SLOVENSKI STANDARD
SIST EN ISO 20785-4:2021

01-oktober-2021

Dozimetrija za merjenje izpostavljenosti kozmičnemu sevanju v civilnem letalskem prometu - 4. del: Kode za preverjanje veljavnosti (ISO 20785-4:2019)

Dosimetry for exposures to cosmic radiation in civilian aircraft - Part 4: Validation of codes (ISO 20785-4:2019)

Dosimétrie pour l'exposition au rayonnement cosmique à bord d'un avion civil - Partie 4: Validation des codes (ISO 20785-4:2019)

Ta slovenski standard je istoveten z: EN ISO 20785-4:2021

ICS:

13.280	Varstvo pred sevanjem	Radiation protection
49.020	Letala in vesoljska vozila na splošno	Aircraft and space vehicles in general

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EUROPEAN STANDARD

NORME EUROPÉENNE

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Dosimetry for exposures to cosmic radiation in civilian aircraft - Part 4: Validation of codes (ISO 20785-4:2019)

Dosimétrie pour l'exposition au rayonnement cosmique à bord d'un avion civil - Partie 4: Validation des codes (ISO 20785-4:2019)

(ISO 20785-4:2019)

This European Standard was approved by CEN on 25 July 2021.

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

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

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European foreword

The text of ISO 20785-4:2019 has been prepared by Technical Committee ISO/TC 85 "Nuclear energy, nuclear technologies, and radiological protection" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 20785-4:2021 by 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of an identical text or by endorsement, at the latest by February 2022, and conflicting national standards shall be withdrawn at the latest by February 2022.

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Endorsement notice

The text of ISO 20785-4:2019 has been approved by CEN as EN ISO 20785-4:2021 without any modification.

INTERNATIONAL STANDARD

ISO 20785-4

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Dosimetry for exposures to cosmic radiation in civilian aircraft —

Part 4:
Validation of codes

Dosimétrie pour les expositions au rayonnement cosmique à bord d'un avion civil —

Partie 4: Validation des codes

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Foreword

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This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 2, *Radiological protection*.

A list of all the 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,[1] the European Union (EU) introduced a Basic Safety Standards Directive[2] (BSS) which included exposure to natural sources of ionizing radiation, including cosmic radiation, as occupational exposure for aircrew. International guidance was also provided by the IAEA Safety Standards Series[3]. This action was confirmed by ICRP Publications 103[4] and 132[5], and the EU BSS[6] was revised. 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:

i) to assess the exposure of the crew concerned;

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

iii) to inform workers concerned with the health risks involved in their work; and

iv) to apply the same special protection during pregnancy to female crew in respect of the ‘child to be born’ as to other female workers.

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.

For regulatory and legislative purposes, the radiation protection quantities of interest are equivalent dose (to the fetus) and effective dose. The cosmic radiation exposure of the body is essentially uniform and the maternal abdomen provides no effective shielding to the fetus. As a result, the magnitude of equivalent dose to the fetus 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 thus not needed nor practical, The preferred approach for the assessment of doses of aircraft crew, where necessary, is to calculate directly the 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 ICRP in Publication 75[7] and Publication 132[5], 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. Effective dose is not directly measurable. The operational quantity of interest is ambient dose equivalent, *H*(10)*. Indeed, as indicated in particular in ICRU Report 84, the ambient dose equivalent is considered to be a conservative estimator of effective dose if isotropic irradiation can be assumed. The operational quantity ambient dose equivalent is a good estimator of effective dose and equivalent dose to the fetus 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 dose for radiation workers. 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 the results can be compared to 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 code. 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 fetus 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 dose for radiation workers.

The route dose is the best estimate of ambient dose equivalent for the actual route recorded for the aircrew. However, the actual route flown for that specific flight may vary due to weather, scheduling, etc.