SOLAR FLARE (S.I.D.) EFFECTS ON THE PROPAGATION OF 164 Kc./s. RADIO-WAVES FROM TASHKENT TO AHMEDABAD

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INTRODUCTION

Continuous recording of cosmic radio noise on 25 Mc./s. is being made at Ahmedabad (23° 01' N, 72° 36' E) since 1956. Solar flares are well shown on these records. A list of the observed flares during 1956-58 together with an analysis has been published by Bhonsle (1960). The effect of a solar flare is to cause a sudden increase in the attenuation of the 25 Mc./s. followed by a slower rise to normal. The whole phenomenon lasts for less than an hour. There is evidence to show that a large part of the increased attenuation takes place in the D region of the ionosphere. It was suggested by Dr. K. R. Ramanathan that it would be useful to supplement the above study by comparing it with the changes imposed on the field strength of low frequency radio-waves propagated over a long distance, preferably along a meridian.

In 1959, S. N. Mitra of the All-India Radio published the results of his studies on the reception of 164 Kc./s. radio signals from Tashkent (42° N, 69° E) at Delhi (28° 38' N, 77° 13' E) over a distance of 1650 km. He reported well-defined sudden increases in the field strength, coincident with the commencement of solar flares followed by a gradual fall.

In March 1960, field strength recordings of the same Tashkent transmissions began to be made at Ahmedabad. Between March and December 1960, more than 115 S.I.D.'s were recorded. In this paper, a comparison is made of the simultaneous effects of solar flares on Cosmic Radio Noise on 25 Mc./s. and the field strengths of Tashkent radio transmissions on 164 Kc./s.

The distance along the great circle between Ahmedabad and Tashkent is 2150 km., the two being nearly on the same longitude. The equivalent
vertical incidence frequencies for one-hop, two-hop and three-hop transmissions are 24 Kc./s., 28 Kc./s. and 36 Kc./s. respectively for an assumed reflecting height of 70 km. The Tashkent transmitter is usually active for nearly 20 hours a day.

**Experimental Set-up at Ahmedabad**

A U.S. Army Signal Corps receiver of type BC-344 D was modified suitably for recording the field intensity of 164 Kc./s. radio-waves. It includes two R.F. and two I.F. stages of amplification. The output after detection was fed to a D.C. recording milliammeter of the Evershed-Vignoles type, through a difference D.C. amplifier. The sensitivity of the D.C. amplifier could be controlled as also the zero level of the D.C. current. The arrangement permitted the elimination of a constant D.C. current in the milliammeter when there was no signal.

The band-width of the receiver is about 2 Kc./s. at 6 db. down. Good voltage stability is secured by feeding the mains supply through a constant voltage transformer. The receiver has been found to possess satisfactory stability over long periods.

The receiver is fed through a Beverage antenna. It is directed towards Radio Tashkent and is terminated to ground at the farther end by a suitable resistance. The length of the wire used is about 100 meters. Although this is only a small fraction of the wavelength, it was found to give sufficient gain throughout the receiving period. Apart from the simplicity of the antenna, it was found useful for cutting down atmospherics from the south.

A standard G.R. Signal generator of type 805 C was used to calibrate the signal strengths in microvolts. The zero level of the receiving system was checked from time to time by tuning in the receiver to a neighbouring frequency on which there was no transmission.

**Normal Variation of Field Strength of 164 Kc./s. Tashkent Transmission at Ahmedabad**

The present study is restricted to S.I.D. effects, and it is not proposed to discuss in detail the diurnal or seasonal variations of the field strength. These will be dealt with in a separate communication. Typical features during quiet days in summer and winter are shown in Fig. 1 in which records are reproduced for one quiet day each in July, October and November.

In an undisturbed record, the maximum signal strength during night is about 25 db. over the day maximum. Shortly after sunrise, the intensity falls off rapidly to a low value (at times to lower than 1 µv) and then builds