

TECHNICAL REPORT



**Validation of dynamic power control and exposure time-averaging algorithms –
Part 1: Cellular network implementations for SAR at frequencies up to 6 GHz**

(<https://standards.iteh.ai>)

Document Preview

[IEC TR 63424-1:2024](https://standards.iteh.ai/catalog/standards/iec/1eb72aad-df6d-43cc-9823-d004191384bd/iec-tr-63424-1-2024)

<https://standards.iteh.ai/catalog/standards/iec/1eb72aad-df6d-43cc-9823-d004191384bd/iec-tr-63424-1-2024>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2024 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

International
Standards
Document Preview
standards.iteh.ai

[IEC TR 63424-1:2024](http://standards.iteh.ai/catalog/standards/iec/1eb72aad-df6d-43cc-9823-d004191384bd/iec-tr-63424-1-2024)

<https://standards.iteh.ai/catalog/standards/iec/1eb72aad-df6d-43cc-9823-d004191384bd/iec-tr-63424-1-2024>

TECHNICAL REPORT



**Validation of dynamic power control and exposure time-averaging algorithms –
Part 1: Cellular network implementations for SAR at frequencies up to 6 GHz**

Document Preview

[IEC TR 63424-1:2024](https://standards.iteh.ai/standards/iec/1eb72aad-df6d-43cc-9823-d004191384bd/iec-tr-63424-1-2024)

<https://standards.iteh.ai/catalog/standards/iec/1eb72aad-df6d-43cc-9823-d004191384bd/iec-tr-63424-1-2024>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 13.280; 17.240

ISBN 978-2-8327-0056-3

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references	10
3 Terms and definitions	10
4 Symbols and abbreviated terms.....	14
4.1 Physical quantities.....	14
4.2 Abbreviated terms.....	15
5 Dynamic power control and exposure time-averaging implementation operation descriptions.....	16
5.1 General.....	16
5.2 General algorithm operation overview	16
5.3 Configurable parameters.....	17
5.3.1 General	17
5.3.2 DPC-ETA power control parameters applicable to existing implementations	18
6 Algorithm validation considerations	20
6.1 General.....	20
6.2 DPC-ETA algorithm validation criteria	20
6.3 SAR linearity.....	21
6.4 Test sequences	21
6.5 Power measurement.....	22
6.6 Measurement rate.....	22
6.7 Measurement automation.....	23
6.8 DPC-ETA power control and time-averaging calculations during transitions	23
6.9 Test reduction	25
6.10 Normalization of measured power.....	25
6.11 Simultaneous transmission with other transmitters in host device	29
6.12 Modular transmitter test platform	29
6.13 Power-up and fail-safe considerations	29
6.13.1 General	29
6.13.2 Power-up and reboot	29
6.13.3 Fail-safe and malfunctioning.....	30
7 Test sequence considerations	30
7.1 Basic algorithm validation with quasi-static test sequences.....	30
7.2 Dynamic test sequences for validation of rapid power changes	30
7.3 Transition between wireless operating modes	31
7.4 Transition between discontinuous transmission conditions	31
7.5 Transition between TDMA, TDD, and FDD transmission conditions.....	31
7.6 Transition between simultaneous transmitters and antennas.....	32
7.6.1 General	32
7.6.2 5G NR NSA EN-DC	33
7.6.3 Carrier aggregation.....	33
7.7 Transitions initiated by host triggered conditions.....	33
7.8 Transition between diversity antennas	33
8 Validation test setup and procedures.....	34

8.1	General.....	34
8.2	Conducted power measurement.....	34
8.3	Radiated power measurement.....	34
9	Post-processing and correlation of measurement results	35
10	Validation and measurement tolerance considerations.....	36
11	Acceptance criteria and algorithm validation requirements.....	36
11.1	General.....	36
11.2	Acceptance criteria	37
11.3	Observation points.....	38
12	Reporting of validation results	39
Annex A (informative)	Test sequence consideration details.....	40
A.1	General.....	40
A.2	General test sequence configuration and measurement considerations.....	40
A.2.1	General	40
A.2.2	Quasi-static and dynamic test sequences	41
A.2.3	Power control parameters.....	41
A.2.4	Power control segments	41
A.2.5	Test sequence and measurement coordination	42
A.2.6	Wireless mode test considerations.....	43
A.2.7	Test sequence considerations	44
A.2.8	TDD and TDMA measurement considerations	44
A.2.9	Normalization of results	44
A.2.10	Measurement automation	45
A.3	Basic algorithm validation	46
A.3.1	General	46
A.3.2	Standalone wireless mode quasi-static test sequence.....	46
A.3.3	User observations.....	47
A.4	Dynamic and random power control test sequences, discontinuous transmissions.....	48
A.4.1	General	48
A.4.2	Test sequence considerations	48
A.4.3	Power measurement considerations	49
A.4.4	Dynamic test sequence.....	49
A.5	Transition between wireless operating modes and call drop conditions	51
A.5.1	General	51
A.5.2	Test sequence considerations	51
A.5.3	Test sequence configuration.....	52
A.6	GSM/GPRS configurations – duty factor, call drop, discontinuous transmission, transition between GSM and UMTS	54
A.6.1	General	54
A.6.2	Test sequence considerations and configuration.....	55
A.6.3	Power measurement considerations	55
A.7	Simultaneous transmission and RAT specific considerations.....	56
A.7.1	General	56
A.7.2	Aggregate power requirements	57
A.7.3	Power measurement and automation considerations	57
A.7.4	Test sequence considerations	58
A.8	Host device based external triggering transitions	59
A.8.1	General	59

A.8.2	DPC-ETA algorithm validation considerations	59
A.9	Transmit diversity and simultaneous transmission antenna configurations	60
A.9.1	Diversity antennas	60
A.9.2	Simultaneous transmission	60
A.10	Illustrative example	61
A.10.1	General	61
A.10.2	DPC-ETA power control and operating parameters	61
A.10.3	Correlating measured responses with expected DPC-ETA behaviour	62
Annex B (informative)	Power measurement test setup considerations	71
B.1	General measurement considerations	71
B.2	Single technology test setup	72
B.3	Multiple or mixed technology test setup	72
B.4	Simultaneous transmission	73
B.5	Automation considerations	73
B.6	Equipment settings and calibration considerations	74
B.7	Measurement system verification	74
B.8	Conducted power measurement setup options	75
B.9	Radiated power measurement setup options	78
B.9.1	General	78
B.9.2	Anechoic chamber considerations	79
Annex C (informative)	Measurement system verification and tolerance considerations	80
C.1	General	80
C.2	Measurement system verification procedures	80
C.3	Power measurement normalization tolerance	81
Annex D (informative)	Correlation between single-point SAR and radiated power measurements	82
D.1	Background	82
D.2	Test results showing equivalency	82
Annex E (informative)	Time-averaged proximity sensors (TA-PS)	85
E.1	Overview	85
E.1.1	Background	85
E.1.2	Various combinations of proximity sensors and time-averaging	85
E.2	Scope and purpose of this annex	87
E.3	Minimum implementation requirements	87
E.3.1	General	87
E.3.2	Threshold time criterion	88
E.4	Specific test sequence and measurement considerations	89
E.5	Quasi-static test sequence (TA-PS)	89
E.5.1	General	89
E.5.2	Example	90
E.6	Dynamic test sequence (TA-PS)	91
E.7	Transitions, transmit diversity and simultaneous transmission considerations	93
Annex F (informative)	Algorithm validation using SAR measurement	94
F.1	General measurement considerations	94
F.2	SAR measurement approaches	95
F.2.1	General	95
F.2.2	Single-point SAR method	95
F.2.3	Multiple single-point SAR method	96

F.2.4	Full-SAR measurement methods.....	96
F.3	Testing procedures	97
F.4	Additional considerations not applicable to Annex A	98
F.4.1	Other time-averaging or DPC-ETA implementations.....	98
F.4.2	Time-averaged proximity sensors	98
F.4.3	SAR methods without access to manufacturer or test tools	98
	Bibliography.....	99
	Figure 1 – Illustration of the output power characteristics of a simple DPC-ETA implementation	19
	Figure A.1 – Plot of simulated power control of quasi-static test sequence and segments A through D	67
	Figure A.2 – Results of Figure A.1 normalized relative to SAR_{target} (not scaled by $SAR_{target,norm}$).....	68
	Figure A.3 – Results of Figure A.1 normalized with respect to SAR limit	69
	Figure A.4 – Plot of normalized ratios relative to SAR_{target} and SAR limit of Figure A.2 and Figure A.3, respectively	70
	Figure B.1 – Typical single RAT power measurement configuration with optional band pass filter for directional coupler cross-coupling isolation.....	76
	Figure B.2 – Typical single RAT power measurement configuration with separate RF ports on the RCT for uplink-downlink isolation to reduce directional coupler cross-coupling	76
	Figure B.3 – Typical multiple RAT or frequency band power measurement configuration with separate RF ports on the RCT and antenna ports on DUT for independent power measurements	77
	Figure B.4 – Typical radiated power measurement configuration for RAT with optional conducted power connection for a second or additional RAT	78
	Figure D.1 – Normalization ratio and time-averaged normalization ratio results of measured radiated power and single-point SAR.....	84
	Figure E.1 – Proximity sensor implementations versus DPC-ETA.....	86
	Figure E.2 – Proximity sensor implementations versus SAR and RF power	86
	Figure E.3 – Minimum implementation requirements overview	88
	Figure E.4 – Rationale behind T_{thresh} criterion	89
	Figure E.5 – Example of implementation response to quasi-static test sequence	91
	Table A.1 – Standalone wireless mode quasi-static test sequence	46
	Table A.2 – Power request time intervals calculated as a function of $T_{w_{avg}}$ and limited to 3 s (Min) to 25 s (Max).....	49
	Table A.3 – Dynamic test sequence	50
	Table A.4 – Example test sequence for handover and call drop	54
	Table A.5 – Example test sequence for GSM/GPRS and transitional operations	56
	Table A.6 – Power control and operating parameters used in the illustrative example	62
	Table A.7 – Power request of test sequence from RCT (specified) and expected steady-state power of DUT (measured).....	64
	Table A.8 – First and last instance of power levels in each step of test sequence or segments	65
	Table A.9 – Highest normalized ratio with respect to $SAR_{target,norm}$ and SAR_{target}	66
	Table E.1 – Quasi-static test sequence (TA-PS)	90
	Table E.2 – Dynamic test sequence (TA-PS)	93

INTERNATIONAL ELECTROTECHNICAL COMMISSION

—————

**VALIDATION OF DYNAMIC POWER CONTROL
AND EXPOSURE TIME-AVERAGING ALGORITHMS –**

**Part 1: Cellular network implementations
for SAR at frequencies up to 6 GHz**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TR 63424-1 has been prepared by IEC technical committee 106: Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure. It is a Technical Report.

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

Draft	Report on voting
106/658/DTR	106/673/RVDTR

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 ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, 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.

A list of all parts in the IEC 63424 series, published under the general title *Validation of dynamic power control and exposure time-averaging algorithms*, can be found on the IEC website.

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
- revised.

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.

iteh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC TR 63424-1:2024](https://standards.iteh.ai/catalog/standards/iec/1eb72aad-df6d-43cc-9823-d004191384bd/iec-tr-63424-1-2024)

<https://standards.iteh.ai/catalog/standards/iec/1eb72aad-df6d-43cc-9823-d004191384bd/iec-tr-63424-1-2024>

INTRODUCTION

The concept of dynamic power control and exposure time-averaging (DPC-ETA) has been introduced recently to enable wireless devices to maintain SAR compliance in real-time. DPC-ETA enables a SAR assessment that is more representative of the user exposure. The procedures in IEC/IEEE 62209-1528:2020 require device under test (DUT) to maintain a fixed output power and transmission duty factor during SAR measurement to establish the correct SAR distribution to determine SAR compliance. When devices are tested at a fixed maximum output power and transmission duty factor for worst-case exposure and continuous use, a reduction in maximum power is often necessary to satisfy SAR compliance. This can result in undesirable device performance with poor link budget and low data throughput.

In DPC-ETA, SAR compliance is determined according to power recorded by the RF modem and time-averaged over a specified window duration. Device output power control is based on the linear SAR to power relationship established for a wireless operating mode and specific exposure condition to maintain SAR compliance during actual use. When the maximum time-averaged power is ensured by DPC-ETA, brief durations of higher instantaneous power can be applied while the maximum time-averaged power is not exceeded.

NOTE 1 The time-averaging windows required by national regulations can be the same as those established for SAR limits or can differ and vary with frequency.

The DPC-ETA algorithms are validated using power control test sequences with conducted and radiated power measurement methods described in Annex A and Annex B. The criteria for correlating power measurement results with expected DPC-ETA behaviour of the test sequences are also described. The measurement system validation and system check considerations are discussed in Annex C. The correlation of radiated power and single-point SAR measurement is illustrated in Annex D. The SAR methods that can be applied instead of radiated power measurement are described in Annex F. Guidance for validation of capacitive proximity sensor triggering with time-averaged detection are provided in Annex E.

NOTE 2 For the purposes of this document, test laboratories and users are referred to as user(s). This document provides recent information for users to address specific testing needs. It is possible that it is not able to provide solutions to all issues that are being identified or explored. The improvements realized from experiences in applying this document for DPC-ETA algorithm validation, including any adjustments needed to validate devices or comprehensive uncertainty analyses, that need further considerations, can be addressed in a subsequent revision of this document.

VALIDATION OF DYNAMIC POWER CONTROL AND EXPOSURE TIME-AVERAGING ALGORITHMS –

Part 1: Cellular network implementations for SAR at frequencies up to 6 GHz

1 Scope

This part of IEC 63424 describes the methods for validating dynamic power control and (dynamic) exposure time-averaging (DPC-ETA) algorithms used in RF modem chipsets of wireless devices. The DPC-ETA implementations are exposure-based, where SAR is time-averaged according to power recorded by the RF modem. Time-averaging windows up to six minutes consistent with applicable SAR limits and regulatory policies are considered for frequencies up to 6 GHz. The DPC-ETA power control parameters are established based on SAR compliance results with all relevant design and operating tolerances taken into consideration. The device output power is controlled by DPC-ETA to maintain SAR compliance in real-time. While SAR compliance is evaluated independently by applying IEC/IEEE 62209-1528:2020 [1]¹, this document contains information for algorithm validation.

Quasi-static and dynamic power control test sequences are described in this document for algorithm validation. The test sequences are sent from a radio communication tester (RCT) and DPC-ETA responses are measured with conducted and radiated power measurement methods to confirm algorithm functionality. Test sequences for wireless configurations that need validation, including wireless mode transitions, call drop, handover, discontinuous transmission, and simultaneous transmission are described. Considerations for measurement automation to acquire time-aligned results for correlation with power changes in the test sequences are provided. DPC-ETA algorithms are validated by correlating the normalized power measurement results with the expected behaviours of an implementation for the applied test sequences. The procedures in this document also support algorithm validation of modular transmitters using an appropriate test platform. Guidance for using SAR methods in place of radiated power measurements and capacitive proximity sensor triggering with time-averaged detection are also included.

NOTE 1 A separate document will be considered to validate DPC-ETA implementations above 6 GHz, according to near-field millimetre-wave band power density exposure requirements. Substantially shorter time-averaging window durations, on the order of a few seconds, can be required to satisfy some national regulatory requirements.

NOTE 2 The scope of this document is limited to cellular network technologies that have RF modem transmission power dictated by a base station and therefore can be tested using RCT test sequences. Cellular network technologies (also referred to as wireless wide area networks (WWAN)) include Global System for Mobile Communications (GSM), Universal Mobile Telecommunication System (UMTS), Long-Term Evolution (LTE) and 5G New Radio (NR), including other related 2G, 3G, 4G, and 5G specifications, respectively. A separate document will be considered for validating DPC-ETA implementations for wireless local area network (WLAN) technologies, such as those based on the IEEE 802.11 standards series. With WLAN technologies, the transmit power is dictated independently by the RF modem and can be specific to each power control implementation, requiring different testing approaches.

NOTE 3 The procedures in this document can also be considered for 3GPP [2] 5G NR FR1 bands above 6 GHz.

NOTE 4 This document does not address algorithm validation for simultaneous transmission configurations involving transmitters that are not controlled by DPC-ETA operations in the RF modem. These are evaluated according to regulatory requirements.

¹ Numbers in square brackets refer to the Bibliography.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC 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>

3.1

dynamic power control

DPC

power control algorithm used in RF modem chipset of wireless devices according to descriptions in this document

Note 1 to entry: Transmitter power control is based on power measured and recorded by the RF modem according to the linear SAR and power relationship of individual wireless mode configurations and exposure conditions to maintain time-averaged power below a specified threshold for continuous exposure and SAR compliance.

3.2

exposure time-averaging

ETA

time-averaging algorithm used in RF modem chipset of wireless devices for calculating time-averaged exposure according to measured and recorded power

Note 1 to entry: The recorded power is time-averaged over a specified time window according to the SAR limit or regulatory requirements. The calculated time-averaged power is used in DPC-ETA implementations as feedback to adjust transmitter power dynamically in real-time. For the purposes of algorithm validation, simple arithmetic averaging, or other suitable types of averaging accepted by the regulator, are covered by the procedures in this document.

3.3

dynamic power control and exposure time-averaging

DPC-ETA

algorithms used in RF modem chipset of wireless devices according to 3.1 and 3.2 to ensure SAR compliance for continuous exposure based on time-averaged power over a specified time window duration

3.4

RF modem

wireless transceiver incorporated in the chipset of wireless devices that supports the wireless protocol and operations

Note 1 to entry: RF modems include, for example, GSM, UMTS, LTE, and 5G NR to support the wireless modes specified by 3GPP protocols.

3.5

wireless operating mode

wireless operating configurations used in RF modems, according to parameters defined by wireless protocols (e.g. 3GPP), for transmission within the wireless network and infrastructure

Note 1 to entry: The parameters include the RF channel frequency, channel bandwidth, signal modulation and other transmission protocol specifications (e.g. power requirements, carrier aggregation, etc.) for communication with other devices in the network.

3.6**proximity sensor**

capacitive sensor or multiple capacitive sensors for detection of user proximity from the DUT, for the purpose of limiting transmitter power in order to ensure conformity with RF exposure limits

3.7**specific absorption rate****SAR**

measure of the rate at which energy is absorbed by the human body when exposed to a radio frequency electromagnetic field

3.8**output power**

power at the output of the RF transmitter when the antenna, or a load with the same input impedance as the antenna, is connected to it

3.9**conducted power**

power delivered by the power amplifier of the device to 50 Ω matched load

Note 1 to entry: For the purposes of this document, conducted power is measured at the antenna port using equipment with 50 Ω input impedance.

3.10**power control algorithm**

DPC-ETA protocol used in a DUT to set and adjust the output power of the transmitter to satisfy SAR compliance

3.11**radiated power**

power measured with the DUT transmitting using its built-in antenna while operating in an anechoic chamber, according to the DPC-ETA algorithm validation procedures described in this document

3.12**time-averaging**

averaging of power recorded by the RF modem or measured by test equipment over a specified time window

Note 1 to entry: The calculated time-averaged power is used by the RF modem for power control to ensure a maximum time-averaged power is not exceeded for continuous exposure.

3.13**maximum time-averaged output power**

P_{limit}

maximum time-averaged power allowed for continuous exposure

Note 1 to entry: For the purposes of this document, a specified P_{limit} includes all tolerances that are relevant to DPC-ETA operations, which corresponds to a not-to-exceed value. The P_{limit} stored in the DUT is typically a nominal value without including the tolerance. The measured P_{limit} can be higher or lower than the nominal value, but within the specified DPC-ETA tolerance and does not exceed the specified P_{limit} .

3.14 time-averaging window time window

$T_{w_{avg}}$

time interval used to calculate time-averaged power and determine time-averaged exposure

Note 1 to entry: For the purposes of this document, time-averaged exposure is determined according to the time-averaging requirements specified by SAR limits and regulatory policies. A frequency-dependent time-averaging window can be required by some national regulations.

3.15 maximum instantaneous output power

P_{max}

maximum output power a transmitter supports for the intended operations

Note 1 to entry: For algorithm validation, a specified P_{max} includes all tolerances relevant to DPC-ETA operations; i.e. it is a not-to-exceed value. The P_{max} stored in a DUT is typically the nominal value without including the tolerance. The measured P_{max} can be higher or lower than the nominal value, but within the specified DPC-ETA tolerance and does not exceed the specified P_{max} .

Note 2 to entry: Compare with IEC 60050-192:2015, 192-13-05: "instantaneous value: value of a time dependent variable at a given instant".

3.16 SAR target SAR_{target}

peak spatial-average SAR value corresponding to the measured P_{limit} of a wireless operating mode and exposure condition

Note 1 to entry: The tolerances for a measured P_{limit} also apply to the SAR_{target} .

3.17 SAR reported

$SAR_{reported}$

peak spatial-average SAR value corresponding to the minimum (specified P_{limit} , specified P_{max}) obtained by scaling measured SAR_{target} associated with measured P_{limit} of a wireless operating mode and exposure condition.

3.18 optional output power threshold

P_{ctrl}

DPC-ETA power control parameter, in addition to P_{max} and P_{limit}

Note 1 to entry: Depending on the DPC-ETA implementation, it can be used to specify a low power threshold for power control or a minimum power level for power adjustment. This can be an internal parameter with no OEM access or not required at all for some implementations.

3.19 power control test sequence

test sequence described in this document for DPC-ETA algorithm validation

Note 1 to entry: Quasi-static and dynamic test sequences are used to validate algorithm functionality and power control continuity in steady-state and dynamic operating conditions. The test sequences are sent by the RCT under program control of the automated measurement setup to enable time-aligned recording of measured responses and power requests in the test sequences.

3.20 dynamic test sequence

test cycle where the requested power levels consist of many changes