

## NATIONAL SEMINAR ON TIME & FREQUENCY

A National Seminar on Time and Frequency was held at the Laboratory from 18 to 20 November 1976. About 250 delegates representing the Indian Space Research Organisation, Electronics Commission, India Meteorological Department, Defence, All India Radio, Uttar Pradesh State Observatory, Indian Institutes of Technology, Ministry of Communication, Bhabha Atomic Research Centre, Tata Institute of Fundamental Research, Vikram Sarabhai Space Centre, Geodetic and Research Branch, University Grants Commission, Universities, electronics industry and other educational institutions, and the CSIR laboratories participated in the seminar.

The objectives of the seminar were: (i) to let the users know the time and frequency facilities available within the country and in return let the requirements of the users be known; (ii) to suggest means to have an immediate time coordination and time synchronization throughout India and the role which NPL can play in it; (iii) to develop, indigenously, time and frequency standards and to provide suitable facilities for it; (iv) to plan, in view of the forthcoming space programmes, time and frequency dissemination via satellite; (v) to emphasize the urgency to have LF/VLF time and frequency dissemination service in India; (vi) to point out the natural interdependence of the basic researches of precise measurements and the availability of accurate time and frequency sources; (vii) to recommend the formation of a committee to look into the above points; and (viii) to achieve the above objectives through the papers presented, mutual discussion and panel discussion.

In his inaugural address, Shri K.C. Pant, Minister for Energy, stressed the importance of accurate measurements in various fields and highlighted the need for maintenance of standard time and frequency to high accuracies commensurate with the requirements of research, industry and technology. He commended the role of NPL in this field and urged that scientists and technologists should single-mindedly orient their work towards the areas of relevance to the country in this important field.

More than sixty papers including seventeen invited talks from scientists of repute were presented at the various sessions of the seminar, and these covered almost all the aspects of time and frequency such as: general review; ATA standard time and frequency transmission; uses and applications—particularly in space technology, oscillators and synchronous

systems; time and frequency standards; techniques and measurements; and instrumentation. A separate panel discussion was also held under the chairmanship of Dr. A.R. Verma, Director of NPL, in which five other scientists, viz. Dr. Y.P. Rao, Director General, India Meteorological Department; Dr. S.P. Kosta, Deputy Director, Indian Space Research Organisation; Prof. B. Ramachandra Rao, Vice Chairman, University grants Commission; Brig. B.S. Paintal, Director, Telecommunication, Ministry of Defence; and Dr. Helmut Hellwig, Chief, Time and Frequency Section, National Bureau of Standards, USA, took part. Dr. Verma proposed the formation of different groups of active scientists who should review progress and formulate the future plan of work in this field periodically. Dr. Helmut Hellwig shared the problem faced by NPL in the dissemination of standard signals and said that as TV synchronization is an accurate and inexpensive means of time dissemination, the potentiality of TV network for time synchronization would be worth exploring. He also emphasized the need for procurement of a large number of portable clocks and cesium clocks to solve the problem of dissemination to some extent.

In response to the deliberations by panelists, the house contended that NPL should take the initiative for VLF transmission of time and frequency signals. It was proposed that crystal oscillators upto the accuracy of  $10^{-9}$  should be available at moderate prices to cater to the needs of a majority of standard time and frequency users. A few R & D laboratories and industries should take initiative for their production. The seminar suggested that the potentiality of surface wave oscillators to serve the purpose of secondary standards might also be explored. Another important suggestion was to arrange for the calculation of mean solar time ( $UT_1$  and  $UT_2$ ) in India, completely independent of foreign agencies. The seminar unanimously called for closer interaction between NPL, the custodian of standards in India, and the users of time and frequency.

An exhibition of electronic instruments related to the subject of the seminar was also arranged on this occasion. A number of firms took part in the exhibition.