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FADING CHARACTERISTICS OF HF COMMUNICATION IN ARID ZONE

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ABSTRACT

This paper presents results of long term measurements made on high frequency link of 100 Watt, operating at 4075 KHz in an arid zone. The results presented shows diurnal and seasonal influences on fade depth over a distance of 158 kms between Delhi and Pilani.

Introduction

The fading phenomenon is one of the major factor upon which the transmission properties of communication system depends. Fading usually refers to the rapid amplitude variation of a radio signal transmitted other relativity long distances through ionosphere. The fading depth and duration have a direct bearing on the system performance. The experiments were carried out over a period of 12 months on Delhi-Pilani HF communication link of 158 kms of tropical climate path. The operating frequency is 4075 KHz in half duplex mode. Various plots shows diurnal and seasonal variation of fade depth.

Fading characteristics

Experimental studies carried out on the link relate to signal characteristics and fading characteristics. The received signal was recorded on thermal printer through microprocessor voltmeter. For the spectral analysis, the recorded data was sampled at the rate of 3 to 4 samples per second for a time period of about one minute in general.

The depth of fade or fading depth in dB is given by

$$\text{Fading depth} = \log \frac{E(0.1)}{E(0.9)}$$

where $E(0.1)$ = Signal level in volts exceeding in median level 10% of the time.

$E(0.9)$ = Signal level in volts exceeding median level 90% of the time.

Fig. 1 shows the signal level distribution from July '88 to June '89. It is observed that the signal level is better in winter as comparison with the signal level in summer months. It may be due to the bending of sun rays. Fig. 2 shows signal level distribution relative to median level as a function of different time of the day. Fig. 3 shows the diurnal variation of the fade depth. The observation indicates that the fade depth is maximum at noon time and decreases in the afternoon. Figure 4 shows the seasonal variation of the fade depth. The fade depth increases in the months of summer. Fig. 5 shows the comparison of two extreme climates and it has been observed that enhancement of the fade depth during the summer months is about 1.4 dB. Fig. 6 shows the relationship between the fade depth and median signal level.

Conclusion

It is interesting to note that on the present HF link between Pilani and Delhi, fading is observed in the forenoon and starts improving in the afternoon hours. The experimental frequency of 4075 KHz is very optimum between 3 PM to 6 PM.

References

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3. Ramola R.C., Bhatnagar P.S., Report on fading characteristics of HF communication link in Arid Zones, 1989, CEERI, Pilani.

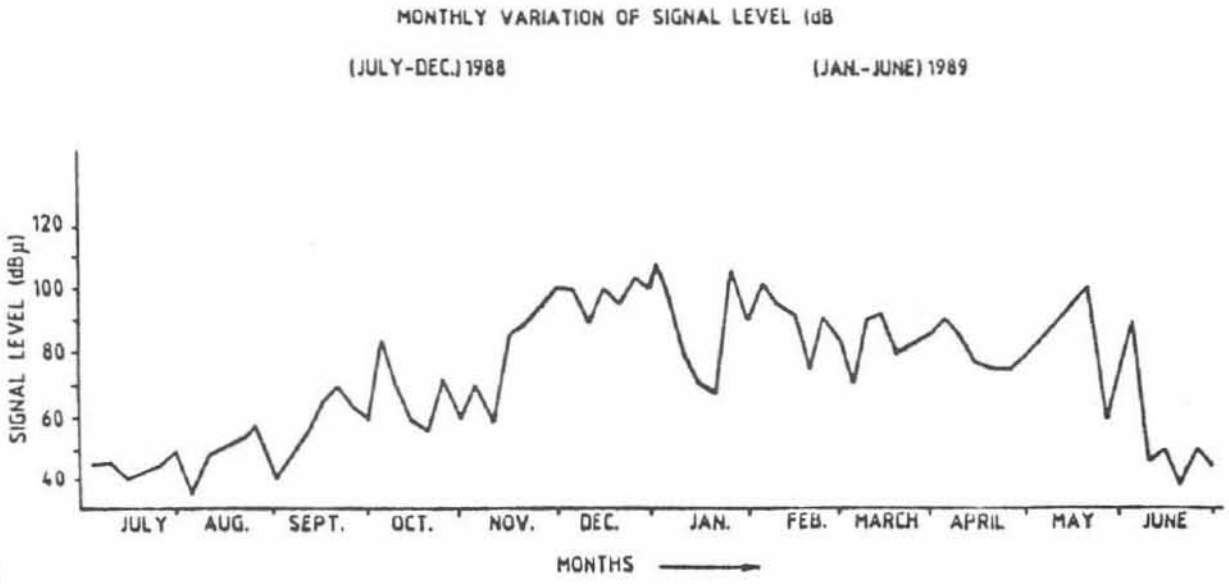

FIG. 1

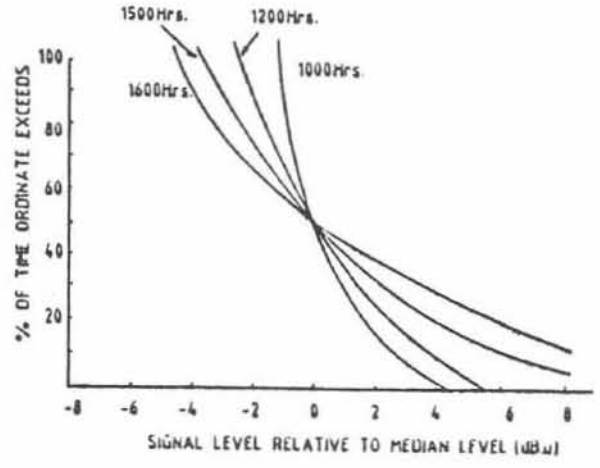

FIG. 2

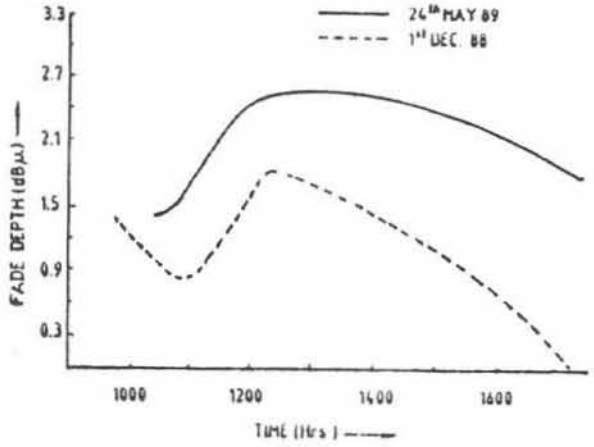

FIG. 3

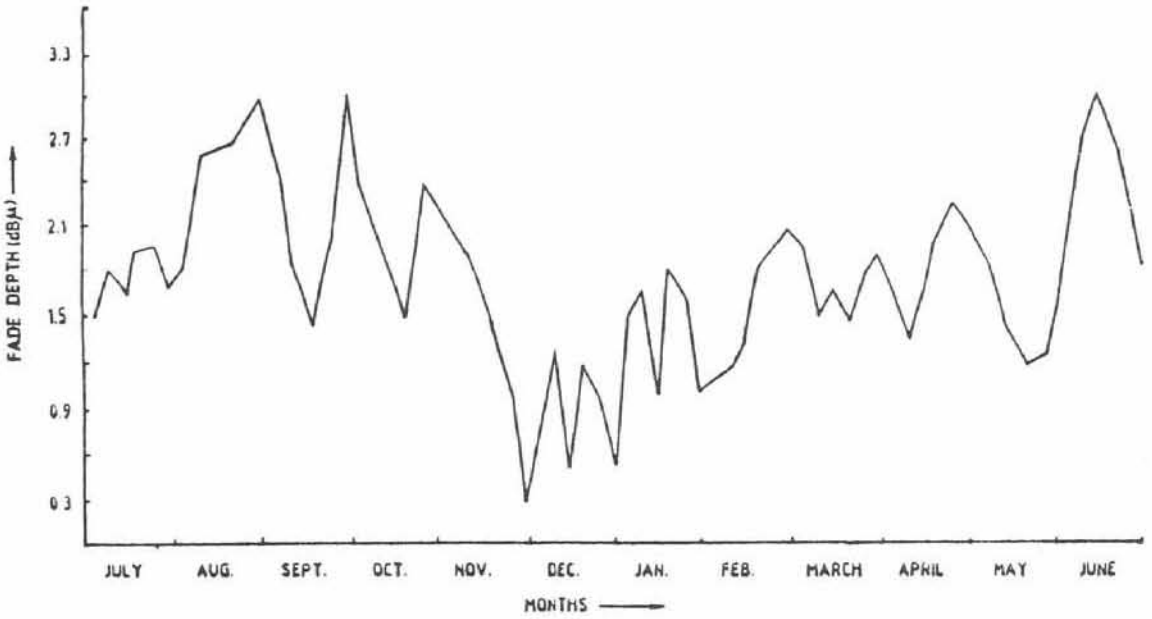

FIG. 4

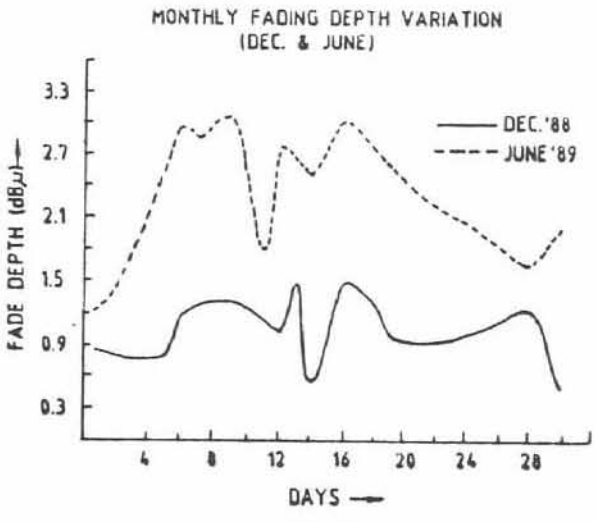

Fig. 5.

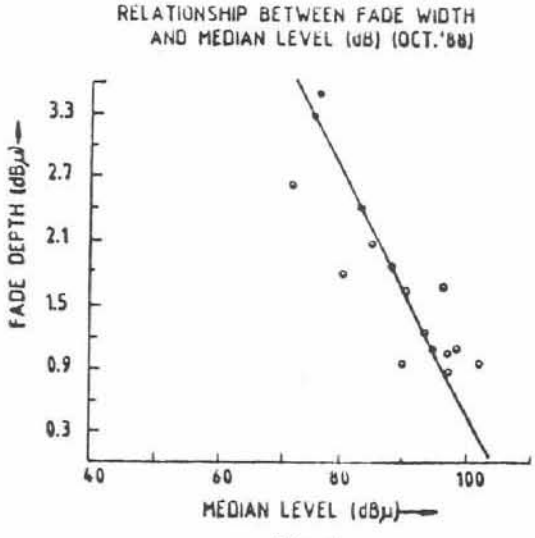

Fig. 6.