

FCC SAR Test Report

APPLICANT : Ascom (Sweden) AB
EQUIPMENT : Myco 4 WiFi, Myco 4 Slim
BRAND NAME : ascom
Model Name : SH4-AABC, SH4-AABB, SH4-ABBC, SH4-ABBB
FCC ID : BXZSH4
STANDARD : FCC 47 CFR Part 2 (2.1093)

We, Sporton International Inc. (Shenzhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Shenzhen), the test report shall not be reproduced except in full.



Approved by: Si Zhang

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People's Republic of China**



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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA2D0705	Rev. 01	Initial issue of report	Jun. 27, 2023

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Ascom (Sweden) AB, Myco 4 WiFi, Myco 4 Slim, SH4-AABC, SH4-AABB, SH4-ABBC, SH4-ABBB**, are as follows.

Highest 1g SAR Summary						
Equipment Class	Frequency Band		Head (Separation 0mm)	Hotspot (Separation 10mm)	Body-worn (Separation 0mm)	Highest Simultaneous Transmission 1g SAR (W/kg)
			1g SAR (W/kg)			
DTS	WLAN	2.4GHz WLAN	0.75	0.20	0.69	1.56
NII		5GHz WLAN	0.66	0.20	0.71	1.56
DSS	Bluetooth	2.4GHz Bluetooth	<0.10	<0.10	0.16	1.56

Highest 10g SAR Summary				
Equipment Class	Frequency Band		Product Specific 10g SAR (W/kg) (Separation 0mm)	Highest Simultaneous Transmission 10g SAR (W/kg)
NII	WLAN	5GHz WLAN	0.25	0.37
Date of Testing:			2023/2/16~2023/6/8	

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR, 4.0 W/kg for Product Specific 10g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2. Administration Data

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Testing Laboratory			
Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR04-SZ	CN1256	421272

Applicant	
Company Name	Ascom (Sweden) AB
Address	Grimbodalen 2, SE-417 49 Gothenburg, Sweden

Manufacturer	
Company Name	Ascom (Sweden) AB
Address	Grimbodalen 2, SE-417 49 Gothenburg, Sweden

3. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02

4. Equipment Under Test (EUT) Information

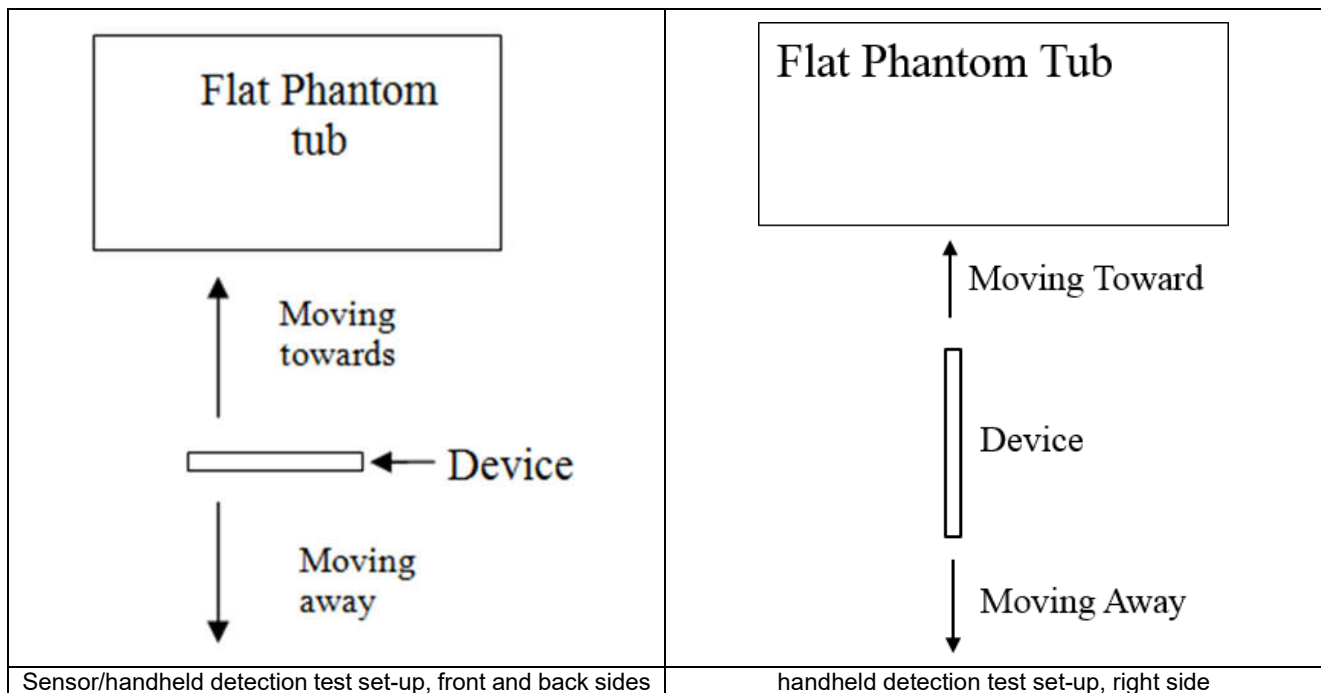
4.1 General Information

Product Feature & Specification	
Equipment Name	Myco 4 WiFi, Myco 4 Slim
Brand Name	ascom
Model Name	SH4-AABC, SH4-AABB, SH4-ABBC, SH4-ABBB
FCC ID	BXZSH4
SN	Sample 1: TI00000556 for SH4-AABC, SH4-AABB Sample 2: TI00000575 for SH4-AABC, SH4-AABB Sample 3: TI00000669 for SH4 ABBC, SH4 ABBB
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz WLAN 6GHz U-NII-5: 5925 MHz ~ 6425 MHz WLAN 6GHz U-NII-6: 6425 MHz ~ 6525 MHz WLAN 6GHz U-NII-7: 6525 MHz ~ 6875 MHz WLAN 6GHz U-NII-8: 6875 MHz ~ 7125 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC: 13.56 MHz
Mode	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ac/ax VHT20/VHT40/HE20/HE40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac/ax VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 WLAN 6GHz 802.11a WLAN 6GHz 802.11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE NFC:ASK
HW Version	V0.50
SW Version	SH4_ASCOM_A12
EUT Stage	Production Unit
Remark: <ol style="list-style-type: none"> 1. This device WLAN 2.4GHz supports hotspot operation and Bluetooth support tethering applications. 2. This device 2.4GHz WLAN/5.2GHz WLAN/5.8GHz WLAN support hotspot operation, and 5.2GHz WLAN/5.8GHz WLAN supports WiFi Direct (GC/GO), and 5.3GHz/5.5GHz supports WiFi Direct (GC only). 3. The 2.4GHz/5GHz/6GHz WLAN can transmit in SISO and MIMO mode. 4. The device implements Proximity sensors/receiver detection/hotspot mode for SAR compliance at different exposure conditions (head, hotspot, body-worn, and extremity). This device uses the receiver to indicate whether the user is making a call in head scenario or not. The selection between head and body power levels is based on the receiver detection mechanism. It can determine proximity to head or body and set the relevant power level for WLAN antennas accordingly. 5. There are three samples. The difference between them can be referred to the SH4-AABC, SH4-AABB, SH4-ABBC, SH4-ABBB_Operational Description of Product Equality Declaration which is exhibit separately. According to the difference, we chose sample 1 to perform full SAR testing and sample 2/3 verified the worst case of sample 1. 6. SAR Power density test report for WLAN6GHz U-NII-5/6/7/8 will be separately submitted. About co-located SAR with WLAN/Bluetooth, always chose higher SAR of WLAN5G U-NII-1/2A/2C/3 and WLAN6G U-NII-5/6/7/8 7. This device has NFC function and the NFC SAR report will be separately submitted. 	

5. Proximity Sensor Triggering Test

5.1 Proximity sensor triggering distances(Per KDB616217§6.2)

1. Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed and the tissue-equivalent medium for 2450MHz frequency was used for proximity sensor triggering testing.
2. Capacitive proximity sensor placed coincident with antenna elements at the bottom end of the phone are utilized to determine when the device comes in proximity of the user's body at the front or back or right side of the device. There is no need to do sensor coverage testing for the proximity sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the proximity sensor entirely covers the antenna.
3. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:



<P-Sensor for ant5>

Proximity Sensor Triggering Distance (mm)						
Position	Front		Back		Right Side	
	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away
Minimum	9	11	25	30	24	31

6. RF Exposure Limits

6.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

6.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

7. Specific Absorption Rate (SAR)

7.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

7.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$SAR = \frac{d}{dt} \left(\frac{dW}{dm} \right) = \frac{d}{dt} \left(\frac{dW}{\rho dv} \right)$$

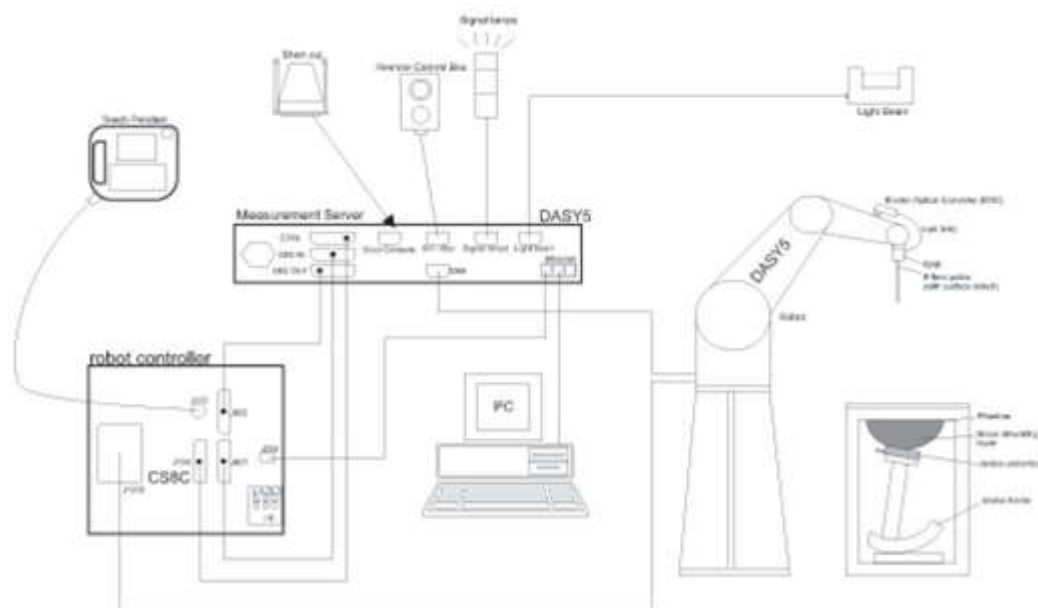
SAR is expressed in units of Watts per kilogram (W/kg)

$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

8. System Description and Setup

The DASY system used for performing compliance tests consists of the following items:




- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 or Win10 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

8.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG). The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ± 0.2 dB (30 MHz – 6 GHz)	
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 μ W/g – >100 mW/g Linearity: ± 0.2 dB (noise: typically <1 μ W/g)	
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	

8.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.


The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



Photo of DAE


8.3 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices or for evaluating transmitters operating at low frequencies. ELI is fully compatible with standard and all known tissue simulating liquids.

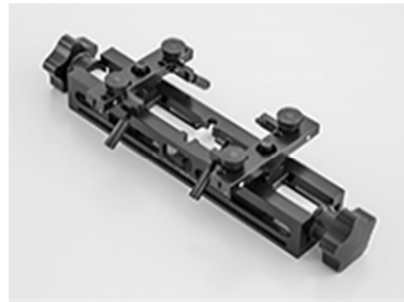
8.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.



Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.



Mounting Device for Laptops

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

- (a) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
- (b) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

- (a) Use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- (b) Place the EUT in the positions as Appendix D demonstrates.
- (c) Set scan area, grid size and other setting on the DASY software.
- (d) Measure SAR results for the highest power channel on each testing position.
- (e) Find out the largest SAR result on these testing positions of each band
- (f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

9.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

9.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

9.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
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 \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

9.4 Zoom Scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			≤ 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: $\Delta z_{\text{Zoom}}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$: 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
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
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 <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> 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.				

9.5 Volume Scan Procedures

The volume scan is used to assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

9.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASy measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

10. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit	D2450V2	924	Sep. 02, 2020	Aug. 31, 2023
SPEAG	5000MHz System Validation Kit	D5GHzV2	1341	Dec. 13, 2021	Dec. 12, 2024
SPEAG	Data Acquisition Electronics	DAE4	1437	Nov. 23, 2022	Nov. 22, 2023
SPEAG	Data Acquisition Electronics	DAE4	914	Jul. 14, 2022	Jul. 13, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	3819	May 30, 2022	May 29, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	7577	Nov. 23, 2022	Nov. 22, 2023
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1500	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P41 AA	2035	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	Wireless Communication Test Set	E5515C	MY50267224	Jul. 07, 2022	Jul. 06, 2023
Keysight	Network Analyzer	E5071C	MY46523671	Oct. 17, 2022	Oct. 16, 2023
Speag	Dielectric Assessment KIT	DAK-3.5	1144	Aug. 15, 2022	Aug. 14, 2023
Agilent	Signal Generator	N5181A	MY50145381	Dec. 27, 2022	Dec. 26, 2023
Anritsu	Power Sensor	MA2411B	1306099	Oct. 17, 2022	Oct. 16, 2023
Anritsu	Power Meter	ML2495A	1349001	Oct. 17, 2022	Oct. 16, 2023
Anritsu	Power Sensor	MA2411B	1542004	Dec. 27, 2022	Dec. 26, 2023
Anritsu	Power Meter	ML2495A	1339473	Dec. 27, 2022	Dec. 26, 2023
R&S	CBT BLUETOOTH TESTER	CBT	100963	Dec. 27, 2022	Dec. 26, 2023
R&S	Spectrum Analyzer	FSP7	100818	Jul. 07, 2022	Jul. 06, 2023
TES	Hygrometer	1310	200505600	Jul. 12, 2022	Jul. 11, 2023
Anymetre	Thermo-Hygrometer	JR593	2020062101	Jul. 12, 2022	Jul. 11, 2023
SPEAG	Device Holder	N/A	N/A	N/A	N/A
AR	Amplifier	5S1G4	0333096	Note 1	
Mini-Circuits	Amplifier	ZVE-3W-83+	599201528	Note 1	
Mini-Circuits	Amplifier	ZVA-183W-S+	726202215	Note 1	
ARRA	Power Divider	A3200-2	N/A	Note 1	
ET Industries	Dual Directional Coupler	C-058-10	N/A	Note 1	
Weinschel	Attenuator 1	3M-10	N/A	Note 1	
Weinschel	Attenuator 2	3M-20	N/A	Note 1	

Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

11. System Verification

11.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

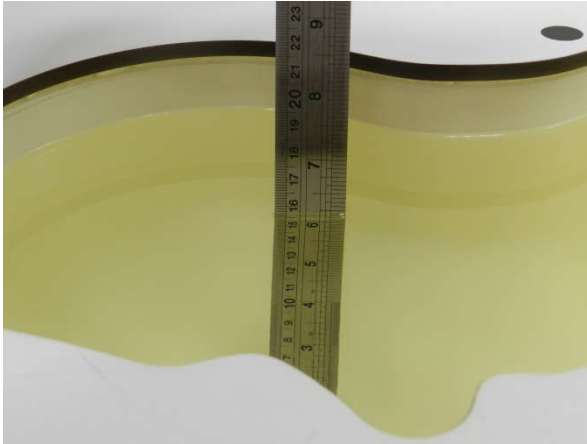


Fig 10.1Photo of Liquid Height for Head SAR

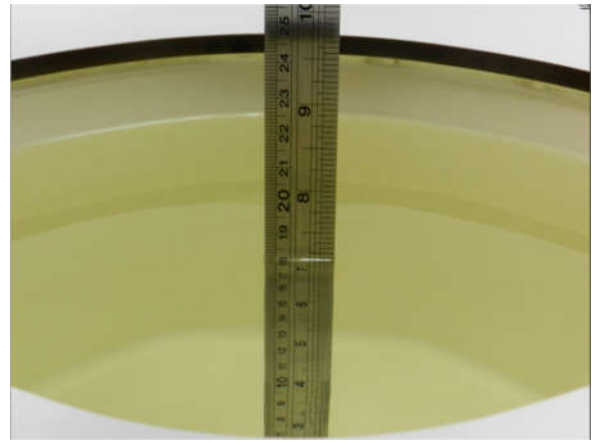


Fig 10.2 Photo of Liquid Height for Body SAR

11.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ϵ_r)
For Head								
2450	55.0	0	0	0	0	45.0	1.80	39.2

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
2450	Head	22.4	1.777	38.496	1.80	39.20	-1.28	-1.80	±5	2023/2/16
2450	Head	22.3	1.825	39.664	1.80	39.20	1.39	1.18	±5	2023/3/20
2450	Head	22.5	1.856	38.095	1.80	39.20	3.11	-2.82	±5	2023/4/14
5250	Head	22.4	4.565	35.644	4.71	35.95	-3.08	-0.85	±5	2023/2/17
5250	Head	22.7	4.660	36.675	4.71	35.95	-1.06	2.02	±5	2023/3/21
5250	Head	22.3	4.500	36.973	4.71	35.95	-4.46	2.85	±5	2023/4/15
5600	Head	22.6	4.948	35.032	5.07	35.50	-2.41	-1.32	±5	2023/2/18
5600	Head	22.5	5.031	36.177	5.07	35.50	-0.77	1.91	±5	2023/3/22
5600	Head	22.7	4.875	36.067	5.07	35.50	-3.85	1.60	±5	2023/4/16
5750	Head	22.4	5.100	34.767	5.22	35.35	-2.30	-1.65	±5	2023/2/19
5750	Head	22.6	5.194	35.974	5.22	35.35	-0.50	1.77	±5	2023/3/23
5750	Head	22.2	5.119	35.497	5.22	35.35	-1.93	0.42	±5	2023/4/17
5250	Head	22.4	4.667	36.859	4.71	35.95	-0.91	2.53	±5	2023/6/6
5600	Head	22.5	5.036	36.346	5.07	35.50	-0.67	2.38	±5	2023/6/7
5750	Head	22.2	5.197	36.138	5.22	35.35	-0.44	2.23	±5	2023/6/8

11.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

<1g>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2023/2/16	2450	Head	250	924	3819	1437	12.400	51.400	49.6	-3.50
2023/3/20	2450	Head	250	924	3819	1437	13.300	51.400	53.2	3.50
2023/4/14	2450	Head	250	924	3819	1437	13.000	51.400	52	1.17
2023/2/17	5250	Head	100	1341	3819	1437	8.730	80.700	87.3	8.18
2023/3/21	5250	Head	100	1341	3819	1437	8.670	80.700	86.7	7.43
2023/4/15	5250	Head	100	1341	3819	1437	8.410	80.700	84.1	4.21
2023/2/18	5600	Head	100	1341	3819	1437	9.100	84.500	91	7.69
2023/3/22	5600	Head	100	1341	3819	1437	9.170	84.500	91.7	8.52
2023/4/16	5600	Head	100	1341	3819	1437	9.030	84.500	90.3	6.86
2023/2/19	5750	Head	100	1341	3819	1437	8.730	80.600	87.3	8.31
2023/3/23	5750	Head	100	1341	3819	1437	8.690	80.600	86.9	7.82
2023/4/17	5750	Head	100	1341	3819	1437	8.600	80.600	86	6.70
2023/6/6	5250	Head	100	1341	7577	914	8.060	80.700	80.6	-0.12
2023/6/7	5600	Head	100	1341	7577	914	8.920	84.500	89.2	5.56
2023/6/8	5750	Head	100	1341	7577	914	8.730	80.600	87.3	8.31

<10g>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2023/2/16	2450	Head	250	924	3819	1437	5.570	24.000	22.28	-7.17
2023/3/20	2450	Head	250	924	3819	1437	5.970	24.000	23.88	-0.50
2023/4/14	2450	Head	250	924	3819	1437	5.820	24.000	23.28	-3.00
2023/2/17	5250	Head	100	1341	3819	1437	2.440	23.100	24.4	5.63
2023/3/21	5250	Head	100	1341	3819	1437	2.440	23.100	24.4	5.63
2023/4/15	5250	Head	100	1341	3819	1437	2.490	23.100	24.9	7.79
2023/2/18	5600	Head	100	1341	3819	1437	2.580	24.000	25.8	7.50
2023/3/22	5600	Head	100	1341	3819	1437	2.560	24.000	25.6	6.67
2023/4/16	5600	Head	100	1341	3819	1437	2.500	24.000	25	4.17
2023/2/19	5750	Head	100	1341	3819	1437	2.460	22.700	24.6	8.37
2023/3/23	5750	Head	100	1341	3819	1437	2.430	22.700	24.3	7.05
2023/4/17	5750	Head	100	1341	3819	1437	2.440	22.700	24.4	7.49
2023/6/6	5250	Head	100	1341	7577	914	2.290	23.100	22.9	-0.87
2023/6/7	5600	Head	100	1341	7577	914	2.530	24.000	25.3	5.42
2023/6/8	5750	Head	100	1341	7577	914	2.450	22.700	24.5	7.93

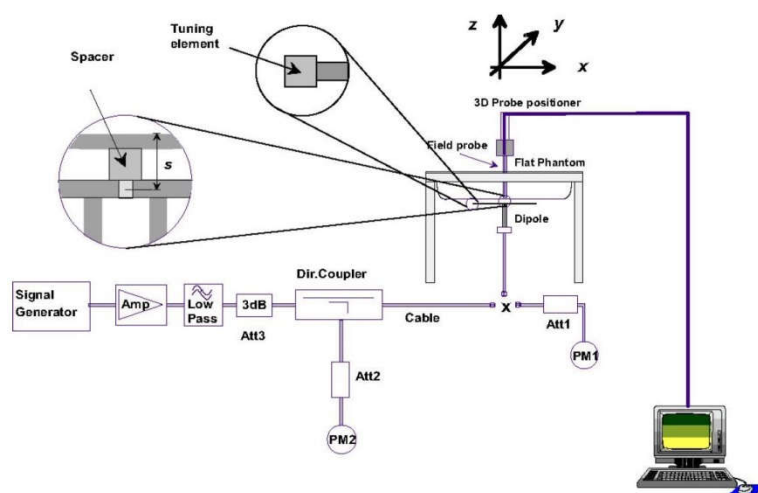


Fig 10.3.1 System Performance Check Setup



Fig 10.3.2 Setup Photo

12. RF Exposure Positions

12.1 Ear and handset reference point

Figure 11.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled "M," the left ear reference point (ERP) is marked "LE," and the right ERP is marked "RE." Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 11.1.2. The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 11.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 11.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

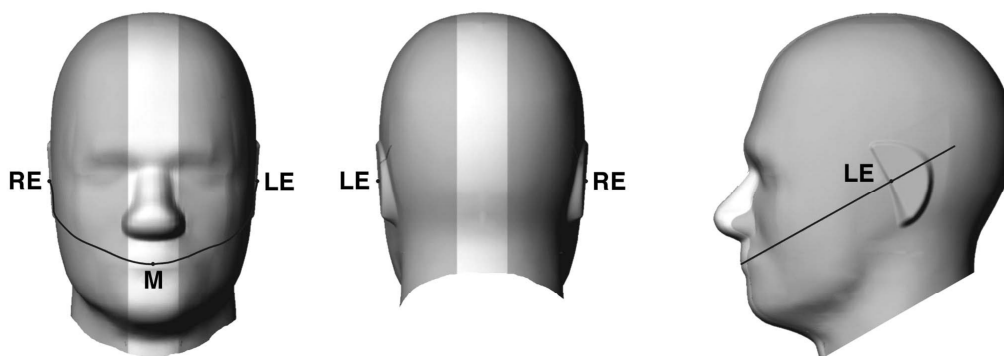


Fig 11.1.1 Front, back, and side views of SAM twin phantom

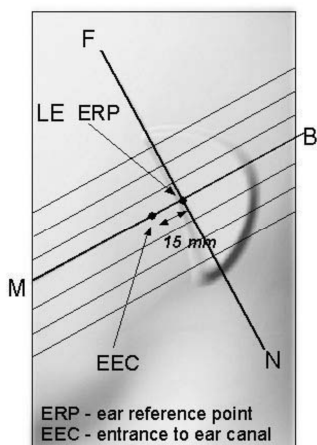


Fig 11.1.2 Close-up side view of phantom showing the ear region.

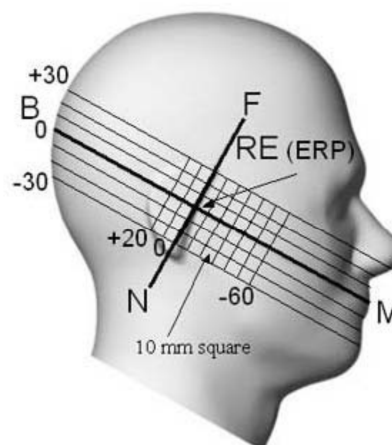


Fig 11.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

12.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—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 in Figure 11.2.1 and Figure 11.2.2), 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 Figure 11.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 11.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. 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 Figure 11.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 11.2.3. The actual rotation angles should be documented in the test report.

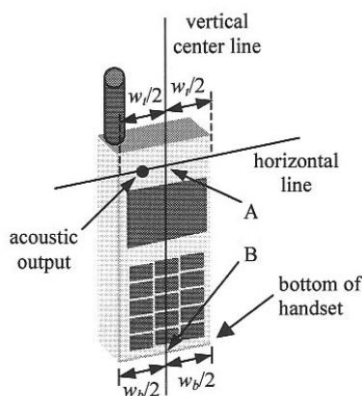


Fig 11.2.1 Handset vertical and horizontal reference lines—"fixed case"

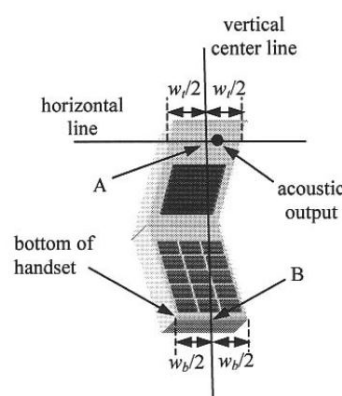


Fig 11.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

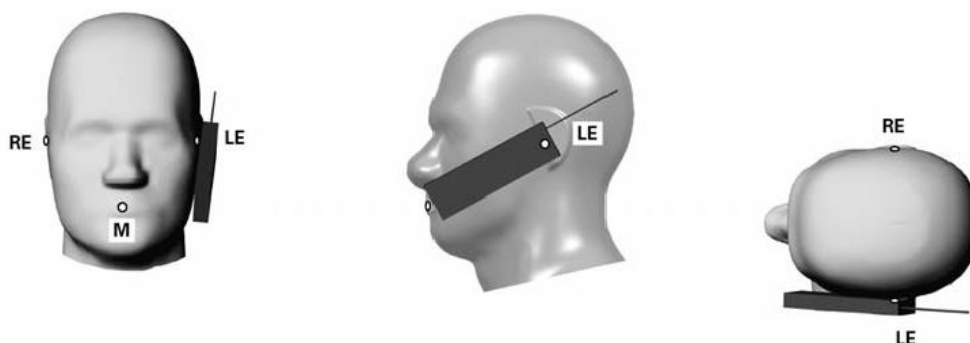


Fig 11.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

12.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 11.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

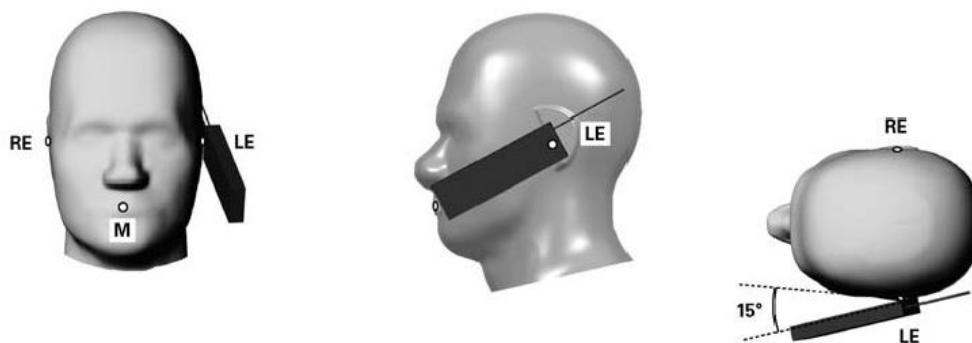


Fig 11.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

12.4 Body Worn Accessory

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 11.4). Per KDB648474 D04v01r03, 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 FCC KDB 447498 D01v06 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 a headset connected to the handset is $> 1.2 \text{ W/kg}$, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a handset attached to the handset.

Accessories for body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are test with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-chip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

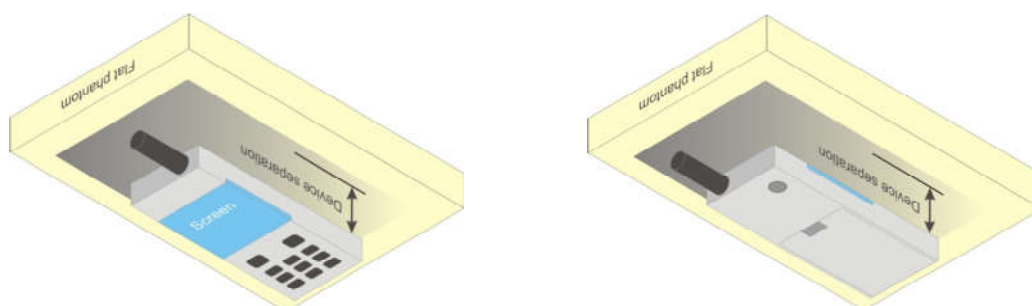


Fig 11.4 Body Worn Position

12.5 Product Specific 10g SAR Exposure

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, that can provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets and support voice calls next to the ear, according to KDB648474 D04v01r03, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance

1. The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.
2. The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions.⁶ The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

12.6 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets ($L \times W \geq 9$ cm x 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

13. Conducted RF Output Power (Unit: dBm)

The detailed conducted power table can refer to Appendix E.

<WLAN Conducted Power>

General Note:

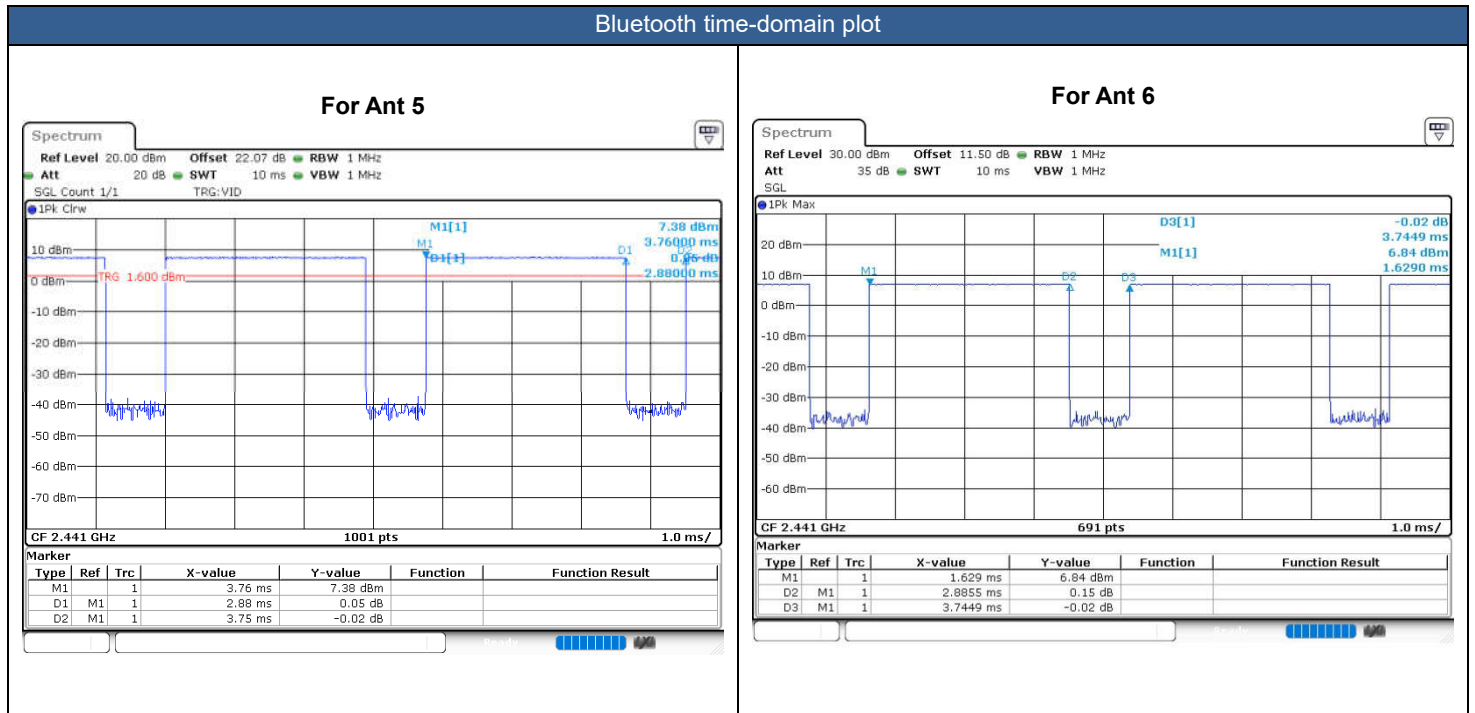
1. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures. For "Not required", SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration. Additional output power measurements were not necessary.
2. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
3. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
4. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
5. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
 - a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
 - b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
6. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
7. For full RU and partial tone size output power measurement, after verification for the partial tone size mode power level will not higher than full tone size power level, so chose full tone power to be measured in this report.
8. For the conducted power measurement is MIMO chains transmitting simultaneously and measured the separately conducted power for both chains and then based on the conducted power of two SISO antennas respectively to calculate sum of the power for MIMO mode.
9. SISO and MIMO all supported by WLAN2.4GHz/WLAN5GHz/WLAN6GHz, for SISO mode power is less than per chain power of MIMO mode. For WLAN SISO & MIMO mode, the whole testing has assessed only MIMO mode by referring to their higher conducted power, so only chose MIMO mode to perform SAR testing.



<2.4GHz Bluetooth>

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The Bluetooth duty cycle is 76.80 % for Ant 5 and 77.05 % for Ant 6 as following figure, according to Oct. 2016 TCB workshop for Bluetooth SAR scaling need further consideration and the maximum duty cycle is 100%, therefore the actual duty cycle will be scaled up to 100% for Bluetooth reported SAR calculation.





14. Antenna Location

The detailed antenna location information can refer to SAR Test Setup Photos.

15. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of BT/WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
 - c. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg.
4. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
5. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15cm or an overall diagonal dimension > 16cm, when hotspot mode applies, 10-g product specific SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg, in this report all the hotspot mode results are < 1.2W/kg.
6. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, when hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg, however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power (for handheld on state, the maximum full power means reduced power), including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.
 - a. WLAN 5.3/5.5 tested the product specific 10g SAR since it has no hotspot mode.
 - b. When 10-g product specific 10g SAR is considered, SAR thresholds is specified in the procedures for SAR test reduction and exclusion should be multiplied by 2.5.
7. "n/a" in the test results means the 1g SAR tube is too small to be found.
8. For WLAN2.4GHz ant5 when in SISO mode, its power can be reduced through the P-sensor mechanism. When in UL MIMO mode compared with WLAN2.4GHz ant6, it can be reduced power through the receiver mechanism. Since its MIMO power is higher than the sensor on reduced power at WLAN2.4GHz ant5, its MIMO SAR can represent the ant5 sensor on power-reduced SAR, so only the WLAN2.4GHz ant5 distance SAR is verified.

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
3. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
4. During SAR testing the WLAN transmission was verified using a spectrum analyzer.
5. For full RU and partial tone size output power measurement, after verification for the partial tone size mode power level will not higher than full tone size power level, so chose full tone power to be measured in this report.
6. For the conducted power measurement is MIMO chains transmitting simultaneously and measured the separately conducted power for both chains and then based on the conducted power of SISO antennas respectively to calculate sum of the power for MIMO mode.
7. SISO and MIMO all supported by WLAN2.4GHz/WLAN5GHz/WLAN6GHz, for SISO mode power is less than per chain power of MIMO mode. For WLAN SISO & MIMO mode, the whole testing has assessed only MIMO mode by referring to their higher conducted power, so only chose MIMO mode to perform SAR testing.
8. For determination of the scaling factor for report SAR of MIMO mode, if the hot spots are separated the scaling factors are individually determined from each transmit chain. Further simplification chose the worse SAR value and the worst scaling factor from each transmit chain perform reported SAR calculation conservatively. If the hot spots are not spatially separated, the scaling factor is determined from the worst number of each transmit chain.

**15.1 Head SAR**

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Sample	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	Bluetooth	DH5 1Mbps	Right Cheek	0mm	Ant 6	Full	39	2441	1	7.80	9.50	1.479	77.05	1.298	-0.09	0.014	0.026
	Bluetooth	DH5 1Mbps	Right Tilted	0mm	Ant 6	Full	39	2441	1	7.80	9.50	1.479	77.05	1.298	0.08	0.013	0.025
	Bluetooth	DH5 1Mbps	Left Cheek	0mm	Ant 6	Full	39	2441	1	7.80	9.50	1.479	77.05	1.298	0.03	0.037	0.072
	Bluetooth	DH5 1Mbps	Left Tilted	0mm	Ant 6	Full	39	2441	1	7.80	9.50	1.479	77.05	1.298	0.13	0.003	0.007
	Bluetooth	DH5 1Mbps	Left Cheek	0mm	Ant 6	Full	0	2402	1	7.00	8.50	1.413	77.05	1.298	0.06	0.027	0.049
	Bluetooth	DH5 1Mbps	Left Cheek	0mm	Ant 6	Full	78	2480	1	6.00	7.50	1.413	77.05	1.298	0.07	0.021	0.039
	Bluetooth	DH5 1Mbps	Left Cheek	0mm	Ant 6	Full	39	2441	3	7.80	9.50	1.479	77.05	1.298	0.05	0.033	0.063
	Bluetooth	DH5 1Mbps	Right Cheek	0mm	Ant 5	Full	39	2441	1	7.74	9.00	1.337	76.8	1.302	-0.06	0.020	0.035
	Bluetooth	DH5 1Mbps	Right Tilted	0mm	Ant 5	Full	39	2441	1	7.74	9.00	1.337	76.8	1.302	-0.06	0.025	0.044
	Bluetooth	DH5 1Mbps	Left Cheek	0mm	Ant 5	Full	39	2441	1	7.74	9.00	1.337	76.8	1.302	0.03	0.026	0.045
	Bluetooth	DH5 1Mbps	Left Tilted	0mm	Ant 5	Full	39	2441	1	7.74	9.00	1.337	76.8	1.302	-0.15	0.030	0.053
	Bluetooth	DH5 1Mbps	Left Tilted	0mm	Ant 5	Full	0	2402	1	6.40	8.00	1.445	76.8	1.302	0.11	0.026	0.049
	Bluetooth	DH5 1Mbps	Left Tilted	0mm	Ant 5	Full	78	2480	1	5.32	7.00	1.472	76.8	1.302	0.03	0.021	0.040
	Bluetooth	DH5 1Mbps	Left Tilted	0mm	Ant 5	Full	39	2441	3	7.74	9.00	1.337	76.8	1.302	-0.15	0.006	0.010
02	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	Ant 5+6(5)	Reduced	6	2437	1	13.60	15.00	1.380	100	1.000	0.06	0.128	0.177
	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	0mm	Ant 5+6(5)	Reduced	6	2437	1	13.60	15.00	1.380	100	1.000	-0.07	0.124	0.171
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	Ant 5+6(5)	Reduced	6	2437	1	13.60	15.00	1.380	100	1.000	0.03	0.476	0.657
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	0mm	Ant 5+6(5)	Reduced	6	2437	1	13.60	15.00	1.380	100	1.000	-0.16	0.425	0.587
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	Ant 5+6(6)	Reduced	1	2412	1	14.50	16.00	1.413	100	1.000	0.12	0.436	0.616
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	Ant 5+6(5)	Reduced	11	2462	1	12.70	14.50	1.514	100	1.000	-0.05	0.498	0.754
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	Ant 5+6(5)	Reduced	11	2462	2	12.70	14.50	1.514	100	1.000	0.1	0.479	0.725
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	Ant 5+6(5)	Reduced	11	2462	3	12.70	14.50	1.514	100	1.000	0.05	0.188	0.285
	WLAN5.3GHz	802.11n-HT40 MCS0	Right Cheek	0mm	Ant 3+10	Rec on	62	5310	1	17.34	19.00	1.466	99.45	1.006	-0.11	0.367	0.541
	WLAN5.3GHz	802.11n-HT40 MCS0	Right Tilted	0mm	Ant 3+10	Rec on	62	5310	1	17.34	19.00	1.466	99.45	1.006	-0.03	0.398	0.587
	WLAN5.3GHz	802.11n-HT40 MCS0	Left Cheek	0mm	Ant 3+10	Rec on	62	5310	1	17.34	19.00	1.466	99.45	1.006	0.13	0.413	0.609
	WLAN5.3GHz	802.11n-HT40 MCS0	Left Tilted	0mm	Ant 3+10	Rec on	62	5310	1	17.34	19.00	1.466	99.45	1.006	-0.02	0.414	0.610
	WLAN5.3GHz	802.11n-HT40 MCS0	Left Tilted	0mm	Ant 3+10	Rec on	54	5270	1	16.80	18.50	1.479	99.45	1.006	-0.1	0.265	0.394
	WLAN5.3GHz	802.11n-HT40 MCS0	Left Tilted	0mm	Ant 3+10	Rec on	62	5310	3	17.34	19.00	1.466	99.45	1.006	0.08	0.425	0.627
	WLAN5.3GHz	802.11n-HT40 MCS0	Left Tilted	0mm	Ant 3+10	Rec on	54	5270	3	16.80	18.50	1.479	99.45	1.006	0.04	0.337	0.501
03	WLAN5.5GHz	802.11n-HT40 MCS0	Right Cheek	0mm	Ant 3+10	Rec on	134	5670	1	17.97	19.50	1.422	99.45	1.006	0.16	0.357	0.511
	WLAN5.5GHz	802.11n-HT40 MCS0	Right Tilted	0mm	Ant 3+10	Rec on	134	5670	1	17.97	19.50	1.422	99.45	1.006	-0.09	0.326	0.466
	WLAN5.5GHz	802.11n-HT40 MCS0	Left Cheek	0mm	Ant 3+10	Rec on	134	5670	1	17.97	19.50	1.422	99.45	1.006	-0.02	0.384	0.549
	WLAN5.5GHz	802.11n-HT40 MCS0	Left Tilted	0mm	Ant 3+10	Rec on	134	5670	1	17.97	19.50	1.422	99.45	1.006	0.18	0.373	0.534
	WLAN5.5GHz	802.11n-HT40 MCS0	Left Cheek	0mm	Ant 3+10(3)	Rec on	102	5510	1	14.18	15.50	1.355	99.45	1.006	-0.19	0.480	0.654
	WLAN5.5GHz	802.11n-HT40 MCS0	Left Cheek	0mm	Ant 3+10	Rec on	110	5550	1	17.57	19.00	1.390	99.45	1.006	-0.15	0.474	0.663
	WLAN5.5GHz	802.11n-HT40 MCS0	Left Cheek	0mm	Ant 3+10	Rec on	102	5510	2	14.18	15.50	1.355	99.45	1.006	-0.04	0.280	0.382
	WLAN5.5GHz	802.11n-HT40 MCS0	Left Cheek	0mm	Ant 3+10	Rec on	110	5550	3	17.57	19.00	1.355	99.45	1.006	-0.04	0.465	0.634
	WLAN5.8GHz	802.11a 6Mbps	Right Cheek	0mm	Ant 3+10(3)	Rec on	157	5785	1	15.57	17.00	1.390	99	1.010	-0.01	0.324	0.455
	WLAN5.8GHz	802.11a 6Mbps	Right Tilted	0mm	Ant 3+10(3)	Rec on	157	5785	1	15.57	17.00	1.390	99	1.010	-0.12	0.305	0.428
	WLAN5.8GHz	802.11a 6Mbps	Left Cheek	0mm	Ant 3+10(3)	Rec on	157	5785	1	15.57	17.00	1.390	99	1.010	0.15	0.348	0.489
	WLAN5.8GHz	802.11a 6Mbps	Left Tilted	0mm	Ant 3+10(3)	Rec on	157	5785	1	15.57	17.00	1.390	99	1.010	-0.14	0.336	0.472
	WLAN5.8GHz	802.11a 6Mbps	Left Cheek	0mm	Ant 3+10(3)	Rec on	149	5745	1	15.22	17.00	1.507	99	1.010	-0.16	0.344	0.523
	WLAN5.8GHz	802.11a 6Mbps	Left Cheek	0mm	Ant 3+10(3)	Rec on	165	5825	1	15.60	17.00	1.380	99	1.010	-0.13	0.378	0.527
	WLAN5.8GHz	802.11a 6Mbps	Left Cheek	0mm	Ant 3+10(3)	Rec on	165	5825	3	15.60	17.00	1.380	99	1.010	0.14	0.375	0.523

**15.2 Hotspot SAR**

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Sample	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	Bluetooth	DH5 1Mbps	Front	10mm	Ant 6	Full	39	2441	1	7.80	9.50	1.479	77.05	1.298	-0.09	0.008	0.015
	Bluetooth	DH5 1Mbps	Back	10mm	Ant 6	Full	39	2441	1	7.80	9.50	1.479	77.05	1.298	-	n/a	n/a
	Bluetooth	DH5 1Mbps	Right Side	10mm	Ant 6	Full	39	2441	1	7.80	9.50	1.479	77.05	1.298	-0.02	0.008	0.014
	Bluetooth	DH5 1Mbps	Top Side	10mm	Ant 6	Full	39	2441	1	7.80	9.50	1.479	77.05	1.298	-0.1	0.007	0.014
	Bluetooth	DH5 1Mbps	Front	10mm	Ant 6	Full	0	2402	1	7.00	8.50	1.413	77.05	1.298	-0.01	0.007	0.013
	Bluetooth	DH5 1Mbps	Front	10mm	Ant 6	Full	78	2480	1	6.00	7.50	1.413	77.05	1.298	0.08	0.007	0.013
	Bluetooth	DH5 1Mbps	Front	10mm	Ant 6	Full	39	2441	3	7.80	9.50	1.479	77.05	1.298	-	0.006	0.012
	Bluetooth	DH5 1Mbps	Back	10mm	Ant 6	Full	39	2441	3	7.80	9.50	1.479	77.05	1.298	0.06	0.015	0.029
	Bluetooth	DH5 1Mbps	Back	10mm	Ant 6	Full	0	2402	3	7.00	8.50	1.413	77.05	1.298	0.02	0.012	0.022
	Bluetooth	DH5 1Mbps	Back	10mm	Ant 6	Full	78	2480	3	6.00	7.50	1.413	77.05	1.298	0.11	0.010	0.018
	Bluetooth	DH5 1Mbps	Front	10mm	Ant 5	Full	39	2441	1	7.74	9.00	1.337	76.8	1.302	0.15	0.006	0.010
	Bluetooth	DH5 1Mbps	Back	10mm	Ant 5	Full	39	2441	1	7.74	9.00	1.337	76.8	1.302	-0.11	0.017	0.029
07	Bluetooth	DH5 1Mbps	Right Side	10mm	Ant 5	Full	39	2441	1	7.74	9.00	1.337	76.8	1.302	0.11	0.027	0.048
	Bluetooth	DH5 1Mbps	Top Side	10mm	Ant 5	Full	39	2441	1	7.74	9.00	1.337	76.8	1.302	-0.03	0.006	0.010
	Bluetooth	DH5 1Mbps	Right Side	10mm	Ant 5	Full	0	2402	1	6.40	8.00	1.445	76.8	1.302	-0.02	0.015	0.028
	Bluetooth	DH5 1Mbps	Right Side	10mm	Ant 5	Full	78	2480	1	5.32	7.00	1.472	76.8	1.302	-0.15	0.019	0.037
	Bluetooth	DH5 1Mbps	Right Side	10mm	Ant 5	Full	39	2441	3	7.74	9.00	1.337	76.8	1.302	0.06	0.016	0.027
	Bluetooth	DH5 1Mbps	Back	10mm	Ant 5	Full	39	2441	3	7.74	9.00	1.337	76.8	1.302	0.08	0.020	0.035
	Bluetooth	DH5 1Mbps	Back	10mm	Ant 5	Full	0	2402	3	6.40	8.00	1.445	76.8	1.302	0.02	0.016	0.030
	Bluetooth	DH5 1Mbps	Back	10mm	Ant 5	Full	78	2480	3	5.32	7.00	1.472	76.8	1.302	0.06	0.018	0.035
	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	Ant 5+6(6)	Reduced	6	2437	1	12.20	13.50	1.349	100	1.000	-0.1	0.043	0.058
	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 5+6(6)	Reduced	6	2437	1	12.20	13.50	1.349	100	1.000	-0.1	0.000	0.000
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10mm	Ant 5+6(6)	Reduced	6	2437	1	12.20	13.50	1.349	100	1.000	-0.02	0.060	0.081
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10mm	Ant 5+6(6)	Reduced	6	2437	2	12.20	13.50	1.349	100	1.000	0.05	0.055	0.074
	WLAN2.4GHz	802.11b 1Mbps	Top Side	10mm	Ant 5+6(6)	Reduced	6	2437	1	12.20	13.50	1.349	100	1.000	-	n/a	n/a
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10mm	Ant 5+6(6)	Reduced	1	2412	1	11.80	13.50	1.479	100	1.000	-0.09	0.040	0.059
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10mm	Ant 5+6(6)	Reduced	11	2462	1	11.40	13.00	1.445	100	1.000	-0.1	0.051	0.074
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10mm	Ant 5+6(6)	Reduced	6	2437	3	12.20	13.50	1.349	100	1.000	-0.1	0.057	0.077
	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 5+6(6)	Reduced	6	2437	3	12.20	13.50	1.349	100	1.000	-0.02	0.130	0.175
08	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 5+6(6)	Reduced	1	2412	3	11.80	13.50	1.479	100	1.000	0.01	0.135	0.200
	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 5+6(6)	Reduced	11	2462	3	11.40	13.00	1.445	100	1.000	-0.09	0.079	0.114
	WLAN5.2GHz	802.11ac-VHT80 MCS0	Front	10mm	Ant 3+10	Hotspot on	42	5210	1	12.98	14.50	1.419	99.68	1.003	-	n/a	n/a
	WLAN5.2GHz	802.11ac-VHT80 MCS0	Back	10mm	Ant 3+10	Hotspot on	42	5210	1	12.98	14.50	1.419	99.68	1.003	-	n/a	n/a
	WLAN5.2GHz	802.11ac-VHT80 MCS0	Right Side	10mm	Ant 3+10	Hotspot on	42	5210	1	12.98	14.50	1.419	99.68	1.003	-	n/a	n/a
	WLAN5.2GHz	802.11ac-VHT80 MCS0	Top Side	10mm	Ant 3+10	Hotspot on	42	5210	1	12.98	14.50	1.419	99.68	1.003	0.03	0.030	0.043
	WLAN5.2GHz	802.11ac-VHT80 MCS0	Top Side	10mm	Ant 3+10	Hotspot on	42	5210	3	12.98	14.50	1.419	99.68	1.003	0.12	0.058	0.083
09	WLAN5.2GHz	802.11ac-VHT80 MCS0	Back	10mm	Ant 3+10	Hotspot on	42	5210	3	12.98	14.50	1.419	99.68	1.003	-0.08	0.087	0.124
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Front	10mm	Ant 3+10(10)	Hotspot on	155	5775	1	7.78	9.50	1.486	99.68	1.003	0.05	0.101	0.151
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Back	10mm	Ant 3+10(10)	Hotspot on	155	5775	1	7.78	9.50	1.486	99.68	1.003	0.11	0.106	0.158
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Back	10mm	Ant 3+10(10)	Hotspot on	155	5775	2	7.78	9.50	1.486	99.68	1.003	0.07	0.101	0.151
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Right Side	10mm	Ant 3+10(10)	Hotspot on	155	5775	1	7.78	9.50	1.486	99.68	1.003	-0.03	0.084	0.125
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Top Side	10mm	Ant 3+10(10)	Hotspot on	155	5775	1	7.78	9.50	1.486	99.68	1.003	0.12	0.079	0.118
10	WLAN5.8GHz	802.11ac-VHT80 MCS0	Back	10mm	Ant 3+10(10)	Hotspot on	155	5775	3	7.78	9.50	1.486	99.68	1.003	0.01	0.133	0.198

**15.3 Body Worn Accessory SAR**

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Sample	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	Bluetooth	DH5 1Mbps	Front	0mm	Ant 6	Full	39	2441	1	7.80	9.50	1.479	77.05	1.298	0.05	0.082	0.156
	Bluetooth	DH5 1Mbps	Back	0mm	Ant 6	Full	39	2441	1	7.80	9.50	1.479	77.05	1.298	-	n/a	n/a
	Bluetooth	DH5 1Mbps	Front	0mm	Ant 6	Full	0	2402	1	7.00	8.50	1.413	77.05	1.298	-0.12	0.051	0.093
	Bluetooth	DH5 1Mbps	Front	0mm	Ant 6	Full	78	2480	1	6.00	7.50	1.413	77.05	1.298	0.05	0.060	0.110
	Bluetooth	DH5 1Mbps	Front	0mm	Ant 6	Full	39	2441	3	7.80	9.50	1.479	77.05	1.298	0.02	0.029	0.055
11	Bluetooth	DH5 1Mbps	Back	0mm	Ant 6	Full	39	2441	3	7.80	9.50	1.479	77.05	1.298	0.02	0.085	0.164
	Bluetooth	DH5 1Mbps	Back	0mm	Ant 6	Full	0	2402	3	7.00	8.50	1.413	77.05	1.298	0.09	0.072	0.132
	Bluetooth	DH5 1Mbps	Back	0mm	Ant 6	Full	78	2480	3	6.00	7.50	1.413	77.05	1.298	0.11	0.077	0.141
	Bluetooth	DH5 1Mbps	Front	0mm	Ant 5	Full	39	2441	1	7.74	9.00	1.337	76.8	1.302	0.14	0.049	0.085
	Bluetooth	DH5 1Mbps	Back	0mm	Ant 5	Full	39	2441	1	7.74	9.00	1.337	76.8	1.302	0.08	0.013	0.023
	Bluetooth	DH5 1Mbps	Front	0mm	Ant 5	Full	0	2402	1	6.40	8.00	1.445	76.8	1.302	-0.13	0.026	0.048
	Bluetooth	DH5 1Mbps	Front	0mm	Ant 5	Full	78	2480	1	5.32	7.00	1.472	76.8	1.302	0.14	0.035	0.066
	Bluetooth	DH5 1Mbps	Front	0mm	Ant 5	Full	39	2441	3	7.74	9.00	1.337	76.8	1.302	0	0.031	0.055
	Bluetooth	DH5 1Mbps	Back	0mm	Ant 5	Full	39	2441	3	7.74	9.00	1.337	76.8	1.302	0.08	0.082	0.143
	Bluetooth	DH5 1Mbps	Back	0mm	Ant 5	Full	0	2402	3	6.40	8.00	1.445	76.8	1.302	0.05	0.070	0.132
	Bluetooth	DH5 1Mbps	Back	0mm	Ant 5	Full	78	2480	3	5.32	7.00	1.472	76.8	1.302	0.03	0.066	0.127
	WLAN2.4GHz	802.11b 1Mbps	Front	0mm	Ant 5+6(6)	Reduced	6	2437	1	12.20	13.50	1.349	100	1.000	-0.09	0.476	0.642
	WLAN2.4GHz	802.11b 1Mbps	Front	0mm	Ant 5+6(6)	Reduced	6	2437	2	12.20	13.50	1.349	100	1.000	0.06	0.371	0.500
	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	Ant 5+6(6)	Reduced	6	2437	1	12.20	13.50	1.349	100	1.000	-0.01	0.116	0.156
	WLAN2.4GHz	802.11b 1Mbps	Front	0mm	Ant 5+6(6)	Reduced	1	2412	1	11.80	13.50	1.479	100	1.000	0.02	0.418	0.618
	WLAN2.4GHz	802.11b 1Mbps	Front	0mm	Ant 5+6(6)	Reduced	11	2462	1	11.40	13.00	1.445	100	1.000	0.01	0.352	0.509
	WLAN2.4GHz	802.11b 1Mbps	Front	0mm	Ant 5+6(6)	Reduced	6	2437	3	12.20	13.50	1.349	100	1.000	-0.14	0.174	0.235
	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	Ant 5+6(6)	Reduced	6	2437	3	12.20	13.50	1.349	100	1.000	0.02	0.470	0.634
	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	Ant 5+6(6)	Reduced	1	2412	3	11.80	13.50	1.479	100	1.000	0.14	0.430	0.636
12	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	Ant 5+6(6)	Reduced	11	2462	3	11.40	13.00	1.445	100	1.000	-0.16	0.474	0.685
	WLAN2.4GHz	802.11b 1Mbps	Front	8mm	Ant 5	Full	6	2437	1	18.10	19.50	1.380	100	1.000	0.07	0.341	0.471
	WLAN2.4GHz	802.11b 1Mbps	Back	24mm	Ant 5	Full	11	2462	3	18.00	19.50	1.413	100	1.000	0.04	0.107	0.151
	WLAN5.3GHz	802.11ac-VHT160 MCS0	Front	0mm	Ant 3+10	Rec off	50	5250	1	13.06	14.50	1.393	100	1.000	0.03	0.108	0.150
	WLAN5.3GHz	802.11ac-VHT160 MCS0	Back	0mm	Ant 3+10	Rec off	50	5250	1	13.06	14.50	1.393	100	1.000	0.05	0.103	0.143
	WLAN5.3GHz	802.11ac-VHT160 MCS0	Front	0mm	Ant 3+10	Rec off	50	5250	3	13.06	14.50	1.393	100	1.000	0.06	0.133	0.185
13	WLAN5.3GHz	802.11ac-VHT160 MCS0	Back	0mm	Ant 3+10	Rec off	50	5250	3	13.06	14.50	1.393	100	1.000	-0.02	0.451	0.628
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Front	0mm	Ant 3+10(10)	Rec off	106	5530	1	9.62	11.00	1.374	99.68	1.003	-0.1	0.207	0.285
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Front	0mm	Ant 3+10(10)	Rec off	106	5530	2	9.62	11.00	1.374	99.68	1.003	0.01	0.139	0.192
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Back	0mm	Ant 3+10(10)	Rec off	106	5530	1	9.62	11.00	1.374	99.68	1.003	0.01	0.166	0.229
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Front	0mm	Ant 3+10(10)	Rec off	106	5530	3	9.62	11.00	1.374	99.68	1.003	-0.06	0.172	0.237
14	WLAN5.5GHz	802.11ac-VHT80 MCS0	Back	0mm	Ant 3+10(10)	Rec off	106	5530	3	9.62	11.00	1.374	99.68	1.003	0.03	0.478	0.659
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Front	0mm	Ant 3+10(10)	Rec off	155	5775	1	7.78	9.50	1.486	99.68	1.003	0.101	0.133	0.198
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Back	0mm	Ant 3+10(10)	Rec off	155	5775	1	7.78	9.50	1.486	99.68	1.003	0.093	0.107	0.159
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Front	0mm	Ant 3+10(10)	Rec off	155	5775	3	7.78	9.50	1.486	99.68	1.003	0.08	0.134	0.200
15	WLAN5.8GHz	802.11ac-VHT80 MCS0	Back	0mm	Ant 3+10(10)	Rec off	155	5775	3	7.78	9.50	1.486	99.68	1.003	-0.04	0.475	0.708

**15.4 Product specific 10g SAR**

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Sample	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	WLAN5.3GHz	802.11ac-VHT160 MCS0	Front	0mm	Ant 3+10	Rec off	50	5250	1	13.06	14.50	1.393	100	1.000	0.03	0.035	0.049
	WLAN5.3GHz	802.11ac-VHT160 MCS0	Back	0mm	Ant 3+10	Rec off	50	5250	1	13.06	14.50	1.393	100	1.000	0.05	0.037	0.052
	WLAN5.3GHz	802.11ac-VHT160 MCS0	Right Side	0mm	Ant 3+10	Rec off	50	5250	1	13.06	14.50	1.393	100	1.000	-	0.026	0.036
	WLAN5.3GHz	802.11ac-VHT160 MCS0	Top Side	0mm	Ant 3+10	Rec off	50	5250	1	13.06	14.50	1.393	100	1.000	0.01	0.062	0.086
	WLAN5.3GHz	802.11ac-VHT160 MCS0	Top Side	0mm	Ant 3+10	Rec off	50	5250	3	13.06	14.50	1.393	100	1.000	-0.11	0.064	0.089
17	WLAN5.3GHz	802.11ac-VHT160 MCS0	Back	0mm	Ant 3+10	Rec off	50	5250	3	13.06	14.50	1.393	100	1.000	-0.02	0.160	0.223
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Front	0mm	Ant 3+10(10)	Rec off	106	5530	1	9.62	11.00	1.374	99.68	1.003	-0.1	0.073	0.101
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Back	0mm	Ant 3+10(10)	Rec off	106	5530	1	9.62	11.00	1.374	99.68	1.003	0.01	0.059	0.081
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Right Side	0mm	Ant 3+10(10)	Rec off	106	5530	1	9.62	11.00	1.374	99.68	1.003	-	0.045	0.062
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Top Side	0mm	Ant 3+10(10)	Rec off	106	5530	1	9.62	11.00	1.374	99.68	1.003	-0.04	0.155	0.214
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Top Side	0mm	Ant 3+10(10)	Rec off	106	5530	2	9.62	11.00	1.374	99.68	1.003	-0.09	0.128	0.176
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Top Side	0mm	Ant 3+10(10)	Rec off	106	5530	3	9.62	11.00	1.374	99.68	1.003	0.09	0.078	0.107
18	WLAN5.5GHz	802.11ac-VHT80 MCS0	Back	0mm	Ant 3+10(10)	Rec off	106	5530	3	9.62	11.00	1.374	99.68	1.003	0.03	0.179	0.247

16. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations	Portable Handset			
		Head	Body-worn	Hotspot	Product specific 10g SAR
1.	WLAN 2.4GHz(chain 1) + BT(chain 0)	Yes	Yes	Yes	Yes
2.	WLAN 2.4GHz(chain 0) + BT(chain 1)	Yes	Yes	Yes	Yes
3.	WLAN 5GHz/6GHZ(chain 0) + BT(chain 0)	Yes	Yes	Yes	Yes
4.	WLAN 5GHz/6GHZ(chain 0) + BT(chain 1)	Yes	Yes	Yes	Yes
5.	WLAN 5GHz/6GHZ(chain 1) + BT(chain 0)	Yes	Yes	Yes	Yes
6.	WLAN 5GHz/6GHZ(chain 1) + BT(chain 1)	Yes	Yes	Yes	Yes
7.	WLAN 5GHz/6GHZ MIMO + BT(chain 0)	Yes	Yes	Yes	Yes
8.	WLAN 5GHz/6GHZ MIMO + BT(chain 1)	Yes	Yes	Yes	Yes
9.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz (chain 0)	Yes	Yes	Yes	Yes
10.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz (chain 1)	Yes	Yes	Yes	Yes
11.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz MIMO	Yes	Yes	Yes	Yes
12.	WLAN 2.4GHz (chain 1) + WLAN 5GHz /6GHz(chain 0)	Yes	Yes	Yes	Yes
13.	WLAN 2.4GHz (chain 1) + WLAN 5GHz /6GHz(chain 1)	Yes	Yes	Yes	Yes
14.	WLAN 2.4GHz (chain 1) + WLAN 5GHz/6GHz MIMO	Yes	Yes	Yes	Yes
15.	WLAN 2.4GHz MIMO + WLAN 5GHz/6GHz (chain 0)	Yes	Yes	Yes	Yes
16.	WLAN 2.4GHz MIMO + WLAN 5GHz/6GHz (chain 1)	Yes	Yes	Yes	Yes
17.	WLAN 2.4GHz MIMO + WLAN 5GHz/6GHz MIMO	Yes	Yes	Yes	Yes
18.	WLAN 2.4GHz (chain 1) + WLAN 5GHz/6GHz (chain 0) + BT(chain 0)	Yes	Yes	Yes	Yes
19.	WLAN 2.4GHz (chain 1) + WLAN 5GHz/6GHz (chain 1) + BT(chain 0)	Yes	Yes	Yes	Yes
20.	WLAN 2.4GHz (chain 1) + WLAN 5GHz/6GHz MIMO + BT(chain 0)	Yes	Yes	Yes	Yes
21.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz (chain 0) + BT(chain 1)	Yes	Yes	Yes	Yes
22.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz (chain 1) + BT(chain 1)	Yes	Yes	Yes	Yes
23.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz MIMO + BT(chain 1)	Yes	Yes	Yes	Yes
24.	WLAN 2.4GHz(chain 1) + BT(chain 0) + NFC				Yes
25.	WLAN 2.4GHz(chain 0) + BT(chain 1) + NFC				Yes
26.	WLAN 5GHz/6GHZ(chain 0) + BT(chain 0) + NFC				Yes
27.	WLAN 5GHz/6GHZ(chain 0) + BT(chain 1) + NFC				Yes
28.	WLAN 5GHz/6GHZ(chain 1) + BT(chain 0) + NFC				Yes
29.	WLAN 5GHz/6GHZ(chain 1) + BT(chain 1) + NFC				Yes
30.	WLAN 5GHz/6GHZ MIMO + BT(chain 0) + NFC				Yes
31.	WLAN 5GHz/6GHZ MIMO + BT(chain 1) + NFC				Yes
32.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz (chain 0) + NFC				Yes
33.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz (chain 1) + NFC				Yes
34.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz MIMO+ NFC				Yes
35.	WLAN 2.4GHz (chain 1) + WLAN 5GHz /6GHz(chain 0) + NFC				Yes
36.	WLAN 2.4GHz (chain 1) + WLAN 5GHz /6GHz(chain 1) + NFC				Yes
37.	WLAN 2.4GHz (chain 1) + WLAN 5GHz/6GHz MIMO+ NFC				Yes
38.	WLAN 2.4GHz MIMO + WLAN 5GHz/6GHz (chain 0) + NFC				Yes
39.	WLAN 2.4GHz MIMO + WLAN 5GHz/6GHz (chain 1) + NFC				Yes
40.	WLAN 2.4GHz MIMO + WLAN 5GHz/6GHz MIMO+ NFC				Yes
41.	WLAN 2.4GHz (chain 1) + WLAN 5GHz/6GHz (chain 0) + BT(chain 0+ NFC)				Yes
42.	WLAN 2.4GHz (chain 1) + WLAN 5GHz/6GHz (chain 1) + BT(chain 0) + NFC				Yes
43.	WLAN 2.4GHz (chain 1) + WLAN 5GHz/6GHz MIMO + BT(chain 0) + NFC				Yes
44.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz (chain 0) + BT(chain 1) + NFC				Yes
45.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz (chain 1) + BT(chain 1) + NFC				Yes
46.	WLAN 2.4GHz (chain 0) + WLAN 5GHz/6GHz MIMO + BT(chain 1) + NFC				Yes

General Note:

1. This device WLAN 2.4GHz supports hotspot operation and Bluetooth support tethering applications.
2. WLAN2.4GHz and Bluetooth when share the same antenna chain, they can't transmit simultaneously.
3. WLAN2.4GHz and Bluetooth when not share the same antenna chain, they can transmit simultaneously.
4. According to the characteristic of EUT, WLAN5GHz/WLAN6GHz and Bluetooth can transmit simultaneously.
5. According to the EUT characteristic, WLAN 2.4GHz and WLAN 5GHz/WLAN6GHz can transmit simultaneously.
6. According to the EUT characteristic, two Bluetooth antennas cannot transmit simultaneously with each other.
7. WLAN2.4GHz/WLAN5GHz MIMO SAR can represent SISO SAR to do co-located SAR analysis.
8. For distance SAR and non-distance SAR always chose higher SAR to do co-located analysis.
9. For simultaneously analysis, since the SAR summation of 3 transmitters can cover others combination of 2 transmitters, therefore in this section did not additional to evaluate 2TX combination of simultaneously transmission.
10. The worst case 5 GHz WLAN SAR for each configuration was used for SAR summation.

11. Chose the worst zoom scan SAR of WLAN correspondingly for co-located analysis.
12. The reported SAR summation is calculated based on the same configuration and test position.
13. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
 - i) 1g Scalar SAR summation < 1.6W/kg and 10g Scalar SAR summation < 4.0W/kg.
 - ii) $SPLSR = (SAR1 + SAR2)^{1.5} / (\text{min. separation distance, mm})$, and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
 - iii) If $SPLSR \leq 0.04$ for 1g SAR and $SPLSR \leq 0.10$ for 10g SAR, simultaneously transmission SAR measurement is not necessary.
 - iv) Simultaneously transmission SAR measurement, and the reported multi-band 1g SAR < 1.6W/kg and 10g SAR < 4.0W/kg.
14. The WLAN6GHz Sim-Tx analysis guidance with other transmitters was based on SAR test results. The simultaneous transmission and test exemption analysis per KDB 447498 D01, and the device does not support FR2 or another MPE field measurement, therefore SAR report in section 16 has include TER analysis requirement according to KDB 987594.

16.1 Head Exposure Conditions

Exposure Position	1	2	3	4	5	1+2+4	1+2+5	1+3+4	1+3+5
	WLAN2.4GHz Ant 5+6	WLAN5GHz Ant 3+10	WLAN6GHz Ant 3+10	Bluetooth Ant 6	Bluetooth Ant 5	Summed	Summed	Summed	Summed
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)
Right Cheek	0.177	0.541	0.663	0.026	0.035	0.74	0.75	0.87	0.88
Right Tilted	0.171	0.587	0.663	0.025	0.044	0.78	0.80	0.86	0.88
Left Cheek	0.754	0.663	0.663	0.072	0.045	1.49	1.46	1.49	1.46
Left Tilted	0.587	0.627	0.663	0.007	0.053	1.22	1.27	1.26	1.30

16.2 Hotspot Exposure Conditions

Exposure Position	1	2	4	5	1+2+4	1+2+5
	WLAN2.4GHz Ant 5+6	WLAN5GHz Ant 3+10	Bluetooth Ant 6	Bluetooth Ant 5	Summed	Summed
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)
Front	0.058	0.151	0.015	0.010	0.22	0.22
Back	0.200	0.198	0.029	0.035	0.43	0.43
Left side					0.00	0.00
Right side	0.081	0.125	0.014	0.048	0.22	0.25
Top side		0.118	0.014	0.010	0.13	0.13
Bottom side					0.00	0.00

16.3 Body-Worn Accessory Exposure Conditions

Exposure Position	1	2	3	4	5	1+2+4	1+2+5	1+3+4	1+3+5
	WLAN2.4GHz Ant 5+6	WLAN5GHz Ant 3+10	WLAN6GHz Ant 3+10	Bluetooth Ant 6	Bluetooth Ant 5	Summed	Summed	Summed	Summed
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)
Front	0.642	0.285	0.584	0.156	0.085	1.08	1.01	1.38	1.31
Back	0.685	0.708	0.584	0.164	0.143	1.56	1.54	1.43	1.41

16.4 Product specific 10g SAR Exposure Conditions

Exposure Position	2	3	4	2+4	3+4
	WLAN5GHz Ant 3+10	WLAN6GHz Ant 3+10	NFC Ant 9	Summed	Summed
	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)
Front	0.101	0.360		0.10	0.36
Back	0.247	0.360	0.014	0.26	0.37
Left side		0.360		0.00	0.36
Right side	0.062	0.360		0.06	0.36
Top side	0.214	0.360		0.21	0.36
Bottom side		0.360		0.00	0.36

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17. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

18. References

- [1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
- [2] ANSI/IEEE Std. C95.1-1992, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", September 1992
- [3] IEEE Std. 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", Sep 2013
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 248227 D01 v02r02, "SAR Guidance for IEEE 802.11 (WiFi) Transmitters", Oct 2015.
- [6] FCC KDB 447498 D01 v06, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", Oct 2015
- [7] FCC KDB 648474 D04 v01r03, "SAR Evaluation Considerations for Wireless Handsets", Oct 2015.
- [8] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.
- [9] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [10] FCC KDB 865664 D02 v01r02, "RF Exposure Compliance Reporting and Documentation Considerations" Oct 2015.
- [11] FCC KDB 616217 D04 v01r02, "SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers", Oct 2015

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