

## 5.4

## SUMMARY AND CONCLUSIONS

Accuracy stability and reproducibility of clock have been the subject of many investigations. The highlights of present work at General Physics laboratories at Shivaji University, Kolhapur are as follows.

1. Location of Kolhapur (Geog lat 16° 43' N; Geog long 74° 15' E) as receiving station, and Delhi (MW and SW) (Geog lat 26° 30' N; Geog long 77° 17' E), B.B.C. (London) Geog lat 51° 30' N; Geog long 0° 5' W) as transmitting station produces interest to study ionosphere within the equatorial anomaly region. At particular frequency, any timing circuit of most accurate, stable clocks, and efficient communication systems, standard time signals transmitted by any transmitting station must be separated with certain time called guard time and must be available with prefixed or allotted time slots, under following circumstances.

a) Time uncertainty due to station clock drift which depends upon the short time stability of local clock.

b) Time uncertainty due to station clock accuracy. So we expect that time signals from any timing circuit be periodic since detected output is proportional to the original modulating wave with an appropriate phase shift. We call these time signals as classical time signals. When we consider encoded time signals that is, recorded on radio receiver, when are computerised detected computer output shows that available time signals are IPM signals (Ionospheric pulse modulated signals).

The first chapter of the present work gives the features of

C - programming and certain examples.

The attempt is also made to explain how C - programs are developed to give more flexibility in achieving results. Some C - programs are developed as specific purpose software.

1) The second chapter deals with historical background of time and time measurement, time used in communication, in industries, accuracy of clocks. Further for improved and enhanced communication efficiency use of GPS - time is explained. The ionospheric effects as from an analysis of standard broadcasting time signals has been outlined.

2) Third chapter accounts introductory basic principles of transmission system, frequency ranges for radio communication. This chapter also deals with broadcasting systems in India, and introduces need for and principles of modulation. It also gives idea of radio wave propagation through ionosphere. There has been urge to explore, the space around the earth, in addition, radio wave propagation through ionosphere is one of a fascinating discovery, which make a major contribution to the understanding of scientific problems in the fields of both geophysics and astrophysics. The study of the theory of radio propagation in the ionosphere has theoretical as well as practical importance, as ionospheric studies offer potent examples of the application of many techniques of electromagnetic theory and practical importance arises as a result of increasing needs for greater performance in global communication efforts.

3. The chapter four attempts to explain the major areas of interest in radio - ray propagation. Third and this chapter also explain some important phenomenae such as Chapman's Layer

formation, full wave - theory. Breit - Tuve's theorem, group propagation, Appleton formula etc.

4. Fifth chapter is fully devoted to results and discussion. Empirical analysis is carried out using C - programming to choose appropriate parameters for ionospheric model, towards a realistic approach of electron density profile determination.

From computer output data, time dispersion analysis of audio signals is done. For this purpose, succesively recorded ten signals received at frequency 10 MHz on date 24th July 1995 are used. This method of determining electron concentration discussed in this dissertation by constructing ionospheric model provides satisfactory features of F - layer profile - for electron density. The electron concentrations determined are tabulated.

The available computer output data of recording from 12th June 1995 onwards has been analyzed for each signal "per second". The quality of occurance of each signal depends on quietest and disturbed days. This study provides a good special coverage for morphological features of ionospheric modulation in the form of stability and reproducibility, with transmission distance between Delhi - Kolhapur being 1500 Km, and transmission distance from London to Kolhapur as 8212 Km.

The finding of this analysis can be stated as follows.

- 1) These encoded time signals can be considered as IPAM (Ionospheric Pulse Amplitude Modulation), IPPM (Ionospheric pulse pososion modulation). In this type of modulation information to be received is converted into pulses of various shapes, sizes and duration. We have defined the associated indices quantitatively.
- 2) This ionospheric modulation is day time as well as night

time activity which can be correlated with the presence of changes in electron concentration so that each signal at each second arrives as ionospheric modulated signal since it suffers reflections by different paths through ionosphere.

- 3) Efforts are made to calculate modulation index.
- 4) Periodicity of succesively arriving signal can be realized with the help of fourier transform, which determines fading of signals, as there is change in ionospheric conditions.
- 5) Pulse amplitude is proportional to the ionospheric interference, which affects communication efficiency.
- 6) Variation in time slots and guard time  $\Delta t$  governs changes in phase path and there are rapid changes and fluctuations of phases of received signals.