be taken in this condition. The diffraction pattern is then photographed after defocusing the condenser lens to increase the coherence. Reconstruction should then give additional resolution.

It is of interest to note that the state of focus is relatively unimportant in producing the diffraction picture. As the instrument is defocused, more of the information concerning small detail is transferred from the normal image to the diffraction fringes. At focus, all the information which the aberrations allow is contained in the normal image. This we may expect, since the aberrations prevent true focusing. The focused image may be reconstructed to give the improved resolution set by the coherence.

The ultimate resolution possible after reconstruction may be judged from the diffraction pattern by the width of the last and narrowest fringe; this is independent of the position of focus and equal to twice the resolving limit.

It is still a necessary requirement that the object take up only a small proportion of the total area occupied by the background interfering beam. This may be regarded as one aspect of the fundamental coherence requirement.

Reconstruction apparatus for the new arrangement has been considered and does not appear to present any special additional difficulties.

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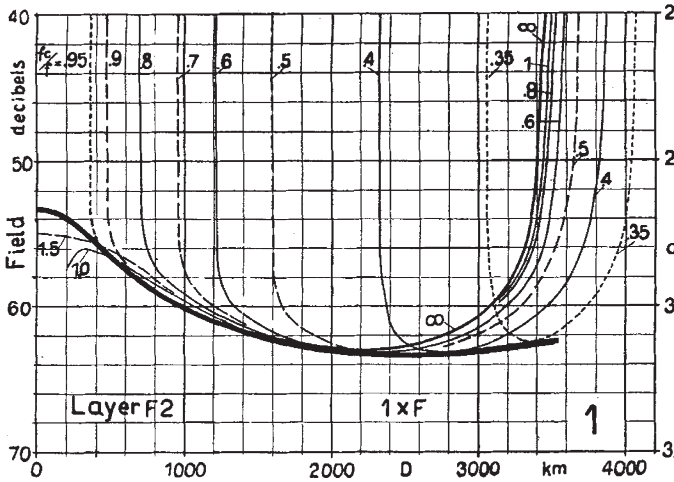
Geometrical Optics of Ionospheric Propagation



Lejay and Lepechinsky[1] recently published a note on field intensity as a function of distance, a question which is of great interest for ionospheric prediction work. With their method of the reflectrix they find two focusing effects, one at a distance corresponding to a path that leaves the earth tangentially, the other at the limit of the skip distance.

The first effect is noted as "an already known fact". In fact, consideration of this effect is one of the fundamental ideas of the ionospheric prediction method, used in Germany during the War (since 1941). I have given a detailed calculation in a report published in 1943 [2], and, since the War, the essential results have been published in France[3]. The second effect was calculated for the first time in an early work of Försterling and Lassen[4], and the same work also contains a theory of the so-called Pedersen-ray.

Meanwhile, a much more complete treatment of the problem has been undertaken[5]. In the case of a parabolic distribution of electron density (earth and ionosphere being curved), the 'geometrical optics' of the ionosphere has been studied by means of an extension of Försterling and Lassen's methods. Theoretically, there are three focusing effects: (1) for the skip distance, resulting from refraction phenomena, (2) for the maximum length of path (tangent ray), due to the curvature of the reflecting layer, (3) for the antipodes, brought about by the spherical form of the earth. The third effect will, in practice, be reduced greatly by irregularities of the reflecting layer.

The first effect, which can be very important in certain cases, corresponds to a distance that can never be fixed. For practical use, neither the first nor the third effect can be applied regularly. The second effect is also influenced by variations of electron density (and layer height). We began by making exact calculations for a given parabolic model of ionospheric layers (limits 240/432 for the F-layer, 100/150 for the E-layer). The various curves of field intensity correspond to all possible ratios of critical to working frequency (f_c versus f) (see graph). We now draw a curve through the lower limits of these curves[6]; this thick curve is used for our prediction work. Thus we find curves for the different paths $1 \times F, 2 \times F, 3 \times F \ldots 1 \times E, 2 \times E \ldots$ For distances of about 20,000 km. the influence of the third focusing effect has been eliminated. The resulting curves are not greatly different from those formerly used[2,3], the influence of curvature being the most important one. Field intensities observed at great distances cannot well be explained, if one does not take this second effect into account.

The work mentioned above[5,6] forms part of the research work of the Service de Prévision Ionosphérique Militaire (France).

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May 25.

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Large-scale Sporadic Movements of the *E*-Layer of the Ionosphere

A WIDESPREAD effort is at present being made to obtain information on the prevalence and occurrence of sporadic E-layer reflexions over the North American continent. Such information is supplied by a network of volunteer radio amateurs (operating in the vicinity of 50 mc./s.), upon whose co-operation the success of the project depends.