INTERSERVICE RADIO PROPAGATION LABORATORY
NATIONAL BUREAU OF STANDARDS
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Nomograms for General Long-Time Frequency Allocation

Nomogram **A** shows approximate upper and lower limits of the optimum working frequency for use at any time over various distances up to 3000 miles. Nomogram B shows the relation between the lowest useful high frequency for 1-kw phone communication and that for other powers, phone and CW; this also is for distances up to 3000 miles. These nomograms apply for any time during the years 1943 to 1945.

A. Optimum Working Frequency Limits.- Nomogram A is for determining the limits of variation of the optimum working frequency (o.w.f.), which is taken as 15% below the maximum usable frequency. This nomogram does not give the lowest useful high frequency.

The distance scale is marked "shortest" on the side pertaining to the lower limit of the o.w.f. because, for given ionosphere conditions, the o.w.f. will be less for the shorter distances; it is marked "longest" on the other side because the o.w.f. is greater for the longer distances.

The method of use is as follows:

If a straightedge is placed so as to align the latitude of the midpoint of the transmission path on the left latitude line with the distance between transmitter and receiver, the lower limit of the optimum working frequency for the path will be indicated.

If, similarly, the straightedge is placed so as to align the latitude of the midpoint on the latitude line at the right with the transmission distance, the upper limit of the optimum working frequency will be indicated.

Frequency allocation for the path chosen should be made between these limits.

Examples of use of Nomogram A.

(1) A transmission path is 1900 miles long and its midpoint lies at latitude 10°S. From the nomogram the upper limit of optimum working frequency is 22.5 Mc and the lower limit is 6.2 Mc.

(2) A group of stations is centered about latitude 20°N. The maximum distance between stations is 2200 miles, and the minimum distance between stations is 500 miles. The upper limit of optimum working

frequency for the group is 25.5 Mc and the lower limit is 3.14 Mc.

B. Lowest Useful High Frequency.- Nomogram B is for obtaining the l.u.h.f., for distances up to 3000 miles, for any power phone or CW, given the l.u.h.f. for 1-kw phone.

During daylight hours, the l.u.h.f. for 1-kw phone over such paths is about 80% of the o.w.f. At night it may be taken as about 25% of the o.w.f., although at this time it is much more variable, and is likely to vary between 20% and 35% of the o.w.f.

The nomogram B will not give very good results if the l.u.h.f. for 1-kw phone is less than about 2 megacycles, as is likely to happen at night at short distances. (2 megacycles is shown as the limit of the nomogram for 1-kw phone). In this case the l.u.h.f. for any power is also likely to be less than 2 megacycles.
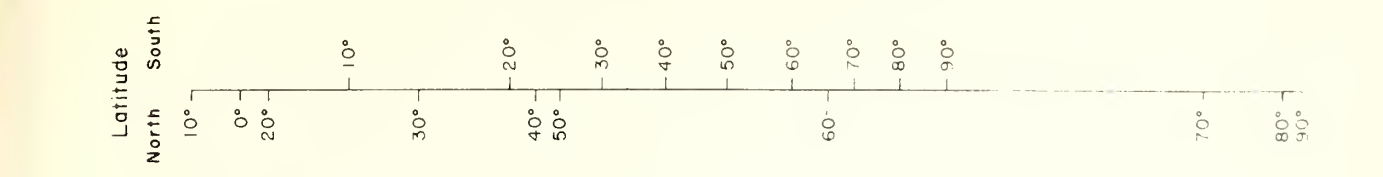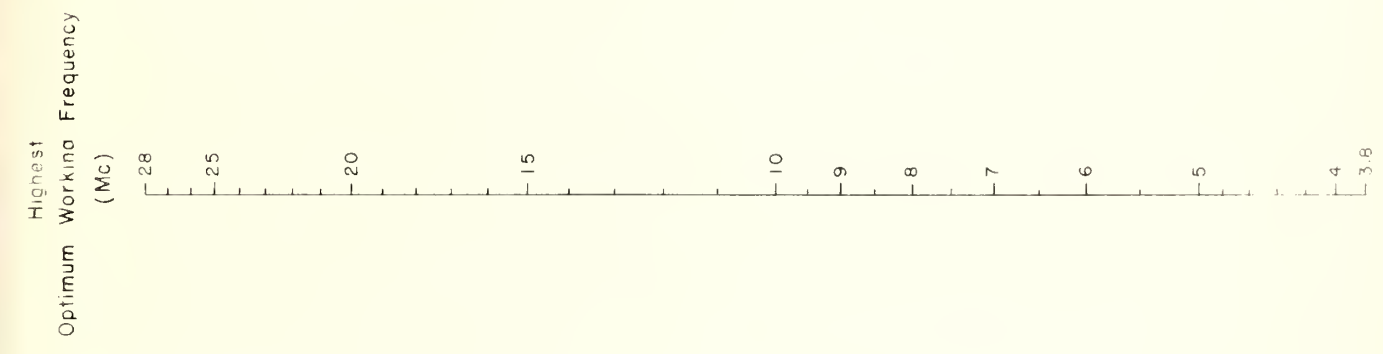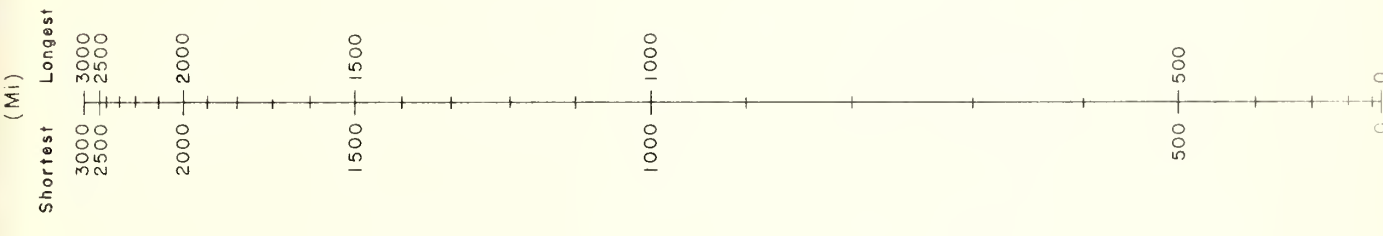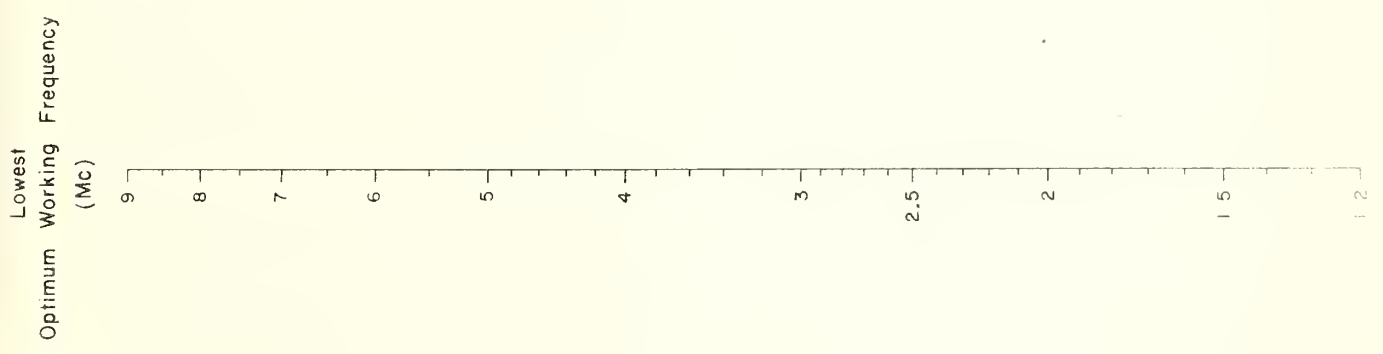
Example of use of Nomogram B: In example (1) above, assume that the upper limit of the o.w.f., (22.5 Mc), occurs in the daytime and the lower limit of the o.w.f., (6.2 Mc), occurs at night. The corresponding values of the l.u.h.f. for 1-kw phone are -

80% x 22.5 Mc = 18.0 Mc
25% x 6.2 Mc = 1.5 Mc

If the transmission is 10 kw CW the actual l-u h.f. are, respectively, 15.5 Mc and less than 2 Mc.

The frequencies to be allocated might then be perhaps one around 16 Mc, one around 6 Mc, and one in between, say around 11 Mc.
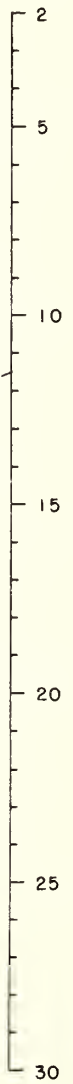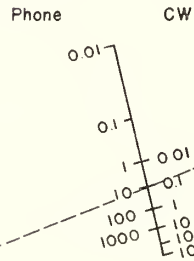
A

Latitude
North   South

Highest

Optimum Working Frequency
(Mc)

Distance
(Mi)

Longest
Shortest

Lowest

Optimum Working Frequency
(Mc)

Latitude
North   South

B

Lowest Useful
High Frequency
(Mc)

Lowest Useful
High Frequency
for 1 - kw Phone
(Mc)

35 —

30 —

— 2

— 5

25 —

Radiated Power,
Kilowatts

— 10

20 —

Phone   CW

0.01

0.1
                1 0.01
                   0.1
15 —   10   1
         100   10
         1000   100
                  1000

— 15

Example shown by
dashed lines:

1 kw phone l.u h.f. = 11.5 Mc
Power = 10 kw Phone
Actual l.u.h.f. = 10 Mc

— 20

10 —

— 25

5 —

1 —

— 30