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Determining the peak spatial-average specific absorption rate (SAR) in the human body from wireless communications devices, 100 kHz to 10 GHz - Part 1: General requirements for using the finite-difference time-domain (FDTD) method for SAR calculations

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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue
New York, NY 10016-5997
United States of America
stds.ipr@ieee.org
www.ieee.org

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CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 7
4 Abbreviated terms 12
5 Finite-difference time-domain method 12
5.1 Definition 12
5.2 Requirements on the implementation of the FDTD method 13
6 SAR calculation and averaging 13
6.1 General 13
6.2 Calculation of SAR in FDTD voxels 14
6.3 Calculation of the psSAR 16
6.3.1 Aligned psSAR calculation 16
6.3.2 Homogeneous psSAR calculation 21
6.3.3 Consideration of different tissue types in one averaging volume 24
6.4 Calculation of the whole-body average SAR 25
6.5 Power scaling 25
6.6 Reporting peak spatial-average SAR and whole-body average SAR 26
6.7 Referencing psSAR and whole-body average SAR 26
7 SAR simulation uncertainty 27
7.1 Considerations for the uncertainty evaluation 27
7.2 Uncertainty of the test setup with respect to simulation parameters 28
7.2.1 General 28
7.2.2 Positioning 29
7.2.3 Mesh resolution 30
7.2.4 Open boundary conditions 31
7.2.5 Power budget 32
7.2.6 Convergence 32
7.2.7 Dielectrics of the phantom or body model 33
7.3 Uncertainty and validation of the developed computational model of the DUT 33
7.3.1 General 33
7.3.2 Uncertainty of the DUT model ($d \geq \lambda/2$ or $d \geq 200$ mm) 34
7.3.3 Uncertainty of the DUT model ($d < \lambda/2$ and $d < 200$ mm) 35
7.3.4 Model validation 36
7.4 Uncertainty budget 38
8 Code verification 38
8.1 General 38
8.2 Code accuracy 40
8.2.1 Free space characteristics 40
8.2.2 Planar dielectric boundaries 46
8.2.3 Open boundary conditions 48
8.2.4 SAR averaging 52
8.3 Canonical benchmarks 55
8.3.1 Generic dipole 55
8.3.2 Microstrip terminated with open boundary conditions 56

8.3.3 SAR calculation for SAM phantom and generic phone 57
8.3.4 Setup for system performance check 58
Annex A (normative) Fundamentals of the FDTD method 59
Annex B (normative) SAR Star 63
B.1 CAD files of the SAR Star 63
B.2 Mesh lines for the SAR Star 63
B.3 Evaluation of the SAR Star benchmark 63
B.3.1 General 63
B.3.2 File format of the benchmark output for aligned SAR averaging 63
B.3.3 File format of the benchmark output for homogeneous SAR averaging 64
Annex C (informative) Practical considerations for the application of FDTD 65
C.1 Overview 65
C.2 Practical considerations 66
C.2.1 Computational requirements 66
C.2.2 Voxel size 67
C.2.3 Stability 68
C.2.4 Open boundary conditions 68
C.2.5 Far-zone transformation 68
C.3 Modelling requirements for sources and loads 69
C.4 Calculation of S-parameters 70
C.5 Calculation of power and efficiency 71
C.6 Inhomogeneous meshes 74
C.7 Background on development of SAR evaluation computational modelling standards in IEC and IEEE technical committees 74
Annex D (informative) Background information on tissue modelling and anatomical models 75
D.1 Dielectric tissue properties 75
D.2 Anatomical models of the human body 75
D.3 Recommended computational models of measurement phantoms 75
D.3.1 Measurement head phantom 75
D.3.2 Measurement body phantom 76
Annex E (normative) Supplemental files and their checksums 77
Bibliography 78

Figure 1 – Field components on mesh cell edges 15
Figure 2 – Flow chart of the SAR averaging algorithm 18
Figure 3 – Illustration of valid and used voxels in a valid averaging cube centred on the highlighted voxel and an invalid averaging volume 19
Figure 4 – Valid, used and partially used voxels 20
Figure 5 – "Unused" location 21
Figure 6 – Construction of the surface sampling points and inner sampling points 24
Figure 7 – Aligned parallel-plate waveguide and locations of the E_y-field components to be recorded for TE-polarization 39
Figure 8 – Permissible power reflection coefficient (grey range) for the aligned open boundary conditions 49
Figure 9 – Tilted parallel-plate waveguide terminated with open boundary conditions and locations of the E_y-field components to be recorded for TE-polarization 51

Figure 10 – Permissible power reflection coefficient (grey range) for the tilted open boundary conditions 52
Figure 11 – Sketch of the testing geometry of the averaging algorithm 53
Figure 12 – 3D view of the SAR Star 53
Figure 13 – Geometry of the microstrip line 57
Figure 14 – Geometry of the setup for the system performance check 57
Figure A.1 – Voxel showing the arrangement of the electric-field and magnetic-field vector components on a staggered mesh 61
Figure A.2 – Voxels with different dielectric properties surrounding a mesh edge with an E_y-component 62
Figure C.1 – FDTD voltage source with source resistance 70
Figure C.2 – Four magnetic field components surrounding the electric field component where the source is located 70
Figure C.3 – Power reference planes 73

Table 1 – Voxel states during SAR averaging 17
Table 2 – Factors contributing to the uncertainty of measurement and computational SAR evaluations 28
Table 3 – Budget of the uncertainty contributions of the computational algorithm and of the rendering of the test- or simulation-setup 29
Table 4 – Budget of the uncertainty of the developed model of the DUT 37
Table 5 – Computational uncertainty budget 38
Table 6 – Results of the evaluation of the numerical dispersion characteristics 45
Table 7 – Results of the evaluation of the numerical reflection coefficient 48
Table 8 – Parameters for the incident electric field of Formula (30) 55
Table 9 – Results of the dipole evaluation 56
Table 10 – Results of the microstrip evaluation 56
Table 11 – 1 g and 10 g psSAR for the SAM phantom exposed to the generic phone for 1 W accepted antenna power as specified in [8] 57
Table 12 – Dielectric properties of the tissue simulant and of the phantom shell specified in IEC/IEEE 62209-1528:2020 and [31] 58
Table 13 – Mechanical parameters of the setup [31] 58
Table 14 – psSAR normalized to 1 W forward power and feedpoint impedance [31] 58

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

This second edition cancels and replaces the first edition published in 2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) specification of a SAR averaging algorithm for the calculation of the psSAR from computational results for arbitrarily shaped homogeneous phantoms, which avoids inconsistencies with respect to the algorithm for SAR averaging algorithm specified in IEC/IEEE 62209-1528 for SAR measurement methods;

b) provision of SHA-256 checksums for all supplemental files;

c) addition of brief informative discussion on developmental stages of IEC and IEEE computational modelling standards for SAR evaluations.

This standard contains attached files in the form of CAD models and reference results described in Annex B and Annex D. Download links and checksums for these files can be found in Annex E.

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

Draft	Report on voting
106/722/FDIS	106/733/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.

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A list of all parts in the IEC/IEEE 62704 series, published under the general title *Determining the peak spatial-average specific absorption rate (SAR) in the human body from wireless communications devices, 100 kHz to 10 GHz*, can be found on the IEC website.

Future documents in this series will carry the new general title as cited above. Titles of existing documents in this series will be updated at the time of the next edition.

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– reconfirmed,

– withdrawn, or

– revised.

INTRODUCTION

Computational techniques have reached a level of maturity which allows their use in specific absorption rate (SAR) assessment of wireless communication devices. Some wireless communication devices are used in situations where SAR measurement is extremely complex or not possible at all. The benefits of consensus standards to users and regulators include standardized and accepted protocols, anatomically correct body models, verification and validation techniques, benchmark data, reporting format and means for estimating the computational uncertainty in order to produce valid, accurate, repeatable, and reproducible data.

1 Scope

This part of IEC/IEEE 62704 defines the methodology for the application of the finite-difference time domain (FDTD) technique when used for determining the peak spatial-average specific absorption rate (psSAR) in the human body exposed to wireless communication devices with known uncertainty. It defines methods to validate the computational model of the device under test (DUT) and to assess its uncertainty when used in SAR simulations. Moreover, it defines procedures to determine the psSAR in a cubical volume and to verify the correct implementation of the FDTD simulation software. The applicable frequency range is 100 kHz to 10 GHz.

This document does not recommend specific SAR limits; these are found elsewhere, for example, in the guidelines published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) [1][1] or in IEEE Std C95.1 [2].

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 - Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)*

3 Terms and definitions

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

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

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

3.1
source
one or more edges of the mesh to which an associated signal feeds electric or magnetic energy

Note 1 to entry: The amplitude of the signal is proportional to an arbitrary function of time.

3.2
feed-point
<antenna> part of the radiating structure where the radio-frequency currents start to support the electromagnetic fields that carry energy away from the antenna

Note 1 to entry: Often the feed-point of the antenna is not accessible because of mechanical support requirements; in this case a connection point is available to inject radio-frequency energy into the antenna. Normally, the connection point is a simple connector or a waveguide flange. If not collocated, the connection and the feed-point of an antenna are interconnected by one or more sections of transmission line. By measuring the antenna impedance at the connection point, if the electrical characteristics of the transmission lines between the connection and the feed-point are known, it is possible to calculate the antenna feed-point impedance.

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