MEASUREMENT OF RADIO NOISE LEVEL IN DELHI AREA—PART II

by

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ABSTRACT

Measurements of Radio Noise Level on 150 Kc/s were carried out by a direct method at Delhi. The nature of diurnal variation of Mean Peak Noise level on this frequency was studied. The results were compared with those obtained for the same frequency in the American Sub-Arctic Region, during 1947. The similarity in the nature of diurnal variation for these two places was observed. For both the places the peak noise level was found to be minimum in the early hours of the morning till sunrise, gradually increasing afterwards. It is maximum around mid-day, falling near sunset and increasing afterwards. From this observation, it was suggested that the ionosphere contributes most to the Radio Noise Level around 150 Kc/s. The observed value of peak noise level at Delhi was found to vary between 10μV/Metre/Kc Bandwidth and 0·35μV/Metre/Kc Bandwidth.

Introduction

Some systematic studies of radio noise level on 150 Kc/s were carried out at Delhi for a period of six months. An objective method was adopted for the measurements employing direct reading equipment, described in detail earlier[1]. The recorded noise level given in μV/Mc Bandwidth by the meter was reduced to noise field intensities in μV/m/Kc Bandwidth by using the well-known relation for a lossless isotropic antenna[2]. The observed value of peak noise level at Delhi on 150 Kc/s was found to be within the limits 10μV/Metre/Kc Bandwidth and 0·35μV/Metre/Kc Bandwidth. There was found to be good agreement between the observed values and the predicted values as given in CCIR report No. 65.

A few representative records of diurnal variation of the noise field strength on 150 Kc/s were compared with the corresponding results of Gerson[3] for the American Sub-Arctic region. Considerable agreement in the nature of diurnal variation for the two places was observed.

Method of measurement

Due to the peculiar characteristics of radio noise it is difficult to devise a method of measurement which will give an accurate and directly usable

noise data for all purposes. Although measurements of noise level have been undertaken in U.K. and U.S.A [4,5] for a number of years, the data obtained by various workers could not be correlated, due to non-standardisation of methods.

In the present studies, an objective method of measurement of radio noise level has been adopted. A direct reading Noise and Field strength Meter was employed in these measurements. Figure 1 gives schemetically the layout of the measuring equipment. A non-directional vertical whip antenna was used to receive the noise. The antenna output was fed to the Noise Field strength meter which indicated the noise level in db above 1 microvolt/Mc bandwidth. An internally built-in impulse generator was used as a comparison standard. For taking continuous record the output from the noise field strength meter was fed to an Easterline—Angus pen recorder. The observed noise levels in db above 1μV/Mc bandwidth were reduced to noise field strength in db above 1μV/m/Kc bandwidth by the well-known relation for a lossless isotropic antenna[2]

$$E_\gamma = \epsilon \frac{\lambda}{\pi} \sqrt{\frac{R_a}{480}}$$

where E_γ = received noise level in μV/Kc across an input impedance of R_a ohms

ϵ = Noise field strength in μV/m/Kc

λ = wavelength in meters

The noise level was recorded round-the-clock for two days a week throughout the period of six months. The analysis of the data is given below.

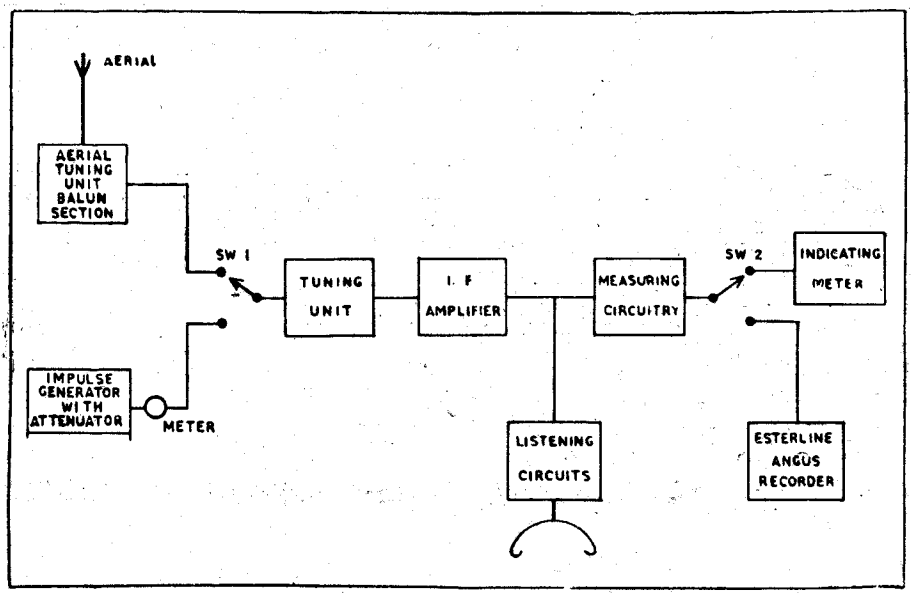


FIG. 1

Fig. giving the layout of the measuring equipment.

Analysis of the noise records

A typical record of Noise on 150 Kc/s and on other frequencies has been shown in figure 2. It may be seen that although the noise level varies continuously, it does not fall below a certain level at any time. This is taken to be the minimum noise level for that particular time and it very nearly represents the fluctuation noise. A sudden burst of maximum represents the value of the peaky type of noise. The total contribution of both the peaky and fluctuation noise for a particular time is obtained by measuring the area formed by the contour of the record and the time axis for a short period during that time. This area, when divided by the time duration in the units of chart length should give the average contribution of all types of noise for that particular time. This figure can, therefore, be called as the average noise level.

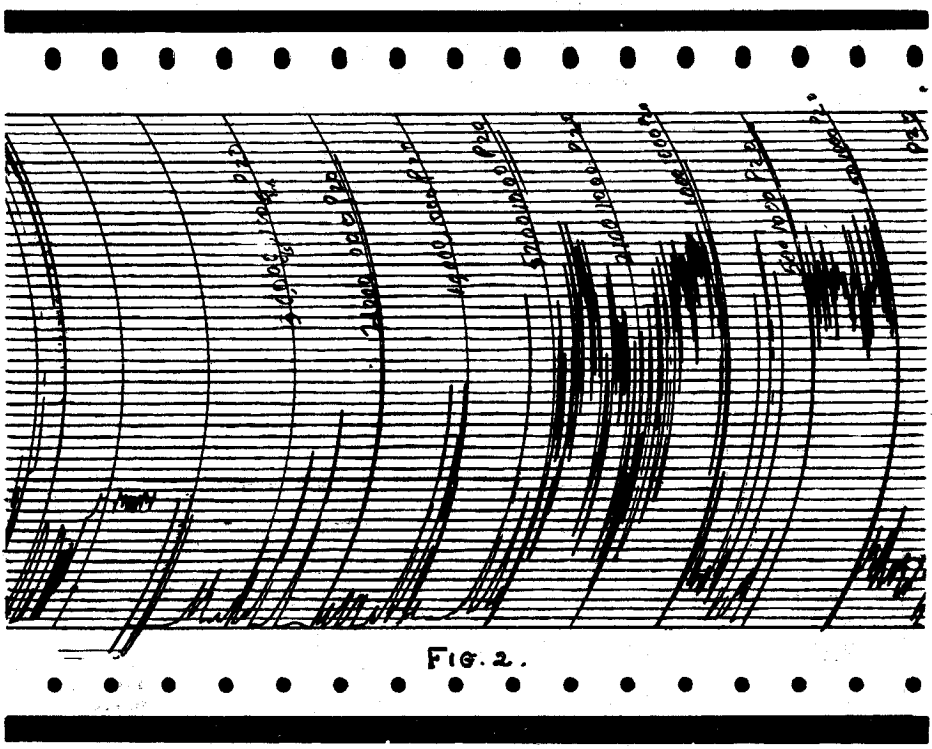


FIG. 2 Noise Level Record

NOTE :—The notations on the record indicate the frequency in Kc/s, the time of taking the record, nature of record and date.

Results

Figures 3, 4 and 5 give some representative diurnal variation curves of the noise field strengths in db above 1μV/m/Kc bandwidth obtained on 150 Kc/s at Delhi. It may be seen that the noise level fluctuates at random with respect to time. The level of this curve is observed to be high at around midnight falling gradually till dawn, and increasing again after sunrise. It reaches a maximum at around noon and then shows a slight downward trend. It falls very rapidly again after sunset and shows an upward trend again sometime before midnight. The general nature of this diurnal variation is more or less similar to that obtained on this frequency by Gerson (Fig. 6) for places situated in the American Sub-Arctic Region except that our values of average noise level at any time during the day are higher than those represented by Gerson. The higher level of noise in Delhi is probably due to increased strength of atmospherics on this frequency. It is, however, evident that there is a marked similarity in the nature of diurnal variation of noise level on 150 Kc/s for these two places, spaced so far apart. This similarity leads one to suggest that the radio noise at 150 Kc/s is mostly of distant origin being propagated in the lower ionosphere before it reaches the receiving point. The characteristics of ionospheric absorption are the same at all places and the nature of the diurnal variation of the propagated noise on 150 Kc/s is likely to be the same at different places on the surface of the earth. Excepting at the places where such noise originates (due to local thunderstorms), the main characteristics of recorded noise at different and distant places should be more or less similar.

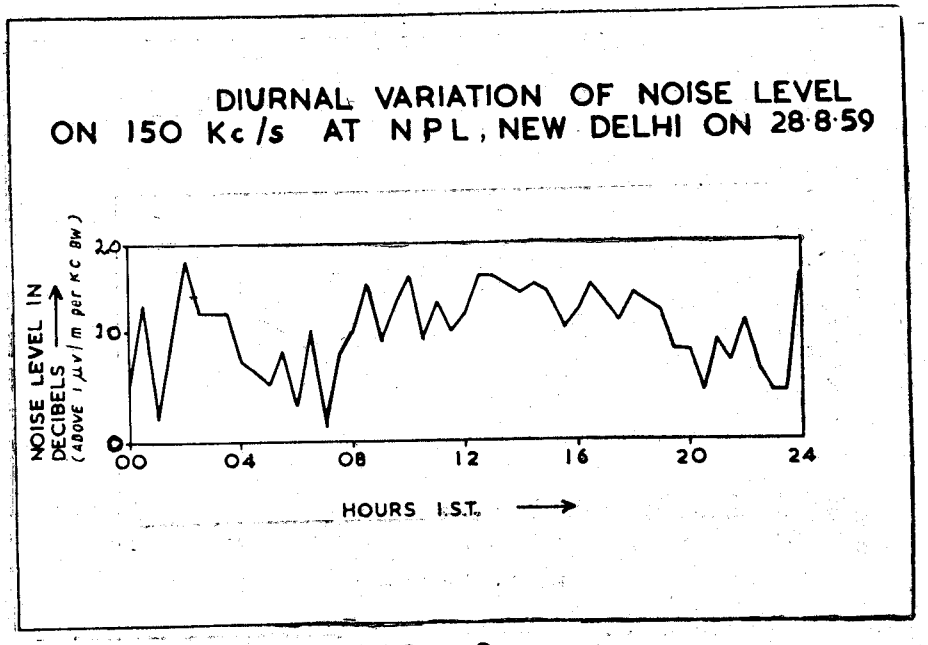


FIG. 3

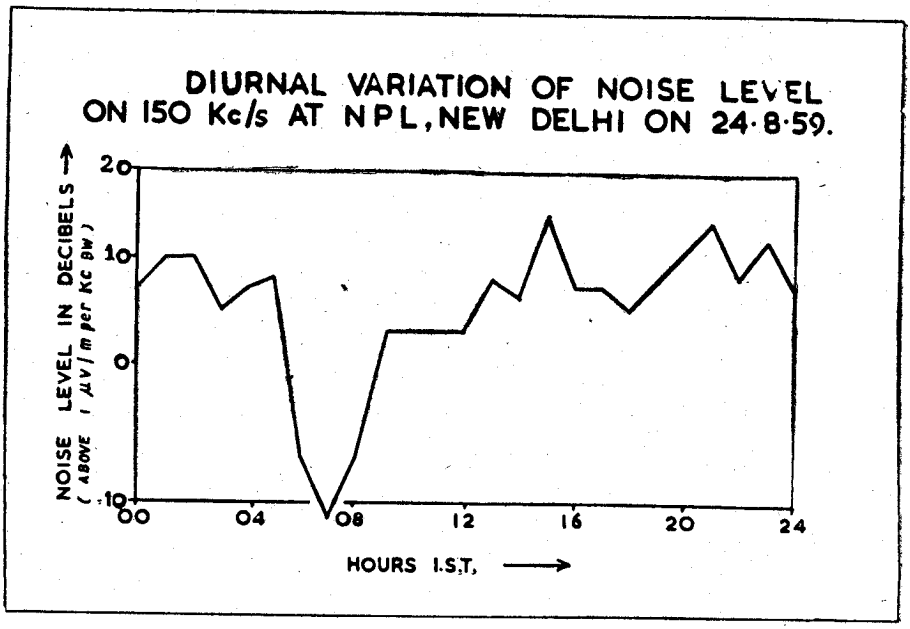

DIURNAL VARIATION OF NOISE LEVEL
ON 150 Kc/s AT NPL, NEW DELHI ON 24·8·59.
NOISE LEVEL IN DECIBELS →
(ABOVE 1 μV/m per Kc BW)
20
10
0
-10
00
04
08
12
16
20
24
HOURS I.S.T. →

FIG. 4

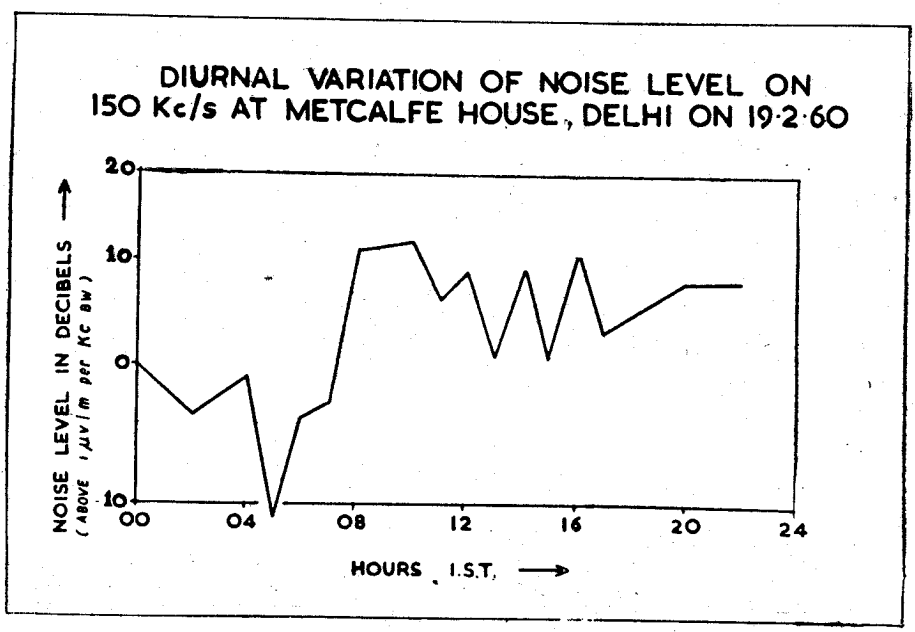
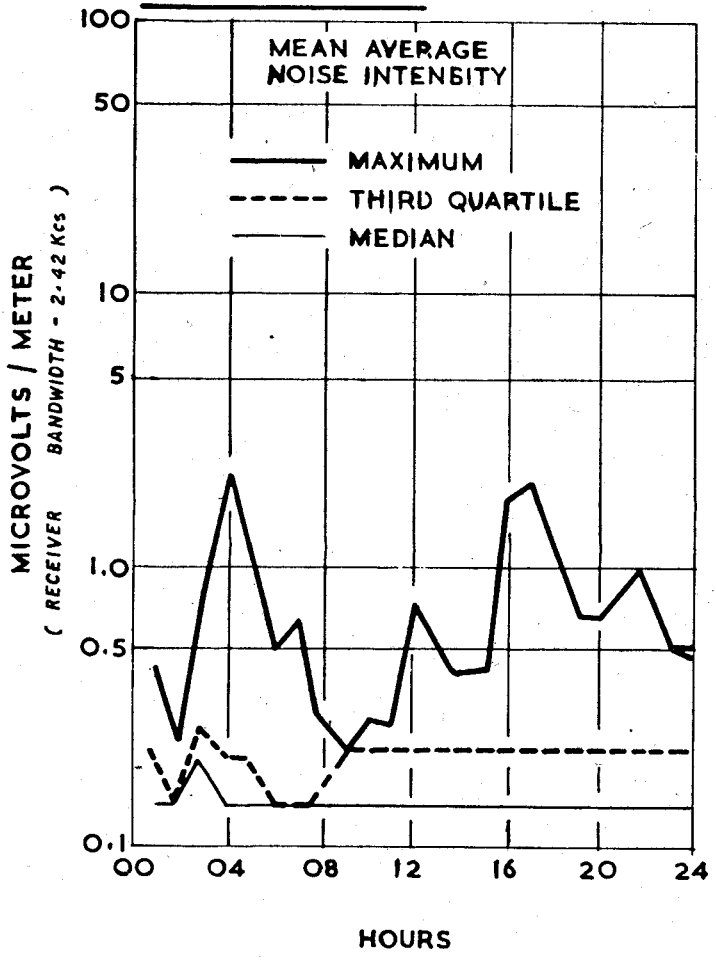

DIURNAL VARIATION OF NOISE LEVEL ON
150 Kc/s AT METCALFE HOUSE, DELHI ON 19·2·60
NOISE LEVEL IN DECIBELS →
(ABOVE 1 μV/m per Kc BW)
20
10
0
-10
00
04
08
12
16
20
24
HOURS I.S.T. →

FIG. 5

MEAN DIURNAL VARIATION OF NOISE LEVEL IN AMERICAN SUB - ARCTIC ON 150 Kc/s.

(TAKEN FROM N.C.GERSON'S PAPER, VIDE REFERENCES)



In Table 1 we give the monthly average of noise levels for the 0800 hrs to 1200 hrs and 1200 hrs to 1600 hrs for the months of December 1959 and January and February 1960.

TABLE I

Monthly average of 150 Kc/s Noise at Delhi (Metcalfe House)*

	08 to 12 hrs	12 to 16 hrs
Dec 1959	11 db	14 db
Jan 1960	6 db	8 db
Feb 1960	11 db	13 db

Acknowledgement

Thanks are due to Shri B. K. Roy and Shri S. P. Singhal for assisting in the observations made at the N.P.L. site Delhi. We are also thankful to Dr. N. B. Bhatt for his encouragement during the period of work.

References

1. Bhatt, N. B. et al (1961), *Def. Sci. Jour.* **11**, 1961.
2. Terman, F. E., *Electronic & Radio Engineering*, IV edition, 1955.
3. Gerson, N. C., *Proc.* I. R. E., **38**, 905, 1950.
4. *N.B.S. Circular* No. 557, 1955.
5. *C.S.I.R. Report* No. 65, 1958.

*All the values are in db above 1μV/m/Kc