



---

## Impact

- **19NRM07 HV-com²-**

*Support for standardisation of high voltage testing with composite and combined wave shapes*

24<sup>th</sup> April 2023

# Recap WP1

# CONCLUSION

Proposal of recommendations and parameters was submitted to MT4 of TC 42 'High-voltage and high-current test techniques' for the ongoing revision of the IEC 60060 series.

Composite and combined wave shapes traceability to the International System of Units was ensured up to 1 kV using **developed standard calibrators**. One calibrator generates voltages up to 900 V with an uncertainty  $< 0.2\%$  for the amplitude and  $1\%$  for the time parameters.

Composite and combined wave shapes parameters were evaluated using the developed **software**.

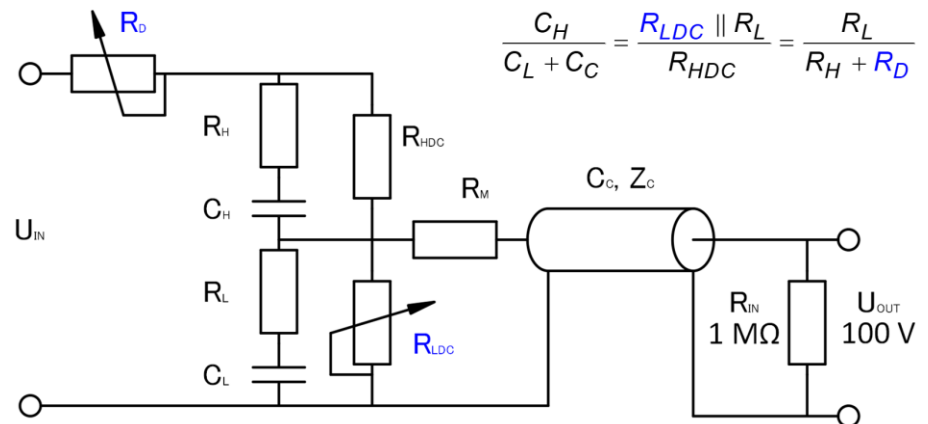
Requirements of the IEC 61083 were verified for LVMI through an Interlaboratory comparison.

Calibration test procedures and uncertainty budget estimate **were established for LVMI calibration**.



# Recap WP2

- Designed and built of Dividers
- First characterization of 100 kV and 200 kV systems show that the measurement uncertainty is lower than 0.1 % for the test voltage value for all voltage types.
- The 200 kV divider is tested PD free up to its nominal voltage.
- The 400 kV setup has been successfully used as the reference system in a comparison with commercial measuring systems.
- Proper metrological characterization still to be done...



# Recap WP3

---

- Commercially available measurement systems based on universal voltage dividers are capable of analyzing DC+LI/SI superimposed voltages with the accuracy required for high voltage testing.
- All systems retained their high overall accuracy during all superimposed voltage tests, especially regarding their dynamic behaviour.
- A DC component did not have any negative effect on the performance of the measurement systems.
- It is sufficient to calibrate a measurement system based on universal voltage dividers for use with composite voltages with the respective individual voltages.
  - Scale factors for the different voltage waveforms should agree within  $\pm 1\%$ .
  - Deviation regarding time parameters should not exceed  $\pm 2\%$ .



# Publications

STANDARDS & REGULATORY ACTIVITIES (STAN)	28
PEER REVIEWED OPEN ACCESS SCIENTIFIC PUBLICATIONS (PUB)	18
CONFERENCE PRESENTATIONS & POSTERS (CONF)	9
TRAINING (TR)	5
OTHER DISSEMINATION (OTH)	7
FOLLOW-ON COLLABORATIONS (FOLL)	2
END USER UPTAKE & EXPLOITATION (UP)	1
COLLABORATORS & STAKEHOLDERS (COLL)	12



# EUROPEAN METROLOGY NETWORK FOR SMART ELECTRICITY GRIDS

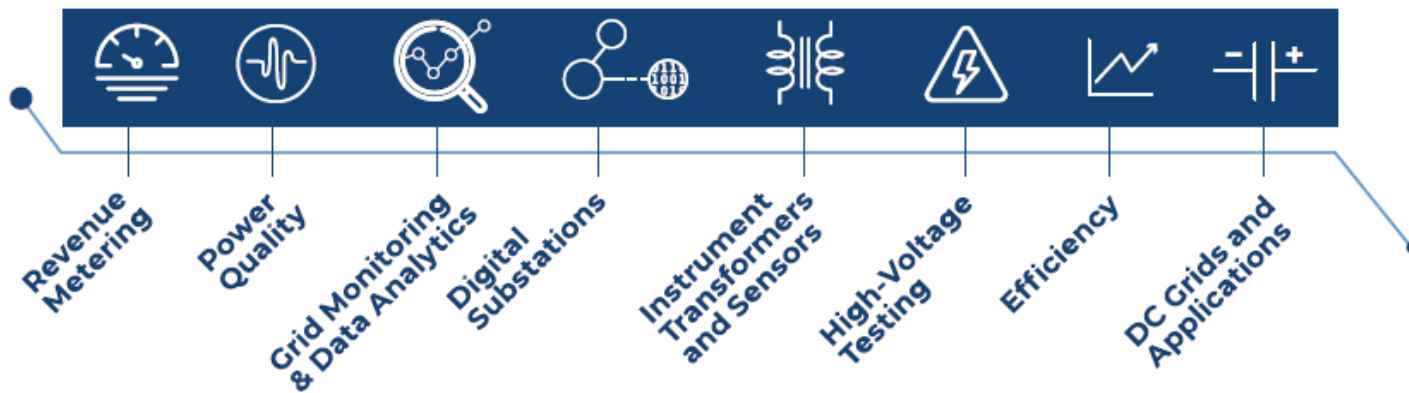


Single point of contact across Europe that provides stakeholders support for metrology and measurement challenges in the realisation of smart electricity grids.

Building a low-carbon, climate resilient future will require secure, clean and efficient energy.

The transition towards a more sustainable energy supply has a profound effect on electricity grids, the backbone of the energy systems in a modern society.

The EMN for Smart Electricity Grids provides support for standardisation and testing, stimulate joint research fostering smart grid development and draws up implementation strategies.



# OUR MEMBERS



## OUR ACTIVITIES



### Support to industry

Point of access to metrology services and consultancy across Europe.

Link with stakeholder organisations and companies, including European network operators.



### Virtual knowledge hub

Collection of results from multiple R&D projects.

Gateway to training material and opportunities.



### Sustainable metrology infrastructure

Optimal and co-ordinated use of European metrology facilities.

Filling of identified service gaps.



### Strategic research agenda

Coordinated alignment of national R&D strategies.

Identification of present and future grid measurement challenges and development of research roadmaps.

## EMPIR

The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

This project 18NET03 SEG-Net has received funding from the EMPIR programme co-financed by the Participating States and from the European Union's Horizon2020 research and innovation programme.

## GET IN TOUCH

[euramet.org/smart-electricity-grids](http://euramet.org/smart-electricity-grids)  
[SmartGrids@euramet.org](mailto:SmartGrids@euramet.org)



WEBSITE




NEWSLETTER





# Impact on Standardisation

---



19NRM07 HV-com<sup>2</sup>

**Recommendation Report for  
the Review of IEC 60060-1**



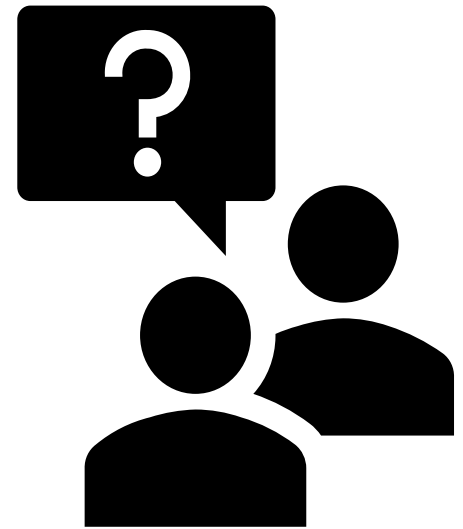
19NRM07 HV-com<sup>2</sup>

**Recommendation Report for  
the Review of IEC 60060-2**



# Discussion – further needs, ideas, proposals?

---



**Thank you for your attention!**

---

