



Consultative Committee for Electricity and Magnetism

Gert Rietveld, CCEM President

November 2022

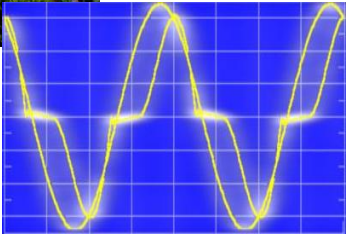
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Working together to
promote and advance
the global comparability
of measurements

Electrical measurements in daily life



Sustainable society



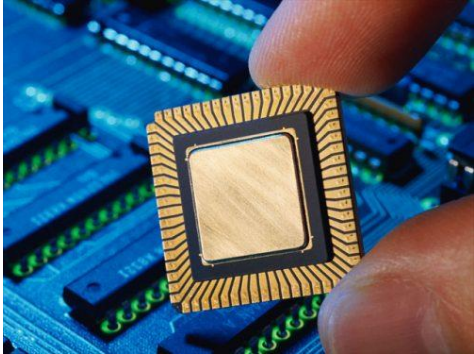
Fair trade



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, WGS1~~



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

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



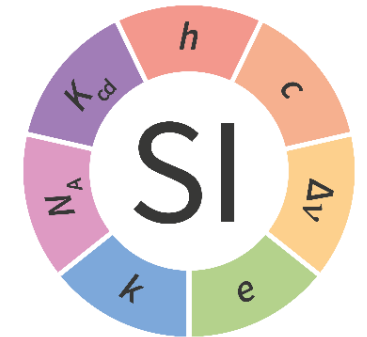
CCEM Strategy

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

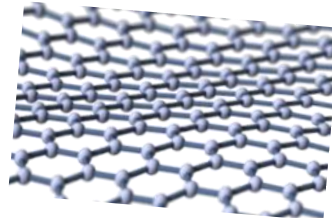
↔ final values of h , e did not perfectly align with 1990 values

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:

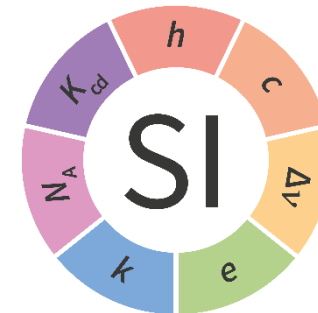
- AC quantum voltage standard
- QHE based on graphene



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

CCEM

Webinars

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

YouTube

YouTube - The BIPM - 22 sep. 2022



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

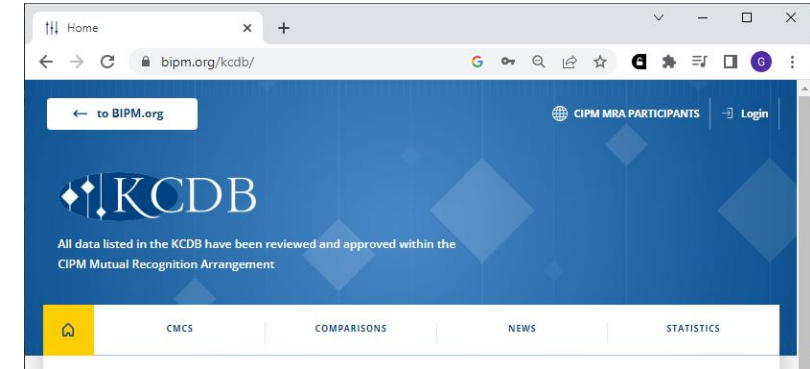
Aim: promote knowledge sharing within wider CCEM community, with presentations on state-of-the-art and topic introductions



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

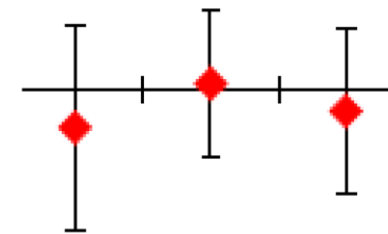
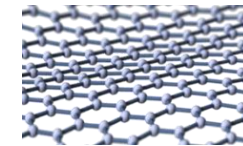
⇒ Trend: enhanced support of society challenges

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