

Indian Standard Time Metrology at CSIR-NPL: In service of the Nation

Precise time with nanosecond accuracy is generated and maintained world over using atomic clocks at national measurement institutes (NMIs) in more than 70 countries including India. CSIR-NPL is the NMI of India to realize and maintain the Indian Standard Time (ISTTM), which is kept traceable to coordinated universal time (UTC; international reference time) with an uncertainty of ± 2.9 nanoseconds. IST is realized at CSIR-NPL through the National Primary Timescale consisting of bank of ultra-stable atomic clocks (five Cesium (Cs) clocks and two active Hydrogen masers). Dissemination of IST across Indian subcontinent is done through network time service and satellite links.

CSIR-NPL is on a mission to synchronize all the clocks in the nation to IST for securing digital infrastructure and reducing cyber crime. CSIR-NPL is already providing IST traceability to ISRO timing centres located at Bengaluru and Lucknow for their crucial NavIC (Navigation with Indian Constellation) programme. All NavIC satellite clocks are now synchronized to IST within a few ns. CSIR-NPL is also establishing five IST traceable secondary timing centres at RRSLs (Regional Reference Standard Laboratories) across India at Ahmedabad, Bengaluru, Bhubaneswar, Guwahati and Faridabad for Department of Legal Metrology. These regional timing centres will aid in providing IST time dissemination services to all the various stakeholders/sectors to create a safe digital India.

Demand for precise time synchronization is rapidly growing in sectors like telecommunication, cyber security, secure banking and stock transactions, deep space navigation, radio telescopes, air traffic control, power grids, cyber physical systems and many more applications. CSIR-NPL is strengthening the national timing infrastructure of India, where a very rough estimate shows an economic impact of more than 10% of GDP.