

SAR Evaluation Report

EUT Information

Manufacturer	Ascom Sweden AB		
Brand Name	WH2		
Model Name	WH2		
FCC ID	BXZWH2		
IC Number	3724B-WH2		
Type / Category	WLAN Handset	☒ portable	☐ mixed mobile/portable
Intended Use	☐ -	☒ next to the ear	☒ body-worn
	☐ hand-held	☐ front-of-face	☐ limb-worn
		☐ body supported	☐ clothing-integrated

Prepared by

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Laboratory Accreditation	 Deutsche Akkreditierungsstelle D-PL-12139-01-00 The Test Center facility 'Dosimetric Test Lab' within IMST GmbH is accredited by the German National 'Deutsche Akkreditierungsstelle GmbH (DAkkS)' for testing according to the scope as listed in the accreditation certificate: D-PL-12139-01-00. The German Bundesnetzagentur (BNetzA) recognizes IMST GmbH as CAB-EMC on the basis of the Council Decision of 22. June 1998 concerning the conclusion of the MRA between the European Community and the United States of America (1999/178/EC) in accordance with § 4 of the Recognition Ordinance of 11. January 2016. The recognition is valid until 20. J uly 2021 under the registration number: BNetzA-CAB-16/21-14.  Bundesnetzagentur BNetzA-CAB-16/21-14		

Prepared for

Applicant	Ascom Sweden AB Grimbodalen 2 SE-41749 Goteborg Sweden
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Test Specification

Applied Rules/Standards	IEEE 1528-2013; RSS-102 Issue 5; FCC CFR 47 § 2.1093		
Exposure Category	☒ general public / uncontrolled exposure	☐ occupational / controlled exposure	
Test Result	☒ PASS	☐ FAIL	

Report Information

Data Stored	60320_6190358_Ascom_WH2		
Issue Date	July 08, 2019		
Revision Date	-		
Revision Number	- Note: A new revision replaces all previous revisions and thus, become invalid herewith.		
Remarks	This report relates only to the item(s) evaluated. This report shall not be reproduced, except in its entirety, without the prior written approval of IMST GmbH. The results and statements contained in this report reflect the evaluation for the certain model described above. The manufacturer is responsible for ensuring that all production devices meet the intent of the requirements described in this report.		



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1 Subject of Investigation and Test Results

The WH2 is a new WLAN Handset from Ascom Sweden AB operating in the IEEE 802.11 abgn, BT and BLE standards with one integrated SISO antenna (not capable of working in simultaneous transmission).

The objective of the measurements performed by IMST is the dosimetric assessment of one device in the intended use positions.

1.1 Technical Data of EUT

Product Specifications	
Model Name	WH2 (refer to chapter 1.2)
IMEI / SN / IMST EUT No.	- / T26106OFF1 / 01
Operation Mode	IEEE 802.11 abgn, BT and BLE
Frequency Range	2402 - 2480, 2412 – 2462 MHz; 5180 - 5320 MHz; 5500 - 5700 MHz; 5750 - 5825 MHz
Maximum Duty Cycle	100 %
Antenna Type	integrated SISO antenna (1xBT/WLAN)
Maximum Output Power	refer chapter 6.3
Power Supply	internal Li-polymer battery DC 3.7V (920mAh)
Used Accessory	belt clip, headset Plantronics HW251NC
EUT Stage	☒ production unit ☐ identical prototype
Notes:	

1.2 Product Family / Model Variants

As declared by the applicant, all variants of WH2-xxxx are electrically identical except for variants WH2-xCxx which had added components for IR/LF and man down/movement functionality.

1.3 Antenna Configuration

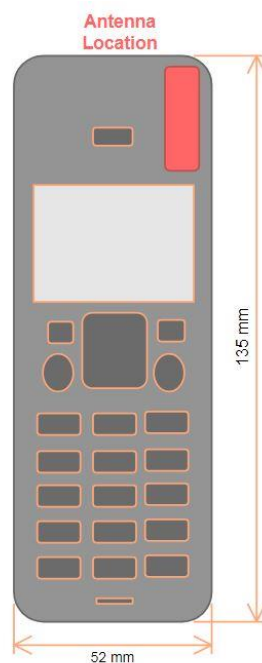


Fig. 1: Sketch of EUT and BT/WLAN antenna location (marked in red).

1.4 Test Specification / Normative References

The tests documented in this report have been performed according to the standards and rules described below.

Test Specifications		
Test Standard / Rule	Description	Issue Date
☒ IEEE 1528-2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.	June 14, 2013
☐ FCC CFR 47 § 2.1091	Code of Federal Regulations; Title 47. Radiofrequency radiation exposure evaluation: Mobile Devices.	October 01, 2010
☒ FCC CFR 47 § 2.1093	Code of Federal Regulations; Title 47. Radiofrequency radiation exposure evaluation: Portable Devices.	October 01, 2010
☒ RSS-102, Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)	March, 2015
Measurement Methodology KDB		
☒ KDB 865664 D01 v01r04	SAR measurement 100 MHz to 6 GHz	August 07, 2015
☒ KDB 865664 D02 v01r01	Exposure Reporting	October 23, 2015
Product KDB		
☒ KDB 447498 D01 v06	General RF Exposure Guidance	October 23, 2015
☒ KDB 648474 D04 v01r03	Handset SAR	October 23, 2015
Technology KDB		
☒ KDB 248227 D01 v02r02	802.11 Wi-Fi SAR	October 23, 2015

1.5 Attestation of Test Results

Highest Reported SAR _{1g} [W/kg]											
Band	Frequency [MHz]	CH	Mode	Equipment Class	Exposure Configuration		Gap [mm]	Pic. No.	Highest Reported SAR _{1g} [W/kg]	SAR _{1g} Limit [W/kg]	
BT	2440	38	DH1	DSS	Head	Left Cheek	0	4	0.045	1.6	PASS
	2480	78	DH1		Body Worn	Front	0	8	0.058	1.6	PASS
WiFi 2.4 GHz	2437	6	b	DTS	Head	Left Cheek	0	4	1.108	1.6	PASS
	2462	11	b		Body Worn	Front	0	8	1.301	1.6	PASS
WiFi 5 GHz	5700	140	n	NII	Head	Left Cheek	0	4	1.045	1.6	PASS
	5795	159	n		Body Worn	Front	0	8	1.586	1.6	PASS
Notes: To establish a connection at a specific channel and with maximum output power, engineering test software has been used. All measured SAR results and configurations are shown in chapter 6.6 on page 28.											

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2 Exposure Criteria and Limits

2.1 SAR Limits

Human Exposure Limits				
Condition	Uncontrolled Environment (General Population)		Controlled Environment (Occupational)	
	SAR Limit [W/kg]	Mass Avg.	SAR Limit [W/kg]	Mass Avg.
SAR averaged over the whole body mass	0.08	whole body	0.4	whole body
Peak spatially-averaged SAR for the head, neck & trunk	1.6	1g of tissue*	8.0	1g of tissue*
Peak spatially-averaged SAR in the limbs	4.0	10g of tissue*	20.0	10g of tissue*
Note: *Defined as a tissue volume in the shape of a cube				

Table 1: SAR limits specified in IEEE Standard C95.1-2005 and Health Canada's Safety Code 6.

In this report the comparison between the exposure limits and the measured data is made using the spatial peak SAR; the power level of the device under test guarantees that the whole body averaged SAR is not exceeded.

2.2 Exposure Categories

General Public / Uncontrolled Exposure
General population comprises individuals of all ages and of varying health status, and may include particularly susceptible groups or individuals. In many cases, members of the public are unaware of their exposure to electromagnetic fields. Moreover, individual members of the public cannot reasonably be expected to take precautions to minimize or avoid exposure.
Occupational / Controlled Exposure
The occupationally exposed population consists of adults who are generally exposed under known conditions and are trained to be aware of potential risk and to take appropriate precautions.

Table 2: RF exposure categories.

2.3 Distinction between Maximum Permissible Exposure and SAR Limits

The biological relevant parameter describing the effects of electromagnetic fields in the frequency range of interest is the specific absorption rate SAR (dimension: power/mass). It is a measure of the power absorbed per unit mass. The SAR may be spatially averaged over the total mass of an exposed body or its parts. The SAR is calculated from the r.m.s. electric field strength E inside the human body, the conductivity σ and the mass density ρ of the biological tissue:

$$SAR = \sigma \frac{E^2}{\rho} = c \frac{\partial T}{\partial t} \Big|_{t \rightarrow 0+} \quad (1)$$

The specific absorption rate describes the initial rate of temperature rise $\partial T / \partial t$ as a function of the specific heat capacity c of the tissue. A limitation of the specific absorption rate prevents an excessive heating of the human body by electromagnetic energy.

As it is sometimes difficult to determine the SAR directly by measurement (e.g. whole body averaged SAR), the standard specifies more readily measurable maximum permissible exposures in terms of external electric E and magnetic field strength H and power density S , derived from the SAR limits. The limits for E , H and S have been fixed so that even under worst case conditions, the limits for the specific absorption rate SAR are not exceeded.

3 The Measurement System

DASY is an abbreviation of „Dosimetric Assessment System“ and describes a system that is able to determine the SAR distribution inside a phantom of a human being according to different standards. The DASY4 system consists of the following items as shown in Fig: 2. Additionally, Fig: 3 shows the equipment, similar to the installations in other laboratories.

- Fully compliant with all current measurement standards as stated in Fig. 9
- High precision robot with controller
- Measurement server (for surveillance of the robot operation and signal filtering)
- Data acquisition electronics DAE (for signal amplification and filtering)
- Field probes calibrated for use in liquids
- Electro-optical converter EOC (conversion from the optical into a digital signal)
- Light beam (improving of the absolute probe positioning accuracy)
- Two SAM phantoms filled with tissue simulating liquid
- DASY4 software
- SEMCAD

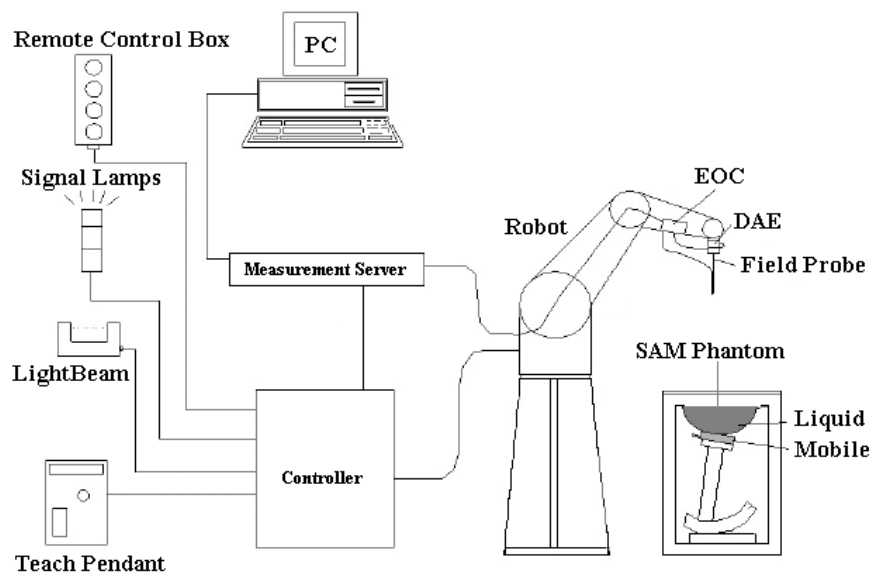


Fig. 2: The DASY4 measurement system.



Fig. 3: The measurement set-up with a DASY system and phantoms containing tissue simulating liquid.

The EUT operating at the maximum power level is placed by a non-metallic device holder (delivered from Schmid & Partner) in the above described positions at a shell phantom of a human being. The distribution of the electric field strength E is measured in the tissue simulating liquid within the shell phantom. For this miniaturised field probes with high sensitivity and low field disturbance are used. Afterwards the corresponding SAR values are calculated with the known electrical conductivity σ and the mass density ρ of the tissue in the SEMCAD FDTD software. The software is able to determine the averaged SAR values (averaging region 1 g or 10 g) for compliance testing.

The measurements are done by two scans: first a coarse scan determines the region of the maximum SAR, afterwards the averaged SAR is measured in a second scan within the shape of a cube.

3.1 Phantoms

TWIN SAM PHANTOM V4.0	
	Specific Anthropomorphic Mannequin defined in IEEE 1528 and IEC 62209-1 and delivered by Schmid & Partner Engineering AG. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. The details and the Certificate of conformity can be found in Fig. 10.
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)
Dimensions	Length: 1000 mm; Width: 500 mm Height: adjustable feet
Filling Volume	approx. 25 liters

3.2 E-Field-Probes

For the measurements the Dosimetric E-Field Probes ET3DV6R or EX3DV4 with following specifications are used. They are manufactured and calibrated in accordance with FCC and IEEE 1528-2013 recommendations annually by Schmid & Partner Engineering AG.

ET3DV6R	
Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system (ET3DV6 only) Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Dimensions	Overall length: 337 mm (Tip: 16 mm) Tip diameter: 6.8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.7 mm
Frequency	10 MHz to 2.3 GHz Linearity: ± 0.2 dB (30 MHz to 2.3 GHz)
Directivity	Axial isotropy: ± 0.2 dB in TSL (rotation around probe axis) Spherical isotropy: ± 0.4 dB in TSL (rotation normal to probe axis)
Dynamic Range	5 $\mu\text{W/g}$ to > 100 mW/g; Linearity: ± 0.2 dB
Calibration Range	450 MHz / 750 MHz / 835 MHz / 1750 MHz / 1900 MHz for head and body simulating liquid

EX3DV4	
Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	Axial isotropy: ± 0.3 dB in TSL (rotation around probe axis) Spherical isotropy: ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 $\mu\text{W/g}$ to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 $\mu\text{W/g}$)
Calibration Range	2450 MHz / 2600 MHz / 5250 MHz / 5600 MHz / 5800 MHz for head and body simulating liquid

4 Measurement Procedure

4.1 General Requirement

The test shall be performed in a laboratory with an environment which avoids influence on SAR measurements by ambient EM sources and any reflection from the environment itself. The ambient temperature shall be in the range of 20°C to 26°C and 30-70% humidity. All tests have been conducted according the latest version of all relevant KDBs.

4.2 Device Operating next to a Person's Ear

4.2.1 Phantom Requirements

The phantom is a simplified representation of the human anatomy and comprised of material with electrical properties similar to the corresponding tissues. The physical characteristics of the phantom model shall resemble the head and the neck of a user since the shape is a dominant parameter for exposure.

4.2.2 Test Positions

As it cannot be expected that the user will hold the mobile phone exactly in one well defined position, different operational conditions shall be tested. The standards require two test positions. For an exact description helpful geometrical definitions are introduced and shown in Fig. 4 - 6. There are two imaginary lines on the mobile, the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width w_t of the handset at the level of the acoustic output (point A on Fig. 4 and 6), and the midpoint of the width w_b of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Fig. 4). The horizontal line is also tangential to the face of the handset at point A. The two lines intersect at point A.

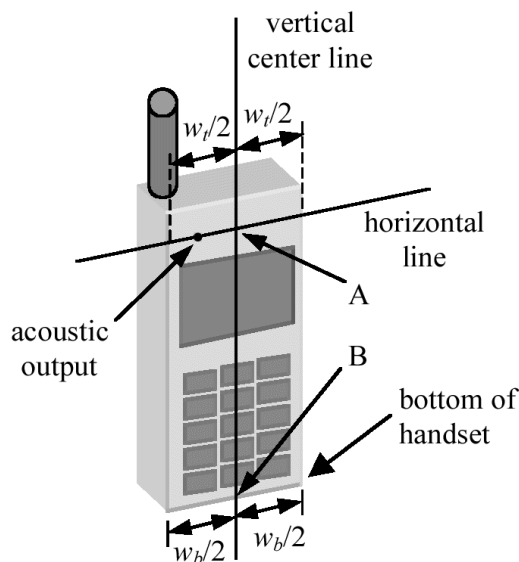


Fig. 4: Geometrical definitions on the telephone (bar phone).

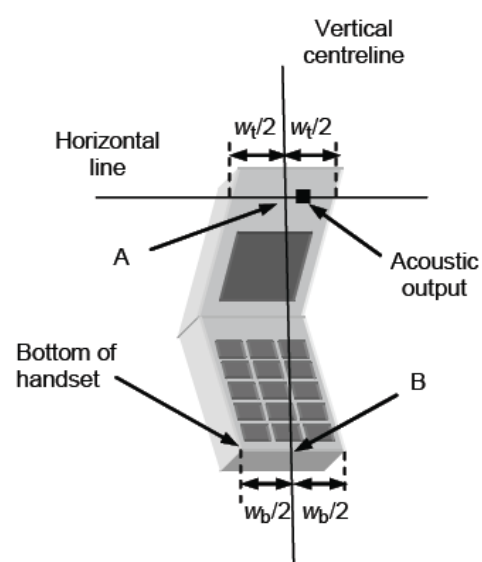


Fig. 5: Geometrical definitions on the telephone (clam shell or flip).

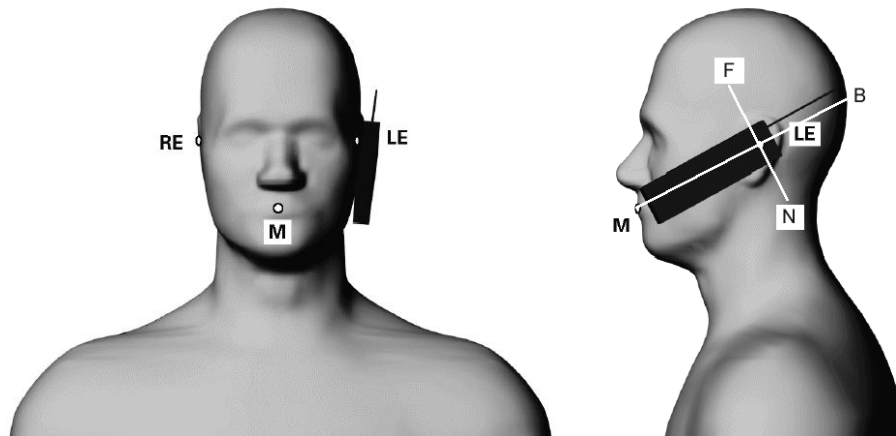


Fig. 6: Phantom reference points.

According to Fig. 6 the human head position is given by means of the following three reference points: auditory canal opening of both ears (RE and LE) and the center of the closed mouth (M). The ear reference points are 15 - 17 mm above the entrance to the ear canal along the BM line (back-mouth), as shown in Fig. 6. The plane passing through the two ear canals and M is defined as the reference plane. The line NF (Neck-Front) perpendicular to the reference plane and passing through the RE (or LE) is called the reference pivoting line. Line BM is perpendicular to the NF line. With this definitions the test positions are given by

- **Cheek Position (see Fig. 7):**

Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Fig. 6), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom. Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the ear. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane). Rotate the phone around the vertical centerline until the phone (horizontal line) is symmetrical with respect to the line NF. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the ear.

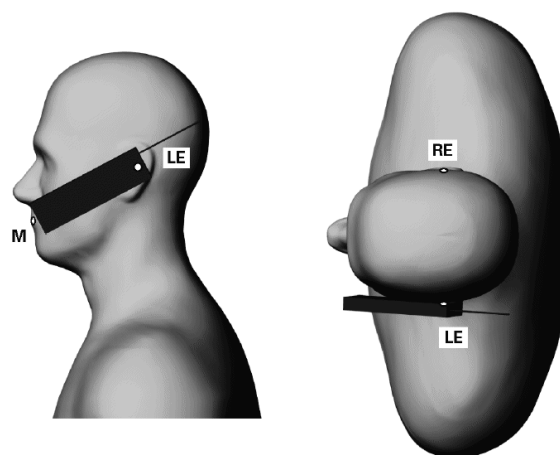


Fig. 7: The cheek position.

- **Tilted Position (see Fig. 8):**

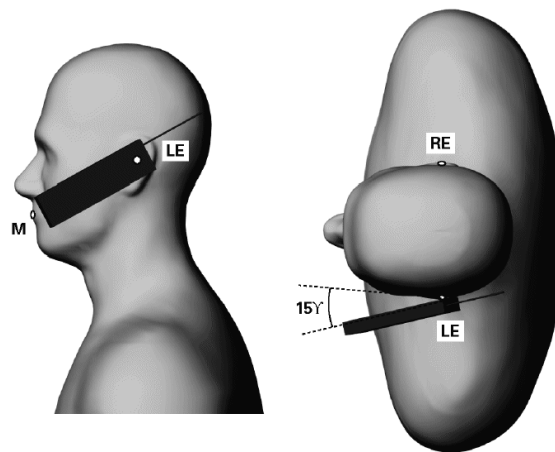


Fig. 8: The tilted position.

While maintaining the orientation of the phone retract the phone parallel to the reference plane far enough to enable a rotation of the phone by 15°. Rotate the phone around the horizontal line by 15°. While maintaining the orientation of the phone, move the phone parallel to the reference plane until any part of the phone touches the head. In this position, point A will be located on the line RE-LE.

4.2.3 Test to be Performed

The SAR test shall be performed with both phone positions described above, on the left and right side of the phantom. The device shall be measured for all modes operating when the device is next to the ear, even if the different modes operate in the same frequency band.

For devices with retractable antenna the SAR test shall be performed with the antenna fully extended and fully retracted. Other factors that may affect the exposure shall also be tested. For example, optional antennas or optional battery packs which may significantly change the volume, lengths, flip open/closed, etc. of the device, or any other accessories which might have the potential to considerably increase the peak spatial-average SAR value.

The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional.

4.3 Device Operating next to a Person's Body

Body-worn operating configurations are tested with available accessories applied on the device and positioned against a flat phantom in a normal use configuration. Per FCC KDB 648474, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in KDB 447498 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body worn accessory, measured without headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body worn accessory with a headset attached to the handset.

For purpose of determining test requirements, accessories may be divided into two categories: those that do not contain metallic components and those that do. For multiple accessories that do not contain metallic

components, the device may be tested only with that accessory which provides the closest spacing to the body.

For multiple accessories that contain metallic components, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component, only the accessory that provides the closest spacing to the body must be tested.

Devices that are designed to operate on the body of users using lanyards and straps, or without requiring additional body worn accessories, must be tested for SAR compliance using a conservative minimum test separation distance ≤ 5 mm to support compliance. Nevertheless, all accessories that contain metallic components must be tested for compliance additionally.

Other separation distances may be used, but they shall not exceed 2.5 cm.

4.3.1 Phantom Requirements

For body-worn and other configurations a flat phantom shall be used which is comprised of material with electrical properties similar to the corresponding tissues.

4.3.2 Test to be Performed

For devices with retractable antenna the SAR test shall be performed with the antenna fully extended and fully retracted. Other factors that may affect the exposure shall also be tested. For example, optional antennas or optional battery packs which may significantly change the volume, lengths, flip open/closed, etc. of the device, or any other accessories which might have the potential to considerably increase the peak spatial-average SAR value.

The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at the middle channel resp. that channel with the highest output power for each test configuration is < 0.4 W/kg, testing at the high and low channels is optional.

4.4 Information for IEEE 802.11 (Wi-Fi) Transmitters

For both DSSS and OFDM wireless modes an initial test position must be established for each applicable exposure configuration using either:

- Design implementation defined by the manufacturer, or
- Investigative results by the test lab based on:
 - Exclusions based on the distance from the antenna to the surface, or
 - Highest measured SAR from the area-scan-only measurements on all applicable test positions at the Initial Test Configuration, if found to require SAR tests.

Then, the initial test position procedure defines the required complete SAR scan measurements on each exposure configuration as following:

- When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurements is not required for the remaining test positions in that configuration as well as 802.11 transmission mode combinations within the frequency or aggregated band.
- When the reported SAR of the initial test position is > 0.4 W/kg, further SAR measurements is required in the initial test position or next closest/smallest test separation distance based on

manufacturer justification, on the following highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.

- When the reported SAR for all initial and subsequent test positions is > 0.8 W/kg, further SAR measurements is required on these positions on the subsequent next highest measured output power channels, until the reported SAR is ≤ 1.2 W/kg or all required channels have been tested.

For OFDM transmission configurations in 2.4 GHz and 5 GHz bands, it is important to determine SAR Initial Test Configuration for each stand alone and aggregated frequency band according to the maximum output power and tune-up tolerance specified for production units. The procedure is as following:

- Highest output power channel is chosen; if there are channels with same maximum output power then the closest to the mid-band frequency is preferred. If there are more than one channel with same maximum output power and same distance to the mid-band frequency, then the channel with the higher frequency is preferred.
- When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel in the subsequent test configuration.

Along with the initial test position reduction guidelines, the following procedures are also applied to SAR measurement requirements when multiple OFDM configurations are supported:

- When the reported SAR of the initial test configuration with the highest output power channel is > 0.8 W/kg, further SAR measurements is required for next highest output power channel in the initial test configuration, until the reported SAR is ≤ 1.2 W/kg or all required channels have been tested.
- When the reported SAR of the subsequent test configuration with the highest output power channel is > 1.2 W/kg, further SAR measurements is required for next highest output power channel in this test configuration, until the reported SAR is ≤ 1.2 W/kg or all required channels have been tested.
- When the reported SAR of the subsequent test configuration is > 1.2 W/kg, further SAR measurements for the following subsequent test configurations are required.

4.5 Measurement Procedure

The following steps are used for each test position:

- Establish a call with the maximum output power with a base station simulator. The connection between the mobile phone and the base station simulator is established via air interface.
- Measurement of the local E-field value at a fixed location (P1). This value serves as a reference value for calculating a possible power drift.
- Measurement of the SAR distribution with resolution settings for area scan and zoom scan according KDB 865664 D01 as shown in Table 3.
- The used extrapolation and interpolation routines are all based on the modified Quadratic Shepard's method [DASY4].
- Repetition of the E-field measurement at the fixed location (P1) and repetition of the whole procedure if the two results differ by more than $\pm 0.21\text{dB}$.

			≤ 3 GHz	≥ 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx _{Area} , Δy _{Area}			≤ 2 GHz: ≤ 15 mm 2 - 3 GHz: ≤ 12 mm	3 - 4 GHz: ≤ 12 mm 4 - 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: ΔX _{Zoom} , ΔY _{Zoom}			≤ 2 GHz: ≤ 8 mm 2 - 3 GHz: ≤ 5 mm*	3 - 4 GHz: ≤ 5 mm* 4 - 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	Uniform grid: ΔZ _{Zoom} (n)		≤ 5 mm	3 - 4 GHz: ≤ 4 mm 4 - 5 GHz: ≤ 3 mm 5 - 6 GHz: ≤ 2 mm
	graded grid	ΔZ _{Zoom} (1): between 1 st two points closest to phantom surface	≤ 4 mm	3 - 4 GHz: ≤ 3 mm 4 - 5 GHz: ≤ 2.5 mm 5 - 6 GHz: ≤ 2 mm
		ΔZ _{Zoom} (n>1): between subsequent points	≤ 1.5· ΔZ _{Zoom} (n-1)	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 - 4 GHz: ≥ 28 mm 4 - 5 GHz: ≥ 25 mm 5 - 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium: see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz				

Table 3: Parameters for SAR scan procedures.

4.6 Measurement Variability

According to KDB 865664 repeated measurements are required only when the measured SAR is ≥ 0.80 W/kg. If the measured SAR value of the initial repeated measurement is < 1.45 W/kg with $\leq 20\%$ variation, only one repeated measurement is required to reaffirm that the results are not expected to have substantial variations, which may introduce significant compliance concerns. A second repeated measurement is required only if the measured result for the initial repeated measurement is within 10% of the SAR limit and vary by more than 20%, which are often related to device and measurement setup difficulties. The following procedures are applied to determine if repeated measurements are required.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg ($\sim 10\%$ from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

5 System Verification and Test Conditions

5.1 Date of Testing

Date of Testing				
Band	Test Position	Frequency [MHz]	Date of System Check	Date of SAR Measurement
BT	Head	2450	May 17, 2019	May 17, 2019
IEEE 802.11 b WLAN 2.4 GHz		2450	March 12, 2019	March 12 - 13, 2019
IEEE 802.11 a WLAN 5 GHz		5250	March 26, 2019	March 26 - 27, 2019
IEEE 802.11 n WLAN 5 GHz		5250	April 01, 2019	April 01 - 02, 2019
IEEE 802.11 n WLAN 5 GHz		5600 / 5750	April 03, 2019	April 03 - 04, 2019
BT	Body	2450	May 16, 2019	May 16, 2019
IEEE 802.11 b WLAN 2.4 GHz		2450	March 06, 2019	March 06 - 07, 2019
IEEE 802.11 an WLAN 5 GHz		5250 / 5600 / 5750	March 19, 2019	March 19 - 20, 2019

Table 4: Date of testing.

5.2 Environment Conditions

Environment Conditions		
Ambient Temperature[°C]	Liquid Temperature [°C]	Humidity [%]
22.0 ± 2	22.0 ± 2	40.0 ± 10
Notes: To comply with the required noise level (less than 12 mW/kg) periodically measurements without a DUT were conducted.		

Table 5: Environment Conditions.

5.3 Tissue Simulating Liquid Recipes

Tissue Simulating Liquid								
Frequency Range		Water	Tween 20	Tween 80	Salt	Preventol	DGME	Triton X/100
[MHz]		[%]	[%]	[%]	[%]	[%]	[%]	[%]
Head Tissue								
☐	450	50.8	47.5	-	1.6	0.1	-	-
☐	700 - 1000	52.8	46.0	-	1.1	0.1	-	-
☐	1600 - 1800	55.4	44.1	-	0.4	0.1	-	-
☐	1850 - 1980	55.2	44.5	-	0.2	0.1	-	-
☒	2000 - 2700	55.7	45.2	-	-	0.1	-	-
☒	5000 - 6000	65.5	-	-	-	-	17.25	17.25
Body Tissue								
☐	450	71.0	28.0	-	0.9	0.1	-	-
☐	700 - 1000	71.2	28.0	-	0.7	0.1	-	-
☐	1600 - 1800	71.4	28.0	-	0.5	0.1	-	-
☐	1850 - 1980	71.5	28.0	-	0.4	0.1	-	-
☒	2000 - 2700	71.6	28.0	-	0.3	0.1	-	-
☒	5000 - 6000	79.9	-	20.0	-	0.1	-	-

Table 6: Recipes of the tissue simulating liquid.

5.4 Tissue Simulating Liquid Parameters

For the measurement of the following parameters the Speag DAK-3.5 dielectric probe kit is used, representing the open-ended coaxial probe measurement procedure.

Recommended values for the dielectric parameters of the tissue simulating liquids are given in IEEE 1528 and FCC published RF Exposure KDB Procedures. All tests were carried out using liquids with dielectric parameters within +/- 5% of the recommended values. The dielectric properties of the tissue simulating liquid have been measured within 24 h before SAR testing. The depth of the tissue simulant was at least 15.0 cm for all system check and device tests, measured from the ear reference point in case of the SAM phantom and from the inner surface of the flat phantom.

Tissue Simulating Liquids Head									
Ambient Temperature(C) : 22.0 ± 2				Liquid Temperature(C) : 22.0 ± 2			Humidity(%) : 40.0 ± 5		
Band	Date	Frequency	Channel	Permittivity			Conductivity		
		Measured		Target	Delta	Measured	Target	Delta	
		ε'		ε'	+/- 5 [%]	σ [S/m]	σ [S/m]	+/- 5 [%]	
BT 2.4 GHz	May 17, 2019	2450	System Check	37.7	39.2	-3.7	1.86	1.80	3.1
		2402	0	37.9	39.3	-3.4	1.80	1.76	2.7
		2440	38	37.8	39.2	-3.6	1.84	1.79	2.9
		2480	78	37.6	39.2	-3.9	1.89	1.83	3.1
WLAN 2.4 GHz	March 12, 2019	2450.0	System Check	39.6	39.2	1.0	1.87	1.80	3.7
		2412.0	1	39.7	39.3	1.1	1.82	1.76	3.2
		2437.0	6	39.6	39.2	1.0	1.85	1.79	3.4
		2462.0	11	39.5	39.2	0.9	1.88	1.81	3.8

Table 7: Parameters of the head tissue simulating liquid for BT and WLAN 2.4GHz.

Tissue Simulating Liquids Head									
Ambient Temperature(C) : 22.0 ± 2				Liquid Temperature(C) : 22.0 ± 2			Humidity(%) : 40.0 ± 5		
WLAN 5 GHz U-NII-1 U-NII-2A	March 26, 2019	5250.0	System Check	37.5	35.9	4.3	4.63	4.71	-1.6
		5180.0	36	37.6	36.0	4.4	4.54	4.63	-2.1
		5220.0	44	37.5	36.0	4.3	4.60	4.68	-1.5
		5240.0	48	37.5	35.9	4.3	4.62	4.70	-1.6
		5260.0	52	37.4	35.9	4.2	4.64	4.72	-1.7
		5300.0	60	37.3	35.9	3.9	4.68	4.76	-1.7
		5320.0	64	37.2	35.8	3.9	4.72	4.78	-1.3
WLAN 5 GHz U-NII-1 U-NII-2A	April 01, 2019	5250.0	System Check	35.8	35.9	-0.4	4.57	4.71	-2.9
		5180.0	36	35.9	36.0	-0.2	4.49	4.63	-3.2
		5190.0	38	35.9	36.0	-0.2	4.50	4.64	-3.1
		5210.0	42	35.9	36.0	-0.3	4.53	4.67	-2.9
		5230.0	46	35.8	36.0	-0.3	4.55	4.69	-2.9
		5240.0	48	35.8	35.9	-0.3	4.56	4.70	-3.0
		5260.0	52	35.8	35.9	-0.4	4.58	4.72	-2.8
		5290.0	58	35.7	35.9	-0.5	4.61	4.75	-2.9
		5310.0	62	35.6	35.9	-0.7	4.64	4.77	-2.7
		5320.0	64	35.6	35.8	-0.7	4.66	4.78	-2.6
WLAN 5 GHz U-NII-2C	April 03, 2019	5600.0	System Check	35.6	35.5	0.1	4.97	5.07	-1.8
		5500.0	100	35.8	35.6	0.4	4.85	4.96	-2.2
		5510.0	102	35.8	35.6	0.4	4.86	4.97	-2.2
		5530.0	106	35.7	35.6	0.3	4.89	4.99	-2.1
		5640.0	128	35.5	35.5	0.0	5.02	5.11	-1.7
		5700.0	140	35.3	35.4	-0.2	5.09	5.17	-1.5
		5710.0	142	35.3	35.4	-0.2	5.10	5.18	-1.4
WLAN 5 GHz U-NII-3	April 03, 2019	5800.0	System Check	35.1	35.3	-0.4	5.20	5.27	-1.3
		5785.0	157	35.2	35.3	-0.4	5.19	5.25	-1.2
		5795.0	159	35.2	35.3	-0.4	5.20	5.26	-1.3
		5825.0	165	35.1	35.3	-0.5	5.24	5.30	-1.1
Notes:									

Table 8: Parameters of the head tissue simulating liquid for WLAN 5GHz.

Tissue Simulating Liquids Body									
Ambient Temperature(C) : 22.0 ± 2				Liquid Temperature(C) : 22.0 ± 2			Humidity(%) : 40.0 ± 5		
Band	Date	Frequency	Channel	Permittivity			Conductivity		
		Measured		Target	Delta	Measured	Target	Delta	
		[MHz]		ε'	ε'	+/- 5 [%]	σ [S/m]	σ [S/m]	+/- 5 [%]
BT 2.4 GHz	May 16, 2019	2450	System Check	50.7	52.7	-3.8	2.04	1.95	4.7
		2402	0	50.8	52.8	-3.7	1.98	1.90	4.3
		2441	39	50.7	52.7	-3.8	2.03	1.94	4.5
		2480	78	50.6	52.7	-3.9	2.08	1.99	4.3
WLAN 2.4 GHz	March 06, 2019	2450.0	System Check	51.5	52.7	-2.2	2.02	1.95	3.7
		2412.0	1	51.6	52.8	-2.2	1.98	1.91	3.3
		2437.0	6	51.6	52.7	-2.2	2.01	1.94	3.6
		2462.0	11	51.5	52.7	-2.3	2.03	1.96	3.6
WLAN 5 GHz U-NII-1 U-NII-2A	March 19, 2019	5250.0	System Check	47.4	48.9	-3.2	5.45	5.36	1.6
		5180.0	36	47.6	49.0	-3.0	5.34	5.28	1.2
		5190.0	38	47.6	49.0	-3.0	5.36	5.29	1.3
		5210.0	42	47.5	49.0	-3.0	5.39	5.31	1.5
		5220.0	44	47.5	49.0	-3.0	5.40	5.32	1.5
		5230.0	46	47.5	49.0	-3.1	5.41	5.33	1.5
		5260.0	52	47.4	48.9	-3.2	5.46	5.37	1.7
		5290.0	58	47.3	48.9	-3.3	5.51	5.40	1.9
		5300.0	60	47.3	48.9	-3.3	5.52	5.42	1.9
		5310.0	62	47.2	48.9	-3.3	5.54	5.43	2.0
WLAN 5 GHz U-NII-2C	March 19, 2019	5320.0	64	47.2	48.9	-3.3	5.55	5.44	2.1
		5600.0	System Check	46.5	48.5	-4.1	5.96	5.77	3.4
		5500.0	100	46.7	48.6	-3.8	5.81	5.65	2.8
		5510.0	102	46.7	48.6	-3.9	5.83	5.66	2.9
		5530.0	106	46.7	48.6	-3.9	5.86	5.68	3.1
		5700.0	140	46.2	48.3	-4.4	6.12	5.88	4.1
WLAN 5 GHz U-NII-3	March 19, 2019	5710.0	142	46.2	48.3	-4.4	6.14	5.89	4.1
		5800.0	System Check	46.0	48.2	-4.6	6.28	6.00	4.6
		5745.0	149	46.1	48.3	-4.5	6.19	5.94	4.3
		5785.0	157	46.0	48.2	-4.6	6.26	5.98	4.6
		5795.0	159	46.0	48.2	-4.6	6.27	5.99	4.6
		5825.0	165	45.9	48.2	-4.7	6.32	6.03	4.8
Notes:									

Table 9: Parameters of the body tissue simulating liquid.

5.5 Simplified Performance Checking

The simplified performance check was realized using the dipole validation kit. The input power of the dipole antenna was 250 mW (CW) and it was placed under the flat part of the SAM phantom. The target and measured results are listed in the table 10 and shown in Appendix C - System Verification Plots. The target values were adopted from the calibration certificates found also in the appendix.

System Check Results										
Frequency [MHz]	Dipole #SN	SAR Values with Head TSL [W/kg]								Date
		Measured				Target		Delta		
		with 250 mW		scaled to 1 W		normalized to 1 W		+/- 10 [%]		
		1g	10g	1g	10g	1g	10g	1g	10g	
2450	D2450V2 #709	14.40	6.64	57.60	26.56	53.50	25.00	7.66	6.24	May 17, 2019
2450	D2450V2 #709	14.50	6.75	58.00	27.00	53.50	25.00	8.41	8.00	March 12, 2019
5250	D5GHzV2 #1028	19.20	5.43	76.80	21.72	79.60	23.00	-3.52	-5.57	March 26, 2019
5600	D5GHzV2 #1028	19.70	5.50	78.80	22.00	82.50	23.70	-4.48	-7.17	
5800	D5GHzV2 #1028	18.70	5.19	74.80	20.76	78.70	22.60	-4.96	-8.14	
5250	D5GHzV2 #1028	18.40	5.21	73.60	20.84	79.60	23.00	-7.54	-9.39	April 01, 2019
5600	D5GHzV2 #1028	20.20	5.65	80.80	22.60	82.50	23.70	-2.06	-4.64	April 03, 2019
5800	D5GHzV2 #1028	18.70	5.22	74.80	20.88	78.70	22.60	-4.96	-7.61	
Frequency [MHz]	Dipole #SN	SAR Values with Body TSL [W/kg]								Date
		Measured				Target		Delta		
		with 250 mW		scaled to 1 W		normalized to 1 W		+/- 10 [%]		
		1g	10g	1g	10g	1g	10g	1g	10g	
2450	D2450V2 #709	12.80	5.91	51.20	23.64	51.20	24.00	0.00	-1.50	May 16, 2019
2450	D2450V2 #709	13.80	6.37	55.20	25.48	51.20	24.00	7.81	6.17	March 06, 2019
5250	D5GHzV2 #1028	17.80	4.98	71.20	19.92	74.90	21.10	-4.94	-5.59	March 19, 2019
5600	D5GHzV2 #1028	18.70	5.18	74.80	20.72	79.10	22.20	-5.44	-6.67	
5800	D5GHzV2 #1028	17.60	4.85	70.40	19.40	76.40	21.30	-7.85	-8.92	

Table 10: Dipole target and measured results.

6 SAR Measurement Conditions and Results

6.1 Test Conditions

Test Conditions					
Band	TX Range [MHz]	RX Range [MHz]	Used Channels	Crest Factor	Phantom
BT	2402.0 – 2480.0	2402.0 – 2480.0	0, 38, 79	1	SAM Twin Phantom V4.0
WLAN 2.4 GHz	2412.0 – 2462.0	2412.0 – 2462.0	1, 6, 11	1	
WLAN 5 GHz U-NII-1 / U-NII-2A	5180.0 – 5320.0	5180.0 – 5320.0	36, 38, 42, 44, 46, 48, 52, 58, 60, 62, 64	1	
WLAN 5 GHz U-NII-2C	5500.0 – 5700.0	5500.0 – 5700.0	100, 102, 106, 140	1	
WLAN 5 GHz U-NII-3	5750.0 – 5825.0	5750.0 – 5825.0	159, 165	1	
Notes: Testing has been performed with configuration of 100% continuous wave with engineering test mode.					

Table 11: Used channels and crest factors during the test.

6.2 Tune-Up Information

Tune-Up Information for DUT			
Band	Mode	Frequency [MHz]	Max. Tune-Up Tolerance Limit [dBm]
BT 2.4	EDR	2402 – 2480	8.50
	LE	2402 – 2480	6.00
WLAN 2.4	b	2412 – 2462	17.50
	g	2412 – 2462	17.00
	n-HT20	2412 – 2462	15.00
WLAN 5.2 / 5.3 / 5.5 U-NII-1 / U-NII-2A / U-NII-2C	a	5180 – 5700	16.25
WLAN 5.8 U-NII-3	a	5745 - 5825	15.75
WLAN 5.2 / 5.3 / 5.5 U-NII-1 / U-NII-2A / U-NII-2C	n-HT20	5180 – 5700	16.25
WLAN 5.8 U-NII-3	n-HT20	5745 - 5825	15.75
WLAN 5.2 / 5.3 / 5.5 U-NII-1 / U-NII-2A / U-NII-2C	n-HT40	5180 – 5700	16.25
WLAN 5.8 U-NII-3	n-HT40	5745 - 5825	15.75
WLAN 5.2 / 5.3 / 5.5 U-NII-1 / U-NII-2A / U-NII-2C	ac-VHT80	5180 – 5700	13.25
WLAN 5.8 U-NII-3	ac-VHT80	5745 - 5825	12.75

Table 12: Maximum transmitting output power values used for SAR measurements (declared by the manufacturer).

6.3 Measured Output Power

6.3.1 BT Output Power

Max. Averaged Output Power [dBm]			
Mode	Frequency [MHz]	Measured Output Power	
		[dBm]	[mW]
GFSK	2402	7.9	6.2
	2440	8.0	6.3
	2480	7.5	5.6
$\pi/4$ - DPSK	2402	6.5	4.5
	2440	6.1	4.1
	2480	5.3	3.4
8 - DPSK	2402	6.9	4.9
	2440	6.4	4.4
	2480	5.6	3.6
BLE	2402	5.1	3.2
	2440	5.3	3.4
	2480	4.8	3.0
Notes: -			

Table 13: Conducted output power values for BT/BLE.

6.3.2 WLAN 2.4 GHz Output Power

Measurements for IEEE 802.11 b/g/n has been performed with test software settings with power level supported by the device and a value for setting the power of -129 provided by the manufacturer.

Max. Averaged Output Power (RMS) [dBm]																
Mode	Frequency [MHz]	CH	Data Rate [Mbit/s]													
			1		2		5.5		11							
2.4 GHz Range																
b	2412	1	16.55		-		-		-							
	2437	6	16.42		-		-		-							
	2462	11	16.69		-		-		-							
Mode	Frequency [MHz]	CH	Data Rate [Mbit/s]													
			6.0		9		12		18		24		36		48	
g	2412	1*	16.15	-	-	-	-	-	-	-	-	-	-	-	-	-
	2437	6	16.30	-	-	-	-	-	-	-	-	-	-	-	-	-
	2462	11*	16.57	-	-	-	-	-	-	-	-	-	-	-	-	-
Mode	Frequency [MHz]	CH	MCS Index No.													
			MCS0		MCS1		MCS2		MCS3		MCS4		MCS5		MCS6	
n HT20	2412	1	14.13	-	-	-	-	-	-	-	-	-	-	-	-	-
	2437	6	14.03	-	-	-	-	-	-	-	-	-	-	-	-	-
	2462	11	14.31	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: SAR measurement have been performed on channel 1, 6 and 11, but the end product will be with reduced output power on channel 1 and 11 in mode g in order to fulfill band edge requirements. * channel with reduced output power due to band edge requirements																

Table 14: Conducted output power values for IEEE 802.11 b/g/n.

6.3.3 WLAN 5 GHz Output Power

Measurements for IEEE 802.11 a/n/ac have been performed with test software settings with power level supported by the device and a value for setting the power of -129 provided by the manufacturer resulting in measured output power as shown in Table 15 - 16. However, due to band edge requirements the end product will be with reduced output power and tune-up values on channels as shown in Table 17.

Max. Averaged Output Power (RMS) [dBm]										
Mode	Frequency [MHz]	Data Rate [Mbit/s]								
		CH	6.0	9	12	18	24	36	48	54
5.2 - 5.3 GHz Range										
a - HT20	5180	36*	15.43	-	-	-	-	-	-	-
	5200	40	-	-	-	-	-	-	-	-
	5220	44	15.46	-	-	-	-	-	-	-
	5240	48	15.59	-	-	-	-	-	-	-
a - HT20	5260	52	15.63	-	-	-	-	-	-	-
	5280	56	-	-	-	-	-	-	-	-
	5300	60	15.55	-	-	-	-	-	-	-
	5320	64*	15.43	-	-	-	-	-	-	-
5.5 - 5.8 GHz Range										
a - HT20	5500	100*	15.18	-	-	-	-	-	-	-
	5560	112	15.34	-	-	-	-	-	-	-
	5700	140*	14.79	-	-	-	-	-	-	-
a - HT20	5745	149	14.56	-	-	-	-	-	-	-
	5785	157	14.46	-	-	-	-	-	-	-
	5825	165	14.28	-	-	-	-	-	-	-
Mode	Frequency [MHz]	CH	MCS Index No.							
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
5.2 - 5.3 GHz Range										
n - HT20	5180	36*	15.05	-	-	-	-	-	-	-
	5200	40	-	-	-	-	-	-	-	-
	5220	44	15.13	-	-	-	-	-	-	-
	5240	48	15.17	-	-	-	-	-	-	-
n - HT20	5260	52	15.09	-	-	-	-	-	-	-
	5280	56	-	-	-	-	-	-	-	-
	5300	60	15.25	-	-	-	-	-	-	-
	5320	64*	15.09	-	-	-	-	-	-	-
5.5 - 5.8 GHz Range										
n - HT20	5500	100*	14.84	-	-	-	-	-	-	-
	5560	112	14.92	-	-	-	-	-	-	-
	5700	140*	14.30	-	-	-	-	-	-	-
	5745	149	14.12	-	-	-	-	-	-	-
n - HT20	5785	157	14.02	-	-	-	-	-	-	-
	5825	165	13.88	-	-	-	-	-	-	-
Notes: SAR measurement have been performed on channels representing the worst case scenarios with the highest output power, but the end product will be with reduced output power on channels marked with * to fulfill band edge requirements.										

Table 15: Conducted output power values for IEEE 802.11 a/n - 5 GHz, HT20.

Max. Averaged Output Power (RMS) [dBm]										
Mode	Frequency [MHz]	CH	MCS Index No.							
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
5.2 - 5.3 GHz Range										
n – HT40	5190	38*	14.99	-	-	-	-	-	-	-
	5230	46	15.17	-	-	-	-	-	-	-
	5270	54	15.15	-	-	-	-	-	-	-
	5310	62*	15.13	-	-	-	-	-	-	-
ac – HT80	5210	42*	12.40	-	-	-	-	-	-	-
	5290	58	12.49	-	-	-	-	-	-	-
5.5 - 5.8 GHz Range										
n – HT40	5510	102*	14.92	-	-	-	-	-	-	-
	5550	110	14.96	-	-	-	-	-	-	-
n – HT40	5670	134	14.60	-	-	-	-	-	-	-
	5755	151	14.14	-	-	-	-	-	-	-
	5795	159	14.00	-	-	-	-	-	-	-
ac – HT80	5530	106*	12.34	-	-	-	-	-	-	-
	5775	155	11.40	-	-	-	-	-	-	-
Notes: SAR measurement have been performed on channels representing the worst case scenarios with the highest output power, but the end product will be with some reduced output power channels marked with * to fulfill band edge requirements. * channel will be with reduced output power due to band edge requirements										

Table 16: Conducted output power values for IEEE 802.11 n/ac - 5 GHz, HT40 and HT80.

Tune-Up Information for End Product			
Band	Mode	Channel	Max. Tune-Up Tolerance Limit [dBm]
WLAN 2.4	b	1, 6, 11	17.50
	g	6	17.00
		1, 11	13.00
	n-HT20	1, 6, 11	15.00
WLAN 5.2 / 5.3 / 5.5 U-NII-1 / U-NII-2A / U-NII-2C	a	44, 48, 52, 60, 112	16.25
		36, 64, 100	13.25
		140	15.75
WLAN 5.8 U-NII-3	a	149, 157, 165	15.75
WLAN 5.2 / 5.3 / 5.5 U-NII-1 / U-NII-2A / U-NII-2C	n-HT20	44, 48, 52, 60, 112	16.25
		36, 64, 100	14.25
		140	13.75
WLAN 5.8 U-NII-3	n-HT20	149, 157, 165	15.75
WLAN 5.2 / 5.3 / 5.5 U-NII-1 / U-NII-2A / U-NII-2C	n-HT40	46, 54, 110, 134	16.25
		38, 62, 102	12.25
		142	15.75
WLAN 5.8 U-NII-3	n-HT40	151, 159	15.75
WLAN 5.2 / 5.3 / 5.5 U-NII-1 / U-NII-2A / U-NII-2C	ac-VHT80	42, 58, 106	11.25
		138	12.75
WLAN 5.8 U-NII-3	ac-VHT80	155	12.75

Table 17: Maximum transmitting output power declared by manufacturer after reducing output power levels (due to band edge requirements).

6.4 Standalone SAR Test Exclusion according to KDB 447498

SAR test exclusion is determined for the EUT according to KDB 447498 D01 with 1g SAR exclusion thresholds for 100 MHz to 6GHz at test separation distances ≤ 50 mm determined by:

$$[(\text{max power of channel. incl. tune-up tolerance. mW}) / (\text{min test separation distance. mm})] * [\sqrt{f(\text{GHz})}]$$

≤ 3.0 for 1g SAR and ≤ 7.5 for 10g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Standalone SAR Test Exclusion								
Mode	Frequency [MHz]	Distance [mm]	Pavg		Calculated Values	Exclusion Threshold SAR 1g	Testing Exclusion	Testing Required
			[dBm]	[mW]				
BT	2440	5	8.5	7.08	2.2	≤ 3.0	YES	NO
BLE	2440	5	6.0	3.98	1.2	≤ 3.0	YES	NO
WLAN	2450	5	17.5	56.23	17.6	≤ 3.0	NO	YES
	5250	5	16.25	42.17	19.3	≤ 3.0	NO	YES
	5600	5	16.25	42.17	20.0	≤ 3.0	NO	YES
	5750	5	15.75	37.58	18.0	≤ 3.0	NO	YES

Table 18: SAR test exclusion for the applicable transmitter according to KDB 447498.

When the standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas the standalone SAR must be estimated according to KDB 447498 in order to determine simultaneous transmission SAR test exclusion:

- $(\text{max. power of channel. including tune-up tolerance. mW}) / (\text{min. test separation distance. mm}) * [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$ for test separation distances ≤ 50 mm;
where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

- 0.4 W/kg for 1g SAR and 1.0 W/kg for 10g SAR. when the test separation distance is > 50 mm

6.5 SAR Test Exclusion Consideration according to RSS-102

Standalone SAR Test Exclusion Consideration (ISED)										
Mode	Freq.	Distance	Output Power (peak)		Maximum Duty Cycle	Output Power (average)		Exemption Limit for 1g SAR [mW]	SAR Testing Exclusion	SAR Testing Required
	[MHz]	[mm]	[dBm]	[mW]	[%]	[dBm]	[mW]	HEAD/BODY	HEAD/BODY	HEAD/BODY
BT EDR	2440	5	8.5	7.08	77.00	7.4	5.45	4.0	NO	YES
BLE	2440	5	6.0	3.98	10.00	-4.0	0.40	4.0	YES	NO
WLAN	2450	5	17.50	56.23	100.00	17.50	56.23	4.0	NO	YES
	5250	5	16.25	42.17	100.00	16.25	42.17	2.0	NO	YES
	5600	5	16.25	42.17	100.00	16.25	42.17	1.5	NO	YES
	5750	5	15.75	37.58	100.00	15.75	37.58	1.0	NO	YES

Table 19: SAR test exclusion for the applicable transmitter according to RSS-102, section 2.5.1.

6.6 SAR Results

The tables below contain the measured SAR values averaged over a mass of 1g. SAR assessment was conducted in the worst case configuration with output power values according to Table 12. According to KDB 447498 D01, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.

Reported SAR is calculated by the following formulas:

- Scaling factor tune up limit = tune-up limit power (mW) / RF power (mW)
- Scaling factor max. duty cycle = max. possible duty cycle / used duty cycle for SAR measurement
- Reported SAR = measured SAR * scaling factor tune up limit * scaling factor max. duty cycle

The plots with the highest measured SAR values are shown in Appendix B - SAR Distribution Plots.

SAR Measurement Results in Head Configurations (BT)												
Band	Freq. [MHz]	CH	Mode [Mbit/s]	EUT* position	Pic. No.	Measured SAR1g [W/kg]	Power Drift [dB]	Output Power [dBm]		Scaling Factor	Reported SAR1g [W/kg]	Plot No.
								Measured	Limit			
BT	2440	38	1	LC	4	0.040	0.082	8.0	8.50	1.122	0.045	1
				LT	5	0.032	0.169	8.0	8.50	1.122	0.036	-
				RC	6	0.036	-0.024	8.0	8.50	1.122	0.040	-
				RT	7	0.034	-0.090	8.0	8.50	1.122	0.038	-
	2402	0	1	LC	4	0.039	-0.038	7.9	8.50	1.148	0.045	-
	2480	79	1	LC	4	0.034	0.193	7.5	8.50	1.259	0.043	-

Table 20: SAR measurement results in head configuration for BT.

SAR Measurement Results in Head Configurations (WLAN 2.4 GHz)												
Band	Freq. [MHz]	CH	Mode [Mbit/s]	EUT* position	Pic. No.	Measured SAR1g [W/kg]	Power Drift [dB]	Output Power [dBm]		Scaling Factor	Reported SAR1g [W/kg]	Plot No.
								Measured	Limit			
IEEE 802.11 b	2437	6	1	LC	4	0.864	0.171	16.4	17.5	1.282	1.108	2
				LC-r	4	0.862	0.029	16.4	17.5	1.282	1.105	-
				LT	5	0.695	0.048	16.4	17.5	1.282	0.891	-
				RC	6	0.782	0.017	16.4	17.5	1.282	1.003	-
				RT	7	0.778	0.057	16.4	17.5	1.282	0.998	-
	2412	1	1	LC	4	0.852	0.007	16.6	17.5	1.245	1.060	-
IEEE 802.11 g	2462	11	1	LC	4	0.874	-0.089	16.7	17.5	1.205	1.053	-
	2437	6	6	LC	4	0.862	0.123	16.3	17.0	1.175	1.013	-
	2462	11	6	LC	4	0.863	0.072	16.6	17.0	1.104	0.953	-

Notes: SAR measurement have been performed on WiFi channels, representing the worst case scenarios with the highest output power being at channel, but the end product will be with reduced power output on channel 1 and 11 in mode g in order to fulfill band edge requirements.
* LC – Left Cheek; LT – Left Cheek Tilted; RC-Right Cheek; RT – Right Cheek Tilted; r – repeated according to chapter 4.6

Table 21: SAR measurement results in head configuration for WLAN 2.4 GHz.

SAR Measurement Results in Head Configurations (WLAN 5 GHz)												
Band	Freq. [MHz]	CH	Mode [Mbit/s]	EUT* position	Pic. No.	Measured SAR1g [W/kg]	Power Drift [dB]	Output Power [dBm]		Scaling Factor	Reported SAR1g [W/kg]	Plot No.
								Measured	Limit			
IEEE 802.11 a	5180	36	6	LC	4	0.933	0.108	15.4	16.25	1.208	1.127	-
				LC-r	4	0.948	0.062	15.4	16.25	1.208	1.145	3
				LT	5	0.604	-0.007	15.4	16.25	1.208	0.730	-
				RC	6	0.765	-0.153	15.4	16.25	1.208	0.924	-
				RT	7	0.488	-0.012	15.4	16.25	1.208	0.589	-
	5240	48	6	LC	4	0.928	-0.042	15.6	16.25	1.164	1.080	-
	5260	52	6	LC	4	0.930	0.183	15.6	16.25	1.153	1.073	-
	5320	64	6	LC	4	0.819	0.080	15.4	16.25	1.208	0.989	-
IEEE 802.11 n HT20	5180	36	MCS0	LC	4	0.850	0.030	15.1	16.25	1.318	1.121	-
	5240	48	MCS0	LC	4	0.814	-0.177	15.2	16.25	1.282	1.044	-
	5260	52	MCS0	LC	4	0.838	0.200	15.1	16.25	1.306	1.095	-
	5320	64	MCS0	LC	4	0.779	-0.024	15.1	16.25	1.306	1.018	-
IEEE 802.11 a	5500	100	6	LC	4	0.663	0.083	15.2	16.25	1.279	0.848	-
	5700	140	6	LC	4	0.724	0.151	14.8	16.25	1.400	1.013	-
	5825	165	6	LC	4	0.697	0.159	14.3	15.75	1.403	0.978	-
IEEE 802.11 n HT20	5500	100	MCS0	LC	4	0.594	0.177	14.8	16.25	1.384	0.822	-
	5700	140	MCS0	LC	4	0.667	0.173	14.3	16.25	1.567	1.045	4
	5825	165	MCS0	LC	4	0.659	-0.170	13.9	15.75	1.538	1.014	-
Notes: SAR measurement have been performed on channels representing the worst case scenarios with the highest output power. * LC – Left Cheek; LT – Left Cheek Tilted; RC-Right Cheek; RT – Right Cheek Tilted; r – repeated according to chapter 4.6												

Table 22: SAR measurement results in head configuration for WLAN 5 GHz.

SAR Measurement Results in Body Worn Configurations (BT)													
Band	Freq. [MHz]	CH	Mode [Mbit/s]	EUT* position	Gap [mm]	Pic. No.	Measured SAR1g [W/kg]	Power Drift [dB]	Output Power [dBm]		Scaling Factor	Reported SAR1g [W/kg]	Plot No.
									Measured	Limit			
BT	2440	38	1	F	0	8	0.045	-0.016	8.0	8.5	1.122	0.045	-
			1	B	0	9	0.010	-0.025	8.0	8.5	1.122	0.011	-
	2402	0	1	F	0	8	0.043	0.126	7.9	8.5	1.148	0.049	-
	2480	79	1	F	0	8	0.046	-0.162	7.5	8.5	1.259	0.058	5
Notes: * F – Front; B – Back													

Table 23: SAR measurement results in body worn configuration for BT.

SAR Measurement Results in Body Worn Configurations (WLAN 2.4 GHz)													
Band	Freq. [MHz]	CH	Mode [Mbit/s]	EUT* position	Gap [mm]	Pic. No.	Measured SAR1g [W/kg]	Power Drift [dB]	Output Power [dBm]		Scaling Factor	Reported SAR1g [W/kg]	Plot No.
									Measured	Limit			
IEEE 802.11 b	2412	1	1	F	0	8	1.020	0.061	16.6	17.5	1.245	1.020	-
				B	0	9	0.216	0.186	16.6	17.5	1.245	0.269	-
	2437	6	1	F	0	8	1.010	0.025	16.4	17.5	1.282	1.295	-
	2462	11	1	F	0	8	1.050	-0.161	16.7	17.5	1.205	1.265	-
	2462	11	1	F-r	0	8	1.080	-0.182	16.7	17.5	1.205	1.301	6
IEEE 802.11 g	2437	6	6	F	0	8	1.070	-0.134	16.3	17.0	1.175	1.257	-
				B	0	9	0.183	-0.072	16.3	17.0	1.175	0.215	-
	2462	11	6	F	0	8	1.030	-0.147	16.6	17.0	1.104	1.137	-
	2412	1	6	F	0	8	0.955	-0.120	16.2	17.0	1.216	1.161	-
IEEE 802.11 n	2462	11	MCS0	F	0	8	0.631	-0.134	14.3	15.0	1.172	0.740	-
				B	0	9	0.121	0.109	14.3	15.0	1.172	0.142	-
Notes: SAR measurement have been performed on WiFi channels, representing the worst case scenarios with the highest output power being at channel, but the end product will be with reduced output power on channel 1 and 11 in mode g in order to fulfill band edge requirements.													
* F – Front Side; B – Back Side; r – repeated according to chapter 4.6													

Table 24: SAR measurement results in body worn configuration for WLAN 2.4 GHz.

SAR Measurement Results in Body Worn Configurations (WLAN 5 GHz)													
Band	Freq. [MHz]	CH	Mode [Mbit/s]	EUT* position	Gap [mm]	Pic. No.	Measured SAR1g [W/kg]	Power Drift [dB]	Output Power [dBm]		Scaling Factor	Reported SAR1g [W/kg]	Plot No.
									Measured	Limit			
IEEE 802.11 a	5220	44	6	F	0	8	1.100	0.143	15.5	16.25	1.199	1.319	-
				F-r	0	8	1.100	0.164	15.5	16.25	1.199	1.319	-
				B	0	9	0.199	-0.024	15.5	16.25	1.199	0.239	-
	5180	36	6	F	0	8	1.290	0.088	15.4	16.25	1.208	1.558	7
	5180	36	6	F-r	0	8	1.250	-0.075	15.4	16.25	1.208	1.510	-
	5260	52	6	F	0	8	1.170	0.200	15.6	16.25	1.153	1.350	-
	5300	60	6	F	0	8	1.160	-0.044	15.6	16.25	1.175	1.363	-
IEEE 802.11 n HT20	5320	64	6	F	0	8	1.080	-0.131	15.4	16.25	1.208	1.304	-
	5180	36	MCS0	F	0	8	1.060	0.112	15.1	16.25	1.318	1.397	-
IEEE 802.11 n HT40	5300	60	MCS0	F	0	8	1.040	-0.161	15.3	16.25	1.259	1.309	-
	5190	38	MCS0	F	0	8	1.070	-0.145	15.0	16.25	1.337	1.430	-
	5230	46	MCS0	F	0	8	1.080	-0.073	15.2	16.25	1.282	1.385	-
IEEE 802.11 ac HT80	5310	62	MCS0	F	0	8	1.020	0.180	15.1	16.25	1.294	1.320	-
	5210	42	MCS0	F	0	8	0.584	0.171	12.4	13.25	1.216	0.710	-
IEEE 802.11 a	5500	100	6	F	0	8	0.503	0.119	15.2	16.25	1.279	0.644	-
				B	0	9	0.174	0.127	15.2	16.25	1.279	0.223	-
	5700	140	6	F	0	8	0.564	0.056	14.8	16.25	1.400	0.789	-
	5825	165	6	F	0	8	1.040	0.060	14.3	15.75	1.403	1.459	-
IEEE 802.11 n	5795	159	MCS0	F	0	8	1.060	0.116	14.0	15.75	1.496	1.586	8
Notes: SAR measurement have been performed on channels representing the worst case scenarios with the highest output power. * F – Front Side; B – Back Side; r – repeated according to chapter 4.6													

Table 25: SAR measurement results in body worn configuration for WLAN 5 GHz.

To control the output power stability during the SAR test the used DASY4 system calculates the power drift by measuring the e-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in the above tables labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

General Note:

When measured maximum SAR was > 0.8 W/kg, measurement variability assessment according to KDB 865664 has been applied to the channel with the highest value at the given frequency range.

7 Administrative Measurement Data

7.1 Calibration of Test Equipment

Test Equipment Overview						
Test Equipment	Manufacturer	Model	Serial Number	Last Calibration	Next Calibration	
DASY System Components						
☒ Software Versions DASY4	SPEAG	V4.7	N/A	N/A	N/A	
☒ Software Versions SEMCAD	SPEAG	V1.8	N/A	N/A	N/A	
☐ Dosimetric E-Field Probe	SPEAG	ET3DV6R	1579	02/2018	02/2019	
☐ Dosimetric E-Field Probe	SPEAG	ET3DV6R	1669	02/2019	02/2020	
☒ Dosimetric E-Field Probe	SPEAG	EX3DV4	3536	09/2018	09/2019	
☐ Dosimetric E-Field Probe	SPEAG	EX3DV4	3860	09/2017	09/2018	
☐ Data Acquisition Electronics	SPEAG	DAE 3	335	02/2019	02/2020	
☒ Data Acquisition Electronics	SPEAG	DAE 4	631	09/2018	09/2019	
☒ Phantom	SPEAG	SAM	1059	N/A	N/A	
☒ Phantom	SPEAG	SAM	1176	N/A	N/A	
☐ Phantom	SPEAG	SAM	1340	N/A	N/A	
☐ Phantom	SPEAG	SAM	1341	N/A	N/A	
☐ Phantom	SPEAG	ELI4	1004	N/A	N/A	
Dipoles						
☐ System Validation Dipole	SPEAG	D450V2	1014	03/2018	03/2021	
☐ System Validation Dipole	SPEAG	D835V2	470	03/2018	03/2021	
☐ System Validation Dipole	SPEAG	D1640V2	311	09/2018	09/2021	
☐ System Validation Dipole	SPEAG	D1750V2	1005	03/2018	03/2021	
☐ System Validation Dipole	SPEAG	D1900V2	535	03/2018	03/2021	
☒ System Validation Dipole	SPEAG	D2450V2	709	11/2018	11/2021	
☐ System Validation Dipole	SPEAG	D2600V2	1019	11/2018	11/2021	
☒ System Validation Dipole	SPEAG	D5GHZV2	1028	05/2017	05/2020	
Material Measurement						
☒ Network Analyzer	Agilent	E5071C	MY46103220	08/2017	08/2019	
☒ Dielectric Probe Kit	SPEAG	DAK-3.5	1234	02/2018	02/2020	
☒ Thermometer	LKMelectronic	DTM3000	3511	02/2018	02/2020	
Power Meters and Sensors						
☒ Power Meter	Anritsu	ML2487A	6K00002319	06/2018	06/2020	
☒ Power Sensor	Anritsu	MA2472A	990365	06/2018	06/2020	
☒ Power Meter	Anritsu	ML2488A	6K00002078	06/2018	06/2020	
☒ Power Sensor	Anritsu	MA2472A	002122	06/2018	06/2020	
☒ Spectrum Analyzer	Rohde & Schwarz	FSP7	100433	04/2018	04/2020	
RF Sources						
☒ Network Analyzer	Agilent	E5071C	MY46103220	08/2017	08/2019	
☐ RF Generator	Rohde & Schwarz	SM300	100142	N/A	N/A	
Amplifiers						
☐ Amplifier 10 MHz – 4200 MHz	Mini Circuits	ZHL-42-42W	D080504-1	N/A	N/A	
☒ Amplifier 2 GHz – 6 GHz	Ciao Wireless	CA26-451	37452	N/A	N/A	
Radio Tester						
☐ Radio Communication Tester	Anritsu	MT8815B	6200576536	04/2016	04/2020	
☐ Radio Communication Tester	Anritsu	MT8820C	6200918336	04/2016	04/2020	
Notes: Used test equipment for measurement is checked above.						

Table 26: Calibration of test equipment.

7.2 Uncertainty Assessment

Uncertainty Budget for SAR Measurements according to IEEE 1528-2013 (300 MHz - 6 GHz)								
Error Sources	Uncertainty Value [± %]	Probability Distribution	Divisor	ci	ci	Standard Uncertainty [± %]		vi ² or veff
Measurement System				1g	10g	1g	10g	
Probe calibration	6.7	Normal	1	1	1	6.7	6.7	∞
Axial isotropy	0.3	Rectangular	√3	√0.5	√0.5	0.1	0.1	∞
Hemispherical isotropy	1.3	Rectangular	√3	√0.5	√0.5	0.5	0.5	∞
Boundary effects	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Linearity	0.3	Rectangular	√3	1	1	0.2	0.2	∞
System detection limit	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Modulation response	4.0	Rectangular	√3	1	1	2.3	2.3	∞
Readout electronics	0.3	Normal	1	1	1	0.3	0.3	∞
Response time	0.8	Rectangular	√3	1	1	0.5	0.5	∞
Integration time	1.4	Rectangular	√3	1	1	0.8	0.8	∞
RF ambient conditions - noise	3.0	Rectangular	√3	1	1	1.7	1.7	∞
RF ambient conditions - refl.	3.0	Rectangular	√3	1	1	1.7	1.7	∞
Probe positioner mech. tol.	0.4	Rectangular	√3	1	1	0.2	0.2	∞
Probe positioning	2.9	Rectangular	√3	1	1	1.7	1.7	∞
Algorithms for max SAR eval.	4.0	Rectangular	√3	1	1	2.3	2.3	∞
Test Sample Related								
Test sample positioning	2.9	Normal	1	1	1	2.9	2.9	145
Device holder uncertainty	3.6	Normal	1	1	1	3.6	3.6	5
SAR drift measurement (< 0.2 dB)	4.7	Rectangular	√3	1	1	2.7	2.7	∞
SAR scaling	2.0	Rectangular	√3	1	1	1.2	1.2	∞
Phantom and Set-up								
Phantom uncertainty	4.0	Rectangular	√3	1	1	2.3	2.3	∞
SAR correction for perm./cond.	1.9	Normal	1	1	0.84	1.9	1.6	∞
Liquid conductivity (meas.)	5.0	Normal	1	0.78	0.71	3.9	3.6	∞
Liquid permittivity (meas.)	5.0	Normal	1	0.23	0.26	1.2	1.3	∞
Liquid conductivity temp. unc.	2.9	Rectangular	√3	0.78	0.71	1.3	1.2	∞
Liquid permittivity temp. unc.	1.8	Rectangular	√3	0.23	0.26	0.2	0.3	∞
Combined Standard Uncertainty						11.1	11.0	
Coverage Factor for 95%						kp=2		
Expanded Standard Uncertainty						22.2	21.9	
Notes: Worst case probe calibration uncertainty has been applied for all available probes and frequencies.								

Table 27: Uncertainty budget for SAR measurements.

Uncertainty Budget for SAR System Validation according to IEEE 1528-2013 (300 MHz - 6 GHz)								
Error Sources	Uncertainty Value [± %]	Probability Distribution	Divisor	ci	ci	Standard Uncertainty [± %]		vi ² or veff
Measurement System				1g	10g	1g	10g	
Probe calibration	6.7	Normal	1	1	1	6.7	6.7	∞
Axial isotropy	0.3	Rectangular	√3	1	1	0.1	0.1	∞
Hemispherical isotropy	1.3	Rectangular	√3	0	0	0.0	0.0	∞
Boundary effects	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Linearity	0.3	Rectangular	√3	1	1	0.2	0.2	∞
System detection limit	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Modulation response	0.0	Rectangular	√3	0	0	0.0	0.0	∞
Readout electronics	0.3	Normal	1	1	1	0.3	0.3	∞
Response time	0.0	Rectangular	√3	0	0	0.0	0.0	∞
Integration time	0.0	Rectangular	√3	0	0	0.0	0.0	∞
RF ambient conditions - noise	1.0	Rectangular	√3	1	1	0.6	0.6	∞
RF ambient conditions - refl.	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Probe positioner mech. tol.	0.4	Rectangular	√3	1	1	0.2	0.2	∞
Probe positioning	2.9	Rectangular	√3	1	1	1.7	1.7	∞
Algorithms for max SAR eval.	4.0	Rectangular	√3	1	1	2.3	2.3	∞
Validation Dipole								
Dev. of exp. dipole from num.	5.0	Normal	1	1	1	5.0	5.0	∞
Input power and SAR drift (< 0.2 dB)	4.7	Rectangular	√3	1	1	2.7	2.7	∞
Dipole axis to liquid distance (< 2deg)	2.0	Rectangular	√3	1	1	1.2	1.2	∞
Phantom and Set-up								
Phantom uncertainty	4.0	Rectangular	√3	1	1	2.3	2.3	∞
SAR correction for perm./cond.	1.9	Normal	1	1	0.84	1.9	1.6	∞
Liquid conductivity (meas.)	5.0	Normal	1	0.78	0.71	3.9	3.6	∞
Liquid permittivity (meas.)	5.0	Normal	1	0.23	0.26	1.2	1.3	∞
Liquid conductivity temp. unc.	2.9	Rectangular	√3	0.78	0.71	1.3	1.2	∞
Liquid permittivity temp. unc.	1.8	Rectangular	√3	0.23	0.26	0.2	0.3	∞
Combined Standard Uncertainty						10.7	10.6	
Coverage Factor for 95%						kp=2		
Expanded Standard Uncertainty						21.5	21.2	
Notes: Worst case probe calibration uncertainty has been applied for all available probes and frequencies.								

Table 28: Uncertainty budget for SAR system validation.

8 Report History

Revision History				
Revision	Description of Revision	Date	Revised Page	Revised By
/	Initial Release	July 08, 2019	-	-

END OF THE SAR REPORT

Please refer to separated appendix file for the following data:

- Appendix A - Pictures
- Appendix B - SAR Distribution Plots
- Appendix C - System Verification Plots
- Appendix D – Certificates of Conformity
- Appendix E – Calibration Certificates for DAEs
- Appendix F – Calibration Certificates for E-Field Probes
- Appendix G – Calibration Certificates for Dipoles