

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Radiation protection instrumentation – Mobile instrumentation for the measurement of photon and neutron radiation in the environment

Instrumentation pour la radioprotection – Instrumentation mobile pour la mesure des rayonnements gamma et neutroniques dans l'environnement



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CONTENTS

FOREWORD.....	6
1 Scope and object.....	8
2 Normative references	8
3 Terms, definitions and nomenclature	9
3.1 Definitions	9
3.1.1 mobile detection system	9
3.1.2 energy resolution.....	9
3.1.3 background (intrinsic, platform and cosmic).....	9
3.1.4 positional reference	9
3.1.5 area of investigation	9
3.1.6 sampling interval	9
3.1.7 reference soil or surface	10
3.1.8 platform	10
3.2 Test nomenclature.....	10
3.2.1 qualification tests	10
3.2.2 acceptance test	10
4 General system configuration	10
5 General requirements	11
5.1 Power supply.....	11
5.2 Battery power supply	12
5.3 Cabling and connections	12
5.4 Shock (operating).....	12
5.5 Vibration (operating).....	12
5.6 Vibration (non-operating).....	12
5.7 Water resistance	12
5.8 Spectrometric systems	12
6 Classification of the performance characteristics	12
7 General test procedures	12
7.1 Nature of tests.....	12
7.2 Reference conditions and standard test conditions	13
7.3 Position of assembly for purposes of tests.....	13
7.4 Statistical fluctuations	13
7.5 Reference radiation	13
8 General performance specification and testing requirement.....	13
8.1 Power supply.....	13
8.1.1 Requirements	13
8.1.2 Test method	13
8.2 Battery power supply	14
8.2.1 Requirements	14
8.2.2 Test method	14
8.3 Warm-up time.....	14
8.3.1 Requirements	14
8.3.2 Test method	14
8.4 Radio frequency (RF) requirements	14
8.4.1 Requirements	14
8.4.2 Test method	15

8.5	RF susceptibility	15
8.5.1	Requirements	15
8.5.2	Test method	15
8.6	Temperature	15
8.6.1	Requirements	15
8.6.2	Test method	15
8.7	Relative Humidity	15
8.7.1	Requirements	15
8.7.2	Test method	15
8.8	Shock (operating)	16
8.8.1	Requirements	16
8.8.2	Test method	16
8.9	Vibration (operating)	16
8.9.1	Requirements	16
8.9.2	Test method	16
8.10	Vibration (non-operating)	16
8.10.1	Requirements	16
8.10.2	Test method	16
8.11	Water resistance	16
8.11.1	Requirements	16
8.11.2	Test method	16
8.12	Temperature effects	17
8.12.1	Requirements	17
8.12.2	Test method	17
8.13	Summed detector resolution	17
8.13.1	Requirements	17
8.13.2	Test method	17
9	Scintillation based detector module requirements	17
9.1	Photomultiplier count rate stability	17
9.1.1	Requirements	17
9.1.2	Test method	17
9.2	Photomultiplier magnetic shielding	17
9.2.1	Requirements	17
9.2.2	Test method	17
10	High purity germanium (HPGE) detector requirements	17
10.1	Spectrum requirements	17
10.2	Test method	18
11	Neutron detector requirements	18
11.1	Neutrons	18
11.1.1	Requirements	18
11.1.2	Test method	18
11.2	Shock and vibration	18
11.2.1	Requirements	18
11.2.2	Test method	18
11.3	Strong gamma ray field	18
11.3.1	Requirements	18
11.3.2	Test method	18
11.4	Measurement time reference	18
11.4.1	Requirements	18

11.4.2	Test method	18
12	Specific test for preamplifier and ADC modules for spectrum-capable detectors	19
12.1	Spectral gain stability	19
12.1.1	Requirements	19
12.1.2	Test method	19
12.2	Livetime reference.....	19
12.2.1	Requirements	19
12.2.2	Test method	19
12.3	ADC	19
12.3.1	Requirements	19
12.3.2	Test method	19
12.4	Linearity of count rate response	19
12.4.1	Requirements	19
12.4.2	Test method	19
13	Spectral specifications and test requirements for spectrum capable detectors	20
13.1	Multicrystal array performance	20
13.1.1	Requirements	20
13.1.2	Test method	20
13.2	Spectrum recording	20
13.2.1	Requirements	20
13.2.2	Test method	20
13.3	Data transfer	20
13.3.1	Requirements	20
13.3.2	Test method	20
13.4	Synchronisation of acquisition periods.....	20
13.4.1	Requirements	20
13.4.2	Test method	20
13.5	Synchronisation with positional information	20
13.5.1	Requirements	20
13.5.2	Test method	20
13.6	Synchronisation with height above ground surface information	21
13.6.1	Requirements	21
13.6.2	Test method	21
14	Data logging	21
14.1	Time referencing	21
14.1.1	Requirements	21
14.1.2	Test method	21
15	Installation requirement minimising shielding from the platform for internally mounted detectors.....	21
15.1	Requirements	21
15.2	Test method	21
16	Additional requirements	21
16.1	General.....	21
16.2	Real time data display requirements.....	22
17	Documentation	22
17.1	Instructions manual	22
17.2	Test certificate	22
18	Safety requirements	22

Annex A (informative) Data processing	24
Annex B (informative) A typical analysis scenario for natural (K(potassium) U(uranium) T(thorium)) extraction only	27
Annex C (informative) Structured sampling plans for reference soils	31
Annex D (informative) Mechanical performance requirements	36
Bibliography	37
Figure 1 – Schematic diagram of the typical components of a mobile platform system	11
Figure C.1 – The expanding hexagonal sampling and typical sampling sets A and B	31
Figure C.2 – Coincidence between the area of investigation for ^{137}Cs and the hexagonal sampling plan	33
Table 1 – Typical detector deployment for different applications	11
Table 2 – RF emission limits measured at 3 m distance from the assembly	15
Table 3 – Reference conditions and standard test conditions	22
Table 4 – Tests performed under standard test conditions	23
Table 5 – Tests performed with variation of influence quantities	23
Table A.1 Conversion values between natural radionuclide concentrations and Kerma rate in air	25
Table C.1 – Weighting for each hexagonal shell with radionuclide energy and detector altitude	32
Table C.2 – The spatially weighted mean activities for ^{137}Cs at Caerlaverock sampling site for detector altitudes at 1 m, 50 m and 100 m	34
Table C.3 – Comparison of derived calibration coefficients from hexagonal calibration sites (all errors quoted as 1σ standard error except which is 1σ standard deviation)	35
Table D.1 – Vibration break points	36

INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIATION PROTECTION INSTRUMENTATION – MOBILE INSTRUMENTATION FOR THE MEASUREMENT OF PHOTON AND NEUTRON RADIATION IN THE ENVIRONMENT

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International Standard IEC 62438 has been prepared by subcommittee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation.

This standard cancels and replaces IEC 61134, issued in 1992. The scope of IEC 61134 was restricted to exploration for geological deposits of potassium, uranium and thorium. IEC 62438 incorporates the range of currently available detector technologies and incorporates neutron monitoring. This standard also relates to a wide range of mobile platform applications including environmental, emergency response, security in addition to geological.

The text of this standard is based on the following documents:

FDIS	Report on voting
45B/633/FDIS	45B/636/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

RADIATION PROTECTION INSTRUMENTATION – MOBILE INSTRUMENTATION FOR THE MEASUREMENT OF PHOTON AND NEUTRON RADIATION IN THE ENVIRONMENT

1 Scope and object

This International Standard is applicable to mobile radiation detection systems used for the detection, quantification and identification of photon and/or neutron emitters in the environment. This includes point and distributed radiation sources.

The object of this standard is to:

- establish definitions;
- establish minimum requirements for the instrumentation;
- establish requirements for deployment and operations;
- provide test and calibration methods; and
- provide guidance to procurement for appropriate equipment.

In general, mobile instrumentation systems for nuclear radiation measurements in the environment are comprised of detectors, detector signal processors, position sensing devices, on-board data recording, operational monitoring, and real time display/alarm capabilities. In addition, advanced systems may provide data streams that can be transmitted by telemetry to operations centres.

2 Normative references

The following referenced documents are indispensable for the application 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 60050-393:2003, *International Electrotechnical Vocabulary (IEV) – Chapter 393: Nuclear instrumentation – Physical phenomena and basic concepts*

IEC 60050-394:2007, *International Electrotechnical Vocabulary (IEV) – Part 394: Nuclear instrumentation – Instruments, systems, equipment and detectors*

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60086 (all parts), *Primary batteries*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60973:1989, *Test procedures for germanium gamma-ray detectors*

IEC 61010-1:2001, *Safety requirements for electrical equipment for measurement, control and laboratory use*

IEC 62534, *Radiation protection instrumentation – Highly sensitive hand-held instruments for neutron detection of radioactive material*¹

ISO 4037 (all parts), *X and gamma reference radiation for calibrating dosimeters and dose rate meters and for determining their response as a function of photon energy*

ISO 6980 (all parts), *Nuclear energy – Reference beta-particle radiation*

3 Terms, definitions and nomenclature

3.1 Definitions

For the purposes of this document, the following terms and definitions apply. Except as specified below, all technical terms are as defined in IEC 60050, particularly for radiation quantities and dosimetric terms defined in IEC 60050-393 and IEC 60050-394.

3.1.1 mobile detection system

mobile detection systems consist of a suitable number of radiation detectors mounted on an transportable platform, which are capable of making measurements while moving (see Figure 1).

NOTE This may include but is not limited to fixed and rotary winged aircraft, surface vehicles, ocean towing, and amphibious vehicles.

3.1.2 energy resolution

the full width in percent or keV at half maximum at a defined total absorption peak (see Annex A)

3.1.3 background (intrinsic, platform and cosmic)

the measured count rate from photons in an energy spectrum or a given energy window or the measured count rate from neutrons from the detection system, platform and cosmic radiation (see Annex A)

3.1.4 positional reference

the spatial reference which defines the location of the detection system in terms of a coordinate system and where necessary, altitude and the height above the surface

3.1.5 area of investigation

the area from which 90 % of the detected photons and neutrons of interest are emitted, assuming a planar surface of uniform activity

3.1.6 sampling interval

the time in seconds between the start of consecutive data samples or measurements. This is also known as the integration time

¹ To be published.