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Status of passive environmental dosimetry in Europe

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HIGHLIGHTS

- Solid state dosemeters are widely used for Environmental Radiation Monitoring (ERM).
- An EURADOS subgroup (WG3-SG2) which works on passive ERM was inaugurated in 2014.
- On the basis of a survey, data on the status of ERM in Europe was obtained.
- The survey helped to design the first EURADOS intercomparison of area dosemeters.
- Some open questions have been identified (terminology, uncertainty assessment…).

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ABSTRACT

EURADOS Working Group 3 (WG3) aims at providing information about the correct measurement of the ambient dose equivalent (rate) in the environment and has a specific subgroup (WG3-SG2) that focuses on passive environmental dosimetry. One of the initial tasks of the subgroup was to gain an overview of passive dosimetry practices in Europe. On the basis of a survey carried out by this subgroup in 2013/2014, information on the state-of-the-art was gained, several conclusions were drawn and some open questions have been identified, e.g. the harmonization in the terminology, uncertainty assessment procedures and corrections of measured values by passive dosemeters due to transport and climate.

1. Introduction

EURADOS (www.eurados.org) is a network of more than 50 European institutions and 250 scientists working within the field of dosimetry and radiation monitoring. Working Group 3 (WG3-Environmental Dosimetry) carries out research projects and coordinated activities to advance the scientific understanding of environmental dosimetry. This group especially promotes the technical development of new methods in environmental radiation monitoring (ERM). Solid state dosemeters are widely used for environmental monitoring in the vicinity of nuclear and radiological facilities to assess the external radiation dose to the general public and to demonstrate compliance with regulations on public dose limits (European Basic Safety Standards, Council of the European Union, 2013). In this field of dosimetry, the measurement of small additional doses caused by artificial radiation on top of the natural environmental radiation is a challenge. Environmental radiation monitoring is performed at measurement positions outside facilities, in most cases outdoor and without artificial radiation contributions the dosemeter should properly measure both the cosmic and terrestrial components of natural radiation.

A specific subgroup (WG3-SG2), which works on passive dosimetry in ERM, was inaugurated in 2014. The first task of the subgroup was to gain an overview of passive dosimetry systems and related measurement practices in Europe.

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2. Materials and methods

The questionnaire was electronically disseminated by e-mail and made known on the EURADOS webpage. It included 20 questions addressing the following topics:

2.1. Dosimetry system

Six questions addressed the main radiological characteristics of the dosimetry systems:

- Measuring quantity ($H^*(10)$ or other).
- Radiation type (photons, neutrons).
- Dosemeter properties: detector type (TLD, RPL, OSL, other) and number of detectors within a dosemeter.
- Number of issued dosemeters per measuring period.
- Rated ranges (dose and energy range).
- Preferred term for the dosimetry system (area dosemeter, ambient dosemeter, environmental dosemeter, other).

2.2. Dose calculation

The dose can be influenced by different contributions, key elements of the dose assessment methodology are the contributions of the background dose and transport dose, e.g., the transport dose can account for up to a 35% of the measured dose if the transit period is high compared with the monitoring period (Duch et al., 2008; Ranogajec-Komor et al., 1996).

In addition, detector readings are usually multiplied by many correction factors. For instance, thermoluminescent detectors can suffer an unintentional loss of the latent information, known as fading effect. Consequently, several questions addressed these topics:

- Net dose calculation and applied methodology to measure/estimate the background dose.
- Transport dose correction and applied methodology to measure/estimate the dose contributions not related to the exposure at the measuring location.
- Fading or climate correction methods.
- Other applied corrections.
- Whether the overall measurement uncertainty is calculated and reported or not.

2.3. Quality assurance

Participants were asked about different aspects of quality assurance, especially if they held a formal certification/accreditation. Some national authorities recommend the adoption of a quality management system, in particular the ISO/IEC 17025:2005 standard on General requirements for the Competence of Testing and Calibration Laboratories (ISO 17025:2005), but the national authorities may require a type approval.

A fundamental element of quality assurance is the participation in intercomparisons, in particular, the standard ISO 17025 requires the regular participation in intercomparisons. Subsequently, some questions were asked to gain an overview on this area:

- Participation in past intercomparisons.
- Traceability to national standards.
- National type approval of the dosimetry system.
- Compatibility with EN IEC 62387-1 (IEC 62387:2012) and EN ISO 17025 (IEC 17025:2005).

2.4. Customers and interest in intercomparisons

The dosimetry services were asked to provide information on other services they provide and on fields of application. Finally, participants were asked about their interest in attending an international intercomparison organized by EURADOS in this area.

3. Results and discussion

By the end of 2014, 60 questionnaires had been received from 47 different institutions and 24 different countries. These institutions issue approximately 10^5 area dosemeters per year.

The response representation per country is shown in Fig. 1. Although we did not receive a response from all European countries, the sample covered 21 of the 28 member states and some

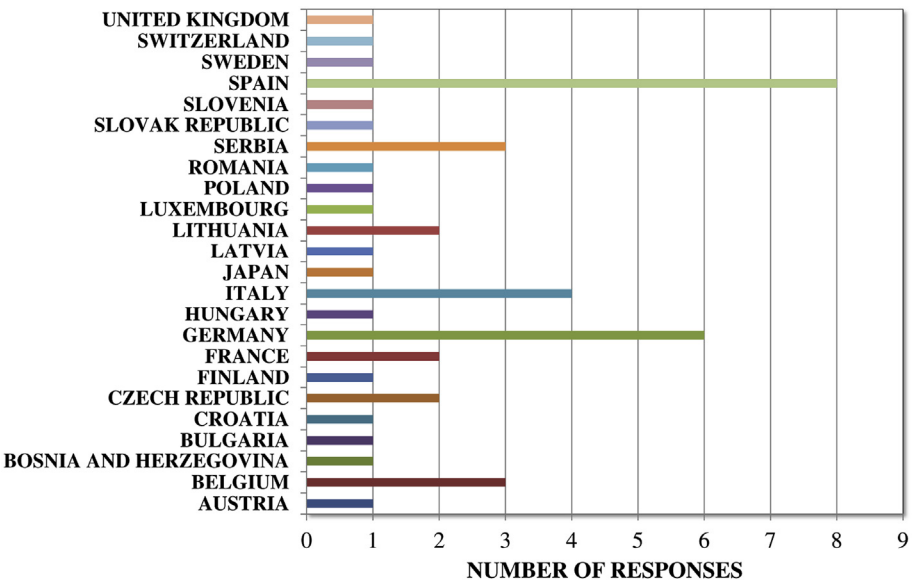

Fig. 1. Number of responses received from various countries.

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