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Determination of RF field strength, power density and SAR in the vicinity of base stations for the purpose of evaluating human exposure

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 62232

June 2025

ICS 13.280; 17.240

Supersedes EN IEC 62232:2022

English Version

Determination of RF field strength, power density and SAR in the vicinity of base stations for the purpose of evaluating human exposure (IEC 62232:2025)

Détermination de l'intensité du champ de radiofréquences, de la densité de puissance et du DAS à proximité des stations de base dans le but d'évaluer l'exposition humaine (IEC 62232:2025)

Bestimmung der HF-Feldstärke, der Leistungsdichte und der spezifischen Absorptionsrate (SAR) in der Nachbarschaft von Funkkommunikations-Basisstationen zur Ermittlung der menschlichen Exposition (IEC 62232:2025)

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The text of document 106/626/CDV, future edition 4 of IEC 62232, prepared by TC 106 "Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62232:2025.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2026-06-30
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Détermination de l'intensité du champ de radiofréquences, de la densité de puissance et du DAS à proximité des stations de base dans le but d'évaluer l'exposition humaine

IEC 62232:2025-04(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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DETERMINATION OF RF FIELD STRENGTH, POWER DENSITY AND SAR IN THE VICINITY OF BASE STATIONS FOR THE PURPOSE OF EVALUATING HUMAN EXPOSURE

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IEC 62232 has been prepared by IEC technical committee 106: Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2022. It includes corrections of obvious errors and text improvements on the third edition in order to bring more clarity in the description of the assessment methods and avoid misinterpretations. This edition has the same technical content as the third edition.

This document contains attached files that are cited in Figure B.30, G.4.4.3 and bibliography reference [67]. These files can be downloaded from https://www.iec.ch/tc106/supportingdocuments.

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

Draft	Report on voting
106/626/CDV	106/672/RVC

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 ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at http://www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at http://www.iec.ch/standardsdev/publications.

The committee has 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
- amended.

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INTRODUCTION

This document addresses the evaluation of RF field strength, power density and specific absorption rate (SAR) levels in the vicinity of base stations (BS), also called products or equipment under test (EUT), intentionally radiating in the radio frequency (RF) range 110 MHz to 300 GHz in accordance with the scope, see Clause 1. It does not address the evaluation of current density.

RF exposure evaluation methods to be used for product compliance, product installation compliance and in-situ RF exposure assessments are specified in this document. Exposure limits are not specified in this document. The entity conducting RF exposure assessments refers to the set of exposure limits applicable where exposure takes place. Examples of applicable exposure limits considered in this document are provided in the Bibliography, for example ICNIRP-2020 [1][1], ICNIRP-1998 [2], IEEE Std C95.1™-2019 [3] and Safety Code 6 [4].

NOTE In this document, “ICNIRP” used without “-1998 or “-2020” applies to both [1] and [2].

This document is based on IEC 62232:2017 leveraging guidelines and lessons learned from the implementation guide IEC TR 62669:2019 [5]. In particular, it specifies how to implement the actual maximum approach. It also includes corrections of obvious errors and text improvements on IEC 62232:2022 in order to bring more clarity in the description of the assessment methods and avoid misinterpretations. It has the same technical content as IEC 62232:2022.

Clause 2, Clause 3 and Clause 4 address normative references, terms and definitions, symbols, and abbreviated terms, respectively.

Clause 5 provides advice on how to use this document, including a quick-start guide.

Clause 6 describes the three main application areas of this document: RF exposure evaluation methods for product compliance, product installation compliance, and in-situ RF exposure assessments. It includes the key requirements for assessing RF exposure based on using the actual maximum approach. It also includes simplified criteria for putting BS into operation. Further details are provided in Annex C, Annex D and Annex E.

Clause 7 provides guidelines on how to select the evaluation method. Further details are provided in Annex A.

Clause 8 specifies the RF exposure evaluation methods to be used and refers to further details in Annex B, Annex C, Annex F and Annex H.

Clause 9 addresses the estimation of uncertainty and refers to Annex G and Annex H for further details.

Clause 10 describes reporting requirements for the evaluation or assessment.

Annexes and the bibliography are referenced extensively to provide useful clarifications or guidance.

Additional guidance can be found in IEC TR 62669 [5], which includes a set of case studies providing practical examples of the application of this document.

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[1] Numbers in square brackets refer to the Bibliography.

DETERMINATION OF RF FIELD STRENGTH, POWER DENSITY AND SAR IN THE VICINITY OF BASE STATIONS FOR THE PURPOSE OF EVALUATING HUMAN EXPOSURE

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1 Scope

This document provides methods for the determination of RF field strength, power density and specific absorption rate (SAR) in the vicinity of base stations (BS) for the purpose of evaluating human exposure.

This document:

a) considers intentionally radiating BS which transmit on one or more antennas using one or more frequencies in the range 110 MHz to 300 GHz;

b) considers the impact of ambient sources on RF exposure at least in the 100 kHz to 300 GHz frequency range;

c) specifies the methods to be used for RF exposure evaluation for compliance assessment applications, namely:

   1) product compliance – determination of compliance boundary information for a BS product before it is placed on the market;

   2) product installation compliance – determination of the total RF exposure levels in accessible areas from a BS product and other relevant sources before the product is put into operation;

   3) in-situ RF exposure assessment – measurement of in-situ RF exposure levels in the vicinity of a BS installation after the product has been taken into operation;

d) specifies how to perform RF exposure assessment based on the actual maximum approach;

e) describes several RF field strength, power density, and SAR measurement and computation methodologies with guidance on their applicability to address both the in-situ evaluation of installed BS and laboratory-based evaluations;

f) describes how surveyors establish their specific evaluation procedures appropriate for their evaluation purpose;

g) provides guidance on how to report, interpret and compare results from different evaluation methodologies and, where the evaluation purpose requires it, determine a justified decision against a limit value;

h) provides methods for the RF exposure assessment of BS using time-varying beam-steering technologies such as new radio (NR) BS using massive multiple input multiple output (MIMO).

NOTE 1 Practical implementation case studies are provided as examples in the companion Technical Report IEC TR 62669 [5].

NOTE 2 Although the current BS product types have been specified to operate up to 200 GHz (see, for example, [6] and [7]), the upper frequency of 300 GHz is consistent with applicable exposure limits.

NOTE 3 The lower frequency considered for ambient sources, 100 kHz, is derived from ICNIRP-1998 [2] and ICNIRP-2020 [1]. However, some applicable exposure guidelines require ambient fields to be evaluated as low as 3 kHz, e.g. Safety Code 6 [4] and IEEE Std C95.1-2019 [3].

NOTE 4 Specification of appropriate RF exposure mitigation measures such as signage, access control, and training are beyond the scope of this document. It is possible to refer to the applicable regulations or recommended practices on these topics.

NOTE 5 While this document is based on the current international consensus about the best engineering practice for assessing the compliance of RF exposure with the applicable exposure limits, it is possible that national regulatory agencies specify different requirements. The entity conducting an RF exposure assessment needs to be aware of the applicable regulations.

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, *Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures: 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 (Frequency range of 4 MHz to 10 GHz)*

IEC 62209-3, *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 3: Vector measurement-based systems (Frequency range of 600 MHz to 6 GHz)*

IEC 62311, *Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz)*

IEC 62479, *Assessment of the compliance of low power electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (10 MHz – 300 GHz)*

IEC/IEEE 62704-1, *Determining the peak spatial-average specific absorption rate (SAR) in the human body from wireless communications devices, 30 MHz to 6 GHz – Part 1: General requirements for using the finite difference time-domain (FDTD) method for SAR calculations*

IEC/IEEE 62704-2, *Determining the peak spatial-average specific absorption rate (SAR) in the human body from wireless communications devices, 30 MHz to 6 GHz – Part 2: Specific requirements for finite difference time domain (FDTD) modelling of exposure from vehicle mounted antennas*

IEC/IEEE 62704-3, *Determining the peak spatial-average specific absorption rate (SAR) in the human body from wireless communications devices, 30 MHz to 6 GHz – Part 3: Specific requirements for using the finite difference time domain (FDTD) method for SAR calculations of mobile phones*

IEC/IEEE 62704-4, *Recommended practise for determining the Peak Spatial Average Specific Absorption Rate (SAR) in the human body from wireless communications devices, 30 MHz – 6 GHz: General requirements for using the Finite-Element Method (FEM) for SAR calculations and specific requirements for modelling vehicle-mounted antennas and personal wireless devices*

IEC/IEEE 63195-1, *Measurement procedure for the assessment of power density of human exposure to radio frequency fields from wireless devices operating in close proximity to the head and body – Frequency range of 6 GHz to 300 GHz*

IEC/IEEE 63195-2, *Determining the power density of the electromagnetic field associated with human exposure to wireless devices operating in close proximity to the head and body using computational techniques, 6 GHz to 300 GHz*

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