LETTERS TO THE EDITORS

PHYSICS

Light from the Corona Discharge

OBSERVATIONS have been made of the light emitted from the positive and negative point surge corona discharges. The photomultiplier used for measuring the light, together with its associated distributed amplifiers with a rise time of not more than 10^{-8} sec., and the recording oscillograph, were contained in a double-screened cage with a filtered mains supply to eliminate large spurious signals originating from the surge generator. The time base of the oscillograph was tripped from a pulse derived from the corona itself via a second photomultiplier so that fast time sweeps could be used.

Fig. 1 shows typical light-time records for both polarities of the total light from a point 2 cm. from a 5-cm. sphere at a peak voltage of 28 kV.

The intensity and duration of the light emitted by the positive point are such as to be just visible; photomultiplier measurements indicate that the total light emitted with the opposite polarity is approximately one hundredth. Fig. 2 shows records obtained through a slit in an opaque screen on which an enlarged image of the gap is focussed. These and similar records taken with the slit in different positions are interpreted as indicating that the discharge involves a number of point light sources, possibly regions of

Fig. 1. Total light-time records.

Fig. 2. Light transmitted through slit.

intense ionisation and excitation, travelling across the gap. These point sources of light do not originate simultaneously. The general shape of the total positive point light pulses agrees with that found by Saxe and Meek^{1,2} but the observations through the slit are quite different in consisting of separate pulses and not a continuous pulse. The probable explanation appears to be that the rise time of 6×10^{-8} sec. of the amplifier used by Saxe gave inadequate time resolution. It is proposed to examine the light from two slits to obtain, if possible, an estimate of the speed of propagation of a light source.

The work described above has been carried out as part of the research programme of the National Physical Laboratory, and this communication is published by permission of the Director of the Laboratory.

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¹ Saxe, R. F., and Meek, J. M., *Nature*, **162**, 263 (1948).² Saxe, R. F., and Meek, J. M., *Proc. Inst. Elec. Eng., Part C Mon.*, **124 M**, 102 (1955).Tides in the F_2 Ionospheric Layer

D. G. PARKYN¹ has shown how third and fourth harmonic tides could explain the peculiar behaviour of Satellites 1958 δ_1 and 1958 α respectively. A few weeks ago I noticed the existence of an 8-hr. tide in the half thickness $ym = h_p - h'$ of the F_2 layer. Parkyn's paper has encouraged me to investigate this matter more thoroughly.

An harmonic analysis of the mean diurnal variation of ym obtained from five years observations (1952–1958) at Léopoldville-Binza shows a prominent first harmonic, associated with the following oscillations listed in order of decreasing amplitude: 8 hr., 4.8 hr. and 12 hr. Half amplitudes are listed on the first line of Table 1.

The eight-hr. oscillation is clearly noticeable in Fig. 1 which was obtained after removing the 24 hr. variation from the data. Maxima occur at 01, 09 and 17 hr. U.T.

Harmonic analysis of the diurnal variation for each calendar month using mean values over five years shows further:

- (1) that the amplitudes of the various harmonic components are subject to annual variations having roughly a minimum in May and a maximum in November;

Table 1. HALF AMPLITUDES OF OSCILLATIONS IN ym (KM). Half amplitudes are listed on the second line of the table. On the third and fourth lines the months of maximum and the annual mean values are given. The fourth line values are different from those listed on the first line owing to an annual oscillation of phase.

	ym_0	Period (hr.)				
		24	12	8	6	4.8
1952–1958	60.2	28.0	3.1	6.4	0.5	3.5
Annual variation	—	3.7	3.5	4.1	1.6	4.0
Month of maximum	—	Oct.	Nov.	Nov.	Jan.	Dec.
Mean annual values	—	28.3	6.2	6.8	3.8	5.3