Transformation to Dirac's gauge requires an S-function satisfying

$$(\partial S/\partial t)^2 - (a \sin \omega (z - t) - \partial S/\partial x)^2 - (\partial S/\partial y)^2 - (\partial S/\partial z)^2 = k^2.$$

Note that there are no solutions with $S = f(z - t)$, for this would make the left-hand side negative. The simplest solution is of the form

$$S = kt + f(z - t),$$

and yields

$$A_0 = k + \frac{a^2}{2k} \sin^2 \omega (z - t) ; \; A_x = a \sin \omega (z - t) ;$$

$$A_y = 0 ; \; A_z = \frac{a^2}{2k} \sin^2 \omega (z - t) ;$$

or a velocity field:

$$v^0 = A^0/k, \; v^1 = A_x/k, \; v^2 = 0, \; v^3 = A_z/k.$$

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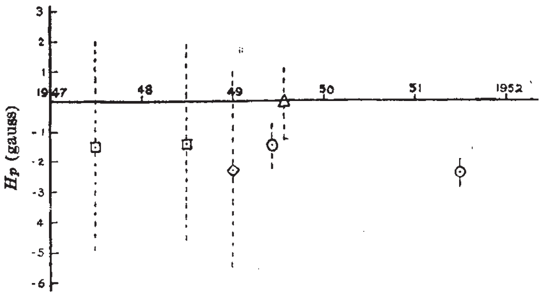
[1] Dirac, P. A. M., *Proc. Roy. Soc.*, A, **209**, 291 (1951).
[2] Dirac, P. A. M., *Nature*, **168**, 906 (1951).
[3] Lorentz, H. A., "Lectures on Theoretical Physics", **1**, chap. 2 (Macmillan, London).

Measurements of the Sun's General Magnetic Field

Measurements of the sun's general magnetic field have been made at ± 45° heliographic latitude. The pole field-strength H_p, given in the accompanying graph, has been calculated from the observations on the assumption that the sun has a dipole field, its axis being parallel to the axis of rotation. A negative sign means that the direction of this field relative to the rotation is opposite to that for the earth.



□, Hamburg, visual[1]; ○, Hamburg, photoelectric[2]; ◇, Mount Wilson, visual[3]; △, Cambridge, photographic[4]

From the visual measurements during 1947 and 1948 in Hamburg[1], it was at first roughly concluded that there was no positive field greater than 5 gauss, but a very small negative field seemed to exist. The exact values of this negative field and the photoelectric measurements for 1951 are given here. The lengths of the dotted lines represent the mean errors.

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An Improved Method for the Calculation of the Field-strength of Waves Reflected by the Ionosphere

Ten years ago a method of calculating the field-strength of the sky wave was developed by one of us[1]. Apart from the well-known conditions for ionospheric reflexion, it takes account of three independent influences: geometrical optics of the reflecting layer, absorption in the D-layer and blanketing caused by the E- and E_s-layers; in a later publication[2] considerations of refraction occurring in the reflecting layer led to a slight modification of the analysis of the first influence[3]. The influence of the blanketing E- and E_s-layers is only of interest for reflexions from the F-layer. Until now, this effect has been supposed to be a discontinuous one: a certain transmission path via the F-layer is assumed to be cut off by the E-layer, if, at the angle of transmission used, the frequency is inferior to the maximum usable frequency of the E-layer. If the frequency is greater, the ray will be assumed to pass.

This problem has now been re-examined. We must distinguish cut-off caused by the thick normal E-layer from the influence of the thin sporadic E_s-layer. In the latter case the above argument is correct, except that the angle of incidence is now calculated with a parabolic F-layer. Conditions in the F-layer affect transmission in the sense that cut-off is favoured by a low height of the F-layer (corresponding to a high value of the transmission-factor '(M 3,000)$F2$').

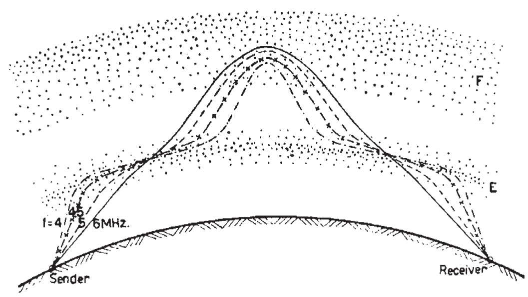

Fig. 1

In the first case, refraction occurring in the thick E-layer should not be neglected. In principle, all frequencies greater than the critical frequency of E can be propagated via the F-layer. With a given distance we find for different frequencies the rays shown in Fig. 1. For each frequency there is a new angle of departure; the lower the frequency the greater is the curvature due to refraction. But the field-strength of these curved rays is rather low, because they are attenuated by two effects: an unfavourable influence of the E-refraction on the geometrical optics of the ray, on one hand, and selective absorption occurring in the E-layer on the other. Thus the cut-off limit becomes a continuous transition with decreasing amplitude, and our problem turns out to be a problem of field-strength calculation.

In consequence the field corresponding to a transmission path near the cut-off limit must be calculated with respect to three attenuation influences: geometrical optics including refraction in the E-layer, non-selective absorption in the D-layer and selective absorption in the E-layer. The calculation of geo-