CHAPTER VI

SCOPE FOR FUTURE STUDY

6.1 INTRODUCTION:

One can study different ionospheric phenomena using the constructed high gain, narrow beamwidth antenna connected to riometer. Figures shown in this chapter were obtained from internet, one can use these figures for further research work.

6.2 DEPENDANCE OF THE TOTAL ATTENUATION OF COSMIC RADIO NOISE ON 30MHz ON THE CRITICAL FREQUENCY OF THE F_2 –REGION:

Evidence that a part of absorption of cosmic noise is to be ascribed by Mitra and Shain[4] who found a correlation between the total absorption of cosmic radio waves on 18.3 MHz and f_0F_2 values above 5MHz. Analysis of a similar character by a Blum, Denisse and Stainberg[5] revealed a partial absorption attributable at 30MHz to F-region. According to them the absorption varies with f_0F_2 almost linearly while according to Mitra and Shain, a curvilinear relatison holds good over the range 4 to 8 MHz. At times when diffuse or spread F-layer echo conditions prevail, there is much less clear relationship with f_0F_2 values. Analysis by Bhonsle and Ramanathan[6] of the cosmic radio noise absorption on 25MHz from March 1957 to February 1958 at Ahemdabad showed that, in general when f_0F_2 exceeded 8MHz the attenuation increased rapidly with increasing f_0F_2.

6.3 SEPERATION OF A DAY TIME COMPONENT SYMMETRICAL ABOUT NOON FROM THE TOTAL ATTENUATION:

The total ionospheric attenuation is caused by the individual contributions of the different ionospheric regions including the region beyond the maximum of F_2. It is expected both on theoretical grounds and from empirical data, that an important fraction of the total attenuation would be a day time effect depending on the solar zenith angle with maximum near noon and smaller values in the morning and evening. Mitra and Shain[9] devised a method to separate the F_2-region component, of absorption from the total attenuation. To do this they plotted the total attenuation against f_0F_2, for each solar hour, and extrapolated the curve for low values of f_0F_2 .There was still a residual absorption, and the extrapolated residual absorption showed solar control with maximum value near noon and minimum values in the morning and evening hours. They found the residual absorption to obey a $\cos^n \chi$ relation where χ is the solar zenith angle and attributed it to the D-region of the ionosphere.

The same method was applied to the Ahmadabad data by Bhonsle and Ramanathan[6].Analysing the cosmic noise absorption data for the period March 1957 to February 1958, it was shown that below 8MHz the total attenuation showed little variation with $f_0 F_2$ and could be considered independent of f_0F_2.

6.4 ANALYSING OF COSMIC NOISE ABSORPTION CURVES FOR FUTURE STUDY:

1) Figure {6.1} shows a typical quiet day curve, the quiet day curve varies according to sidereal time. The quiet day curve may also vary with season and beam.

2) Figure {6.2} shows a quiet day curve involving lightning.

3) Figure {6.3} shows solar radio emissions. During active periods the sun may produce powerful radio emissions. As we approach solar maximum they are more prevelant. Solar emissions are seen only during day light hours.

4) Figure {6.4} shows three well-defined substorms.

5)Figure {6.5} shows ionospheric scintillation. Ionosphere scintillation is characterized by large variations in the received signal power. It is not often seen on the wide beam antenna, nor lower time resolutions.

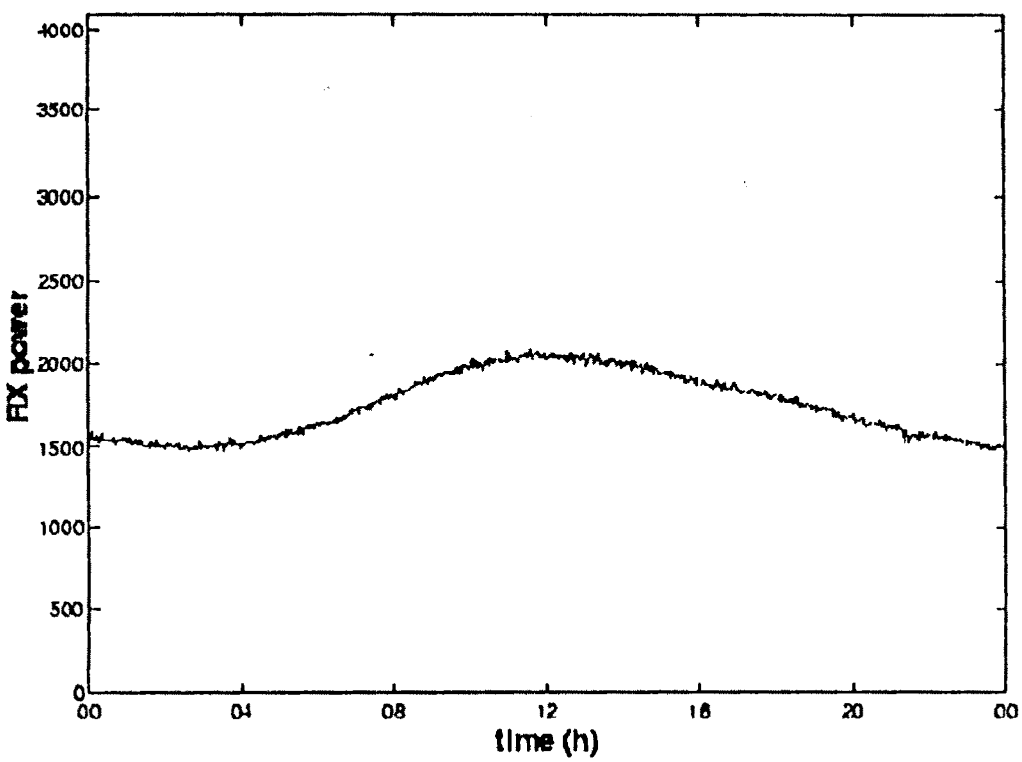

Fig. 6.1 –Shows variation of power with sidereal time on quiet day curve.

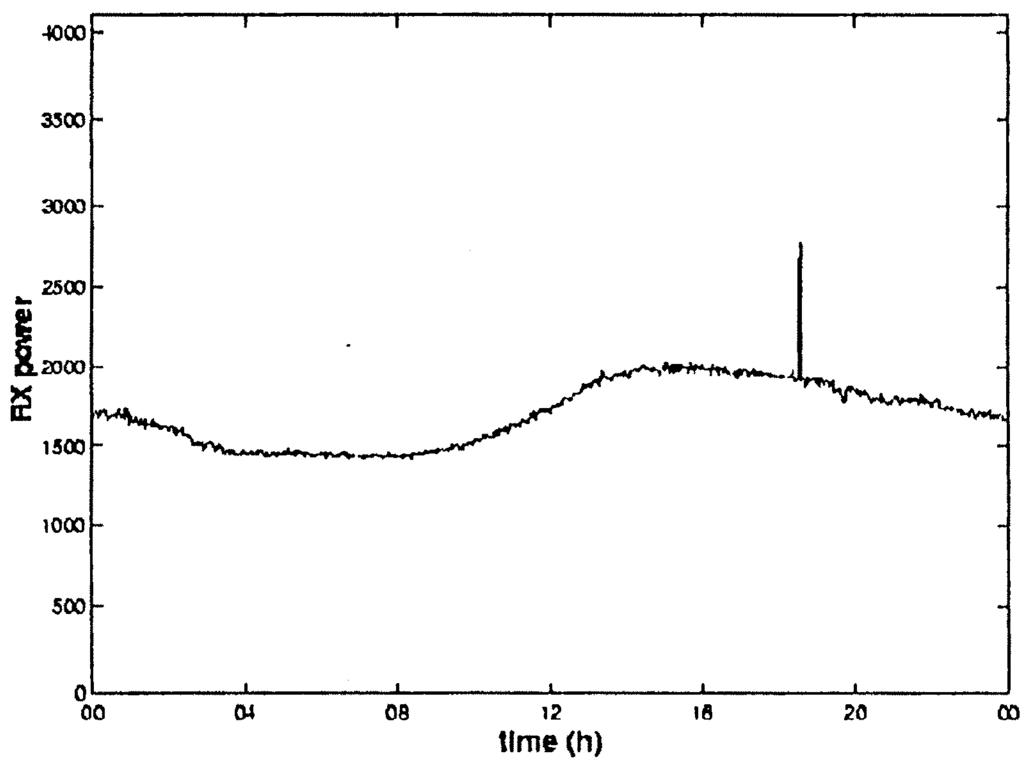

Fig. 6.2 – Shows lightning effect on a quiet day curve.

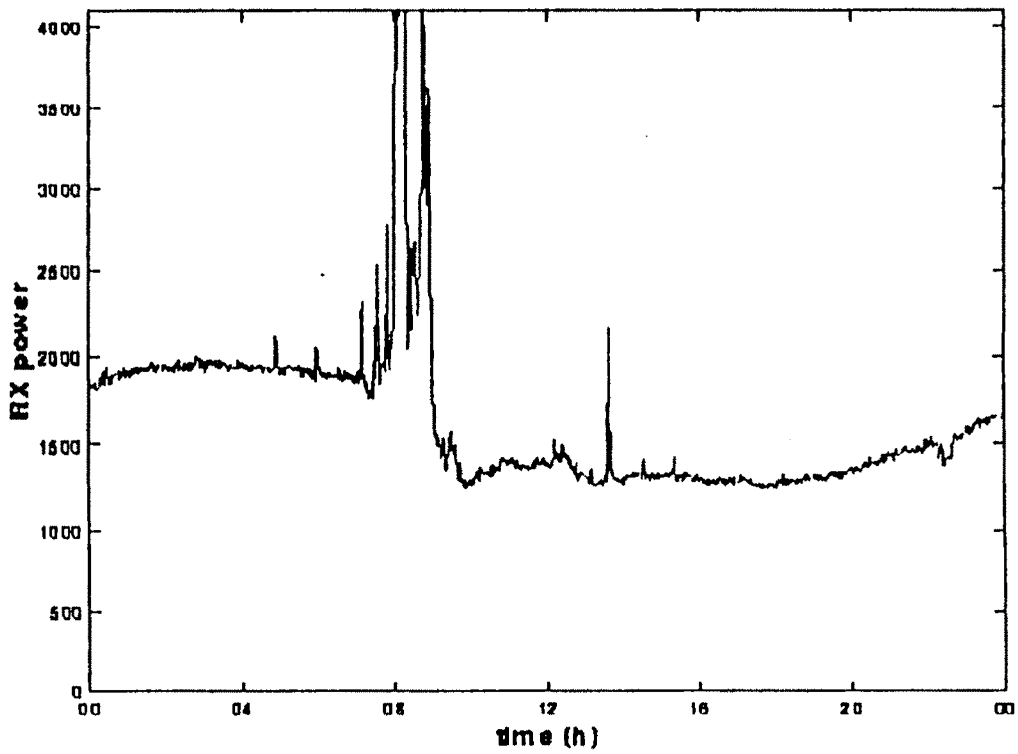

Fig. 6.3 - Shows solar radio emissions.

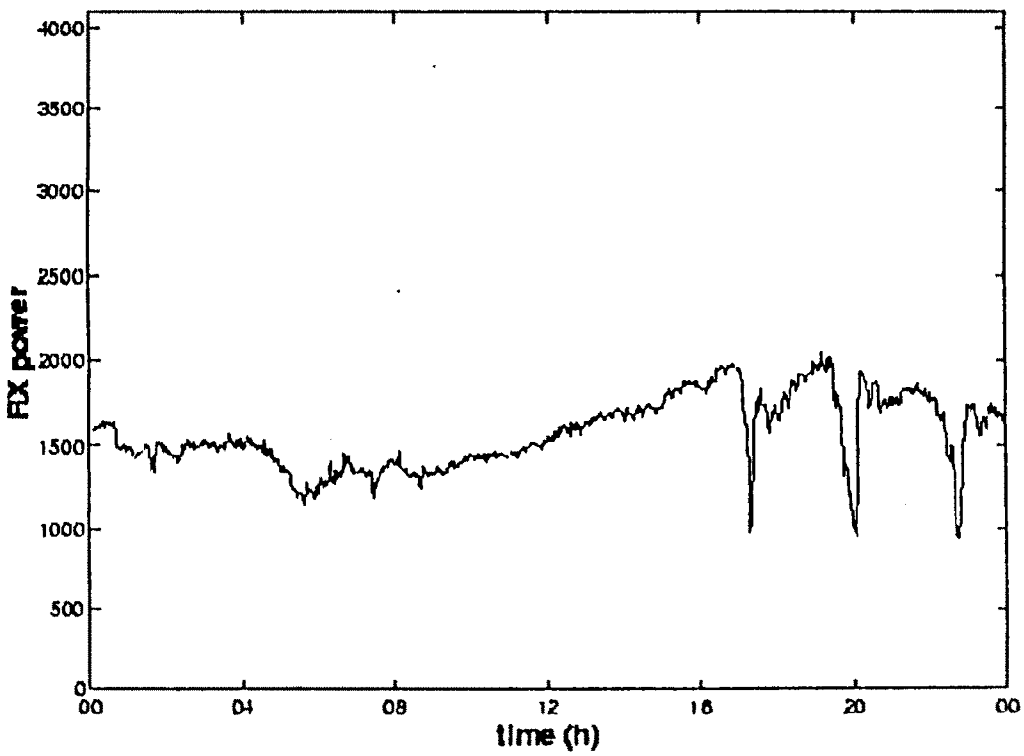

Fig. 6.4 - Shows substorms.

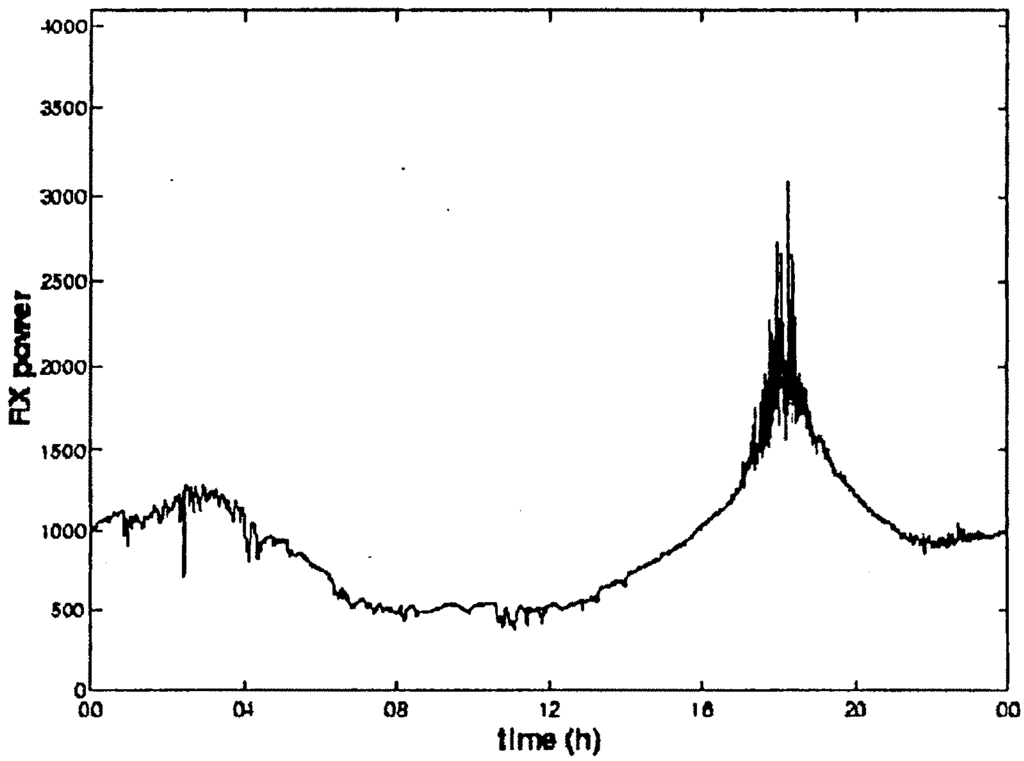

Fig. 6.5 - Shows ionospheric scintillation.

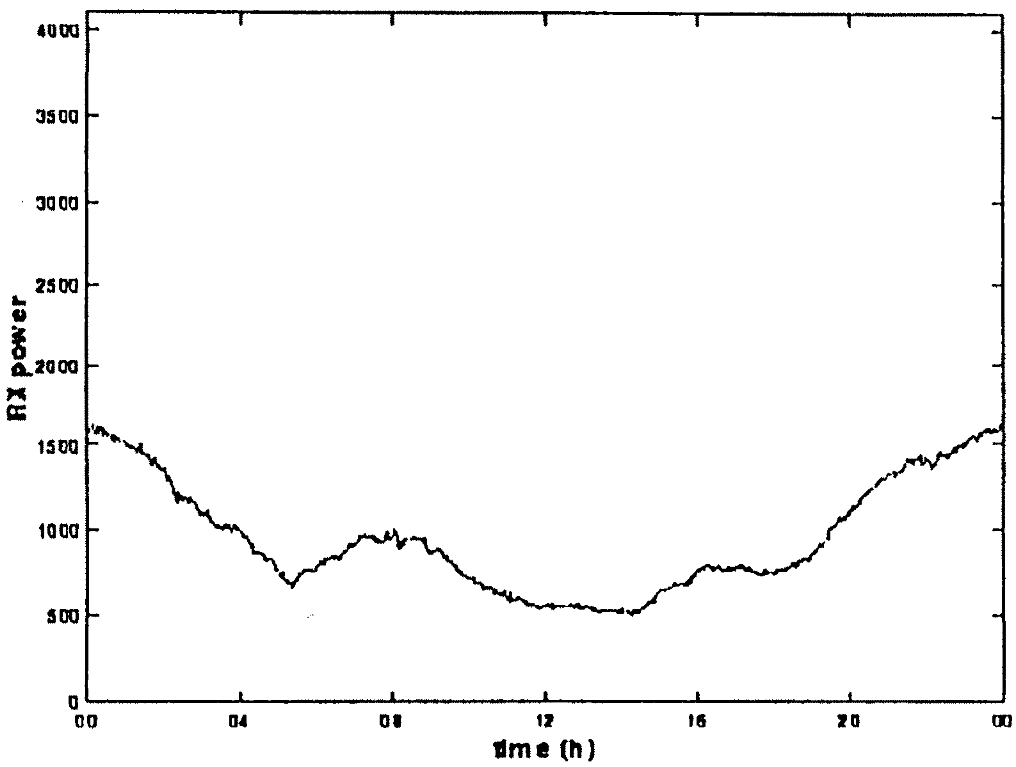

Fig. 6.6 - Shows polar cap absorption.

This is because wide beams and long samplings intervals both average out the variation in cosmic noise level. Any scintillation seen in the wide beam antenna is a clue that the ionosphere was very irregular at that time.

6) Figure {6.6} shows polar cap absorption. This event lost most of the day (pausing only during the middle of the night). Polar cap absorption events often lasts several days.

6.5 CONCLUSION:

The main objective of my M.Phil. dissertation was to design and construct high gain narrow beam antenna array for use in conjunction with the riometer, for measurement of ionospheric attenuation of cosmic radio noise at 30 MH_Z behind Physics Department, Shivaji University, Kolhapur. A high gain antenna was necessary for improving the signal to noise ratio for reliable measurement of ionospheric attenuation. A low gain antenna would have received unwanted manmade noise which would have deteriorated the quality of cosmic noise reception. It was considered adequate to design a broadside-collinear array with polar diagram of (11.46^0 E-W and 14.32^0 N-S) for our purpose. This configuration of antenna was selected from the point of view of convenience of construction and because of its repetitive design, and ease of impedance matching. The antenna array as described in the dissertation was duly constructed and tested by carrying out standing wave ratio measurements. These measurements show that the maximum power transfer by the antenna array via open wire transmission line and balance to unbalance transformation wherever required ensured that the maximum power transfer of 94% to the receiver input. Which is acceptable for cosmic noise reception.