Significant Achievements
Establishing New Standards

Force

Force Standards - Hardness Standardizing machine

The New Primary Hardness Machines are Established for Realization of hardness scale

Great Demand of the Nation - Testing of Concrete and Hard materials (wide utilization in Defense, Space, Highway, Metro, Over Bridge, Tunnel etc.) with traceability to International standards

Acoustics

Acoustics, Vibration and Ultrasonic Standards

- Establishment of Primary Standard of Vibration using Laser Interferometer for calibration of reference standard accelerometer with an uncertainty of 0.3 % (at 160 Hz) at par with PTB Germany.

- Establishment of Secondary Sound Standard for providing calibration services for microphones and other sonic devices
Establishing New Standards Continued ...

**Time**

*First Cold Atom Cesium Fountain (CsF1) primary frequency standard.*

India-CsF1 has become operational.

- C-field mapping, frequency locking with H maser and stability analysis being performed.
- State selection is being implemented and accuracy evaluation is under progress.
Establishing New Standards Continued...

**Dimension**

*Long Gauge Blocks Measurement*  
*Using He-Ne Laser Interferometer*

![Image of measurement equipment](image)

Nominal Range: 0-4000 mm  
Working Range: 0-3700 mm  
Resolution: 0.01 µm  
Maximum Error: 1.5 µm  
Repeatability: 0.1 µm

**AC High Voltage & High Current**  
*(Standards for Power Sector)*

An innovative idea of the measurement of HV Divider up to 200kV almost double of our present 100kV capacity has been generated. A 200kV HV Divider from M/s. KVTEK Gurgaon has been calibrated.

*Set up for 200 kV HV Divider*
Materials & Products

CVD reactor for multiwalled CNTs

Very high yield – Key facility of fuel cell program

- Low temperature growth of graphene by PECVD
- UHV sublimation of Si from SiC
- Electric arc facility for single-wall CNT

Carbon–carbon composite fuel tubes

(for Compact High Temperature Nuclear Reactors at BARC)

- Carbon-carbon composite tubes were successfully developed and handed over to Scientists from BARC for the high temperature nuclear reactor.

- The technology involves weaving 3-D carbon fibre preform followed by repeated cycles of coal tar pitch impregnation, high pressure carbonization and graphitization to achieve a density of 1.8 g/cc

- These tubes will encounter temperature of 800-900°C and are designed to carry molten lead as heat exchanger and also to store nuclear fuel.

Dimensions: 500 mm x 75 mm OD x 35 mm with 12 holes of 10 mm dia. Each up to 400/450 mm depth on 55 mm PCD.
Materials & Products Continued …

**Conducting polymer paints and coatings for corrosion protection**

An outcome of joint efforts under NWP-12 (CSIR-NPL; CSIR-CECRI & CSIR-NCL)
NDA signed with M/s Krishna Conchem Products Pvt. Ltd., Navi Mumbai

![Conventional Epoxy Coatings](image1)

![Conducting Polymers Based Coatings](image2)

**Composites bipolar plate**
- Separate the individual fuel cells from Each other
- Distribute fuel and oxidant
- Carry current away from the cell
- Support for MEA

**Porous carbon paper**
- Provide reactant gases access from flow filed channels to catalyst layer
- Provide passage for removal of product water from catalyst layer
- Mechanical support to MEA

![Composites bipolar plate](image3)

![Porous carbon paper](image4)

**Polymer Electrolyte Fuel Cell (PEFC)**
- Developed indigenous knowhow for key components of PEFC's
- Performance benchmarked against global standards
- Built 1 kW PEFC prototype plant
- Demonstrated durability
- 9 Patents, 45 Papers, 7 Ph.D.s
- Manufacturing of components by MSME; vendor development under progress
- Technology validation at Reliance Industries site in Pataigna

**CSIR – NMITLI Programme**
- Materials development & continuous improvement
- Prototypes & test beds
- Licensing knowhow

**Industrial Consortium**
- Manufacturing components
- Technology validation
- Technology deployment