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PUBLIC CONSULTATION Nº 69

Introduction

This is the revision of Annex I to Act No. 955, of February 8, 2018, which provides for the Testing Procedures for the Specific Absorption Rate (SAR) of Products for Telecommunications, due to the development of new transmission technologies for portable products and their impacts on the assessment of the compliance of the human exposure limit to CEMRF, using the *Time-Period Averaging Specific Absorption Rate* (TAS) technique , in order to contemplate the test procedures for the evaluation of the conformity of products that make the use of this technology.

In addition, the proposal aims to review other topics of the test procedures for SAR assessment in portable terminals for: updating the regulatory references, expanding the range of evaluation of the radio spectrum and adapting content to align with current national and international standards .

Draft Act

CONTRIBUTE

THE SUPERINTENDENT OF GRANT AND RESOURCES TO THE PROVISION - ANATEL, in the use of the attributions conferred to him by Resolution No. 715, of October 23, 2019;

CONSIDERING the competence given by Items XIII and XIV of art. 19 of Law No. 9,472 / 97 - General Telecommunications Law;

WHEREAS § 2 of art. 22 of the Regulations for Conformity Assessment and Homologation of Telecommunications Products, approved by Resolution No. 715, of October 23, 2019;

CONSIDERING the need to update technical requirements to ensure that new products with automatic monitoring and control technologies for the output transmission power operate within the maximum limits allowed for the specific absorption rate (SAR);

CONSIDERING the update of the recommendations regarding the specific absorption rate (SAR) on the ICNIRP temporal average, in the document *Guidelines for limiting exposure to electromagnetic fields* (100 kHz to 300 GHz). *Health Phys* 118 (00): 000–000; 2020;

WHEREAS the case file of process no. 53500.020411 / 2020-07;

RESOLVES:

1st

CONTRIBUTION

Art. 1 Amend the following items, in Annex I of Act No. 955, of February 8, 2018, which approved the Specific Absorption Rate (SAR) Testing Procedures for Telecommunications Products, which are effective with following wording:

1. PURPOSE

TO CONTRIBUTE

1.1 This document establishes the test procedures for the measurement of the specific absorption rate (SAR) in portable terminal stations in the radio frequency range between 4 MHz and 6 GHz, for the purpose of certification and homologation with the National Telecommunications Agency.

2. REFERENCES

CONTRIBUTE

2.1. For the purposes of this document, the following references are adopted:

2.1.1. Regulations for Conformity Assessment and Homologation of Telecommunications Products, approved by Resolution No. 715, of October 23, 2019.

2.1.2. Frequency Band Allocation, Destination and Distribution Plan in Brazil (PDFF), approved by Resolution No. 716, of October 31, 2019.

2.1.3. Regulation on the Evaluation of Human Exposure to Electric, Magnetic and Electromagnetic Fields Associated with the Operation of Radiocommunication Transmitting Stations, approved by Resolution No. 700, of September 28, 2018.

2.1.4. Occupational and Population Exposure Limits in General to Electric, Magnetic and Electromagnetic Fields, among others, attached to Act No. 458, of January 24, 2019.

2.1.5. BRAZILIAN ASSOCIATION OF TECHNICAL STANDARDS - ABNT. NBR ISO / IEC 17.025 - General requirements for competence in testing and calibration laboratories, 2005.

2.1.6. BRAZILIAN ASSOCIATION OF TECHNICAL STANDARDS - ABNT and NATIONAL METROLOGY INSTITUTE - INMETRO. Guide for expression of measurement uncertainty, Third Brazilian edition, 2003.

2.1.7. *AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY* - ACMA. *Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard 2014. Radiocommunications Act 1992.*

2.1.8. EN50371: 2002. *Generic Standard to demonstrate the compliance of low power electronic and electrical apparatus with basic restrictions report to human exposure to electromagnetic fields (10 MHz - 300 GHz) - General public, 2002* .

2.1.9. FCC OET65. *Supplement C. Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields - Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions - SupplementÇ.*

2.1.10. FCC 19-226 (2020-04) - *Notice of Proposed Rulemaking (NPRM), ET Docket No. 19–226, FCC 19–126 - Targeted Changes to the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields.*

2.1.11. IEC 62209 - 1: 2005. *Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz), 2005 .*

2.1.12. IEC 62209 - 2: 2010 . *Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)* .

2.1.13. IEC TR 62630: 2010. *Guidance for evaluating exposure from multiple electromagnetic sources.*

2.1.14. IEC / IEEE 62209-1528 - *Final Draft International Standard - FDIS (* 2020-04). *Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures: Measurement Procedures for the Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-Held and Body-Worn Wireless Comunication Devices* (*frequency range of* 4 MHz *to* 10 GHz).

2.1.15. IEEE STD 1528 (2003) IEEE *Recommended Practice for Determining the Peak Spatial - Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques* .

2.1.16. *INTERNATIONAL COMMISSION ON NON-IONIZING RADIATION PROTECTION* - ICNIRP *Guidelines for Limiting Exposure to Electromagnetic Fields (100 kHz to 300 GHz) Published in: Health Phys* 118 (5): 483–524; 2020.

2.1.17. Kuster N., Kästle, R., and Schmid, T. " *Dosimetric evaluation of mobile communications equipment with known precision* " IEICE *Transactions on Communications,* May 1997, vol. E80-B, no. 5, pp. 645-652.

2.1.18. Kuster, N., " *Review of dosimetry and near-field measurement techniques for human exposure evaluations and bioexperiments* ," in C. Legris, ed., *Communication Mobile — Effects Biologique* , CADAS, *Academie des Sciences, Paris France* , Chap. 3, pp. 45-69, 2001.

2.1.19. Niskala, K., " *Multimode SAR test reduction* ," *Final report, IEC MT1 meeting, Tokyo- Japan, May 2014* .

2.1.20. *UNITED STATES ARMY* , Gordon, CC, Churchill, T., Clauser, CE, Bradtmiller, B., McConville, JT, Tebbetts, I., and Walker, RA "1988 *Anthropometric Survey of US Army Personnel: Methods and Summary Statistics* " *Technical Report* NATICK / TR-89/044, *US Army Natick Research, Development and Engineering Center* , Natick, Massachusetts, Sept. 1989.

3. DEFINITIONS

CONTRIBUTE

3.1. For the purposes of this document, the following definitions apply:

[...]

3.1.1. Accessories: Parts or parts that can be used in conjunction with a portable terminal station and that allow the use of this portable terminal station in a way other than that which the station was designed close to the human body, that is, with a distance not exceeding the 15 mm (fifteen millimeters). The following types of accessories are considered:

[...]

3.1.2. Portable terminal stations: transmitting stations characterized by the portability of the equipment used and whose radiant structures, when in operation, are located less than 15 mm (fifteen millimeters) away from the user's body.

3.1.3. Portable terminal stations with multi-band operation: portable terminal station with operating mode that can transmit in several radio frequency bands.

[...]

3.1.5. TX factor: is the ratio between the power levels of the TSC, namely: average time value of power over peak power value. It can also be expressed in terms of the ratio between the value of the SAR average time controlled by Product - TAS, over the value of SAR obtained from the maximum power of the TSC.

3.1.6. Average time interval: the period of time that should not exceed 6 (six) minutes for portable stations.

3.1.7. Mannequin - flat: refers to the mannequin for SAR measurements in portable terminal stations that operate in positions other than those located against the side of the head, that is, as non-limiting examples, positions close to the user's body, or positions of portable terminals that operate in front of the user's face

3.1.8. Mannequin - SAM or dummy: refers to the *Specific Anthropomorphic Mannequin* (*Specific Anthropomorphic Mannequin* - SAM) for SAR measurements in portable terminal stations that operate close to the user's head.

3.1.9. Attenuation Margin (*Margin*): This is the attenuation margin applied to the instantaneous power value, in order to ensure that the TAS value meets the limits established by specific regulations.

3.1.10. Average SAR peak or maximum SAR in the spatial average or Peak SAR in the spatial average: Maximum average SAR value within a specific mass (*Peak Spatial-Average* SAR - psSAR).

3.1.11. Control Power (*P control*): it is the parameter that identifies the minimum power limit determined by the TAS algorithm, at a given time.

3.1.12. Limit Power (*Plimite*): value of the transmission power, according to the type of technology, mode of operation, radio frequency range and other parameters applicable to the TSC, whose electric field strength when incident on material with a specific mass density value , endowed with electrical properties equivalent to the human body, in addition to other applicable, is capable of producing SAR level, such that its value is equal to *SAR target.*

3.1.13. Average Power by Time Range (*P TAS*): average value of the TSC power, whose measurement performed in real time by the TAS algorithm, in a given average time interval, must be equal to or less than the *Plimite* value , according to the following equation, in which the condition: *P TAS ≤ Plimite,* must always be satisfied: $P\,TAS = \frac{1}{T} \int_{t}^{t+T} P(t)\,dt$.

3.1.14. SAR characterization procedure: This is the procedure performed prior to the tests to assess SAR compliance, in order to determine the *Plimite* values , and other parameters necessary for the operation of the TAS algorithm, according to each radio configuration, scenario exposure, technology, mode of operation, position of use, RF range and others, applicable to TSC. After completing the SAR characterization procedures, the values of these parameters are loaded and stored in non-volatile memory in the TSC, through the *Embedded File System* (EFS) and then used as inputs for the operation of the algorithm of TAS in the TSC.

3.1.15. Target SAR (*SARalvo*): it is the maximum SAR value in the 10g spatial average, which discounting all TSC tolerance values, must be lower than the SAR limit specified by specific regulations. The SAR value measured in real time must be less than the target *SAR* value . Represented by the following formula: *SARalvo = SAR_ Limit* x *10 - (total_ uncertainty / 10).*

3.1.16. Average SAR by *Time-Period Averaged* (TAS): Refers to the average SAR value, in a given average time interval, during which the instantaneous value of the transmission power is controlled, in real time, by TAS algorithm incorporated to TSC *chipset* or modem. It is also called *Device-Based Time-Averaging* SAR.

3.1.17. Average SAR by Time Controlled by the Source (*Source-Based Time-Averaging* SAR): it is the average value of instantaneous exposure, over a determined average period of time, resulting from a property inherent to the mode of operation of the transmitter or its duty cycle, so that the average SAR value complies with the limits established in specific regulations.

3.1.18. Portable Terminal to be Certified (TSC): telecommunication terminal to be submitted to the tests prescribed in this document, aiming at its certification.

4. GENERAL CHARACTERISTICS

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[...]

4.4. Dummy Specifications - SAM

[...]

4.4.4. The SAM mannequin must have at least three reference points, provided by its manufacturer, so that they can be used as a spatial reference in the correlation of the scanning system and the SAM mannequin, according to item 6.1 e) of the IEC / IEEE standard 62209-1528.

4.4.5. The user's hand must not be modeled according to item 6.3 of the IEC / IEEE 62209-15 standard.

[...]

4.4.8. The wall ("shell") of the mannequin - SAM must be built according to the specifications presented in item G.2.2 of the IEC / IEEE 62209-1528 standard. "

[...]

"4.5. Mannequin Specifications - Plan

[...]

4.5.3.2. The use of a flat mannequin with other shapes and smaller dimensions is allowed, for radio frequency bands above 150 MHz and separation distances equal to or less than 25 mm from the outer surface of the back wall of the

mannequin - flat, provided the conditions are respected. Next:

[...]

4.5.3.5. For portable terminal stations operating in the radio frequency range between 150 MHz and 800 MHz, the back wall of the mannequin - plane can have any shape, as long as it includes an ellipse with a length of 0.6 λ0 and a width of 0.4 λ0, where λ0 represents the wavelength in the air; and

4.5.3.6. For portable terminal stations operating in the 800 MHz to 6 GHz radio frequency range, the flat mannequin can have a back wall of any shape, as long as it includes an ellipse with a length of 225 mm and a width of 150 mm. "

[...]

"4.7. Liquid Specifications

[...]

4.7.4. For the radio frequency range from 4 MHz to 6 GHz, the measured values of conductivity (σ) and relative permittivity **(ε ')** must be within ± 10% of the central values described in Table 1, according to item 6.2 of the IEC / IEEE 62209-1528 standard.

Table 1

Frequency (MHz)	**Permissiveness (ε ')**	**Conductivity (σ) (S / m)**	**Depth (E-field), δ (mm)**
4	55	0.75	293
13	55	0.75	165.5
30	55	0.75	112.8
150	52.3	0.76	62.0
300	45.3	0.87	46.1
450	43.5	0.87	43.0
750	41.9	0.89	39.8
835	41.5	0.9	39.0
900	41.5	0.97	36.2
1450	40.5	1.2	28.6
1800	40	1.4	24.3
1900	40	1.4	24.3
1950	40	1.4	24.3
2000	40	1.4	24.3
2100	39.8	1.49	22.8
2450	39.2	1.8	18.7
2600	39	1.96	17.2
3000	38.5	2.4	14.0
3500	37.9	2.91	11.4
4000	37.4	3.43	10.0
4500	36.8	3.94	9.7
5000	36.2	4.45	1.5

5200	36	4.66	8.4
5400	35.8	4.86	8.1
5600	35.5	5.07	7.5
5800	35.3	5.27	7.3
6000	35.1	5.48	7.0
6500	34.5	6.07	6.7
7000	33.9	6.65	6.4
7500	33.3	7.24	6.1
8000	32.7	7.84	5.9
8500	32.1	8.46	5.3
9000	31.6	9.08	4.8
9500	31	9.71	4.4
10000	30.4	10.4	4.0

4.7.7. The human tissue simulating liquid must always be characterized before use in SAR testing procedures. Dielectric properties must be measured 24 hours before SAR testing procedures and for each 48-hour period of continuous use. When the test series is longer than 48 hours, the properties of the medium must also be measured at the end of the test series.

4.7.7.1 If the laboratory maintains a history of liquid conformity measurements, according to the characteristics shown in Table 1 and with the requirements outlined in item 6.2.2 of the IEC / IEEE 62209-1528 standard, the characterization may be valid for a up to 7 days.

[...]

4.7.11. The recipes and characteristics of the ingredients used in the preparation of the liquids must follow the recommendations described in Annex F of the IEC / IEEE 62209-1528 standard. "

[...]

5. TEST METHODS FOR THE EVALUATION OF TELECOMMUNICATIONS EQUIPMENT WITH REGARD TO THE ASPECTS OF THE SPECIFIC ABSORPTION RATE (SAR)

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5.1.3. The test methods described in this document do not apply to low power portable terminal stations. The demonstration of the compliance of these stations with the basic restrictions of exposure of the general public are established by Resolution nº 700, of September 28, 2018, and by Act nº 458, of January 24, 2019, or by others that may replace them.

5.1.4. For the purposes of meeting the hierarchy criteria, regarding the value of the separation distance between the TSC and the Mannequin, outlined in item 7.2.4.1.2 of the IEC / IEEE 62209-1528 standard, specifically with regard to item a), the value to be used is up to 15 mm (fifteen millimeters).

[...]

5.2.1.2. The characterization of the dielectric parameters of the simulator liquid must be carried out according to the procedures described in Annex H of the IEC / IEEE 62209-1528 standard. The validation period for the characterization of the simulator liquid is 24 hours, that is, the use of the liquid in the SAR measurement process must be within this period. However, in the situation where a laboratory maintains a history of liquid compliance measurements, in accordance with Table 1 and with the requirements of item 6.2.2 of IEC / IEEE 62209-1528, using measurement intervals of up to one week, less frequent measurements of dielectric properties are acceptable. If this is not possible, a new characterization must be carried out before continuing or carrying out the SAR measurement.

[...]

5.2.1.4. The function of the control procedure is the daily and systemic verification of the set involved in the SAR measurement and must be carried out in accordance with item A.2 of the IEC / IEEE 62209-1528 standard.

5.2.2. Preparation of the CONTRIBUTE Portable Terminal Station

[...]

5.2.2.1. SAR measurement at the portable terminal station must be performed according to the following requirements:

[...]

f) For TSC sold with two or more batteries that present differences in relation to (the): load capacity, physical dimensions or protection circuit, the tests must be carried out, in full, with the battery with the greatest capacity. The remaining batteries can only be used in tests to determine the highest SAR value in each radio frequency band.

g) If the TSC operates with a cable, headphones or other connected devices, the testing procedures must be performed in accordance with the provisions of the respective item dealing with the accessory in this document.

[...]

j) The TSC cannot exceed the established SAR limit on all channels under test of its radio frequency bands, except in the case of products that use the Average SAR Technique for a Controlled Time Period by Product, whose testing procedures must be carried out in accordance with item 7.6 of IEC / IEEE 62209-1528.

[...]

m) The TSC must be configured to transmit with the maximum power value, in all test conditions, and specific procedures must be observed for the cases of Average SAR by Time Period Controlled by Product, in accordance with the provisions of item 7.6 of the IEC / IEEE 62209-1528 standard.

n) SAR measurements must be performed in all options of operational configurations available in the TSC and in all modes of use, without accessories.

p) After that, the measurements must be repeated with the use of accessories, for all cases in which the highest measurement value was found, according to the radio frequency range and TSC operating mode.

5.2.2.2. Requirements for TSC modes of operation

a) TSC transmission power requirements and signal parameters: This item aims to ensure that the SAR level produced by the TSC is assessed according to its maximum power value, considering the TSC tolerances and variations in production, among others. Therefore, the procedures outlined in item 7.2.3.1 of the IEC / IEEE 62209-1528 standard must be applied.

b) Scheduling procedure: if necessary, the scheduling procedure to be used, during the execution of the test procedures, must be performed according to the provisions of item 7.2.3.2 of the IEC / IEEE 62209-1528 standard. "

"5.2.3. Measurement Positions of the Portable Terminal Station Operating Close to the Head / Ear

[...]

5.2.3.3. The cheek position must be in accordance with the provisions of item 7.2.4.2.2 of the IEC / IEEE 62209-1528 standard.

5.2.3.4. The inclined position must be in accordance with the provisions of item 7.2.4.2.3 of the IEC / IEEE 62209-1528 standard.

[...]

5.2.3.7. The image in Figure 6 represents the use of the TSC reference lines, according to item 7.2.4.1.3 of the IEC / IEEE 62209-1528 standard. "

[...]

5.2.3. Measurement Positions of the Portable Terminal Station Operating Close to the Head / Ear

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[...]

5.2.3.3. The cheek position must be in accordance with the provisions of item 7.2.4.2.2 of the IEC / IEEE 62209-1528 standard.

5.2.3.4. The inclined position must be in accordance with the provisions of item 7.2.4.2.3 of the IEC / IEEE 62209-1528 standard.

[...]

5.2.3.7. The image in Figure 6 represents the use of the TSC reference lines, according to item 7.2.4.1.3 of the IEC / IEEE 62209-1528 standard. "

[...]

"5.2.4. Measurement Positions of the Portable Terminal Station Operating Close to the Body

5.2.4.1. SAR measurements under conditions where the portable terminal station operates close to the body must be carried out with a distance of up to 15 mm (fifteen millimeters) from any part of the human body and not close to the ear. The test distance next to the body declared by the manufacturer may be changed only with the authorization of the Designated Certification Body - OCD, which must assess each case on time.

5.2.4. Measurement Positions of the Portable Terminal Station Operating Close to the Body

CONTRIBUTE

5.2.4.1. SAR measurements under conditions where the portable terminal station operates close to the body must be carried out with a distance of up to 15 mm (fifteen millimeters) from any part of the human body and not close to the ear. The test distance next to the body declared by the manufacturer may be changed only with the authorization of the Designated Certification Body - OCD, which must assess each case on time.

[...]

5.2.5. Measurement Positions of the Portable Terminal Station and Accessories

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[...]

5.2.5.2. Portable terminal station supplied with various accessories, which do not have conductive parts (metal), in its manufacturing process, such as silicone covers, must be tested without accessories.

5.2.5.3. Portable terminal station supplied with various accessories, which have one or more conductive parts (metal) in their manufacturing process, must be tested with each accessory that has this characteristic.

[...]

5.2.5.5. A portable terminal station provided with multi-band simultaneous transmission capability must be tested on the dummy - plane or on the dummy - SAM, in accordance with the provisions of item 7.4.4 of the IEC / IEEE 62209-1528 standard. "

[...]

5.2.8. Measurement Positions of Portable Terminal Station for Use in Other Members and Other Product Types

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[...]

5.2.8.3. Other products, such as bracelets, can be worn on the user's arms or legs while transmitting, except when in *idle* mode .

a) The bracelet must be open so that it is divided into two parts, according to the illustration shown in Figure 12 of the IEC / IEEE 62209-1528 standard.

b) The device must be positioned directly against the surface of the mannequin, with the bracelet aligned as much as possible. With its back pointed towards the mannequin, in accordance with the provisions of item 7.2.4.1.11 of the IEC / IEEE 62209-1528 standard.

c) If the bracelet cannot be opened normally, in order to allow positioning in direct contact with the surface of the mannequin, the need to break or cut the device bracelet should be assessed. Care must be taken to avoid damage to the antenna.

5.2.8.4. Devices larger than the minimum elliptical manikin area.

a) The TSC must be moved so that several area scans can be performed, so that the entire length of the TSC is measured.

b) To reduce differences between SAR measurements resulting from displacement variations, the TSC scan areas of two successive tests must cross at least one third in the direction of displacement, in accordance with the provisions of item 7.2.4.1.4 IEC / IEEE 62209-1528, and as shown in Figure 5 of IEC / IEEE 62209-1528.

c) If the positioning of the antennas is not informed by the manufacturer, the testing procedures can be performed only in the area where they are located, provided that complete measurements are carried out, in advance, of how to confirm that the transmissions occur only in the indicated regions.

5.2.8.6. Generic devices.

a) Products that cannot be classified according to the types of products mentioned in this document, will be considered generic devices. As an example, mention is made of products consisting of a closed box, which includes at least one RF transmitting circuit and antenna within its internal structure, and the provisions of item 7.2.4.1.13 of IEC / IEEE 62209-1528.

b) The SAR measurement for generic devices must be performed on accessible surfaces, according to the intended use and the justification to be presented, as illustrated by Figure 14 of the IEC / IEEE 62209-1528 standard.

c) The separation distance to be used during the testing procedures must comply with the hierarchical criterion established by item 7.2.4.1.2 of the IEC / IEEE 62209-1528 standard.

d) If the intended use or justification is not presented, all surfaces of the TSC must be evaluated directly against the flat mannequin, according to item 7.2.4.1.3. IEC / IEEE 62209-1528 standard.

5.2.8.7. Products Supported or Used Near the Body of Users

a) Typical examples of devices used close to users' bodies include *laptops* with wireless enabled or *tablets* with radio transmitters.

b) Other devices that fall into this category include those whose diagonal dimension of the screen is greater than 20 cm. In addition, credit card and other transaction terminals.

c) The positioning and other test procedures applicable to such devices must be performed in accordance with the provisions of item 7.2.4.1.7 of the IEC / IEEE 62209-1528 standard.

5.2.8.8. Integrated Clothing Products

a) Typical examples of clothing-integrated devices include jackets with integrated wireless communication devices, speakers and microphones. This category also includes headgear, with integrated wireless communication devices.

b) The positioning and other test procedures applicable to such devices must be performed in accordance with the provisions of item 7.2.4.1.12 of the IEC / IEEE 62209-1528 standard.

5.2.8.9. Products with Alternative Formats

a) Typical examples of alternate-shaped devices include wireless headphones connected via *Bluetooth.* The markings of the reference points are different from those used in the other items.

b) The positioning and other testing procedures applicable to such devices must be performed in accordance with the provisions of item 7.2.7 of the IEC / IEEE 62209-1528 standard.

5.2.9. Procedure for Setting the Maximum SAR Measurement in Space Average

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5.2.9.1. To determine the maximum SAR in the space average of a portable terminal station all the conditions and procedures described in the items dealing with Previous Preparation; Preparation of the Portable Terminal Station; Measurement Positions of the Portable Terminal Station Operating Close to the Head / Ear; among others, they must be followed and appropriate to the TSC.

5.2.9.2. For each configuration of the portable terminal station under test, the steps described in items 5.2.9.3, 5.2.9.4, 5.2.9.5 and 5.2.9.6 must be performed. In this way, all station positions (head, body and limbs), configurations and operating modes must be tested for each radio frequency band according to the steps described in the following items. "

[...]

"5.2.9.5. Step 3 - Thin Volume *Scan* (" *Zoom Scan* ")

[...]

c) The pitch of the mesh in the vertical direction in the fine sweep of volume must be calculated by the ratio (8-f [GHz]) and not be greater than 5 mm. In the horizontal direction, parallel to the surface, the pitch must be calculated by the ratio (24 / f [GHz]) and not be greater than 8 mm, provided that uniform mesh spacing is adopted (see Annex C.3.3 of Standard 62209 - 1), if the mesh spacing is not uniform, the pitch in the horizontal direction must be calculated by the ratio (12 / f [GHz]) and not be greater than 4 mm. The use of these resolutions allows the interpolation algorithm to calculate SAR values in a mesh with a 2 mm pitch with an error of less than 5%. If other resolutions are adopted, it is necessary to validate this result.

[...]

g) The maximum spatial average SAR value must be obtained through interpolation and extrapolation procedures. These procedures must follow that established in Annex C of Standard 62209 - 1 or in items 6.5.3, F.4.1.3, F.4.1.4 and F.4.1.5 of Standard 1528 - 2003. "

[...]

5.3 TSC SAR measurements with Antennas or Multiple Transmitters

CONTRIBUTE

5.3.1 TSCs that have multiple antennas or transmitters that operate simultaneously require special testing procedures to determine the combination of fields in order to identify the combined SAR distribution, depending on the transmitter's ability to emit forms of correlated or non-correlated waves over time.

5.3.2. The field summation method and instrumentation requirements for associated measures for correlated signals are different from non-correlated signals, according to IEC TR 62630.

5.3.3 SAR Measures for Non-Correlated

Signals 5.3.3.1 TSCs that have the capability of multiple modes of operation, simultaneously and in different radio frequency bands, must comply with the provisions of item 7.4.4.2 of the IEC / IEEE 62209 standard -1528.

5.3.4 SAR Measures for Correlated Signals

5.3.4.1 TSCs that have several antennas transmitting correlated signals, such as MIMO transmitters with digital beam formation capabilities, must comply with the provisions of item 7.4.4.3 of the IEC / IEEE 62209-1528 standard. "

[...]

6. Test Procedure for Middle Temporal SAR Controlled Product (Time-Averaged SAR Period - TAS)

CONTRIBUTE

6.1. The test procedures provided for in this item apply to products that can control, in real time, by means of an algorithm incorporated into the *chipset* or modem, the instantaneous values of transmission power, in order to ensure that the average time SAR value meets the limits established in specific regulations, in any circumstances.

6.2. The manufacturer must inform in advance and expressly if the TSC falls within the definition of Time Controlled SAR Average by Product (*Time-Averaging* SAR - TAS) and can be evaluated according to the test procedures outlined in this item.

6.3. In addition to the provisions of the previous item, the following requirements must be met:

6.3.1. The TAS algorithm incorporated in the chipset or modem cannot be accessible or changeable by users.

6.3.2. The TSC manufacturer must provide adequate documentation on the operation of the power control algorithm, as well as on the results of the SAR characterization procedures, according to each radio configuration, exposure scenario, technology, mode of operation, position of use, RF range and others, applicable to TSC. In addition to those that have been loaded through the EFS, so that the conformity assessment of the product can be carried out properly.

6.3.3. If the provisions of the previous items are not met, the testing procedures with a view to assessing SAR compliance must be carried out, using the maximum TSC transmission power value, according to the procedures provided for in item 7.4 of the standard IEC / IEEE 62209-1528.

6.4. Average Time Interval for Time-Period Averaged SAR

CONTRIBUTE

6.4.1. Table 2 shows, according to the radio frequency range, the respective value of the average time interval to be used by the TAS algorithm incorporated into the *chipset* or TSC modem, and the following condition must be met:

Table 2

Group	Radio Frequency Range	Average Time Range (seconds)
I	Less than 3 GHz	100
	From 3 GHz to 6 GHz	60
II	4 MHz to 6 GHz	360

6.4.1.1. If the TSC uses the average time intervals corresponding to the RF bands associated with group I, the use of the average time interval corresponding to the RF band of group II will not be allowed. Likewise, if the TSC uses the average time interval referring to the group II RF band, the use of the average time intervals referring to the group I RF band will not be allowed.

6.5. Configurations of TAS Measurement Systems

CONTRIBUTE

6.5.1. For SAR measurement systems in *Array,* the provisions of item 7.6.3.2 of the IEC / IEEE 62209-1528 standard must be applied.

6.5.2. In the case of SAR measurement systems in *Array,* for *fast* SAR class 2, see item 7.9.2 of the IEC / IEEE 62209-1528 standard.

6.5.3. For scanning SAR measurement systems, the provisions of item 7.6.3.3 of the IEC / IEEE 62209-1528 standard must be applied.

6.5.4. In the case of scanning SAR measurement systems, including single probe SAR systems and *fast* SAR Class 1 test systems , see item 7.9.2 of IEC / IEEE 62209-1528.

6.6. TX Factor Evaluation

CONTRIBUTE

6.6.1. Conducted power measurements can be used to determine the TX factor, for both:

6.6.1.1. The detection of the power level, the integration time and the setting of the average sample parameter in the power meter can guarantee that the uncertainty component of the TAS is in accordance with the value to be measured, according to the requirements of item 7.6 .8 of IEC / IEEE 62209-1528.

6.6.1.2. The measurements of conducted power must be carried out precisely for the respective operating mode.

6.6.1.3. Linear scales, such as milliwatt (mW), should be used.

6.6.2. For the determination of the TX factor, the procedures outlined in item 7.6.6 of the IEC / IEEE 62209-1528 standard must be applied, for each mode of operation (technology), and for each applicable radio frequency band.

6.6.2.1. Except for cases in which it can be proven that the same TX factor can be applied to other radio frequency bands and modes of operation.

6.7. Exhibition Conditions and Considerations for Test Positions

CONTRIBUTE

6.7.1. The value of the SAR average time must be measured separately for each radio frequency band and mode of operation (technology) used by TSC. Except when it is demonstrated that the same TX factor can be applied to various radio frequency bands or modes of operation.

6.7.2. Two approaches are considered, depending on the TSC's ability to reliably detect usage positions (*Device State Index* - DSI).

6.7.2.1. If the TSC does not have functionality for detecting the different positions of use, the maximum value of the SAR average, obtained from all measurements of the positions of use, must be used to determine the conformity of the product. This is the most conservative and simple approach applicable.

6.7.2.2. Caso o TSC seja capaz de detectar diferentes posições de uso, estas devem ser agrupadas da seguinte forma:

a) Posições de teste da cabeça: O valor máximo da média temporal de SAR, dentre os valores de medição obtidos em todas as posições de teste da: cabeça, bochecha esquerda, inclinação para a esquerda, bochecha direita e inclinação para a direita, correspondendo a chamadas de áudio através de fone de ouvido, deve ser utilizado para verificar a conformidade do produto com os limites de SAR para a cabeça.

b) Corpo e outras posições de teste: O valor máximo da média temporal de SAR, dentre os valores de medição obtidos em todas as posições de teste do corpo e demais posições aplicáveis, com base nas distâncias de separação para as posições de uso correspondentes, quando não há chamada de áudio através do fone de ouvido, deve ser utilizado para verificar a conformidade do produto com os limites de SAR localizada para os demais casos.

6.8. Transmissões Simultâneas de TAS

CONTRIBUIR

6.8.1. Os seguintes procedimentos devem ser aplicados para determinação do maior valor de psSAR:

6.8.1.1. O fator TX obtido por meio da execução dos procedimentos descritos no item 7.6.6, da norma IEC/IEEE 62209-1528, deve ser aplicado a, no máximo, uma das transmissões simultâneas.
6.8.1.2. Todas as transmissões simultâneas devem ser avaliadas com seus respectivos valores máximos da potência de transmissão.
6.8.1.3. O valor de SAR resultante das combinações de transmissões simultâneas deve ser avaliado de acordo com o disposto no item 7.4.4 da norma IEC/IEEE 62209-1528, referente medição de sinais não-correlacionados e correlacionados.

6.9. Medições de TAS

CONTRIBUIR

6.9.1. Os procedimentos de ensaios devem ser realizados de acordo com o disposto no item 7.6.7 da norma IEC/IEEE 62209-1528.

6.9.1.1. Measurements must be performed for all applicable test positions and conditions, as established by this document. The TAS algorithm built into the TSC's *chipset* or modem must be disabled while performing SAR measurements.

6.10. Uncertainties in the Measurements of TAS

CONTRIBUTE

6.10.1. The provisions of item 7.6.8 of the IEC / IEEE 62209-1528 standard are applied in the evaluation of the uncertainties of the TAS measurements.

7. TAS Algorithm Built into the TSC's Chipset or Modem

CONTRIBUTE

7.1. The test procedures described in this item aim to evaluate the functioning of the TAS algorithm, in addition to the test procedures established in item 6 of this document, when the TSC is subject to network operating conditions that require the use of the maximum value of transmission power for long periods of time. Therefore, the following criteria must be observed:

7.1.1. The control performed by the TAS algorithm incorporated into the TSC *chipset* or modem should ensure, in real time, that as the *PTAS* value increases and approaches the *Plimite* value, the value of the instantaneous transmission power is reduced, in order to ensure that, at any average time interval, the *PTAS* value is less than *Plimite* .

7.2. SAR characterization information relating to the operation of the TAS algorithm, such as average time interval, *Plimite, Pmax, Pcontrole, Margin, target SAR* or the like, for each radio frequency band, operation mode and DSI, as applicable , in addition to the TAS algorithm incorporated in the TSC's *chipset* or modem, they must be stored in non-volatile memory and must be prohibited from access and possibility of change by users.

7.2.1. For the purpose of carrying out the test procedures for evaluating the TAS algorithm, the manufacturer must make available the SAR characterization information, in addition to that stored in the TSC's non-volatile memory.

7.3. Measurement System Configuration

CONTRIBUTE

7.3.1. The configuration of a generic system to carry out the test procedures with measurement of conducted power is shown in Figure 15. For more details on calibration of the measuring equipment, configuration and others, the respective manufacturer should be consulted.

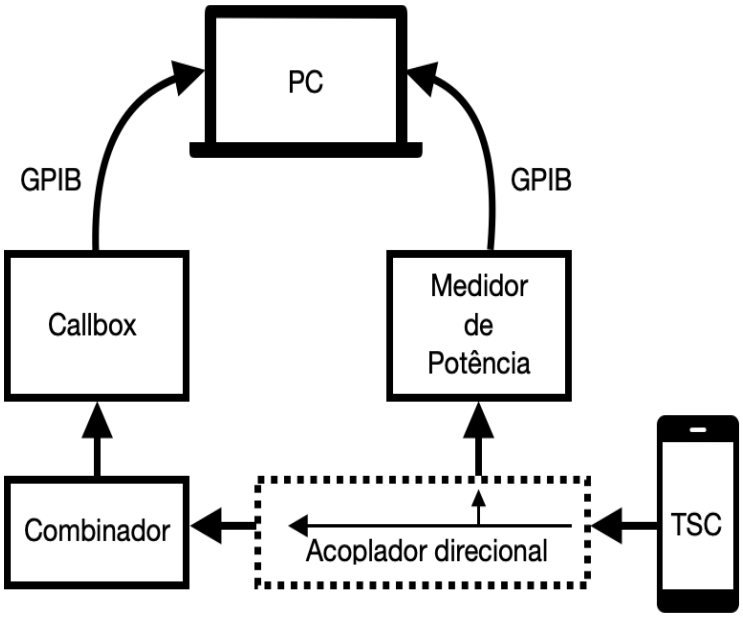

Figure 15 - Generic measurement *setup*

7.4. Test Sequence for Validation of the CONTRIBUTE Algorithm

7.4.1. The parameters used in the generation of test sequences must be obtained through measurements or calculations, which are:

a) measured value of maximum power (*Pmax*);

b) measured value of the limit power (*Plimite*); and

c) calculated value of control power (*P control*).

7.4.2. The maximum power value, *Pmax* , refers to the highest instantaneous power value, for a given set of technology, mode of operation, radio frequency (RF) range, etc., whose measurement must be performed with the TAS algorithm disabled and the *callbox* requesting that the TSC transmit with the highest available power value.

7.4.4. The measurement of the *Plimite* value must be performed with the TAS algorithm enabled, with the *Marginp* value equal to 0 dB and with the *callbox* requesting that the TSC transmit with the highest available power value.

7.4.5. The calculation of the *Pcontrole* value must be performed by applying the measured value of *Plimite* in the following formula: *Pcontrole* (dBm) = *Plimite* (dBm) - *Margin* (dB).

7.4.6. Test Sequence 1: the TSC should receive a request from the *callbox* to transmit with its maximum measured power value, *Pmax* , during the period of 0 seconds until the time corresponding to 80% of the average time interval. Then, the TSC must be requested by the *callbox* to transmit with a power value equal to half the value of the maximum measured power, *Pmax* / 2, during the remainder of the average time interval.

7.4.7. Test Sequence 2: the TSC should receive a request from the *callbox* to transmit the instantaneous power values according to the time period specified in Table 3, within a total time interval of 360 seconds.

Table 3

Time interval	Instantaneous Power Value

(Δt)	P (Δt)
0 to 15s	= *P control* - 2 dB
15s to 35s	= *Plimite*
35s to 55s	= (*Plimite* + *Pmax*) / 2
55s to 65s	= *P control* - 6 dB
65s to 85s	= *Pmax*
85s to 100s	= *Plimite*
100s to 115s	= *P control* - 5 dB
115s to 135s	= *Pmax*
135s to 145s	= *P control* - 3 dB
145s to 160s	= *Plimite*
160s to 170s	= *P control* - 4 dB
170s to 190s	= (*Plimite* + *Pmax*) / 2
190s to 200s	= *P control* - 4 dB
200s to 215s	= *Plimite*
215s to 225s	= *P control* - 3 dB
225s to 245s	= *Pmax*
245s to 260s	= *P control* - 5 dB
260s to 275s	= *Plimite*
275s to 295s	= *Pmax*
295s to 305s	= *P control* - 6 dB
305s to 325s	= (*Plimite* + *Pmax*) / 2
325s to 345s	= *Plimite*
345s to 360s	= *P control* - 2 dB

7.5. Validation of the TAS Algorithm Embedded in the TSC Chipset or Modem

CONTRIBUTE

7.5.1. The following equations should be used in the test procedures covered by this item.

Equation 1: $10\,g\,\mathrm{SAR}\,\mathbf{n}\,(t) = (\,P\,cond\,\_\,\mathbf{n}\,(t) / P\,limit\,\_\,\mathbf{n}\,) \times 10\,g\,\mathrm{SAR}\_\,P\,limit\,\_\,\mathbf{n}$

Equation 2: $\left(\frac{1}{T}\int_{t}^{t+T} 10\,g\,\mathrm{SAR}\,\mathbf{1}\,(t)\,dt + \ldots + \frac{1}{T}\int_{t}^{t+T} 10\,g\,\mathrm{SAR}\,\mathbf{n}\,(t)\,dt\right) / 10\,g\,\mathrm{SAR\ limit} \leq 1$

Equation 3: $10\,g\,\mathrm{SAR}\,(t) = (\mathrm{SAR\_point}\,(t) / \mathrm{SAR\_point}\,Plimite\,) \times 10\,g\,\mathrm{SAR}\_\,Plimite$

Being that:

SAR_point (t), refers to the instantaneous SAR value measured at a given point.

SAR_pointPlimite, refers to the SAR value measured at the point that corresponds to the Plimite value

10 *g* SAR_Plimite, at the value of 10 gSAR measured in Plimite, in the worst scenario of setting the technology parameters, RF range, etc.

7.5.2. Dynamic Control of Instant Power Value

CONTRIBUTE

7.5.2.1. The purpose of this testing procedure is to evaluate the ability of the TAS algorithm to perform the control of the instantaneous power value, through the occurrence of requests from the *callbox* so that the instantaneous power value is increased, in opposition to the minimum power value that maintained to meet the SAR limit.

a) From the SAR characterization information provided by the manufacturer, select two RF bands, which have the highest and lowest *Plimite* value , for each type of technology available at TSC, in which the following condition must be met: *Plimite* < *Pmax* . The selection of *Plimite* must be carried out in such a way that: Δ (*Pmax* - *Plimite*) ≥ 1dB.

b) If the condition, *Plimite* < *Pmax* , cannot be fully met, select any two RF bands, for each mode of operation and technology, which have the highest and lowest *P limit* value .

7.5.2.2. The tests must be performed according to the above RF technology and range, in addition to the use of test sequences 1 and 2.

a) Perform the measurement of the *Pmax* , *Plimite* values and calculate the *Pcontrol* value , using the *Margemp* value , according to the value informed by the manufacturer, in addition to the configuration parameters of the selected mode of operation, technology and RF range.

b) Generate test sequences 1 and 2 in the *callbox,* using as parameters the measured and calculated values according to the previous item and those related to the selected RF technology and range.

c) Perform the measurements and record the instantaneous power values obtained over time.

d) From the instantaneous power values obtained in the previous item:

I - Perform the conversion to the respective values of 10gSAR, using equation 1;

II - Calculate the average value of 10gSAR over the applicable average time interval, according to the example shown in Figure 16.

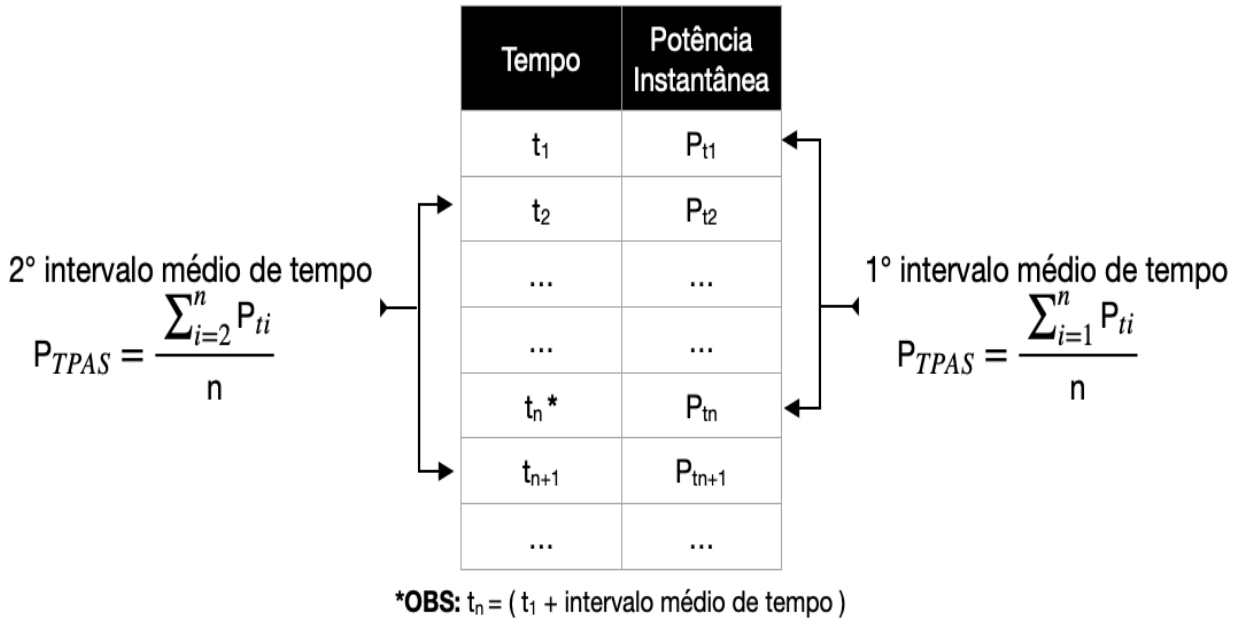

Figure 16 - *PTAS* at average time intervals

e) Plot a graph containing the following information:

I - The instantaneous power values over the determined period; and

II - The power values requested by the *callbox* during the execution of test sequence 1.

f) Plot another graph containing the following information:

I - The instantaneous values of 10gSAR calculated over the testing period;

II - The calculated average value of 10gSAR in the average time interval; and

III - The SAR limit defined in specific regulations.

g) Repeat the steps above for test sequence 2.

h) Repeat the steps above for all combinations of selected RF technologies and bands.

7.5.2.3. The validation criterion for this item is the presentation of compliance in relation to:

a) consistency of the values presented by the manufacturer, in the SAR characterization report, in relation to the measured values; and

b) power limitation controlled by the TAS algorithm, so that the management of this value must ensure compliance with the SAR limit, for the average value of 10gSAR, over the average time interval, according to the generated graphics.

7.5.3. Disconnecting and Restoring Voice Telephone Calls

CONTRIBUTE

7.5.3.1. The purpose of this test procedure is to evaluate the control of the TAS algorithm on the accounting and maintenance of the history on the previous values of instantaneous power, so that the implementation of the power limitation by the TAS algorithm can be verified, when the TSC is asked to use its maximum power value, while disconnecting and re-establishing the voice call occurs.

a) From the highest SAR value resulting from the performance of the test procedures described in item 6 of this document, select any RF technologies and bands that have the lowest *Plimite* value , according to the SAR characterization information, for the the following condition is met: *Plimite* < *Pmax.*

b) If the condition *Plimite* < *Pmax* cannot be satisfied, select any combination of technology and RF range that has the lowest value of *Plimite* , within the technology group with the highest SAR value.

c) This test must be performed with the TSC receiving the operation request with the maximum power value. Thus, with the selection of the technology configuration and RF range above, the TSC should be forced to use the value of *P control* for the longest period of time, in which the disconnection and reestablishment of the call must occur.

7.5.3.2. Test procedure:

a) Perform the measurement of the *Plimite* value , using the configuration parameters of the above technology set and RF range, with the *Margemp* value equal to 0 dB and with the *callbox* requesting the highest TSC power value.

b) Configure the *Margemp,* according to the value informed by the manufacturer. The algorithm must be enabled.

c) Establish the connection between the TSC and the *callbox,* according to the configuration of the selected technology set and RF range.

d) Configure the *callbox* to request that the TSC perform the transmission with the power value at 0 dBm, for at least the applicable average time interval. Then, the TSC must be asked to transmit at the maximum power value for a period equal to 60% of the applicable average time interval. Then, disconnect the call for a period equal to 10% of the applicable average time interval.

e) After that, reestablish the call and configure the *callbox* to request that the TSC transmit with maximum power for a period of time equal to 5 times the average time interval. Perform all measurements and record the transmitted power values over time.

f) From the instantaneous power values obtained:

I - Perform the conversion of the instantaneous power values to the respective values of 10gSAR, using equation 1;

II - Calculate the average of 10gSAR, under the average time interval, as shown in Figure 17.

g) Plot a graph containing the following information:

I - the instantaneous power values over the determined period;

II - identification in the graph of the period in which the call is disconnected and re-established;

h) Plot another graph containing the following information:

I - the values of 10gSAR instantaneous in relation to the determined time;

II - the average time value of 10gSAR, calculated previously; and

III - the SAR limit defined in specific regulations.

7.5.3.3. The validation criterion of this item is the presentation of conformity in relation to:

a) consistency of the values presented by the manufacturer, in the SAR characterization report, in relation to the measured values;

b) compliance with the SAR limit, for an average value of 10gSAR, over the average time interval; and

c) power limitation controlled by the TAS algorithm, so that the *Pcontrol* value must have the same value, before disconnection and after the voice call is reestablished.

7.5.4. Change of Operation Mode and RF Range

CONTRIBUTE

7.5.4.1. The purpose of this testing procedure is to assess whether the TAS algorithm will continue to exercise power level control after the transition from the operating mode, namely, channel, antenna, DSI, RF range and etc., within the same group of technology.

7.5.4.2. The test can also be performed by changing the operating mode and RF range, from the highest to the lowest *Plimite* value , or from the highest *Plimite* value to the lowest.

a) Select the technology that has the highest measured SAR value, according to the testing procedures performed in item 6 of this document. Within the technology group with the highest SAR value, select two sets of operating mode and RF range that have the lowest and highest *Plimite* values , according to the manufacturer's SAR characterization information,

b) If the *Plimite* values are the same within the chosen group, select the second highest SAR value and so on, as appropriate.

c) The test must be performed with the *callbox* asking the TSC to transmit with the maximum power value. The change in technology and RF range must be performed when the TSC is using the power value equal to *Pcontrole* .

7.5.4.3. Test procedure:

a) Perform the *Plimite* measurement for the selected RF technologies and bands, with the *Marginp* value = 0 dB and with the *callbox* requesting the highest TSC power value.

b) Configure the *Margemp,* according to the value informed by the manufacturer. The algorithm must be enabled.

c) Establish the connection between the TSC and the *callbox,* according to the configuration of one of the selected operating modes and RF range.

d) Request that the TSC perform the transmission with the power value at 0 dBm for a period of time that is equal to the average time interval. Then, the TSC should be asked to transmit at the maximum power value for a period equal to 60% of the average time interval.

e) Then, change to the next operating mode and RF range. Continue the tests with the *callbox* requesting that the TSC transmit with the maximum power value for a period of time equal to 5 times the average time interval. Measure and record the transmitted power values over time.

f) From the instantaneous power values obtained:

I - Perform the conversion to the respective values of 10gSAR, using the equations above;

II - Calculate the average of 10gSAR, under the average time interval of 100 seconds, according to the example shown in Figure 16.

g) Plot a graph containing the following information:

I - the value of the instantaneous power over the total time interval of the tests; and

II - the indication of the moment when the transition between the operating modes and the RF range occurs.

h) Plot another graph containing the following information:

I - the value of instantaneous 10gSAR in relation to the determined time;

II - the average value of 10gSAR over time, calculated previously; and

III - the SAR limit defined in specific regulations.

7.5.4.4. The validation criterion of this item is the presentation of conformity in relation to:

a) consistency of the values presented by the manufacturer, in the SAR characterization report, in relation to the measured values;

b) compliance with the SAR limit, for an average value of 10gSAR, over the interval of testing; and

c) power limitation controlled by the TAS algorithm, so that the instantaneous power value must correspond to the *Pcontrol* value of the first mode of operation and RF range, before the transition, and the *Pcontrol* value of the second mode of operation and range RF, after transition.

7.5.5. Antenna Exchange

CONTRIBUTE

7.5.5.1. The purpose of this test is to evaluate the operation of the TAS algorithm during the transitions from primary antenna to diversity of antennas, if the TSC has this feature.

a) Whenever possible, the antenna exchange configuration must be selected within the same technology group, RF range and DSI. The following conditions should preferably be met: *Plimite* must have different values, in addition to: *P limit* < *Pmax* .

b) If the TSC does not have the capacity to perform the antenna exchange in the same technology configuration and RF band, but it has antennas with operation in several RF bands, the antenna exchange test must be performed with the replacement of RF technology and range.

7.5.5.2. The test procedure to be performed is the same as that established for "Change of Operation Mode and RF Range", of this document, with the appropriate adaptation of the part dealing with "Change of Operation Mode and RF Range", in which the "Antenna Exchange" should be performed.

a) Plot a graph containing the following information:

I - the value of the instantaneous power over the total time interval of the tests; and

II - the indication of the moment when the antenna transition occurs.

b) Plot another graph containing the following information:

I - the value of instantaneous 10gSAR in relation to the determined time;

II - the average value of 10gSAR over time, calculated previously; and

III - the SAR limit defined in specific regulations.

7.5.5.3. The validation criterion of this item is the presentation of conformity in relation to:

a) consistency of the values presented by the manufacturer, in the SAR characterization report, in relation to the measured values;

b) compliance with the SAR limit, for an average value of 10gSAR, over the interval of testing; and

c) power limitation controlled by the TAS algorithm, so that the instantaneous power value must correspond to the same value before and after the antenna transition.

7.5.6. Changing the Device State Index (DSI) Use Positions

CONTRIBUTE

7.5.6.1. The purpose of the tests is to evaluate the functioning of the TAS algorithm during the occurrence of transitions in the positions of use of the TSC, for example, when the DSI of functioning close to the body is changed to the DSI of functioning as an access point, TSC has this feature.

a) According to the SAR characterization report, select within a technology group, two sets of DSI, mode of operation and RF range that have different Plimite values, which, preferably, meet the criterion: with *P limit* < *Pmax.*

b) Repeat the above procedures, so that 4 sets of DSI, operating mode and RF range are obtained.
c) This procedure must be performed with the *callbox* asking the TSC to transmit at the highest power value. The change in the state of the device must be performed when the TSC is forced to transmit with the value of *Pcontrole* .

7.5.6.2. The test procedure to be performed is the same as that established for "Change of Operation Mode and RF Range", with the appropriate replacement of the part that deals with "Change of Operation Mode and RF Range", in which it must be "Change of TSC Use Positions" was carried out.

a) Plot a graph containing the following information:

I - the value of the instantaneous power over the total time interval of the tests; and

II - the indication of the moment when the DSI transition occurs.

b) Plot another graph containing the following information:

I - the value of instantaneous 10gSAR in relation to the determined time;

II - the average value of 10gSAR over time, calculated previously; and

III - the SAR limit defined in specific regulations.

7.5.6.3. The validation criterion of this item is the presentation of conformity in relation to:

a) consistency of the values presented by the manufacturer, in the SAR characterization report, in relation to the measured values;

b) compliance with the SAR limit, for an average value of 10gSAR, over the interval of testing; and

c) power limitation controlled by the TAS algorithm, so that the instantaneous power values, before and after the DSI transition, are in accordance with the expected *Pcontrole* values .

7.5.7. Transition between Average Time Intervals

CONTRIBUTE

7.5.7.1. This test procedure does not apply to TSC that uses only an average time interval value or equal to 360 seconds.

7.5.7.2. The purpose of this test is to assess whether the algorithm built into the TSC's *chipset* or modem controls the power limitation during the transition between different average time intervals and keeps the average time exposure normalized below the 1.0 limit, in any circumstances.

a) Select, for each average time interval used by TSC, the highest SAR value obtained during the execution of the test procedures described in item 6 of this document.

b) After that, for each technology group in which the highest SAR value was identified, select the combination of operation mode and RF range that has the highest *Plimite* value , in which the following condition must be satisfied: *P limit* < *Pmax* .

c) If all available combinations have the condition: *Plimite* > *Pmax* , select the combination of technology and RF range, in which the following condition is met: *P limit* - *Pmax* <2.2dB.

d) If it is not possible to meet the criteria outlined in the previous item, the procedure for testing the exchange of average time interval should not be performed.

7.5.7.3. Test Procedure - From the Longest Average Time to the Shortest:

a) Perform the measurement of the *Plimite* value according to the sets of technology and RF range selected for the respective average time interval, with the TAS algorithm enabled, with the *Marginp* value equal to 0 dB and the *callbox* requesting the highest TSC power value.

b) Configure the *Margemp,* according to the value informed by the manufacturer. The algorithm must be enabled.

c) Configure the connection parameters between the TSC and the *callbox* according to the technology and RF range defined for the longest average time interval.

d) The *callbox* must be configured to request the TSC to use the power value equal to 0 dBm, for a period of time equal to the first average time interval. Then, the *callbox* must request the TSC to transmit with the highest power value , for a period of time equal to 1.4 times the first average time interval.

e) After that, change the setting for the technology option and RF range of the shortest average time interval. with the *callbox* asking the TSC to transmit with the highest power value, for a period equal to the shortest average time interval.

f) Then, change the setting to first technology option and RF range, corresponding to the first average time interval, and continue testing with the *callbox* requesting that the TSC transmit with the highest power value , for a period of time equal to the first average time interval.

g) Perform measurements and record the transmission power values over time for the duration of the tests.

h) From the instantaneous power values obtained:

I - Perform the conversion to the respective values of 10gSAR, using equation 1 of this document;

II - Calculate the average of 10gSAR, under the average time interval, according to the example presented in Figure a 17; and

III - Calculate the normalized exposure value using equations 1 and 2.

i) Plot a graph containing the following information:

I - the value of instantaneous power over the testing period;

II - the instantaneous value of 10gSAR over the testing period;

III - the average value of 10gSAR over time, calculated previously; and

IV - the SAR limit established by specific regulation.

j) Plot another graph containing the following information:

I - the value of the normalized exposure according to results obtained from the application of equation 2; and

II - indicate the time instants in which the transitions between the time windows occur.

7.5.7.4. Test Procedure - From the Shortest Average Time to the Longest

a) Configure the connection parameters between the TSC and the *callbox* according to the selected RF technology and range for the shortest average time interval.

b) Configure the *callbox* to request the TSC to transmit with a power value equal to 0 dBm for a period of time equal to the smallest average time interval. Then, the TSC must be asked to transmit with the highest power value for a period equal to 1.4 times the shortest average time interval.

c) After that, change to the other option for setting the RF technology and range, for the longest average time interval. Continue testing with the *callbox* requesting that the TSC transmit with the highest power value for a period equal to the longest average time interval. After that, switch to the technology setting option and RF range of the shortest average time interval. Continue testing with the *callbox* asking the TSC to use the highest power value for the remainder of the time, considering a total test period of 500 seconds. Perform the measurements and record the transmission power value in relation to time.

d) From the instantaneous power values obtained:

I - Perform the conversion to the respective values of 10gSAR, using equation 1 of this document;

II - Calculate the average of 10gSAR, under the average time interval, according to the example presented in Figure 16; and

III - Calculate the normalized exposure value using equations 1 and 2.

e) Plot a graph containing the following information:

I - the value of instantaneous power over the testing period;

II - the instantaneous value of 10gSAR over the testing period;

III - the average value of 10gSAR over time, calculated previously; and

IV - the SAR limit established by specific regulation.

f) Plot another graph containing the following information:

I - the value of the normalized exposure according to results obtained from the application of equation 2; and

II - indicate the time instants in which the transitions between the time windows occur.

7.5.7.5. The validation criterion of this item is the presentation of conformity in relation to the value of the normalized exposure having a value less than or equal to 1 (one).

8. Proximity Sensors

CONTRIBUTE

8.1. The test procedures for assessing the conformity of products must be carried out in accordance with the provisions of item 7.7 of the IEC / IEEE 62209-1528 standard.

9. Measurement Uncertainties

CONTRIBUTE

9.1. The concepts of estimating the uncertainty of SAR values produced by portable terminal stations are based on the general rules provided by ABNT / ISO / IEC in the Guide for the expression of measurement uncertainty.

9.2. The measurement uncertainty must be in accordance with item 8.2 of the IEC / IEEE 62209-1528 standard.

9.3. The calculation of the uncertainty must be carried out in accordance with items 8.3 and 8.4 of the IEC / IEEE 62209-1528 standard.

9.4. The uncertainty values must be informed in the test report of the terminal station under test.

10. Measurement report

CONTRIBUTE

10.1. The results obtained from the measurements must be presented in a measurement report, which contains all the information necessary for the interpretation of the results obtained. The guidelines for preparing the measurement report can be found in item 7.8 of standard 17.025 of ABNT / ISO / IEC.

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Art. 2 This Act enters into force on the date of its publication in Anatel's Electronic Service Bulletin.

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