



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Bureau
International des
Poids et
Mesures



Securing National Time Sovereignty for a Resilient New Bangladesh

NML-BSTI is aiming to establish a primary national time scale, UTC(BD), aiming to achieve a timing accuracy of less than 1 microsecond ($<1 \mu s$) to underpin its 5G infrastructure and mobile financial transactions systems

National Metrology Laboratory (NML), Bangladesh Standards and Testing Institution (BSTI) Bangladesh (BD)



The Challenge

Bangladesh is prioritizing a strategic transition toward becoming a technologically self-reliant, modern, and resilient nation, focusing on building sovereign infrastructure and ensuring institutional integrity. The critical growth sectors for Bangladesh include digital infrastructure, telecommunications networks, financial services, internet connectivity, and industrial automation systems and operations. Modern society requires synchronized "time" to function seamlessly and with minimal disruptions to these important industrial sectors. Without a local national time scale, these industrial sectors, as well as scientific research institutes and data centers, rely on unverified signals from foreign satellite constellations.

Currently, Bangladesh lacks a locally realized version of Coordinated Universal Time (UTC) and thus is reliant on external GPS/GNSS time servers. This creates vulnerabilities to timing inconsistencies, operational disruptions, unreliable timestamps, reduced interoperability between systems, and decreased confidence in digital operations. Measuring the precise time offset between the national time scale and Coordinated Universal Time (UTC) with high accuracy remains a work in progress. To enhance this capability, the NML-BSTI is currently upgrading its facility to integrate primary frequency standards and high-accuracy satellite time-transfer receivers (such as GNSS systems), thereby enabling direct traceability to the BIPM.

The primary measurement challenge is ensuring reliable, metrologically traceable measurements of time intervals and frequencies for use in telecommunications, scientific instrumentation, industrial systems, and digital infrastructure. The absence of a locally implemented UTC(BD) creates significant systemic risks across Bangladesh's most vital sectors, particularly telecommunications, financial systems, and cybersecurity.

For example, in the world of 5G, ultra-precise synchronization is mandatory. Without it, "interference overlaps" occur between base stations, leading to dropped calls, reduced data speeds, and an inefficient system that wastes the expensive technology and energy used to run it.

Additionally, Bangladesh's mobile banking systems process over 20 million transactions daily, as determined from monthly MFS transaction volumes published by Bangladesh Bank.¹ Without a metrologically traceable national timestamp, these transactions lack an official, legal timestamp, making forensic auditing very difficult. If a fraud incident or system crash

¹ Bangladesh Bank, "Mobile Financial Services (MFS) Data," Payment Systems Department, Dhaka, Bangladesh, 2024/2025. Available: <https://www.bb.org.bd>

occurs, it can lead to lengthy legal disputes. Furthermore, international trade and financial regulations often require high-level traceability to the SI second. The lack of a primary time scale acts as a technical barrier to entry for local industries seeking to compete in global high-tech markets. Lastly, reliance solely on external GNSS signals leaves the national infrastructure of Bangladesh vulnerable to "GPS Spoofing" or jamming.

The Solution

Recently (January 2026), the National Metrology Laboratory (NML), Bangladesh Standards and Testing Institution (BSTI) began its transition from secondary time services to a primary national time-scale infrastructure through strategic procurement and capacity-building activities. The laboratory is currently in the procurement phase for a High-Performance Cesium (Cs) Atomic Clock to act as the primary national frequency standard, along with the installation of a BIPM-compliant GNSS Time Transfer Receiver to compare local time with global standards.

While hardware acquisition is underway, NML-BSTI currently uses localized time servers to maintain secondary network synchronization services. Once the primary equipment is fully integrated, NML-BSTI will begin contributing clock data to the BIPM Circular T. This will ensure that Bangladesh's national time, UTC(BD), is internationally recognized and metrologically traceable to the SI second. This intervention will upgrade the national quality infrastructure, providing the high-level synchronization required for 5G networks and secure digital banking.

All findings during the intervention will be verified and documented through NML-BSTI laboratory measurement records, uncertainty analysis, and quality management system (QMS) documentation aligned with international standards. Data reliability will be maintained through strict adherence to BIPM reporting protocols and future participation in the regional Comparison Asia-Pacific Metrology Programme Technical Committee for Time and Frequency (APMPTCTF). Post-intervention data will include daily clock comparisons and Allan Deviation stability analysis, a standard metrological measure of clock frequency stability over time, to verify the performance of the national frequency standard.

A Quantifiable Impact

The establishment of a primary national time scale, UTC(BD), marks a major leap for Bangladesh, moving the country from being a consumer of foreign technology to a contributor to global metrology efforts and scientific progress. As part of this ongoing metrological intervention, NML-BSTI is constructing a "Digital Heartbeat" for its 5G infrastructure, aiming for timing accuracy of less than 1 microsecond ($<1 \mu\text{s}$). This is the exact precision needed for 5G towers to work seamlessly together; without it, phone calls drop, and internet speeds slow down due to tower signal clashes.

The UTC(BD) will also provide legal security for the millions of mobile money transactions that occur in Bangladesh every day. The legal and regulatory oversight of these digital timestamps

is governed by the Office of the Controller of Certifying Authorities (CCA) under the Ministry of Information and Communications Technology (ICT). Providing a legally recognized timestamp protects citizens from fraud and enables financial institutions to definitively prove the exact execution time of any transaction.

As a result of this new metrological infrastructure, Bangladesh will no longer have to rely 100 % on foreign satellite signals. The country will be self-reliant, possessing an independent, atomic-level "National Clock" that keeps national systems running even if external signals are interrupted. Lower measurement uncertainty and more reliable timing will also safeguard the national power grid and transport infrastructure.

This case study demonstrates that investment in a National Metrology Institute (NMI) and its metrological programs is not just a scientific cost but a strategic asset for national sovereignty and economic resilience. Furthermore, by building this trust architecture, the project directly stimulates economic growth by fostering innovation in local-level fintech (such as mobile financial services like bKash, Nagad, Venmo, or Apple Pay) and reinforcing economic transparency through secure digital infrastructure.

Acknowledgments. The project involves collaboration between NML-BSTI, the BIPM, and the Asia-Pacific Metrology Programme (APMP).

POC: Syeda Kimia Alam Diba, kimia15nml.bsti@gmail.com