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Kärnteknisk mätutrustning – Mätutrustning för strålskyddsändamål – Spektroskopibaserade personliga strålningsdetektorer för detektering av olaglig handel med radioaktivt material

*Radiation protection instrumentation –
Spectroscopy-based alarming personal radiation detectors (SPRD) for the detection of illicit trafficking of
radioactive material*

Som svensk standard gäller europastandarden EN IEC 62618:2024. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 62618:2024.

Nationellt förord

Europastandarden EN IEC 62618:2024

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- **IEC 62618, Second edition, 2022 - Radiation protection instrumentation – Spectroscopy-based alarming personal radiation detectors (SPRD) for the detection of illicit trafficking of radioactive material**

utarbetad inom International Electrotechnical Commission, IEC.

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English Version

Radiation protection instrumentation - Spectroscopy-based
alarming personal radiation detectors (SPRD) for the detection of
illicit trafficking of radioactive material
(IEC 62618:2022)

Instrumentation pour la radioprotection - Détecteurs
individuels spectroscopiques d'alarme aux rayonnements
(SPRD) pour la détection du trafic illicite des matières
radioactives
(IEC 62618:2022)

Strahlenschutz-Messgeräte - Spektroskopie-basierte
alarmgebende persönliche Strahlungsdetektoren für den
Nachweis von unerlaubt transportiertem radioaktivem
Material
(IEC 62618:2022)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

This document (EN IEC 62618:2024) consists of the text of IEC 62618:2022 prepared by IEC/SC 45B "Radiation protection instrumentation" of IEC/TC 45 "Nuclear instrumentation".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2025-01-22
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2027-01-22

This document supersedes EN 62618:2016 and all of its amendments and corrigenda (if any).

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Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62618:2022 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60068-2-11	NOTE	Approved as EN IEC 60068-2-11
IEC 60846-1	NOTE	Approved as EN 60846-1
IEC 61526	NOTE	Approved as EN 61526
IEC 62244	NOTE	Approved as EN IEC 62244
IEC 62327	NOTE	Approved as EN IEC 62327
IEC 62401	NOTE	Approved as EN IEC 62401
IEC 62484	NOTE	Approved as EN IEC 62484
IEC 62533	NOTE	Approved as EN 62533
IEC 62534	NOTE	Approved as EN 62534
IEC 62694	NOTE	Approved as EN 62694
IEC 63121	NOTE	Approved as EN IEC 63121

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-395	2014	International Electrotechnical Vocabulary - Part 395: Nuclear instrumentation: Physical phenomena, basic concepts, instruments, systems, equipment and detectors	-	-
+ A1	2016		-	-
+ A2	2020		-	-
IEC 60079-11	-	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"	-	-
IEC 62706	-	Radiation protection instrumentation - Environmental, electromagnetic and mechanical performance requirements	-	-
IEC 62755	-	Radiation protection instrumentation - Data format for radiation instruments used in the detection of illicit trafficking of radioactive materials	-	-
IEC/TR 62971	2015	Radiation instrumentation - Radiation sources used in illicit trafficking detection standards - Guidance and recommendations	-	-
UL 913	-	Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations	-	-
ICRU report 39	-	Determination of Dose Equivalents Resulting from External Radiation Sources	-	-
ICRU report 47	-	Measurement of Dose Equivalents from External Photon and Electron Radiations	-	-

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Radiation protection instrumentation – Spectroscopy-based alarming personal radiation detectors (SPRD) for the detection of illicit trafficking of radioactive material

Instrumentation pour la radioprotection – Détecteurs individuels spectroscopiques d'alarme aux rayonnements (SPRD) pour la détection du trafic illicite de matières radioactives

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COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RADIATION PROTECTION INSTRUMENTATION –
SPECTROSCOPY-BASED ALARMING PERSONAL
RADIATION DETECTORS (SPRD) FOR THE DETECTION
OF ILLICIT TRAFFICKING OF RADIOACTIVE MATERIAL****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 62618 has been prepared by subcommittee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation. It is an International Standard.

This second edition cancels and replaces the first edition published in 2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) making the standard consistent with the new standards for detection of illicit trafficking of radioactive material (see the Introduction);
- b) creating unformed functionality test for all environmental, electromagnetic and mechanical tests and a requirement for the coefficient of variation of each nominal mean reading;
- c) reference to IEC 62706 for the environmental, electromagnetic and mechanical test conditions;
- d) adding information regarding climatic exposures.

The text of this International Standard is based on the following documents:

Draft	Report on voting
45B/1011/FDIS	45B/1017/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

It is important to detect illicit and inadvertent movement of radioactive materials in the form of radiation sources and contaminated metallurgical scrap. Radioactive sources out of regulatory control, so-called “orphan sources”, have frequently caused serious radiation exposures and widespread contamination. Although illicit trafficking of nuclear and other radioactive materials is not a new problem, concern about a nuclear “black market” has increased particularly in view of its terrorist potential.

In response to the technical policy of the International Atomic Energy Agency (IAEA), the World Customs Organization (WCO), and the International Criminal Police Organization (Interpol) related to the detection and identification of special nuclear materials and security trends, nuclear instrumentation companies have developed and manufactured radiation instrumentation to assist in the detection of illicit movement of radioactive and special nuclear materials. This type of instrumentation is widely used for security purposes at nuclear facilities, border control checkpoints, and international seaports and airports.

To ensure that measurement results made at different locations are consistent, it is imperative that radiation instrumentation be designed to specifications based upon agreed performance requirements. IEC standards have been developed to establish performance requirements for personal radiation detectors, radiation portal monitors, highly sensitive gamma and neutron detection systems, spectrometric personal radiation detectors, and backpack-based radiation detection and identification systems. Table 1 contains a list of those standards.

Table 1 – Overview of IEC radiation protection instrumentation standards

Type of instrumentation	IEC number	Title of the standard
Body-worn	62401	Radiation protection instrumentation – Alarming Personal Radiation Devices (PRDs) for the detection of illicit trafficking of radioactive material
	62618	Radiation protection instrumentation – Spectroscopy-Based Alarming Personal Radiation Detectors (SPRD) for the detection of illicit trafficking of radioactive material
	62694	Radiation protection instrumentation – Backpack-type radiation detector (BRD) for the detection of illicit trafficking of radioactive material
Portable or hand-held	62327	Radiation protection instrumentation – Hand-held instruments for the detection and identification of radionuclides and for the estimation of ambient dose equivalent rate from photon radiation
	62533	Radiation protection instrumentation – Highly sensitive hand-held instruments for photon detection of radioactive material
	62534	Radiation protection instrumentation – Highly sensitive hand-held instruments for neutron detection of radioactive material
Portal	62244	Radiation protection instrumentation – Installed radiation portal monitors (RPMs) for the detection of illicit trafficking of radioactive and nuclear materials
	62484	Radiation protection instrumentation – Spectrometric radiation portal monitors (SRPMs) used for the detection and identification of illicit trafficking of radioactive material
Data format	62755	Radiation protection instrumentation – Data format for radiation instruments used in the detection of illicit trafficking of radioactive materials
Mobile system	63121	Radiation protection instrumentation – Vehicle-mounted mobile systems for the detection of illicit trafficking of radioactive materials

RADIATION PROTECTION INSTRUMENTATION – SPECTROSCOPY-BASED ALARMING PERSONAL RADIATION DETECTORS (SPRD) FOR THE DETECTION OF ILLICIT TRAFFICKING OF RADIOACTIVE MATERIAL

1 Scope

This document applies to Spectroscopy-based alarming Personal Radiation Detectors (SPRD). SPRDs detect and identify gamma radiation and may detect neutron radiation. SPRDs can be worn on a belt or in a pocket to alert the wearer of the presence of a radiation source. SPRDs provide search, similar to that of a Personal Radiation Device (PRD), and identification capability to identify radiation sources. They can discriminate between alarms caused by Naturally Occurring Radioactive Materials (NORM) or medical radionuclides and alarms from industrial sources or Special Nuclear Material (SNM).

This document establishes performance requirements and specifies general characteristics, general test conditions, radiological, climatic, mechanical, and electromagnetic characteristics. This document also provides test methods that are used to determine if an SPRD meets the stated requirements.

This document does not apply to the performance of radiation protection instrumentation which is covered in IEC 61526 and IEC 60846-1. SPRDs are not intended for accurate measurement of personal ($H_p(10)$) or ambient ($H^*(10)$) dose equivalent (rate).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-395:2014, *International Electrotechnical Vocabulary (IEV) – Part 395: Nuclear instrumentation – Physical phenomena, basic concepts, instruments, systems, equipment and detectors*

IEC 60050-395:2014/AMD1:2016

IEC 60050-395:2014/AMD2:2020

IEC 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

IEC 62706, *Radiation protection instrumentation – Recommended climatic, electromagnetic and mechanical performance requirements and methods of tests*

IEC 62755, *Radiation protection instrumentation – Data format for radiation instruments used in the detection of illicit trafficking of radioactive materials*

IEC TR 62971:2015, *Radiation instrumentation – Radiation sources used in illicit trafficking detection standards – Guidance and recommendations*

UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations*

ICRU report 39, *Determination of Dose Equivalents Resulting from External Radiation Sources*

ICRU report 47, *Measurement of Dose Equivalents from External Photon and Electron Radiations*