

16th EURADOS webinar: Intercomparison IC2021 area of passive area dosimetry systems – a review by organizers and participants

Introduction



Arturo Vargas

WG3 (Environmental Dosimetry) - chair

- **Associate Members**

More than 600 active scientists contributing to the overall EURADOS objectives

- **Eight EURADOS Working Groups + 1 pilot group**

WG2 - Harmonization of Individual Monitoring
(M.-A. Chevallier, France.)

WG3 - Environmental Dosimetry (A. Vargas, Spain)

WG6 - Computational Dosimetry (H. Rabus, Germany)

WG7 - Internal Dosimetry (B. Breustedt, Germany)

WG9 - Radiation Dosimetry in Radiotherapy (L. Stolarczyk, Denmark)

WG10 - Retrospective Dosimetry (L. Ainsbury, U.K.)

WG11 - High-Energy Dosimetry (M. Caresana, Italy)

WG12 - Dosimetry in Medical Imaging (Ž. Knežević, Croatia)

Pilot group - dosimetry in Nuclear Medicine (W. Li, Germany)



Activities of EURADOS:

- coordination of working groups, which
 - promote technical development and its implementation in routine work
 - contribute to harmonization within Europe
 - perform scientific research
- organization of intercomparisons and bench mark studies
- organization of scientific meetings and conferences, training activities, winter schools, webinars
- organization of Annual Meeting (>300 participants)

WG3 is divided in 3 subgroups

Subgroup WG3-S1 “Spectrometry systems for Environmental dosimetry –early warning networks” (U. Stöhlker). Creation 2012

- **WP1.** “Methods for calculation of $H^*(10)$ of spectroscopy monitors”.
- **WP 2.** “Tools for spectrum analysis including energy re-calibration”.
- **WP3.** “Harmonization of dose rate monitors and spectroscopy detectors including uncertainties”.
- **WP4.** “Development or **airborne spectrometric detectors for UAV-based systems including calibration procedures and comparison exercises**”. (**webinar was in September 2021**)

Subgroup WG3-S2 “Passive Environmental dosimetry” (C. Naber) Creation 2014

Two main tasks:

- **Task1.** “Current status of the passive dosimetry systems used in European countries - Questionnaire ”.
- **Task 2.** “Organization of comparisons”.

Subgroup WG3-S3 “Radon” (A. Röttger). Creation 2018

Subgroup WG3-S2 “questionnaires”

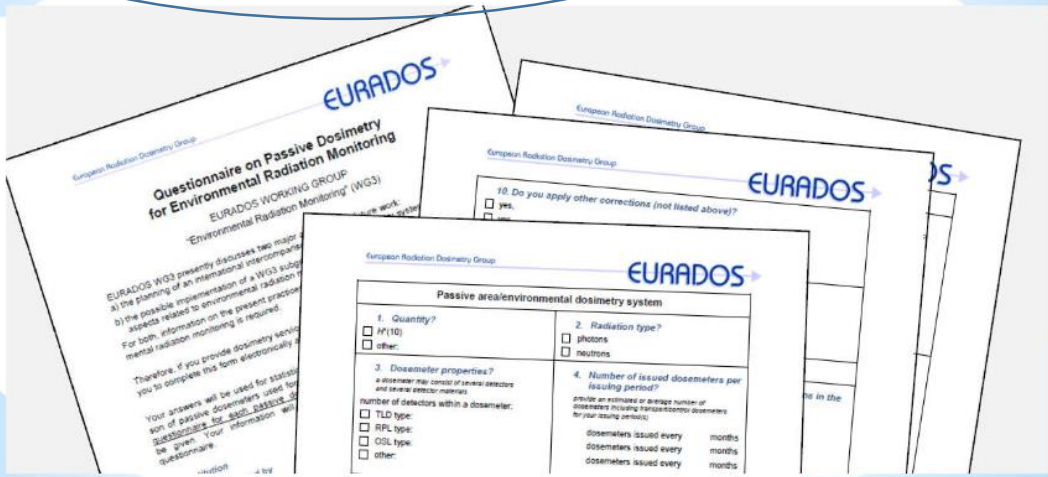
Two questionnaires have been carried out during 2013-2017.


EURADOS WG3-SG2 meeting, February 2017, Karlsruhe

2016 Questionnaire on Passive Dosimetry for Environmental Radiation Monitoring (EURADOS WG3)

20 questions regarding:

- * Dosimetry system (measuring quantity, radiation type, ...)
- * Dose calculation (correction factors, uncertainty statement, ...)
- * Quality assurance (traceability, accreditation, ...)
- * Customers (applications, other services)
- * Further interest (intercomparison, WG3 meetings)




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Analysis of the questionnaires comparison between both have been carried out

Maria A. Duch

Senior researcher and Head of the Radiological Protection Service of the Universitat Politècnica de Catalunya (UPC)



Passive area dosimetry systems used in European countries

EURADOS report “Overview of passive area dosimetry systems used in European countries”.



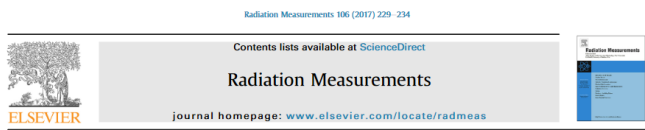
5th EURADOS webinar: Dosimetry for workplace and environmental radiation monitoring. 9th June 2021

The webinar provided an overview on the situation of passive dosimetry systems used for environmental radiation monitoring in Europe, covering the majority of the European countries.

Subgroup WG3-S2 “History of comparisons”

- 1st comparison: 2 years (from autumn 2005 until autumn 2007): PTB in cooperation with the German Swiss Radiation Protection Association. **14 systems** of 10 participants.
- 2nd comparison (PTB): 6 month (from autumn 2011 until spring 2012). **20 systems** of 12 participants
- 1st EURADOS comparison: 6 month (May 2014 until Oct. 2014) ICEnv2014

32 systems of 30 participants
(510 exposed dosimeters)



EURADOS intercomparison of passive $H^*(10)$ area dosimeters 2014

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HIGHLIGHTS

- In an intercomparison, the performance of 32 passive area dosimetry systems was tested under real environmental conditions.
- The dosimeters were exposed at dosimetry reference sites of PTB, while independent $H^*(10)$ reference values were established.
- The response of the systems to terrestrial as well as to secondary cosmic radiation was measured.
- The results provide information on the accuracy of typical passive area dose measurements in Europe.
- Deviations of the absolute dose values of different systems from each other are partly caused by the dissimilar response to cosmic radiation.

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ABSTRACT

Under the umbrella of the European Radiation Dosimetry Group (EURADOS), different working groups have responded to the requests of monitoring services in Europe for independent tests of dosimetry systems for harmonization and quality assurance. After having performed regular intercomparisons of personal dosimeters, EURADOS Working Group 3, “Environmental Dosimetry”, performed the first EURADOS intercomparison for passive ambient dose equivalent, abbreviated $H^*(10)$, area dosimeters



Subgroup WG3-S2 “History of comparisons”

Comparison carried out in the framework of European EURAMET project **Preparedness**, which includes partners from EURADOS-WG3

38 systems of 34 participants (760 exposed dosimeters)
6-months measurement period October 2017- April 2018

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Preparedness intercomparison of passive $H^*(10)$ area photon dosimeters in 2017/2018 (IC2017prep)

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ABSTRACT: This intercomparison serves to investigate the long-term behaviour of passive $H^*(10)$ dosimeters which may be used in the aftermath of a radiological or nuclear event. In routine operation, such dosimeters are generally used to monitor installations like nuclear power plants and accelerators. Such dosimeters are used in the radiation field of the natural ambient radiation, including terrestrial and secondary cosmic radiation. From October 2017 to April 2018, photon dosimeters of 38 dosimetry systems were exposed to ionising radiation at three dosimetric reference sites which are operated by the Physikalisch-Technische Bundesanstalt (PTB). In addition to measurements which were carried out under natural conditions, a number of dosimeters was also

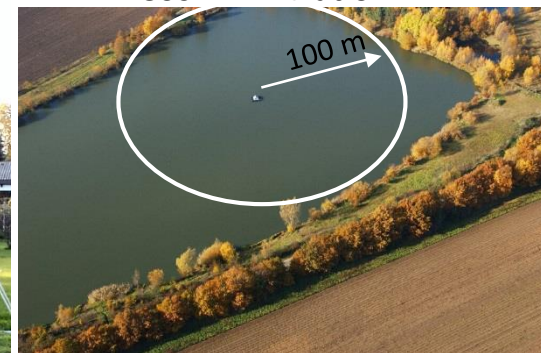
PTB facilities for:

1. Determination of the terrestrial response;
2. Determination of the cosmic response;
3. Direct measurement of the transport dose (storage of dosimeters at low-level);
4. Irradiation in primary PTB photon fields at 2 angles (0° and 90°)

Cosmic and terrestrial radiation



Cosmic radiation



Almost no radiation: UDO II



Subgroup WG3-S2 “history of comparison of calibration methods” (ICXXXXcalm comparisons)

Basic Methodology

- **Every laboratory participant** irradiates at their facility the KIT area dosimeters

$H^*(10)$ dosimetry system of KIT

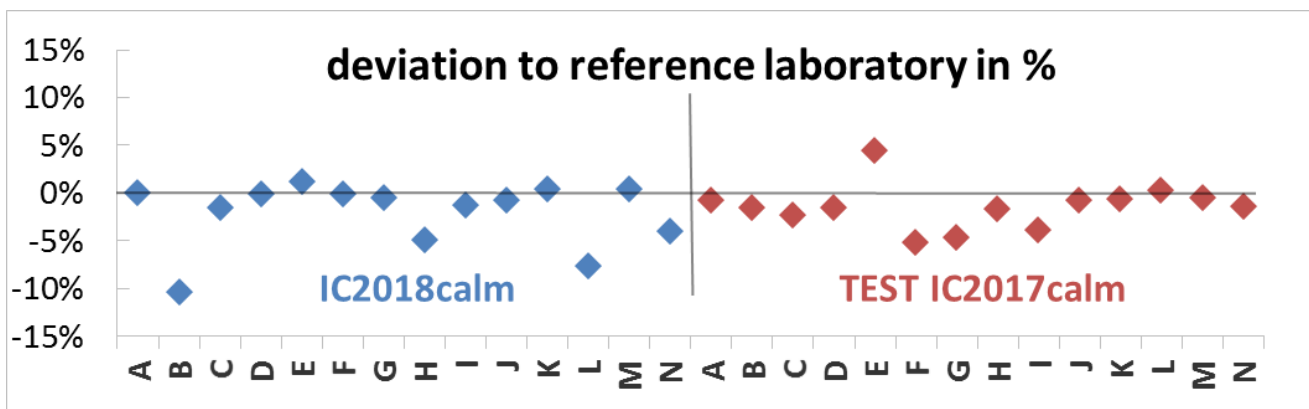


Reference lab: PTB (10 dosimeters irradiated)

$H^*(10)$ laboratory irradiation examples (5 dosimeters irradiated + 5 transport)



- Similar intercomparison **IC2017calm** (15 participants) and **IC2018calm** (14 participants)



Subgroup WG3-S2 “IC2021area”

EURADOS comparison organized by KIT carried out between May 2021 and April 2022

66 participating passive $H^*(10)$ area dosimetry systems from 47 different institutes and monitoring services including EU countries, non-EU European countries (Switzerland and Serbia) and non-European countries (Argentina, Canada, Japan and Marocco).

The challenge of this comparison was measuring additionally irradiated low dose radiation at detectors exposed at environmental conditions



Subgroup WG3-S2 “IC2021area”



- **Introduction and Overview of the Intercomparison IC2021area - Julia Aslan (KIT).** Head of the dosimetry laboratory at the division for safety and environment (SUM) of the (KIT), Germany



- **Results and measurement uncertainty of the CIEMAT TLD system in the IC2021area intercomparison - Rafael Rodríguez Jiménez (CIEMAT).** Head of research service of the Ionizing Radiation Dosimetry Unit of CIEMAT, Spain



- **Feedback and Conclusions of the Intercomparison IC2021area - Christian Hranitzky.** Head of the Dosimetry Laboratory Seibersdorf of the Seibersdorf Labor GmbH, Austria



Moderator- Christian Naber (KIT). Head of department “Dosimetry laboratories” at Karlsruhe Institute of Technology, KIT, Germany.

ENJOY THE WEBINAR

DO NOT FORGET TO

WRITE YOUR QUESTIONS IN THE CHAT. THE MODERATORS WILL ASK THEM TO THE SPEAKERS AT THE END OF THE PRESENTATIONS