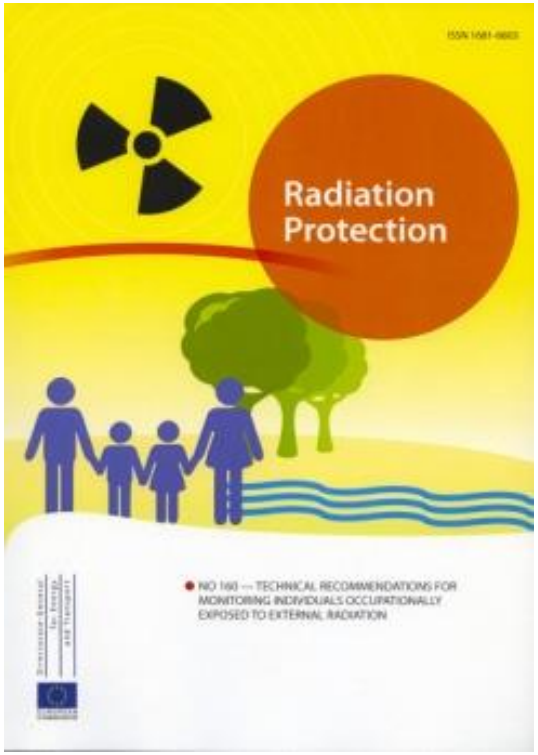
EURADOS Training course



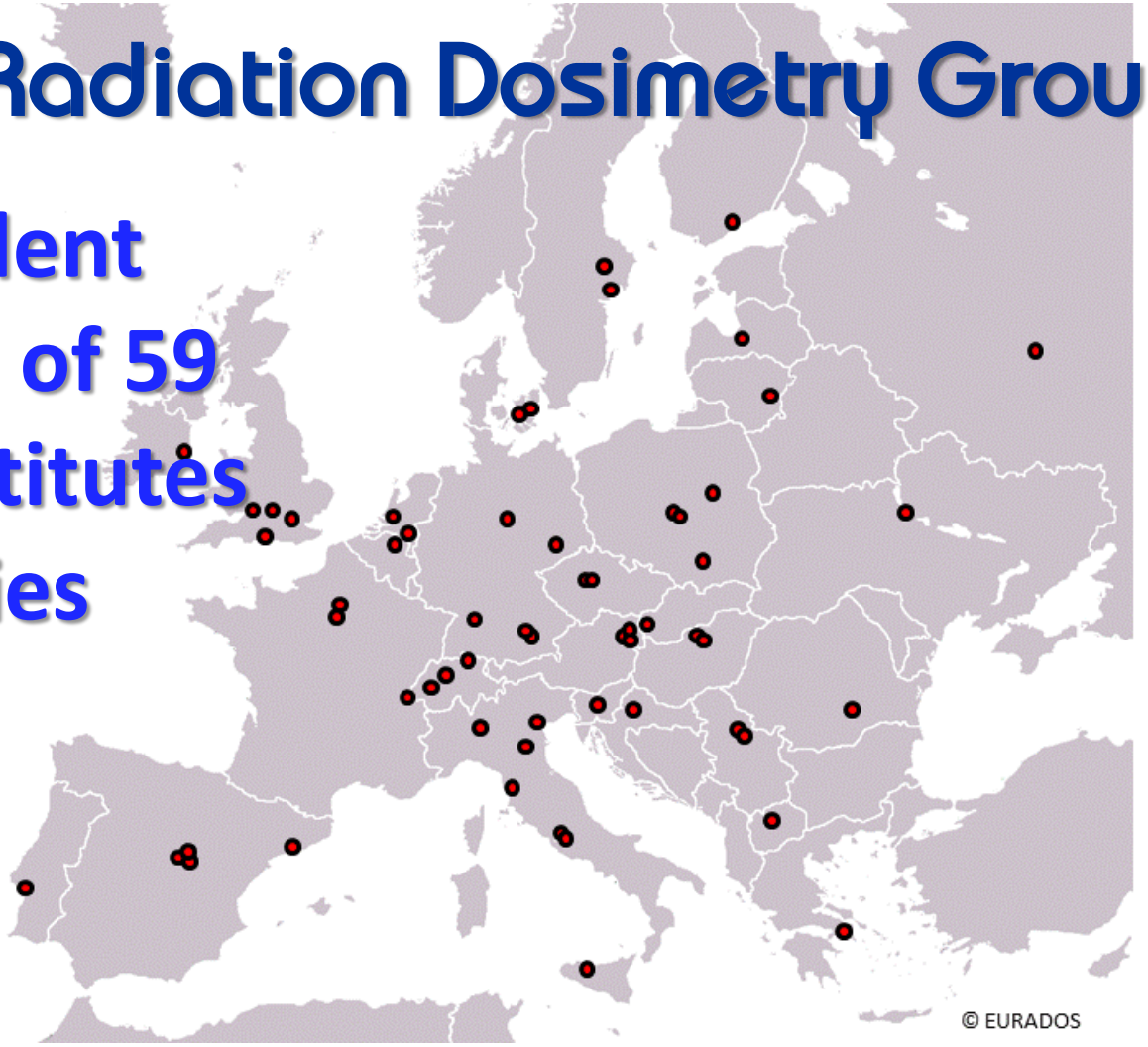
Eurados Training Course
Lisbon, Portugal, 18-22 May 2015

jwe.van.dijk@xs4all.nl

EURADOS

European Radiation Dosimetry Group

An independent organization of 59 scientific institutes in 28 countries



EURADOS

EURADOS working groups

WG2 – Harmonization of individual monitoring

WG3 – Environmental dosimetry

WG6 – Computational dosimetry

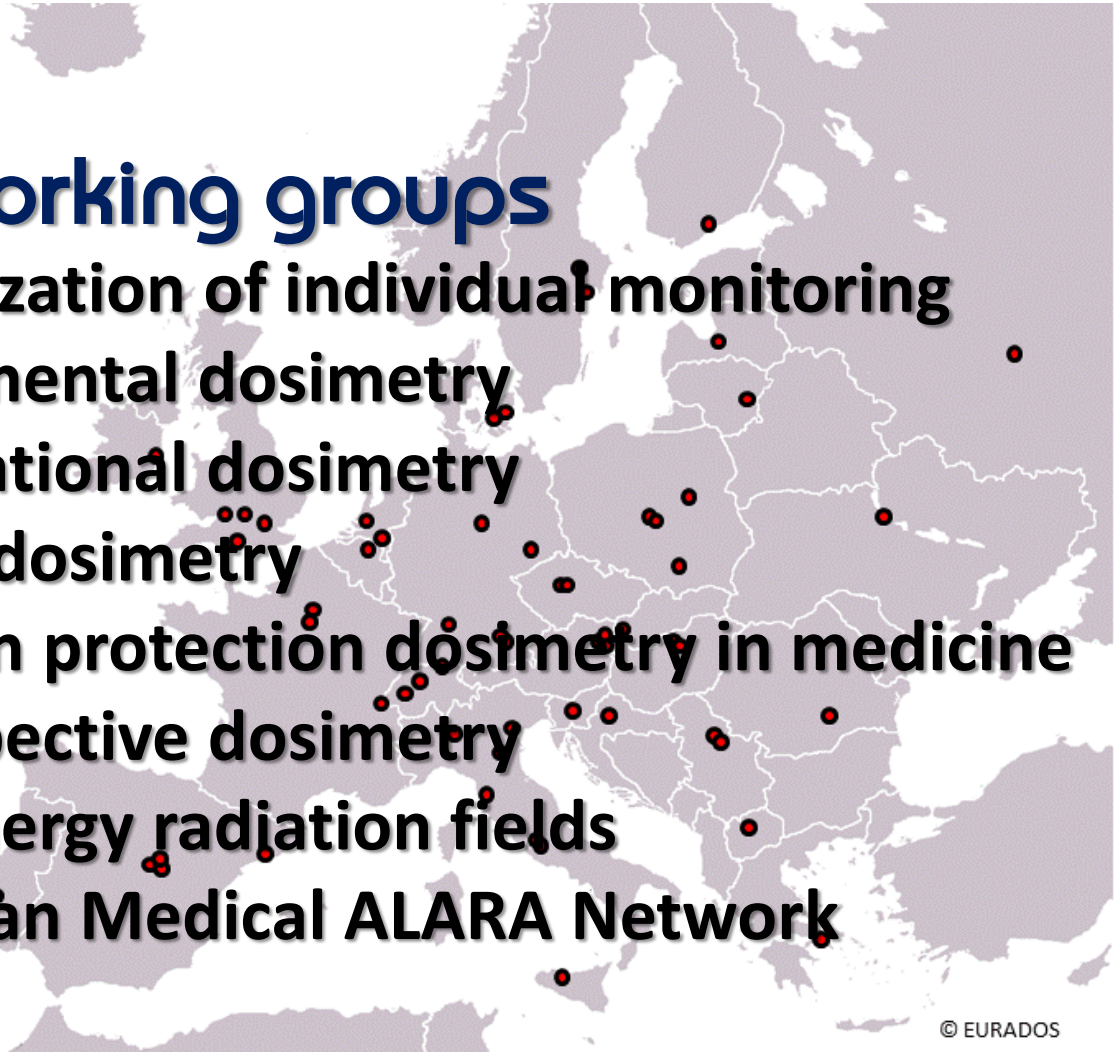
WG7 – Internal dosimetry

WG9 – Radiation protection dosimetry in medicine

WG10 – Retrospective dosimetry

WG11 – High energy radiation fields

WG12 – European Medical ALARA Network



EURADOS

Working group 2 history

1997 – 2000

Status of individual monitoring in European Union

Intercomparison for photon, beta and neutron dosemeters

Individual Monitoring Workshop IM2000, Helsinki

2001 – 2005

Status of quality assurance at dosimetry services in Europe

Individual Monitoring Workshop IM2005, Vienna

2006 – 2010

Revision of European Commission "Technical Recommendations"

Individual monitoring Workshop IM2010, Athens

Start of regular intercomparisons for photon dosemeters (2008 and 2010) and for extremity dosemeters (2010)

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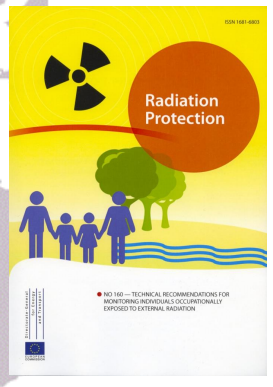
Current activities

- Continuing with photon and beta and neutron intercomparisons
- Training courses on the EC "Technical Recommendations" RP160



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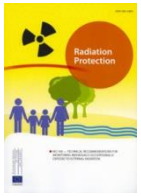
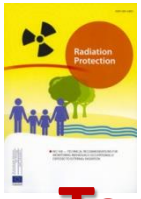


Purpose and scope of RP160

- History
- Background
- Scope
- Structure
- Guide to the document

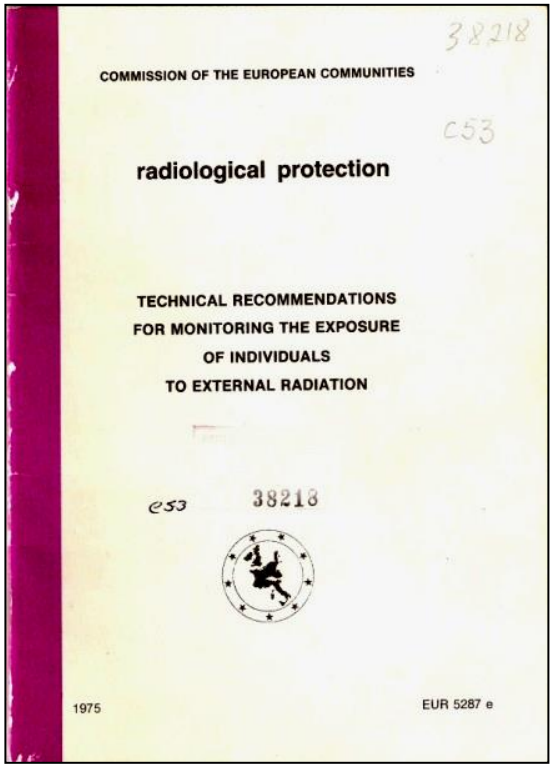
Janwillem van Dijk



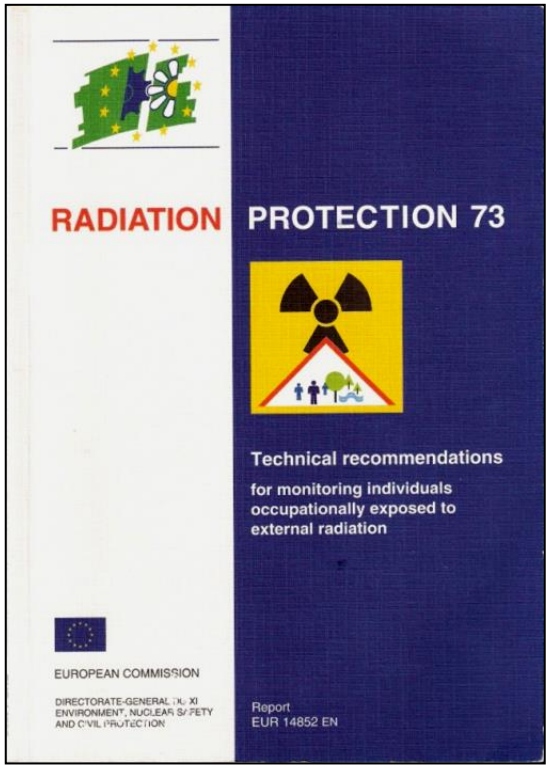
The scope of RP160

EURADOS

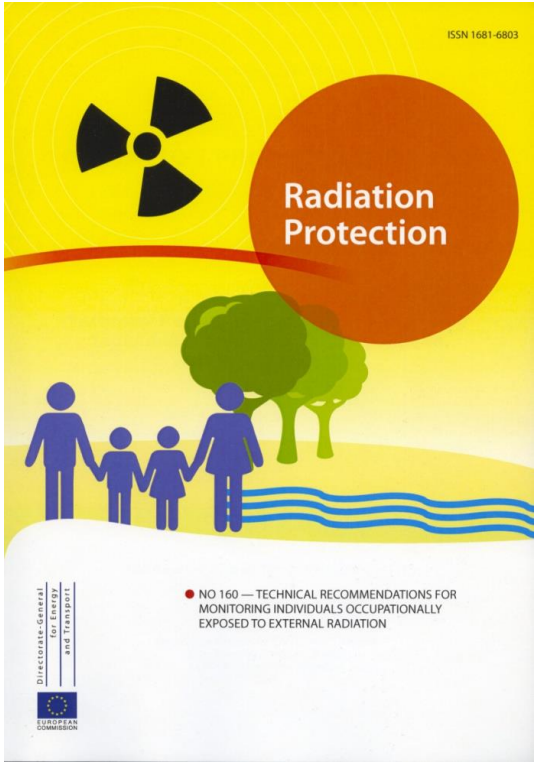
Technical recommendations for monitoring individuals occupationally exposed to external radiation



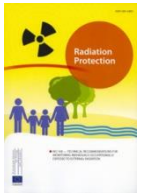
EUR 5286 (1975)



RP 73 (1994)
EUR 14852



RP 160 (2009)



The scope of RP160

EURADOS

IAEA Safety Standards
for protecting people and the environment

Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards

Jointly sponsored by
EC, FAO, IAEA, ILO, OECD/NEA, PAHO, UNEP, WHO

General Safety Requirements Part 3
No. GSR Part 3

IAEA
International Atomic Energy Agency

≈

Content very similar

Official Journal of the European Union

L 13

Legislation

Volume 57
17 January 2014

Contents

II Non-legislative acts

DIRECTIVES

★ Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom ... 1

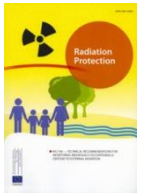
Price: EUR 4

EN

Recommended

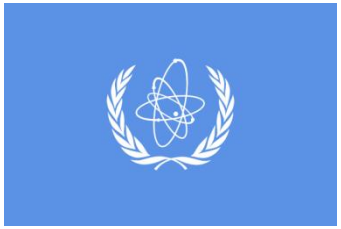
Binding by Euratom Treaty

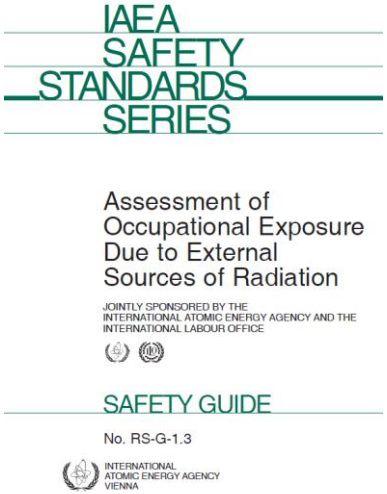
for implementation in legislation of Member-States



The scope of RP160

EURADOS





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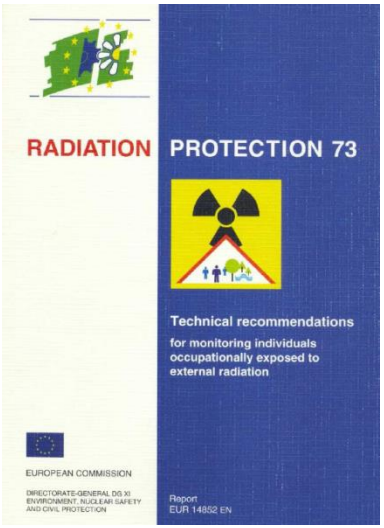
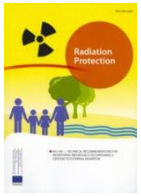
Content very similar



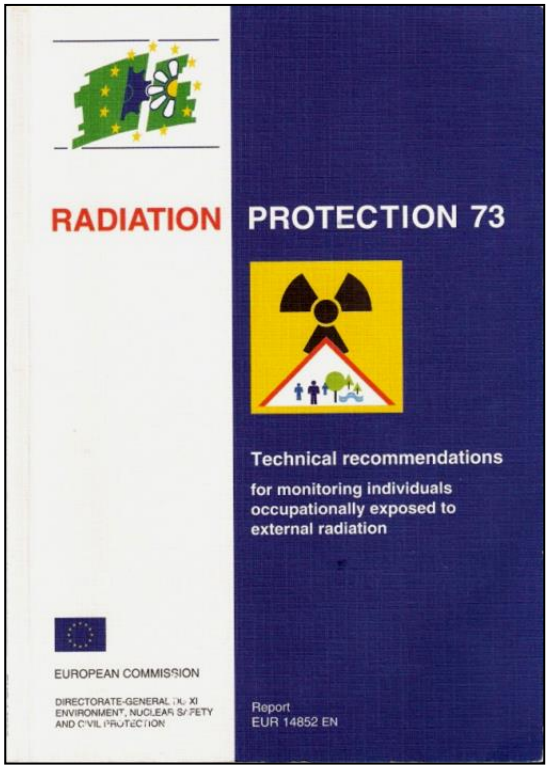
Recommended practices in all Member-States

Required for approval of services in many Member-States



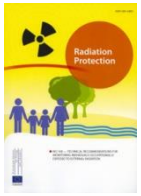
The scope of RP160

EURADOS



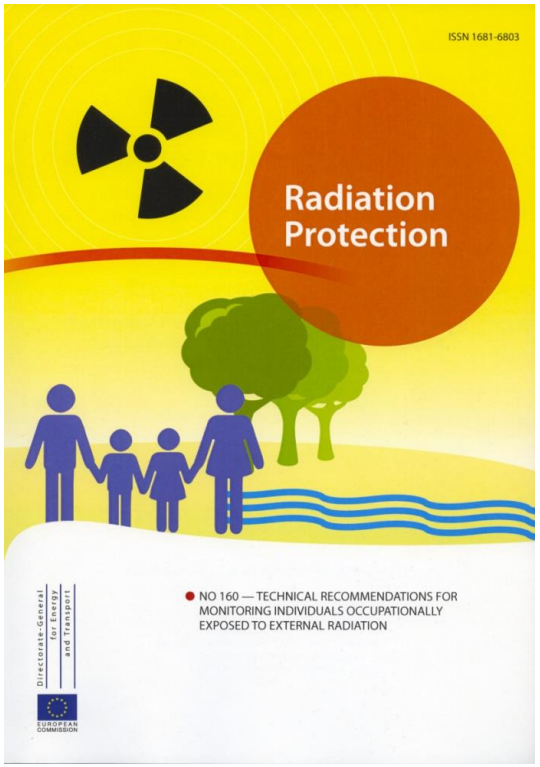
Reason for revision of EUR 5287

- **Introduction of operational quantity**
  Personal dose equivalent
  Hp(10), Hp(3) and Hp(0.07)
- **Drafting of new Euratom BSS**
- **Development of TL-Dosimetry**



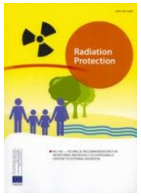
The scope of RP160

EURADOS



Reason for revision of EUR 14852

- Drafting of new Euratom BSS
- Many new standards
  - Technical
  - Quality assurance
- Guide to the expression of uncertainty in measurement, GUM
- Active personal dosemeters
- Correct omissions like film and neutron dosimetry



The scope of RP160

EURADOS

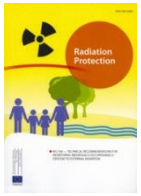
European commission DG TREN
EU-Trimer contract
TREN/07/NUCL/S07.70121

GAEC

Granted to consortium of
Greek Atomic Energy Commission

EURADOS

European Radiation Dosimetry Group



The scope of RP160

EURADOS

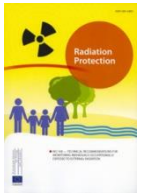
Important additional condition in the contract

The new document must be a *consensus document*

Reviewed by all stakeholders in radiation protection dosimetry

- **Authorities**
- **Dosimetry services**
- **Users of dosimetry services**
- **Standards organizations**

EURADOS offers such a platform

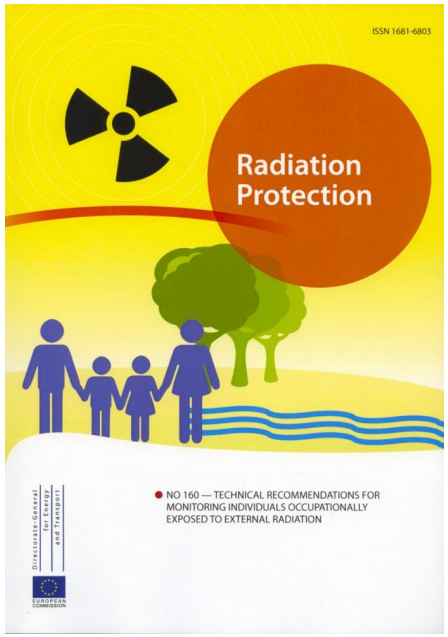


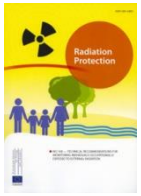
The scope of RP160

EURADOS

After two rounds of consultation and adjustments:

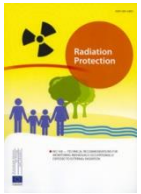
- **Approved by Euratom art. 31 gr. of experts**
- **Published in the fall of 2009**
- **Presented at IM 2010 conference in Athens**





Aim

The aim of publishing the Technical Recommendations is to achieve a harmonized system for individual monitoring in the European Union that complies with international criteria for quality assurance



The scope of RP160

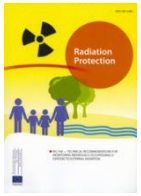
EURADOS

Purpose:

- Guidance for the implementation of the European Union Parliament and Council Directives related to individual monitoring of external radiation
- Encourage the harmonization between the relevant organizations

Addressed to:

- Management and staff of individual monitoring services
- Manufacturers
- Laboratories supplying type testing services
- National authorities and government bodies

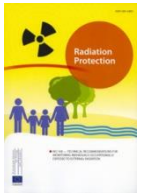


The scope of RP160

EURADOS

The text brings together requirements and guidance given in:

- **EU Council Directives**
- **ICRP publications and ICRU reports**
- **IAEA reports, technical documents and safety guides**
- **Various international standards and guides on metrology and quality assurance, notably IEC, ISO and JCGM**



The scope of RP160

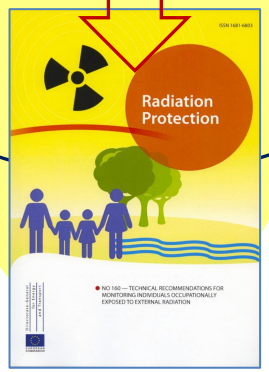
EURADOS

- EC and Euratom Directives
- National legislation
- IAEA BSS

Legislation

QA

ISO,IEC,EN 17025



Radiation protection
- ICRP 4, (26, 35), 60, 75 , 103

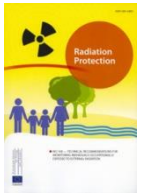
Quantities
- ICRU 51, 60

Tech documents
- ICRU 31, 47, 56, 64, 76
- ICRP 74

Metrology
- JCGM 100, 101, 104
- IAEA Safety Guides and Tech Docs

Dosemeter performance
- ISO, IEC and EN Standards and Norms

Metrology



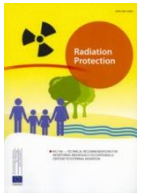
The scope of RP160

EURADOS

Technical recommendations for Individual Monitoring

Fundamentals	Metrology	Reporting, recording, QA accreditation, approval
1. Purpose and scope 2. Framework for IM 3. Dosimetry concepts 4. IM procedures	5. Uncertainties 6. Accuracy requirements 7. Calibration, type testing	8. General req. ADS 9. Reporting, recording 10. QA, QC 11. Approval in EU
1. Introduction 2. Recommendations 3. Terms …main text	1. Introduction 2. Recommendations 3. Terms …main text	1. Introduction 2. Recommendations 3. Terms …main text

References



The scope of RP160

EURADOS

I

Fundamentals

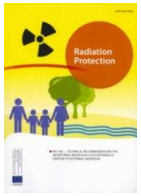
1. Purpose and scope
2. Framework for IM
3. Dosimetry concepts
4. IM procedures

1. Introduction
2. Recommendations
3. Terms

…main text

Recommendations

- Control occupational exposure to ensure safe working conditions
- Demonstrate compliance with limits and application of ALARA
- Inform workers on exposure
- Analyze dose distributions and trends
- Use operational quantities defined in ICRU51: $H_p(0.07)$, $H_p(3)$ and $H_p(10)$
- Determine dosemeter characteristic using radiation qualities and phantoms as defined by ISO (ISO 4037-3 and 12794)
- Other e.g. on: pregnant workers, lead aprons, area monitoring



The scope of RP160

EURADOS

Protection quantities

Effective dose, E
Organ equivalent dose, H_T

Calculated, anthropomorphic phantom, w_R, w_T

Calculated, anthropomorphic phantom, w_R, w_T

Operational quantities
$H_p(d)$
$H^*(10)$
$H'(0.07)$

Related by type test and calibration

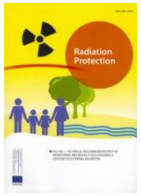
Measured Quantities

Actual measurand, device specific

Fundamental quantities

Fluence,
Kerma, K_T, K_{air}
Absorbed dose, D_T , D_{air}

Calculated, geometric phantom
$Q(L)$



The scope of RP160

EURADOS

II

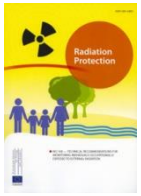
Metrology

5. Uncertainties
6. Accuracy requirements
7. Calibration, type testing

1. Introduction
2. Recommendations
3. Terms
…main text

Recommendations

- Use terms and definitions issued by the Joint Committee on Guides in Metrology, JCGM
- The GUM framework should be used
- All input and influence quantities must be included in the measurement model
- The results of the type test should be used
- The amount of effort should be realistic in view of its purpose
- Acceptable levels of accuracy from ICRU 47 and 66
- At their annual limits: $H_p(10)$, $H_p(3)$, $H_p(0.07)$ u_c < 30% (50% for neutrons)



Assessment of uncertainties

Evaluating the uncertainty in dose a measurement

=

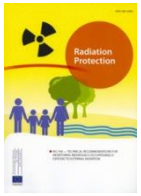
Evaluating the quality of a dose measurement

=

Quantifying the believe that the measured value estimates the true dose value

See also ICRU report 76

Measurement Quality Assurance for Ionizing Radiation Dosimetry



The scope of RP160

EURADOS

III

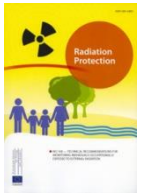
Reporting, recording, QA accreditation, approval

8. General req. ADS
9. Reporting, recording
10. QA, QC
11. Approval in EU

1. Introduction
2. Recommendations
3. Terms
…main text

Recommendations

- Top management must be committed to high standards of service and metrology
- A quality assurance system must be in place that follows to international standards
- Accreditation (IEC/ISO 17025) must be aimed for
- A continuous maintenance cycle for the QA and competence of staff must be in place
- There must be a full knowledge of the characteristics and limitations of the systems



The scope of RP160

EURADOS

III

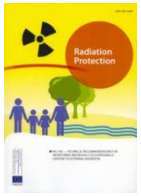
Reporting, recording, QA accreditation, approval

8. General req. ADS
9. Reporting, recording
10. QA, QC
11. Approval in EU

1. Introduction
2. Recommendations
3. Terms
…main text

Recommendations (continued)

- Traceability to National Metrological Institute or SSDL
- Blind tests for monitoring quality of measurement and service
- Participate in (international) intercomparisons
- Adhere to international standards
- All measurements must be recorded (see ISO 17025)
- Data security should respect privacy of workers and data protection legislation

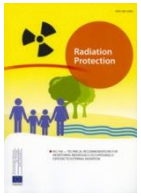


The scope of RP160

EURADOS

The Technical Recommendations RP 160

- Have been drafted with the quality of individual monitoring as central theme
- Draft versions have been send for comment to
  - All national radiation protection authorities in the EU
  - International organizations, ICRP, ICRU, IAEA, IRPA, EAN, ISO and IEC
  - A majority of European dosimetry services
- Approved by the Group of Experts ex article 31 of the Euratom treaty
- Published by the EU Publication Office
- Reviewed and discussed at various international meetings an in scientific journals



Thank you on behalf of:

EURADOS

David Bartlett (formerly HPA) uk, Vasiliki Kamenopoulou GAEC gr,
Elena Fantuzzi ENEA it, Janwillem van Dijk (formerly NRG) nl,
Loraine Currivan RPII ei, Joao Garcia Alves, IST/ITN pt, Peter Ambrosi, PTB de.