

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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**Radiation protection instrumentation – Transportable, mobile or installed equipment to measure photon radiation for environmental monitoring**

**Instrumentation pour la radioprotection – Equipement transportable, mobile ou installé pour mesurer le rayonnement de photons pour la surveillance de l'environnement**



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INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RADIATION PROTECTION INSTRUMENTATION –  
TRANSPORTABLE, MOBILE OR INSTALLED EQUIPMENT TO MEASURE  
PHOTON RADIATION FOR ENVIRONMENTAL MONITORING**

## FOREWORD

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International Standard 61017 has been prepared by subcommittee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation.

This first edition of IEC 61017 cancels and replaces the first edition of IEC 61017-1, published in 1991, and the first edition of IEC 61017-2, published in 1994. It constitutes a technical revision.

The main technical changes with the previous editions are as follows:

- this standard explicitly describes air absorbed dose and dose rate, ambient dose equivalent dose and dose rate, in addition to air kerma and kerma rate;
- this standard includes the description of the typical detector types for use in environmental monitoring.

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

FDIS	Report on voting
45B/825/FDIS	45B/837/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 website 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- withdrawn,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.

## INTRODUCTION

Exposure of members of the public to ionizing radiation produced by nuclear and other facilities is subject to control. An essential part of control is the measurement of the environmental radiation levels in the neighborhood of these facilities .

The evaluation of the environmental radiation dose from photons is difficult. The composition of the background radiation is complex and includes contributions from natural sources such as cosmic radiation and terrestrial radioactivity in addition to man-made radioactivity arising from the operation of nuclear facilities and fall-out from nuclear weapon tests. This, if further complicated by the variation in the natural background radiation dose, varies in time due to variation in ambient radon concentrations and space due to spatial heterogeneity of the natural environmental background.

The requirements specified in this standard relate to normal operations of the assembly. Should an assembly be required for emergency conditions on-site at nuclear facilities then the requirements of IEC 60846-2 should also be applied to the assembly, particularly with regard to overload characteristics. The requirements for portable work place monitors to measure ambient and/or directional dose equivalent (rate) are specified in IEC 60846-1.

# RADIATION PROTECTION INSTRUMENTATION – TRANSPORTABLE, MOBILE OR INSTALLED EQUIPMENT TO MEASURE PHOTON RADIATION FOR ENVIRONMENTAL MONITORING

## 1 Scope

This International Standard is applicable to transportable, mobile or installed assemblies intended to measure environmental air kerma rates or air absorbed dose rates from  $30 \text{ nGy}\cdot\text{h}^{-1}$  to  $30 \text{ }\mu\text{Gy}\cdot\text{h}^{-1}$  or ambient dose equivalent rates from  $30 \text{ nSv}\cdot\text{h}^{-1}$  to  $30 \text{ }\mu\text{Sv}\cdot\text{h}^{-1}$ , or air kerma or air absorbed dose from 10 nGy to 10 mGy, or ambient dose equivalent from 10 nSv to 10 mSv, due to photon radiation of energy between 50 keV and 7 MeV. The measurable range of dose and dose rate can be extended by agreement between the purchaser and the manufacturer. This extension may be realized by combining more than one detector, for example NaI(Tl) scintillator and ionization chamber. For most environmental applications, instruments may measure over a more limited energy range of 80 keV to 3 MeV.

NOTE 1 80 keV to 3 MeV has been chosen to cover the energies of the chief environmental and man-made radio-nuclides that contribute to the environmental dose. The term “dose” used in this standard means the quantity, air kerma, air absorbed dose, and ambient dose equivalent, that the instrument is intended to measure.

If the assembly is to be used to measure these quantities in the area surrounding a nuclear reactor producing 6 MeV radiation from the  $^{16}\text{N}$  isotope, it will be necessary to determine the response at this energy. An absorbed dose in air, which uses the same unit, Gy, as air kerma can be taken to have the same numerical value as air kerma under the condition of electron equilibrium.

Passive devices such as Thermo-Luminescence Dosimeter (TLD), Optically Stimulated Luminescence (OSL) Dosimeter or Glass Radio-Photo Luminescence (RPL) Dosimeter are not covered by this standard.

Installed assemblies should be capable of operating continuously.

This standard does not provide for the measurement of beta and neutron radiation.

The equipment covered by this standard comprises a detector assembly and processing circuits, which may be connected together either rigidly or by means of a flexible cable, or incorporated into a single assembly. The equipment assembly may also include circuits for displaying readings, alarms and communication.

This equipment should meet the environmental conditions of use.

Examples of instruments include (detailed information is described in Annex A):

### a) Ionization chamber

This is suitable for the measurement of air kerma and air absorbed dose and dose rate. In the environment, the correction due to temperature and atmospheric pressure may be required.

NOTE 2 For the measurement of ambient dose equivalent and dose equivalent rate the energy response may be compensated.

### b) Geiger-Muller (GM) counter

The energy response should be corrected. GM counters may overestimate the readings due to the dose (rate) from cosmic radiation.

### c) Scintillation detector