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TRANSFER CHARACTERISTICS OF RADIO WAVES PROPAGATED BETWEEN THE IONOSPHERE AND THE EARTH AT VERY LOW FREQUENCIES

by

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and
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U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
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Boulder, Colorado

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For The

Air Force Cambridge Research Center
Air Research and Development Command
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CONTENTS

TRANSFER CHARACTERISTICS OF RADIO WAVES PROPAGATED BETWEEN THE D-REGION AND THE E-REGION OF THE IONOSPHERE AND THE EARTH BASED ON THE QUASI-LONGITUDINAL THEORY

ABSTRACT

The transfer characteristics (amplitude and phase as a function of frequency) of the sky wave propagated between the D-region and the E-region of the ionosphere and the earth have been evaluated at low and very low frequencies by the geometrical-optical theory employing the quasi-longitudinal approximation of the ionosphere reflection coefficients. Distances, d/j, up to 1000 statute miles are considered and multiple hops or time-modes (j = 1, 2, 3, ...) are evaluated for a vertical electric dipole source. The effects of the electron density, collision frequency, intensity of the earth's magnetic field and the geometrical parameters are illustrated. The effect of the vertical lapse of the permittivity of the earth's atmosphere is introduced into the computation.

Introduction

A theory of geometrical-optical "ray-paths" has been developed to represent the propagation of radio waves between the earth and the ionosphere. The "ray-path" concept, implying infinite frequency, $f = \infty$, simplifies the physical picture of the propagation mechanism, Figs. 1, 2, 3, however, the numerical details of evaluating the field of the propagated wave remain quite involved. These numerical details are investigated in this paper for the particular case of propagation between the D-region and the E-region of the ionosphere and the earth. The formulation of the rigorous geometrical optics presented by Bremmer[1] is followed

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[1] H. Bremmer, "Terrestrial Radio Waves - Theory of Propagation," Elsenier Pub. Co., Inc., New York, N. Y., 1949.

with a few ad hoc refinements in detail.

The theory of propagation of radio wave pulses or transients[2] has emphasized the importance of a precise determination of the transfer characteristic of the propagation medium, i.e., the description of the amplitude and phase of the continuous wave as a function of frequency, which task is the object of this paper.

The source of the radiation is assumed to be vertical electric polarization, although vertical magnetic components, Fig. 3, arise as a result of the ionosphere reflection process. The local reflection coefficients of the ionosphere are evaluated by the quasi-longitudinal[3] approximation. This confines the argument of this paper to frequencies in the neighborhood of 10 kilocycles, and a moderately wide range of frequencies about 10 kilocycles were evaluated (ω/ω_r = 0.01 to 5). The local ground reflection coefficients have been determined by the Fresnel approximation. This confines the argument of this paper to distances[4], d/j up to 1000 statute miles from the source. Distances, d/j, in the neighborhood of 1200 statute miles require corrections for diffraction and convergence, which

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2 J. R. Johler and L. C. Walters, "Transmission of a Ground Wave Pulse Around a Finitely Conducting Spherical Earth," National Bureau of Standards Report No. 5566, April 17, 1958.

3 K. G. Budden, "The Reflection of Very Low Frequency Radio Waves at the Surface of a Sharply Bounded Ionosphere with Superimposed Magnetic Field," Phil. Mag. 42, 7 Series. LXXXV, 1951, pp. 833-850.

4 j = 1, 2, 3..., is an integer denoting the order of the time-modes or "hops" to and fro between the earth and the ionosphere. Thus d/j = 1000 miles, for j = 2, d = 2000 miles.

problems are beyond the scope of this paper.[†]

The first, second, third and fourth time modes or "hops" are evaluated in considerable detail in this paper. The effect of the vertical lapse of the permittivity of the earth's atmosphere is considered by introducing into the computation the special geometrical parameters of the Norton[5] type 301 atmosphere. These parameters have been determined by ray tracing techniques and Norton's results are presented in Table 16.

Theory

A vertically polarized Hertzian-type dipole oscillator source, s, is situated on the surface of the earth, Fig. 1. The oscillation is continuous, (undamped) and varies harmonically in time at each frequency under consideration. The vertical electric field strength, $E(\omega, d)$, developed at a point, 0, Fig. 1, on the surface of the earth is determined at various frequencies ω and distances, d.

Physically, the sky-wave is characterized by time modes or "hops" which are clearly indicated in the geometrical-optical theory by the sum:

$$E(\omega, d) = \sum_{j=0}^{n} E_j(\omega, d). \qquad (1)$$

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† For convergence and diffraction corrections see: J.R. Wait, "Diffractive Corrections to the Geometrical Optics of Low Frequency Propagation," NBS Report No. 5572, June 2, 1958. See also: J.R. Wait and A.M. Conda, "Pattern of An Antenna on a Curved Lossy Surface," NBS Report No. 5562, Feb. 15, 1958.

5 K. A. Norton, "Transmission Loss in Radio Propagation," NBS Report No. 5092, 25 July 1957. See also: B. R. Bean and G. Thayer, "A Model Radio Refractivity Atmosphere," NBS Report No. 5576, June 1958.

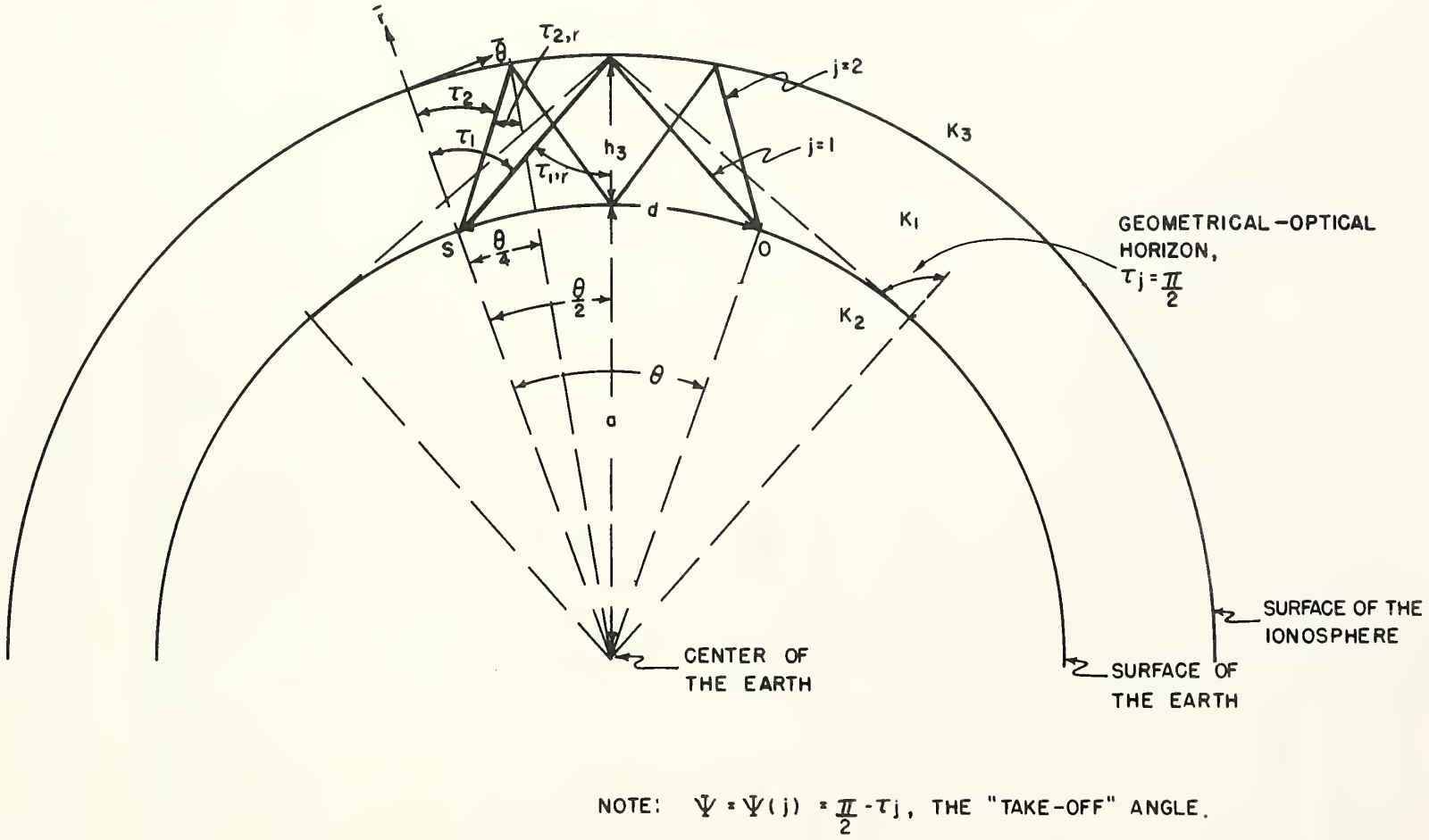

Fig. 1 - Coordinate system illustrating the geometry of the optical ray theory of the propagation of radio waves between the earth and the ionosphere from a source, s, to an observer, o.

The index, j = 1, 2, 3 . . . , denotes the order of the time-modes or "hops" to and fro between the earth and the ionosphere, Figs. 1, 2, 3. Note that the time-mode, $E_o(\omega/d)$, j = 0, represents the ground wave[6]. This paper is primarily concerned with the calculation of the individual sky-wave time-modes, $E_j(\omega, d)$, j = 1, 2, 3 . . . . Such a time-mode can be represented as follows:

$$E_j(\omega, d) = \frac{i\omega d}{D_j} C \exp(i\omega t'_j)(\sin^2 \tau_j) \propto_j F_j C_j. \quad (2)$$

$$C = \frac{2 I_o \ell a^2}{4\pi\kappa d^3} = \frac{2(10^{-7})}{d}, \quad (3)$$

where, for purposes of this paper, the dipole momentum is assigned a value of unity,

$$I_o \ell = 1 \text{ ampere-meter.}$$

The local time for the ground wave, t'_o, is,

$$t'_o = t - a, \quad (4)$$

$$a = \frac{\eta_1 d}{c}. \quad (5)$$

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6 J. R. Johler, W. J. Kellar and L. C. Walters, "Phase of the Low Radio Frequency Ground Wave," National Bureau of Standards Circular 573, 14 March 1956.

Similarly, the local sky-wave time, t'_j (j = 1, 2, 3, . . .) is,

$$t'_j = t - \widehat{a}_j \tag{6}$$

$$\widehat{a}_j = \frac{\eta_1 \widehat{D}_j}{c} \ . \tag{7}$$

The local time is an important consideration in the transient problem since, $t'_o = 0$, is the earliest time at which the first precursor of a ground wave pulse signal could be observed. Similarily, $t'_j = 0$, is the earliest time a jth sky wave time-mode pulse signal could be observed, since the signal could not be expected to travel faster than the speed of light over the ray path. Thus, the parameter, $\widehat{a}_j$ - a, has been computed, Table 123, as the "sky wave delay," i. e., the time delay introduced into the sky-wave propagation by the greater physical length, $\widehat{D}_j$, of the sky-wave ray as compared with the physical length, d, Fig. 1, of the ground wave "ray." Thus, the first signal to arrive could arrive no sooner than a signal travelling around the curvature of the earth, d, at the speed of light.

The physical length of the ray, $\widehat{D}_j$, Fig. 1, is,

$$\widehat{D}_j = 2j\left[(a + h_3)\cos\tau_{j,r} - a\cos\tau_j\right] \ , \tag{8}$$

Thus, the radius of the earth, a, the height of the ionosphere reflecting region, h_3, the angle of incidence on the ionosphere, $\tau_{j,r}$, and the angle of incidence of the ground reflection, τ_j,

determine the geometry of the "ray path" if the vertical lapse of the permittivity of the atmosphere is neglected.

The effect of bending of rays by the atmosphere, as a result of this vertical lapse, Fig. 2, has been introduced by a modification of the parameters, $\tau_{j,r}$ and τ_j, Table 16. The rigorous geometrical-optics can account for such bending at grazing incidence on the earth only ($\tau_j = \frac{\pi}{2}, \Psi = 0$), and a value of effective earth radius factor, $\alpha' = 0.75$, typifies an average atmosphere. This factor cannot remain constant as τ_j decreases and at vertical incidence should approach unity, $\alpha' = 1$. A value for α' between the limits 0.75 and 1 can be determined from Norton's data, Table 16. As a consequence of these considerations, the radian distance, θ, Fig. 1, for purposes of Tables 119-123, has been adjusted by a factor α'_1,

$$\theta = \frac{\alpha'_1 \, d}{\alpha \, a} \tag{9}$$

$$\sin \tau'_j = \frac{1}{\Delta'_j} \, (a + h_3) \sin \theta'/2j \tag{10}$$

$$\Delta'_j = \left[2a \, (a+h_3) \, (1 - \cos \theta'/2j) + {h_3}^2 \right]^{\frac{1}{2}} \tag{11}$$

and the value of α'_1 could be deduced from Table 16, but can be represented to a close approximation by,

$$\alpha'_1 \sim 1 - (1 - \alpha') \sin \tau'_1 \tag{12}$$

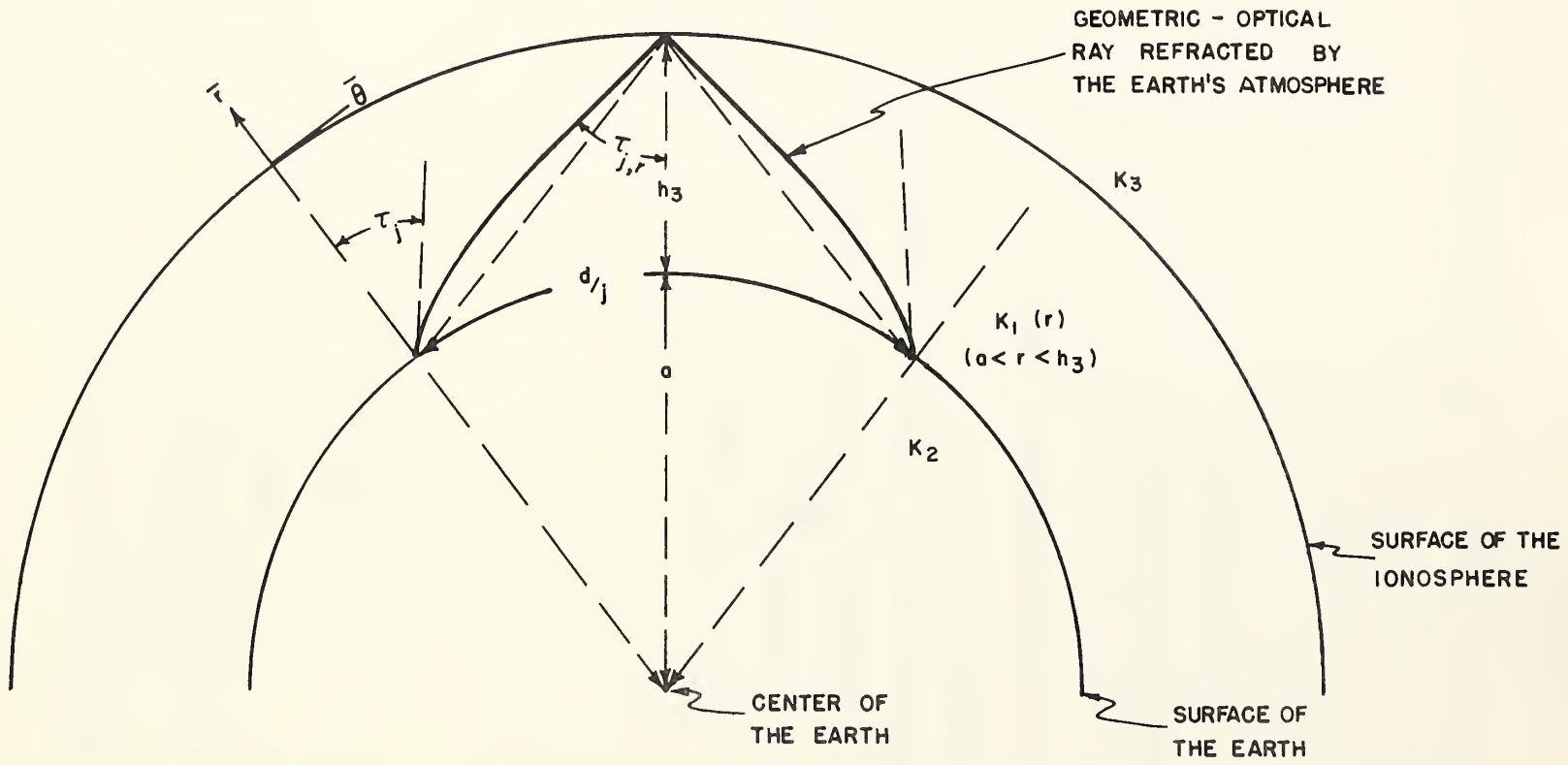

Fig. 2 - Refraction of geometrical-optical rays by the vertical lapse of the permittivity of the earth's atmosphere illustrating the resultant modification of the geometric parameter, τ_j, (incident angle on the surface of the earth) and $\tau_{j,r}$ (incident angle on the ionosphere).

$$\sin \tau_{j,r} = \frac{1}{\Delta_j} a \sin \frac{\theta}{2j} \tag{13}$$

$$\cos \tau_{j,r} = \frac{1}{\Delta_j}\left[a\,(1 - \cos \theta/2j) + h_3 \right] \tag{14}$$

$$\sin \tau_j = \frac{1}{\Delta_j} (a + h_3) \cos \theta/2j \tag{15}$$

$$\cos \tau_j = \frac{1}{\Delta_j}\left[a\,(\cos \theta/2j - 1) + h_3 \cos \theta/2j \right] \tag{16}$$

$$\Delta_j = \left[2a\,(a + h_3)\,(1 - \cos \theta/2j) + h_3^{\,2} \right]^{\frac{1}{2}} \tag{17}$$

It should be noted in passing that the validity of ray tracing at low and very low frequencies should be further investigated when the thickness of the earth's atmosphere is of the order of magnitude of a wavelength or less. This problem is beyond the scope of this paper.

The factor $\sin^2 \tau_j$ (2) accounts for the observer and source dipole radiation patterns. The factor, α_j accounts for the convergence or divergence of the rays as a result of reflection from the ionosphere and the earth respectively,

$$\alpha_j = \left[1 + \frac{h_3}{a} \right]\left[\frac{2j \sin \frac{\theta}{2j}}{\sin \theta} \right]^{\frac{1}{2}}\left[\frac{a\,(1 - \cos \frac{\theta}{2j}) + h_3}{(a + h_3) \cos \frac{\theta}{2j} - a} \right]^{\frac{1}{2}} . \tag{18}$$

The factor, F_j, accounts for the presence of the earth at the source and the observer. It is assumed that the ray is not too close to or beyond the geometrical optical horizon. Then the Fresnel approximation of the ground reflection coefficients determines F_j,

$$F_j \sim \left[1 + R_{eT}(\tau_j)\right]\left[1 + R_{eR}(\tau_j)\right]. \tag{19}$$

R_{eT} is the plane reflection coefficient of Fresnel for the vertical electric source at an angle of incidence, τ_j and R_{eR} refers to the observer. The Fresnel electric, R_e, and magnetic, R_m, reflection coefficients are,

$$R_e(\tau_j) = \frac{\frac{k_2^2}{k_1^2}\cos\tau_j - \left[\frac{k_2^2}{k_1^2} - \sin^2\tau_j\right]^{\frac{1}{2}}}{\frac{k_2^2}{k_1^2}\cos\tau_j + \left[\frac{k_2^2}{k_1^2} - \sin^2\tau_j\right]^{\frac{1}{2}}}, \tag{20}$$

$$R_m(\tau_j) = \frac{\cos\tau_j - \left[\frac{k_2^2}{k_1^2} - \sin^2\tau_j\right]^{\frac{1}{2}}}{\cos\tau_j + \left[\frac{k_2^2}{k_1^2} - \sin^2\tau_j\right]^{\frac{1}{2}}}, \tag{21}$$

$$k_1 = \frac{\omega}{c}\,\eta_1$$

$$k_2 = \frac{\omega}{c}\left[\epsilon_2 - i\,\frac{\sigma\mu_o c^2}{\omega}\right]^{\frac{1}{2}} \tag{22}$$

The effective reflection coefficients, C_j, of primary interest in this paper, can be determined as follows[7]:

$$C_j = \frac{1}{j!\,R_e}\,\frac{d^j}{dx^j}\left[\frac{1 + A_1 x}{1 + A_2 x + A_3 x^2}\right]_{x=0}, \tag{23}$$

where,

$$A_1 = R_m T_{mm} \tag{24}$$

$$A_2 = R_e T_{ee} - R_m T_{mm} \tag{25}$$

$$A_3 = R_e R_m \left[T_{ee} T_{mm} + T_{em} T_{me}\right]. \tag{26}$$

The T's refer to the ionosphere reflection coefficients, with subscripts e for the electric vector in the plane of incidence of the ray and m for the magnetic vector in the plane of incidence of the ray and where the first subscript refers to the incident ray and the second subscript refers to the reflected ray. Thus, for example, T_{em} refers to the complex sky wave reflection coefficient, $T_{em} = |T_{em}| \exp\left[i \operatorname{Arg} T_{em}\right]$ with electric vector of incident ray

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[7] op. cit. 1. p. 296.

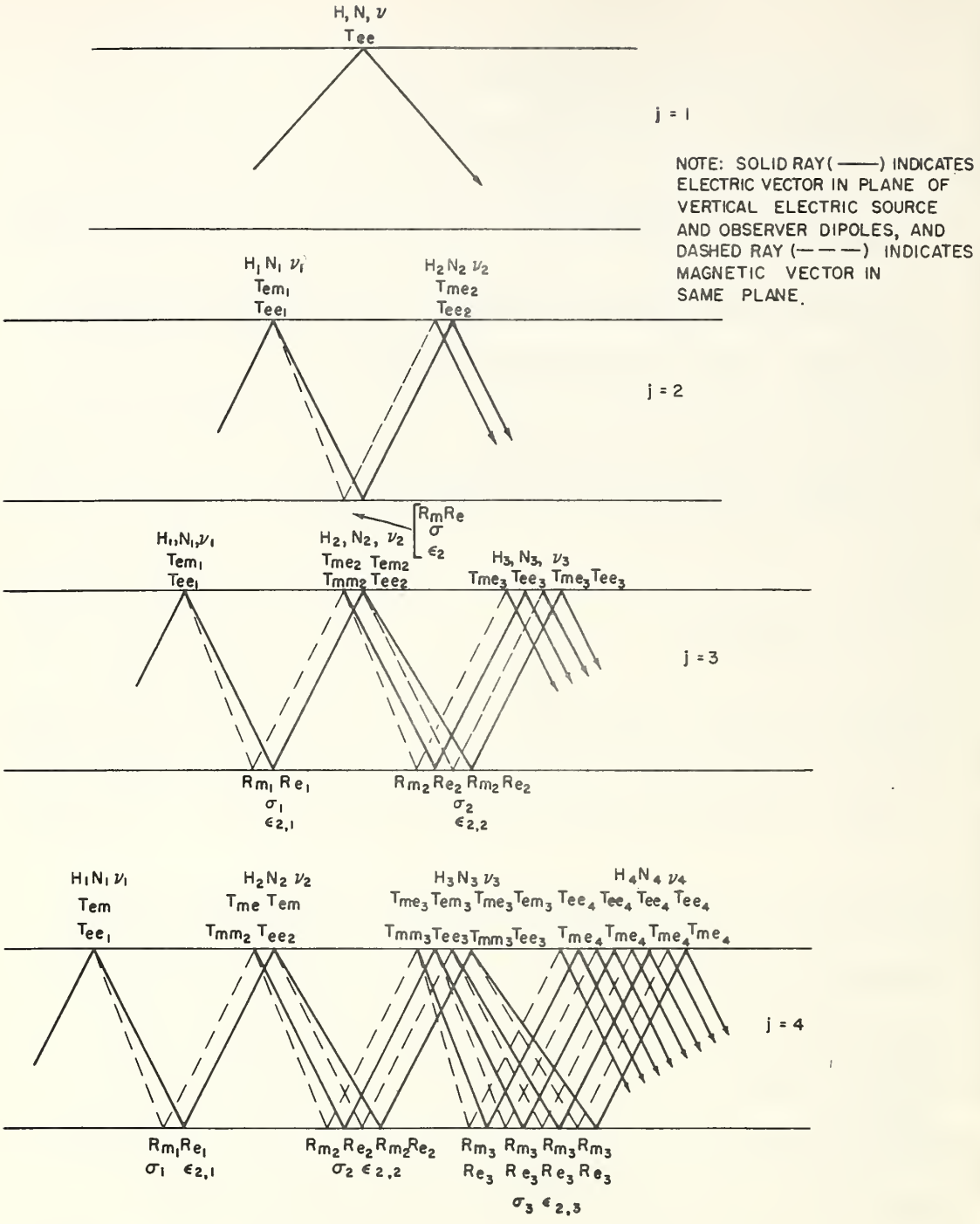

Fig. 3 - Geometrical-optical ray propagation mechanism illustrating the splitting of rays into vertical electric and vertical magnetic components applicable to vertical electric source, s, and observer, o, dipoles.

in plane of incidence and magnetic vector of reflected ray in plane of incidence. The effective reflection coefficients (2), C_j, are then, Fig. 4.,

$$C_1 = C_1(\tau_1) = T_{ee},$$

$$C_2 = C_2(\tau_2) = T_{ee_1} T_{ee_2} R_{e_1} + R_{m_1} T_{em_1} T_{me_2},$$

$$C_3 = C_3(\tau_3) = R_{e_2} R_{m_1} T_{ee_3} T_{em_1} T_{me_2} + R_{e_1} R_{m_2} T_{ee_1} T_{em_2} T_{me_3}$$

$$+ R_{e_1} R_{e_2} T_{ee_1} T_{ee_2} T_{ee_3} + R_{m_1} R_{m_2} T_{mm_2} T_{em_1} T_{me_3},$$

$$C_4 = C_4(\tau_4) = R_{e_1} R_{e_2} R_{e_3} T_{ee_4} T_{ee_3} T_{ee_2} T_{ee_1}$$

$$+ R_{e_1} R_{e_2} R_{m_3} T_{me_4} T_{em_3} T_{ee_2} T_{ee_1}$$
$$+ R_{e_1} R_{m_2} R_{e_3} T_{ee_4} T_{me_3} T_{em_2} T_{ee_1}$$
$$+ R_{e_1} R_{m_2} R_{m_3} T_{me_4} T_{mm_3} T_{em_2} T_{ee_1}$$
$$+ R_{m_1} R_{e_2} R_{e_3} T_{ee_4} T_{ee_3} T_{me_2} T_{em_1}$$
$$+ R_{m_1} R_{e_2} R_{m_3} T_{me_4} T_{em_3} T_{me_2} T_{em_1}$$
$$+ R_{m_1} R_{m_2} R_{e_3} T_{ee_4} T_{me_3} T_{mm_2} T_{em_1}$$
$$+ R_{m_1} R_{m_2} R_{m_3} T_{me_4} T_{mm_3} T_{mm_2} T_{em_1},$$

$$\ldots \quad . \qquad (27)$$

The subscript for each T or R refers to the particular local conditions (constants σ, ϵ_2, N, ν, H) of the ionosphere or ground, Fig. 3. Thus, one of the most important advantages to the geometrical-optical theory is the convenience with which local

conditions of a heterogeneous earth and ionosphere can be considered. For the particular case of the homogeneous earth and ionosphere, the coefficients, C_j, reduce as follows:

$$C_1 = C_1(\tau_1) = T_{ee},$$

$$C_2 = C_2(\tau_2) = T_{ee}^2 R_e + R_m T_{em} T_{me},$$

$$C_3 = C_3(\tau_3) = 2 R_e R_m T_{ee} T_{em} T_{me} + R_e^2 T_{ee}^2 + R_m^2 T_{mm} T_{em} T_{me},$$

$$C_4 = C_4(\tau_4) = R_e R_m^2 T_{em}^2 T_{me}^2 + 3 R_e^2 R_m T_{ee}^2 T_{em} T_{me} + 2 R_e R_m^2 T_{ee} T_{mm} T_{em} T_{me} + R_m^3 T_{mm}^2 T_{em} T_{me} + R_e^3 T_{ee}^4,$$

$$\ldots \quad . \tag{28}$$

These formulas can be derived intuitively, Fig. 3, by a consideration of each local reflection between the earth and the ionosphere and a concomitant splitting of each ray into electric and magnetic components noting that the source radiates only vertical polarization (electric vector in the plane of incidence), and the observer can only receive vertical polarization.

Irrespective of the order of j, the effective reflection coefficient, C_j, obviously is dependent upon a complicated

combination of only four basic ionosphere reflection coefficients, T_{ee}, T_{em}, T_{me} and T_{mm}, the evaluation of which is the most difficult aspect of the geometrical-optical theory.

The argument of this paper will be confined to the region about 10 kilocycles, hence, the numerical details of evaluating the ionosphere reflection coefficients can be simplified by the quasi-longitudinal approximation formulated by Budden[8]. The wave number, k_3, of the ionosphere is represented in dual form,

$$\begin{aligned} k_3 &= \frac{\omega}{c}\eta_o \\ &= \frac{\omega}{c}\eta_e \end{aligned} \tag{29}$$

where two waves are propagated upward with complex index of refraction η_o for the ordinary wave and η_e for the extraordinary wave. In terms of the two indexes, η_o and η_e, and the corresponding transmitted wave normals determined by Snell's law,

$$\sin \tau_{j,r} = \eta_{\substack{o \\ e}} \sin \Theta_{\substack{o \\ e}}, \tag{30}$$

the four basic reflection coefficients can be determined,

$$\begin{aligned} T_{ee} = \Delta_b^{-1}\Big\{&(\eta_o + \eta_e)(\cos^2 \tau_{j,r} - \cos\Theta_o \cos\Theta_e) \\ &+ (\eta_o \eta_e - 1)(\cos\Theta_o + \cos\Theta_e)\cos\tau_{j,r}\Big\} \end{aligned} \tag{31}$$

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[8] K. G. Budden, op. cit. 3.

$$T_{mm} = \Delta_b^{-1} \left\{ (\eta_o + \eta_e) (\cos^2 T_{j,r} - \cos \Theta_o \cos \Theta_e) \right.$$

$$\left. - (\eta_o \eta_e - 1) (\cos \Theta_o + \cos \Theta_e) \cos \tau_{j,r} \right\} \quad (32)$$

$$T_{em} = \Delta_b^{-1} \left\{ 2i \cos \tau_{j,r} (\eta_o \cos \Theta_o - \eta_e \cos \Theta_e) \right\} \quad (33)$$

$$T_{me} = \Delta_b^{-1} \left\{ 2i \cos \tau_{j,r} (\eta_o \cos \Theta_e - \eta_e \cos \Theta_o) \right\} \quad (34)$$

where

$$\Delta_b = (\eta_o + \eta_e) (\cos^2 \tau_{j,r} + \cos \Theta_o \cos \Theta_e) + (\eta_o \eta_e + 1)(\cos \Theta_o$$

$$+ \cos \Theta_e) \cos \tau_{j,r} . \quad (35)$$

The complex index of refraction $\eta_{\substack{o \\ e}}$ is calculated by the quasi-longitudinal approximation,†

$$\eta_{\substack{o \\ e}}^2 = 1 - i \frac{\omega_r}{\omega} \exp \mp i \phi_1 \quad (36)$$

$$\tan \phi_1 = \frac{\omega_{\mathcal{L}}}{\nu} \quad (37)$$

$$\frac{\omega_r}{\omega} = \frac{\omega_{cr}^2}{\omega \sqrt{\nu^2 + \omega_{\mathcal{L}}^2}} \quad (38)$$

$$\omega_{cr}^2 = \frac{Ne^2}{\kappa m} \quad (39)$$

$$\omega_{\mathcal{L}} = \frac{\mu_o H}{m} , \quad (40)$$

where ω_{cr} is the critical or plasma frequency of the electrons and $\omega_{\mathcal{L}}$ is the gyro frequency.

† The value of η should be selected in the fourth quadrant of the complex plane, i.e., Im η is negative.

Computations

The ionosphere reflection coefficients, T_{ee}, T_{mm}, T_{em}, T_{me} were calculated for various incident angles, $\tau_{j,r}$, earth's magnetic field intensity parameter, ϕ_1, and frequencies, ω/ω_r, Tables 1 to 15. The ground reflection coefficients, $R_e(\tau_j)$, $R_m(\tau_j)$ and the ionosphere reflection coefficients, T, were calculated at the various distances, d/j, for the type 301 atmosphere constants at various frequencies, ω/ω_r and f, Tables 16 - 58. The corresponding effective reflection coefficients, C_j, (j = 1, 2, 3, 4) were then determined, Tables 59 - 118. The transfer characteristic of the sky wave $E_j(\omega, d)$, was then determined in the frequency range 1 kc to 100 kc, Tables 119 to 122. The corresponding sky wave delays $\widehat{a}_j$ - a and the convergence coefficient α_j are presented in Table 123.

A "cross section" of the data is presented graphically, Figs. 5 - 23 . It is quite possible with the aid of Tables 59 - 118 or Figs. 5 - 23 and eq. 2. to determine field strengths, $E_j(\omega, d)$, for a wide variety of examples, and construct transfer characteristics similar to those presented in Tables 119 - 122, or Figs. 20 to 23. Since, however, the form of the function is of primary interest and the precise variation with distance only of secondary interest in the transient problem, the approximation, eq. 12, was employed to facilitate the computation.

The results of the computation of the reflection coefficients, T,

were checked where possible with previous calculations [9, 10], and reasonable agreement was obtained. Previous calculations of effective reflection coefficient, C_j, were not available.

Conclusions

The simplicity of the quasi-longitudinal approximation permits the calculation of a wide variety of examples in the neighborhood of 10 kilocycles and the transfer characteristic can reasonably be extended over this region. However, the complete description of the D-region and the E-region as a transfer characteristic requires a more rigorous evaluation of the reflection coefficients at the higher frequencies. Yabroff [11] and Bremmer [12] have proposed methods which are rigorous for a sharply bounded ionosphere at the higher frequencies. The effects of "non– sharply" and/or diffusely bounded ionosphere seem to be an appropriate enhancement of the theory at the higher frequencies.

Additional corrections in the vicinity of distances, d/j, of 1200 statute miles or greater to determine the value of the diffracted

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9 K. G. Budden, op. cit. 3.

10 J. R. Wait and L. B. Perry, "Calculations of Ionosphere Reflection Coefficients at Very Low Frequencies," Jour. of Geof. Res. Vol.1. 62, No. 1, March 1957.

11 I. W. Yabroff, "Reflection at a sharply Bounded Ionosphere," proc. I.R.E., Vol. 45, No. 6, June 1957, p. 750-753.

12 H. Bremmer, op. cit. 1.

sky wave are also appropriate to further enhance the range of application of the theory.

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GLOSSARY

E = $E(\omega, d)$, the electric field strength, volts/meter.

j = The order of the time-modes ($j = 1, 2, 3, \ldots$).

ω = The frequency, $\omega = 2\pi f$, radians/second.

d = The distance, meters.

t = The time, seconds.

t' = The local time (4, 5).

t'_j = The local time for jth time-mode (4, 5, 6, 7).

D_j = The ray distance for jth time-mode (8).

a_j = The ray propagation time (5, 7).

η_1 = Index of refraction of air at the surface of the earth. $\eta_1 \sim 1.000338$.

$I_o \ell$ = The dipole momentum, ampere-meters.

κ = The universal constant,

$$\kappa = \frac{\epsilon}{c^2 \mu_o}$$

c = The speed of light. $c \sim 2.997925\ (10^8)$ meters/second. A value of $2.997951\ (10^8)$ is sometimes used.

ϵ = The dielectric constant.
$\epsilon_2 \sim 15$, the dielectric constant of land.

$\epsilon_2 \sim 80$, the dielectric constant of water.

σ = The conductivity, mhos/meter.
$\sigma \sim 0.005$, the conductivity of land.
$\sigma \sim 5$, the conductivity of sea-water.

μ_o = A universal constant, the permeability of space, $\mu_o = 4\pi\ (10^{-7})$.

θ = The effective radian distance along the surface of the earth, Fig. 1, (9).

τ'_j = The ray angle of incidence at the surface of the earth, (10).

τ_j = The effective ray angle of incidence at the surface of the earth, Fig. 1, (15, 16).

$\tau_{j,r}$ = The effective ray angle of incidence at the surface of the ionosphere, Fig. 1, (13, 14).

h_3 = The height of the ionosphere, meters, Fig. 1.

α' = Effective earth radius factor at the surface of the earth for the tangent ray. $\alpha' = 0.75$.

α'_1 = The modified effective earth radius factor for the bending of rays passing through the atmosphere. (12).

t'_o = The ground wave local time (4, 5).

t'_j = The sky-wave local time (6, 7).

$\hat{a}_j - a$ = Sky wave delay. (5, 7).

α_j = The convergence-divergence factor for rays reflecting from the ionosphere and the earth (18).

F_j = The ground attenuation factor for the source and the observer (19).

$R_e(\tau)$ = The vertical electric ground reflection coefficient (20).

$R_m(\tau)$ = The vertical magnetic ground reflection coefficient (21).

k_1 = The wave number of air. (22).

k_2 = The wave number of the earth. (22).

C_j = The effective reflection coefficient for propagation between the earth and the ionosphere (23).

T_{ee} = Ionosphere reflection coefficient for vertical electric vector in plane of incidence for incident ray and vertical electric vector in plane of incidence for reflected ray. (31).

T_{em} = Ionosphere reflection coefficient for vertical electric vector in plane of incidence of incident ray and vertical magnetic vector in plane of incidence of reflected ray (33).

T_{me} = Ionosphere reflection coefficient for vertical magnetic vector in plane of incidence of incident ray and vertical magnetic vector in plane of incidence of reflected ray (34).

T_{mm} = Ionosphere reflection coefficient for vertical magnetic vector in plane of incidence of incident ray and vertical magnetic vector in plane of incidence of reflected ray (32).

k_3 = The wave number of the ionosphere (29).

Ψ = The "take-off" angle for Norton's type 301 atmosphere ray tracing techniques.

a = The radius of the earth, meters. $a \sim 6.36739\ (10^6)$.

η_o = The complex index of refraction for the ordinary wave in the ionosphere (29) (36).

η_e = The complex index of refraction for the extraordinary wave in the ionosphere. (29 (36).

Θ_o = The direction of the wave normal of the ordinary wave in the ionosphere (30).

Θ_e = The direction of the wave normal of the extraordinary wave in the ionosphere (30).

ϕ_1 = The earth's magnetic field parameter (37).

ω_r = A frequency parameter (38).

ω_{cr} = The critical or plasma frequency of the electrons (39). $\omega_{cr}^2 = 3.1824858(10^9)N$

$\omega_{\mathcal{L}}$ = The gyro frequency (40) $\omega_{\mathcal{L}} = 1.75888(10^7)H_m$

H = The earth's magnetic field intensity. $H \sim 0.535$ gauss.

N = The number of electrons per cubic centimeter.

ν = The collision frequency.

e/m = A universal constant, the ratio of charge to mass of the electron.

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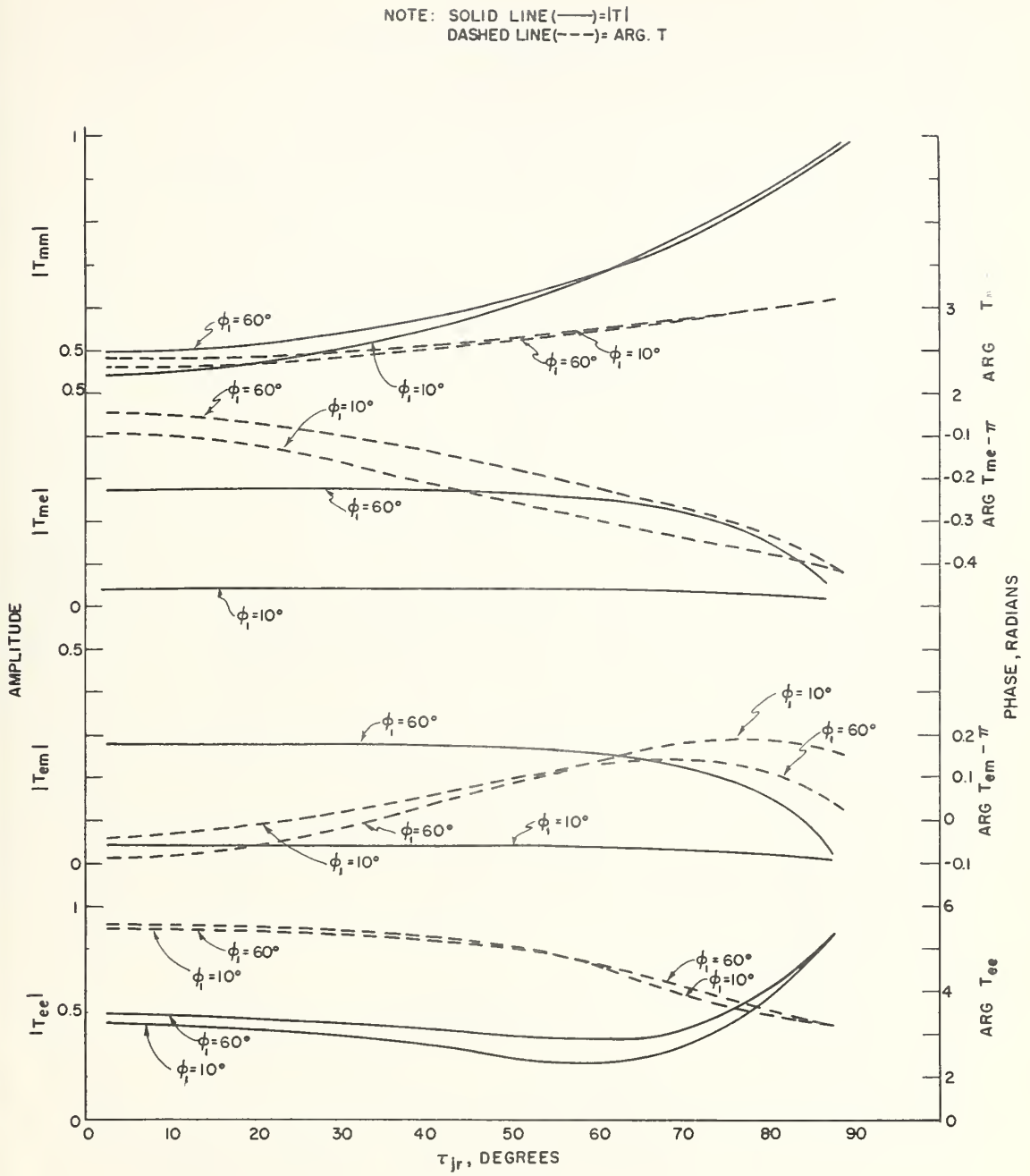


Fig. 4 - Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation for various incident angles, $\tau_{j,r}$ and earth's magnetic field parameter, ϕ_1.

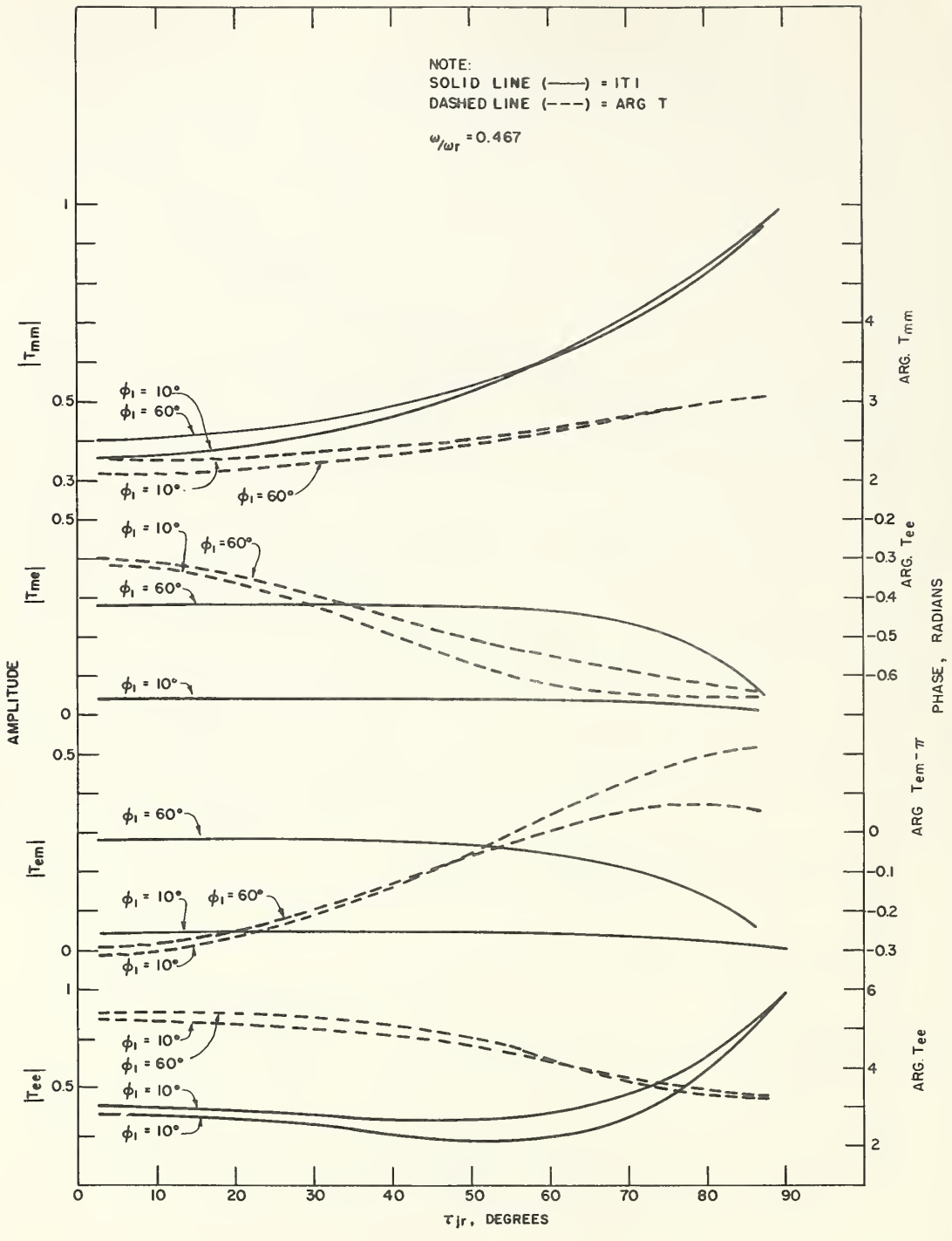
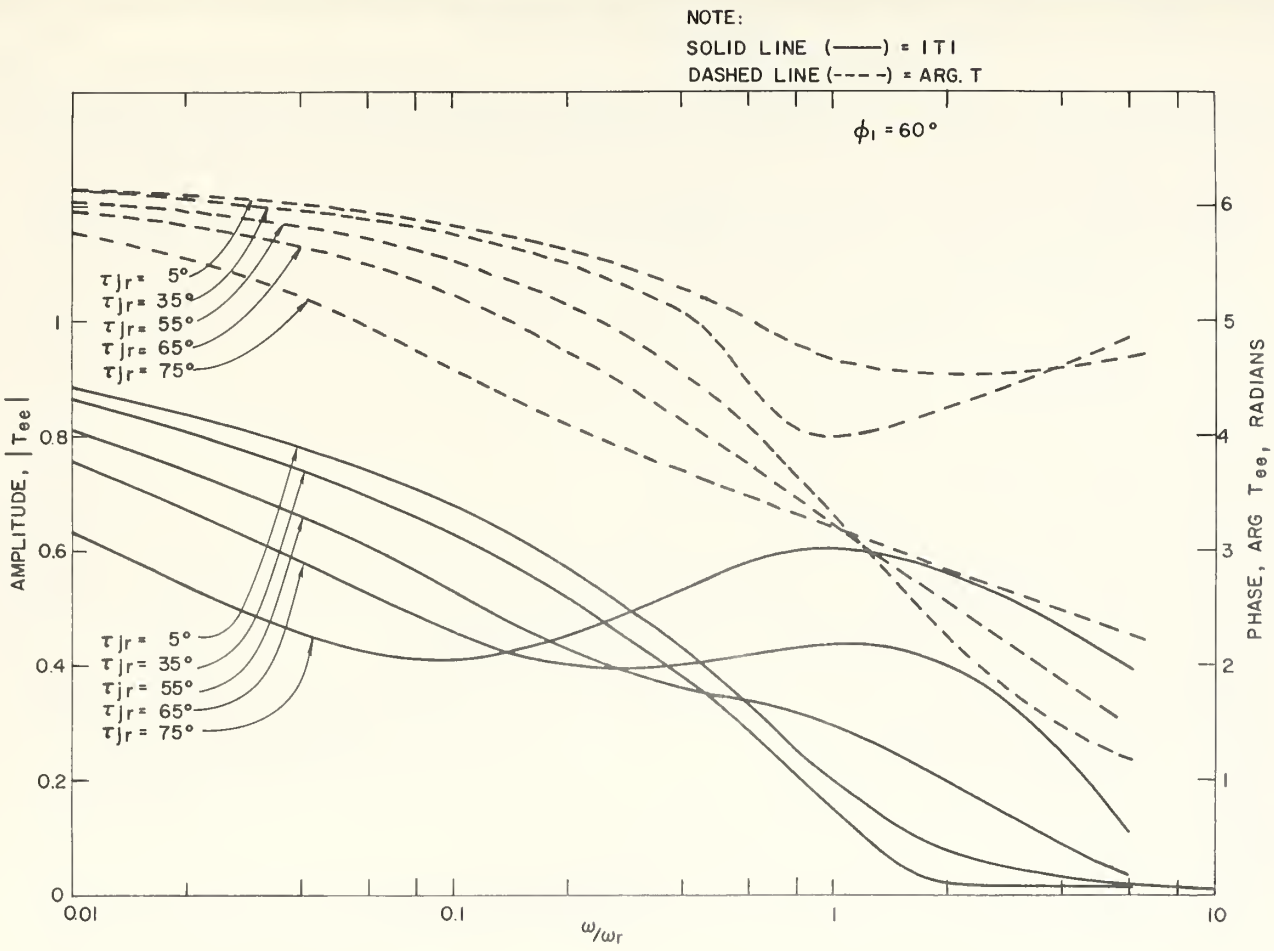


Fig. 5 - Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation for various incident angles, $\tau_{j,r}$ and earth's magnetic field parameter, ϕ_1.



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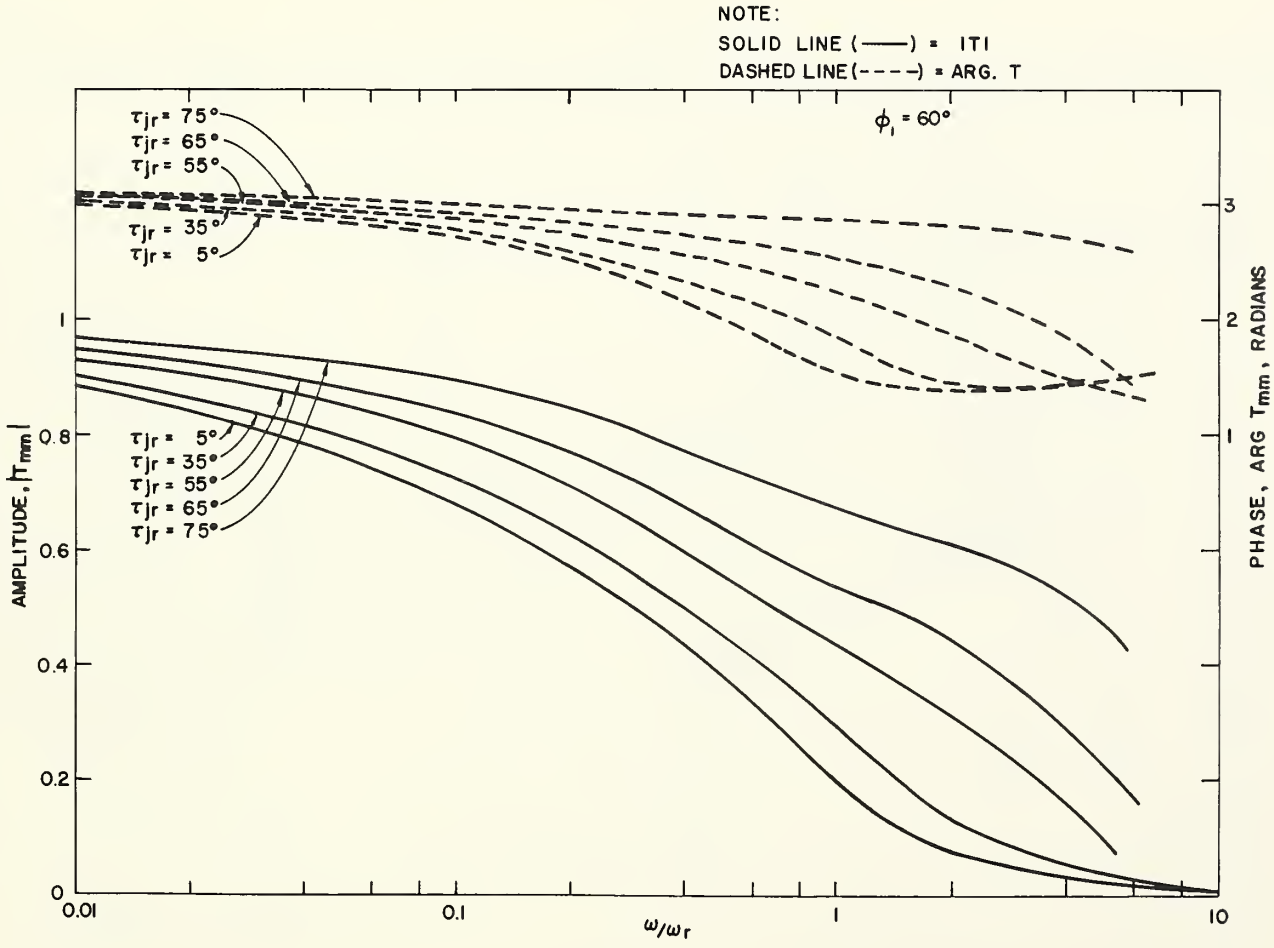

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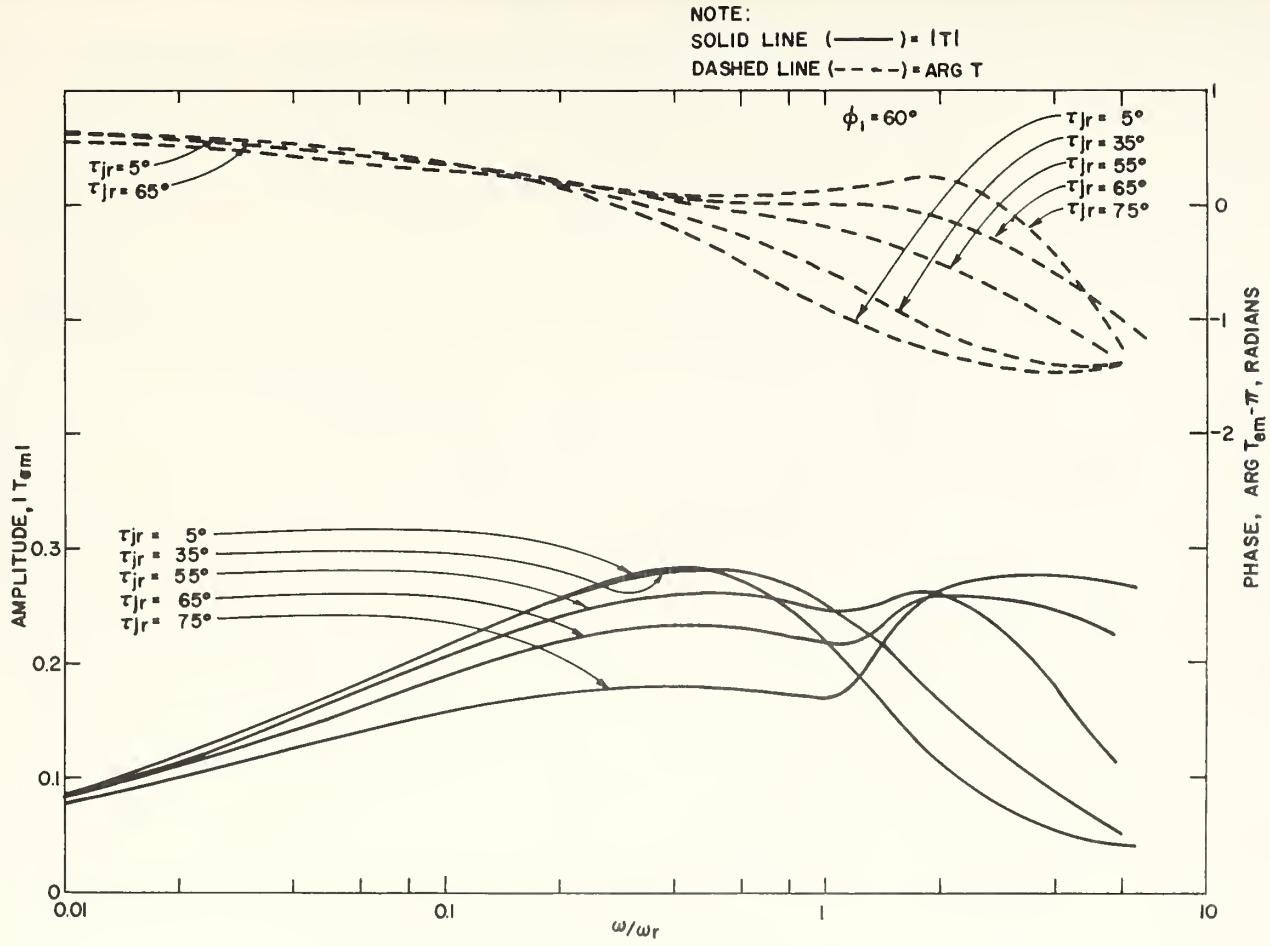


Fig. 8 - Ionosphere reflection coefficients (amplitude, $|T_{em}|$, and phase, Arg T_{em}) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r and incident angles, $\tau_{j,r}$.

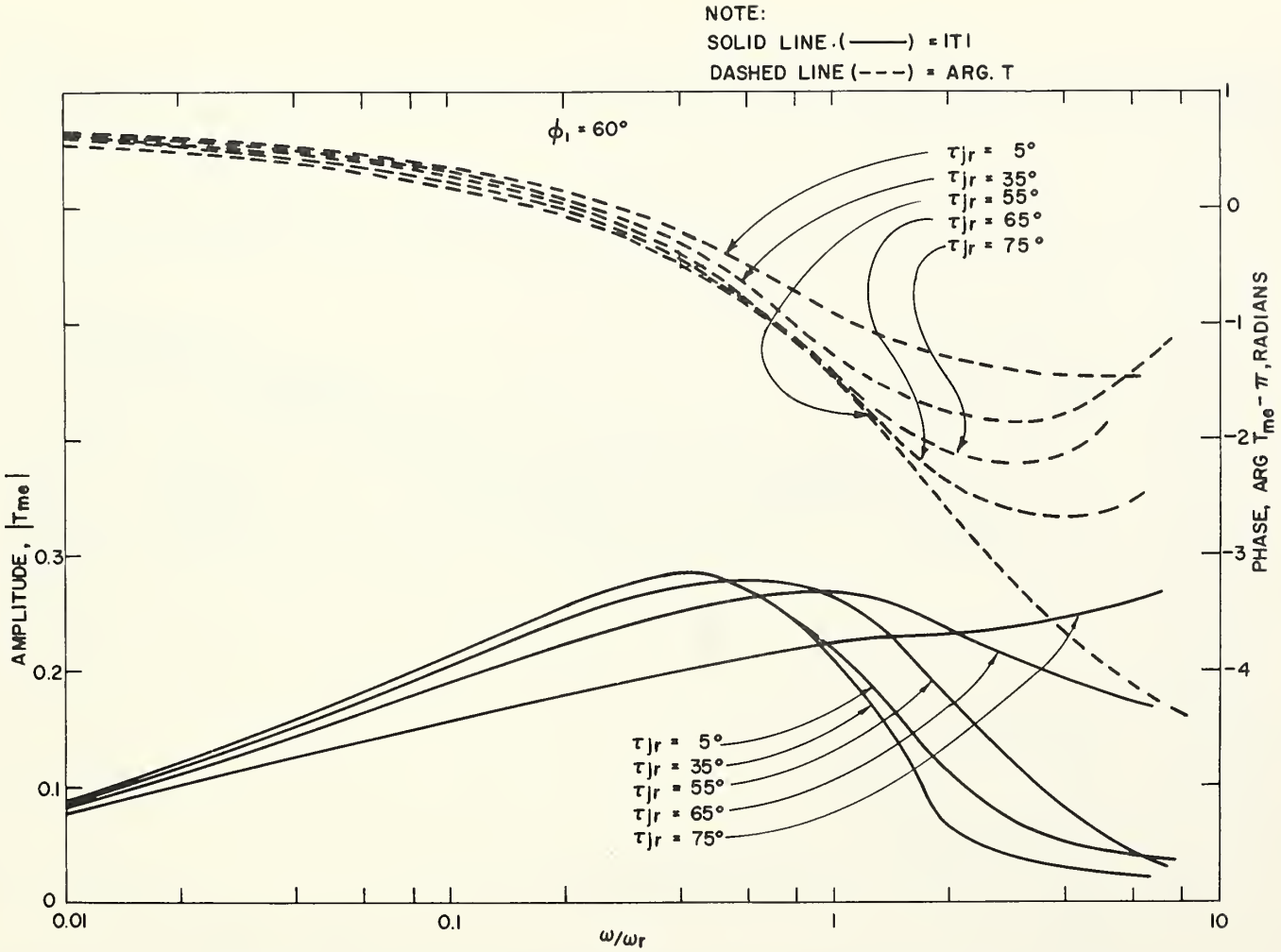


Fig. 9 - Ionosphere reflection coefficients (amplitude, $|T_{me}|$, and phase, Arg T_{me}) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r and incident angles, $\tau_{j,r}$.

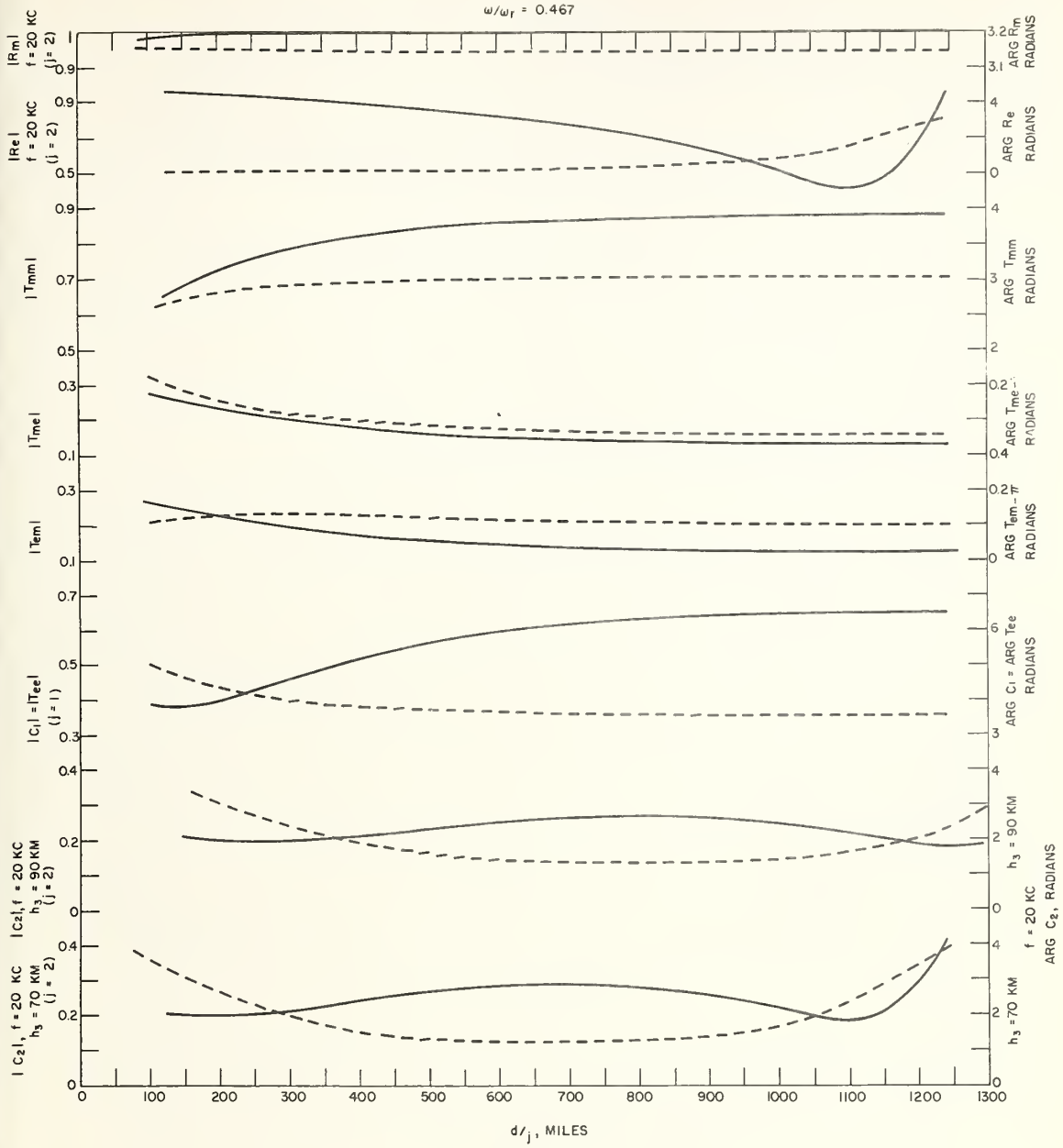


Fig. 10 - Ionosphere (quasi-longitudinal) and ground (Fresnel) reflection coefficients (amplitude, $|T|$, $|R|$, and phase, Arg T, Arg R) and effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) and the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

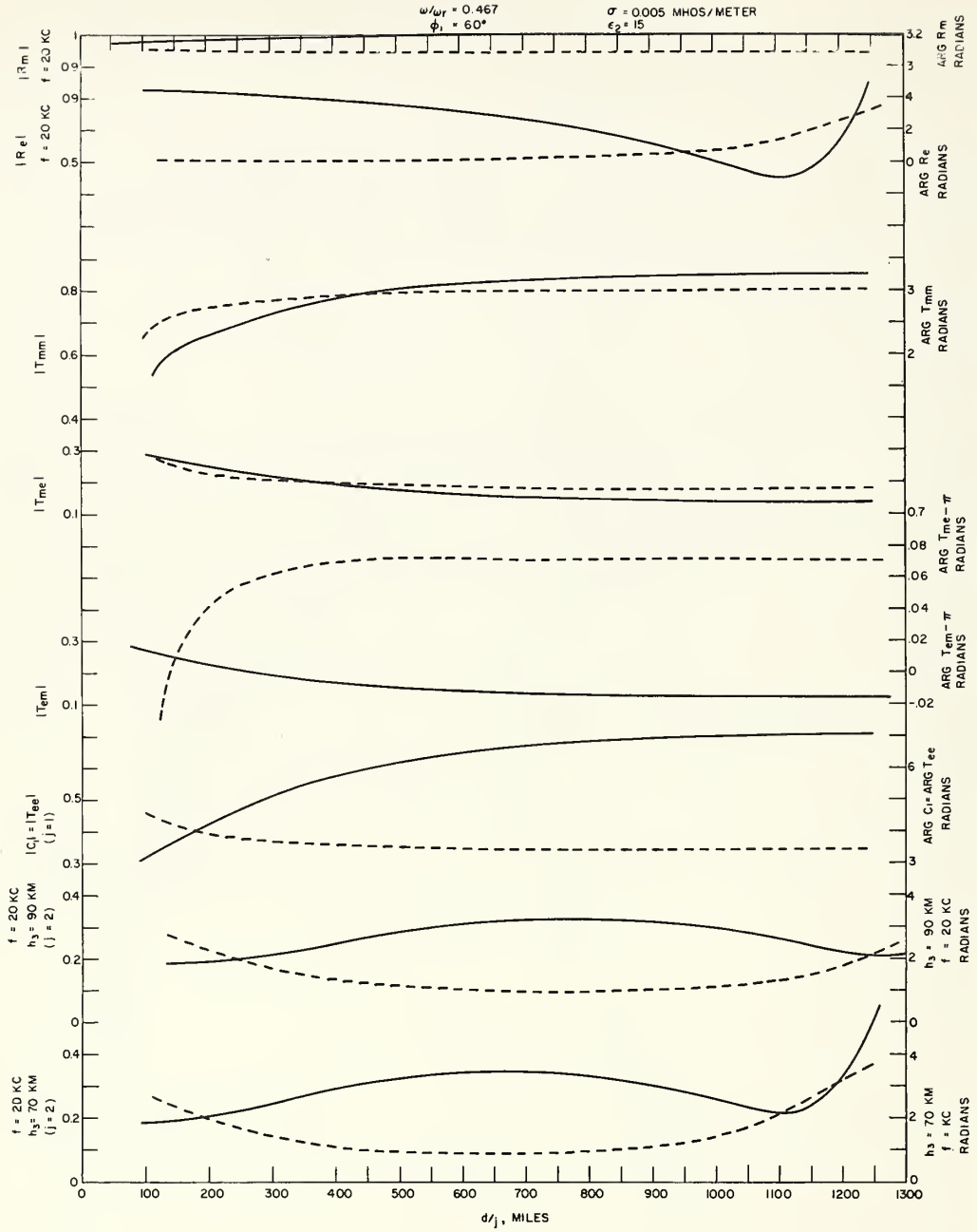
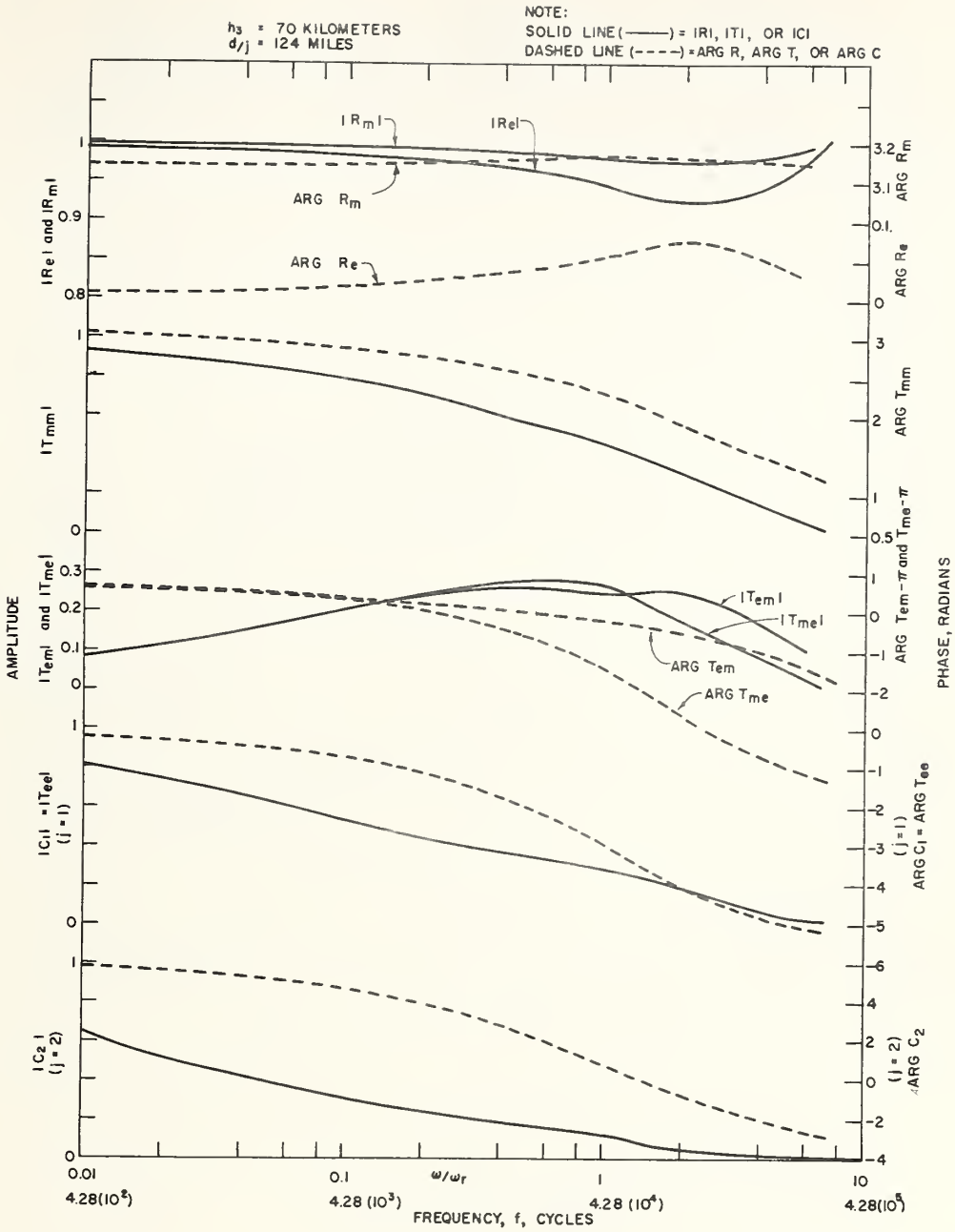


Fig. 11- Ionosphere (quasi-longitudinal) and ground (Fresnel) reflection coefficients (amplitude, $|T|$, $|R|$, and phase, Arg T, Arg R) and effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) and the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.



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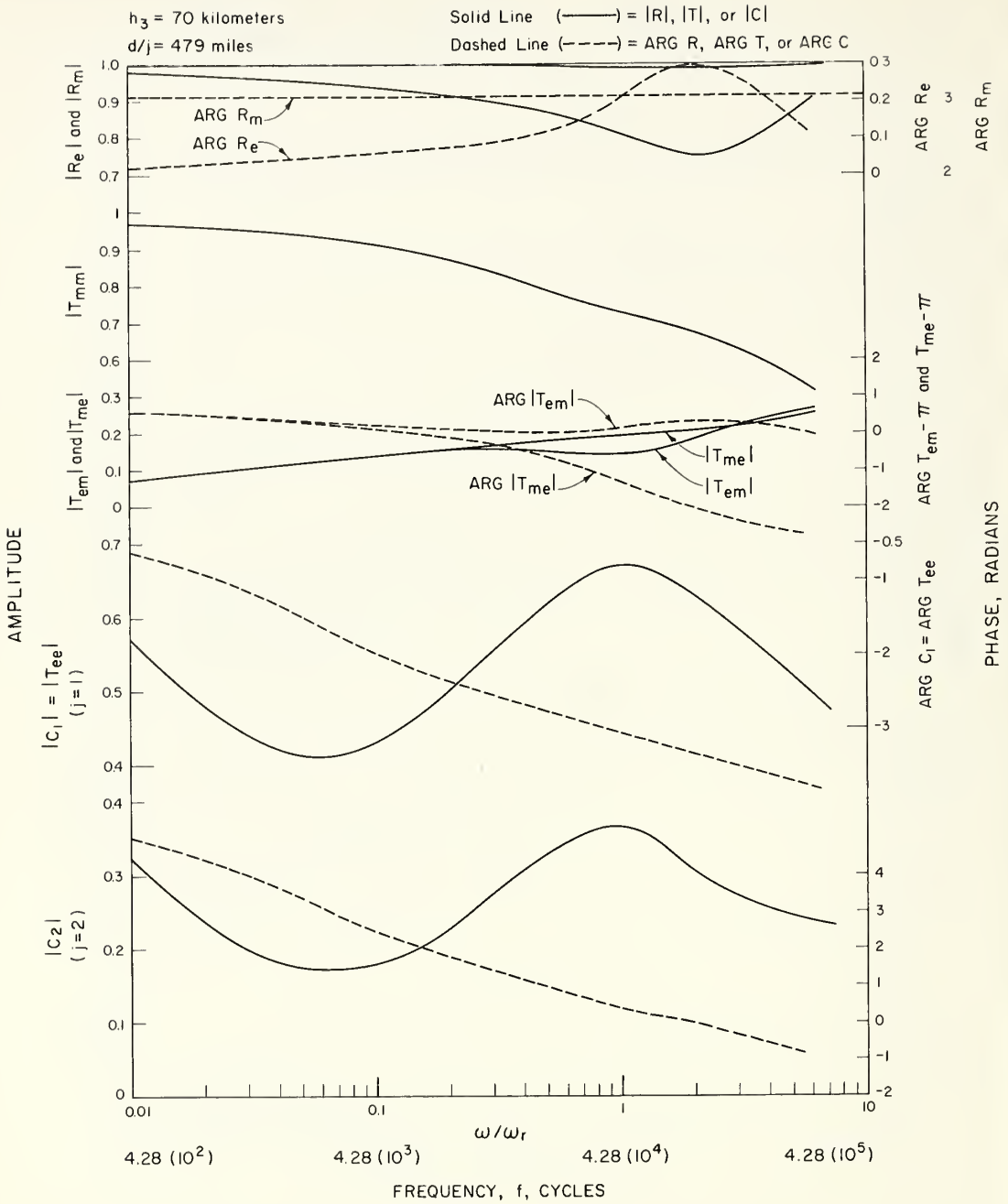


Fig. 13 - Ionosphere (quasi-longitudinal) and ground (Fresnel) reflection coefficients (amplitude, $|T|$, $|R|$, and phase, Arg T, Arg R) and effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers and the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

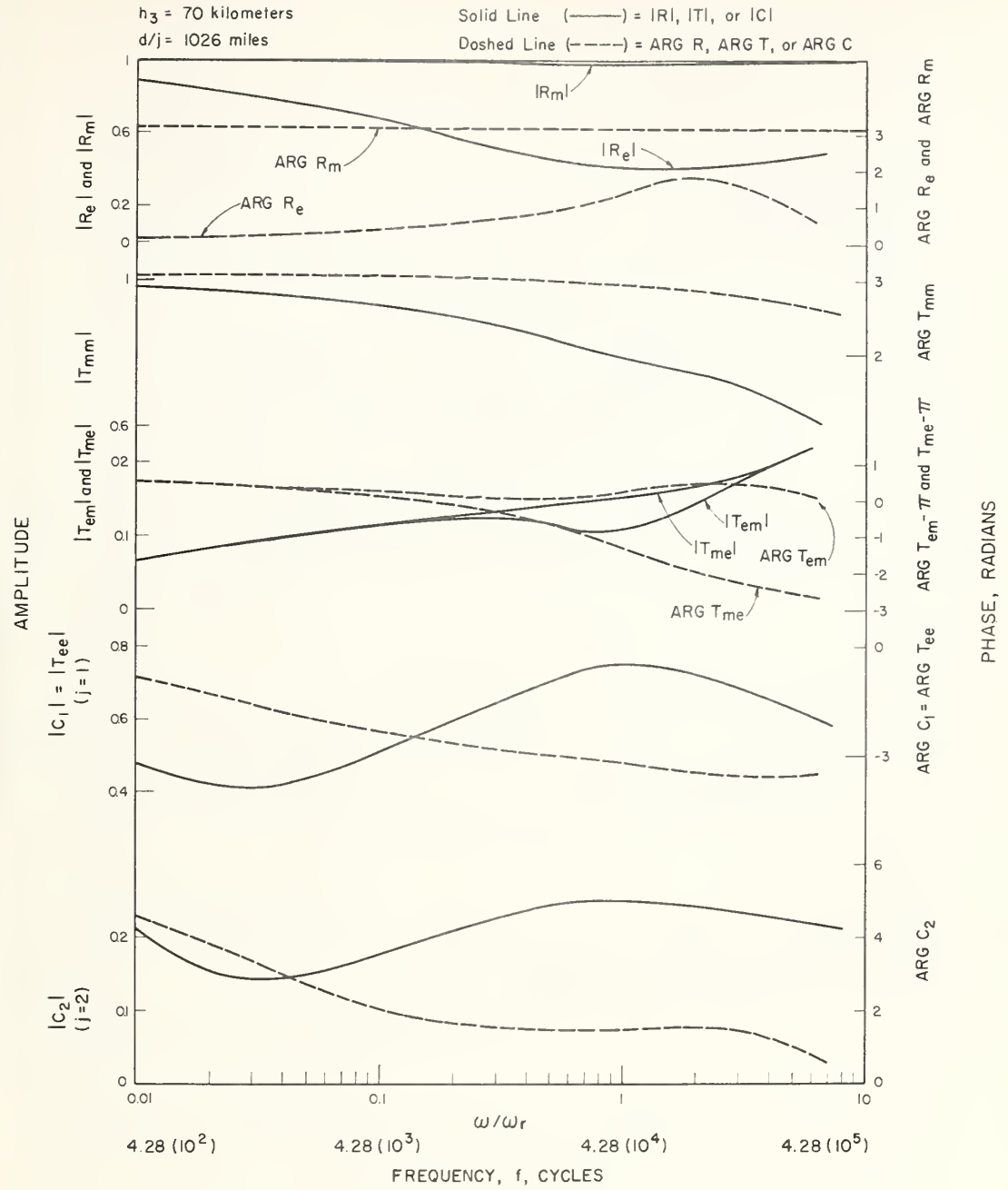


Fig. 14 - Ionosphere (quasi-longitudinal) and ground (Fresnel) reflection coefficients (amplitude, $|T|$, $|R|$, and phase, Arg T, Arg R) and effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers and the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

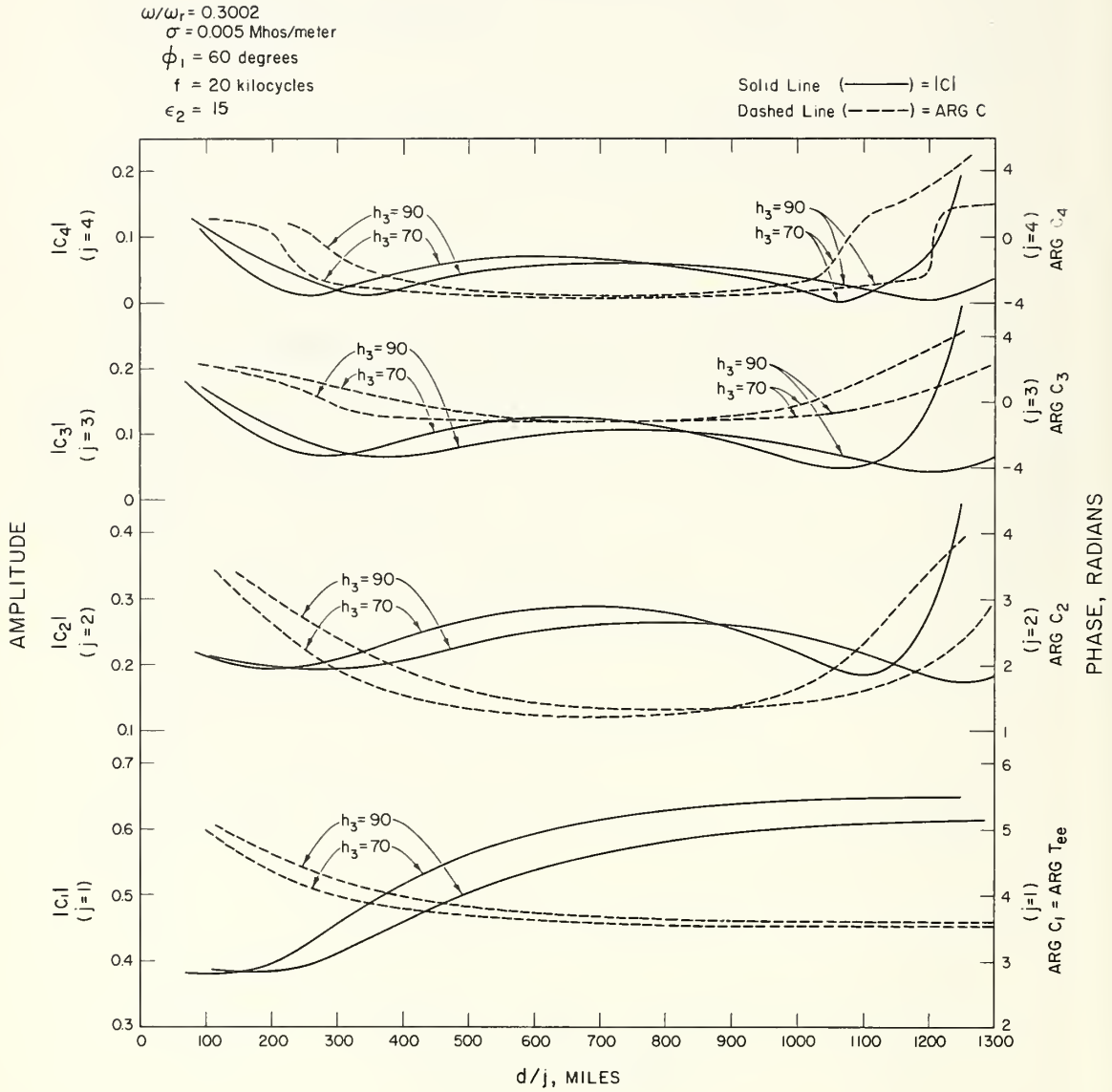
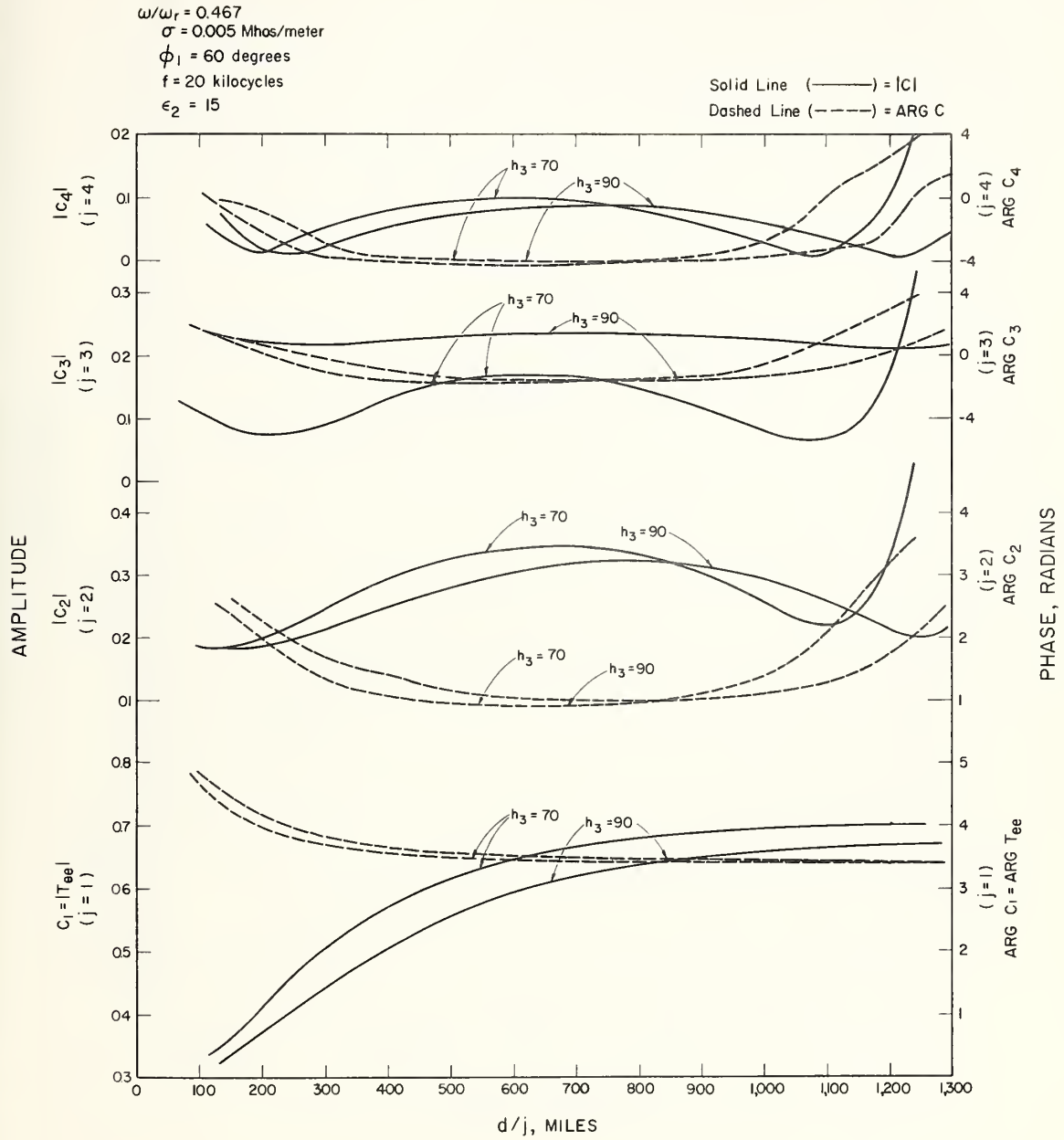


Fig. 15 - Effective quasi-longitudinal-Fresnel reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) and the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.



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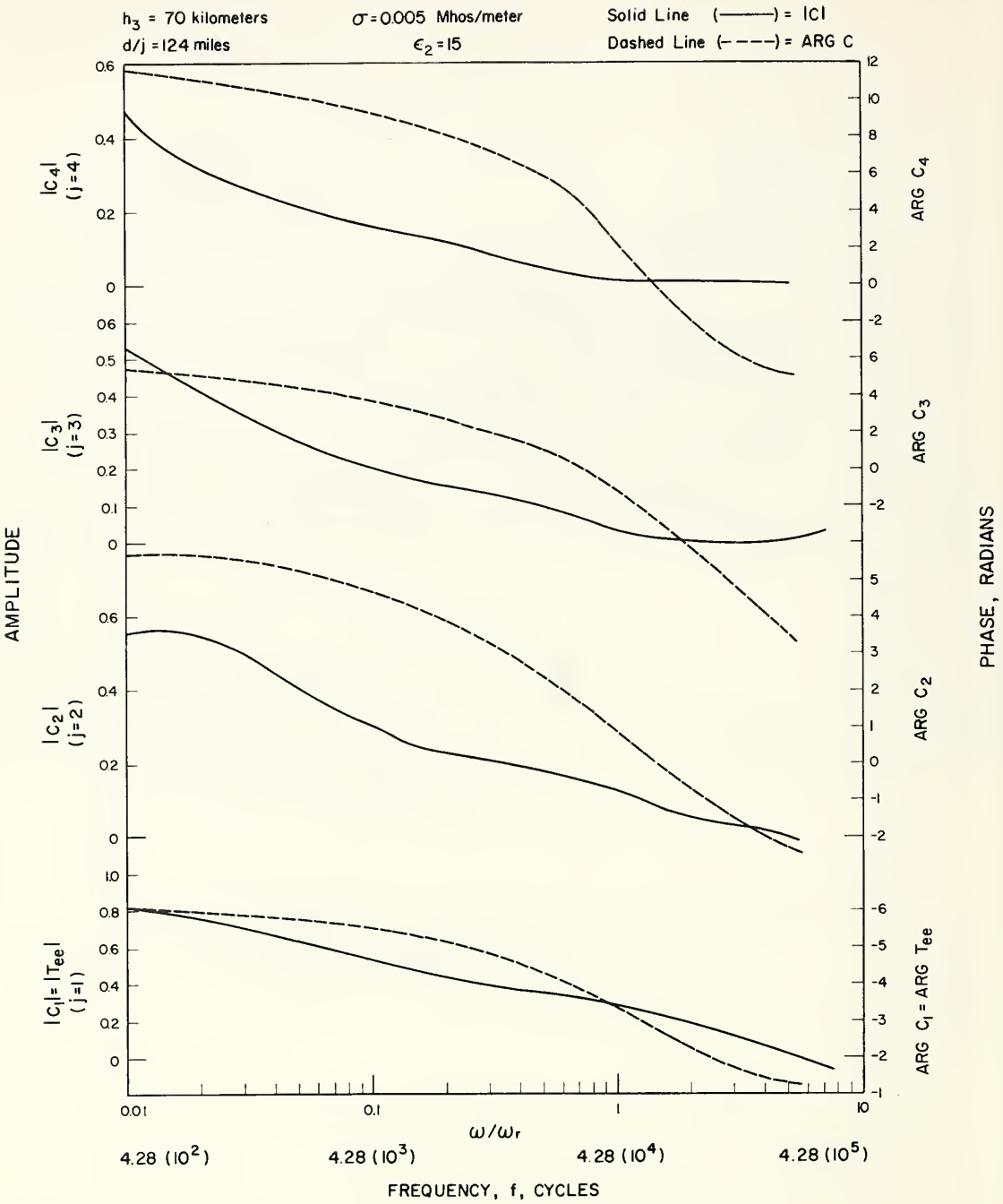

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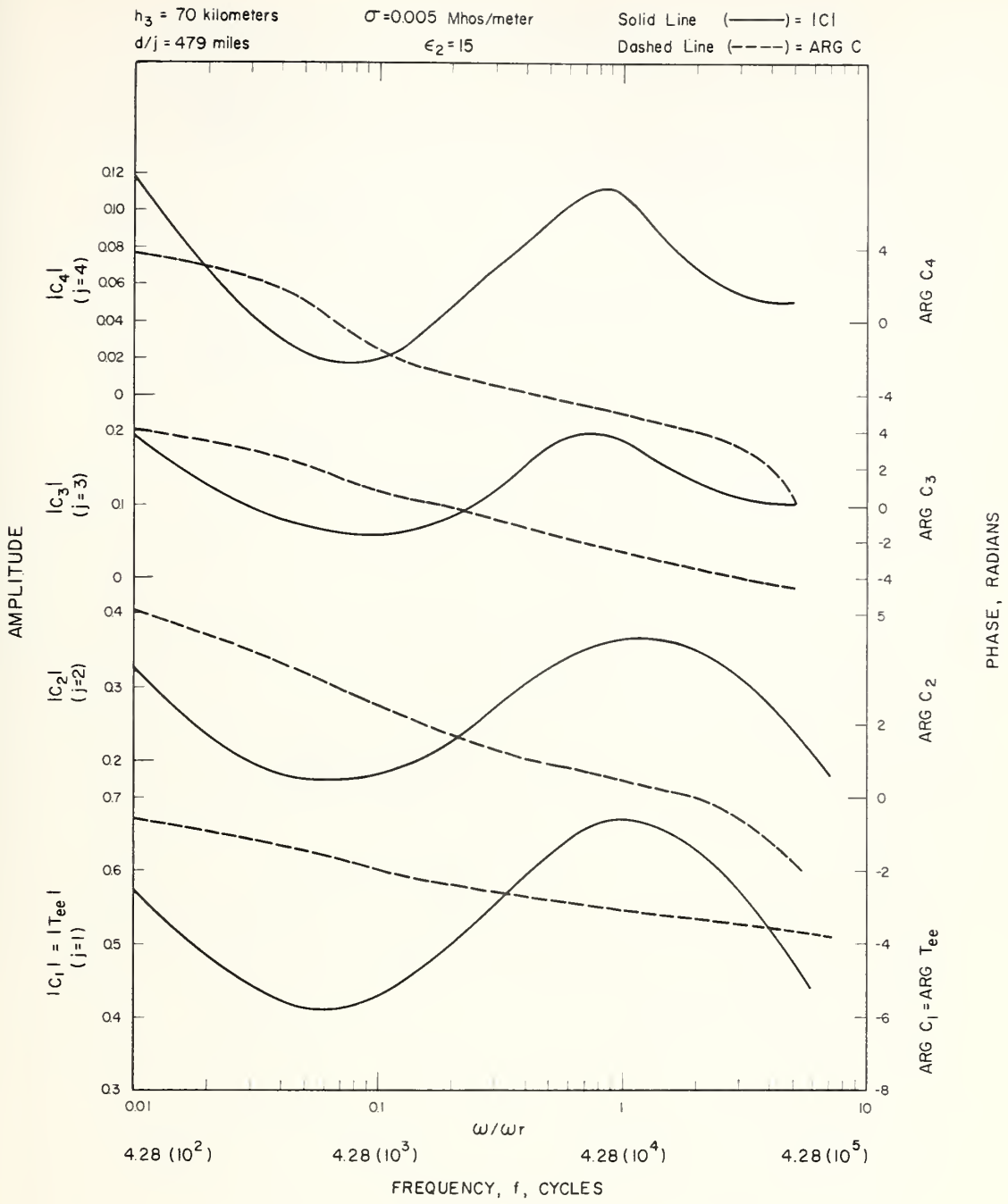

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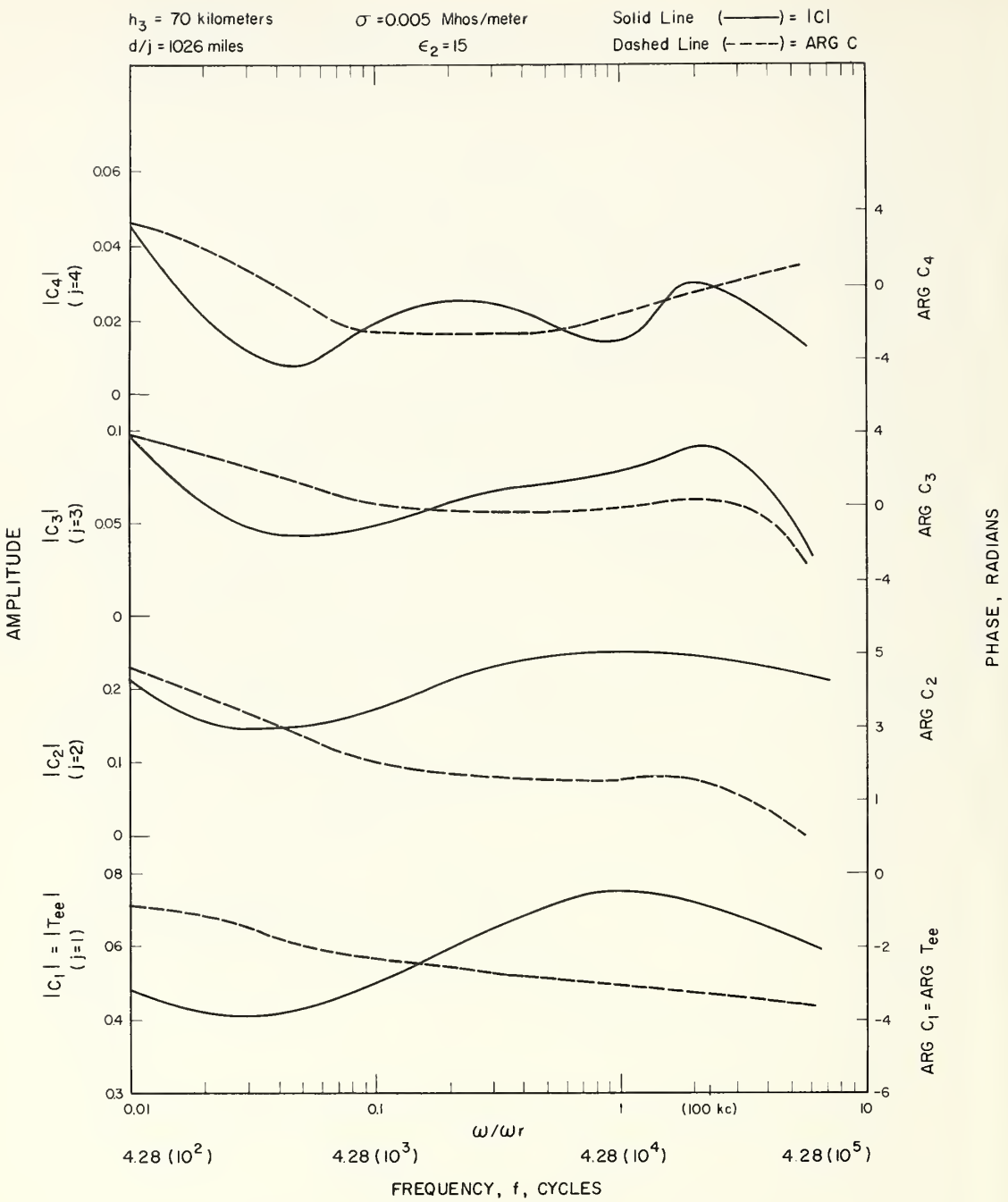

Fig. 19 - Effective quasi-longitudinal-Fresnel reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) and the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

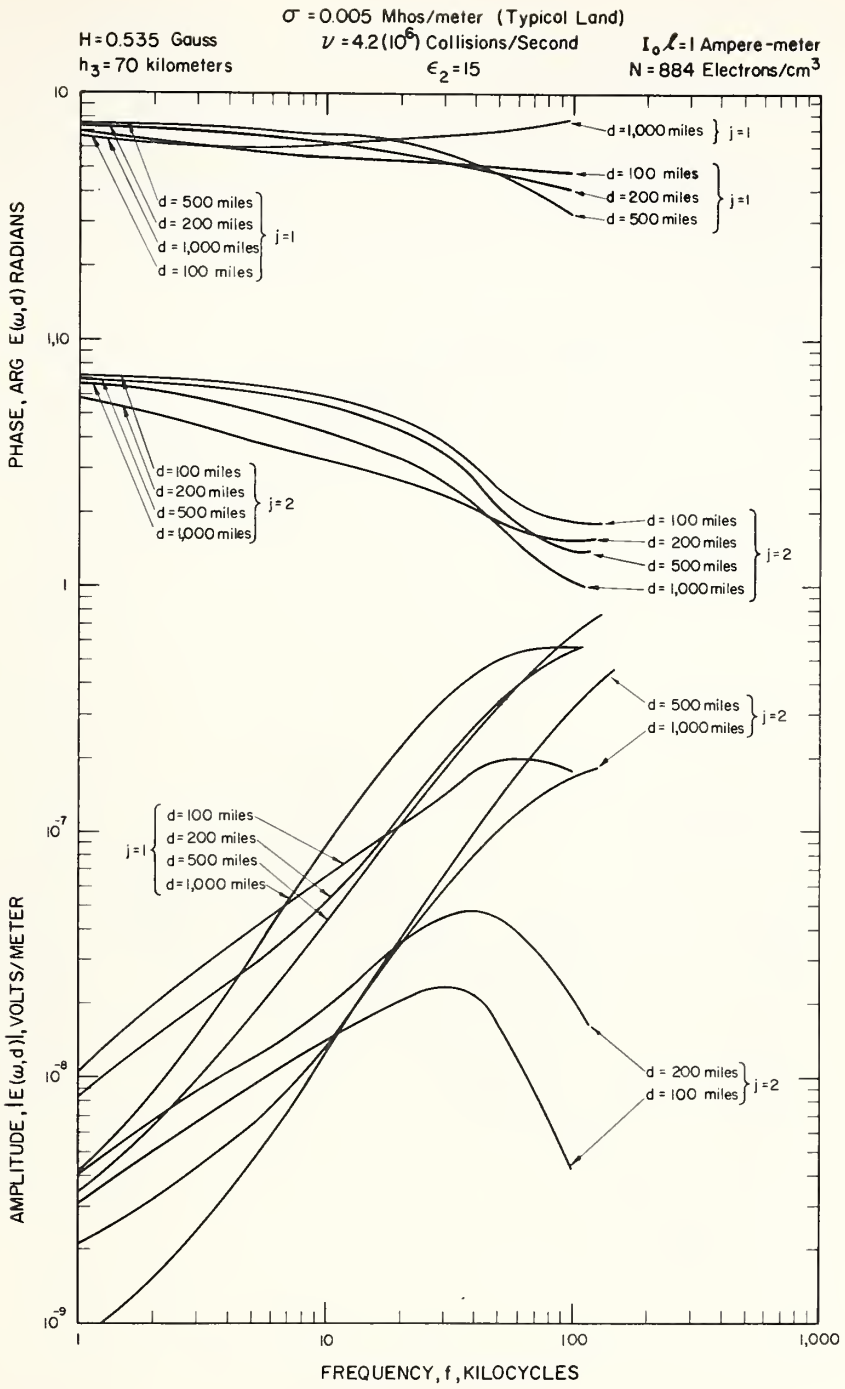

Fig. 20 - Transfer characteristic or "steady state" frequency characteristic, $E_j(\omega, d)$, (amplitude, $|E_j(\omega, d)|$, and phase, Arg $E_j(\omega, d)$) of the time-modes (j = 1, 2) of the sky wave, assuming the quasi-longitudinal-Fresnel approximation.

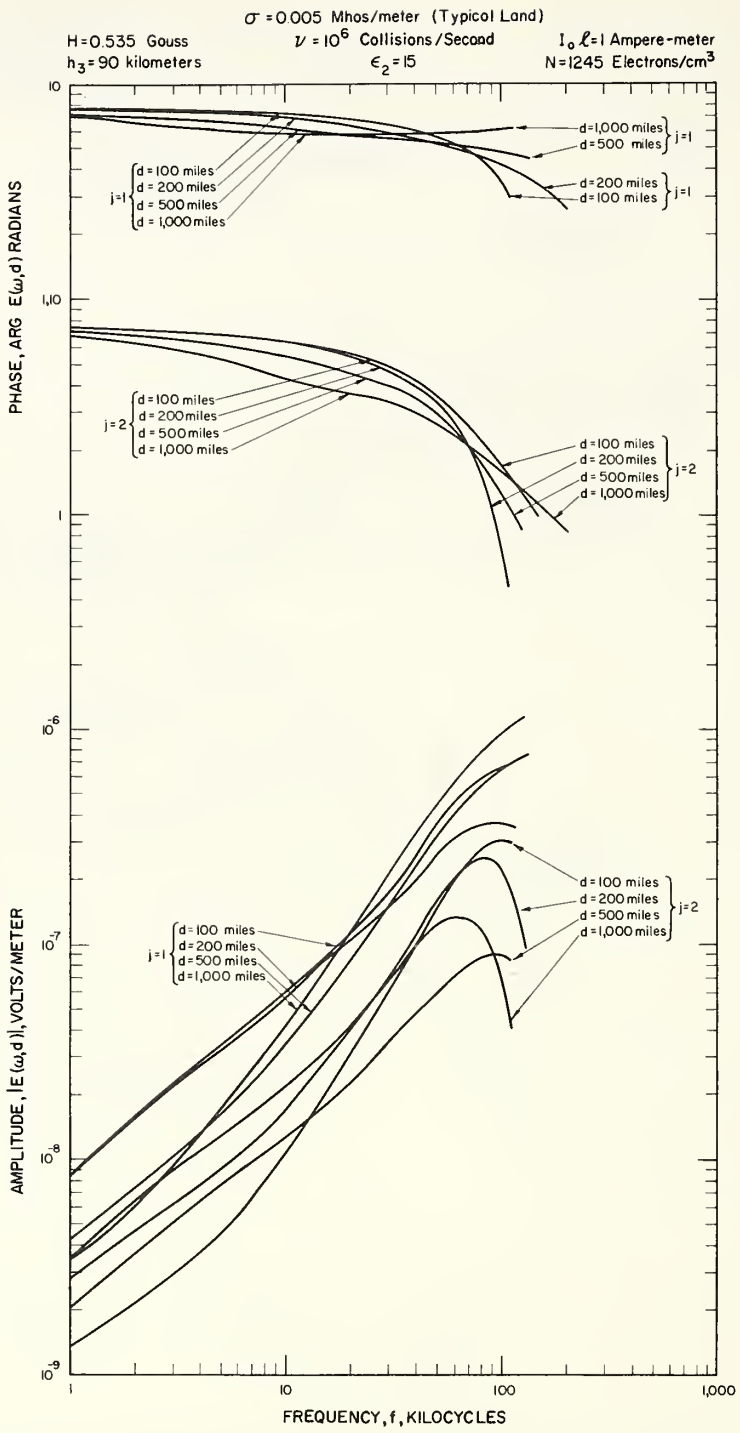

Fig. 21 - Transfer characteristic or "steady state" frequency characteristic, $E_j(\omega, d)$, (amplitude, $|E_j(\omega, d)|$, and phase, Arg $E_j(\omega, d)$) of the time-modes ($j = 1, 2$) of the sky wave, assuming the quasi-longitudinal-Fresnel approximation.

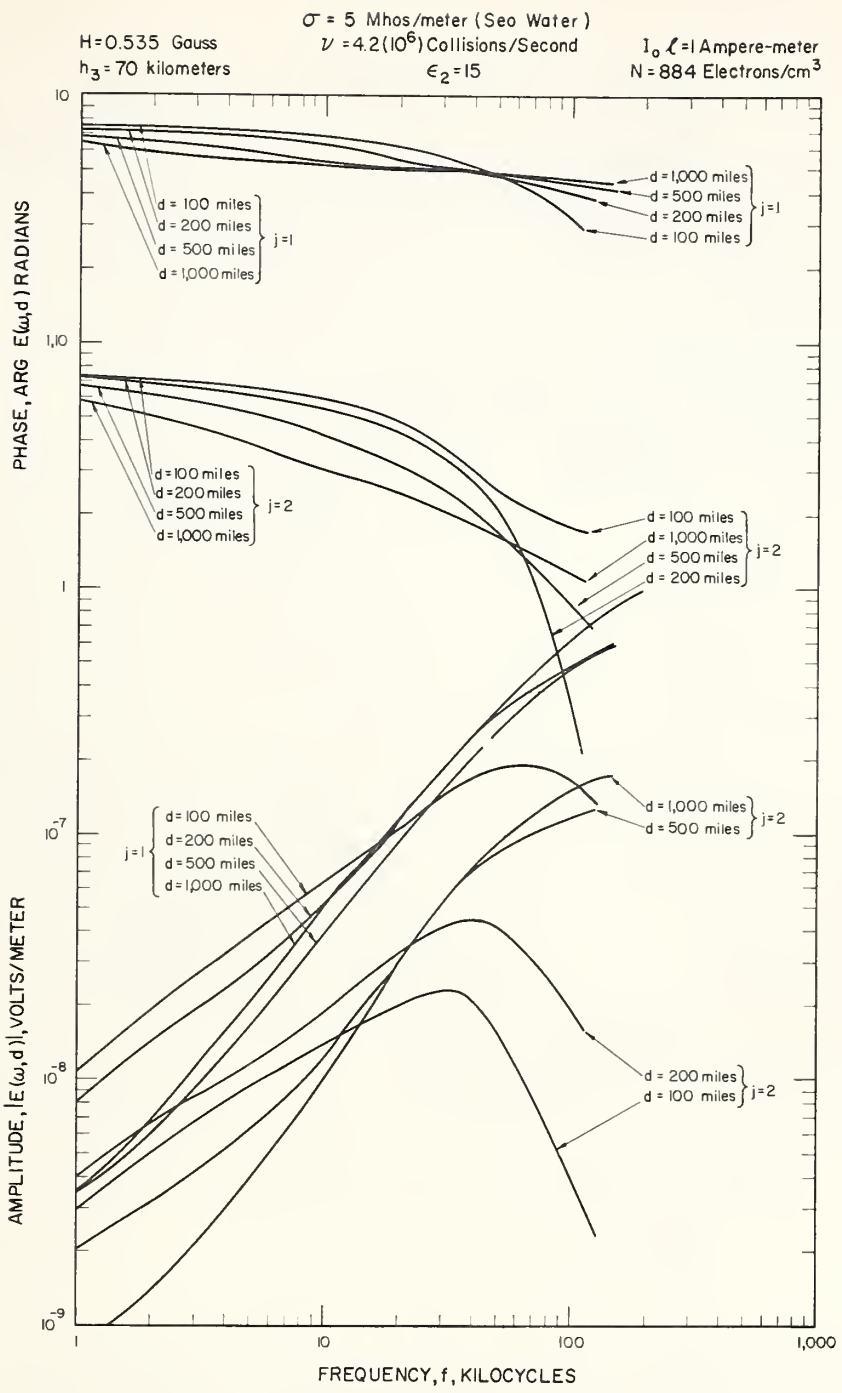

Fig. 22 -Transfer characteristic or "steady state" frequency characteristic, $E_j(\omega, d)$, (amplitude, $|E_j(\omega, d)|$, and phase, Arg $E_j(\omega, d)$) of the time-modes (j = 1, 2) of the sky wave, assuming the quasi-longitudinal-Fresnel approximation.

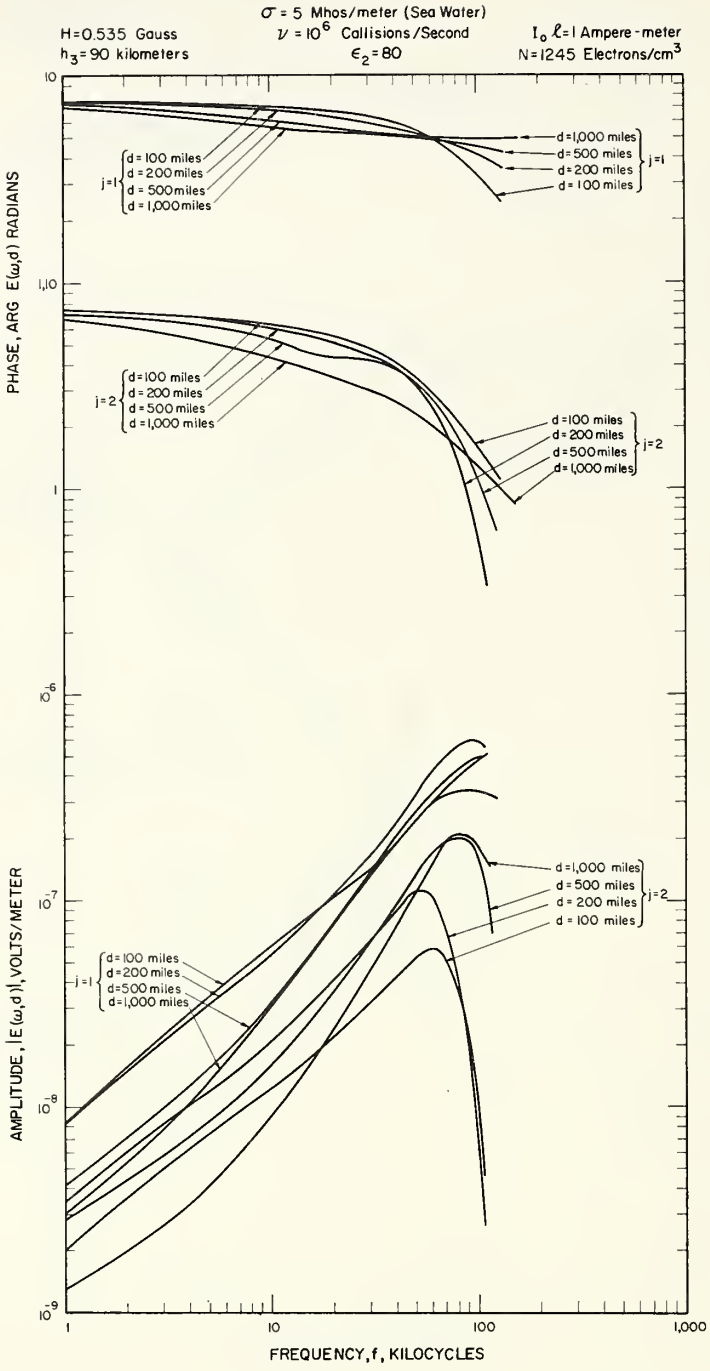

Fig. 23 - Transfer characteristic or "steady state" frequency characteristic, $E_j(\omega, d)$, (amplitude, $|E_j(\omega, d)|$, and phase, Arg $E_j(\omega, d)$) of the time-modes (j = 1, 2) of the sky wave, assuming the quasi-longitudinal-Fresnel approximation.

APPENDIX

Pulses and Time-Modes

Data available in the form of oscillograms from the Loran-C (Cytac[13]) radio navigation system illustrates the physical aspects of time-mode's. Sinusoidal pulses radiated at a rate of approximately twenty per second were received on "broad-band" receivers at various distances from the transmitter. The changes in pulse form or shape as a result of the propagation mechanism were observed at the radiofrequency output of the receivers. The envelope of the pulse was also observed at the output of the envelope detector.

In previous papers[14], the author has developed a mathematical representative of such pulses as a Fourier integral,

$$E(t', d) = \frac{1}{2\pi} \int_{-\infty}^{\infty} \exp(i\omega t') E(\omega, d) \int_{o}^{\infty} \exp(-i\omega t') F_s(t)\, dt\, d\omega, \qquad (41)$$

$$\text{or } E(t', d) = \frac{1}{2\pi} \int_{-\infty}^{\infty} \exp(i\omega t') E(\omega, d) F_s(\omega)\, d\omega, \qquad (42)$$

The complex source function, $F_s(t)$, has been introduced to simplify the operational techniques employed in the analysis and also provide a description of the "ideal" amplitude envelope of the pulse, $|E(t', d)|$.

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13 W. P. Frantz, W. N. Dean, R. L. Frank, "A Precision Multi-Purpose Radio Navigation System," 1957 IRE National Convention Record, Part 8 (March 18-21, 1957) p. 79-102.

14 J. R. Johler, op. cit. 2.

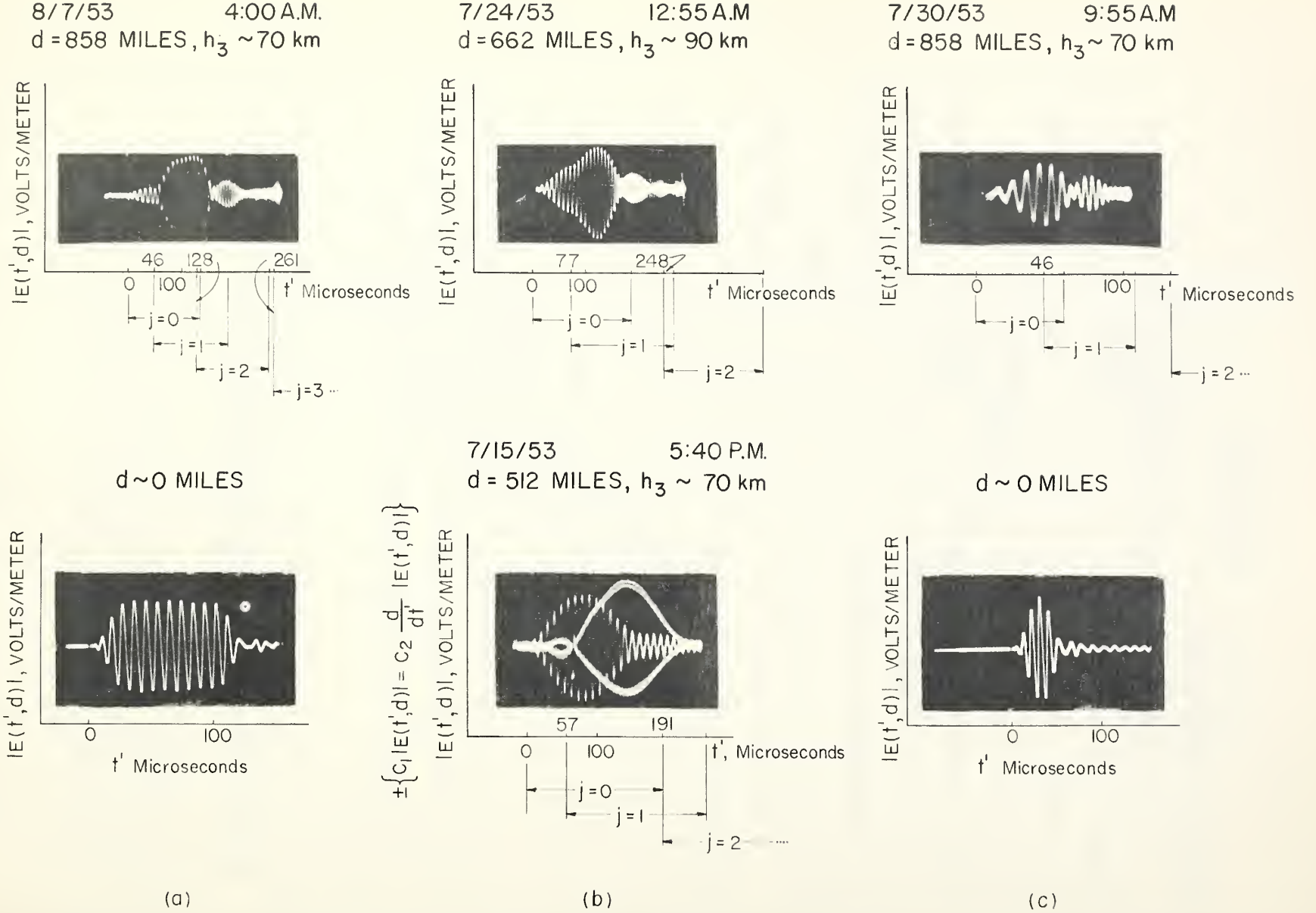

Fig. 24 -Observed oscillograms (abscissa-time, ordinate-amplitude) of sinusoidal radiofrequency pulse, illustrating the physical significance of the geometrical-optical time-modes for propagation between the earth and the ionosphere.

As a consequence of the time-modes eq. (2),

$$E(t', d) = \sum_{j=o}^{n} E_j(t'_j, d) = \sum_{j=o}^{n} \frac{1}{2\pi} \int_{-\infty}^{\infty} \exp(i\omega t'_j)\, E_j(\omega, d)\, F_s(\omega)\, d\omega. \quad (43)$$

This merely represents the sum of separate Fourier integrals for each time-mode, separated in time by the sky wave time-mode delay, $\hat{a}_j - a$, (4, 5, 6, 7).

The physical picture of the sum of j time-modes or hops for the Cytac pulse is illustrated[15] Fig. 24. The undisturbed form of the radiated pulse is shown by oscillograms at short distances. The action of the propagation medium is shown by the complicated multiple pulses observed at great distances. Note that at great distances the amplitude-time function, $E(t', d)$, comprises the superimposed multiple time-modes or hops, $E_j(t', d)$ apparently added together according to the complex field strength, E_j, of each and separated in time in accord with the sky wave delay $\hat{a}_j - a$, of each time-mode. The approximate area in time occupied by each time-mode of propagation is shown, Fig. 24. Note the areas of overlap in which both constructive and destructive interference between cycles of the multiple pulses produces "notches" and enhancements in the form of the composite pulse.

An interesting aspect of the equipment employed in the Cytac system is the method of "tagging" cycles or parts of cycles on the pulse. The envelope detector, in effect, forms the difference

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15 From the author's (Johler's) personal notes on the 1953 preliminary testing of the Cytac System, RADC-WADC Contract 33(616)-54-7.

between the envelope and its derivative,

$$\pm \left\{ a \left| E\left(t', d\right) \right| - b \frac{d}{dt} \left| E\left(t', d\right) \right| \right\},$$

where a and b are constants which move the null point or zero crossing on the oscillogram and which can be set by the operator to pick out a particular point on the pulse.

The technique for the evaluation of the amplitude-time function, $E\left(t', d\right)$, has been developed[16]. It should be noted that such a technique is not only applicable to radio navigation pulses but also to sferics. It is necessary, however, before calculating such pulses as described above, to provide this analysis with suitable transfer characteristics, $E_j\left(\omega, d\right)$, eq. 43, which task was initiated in this paper.

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16 op. cit. 2.

PREFACE TO TABLES

Although the computation precision was held at eight significant figures, the physical significance of any such precision is open to question, especially as this implies more precise knowledge of the universal constants (c, e/m) than is at present justified. Consequently, the author recommends that the tables be rounded to at least five significant figures. This operation was not performed as it was concluded that the expense of the rounding operation could more profitably be applied to other more urgent problems. Also, the excess computation precision automatically available from the electronic computer is not detrimental if it is not misinterpreted.

The integer to the right of each table entry, if present, indicates a power of the factor 10 by which the number is multiplied, thus positioning the decimal point. For example, 8.8511589 -1 = 0.88511589.

The phase of each entry (Arg T or Arg C) can be ambiguous by a factor of 2π (2π = 6.283185307 radians), hence any apparent discontinuities in the phase functions can be resolved merely by adding or subtracting 2π from the argument or phase, (Arg).

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Table 8. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, frequencies, ω/ω_r, and earth's magnetic field parameter, ϕ_1.
T_{em}, T_{me}, $\omega/\omega_r = 0.467$, $\phi_1 = 40, 50, 60$ degrees

Table 9. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field parameter, ϕ_1, and incident angle, $\tau_{j,r}$.
T_{ee}, T_{mm}, $\phi_1 = 60$ degrees, $\tau_{j,r} = 5, 15, 25$ degrees

Table 10. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field parameter, ϕ_1, and incident angle, $\tau_{j,r}$.
T_{ee}, T_{mm}, $\phi_1 = 60$ degrees, $\tau_{j,r} = 35, 45, 55$ degrees

Table 11. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field paramter, ϕ_1, and incident angle, $\tau_{j,r}$.
T_{ee}, T_{mm}, $\phi_1 = 60$ degrees, $\tau_{j,r} = 65, 75, 85$ degrees

Table 12. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field parameter, ϕ_1, and incident angle, $\tau_{j,r}$.
T_{em}, T_{me}, $\phi_1 = 60$ degrees, $\tau_{j,r} = 5, 15, 25$ degrees

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T_{em}, T_{me}, $\phi_1 = 60$ degrees, $\tau_{j,r} = 34, 45, 55$ degrees

Table 14. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field parameter, ϕ_1, and incident angle, $\tau_{j,r}$.
T_{em}, T_{me}, $\phi_1 = 60$ degrees, $\tau_{j,r} = 65, 75, 85$ degrees

Table 15. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, earth's magnetic field parameter, ϕ_1, and frequencies, ω/ω_r.
T_{ee}, T_{mm}, T_{em}, T_{me}, $\phi_1 = 60$ degrees, $\omega/\omega_r = 0.1501, 0.2335$

Table 16. Geometric parameters, Ψ, d/j, and $\tau_{j,r}$, for the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

Table 17. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 20 kc

Table 18. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 10 kc

Table 19. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 0.42826552 kc

Table 20. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 0.85653105 kc

Table 21. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 2.1413276 kc

Table 22. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 4.2826552 kc

Table 23. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 8.5653105 kc

Table 24. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 42.826552 kc

Table 25. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 85.653105 kc

Table 26. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 214.13276 kc

Table 27. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 0.66622256 kc

Table 28. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 1.332425 kc

Table 29. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth. R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 3.3311126 kc

Table 30. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 6.6622252 kc

Table 31. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 13.324450 kc

Table 32. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 66.622252 kc

Table 33. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 133.24450 kc

Table 34. Ground reflection coefficients (amplitude, $|R|$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or theE-region (h_3 = 90 kilometers) of the ionosphere and the earth.
R_e, R_m, σ = 0.005 mhos/meter, ϵ_2 = 15, f = 333.11126 kc

Table 35. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 0.3002

Table 36. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 0.467

Table 37. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 0.1501

Table 38. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 0.2335

Table 39. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 0.01

Table 40. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 0.02

Table 41. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 0.05

Table 42. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 0.1

Table 43. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 0.2

Table 44. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 1

Table 45. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 2

Table 46. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{ee}, T_{mm}, ϕ_1 = 60 degrees, ω/ω_r = 5

Table 47. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 0.3002

Table 48. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 0.467

Table 49. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 0.1501

Table 50. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 0.2335

Table 51. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 0.01

Table 52. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 0.02

Table 53. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_e = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 0.05

Table 54. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 0.1

Table 55. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 0.2

Table 56. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 1

Table 57. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 2

Table 58. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
T_{em}, T_{me}, ϕ_1 = 60 degrees, ω/ω_r = 5

Table 59. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, ω/ω_r = 0.3002, ϕ_1 = 60 degrees, σ = 0.005, ϵ_2 = 15, f = 20 kc

Table 60. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.467$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 20 kc

Table 61. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.1501$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 10 kc

Table 62. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.2335$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 10 kc

Table 63. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.01$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 0.42826552 kc

Table 64. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.02$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 0.85653105 kc

Table 65. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.05$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 2.1413276 kc

Table 66. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 4.2826552 kc

Table 67. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 8.5653105 kc

Table 68. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 42.826552 kc

Table 69. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 85.653105 kc

Table 70. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 5$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 214.13276 kc

Table 71. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.01$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 0.66622256 kc

Table 72. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.02$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 1.332425 kc

Table 73. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.05$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 3.3311126 kc

Table 74. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 6.6622252 kc

Table 75. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 0.2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 13.324450 kc

Table 76. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 66.622252 kc

Table 77. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 133.24450 kc

Table 78. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_2|$, $\omega/\omega_r = 5$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 333.11126 kc

Table 79. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.3002$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 20 kc

Table 80. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.467$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 20 kc

Table 81. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.1501$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 10 kc

Table 82. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.2335$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 10 kc

Table 83. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.01$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 0.42826532 kc

Table 84. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg Cj) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.02$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 0.85653105 kc

Table 85. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.05$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 2.1413276 kc

Table 86. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 4.2826552 kc

Table 87. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 8.5653105 kc

Table 88. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 42.826552 kc

Table 89. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 85.653105 kc

Table 90. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 5$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 214.13276 kc

Table 91. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.01$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$,
f = 0.66622256 kc

Table 92. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.02$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$,
f = 1.332425 kc

Table 93. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.005$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$,
f = 3.3311126 kc

Table 94. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$,
f = 6.6622252 kc

Table 95. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 0.2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$,
f = 13.324450 kc

Table 96. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$,
f = 66.622252 kc

Table 97. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 133.24450 kc

Table 98. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_3|$, $\omega/\omega_r = 5$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 333.11126 kc

Table 99. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 0.3002$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 20 kc

Table 100. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 0.467$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 20 kc

Table 101. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 0.1501$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 10 kc

Table 102. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 0.2335$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 10 kc

Table 103. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 0.01$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 0.42826552 kc

Table 104. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 0.02$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, $f = 0.85653105$ kc

Table 105. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 0.05$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, $f = 2.1413276$ kc

Table 106. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_e = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 0.1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, $f = 4.2826552$ kc

Table 107. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 0.2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, $f = 8.5653105$ kc

Table 108. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, $f = 42.826552$ kc

Table 109. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, $f = 85.653105$ kc

Table 110. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, ω/ω_r = 5, ϕ_1 = 60 degree, σ = 0.005, ϵ_2 = 15, f = 214.13276 kc

Table 111. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, ω/ω_r = 0.01, ϕ_1 = 60 degrees, σ = 0.005, ϵ_2 = 15, f = 0.66622256 kc

Table 112. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, ω/ω_r = 0.02, ϕ_1 = 60 degrees, σ = 0.005, ϵ_2 = 15, f = 1.332425 kc

Table 113. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, ω/ω_r = 0.05, ϕ_1 = 60 degrees, σ = 0.005, ϵ_2 = 15, f = 3.3311126 kc

Table 114. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, ω/ω_r = 0.1, ϕ_1 = 60 degrees, σ = 0.005, ϵ_2 = 15, f = 6.6622262 kc

Table 115. Effective reflection coefficients (amplitude, $|C_j|$), and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, ω/ω_r = 0.2, ϕ_1 = 60 degrees, σ = 0.005, ϵ_2 = 15, f = 13.324450 kc

Table 116. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 1$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 66.622252 kc

Table 117. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 2$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 133.24450 kc

Table 118. Effective reflection coefficients (amplitude, $|C_j|$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.
$|C_4|$, $\omega/\omega_r = 5$, $\phi_1 = 60$ degrees, $\sigma = 0.005$, $\epsilon_2 = 15$, f = 333.11126 kc

Table 119. Very low frequency and low frequency part of sky wave transfer characteristic (amplitude, $|E(\omega, d)|$, and phase, Arg $E(\omega, d)$) assuming the geometrical-optical and quasi-longitudinal-Fresnel approximations for various distances, d, electron density, N, collision frequency, ν, and earth's magnetic field strength, H.

Table 120. Very low frequency and low frequency part of sky wave transfer characteristic (amplitude, $|E(\omega, d)|$, and phase, Arg $E(\omega, d)$) assuming the geometrical-optical and quasi-longitudinal-Fresnel approximations for various distances, d, electron density, N, collision frequency, ν, and earth's magnetic field strength, H.

Table 121. Very low frequency and low frequency part of sky wave transfer characteristic (amplitude, $|E(\omega, d)|$, and phase, Arg $E(\omega, d)$ assuming the geometrical-optical and quasi-longitudinal-Fresnel approximations for various distances, d, electron density, N, collision frequency, ν, and earth's magnetic field strength, H.

Table 122. Very low frequency and low frequency part of sky wave transfer characteristic (amplitude, $|E(\omega, d)|$, and phase, Arg $E(\omega, d)$) assuming the geometrical-optical and quasi-longitudinal-Fresnel approximations for various distances, d, electron density, N, collision frequency, ν, and earth's magnetic field strength, H.

Table 123. Sky wave delay, $\widehat{a_j} - a$, and the geometrical-optical ray divergence-convergence coefficient, α_j, for various distances, d.

$\omega/\omega_r = 0.3002$

$\tau_{j,r}$ degrees	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}
		ϕ_l = 10 degrees		
5	4.4552333 - 1	7.3725810 - 1	4.4844018 - 1	2.4092733
15	4.3377702 - 1	7.5812560 - 1	4.6018533 - 1	2.4290032
25	4.0994560 - 1	8.0616550 - 1	4.8407615 - 1	2.4685756
35	3.7387817 - 1	8.9784570 - 1	5.2085258 - 1	2.5280043
45	3.2772442 - 1	1.0711519	5.7148817 - 1	2.6068442
55	2.8414416 - 1	1.4077680	6.3707095 - 1	2.7038032
65	2.9002620 - 1	1.9831845	7.1871248 - 1	2.8164873
75	4.2615247 - 1	3.7076184	8.1749512 - 1	2.9413729
85	7.4695888 - 1	3.3041685	9.3443617 - 1	3.0739868
		ϕ_l = 20 degrees		
5	4.4890554 - 1	7.4582840 - 1	4.5179812 - 1	2.4008496
15	4.3727146 - 1	7.6728700 - 1	4.6343969 - 1	2.4211441
25	4.1374457 - 1	8.1650590 - 1	4.8708906 - 1	2.4617433
35	3.7833939 - 1	9.0977750 - 1	5.2343327 - 1	2.5224739
45	3.3343430 - 1	1.0840055	5.7340480 - 1	2.6026658
55	2.9167766 - 1	1.4163042	6.3810629 - 1	2.7008422
65	2.9818618 - 1	1.9761741	7.1876545 - 1	2.8145366
75	4.3153210 - 1	3.7209551	8.1675108 - 1	2.9402798
85	7.4872699 - 1	3.3094437	9.3371418 - 1	3.0736796
		ϕ_l = 30 degrees		
5	4.5491602 - 1	7.5984010 - 1	4.5775948 - 1	2.3870732
15	4.4350350 - 1	7.8224050 - 1	4.6919425 - 1	2.4082737
25	4.2054946 - 1	8.3328980 - 1	4.9237872 - 1	2.4505112
35	3.8632541 - 1	9.2887370 - 1	5.2792245 - 1	2.5133055
45	3.4353181 - 1	1.1039507	5.7670604 - 1	2.5956336
55	3.0467060 - 1	1.4284345	6.3986929 - 1	2.6957487
65	3.1196881 - 1	1.9637604	7.1883874 - 1	2.8110973
75	4.4059378 - 1	3.7433517	8.1546277 - 1	2.9383160
85	7.5166841 - 1	3.3184052	9.3247053 - 1	3.0731267

Table 1. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, frequencies, ω/ω_r and earth's magnetic field parameter, ϕ_l.

ω/ω_r = 0.3002

$\tau_{j,r}$ degrees	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}
		ϕ_l = 40 degrees		
5	4.6413032 - 1	7.7875900 - 1	4.6688630 - 1	2.3684597
15	4.5310073 - 1	8.0236280 - 1	4.7795975 - 1	2.3908321
25	4.3108063 - 1	8.5564520 - 1	5.0036206 - 1	2.4351729
35	3.9865326 - 1	9.5372000 - 1	5.3462121 - 1	2.5005947
45	3.5884212 - 1	1.1286349	5.8157659 - 1	2.5856404
55	3.2371482 - 1	1.4412371	6.4244335 - 1	2.6882642
65	3.3162964 - 1	1.9449455	7.1893282 - 1	2.8058611
75	4.5347526 - 1	3.7750788	8.1356762 - 1	2.9352472
85	7.5577027 - 1	3.3313228	9.3064388 - 1	3.0722607
		ϕ_l = 50 degrees		
5	4.7736858 - 1	8.0158970 - 1	4.7998056 - 1	2.3459664
15	4.6695211 - 1	8.2649000 - 1	4.9046849 - 1	2.3696293
25	4.4633877 - 1	8.8199550 - 1	5.1164960 - 1	2.4162670
35	4.1641377 - 1	9.8196580 - 1	5.4399257 - 1	2.4845374
45	3.8040106 - 1	1.1546418	5.8833248 - 1	2.5725453
55	3.4950983 - 1	1.4510906	6.4600998 - 1	2.6780017
65	3.5748464 - 1	1.9185001	7.1910180 - 1	2.7983522
75	4.7035549 - 1	3.8165426	8.1100422 - 1	2.9307023
85	7.6100401 - 1	3.3486045	9.2814664 - 1	3.0709719
		ϕ_l = 60 degrees		
5	4.9566687 - 1	8.2667620 - 1	4.9805880 - 1	2.3211854
15	4.8616373 - 1	8.5269800 - 1	5.0766270 - 1	2.3460140
25	4.6752671 - 1	9.0983470 - 1	5.2705729 - 1	2.3947082
35	4.4084270 - 1	1.0102058	5.5670485 - 1	2.4655207
45	4.0928723 - 1	1.1776945	5.9749206 - 1	2.5562285
55	3.8272913 - 1	1.4541628	6.5093091 - 1	2.6644614
65	3.8985864 - 1	1.8830998	7.1952603 - 1	2.7879043
75	4.9143779 - 1	3.8682997	8.0774989 - 1	2.9241324
85	7.6731483 - 1	3.3708281	9.2486587 - 1	3.0690918

Table 2. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, frequencies, ω/ω_r and earth's magnetic field parameter, ϕ_l.

$\omega/\omega_r = 0.3002$

$\tau_{j,r}$ degrees	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Art T_{me} - π
		ϕ_l = 10 degrees		
5	4.1866723 - 2	8.9089000 - 2	4.1815986 - 2	9.3272300 - 2
15	4.2049756 - 2	7.2566600 - 2	4.1625768 - 2	1.0978920 - 1
25	4.2307904 - 2	4.0687100 - 2	4.1302304 - 2	1.4144900 - 1
35	4.2411299 - 2	3.9955000 - 3	4.0891971 - 2	1.8467640 - 1
45	4.1974015 - 2	5.7186400 - 2	4.0280757 - 2	2.3317800 - 1
55	4.0379401 - 2	1.1246580 - 1	3.8967306 - 2	2.7946820 - 1
65	3.6601813 - 2	1.6074110 - 1	3.5788995 - 2	3.1880410 - 1
75	2.8770215 - 2	1.8886360 - 1	2.8538821 - 2	3.5390620 - 1
85	1.3087681 - 2	1.7559910 - 1	1.3101547 - 2	4.0001810 - 1
		ϕ_l = 20 degrees		
5	8.4402734 - 2	8.5497800 - 2	8.4309365 - 2	8.9660200 - 2
15	8.4736509 - 2	6.9076100 - 2	8.3959841 - 2	1.0607000 - 1
25	8.5189895 - 2	3.7483200 - 2	8.3365922 - 2	1.3741190 - 1
35	8.5308622 - 2	6.5890000 - 3	8.2599730 - 2	1.8001590 - 1
45	8.4332574 - 2	5.8712900 - 2	8.1402205 - 2	2.2769260 - 1
55	8.1044555 - 2	1.1238540 - 1	7.8742899 - 2	2.7335380 - 1
65	7.3406070 - 2	1.5848470 - 1	7.2285055 - 2	3.1280120 - 1
75	5.7673357 - 2	1.8380010 - 1	5.7607875 - 2	3.4921530 - 1
85	2.6228123 - 2	1.6684570 - 1	2.6434066 - 2	3.9825640 - 1
		ϕ_l = 30 degrees		
5	1.2829470 - 1	7.9190800 - 2	1.2817527 - 1	8.3307800 - 2
15	1.2871358 - 1	6.2977900 - 2	1.2772915 - 1	9.9498600 - 2
25	1.2923595 - 1	3.1936100 - 2	1.2697065 - 1	1.3025110 - 1
35	1.2919694 - 1	1.1030000 - 2	1.2595388 - 1	1.7177580 - 1
45	1.2748740 - 1	6.1292200 - 2	1.2421432 - 1	2.1809390 - 1
55	1.2231971 - 1	1.1223220 - 1	1.2014213 - 1	2.6278070 - 1
65	1.1066333 - 1	1.5467520 - 1	1.1020646 - 1	3.0250170 - 1
75	8.6891490 - 2	1.7528660 - 1	8.7754783 - 2	3.4118260 - 1
85	3.9501647 - 2	1.5211500 - 1	4.0241265 - 2	3.9520350 - 1

Table 3. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, frequencies, ω/ω_r and earth's magnetic field parameter, ϕ_l.

$\omega/\omega_r = 0.3002$

$\tau_{j,r}$ degrees	$\lvert T_{em} \rvert$	Arg T_{em} - π	$\lvert T_{me} \rvert$	Arg T_{me} - π
		ϕ_l = 40 degrees		
5	1.7425748 - 1	6.9677400 - 2	1.7413725 - 1	7.3708500 - 2
15	1.7466179 - 1	5.3841100 - 2	1.7368959 - 1	8.9512900 - 2
25	1.7506600 - 1	2.3722000 - 2	1.7292195 - 1	1.1932150 - 1
35	1.7462134 - 1	1.7518600 - 2	1.7180171 - 1	1.5926150 - 1
45	1.7190915 - 1	6.5022300 - 2	1.6957396 - 1	2.0372260 - 1
55	1.6461240 - 1	1.1204070 - 1	1.6398604 - 1	2.4719560 - 1
65	1.4872778 - 1	1.4932070 - 1	1.5028919 - 1	2.8747410 - 1
75	1.1671209 - 1	1.6330220 - 1	1.1956050 - 1	3.2948330 - 1
85	5.3047658 - 2	1.3128510 - 1	5.4793144 - 2	3.9067130 - 1
		ϕ_l = 50 degrees		
5	2.2302898 - 1	5.6265300 - 2	2.2294160 - 1	6.0149300 - 2
15	2.2328885 - 1	4.1054100 - 2	2.2261589 - 1	7.5325700 - 2
25	2.2333856 - 1	1.2361600 - 2	2.2203344 - 1	1.0373900 - 1
35	2.2218926 - 1	2.6393400 - 2	2.2098187 - 1	1.4154970 - 1
45	2.1816652 - 1	7.0137000 - 2	2.1831719 - 1	1.8371950 - 1
55	2.0846779 - 1	1.1199840 - 1	2.1108129 - 1	2.2587590 - 1
65	1.8812308 - 1	1.4260470 - 1	1.9328227 - 1	2.6713540 - 1
75	1.4759501 - 1	1.4801680 - 1	1.5365286 - 1	3.1365530 - 1
85	6.7103584 - 2	1.0439210 - 1	7.0401615 - 2	3.8438570 - 1
		ϕ_l = 60 degrees		
5	2.7533769 - 1	3.8087000 - 2	2.7532146 - 1	4.1740100 - 2
15	2.7530670 - 1	2.3831800 - 2	2.7525674 - 1	5.5970900 - 2
25	2.7474604 - 1	2.8022000 - 3	2.7506843 - 1	8.2455300 - 2
35	2.7258785 - 1	3.8195500 - 2	2.7425708 - 1	1.1758670 - 1
45	2.6696417 - 1	7.7120700 - 2	2.7119537 - 1	1.5712740 - 1
55	2.5462444 - 1	1.1260460 - 1	2.6217212 - 1	1.9800700 - 1
65	2.2961200 - 1	1.3508550 - 1	2.3992588 - 1	2.4079150 - 1
75	1.8024809 - 1	1.3001740 - 1	1.9071364 - 1	2.9310820 - 1
85	8.2051798 - 2	7.1869400 - 2	8.7439262 - 2	3.7597460 - 1

Table 4. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, frequencies ω/ω_r and earth's magnetic field parameter, ϕ_l.

$\omega/\omega_r = 0.467$

$\tau_{j,r}$ degrees	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}
		ϕ_l = 10 degrees		
5	3.5859720 - 1	8.8861870 - 1	3.6160796 - 1	2.2584106
15	3.4649923 - 1	9.1200190 - 1	3.7379414 - 1	2.2802339
25	3.2215247 - 1	9.6828490 - 1	3.9888709 - 1	2.3246079
35	2.8631557 - 1	1.0834105	4.3823613 - 1	2.3926055
45	2.4480804 - 1	1.3183237	4.9360615 - 1	2.4848622
55	2.2223139 - 1	1.7752773	5.6715389 - 1	2.6010015
65	2.7684411 - 1	3.9118590	6.6093240 - 1	2.7383809
75	4.5112006 - 1	3.4913849	7.7729426 - 1	2.8925639
85	7.6796371 - 1	3.2413418	9.1885497 - 1	3.0574058
		ϕ_l = 20 degrees		
5	3.6063967 - 1	9.0468970 - 1	3.6365818 - 1	2.2426252
15	3.4854021 - 1	9.2927990 - 1	3.7586372 - 1	2.2655652
25	3.2435763 - 1	9.8826100 - 1	4.0093078 - 1	2.3120414
35	2.8926138 - 1	1.1078125	4.4008944 - 1	2.3828257
45	2.4979005 - 1	1.3468391	4.9497520 - 1	2.4780796
55	2.3072269 - 1	1.7951246	5.6769692 - 1	2.5969188
65	2.8678407 - 1	3.9166809	6.6045675 - 1	2.7363519
75	4.5860544 - 1	3.5024424	7.7603589 - 1	2.8918713
85	7.7104995 - 1	3.2459142	9.1787554 - 1	3.0573799
		ϕ_l = 30 degrees		
5	3.6458534 - 1	9.3183150 - 1	3.6760483 - 1	2.2159812
15	3.5253622 - 1	9.5850170 - 1	3.7979412 - 1	2.2408558
25	3.2875902 - 1	1.0220002	4.0471611 - 1	2.2909328
35	2.9512596 - 1	1.1484745	4.4340638 - 1	2.3664102
45	2.5926004 - 1	1.3924189	4.9731319 - 1	2.4666312
55	2.4578519 - 1	1.8241110	5.6851365 - 1	2.5899112
65	3.0377390 - 1	3.9258094	6.5949689 - 1	2.7327590
75	4.7132911 - 1	3.5210750	7.7377104 - 1	2.8905827
85	7.7627066 - 1	3.2536837	9.1616254 - 1	3.0573123

Table 5. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, frequencies, ω/ω_r and earth's magnetic field parameter, ϕ_l.

$\omega/\omega_r = 0.467$

$\tau_{j,r}$ degrees	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}
		$\phi_l = 40$ degrees		
5	3.7136585 - 1	9.7031050 - 1	3.7435592 - 1	2.1782307
15	3.5952137 - 1	9.9997500 - 1	3.8639813 - 1	2.2059206
25	3.3662167 - 1	1.0696480	4.1086687 - 1	2.2611479
35	3.0551643 - 1	1.2044650	4.4854962 - 1	2.3431855
45	2.7502347 - 1	1.4510982	5.0070749 - 1	2.4502136
55	2.6871752 - 1	1.8564924	5.6947043 - 1	2.5795577
65	3.2845199 - 1	3.9407840	6.5779700 - 1	2.7271897
75	4.8967129 - 1	3.5476436	7.7023675 - 1	2.8884442
85	7.8374395 - 1	3.2648979	9.1358567 - 1	3.0571551
		$\phi_l = 50$ degrees		
5	3.8252637 - 1	1.0198159	3.8541095 - 1	2.1296749
15	3.7122823 - 1	1.0532709	3.9699635 - 1	2.1610052
25	3.5004740 - 1	1.1300992	4.2037126 - 1	2.2227539
35	3.2295383 - 1	1.2725075	4.5608886 - 1	2.3128902
45	2.9960588 - 1	1.5157753	5.0531909 - 1	2.4281945
55	3.0119048 - 1	1.8851576	5.7041063 - 1	2.5650011
65	3.6170243 - 1	3.9636140	6.5501153 - 1	2.7188417
75	5.1416956 - 1	3.5827632	7.6504951 - 1	2.8849748
85	7.9363533 - 1	3.2799582	9.0994395 - 1	3.0568149
		$\phi_l = 60$ degrees		
5	4.0042726 - 1	1.0784740	4.0305332 - 1	2.0720831
15	3.9031007 - 1	1.1159769	4.1358040 - 1	2.1074695
25	3.7216247 - 1	1.1993008	4.3471779 - 1	2.1763336
35	3.5086620 - 1	1.3452587	4.6693375 - 1	2.2751465
45	3.3599495 - 1	1.5761149	5.1152831 - 1	2.3993684
55	3.4505296 - 1	1.9026259	5.7129028 - 1	2.5446279
65	4.0459400 - 1	3.9966999	6.5079111 - 1	2.7062360
75	5.4549435 - 1	3.6274024	7.5772314 - 1	2.8792911
85	8.0614568 - 1	3.2994773	9.0495019 - 1	3.0561132

Table 6. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, frequencies, ω/ω_r and earth's magnetic field parameter, ϕ_l.

$\omega/\omega_r = 0.467$

$\tau_{j,r}$ degrees	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π
		ϕ_1 = 10 degrees		
5	4.1014007 - 2	3.1067500 - 1	4.0905189 - 2	3.1654130 - 1
15	4.1425426 - 2	2.8734390 - 1	4.0506081 - 2	3.4012080 - 1
25	4.2110740 - 2	2.4143440 - 1	3.9888653 - 2	3.8708880 - 1
35	4.2769317 - 2	1.7500980 - 1	3.9340642 - 2	4.5378400 - 1
45	4.2894880 - 2	9.2361500 - 2	3.9009531 - 2	5.2876750 - 1
55	4.1712099 - 2	4.3870000 - 4	3.8445266 - 2	5.9423210 - 1
65	3.8038289 - 2	9.0476200 - 2	3.6154969 - 2	6.3545820 - 1
75	2.9893814 - 2	1.6720860 - 1	2.9352558 - 2	5.6325296
85	1.3503975 - 2	2.1192300 - 1	1.3528105 - 2	5.6308749
		ϕ_1 = 20 degrees		
5	8.2929198 - 2	3.1031670 - 1	8.2721753 - 2	3.1625520 - 1
15	8.3708888 - 2	2.8672670 - 1	8.1966546 - 2	3.4006430 - 1
25	8.4985296 - 2	2.4048070 - 1	8.0821450 - 2	3.8716220 - 1
35	8.6150128 - 2	1.7398190 - 1	7.9845770 - 2	4.5331560 - 1
45	8.6200204 - 2	9.1912800 - 2	7.9271800 - 2	5.2679130 - 1
55	8.3618506 - 2	1.4927000 - 3	7.8113821 - 2	5.9045070 - 1
65	7.6086983 - 2	8.6967000 - 2	7.3347190 - 2	6.3086750 - 1
75	5.9687731 - 2	1.6041470 - 1	5.9421200 - 2	5.6361205
85	2.6918182 - 2	2.0109330 - 1	2.7330130 - 2	5.6315226
		ϕ_1 = 30 degrees		
5	1.2672711 - 1	3.0930870 - 1	1.2644482 - 1	3.1535710 - 1
15	1.2777729 - 1	2.8534100 - 1	1.2543048 - 1	3.3949060 - 1
25	1.2943643 - 1	2.3866120 - 1	1.2395289 - 1	3.8666250 - 1
35	1.3078356 - 1	1.7224290 - 1	1.2279589 - 1	4.5172190 - 1
45	1.3034821 - 1	9.1386400 - 2	1.2214079 - 1	5.2260460 - 1
55	1.2594161 - 1	3.6971000 - 3	1.2030553 - 1	5.8339100 - 1
65	1.1419694 - 1	8.0504900 - 2	1.1267231 - 1	6.2269810 - 1
75	8.9326260 - 2	1.4835960 - 1	9.0967319 - 2	5.6424141
85	4.0177383 - 2	1.8218240 - 1	4.1700853 - 2	5.6327431

Table 7. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, frequencies, ω/ω_r and earth's magnetic field parameter, ϕ_1.

$\omega/\omega_r = 0.467$

$\tau_{j,r}$ degrees	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π
		ϕ_1 = 40 degrees		
5	1.7355529 - 1	3.0694110 - 1	1.7324176 - 1	3.1310890 - 1
15	1.7469869 - 1	2.8258580 - 1	1.7214268 - 1	3.3754860 - 1
25	1.7637972 - 1	2.3560690 - 1	1.7066131 - 1	3.8449500 - 1
35	1.7738162 - 1	1.6977110 - 1	1.6969793 - 1	4.4763320 - 1
45	1.7583533 - 1	9.1147900 - 2	1.6916209 - 1	5.1477590 - 1
55	1.6898833 - 1	7.7477000 - 3	1.6646497 - 1	5.7186850 - 1
65	1.5252982 - 1	7.0161000 - 2	1.5534069 - 1	6.1013240 - 1
75	1.1886775 - 1	1.2993350 - 1	1.2484504 - 1	6.3126370 - 1
85	5.3277129 - 2	1.5387970 - 1	5.6979214 - 2	5.6347853
		ϕ_1 = 50 degrees		
5	2.2481350 - 1	3.0201400 - 1	2.2454236 - 1	3.0825920 - 1
15	2.2575789 - 1	2.7747250 - 1	2.2364266 - 1	3.3277280 - 1
25	2.2689993 - 1	2.3074490 - 1	2.2264877 - 1	3.7880590 - 1
35	2.2680087 - 1	1.6654240 - 1	2.2236453 - 1	4.3886340 - 1
45	2.2332073 - 1	9.1717100 - 2	2.2212354 - 1	5.0115980 - 1
55	2.1327631 - 1	1.4589100 - 2	2.1822044 - 1	5.5415340 - 1
65	1.9149933 - 1	5.4697800 - 2	2.0272208 - 1	5.9194020 - 1
75	1.4861271 - 1	1.0365970 - 1	1.6205079 - 1	6.1772940 - 1
85	6.6337699 - 2	1.1440410 - 1	7.3575899 - 2	6.4510660 - 1
		ϕ_1 = 60 degrees		
5	2.8221185 - 1	2.9263990 - 1	2.8209639 - 1	2.9882540 - 1
15	2.8252031 - 1	2.6847900 - 1	2.8181469 - 1	3.2282800 - 1
25	2.8234237 - 1	2.2319770 - 1	2.8195705 - 1	3.6674240 - 1
35	2.8018850 - 1	1.6241730 - 1	2.8287938 - 1	4.2229080 - 1
45	2.7383554 - 1	9.3586300 - 2	2.8299760 - 1	4.7888880 - 1
55	2.5978873 - 1	2.5149900 - 2	2.7734781 - 1	5.2796490 - 1
65	2.3203969 - 1	3.2898400 - 2	2.5635185 - 1	5.6643140 - 1
75	1.7933872 - 1	6.8051700 - 2	2.0376340 - 1	5.9896570 - 1
85	7.9718413 - 2	6.1856100 - 2	9.2005343 - 2	6.3986860 - 1

Table 8. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, frequencies, ω/ω_r and earth's magnetic field parameter, ϕ_1.

ϕ_1 = 60 degrees

ω/ω_r	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}
		$\tau_{j,r}$ = 5 degrees		
0.0100	8.8429377 - 1	1.2794530 - 1	8.8511589 - 1	3.0145861
0.0200	8.4032574 - 1	1.8387820 - 1	8.4142553 - 1	2.9590490
0.0500	7.5914561 - 1	2.9998050 - 1	7.6069617 - 1	2.8437574
0.1000	6.7602134 - 1	4.3909550 - 1	6.7793816 - 1	2.7056238
0.2000	5.7028228 - 1	6.5118390 - 1	5.7251952 - 1	2.4951445
0.3002	4.9566687 - 1	8.2667620 - 1	4.9805880 - 1	2.3211854
0.4670	4.0042726 - 1	1.0784740	4.0305332 - 1	2.0720831
1.0000	1.9488869 - 1	1.6214996	1.9871032 - 1	1.5321267
2.0000	7.3221492 - 2	1.7525490	7.4749828 - 2	1.3888338
5.0000	2.5538450 - 2	1.6655937	2.5958680 - 2	1.4746904
		$\tau_{j,r}$ = 15 degrees		
0.0100	8.8091136 - 1	1.3181870 - 1	8.8838687 - 1	3.0183123
0.0200	8.3580720 - 1	1.8938610 - 1	8.4580539 - 1	2.9643468
0.0500	7.5279571 - 1	3.0884100 - 1	7.6688278 - 1	2.8522748
0.1000	6.6821019 - 1	4.5202300 - 1	6.8560286 - 1	2.7180376
0.2000	5.6126656 - 1	6.7080050 - 1	5.8149040 - 1	2.5139315
0.3002	4.8616373 - 1	8.5269800 - 1	5.0766270 - 1	2.3460140
0.4670	3.9031007 - 1	1.1159769	4.1358040 - 1	2.1074695
1.0000	1.7999211 - 1	1.6810953	2.1430646 - 1	1.5819013
2.0000	6.6671110 - 2	1.7525332	8.1311070 - 2	1.3889334
5.0000	2.3767424 - 2	1.6592362	2.7731443 - 2	1.4693307
		$\tau_{j,r}$ = 25 degrees		
0.0100	8.7363950 - 1	1.4021060 - 1	8.9486409 - 1	3.0256536
0.0200	8.2612622 - 1	2.0132840 - 1	8.5449667 - 1	2.9747862
0.0500	7.3930524 - 1	3.2809020 - 1	7.7921218 - 1	2.8690657
0.1000	6.5182805 - 1	4.8018610 - 1	7.0095125 - 1	2.7425129
0.2000	5.4290073 - 1	7.1371300 - 1	5.9956351 - 1	2.5509114
0.3002	4.6752671 - 1	9.0983470 - 1	5.2705729 - 1	2.3947082
0.4670	3.7216247 - 1	1.1993008	4.3471779 - 1	2.1763336
1.0000	1.5529126 - 1	1.8702913	2.4636618 - 1	1.6900501
2.0000	5.0817002 - 2	1.7639929	9.7256825 - 2	1.3956704
5.0000	1.9678494 - 2	1.6375586	3.1837793 - 2	1.4576498

Table 9. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field parameter, ϕ_1, and incident angle, $\tau_{j,r}$.

ϕ_l = 60 degrees

ω/ω_r	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}
		$\tau_{j,r}$ = 35 degrees		
0.0100	8.6126604 - 1	1.5469920 - 1	9.0441511 - 1	3.0363910
0.0200	8.0976160 - 1	2.2197590 - 1	8.6735830 - 1	2.9900615
0.0500	7.1685422 - 1	3.6150090 - 1	7.9758626 - 1	2.8936576
0.1000	6.2520491 - 1	5.2931820 - 1	7.2401197 - 1	2.7783785
0.2000	5.1461541 - 1	7.8900800 - 1	6.2702212 - 1	2.6049862
0.3002	4.4084270 - 1	1.0102058	5.5670485 - 1	2.4655207
0.4670	3.5086620 - 1	1.3452587	4.6693375 - 1	2.2751465
1.0000	1.4671623 - 1	2.2984695	2.9429755 - 1	1.8610742
2.0000	1.8517306 - 2	2.0417237	1.3079280 - 1	1.4328543
5.0000	1.1779648 - 2	1.5382695	3.9872770 - 2	1.4378299
		$\tau_{j,r}$ = 45 degrees		
0.0100	8.4132262 - 1	1.7863980 - 1	9.1683749 - 1	3.0502071
0.0200	7.8367543 - 1	2.5618390 - 1	8.8416515 - 1	3.0097320
0.0500	6.8200219 - 1	4.1723720 - 1	8.2183102 - 1	2.9253824
0.1000	5.8550949 - 1	6.1194280 - 1	7.5479993 - 1	2.8247127
0.2000	4.7620897 - 1	9.1612220 - 1	6.6433415 - 1	2.6747145
0.3002	4.0928723 - 1	1.1776945	5.9749206 - 1	2.5562285
0.4670	3.3599112 - 1	1.5762756	5.1155793 - 1	2.3994461
1.0000	1.9496976 - 1	3.5362965	3.5594609 - 1	2.0803039
2.0000	5.8368942 - 2	2.0124468	1.9993596 - 1	1.5717297
5.0000	5.9278107 - 3	7.8938600 - 1	5.6334561 - 2	1.4093987
		$\tau_{j,r}$ = 55 degrees		
0.0100	8.0863492 - 1	2.1961060 - 1	9.3185052 - 1	3.0667006
0.0200	7.4173589 - 1	3.1501950 - 1	9.0459466 - 1	3.0332495
0.0500	6.2852455 - 1	5.1426290 - 1	8.5166558 - 1	2.9634398
0.1000	5.2891610 - 1	7.5729480 - 1	7.9329410 - 1	2.8804583
0.2000	4.3075096 - 1	1.1369939	7.1221475 - 1	2.7585216
0.3002	3.8272913 - 1	1.4541628	6.5093091 - 1	2.6644614
0.4670	3.4505296 - 1	1.9026259	5.7129028 - 1	2.5446279
1.0000	2.9531957 - 1	3.3229046	4.3279778 - 1	2.3224695
2.0000	1.9041680 - 1	2.2372635	3.1326992 - 1	1.8923383
5.0000	4.5816198 - 2	1.2991823	9.7430842 - 2	1.3955272

Table 10. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field parameter, ϕ_l, and incident angle, $\tau_{j,r}$.

ϕ_l = 60 degrees

ω/ω_r	$\lvert T_{ee}\rvert$	Arg T_{ee}	$\lvert T_{mm}\rvert$	Arg T_{mm}
		$\tau_{j,r}$ = 65 degrees		
0.0100	7.5104565 - 1	2.9806110 - 1	9.4908796 - 1	3.0854160
0.0200	6.7058220 - 1	4.2884790 - 1	9.2820631 - 1	3.0600163
0.0500	5.4613515 - 1	7.0576340 - 1	8.8668326 - 1	3.0070336
0.1000	4.5529763 - 1	1.0441259	8.3946895 - 1	2.9446406
0.2000	3.9712325 - 1	1.5352191	7.7182330 - 1	2.8549410
0.3002	3.8985864 - 1	1.8830998	7.1952603 - 1	2.7879043
0.4670	4.0459400 - 1	3.9966999	6.5079111 - 1	2.7062360
1.0000	4.3102292 - 1	3.2428149	5.3315587 - 1	2.5691689
2.0000	3.5976189 - 1	2.5673788	4.4741049 - 1	2.2927606
5.0000	1.7811782 - 1	1.6531056	2.3096071 - 1	1.6221571
		$\tau_{j,r}$ = 75 degrees		
0.0100	6.3424738 - 1	4.9352110 - 1	9.6808074 - 1	3.1059300
0.0200	5.4011480 - 1	7.1882960 - 1	9.5443417 - 1	3.0895637
0.0500	4.3461680 - 1	1.1932647	9.2645538 - 1	3.0557467
0.1000	4.0911405 - 1	1.6844665	8.9365702 - 1	3.0168312
0.2000	4.4783115 - 1	4.1129799	8.4552745 - 1	2.9628373
0.3002	4.9143779 - 1	3.8682997	8.0774989 - 1	2.9241324
0.4670	5.4549435 - 1	3.6274024	7.5772314 - 1	2.8792911
1.0000	6.0622348 - 1	3.2045786	6.7174227 - 1	2.8101571
2.0000	5.5962446 - 1	2.8436627	6.1111128 - 1	2.6678612
5.0000	4.3200936 - 1	2.3577353	4.7177132 - 1	2.2913477
		$\tau_{j,r}$ = 85 degrees		
0.0100	4.1377694 - 1	1.5644026	9.8833903 - 1	3.1284032
0.0200	4.4518437 - 1	2.0311422	9.8297764 - 1	3.1224825
0.0500	5.5262080 - 1	3.8069332	9.7187850 - 1	3.1107662
0.1000	6.4413768 - 1	3.5923234	9.5888449 - 1	3.0978933
0.2000	7.2598233 - 1	3.4417584	9.3984484 - 1	3.0808153
0.3002	7.6731469 - 1	3.3708284	9.2486583 - 1	3.0690917
0.4670	8.0614547 - 1	3.2994775	9.0495003 - 1	3.0561130
1.0000	8.4414668 - 1	3.1673709	8.6988574 - 1	3.0369789
2.0000	8.2382668 - 1	3.0570633	8.4280337 - 1	2.9966627
5.0000	7.6417887 - 1	2.9230076	7.8000075 - 1	2.8947042

Table 11. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field parameter, ϕ_l, and incident angle, $\tau_{j,r}$.

ϕ_l = 60 degrees

ω/ω_r	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π
		$\tau_{j,r}$ = 5 degrees		
0.0100	8.8471589 - 2	6.5797890 - 1	8.8471589 - 2	6.5786500 - 1
0.0200	1.1892370 - 1	6.0230080 - 1	1.1892371 - 1	6.0207270 - 1
0.0500	1.6997653 - 1	4.8676870 - 1	1.6997651 - 1	4.8619800 - 1
0.1000	2.1434754 - 1	3.4837900 - 1	2.1434750 - 1	3.4723100 - 1
0.2000	2.5682270 - 1	1.3724860 - 1	2.5682015 - 1	1.3490140 - 1
0.3002	2.7533769 - 1	3.8087000 - 2	2.7532146 - 1	4.1740100 - 2
0.4670	2.8221185 - 1	2.9263990 - 1	2.8209639 - 1	2.9882540 - 1
1.0000	2.1878662 - 1	9.0847230 - 1	2.1680383 - 1	9.2155850 - 1
2.0000	1.1196951 - 1	1.2952804	1.1019744 - 1	1.3006109
5.0000	4.3850293 - 2	1.4685586	4.3176223 - 2	1.4701922
		$\tau_{j,r}$ = 15 degrees		
0.0100	8.8465232 - 2	6.5836860 - 1	8.8465264 - 2	6.5736370 - 1
0.0200	1.1891170 - 1	6.0312230 - 1	1.1891187 - 1	6.0111220 - 1
0.0500	1.6995009 - 1	4.8891770 - 1	1.6995147 - 1	4.8388470 - 1
0.1000	2.1430252 - 1	3.5278900 - 1	2.1430857 - 1	3.4266890 - 1
0.2000	2.5676022 - 1	1.4637570 - 1	2.5677156 - 1	1.2569970 - 1
0.3002	2.7530670 - 1	2.3831800 - 2	2.7525674 - 1	5.5970900 - 2
0.4670	2.8252031 - 1	2.6847900 - 1	2.8181469 - 1	3.2282800 - 1
1.0000	2.2635439 - 1	8.5526510 - 1	2.1004073 - 1	9.7868560 - 1
2.0000	1.1940686 - 1	1.2727546	1.0285694 - 1	1.3270316
5.0000	4.6677960 - 2	1.4617444	4.0352590 - 2	1.4781829
		$\tau_{j,r}$ = 25 degrees		
0.0100	8.8419763 - 2	6.5880810 - 1	8.8419972 - 2	6.5612890 - 1
0.0200	1.1882608 - 1	6.0430110 - 1	1.1882724 - 1	5.9894150 - 1
0.0500	1.6976177 - 1	4.9252080 - 1	1.6977185 - 1	4.7910340 - 1
0.1000	2.1398010 - 1	3.6066010 - 1	2.1402889 - 1	3.3369380 - 1
0.2000	2.5625945 - 1	1.6325250 - 1	2.5645782 - 1	1.0825720 - 1
0.3002	2.7474604 - 1	2.8022000 - 3	2.7506843 - 1	8.2455300 - 2
0.4670	2.8234237 - 1	2.2319770 - 1	2.8195705 - 1	3.6674240 - 1
1.0000	2.3888186 - 1	7.4557740 - 1	2.0363346 - 1	1.1083027
2.0000	1.3628532 - 1	1.2191262	8.7098022 - 2	4.8631428
5.0000	5.3121295 - 2	1.4461081	3.3952251 - 2	1.5056971

Table 12. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field parameter, ϕ_l, and incident angle, $\tau_{j,r}$.

ϕ_1 = 60 degrees

ω/ω_r	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π
		$\tau_{j,r}$ = 35 degrees		
0.0100	8.8258062 - 2	6.5851980 - 1	8.8258784 - 2	6.5358460 - 1
0.0200	1.1852227 - 1	6.0478990 - 1	1.1852612 - 1	5.9491800 - 1
0.0500	1.6909616 - 1	4.9605790 - 1	1.6913032 - 1	4.7134910 - 1
0.1000	2.1284521 - 1	3.6998750 - 1	2.1301516 - 1	3.2036240 - 1
0.2000	2.5447915 - 1	1.8511060 - 1	2.5524936 - 1	8.4183600 - 2
0.3002	2.7258785 - 1	3.8195500 - 2	2.7425708 - 1	1.1758670 - 1
0.4670	2.8018850 - 1	1.6241730 - 1	2.8287938 - 1	4.2229080 - 1
1.0000	2.5022284 - 1	5.8385060 - 1	2.1135165 - 1	4.9964004
2.0000	1.6712486 - 1	1.1095470	6.6166386 - 2	4.5044707
5.0000	6.5283838 - 2	1.4161202	2.2159298 - 2	4.6569989
		$\tau_{j,r}$ = 45 degrees		
0.0100	8.7825407 - 2	6.5601030 - 1	8.7827059 - 2	6.4850980 - 1
0.0200	1.1771197 - 1	6.0262680 - 1	1.1772079 - 1	5.8762400 - 1
0.0500	1.6733502 - 1	4.9681850 - 1	1.6741334 - 1	4.5927750 - 1
0.1000	2.0987214 - 1	3.7739170 - 1	2.1026329 - 1	3.0206250 - 1
0.2000	2.4986968 - 1	2.0766070 - 1	2.5169611 - 1	5.5005100 - 2
0.3002	2.6696417 - 1	7.7120700 - 2	2.7119537 - 1	1.5712740 - 1
0.4670	2.7383017 - 1	9.3546100 - 2	2.8299670 - 1	4.7891960 - 1
1.0000	2.5317992 - 1	3.9149970 - 1	2.3699892 - 1	4.8636865
2.0000	2.1530498 - 1	8.8708970 - 1	8.6783664 - 2	3.7266013
5.0000	8.8354368 - 2	1.3570827	9.8436937 - 3	3.1865873
		$\tau_{j,r}$ = 55 degrees		
0.0100	8.6798418 - 2	6.4831080 - 1	8.6801361 - 2	6.3824510 - 1
0.0200	1.1580205 - 1	5.9404170 - 1	1.1581769 - 1	5.7390890 - 1
0.0500	1.6324615 - 1	4.8994500 - 1	1.6338389 - 1	4.3958110 - 1
0.1000	2.0309029 - 1	3.7728770 - 1	2.0377447 - 1	2.7633130 - 1
0.2000	2.3960543 - 1	2.2460060 - 1	2.4280883 - 1	2.0834300 - 2
0.3002	2.5462444 - 1	1.1260460 - 1	2.6217212 - 1	1.9800700 - 1
0.4670	2.5978873 - 1	2.5149900 - 2	2.7734781 - 1	5.2796490 - 1
1.0000	2.4342074 - 1	1.9509770 - 1	2.6338521 - 1	4.8227249
2.0000	2.5809795 - 1	5.1898050 - 1	1.7339980 - 1	3.6429653
5.0000	1.3653684 - 1	1.2201349	5.5477304 - 2	2.3146106

Table 13. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field parameter, ϕ_1, and incident angle, $\tau_{j,r}$.

ϕ_l = 60 degrees

ω/ω_r	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π
		$\tau_{j,r}$ = 65 degrees		
0.0100	8.4394723 - 2	6.2859580 - 1	8.4399007 - 2	6.1627470 - 1
0.0200	1.1139871 - 1	5.7076430 - 1	1.1142125 - 1	5.4612090 - 1
0.0500	1.5410265 - 1	4.6573980 - 1	1.5429754 - 1	4.0410890 - 1
0.1000	1.8840924 - 1	3.5965390 - 1	1.8936140 - 1	2.3623330 - 1
0.2000	2.1825535 - 1	2.2620650 - 1	2.2264779 - 1	2.1936600 - 2
0.3002	2.2961200 - 1	1.3508550 - 1	2.3992588 - 1	2.4079150 - 1
0.4670	2.3203969 - 1	3.2898400 - 2	2.5635185 - 1	5.6643140 - 1
1.0000	2.1731849 - 1	1.2704900 - 2	2.6710263 - 1	4.8481129
2.0000	2.5914040 - 1	1.2113800 - 1	2.3738048 - 1	3.8940635
5.0000	2.3535546 - 1	8.0347670 - 1	1.7057965 - 1	2.6507151
		$\tau_{j,r}$ = 75 degrees		
0.0100	7.8118412 - 2	5.7631240 - 1	7.8123513 - 2	5.6231690 - 1
0.0200	1.0032222 - 1	5.0968140 - 1	1.0034844 - 1	4.8169010 - 1
0.0500	1.3263996 - 1	4.0064880 - 1	1.3285640 - 1	3.3066130 - 1
0.1000	1.5612352 - 1	3.0344200 - 1	1.5714166 - 1	1.6339570 - 1
0.2000	1.7444598 - 1	1.9554400 - 1	1.7897845 - 1	8.5164800 - 2
0.3002	1.8024809 - 1	1.3001740 - 1	1.9071364 - 1	2.9310820 - 1
0.4670	1.7933872 - 1	6.8051700 - 2	2.0376340 - 1	5.9896570 - 1
1.0000	1.6669467 - 1	1.4430030 - 1	2.2399638 - 1	4.9087319
2.0000	2.1213769 - 1	2.2560790 - 1	2.2954383 - 1	4.1657744
5.0000	2.7245669 - 1	8.7015000 - 2	2.5265442 - 1	3.3675378
		$\tau_{j,r}$ = 85 degrees		
0.0100	5.3945568 - 2	3.8613220 - 1	5.3949551 - 2	3.7124590 - 1
0.0200	6.2876424 - 2	3.1137430 - 1	6.2895003 - 2	2.8160220 - 1
0.0500	7.2955300 - 2	2.1764470 - 1	7.3089985 - 2	1.4321280 - 1
0.1000	7.8609121 - 2	1.5393820 - 1	7.9189023 - 2	5.0634000 - 3
0.2000	8.1879354 - 2	9.8066500 - 2	8.4285470 - 2	1.9983480 - 1
0.3002	8.2051888 - 2	7.1869500 - 2	8.7439347 - 2	3.7597460 - 1
0.4670	7.9718483 - 2	6.1856100 - 2	9.2005430 - 2	6.3986860 - 1
1.0000	7.3294015 - 2	2.6512520 - 1	1.0306341 - 1	4.9832327
2.0000	9.8387683 - 2	5.0920310 - 1	1.1480474 - 1	4.4130092
5.0000	1.4977265 - 1	4.9990490 - 1	1.5254824 - 1	3.9437012

Table 14. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various frequencies, ω/ω_r, earth's magnetic field parameter, ϕ_l, and incident angle, $\tau_{j,r}$.

ϕ_1 = 60 degrees

$\tau_{j,r}$ degrees	$\lvert T_{ee}\rvert$	Arg T_{ee}	$\lvert T_{mm}\rvert$	Arg T_{mm}
		ω/ω_r = 0.1501		
5	6.1708365 - 1	5.5211680 - 1	6.1919803 - 1	2.5934354
15	6.0851277 - 1	5.6850330 - 1	6.2766588 - 1	2.6091515
25	5.9078300 - 1	6.0428240 - 1	6.4468255 - 1	2.6401212
35	5.6268790 - 1	6.6692290 - 1	6.7040938 - 1	2.6854774
45	5.2257613 - 1	7.7267900 - 1	7.0508668 - 1	2.7440580
55	4.6995532 - 1	9.5855490 - 1	7.4904368 - 1	2.8145687
65	4.1511358 - 1	1.3132018	8.0280942 - 1	2.8958288
75	4.2493087 - 1	1.9780930	8.6770292 - 1	2.9871536
85	6.9373172 - 1	3.4984252	9.4861936 - 1	3.0884031
		ω/ω_r = 0.2335		
5	5.4307379 - 1	7.1269510 - 1	5.4537141 - 1	2.4341446
15	5.3385517 - 1	7.3444240 - 1	5.5458986 - 1	2.4549498
25	5.1529162 - 1	7.8207370 - 1	5.7318464 - 1	2.4958597
35	4.8731537 - 1	8.6571710 - 1	6.0150967 - 1	2.5555904
45	4.5079761 - 1	1.0066154	6.4018084 - 1	2.6324770
55	4.1118155 - 1	1.2482384	6.9018036 - 1	2.7247172
65	3.9175858 - 1	1.6641085	7.5311194 - 1	2.8306019
75	4.6323662 - 1	4.0160879	8.3205390 - 1	2.9486102
85	7.4234630 - 1	3.4136795	9.3450779 - 1	3.0764542

$\tau_{j,r}$ degrees	$\lvert T_{em}\rvert$	Arg T_{em}	$\lvert T_{me}\rvert$	Art T_{me}
		ω/ω_r = 0.1501		
5	2.4016093 - 1	2.3591980 - 1	2.4016031 - 1	2.3418060 - 1
15	2.4010331 - 1	2.4265450 - 1	2.4011476 - 1	2.2732790 - 1
25	2.3967815 - 1	2.5496030 - 1	2.3979373 - 1	2.1415240 - 1
35	2.3818118 - 1	2.7044490 - 1	2.3860048 - 1	1.9543460 - 1
45	2.3428815 - 1	2.8525100 - 1	2.3526410 - 1	1.7155910 - 1
55	2.2552587 - 1	2.9339600 - 1	2.2723228 - 1	1.4128270 - 1
65	2.0698161 - 1	2.8498950 - 1	2.0933415 - 1	9.9331400 - 2
75	1.6782517 - 1	2.4130960 - 1	1.7028703 - 1	3.0913800 - 2
85	8.0884831 - 2	1.2006330 - 1	8.2226955 - 2	1.0343640 - 1
		ω/ω_r = 0.2335		
5	2.6478391 - 1	7.5896400 - 2	2.6477868 - 1	7.3126600 - 2
15	2.6472430 - 1	8.6684000 - 2	2.6472768 - 1	6.2296600 - 2
25	2.6418831 - 1	1.0672800 - 1	2.6444167 - 1	4.1914400 - 2
35	2.6225437 - 1	1.3299590 - 1	2.6330565 - 1	1.4204500 - 2
45	2.5725007 - 1	1.6090230 - 1	2.5978668 - 1	1.8465300 - 2
55	2.4617293 - 1	1.8393380 - 1	2.5063994 - 1	5.5025200 - 2
65	2.2335502 - 1	1.9245150 - 1	2.2946698 - 1	9.8010500 - 2
75	1.7723676 - 1	1.7047040 - 1	1.8350008 - 1	1.5763570 - 1
85	8.2144294 - 2	8.7166400 - 2	8.5427275 - 2	2.6075960 - 1

Table 15. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for various incident angles, $\tau_{j,r}$, earth's magnetic field parameter, ϕ_1 and frequencies, ω/ω_r.

Ψ radians	d/j miles		$\tau_{j,r}$ degrees		$\tau_{j,r}$ radians
		h_3 = 70 kilometers			
0.0005	1.2433895	3	8.1663513	1	1.4252972
0.0010	1.2381675	3	8.1663364	1	1.4252946
0.0020	1.2278386	3	8.1662780	1	1.4252844
0.0030	1.2176623	3	8.1661800	1	1.4252673
0.0040	1.2076369	3	8.1660431	1	1.4252434
0.0050	1.1977599	3	8.1658672	1	1.4252127
0.0060	1.1880278	3	8.1656523	1	1.4251752
0.0070	1.1784374	3	8.1653985	1	1.4251309
0.0080	1.1689853	3	8.1651057	1	1.4250798
0.0090	1.1596669	3	8.1647740	1	1.4250219
0.0100	1.1504788	3	8.1644033	1	1.4249572
0.0120	1.1324770	3	8.1635456	1	1.4248075
0.0150	1.1063547	3	8.1619688	1	1.4245323
0.0200	1.0649462	3	8.1585723	1	1.4239395
0.0250	1.0259098	3	8.1542253	1	1.4231808
0.0300	9.8899038	2	8.1489426	1	1.4222588
0.0400	9.2076906	2	8.1356414	1	1.4199373
0.0500	8.5914709	2	8.1188348	1	1.4170040
0.0650	7.7737068	2	8.0874866	1	1.4115327
0.0800	7.0657786	2	8.0494336	1	1.4048912
0.1000	6.2644905	2	7.9895933	1	1.3944471
0.1500	4.7915900	2	7.8048574	1	1.3622046
0.2000	3.8174547	2	7.5862178	1	1.3240448
0.3000	2.6471062	2	7.0951420	1	1.2383359
0.4000	1.9802951	2	6.5689639	1	1.1465005
0.6000	1.2445355	2	5.4747354	1	9.5552159 - 1
		h_3 = 90 kilometers			
0.0005	1.4000780	3	8.0530037	1	1.4055143
0.0010	1.3948535	3	8.0529911	1	1.4055121
0.0020	1.3845147	3	8.0529395	1	1.4055031
0.0030	1.3743220	3	8.0528536	1	1.4054881
0.0040	1.3642736	3	8.0527338	1	1.4054672
0.0050	1.3543670	3	8.0525791	1	1.4054402
0.0060	1.3445989	3	8.0523900	1	1.4054072
0.0070	1.3349661	3	8.0521666	1	1.4053682
0.0080	1.3254647	3	8.0519099	1	1.4053234
0.0090	1.3160909	3	8.0516177	1	1.4052724
0.0100	1.3068406	3	8.0512922	1	1.4052156
0.0120	1.2886954	3	8.0505382	1	1.4050840
0.0150	1.2623103	3	8.0491517	1	1.4048420
0.0200	1.2203378	3	8.0461631	1	1.4043204
0.0250	1.1805854	3	8.0423341	1	1.4036521
0.0300	1.1428039	3	8.0376753	1	1.4028390
0.0400	1.0724503	3	8.0259159	1	1.4007866
0.0500	1.0082107	3	8.0110030	1	1.3981838
0.0650	9.2176798	2	7.9830306	1	1.3933017
0.0800	8.4566114	2	7.9488216	1	1.3873311
0.1000	7.5787071	2	7.8945241	1	1.3778544
0.1500	5.9120543	2	7.7238039	1	1.3480581
0.2000	4.7678510	2	7.5174669	1	1.3120455
0.3000	3.3479623	2	7.0444427	1	1.2294872
0.4000	2.5187906	2	6.5300097	1	1.1397017
0.6000	1.5902204	2	5.4497290	1	9.5115716 - 1

Table 16. Geometric parameters, Ψ, d/j and $\tau_{j,r}$ for the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 20 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.5372371 - 1	3.0942024	9.9998941 - 1	3.1416033	1.2433895 3
0.0010	9.0968602 - 1	3.0467061	9.9997889 - 1	3.1416138	1.2381675 3
0.0020	8.2824224 - 1	2.9509792	9.9995777 - 1	3.1416349	1.2278386 3
0.0030	7.5542424 - 1	2.8536195	9.9993673 - 1	3.1416561	1.2176623 3
0.0040	6.9090857 - 1	2.7539360	9.9991554 - 1	3.1416771	1.2076369 3
0.0050	6.3433629 - 1	2.6514007	9.9989450 - 1	3.1416983	1.1977599 3
0.0060	5.8533576 - 1	2.5457212	9.9987339 - 1	3.1417193	1.1880278 3
0.0070	5.4352842 - 1	2.4369124	9.9985228 - 1	3.1417405	1.1784374 3
0.0080	5.0852359 - 1	2.3253590	9.9983117 - 1	3.1417615	1.1689853 3
0.0090	4.7990589 - 1	2.2118403	9.9981006 - 1	3.1417827	1.1596669 3
0.0100	4.5722208 - 1	2.0975011	9.9978902 - 1	3.1418037	1.1504788 3
0.0120	4.2761382 - 1	1.8721316	9.9974673 - 1	3.1418460	1.1324770 3
0.0150	4.1405843 - 1	1.5635072	9.9968347 - 1	3.1419092	1.1063547 3
0.0200	4.3803429 - 1	1.1730416	9.9957801 - 1	3.1420148	1.0649462 3
0.0250	4.8228099 - 1	9.1926660 - 1	9.9947256 - 1	3.1421201	1.0259098 3
0.0300	5.2788869 - 1	7.5164990 - 1	9.9936719 - 1	3.1422257	9.8899038 2
0.0400	6.0557853 - 1	5.4987050 - 1	9.9915642 - 1	3.1424365	9.2076906 2
0.0500	6.6418283 - 1	4.3397390 - 1	9.9894577 - 1	3.1426473	8.5914709 2
0.0650	7.2680204 - 1	3.3033940 - 1	9.9863010 - 1	3.1429633	7.7737068 2
0.0800	7.7026714 - 1	2.6700680 - 1	9.9831490 - 1	3.1432791	7.0657786 2
0.1000	8.1070517 - 1	2.1288160 - 1	9.9789526 - 1	3.1436994	6.2644905 2
0.1500	8.6867576 - 1	1.4164630 - 1	9.9685113 - 1	3.1447462	4.7915900 2
0.2000	8.9937743 - 1	1.0639390 - 1	9.9581597 - 1	3.1457851	3.8174547 2
0.3000	9.3111783 - 1	7.1452500 - 2	9.9378255 - 1	3.1478288	2.6471062 2
0.4000	9.4726187 - 1	5.4204500 - 2	9.9181515 - 1	3.1498102	1.9802951 2
0.6000	9.6331471 - 1	3.7374400 - 2	9.8815410 - 1	3.1535078	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.5372371 - 1	3.0942024	9.9998941 - 1	3.1416033	1.4000780 3
0.0010	9.0968602 - 1	3.0467061	9.9997889 - 1	3.1416138	1.3948535 3
0.0020	8.2824224 - 1	2.9509792	9.9995777 - 1	3.1416349	1.3845147 3
0.0030	7.5542424 - 1	2.8536195	9.9993673 - 1	3.1416561	1.3743220 3
0.0040	6.9090857 - 1	2.7539360	9.9991554 - 1	3.1416771	1.3642736 3
0.0050	6.3433629 - 1	2.6514007	9.9989450 - 1	3.1416983	1.3543670 3
0.0060	5.8533576 - 1	2.5457212	9.9987339 - 1	3.1417193	1.3445989 3
0.0070	5.4352842 - 1	2.4369124	9.9985228 - 1	3.1417405	1.3349661 3
0.0080	5.0852359 - 1	2.3253590	9.9983117 - 1	3.1417615	1.3254647 3
0.0090	4.7990589 - 1	2.2118403	9.9981006 - 1	3.1417827	1.3160909 3
0.0100	4.5722208 - 1	2.0975011	9.9978902 - 1	3.1418037	1.3068406 3
0.0120	4.2761382 - 1	1.8721316	9.9974673 - 1	3.1418460	1.2886954 3
0.0150	4.1405843 - 1	1.5635072	9.9968347 - 1	3.1419092	1.2623103 3
0.0200	4.3803429 - 1	1.1730416	9.9957801 - 1	3.1420148	1.2203378 3
0.0250	4.8228099 - 1	9.1926660 - 1	9.9947256 - 1	3.1421201	1.1805854 3
0.0300	5.2788869 - 1	7.5164990 - 1	9.9936719 - 1	3.1422257	1.1428039 3
0.0400	6.0557853 - 1	5.4987050 - 1	9.9915642 - 1	3.1424365	1.0724503 3
0.0500	6.6418283 - 1	4.3397390 - 1	9.9894577 - 1	3.1426473	1.0082107 3
0.0650	7.2680204 - 1	3.3033940 - 1	9.9863010 - 1	3.1429633	9.2176798 2
0.0800	7.7026714 - 1	2.6700680 - 1	9.9831490 - 1	3.1432791	8.4566114 2
0.1000	8.1070517 - 1	2.1288160 - 1	9.9789526 - 1	3.1436994	7.5787071 2
0.1500	8.6867576 - 1	1.4164630 - 1	9.9685113 - 1	3.1447462	5.9120543 2
0.2000	8.9937743 - 1	1.0639390 - 1	9.9581597 - 1	3.1457851	4.7678510 2
0.3000	9.3111783 - 1	7.1452500 - 2	9.9378255 - 1	3.1478288	3.3479623 2
0.4000	9.4726187 - 1	5.4204500 - 2	9.9181515 - 1	3.1498102	2.5187906 2
0.6000	9.6331471 - 1	3.7374400 - 2	9.8815410 - 1	3.1535078	1.5902204 2

Table 17. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 10 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.3522075 - 1	3.0745383	9.9999256 - 1	3.1416002	1.2433895 3
0.0010	8.7490274 - 1	3.0071851	9.9998507 - 1	3.1416076	1.2381675 3
0.0020	7.6734772 - 1	2.8704353	9.9997014 - 1	3.1416225	1.2278386 3
0.0030	6.7650622 - 1	2.7292825	9.9995526 - 1	3.1416375	1.2176623 3
0.0040	6.0136974 - 1	2.5822810	9.9994033 - 1	3.1416524	1.2076369 3
0.0050	5.4087857 - 1	2.4289960	9.9992540 - 1	3.1416673	1.1977599 3
0.0060	4.9393008 - 1	2.2703786	9.9991047 - 1	3.1416823	1.1880278 3
0.0070	4.5931835 - 1	2.1089205	9.9989554 - 1	3.1416972	1.1784374 3
0.0080	4.3567140 - 1	1.9483760	9.9988061 - 1	3.1417121	1.1689853 3
0.0090	4.2144176 - 1	1.7930128	9.9986569 - 1	3.1417271	1.1596669 3
0.0100	4.1497609 - 1	1.6466663	9.9985081 - 1	3.1417419	1.1504788 3
0.0120	4.1893220 - 1	1.3903898	9.9982095 - 1	3.1417718	1.1324770 3
0.0150	4.4806613 - 1	1.1009232	9.9977617 - 1	3.1418165	1.1063547 3
0.0200	5.1265606 - 1	8.0205290 - 1	9.9970159 - 1	3.1418912	1.0649462 3
0.0250	5.7215580 - 1	6.2814710 - 1	9.9962701 - 1	3.1419656	1.0259098 3
0.0300	6.2147185 - 1	5.1630310 - 1	9.9955250 - 1	3.1420404	9.8899038 2
0.0400	6.9474504 - 1	3.8139170 - 1	9.9940343 - 1	3.1421894	9.2076906 2
0.0500	7.4522894 - 1	3.0284560 - 1	9.9925443 - 1	3.1423385	8.5914709 2
0.0650	7.9634980 - 1	2.3169360 - 1	9.9903119 - 1	3.1425620	7.7737068 2
0.0800	8.3055720 - 1	1.8777660 - 1	9.9880816 - 1	3.1427852	7.0657786 2
0.1000	8.6162674 - 1	1.5000480 - 1	9.9851137 - 1	3.1430824	6.2644905 2
0.1500	9.0510552 - 1	1.0000810 - 1	9.9777249 - 1	3.1438226	4.7915900 2
0.2000	9.2769612 - 1	7.5171900 - 2	9.9703968 - 1	3.1445573	3.8174547 2
0.3000	9.5077248 - 1	5.0510000 - 2	9.9559974 - 1	3.1460025	2.6471062 2
0.4000	9.6240947 - 1	3.8323900 - 2	9.9420562 - 1	3.1474036	1.9802951 2
0.6000	9.7391802 - 1	2.6427900 - 2	9.9160932 - 1	3.1500182	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.3522075 - 1	3.0745383	9.9999256 - 1	3.1416002	1.4000780 3
0.0010	8.7490274 - 1	3.0071851	9.9998507 - 1	3.1416076	1.3948535 3
0.0020	7.6734772 - 1	2.8704353	9.9997014 - 1	3.1416225	1.3845147 3
0.0030	6.7650622 - 1	2.7292825	9.9995526 - 1	3.1416375	1.3743220 3
0.0040	6.0136974 - 1	2.5822810	9.9994033 - 1	3.1416524	1.3642736 3
0.0050	5.4087857 - 1	2.4289960	9.9992540 - 1	3.1416673	1.3543670 3
0.0060	4.9393008 - 1	2.2703786	9.9991047 - 1	3.1416823	1.3445989 3
0.0070	4.5931835 - 1	2.1089205	9.9989554 - 1	3.1416972	1.3349661 3
0.0080	4.3567140 - 1	1.9483760	9.9988061 - 1	3.1417121	1.3254647 3
0.0090	4.2144176 - 1	1.7930128	9.9986569 - 1	3.1417271	1.3160909 3
0.0100	4.1497609 - 1	1.6466663	9.9985081 - 1	3.1417419	1.3068406 3
0.0120	4.1893220 - 1	1.3903898	9.9982095 - 1	3.1417718	1.2886954 3
0.0150	4.4806613 - 1	1.1009232	9.9977617 - 1	3.1418165	1.2623103 3
0.0200	5.1265606 - 1	8.0205290 - 1	9.9970159 - 1	3.1418912	1.2203378 3
0.0250	5.7215580 - 1	6.2814710 - 1	9.9962701 - 1	3.1419656	1.1805854 3
0.0300	6.2147185 - 1	5.1630310 - 1	9.9955250 - 1	3.1420404	1.1428039 3
0.0400	6.9474504 - 1	3.8139170 - 1	9.9940343 - 1	3.1421894	1.0724503 3
0.0500	7.4522894 - 1	3.0284560 - 1	9.9925443 - 1	3.1423385	1.0082107 3
0.0650	7.9634980 - 1	2.3169360 - 1	9.9903119 - 1	3.1425620	9.2176798 2
0.0800	8.3055720 - 1	1.8777660 - 1	9.9880816 - 1	3.1427852	8.4566114 2
0.1000	8.6162674 - 1	1.5000480 - 1	9.9851137 - 1	3.1430824	7.5787071 2
0.1500	9.0510552 - 1	1.0000810 - 1	9.9777249 - 1	3.1438226	5.9120543 2
0.2000	9.2769612 - 1	7.5171900 - 2	9.9703968 - 1	3.1445573	4.7678510 2
0.3000	9.5077248 - 1	5.0510000 - 2	9.9559974 - 1	3.1460025	3.3479623 2
0.4000	9.6240947 - 1	3.8323900 - 2	9.9420562 - 1	3.1474036	2.5187906 2
0.6000	9.7391802 - 1	2.6427900 - 2	9.9160932 - 1	3.1500182	1.5902204 2

Table 18. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 0.42826552 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	7.2760752 - 1	2.8122977	9.9999845 - 1	3.1415942	1.2433895 3
0.0010	5.5010743 - 1	2.4550692	9.9999690 - 1	3.1415958	1.2381675 3
0.0020	4.1646035 - 1	1.6945478	9.9999384 - 1	3.1415988	1.2278386 3
0.0030	4.4220005 - 1	1.1423184	9.9999074 - 1	3.1416020	1.2176623 3
0.0040	5.0407376 - 1	8.3288090 - 1	9.9998766 - 1	3.1416050	1.2076369 3
0.0050	5.6295438 - 1	6.5188650 - 1	9.9998456 - 1	3.1416082	1.1977599 3
0.0060	6.1241260 - 1	5.3545320 - 1	9.9998148 - 1	3.1416112	1.1880278 3
0.0070	6.5306259 - 1	4.5458210 - 1	9.9997838 - 1	3.1416143	1.1784374 3
0.0080	6.8658189 - 1	3.9515360 - 1	9.9997530 - 1	3.1416174	1.1689853 3
0.0090	7.1450144 - 1	3.4961280 - 1	9.9997220 - 1	3.1416205	1.1596669 3
0.0100	7.3802716 - 1	3.1357870 - 1	9.9996912 - 1	3.1416236	1.1504788 3
0.0120	7.7533889 - 1	2.6013070 - 1	9.9996294 - 1	3.1416298	1.1324770 3
0.0150	8.1512753 - 1	2.0731660 - 1	9.9995366 - 1	3.1416390	1.1063547 3
0.0200	8.5744432 - 1	1.5502440 - 1	9.9993827 - 1	3.1416544	1.0649462 3
0.0250	8.8406682 - 1	1.2384960 - 1	9.9992281 - 1	3.1416699	1.0259098 3
0.0300	9.0233375 - 1	1.0313350 - 1	9.9990735 - 1	3.1416854	9.8899038 2
0.0400	9.2575371 - 1	7.7299800 - 2	9.9987652 - 1	3.1417162	9.2076906 2
0.0500	9.4011862 - 1	6.1827100 - 2	9.9984565 - 1	3.1417471	8.5914709 2
0.0650	9.5358624 - 1	4.7560600 - 2	9.9979945 - 1	3.1417933	7.7737068 2
0.0800	9.6210341 - 1	3.8652100 - 2	9.9975326 - 1	3.1418395	7.0657786 2
0.1000	9.6954535 - 1	3.0937400 - 2	9.9969174 - 1	3.1419010	6.2644905 2
0.1500	9.7954847 - 1	2.0666200 - 2	9.9953864 - 1	3.1420541	4.7915900 2
0.2000	9.8457671 - 1	1.5544500 - 2	9.9938668 - 1	3.1422063	3.8174547 2
0.3000	9.8960483 - 1	1.0449800 - 2	9.9908781 - 1	3.1425053	2.6471062 2
0.4000	9.9454581 - 1	5.4692000 - 3	9.9825785 - 1	3.1433364	1.9802951 2
0.6000	9.9210129 - 1	7.9301000 - 3	9.9879816 - 1	3.1427953	1.2445355 2
		h_3 = 90 kilometers			
0.0005	7.2760752 - 1	2.8122977	9.9999845 - 1	3.1415942	1.4000780 3
0.0010	5.5010743 - 1	2.4550692	9.9999690 - 1	3.1415958	1.3948535 3
0.0020	4.1646035 - 1	1.6945478	9.9999384 - 1	3.1415988	1.3845147 3
0.0030	4.4220005 - 1	1.1423184	9.9999074 - 1	3.1416020	1.3743220 3
0.0040	5.0407376 - 1	8.3288090 - 1	9.9998766 - 1	3.1416050	1.3642736 3
0.0050	5.6295438 - 1	6.5188650 - 1	9.9998456 - 1	3.1416082	1.3543670 3
0.0060	6.1241260 - 1	5.3545320 - 1	9.9998148 - 1	3.1416112	1.3445989 3
0.0070	6.5306259 - 1	4.5458210 - 1	9.9997838 - 1	3.1416143	1.3349661 3
0.0080	6.8658189 - 1	3.9515360 - 1	9.9997530 - 1	3.1416174	1.3254647 3
0.0090	7.1450144 - 1	3.4961280 - 1	9.9997220 - 1	3.1416205	1.3160909 3
0.0100	7.3802716 - 1	3.1357870 - 1	9.9996912 - 1	3.1416236	1.3068406 3
0.0120	7.7533889 - 1	2.6013070 - 1	9.9996294 - 1	3.1416298	1.2886954 3
0.0150	8.1512753 - 1	2.0731660 - 1	9.9995366 - 1	3.1416390	1.2623103 3
0.0200	8.5744432 - 1	1.5502440 - 1	9.9993827 - 1	3.1416544	1.2203378 3
0.0250	8.8406682 - 1	1.2384960 - 1	9.9992281 - 1	3.1416699	1.1805854 3
0.0300	9.0233375 - 1	1.0313350 - 1	9.9990735 - 1	3.1416854	1.1428039 3
0.0400	9.2575371 - 1	7.7299800 - 2	9.9987652 - 1	3.1417162	1.0724503 3
0.0500	9.4011862 - 1	6.1827100 - 2	9.9984565 - 1	3.1417471	1.0082107 3
0.0650	9.5358624 - 1	4.7560600 - 2	9.9979945 - 1	3.1417933	9.2176798 2
0.0800	9.6210341 - 1	3.8652100 - 2	9.9975326 - 1	3.1418395	8.4566114 2
0.1000	9.6954535 - 1	3.0937400 - 2	9.9969174 - 1	3.1419010	7.5787071 2
0.1500	9.7954847 - 1	2.0666200 - 2	9.9953864 - 1	3.1420541	5.9120543 2
0.2000	9.8457671 - 1	1.5544500 - 2	9.9938668 - 1	3.1422063	4.7678510 2
0.3000	9.8960483 - 1	1.0449800 - 2	9.9908781 - 1	3.1425053	3.3479623 2
0.4000	9.9210129 - 1	7.9301000 - 3	9.9879816 - 1	3.1427953	2.5187906 2
0.6000	9.9454581 - 1	5.4692000 - 3	9.9825785 - 1	3.1433364	1.5902204 2

Table 19. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 0.85653105 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	7.9696248 - 1	2.9106499	9.9999781 - 1	3.1415949	1.2433895 3
0.0010	6.4337594 - 1	2.6687131	9.9999561 - 1	3.1415971	1.2381675 3
0.0020	4.6433743 - 1	2.1357482	9.9999123 - 1	3.1416014	1.2278386 3
0.0030	4.1445199 - 1	1.6117222	9.9998694 - 1	3.1416058	1.2176623 3
0.0040	4.3311065 - 1	1.2164162	9.9998255 - 1	3.1416102	1.2076369 3
0.0050	4.7463973 - 1	9.5461510 - 1	9.9997817 - 1	3.1416145	1.1977599 3
0.0060	5.1911354 - 1	7.8046080 - 1	9.9997378 - 1	3.1416189	1.1880278 3
0.0070	5.6020975 - 1	6.5909740 - 1	9.9996940 - 1	3.1416233	1.1784374 3
0.0080	5.9650704 - 1	5.7037390 - 1	9.9996507 - 1	3.1416276	1.1689853 3
0.0090	6.2813736 - 1	5.0284940 - 1	9.9996069 - 1	3.1416320	1.1596669 3
0.0100	6.5565634 - 1	4.4976750 - 1	9.9995630 - 1	3.1416364	1.1504788 3
0.0120	7.0074354 - 1	3.7164380 - 1	9.9994753 - 1	3.1416451	1.1324770 3
0.0150	7.5054946 - 1	2.9516430 - 1	9.9993450 - 1	3.1416582	1.1063547 3
0.0200	8.0523596 - 1	2.2008540 - 1	9.9991264 - 1	3.1416800	1.0649462 3
0.0250	8.4045343 - 1	1.7558700 - 1	9.9989081 - 1	3.1417019	1.0259098 3
0.0300	8.6495214 - 1	1.4610650 - 1	9.9986898 - 1	3.1417237	9.8899038 2
0.0400	8.9673583 - 1	1.0942570 - 1	9.9982541 - 1	3.1417674	9.2076906 2
0.0500	9.1642860 - 1	8.7491600 - 2	9.9978172 - 1	3.1418110	8.5914709 2
0.0650	9.3502136 - 1	6.7285800 - 2	9.9971637 - 1	3.1418763	7.7737068 2
0.0800	9.4684264 - 1	5.4675600 - 2	9.9965107 - 1	3.1419416	7.0657786 2
0.1000	9.5721048 - 1	4.3758900 - 2	9.9956408 - 1	3.1420287	6.2644905 2
0.1500	9.7120215 - 1	2.9228300 - 2	9.9934754 - 1	3.1422454	4.7915900 2
0.2000	9.7825880 - 1	2.1984100 - 2	9.9913277 - 1	3.1424603	3.8174547 2
0.3000	9.8533083 - 1	1.4778500 - 2	9.9871022 - 1	3.1428834	2.6471062 2
0.4000	9.8884795 - 1	1.1215000 - 2	9.9830070 - 1	3.1432934	1.9802951 2
0.6000	9.9229527 - 1	7.7346000 - 3	9.9753712 - 1	3.1440586	1.2445355 2
		h_3 = 90 kilometers			
0.0005	7.9696248 - 1	2.9106499	9.9999781 - 1	3.1415949	1.4000780 3
0.0010	6.4337594 - 1	2.6687131	9.9999561 - 1	3.1415971	1.3948535 3
0.0020	4.6433743 - 1	2.1357482	9.9999123 - 1	3.1416014	1.3845147 3
0.0030	4.1445199 - 1	1.6117222	9.9998694 - 1	3.1416058	1.3743220 3
0.0040	4.3311065 - 1	1.2164162	9.9998255 - 1	3.1416102	1.3642736 3
0.0050	4.7463973 - 1	9.5461510 - 1	9.9997817 - 1	3.1416145	1.3543670 3
0.0060	5.1911354 - 1	7.8046080 - 1	9.9997378 - 1	3.1416189	1.3445989 3
0.0070	5.6020975 - 1	6.5909740 - 1	9.9996940 - 1	3.1416233	1.3349661 3
0.0080	5.9650704 - 1	5.7037390 - 1	9.9996507 - 1	3.1416276	1.3254647 3
0.0090	6.2813736 - 1	5.0284940 - 1	9.9996069 - 1	3.1416320	1.3160909 3
0.0100	6.5565634 - 1	4.4976750 - 1	9.9995630 - 1	3.1416364	1.3068406 3
0.0120	7.0074354 - 1	3.7164380 - 1	9.9994753 - 1	3.1416451	1.2886954 3
0.0150	7.5054946 - 1	2.9516430 - 1	9.9993450 - 1	3.1416582	1.2623103 3
0.0200	8.0523596 - 1	2.2008540 - 1	9.9991264 - 1	3.1416800	1.2203378 3
0.0250	8.4045343 - 1	1.7558700 - 1	9.9989081 - 1	3.1417019	1.1805854 3
0.0300	8.6495214 - 1	1.4610650 - 1	9.9986898 - 1	3.1417237	1.1428039 3
0.0400	8.9673583 - 1	1.0942570 - 1	9.9982541 - 1	3.1417674	1.0724503 3
0.0500	9.1642860 - 1	8.7491600 - 2	9.9978172 - 1	3.1418110	1.0082107 3
0.0650	9.3502136 - 1	6.7285800 - 2	9.9971637 - 1	3.1418763	9.2176798 2
0.0800	9.4684264 - 1	5.4675600 - 2	9.9965107 - 1	3.1419416	8.4566114 2
0.1000	9.5721048 - 1	4.3758900 - 2	9.9956408 - 1	3.1420287	7.5787071 2
0.1500	9.7120215 - 1	2.9228300 - 2	9.9934754 - 1	3.1422454	5.9120543 2
0.2000	9.7825880 - 1	2.1984100 - 2	9.9913277 - 1	3.1424603	4.7678510 2
0.3000	9.8533083 - 1	1.4778500 - 2	9.9871022 - 1	3.1428834	3.3479623 2
0.4000	9.8884795 - 1	1.1215000 - 2	9.9830070 - 1	3.1432934	2.5187906 2
0.6000	9.9229527 - 1	7.7346000 - 3	9.9753712 - 1	3.1440586	1.5902204 2

Table 20. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 2.1413276 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	8.6561711 - 1	2.9962765	9.9999653 - 1	3.1415962	1.2433895 3
0.0010	7.5164151 - 1	2.8480213	9.9999312 - 1	3.1415996	1.2381675 3
0.0020	5.8038346 - 1	2.5335359	9.9998618 - 1	3.1416065	1.2278386 3
0.0030	4.7580389 - 1	2.1924738	9.9997930 - 1	3.1416134	1.2176623 3
0.0040	4.2559088 - 1	1.8474151	9.9997236 - 1	3.1416203	1.2076369 3
0.0050	4.1436098 - 1	1.5372500	9.9996548 - 1	3.1416272	1.1977599 3
0.0060	4.2634366 - 1	1.2853422	9.9995860 - 1	3.1416342	1.1880278 3
0.0070	4.4967053 - 1	1.0908877	9.9995166 - 1	3.1416410	1.1784374 3
0.0080	4.7730280 - 1	9.4219960 - 1	9.9994478 - 1	3.1416480	1.1689853 3
0.0090	5.0562169 - 1	8.2718250 - 1	9.9993784 - 1	3.1416548	1.1596669 3
0.0100	5.3293328 - 1	7.3649720 - 1	9.9993096 - 1	3.1416618	1.1504788 3
0.0120	5.8218366 - 1	6.0372130 - 1	9.9991714 - 1	3.1416756	1.1324770 3
0.0150	6.4199789 - 1	4.7551070 - 1	9.9989644 - 1	3.1416962	1.1063547 3
0.0200	7.1305233 - 1	3.5188100 - 1	9.9986188 - 1	3.1417309	1.0649462 3
0.0250	7.6135502 - 1	2.7966120 - 1	9.9982736 - 1	3.1417654	1.0259098 3
0.0300	7.9600393 - 1	2.3220300 - 1	9.9979285 - 1	3.1417999	9.8899038 2
0.0400	8.4213369 - 1	1.7352230 - 1	9.9972392 - 1	3.1418688	9.2076906 2
0.0500	8.7133881 - 1	1.3859530 - 1	9.9965490 - 1	3.1419378	8.5914709 2
0.0650	8.9932429 - 1	1.0650580 - 1	9.9955157 - 1	3.1420412	7.7737068 2
0.0800	9.1731681 - 1	8.6512500 - 2	9.9944830 - 1	3.1421445	7.0657786 2
0.1000	9.3321985 - 1	6.9220700 - 2	9.9931084 - 1	3.1422820	6.2644905 2
0.1500	9.5485771 - 1	4.6223200 - 2	9.9896861 - 1	3.1426247	4.7915900 2
0.2000	9.6584542 - 1	3.4763500 - 2	9.9862909 - 1	3.1429646	3.8174547 2
0.3000	9.7690582 - 1	2.3367800 - 2	9.9796144 - 1	3.1436333	2.6471062 2
0.4000	9.8242458 - 1	1.7732600 - 2	9.9731454 - 1	3.1442817	1.9802951 2
0.6000	9.8784507 - 1	1.2229400 - 2	9.9610858 - 1	3.1454917	1.2445355 2
		h_3 = 90 kilometers			
0.0005	8.6561711 - 1	2.9962765	9.9999653 - 1	3.1415962	1.4000780 3
0.0010	7.5164151 - 1	2.8480213	9.9999312 - 1	3.1415996	1.3948535 3
0.0020	5.8038346 - 1	2.5335359	9.9998618 - 1	3.1416065	1.3845147 3
0.0030	4.7580389 - 1	2.1924738	9.9997930 - 1	3.1416134	1.3743220 3
0.0040	4.2559088 - 1	1.8474151	9.9997236 - 1	3.1416203	1.3642736 3
0.0050	4.1436098 - 1	1.5372500	9.9996548 - 1	3.1416272	1.3543670 3
0.0060	4.2634366 - 1	1.2853422	9.9995860 - 1	3.1416342	1.3445989 3
0.0070	4.4967053 - 1	1.0908877	9.9995166 - 1	3.1416410	1.3349661 3
0.0080	4.7730280 - 1	9.4219960 - 1	9.9994478 - 1	3.1416480	1.3254647 3
0.0090	5.0562169 - 1	8.2718250 - 1	9.9993784 - 1	3.1416548	1.3160909 3
0.0100	5.3293328 - 1	7.3649720 - 1	9.9993096 - 1	3.1416618	1.3068406 3
0.0120	5.8218366 - 1	6.0372130 - 1	9.9991714 - 1	3.1416756	1.2886954 3
0.0150	6.4199789 - 1	4.7551070 - 1	9.9989644 - 1	3.1416962	1.2623103 3
0.0200	7.1305233 - 1	3.5188100 - 1	9.9986188 - 1	3.1417309	1.2203378 3
0.0250	7.6135502 - 1	2.7966120 - 1	9.9982736 - 1	3.1417654	1.1805854 3
0.0300	7.9600393 - 1	2.3220300 - 1	9.9979285 - 1	3.1417999	1.1428039 3
0.0400	8.4213369 - 1	1.7352230 - 1	9.9972392 - 1	3.1418688	1.0724503 3
0.0500	8.7133881 - 1	1.3859530 - 1	9.9965490 - 1	3.1419378	1.0082107 3
0.0650	8.9932429 - 1	1.0650580 - 1	9.9955157 - 1	3.1420412	9.2176798 2
0.0800	9.1731681 - 1	8.6512500 - 2	9.9944830 - 1	3.1421445	8.4566114 2
0.1000	9.3321985 - 1	6.9220700 - 2	9.9931084 - 1	3.1422820	7.5787071 2
0.1500	9.5485771 - 1	4.6223200 - 2	9.9896861 - 1	3.1426247	5.9120543 2
0.2000	9.6584542 - 1	3.4763500 - 2	9.9862909 - 1	3.1429646	4.7678510 2
0.3000	9.7690582 - 1	2.3367800 - 2	9.9796144 - 1	3.1436333	3.3479623 2
0.4000	9.8242458 - 1	1.7732600 - 2	9.9731454 - 1	3.1442817	2.5187906 2
0.6000	9.8784507 - 1	1.2229400 - 2	9.9610858 - 1	3.1454917	1.5902204 2

Table 21. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 4.2826552 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.0282360 - 1	3.0390190	9.9999517 - 1	3.1415976	1.2433895 3
0.0010	8.1597957 - 1	2.9353883	9.9999019 - 1	3.1416024	1.2381675 3
0.0020	6.7190501 - 1	2.7211641	9.9998046 - 1	3.1416122	1.2278386 3
0.0030	5.6435159 - 1	2.4934275	9.9997072 - 1	3.1416220	1.2176623 3
0.0040	4.8949004 - 1	2.2522884	9.9996092 - 1	3.1416318	1.2076369 3
0.0050	4.4304970 - 1	2.0057043	9.9995118 - 1	3.1416415	1.1977599 3
0.0060	4.1989988 - 1	1.7676166	9.9994138 - 1	3.1416513	1.1880278 3
0.0070	4.1423305 - 1	1.5515332	9.9993164 - 1	3.1416610	1.1784374 3
0.0080	4.2044529 - 1	1.3648903	9.9992184 - 1	3.1416708	1.1689853 3
0.0090	4.3396714 - 1	1.2084453	9.9991210 - 1	3.1416806	1.1596669 3
0.0100	4.5153280 - 1	1.0789615	9.9990236 - 1	3.1416904	1.1504788 3
0.0120	4.9107873 - 1	8.8282430 - 1	9.9988282 - 1	3.1417099	1.1324770 3
0.0150	5.4866849 - 1	6.9045370 - 1	9.9985355 - 1	3.1417392	1.1063547 3
0.0200	6.2645828 - 1	5.0619260 - 1	9.9980467 - 1	3.1417880	1.0649462 3
0.0250	6.8364307 - 1	4.0009730 - 1	9.9975586 - 1	3.1418369	1.0259098 3
0.0300	7.2639714 - 1	3.3110840 - 1	9.9970712 - 1	3.1418856	9.8899038 2
0.0400	7.8525441 - 1	2.4657100 - 1	9.9960952 - 1	3.1419832	9.2076906 2
0.0500	8.2353793 - 1	1.9660850 - 1	9.9951206 - 1	3.1420808	8.5914709 2
0.0650	8.6089482 - 1	1.5089770 - 1	9.9936589 - 1	3.1422270	7.7737068 2
0.0800	8.8523621 - 1	1.2249450 - 1	9.9921994 - 1	3.1423730	7.0657786 2
0.1000	9.0695069 - 1	9.7967600 - 2	9.9902559 - 1	3.1425676	6.2644905 2
0.1500	9.3678143 - 1	6.5390700 - 2	9.9854164 - 1	3.1430520	4.7915900 2
0.2000	9.5205017 - 1	4.9171400 - 2	9.9806172 - 1	3.1435328	3.8174547 2
0.3000	9.6749899 - 1	3.3049200 - 2	9.9711819 - 1	3.1444786	2.6471062 2
0.4000	9.7523595 - 1	2.5078300 - 2	9.9620430 - 1	3.1453955	1.9802951 2
0.6000	9.8285368 - 1	1.7294900 - 2	9.9450107 - 1	3.1471067	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.0282360 - 1	3.0390190	9.9999517 - 1	3.1415976	1.4000780 3
0.0010	8.1597957 - 1	2.9353883	9.9999019 - 1	3.1416024	1.3948535 3
0.0020	6.7190501 - 1	2.7211641	9.9998046 - 1	3.1416122	1.3845147 3
0.0030	5.6435159 - 1	2.4934275	9.9997072 - 1	3.1416220	1.3743220 3
0.0040	4.8949004 - 1	2.2522884	9.9996092 - 1	3.1416318	1.3642736 3
0.0050	4.4304970 - 1	2.0057043	9.9995118 - 1	3.1416415	1.3543670 3
0.0060	4.1989988 - 1	1.7676166	9.9994138 - 1	3.1416513	1.3445989 3
0.0070	4.1423305 - 1	1.5515332	9.9993164 - 1	3.1416610	1.3349661 3
0.0080	4.2044529 - 1	1.3648903	9.9992184 - 1	3.1416708	1.3254647 3
0.0090	4.3396714 - 1	1.2084453	9.9991210 - 1	3.1416806	1.3160909 3
0.0100	4.5153280 - 1	1.0789615	9.9990236 - 1	3.1416904	1.3068406 3
0.0120	4.9107873 - 1	8.8282430 - 1	9.9988282 - 1	3.1417099	1.2886954 3
0.0150	5.4866849 - 1	6.9045370 - 1	9.9985355 - 1	3.1417392	1.2623103 3
0.0200	6.2645828 - 1	5.0619260 - 1	9.9980467 - 1	3.1417880	1.2203378 3
0.0250	6.8364307 - 1	4.0009730 - 1	9.9975586 - 1	3.1418369	1.1805854 3
0.0300	7.2639714 - 1	3.3110840 - 1	9.9970712 - 1	3.1418856	1.1428039 3
0.0400	7.8525441 - 1	2.4657100 - 1	9.9960952 - 1	3.1419832	1.0724503 3
0.0500	8.2353793 - 1	1.9660850 - 1	9.9951206 - 1	3.1420808	1.0082107 3
0.0650	8.6089482 - 1	1.5089770 - 1	9.9936589 - 1	3.1422270	9.2176798 2
0.0800	8.8523621 - 1	1.2249450 - 1	9.9921994 - 1	3.1423730	8.4566114 2
0.1000	9.0695069 - 1	9.7967600 - 2	9.9902559 - 1	3.1425676	7.5787071 2
0.1500	9.3678143 - 1	6.5390700 - 2	9.9854164 - 1	3.1430520	5.9120543 2
0.2000	9.5205017 - 1	4.9171400 - 2	9.9806172 - 1	3.1435328	4.7678510 2
0.3000	9.6749899 - 1	3.3049200 - 2	9.9711819 - 1	3.1444786	3.3479623 2
0.4000	9.7523595 - 1	2.5078300 - 2	9.9620430 - 1	3.1453955	2.5187906 2
0.6000	9.8285368 - 1	1.7294900 - 2	9.9450107 - 1	3.1471067	1.5902204 2

Table 22. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 8.5653105 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.3020145 - 1	3.0691294	9.9999316 - 1	3.1415996	1.2433895 3
0.0010	8.6560578 - 1	2.9962893	9.9998613 - 1	3.1416065	1.2381675 3
0.0020	7.5162135 - 1	2.8480461	9.9997236 - 1	3.1416203	1.2278386 3
0.0030	6.5696598 - 1	2.6943420	9.9995850 - 1	3.1416341	1.2176623 3
0.0040	5.8034986 - 1	2.5335791	9.9994473 - 1	3.1416480	1.2076369 3
0.0050	5.2042451 - 1	2.3656699	9.9993096 - 1	3.1416618	1.1977599 3
0.0060	4.7576038 - 1	2.1925207	9.9991719 - 1	3.1416756	1.1880278 3
0.0070	4.4474944 - 1	2.0180486	9.9990333 - 1	3.1416894	1.1784374 3
0.0080	4.2554105 - 1	1.8474490	9.9988956 - 1	3.1417032	1.1689853 3
0.0090	4.1608914 - 1	1.6858882	9.9987569 - 1	3.1417171	1.1596669 3
0.0100	4.1430849 - 1	1.5372646	9.9986193 - 1	3.1417309	1.1504788 3
0.0120	4.2629094 - 1	1.2853419	9.9983429 - 1	3.1417585	1.1324770 3
0.0150	4.6318294 - 1	1.0116226	9.9979290 - 1	3.1417999	1.1063547 3
0.0200	5.3288151 - 1	7.3649310 - 1	9.9972377 - 1	3.1418690	1.0649462 3
0.0250	5.9322533 - 1	5.7771040 - 1	9.9965485 - 1	3.1419379	1.0259098 3
0.0300	6.4193963 - 1	4.7553100 - 1	9.9958574 - 1	3.1420069	9.8899038 2
0.0400	7.1298301 - 1	3.5192500 - 1	9.9944791 - 1	3.1421450	9.2076906 2
0.0500	7.6127243 - 1	2.7972700 - 1	9.9931001 - 1	3.1422830	8.5914709 2
0.0650	8.0975696 - 1	2.1417380 - 1	9.9910335 - 1	3.1424897	7.7737068 2
0.0800	8.4200587 - 1	1.7364750 - 1	9.9889691 - 1	3.1426963	7.0657786 2
0.1000	8.7117884 - 1	1.3875760 - 1	9.9862216 - 1	3.1429715	6.2644905 2
0.1500	9.1183597 - 1	9.2536500 - 2	9.9793829 - 1	3.1436564	4.7915900 2
0.2000	9.3289095 - 1	6.9562800 - 2	9.9725995 - 1	3.1443363	3.8174547 2
0.3000	9.5435347 - 1	4.6744400 - 2	9.9592703 - 1	3.1456739	2.6471062 2
0.4000	9.6516049 - 1	3.5467900 - 2	9.9463630 - 1	3.1469706	1.9802951 2
0.6000	9.7583776 - 1	2.4458700 - 2	9.9223222 - 1	3.1493904	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.3020145 - 1	3.0691294	9.9999316 - 1	3.1415996	1.4000780 3
0.0010	8.6560578 - 1	2.9962893	9.9998613 - 1	3.1416065	1.3948535 3
0.0020	7.5162135 - 1	2.8480461	9.9997236 - 1	3.1416203	1.3845147 3
0.0030	6.5696598 - 1	2.6943420	9.9995850 - 1	3.1416341	1.3743220 3
0.0040	5.8034986 - 1	2.5335791	9.9994473 - 1	3.1416480	1.3642736 3
0.0050	5.2042451 - 1	2.3656699	9.9993096 - 1	3.1416618	1.3543670 3
0.0060	4.7576038 - 1	2.1925207	9.9991719 - 1	3.1416756	1.3445989 3
0.0070	4.4474944 - 1	2.0180486	9.9990333 - 1	3.1416894	1.3349661 3
0.0080	4.2554105 - 1	1.8474490	9.9988956 - 1	3.1417032	1.3254647 3
0.0090	4.1608914 - 1	1.6858882	9.9987569 - 1	3.1417171	1.3160909 3
0.0100	4.1430849 - 1	1.5372646	9.9986193 - 1	3.1417309	1.3068406 3
0.0120	4.2629094 - 1	1.2853419	9.9983429 - 1	3.1417585	1.2886954 3
0.0150	4.6318294 - 1	1.0116226	9.9979290 - 1	3.1417999	1.2623103 3
0.0200	5.3288151 - 1	7.3649310 - 1	9.9972377 - 1	3.1418690	1.2203378 3
0.0250	5.9322533 - 1	5.7771040 - 1	9.9965485 - 1	3.1419379	1.1805854 3
0.0300	6.4193963 - 1	4.7553100 - 1	9.9958574 - 1	3.1420069	1.1428039 3
0.0400	7.1298301 - 1	3.5192500 - 1	9.9944791 - 1	3.1421450	1.0724503 3
0.0500	7.6127243 - 1	2.7972700 - 1	9.9931001 - 1	3.1422830	1.0082107 3
0.0650	8.0975696 - 1	2.1417380 - 1	9.9910335 - 1	3.1424897	9.2176798 2
0.0800	8.4200587 - 1	1.7364750 - 1	9.9889691 - 1	3.1426963	8.4566114 2
0.1000	8.7117884 - 1	1.3875760 - 1	9.9862216 - 1	3.1429715	7.5787071 2
0.1500	9.1183597 - 1	9.2536500 - 2	9.9793829 - 1	3.1436564	5.9120543 2
0.2000	9.3289095 - 1	6.9562800 - 2	9.9725995 - 1	3.1443363	4.7678510 2
0.3000	9.5435347 - 1	4.6744400 - 2	9.9592703 - 1	3.1456739	3.3479623 2
0.4000	9.6516049 - 1	3.5467900 - 2	9.9463630 - 1	3.1469706	2.5187906 2
0.6000	9.7583776 - 1	2.4458700 - 2	9.9223222 - 1	3.1493904	1.5902204 2

Table 23. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 42.826552 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.6812326 - 1	3.1092242	9.9998458 - 1	3.1416082	1.2433895 3
0.0010	9.3729451 - 1	3.0768216	9.9996912 - 1	3.1416236	1.2381675 3
0.0020	8.7876084 - 1	3.0117802	9.9993823 - 1	3.1416545	1.2278386 3
0.0030	8.2433792 - 1	2.9462050	9.9990733 - 1	3.1416854	1.2176623 3
0.0040	7.7393938 - 1	2.8798470	9.9987650 - 1	3.1417162	1.2076369 3
0.0050	7.2746259 - 1	2.8124795	9.9984559 - 1	3.1417471	1.1977599 3
0.0060	6.8479583 - 1	2.7439077	9.9981471 - 1	3.1417780	1.1880278 3
0.0070	6.4582235 - 1	2.6739782	9.9978382 - 1	3.1418088	1.1784374 3
0.0080	6.1042355 - 1	2.6025908	9.9975293 - 1	3.1418398	1.1689853 3
0.0090	5.7847942 - 1	2.5297090	9.9972208 - 1	3.1418706	1.1596669 3
0.0100	5.4986840 - 1	2.4553707	9.9969117 - 1	3.1419015	1.1504788 3
0.0120	5.0214339 - 1	2.3028952	9.9962944 - 1	3.1419632	1.1324770 3
0.0150	4.5224533 - 1	2.0690368	9.9953685 - 1	3.1420559	1.1063547 3
0.0200	4.1612034 - 1	1.6947121	9.9938253 - 1	3.1422103	1.0649462 3
0.0250	4.1916904 - 1	1.3812038	9.9922828 - 1	3.1423645	1.0259098 3
0.0300	4.4185474 - 1	1.1422778	9.9907402 - 1	3.1425189	9.8899038 2
0.0400	5.0373414 - 1	8.3283030 - 1	9.9876568 - 1	3.1428275	9.2076906 2
0.0500	5.6260703 - 1	6.5189470 - 1	9.9845761 - 1	3.1431359	8.5914709 2
0.0650	6.3335699 - 1	4.9178920 - 1	9.9799593 - 1	3.1435983	7.7737068 2
0.0800	6.8615753 - 1	3.9538010 - 1	9.9753487 - 1	3.1440603	7.0657786 2
0.1000	7.3752938 - 1	3.1393920 - 1	9.9692142 - 1	3.1446753	6.2644905 2
0.1500	8.1441622 - 1	2.0798070 - 1	9.9539523 - 1	3.1462070	4.7915900 2
0.2000	8.5649933 - 1	1.5597130 - 1	9.9388289 - 1	3.1477271	3.8174547 2
0.3000	9.0089443 - 1	1.0462750 - 1	9.9091436 - 1	3.1507176	2.6471062 2
0.4000	9.2379786 - 1	7.9339500 - 2	9.8804477 - 1	3.1536168	1.9802951 2
0.6000	9.4677600 - 1	5.4690500 - 2	9.8271186 - 1	3.1590271	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.6812326 - 1	3.1092242	9.9998458 - 1	3.1416082	1.4000780 3
0.0010	9.3729451 - 1	3.0768216	9.9996912 - 1	3.1416236	1.3948535 3
0.0020	8.7876084 - 1	3.0117802	9.9993823 - 1	3.1416545	1.3845147 3
0.0030	8.2433792 - 1	2.9462050	9.9990733 - 1	3.1416854	1.3743220 3
0.0040	7.7393938 - 1	2.8798470	9.9987650 - 1	3.1417162	1.3642736 3
0.0050	7.2746259 - 1	2.8124795	9.9984559 - 1	3.1417471	1.3543670 3
0.0060	6.8479583 - 1	2.7439077	9.9981471 - 1	3.1417780	1.3445989 3
0.0070	6.4582235 - 1	2.6739782	9.9978382 - 1	3.1418088	1.3349661 3
0.0080	6.1042355 - 1	2.6025908	9.9975293 - 1	3.1418398	1.3254647 3
0.0090	5.7847942 - 1	2.5297090	9.9972208 - 1	3.1418706	1.3160909 3
0.0100	5.4986840 - 1	2.4553707	9.9969117 - 1	3.1419015	1.3068406 3
0.0120	5.0214339 - 1	2.3028952	9.9962944 - 1	3.1419632	1.2886954 3
0.0150	4.5224533 - 1	2.0690368	9.9953685 - 1	3.1420559	1.2623103 3
0.0200	4.1612034 - 1	1.6947121	9.9938253 - 1	3.1422103	1.2203378 3
0.0250	4.1916904 - 1	1.3812038	9.9922828 - 1	3.1423645	1.1805854 3
0.0300	4.4185474 - 1	1.1422778	9.9907402 - 1	3.1425189	1.1428039 3
0.0400	5.0373414 - 1	8.3283030 - 1	9.9876568 - 1	3.1428275	1.0724503 3
0.0500	5.6260703 - 1	6.5189470 - 1	9.9845761 - 1	3.1431359	1.0082107 3
0.0650	6.3335699 - 1	4.9178920 - 1	9.9799593 - 1	3.1435983	9.2176798 2
0.0800	6.8615753 - 1	3.9538010 - 1	9.9753487 - 1	3.1440603	8.4566114 2
0.1000	7.3752938 - 1	3.1393920 - 1	9.9692142 - 1	3.1446753	7.5787071 2
0.1500	8.1441622 - 1	2.0798070 - 1	9.9539523 - 1	3.1462070	5.9120543 2
0.2000	8.5649933 - 1	1.5597130 - 1	9.9388289 - 1	3.1477271	4.7678510 2
0.3000	9.0089443 - 1	1.0462750 - 1	9.9091436 - 1	3.1507176	3.3479623 2
0.4000	9.2379786 - 1	7.9339500 - 2	9.8804477 - 1	3.1536168	2.5187906 2
0.6000	9.4677600 - 1	5.4690500 - 2	9.8271186 - 1	3.1590271	1.5902204 2

Table 24. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 85.653105 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.7733777 - 1	3.1187203	9.9997814 - 1	3.1416145	1.2433895 3
0.0010	9.5520060 - 1	3.0958359	9.9995627 - 1	3.1416364	1.2381675 3
0.0020	9.1249572 - 1	3.0499830	9.9991261 - 1	3.1416801	1.2278386 3
0.0030	8.7186869 - 1	3.0039394	9.9986892 - 1	3.1417237	1.2176623 3
0.0040	8.3329448 - 1	2.9576124	9.9982526 - 1	3.1417674	1.2076369 3
0.0050	7.9674239 - 1	2.9109137	9.9978160 - 1	3.1418110	1.1977599 3
0.0060	7.6217727 - 1	2.8637598	9.9973795 - 1	3.1418547	1.1880278 3
0.0070	7.2956102 - 1	2.8160742	9.9969432 - 1	3.1418984	1.1784374 3
0.0080	6.9885366 - 1	2.7677888	9.9965061 - 1	3.1419420	1.1689853 3
0.0090	6.7001408 - 1	2.7188458	9.9960693 - 1	3.1419856	1.1596669 3
0.0100	6.4300044 - 1	2.6691995	9.9956328 - 1	3.1420294	1.1504788 3
0.0120	5.9428186 - 1	2.5676877	9.9947590 - 1	3.1421167	1.1324770 3
0.0150	5.3383361 - 1	2.4099259	9.9934501 - 1	3.1422476	1.1063547 3
0.0200	4.6374584 - 1	2.1363543	9.9912678 - 1	3.1424659	1.0649462 3
0.0250	4.2630732 - 1	1.8636455	9.9890867 - 1	3.1426841	1.0259098 3
0.0300	4.1376435 - 1	1.6119791	9.9869054 - 1	3.1429023	9.8899038 2
0.0400	4.3241721 - 1	1.2163706	9.9825467 - 1	3.1433387	9.2076906 2
0.0500	4.7395850 - 1	9.5449250 - 1	9.9781915 - 1	3.1437749	8.5914709 2
0.0650	5.3954699 - 1	7.1467080 - 1	9.9716663 - 1	3.1444287	7.7737068 2
0.0800	5.9579019 - 1	5.7048640 - 1	9.9651519 - 1	3.1450820	7.0657786 2
0.1000	6.5486737 - 1	4.5008930 - 1	9.9564849 - 1	3.1459516	6.2644905 2
0.1500	7.4950619 - 1	2.9596530 - 1	9.9349336 - 1	3.1481174	4.7915900 2
0.2000	8.0388964 - 1	2.2131790 - 1	9.9135904 - 1	3.1502670	3.8174547 2
0.3000	8.6293826 - 1	1.4814800 - 1	9.8717365 - 1	3.1544956	2.6471062 2
0.4000	8.9400995 - 1	1.1225750 - 1	9.8313254 - 1	3.1585951	1.9802951 2
0.6000	9.2556697 - 1	7.7342300 - 2	9.7563519 - 1	3.1662449	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.7733777 - 1	3.1187203	9.9997814 - 1	3.1416145	1.4000780 3
0.0010	9.5520060 - 1	3.0958359	9.9995627 - 1	3.1416364	1.3948535 3
0.0020	9.1249572 - 1	3.0499830	9.9991261 - 1	3.1416801	1.3845147 3
0.0030	8.7186869 - 1	3.0039394	9.9986892 - 1	3.1417237	1.3743220 3
0.0040	8.3329448 - 1	2.9576124	9.9982526 - 1	3.1417674	1.3642736 3
0.0050	7.9674239 - 1	2.9109137	9.9978160 - 1	3.1418110	1.3543670 3
0.0060	7.6217727 - 1	2.8637598	9.9973795 - 1	3.1418547	1.3445989 3
0.0070	7.2956102 - 1	2.8160742	9.9969432 - 1	3.1418984	1.3349661 3
0.0080	6.9885366 - 1	2.7677888	9.9965061 - 1	3.1419420	1.3254647 3
0.0090	6.7001408 - 1	2.7188458	9.9960693 - 1	3.1419856	1.3160909 3
0.0100	6.4300044 - 1	2.6691995	9.9956328 - 1	3.1420294	1.3068406 3
0.0120	5.9428186 - 1	2.5676877	9.9947590 - 1	3.1421167	1.2886954 3
0.0150	5.3383361 - 1	2.4099259	9.9934501 - 1	3.1422476	1.2623103 3
0.0200	4.6374584 - 1	2.1363543	9.9912678 - 1	3.1424659	1.2203378 3
0.0250	4.2630732 - 1	1.8636455	9.9890867 - 1	3.1426841	1.1805854 3
0.0300	4.1376435 - 1	1.6119791	9.9869054 - 1	3.1429023	1.1428039 3
0.0400	4.3241721 - 1	1.2163706	9.9825467 - 1	3.1433387	1.0724503 3
0.0500	4.7395850 - 1	9.5449250 - 1	9.9781915 - 1	3.1437749	1.0082107 3
0.0650	5.3954699 - 1	7.1467080 - 1	9.9716663 - 1	3.1444287	9.2176798 2
0.0800	5.9579019 - 1	5.7048640 - 1	9.9651519 - 1	3.1450820	8.4566114 2
0.1000	6.5486737 - 1	4.5008930 - 1	9.9564849 - 1	3.1459516	7.5787071 2
0.1500	7.4950619 - 1	2.9596530 - 1	9.9349336 - 1	3.1481174	5.9120543 2
0.2000	8.0388964 - 1	2.2131790 - 1	9.9135904 - 1	3.1502670	4.7678510 2
0.3000	8.6293826 - 1	1.4814800 - 1	9.8717365 - 1	3.1544956	3.3479623 2
0.4000	8.9400995 - 1	1.1225750 - 1	9.8313254 - 1	3.1585951	2.5187906 2
0.6000	9.2556697 - 1	7.7342300 - 2	9.7563519 - 1	3.1662449	1.5902204 2

Table 25. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 214.13276 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.5523975 - 1	3.0957951	9.9998904 - 1	3.1416036	1.2433895 3
0.0010	9.1257072 - 1	3.0499015	9.9997815 - 1	3.1416145	1.2381675 3
0.0020	8.3343295 - 1	2.9574512	9.9995630 - 1	3.1416364	1.2278386 3
0.0030	7.6237046 - 1	2.8635227	9.9993453 - 1	3.1416583	1.2176623 3
0.0040	6.9909502 - 1	2.7674817	9.9991269 - 1	3.1416801	1.2076369 3
0.0050	6.4328492 - 1	2.6688310	9.9989084 - 1	3.1417019	1.1977599 3
0.0060	5.9460562 - 1	2.5672692	9.9986900 - 1	3.1417237	1.1880278 3
0.0070	5.5271675 - 1	2.4627536	9.9984715 - 1	3.1417456	1.1784374 3
0.0080	5.1726894 - 1	2.3555546	9.9982531 - 1	3.1417674	1.1689853 3
0.0090	4.8789409 - 1	2.2462866	9.9980354 - 1	3.1417892	1.1596669 3
0.0100	4.6419400 - 1	2.1358952	9.9978162 - 1	3.1418111	1.1504788 3
0.0120	4.3202910 - 1	1.9167445	9.9973801 - 1	3.1418548	1.1324770 3
0.0150	4.1428523 - 1	1.6117847	9.9967248 - 1	3.1419202	1.1063547 3
0.0200	4.3294237 - 1	1.2164055	9.9956336 - 1	3.1420294	1.0649462 3
0.0250	4.7447437 - 1	9.5458550 - 1	9.9945425 - 1	3.1421385	1.0259098 3
0.0300	5.1894848 - 1	7.8044180 - 1	9.9934522 - 1	3.1422476	9.8899038 2
0.0400	5.9633305 - 1	5.7040100 - 1	9.9912714 - 1	3.1424659	9.2076906 2
0.0500	6.5546482 - 1	4.4984530 - 1	9.9890910 - 1	3.1426840	8.5914709 2
0.0650	7.1910581 - 1	3.4219490 - 1	9.9858256 - 1	3.1430109	7.7737068 2
0.0800	7.6349040 - 1	2.7648910 - 1	9.9825643 - 1	3.1433377	7.0657786 2
0.1000	8.0490985 - 1	2.2038250 - 1	9.9782224 - 1	3.1437726	6.2644905 2
0.1500	8.6446641 - 1	1.4659650 - 1	9.9674188 - 1	3.1448557	4.7915900 2
0.2000	8.9608231 - 1	1.1010130 - 1	9.9567098 - 1	3.1459306	3.8174547 2
0.3000	9.2881570 - 1	7.3937100 - 2	9.9356732 - 1	3.1480453	2.6471062 2
0.4000	9.4548204 - 1	5.6087900 - 2	9.9153203 - 1	3.1500956	1.9802951 2
0.6000	9.6206507 - 1	3.8672400 - 2	9.8774517 - 1	3.1539215	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.5523975 - 1	3.0957951	9.9998904 - 1	3.1416036	1.4000780 3
0.0010	9.1257072 - 1	3.0499015	9.9997815 - 1	3.1416145	1.3948535 3
0.0020	8.3343295 - 1	2.9574512	9.9995630 - 1	3.1416364	1.3845147 3
0.0030	7.6237046 - 1	2.8635227	9.9993453 - 1	3.1416583	1.3743220 3
0.0040	6.9909502 - 1	2.7674817	9.9991269 - 1	3.1416801	1.3642736 3
0.0050	6.4328492 - 1	2.6688310	9.9989084 - 1	3.1417019	1.3543670 3
0.0060	5.9460562 - 1	2.5672692	9.9986900 - 1	3.1417237	1.3445989 3
0.0070	5.5271675 - 1	2.4627536	9.9984715 - 1	3.1417456	1.3349661 3
0.0080	5.1726894 - 1	2.3555546	9.9982531 - 1	3.1417674	1.3254647 3
0.0090	4.8789409 - 1	2.2462866	9.9980354 - 1	3.1417892	1.3160909 3
0.0100	4.6419400 - 1	2.1358952	9.9978162 - 1	3.1418111	1.3068406 3
0.0120	4.3202910 - 1	1.9167445	9.9973801 - 1	3.1418548	1.2886954 3
0.0150	4.1428523 - 1	1.6117847	9.9967248 - 1	3.1419202	1.2623103 3
0.0200	4.3294237 - 1	1.2164055	9.9956336 - 1	3.1420294	1.2203378 3
0.0250	4.7447437 - 1	9.5458550 - 1	9.9945425 - 1	3.1421385	1.1805854 3
0.0300	5.1894848 - 1	7.8044180 - 1	9.9934522 - 1	3.1422476	1.1428039 3
0.0400	5.9633305 - 1	5.7040100 - 1	9.9912714 - 1	3.1424659	1.0724503 3
0.0500	6.5546482 - 1	4.4984530 - 1	9.9890910 - 1	3.1426840	1.0082107 3
0.0650	7.1910581 - 1	3.4219490 - 1	9.9858256 - 1	3.1430109	9.2176798 2
0.0800	7.6349040 - 1	2.7648910 - 1	9.9825643 - 1	3.1433377	8.4566114 2
0.1000	8.0490985 - 1	2.2038250 - 1	9.9782224 - 1	3.1437726	7.5787071 2
0.1500	8.6446641 - 1	1.4659650 - 1	9.9674188 - 1	3.1448557	5.9120543 2
0.2000	8.9608231 - 1	1.1010130 - 1	9.9567098 - 1	3.1459306	4.7678510 2
0.3000	9.2881570 - 1	7.3937100 - 2	9.9356732 - 1	3.1480453	3.3479623 2
0.4000	9.4548204 - 1	5.6087900 - 2	9.9153203 - 1	3.1500956	2.5187906 2
0.6000	9.6206507 - 1	3.8672400 - 2	9.8774517 - 1	3.1539215	1.5902204 2

Table 26. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 0.66622256 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	7.7363343 - 1	2.8791097	9.9999807 - 1	3.1415946	1.2433895 3
0.0010	6.1003451 - 1	2.6010528	9.9999616 - 1	3.1415966	1.2381675 3
0.0020	4.4073711 - 1	1.9883651	9.9999229 - 1	3.1416004	1.2278386 3
0.0030	4.1693168 - 1	1.4346986	9.9998843 - 1	3.1416042	1.2176623 3
0.0040	4.5424172 - 1	1.0625484	9.9998456 - 1	3.1416081	1.2076369 3
0.0050	5.0462510 - 1	8.3085530 - 1	9.9998069 - 1	3.1416120	1.1977599 3
0.0060	5.5249141 - 1	6.7992420 - 1	9.9997688 - 1	3.1416158	1.1880278 3
0.0070	5.9436666 - 1	5.7524250 - 1	9.9997306 - 1	3.1416196	1.1784374 3
0.0080	6.3021914 - 1	4.9866820 - 1	9.9996920 - 1	3.1416236	1.1689853 3
0.0090	6.6084278 - 1	4.4026620 - 1	9.9996538 - 1	3.1416274	1.1596669 3
0.0100	6.8711664 - 1	3.9424700 - 1	9.9996152 - 1	3.1416312	1.1504788 3
0.0120	7.2956543 - 1	3.2631100 - 1	9.9995378 - 1	3.1416390	1.1324770 3
0.0150	7.7575992 - 1	2.5954900 - 1	9.9994224 - 1	3.1416504	1.1063547 3
0.0200	8.2580763 - 1	1.9377080 - 1	9.9992298 - 1	3.1416698	1.0649462 3
0.0250	8.5772694 - 1	1.5468600 - 1	9.9990373 - 1	3.1416890	1.0259098 3
0.0300	8.7980568 - 1	1.2875750 - 1	9.9988445 - 1	3.1417082	9.8899038 2
0.0400	9.0831092 - 1	9.6464700 - 2	9.9984597 - 1	3.1417468	9.2076906 2
0.0500	9.2589969 - 1	7.7140700 - 2	9.9980752 - 1	3.1417852	8.5914709 2
0.0650	9.4245824 - 1	5.9332200 - 2	9.9974988 - 1	3.1418429	7.7737068 2
0.0800	9.5296356 - 1	4.8215300 - 2	9.9969226 - 1	3.1419005	7.0657786 2
0.1000	9.6216294 - 1	3.8590100 - 2	9.9961554 - 1	3.1419772	6.2644905 2
0.1500	9.7455769 - 1	2.5776800 - 2	9.9942455 - 1	3.1421683	4.7915900 2
0.2000	9.8080055 - 1	1.9388200 - 2	9.9923509 - 1	3.1423579	3.8174547 2
0.3000	9.8705140 - 1	1.3033700 - 2	9.9886243 - 1	3.1427309	2.6471062 2
0.4000	9.9320180 - 1	6.8215000 - 3	9.9782754 - 1	3.1437675	1.9802951 2
0.6000	9.9015807 - 1	9.8908000 - 3	9.9850120 - 1	3.1430927	1.2445355 2
		h_3 = 90 kilometers			
0.0005	7.7363343 - 1	2.8791097	9.9999807 - 1	3.1415946	1.4000780 3
0.0010	6.1003451 - 1	2.6010528	9.9999616 - 1	3.1415966	1.3948535 3
0.0020	4.4073711 - 1	1.9883651	9.9999229 - 1	3.1416004	1.3845147 3
0.0030	4.1693168 - 1	1.4346986	9.9998843 - 1	3.1416042	1.3743220 3
0.0040	4.5424172 - 1	1.0625484	9.9998456 - 1	3.1416081	1.3642736 3
0.0050	5.0462510 - 1	8.3085530 - 1	9.9998069 - 1	3.1416120	1.3543670 3
0.0060	5.5249141 - 1	6.7992420 - 1	9.9997688 - 1	3.1416158	1.3445989 3
0.0070	5.9436666 - 1	5.7524250 - 1	9.9997306 - 1	3.1416196	1.3349661 3
0.0080	6.3021914 - 1	4.9866820 - 1	9.9996920 - 1	3.1416236	1.3254647 3
0.0090	6.6084278 - 1	4.4026620 - 1	9.9996538 - 1	3.1416274	1.3160909 3
0.0100	6.8711664 - 1	3.9424700 - 1	9.9996152 - 1	3.1416312	1.3068406 3
0.0120	7.2956543 - 1	3.2631100 - 1	9.9995378 - 1	3.1416390	1.2886954 3
0.0150	7.7575992 - 1	2.5954900 - 1	9.9994224 - 1	3.1416504	1.2623103 3
0.0200	8.2580763 - 1	1.9377080 - 1	9.9992298 - 1	3.1416698	1.2203378 3
0.0250	8.5772694 - 1	1.5468600 - 1	9.9990373 - 1	3.1416890	1.1805854 3
0.0300	8.7980568 - 1	1.2875750 - 1	9.9988445 - 1	3.1417082	1.1428039 3
0.0400	9.0831092 - 1	9.6464700 - 2	9.9984597 - 1	3.1417468	1.0724503 3
0.0500	9.2589969 - 1	7.7140700 - 2	9.9980752 - 1	3.1417852	1.0082107 3
0.0650	9.4245824 - 1	5.9332200 - 2	9.9974988 - 1	3.1418429	9.2176798 2
0.0800	9.5296356 - 1	4.8215300 - 2	9.9969226 - 1	3.1419005	8.4566114 2
0.1000	9.6216294 - 1	3.8590100 - 2	9.9961554 - 1	3.1419772	7.5787071 2
0.1500	9.7455769 - 1	2.5776800 - 2	9.9942455 - 1	3.1421683	5.9120543 2
0.2000	9.8080055 - 1	1.9388200 - 2	9.9923509 - 1	3.1423579	4.7678510 2
0.3000	9.8705140 - 1	1.3033700 - 2	9.9886243 - 1	3.1427309	3.3479623 2
0.4000	9.9015807 - 1	9.8908000 - 3	9.9850120 - 1	3.1430927	2.5187906 2
0.6000	9.9320180 - 1	6.8215000 - 3	9.9782754 - 1	3.1437675	1.5902204 2

Table 27. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 1.332425 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	8.3314524 - 1	2.9569901	9.9999727 - 1	3.1415954	1.2433895 3
0.0010	6.9864594 - 1	2.7665271	9.9999457 - 1	3.1415981	1.2381675 3
0.0020	5.1682192 - 1	2.3534935	9.9998910 - 1	3.1416036	1.2278386 3
0.0030	4.3187938 - 1	1.9137780	9.9998367 - 1	3.1416091	1.2176623 3
0.0040	4.1462068 - 1	1.5173903	9.9997820 - 1	3.1416145	1.2076369 3
0.0050	4.3341850 - 1	1.2135851	9.9997277 - 1	3.1416199	1.1977599 3
0.0060	4.6620171 - 1	9.9611460 - 1	9.9996730 - 1	3.1416254	1.1880278 3
0.0070	5.0209024 - 1	8.4018150 - 1	9.9996187 - 1	3.1416308	1.1784374 3
0.0080	5.3667760 - 1	7.2521280 - 1	9.9995644 - 1	3.1416363	1.1689853 3
0.0090	5.6845562 - 1	6.3767180 - 1	9.9995097 - 1	3.1416417	1.1596669 3
0.0100	5.9710029 - 1	5.6902430 - 1	9.9994550 - 1	3.1416472	1.1504788 3
0.0120	6.4567131 - 1	4.6848550 - 1	9.9993464 - 1	3.1416581	1.1324770 3
0.0150	7.0126072 - 1	3.7079660 - 1	9.9991831 - 1	3.1416744	1.1063547 3
0.0200	7.6419253 - 1	2.7565710 - 1	9.9989104 - 1	3.1417016	1.0649462 3
0.0250	8.0560606 - 1	2.1960050 - 1	9.9986385 - 1	3.1417289	1.0259098 3
0.0300	8.3477647 - 1	1.8258050 - 1	9.9983659 - 1	3.1417561	9.8899038 2
0.0400	8.7302445 - 1	1.3662910 - 1	9.9978221 - 1	3.1418106	9.2076906 2
0.0500	8.9693489 - 1	1.0919960 - 1	9.9972776 - 1	3.1418649	8.5914709 2
0.0650	9.1964925 - 1	8.3956600 - 2	9.9964629 - 1	3.1419465	7.7737068 2
0.0800	9.3415843 - 1	6.8212400 - 2	9.9956482 - 1	3.1420280	7.0657786 2
0.1000	9.4692502 - 1	5.4587600 - 2	9.9945637 - 1	3.1421364	6.2644905 2
0.1500	9.6421312 - 1	3.6457700 - 2	9.9918632 - 1	3.1424068	4.7915900 2
0.2000	9.7295761 - 1	2.7420700 - 2	9.9891843 - 1	3.1426748	3.8174547 2
0.3000	9.8173738 - 1	1.8432800 - 2	9.9839157 - 1	3.1432024	2.6471062 2
0.4000	9.8610988 - 1	1.3987900 - 2	9.9788107 - 1	3.1437139	1.9802951 2
0.6000	9.9039948 - 1	9.6469000 - 3	9.9692911 - 1	3.1446683	1.2445355 2
		h_3 = 90 kilometers			
0.0005	8.3314524 - 1	2.9569901	9.9999727 - 1	3.1415954	1.4000780 3
0.0010	6.9864594 - 1	2.7665271	9.9999457 - 1	3.1415981	1.3948535 3
0.0020	5.1682192 - 1	2.3534935	9.9998910 - 1	3.1416036	1.3845147 3
0.0030	4.3187938 - 1	1.9137780	9.9998367 - 1	3.1416091	1.3743220 3
0.0040	4.1462068 - 1	1.5173903	9.9997820 - 1	3.1416145	1.3642736 3
0.0050	4.3341850 - 1	1.2135851	9.9997277 - 1	3.1416199	1.3543670 3
0.0060	4.6620171 - 1	9.9611460 - 1	9.9996730 - 1	3.1416254	1.3445989 3
0.0070	5.0209024 - 1	8.4018150 - 1	9.9996187 - 1	3.1416308	1.3349661 3
0.0080	5.3667760 - 1	7.2521280 - 1	9.9995644 - 1	3.1416363	1.3254647 3
0.0090	5.6845562 - 1	6.3767180 - 1	9.9995097 - 1	3.1416417	1.3160909 3
0.0100	5.9710029 - 1	5.6902430 - 1	9.9994550 - 1	3.1416472	1.3068406 3
0.0120	6.4567131 - 1	4.6848550 - 1	9.9993464 - 1	3.1416581	1.2886954 3
0.0150	7.0126072 - 1	3.7079660 - 1	9.9991831 - 1	3.1416744	1.2623103 3
0.0200	7.6419253 - 1	2.7565710 - 1	9.9989104 - 1	3.1417016	1.2203378 3
0.0250	8.0560606 - 1	2.1960050 - 1	9.9986385 - 1	3.1417289	1.1805854 3
0.0300	8.3477647 - 1	1.8258050 - 1	9.9983659 - 1	3.1417561	1.1428039 3
0.0400	8.7302445 - 1	1.3662910 - 1	9.9978221 - 1	3.1418106	1.0724503 3
0.0500	8.9693489 - 1	1.0919960 - 1	9.9972776 - 1	3.1418649	1.0082107 3
0.0650	9.1964925 - 1	8.3956600 - 2	9.9964629 - 1	3.1419465	9.2176798 2
0.0800	9.3415843 - 1	6.8212400 - 2	9.9956482 - 1	3.1420280	8.4566114 2
0.1000	9.4692502 - 1	5.4587600 - 2	9.9945637 - 1	3.1421364	7.5787071 2
0.1500	9.6421312 - 1	3.6457700 - 2	9.9918632 - 1	3.1424068	5.9120543 2
0.2000	9.7295761 - 1	2.7420700 - 2	9.9891843 - 1	3.1426748	4.7678510 2
0.3000	9.8173738 - 1	1.8432800 - 2	9.9839157 - 1	3.1432024	3.3479623 2
0.4000	9.8610988 - 1	1.3987900 - 2	9.9788107 - 1	3.1437139	2.5187906 2
0.6000	9.9039948 - 1	9.6469000 - 3	9.9692911 - 1	3.1446683	1.5902204 2

Table 28. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 3.3311126 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	8.9060610 - 1	3.0252287	9.9999568 - 1	3.1415970	1.2433895 3
0.0010	7.9444619 - 1	2.9073313	9.9999141 - 1	3.1416013	1.2381675 3
0.0020	6.3968844 - 1	2.6616329	9.9998277 - 1	3.1416099	1.2278386 3
0.0030	5.3058912 - 1	2.3979255	9.9997412 - 1	3.1416185	1.2176623 3
0.0040	4.6139894 - 1	2.1201113	9.9996553 - 1	3.1416271	1.2076369 3
0.0050	4.2533655 - 1	1.8444784	9.9995694 - 1	3.1416357	1.1977599 3
0.0060	4.1425140 - 1	1.5918577	9.9994830 - 1	3.1416444	1.1880278 3
0.0070	4.1980549 - 1	1.3757265	9.9993977 - 1	3.1416530	1.1784374 3
0.0080	4.3511845 - 1	1.1984241	9.9993112 - 1	3.1416616	1.1689853 3
0.0090	4.5542652 - 1	1.0553606	9.9992248 - 1	3.1416702	1.1596669 3
0.0100	4.7779409 - 1	9.3990840 - 1	9.9991383 - 1	3.1416788	1.1504788 3
0.0120	5.2275533 - 1	7.6845930 - 1	9.9989666 - 1	3.1416960	1.1324770 3
0.0150	5.8277324 - 1	6.0228590 - 1	9.9987084 - 1	3.1417219	1.1063547 3
0.0200	6.5923339 - 1	4.4316440 - 1	9.9982773 - 1	3.1417650	1.0649462 3
0.0250	7.1354748 - 1	3.5108700 - 1	9.9978474 - 1	3.1418081	1.0259098 3
0.0300	7.5344289 - 1	2.9096040 - 1	9.9974163 - 1	3.1418511	9.8899038 2
0.0400	8.0759576 - 1	2.1700300 - 1	9.9965561 - 1	3.1419371	9.2076906 2
0.0500	8.4242514 - 1	1.7316020 - 1	9.9956965 - 1	3.1420231	8.5914709 2
0.0650	8.7615724 - 1	1.3297450 - 1	9.9944073 - 1	3.1421521	7.7737068 2
0.0800	8.9801596 - 1	1.0797480 - 1	9.9931201 - 1	3.1422810	7.0657786 2
0.1000	9.1744195 - 1	8.6372100 - 2	9.9914058 - 1	3.1424525	6.2644905 2
0.1500	9.4402407 - 1	5.7662200 - 2	9.9871377 - 1	3.1428798	4.7915900 2
0.2000	9.5758621 - 1	4.3362800 - 2	9.9829036 - 1	3.1433037	3.8174547 2
0.3000	9.7127962 - 1	2.9146600 - 2	9.9745799 - 1	3.1441378	2.6471062 2
0.4000	9.7812716 - 1	2.2117300 - 2	9.9665168 - 1	3.1449465	1.9802951 2
0.6000	9.8486260 - 1	1.5253100 - 2	9.9514877 - 1	3.1464556	1.2445355 2
		h_3 = 90 kilometers			
0.0005	8.9060610 - 1	3.0252287	9.9999568 - 1	3.1415970	1.4000780 3
0.0010	7.9444619 - 1	2.9073313	9.9999141 - 1	3.1416013	1.3948535 3
0.0020	6.3968844 - 1	2.6616329	9.9998277 - 1	3.1416099	1.3845147 3
0.0030	5.3058912 - 1	2.3979255	9.9997412 - 1	3.1416185	1.3743220 3
0.0040	4.6139894 - 1	2.1201113	9.9996553 - 1	3.1416271	1.3642736 3
0.0050	4.2533655 - 1	1.8444784	9.9995694 - 1	3.1416357	1.3543670 3
0.0060	4.1425140 - 1	1.5918577	9.9994830 - 1	3.1416444	1.3445989 3
0.0070	4.1980549 - 1	1.3757265	9.9993977 - 1	3.1416530	1.3349661 3
0.0080	4.3511845 - 1	1.1984241	9.9993112 - 1	3.1416616	1.3254647 3
0.0090	4.5542652 - 1	1.0553606	9.9992248 - 1	3.1416702	1.3160909 3
0.0100	4.7779409 - 1	9.3990840 - 1	9.9991383 - 1	3.1416788	1.3068406 3
0.0120	5.2275533 - 1	7.6845930 - 1	9.9989666 - 1	3.1416960	1.2886954 3
0.0150	5.8277324 - 1	6.0228590 - 1	9.9987084 - 1	3.1417219	1.2623103 3
0.0200	6.5923339 - 1	4.4316440 - 1	9.9982773 - 1	3.1417650	1.2203378 3
0.0250	7.1354748 - 1	3.5108700 - 1	9.9978474 - 1	3.1418081	1.1805854 3
0.0300	7.5344289 - 1	2.9096040 - 1	9.9974163 - 1	3.1418511	1.1428039 3
0.0400	8.0759576 - 1	2.1700300 - 1	9.9965561 - 1	3.1419371	1.0724503 3
0.0500	8.4242514 - 1	1.7316020 - 1	9.9956965 - 1	3.1420231	1.0082107 3
0.0650	8.7615724 - 1	1.3297450 - 1	9.9944073 - 1	3.1421521	9.2176798 2
0.0800	8.9801596 - 1	1.0797480 - 1	9.9931201 - 1	3.1422810	8.4566114 2
0.1000	9.1744195 - 1	8.6372100 - 2	9.9914058 - 1	3.1424525	7.5787071 2
0.1500	9.4402407 - 1	5.7662200 - 2	9.9871377 - 1	3.1428798	5.9120543 2
0.2000	9.5758621 - 1	4.3362800 - 2	9.9829036 - 1	3.1433037	4.7678510 2
0.3000	9.7127962 - 1	2.9146600 - 2	9.9745799 - 1	3.1441378	3.3479623 2
0.4000	9.7812716 - 1	2.2117300 - 2	9.9665168 - 1	3.1449465	2.5187906 2
0.6000	9.8486260 - 1	1.5253100 - 2	9.9514877 - 1	3.1464556	1.5902204 2

Table 29. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301, atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 6.6622252 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.2125626 - 1	3.0594064	9.9999389 - 1	3.1415988	1.2433895 3
0.0010	8.4918744 - 1	2.9766722	9.9998777 - 1	3.1416049	1.2381675 3
0.0020	7.2444256 - 1	2.8075088	9.9997563 - 1	3.1416171	1.2278386 3
0.0030	6.2411310 - 1	2.6306616	9.9996348 - 1	3.1416292	1.2176623 3
0.0040	5.4628489 - 1	2.4444731	9.9995134 - 1	3.1416414	1.2076369 3
0.0050	4.8894724 - 1	2.2501366	9.9993911 - 1	3.1416536	1.1977599 3
0.0060	4.4987159 - 1	2.0522382	9.9992688 - 1	3.1416658	1.1880278 3
0.0070	4.2645499 - 1	1.8579586	9.9991474 - 1	3.1416780	1.1784374 3
0.0080	4.1574942 - 1	1.6748777	9.9990260 - 1	3.1416901	1.1689853 3
0.0090	4.1472553 - 1	1.5086387	9.9989037 - 1	3.1417023	1.1596669 3
0.0100	4.2061248 - 1	1.3618747	9.9987814 - 1	3.1417145	1.1504788 3
0.0120	4.4454034 - 1	1.1251216	9.9985386 - 1	3.1417389	1.1324770 3
0.0150	4.9159099 - 1	8.8067270 - 1	9.9981734 - 1	3.1417755	1.1063547 3
0.0200	5.6672319 - 1	6.4199250 - 1	9.9975638 - 1	3.1418363	1.0649462 3
0.0250	6.2702243 - 1	5.0501300 - 1	9.9969559 - 1	3.1418971	1.0259098 3
0.0300	6.7406785 - 1	4.1660280 - 1	9.9963464 - 1	3.1419580	9.8899038 2
0.0400	7.4098529 - 1	3.0912810 - 1	9.9951308 - 1	3.1420798	9.2076906 2
0.0500	7.8562939 - 1	2.4604790 - 1	9.9939145 - 1	3.1422014	8.5914709 2
0.0650	8.2992190 - 1	1.8858660 - 1	9.9920916 - 1	3.1423838	7.7737068 2
0.0800	8.5913212 - 1	1.5298440 - 1	9.9902717 - 1	3.1425660	7.0657786 2
0.1000	8.8540476 - 1	1.2229330 - 1	9.9878482 - 1	3.1428087	6.2644905 2
0.1500	9.2180432 - 1	8.1587900 - 2	9.9818148 - 1	3.1434128	4.7915900 2
0.2000	9.4056453 - 1	6.1340700 - 2	9.9758306 - 1	3.1440124	3.8174547 2
0.3000	9.5963004 - 1	4.1223500 - 2	9.9640694 - 1	3.1451920	2.6471062 2
0.4000	9.6920900 - 1	3.1279800 - 2	9.9526796 - 1	3.1463358	1.9802951 2
0.6000	9.7865978 - 1	2.1571000 - 2	9.9314614 - 1	3.1484698	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.2125626 - 1	3.0594064	9.9999389 - 1	3.1415988	1.4000780 3
0.0010	8.4918744 - 1	2.9766722	9.9998777 - 1	3.1416049	1.3948535 3
0.0020	7.2444256 - 1	2.8075088	9.9997563 - 1	3.1416171	1.3845147 3
0.0030	6.2411310 - 1	2.6306616	9.9996348 - 1	3.1416292	1.3743220 3
0.0040	5.4628489 - 1	2.4444731	9.9995134 - 1	3.1416414	1.3642736 3
0.0050	4.8894724 - 1	2.2501366	9.9993911 - 1	3.1416536	1.3543670 3
0.0060	4.4987159 - 1	2.0522382	9.9992688 - 1	3.1416658	1.3445989 3
0.0070	4.2645499 - 1	1.8579586	9.9991474 - 1	3.1416780	1.3349661 3
0.0080	4.1574942 - 1	1.6748777	9.9990260 - 1	3.1416901	1.3254647 3
0.0090	4.1472553 - 1	1.5086387	9.9989037 - 1	3.1417023	1.3160909 3
0.0100	4.2061248 - 1	1.3618747	9.9987814 - 1	3.1417145	1.3068406 3
0.0120	4.4454034 - 1	1.1251216	9.9985386 - 1	3.1417389	1.2886954 3
0.0150	4.9159099 - 1	8.8067270 - 1	9.9981734 - 1	3.1417755	1.2623103 3
0.0200	5.6672319 - 1	6.4199250 - 1	9.9975638 - 1	3.1418363	1.2203378 3
0.0250	6.2702243 - 1	5.0501300 - 1	9.9969559 - 1	3.1418971	1.1805854 3
0.0300	6.7406785 - 1	4.1660280 - 1	9.9963464 - 1	3.1419580	1.1428039 3
0.0400	7.4098529 - 1	3.0912810 - 1	9.9951308 - 1	3.1420798	1.0724503 3
0.0500	7.8562939 - 1	2.4604790 - 1	9.9939145 - 1	3.1422014	1.0082107 3
0.0650	8.2992190 - 1	1.8858660 - 1	9.9920916 - 1	3.1423838	9.2176798 2
0.0800	8.5913212 - 1	1.5298440 - 1	9.9902717 - 1	3.1425660	8.4566114 2
0.1000	8.8540476 - 1	1.2229330 - 1	9.9878482 - 1	3.1428087	7.5787071 2
0.1500	9.2180432 - 1	8.1587900 - 2	9.9818148 - 1	3.1434128	5.9120543 2
0.2000	9.4056453 - 1	6.1340700 - 2	9.9758306 - 1	3.1440124	4.7678510 2
0.3000	9.5963004 - 1	4.1223500 - 2	9.9640694 - 1	3.1451920	3.3479623 2
0.4000	9.6920900 - 1	3.1279800 - 2	9.9526796 - 1	3.1463358	2.5187906 2
0.6000	9.7865978 - 1	2.1571000 - 2	9.9314614 - 1	3.1484698	1.5902204 2

Table 30. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 13.324450 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.4361886 - 1	3.0835161	9.9999135 - 1	3.1416013	1.2433895 3
0.0010	8.9059159 - 1	3.0252447	9.9998277 - 1	3.1416099	1.2381675 3
0.0020	7.9441994 - 1	2.9073629	9.9996553 - 1	3.1416272	1.2278386 3
0.0030	7.1098222 - 1	2.7865479	9.9994836 - 1	3.1416444	1.2176623 3
0.0040	6.3964372 - 1	2.6616909	9.9993106 - 1	3.1416617	1.2076369 3
0.0050	5.7972522 - 1	2.5321596	9.9991389 - 1	3.1416789	1.1977599 3
0.0060	5.3053000 - 1	2.3979984	9.9989666 - 1	3.1416961	1.1880278 3
0.0070	4.9132943 - 1	2.2600886	9.9987943 - 1	3.1417133	1.1784374 3
0.0080	4.6132869 - 1	2.1201820	9.9986219 - 1	3.1417305	1.1689853 3
0.0090	4.3963627 - 1	1.9807343	9.9984496 - 1	3.1417477	1.1596669 3
0.0100	4.2525888 - 1	1.8445312	9.9982779 - 1	3.1417650	1.1504788 3
0.0120	4.1417015 - 1	1.5918860	9.9979333 - 1	3.1417994	1.1324770 3
0.0150	4.2650691 - 1	1.2824132	9.9974163 - 1	3.1418511	1.1063547 3
0.0200	4.7771377 - 1	9.3989400 - 1	9.9965555 - 1	3.1419372	1.0649462 3
0.0250	5.3342765 - 1	7.3470980 - 1	9.9956947 - 1	3.1420232	1.0259098 3
0.0300	5.8268994 - 1	6.0229420 - 1	9.9948346 - 1	3.1421093	9.8899038 2
0.0400	6.5913962 - 1	4.4320380 - 1	9.9931140 - 1	3.1422814	9.2076906 2
0.0500	7.1343946 - 1	3.5115580 - 1	9.9913943 - 1	3.1424536	8.5914709 2
0.0650	7.6945953 - 1	2.6818210 - 1	9.9888171 - 1	3.1427115	7.7737068 2
0.0800	8.0743520 - 1	2.1715010 - 1	9.9862437 - 1	3.1429692	7.0657786 2
0.1000	8.4222582 - 1	1.7335530 - 1	9.9828179 - 1	3.1433122	6.2644905 2
0.1500	8.9133855 - 1	1.1549900 - 1	9.9742913 - 1	3.1441666	4.7915900 2
0.2000	9.1703522 - 1	8.6795100 - 2	9.9658364 - 1	3.1450146	3.8174547 2
0.3000	9.4340009 - 1	5.8310100 - 2	9.9492238 - 1	3.1466829	2.6471062 2
0.4000	9.5673756 - 1	4.4239600 - 2	9.9331439 - 1	3.1483002	1.9802951 2
0.6000	9.6995418 - 1	3.0506000 - 2	9.9032068 - 1	3.1513183	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.4361886 - 1	3.0835161	9.9999135 - 1	3.1416013	1.4000780 3
0.0010	8.9059159 - 1	3.0252447	9.9998277 - 1	3.1416099	1.3948535 3
0.0020	7.9441994 - 1	2.9073629	9.9996553 - 1	3.1416272	1.3845147 3
0.0030	7.1098222 - 1	2.7865479	9.9994836 - 1	3.1416444	1.3743220 3
0.0040	6.3964372 - 1	2.6616909	9.9993106 - 1	3.1416617	1.3642736 3
0.0050	5.7972522 - 1	2.5321596	9.9991389 - 1	3.1416789	1.3543670 3
0.0060	5.3053000 - 1	2.3979984	9.9989666 - 1	3.1416961	1.3445989 3
0.0070	4.9132943 - 1	2.2600886	9.9987943 - 1	3.1417133	1.3349661 3
0.0080	4.6132869 - 1	2.1201820	9.9986219 - 1	3.1417305	1.3254647 3
0.0090	4.3963627 - 1	1.9807343	9.9984496 - 1	3.1417477	1.3160909 3
0.0100	4.2525888 - 1	1.8445312	9.9982779 - 1	3.1417650	1.3068406 3
0.0120	4.1417015 - 1	1.5918860	9.9979333 - 1	3.1417994	1.2886954 3
0.0150	4.2650691 - 1	1.2824132	9.9974163 - 1	3.1418511	1.2623103 3
0.0200	4.7771377 - 1	9.3989400 - 1	9.9965555 - 1	3.1419372	1.2203378 3
0.0250	5.3342765 - 1	7.3470980 - 1	9.9956947 - 1	3.1420232	1.1805854 3
0.0300	5.8268994 - 1	6.0229420 - 1	9.9948346 - 1	3.1421093	1.1428039 3
0.0400	6.5913962 - 1	4.4320380 - 1	9.9931140 - 1	3.1422814	1.0724503 3
0.0500	7.1343946 - 1	3.5115580 - 1	9.9913943 - 1	3.1424536	1.0082107 3
0.0650	7.6945953 - 1	2.6818210 - 1	9.9888171 - 1	3.1427115	9.2176798 2
0.0800	8.0743520 - 1	2.1715010 - 1	9.9862437 - 1	3.1429692	8.4566114 2
0.1000	8.4222582 - 1	1.7335530 - 1	9.9828179 - 1	3.1433122	7.5787071 2
0.1500	8.9133855 - 1	1.1549900 - 1	9.9742913 - 1	3.1441666	5.9120543 2
0.2000	9.1703522 - 1	8.6795100 - 2	9.9658364 - 1	3.1450146	4.7678510 2
0.3000	9.4340009 - 1	5.8310100 - 2	9.9492238 - 1	3.1466829	3.3479623 2
0.4000	9.5673756 - 1	4.4239600 - 2	9.9331439 - 1	3.1483002	2.5187906 2
0.6000	9.6995418 - 1	3.0506000 - 2	9.9032068 - 1	3.1513183	1.5902204 2

Table 31. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 66.622252 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.7435063 - 1	3.1156509	9.9998074 - 1	3.1416119	1.2433895 3
0.0010	9.4937573 - 1	3.0896917	9.9996146 - 1	3.1416312	1.2381675 3
0.0020	9.0144068 - 1	3.0376509	9.9992295 - 1	3.1416697	1.2278386 3
0.0030	8.5616795 - 1	2.9853328	9.9988445 - 1	3.1417083	1.2176623 3
0.0040	8.1351833 - 1	2.9326046	9.9984591 - 1	3.1417468	1.2076369 3
0.0050	7.7344395 - 1	2.8793407	9.9980738 - 1	3.1417853	1.1977599 3
0.0060	7.3589094 - 1	2.8254253	9.9976891 - 1	3.1418238	1.1880278 3
0.0070	7.0080181 - 1	2.7707561	9.9973041 - 1	3.1418623	1.1784374 3
0.0080	6.6811678 - 1	2.7152469	9.9969185 - 1	3.1419008	1.1689853 3
0.0090	6.3777503 - 1	2.6588313	9.9965333 - 1	3.1419393	1.1596669 3
0.0100	6.0971503 - 1	2.6014671	9.9961483 - 1	3.1419778	1.1504788 3
0.0120	5.6019192 - 1	2.4838637	9.9953784 - 1	3.1420548	1.1324770 3
0.0150	5.0144205 - 1	2.3010263	9.9942232 - 1	3.1421703	1.1063547 3
0.0200	4.4024726 - 1	1.9887867	9.9922987 - 1	3.1423628	1.0649462 3
0.0250	4.1581840 - 1	1.6917208	9.9903748 - 1	3.1425553	1.0259098 3
0.0300	4.1639018 - 1	1.4347817	9.9884513 - 1	3.1427478	9.8899038 2
0.0400	4.5370777 - 1	1.0624639	9.9846065 - 1	3.1431327	9.2076906 2
0.0500	5.0409703 - 1	8.3077680 - 1	9.9807645 - 1	3.1435174	8.5914709 2
0.0650	5.7367001 - 1	6.2323510 - 1	9.9750089 - 1	3.1440940	7.7737068 2
0.0800	6.2963386 - 1	4.9884330 - 1	9.9692614 - 1	3.1446702	7.0657786 2
0.1000	6.8645584 - 1	3.9460180 - 1	9.9616144 - 1	3.1454371	6.2644905 2
0.1500	7.7485679 - 1	2.6030880 - 1	9.9425961 - 1	3.1473474	4.7915900 2
0.2000	8.2462685 - 1	1.9489940 - 1	9.9237574 - 1	3.1492432	3.8174547 2
0.3000	8.7802418 - 1	1.3058600 - 1	9.8867995 - 1	3.1529729	2.6471062 2
0.4000	9.0589451 - 1	9.8982900 - 2	9.8510989 - 1	3.1565887	1.9802951 2
0.6000	9.3405848 - 1	6.8211900 - 2	9.7848196 - 1	3.1633359	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.7435063 - 1	3.1156509	9.9998074 - 1	3.1416119	1.4000780 3
0.0010	9.4937573 - 1	3.0896917	9.9996146 - 1	3.1416312	1.3948535 3
0.0020	9.0144068 - 1	3.0376509	9.9992295 - 1	3.1416697	1.3845147 3
0.0030	8.5616795 - 1	2.9853328	9.9988445 - 1	3.1417083	1.3743220 3
0.0040	8.1351833 - 1	2.9326046	9.9984591 - 1	3.1417468	1.3642736 3
0.0050	7.7344395 - 1	2.8793407	9.9980738 - 1	3.1417853	1.3543670 3
0.0060	7.3589094 - 1	2.8254253	9.9976891 - 1	3.1418238	1.3445989 3
0.0070	7.0080181 - 1	2.7707561	9.9973041 - 1	3.1418623	1.3349661 3
0.0080	6.6811678 - 1	2.7152469	9.9969185 - 1	3.1419008	1.3254647 3
0.0090	6.3777503 - 1	2.6588313	9.9965333 - 1	3.1419393	1.3160909 3
0.0100	6.0971503 - 1	2.6014671	9.9961483 - 1	3.1419778	1.3068406 3
0.0120	5.6019192 - 1	2.4838637	9.9953784 - 1	3.1420548	1.2886954 3
0.0150	5.0144205 - 1	2.3010263	9.9942232 - 1	3.1421703	1.2623103 3
0.0200	4.4024726 - 1	1.9887867	9.9922987 - 1	3.1423628	1.2203378 3
0.0250	4.1581840 - 1	1.6917208	9.9903748 - 1	3.1425553	1.1805854 3
0.0300	4.1639018 - 1	1.4347817	9.9884513 - 1	3.1427478	1.1428039 3
0.0400	4.5370777 - 1	1.0624639	9.9846065 - 1	3.1431327	1.0724503 3
0.0500	5.0409703 - 1	8.3077680 - 1	9.9807645 - 1	3.1435174	1.0082107 3
0.0650	5.7367001 - 1	6.2323510 - 1	9.9750089 - 1	3.1440940	9.2176798 2
0.0800	6.2963386 - 1	4.9884330 - 1	9.9692614 - 1	3.1446702	8.4566114 2
0.1000	6.8645584 - 1	3.9460180 - 1	9.9616144 - 1	3.1454371	7.5787071 2
0.1500	7.7485679 - 1	2.6030880 - 1	9.9425961 - 1	3.1473474	5.9120543 2
0.2000	8.2462685 - 1	1.9489940 - 1	9.9237574 - 1	3.1492432	4.7678510 2
0.3000	8.7802418 - 1	1.3058600 - 1	9.8867995 - 1	3.1529729	3.3479623 2
0.4000	9.0589451 - 1	9.8982900 - 2	9.8510989 - 1	3.1565887	2.5187906 2
0.6000	9.3405848 - 1	6.8211900 - 2	9.7848196 - 1	3.1633359	1.5902204 2

Table 32. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 133.24450 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m \rvert$	Arg R_m	d/j miles
		h_3 = 70 kilometers			
0.0005	9.8177657 - 1	3.1232672	9.9997273 - 1	3.1416199	1.2433895 3
0.0010	9.6389111 - 1	3.1049354	9.9994550 - 1	3.1416471	1.2381675 3
0.0020	9.2913196 - 1	3.0682284	9.9989100 - 1	3.1417016	1.2278386 3
0.0030	8.9571499 - 1	3.0314226	9.9983655 - 1	3.1417560	1.2176623 3
0.0040	8.6362920 - 1	2.9944695	9.9978206 - 1	3.1418105	1.2076369 3
0.0050	8.3286047 - 1	2.9573218	9.9972761 - 1	3.1418650	1.1977599 3
0.0060	8.0339250 - 1	2.9199341	9.9967309 - 1	3.1419194	1.1880278 3
0.0070	7.7520723 - 1	2.8822631	9.9961864 - 1	3.1419739	1.1784374 3
0.0080	7.4828534 - 1	2.8442677	9.9956417 - 1	3.1420282	1.1689853 3
0.0090	7.2260645 - 1	2.8059110	9.9950973 - 1	3.1420828	1.1596669 3
0.0100	6.9814967 - 1	2.7671589	9.9945522 - 1	3.1421372	1.1504788 3
0.0120	6.5281678 - 1	2.6883567	9.9934632 - 1	3.1422461	1.1324770 3
0.0150	5.9344318 - 1	2.5666348	9.9918301 - 1	3.1424094	1.1063547 3
0.0200	5.1601486 - 1	2.3544681	9.9891081 - 1	3.1426816	1.0649462 3
0.0250	4.6295104 - 1	2.1342543	9.9863883 - 1	3.1429538	1.0259098 3
0.0300	4.3087502 - 1	1.9145498	9.9836685 - 1	3.1432260	9.8899038 2
0.0400	4.1354226 - 1	1.5176624	9.9782334 - 1	3.1437701	9.2076906 2
0.0500	4.3234053 - 1	1.2135105	9.9728032 - 1	3.1443140	8.5914709 2
0.0650	4.8307519 - 1	9.1173370 - 1	9.9646686 - 1	3.1451295	7.7737068 2
0.0800	5.3561505 - 1	7.2514180 - 1	9.9565483 - 1	3.1459441	7.0657786 2
0.1000	5.9598538 - 1	5.6920240 - 1	9.9457478 - 1	3.1470287	6.2644905 2
0.1500	6.9988807 - 1	3.7161380 - 1	9.9189005 - 1	3.1497296	4.7915900 2
0.2000	7.6247635 - 1	2.7705090 - 1	9.8923265 - 1	3.1524102	3.8174547 2
0.3000	8.3226759 - 1	1.8502910 - 1	9.8402555 - 1	3.1576835	2.6471062 2
0.4000	8.6965100 - 1	1.4008850 - 1	9.7900311 - 1	3.1627959	1.9802951 2
0.6000	9.0803220 - 1	9.6462900 - 2	9.6969839 - 1	3.1723353	1.2445355 2
		h_3 = 90 kilometers			
0.0005	9.8177657 - 1	3.1232672	9.9997273 - 1	3.1416199	1.4000780 3
0.0010	9.6389111 - 1	3.1049354	9.9994550 - 1	3.1416471	1.3948535 3
0.0020	9.2913196 - 1	3.0682284	9.9989100 - 1	3.1417016	1.3845147 3
0.0030	8.9571499 - 1	3.0314226	9.9983655 - 1	3.1417560	1.3743220 3
0.0040	8.6362920 - 1	2.9944695	9.9978206 - 1	3.1418105	1.3642736 3
0.0050	8.3286047 - 1	2.9573218	9.9972761 - 1	3.1418650	1.3543670 3
0.0060	8.0339250 - 1	2.9199341	9.9967309 - 1	3.1419194	1.3445989 3
0.0070	7.7520723 - 1	2.8822631	9.9961864 - 1	3.1419739	1.3349661 3
0.0080	7.4828534 - 1	2.8442677	9.9956417 - 1	3.1420282	1.3254647 3
0.0090	7.2260645 - 1	2.8059110	9.9950973 - 1	3.1420828	1.3160909 3
0.0100	6.9814967 - 1	2.7671589	9.9945522 - 1	3.1421372	1.3068406 3
0.0120	6.5281678 - 1	2.6883567	9.9934632 - 1	3.1422461	1.2886954 3
0.0150	5.9344318 - 1	2.5666348	9.9918301 - 1	3.1424094	1.2623103 3
0.0200	5.1601486 - 1	2.3544681	9.9891081 - 1	3.1426816	1.2203378 3
0.0250	4.6295104 - 1	2.1342543	9.9863883 - 1	3.1429538	1.1805854 3
0.0300	4.3087502 - 1	1.9145498	9.9836685 - 1	3.1432260	1.1428039 3
0.0400	4.1354226 - 1	1.5176624	9.9782334 - 1	3.1437701	1.0724503 3
0.0500	4.3234053 - 1	1.2135105	9.9728032 - 1	3.1443140	1.0082107 3
0.0650	4.8307519 - 1	9.1173370 - 1	9.9646686 - 1	3.1451295	9.2176798 2
0.0800	5.3561505 - 1	7.2514180 - 1	9.9565483 - 1	3.1459441	8.4566114 2
0.1000	5.9598538 - 1	5.6920240 - 1	9.9457478 - 1	3.1470287	7.5787071 2
0.1500	6.9988807 - 1	3.7161380 - 1	9.9189005 - 1	3.1497296	5.9120543 2
0.2000	7.6247635 - 1	2.7705090 - 1	9.8923265 - 1	3.1524102	4.7678510 2
0.3000	8.3226759 - 1	1.8502910 - 1	9.8402555 - 1	3.1576835	3.3479623 2
0.4000	8.6965100 - 1	1.4008850 - 1	9.7900311 - 1	3.1627959	2.5187906 2
0.6000	9.0803220 - 1	9.6462900 - 2	9.6969839 - 1	3.1723353	1.5902204 2

Table 33. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

f = 333.11126 kilocycles
σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert R_e \rvert$	Arg R_e	$\lvert R_m T \rvert$	Arg R_m	d/j miles	
		h_3 = 70 kilometers				
0.0005	9.8840331 - 1	3.1300353	9.9995694 - 1	3.1416357	1.2433895	3
0.0010	9.8840331 - 1	3.1300353	9.9995694 - 1	3.1416357	1.2381675	3
0.0020	9.7694242 - 1	3.1184762	9.9991383 - 1	3.1416787	1.2278386	3
0.0030	9.5442831 - 1	3.0953471	9.9982761 - 1	3.1417649	1.2176623	3
0.0040	9.3245619 - 1	3.0721926	9.9974145 - 1	3.1418509	1.2076369	3
0.0050	9.1102387 - 1	3.0490004	9.9965524 - 1	3.1419369	1.1977599	3
0.0060	8.9012863 - 1	3.0257578	9.9956904 - 1	3.1420230	1.1880278	3
0.0070	8.6976721 - 1	3.0024528	9.9948291 - 1	3.1421090	1.1784374	3
0.0080	8.4993590 - 1	2.9790732	9.9939673 - 1	3.1421951	1.1689853	3
0.0090	8.3063052 - 1	2.9556072	9.9931061 - 1	3.1422811	1.1596669	3
0.0100	8.1184690 - 1	2.9320433	9.9922444 - 1	3.1423672	1.1504788	3
0.0120	7.9358036 - 1	2.9083704	9.9913827 - 1	3.1424531	1.1324770	3
0.0150	7.5857843 - 1	2.8606547	9.9896609 - 1	3.1426253	1.1063547	3
0.0200	7.0982613 - 1	2.7880102	9.9870781 - 1	3.1428834	1.0649462	3
0.0250	6.3821335 - 1	2.6635441	9.9827747 - 1	3.1433136	1.0259098	3
0.0300	5.7805169 - 1	2.5343118	9.9784744 - 1	3.1437436	9.8899038	2
0.0400	5.2863948 - 1	2.4003303	9.9741759 - 1	3.1441737	9.2076906	2
0.0500	4.5908287 - 1	2.1224446	9.9655870 - 1	3.1450336	8.5914709	2
0.0650	4.2277839 - 1	1.8462128	9.9570079 - 1	3.1458932	7.7737068	2
0.0800	4.1272941 - 1	1.4793958	9.9441628 - 1	3.1471818	7.0657786	2
0.1000	4.3243253 - 1	1.1981945	9.9313457 - 1	3.1484690	6.2644905	2
0.1500	4.7515778 - 1	9.3942210 - 1	9.9143076 - 1	3.1501829	4.7915900	2
0.2000	5.8004050 - 1	6.0256630 - 1	9.8720013 - 1	3.1544510	3.8174547	2
0.3000	6.5615517 - 1	4.4448940 - 1	9.8301916 - 1	3.1586869	2.6471062	2
0.4000	7.4934238 - 1	2.9420100 - 1	9.7484508 - 1	3.1670196	1.9802951	2
0.6000	8.0226507 - 1	2.2199660 - 1	9.6698436 - 1	3.1750972	1.2445355	2
		h_3 = 90 kilometers				
0.0005	8.5851077 - 1	1.5250560 - 1	9.5248151 - 1	3.1901681	1.4000780	3
0.0010	9.7694242 - 1	3.1184762	9.9991383 - 1	3.1416787	1.3948535	3
0.0020	9.5442831 - 1	3.0953471	9.9982761 - 1	3.1417649	1.3845147	3
0.0030	9.3245619 - 1	3.0721926	9.9974145 - 1	3.1418509	1.3743220	3
0.0040	9.1102387 - 1	3.0490004	9.9965524 - 1	3.1419369	1.3642736	3
0.0050	8.9012863 - 1	3.0257578	9.9956904 - 1	3.1420230	1.3543670	3
0.0060	8.6976721 - 1	3.0024528	9.9948291 - 1	3.1421090	1.3445989	3
0.0070	8.4993590 - 1	2.9790732	9.9939673 - 1	3.1421951	1.3349661	3
0.0080	8.3063052 - 1	2.9556072	9.9931061 - 1	3.1422811	1.3254647	3
0.0090	8.1184690 - 1	2.9320433	9.9922444 - 1	3.1423672	1.3160909	3
0.0100	7.9358036 - 1	2.9083704	9.9913827 - 1	3.1424531	1.3068406	3
0.0120	7.5857843 - 1	2.8606547	9.9896609 - 1	3.1426253	1.2886954	3
0.0150	7.0982613 - 1	2.7880102	9.9870781 - 1	3.1428834	1.2623103	3
0.0200	6.3821335 - 1	2.6635441	9.9827747 - 1	3.1433136	1.2203378	3
0.0250	5.7805169 - 1	2.5343118	9.9784744 - 1	3.1437436	1.1805854	3
0.0300	5.2863948 - 1	2.4003303	9.9741759 - 1	3.1441737	1.1428039	3
0.0400	4.5908287 - 1	2.1224446	9.9655870 - 1	3.1450336	1.0724503	3
0.0500	4.2277839 - 1	1.8462128	9.9570079 - 1	3.1458932	1.0082107	3
0.0650	4.1272941 - 1	1.4793958	9.9441628 - 1	3.1471818	9.2176798	2
0.0800	4.3243253 - 1	1.1981945	9.9313457 - 1	3.1484690	8.4566114	2
0.1000	4.7515778 - 1	9.3942210 - 1	9.9143076 - 1	3.1501829	7.5787071	2
0.1500	5.8004050 - 1	6.0256630 - 1	9.8720013 - 1	3.1544510	5.9120543	2
0.2000	6.5615517 - 1	4.4448940 - 1	9.8301916 - 1	3.1586869	4.7678510	2
0.3000	7.4934238 - 1	2.9420100 - 1	9.7484508 - 1	3.1670196	3.3479623	2
0.4000	8.0226507 - 1	2.2199660 - 1	9.6698436 - 1	3.1750972	2.5187906	2
0.6000	8.5851077 - 1	1.5250560 - 1	9.5248151 - 1	3.1901681	1.5902204	2

Table 34. Ground reflection coefficients (amplitude, $\lvert R \rvert$, and phase, Arg R) assuming the Fresnel approximation for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.3002
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee}\rvert$	Arg T_{ee}	$\lvert T_{mm}\rvert$	Arg T_{mm}	d/j miles
		h_3 = 70 kilometers			
0.0005	6.5054409 - 1	3.5290341	8.8163764 - 1	3.0202126	1.2433895 3
0.0010	6.5053942 - 1	3.5290413	8.8163573 - 1	3.0202104	1.2381675 3
0.0020	6.5052144 - 1	3.5290695	8.8162861 - 1	3.0202019	1.2278386 3
0.0030	6.5049114 - 1	3.5291171	8.8161662 - 1	3.0201876	1.2176623 3
0.0040	6.5044874 - 1	3.5291833	8.8159976 - 1	3.0201675	1.2076369 3
0.0050	6.5039432 - 1	3.5292688	8.8157817 - 1	3.0201418	1.1977599 3
0.0060	6.5032801 - 1	3.5293730	8.8155200 - 1	3.0201105	1.1880278 3
0.0070	6.5024944 - 1	3.5294960	8.8152076 - 1	3.0200733	1.1784374 3
0.0080	6.5015910 - 1	3.5296378	8.8148500 - 1	3.0200305	1.1689853 3
0.0090	6.5005663 - 1	3.5297987	8.8144427 - 1	3.0199820	1.1596669 3
0.0100	6.4994214 - 1	3.5299785	8.8139894 - 1	3.0199279	1.1504788 3
0.0120	6.4967747 - 1	3.5303943	8.8129403 - 1	3.0198025	1.1324770 3
0.0150	6.4919117 - 1	3.5311592	8.8110087 - 1	3.0195721	1.1063547 3
0.0200	6.4814564 - 1	3.5328072	8.8068543 - 1	3.0190757	1.0649462 3
0.0250	6.4681162 - 1	3.5349171	8.8015446 - 1	3.0184404	1.0259098 3
0.0300	6.4519619 - 1	3.5374836	8.7951000 - 1	3.0176686	9.8899038 2
0.0400	6.4115719 - 1	3.5439536	8.7789240 - 1	3.0157255	9.2076906 2
0.0500	6.3611182 - 1	3.5521476	8.7585825 - 1	3.0132717	8.5914709 2
0.0650	6.2687250 - 1	3.5674858	8.7209290 - 1	3.0086976	7.7737068 2
0.0800	6.1595333 - 1	3.5862016	8.6757205 - 1	3.0031513	7.0657786 2
0.1000	5.9942706 - 1	3.6158525	8.6057013 - 1	2.9944444	6.2644905 2
0.1500	5.5318278 - 1	3.7091015	8.3974363 - 1	2.9677011	4.7915900 2
0.2000	5.0716718 - 1	3.8226737	8.1651765 - 1	2.9363741	3.8174547 2
0.3000	4.3395658 - 1	2.1968715	7.6923723 - 1	2.8676236	2.6471062 2
0.4000	3.9295984 - 1	1.9180198	7.2491069 - 1	2.7969196	1.9802951 2
0.6000	3.8316778 - 1	1.4454074	6.4940751 - 1	2.6615301	1.2445355 2
		h_3 = 90 kilometers			
0.0005	6.1696408 - 1	3.5844412	8.6799380 - 1	3.0036714	1.4000780 3
0.0010	6.1696058 - 1	3.5844473	8.6799246 - 1	3.0036695	1.3948535 3
0.0020	6.1694592 - 1	3.5844727	8.6798629 - 1	3.0036619	1.3845147 3
0.0030	6.1692156 - 1	3.5845151	8.6797619 - 1	3.0036494	1.3743220 3
0.0040	6.1688756 - 1	3.5845742	8.6796192 - 1	3.0036320	1.3642736 3
0.0050	6.1684382 - 1	3.5846504	8.6794373 - 1	3.0036095	1.3543670 3
0.0060	6.1679010 - 1	3.5847436	8.6792123 - 1	3.0035819	1.3445989 3
0.0070	6.1672682 - 1	3.5848540	8.6789494 - 1	3.0035494	1.3349661 3
0.0080	6.1665412 - 1	3.5849804	8.6786448 - 1	3.0035121	1.3254647 3
0.0090	6.1657131 - 1	3.5851245	8.6783006 - 1	3.0034694	1.3160909 3
0.0100	6.1647923 - 1	3.5852850	8.6779159 - 1	3.0034220	1.3068406 3
0.0120	6.1626583 - 1	3.5856568	8.6770255 - 1	3.0033122	1.2886954 3
0.0150	6.1587365 - 1	3.5863406	8.6753877 - 1	3.0031101	1.2623103 3
0.0200	6.1502995 - 1	3.5878150	8.6718611 - 1	3.0026750	1.2203378 3
0.0250	6.1395171 - 1	3.5897054	8.6673441 - 1	3.0021174	1.1805854 3
0.0300	6.1264425 - 1	3.5920065	8.6618587 - 1	3.0014389	1.1428039 3
0.0400	6.0936521 - 1	3.5978224	8.6480472 - 1	2.9997271	1.0724503 3
0.0500	6.0525040 - 1	3.6052129	8.6306042 - 1	2.9975574	1.0082107 3
0.0650	5.9766196 - 1	3.6191206	8.5981017 - 1	2.9934906	9.2176798 2
0.0800	5.8860978 - 1	3.6362100	8.5587304 - 1	2.9885235	8.4566114 2
0.1000	5.7474817 - 1	3.6635175	8.4970759 - 1	2.9806539	7.5787071 2
0.1500	5.3506435 - 1	3.7508185	8.3096140 - 1	2.9560429	5.9120543 2
0.2000	4.9451871 - 1	3.8590227	8.0950912 - 1	2.9266069	4.7678510 2
0.3000	4.2849489 - 1	2.1694486	7.6470064 - 1	2.8606698	3.3479623 2
0.4000	3.9115221 - 1	1.8982300	7.2185780 - 1	2.7918198	2.5187906 2
0.6000	3.8362041 - 1	1.4368417	6.4790913 - 1	2.6586383	1.5902204 2

Table 35. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.467
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}	d/j miles
		h_3 = 70 kilometers			
0.0005	7.0264352 - 1	3.4055291	8.5023379 - 1	2.9974098	1.2433895 3
0.0010	7.0263913 - 1	3.4055338	8.5023131 - 1	2.9974071	1.2381675 3
0.0020	7.0262265 - 1	3.4055527	8.5022233 - 1	2.9973968	1.2278386 3
0.0030	7.0259493 - 1	3.4055842	8.5020716 - 1	2.9973795	1.2176623 3
0.0040	7.0255614 - 1	3.4056282	8.5018588 - 1	2.9973553	1.2076369 3
0.0050	7.0250647 - 1	3.4056847	8.5015874 - 1	2.9973242	1.1977599 3
0.0060	7.0244573 - 1	3.4057539	8.5012556 - 1	2.9972862	1.1880278 3
0.0070	7.0237376 - 1	3.4058354	8.5008614 - 1	2.9972411	1.1784374 3
0.0080	7.0229112 - 1	3.4059296	8.5004093 - 1	2.9971895	1.1689853 3
0.0090	7.0219730 - 1	3.4060360	8.4998964 - 1	2.9971307	1.1596669 3
0.0100	7.0209252 - 1	3.4061552	8.4993225 - 1	2.9970651	1.1504788 3
0.0120	7.0185020 - 1	3.4064307	8.4979967 - 1	2.9969132	1.1324770 3
0.0150	7.0140494 - 1	3.4069377	8.4955596 - 1	2.9966343	1.1063547 3
0.0200	7.0044712 - 1	3.4080294	8.4903138 - 1	2.9960331	1.0649462 3
0.0250	6.9922374 - 1	3.4094273	8.4836074 - 1	2.9952637	1.0259098 3
0.0300	6.9774111 - 1	3.4111269	8.4754725 - 1	2.9943287	9.8899038 2
0.0400	6.9402698 - 1	3.4154092	8.4550529 - 1	2.9919735	9.2076906 2
0.0500	6.8937281 - 1	3.4208272	8.4293831 - 1	2.9889971	8.5914709 2
0.0650	6.8080609 - 1	3.4309545	8.3818900 - 1	2.9834426	7.7737068 2
0.0800	6.7060541 - 1	3.4432874	8.3249129 - 1	2.9766966	7.0657786 2
0.1000	6.5499464 - 1	3.4627744	8.2367679 - 1	2.9660815	6.2644905 2
0.1500	6.0999277 - 1	3.5237325	7.9754539 - 1	2.9332922	4.7915900 2
0.2000	5.6256878 - 1	3.5976623	7.6859183 - 1	2.8945350	3.8174547 2
0.3000	4.7653907 - 1	3.7717689	7.1045671 - 1	2.8082397	2.6471062 2
0.4000	4.1133273 - 1	3.9700518	6.5717344 - 1	2.7178687	1.9802951 2
0.6000	3.4432815 - 1	1.8933838	5.6956239 - 1	2.5407388	1.2445355 2
		h_3 = 90 kilometers			
0.0005	6.7155317 - 1	3.4421286	8.3302267 - 1	2.9773296	1.4000780 3
0.0010	6.7154988 - 1	3.4421326	8.3302092 - 1	2.9773274	1.3948535 3
0.0020	6.7153621 - 1	3.4421493	8.3301321 - 1	2.9773182	1.3845147 3
0.0030	6.7151337 - 1	3.4421773	8.3300036 - 1	2.9773031	1.3743220 3
0.0040	6.7148155 - 1	3.4422160	8.3298255 - 1	2.9772817	1.3642736 3
0.0050	6.7144040 - 1	3.4422664	8.3295951 - 1	2.9772544	1.3543670 3
0.0060	6.7139011 - 1	3.4423277	8.3293129 - 1	2.9772208	1.3445989 3
0.0070	6.7133080 - 1	3.4424003	8.3289800 - 1	2.9771812	1.3349661 3
0.0080	6.7126258 - 1	3.4424835	8.3285980 - 1	2.9771356	1.3254647 3
0.0090	6.7118496 - 1	3.4425785	8.3281626 - 1	2.9770840	1.3160909 3
0.0100	6.7109855 - 1	3.4426841	8.3276786 - 1	2.9770262	1.3068406 3
0.0120	6.7089838 - 1	3.4429290	8.3265561 - 1	2.9768925	1.2886954 3
0.0150	6.7053060 - 1	3.4433791	8.3244935 - 1	2.9766466	1.2623103 3
0.0200	6.6973870 - 1	3.4443494	8.3200501 - 1	2.9761165	1.2203378 3
0.0250	6.6872580 - 1	3.4455933	8.3143617 - 1	2.9754375	1.1805854 3
0.0300	6.6749666 - 1	3.4471073	8.3074526 - 1	2.9746113	1.1428039 3
0.0400	6.6440802 - 1	3.4509321	8.2900603 - 1	2.9725257	1.0724503 3
0.0500	6.6052001 - 1	3.4557889	8.2681022 - 1	2.9698801	1.0082107 3
0.0650	6.5331423 - 1	3.4649187	8.2272087 - 1	2.9649169	9.2176798 2
0.0800	6.4465418 - 1	3.4761207	8.1777137 - 1	2.9588461	8.4566114 2
0.1000	6.3124705 - 1	3.4939861	8.1002986 - 1	2.9492082	7.5787071 2
0.1500	5.9170069 - 1	3.5508997	7.8657154 - 1	2.9189120	5.9120543 2
0.2000	5.4888198 - 1	3.6213495	7.5990092 - 1	2.8823771	4.7678510 2
0.3000	4.6912176 - 1	3.7903912	7.0494520 - 1	2.7994217	3.3479623 2
0.4000	4.0747842 - 1	3.9850912	6.5355238 - 1	2.7112912	2.5187906 2
0.6000	3.4364182 - 1	1.8842763	5.6786432 - 1	2.5369000	1.5902204 2

Table 36. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1501
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee}\rvert$	Arg T_{ee}	$\lvert T_{mm}\rvert$	Arg T_{mm}	d/j miles	
		h_3 = 70 kilometers				
0.0005	5.6030252 - 1	3.7550434	9.1915792 - 1	3.0535762	1.2433895	3
0.0010	5.6029750 - 1	3.7550553	9.1915649 - 1	3.0535746	1.2381675	3
0.0020	5.6027846 - 1	3.7551021	9.1915167 - 1	3.0535686	1.2278386	3
0.0030	5.6024660 - 1	3.7551801	9.1914350 - 1	3.0535585	1.2176623	3
0.0040	5.6020195 - 1	3.7552895	9.1913191 - 1	3.0535444	1.2076369	3
0.0050	5.6014468 - 1	3.7554296	9.1911723 - 1	3.0535262	1.1977599	3
0.0060	5.6007473 - 1	3.7556012	9.1909929 - 1	3.0535041	1.1880278	3
0.0070	5.5999203 - 1	3.7558036	9.1907774 - 1	3.0534780	1.1784374	3
0.0080	5.5989682 - 1	3.7560372	9.1905339 - 1	3.0534478	1.1689853	3
0.0090	5.5978896 - 1	3.7563021	9.1902550 - 1	3.0534138	1.1596669	3
0.0100	5.5966838 - 1	3.7565977	9.1899438 - 1	3.0533756	1.1504788	3
0.0120	5.5938982 - 1	3.7572822	9.1892248 - 1	3.0532874	1.1324770	3
0.0150	5.5887835 - 1	3.7585410	9.1879033 - 1	3.0531250	1.1063547	3
0.0200	5.5778020 - 1	3.7612538	9.1850578 - 1	3.0527755	1.0649462	3
0.0250	5.5638187 - 1	3.7647286	9.1814205 - 1	3.0523285	1.0259098	3
0.0300	5.5469300 - 1	3.7689553	9.1770051 - 1	3.0517854	9.8899038	2
0.0400	5.5049188 - 1	3.7796177	9.1659191 - 1	3.0504188	9.2076906	2
0.0500	5.4528778 - 1	3.7931301	9.1519680 - 1	3.0486949	8.5914709	2
0.0650	5.3588830 - 1	3.8184497	9.1261182 - 1	3.0454861	7.7737068	2
0.0800	5.2500775 - 1	3.8493782	9.0950341 - 1	3.0416037	7.0657786	2
0.1000	5.0904324 - 1	3.8984059	9.0467771 - 1	3.0355270	6.2644905	2
0.1500	4.6811506 - 1	4.0519330	8.9023066 - 1	3.0169911	4.7915900	2
0.2000	4.3438235 - 1	2.0488856	8.7392182 - 1	2.9954968	3.8174547	2
0.3000	4.0353424 - 1	1.6681123	8.3992310 - 1	2.9489777	2.6471062	2
0.4000	4.1226586 - 1	1.3478052	8.0690271 - 1	2.9018070	1.9802951	2
0.6000	4.7140703 - 1	9.5232110 - 1	7.4781537 - 1	2.8126506	1.2445355	2
		h_3 = 90 kilometers				
0.0005	5.2600412 - 1	3.8464680	9.0979361 - 1	3.0419675	1.4000780	3
0.0010	5.2600061 - 1	3.8464783	9.0979260 - 1	3.0419662	1.3948535	3
0.0020	5.2598614 - 1	3.8465202	9.0978838 - 1	3.0419609	1.3845147	3
0.0030	5.2596216 - 1	3.8465901	9.0978142 - 1	3.0419522	1.3743220	3
0.0040	5.2592865 - 1	3.8466878	9.0977162 - 1	3.0419399	1.3642736	3
0.0050	5.2588539 - 1	3.8468138	9.0975917 - 1	3.0419242	1.3543670	3
0.0060	5.2583246 - 1	3.8469680	9.0974363 - 1	3.0419050	1.3445989	3
0.0070	5.2577011 - 1	3.8471502	9.0972556 - 1	3.0418822	1.3349661	3
0.0080	5.2569832 - 1	3.8473593	9.0970458 - 1	3.0418560	1.3254647	3
0.0090	5.2561666 - 1	3.8475976	9.0968076 - 1	3.0418261	1.3160909	3
0.0100	5.2552591 - 1	3.8478627	9.0965446 - 1	3.0417932	1.3068406	3
0.0120	5.2531549 - 1	3.8484775	9.0959316 - 1	3.0417163	1.2886954	3
0.0150	5.2492931 - 1	3.8496081	9.0948052 - 1	3.0415751	1.2623103	3
0.0200	5.2409939 - 1	3.8520459	9.0923781 - 1	3.0412708	1.2203378	3
0.0250	5.2304106 - 1	3.8551707	9.0892684 - 1	3.0408811	1.1805854	3
0.0300	5.2176126 - 1	3.8589756	9.0854916 - 1	3.0404071	1.1428039	3
0.0400	5.1856846 - 1	3.8685923	9.0759777 - 1	3.0392115	1.0724503	3
0.0500	5.1459641 - 1	3.8808131	9.0639564 - 1	3.0376972	1.0082107	3
0.0650	5.0737596 - 1	3.9038092	9.0415305 - 1	3.0348627	9.2176798	2
0.0800	4.9894716 - 1	3.9320508	9.0143226 - 1	3.0314069	8.4566114	2
0.1000	4.8645447 - 1	3.9771045	8.9716113 - 1	3.0259455	7.5787071	2
0.1500	4.5387015 - 1	4.1197479	8.8409057 - 1	3.0089664	5.9120543	2
0.2000	4.2668465 - 1	1.9923467	8.6895352 - 1	2.9888379	4.7678510	2
0.3000	4.0298798 - 1	1.6328443	8.3659724 - 1	2.9443127	3.3479623	2
0.4000	4.1384240 - 1	1.3280613	8.0458421 - 1	2.8984244	2.5187906	2
0.6000	4.7283981 - 1	9.4624970 - 1	7.4660569 - 1	2.8107589	1.5902204	2

Table 37. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2335
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee}\rvert$	Arg T_{ee}	$\lvert T_{mm}\rvert$	Arg T_{mm}	d/j miles	
			h_3 = 70 kilometers			
0.0005	6.1853098 - 1	3.6042148	8.9686339 - 1	3.0330037	1.2433895	3
0.0010	6.1852613 - 1	3.6042235	8.9686173 - 1	3.0330018	1.2381675	3
0.0020	6.1850747 - 1	3.6042578	8.9685552 - 1	3.0329942	1.2278386	3
0.0030	6.1847615 - 1	3.6043153	8.9684503 - 1	3.0329815	1.2176623	3
0.0040	6.1843226 - 1	3.6043959	8.9683046 - 1	3.0329638	1.2076369	3
0.0050	6.1837589 - 1	3.6044992	8.9681156 - 1	3.0329410	1.1977599	3
0.0060	6.1830711 - 1	3.6046253	8.9678870 - 1	3.0329132	1.1880278	3
0.0070	6.1822587 - 1	3.6047745	8.9676149 - 1	3.0328804	1.1784374	3
0.0080	6.1813230 - 1	3.6049465	8.9673030 - 1	3.0328426	1.1689853	3
0.0090	6.1802611 - 1	3.6051412	8.9669481 - 1	3.0327996	1.1596669	3
0.0100	6.1790760 - 1	3.6053591	8.9665515 - 1	3.0327517	1.1504788	3
0.0120	6.1790760 - 1	3.6053591	8.9665515 - 1	3.0327517	1.1324770	3
0.0150	6.1713025 - 1	3.6067894	8.9639532 - 1	3.0324368	1.1063547	3
0.0200	6.1604845 - 1	3.6087861	8.9603297 - 1	3.0319974	1.0649462	3
0.0250	6.1466883 - 1	3.6113435	8.9556974 - 1	3.0314355	1.0259098	3
0.0300	6.1299941 - 1	3.6144537	8.9500761 - 1	3.0307524	9.8899038	2
0.0400	6.0883190 - 1	3.6222982	8.9359646 - 1	3.0290340	9.2076906	2
0.0500	6.0363807 - 1	3.6322360	8.9182142 - 1	3.0268641	8.5914709	2
0.0650	5.9416383 - 1	3.6508512	8.8853472 - 1	3.0228223	7.7737068	2
0.0800	5.8303171 - 1	3.6735848	8.8458644 - 1	3.0179255	7.0657786	2
0.1000	5.6632720 - 1	3.7096366	8.7846694 - 1	3.0102472	6.2644905	2
0.1500	5.2067374 - 1	3.8231473	8.6022425 - 1	2.9867296	4.7915900	2
0.2000	4.7737070 - 1	3.9610354	8.3979389 - 1	2.9592981	3.8174547	2
0.3000	4.1626484 - 1	2.0095349	7.9784635 - 1	2.8994716	2.6471062	2
0.4000	3.9258032 - 1	1.7007927	7.5799177 - 1	2.8383680	1.9802951	2
0.6000	4.1210073 - 1	1.2403360	6.8876650 - 1	2.7222121	1.2445355	2
			h_3 = 90 kilometers			
0.0005	5.8405915 - 1	3.6714456	8.8495500 - 1	3.0183844	1.4000780	3
0.0010	5.8405555 - 1	3.6714531	8.8495375 - 1	3.0183828	1.3948535	3
0.0020	5.8404064 - 1	3.6714841	8.8494839 - 1	3.0183762	1.3845147	3
0.0030	5.8401586 - 1	3.6715353	8.8493946 - 1	3.0183651	1.3743220	3
0.0040	5.8398138 - 1	3.6716072	8.8492717 - 1	3.0183498	1.3642736	3
0.0050	5.8393683 - 1	3.6716999	8.8491119 - 1	3.0183299	1.3543670	3
0.0060	5.8388227 - 1	3.6718132	8.8489157 - 1	3.0183056	1.3445989	3
0.0070	5.8381795 - 1	3.6719470	8.8486859 - 1	3.0182768	1.3349661	3
0.0080	5.8374397 - 1	3.6721007	8.8484199 - 1	3.0182437	1.3254647	3
0.0090	5.8365980 - 1	3.6722759	8.8481183 - 1	3.0182062	1.3160909	3
0.0100	5.8356626 - 1	3.6724709	8.8477833 - 1	3.0181644	1.3068406	3
0.0120	5.8334921 - 1	3.6729228	8.8470044 - 1	3.0180675	1.2886954	3
0.0150	5.8295076 - 1	3.6737538	8.8455748 - 1	3.0178892	1.2623103	3
0.0200	5.8209369 - 1	3.6755457	8.8424933 - 1	3.0175051	1.2203378	3
0.0250	5.8099900 - 1	3.6778427	8.8385479 - 1	3.0170130	1.1805854	3
0.0300	5.7967267 - 1	3.6806398	8.8337551 - 1	3.0164145	1.1428039	3
0.0400	5.7635091 - 1	3.6877095	8.8216860 - 1	3.0149044	1.0724503	3
0.0500	5.7219256 - 1	3.6966960	8.8064414 - 1	3.0129911	1.0082107	3
0.0650	5.6455369 - 1	3.7136128	8.7780221 - 1	3.0094068	9.2176798	2
0.0800	5.5549468 - 1	3.7344082	8.7435798 - 1	3.0050319	8.4566114	2
0.1000	5.4174346 - 1	3.7676514	8.6895999 - 1	2.9981080	7.5787071	2
0.1500	5.0332281 - 1	3.8738915	8.5251078 - 1	2.9765070	5.9120543	2
0.2000	4.6597257 - 1	4.0049168	8.3360828 - 1	2.9507693	4.7678510	2
0.3000	4.1237571 - 1	1.9780068	7.9379249 - 1	2.8934450	3.3479623	2
0.4000	3.9206390 - 1	1.6799471	7.5522611 - 1	2.8339743	2.5187906	2
0.6000	4.1302013 - 1	1.2326235	6.8737528 - 1	2.7197411	1.5902204	2

Table 38. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0100
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee}\rvert$	Arg T_{ee}	$\lvert T_{mm}\rvert$	Arg T_{mm}	d/j miles	
		h_3 = 70 kilometers				
0.0005	4.8176526 - 1	9.2331030 - 1	9.8144145 - 1	3.1205808	1.2433895	3
0.0010	4.8176940 - 1	9.2329230 - 1	9.8144114 - 1	3.1205804	1.2381675	3
0.0020	4.8178556 - 1	9.2322170 - 1	9.8143998 - 1	3.1205790	1.2278386	3
0.0030	4.8181265 - 1	9.2310330 - 1	9.8143797 - 1	3.1205768	1.2176623	3
0.0040	4.8185057 - 1	9.2293780 - 1	9.8143517 - 1	3.1205737	1.2076369	3
0.0050	4.8189922 - 1	9.2272510 - 1	9.8143157 - 1	3.1205697	1.1977599	3
0.0060	4.8195867 - 1	9.2246580 - 1	9.8142723 - 1	3.1205648	1.1880278	3
0.0070	4.8202898 - 1	9.2215910 - 1	9.8142202 - 1	3.1205590	1.1784374	3
0.0080	4.8210997 - 1	9.2180600 - 1	9.8141605 - 1	3.1205524	1.1689853	3
0.0090	4.8220178 - 1	9.2140630 - 1	9.8140929 - 1	3.1205448	1.1596669	3
0.0100	4.8230437 - 1	9.2096000 - 1	9.8140184 - 1	3.1205363	1.1504788	3
0.0120	4.8254175 - 1	9.1992850 - 1	9.8138439 - 1	3.1205168	1.1324770	3
0.0150	4.8297797 - 1	9.1803850 - 1	9.8135198 - 1	3.1204810	1.1063547	3
0.0200	4.8391784 - 1	9.1399230 - 1	9.8128271 - 1	3.1204036	1.0649462	3
0.0250	4.8512066 - 1	9.0886320 - 1	9.8119414 - 1	3.1203046	1.0259098	3
0.0300	4.8658192 - 1	9.0270410 - 1	9.8108640 - 1	3.1201845	9.8899038	2
0.0400	4.9025784 - 1	8.8754530 - 1	9.8081531 - 1	3.1198823	9.2076906	2
0.0500	4.9489082 - 1	8.6908170 - 1	9.8047301 - 1	3.1195014	8.5914709	2
0.0650	5.0347697 - 1	8.3657000 - 1	9.7983553 - 1	3.1187929	7.7737068	2
0.0800	5.1376078 - 1	8.0018190 - 1	9.7906309 - 1	3.1179366	7.0657786	2
0.1000	5.2952352 - 1	7.4892430 - 1	9.7785163 - 1	3.1165976	6.2644905	2
0.1500	5.7419695 - 1	6.2561410 - 1	9.7413474 - 1	3.1125168	4.7915900	2
0.2000	6.1887080 - 1	5.2459340 - 1	9.6978238 - 1	3.1077759	3.8174547	2
0.3000	6.9290809 - 1	3.8780730 - 1	9.6021480 - 1	3.0974269	2.6471062	2
0.4000	7.4553402 - 1	3.0606190 - 1	9.5034757 - 1	3.0867770	1.9802951	2
0.6000	8.0969137 - 1	2.1825000 - 1	9.3144209 - 1	3.0662545	1.2445355	2
		h_3 = 90 kilometers				
0.0005	5.1280372 - 1	8.0346200 - 1	9.7913557 - 1	3.1180167	1.4000780	3
0.0010	5.1280711 - 1	8.0345040 - 1	9.7913531 - 1	3.1180165	1.3948535	3
0.0020	5.1282094 - 1	8.0340290 - 1	9.7913429 - 1	3.1180153	1.3845147	3
0.0030	5.1284401 - 1	8.0332360 - 1	9.7913254 - 1	3.1180134	1.3743220	3
0.0040	5.1287612 - 1	8.0321310 - 1	9.7913011 - 1	3.1180107	1.3642736	3
0.0050	5.1291764 - 1	8.0307060 - 1	9.7912701 - 1	3.1180072	1.3543670	3
0.0060	5.1296832 - 1	8.0289640 - 1	9.7912313 - 1	3.1180029	1.3445989	3
0.0070	5.1302829 - 1	8.0269070 - 1	9.7911863 - 1	3.1179979	1.3349661	3
0.0080	5.1309706 - 1	8.0245440 - 1	9.7911340 - 1	3.1179922	1.3254647	3
0.0090	5.1317548 - 1	8.0218550 - 1	9.7910743 - 1	3.1179856	1.3160909	3
0.0100	5.1326267 - 1	8.0188640 - 1	9.7910079 - 1	3.1179783	1.3068406	3
0.0120	5.1346474 - 1	8.0119430 - 1	9.7908553 - 1	3.1179613	1.2886954	3
0.0150	5.1383628 - 1	7.9992400 - 1	9.7905740 - 1	3.1179302	1.2623103	3
0.0200	5.1463607 - 1	7.9720030 - 1	9.7899680 - 1	3.1178632	1.2203378	3
0.0250	5.1565887 - 1	7.9373750 - 1	9.7891916 - 1	3.1177773	1.1805854	3
0.0300	5.1690062 - 1	7.8956420 - 1	9.7882471 - 1	3.1176728	1.1428039	3
0.0400	5.2002093 - 1	7.7922260 - 1	9.7858655 - 1	3.1174093	1.0724503	3
0.0500	5.2394794 - 1	7.6649040 - 1	9.7828467 - 1	3.1170756	1.0082107	3
0.0650	5.3121733 - 1	7.4370060 - 1	9.7771891 - 1	3.1164513	9.2176798	2
0.0800	5.3992572 - 1	7.1762120 - 1	9.7702825 - 1	3.1156904	8.4566114	2
0.1000	5.5331182 - 1	6.7983430 - 1	9.7593453 - 1	3.1144882	7.5787071	2
0.1500	5.9176473 - 1	5.8374190 - 1	9.7251526 - 1	3.1107489	5.9120543	2
0.2000	6.3122628 - 1	4.9949890 - 1	9.6842492 - 1	3.1063029	4.7678510	2
0.3000	6.9895559 - 1	3.7786830 - 1	9.5924544 - 1	3.0963808	3.3479623	2
0.4000	7.4867970 - 1	3.0148380 - 1	9.4963508 - 1	3.0860072	2.5187906	2
0.6000	8.1072268 - 1	2.1692440 - 1	9.3103924 - 1	3.0658145	1.5902204	2

Table 39. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0200
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}	d/j miles	
			h_3 = 70 kilometers			
0.0005	4.2143411 - 1	1.3413522	9.7312330 - 1	3.1109462	1.2433895	3
0.0010	4.2143576 - 1	1.3413282	9.7312277 - 1	3.1109456	1.2381675	3
0.0020	4.2144254 - 1	1.3412340	9.7312119 - 1	3.1109437	1.2278386	3
0.0030	4.2145361 - 1	1.3410760	9.7311833 - 1	3.1109404	1.2176623	3
0.0040	4.2146926 - 1	1.3408551	9.7311438 - 1	3.1109359	1.2076369	3
0.0050	4.2148925 - 1	1.3405719	9.7310925 - 1	3.1109300	1.1977599	3
0.0060	4.2151372 - 1	1.3402257	9.7310308 - 1	3.1109228	1.1880278	3
0.0070	4.2154263 - 1	1.3398170	9.7309569 - 1	3.1109143	1.1784374	3
0.0080	4.2157616 - 1	1.3393459	9.7308741 - 1	3.1109044	1.1689853	3
0.0090	4.2161412 - 1	1.3388125	9.7307773 - 1	3.1108933	1.1596669	3
0.0100	4.2165672 - 1	1.3382165	9.7306705 - 1	3.1108808	1.1504788	3
0.0120	4.2175543 - 1	1.3368394	9.7304237 - 1	3.1108521	1.1324770	3
0.0150	4.2193804 - 1	1.3343132	9.7299682 - 1	3.1107993	1.1063547	3
0.0200	4.2233660 - 1	1.3288962	9.7289897 - 1	3.1106856	1.0649462	3
0.0250	4.2285646 - 1	1.3220116	9.7277349 - 1	3.1105402	1.0259098	3
0.0300	4.2350299 - 1	1.3137173	9.7262142 - 1	3.1103634	9.8899038	2
0.0400	4.2519880 - 1	1.2931835	9.7223847 - 1	3.1099195	9.2076906	2
0.0500	4.2747131 - 1	1.2679447	9.7175540 - 1	3.1093596	8.5914709	2
0.0650	4.3205276 - 1	1.2229199	9.7085647 - 1	3.1083192	7.7737068	2
0.0800	4.3811433 - 1	1.1717011	9.6976893 - 1	3.1070629	7.0657786	2
0.1000	4.4847351 - 1	1.0982327	9.6806637 - 1	3.1051006	6.2644905	2
0.1500	4.8346589 - 1	9.1674580 - 1	9.6286278 - 1	3.0991379	4.7915900	2
0.2000	5.2476210 - 1	7.6544670 - 1	9.5679866 - 1	3.0922410	3.8174547	2
0.3000	6.0294063 - 1	5.6101980 - 1	9.4354019 - 1	3.0772769	2.6471062	2
0.4000	6.6397499 - 1	4.4054760 - 1	9.2993835 - 1	3.0619679	1.9802951	2
0.6000	7.4307495 - 1	3.1305920 - 1	9.0403725 - 1	3.0326128	1.2445355	2
			h_3 = 90 kilometers			
0.0005	4.3752559 - 1	1.1763519	9.6987089 - 1	3.1071804	1.4000780	3
0.0010	4.3752770 - 1	1.1763354	9.6987061 - 1	3.1071800	1.3948535	3
0.0020	4.3753616 - 1	1.1762680	9.6986910 - 1	3.1071783	1.3845147	3
0.0030	4.3755029 - 1	1.1761556	9.6986665 - 1	3.1071754	1.3743220	3
0.0040	4.3756990 - 1	1.1759994	9.6986317 - 1	3.1071715	1.3642736	3
0.0050	4.3759539 - 1	1.1757973	9.6985873 - 1	3.1071665	1.3543670	3
0.0060	4.3762642 - 1	1.1755504	9.6985331 - 1	3.1071602	1.3445989	3
0.0070	4.3766324 - 1	1.1752587	9.6984687 - 1	3.1071529	1.3349661	3
0.0080	4.3770556 - 1	1.1749236	9.6983962 - 1	3.1071444	1.3254647	3
0.0090	4.3775366 - 1	1.1745424	9.6983120 - 1	3.1071348	1.3160909	3
0.0100	4.3780740 - 1	1.1741184	9.6982206 - 1	3.1071240	1.3068406	3
0.0120	4.3793169 - 1	1.1731367	9.6980038 - 1	3.1070993	1.2886954	3
0.0150	4.3816095 - 1	1.1713351	9.6976089 - 1	3.1070536	1.2623103	3
0.0200	4.3865693 - 1	1.1674679	9.6967560 - 1	3.1069552	1.2203378	3
0.0250	4.3929629 - 1	1.1625447	9.6956654 - 1	3.1068292	1.1805854	3
0.0300	4.4007969 - 1	1.1566028	9.6943380 - 1	3.1066760	1.1428039	3
0.0400	4.4208263 - 1	1.1418346	9.6909878 - 1	3.1062897	1.0724503	3
0.0500	4.4467179 - 1	1.1235713	9.6867456 - 1	3.1058008	1.0082107	3
0.0650	4.4965658 - 1	1.0906681	9.6788011 - 1	3.1048865	9.2176798	2
0.0800	4.5593566 - 1	1.0527089	9.6691111 - 1	3.1037728	8.4566114	2
0.1000	4.6618640 - 1	9.9720450 - 1	9.6537902 - 1	3.1020152	7.5787071	2
0.1500	4.9906305 - 1	8.5416210 - 1	9.6060320 - 1	3.0965622	5.9120543	2
0.2000	5.3705769 - 1	7.2779420 - 1	9.5491200 - 1	3.0901042	4.7678510	2
0.3000	6.0975168 - 1	5.4628620 - 1	9.4220124 - 1	3.0757698	3.3479623	2
0.4000	6.6774142 - 1	4.3385090 - 1	9.2895851 - 1	3.0608640	2.5187906	2
0.6000	7.4438289 - 1	3.1114980 - 1	9.0348747 - 1	3.0319847	1.5902204	2

Table 40. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0500
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee}\rvert$	Arg T_{ee}	$\lvert T_{mm}\rvert$	Arg T_{mm}	d/j miles
		h_3 = 70 kilometers			
0.0005	4.3534476 - 1	1.9768188	9.5580274 - 1	3.0914950	1.2433895 3
0.0010	4.3534203 - 1	1.9767965	9.5580207 - 1	3.0914943	1.2381675 3
0.0020	4.3533117 - 1	1.9767097	9.5579937 - 1	3.0914909	1.2278386 3
0.0030	4.3531304 - 1	1.9765642	9.5579478 - 1	3.0914854	1.2176623 3
0.0040	4.3528780 - 1	1.9763606	9.5578844 - 1	3.0914778	1.2076369 3
0.0050	4.3525521 - 1	1.9760991	9.5578029 - 1	3.0914679	1.1977599 3
0.0060	4.3521553 - 1	1.9757795	9.5577046 - 1	3.0914558	1.1880278 3
0.0070	4.3516852 - 1	1.9754023	9.5575858 - 1	3.0914414	1.1784374 3
0.0080	4.3511455 - 1	1.9749670	9.5574503 - 1	3.0914251	1.1689853 3
0.0090	4.3505350 - 1	1.9744740	9.5572959 - 1	3.0914064	1.1596669 3
0.0100	4.3498523 - 1	1.9739231	9.5571241 - 1	3.0913857	1.1504788 3
0.0120	4.3482803 - 1	1.9726489	9.5567275 - 1	3.0913375	1.1324770 3
0.0150	4.3454044 - 1	1.9703068	9.5559965 - 1	3.0912490	1.1063547 3
0.0200	4.3392822 - 1	1.9652660	9.5544226 - 1	3.0910582	1.0649462 3
0.0250	4.3315867 - 1	1.9588227	9.5524094 - 1	3.0908144	1.0259098 3
0.0300	4.3224486 - 1	1.9510049	9.5499672 - 1	3.0905181	9.8899038 2
0.0400	4.3004544 - 1	1.9313846	9.5438275 - 1	3.0897735	9.2076906 2
0.0500	4.2747027 - 1	1.9067351	9.5360906 - 1	3.0888348	8.5914709 2
0.0650	4.2325287 - 1	1.8612317	9.5217229 - 1	3.0870902	7.7737068 2
0.0800	4.1910425 - 1	1.8069485	9.5043879 - 1	3.0849834	7.0657786 2
0.1000	4.1455253 - 1	1.7240600	9.4773479 - 1	3.0816942	6.2644905 2
0.1500	4.1277771 - 1	1.4916134	9.3954145 - 1	3.0717116	4.7915900 2
0.2000	4.2649951 - 1	1.2672987	9.3010622 - 1	3.0602021	3.8174547 2
0.3000	4.8030329 - 1	9.3099800 - 1	9.0979399 - 1	3.0353936	2.6471062 2
0.4000	5.3910354 - 1	7.2565880 - 1	8.8927723 - 1	3.0102285	1.9802951 2
0.6000	6.3018026 - 1	5.1100650 - 1	8.5084601 - 1	2.9624070	1.2445355 2
		h_3 = 90 kilometers			
0.0005	4.1945011 - 1	1.8119931	9.5060077 - 1	3.0851806	1.4000780 3
0.0010	4.1944885 - 1	1.8119753	9.5060034 - 1	3.0851799	1.3948535 3
0.0020	4.1944383 - 1	1.8119022	9.5059793 - 1	3.0851771	1.3845147 3
0.0030	4.1943539 - 1	1.8117806	9.5059396 - 1	3.0851723	1.3743220 3
0.0040	4.1942368 - 1	1.8116114	9.5058861 - 1	3.0851657	1.3642736 3
0.0050	4.1940868 - 1	1.8113924	9.5058176 - 1	3.0851572	1.3543670 3
0.0060	4.1939011 - 1	1.8111253	9.5057305 - 1	3.0851467	1.3445989 3
0.0070	4.1936822 - 1	1.8108092	9.5056292 - 1	3.0851345	1.3349661 3
0.0080	4.1934321 - 1	1.8104463	9.5055125 - 1	3.0851202	1.3254647 3
0.0090	4.1931478 - 1	1.8100333	9.5053797 - 1	3.0851040	1.3160909 3
0.0100	4.1928317 - 1	1.8095735	9.5052309 - 1	3.0850860	1.3068406 3
0.0120	4.1921038 - 1	1.8085084	9.5048892 - 1	3.0850445	1.2886954 3
0.0150	4.1907732 - 1	1.8065510	9.5042594 - 1	3.0849679	1.2623103 3
0.0200	4.1879494 - 1	1.8023368	9.5029021 - 1	3.0848030	1.2203378 3
0.0250	4.1844217 - 1	1.7969488	9.5011665 - 1	3.0845917	1.1805854 3
0.0300	4.1802618 - 1	1.7904105	9.4990525 - 1	3.0843349	1.1428039 3
0.0400	4.1704028 - 1	1.7739889	9.4937288 - 1	3.0836873	1.0724503 3
0.0500	4.1591896 - 1	1.7533410	9.4869928 - 1	3.0828677	1.0082107 3
0.0650	4.1418932 - 1	1.7151731	9.4743984 - 1	3.0813352	9.2176798 2
0.0800	4.1269830 - 1	1.6695498	9.4590718 - 1	3.0794692	8.4566114 2
0.1000	4.1161491 - 1	1.5996837	9.4349084 - 1	3.0765257	7.5787071 2
0.1500	4.1638133 - 1	1.4020338	9.3601276 - 1	3.0674081	5.9120543 2
0.2000	4.3288946 - 1	1.2076561	9.2719196 - 1	3.0566457	4.7678510 2
0.3000	4.8625424 - 1	9.0594690 - 1	9.0776155 - 1	3.0329073	3.3479623 2
0.4000	5.4309765 - 1	7.1426760 - 1	8.8780934 - 1	3.0084209	2.5187906 2
0.6000	6.3180104 - 1	5.0783610 - 1	8.5003812 - 1	2.9613883	1.5902204 2

Table 41. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1000
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}	d/j miles
		h_3 = 70 kilometers			
0.0005	5.0769109 - 1	3.9245611	9.3536272 - 1	3.0697649	1.2433895 3
0.0010	5.0768645 - 1	3.9245764	9.3536165 - 1	3.0697636	1.2381675 3
0.0020	5.0766860 - 1	3.9246371	9.3535776 - 1	3.0697588	1.2278386 3
0.0030	5.0763864 - 1	3.9247380	9.3535114 - 1	3.0697506	1.2176623 3
0.0040	5.0759676 - 1	3.9248799	9.3534194 - 1	3.0697393	1.2076369 3
0.0050	5.0754295 - 1	3.9250617	9.3533011 - 1	3.0697248	1.1977599 3
0.0060	5.0747733 - 1	3.9252840	9.3531578 - 1	3.0697071	1.1880278 3
0.0070	5.0739974 - 1	3.9255466	9.3529863 - 1	3.0696860	1.1784374 3
0.0080	5.0731039 - 1	3.9258494	9.3527904 - 1	3.0696619	1.1689853 3
0.0090	5.0720904 - 1	3.9261928	9.3525658 - 1	3.0696345	1.1596669 3
0.0100	5.0709605 - 1	3.9265762	9.3523169 - 1	3.0696038	1.1504788 3
0.0120	5.0683483 - 1	3.9274635	9.3517415 - 1	3.0695329	1.1324770 3
0.0150	5.0635548 - 1	3.9290952	9.3506820 - 1	3.0694026	1.1063547 3
0.0200	5.0532794 - 1	3.9326112	9.3484015 - 1	3.0691221	1.0649462 3
0.0250	5.0402246 - 1	3.9371141	9.3454854 - 1	3.0687632	1.0259098 3
0.0300	5.0245033 - 1	3.9425904	9.3419449 - 1	3.0683273	9.8899038 2
0.0400	4.9856197 - 1	3.9563977	9.3330535 - 1	3.0672309	9.2076906 2
0.0500	4.9379055 - 1	3.9738804	9.3218600 - 1	3.0658483	8.5914709 2
0.0650	4.8530723 - 1	4.0065840	9.3011038 - 1	3.0632766	7.7737068 2
0.0800	4.7572214 - 1	4.0464110	9.2761169 - 1	3.0601682	7.0657786 2
0.1000	4.6217582 - 1	4.1091922	9.2372625 - 1	3.0553089	6.2644905 2
0.1500	4.3116816 - 1	1.9815070	9.1204321 - 1	3.0405270	4.7915900 2
0.2000	4.1230066 - 1	1.7645282	8.9875405 - 1	3.0234473	3.8174547 2
0.3000	4.1562853 - 1	1.3628692	8.7068125 - 1	2.9866202	2.6471062 2
0.4000	4.5003907 - 1	1.0734235	8.4293927 - 1	2.9493610	1.9802951 2
0.6000	5.3058009 - 1	7.5239610 - 1	7.9222703 - 1	2.8789424	1.2445355 2
		h_3 = 90 kilometers			
0.0005	4.7658878 - 1	4.0426697	9.2784521 - 1	3.0604590	1.4000780 3
0.0010	4.7658574 - 1	4.0426830	9.2784435 - 1	3.0604581	1.3948525 3
0.0020	4.7657313 - 1	4.0427370	9.2784099 - 1	3.0604539	1.3845147 3
0.0030	4.7655221 - 1	4.0428271	9.2783530 - 1	3.0604469	1.3743220 3
0.0040	4.7652300 - 1	4.0429523	9.2782743 - 1	3.0604371	1.3642736 3
0.0050	4.7648543 - 1	4.0431145	9.2781747 - 1	3.0604246	1.3543670 3
0.0060	4.7643932 - 1	4.0433125	9.2780501 - 1	3.0604090	1.3445989 3
0.0070	4.7638503 - 1	4.0435467	9.2779044 - 1	3.0603910	1.3349661 3
0.0080	4.7632261 - 1	4.0438155	9.2777359 - 1	3.0603700	1.3254647 3
0.0090	4.7625148 - 1	4.0441220	9.2775441 - 1	3.0603460	1.3160909 3
0.0100	4.7617253 - 1	4.0444628	9.2773324 - 1	3.0603197	1.3068406 3
0.0120	4.7598962 - 1	4.0452531	9.2768397 - 1	3.0602582	1.2886954 3
0.0150	4.7565404 - 1	4.0467061	9.2759321 - 1	3.0601452	1.2623103 3
0.0200	4.7493418 - 1	4.0498386	9.2739798 - 1	3.0599017	1.2203378 3
0.0250	4.7401870 - 1	4.0538526	9.2714797 - 1	3.0595898	1.1805854 3
0.0300	4.7291510 - 1	4.0587373	9.2684401 - 1	3.0592105	1.1428039 3
0.0400	4.7017958 - 1	4.0710716	9.2607830 - 1	3.0582542	1.0724503 3
0.0500	4.6681264 - 1	4.0867205	9.2511032 - 1	3.0570434	1.0082107 3
0.0650	4.6080034 - 1	4.1160801	9.2330332 - 1	3.0547780	9.2176798 2
0.0800	4.5397318 - 1	4.1519670	9.2110848 - 1	3.0520181	8.4566114 2
0.1000	4.4428112 - 1	2.0744148	9.1765773 - 1	3.0476608	7.5787071 2
0.1500	4.2216308 - 1	1.8991264	9.0705310 - 1	3.0341438	5.9120543 2
0.2000	4.0959332 - 1	1.7003879	8.9468340 - 1	3.0181663	4.7678510 2
0.3000	4.1814749 - 1	1.3291056	8.6790810 - 1	2.9829333	3.3479623 2
0.4000	4.5300176 - 1	1.0566686	8.4097443 - 1	2.9466901	2.5187906 2
0.6000	5.3221499 - 1	7.4762770 - 1	7.9117563 - 1	2.8774475	1.5902204 2

Table 42. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2000
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee}\rvert$	Arg T_{ee}	$\lvert T_{mm}\rvert$	Arg T_{mm}	d/j miles
		h_3 = 70 kilometers			
0.0005	5.9828483 - 1	3.6538869	9.0529494 - 1	3.0405377	1.2433895 3
0.0010	5.9827984 - 1	3.6538967	9.0529334 - 1	3.0405359	1.2381675 3
0.0020	5.9826089 - 1	3.6539351	9.0528763 - 1	3.0405290	1.2278386 3
0.0030	5.9822914 - 1	3.6539994	9.0527806 - 1	3.0405173	1.2176623 3
0.0040	5.9818467 - 1	3.6540892	9.0526459 - 1	3.0405009	1.2076369 3
0.0050	5.9812750 - 1	3.6542047	9.0524720 - 1	3.0404798	1.1977599 3
0.0060	5.9805795 - 1	3.6543456	9.0522628 - 1	3.0404541	1.1880278 3
0.0070	5.9797552 - 1	3.6545122	9.0520129 - 1	3.0404237	1.1784374 3
0.0080	5.9788067 - 1	3.6547043	9.0517268 - 1	3.0403887	1.1689853 3
0.0090	5.9777306 - 1	3.6549219	9.0514001 - 1	3.0403490	1.1596669 3
0.0100	5.9765294 - 1	3.6551651	9.0510353 - 1	3.0403047	1.1504788 3
0.0120	5.9737530 - 1	3.6557281	9.0501952 - 1	3.0402022	1.1324770 3
0.0150	5.9686527 - 1	3.6567632	9.0486486 - 1	3.0400135	1.1063547 3
0.0200	5.9576949 - 1	3.6589941	9.0453191 - 1	3.0396074	1.0649462 3
0.0250	5.9437257 - 1	3.6618512	9.0410620 - 1	3.0390879	1.0259098 3
0.0300	5.9268340 - 1	3.6653266	9.0358973 - 1	3.0384568	9.8899038 2
0.0400	5.8847054 - 1	3.6740925	9.0229292 - 1	3.0368683	9.2076906 2
0.0500	5.8322990 - 1	3.6852002	9.0066174 - 1	3.0348632	8.5914709 2
0.0650	5.7369789 - 1	3.7060123	8.9764029 - 1	3.0311296	7.7737068 2
0.0800	5.6254703 - 1	3.7314373	8.9400959 - 1	3.0266085	7.0657786 2
0.1000	5.4592322 - 1	3.7717679	8.8837910 - 1	3.0195238	6.2644905 2
0.1500	5.0131577 - 1	3.8986847	8.7157039 - 1	2.9978588	4.7915900 2
0.2000	4.6060762 - 1	4.0521371	8.5269471 - 1	2.9726459	3.8174547 2
0.3000	4.0887688 - 1	1.8908749	8.1373063 - 1	2.9178312	2.6471062 2
0.4000	3.9657297 - 1	1.5718465	7.7641345 - 1	2.8620243	1.9802951 2
0.6000	4.3189926 - 1	1.1296805	7.1086696 - 1	2.7562433	1.2445355 2
		h_3 = 90 kilometers			
0.0005	5.6357378 - 1	3.7290445	8.9434850 - 1	3.0270321	1.4000780 3
0.0010	5.6357015 - 1	3.7290529	8.9434734 - 1	3.0270306	1.3948535 3
0.0020	5.6355534 - 1	3.7290875	8.9434247 - 1	3.0270245	1.3845147 3
0.0030	5.6353047 - 1	3.7291451	8.9433425 - 1	3.0270142	1.3743220 3
0.0040	5.6349599 - 1	3.7292252	8.9432289 - 1	3.0270001	1.3642736 3
0.0050	5.6345155 - 1	3.7293289	8.9430825 - 1	3.0269818	1.3543670 3
0.0060	5.6339703 - 1	3.7294557	8.9429022 - 1	3.0269594	1.3445989 3
0.0070	5.6333267 - 1	3.7296055	8.9426903 - 1	3.0269328	1.3349661 3
0.0080	5.6325882 - 1	3.7297773	8.9424462 - 1	3.0269023	1.3254647 3
0.0090	5.6317460 - 1	3.7299733	8.9421678 - 1	3.0268676	1.3160909 3
0.0100	5.6308108 - 1	3.7301913	8.9418605 - 1	3.0268290	1.3068406 3
0.0120	5.6286434 - 1	3.7306968	8.9411446 - 1	3.0267395	1.2886954 3
0.0150	5.6246609 - 1	3.7316264	8.9398288 - 1	3.0265750	1.2623103 3
0.0200	5.6160988 - 1	3.7336306	8.9369942 - 1	3.0262204	1.2203378 3
0.0250	5.6051689 - 1	3.7362000	8.9333659 - 1	3.0257662	1.1805854 3
0.0300	5.5919324 - 1	3.7393289	8.9289568 - 1	3.0252139	1.1428039 3
0.0400	5.5588209 - 1	3.7472374	8.9178550 - 1	3.0238204	1.0724503 3
0.0500	5.5174447 - 1	3.7572905	8.9038273 - 1	3.0220550	1.0082107 3
0.0650	5.4416673 - 1	3.7762162	8.8776738 - 1	3.0187488	9.2176798 2
0.0800	5.3522089 - 1	3.7994809	8.8459654 - 1	3.0147151	8.4566114 2
0.1000	5.2173359 - 1	3.8366635	8.7962442 - 1	3.0083347	7.5787071 2
0.1500	4.8477056 - 1	3.9552935	8.6445089 - 1	2.9884562	5.9120543 2
0.2000	4.5027877 - 1	4.1006588	8.4696740 - 1	2.9648181	4.7678510 2
0.3000	4.0610025 - 1	1.8574344	8.0994856 - 1	2.9123201	3.3479623 2
0.4000	3.9683704 - 1	1.5510004	7.7381257 - 1	2.8580166	2.5187906 2
0.6000	4.3304015 - 1	1.1225496	7.0954020 - 1	2.7539962	1.5902204 2

Table 43. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 1.0000
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}	d/j miles	
			h_3 = 70 kilometers			
0.0005	7.5550691 - 1	3.1812521	7.9553533 - 1	2.9634975	1.2433895	3
0.0010	7.5550318 - 1	3.1812525	7.9553224 - 1	2.9634940	1.2381675	3
0.0020	7.5548851 - 1	3.1812548	7.9551995 - 1	2.9634810	1.2278386	3
0.0030	7.5546408 - 1	3.1812586	7.9549950 - 1	2.9634590	1.2176623	3
0.0040	7.5542974 - 1	3.1812639	7.9547074 - 1	2.9634284	1.2076369	3
0.0050	7.5538581 - 1	3.1812707	7.9543395 - 1	2.9633890	1.1977599	3
0.0060	7.5533195 - 1	3.1812791	7.9538879 - 1	2.9633409	1.1880278	3
0.0070	7.5526856 - 1	3.1812888	7.9533574 - 1	2.9632840	1.1784374	3
0.0080	7.5519554 - 1	3.1813002	7.9527463 - 1	2.9632185	1.1689853	3
0.0090	7.5511255 - 1	3.1813128	7.9520514 - 1	2.9631441	1.1596669	3
0.0100	7.5501994 - 1	3.1813272	7.9512751 - 1	2.9630611	1.1504788	3
0.0120	7.5480560 - 1	3.1813603	7.9494801 - 1	2.9628690	1.1324770	3
0.0150	7.5441197 - 1	3.1814210	7.9461845 - 1	2.9625156	1.1063547	3
0.0200	7.5356465 - 1	3.1815518	7.9390887 - 1	2.9617544	1.0649462	3
0.0250	7.5248163 - 1	3.1817190	7.9300200 - 1	2.9607800	1.0259098	3
0.0300	7.5116766 - 1	3.1819217	7.9190190 - 1	2.9595952	9.8899038	2
0.0400	7.4787014 - 1	3.1824301	7.8914151 - 1	2.9566092	9.2076906	2
0.0500	7.4372530 - 1	3.1830689	7.8567277 - 1	2.9528313	8.5914709	2
0.0650	7.3605897 - 1	3.1842492	7.7926023 - 1	2.9457691	7.7737068	2
0.0800	7.2686398 - 1	3.1856636	7.7157495 - 1	2.9371701	7.0657786	2
0.1000	7.1264452 - 1	3.1878497	7.5970477 - 1	2.9235006	6.2644905	2
0.1500	6.7050602 - 1	3.1943516	7.2466082 - 1	2.8812528	4.7915900	2
0.2000	6.2378751 - 1	3.2017191	6.8612185 - 1	2.8304061	3.8174547	2
0.3000	5.2947874 - 1	3.2182845	6.0982271 - 1	2.7137884	2.6471062	2
0.4000	4.4167566 - 1	3.2394824	5.4128068 - 1	2.5860635	1.9802951	2
0.6000	2.9232239 - 1	3.3261082	4.3061552 - 1	2.3162399	1.2445355	2
			h_3 = 90 kilometers			
0.0005	7.2772149 - 1	3.1855317	7.7229141 - 1	2.9379780	1.4000780	3
0.0010	7.2771842 - 1	3.1855322	7.7228882 - 1	2.9379751	1.3948535	3
0.0020	7.2770603 - 1	3.1855342	7.7227846 - 1	2.9379636	1.3845147	3
0.0030	7.2768540 - 1	3.1855373	7.7226121 - 1	2.9379441	1.3743220	3
0.0040	7.2765663 - 1	3.1855416	7.7223721 - 1	2.9379169	1.3642736	3
0.0050	7.2761952 - 1	3.1855474	7.7220618 - 1	2.9378820	1.3543670	3
0.0060	7.2757401 - 1	3.1855544	7.7216818 - 1	2.9378392	1.3445989	3
0.0070	7.2752030 - 1	3.1855627	7.7212333 - 1	2.9377886	1.3349661	3
0.0080	7.2745869 - 1	3.1855720	7.7207182 - 1	2.9377304	1.3254647	3
0.0090	7.2738843 - 1	3.1855829	7.7201312 - 1	2.9376643	1.3160909	3
0.0100	7.2731027 - 1	3.1855949	7.7194784 - 1	2.9375906	1.3068406	3
0.0120	7.2712910 - 1	3.1856227	7.7179643 - 1	2.9374200	1.2886954	3
0.0150	7.2679617 - 1	3.1856740	7.7151833 - 1	2.9371062	1.2623103	3
0.0200	7.2607928 - 1	3.1857842	7.7091944 - 1	2.9364297	1.2203378	3
0.0250	7.2516172 - 1	3.1859253	7.7015299 - 1	2.9355626	1.1805854	3
0.0300	7.2404693 - 1	3.1860967	7.6922183 - 1	2.9345072	1.1428039	3
0.0400	7.2124091 - 1	3.1865281	7.6687868 - 1	2.9318415	1.0724503	3
0.0500	7.1769872 - 1	3.1870727	7.6392178 - 1	2.9284569	1.0082107	3
0.0650	7.1110260 - 1	3.1880868	7.5841881 - 1	2.9220972	9.2176798	2
0.0800	7.0312019 - 1	3.1893145	7.5176534 - 1	2.9142993	8.4566114	2
0.1000	6.9063676 - 1	3.1912374	7.4137462 - 1	2.9018786	7.5787071	2
0.1500	6.5280718 - 1	3.1971127	7.1001581 - 1	2.8624913	5.9120543	2
0.2000	6.0974461 - 1	3.2040000	6.7461957 - 1	2.8142680	4.7678510	2
0.3000	5.2047433 - 1	3.2200954	6.0267069 - 1	2.7015889	3.3479623	2
0.4000	4.3563596 - 1	3.2413436	5.3666903 - 1	2.5765241	2.5187906	2
0.6000	2.8237695 - 1	3.3293602	4.2846983 - 1	2.3100763	1.5902204	2

Table 44. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 2.0000
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee} \rvert$	Arg T_{ee}	$\lvert T_{mm} \rvert$	Arg T_{mm}	d/j miles	
		h_3 = 70 kilometers				
0.0005	7.2509765 - 1	2.9925087	7.5497005 - 1	2.8924725	1.2433895	3
0.0010	7.2509356 - 1	2.9925057	7.5496632 - 1	2.8924678	1.2381675	3
0.0020	7.2507719 - 1	2.9924938	7.5495194 - 1	2.8924490	1.2278386	3
0.0030	7.2505005 - 1	2.9924739	7.5492799 - 1	2.8924176	1.2176623	3
0.0040	7.2501208 - 1	2.9924461	7.5489433 - 1	2.8923737	1.2076369	3
0.0050	7.2496315 - 1	2.9924102	7.5485111 - 1	2.8923172	1.1977599	3
0.0060	7.2490370 - 1	2.9923666	7.5479841 - 1	2.8922483	1.1880278	3
0.0070	7.2483329 - 1	2.9923150	7.5473610 - 1	2.8921669	1.1784374	3
0.0080	7.2475205 - 1	2.9922554	7.5466428 - 1	2.8920729	1.1689853	3
0.0090	7.2466009 - 1	2.9921879	7.5458286 - 1	2.8919664	1.1596669	3
0.0100	7.2455730 - 1	2.9921126	7.5449201 - 1	2.8918475	1.1504788	3
0.0120	7.2431964 - 1	2.9919381	7.5428158 - 1	2.8915723	1.1324770	3
0.0150	7.2388277 - 1	2.9916172	7.5389520 - 1	2.8910662	1.1063547	3
0.0200	7.2294256 - 1	2.9909254	7.5306347 - 1	2.8899755	1.0649462	3
0.0250	7.2174098 - 1	2.9900390	7.5200074 - 1	2.8885788	1.0259098	3
0.0300	7.2028350 - 1	2.9889606	7.5071176 - 1	2.8868804	9.8899038	2
0.0400	7.1662579 - 1	2.9862374	7.4747868 - 1	2.8825973	9.2076906	2
0.0500	7.1202974 - 1	2.9827817	7.4341867 - 1	2.8771729	8.5914709	2
0.0650	7.0353096 - 1	2.9762909	7.3591899 - 1	2.8670175	7.7737068	2
0.0800	6.9334169 - 1	2.9683336	7.2694229 - 1	2.8546246	7.0657786	2
0.1000	6.7759222 - 1	2.9556453	7.1310052 - 1	2.8349914	6.2644905	2
0.1500	6.3093948 - 1	2.9151157	6.7237573 - 1	2.7732779	4.7915900	2
0.2000	5.7914857 - 1	2.8644559	6.2774932 - 1	2.6981201	3.8174547	2
0.3000	4.7358871 - 1	2.7396841	5.3916486 - 1	2.5211855	2.6471062	2
0.4000	3.7236076 - 1	2.5885259	4.5740439 - 1	2.3199268	1.9802951	2
0.6000	1.8648557 - 1	2.2288838	3.1007685 - 1	1.8825428	1.2445355	2
		h_3 = 90 kilometers				
0.0005	6.9429197 - 1	2.9690837	7.2777873 - 1	2.8557903	1.4000780	3
0.0010	6.9428849 - 1	2.9690810	7.2777574 - 1	2.8557861	1.3948535	3
0.0020	6.9427472 - 1	2.9690704	7.2776348 - 1	2.8557694	1.3845147	3
0.0030	6.9425190 - 1	2.9690523	7.2774346 - 1	2.8557413	1.3743220	3
0.0040	6.9422003 - 1	2.9690271	7.2771532 - 1	2.8557022	1.3642736	3
0.0050	6.9417893 - 1	2.9689946	7.2767924 - 1	2.8556517	1.3543670	3
0.0060	6.9412850 - 1	2.9689550	7.2763483 - 1	2.8555901	1.3445989	3
0.0070	6.9406910 - 1	2.9689080	7.2758254 - 1	2.8555171	1.3349661	3
0.0080	6.9400061 - 1	2.9688540	7.2752223 - 1	2.8554332	1.3254647	3
0.0090	6.9392288 - 1	2.9687926	7.2745389 - 1	2.8553378	1.3160909	3
0.0100	6.9383623 - 1	2.9687243	7.2737750 - 1	2.8552316	1.3068406	3
0.0120	6.9363560 - 1	2.9685657	7.2720096 - 1	2.8549853	1.2886954	3
0.0150	6.9326670 - 1	2.9682743	7.2687629 - 1	2.8545324	1.2623103	3
0.0200	6.9247252 - 1	2.9676455	7.2617727 - 1	2.8535560	1.2203378	3
0.0250	6.9145603 - 1	2.9668394	7.2528272 - 1	2.8523045	1.1805854	3
0.0300	6.9022102 - 1	2.9658573	7.2419624 - 1	2.8507807	1.1428039	3
0.0400	6.8711279 - 1	2.9633725	7.2146279 - 1	2.8469297	1.0724503	3
0.0500	6.8318950 - 1	2.9602094	7.1801488 - 1	2.8420360	1.0082107	3
0.0650	6.7588482 - 1	2.9542406	7.1160254 - 1	2.8328274	9.2176798	2
0.0800	6.6704649 - 1	2.9468771	7.0385690 - 1	2.8215136	8.4566114	2
0.1000	6.5322634 - 1	2.9350453	6.9177546 - 1	2.8034390	7.5787071	2
0.1500	6.1133561 - 1	2.8966787	6.5540474 - 1	2.7456810	5.9120543	2
0.2000	5.6354200 - 1	2.8479128	6.1444101 - 1	2.6740194	4.7678510	2
0.3000	4.6337988 - 1	2.7259133	5.3078265 - 1	2.5022973	3.3479623	2
0.4000	3.6522804 - 1	2.5766178	4.5174268 - 1	2.3046018	2.5187906	2
0.6000	1.8261631 - 1	2.2206312	3.0692648 - 1	1.8728959	1.5902204	2

Table 45. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 5.0000
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{ee}\rvert$	Arg T_{ee}	$\lvert T_{mm}\rvert$	Arg T_{mm}	d/j miles
		h_3 = 70 kilometers			
0.0005	6.3820453 - 1	2.7546309	6.6252588 - 1	2.7095843	1.2433895 3
0.0010	6.3819940 - 1	2.7546232	6.6252110 - 1	2.7095759	1.2381675 3
0.0020	6.3817905 - 1	2.7545920	6.6250219 - 1	2.7095420	1.2278386 3
0.0030	6.3814491 - 1	2.7545397	6.6247039 - 1	2.7094853	1.2176623 3
0.0040	6.3809700 - 1	2.7544666	6.6242584 - 1	2.7094059	1.2076369 3
0.0050	6.3803564 - 1	2.7543728	6.6236882 - 1	2.7093040	1.1977599 3
0.0060	6.3796066 - 1	2.7542582	6.6229911 - 1	2.7091795	1.1880278 3
0.0070	6.3787227 - 1	2.7541228	6.6221687 - 1	2.7090325	1.1784374 3
0.0080	6.3777010 - 1	2.7539667	6.6212188 - 1	2.7088630	1.1689853 3
0.0090	6.3765451 - 1	2.7537898	6.6201440 - 1	2.7086709	1.1596669 3
0.0100	6.3752520 - 1	2.7535917	6.6189419 - 1	2.7084559	1.1504788 3
0.0120	6.3722615 - 1	2.7531341	6.6161606 - 1	2.7079590	1.1324770 3
0.0150	6.3667676 - 1	2.7522921	6.6110523 - 1	2.7070448	1.1063547 3
0.0200	6.3549466 - 1	2.7504771	6.6000615 - 1	2.7050747	1.0649462 3
0.0250	6.3398444 - 1	2.7481514	6.5860204 - 1	2.7025508	1.0259098 3
0.0300	6.3215284 - 1	2.7453201	6.5689935 - 1	2.6994796	9.8899038 2
0.0400	6.2755918 - 1	2.7381698	6.5262972 - 1	2.6917290	9.2076906 2
0.0500	6.2179251 - 1	2.7290901	6.4727146 - 1	2.6818989	8.5914709 2
0.0650	6.1114450 - 1	2.7120192	6.3738238 - 1	2.6634530	7.7737068 2
0.0800	5.9840256 - 1	2.6910584	6.2555692 - 1	2.6408682	7.0657786 2
0.1000	5.7875235 - 1	2.6575613	6.0733795 - 1	2.6049228	6.2644905 2
0.1500	5.2075765 - 1	2.5499170	5.5368673 - 1	2.4906422	4.7915900 2
0.2000	4.5638839 - 1	2.4139570	4.9427504 - 1	2.3490138	3.8174547 2
0.3000	3.2285550 - 1	2.0753448	3.7032626 - 1	2.0100638	2.6471062 2
0.4000	1.9323360 - 1	1.6972692	2.4588669 - 1	1.6601140	1.9802951 2
0.6000	4.4151811 - 2	1.2943800	9.5736350 - 2	1.3948472	1.2445355 2
		h_3 = 90 kilometers			
0.0005	5.9958955 - 1	2.6930361	6.2665813 - 1	2.6429961	1.4000780 3
0.0010	5.9958533 - 1	2.6930291	6.2665422 - 1	2.6429885	1.3948535 3
0.0020	5.9956825 - 1	2.6930007	6.2663843 - 1	2.6429580	1.3845147 3
0.0030	5.9953959 - 1	2.6929530	6.2661180 - 1	2.6429067	1.3743220 3
0.0040	5.9949969 - 1	2.6928866	6.2657480 - 1	2.6428352	1.3642736 3
0.0050	5.9944832 - 1	2.6928011	6.2652715 - 1	2.6427432	1.3543670 3
0.0060	5.9938535 - 1	2.6926964	6.2646869 - 1	2.6426305	1.3445989 3
0.0070	5.9931103 - 1	2.6925726	6.2639976 - 1	2.6424973	1.3349661 3
0.0080	5.9922582 - 1	2.6924305	6.2632068 - 1	2.6423444	1.3254647 3
0.0090	5.9912850 - 1	2.6922687	6.2623040 - 1	2.6421703	1.3160909 3
0.0100	5.9902018 - 1	2.6920883	6.2612989 - 1	2.6419762	1.3068406 3
0.0120	5.9876964 - 1	2.6916707	6.2589746 - 1	2.6415269	1.2886954 3
0.0150	5.9830876 - 1	2.6909020	6.2546992 - 1	2.6406999	1.2623103 3
0.0200	5.9731654 - 1	2.6892447	6.2454943 - 1	2.6389172	1.2203378 3
0.0250	5.9604688 - 1	2.6871188	6.2337165 - 1	2.6366311	1.1805854 3
0.0300	5.9450475 - 1	2.6845284	6.2194131 - 1	2.6338467	1.1428039 3
0.0400	5.9062479 - 1	2.6779724	6.1834306 - 1	2.6268042	1.0724503 3
0.0500	5.8572994 - 1	2.6696217	6.1380485 - 1	2.6178438	1.0082107 3
0.0650	5.7662489 - 1	2.6538476	6.0536673 - 1	2.6009488	9.2176798 2
0.0800	5.6562051 - 1	2.6343589	5.9517458 - 1	2.5801308	8.4566114 2
0.1000	5.4843545 - 1	2.6029748	5.7927084 - 1	2.5467355	7.5787071 2
0.1500	4.9641952 - 1	2.5006144	5.3121414 - 1	2.4389316	5.9120543 2
0.2000	4.3690886 - 1	2.3692444	4.7629554 - 1	2.3031091	4.7678510 2
0.3000	3.0968186 - 1	2.0382825	3.5793402 - 1	1.9742511	3.3479623 2
0.4000	1.8461446 - 1	1.6720286	2.3738676 - 1	1.6383142	2.5187906 2
0.6000	4.2553990 - 2	1.2896447	9.4109718 - 2	1.3942786	1.5902204 2

Table 46. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.3002
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π	d/j miles
		h_3 = 70 kilometers			
0.0005	1.2267135 - 1	9.9541200 - 2	1.3051075 - 1	3.4274120 - 1	1.2433895 3
0.0010	1.2267293 - 1	9.9542200 - 2	1.3051244 - 1	3.4273990 - 1	1.2381675 3
0.0020	1.2267926 - 1	9.9546100 - 2	1.3051912 - 1	3.4273480 - 1	1.2278386 3
0.0030	1.2268984 - 1	9.9552800 - 2	1.3053028 - 1	3.4272590 - 1	1.2176623 3
0.0040	1.2270461 - 1	9.9562100 - 2	1.3054591 - 1	3.4271370 - 1	1.2076369 3
0.0050	1.2272363 - 1	9.9574300 - 2	1.3056600 - 1	3.4269800 - 1	1.1977599 3
0.0060	1.2274682 - 1	9.9589100 - 2	1.3059051 - 1	3.4267880 - 1	1.1880278 3
0.0070	1.2277421 - 1	9.9606600 - 2	1.3061942 - 1	3.4265600 - 1	1.1784374 3
0.0080	1.2280582 - 1	9.9626500 - 2	1.3065282 - 1	3.4263010 - 1	1.1689853 3
0.0090	1.2284160 - 1	9.9649200 - 2	1.3069063 - 1	3.4260020 - 1	1.1596669 3
0.0100	1.2288160 - 1	9.9674800 - 2	1.3073287 - 1	3.4256720 - 1	1.1504788 3
0.0120	1.2297407 - 1	9.9733400 - 2	1.3083057 - 1	3.4249060 - 1	1.1324770 3
0.0150	1.2314391 - 1	9.9841300 - 2	1.3101000 - 1	3.4234980 - 1	1.1063547 3
0.0200	1.2350914 - 1	1.0007280 - 1	1.3139583 - 1	3.4204720 - 1	1.0649462 3
0.0250	1.2397533 - 1	1.0036780 - 1	1.3188824 - 1	3.4166090 - 1	1.0259098 3
0.0300	1.2453994 - 1	1.0072440 - 1	1.3248454 - 1	3.4119270 - 1	9.8899038 2
0.0400	1.2595233 - 1	1.0161240 - 1	1.3397584 - 1	3.4002060 - 1	9.2076906 2
0.0500	1.2771823 - 1	1.0271500 - 1	1.3583968 - 1	3.3855290 - 1	8.5914709 2
0.0650	1.3095701 - 1	1.0471340 - 1	1.3925583 - 1	3.3585490 - 1	7.7737068 2
0.0800	1.3479424 - 1	1.0704030 - 1	1.4329925 - 1	3.3264700 - 1	7.0657786 2
0.1000	1.4062588 - 1	1.1048560 - 1	1.4943534 - 1	3.2774550 - 1	6.2644905 2
0.1500	1.5717018 - 1	1.1957080 - 1	1.6677253 - 1	3.1362250 - 1	4.7915900 2
0.2000	1.7420445 - 1	1.2758830 - 1	1.8447845 - 1	2.9860270 - 1	3.8174547 2
0.3000	2.0431788 - 1	1.3666460 - 1	2.1519495 - 1	2.6984580 - 1	2.6471062 2
0.4000	2.2717524 - 1	1.3583150 - 1	2.3761095 - 1	2.4394730 - 1	1.9802951 2
0.6000	2.5505887 - 1	1.1182050 - 1	2.6252231 - 1	1.9696420 - 1	1.2445355 2
		h_3 = 90 kilometers			
0.0005	1.3443855 - 1	1.0682650 - 1	1.4292467 - 1	3.3294490 - 1	1.4000780 3
0.0010	1.3443981 - 1	1.0682720 - 1	1.4292600 - 1	3.3294390 - 1	1.3948535 3
0.0020	1.3444496 - 1	1.0683020 - 1	1.4293140 - 1	3.3293970 - 1	1.3845147 3
0.0030	1.3445354 - 1	1.0683540 - 1	1.4294043 - 1	3.3293240 - 1	1.3743220 3
0.0040	1.3446548 - 1	1.0684270 - 1	1.4295301 - 1	3.3292250 - 1	1.3642736 3
0.0050	1.3448091 - 1	1.0685190 - 1	1.4296928 - 1	3.3290950 - 1	1.3543670 3
0.0060	1.3449974 - 1	1.0686320 - 1	1.4298910 - 1	3.3289380 - 1	1.3445989 3
0.0070	1.3452204 - 1	1.0687680 - 1	1.4301260 - 1	3.3287510 - 1	1.3349661 3
0.0080	1.3454762 - 1	1.0689200 - 1	1.4303953 - 1	3.3285370 - 1	1.3254647 3
0.0090	1.3457675 - 1	1.0690970 - 1	1.4307022 - 1	3.3282920 - 1	1.3160909 3
0.0100	1.3460918 - 1	1.0692910 - 1	1.4310437 - 1	3.3280200 - 1	1.3068406 3
0.0120	1.3468428 - 1	1.0697420 - 1	1.4318348 - 1	3.3273920 - 1	1.2886954 3
0.0150	1.3482229 - 1	1.0705720 - 1	1.4332882 - 1	3.3262370 - 1	1.2623103 3
0.0200	1.3511929 - 1	1.0723520 - 1	1.4364159 - 1	3.3237470 - 1	1.2203378 3
0.0250	1.3549890 - 1	1.0746260 - 1	1.4404131 - 1	3.3205650 - 1	1.1805854 3
0.0300	1.3595942 - 1	1.0773760 - 1	1.4452618 - 1	3.3167040 - 1	1.1428039 3
0.0400	1.3711521 - 1	1.0842490 - 1	1.4574276 - 1	3.3070030 - 1	1.0724503 3
0.0500	1.3856735 - 1	1.0928230 - 1	1.4727064 - 1	3.2947960 - 1	1.0082107 3
0.0650	1.4125073 - 1	1.1084770 - 1	1.5009215 - 1	3.2721820 - 1	9.2176798 2
0.0800	1.4446211 - 1	1.1268760 - 1	1.5346535 - 1	3.2450180 - 1	8.4566114 2
0.1000	1.4940484 - 1	1.1544350 - 1	1.5864944 - 1	3.2029660 - 1	7.5787071 2
0.1500	1.6378655 - 1	1.2286900 - 1	1.7367021 - 1	3.0785860 - 1	5.9120543 2
0.2000	1.7905239 - 1	1.2955650 - 1	1.8948232 - 1	2.9420380 - 1	4.7678510 2
0.3000	2.0689147 - 1	1.3700510 - 1	2.1776912 - 1	2.6717450 - 1	3.3479623 2
0.4000	2.2856561 - 1	1.3542620 - 1	2.3893407 - 1	2.4215960 - 1	2.5187906 2
0.6000	2.5548131 - 1	1.1103680 - 1	2.6286113 - 1	1.9593290 - 1	1.5902204 2

Table 47. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.467
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em} \rvert$	Arg T_{em} - π	$\lvert T_{me} \rvert$	Arg T_{me} - π	d/j Miles
		h_3 = 70 kilometers			
0.0005	1.2025081 - 1	7.0070700 - 2	1.3828884 - 1	6.2388590 - 1	1.2433895 3
0.0010	1.2025243 - 1	7.0071000 - 2	1.3829067 - 1	6.2388530 - 1	1.2381675 3
0.0020	1.2025879 - 1	7.0071800 - 2	1.3829790 - 1	6.2388280 - 1	1.2278386 3
0.0030	1.2026947 - 1	7.0073300 - 2	1.3830997 - 1	6.2387840 - 1	1.2176623 3
0.0040	1.2028439 - 1	7.0075100 - 2	1.3832689 - 1	6.2387250 - 1	1.2076369 3
0.0050	1.2030354 - 1	7.0077700 - 2	1.3834857 - 1	6.2386490 - 1	1.1977599 3
0.0060	1.2032695 - 1	7.0080800 - 2	1.3837512 - 1	6.2385560 - 1	1.1880278 3
0.0070	1.2035457 - 1	7.0084400 - 2	1.3840640 - 1	6.2384470 - 1	1.1784374 3
0.0080	1.2038641 - 1	7.0088500 - 2	1.3844249 - 1	6.2383190 - 1	1.1689853 3
0.0090	1.2042251 - 1	7.0093300 - 2	1.3848340 - 1	6.2381770 - 1	1.1596669 3
0.0100	1.2046287 - 1	7.0098500 - 2	1.3852910 - 1	6.2380160 - 1	1.1504788 3
0.0120	1.2055611 - 1	7.0110400 - 2	1.3863476 - 1	6.2376450 - 1	1.1324770 3
0.0150	1.2072745 - 1	7.0132700 - 2	1.3882884 - 1	6.2369620 - 1	1.1063547 3
0.0200	1.2109590 - 1	7.0179700 - 2	1.3924620 - 1	6.2354980 - 1	1.0649462 3
0.0250	1.2156629 - 1	7.0239200 - 2	1.3977893 - 1	6.2336260 - 1	1.0259098 3
0.0300	1.2213619 - 1	7.0309800 - 2	1.4042415 - 1	6.2313570 - 1	9.8899038 2
0.0400	1.2356259 - 1	7.0480600 - 2	1.4203828 - 1	6.2256740 - 1	9.2076906 2
0.0500	1.2534754 - 1	7.0682200 - 2	1.4405646 - 1	6.2185490 - 1	8.5914709 2
0.0650	1.2862597 - 1	7.1015000 - 2	1.4775811 - 1	6.2054300 - 1	7.7737068 2
0.0800	1.3251802 - 1	7.1345100 - 2	1.5214344 - 1	6.1897870 - 1	7.0657786 2
0.1000	1.3844982 - 1	7.1704500 - 2	1.5880620 - 1	6.1657840 - 1	6.2644905 2
0.1500	1.5539357 - 1	7.1645000 - 2	1.7767290 - 1	6.0956570 - 1	4.7915900 2
0.2000	1.7303076 - 1	6.9477400 - 2	1.9697145 - 1	6.0187000 - 1	3.8174547 2
0.3000	2.0475211 - 1	5.7570600 - 2	2.3028812 - 1	5.8584860 - 1	2.6471062 2
0.4000	2.2938094 - 1	3.6225800 - 2	2.5397696 - 1	5.6876230 - 1	1.9802951 2
0.6000	2.6027912 - 1	2.6795800 - 2	2.7762778 - 1	5.2685820 - 1	1.2445355 2
		h_3 = 90 kilometers			
0.0005	1.3215692 - 1	7.1317700 - 2	1.5173700 - 1	6.1912420 - 1	1.4000780 3
0.0010	1.3215821 - 1	7.1317600 - 2	1.5173842 - 1	6.1912370 - 1	1.3948535 3
0.0020	1.3216341 - 1	7.1317900 - 2	1.5174431 - 1	6.1912160 - 1	1.3845147 3
0.0030	1.3217211 - 1	7.1318600 - 2	1.5175411 - 1	6.1911810 - 1	1.3743220 3
0.0040	1.3218422 - 1	7.1319600 - 2	1.5176775 - 1	6.1911330 - 1	1.3642736 3
0.0050	1.3219990 - 1	7.1320900 - 2	1.5178539 - 1	6.1910700 - 1	1.3543670 3
0.0060	1.3221905 - 1	7.1322300 - 2	1.5180693 - 1	6.1909940 - 1	1.3445989 3
0.0070	1.3224165 - 1	7.1324000 - 2	1.5183237 - 1	6.1909010 - 1	1.3349661 3
0.0080	1.3226763 - 1	7.1326100 - 2	1.5186162 - 1	6.1907980 - 1	1.3254647 3
0.0090	1.3229720 - 1	7.1328300 - 2	1.5189489 - 1	6.1906780 - 1	1.3160909 3
0.0100	1.3233015 - 1	7.1330800 - 2	1.5193196 - 1	6.1905440 - 1	1.3068406 3
0.0120	1.3240641 - 1	7.1336600 - 2	1.5201780 - 1	6.1902380 - 1	1.2886954 3
0.0150	1.3254653 - 1	7.1347200 - 2	1.5217551 - 1	6.1896750 - 1	1.2623103 3
0.0200	1.3284813 - 1	7.1369800 - 2	1.5251490 - 1	6.1884580 - 1	1.2203378 3
0.0250	1.3323374 - 1	7.1397900 - 2	1.5294870 - 1	6.1869040 - 1	1.1805854 3
0.0300	1.3370159 - 1	7.1431000 - 2	1.5347494 - 1	6.1850160 - 1	1.1428039 3
0.0400	1.3487642 - 1	7.1509500 - 2	1.5479558 - 1	6.1802690 - 1	1.0724503 3
0.0500	1.3635362 - 1	7.1598000 - 2	1.5645469 - 1	6.1742910 - 1	1.0082107 3
0.0650	1.3908664 - 1	7.1732400 - 2	1.5951992 - 1	6.1631940 - 1	9.2176798 2
0.0800	1.4236323 - 1	7.1840700 - 2	1.6318684 - 1	6.1498150 - 1	8.4566114 2
0.1000	1.4741895 - 1	7.1888500 - 2	1.6882672 - 1	6.1290020 - 1	7.5787071 2
0.1500	1.6222002 - 1	7.1093700 - 2	1.8519018 - 1	6.0664820 - 1	5.9120543 2
0.2000	1.7808855 - 1	6.8365400 - 2	2.0242265 - 1	5.9954920 - 1	4.7678510 2
0.3000	2.0749913 - 1	5.5860900 - 2	2.3305136 - 1	5.8423030 - 1	3.3479623 2
0.4000	2.3089716 - 1	3.4359800 - 2	2.5533678 - 1	5.6744950 - 1	2.5187906 2
0.6000	2.6075628 - 1	2.8431000 - 2	2.7789573 - 1	5.2575580 - 1	1.5902204 2

Table 48. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1501
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em}\rvert$	Arg $T_{em} - \pi$	$\lvert T_{me}\rvert$	Arg $T_{me} - \pi$	d/j miles
		h_3 = 70 kilometers			
0.0005	1.1824714 - 1	1.7370880 - 1	1.2015662 - 1	4.6832400 - 2	1.2433895 3
0.0010	1.1824857 - 1	1.7371100 - 1	1.2015807 - 1	4.6833200 - 2	1.2381673 3
0.0020	1.1825425 - 1	1.7371890 - 1	1.2016382 - 1	4.6821600 - 2	1.2278386 3
0.0030	1.1826370 - 1	1.7373230 - 1	1.2017342 - 1	4.6807000 - 2	1.2176623 3
0.0040	1.1827695 - 1	1.7375110 - 1	1.2018686 - 1	4.6786700 - 2	1.2076369 3
0.0050	1.1829398 - 1	1.7377510 - 1	1.2020412 - 1	4.6760800 - 2	1.1977599 3
0.0060	1.1831477 - 1	1.7380470 - 1	1.2022521 - 1	4.6729000 - 2	1.1880278 3
0.0070	1.1833930 - 1	1.7383940 - 1	1.2025009 - 1	4.6691500 - 2	1.1784374 3
0.0080	1.1836762 - 1	1.7387940 - 1	1.2027880 - 1	4.6648100 - 2	1.1689853 3
0.0090	1.1839970 - 1	1.7392480 - 1	1.2031130 - 1	4.6599000 - 2	1.1596669 3
0.0100	1.1843551 - 1	1.7397560 - 1	1.2034763 - 1	4.6544200 - 2	1.1504788 3
0.0120	1.1851833 - 1	1.7409280 - 1	1.2043164 - 1	4.6417400 - 2	1.1324770 3
0.0150	1.1867046 - 1	1.7430810 - 1	1.2058593 - 1	4.6184600 - 2	1.1063547 3
0.0200	1.1899747 - 1	1.7477100 - 1	1.2091753 - 1	4.5684100 - 2	1.0649462 3
0.0250	1.1941461 - 1	1.7536090 - 1	1.2134054 - 1	4.5045700 - 2	1.0259098 3
0.0300	1.1991950 - 1	1.7607490 - 1	1.2185251 - 1	4.4272400 - 2	9.8899038 2
0.0400	1.2118084 - 1	1.7785680 - 1	1.2313147 - 1	4.2339600 - 2	9.2076906 2
0.0500	1.2275450 - 1	1.8007660 - 1	1.2472688 - 1	3.9925700 - 2	8.5914709 2
0.0650	1.2563099 - 1	1.8412450 - 1	1.2764265 - 1	3.5506300 - 2	7.7737068 2
0.0800	1.2902266 - 1	1.8888020 - 1	1.3107964 - 1	3.0282600 - 2	7.0657786 2
0.1000	1.3414304 - 1	1.9602170 - 1	1.3626634 - 1	2.2368200 - 2	6.2644905 2
0.1500	1.4844375 - 1	2.1567110 - 1	1.5073516 - 1	4.8000000 - 5	4.7915900 2
0.2000	1.6281416 - 1	2.3482260 - 1	1.6524013 - 1	2.2807800 - 2	3.8174547 2
0.3000	1.8731917 - 1	2.6511840 - 1	1.8983913 - 1	6.3467100 - 2	2.6471062 2
0.4000	2.0512548 - 1	2.8340940 - 1	2.0750918 - 1	9.5723400 - 2	1.9802951 2
0.6000	2.2583920 - 1	2.9334050 - 1	2.2752669 - 1	1.4215600 - 1	1.2445355 2
		h_3 = 90 kilometers			
0.0005	1.2870900 - 1	1.8844130 - 1	1.3076185 - 1	3.0766100 - 2	1.4000780 3
0.0010	1.2871010 - 1	1.8844290 - 1	1.3076295 - 1	3.0764500 - 2	1.3948535 3
0.0020	1.2871462 - 1	1.8844920 - 1	1.3076755 - 1	3.0757600 - 2	1.3845147 3
0.0030	1.2872218 - 1	1.8845980 - 1	1.3077522 - 1	3.0746000 - 2	1.3743220 3
0.0040	1.2873272 - 1	1.8847460 - 1	1.3078589 - 1	3.0729700 - 2	1.3642736 3
0.0050	1.2874635 - 1	1.8849370 - 1	1.3079969 - 1	3.0708700 - 2	1.3543670 3
0.0060	1.2876295 - 1	1.8851690 - 1	1.3081652 - 1	3.0682900 - 2	1.3445989 3
0.0070	1.2878261 - 1	1.8854430 - 1	1.3083644 - 1	3.0652700 - 2	1.3349661 3
0.0080	1.2880518 - 1	1.8857590 - 1	1.3085930 - 1	3.0618000 - 2	1.3254647 3
0.0090	1.2883085 - 1	1.8861200 - 1	1.3088533 - 1	3.0578400 - 2	1.3160909 3
0.0100	1.2885944 - 1	1.8865200 - 1	1.3091430 - 1	3.0534200 - 2	1.3068406 3
0.0120	1.2892568 - 1	1.8874450 - 1	1.3098140 - 1	3.0432100 - 2	1.2886954 3
0.0150	1.2904736 - 1	1.8891480 - 1	1.3110467 - 1	3.0244400 - 2	1.2623103 3
0.0200	1.2930914 - 1	1.8928120 - 1	1.3136993 - 1	2.9840600 - 2	1.2203378 3
0.0250	1.2964355 - 1	1.8974890 - 1	1.3170871 - 1	2.9324800 - 2	1.1805854 3
0.0300	1.3004898 - 1	1.9031580 - 1	1.3211951 - 1	2.8699000 - 2	1.1428039 3
0.0400	1.3106545 - 1	1.9173520 - 1	1.3314921 - 1	2.7129300 - 2	1.0724503 3
0.0500	1.3234028 - 1	1.9351290 - 1	1.3444052 - 1	2.5158600 - 2	1.0082107 3
0.0650	1.3468924 - 1	1.9678050 - 1	1.3681942 - 1	2.1521700 - 2	9.2176798 2
0.0800	1.3748887 - 1	2.0066080 - 1	1.3965392 - 1	1.7176400 - 2	8.4566114 2
0.1000	1.4177330 - 1	2.0656600 - 1	1.4398976 - 1	1.0502700 - 2	7.5787071 2
0.1500	1.5406841 - 1	2.2325130 - 1	1.5641736 - 1	8.8375000 - 3	5.9120543 2
0.2000	1.6683742 - 1	2.4004020 - 1	1.6929277 - 1	2.9309400 - 2	4.7678510 2
0.3000	1.8935900 - 1	2.6743060 - 1	1.9187499 - 1	6.7002100 - 2	3.3479623 2
0.4000	2.0618557 - 1	2.8432210 - 1	2.0855198 - 1	9.7776100 - 2	2.5187906 2
0.6000	2.2614350 - 1	2.9327560 - 1	2.2781227 - 1	1.4301380 - 1	1.5902204 2

Table 49. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2335
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π	d/j miles
		h_3 = 70 kilometers			
0.0005	1.2196236 - 1	1.2480070 - 1	1.2670633 - 1	2.1865830 - 1	1.2433895 3
0.0010	1.2196392 - 1	1.2480210 - 1	1.2670795 - 1	2.1865650 - 1	1.2381675 3
0.0020	1.2197008 - 1	1.2480760 - 1	1.2671428 - 1	2.1865010 - 1	1.2278386 3
0.0030	1.2198036 - 1	1.2481700 - 1	1.2672493 - 1	2.1863910 - 1	1.2176623 3
0.0040	1.2199474 - 1	1.2483000 - 1	1.2673981 - 1	2.1862360 - 1	1.2076369 3
0.0050	1.2201320 - 1	1.2484700 - 1	1.2675889 - 1	2.1860390 - 1	1.1977599 3
0.0060	1.2203577 - 1	1.2486740 - 1	1.2678224 - 1	2.1857980 - 1	1.1880278 3
0.0070	1.2206239 - 1	1.2489160 - 1	1.2680979 - 1	2.1855130 - 1	1.1784374 3
0.0080	1.2209312 - 1	1.2491960 - 1	1.2684156 - 1	2.1851860 - 1	1.1689853 3
0.0090	1.2212792 - 1	1.2495110 - 1	1.2687755 - 1	2.1848130 - 1	1.1596669 3
0.0100	1.2216677 - 1	1.2498660 - 1	1.2691776 - 1	2.1843980 - 1	1.1504788 3
0.0120	1.2216677 - 1	1.2498660 - 1	1.2691776 - 1	2.1843980 - 1	1.1324770 3
0.0150	1.2242183 - 1	1.2521850 - 1	1.2718151 - 1	2.1816710 - 1	1.1063547 3
0.0200	1.2277687 - 1	1.2554110 - 1	1.2754871 - 1	2.1778750 - 1	1.0649462 3
0.0250	1.2322997 - 1	1.2595250 - 1	1.2801726 - 1	2.1730280 - 1	1.0259098 3
0.0300	1.2377862 - 1	1.2644990 - 1	1.2858460 - 1	2.1671560 - 1	9.8899038 2
0.0400	1.2515049 - 1	1.2769100 - 1	1.3000298 - 1	2.1524630 - 1	9.2076906 2
0.0500	1.2686461 - 1	1.2923580 - 1	1.3177474 - 1	2.1340880 - 1	8.5914709 2
0.0650	1.3000504 - 1	1.3204810 - 1	1.3501943 - 1	2.1003500 - 1	7.7737068 2
0.0800	1.3372010 - 1	1.3534400 - 1	1.3885541 - 1	2.0603200 - 1	7.0657786 2
0.1000	1.3935422 - 1	1.4027320 - 1	1.4466757 - 1	1.9993420 - 1	6.2644905 2
0.1500	1.5525830 - 1	1.5366480 - 1	1.6103154 - 1	1.8250330 - 1	4.7915900 2
0.2000	1.7150507 - 1	1.6632370 - 1	1.7766125 - 1	1.6423570 - 1	3.8174547 2
0.3000	1.9988576 - 1	1.8452100 - 1	2.0636326 - 1	1.3031190 - 1	2.6471062 2
0.4000	2.2111012 - 1	1.9215610 - 1	2.2729688 - 1	1.0140300 - 1	1.9802951 2
0.6000	2.4656519 - 1	1.8348100 - 1	2.5098285 - 1	5.4044300 - 2	1.2445355 2
		h_3 = 90 kilometers			
0.0005	1.3337600 - 1	1.3504000 - 1	1.3850025 - 1	2.0640330 - 1	1.4000780 3
0.0010	1.3337722 - 1	1.3504130 - 1	1.3850151 - 1	2.0640200 - 1	1.3948535 3
0.0020	1.3338219 - 1	1.3504560 - 1	1.3850665 - 1	2.0639650 - 1	1.3845147 3
0.0030	1.3339047 - 1	1.3505280 - 1	1.3851517 - 1	2.0638790 - 1	1.3743220 3
0.0040	1.3340204 - 1	1.3506320 - 1	1.3852713 - 1	2.0637520 - 1	1.3642736 3
0.0050	1.3341696 - 1	1.3507630 - 1	1.3854253 - 1	2.0635930 - 1	1.3543670 3
0.0060	1.3343519 - 1	1.3509250 - 1	1.3856135 - 1	2.0633950 - 1	1.3445989 3
0.0070	1.3345675 - 1	1.3511140 - 1	1.3858361 - 1	2.0631620 - 1	1.3349661 3
0.0080	1.3348150 - 1	1.3513320 - 1	1.3860917 - 1	2.0628960 - 1	1.3254647 3
0.0090	1.3350969 - 1	1.3515830 - 1	1.3863824 - 1	2.0625910 - 1	1.3160909 3
0.0100	1.3354107 - 1	1.3518580 - 1	1.3867063 - 1	2.0622520 - 1	1.3068406 3
0.0120	1.3361371 - 1	1.3525000 - 1	1.3874564 - 1	2.0614690 - 1	1.2886954 3
0.0150	1.3374723 - 1	1.3536790 - 1	1.3888345 - 1	2.0600270 - 1	1.2623103 3
0.0200	1.3403452 - 1	1.3562140 - 1	1.3917998 - 1	2.0569250 - 1	1.2203378 3
0.0250	1.3440167 - 1	1.3594480 - 1	1.3955888 - 1	2.0529630 - 1	1.1805854 3
0.0300	1.3484696 - 1	1.3633670 - 1	1.4001844 - 1	2.0481510 - 1	1.1428039 3
0.0400	1.3596419 - 1	1.3731750 - 1	1.4117123 - 1	2.0360750 - 1	1.0724503 3
0.0500	1.3736707 - 1	1.3854460 - 1	1.4261843 - 1	2.0208880 - 1	1.0082107 3
0.0650	1.3995708 - 1	1.4079560 - 1	1.4528904 - 1	1.9927950 - 1	9.2176798 2
0.0800	1.4305262 - 1	1.4346030 - 1	1.4847890 - 1	1.9591160 - 1	8.4566114 2
0.1000	1.4780840 - 1	1.4749650 - 1	1.5337486 - 1	1.9071310 - 1	7.5787071 2
0.1500	1.6158461 - 1	1.5873560 - 1	1.6751925 - 1	1.7545660 - 1	5.9120543 2
0.2000	1.7610414 - 1	1.6966630 - 1	1.8234769 - 1	1.5894780 - 1	4.7678510 2
0.3000	2.0228984 - 1	1.8572510 - 1	2.0876426 - 1	1.2724890 - 1	3.3479623 2
0.4000	2.2239145 - 1	1.9234070 - 1	2.2853684 - 1	9.9477500 - 2	2.5187906 2
0.6000	2.4694654 - 1	1.8302420 - 1	2.5131515 - 1	5.3077200 - 2	1.5902204 2

Table 50. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0100
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π	d/j miles
		h_3 = 70 kilometers			
0.0005	6.6735661 - 2	4.8453870 - 1	6.6740453 - 2	4.6985400 - 1	1.2433895 3
0.0010	6.6736068 - 2	4.8454190 - 1	6.6740864 - 2	4.6985730 - 1	1.2381675 3
0.0020	6.6737673 - 2	4.8455450 - 1	6.6742478 - 2	4.6986990 - 1	1.2278386 3
0.0030	6.6740360 - 2	4.8457570 - 1	6.6745160 - 2	4.6989110 - 1	1.2176623 3
0.0040	6.6744118 - 2	4.8460520 - 1	6.6748913 - 2	4.6992080 - 1	1.2076369 3
0.0050	6.6748941 - 2	4.8464320 - 1	6.6753740 - 2	4.6995890 - 1	1.1977599 3
0.0060	6.6754835 - 2	4.8468970 - 1	6.6759633 - 2	4.7000550 - 1	1.1880278 3
0.0070	6.6761796 - 2	4.8474440 - 1	6.6766598 - 2	4.7006050 - 1	1.1784374 3
0.0080	6.6769814 - 2	4.8480760 - 1	6.6774610 - 2	4.7012390 - 1	1.1689853 3
0.0090	6.6778894 - 2	4.8487920 - 1	6.6783694 - 2	4.7019570 - 1	1.1596669 3
0.0100	6.6789039 - 2	4.8495900 - 1	6.6793832 - 2	4.7027570 - 1	1.1504788 3
0.0120	6.6812496 - 2	4.8514370 - 1	6.6817286 - 2	4.7046110 - 1	1.1324770 3
0.0150	6.6855492 - 2	4.8548250 - 1	6.6860299 - 2	4.7080110 - 1	1.1063547 3
0.0200	6.6947739 - 2	4.8620940 - 1	6.6952547 - 2	4.7153050 - 1	1.0649462 3
0.0250	6.7065017 - 2	4.8713380 - 1	6.7069832 - 2	4.7245830 - 1	1.0259098 3
0.0300	6.7206331 - 2	4.8824830 - 1	6.7211163 - 2	4.7357670 - 1	9.8899038 2
0.0400	6.7556518 - 2	4.9101290 - 1	6.7561373 - 2	4.7635150 - 1	9.2076906 2
0.0500	6.7987726 - 2	4.9442230 - 1	6.7992599 - 2	4.7977410 - 1	8.5914709 2
0.0650	6.8759997 - 2	5.0054290 - 1	6.8764901 - 2	4.8592010 - 1	7.7737068 2
0.0800	6.9644953 - 2	5.0758070 - 1	6.9649891 - 2	4.9298980 - 1	7.0657736 2
0.1000	7.0930931 - 2	5.1785350 - 1	7.0935936 - 2	5.0331500 - 1	6.2644905 2
0.1500	7.4231656 - 2	5.4447770 - 1	7.4236743 - 2	5.3012090 - 1	4.7915900 2
0.2000	7.7171242 - 2	5.6850700 - 1	7.7176351 - 2	5.5440160 - 1	3.8174547 2
0.3000	8.1471513 - 2	6.0416510 - 1	8.1476394 - 2	5.9076250 - 1	2.6471062 2
0.4000	8.6836337 - 2	6.4861030 - 1	8.6839240 - 2	6.3520730 - 1	1.9802951 2
0.6000	8.4136179 - 2	6.2643880 - 1	8.4140544 - 2	6.1398090 - 1	1.2445355 2
		h_3 = 90 kilometers			
0.0005	6.9564268 - 2	5.0693780 - 1	6.9569197 - 2	4.9234380 - 1	1.4000780 3
0.0010	6.9564553 - 2	5.0694010 - 1	6.9569483 - 2	4.9234610 - 1	1.3948535 3
0.0020	6.9565722 - 2	5.0694940 - 1	6.9570660 - 2	4.9235550 - 1	1.3845147 3
0.0030	6.9567670 - 2	5.0696500 - 1	6.9572608 - 2	4.9237110 - 1	1.3743220 3
0.0040	6.9570383 - 2	5.0698650 - 1	6.9575317 - 2	4.9239290 - 1	1.3642736 3
0.0050	6.9573891 - 2	5.0701440 - 1	6.9578823 - 2	4.9242080 - 1	1.3543670 3
0.0060	6.9578159 - 2	5.0704870 - 1	6.9583108 - 2	4.9245510 - 1	1.3445989 3
0.0070	6.9583230 - 2	5.0708890 - 1	6.9588161 - 2	4.9249560 - 1	1.3349661 3
0.0080	6.9589041 - 2	5.0713510 - 1	6.9593976 - 2	4.9254210 - 1	1.3254647 3
0.0090	6.9595643 - 2	5.0718790 - 1	6.9600594 - 2	4.9259500 - 1	1.3160909 3
0.0100	6.9603011 - 2	5.0724640 - 1	6.9607951 - 2	4.9265390 - 1	1.3068406 3
0.0120	6.9620049 - 2	5.0738210 - 1	6.9624983 - 2	4.9279020 - 1	1.2886954 3
0.0150	6.9651307 - 2	5.0763140 - 1	6.9656252 - 2	4.9304050 - 1	1.2623103 3
0.0200	6.9718474 - 2	5.0816660 - 1	6.9723426 - 2	4.9357840 - 1	1.2203378 3
0.0250	6.9804061 - 2	5.0884870 - 1	6.9809012 - 2	4.9426370 - 1	1.1805854 3
0.0300	6.9907466 - 2	5.0967330 - 1	6.9912421 - 2	4.9509250 - 1	1.1428039 3
0.0400	7.0165064 - 2	5.1172890 - 1	7.0170044 - 2	4.9715830 - 1	1.0724503 3
0.0500	7.0484844 - 2	5.1428380 - 1	7.0489835 - 2	4.9972630 - 1	1.0082107 3
0.0650	7.1064684 - 2	5.1892510 - 1	7.1069679 - 2	5.0439260 - 1	9.2176798 2
0.0800	7.1740232 - 2	5.2434680 - 1	7.1745258 - 2	5.0984620 - 1	8.4566114 2
0.1000	7.2742637 - 2	5.3242070 - 1	7.2747683 - 2	5.1797210 - 1	7.5787071 2
0.1500	7.5423788 - 2	5.5418660 - 1	7.5428903 - 2	5.3991840 - 1	5.9120543 2
0.2000	7.7934679 - 2	5.7479590 - 1	7.7939784 - 2	5.6077780 - 1	4.7678510 2
0.3000	8.1794651 - 2	6.0686370 - 1	8.1799502 - 2	5.9354410 - 1	3.3479623 2
0.4000	8.4284266 - 2	6.2767450 - 1	8.4288580 - 2	6.1529360 - 1	2.5187906 2
0.6000	8.6873090 - 2	6.4890040 - 1	8.6875962 - 2	6.3895890 - 1	1.5902204 2

Table 51. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0200
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π	d/j miles
		h_3 = 70 kilometers			
0.0005	8.1717391 - 2	4.0929260 - 1	8.1740897 - 2	3.7992300 - 1	1.2433895 3
0.0010	8.1718017 - 2	4.0929590 - 1	8.1741530 - 2	3.7992630 - 1	1.2381675 3
0.0020	8.1720525 - 2	4.0930910 - 1	8.1744022 - 2	3.7993950 - 1	1.2278386 3
0.0030	8.1724710 - 2	4.0933110 - 1	8.1748197 - 2	3.7996190 - 1	1.2176623 3
0.0040	8.1730537 - 2	4.0936220 - 1	8.1754054 - 2	3.7999300 - 1	1.2076369 3
0.0050	8.1738048 - 2	4.0940190 - 1	8.1761547 - 2	3.8003290 - 1	1.1977599 3
0.0060	8.1747206 - 2	4.0945040 - 1	8.1770709 - 2	3.8008180 - 1	1.1880278 3
0.0070	8.1758033 - 2	4.0950760 - 1	8.1781524 - 2	3.8013940 - 1	1.1784374 3
0.0080	8.1770502 - 2	4.0957350 - 1	8.1794020 - 2	3.8020570 - 1	1.1689853 3
0.0090	8.1784631 - 2	4.0964830 - 1	8.1808144 - 2	3.8028090 - 1	1.1596669 3
0.0100	8.1800409 - 2	4.0973170 - 1	8.1823925 - 2	3.8036500 - 1	1.1504788 3
0.0120	8.1836884 - 2	4.0992480 - 1	8.1860409 - 2	3.8055930 - 1	1.1324770 3
0.0150	8.1903804 - 2	4.1027900 - 1	8.1927344 - 2	3.8091580 - 1	1.1063547 3
0.0200	8.2047422 - 2	4.1103930 - 1	8.2071004 - 2	3.8168120 - 1	1.0649462 3
0.0250	8.2230156 - 2	4.1200680 - 1	8.2253781 - 2	3.8265560 - 1	1.0259098 3
0.0300	8.2450632 - 2	4.1317490 - 1	8.2474308 - 2	3.8383160 - 1	9.8899038 2
0.0400	8.2998127 - 2	4.1607760 - 1	8.3021916 - 2	3.8675490 - 1	9.2076906 2
0.0500	8.3674563 - 2	4.1966830 - 1	8.3698494 - 2	3.9037200 - 1	8.5914709 2
0.0650	8.4892366 - 2	4.2614580 - 1	8.4916560 - 2	3.9690000 - 1	7.7737068 2
0.0800	8.6297991 - 2	4.3364320 - 1	8.6322489 - 2	4.0446100 - 1	7.0057786 2
0.1000	8.8360005 - 2	4.4468220 - 1	8.8384899 - 2	4.1560520 - 1	6.2644905 2
0.1500	9.3760013 - 2	4.7382450 - 1	9.3785785 - 2	4.4511040 - 1	4.7915900 2
0.2000	9.8702471 - 2	5.0078830 - 1	9.8728628 - 2	4.7257750 - 1	3.8174547 2
0.3000	1.0616497 - 1	5.4192640 - 1	1.0619040 - 1	5.1512070 - 1	2.6471062 2
0.4000	1.1093051 - 1	5.6820500 - 1	1.1095346 - 1	5.4328770 - 1	1.9802951 2
0.6000	1.1587227 - 1	5.9438880 - 1	1.1588773 - 1	5.7438050 - 1	1.2445355 2
		h_3 = 90 kilometers			
0.0005	8.6169360 - 2	4.3295610 - 1	8.6193832 - 2	4.0376790 - 1	1.4000780 3
0.0010	8.6169821 - 2	4.3295860 - 1	8.6194293 - 2	4.0377040 - 1	1.3948535 3
0.0020	8.6171684 - 2	4.3296860 - 1	8.6196154 - 2	4.0378040 - 1	1.3845147 3
0.0030	8.6174787 - 2	4.3298520 - 1	8.6199264 - 2	4.0379710 - 1	1.3743220 3
0.0040	8.6179106 - 2	4.3300820 - 1	8.6203581 - 2	4.0382040 - 1	1.3642736 3
0.0050	8.6184697 - 2	4.3303800 - 1	8.6209170 - 2	4.0385050 - 1	1.3543670 3
0.0060	8.6191521 - 2	4.3307440 - 1	8.6215990 - 2	4.0388730 - 1	1.3445989 3
0.0070	8.6199588 - 2	4.3311760 - 1	8.6224054 - 2	4.0393070 - 1	1.3349661 3
0.0080	8.6208830 - 2	4.3316700 - 1	8.6233314 - 2	4.0398060 - 1	1.3254647 3
0.0090	8.6219360 - 2	4.3322340 - 1	8.6243854 - 2	4.0403740 - 1	1.3160909 3
0.0100	8.6231097 - 2	4.3328600 - 1	8.6255609 - 2	4.0410060 - 1	1.3068406 3
0.0120	8.6258255 - 2	4.3343100 - 1	8.6282741 - 2	4.0424710 - 1	1.2886954 3
0.0150	8.6308119 - 2	4.3369730 - 1	8.6332627 - 2	4.0451570 - 1	1.2623103 3
0.0200	8.6415252 - 2	4.3426970 - 1	8.6439774 - 2	4.0509320 - 1	1.2203378 3
0.0250	8.6551849 - 2	4.3499960 - 1	8.6576394 - 2	4.0582960 - 1	1.1805854 3
0.0300	8.6717039 - 2	4.3588260 - 1	8.6741630 - 2	4.0672070 - 1	1.1428039 3
0.0400	8.7129181 - 2	4.3808720 - 1	8.7153848 - 2	4.0894540 - 1	1.0724503 3
0.0500	8.7642115 - 2	4.4083340 - 1	8.7666874 - 2	4.1171800 - 1	1.0082107 3
0.0650	8.8575793 - 2	4.4584040 - 1	8.8600738 - 2	4.1677510 - 1	9.2176798 2
0.0800	8.9669609 - 2	4.5171880 - 1	8.9694758 - 2	4.2271680 - 1	8.4566114 2
0.1000	9.1304630 - 2	4.6053140 - 1	9.1330038 - 2	4.3163410 - 1	7.5787071 2
0.1500	9.5749088 - 2	4.8464340 - 1	9.5775067 - 2	4.5610680 - 1	5.9120543 2
0.2000	1.0000698 - 1	5.0794860 - 1	1.0003318 - 1	4.7991190 - 1	4.7678510 2
0.3000	1.0673707 - 1	5.4509040 - 1	1.0676232 - 1	5.1845030 - 1	3.3479623 2
0.4000	1.1119855 - 1	5.6967110 - 1	1.1122127 - 1	5.4490780 - 1	2.5187906 2
0.6000	1.1594033 - 1	5.9472390 - 1	1.1595559 - 1	5.7483920 - 1	1.5902204 2

Table 52. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0500
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π	d/j miles	
		h_3 = 70 kilometers				
0.0005	1.0082407 - 1	3.0243240 - 1	1.0100520 - 1	2.2900500 - 1	1.2433895	3
0.0010	1.0082508 - 1	3.0243560 - 1	1.0100621 - 1	2.2900820 - 1	1.2381675	3
0.0020	1.0082904 - 1	3.0244770 - 1	1.0101017 - 1	2.2902050 - 1	1.2278386	3
0.0030	1.0083566 - 1	3.0246790 - 1	1.0101681 - 1	2.2904120 - 1	1.2176623	3
0.0040	1.0084493 - 1	3.0249630 - 1	1.0102609 - 1	2.2907010 - 1	1.2076369	3
0.0050	1.0085682 - 1	3.0253280 - 1	1.0103801 - 1	2.2910730 - 1	1.1977599	3
0.0060	1.0087136 - 1	3.0257730 - 1	1.0105257 - 1	2.2915260 - 1	1.1880278	3
0.0070	1.0088851 - 1	3.0262990 - 1	1.0106973 - 1	2.2920610 - 1	1.1784374	3
0.0080	1.0090829 - 1	3.0269060 - 1	1.0108955 - 1	2.2926800 - 1	1.1689853	3
0.0090	1.0093070 - 1	3.0275930 - 1	1.0111200 - 1	2.2933790 - 1	1.1596669	3
0.0100	1.0095573 - 1	3.0283610 - 1	1.0113706 - 1	2.2941600 - 1	1.1504788	3
0.0120	1.0101359 - 1	3.0301340 - 1	1.0119501 - 1	2.2959670 - 1	1.1324770	3
0.0150	1.0111982 - 1	3.0333940 - 1	1.0130139 - 1	2.2992840 - 1	1.1063547	3
0.0200	1.0134797 - 1	3.0403900 - 1	1.0152989 - 1	2.3064090 - 1	1.0649462	3
0.0250	1.0163861 - 1	3.0493070 - 1	1.0182096 - 1	2.3154900 - 1	1.0259098	3
0.0300	1.0198985 - 1	3.0600810 - 1	1.0217274 - 1	2.3264650 - 1	9.8899038	2
0.0400	1.0286461 - 1	3.0869270 - 1	1.0304881 - 1	2.3538250 - 1	9.2076906	2
0.0500	1.0395063 - 1	3.1202740 - 1	1.0413643 - 1	2.3878310 - 1	8.5914709	2
0.0650	1.0592041 - 1	3.1808100 - 1	1.0610908 - 1	2.4496270 - 1	7.7737068	2
0.0800	1.0821767 - 1	3.2514890 - 1	1.0840960 - 1	2.5218930 - 1	7.0657786	2
0.1000	1.1163465 - 1	3.3567700 - 1	1.1183122 - 1	2.6297960 - 1	6.2644905	2
0.1500	1.2085877 - 1	3.6417520 - 1	1.2106629 - 1	2.9238380 - 1	4.7915900	2
0.2000	1.2967094 - 1	3.9146000 - 1	1.2988587 - 1	3.2092420 - 1	3.8174547	2
0.3000	1.4370069 - 1	4.3468460 - 1	1.4391572 - 1	3.6765590 - 1	2.6471062	2
0.4000	1.5315207 - 1	4.6298490 - 1	1.5335008 - 1	4.0067060 - 1	1.9802951	2
0.6000	1.6339502 - 1	4.9027480 - 1	1.6353119 - 1	4.4022210 - 1	1.2445355	2
		h_3 = 90 kilometers				
0.0005	1.0800639 - 1	3.2449840 - 1	1.0819803 - 1	2.5152360 - 1	1.4000780	3
0.0010	1.0800714 - 1	3.2450080 - 1	1.0819878 - 1	2.5152600 - 1	1.3948535	3
0.0020	1.0801020 - 1	3.2451020 - 1	1.0820185 - 1	2.5153570 - 1	1.3845147	3
0.0030	1.0801529 - 1	3.2452590 - 1	1.0820695 - 1	2.5155180 - 1	1.3743220	3
0.0040	1.0802237 - 1	3.2454770 - 1	1.0821405 - 1	2.5157410 - 1	1.3642736	3
0.0050	1.0803158 - 1	3.2457600 - 1	1.0822325 - 1	2.5160300 - 1	1.3543670	3
0.0060	1.0804277 - 1	3.2461040 - 1	1.0823446 - 1	2.5163820 - 1	1.3445989	3
0.0070	1.0805600 - 1	3.2465130 - 1	1.0824772 - 1	2.5168010 - 1	1.3349661	3
0.0080	1.0807122 - 1	3.2469810 - 1	1.0826295 - 1	2.5172800 - 1	1.3254647	3
0.0090	1.0808853 - 1	3.2475140 - 1	1.0828027 - 1	2.5178250 - 1	1.3160909	3
0.0100	1.0810779 - 1	3.2481040 - 1	1.0829957 - 1	2.5184300 - 1	1.3068406	3
0.0120	1.0815240 - 1	3.2494810 - 1	1.0834423 - 1	2.5198360 - 1	1.2886954	3
0.0150	1.0823433 - 1	3.2520010 - 1	1.0842628 - 1	2.5224180 - 1	1.2623103	3
0.0200	1.0841048 - 1	3.2574260 - 1	1.0860268 - 1	2.5279700 - 1	1.2203378	3
0.0250	1.0863531 - 1	3.2643470 - 1	1.0882784 - 1	2.5350530 - 1	1.1805854	3
0.0300	1.0890752 - 1	3.2727280 - 1	1.0910040 - 1	2.5436360 - 1	1.1428039	3
0.0400	1.0958828 - 1	3.2936960 - 1	1.0978210 - 1	2.5651130 - 1	1.0724503	3
0.0500	1.1043862 - 1	3.3198990 - 1	1.1063359 - 1	2.5919690 - 1	1.0082107	3
0.0650	1.1199555 - 1	3.3679000 - 1	1.1219261 - 1	2.6412240 - 1	9.2176798	2
0.0800	1.1383450 - 1	3.4246390 - 1	1.1403391 - 1	2.6995420 - 1	8.4566114	2
0.1000	1.1661397 - 1	3.5104830 - 1	1.1681678 - 1	2.7879920 - 1	7.5787071	2
0.1500	1.2436129 - 1	3.7501750 - 1	1.2457221 - 1	3.0366880 - 1	5.9120543	2
0.2000	1.3205888 - 1	3.9885130 - 1	1.3227508 - 1	3.2875030 - 1	4.7678510	2
0.3000	1.4481431 - 1	4.3807620 - 1	1.4502833 - 1	3.7146100 - 1	3.3479623	2
0.4000	1.5369577 - 1	4.6456370 - 1	1.5389203 - 1	4.0263370 - 1	2.5187906	2
0.6000	1.6353948 - 1	4.9059120 - 1	1.6367407 - 1	4.4084750 - 1	1.5902204	2

Table 53. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1000
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π	d/j miles	
		h_3 = 70 kilometers				
0.0005	1.1287573 - 1	2.2066070 - 1	1.1368611 - 1	7.3780200 - 2	1.2433895	3
0.0010	1.1287703 - 1	2.2066310 - 1	1.1368740 - 1	7.3782900 - 2	1.2381675	3
0.0020	1.1288211 - 1	2.2067300 - 1	1.1369252 - 1	7.3793400 - 2	1.2278386	3
0.0030	1.1289062 - 1	2.2068930 - 1	1.1370105 - 1	7.3810400 - 2	1.2176623	3
0.0040	1.1290253 - 1	2.2071260 - 1	1.1371305 - 1	7.3834600 - 2	1.2076369	3
0.0050	1.1291782 - 1	2.2074220 - 1	1.1372843 - 1	7.3865500 - 2	1.1977599	3
0.0060	1.1293649 - 1	2.2077860 - 1	1.1374722 - 1	7.3903300 - 2	1.1880278	3
0.0070	1.1295853 - 1	2.2082120 - 1	1.1376941 - 1	7.3948000 - 2	1.1784374	3
0.0080	1.1298396 - 1	2.2087070 - 1	1.1379499 - 1	7.3999600 - 2	1.1689853	3
0.0090	1.1301275 - 1	2.2092650 - 1	1.1382397 - 1	7.4058100 - 2	1.1596669	3
0.0100	1.1304492 - 1	2.2098880 - 1	1.1385633 - 1	7.4123100 - 2	1.1504788	3
0.0120	1.1311932 - 1	2.2113330 - 1	1.1393119 - 1	7.4273800 - 2	1.1324770	3
0.0150	1.1325592 - 1	2.2139840 - 1	1.1406864 - 1	7.4550700 - 2	1.1063547	3
0.0200	1.1354946 - 1	2.2196800 - 1	1.1436400 - 1	7.5146000 - 2	1.0649462	3
0.0250	1.1392377 - 1	2.2269420 - 1	1.1474061 - 1	7.5904800 - 2	1.0259098	3
0.0300	1.1437655 - 1	2.2357280 - 1	1.1519620 - 1	7.6823200 - 2	9.8899038	2
0.0400	1.1550658 - 1	2.2576430 - 1	1.1633317 - 1	7.9116700 - 2	9.2076906	2
0.0500	1.1691412 - 1	2.2849330 - 1	1.1774926 - 1	8.1976400 - 2	8.5914709	2
0.0650	1.1948032 - 1	2.3346490 - 1	1.2033087 - 1	8.7198300 - 2	7.7737068	2
0.0800	1.2249511 - 1	2.3929880 - 1	1.2336334 - 1	9.3347700 - 2	7.0657786	2
0.1000	1.2702384 - 1	2.4804640 - 1	1.2791769 - 1	1.0261630 - 1	6.2644905	2
0.1500	1.3952620 - 1	2.7206340 - 1	1.4048369 - 1	1.2843230 - 1	4.7915900	2
0.2000	1.5187084 - 1	2.9547950 - 1	1.5287687 - 1	1.5434350 - 1	3.8174547	2
0.3000	1.7240837 - 1	3.3309580 - 1	1.7343942 - 1	1.9893260 - 1	2.6471062	2
0.4000	1.8691742 - 1	3.5736920 - 1	1.8788316 - 1	2.3258760 - 1	1.9802951	2
0.6000	2.0333464 - 1	3.7744980 - 1	2.0401119 - 1	2.7711430 - 1	1.2445355	2
		h_3 = 90 kilometers				
0.0005	1.2221683 - 1	2.3876050 - 1	1.2308345 - 1	9.2779100 - 2	1.4000780	3
0.0010	1.2221781 - 1	2.3876240 - 1	1.2308442 - 1	9.2781300 - 2	1.3948535	3
0.0020	1.2222184 - 1	2.3877030 - 1	1.2308848 - 1	9.2789500 - 2	1.3845147	3
0.0030	1.2222854 - 1	2.3878320 - 1	1.2309523 - 1	9.2803200 - 2	1.3743220	3
0.0040	1.2223788 - 1	2.3880140 - 1	1.2310463 - 1	9.2822300 - 2	1.3642736	3
0.0050	1.2224997 - 1	2.3882470 - 1	1.2311678 - 1	9.2846900 - 2	1.3543670	3
0.0060	1.2226472 - 1	2.3885320 - 1	1.2313160 - 1	9.2877000 - 2	1.3445989	3
0.0070	1.2228215 - 1	2.3888700 - 1	1.2314916 - 1	9.2912700 - 2	1.3349661	3
0.0080	1.2230217 - 1	2.3892570 - 1	1.2316928 - 1	9.2953500 - 2	1.3254647	3
0.0090	1.2232497 - 1	2.3896960 - 1	1.2319222 - 1	9.3000000 - 2	1.3160909	3
0.0100	1.2235036 - 1	2.3901880 - 1	1.2321773 - 1	9.3052000 - 2	1.3068406	3
0.0120	1.2240910 - 1	2.3913240 - 1	1.2327684 - 1	9.3172000 - 2	1.2886954	3
0.0150	1.2251703 - 1	2.3934110 - 1	1.2338540 - 1	9.3392300 - 2	1.2623103	3
0.0200	1.2274921 - 1	2.3979000 - 1	1.2361892 - 1	9.3866700 - 2	1.2203378	3
0.0250	1.2304573 - 1	2.4036360 - 1	1.2391712 - 1	9.4472300 - 2	1.1805854	3
0.0300	1.2340505 - 1	2.4105810 - 1	1.2427855 - 1	9.5206800 - 2	1.1428039	3
0.0400	1.2430518 - 1	2.4279750 - 1	1.2518376 - 1	9.7047400 - 2	1.0724503	3
0.0500	1.2543252 - 1	2.4497500 - 1	1.2631751 - 1	9.9354900 - 2	1.0082107	3
0.0650	1.2750531 - 1	2.4897520 - 1	1.2840180 - 1	1.0360400 - 1	9.2176798	2
0.0800	1.2996823 - 1	2.5372220 - 1	1.3087807 - 1	1.0866430 - 1	8.4566114	2
0.1000	1.3372143 - 1	2.6094090 - 1	1.3465080 - 1	1.1640070 - 1	7.5787071	2
0.1500	1.4438424 - 1	2.8132320 - 1	1.4536285 - 1	1.3857160 - 1	5.9120543	2
0.2000	1.5528740 - 1	3.0188190 - 1	1.5630335 - 1	1.6161010 - 1	4.7678510	2
0.3000	1.7408836 - 1	3.3604560 - 1	1.7511666 - 1	2.0270440 - 1	3.3479623	2
0.4000	1.8776993 - 1	3.5868170 - 1	1.8872813 - 1	2.3466520 - 1	2.5187906	2
0.6000	2.0357190 - 1	3.7759990 - 1	2.0424083 - 1	2.7788100 - 1	1.5902204	2

Table 54. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2000
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π	d/j miles
		h_3 = 70 kilometers			
0.0005	1.2096947 - 1	1.4152180 - 1	1.2442911 - 1	1.5250170 - 1	1.2433895 3
0.0010	1.2097099 - 1	1.4152340 - 1	1.2443066 - 1	1.5249980 - 1	1.2381675 3
0.0020	1.2097697 - 1	1.4152990 - 1	1.2443682 - 1	1.5249260 - 1	1.2278386 3
0.0030	1.2098702 - 1	1.4154090 - 1	1.2444711 - 1	1.5248020 - 1	1.2176623 3
0.0040	1.2100103 - 1	1.4155600 - 1	1.2446148 - 1	1.5246320 - 1	1.2076369 3
0.0050	1.2101906 - 1	1.4157550 - 1	1.2447997 - 1	1.5244100 - 1	1.1977599 3
0.0060	1.2104109 - 1	1.4159920 - 1	1.2450256 - 1	1.5241390 - 1	1.1880278 3
0.0070	1.2106710 - 1	1.4162740 - 1	1.2452920 - 1	1.5238230 - 1	1.1784374 3
0.0080	1.2109709 - 1	1.4166000 - 1	1.2455995 - 1	1.5234570 - 1	1.1689853 3
0.0090	1.2113103 - 1	1.4169670 - 1	1.2459476 - 1	1.5230410 - 1	1.1596669 3
0.0100	1.2116898 - 1	1.4173770 - 1	1.2463363 - 1	1.5225780 - 1	1.1504788 3
0.0120	1.2125673 - 1	1.4183250 - 1	1.2472360 - 1	1.5215020 - 1	1.1324770 3
0.0150	1.2141790 - 1	1.4200690 - 1	1.2488884 - 1	1.5195310 - 1	1.1063547 3
0.0200	1.2176439 - 1	1.4238140 - 1	1.2524400 - 1	1.5152910 - 1	1.0649462 3
0.0250	1.2220650 - 1	1.4285890 - 1	1.2569717 - 1	1.5098770 - 1	1.0259098 3
0.0300	1.2274175 - 1	1.4343690 - 1	1.2624580 - 1	1.5033210 - 1	9.8899038 2
0.0400	1.2407984 - 1	1.4487880 - 1	1.2761711 - 1	1.4869250 - 1	9.2076906 2
0.0500	1.2575086 - 1	1.4667440 - 1	1.2932936 - 1	1.4664230 - 1	8.5914709 2
0.0650	1.2881010 - 1	1.4994720 - 1	1.3246307 - 1	1.4288220 - 1	7.7737068 2
0.0800	1.3242529 - 1	1.5378910 - 1	1.3616448 - 1	1.3842680 - 1	7.0657786 2
0.1000	1.3789986 - 1	1.5954950 - 1	1.4176574 - 1	1.3165260 - 1	6.2644905 2
0.1500	1.5329998 - 1	1.7531800 - 1	1.5749114 - 1	1.1238000 - 1	4.7915900 2
0.2000	1.6894707 - 1	1.9048350 - 1	1.7340579 - 1	9.2351500 - 2	3.8174547 2
0.3000	1.9606153 - 1	2.1345730 - 1	2.0073298 - 1	5.5756000 - 2	2.6471062 2
0.4000	2.1614208 - 1	2.2538910 - 1	2.2058969 - 1	2.5429000 - 2	1.9802951 2
0.6000	2.3997022 - 1	2.2431040 - 1	2.4313827 - 1	2.1776500 - 2	1.2445355 2
		h_3 = 90 kilometers			
0.0005	1.3209063 - 1	1.5343460 - 1	1.3582193 - 1	1.3884000 - 1	1.4000780 3
0.0010	1.3209181 - 1	1.5343590 - 1	1.3582313 - 1	1.3883840 - 1	1.3948535 3
0.0020	1.3209665 - 1	1.5344100 - 1	1.3582812 - 1	1.3883250 - 1	1.3845147 3
0.0030	1.3210470 - 1	1.5344960 - 1	1.3583634 - 1	1.3882250 - 1	1.3743220 3
0.0040	1.3211595 - 1	1.5346160 - 1	1.3584784 - 1	1.3880860 - 1	1.3642736 3
0.0050	1.3213046 - 1	1.5347700 - 1	1.3586272 - 1	1.3879090 - 1	1.3543670 3
0.0060	1.3214820 - 1	1.5349560 - 1	1.3588085 - 1	1.3876880 - 1	1.3445989 3
0.0070	1.3216917 - 1	1.5351780 - 1	1.3590235 - 1	1.3874300 - 1	1.3349661 3
0.0080	1.3219325 - 1	1.5354330 - 1	1.3592697 - 1	1.3871340 - 1	1.3254647 3
0.0090	1.3222064 - 1	1.5357250 - 1	1.3595502 - 1	1.3867940 - 1	1.3160909 3
0.0100	1.3225118 - 1	1.5360470 - 1	1.3598627 - 1	1.3864180 - 1	1.3068406 3
0.0120	1.3232183 - 1	1.5367950 - 1	1.3605861 - 1	1.3855450 - 1	1.2886954 3
0.0150	1.3245169 - 1	1.5381710 - 1	1.3619152 - 1	1.3839430 - 1	1.2623103 3
0.0200	1.3273105 - 1	1.5411270 - 1	1.3647748 - 1	1.3804940 - 1	1.2203378 3
0.0250	1.3308805 - 1	1.5449020 - 1	1.3684287 - 1	1.3760870 - 1	1.1805854 3
0.0300	1.3352104 - 1	1.5494780 - 1	1.3728598 - 1	1.3707380 - 1	1.1428039 3
0.0400	1.3460701 - 1	1.5609320 - 1	1.3839728 - 1	1.3573140 - 1	1.0724503 3
0.0500	1.3597012 - 1	1.5752740 - 1	1.3979189 - 1	1.3404440 - 1	1.0082107 3
0.0650	1.3848509 - 1	1.6016100 - 1	1.4236417 - 1	1.3092630 - 1	9.2176798 2
0.0800	1.4148820 - 1	1.6328460 - 1	1.4543423 - 1	1.2719260 - 1	8.4566114 2
0.1000	1.4609615 - 1	1.6802940 - 1	1.5014144 - 1	1.2143950 - 1	7.5787071 2
0.1500	1.5940319 - 1	1.8135280 - 1	1.6370764 - 1	1.0463190 - 1	5.9120543 2
0.2000	1.7336028 - 1	1.9455780 - 1	1.7787915 - 1	8.6591100 - 2	4.7678510 2
0.3000	1.9834485 - 1	2.1510490 - 1	2.0301241 - 1	5.2499300 - 2	3.3479623 2
0.4000	2.1734857 - 1	2.2586940 - 1	2.2176562 - 1	2.3444700 - 2	2.5187906 2
0.6000	2.4032468 - 1	2.2401400 - 1	2.4345766 - 1	2.2704100 - 2	1.5902204 2

Table 55. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 1.0000
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em} \rvert$	Arg T_{em} - π	$\lvert T_{me} \rvert$	Arg T_{me} - π	d /j miles
		h_3 = 70 kilometers			
0.0005	1.1098227 - 1	2.2960840 - 1	1.5448463 - 1	4.9579320	1.2433895 3
0.0010	1.1098378 - 1	2.2960650 - 1	1.5448664 - 1	4.9579309	1.2381675 3
0.0020	1.1098971 - 1	2.2959990 - 1	1.5449457 - 1	4.9579266	1.2278386 3
0.0030	1.1099969 - 1	2.2958850 - 1	1.5450785 - 1	4.9579190	1.2176623 3
0.0040	1.1101362 - 1	2.2957300 - 1	1.5452645 - 1	4.9579087	1.2076369 3
0.0050	1.1103152 - 1	2.2955290 - 1	1.5455033 - 1	4.9578954	1.1977599 3
0.0060	1.1105338 - 1	2.2952840 - 1	1.5457950 - 1	4.9578791	1.1880278 3
0.0070	1.1107921 - 1	2.2949940 - 1	1.5461396 - 1	4.9578598	1.1784374 3
0.0080	1.1110900 - 1	2.2946610 - 1	1.5465369 - 1	4.9578377	1.1689853 3
0.0090	1.1114272 - 1	2.2942810 - 1	1.5469868 - 1	4.9578125	1.1596669 3
0.0100	1.1118040 - 1	2.2938600 - 1	1.5474896 - 1	4.9577844	1.1504788 3
0.0120	1.1126756 - 1	2.2928770 - 1	1.5486519 - 1	4.9577195	1.1324770 3
0.0150	1.1142768 - 1	2.2910730 - 1	1.5507876 - 1	4.9575998	1.1063547 3
0.0200	1.1177206 - 1	2.2871870 - 1	1.5553784 - 1	4.9573425	1.0649462 3
0.0250	1.1221175 - 1	2.2822050 - 1	1.5612364 - 1	4.9570130	1.0259098 3
0.0300	1.1274454 - 1	2.2761370 - 1	1.5683289 - 1	4.9566126	9.8899038 2
0.0400	1.1407839 - 1	2.2606090 - 1	1.5860597 - 1	4.9556051	9.2076906 2
0.0500	1.1574828 - 1	2.2413280 - 1	1.6082026 - 1	4.9543327	8.5914709 2
0.0650	1.1881752 - 1	2.2046610 - 1	1.6487359 - 1	4.9519616	7.7737068 2
0.0800	1.2246496 - 1	2.1595760 - 1	1.6966102 - 1	4.9490877	7.0657786 2
0.1000	1.2803181 - 1	2.0874230 - 1	1.7690068 - 1	4.9445810	6.2644905 2
0.1500	1.4398900 - 1	1.8552940 - 1	1.9711678 - 1	4.9308007	4.7915900 2
0.2000	1.6069452 - 1	1.5631350 - 1	2.1716287 - 1	4.9148664	3.8174547 2
0.3000	1.9100933 - 1	8.4442200 - 2	2.4883385 - 1	4.8814721	2.6471062 2
0.4000	2.1475325 - 1	9.4720000 - 4	2.6593270 - 1	4.8514507	1.9802951 2
0.6000	2.4384811 - 1	1.9994350 - 1	2.6290092 - 1	4.8227901	1.2445355 2
		h_3 = 90 kilometers			
0.0005	1.2212635 - 1	2.1638310 - 1	1.6921797 - 1	4.9493571	1.4000780 3
0.0010	1.2212755 - 1	2.1638180 - 1	1.6921953 - 1	4.9493562	1.3948535 3
0.0020	1.2213244 - 1	2.1637560 - 1	1.6922598 - 1	4.9493523	1.3845147 3
0.0030	1.2214060 - 1	2.1636520 - 1	1.6923664 - 1	4.9493458	1.3743220 3
0.0040	1.2215196 - 1	2.1635110 - 1	1.6925153 - 1	4.9493368	1.3642736 3
0.0050	1.2216666 - 1	2.1633250 - 1	1.6927074 - 1	4.9493251	1.3543670 3
0.0060	1.2218460 - 1	2.1631000 - 1	1.6929423 - 1	4.9493109	1.3445989 3
0.0070	1.2220580 - 1	2.1628340 - 1	1.6932197 - 1	4.9492940	1.3349661 3
0.0080	1.2223016 - 1	2.1625290 - 1	1.6935386 - 1	4.9492746	1.3254647 3
0.0090	1.2225789 - 1	2.1621790 - 1	1.6939013 - 1	4.9492525	1.3160909 3
0.0100	1.2228877 - 1	2.1617920 - 1	1.6943054 - 1	4.9492279	1.3068406 3
0.0120	1.2236026 - 1	2.1608920 - 1	1.6952405 - 1	4.9491711	1.2886954 3
0.0150	1.2249165 - 1	2.1592390 - 1	1.6969595 - 1	4.9490665	1.2623103 3
0.0200	1.2277449 - 1	2.1556710 - 1	1.7006576 - 1	4.9488411	1.2203378 3
0.0250	1.2313612 - 1	2.1510960 - 1	1.7053828 - 1	4.9485523	1.1805854 3
0.0300	1.2357492 - 1	2.1455180 - 1	1.7111120 - 1	4.9482009	1.1428039 3
0.0400	1.2467708 - 1	2.1314020 - 1	1.7254796 - 1	4.9473146	1.0724503 3
0.0500	1.2606343 - 1	2.1134130 - 1	1.7435056 - 1	4.9461917	1.0082107 3
0.0650	1.2863004 - 1	2.0794190 - 1	1.7767353 - 1	4.9440880	9.2176798 2
0.0800	1.3170985 - 1	2.0373980 - 1	1.8163535 - 1	4.9415209	8.4566114 2
0.1000	1.3646810 - 1	1.9697040 - 1	1.8769741 - 1	4.9374607	7.5787071 2
0.1500	1.5044280 - 1	1.7491260 - 1	2.0501885 - 1	4.9248376	5.9120543 2
0.2000	1.6550437 - 1	1.4675590 - 1	2.2265874 - 1	4.9099671	4.7678510 2
0.3000	1.9365086 - 1	7.6569100 - 2	2.5117219 - 1	4.8782767	3.3479623 2
0.4000	2.1621632 - 1	7.5735000 - 3	2.6662109 - 1	4.8495459	2.5187906 2
0.6000	2.4426115 - 1	2.0474910 - 1	2.6240760 - 1	4.8228964	1.5902204 2

Table 56. Ionosphere reflection coefficients (amplitude, $\lvert T \rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 2.0000
ϕ_1 = 60 degrees

Ψ radians	$\|T_{em}\|$	Arg T_{em} - π	$\|T_{me}\|$	Arg T_{me} - π	d/j miles	
		h_3 = 70 kilometers				
0.0005	1.4635752 - 1	4.2188170 - 1	1.6799323 - 1	4.3337942	1.2433895	3
0.0010	1.4635938 - 1	4.2187750 - 1	1.6799522 - 1	4.3337905	1.2381675	3
0.0020	1.4636677 - 1	4.2186180 - 1	1.6800310 - 1	4.3337764	1.2278386	3
0.0030	1.4637918 - 1	4.2183450 - 1	1.6801627 - 1	4.3337522	1.2176623	3
0.0040	1.4639648 - 1	4.2179750 - 1	1.6803474 - 1	4.3337193	1.2076369	3
0.0050	1.4641874 - 1	4.2174940 - 1	1.6805844 - 1	4.3336765	1.1977599	3
0.0060	1.4644592 - 1	4.2169090 - 1	1.6808740 - 1	4.3336245	1.1880278	3
0.0070	1.4647798 - 1	4.2162160 - 1	1.6812159 - 1	4.3335630	1.1784374	3
0.0080	1.4651499 - 1	4.2154160 - 1	1.6816099 - 1	4.3334919	1.1689853	3
0.0090	1.4655688 - 1	4.2145110 - 1	1.6820560 - 1	4.3334115	1.1596669	3
0.0100	1.4660372 - 1	4.2135020 - 1	1.6825551 - 1	4.3333217	1.1504788	3
0.0120	1.4671200 - 1	4.2111560 - 1	1.6837079 - 1	4.3331133	1.1324770	3
0.0150	1.4691088 - 1	4.2068490 - 1	1.6858246 - 1	4.3327307	1.1063547	3
0.0200	1.4733849 - 1	4.1975680 - 1	1.6903733 - 1	4.3319063	1.0649462	3
0.0250	1.4788414 - 1	4.1856740 - 1	1.6961706 - 1	4.3308505	1.0259098	3
0.0300	1.4854482 - 1	4.1712090 - 1	1.7031809 - 1	4.3295669	9.8899038	2
0.0400	1.5019669 - 1	4.1346990 - 1	1.7206598 - 1	4.3263309	9.2076906	2
0.0500	1.5226015 - 1	4.0883990 - 1	1.7423951 - 1	4.3222346	8.5914709	2
0.0650	1.5603910 - 1	4.0015410 - 1	1.7819019 - 1	4.3145713	7.7737068	2
0.0800	1.6050646 - 1	3.8952360 - 1	1.8280734 - 1	4.3052300	7.0657786	2
0.1000	1.6727328 - 1	3.7261540 - 1	1.8967976 - 1	4.2904546	6.2644905	2
0.1500	1.8628886 - 1	3.1894990 - 1	2.0802440 - 1	4.2441899	4.7915900	2
0.2000	2.0547115 - 1	2.5260480 - 1	2.2450001 - 1	4.1882045	3.8174547	2
0.3000	2.3745073 - 1	9.2604000 - 2	2.4325864 - 1	4.0579799	2.6471062	2
0.4000	2.5749317 - 1	9.5297100 - 2	2.3947913 - 1	3.9132113	1.9802951	2
0.6000	2.5746033 - 1	5.2925670 - 1	1.7115844 - 1	3.6384256	1.2445355	2
		h_3 = 90 kilometers				
0.0005	1.6009286 - 1	3.9052500 - 1	1.8238246 - 1	4.3061083	1.4000780	3
0.0010	1.6009432 - 1	3.9052140 - 1	1.8238393 - 1	4.3061050	1.3948535	3
0.0020	1.6010028 - 1	3.9050730 - 1	1.8239009 - 1	4.3060927	1.3845147	3
0.0030	1.6011027 - 1	3.9048300 - 1	1.8240035 - 1	4.3060714	1.3743220	3
0.0040	1.6012415 - 1	3.9044940 - 1	1.8241460 - 1	4.3060419	1.3642736	3
0.0050	1.6014210 - 1	3.9040590 - 1	1.8243304 - 1	4.3060038	1.3543670	3
0.0060	1.6016400 - 1	3.9035310 - 1	1.8245559 - 1	4.3059574	1.3445989	3
0.0070	1.6018993 - 1	3.9029030 - 1	1.8248221 - 1	4.3059024	1.3349661	3
0.0080	1.6021968 - 1	3.9021840 - 1	1.8251278 - 1	4.3058393	1.3254647	3
0.0090	1.6025355 - 1	3.9013630 - 1	1.8254758 - 1	4.3057673	1.3160909	3
0.0100	1.6029126 - 1	3.9004520 - 1	1.8258633 - 1	4.3056874	1.3068406	3
0.0120	1.6037862 - 1	3.8983340 - 1	1.8267605 - 1	4.3055016	1.2886954	3
0.0150	1.6053908 - 1	3.8944460 - 1	1.8284085 - 1	4.3051608	1.2623103	3
0.0200	1.6088438 - 1	3.8860570 - 1	1.8319517 - 1	4.3044252	1.2203378	3
0.0250	1.6132563 - 1	3.8753010 - 1	1.8364738 - 1	4.3034827	1.1805854	3
0.0300	1.6186076 - 1	3.8621990 - 1	1.8419496 - 1	4.3023350	1.1428039	3
0.0400	1.6320302 - 1	3.8290660 - 1	1.8556438 - 1	4.2994358	1.0724503	3
0.0500	1.6488792 - 1	3.7869170 - 1	1.8727486 - 1	4.2957529	1.0082107	3
0.0650	1.6799661 - 1	3.7074680 - 1	1.9040498 - 1	4.2888277	9.2176798	2
0.0800	1.7170832 - 1	3.6096120 - 1	1.9409591 - 1	4.2803277	8.4566114	2
0.1000	1.7740113 - 1	3.4527350 - 1	1.9964959 - 1	4.2667671	7.5787071	2
0.1500	1.9379771 - 1	2.9471040 - 1	2.1476873 - 1	4.2235876	5.9120543	2
0.2000	2.1082595 - 1	2.3111510 - 1	2.2858574 - 1	4.1703342	4.7678510	2
0.3000	2.3998080 - 1	7.5230900 - 2	2.4389795 - 1	4.0442199	3.3479623	2
0.4000	2.5845073 - 1	1.0985970 - 1	2.3833651 - 1	3.9023950	2.5187906	2
0.6000	2.5680026 - 1	5.3941250 - 1	1.6892241 - 1	3.6341094	1.5902204	2

Table 57. Ionosphere reflection coefficients (amplitude, $|T|$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 5.0000
ϕ_1 = 60 degrees

Ψ radians	$\lvert T_{em}\rvert$	Arg T_{em} - π	$\lvert T_{me}\rvert$	Arg T_{me} - π	d/j miles
		h_3 = 70 kilometers			
0.0005	2.1155666 - 1	3.2228310 - 1	2.1122241 - 1	3.7694109	1.2433895 3
0.0010	2.1155889 - 1	3.2227490 - 1	2.1122440 - 1	3.7694029	1.2381675 3
0.0020	2.1156760 - 1	3.2224280 - 1	2.1123219 - 1	3.7693714	1.2278386 3
0.0030	2.1158220 - 1	3.2218690 - 1	2.1124513 - 1	3.7693168	1.2176623 3
0.0040	2.1160263 - 1	3.2211080 - 1	2.1126339 - 1	3.7692421	1.2076369 3
0.0050	2.1162891 - 1	3.2201320 - 1	2.1128685 - 1	3.7691465	1.1977599 3
0.0060	2.1166091 - 1	3.2189260 - 1	2.1131533 - 1	3.7690285	1.1880278 3
0.0070	2.1169881 - 1	3.2175110 - 1	2.1134916 - 1	3.7688897	1.1784374 3
0.0080	2.1174245 - 1	3.2158750 - 1	2.1138805 - 1	3.7687294	1.1689853 3
0.0090	2.1179186 - 1	3.2140190 - 1	2.1143206 - 1	3.7685478	1.1596669 3
0.0100	2.1184709 - 1	3.2119470 - 1	2.1148126 - 1	3.7683447	1.1504788 3
0.0120	2.1197473 - 1	3.2071460 - 1	2.1159489 - 1	3.7678746	1.1324770 3
0.0150	2.1220894 - 1	3.1983240 - 1	2.1180337 - 1	3.7670104	1.1063547 3
0.0200	2.1271192 - 1	3.1793030 - 1	2.1225045 - 1	3.7651473	1.0649462 3
0.0250	2.1335232 - 1	3.1549420 - 1	2.1281874 - 1	3.7627613	1.0259028 3
0.0300	2.1412559 - 1	3.1252830 - 1	2.1350323 - 1	3.7598565	9.8899038 2
0.0400	2.1604846 - 1	3.0504200 - 1	2.1519754 - 1	3.7525246	9.2076906 2
0.0500	2.1842940 - 1	2.9554210 - 1	2.1727917 - 1	3.7432209	8.5914709 2
0.0650	2.2272677 - 1	2.7769950 - 1	2.2098711 - 1	3.7257481	7.7737068 2
0.0800	2.2769693 - 1	2.5582580 - 1	2.2518743 - 1	3.7043281	7.0657786 2
0.1000	2.3498124 - 1	2.2094940 - 1	2.3114177 - 1	3.6701726	6.2644905 2
0.1500	2.5358751 - 1	1.0953320 - 1	2.4474592 - 1	3.5609689	4.7915900 2
0.2000	2.6855312 - 1	2.9806400 - 2	2.5216149 - 1	3.4239800	3.8174547 2
0.3000	2.7583810 - 1	3.7187530 - 1	2.3765366 - 1	3.0842540	2.6471062 2
0.4000	2.4245730 - 1	7.5678680 - 1	1.8022902 - 1	2.6972919	1.9802951 2
0.6000	1.3477413 - 1	1.2255798	5.3603473 - 2	2.3145602	1.2445355 2
		h_3 = 90 kilometers			
0.0005	2.2724190 - 1	2.5788750 - 1	2.2480715 - 1	3.7063471	1.4000780 3
0.0010	2.2724357 - 1	2.5788080 - 1	2.2480856 - 1	3.7063405	1.3948535 3
0.0020	2.2725015 - 1	2.5785140 - 1	2.2481406 - 1	3.7063117	1.3845147 3
0.0030	2.2726112 - 1	2.5780090 - 1	2.2482321 - 1	3.7062623	1.3743220 3
0.0040	2.2727638 - 1	2.5773230 - 1	2.2483602 - 1	3.7061952	1.3642736 3
0.0050	2.2729615 - 1	2.5764270 - 1	2.2485252 - 1	3.7061074	1.3543670 3
0.0060	2.2732031 - 1	2.5753320 - 1	2.2487269 - 1	3.7060001	1.3445989 3
0.0070	2.2734881 - 1	2.5740440 - 1	2.2489655 - 1	3.7058740	1.3349661 3
0.0080	2.2738158 - 1	2.5725660 - 1	2.2492399 - 1	3.7057293	1.3254647 3
0.0090	2.2741886 - 1	2.5708730 - 1	2.2495512 - 1	3.7055636	1.3160909 3
0.0100	2.2746032 - 1	2.5689890 - 1	2.2498971 - 1	3.7053791	1.3068406 3
0.0120	2.2755640 - 1	2.5646400 - 1	2.2507006 - 1	3.7049531	1.2886954 3
0.0150	2.2773272 - 1	2.5566280 - 1	2.2521727 - 1	3.7041686	1.2623103 3
0.0200	2.2811168 - 1	2.5393510 - 1	2.2553328 - 1	3.7024765	1.2203378 3
0.0250	2.2859478 - 1	2.5171920 - 1	2.2593515 - 1	3.7003067	1.1805854 3
0.0300	2.2917902 - 1	2.4901930 - 1	2.2641967 - 1	3.6976626	1.1428039 3
0.0400	2.3063624 - 1	2.4218980 - 1	2.2762141 - 1	3.6909746	1.0724503 3
0.0500	2.3244849 - 1	2.3349490 - 1	2.2910150 - 1	3.6824596	1.0082107 3
0.0650	2.3574141 - 1	2.1708850 - 1	2.3174725 - 1	3.6663911	9.2176798 2
0.0800	2.3958258 - 1	1.9684940 - 1	2.3475429 - 1	3.6465660	8.4566114 2
0.1000	2.4526845 - 1	1.6432460 - 1	2.3902080 - 1	3.6146964	7.5787071 2
0.1500	2.5999800 - 1	5.8833200 - 2	2.4855296 - 1	3.5111927	5.9120543 2
0.2000	2.7175560 - 1	7.5321500 - 2	2.5266233 - 1	3.3790856	4.7678510 2
0.3000	2.7448187 - 1	4.0912800 - 1	2.3383622 - 1	3.0469226	3.3479623 2
0.4000	2.3849864 - 1	7.8338550 - 1	1.7480511 - 1	2.6707218	2.5187906 2
0.6000	1.3306597 - 1	1.2308185	5.1792426 - 2	2.3149455	1.5902204 2

Table 58. Ionosphere reflection coefficients (amplitude, $\lvert T\rvert$, and phase, Arg T) assuming the quasi-longitudinal approximation, for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.3002 f = 20 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	4.1287588 - 1	3.8370798	1.5702963	1.2433895	3
0.0010	3.9484557 - 1	3.7892607	1.5697963	1.2381675	3
0.0020	3.6152155 - 1	3.6933205	1.5687963	1.2278386	3
0.0030	3.3175230 - 1	3.5964664	1.5677963	1.2176623	3
0.0040	3.0539490 - 1	3.4981882	1.5667963	1.2076369	3
0.0050	2.8228636 - 1	3.3981456	1.5657963	1.1977599	3
0.0060	2.6225363 - 1	3.2962114	1.5647963	1.1880278	3
0.0070	2.4511728 - 1	3.1925117	1.5637963	1.1784374	3
0.0080	2.3069282 - 1	3.0874503	1.5627963	1.1689853	3
0.0090	2.1878733 - 1	2.9817008	1.5617963	1.1596669	3
0.0100	2.0919871 - 1	2.8761644	1.5607963	1.1504788	3
0.0120	1.9611499 - 1	2.6699763	1.5587963	1.1324770	3
0.0150	1.8838966 - 1	2.3878953	1.5557963	1.1063547	3
0.0200	1.9396829 - 1	2.0232842	1.5507963	1.0649462	3
0.0250	2.0832416 - 1	1.7789499	1.5457963	1.0259098	3
0.0300	2.2380686 - 1	1.6155136	1.5407963	9.8899038	2
0.0400	2.4987210 - 1	1.4221042	1.5307963	9.2076906	2
0.0500	2.6791020 - 1	1.3196062	1.5207963	8.5914709	2
0.0650	2.8330041 - 1	1.2456422	1.5057963	7.7737068	2
0.0800	2.8920449 - 1	1.2217408	1.4907963	7.0657786	2
0.1000	2.8798498 - 1	1.2329101	1.4707963	6.2644905	2
0.1500	2.6441229 - 1	1.3751166	1.4207963	4.7915900	2
0.2000	2.3557661 - 1	1.6045393	1.3707963	3.8174547	2
0.3000	2.0057473 - 1	2.1514172	1.2707963	2.6471062	2
0.4000	1.9414728 - 1	2.6436885	1.1707963	1.9802951	2
0.6000	2.0466471 - 1	3.3151912	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	3.7272809 - 1	3.9348034	1.5702963	1.4000780	3
0.0010	3.5674435 - 1	3.8865920	1.5697963	1.3948535	3
0.0020	3.2722804 - 1	3.7899603	1.5687963	1.3845147	3
0.0030	3.0089492 - 1	3.6925811	1.5677963	1.3743220	3
0.0040	2.7761326 - 1	3.5940069	1.5667963	1.3642736	3
0.0050	2.5723206 - 1	3.4939641	1.5657963	1.3543670	3
0.0060	2.3959016 - 1	3.3923887	1.5647963	1.3445989	3
0.0070	2.2452061 - 1	3.2894598	1.5637963	1.3349661	3
0.0080	2.1185055 - 1	3.1856077	1.5627963	1.3254647	3
0.0090	2.0140029 - 1	3.0815053	1.5617963	1.3160909	3
0.0100	1.9298361 - 1	2.9780098	1.5607963	1.3068406	3
0.0120	1.8147147 - 1	2.7767484	1.5587963	1.2886954	3
0.0150	1.7454721 - 1	2.5024877	1.5557963	1.2623103	3
0.0200	1.7907106 - 1	2.1470698	1.5507963	1.2203378	3
0.0250	1.9139523 - 1	1.9065443	1.5457963	1.1805854	3
0.0300	2.0488863 - 1	1.7440262	1.5407963	1.1428039	3
0.0400	2.2798266 - 1	1.5494620	1.5307963	1.0724503	3
0.0500	2.4435543 - 1	1.4447329	1.5207963	1.0082107	3
0.0650	2.5898681 - 1	1.3670313	1.5057963	9.2176798	2
0.0800	2.6547500 - 1	1.3392525	1.4907963	8.4566114	2
0.1000	2.6621690 - 1	1.3451457	1.4707963	7.5787071	2
0.1500	2.4949346 - 1	1.4739480	1.4207963	5.9120543	2
0.2000	2.2683867 - 1	1.6894615	1.3707963	4.7678510	2
0.3000	1.9869372 - 1	2.2067538	1.2707963	3.3479623	2
0.4000	1.9416774 - 1	2.6756027	1.1707963	2.5187906	2
0.6000	2.0490606 - 1	3.3269857	9.7079630 - 1	1.5902204	2

Table 59. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.467 f = 20 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	4.7957379 - 1	3.5922680	1.5702963	1.2433895 3
0.0010	4.5849250 - 1	3.5443255	1.5697963	1.2381675 3
0.0020	4.1953862 - 1	3.4480640	1.5687963	1.2278386 3
0.0030	3.8475311 - 1	3.3507743	1.5677963	1.2176623 3
0.0040	3.5396976 - 1	3.2519350	1.5667963	1.2076369 3
0.0050	3.2699951 - 1	3.1511953	1.5657963	1.1977599 3
0.0060	3.0364151 - 1	3.0484263	1.5647963	1.1880278 3
0.0070	2.8368785 - 1	2.9437603	1.5637963	1.1784374 3
0.0080	2.6692395 - 1	2.8376205	1.5627963	1.1689853 3
0.0090	2.5312462 - 1	2.7307096	1.5617963	1.1596669 3
0.0100	2.4205284 - 1	2.6239715	1.5607963	1.1504788 3
0.0120	2.2708063 - 1	2.4154434	1.5587963	1.1324770 3
0.0150	2.1859914 - 1	2.1305581	1.5557963	1.1063547 3
0.0200	2.2599019 - 1	1.7635606	1.5507963	1.0649462 3
0.0250	2.4346442 - 1	1.5181879	1.5457963	1.0259098 3
0.0300	2.6212586 - 1	1.3537428	1.5407963	9.8899038 2
0.0400	2.9357764 - 1	1.1570890	1.5307963	9.2076906 2
0.0500	3.1564900 - 1	1.0495975	1.5207963	8.5914709 2
0.0650	3.3525028 - 1	9.6534106 - 1	1.5057963	7.7737068 2
0.0800	3.4387722 - 1	9.2826372 - 1	1.4907963	7.0657786 2
0.1000	3.4471322 - 1	9.1798690 - 1	1.4707963	6.2644905 2
0.1500	3.2081872 - 1	9.9109167 - 1	1.4207963	4.7915900 2
0.2000	2.8584249 - 1	1.1375145	1.3707963	3.8174547 2
0.3000	2.2899790 - 1	1.5295749	1.2707963	2.6471062 2
0.4000	2.0111960 - 1	1.9392362	1.1707963	1.9802951 2
0.6000	1.8552125 - 1	2.5592026	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	4.3954730 - 1	3.6545743	1.5702963	1.4000780 3
0.0010	4.2051961 - 1	3.6063159	1.5697963	1.3948535 3
0.0020	3.8538434 - 1	3.5095035	1.5687963	1.3845147 3
0.0030	3.5404195 - 1	3.4118096	1.5677963	1.3743220 3
0.0040	3.2633753 - 1	3.3127650	1.5667963	1.3642736 3
0.0050	3.0209368 - 1	3.2120773	1.5657963	1.3543670 3
0.0060	2.8112190 - 1	3.1096705	1.5647963	1.3445989 3
0.0070	2.6322606 - 1	3.0057227	1.5637963	1.3349661 3
0.0080	2.4820317 - 1	2.9006786	1.5627963	1.3254647 3
0.0090	2.3584134 - 1	2.7952392	1.5617963	1.3160909 3
0.0100	2.2591950 - 1	2.6903054	1.5607963	1.3068406 3
0.0120	2.1246435 - 1	2.4860822	1.5587963	1.2886954 3
0.0150	2.0468765 - 1	2.2079078	1.5557963	1.2623103 3
0.0200	2.1087312 - 1	1.8485696	1.5507963	1.2203378 3
0.0250	2.2620037 - 1	1.6062279	1.5457963	1.1805854 3
0.0300	2.4277994 - 1	1.4424426	1.5407963	1.1428039 3
0.0400	2.7109447 - 1	1.2447830	1.5307963	1.0724503 3
0.0500	2.9132795 - 1	1.1355335	1.5207963	1.0082107 3
0.0650	3.0988396 - 1	1.0484609	1.5057963	9.2176798 2
0.0800	3.1878405 - 1	1.0085637	1.4907963	8.4566114 2
0.1000	3.2116255 - 1	9.9457164 - 1	1.4707963	7.5787071 2
0.1500	3.0326746 - 1	1.0588666	1.4207963	5.9120543 2
0.2000	2.7410978 - 1	1.1972160	1.3707963	4.7678510 2
0.3000	2.2472829 - 1	1.5734341	1.2707963	3.3479623 2
0.4000	1.9984975 - 1	1.9678088	1.1707963	2.5187906 2
0.6000	1.8531303 - 1	2.5702834	9.7079630 - 1	1.5902204 2

Table 60. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) and the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1501 f = 10 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	3.0112796 - 1	4.2609074	1.5702963	1.2433895 3
0.0010	2.8298564 - 1	4.1928077	1.5697963	1.2381675 3
0.0020	2.5069936 - 1	4.0556583	1.5687963	1.2278386 3
0.0030	2.2350105 - 1	3.9160756	1.5677963	1.2176623 3
0.0040	2.0104309 - 1	3.7732516	1.5667963	1.2076369 3
0.0050	1.8294781 - 1	3.6272629	1.5657963	1.1977599 3
0.0060	1.6881865 - 1	3.4792170	1.5647963	1.1880278 3
0.0070	1.5823660 - 1	3.3311879	1.5637963	1.1784374 3
0.0080	1.5075749 - 1	3.1859100	1.5627963	1.1689853 3
0.0090	1.4591793 - 1	3.0462633	1.5617963	1.1596669 3
0.0100	1.4325376 - 1	2.9147376	1.5607963	1.1504788 3
0.0120	1.4273171 - 1	2.6821293	1.5587963	1.1324770 3
0.0150	1.4889121 - 1	2.4122171	1.5557963	1.1063547 3
0.0200	1.6486837 - 1	2.1236877	1.5507963	1.0649462 3
0.0250	1.8017526 - 1	1.9536938	1.5457963	1.0259098 3
0.0300	1.9276093 - 1	1.8466980	1.5407963	9.8899038 2
0.0400	2.1032708 - 1	1.7283149	1.5307963	9.2076906 2
0.0500	2.2049570 - 1	1.6749739	1.5207963	8.5914709 2
0.0650	2.2709249 - 1	1.6553686	1.5057963	7.7737068 2
0.0800	2.2740368 - 1	1.6770965	1.4907963	7.0657786 2
0.1000	2.2251321 - 1	1.7454715	1.4707963	6.2644905 2
0.1500	2.0248975 - 1	2.0302046	1.4207963	4.7915900 2
0.2000	1.8779823 - 1	2.3908322	1.3707963	3.8174547 2
0.3000	1.8698207 - 1	3.0845315	1.2707963	2.6471062 2
0.4000	2.0572703 - 1	3.6054918	1.1707963	1.9802951 2
0.6000	2.5395481 - 1	4.2578185	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	2.6554831 - 1	4.4255347	1.5702963	1.4000780 3
0.0010	2.4989164 - 1	4.3563666	1.5697963	1.3948535 3
0.0020	2.2209810 - 1	4.2172709	1.5687963	1.3845147 3
0.0030	1.9877792 - 1	4.0761824	1.5677963	1.3743220 3
0.0040	1.7961305 - 1	3.9325507	1.5667963	1.3642736 3
0.0050	1.6425406 - 1	3.7867085	1.5657963	1.3543670 3
0.0060	1.5233200 - 1	3.6399408	1.5647963	1.3445989 3
0.0070	1.4345860 - 1	3.4943530	1.5637963	1.3349661 3
0.0080	1.3722812 - 1	3.3525156	1.5627963	1.3254647 3
0.0090	1.3322667 - 1	3.2169942	1.5617963	1.3160909 3
0.0100	1.3104969 - 1	3.0898870	1.5607963	1.3068406 3
0.0120	1.3070398 - 1	2.8656663	1.5587963	1.2886954 3
0.0150	1.3597303 - 1	2.6048667	1.5557963	1.2623103 3
0.0200	1.4959540 - 1	2.3231609	1.5507963	1.2203378 3
0.0250	1.6276159 - 1	2.1548911	1.5457963	1.1805854 3
0.0300	1.7371526 - 1	2.0477399	1.5407963	1.1428039 3
0.0400	1.8935377 - 1	1.9271726	1.5307963	1.0724503 3
0.0500	1.9887424 - 1	1.8707255	1.5207963	1.0082107 3
0.0650	2.0599645 - 1	1.8456141	1.5057963	9.2176798 2
0.0800	2.0790557 - 1	1.8610599	1.4907963	8.4566114 2
0.1000	2.0597515 - 1	1.9200139	1.4707963	7.5787071 2
0.1500	1.9383135 - 1	2.1767689	1.4207963	5.9120543 2
0.2000	1.8474945 - 1	2.5055177	1.3707963	4.7678510 2
0.3000	1.8810469 - 1	3.1451657	1.2707963	3.3479623 2
0.4000	2.0726566 - 1	3.6374411	1.1707963	2.5187906 2
0.6000	2.5499856 - 1	4.2686239	9.7079630 - 1	1.5902204 2

Table 61. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) and the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2335 f = 10 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	3.6697651 - 1	3.9654737	1.5702963	1.2433895 3
0.0010	3.4471322 - 1	3.8977541	1.5697963	1.2381675 3
0.0020	3.0506054 - 1	3.7613011	1.5687963	1.2278386 3
0.0030	2.7161215 - 1	3.6222649	1.5677963	1.2176623 3
0.0040	2.4394890 - 1	3.4797463	1.5667963	1.2076369 3
0.0050	2.2161763 - 1	3.3337261	1.5657963	1.1977599 3
0.0060	2.0414449 - 1	3.1852334	1.5647963	1.1880278 3
0.0070	1.9102890 - 1	3.0363176	1.5637963	1.1784374 3
0.0080	1.8173759 - 1	2.8897536	1.5627963	1.1689853 3
0.0090	1.7571007 - 1	2.7485266	1.5617963	1.1596669 3
0.0100	3.4405661 - 1	3.8997900	1.5697963	1.1504788 3
0.0120	1.7238030 - 1	2.6152682	1.5607963	1.1324770 3
0.0150	1.7931498 - 1	2.1052440	1.5557963	1.1063547 3
0.0200	1.9912556 - 1	1.8125398	1.5507963	1.0649462 3
0.0250	2.1812029 - 1	1.6397308	1.5457963	1.0259098 3
0.0300	2.3376968 - 1	1.5301194	1.5407963	9.8899038 2
0.0400	2.5574704 - 1	1.4057926	1.5307963	9.2076906 2
0.0500	2.6867258 - 1	1.3450668	1.5207963	8.5914709 2
0.0650	2.7742924 - 1	1.3115933	1.5057963	7.7737068 2
0.0800	2.7832876 - 1	1.3163743	1.4907963	7.0657786 2
0.1000	2.7253217 - 1	1.3581309	1.4707963	6.2644905 2
0.1500	2.4462187 - 1	1.5649354	1.4207963	4.7915900 2
0.2000	2.1768103 - 1	1.8527309	1.3707963	3.8174547 2
0.3000	1.9336788 - 1	2.4798191	1.2707963	2.6471062 2
0.4000	1.9640671 - 1	2.9996079	1.1707963	1.9802951 2
0.6000	2.2007462 - 1	3.6828005	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	3.2839067 - 1	4.0850441	1.5702963	1.4000780 3
0.0010	3.0887001 - 1	4.0166671	1.5697963	1.3948535 3
0.0020	2.7415636 - 1	3.8791328	1.5687963	1.3845147 3
0.0030	2.4494540 - 1	3.7394759	1.5677963	1.3743220 3
0.0040	2.2085187 - 1	3.5970050	1.5667963	1.3642736 3
0.0050	2.0145531 - 1	3.4518902	1.5657963	1.3543670 3
0.0060	1.8631484 - 1	3.3052711	1.5647963	1.3445989 3
0.0070	1.7496739 - 1	3.1591681	1.5637963	1.3349661 3
0.0080	1.6692688 - 1	3.0161664	1.5627963	1.3254647 3
0.0090	1.6169262 - 1	2.8789407	1.5617963	1.3160909 3
0.0100	1.5876925 - 1	2.7497651	1.5607963	1.3068406 3
0.0120	1.5803485 - 1	2.5210410	1.5587963	1.2886954 3
0.0150	1.6437553 - 1	2.2542787	1.5557963	1.2623103 3
0.0200	1.8126673 - 1	1.9660676	1.5507963	1.2203378 3
0.0250	1.9769666 - 1	1.7937552	1.5457963	1.1805854 3
0.0300	2.1139120 - 1	1.6834186	1.5407963	1.1428039 3
0.0400	2.3097411 - 1	1.5567317	1.5307963	1.0724503 3
0.0500	2.4291826 - 1	1.4933645	1.5207963	1.0082107 3
0.0650	2.5183312 - 1	1.4557241	1.5057963	9.2176798 2
0.0800	2.5406796 - 1	1.4561133	1.4907963	8.4566114 2
0.1000	2.5101580 - 1	1.4916955	1.4707963	7.5787071 2
0.1500	2.3110158 - 1	1.6817370	1.4207963	5.9120543 2
0.2000	2.1066780 - 1	1.9507743	1.3707963	4.7678510 2
0.3000	1.9265674 - 1	2.5389521	1.2707963	3.3479623 2
0.4000	1.9700786 - 1	3.0322232	1.1707963	2.5187906 2
0.6000	2.2060262 - 1	3.6945851	9.7079630 - 1	1.5902204 2

Table 62. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0100 f = 0.42826552 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	1.6442242 - 1	9.6598276 - 1	1.5702963	1.2433895 3
0.0010	1.2349996 - 1	5.9625614 - 1	1.5697963	1.2381675 3
0.0020	9.4756125 - 2	6.0892502	1.5687963	1.2278386 3
0.0030	1.0313893 - 1	5.5362594	1.5677963	1.2176623 3
0.0040	1.1882837 - 1	5.2356043	1.5667963	1.2076369 3
0.0050	1.3321751 - 1	5.0615933	1.5657963	1.1977599 3
0.0060	1.4514258 - 1	4.9500909	1.5647963	1.1880278 3
0.0070	1.5488814 - 1	4.8728634	1.5637963	1.1784374 3
0.0080	1.6290776 - 1	4.8163089	1.5627963	1.1689853 3
0.0090	1.6958890 - 1	4.7731793	1.5617963	1.1596669 3
0.0100	1.7522891 - 1	4.7392752	1.5607963	1.1504788 3
0.0120	1.8422114 - 1	4.6896519	1.5587963	1.1324770 3
0.0150	1.9395265 - 1	4.6422515	1.5557963	1.1063547 3
0.0200	2.0471487 - 1	4.5995209	1.5507963	1.0649462 3
0.0250	2.1204119 - 1	4.5793623	1.5457963	1.0259098 3
0.0300	2.1765981 - 1	4.5713761	1.5407963	9.8899038 2
0.0400	2.2657279 - 1	4.5761591	1.5307963	9.2076906 2
0.0500	2.3433723 - 1	4.5975508	1.5207963	8.5914709 2
0.0650	2.4581561 - 1	4.6478946	1.5057963	7.7737068 2
0.0800	2.5801995 - 1	4.7111879	1.4907963	7.0657786 2
0.1000	2.7586730 - 1	4.8051927	1.4707963	6.2644905 2
0.1500	3.2667779 - 1	5.0401129	1.4207963	4.7915900 2
0.2000	3.8041980 - 1	5.2365100	1.3707963	3.8174547 2
0.3000	4.7769273 - 1	5.5051805	1.2707963	2.6471062 2
0.4000	6.5318570 - 1	5.8407578	9.7079630 - 1	1.9802951 2
0.6000	5.5339275 - 1	5.6666943	1.1707963	1.2445355 2
		h_3 = 90 kilometers		
0.0005	1.8660277 - 1	1.2106809	1.5702963	1.4000780 3
0.0010	1.3987987 - 1	8.4295970 - 1	1.5697963	1.3948535 3
0.0020	1.0662726 - 1	5.1855900 - 2	1.5687963	1.3845147 3
0.0030	1.1588506 - 1	5.7773188	1.5677963	1.3743220 3
0.0040	1.3364844 - 1	5.4741532	1.5667963	1.3642736 3
0.0050	1.4998043 - 1	5.2989873	1.5657963	1.3543670 3
0.0060	1.6352048 - 1	5.1868468	1.5647963	1.3445989 3
0.0070	1.7458379 - 1	5.1091788	1.5637963	1.3349661 3
0.0080	1.8368353 - 1	5.0522600	1.5627963	1.3254647 3
0.0090	1.9126006 - 1	5.0087936	1.5617963	1.3160909 3
0.0100	1.9765057 - 1	4.9745511	1.5607963	1.3068406 3
0.0120	2.0782415 - 1	4.9242098	1.5587963	1.2886954 3
0.0150	2.1879637 - 1	4.8755661	1.5557963	1.2623103 3
0.0200	2.3083203 - 1	4.8302365	1.5507963	1.2203378 3
0.0250	2.3890111 - 1	4.8068178	1.5457963	1.1805854 3
0.0300	2.4496798 - 1	4.7949471	1.5407963	1.1428039 3
0.0400	2.5427622 - 1	4.7903008	1.5307963	1.0724503 3
0.0500	2.6203602 - 1	4.8004637	1.5207963	1.0082107 3
0.0650	2.7304464 - 1	4.8317413	1.5057963	9.2176798 2
0.0800	2.8439243 - 1	4.8747929	1.4907963	8.4566114 2
0.1000	3.0067902 - 1	4.9423052	1.4707963	7.5787071 2
0.1500	3.4658618 - 1	5.1235130	1.4207963	5.9120543 2
0.2000	3.9550216 - 1	5.2866371	1.3707963	4.7678510 2
0.3000	4.8595371 - 1	5.5251024	1.2707963	3.3479623 2
0.4000	5.5801760 - 1	5.6758869	1.1707963	2.5187906 2
0.6000	6.5483375 - 1	5.8434246	9.7079630 - 1	1.5902204 2

Table 63. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0200 f = 0.85653105 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	1.3593754 - 1	2.0178840 - 1	1.5702963	1.2433895	3
0.0010	1.0973550 - 1	6.2254275	1.5697963	1.2381675	3
0.0020	8.1178885 - 2	5.6563494	1.5687963	1.2278386	3
0.0030	7.5790885 - 2	5.1281614	1.5677963	1.2176623	3
0.0040	8.1322760 - 2	4.7541613	1.5667963	1.2076369	3
0.0050	8.9823755 - 2	4.5130750	1.5657963	1.1977599	3
0.0060	9.8289220 - 2	4.3534846	1.5647963	1.1880278	3
0.0070	1.0589294 - 1	4.2421048	1.5637963	1.1784374	3
0.0080	1.1251750 - 1	4.1605380	1.5627963	1.1689853	3
0.0090	1.1824864 - 1	4.0984557	1.5617963	1.1596669	3
0.0100	1.2321574 - 1	4.0497590	1.5607963	1.1504788	3
0.0120	1.3133783 - 1	3.9786510	1.5587963	1.1324770	3
0.0150	1.4032962 - 1	3.9108290	1.5557963	1.1063547	3
0.0200	1.5033620 - 1	3.8494557	1.5507963	1.0649462	3
0.0250	1.5699465 - 1	3.8199752	1.5457963	1.0259098	3
0.0300	1.6187154 - 1	3.8075885	1.5407963	9.8899038	2
0.0400	1.6895078 - 1	3.8118680	1.5307963	9.2076906	2
0.0500	1.7441648 - 1	3.8394764	1.5207963	8.5914709	2
0.0650	1.8173421 - 1	3.9070207	1.5057963	7.7737068	2
0.0800	1.8918704 - 1	3.9938914	1.4907963	7.0657786	2
0.1000	2.0026705 - 1	4.1254968	1.4707963	6.2644905	2
0.1500	2.3506708 - 1	4.4637551	1.4207963	4.7915900	2
0.2000	2.7715315 - 1	4.7527788	1.3707963	3.8174547	2
0.3000	3.6463290 - 1	5.1503463	1.2707963	2.6471062	2
0.4000	4.4101344 - 1	5.3877755	1.1707963	1.9802951	2
0.6000	5.5096915 - 1	5.6410671	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	1.4543531 - 1	5.4389227 - 1	1.5702963	1.4000780	3
0.0010	1.1677723 - 1	2.8439610 - 1	1.5697963	1.3948535	3
0.0020	8.5463075 - 2	5.9907848	1.5687963	1.3845147	3
0.0030	7.9742585 - 2	5.4493121	1.5677963	1.3743220	3
0.0040	8.6102595 - 2	5.0681060	1.5667963	1.3642736	3
0.0050	9.5641485 - 2	4.8249459	1.5657963	1.3543670	3
0.0060	1.0505459 - 1	4.6651488	1.5647963	1.3445989	3
0.0070	1.1346693 - 1	4.5540668	1.5637963	1.3349661	3
0.0080	1.2077286 - 1	4.4728599	1.5627963	1.3254647	3
0.0090	1.2708052 - 1	4.4110732	1.5617963	1.3160909	3
0.0100	1.3253953 - 1	4.3625677	1.5607963	1.3068406	3
0.0120	1.4145449 - 1	4.2915445	1.5587963	1.2886954	3
0.0150	1.5131427 - 1	4.2232201	1.5557963	1.2623103	3
0.0200	1.6228783 - 1	4.1597653	1.5507963	1.2203378	3
0.0250	1.6960260 - 1	4.1270309	1.5457963	1.1805854	3
0.0300	1.7497399 - 1	4.1104391	1.5407963	1.1428039	3
0.0400	1.8279527 - 1	4.1039638	1.5307963	1.0724503	3
0.0500	1.8882841 - 1	4.1182941	1.5207963	1.0082107	3
0.0650	1.9679671 - 1	4.1626007	1.5057963	9.2176798	2
0.0800	2.0468753 - 1	4.2240219	1.4907963	8.4566114	2
0.1000	2.1601123 - 1	4.3211929	1.4707963	7.5787071	2
0.1500	2.4988113 - 1	4.5858305	1.4207963	5.9120543	2
0.2000	2.8975440 - 1	4.8268521	1.3707963	4.7678510	2
0.3000	3.7262503 - 1	5.1797052	1.2707963	3.3479623	2
0.4000	4.4588134 - 1	5.4012125	1.1707963	2.5187906	2
0.6000	5.5286350 - 1	5.6449236	9.7079630 - 1	1.5902204	2

Table 64. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0500 f = 2.1413276 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	1.6353732 - 1	5.2637219	1.5702963	1.2433895	3
0.0010	1.4348733 - 1	5.1067357	1.5697963	1.2381675	3
0.0020	1.1416568 - 1	4.7803803	1.5687963	1.2278386	3
0.0030	9.7192075 - 2	4.4437549	1.5677963	1.2176623	3
0.0040	8.9691935 - 2	4.1229288	1.5667963	1.2076369	3
0.0050	8.8518460 - 2	3.8459328	1.5657963	1.1977599	3
0.0060	9.0933345 - 2	3.6232867	1.5647963	1.1880278	3
0.0070	9.5067155 - 2	3.4498282	1.5637963	1.1784374	3
0.0080	9.9845880 - 2	3.3150705	1.5627963	1.1689853	3
0.0090	1.0471379 - 1	3.2092105	1.5617963	1.1596669	3
0.0100	1.0940476 - 1	3.1247133	1.5607963	1.1504788	3
0.0120	1.1787338 - 1	2.9996408	1.5587963	1.1324770	3
0.0150	1.2816629 - 1	2.8785199	1.5557963	1.1063547	3
0.0200	1.4032091 - 1	2.7651302	1.5507963	1.0649462	3
0.0250	1.4841649 - 1	2.7051142	1.5457963	1.0259098	3
0.0300	1.5402124 - 1	2.6726542	1.5407963	9.8899038	2
0.0400	1.6090074 - 1	2.6524272	1.5307963	9.2076906	2
0.0500	1.6455675 - 1	2.6664781	1.5207963	8.5914709	2
0.0650	1.6709570 - 1	2.7251677	1.5057963	7.7737068	2
0.0800	1.6809060 - 1	2.8131227	1.4907963	7.0657786	2
0.1000	1.6898946 - 1	2.9591214	1.4707963	6.2644905	2
0.1500	1.7595272 - 1	3.3825478	1.4207963	4.7915900	2
0.2000	1.9246862 - 1	3.7896377	1.3707963	3.8174547	2
0.3000	2.4368965 - 1	4.4040478	1.2707963	2.6471062	2
0.4000	3.0163566 - 1	4.7916582	1.1707963	1.9802951	2
0.6000	4.0277199 - 1	5.2118334	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	1.4850260 - 1	5.5819589	1.5702963	1.4000780	3
0.0010	1.3020553 - 1	5.4195324	1.5697963	1.3948535	3
0.0020	1.0387693 - 1	5.0806887	1.5687963	1.3845147	3
0.0030	8.9276980 - 2	4.7331709	1.5677963	1.3743220	3
0.0040	8.3512290 - 2	4.4078210	1.5667963	1.3642736	3
0.0050	8.3433165 - 2	4.1329176	1.5657963	1.3543670	3
0.0060	8.6419130 - 2	3.9156359	1.5647963	1.3445989	3
0.0070	9.0773615 - 2	3.7480125	1.5637963	1.3349661	3
0.0080	9.5566365 - 2	3.6183678	1.5627963	1.3254647	3
0.0090	1.0033627 - 1	3.5166554	1.5617963	1.3160909	3
0.0100	1.0487368 - 1	3.4354228	1.5607963	1.3068406	3
0.0120	1.1298262 - 1	3.3148928	1.5587963	1.2886954	3
0.0150	1.2277318 - 1	3.1974783	1.5557963	1.2623103	3
0.0200	1.3435081 - 1	3.0861879	1.5507963	1.2203378	3
0.0250	1.4216514 - 1	3.0258228	1.5457963	1.1805854	3
0.0300	1.4770992 - 1	2.9916636	1.5407963	1.1428039	3
0.0400	1.5492944 - 1	2.9654688	1.5307963	1.0724503	3
0.0500	1.5933147 - 1	2.9710725	1.5207963	1.0082107	3
0.0650	1.6341896 - 1	3.0136183	1.5057963	9.2176798	2
0.0800	1.6617945 - 1	3.0823326	1.4907963	8.4566114	2
0.1000	1.6938338 - 1	3.1996930	1.4707963	7.5787071	2
0.1500	1.8040651 - 1	3.5503639	1.4207963	5.9120543	2
0.2000	1.9842891 - 1	3.8998178	1.3707963	4.7678510	2
0.3000	2.4917799 - 1	4.4512924	1.2707963	3.3479623	2
0.4000	3.0566933 - 1	4.8138197	1.1707963	2.5187906	2
0.6000	4.0467770 - 1	5.2182275	9.7079630 - 1	1.5902204	2

Table 65. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1000 f = 4.2826552 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	2.3801554 - 1	4.5553173	1.5702963	1.2433895	3
0.0010	2.1681999 - 1	4.4495495	1.5697963	1.2381675	3
0.0020	1.8188324 - 1	4.2341636	1.5687963	1.2278386	3
0.0030	1.5603141 - 1	4.0116631	1.5677963	1.2176623	3
0.0040	1.3811189 - 1	3.7841462	1.5667963	1.2076369	3
0.0050	1.2686365 - 1	3.5588789	1.5657963	1.1977599	3
0.0060	1.2092473 - 1	3.3457456	1.5647963	1.1880278	3
0.0070	1.1892376 - 1	3.1531291	1.5637963	1.1784374	3
0.0080	1.1963095 - 1	2.9852436	1.5627963	1.1689853	3
0.0090	1.2206613 - 1	2.8422147	1.5617963	1.1596669	3
0.0100	1.2551963 - 1	2.7216723	1.5607963	1.1504788	3
0.0120	1.3373009 - 1	2.5348161	1.5587963	1.1324770	3
0.0150	1.4617498 - 1	2.3469899	1.5557963	1.1063547	3
0.0200	1.6329732 - 1	2.1658973	1.5507963	1.0649462	3
0.0250	1.7573511 - 1	2.0650240	1.5457963	1.0259098	3
0.0300	1.8466327 - 1	2.0043581	1.5407963	9.8899038	2
0.0400	1.9564917 - 1	1.9448887	1.5307963	9.2076906	2
0.0500	2.0099085 - 1	1.9296832	1.5207963	8.5914709	2
0.0650	2.0310830 - 1	1.9516760	1.5057963	7.7737068	2
0.0800	2.0132714 - 1	2.0071729	1.4907963	7.0657786	2
0.1000	1.9618886 - 1	2.1154934	1.4707963	6.2644905	2
0.1500	1.8288639 - 1	2.4837500	1.4207963	4.7915900	2
0.2000	1.7890866 - 1	2.8954418	1.3707963	3.8174547	2
0.3000	1.9685531 - 1	3.6035078	1.2707963	2.6471062	2
0.4000	2.2983248 - 1	4.0984636	1.1707963	1.9802951	2
0.6000	3.0117725 - 1	4.6806167	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	2.0861478 - 1	4.7704834	1.5702963	1.4000780	3
0.0010	1.9041461 - 1	4.6621754	1.5697963	1.3948535	3
0.0020	1.6061722 - 1	4.4421053	1.5687963	1.3845147	3
0.0030	1.3883866 - 1	4.2163840	1.5677963	1.3743220	3
0.0040	1.2399870 - 1	3.9882771	1.5667963	1.3642736	3
0.0050	1.1490763 - 1	3.7656196	1.5657963	1.3543670	3
0.0060	1.1030672 - 1	3.5577474	1.5647963	1.3445989	3
0.0070	1.0897477 - 1	3.3717120	1.5637963	1.3349661	3
0.0080	1.0985574 - 1	3.2104190	1.5627963	1.3254647	3
0.0090	1.1213118 - 1	3.0732148	1.5617963	1.3160909	3
0.0100	1.1521916 - 1	2.9574531	1.5607963	1.3068406	3
0.0120	1.2241165 - 1	2.7772800	1.5587963	1.2886954	3
0.0150	1.3321916 - 1	2.5946503	1.5557963	1.2623103	3
0.0200	1.4811482 - 1	2.4164299	1.5507963	1.2203378	3
0.0250	1.5904740 - 1	2.3157599	1.5457963	1.1805854	3
0.0300	1.6702952 - 1	2.2542685	1.5407963	1.1428039	3
0.0400	1.7725985 - 1	2.1917332	1.5307963	1.0724503	3
0.0500	1.8282644 - 1	2.1723221	1.5207963	1.0082107	3
0.0650	1.8635992 - 1	2.1864219	1.5057963	9.2176798	2
0.0800	1.8671266 - 1	2.2324066	1.4907963	8.4566114	2
0.1000	1.8485436 - 1	2.3258931	1.4707963	7.5787071	2
0.1500	1.7893982 - 1	2.6498317	1.4207963	5.9120543	2
0.2000	1.7926915 - 1	3.0161718	1.3707963	4.7678510	2
0.3000	1.9955435 - 1	3.6618624	1.2707963	3.3479623	2
0.4000	2.3234269 - 1	4.1279414	1.1707963	2.5187906	2
0.6000	3.0265868 - 1	4.6898132	9.7079630 - 1	1.5902204	2

Table 66. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2000 f = 8.5653105 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j Miles	
		h_3 = 70 kilometers			
0.0005	3.4177859 - 1	4.0575547	1.5702963	1.2433895	3
0.0010	3.1951908 - 1	3.9842747	1.5697963	1.2381675	3
0.0020	2.8029758 - 1	3.8364279	1.5687963	1.2278386	3
0.0030	2.4777813 - 1	3.6854210	1.5677963	1.2176623	3
0.0040	2.2145360 - 1	3.5303549	1.5667963	1.2076369	3
0.0050	2.0077939 - 1	3.3715984	1.5657963	1.1977599	3
0.0060	1.8518290 - 1	3.2109428	1.5647963	1.1880278	3
0.0070	1.7405397 - 1	3.0514176	1.5637963	1.1784374	3
0.0080	1.6674416 - 1	2.8966955	1.5627963	1.1689853	3
0.0090	1.6258569 - 1	2.7502803	1.5617963	1.1596669	3
0.0100	1.6092922 - 1	2.6148106	1.5607963	1.1504788	3
0.0120	1.6283913 - 1	2.3814205	1.5587963	1.1324770	3
0.0150	1.7254543 - 1	2.1199412	1.5557963	1.1063547	3
0.0200	1.9288783 - 1	1.8486882	1.5507963	1.0649462	3
0.0250	2.1097916 - 1	1.6909638	1.5457963	1.0259098	3
0.0300	2.2538861 - 1	1.5917167	1.5407963	9.8899038	2
0.0400	2.4502983 - 1	1.4808251	1.5307963	9.2076906	2
0.0500	2.5614537 - 1	1.4291077	1.5207963	8.5914709	2
0.0650	2.6305579 - 1	1.4060673	1.5057963	7.7737068	2
0.0800	2.6286997 - 1	1.4200397	1.4907963	7.0657786	2
0.1000	2.5645680 - 1	1.4737697	1.4707963	6.2644905	2
0.1500	2.2972574 - 1	1.7117493	1.4207963	4.7915900	2
0.2000	2.0624947 - 1	2.0293678	1.3707963	3.8174547	2
0.3000	1.8999801 - 1	2.6900566	1.2707963	2.6471062	2
0.4000	1.9868018 - 1	3.2158171	1.1707963	1.9802951	2
0.6000	2.3071445 - 1	3.8952686	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	3.0419321 - 1	4.1917770	1.5702963	1.4000780	3
0.0010	2.8480014 - 1	4.1176716	1.5697963	1.3948535	3
0.0020	2.5069739 - 1	3.9684550	1.5687963	1.3845147	3
0.0030	2.2251098 - 1	3.8166625	1.5677963	1.3743220	3
0.0040	1.9977543 - 1	3.6616770	1.5667963	1.3642736	3
0.0050	1.8198569 - 1	3.5041091	1.5657963	1.3543670	3
0.0060	1.6860987 - 1	3.3458545	1.5647963	1.3445989	3
0.0070	1.5908754 - 1	3.1898294	1.5637963	1.3349661	3
0.0080	1.5283452 - 1	3.0393747	1.5627963	1.3254647	3
0.0090	1.4926286 - 1	2.8975471	1.5617963	1.3160909	3
0.0100	1.4781321 - 1	2.7665476	1.5607963	1.3068406	3
0.0120	1.4934424 - 1	2.5406583	1.5587963	1.2886954	3
0.0150	1.5749775 - 1	2.2859974	1.5557963	1.2623103	3
0.0200	1.7484042 - 1	2.0186003	1.5507963	1.2203378	3
0.0250	1.9046323 - 1	1.8611261	1.5457963	1.1805854	3
0.0300	2.0305480 - 1	1.7610593	1.5407963	1.1428039	3
0.0400	2.2057135 - 1	1.6476932	1.5307963	1.0724503	3
0.0500	2.3093429 - 1	1.5931762	1.5207963	1.0082107	3
0.0650	2.3827820 - 1	1.5656101	1.5057963	9.2176798	2
0.0800	2.3964154 - 1	1.5746972	1.4907963	8.4566114	2
0.1000	2.3618394 - 1	1.6214021	1.4707963	7.5787071	2
0.1500	2.1767009 - 1	1.8395658	1.4207963	5.9120543	2
0.2000	2.0056920 - 1	2.1344167	1.3707963	4.7678510	2
0.3000	1.8997239 - 1	2.7503673	1.2707963	3.3479623	2
0.4000	1.9961416 - 1	3.2484455	1.1707963	2.5187906	2
0.6000	2.3142495 - 1	3.9068399	9.7079630 - 1	1.5902204	2

Table 67. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 1.0000 f = 42.826552 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	5.5993240 - 1	3.1606849	1.5702963	1.2433895	3
0.0010	5.4283210 - 1	3.1278453	1.5697963	1.2381675	3
0.0020	5.1038375 - 1	3.0620418	1.5687963	1.2278386	3
0.0030	4.8024110 - 1	2.9958860	1.5677963	1.2176623	3
0.0040	4.5235505 - 1	2.9291749	1.5667963	1.2076369	3
0.0050	4.2666636 - 1	2.8617314	1.5657963	1.1977599	3
0.0060	4.0310833 - 1	2.7934147	1.5647963	1.1880278	3
0.0070	3.8161080 - 1	2.7241262	1.5637963	1.1784374	3
0.0080	3.6210055 - 1	2.6538201	1.5627963	1.1689853	3
0.0090	3.4450217 - 1	2.5825067	1.5617963	1.1596669	3
0.0100	3.2873893 - 1	2.5102624	1.5607963	1.1504788	3
0.0120	3.0239864 - 1	2.3636138	1.5587963	1.1324770	3
0.0150	2.7457582 - 1	2.1422186	1.5557963	1.1063547	3
0.0200	2.5308301 - 1	1.7929726	1.5507963	1.0649462	3
0.0250	2.5214389 - 1	1.4996847	1.5457963	1.0259098	3
0.0300	2.6168096 - 1	1.2723434	1.5407963	9.8899038	2
0.0400	2.8996513 - 1	9.7081496 - 1	1.5307963	9.2076906	2
0.0500	3.1660899 - 1	7.9149715 - 1	1.5207963	8.5914709	2
0.0650	3.4593202 - 1	6.3327400 - 1	1.5057963	7.7737068	2
0.0800	3.6369754 - 1	5.4051762 - 1	1.4907963	7.0657786	2
0.1000	3.7439585 - 1	4.6675562 - 1	1.4707963	6.2644905	2
0.1500	3.6454886 - 1	3.9072395 - 1	1.4207963	4.7915900	2
0.2000	3.3200310 - 1	3.8046942 - 1	1.3707963	3.8174547	2
0.3000	2.5670268 - 1	4.4252644 - 1	1.2707963	2.6471062	2
0.4000	1.9543700 - 1	5.6566036 - 1	1.1707963	1.9802951	2
0.6000	1.2395280 - 1	8.8718383 - 1	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	5.2105255 - 1	3.1605307	1.5702963	1.4000780	3
0.0010	5.0533610 - 1	3.1275248	1.5697963	1.3948535	3
0.0020	4.7552425 - 1	3.0614167	1.5687963	1.3845147	3
0.0030	4.4784546 - 1	2.9950047	1.5677963	1.3743220	3
0.0040	4.2225354 - 1	2.9280983	1.5667963	1.3642736	3
0.0050	3.9869195 - 1	2.8605352	1.5657963	1.3543670	3
0.0060	3.7709788 - 1	2.7921888	1.5647963	1.3445989	3
0.0070	3.5740454 - 1	2.7229764	1.5637963	1.3349661	3
0.0080	3.3954268 - 1	2.6528656	1.5627963	1.3254647	3
0.0090	3.2343990 - 1	2.5818813	1.5617963	1.3160909	3
0.0100	3.0902339 - 1	2.5101081	1.5607963	1.3068406	3
0.0120	2.8494385 - 1	2.3648470	1.5587963	1.2886954	3
0.0150	2.5949775 - 1	2.1465552	1.5557963	1.2623103	3
0.0200	2.3969351 - 1	1.8038188	1.5507963	1.2203378	3
0.0250	2.3853479 - 1	1.5160876	1.5457963	1.1805854	3
0.0300	2.4695382 - 1	1.2921384	1.5407963	1.1428039	3
0.0400	2.7250440 - 1	9.9293489 - 1	1.5307963	1.0724503	3
0.0500	2.9694173 - 1	8.1360066 - 1	1.5207963	1.0082107	3
0.0650	3.2430779 - 1	6.5444406 - 1	1.5057963	9.2176798	2
0.0800	3.4137715 - 1	5.6067864 - 1	1.4907963	8.4566114	2
0.1000	3.5240860 - 1	4.8574801 - 1	1.4707963	7.5787071	2
0.1500	3.4618829 - 1	4.0758536 - 1	1.4207963	5.9120543	2
0.2000	3.1799246 - 1	3.9593828 - 1	1.3707963	4.7678510	2
0.3000	2.4923513 - 1	4.5623193 - 1	1.2707963	3.3479623	2
0.4000	1.9160526 - 1	5.7774838 - 1	1.1707963	2.5187906	2
0.6000	1.2289413 - 1	8.9481412 - 1	9.7079630 - 1	1.5902204	2

Table 68. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 2.0000 f = 85.653105 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	5.2311740 - 1	2.7766235	1.5702963	1.2433895 3
0.0010	5.1199835 - 1	2.7531825	1.5697963	1.2381675 3
0.0020	4.9056081 - 1	2.7062763	1.5687963	1.2278386 3
0.0030	4.7018439 - 1	2.6592763	1.5677963	1.2176623 3
0.0040	4.5085709 - 1	2.6121120	1.5667963	1.2076369 3
0.0050	4.3256319 - 1	2.5647192	1.5657963	1.1977599 3
0.0060	4.1528494 - 1	2.5170415	1.5647963	1.1880278 3
0.0070	3.9900139 - 1	2.4690297	1.5637963	1.1784374 3
0.0080	3.8369066 - 1	2.4206450	1.5627963	1.1689853 3
0.0090	3.6932976 - 1	2.3718599	1.5617963	1.1596669 3
0.0100	3.5589448 - 1	2.3226584	1.5607963	1.1504788 3
0.0120	3.3170107 - 1	2.2230095	1.5587963	1.1324770 3
0.0150	3.0171357 - 1	2.0708168	1.5557963	1.1063547 3
0.0200	2.6669408 - 1	1.8142854	1.5507963	1.0649462 3
0.0250	2.4709771 - 1	1.5654421	1.5457963	1.0259098 3
0.0300	2.3892141 - 1	1.3379411	1.5407963	9.8899038 2
0.0400	2.4245791 - 1	9.7379513 - 1	1.5307963	9.2076906 2
0.0500	2.5649696 - 1	7.2120633 - 1	1.5207963	8.5914709 2
0.0650	2.7850137 - 1	4.7669254 - 1	1.5057963	7.7737068 2
0.0800	2.9467974 - 1	3.2054341 - 1	1.4907963	7.0657786 2
0.1000	3.0616013 - 1	1.8077521 - 1	1.4707963	6.2644905 2
0.1500	3.0029549 - 1	6.2547461	1.4207963	4.7915900 2
0.2000	2.7031133 - 1	6.1198005	1.3707963	3.8174547 2
0.3000	1.9585461 - 1	5.9212018	1.2707963	2.6471062 2
0.4000	1.3151052 - 1	5.7648999	1.1707963	1.9802951 2
0.6000	4.9168725 - 2	5.5740401	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	4.8196792 - 1	2.7168098	1.5702963	1.4000780 3
0.0010	4.7192008 - 1	2.6932124	1.5697963	1.3948535 3
0.0020	4.5255537 - 1	2.6460186	1.5687963	1.3845147 3
0.0030	4.3415894 - 1	2.5987680	1.5677963	1.3743220 3
0.0040	4.1671932 - 1	2.5513974	1.5667963	1.3642736 3
0.0050	4.0022160 - 1	2.5038486	1.5657963	1.3543670 3
0.0060	3.8464839 - 1	2.4560718	1.5647963	1.3445989 3
0.0070	3.6998072 - 1	2.4080250	1.5637963	1.3349661 3
0.0080	3.5619753 - 1	2.3596774	1.5627963	1.3254647 3
0.0090	3.4327679 - 1	2.3110070	1.5617963	1.3160909 3
0.0100	3.3119585 - 1	2.2620060	1.5607963	1.3068406 3
0.0120	3.0945783 - 1	2.1630359	1.5587963	1.2886954 3
0.0150	2.8253947 - 1	2.0126183	1.5557963	1.2623103 3
0.0200	2.5109935 - 1	1.7610192	1.5507963	1.2203378 3
0.0250	2.3340003 - 1	1.5187501	1.5457963	1.1805854 3
0.0300	2.2582817 - 1	1.2979367	1.5407963	1.1428039 3
0.0400	2.2841058 - 1	9.4351678 - 1	1.5307963	1.0724503 3
0.0500	2.4060558 - 1	6.9557810 - 1	1.5207963	1.0082107 3
0.0650	2.6027858 - 1	4.5355964 - 1	1.5057963	9.2176798 2
0.0800	2.7516064 - 1	2.9831071 - 1	1.4907963	8.4566114 2
0.1000	2.8625263 - 1	1.5940414 - 1	1.4707963	7.5787071 2
0.1500	2.8289187 - 1	6.2360174	1.4207963	5.9120543 2
0.2000	2.5672032 - 1	6.1039487	1.3707963	4.7678510 2
0.3000	1.8832406 - 1	5.9101026	1.2707963	3.3479623 2
0.4000	1.2741149 - 1	5.7572481	1.1707963	2.5187906 2
0.6000	4.7936796 - 2	5.5736467	9.7079630 - 1	1.5902204 2

Table 69. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg Cj) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 5.0000 f = 214.13276 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	4.0031303 - 1	2.2122308	1.5702963	1.2433895 3
0.0010	3.8497352 - 1	2.1631139	1.5697963	1.2381675 3
0.0020	3.5672916 - 1	2.0649651	1.5687963	1.2278386 3
0.0030	3.3163991 - 1	1.9666905	1.5677963	1.2176623 3
0.0040	3.0956570 - 1	1.8681296	1.5667963	1.2076369 3
0.0050	2.9034240 - 1	1.7692834	1.5657963	1.1977599 3
0.0060	2.7379016 - 1	1.6703228	1.5647963	1.1880278 3
0.0070	2.5971985 - 1	1.5715861	1.5637963	1.1784374 3
0.0080	2.4793455 - 1	1.4735553	1.5627963	1.1689853 3
0.0090	2.3823354 - 1	1.3768188	1.5617963	1.1596669 3
0.0100	2.3041327 - 1	1.2820179	1.5607963	1.1504788 3
0.0120	2.1960841 - 1	1.1007403	1.5587963	1.1324770 3
0.0150	2.1264160 - 1	8.5688508 - 1	1.5557963	1.1063547 3
0.0200	2.1540090 - 1	5.3621693 - 1	1.5507963	1.0649462 3
0.0250	2.2552456 - 1	3.0817107 - 1	1.5457963	1.0259098 3
0.0300	2.3709818 - 1	1.4454802 - 1	1.5407963	9.8899038 2
0.0400	2.5721888 - 1	6.2125827	1.5307963	9.2076906 2
0.0500	2.7112674 - 1	6.0759966	1.5207963	8.5914709 2
0.0650	2.8205366 - 1	5.9381822	1.5057963	7.7737068 2
0.0800	2.8439289 - 1	5.8381241	1.4907963	7.0657786 2
0.1000	2.7876623 - 1	5.7306589	1.4707963	6.2644905 2
0.1500	2.4256992 - 1	5.5043075	1.4207963	4.7915900 2
0.2000	1.9645660 - 1	5.2881673	1.3707963	3.8174547 2
0.3000	1.1312075 - 1	4.8366937	1.2707963	2.6471062 2
0.4000	5.3964585 - 2	4.3795450	1.1707963	1.9802951 2
0.6000	7.2967105 - 3	3.9832254	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	3.5684011 - 1	2.0577634	1.5702963	1.4000780 3
0.0010	3.4384606 - 1	2.0079813	1.5697963	1.3948535 3
0.0020	3.1997347 - 1	1.9088077	1.5687963	1.3845147 3
0.0030	2.9883523 - 1	1.8100008	1.5677963	1.3743220 3
0.0040	2.8029917 - 1	1.7114981	1.5667963	1.3642736 3
0.0050	2.6421025 - 1	1.6133801	1.5657963	1.3543670 3
0.0060	2.5040009 - 1	1.5158729	1.5647963	1.3445989 3
0.0070	2.3869224 - 1	1.4193316	1.5637963	1.3349661 3
0.0080	2.2890569 - 1	1.3242111	1.5627963	1.3254647 3
0.0090	2.2085704 - 1	1.2310199	1.5617963	1.3160909 3
0.0100	2.1436555 - 1	1.1402879	1.5607963	1.3068406 3
0.0120	2.0535173 - 1	9.6812364 - 1	1.5587963	1.2886954 3
0.0150	1.9935284 - 1	7.3817178 - 1	1.5557963	1.2623103 3
0.0200	2.0104680 - 1	4.3544915 - 1	1.5507963	1.2203378 3
0.0250	2.0887657 - 1	2.1769202 - 1	1.5457963	1.1805854 3
0.0300	2.1807846 - 1	5.9460610 - 2	1.5407963	1.1428039 3
0.0400	2.3442140 - 1	6.1319576	1.5307963	1.0724503 3
0.0500	2.4596375 - 1	5.9971233	1.5207963	1.0082107 3
0.0650	2.5530274 - 1	5.8611284	1.5057963	9.2176798 2
0.0800	2.5758657 - 1	5.7630738	1.4907963	8.4566114 2
0.1000	2.5325627 - 1	5.6587592	1.4707963	7.5787071 2
0.1500	2.2278798 - 1	5.4411320	1.4207963	5.9120543 2
0.2000	1.8227461 - 1	5.2328732	1.3707963	4.7678510 2
0.3000	1.0615337 - 1	4.7933691	1.2707963	3.3479623 2
0.4000	5.0697230 - 2	4.3504330	1.1707963	2.5187906 2
0.6000	6.9430885 - 3	3.9847346	9.7079630 - 1	1.5902204 2

Table 70. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0100 f = 0.66622256 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	1.7511855 - 1	1.0344734	1.5702963	1.2433895 3
0.0010	1.3722766 - 1	7.4802207 - 1	1.5697963	1.2381675 3
0.0020	9.9292340 - 2	1.0934717 - 1	1.5687963	1.2278386 3
0.0030	9.5981125 - 2	5.8262211	1.5677963	1.2176623 3
0.0040	1.0629750 - 1	5.4585190	1.5667963	1.2076369 3
0.0050	1.1898701 - 1	5.2340700	1.5657963	1.1977599 3
0.0060	1.3071555 - 1	5.0890900	1.5647963	1.1880278 3
0.0070	1.4085529 - 1	4.9889747	1.5637963	1.1784374 3
0.0080	1.4948905 - 1	4.9159977	1.5627963	1.1689853 3
0.0090	1.5684783 - 1	4.8605621	1.5617963	1.1596669 3
0.0100	1.6316133 - 1	4.8171031	1.5607963	1.1504788 3
0.0120	1.7339142 - 1	4.7536028	1.5587963	1.1324770 3
0.0150	1.8464431 - 1	4.6928147	1.5557963	1.1063547 3
0.0200	1.9722064 - 1	4.6371014	1.5507963	1.0649462 3
0.0250	2.0577696 - 1	4.6093062	1.5457963	1.0259098 3
0.0300	2.1227276 - 1	4.5962778	1.5407963	9.8899038 2
0.0400	2.2234039 - 1	4.5948012	1.5307963	9.2076906 2
0.0500	2.3082158 - 1	4.6124545	1.5207963	8.5914709 2
0.0650	2.4296693 - 1	4.6593566	1.5057963	7.7737068 2
0.0800	2.5558238 - 1	4.7205031	1.4907963	7.0657786 2
0.1000	2.7377418 - 1	4.8126514	1.4707963	6.2644905 2
0.1500	3.2501160 - 1	5.0451042	1.4207963	4.7915900 2
0.2000	3.7895496 - 1	5.2402733	1.3707963	3.8174547 2
0.3000	4.7645190 - 1	5.5077214	1.2707963	2.6471062 2
0.4000	6.5229725 - 1	5.8420978	9.7079630 - 1	1.9802951 2
0.6000	5.5230085 - 1	5.6686286	1.1707963	1.2445355 2
		h_3 = 90 kilometers		
0.0005	1.9878443 - 1	1.2787476	1.5702963	1.4000780 3
0.0010	1.5558197 - 1	9.9399218 - 1	1.5697963	1.3948535 3
0.0020	1.1199725 - 1	3.5652776 - 1	1.5687963	1.3845147 3
0.0030	1.0786645 - 1	6.0698884	1.5677963	1.3743220 3
0.0040	1.1944944 - 1	5.6987900	1.5667963	1.3642736 3
0.0050	1.3382346 - 1	5.4724688	1.5657963	1.3543670 3
0.0060	1.4713172 - 1	5.3264541	1.5647963	1.3445989 3
0.0070	1.5864061 - 1	5.2256794	1.5637963	1.3349661 3
0.0080	1.6843814 - 1	5.1522105	1.5627963	1.3254647 3
0.0090	1.7678540 - 1	5.0963594	1.5617963	1.3160909 3
0.0100	1.8394226 - 1	5.0525111	1.5607963	1.3068406 3
0.0120	1.9552477 - 1	4.9882342	1.5587963	1.2886954 3
0.0150	2.0822926 - 1	4.9261632	1.5557963	1.2623103 3
0.0200	2.2233174 - 1	4.8678275	1.5507963	1.2203378 3
0.0250	2.3180368 - 1	4.8367648	1.5457963	1.1805854 3
0.0300	2.3887238 - 1	4.8198496	1.5407963	1.1428039 3
0.0400	2.4950262 - 1	4.8089434	1.5307963	1.0724503 3
0.0500	2.5808668 - 1	4.8153691	1.5207963	1.0082107 3
0.0650	2.6986756 - 1	4.8432069	1.5057963	9.2176798 2
0.0800	2.8169634 - 1	4.8841128	1.4907963	8.4566114 2
0.1000	2.9839132 - 1	4.9497688	1.4707963	7.5787071 2
0.1500	3.4481613 - 1	5.1285081	1.4207963	5.9120543 2
0.2000	3.9397820 - 1	5.2904026	1.3707963	4.7678510 2
0.3000	4.8469119 - 1	5.5276439	1.2707963	3.3479623 2
0.4000	5.5691655 - 1	5.6778214	1.1707963	2.5187906 2
0.6000	6.5394305 - 1	5.8447647	9.7079630 - 1	1.5902204 2

Table 71. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0200 f = 1.332425 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	1.4219680 - 1	2.5114971 - 1	1.5702963	1.2433895	3
0.0010	1.1907815 - 1	4.7495870 - 2	1.5697963	1.2381675	3
0.0020	8.9076515 - 2	5.8867163	1.5687963	1.2278386	3
0.0030	7.6914815 - 2	5.4278503	1.5677963	1.2176623	3
0.0040	7.6399865 - 2	5.0376529	1.5667963	1.2076369	3
0.0050	8.1396935 - 2	4.7520662	1.5657963	1.1977599	3
0.0060	8.8177900 - 2	4.5518948	1.5647963	1.1880278	3
0.0070	9.5104225 - 2	4.4092555	1.5637963	1.1784374	3
0.0080	1.0157948 - 1	4.3041677	1.5627963	1.1689853	3
0.0090	1.0743541 - 1	4.2241356	1.5617963	1.1596669	3
0.0100	1.1266726 - 1	4.1614232	1.5607963	1.1504782	3
0.0120	1.2148203 - 1	4.0699780	1.5587963	1.1324770	3
0.0150	1.3154750 - 1	3.9826796	1.5557963	1.1063547	3
0.0200	1.4303706 - 1	3.9026206	1.5507963	1.0649462	3
0.0250	1.5079185 - 1	3.8622407	1.5457963	1.0259098	3
0.0300	1.5648733 - 1	3.8426874	1.5407963	9.8899038	2
0.0400	1.6468600 - 1	3.8380895	1.5307963	9.2076906	2
0.0500	1.7086945 - 1	3.8603992	1.5207963	8.5914709	2
0.0650	1.7887017 - 1	3.9230618	1.5057963	7.7737068	2
0.0800	1.8674971 - 1	4.0068847	1.4907963	7.0657786	2
0.1000	1.9818683 - 1	4.1358552	1.4707963	6.2644905	2
0.1500	2.3340784 - 1	4.4706363	1.4207963	4.7915900	2
0.2000	2.7566166 - 1	4.7579581	1.3707963	3.8174547	2
0.3000	3.6329430 - 1	5.1538568	1.2707963	2.6471062	2
0.4000	4.3977834 - 1	5.3904612	1.1707963	1.9802951	2
0.6000	5.4990375 - 1	5.6429410	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	1.5226997 - 1	5.9305017 - 1	1.5702963	1.4000780	3
0.0010	1.2700568 - 1	3.8985458 - 1	1.5697963	1.3948535	3
0.0020	9.4119915 - 2	6.2255666	1.5687963	1.3845147	3
0.0030	8.0833450 - 2	5.7566269	1.5677963	1.3743220	3
0.0040	8.0473040 - 2	5.3566005	1.5667963	1.3642736	3
0.0050	8.6187830 - 2	5.0658330	1.5657963	1.3543670	3
0.0060	9.3805070 - 2	4.8637370	1.5647963	1.3445989	3
0.0070	1.0152249 - 1	4.7206081	1.5637963	1.3349661	3
0.0080	1.0870186 - 1	4.6155491	1.5627963	1.3254647	3
0.0090	1.1517371 - 1	4.5356924	1.5617963	1.3160909	3
0.0100	1.2094293 - 1	4.4731486	1.5607963	1.3068406	3
0.0120	1.3064255 - 1	4.3818521	1.5587963	1.2886954	3
0.0150	1.4169744 - 1	4.2942015	1.5557963	1.2623103	3
0.0200	1.5430606 - 1	4.2122673	1.5507963	1.2203378	3
0.0250	1.6282347 - 1	4.1687739	1.5457963	1.1805854	3
0.0300	1.6909057 - 1	4.1451142	1.5407963	1.1428039	3
0.0400	1.7813459 - 1	4.1298900	1.5307963	1.0724503	3
0.0500	1.8495126 - 1	4.1390021	1.5207963	1.0082107	3
0.0650	1.9366662 - 1	4.1785040	1.5057963	9.2176798	2
0.0800	2.0202722 - 1	4.2369265	1.4907963	8.4566114	2
0.1000	2.1374946 - 1	4.3315039	1.4707963	7.5787071	2
0.1500	2.4810802 - 1	4.5927064	1.4207963	5.9120543	2
0.2000	2.8819054 - 1	4.8320343	1.3707963	4.7678510	2
0.3000	3.7125601 - 1	5.1832178	1.2707963	3.3479623	2
0.4000	4.4463232 - 1	5.4038991	1.1707963	2.5187906	2
0.6000	5.5179445 - 1	5.6467978	9.7079630 - 1	1.5902204	2

Table 72. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0500 f = 3.3311126 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	1.6796985 - 1	5.2944844	1.5702963	1.2433895 3
0.0010	1.5097986 - 1	5.1694221	1.5697963	1.2381675 3
0.0020	1.2416579 - 1	4.9118914	1.5687963	1.2278386 3
0.0030	1.0594163 - 1	4.6442544	1.5677963	1.2176623 3
0.0040	9.4954290 - 2	4.3752495	1.5667963	1.2076369 3
0.0050	8.9644855 - 2	4.1207236	1.5657963	1.1977599 3
0.0060	8.8376075 - 2	3.8949338	1.5647963	1.1880278 3
0.0070	8.9689995 - 2	3.7041725	1.5637963	1.1784374 3
0.0080	9.2487400 - 2	3.5472781	1.5627963	1.1689853 3
0.0090	9.6037170 - 2	3.4193922	1.5617963	1.1596669 3
0.0100	9.9891895 - 2	3.3149347	1.5607963	1.1504788 3
0.0120	1.0759706 - 1	3.1574673	1.5587963	1.1324770 3
0.0150	1.1787187 - 1	3.0028450	1.5557963	1.1063547 3
0.0200	1.3092018 - 1	2.8564531	1.5507963	1.0649462 3
0.0250	1.4005764 - 1	2.7772518	1.5457963	1.0259098 3
0.0300	1.4659038 - 1	2.7322931	1.5407963	9.8899038 2
0.0400	1.5491390 - 1	2.6967394	1.5307963	9.2076906 2
0.0500	1.5959757 - 1	2.7017173	1.5207963	8.5914709 2
0.0650	1.6319544 - 1	2.7520723	1.5057963	7.7737068 2
0.0800	1.6490021 - 1	2.8348077	1.4907963	7.0657786 2
0.1000	1.6642850 - 1	2.9762461	1.4707963	6.2644905 2
0.1500	1.7416998 - 1	3.3935033	1.4207963	4.7915900 2
0.2000	1.9096918 - 1	3.7975587	1.3707963	3.8174547 2
0.3000	2.4233513 - 1	4.4092265	1.2707963	2.6471062 2
0.4000	3.0031622 - 1	4.7956337	1.1707963	1.9802951 2
0.6000	4.0152933 - 1	5.2146761	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	1.5256544 - 1	5.6137001	1.5702963	1.4000780 3
0.0010	1.3702564 - 1	5.4844672	1.5697963	1.3948535 3
0.0020	1.1276848 - 1	5.2172481	1.5687963	1.3845147 3
0.0030	9.6691420 - 2	4.9396092	1.5677963	1.3743220 3
0.0040	8.7456390 - 2	4.6630592	1.5667963	1.3642736 3
0.0050	8.3482955 - 2	4.4055269	1.5657963	1.3543670 3
0.0060	8.3135860 - 2	4.1810322	1.5647963	1.3445989 3
0.0070	8.5015290 - 2	3.9940932	1.5637963	1.3349661 3
0.0080	8.8111230 - 2	3.8418418	1.5627963	1.3254647 3
0.0090	9.1778260 - 2	3.7184442	1.5617963	1.3160909 3
0.0100	9.5635275 - 2	3.6179190	1.5607963	1.3068406 3
0.0120	1.0316703 - 1	3.4664547	1.5587963	1.2886954 3
0.0150	1.1304586 - 1	3.3172330	1.5557963	1.2623103 3
0.0200	1.2552249 - 1	3.1745474	1.5507963	1.2203378 3
0.0250	1.3432495 - 1	3.0958281	1.5457963	1.1805854 3
0.0300	1.4073473 - 1	3.0496522	1.5407963	1.1428039 3
0.0400	1.4928383 - 1	3.0086463	1.5307963	1.0724503 3
0.0500	1.5462225 - 1	3.0054403	1.5207963	1.0082107 3
0.0650	1.5966670 - 1	3.0398678	1.5057963	9.2176798 2
0.0800	1.6306509 - 1	3.1034919	1.4907963	8.4566114 2
0.1000	1.6683468 - 1	3.2164132	1.4707963	7.5787071 2
0.1500	1.7857044 - 1	3.5611251	1.4207963	5.9120543 2
0.2000	1.9687054 - 1	3.9076645	1.3707963	4.7678510 2
0.3000	2.4778668 - 1	4.4564677	1.2707963	3.3479623 2
0.4000	3.0432995 - 1	4.8177978	1.1707963	2.5187906 2
0.6000	4.0342884 - 1	5.2210711	9.7079630 - 1	1.5902204 2

Table 73. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1000 f = 6.6622252 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	2.4252418 - 1	4.5762166	1.5702963	1.2433895 3
0.0010	2.2491249 - 1	4.4916001	1.5697963	1.2381675 3
0.0020	1.9457871 - 1	4.3204070	1.5687963	1.2278386 3
0.0030	1.7035832 - 1	4.1449793	1.5677963	1.2176623 3
0.0040	1.5168785 - 1	3.9650152	1.5667963	1.2076369 3
0.0050	1.3795660 - 1	3.7824721	1.5657963	1.1977599 3
0.0060	1.2850836 - 1	3.6014030	1.5647963	1.1880278 3
0.0070	1.2264226 - 1	3.4269752	1.5637963	1.1784374 3
0.0080	1.1964098 - 1	3.2640205	1.5627963	1.1689853 3
0.0090	1.1882147 - 1	3.1158644	1.5617963	1.1596669 3
0.0100	1.1958418 - 1	2.9839300	1.5607963	1.1504788 3
0.0120	1.2401257 - 1	2.7670067	1.5587963	1.1324770 3
0.0150	1.3364715 - 1	2.5361398	1.5557963	1.1063547 3
0.0200	1.4973505 - 1	2.3053918	1.5507963	1.0649462 3
0.0250	1.6271976 - 1	2.1743955	1.5457963	1.0259098 3
0.0300	1.7259484 - 1	2.0941581	1.5407963	9.8899038 2
0.0400	1.8550709 - 1	2.0110596	1.5307963	9.2076906 2
0.0500	1.9244680 - 1	1.9821457	1.5207963	8.5914709 2
0.0650	1.9636966 - 1	1.9917663	1.5057963	7.7737068 2
0.0800	1.9589037 - 1	2.0396339	1.4907963	7.0657786 2
0.1000	1.9198424 - 1	2.1413559	1.4707963	6.2644905 2
0.1500	1.8038112 - 1	2.5005743	1.4207963	4.7915900 2
0.2000	1.7712875 - 1	2.9074082	1.3707963	3.8174547 2
0.3000	1.9549035 - 1	3.6106303	1.2707963	2.6471062 2
0.4000	2.2851783 - 1	4.1036287	1.1707963	1.9802951 2
0.6000	2.9987607 - 1	4.6843302	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	2.1249505 - 1	4.7918875	1.5702963	1.4000780 3
0.0010	1.9735518 - 1	4.7052266	1.5697963	1.3948535 3
0.0020	1.7140935 - 1	4.5300919	1.5687963	1.3845147 3
0.0030	1.5087132 - 1	4.3513533	1.5677963	1.3743220 3
0.0040	1.3521824 - 1	4.1693342	1.5667963	1.3642736 3
0.0050	1.2387459 - 1	3.9865645	1.5657963	1.3543670 3
0.0060	1.1622102 - 1	3.8073415	1.5647963	1.3445989 3
0.0070	1.1160773 - 1	3.6365975	1.5637963	1.3349661 3
0.0080	1.0938877 - 1	3.4785312	1.5627963	1.3254647 3
0.0090	1.0896804 - 1	3.3357260	1.5617963	1.3160909 3
0.0100	1.0983668 - 1	3.2089921	1.5607963	1.3068406 3
0.0120	1.1391231 - 1	3.0007763	1.5587963	1.2886954 3
0.0150	1.2239304 - 1	2.7781732	1.5557963	1.2623103 3
0.0200	1.3642138 - 1	2.5532083	1.5507963	1.2203378 3
0.0250	1.4780808 - 1	2.4236832	1.5457963	1.1805854 3
0.0300	1.5658397 - 1	2.3432139	1.5407963	1.1428039 3
0.0400	1.6843457 - 1	2.2575145	1.5307963	1.0724503 3
0.0500	1.7534614 - 1	2.2245356	1.5207963	1.0082107 3
0.0650	1.8039744 - 1	2.2263041	1.5057963	9.2176798 2
0.0800	1.8184324 - 1	2.2646404	1.4907963	8.4566114 2
0.1000	1.8101944 - 1	2.3514847	1.4707963	7.5787071 2
0.1500	1.7654012 - 1	2.6663366	1.4207963	5.9120543 2
0.2000	1.7749580 - 1	3.0278924	1.3707963	4.7678510 2
0.3000	1.9816093 - 1	3.6689175	1.2707963	3.3479623 2
0.4000	2.3100724 - 1	4.1330966	1.1707963	2.5187906 2
0.6000	3.0134974 - 1	4.6935287	9.7079630 - 1	1.5902204 2

Table 74. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2000 f = 13.324450 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	3.4640400 - 1	4.0720714	1.5702963	1.2433895	3
0.0010	3.2812390 - 1	4.0133695	1.5697963	1.2381675	3
0.0020	2.9500683 - 1	3.8953859	1.5687963	1.2278386	3
0.0030	2.6631425 - 1	3.7757778	1.5677963	1.2176623	3
0.0040	2.4180230 - 1	3.6538120	1.5667963	1.2076369	3
0.0050	2.2120164 - 1	3.5292049	1.5657963	1.1977599	3
0.0060	2.0423051 - 1	3.4022195	1.5647963	1.1880278	3
0.0070	1.9059511 - 1	3.2737197	1.5637963	1.1784374	3
0.0080	1.7998731 - 1	3.1451184	1.5627963	1.1689853	3
0.0090	1.7208103 - 1	3.0182170	1.5617963	1.1596669	3
0.0100	1.6653623 - 1	2.8949490	1.5607963	1.1504788	3
0.0120	1.6115607 - 1	2.6660848	1.5587963	1.1324770	3
0.0150	1.6267152 - 1	2.3808906	1.5557963	1.1063547	3
0.0200	1.7622911 - 1	2.0540237	1.5507963	1.0649462	3
0.0250	1.9226821 - 1	1.8533757	1.5457963	1.0259098	3
0.0300	2.0658093 - 1	1.7245302	1.5407963	9.8899038	2
0.0400	2.2786615 - 1	1.5775799	1.5307963	9.2076906	2
0.0500	2.4106019 - 1	1.5052302	1.5207963	8.5914709	2
0.0650	2.5072846 - 1	1.4639252	1.5057963	7.7737068	2
0.0800	2.5272644 - 1	1.4668554	1.4907963	7.0657786	2
0.1000	2.4851830 - 1	1.5112238	1.4707963	6.2644905	2
0.1500	2.2514098 - 1	1.7368469	1.4207963	4.7915900	2
0.2000	2.0336237 - 1	2.0479456	1.3707963	3.8174547	2
0.3000	1.8838904 - 1	2.7010751	1.2707963	2.6471062	2
0.4000	1.9733914 - 1	3.2230497	1.1707963	1.9802951	2
0.6000	2.2941760 - 1	3.8999101	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	3.0822604 - 1	4.2064644	1.5702963	1.4000780	3
0.0010	2.9229433 - 1	4.1470849	1.5697963	1.3948535	3
0.0020	2.6347606 - 1	4.0278970	1.5687963	1.3845147	3
0.0030	2.3856739 - 1	3.9073898	1.5677963	1.3743220	3
0.0040	2.1734565 - 1	3.7849715	1.5667963	1.3642736	3
0.0050	1.9956236 - 1	3.6605034	1.5657963	1.3543670	3
0.0060	1.8495583 - 1	3.5343705	1.5647963	1.3445989	3
0.0070	1.7325357 - 1	3.4074999	1.5637963	1.3349661	3
0.0080	1.6417091 - 1	3.2812808	1.5627963	1.3254647	3
0.0090	1.5741077 - 1	3.1573981	1.5617963	1.3160909	3
0.0100	1.5266955 - 1	3.0375811	1.5607963	1.3068406	3
0.0120	1.4804146 - 1	2.8159795	1.5587963	1.2886954	3
0.0150	1.4923407 - 1	2.5399262	1.5557963	1.2623103	3
0.0200	1.6068893 - 1	2.2209669	1.5507963	1.2203378	3
0.0250	1.7443971 - 1	2.0226141	1.5457963	1.1805854	3
0.0300	1.8686084 - 1	1.8938362	1.5407963	1.1428039	3
0.0400	2.0568376 - 1	1.7449491	1.5307963	1.0724503	3
0.0500	2.1777709 - 1	1.6698601	1.5207963	1.0082107	3
0.0650	2.2744707 - 1	1.6239455	1.5057963	9.2176798	2
0.0800	2.3066431 - 1	1.6218772	1.4907963	8.4566114	2
0.1000	2.2908752 - 1	1.6590802	1.4707963	7.5787071	2
0.1500	2.1345813 - 1	1.8646132	1.4207963	5.9120543	2
0.2000	1.9783557 - 1	2.1527855	1.3707963	4.7678510	2
0.3000	1.8837023 - 1	2.7612019	1.2707963	3.3479623	2
0.4000	1.9825983 - 1	3.2556088	1.1707963	2.5187906	2
0.6000	2.3012053 - 1	3.9114774	9.7079630 - 1	1.5902204	2

Table 75. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 1.0000 f = 66.622252 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	5.6338640 - 1	3.1672019	1.5702963	1.2433895 3
0.0010	5.4952975 - 1	3.1408844	1.5697963	1.2381675 3
0.0020	5.2294315 - 1	3.0881950	1.5687963	1.2278386 3
0.0030	4.9784626 - 1	3.0353344	1.5677963	1.2176623 3
0.0040	4.7421757 - 1	2.9821916	1.5667963	1.2076369 3
0.0050	4.5203084 - 1	2.9286655	1.5657963	1.1977599 3
0.0060	4.3125467 - 1	2.8746664	1.5647963	1.1880278 3
0.0070	4.1185602 - 1	2.8201191	1.5637963	1.1784374 3
0.0080	3.9379909 - 1	2.7649669	1.5627963	1.1689853 3
0.0090	3.7704674 - 1	2.7091710	1.5617963	1.1596669 3
0.0100	3.6156137 - 1	2.6527179	1.5607963	1.1504788 3
0.0120	3.3423567 - 1	2.5379025	1.5587963	1.1324770 3
0.0150	3.0175294 - 1	2.3618662	1.5557963	1.1063547 3
0.0200	2.6736559 - 1	2.0671806	1.5507963	1.0649462 3
0.0250	2.5234792 - 1	1.7906500	1.5457963	1.0259098 3
0.0300	2.5036103 - 1	1.5510096	1.5407963	9.8899038 2
0.0400	2.6540443 - 1	1.1973777	1.5307963	9.2076906 2
0.0500	2.8732890 - 1	9.7210563 - 1	1.5207963	8.5914709 2
0.0650	3.1613205 - 1	7.6853569 - 1	1.5057963	7.7737068 2
0.0800	3.3599426 - 1	6.4814197 - 1	1.4907963	7.0657786 2
0.1000	3.5030593 - 1	5.5150913 - 1	1.4707963	6.2644905 2
0.1500	3.4826421 - 1	4.4686706 - 1	1.4207963	4.7915900 2
0.2000	3.2096464 - 1	4.2311612 - 1	1.3707963	3.8174547 2
0.3000	2.5147576 - 1	4.7190319 - 1	1.2707963	2.6471062 2
0.4000	1.9287864 - 1	5.8769606 - 1	1.1707963	1.9802951 2
0.6000	1.2308834 - 1	8.9953086 - 1	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	5.2422760 - 1	3.1670817	1.5702963	1.4000780 3
0.0010	5.1149145 - 1	3.1406288	1.5697963	1.3948535 3
0.0020	4.8706207 - 1	3.0876851	1.5687963	1.3845147 3
0.0030	4.6401136 - 1	3.0345978	1.5677963	1.3743220 3
0.0040	4.4231940 - 1	2.9812624	1.5667963	1.3642736 3
0.0050	4.2196045 - 1	2.9275848	1.5657963	1.3543670 3
0.0060	4.0290538 - 1	2.8734822	1.5647963	1.3445989 3
0.0070	3.8512246 - 1	2.8188878	1.5637963	1.3349661 3
0.0080	3.6857826 - 1	2.7637514	1.5627963	1.3254647 3
0.0090	3.5323691 - 1	2.7080439	1.5617963	1.3160909 3
0.0100	3.3906306 - 1	2.6517571	1.5607963	1.3068406 3
0.0120	3.1406813 - 1	2.5375358	1.5587963	1.2886954 3
0.0150	2.8437909 - 1	2.3630958	1.5557963	1.2623103 3
0.0200	2.5293064 - 1	2.0727519	1.5507963	1.2203378 3
0.0250	2.3907984 - 1	1.8014715	1.5457963	1.1805854 3
0.0300	2.3705526 - 1	1.5664023	1.5407963	1.1428039 3
0.0400	2.5043286 - 1	1.2178313	1.5307963	1.0724503 3
0.0500	2.7038712 - 1	9.9396184 - 1	1.5207963	1.0082107 3
0.0650	2.9706798 - 1	7.9016657 - 1	1.5057963	9.2176798 2
0.0800	3.1591674 - 1	6.6890532 - 1	1.4907963	8.4566114 2
0.1000	3.3014199 - 1	5.7107840 - 1	1.4707963	7.5787071 2
0.1500	3.3096648 - 1	4.6411748 - 1	1.4207963	5.9120543 2
0.2000	3.0758626 - 1	4.3882730 - 1	1.3707963	4.7678510 2
0.3000	2.4424929 - 1	4.8565712 - 1	1.2707963	3.3479623 2
0.4000	1.8914204 - 1	5.9971861 - 1	1.1707963	2.5187906 2
0.6000	1.2204191 - 1	9.0707059 - 1	9.7079630 - 1	1.5902204 2

Table 76. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 2.0000 f = 133.24450 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	5.2534630 - 1	2.7812819	1.5702963	1.2433895 3
0.0010	5.1635950 - 1	2.7624967	1.5697963	1.2381675 3
0.0020	4.9889825 - 1	2.7249139	1.5687963	1.2278386 3
0.0030	4.8211805 - 1	2.6872818	1.5677963	1.2176623 3
0.0040	4.6601429 - 1	2.6495631	1.5667963	1.2076369 3
0.0050	4.5058039 - 1	2.6117215	1.5657963	1.1977599 3
0.0060	4.3580922 - 1	2.5737255	1.5647963	1.1880278 3
0.0070	4.2169116 - 1	2.5355444	1.5637963	1.1784374 3
0.0080	4.0821654 - 1	2.4971514	1.5627963	1.1689853 3
0.0090	3.9537475 - 1	2.4585248	1.5617963	1.1596669 3
0.0100	3.8315438 - 1	2.4196461	1.5607963	1.1504788 3
0.0120	3.6053078 - 1	2.3410820	1.5587963	1.1324770 3
0.0150	3.3095003 - 1	2.2211759	1.5557963	1.1063547 3
0.0200	2.9237477 - 1	2.0167299	1.5507963	1.0649462 3
0.0250	2.6564809 - 1	1.8103870	1.5457963	1.0259098 3
0.0300	2.4880004 - 1	1.6090262	1.5407963	9.8899038 2
0.0400	2.3639974 - 1	1.2487830	1.5307963	9.2076906 2
0.0500	2.4008976 - 1	9.6662851 - 1	1.5207963	8.5914709 2
0.0650	2.5523543 - 1	6.7233777 - 1	1.5057963	7.7737068 2
0.0800	2.6999410 - 1	4.7879072 - 1	1.4907963	7.0657786 2
0.1000	2.8283780 - 1	3.0586134 - 1	1.4707963	6.2644905 2
0.1500	2.8351922 - 1	5.4410240 - 2	1.4207963	4.7915900 2
0.2000	2.5904313 - 1	6.1830170	1.3707963	3.8174547 2
0.3000	1.9111705 - 1	5.9655401	1.2707963	2.6471062 2
0.4000	1.2975026 - 1	5.7988260	1.1707963	1.9802951 2
0.6000	4.9016160 - 2	5.5917134	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	4.8398229 - 1	2.7214999	1.5702963	1.4000780 3
0.0010	4.7586076 - 1	2.7025878	1.5697963	1.3948535 3
0.0020	4.6008595 - 1	2.6647670	1.5687963	1.3845147 3
0.0030	4.4493320 - 1	2.6269197	1.5677963	1.3743220 3
0.0040	4.3039798 - 1	2.5890121	1.5667963	1.3642736 3
0.0050	4.1647404 - 1	2.5510115	1.5657963	1.3543670 3
0.0060	4.0315376 - 1	2.5128889	1.5647963	1.3445989 3
0.0070	3.9042907 - 1	2.4746175	1.5637963	1.3349661 3
0.0080	3.7829033 - 1	2.4361751	1.5627963	1.3254647 3
0.0090	3.6672727 - 1	2.3975422	1.5617963	1.3160909 3
0.0100	3.5572942 - 1	2.3587050	1.5607963	1.3068406 3
0.0120	3.3538357 - 1	2.2803800	1.5587963	1.2886954 3
0.0150	3.0881068 - 1	2.1612723	1.5557963	1.2623103 3
0.0200	2.7420090 - 1	1.9594631	1.5507963	1.2203378 3
0.0250	2.5021684 - 1	1.7573310	1.5457963	1.1805854 3
0.0300	2.3503355 - 1	1.5612451	1.5407963	1.1428039 3
0.0400	2.2357071 - 1	1.2115926	1.5307963	1.0724503 3
0.0500	2.2648511 - 1	9.3685758 - 1	1.5207963	1.0082107 3
0.0650	2.3978875 - 1	6.4798389 - 1	1.5057963	9.2176798 2
0.0800	2.5316748 - 1	4.5660404 - 1	1.4907963	8.4566114 2
0.1000	2.6526334 - 1	2.8509924 - 1	1.4707963	7.5787071 2
0.1500	2.6755402 - 1	3.6348920 - 2	1.4207963	5.9120543 2
0.2000	2.4631822 - 1	6.1676374	1.3707963	4.7678510 2
0.3000	1.8391216 - 1	5.9545896	1.2707963	3.3479623 2
0.4000	1.2577456 - 1	5.7911028	1.1707963	2.5187906 2
0.6000	4.7794384 - 2	5.5910805	9.7079630 - 1	1.5902204 2

Table 77. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 5.0000 f = 333.11126 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_2 \rvert$	Arg C_2	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	4.1227652 - 1	2.2489936	1.5702963	1.2433895	3
0.0010	4.0812721 - 1	2.2365453	1.5697963	1.2381675	3
0.0020	3.9997864 - 1	2.2116334	1.5687963	1.2278386	3
0.0030	3.9202975 - 1	2.1866944	1.5677963	1.2176623	3
0.0040	3.8428099 - 1	2.1617221	1.5667963	1.2076369	3
0.0050	3.7673249 - 1	2.1367101	1.5657963	1.1977599	3
0.0060	3.6938349 - 1	2.1116525	1.5647963	1.1880278	3
0.0070	3.6223368 - 1	2.0865435	1.5637963	1.1784374	3
0.0080	3.5528155 - 1	2.0613785	1.5627963	1.1689853	3
0.0090	3.4852640 - 1	2.0361532	1.5617963	1.1596669	3
0.0100	3.4196661 - 1	2.0108630	1.5607963	1.1504788	3
0.0120	3.2942707 - 1	1.9600816	1.5587963	1.1324770	3
0.0150	3.1204030 - 1	1.8833821	1.5557963	1.1063547	3
0.0200	2.8670874 - 1	1.7541991	1.5507963	1.0649462	3
0.0250	2.6565413 - 1	1.6237492	1.5457963	1.0259098	3
0.0300	2.4850581 - 1	1.4929546	1.5407963	9.8899038	2
0.0400	2.2425892 - 1	1.2357851	1.5307963	9.2076906	2
0.0500	2.1045057 - 1	9.9438218 - 1	1.5207963	8.5914709	2
0.0650	2.0196595 - 1	6.7958145 - 1	1.5057963	7.7737068	2
0.0800	2.0047761 - 1	4.2551660 - 1	1.4907963	7.0657786	2
0.1000	2.0083352 - 1	1.6237022 - 1	1.4707963	6.2644905	2
0.1500	1.9196652 - 1	5.9941619	1.4207963	4.7915900	2
0.2000	1.6828378 - 1	5.6611392	1.3707963	3.8174547	2
0.3000	1.0742949 - 1	5.0751307	1.2707963	2.6471062	2
0.4000	5.3519045 - 2	4.5232841	1.1707963	1.9802951	2
0.6000	7.1349755 - 3	4.0425153	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	3.6698621 - 1	2.0950794	1.5702963	1.4000780	3
0.0010	3.6346538 - 1	2.0824392	1.5697963	1.3948535	3
0.0020	3.5655491 - 1	2.0571616	1.5687963	1.3845147	3
0.0030	3.4981948 - 1	2.0318823	1.5677963	1.3743220	3
0.0040	3.4325961 - 1	2.0065979	1.5667963	1.3642736	3
0.0050	3.3687450 - 1	1.9813020	1.5657963	1.3543670	3
0.0060	3.3066346 - 1	1.9559905	1.5647963	1.3445989	3
0.0070	3.2462600 - 1	1.9306599	1.5637963	1.3349661	3
0.0080	3.1876137 - 1	1.9053089	1.5627963	1.3254647	3
0.0090	3.1306718 - 1	1.8799313	1.5617963	1.3160909	3
0.0100	3.0754307 - 1	1.8545285	1.5607963	1.3068406	3
0.0120	2.9699781 - 1	1.8036395	1.5587963	1.2886954	3
0.0150	2.8240847 - 1	1.7271004	1.5557963	1.2623103	3
0.0200	2.6122559 - 1	1.5991333	1.5507963	1.2203378	3
0.0250	2.4368699 - 1	1.4711724	1.5457963	1.1805854	3
0.0300	2.2944375 - 1	1.3441427	1.5407963	1.1428039	3
0.0400	2.0932342 - 1	1.0976767	1.5307963	1.0724503	3
0.0500	1.9777548 - 1	8.6920867 - 1	1.5207963	1.0082107	3
0.0650	1.9040611 - 1	5.7277141 - 1	1.5057963	9.2176798	2
0.0800	1.8876914 - 1	3.3257822 - 1	1.4907963	8.4566114	2
0.1000	1.8859939 - 1	8.1512850 - 2	1.4707963	7.5787071	2
0.1500	1.8010230 - 1	5.9284061	1.4207963	5.9120543	2
0.2000	1.5843136 - 1	5.6033268	1.3707963	4.7678510	2
0.3000	1.0151502 - 1	5.0275851	1.2707963	3.3479623	2
0.4000	5.0366720 - 2	4.4903564	1.1707963	2.5187906	2
0.6000	6.7885665 - 3	4.0433322	9.7079630 - 1	1.5902204	2

Table 78. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg Cj) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.3002 f = 20 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	2.6533839 - 1	4.0944117	1.5702963	1.2433895	3
0.0010	2.4423550 - 1	3.9957923	1.5697963	1.2381675	3
0.0020	2.0791695 - 1	3.7995427	1.5687963	1.2278386	3
0.0030	1.7836031 - 1	3.6046185	1.5677963	1.2176623	3
0.0040	1.5437453 - 1	3.4113240	1.5667963	1.2076369	3
0.0050	1.3491567 - 1	3.2202185	1.5657963	1.1977599	3
0.0060	1.1909265 - 1	3.0319715	1.5647963	1.1880278	3
0.0070	1.0616307 - 1	2.8471914	1.5637963	1.1784374	3
0.0080	9.5524165 - 2	2.6662863	1.5627963	1.1689853	3
0.0090	8.6698165 - 2	2.4893828	1.5617963	1.1596669	3
0.0100	7.9316905 - 2	2.3163054	1.5607963	1.1504788	3
0.0120	6.7859035 - 2	1.9798163	1.5587963	1.1324770	3
0.0150	5.6714300 - 2	1.4914007	1.5557963	1.1063547	3
0.0200	5.0124855 - 2	7.2650433 - 1	1.5507963	1.0649462	3
0.0250	5.4277370 - 2	1.1698126 - 1	1.5457963	1.0259098	3
0.0300	6.3522360 - 2	5.9860773	1.5407963	9.8899038	2
0.0400	8.4007445 - 2	5.5242364	1.5307963	9.2076906	2
0.0500	1.0069916 - 1	5.2915025	1.5207963	8.5914709	2
0.0650	1.1702730 - 1	5.1188826	1.5057963	7.7737068	2
0.0800	1.2506493 - 1	5.0474156	1.4907963	7.0657786	2
0.1000	1.2701984 - 1	5.0336982	1.4707963	6.2644905	2
0.1500	1.1021965 - 1	5.2125956	1.4207963	4.7915900	2
0.2000	8.6337775 - 2	5.5870417	1.3707963	3.8174547	2
0.3000	6.7675255 - 2	4.3732266 - 1	1.2707963	2.6471062	2
0.4000	8.8836080 - 2	1.2957395	1.1707963	1.9802951	2
0.6000	1.3357666 - 1	2.0662384	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	2.2707265 - 1	4.2141574	1.5702963	1.4000780	3
0.0010	2.0975251 - 1	4.1128204	1.5697963	1.3948535	3
0.0020	1.8006437 - 1	3.9117065	1.5687963	1.3845147	3
0.0030	1.5603185 - 1	3.7131161	1.5677963	1.3743220	3
0.0040	1.3661534 - 1	3.5178678	1.5667963	1.3642736	3
0.0050	1.2090535 - 1	3.3269423	1.5657963	1.3543670	3
0.0060	1.0812966 - 1	3.1412767	1.5647963	1.3445989	3
0.0070	9.7651985 - 2	2.9615642	1.5637963	1.3349661	3
0.0080	8.8962340 - 2	2.7881357	1.5627963	1.3254647	3
0.0090	8.1663535 - 2	2.6209366	1.5617963	1.3160909	3
0.0100	7.5455100 - 2	2.4595479	1.5607963	1.3068406	3
0.0120	6.5486605 - 2	2.1513493	1.5587963	1.2886954	3
0.0150	5.4934120 - 2	1.7129397	1.5557963	1.2623103	3
0.0200	4.6251203 - 2	1.0169364	1.5507963	1.2203378	3
0.0250	4.6696255 - 2	4.1282141 - 1	1.5457963	1.1805854	3
0.0300	5.2675670 - 2	6.2533941	1.5407963	1.1428039	3
0.0400	6.8854820 - 2	5.7464935	1.5307963	1.0724503	3
0.0500	8.3072345 - 2	5.4925743	1.5207963	1.0082107	3
0.0650	9.7656880 - 2	5.3047898	1.5057963	9.2176798	2
0.0800	1.0545022 - 1	5.2249542	1.4907963	8.4566114	2
0.1000	1.0846961 - 1	5.2040001	1.4707963	7.5787071	2
0.1500	9.7093205 - 2	5.3746971	1.4207963	5.9120543	2
0.2000	7.9046845 - 2	5.7501638	1.3707963	4.7678510	2
0.3000	6.8509055 - 2	5.5363598 - 1	1.2707963	3.3479623	2
0.4000	9.0770735 - 2	1.3410109	1.1707963	2.5187906	2
0.6000	1.3424824 - 1	2.0779513	9.7079630 - 1	1.5902204	2

Table 79. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.467 f = 20 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	3.3105805 - 1	3.7385426	1.5702963	1.2433895 3
0.0010	3.0418877 - 1	3.6403700	1.5697963	1.2381675 3
0.0020	2.5791258 - 1	3.4445981	1.5687963	1.2278386 3
0.0030	2.2022719 - 1	3.2493977	1.5677963	1.2176623 3
0.0040	1.8964558 - 1	3.0548432	1.5667963	1.2076369 3
0.0050	1.6486441 - 1	2.8613045	1.5657963	1.1977599 3
0.0060	1.4476924 - 1	2.6693353	1.5647963	1.1880278 3
0.0070	1.2842861 - 1	2.4795155	1.5637963	1.1784374 3
0.0080	1.1508220 - 1	2.2923205	1.5627963	1.1689853 3
0.0090	1.0412347 - 1	2.1080141	1.5617963	1.1596669 3
0.0100	9.5081540 - 2	1.9266262	1.5607963	1.1504788 3
0.0120	8.1417295 - 2	1.5718434	1.5587963	1.1324770 3
0.0150	6.9033890 - 2	1.0570634	1.5557963	1.1063547 3
0.0200	6.3947640 - 2	2.7653615 - 1	1.5507963	1.0649462 3
0.0250	7.1477150 - 2	5.9697101	1.5457963	1.0259098 3
0.0300	8.4287885 - 2	5.5756118	1.5407963	9.8899038 2
0.0400	1.1113089 - 1	5.1287872	1.5307963	9.2076906 2
0.0500	1.3293297 - 1	4.8949125	1.5207963	8.5914709 2
0.0650	1.5490362 - 1	4.7100034	1.5057963	7.7737068 2
0.0800	1.6672762 - 1	4.6198712	1.4907963	7.0657786 2
0.1000	1.7165388 - 1	4.5742419	1.4707963	6.2644905 2
0.1500	1.5553399 - 1	4.6411040	1.4207963	4.7915900 2
0.2000	1.2590440 - 1	4.8491373	1.3707963	3.8174547 2
0.3000	7.9906975 - 2	5.5796316	1.2707963	2.6471062 2
0.4000	7.4525715 - 2	1.8457793 - 1	1.1707963	1.9802951 2
0.6000	1.0359002 - 1	1.0972028	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	2.9067103 - 1	3.8117892	1.5702963	1.4000780 3
0.0010	2.6785701 - 1	3.7117515	1.5697963	1.3948535 3
0.0020	2.2865567 - 1	3.5127430	1.5687963	1.3845147 3
0.0030	1.9682375 - 1	3.3153004	1.5677963	1.3743220 3
0.0040	1.7104638 - 1	3.1198998	1.5667963	1.3642736 3
0.0050	1.5017178 - 1	2.9272590	1.5657963	1.3543670 3
0.0060	1.3321889 - 1	2.7381619	1.5647963	1.3445989 3
0.0070	1.1937311 - 1	2.5532824	1.5637963	1.3349661 3
0.0080	1.0797559 - 1	2.3730408	1.5627963	1.3254647 3
0.0090	9.8507365 - 2	2.1975423	1.5617963	1.3160909 3
0.0100	9.0570920 - 2	2.0265699	1.5607963	1.3068406 3
0.0120	7.8189375 - 2	1.6962389	1.5587963	1.2886954 3
0.0150	6.5982870 - 2	1.2212522	1.5557963	1.2623103 3
0.0200	5.8277345 - 2	4.8188268 - 1	1.5507963	1.2203378 3
0.0250	6.2162970 - 2	6.1666944	1.5457963	1.1805854 3
0.0300	7.1923220 - 2	5.7499736	1.5407963	1.1428039 3
0.0400	9.4560885 - 2	5.2740952	1.5307963	1.0724503 3
0.0500	1.1375483 - 1	5.0271135	1.5207963	1.0082107 3
0.0650	1.3369593 - 1	4.8325157	1.5057963	9.2176798 2
0.0800	1.4500216 - 1	4.7366115	1.4907963	8.4566114 2
0.1000	1.5069101 - 1	4.6854111	1.4707963	7.5787071 2
0.1500	1.3950218 - 1	4.7433711	1.4207963	5.9120543 2
0.2000	1.1527603 - 1	4.9484911	1.3707963	4.7678510 2
0.3000	7.7264615 - 2	5.6771868	1.2707963	3.3479623 2
0.4000	7.5270530 - 2	2.4089864 - 1	1.1707963	2.5187906 2
0.6000	1.0410651 - 1	1.1096194	9.7079630 - 1	1.5902204 2

Table 80. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1501 f = 10 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	1.6228006 - 1	4.6882584	1.5702963	1.2433895 3
0.0010	1.4514668 - 1	4.5435164	1.5697963	1.2381675 3
0.0020	1.1778682 - 1	4.2567709	1.5687963	1.2278386 3
0.0030	9.7718310 - 2	3.9759417	1.5677963	1.2176623 3
0.0040	8.2972850 - 2	3.7045096	1.5667963	1.2076369 3
0.0050	7.1993985 - 2	3.4455440	1.5657963	1.1977599 3
0.0060	6.3624200 - 2	3.2006177	1.5647963	1.1880278 3
0.0070	5.7054230 - 2	2.9694737	1.5637963	1.1784374 3
0.0080	5.1751710 - 2	2.7504015	1.5627963	1.1689853 3
0.0090	4.7386852 - 2	2.5408980	1.5617963	1.1596669 3
0.0100	4.3768659 - 2	2.3383299	1.5607963	1.1504788 3
0.0120	3.8418232 - 2	1.9459693	1.5587963	1.1324770 3
0.0150	3.4656528 - 2	1.3850976	1.5557963	1.1063547 3
0.0200	3.7449695 - 2	6.3110825 - 1	1.5507963	1.0649462 3
0.0250	4.5465415 - 2	1.6809511 - 1	1.5457963	1.0259098 3
0.0300	5.4077500 - 2	6.1763280	1.5407963	9.8899038 2
0.0400	6.8199370 - 2	5.8877241	1.5307963	9.2076906 2
0.0500	7.7536040 - 2	5.7550752	1.5207963	8.5914709 2
0.0650	8.4703985 - 2	5.6841667	1.5057963	7.7737068 2
0.0800	8.6381855 - 2	5.6947519	1.4907963	7.0657786 2
0.1000	8.3624795 - 2	5.7849057	1.4707963	6.2644905 2
0.1500	6.8812590 - 2	6.2594258	1.4207963	4.7915900 2
0.2000	6.1227615 - 2	6.8253659 - 1	1.3707963	3.8174547 2
0.3000	8.4131040 - 2	1.8811428	1.2707963	2.6471062 2
0.4000	1.1992628 - 1	2.5246325	1.1707963	1.9802951 2
0.6000	1.7344026 - 1	3.2331951	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	1.3164471 - 1	4.8944173	1.5702963	1.4000780 3
0.0010	1.1845800 - 1	4.7411516	1.5697963	1.3948535 3
0.0020	9.7787820 - 2	4.4387954	1.5687963	1.3845147 3
0.0030	8.3027290 - 2	4.1467159	1.5677963	1.3743220 3
0.0040	7.2433350 - 2	3.8705775	1.5667963	1.3642736 3
0.0050	6.4650005 - 2	3.6141515	1.5657963	1.3543670 3
0.0060	5.8705335 - 2	3.3784109	1.5647963	1.3445989 3
0.0070	5.3954105 - 2	3.1619431	1.5637963	1.3349661 3
0.0080	4.9996202 - 2	2.9619418	1.5627963	1.3254647 3
0.0090	4.6599058 - 2	2.7751252	1.5617963	1.3160909 3
0.0100	4.3636829 - 2	2.5983130	1.5607963	1.3068406 3
0.0120	3.8808194 - 2	2.2644028	1.5587963	1.2886954 3
0.0150	3.4156723 - 2	1.7916985	1.5557963	1.2623103 3
0.0200	3.2953088 - 2	1.0973961	1.5507963	1.2203378 3
0.0250	3.7113899 - 2	6.0439875 - 1	1.5457963	1.1805854 3
0.0300	4.3001810 - 2	2.9200201 - 1	1.5407963	1.1428039 3
0.0400	5.3933450 - 2	6.2421189	1.5307963	1.0724503 3
0.0500	6.1783215 - 2	6.0880873	1.5207963	1.0082107 3
0.0650	6.8489210 - 2	6.0008259	1.5057963	9.2176798 2
0.0800	7.0962840 - 2	6.0024613	1.4907963	8.4566114 2
0.1000	7.0339730 - 2	6.0856745	1.4707963	7.5787071 2
0.1500	6.2712245 - 2	2.6384927 - 1	1.4207963	5.9120543 2
0.2000	6.1446980 - 2	9.1553214 - 1	1.3707963	4.7678510 2
0.3000	8.7553295 - 2	1.9657904	1.2707963	3.3479623 2
0.4000	1.2229357 - 1	2.5608673	1.1707963	2.5187906 2
0.6000	1.7430823 - 1	3.2451086	9.7079630 - 1	1.5902204 2

Table 81. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2335 f = 10 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	2.2075288 - 1	4.2666521	1.5702963	1.2433895 3
0.0010	1.9692076 - 1	4.1263458	1.5697963	1.2381675 3
0.0020	1.5852795 - 1	3.8481268	1.5687963	1.2278386 3
0.0030	1.3000166 - 1	3.5741051	1.5677963	1.2176623 3
0.0040	1.0879071 - 1	3.3063000	1.5667963	1.2076369 3
0.0050	9.2874055 - 2	3.0467928	1.5657963	1.1977599 3
0.0060	8.0732115 - 2	2.7968163	1.5647963	1.1880278 3
0.0070	7.1281355 - 2	2.5562934	1.5637963	1.1784374 3
0.0080	6.3790930 - 2	2.3239379	1.5627963	1.1689853 3
0.0090	5.7795690 - 2	2.0977675	1.5617963	1.1596669 3
0.0100	1.9636390 - 1	4.1288421	1.5697963	1.1504788 3
0.0120	5.3018220 - 2	1.8757837	1.5607963	1.1324770 3
0.0150	4.3647100 - 2	8.2748152 - 1	1.5557963	1.1063547 3
0.0200	5.1058660 - 2	7.0775960 - 2	1.5507963	1.0649462 3
0.0250	6.3819980 - 2	5.9203837	1.5457963	1.0259098 3
0.0300	7.6372305 - 2	5.6637933	1.5407963	9.8899038 2
0.0400	9.6326950 - 2	5.3864858	1.5307963	9.2076906 2
0.0500	1.0953439 - 1	5.2500295	1.5207963	8.5914709 2
0.0650	1.2008514 - 1	5.1610109	1.5057963	7.7737068 2
0.0800	1.2318513 - 1	5.1440883	1.4907963	7.0657786 2
0.1000	1.2025056 - 1	5.1855520	1.4707963	6.2644905 2
0.1500	9.8049960 - 2	5.4818215	1.4207963	4.7915900 2
0.2000	7.5616750 - 2	5.9868373	1.3707963	3.8174547 2
0.3000	7.1249920 - 2	9.8241232 - 1	1.2707963	2.6471062 2
0.4000	1.0055132 - 1	1.7690915	1.1707963	1.9802951 2
0.6000	1.4973615 - 1	2.5132455	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	1.8588649 - 1	4.4134308	1.5702963	1.4000780 3
0.0010	1.6679662 - 1	4.2682492	1.5697963	1.3948535 3
0.0020	1.3630020 - 1	3.9819036	1.5687963	1.3845147 3
0.0030	1.1387802 - 1	3.7033934	1.5677963	1.3743220 3
0.0040	9.7315045 - 2	3.4361052	1.5667963	1.3642736 3
0.0050	8.4876860 - 2	3.1826713	1.5657963	1.3543670 3
0.0060	7.5288735 - 2	2.9440963	1.5647963	1.3445989 3
0.0070	6.7668810 - 2	2.7196437	1.5637963	1.3349661 3
0.0080	6.1441215 - 2	2.5072897	1.5627963	1.3254647 3
0.0090	5.6250910 - 2	2.3043666	1.5617963	1.3160909 3
0.0100	5.1892640 - 2	2.1081301	1.5607963	1.3068406 3
0.0120	4.5292903 - 2	1.7271372	1.5587963	1.2886954 3
0.0150	4.0237482 - 2	1.1763770	1.5557963	1.2623103 3
0.0200	4.2491576 - 2	4.1478475 - 1	1.5507963	1.2203378 3
0.0250	5.1314855 - 2	6.2195015	1.5457963	1.1805854 3
0.0300	6.1161950 - 2	5.9329245	1.5407963	1.1428039 3
0.0400	7.7770070 - 2	5.6268416	1.5307963	1.0724503 3
0.0500	8.9250580 - 2	5.4774997	1.5207963	1.0082107 3
0.0650	9.9019585 - 2	5.3781149	1.5057963	9.2176798 2
0.0800	1.0267740 - 1	5.3546874	1.4907963	8.4566114 2
0.1000	1.0164665 - 1	5.3902167	1.4707963	7.5787071 2
0.1500	8.6163890 - 2	5.6812929	1.4207963	5.9120543 2
0.2000	7.0336305 - 2	6.1856657	1.3707963	4.7678510 2
0.3000	7.3430380 - 2	1.0903498	1.2707963	3.3479623 2
0.4000	1.0277634 - 1	1.8101795	1.1707963	2.5187906 2
0.6000	1.5047816 - 1	2.5250446	9.7079630 - 1	1.5902204 2

Table 82. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0100 f = 0.42826552 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	5.7724405 - 2	2.9264599	1.5702963	1.2433895	3
0.0010	3.0240559 - 2	2.2490910	1.5697963	1.2381675	3
0.0020	1.4735341 - 2	4.1799113 - 1	1.5687963	1.2278386	3
0.0030	2.2256838 - 2	5.5156561	1.5677963	1.2176623	3
0.0040	3.1779552 - 2	4.9933146	1.5667963	1.2076369	3
0.0050	4.0313949 - 2	4.6947925	1.5657963	1.1977599	3
0.0060	4.7664937 - 2	4.4992305	1.5647963	1.1880278	3
0.0070	5.3951070 - 2	4.3607820	1.5637963	1.1784374	3
0.0080	5.9339535 - 2	4.2575886	1.5627963	1.1689853	3
0.0090	6.3987125 - 2	4.1777749	1.5617963	1.1596669	3
0.0100	6.8026240 - 2	4.1143020	1.5607963	1.1504788	3
0.0120	7.4688485 - 2	4.0200851	1.5587963	1.1324770	3
0.0150	8.2202770 - 2	3.9281714	1.5557963	1.1063547	3
0.0200	9.0849165 - 2	3.8421359	1.5507963	1.0649462	3
0.0250	9.6887240 - 2	3.7980247	1.5457963	1.0259098	3
0.0300	1.0155558 - 1	3.7763249	1.5407963	9.8899038	2
0.0400	1.0892845 - 1	3.7703379	1.5307963	9.2076906	2
0.0500	1.1525679 - 1	3.7934108	1.5207963	8.5914709	2
0.0650	1.2447902 - 1	3.8589193	1.5057963	7.7737068	2
0.0800	1.3423650 - 1	3.9459998	1.4907963	7.0657786	2
0.1000	1.4861379 - 1	4.0784916	1.4707963	6.2644905	2
0.1500	1.9108081 - 1	4.4164054	1.4207963	4.7915900	2
0.2000	2.3898933 - 1	4.7034508	1.3707963	3.8174547	2
0.3000	3.3373521 - 1	5.1011708	1.2707963	2.6471062	2
0.4000	5.2918225 - 1	5.6040300	9.7079630 - 1	1.9802951	2
0.6000	4.1434070 - 1	5.3424940	1.1707963	1.2445355	2
		h_3 = 90 kilometers			
0.0005	7.0931090 - 2	3.2771282	1.5702963	1.4000780	3
0.0010	3.8134180 - 2	2.6133767	1.5697963	1.3948535	3
0.0020	1.7461150 - 2	8.8602405 - 1	1.5687963	1.3845147	3
0.0030	2.4836480 - 2	5.8968765	1.5677963	1.3743220	3
0.0040	3.6195279 - 2	5.3407829	1.5667963	1.3642736	3
0.0050	4.6613687 - 2	5.0328962	1.5657963	1.3543670	3
0.0060	5.5629090 - 2	4.8344071	1.5647963	1.3445989	3
0.0070	6.3343205 - 2	4.6950224	1.5637963	1.3349661	3
0.0080	6.9951795 - 2	4.5915588	1.5627963	1.3254647	3
0.0090	7.5646025 - 2	4.5116885	1.5617963	1.3160909	3
0.0100	8.0588435 - 2	4.4481921	1.5607963	1.3068406	3
0.0120	8.8723435 - 2	4.3538034	1.5587963	1.2886954	3
0.0150	9.7859885 - 2	4.2611230	1.5557963	1.2623103	3
0.0200	1.0827855 - 1	4.1724989	1.5507963	1.2203378	3
0.0250	1.1543941 - 1	4.1244448	1.5457963	1.1805854	3
0.0300	1.2086346 - 1	4.0976840	1.5407963	1.1428039	3
0.0400	1.2913201 - 1	4.0788455	1.5307963	1.0724503	3
0.0500	1.3588991 - 1	4.0862513	1.5207963	1.0082107	3
0.0650	1.4526855 - 1	4.1248687	1.5057963	9.2176798	2
0.0800	1.5481171 - 1	4.1832415	1.4907963	8.4566114	2
0.1000	1.6851816 - 1	4.2780212	1.4707963	7.5787071	2
0.1500	2.0821615 - 1	4.5389411	1.4207963	5.9120543	2
0.2000	2.5286903 - 1	4.7777212	1.3707963	4.7678510	2
0.3000	3.4218726 - 1	5.1309992	1.2707963	3.3479623	2
0.4000	4.1942147 - 1	5.3563296	1.1707963	2.5187906	2
0.6000	5.3114640 - 1	5.6080636	9.7079630 - 1	1.5902204	2

Table 83. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0200 f = 0.85653105 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	4.0571558 - 2	1.8765219	1.5702963	1.2433895 3
0.0010	2.2957186 - 2	1.3490791	1.5697963	1.2381675 3
0.0020	1.1399656 - 2	6.0052561	1.5687963	1.2278386 3
0.0030	1.6033557 - 2	4.9070541	1.5677963	1.2176623 3
0.0040	2.1177146 - 2	4.3803008	1.5667963	1.2076369 3
0.0050	2.5517911 - 2	4.0409291	1.5657963	1.1977599 3
0.0060	2.9308608 - 2	3.7969187	1.5647963	1.1880278 3
0.0070	3.2688659 - 2	3.6128653	1.5637963	1.1784374 3
0.0080	3.5724492 - 2	3.4697540	1.5627963	1.1689853 3
0.0090	3.8458474 - 2	3.3558483	1.5617963	1.1596669 3
0.0100	4.0925423 - 2	3.2634331	1.5607963	1.1504788 3
0.0120	4.5179792 - 2	3.1235621	1.5587963	1.1324770 3
0.0150	5.0241110 - 2	2.9842727	1.5557963	1.1063547 3
0.0200	5.6348955 - 2	2.8510229	1.5507963	1.0649462 3
0.0250	6.0715940 - 2	2.7805312	1.5457963	1.0259098 3
0.0300	6.4082765 - 2	2.7437225	1.5407963	9.8899038 2
0.0400	6.9243330 - 2	2.7260814	1.5307963	9.2076906 2
0.0500	7.3442075 - 2	2.7515549	1.5207963	8.5914709 2
0.0650	7.9262510 - 2	2.8352228	1.5057963	7.7737068 2
0.0800	8.5272920 - 2	2.9506544	1.4907963	7.0657786 2
0.1000	9.4180390 - 2	3.1292724	1.4707963	6.2644905 2
0.1500	1.2182600 - 1	3.5927296	1.4207963	4.7915900 2
0.2000	1.5560650 - 1	3.9936807	1.3707963	3.8174547 2
0.3000	2.3021533 - 1	4.5596926	1.2707963	2.6471062 2
0.4000	3.0146380 - 1	4.9075306	1.1707963	1.9802951 2
0.6000	4.1429748 - 1	5.2862168	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	4.7981648 - 2	2.4124663	1.5702963	1.4000780 3
0.0010	2.7480396 - 2	1.9546788	1.5697963	1.3948535 3
0.0020	9.8607660 - 3	4.2793498 - 1	1.5687963	1.3845147 3
0.0030	1.4444876 - 2	5.2931982	1.5677963	1.3743220 3
0.0040	2.1321046 - 2	4.7306496	1.5667963	1.3642736 3
0.0050	2.7158885 - 2	4.3971443	1.5657963	1.3543670 3
0.0060	3.2176837 - 2	4.1649056	1.5647963	1.3445989 3
0.0070	3.6563326 - 2	3.9923360	1.5637963	1.3349661 3
0.0080	4.0432157 - 2	3.8590926	1.5627963	1.3254647 3
0.0090	4.3863962 - 2	3.7533379	1.5617963	1.3160909 3
0.0100	4.6922608 - 2	3.6675573	1.5607963	1.3068406 3
0.0120	5.2124535 - 2	3.5374368	1.5587963	1.2886954 3
0.0150	5.8213285 - 2	3.4068523	1.5557963	1.2623103 3
0.0200	6.5443410 - 2	3.2794002	1.5507963	1.2203378 3
0.0250	7.0543015 - 2	3.2089034	1.5457963	1.1805854 3
0.0300	7.4433115 - 2	3.1687156	1.5407963	1.1428039 3
0.0400	8.0308135 - 2	3.1380221	1.5307963	1.0724503 3
0.0500	8.4982755 - 2	3.1449812	1.5207963	1.0082107 3
0.0650	9.1269435 - 2	3.1948708	1.5057963	9.2176798 2
0.0800	9.7538975 - 2	3.2731490	1.4907963	8.4566114 2
0.1000	1.0653489 - 1	3.4021855	1.4707963	7.5787071 2
0.1500	1.3346802 - 1	3.7629301	1.4207963	5.9120543 2
0.2000	1.6583070 - 1	4.0983470	1.3707963	4.7678510 2
0.3000	2.3733618 - 1	4.6024813	1.2707963	3.3479623 2
0.4000	3.0617149 - 1	4.9275030	1.1707963	2.5187906 2
0.6000	4.1633194 - 1	5.2920560	9.7079630 - 1	1.5902204 2

Table 84. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0500 f = 2.1413276 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	5.3577440 - 2	6.1268185	1.5702963	1.2433895 3
0.0010	4.1794694 - 2	5.7316167	1.5697963	1.2381675 3
0.0020	3.0994575 - 2	4.9418864	1.5687963	1.2278386 3
0.0030	2.8365686 - 2	4.3050712	1.5677963	1.2176623 3
0.0040	2.7733636 - 2	3.8365001	1.5667963	1.2076369 3
0.0050	2.7345105 - 2	3.4719474	1.5657963	1.1977599 3
0.0060	2.7016864 - 2	3.1681564	1.5647963	1.1880278 3
0.0070	2.6858374 - 2	2.9044132	1.5637963	1.1784374 3
0.0080	2.6957332 - 2	2.6717785	1.5627963	1.1689853 3
0.0090	2.7335400 - 2	2.4663981	1.5617963	1.1596669 3
0.0100	2.7965703 - 2	2.2860578	1.5607963	1.1504788 3
0.0120	2.9776218 - 2	1.9919643	1.5587963	1.1324770 3
0.0150	3.3129787 - 2	1.6812595	1.5557963	1.1063547 3
0.0200	3.8617008 - 2	1.3762909	1.5507963	1.0649462 3
0.0250	4.3119494 - 2	1.2102263	1.5457963	1.0259098 3
0.0300	4.6626720 - 2	1.1153998	1.5407963	9.8899038 2
0.0400	5.1443020 - 2	1.0359845	1.5307963	9.2076906 2
0.0500	5.4391705 - 2	1.0359435	1.5207963	8.5914709 2
0.0650	5.7018405 - 2	1.1166596	1.5057963	7.7737068 2
0.0800	5.8813615 - 2	1.2560850	1.4907963	7.0657786 2
0.1000	6.1372865 - 2	1.4940349	1.4707963	6.2644905 2
0.1500	7.3297200 - 2	2.1532024	1.4207963	4.7915900 2
0.2000	9.2831115 - 2	2.7206677	1.3707963	3.8174547 2
0.3000	1.4067446 - 1	3.5110758	1.2707963	2.6471062 2
0.4000	1.8932734 - 1	4.0151450	1.1707963	1.9802951 2
0.6000	2.7502932 - 1	4.5986316	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	4.1829063 - 2	3.7604797 - 1	1.5702963	1.4000780 3
0.0010	3.1026629 - 2	6.2136555	1.5697963	1.3948535 3
0.0020	2.3288486 - 2	5.2542123	1.5687963	1.3845147 3
0.0030	2.4161717 - 2	4.5450379	1.5677963	1.3743220 3
0.0040	2.6060784 - 2	4.0844393	1.5667963	1.3642736 3
0.0050	2.7420453 - 2	3.7492016	1.5657963	1.3543670 3
0.0060	2.8326669 - 2	3.4807531	1.5647963	1.3445989 3
0.0070	2.9023566 - 2	3.2544826	1.5637963	1.3349661 3
0.0080	2.9674665 - 2	3.0590808	1.5627963	1.3254647 3
0.0090	3.0361196 - 2	2.8885938	1.5617963	1.3160909 3
0.0100	3.1111387 - 2	2.7392569	1.5607963	1.3068406 3
0.0120	3.2789851 - 2	2.4932155	1.5587963	1.2886954 3
0.0150	3.5526899 - 2	2.2242537	1.5557963	1.2623103 3
0.0200	3.9900925 - 2	1.9443525	1.5507963	1.2203378 3
0.0250	4.3595490 - 2	1.7819674	1.5457963	1.1805854 3
0.0300	4.6606349 - 2	1.6836456	1.5407963	1.1428039 3
0.0400	5.1103235 - 2	1.5897836	1.5307963	1.0724503 3
0.0500	5.4311755 - 2	1.5706292	1.5207963	1.0082107 3
0.0650	5.7921125 - 2	1.6164225	1.5057963	9.2176798 2
0.0800	6.1004585 - 2	1.7143818	1.4907963	8.4566114 2
0.1000	6.5257165 - 2	1.8899827	1.4707963	7.5787071 2
0.1500	7.9553575 - 2	2.3985386	1.4207963	5.9120543 2
0.2000	9.9125825 - 2	2.8673846	1.3707963	4.7678510 2
0.3000	1.4537201 - 1	3.5718121	1.2707963	3.3479623 2
0.4000	1.9264909 - 1	4.0448696	1.1707963	2.5187906 2
0.6000	2.7668486 - 1	4.6079185	9.7079630 - 1	1.5902204 2

Table 85. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1000 f = 4.2826552 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	1.0939798 - 1	5.0819352	1.5702963	1.2433895	3
0.0010	9.3006410 - 2	4.8483638	1.5697963	1.2381675	3
0.0020	7.0577590 - 2	4.3904668	1.5687963	1.2278386	3
0.0030	5.7264900 - 2	3.9628733	1.5677963	1.2176623	3
0.0040	4.8970776 - 2	3.5800840	1.5667963	1.2076369	3
0.0050	4.3281351 - 2	3.2419598	1.5657963	1.1977599	3
0.0060	3.9003009 - 2	2.9390547	1.5647963	1.1880278	3
0.0070	3.5637365 - 2	2.6602331	1.5637963	1.1784374	3
0.0080	3.3019205 - 2	2.3968661	1.5627963	1.1689853	3
0.0090	3.1115958 - 2	2.1443585	1.5617963	1.1596669	3
0.0100	2.9924340 - 2	1.9022466	1.5607963	1.1504788	3
0.0120	2.9535976 - 2	1.4609770	1.5587963	1.1324770	3
0.0150	3.2581251 - 2	9.4846181 - 1	1.5557963	1.1063547	3
0.0200	4.1138951 - 2	4.4576183 - 1	1.5507963	1.0649462	3
0.0250	4.9385559 - 2	1.8208202 - 1	1.5457963	1.0259098	3
0.0300	5.6098585 - 2	2.9221000 - 2	1.5407963	9.8899038	2
0.0400	6.5263775 - 2	6.1594122	1.5307963	9.2076906	2
0.0500	7.0290150 - 2	6.1055279	1.5207963	8.5914709	2
0.0650	7.3010590 - 2	6.1170366	1.5057963	7.7737068	2
0.0800	7.2352115 - 2	6.1953789	1.4907963	7.0657786	2
0.1000	6.9025265 - 2	8.7419790 - 2	1.4707963	6.2644905	2
0.1500	6.1630070 - 2	7.5647269 - 1	1.4207963	4.7915900	2
0.2000	6.6902850 - 2	1.5054542	1.3707963	3.8174547	2
0.3000	1.0247114 - 1	2.5246320	1.2707963	2.6471062	2
0.4000	1.4131163 - 1	3.1106500	1.1707963	1.9802951	2
0.6000	2.0282913 - 1	3.8007835	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	8.5412510 - 2	5.3602133	1.5702963	1.4000780	3
0.0010	7.3196070 - 2	5.1041488	1.5697963	1.3948535	3
0.0020	5.7576430 - 2	4.6063698	1.5687963	1.3845147	3
0.0030	4.9279489 - 2	4.1594799	1.5677963	1.3743220	3
0.0040	4.4506339 - 2	3.7804877	1.5667963	1.3642736	3
0.0050	4.1227361 - 2	3.4620447	1.5657963	1.3543670	3
0.0060	3.8586765 - 2	3.1883937	1.5647963	1.3445989	3
0.0070	3.6302751 - 2	2.9453569	1.5637963	1.3349661	3
0.0080	3.4324473 - 2	2.7228126	1.5627963	1.3254647	3
0.0090	3.2676304 - 2	2.5144513	1.5617963	1.3160909	3
0.0100	3.1393251 - 2	2.3169878	1.5607963	1.3068406	3
0.0120	2.9982638 - 2	1.9520893	1.5587963	1.2886954	3
0.0150	3.0432696 - 2	1.4924191	1.5557963	1.2623103	3
0.0200	3.4960558 - 2	9.7601965 - 1	1.5507963	1.2203378	3
0.0250	4.0519154 - 2	6.8013546 - 1	1.5457963	1.1805854	3
0.0300	4.5504800 - 2	5.0343346 - 1	1.5407963	1.1428039	3
0.0400	5.2888335 - 2	3.2221045 - 1	1.5307963	1.0724503	3
0.0500	5.7429100 - 2	2.5260637 - 1	1.5207963	1.0082107	3
0.0650	6.0777000 - 2	2.4942166 - 1	1.5057963	9.2176798	2
0.0800	6.1686990 - 2	3.1680159 - 1	1.4907963	8.4566114	2
0.1000	6.1193790 - 2	4.7718906 - 1	1.4707963	7.5787071	2
0.1500	6.1220980 - 2	1.0749667	1.4207963	5.9120543	2
0.2000	7.0551130 - 2	1.7076388	1.3707963	4.7678510	2
0.3000	1.0632853 - 1	2.5973272	1.2707963	3.3479623	2
0.4000	1.4385972 - 1	3.1448970	1.1707963	2.5187906	2
0.6000	2.0394789 - 1	3.8123301	9.7079630 - 1	1.5902204	2

Table 86. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2000 f = 8.5653105 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	1.9767811 - 1	4.3947470	1.5702963	1.2433895	3
0.0010	1.7499697 - 1	4.2420216	1.5697963	1.2381675	3
0.0020	1.3918679 - 1	3.9397085	1.5687963	1.2278386	3
0.0030	1.1329832 - 1	3.6434600	1.5677963	1.2176623	3
0.0040	9.4513940 - 2	3.3563900	1.5667963	1.2076369	3
0.0050	8.0675120 - 2	3.0811636	1.5657963	1.1977599	3
0.0060	7.0230505 - 2	2.8187766	1.5647963	1.1880278	3
0.0070	6.2135035 - 2	2.5682674	1.5637963	1.1784374	3
0.0080	5.5730585 - 2	2.3272425	1.5627963	1.1689853	3
0.0090	5.0631330 - 2	2.0928018	1.5617963	1.1596669	3
0.0100	4.6629469 - 2	1.8625071	1.5607963	1.1504788	3
0.0120	4.1552305 - 2	1.4116723	1.5587963	1.1324770	3
0.0150	4.0397150 - 2	7.9331255 - 1	1.5557963	1.1063547	3
0.0200	4.9177749 - 2	7.5692480 - 2	1.5507963	1.0649462	3
0.0250	6.1643480 - 2	5.9635380	1.5457963	1.0259098	3
0.0300	7.3265295 - 2	5.7314034	1.5407963	9.8899038	2
0.0400	9.1063275 - 2	5.4822954	1.5307963	9.2076906	2
0.0500	1.0239375 - 1	5.3629333	1.5207963	8.5914709	2
0.0650	1.1087743 - 1	5.2925349	1.5057963	7.7737068	2
0.0800	1.1267009 - 1	5.2915335	1.4907963	7.0657786	2
0.1000	1.0887717 - 1	5.3539521	1.4707963	6.2644905	2
0.1500	8.7496895 - 2	5.7129127	1.4207963	4.7915900	2
0.2000	6.8975015 - 2	1.4861060 - 2	1.3707963	3.8174547	2
0.3000	7.5022445 - 2	1.3127044	1.2707963	2.6471062	2
0.4000	1.0760092 - 1	2.0445580	1.1707963	1.9802951	2
0.6000	1.5845083 - 1	2.7744678	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	1.6452428 - 1	4.5599772	1.5702963	1.4000780	3
0.0010	1.4663380 - 1	4.4009445	1.5697963	1.3948535	3
0.0020	1.1872046 - 1	4.0881007	1.5687963	1.3845147	3
0.0030	9.8844325 - 2	3.7862127	1.5677963	1.3743220	3
0.0040	8.4558250 - 2	3.5001283	1.5667963	1.3642736	3
0.0050	7.4020710 - 2	3.2328903	1.5657963	1.3543670	3
0.0060	6.5950410 - 2	2.9848217	1.5647963	1.3445989	3
0.0070	5.9519050 - 2	2.7539274	1.5637963	1.3349661	3
0.0080	5.4226545 - 2	2.5368787	1.5627963	1.3254647	3
0.0090	4.9791515 - 2	2.3299880	1.5617963	1.3160909	3
0.0100	4.6069400 - 2	2.1298876	1.5607963	1.3068406	3
0.0120	4.0546774 - 2	1.7410522	1.5587963	1.2886954	3
0.0150	3.6851510 - 2	1.1848045	1.5557963	1.2623103	3
0.0200	4.0355157 - 2	4.5009334 - 1	1.5507963	1.2203378	3
0.0250	4.9035453 - 2	7.7102300 - 3	1.5457963	1.1805854	3
0.0300	5.8101555 - 2	6.0289176	1.5407963	1.1428039	3
0.0400	7.2819415 - 2	5.7509615	1.5307963	1.0724503	3
0.0500	8.2656070 - 2	5.6183973	1.5207963	1.0082107	3
0.0650	9.0643195 - 2	5.5373056	1.5057963	9.2176798	2
0.0800	9.3209485 - 2	5.5297254	1.4907963	8.4566114	2
0.1000	9.1528270 - 2	5.5864745	1.4707963	7.5787071	2
0.1500	7.7203095 - 2	5.9413413	1.4207963	5.9120543	2
0.2000	6.5495710 - 2	2.3397864 - 1	1.3707963	4.7678510	2
0.3000	7.7811725 - 2	1.4122312	1.2707963	3.3479623	2
0.4000	1.0991411 - 1	2.0835654	1.1707963	2.5187906	2
0.6000	1.5923135 - 1	2.7863319	9.7079630 - 1	1.5902204	2

Table 87. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 1.0000 f = 42.826552 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	4.1942849 - 1	3.1097667	1.5702963	1.2433895 3
0.0010	3.9529888 - 1	3.0430099	1.5697963	1.2381675 3
0.0020	3.5165510 - 1	2.9096995	1.5687963	1.2278386 3
0.0030	3.1360878 - 1	2.7764913	1.5677963	1.2176623 3
0.0040	2.8052399 - 1	2.6432470	1.5667963	1.2076369 3
0.0050	2.5180952 - 1	2.5099004	1.5657963	1.1977599 3
0.0060	2.2692237 - 1	2.3764583	1.5647963	1.1880278 3
0.0070	2.0537119 - 1	2.2429859	1.5637963	1.1784374 3
0.0080	1.8671495 - 1	2.1096004	1.5627963	1.1689853 3
0.0090	1.7056178 - 1	1.9764475	1.5617963	1.1596669 3
0.0100	1.5656752 - 1	1.8436872	1.5607963	1.1504788 3
0.0120	1.3389802 - 1	1.5799254	1.5587963	1.1324770 3
0.0150	1.0986991 - 1	1.1901938	1.5557963	1.1063547 3
0.0200	8.7203385 - 2	5.5993440 - 1	1.5507963	1.0649462 3
0.0250	7.8858990 - 2	6.2531973	1.5457963	1.0259098 3
0.0300	8.0348495 - 2	5.7450868	1.5407963	9.8899038 2
0.0400	9.8431850 - 2	5.0449023	1.5307963	9.2076906 2
0.0500	1.2135857 - 1	4.6441788	1.5207963	8.5914709 2
0.0650	1.5091786 - 1	4.3061566	1.5057963	7.7737068 2
0.0800	1.7168085 - 1	4.1121143	1.4907963	7.0657786 2
0.1000	1.8743915 - 1	3.9564343	1.4707963	6.2644905 2
0.1500	1.8906496 - 1	3.7799795	1.4207963	4.7915900 2
0.2000	1.6558531 - 1	3.7273014	1.3707963	3.8174547 2
0.3000	1.0647098 - 1	3.7829845	1.2707963	2.6471062 2
0.4000	6.2226705 - 2	4.0192296	1.1707963	1.9802951 2
0.6000	3.2371695 - 2	4.9844634	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	3.7779152 - 1	3.0958356	1.5702963	1.4000780 3
0.0010	3.5661017 - 1	3.0283745	1.5697963	1.3948535 3
0.0020	3.1831926 - 1	2.8938449	1.5687963	1.3845147 3
0.0030	2.8495851 - 1	2.7597430	1.5677963	1.3743220 3
0.0040	2.5595782 - 1	2.6260205	1.5667963	1.3642736 3
0.0050	2.3078622 - 1	2.4926994	1.5657963	1.3543670 3
0.0060	2.0895727 - 1	2.3598668	1.5647963	1.3445989 3
0.0070	1.9003078 - 1	2.2276552	1.5637963	1.3349661 3
0.0080	1.7361293 - 1	2.0962279	1.5627963	1.3254647 3
0.0090	1.5935438 - 1	1.9657556	1.5617963	1.3160909 3
0.0100	1.4695006 - 1	1.8363932	1.5607963	1.3068406 3
0.0120	1.2668309 - 1	1.5814535	1.5587963	1.2886954 3
0.0150	1.0474078 - 1	1.2089782	1.5557963	1.2623103 3
0.0200	8.2842525 - 2	6.1104300 - 1	1.5507963	1.2203378 3
0.0250	7.3266245 - 2	4.3447860 - 2	1.5457963	1.1805854 3
0.0300	7.2707485 - 2	5.8212773	1.5407963	1.1428039 3
0.0400	8.6951580 - 2	5.1004250	1.5307963	1.0724503 3
0.0500	1.0711684 - 1	4.6843722	1.5207963	1.0082107 3
0.0650	1.3400553 - 1	4.3362706	1.5057963	9.2176798 2
0.0800	1.5338770 - 1	4.1379975	1.4907963	8.4566114 2
0.1000	1.6871944 - 1	3.9795637	1.4707963	7.5787071 2
0.1500	1.7291347 - 1	3.8003226	1.4207963	5.9120543 2
0.2000	1.5338450 - 1	3.7470084	1.3707963	4.7678510 2
0.3000	1.0046891 - 1	3.8054730	1.2707963	3.3479623 2
0.4000	5.9678600 - 2	4.0488868	1.1707963	2.5187906 2
0.6000	3.2277877 - 2	5.0054970	9.7079630 - 1	1.5902204 2

Table 88. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 2.0000 f = 85.653105 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	3.8513132 - 1	2.5174572	1.5702963	1.2433895 3
0.0010	3.7003195 - 1	2.4697962	1.5697963	1.2381675 3
0.0020	3.4188076 - 1	2.3748096	1.5687963	1.2278386 3
0.0030	3.1628449 - 1	2.2802421	1.5677963	1.2176623 3
0.0040	2.9303775 - 1	2.1860700	1.5667963	1.2076369 3
0.0050	2.7194299 - 1	2.0922898	1.5657963	1.1977599 3
0.0060	2.5281286 - 1	1.9989112	1.5647963	1.1880278 3
0.0070	2.3546957 - 1	1.9059559	1.5637963	1.1784374 3
0.0080	2.1974727 - 1	1.8134567	1.5627963	1.1689853 3
0.0090	2.0549157 - 1	1.7214525	1.5617963	1.1596669 3
0.0100	1.9255942 - 1	1.6299883	1.5607963	1.1504788 3
0.0120	1.7015157 - 1	1.4488486	1.5587963	1.1324770 3
0.0150	1.4354006 - 1	1.1821102	1.5557963	1.1063547 3
0.0200	1.1236362 - 1	7.5109509 - 1	1.5507963	1.0649462 3
0.0250	9.1961665 - 2	3.3313944 - 1	1.5457963	1.0259098 3
0.0300	7.8864910 - 2	6.2056388	1.5407963	9.8899038 2
0.0400	6.8912240 - 2	5.4252150	1.5307963	9.2076906 2
0.0500	7.3775035 - 2	4.8011588	1.5207963	8.5914709 2
0.0650	9.1011240 - 2	4.2092988	1.5057963	7.7737068 2
0.0800	1.0769830 - 1	3.8615894	1.4907963	7.0657786 2
0.1000	1.2304266 - 1	3.5695170	1.4707963	6.2644905 2
0.1500	1.3079672 - 1	3.1528423	1.4207963	4.7915900 2
0.2000	1.1493317 - 1	2.8869061	1.3707963	3.8174547 2
0.3000	6.8821845 - 2	2.4804511	1.2707963	2.6471062 2
0.4000	3.2871175 - 2	2.1354035	1.1707963	1.9802951 2
0.6000	1.9658540 - 3	2.0815994	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	3.4372697 - 1	2.4096047	1.5702963	1.4000780 3
0.0010	3.3080089 - 1	2.3615633	1.5697963	1.3948535 3
0.0020	3.0670099 - 1	2.2659979	1.5687963	1.3845147 3
0.0030	2.8478301 - 1	2.1711208	1.5677963	1.3743220 3
0.0040	2.6486671 - 1	2.0769418	1.5667963	1.3642736 3
0.0050	2.4677896 - 1	1.9834847	1.5657963	1.3543670 3
0.0060	2.3035539 - 1	1.8907839	1.5647963	1.3445989 3
0.0070	2.1544175 - 1	1.7988781	1.5637963	1.3349661 3
0.0080	2.0189338 - 1	1.7078170	1.5627963	1.3254647 3
0.0090	1.8957649 - 1	1.6176423	1.5617963	1.3160909 3
0.0100	1.7836777 - 1	1.5284017	1.5607963	1.3068406 3
0.0120	1.5883307 - 1	1.3528563	1.5587963	1.2886954 3
0.0150	1.3534214 - 1	1.0971241	1.5557963	1.2623103 3
0.0200	1.0707823 - 1	6.8972189 - 1	1.5507963	1.2203378 3
0.0250	8.7727970 - 2	2.9876389 - 1	1.5457963	1.1805854 3
0.0300	7.4499260 - 2	6.1973052	1.5407963	1.1428039 3
0.0400	6.2261060 - 2	5.4438137	1.5307963	1.0724503 3
0.0500	6.4306260 - 2	4.8055978	1.5207963	1.0082107 3
0.0650	7.8667535 - 2	4.1853064	1.5057963	9.2176798 2
0.0800	9.3779565 - 2	3.8252933	1.4907963	8.4566114 2
0.1000	1.0830918 - 1	3.5284084	1.4707963	7.5787071 2
0.1500	1.1755772 - 1	3.1135796	1.4207963	5.9120543 2
0.2000	1.0483476 - 1	2.8525508	1.3707963	4.7678510 2
0.3000	6.3889495 - 2	2.4548585	1.2707963	3.3479623 2
0.4000	3.0693333 - 2	2.1173111	1.1707963	2.5187906 2
0.6000	1.7570115 - 3	2.1614286	9.7079630 - 1	1.5902204 2

Table 89. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 5.0000 f = 214.13276 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	2.6688918 - 1	1.5751495	1.5702963	1.2433895	3
0.0010	2.5034714 - 1	1.4768820	1.5697963	1.2381675	3
0.0020	2.2159275 - 1	1.2853715	1.5687963	1.2278386	3
0.0030	1.9771831 - 1	1.1010169	1.5677963	1.2176623	3
0.0040	1.7777613 - 1	9.2421576 - 1	1.5667963	1.2076369	3
0.0050	1.6096847 - 1	7.5512660 - 1	1.5657963	1.1977599	3
0.0060	1.4664545 - 1	5.9362186 - 1	1.5647963	1.1880278	3
0.0070	1.3429243 - 1	4.3930191 - 1	1.5637963	1.1784374	3
0.0080	1.2351024 - 1	2.9153035 - 1	1.5627963	1.1689853	3
0.0090	1.1399626 - 1	1.4949550 - 1	1.5617963	1.1596669	3
0.0100	1.0552484 - 1	1.2262270 - 2	1.5607963	1.1504788	3
0.0120	9.1096850 - 2	6.0313743	1.5587963	1.1324770	3
0.0150	7.4454025 - 2	5.6466356	1.5557963	1.1063547	3
0.0200	5.8016595 - 2	4.9945526	1.5507963	1.0649462	3
0.0250	5.4404630 - 2	4.3647319	1.5457963	1.0259098	3
0.0300	5.9569220 - 2	3.8692901	1.5407963	9.8899038	2
0.0400	7.7691395 - 2	3.2832157	1.5307963	9.2076906	2
0.0500	9.4038995 - 2	2.9687680	1.5207963	8.5914709	2
0.0650	1.1028204 - 1	2.6851509	1.5057963	7.7737068	2
0.0800	1.1817582 - 1	2.4927163	1.4907963	7.0657786	2
0.1000	1.1976124 - 1	2.2931911	1.4707963	6.2644905	2
0.1500	1.0118899 - 1	1.8816427	1.4207963	4.7915900	2
0.2000	7.3448990 - 2	1.4868180	1.3707963	3.8174547	2
0.3000	2.9081786 - 2	6.3547405 - 1	1.2707963	2.6471062	2
0.4000	7.3702130 - 3	5.9932758	1.1707963	1.9802951	2
0.6000	1.4738737 - 4	3.5081427	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	2.3178382 - 1	1.3109520	1.5702963	1.4000780	3
0.0010	2.1894177 - 1	1.2136237	1.5697963	1.3948535	3
0.0020	1.9647268 - 1	1.0257732	1.5687963	1.3845147	3
0.0030	1.7759226 - 1	8.4725976 - 1	1.5677963	1.3743220	3
0.0040	1.6157535 - 1	6.7814890 - 1	1.5667963	1.3642736	3
0.0050	1.4782772 - 1	5.1819016 - 1	1.5657963	1.3543670	3
0.0060	1.3587757 - 1	3.6686782 - 1	1.5647963	1.3445989	3
0.0070	1.2535901 - 1	2.2344926 - 1	1.5637963	1.3349661	3
0.0080	1.1599358 - 1	8.7054870 - 2	1.5627963	1.3254647	3
0.0090	1.0757214 - 1	6.2398885	1.5617963	1.3160909	3
0.0100	9.9940550 - 2	6.1145635	1.5607963	1.3068406	3
0.0120	8.6627540 - 2	5.8748792	1.5587963	1.2886954	3
0.0150	7.0640255 - 2	5.5281756	1.5557963	1.2623103	3
0.0200	5.3185215 - 2	4.9359808	1.5507963	1.2203378	3
0.0250	4.6694384 - 2	4.3262921	1.5457963	1.1805854	3
0.0300	4.8834754 - 2	3.8060534	1.5407963	1.1428039	3
0.0400	6.2850790 - 2	3.1715774	1.5307963	1.0724503	3
0.0500	7.6773170 - 2	2.8396441	1.5207963	1.0082107	3
0.0650	9.1174265 - 2	2.5497425	1.5057963	9.2176798	2
0.0800	9.8664890 - 2	2.3580944	1.4907963	8.4566114	2
0.1000	1.0109759 - 1	2.1628939	1.4707963	7.5787071	2
0.1500	8.7353540 - 2	1.7654785	1.4207963	5.9120543	2
0.2000	6.4431820 - 2	1.3834734	1.3707963	4.7678510	2
0.3000	2.5845812 - 2	5.5110394 - 1	1.2707963	3.3479623	2
0.4000	6.5006280 - 3	5.9297989	1.1707963	2.5187906	2
0.6000	1.4318184 - 4	3.4279287	9.7079630 - 1	1.5902204	2

Table 90. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0100 f = 0.66622256 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	6.5777425 - 2	3.0510871	1.5702963	1.2433895 3
0.0010	3.8922467 - 2	2.5310487	1.5697963	1.2381675 3
0.0020	1.6214498 - 2	1.1952232	1.5687963	1.2278386 3
0.0030	1.6892888 - 2	6.0835106	1.5677963	1.2176623 3
0.0040	2.4267300 - 2	5.3770562	1.5667963	1.2076369 3
0.0050	3.1866282 - 2	4.9905805	1.5657963	1.1977599 3
0.0060	3.8802200 - 2	4.7421805	1.5647963	1.1880278 3
0.0070	4.4971690 - 2	4.5676632	1.5637963	1.1784374 3
0.0080	5.0420380 - 2	4.4380276	1.5627963	1.1689853 3
0.0090	5.5231110 - 2	4.3379129	1.5617963	1.1596669 3
0.0100	5.9490760 - 2	4.2583277	1.5607963	1.1504788 3
0.0120	6.6665265 - 2	4.1401003	1.5587963	1.1324770 3
0.0150	7.4954520 - 2	4.0242933	1.5557963	1.1063547 3
0.0200	8.4693115 - 2	3.9143941	1.5507963	1.0649462 3
0.0250	9.1560560 - 2	3.8559364	1.5457963	1.0259098 3
0.0300	9.6858945 - 2	3.8246438	1.5407963	9.8899038 2
0.0400	1.0510343 - 1	3.8066188	1.5307963	9.2076906 2
0.0500	1.1199139 - 1	3.8224358	1.5207963	8.5914709 2
0.0650	1.2173873 - 1	3.8812236	1.5057963	7.7737068 2
0.0800	1.3181427 - 1	3.9640972	1.4907963	7.0657786 2
0.1000	1.4644492 - 1	4.0929499	1.4707963	6.2644905 2
0.1500	1.8917724 - 1	4.4260577	1.4207963	4.7915900 2
0.2000	2.3717183 - 1	4.7107406	1.3707963	3.8174547 2
0.3000	3.3200360 - 1	5.1061260	1.2707963	2.6471062 2
0.4000	5.2773590 - 1	5.6066791	9.7079630 - 1	1.9802951 2
0.6000	4.1270083 - 1	5.3462881	1.1707963	1.2445355 2
		h_3 = 90 kilometers		
0.0005	8.0531770 - 2	3.4016496	1.5702963	1.4000780 3
0.0010	4.8523991 - 2	2.8863068	1.5697963	1.3948535 3
0.0020	2.0524326 - 2	1.6334352	1.5687963	1.3845147 3
0.0030	1.9001374 - 2	2.3404261 - 1	1.5677963	1.3743220 3
0.0040	2.7182395 - 2	5.7470439	1.5667963	1.3642736 3
0.0050	3.6298982 - 2	5.3377348	1.5657963	1.3543670 3
0.0060	4.4758840 - 2	5.0810728	1.5647963	1.3445989 3
0.0070	5.2318040 - 2	4.9032647	1.5637963	1.3349661 3
0.0080	5.9000720 - 2	4.7722274	1.5627963	1.3254647 3
0.0090	6.4899435 - 2	4.6714825	1.5617963	1.3160909 3
0.0100	7.0117965 - 2	4.5915758	1.5607963	1.3068406 3
0.0120	7.8892220 - 2	4.4729497	1.5587963	1.2886954 3
0.0150	8.8992210 - 2	4.3563577	1.5557963	1.2623103 3
0.0200	1.0076531 - 1	4.2440052	1.5507963	1.2203378 3
0.0250	1.0895410 - 1	4.1817412	1.5457963	1.1805854 3
0.0300	1.1515999 - 1	4.1454973	1.5407963	1.1428039 3
0.0400	1.2451421 - 1	4.1147771	1.5307963	1.0724503 3
0.0500	1.3197485 - 1	4.1150306	1.5207963	1.0082107 3
0.0650	1.4202258 - 1	4.1470279	1.5057963	9.2176798 2
0.0800	1.5198133 - 1	4.2012562	1.4907963	8.4566114 2
0.1000	1.6603214 - 1	4.2924451	1.4707963	7.5787071 2
0.1500	2.0612961 - 1	4.5485989	1.4207963	5.9120543 2
0.2000	2.5094024 - 1	4.7850196	1.3707963	4.7678510 2
0.3000	3.4041043 - 1	5.1359579	1.2707963	3.3479623 2
0.4000	4.1776108 - 1	5.3601251	1.1707963	2.5187906 2
0.6000	5.2969465 - 1	5.6107129	9.7079630 - 1	1.5902204 2

Table 91. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0200 f = 1.332425 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	4.5248830 - 2	1.9689574	1.5702963	1.2433895	3
0.0010	2.8847643 - 2	1.5743886	1.5697963	1.2381675	3
0.0020	1.2627423 - 2	4.3473692 - 1	1.5687963	1.2278386	3
0.0030	1.2779985 - 2	5.4373196	1.5677963	1.2176623	3
0.0040	1.7170239 - 2	4.7729614	1.5667963	1.2076369	3
0.0050	2.1218687 - 2	4.3772896	1.5657963	1.1977599	3
0.0060	2.4747229 - 2	4.0971933	1.5647963	1.1880278	3
0.0070	2.7900227 - 2	3.8841922	1.5637963	1.1784374	3
0.0080	3.0766138 - 2	3.7163728	1.5627963	1.1689853	3
0.0090	3.3391132 - 2	3.5811165	1.5617963	1.1596669	3
0.0100	3.5803169 - 2	3.4702080	1.5607963	1.1504788	3
0.0120	4.0068931 - 2	3.3003001	1.5587963	1.1324770	3
0.0150	4.5320980 - 2	3.1284890	1.5557963	1.1063547	3
0.0200	5.1892655 - 2	2.9606928	1.5507963	1.0649462	3
0.0250	5.6714475 - 2	2.8687098	1.5457963	1.0259098	3
0.0300	6.0472985 - 2	2.8173101	1.5407963	9.8899038	2
0.0400	6.6231860 - 2	2.7811533	1.5307963	9.2076906	2
0.0500	7.0846155 - 2	2.7953597	1.5207963	8.5914709	2
0.0650	7.7076675 - 2	2.8685023	1.5057963	7.7737068	2
0.0800	8.3341975 - 2	2.9772906	1.4907963	7.0657786	2
0.1000	9.2449600 - 2	3.1501337	1.4707963	6.2644905	2
0.1500	1.2026449 - 1	3.6060548	1.4207963	4.7915900	2
0.2000	1.5403942 - 1	4.0035018	1.3707963	3.8174547	2
0.3000	2.2856666 - 1	4.5663204	1.2707963	2.6471062	2
0.4000	2.9978495 - 1	4.9126539	1.1707963	1.9802951	2
0.6000	4.1268579 - 1	5.2898612	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	5.3286655 - 2	2.4969245	1.5702963	1.4000780	3
0.0010	3.4485931 - 2	2.1452983	1.5697963	1.3948535	3
0.0020	1.3420308 - 2	1.1895169	1.5687963	1.3845147	3
0.0030	1.0494749 - 2	5.9549224	1.5677963	1.3743220	3
0.0040	1.5942559 - 2	5.1425291	1.5667963	1.3642736	3
0.0050	2.1376728 - 2	4.7274843	1.5657963	1.3543670	3
0.0060	2.6125740 - 2	4.4512621	1.5647963	1.3445989	3
0.0070	3.0320346 - 2	4.2471683	1.5637963	1.3349661	3
0.0080	3.4073010 - 2	4.0888146	1.5627963	1.3254647	3
0.0090	3.7456292 - 2	3.9622547	1.5617963	1.3160909	3
0.0100	4.0521237 - 2	3.8589141	1.5607963	1.3068406	3
0.0120	4.5849281 - 2	3.7008608	1.5587963	1.2886954	3
0.0150	5.2272995 - 2	3.5404771	1.5557963	1.2623103	3
0.0200	6.0143480 - 2	3.3815096	1.5507963	1.2203378	3
0.0250	6.5820660 - 2	3.2913557	1.5457963	1.1805854	3
0.0300	7.0191665 - 2	3.2377694	1.5407963	1.1428039	3
0.0400	7.6784860 - 2	3.1899984	1.5307963	1.0724503	3
0.0500	8.1951455 - 2	3.1865250	1.5207963	1.0082107	3
0.0650	8.8722690 - 2	3.2266492	1.5057963	9.2176798	2
0.0800	9.5297465 - 2	3.2987580	1.4907963	8.4566114	2
0.1000	1.0454270 - 1	3.4224237	1.4707963	7.5787071	2
0.1500	1.3172972 - 1	3.7760928	1.4207963	5.9120543	2
0.2000	1.6414333 - 1	4.1081369	1.3707963	4.7678510	2
0.3000	2.3563088 - 1	4.6091154	1.2707963	3.3479623	2
0.4000	3.0446456 - 1	4.9326305	1.1707963	2.5187906	2
0.6000	4.1471208 - 1	5.2957012	9.7079630 - 1	1.5902204	2

Table 92. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0500 f = 3.3311126 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	5.6602185 - 2	6.2023865	1.5702963	1.2433895 3
0.0010	4.5816115 - 2	5.8907445	1.5697963	1.2381675 3
0.0020	3.3752791 - 2	5.2448623	1.5687963	1.2278386 3
0.0030	2.9424262 - 2	4.6604737	1.5677963	1.2176623 3
0.0040	2.8167683 - 2	4.1966458	1.5667963	1.2076369 3
0.0050	2.7726474 - 2	3.8333597	1.5657963	1.1977599 3
0.0060	2.7414671 - 2	3.5360970	1.5647963	1.1880278 3
0.0070	2.7132253 - 2	3.2814230	1.5637963	1.1784374 3
0.0080	2.6929329 - 2	3.0562511	1.5627963	1.1689853 3
0.0090	2.6865559 - 2	2.8537972	1.5617963	1.1596669 3
0.0100	2.6974993 - 2	2.6706839	1.5607963	1.1504788 3
0.0120	2.7720246 - 2	2.3560729	1.5587963	1.1324770 3
0.0150	2.9826112 - 2	1.9965130	1.5557963	1.1063547 3
0.0200	3.4322372 - 2	1.6158444	1.5507963	1.0649462 3
0.0250	3.8615289 - 2	1.3980017	1.5457963	1.0259098 3
0.0300	4.2233627 - 2	1.2686529	1.5407963	9.8899038 2
0.0400	4.7549512 - 2	1.1477355	1.5307963	9.2076906 2
0.0500	5.1027100 - 2	1.1240628	1.5207963	8.5914709 2
0.0650	5.4317310 - 2	1.1838014	1.5057963	7.7737068 2
0.0800	5.6613640 - 2	1.3103010	1.4907963	7.0657786 2
0.1000	5.9642045 - 2	1.5367293	1.4707963	6.2644905 2
0.1500	7.2096950 - 2	2.1788720	1.4207963	4.7915900 2
0.2000	9.1700315 - 2	2.7375299	1.3707963	3.8174547 2
0.3000	1.3935147 - 1	3.5207699	1.2707963	2.6471062 2
0.4000	1.8781455 - 1	4.0223013	1.1707963	1.9802951 2
0.6000	2.7335982 - 1	4.6038604	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	4.4660367 - 2	4.5702092 - 1	1.5702963	1.4000780 3
0.0010	3.4642047 - 2	1.1445666 - 1	1.5697963	1.3948535 3
0.0020	2.4635486 - 2	5.6228756	1.5687963	1.3845147 3
0.0030	2.3224547 - 2	4.9275693	1.5677963	1.3743220 3
0.0040	2.4570666 - 2	4.4345362	1.5667963	1.3642736 3
0.0050	2.6072186 - 2	4.0813790	1.5657963	1.3543670 3
0.0060	2.7203856 - 2	3.8069382	1.5647963	1.3445989 3
0.0070	2.8013075 - 2	3.5796100	1.5637963	1.3349661 3
0.0080	2.8633238 - 2	3.3837784	1.5627963	1.3254647 3
0.0090	2.9172558 - 2	3.2113310	1.5617963	1.3160909 3
0.0100	2.9699774 - 2	3.0577069	1.5607963	1.3068406 3
0.0120	3.0844472 - 2	2.7965085	1.5587963	1.2886954 3
0.0150	3.2858113 - 2	2.4956445	1.5557963	1.2623103 3
0.0200	3.6551680 - 2	2.1627569	1.5507963	1.2203378 3
0.0250	4.0047055 - 2	1.9596830	1.5457963	1.1805854 3
0.0300	4.3094492 - 2	1.8318636	1.5407963	1.1428039 3
0.0400	4.7907071 - 2	1.6998847	1.5307963	1.0724503 3
0.0500	5.1484390 - 2	1.6577133	1.5207963	1.0082107 3
0.0650	5.5571725 - 2	1.6822946	1.5057963	9.2176798 2
0.0800	5.9019250 - 2	1.7669077	1.4907963	8.4566114 2
0.1000	6.3610930 - 2	1.9306879	1.4707963	7.5787071 2
0.1500	7.8286495 - 2	2.4228231	1.4207963	5.9120543 2
0.2000	9.7905035 - 2	2.8836537	1.3707963	4.7678510 2
0.3000	1.4398823 - 1	3.5814231	1.2707963	3.3479623 2
0.4000	1.9110126 - 1	4.0520192	1.1707963	2.5187906 2
0.6000	2.7500358 - 1	4.6131504	9.7079630 - 1	1.5902204 2

Table 93. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1000 f = 6.6622252 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	1.1316033 - 1	5.1283277	1.5702963	1.2433895	3
0.0010	9.9012465 - 2	4.9408580	1.5697963	1.2381675	3
0.0020	7.8084830 - 2	4.5696686	1.5687963	1.2278386	3
0.0030	6.4346985 - 2	4.2125290	1.5677963	1.2176623	3
0.0040	5.5227850 - 2	3.8799738	1.5667963	1.2076369	3
0.0050	4.8901384 - 2	3.5772899	1.5657963	1.1977599	3
0.0060	4.4217553 - 2	3.3035189	1.5647963	1.1880278	3
0.0070	4.0528992 - 2	3.0538658	1.5637963	1.1784374	3
0.0080	3.7508233 - 2	2.8224382	1.5627963	1.1689853	3
0.0090	3.5009392 - 2	2.6039650	1.5617963	1.1596669	3
0.0100	3.2980000 - 2	2.3946086	1.5607963	1.1504788	3
0.0120	3.0293131 - 2	1.9965772	1.5587963	1.1324770	3
0.0150	2.9522317 - 2	1.4629414	1.5557963	1.1063547	3
0.0200	3.4049821 - 2	8.2718627 - 1	1.5507963	1.0649462	3
0.0250	4.0862643 - 2	4.6199760 - 1	1.5457963	1.0259098	3
0.0300	4.7301313 - 2	2.4722697 - 1	1.5407963	9.8899038	2
0.0400	5.7056950 - 2	2.7787560 - 2	1.5307963	9.2076906	2
0.0500	6.3026575 - 2	6.2229310	1.5207963	8.5914709	2
0.0650	6.7092615 - 2	6.2063555	1.5057963	7.7737068	2
0.0800	6.7547420 - 2	6.2688681	1.4907963	7.0657786	2
0.1000	6.5377770 - 2	1.4849083 - 1	1.4707963	6.2644905	2
0.1500	5.9782795 - 2	8.0176791 - 1	1.4207963	4.7915900	2
0.2000	6.5831900 - 2	1.5374578	1.3707963	3.8174547	2
0.3000	1.0148242 - 1	2.5400469	1.2707963	2.6471062	2
0.4000	1.4005731 - 1	3.1204647	1.1707963	1.9802951	2
0.6000	2.0124475 - 1	3.8073181	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	8.8278005 - 2	5.4109377	1.5702963	1.4000780	3
0.0010	7.7614680 - 2	5.2056095	1.5697963	1.3948535	3
0.0020	6.2614160 - 2	4.7996344	1.5687963	1.3845147	3
0.0030	5.3582465 - 2	4.4175828	1.5677963	1.3743220	3
0.0040	4.8084420 - 2	4.0755975	1.5667963	1.3642736	3
0.0050	4.4464785 - 2	3.7777155	1.5657963	1.3543670	3
0.0060	4.1777120 - 2	3.5188499	1.5647963	1.3445989	3
0.0070	3.9555143 - 2	3.2907522	1.5637963	1.3349661	3
0.0080	3.7601281 - 2	3.0855626	1.5627963	1.3254647	3
0.0090	3.5850879 - 2	2.8970324	1.5617963	1.3160909	3
0.0100	3.4297919 - 2	2.7206250	1.5607963	1.3068406	3
0.0120	3.1848440 - 2	2.3933642	1.5587963	1.2886954	3
0.0150	2.9993793 - 2	1.9529125	1.5557963	1.2623103	3
0.0200	3.1098772 - 2	1.3725572	1.5507963	1.2203378	3
0.0250	3.4899605 - 2	9.9087005 - 1	1.5457963	1.1805854	3
0.0300	3.9232610 - 2	7.5026359 - 1	1.5407963	1.1428039	3
0.0400	4.6646635 - 2	4.9415308 - 1	1.5307963	1.0724503	3
0.0500	5.1750605 - 2	3.8496538 - 1	1.5207963	1.0082107	3
0.0650	5.6049485 - 2	3.4925340 - 1	1.5057963	9.2176798	2
0.0800	5.7798405 - 2	3.9825664 - 1	1.4907963	8.4566114	2
0.1000	5.8205235 - 2	5.4378793 - 1	1.4707963	7.5787071	2
0.1500	5.9635840 - 2	1.1204944	1.4207963	5.9120543	2
0.2000	6.9515580 - 2	1.7381185	1.3707963	4.7678510	2
0.3000	1.0528928 - 1	2.6123410	1.2707963	3.3479623	2
0.4000	1.4256968 - 1	3.1546232	1.1707963	2.5187906	2
0.6000	2.0235032 - 1	3.8188617	9.7079630 - 1	1.5902204	2

Table 94. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2000 f = 13.324450 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	2.0260933 - 1	4.4251408	1.5702963	1.2433895	3
0.0010	1.8355945 - 1	4.3024865	1.5697963	1.2381675	3
0.0020	1.5200754 - 1	4.0590610	1.5687963	1.2278386	3
0.0030	1.2765579 - 1	3.8188703	1.5677963	1.2176623	3
0.0040	1.0888510 - 1	3.5833638	1.5667963	1.2076369	3
0.0050	9.4348410 - 2	3.3542055	1.5657963	1.1977599	3
0.0060	8.2970340 - 2	3.1327367	1.5647963	1.1880278	3
0.0070	7.3926835 - 2	2.9195804	1.5637963	1.1784374	3
0.0080	6.6612735 - 2	2.7145219	1.5627963	1.1689853	3
0.0090	6.0601805 - 2	2.5166300	1.5617963	1.1596669	3
0.0100	5.5607035 - 2	2.3245229	1.5607963	1.1504788	3
0.0120	4.8000980 - 2	1.9518587	1.5587963	1.1324770	3
0.0150	4.1465947 - 2	1.4106238	1.5557963	1.1063547	3
0.0200	4.1258418 - 2	6.1933278 - 1	1.5507963	1.0649462	3
0.0250	4.8854146 - 2	8.4215010 - 2	1.5457963	1.0259098	3
0.0300	5.8504060 - 2	6.0391413	1.5407963	9.8899038	2
0.0400	7.5800000 - 2	5.6887347	1.5307963	9.2076906	2
0.0500	8.8119385 - 2	5.5194969	1.5207963	8.5914709	2
0.0650	9.8614275 - 2	5.4089674	1.5057963	7.7737068	2
0.0800	1.0232382 - 1	5.3853219	1.4907963	7.0657786	2
0.1000	1.0067636 - 1	5.4296958	1.4707963	6.2644905	2
0.1500	8.2904815 - 2	5.7688585	1.4207963	4.7915900	2
0.2000	6.6487070 - 2	6.4878910 - 2	1.3707963	3.8174547	2
0.3000	7.4195865 - 2	1.3426337	1.2707963	2.6471062	2
0.4000	1.0666899 - 1	2.0607500	1.1707963	1.9802951	2
0.6000	1.5703302 - 1	2.7832887	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	1.6843195 - 1	4.5916611	1.5702963	1.4000780	3
0.0010	1.5337093 - 1	4.4638572	1.5697963	1.3948535	3
0.0020	1.2866094 - 1	4.2111696	1.5687963	1.3845147	3
0.0030	1.0983461 - 1	3.9642417	1.5677963	1.3743220	3
0.0040	9.5480395 - 2	3.7257083	1.5667963	1.3642736	3
0.0050	8.4432120 - 2	3.4979273	1.5657963	1.3543670	3
0.0060	7.5775180 - 2	3.2823483	1.5647963	1.3445989	3
0.0070	6.8827600 - 2	3.0792638	1.5637963	1.3349661	3
0.0080	6.3104470 - 2	2.8879263	1.5627963	1.3254647	3
0.0090	5.8275935 - 2	2.7068783	1.5617963	1.3160909	3
0.0100	5.4127490 - 2	2.5342826	1.5607963	1.3068406	3
0.0120	4.7392270 - 2	2.2069891	1.5587963	1.2886954	3
0.0150	4.0482741 - 2	1.7397849	1.5557963	1.2623103	3
0.0200	3.6687952 - 2	1.0164131	1.5507963	1.2203378	3
0.0250	4.0190607 - 2	4.5850002 - 1	1.5457963	1.1805854	3
0.0300	4.6801219 - 2	9.1778410 - 2	1.5407963	1.1428039	3
0.0400	6.0392555 - 2	5.9785965	1.5307963	1.0724503	3
0.0500	7.0795675 - 2	5.7883631	1.5207963	1.0082107	3
0.0650	8.0299825 - 2	5.6622910	1.5057963	9.2176798	2
0.0800	8.4394830 - 2	5.6300817	1.4907963	8.4566114	2
0.1000	8.4467655 - 2	5.6676751	1.4707963	7.5787071	2
0.1500	7.3200070 - 2	6.0018781	1.4207963	5.9120543	2
0.2000	6.3344220 - 2	2.8623306 - 1	1.3707963	4.7678510	2
0.3000	7.6995130 - 2	1.4410126	1.2707963	3.3479623	2
0.4000	1.0895141 - 1	2.0994561	1.1707963	2.5187906	2
0.6000	1.5780054 - 1	2.7951215	9.7079630 - 1	1.5902204	2

Table 95. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the specia ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 1.0000 f = 66.622252 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	4.2439736 - 1	3.1230281	1.5702963	1.2433895 3
0.0010	4.0465671 - 1	3.0694988	1.5697963	1.2381675 3
0.0020	3.6821745 - 1	2.9625945	1.5687963	1.2278386 3
0.0030	3.3554395 - 1	2.8557998	1.5677963	1.2176623 3
0.0040	3.0629927 - 1	2.7490255	1.5667963	1.2076369 3
0.0050	2.8016309 - 1	2.6422111	1.5657963	1.1977599 3
0.0060	2.5683308 - 1	2.5353261	1.5647963	1.1880278 3
0.0070	2.3602782 - 1	2.4283718	1.5637963	1.1784374 3
0.0080	2.1748635 - 1	2.3213750	1.5627963	1.1689853 3
0.0090	2.0096844 - 1	2.2143860	1.5617963	1.1596669 3
0.0100	1.8625523 - 1	2.1074736	1.5607963	1.1504788 3
0.0120	1.6146595 - 1	1.8941975	1.5587963	1.1324770 3
0.0150	1.3345499 - 1	1.5768732	1.5557963	1.1063547 3
0.0200	1.0346125 - 1	1.0586102	1.5507963	1.0649462 3
0.0250	8.6802580 - 2	5.5679627 - 1	1.5457963	1.0259098 3
0.0300	7.9156625 - 2	8.0828580 - 2	1.5407963	9.8899038 2
0.0400	8.1962555 - 2	5.5729104	1.5307963	9.2076906 2
0.0500	9.6704015 - 2	5.0479139	1.5207963	8.5914709 2
0.0650	1.2203124 - 1	4.5913850	1.5057963	7.7737068 2
0.0800	1.4274791 - 1	4.3317025	1.4907963	7.0657786 2
0.1000	1.6076632 - 1	4.1253696	1.4707963	6.2644905 2
0.1500	1.6993552 - 1	3.8893220	1.4207963	4.7915900 2
0.2000	1.5250862 - 1	3.8100898	1.3707963	3.8174547 2
0.3000	1.0050493 - 1	3.8433989	1.2707963	2.6471062 2
0.4000	5.9653825 - 2	4.0736880	1.1707963	1.9802951 2
0.6000	3.2037566 - 2	5.0204970	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	3.8215421 - 1	3.1092430	1.5702963	1.4000780 3
0.0010	3.6482359 - 1	3.0551359	1.5697963	1.3948535 3
0.0020	3.3284732 - 1	2.9471882	1.5687963	1.3845147 3
0.0030	3.0419090 - 1	2.8395377	1.5677963	1.3743220 3
0.0040	2.7855226 - 1	2.7321378	1.5667963	1.3642736 3
0.0050	2.5564333 - 1	2.6249775	1.5657963	1.3543670 3
0.0060	2.3519322 - 1	2.5180704	1.5647963	1.3445989 3
0.0070	2.1694944 - 1	2.4114598	1.5637963	1.3349661 3
0.0080	2.0067831 - 1	2.3052106	1.5627963	1.3254647 3
0.0090	1.8616482 - 1	2.1994011	1.5617963	1.3160909 3
0.0100	1.7321368 - 1	2.0941214	1.5607963	1.3068406 3
0.0120	1.5130684 - 1	1.8855012	1.5587963	1.2886954 3
0.0150	1.2629644 - 1	1.5784728	1.5557963	1.2623103 3
0.0200	9.8764850 - 2	1.0839011	1.5507963	1.2203378 3
0.0250	8.2500605 - 2	6.0785928 - 1	1.5457963	1.1805854 3
0.0300	7.3997790 - 2	1.5112375 - 1	1.5407963	1.1428039 3
0.0400	7.3683180 - 2	5.6459396	1.5307963	1.0724503 3
0.0500	8.5618345 - 2	5.1035264	1.5207963	1.0082107 3
0.0650	1.0811837 - 1	4.6297497	1.5057963	9.2176798 2
0.0800	1.2722157 - 1	4.3623458	1.4907963	8.4566114 2
0.1000	1.4442391 - 1	4.1512888	1.4707963	7.5787071 2
0.1500	1.5524619 - 1	3.9110599	1.4207963	5.9120543 2
0.2000	1.4117148 - 1	3.8308910	1.3707963	4.7678510 2
0.3000	9.4820375 - 2	3.8669416	1.2707963	3.3479623 2
0.4000	5.7239865 - 2	4.1043269	1.1707963	2.5187906 2
0.6000	3.1954208 - 2	5.0411120	9.7079630 - 1	1.5902204 2

Table 96. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg Cj) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 =70 Kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 2.0000 f = 133.24450 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	3.8819880 - 1	2.5269416	1.5702963	1.2433895 3
0.0010	3.7591308 - 1	2.4887193	1.5697963	1.2381675 3
0.0020	3.5268024 - 1	2.4124856	1.5687963	1.2278386 3
0.0030	3.3114182 - 1	2.3365152	1.5677963	1.2176623 3
0.0040	3.1119118 - 1	2.2607924	1.5667963	1.2076369 3
0.0050	2.9272381 - 1	2.1853085	1.5657963	1.1977599 3
0.0060	2.7563956 - 1	2.1100636	1.5647963	1.1880278 3
0.0070	2.5984095 - 1	2.0350607	1.5637963	1.1784374 3
0.0080	2.4523548 - 1	1.9603106	1.5627963	1.1689853 3
0.0090	2.3173496 - 1	1.8858284	1.5617963	1.1596669 3
0.0100	2.1925577 - 1	1.8116337	1.5607963	1.1504788 3
0.0120	1.9705063 - 1	1.6641949	1.5587963	1.1324770 3
0.0150	1.6958431 - 1	1.4457754	1.5557963	1.1063547 3
0.0200	1.3558399 - 1	1.0903015	1.5507963	1.0649462 3
0.0250	1.1177398 - 1	7.4586809 - 1	1.5457963	1.0259098 3
0.0300	9.4776675 - 2	4.1030715 - 1	1.5407963	9.8899038 2
0.0400	7.4506100 - 2	6.0382421	1.5307963	9.2076906 2
0.0500	6.7634660 - 2	5.4210880	1.5207963	8.5914709 2
0.0650	7.3023840 - 2	4.6935219	1.5057963	7.7737068 2
0.0800	8.4991070 - 2	4.2246377	1.4907963	7.0657786 2
0.1000	9.9353170 - 2	3.8360446	1.4707963	6.2644905 2
0.1500	1.1200356 - 1	3.3148629	1.4207963	4.7915900 2
0.2000	1.0183619 - 1	3.0059296	1.3707963	3.8174547 2
0.3000	6.3045390 - 2	2.5626610	1.2707963	2.6471062 2
0.4000	3.0509712 - 2	2.2049900	1.1707963	1.9802951 2
0.6000	1.8703981 - 3	2.2507739	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	3.4635264 - 1	2.4191712	1.5702963	1.4000780 3
0.0010	3.3583501 - 1	2.3806305	1.5697963	1.3948535 3
0.0020	3.1594610 - 1	2.3038742	1.5687963	1.3845147 3
0.0030	2.9750597 - 1	2.2275462	1.5677963	1.3743220 3
0.0040	2.8042072 - 1	2.1516498	1.5667963	1.3642736 3
0.0050	2.6459865 - 1	2.0761913	1.5657963	1.3543670 3
0.0060	2.4995133 - 1	2.0011849	1.5647963	1.3445989 3
0.0070	2.3639435 - 1	1.9266467	1.5637963	1.3349661 3
0.0080	2.2384647 - 1	1.8525984	1.5627963	1.3254647 3
0.0090	2.1223078 - 1	1.7790635	1.5617963	1.3160909 3
0.0100	2.0147485 - 1	1.7060674	1.5607963	1.3068406 3
0.0120	1.8227272 - 1	1.5617865	1.5587963	1.2886954 3
0.0150	1.5834783 - 1	1.3499697	1.5557963	1.2623103 3
0.0200	1.2824697 - 1	1.0098907	1.5507963	1.2203378 3
0.0250	1.0656622 - 1	6.8486383 - 1	1.5457963	1.1805854 3
0.0300	9.0526465 - 2	3.7078890 - 1	1.5407963	1.1428039 3
0.0400	6.9995875 - 2	6.0389311	1.5307963	1.0724503 3
0.0500	6.1281450 - 2	5.4401983	1.5207963	1.0082107 3
0.0650	6.3692590 - 2	4.6953710	1.5057963	9.2176798 2
0.0800	7.3806130 - 2	4.2048341	1.4907963	8.4566114 2
0.1000	8.7043590 - 2	3.8032924	1.4707963	7.5787071 2
0.1500	1.0037401 - 1	3.2782562	1.4207963	5.9120543 2
0.2000	9.2713285 - 2	2.9730845	1.3707963	4.7678510 2
0.3000	5.8457085 - 2	2.5381407	1.2707963	3.3479623 2
0.4000	2.8457209 - 2	2.1881742	1.1707963	2.5187906 2
0.6000	1.6947492 - 3	2.3432426	9.7079630 - 1	1.5902204 2

Table 97. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 5.0000 f = 333.11126 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_3 \rvert$	Arg C_3	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	2.8026467 - 1	1.6496167	1.5702963	1.2433895	3
0.0010	2.7557242 - 1	1.6243195	1.5697963	1.2381675	3
0.0020	2.6650987 - 1	1.5739590	1.5687963	1.2278386	3
0.0030	2.5786079 - 1	1.5239173	1.5677963	1.2176623	3
0.0040	2.4960785 - 1	1.4742076	1.5667963	1.2076369	3
0.0050	2.4173389 - 1	1.4248384	1.5657963	1.1977599	3
0.0060	2.3422111 - 1	1.3758218	1.5647963	1.1880278	3
0.0070	2.2705309 - 1	1.3271686	1.5637963	1.1784374	3
0.0080	2.2021271 - 1	1.2788885	1.5627963	1.1689853	3
0.0090	2.1368428 - 1	1.2309922	1.5617963	1.1596669	3
0.0100	2.0745196 - 1	1.1834882	1.5607963	1.1504788	3
0.0120	1.9581537 - 1	1.0896996	1.5587963	1.1324770	3
0.0150	1.8021946 - 1	9.5217951 - 1	1.5557963	1.1063547	3
0.0200	1.5834456 - 1	7.3177006 - 1	1.5507963	1.0649462	3
0.0250	1.4048190 - 1	5.2247994 - 1	1.5457963	1.0259098	3
0.0300	1.2561296 - 1	3.2383681 - 1	1.5407963	9.8899038	2
0.0400	1.0211422 - 1	6.2370746	1.5307963	9.2076906	2
0.0500	8.4231870 - 2	5.8930386	1.5207963	8.5914709	2
0.0650	6.4566055 - 2	5.3978728	1.5057963	7.7737068	2
0.0800	5.1657000 - 2	4.9043436	1.4907963	7.0657786	2
0.1000	4.2743070 - 2	4.2613832	1.4707963	6.2644905	2
0.1500	3.8290743 - 2	3.0635788	1.4207963	4.7915900	2
0.2000	3.3245770 - 2	2.3248020	1.3707963	3.8174547	2
0.3000	1.6162227 - 2	1.2038181	1.2707963	2.6471062	2
0.4000	4.3527157 - 3	1.7203994 - 1	1.1707963	1.9802951	2
0.6000	1.2044627 - 4	3.1177098	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	2.4213635 - 1	1.3851131	1.5702963	1.4000780	3
0.0010	2.3850402 - 1	1.3598830	1.5697963	1.3948535	3
0.0020	2.3148123 - 1	1.3097786	1.5687963	1.3845147	3
0.0030	2.2476852 - 1	1.2601574	1.5677963	1.3743220	3
0.0040	2.1835205 - 1	1.2110331	1.5667963	1.3642736	3
0.0050	2.1221736 - 1	1.1624115	1.5657963	1.3543670	3
0.0060	2.0635063 - 1	1.1143019	1.5647963	1.3445989	3
0.0070	2.0073861 - 1	1.0667123	1.5637963	1.3349661	3
0.0080	1.9536849 - 1	1.0196537	1.5627963	1.3254647	3
0.0090	1.9022668 - 1	9.7312455 - 1	1.5617963	1.3160909	3
0.0100	1.8530194 - 1	9.2713558 - 1	1.5607963	1.3068406	3
0.0120	1.7605688 - 1	8.3678662 - 1	1.5587963	1.2886954	3
0.0150	1.6353862 - 1	7.0535170 - 1	1.5557963	1.2623103	3
0.0200	1.4565111 - 1	4.9707770 - 1	1.5507963	1.2203378	3
0.0250	1.3066074 - 1	3.0163179 - 1	1.5457963	1.1805854	3
0.0300	1.1784963 - 1	1.1778072 - 1	1.5407963	1.1428039	3
0.0400	9.6882545 - 2	6.0614917	1.5307963	1.0724503	3
0.0500	8.0297025 - 2	5.7477447	1.5207963	1.0082107	3
0.0650	6.1347365 - 2	5.2968141	1.5057963	9.2176798	2
0.0800	4.8232602 - 2	4.8428189	1.4907963	8.4566114	2
0.1000	3.8303739 - 2	4.2291196	1.4707963	7.5787071	2
0.1500	3.2675834 - 2	3.0053424	1.4207963	5.9120543	2
0.2000	2.8739239 - 2	2.2508860	1.3707963	4.7678510	2
0.3000	1.4218669 - 2	1.1329103	1.2707963	3.3479623	2
0.4000	3.7870410 - 3	1.1715968 - 1	1.1707963	2.5187906	2
0.6000	1.2147722 - 4	3.0650052	9.7079630 - 1	1.5902204	2

Table 98. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.3002 f = 20 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	1.7015835 - 1	4.2837746	1.5702963	1.2433895	3
0.0010	1.5248300 - 1	4.1267705	1.5697963	1.2381675	3
0.0020	1.2430847 - 1	3.8198996	1.5687963	1.2278386	3
0.0030	1.0340162 - 1	3.5263999	1.5677963	1.2176623	3
0.0040	8.7573985 - 2	3.2502236	1.5667963	1.2076369	3
0.0050	7.5228250 - 2	2.9937668	1.5657963	1.1977599	3
0.0060	6.5255185 - 2	2.7576569	1.5647963	1.1880278	3
0.0070	5.6915025 - 2	2.5411191	1.5637963	1.1784374	3
0.0080	4.9728260 - 2	2.3425194	1.5627963	1.1689853	3
0.0090	4.3387306 - 2	2.1598287	1.5617963	1.1596669	3
0.0100	3.7694168 - 2	1.9909258	1.5607963	1.1504788	3
0.0120	2.7771305 - 2	1.6861970	1.5587963	1.1324770	3
0.0150	1.5540040 - 2	1.2786720	1.5557963	1.1063547	3
0.0200	1.6999015 - 3	5.4064799	1.5507963	1.0649462	3
0.0250	1.2718211 - 2	3.8471969	1.5457963	1.0259098	3
0.0300	2.2654125 - 2	3.5249011	1.5407963	9.8899038	2
0.0400	3.8285701 - 2	3.1288370	1.5307963	9.2076906	2
0.0500	4.9839009 - 2	2.8908425	1.5207963	8.5914709	2
0.0650	6.1437730 - 2	2.6898676	1.5057963	7.7737068	2
0.0800	6.7805195 - 2	2.5952818	1.4907963	7.0657786	2
0.1000	7.0583315 - 2	2.5631200	1.4707963	6.2644905	2
0.1500	6.2459665 - 2	2.7161268	1.4207963	4.7915900	2
0.2000	4.6753832 - 2	3.0158514	1.3707963	3.8174547	2
0.3000	1.3488403 - 2	4.0523169	1.2707963	2.6471062	2
0.4000	2.6991512 - 2	2.6697816 - 1	1.1707963	1.9802951	2
0.6000	8.1908255 - 2	1.0150020	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	1.3631884 - 1	4.3981484	1.5702963	1.4000780	3
0.0010	1.2343616 - 1	4.2320234	1.5697963	1.3948535	3
0.0020	1.0324822 - 1	3.9105699	1.5687963	1.3845147	3
0.0030	8.8514870 - 2	3.6090575	1.5677963	1.3743220	3
0.0040	7.7391690 - 2	3.3319574	1.5667963	1.3642736	3
0.0050	6.8595605 - 2	3.0807704	1.5657963	1.3543670	3
0.0060	6.1293000 - 2	2.8546394	1.5647963	1.3445989	3
0.0070	5.4970735 - 2	2.6513898	1.5637963	1.3349661	3
0.0080	4.9323257 - 2	2.4683923	1.5627963	1.3254647	3
0.0090	4.4171773 - 2	2.3030919	1.5617963	1.3160909	3
0.0100	3.9410844 - 2	2.1532264	1.5607963	1.3068406	3
0.0120	3.0826170 - 2	1.8927565	1.5587963	1.2886954	3
0.0150	1.9819460 - 2	1.5842575	1.5557963	1.2623103	3
0.0200	5.3191050 - 3	1.3731354	1.5507963	1.2203378	3
0.0250	6.5547230 - 3	3.6489115	1.5457963	1.1805854	3
0.0300	1.5716483 - 2	3.5434559	1.5407963	1.1428039	3
0.0400	2.9953863 - 2	3.2455484	1.5307963	1.0724503	3
0.0500	4.0301302 - 2	3.0402809	1.5207963	1.0082107	3
0.0650	5.0706825 - 2	2.8570293	1.5057963	9.2176798	2
0.0800	5.6642175 - 2	2.7658572	1.4907963	8.4566114	2
0.1000	5.9726330 - 2	2.7291718	1.4707963	7.5787071	2
0.1500	5.4105125 - 2	2.8563250	1.4207963	5.9120543	2
0.2000	4.0683982 - 2	3.1315736	1.3707963	4.7678510	2
0.3000	1.0755333 - 2	4.3232824	1.2707963	3.3479623	2
0.4000	2.9381311 - 2	3.2366127 - 1	1.1707963	2.5187906	2
0.6000	8.2823660 - 2	1.0257283	9.7079630 - 1	1.5902204	2

Table 99. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.467 f = 20 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	2.2938565 - 1	3.8356071	1.5702963	1.2433895	3
0.0010	2.0434917 - 1	3.6823269	1.5697963	1.2381675	3
0.0020	1.6418179 - 1	3.3810054	1.5687963	1.2278386	3
0.0030	1.3419794 - 1	3.0894094	1.5677963	1.2176623	3
0.0040	1.1149948 - 1	2.8107043	1.5667963	1.2076369	3
0.0050	9.3930865 - 2	2.5471967	1.5657963	1.1977599	3
0.0060	7.9951065 - 2	2.2998970	1.5647963	1.1880278	3
0.0070	6.8495210 - 2	2.0685237	1.5637963	1.1784374	3
0.0080	5.8845985 - 2	1.8517749	1.5627963	1.1689853	3
0.0090	5.0526135 - 2	1.6476120	1.5617963	1.1596669	3
0.0100	4.3219146 - 2	1.4534871	1.5607963	1.1504788	3
0.0120	3.0866556 - 2	1.0823626	1.5587963	1.1324770	3
0.0150	1.6526548 - 2	4.8380932 - 1	1.5557963	1.1063547	3
0.0200	8.5672315 - 3	4.6205440	1.5507963	1.0649462	3
0.0250	2.0725261 - 2	3.5891740	1.5457963	1.0259098	3
0.0300	3.2675869 - 2	3.1738358	1.5407963	9.8899038	2
0.0400	5.2571345 - 2	2.6998745	1.5307963	9.2076906	2
0.0500	6.7993880 - 2	2.4239220	1.5207963	8.5914709	2
0.0650	8.4210215 - 2	2.1857908	1.5057963	7.7737068	2
0.0800	9.3776035 - 2	2.0604875	1.4907963	7.0657786	2
0.1000	9.8993630 - 2	1.9886354	1.4707963	6.2644905	2
0.1500	9.1263910 - 2	2.0396207	1.4207963	4.7915900	2
0.2000	7.2913450 - 2	2.2400257	1.3707963	3.8174547	2
0.3000	3.6237500 - 2	2.8427881	1.2707963	2.6471062	2
0.4000	1.4428875 - 2	4.3042101	1.1707963	1.9802951	2
0.6000	4.8548302 - 2	6.0649270	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	1.9206368 - 1	3.9019780	1.5702963	1.4000780	3
0.0010	1.7245994 - 1	3.7431059	1.5697963	1.3948535	3
0.0020	1.4122746 - 1	3.4330434	1.5687963	1.3845147	3
0.0030	1.1803857 - 1	3.1371435	1.5677963	1.3743220	3
0.0040	1.0044244 - 1	2.8592182	1.5667963	1.3642736	3
0.0050	8.6664550 - 2	2.6013621	1.5657963	1.3543670	3
0.0060	7.5483390 - 2	2.3638688	1.5647963	1.3445989	3
0.0070	6.6091095 - 2	2.1456595	1.5637963	1.3349661	3
0.0080	5.7967090 - 2	1.9448598	1.5627963	1.3254647	3
0.0090	5.0779175 - 2	1.7592422	1.5617963	1.3160909	3
0.0100	4.4313846 - 2	1.5864917	1.5607963	1.3068406	3
0.0120	3.3033382 - 2	1.2703228	1.5587963	1.2886954	3
0.0150	1.9161604 - 2	8.2875460 - 1	1.5557963	1.2623103	3
0.0200	3.7778330 - 3	5.4475438	1.5507963	1.2203378	3
0.0250	1.3911916 - 2	3.6258497	1.5457963	1.1805854	3
0.0300	2.5223324 - 2	3.2364108	1.5407963	1.1428039	3
0.0400	4.3409616 - 2	2.8012797	1.5307963	1.0724503	3
0.0500	5.7190890 - 2	2.5422609	1.5207963	1.0082107	3
0.0650	7.1667225 - 2	2.3132828	1.5057963	9.2176798	2
0.0800	8.0446350 - 2	2.1891213	1.4907963	8.4566114	2
0.1000	8.5766070 - 2	2.1137448	1.4707963	7.5787071	2
0.1500	8.0921155 - 2	2.1480967	1.4207963	5.9120543	2
0.2000	6.5727960 - 2	2.3314275	1.3707963	4.7678510	2
0.3000	3.2754327 - 2	2.9262162	1.2707963	3.3479623	2
0.4000	1.4452153 - 2	4.4823672	1.1707963	2.5187906	2
0.6000	4.9271062 - 2	6.0780633	9.7079630 - 1	1.5902204	2

Table 100. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1501 f = 10 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	8.3861665 - 2	4.9926785	1.5702963	1.2433895	3
0.0010	7.3415975 - 2	4.7450460	1.5697963	1.2381675	3
0.0020	5.9203790 - 2	4.2785345	1.5687963	1.2278386	3
0.0030	5.0318510 - 2	3.8689704	1.5677963	1.2176623	3
0.0040	4.4000708 - 2	3.5221467	1.5667963	1.2076369	3
0.0050	3.8857803 - 2	3.2312971	1.5657963	1.1977599	3
0.0060	3.4287113 - 2	2.9863105	1.5647963	1.1880278	3
0.0070	3.0058383 - 2	2.7783021	1.5637963	1.1784374	3
0.0080	2.6093846 - 2	2.6007452	1.5627963	1.1689853	3
0.0090	2.2370158 - 2	2.4493993	1.5617963	1.1596669	3
0.0100	1.8880038 - 2	2.3220980	1.5607963	1.1504788	3
0.0120	1.2587075 - 2	2.1428928	1.5587963	1.1324770	3
0.0150	5.0486285 - 3	2.2472908	1.5557963	1.1063547	3
0.0200	7.6335575 - 3	3.9019658	1.5507963	1.0649462	3
0.0250	1.5692721 - 2	3.8562842	1.5457963	1.0259098	3
0.0300	2.2300891 - 2	3.7230049	1.5407963	9.8899038	2
0.0400	3.2031162 - 2	3.5190909	1.5307963	9.2076906	2
0.0500	3.8383816 - 2	3.4004324	1.5207963	8.5914709	2
0.0650	4.3604007 - 2	3.3247298	1.5057963	7.7737068	2
0.0800	4.5337506 - 2	3.3248028	1.4907963	7.0657786	2
0.1000	4.4249349 - 2	3.3961015	1.4707963	6.2644905	2
0.1500	3.3203307 - 2	3.7601358	1.4207963	4.7915900	2
0.2000	1.7351603 - 2	4.3209310	1.3707963	3.8174547	2
0.3000	2.5443186 - 2	1.1114474	1.2707963	2.6471062	2
0.4000	6.6562880 - 2	1.7319183	1.1707963	1.9802951	2
0.6000	1.2926273 - 1	2.3762388	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	5.8990760 - 2	5.1845176	1.5702963	1.4000780	3
0.0010	5.2996625 - 2	4.9008148	1.5697963	1.3948535	3
0.0020	4.6069970 - 2	4.3873754	1.5687963	1.3845147	3
0.0030	4.2410284 - 2	3.9671231	1.5677963	1.3743220	3
0.0040	3.9702025 - 2	3.6313311	1.5667963	1.3642736	3
0.0050	3.7079052 - 2	3.3598868	1.5657963	1.3543670	3
0.0060	3.4329107 - 2	3.1360281	1.5647963	1.3445989	3
0.0070	3.1466448 - 2	2.9482771	1.5637963	1.3349661	3
0.0080	2.8560492 - 2	2.7891655	1.5627963	1.3254647	3
0.0090	2.5678786 - 2	2.6539235	1.5617963	1.3160909	3
0.0100	2.2872318 - 2	2.5396288	1.5607963	1.3068406	3
0.0120	1.7612460 - 2	2.3690943	1.5587963	1.2886954	3
0.0150	1.0872036 - 2	2.2773367	1.5557963	1.2623103	3
0.0200	5.1213605 - 3	3.0614330	1.5507963	1.2203378	3
0.0250	9.4439155 - 3	3.7643993	1.5457963	1.1805854	3
0.0300	1.4923591 - 2	3.8104184	1.5407963	1.1428039	3
0.0400	2.3403852 - 2	3.7120422	1.5307963	1.0724503	3
0.0500	2.9038137 - 2	3.6279633	1.5207963	1.0082107	3
0.0650	3.3840689 - 2	3.5683691	1.5057963	9.2176798	2
0.0800	3.5698041 - 2	3.5678750	1.4907963	8.4566114	2
0.1000	3.5223396 - 2	3.6279252	1.4707963	7.5787071	2
0.1500	2.6074636 - 2	3.9590570	1.4207963	5.9120543	2
0.2000	1.1935023 - 2	4.6073565	1.3707963	4.7678510	2
0.3000	2.9560757 - 2	1.2087052	1.2707963	3.3479623	2
0.4000	6.9385680 - 2	1.7654287	1.1707963	2.5187906	2
0.6000	1.3026367 - 1	2.3873288	9.7079630 - 1	1.5902204	2

Table 101. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2335 f = 10 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	1.3205560 - 1	4.4809915	1.5702963	1.2433895	3
0.0010	1.1427645 - 1	4.2549415	1.5697963	1.2381675	3
0.0020	8.8633670 - 2	3.8237672	1.5687963	1.2278386	3
0.0030	7.1580725 - 2	3.4321290	1.5677963	1.2176623	3
0.0040	5.9377970 - 2	3.0865520	1.5667963	1.2076369	3
0.0050	4.9894260 - 2	2.7856199	1.5657963	1.1977599	3
0.0060	4.2014122 - 2	2.5238468	1.5647963	1.1880278	3
0.0070	3.5175657 - 2	2.2949524	1.5637963	1.1784374	3
0.0080	2.9091193 - 2	2.0934274	1.5627963	1.1689853	3
0.0090	2.3601632 - 2	1.9150367	1.5617963	1.1596669	3
0.0100	1.1383254 - 1	4.2572214	1.5697963	1.1504788	3
0.0120	1.8607462 - 2	1.7569336	1.5607963	1.1324770	3
0.0150	1.2051170 - 3	3.7088890	1.5557963	1.1063547	3
0.0200	1.5115592 - 2	3.7716317	1.5507963	1.0649462	3
0.0250	2.6042267 - 2	3.4915069	1.5457963	1.0259098	3
0.0300	3.4909505 - 2	3.2829260	1.5407963	9.8899028	2
0.0400	4.8265887 - 2	3.0108365	1.5307963	9.2076906	2
0.0500	5.7303755 - 2	2.8554138	1.5207963	8.5914709	2
0.0650	6.5139280 - 2	2.7416618	1.5057963	7.7737068	2
0.0800	6.8221960 - 2	2.7104085	1.4907963	7.0657786	2
0.1000	6.7648290 - 2	2.7431481	1.4707963	6.2644905	2
0.1500	5.5344060 - 2	3.0127904	1.4207963	4.7915900	2
0.2000	3.8284954 - 2	3.4002096	1.3707963	3.8174547	2
0.3000	8.0738200 - 3	5.4545285	1.2707963	2.6471062	2
0.4000	4.0836882 - 2	8.6798131 - 1	1.1707963	1.9802951	2
0.6000	1.0130729 - 1	1.5457766	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	1.0257405 - 1	4.6174596	1.5702963	1.4000780	3
0.0010	9.0489705 - 2	4.3745778	1.5697963	1.3948535	3
0.0020	7.3724145 - 2	3.9217997	1.5687963	1.3845147	3
0.0030	6.2829215 - 2	3.5267524	1.5677963	1.3743220	3
0.0040	5.4810560 - 2	3.1915608	1.5667963	1.3642736	3
0.0050	4.8182111 - 2	2.9087782	1.5657963	1.3543670	3
0.0060	4.2296387 - 2	2.6689222	1.5647963	1.3445989	3
0.0070	3.6895863 - 2	2.4638875	1.5637963	1.3349661	3
0.0080	3.1882925 - 2	2.2877272	1.5627963	1.3254647	3
0.0090	2.7218528 - 2	2.1365474	1.5617963	1.3160909	3
0.0100	2.2881869 - 2	2.0083369	1.5607963	1.3068406	3
0.0120	1.5132592 - 2	1.8238945	1.5587963	1.2886954	3
0.0150	5.8849050 - 3	1.9079204	1.5557963	1.2623103	3
0.0200	9.0038015 - 3	3.6263626	1.5507963	1.2203378	3
0.0250	1.8648008 - 2	3.5612571	1.5457963	1.1805854	3
0.0300	2.6537495 - 2	3.4173823	1.5407963	1.1428039	3
0.0400	3.8287618 - 2	3.1958190	1.5307963	1.0724503	3
0.0500	4.6216101 - 2	3.0591022	1.5207963	1.0082107	3
0.0650	5.3277980 - 2	2.9533125	1.5057963	9.2176798	2
0.0800	5.6404150 - 2	2.9197620	1.4907963	8.4566114	2
0.1000	5.6640395 - 2	2.9423245	1.4707963	7.5787071	2
0.1500	4.7261568 - 2	3.1756579	1.4207963	5.9120543	2
0.2000	3.2318354 - 2	3.5370008	1.3707963	4.7678510	2
0.3000	9.3123920 - 3	5.9558002	1.2707963	3.3479623	2
0.4000	4.3523065 - 2	9.0894939 - 1	1.1707963	2.5187906	2
0.6000	1.0229642 - 1	1.5565078	9.7079630 - 1	1.5902204	2

Table 102. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0100 f = 0.42826552 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	2.3485875 - 2	4.7507490	1.5702963	1.2433895 3
0.0010	1.1767889 - 2	3.9698518	1.5697963	1.2381675 3
0.0020	2.0672752 - 3	4.0501156	1.5687963	1.2278386 3
0.0030	6.9869515 - 3	4.8558766	1.5677963	1.2176623 3
0.0040	1.2123268 - 2	4.5413166	1.5667963	1.2076369 3
0.0050	1.6305349 - 2	4.2699574	1.5657963	1.1977599 3
0.0060	1.9831230 - 2	4.0583678	1.5647963	1.1880278 3
0.0070	2.2871460 - 2	3.8929070	1.5637963	1.1784374 3
0.0080	2.5528761 - 2	3.7614773	1.5627963	1.1689853 3
0.0090	2.7873303 - 2	3.6552948	1.5617963	1.1596669 3
0.0100	2.9957538 - 2	3.5681535	1.5607963	1.1504788 3
0.0120	3.3502085 - 2	3.4345720	1.5587963	1.1324770 3
0.0150	3.7676043 - 2	3.2994209	1.5557963	1.1063547 3
0.0200	4.2734230 - 2	3.1677554	1.5507963	1.0649462 3
0.0250	4.6445716 - 2	3.0965403	1.5457963	1.0259098 3
0.0300	4.9426320 - 2	3.0581074	1.5407963	9.8899038 2
0.0400	5.4340800 - 2	3.0358717	1.5307963	9.2076906 2
0.0500	5.8745565 - 2	3.0555138	1.5207963	8.5914709 2
0.0650	6.5389240 - 2	3.1285604	1.5057963	7.7737068 2
0.0800	7.2601355 - 2	3.2315977	1.4907963	7.0657786 2
0.1000	8.3441250 - 2	3.3920346	1.4707963	6.2644905 2
0.1500	1.1652770 - 1	3.8098475	1.4207963	4.7915900 2
0.2000	1.5565972 - 1	4.1725610	1.3707963	3.8174547 2
0.3000	2.3872679 - 1	4.6869541	1.2707963	2.6471062 2
0.4000	4.3197481 - 1	5.3542390	9.7079630 - 1	1.9802951 2
0.6000	3.1506726 - 1	5.0051661	1.1707963	1.2445355 2
		h_3 = 90 kilometers		
0.0005	2.8864434 - 2	5.1880007	1.5702963	1.4000780 3
0.0010	1.5055896 - 2	4.3002723	1.5697963	1.3948535 3
0.0020	3.1879793 - 3	3.5210068	1.5687963	1.3845147 3
0.0030	5.9688985 - 3	5.1779135	1.5677963	1.3743220 3
0.0040	1.2690243 - 2	4.8871223	1.5667963	1.3642736 3
0.0050	1.8382352 - 2	4.6212755	1.5657963	1.3543670 3
0.0060	2.3261727 - 2	4.4160533	1.5647963	1.3445989 3
0.0070	2.7490816 - 2	4.2569738	1.5637963	1.3349661 3
0.0080	3.1186213 - 2	4.1313178	1.5627963	1.3254647 3
0.0090	3.4437873 - 2	4.0301253	1.5617963	1.3160909 3
0.0100	3.7317451 - 2	3.9471936	1.5607963	1.3068406 3
0.0120	4.2183418 - 2	3.8200359	1.5587963	1.2886954 3
0.0150	4.7848946 - 2	3.6908116	1.5557963	1.2623103 3
0.0200	5.4583470 - 2	3.5628960	1.5507963	1.2203378 3
0.0250	5.9388185 - 2	3.4909041	1.5457963	1.1805854 3
0.0300	6.3125320 - 2	3.4488528	1.5407963	1.1428039 3
0.0400	6.8983005 - 2	3.4138122	1.5307963	1.0724503 3
0.0500	7.3902580 - 2	3.4157469	1.5207963	1.0082107 3
0.0650	8.0884400 - 2	3.4569541	1.5057963	9.2176798 2
0.0800	8.8121700 - 2	3.5254245	1.4907963	8.4566114 2
0.1000	9.8688455 - 2	3.6402494	1.4707963	7.5787071 2
0.1500	1.3022993 - 1	3.9645833	1.4207963	5.9120543 2
0.2000	1.6730238 - 1	4.2678806	1.3707963	4.7678510 2
0.3000	2.4646280 - 1	4.7261295	1.2707963	3.3479623 2
0.4000	3.2002531 - 1	5.0235585	1.1707963	2.5187906 2
0.6000	4.3404445 - 1	5.3596597	9.7079630 - 1	1.5902204 2

Table 103. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0200 f = 0.85653105 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	1.8287289 - 2	3.6800940	1.5702963	1.2433895 3
0.0010	9.3974650 - 3	3.4474469	1.5697963	1.2381675 3
0.0020	5.2739620 - 3	4.1886537	1.5687963	1.2278386 3
0.0030	8.8950055 - 3	4.2310526	1.5677963	1.2176623 3
0.0040	1.1390538 - 2	3.9828581	1.5667963	1.2076369 3
0.0050	1.2860743 - 2	3.7343863	1.5657963	1.1977599 3
0.0060	1.3757271 - 2	3.5124693	1.5647963	1.1880278 3
0.0070	1.4356669 - 2	3.3171783	1.5637963	1.1784374 3
0.0080	1.4811282 - 2	3.1454201	1.5627963	1.1689853 3
0.0090	1.5201184 - 2	2.9941702	1.5617963	1.1596669 3
0.0100	1.5566407 - 2	2.8608322	1.5607963	1.1504788 3
0.0120	1.6285395 - 2	2.6392185	1.5587963	1.1324770 3
0.0150	1.7377691 - 2	2.3935006	1.5557963	1.1063547 3
0.0200	1.9151075 - 2	2.1342514	1.5507963	1.0649462 3
0.0250	2.0772586 - 2	1.9849403	1.5457963	1.0259098 3
0.0300	2.2244247 - 2	1.8985691	1.5407963	9.8899038 2
0.0400	2.4906707 - 2	1.8309925	1.5307963	9.2076906 2
0.0500	2.7446125 - 2	1.8415839	1.5207963	8.5914709 2
0.0650	3.1441414 - 2	1.9334306	1.5057963	7.7737068 2
0.0800	3.5954567 - 2	2.0726397	1.4907963	7.0657786 2
0.1000	4.3003762 - 2	2.2891151	1.4707963	6.2644905 2
0.1500	6.5592300 - 2	2.8363307	1.4207963	4.7915900 2
0.2000	9.3287025 - 2	3.3033545	1.3707963	3.8174547 2
0.3000	1.5499928 - 1	3.9797092	1.2707963	2.6471062 2
0.4000	2.1617651 - 1	4.4147227	1.1707963	1.9802951 2
0.6000	3.1940706 - 1	4.9078158	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	2.2780542 - 2	4.1794184	1.5702963	1.4000780 3
0.0010	1.3513146 - 2	3.8087862	1.5697963	1.3948535 3
0.0020	6.0647190 - 3	3.9658394	1.5687963	1.3845147 3
0.0030	8.3559815 - 3	4.3174723	1.5677963	1.3743220 3
0.0040	1.1699973 - 2	4.1855526	1.5667963	1.3642736 3
0.0050	1.4246715 - 2	3.9844708	1.5657963	1.3543670 3
0.0060	1.6160407 - 2	3.7932180	1.5647963	1.3445989 3
0.0070	1.7663732 - 2	3.6238233	1.5637963	1.3349661 3
0.0080	1.8903833 - 2	3.4762839	1.5627963	1.3254647 3
0.0090	1.9969437 - 2	3.3481811	1.5617963	1.3160909 3
0.0100	2.0913264 - 2	3.2367830	1.5607963	1.3068406 3
0.0120	2.2551356 - 2	3.0544843	1.5587963	1.2886954 3
0.0150	2.4596450 - 2	2.8548797	1.5557963	1.2623103 3
0.0200	2.7316506 - 2	2.6429936	1.5507963	1.2203378 3
0.0250	2.9493986 - 2	2.5165556	1.5457963	1.1805854 3
0.0300	3.1338012 - 2	2.4385808	1.5407963	1.1428039 3
0.0400	3.4494055 - 2	2.3639593	1.5307963	1.0724503 3
0.0500	3.7366703 - 2	2.3505592	1.5207963	1.0082107 3
0.0650	4.1695013 - 2	2.3921995	1.5057963	9.2176798 2
0.0800	4.6380413 - 2	2.4758532	1.4907963	8.4566114 2
0.1000	5.3434855 - 2	2.6215464	1.4707963	7.5787071 2
0.1500	7.5241820 - 2	3.0365254	1.4207963	5.9120543 2
0.2000	1.0168375 - 1	3.4269361	1.3707963	4.7678510 2
0.3000	1.6097297 - 1	4.0324341	1.2707963	3.3479623 2
0.4000	2.2030396 - 1	4.4402524	1.1707963	2.5187906 2
0.6000	3.2133484 - 1	4.9155764	9.7079630 - 1	1.5902204 2

Table 104. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0500 f = 2.1413276 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	8.9050975 - 3	8.9368665 - 1	1.5702963	1.2433895	3
0.0010	5.7479190 - 3	5.6092541	1.5697963	1.2381675	3
0.0020	1.2905682 - 2	4.3838669	1.5687963	1.2278386	3
0.0030	1.6074131 - 2	3.9227357	1.5677963	1.2176623	3
0.0040	1.6582472 - 2	3.6010566	1.5667963	1.2076369	3
0.0050	1.5809379 - 2	3.3518347	1.5657963	1.1977599	3
0.0060	1.4436912 - 2	3.1510211	1.5647963	1.1880278	3
0.0070	1.2804640 - 2	2.9852913	1.5637963	1.1784374	3
0.0080	1.1086531 - 2	2.8458643	1.5627963	1.1689853	3
0.0090	9.3733950 - 3	2.7263825	1.5617963	1.1596669	3
0.0100	7.7125435 - 3	2.6218556	1.5607963	1.1504788	3
0.0120	4.6302118 - 3	2.4391685	1.5587963	1.1324770	3
0.0150	7.1679935 - 4	1.9058595	1.5557963	1.1063547	3
0.0200	4.4189151 - 3	5.3678586	1.5507963	1.0649462	3
0.0250	8.0203455 - 3	5.2361955	1.5457963	1.0259098	3
0.0300	1.0607249 - 2	5.1696583	1.5407963	9.8899038	2
0.0400	1.3783238 - 2	5.1273448	1.5307963	9.2076906	2
0.0500	1.5274799 - 2	5.1571590	1.5207963	8.5914709	2
0.0650	1.5705164 - 2	5.2939319	1.5057963	7.7737068	2
0.0800	1.5001544 - 2	5.5270273	1.4907963	7.0657786	2
0.1000	1.3820420 - 2	5.9929377	1.4707963	6.2644905	2
0.1500	2.0397943 - 2	1.1316603	1.4207963	4.7915900	2
0.2000	3.9719256 - 2	1.9298924	1.3707963	3.8174547	2
0.3000	8.7249880 - 2	2.7862443	1.2707963	2.6471062	2
0.4000	1.3279369 - 1	3.3190113	1.1707963	1.9802951	2
0.6000	2.0629444 - 1	3.9765533	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	9.4974760 - 3	2.4483709	1.5702963	1.4000780	3
0.0010	3.0913258 - 3	3.4029313	1.5697963	1.3948535	3
0.0020	1.0734970 - 2	4.2606492	1.5687963	1.3845147	3
0.0030	1.5326484 - 2	4.0036570	1.5677963	1.3743220	3
0.0040	1.7183154 - 2	3.7515579	1.5667963	1.3642736	3
0.0050	1.7571912 - 2	3.5350320	1.5657963	1.3543670	3
0.0060	1.7165699 - 2	3.3506818	1.5647963	1.3445989	3
0.0070	1.6331589 - 2	3.1919634	1.5637963	1.3349661	3
0.0080	1.5277291 - 2	3.0529403	1.5627963	1.3254647	3
0.0090	1.4123842 - 2	2.9287354	1.5617963	1.3160909	3
0.0100	1.2943039 - 2	2.8153509	1.5607963	1.3068406	3
0.0120	1.0655397 - 2	2.6080738	1.5587963	1.2886954	3
0.0150	7.6748075 - 3	2.3044217	1.5557963	1.2623103	3
0.0200	4.4285419 - 3	1.6350984	1.5507963	1.2203378	3
0.0250	3.9399651 - 3	7.5541111 - 1	1.5457963	1.1805854	3
0.0300	5.1417895 - 3	2.3458859 - 1	1.5407963	1.1428039	3
0.0400	7.7166550 - 3	6.1894820	1.5307963	1.0724503	3
0.0500	9.4454605 - 3	6.1468044	1.5207963	1.0082107	3
0.0650	1.0999477 - 2	6.2686491	1.5057963	9.2176798	2
0.0800	1.2177263 - 2	2.2656579 - 1	1.4907963	8.4566114	2
0.1000	1.4403958 - 2	6.3367025 - 1	1.4707963	7.5787071	2
0.1500	2.6802526 - 2	1.5260373	1.4207963	5.9120543	2
0.2000	4.6276466 - 2	2.1019925	1.3707963	4.7678510	2
0.3000	9.1838330 - 2	2.8503135	1.2707963	3.3479623	2
0.4000	1.3579478 - 1	3.3512530	1.1707963	2.5187906	2
0.6000	2.0765066 - 1	3.9876026	9.7079630 - 1	1.5902204	2

Table 105. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1000 f = 4.2826552 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	4.4525539 - 2	5.4241739	1.5702963	1.2433895	3
0.0010	3.8039931 - 2	4.9847927	1.5697963	1.2381675	3
0.0020	3.2653312 - 2	4.2548386	1.5687963	1.2278386	3
0.0030	2.9956088 - 2	3.7391643	1.5677963	1.2176623	3
0.0040	2.7117374 - 2	3.3665608	1.5667963	1.2076369	3
0.0050	2.3906215 - 2	3.0837031	1.5657963	1.1977599	3
0.0060	2.0540557 - 2	2.8629707	1.5647963	1.1880278	3
0.0070	1.7211964 - 2	2.6909145	1.5637963	1.1784374	3
0.0080	1.4035977 - 2	2.5625591	1.5627963	1.1689853	3
0.0090	1.1078784 - 2	2.4804095	1.5617963	1.1596669	3
0.0100	8.3920670 - 3	2.4579913	1.5607963	1.1504788	3
0.0120	4.2981329 - 3	2.7817235	1.5587963	1.1324770	3
0.0150	5.5712810 - 3	3.9743208	1.5557963	1.1063547	3
0.0200	1.3260720 - 2	4.1127290	1.5507963	1.0649462	3
0.0250	1.9393576 - 2	4.0149538	1.5457963	1.0259098	3
0.0300	2.4066251 - 2	3.9270328	1.5407963	9.8899038	2
0.0400	3.0321923 - 2	3.8167643	1.5307963	9.2076906	2
0.0500	3.3807528 - 2	3.7713159	1.5207963	8.5914709	2
0.0650	3.5806252 - 2	3.7787877	1.5057963	7.7737068	2
0.0800	3.5362424 - 2	3.8445616	1.4907963	7.0657786	2
0.1000	3.2480259 - 2	3.9918276	1.4707963	6.2644905	2
0.1500	1.9669931 - 2	4.5926219	1.4207963	4.7915900	2
0.2000	9.7711485 - 3	6.2295753	1.3707963	3.8174547	2
0.3000	4.7547278 - 2	1.7806194	1.2707963	2.6471062	2
0.4000	9.0983100 - 2	2.3466992	1.1707963	1.9802951	2
0.6000	1.5541338 - 1	3.0152572	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	2.6034932 - 2	5.6847100	1.5702963	1.4000780	3
0.0010	2.4083292 - 2	5.1145266	1.5697963	1.3948535	3
0.0020	2.5823933 - 2	4.3183091	1.5687963	1.3845147	3
0.0030	2.7180649 - 2	3.8395414	1.5677963	1.3743220	3
0.0040	2.6815647 - 2	3.5069273	1.5667963	1.3642736	3
0.0050	2.5301732 - 2	3.2542337	1.5657963	1.3543670	3
0.0060	2.3181817 - 2	3.0542350	1.5647963	1.3445989	3
0.0070	2.0798544 - 2	2.8936919	1.5637963	1.3349661	3
0.0080	1.8349320 - 2	2.7655299	1.5627963	1.3254647	3
0.0090	1.5944905 - 2	2.6661652	1.5617963	1.3160909	3
0.0100	1.3647554 - 2	2.5946131	1.5607963	1.3068406	3
0.0120	9.5172325 - 3	2.5450170	1.5587963	1.2886954	3
0.0150	5.0942530 - 3	2.8636949	1.5557963	1.2623103	3
0.0200	6.5560255 - 3	4.0064570	1.5507963	1.2203378	3
0.0250	1.1405814 - 2	4.1731879	1.5457963	1.1805854	3
0.0300	1.5414745 - 2	4.1660955	1.5407963	1.1428039	3
0.0400	2.0927740 - 2	4.1139115	1.5307963	1.0724503	3
0.0500	2.4103446 - 2	4.0879232	1.5207963	1.0082107	3
0.0650	2.6121913 - 2	4.1019774	1.5057963	9.2176798	2
0.0800	2.6029200 - 2	4.1643466	1.4907963	8.4566114	2
0.1000	2.3839372 - 2	4.3054467	1.4707963	7.5787071	2
0.1500	1.3327614 - 2	5.0071996	1.4207963	5.9120543	2
0.2000	1.2418667 - 2	5.9908043 - 1	1.3707963	4.7678510	2
0.3000	5.1970730 - 2	1.8546263	1.2707963	3.3479623	2
0.4000	9.3861595 - 2	2.3797508	1.1707963	2.5187906	2
0.6000	1.5646895 - 1	3.0268231	9.7079630 - 1	1.5902204	2

Table 106. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2000 f = 8.5653105 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	a/j miles	
		h_3 = 70 kilometers			
0.0005	1.1292827 - 1	4.6321797	1.5702963	1.2433895	3
0.0010	9.7184710 - 2	4.3827714	1.5697963	1.2381675	3
0.0020	7.5304795 - 2	3.9126996	1.5687963	1.2278386	3
0.0030	6.1224015 - 2	3.4963794	1.5677963	1.2176623	3
0.0040	5.1154435 - 2	3.1392647	1.5667963	1.2076369	3
0.0050	4.3156484 - 2	2.8360189	1.5657963	1.1977599	3
0.0060	3.6333815 - 2	2.5778143	1.5647963	1.1880278	3
0.0070	3.0287498 - 2	2.3565572	1.5637963	1.1784374	3
0.0080	2.4832528 - 2	2.1662817	1.5627963	1.1689853	3
0.0090	1.9870224 - 2	2.0034956	1.5617963	1.1596669	3
0.0100	1.5337355 - 2	1.8677484	1.5607963	1.1504788	3
0.0120	7.3987890 - 3	1.7119042	1.5587963	1.1324770	3
0.0150	3.2867359 - 3	3.7349857	1.5557963	1.1063547	3
0.0200	1.5857959 - 2	3.7753131	1.5507963	1.0649462	3
0.0250	2.5842953 - 2	3.5395817	1.5457963	1.0259098	3
0.0300	3.3863215 - 2	3.3571959	1.5407963	9.8899038	2
0.0400	4.5692244 - 2	3.1188123	1.5307963	9.2076906	2
0.0500	5.3439810 - 2	2.9857359	1.5207963	8.5914709	2
0.0650	5.9811360 - 2	2.8960487	1.5057963	7.7737068	2
0.0800	6.1933980 - 2	2.8834988	1.4907963	7.0657786	2
0.1000	6.0673720 - 2	2.9372426	1.4707963	6.2644905	2
0.1500	4.8181619 - 2	3.2500474	1.4207963	4.7915900	2
0.2000	3.1333610 - 2	3.6811209	1.3707963	3.8174547	2
0.3000	1.1625166 - 2	1.9302138 - 1	1.2707963	2.6471062	2
0.4000	4.9923999 - 2	1.1917083	1.1707963	1.9802951	2
0.6000	1.1204565 - 1	1.8502564	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	8.5447785 - 2	4.7838117	1.5702963	1.4000780	3
0.0010	7.5313735 - 2	4.5118123	1.5697963	1.3948535	3
0.0020	6.2092920 - 2	4.0147786	1.5687963	1.3845147	3
0.0030	5.3876235 - 2	3.5966693	1.5677963	1.3743220	3
0.0040	4.7696060 - 2	3.2537632	1.5667963	1.3642736	3
0.0050	4.2317913 - 2	2.9718297	1.5657963	1.3543670	3
0.0060	3.7323404 - 2	2.7373422	1.5647963	1.3445989	3
0.0070	3.2604781 - 2	2.5403884	1.5637963	1.3349661	3
0.0080	2.8150958 - 2	2.3744655	1.5627963	1.3254647	3
0.0090	2.3971132 - 2	2.2358555	1.5617963	1.3160909	3
0.0100	2.0072577 - 2	2.1232925	1.5607963	1.3068406	3
0.0120	1.3134888 - 2	1.9867169	1.5587963	1.2886954	3
0.0150	5.4144750 - 3	2.2723342	1.5557963	1.2623103	3
0.0200	9.7097960 - 3	3.6582275	1.5507963	1.2203378	3
0.0250	1.8342922 - 2	3.6262221	1.5457963	1.1805854	3
0.0300	2.5404956 - 2	3.5092099	1.5407963	1.1428039	3
0.0400	3.5767697 - 2	3.3221113	1.5307963	1.0724503	3
0.0500	4.2575776 - 2	3.2078045	1.5207963	1.0082107	3
0.0650	4.8383622 - 2	3.1255031	1.5057963	9.2176798	2
0.0800	5.0673230 - 2	3.1095729	1.4907963	8.4566114	2
0.1000	5.0264305 - 2	3.1512871	1.4707963	7.5787071	2
0.1500	4.0462634 - 2	3.4241932	1.4207963	5.9120543	2
0.2000	2.5476785 - 2	3.8368458	1.3707963	4.7678510	2
0.3000	1.4975066 - 2	4.3423395 - 1	1.2707963	3.3479623	2
0.4000	5.2703885 - 2	1.2285922	1.1707963	2.5187906	2
0.6000	1.1305154 - 1	1.8610785	9.7079630 - 1	1.5902204	2

Table 107. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 1.0000 f = 42.826552 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	3.1717276 - 1	3.0274102	1.5702963	1.2433895	3
0.0010	2.9184308 - 1	2.9252094	1.5697963	1.2381675	3
0.0020	2.4809554 - 1	2.7225505	1.5687963	1.2278386	3
0.0030	2.1216081 - 1	2.5226401	1.5677963	1.2176623	3
0.0040	1.8257527 - 1	2.3260684	1.5667963	1.2076369	3
0.0050	1.5811025 - 1	2.1334601	1.5657963	1.1977599	3
0.0060	1.3775028 - 1	1.9453760	1.5647963	1.1880278	3
0.0070	1.2066864 - 1	1.7622427	1.5637963	1.1784374	3
0.0080	1.0620138 - 1	1.5842933	1.5627963	1.1689853	3
0.0090	9.3821520 - 2	1.4115350	1.5617963	1.1596669	3
0.0100	8.3115945 - 2	1.2437429	1.5607963	1.1504788	3
0.0120	6.5514090 - 2	9.2103176 - 1	1.5587963	1.1324770	3
0.0150	4.5694612 - 2	4.5569394 - 1	1.5557963	1.1063547	3
0.0200	2.3807747 - 2	5.8974238	1.5507963	1.0649462	3
0.0250	1.4765032 - 2	4.6470393	1.5457963	1.0259098	3
0.0300	1.9886235 - 2	3.5259224	1.5407963	9.8899038	2
0.0400	3.8779154 - 2	2.5833339	1.5307963	9.2076906	2
0.0500	5.6031455 - 2	2.1118289	1.5207963	8.5914709	2
0.0650	7.7109895 - 2	1.6885618	1.5057963	7.7737068	2
0.0800	9.2512275 - 2	1.4289990	1.4907963	7.0657786	2
0.1000	1.0518964 - 1	1.2121143	1.4707963	6.2644905	2
0.1500	1.0971709 - 1	9.5762098 - 1	1.4207963	4.7915900	2
0.2000	9.5364635 - 2	8.7476708 - 1	1.3707963	3.8174547	2
0.3000	5.8318035 - 2	8.9779247 - 1	1.2707963	2.6471062	2
0.4000	3.0974986 - 2	1.0424277	1.1707963	1.9802951	2
0.6000	6.2541615 - 3	2.1154720	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	2.7707776 - 1	2.9905061	1.5702963	1.4000780	3
0.0010	2.5594659 - 1	2.8867122	1.5697963	1.3948535	3
0.0020	2.1946025 - 1	2.6816395	1.5687963	1.3845147	3
0.0030	1.8946775 - 1	2.4805610	1.5677963	1.3743220	3
0.0040	1.6471362 - 1	2.2842847	1.5667963	1.3642736	3
0.0050	1.4415150 - 1	2.0935453	1.5657963	1.3543670	3
0.0060	1.2692483 - 1	1.9089399	1.5647963	1.3445989	3
0.0070	1.1234453 - 1	1.7308423	1.5637963	1.3349661	3
0.0080	9.9864310 - 2	1.5593831	1.5627963	1.3254647	3
0.0090	8.9056225 - 2	1.3944581	1.5617963	1.3160909	3
0.0100	7.9589020 - 2	1.2357398	1.5607963	1.3068406	3
0.0120	6.3715985 - 2	9.3471086 - 1	1.5587963	1.2886954	3
0.0150	4.5248882 - 2	5.1186565 - 1	1.5557963	1.2623103	3
0.0200	2.3515646 - 2	6.0729970	1.5507963	1.2203378	3
0.0250	1.1575827 - 2	4.9332929	1.5457963	1.1805854	3
0.0300	1.4586768 - 2	3.5583482	1.5407963	1.1428039	3
0.0400	3.2552956 - 2	2.5717509	1.5307963	1.0724503	3
0.0500	4.8471705 - 2	2.1166448	1.5207963	1.0082107	3
0.0650	6.7547630 - 2	1.7066061	1.5057963	9.2176798	2
0.0800	8.1498225 - 2	1.4523623	1.4907963	8.4566114	2
0.1000	9.3268970 - 2	1.2378199	1.4707963	7.5787071	2
0.1500	9.8949650 - 2	9.8265833 - 1	1.4207963	5.9120543	2
0.2000	8.7360770 - 2	8.9743194 - 1	1.3707963	4.7678510	2
0.3000	5.4614640 - 2	9.1642418 - 1	1.2707963	3.3479623	2
0.4000	2.9321612 - 2	1.0604554	1.1707963	2.5187906	2
0.6000	6.0991285 - 3	2.1717862	9.7079630 - 1	1.5902204	2

Table 108. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 2.0000 f = 85.653105 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	2.9075192 - 1	2.2195112	1.5702963	1.2433895	3
0.0010	2.7541564 - 1	2.1474747	1.5697963	1.2381675	3
0.0020	2.4765191 - 1	2.0051242	1.5687963	1.2278386	3
0.0030	2.2333293 - 1	1.8652570	1.5677963	1.2176623	3
0.0040	2.0198678 - 1	1.7280952	1.5667963	1.2076369	3
0.0050	1.8319711 - 1	1.5938419	1.5657963	1.1977599	3
0.0060	1.6660010 - 1	1.4626727	1.5647963	1.1880278	3
0.0070	1.5187991 - 1	1.3347138	1.5637963	1.1784374	3
0.0080	1.3876535 - 1	1.2100522	1.5627963	1.1689853	3
0.0090	1.2702480 - 1	1.0887252	1.5617963	1.1596669	3
0.0100	1.1646175 - 1	9.7071615 - 1	1.5607963	1.1504788	3
0.0120	9.8230630 - 2	7.4434654 - 1	1.5587963	1.1324770	3
0.0150	7.6344975 - 2	4.2671962 - 1	1.5557963	1.1063547	3
0.0200	4.9444403 - 2	6.2228437	1.5507963	1.0649462	3
0.0250	3.0158236 - 2	5.7450401	1.5457963	1.0259098	3
0.0300	1.6296748 - 2	5.1553838	1.5407963	9.8899038	2
0.0400	1.2269573 - 2	2.9153454	1.5307963	9.2076906	2
0.0500	2.5466971 - 2	2.0585350	1.5207963	8.5914709	2
0.0650	4.1661732 - 2	1.4665849	1.5057963	7.7737068	2
0.0800	5.3507990 - 2	1.0880167	1.4907963	7.0657786	2
0.1000	6.3873900 - 2	7.3604163 - 1	1.4707963	6.2644905	2
0.1500	6.9889925 - 2	1.9706333 - 1	1.4207963	4.7915900	2
0.2000	6.0581990 - 2	6.1379677	1.3707963	3.8174547	2
0.3000	3.4181154 - 2	5.6434115	1.2707963	2.6471062	2
0.4000	1.5916617 - 2	5.2336416	1.1707963	1.9802951	2
0.6000	2.0291360 - 3	4.4404484	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	2.5373796 - 1	2.0559971	1.5702963	1.4000780	3
0.0010	2.4128594 - 1	1.9838621	1.5697963	1.3948535	3
0.0020	2.1868545 - 1	1.8419390	1.5687963	1.3845147	3
0.0030	1.9880009 - 1	1.7033537	1.5677963	1.3743220	3
0.0040	1.8124684 - 1	1.5683243	1.5667963	1.3642736	3
0.0050	1.6569061 - 1	1.4370280	1.5657963	1.3543670	3
0.0060	1.5184161 - 1	1.3095839	1.5647963	1.3445989	3
0.0070	1.3945170 - 1	1.1860650	1.5637963	1.3349661	3
0.0080	1.2830959 - 1	1.0664846	1.5627963	1.3254647	3
0.0090	1.1823683 - 1	9.5080485 - 1	1.5617963	1.3160909	3
0.0100	1.0908353 - 1	8.3894213 - 1	1.5607963	1.3068406	3
0.0120	9.3053090 - 2	6.2614809 - 1	1.5587963	1.2886954	3
0.0150	7.3366035 - 2	3.3159871 - 1	1.5557963	1.2623103	3
0.0200	4.8436876 - 2	6.1743844	1.5507963	1.2203378	3
0.0250	2.9991970 - 2	5.7646233	1.5457963	1.1805854	3
0.0300	1.6038490 - 2	5.3088467	1.5407963	1.1428039	3
0.0400	7.8542485 - 3	2.7909513	1.5307963	1.0724503	3
0.0500	2.0852815 - 2	1.9135053	1.5207963	1.0082107	3
0.0650	3.5920867 - 2	1.3677716	1.5057963	9.2176798	2
0.0800	4.6651116 - 2	1.0106851	1.4907963	8.4566114	2
0.1000	5.6049645 - 2	6.7309326 - 1	1.4707963	7.5787071	2
0.1500	6.2243105 - 2	1.4974424 - 1	1.4207963	5.9120543	2
0.2000	5.4776295 - 2	6.0988992	1.3707963	4.7678510	2
0.3000	3.1629441 - 2	5.6142479	1.2707963	3.3479623	2
0.4000	1.4925959 - 2	5.2098906	1.1707963	2.5187906	2
0.6000	1.9123109 - 3	4.4214909	9.7079630 - 1	1.5902204	2

Table 109. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 5.0000 f = 214.13276 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	1.9409431 - 1	8.8979055 - 1	1.5702963	1.2433895	3
0.0010	1.7997353 - 1	7.5272322 - 1	1.5697963	1.2381675	3
0.0020	1.5567633 - 1	4.9529085 - 1	1.5687963	1.2278386	3
0.0030	1.3541429 - 1	2.5942137 - 1	1.5677963	1.2176623	3
0.0040	1.1813613 - 1	4.3574020 - 2	1.5667963	1.2076369	3
0.0050	1.0313726 - 1	6.1289704	1.5657963	1.1977599	3
0.0060	8.9943535 - 2	5.9471670	1.5647963	1.1880278	3
0.0070	7.8229015 - 2	5.7793566	1.5637963	1.1784374	3
0.0080	6.7760110 - 2	5.6237050	1.5627963	1.1689853	3
0.0090	5.8362005 - 2	5.4785699	1.5617963	1.1596669	3
0.0100	4.9897089 - 2	5.3424728	1.5607963	1.1504788	3
0.0120	3.5333391 - 2	5.0920541	1.5587963	1.1324770	3
0.0150	1.8153967 - 2	4.7489414	1.5557963	1.1063547	3
0.0200	2.4033724 - 3	1.7486554	1.5507963	1.0649462	3
0.0250	1.5978848 - 2	9.7942981 - 1	1.5457963	1.0259098	3
0.0300	2.6145865 - 2	6.7419775 - 1	1.5407963	9.8899038	2
0.0400	4.0549318 - 2	2.3703032 - 1	1.5307963	9.2076906	2
0.0500	5.0334860 - 2	6.2110209	1.5207963	8.5914709	2
0.0650	5.9451210 - 2	5.8792993	1.5057963	7.7737068	2
0.0800	6.3712570 - 2	5.6340883	1.4907963	7.0657786	2
0.1000	6.4127970 - 2	5.3747570	1.4707963	6.2644905	2
0.1500	5.1824430 - 2	4.8558521	1.4207963	4.7915900	2
0.2000	3.5211175 - 2	4.3863364	1.3707963	3.8174547	2
0.3000	1.2163748 - 2	3.4370676	1.2707963	2.6471062	2
0.4000	2.8687685 - 3	2.4848666	1.1707963	1.9802951	2
0.6000	6.6012400 - 5	1.5025103	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	1.6830667 - 1	5.2874272 - 1	1.5702963	1.4000780	3
0.0010	1.5762028 - 1	3.9866727 - 1	1.5697963	1.3948535	3
0.0020	1.3867013 - 1	1.5661661 - 1	1.5687963	1.3845147	3
0.0030	1.2225533 - 1	6.2201217	1.5677963	1.3743220	3
0.0040	1.0780241 - 1	6.0204454	1.5667963	1.3642736	3
0.0050	9.4936565 - 2	5.8383980	1.5657963	1.3543670	3
0.0060	8.3404115 - 2	5.6718017	1.5647963	1.3445989	3
0.0070	7.3023705 - 2	5.5187401	1.5637963	1.3349661	3
0.0080	6.3656640 - 2	5.3775816	1.5627963	1.3254647	3
0.0090	5.5189995 - 2	5.2469552	1.5617963	1.3160909	3
0.0100	4.7527940 - 2	5.1257600	1.5607963	1.3068406	3
0.0120	3.4290126 - 2	4.9084452	1.5587963	1.2886954	3
0.0150	1.8630745 - 2	4.6407188	1.5557963	1.2623103	3
0.0200	1.0499163 - 3	5.5389258	1.5507963	1.2203378	3
0.0250	1.2220839 - 2	6.4032276 - 1	1.5457963	1.1805854	3
0.0300	2.1151759 - 2	4.1307066 - 1	1.5407963	1.1428039	3
0.0400	3.3411397 - 2	2.7657480 - 2	1.5307963	1.0724503	3
0.0500	4.1480957 - 2	6.0233266	1.5207963	1.0082107	3
0.0650	4.8920362 - 2	5.7080942	1.5057963	9.2176798	2
0.0800	5.2493475 - 2	5.4728463	1.4907963	8.4566114	2
0.1000	5.3118910 - 2	5.2236464	1.4707963	7.5787071	2
0.1500	4.3814998 - 2	4.7254659	1.4207963	5.9120543	2
0.2000	3.0360057 - 2	4.2726336	1.3707963	4.7678510	2
0.3000	1.0725615 - 2	3.3478143	1.2707963	3.3479623	2
0.4000	2.5378834 - 3	2.4239069	1.1707963	2.5187906	2
0.6000	6.0444880 - 5	1.4952684	9.7079630 - 1	1.5902204	2

Table 110. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0100 f = 0.66622256 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	2.7325776 - 2	4.9328293	1.5702963	1.2433895 3
0.0010	1.5352570 - 2	4.2470796	1.5697963	1.2381675 3
0.0020	4.5280269 - 3	3.5025757	1.5687963	1.2278386 3
0.0030	3.4361167 - 3	4.8754099	1.5677963	1.2176623 3
0.0040	8.1466675 - 3	4.7940809	1.5667963	1.2076369 3
0.0050	1.2164858 - 2	4.5392123	1.5657963	1.1977599 3
0.0060	1.5574772 - 2	4.3172575	1.5647963	1.1880278 3
0.0070	1.8538501 - 2	4.1353181	1.5637963	1.1784374 3
0.0080	2.1158112 - 2	3.9865923	1.5627963	1.1689853 3
0.0090	2.3499264 - 2	3.8640251	1.5617963	1.1596669 3
0.0100	2.5607814 - 2	3.7619452	1.5607963	1.1504788 3
0.0120	2.9258309 - 2	3.6029909	1.5587963	1.1324770 3
0.0150	3.3663396 - 2	3.4391045	1.5557963	1.1063547 3
0.0200	3.9137964 - 2	3.2756589	1.5507963	1.0649462 3
0.0250	4.3216968 - 2	3.1840708	1.5457963	1.0259098 3
0.0300	4.6499907 - 2	3.1315598	1.5407963	9.8899038 2
0.0400	5.1857825 - 2	3.0912000	1.5307963	9.2076906 2
0.0500	5.6556650 - 2	3.0996927	1.5207963	8.5914709 2
0.0650	6.3473625 - 2	3.1622758	1.5057963	7.7737068 2
0.0800	7.0840440 - 2	3.2587123	1.4907963	7.0657786 2
0.1000	8.1783350 - 2	3.4134367	1.4707963	6.2644905 2
0.1500	1.1489821 - 1	3.8238249	1.4207963	4.7915900 2
0.2000	1.5395700 - 1	4.1830319	1.3707963	3.8174547 2
0.3000	2.3689498 - 1	4.6940957	1.2707963	2.6471062 2
0.4000	4.3019633 - 1	5.3581401	9.7079630 - 1	1.9802951 2
0.6000	3.1320155 - 1	5.0106809	1.1707963	1.2445355 2
		h_3 = 90 kilometers		
0.0005	3.3666778 - 2	5.3853581	1.5702963	1.4000780 3
0.0010	1.9105429 - 2	4.6240321	1.5697963	1.3948535 3
0.0020	7.0068275 - 3	3.6076364	1.5687963	1.3845147 3
0.0030	1.8760599 - 3	4.7721179	1.5677963	1.3743220 3
0.0040	7.4514245 - 3	5.1286456	1.5667963	1.3642736 3
0.0050	1.2745123 - 2	4.8849544	1.5657963	1.3543670 3
0.0060	1.7375637 - 2	4.6672663	1.5647963	1.3445989 3
0.0070	2.1462169 - 2	4.4901833	1.5637963	1.3349661 3
0.0080	2.5097337 - 2	4.3465491	1.5627963	1.3254647 3
0.0090	2.8350695 - 2	4.2288443	1.5617963	1.3160909 3
0.0100	3.1276903 - 2	4.1311628	1.5607963	1.3068406 3
0.0120	3.6320423 - 2	3.9794175	1.5587963	1.2886954 3
0.0150	4.2346279 - 2	3.8228131	1.5557963	1.2623103 3
0.0200	4.9700207 - 2	3.6649440	1.5507963	1.2203378 3
0.0250	5.5037865 - 2	3.5738440	1.5457963	1.1805854 3
0.0300	5.9208875 - 2	3.5186095	1.5407963	1.1428039 3
0.0400	6.5701530 - 2	3.4666101	1.5307963	1.0724503 3
0.0500	7.1046395 - 2	3.4581166	1.5207963	1.0082107 3
0.0650	7.8435595 - 2	3.4895346	1.5057963	9.2176798 2
0.0800	8.5919595 - 2	3.5518175	1.4907963	8.4566114 2
0.1000	9.6676550 - 2	3.6612608	1.4707963	7.5787071 2
0.1500	1.2838040 - 1	3.9784926	1.4207963	5.9120543 2
0.2000	1.6545698 - 1	4.2783519	1.3707963	4.7678510 2
0.3000	2.4456721 - 1	4.7332798	1.2707963	3.3479623 2
0.4000	3.1812881 - 1	5.0290774	1.1707963	2.5187906 2
0.6000	4.3225726 - 1	5.3635616	9.7079630 - 1	1.5902204 2

Table III. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	2.0742294 - 2	3.7588510	1.5702963	1.2433895 3
0.0010	1.2315946 - 2	3.5003536	1.5697963	1.2381675 3
0.0020	4.8462535 - 3	3.8053291	1.5687963	1.2278386 3
0.0030	6.7633860 - 3	4.3013522	1.5677963	1.2176623 3
0.0040	9.5217705 - 3	4.1845825	1.5667963	1.2076369 3
0.0050	1.1407862 - 2	3.9809545	1.5657963	1.1977599 3
0.0060	1.2640519 - 2	3.7801828	1.5647963	1.1880278 3
0.0070	1.3463513 - 2	3.5961127	1.5637963	1.1784374 3
0.0080	1.4042626 - 2	3.4298245	1.5627963	1.1689853 3
0.0090	1.4482082 - 2	3.2799691	1.5617963	1.1596669 3
0.0100	1.4845286 - 2	3.1448923	1.5607963	1.1504788 3
0.0120	1.5476731 - 2	2.9131380	1.5587963	1.1324770 3
0.0150	1.6383088 - 2	2.6434133	1.5557963	1.1063547 3
0.0200	1.7934231 - 2	2.3410885	1.5507963	1.0649462 3
0.0250	1.9467241 - 2	2.1561697	1.5457963	1.0259098 3
0.0300	2.0928617 - 2	2.0425882	1.5407963	9.8899038 2
0.0400	2.3660733 - 2	1.9381140	1.5307963	9.2076906 2
0.0500	2.6293361 - 2	1.9254881	1.5207963	8.5914709 2
0.0650	3.0401772 - 2	1.9953821	1.5057963	7.7737068 2
0.0800	3.4983079 - 2	2.1206821	1.4907963	7.0657786 2
0.1000	4.2064551 - 2	2.3251392	1.4707963	6.2644905 2
0.1500	6.4563625 - 2	2.8572433	1.4207963	4.7915900 2
0.2000	9.2079125 - 2	3.3178256	1.3707963	3.8174547 2
0.3000	1.5345696 - 1	3.9890086	1.2707963	2.6471062 2
0.4000	2.1443141 - 1	4.4219054	1.1707963	1.9802951 2
0.6000	3.1754698 - 1	4.9130485	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	2.5330318 - 2	4.2771389	1.5702963	1.4000780 3
0.0010	1.6596653 - 2	3.9287041	1.5697963	1.3948535 3
0.0020	7.4923425 - 3	3.7412202	1.5687963	1.3845147 3
0.0030	6.4235125 - 3	4.2104189	1.5677963	1.3743220 3
0.0040	9.0992840 - 3	4.3073260	1.5667963	1.3642736 3
0.0050	1.1725741 - 2	4.1841177	1.5657963	1.3543670 3
0.0060	1.3822045 - 2	4.0230771	1.5647963	1.3445989 3
0.0070	1.5481729 - 2	3.8656360	1.5637963	1.3349661 3
0.0080	1.6830427 - 2	3.7212567	1.5627963	1.3254647 3
0.0090	1.7962864 - 2	3.5914538	1.5617963	1.3160909 3
0.0100	1.8943362 - 2	3.4754976	1.5607963	1.3068406 3
0.0120	2.0604120 - 2	3.2797338	1.5587963	1.2886954 3
0.0150	2.2643571 - 2	3.0567569	1.5557963	1.2623103 3
0.0200	2.5377911 - 2	2.8095823	1.5507963	1.2203378 3
0.0250	2.7615934 - 2	2.6558449	1.5457963	1.1805854 3
0.0300	2.9542312 - 2	2.5571937	1.5407963	1.1428039 3
0.0400	3.2867612 - 2	2.4541595	1.5307963	1.0724503 3
0.0500	3.5881695 - 2	2.4224616	1.5207963	1.0082107 3
0.0650	4.0360333 - 2	2.4464539	1.5057963	9.2176798 2
0.0800	4.5136611 - 2	2.5187580	1.4907963	8.4566114 2
0.1000	5.2248150 - 2	2.6545120	1.4707963	7.5787071 2
0.1500	7.4024045 - 2	3.0565829	1.4207963	5.9120543 2
0.2000	1.0033687 - 1	3.4411668	1.3707963	4.7678510 2
0.3000	1.5935783 - 1	4.0417234	1.2707963	3.3479623 2
0.4000	2.1852024 - 1	4.4474418	1.1707963	2.5187906 2
0.6000	3.1946266 - 1	4.9208116	9.7079630 - 1	1.5902204 2

Table 112. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.0500 f = 3.3111126 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	1.0869451 - 2	1.0800711	1.5702963	1.2433895 3
0.0010	5.4587875 - 3	3.2259800 - 3	1.5697963	1.2381675 3
0.0020	1.0430211 - 2	4.6645207	1.5687963	1.2278386 3
0.0030	1.4640221 - 2	4.1706090	1.5677963	1.2176623 3
0.0040	1.6336806 - 2	3.8483571	1.5667963	1.2076369 3
0.0050	1.6580305 - 2	3.5989054	1.5657963	1.1977599 3
0.0060	1.6019476 - 2	3.3953068	1.5647963	1.1880278 3
0.0070	1.5020563 - 2	3.2248245	1.5637963	1.1784374 3
0.0080	1.3792251 - 2	3.0796681	1.5627963	1.1689853 3
0.0090	1.2455755 - 2	2.9544202	1.5617963	1.1596669 3
0.0100	1.1082621 - 2	2.8450481	1.5607963	1.1504788 3
0.0120	8.3795815 - 3	2.6617673	1.5587963	1.1324770 3
0.0150	4.6766575 - 3	2.4378703	1.5557963	1.1063547 3
0.0200	5.1350870 - 4	6.2020944	1.5507963	1.0649462 3
0.0250	4.1774532 - 3	5.4110705	1.5457963	1.0259098 3
0.0300	7.0026400 - 3	5.3037120	1.5407963	9.8899038 2
0.0400	1.0667298 - 2	5.2291856	1.5307963	9.2076906 2
0.0500	1.2582626 - 2	5.2432850	1.5207963	8.5914709 2
0.0650	1.3519997 - 2	5.3695892	1.5057963	7.7737068 2
0.0800	1.3218346 - 2	5.6027825	1.4907963	7.0657786 2
0.1000	1.2514781 - 2	6.0804198	1.4707963	6.2644905 2
0.1500	2.0001573 - 2	1.1967949	1.4207963	4.7915900 2
0.2000	3.9310257 - 2	1.9622656	1.3707963	3.8174547 2
0.3000	8.6341465 - 2	2.8012506	1.2707963	2.6471062 2
0.4000	1.3146697 - 1	3.3291791	1.1707963	1.9802951 2
0.6000	2.0453566 - 1	3.9837077	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	1.1596296 - 2	2.4431732	1.5702963	1.4000780 3
0.0010	4.4542575 - 3	2.7202418	1.5697963	1.3948535 3
0.0020	7.7283100 - 3	4.3031924	1.5687963	1.3845147 3
0.0030	1.3042216 - 2	4.1632156	1.5677963	1.3743220 3
0.0040	1.5880514 - 2	3.9489298	1.5667963	1.3642736 3
0.0050	1.7191471 - 2	3.7496971	1.5657963	1.3543670 3
0.0060	1.7575788 - 2	3.5737259	1.5647963	1.3445989 3
0.0070	1.7393701 - 2	3.4192492	1.5637963	1.3349661 3
0.0080	1.6865758 - 2	3.2828891	1.5627963	1.3254647 3
0.0090	1.6130489 - 2	3.1613462	1.5617963	1.3160909 3
0.0100	1.5276671 - 2	3.0517257	1.5607963	1.3068406 3
0.0120	1.3425264 - 2	2.8588258	1.5587963	1.2886954 3
0.0150	1.0694319 - 2	2.6079241	1.5557963	1.2623103 3
0.0200	6.9561780 - 3	2.1973128	1.5507963	1.2203378 3
0.0250	4.6476233 - 3	1.6612061	1.5457963	1.1805854 3
0.0300	4.0527770 - 3	1.0063614	1.5407963	1.1428039 3
0.0400	5.6920560 - 3	2.8025179 - 1	1.5307963	1.0724503 3
0.0500	7.5201230 - 3	1.0968795 - 1	1.5207963	1.0082107 3
0.0650	9.4517675 - 3	1.6539937 - 1	1.5057963	9.2176798 2
0.0800	1.1015522 - 2	3.7643870 - 1	1.4907963	8.4566114 2
0.1000	1.3669378 - 2	7.5116962 - 1	1.4707963	7.5787071 2
0.1500	2.6445209 - 2	1.5803019	1.4207963	5.9120543 2
0.2000	4.5778565 - 2	2.1316447	1.3707963	4.7678510 2
0.3000	9.0857460 - 2	2.8650158	1.2707963	3.3479623 2
0.4000	1.3442397 - 1	3.3613649	1.1707963	2.5187906 2
0.6000	2.0587630 - 1	3.9947582	9.7079630 - 1	1.5902204 2

Table 113. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.1000 f = 6.6622252 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	4.6346140 - 2	5.5139203	1.5702963	1.2433895 3
0.0010	4.0137580 - 2	5.1551806	1.5697963	1.2381675 3
0.0020	3.4114764 - 2	4.5160621	1.5687963	1.2278386 3
0.0030	3.1496930 - 2	4.0238946	1.5677963	1.2176623 3
0.0040	2.9399246 - 2	3.6527068	1.5667963	1.2076369 3
0.0050	2.7087949 - 2	3.3640463	1.5657963	1.1977599 3
0.0060	2.4534002 - 2	3.1324200	1.5647963	1.1880278 3
0.0070	2.1854488 - 2	2.9429750	1.5637963	1.1784374 3
0.0080	1.9160166 - 2	2.7872670	1.5627963	1.1689853 3
0.0090	1.6528313 - 2	2.6608492	1.5617963	1.1596669 3
0.0100	1.4007763 - 2	2.5622850	1.5607963	1.1504788 3
0.0120	9.4199230 - 3	2.4595569	1.5587963	1.1324770 3
0.0150	4.3239978 - 3	2.7816362	1.5557963	1.1063547 3
0.0200	7.0690325 - 3	4.0739115	1.5507963	1.0649462 3
0.0250	1.3039658 - 2	4.1158304	1.5457963	1.0259098 3
0.0300	1.7901872 - 2	4.0455341	1.5407963	9.8899038 2
0.0400	2.4751039 - 2	3.9256600	1.5307963	9.2076906 2
0.0500	2.8862904 - 2	3.8643024	1.5207963	8.5914709 2
0.0650	3.1697675 - 2	3.8518741	1.5057963	7.7737068 2
0.0800	3.1932745 - 2	3.9027467	1.4907963	7.0657786 2
0.1000	2.9741142 - 2	4.0354846	1.4707963	6.2644905 2
0.1500	1.7947624 - 2	4.6194490	1.4207963	4.7915900 2
0.2000	9.1136080 - 3	7.2573590 - 2	1.3707963	3.8174547 2
0.3000	4.7293728 - 2	1.8088131	1.2707963	2.6471062 2
0.4000	9.0147690 - 2	2.3622876	1.1707963	1.9802951 2
0.6000	1.5385983 - 1	3.0246275	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	2.6968962 - 2	5.8050342	1.5702963	1.4000780 3
0.0010	2.4399687 - 2	5.3294475	1.5697963	1.3948535 3
0.0020	2.4899863 - 2	4.5815739	1.5687963	1.3845147 3
0.0030	2.6589511 - 2	4.0991409	1.5677963	1.3743220 3
0.0040	2.7228727 - 2	3.7619471	1.5667963	1.3642736 3
0.0050	2.6803953 - 2	3.5046202	1.5657963	1.3543670 3
0.0060	2.5648112 - 2	3.2978314	1.5647963	1.3445989 3
0.0070	2.4052352 - 2	3.1270325	1.5637963	1.3349661 3
0.0080	2.2219772 - 2	2.9841373	1.5627963	1.3254647 3
0.0090	2.0282706 - 2	2.8643099	1.5617963	1.3160909 3
0.0100	1.8324794 - 2	2.7645824	1.5607963	1.3068406 3
0.0120	1.4536670 - 2	2.6197074	1.5587963	1.2886954 3
0.0150	9.5293965 - 3	2.5455625	1.5557963	1.2623103 3
0.0200	4.4652402 - 3	3.1210804	1.5507963	1.2203378 3
0.0250	6.4104390 - 3	3.9952377	1.5457963	1.1805854 3
0.0300	1.0181699 - 2	4.1663533	1.5407963	1.1428039 3
0.0400	1.6076117 - 2	4.1742072	1.5307963	1.0724503 3
0.0500	1.9763131 - 2	4.1510419	1.5207963	1.0082107 3
0.0650	2.2472031 - 2	4.1564177	1.5057963	9.2176798 2
0.0800	2.2937527 - 2	4.2093824	1.4907963	8.4566114 2
0.1000	2.1317600 - 2	4.3407044	1.4707963	7.5787071 2
0.1500	1.1694422 - 2	5.0520060	1.4207963	5.9120543 2
0.2000	1.2244753 - 2	7.1195880 - 1	1.3707963	4.7678510 2
0.3000	5.1654480 - 2	1.8814202	1.2707963	3.3479623 2
0.4000	9.2980090 - 2	2.3951147	1.1707963	2.5187906 2
0.6000	1.5489843 - 1	3.0361727	9.7079630 - 1	1.5902204 2

Table 114. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 0.2000 f = 13.324450 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	1.1655163 - 1	4.6823692	1.5702963	1.2433895	3
0.0010	1.0294902 - 1	4.4808393	1.5697963	1.2381675	3
0.0020	8.2746325 - 2	4.0935270	1.5687963	1.2278386	3
0.0030	6.8912455 - 2	3.7369757	1.5677963	1.2176623	3
0.0040	5.8882995 - 2	3.4178409	1.5667963	1.2076369	3
0.0050	5.1064985 - 2	3.1366650	1.5657963	1.1977599	3
0.0060	4.4553905 - 2	2.8901690	1.5647963	1.1880278	3
0.0070	3.8865912 - 2	2.6737597	1.5637963	1.1784374	3
0.0080	3.3749175 - 2	2.4830070	1.5627963	1.1689853	3
0.0090	2.9070590 - 2	2.3142685	1.5617963	1.1596669	3
0.0100	2.4755428 - 2	2.1648665	1.5607963	1.1504788	3
0.0120	1.7041698 - 2	1.9187929	1.5587963	1.1324770	3
0.0150	7.3798450 - 3	1.7178722	1.5557963	1.1063547	3
0.0200	5.9299035 - 3	3.8871879	1.5507963	1.0649462	3
0.0250	1.5695704 - 2	3.7734202	1.5457963	1.0259098	3
0.0300	2.3690619 - 2	3.5867181	1.5407963	9.8899038	2
0.0400	3.5801975 - 2	3.3145519	1.5307963	9.2076906	2
0.0500	4.4147774 - 2	3.1506040	1.5207963	8.5914709	2
0.0650	5.1661540 - 2	3.0263739	1.5057963	7.7737068	2
0.0800	5.4943915 - 2	2.9893383	1.4907963	7.0657786	2
0.1000	5.5044700 - 2	3.0197744	1.4707963	6.2644905	2
0.1500	4.4823518 - 2	3.2967979	1.4207963	4.7915900	2
0.2000	2.9132130 - 2	3.7064486	1.3707963	3.8174547	2
0.3000	1.1724844 - 2	3.1138897 - 1	1.2707963	2.6471062	2
0.4000	4.9728627 - 2	1.2206050	1.1707963	1.9802951	2
0.6000	1.1082665 - 1	1.8641436	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	8.7847425 - 2	4.8389635	1.5702963	1.4000780	3
0.0010	7.8965280 - 2	4.6182588	1.5697963	1.3948535	3
0.0020	6.6481390 - 2	4.2030241	1.5687963	1.3845147	3
0.0030	5.8370550 - 2	3.8356688	1.5677963	1.3743220	3
0.0040	5.2478830 - 2	3.5200612	1.5667963	1.3642736	3
0.0050	4.7636535 - 2	3.2512514	1.5657963	1.3543670	3
0.0060	4.3292625 - 2	3.0215483	1.5647963	1.3445989	3
0.0070	3.9219177 - 2	2.8237883	1.5637963	1.3349661	3
0.0080	3.5336375 - 2	2.6523052	1.5627963	1.3254647	3
0.0090	3.1624823 - 2	2.5029646	1.5617963	1.3160909	3
0.0100	2.8085578 - 2	2.3729031	1.5607963	1.3068406	3
0.0120	2.1543526 - 2	2.1645785	1.5587963	1.2886954	3
0.0150	1.3112039 - 2	1.9884963	1.5557963	1.2623103	3
0.0200	4.4145045 - 3	2.6939671	1.5507963	1.2203378	3
0.0250	9.6166185 - 3	3.6503966	1.5457963	1.1805854	3
0.0300	1.6502214 - 2	3.6468060	1.5407963	1.1428039	3
0.0400	2.7210491 - 2	3.4761784	1.5307963	1.0724503	3
0.0500	3.4607161 - 2	3.3459957	1.5207963	1.0082107	3
0.0650	4.1404620 - 2	3.2386086	1.5057963	9.2176798	2
0.0800	4.4641784 - 2	3.2026414	1.4907963	8.4566114	2
0.1000	4.5322688 - 2	3.2241916	1.4707963	7.5787071	2
0.1500	3.7364536 - 2	3.4648187	1.4207963	5.9120543	2
0.2000	2.3373145 - 2	3.8582953	1.3707963	4.7678510	2
0.3000	1.5200190 - 2	5.2679571 - 1	1.2707963	3.3479623	2
0.4000	5.2464920 - 2	1.2566140	1.1707963	2.5187906	2
0.6000	1.1181406 - 1	1.8749039	9.7079630 - 1	1.5902204	2

Table 115. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 1.0000 f = 66.622252 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	3.2248785 - 1	3.0477568	1.5702963	1.2433895	3
0.0010	3.0156985 - 1	2.9657134	1.5697963	1.2381675	3
0.0020	2.6437971 - 1	2.8026916	1.5687963	1.2278386	3
0.0030	2.3262601 - 1	2.6412923	1.5677963	1.2176623	3
0.0040	2.0549163 - 1	2.4817995	1.5667963	1.2076369	3
0.0050	1.8226138 - 1	2.3245328	1.5657963	1.1977599	3
0.0060	1.6231476 - 1	2.1698124	1.5647963	1.1880278	3
0.0070	1.4511977 - 1	2.0179401	1.5637963	1.1784374	3
0.0080	1.3022391 - 1	1.8691622	1.5627963	1.1689853	3
0.0090	1.1724587 - 1	1.7236552	1.5617963	1.1596669	3
0.0100	1.0586766 - 1	1.5815083	1.5607963	1.1504788	3
0.0120	8.6901990 - 2	1.3071844	1.5587963	1.1324770	3
0.0150	6.5226070 - 2	9.1771302 - 1	1.5557963	1.1063547	3
0.0200	4.0111525 - 2	2.9742364 - 1	1.5507963	1.0649462	3
0.0250	2.3589660 - 2	5.8964334	1.5457963	1.0259098	3
0.0300	1.5029184 - 2	4.9313452	1.5407963	9.8899038	2
0.0400	2.3091968 - 2	3.2437794	1.5307963	9.2076906	2
0.0500	3.7923947 - 2	2.5767566	1.5207963	8.5914709	2
0.0650	5.7210315 - 2	2.0395245	1.5057963	7.7737068	2
0.0800	7.2223720 - 2	1.7147973	1.4907963	7.0657786	2
0.1000	8.5880010 - 2	1.4411816	1.4707963	6.2644905	2
0.1500	9.5509755 - 2	1.1098954	1.4207963	4.7915900	2
0.2000	8.5910445 - 2	9.8790233 - 1	1.3707963	3.8174547	2
0.3000	5.4340000 - 2	9.6996605 - 1	1.2707963	2.6471062	2
0.4000	2.9206674 - 2	1.0934935	1.1707963	1.9802951	2
0.6000	5.9323140 - 3	2.1834488	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	2.8151285 - 1	3.0111938	1.5702963	1.4000780	3
0.0010	2.6405968 - 1	2.9278186	1.5697963	1.3948535	3
0.0020	2.3304117 - 1	2.7626001	1.5687963	1.3845147	3
0.0030	2.0655342 - 1	2.5997402	1.5677963	1.3743220	3
0.0040	1.8389386 - 1	2.4396533	1.5667963	1.3642736	3
0.0050	1.6444981 - 1	2.2827498	1.5657963	1.3543670	3
0.0060	1.4769344 - 1	2.1294104	1.5647963	1.3445989	3
0.0070	1.3317555 - 1	1.9799556	1.5637963	1.3349661	3
0.0080	1.2051800 - 1	1.8346116	1.5627963	1.3254647	3
0.0090	1.0940483 - 1	1.6935145	1.5617963	1.3160909	3
0.0100	9.9575685 - 2	1.5566959	1.5607963	1.3068406	3
0.0120	8.2953525 - 2	1.2955422	1.5587963	1.2886954	3
0.0150	6.3456855 - 2	9.3154595 - 1	1.5557963	1.2623103	3
0.0200	3.9908670 - 2	3.7136205 - 1	1.5507963	1.2203378	3
0.0250	2.3330248 - 2	6.0718840	1.5457963	1.1805854	3
0.0300	1.2719155 - 2	5.2312610	1.5407963	1.1428039	3
0.0400	1.7727388 - 2	3.2409412	1.5307963	1.0724503	3
0.0500	3.1895781 - 2	2.5647401	1.5207963	1.0082107	3
0.0650	4.9790342 - 2	2.0459591	1.5057963	9.2176798	2
0.0800	6.3544435 - 2	1.7308934	1.4907963	8.4566114	2
0.1000	7.6185545 - 2	1.4626281	1.4707963	7.5787071	2
0.1500	8.6197505 - 2	1.1331216	1.4207963	5.9120543	2
0.2000	7.8726355 - 2	1.0093696	1.3707963	4.7678510	2
0.3000	5.0873340 - 2	9.8784773 - 1	1.2707963	3.3479623	2
0.4000	2.7624965 - 2	1.1112329	1.1707963	2.5187906	2
0.6000	5.7952085 - 3	2.2417016	9.7079630 - 1	1.5902204	2

Table 116. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 2.0000 f = 133.24450 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles	
		h_3 = 70 kilometers			
0.0005	2.9390474 - 1	2.2338879	1.5702963	1.2433895	3
0.0010	2.8135028 - 1	2.1760292	1.5697963	1.2381675	3
0.0020	2.5817278 - 1	2.0613769	1.5687963	1.2278386	3
0.0030	2.3733962 - 1	1.9482436	1.5677963	1.2176623	3
0.0040	2.1859386 - 1	1.8367459	1.5667963	1.2076369	3
0.0050	2.0170156 - 1	1.7269962	1.5657963	1.1977599	3
0.0060	1.8645180 - 1	1.6191034	1.5647963	1.1880278	3
0.0070	1.7265454 - 1	1.5131545	1.5637963	1.1784374	3
0.0080	1.6014028 - 1	1.4092285	1.5627963	1.1689853	3
0.0090	1.4875847 - 1	1.3073860	1.5617963	1.1596669	3
0.0100	1.3837597 - 1	1.2076630	1.5607963	1.1504788	3
0.0120	1.2015467 - 1	1.0146247	1.5587963	1.1324770	3
0.0150	9.7826470 - 2	7.4075734 - 1	1.5557963	1.1063547	3
0.0200	6.9777160 - 2	3.2147098 - 1	1.5507963	1.0649462	3
0.0250	4.9102153 - 2	6.2184722	1.5457963	1.0259098	3
0.0300	3.3244403 - 2	5.8407975	1.5407963	9.8899038	2
0.0400	1.2001792 - 2	4.8223441	1.5307963	9.2076906	2
0.0500	1.1656553 - 2	2.8813367	1.5207963	8.5914709	2
0.0650	2.6755526 - 2	1.9183363	1.5057963	7.7737068	2
0.0800	3.8535920 - 2	1.4560974	1.4907963	7.0657786	2
0.1000	4.9349917 - 2	1.0403782	1.4707963	6.2644905	2
0.1500	5.8691135 - 2	4.0877797 - 1	1.4207963	4.7915900	2
0.2000	5.3203965 - 2	1.5844260 - 2	1.3707963	3.8174547	2
0.3000	3.1535555 - 2	5.7495621	1.2707963	2.6471062	2
0.4000	1.5057656 - 2	5.3071616	1.1707963	1.9802951	2
0.6000	1.9448005 - 3	4.4683727	9.7079630 - 1	1.2445355	2
		h_3 = 90 kilometers			
0.0005	2.5629500 - 1	2.0704173	1.5702963	1.4000780	3
0.0010	2.4610563 - 1	2.0124303	1.5697963	1.3948535	3
0.0020	2.2725848 - 1	1.8979229	1.5687963	1.3845147	3
0.0030	2.1026324 - 1	1.7854789	1.5677963	1.3743220	3
0.0040	1.9491009 - 1	1.6752251	1.5667963	1.3642736	3
0.0050	1.8100954 - 1	1.5672661	1.5657963	1.3543670	3
0.0060	1.6839167 - 1	1.4616904	1.5647963	1.3445989	3
0.0070	1.5690560 - 1	1.3585685	1.5637963	1.3349661	3
0.0080	1.4641731 - 1	1.2579458	1.5627963	1.3254647	3
0.0090	1.3680894 - 1	1.1598444	1.5617963	1.3160909	3
0.0100	1.2797741 - 1	1.0642638	1.5607963	1.3068406	3
0.0120	1.1229550 - 1	8.8057058 - 1	1.5587963	1.2886954	3
0.0150	9.2696935 - 2	6.2287465 - 1	1.5557963	1.2623103	3
0.0200	6.7360605 - 2	2.3511525 - 1	1.5507963	1.2203378	3
0.0250	4.8122919 - 2	6.1701972	1.5457963	1.1805854	3
0.0300	3.3008439 - 2	5.8433641	1.5407963	1.1428039	3
0.0400	1.1356956 - 2	5.0699471	1.5307963	1.0724503	3
0.0500	7.4298255 - 3	2.7518408	1.5207963	1.0082107	3
0.0650	2.2314675 - 2	1.7834107	1.5057963	9.2176798	2
0.0800	3.3363928 - 2	1.3576489	1.4907963	8.4566114	2
0.1000	4.3351937 - 2	9.6585768 - 1	1.4707963	7.5787071	2
0.1500	5.2424230 - 2	3.5762962 - 1	1.4207963	5.9120543	2
0.2000	4.8211924 - 2	6.2579563	1.3707963	4.7678510	2
0.3000	2.9213503 - 2	5.7191423	1.2707963	3.3479623	2
0.4000	1.4126279 - 2	5.2822960	1.1707963	2.5187906	2
0.6000	1.8321928 - 3	4.4483991	9.7079630 - 1	1.5902204	2

Table 117. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$, and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

ω/ω_r = 5.0000 f = 333.11126 kilocycles
ϕ_1 = 60 degrees σ = 0.005 mhos/meter
ϵ_2 = 15

Ψ radians	$\lvert C_4 \rvert$	Arg C_4	τ_j	d/j miles
		h_3 = 70 kilometers		
0.0005	2.0565230 - 1	9.9585851 - 1	1.5702963	1.2433895 3
0.0010	2.0157257 - 1	9.5962166 - 1	1.5697963	1.2381675 3
0.0020	1.9374755 - 1	8.8812963 - 1	1.5687963	1.2278386 3
0.0030	1.8633887 - 1	8.1795409 - 1	1.5677963	1.2176623 3
0.0040	1.7931459 - 1	7.4910561 - 1	1.5667963	1.2076369 3
0.0050	1.7264481 - 1	6.8158839 - 1	1.5657963	1.1977599 3
0.0060	1.6630135 - 1	6.1540119 - 1	1.5647963	1.1880278 3
0.0070	1.6025939 - 1	5.5053775 - 1	1.5637963	1.1784374 3
0.0080	1.5449547 - 1	4.8698773 - 1	1.5627963	1.1689853 3
0.0090	1.4898903 - 1	4.2473724 - 1	1.5617963	1.1596669 3
0.0100	1.4372072 - 1	3.6376582 - 1	1.5607963	1.1504788 3
0.0120	1.3383099 - 1	2.4558268 - 1	1.5587963	1.1324770 3
0.0150	1.2039973 - 1	7.7328460 - 2	1.5557963	1.1063547 3
0.0200	1.0102847 - 1	6.1022415	1.5507963	1.0649462 3
0.0250	8.4598955 - 2	5.8684164	1.5457963	1.0259098 3
0.0300	7.0480330 - 2	5.6555004	1.5407963	9.8899038 2
0.0400	4.7620161 - 2	5.2808288	1.5307963	9.2076906 2
0.0500	3.0253844 - 2	4.9612761	1.5207963	8.5914709 2
0.0650	1.1584061 - 2	4.5825850	1.5057963	7.7737068 2
0.0800	1.3788795 - 3	2.2975636 - 1	1.4907963	7.0657786 2
0.1000	1.1534486 - 2	4.7764362 - 1	1.4707963	6.2644905 2
0.1500	2.0750594 - 2	5.9375121	1.4207963	4.7915900 2
0.2000	1.8938349 - 2	5.2377286	1.3707963	3.8174547 2
0.3000	8.7776735 - 3	3.9868555	1.2707963	2.6471062 2
0.4000	2.3430928 - 3	2.8277043	1.1707963	1.9802951 2
0.6000	5.5694900 - 5	1.6404501	9.7079630 - 1	1.2445355 2
		h_3 = 90 kilometers		
0.0005	1.7689696 - 1	6.3006286 - 1	1.5702963	1.4000780 3
0.0010	1.7387501 - 1	5.9539056 - 1	1.5697963	1.3948535 3
0.0020	1.6803480 - 1	5.2719508 - 1	1.5687963	1.3845147 3
0.0030	1.6244867 - 1	4.6051758 - 1	1.5677963	1.3743220 3
0.0040	1.5709732 - 1	3.9534660 - 1	1.5667963	1.3642736 3
0.0050	1.5196283 - 1	3.3165155 - 1	1.5657963	1.3543670 3
0.0060	1.4702898 - 1	2.6940714 - 1	1.5647963	1.3445989 3
0.0070	1.4228141 - 1	2.0858690 - 1	1.5637963	1.3349661 3
0.0080	1.3770759 - 1	1.4916028 - 1	1.5627963	1.3254647 3
0.0090	1.3329505 - 1	9.1084530 - 2	1.5617963	1.3160909 3
0.0100	1.2903399 - 1	3.4332340 - 2	1.5607963	1.3068406 3
0.0120	1.2092939 - 1	6.2078371	1.5587963	1.2886954 3
0.0150	1.0970176 - 1	6.0523173	1.5557963	1.2623103 3
0.0200	9.3084545 - 2	5.8147485	1.5507963	1.2203378 3
0.0250	7.8648410 - 2	5.6006635	1.5457963	1.1805854 3
0.0300	6.6043075 - 2	5.4065766	1.5407963	1.1428039 3
0.0400	4.5358098 - 2	5.0681622	1.5307963	1.0724503 3
0.0500	2.9508576 - 2	4.7867076	1.5207963	1.0082107 3
0.0650	1.2458743 - 2	4.4905642	1.5057963	9.2176798 2
0.0800	2.3365573 - 3	5.2262117	1.4907963	8.4566114 2
0.1000	9.2490720 - 3	1.7745991 - 1	1.4707963	7.5787071 2
0.1500	1.7870897 - 2	5.7668973	1.4207963	5.9120543 2
0.2000	1.6610317 - 2	5.1021089	1.3707963	4.7678510 2
0.3000	7.8041255 - 3	3.8845314	1.2707963	3.3479623 2
0.4000	2.0762033 - 3	2.7577122	1.1707963	2.5187906 2
0.6000	5.0997720 - 5	1.6304243	9.7079630 - 1	1.5902204 2

Table 118. Effective reflection coefficient (amplitude, $\lvert C_j \rvert$), and phase, Arg C_j) for the special ray configuration of the Norton type 301 atmosphere, applicable to the propagation of waves between the D-region (h_3 = 70 kilometers) or the E-region (h_3 = 90 kilometers) of the ionosphere and the earth.

$I_0\ell$ = 1 ampere-meter
N = 884 electrons/$(cm)^3$
ν = 4.2(2(10^6) collisions/sec
H = 0.535 gauss
h_3 = 70 kilometers
σ = 0.005 mhos/meter
ϵ_2 = 15

f kilocycles	j = 1 $\lvert E_j(\omega, d)\rvert$	j = 1 Arg $E_j(\omega, d)$	j = 2 $\lvert E_j^*(\omega, d)\rvert$	j = 2 Arg $E_j(\omega, d)$
		d = 100 miles		
1	1.0692390 - 8	1.2807795	3.0477374 - 9	7.3743332
2	1.9192746 - 8	1.1488584	5.1748468 - 9	7.1411626
5	3.9261334 - 8	8.6104680 - 1	9.5422171 - 9	6.6159077
10	6.4753204 - 8	4.8883370 - 1	1.4206868 - 8	5.9239930
20	1.0681750 - 7	1.2992880 - 1	2.0803246 - 8	4.8037837
40	1.7804138 - 7	5.1056051	2.1996566 - 8	3.1097287
50	1.9709732 - 7	4.6666654	1.6271952 - 8	2.5130984
100	1.7539368 - 7	3.2911428	4.3272457 - 9	1.8886186
		d = 200 miles		
1	8.2600435 - 9	1.1113122	4.1188186 - 9	7.2377100
2	1.4220227 - 8	8.9769100 - 1	6.7407868 - 9	6.9420692
5	2.8796289 - 8	4.3612690 - 1	1.2119290 - 8	6.2850924
10	5.3827079 - 8	7.7302000 - 2	1.9386918 - 8	5.4737236
20	1.1807399 - 7	6.6363530 - 1	3.4486249 - 8	4.3437394
40	2.6987953 - 7	4.9717806	4.8467717 - 8	2.7357798
50	3.3422483 - 7	4.7495315	4.5156270 - 8	2.1062029
100	5.5821860 - 7	4.1401379	2.0506352 - 8	6.6958332
		d = 500 miles		
1	3.5518942 - 9	6.1472700 - 1	2.1638212 - 9	6.7179590
2	6.4323913 - 9	1.8820390 - 1	3.2711403 - 9	6.1849117
5	1.7799543 - 8	4.1611830 - 1	6.4780189 - 9	5.1516797
10	4.3462070 - 8	5.5265887	1.3860014 - 8	4.2484302
20	1.0776297 - 7	5.2805604	3.4163543 - 8	3.3133682
40	2.5595221 - 7	5.0475460	8.3078522 - 8	2.1643083
50	3.2701701 - 7	4.9741674	1.0422786 - 7	1.7939357
100	6.5990091 - 7	4.8371558	1.7453180 - 7	7.3270093
		d = 1000 miles		
1	4.1380396 - 9	4.3716860 - 1	8.9812354 -10	5.9220755
2	9.0758777 - 9	5.9561900 - 2	1.5219717 - 9	5.0772228
5	3.2097033 - 8	6.0649529	4.6702339 - 9	3.9520633
10	8.7557546 - 8	6.1152527	1.2829677 - 8	3.2886617
20	2.2579363 - 7	6.4168125	3.6571216 - 8	2.7133295
40	4.5797054 - 7	6.9397133	1.0433236 - 7	2.0703832
50	5.1806717 - 7	7.1342623	1.4098758 - 7	1.8766344
100	5.5868461 - 7	7.7313645	3.2674246 - 7	7.8387538

Table 119. Very low frequency and low frequency part of sky-wave transfer characteristic (amplitude, $\lvert E_j(\omega, d)\rvert$, and phase, Arg $E_j(\omega, d)$) assuming the geometrical-optical and quasi-longitudinal-Fresnel approximations, for various distances, d, electron density, N, collision frequency, ν and earth's magnetic field strength, H.

$I_o \ell$ = 1 ampere-meter
N = 1245 electrons/(cm)^3
ν = 10^6 collisions/sec
H = 0.535 gauss
h_3 = 90 kilometers
σ = 0.005 mhos/meter
ϵ_2 = 15

f kilocycles	j = 1 $\lvert E_j(\omega, d) \rvert$	j = 1 Arg $E_j(\omega, d)$	j = 2 $\lvert E_j(\omega, d) \rvert$	j = 2 Arg $E_j(\omega, d)$
		d = 100 miles		
1	8.4787932 - 9	1.3845716	2.0764915 - 9	7.5141626
2	1.5833866 - 8	1.2977581	3.7264415 - 9	7.3404436
5	3.4782565 - 8	1.1059334	7.6680214 - 9	6.9389787
10	6.1129882 - 8	8.5474460 - 1	1.2950036 - 8	6.4042571
20	1.0666085 - 7	4.2851690 - 1	2.2997916 - 8	5.5396577
40	2.0237769 - 7	3.3679410 - 1	4.6778642 - 8	4.1833644
50	2.6349079 - 7	7.2150750 - 1	5.8201575 - 8	3.5390870
100	3.7020530 - 7	3.4444583	8.9826217 - 9	1.6776047
		d = 200 miles		
1	8.4469820 - 9	1.2997509	3.5971402 - 9	7.4470665
2	1.5338006 - 8	1.1743523	6.3324315 - 9	7.2428280
5	3.2462965 - 8	8.9758990 - 1	1.2783460 - 8	6.7763141
10	5.7331972 - 8	5.4546920 - 1	2.2005558 - 8	6.1740067
20	1.1128719 - 7	2.3449600 - 2	4.2507441 - 8	5.2683286
40	2.6414297 - 7	6.5930720 - 1	9.7017743 - 8	3.9646588
50	3.6507733 - 7	5.3501255	1.2543848 - 7	3.3554322
100	6.6491220 - 7	4.2595628	5.8703768 - 8	6.9642874
		d = 500 miles		
1	4.2908679 - 9	1.0382646	2.8512530 - 9	7.1800514
2	7.4172714 - 9	7.8552950 - 1	4.6964156 - 9	6.8564725
5	1.6276940 - 8	2.6936000 - 1	9.1242879 - 9	6.1605805
10	3.4989978 - 8	1.9568350 - 1	1.7308844 - 8	5.3960961
20	8.7269807 - 8	5.6907834	4.0869937 - 8	4.4921069
40	2.3262213 - 7	5.3560800	1.1293701 - 7	3.4006306
50	3.2037209 - 7	5.2316195	1.5735333 - 7	2.9096684
100	6.4598024 - 7	4.8026416	2.1993246 - 7	7.5409551
		d = 1000 miles		
1	3.4211754 - 9	8.5928600 - 1	1.3981929 - 9	6.7513289
2	6.1845832 - 9	5.2541620 - 1	2.1681030 - 9	6.2357918
5	1.6776555 - 8	4.6282000 - 3	4.5843831 - 9	5.2400047
10	4.3051594 - 8	5.9906957	1.0886662 - 8	4.4160719
20	1.1871637 - 7	5.8771110	3.1319759 - 8	3.6903483
40	3.3481325 - 7	5.9160003	9.7826080 - 8	2.9348159
50	4.6579327 - 7	5.9467628	1.4324610 - 7	2.5995566
100	9.7488163 - 7	6.1573593	3.0941428 - 7	7.8749489

Table 120. Very low frequency and low frequency part of sky-wave transfer characteristic (amplitude, $\lvert E_j(\omega, d) \rvert$, and phase, Arg $E_j(\omega, d)$) assuming the geometrical-optical and quasi-longitudinal-Fresnel approximations, for various distances, d, electron density, N, collision frequency, ν and earth's magnetic field strength, H.

I_{ℓ} = 1 ampere-meter
N_0 = 884 electrons/$(cm)^3$
ν = 4.2(10^6) collisions/sec
H = 0.53 gauss
h_3 = 70 kilometers
σ = 5 mhos/meter
ϵ_2 = 15

f kilocycles	j = 1 $\lvert E_j(\omega, d)\rvert$	j = 1 Arg $E_j(\omega, d)$	j = 2 $\lvert E_j(\omega, d)\rvert$	j = 2 Arg $E_j(\omega, d)$
		d = 100 miles		
1	1.0615106 - 8	1.2734984	3.0079013 - 9	7.3676743
2	1.8996831 - 8	1.1385458	5.0760074 - 9	7.1301036
5	3.8629398 - 8	8.4469360 - 1	9.2719671 - 9	6.5926981
10	6.3283595 - 8	4.6563370 - 1	1.3773076 - 8	5.8894556
20	1.0340242 - 7	1.6287670 - 1	1.9926036 - 8	4.7700037
40	1.7003193 - 7	5.0587550	2.0652831 - 8	3.0464021
50	1.8720246 - 7	4.6141788	1.5254084 - 8	2.4475810
100	1.6302079 - 7	3.2163902	3.9415411 - 9	1.7934044
		d = 200 miles		
1	8.1613918 - 9	1.0992218	4.0460757 - 9	7.2279276
2	1.3980624 - 8	8.8054890 - 1	6.5730421 - 9	6.9252121
5	2.8032724 - 8	4.0888630 - 1	1.1737782 - 8	6.2521733
10	5.1819059 - 8	1.1603920 - 1	1.8753157 - 8	5.4365586
20	1.1188907 - 7	7.1883360 - 1	3.2382772 - 8	4.3022832
40	2.5007913 - 7	4.8929165	4.5327015 - 8	2.6710891
50	3.0691154 - 7	4.6610082	4.1535299 - 8	2.0574869
100	4.9459140 - 7	4.0130899	1.8820849 - 8	6.6057819
		d = 500 miles		
1	3.4370215 - 9	5.8126860 - 1	2.0904785 - 9	6.6907262
2	6.1402067 - 9	1.4054400 - 1	3.1491228 - 9	6.1435366
5	1.6538539 - 8	4.9255710 - 1	6.1563247 - 9	5.1138752
10	3.9174755 - 8	5.4167465	1.2477564 - 8	4.1937748
20	9.3059019 - 8	5.1216915	3.0052873 - 8	3.1966902
40	2.0810471 - 7	4.8156898	7.1182238 - 8	2.0662208
50	2.5954614 - 7	4.7116638	8.4562049 - 8	1.7024445
100	4.7700474 - 7	4.4473913	1.1896737 - 7	7.1314068
		d = 1000 miles		
1	3.3977129 - 9	2.1594060 - 1	8.5205863 -10	5.8614324
2	6.8860640 - 9	2.6754520 - 1	1.4090868 - 9	5.0269534
5	2.1042304 - 8	5.5007656	3.8965617 - 9	3.8400907
10	5.0136695 - 8	5.2404733	1.0440711 - 8	3.0845541
20	1.1662387 - 7	5.0393882	2.9263631 - 8	2.4692624
40	2.5759642 - 7	4.8286404	7.3315471 - 8	1.8339798
50	3.2297202 - 7	4.7574685	9.0805211 - 8	1.6266639
100	6.1742775 - 7	4.5873244	1.5251925 - 7	7.4314273

Table 121. Very low frequency and low frequency part of sky-wave transfer characteristic (amplitude, $\lvert E_j(\omega, d)\rvert$, and phase, Arg $E_j(\omega, d)$) assuming the geometrical-optical and quasi-longitudinal-Fresnel approximations, for various distances, d, electron density, N, collision frequency, ν and earth's magnetic field strength, H.

$I\ell$ = 1 ampere-meter
N^o = 1245 electrons/$(cm)^3$
ν = 10^6 collisions/sec
H = 0.535 gauss
h_3 = 90 kilometers
σ = 5 mhos/meter
ϵ_2 = 15

f kilocycles	j = 1 $\lvert E_j(\omega, d)\rvert$	j = 1 Arg $E_j(\omega, d)$	j = 2 $\lvert E_j(\omega, d)\rvert$	j = 2 Arg $E_j(\omega, d)$
		d = 100 miles		
1	8.4246779 - 9	1.3781479	2.0518342 - 9	7.5084027
2	1.5691125 - 8	1.2886617	3.6609610 - 9	7.3313663
5	3.4287958 - 8	1.0915142	7.4490963 - 9	6.9203151
10	5.9903663 - 8	8.3429710 - 1	1.2485622 - 8	6.3716277
20	1.0364526 - 7	3.9949510 - 1	2.2124527 - 8	5.4977374
40	1.9432006 - 7	3.7802660 - 1	4.3657425 - 8	4.1337749
50	2.5177977 - 7	7.6768510 - 1	5.3938260 - 8	3.4723004
100	3.4705510 - 7	3.3787796	8.1864043 - 9	1.5847282
		d = 200 miles		
1	8.3644596 - 9	1.2898839	3.5433593 - 9	7.4395836
2	1.5126512 - 8	1.1603693	6.1935300 - 9	7.2306502
5	3.1757897 - 8	8.7539110 - 1	1.2353559 - 8	6.7506890
10	5.5578270 - 8	5.1393620 - 1	2.1174787 - 8	6.1328279
20	1.0650016 - 7	2.1413500 - 2	4.0721255 - 8	5.2245007
40	2.4819446 - 7	7.2326340 - 1	8.9345913 - 8	3.9029933
50	3.4050326 - 7	5.2784005	1.1541054 - 7	3.2755649
100	6.0226885 - 7	4.1569895	5.4356518 - 8	6.8683082
		d = 500 miles		
1	4.1863022 - 9	1.0132686	2.7695374 - 9	7.1633041
2	7.1629486 - 9	7.4998870 - 1	4.5124210 - 9	6.8274341
5	1.5403384 - 8	2.1256570 - 1	8.7108240 - 9	6.1084699
10	3.2364375 - 8	2.7696010 - 1	1.6432333 - 8	5.3443486
20	7.8156390 - 8	5.5739199	3.6861710 - 8	4.4353943
40	1.9903803 - 7	5.1869504	9.8089468 - 8	3.2740101
50	2.6912927 - 7	5.0407812	1.3797257 - 7	2.7755538
100	5.0497355 - 7	4.5230222	1.5953511 - 7	7.4205667
		d = 1000 miles		
1	3.1063750 - 9	7.5745240 - 1	1.3197602 - 9	6.7061499
2	5.3967820 - 9	3.7826440 - 1	2.0334958 - 9	6.1665280
5	1.3542479 - 8	2.4747620 - 1	4.2190799 - 9	5.1755458
10	3.1908581 - 8	5.6303282	9.1568095 - 9	4.3330246
20	7.8546405 - 8	5.3321712	2.4482307 - 8	3.5013062
40	1.9320459 - 7	5.0729179	7.6446888 - 8	2.6663143
50	2.5723816 - 7	4.9720343	1.1077536 - 7	2.3419836
100	4.9417716 - 7	4.6218205	1.7541567 - 7	7.6093219

Table 122. Very low frequency and low frequency part of sky-wave transfer characteristic (amplitude, $\lvert E_j(\omega, d)\rvert$, and phase, Arg $E_j(\omega, d)$) assuming the geometrical-optical and quasi-longitudinal-Fresnel approximations, for various distances, d, electron density, N, collision frequency, ν and earth's magnetic field strength, H.

d miles	$\widehat{a} - a$ seconds	α_j	$\widehat{D}_j$ meters	
		h_3 = 70 kilometers		
		j = 1		
100	1.9845215 - 4	1.0192435	2.2040960	5
200	1.1693188 - 4	1.0420412	3.5691320	5
500	5.7792319 - 5	1.2179881	8.2199360	5
1000	4.6361986 - 5	2.5826105	1.6232416	6
		j = 2		
100	5.7863886 - 4	1.0134103	3.3434920	5
200	3.9690430 - 4	1.0194247	4.4081920	5
500	1.9474143 - 4	1.0604800	8.6303640	5
1000	1.1558464 - 4	1.2228859	1.6439872	6
		h_3 = 90 kilometers		
		j = 1		
100	2.9905216 - 4	1.0208773	2.5055880	5
200	1.8532769 - 4	1.0387783	3.7741100	5
500	9.1037585 - 5	1.1724308	8.3195700	5
1000	6.7506905 - 5	1.9468988	1.6295786	6
		j = 2		
100	8.1837688 - 4	1.0161502	4.0619720	5
200	5.9810433 - 4	1.0210649	5.0111760	5
500	3.1058500 - 4	1.0533450	8.9775400	5
1000	1.8207517 - 4	1.1771578	1.6639140	6

Table 123. Skywave delay, $\widehat{a} - a$, the geometrical-optical ray divergence-convergence coefficient, α_j, and ray length, $\widehat{D}_j$, for various distances, d.

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