Table 2—Association of D-,E-,F-, and H-types of Flares with Decametric Type III Bursts

Type of flares	No. of flare-associated type III decametric bursts	Flare-associated type III bursts accompanied with decimetric bursts	Flare-associated type III bursts accompanied with microwave bursts
D(375)	22	9	4
E(298)	17	8	7
F(258)	10	3	4
H(47)	3	3	2
Remaining types together (81)	4	1	—

(Figures in parentheses in the first column represent the number of flares.)

The flares were also examined in relation to the occurrences of the decametric type III bursts. The results are shown in Table 2.

The overall percentage association of flares with these types of bursts is 5·3% only. Again amongst the flare related decametric type III bursts, about 43% and 30% are accompained with the decimetric and microwave bursts, respectively. These results conform partly with that of Pick.[7]

Lastly, the individual type of flares were associated with the SIDs. The flare-SID associations for D-,E-,F- and H-types are, respectively, 12·3, 19·8, 27·1 and 21·3% only. Again, most of the associated SIDs are of importance 1; where the SIDs have been designated under the importance rating based on a scale of 1, the least, to 3, the most important, producing intense ionization in the ionospheric D-layer.

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Fading of Simultaneous lf Radio Signals for Two Propagation Paths with the Same Effective Height

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Simultaneous observations of the field strength of lf radio signals on 332 and 280 kHz propagated over two paths for which the effective heights of reflection are the same, have been made at Berhampore, West Bengal. A preliminary analysis of the data indicated that the fadings at the two frequencies are independent, the depth of fading being more at night than in daytime. There is a tendency for the fading depth at night to decrease abruptly after midnight, particularly for the propagation path at 332 kHz. The results have been critically examined in the light of the current knowledge about radio wave propagation in the lower ionosphere.

Radio navigational signals in the lf band are widely used for homing of aircrafts towards various airports. A knowledge of the fading characteristics is important for the setting up and successful operation of the homing links. It is expected that the fading characteristics would be a function of the effective frequency as given by $f_v = f \cos i$, where, i is the angle of incidence on the ionosphere and f is the frequency of transmission. For the last few years, we have been recording simultaneously the field strength of two radio signals in the lf band on 280 kHz (call sign JR and CHB) and 332 kHz (call sign EA) for which the effective frequencies are of the same order. The fading of the signals exhibits certain interesting characteristic features. The results obtained from a preliminary analysis of the data are presented in this communication.

The signal at 332 kHz is transmitted from Calcutta (lat., 22°34′N; long., 88°24′E) while that at 280 kHz for the daytime period is due to a transmission from Jessore (lat., 23°10′N; long., 89°10′ E) in Bangladesh. At night this daytime transmission is stopped when a signal at the same frequency is received throughout the night from China Bay (lat., 9°11′N; long., 81°11′E) in Ceylon. Two typical records of the nighttime field strengths on 332 and 280 kHz exhibiting the fading are reproduced in Fig. 1. In the upper record [Fig. 1(a)], which is due to the 280 kHz transmission (CHB), the fading is quite marked. In the lower record [Fig. 1(b)], due to the 332 kHz

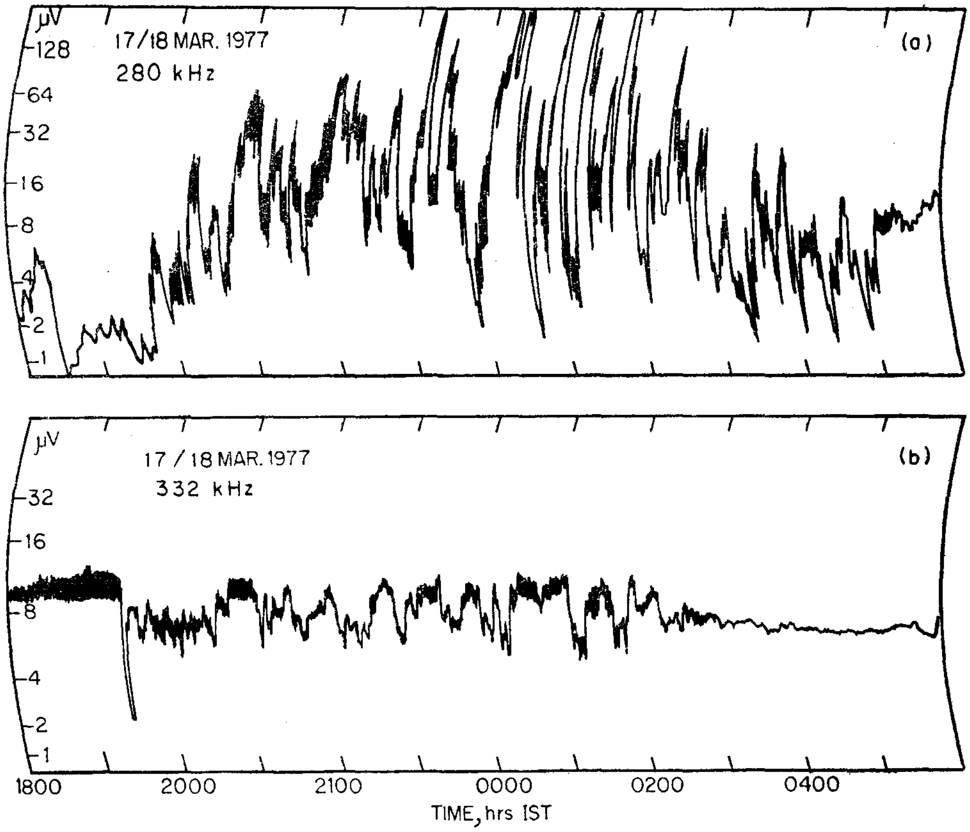

Fig. 1—A typical record of the field strength for : (a) 280 kHz transmission and (b) 332 kHz transmission (The ordinates show the receiver input in μV)

transmission, however, the fading decreases suddenly after midnight. The results can be summarized as follows.

(i) There are two distinct types of fading, short and long period types, observed at each of the frequencies. For the long period fading the period varies from 20 to 40 min, while for the short period fading it is about 2 to 10 min.

(ii) The depth of fading at the two frequencies appears to be independent.

(iii) The fading depth at night is much larger than that in daytime.

(iv) There is a tendency for the depth of fading to decrease abruptly after midnight; the tendency is remarkable in the records of the 332 kHz transmission.

The occurrence of fading with two distinctive periods on a particular frequency suggests an origin of the fading from two different scale size ranges of drifting irregularities at the effective height of reflection involved.[1] It may be noted that the regions of reflection for the two propagation paths considered are at different locations although the effective heights are of the same order. The difference in the fading characteristics at the two frequencies, therefore, appears to be due to the differences in the location of the reflection regions. The abrupt decrease in the fading depth after midnight for the 332 kHz transmission indicates a decrease in the electron density deviation from the mean value occurring at the reflection region at such times. A detailed analysis of the data is in progress.

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