Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (frequency range of 6 GHz to 300 GHz) - Part 1: Measurement procedure

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN IEC/IEEE 63195-1:2023 sisaldab Euroopa standardi EN IEC/IEEE 63195-1:2023 ingliskeelset teksti.	This Estonian standard EVS-EN IEC/IEEE 63195-1:2023 consists of the English text of the European standard EN IEC/IEEE 63195-1:2023.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 13.01.2023.	Date of Availability of the European standard is 13.01.2023.
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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English Version

Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (frequency range of 6 GHz to 300 GHz) - Part 1: Measurement procedure (IEC/IEEE 63195-1:2022)

Évaluation de la densité de puissance de l'exposition humaine aux champs radiofréquences provenant de dispositifs sans fil à proximité immédiate de la tête et du corps (plage de fréquences de 6 GHz à 300 GHz) - Partie 1: Procédure de mesure (IEC/IEEE 63195-1:2022)

Bewertung der Leistungsdichte der Exposition des Menschen gegenüber hochfrequenten Feldern von drahtlosen Geräten in unmittelbarer Nähe des Kopfes und des Körpers (Frequenzbereich von 6 GHz bis 300 GHz) - Teil 1: Messverfahren (IEC/IEEE 63195-1:2022)

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European foreword

This document (EN IEC/IEEE 63195-1:2023) consists of the text of document IEC/IEEE 63195-1:2022, prepared by IEC/TC 106 "Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2024-01-09
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2026-01-09

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In the official version, for Bibliography, the following notes have to be added for the standard indicated:

ISO/IEC 17025:2017	NOTE	Harmonized as EN ISO/IEC 17025:2017 (not modified)
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ASSESSMENT OF POWER DENSITY OF HUMAN EXPOSURE TO RADIO FREQUENCY FIELDS FROM WIRELESS DEVICES IN CLOSE PROXIMITY TO THE HEAD AND BODY (FREQUENCY RANGE OF 6 GHz TO 300 GHz) –

Part 1: Measurement procedure

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IEC/IEEE 63195-1 was prepared by IEC technical committee 106: Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure, in cooperation with the International Committee on Electromagnetic Safety of the IEEE Standards Association, under the IEC/IEEE Dual Logo Agreement between IEC and IEEE. It is an International Standard.

This document is published as an IEC/IEEE Dual Logo standard.

This publication contains supplemental files in the form of analytical reference functions for validation of the reconstruction algorithms in Annex E. Download links for these files can be found in Clause E.5.

The text of this International Standard is based on the following IEC documents:

Draft	Report on voting
106/565/FDIS	106/570/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with the rules given in the ISO/IEC Directives, Part 2, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC/IEEE 63195 series, published under the general title *Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body*, can be found on the IEC website.

The IEC Technical Committee and IEEE Technical Committee have decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This document provides methods to evaluate incident power density exposures due to any electromagnetic field (EMF) transmitting device intended to be used at a position near the human head or body, or mounted on the body, combined with other transmitters within a product, or embedded in garments. The device categories covered include but are not limited to mobile telephones, radio transmitters in personal computers, and desktop and laptop devices. This document also addresses multi-band and multi-antenna devices. The overall applicable frequency range is from 6 GHz to 300 GHz. This document specifies:

- measurement system (Clause 6);
- power density measurement protocols (Clause 7);
- uncertainty evaluation (Clause 8);
- measurement report (Clause 9);
- system checks and system validation (Annex B).

To develop this document, IEC Technical Committee 106 (TC 106) and Technical Committee 34 (TC 34) Subcommittee 1 (SC 1) of IEEE International Committee on Electromagnetic Safety (ICES) formed Joint Working Group 12 (JWG 12) on measurement methods to assess the power density of electromagnetic fields from wireless devices in close proximity to the head and body.

This document is partly based on IEC TR 63170:2018.

NOTE System validation tests are specified in Annex B for 10 GHz, 30 GHz, 60 GHz, and 90 GHz to cover the frequency range from 6 GHz to 110 GHz. Additional validation antennas to cover the frequency range up to 300 GHz will be developed in a future revision of this document. Further discussion on rationales is given in Annex I.

ASSESSMENT OF POWER DENSITY OF HUMAN EXPOSURE TO RADIO FREQUENCY FIELDS FROM WIRELESS DEVICES IN CLOSE PROXIMITY TO THE HEAD AND BODY (FREQUENCY RANGE OF 6 GHz TO 300 GHz) –

Part 1: Measurement procedure

1 Scope

This document specifies protocols and test procedures for repeatable and reproducible measurements of power density (PD) that provide conservative estimates of exposure incident to a human head or body due to radio-frequency (RF) electromagnetic field (EMF) transmitting communication devices, with a specified measurement uncertainty. These protocols and procedures apply for exposure evaluations of a significant majority of the population during the use of hand-held and body-worn RF transmitting communication devices. The methods apply for devices that can feature single or multiple transmitters or antennas, and can be operated with their radiating structure(s) at distances up to 200 mm from a human head or body.

The methods of this document can be used to determine conformity with applicable maximum PD requirements of different types of RF transmitting communication devices being used in close proximity to the head and body, including if combined with other RF transmitting or non-transmitting devices or accessories (e.g. belt-clip), or embedded in garments. The overall applicable frequency range of these protocols and procedures is from 6 GHz to 300 GHz.

The RF transmitting communication device categories covered in this document include but are not limited to mobile telephones, radio transmitters in personal computers, desktop and laptop devices, and multi-band and multi-antenna devices.

NOTE 1 System validation tests are specified in Annex B for 10 GHz, 30 GHz, 60 GHz, and 90 GHz to cover the frequency range from 6 GHz to 110 GHz. Additional validation antennas to cover the frequency range up to 300 GHz will be developed in a future revision of this document. Further discussion on rationales is given in Annex I.

NOTE 2 The protocols and test procedures in this document can be adapted to evaluate exposure also due to non-communication types of devices operating in close proximity to the head and body, but these devices are not in the scope of this document.

NOTE 3 For the assessment of the combined exposure from simultaneous transmitters operating on frequencies below 6 GHz, the relevant standards for SAR measurements are IEC/IEEE 62209-1528:2020 and IEC/IEEE 62209-3:2019 [1].

NOTE 4 Between 6 GHz and 10 GHz, the scopes of this document and IEC/IEEE 62209-1528:2020 overlap. According to ICNIRP [2] guidelines and IEEE ICES C95.1 [3] standard, power density is the conformity metric in this frequency range. SAR can be used as conformity metric if local regulatory requirements allow it. (e.g. in case where a single transmit band includes test channels at both below and above 6 GHz).

The procedures of this document do not apply for EMF measurements of devices or objects intended to be implanted in the body.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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/IEEE 62209-1528:2020, *Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)*

IEC/IEEE 63195-2:2021[1], *Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (Frequency range of 6 GHz to 300 GHz) – Part 2: Computational procedure*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO, IEC, and IEEE maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp
- IEEE Dictionary Online: available at http://dictionary.ieee.org

3.1 Exposure metrics and parameters

3.1.1
power density
PD
local power density
function of the complex Poynting vector $\boldsymbol{S}$ at the location $\boldsymbol{r}$ that is integrated over a surface to calculate the sPD

Note 1 to entry: Specifications of power density in terms of the integrands of Formula (4), Formula (5), and Formula (8) are provided in 6.7.1. See also rationales provided in Annex I for the PD specifications of 6.7.1.

Note 2 to entry: The formula used to calculate PD can depend on the applicable exposure guidelines or national regulations.

Note 3 to entry: Power density is also referred to as power flux density.

Note 4 to entry: The associated term incident power density refers to quantity of power per unit area that impinges on the body surface. The incident power density just outside the body surface is used to establish local exposure reference levels, which apply at frequencies above 6 GHz in some jurisdictions.

3.1.2
spatial-average power density
sPD
PD (3.1.1) averaged over a surface of area A_{av}

Note 1 to entry: sPD is a function of the location vector $\boldsymbol{r}$. It is defined on the evaluation surface, except for the edges where no averaging area can be constructed.

Note 2 to entry: Example averaging area sizes specified in exposure limits are 1 cm^2 and/or 4 cm^2.

[1] To be published.