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MICROWAVE SPECTRAL TABLES

Diatomic Molecules

U.S. DEPARTMENT OF COMMERCE
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Paul F. Wacker, Masataka Mizushima, Jean D. Peterson, and Joe R. Ballard

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Contents

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Microwave Spectral Tables

Volume I: Diatomic Molecules

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For about 1500 spectral lines of diatomic molecules observed by coherent radiation techniques, measured frequencies, assigned molecular species, assigned quantum numbers, and newly computed intensities are given. Molecular data, such as rotational constants, dipole moments, and various coupling constants, determined by such techniques, are also tabulated, as are other molecular constants used in the intensity computations. References are given for all included data. For determination of hyperfine spectra, both Casimir's function and the intensity splitting factor are given for both integral and half-integral quantum numbers J and I, permitting application to additional molecules with unclosed electronic shells and with hyperfine splitting produced by more than one nucleus.

1. Introduction

These tables represent the first volume of a revision of Kisliuk and Townes' "Molecular Microwave Spectra Tables," published as National Bureau of Standards Circular 518 [1]*. The spectral lines reported are not restricted to those in a given frequency range or to those observed by conventional microwave spectroscopy, but rather include those observed by any coherent radiation technique, including molecular beam techniques. However, the lines reported have been restricted to those measured in or extrapolated to negligible external fields and to those applying to relatively isolated molecules and radicals. Nevertheless, molecular parameters describing field-dependent data are included, particularly for paramagnetic gases and when given in articles reporting field-independent data.

Physics Abstracts, Chemical Abstracts, Physical Review, Journal of Chemical Physics, and Reviews of Modern Physics were searched through the end of 1960. All the original sources so located plus various unpublished reports have been studied. The authors would like to receive information regarding any errors, misinterpretations, and omissions (of data not likely to be listed in abstract journals dated after 1960), as well as reports on further unpublished work, addressed to the Radio Standards Laboratory, National Bureau of Standards, Boulder, Colorado.

* Numbers in brackets indicate references listed on page XVII.

In order to reduce transcription errors, all tabular material (except for the bibliography, molecular constants not used for computations, and a few exceptional cases) was printed automatically as computer output and reproduced photographically. The computer input was punched on cards and the cards verified by a second operator. Such verification is better than proofreading, since two independent operations are compared electrically.

2. Description of Tables

For each spectral line, there are given the measured frequency and its uncertainty, the assigned "isotopic molecular species," the assigned initial and final quantum numbers, a reference, and intensities computed for 300° and 195° Kelvin. ("Isotopic molecular species" is used here to indicate a molecular species in which the isotopic species of each individual atom is specified.) In table 1, the lines are listed alphabetically according to the International Union of Chemistry name of the compound [10] and cross-indexed according to all other commonly used names. The listing is subdivided first according to the isotopic molecular species and then according to the major quantum numbers for the transitions. Within these subdivisions, hyperfine components and incompletely identified transitions are listed according to frequency. For each molecule, a table of molecular constants, such as line widths, rotational constants, dipole moments, and various coupling constants, is also given. These constants comprise essentially all those reported in articles which include line frequencies, as well as all other constants used for the computations. The latter constants are commonly taken from standard tabulations and, if necessary, adjusted with simple relations (see Computation of Intensities). The internuclear distances are given diagrammatically. The distance given is r_e, the distance to the minimum in the potential energy curve.

Ordinarily, the frequencies and uncertainties given are those reported in the source deemed most accurate. Because the uncertainties reported in so many of the papers are not precisely defined, no attempt was made to reduce them to a common basis. The reader interested in precise estimates of both random and consistent error is referred to the original papers or to the authors themselves. If two or more sources seemed to be of comparable accuracy, an average of the frequencies was used. In general, the molecular constants are given as reported in the original article; it is <u>not</u> implied that the values are accurate to one unit in the last reported digit. If insufficient data were available for computation of intensities, unknown factors (see Computation of Intensities) were put equal to unity and the values marked R for relative. No intensity was computed for "forbidden" lines. For each group of unresolved lines, both the individual intensities and their sums are given. Being direct computer output, the intensities are written, e.g., in the form 41.E-08, meaning $41.\times10^{-8}$.

Casimir's function and the hyperfine intensity splitting factor are given in table 2 (see introduction to table 2 and Computation of Intensities) [2: pages 151 and 499][†]. All the angular momenta are given for half-integral as well as integral values, permitting application to additional molecules with unclosed (electronic) shells or, for the intensity, to additional molecules with hyperfine splitting caused by more than one nucleus.

The four-digit numbers refer to the bibliography at the end of this volume. Apart from the numbers above 1725, the reference numbers are arranged according to year and then alphabetically according to the first author. When constants obtained from non-microwave sources have been used in fitting parameters to microwave data, reference is commonly made to the microwave paper rather than to the original source. The bibliography includes references to articles of possible interest, even to those giving no data suitable for inclusion in these tables.

The spectral lines will be ordered according to frequency only in a final volume, along with lines from non-diatomic molecules.

3. Symbols Used in Tabulations

The sources of some of the molecular constant data are indicated by small letters immediately following the individual values. The significances are as follows:

Line width field:

a	rough average of values for many lines
m	microwave spectroscopic measurement

Dipole moment field:

c	computed by assuming polarizable ions (for alkali halides)
i	computed from intensity and line width
m	microwave Stark or electric resonance beam measurement
p	computed from polarization data

Rotational constant field:

c	computed from another isotopic species assuming inverse proportionality to the reduced mass
m	microwave measurement for the given isotopic species
ν	computed from measured frequency neglecting centrifugal stretching

[†] The notations [2: equations (1-50)], [4: page 201], etc., indicate equation (1-50) of reference 2, page 201 of reference 4, etc. Most of the references given here are to standard sources where both a general background and references to the original literature may be found.

y value listed is Dunham's Y_{01} rather than the constant B

Vibrational frequency field:

c computed from another isotopic species assuming inverse proportionality to the square root of the reduced mass

{ } measurement not attributed to a specific isotopic molecular species

( ) from simple theoretical relations and measured quantities

[ ] from extrapolation of related data

The following spectroscopic symbols are used in the tabulations. In some cases, a given symbol has become relatively standard for more than one quantity. Rather than introduce new symbols in the tabulations, the literature designations are used together with distinguishing words for the less common usages.

', '' used to distinguish upper (') and lower ('') energy levels in a transition

+, - used as subscripts on integers denoting oxygen lines. The integer denotes the unchanging quantum number N, while the subscripts + and - indicate that the J value changes from N+1 to N and N-1 to N, respectively, in absorption.

+, - as right superscripts to an electronic state designation, indicate that the electronic wave function is symmetric and antisymmetric, respectively, with respect to reflection in a plane containing the internuclear axis [5: page 217]. For NO or OH, designations are equivalent to Mulliken's c and d designations.

α, γ coefficients in the power series for the rotational constant $B_v = B_e - \alpha(v + 1/2) + \gamma(v + 1/2)^2 + \ldots\ldots$

α, β, γ the ℓ- uncoupling constants

$$\sum \frac{|(\Pi|AL_{x'}|\Sigma)|^2}{E} = \alpha,$$

$$4\sum \frac{(\Pi|AL_{x'}|\Sigma)(\Sigma|BL_{x'}|\Pi)}{E} = \beta,$$

and

$$4\sum \frac{|(\Pi|BL_{x'}|\Sigma)|^2}{E} = \gamma$$

respectively, where $L_{x'}$ is the component of electronic orbital angular momentum about an axis perpendicular to the internuclear

axis, Π indicates the $^2\Pi$ electronic ground state, Σ indicates a given Σ electronic state, E indicates the energy difference between the given Σ state and the ground state, and the summation is taken over all Σ states (reference [12]; reference [13], which introduces the α, β, γ notation, omits the factor 4 from the definitions of β and γ, yet uses the values of [12] for them).

a_p, β_p Λ-doubling constants; $a_p = p_\Lambda + 2q_\Lambda$ and $\beta_p = q_\Lambda$

λ multiplet splitting constant A/B_p

λ_0, λ_1 See textual material on oxygen.

μ electric dipole moment

μ_0, μ_1 See textual material on oxygen.

ν measured line frequency

$\Delta\nu/p$ half-width (of spectral line) at half-maximum intensity per unit pressure.

Σ state for which the axial component of the electronic orbital angular momentum is zero. A right subscript g indicates symmetry of the electronic wave function with respect to inversion in the center of the molecule. For other auxiliary notations, see Π and +, - .

Π state for which the axial component of the electronic orbital angular momentum is $h/2\pi$. The left superscript is 2S+1 where $Sh/2\pi$ is the resultant electronic spin angular momentum and the numerical right subscript is $2\pi/h$ times the sum of the axial components of the electronic orbital and spin angular momenta.

χ the angle between the internuclear axis and the radius vector from the nucleus to the electron.

$\Psi^2(0)$ density of the unpaired electrons at the given nucleus.

ω fundamental vibrational frequency

$\omega_e x_e$ coefficient in the power series expansion for the vibrational energy $h[\omega_e(v+1/2) - \omega_e x_e(v+1/2)^2 + \ldots]$.

A multiplet splitting constant, namely the coefficient in the expression $hA\vec{S}\cdot\vec{\Lambda}$ for the coupling energy between the resultant electronic spin and the axial component of the orbital angular momentum [2: page 186].

a, b, c, d, magnetic hyperfine coupling constants, namely [11]

$$a = 2U(1/r^3)_{av},\quad b = -U\left(\frac{3\cos^2\chi - 1}{r^3}\right)_{av} + \frac{16}{3}\pi U\Psi^2(0),$$

$$c = 3U\left(\frac{3\cos^2\chi - 1}{r^3}\right)_{av},\ \text{and}\ d = 3U\left(\frac{\sin^2\chi}{r^3}\right)_{av},$$

where $U = \mu_0\mu_I/I$, μ_0 is the absolute value of the Bohr magneton, μ_I is the nuclear magnetic moment, and I is the nuclear spin in units of $h/2\pi$.

B, D coefficients in the power series expansion for the rotational energy $h[BJ(J+1) - DJ^2(J+1)^2 + \ldots]$ [2: page 1-36]. A numerical subscript generally indicates the vibrational quantum number v, but for oxygen see the textual material relating to this compound. For OH and NO, B_p and B_s indicate the B values for the lowest $^2\Pi$ and $^2\Sigma$ electronic states, respectively. For small spin uncoupling, the effective B value includes electronic effects [textual material on OH; 2: page 186; 12: page 1728].

C coefficient in the expression $hC\vec{I}\cdot\vec{J}$ for the magnetic hyperfine coupling energy of a diatomic molecule [2: equation 8-40]. The nucleus involved is indicated in parentheses.

e as a subscript, indicates the minimum in the vibrational potential curve.

eQq quadrupole coupling constant. With Feld's normalization used here, the quadrupolar energy for a linear molecule is $-heQq\, f(I, J, F)$ where $f(I, J, F)$ is Casimir's function [table 2; 2: pages 150, 151, 499]. The mean field gradient q is taken along the internuclear axis. The nucleus involved is indicated in parentheses.

$e^2Q\left(\frac{3\sin^2\chi}{r^3}\right)_{av}$ quadrupole coupling constant with the field gradient taken perpendicular to the internuclear axis. Occurs for OH and NO.

F, F_1 quantum number such that $Fh/2\pi$ is the total resultant angular momentum including nuclear spin. The quantum number F_1 excludes nuclear spins except that for the nucleus most closely coupled to the non-nuclear angular momentum.

g, g_J Zeeman splitting factor. For a paramagnetic molecule g_J is defined by the expression for the Zeeman energy $-\mu_0 g_J \vec{J}\cdot\vec{H}$, where

μ_0 is the absolute value of the Bohr magneton and $\vec{H}$ is the magnetic field. For the smaller Zeeman energy of a closed shell molecule, μ_0 in the expression is replaced by μ_n, the nuclear magneton; in this case g_J is essentially independent of J and the subscript is commonly omitted. A + or - superscript on the symbol for OH indicates a $^2\Pi^+$ or $^2\Pi^-$ electronic state [2: page 286].

I — moment of inertia

I — nuclear spin quantum number. $Ih/2\pi$ is the angular momentum due to the spin of a given nucleus.

J — quantum number. $Jh/2\pi$ is the total (resultant) angular momentum apart from nuclear spin.

M_F — Projection of total angular momentum $\vec{F}$ in the direction of electric or magnetic field.

N — quantum number. $Nh/2\pi$ is the total (resultant) orbital angular momentum including molecular rotation.

0 — as a subscript, generally indicates the vibrational quantum number $v = 0$, but see textual material on oxygen.

p_Λ, q_Λ — the Λ-doubling constants

$$p_\Lambda = 4\sum \frac{(-1)^s}{E} (\Pi|AL_{x'}|\Sigma)(\Sigma|BL_{x'}|\Pi) \text{ and}$$

$$q_\Lambda = 4\sum \frac{(-1)^s}{E} |(\Pi|BL_{x'}|\Sigma)|^2 ,$$

where s is an even integer for a Σ^+ state and an odd integer for a Σ^- state [14: pages 494 and 487] and the other symbols have the same significance as in the expressions for the ℓ-uncoupling constants α, β, and γ.

Q — electric quadrupole moment of the nucleus [2: page 134]. The nucleus involved is denoted in parentheses.

r — distance from a given nucleus to an unpaired electron, but r_0 is the internuclear separation for v=0.

v — vibrational quantum number which assumes integral values (v=0 for the ground state).

Y — coefficient in Dunham's expression for the energy levels of a

rotating vibrator

$$h \sum_{\ell, j} Y_{\ell j} (v+1/2)^{\ell} J^{j} (J+1)^{j} .$$

The following approximate relations exist: $Y_{01} \sim B_e$, $Y_{02} \sim -D_e$, $Y_{10} \sim \omega_e$, $Y_{11} \sim -\alpha_e$, $Y_{20} \sim -\omega_e x_e$, and $Y_{21} \sim \gamma_e$ [2: pages 9-11].

4. Computation of Intensities

Since the spectral lines reported in these tables are observed in or extrapolated to negligible external fields, neither the initial nor final orientation of the total angular momentum (M_F value) has an effect upon the frequency, and hence they are not reported. The intensity of absorption of unpolarized radiation is similarly independent of the initial M_F value [2: page 23; 4: page 201], and the peak intensity of a narrow pressure-broadened line is essentially independent of pressure, assuming the Van Vleck-Weisskopf line shape. The intensities reported in these tables are the fractional energy absorption per centimeter under the preceding conditions.

Subject to the conditions of the preceding paragraph, the intensity of absorption from a single state to a set of states, which differ only in M_F value but which set includes all possible M_F values, is given by [2: equations (1-50) and (13-19)]

$$\gamma_{max} = 8\pi^2 N f_p |\mu_{pq}|^2 \nu_o^2 / (3ckT\Delta\nu) , \qquad (1)$$

where

N = the number of molecules per cm^3 of the isotopic molecular species giving rise to the absorption,

f = the ratio of the number of molecules of the given species in a given state or set of states to the total number of molecules of the given species in all states,

f_p = f for the initial state p,

ν_o = the resonant frequency (or center approximately) of the absorption line,

$\Delta\nu$ = half-width of the line at half-maximum intensity (the line breadth parameter),

c = velocity of light,

k = Boltzmann's constant,

T = absolute temperature in degrees Kelvin, and

$|\mu_{pq}|^2$ = the square of the absolute value of the dipole moment matrix element for a transition from the initial state p to a set q of final states, summation being carried out over the three perpendicular laboratory-fixed directions of space and over the permitted M_F values of the set of final states.

A simple extension of the preceding discussion is required. For non-zero initial F values, more than one initial M_F value is involved. Further, for the rotational spectrum of NO, the number of both initial states and sets of final states is doubled by the Λ-doubling. However, these situations can be considered to involve independent sets of transitions, with the original formulation holding for each set. Since in these cases the $|\mu_{pq}|^2$'s are the same for each set of transitions, the preceding formula holds if f_p is replaced by f_P, the fraction of molecules in the whole set of initial states. For this more general case, $|\mu_{pq}|^2$ is written $|\mu_{PQ}|^2$.

So that hyperfine splitting may be treated as a subsidiary effect, a hypothetical molecule is introduced in which all the nuclear spins are changed to zero, but in which the masses and distinctions between types of nuclei (even between isotopic forms of the same element) remain unchanged; such a molecule is henceforth called "the hypothetical molecule."

For practical computations, the following additional symbols are introduced:

s = the ratio of the number of molecules belonging to the given isotopic molecular species to the total number of molecules of that kind, regardless of isotopic species,

p = total pressure, in mm of Hg, of all the molecules of a given kind, regardless of isotopic species,

L_0 = Loschmidt's number, the number of molecules of an ideal gas per cm^3 at 0°C and 760 mm Hg,

h = Planck's constant,

B = the rotational constant in megacycles,

W = $10^6\ h/kT$,

X = BW,

t = hc/kT,

V = the ratio of $|\mu_{PQ}|^2$ for the hypothetical molecule to μ^2, the square of the permanent dipole moment,

Z = the sum of the Boltzmann factors, $\exp(-E/kT)$, over the set P of initial states of the hypothetical molecule. Constant terms are regularly omitted from the (relative) energy E. Note that the nuclear spin factors $(2I_m+1)$ do not occur, since the definition is in terms of the hypothetical molecule. Z is approximated as the product $Z_v Z_r$, where Z_v depends only on the vibrational quantum numbers and Z_r depends only upon the rotational (and sometimes electronic) quantum numbers.

Q = the sum of Z's over all states of the hypothetical molecule. The fractional number f_P of hypothetical molecules in the initial set P of states is Z/Q. Like Z, Q is approximated as the product of a vibrational factor Q_v and rotational-electronic factor Q_r.

H = the hyperfine structure intensity splitting-factor. This factor contains both dipole moment and population factors such that the product of a given H with the intensity for the hypothetical molecule is equal to the intensity of a given hyperfine component of the given spectral line. Values for specific cases are discussed on pages XIV and XV.

The absorption coefficient may now be written as

$$\gamma_{max} = G\{\mu^2 s/Q_r Q_v\} Z_r Z_v V H \nu_o^2 , \qquad (2)$$

where G depends only upon the line width and temperature, the factor in brackets for our purpose depends only upon the molecular species and temperature, and the remaining factors depend at least upon the line involved.

For computational purposes, it is assumed the $\Delta\nu$ is proportional to $pT^{-3/4}$ [2: pages 24, 368-369; 4: page 196] and we write $(\Delta\nu/p)_{300}$ for the value of $\Delta\nu/p$ at 300°K. Thus

$$\Delta\nu/p = (\Delta\nu/p)_{300} (T/300)^{-3/4} .$$

Then for an ideal gas

$$N/\Delta\nu = N/[p(\Delta\nu/p)_{300} (T/300)^{-3/4}] = 273.16 s L_0/[760 T (\Delta\nu/p)_{300} (T/300)^{-3/4}] .$$

In case no value for $\Delta\nu$ is known, 25 Mc/mmHg = $(\Delta\nu/p)_{300std}$ is used as a standard value, yielding a standard G, G_{std}, in equation (2). When an experimental value is known for $\Delta\nu$,

$G'/(\Delta\nu/p)_{300}$ replaces G in the latter equation, yielding

$$\gamma_{max} = G'\{\mu^2 s/Q_r Q_v (\Delta\nu/p)_{300}\} Z_r Z_v V H\nu_o^2 , \quad (3)$$

where $G' = G_{std}(\Delta\nu/p)_{300std}$. To simplify computations, only one line width parameter was used for each molecule; the value used is given in the appropriate molecular constant table.

Expressing the dipole moment in Debye units (10^{-18} esu) and the frequency in megacycles, the following values were obtained for the G's:

	T = 300°K	T = 195°K
G_{std}	2.730×10^{-11}	4.677×10^{-11}
G'	6.825×10^{-10}	1.169×10^{-9}

The quotient s of the number of molecules belonging to a given isotopic molecular species divided by the total number of molecules, regardless of isotopic species, is given by

$$s = (\sigma/\sigma_i)a_1 a_2 , \quad (4)$$

where (σ/σ_i) is two for the heteronuclear oxygen molecules but unity for the other isotopic molecular species of this tabulation [7: introduction]. The symbols a_1 and a_2 represent, for the first and second atoms respectively, the natural terrestial ratio of the abundance of the given nuclide to the total abundance of all the nuclides with the given atomic number. The abundances are taken from the American Institute of Physics Handbook [6: pages 8-5 to 8-18]. Rather than report zero intensity for the tritium halides, the abundance of tritium was taken as 100 percent and the resulting intensities marked R for relative. Equation (4) neglects the slight differences in chemical stability of the isotopic molecular species.

For the vibrational partition function, the harmonic oscillator approximation

$$Q_v = 1/[1 - \exp(-\omega t)] \quad (5)$$

was used, where ω is the fundamental vibrational frequency in cm^{-1}. (For the gallium and

indium halides, Q_v is quite significantly different from unity.) Similarly,

$$Z_v = \exp(-v\omega t) \tag{6}$$

was used, where v is the (integral) vibrational quantum number.

When possible, the ω values were taken from Herzberg's tabulations [6: pages 7-137 to 7-141; 5: pages 501-581]. If the ω value was not available for the required isotopic molecular species, it was assumed to be inversely proportional to the square root of the reduced mass [2: equation 1-41]. If one or both of the nuclides corresponding to the measured ω value was unknown, the tabulated value was enclosed in square brackets; if the isotopic dependence was significant, the reduced mass of the measured value was assumed to be that given in Herzberg's tabulation [6: pages 7-137 to 7-141].

For the closed shell molecules (here molecules other than the hydroxyl radical, nitric oxide, or oxygen), the Mulholland approximation [3: equation V, 21]

$$Q_r = (1 + X/3)/X \tag{7}$$

suffices. For the same group of molecules,

$$VZ_r = (J+1)\exp[-XJ(J+1)] \tag{8}$$

was used [2: equations 1-27 and 1-76] for the transitions J+1←J. If no value for permanent dipole moment μ was available, it was set equal to one Debye and the resulting intensity marked R for relative.

The expressions used for V, Z_r, and Q_r for the unclosed shells are discussed under the individual molecules.

For a molecule with only one non-zero nuclear spin I, the hyperfine structure splitting factors H(I, J', F'; I, J'', F'') for the transitions I, J', F'←I, J'', F'' are given by [8: equations $2^9$2a and $2^9$2b, page 238]

J+1←J transition

$$H(I, J+1, F+1; I, J, F) = \frac{(J+F+I+3)(J+F+I+2)(J+F-I+2)(J+F-I+1)}{F+1}\omega_A , \tag{9}$$

$$H(I, J+1, F; I, J, F) = \frac{-(J+F+I+2)(J+F-I+1)(J-F+I+1)(J-F-I)(2F+1)}{F(F+1)}\omega_A , \tag{10}$$

$$H(I, J+1, F-1; I, J, F) = \frac{(J-F+I+2)(J-F+I+1)(J-F-I+1)(J-F-I)}{F}\omega_A , \quad (11)$$

J←J transition

$$H(I, J, F+1; I, J, F) = \frac{-(J+F+I+2)(J+F-I+1)(J-F+I)(J-F-I-1)}{F+1}\omega_B , \quad (12)$$

$$H(I, J, F; I, J, F) = \frac{[J(J+1)+F(F+1)-I(I+1)]^2 (2F+1)}{F(F+1)}\omega_B , \quad (13)$$

and

$$H(I, J, F-1; I, J, F) = \frac{-(J+F+I+1)(J+F-I)(J-F+I+1)(J-F-I)}{F}\omega_B , \quad (14)$$

where ω_A and ω_B are normalization constants such that $\sum_{F'}\sum_{F''} H(I, J', F'; I, J'', F'')$ equals unity. Substituting the expressions for the sums given in Condon and Shortley (equations $2^9 6$) shows that

$$4(2J+1)(2I+1)(J+1)(2J+3)\omega_A = 1$$

and

$$4(2J+1)(2I+1)(J+1)J\omega_B = 1$$

(Attention is called to a typographical error in Townes and Schawlow's expression for the transition J, F←J-1, F (2: page 152). Since these expressions assume only that the J's and F's are good quantum numbers and that the hyperfine splittings are small compared to kT, they apply for the molecules with unclosed shells as well as with closed shells. These H's are given in table 2 of this volume for both integral and half-integral values of J (see next paragraph).

For hyperfine splitting associated with two nuclei, the following treatment was used. If the hyperfine splittings are small compared to kT and if the spin I_1 of the first nucleus combines with J to form a good (angular momentum) quantum number F_1, the previous H factors can be applied with I_1, J, F_1 substituted for I, J, F, then again with I_2, F_1, F substituted for I, J, F. In this tabulation, two nuclei contribute to hyperfine splitting only for closed shell molecules; in this case the preceding quantum number condition is obeyed provided the quadrupole coupling constant eQq for I_1 is large in absolute value compared to that for I_2 (and both large compared to the small magnetic couplings) [2: page 172]. Rather than carrying out the tedious computations for intermediate coupling [2: page 172] or reporting no hyperfine

intensities in some cases, the preceding successive factors were used in all cases and a footnote concerning accuracy added when the couplings were not widely different. In any event, for fixed initial and final J's and F's, the sums over all possible initial and final F_1's are accurate according to the principle of spectroscopic stability [9: pages 137-142, equation 42], the J's, I's, and F's being good quantum numbers.

All computations were carried out on a digital computer so that there are few, if any, random computational errors. There are inaccuracies due to the approximations mentioned and due to inaccurate molecular constants. All constants used in the computations are given in the molecular constant tables, so that correction can be made for improvement in such constants. Further, the ratios of intensities are often better than the intensities themselves.

The tables of Casimir's function and the hyperfine splitting factors are described in detail immediately preceding the tabular material itself.

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Table 1

Molecules Listed Alphabetically According to I.U.C. Name

In this table, the spectra and molecular data are ordered alphabetically according to I.U.C. names of the compounds, and cross indexed according to other common names of the molecules.

2.138 Å

Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_o cm^{-1}	α_e Mc/sec	eqQ(Br) Mc/sec	eqQ(Cl) Mc/sec	
$Br^{79}Cl^{35}$		0.57	4570.92 m	[430]	23.22	+876.8	-103.6	
$Br^{79}Cl^{37}$			4499.84 m	[430]	21.94	+876.8	- 81.14	
$Br^{81}Cl^{35}$			4536.14 m	[430]	22.95	+732.9	-103.6	
$Br^{81}Cl^{37}$			4365.01 m	[430]	21.67	+732.9	- 81.14	
References		0363	0363	9901	0363	0363	0363	

Isotopic Molecular Species	Rotation J'←J"	Vibration v	F_1'	F'	F_1''	F"	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$Br^{79}Cl^{35}$	1←0	ground	1/2	2	3/2	3	8899.50	12.E-09	36.E-09	0363
			5/2	3	3/2	3	9063.77	52.E-10	15.E-09	
			5/2	2	3/2	3	9074.91	37.E-11	11.E-10	
			5/2	4	3/2	3	9080.73	33.E-09	96.E-09	
			5/2	1	3/2	0	9088.61	56.E-10	16.E-09	
			3/2	3	3/2	3	9291.61	22.E-09	63.E-09	
			3/2	2	3/2	3	9307.96	54.E-10	16.E-09	
		1	5/2	4	3/2	3	9034.14	42.E-10	40.E-10	0363
$Br^{79}Cl^{37}$	1←0	ground	1/2	2	3/2	3	8559.58	37.E-10	11.E-09	0363
			5/2	3	3/2	3	8725.49	15.E-10	44.E-10	
			5/2	2	3/2	3	8733.84	11.E-11	32.E-11	
			5/2	4	3/2	3	8738.47	99.E-10	29.E-09	
			5/2	1	3/2	0	8745.17	17.E-10	48.E-10	
			3/2	3	3/2	3	8951.38	65.E-10	19.E-09	
			3/2	2	3/2	3	8964.19	16.E-10	47.E-10	
$Br^{81}Cl^{35}$	1←0	ground	1/2	2	3/2	3	8865.66	12.E-09	35.E-09	0363
			5/2	3	3/2	3	9001.44	50.E-10	14.E-09	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Br^{81}Cl^{35}$	1←0	ground	5/2	2	3/2	3	9012.97	35.E-11 10.E-10	0363
			5/2	4	3/2	3	9018.40	32.E-09 92.E-09	
			5/2	1	3/2	0	9026.17	53.E-10 15.E-09	
			3/2	3	3/2	3	9193.26	21.E-09 60.E-09	
			3/2	2	3/2	3	9209.57	52.E-10 15.E-09	
		1	5/2	4	3/2	3	8972.41	40.E-10 38.E-10	0363
$Br^{81}Cl^{37}$	1←0	ground	1/2	2	3/2	3	8525.53	35.E-10 10.E-09	0363
			5/2	3	3/2	3	8663.40	14.E-10 42.E-10	
			5/2	2	3/2	3	8671.87	10.E-11 30.E-11	
			5/2	4	3/2	3	8676.37	93.E-10 27.E-09	
			5/2	1	3/2	0	8683.06	16.E-10 45.E-10	
			3/2	3	3/2	3	8852.93	60.E-10 17.E-09	

BrF Bromine monofluoride

1.759 Å

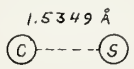
Br ---- F

Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	I_e $10^{-40} gcm^2$	q_e Mc/sec	eqQ(Br) Mc/sec	
$Br^{79}F^{19}$		1.29 m	10706.9 m	671	78.355	156.3	+1089.0	
$Br^{81}F^{19}$			10655.7 m		78.658	155.8	+ 909.2	
References		0362	0362	9900	0362	0362	0362	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Br^{79}F^{19}$	1←0	ground		1/2		3/2	20985.5	28.E-07 75.E-07	0362
				5/2		3/2	21202.6	85.E-07 23.E-06	
				3/2		3/2	21475.4	58.E-07 16.E-06	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Br^{79}F^{19}$	1←0	1		1/2		3/2	20828.9	11.E-08 53.E-09	0362
				5/2		3/2	21045.6	33.E-08 16.E-08	
				3/2		3/2	21319.4	23.E-08 11.E-08	
$Br^{81}F^{19}$	1←0	ground		1/2		3/2	20928.4	27.E-07 73.E-07	0362
				5/2		3/2	21110.4	82.E-07 22.E-06	
				3/2		3/2	21337.5	56.E-07 15.E-06	
		1		1/2		3/2	20772.3	11.E-08 51.E-09	0362
				5/2		3/2	20954.6	32.E-08 16.E-08	
				3/2		3/2	21181.7	22.E-08 11.E-08	

CS Carbon monosulfide



Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	α_e Mc/sec	eqQ(S) Mc/sec	C(S) Mc/sec	Additional Microwave References	
$C^{12}S^{32}$		1.97 m	24584.35m	1285	+177.544		0.019	1502	
$C^{12}S^{33}$			24381.01m			+12.835		1463	
$C^{12}S^{34}$			24190.20m					0659	
$C^{13}S^{32}$			23205.22m						
References		1042	1042	9900	1042	1042	1042		

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$C^{12}S^{32}$	1←0	ground					48991.000 ±.006	94.E-05 25.E-04	1042
		1					48635.912 ±.040	19.E-07 19.E-08	1042
$C^{12}S^{33}$	1←0	ground		1/2		3/2	48583.264 ±.010	12.E-07 32.E-07	1042
				5/2		3/2	48585.906 ±.010	36.E-07 95.E-07	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$C^{12}S^{33}$	1←0	ground		3/2		3/2	48589.068 ±.010	24.E-07 63.E-07	1042
$C^{13}S^{32}$	1←0	ground					46247.472 ±.020	88.E-07 23.E-06	1042
$C^{12}S^{34}$	1←0	ground					48206.948 ±.006	40.E-06 10.E-05	1042

CO Carbon monoxide

1.1282 Å

C-----O

Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_o Mc/sec	ω_e cm^{-1}	eqQ(0) Mc/sec	D_o kc/sec	g nuclear magnetons	B_e Mc/sec	α_e Mc/sec
$C^{12}O^{16}$		0.112 m	57635.97m	2170		183.8	-0.26910	57898.568	525.24
$C^{12}O^{17}$					+4.43			56432.675	
$C^{12}O^{18}$							-0.25622	55135.449	
$C^{13}O^{16}$							-0.25704	55346.447	
$C^{13}O^{18}$								52583.288	
$C^{14}O^{16}$							-0.24664	53166.936	
References		1436	1641	9900	1367	1641	1501	1641	1641

Footnote: ***(below) This value is a weighted average of values presented in the following papers: 1144, 0422, 1436, 0285, 1641,1045, 1501, 1306.

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$C^{12}O^{16}$	1←0	ground					115271.201 ***	41.E-06 11.E-05	1501
	2←1	ground					230537.974 ±.030	32.E-05 84.E-05	1641
	3←2	ground					345795.900 ±.090	11.E-04 27.E-04	1641
$C^{12}O^{17}$	1←0	ground					112359.228 ±.020	15(-4 8.E-09	1501
$C^{12}O^{18}$	1←0	ground					109782.182 ±.008	77.E-09 20.E-08	1501
$C^{13}O^{16}$	1←0	ground					110201.370 ±.002	42.E-08 11.E-07	1501
$C^{13}O^{18}$	1←0	ground					104711.416 ±.008	78.E-11 21.E-10	1501

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$C^{14}O^{16}$	1←0	ground					105871.110 ±.004	35.E-06 93.E-06	1722

ClBr Chlorine monobromide (see Bromine monochloride)

ClF Chlorine monofluoride (see Fluorine chloride)

ClI Chlorine monoiodide (see Iodine monochloride)

CsBr Cesium bromide

3.0720 Å

Cs---Br

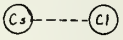
Molecular Isotope	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	γ_e kc/sec	D_e kc/sec	I_e $10^{-40} gcm^2$	
$Cs^{133}Br^{79}$		9.974 p	1081.343m	[194]	1081.3392	3.7175	3.1	0.27	467.5039	
$Cs^{133}Br^{81}$			1064.585y	[194]	1064.5853	3.6313	3.1			
References		0858	0858	9900	0858	0858	0858	0858	0858	
			0699	0699	0699	0699	0699	0699		

Molecular Isotope	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Cs^{133}Br^{79}$	10←9	ground					21588.57 ±0.10	66.E-05 22.E-04	0858
		1					21514.48 ±0.20	26.E-05 51.E-05	0858
		2					21440.65 ±0.20	10.E-05 12.E-05	0858
		3					21366.36 ±0.20	40.E-06 29.E-06	0858
		4					21292.40 ±0.20	16.E-06 69.E-07	0858
		5					21218.66 ±0.20	61.E-07 16.E-07	0858
	11←10	ground					23747.17 ±0.10	72(-05) 25(-04)	0858
		1					23665.60 ±0.20	34.E-05 68.E-05	0858
		2					23583.87 ±0.20	13.E-05 16.E-05	0858
		3					23502.95 ±0.20	53.E-06 38.E-06	0858
		5					23340.26 ±0.20	81.E-07 22.E-07	0858
		6					23259.19 ±0.20	32.E-07 51.E-08	0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Cs^{133}Br^{79}$	11←10	7					23178.25 ±0.20	12.E-07 12.E-08	0858
		8					23097.97 ±0.20	49.E-08 29.E-09	0858
	12←11	1					25816.53 ±0.20	44.E-05 88.E-05	0858
		2					25648.95 ±0.20	17.E-05 21.E-05	0858
		3					25550.22 ±0.20	68.E-06 49.E-06	0858
$Cs^{133}Br^{81}$	10←9	ground					21254.44 ±0.10	62.E-05 20.E-04	0858
	11←10	ground					23379.53 ±0.10	82.E-05 27.E-04	0858
		1					23299.79 ±0.20	32.E-05 64.E-05	0858
		2					23220.22 ±0.20	13.E-05 15.E-05	0858
		3					23140.61 ±0.20	49.E-06 36.E-06	0858
		4					23061.38 ±0.20	19.E-06 85.E-07	0858
	12←11	ground					25504.69 ±0.10	11.E-04 35.E-04	0858

CsCl Cesium chloride

2.9062 Å



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	γ_e kc/sec	I_e $10^{-40}gcm^2$	|eqQ| Mc/sec (Cs)	(Cl)	Addnl. Micro. Refs.
$Cs^{133}Cl^{35}$		10.40 m	2161.208m	240	2161.195	10.085	7.1	233.9118	<4	<3	0621
$Cs^{133}Cl^{37}$			2068.761y		2068.761	9.46					0437
References		0858	0858	0858	0858	0858	0858	0858	0858		

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Cs^{133}Cl^{35}$	6←5	ground					25873.11 ±.10	21.E-04 67.E-04	0699

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Cs^{133}Cl^{35}$	6←5	1					25752.16 ±.20	66.E-05 11.E-04	0699
		2					25631.58 ±.20	21.E-05 19.E-05	0699
		3					25511.25 ±.20	64.E-06 32.E-06	0699
		4					25390.36 ±.40	20.E-06 54.E-07.	0699
		6					25270.0 ±.6	63.E-07 91.E-08	0699
		6					25150.1 ±.6	20.E-07 15.E-08	0699
		7					25031.0 ±.6	62.E-08 26.E-09	0699
		8					24911.2 ±.6	19.E-08 43.E-10	0699
$Cs^{133}Cl^{37}$	6←5	ground					24767.86 ±.10	59.E-05 19.E-04	0699
		1					24654.86 ±.30	19.E-05 33.E-05	0699
		2					24541.40 ±.50	61.E-06 58.E-06	0699
		4					24337.9* ±1.5	63.E-07 18.E-07	0621

Footnote *This line is apparently 30 Mc/sec too high, but was not remeasured as were all the other lines for this isotope. [0621, 0699]

CsF Cesium fluoride

2.3453 Å

Cs ----- F

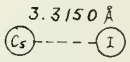
Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(Cs) Mc/sec	α_e Mc/sec	C(Cs)[1] kc/sec	C(F)[2] kc/sec	Additional Microwave References
$Cs^{133}F^{19}$		7.875 m	5527.34 m	270	+1.240	33.13	0	+16	0080, 0487, 0804
References		1244	0858	9900	0858	0858	1730	1730	0252, 0699, 1244

Footnotes: 1. For strong field, C(Cs) = −.6 ± 1 and for weak field C = +.5 ±1.
2. For strong field, C(F) = +18 ± 2 and for weak field C = 14 ± 3.

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Cs^{133}F^{19}$	2←1	ground					22038.51 ±.20	11.E-04 33.E-04	0858
		1					21898.21 ±.40	28.E-05 44.E-05	0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Cs^{133}F^{19}$	2←1	2					21757.58 ±.60	77.E-06 60.E-06	0858
		3					21617.09 ±.60	21.E-06 81.E-07	0858
		4					21477.5 ±1.0	56.E-07 11.E-07	0858

CsI Cesium iodide



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	γ_e kc/sec	D_e kc/sec	I_e $10^{-40} gcm^2$	
$Cs^{133}I^{127}$		12.1 m	708.3579m	142	708.3568	2.0441	1.45	0.152	713.6686	
References		0858	0858	9900	0858	0858	0858	0858	0858	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Cs^{133}I^{127}$	16←15	ground					22632.26 ±0.10	18.E-04 61.E-04	0858
		1					22567.02 ±0.10	90.E-05 21.E-04	0858
	17←16	ground					24046.40 ±0.10	21.E-04 73.E-04	0858
		1					23976.96 ±0.10	11.E-04 25.E-04	0858
		2					23907.70 ±0.10	54.E-05 88.E-05	0858
		3					23838.47 ±0.10	27.E-05 31.E-05	0858
	18←17	ground					25460.53 ±0.10	25.E-04 86.E-04	0858
		1					25387.04 ±0.10	13.E-04 30.E-04	0858
		2					25313.66 ±0.10	64.E-05 10.E-04	0858

FBr Fluorine monobromide (see Bromine monofluoride)

FCl Fluorine chloride

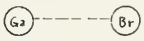
1.6281 Å

Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(Cl) Mc/sec	C (Cl) kc/sec	α Mc/sec	I_e 10^{-40} gcm^2	D_e kc/sec	Addnl. Micro. Refs.
$F^{19}Cl^{35}$		0.881 m	15483.69m	793	-145.837	+22±3	130.666	54.1822	26.3	0284
$F^{19}Cl^{37}$			15189.22m		-114.977	+18±3	126.957	55.2326	25.3	
References		0190	0190	9900	1731	1731	0190	0190	0190	

Isotopic Molecular Species	Rotation J'←J"	Vibration v	F_1'	F'	F_1''	F"	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$F^{19}Cl^{35}$	1←0	ground		3/2		3/2	30807.366 ±0.003	12.E-06 33.E-06	1731
				5/2		3/2	30843.875 ±0.004	18.E-06 49.E-06	
				1/2		3/2	30872.963 ±0.004	61.E-07 17.E-06	
		1		3/2		3/2	30545.994 ±0.069	27.E-08 93.E-09	0190
				5/2		3/2	30582.614 ±0.069	40.E-08 14.E-08	
				1/2		3/2	30611.761 ±0.069	13.E-08 47.E-09	
$F^{19}Cl^{37}$	1←0	ground		3/2		3/2	30228.344 ±0.004	38.E-07 10.E-06	1731
				5/2		3/2	30257.135 ±0.003	57.E-07 15.E-06	
				1/2		3/2	30280.056 ±0.003	19.E-07 51.E-07	
		1		3/2		3/2	29974.470 ±0.069	86.E-09 30.E-09	0190
				5/2		3/2	30003.218 ±0.069	13.E-08 45.E-09	
				1/2		3/2	30026.195 ±0.069	43.E-09 15.E-09	

GaBr Gallium monobromide

2.3525 Å



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(Br) Mc/sec	eqQ(Ga) Mc/sec	α_e Mc/sec	D_e kc/sec	Additional Microwave References	
$Ga^{69}Br^{79}$			2481.99 m		+134±3	-74±5	9.74		1192	

Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(Br) Mc/sec	eqQ(Ga) Mc/sec	α_e Mc/sec	D_e kc/sec	Additional Microwave References	
$Ga^{69}Br^{81}$			2453.48 m	263			9.613	0.74	1341	
$Ga^{71}Br^{79}$			2444.65 m				9.74			
$Ga^{71}Br^{81}$			2416.10 m							
References			1425	9901	1425	1425	1425	1425		

Footnote: For validity of computed intensities see introductory remarks on hyperfine splitting.

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{69}Br^{79}$	5←4	ground	7/2	5	5/2	4	24768.02 ±0.20	41.E-08R13.E-07	1425
			7/2	2	5/2	1	24771.22 ±0.20	15.E-08R47.E-08	
			7/2	3	5/2	2	24771.22 ±0.20	21.E-08R67.E-08	
			7/2	4	5/2	3	24771.22 ±0.20	30.E-08R95.E-08	
			9/2	3	7/2	2	24771.22 ±0.20	23.E-08R73.E-08	
			9/2	4	7/2	3	24771.22 ±0.20	30.E-08R94.E-08	
			9/2	5	7/2	4	24771.22 ±0.20	38.E-08R12.E-07	
			9/2	6	7/2	5	24771.22 ±0.20	49.E-08R15.E-07	
			11/2	4	9/2	3	24771.22 ±0.20	33.E-08R10.E-07	
			11/2	5	9/2	4	24771.22 ±0.20	40.E-08R12.E-07	
			11/2	6	9/2	5	24771.22 ±0.20	48.E-08R15.E-07	
			11/2	7	9/2	6	24771.22 ±0.20	58.E-08R18.E-07	
			13/2	5	11/2	4	24771.22 ±0.20	43.E-08R13.E-07	
			13/2	6	11/2	5	24771.22 ±0.20	51.E-08R16.E-07	
			13/2	7	11/2	6	24771.22 ±0.20	59.E-08R19.E-07	
			13/2	8	11/2	7	24771.22 ±0.20	70.E-08R22.E-07	
							total intensity	61.E-07R19.E-06	
			7/2	5	7/2	5	24796.70 ±0.30	34.E-09R11.E-08	
			7/2	2	7/2	2	24802.17 ±0.30	14.E-09R45.E-09	
			7/2	3	7/2	3	24802.17 ±0.30	18.E-09R56.E-09	
							total intensity	32.E-09R10.E-08	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{69}Br^{79}$	5←4	1	7/2	2	5/2	1	24673.55 ±0.20	42.E-09R66.E-09	1425
			7/2	3	5/2	2	24673.55 ±0.20	60.E-09R95.E-09	
			7/2	4	5/2	3	24673.55 ±0.20	84.E-09R13.E-08	
			9/2	3	7/2	2	24673.55 ±0.20	65.E-09R10.E-08	
			9/2	4	7/2	3	24673.55 ±0.20	84.E-09R13.E-08	
			9/2	5	7/2	4	24673.55 ±0.20	11.E-08R17.E-08	
			9/2	6	7/2	5	24673.55 ±0.20	14.E-08R21.E-08	
			11/2	4	9/2	3	24673.55 ±0.20	91.E-09R14.E-08	
			11/2	5	9/2	4	24673.55 ±0.20	11.E-08R17.E-08	
			11/2	6	9/2	5	24673.55 ±0.20	13.E-08R21.E-08	
			11/2	7	9/2	6	24673.55 ±0.20	16.E-08R26.E-08	
			13/2	5	11/2	4	24673.55 ±0.20	12.E-08R19.E-08	
			13/2	6	11/2	5	24673.55 ±0.20	14.E-08R22.E-08	
			13/2	7	11/2	6	24673.55 ±0.20	17.E-08R26.E-08	
			13/2	8	11/2	7	24673.55 ±0.20	19.E-08R31.E-08	
							total intensity	17.E-07R27.E-07	
		2	7/2	2	5/2	1	24576.08 ±0.20	12.E-09R93.E-10	1425
			7/2	3	5/2	2	24576.08 ±0.20	17.E-09R13.E-09	
			7/2	4	5/2	3	24576.08 ±0.20	23.E-09R19.E-09	
			9/2	3	7/2	2	24576.08 ±0.20	18.E-09R15.E-09	
			9/2	4	7/2	3	24576.08 ±0.20	23.E-09R19.E-09	
			9/2	5	7/2	4	24576.08 ±0.20	30.E-09R24.E-09	
			9/2	6	7/2	5	24576.08 ±0.20	38.E-09R30.E-09	
			11/2	4	9/2	3	24576.08 ±0.20	25.E-09R20.E-09	
			11/2	5	9/2	4	24576.08 ±0.20	31.E-09R25.E-09	
			11/2	6	9/2	5	24576.08 ±0.20	37.E-09R30.E-09	
			11/2	7	9/2	6	24576.08 ±0.20	45.E-09R36.E-09	
			13/2	5	11/2	4	24576.08 ±0.20	33.E-09R27.E-09	

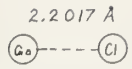
Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{69}Br^{79}$	5←4	2	13/2	6	11/2	5	24576.08 ±0.20	39.E-09R31.E-09	1425
			13/2	7	11/2	6	24576.08 ±0.20	46.E-09R37.E-09	
			13/2	8	11/2	7	24576.08 ±0.20	54.E-09R43.E-09	
							total intensity	47.E-08R38.E-08	
$Ga^{69}Br^{81}$	5←4	ground	7/2	5	5/2	4	24483.58 ±0.20	39.E-08R12.E-07	1425
			7/2	2	5/2	1	24486.56 ±0.20	14.E-08R44.E-08	
			7/2	3	5/2	2	24486.56 ±0.20	20.E-08R64.E-08	
			7/2	4	5/2	3	24486.56 ±0.20	28.E-08R89.E-08	
			9/2	3	7/2	2	24486.56 ±0.20	22.E-08R69.E-08	
			9/2	4	7/2	3	24486.56 ±0.20	28.E-08R89.E-08	
			9/2	5	7/2	4	24486.56 ±0.20	36.E-08R11.E-07	
			9/2	6	7/2	5	24486.56 ±0.20	46.E-08R14.E-07	
			11/2	4	9/2	3	24486.56 ±0.20	31.E-08R96.E-08	
			11/2	5	9/2	4	24486.56 ±0.20	37.E-08R12.E-07	
			11/2	6	9/2	5	24486.56 ±0.20	45.E-08R14.E-07	
			11/2	7	9/2	6	24486.56 ±0.20	55.E-08R17.E-07	
			13/2	5	11/2	4	24486.56 ±0.20	41.E-08R13.E-07	
			13/2	6	11/2	5	24486.56 ±0.20	48.E-08R15.E-07	
			13/2	7	11/2	6	24486.56 ±0.20	56.E-08R18.E-07	
			13/2	8	11/2	7	24486.56 ±0.20	66.E-08R21.E-07	
							total intensity	57.E-07R18.E-06	
		1	7/2	2	5/2	1	24390.37 ±0.20	40.E-09R63.E-09	1425
			7/2	3	5/2	2	24390.37 ±0.20	57.E-09R90.E-09	
			7/2	4	5/2	3	24390.37 ±0.20	80.E-09R13.E-08	
			9/2	3	7/2	2	24390.37 ±0.20	62.E-09R99.E-09	
			9/2	4	7/2	3	24390.37 ±0.20	80.E-09R13.E-08	
			9/2	5	7/2	4	24390.37 ±0.20	10.E-08R16.E-08	
			9/2	6	7/2	5	24390.37 ±0.20	13.E-08R20.E-08	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{69}Br^{81}$	5←4	1	11/2	4	9/2	3	24390.37 ±0.20	86.E-09R14.E-08	1425
			11/2	5	9/2	4	24390.37 ±0.20	10.E-08R17.E-08	
			11/2	6	9/2	5	24390.37 ±0.20	13.E-08R20.E-08	
			11/2	7	9/2	6	24390.37 ±0.20	15.E-08R24.E-08	
			13/2	5	11/2	4	24390.37 ±0.20	11.E-08R18.E-08	
			13/2	6	11/2	5	24390.37 ±0.20	13.E-08R21.E-08	
			13/2	7	11/2	6	24390.37 ±0.20	16.E-08R25.E-08	
			13/2	8	11/2	7	24390.37 ±0.20	18.E-08R29.E-08	
							total intensity	16.E-07R26.E-07	
		2	7/2	2	5/2	1	24294.26 ±0.20	11.E-09R90.E-10	1425
			7/2	3	5/2	2	24294.26 ±0.20	16.E-09R13.E-09	
			7/2	4	5/2	3	24294.26 ±0.20	22.E-09R18.E-09	
			9/2	3	7/2	2	24294.26 ±0.20	17.E-09R14.E-09	
			9/2	4	7/2	3	24294.26 ±0.20	22.E-09R18.E-09	
			9/2	5	7/2	4	24294.26 ±0.20	29.E-09R23.E-09	
			9/2	6	7/2	5	24294.26 ±0.20	36.E-09R29.E-09	
			11/2	4	9/2	3	24294.26 ±0.20	24.E-09R20.E-09	
			11/2	5	9/2	4	24294.26 ±0.20	29.E-09R24.E-09	
			11/2	6	9/2	5	24294.26 ±0.20	36.E-09R29.E-09	
			11/2	7	9/2	6	24294.26 ±0.20	43.E-09R35.E-09	
			13/2	5	11/2	4	24294.26 ±0.20	32.E-09R26.E-09	
			13/2	6	11/2	5	24294.26 ±0.20	38.E-09R30.E-09	
			13/2	7	11/2	6	24294.26 ±0.20	44.E-09R36.E-09	
			13/2	8	11/2	7	24294.26 ±0.20	52.E-09R42.E-09	
							total intensity	45.E-08R37.E-08	
$Ga^{71}Br^{79}$	5←4	ground	7/2	2	5/2	1	24399.00 ±0.20	95.E-09R30.E-08	1425
			7/2	3	5/2	2	24399.00 ±0.20	14.E-08R42.E-08	
			7/2	4	5/2	3	24399.00 ±0.20	19.E-08R60.E-08	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{71}Br^{79}$	5←4	ground	9/2	3	7/2	2	24399.00 ±0.20	15.E-08R46.E-08	1425
			9/2	4	7/2	3	24399.00 ±0.20	19.E-08R59.E-08	
			9/2	5	7/2	4	24399.00 ±0.20	24.E-08R76.E-08	
			9/2	6	7/2	5	24399.00 ±0.20	31.E-08R96.E-08	
			11/2	4	9/2	3	24399.00 ±0.20	20.E-08R64.E-08	
			11/2	5	9/2	4	24399.00 ±0.20	25.E-08R78.E-08	
			11/2	6	9/2	5	24399.00 ±0.20	30.E-08R95.E-08	
			11/2	7	9/2	6	24399.00 ±0.20	37.E-08R11.E-07	
			13/2	5	11/2	4	24399.00 ±0.20	27.E-08R85.E-08	
			13/2	6	11/2	5	24399.00 ±0.20	32.E-08R00.E-08	
			13/2	7	11/2	6	24399.00 ±0.20	37.E-08R12.E-07	
			13/2	8	11/2	7	24399.00 ±0.20	44.E-08R14.E-07	
							total intensity	38.E-07R12.E-06	
$Ga^{71}Br^{81}$	5←4	ground	7/2	2	5/2	1	24114.08 ±0.20	89.E-09R28.E-08	1425
			7/2	3	5/2	2	24114.08 ±0.20	13.E-08R40.E-08	
			7/2	4	5/2	3	24114.08 ±0.20	18.E-08R56.E-08	
			9/2	3	7/2	2	24114.08 ±0.20	14.E-08R44.E-08	
			9/2	4	7/2	3	24114.08 ±0.20	18.E-08R56.E-08	
			9/2	5	7/2	4	24114.08 ±0.20	23.E-08R72.E-08	
			9/2	6	7/2	5	24114.08 ±0.20	29.E-08R91.E-08	
			11/2	4	9/2	3	24114.08 ±0.20	19.E-08R61.E-08	
			11/2	5	9/2	4	24114.08 ±0.20	23.E-08R74.E-08	
			11/2	6	9/2	5	24114.08 ±0.20	29.E-08R90.E-08	
			11/2	7	9/2	6	24114.08 ±0.20	34.E-08R11.E-07	
			13/2	5	11/2	4	24114.08 ±0.20	26.E-08R80.E-08	
			13/2	6	11/2	5	24114.08 ±0.20	30.E-08R94.E-08	
			13/2	7	11/2	6	24114.08 ±0.20	35.E-08R11.E-07	
			13/2	8	11/2	7	24114.08 ±0.20	41.E-08R13.E-07	
							total intensity	36.E-07R11.E-06	

GaCl Gallium monochloride

2.2017 Å



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eQq(Ga) Mc/sec	eQq(Cl) Mc/sec	a_e Mc/sec	D_e kc/sec	Additional Microwave References	
$Ga^{69}Cl^{35}$			4493.73 m	365	-84.7	-20±2	23.27	2.59	1192, 1106	
$Ga^{69}Cl^{37}$										
$Ga^{71}Cl^{35}$										
$Ga^{71}Cl^{37}$										
References			1425	9901	1425	1425	1425	1425		

Footnote: For validity of computed intensities see introductory remarks on hyperfine splitting.

Isotopic Molecular Species	Rotation J'←J"	Vibration v	F_1'	F'	F_1''	F"	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{69}Cl^{35}$	2←1	ground	3/2	3	1/2	2	17906.92 ±0.20	17.E-08R51.E-08	1425
			3/2	2	1/2	2	17906.92 ±0.20	61.E-09R18.E-08	
			3/2	2	1/2	1	17906.92 ±0.20	61.E-09R18.E-08	
			3/2	1	1/2	1	17906.92 ±0.20	61.E-09R18.E-08	
			5/2	4	5/2	4	17906.92 ±0.20	14.E-08R42.E-08	
			5/2	4	5/2	3	17906.92 ±0.20	17.E-09R51.E-09	
			5/2	3	5/2	4	17906.92 ±0.20	17.E-09R51.E-09	
			5/2	3	5/2	3	17906.92 ±0.20	85.E-09R25.E-08	
			5/2	3	5/2	2	17906.92 ±0.20	22.E-09R64.E-09	
			5/2	2	5/2	3	17906.92 ±0.20	22.E-09R64.E-09	
			5/2	2	5/2	2	17906.92 ±0.20	51.E-09R15.E-08	
			5/2	2	5/2	1	17906.92 ±0.20	16.E-09R47.E-09	
			5/2	1	5/2	2	17906.92 ±0.20	16.E-09R47.E-09	
							total intensity	74.E-08R22.E-07	
			1/2	2	1/2	2	17928.55 ±0.20	12.E-08R37.E-08	
			1/2	2	1/2	1	17928.55 ±0.20	12.E-08R37.E-08	
			1/2	1	1/2	2	17928.55 ±0.20	12.E-08R37.E-08	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{69}Cl^{35}$	2←1	ground	1/2	1	1/2	1	17928.55 ±0.20	25.E-09R73.E-09	1425
			7/2	4	5/2	4	17928.55 ±0.20	57.E-09R17.E-08	
			5/2	3	3/2	2	17928.55 ±0.20	23.E-08R69.E-08	
			5/2	2	3/2	2	17928.55 ±0.20	72.E-09R21.E-08	
							total intensity	75.E-08R22.E-07	
			7/2	5	5/2	4	17930.57 ±0.20	65.E-08R19.E-07	
			7/2	4	5/2	3	17930.57 ±0.20	47.E-08R14.E-07	
			7/2	3	5/2	3	17930.57 ±0.20	74.E-09R22.E-08	
			7/2	3	5/2	2	17930.57 ±0.20	34.E-08R10.E-07	
			7/2	2	5/2	2	17930.57 ±0.20	56.E-09R17.E-08	
			7/2	2	5/2	1	17930.57 ±0.20	24.E-08R70.E-08	
			5/2	4	3/2	3	17930.57 ±0.20	37.E-08R11.E-07	
			5/2	3	3/2	3	17930.57 ±0.20	58.E-09R17.E-08	
			5/2	2	3/2	1	17930.57 ±0.20	13.E-08R39.E-08	
			5/2	1	3/2	1	17930.57 ±0.20	56.E-09R17.E-08	
			5/2	1	3/2	0	17930.57 ±0.20	62.E-09R18.E-08	
							total intensity	25.E-07R74.E-07	
			3/2	3	3/2	2	17942.92 ±0.40	44.E-09R13.E-08	
			3/2	2	3/2	2	17942.92 ±0.40	63.E-09R19.E-08	
			3/2	1	3/2	2	17942.92 ±0.40	50.E-09R15.E-08	
							total intensity	16.E-08R47.E-08	
			3/2	3	3/2	3	17946.83 ±0.30	18.E-08R53.E-08	
			3/2	2	3/2	3	17946.83 ±0.30	44.E-09R13.E-08	
			3/2	2	3/2	1	17946.83 ±0.30	50.E-09R15.E-08	
			3/2	1	3/2	1	17946.83 ±0.30	13.E-09R38.E-09	
			3/2	1	3/2	0	17946.83 ±0.30	32.E-09R94.E-09	
			3/2	0	3/2	1	17946.83 ±0.30	32.E-09R94.E-09	
							total intensity	35.E-08R10.E-07	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{69}Cl^{35}$	2←1	1	7/2	5	5/2	4	17837.00 ±0.50	11.E-08R13.E-08	1425
			7/2	4	5/2	3	17837.00 ±0.50	82.E-09R94.E-09	
			7/2	3	5/2	3	17837.00 ±0.50	13.E-09R15.E-09	
			7/2	3	5/2	2	17837.00 ±0.50	58.E-09R67.E-09	
			7/2	2	5/2	2	17837.00 ±0.50	97.E-10R11.E-09	
			7/2	2	5/2	1	17837.00 ±0.50	41.E-09R47.E-09	
			5/2	4	3/2	3	17837.00 ±0.50	64.E-09R74.E-09	
			5/2	3	3/2	3	17837.00 ±0.50	99.E-10R12.E-09	
			5/2	2	3/2	1	17837.00 ±0.50	22.E-09R26.E-09	
			5/2	1	3/2	1	17837.00 ±0.50	96.E-10R11.E-09	
			5/2	1	3/2	0	17837.00 ±0.50	11.E-09R12.E-09	
							total intensity	43.E-08R50.E-08	
		2	7/2	5	5/2	4	17743.96 ±0.50	19.E-09R87.E-10	1425
			7/2	4	5/2	3	17743.96 ±0.50	14.E-09R63.E-10	
			7/2	3	5/2	3	17743.96 ±0.50	22.E-10R98.E-11	
			7/2	3	5/2	2	17743.96 ±0.50	00.E-10R45.E-10	
			7/2	2	5/2	2	17743.96 ±0.50	17.E-10R75.E-11	
			7/2	2	5/2	1	17743.96 ±0.50	70.E-10R31.E-10	
			5/2	4	3/2	3	17743.96 ±0.50	11.E-09R50.E-10	
			5/2	3	3/2	3	17743.96 ±0.50	17.E-10R77.E-11	
			5/2	2	3/2	1	17743.96 ±0.50	38.E-10R17.E-10	
			5/2	1	3/2	1	17743.96 ±0.50	16.E-10R74.E-11	
			5/2	1	3/2	0	17743.96 ±0.50	18.E-10R83.E-11	
							total intensity	74.E-09R33.E-09	
		3	7/2	5	5/2	4	17650.97 ±0.50	33.E-10R58.E-11	1425
			7/2	4	5/2	3	17650.97 ±0.50	24.E-10R42.E-11	
			7/2	3	5/2	3	17650.97 ±0.50	37.E-11R66.E-12	
			7/2	3	5/2	2	17650.97 ±0.50	17.E-10R30.E-11	

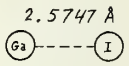
Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{69}Cl^{35}$	2←1	3	7/2	2	5/2	2	17650.97 ±0.50	29.E-11R50.E-12	1425
			7/2	2	5/2	1	17650.97 ±0.50	12.E-10R21.E-11	
			5/2	4	3/2	3	17650.97 ±0.50	19.E-10R33.E-11	
			5/2	3	3/2	3	17650.97 ±0.50	29.E-11R52.E-12	
			5/2	2	3/2	1	17650.97 ±0.50	66.E-11R12.E-11	
			5/2	1	3/2	1	17650.97 ±0.50	28.E-11R50.E-12	
			5/2	1	3/2	0	17650.97 ±0.50	31.E-11R55.E-12	
							total intensity	13.E-09R22.E-10	
$Ga^{69}Cl^{37}$	2←1	ground	7/2	5	5/2	4	17289.15 ±0.50	20.E-08R58.E-08	1425
			7/2	4	5/2	3	17289.15 ±0.50	14.E-08R43.E-08	
			7/2	3	5/2	3	17289.15 ±0.50	22.E-09R66.E-09	
			7/2	3	5/2	2	17289.15 ±0.50	10.E-08R30.E-08	
			7/2	2	5/2	2	17289.15 ±0.50	17.E-09R51.E-09	
			7/2	2	5/2	1	17289.15 ±0.50	71.E-09R21.E-08	
			5/2	4	3/2	3	17289.15 ±0.50	11.E-08R33.E-08	
			5/2	3	3/2	3	17289.15 ±0.50	17.E-09R52.E-09	
			5/2	2	3/2	1	17289.15 ±0.50	39.E-09R12.E-08	
			5/2	1	3/2	1	17289.15 ±0.50	17.E-09R50.E-09	
			5/2	1	3/2	0	17289.15 ±0.50	19.E-09R56.E-09	
							total intensity	76.E-08R23.E-07	
$Ga^{71}Cl^{35}$	2←1	ground	7/2	5	5/2	4	17759.09 ±0.50	42.E-08R13.E-07	1425
			7/2	4	5/2	3	17759.09 ±0.50	31.E-08R91.E-08	
			7/2	3	5/2	3	17759.09 ±0.50	48.E-09R14.E-08	
			7/2	3	5/2	2	17759.09 ±0.50	22.E-08R65.E-08	
			7/2	2	5/2	2	17759.09 ±0.50	36.E-09R11.E-08	
			7/2	2	5/2	1	17759.09 ±0.50	15.E-08R45.E-08	
			5/2	4	3/2	3	17759.09 ±0.50	24.E-08R72.E-08	
			5/2	3	3/2	3	17759.09 ±0.50	37.E-09R11.E-08	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{71}Cl^{35}$	2←1	ground	5/2	2	3/2	1	17759.09 ±0.50	84.E-09R25.E-08	1425
			5/2	1	3/2	1	17759.09 ±0.50	36.E-09R11.E-08	
			5/2	1	3/2	0	17759.09 ±0.50	40.E-09R12.E-08	
							total intensity	16.E-07R48.E-07	
		1	7/2	5	5/2	4	17666.88 ±0.50	73.E-09R85.E-09	1425
			7/2	4	5/2	3	17666.88 ±0.50	53.E-09R62.E-09	
			7/2	3	5/2	3	17666.88 ±0.50	83.E-10R96.E-10	
			7/2	3	5/2	2	17666.88 ±0.50	38.E-09R44.E-09	
			7/2	2	5/2	2	17666.88 ±0.50	63.E-10R73.E-10	
			7/2	2	5/2	1	17666.88 ±0.50	27.E-09R31.E-09	
			5/2	4	3/2	3	17666.88 ±0.50	42.E-09R49.E-09	
			5/2	3	3/2	3	17666.88 ±0.50	65.E-10R76.E-10	
			5/2	2	3/2	1	17666.88 ±0.50	15.E-09R17.E-09	
			5/2	1	3/2	1	17666.88 ±0.50	63.E-10R73.E-10	
			5/2	1	3/2	0	17666.88 ±0.50	70.E-10R81.E-10	
							total intensity	28.E-08R33.E-08	
		2	7/2	5	5/2	4	17573.70 ±0.50	13.E-09R58.E-10	1425
			7/2	4	5/2	3	17573.70 ±0.50	92.E-10R42.E-10	
			7/2	3	5/2	3	17573.70 ±0.50	14.E-10R65.E-11	
			7/2	3	5/2	2	17573.70 ±0.50	66.E-10R30.E-10	
			7/2	2	5/2	2	17573.70 ±0.50	11.E-10R50.E-11	
			7/2	2	5/2	1	17573.70 ±0.50	46.E-10R21.E-10	
			5/2	4	3/2	3	17573.70 ±0.50	72.E-10R33.E-10	
			5/2	3	3/2	3	17573.70 ±0.50	11.E-10R51.E-11	
			5/2	2	3/2	1	17573.70 ±0.50	25.E-10R12.E-10	
			5/2	1	3/2	1	17573.70 ±0.50	11.E-10R49.E-11	
			5/2	1	3/2	0	17573.70 ±0.50	12.E-10R55.E-11	
							total intensity	49.E-09R22.E-09	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{71}Cl^{37}$	2←1	ground	7/2	5	5/2	4	17118.24 ±0.50	13.E-08R38.E-08	1425
			7/2	4	5/2	3	17118.24 ±0.50	93.E-09R28.E-08	
			7/2	3	5/2	3	17118.24 ±0.50	14.E-09R43.E-09	
			7/2	3	5/2	2	17118.24 ±0.50	66.E-09R20.E-08	
			7/2	2	5/2	2	17118.24 ±0.50	11.E-09R33.E-09	
			7/2	2	5/2	1	17118.24 ±0.50	46.E-09R14.E-08	
			5/2	4	3/2	3	17118.24 ±0.50	73.E-09R22.E-08	
			5/2	3	3/2	3	17118.24 ±0.50	11.E-09R34.E-09	
			5/2	2	3/2	1	17118.24 ±0.50	25.E-09R76.E-09	
			5/2	1	3/2	1	17118.24 ±0.50	11.E-09R32.E-09	
			5/2	1	3/2	0	17118.24 ±0.50	12.E-09R36.E-09	
							total intensity	49.E-08R15.E-07	

GaI Gallium monoiodide

2.5747 Å



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(I) Mc/sec	eqQ(Ga) Mc/sec	α_e Mc/sec	D_e kc/sec	Additional Microwave References	
$Ga^{69}I^{127}$			1706.86 m	216	-549	-66	5.667	0.47	1192, 1341	
$Ga^{71}I^{127}$			1675.73 m				5.535			
References			1425	9900	1425	1425	1425	1425		

Footnote: Intensities for those components of degenerate lines were not computed if they involved forbidden transitions, in this case, $\Delta F_1 = 3$.

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{69}I^{127}$	7←6	ground	9/2	4	7/2	3	23851.47 ±0.20	23.E-08R76.E-08	1425
			11/2	4	9/2	3	23851.47 ±0.20	24.E-08R77.E-08	
			11/2	7	9/2	6	23851.47 ±0.20	43.E-08R14.E-07	
			13/2	6	11/2	5	23851.47 ±0.20	35.E-08R11.E-07	
			13/2	7	15/2	6	23851.47 ±0.20	21.E-14R69.E-14	
							total intensity	13.E-07R41.E-07	
			17/2	8	11/2	7	23853.25 ±0.20		
			9/2	3	7/2	2	23853.25 ±0.20	18.E-08R59.E-08	
			9/2	5	7/2	4	23853.25 ±0.20	30.E-08R97.E-08	
			9/2	6	7/2	5	23853.25 ±0.20	38.E-08R12.E-07	
			13/2	5	11/2	4	23853.25 ±0.20	30.E-08R97.E-08	
							total intensity	12.E-07R38.E-07	
			15/2	6	13/2	5	23855.66 ±0.20	37.E-08R12.E-07	
			15/2	7	13/2	6	23855.66 ±0.20	42.E-08R14.E-07	
			15/2	8	13/2	7	23855.66 ±0.20	49.E-08R16.E-07	
							total intensity	13.E-07R41.E-07	
			17/2	7	11/2	6	23857.29 ±0.20		
			15/2	9	13/2	8	23857.29 ±0.20	56.E-08R18.E-07	
			13/2	8	15/2	7	23857.29 ±0.20	19.E-14R60.E-14	
			17/2	9	15/2	8	23857.29 ±0.20	57.E-08R18.E-07	
			19/2	8	17/2	7	23857.29 ±0.20	53.E-08R17.E-07	
			19/2	9	17/2	8	23857.29 ±0.20	59.E-08R19.E-07	
			19/2	10	17/2	9	23857.29 ±0.20	66.E-08R21.E-07	
			19/2	11	17/2	10	23857.29 ±0.20	73.E-08R24.E-07	
							total intensity	36.E-07R12.E-06	
		1	17/2	7	11/2	6	23778.29 ±0.20		1425
			15/2	9	13/2	8	23778.29 ±0.20	20.E-08R36.E-08	
			13/2	8	15/2	7	23778.29 ±0.20	66.E-15R12.E-14	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{69}I^{127}$	7←6	1	17/2	9	15/2	8	23778.29 ±0.20	20.E-08R37.E-08	1425
			19/2	8	17/2	7	23778.29 ±0.20	19.E-08R34.E-08	
			19/2	9	17/2	8	23778.29 ±0.20	21.E-08R38.E-08	
			19/2	10	17/2	9	23778.29 ±0.20	23.E-08R43.E-08	
			19/2	11	17/2	10	23778.29 ±0.20	26.E-08R47.E-08	
							total intensity	13.E-07R24.E-07	
		2	17/2	7	11/2	6	23698.78 ±0.30		1425
			15/2	9	13/2	8	23698.78 ±0.30	69.E-09R73.E-09	
			13/2	8	15/2	7	23698.78 ±0.30	23.E-15R24.E-15	
			17/2	9	15/2	8	23698.78 ±0.30	70.E-09R74.E-09	
			19/2	8	17/2	7	23698.78 ±0.30	65.E-09R69.E-09	
			19/2	9	17/2	8	23698.78 ±0.30	73.E-09R77.E-09	
			19/2	10	17/2	9	23698.78 ±0.30	81.E-09R86.E-09	
			19/2	11	17/2	10	23698.78 ±0.30	90.E-09R95.E-09	
							total intensity	45.E-08R47.E-08	
$Ga^{71}I^{127}$	7←6	ground	17/2	7	11/2	6	23421.95 ±0.20		1425
			15/2	9	13/2	8	23421.95 ±0.20	35.E-08R11.E-07	
			13/2	8	15/2	7	23421.95 ±0.20	12.E-14R38.E-14	
			17/2	9	15/2	8	23421.95 ±0.20	36.E-08R12.E-07	
			19/2	8	17/2	7	23421.95 ±0.20	34.E-08R11.E-07	
			19/2	9	17/2	8	23421.95 ±0.20	37.E-08R12.E-07	
			19/2	10	17/2	9	23421.95 ±0.20	42.E-08R14.E-07	
			19/2	11	17/2	10	23421.95 ±0.20	46.E-08R15.E-07	
							total intensity	23.E-07R75.E-07	
		1	17/2	7	11/2	6	23344.45 ±0.30		1425
			15/2	9	13/2	8	23344.45 ±0.30	13.E-08R23.E-08	
			13/2	8	15/2	7	23344.45 ±0.30	42.E-15R78.E-15	
			17/2	9	15/2	8	23344.45 ±0.30	13.E-08R24.E-08	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Ga^{71}I^{127}$	7←6	1	19/2	8	17/2	7	23344.45 ±0.30	77.E-09R14.E-08	1425
			19/2	9	17/2	8	23344.45 ±0.30	86.E-09R16.E-08	
			19/2	10	17/2	9	23344.45 ±0.30	95.E-09R18.E-08	
			19/2	11	17/2	10	23344.45 ±0.30	11.E-08R20.E-08	
							total intensity	62.E-08R11.E-07	

HBr Hydrogen bromide (hydrobromic acid)

1.4145 Å

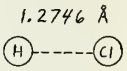
Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(Br) Mc/sec	g_J(J=1) nuclear magnetons	C(Br)	Additional Microwave References	α_e Mc/sec
H^1Br^{79}				{2650}				0845	
H^1Br^{81}				{2650}					
H^2Br^{79}		0.83 m	128600 m		+530.65	+0.181	0.15		2515
H^2Br^{81}		0.83 m	128500 m		+443.29	+0.184	0.16		2512
H^3Br^{79}			86947.2 m		+527.6				1390
H^3Br^{81}			86868.8 m		+442.1				1389
References		1530	1441 0971	9900	1529 1061	1529	1441		1441 0971

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
H^2Br^{79}	1←0	ground		1/2		3/2	254571.661 ±.050	31.E-08 82.E-08	1441
				5/2		3/2	254678.380 ±.050	94.E-08 25.E-07	
				3/2		3/2	254810.634 ±.050	63.E-08 16.E-07	
H^2Br^{81}	1←0	ground		1/2		3/2	254437.641 ±.050	31.E-08 80.E-08	1441
				5/2		3/2	254526.984 ±.050	92.E-08 24.E-07	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
H^2Br^{81}	1←0	ground		3/2		3/2	254637.448 ±.050	61.E-08 16.E-07	1441
H^3Br^{79}	1←0	ground		5/2		3/2	172472.72 ±.40	28.E-04R75.E-04	1061
				3/2		3/2	172604.60 ±.40	19.E-04R50.E-04	
H^3Br^{81}	1←0	ground		5/2		3/2	172320.96 ±.40	28.E-04R73.E-04	1061
				3/2		3/2	172431.49 ±.40	19.E-04R49.E-04	

HCl Hydrogen chloride (hydrochloric acid)

1.2746 Å

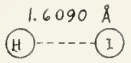


Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(Cl) Mc/sec	C(Cl) kc/sec	α_e Mc/sec	α cm^{-1}	
H^1Cl^{35}				2990					
H^1Cl^{37}									
H^2Cl^{35}		1.12 m	163340.1m	2090	−67.3	0.03		0.1123	
H^2Cl^{37}		1.12 m	162859.0m		−53.0	0.00		0.1118	
H^3Cl^{35}			112032.0m		−67.0		1912		
H^3Cl^{37}			111550.6m		−53.0		1898		
References			1284	9901	1441	1441		1284	
		1530	0971	9900	0971		0971		

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
H^2Cl^{35}	1←0	ground		3/2		3/2	323282.28 ±.13	35.E-07 91.E-07	1441
				5/2		3/2	323299.17 ±.13	52.E-07 14.E-06	
				1/2		3/2	323312.52 ±.13	17.E-07 46.E-07	
H^2Cl^{37}	1←0	ground		3/2		3/2	322339.09 ±.13	11.E-07 29.E-07	1441
				5/2		3/2	322352.33 ±.13	17.E-07 44.E-07	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
H^2Cl^{37}	1←0	ground		1/2		3/2	322362.94 ±.13	56.E-08 15.E-07	1441
H^3Cl^{35}	1←0	ground		3/2		3/2	222130.32 ±.4	60.E-04R16.E-03	0971
				5/2		3/2	222147.23 ±.4	90.E-04R24.E-03	
				1/2		3/2	222160.50 ±.4	30.E-04R79.E-04	
H^3Cl^{37}	1←0	ground		3/2		3/2	221184.82 ±.4	19.E-04R51.E-04	0971
				5/2		3/2	221198.00 ±.4	29.E-04R77.E-04	
				1/2		3/2	221208.69 ±.4	97.E-05R26.E-04	

HI Hydrogen iodide (hydroiodic acid)



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(I) Mc/sec	C(I) kc/sec	α_e Mc/sec	α cm^{-1}
H^1I^{127}			195229.1m	2310	-1831	0.26		0.1715
H^2I^{127}		0.445 m	98447 m		-1823.3	0.17	1820	
H^3I^{127}			65750.88v		-1822.6			
References			1124	9900	1124	1124		1125
		1530	1441		1441	1441	1441	
			1061		1061			

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
H^1I^{127}	1←0	ground		5/2		5/2	385000.11 ±.7	83.E-04 22.E-03	1124
				7/2		5/2	385385.52 ±.7	11.E-03 30.E-03	
				3/2		5/2	385548.80 ±.7	55.E-04 14.E-03	
H^2I^{127}	1←0	ground		5/2		5/2	194776.10 ±.04	32.E-08 83.E-08	1441
				7/2		5/2	195159.554 ±.04	41.E-08 11.E-07	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
H^2I^{127}	1←0	ground		3/2		5/2	195322.706 ±.04	11.E-08 28.E-08	1441
H^3I^{127}	1←0	ground		5/2		5/2	131210.20 ±.25	17.E-04R44.E-04	1061
				7/2		5/2	131592.95 ±.25	22.E-04R59.E-04	

The electronic ground state of the hydroxyl radical is designated $^2\Pi$, i.e., the spin S is 1/2 and the projection Λ of the orbital angular momentum on the internuclear axis is equal to unity. For low rotational states, S and Λ couple vectorially according to Hund's case (a), giving a projection Ω of the total angular momentum (excluding nuclear spin) equal to 1/2 or 3/2. However, for high rotational states, S couples according to Hund's case (b) to the vector sum of Λ and the orbital angular momentum O due to nuclear motion (molecular rotation).

Using Hill and Van Vleck's formula [2: equation 7-12; 5: equation V, 28] for intermediate coupling, but neglecting centrifugal distortion, the small interaction constant γ between S and N, and a constant term in the energy, one obtains

$$Z_r = (2J + 1)e^{-X[J(J + 1) \pm \sqrt{(J + 1/2)^2 + w}]}.$$

Here, $w = \lambda(\lambda - 4)/4$, $\lambda = A/B$, and $A = -137.76$ cm^{-1} is the interaction constant between S and Λ(energy = $AS\cdot\Lambda$). For low values of J and negative A, the upper and lower signs apply to the $^2\Pi_{1/2}$ and $^2\Pi_{3/2}$ states respectively [5: pages 232]; for large J these signs apply to the sets of states for which J = N-1/2 and J = N+1/2 respectively, where N is the resultant of the electronic orbital angular momentum and the angular momentum of molecular rotation [5: pages 232-4;2: page 186]. Note: Townes and Schawlow's equations (7-13) should have absolute value signs about $A\Lambda$, otherwise they are incorrect for $-\lambda >> +1$, the case for OH. Since the series converges rather rapidly, the state sum Q_r was obtained by direct summation over the two sets of Z_r's, with J taking on the half integral values from Ω to infinity. An additional factor of two was introduced into Q_r, since Λ-doubling multiplies the number of states by two. (The factor of two does not occur in Z_r, since absorption occurs only from the lower member of a doublet in the Λ-doubling spectrum observed for OH.)

Since V depends only upon the coupling of angular momentum, V for OH ($\Delta J = 0$) may be obtained from that for a symmetric top, namely

$$V = \frac{(\Omega_{eff})^2}{J(J+1)}$$

[2: equation 3 - 41; 5: equation IV, 81], where Ω_{eff} is the effective value of Ω.

$$\Omega_{eff} = \delta\Omega_1 + \varepsilon\Omega_2 ,$$

where

$$\Omega_1 = 1/2, \ \Omega_2 = 3/2 ,$$

$$\delta = (\mp z - 2 + \lambda)/2z ,$$

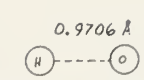
$$\varepsilon = (\mp z + 2 - \lambda)/2z ,$$

and

$$z = \sqrt{4(J+1/2)^2 + \lambda(\lambda-4)} ,$$

and the upper and lower signs are correlated as before [1141,0982].

Note: Townes and Schawlow's equations (7 - 20) and (2 - 16), as well as those in Dousmanis, Sanders, and Townes's [0982] section 4(e) are in error. Equation [2: 2 - 16] is not identical with that of a slightly asymmetric top, as may be seen in equation [2: 3 - 41]. Relative to the statement on page [2:34], the analog of the state J,ℓ_1, does not occur for $\ell = 0$.



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e cm^{-1}	ω_e cm^{-1}	Λ-type doubling parameters λ = A/B	α_p Mc/sec	β_p Mc/sec	D_o cm^{-1}	B_S=rot. const. in $^2\Sigma$ state cm^{-1}	Addnl. Micro. Refs.
H^1O^{16}	~8.0 m	1.54 *	18.871	3735	-7.444	-2361.37	576.18	0.00187	16.961	0764
H^2O^{16}			10.016	3735	-13.954	-1548.99	161.94	0.00052	9.03	0832
H^1O^{18}								0.00187	16.961	
References	0982	1863	9901	9900 9901	0982	0982	0982	1132	0982	

Isotopic Molecular Species	Magnetic hfs constants Mc/sec a	b	c	d	$\langle 1/r^3 \rangle_{av}$ $10^{24}cm^{-3}$	$\langle (3\cos\chi-1)/r^3 \rangle_{av}$ $10^{24}cm^{-1}$	$\Psi^2(0)$ $10^{24}cm^{-3}$	$\langle \sin^2\chi/r^3 \rangle_{av}$ $10^{24}cm^{-3}$
H^1O^{16}	48.7±0.5	113.6±0.6	-25.±5.	57.0±1.5	0.616±0.006	(-0.21±0.04)	(0.184±0.004)	(0.490±0.013)
H^2O^{16}				8.69±0.16				(0.486±0.009)
H^1O^{18}								
References	1693	1693	1693	0982	1693	1693	1693	0982

Isotopic Molecular Species	$-g_J^+$ J = 3/2	J = 5/2	J = 7/2	$-g_J^-$ J = 3/2	J = 5/2	J = 7/2	$-(g_J^- - g_J^+)$ J = 3/2	J = 5/2	J = 7/2
H^1O^{16}	0.93493	0.48435	0.32454	0.93622	0.48623	0.32668	0.00129	0.00188	0.00214
H^2O^{16}	0.88920			0.88971			0.00051		
H^1O^{18}									
References	1693			1693			1693		

Isotopic Molecular Species	α_e cm^{-1}
H^1O^{16}	0.714
H^2O^{16}	0.295
H^1O^{18}	
References	9900 9901

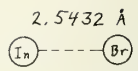
* Computed from measured ratios of intensities of OH and H_2O lines.

Isotopic Molecular Species	Rotation J,N	Vibration v	Electronic	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
H^1O^{16}	3/2,2	ground	$^2\Pi_{1/2}$		1		1	7760.36 ±0.15	37.E-07 59.E-07	0982
					2		2	7819.92 ±0.10	67.E-07 11.E-06	
	5/2,3	ground	$^2\Pi_{1/2}$		2		2	8135.51 ±0.15	22.E-07 28.E-07	0982
					3		3	8188.94 ±0.10	33.E-07 41.E-07	
	7/2,3	ground	$^2\Pi_{3/2}$		3		3	13434.62 ±0.05	42.E-06 67.E-06	0982
					4		4	13441.36 ±0.05	60.E-06 93.E-06	
	9/2,4	ground	$^2\Pi_{3/2}$		4		5	23806.5 ±0.5	12.E-07 12.E-07	0982
					4		4	23818.18 ±0.05	53.E-06 53.E-06	
					5		5	23826.90 ±0.05	65.E-06 65.E-06	
					5		4	23837.8 ±0.3	12.E-07 12.E-07	
	11/2,5	ground	$^2\Pi_{3/2}$		5		5	36983.47 ±0.15	40.E-06 25.E-06	0982
					6		6	36994.43 ±0.15	47.E-06 30.E-06	
H^2O^{16}	5/2,3	ground	$^2\Pi_{1/2}$		3/2		3/2	8110.20 ±0.10	11.E-11 17.E-11	0982
					5/2		5/2	8117.69 ±0.10	15.E-11 24.E-11	
					7/2		7/2	8127.64 ±0.15	23.E-11 37.E-11	
	7/2,4	ground	$^2\Pi_{1/2}$		5/2		5/2	9578.51 ±0.15	10.E-11 14.E-11	0982
					7/2		7/2	9586.03 ±0.10	13.E-11 17.E-11	
					9/2		9/2	9595.26 ±0.10	18.E-11 24.E-11	

Isotopic Molecular Species	Rotation J,N	Vibration v	Electronic	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
H^2O^{16}	9/2,5	ground	$^2\Pi_{1/2}$		7/2		7/2	10191.64 ±0.10	70.E-12 74.E-12	0982
					9/2		9/2	10199.10 ±0.10	85.E-12 90.E-12	
					11/2		11/2	10208.14 ±0.10	11.E-11 11.E-11	
	11/2,6	ground	$^2\Pi_{1/2}$		9/2		9/2	9914.39 ±0.10	37.E-12 28.E-12	0982
					11/2		11/2	9921.53 ±0.10	43.E-12 33.E-12	
					13/2		13/2	9929.88 ±0.10	52.E-12 40.E-12	
	11/2,5	ground	$^2\Pi_{3/2}$		9/2		9/2	8672.36 ±0.10	41.E-11 52.E-11	0982
					11/2		11/2	8672.36 ±0.10	48.E-11 61.E-11	
					13/2		13/2	8672.36 ±0.10	58.E-11 74.E-11	
								total intensity	15.E-10 19.E-10	
	13/2,6	ground	$^2\Pi_{3/2}$		11/2		11/2	12918.01 ±0.10	43.E-11 39.E-11	0982
					13/2		13/2	12918.01 ±0.10	49.E-11 44.E-11	
					15/2		15/2	12918.01 ±0.10	57.E-11 52.E-11	
								total intensity	15.E-10 14.E-10	
	15/2,7	ground	$^2\Pi_{3/2}$		13/2		13/2	18009.60 ±0.10	36.E-11 23.E-11	0982
					15/2		15/2	18009.60 ±0.10	40.E-11 26.E-11	
					17/2		17/2	18009.60 ±0.10	46.E-11 29.E-11	
								total intensity	12.E-10 78.E-11	
	17/2,8	ground	$^2\Pi_{3/2}$		15/2		15/2	23907.12 ±0.10	25.E-11 11.E-11	0982
					17/2		17/2	23907.12 ±0.10	28.E-11 12.E-11	
					19/2		19/2	23907.12 ±0.10	32.E-11 13.E-11	
								total intensity	85.E-11 36.E-11	
H^1O^{18}	9/2,4	ground	$^2\Pi_{3/2}$		4		4	23469.5 ±0.5	52.E-12 13.E-11	0982
					5		5	23479.1 ±0.5	64.E-12 17.E-11	
H^1O^{16}	3/2	ground	$^2\Pi_{3/2}$		2		2	1667.34 ±0.03		1961
					1		1	1665.46 ±0.10		

InBr Indium bromide

2.5432 Å



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(In) Mc/sec	eqQ(Br) Mc/sec	α_e Mc/sec	D_e kc/sec	Additional Microwave References	
$In^{115}Br^{79}$			1670.14 m	224c	-642	138	5.706	0.43	1106, 0965	
References			1425	9900	1425	1425	1425	1425		

Footnote: For validity of computed intensities see introductory remarks on hyperfine splitting.

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}Br^{79}$	7←6	ground	19/2	10	19/2	10	23308.30 ±0.20	34.E-09R11.E-08	1425
			19/2	11	19/2	11	23308.30 ±0.20	38.E-09R12.E-08	
							total intensity	72.E-09R23.E-08	
			13/2	5	11/2	4	23328.97 ±0.20	11.E-08R36.E-08	
			11/2	4	9/2	3	23328.97 ±0.20	87.E-09R28.E-08	
			11/2	7	9/2	6	23328.97 ±0.20	16.E-08R50.E-08	
							total intensity	36.E-08R11.E-07	
			9/2	6	7/2	5	23331.51 ±0.20	13.E-08R42.E-08	
			9/2	3	7/2	2	23331.51 ±0.20	63.E-09R20.E-08	
			7/2	2	5/2	1	23331.51 ±0.20	41.E-09R13.E-08	
			7/2	5	5/2	4	23331.51 ±0.20	11.E-08R36.E-08	
							total intensity	35.E-08R11.E-07	
			15/2	6	13/2	5	23334.50 ±0.20	14.E-08R46.E-08	
			13/2	8	11/2	7	23334.50 ±0.20	18.E-08R59.E-08	
			13/2	7	11/2	6	23334.50 ±0.20	16.E-08R50.E-08	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}Br^{79}$	7←6	ground	13/2	6	11/2	5	23334.50 ±0.20	13.E-08R43.E-08	1425
			11/2	6	9/2	5	23334.50 ±0.20	13.E-08R41.E-08	
			11/2	5	9/2	4	23334.50 ±0.20	11.E-08R34.E-08	
			9/2	5	7/2	4	23334.50 ±0.20	10.E-08R33.E-08	
			9/2	4	7/2	3	23334.50 ±0.20	81.E-09R26.E-08	
			7/2	4	5/2	3	23334.50 ±0.20	82.E-09R27.E-08	
			7/2	3	5/2	2	23334.50 ±0.20	59.E-09R19.E-08	
			5/2	4	3/2	3	23334.50 ±0.20	10.E-08R32.E-08	
							total intensity	13.E-07R41.E-07	
			15/2	6	13/2	5	23335.55 ±0.20	14.E-08R46.E-08	
			13/2	8	11/2	7	23335.55 ±0.20	18.E-08R59.E-08	
			13/2	7	11/2	6	23335.55 ±0.20	16.E-08R50.E-08	
			13/2	6	11/2	5	23335.55 ±0.20	13.E-08R43.E-08	
			11/2	6	9/2	5	23335.55 ±0.20	13.E-08R41.E-08	
			11/2	5	9/2	4	23335.55 ±0.20	11.E-08R34.E-08	
			9/2	5	7/2	4	23335.55 ±0.20	10.E-08R33.E-08	
			9/2	4	7/2	3	23335.55 ±0.20	81.E-09R26.E-08	
			7/2	4	5/2	3	23335.55 ±0.20	82.E-09R27.E-08	
			7/2	3	5/2	2	23335.55 ±0.20	59.E-09R19.E-08	
			5/2	4	3/2	3	23335.55 ±0.20	10.E-08R32.E-08	
							total intensity	13.E-07R41.E-07	
			19/2	9	13/2	8	23339.12 ±0.20		
			19/2	8	13/2	7	23339.12 ±0.20		
			15/2	8	17/2	7	23339.12 ±0.20	36.E-14R12.E-13	
			15/2	7	13/2	6	23339.12 ±0.20	16.E-08R53.E-08	
			5/2	3	3/2	2	23339.12 ±0.20	63.E-09R20.E-08	
			5/2	2	3/2	1	23339.12 ±0.20	35.E-09R11.E-08	
			5/2	1	3/2	0	23339.12 ±0.20	17.E-09R54.E-09	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}Br^{79}$	7←6	ground	17/2	10	15/2	9	23339.12 ±0.20	25.E-08R81.E-08	1425
			17/2	9	15/2	8	23339.12 ±0.20	22.E-08R72.E-08	
			15/2	7	17/2	8	23339.12 ±0.20	22.E-10R70.E-10	
							total intensity	76.E-08R24.E-07	
			19/2	9	13/2	8	23341.01 ±0.20		
			19/2	8	13/2	7	23341.01 ±0.20		
			15/2	8	17/2	7	23341.01 ±0.20	36.E-14R12.E-13	
			15/2	7	13/2	6	23341.01 ±0.20	16.E-08R53.E-08	
			5/2	3	3/2	2	23341.01 ±0.20	63.E-09R20.E-08	
			5/2	2	3/2	1	23341.01 ±0.20	35.E-09R11.E-08	
			5/2	1	3/2	0	23341.01 ±0.20	17.E-09R54.E-09	
			17/2	10	15/2	9	23341.01 ±0.20	25.E-08R81.E-08	
			17/2	9	15/2	8	23341.01 ±0.20	22.E-08R72.E-08	
			15/2	7	17/2	8	23341.01 ±0.20	22.E-10R70.E-10	
							total intensity	76.E-08R24.E-07	
			23/2	13	21/2	12	23343.33 ±0.20	39.E-08R13.E-07	
			23/2	12	21/2	11	23343.33 ±0.20	36.E-08R12.E-07	
			23/2	11	21/2	10	23343.33 ±0.20	33.E-08R11.E-07	
			23/2	10	21/2	9	23343.33 ±0.20	30.E-08R97.E-08	
			21/2	12	19/2	11	23343.33 ±0.20	34.E-08R11.E-07	
			21/2	11	19/2	10	23343.33 ±0.20	31.E-08R00.E-08	
			21/2	10	19/2	9	23343.33 ±0.20	28.E-08R90.E-08	
			21/2	9	19/2	8	23343.33 ±0.20	26.E-08R82.E-08	
			19/2	11	17/2	10	23343.33 ±0.20	29.E-08R95.E-08	
			19/2	10	17/2	9	23343.33 ±0.20	26.E-08R85.E-08	
			17/2	9	15/2	9	23343.33 ±0.20	45.E-10R14.E-09	
			17/2	9	15/2	8	23343.33 ±0.20	22.E-08R72.E-08	
			15/2	9	17/2	8	23343.33 ±0.20	32.E-14R10.E-13	
							total intensity	34.E-07R11.E-06	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}Br^{79}$	7←6	ground	23/2	13	21/2	12	23345.07 ±0.20	39.E-08R13.E-07	1425
			23/2	12	21/2	11	23345.07 ±0.20	36.E-08R12.E-07	
			23/2	11	21/2	10	23345.07 ±0.20	33.E-08R11.E-07	
			23/2	10	21/2	9	23345.07 ±0.20	30.E-08R97.E-08	
			21/2	12	19/2	11	22345.07 ±0.20	31.E-08R10.E-07	
			21/2	11	19/2	10	23345.07 ±0.20	31.E-08R00.E-08	
			21/2	10	19/2	9	23345.07 ±0.20	28.E-08R90.E-08	
			21/2	9	19/2	8	23345.07 ±0.20	26.E-08R82.E-08	
			19/2	11	17/2	10	23345.07 ±0.20	29.E-08R95.E-08	
			19/2	10	17/2	9	23345.07 ±0.20	26.E-08R85.E-08	
			17/2	9	15/2	9	23345.07 ±0.20	45.E-10R14.E-09	
			17/2	9	15/2	8	23345.07 ±0.20	22.E-08R72.E-08	
			15/2	9	17/2	8	23345.07 ±0.20	32.E-14R10.E-13	
							total intensity	33.E-07R11.E-06	
			23/2	13	21/2	12	23346.51 ±0.20	39.E-08R13.E-07	
			23/2	12	21/2	11	23346.51 ±0.20	36.E-08R12.E-07	
			23/2	11	21/2	10	23346.51 ±0.20	33.E-08R11.E-07	
			23/2	10	21/2	9	23346.51 ±0.20	30.E-08R97.E-08	
			21/2	12	19/2	11	23346.51 ±0.20	34.E-08R11.E-07	
			21/2	11	19/2	10	23346.51 ±0.20	31.E-08R00.E-08	
			21/2	10	19/2	9	23346.51 ±0.20	28.E-08R90.E-08	
			21/2	9	19/2	8	23346.51 ±0.20	26.E-08R82.E-08	
			19/2	11	17/2	10	23346.51 ±0.20	29.E-08R95.E-08	
			19/2	10	17/2	9	23346.51 ±0.20	26.E-08R85.E-08	
			17/2	8	15/2	7	23346.51 ±0.20	20.E-08R64.E-08	
			17/2	9	15/2	9	23346.51 ±0.20	45.E-10R14.E-09	
			15/2	9	17/2	8	23346.51 ±0.20	32.E-14R10.E-13	
							total intensity	33.E-07R11.E-06	

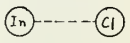
Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}Br^{79}$	7←6	ground	15/2	8	15/2	8	23353.40 ±0.20	49.E-09R16.E-08	1425
			15/2	6	15/2	6	23353.40 ±0.20	38.E-09R12.E-08	
			13/2	8	13/2	8	23353.40 ±0.20	58.E-09R19.E-08	
			13/2	7	13/2	7	23353.40 ±0.20	49.E-09R16.E-08	
							total intensity	19.E-08R62.E-08	
			13/2	6	13/2	6	23358.74 ±0.20	42.E-09R14.E-08	
			13/2	5	13/2	5	23358.74 ±0.20	37.E-09R12.E-08	
			5/2	4	5/2	4	23358.74 ±0.20	25.E-09R80.E-09	
			19/2	9	17/2	8	23358.74 ±0.20	24.E-08R77.E-08	
							total intensity	34.E-08R11.E-07	
			13/2	7	17/2	7	23361.35 ±0.20		
			13/2	4	13/2	4	23361.35 ±0.20	34.E-09R11.E-08	
			13/2	3	13/2	3	23361.35 ±0.20	34.E-09R11.E-08	
			7/2	5	7/2	5	23361.35 ±0.20	40.E-09R13.E-08	
			11/2	7	11/2	7	23361.35 ±0.20	56.E-09R18.E-08	
			11/2	4	11/2	4	23361.35 ±0.20	33.E-09R11.E-08	
							total intensity	20.E-08R63.E-08	
			13/2	7	17/2	7	23362.70 ±0.20		
			13/2	4	13/2	4	23362.70 ±0.20	34.E-09R11.E-08	
			13/2	3	13/2	3	23362.70 ±0.20	34.E-09R11.E-08	
			7/2	5	7/2	5	23362.70 ±0.20	40.E-09R13.E-08	
			11/2	7	11/2	7	23362.70 ±0.20	56.E-09R18.E-08	
			11/2	4	11/2	4	23362.70 ±0.20	33.E-09R11.E-08	
							total intensity	20.E-08R64.E-08	
			11/2	6	11/2	6	23365.60 ±0.20	46.E-09R15.E-08	
			11/2	5	11/2	5	23365.60 ±0.20	38.E-09R12.E-08	
							total intensity	84.E-09R27.E-08	
			9/2	5	9/2	5	23367.97 ±0.20	39.E-09R13.E-08	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}Br^{79}$	7←6	ground	9/2	4	9/2	4	23367.97 ±0.20	31.E-09R99.E-09	1425
			7/2	4	7/2	4	23367.97 ±0.20	29.E-09R92.E-09	
			7/2	3	7/2	3	23367.97 ±0.20	21.E-09R67.E-09	
							total intensity	12.E-08R38.E-08	
		1	19/2	10	19/2	10	23228.68 ±0.20	12.E-09R21.E-09	1425
			19/2	11	19/2	11	23228.68 ±0.20	13.E-09R24.E-09	
							total intensity	25.E-09R45.E-09	
			23/2	13	21/2	12	23263.76 ±0.20	13.E-08R24.E-08	
			23/2	12	21/2	11	23263.76 ±0.20	12.E-08R22.E-08	
			23/2	11	21/2	10	23263.76 ±0.20	11.E-08R20.E-08	
			23/2	10	21/2	9	23263.76 ±0.20	10.E-08R19.E-08	
			21/2	12	19/2	11	23263.76 ±0.20	12.E-08R21.E-08	
			21/2	11	19/2	10	23263.76 ±0.20	11.E-08R19.E-08	
			21/2	10	19/2	9	23263.76 ±0.20	96.E-09R17.E-08	
			21/2	9	19/2	8	23263.76 ±0.20	87.E-09R16.E-08	
			19/2	11	17/2	10	23263.76 ±0.20	10.E-08R18.E-08	
			19/2	10	17/2	9	23263.76 ±0.20	90.E-09R16.E-08	
			17/2	8	15/2	7	23263.76 ±0.20	68.E-09R12.E-08	
			17/2	9	15/2	9	23263.76 ±0.20	15.E-10R28.E-10	
			15/2	9	17/2	8	23263.76 ±0.20	11.E-14R20.E-14	
							total intensity	11.E-07R21.E-07	
			13/2	6	13/2	6	23279.09 ±0.20	14.E-09R26.E-09	
			13/2	5	13/2	5	23279.09 ±0.20	13.E-09R23.E-09	
			5/2	4	5/2	4	23279.09 ±0.20	85.E-10R15.E-09	
			19/2	9	17/2	8	23279.09 ±0.20	81.E-09R15.E-08	
							total intensity	12.E-08R21.E-08	
			13/2	7	17/2	7	23282.61 ±0.20		
			13/2	4	13/2	4	23282.61 ±0.20	12.E-09R21.E-09	

Isotopic Molecular Species	Rotation J'←J"	Vibration v	F_1'	F'	F_1''	F"	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}Br^{79}$	7←6	1	13/2	3	13/2	3	23282.61 ±0.20	12.E-09R21.E-09	1425
			7/2	5	7/2	5	23282.61 ±0.20	14.E-09R25.E-09	
			11/2	7	11/2	7	23282.61 ±0.20	19.E-09R35.E-09	
			11/2	4	11/2	4	23282.61 ±0.20	11.E-09R20.E-09	
							total intensity	67.E-09R12.E-08	
			11/2	6	11/2	6	23285.37 ±0.20	16.E-09R28.E-09	
			11/2	5	11/2	5	23285.37 ±0.20	13.E-09R24.E-09	
			9/2	5	9/2	5	23287.37 ±0.20	13.E-09R24.E-09	
			9/2	4	9/2	4	23287.37 ±0.20	11.E-09R19.E-09	
			7/2	4	7/2	4	23287.37 ±0.20	97.E-10R18.E-09	
			7/2	3	7/2	3	23287.37 ±0.20	71.E-10R13.E-09	
							total intensity	69.E-09R13.E-08	

InCl Indium chloride

2.4011 Å



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(In) Mc/sec	eqQ(Cl) Mc/sec	α_e Mc/sec	D_e kc/sec	Additional Microwave References	
$In^{115}Cl^{35}$			3269.47 m	317	−655	−18	15.35	1.55	1106	
$In^{115}Cl^{37}$										
References			1425	9900	1425	1425	1425	1425		

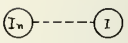
Footnote: For validity of computed intensities see introductory remarks on hyperfine splitting.

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}Cl^{35}$	3←2	ground	9/2	5	7/2	4	19526.26 ±0.20	12.E-08R35.E-08	1425
			9/2	6	7/2	5	19526.26 ±0.20	15.E-08R45.E-08	
							total intensity	26.E-08R80.E-08	
			9/2	3	7/2	2	19527.77 ±0.20	71.E-09R22.E-08	
			9/2	4	7/2	3	19527.77 ±0.20	91.E-09R28.E-08	
							total intensity	16.E-08R49.E-08	
			5/2	1	5/2	1	19539.67 ±0.20	36.E-09R11.E-08	
			5/2	2	5/2	2	19539.67 ±0.20	49.E-09R15.E-08	
			5/2	3	5/2	3	19539.67 ±0.20	83.E-09R25.E-08	
			5/2	4	5/2	4	19539.67 ±0.20	14.E-08R42.E-08	
							total intensity	31.E-08R93.E-08	
			11/2	4	9/2	3	19563.97 ±0.20	15.E-08R46.E-08	
			11/2	5	9/2	4	19563.97 ±0.20	19.E-08R56.E-08	
			11/2	6	9/2	5	19563.97 ±0.20	23.E-08R68.E-08	
			11/2	7	9/2	6	19563.97 ±0.20	27.E-08R83.E-08	
			11/2	4	11/2	4	19563.97 ±0.20	12.E-08R36.E-08	
			11/2	5	11/2	5	19563.97 ±0.20	14.E-08R41.E-08	
			11/2	6	11/2	6	19563.97 ±0.20	16.E-08R50.E-08	
			11/2	7	11/2	7	19563.97 ±0.20	20.E-08R61.E-08	
							total intensity	14.E-07R44.E-07	
			11/2	4	9/2	3	19565.84 ±0.20	15.E-08R46.E-08	
			11/2	5	9/2	4	19565.84 ±0.20	19.E-08R56.E-08	
			11/2	6	9/2	5	19565.84 ±0.20	23.E-08R68.E-08	
			11/2	7	9/2	6	19565.84 ±0.20	27.E-08R83.E-08	
			11/2	4	11/2	4	19565.84 ±0.20	12.E-08R36.E-08	
			11/2	5	11/2	5	19565.84 ±0.20	14.E-08R41.E-08	
			11/2	6	11/2	6	19565.84 ±0.20	16.E-08R50.E-08	
			11/2	7	11/2	7	19565.84 ±0.20	20.E-08R61.E-08	
							total intensity	14.E-07R44.E-07	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}Cl^{35}$	3←2	ground	7/2	2	7/2	2	19570.25 ±0.20	86.E-09R26.E-08	1425
			7/2	3	7/2	3	19570.25 ±0.20	11.E-08R33.E-08	
			7/2	4	7/2	4	19570.25 ±0.20	15.E-08R45.E-08	
			7/2	5	7/2	5	19570.25 ±0.20	21.E-08R63.E-08	
							total intensity	55.E-08R17.E-07	
			15/2	6	13/2	5	19578.36 ±0.20	41.E-08R13.E-07	
			15/2	7	13/2	6	19578.36 ±0.20	48.E-08R14.E-07	
			15/2	8	13/2	7	19578.36 ±0.20	55.E-08R17.E-07	
			15/2	9	13/2	8	19578.36 ±0.20	63.E-08R19.E-07	
							total intensity	21.E-07R63.E-07	
			9/2	3	9/2	3	19584.56 ±0.20	12.E-08R35.E-08	
			9/2	4	9/2	4	19584.56 ±0.20	14.E-08R42.E-08	
			9/2	5	9/2	5	19584.56 ±0.20	18.E-08R53.E-08	
			9/2	6	9/2	6	19584.56 ±0.20	23.E-08R69.E-08	
			3/2	0	5/2	1	19584.56 ±0.20	33.E-09R10.E-08	
			3/2	1	5/2	2	19584.56 ±0.20	69.E-09R21.E-08	
			3/2	2	5/2	3	19584.56 ±0.20	12.E-08R37.E-08	
			3/2	3	5/2	4	19584.56 ±0.20	20.E-08R60.E-08	
			13/2	7	11/2	6	19584.56 ±0.20	37.E-08R11.E-07	
							total intensity	14.E-07R44.E-07	
			13/2	5	11/2	4	19589.08 ±0.20	27.E-08R81.E-08	
			13/2	6	11/2	5	19589.08 ±0.20	31.E-08R95.E-08	
			13/2	8	11/2	7	19589.08 ±0.20	43.E-08R13.E-07	
							total intensity	10.E-07R31.E-07	
			5/2	1	7/2	2	19621.36 ±0.20	47.E-09R14.E-08	
			5/2	2	7/2	3	19621.36 ±0.20	67.E-09R21.E-08	
			5/2	3	7/2	4	19621.36 ±0.20	95.E-09R29.E-08	
			5/2	4	7/2	5	19621.36 ±0.20	13.E-08R40.E-08	
							total intensity	34.E-08R10.E-07	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}Cl^{35}$	3←2	ground	7/2	2	9/2	3	19628.75 ±0.20	39.E-09R12.E-08	1425
			7/2	3	9/2	4	19628.75 ±0.20	50.E-09R15.E-08	
			7/2	4	9/2	5	19628.75 ±0.20	63.E-09R19.E-08	
			7/2	5	9/2	6	19628.75 ±0.20	80.E-09R24.E-08	
							total intensity	23.E-08R71.E-08	
		1	15/2	6	13/2	5	19486.10 ±0.20	89.E-09R12.E-08	1425
			15/2	7	13/2	6	19486.10 ±0.20	10.E-08R14.E-08	
			15/2	8	13/2	7	19486.10 ±0.20	12.E-08R16.E-08	
			15/2	9	13/2	8	19486.10 ±0.20	14.E-08R18.E-08	
							total intensity	45.E-08R60.E-08	
			9/2	3	9/2	4	19491.88 ±0.20	23.E-10R31.E-10	
			9/2	4	9/2	4	19491.88 ±0.20	30.E-09R40.E-09	
			9/2	5	9/2	5	19491.88 ±0.20	38.E-09R51.E-09	
			9/2	6	9/2	6	19491.88 ±0.20	49.E-09R65.E-09	
			3/2	0	5/2	1	19491.88 ±0.20	71.E-10R95.E-10	
			3/2	1	5/2	2	19491.88 ±0.20	15.E-09R20.E-09	
			3/2	2	5/2	3	19491.88 ±0.20	27.E-09R36.E-09	
			3/2	3	5/2	4	19491.88 ±0.20	43.E-09R57.E-09	
			13/2	7	11/2	6	19491.88 ±0.20	79.E-09R11.E-08	
							total intensity	29.E-08R39.E-08	
			13/2	5	11/2	4	19496.29 ±0.20	58.E-09R77.E-09	
			13/2	6	11/2	5	19496.29 ±0.20	68.E-09R91.E-09	
			13/2	8	11/2	7	19496.29 ±0.20	93.E-09R12.E-08	
							total intensity	22.E-08R29.E-08	
$In^{115}Cl^{37}$	3←2	ground	15/2	6	13/2	5	18768.93 ±0.20	12.E-08R38.E-08	1425
			15/2	7	13/2	6	18768.93 ±0.20	14.E-08R43.E-08	
			15/2	8	13/2	7	18768.93 ±0.20	16.E-08R50.E-08	
			15/2	9	13/2	8	18768.93 ±0.20	19.E-08R57.E-08	
							total intensity	61.E-08R19.E-07	

2.7539 Å



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Q(In) $10^{-24} cm^2$	α_e Mc/sec	D_e kc/sec	Additional Microwave References	
$In^{115}I^{127}$			1104.95 m	177	0.84	3.117	0.19	1106	
References			1425	9900	0015	1425	1425		

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$In^{115}I^{127}$	11←10	ground					24275.39 ±0.20	17.E-06R56.E-06	1425
							24278.01 ±0.20	17.E-06R56.E-06	
							24279.23 ±0.20	17.E-06R56.E-06	
							24280.42 ±0.20	17.E-06R56.E-06	
							24282.48 ±0.20	17.E-06R56.E-06	
		1					24206.89 ±0.20	71.E-07R15.E-06	1425
							24209.36 ±0.20	71.E-07R15.E-06	
							24210.68 ±0.20	71.E-07R15.E-06	
							24211.78 ±0.20	71.E-07R15.E-06	
							24213.78 ±0.20	71.E-07R15.E-06	
		2					24140.91 ±0.20	30.E-07R40.E-07	1425
							24143.30 ±0.20	30.E-07R40.E-07	

2.3207 Å

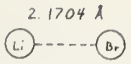
Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(I) Mc/sec	eqQ(Cl) Mc/sec	α_e Mc/sec	Additional Microwave References	
$I^{127}Cl^{35}$	9.79 m	0.65 i	3422.300m	384	-2930.0	-82.1	16.060	0322, 0165	
$I^{127}Cl^{37}$	9.79 m							0109, 0162	
References	0163	0163	0163	9900	0163	0163	0163		

Footnote: Measured half-width of 13/2 ← 11/2 lines was 11±2 Mc at T = -15°C, P = 1mm Hg (0163).
For validity of computed intensities see introductory remarks on hyperfine splitting.

Isotopic Molecular Species	Rotation J'←J"	Vibration v	F_1'	F'	F_1''	F"	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$I^{127}Cl^{35}$	4←3	ground	5/2	3	3/2	2	27194.75	50.E-08	15.E-07	0163
			5/2	2	3/2	1	27202.64	28.E-08	83.E-08	
			5/2	4	3/2	3	27204.99	81.E-08	24.E-07	
			7/2	4	5/2	3	27217.51	79.E-08	23.E-07	
			7/2	3	5/2	2	27221.02	56.E-08	16.E-07	
			7/2	5	5/2	4	27225.32	11.E-07	32.E-07	
			7/2	2	5/2	1	27228.34	39.E-08	12.E-07	
			3/2	2	1/2	1	27242.59	22.E-08	66.E-08	
			3/2	3	1/2	2	27254.90	63.E-08	18.E-07	
			9/2		9/2		27283.66	30.E-06	89.E-06	
			9/2		7/2		27283.66	30.E-06	89.E-06	
							total intensity	61.E-06	18.E-05	
			9/2		9/2		27286.25	30.E-06	89.E-06	
			9/2		7/2		27286.25	30.E-06	89.E-06	
							total intensity	61.E-06	18.E-05	
			9/2		9/2		27292.63	30.E-06	89.E-06	
			9/2		7/2		27292.63	30.E-06	89.E-06	
							total intensity	61.E-06	18.E-05	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$I^{127}Cl^{35}$	4←3	ground	9/2		9/2		27295.05	30.E-06 89.E-06	0163
			9/2		7/2		27295.05	30.E-06 89.E-06	
							total intensity	61.E-06 18.E-05	
			11/2	6	7/2	5	27333.85		
			11/2	6	9/2	5	27333.85	15.E-07 45.E-07	
							total intensity	15.E-07 45.E-07	
			13/2	7	11/2	6	27336.68	20.E-07 60.E-07	
			13/2	6	11/2	5	27336.68	17.E-07 51.E-07	
							total intensity	38.E-07 11.E-06	
			13/2	8	11/2	7	27337.38	24.E-07 70.E-07	
			13/2	5	11/2	4	27337.38	15.E-07 43.E-07	
							total intensity	39.E-07 11.E-06	
			11/2	4	7/2	3	27346.31		
			11/2	4	9/2	3	27346.31	10.E-07 31.E-07	
							total intensity	10.E-07 31.E-07	
			11/2	5	7/2	4	27354.71		
			11/2	5	9/2	4	27354.71	13.E-07 37.E-07	
							total intensity	13.E-07 37.E-07	
			11/2	7	9/2	6	27356.58	19.E-07 55.E-07	
			11/2	6	7/2	5	27357.73		
			11/2	6	9/2	5	27357.73	15.E-07 46.E-07	
							total intensity	15.E-07 46.E-07	
		1	13/2		11/2		27208.54	48.E-07 52.E-07	0163

LiBr Lithium bromide



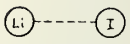
Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	γ_e kc/sec	D_e kc/sec	$\omega_e x_e$ cm^{-1}	I_e $10^{-40}gcm^2$
Li^6Br^{81}			19162.32m		19161.511	(208.75)	(868)	[109]		
Li^7Br^{79}		6.19 m	16651.19m	[480]	16650.570	169.09	656	[82]	[1.7]	30.36012
Li^7Br^{81}			16617.62m		16650.002	168.58	653	[82]		
References		0858	0858	0858	0858	0858	0858	0858	0858	0858

Isotopic Molecular Species	eqQ(Br) Mc/sec v = 0	v = 1	eqQ(Li) Mc/sec
Li^6Br^{81}			
Li^7Br^{79}	+37.20		+0.184
Li^7Br^{81}	+30.71	+33.19	
References	0858		0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
Li^6Br^{81}	1←0	ground		5/2		3/2	38112.72 ±0.10	79.E-06	22.E-05	0858
Li^7Br^{79}	1←0	ground		1/2		3/2	33122.44 ±0.30	21.E-05	61.E-05	0858
				5/2		3/2	33130.30 ±0.10	64.E-05	18.E-04	
				3/2		3/2	33139.50 ±0.10	43.E-05	12.E-04	
		2		5/2		3/2	32461.52 ±0.10	62.E-07	15.E-07	0858
Li^7Br^{81}	1←0	ground		1/2		3/2	33057.54 ±0.25	21.E-05	59.E-05	0858
				5/2		3/2	33063.96 ±0.10	62.E-05	18.E-04	
				3/2		3/2	33071.53 ±0.10	42.E-05	12.E-04	
		1		1/2		3/2	32722.60 ±0.10	21.E-06	17.E-06	0858
				5/2		3/2	32729.14 ±0.10	62.E-06	51.E-06	
				3/2		3/2	32737.53 ±0.10	41.E-06	34.E-06	
		2		5/2		3/2	32397.13 ±0.10	62.E-07	15.E-07	0858

LiI Lithium iodide

2.3919 Å



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	D_e kc/sec	γ_e kc/sec	I_e $10^{-40}gcm^2$	eqQ(Li) Mc/sec
Li^6I^{127}			15381.99m		15381.448	152.59	(69.0)	(610)		
Li^7I^{127}		6.25 m	13286.78m	450	13286.386	122.62	(51.5)	455	38.04799	+0.172
References		0858	0858	0858	0858	0858	0858	0858	0858	0858

Isotopic Molecular Species	eqQ(I) Mc/sec v = 0	v = 1	v = 2
Li^6I^{127}	-199.43	-206.8	
Li^7I^{127}	-198.15	-206.5	-212.6
References		0858	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
Li^6I^{127}	1←0	ground		5/2		5/2	30578.28 ±0.10	54.E-06	16.E-05	0858
				7/2		5/2	30620.17 ±0.10	73.E-06	21.E-05	
				3/2		5/2	30638.10 ±0.15	36.E-06	10.E-05	
		1		7/2		5/2	30317.79 ±0.20	82.E-07	74.E-07	0858
				3/2		5/2	30336.40 ±0.40	41.E-07	37.E-07	
Li^7I^{127}	1←0	ground		5/2		5/2	26418.44 ±0.10	43.E-05	12.E-04	0858
				7/2		5/2	26460.14 ±0.10	58.E-05	17.E-04	
				3/2		5/2	26477.88 ±0.10	29.E-05	83.E-05	
		1		5/2		5/2	26173.72 ±0.10	49.E-06	44.E-06	0858
				7/2		5/2	26217.11 ±0.10	65.E-06	59.E-06	
				3/2		5/2	26235.65 ±0.10	33.E-06	29.E-06	
		2		5/2		5/2	25931.21 ±0.20	55.E-07	16.E-07	0858
				7/2		5/2	25975.62 ±0.20	74.E-07	21.E-07	
				3/2		5/2	25995.48 ±0.40	37.E-07	10.E-07	

The electronic state of nitric oxide, like that of the hydroxyl radical, is a $^2\Pi$ state with coupling intermediate between Hund's cases (a) and (b). However, since B is much smaller than for OH, $|\lambda|$ is much larger and the coupling is more nearly Hund's case (a). (See the discussion of Z_r and Q_r for the hydroxyl radical.) For $+w>>(J + 1/2)^2$, the first order binomial expansion of $\sqrt{(J + 1/2)^2 + w}$ yields

$$\zeta + \frac{J(J + 1)}{2\sqrt{w}} ,$$

where $\zeta = \sqrt{w} + 1/(8\sqrt{w})$. Hence,

$$Z_r = (2J + 1)e^{-\zeta WB - X_{\pm}J(J + 1)} ,$$

where $X_{\pm} = WB(1 \pm 1/(2\sqrt{w}))$. As for OH, the upper and lower signs respectively correspond to positive and negative signs before the radical or, for large J, to $J = N - 1/2$ and to $J = N + 1/2$. However, since the coupling constant A for NO is positive, the respective signs now correspond to $^2\Pi_{3/2}$ and $^2\Pi_{1/2}$ for low J values. To the extent that the binomial approximation is adequate,

$$Q_r = 2e^{-\zeta WB} \sum_{J=1/2}^{\infty} (2J + 1)e^{-X_+J(J + 1)} + 2e^{+\zeta WB} \sum_{J=3/2}^{\infty} (2J + 1)^{-X_-J(J + 1)} .$$

Again as for OH, the Λ-doubling factor 2 appears in the expression for Q_r but not for Z_r, since the doubling is resolved in the spectra reported here.

Evaluation of the rather slowly converging series

$$\sum_{J=\Omega}^{\infty} (2J + 1)e^{-X_{\pm}J(J + 1)} = 2e^{+X_{\pm}/4} \sum_{j=\Omega+1/2}^{\infty} je^{-X_{\pm} j^2}$$

by means of the Euler-Maclaurin expansion yields, for $\Omega = 1/2$,

$$e^{+X_{\pm}/4}\left(\frac{1}{X_{\pm}} - \frac{1}{6}\right).$$

Hence, the approximation

$$Q_r = 2e^{-\zeta WB + X_+/4}\left(\frac{1}{X_+} - \frac{1}{6}\right) + 2e^{+\zeta WB + X_-/4}\left(\frac{1}{X_-} - \frac{1}{6} - 2e^{-X_-}\right)$$

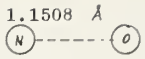
was used.

Since the maximum J value involved in an observed microwave transition is 5/2, Hund's case (a) provides a rather good approximation for computing V. For the transition J+1←J,

$$V = \frac{(J+1)^2 - \Omega^2}{(J+1)(2J+1)}$$

[2: equation 3-40].

NO Nitric oxide



Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_o Mc/sec	ω_e cm^{-1}	$(B_o)_{eff}\ ^2\Pi_{1/2}$ Mc/sec	$(B_o)_{eff}\ ^2\Pi_{3/2}$ Mc/sec	B_e Mc/sec	$D_{o_{eff}}\ ^2\Pi_{1/2}$ Mc/sec	$D_{o_{eff}}\ ^2\Pi_{3/2}$ Mc/sec
$N^{14}O^{16}$		0.158 m	50848.42m	1904	50121.15	51571.61	51109.51	0.034	0.319
$N^{15}O^{16}$			49043.86m		48375.04	49689.35	49298.14	0.017	0.261
References		1739	1547 0992	9900	1141	1547, 1141	1141	1141	1141

Isotopic Molecular Species	D_o Mc/sec	Q(N) $10^{-24}cm^2$	I_o $10^{-40}gcm^2$	I_e $10^{-40}gcm^2$	α_e cm^{-1}	A cm^{-1}	eqQ(N) Mc/sec	$e^2Q\left(\frac{3\sin^2\chi}{r^3}\right)$	
$N^{14}O^{16}$	0.177	0.016	16.505	14.416	0.0181	122.14	-2	22 ± 9 Mc/sec	
$N^{15}O^{16}$	0.139		17.101	17.019	0.0171				
References	1141	1673	1141	1141	1141	1547	1547	1547	

Isotopic Molecular Species	Λ-doubling, ℓ-uncoupling constants, Mc/sec p_Λ,β	q_Λ,γ	α	magnetic hfs constants Mc/sec a	b	c	d	a-(b+c)/2	
$N^{14}O^{16}$	+176.15	+1.15	+3216.99	83.82	68.49	- 86.34	112.60	92.74	
$N^{15}O^{16}$	+170.45	+0.71	+3224.79	-116.94	-96.63	+122.82	-157.88	-130.03	
References	1141			1547, 1141					

Isotopic Molecular Species	a + (b+c)/2 Mc/sec	-g in Bohr magnetons** $^2\Pi^+_{1/2}$, J = 1/2	$^2\Pi^-_{1/2}$, J = 1/2	$^2\Pi^+_{1/2}$, J = 3/2	$^2\Pi^-_{1/2}$, J = 3/2	
$N^{14}O^{16}$	74.895	.0007 + α	.0007 - α	$\bar{g}$ + (2/5)α	$\bar{g}$ - (2/5)α	
$N^{15}O^{16}$						
References	1547	1041				

Footnote: ** α = +0.0025, $\bar{g}$ = -0.0230. For the $^2\Pi_{3/2}$ state, see 0809, theoretical treatment in 1029, and parameters listed here.

Isotopic Molecular Species	Rotation J'←J"	Vibration v	Electronic	F_1'	F'	F_1''	F"	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$N^{14}O^{16}$	3/2←1/2	ground	$^2\Pi^+_{1/2}$		5/2		3/2	150176.30 ±0.25	26.E-06	80.E-06	1141
					3/2		1/2	150198.52 ±0.25	98.E-07	29.E-06	
					3/2		3/2	150218.57 ±0.25	78.E-07	24.E-06	
					1/2		1/2	150225.47 ±0.25	78.E-07	24.E-06	
					1/2		3/2	150245.38 ±0.25	98.E-08	29.E-07	
			$^2\Pi^-_{1/2}$		1/2		3/2	150375.02 ±0.25	98.E-08	29.E-07	
					3/2		3/2	150438.72 ±0.25	78.E-07	24.E-06	
					5/2		3/2	150546.25 ±0.25	26.E-06	80.E-06	
					1/2		1/2	150580.38 ±0.25	78.E-07	24.E-06	
					3/2		1/2	150644.11 ±0.25	98.E-07	29.E-06	
	5/2←3/2	ground	$^2\Pi^+_{1/2}$		7/2		5/2	250435.60 ±0.50	11.E-05	33.E-05	1141
					5/2		3/2	250439.20 ±0.50	72.E-06	21.E-05	
					3/2		1/2	250447.16 ±0.50	43.E-06	12.E-05	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	Electronic	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$N^{14}O^{16}$	5/2←3/2	ground	$^2\Pi_{1/2}^+$		3/2		3/2	250474.02 ±0.50	14.E-06 40.E-06	1141
					5/2		5/2	250481.52 ±0.50	14.E-06 40.E-06	
			$^2\Pi_{1/2}^-$		5/2		5/2	250707.12 ±0.50	14.E-06 40.E-06	
					3/2		3/2	250752.61 ±0.50	14.E-06 40.E-06	
					7/2		5/2	250794.99 ±0.50	11.E-05 33.E-05	
					5/2		3/2	250814.64 ±0.50	72.E-06 21.E-05	
					3/2		1/2	250816.24 ±0.50	43.E-06 12.E-05	
	5/2←3/2	ground	$^2\Pi_{3/2}^+$		7/2		5/2	257822.06 ±0.3	44.E-06 97.E-06	1547
					5/2		3/2	257852.87 ±0.3	28.E-06 61.E-06	
					3/2		1/2	257867.67 ±0.3	17.E-06 37.E-06	
			$^2\Pi_{3/2}^-$		7/2		5/2	257825.02 ±0.3	44.E-06 97.E-06	
					5/2		3/2	257855.36 ±0.3	28.E-06 61.E-06	
					3/2		1/2	257870.35 ±0.3	17.E-06 37.E-06	
$N^{15}O^{16}$	3/2←1/2	ground	$^2\Pi_{1/2}^+$		1		1	144927.81 ±0.25	22.E-09 64.E-09	1141
					1		0	144946.34 ±0.25	44.E-09 13.E-08	
					2		1	144976.00 ±0.25	11.E-08 32.E-08	
			$^2\Pi_{1/2}^-$		1		0	145236.09 ±0.25	44.E-09 13.E-08	
					2		1	145307.81 ±0.25	11.E-08 32.E-08	
					1		1	145428.07 ±0.25	22.E-09 64.E-09	
	5/2←3/2	ground	$^2\Pi_{1/2}^+$		2		1	241715.40 ±0.50	31.E-08 91.E-08	1141
					3		2	241723.79 ±0.50	49.E-08 14.E-07	
			$^2\Pi_{1/2}^-$		2		1	242046.03 ±0.50	31.E-08 93.E-08	
					3		2	242060.35 ±0.50	49.E-08 14.E-07	

O_2 Oxygen

The ground electronic state of the oxygen molecule is a $^3\Sigma_g^-$ state. The spin S = 1 couples to the angular momentum N of nuclear motion according to Hund's case (b), yielding three sets of levels for which J = N+1, N, and N-1 respectively, where N is zero (in the first case only for which J = S = 1) or a positive integer [5: page 222]. For intensity computations, the energies may in general be adequately approximated by $BN(N + 1)-\lambda$, $BN(N + 1)+0$, and $BN(N + 1)-\lambda$, for J = N+1, N, and N-1 respectively, where λ is approximately 60,000 Mc/sec; however, for the N = 1, J = 0 level the energy is $BN(N + 1)-2\lambda$ [2: figure 7-6 and equation 7-6]. Adding the constant $+\lambda$ to the previous energies, the Z_r values for heteronuclear molecules are given by $Z_r \exp(+XN(N + 1)) = 2N + 3$, $(2N + 1)\exp(-\lambda W)$, and $2N - 1$, except for the additional factor $\exp(+\lambda W)$ for the N = 1, J = 0 state. Correcting for the missing two N = 0 states and the state of exceptional energy and combining the first and last sets of states, the Mulholland approximation yields

$$Q_r = (3 - Y)(1/X + 1/3 + X/15) + 2\lambda W$$

for the heteronuclear molecules.

For homonuclear molecules, the Pauli exclusion principle must be satisfied for interchange of the nuclei as well as for interchange of electrons. Since the electronic wave function of oxygen is antisymmetric with respect to interchange of the nuclei and the spins of O^{16} and O^{18} are zero, the statistical weights of O_2^{16} and O_2^{18} are normal for odd N and zero for even N. Consequently, the heteronuclear Z_r's are multiplied by 1 or 0 for O_2^{16} and O_2^{18}, for odd or even N respectively. To the required accuracy, Q_r for the (hypothetical) homonuclear molecules is half that for the heteronuclear molecules.

The values of V are

$$N(2N + 3)/(2N + 1)(N + 1)$$

and

$$(N + 1)(2N - 1)/N(2N + 1)$$

for the transitions N, N+1 and N, N-1 respectively, where the magnetic dipole moment is 2 Bohr magnetons [2: equation 7-8 in which the direction of the arrows indicate emission]. The resonant frequencies of oxygen are given by

$$\nu(N, J = N \leftarrow N, J = N \pm 1) = \lambda_0 + \mu_0/2 - 6\mu_1/2$$

$$+(\lambda_1 + 5\mu_1/2)(n^2 + n + 2) \mp [(2n + 1)\{B_0 + 2B_1(n^2 + n + 1)$$

$$+B_2(3n^4 + 6n^3 + 13n^2 + 10n + 4)\} - f(n)]$$

where

$$B(N) = B_0 + B_1N(N + 1) + B_2N^2(N + 1)^2 ,$$

$$\mu(N) = \mu_0 + \mu_1N(N + 1) ,$$

$$[f(n)]^2 = \left[(2n + 1)\{(B_0 - \mu_0/2) + (2B_1 - \mu_1/2)(n^2 + n + 1)\right.$$

$$\left.+B_2(3n^4 + 6n^3 + 13n^2 + 10n + 4)\} - \frac{3\mu_1}{2}\right.$$

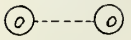
$$\left. - \frac{\lambda_0 + \lambda_1(5n^2 + 5n + 2)}{2n + 1}\right]^2 + \left[\frac{2\lambda_0 + 2\lambda_1(n^2 + n + 1)}{2n + 1}\right]^2 n(n + 1) ,$$

$$n = N \mp 1,$$

and the parameters are given in the molecular constant table under reference number 1958. (The s's in the published expression for f(n) should be entered as 5's as above.)

O_2 Oxygen

1.2074 Å



Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_o Mc/sec	ω_e cm^{-1}	eqQ Mc/sec	B_1 Mc/sec	B_2 Mc/sec	λ_o Mc/sec	λ_1 Mc/sec	$\mu_o/2$ Mc/sec	
O_2^{16}	2.00 a		43100.5 m	1580		-0.1470	0 ± 10^{-5}	59501.332	0.05858	-126.2930	
O_2^{18}	2.00 a		48488.2 c								
$O^{16}O^{17}$	2.00 a		44406.5 c		2.7						
$O^{16}O^{18}$	2.00 a		45794.8 c								
References	*		1958	9900	0736	1958	1958	1958	1958	1958	

* a: Rough average of several experimental values. See material below on line width parameter.

Isotopic Molecular Species	$\mu_1/2$ Mc/sec	Magnetic hfs constants Mc/sec b	c	$\langle 3\cos^2\chi-1/2r^3\rangle_{av}$ $10^{24}cm^{-3}$	$\langle 1/r^3\rangle_{av}$ $10^{25}cm^{-3}$	$\Psi^2(0)$ $10^{24}cm^{-3}$	Additional Microwave References
O_2^{16}	-0.000117	-102	140	-8.9	4.45	1.26	0172, 0273, 0293,0381, 0385, 0409, 0422,0507, 0539, 0545, 0650,0736, 0752, 0972, 0973,1077, 1078, 1120, 1144,1411, 1499, 1713, 1744.
O_2^{18}							
$O^{16}O^{17}$							
$O^{16}O^{18}$							
References	1958	0737		0738	0738	0738	

Footnotes: Miscellaneous references on absorption coefficients, high pressure line widths, foreign gas broadening and line shapes include: 0036, 0049, 0105, 0138, 0139, 0246, 0797, 1036, 1094, 1511, 1682, and 1684.

** Rough averages of discordant results, where g_s, g_s', g_ℓ, g_r are the splitting factors for the free electron, the electron spin in the molecule, the molecular electronic orbital moment, and the molecular rotational moment, respectively.

Two lines were observed in the range 60,170–60,180 Mc/sec and theoretical computation gave 60,172 and 60,179 for the respective lines.

Frequency reported 60240–250 Mc/sec, while theory gave 60250, 60251 for the respective lines.

Line width parameter is a weighted average from 0500, 0797, and 1958.

Line Widths

300°K

Line	Mc/mm	Line	Mc/mm
1_+	2.08	1_-	1.97
3_+	2.03	3_-	1.94
5_+	1.77	5_-	1.82
7_+	1.88	7_-	1.84
9_+	1.68	9_-	1.86
11_+	1.78	11_-	1.97
13_+	1.54	13_-	1.86
15_+	1.77	15_-	1.99
17_+	1.50	17_-	1.79
19_+	1.58	19_-	1.77
21_+		21_-	1.26
23_+	1.26	23_-	1.49

Values averaged from 1958, 0797, 0500, 0855, 1959, 1960

193°K

Line	Mc/mm
1_-	4.7

0380

90°K

Line	Mc/mm
1_-	5.80
1_+	5.63
3_+	5.77
5_+	5.22
7_-	5.52
9_-	4.55

0855

Magnetic Resonance Widths
Δν/P in Mc/mm

Transition N J	M	Δν/P O_2 at 300°K	Δν/P O_2 at 78°K	Δν/P air at 78°K
1 1	−1→0	2.35 ±0.10	6.13 ±0.3	6.13 ±0.3
1 2	1→2	2.20 ±0.10	6.00 ±0.2	6.02 ±0.3
1 2	0→1		5.92 ±0.3	
1 2	−1→0	2.23 ±0.14	6.20 ±0.1	6.21 ±0.2
3 2	0→−1		5.93 ±0.3	6.63 ±0.3
3 4	−1→0	2.00 ±0.10	5.70 ±0.3	6.12 ±0.3
5 4	0→−1		6.0 ±0.5	
5 6	−1→0		5.5 ±0.3	

1079

Zeeman constants **	
$g_s'/g_s - 1$	-1.6×10^{-4}
g_ℓ/g_s	1.5×10^{-3}
g_r/g_s	6.4×10^{-5}

1959, 1960, 1078, 0855

Molecular Isotope	Rotation $J',N' \leftarrow J'',N''$	Vibration v	Electronic	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
O_2^{16}	1,1←0,1	ground	$^3\Sigma_g^-$					118750.5 ±0.5	71.E-07	19.E-06	0900
	3,3←2,3	ground	$^3\Sigma_g^-$					62486.255 ±0.010	11.E-06	27.E-06	1958
	5,5←4,5	ground	$^3\Sigma_g^-$					60306.044 ±0.010	16.E-06	38.E-06	1958
	7,7←6,7	ground	$^3\Sigma_g^-$					59164.215 ±0.010	19.E-06	40.E-06	1958

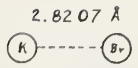
Isotopic Molecular Species	Rotation $J',N' \leftarrow J'',N''$	Vibration v	Electronic	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
O_2^{16}	9,9←8,9	ground	$^3\Sigma_g^-$					58323.885 ±0.010	19.E-06	36.E-06	1958
	11,11←10,11	ground	$^3\Sigma_g^-$					57611.4 ±0.2	17.E-06	27.E-06	0900
	13,13←12,13	ground	$^3\Sigma_g^-$					56970.8 ±0.4	14.E-06	19.E-06	0900
	15,15←14,15	ground	$^3\Sigma_g^-$					56364.1 ±0.4	11.E-06	12.E-06	0900
	17,17←16,17	ground	$^3\Sigma_g^-$					55784.6 ±0.4	76.E-07	64.E-07	0900
	19,19←18,19	ground	$^3\Sigma_g^-$					55221.6 ±0.4	50.E-07	32.E-07	0900
	23,23←22,23	ground	$^3\Sigma_g^-$					54129.4 ±0.4	18.E-07	61.E-08	0900
	25,25←24,25	ground	$^3\Sigma_g^-$					53599.4 ±0.8	97.E-08	23.E-08	0900
	1,1←2,1	ground	$^3\Sigma_g^-$					56265.4 ±0.6	63.E-07	17.E-06	0900
	3,3←4,3	ground	$^3\Sigma_g^-$					58446.580 ±0.010	16.E-06	41.E-06	1958
	5,5←6,5	ground	$^3\Sigma_g^-$					59590.978 ±0.010	22.E-06	53.E-06	1958
	7,7←8,7	ground	$^3\Sigma_g^-$					60434.776 ±0.010	25.E-06	54.E-06	1958
	9,9←10,9	ground	$^3\Sigma_g^-$					61150.570 ±0.010	26.E-06	48.E-06	1958
	11,11←12,11	ground	$^3\Sigma_g^-$					61800.155 ±0.010	23.E-06	38.E-06	1958
	13,13←14,13	ground	$^3\Sigma_g^-$					62411.223 ±0.010	20.E-06	26.E-06	1958
	15,15←16,15	ground	$^3\Sigma_g^-$					62996.6 ±0.2	15.E-06	16.E-06	0900
	17,17←18,17	ground	$^3\Sigma_g^-$					63568.520 ±0.010	11.E-06	93.E-07	1958
	19,19←20,19	ground	$^3\Sigma_g^-$					64128.0 ±0.8	75.E-07	48.E-07	0900
	21,21←22,21	ground	$^3\Sigma_g^-$					64678.2 ±0.2	47.E-07	23.E-07	0900
	23,23←24,23	ground	$^3\Sigma_g^-$					65224.120 ±0.2	28.E-07	96.E-08	1958
O_2^{18}	3,3←4,3	ground	$^3\Sigma_g^-$					58900 ±2	63.E-12	15.E-11	0445
	5,5←6,5	ground	$^3\Sigma_g^-$					59810 ±2	90.E-12	21.E-11	0445
	5,5←4,5	ground	$^3\Sigma_g^-$					59875 ±2	60.E-12	15.E-11	0445
	7,7←6,7	ground	$^3\Sigma_g^-$					58965 ±2	72.E-12	15.E-11	0445
$O^{16}O^{17}$	4,4←5,4	ground	$^3\Sigma_g^-$		11/2		13/2	59250	14.E-10	35.E-10	0737
					13/2		15/2	59398	18.E-10	43.E-10	
	5,5←6,5	ground	$^3\Sigma_g^-$		5/2		7/2	59359	73.E-11	17.E-10	0737
					7/2		9/2	59431	89.E-11	21.E-10	

Isotopic Molecular Species	Rotation $J',N' \leftarrow J'',N''$	Vibration v	Electronic	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$O^{16}O^{17}$	5,5←6,5	ground	$^3\Sigma_g^-$		11/2		13/2	59627	13.E-10	31.E-10	0737
					13/2		15/2	59748	16.E-10	37.E-10	
					15/2		17/2	59889	19.E-10	45.E-10	
	6,6←7,6	ground	$^3\Sigma_g^-$		7/2		9/2	59790	90.E-11	20.E-10	0737
					11/2		13/2	59956	12.E-10	28.E-10	
					9/2		11/2	59864	11.E-10	24.E-10	
					13/2		15/2	60060	15.E-10	33.E-10	
					15/2		17/2	60180	17.E-10	38.E-10	
	7,7←8,7	ground	$^3\Sigma_g^-$		9/2		11/2	60170	10.E-10	22.E-10	0737
	5,5←4,5	ground	$^3\Sigma_g^-$		15/2		13/2	59989	14.E-10	33.E-10	0737
					13/2		11/2	60130	11.E-10	27.E-10	
	6,6←5,6	ground	$^3\Sigma_g^-$		17/2		15/2	59385	15.E-10	33.E-10	0737
					13/2		11/2	59638	10.E-10	23.E-10	
					11/2		9/2	59737	86.E-11	19.E-10	
	7,7←6,7	ground	$^3\Sigma_g^-$		11/2		9/2	59322	82.E-11	18.E-10	0737
					9/2		7/2	59390	70.E-11	15.E-10	
	6,6←5,6	ground	$^3\Sigma_g^-$		15/2		13/2	59519	12.E-10	28.E-10	0737
	5,5←6,5	ground	$^3\Sigma_g^-$		9/2		11/2	59519	11.E-10	26.E-10	0737
	5,5←4,5	ground	$^3\Sigma_g^-$		11/2		9/2	60245	90.E-11	21.E-10	0737
	7,7←8,7	ground	$^3\Sigma_g^-$		11/2		13/2	60245	12.E-10	25.E-10	0737
$O^{16}O^{18}$	3,3←4,3	ground	$^3\Sigma_g^-$					58650 ±2	32.E-09	81.E-09	0445
	4,4←5,4	ground	$^3\Sigma_g^-$					59220 ±2	39.E-09	95.E-09	0445
	5,5←6,5	ground	$^3\Sigma_g^-$					59685 ±2	44.E-09	10.E-08	0445
	6,6←5,6	ground	$^3\Sigma_g^-$					59540 ±2	35.E-09	79.E-09	0445
	7,7←6,7	ground	$^3\Sigma_g^-$					59075 ±2	37.E-09	80.E-09	0445
	8,8←7,8	ground	$^3\Sigma_g^-$					58670 ±2	38.E-09	77.E-09	0445

Isotopic Molecular Species	Rotation $J',N' \leftarrow J'',N''$	Vibration v	Electronic	F_1'	F'	F_1''	F''	ν Mc/sec		Intensity cm^{-1} 300°	195°	Ref
$O^{16}O^{18}$	9,9←8,9	ground	$^3\Sigma_g^-$					58310	±2	38.E-09	72.E-09	0445

KBr Potassium bromide

2.8207 Å



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	$-Y_{02}$ Mc/sec	$-Y_{11}\approx a_e$ Mc/sec	Y_{21} Mc/sec	eqQ(K) Mc/sec v = 0
$K^{39}Br^{79}$		10.41 m	2434.953m	{231}	2434.947	0.001	12.136	0.023	-5.003
$K^{39}Br^{81}$			2415.081m	{231}	2415.075	0.001	11.987	0.022	-5.002
References		0684	0684	9900	0684	0684	0684	0684	0684

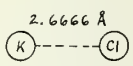
Isotopic Molecular Species	eqQ(K) Mc/sec v = 1	v = 2	eqQ(Br) Mc/sec v = 0	v = 1	v = 2
$K^{39}Br^{79}$	-4.894	-4.915	+10.244	+11.224	+12.204
$K^{39}Br^{81}$			+ 8.555		
References	0684		0684		

Footnote: For validity of computed intensities see introductory remarks on hyperfine splitting.

Isotopic Molecular Species	Rotation J'←J"	Vibration v	F_1'	F'	F_1''	F"	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$K^{39}Br^{79}$	1←0	ground	3/2	2	3/2	3	4854.856	25.E-08	80.E-08	0684
			3/2	3	3/2	3	4856.588	00.E-08	32.E-07	
			5/2	2	3/2	3	4857.383	18.E-09	57.E-09	
			5/2	4	3/2	3	4857.502	16.E-07	52.E-07	
			5/2	3	3/2	3	4859.740	25.E-08	80.E-08	
			1/2	2	3/2	3	4860.523	63.E-08	20.E-07	
		1	3/2	2	3/2	3	4830.463	82.E-09	14.E-08	0684
			3/2	3	3/2	3	4832.362	33.E-08	58.E-08	
			5/2	2	3/2	3	4833.143	58.E-10	10.E-09	
			5/2	4	3/2	3	4833.270	52.E-08	93.E-08	
			5/2	3	3/2	3	4835.743	82.E-09	14.E-08	
			1/2	2	3/2	3	4836.530	20.E-08	36.E-08	
		2	3/2	2	3/2	3	4806.153	27.E-09	26.E-09	0684
			3/2	3	3/2	3	4808.247	11.E-08	10.E-08	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$K^{39}Br^{79}$	1←0	2	5/2	2	3/2	3	4808.990	19.E-10	19.E-10	0684
			5/2	4	3/2	3	4809.129	17.E-08	17.E-08	
			5/2	3	3/2	3	4811.835	27.E-09	26.E-09	
			1/2	2	3/2	3	4812.622	67.E-09	65.E-09	
$K^{39}Br^{81}$	1←0	ground	3/2	2	3/2	3	4815.635	24.E-08	77.E-08	0684
			3/2	1	3/2	0	4815.884	17.E-08	55.E-08	
			3/2	3	3/2	3	4817.056	95.E-08	31.E-07	
			5/2	2	3/2	3	4817.909	17.E-09	55.E-09	
			5/2	4	3/2	3	4817.992	15.E-07	49.E-07	
			5/2	1	3/2	0	4818.143	26.E-08	82.E-08	
			5/2	3	3/2	3	4819.815	24.E-08	77.E-08	
			1/2	1	3/2	0	4820.130	85.E-09	27.E-08	
			1/2	2	3/2	3	4820.613	60.E-08	19.E-07	
		1	5/2	3	3/2	3	4793.140	78.E-09	14.E-08	0684
			1/2	2	3/2	3	4794.062	20.E-08	35.E-08	

KCl Potassium chloride



Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	$-Y_{02}$ Mc/sec	$-Y_{11} \approx \alpha_e$ Mc/sec	Y_{21} Mc/sec	eqQ(K) Mc/sec v = 0	v = 1
$K^{39}Cl^{35}$		10.48 m	3856.399m	{280}	3856.370	0.003	23.680	0.050	-5.656	-5.622
$K^{39}Cl^{37}$			3746.611m	{280}	3746.583	0.003	22.676	0.047	-5.660	-5.628
$K^{41}Cl^{35}$			3767.421m	{280}	3767.394	0.003	22.865	0.048	-6.899	-6.840
References		0722	0722	9900	0722	0722	0722	0722	0722	

Isotopic Molecular Species	eqQ(K) Mc/sec		|eqQ(Cl)| Mc/sec				Additional Microwave References	
	v = 2	v = 3	v = 0	v = 1	v = 2	v = 3		
$K^{39}Cl^{35}$	-5.571	-5.511	<0.040	0.075	0.237	0.393	0858, 0527	
$K^{39}Cl^{37}$							0938, 1728	
$K^{41}Cl^{35}$							1452	
References	0722		0722					

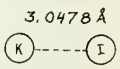
Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$K^{39}Cl^{35}$	1←0	ground	3/2	0	3/2	0	7687.942	0.	0.	0722
			3/2	1	3/2	0	7687.942	12.E-07	37.E-07	
			3/2	2	3/2	3	7687.942	17.E-07	52.E-07	
			3/2	3	3/2	3	7687.942	66.E-07	21.E-06	
							total intensity	94.E-07	29.E-06	
			5/2	3	3/2	3	7689.356	17.E-07	52.E-07	
			5/2	1	3/2	0	7689.356	18.E-07	55.E-07	
			5/2	2	3/2	3	7689.356	12.E-08	37.E-08	
			5/2	4	3/2	3	7689.356	11.E-06	33.E-06	
							total intensity	14.E-06	44.E-06	
			1/2	1	3/2	0	7690.487	59.E-08	18.E-07	
			1/2	2	3/2	3	7690.487	41.E-07	13.E-06	
							total intensity	47.E-07	15.E-06	
		1	3/2	1	3/2	0	7640.783	30.E-08	46.E-08	0722
			3/2	2	3/2	3	7640.783	43.E-08	64.E-08	
			3/2	3	3/2	3	7640.783	17.E-07	26.E-07	
							total intensity	24.E-07	37.E-07	
			3/2	1	3/2	0	7640.795	30.E-08	46.E-08	
			3/2	2	3/2	3	7640.795	43.E-08	64.E-08	
			3/2	3	3/2	3	7640.795	17.E-07	26.E-07	
							total intensity	24.E-07	37.E-07	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$K^{39}Cl^{35}$	1←0	1	5/2	1	3/2	0	7642.200	46.E-08 69.E-08	0722
			5/2	2	3/2	3	7642.200	30.E-09 46.E-09	
			5/2	3	3/2	3	7642.200	43.E-08 64.E-08	
			5/2	4	3/2	3	7642.200	27.E-07 41.E-07	
							total intensity	37.E-07 55.E-07	
			1/2	1	3/2	0	7643.316	15.E-08 23.E-08	
			1/2	2	3/2	3	7643.316	11.E-07 16.E-07	
							total intensity	12.E-07 18.E-07	
		2	3/2	1	3/2	0	7593.830	79.E-09 58.E-09	0722
			3/2	2	3/2	3	7593.830	11.E-08 81.E-09	
			3/2	3	3/2	3	7593.830	44.E-08 32.E-08	
							total intensity	63.E-08 46.E-08	
			3/2	1	3/2	0	7593.868	79.E-09 58.E-09	
			3/2	2	3/2	3	7593.868	11.E-08 81.E-09	
			3/2	3	3/2	3	7593.868	44.E-08 32.E-08	
							total intensity	63.E-08 46.E-08	
			1/2	1	3/2	0	7596.347	39.E-09 29.E-09	
			1/2	2	3/2	3	7596.347	28.E-08 20.E-08	
							total intensity	31.E-08 23.E-08	
		3	3/2	1	3/2	0	7547.073	20.E-09 72.E-10	0722
			3/2	2	3/2	3	7547.073	28.E-09 10.E-09	
			3/2	3	3/2	3	7547.073	11.E-08 40.E-09	
							total intensity	16.E-08 58.E-09	
			3/2	1	3/2	0	7547.136	20.E-09 72.E-10	
			3/2	2	3/2	3	7547.136	28.E-09 10.E-09	
			3/2	3	3/2	3	7547.136	11.E-08 40.E-09	
							total intensity	16.E-08 58.E-09	
			1/2	1	3/2	0	7549.569	10.E-09 36.E-10	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$K^{39}Cl^{35}$	1←0	3	1/2	2	3/2	3	7549.569	71.E-09	25.E-09	0722
							total intensity	81.E-09	29.E-09	
	3←2	ground					23067.5 ±0.5	15.E-04	47.E-04	0938
		1					22925.4 ±0.5	39.E-05	59.E-05	0938
		2					22785.2 ±1.0	10.E-05	74.E-06	0938
		3					22644.0 ±2.0	26.E-06	93.E-07	0938
	13←12	ground					99929.450 ±.016	11.E-02	33.E-02	1452
		1					99316.456 ±.016	29.E-03	42.E-03	1452
$K^{39}Cl^{37}$	1←0	ground	3/2	0	3/2	0	7469.370	0.	0.	0722
			3/2	1	3/2	0	7469.370	35.E-08	11.E-07	
			3/2	2	3/2	3	7469.370	49.E-08	15.E-07	
			3/2	3	3/2	3	7469.370	20.E-07	62.E-07	
							total intensity	28.E-07	88.E-07	
			5/2	1	3/2	0	7470.776	53.E-08	17.E-07	
			5/2	2	3/2	3	7470.776	35.E-09	11.E-08	
			5/2	3	3/2	3	7470.776	49.E-08	15.E-07	
			5/2	4	3/2	3	7470.776	32.E-07	99.E-07	
							total intensity	42.E-07	13.E-06	
			1/2	1	3/2	0	7471.917	18.E-08	55.E-08	
			1/2	2	3/2	3	7471.917	12.E-07	39.E-07	
							total intensity	14.E-07	44.E-07	
		1	1/2	1	3/2	0	7426.754	46.E-09	69.E-09	0722
			1/2	2	3/2	3	7426.754	32.E-08	48.E-08	
							total intensity	36.E-08	55.E-08	
	3←2	ground					22410.3 ±1.5	46.E-05	14.E-04	0938
		1					22278.0 ±3.0	12.E-05	18.E-05	0938
$K^{41}Cl^{35}$	1←0	ground	3/2	0	3/2	0	7510.555	0.	0.	0722
			3/2	1	3/2	0	7510.555	82.E-09	25.E-08	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$K^{41}Cl^{35}$	1←0	ground	3/2	2	3/2	3	7510.555	11.E-08	36.E-08	0722
			3/2	3	3/2	3	7510.555	46.E-08	14.E-07	
							total intensity	65.E-08	20.E-07	
			5/2	1	3/2	0	7512.280	12.E-08	38.E-08	
			5/2	2	3/2	3	7512.280	82.E-10	25.E-09	
			5/2	3	3/2	3	7512.280	11.E-08	36.E-08	
			5/2	4	3/2	3	7512.280	74.E-08	23.E-07	
							total intensity	98.E-08	31.E-07	
			1/2	1	3/2	0	7513.659	41.E-09	13.E-08	
			1/2	2	3/2	3	7513.659	29.E-08	89.E-08	
							total intensity	33.E-08	10.E-07	
		1	1/2	1	3/2	0	7468.107	11.E-09	16.E-09	0722
			1/2	2	3/2	3	7468.107	74.E-09	11.E-08	
							total intensity	84.E-09	13.E-08	

KI Potassium iodide

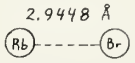


Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	D_e kc/sec	eqQ(I) Mc/sec	γ_e kc/sec	$\omega_e x_e$ cm^{-1}	I_e $10^{-40} gcm^2$
$K^{39}I^{127}$		11.05 m	1825.012m	212	1825.006	8.0337	1.03	−60±10	12.21	0.5	277.00945
$K^{41}I^{127}$					1756.903						
References		0858	0858	9900	0858	0858	0858	0858	0858	0858	0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$K^{39}I^{127}$	5←4	ground					18209.77 ±0.10	95.E-05	31.E-04	0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$K^{39}I^{127}$	5←4	1					18129.61 ±0.20	34.E-05 64.E-05	0858
	6←5	ground					21851.32 ±0.10	16.E-04 53.E-04	0858
		1					21755.19 ±0.10	59.E-05 11.E-04	0858
		2					21659.38 ±0.10	21.E-05 23.E-05	0858
		3					21563.91 ±0.10	76.E-06 48.E-06	0858
		5					21373.63 ±0.10	97.E-07 20.E-07	0858
		6					21279.07 ±0.10	35.E-07 42.E-08	0858
		7					21184.73 ±0.10	13.E-07 88.E-09	0858
	7←6	ground					25492.81 ±0.15	26.E-04 84.E-04	0858
		1					25380.71 ±0.15	93.E-05 17.E-04	0858
		2					25268.95 ±0.15	33.E-05 36.E-05	0858
		3					25157.04 ±0.30	12.E-05 75.E-06	0858
$K^{41}I^{127}$	6←5	ground					21036.78 ±0.10	11.E-05 35.E-05	0858

RbBr Rubidium bromide

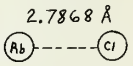


Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	D_e kc/sec	γ_e kc/sec	$\omega_e x_e$ cm^{-1}	I_e $10^{-40}gcm^2$
$Rb^{85}Br^{79}$		9.925 c	1424.840m	181	1424.8342	5.5782	0.45	7.9±1.1	0.35	354.8006
$Rb^{85}Br^{81}$			1406.594y		1406.5944	5.461				
$Rb^{87}Br^{79}$			1409.057y		1409.0573	5.4744				
References		0858	0858	0858	0858	0858	0858	0858	0858	0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Rb^{85}Br^{79}$	8←7	ground					22752.29 ±0.10	53.E-05 18.E-04	0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Rb^{85}Br^{79}$	9←8	ground					25596.03 ±0.10	75.E-05 25.E-04	0858
		1					25495.98 ±0.10	31.E-05 65.E-05	0858
		2					25396.14 ±0.10	13.E-05 17.E-05	0858
		3					25296.52 ±0.10	54.E-06 44.E-06	0858
		4					25197.32 ±0.10	23.E-06 12.E-06	0858
$Rb^{85}Br^{81}$	9←8	ground					25268.84 ±0.10	71.E-05 24.E-04	0858
		1					25170.56 ±0.10	30.E-05 61.E-05	0858
		2					25072.63 ±0.10	12.E-05 16.E-05	0858
$Rb^{87}Br^{79}$	9←8	ground					25312.99 ±0.10	28.E-05 93.E-05	0858
		1					25214.65 ±0.10	12.E-05 24.E-05	0858
		2					25116.57 ±0.10	49.E-06 64.E-06	0858

RbCl Rubidium chloride



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	$-Y_{11} \approx \alpha_e$ Mc/sec	Y_{21} Mc/sec	eqQ(Rb) Mc/sec v = 0	v = 1	v = 2
$Rb^{85}Cl^{35}$		9.450 c	2767.414m	{253}	2627.394	13.601	0.021	-52.675	-52.306	-51.903
$Rb^{87}Cl^{35}$			2609.799y	{253}	2609.779	13.464	0.021	-25.485		
References		0858	0944	9900	0944	0944	0944	0944		

Isotopic Molecular Species	eqQ(Cl) Mc/sec v = 0	v = 1	v = 2	C(Rb) (v=0) kc/sec	C(Cl) (v=0) kc/sec	I_e $10^{-40} gcm^2$	
$Rb^{85}Cl^{35}$	+0.774	+0.612	+0.470	+0.3±0.3	0.0±0.8	192.4077	
$Rb^{87}Cl^{35}$							
References	0944			0944	0944	0858	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Rb^{85}Cl^{35}$	1←0	ground	5/2	3	5/2	4	5232.671 ±.002	14.E-08 46.E-08	0944
			5/2	2	5/2	1	5232.750 ±.002	13.E-08 43.E-08	
			5/2	4	5/2	4	5232.809 ±.002	12.E-07 38.E-07	
			5/2	1	5/2	1	5232.889 ±.002	31.E-08 99.E-08	
			7/2	2	5/2	1	5243.745 ±.002	60.E-08 19.E-07	
			7/2	5	5/2	4	5243.788 ±.002	16.E-07 52.E-07	
			7/2	3	5/2	4	5243.855 ±.022	53.E-10 17.E-09	
			7/2	4	5/2	4	5243.905 ±.002	14.E-08 46.E-08	
			3/2	1	5/2	1	5248.566 ±.002	13.E-08 43.E-08	
			3/2	3	5/2	4	5248.566 ±.002	90.E-08 29.E-07	
							total intensity	10.E-07 33.E-07	
			3/2	2	5/2	1	5248.596 ±.002	15.E-09 48.E-09	
		1	7/2	2	5/2	1	5216.630 ±.002	18.E-08 29.E-08	0944
			7/2	5	5/2	4	5216.440 ±.002	48.E-08 80.E-08	
			7/2	3	5/2	4	5216.712 ±.002	16.E-10 26.E-10	
			7/2	4	5/2	4	5216.752 ±.002	42.E-09 70.E-09	
			3/2	3	5/2	4	5221.395 ±.002	26.E-08 44.E-08	
			3/2	1	5/2	1	5221.395 ±.002	40.E-09 65.E-09	
							total intensity	30.E-08 50.E-08	
			3/2	2	5/2	1	5221.421 ±.002	44.E-10 73.E-10	
		2	7/2	2	5/2	1	5189.587 ±.0025	52.E-09 44.E-09	0944
			7/2	5	5/2	4	5189.616 ±.0025	14.E-08 12.E-08	
			7/2	3	5/2	4	5189.656 ±.0025	46.E-11 40.E-11	
			7/2	4	5/2	4	5189.681 ±.0025	12.E-09 11.E-09	
			3/2	1	5/2	1	5194.306 ±.0025	12.E-09 10.E-09	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$Rb^{85}Cl^{35}$	1←0	2	3/2	3	5/2	4	5194.306 ±.0025	78.E-09	67.E-09	0944
							total intensity	89.E-09	77.E-09	
$Rb^{87}Cl^{35}$	1←0	ground	3/2	3	3/2	3	5201.032 ±.002	47.E-08	15.E-07	0944
			3/2	1	3/2	0	5201.032 ±.002	85.E-09	27.E-08	
							total intensity	56.E-08	18.E-07	
			5/2	2	3/2	3	5207.389 ±.002	85.E-10	27.E-09	
			1/2	2	3/2	3	5212.474 ±.002	30.E-08	94.E-08	
			1/2	1	3/2	0	5212.474 ±.002	43.E-09	13.E-08	
							total intensity	34.E-08	11.E-07	
			5/2	4	3/2	3	5247.332 ±.002	78.E-08	25.E-07	

RbI

Rubidium iodide

3.1769 Å

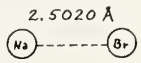
Rb ----- I

Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	γ_e kc/sec	D_e kc/sec	$\omega_e x_e$ cm^{-1}	I_e $10^{-40} gcm^2$
$Rb^{85}I^{127}$		9.762 c	984.3166m	147	984.3137	3.2806	2.98	0.234	0.25	513.5883
$Rb^{87}I^{127}$			970.7601y		970.7601	3.2135				
References		0858	0858	0858	0858	0858	0858	0858	0858	0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$Rb^{85}I^{127}$	11←10	ground					21617.58 ±0.10	76.E-05	26.E-04	0858
	12←11	1					23503.98 ±0.10	48.E-05	11.E-04	0858
		2					23425.51 ±0.10	24.E-05	38.E-05	0858
	13←12	ground					25547.52 ±0.10	12.E-04	42.E-04	0858
		1					25462.28 ±0.10	61.E-05	14.E-04	0858
		2					25377.33 ±0.10	30.E-05	48.E-05	0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$Rb^{85}I^{127}$	13←12	3					25292.65 ±0.10	15.E-05	16.E-05	0858
		4					25207.88 ±0.20	72.E-06	54.E-06	0858
		5					25123.45 ±0.10	35.E-06	18.E-06	0858
		6					25038.99 ±0.10	17.E-06	60.E-07	0858
$Rb^{87}I^{127}$	13←12	ground					25196.01 ±0.10	46.E-05	16.E-04	0858
		1					25112.84 ±0.10	23.E-05	53.E-05	0858
		2					25029.38 ±0.10	11.E-05	18.E-05	0858

NaBr Sodium bromide



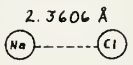
Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	γ_e kc/sec	D_e kc/sec	eqQ(Br) (v=0) Mc/sec	eqQ(Na) Mc/sec	I_e 10^{-40} gcm^2
$Na^{23}Br^{79}$		7.959 c	4534.52 m	{315}	4534.51	28.25	85±30	7±3	+58±2	−4.68	111.486
$Na^{23}Br^{81}$			4509.35 m	{315}	4509.34	28.06	[84]	(4.13)		−4.68	
References		0858	0858	9900	0858	0858	0858	0858	0858	0858	0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$Na^{23}Br^{79}$	2←1	ground		3/2		3/2	18070.07 ±.10	34.E-06	10.E-05	0858
				7/2		5/2	18080.13 ±.10	13.E-05	39.E-05	
				5/2		3/2	18080.13 ±.10	68.E-06	21.E-05	
							total intensity	20.E-05	60.E-05	
				3/2		1/2	18095.95 ±.15	27.E-06	82.E-06	
				5/2		5/2	18095.95 ±.15	29.E-06	89.E-06	
							total intensity	56.E-06	17.E-05	
		1		3/2		1/2	17082.5 ±.8	53.E-07	72.E-07	0858

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Na^{23}Br^{79}$	2←1	1		5/2		5/2	17082.5 ±.8	57.E-07 77.E-07	0858
							total intensity	11.E-06 15.E-06	
				7/2		5/2	17968.42 ±.20	28.E-06 38.E-06	
				5/2		3/2	17968.42 ±.20	15.E-06 20.E-06	
							total intensity	43.E-06 58.E-06	
		2		7/2		5/2	17856.57 ±.10	61.E-07 37.E-07	0858
				5/2		3/2	17856.57 ±.10	32.E-07 19.E-07	
							total intensity	93.E-07 56.E-07	
	3←2	1		9/2		7/2	26952.98 ±.10	84.E-06 11.E-05	0858
				7/2		5/2	26952.98 ±.10	58.E-06 78.E-06	
							total intensity	14.E-05 19.E-05	
				5/2		3/2	26956.30 ±.30	38.E-06 51.E-06	
				3/2		1/2	26956.30 ±.30	24.E-06 32.E-06	
							total intensity	62.E-06 83.E-06	
		2		9/2		7/2	26785.63 ±.10	18.E-06 11.E-06	0858
				7/2		5/2	26785.63 ±.10	13.E-06 76.E-07	
							total intensity	31.E-06 19.E-06	
				5/2		3/2	26789.51 ±.30	83.E-07 49.E-07	
				3/2		1/2	26789.51 ±.30	52.E-07 31.E-07	
							total intensity	13.E-06 80.E-07	
		3		9/2		7/2	26621.8 ±.8	40.E-07 11.E-07	0858
				7/2		5/2	26621.8 ±.8	28.E-07 73.E-08	
							total intensity	68.E-07 18.E-07	
		4		9/2		7/2	26455.8 ±.8	88.E-08 10.E-08	0858
				7/2		5/2	26455.8 ±.8	60.E-08 71.E-09	
							total intensity	15.E-07 17.E-08	
$Na^{23}Br^{81}$	2←1	ground		3/2		3/2	17971.0 ±.5	33.E-06 10.E-05	0858
				7/2		5/2	17980.48 ±.20	12.E-05 38.E-05	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Na^{23}Br^{81}$	2←1	ground		5/2		3/2	17980.48 ±.20	65.E-06 20.E-05	0858
							total intensity	19.E-05 58.E-05	
		1		7/2		5/2	17868.49 ±.10	27.E-06 37.E-06	0858
				5/2		3/2	17868.49 ±.10	14.E-06 19.E-06	
							total intensity	41.E-06 56.E-06	
	3←2	1		9/2		7/2	26803.55 ±.10	81.E-06 11.E-05	0858
				7/2		5/2	26803.55 ±.10	56.E-06 75.E-06	
							total intensity	14.E-05 19.E-05	
				5/2		3/2	26806.32 ±.40	36.E-06 49.E-06	
				3/2		1/2	26806.32 ±.40	23.E-06 31.E-06	
							total intensity	59.E-06 80.E-06	
		2		9/2		7/2	26639.9 ±.8	18.E-06 11.E-06	0858
				7/2		5/2	26639.9 ±.8	12.E-06 73.E-07	
							total intensity	30.E-06 18.E-06	
				5/2		3/2	26643.2 ±.8	80.E-07 48.E-07	
				3/2		1/2	26643.2 ±.8	50.E-07 30.E-07	
							total intensity	13.E-06 77.E-07	
		3		9/2		7/2	26475.0 ±.8	39.E-07 10.E-07	0858
				7/2		5/2	26475.0 ±.8	27.E-07 70.E-08	
							total intensity	65.E-07 17.E-07	

NaCl Sodium chloride

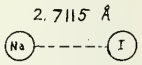


Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	γ_e kc/sec	D_e kc/sec	eqQ(Na) Mc/sec	I_e $10^{-40}gcm^2$	Addnl Micro Refs
$Na^{23}Cl^{35}$		8.5 m	6537.07 m	{380}	6536.86	48.28	[145]	(8.60)	-5.40	77.3331	0621

Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	γ_e kc/sec	D_e kc/sec	eqQ(Na) Mc/sec	I_e $10^{-40}gcm^2$	Addnl Micro Refs
$Na^{23}Cl^{37}$				{380}				(8.24)	-5.40		0938
References		0858	0858	9900	0858	0858	0858	0858	0858	0858	1357

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$Na^{23}Cl^{35}$	2←1	ground					26051.1 ±0.75	18.E-04	52.E-04	0858
		1					25857.6 ±0.75	28.E-05	31.E-05	0858
		2					25666.5 ±0.75	45.E-06	19.E-06	0858
		3					25473.9 ±0.75	71.E-07	11.E-07	0858
	7←6	ground					91170.45 ±0.04	73.E-03	21.E-02	1452
$Na^{23}Cl^{37}$	2←1	ground					25493.9 ±0.75	55.E-05	16.E-04	0858
		1					25307.5 ±0.75	88.E-06	97.E-06	0858
		2					25120.3 ±0.75	14.E-06	58.E-07	0858

NaI Sodium iodide



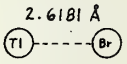
Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	Y_{01} Mc/sec	α_e Mc/sec	γ_e kc/sec	D_e kc/sec	eqQ(Na) Mc/sec	I_e $10^{-40}gcm^2$
$Na^{23}I^{127}$		7.993 c	3531.778m	286	3531.759	19.439	46.9	(2.39)	-3.88	143.138
References		0858	0858	9900	0858	0858	0858	0858	0858	0858

Isotopic Molecular Species	eqQ(I) Mc/sec v = 0	v = 1	v = 2	v = 3	
$Na^{23}I^{127}$	-259.87	-264.52	-267.59	-271.03	
References	0858				

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Na^{23}I^{127}$	3←2	ground		3/2		1/2	21108.64 ±.20	98.E-05 30.E-04	0858
				5/2		3/2	21111.67 ±.20	98.E-05 30.E-04	
				7/2		5/2	21124.58 ±.20	98.E-05 30.E-04	
				11/2		9/2	21135.35 ±.20	98.E-05 30.E-04	
				9/2		7/2	21137.49 ±.20	98.E-05 30.E-04	
				7/2		7/2	21137.49 ±.20	98.E-05 30.E-04	
							total intensity	20.E-04 61.E-04	
				3/2		3/2	21141.93 ±.20	98.E-05 30.E-04	
				5/2		5/2	21148.85 ±.20	98.E-05 30.E-04	
		1		9/2		9/2	20970.52 ±.20	25.E-05 36.E-05	0858
				7/2		5/2	21008.40 ±.20	25.E-05 36.E-05	
				9/2		7/2	21021.50 ±.20	25.E-05 36.E-05	
				7/2		7/2	21021.50 ±.20	25.E-05 36.E-05	
							total intensity	49.E-05 73.E-05	
		2		9/2		9/2	20854.59 ±.20	62.E-06 44.E-06	0858
				5/2		3/2	20879.61 ±.20	62.E-06 44.E-06	
				7/2		5/2	20892.92 ±.20	62.E-06 44.E-06	
				11/2		9/2	20903.62 ±.20	62.E-06 44.E-06	
				9/2		7/2	20906.05 ±.20	62.E-06 44.E-06	
				7/2		7/2	20906.05 ±.20	62.E-06 44.E-06	
							total intensity	12.E-05 87.E-06	
				5/2		5/2	20917.89 ±.20	62.E-06 44.E-06	
		3		9/2		9/2	20738.98 ±.20	15.E-06 52.E-07	0858
				5/2		3/2	20764.43 ±.40	15.E-06 52.E-07	
				7/2		5/2	20777.70 ±.20	15.E-06 52.E-07	
				11/2		9/2	20788.73 ±.20	16.E-06 52.E-07	
				9/2		7/2	20791.24 ±.20	16.E-06 52.E-07	
				7/2		7/2	20791.24 ±.20	16.E-06 52.E-07	
							total intensity	31.E-06 10.E-06	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$Na^{23}I^{127}$	3←2	3		5/2		5/2	20803.00 ±.20	16.E-06	52.E-07	0858
		4		7/2		5/2	20663.68 ±.2	39.E-07	63.E-08	0858
				11/2		9/2	20674.43 ±.2	39.E-07	63.E-08	
				9/2		7/2	20676.96 ±.2	39.E-07	63.E-08	
				7/2		7/2	20676.96 ±.2	39.E-07	63.E-08	
							total intensity	78.E-07	13.E-07	

TlBr Thallium bromide



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	α_e Mc/sec	D kc/sec	B_o Mc/sec	eqQ(Br) Mc/sec v = 0	v = 1	v = 2
$Tl^{203}Br^{79}$		4.49 p	1297.409m	{192}	3.934		1295.442	124.5		
$Tl^{203}Br^{81}$		4.49 p	1274.382m	{192}	3.872		1272.456	103.1		
$Tl^{205}Br^{79}$		4.49 p	1293.879m	{192}	3.932		1291.912	125.2	123.8	125.8
$Tl^{205}Br^{81}$		4.49 p	1270.805m	{192}	3.824	0.247	1268.894	105.2	104.5	106.2
References		1732	1449	9900	1449	1449	1449	1449		

Isotopic Molecular Species	eqQ(Br) Mc/sec v = 3	v = 4	Additional Microwave References	
$Tl^{203}Br^{79}$			1035	
$Tl^{203}Br^{81}$			1341	
$Tl^{205}Br^{79}$	132.8	125.8		
$Tl^{205}Br^{81}$	104.1	105.5		
References	1449			

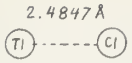
Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Tl^{203}Br^{79}$	4←3	ground		11/2		9/2	10362.63 ±0.03	15.E-07 48.E-07	1449
				9/2		7/2	10362.63 ±0.03	11.E-07 37.E-07	
							total intensity	26.E-07 86.E-07	
				7/2		5/2	10366.24 ±0.04	84.E-08 28.E-07	
				5/2		3/2	10366.24 ±0.04	63.E-08 21.E-07	
							total intensity	15.E-07 49.E-07	
		1		11/2		9/2	10331.16 ±0.04	58.E-08 12.E-07	1449
				9/2		7/2	10331.16 ±0.04	44.E-08 89.E-08	
							total intensity	10.E-07 21.E-07	
	9←8	ground					23317.65 ±0.10	49.E-06 16.E-05	1425
		1					23246.83 ±0.20	20.E-06 39.E-06	1425
		2					23175.68 ±0.20	77.E-07 94.E-07	1425
$Tl^{203}Br^{81}$	4←3	ground		11/2		9/2	10178.87 ±0.04	14.E-07 45.E-07	1449
				9/2		7/2	10178.87 ±0.04	10.E-07 34.E-07	
							total intensity	24.E-07 79.E-07	
				7/2		5/2	10181.86 ±0.06	78.E-08 26.E-07	
				5/2		3/2	10181.86 ±0.06	58.E-08 19.E-07	
							total intensity	14.E-07 45.E-07	
		1		11/2		9/2	10147.89 ±0.04	54.E-08 11.E-07	1449
				9/2		7/2	10147.89 ±0.04	41.E-08 83.E-08	
							total intensity	95.E-08 19.E-07	
	9←8	ground					22903.48 ±0.10	46.E-06 15.E-05	1425
		1					22834.13 ±0.20	18.E-06 36.E-06	1425
$Tl^{205}Br^{79}$	4←3	ground		11/2		9/2	10334.35 ±0.03	35.E-07 11.E-06	1449
				9/2		7/2	10334.35 ±0.03	27.E-07 88.E-07	
							total intensity	61.E-07 20.E-06	
				7/2		5/2	10337.98 ±0.03	20.E-07 66.E-07	
				5/2		3/2	10337.98 ±0.03	15.E-07 49.E-07	
							total intensity	35.E-07 12.E-06	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Tl^{205}Br^{79}$	4←3	1		11/2		9/2	10302.91 ±0.03	14.E-07 28.E-07	1449
				9/2		7/2	10302.91 ±0.03	10.E-07 21.E-07	
							total intensity	24.E-07 49.E-07	
				7/2		5/2	10306.50 ±0.03	79.E-08 16.E-07	
				5/2		3/2	10306.50 ±0.03	59.E-08 12.E-07	
							total intensity	14.E-07 28.E-07	
		2		11/2		9/2	10271.55 ±0.03	54.E-08 67.E-08	1449
				9/2		7/2	10271.55 ±0.03	41.E-08 51.E-08	
							total intensity	96.E-08 12.E-07	
				7/2		5/2	10275.20 ±0.03	31.E-08 38.E-08	
				5/2		3/2	10275.20 ±0.03	23.E-08 29.E-08	
							total intensity	54.E-08 67.E-08	
		3		11/2		9/2	10240.21 ±0.03	21.E-08 16.E-08	1449
				9/2		7/2	10240.21 ±0.03	16.E-08 12.E-08	
							total intensity	38.E-08 28.E-08	
				7/2		5/2	10243.80 ±0.03	12.E-08 92.E-09	
				5/2		3/2	10243.80 ±0.03	92.E-09 69.E-09	
							total intensity	22.E-08 16.E-08	
		4		11/2		9/2	10208.93 ±0.03	85.E-09 39.E-09	1449
				9/2		7/2	10208.93 ±0.03	65.E-09 30.E-09	
							total intensity	15.E-08 68.E-09	
				7/2		5/2	10212.58 ±0.04	49.E-09 22.E-09	
				5/2		3/2	10212.58 ±0.04	36.E-09 17.E-09	
							total intensity	85.E-09 39.E-09	
	6←5	ground		15/2		13/2	15502.55 ±0.10	11.E-06 36.E-06	1425
				13/2		11/2	15502.55 ±0.10	91.E-07 30.E-06	
							total intensity	20.E-06 66.E-06	
				11/2		9/2	15503.79 ±0.20	76.E-07 25.E-06	

Isotopic Molecular Species	Rotation J'←J"	Vibration v	F_1'	F'	F_1''	F"	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Tl^{205}Br^{79}$	6←5	ground		9/2		7/2	15503.79 ±0.20	64.E-07 21.E-06	1425
							total intensity	14.E-06 46.E-06	
	9←8	ground					23254.06 ±0.05	12.E-05 39.E-05	1425
		1					23183.49 ±0.10	46.E-06 93.E-06	1425
		2					23112.80 ±0.10	18.E-06 22.E-06	1425
		3					23042.54 ±0.10	72.E-07 54.E-07	1425
$Tl^{205}Br^{81}$	4←3	ground		11/2		9/2	10150.36 ±0.03	32.E-07 11.E-06	1449
				9/2		7/2	10150.36 ±0.03	25.E-07 81.E-07	
							total intensity	57.E-07 19.E-06	
				7/2		5/2	10153.41 ±0.03	18.E-07 61.E-07	
				5/2		3/2	10153.41 ±0.03	14.E-07 46.E-07	
							total intensity	32.E-07 11.E-06	
		1		11/2		9/2	10119.78 ±0.03	13.E-07 26.E-07	1449
				9/2		7/2	10119.78 ±0.03	97.E-08 20.E-07	
							total intensity	22.E-07 45.E-07	
				7/2		5/2	10122.81 ±0.03	73.E-08 15.E-07	
				5/2		3/2	10122.81 ±0.03	55.E-08 11.E-07	
							total intensity	13.E-07 26.E-07	
		2		11/2		9/2	10089.30 ±0.03	50.E-08 62.E-08	1449
				9/2		7/2	10089.30 ±0.03	38.E-08 47.E-08	
							total intensity	89.E-08 11.E-07	
				7/2		5/2	10092.38 ±0.03	29.E-08 36.E-08	
				5/2		3/2	10092.38 ±0.03	22.E-08 27.E-08	
							total intensity	51.E-08 62.E-08	
		3		11/2		9/2	10058.68 ±0.03	20.E-08 15.E-08	1449
				9/2		7/2	10058.68 ±0.03	15.E-08 11.E-08	
							total intensity	35.E-08 26.E-08	
				7/2		5/2	10061.70 ±0.03	11.E-08 86.E-09	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Tl^{205}Br^{81}$	4←3	3		5/2		3/2	10061.70 ±0.03	85.E-09 64.E-09	1449
							total intensity	20.E-08 15.E-08	
		4		11/2		9/2	10028.30 ±0.03	79.E-09 36.E-09	1449
				9/2		7/2	10028.30 ±0.03	60.E-09 27.E-09	
							total intensity	14.E-08 63.E-09	
				7/2		5/2	10031.36 ±0.04	45.E-09 21.E-09	
				5/2		3/2	10031.36 ±0.04	34.E-09 15.E-09	
							total intensity	79.E-09 36.E-09	
		5		11/2		9/2	9998.00 ±0.03	31.E-09 86.E-10	1449
				9/2		7/2	9998.00 ±0.03	24.E-09 66.E-10	
							total intensity	55.E-09 15.E-09	
		6		11/2		9/2	9967.35 ±0.08	12.E-09 21.E-10	1449
				9/2		7/2	9967.35 ±0.08	94.E-10 16.E-10	
							total intensity	22.E-09 37.E-10	
		7		11/2		9/2	9937.15 ±0.10	49.E-10 50.E-11	1449
				9/2		7/2	9937.15 ±0.10	37.E-10 38.E-11	
							total intensity	86.E-10 89.E-11	
		8		11/2		9/2	9906.80 ±0.10	19.E-10 12.E-11	1449
				9/2		7/2	9906.80 ±0.10	15.E-10 92.E-12	
							total intensity	34.E-10 21.E-11	
		9		11/2		9/2	9876.60 ±0.15	76.E-11 29.E-12	1449
				9/2		7/2	9876.60 ±0.15	58.E-11 22.E-12	
							total intensity	13.E-10 51.E-12	
	9←8	ground					22839.75 ±0.10	11.E-05 36.E-05	1425
		1					22771.22 ±0.20	43.E-06 86.E-06	1425
	10←9	ground					25377.53 ±0.05	15.E-05 49.E-05	1425

TlCl Thallium chloride



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	eqQ(Cl) Mc/sec	α_e Mc/sec	D kc/sec	B_o Mc/sec	Additional Microwave References	
$Tl^{203}Cl^{35}$			2743.913m	{287}	-15.8	11.950		2737.955	0518	
$Tl^{203}Cl^{37}$			2617.498m	{287}		11.175		2611.927	1341	
$Tl^{205}Cl^{35}$		4.444 m	2739.978m	{287}	-15.79	11.920	1.112	2734.035	1269	
$Tl^{205}Cl^{37}$			2613.548m	{287}	-11.75	11.145		2608.027	1035	
References		0518	1449	9900	1449,1425	1449	1449	1449		

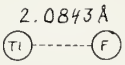
Isotopic Molecular Species	Rotation J'←J"	Vibration v	F_1'	F'	$F_1"$	F"	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$Tl^{203}Cl^{35}$	2←1	ground		7/2		5/2	10952.16 ±0.03	38.E-07	12.E-06	1449
				5/2		3/2	10952.16 ±0.03	20.E-07	61.E-07	
							total intensity	58.E-07	18.E-06	
		1		7/2		5/2	10904.36 ±0.03	94.E-08	14.E-07	1449
				5/2		3/2	10904.36 ±0.03	49.E-08	73.E-08	
							total intensity	14.E-07	21.E-07	
	4←3	ground					21903.16 ±0.20	75.E-06	23.E-05	1425
	5←4	ground		11/2		11/2	27376.62 ±0.10	22.E-07	67.E-07	1425
				13/2		11/2	27379.49 ±0.10	47.E-06	14.E-05	
				11/2		9/2	27379.49 ±0.10	38.E-06	12.E-05	
				9/2		7/2	27379.49 ±0.10	30.E-06	94.E-06	
				7/2		5/2	27379.49 ±0.10	24.E-06	75.E-06	
							total intensity	14.E-05	43.E-05	
		1		13/2		11/2	27260.18 ±0.10	12.E-06	17.E-06	1425
				11/2		9/2	27260.18 ±0.10	94.E-07	14.E-06	
				9/2		7/2	27260.18 ±0.10	76.E-07	11.E-06	
				7/2		5/2	27260.18 ±0.10	61.E-07	89.E-07	
							total intensity	35.E-06	51.E-06	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$Tl^{203}Cl^{35}$	5←4	2		13/2		11/2	27140.35 ±0.10	29.E-07	20.E-07	1425
				11/2		9/2	27140.35 ±0.10	24.E-07	16.E-07	
				9/2		7/2	27140.35 ±0.10	19.E-07	13.E-07	
				7/2		5/2	27140.35 ±0.10	15.E-07	11.E-07	
							total intensity	87.E-07	61.E-07	
$Tl^{203}Cl^{37}$	2←1	ground		7/2		5/2	10447.98 ±0.06	11.E-07	33.E-07	1449
				5/2		3/2	10447.98 ±0.06	56.E-08	17.E-07	
							total intensity	16.E-07	50.E-07	
		1		7/2		5/2	10403.28 ±0.06	27.E-08	41.E-08	1449
				5/2		3/2	10403.28 ±0.06	14.E-08	22.E-08	
							total intensity	42.E-08	63.E-08	
	4←3	ground					20895.33 ±0.10	21.E-06	65.E-06	1425
		1					20806.64 ±0.30	54.E-07	82.E-07	1425
	5←4	ground					26119.36 ±0.10	41.E-06	13.E-05	1425
$Tl^{205}Cl^{35}$	2←1	ground		7/2		5/2	10936.48 ±0.02	90.E-07	28.E-06	1449
				5/2		3/2	10936.48 ±0.02	47.E-07	15.E-06	
							total intensity	14.E-06	42.E-06	
				3/2		3/2	10939.30 ±0.02	24.E-07	74.E-07	
		1		7/2		5/2	10888.80 ±0.03	22.E-07	33.E-07	1449
				5/2		3/2	10888.80 ±0.03	12.E-07	17.E-07	
							total intensity	34.E-07	50.E-07	
		2		7/2		5/2	10841.66 ±0.03	56.E-08	39.E-08	1449
				5/2		3/2	10841.66 ±0.03	29.E-08	21.E-08	
							total intensity	85.E-08	60.E-08	
	4←3	ground					21872.16 ±0.10	18.E-05	55.E-05	1425
	5←4	ground					27340.51 ±0.10	35.E-05	11.E-04	1425
		1					27221.30 ±0.10	87.E-06	13.E-05	1425
		2					27102.42 ±0.10	22.E-06	15.E-06	1425

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Tl^{205}Cl^{37}$	2←1	ground		7/2		5/2	10432.38 ±0.06	25.E-07 78.E-07	1449
				5/2		3/2	10432.38 ±0.06	13.E-07 41.E-07	
							total intensity	38.E-07 12.E-06	
				3/2		3/2	10434.48 ±0.06	67.E-08 21.E-07	
		1		7/2		5/2	10387.80 ±0.12	65.E-08 98.E-08	1449
				5/2		3/2	10387.80 ±0.12	34.E-08 51.E-08	
							total intensity	99.E-08 15.E-07	
	4←3	ground					20864.11 ±0.20	50.E-06 16.E-05	1425
		1					20776.20 ±0.20	13.E-06 19.E-06	1425
	5←4	ground					26079.87 ±0.10	98.E-06 30.E-05	1425
		1					25969.04 ±0.20	25.E-06 38.E-06	1425

TlF Thallium fluoride

2.0843 Å

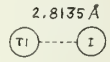


Isotopic Molecular Species	$\Delta\nu/p$ Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	α_e Mc/sec	D_e kc/sec	B_o Mc/sec	γ_e kc/sec	Additional Microwave References	
$Tl^{203}F^{19}$			6695.46 m	{475}	45.11		6672.90		1035	
$Tl^{205}F^{19}$		4.2282m	6689.71 m	{475}	44.83	5.91	6667.29	130	1341	
References		1454	1449	9900	1449	1425	1449	1449		

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Tl^{203}F^{19}$	1←0	ground					13345.80 ±0.06	25.E-06 70.E-06	1449
		1					13255.58 ±0.06	25.E-07 21.E-07	1449
	2←1	ground					26291.86 ±0.10	19.E-05 54.E-05	1425
$Tl^{205}F^{19}$	1←0	ground					13334.58 ±0.04	59.E-06 17.E-05	1449

Isotopic Molecular Species	Rotation J'←J"	Vibration v	F_1'	F'	F_1''	F"	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Tl^{205}F^{19}$	1←0	1					13244.92 ±0.04	59.E-07 50.E-07	1449
		2					13155.78 ±0.06	60.E-08 15.E-08	1449
	2←1	ground					26669.76 ±0.10	47.E-05 13.E-04	1425
		1					26489.86 ±0.20	47.E-06 40.E-06	1425

TlI Thallium iodide



Isotopic Molecular Species	Δν/p Mc/mm	μ Debye	B_e Mc/sec	ω_e cm^{-1}	α_e Mc/sec	eqQ(I) Mc/sec	D kc/sec	Additional Microwave References	
$Tl^{203}I^{127}$		4.60 p	817.510 m	{150}	1.98	-523		1035	
$Tl^{205}I^{127}$		4.60 p	814.460 m	{150}	1.989	-436.8	0.056	1341	
References		1732	1449	9900	1309, 1449	1309, 1449	1449		

Isotopic Molecular Species	Rotation J'←J"	Vibration v	F_1'	F'	F_1''	F"	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Tl^{203}I^{127}$	6←5	ground		15/2		13/2	9801.20 ±0.05	13.E-07 44.E-07	1449
	11←10	ground					17963.2	40.E-06 14.E-05	1309
		1					17919.2	19.E-06 45.E-06	1309
		2					17875.8	94.E-07 15.E-06	1309
		3					17831.8	46.E-07 49.E-07	1309
	17←16	ground					27760.25 ±0.30	14.E-05 49.E-05	1425
		1					27692.01 ±0.40	70.E-06 16.E-05	1425
		2					27624.02 ±0.20	34.E-06 53.E-06	1425
$Tl^{205}I^{127}$	5←4	ground		9/2		7/2	8131.45 ±0.04	11.E-07 38.E-07	1449
				11/2		9/2	8133.10 ±0.03	14.E-07 48.E-07	
				15/2		13/2	8136.96 ±0.02	22.E-07 75.E-07	

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300°	195°	Ref
$Tl^{205}I^{127}$	5←4	ground		13/2		11/2	8138.66 ±0.03	18.E-07	60.E-07	1449
		1		15/2		13/2	8117.06 ±0.03	11.E-07	25.E-07	1449
		2		15/2		13/2	8097.22 ±0.05	51.E-08	81.E-08	1449
	6←5	ground		9/2		7/2	9755.55 ±0.04	17.E-07	58.E-07	1449
				11/2		9/2	9757.30 ±0.03	21.E-07	71.E-07	
				7/2		5/2	9758.18 ±0.03	14.E-07	48.E-07	
				13/2		11/2	9761.27 ±0.02	25.E-07	86.E-07	
				17/2		15/2	9763.27 ±0.02	36.E-07	12.E-06	
				15/2		13/2	9764.52 ±0.03	30.E-07	10.E-06	
		1					9734.0	75.E-07	17.E-06	1309
	10←9	ground		19/2		17/2	16268.26 ±0.10	11.E-06	37.E-06	1425
				17/2		15/2	16268.26 ±0.10	97.E-07	33.E-06	
				15/2		13/2	16268.26 ±0.10	87.E-07	30.E-06	
							total intensity	29.E-06	00.E-06	
				25/2		23/2	16270.38 ±0.10	15.E-06	50.E-06	
				23/2		21/2	16270.38 ±0.10	13.E-06	45.E-06	
				21/2		19/2	16270.38 ±0.10	12.E-06	41.E-06	
							total intensity	40.E-06	14.E-05	
		1		19/2		17/2	16228.26 ±0.10	52.E-07	12.E-06	1425
				17/2		15/2	16228.26 ±0.10	47.E-07	11.E-06	
				15/2		13/2	16228.26 ±0.10	42.E-07	98.E-07	
							total intensity	14.E-06	33.E-06	
				25/2		23/2	16230.50 ±0.10	71.E-07	17.E-06	
				23/2		21/2	16230.50 ±0.10	64.E-07	15.E-06	
				21/2		19/2	16230.50 ±0.10	58.E-07	13.E-06	
							total intensity	19.E-06	45.E-06	
		2					16191.4	17.E-06	26.E-06	1309
		3					16152.0	81.E-07	87.E-07	1309

Isotopic Molecular Species	Rotation $J' \leftarrow J''$	Vibration v	F_1'	F'	F_1''	F''	ν Mc/sec	Intensity cm^{-1} 300° 195°	Ref
$Tl^{205}I^{127}$	11←10	ground					17896.0	95.E-06 32.E-05	1309
		1					17852.8	46.E-06 11.E-05	1309
		2					17809.2	22.E-06 35.E-06	1309
	13←12	ground		25/2		23/2	21148.78 ±0.05	24.E-06 82.E-06	1425
				23/2		21/2	21148.78 ±0.05	22.E-06 76.E-06	
				21/2		19/2	21148.78 ±0.05	21.E-06 70.E-06	
							total intensity	67.E-06 23.E-05	
				31/2		29/2	21149.81 ±0.10	31.E-06 10.E-05	
				29/2		27/2	21149.81 ±0.10	28.E-06 96.E-06	
				27/2		25/2	21149.81 ±0.10	26.E-06 89.E-06	
							total intensity	85.E-06 29.E-05	
	15←14	ground		29/2		27/2	24402.36 ±0.10	37.E-06 13.E-05	1425
				27/2		25/2	24402.36 ±0.10	35.E-06 12.E-05	
				25/2		23/2	24402.36 ±0.10	33.E-06 11.E-05	
							total intensity	10.E-05 36.E-05	
				35/2		33/2	24403.14 ±0.10	46.E-06 16.E-05	
				33/2		31/2	24403.14 ±0.10	43.E-06 15.E-05	
				31/2		29/2	24403.14 ±0.10	40.E-06 14.E-05	
							total intensity	13.E-05 44.E-05	
				35/2		33/2	24403.20 ±0.10	46.E-06 16.E-05	
	16←15	ground					26029.54 ±0.30	29.E-05 97.E-05	1425
	17←16	ground					27655.37 ±0.10	34.E-05 12.E-04	1425
		1					27588.22 ±0.20	17.E-05 38.E-05	1425
		2					27520.39 ±0.20	80.E-06 12.E-05	1425

Table 2.

Casimir's Function and Hyperfine Intensities

Casimir's function is given by the expression

$$f=[3C(C+1)/4-I(I+1)J(J+1)]/2I(2I-1)(2J-1)(2J+3)$$

where $C=F(F+1)-I(I+1)-J(J+1)$ and I, J, and F are the angular momentum quantum numbers. The hyperfine intensities $H(I, J', F'; I, J'', F'')$ are defined under Computation of Intensities. Both f and H are given for $I=1/2$ to $9/2$ in steps of $1/2$ and for $J=0$ to 10 in steps of $1/2$ and 11 to 20 in steps of 1.

				J+1←J			J←J	
I	J	F	CASIMIR'S FUNCTION	F+1←F	F←F	F−1←F	F←F+1 F+1←F	F←F
1/2	0	1/2	.000000	.666667	.333333			
1/2	1/2	1	.000000	.625000	.125000			.500000
1/2	1/2	0	.000000	.250000			.250000	
1/2	1	3/2	.000000	.600000	.066667			.555556
1/2	1	1/2	.000000	.333333			.111111	.222222
1/2	3/2	2	.000000	.583333	.041667			.562500
1/2	3/2	1	.000000	.375000			.062500	.312500
1/2	2	5/2	.000000	.571429	.028571			.560000
1/2	2	3/2	.000000	.400000			.040000	.360000
1/2	5/2	3	.000000	.562500	.020833			.555556
1/2	5/2	2	.000000	.416667			.027778	.388889
1/2	3	7/2	.000000	.555556	.015873			.551020
1/2	3	5/2	.000000	.428571			.020408	.408163
1/2	7/2	4	.000000	.550000	.012500			.546875
1/2	7/2	3	.000000	.437500			.015625	.421875
1/2	4	9/2	.000000	.545455	.010101			.543210
1/2	4	7/2	.000000	.444444			.012346	.432099
1/2	9/2	5	.000000	.541667	.008333			.540000
1/2	9/2	4	.000000	.450000			.010000	.440000
1/2	5	11/2	.000000	.538462	.006993			.537190
1/2	5	9/2	.000000	.454545			.008264	.446281
1/2	11/2	6	.000000	.535714	.005952			.534722
1/2	11/2	5	.000000	.458333			.006944	.451389
1/2	6	13/2	.000000	.533333	.005128			.532544
1/2	6	11/2	.000000	.461538			.005917	.455621
1/2	13/2	7	.000000	.531250	.004464			.530612
1/2	13/2	6	.000000	.464286			.005102	.459184
1/2	7	15/2	.000000	.529412	.003922			.528889
1/2	7	13/2	.000000	.466667			.004444	.462222
1/2	15/2	8	.000000	.527778	.003472			.527344
1/2	15/2	7	.000000	.468750			.003906	.464844
1/2	8	17/2	.000000	.526316	.003096			.525952
1/2	8	15/2	.000000	.470588			.003460	.467128
1/2	17/2	9	.000000	.525000	.002778			.524691
1/2	17/2	8	.000000	.472222			.003086	.469136
1/2	9	19/2	.000000	.523810	.002506			.523546
1/2	9	17/2	.000000	.473684			.002770	.470914

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
1/2	19/2	10	.000000	.522727	.002273			.522500
1/2	19/2	9	.000000	.475000			.002500	.472500
1/2	10	21/2	.000000	.521739	.002070			.521542
1/2	10	19/2	.000000	.476190			.002268	.473923
1/2	11	23/2	.000000	.520000	.001739			.519849
1/2	11	21/2	.000000	.478261			.001890	.476371
1/2	12	25/2	.000000	.518519	.001481			.518400
1/2	12	23/2	.000000	.480000			.001600	.478400
1/2	13	27/2	.000000	.517241	.001277			.517147
1/2	13	25/2	.000000	.481481			.001372	.480110
1/2	14	29/2	.000000	.516129	.001112			.516052
1/2	14	27/2	.000000	.482759			.001189	.481570
1/2	15	31/2	.000000	.515152	.000978			.515088
1/2	15	29/2	.000000	.483871			.001041	.482830
1/2	16	33/2	.000000	.514286	.000866			.514233
1/2	16	31/2	.000000	.484848			.000918	.483930
1/2	17	35/2	.000000	.513514	.000772			.513469
1/2	17	33/2	.000000	.485714			.000816	.484898
1/2	18	37/2	.000000	.512821	.000693			.512783
1/2	18	35/2	.000000	.486486			.000730	.485756
1/2	19	39/2	.000000	.512195	.000625			.512163
1/2	19	37/2	.000000	.487179			.000657	.486522
1/2	20	41/2	.000000	.511628	.000567			.511600
1/2	20	39/2	.000000	.487805			.000595	.487210
1	0	1	.000000	.555556	.333333	.111111		
1	1/2	3/2	.000000	.500000	.148148	.018519		.370370
1	1/2	1/2	.000000	.185185	.148148		.296296	.037037
1	1	2	.050000	.466667	.083333	.005556		.416667
1	1	1	-.250000	.250000	.083333		.138889	.083333
1	1	0	.500000	.111111			.111111	
1	3/2	5/2	.062500	.444444	.053333	.002222		.420000
1	3/2	3/2	-.250000	.280000	.053333		.080000	.179259
1	3/2	1/2	.312500	.166667			.074074	.092593
1	2	3	.071429	.428571	.037037	.001058		.414815
1	2	2	-.250000	.296296	.037037		.051852	.231481
1	2	1	.250000	.200000			.050000	.150000
1	5/2	7/2	.078125	.416667	.027211	.000567		.408163

				J+1←J			J←J	
I	J	F	CASIMIR'S FUNCTION	F+1←F	F←F	F−1←F	F←F+1 F+1←F	F←F
1	5/2	5/2	−.250000	.306122	.027211		.036281	.261497
1	5/2	3/2	.218750	.222222			.035556	.186667
1	3	4	.083333	.407407	.020833	.000331		.401786
1	3	3	−.250000	.312500	.020833		.026786	.280093
1	3	2	.200000	.238095			.026455	.211640
1	7/2	9/2	.087500	.400000	.016461	.000206		.396091
1	7/2	7/2	−.250000	.316872	.016461		.020576	.292349
1	7/2	5/2	.187500	.250000			.020408	.229592
1	4	5	.090909	.393939	.013333	.000135		.391111
1	4	4	−.250000	.320000	.013333		.016296	.300833
1	4	3	.178571	.259259			.016204	.243056
1	9/2	11/2	.093750	.388889	.011019	.000092		.386777
1	9/2	9/2	−.250000	.322314	.011019		.013223	.306941
1	9/2	7/2	.171875	.266667			.013169	.253498
1	5	6	.096154	.384615	.009259	.000065		.382997
1	5	5	−.250000	.324074	.009259		.010943	.311481
1	5	4	.166667	.272727			.010909	.261818
1	11/2	13/2	.098214	.380952	.007890	.000047		.379684
1	11/2	11/2	−.250000	.325444	.007890		.009204	.314946
1	11/2	9/2	.162500	.277778			.009183	.268595
1	6	7	.100000	.377778	.006803	.000035		.376766
1	6	6	−.250000	.326531	.006803		.007849	.317649
1	6	5	.159091	.282051			.007835	.274217
1	13/2	15/2	.101563	.375000	.005926	.000026		.374180
1	13/2	13/2	−.250000	.327407	.005926		.006772	.319798
1	13/2	11/2	.156250	.285714			.006762	.278952
1	7	8	.102941	.372549	.005208	.000020		.371875
1	7	7	−.250000	.328125	.005208		.005903	.321535
1	7	6	.153846	.288889			.005896	.282993
1	15/2	17/2	.104167	.370370	.004614	.000016		.369810
1	15/2	15/2	−.250000	.328720	.004614		.005190	.322958
1	15/2	13/2	.151786	.291667			.005185	.286481
1	8	9	.105263	.368421	.004115	.000013		.367950
1	8	8	−.250000	.329218	.004115		.004599	.324138
1	8	7	.150000	.294118			.004596	.289522
1	17/2	19/2	.106250	.366667	.003693	.000010		.366267
1	17/2	17/2	−.250000	.329640	.003693		.004104	.325129
1	17/2	15/2	.148438	.296296			.004101	.292195
1	9	10	.107143	.365079	.003333	.000008		.364737
1	9	9	−.250000	.330000	.003333		.003684	.325967
1	9	8	.147059	.298246			.003682	.294564

I	J	F	CASIMIR'S FUNCTION	J+1←J			J←J	
				F+1←F	F←F	F−1←F	F←F+1 F+1←F	F←F
1	19/2	21/2	.107955	.363636	.003023	.000007		.363341
1	19/2	19/2	−.250000	.330310	.003023		.003326	.326683
1	19/2	17/2	.145833	.300000			.003324	.296676
1	10	11	.108696	.362319	.002755	.000006		.362062
1	10	10	−.250000	.330579	.002755		.003017	.327300
1	10	9	.144737	.301587			.003016	.298571
1	11	12	.110000	.360000	.002315	.000004		.359803
1	11	11	−.250000	.331019	.002315		.002516	.328302
1	11	10	.142857	.304348			.002515	.301833
1	12	13	.111111	.358025	.001972	.000003		.357870
1	12	12	−.250000	.331361	.001972		.002130	.329074
1	12	11	.141304	.306667			.002130	.304537
1	13	14	.112069	.356322	.001701	.000002		.356198
1	13	13	−.250000	.331633	.001701		.001827	.329680
1	13	12	.140000	.308642			.001826	.306816
1	14	15	.112903	.354839	.001481	.000002		.354738
1	14	14	−.250000	.331852	.001481		.001584	.330166
1	14	13	.138889	.310345			.001583	.308761
1	15	16	.113636	.353535	.001302	.000001		.353453
1	15	15	−.250000	.332031	.001302		.001386	.330561
1	15	14	.137931	.311828			.001386	.310442
1	16	17	.114286	.352381	.001153	.000001		.352312
1	16	16	−.250000	.332180	.001153		.001223	.330887
1	16	15	.137097	.313131			.001223	.311908
1	17	18	.114865	.351351	.001029	.000001		.351293
1	17	17	−.250000	.332305	.001029		.001088	.331158
1	17	16	.136364	.314286			.001087	.313198
1	18	19	.115385	.350427	.000923	.000001		.350378
1	18	18	−.250000	.332410	.000923		.000973	.331387
1	18	17	.135714	.315315			.000973	.314342
1	19	20	.115854	.349593	.000833	.000001		.349551
1	19	19	−.250000	.332500	.000833		.000876	.331581
1	19	18	.135135	.316239			.000876	.315363
1	20	21	.116279	.348837	.000756	.000000		.348801
1	20	20	−.250000	.332577	.000756		.000793	.331748
1	20	19	.134615	.317073			.000793	.316280
3/2	0	3/2	.000000	.500000	.333333	.166667		
3/2	1/2	2	.000000	.437500	.156250	.031250		.312500
3/2	1/2	1	.000000	.156250	.156250	.062500	.312500	.062500
3/2	1	5/2	.050000	.400000	.090000	.010000		.350000
3/2	1	3/2	−.200000	.210000	.106667	.016667	.150000	.044444

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
3/2	1	1/2	.250000	.083333	.083333		.138889	.027778
3/2	3/2	3	.062500	.375000	.058333	.004167		.350000
3/2	3/2	2	-.187500	.233333	.072917	.006250	.087500	.125000
3/2	3/2	1	.062500	.131250	.056250		.100000	.025000
3/2	3/2	0	.312500	.062500			.062500	
3/2	2	7/2	.071429	.357143	.040816	.002041		.342857
3/2	2	5/2	-.178571	.244898	.052245	.002857	.057143	.172857
3/2	2	3/2	.000000	.160000	.040000		.070000	.080000
3/2	2	1/2	.250000	.100000			.050000	.050000
3/2	5/2	4	.078125	.343750	.030134	.001116		.334821
3/2	5/2	3	-.171875	.251116	.039063	.001488	.040179	.200694
3/2	5/2	2	-.031250	.178571	.029762		.050794	.120040
3/2	5/2	1	.218750	.125000			.037500	.087500
3/2	3	9/2	.083333	.333333	.023148	.000661		.327381
3/2	3	7/2	-.166667	.254630	.030234	.000850	.029762	.217687
3/2	3	5/2	-.050000	.191327	.022959		.038265	.147449
3/2	3	3/2	.200000	.142857			.028571	.114286
3/2	7/2	5	.087500	.325000	.018333	.000417		.320833
3/2	7/2	4	-.162500	.256667	.024062	.000521	.022917	.228571
3/2	7/2	3	-.062500	.200521	.018229		.029762	.166667
3/2	7/2	2	.187500	.156250			.022321	.133929
3/2	4	11/2	.090909	.318182	.014876	.000275		.315152
3/2	4	9/2	-.159091	.257851	.019590	.000337	.018182	.235831
3/2	4	7/2	-.071429	.207407	.014815		.023765	.180600
3/2	4	5/2	.178571	.166667			.017857	.148810
3/2	9/2	6	.093750	.312500	.012311	.000189		.310227
3/2	9/2	5	-.156250	.258523	.016250	.000227	.014773	.240833
3/2	9/2	4	-.078125	.212727	.012273		.019394	.191023
3/2	9/2	3	.171875	.175000			.014583	.160417
3/2	5	13/2	.096154	.307692	.010355	.000134		.305944
3/2	5	11/2	-.153846	.258876	.013693	.000159	.012238	.244374
3/2	5	9/2	-.083333	.216942	.010331		.016116	.199036
3/2	5	7/2	.166667	.181818			.012121	.169697
3/2	11/2	7	.098214	.303571	.008830	.000098		.302198
3/2	11/2	6	-.151786	.259027	.011692	.000114	.010302	.246934
3/2	11/2	5	-.087500	.220353	.008814		.013598	.205342
3/2	11/2	4	.162500	.187500			.010227	.177273
3/2	6	15/2	.100000	.300000	.007619	.000073		.298901
3/2	6	13/2	-.150000	.259048	.010099	.000085	.008791	.248817
3/2	6	11/2	-.090909	.223161	.007608		.011623	.210405
3/2	6	9/2	.159091	.192308			.008741	.183566
3/2	13/2	8	.101563	.296875	.006641	.000056		.295982
3/2	13/2	7	-.148438	.258984	.008809	.000064	.007589	.250221
3/2	13/2	6	-.093750	.225510	.006633		.010047	.214541

I	J	F	CASIMIR'S FUNCTION	J+1←J			J←J	
				F+1←F	F←F	F−1←F	F←F+1 F+1←F	F←F
3/2	13/2	5	.156250	.196429			.007555	.188874
3/2	7	17/2	.102941	.294118	.005839	.000043		.293382
3/2	7	15/2	−.147059	.258867	.007751	.000049	.006618	.251279
3/2	7	13/2	−.096154	.227500	.005833		.008770	.217970
3/2	7	11/2	.153846	.200000			.006593	.193407
3/2	15/2	9	.104167	.291667	.005174	.000034		.291054
3/2	15/2	8	−.145833	.258715	.006872	.000038	.005821	.252083
3/2	15/2	7	−.098214	.229205	.005170		.007721	.220851
3/2	15/2	6	.151786	.203125			.005804	.197321
3/2	8	19/2	.105263	.289474	.004617	.000027		.288958
3/2	8	17/2	−.144737	.258541	.006134	.000030	.005160	.252698
3/2	8	15/2	−.100000	.230681	.004614		.006848	.223299
3/2	8	13/2	.150000	.205882			.005147	.200735
3/2	17/2	10	.106250	.287500	.004145	.000022		.287061
3/2	17/2	9	−.143750	.258355	.005509	.000024	.004605	.253168
3/2	17/2	8	−.101563	.231969	.004142		.006116	.225400
3/2	17/2	7	.148438	.208333			.004596	.203738
3/2	9	21/2	.107143	.285714	.003741	.000018		.285338
3/2	9	19/2	−.142857	.258163	.004975	.000020	.004135	.253529
3/2	9	17/2	−.102941	.233102	.003740		.005494	.227220
3/2	9	15/2	.147059	.210526			.004128	.206398
3/2	19/2	11	.107955	.284091	.003394	.000015		.283766
3/2	19/2	10	−.142045	.257969	.004514	.000016	.003734	.253804
3/2	19/2	9	−.104167	.234107	.003393		.004962	.228810
3/2	19/2	8	.145833	.212500			.003728	.208772
3/2	10	23/2	.108696	.282609	.003093	.000012		.282326
3/2	10	21/2	−.141304	.257776	.004115	.000013	.003388	.254013
3/2	10	19/2	−.105263	.235003	.003092		.004504	.230208
3/2	10	17/2	.144737	.214286			.003383	.210902
3/2	11	25/2	.110000	.280000	.002600	.000009		.279783
3/2	11	23/2	−.140000	.257400	.003460	.000009	.002826	.254284
3/2	11	21/2	−.107143	.236531	.002599		.003759	.232548
3/2	11	19/2	.142857	.217391			.002823	.214568
3/2	12	27/2	.111111	.277778	.002216	.000006		.277607
3/2	12	25/2	−.138889	.257043	.002950	.000007	.002393	.254422
3/2	12	23/2	−.108696	.237785	.002215		.003185	.234424
3/2	12	21/2	.141304	.220000			.002391	.217609
3/2	13	29/2	.112069	.275862	.001911	.000005		.275725
3/2	13	27/2	−.137931	.256710	.002544	.000005	.002053	.254475
3/2	13	25/2	−.110000	.238830	.001911		.002732	.235957
3/2	13	23/2	.140000	.222222			.002051	.220171
3/2	14	31/2	.112903	.274194	.001665	.000004		.274082
3/2	14	29/2	−.137097	.256400	.002217	.000004	.001780	.254471
3/2	14	27/2	−.111111	.239715	.001665		.002370	.237231

I	J	F	CASIMIR'S FUNCTION	J+1←J			J←J	
				F+1←F	F←F	F−1←F	F←F+1 F+1←F	F←F
3/2	14	25/2	.138889	.224138			.001779	.222359
3/2	15	33/2	.113636	.272727	.001463	.000003		.272636
3/2	15	31/2	−.136364	.256112	.001949	.000003	.001558	.254432
3/2	15	29/2	−.112069	.240472	.001463		.002075	.238304
3/2	15	27/2	.137931	.225806			.001557	.224249
3/2	16	35/2	.114286	.271429	.001297	.000002		.271352
3/2	16	33/2	−.135714	.255846	.001727	.000002	.001375	.254369
3/2	16	31/2	−.112903	.241128	.001296		.001831	.239218
3/2	16	29/2	.137097	.227273			.001375	.225898
3/2	17	37/2	.114865	.270270	.001157	.000002		.270206
3/2	17	35/2	−.135135	.255600	.001541	.000002	.001223	.254292
3/2	17	33/2	−.113636	.241701	.001156		.001629	.240006
3/2	17	31/2	.136364	.228571			.001222	.227349
3/2	18	39/2	.115385	.269231	.001038	.000001		.269176
3/2	18	37/2	−.134615	.255372	.001383	.000001	.001094	.254205
3/2	18	35/2	−.114286	.242205	.001038		.001458	.240692
3/2	18	33/2	.135714	.229730			.001094	.228636
3/2	19	41/2	.115854	.268293	.000937	.000001		.268246
3/2	19	39/2	−.134146	.255161	.001248	.000001	.000985	.254113
3/2	19	37/2	−.114865	.242653	.000937		.001312	.241293
3/2	19	35/2	.135135	.230769			.000985	.229784
3/2	20	43/2	.116279	.267442	.000850	.000001		.267401
3/2	20	41/2	−.133721	.254964	.001132	.000001	.000891	.254019
3/2	20	39/2	−.115385	.243053	.000850		.001188	.241824
3/2	20	37/2	.134615	.231707			.000891	.230816
2	0	2	.000000	.466667	.333333	.200000		
2	1/2	5/2	.000000	.400000	.160000	.040000		.280000
2	1/2	3/2	.000000	.140000	.160000	.100000	.320000	.080000
2	1	3	.050000	.360000	.093333	.013333		.311111
2	1	2	−.175000	.186667	.116667	.030000	.155556	.027778
2	1	1	.175000	.070000	.090000	.040000	.150000	.050000
2	3/2	7/2	.062500	.333333	.060952	.005714		.308571
2	3/2	5/2	−.156250	.205714	.082286	.012000	.091429	.096571
2	3/2	3/2	.000000	.112000	.074667	.013333	.112000	.008000
2	3/2	1/2	.218750	.046667	.053333		.080000	.020000
2	2	4	.071429	.314286	.042857	.002857		.300000
2	2	3	−.142857	.214286	.060000	.005714	.060000	.140000
2	2	2	−.053571	.137143	.057143	.005714	.080000	.050000
2	2	1	.125000	.080000	.040000		.070000	.010000
2	2	0	.250000	.040000			.040000	
2	5/2	9/2	.078125	.300000	.031746	.001587		.291005
2	5/2	7/2	−.132813	.218254	.045351	.003061	.042328	.165563
2	5/2	5/2	−.078125	.153061	.044082	.002857	.058776	.086367

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
2	5/2	3/2	.078125	.102857	.030476		.054857	.042921
2	5/2	1/2	.218750	.066667			.035556	.031111
2	3	5	.083333	.288889	.024444	.000952		.282857
2	3	4	−.125000	.220000	.035357	.001786	.031429	.181071
2	3	3	−.091667	.163690	.034722	.001587	.044643	.112500
2	3	2	.050000	.119048	.023810		.042857	.071429
2	3	1	.200000	.085714			.028571	.057143
2	7/2	11/2	.087500	.280000	.019394	.000606		.275758
2	7/2	9/2	−.118750	.220606	.028283	.001111	.024242	.190837
2	7/2	7/2	−.100000	.171111	.027937	.000952	.034921	.131066
2	7/2	5/2	.031250	.130952	.019048		.034014	.093129
2	7/2	3/2	.187500	.100000			.022857	.077143
2	4	6	.090909	.272727	.015758	.000404		.269630
2	4	5	−.113636	.220606	.023111	.000727	.019259	.197185
2	4	4	−.105519	.176485	.022909	.000606	.028000	.144500
2	4	3	.017857	.140000	.015556		.027500	.109537
2	4	2	.178571	.111111			.018519	.092593
2	9/2	13/2	.093750	.266667	.013054	.000280		.264336
2	9/2	11/2	−.109375	.220280	.019224	.000496	.015664	.201416
2	9/2	9/2	−.109375	.180496	.019100	.000404	.022920	.154454
2	9/2	7/2	.007813	.147071	.012929		.022626	.122136
2	9/2	5/2	.171875	.120000			.015238	.104762
2	5	7	.096154	.261538	.010989	.000200		.259740
2	5	6	−.105769	.219780	.016234	.000350	.012987	.204286
2	5	5	−.112179	.183566	.016154	.000280	.019091	.162000
2	5	4	.000000	.152727	.010909		.018909	.132000
2	5	3	.166667	.127273			.012727	.114545
2	11/2	15/2	.098214	.257143	.009377	.000147		.255726
2	11/2	13/2	−.102679	.219194	.013886	.000254	.010940	.206255
2	11/2	11/2	−.114286	.185968	.013832	.000200	.016138	.167842
2	11/2	9/2	−.006250	.157343	.009324		.016020	.139872
2	11/2	7/2	.162500	.133333			.010774	.122559
2	6	8	.100000	.253333	.008095	.000110		.252198
2	6	7	−.100000	.218571	.012009	.000188	.009341	.207614
2	6	6	−.115909	.187881	.011973	.000147	.013815	.172449
2	6	5	−.011364	.161172	.008059		.013736	.146264
2	6	4	.159091	.138462			.009231	.129231
2	13/2	17/2	.101563	.250000	.007059	.000084		.249076
2	13/2	15/2	−.097656	.217941	.010487	.000143	.008067	.208548
2	13/2	13/2	−.117188	.189429	.010462	.000110	.011956	.176142
2	13/2	11/2	−.015625	.164396	.007033		.011902	.151535
2	13/2	9/2	.156250	.142857			.007992	.134865
2	7	9	.102941	.247059	.006209	.000065		.246296
2	7	8	−.095588	.217320	.009236	.000110	.007037	.209183
2	7	7	−.118213	.190699	.009217	.000084	.010446	.179145
2	7	6	−.019231	.167143	.006190		.010408	.155941

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
2	7	5	.153846	.146667			.006984	.139683
2	15/2	19/2	.104167	.244444	.005504	.000052		.243808
2	15/2	17/2	−.093750	.216718	.008195	.000087	.006192	.209604
2	15/2	15/2	−.119048	.191753	.008181	.000065	.009204	.181619
2	15/2	13/2	−.022321	.169510	.005490		.009176	.159670
2	15/2	11/2	.151786	.150000			.006154	.143846
2	8	10	.105263	.242105	.004912	.000041		.241569
2	8	9	−.092105	.216140	.007320	.000069	.005490	.209869
2	8	8	−.119737	.192638	.007310	.000052	.008170	.183681
2	8	7	−.025000	.171569	.004902		.008150	.162859
2	8	6	.150000	.152941			.005462	.147479
2	17/2	21/2	.106250	.240000	.004411	.000033		.239543
2	17/2	19/2	−.090625	.215589	.006578	.000055	.004901	.210021
2	17/2	17/2	−.120312	.193389	.006570	.000041	.007300	.185415
2	17/2	15/2	−.027344	.173375	.004403		.007285	.165613
2	17/2	13/2	.148438	.155556			.004880	.150675
2	9	11	.107143	.238095	.003983	.000027		.237703
2	9	10	−.089286	.215065	.005943	.000045	.004402	.210089
2	9	9	−.120798	.194030	.005937	.000033	.006561	.186889
2	9	8	−.029412	.174971	.003977		.006550	.168012
2	9	7	.147059	.157895			.004386	.153509
2	19/2	23/2	.107955	.236364	.003614	.000023		.236025
2	19/2	21/2	−.088068	.214568	.005395	.000037	.003975	.210096
2	19/2	19/2	−.121212	.194583	.005390	.000027	.005929	.188151
2	19/2	17/2	−.031250	.176391	.003609		.005920	.170117
2	19/2	15/2	.145833	.160000			.003963	.156037
2	10	12	.108696	.234783	.003294	.000019		.234488
2	10	11	−.086957	.214097	.004919	.000031	.003608	.210056
2	10	10	−.121568	.195062	.004916	.000023	.005384	.189240
2	10	9	−.032895	.177662	.003290		.005377	.171978
2	10	8	.144737	.161905			.003598	.158307
2	11	13	.110000	.232000	.002769	.000013		.231773
2	11	12	−.085000	.213231	.004139	.000022	.003010	.209885
2	11	11	−.122143	.195848	.004136	.000016	.004496	.191012
2	11	10	−.035714	.179842	.002767		.004492	.175113
2	11	9	.142857	.165217			.003004	.162213
2	12	14	.111111	.229630	.002361	.000010		.229451
2	12	13	−.083333	.212454	.003530	.000016	.002549	.209640
2	12	12	−.122585	.196460	.003528	.000011	.003811	.192382
2	12	11	−.038043	.181641	.002359		.003808	.177647
2	12	10	.141304	.168000			.002545	.165455
2	13	15	.112069	.227586	.002036	.000007		.227443
2	13	14	−.081897	.211757	.003046	.000012	.002187	.209357
2	13	13	−.122931	.196947	.003045	.000008	.003271	.193461
2	13	12	−.040000	.183150	.002035		.003269	.179732
2	13	11	.140000	.170370			.002184	.168186

I	J	F	CASIMIR'S FUNCTION	J + I ← J			J ← J	
				F + I ← F	F ← F	F − I ← F	F ← F + I F + I ← F	F ← F
2	14	16	.112903	.225806	.001774	.000006		.225690
2	14	15	−.080645	.211129	.002655	.000009	.001897	.209059
2	14	14	−.123208	.197339	.002654	.000006	.002837	.194327
2	14	13	−.041667	.184433	.001773		.002836	.181476
2	14	12	.138889	.172414			.001895	.170519
2	15	17	.113636	.224242	.001560	.000004		.224146
2	15	16	−.079545	.210561	.002335	.000007	.001660	.208758
2	15	15	−.123433	.197661	.002334	.000005	.002485	.195031
2	15	14	−.043103	.185538	.001559		.002484	.182954
2	15	13	.137931	.174194			.001659	.172535
2	16	18	.114286	.222857	.001382	.000003		.222777
2	16	17	−.078571	.210047	.002069	.000005	.001466	.208461
2	16	16	−.123618	.197927	.002069	.000004	.002194	.195613
2	16	15	−.044355	.186497	.001381		.002193	.184221
2	16	14	.137097	.175758			.001465	.174293
2	17	19	.114865	.221622	.001233	.000003		.221554
2	17	18	−.077703	.209578	.001846	.000004	.001303	.208174
2	17	17	−.123771	.198151	.001846	.000003	.001951	.196098
2	17	16	−.045455	.187339	.001232		.001951	.185318
2	17	15	.136364	.177143			.001303	.175840
2	18	20	.115385	.220513	.001107	.000002		.220455
2	18	19	−.076923	.209150	.001658	.000003	.001166	.207897
2	18	18	−.123901	.198340	.001657	.000002	.001747	.196507
2	18	17	−.046429	.188083	.001106		.001746	.186277
2	18	16	.135714	.178378			.001166	.177213
2	19	21	.115854	.219512	.000999	.000002		.219463
2	19	20	−.076220	.208757	.001496	.000003	.001050	.207633
2	19	19	−.124011	.198502	.001496	.000002	.001573	.196855
2	19	18	−.047297	.188745	.000999		.001573	.187121
2	19	17	.135135	.179487			.001050	.178438
2	20	22	.116279	.218605	.000906	.000001		.218562
2	20	21	−.075581	.208396	.001358	.000002	.000950	.207382
2	20	20	−.124106	.198641	.001357	.000002	.001424	.197153
2	20	19	−.048077	.189338	.000906		.001423	.187871
2	20	18	.134615	.180488			.000950	.179538
5/2	0	5/2	.000000	.444444	.333333	.222222		
5/2	1/2	3	.000000	.375000	.162037	.046296		.259259
5/2	1/2	2	.000000	.129630	.162037	.125000	.324074	.092593
5/2	1	7/2	.050000	.333333	.095238	.015873		.285714
5/2	1	5/2	−.160000	.171429	.121905	.040000	.158730	.019048
5/2	1	3/2	.140000	.062222	.093333	.066667	.155556	.066667
5/2	3/2	4	.062500	.305556	.062500	.006944		.281250
5/2	3/2	3	−.137500	.187500	.087500	.016667	.093750	.079398
5/2	3/2	2	−.025000	.100000	.083333	.025000	.118519	.002315

				J+I ← J			J ← J	
							F ← F+I	
I	J	F	CASIMIR'S FUNCTION	F+I ← F	F ← F	F−I ← F	F+I ← F	F ← F
5/2	3/2	1	.175000	.038889	.058333	.027778	.087500	.037500
5/2	2	9/2	.071429	.285714	.044092	.003527		.271605
5/2	2	7/2	−.121429	.194004	.064500	.008163	.061728	.119224
5/2	2	5/2	−.071429	.122449	.066122	.011429	.085714	.034286
5/2	2	3/2	.071429	.068571	.054180	.010582	.080000	.001481
5/2	2	1/2	.200000	.029630	.037037		.051852	.014815
5/2	5/2	5	.078125	.270833	.032738	.001984		.261905
5/2	5/2	4	−.109375	.196429	.049107	.004464	.043651	.142857
5/2	5/2	3	−.090625	.136409	.052083	.005952	.063492	.066667
5/2	5/2	2	.021875	.089286	.044643	.004960	.064286	.023810
5/2	5/2	1	.143750	.053571	.029762		.050794	.004762
5/2	5/2	0	.218750	.027778			.027778	
5/2	3	11/2	.083333	.259259	.025253	.001203		.253247
5/2	3	9/2	−.100000	.196970	.038480	.002646	.032468	.157127
5/2	3	7/2	−.100000	.145503	.041572	.003401	.048501	.090955
5/2	3	5/2	−.006667	.103930	.036281	.002646	.051020	.048980
5/2	3	3/2	.110000	.071429	.023810		.042857	.025926
5/2	3	1/2	.200000	.047619			.026455	.021164
5/2	7/2	6	.087500	.250000	.020062	.000772		.245756
5/2	7/2	5	−.092500	.196605	.030895	.001667	.025077	.165994
5/2	7/2	4	−.105000	.151667	.033750	.002083	.038095	.108482
5/2	7/2	3	−.025000	.114583	.029707	.001543	.040923	.069637
5/2	7/2	2	.087500	.084877	.019290		.035273	.046572
5/2	7/2	1	.187500	.062500			.022321	.040179
5/2	4	13/2	.090909	.242424	.016317	.000518		.239316
5/2	4	11/2	−.086364	.195804	.025316	.001102	.019943	.171639
5/2	4	9/2	−.107792	.155984	.027854	.001347	.030640	.121212
5/2	4	7/2	−.037662	.122559	.024627	.000962	.033333	.085714
5/2	4	5/2	.071429	.095238	.015873		.029101	.063492
5/2	4	3/2	.178571	.074074			.018519	.055556
5/2	9/2	7	.093750	.236111	.013528	.000361		.233766
5/2	9/2	6	−.081250	.194805	.021104	.000758	.016234	.175293
5/2	9/2	5	−.109375	.159091	.023333	.000909	.025140	.130617
5/2	9/2	4	−.046875	.128687	.020682	.000631	.027576	.098182
5/2	9/2	3	.059375	.103409	.013258		.024242	.076992
5/2	9/2	2	.171875	.083333			.015432	.067901
5/2	5	15/2	.096154	.230769	.011396	.000259		.228956
5/2	5	13/2	−.076923	.193732	.017851	.000538	.013468	.177674
5/2	5	11/2	−.110256	.161377	.019805	.000636	.020979	.137699
5/2	5	9/2	−.053846	.133503	.017581	.000432	.023140	.107948
5/2	5	7/2	.050000	.109989	.011223		.020426	.087799
5/2	5	5/2	.166667	.090909			.012987	.077922
5/2	11/2	8	.098214	.226190	.009730	.000191		.224760
5/2	11/2	7	−.073214	.192651	.015290	.000392	.011351	.179222
5/2	11/2	6	−.110714	.163091	.017007	.000458	.017760	.143128
5/2	11/2	5	−.059286	.137363	.015110	.000305	.019668	.115705
5/2	11/2	4	.042500	.115385	.009615		.017405	.096547

				J+1←J			J←J	
I	J	F	CASIMIR'S FUNCTION	F+1←F	F←F	F−1←F	F←F+1 F+1←F	F←F
5/2	11/2	3	.162500	.097222			.011048	.086174
5/2	6	17/2	.100000	.222222	.008403	.000144		.221073
5/2	6	15/2	−.070000	.191597	.013239	.000293	.009696	.180210
5/2	6	13/2	−.110909	.164396	.014753	.000338	.015222	.147359
5/2	6	11/2	−.063636	.140509	.013115	.000222	.016906	.121955
5/2	6	9/2	.036364	.119880	.008325		.014985	.103723
5/2	6	7/2	.159091	.102564			.009497	.093067
5/2	13/2	9	.101563	.218750	.007330	.000110		.217813
5/2	13/2	8	−.067187	.190586	.011571	.000223	.008377	.180817
5/2	13/2	7	−.110937	.165402	.012915	.000255	.013187	.150706
5/2	13/2	6	−.067187	.143112	.011484	.000165	.014678	.127060
5/2	13/2	5	.031250	.123677	.007275		.013024	.109687
5/2	13/2	4	.156250	.107143			.008242	.098901
5/2	7	19/2	.102941	.215686	.006450	.000086		.214912
5/2	7	17/2	−.064706	.189628	.010199	.000173	.007310	.181159
5/2	7	15/2	−.110860	.166186	.011396	.000196	.011531	.153389
5/2	7	13/2	−.070136	.145294	.010136	.000126	.012857	.131282
5/2	7	11/2	.026923	.126923	.006410		.011416	.114702
5/2	7	9/2	.153846	.111111			.007215	.103896
5/2	15/2	10	.104167	.212963	.005719	.000068		.212316
5/2	15/2	9	−.062500	.188725	.009055	.000136	.006434	.181316
5/2	15/2	8	−.110714	.166803	.010127	.000153	.010167	.155565
5/2	15/2	7	−.072619	.147144	.009009	.000097	.011351	.134815
5/2	15/2	6	.023214	.129727	.005690		.010084	.118967
5/2	15/2	5	.151786	.114583			.006366	.108218
5/2	8	21/2	.105263	.210526	.005105	.000055		.209980
5/2	8	19/2	−.060526	.187877	.008093	.000109	.005706	.181343
5/2	8	17/2	−.110526	.167291	.009058	.000121	.009030	.157348
5/2	8	15/2	−.074737	.148728	.008058	.000076	.010092	.137802
5/2	8	13/2	.020000	.132171	.005084		.008969	.122630
5/2	8	11/2	.150000	.117647			.005656	.111991
5/2	17/2	11	.106250	.208333	.004585	.000044		.207868
5/2	17/2	10	−.058750	.187081	.007275	.000088	.005095	.181277
5/2	17/2	9	−.110312	.167680	.008148	.000097	.008072	.158824
5/2	17/2	8	−.076562	.150097	.007249	.000061	.009030	.140351
5/2	17/2	7	.017187	.134320	.004569		.008027	.125805
5/2	17/2	6	.148438	.120370			.005058	.115313
5/2	9	23/2	.107143	.206349	.004141	.000036		.205950
5/2	9	21/2	−.057143	.186335	.006575	.000072	.004577	.181147
5/2	9	19/2	−.110084	.167991	.007368	.000079	.007259	.160054
5/2	9	17/2	−.078151	.151291	.006555	.000049	.008126	.142545
5/2	9	15/2	.014706	.136223	.004128		.007224	.128579
5/2	9	13/2	.147059	.122807			.004548	.118259
5/2	19/2	12	.107955	.204545	.003758	.000030		.204200
5/2	19/2	11	−.055682	.185636	.005972	.000059	.004134	.180971
5/2	19/2	10	−.109848	.168241	.006694	.000065	.006562	.161089
5/2	19/2	9	−.079545	.152338	.005956	.000040	.007350	.144449

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
5/2	19/2	8	.012500	.137919	.003748		.006535	.131020
5/2	19/2	7	.145833	.125000			.004112	.120888
5/2	10	25/2	.108696	.202899	.003426	.000025		.202597
5/2	10	23/2	−.054348	.184980	.005447	.000049	.003752	.180764
5/2	10	21/2	−.109611	.168441	.006108	.000054	.005960	.161964
5/2	10	19/2	−.080778	.153263	.005434	.000033	.006679	.146112
5/2	10	17/2	.010526	.139440	.003418		.005939	.133183
5/2	10	15/2	.144737	.126984			.003735	.123249
5/2	11	27/2	.110000	.200000	.002881	.000018		.199767
5/2	11	25/2	−.052000	.183786	.004585	.000035	.003131	.180294
5/2	11	23/2	−.109143	.168730	.005145	.000038	.004980	.163348
5/2	11	21/2	−.082857	.154820	.004577	.000023	.005585	.148868
5/2	11	19/2	.007143	.142052	.002876		.004967	.136840
5/2	11	17/2	.142857	.130435			.003120	.127314
5/2	12	29/2	.111111	.197531	.002456	.000013		.197347
5/2	12	27/2	−.050000	.182729	.003912	.000025	.002653	.179791
5/2	12	25/2	−.108696	.168914	.004392	.000027	.004223	.164372
5/2	12	23/2	−.084541	.156077	.003907	.000017	.004738	.151047
5/2	12	21/2	.004348	.144214	.002453		.004214	.139807
5/2	12	19/2	.141304	.133333			.002646	.130688
5/2	13	31/2	.112069	.195402	.002119	.000010		.195255
5/2	13	29/2	−.048276	.181789	.003377	.000019	.002276	.179284
5/2	13	27/2	−.108276	.169027	.003792	.000020	.003626	.165144
5/2	13	25/2	−.085931	.157108	.003373	.000012	.004070	.152804
5/2	13	23/2	.002000	.146032	.002116		.003620	.142258
5/2	13	21/2	.140000	.135802			.002271	.133532
5/2	14	33/2	.112903	.193548	.001846	.000007		.193429
5/2	14	31/2	−.046774	.180949	.002944	.000014	.001974	.178788
5/2	14	29/2	−.107885	.169091	.003307	.000015	.003146	.165734
5/2	14	27/2	−.087097	.157969	.002942	.000009	.003533	.154244
5/2	14	25/2	.000000	.147581	.001845		.003142	.144313
5/2	14	23/2	.138889	.137931			.001970	.135961
5/2	15	35/2	.113636	.191919	.001623	.000006		.191820
5/2	15	33/2	−.045455	.180195	.002590	.000011	.001728	.178312
5/2	15	31/2	−.107524	.169122	.002910	.000012	.002756	.166191
5/2	15	29/2	−.088088	.158695	.002588	.000007	.003096	.155442
5/2	15	27/2	−.001724	.148915	.001622		.002753	.146059
5/2	15	25/2	.137931	.139785			.001726	.138059
5/2	16	37/2	.114286	.190476	.001438	.000005		.190394
5/2	16	35/2	−.044286	.179514	.002295	.000009	.001526	.177859
5/2	16	33/2	−.107189	.169128	.002579	.000009	.002434	.166549
5/2	16	31/2	−.088940	.159317	.002294	.000005	.002735	.156450
5/2	16	29/2	−.003226	.150078	.001438		.002432	.147559
5/2	16	27/2	.137097	.141414			.001524	.139890
5/2	17	39/2	.114865	.189189	.001283	.000004		.189120
5/2	17	37/2	−.043243	.178897	.002049	.000007	.001357	.177431
5/2	17	35/2	−.106880	.169119	.002302	.000007	.002165	.166830

				J+I←J			J←J	
I	J	F	CASIMIR'S FUNCTION	F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
5/2	17	33/2	−.089681	.159853	.002048	.000004	.002433	.157308
5/2	17	31/2	−.004545	.151098	.001283		.002164	.148862
5/2	17	29/2	.136364	.142857			.001355	.141502
5/2	18	41/2	.115385	.188034	.001152	.000003		.187975
5/2	18	39/2	−.042308	.178335	.001839	.000006	.001214	.177027
5/2	18	37/2	−.106593	.169098	.002067	.000006	.001939	.167054
5/2	18	35/2	−.090330	.160320	.001839	.000003	.002179	.158046
5/2	18	33/2	−.005714	.152002	.001152		.001937	.150003
5/2	18	31/2	.135714	.144144			.001213	.142931
5/2	19	43/2	.115854	.186992	.001040	.000002		.186941
5/2	19	41/2	−.041463	.177822	.001661	.000005	.001093	.176648
5/2	19	39/2	−.106328	.169069	.001867	.000005	.001746	.167233
5/2	19	37/2	−.090903	.160730	.001660	.000003	.001962	.158686
5/2	19	35/2	−.006757	.152807	.001040		.001745	.151009
5/2	19	33/2	.135135	.145299			.001092	.144207
5/2	20	45/2	.116279	.186047	.000943	.000002		.186002
5/2	20	43/2	−.040698	.177351	.001507	.000004	.000989	.176292
5/2	20	41/2	−.106082	.169034	.001694	.000004	.001580	.167375
5/2	20	39/2	−.091413	.161093	.001506	.000002	.001776	.159246
5/2	20	37/2	−.007692	.153528	.000943		.001579	.151903
5/2	20	35/2	.134615	.146341			.000989	.145353
3	0	3	.000000	.428571	.333333	.238095		
3	1/2	7/2	.000000	.357143	.163265	.051020		.244898
3	1/2	5/2	.000000	.122449	.163265	.142857	.326531	.102041
3	1	4	.050000	.314286	.096429	.017857		.267857
3	1	3	−.150000	.160714	.125000	.047619	.160714	.013889
3	1	2	.120000	.057143	.095238	.085714	.158730	.079365
3	3/2	9/2	.062500	.285714	.063492	.007937		.261905
3	3/2	7/2	−.125000	.174603	.090703	.020408	.095238	.068027
3	3/2	5/2	−.037500	.091837	.088163	.034286	.122449	.000408
3	3/2	3/2	.150000	.034286	.060952	.047619	.091429	.051429
3	2	5	.071429	.265306	.044898	.004082		.251429
3	2	4	−.107143	.179592	.067347	.010204	.062857	.105000
3	2	3	−.078571	.112245	.071429	.016327	.089286	.025000
3	2	2	.042857	.061224	.061224	.020408	.085714	
3	2	1	.171429	.024490	.040816	.020408	.057143	.028571
3	5/2	11/2	.078125	.250000	.033395	.002319		.241187
3	5/2	9/2	−.093750	.180891	.051536	.005669	.044527	.127053
3	5/2	7/2	−.093750	.124717	.057013	.008746	.066515	.053990
3	5/2	5/2	−.006250	.080175	.052478	.010204	.069971	.014111
3	5/2	3/2	.103125	.045918	.040816	.008503	.058776	.000181
3	5/2	1/2	.187500	.020408	.027211		.036281	.011338
3	3	6	.083333	.238095	.025794	.001417		.232143
3	3	5	−.083333	.180556	.040533	.003401	.033163	.140306
3	3	4	−.100000	.132653	.045918	.005102	.051020	.076531

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
3	3	3	−.033333	.093537	.043651	.005669	.056122	.035714
3	3	2	.063333	.062358	.035431	.004252	.051020	.012755
3	3	1	.150000	.038265	.022959		.038265	.002551
3	3	0	.200000	.020408			.020408	
3	7/2	13/2	.087500	.228571	.020513	.000916		.224359
3	7/2	11/2	−.075000	.179487	.032634	.002165	.025641	.148447
3	7/2	9/2	−.102500	.137879	.037518	.003175	.040198	.093022
3	7/2	7/2	−.050000	.103175	.036281	.003401	.045351	.054746
3	7/2	5/2	.037500	.074830	.029932	.002381	.042760	.030369
3	7/2	3/2	.125000	.052381	.019048		.034014	.017007
3	7/2	1/2	.187500	.035714			.020408	.015306
3	4	7	.090909	.220779	.016698	.000618		.217687
3	4	6	−.068182	.178108	.026799	.001443	.020408	.153534
3	4	5	−.103247	.141414	.031111	.002078	.032407	.105053
3	4	4	−.061039	.110303	.030390	.002165	.037143	.070000
3	4	3	.019481	.084416	.025253	.001443	.035714	.046296
3	4	2	.107143	.063492	.015873		.029101	.032407
3	4	1	.178571	.047619			.017857	.029762
3	9/2	15/2	.093750	.214286	.013853	.000433		.211948
3	9/2	13/2	−.062500	.176623	.022378	.000999	.016623	.156737
3	9/2	11/2	−.103125	.143856	.026156	.001417	.026640	.113935
3	9/2	9/2	−.068750	.115702	.025712	.001443	.030854	.081989
3	9/2	7/2	.006250	.091919	.021439	.000928	.030014	.059534
3	9/2	5/2	.093750	.072356	.013358		.024737	.045739
3	9/2	3/2	.171875	.057143			.015238	.041905
3	5	8	.096154	.208791	.011676	.000312		.206981
3	5	7	−.057692	.175137	.018954	.000714	.013799	.158743
3	5	6	−.102564	.145569	.022263	.000999	.022263	.120594
3	5	5	−.074359	.119880	.021978	.000999	.025974	.091429
3	5	4	−.003846	.097902	.018357	.000624	.025455	.070325
3	5	3	.083333	.079545	.011364		.021104	.056818
3	5	2	.166667	.064935			.012987	.051948
3	11/2	17/2	.098214	.204082	.009973	.000231		.202650
3	11/2	15/2	−.053571	.173700	.016253	.000523	.011635	.159971
3	11/2	13/2	−.101786	.146782	.019160	.000725	.018870	.125665
3	11/2	11/2	−.078571	.123174	.018970	.000714	.022132	.098929
3	11/2	9/2	−.011786	.102754	.015857	.000436	.021796	.079121
3	11/2	7/2	.075000	.085470	.009768		.018130	.065976
3	11/2	5/2	.162500	.071429			.011132	.060297
3	6	9	.100000	.200000	.008617	.000174		.198849
3	6	8	−.050000	.172336	.014085	.000392	.009942	.160682
3	6	7	−.100909	.147645	.016652	.000538	.016189	.129583
3	6	6	−.081818	.125813	.016521	.000523	.019063	.104956
3	6	5	−.018182	.106750	.013815	.000314	.018838	.086342
3	6	4	.068182	.090424	.008477		.015699	.073587
3	6	3	.159091	.076923			.009615	.067308
3	13/2	19/2	.101563	.196429	.007519	.000134		.195489
3	13/2	17/2	−.046875	.171053	.012321	.000300	.008593	.161044

				J+1←J			J←J	
							F←F+1	
I	J	F	CASIMIR'S FUNCTION	F+1←F	F←F	F−1←F	F+1←F	F←F
3	13/2	15/2	−.100000	.148259	.014598	.000408	.014036	.132651
3	13/2	13/2	−.084375	.127959	.014505	.000392	.016578	.109856
3	13/2	11/2	−.023438	.110086	.012131	.000232	.016423	.092325
3	13/2	9/2	.062500	.094620	.007421		.013701	.079968
3	13/2	7/2	.156250	.081633			.008373	.073260
3	7	10	.102941	.193277	.006618	.000105		.192500
3	7	9	−.044118	.169853	.010866	.000233	.007500	.161170
3	7	8	−.099095	.148693	.012897	.000315	.012283	.135081
3	7	7	−.086425	.129727	.012830	.000300	.014541	.113885
3	7	6	−.027828	.112905	.010729	.000175	.014431	.097332
3	7	5	.057692	.098214	.006548		.012046	.085368
3	7	4	.153846	.085714			.007347	.078367
3	15/2	21/2	.104167	.190476	.005869	.000083		.189826
3	15/2	19/2	−.041667	.168734	.009653	.000184	.006603	.161133
3	15/2	17/2	−.098214	.148994	.011473	.000247	.010836	.137026
3	15/2	15/2	−.088095	.131200	.011424	.000233	.012852	.117232
3	15/2	13/2	−.031548	.115313	.009553	.000135	.012773	.101561
3	15/2	11/2	.053571	.101325	.005818		.010666	.089984
3	15/2	9/2	.151786	.089286			.006494	.082792
3	8	11	.105263	.187970	.005240	.000067		.187420
3	8	10	−.039474	.167692	.008631	.000147	.005857	.160985
3	8	9	−.097368	.149197	.010271	.000197	.009629	.138597
3	8	8	−.089474	.132439	.010234	.000184	.011438	.120040
3	8	7	−.034737	.117389	.008556	.000105	.011380	.105167
3	8	6	.050000	.104042	.005202		.009504	.093963
3	8	5	.150000	.092437			.005777	.086660
3	17/2	23/2	.106250	.185714	.004707	.000054		.185246
3	17/2	21/2	−.037500	.166721	.007763	.000119	.005230	.160761
3	17/2	19/2	−.096562	.149326	.009246	.000158	.008612	.139876
3	17/2	17/2	−.090625	.133492	.009218	.000147	.010242	.122416
3	17/2	15/2	−.037500	.119195	.007706	.000084	.010199	.108268
3	17/2	13/2	.046875	.106433	.004678		.008518	.097422
3	17/2	11/2	.148438	.095238			.005171	.090067
3	9	12	.107143	.183673	.004252	.000045		.183271
3	9	11	−.035714	.165816	.007018	.000098	.004699	.160486
3	9	10	−.095798	.149399	.008366	.000129	.007747	.140925
3	9	9	−.091597	.134393	.008345	.000119	.009223	.124444
3	9	8	−.039916	.120778	.006974	.000067	.009190	.110954
3	9	7	.044118	.108553	.004229		.007675	.100452
3	9	6	.147059	.097744			.004654	.093090
3	19/2	25/2	.107955	.181818	.003859	.000037		.181469
3	19/2	23/2	−.034091	.164972	.006376	.000081	.004245	.160179
3	19/2	21/2	−.095076	.149431	.007606	.000106	.007005	.141790
3	19/2	19/2	−.092424	.135171	.007589	.000098	.008347	.126188
3	19/2	17/2	−.042045	.122176	.006341	.000055	.008322	.113300
3	19/2	15/2	.041667	.110444	.003842		.006950	.103125
3	19/2	13/2	.145833	.100000			.004211	.095789
3	10	13	.108696	.180124	.003518	.000031		.179820

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
3	10	12	−.032609	.164184	.005817	.000067	.003853	.159850
3	10	11	−.094394	.149431	.006943	.000088	.006365	.142508
3	10	10	−.093135	.135847	.006930	.000081	.007590	.127698
3	10	9	−.043936	.123417	.005790	.000045	.007570	.115360
3	10	8	.039474	.112142	.003504		.006322	.105498
3	10	7	.144737	.102041			.003827	.098214
3	11	14	.110000	.177143	.002959	.000022		.176908
3	11	13	−.030000	.162755	.004899	.000048	.003217	.159165
3	11	12	−.093143	.149365	.005853	.000062	.005321	.143606
3	11	11	−.094286	.136957	.005844	.000056	.006352	.130165
3	11	10	−.047143	.125522	.004881	.000031	.006340	.118802
3	11	9	.035714	.115062	.002950		.005294	.109519
3	11	8	.142857	.105590			.003200	.102390
3	12	15	.111111	.174603	.002523	.000016		.174418
3	12	14	−.027778	.161498	.004182	.000035	.002725	.158476
3	12	13	−.092029	.149241	.004999	.000045	.004513	.144379
3	12	12	−.095169	.137823	.004994	.000041	.005393	.132079
3	12	11	−.049758	.127236	.004170	.000022	.005385	.121548
3	12	10	.032609	.117483	.002517		.004496	.112790
3	12	9	.141304	.108571			.002714	.105857
3	13	16	.112069	.172414	.002177	.000012		.172265
3	13	15	−.025862	.160384	.003611	.000026	.002338	.157807
3	13	14	−.091034	.149086	.004319	.000034	.003876	.144928
3	13	13	−.095862	.138512	.004315	.000030	.004635	.133593
3	13	12	−.051931	.128656	.003603	.000016	.004629	.123782
3	13	11	.030000	.119520	.002173		.003864	.115498
3	13	10	.140000	.111111			.002331	.108780
3	14	17	.112903	.170507	.001898	.000009		.170385
3	14	16	−.024194	.159393	.003149	.000020	.002028	.157168
3	14	15	−.090143	.148915	.003768	.000025	.003365	.145319
3	14	14	−.096416	.139069	.003766	.000023	.004025	.134810
3	14	13	−.053763	.129849	.003143	.000012	.004021	.125627
3	14	12	.027778	.121258	.001895		.003356	.117773
3	14	11	.138889	.113300			.002023	.111277
3	15	18	.113636	.168831	.001668	.000007		.168731
3	15	17	−.022727	.158505	.002770	.000015	.001776	.156566
3	15	16	−.089342	.148738	.003316	.000020	.002948	.145598
3	15	15	−.096865	.139525	.003314	.000017	.003528	.135804
3	15	14	−.055329	.130865	.002766	.000009	.003525	.127173
3	15	13	.025862	.122758	.001666		.002942	.119710
3	15	12	.137931	.115207			.001772	.113435
3	16	19	.114286	.167347	.001478	.000006		.167263
3	16	18	−.021429	.157705	.002456	.000012	.001568	.156001
3	16	17	−.088618	.148559	.002941	.000015	.002604	.145794
3	16	16	−.097235	.139904	.002939	.000014	.003118	.136624
3	16	15	−.056682	.131739	.002453	.000007	.003115	.128484
3	16	14	.024194	.124064	.001477		.002600	.121376
3	16	13	.137097	.116883			.001565	.115318

I	J	F	CASIMIR'S FUNCTION	J+1←J F+1←F	J+1←J F←F	J+1←J F−1←F	J←J F←F+1 F+1←F	J←J F←F
3	17	20	.114865	.166023	.001319	.000005		.165952
3	17	19	−.020270	.156982	.002192	.000010	.001395	.155472
3	17	18	−.087961	.148383	.002626	.000012	.002317	.145929
3	17	17	−.097543	.140222	.002624	.000011	.002774	.137310
3	17	16	−.057862	.132498	.002190	.000006	.002773	.129608
3	17	15	.022727	.125213	.001318		.002313	.122825
3	17	14	.136364	.118367			.001393	.116975
3	18	21	.115385	.164835	.001184	.000004		.164775
3	18	20	−.019231	.156325	.001968	.000008	.001248	.154978
3	18	19	−.087363	.148211	.002358	.000010	.002074	.146020
3	18	18	−.097802	.140491	.002357	.000009	.002485	.137889
3	18	17	−.058901	.133164	.001967	.000005	.002484	.130579
3	18	16	.021429	.126230	.001183		.002072	.124094
3	18	15	.135714	.119691			.001247	.118444
3	19	22	.115854	.163763	.001069	.000003		.163711
3	19	21	−.018293	.155725	.001777	.000006	.001124	.154517
3	19	20	−.086816	.148045	.002130	.000008	.001868	.146077
3	19	19	−.098022	.140721	.002129	.000007	.002238	.138381
3	19	18	−.059822	.133751	.001776	.000004	.002237	.131427
3	19	17	.020270	.127137	.001068		.001866	.125216
3	19	16	.135135	.120879			.001123	.119756
3	20	23	.116279	.162791	.000970	.000003		.162746
3	20	22	−.017442	.155176	.001613	.000005	.001017	.154086
3	20	21	−.086315	.147886	.001933	.000007	.001691	.146108
3	20	20	−.098211	.140919	.001932	.000006	.002027	.138805
3	20	19	−.060644	.134274	.001612	.000003	.002026	.132173
3	20	18	.019231	.127951	.000969		.001690	.126214
3	20	17	.134615	.121951			.001016	.120935
7/2	0	7/2	.000000	.416667	.333333	.250000		
7/2	1/2	4	.000000	.343750	.164063	.054688		.234375
7/2	1/2	3	.000000	.117188	.164063	.156250	.328125	.109375
7/2	1	9/2	.050000	.300000	.097222	.019444		.254630
7/2	1	7/2	−.142857	.152778	.126984	.053571	.162037	.010582
7/2	1	5/2	.107143	.053571	.096429	.100000	.160714	.089286
7/2	3/2	5	.062500	.270833	.064167	.008750		.247500
7/2	3/2	4	−.116071	.165000	.092812	.023438	.096250	.060000
7/2	3/2	3	−.044643	.085938	.091146	.041667	.125000	
7/2	3/2	2	.133929	.031250	.062500	.062500	.093750	.062500
7/2	2	11/2	.071429	.250000	.045455	.004545		.236364
7/2	2	9/2	−.096939	.168831	.069264	.011905	.063636	.094697
7/2	2	7/2	−.081633	.104762	.074830	.020408	.091667	.019048
7/2	2	5/2	.025510	.056122	.065306	.028571	.089286	.000714
7/2	2	3/2	.153061	.021429	.042857	.035714	.060000	.040000
7/2	5/2	6	.078125	.234375	.033854	.002604		.225694
7/2	5/2	5	−.082589	.169271	.053199	.006696	.045139	.115456
7/2	5/2	4	−.093750	.116071	.060268	.011161	.068571	.045268

I	J	F	CASIMIR'S FUNCTION	J+1←J			J←J	
				F+1←F	F←F	F−1←F	F←F+1 F+1←F	F←F
7/2	5/2	3	-.022321	.073661	.057292	.014881	.073661	.008681
7/2	5/2	2	.078125	.040923	.046503	.016741	.063492	.000496
7/2	5/2	1	.167411	.016741	.030134	.015625	.040179	.022321
7/2	3	13/2	.083333	.222222	.026175	.001603		.216346
7/2	3	11/2	-.071429	.168269	.041958	.004058	.033654	.127872
7/2	3	9/2	-.097619	.123106	.048852	.006614	.052760	.066288
7/2	3	7/2	-.047619	.085979	.048375	.008503	.059524	.027211
7/2	3	5/2	.035714	.056122	.042092	.008929	.056122	.006378
7/2	3	3/2	.119048	.032738	.031746	.006944	.044643	
7/2	3	1/2	.178571	.014881	.020833		.026786	.008929
7/2	7/2	7	.087500	.212500	.020833	.001042		.208333
7/2	7/2	6	-.062500	.166667	.033854	.002604	.026042	.135417
7/2	7/2	5	-.098214	.127604	.040104	.004167	.041667	.081845
7/2	7/2	4	-.062500	.094792	.040625	.005208	.048363	.044643
7/2	7/2	3	.008929	.067708	.036458	.005208	.047619	.020833
7/2	7/2	2	.087500	.045833	.028646	.003646	.040923	.007440
7/2	7/2	1	.151786	.028646	.018229		.029762	.001488
7/2	7/2	0	.187500	.015625			.015625	
7/2	4	15/2	.090909	.204545	.016970	.000707		.201481
7/2	4	13/2	-.055195	.164848	.027848	.001748	.020741	.140050
7/2	4	11/2	-.097403	.130536	.033376	.002755	.033654	.093240
7/2	4	9/2	-.071892	.101240	.034282	.003367	.039773	.058993
7/2	4	7/2	-.009276	.076599	.031265	.003247	.040123	.035273
7/2	4	5/2	.065399	.056277	.024935	.002121	.035714	.020119
7/2	4	3/2	.132653	.040000	.015556		.027500	.011852
7/2	4	1/2	.178571	.027778			.016204	.011574
7/2	9/2	8	.093750	.197917	.014086	.000497		.195597
7/2	9/2	7	-.049107	.162997	.023285	.001218	.016903	.142891
7/2	9/2	6	-.095982	.132468	.028139	.001894	.027706	.101650
7/2	9/2	5	-.078125	.106061	.029167	.002273	.033144	.070417
7/2	9/2	4	-.022321	.083523	.026847	.002131	.033939	.047784
7/2	9/2	3	.049107	.064631	.021544	.001326	.030777	.032481
7/2	9/2	2	.118304	.049242	.013258		.024242	.023674
7/2	9/2	1	.171875	.037500			.014583	.022917
7/2	5	17/2	.096154	.192308	.011878	.000360		.190508
7/2	5	15/2	-.043956	.161199	.019745	.000874	.014037	.144599
7/2	5	13/2	-.094322	.133741	.024005	.001345	.023182	.107937
7/2	5	11/2	-.082418	.109736	.025038	.001589	.027972	.079466
7/2	5	9/2	-.032051	.089002	.023178	.001457	.028926	.058196
7/2	5	7/2	.036630	.071387	.018648	.000874	.026515	.043290
7/2	5	5/2	.107143	.056818	.011364		.021104	.034351
7/2	5	3/2	.166667	.045455			.012727	.032727
7/2	11/2	9	.098214	.187500	.010150	.000267		.186075
7/2	11/2	8	-.039541	.159493	.016946	.000644	.011841	.145574
7/2	11/2	7	-.092602	.134572	.020696	.000981	.019668	.112700
7/2	11/2	6	-.085459	.112588	.021684	.001145	.023882	.086670
7/2	11/2	5	-.039541	.093407	.020147	.001030	.024864	.066774
7/2	11/2	4	.026786	.076923	.016226	.000601	.022946	.052448
7/2	11/2	3	.098214	.063101	.009816		.018357	.043512

				J + I ← J			J ← J	
I	J	F	CASIMIR'S FUNCTION	F + I ← F	F ← F	F − I ← F	F ← F + I F + I ← F	F ← F
7/2	11/2	2	.162500	.052083			.011048	.041035
7/2	6	19/2	.100000	.183333	.008772	.000202		.182186
7/2	6	17/2	−.035714	.157895	.014697	.000485	.010121	.146068
7/2	6	15/2	−.090909	.135100	.018013	.000733	.016888	.116354
7/2	6	13/2	−.087662	.114835	.018935	.000845	.020604	.092456
7/2	6	11/2	−.045455	.096999	.017636	.000749	.021555	.073849
7/2	6	9/2	.018831	.081518	.014208	.000427	.019980	.060148
7/2	6	7/2	.090909	.068376	.008547		.016026	.051282
7/2	6	5/2	.159091	.057692			.009615	.048077
7/2	13/2	10	.101563	.179688	.007656	.000156		.178750
7/2	13/2	9	−.032366	.156406	.012865	.000372	.008750	.146241
7/2	13/2	8	−.089286	.135417	.015811	.000558	.014652	.119191
7/2	13/2	7	−.089286	.116629	.016661	.000638	.017943	.097147
7/2	13/2	6	−.050223	.099968	.015545	.000558	.018838	.079719
7/2	13/2	5	.012277	.085379	.012522	.000312	.017514	.066635
7/2	13/2	4	.084821	.072857	.007500		.014066	.057878
7/2	13/2	3	.156250	.062500			.008413	.054087
7/2	7	21/2	.102941	.176471	.006740	.000123		.175694
7/2	7	19/2	−.029412	.155025	.011352	.000290	.007639	.146199
7/2	7	17/2	−.087750	.135584	.013983	.000433	.012829	.121415
7/2	7	15/2	−.090498	.118080	.014764	.000490	.015756	.100990
7/2	7	13/2	−.054137	.102451	.013791	.000424	.016587	.084626
7/2	7	11/2	.006787	.088660	.011107	.000234	.015453	.072128
7/2	7	9/2	.079670	.076705	.006629		.012419	.063507
7/2	7	7/2	.153846	.066667			.007407	.059259
7/2	15/2	11	.104167	.173611	.005979	.000097		.172961
7/2	15/2	10	−.026786	.153743	.010089	.000230	.006726	.146013
7/2	15/2	9	−.086310	.135646	.012451	.000340	.011324	.123174
7/2	15/2	8	−.091412	.119264	.013166	.000383	.013940	.104167
7/2	15/2	7	−.057398	.104550	.012310	.000328	.014706	.088761
7/2	15/2	6	.002126	.091474	.009910	.000179	.013721	.076812
7/2	15/2	5	.075255	.080040	.005898		.011029	.068346
7/2	15/2	4	.151786	.070313			.006562	.063750
7/2	8	23/2	.105263	.171053	.005339	.000079		.170503
7/2	8	21/2	−.024436	.152555	.009025	.000184	.005968	.145731
7/2	8	19/2	−.084962	.135633	.011154	.000272	.010067	.124576
7/2	8	17/2	−.092105	.120241	.011809	.000304	.012416	.106817
7/2	8	15/2	−.060150	.106341	.011048	.000258	.013120	.092272
7/2	8	13/2	−.001880	.093911	.008891	.000139	.012255	.080835
7/2	8	11/2	.071429	.082956	.005279		.009851	.072535
7/2	8	9/2	.150000	.073529			.005849	.067680
7/2	17/2	12	.106250	.168750	.004797	.000064		.168281
7/2	17/2	11	−.022321	.151453	.008120	.000150	.005330	.145386
7/2	17/2	10	−.083705	.135566	.010048	.000219	.009006	.125701
7/2	17/2	9	−.092634	.121053	.010648	.000244	.011126	.109046
7/2	17/2	8	−.062500	.107883	.009967	.000206	.011772	.095278
7/2	17/2	7	−.005357	.096039	.008018	.000110	.011005	.084316
7/2	17/2	6	.068080	.085526	.004751		.008846	.076190
7/2	17/2	5	.148438	.076389			.005242	.071147

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
7/2	9	25/2	.107143	.166667	.004333	.000053		.166263
7/2	9	23/2	−.020408	.150429	.007344	.000123	.004789	.145001
7/2	9	21/2	−.082533	.135461	.009097	.000179	.008105	.126607
7/2	9	19/2	−.093037	.121733	.009648	.000198	.010025	.110935
7/2	9	17/2	−.064526	.109220	.009035	.000166	.010619	.097869
7/2	9	15/2	−.008403	.097910	.007265	.000088	.009933	.087348
7/2	9	13/2	.065126	.087807	.004298		.007982	.079399
7/2	9	11/2	.147059	.078947			.004723	.074224
7/2	19/2	13	.107955	.164773	.003934	.000044		.164423
7/2	19/2	12	−.018669	.149476	.006673	.000101	.004327	.144592
7/2	19/2	11	−.081439	.135329	.008274	.000148	.007331	.127341
7/2	19/2	10	−.093344	.122307	.008781	.000162	.009078	.112548
7/2	19/2	9	−.066288	.110390	.008225	.000135	.009624	.100119
7/2	19/2	8	−.011093	.099567	.006612	.000071	.009007	.090006
7/2	19/2	7	.062500	.089844	.003906		.007237	.082237
7/2	19/2	6	.145833	.081250			.004276	.076974
7/2	10	27/2	.108696	.163043	.003587	.000037		.162738
7/2	10	25/2	−.017081	.148587	.006090	.000085	.003928	.144171
7/2	10	23/2	−.080418	.135178	.007557	.000123	.006662	.127937
7/2	10	21/2	−.093576	.122794	.008024	.000134	.008258	.113933
7/2	10	19/2	−.067833	.111418	.007518	.000111	.008761	.102084
7/2	10	17/2	−.013485	.101043	.006042	.000058	.008202	.092352
7/2	10	15/2	.060150	.091673	.003565		.006589	.084760
7/2	10	13/2	.144737	.083333			.003889	.079444
7/2	11	29/2	.110000	.160000	.003017	.000026		.159764
7/2	11	27/2	−.014286	.146983	.005131	.000060	.003280	.143322
7/2	11	25/2	−.078571	.134843	.006374	.000087	.005572	.128815
7/2	11	23/2	−.093878	.123565	.006775	.000095	.006917	.116171
7/2	11	21/2	−.070408	.113138	.006350	.000078	.007347	.105337
7/2	11	19/2	−.017551	.103556	.005100	.000040	.006882	.096288
7/2	11	17/2	.056122	.094823	.003003		.005526	.089045
7/2	11	15/2	.142857	.086957			.003255	.083701
7/2	12	31/2	.111111	.157407	.002573	.000019		.157221
7/2	12	29/2	−.011905	.145575	.004381	.000044	.002779	.142493
7/2	12	27/2	−.076950	.134489	.005448	.000063	.004728	.129396
7/2	12	25/2	−.094030	.124137	.005794	.000068	.005876	.117878
7/2	12	23/2	−.072464	.114513	.005431	.000056	.006246	.107901
7/2	12	21/2	−.020876	.105611	.004360	.000028	.005853	.099449
7/2	12	19/2	.052795	.097436	.002564		.004698	.092539
7/2	12	17/2	.141304	.090000			.002763	.087237
7/2	13	33/2	.112069	.155172	.002220	.000015		.155022
7/2	13	31/2	−.009852	.144331	.003784	.000033	.002385	.141701
7/2	13	29/2	−.075517	.134133	.004709	.000047	.004062	.129775
7/2	13	27/2	−.094089	.124568	.005011	.000051	.005052	.119203
7/2	13	25/2	−.074138	.115632	.004698	.000041	.005374	.109960
7/2	13	23/2	−.023645	.107321	.003770	.000021	.005037	.102033
7/2	13	21/2	.050000	.099638	.002214		.004041	.095436
7/2	13	19/2	.140000	.092593			.002374	.090218

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
7/2	14	35/2	.112903	.153226	.001935	.000011		.153103
7/2	14	33/2	−.008065	.143226	.003301	.000025	.002069	.140956
7/2	14	31/2	−.074245	.133785	.004110	.000036	.003527	.130015
7/2	14	29/2	−.094086	.124897	.004375	.000038	.004390	.120249
7/2	14	27/2	−.075525	.116557	.004102	.000031	.004671	.111640
7/2	14	25/2	−.025986	.108763	.003291	.000016	.004379	.104178
7/2	14	23/2	.047619	.101517	.001931		.003512	.097874
7/2	14	21/2	.138889	.094828			.002061	.092766
7/2	15	37/2	.113636	.151515	.001702	.000009		.151414
7/2	15	35/2	−.006494	.142237	.002904	.000020	.001812	.140259
7/2	15	33/2	−.073108	.133451	.003618	.000028	.003090	.130157
7/2	15	31/2	−.094044	.125150	.003853	.000030	.003849	.121086
7/2	15	29/2	−.076691	.117332	.003612	.000024	.004097	.113029
7/2	15	27/2	−.027989	.109994	.002897	.000012	.003841	.105982
7/2	15	25/2	.045567	.103140	.001699		.003080	.099952
7/2	15	23/2	.137931	.096774			.001806	.094968
7/2	16	39/2	.114286	.150000	.001508	.000007		.149915
7/2	16	37/2	−.005102	.141349	.002575	.000015	.001600	.139609
7/2	16	35/2	−.072087	.133132	.003209	.000022	.002730	.130231
7/2	16	33/2	−.093976	.125347	.003418	.000023	.003402	.121763
7/2	16	31/2	−.077683	.117989	.003205	.000018	.003622	.114194
7/2	16	29/2	−.029724	.111057	.002570	.000009	.003396	.107517
7/2	16	27/2	.043779	.104555	.001506		.002723	.101742
7/2	16	25/2	.137097	.098485			.001596	.096889
7/2	17	41/2	.114865	.148649	.001346	.000005		.148577
7/2	17	39/2	−.003861	.140546	.002299	.000012	.001423	.139005
7/2	17	37/2	−.071165	.132831	.002866	.000017	.002429	.130257
7/2	17	35/2	−.093893	.125500	.003053	.000018	.003028	.122318
7/2	17	33/2	−.078536	.118551	.002863	.000015	.003225	.115179
7/2	17	31/2	−.031239	.111984	.002295	.000007	.003024	.108838
7/2	17	29/2	.042208	.105799	.001344		.002424	.103299
7/2	17	27/2	.136364	.100000			.001420	.098580
7/2	18	43/2	.115385	.147436	.001208	.000004		.147375
7/2	18	41/2	−.002747	.139817	.002065	.000010	.001274	.138443
7/2	18	39/2	−.070330	.132546	.002575	.000014	.002176	.130247
7/2	18	37/2	−.093799	.125620	.002743	.000015	.002713	.122776
7/2	18	35/2	−.079278	.119038	.002572	.000012	.002890	.116022
7/2	18	33/2	−.032575	.112798	.002061	.000006	.002709	.109984
7/2	18	31/2	.040816	.106901	.001207		.002171	.104665
7/2	18	29/2	.135714	.101351			.001271	.100080
7/2	19	45/2	.115854	.146341	.001091	.000004		.146289
7/2	19	43/2	−.001742	.139153	.001864	.000008	.001147	.137919
7/2	19	41/2	−.069569	.132278	.002326	.000011	.001960	.130212
7/2	19	39/2	−.093700	.125715	.002478	.000012	.002444	.123157
7/2	19	37/2	−.079927	.119462	.002324	.000010	.002604	.116750
7/2	19	35/2	−.033760	.113518	.001862	.000005	.002441	.110987
7/2	19	33/2	.039575	.107885	.001090		.001956	.105873
7/2	19	31/2	.135135	.102564			.001145	.101419
7/2	20	47/2	.116279	.145349	.000990	.000003		.145304

I	J	F	CASIMIR'S FUNCTION	J+1←J			J←J	
				F+1←F	F←F	F−1←F	F←F+1 F+1←F	F←F
7/2	20	45/2	−.000831	.138545	.001692	.000007	.001038	.137432
7/2	20	43/2	−.068873	.132026	.002111	.000009	.001774	.130159
7/2	20	41/2	−.093598	.125789	.002250	.000010	.002213	.123477
7/2	20	39/2	−.080501	.119834	.002109	.000008	.002358	.117382
7/2	20	37/2	−.034820	.114160	.001690	.000004	.002211	.111871
7/2	20	35/2	.038462	.108767	.000989		.001772	.106948
7/2	20	33/2	.134615	.103659			.001037	.102622
4	0	4	.000000	.407407	.333333	.259259		
4	1/2	9/2	.000000	.333333	.164609	.057613		.226337
4	1/2	7/2	.000000	.113169	.164609	.166667	.329218	.115226
4	1	5	.050000	.288889	.097778	.020741		.244444
4	1	4	−.137500	.146667	.128333	.058333	.162963	.008333
4	1	3	.098214	.050926	.097222	.111111	.162037	.097222
4	3/2	11/2	.062500	.259259	.064646	.009428		.236364
4	3/2	9/2	−.109375	.157576	.094276	.025926	.096970	.054059
4	3/2	7/2	−.049107	.081481	.093122	.047619	.126749	.000235
4	3/2	5/2	.122768	.029101	.063492	.074074	.095238	.071429
4	2	6	.071429	.238095	.045855	.004938		.224691
4	2	5	−.089286	.160494	.070617	.013333	.064198	.086914
4	2	4	−.082908	.099048	.077143	.023810	.093333	.015000
4	2	3	.014031	.052381	.067901	.035273	.091667	.002160
4	2	2	.140306	.019400	.044092	.047619	.061728	.049383
4	5/2	13/2	.078125	.222222	.034188	.002849		.213675
4	5/2	11/2	−.074219	.160256	.054390	.007576	.045584	.106605
4	5/2	9/2	−.092634	.109428	.062530	.013228	.070034	.038961
4	5/2	7/2	−.032366	.068783	.060469	.018896	.076190	.005442
4	5/2	5/2	.061384	.037415	.049887	.023810	.066515	.002268
4	5/2	3/2	.153460	.014550	.031746	.027778	.042328	.031746
4	3	7	.083333	.209877	.026455	.001764		.204082
4	3	6	−.062500	.158730	.042989	.004630	.034014	.118323
4	3	5	−.094643	.115741	.050926	.007937	.054012	.058686
4	3	4	−.055952	.080247	.051587	.011023	.061905	.021429
4	3	3	.017857	.051587	.046296	.013228	.059524	.003086
4	3	2	.098214	.029101	.036376	.013889	.048501	.001102
4	3	1	.163690	.012125	.023148	.012346	.029762	.017857
4	7/2	15/2	.087500	.200000	.021070	.001152		.195885
4	7/2	13/2	−.053125	.156708	.034745	.002991	.026337	.125372
4	7/2	11/2	−.093750	.119658	.041958	.005051	.042735	.073427
4	7/2	9/2	−.069196	.088384	.043646	.006859	.050505	.037433
4	7/2	7/2	−.008929	.062414	.040760	.007937	.050950	.014809
4	7/2	5/2	.062946	.041270	.034286	.007778	.045351	.003061
4	7/2	3/2	.127679	.024444	.025350	.005761	.034921	.000059
4	7/2	1/2	.171875	.011317	.016461		.020576	.007202
4	4	8	.090909	.191919	.017172	.000786		.188889
4	4	7	−.045455	.154545	.028620	.002020	.020988	.129630
4	4	6	−.091721	.122110	.035017	.003367	.034568	.084259

				J+1←J			J←J	
							F←F+1	
I	J	F	CASIMIR'S FUNCTION	F+1←F	F←F	F−1←F	F+1←F	F←F
4	4	5	−.077110	.094276	.037037	.004489	.041667	.050926
4	4	4	−.026670	.070707	.035354	.005051	.043210	.027778
4	4	3	.038729	.051066	.030640	.004714	.040123	.012963
4	4	2	.102389	.035017	.023569	.003143	.033333	.004630
4	4	1	.151786	.022222	.014815		.023765	.000926
4	4	0	.178571	.012346			.012346	
4	9/2	17/2	.093750	.185185	.014260	.000555		.182888
4	9/2	15/2	−.039063	.152406	.023957	.001414	.017112	.132173
4	9/2	13/2	−.089286	.123636	.029588	.002331	.028492	.092254
4	9/2	11/2	−.082031	.098627	.031645	.003061	.034810	.061793
4	9/2	9/2	−.039063	.077135	.030609	.003367	.036731	.039463
4	9/2	7/2	.021205	.058923	.026936	.003030	.034917	.023957
4	9/2	5/2	.083705	.043771	.021010	.001886	.030014	.014026
4	9/2	3/2	.136719	.031515	.012929		.022626	.008649
4	9/2	1/2	.171875	.022222			.013169	.009053
4	5	9	.096154	.179487	.012029	.000403		.177703
4	5	8	−.033654	.150364	.020333	.001020	.014216	.133637
4	5	7	−.086767	.124563	.025287	.001665	.023864	.098214
4	5	6	−.085165	.101898	.027257	.002158	.029437	.070451
4	5	5	−.048077	.082189	.026591	.002331	.031425	.049383
4	5	4	.008013	.065268	.023601	.002040	.030303	.034091
4	5	3	.069368	.050991	.018508	.001209	.026515	.023765
4	5	2	.125000	.039282	.011223		.020426	.017957
4	5	1	.166667	.030303			.012121	.018182
4	11/2	19/2	.098214	.174603	.010282	.000300		.173189
4	11/2	17/2	−.029018	.148448	.017464	.000754	.011996	.134408
4	11/2	15/2	−.084311	.125093	.021834	.001221	.020263	.102710
4	11/2	13/2	−.087181	.104396	.023669	.001565	.025175	.077359
4	11/2	11/2	−.054847	.086221	.023225	.001665	.027095	.057645
4	11/2	9/2	−.002232	.070448	.020720	.001425	.026371	.042912
4	11/2	7/2	.058036	.056980	.016280	.000814	.023310	.032634
4	11/2	5/2	.115625	.045788	.009768		.018130	.026651
4	11/2	3/2	.162500	.037037			.010774	.026263
4	6	10	.100000	.170370	.008889	.000228		.169231
4	6	9	−.025000	.146667	.015157	.000570	.010256	.134726
4	6	8	−.081981	.125356	.019027	.000916	.017411	.106139
4	6	7	−.088474	.106329	.020713	.001163	.021749	.082908
4	6	6	−.060065	.089482	.020408	.001221	.023548	.064500
4	6	5	−.010390	.074725	.018266	.001026	.023063	.050441
4	6	4	.048864	.061994	.014359	.000570	.020513	.040385
4	6	3	.107955	.051282	.008547		.016026	.034307
4	6	2	.159091	.042735			.009497	.033238
4	13/2	21/2	.101563	.166667	.007760	.000176		.165734
4	13/2	19/2	−.021484	.145018	.013274	.000439	.008869	.134747
4	13/2	17/2	−.079799	.125439	.016718	.000700	.015115	.108781
4	13/2	15/2	−.089286	.107843	.018259	.000882	.018961	.087401
4	13/2	13/2	−.064174	.092152	.018044	.000916	.020621	.070202
4	13/2	11/2	−.017020	.078297	.016184	.000758	.020287	.056835
4	13/2	9/2	.041295	.066234	.012720	.000412	.018115	.047068
4	13/2	7/2	.101563	.055967	.007525		.014182	.040938

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
4	13/2	5/2	.156250	.047619			.008373	.039246
4	7	11	.102941	.163399	.006833	.000139		.162626
4	7	10	−.018382	.143494	.011719	.000343	.007744	.134571
4	7	9	−.077771	.125398	.014798	.000545	.013241	.110833
4	7	8	−.089771	.109041	.016204	.000681	.016667	.091071
4	7	7	−.067469	.094363	.016048	.000700	.018188	.074972
4	7	6	−.022503	.081310	.014414	.000572	.017952	.062273
4	7	5	.034947	.069853	.011324	.000305	.016071	.052817
4	7	4	.096154	.060000	.006667		.012593	.046667
4	7	3	.153846	.051852			.007407	.044444
4	15/2	23/2	.104167	.160494	.006062	.000111		.159847
4	15/2	21/2	−.015625	.142086	.010420	.000272	.006820	.134266
4	15/2	19/2	−.075893	.125272	.013187	.000430	.011692	.112439
4	15/2	17/2	−.090030	.109998	.014468	.000534	.014757	.094095
4	15/2	15/2	−.070153	.096213	.014353	.000545	.016148	.078987
4	15/2	13/2	−.027105	.083878	.012904	.000440	.015977	.066917
4	15/2	11/2	.029549	.072971	.010131	.000231	.014329	.057775
4	15/2	9/2	.091518	.063503	.005942		.011230	.051630
4	15/2	7/2	.151786	.055556			.006584	.048971
4	8	12	.105263	.157895	.005415	.000089		.157347
4	8	11	−.013158	.140784	.009324	.000219	.006052	.133877
4	8	10	−.074154	.125090	.011821	.000344	.010398	.113703
4	8	9	−.090132	.110767	.012991	.000425	.013154	.096606
4	8	8	−.072368	.097776	.012905	.000430	.014423	.082390
4	8	7	−.031015	.086085	.011610	.000344	.014297	.070903
4	8	6	.024906	.075679	.009110	.000178	.012838	.062068
4	8	5	.087500	.066570	.005326		.010061	.055952
4	8	4	.150000	.058824			.005882	.052941
4	17/2	25/2	.106250	.155556	.004865	.000073		.155088
4	17/2	23/2	−.010937	.139579	.008391	.000178	.005406	.133436
4	17/2	21/2	−.072545	.124869	.010655	.000278	.009306	.114702
4	17/2	19/2	−.090123	.111390	.011725	.000342	.011794	.098707
4	17/2	17/2	−.074219	.099107	.011660	.000344	.012955	.085295
4	17/2	15/2	−.034375	.087998	.010494	.000273	.012861	.074347
4	17/2	13/2	.020871	.078051	.008229	.000140	.011558	.065806
4	17/2	11/2	.083984	.069276	.004798		.009056	.059737
4	17/2	9/2	.148438	.061728			.005282	.056447
4	9	13	.107143	.153439	.004396	.000060		.153036
4	9	12	−.008929	.138462	.007591	.000146	.004858	.132964
4	9	11	−.071053	.124624	.009651	.000228	.008377	.115494
4	9	10	−.090036	.111896	.010633	.000278	.010633	.100478
4	9	9	−.075780	.100251	.010582	.000278	.011696	.087791
4	9	8	−.037290	.089669	.009527	.000219	.011624	.077338
4	9	7	.017332	.080141	.007467	.000111	.010453	.069079
4	9	6	.080882	.071679	.004344		.008187	.063071
4	9	5	.147059	.064327			.004765	.059562
4	19/2	27/2	.107955	.151515	.003991	.000050		.151166
4	19/2	25/2	−.007102	.137424	.006900	.000121	.004390	.132476
4	19/2	23/2	−.069670	.124364	.008781	.000188	.007579	.116122

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
4	19/2	21/2	−.089894	.112309	.009684	.000229	.009633	.101981
4	19/2	19/2	−.077110	.101239	.009644	.000228	.010609	.089950
4	19/2	17/2	−.039840	.091137	.008685	.000178	.010553	.079953
4	19/2	15/2	.014205	.081996	.006803	.000090	.009494	.071961
4	19/2	13/2	.078125	.073827	.003951		.007433	.066026
4	19/2	11/2	.145833	.066667			.004318	.062348
4	10	14	.108696	.149758	.003639	.000042		.149454
4	10	13	−.005435	.136458	.006298	.000101	.003985	.131982
4	10	12	−.068384	.124095	.008023	.000157	.006889	.116619
4	10	11	−.089715	.112648	.008855	.000190	.008766	.103263
4	10	10	−.078253	.102099	.008823	.000188	.009664	.091827
4	10	9	−.042089	.092436	.007947	.000146	.009620	.082251
4	10	8	.011421	.083652	.006222	.000073	.008658	.074513
4	10	7	.075658	.075758	.003608		.006776	.068659
4	10	6	.144737	.068783			.003930	.064853
4	11	15	.110000	.146667	.003062	.000030		.146430
4	11	14	−.002500	.134716	.005308	.000072	.003328	.131004
4	11	13	−.066071	.123551	.006773	.000111	.005764	.117323
4	11	12	−.089286	.113155	.007484	.000134	.007348	.105313
4	11	11	−.080102	.103516	.007464	.000132	.008113	.094914
4	11	10	−.045867	.094625	.006723	.000101	.008085	.086085
4	11	9	.006684	.086478	.005259	.000050	.007279	.078815
4	11	8	.071429	.079084	.003042		.005693	.073139
4	11	7	.142857	.072464			.003294	.069170
4	12	16	.111111	.144033	.002612	.000022		.143846
4	12	15	.000000	.133191	.004534	.000053	.002821	.130065
4	12	14	−.064053	.123016	.005791	.000081	.004893	.117751
4	12	13	−.088811	.113497	.006406	.000097	.006245	.106851
4	12	12	−.081522	.104624	.006392	.000095	.006903	.097323
4	12	11	−.048913	.096391	.005758	.000073	.006885	.089137
4	12	10	.002804	.088797	.004501	.000035	.006200	.082287
4	12	9	.067935	.081846	.002598		.004846	.076800
4	12	8	.141304	.075556			.002798	.072757
4	13	17	.112069	.141762	.002254	.000017		.141612
4	13	16	.002155	.131846	.003917	.000040	.002421	.129177
4	13	15	−.062278	.122503	.005008	.000061	.004204	.117995
4	13	14	−.088325	.113726	.005543	.000072	.005372	.108026
4	13	13	−.082635	.105507	.005534	.000070	.005943	.099237
4	13	12	−.051416	.097842	.004985	.000053	.005931	.091608
4	13	11	−.000431	.090730	.003894	.000026	.005342	.085136
4	13	10	.065000	.084175	.002245		.004173	.079841
4	13	9	.140000	.078189			.002406	.075783
4	14	18	.112903	.139785	.001965	.000013		.139662
4	14	17	.004032	.130652	.003417	.000031	.002100	.128348
4	14	16	−.060708	.122018	.004373	.000046	.003651	.118116
4	14	15	−.087846	.113877	.004842	.000055	.004670	.108935
4	14	14	−.083525	.106222	.004836	.000053	.005169	.100781
4	14	13	−.053507	.099052	.004356	.000040	.005161	.093639
4	14	12	−.003168	.092365	.003401	.000019	.004648	.087508
4	14	11	.062500	.086164	.001958		.003629	.082404

				J + I ← J			J ← J	
I	J	F	CASIMIR'S FUNCTION	F + I ← F	F ← F	F − I ← F	F ← F + I F + I ← F	F ← F
4	14	10	.138889	.080460			.002090	.078370
4	15	19	.113636	.138047	.001728	.000010		.137946
4	15	18	.005682	.129585	.003007	.000024	.001839	.127577
4	15	17	−.059309	.121562	.003850	.000036	.003200	.118152
4	15	16	−.087382	.113971	.004266	.000042	.004096	.109648
4	15	15	−.084248	.106809	.004261	.000041	.004536	.102045
4	15	14	−.055279	.100073	.003839	.000031	.004530	.095332
4	15	13	−.005514	.093764	.002996	.000015	.004080	.089509
4	15	12	.060345	.087883	.001723		.003184	.084589
4	15	11	.137931	.082437			.001832	.080605
4	16	20	.114286	.136508	.001531	.000008		.136423
4	16	19	.007143	.128627	.002667	.000019	.001624	.126861
4	16	18	−.058056	.121135	.003416	.000028	.002828	.118131
4	16	17	−.086940	.114025	.003786	.000033	.003621	.110212
4	16	16	−.084842	.107296	.003783	.000032	.004012	.103091
4	16	15	−.056797	.100946	.003408	.000024	.004008	.096760
4	16	14	−.007546	.094973	.002659	.000011	.003610	.091217
4	16	13	.058468	.089381	.001528		.002816	.086474
4	16	12	.137097	.084175			.001619	.082556
4	17	21	.114865	.135135	.001366	.000006		.135063
4	17	20	.008446	.127763	.002381	.000015	.001445	.126198
4	17	19	−.056928	.120736	.003051	.000023	.002516	.118069
4	17	18	−.086522	.114051	.003383	.000026	.003224	.110663
4	17	17	−.085337	.107706	.003380	.000025	.003573	.103968
4	17	16	−.058112	.101698	.003045	.000019	.003570	.097976
4	17	15	−.009323	.096029	.002375	.000009	.003215	.092689
4	17	14	.056818	.090700	.001364		.002508	.088115
4	17	13	.136364	.085714			.001441	.084274
4	18	22	.115385	.133903	.001227	.000005		.133842
4	18	21	.009615	.126978	.002139	.000012	.001293	.125582
4	18	20	−.055907	.120363	.002742	.000018	.002254	.117981
4	18	19	−.086126	.114055	.003040	.000021	.002888	.111026
4	18	18	−.085754	.108052	.003038	.000020	.003203	.104708
4	18	17	−.059262	.102353	.002737	.000015	.003200	.099023
4	18	16	−.010891	.096958	.002134	.000007	.002882	.093970
4	18	15	.055357	.091868	.001225		.002247	.089556
4	18	14	.135714	.087087			.001290	.085797
4	19	23	.115854	.132791	.001108	.000004		.132739
4	19	22	.010671	.126264	.001931	.000010	.001164	.125011
4	19	21	−.054978	.120016	.002477	.000015	.002030	.117874
4	19	20	−.085754	.114044	.002747	.000017	.002603	.111320
4	19	19	−.086107	.108349	.002746	.000016	.002886	.105340
4	19	18	−.060275	.102928	.002473	.000012	.002885	.099931
4	19	17	−.012283	.097782	.001928	.000006	.002598	.095092
4	19	16	.054054	.092911	.001106		.002025	.090830
4	19	15	.135135	.088319			.001162	.087157
4	20	24	.116279	.131783	.001005	.000004		.131737
4	20	23	.011628	.125610	.001753	.000008	.001054	.124479
4	20	22	−.054130	.119691	.002248	.000012	.001838	.117756

				J + I ← J			J ← J	
							F ← F + I	
I	J	F	CASIMIR'S FUNCTION	F + I ← F	F ← F	F − I ← F	F + I ← F	F ← F
4	20	21	−.085404	.114022	.002494	.000014	.002357	.111559
4	20	20	−.086411	.108604	.002493	.000014	.002615	.105883
4	20	19	−.061174	.103436	.002245	.000010	.002613	.100724
4	20	18	−.013529	.098516	.001750	.000005	.002353	.096083
4	20	17	.052885	.093847	.001004		.001834	.091965
4	20	16	.134615	.089431			.001052	.088379
9/2	0	9/2	.000000	.400000	.333333	.266667		
9/2	1/2	5	.000000	.325000	.165000	.060000		.220000
9/2	1/2	4	.000000	.110000	.165000	.175000	.330000	.120000
9/2	1	11/2	.050000	.280000	.098182	.021818		.236364
9/2	1	9/2	−.133333	.141818	.129293	.062222	.163636	.006734
9/2	1	7/2	.091667	.048889	.097778	.120000	.162963	.103704
9/2	3/2	6	.062500	.250000	.065000	.010000		.227500
9/2	3/2	5	−.104167	.151667	.095333	.028000	.097500	.049500
9/2	3/2	4	−.052083	.078000	.094500	.052500	.128000	.000750
9/2	3/2	3	.114583	.027500	.064167	.083333	.096250	.078750
9/2	2	13/2	.071429	.228571	.046154	.005275		.215385
9/2	2	11/2	−.083333	.153846	.071608	.014545	.064615	.080839
9/2	2	9/2	−.083333	.094545	.078788	.026667	.094545	.012121
9/2	2	7/2	.005952	.049524	.069660	.040816	.093333	.003810
9/2	2	5/2	.130952	.017959	.044898	.057143	.062857	.057143
9/2	5/2	7	.078125	.212500	.034439	.003061		.204082
9/2	5/2	6	−.067708	.153061	.055272	.008333	.045918	.099637
9/2	5/2	5	−.091146	.104167	.064167	.015000	.071111	.034222
9/2	5/2	4	−.039063	.065000	.062679	.022321	.078000	.003429
9/2	5/2	3	.049479	.034821	.052083	.029762	.068571	.004444
9/2	5/2	2	.143229	.013095	.032738	.037500	.043651	.039683
9/2	3	15/2	.083333	.200000	.026667	.001905		.194286
9/2	3	13/2	−.055556	.151111	.043761	.005128	.034286	.110769
9/2	3	11/2	−.091667	.109890	.052448	.009091	.054945	.052847
9/2	3	9/2	−.061111	.075758	.053872	.013228	.063636	.017316
9/2	3	7/2	.005556	.048148	.049131	.017007	.061905	.001361
9/2	3	5/2	.083333	.026531	.039184	.020000	.051020	.003265
9/2	3	3/2	.152778	.010476	.024444	.022222	.031429	.025714
9/2	7/2	8	.087500	.190000	.021250	.001250		.185937
9/2	7/2	7	−.045833	.148750	.035417	.003333	.026562	.117400
9/2	7/2	6	−.089583	.113333	.043333	.005833	.043537	.066879
9/2	7/2	5	−.072917	.083333	.045833	.008333	.052083	.032083
9/2	7/2	4	−.020833	.058333	.043750	.010417	.053333	.010804
9/2	7/2	3	.045833	.037917	.037917	.011667	.048363	.001042
9/2	7/2	2	.110417	.021667	.029167	.011667	.038095	.001488
9/2	7/2	1	.160417	.009167	.018333	.010000	.022917	.014583
9/2	4	17/2	.090909	.181818	.017326	.000856		.178824
9/2	4	15/2	−.037879	.146310	.029205	.002263	.021176	.121342
9/2	4	13/2	−.086580	.115394	.036246	.003916	.035259	.077219
9/2	4	11/2	−.079545	.088765	.039059	.005510	.043077	.044802

I	J	F	CASIMIR'S FUNCTION	J+1←J			J←J	
				F+1←F	F←F	F−1←F	F←F+1 F+1←F	F←F
9/2	4	9/2	−.037879	.066116	.038261	.006734	.045455	.022447
9/2	4	7/2	.020563	.047138	.034478	.007273	.043210	.008536
9/2	4	5/2	.081169	.031515	.028364	.006788	.037143	.001524
9/2	4	3/2	.132576	.018909	.020687	.004848	.028000	.000148
9/2	4	1/2	.166667	.008889	.013333		.016296	.005926
9/2	9/2	9	.093750	.175000	.014394	.000606		.172727
9/2	9/2	8	−.031250	.143939	.024470	.001591	.017273	.123636
9/2	9/2	7	−.083333	.116591	.030682	.002727	.029091	.084848
9/2	9/2	6	−.083333	.092727	.033485	.003788	.036061	.055152
9/2	9/2	5	−.049479	.072121	.033333	.004545	.038788	.033333
9/2	9/2	4	.002604	.054545	.030682	.004773	.037879	.018182
9/2	9/2	3	.059896	.039773	.025985	.004242	.033939	.008485
9/2	9/2	2	.111979	.027576	.019697	.002727	.027576	.003030
9/2	9/2	1	.151042	.017727	.012273		.019394	.000606
9/2	9/2	0	.171875	.010000			.010000	
9/2	5	19/2	.096154	.169231	.012146	.000442		.167464
9/2	5	17/2	−.025641	.141700	.020784	.001152	.014354	.124897
9/2	5	15/2	−.080128	.117236	.026261	.001958	.024385	.090524
9/2	5	13/2	−.085470	.095664	.028919	.002690	.030545	.063441
9/2	5	11/2	−.057692	.076815	.029097	.003179	.033287	.042746
9/2	5	9/2	−.010684	.060521	.027124	.003263	.033058	.027548
9/2	5	7/2	.043803	.046620	.023310	.002797	.030303	.016970
9/2	5	5/2	.096154	.034965	.017902	.001678	.025455	.010182
9/2	5	3/2	.138889	.025455	.010909		.018909	.006545
9/2	5	1/2	.166667	.018182			.010909	.007273
9/2	11/2	10	.098214	.164286	.010385	.000330		.162885
9/2	11/2	9	−.020833	.139615	.017863	.000855	.012115	.125498
9/2	11/2	8	−.077083	.117521	.022703	.001442	.020720	.094788
9/2	11/2	7	−.086607	.097871	.025167	.001962	.026158	.070071
9/2	11/2	6	−.063690	.080534	.025510	.002289	.028771	.050667
9/2	11/2	5	−.020833	.065385	.023974	.002308	.028895	.035919
9/2	11/2	4	.031250	.052308	.020769	.001923	.026853	.025201
9/2	11/2	3	.083631	.041209	.016026	.001099	.022946	.017983
9/2	11/2	2	.129167	.032051	.009615		.017405	.014035
9/2	11/2	1	.162500	.025000			.010227	.014773
9/2	6	21/2	.100000	.160000	.008980	.000251		.158870
9/2	6	19/2	−.016667	.137687	.015511	.000648	.010361	.125671
9/2	6	17/2	−.074242	.117571	.019805	.001086	.017814	.098023
9/2	6	15/2	−.087121	.099548	.022064	.001465	.022624	.075398
9/2	6	13/2	−.068182	.083516	.022485	.001691	.025055	.057278
9/2	6	11/2	−.028788	.069383	.021246	.001678	.025359	.043172
9/2	6	9/2	.021212	.057063	.018493	.001368	.023776	.032634
9/2	6	7/2	.073485	.046496	.014289	.000754	.020513	.025327
9/2	6	5/2	.121212	.037677	.008477		.015699	.021224
9/2	6	3/2	.159091	.030769			.009231	.021538
9/2	13/2	11	.101563	.156250	.007841	.000195		.155325
9/2	13/2	10	−.013021	.135909	.013591	.000500	.008961	.125566
9/2	13/2	9	−.071615	.117464	.017417	.000833	.015473	.100498
9/2	13/2	8	−.087240	.100833	.019479	.001116	.019744	.079707
9/2	13/2	7	−.071615	.085938	.019930	.001276	.021978	.062794

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
9/2	13/2	6	−.035156	.072704	.018903	.001250	.022370	.049388
9/2	13/2	5	.013021	.061071	.016500	.001000	.021099	.039165
9/2	13/2	4	.065104	.051000	.012750	.000536	.018308	.031912
9/2	13/2	3	.114583	.042500	.007500		.014066	.027692
9/2	13/2	2	.156250	.035714			.008242	.027473
9/2	7	23/2	.102941	.152941	.006905	.000153		.152174
9/2	7	21/2	−.009804	.134271	.012003	.000392	.007826	.125280
9/2	7	19/2	−.069193	.117255	.015428	.000650	.013560	.102405
9/2	7	17/2	−.087104	.101827	.017308	.000865	.017368	.083220
9/2	7	15/2	−.074284	.087924	.017762	.000980	.019412	.067414
9/2	7	13/2	−.040347	.075490	.016893	.000950	.019841	.054701
9/2	7	11/2	.006222	.064480	.014772	.000749	.018791	.044845
9/2	7	9/2	.058069	.054866	.011408	.000392	.016364	.037710
9/2	7	7/2	.108974	.046667	.006667		.012593	.033394
9/2	7	5/2	.153846	.040000			.007347	.032653
9/2	15/2	12	.104167	.150000	.006127	.000123		.149357
9/2	15/2	11	−.006944	.132761	.010677	.000312	.006893	.124878
9/2	15/2	10	−.066964	.116979	.013757	.000515	.011979	.103882
9/2	15/2	9	−.086806	.102598	.015471	.000681	.015390	.086105
9/2	15/2	8	−.076389	.089570	.015914	.000766	.017255	.071302
9/2	15/2	7	−.044643	.077849	.015165	.000735	.017693	.059250
9/2	15/2	6	.000496	.067402	.013276	.000572	.016807	.049774
9/2	15/2	5	.052083	.058211	.010245	.000294	.014669	.042787
9/2	15/2	4	.104167	.050294	.005956		.011294	.038393
9/2	15/2	3	.151786	.043750			.006562	.037187
9/2	8	25/2	.105263	.147368	.005474	.000099		.146824
9/2	8	23/2	−.004386	.131368	.009557	.000251	.006118	.124402
9/2	8	21/2	−.064912	.116660	.012339	.000413	.010656	.105030
9/2	8	19/2	−.086404	.103199	.013905	.000543	.013725	.088493
9/2	8	17/2	−.078070	.090946	.014330	.000607	.015428	.074595
9/2	8	15/2	−.048246	.079864	.013676	.000578	.015859	.063160
9/2	8	13/2	−.004386	.069928	.011981	.000445	.015098	.054057
9/2	8	11/2	.046930	.061126	.009237	.000225	.013198	.047230
9/2	8	9/2	.100000	.053476	.005348		.010160	.042781
9/2	8	7/2	.150000	.047059			.005882	.041176
9/2	17/2	13	.106250	.145000	.004919	.000081		.144534
9/2	17/2	12	−.002083	.130081	.008603	.000205	.005466	.123883
9/2	17/2	11	−.063021	.116316	.011127	.000335	.009540	.105924
9/2	17/2	10	−.085938	.103668	.012560	.000439	.012314	.090483
9/2	17/2	9	−.079427	.092105	.012963	.000487	.013870	.077400
9/2	17/2	8	−.051302	.081598	.012385	.000461	.014285	.066537
9/2	17/2	7	−.008594	.072127	.010855	.000351	.013622	.057792
9/2	17/2	6	.042448	.063684	.008363	.000175	.011920	.051129
9/2	17/2	5	.096354	.056287	.004825		.009173	.046644
9/2	17/2	4	.148438	.050000			.005294	.044706
9/2	9	27/2	.107143	.142857	.004444	.000067		.142456
9/2	9	25/2	.000000	.128889	.007785	.000168	.004912	.123340
9/2	9	23/2	−.061275	.115958	.010083	.000275	.008589	.106620
9/2	9	21/2	−.085434	.104034	.011397	.000358	.011106	.092152
9/2	9	19/2	−.080532	.093090	.011778	.000396	.012531	.079805

I	J	F	CASIMIR'S FUNCTION	J+I←J			J←J	
				F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
9/2	9	17/2	−.053922	.083102	.011263	.000372	.012927	.069467
9/2	9	15/2	−.012255	.074056	.009874	.000281	.012343	.061061
9/2	9	13/2	.038515	.065945	.007601	.000139	.010807	.054564
9/2	9	11/2	.093137	.058785	.004372		.008313	.050060
9/2	9	9/2	.147059	.052632			.004785	.047847
9/2	19/2	14	.107955	.140909	.004035	.000056		.140561
9/2	19/2	13	.001894	.127783	.007077	.000140	.004439	.122788
9/2	19/2	12	−.059659	.115594	.009178	.000227	.007773	.107161
9/2	19/2	11	−.084912	.104318	.010387	.000295	.010066	.093560
9/2	19/2	10	−.081439	.093932	.010744	.000325	.011374	.081878
9/2	19/2	9	−.056187	.084416	.010281	.000303	.011748	.072024
9/2	19/2	8	−.015467	.075758	.009015	.000227	.011228	.063936
9/2	19/2	7	.035038	.067955	.006934	.000111	.009836	.057603
9/2	19/2	6	.090278	.061020	.003980		.007562	.053096
9/2	19/2	5	.145833	.055000			.004342	.050658
9/2	10	29/2	.108696	.139130	.003680	.000047		.138827
9/2	10	27/2	.003623	.126755	.006461	.000117	.004030	.122235
9/2	10	25/2	−.058162	.115231	.008389	.000190	.007068	.107578
9/2	10	23/2	−.084382	.104538	.009503	.000246	.009164	.094755
9/2	10	21/2	−.082189	.094655	.009838	.000269	.010367	.083675
9/2	10	19/2	−.058162	.085569	.009419	.000250	.010719	.074266
9/2	10	17/2	−.018307	.077268	.008260	.000186	.010253	.066477
9/2	10	15/2	.031941	.069751	.006349	.000090	.008984	.060303
9/2	10	13/2	.087719	.063030	.003636		.006903	.055807
9/2	10	11/2	.144737	.057143			.003956	.053187
9/2	11	31/2	.110000	.136000	.003097	.000034		.135764
9/2	11	29/2	.006667	.124903	.005448	.000084	.003366	.121153
9/2	11	27/2	−.055476	.114519	.007085	.000135	.005915	.108138
9/2	11	25/2	−.083333	.104831	.008039	.000174	.007686	.096646
9/2	11	23/2	−.083333	.095826	.008333	.000189	.008711	.086614
9/2	11	21/2	−.061429	.087493	.007985	.000174	.009022	.077991
9/2	11	19/2	−.023095	.079826	.007002	.000128	.008639	.070745
9/2	11	17/2	.026667	.072824	.005376	.000061	.007572	.064876
9/2	11	15/2	.083333	.066496	.003069		.005813	.060432
9/2	11	13/2	.142857	.060870			.003320	.057549
9/2	12	33/2	.111111	.133333	.002642	.000025		.133147
9/2	12	31/2	.009259	.123284	.004654	.000062	.002853	.120125
9/2	12	29/2	−.053140	.113840	.006061	.000099	.005022	.108442
9/2	12	27/2	−.082327	.104988	.006885	.000127	.006536	.098045
9/2	12	25/2	−.084138	.096719	.007144	.000137	.007419	.088889
9/2	12	23/2	−.064010	.089026	.006849	.000125	.007692	.080936
9/2	12	21/2	−.026973	.081903	.006006	.000091	.007371	.074167
9/2	12	19/2	.022343	.075350	.004606	.000043	.006462	.068583
9/2	12	17/2	.079710	.069377	.002623		.004955	.064221
9/2	12	15/2	.141304	.064000			.002824	.061176
9/2	13	35/2	.112069	.131034	.002280	.000019		.130884
9/2	13	33/2	.011494	.121858	.004022	.000046	.002449	.119160
9/2	13	31/2	−.051092	.113201	.005243	.000074	.004317	.108577
9/2	13	29/2	−.081379	.105055	.005962	.000094	.005624	.099095
9/2	13	27/2	−.084713	.097412	.006190	.000101	.006391	.090680

				J+I←J			J←J	
			CASIMIR'S				F←F+I	
I	J	F	FUNCTION	F+I←F	F←F	F−I←F	F+I←F	F←F
9/2	13	25/2	−.066092	.090267	.005937	.000092	.006633	.083305
9/2	13	23/2	−.030172	.083617	.005205	.000067	.006359	.076956
9/2	13	21/2	.018736	.077461	.003989	.000031	.005574	.071636
9/2	13	19/2	.076667	.071807	.002268		.004272	.067373
9/2	13	17/2	.140000	.066667			.002429	.064238
9/2	14	37/2	.112903	.129032	.001988	.000014		.128910
9/2	14	35/2	.013441	.120593	.003509	.000036	.002125	.118264
9/2	14	33/2	−.049283	.112605	.004580	.000057	.003749	.108602
9/2	14	31/2	−.080496	.105062	.005211	.000072	.004890	.099893
9/2	14	29/2	−.085125	.097958	.005413	.000077	.005562	.092111
9/2	14	27/2	−.067802	.091289	.005193	.000069	.005775	.085237
9/2	14	25/2	−.032855	.085053	.004553	.000050	.005539	.079261
9/2	14	23/2	.015681	.079249	.003486	.000023	.004855	.074185
9/2	14	21/2	.074074	.073883	.001979		.003718	.070033
9/2	14	19/2	.138889	.068966			.002111	.066854
9/2	15	39/2	.113636	.127273	.001748	.000011		.127171
9/2	15	37/2	.015152	.119464	.003089	.000028	.001861	.117433
9/2	15	35/2	−.047675	.112051	.004034	.000044	.003287	.108552
9/2	15	33/2	−.079676	.105029	.004593	.000056	.004290	.100504
9/2	15	31/2	−.085423	.098394	.004773	.000059	.004883	.093270
9/2	15	29/2	−.069227	.092141	.004580	.000053	.005073	.086835
9/2	15	27/2	−.035136	.086270	.004014	.000038	.004867	.081191
9/2	15	25/2	.013062	.080781	.003072	.000018	.004265	.076341
9/2	15	23/2	.071839	.075677	.001742		.003265	.072304
9/2	15	21/2	.137931	.070968			.001851	.069116
9/2	16	41/2	.114286	.125714	.001549	.000009		.125629
9/2	16	39/2	.016667	.118451	.002740	.000022	.001643	.116664
9/2	16	37/2	−.046237	.111537	.003580	.000035	.002905	.108453
9/2	16	35/2	−.078917	.104970	.004078	.000044	.003794	.100977
9/2	16	33/2	−.085637	.098745	.004239	.000046	.004320	.094220
9/2	16	31/2	−.070430	.092860	.004068	.000041	.004490	.088171
9/2	16	29/2	−.037097	.087314	.003565	.000030	.004308	.082825
9/2	16	27/2	.010791	.082107	.002727	.000014	.003776	.078185
9/2	16	25/2	.069892	.077243	.001545		.002888	.074263
9/2	16	23/2	.137097	.072727			.001636	.071091
9/2	17	43/2	.114865	.124324	.001383	.000007		.124252
9/2	17	41/2	.018018	.117536	.002446	.000018	.001462	.115953
9/2	17	39/2	−.044943	.111060	.003198	.000028	.002585	.108322
9/2	17	37/2	−.078215	.104893	.003644	.000035	.003379	.101344
9/2	17	35/2	−.085790	.099031	.003789	.000037	.003849	.095007
9/2	17	33/2	−.071458	.093473	.003637	.000033	.004002	.089301
9/2	17	31/2	−.038800	.088218	.003187	.000023	.003840	.084224
9/2	17	29/2	.008804	.083266	.002437	.000011	.003365	.079776
9/2	17	27/2	.068182	.078621	.001379		.002573	.075970
9/2	17	25/2	.136364	.074286			.001457	.072829
9/2	18	45/2	.115385	.123077	.001242	.000006		.123016
9/2	18	43/2	.019231	.116707	.002198	.000014	.001309	.115295
9/2	18	41/2	−.043773	.110617	.002874	.000022	.002316	.108170
9/2	18	39/2	−.077564	.104804	.003276	.000028	.003028	.101630
9/2	18	37/2	−.085897	.099266	.003407	.000030	.003450	.095664

				J+I←J			J←J	
I	J	F	CASIMIR'S FUNCTION	F+I←F	F←F	F−I←F	F←F+I F+I←F	F←F
9/2	18	35/2	−.072344	.094000	.003271	.000026	.003588	.090265
9/2	18	33/2	−.040293	.089008	.002866	.000019	.003444	.085431
9/2	18	31/2	.007051	.084287	.002191	.000008	.003017	.081163
9/2	18	29/2	.066667	.079842	.001239		.002307	.077470
9/2	18	27/2	.135714	.075676			.001305	.074371
9/2	19	47/2	.115854	.121951	.001121	.000005		.121899
9/2	19	45/2	.020325	.115952	.001985	.000012	.001178	.114684
9/2	19	43/2	−.042710	.110206	.002597	.000018	.002086	.108006
9/2	19	41/2	−.076961	.104709	.002961	.000023	.002729	.101853
9/2	19	39/2	−.085970	.099460	.003080	.000024	.003110	.096218
9/2	19	37/2	−.073116	.094458	.002957	.000021	.003235	.091095
9/2	19	35/2	−.041612	.089702	.002590	.000015	.003105	.086482
9/2	19	33/2	.005493	.085193	.001979	.000007	.002721	.082380
9/2	19	31/2	.065315	.080932	.001119		.002079	.078797
9/2	19	29/2	.135135	.076923			.001175	.075748
9/2	20	49/2	.116279	.120930	.001017	.000004		.120885
9/2	20	47/2	.021318	.115262	.001801	.000010	.001067	.114118
9/2	20	45/2	−.041741	.109822	.002358	.000015	.001889	.107835
9/2	20	43/2	−.076401	.104610	.002689	.000019	.002472	.102027
9/2	20	41/2	−.086017	.099622	.002797	.000020	.002818	.096689
9/2	20	39/2	−.073792	.094858	.002685	.000017	.002932	.091815
9/2	20	37/2	−.042785	.090318	.002353	.000012	.002814	.087403
9/2	20	35/2	.004100	.086002	.001797	.000006	.002465	.083456
9/2	20	33/2	.064103	.081911	.001015		.001884	.079979
9/2	20	31/2	.134615	.078049			.001064	.076984

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