LETTERS TO THE EDITOR

STUDY ON FORWARD SCATTERING OF METEOR BURSTS

MYRIADS of meteors have been entering out atmosphere incessantly from all directions. Most of them are completely burn by the heat produced from frictional forces at a height about 100 Km. This relatively small zone of meteoric region is due to the rapid change of air density over the said range. On destruction, the meteors produce highly ionized trails (ionisation of the order of 10^{10} to 10^{16} electrons per meter). These trials are able to reflect and scatter the lower part of (30–100 MHz) VHF spectrum. The strong signals reflected from the trails are called as meteor bursts. The rate of arrival of meter bursts, their diurnal and seasonal variation,, and variation of duty cycle (fraction of time the signal amplitude remains above a fixed level) were studied in detail by Radar and Forward Scatter technique[1]. The characteristics of meteor bursts vary with geographical position, direction and length of transmission path and other system characteristics.

Investigations were carried out during Oct. 1974 to Nov. 1975 between Dehra Dun and Waltair (Great circle distance 1533 Km), jointly by the Defence Electronics Applications Laboratory, Dehra Dun and the Andhra University, Waltair, to study some characteristic of the meteor bursts by forward scatter technique.

One VHF Transmitter (Power 100 W and operating frequency of 48·2 MHz) was located at Dehra Dun. The antenna used was a 6 element yagi with about 10 db gain and 60° half power beamwidth. Continuous transmissions of CW was made every second half of each hour, round the clock, for a period of one year from Oct. 74 to Nov. 75.

The forward scattered signals were received at Waltair by a VHF Receiver. This was a crystal controlled, double conversion superheterodyne receiver with gain about 100 db and 3·0 KHz bandwidth. The receiving antenna was similar to the transmitting antenna. The detected output was recorded on paper charts suitably calibrated.

Results.

Diurnal Variation

The rate of arrival of meteors varies from hour to hour. In the morning hours when the earth is moving towards the apex of the orbit, it catches up even slower meteors. While in the evening hours, only the meteors with higher velocities can overtake the earth's atmosphere. As a result the arrival rate of meteors is more in the morning hours than in the evening hours. This is evident from Fig. 1. The quantity of

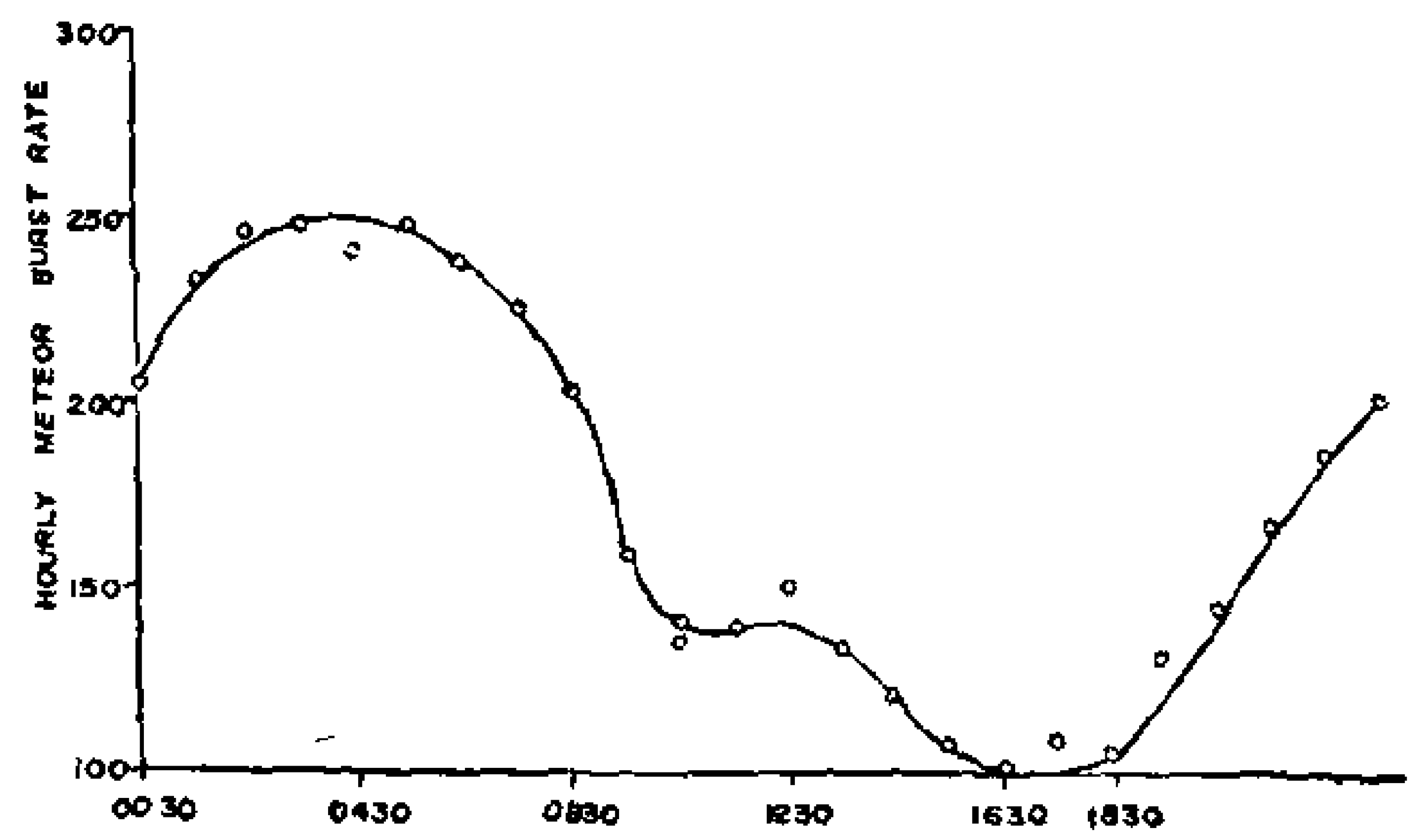

FIG. 1. Mean diurnal variation of hourly burst rate meteors for Nov. 74–Oct. 75.

diurnal variation changes with geographical position and ranges from 2 to 6.

Annual Variation

The annual variation of meteors arrival rate is expected from the tilt of the earth's atmosphere and the particular space distribution of radiants of sporadic meteors. The minimum occurs generally around February and maximum around July. Somewhat different results have been noticed in this experiment.

The weekly averages of half hourly rate of meteor bursts are shown in Fig. 2. Here though the arrival

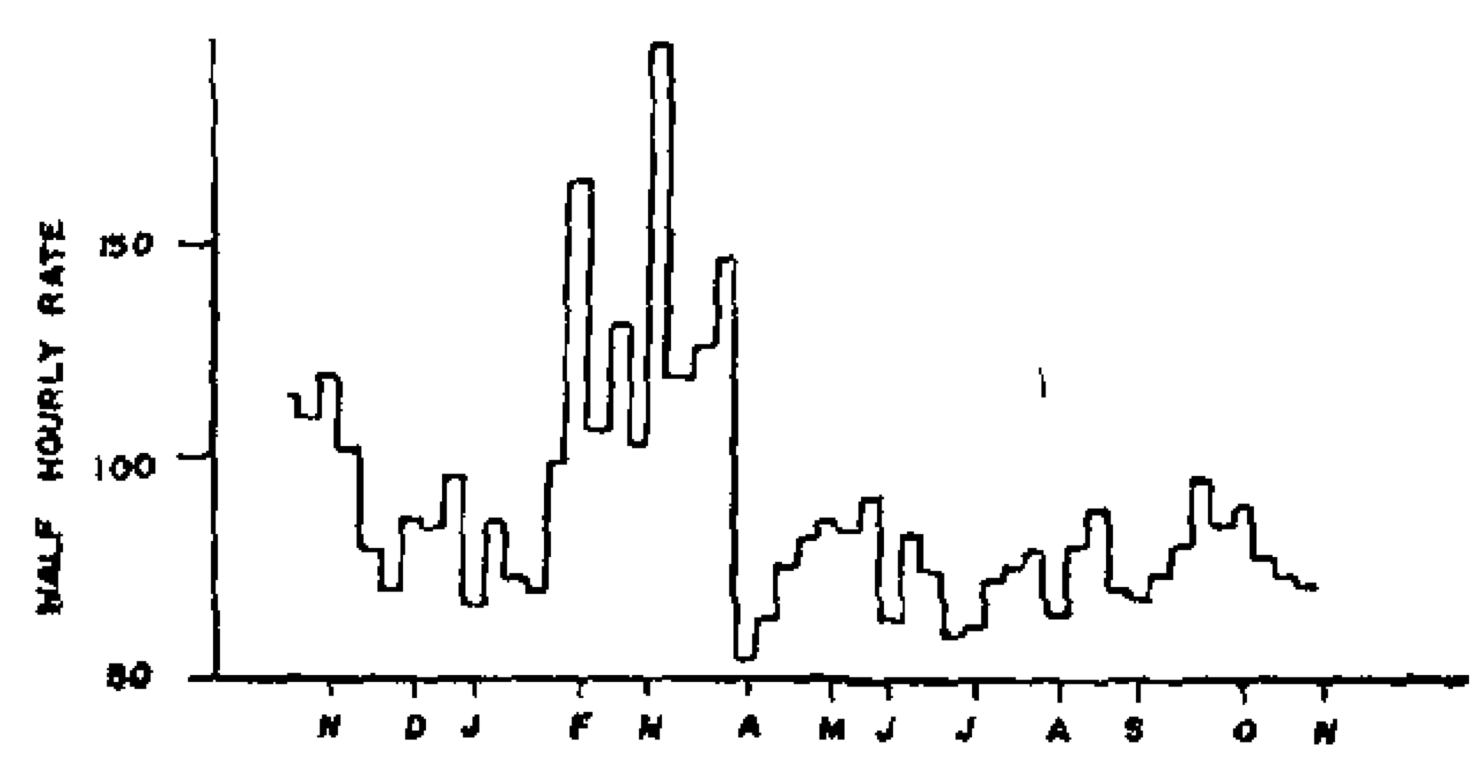

FIG. 2. Annual variation of weekly averages of half hourly-burst rate of meteors.

rate of meteors is low in February, the lowest occurs around Apri and there is a maximum in between. The discrepancy may be due to the fact that the year 1974 was passing thsough the sunspot minimum. The non-uniformity of shower rate and the planetory position may also have some effect.

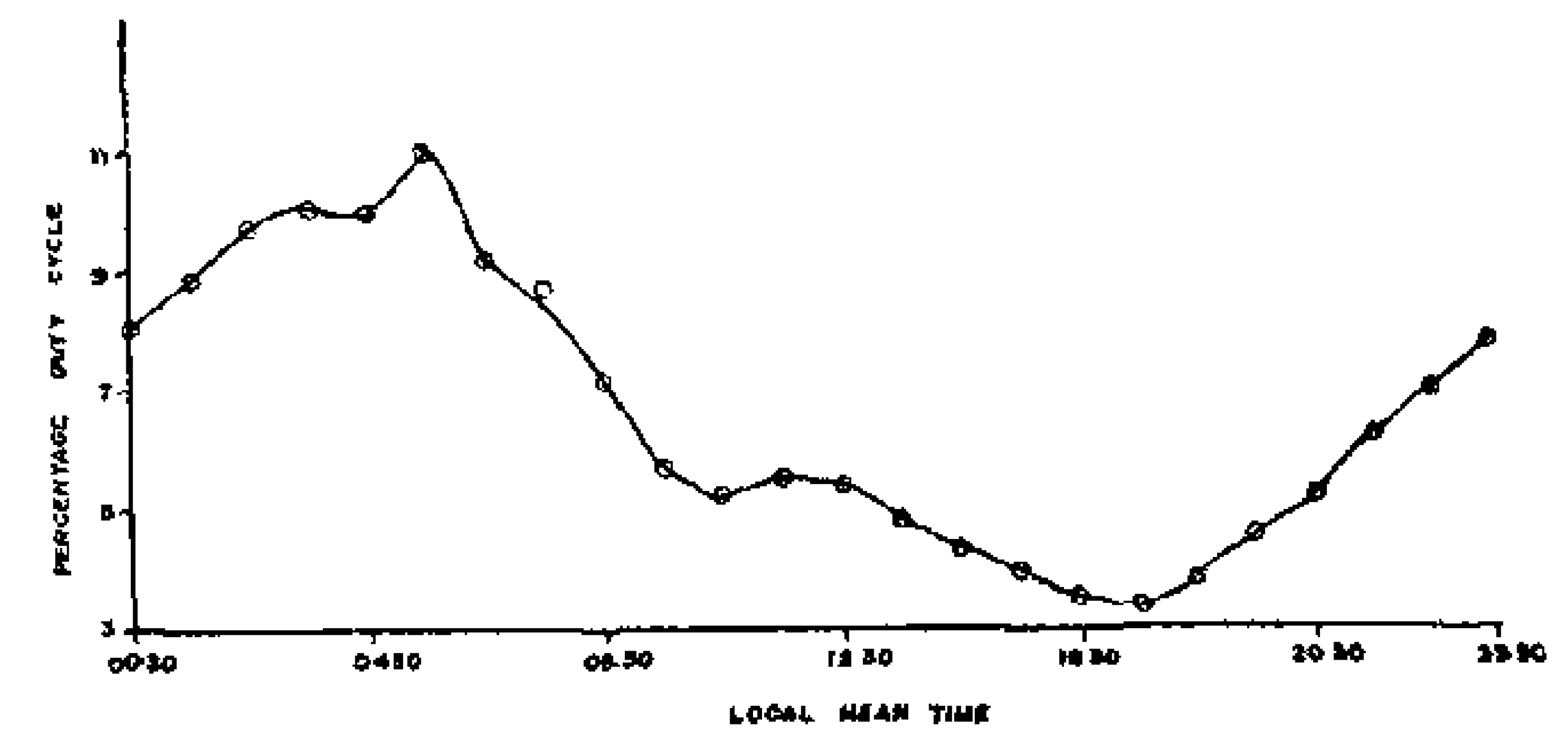

FIG. 3. Diurnal variation of percentage duty cycle averaged over eleven months.

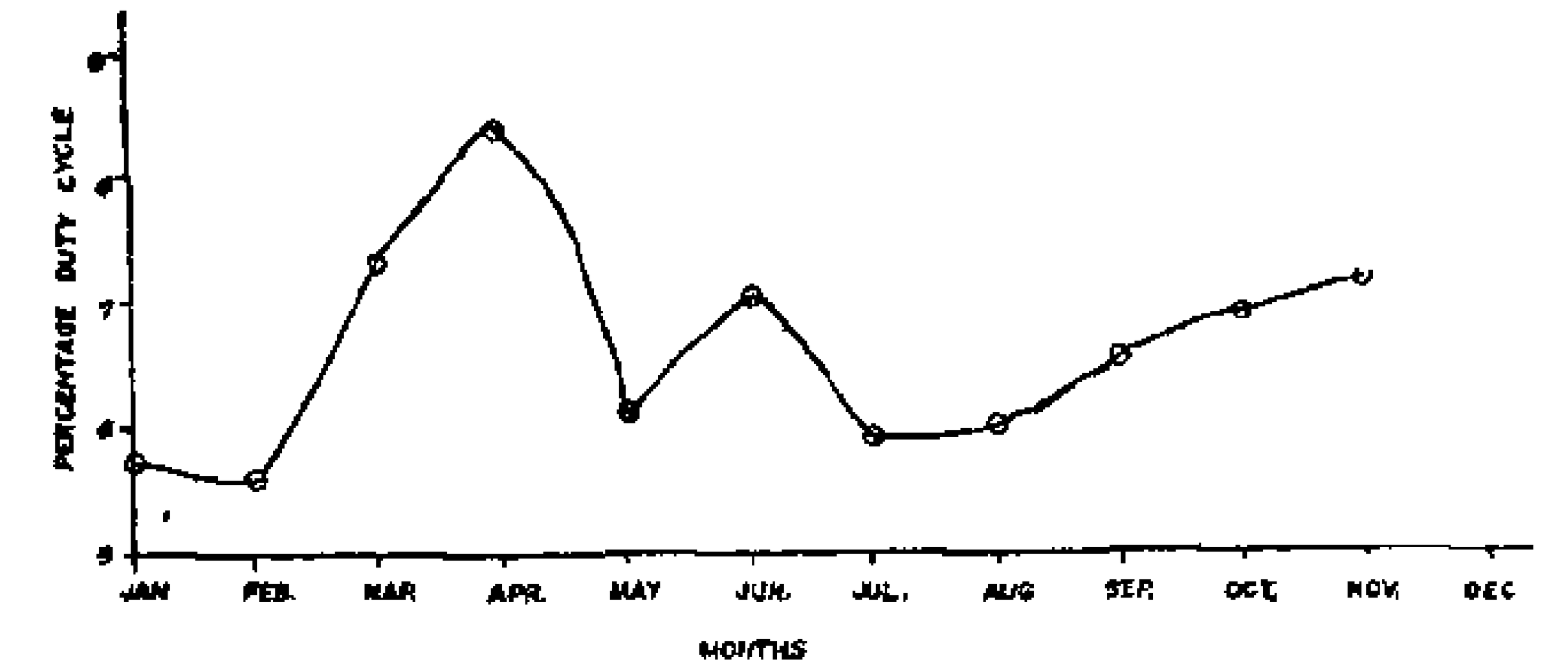

FIG 4 Annual variation of percentage duty cycle.

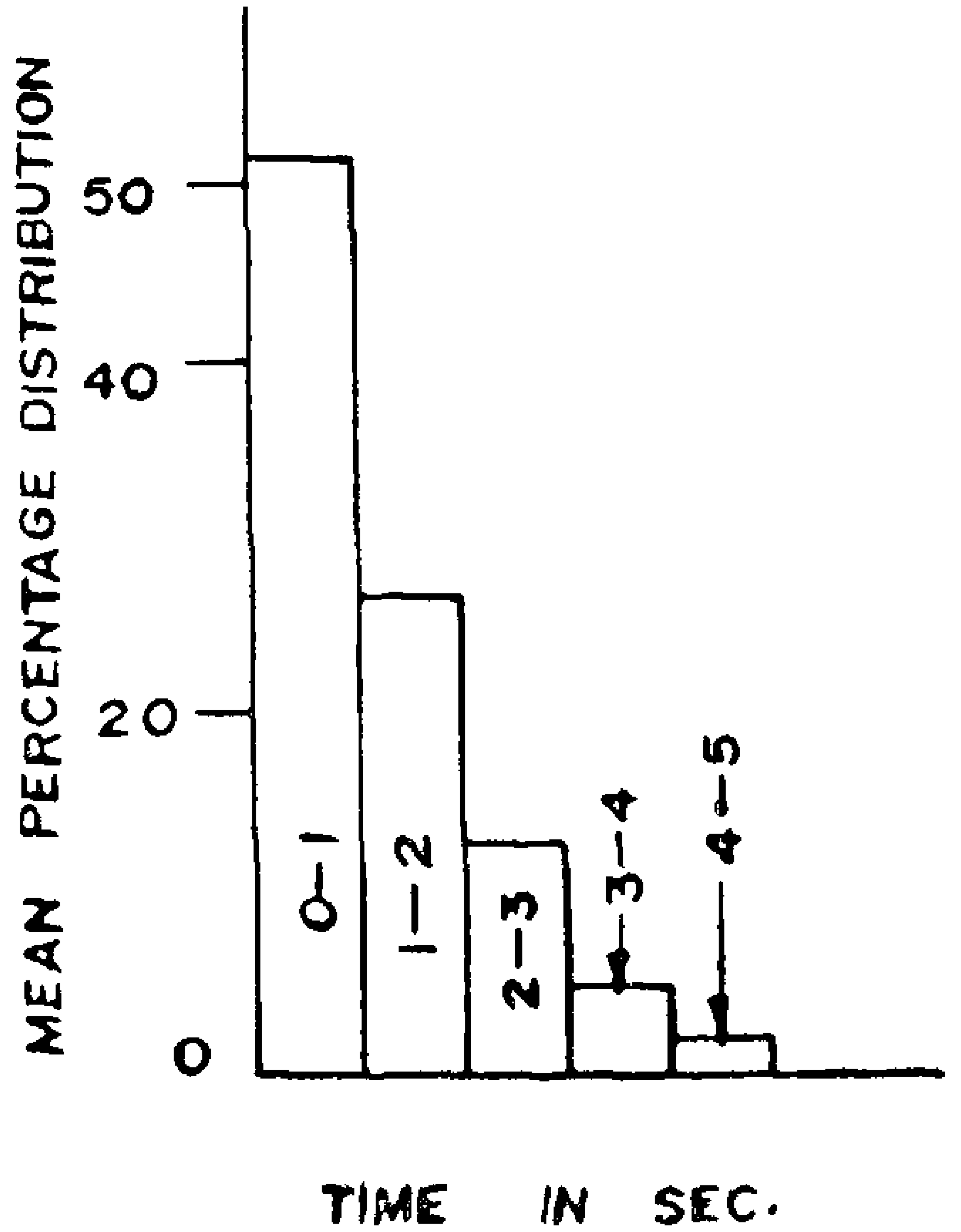

FIG. 5. Histogram of percentage distribution of meteor burst of different duration.

Duty Cycle

The fraction of time the echoes remain above a present value (Threshold) is defined as duty cycle. This varies with the threshold selected and also with days and months. In this experiment signals above 2 μV were taken into consideration. The diurnal variation of duty cycle over a period of eleven months is depicted in Fig. 3. This (like that of the bursts rate) clearly shows a maximum in the early morning and a minimom in the evening hours and is more or less sinusoidal in nature. The range of vairation is from 2 to 8. The annual variation of duty cycle shows a maximum value near Mar.-Apr. and a minimum around February (Fig. 4). The range of variation is about 3·5%.

The duration of meter busts varies from a fraction of a second to many seconds but more than 95% of bursts have duration less than 5 seconds. The distribution of duration of echoes of duration less than 5 seconds is shown in Fig. 5. All the above results were obtained by studying one second bursts only.

The results give a quantitative idea of the important characteristics of the meteor burst propagation which are essential for design of a meteor burst communication system.

Defence Electronics D. K. GANGOPADHYAY.
Applications Laboratory,
Dehra Dun,
October 22, 1977.

1. Papers (12 numbers) on meteor burst communication, *Proc. IRE*, 1957, 95, 1642.
2. Rao, B. R., Rao, M. S., Ratnam, S. R., Rao, D. A. V. K. and Rao, E. B., *Indian Journal of Radio and Space Physics*, 1975, 4, 99.
3. —, —, —, —, *Ibid.*, 1976, 5, 103.

SYNTHESIS AND STRUCTURAL STUDIES OF TETRATHIOCYANATE COMPLEXES WITH FIVE MEMBERED RING MOLECULES AS LEWIS BASES

RECENTLY[1,2], we have studied the effect of six membered ring ligands towards the mode of thiocyanate bonding in tetrathiocyanate complexes. It has been pointed out that the mode of thiocyanate bonding depends upon the nature of the ligand and metal. In the present communication we are presenting the synthesis and structural studies of some new bimetallic tetrathiocynate complexes with five membered ring ligands having multisites of bonding.

Synthesis of the complexes and physical measurements were made as described earlier[1,2]. These complexes have been characterized by elemental analysis, molar conductance, magnetic moment and infrared spectral studies. Elemental analyses indicate the complexes to be of the type $CuM(NCS)_4 \times L$ [M = Cd (II), Hg (II) $x = 2, 4$ and L = Thiozolidinethione (tzt), thiohydantoin (thn) and Ethylenethiourea (etu)]. To establish the structure of the complexes, group theoretical calculation have also been performed, treating ligands as points (3).