SLOVENSKI STANDARD
SIST EN ISO 20785-3:2023

01-september-2023

Dozimetrija za merjenje izpostavljenosti kozmičnemu sevanju v civilnem letalskem prometu - 3. del: Meritve na višini letenja (ISO 20785-3:2023)

Dosimetry for exposures to cosmic radiation in civilian aircraft - Part 3: Measurements at aviation altitudes (ISO 20785-3:2023)

Dosimetrie zu Expositionen durch kosmische Strahlung in Zivilluftfahrzeugen - Teil 3: Messungen auf Flughöhen (ISO 20785-3:2023)

Dosimétrie pour les expositions au rayonnement cosmique à bord d'un avion civil - Partie 3: Mesurages à bord d'avions (ISO 20785-3:2023)

Ta slovenski standard je istoveten z: **EN ISO 20785-3:2023**

ICS:

17.240	Merjenje sevanja	Radiation measurements
49.020	Letala in vesoljska vozila na splošno	Aircraft and space vehicles in general

SIST EN ISO 20785-3:2023 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 20785-3

June 2023

ICS 13.280; 17.240; 49.020

Supersedes EN ISO 20785-3:2017

English Version

Dosimetry for exposures to cosmic radiation in civilian aircraft - Part 3: Measurements at aviation altitudes (ISO 20785-3:2023)

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This European Standard was approved by CEN on 10 June 2023.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN ISO 20785-3:2023 E

Contents

Page

European foreword

This document (EN ISO 20785-3:2023) has been prepared by Technical Committee ISO/TC 85 "Nuclear energy, nuclear technologies, and radiological protection" in collaboration with Technical Committee CEN/TC 430 “Nuclear energy, nuclear technologies, and radiological protection” the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2023, and conflicting national standards shall be withdrawn at the latest by December 2023.

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

This document supersedes EN ISO 20785-3:2017.

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Endorsement notice

The text of ISO 20785-3:2023 has been approved by CEN as EN ISO 20785-3:2023 without any modification.

INTERNATIONAL STANDARD

ISO 20785-3

Second edition
2023-06

Dosimetry for exposures to cosmic radiation in civilian aircraft —

Part 3: Measurements at aviation altitudes

Dosimétrie pour les expositions au rayonnement cosmique à bord d'un avion civil —
Partie 3: Mesurages à bord d'avions

Reference number
ISO 20785-3:2023(E)

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Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technology, and radiological protection*, Subcommittee SC 2, *Radiological protection,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 430, *nuclear energy, nuclear technologies and radiological protection,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 20785-3:2015), which has been technically revised.

The main changes are as follows:

— revision of the definitions of the terms;

— updated references.

A list of all parts in the ISO 20785 series can be found on the ISO website.

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Introduction

Aircraft crews are exposed to elevated levels of cosmic radiation of galactic and solar origin and secondary radiation produced in the atmosphere, the aircraft structure and its contents. Following recommendations of the International Commission on Radiological Protection (ICRP) in Publication 60[3], confirmed by Publication 103[4], the European Union (EU) introduced a revised Basic Safety Standards Directive[5] which included exposure to natural sources of ionizing radiation, including cosmic radiation, as occupational exposure. The Directive requires account to be taken of the exposure of aircraft crew liable to receive more than 1 mSv per year. It then identifies the following four protection measures:

a) to assess the exposure of the crew concerned;

b) to take into account the assessed exposure when organizing working schedules with a view to reducing the doses of highly exposed crew;

c) to inform the workers concerned of the health risks their work involves;

d) to apply the same special protection during pregnancy to female crew in respect of the 'child to be born' as to other female workers; after declaration of pregnancy, to ensure that the additional dose to the embryo/foetus would not exceed 1 mSv.

The EU Council Directive has to be incorporated into laws and regulations of EU Member States and has to be included in the aviation safety standards and procedures of the Joint Aviation Authorities and the European Air Safety Agency. Other countries such as Canada and Japan have issued advisories to their airline industries to manage aircraft crew exposure. ICRP has recommended a graded approach for radiological protection of flyers by setting three groups: aircraft crews, frequent flyers, and occasional flyers and encourages frequent flyers to perform self-assessment of their doses from cosmic radiation so that they could consider adjustment of their flight frequency as necessary[6].

For regulatory and legislative purposes, the radiation protection quantities of interest are equivalent dose (to the foetus) and effective dose. The cosmic radiation exposure of the body is essentially uniform and the maternal abdomen provides no effective shielding to the foetus. As a result, the magnitude of equivalent dose to the foetus can be put equal to that of the effective dose received by the mother. Doses on board aircraft are generally predictable, and events comparable to unplanned exposure in other radiological workplaces cannot normally occur (with the rare exceptions of extremely intense and energetic solar particle events). Personal dosemeters for routine use are not considered necessary. The preferred approach for the assessment of doses of aircraft crew, where necessary, is to calculate directly effective dose rate, as a function of geographic location, altitude and solar cycle phase, and to fold these values with flight and staff roster information to obtain estimates of effective doses for individuals. This approach is supported by guidance from the European Commission, the ICRP in Publication 75[7] and the ICRU in Report 84[8].

The role of calculations in this procedure is unique in routine radiation protection and it is widely accepted that the calculated doses should be validated by measurement. As effective dose is not directly measurable, the operational quantity of interest is ambient dose equivalent, $H^*(10)$. Although the new recommendations on operational quantities have recently been published by ICRU[9], there would be a delay before being introduced into future ISO and IEC standards. As indicated in particular in ICRU Report 84, the ambient dose equivalent is considered to be a conservative estimator of effective dose if isotropic or superior isotropic irradiation can be assumed. In order to validate the assessed doses obtained in terms of effective dose, calculations can be made of ambient dose equivalent rates or route doses in terms of ambient dose equivalent, and values of this quantity determined by measurements traceable to national standards. The validation of calculations of ambient dose equivalent for a particular calculation method may be taken as a validation of the calculation of effective dose by the same computer code, but this step in the process may need to be confirmed. The alternative is to establish, *a priori*, that the operational quantity ambient dose equivalent is a good estimator of effective dose and equivalent dose to the foetus for the radiation fields being considered, in the same way that the use of the operational quantity personal dose equivalent is justified for the estimation of effective