




Consultative Committee for Electricity and Magnetism

Gert Rietveld, CCEM President

November 2022

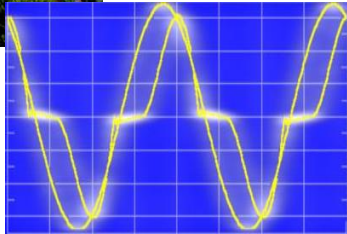
A graphic on the right side of the slide consisting of numerous concentric, slightly offset circles in a rainbow color palette (red, orange, yellow, green, blue, purple). The circles are of varying thicknesses and are arranged in a way that creates a sense of depth and movement, resembling a stylized spiral or a series of overlapping orbits.

Working together to
promote and advance
the global comparability
of measurements

Electrical measurements in daily life



Sustainable
society



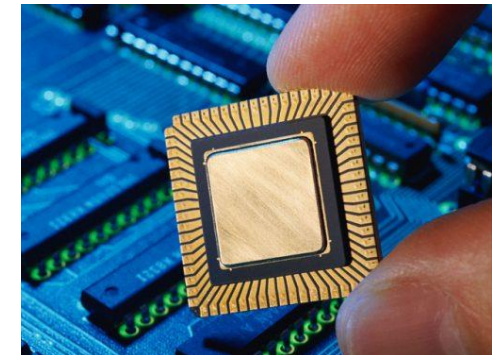
Fair trade



Telecom



Nanoelectronics



Introducing the CCEM community

Key objective: advise CIPM on
electromagnetic metrology

26 members
(CMI new member)
2 observers

Meetings: 2019, 2021 (web)

WGLF + GTRF, WGRMO
~~WGKG, WGS~~



<https://www.bipm.org/en/committees/cc/ccem/publications>

- ◆ Revised SI – support CCM
- ◆ CCEM Strategy
- ◆ Workshop on microwave measurements (2019)
- ◆ BIPM work programme



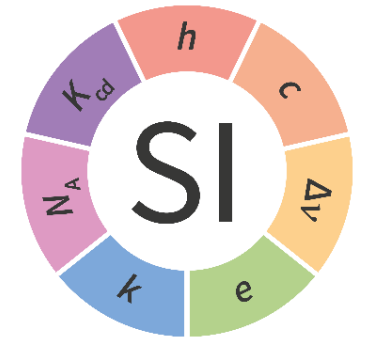
CCEM Strategy

Vision: To be the recognized international focus for electrical metrology, serving the global community by providing a reliable measurement foundation for science, innovation in industry and emerging technologies.



Mission: To foster equivalence and promote harmonization of electrical measurement worldwide, by providing:

- an international forum for coordination of global comparability of electromagnetic measurements and
- collective leadership in progressing the science and the application of electrical metrology.



Electrical measurements: back into the SI!

Reminder: electrical quantum standards are based on h , e

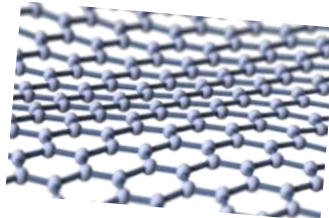
⇔ final values of h , e did not perfectly align with 1990 values

Consequence: CCEM was the only CC with a step change!

Good news: no issues with implementation of the revised SI in industry!

Present progress in state-of-the-art:

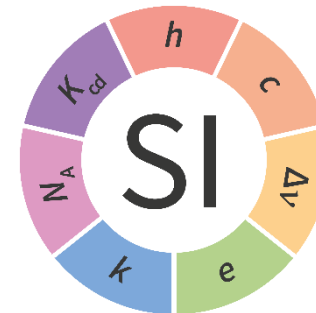
- AC quantum voltage standard
- QHE based on graphene



for voting



to the revised SI...



Facilitating dialogue between NMIs and stakeholders

Workshop on microwave metrology

- S-parameters in coax systems
- Communications, 5G
- Chip characterisation (on-wafer)

**Bureau
International des
Poids et
Mesures**

**CCEM workshop on “Metrology for radiofrequencies and microwaves,”
to be held at the BIPM, 27 March 2019**

Venue: Pavillon du Mail, BIPM, Sèvres, France



Webinars

CCEM Webinar - 15/09/2022 – CCEM strategy 2020-2030 ...

YouTube

YouTube · The BIPM · 22 sep. 2022



CCEM Webinar - 15/09/2022 – The BIPM electricity laboratories

YouTube

YouTube · The BIPM · 22 sep. 2022



https://www.youtube.com/watch?v=w2F1FB_Id0w

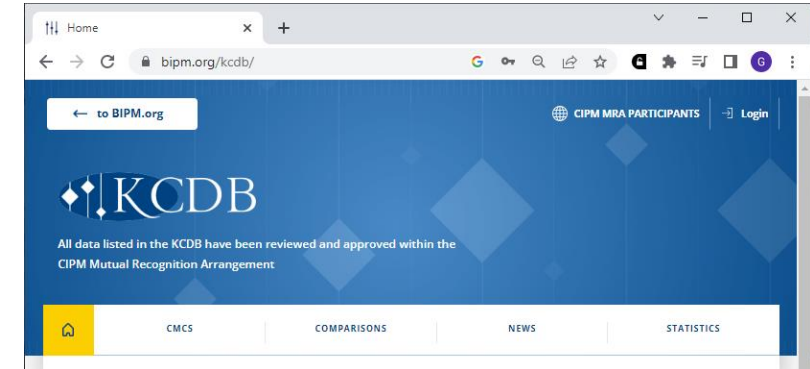
Aim: promote knowledge sharing within wider CCEM community, with presentations on state-of-the-art and topic introductions



Global comparability of measurements

‘Run’ the CIPM MRA as smoothly and effectively as possible:

- KCDB2.0
- Efficient CMC review
- BIPM laboratory programme



<https://www.bipm.org/kcdb/>

Comparisons:

- Strategic planning of comparisons
- BIPM completed K4 comparison in ‘star mode’ in 20 months!
- Others still take very long – issues with transport / customs, pandemic, ...



Summary and Outlook

Extending quantum basis of electrical measurements

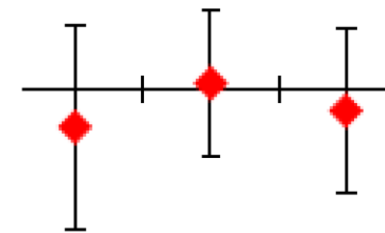
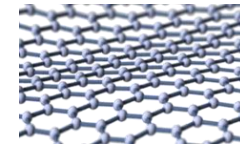
⇒ Trend: enhanced support of society challenges

New ways of implementing coordination and dialogue

⇒ Workshops, webinars, hybrid meetings

Continued attention to efficient implementation of the CIPM MRA, with *crucial support from BIPM laboratories*

(see the posters!)






**Merci de votre
attention!**

Gert Rietveld, CCEM President

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A large, vibrant graphic on the right side of the slide. It consists of numerous concentric, slightly offset circular bands in a rainbow color palette (red, orange, yellow, green, blue, purple). These bands spiral inward, creating a sense of depth and movement. The center of the spiral is a dark blue circle containing white text.

27^e réunion de la
Conférence générale
des poids et mesures