Consultative Committee for Length

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Global forum for progressing the state-of-the-art

- **Improved description of the practical realization of the metre (mise-en-pratique)**
  Explicit description of time-of-flight and interferometric techniques plus Si lattice parameter as a secondary representation
- **Secondary representation of the metre for nano dimensional applications**
  Traceability via silicon lattice parameter
- **Improved accuracy of Coordinate Measuring Machines**
  Increased use for measurements at the NMI level
- **Non-contact dimensional measurements**
  Optical scanners, X-ray computed tomography, laser trackers
Secondary representation of the metre for nano dimensional applications

- Need for a nano dimensional length standard not based on optical fringe division identified by CCL via the CCL WG-N
- Traceability to metre via silicon lattice parameter
- $\text{Si } d_{220}$ lattice parameter measured via x-ray interferometry to support Avogadro project and quoted in CODATA
- Represents a length scale derived from the bottom up and using nature
- Currently three routes to realization are being incorporated into the updated MeP for the metre
1. Realized via x-ray interferometry which can be used as a 1 dimensional ruler or translation stage with graduations every 192 pm; sub division also possible
2. Silicon monoatomic steps: an amphitheatre of monoatomic steps
3. Counting atoms in pillars of silicon imaged by TEM
Facilitating dialogue between NMIs and stakeholders

- **National Metrology Institutes**
  - Inter-NMI Research programmes (e.g. EMPIR)
  - Prioritizing of national programmes

- **Instrument manufacturers and end users**
  - Major industrial stakeholders include aerospace, automotive and semiconductor manufacturers but dimensional metrology touches every aspect of manufacturing
  - “MacroScale” and “NanoScale” conference series
  - Presentations from equipment manufacturers, some end-users and other stakeholders
Standards organizations, accreditors and regulators

- **Standards organizations**
  - ISO/TC 213 Dimensional and geometrical product specification and verification officially accepted a liaison with the CCL
  - CCL members play a major role in national, international and industry-based standards organizations

- **Accreditors and regulators**
  - CCL technical decisions are used by members, observers and liaison organizations to support accreditors and regulators
Global comparability of measurements

- **A comparison portfolio based on dimensional metrology techniques**
  Nine key comparisons test the principal techniques required by a competent dimensional metrology laboratory

- **CCL-RMO comparisons**
  Interlinked RMO comparisons improve the efficiency of the process where there are insufficient numbers of laboratories offering a service to make the classical scheme (of CCL and multiple RMO comparisons) worthwhile

www.bipm.org
Guidance on CMCs and comparisons

- **CCL Length Services Classification scheme (DimVIM)**
  Has been translated into 14 languages and has served as a template for other CCs, accreditation bodies, and other organizations.

- **Guidance documents**
  Guidance documents and templates have been developed on formatting CMCs, conducting comparisons, model protocols and final reports.
Thank you very much for your attention.

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