



## EMN Mathmet

### “Supporting mathematical and statistical applications for measurement science in Europe”

Chair: Francesca Pennechi (INRiM)

**Our Vision:** *EMN Mathmet ensures quality and trust in algorithms, software tools and data for metrology, and in inferences made from such data, to foster the digital transformation*

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<https://www.euramet.org/european-metrology-networks/mathmet>



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# EMN Mathmet

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- EMN Mathmet was established in June 2019
- Today, the EMN comprises 16 NMIs/DIs and partner institutes
- Supported by EMPIR JNP 18NET05 (2019-2023)



- Expertise:
  - Uncertainty Quantification
  - Data analysis
  - Computational Modelling & ML
- Activities:
  - JNP
  - Stakeholder consultations
  - Measurement Uncertainty Training



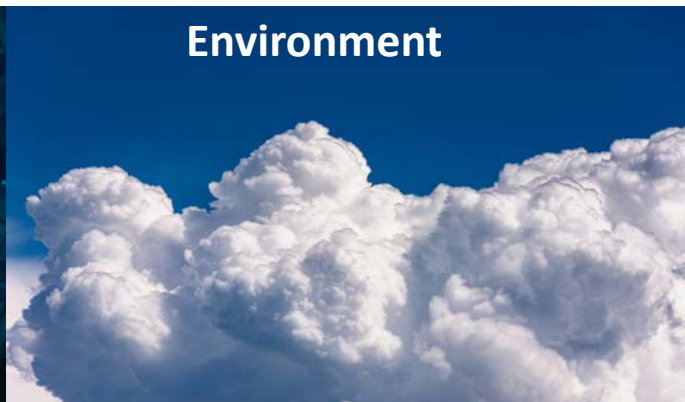
# Achievements

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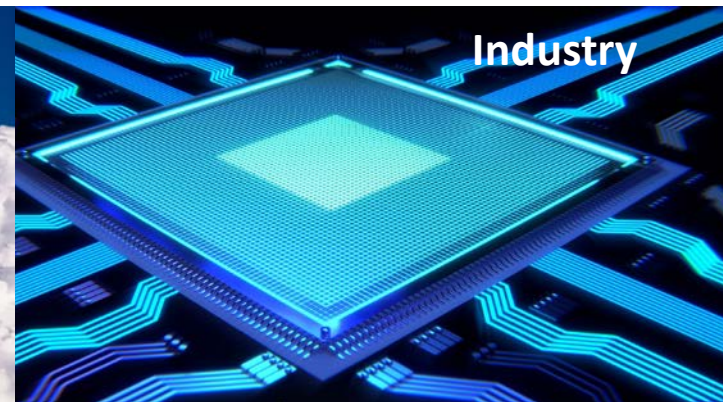
**Backbone EMN** – crosscutting Maths&Stats research for a variety of applications



Health



Environment



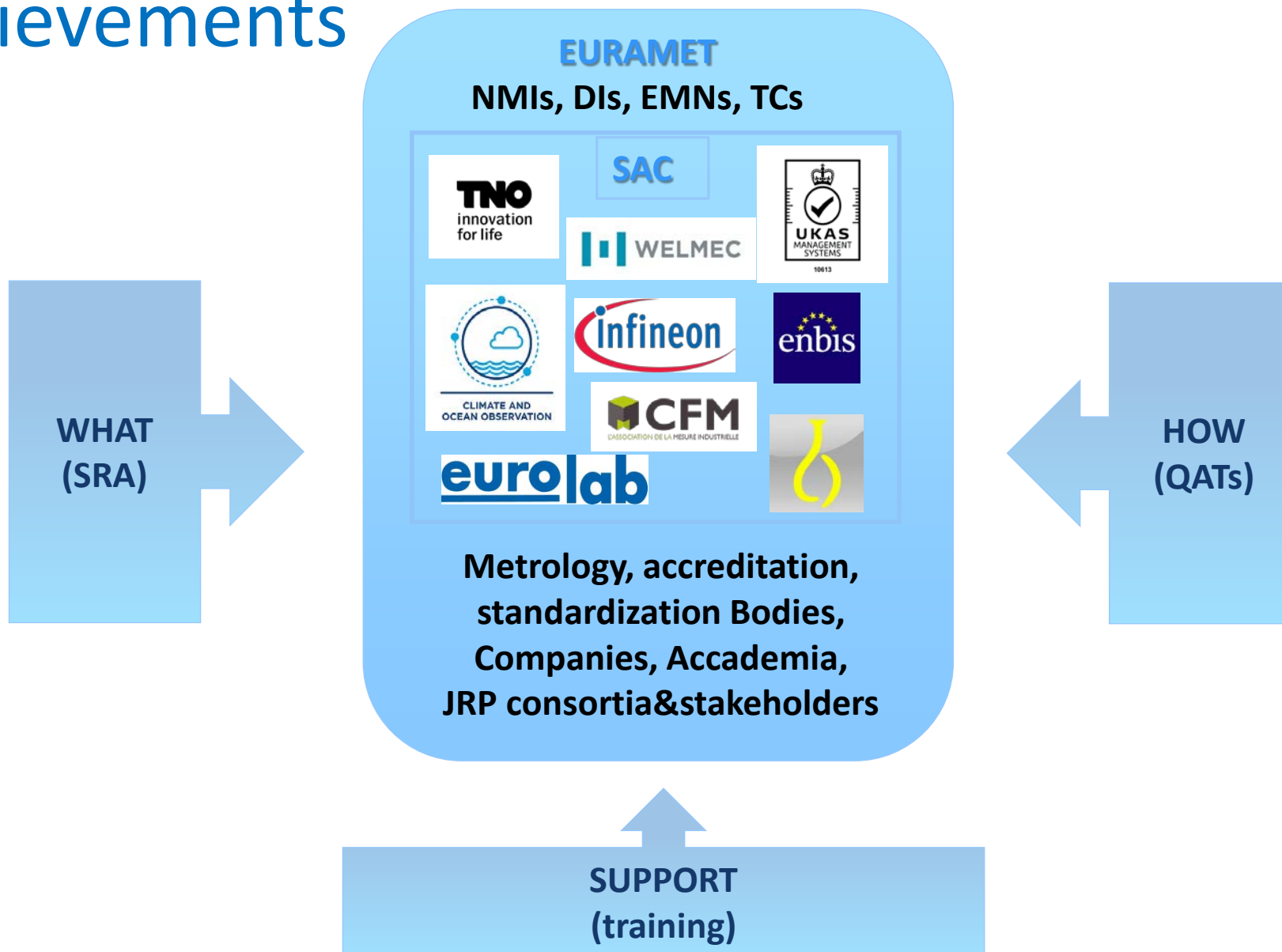
Industry





# Achievements

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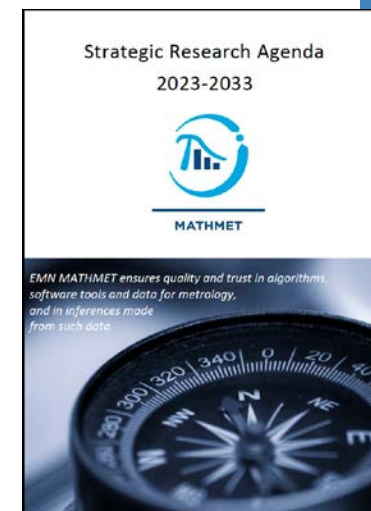


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# Achievements cont.

*Visit our website and  
download SRA and QATs!*

**Strategic Research Agenda (SRA)** – <https://www.euramet.org/european-metrology-networks/mathmet/strategy/strategic-research-agenda>



**Quality Assurance Tools (QATs)** – <https://www.euramet.org/european-metrology-networks/mathmet/activities/quality-assurance-tools>

Consist of separate components for data, software, and guidelines:

- For data and software: **on-line interactive risk assessment tool** for guiding the user in developing a quality management plan and assigning the integrity level
- For guidelines (future and existing): **interactive checklist** comprising a set of questions, and a recommendation box based on the answers to those questions

**Online training** at <https://e-learning.bipm.org/course/index.php?categoryid=9>



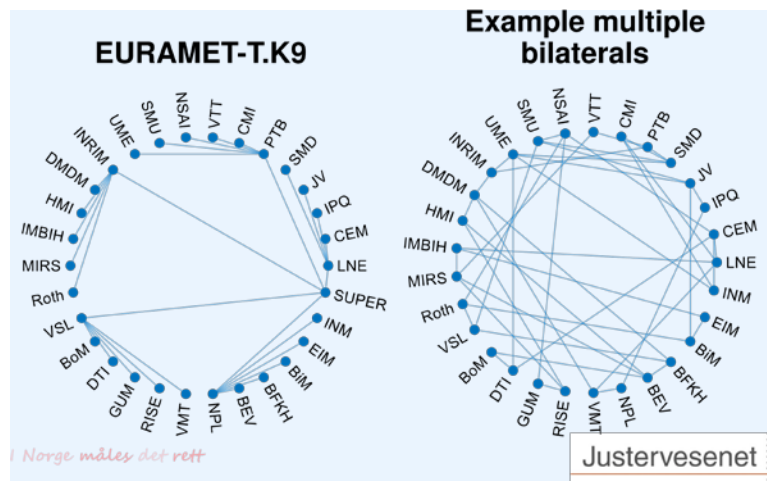




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# Mathmet activities

- **Comparisons as continuously evolving bilateral comparisons** (Sep. 2022 – in progress):
  - Joint Euramet TC-IM Project (n. 1561) and Mathmet Activity (<https://www.euramet.org/technical-committees/tc-projects/details/project/comparisons-as-continuously-evolving-bilateral-comparisons>)
  - Coordinator: Åge Andreas Falnes Olsen (JV)
  - Mathmet reference contact: Maurice Cox (NPL)
  - The project explores the feasibility of a network-based scheme for key comparisons (KCs). In contrast to a few top-down designed comparisons with many participants, the scheme would comprise many bilateral comparisons with relatively few participants in each.





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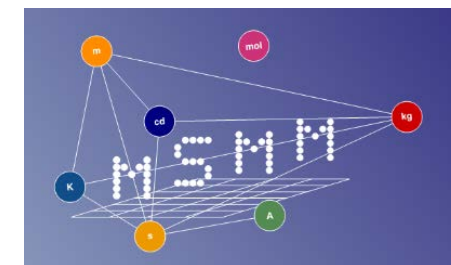
# Mathmet impact and dissemination

## ■ Training activities

- Training course on measurement uncertainty and software quality for Western Balkan Countries
- QATs for data, software, and guidelines (ENBIS webinar and Mathmet online course)
- e-learning course on QATs (on BIPM platform)
- e-learning course on MU training activity (to be done)

## ■ (Recent) Conferences, workshops and events

- [Mathmet Conference](#) (Paris, 2-4 Nov 2022), with an ENBIS session and a Roundtable for Stakeholders (4 from the SAC, 3 EMNs, 5 TCs, and others)
- Joint ENBIS-MATHMET [MSMM 2023](#) Workshop (Torino, 30-31 May 2023)
- Organized MU SIG session at the [ENBIS 2023 conference](#) (Valencia, 10-14 Sep 2023).
- Advanced Mathematical and Computational Tools in Metrology and Testing [AMCTM 2023](#) (Sarajevo, 26-28 Sept 2023); an event of IMEKO TC21: Mathematical Tools for Measurements, in conjunction with IMEKO TC6: Digitalisation and EMN Mathmet.
- [Impact Workshop](#) (Online, 14 March 2024) of the MU Training Activity.





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# EMPIR - EPM Projects related to Mathmet

Recent projects listed at <https://www.euramet.org/european-metrology-networks/mathmet/activities/projects>

- **CASoft** - Software to maximize end user uptake of conformity assessment with measurement uncertainty (2018-2021)
- **EMUE** - Advancing measurement uncertainty - comprehensive examples for key international standards (2018-2021)
- **MET4FoF** - Metrology for the Factory of the Future (2018-2021)
- **SmartCom** - Communication and validation of smart data in IoT-networks (2018-2021)
- **MIMAS**: Procedures allowing medical implant manufacturers to demonstrate compliance with MRI safety regulations (2018-2021)
- **RaCHy** - Radiotherapy coupled with hyperthermia - adapting the biological equivalent dose concept (2019-2022)
- **QUIERO** - Quantitative MR-based imaging of physical biomarkers (2019-2022)
- **MedalCare** - Metrology of automated data analysis for cardiac arrhythmia management (2019-2022)
- **TracPETperf** - Software for evaluating PET cardiac perfusion imaging uncertainties for more accurate diagnosis (2020-2022)







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# EMPIR - EPM Projects related to Mathmet cont.

Recent projects listed at <https://www.euramet.org/european-metrology-networks/mathmet/activities/projects>

- **ATMOC** - Traceable metrology of soft X-ray to IR optical constants and nanofilms for advanced manufacturing (2021-2024)
- **iMET-MRI** - Improved metrology for quantitative MRI (2021-2024)
- **Met4H2** - Metrology for the hydrogen supply chain (2022-2025)
- **STASIS** - Standardisation for safe implant scanning in MRI (2022-2025)
- **MAIBAI** - Developing a metrological framework for assessment of image-based Artificial Intelligence systems for disease detection (2023-2026)
- **A4IM** - Affordable low-field MRI reference system (2023-2026)
- **QUMPHY** - Uncertainty quantification for machine learning models applied to photoplethysmography signals (2023-2026)
- **FunSNM** - Fundamental principles of sensor network metrology (2023-2026)
- **ViDiT** - Trustworthy virtual experiments and digital twins (2023-2026)



**MET4H2**





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**For any information, visit our website or contact us:**

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**Thank you for your attention!**