

Units

The Consultative Committee for Units (CCU)

The Consultative Committee for Units (CCU) deals with the central goal of the Metre Convention:

- It advises the International Committee on Weights and Measures (CIPM) in all matters concerning the International System of Units (SI),...
- ... in particular, on how to establish, maintain, and disseminate the SI at the state of the art of science and adapted to the evolving needs of its users across the world.
- It disseminates knowledge about the SI and about its practical realization not only to metrology experts but also to a wide stakeholder community as well as to the general public.

Scope of the CCU

- Structuring, developing and disseminating the SI
- Advice to the CIPM concerning units of measurement
- Preparing successive editions of the SI Brochure
- Educating the general public about the SI

Areas of impact and stakeholders

- Uniform and correct measurements underpin all national and international trade
- Member States and Associates represent 98 % of world economic power
- Involves international stakeholders such as OIML, ISO, IEC, CIE, IUPAP, IUPAC
- The SI Brochure is adopted as an official reference by almost all countries

Main achievements

The CCU prepared decisions by the CIPM and the CGPM on the adoption of the new definitions of the revised SI

- Definitions of base units are independent of any particular realization.
- Technical advances will no longer necessitate the redefinition of a unit...
- ... but instead translate directly into a better realization of that unit (update of the *mise en pratique*).

The CCU prepared the public for the revised SI

- Together with the BIPM, the CCU has expanded the information on the revised SI on the BIPM webpages.
- The CCU prepared the 9th edition of the SI Brochure.

The CCU launched a survey about the impact of the SI revision

- Survey organized amongst NMIs, liaison organizations and teaching institutions.
- No difficulties in the implementation of the revised SI were reported.
- Several possibilities for innovative technologies were mentioned.
- Liaison organizations were generally sufficiently well informed.

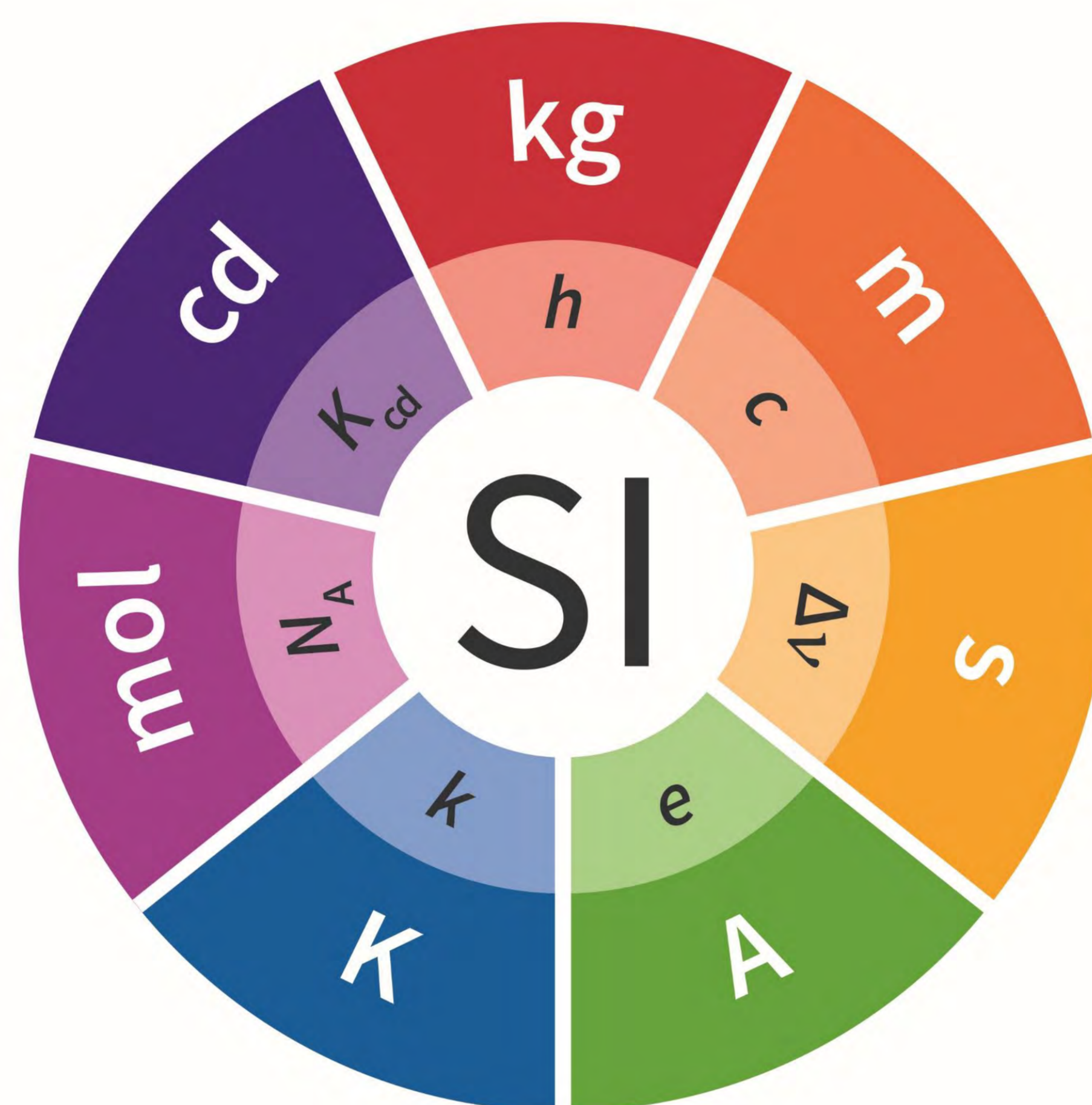
CCU membership

President: Prof. J. Ullrich, CIPM Vice-President

Executive Secretary: Dr M. Stock, BIPM

Members: CEM, Rosstandart, METAS, KRIS, INRIM, LNE, NIM, NIST, NMIJ/AIST, NPL, NRC, NSC IM, PTB

Liaisons: CIE, CODATA, IAU, ICRU, IEC, IFCC, IMU, ISO, OIML, IUPAC, IUPAP



The Revised SI

The International System of Units, the SI, is the system of units in which:

- the unperturbed ground state hyperfine transition frequency of the caesium 133 atom $\Delta\nu_{Cs}$ is **9 192 631 770 Hz**,
- the speed of light in vacuum c is **299 792 458 m/s**,
- the Planck constant h is **$6.626\ 070\ 15 \times 10^{-34}$ J s**,
- the elementary charge e is **$1.602\ 176\ 634 \times 10^{-19}$ C**,
- the Boltzmann constant k is **$1.380\ 649 \times 10^{-23}$ J/K**,
- the Avogadro constant N_A is **$6.022\ 140\ 76 \times 10^{23}$ mol⁻¹**,
- the luminous efficacy of monochromatic radiation of frequency 540×10^{12} Hz K_{cd} is **683 lm/W**.



24th meeting of the CCU (October 2019) chaired by Prof. J. Ullrich.
The 25th meeting (2021) was held on-line.

Key challenges for the future

Prepare the redefinition of the second for 2030 or later with the CCTF

- Encourage and monitor research on optical transitions whose frequencies could be candidates for redefining the SI second.
- This will probably be the last redefinition of a base unit of the SI for a long time.

Clarify the status of the radian within the SI

- It is recognized that the present status of the radian in the SI can lead to ambiguities.
- In the short term improve the clarity of the text of the SI Brochure with respect to the radian.
- In the longer term review the status of the radian being a derived unit.

Develop definitions of core metrological terms

- Propose definitions that underpin machine-actionable services in metrology for the Quality Infrastructure.
- Examples of core metrological terms: “quantity”, “unit”, “quantity value”.
- Work done in collaboration with experts in mathematics, digitalization, linguistics etc.