FCC SAR Test Report

APPLICANT	:	**SHARP CORPORATION, IoT Communication BU**
EQUIPMENT	:	**Smart Phone**
BRAND NAME	:	**NTT docomo**
MODEL NAME	:	**SH-03J**
FCC ID	:	**APYHRO00248**
STANDARD	:	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2013**

We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had 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., the test report shall not be reproduced except in full.

Eric Huang

Reviewed by: Eric Huang / Manager

Jones Tsai

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)

Table of Contents

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA740120	Rev. 01	Initial issue of report	Jun. 02, 2017

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for SHARP CORPORATION, IoT Communication BU, Smart Phone, SH-03J, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary				Highest Simultaneous Transmission 1g SAR (W/kg)
		Head (Separation 0mm)	Body-worn (Separation 15mm)	Hotspot (Separation 10mm)	Product Specific (Separation 0mm)	
		1g SAR (W/kg)			10g SAR (W/kg)	
Licensed	GSM850	0.51	0.58	0.66		1.14
	GSM1900	0.09	0.53	1.14	2.53	
	WCDMA V	0.34	0.36	0.41		
	LTE Band 5	0.30	0.35	0.38		
DTS	2.4GHz WLAN	0.52	0.03	0.07		1.14
NII	5GHz WLAN	0.42	0.15		0.53	1.04
Date of Testing:		2017/4/18 ~ 2017/4/27				

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body, 4.0 W/kg for Product Specific) 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

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	SHARP CORPORATION, IoT Communication BU
Address	2-13-1, Hachihonmatsu-Iida, Higashi-hiroshima-shi, Hiroshima, 739-0192, Japan

Manufacturer	
Company Name	SHARP CORPORATION, IoT Communication BU
Address	2-13-1, Hachihonmatsu-Iida, Higashi-hiroshima-shi, Hiroshima, 739-0192, Japan

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 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Smart Phone
Brand Name	NTT docomo
Model Name	SH-03J
FCC ID	APYHRO00248
IMEI Code	004401116021045
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz 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 Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	GSM/GPRS RMC/AMR 12.2Kbps HSDPA HSUPA LTE: QPSK, 16QAM WLAN 2.4GHz : 802.11b/g/n/ac HT20/HT40/VHT20/VHT40 WLAN 5GHz : 802.11a/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC:ASK
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype
Remark: 1. This device 2.4GHz WLAN supports Hotspot operation. 2. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of GSM1900.	

4.2 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>APYHRO00248</td></tr>
<tr><td>Equipment Name</td><td>Smart Phone</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 5: 824.7 MHz ~ 848.3 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 05:1.4MHz, 3MHz, 5MHz, 10MHz</td></tr>
<tr><td>uplink modulations used</td><td>QPSK, and 16QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Voice and Data</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
</table>
</td></tr>
<tr><td>LTE A-MPR</td><td>In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
</table>

<table>
<tr><th colspan="9">Transmission (H, M, L) channel numbers and frequencies in each LTE band</th></tr>
<tr><th colspan="9">LTE Band 5</th></tr>
<tr><th rowspan="2"></th><th colspan="2">Bandwidth 1.4 MHz</th><th colspan="2">Bandwidth 3 MHz</th><th colspan="2">Bandwidth 5 MHz</th><th colspan="2">Bandwidth 10 MHz</th></tr>
<tr><th>Ch. #</th><th>Freq. (MHz)</th><th>Ch. #</th><th>Freq. (MHz)</th><th>Ch. #</th><th>Freq. (MHz)</th><th>Ch. #</th><th>Freq. (MHz)</th></tr>
<tr><td>L</td><td>20407</td><td>824.7</td><td>20415</td><td>825.5</td><td>20425</td><td>826.5</td><td>20450</td><td>829</td></tr>
<tr><td>M</td><td>20525</td><td>836.5</td><td>20525</td><td>836.5</td><td>20525</td><td>836.5</td><td>20525</td><td>836.5</td></tr>
<tr><td>H</td><td>20643</td><td>848.3</td><td>20635</td><td>847.5</td><td>20625</td><td>846.5</td><td>20600</td><td>844</td></tr>
</table>

5. RF Exposure Limits

5.1 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.

5.2 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

1. 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.

6. Specific Absorption Rate (SAR)

6.1 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.

6.2 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:

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

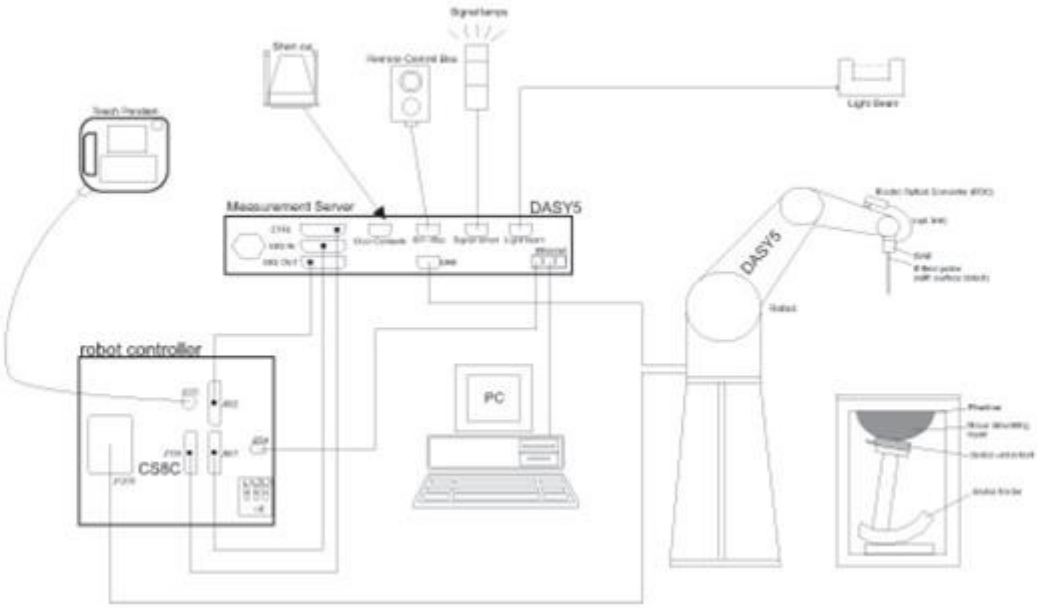
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. 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 WinXP or Win7 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.

7.1 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.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm

<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 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/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

7.2 Data Acquisition Electronics (DAE)

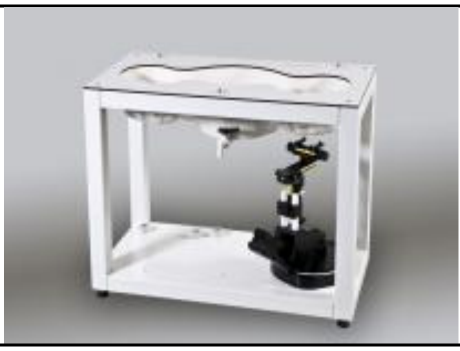
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an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

Fig 5.1 Photo of DAE

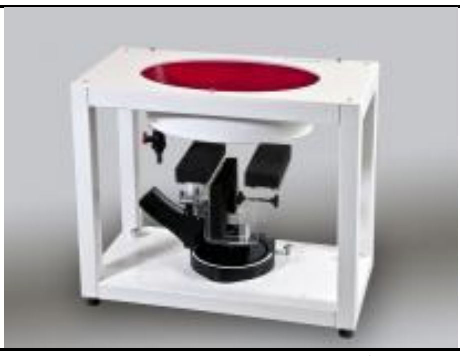
7.3 Phantom

<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 in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

7.4 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

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) 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
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and 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

8.1 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 form 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

8.2 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.

8.3 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 dB0 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	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.	

8.4 Zoom Scan

Zoom scans are used 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 shoes 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.

<table>
<tr><td colspan="3"></td><td>$\leq$ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>$\leq$ 2 GHz: $\leq$ 8 mm
2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*
4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm
4 – 5 GHz: $\leq$ 3 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm
4 – 5 GHz: $\leq$ 2.5 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm
4 – 5 GHz: $\geq$ 25 mm
5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">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 <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 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.</td></tr>
</table>

8.5 Volume Scan Procedures

The volume scan is used for 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.

8.6 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.

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	499	Mar. 21, 2017	Mar. 20, 2018
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Sep. 30, 2016	Sep. 29, 2017
SPEAG	2450MHz System Validation Kit	D2450V2	926	Jul. 25, 2016	Jul. 24, 2017
SPEAG	5GHz System Validation Kit	D5GHzV2	1006	Sep. 27, 2016	Sep. 26, 2017
SPEAG	Data Acquisition Electronics	DAE4	1399	Nov. 17, 2016	Nov. 16, 2017
SPEAG	Data Acquisition Electronics	DAE4	778	May. 12, 2016	May. 11, 2017
SPEAG	Dosimetric E-Field Probe	EX3DV4	3955	Nov. 24, 2016	Nov. 23, 2017
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Aug. 26, 2016	Aug. 25, 2017
WonDer	Thermometer	WD-5015	TM642	Oct. 12, 2016	Oct. 11, 2017
Wisewind	Thermometer	HTC-1	TM560	Oct. 12, 2016	Oct. 11, 2017
Anritsu	Radio Communication Analyzer	MT8820C	6201381760	May. 10, 2016	May. 09, 2017
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 17, 2016	May. 16, 2017
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Dec. 09, 2016	Dec. 08, 2017
Agilent	ENA Network Analyzer	E5071C	MY46316648	Jan. 04, 2017	Jan. 03, 2018
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Jul. 19, 2016	Jul. 18, 2017
LINE SEIKI	Digital Thermometer	LKMelectronic	DTM3000SPEZIAL	Sep. 05, 2016	Sep. 04, 2017
Anritsu	Power Meter	ML2495A	1419002	May. 10, 2016	May. 09, 2017
Anritsu	Power Meter	ML2495A	1438002	Dec. 06, 2016	Dec. 05, 2017
Anritsu	Power Sensor	MA2411B	1339124	May. 10, 2016	May. 09, 2017
Anritsu	Power Sensor	MA2411B	1339195	Dec. 06, 2016	Dec. 05, 2017
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jun. 21, 2016	Jun. 20, 2017
Mini-Circuits	Power Amplifier	ZVE-8G+	D120604	Mar. 09, 2017	Mar. 08, 2018
Mini-Circuits	Power Amplifier	ZHL-42W+	QA1344002	Mar. 09, 2017	Mar. 08, 2018
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General 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.

10. System Verification

10.1 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.

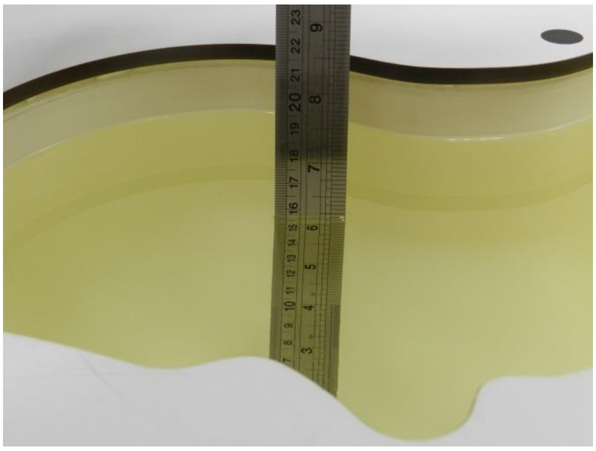


Fig 10.1Photo of Liquid Height for Head SAR

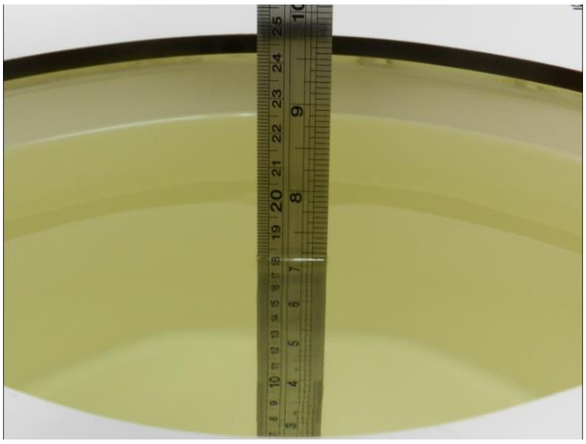


Fig 10.2 Photo of Liquid Height for Body SAR

10.2 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 (εr)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

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. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
835	HSL	22.5	0.896	42.209	0.90	41.50	-0.44	1.71	±5	2017/4/19
835	MSL	22.4	0.963	55.698	0.97	55.20	-0.72	0.90	±5	2017/4/18
1900	HSL	22.4	1.445	41.501	1.40	40.00	3.21	3.75	±5	2017/4/18
1900	MSL	22.2	1.556	55.543	1.52	53.30	2.37	4.21	±5	2017/4/18
2450	HSL	22.5	1.767	39.596	1.80	39.20	-1.83	1.01	±5	2017/4/23
2450	MSL	22.5	2.024	52.188	1.95	52.70	3.79	-0.97	±5	2017/4/23
5250	HSL	22.2	4.690	36.100	4.71	35.95	-0.42	0.42	±5	2017/4/26
5250	MSL	22.3	5.430	47.300	5.36	48.95	1.31	-3.37	±5	2017/4/27
5600	HSL	22.2	5.030	35.600	5.07	35.50	-0.79	0.28	±5	2017/4/26
5600	MSL	22.3	5.890	46.700	5.77	48.50	2.08	-3.71	±5	2017/4/27

10.3 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.

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 (%)
2017/4/19	835	HSL	250	D835V2-499	ES3DV3 - SN3270	DAE4 Sn778	2.43	9.45	9.72	2.86
2017/4/18	835	MSL	250	D835V2-499	ES3DV3 - SN3270	DAE4 Sn778	2.44	9.67	9.76	0.93
2017/4/18	1900	HSL	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn778	10.60	40.50	42.40	4.69
2017/4/18	1900	MSL	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn778	10.10	38.80	40.40	4.12
2017/4/23	2450	HSL	250	D2450V2-926	EX3DV4 - SN3955	DAE4 Sn1399	13.80	52.80	55.20	4.55
2017/4/23	2450	MSL	250	D2450V2-926	EX3DV4 - SN3955	DAE4 Sn1399	12.40	51.20	49.60	-3.13
2017/4/26	5250	HSL	100	D5GHzV2-1006	EX3DV4 - SN3955	DAE4 Sn1399	8.25	80.60	82.50	2.36
2017/4/27	5250	MSL	100	D5GHzV2-1006	EX3DV4 - SN3955	DAE4 Sn1399	7.38	75.50	73.80	-2.25
2017/4/26	5600	HSL	100	D5GHzV2-1006	EX3DV4 - SN3955	DAE4 Sn1399	8.54	83.80	85.40	1.91
2017/4/27	5600	MSL	100	D5GHzV2-1006	EX3DV4 - SN3955	DAE4 Sn1399	7.69	78.60	76.90	-2.16

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 (%)
2017/4/18	1900	MSL	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn778	5.37	20.60	21.48	4.27
2017/4/27	5250	MSL	100	D5GHzV2-1006	EX3DV4 - SN3955	DAE4 Sn1399	2.03	21.20	20.30	-4.25
2017/4/27	5600	MSL	100	D5GHzV2-1006	EX3DV4 - SN3955	DAE4 Sn1399	2.07	22.00	20.70	-5.91

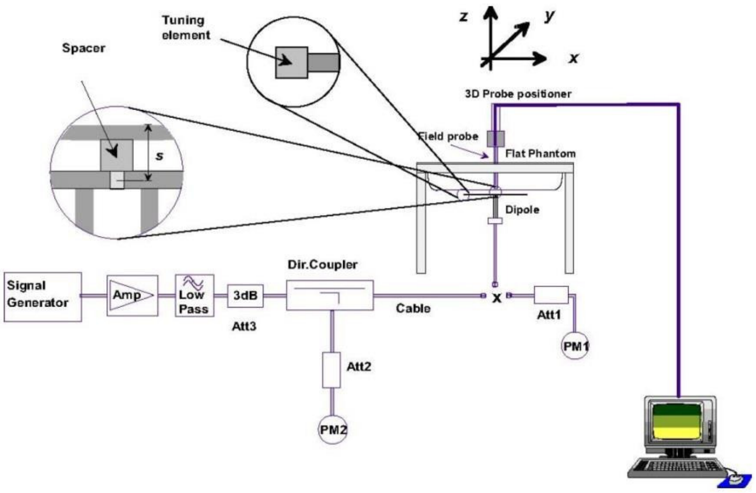


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

Figure 9.1.1 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 9.1.2 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 9.1.3). 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 9.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

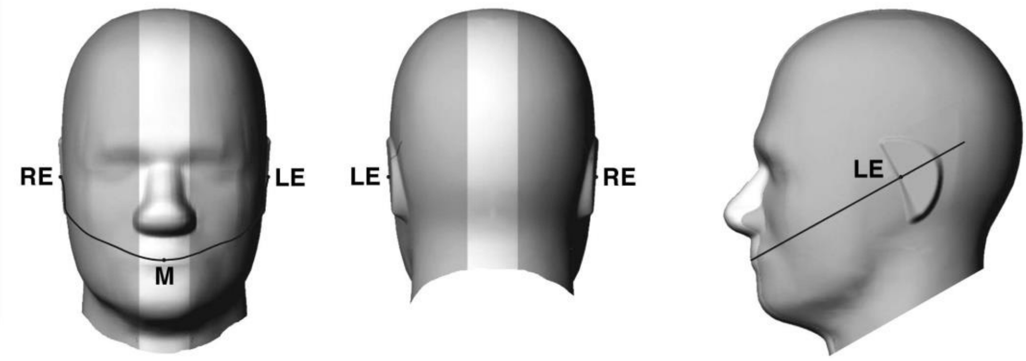


Fig 9.1.1 Front, back, and side views of SAM twin phantom

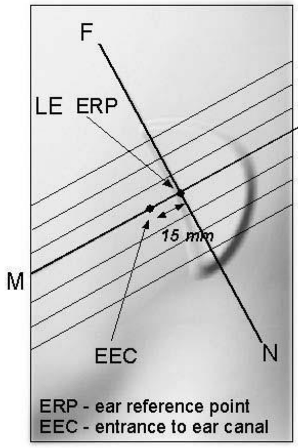


Fig 9.1.2 Close-up side view of phantom showing the ear region.

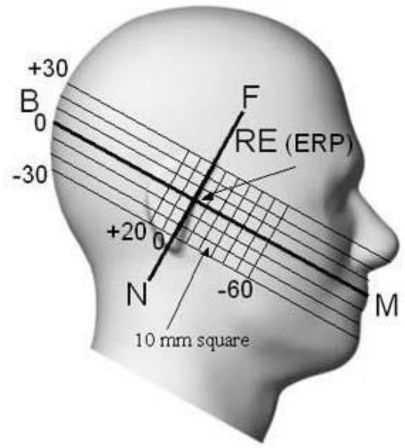


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

11.2 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 wt of the handset at the level of the acoustic output (point A in Figure 9.2.1 and Figure 9.2.2), and the midpoint of the width wb 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 9.2.1). 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 9.2.2), 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 9.2.3), 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 9.2.3. The actual rotation angles should be documented in the test report.

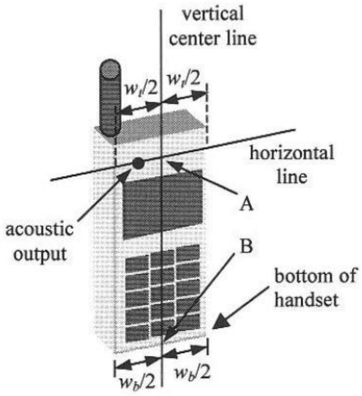


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case

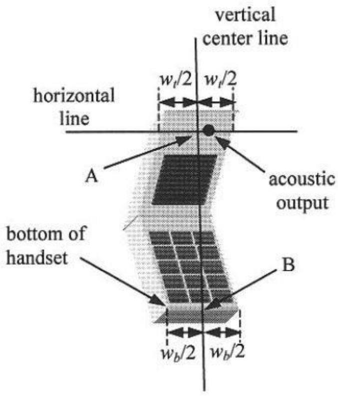


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

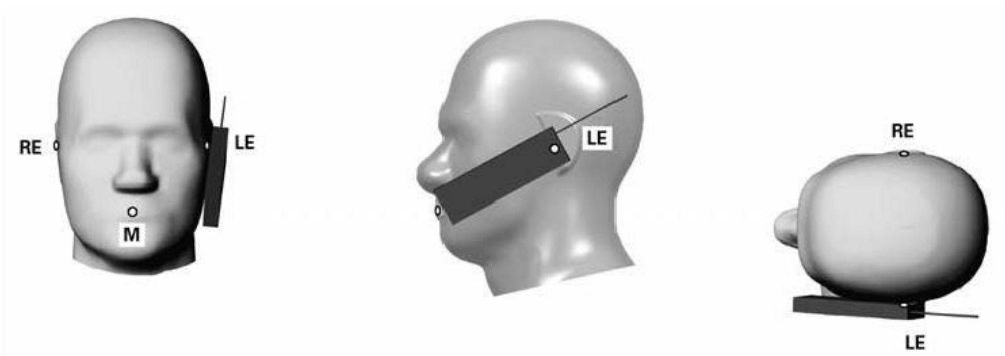


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

11.3 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 9.3.1. 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

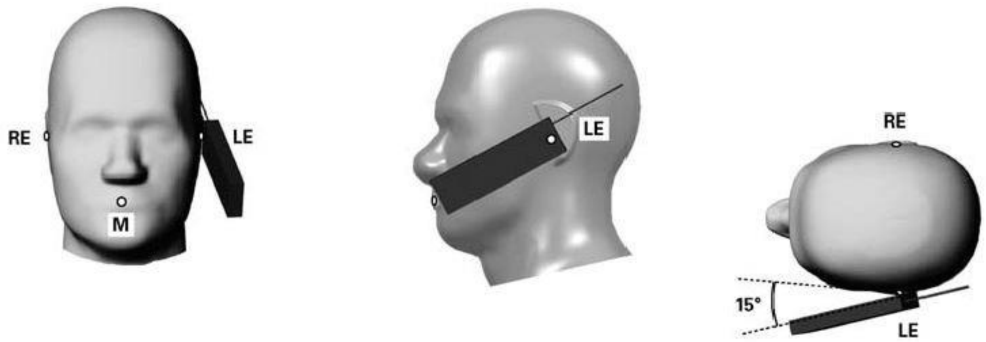


Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

11.4 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 9.4). 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 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 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.

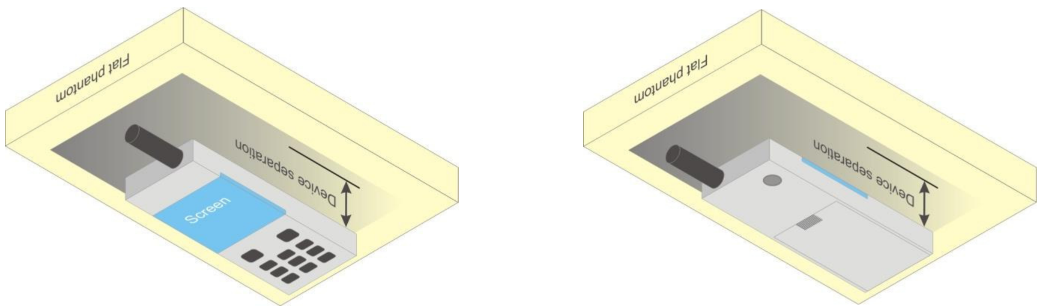


Fig 9.4 Body Worn Position

11.5 Product Specific Exposure

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that 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 Product Specific 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 Product Specific SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

11.6 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 x W ≥ 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 form 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.

12. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the GPRS (4Tx slots) for GSM850/GSM1900 is considered as the primary mode.
3. Other configurations of GSM / GPRS are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode
4. Power reduction which is triggered by hotspot mode is implemented in GSM1900 band, for hotspot mode SAR testing EUT was set in reduced power mode and GPRS 4 Tx slot due to its highest frame-average power.

<Default Power Mode>

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM 1 Tx slot	32.26	32.24	32.12	33.00	23.26	23.24	23.12	24.00
GPRS 1 Tx slot	32.30	32.28	32.15	33.00	23.30	23.28	23.15	24.00
GPRS 2 Tx slots	29.88	29.87	29.82	31.00	23.88	23.87	23.82	25.00
GPRS 3 Tx slots	27.66	27.64	27.56	29.10	23.40	23.38	23.30	24.84
GPRS 4 Tx slots	27.26	27.24	27.18	28.50	24.26	24.24	24.18	25.50

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	29.11	29.37	29.35	30.00	20.11	20.37	20.35	21.00
GPRS 1 Tx slot	29.16	29.38	29.36	30.00	20.16	20.38	20.36	21.00
GPRS 2 Tx slots	26.78	26.81	27.22	27.50	20.78	20.81	21.22	21.50
GPRS 3 Tx slots	25.10	25.31	25.46	26.20	20.84	21.05	21.20	21.94
GPRS 4 Tx slots	24.37	24.53	24.65	25.50	21.37	21.53	21.65	22.50

<Reduced Power Mode>

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	25.42	25.79	25.78	27.00	16.42	16.79	16.78	18.00
GPRS 1 Tx slot	25.51	25.80	25.85	27.00	16.51	16.80	16.85	18.00
GPRS 2 Tx slots	23.15	23.36	23.56	24.50	17.15	17.36	17.56	18.50
GPRS 3 Tx slots	21.30	21.42	21.44	23.20	17.04	17.16	17.18	18.94
GPRS 4 Tx slots	20.63	20.73	20.91	22.50	17.63	17.73	17.91	19.50

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1, Note 2)*	CM (dB) *(Note 3)*	MPR (dB) *(Note 3)*
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 *(Note 4)*	15/15 *(Note 4)*	64	12/15 *(Note 4)*	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$, and Δ_{CQI} = 24/15 with $\beta_{hs} = 24/15 * \beta_c$.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
  i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
  ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
  iii. Set Cell Power = -86 dBm
  iv. Set Channel Type = 12.2k + HSPA
  v. Set UE Target Power
  vi. Power Ctrl Mode= Alternating bits
  vii. Set and observe the E-TFCI
  viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$. For sub-test 5, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 5/15 with $\beta_{hs} = 5/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

Setup Configuration

<WCDMA Conducted Power>

General Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA.

Band		WCDMA V			Tune-up Limit (dBm)
TX Channel		4132	4182	4233	
Rx Channel		4357	4407	4458	
Frequency (MHz)		826.4	836.4	846.6	
3GPP Rel 99	AMR 12.2Kbps	22.56	22.61	22.53	24.00
3GPP Rel 99	RMC 12.2Kbps	22.59	22.62	22.55	24.00
3GPP Rel 6	HSDPA Subtest-1	21.62	21.64	21.56	24.00
3GPP Rel 6	HSDPA Subtest-2	21.64	21.61	21.55	24.00
3GPP Rel 6	HSDPA Subtest-3	21.17	21.18	21.13	23.50
3GPP Rel 6	HSDPA Subtest-4	21.18	21.17	21.15	23.50
3GPP Rel 6	HSUPA Subtest-1	21.61	21.63	21.56	24.00
3GPP Rel 6	HSUPA Subtest-2	19.62	19.65	19.51	22.00
3GPP Rel 6	HSUPA Subtest-3	20.61	20.63	20.52	23.00
3GPP Rel 6	HSUPA Subtest-4	19.66	19.64	19.53	22.00
3GPP Rel 6	HSUPA Subtest-5	21.64	21.65	21.59	24.00

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B5 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.40	22.56	22.72	24	0
10	QPSK	1	25	22.44	22.57	22.71		
10	QPSK	1	49	22.45	22.51	22.64		
10	QPSK	25	0	21.45	21.66	21.80	23	1
10	QPSK	25	12	21.50	21.65	21.79		
10	QPSK	25	25	21.44	21.61	21.71		
10	QPSK	50	0	21.48	21.63	21.76		
10	16QAM	1	0	21.71	21.84	21.98	23	1
10	16QAM	1	25	21.74	21.86	22.00		
10	16QAM	1	49	21.76	21.79	21.92		
10	16QAM	25	0	20.43	20.67	20.80	22	2
10	16QAM	25	12	20.52	20.67	20.80		
10	16QAM	25	25	20.45	20.60	20.71		
10	16QAM	50	0	20.51	20.66	20.76		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.42	22.58	22.71	24	0
5	QPSK	1	12	22.35	22.54	22.66		
5	QPSK	1	24	22.44	22.51	22.65		
5	QPSK	12	0	21.45	21.64	21.74	23	1
5	QPSK	12	7	21.42	21.65	21.75		
5	QPSK	12	13	21.47	21.58	21.70		
5	QPSK	25	0	21.42	21.60	21.71		
5	16QAM	1	0	21.70	21.89	22.00	23	1
5	16QAM	1	12	21.64	21.85	21.97		
5	16QAM	1	24	21.71	21.79	21.93		
5	16QAM	12	0	20.43	20.65	20.76	22	2
5	16QAM	12	7	20.48	20.63	20.76		
5	16QAM	12	13	20.52	20.63	20.70		
5	16QAM	25	0	20.46	20.63	20.73		
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.38	22.56	22.67	24	0
3	QPSK	1	8	22.35	22.53	22.62		
3	QPSK	1	14	22.31	22.52	22.63		
3	QPSK	8	0	21.45	21.60	21.72	23	1
3	QPSK	8	4	21.43	21.64	21.70		
3	QPSK	8	7	21.41	21.58	21.66		
3	QPSK	15	0	21.38	21.59	21.71		
3	16QAM	1	0	21.67	21.84	21.98	23	1
3	16QAM	1	8	21.64	21.84	21.96		
3	16QAM	1	14	21.62	21.81	21.91		
3	16QAM	8	0	20.48	20.67	20.76	22	2
3	16QAM	8	4	20.50	20.68	20.76		
3	16QAM	8	7	20.44	20.66	20.76		
3	16QAM	15	0	20.43	20.61	20.74		

Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.30	22.47	22.57	24	0
1.4	QPSK	1	3	22.36	22.51	22.63		
1.4	QPSK	1	5	22.28	22.46	22.55		
1.4	QPSK	3	0	22.32	22.50	22.57		
1.4	QPSK	3	1	22.37	22.53	22.65		
1.4	QPSK	3	3	22.32	22.48	22.59		
1.4	QPSK	6	0	21.33	21.51	21.60	23	1
1.4	16QAM	1	0	21.58	21.76	21.84	23	1
1.4	16QAM	1	3	21.65	21.81	21.91		
1.4	16QAM	1	5	21.57	21.73	21.85		
1.4	16QAM	3	0	21.36	21.51	21.63		
1.4	16QAM	3	1	21.40	21.57	21.69		
1.4	16QAM	3	3	21.33	21.52	21.62		
1.4	16QAM	6	0	20.41	20.60	20.67	22	2

<WLAN Conducted Power>

General Note:

1. For each antenna, transmit power in SISO operation is larger than (or equal to) the power in MIMO operation, RF exposure compliance of MIMO mode can be deduced from the compliance simultaneous transmission of antennas operating in SISO mode.
2. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio ≤ 0.04, no additional SAR measurements for MIMO.
3. 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.
4. 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).
5. 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.
6. 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.
    c. 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.

<2.4GHz WLAN ANT 1>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	11.01	13.00	99.02
		6	2437	11.09	13.00	
		11	2462	11.17	13.00	
	802.11g 6Mbps	1	2412	10.02	12.00	93.58
		6	2437	10.11	12.00	
		11	2462	10.18	12.00	
	802.11n-HT20 MCS0	1	2412	10.02	12.00	94.40
		6	2437	10.10	12.00	
		11	2462	10.14	12.00	
	802.11n-HT40 MCS0	3	2422	10.09	12.00	89.42
		6	2437	10.14	12.00	
		9	2452	10.19	12.00	
	802.11ac-VHT20 MCS0	1	2412	10.01	12.00	94.06
		6	2437	10.02	12.00	
		11	2462	10.18	12.00	
	802.11ac-VHT40 MCS0	3	2422	10.06	12.00	87.85
		6	2437	10.11	12.00	
		9	2452	10.23	12.00	

<2.4GHz WLAN ANT 2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	11.26	13.00	98.70
		6	2437	11.59	13.00	
		11	2462	11.37	13.00	
	802.11g 6Mbps	1	2412	10.12	12.00	94.39
		6	2437	10.57	12.00	
		11	2462	10.08	12.00	
	802.11n-HT20 MCS0	1	2412	10.17	12.00	93.65
		6	2437	10.61	12.00	
		11	2462	10.00	12.00	
	802.11n-HT40 MCS0	3	2422	10.40	12.00	87.74
		6	2437	10.32	12.00	
		9	2452	10.36	12.00	
	802.11ac-VHT20 MCS0	1	2412	10.10	12.00	93.14
		6	2437	10.22	12.00	
		11	2462	10.08	12.00	
	802.11ac-VHT40 MCS0	3	2422	10.25	12.00	87.74
		6	2437	10.27	12.00	
		9	2452	10.30	12.00	

<2.4GHz WLAN ANT 1+2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	14.13	16.00	99.02
		6	2437	14.34	16.00	
		11	2462	14.34	16.00	
	802.11g 6Mbps	1	2412	13.01	15.00	94.44
		6	2437	13.41	15.00	
		11	2462	13.06	15.00	
	802.11n-HT20 MCS0	1	2412	13.01	15.00	94.40
		6	2437	13.39	15.00	
		11	2462	13.02	15.00	
	802.11n-HT40 MCS0	3	2422	13.22	15.00	87.74
		6	2437	13.26	15.00	
		9	2452	13.25	15.00	
	802.11ac-VHT20 MCS0	1	2412	13.05	15.00	93.14
		6	2437	13.16	15.00	
		11	2462	13.07	15.00	
	802.11ac-VHT40 MCS0	3	2422	13.12	15.00	88.57
		6	2437	13.24	15.00	
		9	2452	13.26	15.00	

<5GHz WLAN ANT1>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	10.45	12.00	94.39
		40	5200	10.45	12.00	
		44	5220	10.37	12.00	
		48	5240	10.51	12.00	
	802.11n-HT20 MCS0	36	5180	10.91	12.00	94.00
		40	5200	10.74	12.00	
		44	5220	10.41	12.00	
		48	5240	10.82	12.00	
	802.11n-HT40 MCS0	38	5190	10.98	12.00	89.47
		46	5230	10.43	12.00	
	802.11ac-VHT20 MCS0	36	5180	11.00	12.00	94.06
		40	5200	10.72	12.00	
		44	5220	10.37	12.00	
		48	5240	10.89	12.00	
	802.11ac-VHT40 MCS0	38	5190	11.03	12.00	89.91
		46	5230	10.40	12.00	
	802.11ac-VHT80 MCS0	42	5210	10.88	12.00	95.17

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	10.48	12.00	94.39
		56	5280	10.48	12.00	
		60	5300	10.43	12.00	
		64	5320	10.44	12.00	
	802.11n-HT20 MCS0	52	5260	10.79	12.00	94.00
		56	5280	10.79	12.00	
		60	5300	10.40	12.00	
		64	5320	10.83	12.00	
	802.11n-HT40 MCS0	54	5270	10.99	12.00	89.47
		62	5310	10.44	12.00	
	802.11ac-VHT20 MCS0	52	5260	10.78	12.00	94.06
		56	5280	10.70	12.00	
		60	5300	10.32	12.00	
		64	5320	10.79	12.00	
	802.11ac-VHT40 MCS0	54	5270	10.96	12.00	89.91
		62	5310	10.38	12.00	
	802.11ac-VHT80 MCS0	58	5290	10.77	12.00	95.17

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	10.49	12.00	94.39
		116	5580	10.37	12.00	
		124	5620	10.49	12.00	
		132	5660	10.39	12.00	
		140	5700	10.39	12.00	
	802.11n-HT20 MCS0	100	5500	10.79	12.00	94.00
		116	5580	10.32	12.00	
		124	5620	10.79	12.00	
		132	5660	10.72	12.00	
		140	5700	10.50	12.00	
	802.11n-HT40 MCS0	102	5510	10.83	12.00	89.47
		110	5550	10.47	12.00	
		126	5630	10.48	12.00	
		134	5670	10.65	12.00	
	802.11ac-VHT20 MCS0	100	5500	10.84	12.00	94.06
		116	5580	10.29	12.00	
		124	5620	10.83	12.00	
		132	5660	10.77	12.00	
		140	5700	10.50	12.00	
	802.11ac-VHT40 MCS0	102	5510	10.90	12.00	89.91
		110	5550	10.32	12.00	
		126	5630	10.52	12.00	
		134	5670	10.77	12.00	
	802.11ac-VHT80 MCS0	106	5530	10.44	12.00	95.17
		122	5610	10.33	12.00	

<5GHz WLAN ANT2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	10.35	12.00	94.39
		40	5200	10.30	12.00	
		44	5220	10.05	12.00	
		48	5240	10.08	12.00	
	802.11n-HT20 MCS0	36	5180	10.39	12.00	94.00
		40	5200	10.36	12.00	
		44	5220	10.13	12.00	
		48	5240	10.09	12.00	
	802.11n-HT40 MCS0	38	5190	10.51	12.00	89.42
		46	5230	10.29	12.00	
	802.11ac-VHT20 MCS0	36	5180	10.45	12.00	94.06
		40	5200	10.40	12.00	
		44	5220	10.07	12.00	
		48	5240	10.31	12.00	
	802.11ac-VHT40 MCS0	38	5190	10.53	12.00	89.31
		46	5230	10.27	12.00	
	802.11ac-VHT80 MCS0	42	5210	10.35	12.00	95.50

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	10.00	12.00	94.39
		56	5280	10.01	12.00	
		60	5300	10.10	12.00	
		64	5320	10.12	12.00	
	802.11n-HT20 MCS0	52	5260	10.12	12.00	94.00
		56	5280	10.02	12.00	
		60	5300	10.02	12.00	
		64	5320	10.14	12.00	
	802.11n-HT40 MCS0	54	5270	10.33	12.00	89.42
		62	5310	10.21	12.00	
	802.11ac-VHT20 MCS0	52	5260	10.15	12.00	94.06
		56	5280	10.20	12.00	
		60	5300	10.01	12.00	
		64	5320	10.22	12.00	
	802.11ac-VHT40 MCS0	54	5270	10.39	12.00	89.31
		62	5310	10.19	12.00	
	802.11ac-VHT80 MCS0	58	5290	10.28	12.00	95.50

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	10.25	12.00	94.39
		116	5580	10.03	12.00	
		124	5620	10.22	12.00	
		132	5660	10.15	12.00	
		140	5700	10.15	12.00	
	802.11n-HT20 MCS0	100	5500	10.05	12.00	94.00
		116	5580	10.01	12.00	
		124	5620	10.05	12.00	
		132	5660	10.01	12.00	
		140	5700	10.04	12.00	
	802.11n-HT40 MCS0	102	5510	10.18	12.00	89.42
		110	5550	10.15	12.00	
		126	5630	10.11	12.00	
		134	5670	10.12	12.00	
	802.11ac-VHT20 MCS0	100	5500	10.14	12.00	94.06
		116	5580	10.00	12.00	
		124	5620	10.10	12.00	
		132	5660	10.14	12.00	
		140	5700	10.03	12.00	
	802.11ac-VHT40 MCS0	102	5510	10.18	12.00	89.31
		110	5550	10.05	12.00	
		126	5630	10.20	12.00	
		134	5670	10.20	12.00	
	802.11ac-VHT80 MCS0	106	5530	10.20	12.00	95.50
		122	5610	10.15	12.00	

<5GHz WLAN ANT1+2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	13.59	15.00	94.39
		40	5200	13.59	15.00	
		44	5220	13.30	15.00	
		48	5240	13.35	15.00	
	802.11n-HT20 MCS0	36	5180	13.77	15.00	93.07
		40	5200	13.56	15.00	
		44	5220	13.33	15.00	
		48	5240	13.56	15.00	
	802.11n-HT40 MCS0	38	5190	13.85	15.00	87.62
		46	5230	13.42	15.00	
	802.11ac-VHT20 MCS0	36	5180	13.40	15.00	94.00
		40	5200	13.39	15.00	
		44	5220	13.20	15.00	
		48	5240	13.31	15.00	
	802.11ac-VHT40 MCS0	38	5190	13.78	15.00	89.23
		46	5230	13.36	15.00	
	802.11ac-VHT80 MCS0	42	5210	13.84	15.00	95.17

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	13.32	15.00	94.39
		56	5280	13.30	15.00	
		60	5300	13.24	15.00	
		64	5320	13.38	15.00	
	802.11n-HT20 MCS0	52	5260	13.48	15.00	93.07
		56	5280	13.44	15.00	
		60	5300	13.29	15.00	
		64	5320	13.51	15.00	
	802.11n-HT40 MCS0	54	5270	13.81	15.00	87.62
		62	5310	13.46	15.00	
	802.11ac-VHT20 MCS0	52	5260	13.19	15.00	94.00
		56	5280	13.23	15.00	
		60	5300	13.23	15.00	
		64	5320	13.40	15.00	
	802.11ac-VHT40 MCS0	54	5270	13.79	15.00	89.23
		62	5310	13.33	15.00	
	802.11ac-VHT80 MCS0	58	5290	13.55	15.00	95.17

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	13.34	15.00	94.39
		116	5580	13.19	15.00	
		124	5620	13.30	15.00	
		132	5660	13.27	15.00	
		140	5700	13.29	15.00	
	802.11n-HT20 MCS0	100	5500	13.50	15.00	93.07
		116	5580	13.17	15.00	
		124	5620	13.25	15.00	
		132	5660	13.27	15.00	
		140	5700	13.27	15.00	
	802.11n-HT40 MCS0	102	5510	13.67	15.00	87.62
		110	5550	13.42	15.00	
		126	5630	13.42	15.00	
		134	5670	13.51	15.00	
	802.11ac-VHT20 MCS0	100	5500	13.29	15.00	94.00
		116	5580	13.05	15.00	
		124	5620	13.29	15.00	
		132	5660	13.25	15.00	
		140	5700	13.14	15.00	
	802.11ac-VHT40 MCS0	102	5510	13.57	15.00	89.23
		110	5550	13.23	15.00	
		126	5630	13.27	15.00	
		134	5670	13.52	15.00	
	802.11ac-VHT80 MCS0	106	5530	13.35	15.00	95.17
		122	5610	13.34	15.00	

13. Bluetooth Exclusions Applied

Mode Band	Average power(dBm)	
	BR/EDR	LE
2.4GHz Bluetooth	8	6

Note:

1. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g Product Specific SAR
   - f(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

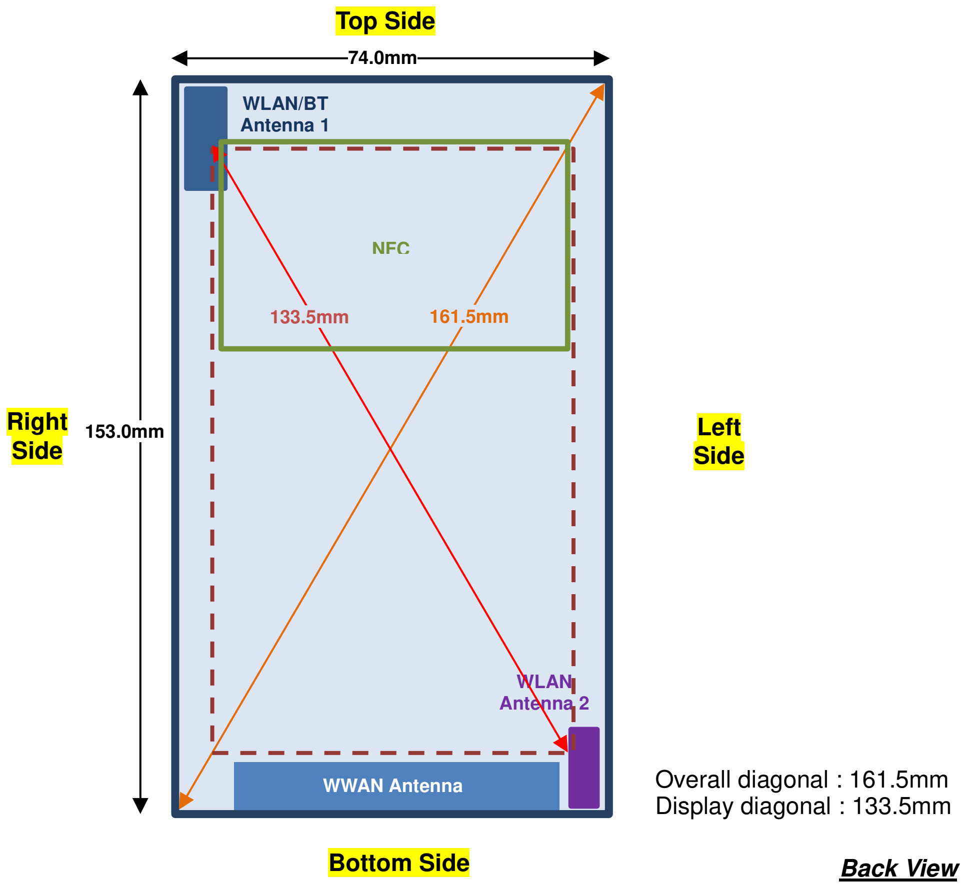
Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
8	15	2.48	0.63

Note:

Per KDB 447498 D01v06, when the minimum test separation distance is 15 mm, the test exclusion threshold is 0.63 which is <= 3, SAR testing is not required.

14. Antenna Location

<Mobile Phone>



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN	≤ 25mm	≤ 25mm	>25 mm	≤ 25mm	≤ 25mm	≤ 25mm
BT & WLAN Ant 1	≤ 25mm	≤ 25mm	≤ 25mm	>25 mm	≤ 25mm	>25 mm
WLAN Ant 2	≤ 25mm	≤ 25mm	>25 mm	≤ 25mm	>25 mm	≤ 25mm
WLAN MIMO	≤ 25mm	≤ 25mm	≤ 25mm	≤ 25mm	≤ 25mm	≤ 25mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN	Yes	Yes	No	Yes	Yes	Yes
BT & WLAN Ant 1	Yes	Yes	Yes	No	Yes	No
WLAN Ant 2	Yes	Yes	No	Yes	No	Yes
WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes

General Note:

1. Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge
2. Since the device supports MIMO operated, when each chain transmits at the same time that all surface is required for WLAN SAR.

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 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 WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN: 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 ≥0.8W/kg.
4. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of GSM1900.
5. 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.
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 Product Specific 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, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold, for this device only front and bottom side SAR for WWAN transmitter scaled to maximum output power is higher than 1.2W/kg of GSM1900, therefore product specific SAR is necessary.
7. For 5.3GHz / 5.5GHz WLAN product specific SAR is necessary, due to an overall diagonal dimension is > 16cm.

GSM Note:

1. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the GPRS (4Tx slots) for GSM850/GSM1900 is considered as the primary mode.
2. Other configurations of GSM / GPRS are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.
3. Power reduction which is triggered by hotspot mode is implemented in GSM1900 band, for hotspot mode SAR testing EUT was set in reduced power mode and GPRS 4 Tx slot due to its highest frame-average power.

UMTS Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA.

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B5 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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. Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band.
3. 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.
4. 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.
5. For WLAN SAR testing was performed on single antenna RF power in SISO mode is larger or equal to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode.
6. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio ≤ 0.04, no additional SAR measurements for MIMO.
7. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

15.1 Head SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM850	GPRS (4 Tx slots)	Right Cheek	0mm	128	824.2	27.26	28.50	1.330	-0.08	0.312	0.415
	GSM850	GPRS (4 Tx slots)	Right Tilted	0mm	128	824.2	27.26	28.50	1.330	0.12	0.204	0.271
01	GSM850	GPRS (4 Tx slots)	Left Cheek	0mm	128	824.2	27.26	28.50	1.330	-0.01	0.383	0.510
	GSM850	GPRS (4 Tx slots)	Left Tilted	0mm	128	824.2	27.26	28.50	1.330	0.02	0.182	0.242
	GSM1900	GPRS (4 Tx slots)	Right Cheek	0mm	810	1909.8	24.65	25.50	1.216	0.08	0.064	0.078
	GSM1900	GPRS (4 Tx slots)	Right Tilted	0mm	810	1909.8	24.65	25.50	1.216	-0.13	0.028	0.034
02	GSM1900	GPRS (4 Tx slots)	Left Cheek	0mm	810	1909.8	24.65	25.50	1.216	-0.19	0.077	0.094
	GSM1900	GPRS (4 Tx slots)	Left Tilted	0mm	810	1909.8	24.65	25.50	1.216	-0.16	0.032	0.039

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA V	RMC 12.2Kbps	Right Cheek	0mm	4182	836.4	22.62	24.00	1.374	0.02	0.192	0.264
	WCDMA V	RMC 12.2Kbps	Right Tilted	0mm	4182	836.4	22.62	24.00	1.374	0.05	0.090	0.124
03	WCDMA V	RMC 12.2Kbps	Left Cheek	0mm	4182	836.4	22.62	24.00	1.374	-0.03	0.246	0.338
	WCDMA V	RMC 12.2Kbps	Left Tilted	0mm	4182	836.4	22.62	24.00	1.374	0.07	0.089	0.122

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 5	10M	QPSK	1	0	Right Cheek	0mm	20525	836.5	22.56	24.00	1.393	0.01	0.173	0.241
	LTE Band 5	10M	QPSK	25	0	Right Cheek	0mm	20525	836.5	21.66	23.00	1.361	0.05	0.143	0.195
	LTE Band 5	10M	QPSK	1	0	Right Tilted	0mm	20525	836.5	22.56	24.00	1.393	0.05	0.095	0.132
	LTE Band 5	10M	QPSK	25	0	Right Tilted	0mm	20525	836.5	21.66	23.00	1.361	0.08	0.072	0.098
04	LTE Band 5	10M	QPSK	1	0	Left Cheek	0mm	20525	836.5	22.56	24.00	1.393	-0.01	0.213	0.297
	LTE Band 5	10M	QPSK	25	0	Left Cheek	0mm	20525	836.5	21.66	23.00	1.361	0.02	0.178	0.242
	LTE Band 5	10M	QPSK	1	0	Left Tilted	0mm	20525	836.5	22.56	24.00	1.393	0.01	0.086	0.120
	LTE Band 5	10M	QPSK	25	0	Left Tilted	0mm	20525	836.5	21.66	23.00	1.361	0.07	0.067	0.091

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	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)
	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	0.16	0.112	0.172
	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	0mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	-0.07	0.094	0.145
05	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	-0.1	0.340	0.523
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	0mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	-0.14	0.195	0.300
	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	-0.16	0.001	0.001
	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	0mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	0.04	0.001	0.001
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	-0.16	0.006	0.008
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	0mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	0.19	0.002	0.003
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	0.11	0.057	0.079
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Tilted	0mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	0.164	0.045	0.063
06	WLAN5GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	-0.082	0.211	0.294
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Tilted	0mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	-0.108	0.131	0.183
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Tilted	0mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Tilted	0mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	0.008	0.114	0.171
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Tilted	0mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	0.163	0.118	0.177
07	WLAN5GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	-0.151	0.276	0.415
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Tilted	0mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	-0.088	0.211	0.317
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Tilted	0mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Tilted	0mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0	0.001	0.002

15.2 Hotspot SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM850	GPRS (4 Tx slots)	Front	10mm	OFF	128	824.2	27.26	28.50	1.330	-0.13	0.360	0.479
08	GSM850	GPRS (4 Tx slots)	Back	10mm	OFF	128	824.2	27.26	28.50	1.330	0.04	0.492	0.655
	GSM850	GPRS (4 Tx slots)	Left Side	10mm	OFF	128	824.2	27.26	28.50	1.330	-0.13	0.472	0.628
	GSM850	GPRS (4 Tx slots)	Right Side	10mm	OFF	128	824.2	27.26	28.50	1.330	-0.07	0.325	0.432
	GSM850	GPRS (4 Tx slots)	Bottom Side	10mm	OFF	128	824.2	27.26	28.50	1.330	0.07	0.208	0.277
	GSM1900	GPRS (4 Tx slots)	Front	10mm	ON	810	1909.8	20.91	22.50	1.442	0.06	0.432	0.623
	GSM1900	GPRS (4 Tx slots)	Back	10mm	ON	810	1909.8	20.91	22.50	1.442	0.06	0.386	0.557
	GSM1900	GPRS (4 Tx slots)	Left Side	10mm	ON	810	1909.8	20.91	22.50	1.442	0.06	0.080	0.115
	GSM1900	GPRS (4 Tx slots)	Right Side	10mm	ON	810	1909.8	20.91	22.50	1.442	-0.14	0.015	0.022
09	GSM1900	GPRS (4 Tx slots)	Bottom Side	10mm	ON	810	1909.8	20.91	22.50	1.442	-0.14	0.788	1.136
	GSM1900	GPRS (4 Tx slots)	Bottom Side	10mm	ON	512	1850.2	20.63	22.50	1.538	-0.02	0.488	0.751
	GSM1900	GPRS (4 Tx slots)	Bottom Side	10mm	ON	661	1880	20.73	22.50	1.503	0.12	0.707	1.063

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA V	RMC 12.2Kbps	Front	10mm	OFF	4182	836.4	22.62	24.00	1.374	-0.02	0.241	0.331
10	WCDMA V	RMC 12.2Kbps	Back	10mm	OFF	4182	836.4	22.62	24.00	1.374	0.02	0.298	0.409
	WCDMA V	RMC 12.2Kbps	Left Side	10mm	OFF	4182	836.4	22.62	24.00	1.374	0.01	0.286	0.393
	WCDMA V	RMC 12.2Kbps	Right Side	10mm	OFF	4182	836.4	22.62	24.00	1.374	-0.03	0.198	0.272
	WCDMA V	RMC 12.2Kbps	Bottom Side	10mm	OFF	4182	836.4	22.62	24.00	1.374	0.06	0.133	0.183

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 5	10M	QPSK	1	0	Front	10mm	OFF	20525	836.5	22.56	24.00	1.393	0	0.215	0.300
	LTE Band 5	10M	QPSK	25	0	Front	10mm	OFF	20525	836.5	21.66	23.00	1.361	0.01	0.178	0.242
11	LTE Band 5	10M	QPSK	1	0	Back	10mm	OFF	20525	836.5	22.56	24.00	1.393	-0.11	0.274	0.382
	LTE Band 5	10M	QPSK	25	0	Back	10mm	OFF	20525	836.5	21.66	23.00	1.361	0.05	0.224	0.305
	LTE Band 5	10M	QPSK	1	0	Left Side	10mm	OFF	20525	836.5	22.56	24.00	1.393	0.04	0.257	0.358
	LTE Band 5	10M	QPSK	25	0	Left Side	10mm	OFF	20525	836.5	21.66	23.00	1.361	-0.05	0.207	0.282
	LTE Band 5	10M	QPSK	1	0	Right Side	10mm	OFF	20525	836.5	22.56	24.00	1.393	-0.08	0.186	0.259
	LTE Band 5	10M	QPSK	25	0	Right Side	10mm	OFF	20525	836.5	21.66	23.00	1.361	0.02	0.151	0.206
	LTE Band 5	10M	QPSK	1	0	Bottom Side	10mm	OFF	20525	836.5	22.56	24.00	1.393	0.03	0.119	0.166
	LTE Band 5	10M	QPSK	25	0	Bottom Side	10mm	OFF	20525	836.5	21.66	23.00	1.361	0.04	0.096	0.131

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	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)
12	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	-0.13	0.048	0.074
	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	-0.18	0.040	0.062
	WLAN2.4GHz	802.11b 1Mbps	Left Side	10mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	-0.01	0.001	0.002
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	-0.08	0.037	0.057
	WLAN2.4GHz	802.11b 1Mbps	Top Side	10mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	-0.15	0.033	0.051
	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	10mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	0	0.001	0.002
	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	0.07	0.016	0.022
	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	0.13	0.019	0.027
	WLAN2.4GHz	802.11b 1Mbps	Left Side	10mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	0.08	0.010	0.014
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	-0.17	0.001	0.001
	WLAN2.4GHz	802.11b 1Mbps	Top Side	10mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	0	0.001	0.001
	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	10mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	0.12	0.004	0.006

15.3 Product Specific SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	GSM1900	GPRS (4 Tx slots)	Front	0mm	810	1909.8	24.65	25.50	1.216	-0.01	2.030	2.469
	GSM1900	GPRS (4 Tx slots)	Front	0mm	512	1850.2	24.37	25.50	1.297	0	1.700	2.205
13	GSM1900	GPRS (4 Tx slots)	Front	0mm	661	1880	24.53	25.50	1.250	-0.02	2.020	2.526
	GSM1900	GPRS (4 Tx slots)	Bottom Side	0mm	810	1909.8	24.65	25.50	1.216	0.01	0.969	1.178

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	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)
	WLAN5GHz	802.11ac-VHT80 MCS0	Front	0mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	-0.007	0.161	0.224
14	WLAN5GHz	802.11ac-VHT80 MCS0	Back	0mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	-0.113	0.253	0.353
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Side	0mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	0.17	0.003	0.004
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Side	0mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	-0.17	0.100	0.139
	WLAN5GHz	802.11ac-VHT80 MCS0	Top Side	0mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	0	0.036	0.050
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom Side	0mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	0.188	0.001	0.001
	WLAN5GHz	802.11ac-VHT80 MCS0	Front	0mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0.039	0.080	0.124
	WLAN5GHz	802.11ac-VHT80 MCS0	Back	0mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0.114	0.098	0.152
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Side	0mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0.119	0.032	0.050
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Side	0mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0	0.003	0.004
	WLAN5GHz	802.11ac-VHT80 MCS0	Top Side	0mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom Side	0mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0.047	0.017	0.026
	WLAN5GHz	802.11ac-VHT80 MCS0	Front	0mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	0.034	0.065	0.098
15	WLAN5GHz	802.11ac-VHT80 MCS0	Back	0mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	0.095	0.355	0.534
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Side	0mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Side	0mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	0.059	0.134	0.201
	WLAN5GHz	802.11ac-VHT80 MCS0	Top Side	0mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	0.031	0.069	0.104
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom Side	0mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Front	0mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0.012	0.052	0.082
	WLAN5GHz	802.11ac-VHT80 MCS0	Back	0mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0.173	0.059	0.093
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Side	0mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	-0.14	0.013	0.021
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Side	0mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Top Side	0mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0	0.001	0.002
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom Side	0mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0.161	0.007	0.012

15.4 Body Worn Accessory SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM850	GPRS (4 Tx slots)	Front	15mm	OFF	128	824.2	27.26	28.50	1.330	-0.13	0.358	0.476
16	GSM850	GPRS (4 Tx slots)	Back	15mm	OFF	128	824.2	27.26	28.50	1.330	-0.16	0.433	0.576
17	GSM1900	GPRS (4 Tx slots)	Front	15mm	OFF	810	1909.8	24.65	25.50	1.216	0.04	0.437	0.531
	GSM1900	GPRS (4 Tx slots)	Back	15mm	OFF	810	1909.8	24.65	25.50	1.216	0.06	0.394	0.479

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA V	RMC 12.2Kbps	Front	15mm	OFF	4182	836.4	22.62	24.00	1.374	-0.01	0.215	0.295
18	WCDMA V	RMC 12.2Kbps	Back	15mm	OFF	4182	836.4	22.62	24.00	1.374	0.01	0.262	0.360

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 5	10M	QPSK	1	0	Front	15mm	OFF	20525	836.5	22.56	24.00	1.393	0.02	0.207	0.288
	LTE Band 5	10M	QPSK	25	0	Front	15mm	OFF	20525	836.5	21.66	23.00	1.361	0.01	0.171	0.233
19	LTE Band 5	10M	QPSK	1	0	Back	15mm	OFF	20525	836.5	22.56	24.00	1.393	0	0.249	0.347
	LTE Band 5	10M	QPSK	25	0	Back	15mm	OFF	20525	836.5	21.66	23.00	1.361	-0.03	0.199	0.271

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	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)
20	WLAN2.4GHz	802.11b 1Mbps	Front	15mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	-0.15	0.020	0.031
	WLAN2.4GHz	802.11b 1Mbps	Back	15mm	Ant 1	11	2462	11.17	13.00	1.523	99.02	1.010	-0.1	0.014	0.022
	WLAN2.4GHz	802.11b 1Mbps	Front	15mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	-0.19	0.005	0.008
	WLAN2.4GHz	802.11b 1Mbps	Back	15mm	Ant 2	6	2437	11.59	13.00	1.385	98.70	1.013	0.17	0.008	0.011
	WLAN5GHz	802.11ac-VHT80 MCS0	Front	15mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	-0.13	0.008	0.011
21	WLAN5GHz	802.11ac-VHT80 MCS0	Back	15mm	Ant 1	58	5290	10.77	12.00	1.326	95.17	1.051	0.147	0.041	0.057
	WLAN5GHz	802.11ac-VHT80 MCS0	Front	15mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	-0.14	0.008	0.013
	WLAN5GHz	802.11ac-VHT80 MCS0	Back	15mm	Ant 2	58	5290	10.28	12.00	1.486	95.50	1.047	0.045	0.011	0.017
	WLAN5GHz	802.11ac-VHT80 MCS0	Front	15mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	0.091	0.022	0.033
22	WLAN5GHz	802.11ac-VHT80 MCS0	Back	15mm	Ant 1	106	5530	10.44	12.00	1.431	95.17	1.051	0.065	0.101	0.152
	WLAN5GHz	802.11ac-VHT80 MCS0	Front	15mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0.104	0.008	0.013
	WLAN5GHz	802.11ac-VHT80 MCS0	Back	15mm	Ant 2	106	5530	10.20	12.00	1.514	95.50	1.047	0.12	0.011	0.017

15.5 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Ratio	Reported 10g SAR (W/kg)
1st	GSM1900	GPRS (4 Tx slots)	Front	0mm	810	1909.8	24.65	25.50	1.216	-0.01	2.030		2.469
2nd	GSM1900	GPRS (4 Tx slots)	Front	0mm	810	1909.8	24.65	25.50	1.216	0	1.920	1.06	2.335

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. Per KDB 865664 D01v01r04, if the Product Specific repeated SAR is necessary, the same procedures should be adapted for measurements according to Product Specific and occupational exposure limits by applying a factor of 2.5 for Product Specific exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.
4. The ratio is the difference in percentage between original and repeated *measured SAR*.
5. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

16. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Portable Handset			
		Head	Body-worn	Hotspot	Product Specific
1.	WWAN (Voice) + WLAN Ant 1 + WLAN Ant 2	Yes	Yes		Yes
2.	WWAN (Data) + WLAN Ant 1 + WLAN Ant 2	Yes	Yes	Yes	Yes
3.	WWAN (Voice) + Bluetooth Ant 1 + 5GHz WLAN Ant 1 + 5GHz WLAN Ant 2		Yes		Yes
4.	WWAN (Data) + Bluetooth Ant 1 + 5GHz WLAN Ant 1 + 5GHz WLAN Ant 2		Yes		Yes

General Note:

1. This device 2.4GHz WLAN supports Hotspot operation.
2. 2.4GHz WLAN and Bluetooth share the same antenna 1, and cannot transmit simultaneously.
3. For SAR testing was performed on single antenna RF power in SISO mode is larger or equal to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode.
4. The worst case WLAN reported SAR for each configuration was used for SAR summation. Therefore, the following summations represent the absolute worst cases for simultaneous transmission with WLAN.
5. The Scaled SAR summation is calculated based on the same configuration and test position.
6. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (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 ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
7. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.

Bluetooth Max Power	Exposure Position	Body worn
	Test separation	15 mm
8dBm	Estimated 1g SAR (W/kg)	0.084W/kg

Bluetooth Max Power	Exposure Position	Product Specific
	Test separation	5 mm
8dBm	Estimated 10g SAR (W/kg)	0.101W/kg

16.1 Head Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN Ant 1 1g SAR (W/kg)	3 2.4GHz WLAN Ant 2 1g SAR (W/kg)	4 5GHz WLAN Ant 1 1g SAR (W/kg)	5 5GHz WLAN Ant 2 1g SAR (W/kg)	1+2+3 Summed 1g SAR (W/kg)	1+4+5 Summed 1g SAR (W/kg)	1+2+5 Summed 10g SAR (W/kg)	1+3+4 Summed 10g SAR (W/kg)
GSM	GSM850	Right Cheek	0.415	0.172	0.001	0.171	0.002	**0.588**	**0.588**	**0.589**	**0.587**
		Right Tilted	0.271	0.145	0.001	0.177	0.002	**0.417**	**0.450**	**0.418**	**0.449**
		Left Cheek	0.510	0.523	0.008	0.415	0.002	**1.041**	**0.927**	**1.035**	**0.933**
		Left Tilted	0.242	0.300	0.003	0.317	0.002	**0.545**	**0.561**	**0.544**	**0.562**
	GSM1900	Right Cheek	0.078	0.172	0.001	0.171	0.002	**0.251**	**0.251**	**0.252**	**0.250**
		Right Tilted	0.034	0.145	0.001	0.177	0.002	**0.180**	**0.213**	**0.181**	**0.212**
		Left Cheek	0.094	0.523	0.008	0.415	0.002	**0.625**	**0.511**	**0.619**	**0.517**
		Left Tilted	0.039	0.300	0.003	0.317	0.002	**0.342**	**0.358**	**0.341**	**0.359**
WCDMA	WCDMA V	Right Cheek	0.264	0.172	0.001	0.171	0.002	**0.437**	**0.437**	**0.438**	**0.436**
		Right Tilted	0.124	0.145	0.001	0.177	0.002	**0.270**	**0.303**	**0.271**	**0.302**
		Left Cheek	0.338	0.523	0.008	0.415	0.002	**0.869**	**0.755**	**0.863**	**0.761**
		Left Tilted	0.122	0.300	0.003	0.317	0.002	**0.425**	**0.441**	**0.424**	**0.442**
LTE	LTE Band 5	Right Cheek	0.241	0.172	0.001	0.171	0.002	**0.414**	**0.414**	**0.415**	**0.413**
		Right Tilted	0.132	0.145	0.001	0.177	0.002	**0.278**	**0.311**	**0.279**	**0.310**
		Left Cheek	0.297	0.523	0.008	0.415	0.002	**0.828**	**0.714**	**0.822**	**0.720**
		Left Tilted	0.120	0.300	0.003	0.317	0.002	**0.423**	**0.439**	**0.422**	**0.440**

16.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1	2	3	1+2+3 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN Ant 1	2.4GHz WLAN Ant 2	
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	
GSM	GSM850	Front	0.479	0.074	0.022	**0.575**
		Back	0.655	0.062	0.027	**0.744**
		Left side	0.628	0.002	0.014	**0.644**
		Right side	0.432	0.057	0.001	**0.490**
		Top side		0.051	0.001	**0.052**
		Bottom side	0.277	0.002	0.006	**0.285**
	GSM1900	Front	0.623	0.074	0.022	**0.719**
		Back	0.557	0.062	0.027	**0.646**
		Left side	0.115	0.002	0.014	**0.131**
		Right side	0.022	0.057	0.001	**0.080**
		Top side		0.051	0.001	**0.052**
		Bottom side	1.136	0.002	0.006	**1.144**
WCDMA	WCDMA V	Front	0.331	0.074	0.022	**0.427**
		Back	0.409	0.062	0.027	**0.498**
		Left side	0.393	0.002	0.014	**0.409**
		Right side	0.272	0.057	0.001	**0.330**
		Top side		0.051	0.001	**0.052**
		Bottom side	0.183	0.002	0.006	**0.191**
LTE	LTE Band 5	Front	0.300	0.074	0.022	**0.396**
		Back	0.382	0.062	0.027	**0.471**
		Left side	0.358	0.002	0.014	**0.374**
		Right side	0.259	0.057	0.001	**0.317**
		Top side		0.051	0.001	**0.052**
		Bottom side	0.166	0.002	0.006	**0.174**

16.3 Product Specific Exposure Conditions

WWAN Band	Exposure Position	1	2	3	4	5	6	1+2+3 Summed 1g SAR (W/kg)	1+4+5 Summed 1g SAR (W/k	1+2+5 Summed 10g SAR (W/kg)	1+3+4 Summed 10g SAR (W/kg)	1+4+5+6 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN Ant 1	2.4GHz WLAN Ant 2	5GHz WLAN Ant 1	5GHz WLAN Ant 2	Bluetooth Ant 1					
		10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	Estimated 10g SAR (W/kg)					
GSM1900	Front	2.526	-	-	0.224	0.124	0.101	**2.526**	**2.874**	**2.650**	**2.750**	**2.975**
	Back	-	-	-	0.534	0.152	0.101	**-**	**0.686**	**0.152**	**0.534**	**0.787**
	Left Side	-	-	-	0.004	0.050	0.101	**-**	**0.054**	**0.050**	**0.004**	**0.155**
	Right Side	-	-	-	0.201	0.004	0.101	**-**	**0.205**	**0.004**	**0.201**	**0.306**
	Top Side	-	-	-	0.104	0.002	0.101	**-**	**0.106**	**0.002**	**0.104**	**0.207**
	Bottom Side	1.178	-	-	0.002	0.026	0.101	**1.178**	**1.206**	**1.204**	**1.180**	**1.307**

Note :

1. According to KDB 648474 D04v01r03, for WWAN / WLAN SAR (“-“) was excluded, due to Hotspot SAR was < 1.2W/kg or the distance to the edges are higher 25mm.

16.4 Body-Worn Accessory Exposure Conditions

WWAN Band		Exposure Position	1	2	3	4	5	6	1+2+3 Summed 1g SAR (W/kg)	1+4+5 Summed 1g SAR (W/k	1+2+5 Summed 10g SAR (W/kg)	1+3+4 Summed 10g SAR (W/kg)	1+4+5+6 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN Ant 1	2.4GHz WLAN Ant 2	5GHz WLAN Ant 1	5GHz WLAN Ant 2	Bluetooth Ant 1					
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)					
GSM	GSM850	Front	0.476	0.031	0.008	0.033	0.013	0.084	**0.515**	**0.522**	**0.520**	**0.517**	**0.606**
		Back	0.576	0.022	0.011	0.152	0.017	0.084	**0.609**	**0.745**	**0.615**	**0.739**	**0.829**
	GSM1900	Front	0.531	0.031	0.008	0.033	0.013	0.084	**0.570**	**0.577**	**0.575**	**0.572**	**0.661**
		Back	0.479	0.022	0.011	0.152	0.017	0.084	**0.512**	**0.648**	**0.518**	**0.642**	**0.732**
WCDMA	WCDMA V	Front	0.295	0.031	0.008	0.033	0.013	0.084	**0.334**	**0.341**	**0.339**	**0.336**	**0.425**
		Back	0.360	0.022	0.011	0.152	0.017	0.084	**0.393**	**0.529**	**0.399**	**0.523**	**0.613**
LTE	LTE Band 5	Front	0.288	0.031	0.008	0.033	0.013	0.084	**0.327**	**0.334**	**0.332**	**0.329**	**0.418**
		Back	0.347	0.022	0.011	0.152	0.017	0.084	**0.380**	**0.516**	**0.386**	**0.510**	**0.600**

Test Engineer : Ken Li and San Lin

17. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	$1/k^{(b)}$	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

Table 17.1. Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.00	N	1	1	1	6.0	6.0
Axial Isotropy	4.70	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.60	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.00	R	1.732	1	1	0.6	0.6
Linearity	4.70	R	1.732	1	1	2.7	2.7
System Detection Limits	1.00	R	1.732	1	1	0.6	0.6
Modulation Response	4.68	R	1.732	1	1	2.7	2.7
Readout Electronics	0.30	N	1	1	1	0.3	0.3
Response Time	0.00	R	1.732	1	1	0.0	0.0
Integration Time	2.60	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.00	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.00	R	1.732	1	1	1.7	1.7
Probe Positioner	0.40	R	1.732	1	1	0.2	0.2
Probe Positioning	2.90	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.00	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.03	N	1	1	1	3.0	3.0
Device Holder	3.60	N	1	1	1	3.6	3.6
Power Drift	5.00	R	1.732	1	1	2.9	2.9
Power Scaling	0.00	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.10	R	1.732	1	1	3.5	3.5
SAR correction	0.00	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.03	N	1	0.78	0.71	0.0	0.0
Liquid Conductivity (target)	5.00	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.50	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.68	R	1.732	0.78	0.71	1.7	1.5
Liquid Permittivity Repeatability	0.02	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.00	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.50	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.84	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.6%	11.6%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						23.2%	23.1%

Table 17.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.70	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.60	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	2.00	R	1.732	1	1	1.2	1.2
Linearity	4.70	R	1.732	1	1	2.7	2.7
System Detection Limits	1.00	R	1.732	1	1	0.6	0.6
Modulation Response	4.68	R	1.732	1	1	2.7	2.7
Readout Electronics	0.30	N	1	1	1	0.3	0.3
Response Time	0.00	R	1.732	1	1	0.0	0.0
Integration Time	2.60	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.00	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.00	R	1.732	1	1	1.7	1.7
Probe Positioner	0.40	R	1.732	1	1	0.2	0.2
Probe Positioning	6.70	R	1.732	1	1	3.9	3.9
Max. SAR Eval.	4.00	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Positioning	3.03	N	1	1	1	3.0	3.0
Device Holder	3.60	N	1	1	1	3.6	3.6
Power Drift	5.00	R	1.732	1	1	2.9	2.9
Power Scaling	0.00	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.60	R	1.732	1	1	3.8	3.8
SAR correction	0.00	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.03	N	1	0.78	0.71	0.0	0.0
Liquid Conductivity (target)	5.00	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.50	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.68	R	1.732	0.78	0.71	1.7	1.5
Liquid Permittivity Repeatability	0.02	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.00	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.50	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.84	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						12.7%	12.6%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						25.4%	25.3%

Table 17.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

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 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[9] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[10] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.

[11] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[12] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.