



# EMN Radiation Protection

EMN Chair:

Annette Röttger, PTB (Germany)

EMN Vice Chair:

**Teemu Siiskonen**, STUK (Finland)

EMN Secretary:

Behnam Khanbabaee, PTB (Germany)

## 2023 Metrology for Regulation

# European Metrology Networks



**Objective:** Create sustainable structures in areas of strategic importance for the future of European metrology



## The Networks...

- cover areas of major strategic importance, with a **European dimension**
- establish close links with a wider **stakeholder community**, including other European Partnerships
- strive for **scientific excellence**
- develop and coordinate a **common metrology strategy & infrastructure** to support innovation, public policy, and regulation

# Short history of the EMN RP



RADIATION  
PROTECTION

2019-02-18	PNT submitted to EURAMET „Support for a European Metrology Network on reliable radiation protection regulation”
2019-07-02	Partnering Meeting at LNE, Paris
2019-11-05	Successful Conference in Amsterdam
2020-06-23	Kick-off meeting of 19NET03 supportBSS
2020-06-24	Formal Meeting: EMN based on 19NET03
2021-06-08	GA approval of the EMN
2021-09-09	EMN for Radiation Protection is established
2021-09-29	1 <sup>st</sup> EMN Meeting (Kick-off)
2021-11-01	Call for Candidates
2022-01-18	Election Process finished
2022-02-25	Letter of Intent to cooperate between ICRP and EURAMET
2022-04-13	2 <sup>nd</sup> EMN Meeting
2022-10	EURADOS Training Course on Radiation Protection Dosimetry and Accreditation of IMS
2022-10-05	Metrology for Industry (Call 2023): Open consultation on Metrology for Radiation Protection
2023-06-15	3 <sup>rd</sup> EMN Meeting



## EMN for Radiation Protection Chair:

Annette Röttger

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To underpin the **EU regulation on ionizing radiation** by metrology:

- Council Directive 2013/59/EURATOM
- Treaty establishing the European Atomic Energy Community

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



# Basic framework of RP regulation



RP is governed by policies and regulations that stem from basic science, expectations, prejudice and the interests of professions and other stakeholders

## Basic science

- Chemistry and biology → understanding of mechanisms why radiation is harmful
- Physics → quantification of exposure, interaction mechanisms and measurements
- Epidemiology → risk models and quantification of risk (harmful effects)
- Social sciences → expectations, risk perception, acceptance, justification

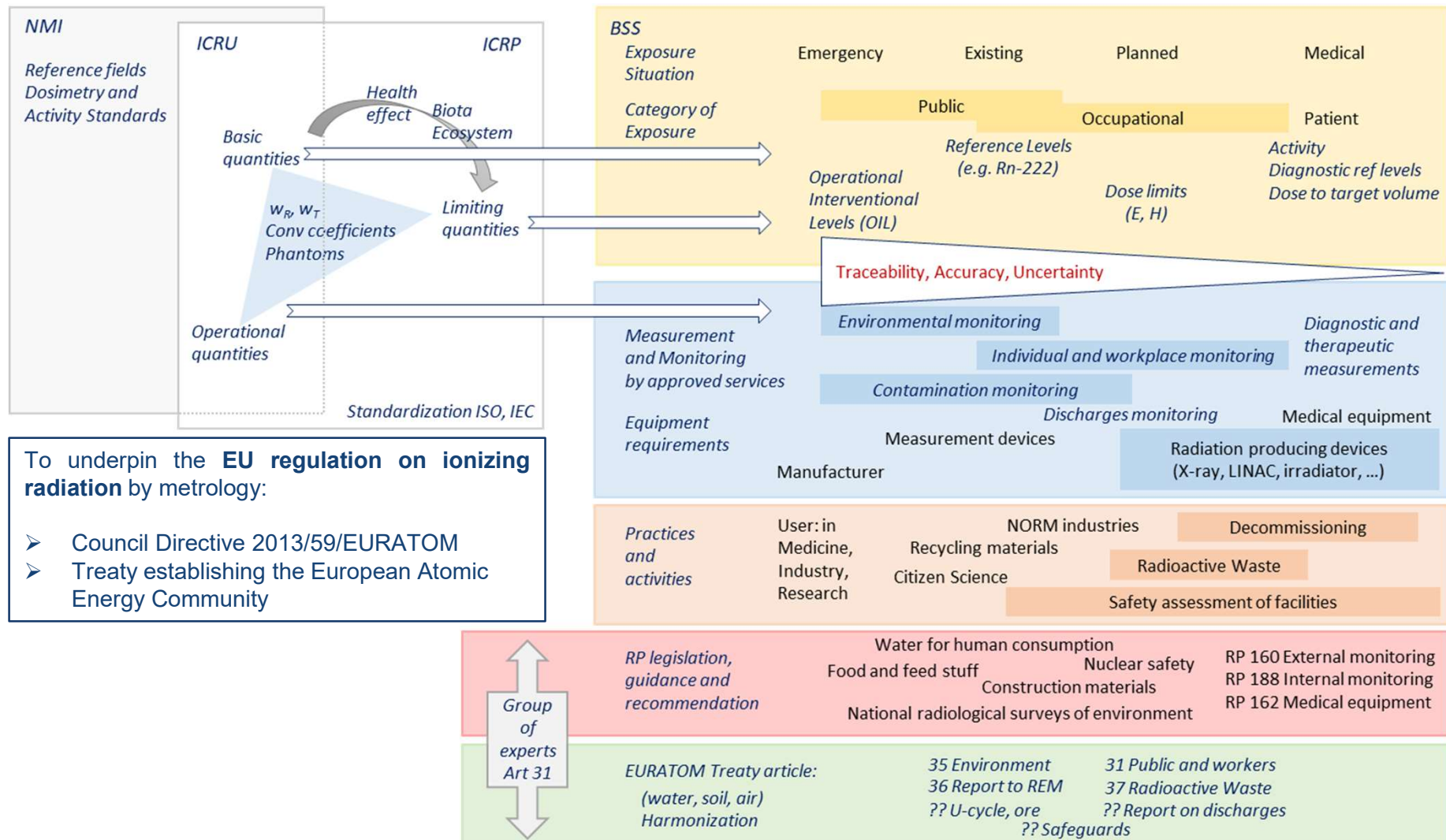
## Use of radiation is a heavily regulated area

- Regulations and decisions are affected by opinions and values of various stakeholders and these opinions are not necessarily based on scientific knowledge
- Science is the basis for risk estimates and methods to estimate radiation exposure



**There is an increasing need to have scientific input to discussions on policies and regulations**

# Towards – SRA and SA





- Questionnaire *Metrology supporting European regulation for Radiation Protection*

EURAMET 19NET03 SupportBSS  
Revised by all partners, 16-Feb-2023



*Metrology supporting the European regulation for Radiation Protection*  
*Questionnaire*

**Introduction**

This questionnaire was prepared in the framework of project EURAMET EMPIR 19NET03 – supportBSS entitled *Support for a European Metrology Network on reliable radiation protection regulation*.

In order to prepare a **Strategic Research Agenda** and **Roadmaps** on the needs and gaps in metrology related to the Council Directive 2013/59/Euratom and the Euratom Treaty, the metrology community would like to receive your visions and contributions on this subject.

Please refer to the accompanying paper with the same title as the questionnaire. The questionnaire aims at all stakeholders, with questions for metrology laboratories and specific questions for the fields of activity grouped by “Public, environmental and ionizing radiation in the ecosystem”, “Emergency exposure”, “Occupational exposure” and “Medical use of ionizing radiation”.

*Please feel free to answer all the questions, but as minimum, please answer the general questions and the*

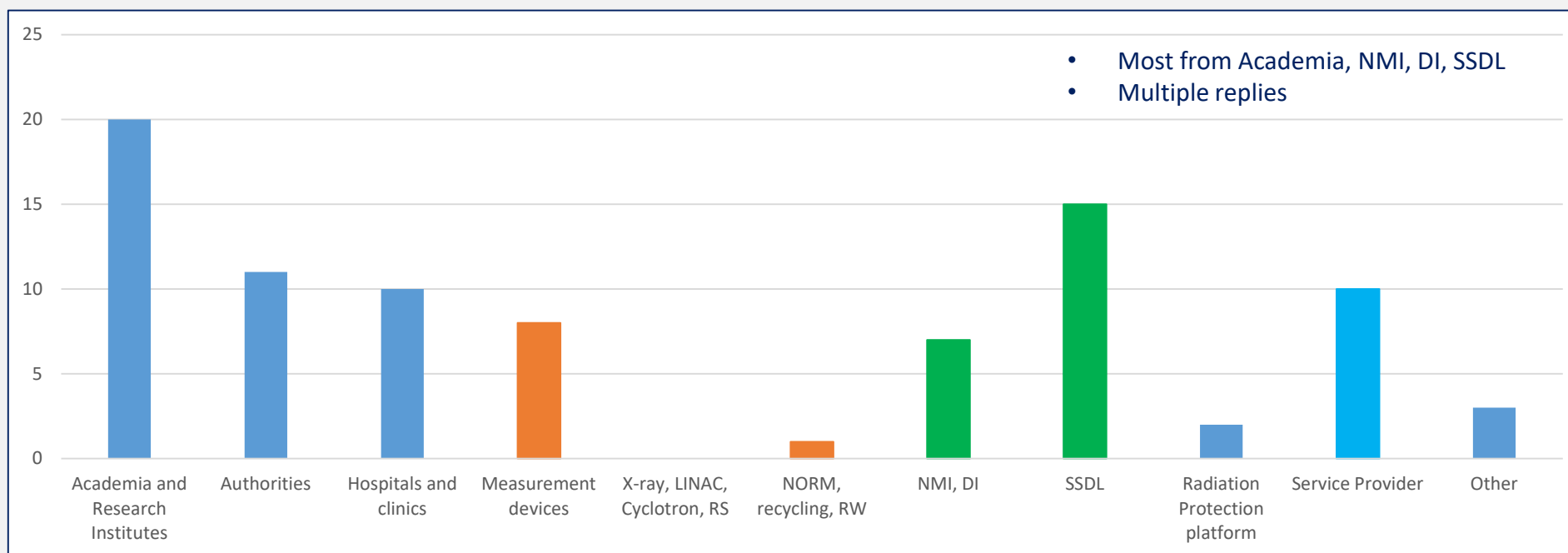
- What are the missing topics on the implementation of legislation or regulation on metrology that you consider relevant?
  - Where is the most important knowledge gap in Radiation Protection?
  - Which topics are more relevant for Radiation Protection research in the future?
- **Public, environmental and IR in the ecosystem**
  - **Emergency exposure**
  - **Occupational exposure**
  - **Medical use of IR (occupational exposure)**

59 replies: 56 Europe (EU and other), 3 (RSA, Khazkstan, Uruguay)

## Preliminary results

- **Universe of respondents**

Stakeholders identified themselves as members of:





## What are the missing topics on the implementation of legislation or regulation on metrology that you consider relevant?

Metrology of pulsed fields, introduction of **new quantities**

Need to **clarify** the metrology terms (calibration, verification, type testing) - implications on frequency, measurement range and qualities of reference.

**Radon and NORM** related issues

Wildlife and species of reference

Metrology for high-dose, high-dose rate (levels)

NORM related issues

Assessment of **neutron** doses

Approval of dosimetry services, Dose Registers

IC for patient dosimetry, IC for brachytherapy sources; Relevance of DRL; Sentinel lymph-node probes; Well counters in NM (local PT?); Dosimetry for new techniques (e.g. Flash). **Attention: EMN-Med**

General  
Publ Env  
Emergency  
Occupational  
Medical

## Where is the most important knowledge gap in Radiation Protection?

Need for **clarification** of metrology terms

**Dose quantities**, conversion coefficients, **uncertainties**

Fit for purpose: proper use of instruments, including low energy range

**Neutron** devices, cross-sections for high-energy **neutrons**

Impact of very low doses

Dose to reference species

**Radon** dosimetry

Dose estimates from measurement results

General  
Publ Env  
Emergency  
Occupational  
Medical

Radiation protection of masses on a large-scale nuclear accident

Simulations and **error**

**Reliability** of electronic/hybrid dosimeters, awareness of physical limitation of dosimeters and detection limits

RBE physical/chemical effects of radiation cell/organ damage; Treatment plan for RN therapy; Measurement and QA in Flash and Hadron therapy **Attention: EMN-Med**

## Which topics are more relevant for Radiation Protection research in the future?

Dosimetry, **quantities** and units, **uncertainty**  
E&T for citizen science

**Uncertainty** of dose from **radon** measurements, **radon** and NORM related issues  
Reference animals and plants  
Impact of deep geological storage

Pulsed fields with active detectors  
Implementation of the **new operational quantities**  
Ratio E/Hp(10) for real workplace  
Development of computational and AI alternatives for some workplaces

Internal monitoring (bioassay) for rare RN for a large number of persons  
Modelling impact assessments  
Facilitating the use of measuring instruments and **simplifying** the assessment of exposure for services or people who do not deal with RP on a daily basis

Nanodosimetry; Quantification of risk of stochastic effects caused by low radiation doses; Alpha particle therapy; Flash therapy **Attention: EMN-Med**

**General**  
**Publ Env**  
**Emergency**  
**Occupational**  
**Medical**

# Success Stories: Research



## High-energy, pulsed reference field (national funds)

*National Project:* Establishment and characterisation of a reference field for ensuring radiation protection at accelerator facilities in medicine and research and for testing and calibrating of corresponding measuring instruments



Bundesamt  
für Strahlenschutz



Bundesministerium  
für Umwelt, Naturschutz, nukleare Sicherheit  
und Verbraucherschutz



Physikalisch-Technische Bundesanstalt  
National Metrology Institute

## Harmonisation (European funds)

JRP 22NRM07 GuideRadPROS

*EURAMET Project:* Harmonisation, update and implementation of standards related to radiation protection dosimeters for photon radiation

EUROPEAN PARTNERSHIP



Co-funded by  
the European Union

METROLOGY  
PARTNERSHIP



## Open consultation on Metrology for Radiation Protection Brainstorming Workshop on Radiation Protection issues with Industry Representatives: Support for technological trends (Call 2023)

Open consultation on Metrology for Radiation Protection  
Support for technological trends: EURAMET's Work Programme on Metrology for Industry Call 2023  
Final Agenda



Time	5 October 2022 14:00 - 15:30 CEST 6 October 2022 15:00 - 15:30 CEST
Place	Online
Time-Center/Topic	Speaker
14:00 Welcome & Introduction	Arnette Ritzger, EURAMET Chair
14:05 European Partnership on Metrology Information about the Industry Call	Regina Kuchler, EURAMET
14:15 Topical of European Metrology Network (EMN) for Radiation Protection	Arnette Ritzger, EURAMET Chair
14:20 Sensor Measurements: Sensor networks for big buildings and large sites	Tatjana Biele, PTB, Germany
14:25 Sensor Measurements: Sensor networks for big buildings and large sites	Josef-Luis Guderian Villaverde, INMUCON, Spain
14:30 Availability of measurements of the size distribution of aerosols in air	Katerina Kuchlerova, Central Laboratory for Radiological Protection, Poland
14:35 Discussion	Participants
15:00 Coffee break	
15:05 The future of radiation dosimetry	Philipp Kuchler, Chair of EURAMET
15:10 Lack of calibration facilities for pulsed neutron fields	Marina Gerasimova, Radiological & Metrology, Italy
15:15 Discussion	Participants
15:20 Radiation Protection for Flight RT: integral dose or instantaneous dose rate?	Georgios Pappas, Scientific Officer at EIT - Radiation QST Technologies S.p.A. Italy
15:25 Establishing radiation protection issues in the novel PLASMA from the point of view of users	Georgios Pappas, Scientific Officer at EIT - Radiation QST Technologies S.p.A. Italy
15:30 Discussion	Participants
15:35	Wrap up & end of the meeting

Time-Center/Topic	Speaker
15:00 New operational guidelines: Calibration field requirements for the new CERN-based experiments	John Turner & Jon Evans, UK Health Security Agency, UK
15:05 Discussion	Participants
15:10 Pulsed field, high energy X-ray radiation: primary standards for the PV-based experiments	Jan Guderian Villaverde, Central Laboratory for Radiological Protection, Poland
15:15 Discussion	Participants
15:20 Topic: Occupational radiation safety and dose estimation	Tatjana Biele, PTB, Germany
15:25 Discussion	Participants
15:30 EURAMET's Secondary Laboratory with the associated difficulties and challenges	Josef-Luis Guderian Villaverde, INMUCON, Spain
15:35 Discussion	Participants
15:40 Needs and future developments in measurements of HVT	Tatjana Biele, PTB, Germany
15:45 Discussion	Participants
15:50	Wrap up & end of the meeting

EURAMET is a European Union (EU) Metrology Partnership  
Project 2020-2023  
Final Agenda



EURAMET Project  
Open consultation on Metrology for Radiation Protection  
Final Agenda

# Success Stories: Brokerage Events



## Open consultation on Metrology for Radiation Protection Brainstorming Workshop on Radiation Protection issues with Industry Representatives: Support for technological trends (Call 2023)

Get people

- **informed early** (use multipliers – use your Stakeholders)
- **attracted** (funding for new solutions)
- **motivated** (be personally active and hold contacts)
- **involved** (break the silence, ask for personal needs)

Bring people together for a basic consortium with NMI/DI

... then, let it go ;-)

Open consultation on Metrology for Radiation Protection  
Support for technological trends: EURAMET's Work Programme on 'Metrology for Industry (Call 2023)'



Final Agenda

Time 5 October 2022 | 14:00 - 16:30 CEST  
6 October 2022 | 10:00 - 12:30 CEST  
Place Online

5 October 2022

Time CEST	Item	Speaker
14:00	Welcome & Introduction	Annette Röttger, EMN RP Chair
14:05	European Partnership on Metrology: Information about the Industry Call	Dagmar Auerbach, EURAMET
14:15	The role of European Metrology Network (EMN) for Radiation Protection	Annette Röttger, EMN RP Chair
14:20	Radon Measurements: Sensor networks for big buildings and future cities	Tanita Ballé, PTB, Germany
	Radon Measurements: Sensor networks for big buildings and future cities	Jose Luis Gutierrez Villanueva, RADONOVA, Sweden
	Traceability of measurements of the size distribution of radioactive aerosols formed by the short-lived radon progeny	Katarzyna Wołoszczuk, Central Laboratory for Radiological Protection, Poland
	Discussion	Participants
15:15	Coffee break	
15:20	The future of neutron dosimetry	Filip Vanhavere, Chair of EURADOS
	Lack of calibration facilities for pulsed neutron fields	Marco Caresana, Politecnico di Milano, Italy
	Discussion	Participants
15:50	Radiation Protection for Flash RT, integral dose or instantaneous dose rate?	Giuseppe Felici, Scientific Director at S.I.T. Sordina IORT Technologies S.p.A., Italy
	Existing radiation protection issues at the novel FLASH units from the point of view of users	Cristina Garibaldi, Medical Physicist Deputy Director European Institute of Oncology, Italy
	Discussion	Participants
16:20	Wrap up & end of the meeting	



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RADIATION  
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6 October 2022

Time CEST	Item	Speaker
10:00	New operational quantities: Calibration field requirements for the new ICRU95 operational quantities	Rick Tanner & Jon Eakins UK Health Security Agency, UK
	Discussion	Participants
10:20	Pulsed fields, high energy fields Radiation protection assessments for the PW laser-based experiments	Iani-Octavian Mitu, Extreme Light Infrastructure - Nuclear Physics (ELI-NP)/National Institute for Physics and Nuclear Engineering - Horia Hulubei (IFIN-HH), Romania
	Discussion	Participants
10:40	Coffee break	
10:50	Topic: Occupational radiation safety and dose estimation	Mara Popovici, Extreme Light Infrastructure - Nuclear Physics, National Institute for Nuclear Physics and Engineering, Romania
	ELI-NP's Dosimetry Laboratory with the associated difficulties and challenges	Irina Avram, ELI-NP/NIPNE, Romania
	Discussion	Participants
11:20	Needs and future developments in measurements at NPP	Timo Kontio, Fortum (operating the Loviisa nuclear power plant), Finland
	Discussion	Participants
11:40	Wrap up & end of the event	

EMN Radiation Protection  
Open consultation on Metrology for Radiation Protection  
Final Agenda

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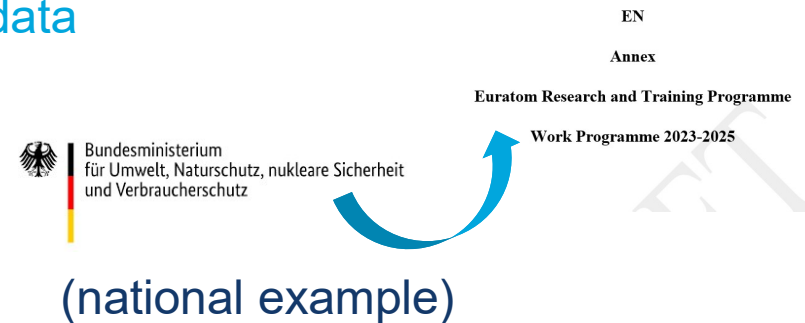
# Success Stories: Awareness



## Awareness raising, lobby work for **general** metrology needs

Euratom Research and Training Programme –  
Work Programme 2023-2025. Suggestions implemented:  
**Quality assurance for measurement and for data**

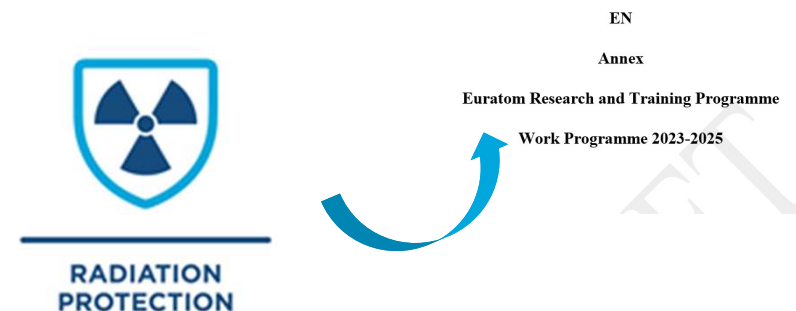
Euratom Research and Training Programme - Work Programme 2023-2025



## Awareness raising, lobby work for **specific** metrology needs

Euratom Research and Training Programme –  
Work Programme 2023-2025. Call implemented:  
**Metrology for basic radionuclide data**

Euratom Research and Training Programme - Work Programme 2023-2025





# Thanks



## Members:



## Partners:



## Key Stakeholders



**RADIATION  
PROTECTION**