IEC 61017

Edition 1.0 2016-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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

IEC 61017:2016-02(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org
Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 61017

Edition 1.0 2016-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 13.280

ISBN 978-2-8322-3160-9

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

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

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.

2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.

3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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 nGy·h^{-1} to 30 μGy·h^{-1} or ambient dose equivalent rates from 30 nSv·h^{-1} to 30 μSv·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 radionuclides 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}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 Dosemeter (TLD), Optically Stimulated Luminescence (OSL) Dosemeter or Glass Radio-Photo Luminescence (RPL) Dosemeter 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