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Evaluation of absorbed power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 300 GHz

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The text of this Technical Report is based on the following IEC documents:

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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 Technical Report 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/publications/.

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– withdrawn, or
– revised.

INTRODUCTION

This document describes computational and measurement methods for the evaluation of absorbed (epithelial) power density related to human exposures due to electromagnetic field (EMF) transmitting devices operating in close proximity to the user at frequencies between 6 GHz and 300 GHz. The types of devices include but are not limited to mobile telephones, tablets, laptops, etc.

For portable devices, the specific absorption rate (SAR) assessment standard for wireless devices used in close proximity to the user IEC/IEEE 62209-1528:2020 [1] is specified up to 10 GHz. The IEC/IEEE 63195-1 and IEC/IEEE 63195-2 standards on the assessment of the incident power density (IPD) for wireless devices used in close proximity to the user are valid from 6 GHz to 300 GHz. For exposure to EMF emitted from base stations, IEC 62232:2022 [2] specifies methods to assess the compliance boundaries based on reference levels and basic restrictions for a frequency range from 110 MHz to 300 GHz.

The absorbed power density (APD) is considered as the relevant local basic restriction and exposure metric above 6 GHz in the ICNIRP 2020 guidelines [3] and in the Health Canada Notice [4]. Similarly, IEEE Std C95.1™-2019 [5] requires equivalent assessment of epithelial power density above 6 GHz. IEC PAS 63446 [6] describes methods to convert SAR results into APD in frequency range of 6 GHz to 10 GHz.

IEC TC 106 and IEEE ICES TC 34 (IEC/IEEE) have previously noted the necessity to extend compliance assessment standards for portable devices to cover the basic restrictions on APD. To ensure timely publication of the available knowledge on the computational and measurement technologies on APD assessment, IEC TC 106 and IEEE ICES TC 34 decided on a two-step strategy to ensure that the fundamental approaches are available.

In 2023 and 2024, the focus was on the development of a Technical Report (this document), specifying the state of the art of computational and measurement techniques and test approaches for evaluating portable devices based on absorbed power density measurements from 6 GHz to 300 GHz.

Upon drafting this document, a Technical Report, a new work item proposal has been initiated to develop a Dual Logo International Standard (IS) jointly among IEEE and IEC on the computational and measurement procedures based on leveraging the content of this document.

This document is an informative document that serves as the starting point for the International Standards on computational and measurement assessment procedures of the APD. The methodologies and approaches described in this document can be useful for the assessment of APD in the early phase of computational and measurement technology development. It also contains recommendations for future standardization work and highlights areas that require additional investigation or consideration.

1 Scope

This document describes the computation and measurement techniques and test approaches for evaluating the local peak absorbed power density (pAPD) and peak spatial average absorbed (epithelial) power density (psAPD) induced in a human body from a wireless device transmitting in close proximity to the user at frequencies between 6 GHz and 300 GHz.

This document provides information on the testing of portable devices transmitting at distances close to the human body, such as mobile phones, tablets, wearable devices, etc. The information in this document is also relevant to exposure in the close proximity of base stations.

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 63195-1, *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 1: Measurement procedure*

IEC/IEEE 63195-2*, 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*

Bibliography

[1] 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-Worn Wireless Communication Devices: Human Models, Instrumentation and Procedures (Frequency Range of 4 MHz to 10 GHz)*

[2] IEC 62232:2022, *Determination of RF field strength, power density and SAR in the vicinity of base stations for the purpose of evaluating human exposure*

[3] International Commission on Non-Ionizing Radiation Protection (ICNIRP), Guidelines for limiting exposure to electromagnetic fields (100 kHz to 300 GHz), *Health Physics*, vol. 118, no. 5, pp. 483–524, 2020

[4] Government of Canada, Health Canada Safety Note, *Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz*, https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/types-sources/radiofrequency-fields/notice-localized-human-exposure-limits-range-6-ghz-300-ghz.html, online, accessed 2024-06-21

[5] IEEE Std C95.1-2019, *IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz*

[6] IEC PAS 63446:2022, *Conversion method of specific absorption rate to absorbed power density for the assessment of human exposure to radio frequency electromagnetic fields from wireless devices in close proximity to the head and body - Frequency range of 6 GHz to 10 GHz*

[7] IEC 60050-121:2019 *International Electrotechnical Vocabulary (IEV) - Part 121: Electromagnetism*, available at https://www.electropedia.org

[8] IEC 60050-712:1992, *International Electrotechnical Vocabulary (IEV) - Part 712: Antennas*, available at https://www.electropedia.org

[9] Neufeld, E., Carrasco, E., Murbach, M., Balzano, Q., Christ, A., & Kuster, N. (2018), Theoretical and numerical assessment of maximally allowable power-density averaging area for conservative electromagnetic exposure assessment above 6 GHz. *Bioelectromagnetics*, *39*(8), 617-630

[10] Christ, A., Samaras, T., Neufeld, E., & Kuster, N. (2020), Limitations of incident power density as a proxy for induced electromagnetic fields, *Bioelectromagnetics*, *41*(5), 348-359

[11] Samaras, T., Christ, A., & Kuster, N. (2021), Compliance assessment of the epithelial or absorbed power density below 10 GHz using SAR measurement systems. *Bioelectromagnetics*, *42*(6), 484-490

[12] Christ, A., Samaras, T., Neufeld, E., and Kuster, N. (2020), Transmission coefficient of power density into skin tissue between 6 and 300 GHz, *Radiation Protection Dosimetry*, 192(1), 113-118

[13] Li, K., Sasaki, K., Watanabe, S., & Shirai, H. (2019), Relationship between power density and surface temperature elevation for human skin exposure to electromagnetic waves with oblique incidence angle from 6 GHz to 1 THz, *Physics in Medicine & Biology*, *64*(6), 065016