The SI Reference Point

Core (SI Brochure) plus First extension (KCDB)

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SI Reference Point

**What is included?** SI base units, derived units, prefixes, defining constants

- Machine-machine interactions
- Data sets
- Digital Calibration Certificates

**What is not?**

- Blockchain
- Big Data
- Artificial intelligence
How to achieve the goals set

Tools

XML

Knowledge Graph

RDF

SPARQL

JSON

GO-FAIR

Ontology

It’s all about identifiers
Some familiar digital identifiers: DOIs and ORCiDs
The Interoperability Plane: Interoperability and Reusability

- Units
- Quantities
- Constants
- International vocabulary

BIPM core references

- VIM
- SI Brochure
- GUM
## The Interoperability Plane: Interoperability and Reusability

### Content

**Units**
- Symbol
- Definitions (of SI base units (EN/FR))
- Validity dates of definition
- Defining CGPM Resolutions

**Prefixes**
- Symbol
- Multiplication factor

### Status

- Advanced prototype available
- Being tested together with other modules
The Interoperability Plane: Interoperability and Reusability

Prototype

BIPM core references

VIM
SI Brochure
GUM

Units

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```python
### http://si-digital-framework.org/SI#second1967
SI:second1967 rdf:type owl:NamedIndividual,
   SI:Definition;
   SI:hasDefiningAuthority <http://si-digital-framework.org/SI#13th_CGPM> ;
   SI:hasDefiningText "La seconde est la durée de 9 192 631 770 périodes de
   "The second is the duration of 9192631770periods of th
   SI:hasEndValidity "2019-05-19"^^xsd:date ;
   SI:hasStartValidity "1967-05-20"^^xsd:date .

### http://si-digital-framework.org/SI#second2018
SI:second2018 rdf:type owl:NamedIndividual,
   SI:Definition;
   SI:hasDefiningAuthority <http://si-digital-framework.org/SI#26th_CGPM> ;
   SI:hasDefiningText "La seconde, symbole s, est l'unité de temps du SI. E"'
```
Application to the KCDB

Current response

```json
'quantityValue': 'Temperature',
'cmc': {
  'lowerLimit': 961.78,
  'upperLimit': 961.78,
  'unit': '°C',
  'cmcUncertainty': {
    'lowerLimit': 0.09,
    'upperLimit': 0.09,
    'unit': '°C'},
  'cmcBaseUnit': {
    'lowerLimit': 1234.92999999999998,
    'upperLimit': 1234.92999999999998,
    'unit': '°C'},
  'cmcUncertaintyBaseUnit': {
    'lowerLimit': 273.239999999999995,
    'upperLimit': 273.239999999999995,
    'unit': '°C'},
  'confidenceLevel': 95.0,
  'coverageFactor': 2.0,
}
```

Machine-actionable response

Replace units expressed in **strings** (not machine-actionable) by identifiers from the **SI Reference Point**

https://www.bipm.org/kcdb/
First extension: to cover the CC Service Categories

Identifiers for “compound” measurement units

10 mW

http://si-digital-framework.org/SI/unit#watt

http://si-digital-framework.org/SI/prefix#milli

12.3 km

http://si-digital-framework.org/SI/unit#kilogram

http://si-digital-framework.org/SI/unit#metre 

It’s all about identifiers
Calibration certificates

CIPM MRA Logo and statement

France, LNE-LCM/Cnam (Conservatoire National des Arts et Métiers/Laboratoire Commun de Métrologie)

Items for defining ITS-90, Temperature : **660.323 °C**
Aluminium for SPRT
Absolute expanded uncertainty : **2.4 mK**
Comparison with a cell
Pressure-controlled heat pipe furnace Service provided by the LNE-INM
Approved on 18 May 2004
Institute service identifier : CMT

Summary

• Techniques from the semantic web allow us to make data **machine readable / actionable (FAIR)**

• BIPM is committed to providing a digital **SI Reference Point**

• An **advanced prototype** of the SI Reference Point has been developed

• A **testbed** for the SI Reference Point (producing HTML and JSON outputs) will be tested by the CIPM Expert Group before being released to the community for beta-testing

• The BIPM will work with the CCs to extend the core SI Reference Point to cover the CMCs (units and kinds of quantity) included in all the Service Categories defined by the CCs in the CIPM MRA
THANK YOU

Happy to answer any questions!

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