FCC SAR Test Report

APPLICANT	:	**Joyous LLC**
EQUIPMENT	:	**Mobile Phone**
MODEL NAME	:	**SD4930UR**
FCC ID	:	**ZWH-1210**
STANDARD	:	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2003**

The testing completed on Apr. 12, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the 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.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA372301-01	Rev. 01	Initial issue of report	Apr. 14, 2014
FA372301-01	Rev. 02	In page 57, added WLAN 5.8GHz Left-Tilted SAR test results	Apr. 15, 2014

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Joyous LLC Mobile Phone, SD4930UR** are as follows.

<Highest SAR Summary>

Exposure Position	Frequency Band	Reported 1g-SAR (W/kg)	Equipment Class	Highest Reported 1g-SAR (W/kg)
Head (Separation 0mm)	GSM850	0.31	PCE	1.34
	GSM1900	0.48		
	WCDMA Band V	0.34		
	WCDMA Band IV	0.26		
	WCDMA Band II	0.52		
	LTE Band 17	0.25		
	LTE Band 5	0.34		
	LTE Band 4	0.30		
	LTE Band 2	0.48		
	LTE Band 7	0.47		
	WLAN2.4GHz Band	1.15	DTS	
	WLAN5.8GHz Band	1.34		
	WLAN5.2GHz Band	0.76	NII	
Hotspot (Separation 10mm)	GSM850	0.63	PCE	1.34
	GSM1900	1.30		
	WCDMA Band V	0.68		
	WCDMA Band IV	1.32		
	WCDMA Band II	1.13		
	LTE Band 17	0.35		
	LTE Band 5	0.69		
	LTE Band 4	1.34		
	LTE Band 2	1.23		
	LTE Band 7	0.79		
	WLAN2.4GHz Band	0.23	DTS	
	WLAN5.8GHz Band	0.21		
Body-worn (Separation 15mm)	GSM850	0.43	PCE	0.71
	GSM1900	0.71		
	WCDMA Band V	0.42		
	WCDMA Band IV	0.37		
	WCDMA Band II	0.46		
	LTE Band 17	0.26		
	LTE Band 5	0.44		
	LTE Band 4	0.70		
	LTE Band 2	0.53		
	LTE Band 7	0.39		
	WLAN2.4GHz Band	0.08	DTS	
	WLAN5.8GHz Band	0.04		
	WLAN5.2GHz Band	0.12	NII	

<Highest Simultaneous transmission SAR>

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Head (Separation 0mm)	GSM850	PCE	1.59
	WLAN 5.8GHz Band	DTS	

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Head (Separation 0mm)	WCDMA II	PCE	1.28
	WLAN 5.2GHz Band	NII	

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Hotspot (Separation 10mm)	LTE Band 4	PCE	1.51
	Bluetooth	DSS	

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) 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 1528-2003.

2. Administration Data

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978

2.2 Applicant

Company Name	Joyous LLC
Address	1090 Vermont Avenue NW Suite 430 Washington, DC 20005

2.3 Application Details

Test dates	Nov. 27, 2013 ~ Apr. 12, 2014

3. General Information

3.1 Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT	Mobile Phone
Model Name	SD4930UR
FCC ID	ZWH-1210
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 WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC: 13.56 MHz
Mode	・GSM/GPRS/EGPRS ・RMC/AMR 12.2Kbps ・HSDPA ・HSUPA ・LTE: QPSK, 16QAM ・LTE Carrier Aggregation (Downlink only) ・802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 ・Bluetooth v3.0+EDR，Bluetooth v4.0-LE ・NFC:ASK
Antenna Type	Fixed Internal Antenna
Transfer Mode Category	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. 802.11n-HT40 is not supported in 2.4GHz frequency band.
3. This device supports GRPS/EGPRS mode up to multi-slot class10.
4. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of UMTS band 2 and LTE band 2.
5. This device supports inter-band LTE carrier aggregation (CA) in the downlink only. Uplink maximum output power measurement with downlink carrier aggregation active was measured to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than 1.4 dB higher than the maximum output measured without downlink carrier aggregation active.

3.2 Maximum RF output power among production units

Band / Mode	Burst Average power(dBm)	
	GSM 850	GSM 1900
	Full power mode	Full power mode
GSM (GMSK, 1 Tx slot)	33.0	30.0
GPRS (GMSK, 1 Tx slot)	33.0	30.0
GPRS (GMSK, 2 Tx slots)	33.0	30.0
EDGE (8PSK, 1 Tx slot)	26.0	26.0
EDGE (8PSK, 2 Tx slots)	26.0	26.0

Band / Mode		Average Power (dBm)	
		Full power Mode	Reduced Power Mode
WCDMA V	AMR / RMC 12.2Kbps	23.5	
	HSDPA	22.5	
	HSUPA	22.5	
WCDMA IV	AMR / RMC 12.2Kbps	23.5	
	HSDPA	22.5	
	HSUPA	22.5	
WCDMA II	AMR / RMC 12.2Kbps	23.5	22.0
	HSDPA	22.5	22.0
	HSUPA	22.5	21.0
LTE	Band 17	24.0	
	Band 5	24.0	
	Band 4	24.0	
	Band 2	24.0	22.0
	Band 7	24.0	

Band / Frequency (MHz)			IEEE 802.11 Average Power (dBm)							
			11b	11g	11a	HT20	HT40	VHT20	VHT40	VHT80
2.4GHz Band	CH 01	2412	17.5	16.0		15.5				
	CH 06	2437	17.5	17.5		17.5				
	CH 11	2462	17.5	16.0		14.5				
5.2GHz Band	CH 36	5180			15.0	15.0		15.0		
	CH 39	5190					17.5		17.5	
	CH 40	5200			15.0	15.0		15.0		
	CH 42	5210								15.0
	CH 44	5220			15.0	15.0		15.0		
	CH 46	5230					17.5		17.5	
	CH 48	5240			15.0	15.0		15.0		
5.8GHz Band	CH 149	5745			19.0	19.0		19.0		
	CH 151	5755					19.0		19.0	
	CH 153	5765			19.0	19.0				
	CH 155	5775								19.0
	CH 157	5785			19.0	19.0		19.0		
	CH 159	5795					19.0		19.0	
	CH 161	5805			19.0	19.0				
	CH 165	5825			19.0	19.0		19.0		

Band	Average power (dBm)			
	v3.0+EDR			v4.0-LE
	1Mbps	2Mbps	3Mbps	
2.4 GHz Bluetooth	9.0	8.0	8.0	2.0

The table below summarized necessary items addressed in KDB 941225 D05 v02r03.

FCC ID	ZWH-1210
EUT	Mobile Phone
Operating Frequency Range of each LTE transmission band	LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz
Channel Bandwidth	LTE Band 17: 5MHz, 10MHz LTE Band 5: 1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 4: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 2: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz

Transmission (H, M, L) channel numbers and frequencies in each LTE band

Band 17

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Frequency (MHz)	Channel #	Frequency (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

LTE Band 5

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 7

	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

<table>
<tr><td>LTE uplink modulations used</td><td colspan="3">QPSK, and 16QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td colspan="3">Voice and Data</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td colspan="3">
<table>
<tr><td colspan="7">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</td></tr>
<tr><td rowspan="2">Modulation</td><td colspan="6">Channel bandwidth / Transmission bandwidth (RB)</td><td rowspan="2">MPR (dB)</td></tr>
<tr><td>1.4 MHz</td><td>3.0 MHz</td><td>5 MHz</td><td>10 MHz</td><td>15 MHz</td><td>20 MHz</td></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 colspan="3">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 rowspan="6">LTE Carrier Aggregation Combinations</td><td>Intra-band</td><td colspan="2">not support</td></tr>
<tr><td rowspan="5">Inter Band</td><td>B4 (PCC) + B17 (SCC)</td><td>B2 (PCC) + B17 (SCC)</td></tr>
<tr><td>5 MHz (B4) + 5 MHz (B17)</td><td>5 MHz (B2) + 5 MHz (B17)</td></tr>
<tr><td>5 MHz (B4) + 10 MHz (B17)</td><td>5 MHz (B2) + 10 MHz (B17)</td></tr>
<tr><td>10 MHz (B4) + 5 MHz (B17)</td><td>10 MHz (B2) + 5 MHz (B17)</td></tr>
<tr><td>10 MHz (B4) + 10 MHz (B17)</td><td>10 MHz (B2) + 10 MHz (B17)</td></tr>
<tr><td>LTE Carrier Aggregation Additional Information</td><td colspan="3">All uplink communications are identical to the Release 8 specifications. Uplink communications are done on the PCC. Due to carrier capability, only B4 (PCC) + B17 (SCC), B2 (PCC) + B17 (SCC) are supported.</td></tr>
<tr><td>Base station simulator used for Testing</td><td colspan="3">Anritsu MT8820C, R&S CMW500</td></tr>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td colspan="3">Power reduction for LTE band 2 is activated in hotspot mode.</td></tr>
</table>

Note:
The following LTE Release 10 Features are not supported: Relay, HetNet, Enhanced MIMO, eICIC, WIFI offloading, MDT, eMBMA, Cross-Carrier Scheduling, SC-FDMA.

Target Power reduction applied for each wireless mode

Exposure Position / wireless mode	Hotspot(1)
UMTS Band 2	1.5 dB
LTE band 2	2.0 dB

Remark:
1. (1): Reduced maximum limit applied by activation of Hotspot operation
2. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of UMTS Band2 and LTE Band2. Power reduction is not applicable for other wireless interfaces and frequency bands.

3.3 Applied Standard

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 1528-2003
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- FCC KDB 865664 D02 SAR Reporting v01r01
- FCC KDB 447498 D01 General RF Exposure Guidance v05r02
- FCC KDB 648474 D04 Handset SAR v01r02
- FCC KDB 248227 D01 SAR meas for 802 11abg v01r02
- FCC KDB 644545 D01 Guidance for IEEE 802 11ac v01r02
- FCC KDB 941225 D01 SAR test for 3G devices v02
- FCC KDB 941225 D02 HSPA and 1x Advanced v02r02
- FCC KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- FCC KDB 941225 D05 SAR for LTE Devices v02r03
- FCC KDB 941225 D06 Hotspot Mode SAR v01r01
- FCC 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01

3.4 Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

3.5 Test Conditions

3.5.1 Ambient Condition

Ambient Temperature	20 to 24 ℃
Humidity	< 60 %

3.5.2 Test Configuration

For WWAN SAR testing, the device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the EUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT.

For WLAN SAR testing, WLAN engineering testing software installed on the EUT can provide continuous transmitting RF signal.

4. Specific Absorption Rate (SAR)

4.1 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.

4.2 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)

SAR measurement can be either related to the temperature elevation in tissue by

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\boldsymbol{\delta}\mathbf{T}}{\boldsymbol{\delta}\mathbf{t}}\right)$$

Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

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

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

5. SAR Measurement System

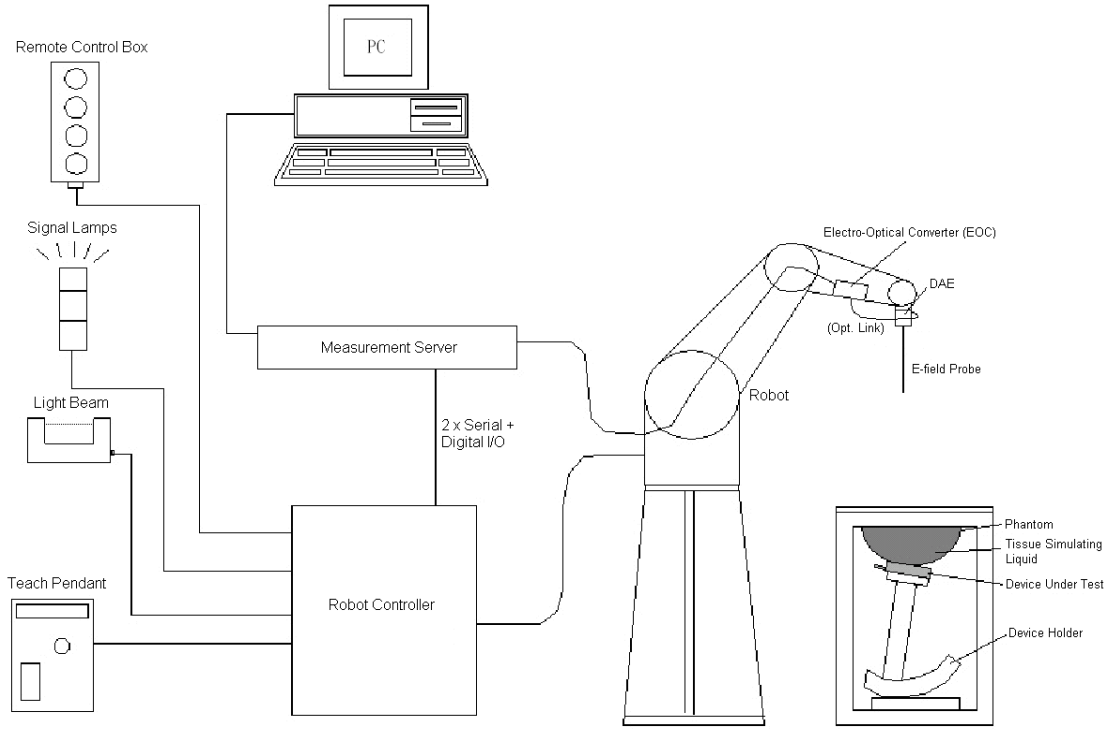


Fig 5.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY software
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Component details are described in in the following sub-sections.

5.1 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.

5.1.1 E-Field Probe Specification

<ES3DV3 Probe >

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	 **Fig 5.2 Photo of ES3DV3**
Frequency	10 MHz to 3 GHz; Linearity: ± 0.2 dB	
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)	
Dynamic Range	5 µW/g to 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 337 mm (Tip: 10 mm) Tip diameter: 4 mm (Body: 10 mm) Distance from probe tip to dipole centers: 3 mm	

<EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	 **Fig 5.3 Photo of EX3DV4/ES3DV4**
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 µW/g to 100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 µW/g)	
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

5.1.2 E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy shall be evaluated and within ± 0.25dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

5.2 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 5.4 Photo of DAE

5.3 Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90BL; DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ±0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

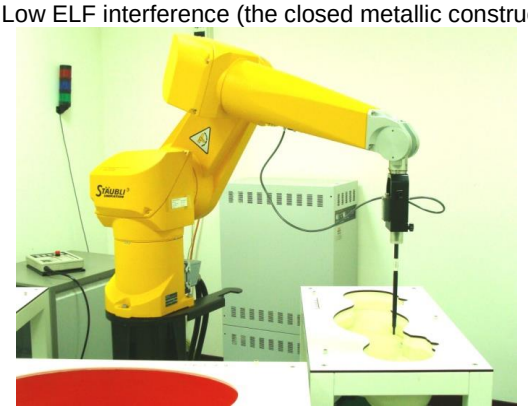


Fig 5.5 Photo of DASY4

Fig 5.6 Photo of DASY5

5.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chipdisk (DASY4: 32 MB; DASY5: 128 MB), RAM (DASY4: 64 MB, DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

Fig 5.7 Photo of Server for DASY4

Fig 5.8 Photo of Server for DASY5

5.5 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

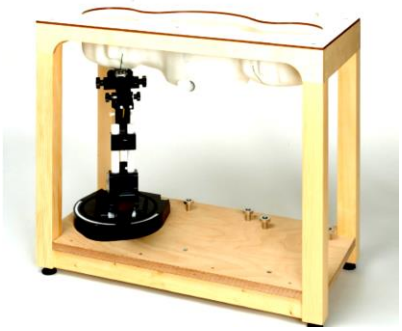


Fig 5.9 Photo of SAM Phantom

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.

<ELI4 Phantom>

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

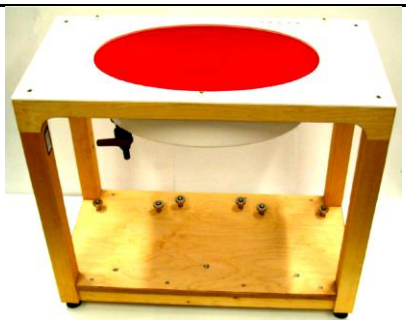


Fig 5.10 Photo of ELI4 Phantom

The ELI4 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.

5.6 Device Holder

<Device Holder for SAM Twin Phantom>

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ± 0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

Fig 5.11 Device Holder

<Laptop Extension Kit>

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.

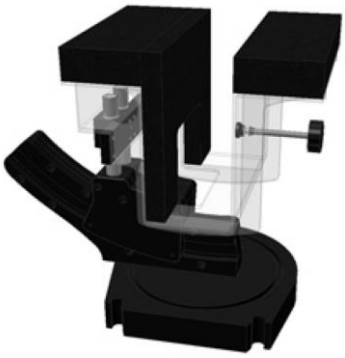


Fig 5.12 Laptop Extension Kit

5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [A/m], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

5.7.2 Data Evaluation

The DASY post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software：

Probe parameters：	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcp_i
Device parameters：	- Frequency	f
	- Crest factor	cf
Media parameters：	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.

The formula for each channel can be given as：

$$\mathbf{V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}}$$

with V_i = compensated signal of channel i, (i = x, y, z)
U_i = input signal of channel i, (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

From the compensated input signals, the primary field data for each channel can be evaluated：

E-field Probes：$\mathbf{E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}}$

H-field Probes：$\mathbf{H_i = \sqrt{V_i} \cdot \frac{a_{i0}+a_{i1}f+a_{i2}f^2}{f}}$

with V_i = compensated signal of channel i, (i = x, y, z)
$Norm_i$ = sensor sensitivity of channel i, (i = x, y, z), μV/(V/m)^2 for E-field Probes
ConvF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
E_i = electric field strength of channel i in V/m
H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude)：

$$\mathbf{E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}}$$

The primary field data are used to calculate the derived field units.

$$\mathbf{SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}}$$

with SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

5.8 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1012	May. 28, 2013	May. 27, 2014
SPEAG	835MHz System Validation Kit	D835V2	4d162	Nov. 11, 2013	Nov. 10, 2014
SPEAG	1750MHz System Validation Kit	D1750V2	1023	Jun. 11, 2013	Jun. 10, 2014
SPEAG	1900MHz System Validation Kit	D1900V2	5d182	Nov. 12, 2013	Nov. 11, 2014
SPEAG	2450MHz System Validation Kit	D2450V2	736	Aug. 23, 2013	Aug. 22, 2014
SPEAG	2600MHz System Validation Kit	D2600V2	1008	Aug. 23, 2013	Aug. 22, 2014
SPEAG	5GHz System Validation Kit	D5GHzV2	1128	Jul. 24, 2013	Jul. 23, 2014
SPEAG	Data Acquisition Electronics	DAE3	577	May. 08, 2013	May. 07, 2014
SPEAG	Data Acquisition Electronics	DAE4	778	Aug. 21, 2013	Aug. 20, 2014
SPEAG	Data Acquisition Electronics	DAE3	495	May. 08, 2013	May. 07, 2014
SPEAG	Data Acquisition Electronics	DAE4	1279	Jan. 30, 2013	Jan. 29, 2014
SPEAG	Data Acquisition Electronics	DAE4	1399	Nov. 07, 2013	Nov. 06, 2014
SPEAG	Data Acquisition Electronics	DAE4	1338	Nov. 05, 2013	Nov. 04, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3931	Sep. 10, 2013	Sep. 09, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3661	Jan. 15, 2013	Jan. 14, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3898	Jan. 14, 2013	Jan. 13, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3935	Nov. 04, 2013	Nov. 03, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3955	Nov. 12, 2013	Nov. 11, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3697	Oct. 15, 2013	Oct. 14, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3925	Jun. 12, 2013	Jun. 11, 2014
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 24, 2013	Sep. 23, 2014
Wisewind	Thermometer	ETP-101	TM560	Oct. 22, 2013	Oct. 21, 2014
Wisewind	Thermometer	ETP-101	TM685	Oct. 22, 2013	Oct. 21, 2014
Wisewind	Thermometer	HTC-1	TM642	Oct. 22, 2013	Oct. 21, 2014
Wisewind	Thermometer	HTC-1	TM281	Oct. 22, 2013	Oct. 21, 2014
H.M.IRIS	Thermometer	TH-08	TM658	Oct. 22, 2013	Oct. 21, 2014
WonDer	Thermometer	WD-5015	TM225	Dec. 02, 2013	Dec. 01, 2014
Anritsu	Radio Communication Analyzer	MT8820C	6201341950	Oct. 25, 2013	Oct. 24, 2014
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 06, 2013	May. 05, 2014
Agilent	Wireless Communication Test Set	E5515C	MY50264370	Apr. 29, 2013	Apr. 28, 2014
R&S	Radio communication Tester	CMW500	113998	Oct. 04, 2013	Oct. 03, 2014
SPEAG	Device Holder	N/A	N/A	NCR	NCR
R&S	Signal Generator	SMF 100A	101107	May. 27, 2013	May. 26, 2014
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Jul. 23, 2013	Jul. 22, 2014
Agilent	ENA Network Analyzer	E5071C	MY46101588	Jun. 06, 2013	Jun. 05, 2014
Anritsu	Power Meter	ML2495A	1132003	Aug. 28, 2013	Aug. 27, 2014
Anritsu	Power Sensor	MA2411B	1126017	Aug. 27, 2013	Aug. 26, 2014
Agilent	Dual Directional Coupler	778D	50422	Note 2	
Woken	Attenuator 1	WK0602-XX	N/A	Note 2	
PE	Attenuator 2	PE7005-10	N/A	Note 2	
PE	Attenuator 3	PE7005- 3	N/A	Note 2	
AR	Power Amplifier	5S1G4M2	328767	Note 3	
R&S	Spectrum Analyzer	FSP 7	101131	Jul. 09, 2013	Jul. 08, 2014

Table 5.1 Test Equipment List

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
3. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it
4. Attenuator insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.

6. 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. 6.1. 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. 6.2.

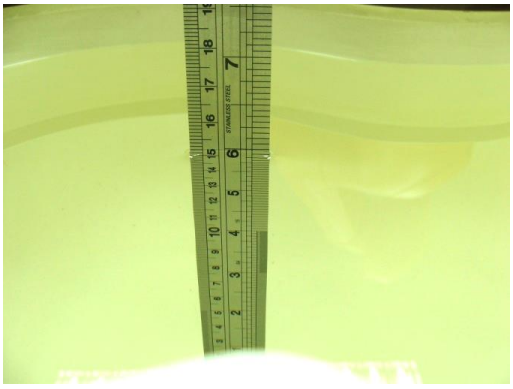


Fig 6.1 Photo of Liquid Height for Head SAR

Fig 6.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ε_r)
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

Table 6.1 Recipes of Tissue Simulating Liquid

Simulating Liquid for 5G, Manufactured by SPEAG

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

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an SPEAG DAK-3.5 Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid.

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
750	Head	22.6	0.889	40.877	0.89	41.90	-0.11	-2.44	±5	2014/4/3
750	Body	22.4	0.961	53.917	0.96	55.50	0.10	-2.85	±5	2014/4/3
750	Body	22.6	0.970	54.633	0.96	55.50	1.04	-1.56	±5	2014/4/12
835	Head	22.5	0.916	41.740	0.90	41.50	1.78	0.58	±5	2014/4/2
835	Body	22.4	0.963	54.498	0.97	55.20	-0.72	-1.27	±5	2014/4/2
835	Body	22.6	0.962	54.572	0.97	55.20	-0.82	-1.14	±5	2014/4/12
1750	Head	22.5	1.404	39.373	1.40	40.00	0.29	-1.57	±5	2013/11/27
1750	Head	22.2	1.407	39.137	1.41	39.14	-0.21	-0.01	±5	2014/1/14
1750	Body	22.4	1.490	52.851	1.52	53.30	-1.97	-0.84	±5	2013/11/28
1750	Body	22.5	1.545	51.722	1.52	53.30	1.64	-2.96	±5	2014/1/13
1900	Head	22.5	1.435	38.114	1.40	40.00	2.50	-4.72	±5	2013/11/27
1900	Head	22.4	1.430	38.937	1.40	40.00	2.14	-2.66	±5	2014/1/12
1900	Body	22.3	1.534	51.914	1.52	53.30	0.92	-2.60	±5	2014/1/8
2450	Head	22.5	1.830	38.178	1.80	39.20	1.67	-2.61	±5	2013/12/3
2450	Body	22.5	1.962	53.867	1.95	52.70	0.62	2.21	±5	2013/12/1
2600	Head	22.5	1.974	38.204	1.96	39.00	0.71	-2.04	±5	2013/12/3
2600	Body	22.5	2.209	51.123	2.21	51.12	-0.05	0.01	±5	2013/12/5
5200	Head	22.5	4.444	36.555	4.66	36.00	-4.64	1.54	±5	2013/12/1
5200	Body	22.4	5.373	48.526	5.30	49.00	1.38	-0.97	±5	2013/12/1
5800	Head	22.5	5.035	35.750	5.27	35.30	-4.46	1.27	±5	2013/12/1
5800	Body	22.4	6.219	47.128	6.00	48.20	3.65	-2.22	±5	2013/12/1

Table 6.2 Measuring Results for Simulating Liquid

7. System Verification Procedures

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

7.1 Purpose of System Performance check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

7.2 System Setup

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

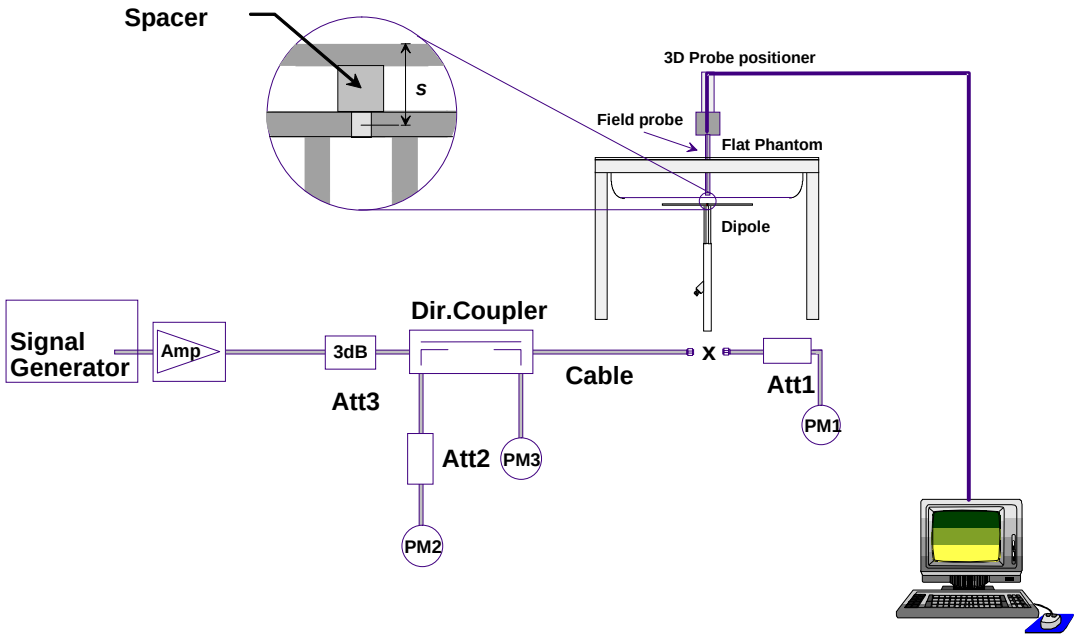


Fig 7.1 System Setup for System Evaluation

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole

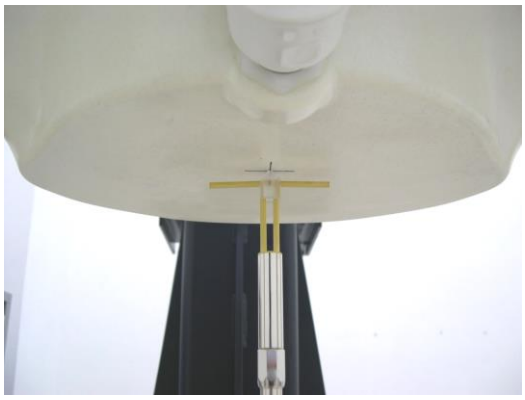


Fig 7.2 Photo of Dipole Setup

7.3 SAR System Verification Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Table 7.1 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 SAR (W/kg)	Targeted SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
2014/4/3	750	Head	250	D750V3-1099	3925	495	2.21	8.42	8.84	4.99
2014/4/3	750	Body	250	D750V3-1099	3925	495	2.09	8.56	8.36	-2.34
2014/4/12	750	Body	250	D750V3-1099	3955	1399	2.10	8.56	8.40	-1.87
2014/4/2	835	Head	250	D835V2-4d162	3270	778	2.40	9.53	9.60	0.73
2014/4/2	835	Body	250	D835V2-4d162	3270	778	2.35	9.63	9.40	-2.39
2014/4/12	835	Body	250	D835V2-4d162	3931	577	2.42	9.63	9.68	0.52
2013/11/27	1750	Head	250	D1750V2-SN:1023	3270	778	8.60	35.90	34.40	-4.18
2014/1/14	1750	Head	250	D1750V2-SN:1023	3661	778	8.59	35.90	34.36	-4.29
2013/11/28	1750	Body	250	D1750V2-SN:1023	3270	778	8.81	37.10	35.24	-5.01
2014/1/13	1750	Body	250	D1750V2-SN:1023	3661	778	9.62	37.10	38.48	3.72
2013/11/27	1900	Head	250	D1900V2-5d182	3270	778	10.20	40.10	40.80	1.75
2014/1/12	1900	Head	250	D1900V2-5d182	3931	577	10.40	40.10	41.60	3.74
2014/1/8	1900	Body	250	D1900V2-5d182	3898	1399	10.20	39.50	40.80	3.29
2013/12/3	2450	Head	250	D2450V2-SN:736	3697	1279	13.30	53.20	53.20	0.00
2013/12/1	2450	Body	250	D2450V2-SN:736	3925	495	13.60	51.30	54.40	6.04
2013/12/3	2600	Head	250	D2600V2-SN:1008	3955	1279	13.60	58.80	54.40	-7.48
2013/12/5	2600	Body	250	D2600V2-SN:1008	3935	1338	12.80	55.20	51.20	-7.25
2013/12/1	5200	Head	100	D5GHzV2-SN:1128	3697	1279	8.09	78.20	80.90	3.45
2013/12/1	5200	Body	100	D5GHzV2-SN:1128	3925	495	7.80	73.40	78.00	6.27
2013/12/1	5800	Head	100	D5GHzV2-SN:1128	3925	495	7.65	77.20	76.50	-0.91
2013/12/1	5800	Body	100	D5GHzV2-SN:1128	3925	495	7.59	72.20	75.90	5.12

Table 7.1 Target and Measurement SAR after Normalized

8. EUT Testing Position

8.1 Define two imaginary lines on the handset

(a) The vertical centerline passes through two points on the front side of the handset - the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.

(b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

(c) 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, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

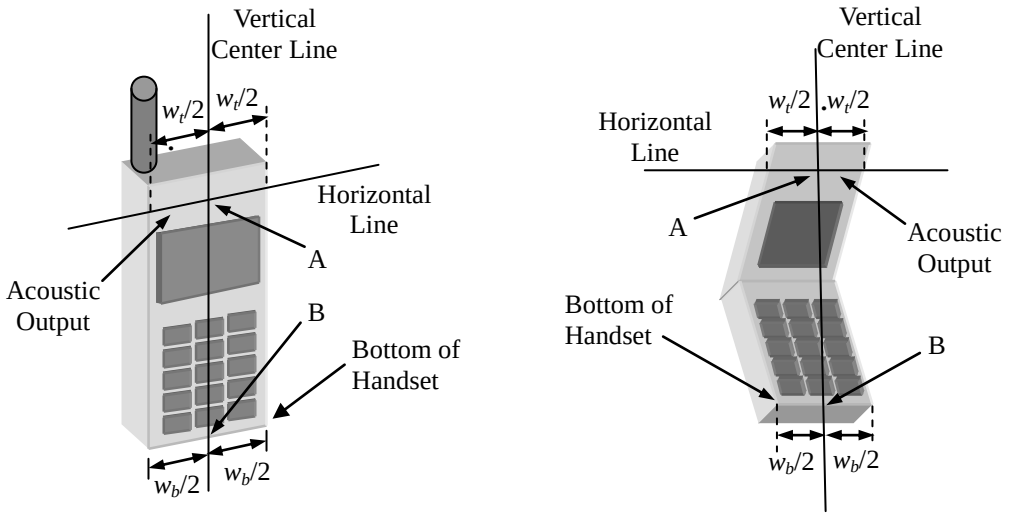


Fig 8.1 Illustration for Handset Vertical and Horizontal Reference Lines

8.2 Cheek Position

(a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

(b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig. 8.2).

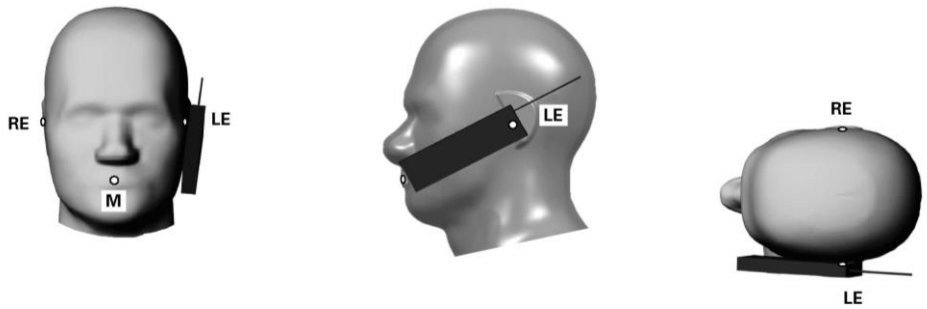


Fig 8.2 Illustration for Cheek Position

8.3 Tilted Position

(a) To position the device in the “cheek” position described above.

(b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see Fig. 8.3).

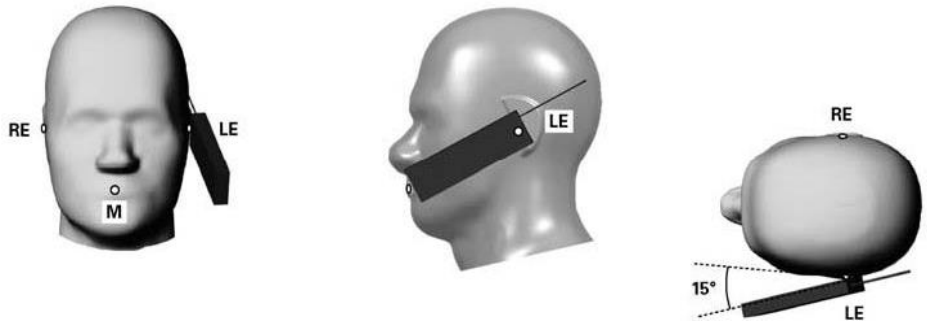


Fig 8.3 Illustration for Tilted Position

8.4 Body Worn Position

(a) To position the device parallel to the phantom surface with either keypad up or down.
(b) To adjust the device parallel to the flat phantom.
(c) To adjust the distance between the device surface and the flat phantom to 1.5 cm.

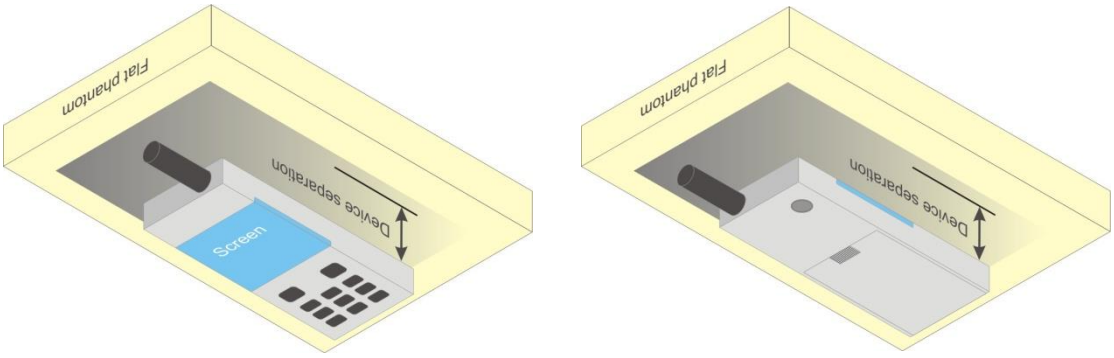


Fig 8.4 Illustration for Body Worn Position

8.5 Hotspot Position

(a) To position the device parallel to the phantom surface with all sides and either keypad up or down.
(b) To adjust the device parallel to the flat phantom.
(c) To adjust the distance between the device and the flat phantom to 1.0cm.

<EUT Setup Photos>

Please refer to Appendix D for the test setup photos.

9. 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

9.1 Spatial Peak SAR Evaluation

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

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

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

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values 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

9.2 Power Reference Measurement

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

9.3 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r03 quoted below.

When the 1-g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the area scan based *1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

9.4 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.

9.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

9.6 Power Drift Monitoring

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

10. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

Note:

1. Per KDB 447498 D01v05r02, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. For Head and Body-worn SAR testing, the EUT was set in GSM Voice for GSM850/GSM1900 and was additional EGPRS SAR testing performed on voice mode worse case.
3. For hotspot mode SAR testing, GPRS and EDGE should be evaluated, therefore the EUT was set in GPRS 2 Tx slots for GSM850/1900 band due to its highest frame-average power.

<Full power mode>

Band GSM850	Burst Average Power (dBm)			Frame-Average Power (dBm)		
TX Channel	128	189	251	128	189	251
Frequency (MHz)	824.2	836.4	848.8	824.2	836.4	848.8
GSM (GMSK, 1 Tx slot)	32.61	32.94	32.96	23.61	23.94	23.96
GPRS (GMSK, 1 Tx slot)	32.63	32.70	32.98	23.63	23.70	23.98
GPRS (GMSK, 2 Tx slots)	32.71	32.76	32.75	26.71	26.76	26.75
EDGE (8PSK, 1 Tx slot)	25.84	25.63	25.64	16.84	16.63	16.64
EDGE (8PSK, 2 Tx slots)	25.62	25.48	25.54	19.62	19.48	19.54

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<Full power mode>

Band GSM1900	Burst Average Power (dBm)			Frame-Average Power (dBm)		
TX Channel	512	661	810	512	661	810
Frequency (MHz)	1850.2	1880	1909.8	1850.2	1880	1909.8
GSM (GMSK, 1 Tx slot)	29.85	29.96	29.83	20.85	20.96	20.83
GPRS (GMSK, 1 Tx slot)	29.78	29.89	29.78	20.78	20.89	20.78
GPRS (GMSK, 2 Tx slots)	29.90	29.65	29.89	23.90	23.65	23.89
EDGE (8PSK, 1 Tx slot)	25.99	25.79	25.66	16.99	16.79	16.66
EDGE (8PSK, 2 Tx slots)	25.90	25.71	25.61	19.90	19.71	19.61

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<WCDMA Conducted Power>

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.

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 β_{hs} = 30/15 * β_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 β_{hs} = 30/15 * β_c , and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_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 5) (Note 6)*	β_{ed} *(SF)*	β_{ed} *(Codes)*	CM *(dB)* *(Note 2)*	MPR *(dB)* *(Note 2)*	*AG Index* *(Note 6)*	*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	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 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 *(Note 4)*	15/15 *(Note 4)*	64	15/15 *(Note 4)*	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_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: For subtest 5 the β_c/β_d ratio of 15/15 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 = 14/15 and β_d = 15/15.

Note 5: 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 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

<WCDMA Conducted Power>

Note:

1. Per KDB 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA / HSUPA output power is < 0.25dB higher than RMC, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA / HSUPA SAR evaluation can be excluded.

<Hotspot inactive - full power mode>

Band			WCDMA V			WCDMA II			WCDMA IV		
TX Channel			4132	4182	4233	9262	9400	9538	1312	1413	1513
Frequency (MHz)			826.4	836.4	846.6	1852.4	1880	1907.6	1712.4	1732.6	1752.6
MPR (dB)	3GPP Rel 99	AMR 12.2Kbps	23.45	23.48	23.43	23.45	23.30	23.15	23.40	23.35	23.33
	3GPP Rel 99	RMC 12.2Kbps	23.48	23.50	23.44	23.49	23.35	23.19	23.45	23.38	23.37
0	3GPP Rel 6	HSDPA Subtest-1	22.20	22.25	22.14	22.45	22.03	22.04	22.49	22.25	22.12
0	3GPP Rel 6	HSDPA Subtest-2	22.40	22.42	22.49	22.45	22.04	22.05	22.48	22.23	22.08
0.5	3GPP Rel 6	HSDPA Subtest-3	22.00	22.01	22.04	22.45	21.75	21.85	22.00	21.81	21.63
0.5	3GPP Rel 6	HSDPA Subtest-4	21.93	22.02	22.15	22.43	21.74	21.75	21.91	21.76	21.58
0	3GPP Rel 6	HSUPA Subtest-1	22.38	22.34	22.50	22.40	22.40	21.99	22.27	22.24	22.12
2	3GPP Rel 6	HSUPA Subtest-2	20.90	21.00	21.04	21.49	21.14	20.98	20.80	20.74	20.60
1	3GPP Rel 6	HSUPA Subtest-3	20.81	20.87	21.12	21.38	21.40	21.21	21.20	21.09	20.90
2	3GPP Rel 6	HSUPA Subtest-4	22.27	22.31	22.41	21.42	21.50	21.33	21.95	21.80	21.65
0	3GPP Rel 6	HSUPA Subtest-5	22.16	22.28	22.27	22.43	22.43	22.32	22.45	22.28	22.19

<Hotspot active - reduced power mode>

Band			WCDMA II		
TX Channel			9262	9400	9538
Frequency (MHz)			1852.4	1880	1907.6
MPR (dB)	3GPP Rel 99	AMR 12.2Kbps	21.41	21.49	21.42
	3GPP Rel 99	RMC 12.2Kbps	21.42	21.52	21.43
0	3GPP Rel 6	HSDPA Subtest-1	20.45	20.61	20.56
0	3GPP Rel 6	HSDPA Subtest-2	20.39	20.60	20.53
0.5	3GPP Rel 6	HSDPA Subtest-3	19.99	20.18	20.04
0.5	3GPP Rel 6	HSDPA Subtest-4	19.96	20.10	20.03
0	3GPP Rel 6	HSUPA Subtest-1	19.92	20.14	20.11
2	3GPP Rel 6	HSUPA Subtest-2	19.30	19.54	19.42
1	3GPP Rel 6	HSUPA Subtest-3	19.52	19.76	19.66
2	3GPP Rel 6	HSUPA Subtest-4	19.55	19.78	19.71
0	3GPP Rel 6	HSUPA Subtest-5	20.45	20.65	20.51

<LTE Conducted Power>

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 D05v02r03, 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 D05v02r03, 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 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r03, when reported SAR of 1RB and 50%RB allocation for QPSK ≤0.8W/kg, and 100%RB with QPSK output power is less than 1RB and 50%RB, 100%RB allocation for QPSK is not required.
6. Per KDB 941225 D05v02r03, when reported SAR of 1RB and 50%RB allocation for QPSK >0.8W/kg for any exposure position, SAR testing of 100%RB allocation for QPSK is performed at the highest power channel.
7. 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 D05v02r03, 16QAM SAR testing is not required.
8. 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 D05v02r03, smaller bandwidth SAR testing is not required.

<LTE Band 17 Conducted Power>

<Full power mode>

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				23780	23790	23800		
Frequency (MHz)				709	710	711		
10	QPSK	1	0	22.81	22.85	22.92	24	0
10	QPSK	1	24	22.51	22.85	22.79		
10	QPSK	1	49	22.30	22.61	22.49		
10	QPSK	25	0	22.31	21.98	21.98	23	1
10	QPSK	25	12	21.98	22.02	22.00		
10	QPSK	25	24	21.97	22.00	22.00		
10	QPSK	50	0	21.92	22.00	21.99		
10	16QAM	1	0	21.96	21.83	21.87	23	1
10	16QAM	1	24	21.89	21.86	21.75		
10	16QAM	1	49	21.79	21.89	21.82		
10	16QAM	25	0	20.98	21.00	21.00	22	2
10	16QAM	25	12	20.98	20.97	20.95		
10	16QAM	25	24	21.00	20.96	20.98		
10	16QAM	50	0	20.96	20.94	20.93		
Channel				23755	23790	23825	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				706.5	710	713.5		
5	QPSK	1	0	22.90	22.84	22.72	24	0
5	QPSK	1	12	22.88	22.69	22.76		
5	QPSK	1	24	22.61	22.51	22.35		
5	QPSK	12	0	22.35	22.01	22.05	23	1
5	QPSK	12	6	22.36	22.00	21.96		
5	QPSK	12	11	22.03	22.02	21.93		
5	QPSK	25	0	22.03	21.99	21.95		
5	16QAM	1	0	21.94	21.78	21.75	23	1
5	16QAM	1	12	21.92	21.84	21.75		
5	16QAM	1	24	21.89	21.88	21.64		
5	16QAM	12	0	21.05	20.98	21.01	22	2
5	16QAM	12	6	21.02	20.97	20.94		
5	16QAM	12	11	21.06	20.98	20.96		
5	16QAM	25	0	21.02	20.96	20.97		

<LTE Band 5 Conducted Power>

<Full power mode>

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	22.92	22.83	22.94	24	0
10	QPSK	1	24	22.80	22.74	22.84		
10	QPSK	1	49	22.91	22.88	22.92		
10	QPSK	25	0	21.87	21.83	21.87	23	1
10	QPSK	25	12	21.79	21.95	21.87		
10	QPSK	25	24	21.79	21.73	21.94		
10	QPSK	50	0	21.87	21.77	21.85		
10	16QAM	1	0	21.92	21.73	21.76	23	1
10	16QAM	1	24	21.75	21.68	21.74		
10	16QAM	1	49	21.83	21.76	21.84		
10	16QAM	25	0	20.86	20.79	20.80	22	2
10	16QAM	25	12	20.83	20.74	20.81		
10	16QAM	25	24	20.80	20.75	20.91		
10	16QAM	50	0	20.78	20.69	20.77		
Channel				20425	20525	20625	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.92	22.87	22.79	24	0
5	QPSK	1	12	22.83	22.75	22.88		
5	QPSK	1	24	22.83	22.83	22.88		
5	QPSK	12	0	21.91	21.79	21.84	23	1
5	QPSK	12	6	21.90	21.78	21.90		
5	QPSK	12	11	21.89	21.75	21.89		
5	QPSK	25	0	21.89	21.76	21.95		
5	16QAM	1	0	21.92	21.79	21.77	23	1
5	16QAM	1	12	21.75	21.71	21.81		
5	16QAM	1	24	21.72	21.76	21.77		
5	16QAM	12	0	20.87	20.78	20.80	22	2
5	16QAM	12	6	20.84	20.76	20.88		
5	16QAM	12	11	20.85	20.74	20.86		
5	16QAM	25	0	20.82	20.74	20.90		
Channel				20415	20525	20635	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.82	22.57	22.74	24	0
3	QPSK	1	7	22.65	22.58	22.70		
3	QPSK	1	14	22.68	22.70	22.71		
3	QPSK	8	0	21.73	21.61	21.71	23	1
3	QPSK	8	4	21.70	21.56	21.75		
3	QPSK	8	7	21.72	21.60	21.76		
3	QPSK	15	0	21.69	21.61	21.73		
3	16QAM	1	0	21.72	21.51	21.63	23	1
3	16QAM	1	7	21.57	21.52	21.62		
3	16QAM	1	14	21.60	21.61	21.63		
3	16QAM	8	0	20.65	20.58	20.69	22	2
3	16QAM	8	4	20.69	20.55	20.73		
3	16QAM	8	7	20.68	20.54	20.72		
3	16QAM	15	0	20.64	20.52	20.67		

Channel				20407	20525	20643	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.82	22.86	22.75	24	0
1.4	QPSK	1	2	22.81	22.60	22.73		
1.4	QPSK	1	5	22.70	22.61	22.74		
1.4	QPSK	3	0	22.85	22.60	22.74		
1.4	QPSK	3	1	22.85	22.59	22.71		
1.4	QPSK	3	2	22.70	22.59	22.77		
1.4	QPSK	6	0	21.76	21.61	21.78	23	1
1.4	16QAM	1	0	21.75	21.52	21.67	23	1
1.4	16QAM	1	2	21.78	21.56	21.67		
1.4	16QAM	1	5	21.65	21.56	21.67		
1.4	16QAM	3	0	21.77	21.57	21.72		
1.4	16QAM	3	1	21.75	21.57	21.67		
1.4	16QAM	3	2	21.68	21.58	21.65		
1.4	16QAM	6	0	20.55	20.53	20.58	22	2

<LTE Band 4 Conducted Power>

<Full power mode>

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				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	23.70	23.75	23.74	24	0
20	QPSK	1	49	23.59	23.64	23.64		
20	QPSK	1	99	23.56	23.67	23.61		
20	QPSK	50	0	22.70	22.94	22.90	23	1
20	QPSK	50	24	22.73	22.91	22.83		
20	QPSK	50	49	22.69	22.88	22.83		
20	QPSK	100	0	22.66	22.84	22.74		
20	16QAM	1	0	22.62	22.63	22.71	23	1
20	16QAM	1	49	22.54	22.71	22.60		
20	16QAM	1	99	22.56	22.62	22.58		
20	16QAM	50	0	21.65	21.85	21.83	22	2
20	16QAM	50	24	21.64	21.82	21.77		
20	16QAM	50	49	21.69	21.79	21.78		
20	16QAM	100	0	21.65	21.82	21.76		
Channel				20025	20175	20325	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	23.58	23.56	23.69	24	0
15	QPSK	1	37	23.56	23.54	23.68		
15	QPSK	1	74	23.47	23.57	23.66		
15	QPSK	36	0	22.65	22.71	22.79	23	1
15	QPSK	36	18	22.67	22.67	22.75		
15	QPSK	36	37	22.68	22.71	22.82		
15	QPSK	75	0	22.68	22.76	22.79		
15	16QAM	1	0	22.55	22.53	22.63	23	1
15	16QAM	1	37	22.56	22.47	22.62		
15	16QAM	1	74	22.46	22.52	22.60		
15	16QAM	36	0	21.56	21.63	21.72	22	2
15	16QAM	36	18	21.56	21.67	21.69		
15	16QAM	36	37	21.57	21.66	21.75		
15	16QAM	75	0	21.67	21.73	21.79		
Channel				20000	20175	20350	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	23.34	23.49	23.50	24	0
10	QPSK	1	24	23.37	23.44	23.49		
10	QPSK	1	49	23.35	23.43	23.49		
10	QPSK	25	0	22.44	22.46	22.60	23	1
10	QPSK	25	12	22.38	22.47	22.61		
10	QPSK	25	24	22.43	22.44	22.54		
10	QPSK	50	0	22.48	22.62	22.69		
10	16QAM	1	0	22.34	22.40	22.50	23	1
10	16QAM	1	24	22.32	22.38	22.46		
10	16QAM	1	49	22.33	22.39	22.44		
10	16QAM	25	0	21.43	21.46	21.55	22	2
10	16QAM	25	12	21.42	21.48	21.56		
10	16QAM	25	24	21.38	21.46	21.56		
10	16QAM	50	0	21.45	21.53	21.62		

Channel				19975	20175	20375	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	23.35	23.47	23.53	24	0
5	QPSK	1	12	23.34	23.34	23.52		
5	QPSK	1	24	23.39	23.38	23.49		
5	QPSK	12	0	22.41	22.53	22.62	23	1
5	QPSK	12	6	22.42	22.51	22.64		
5	QPSK	12	11	22.43	22.42	22.62		
5	QPSK	25	0	22.46	22.47	22.60		
5	16QAM	1	0	22.33	22.40	22.51	23	1
5	16QAM	1	12	22.30	22.29	22.48		
5	16QAM	1	24	22.32	22.29	22.45		
5	16QAM	12	0	21.42	21.50	21.62	22	2
5	16QAM	12	6	21.42	21.49	21.63		
5	16QAM	12	11	21.41	21.41	21.63		
5	16QAM	25	0	21.39	21.51	21.63		
Channel				19965	20175	20385	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	23.41	23.47	23.59	24	0
3	QPSK	1	7	23.34	23.32	23.47		
3	QPSK	1	14	23.40	23.36	23.50		
3	QPSK	8	0	22.44	22.53	22.60	23	1
3	QPSK	8	4	22.40	22.51	22.49		
3	QPSK	8	7	22.42	22.41	22.57		
3	QPSK	15	0	22.47	22.48	22.57		
3	16QAM	1	0	22.32	22.39	22.53	23	1
3	16QAM	1	7	22.31	22.29	22.41		
3	16QAM	1	14	22.34	22.35	22.50		
3	16QAM	8	0	21.42	21.49	21.66	22	2
3	16QAM	8	4	21.45	21.49	21.57		
3	16QAM	8	7	21.41	21.40	21.55		
3	16QAM	15	0	21.39	21.46	21.52		
Channel				19957	20175	20393	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	23.41	23.51	23.58	24	0
1.4	QPSK	1	2	23.43	23.52	23.52		
1.4	QPSK	1	5	23.44	23.42	23.57		
1.4	QPSK	3	0	23.45	23.48	23.55		
1.4	QPSK	3	1	23.43	23.50	23.53		
1.4	QPSK	3	2	23.43	23.54	23.52		
1.4	QPSK	6	0	22.50	22.56	22.61	23	1
1.4	16QAM	1	0	22.37	22.48	22.48	23	1
1.4	16QAM	1	2	22.40	22.47	22.56		
1.4	16QAM	1	5	22.41	22.32	22.50		
1.4	16QAM	3	0	22.42	22.47	22.51		
1.4	16QAM	3	1	22.40	22.48	22.49		
1.4	16QAM	3	2	22.40	22.49	22.55		
1.4	16QAM	6	0	21.30	21.37	21.46	22	2

<LTE Band 2 Conducted Power>

<Hotspot inactive - full power mode>

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				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	23.07	23.44	23.09	24	0
20	QPSK	1	49	22.97	23.20	22.78		
20	QPSK	1	99	23.01	23.01	22.76		
20	QPSK	50	0	22.34	22.43	22.20	23	1
20	QPSK	50	24	22.49	22.56	22.15		
20	QPSK	50	49	22.29	22.37	21.90		
20	QPSK	100	0	22.20	22.21	21.75		
20	16QAM	1	0	22.26	22.81	22.22	23	1
20	16QAM	1	49	22.42	22.45	22.14		
20	16QAM	1	99	22.24	22.25	21.96		
20	16QAM	50	0	21.17	21.29	20.86	22	2
20	16QAM	50	24	21.34	21.43	20.96		
20	16QAM	50	49	21.24	21.27	20.81		
20	16QAM	100	0	20.84	20.87	20.49		
Channel				18675	18900	19125	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	23.43	23.37	23.08	24	0
15	QPSK	1	37	23.38	23.35	23.05		
15	QPSK	1	74	23.29	23.32	23.06		
15	QPSK	36	0	22.88	22.95	22.49	23	1
15	QPSK	36	18	22.98	22.92	22.49		
15	QPSK	36	37	22.95	22.97	22.50		
15	QPSK	75	0	22.22	22.25	21.76		
15	16QAM	1	0	22.54	22.60	22.42	23	1
15	16QAM	1	37	22.71	22.74	22.32		
15	16QAM	1	74	22.75	22.68	22.30		
15	16QAM	36	0	21.76	21.93	21.47	22	2
15	16QAM	36	18	21.87	21.99	21.50		
15	16QAM	36	37	21.87	21.92	21.42		
15	16QAM	75	0	20.90	20.99	20.80		
Channel				18650	18900	19150	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	23.07	23.42	22.97	24	0
10	QPSK	1	24	23.13	23.30	22.88		
10	QPSK	1	49	23.27	23.30	22.82		
10	QPSK	25	0	22.94	22.93	22.60	23	1
10	QPSK	25	12	22.97	22.91	22.50		
10	QPSK	25	24	22.91	22.92	22.42		
10	QPSK	50	0	22.89	22.97	22.52		
10	16QAM	1	0	22.36	22.66	22.22	23	1
10	16QAM	1	24	22.41	22.55	22.15		
10	16QAM	1	49	22.57	22.57	22.16		
10	16QAM	25	0	21.92	21.98	21.49	22	2
10	16QAM	25	12	21.95	21.97	21.48		
10	16QAM	25	24	21.94	21.99	21.52		
10	16QAM	50	0	21.96	21.94	21.50		

Channel				18625	18900	19175	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	23.05	23.38	22.91	24	0
5	QPSK	1	12	22.95	23.29	22.86		
5	QPSK	1	24	22.91	23.34	22.90		
5	QPSK	12	0	22.31	22.69	22.41	23	1
5	QPSK	12	6	22.60	22.91	22.42		
5	QPSK	12	11	22.55	22.92	22.43		
5	QPSK	25	0	21.91	22.03	21.58		
5	16QAM	1	0	22.32	22.60	22.12	23	1
5	16QAM	1	12	22.41	22.57	22.16		
5	16QAM	1	24	22.43	22.59	22.21		
5	16QAM	12	0	21.63	21.87	21.44	22	2
5	16QAM	12	6	21.70	21.90	21.46		
5	16QAM	12	11	21.72	21.92	21.42		
5	16QAM	25	0	20.65	20.83	20.42		
Channel				18615	18900	19185	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	23.03	23.32	22.84	24	0
3	QPSK	1	7	22.81	23.31	22.88		
3	QPSK	1	14	22.86	23.31	22.87		
3	QPSK	8	0	22.68	22.96	22.55	23	1
3	QPSK	8	4	22.58	22.91	22.50		
3	QPSK	8	7	22.63	22.88	22.51		
3	QPSK	15	0	22.36	22.56	22.11		
3	16QAM	1	0	22.27	22.59	22.11	23	1
3	16QAM	1	7	22.37	22.57	22.10		
3	16QAM	1	14	22.41	22.54	22.09		
3	16QAM	8	0	21.57	21.92	21.45	22	2
3	16QAM	8	4	21.64	21.87	21.53		
3	16QAM	8	7	21.67	21.86	21.54		
3	16QAM	15	0	21.31	21.54	21.05		
Channel				18607	18900	19193	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	23.05	23.32	22.85	22	0
1.4	QPSK	1	2	23.13	23.24	22.88		
1.4	QPSK	1	5	23.07	23.26	22.82		
1.4	QPSK	3	0	22.91	22.95	22.53		
1.4	QPSK	3	1	22.85	22.89	22.45		
1.4	QPSK	3	2	22.76	22.85	22.42		
1.4	QPSK	6	0	22.68	22.73	22.30	22	1
1.4	16QAM	1	0	22.22	22.57	22.07	22	1
1.4	16QAM	1	2	22.35	22.48	22.08		
1.4	16QAM	1	5	22.27	22.49	22.02		
1.4	16QAM	3	0	21.99	21.99	21.54		
1.4	16QAM	3	1	21.88	21.93	21.46		
1.4	16QAM	3	2	21.85	21.84	21.44		
1.4	16QAM	6	0	21.73	21.74	21.28	22	2

<LTE Band 2 Conducted Power>

<Hotspot active - reduced power mode>

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				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	20.77	20.98	20.61	22	0
20	QPSK	1	49	20.78	20.73	20.70		
20	QPSK	1	99	20.65	20.56	20.76		
20	QPSK	50	0	19.78	19.74	19.80	21	1
20	QPSK	50	24	19.85	19.92	19.82		
20	QPSK	50	49	19.81	19.71	19.91		
20	QPSK	100	0	19.75	19.79	19.75		
20	16QAM	1	0	19.80	19.77	19.59	21	1
20	16QAM	1	49	19.77	19.74	19.63		
20	16QAM	1	99	19.66	19.52	19.69		
20	16QAM	50	0	18.77	18.84	18.81	20	2
20	16QAM	50	24	18.86	18.80	18.90		
20	16QAM	50	49	18.82	18.78	18.94		
20	16QAM	100	0	18.84	18.85	18.84		
Channel				18675	18900	19125	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	20.97	20.87	20.91	22	0
15	QPSK	1	37	20.92	20.90	20.93		
15	QPSK	1	74	20.89	20.85	20.95		
15	QPSK	36	0	19.96	19.96	19.95	21	1
15	QPSK	36	18	19.90	19.91	19.99		
15	QPSK	36	37	19.93	19.86	19.96		
15	QPSK	75	0	19.98	19.98	19.93		
15	16QAM	1	0	19.99	19.88	19.80	21	1
15	16QAM	1	37	19.91	19.89	19.92		
15	16QAM	1	74	19.89	19.84	19.95		
15	16QAM	36	0	18.97	18.98	18.92	20	2
15	16QAM	36	18	18.97	18.91	18.97		
15	16QAM	36	37	18.95	18.98	18.97		
15	16QAM	75	0	18.96	18.96	18.86		
Channel				18650	18900	19150	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	20.75	20.82	20.95	22	0
10	QPSK	1	24	20.71	20.86	20.94		
10	QPSK	1	49	20.79	20.78	20.91		
10	QPSK	25	0	19.84	19.96	20.00	21	1
10	QPSK	25	12	19.83	19.95	19.99		
10	QPSK	25	24	19.85	19.94	19.94		
10	QPSK	50	0	19.83	19.97	19.94		
10	16QAM	1	0	19.79	19.83	19.84	21	1
10	16QAM	1	24	19.77	19.84	19.82		
10	16QAM	1	49	19.88	19.77	19.87		
10	16QAM	25	0	18.99	18.99	18.97	20	2
10	16QAM	25	12	18.94	18.94	18.97		
10	16QAM	25	24	18.98	18.94	18.99		
10	16QAM	50	0	18.93	18.95	18.95		

Channel				18625	18900	19175	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	20.78	20.90	20.96	22	0
5	QPSK	1	12	20.77	20.88	20.89		
5	QPSK	1	24	20.73	20.80	20.94		
5	QPSK	12	0	19.87	19.94	19.95	21	1
5	QPSK	12	6	19.86	19.99	19.94		
5	QPSK	12	11	19.96	19.92	19.97		
5	QPSK	25	0	19.94	19.92	19.94		
5	16QAM	1	0	19.84	19.82	19.96	21	1
5	16QAM	1	12	19.82	19.84	19.87		
5	16QAM	1	24	19.78	19.75	19.90		
5	16QAM	12	0	18.91	18.94	18.95	20	2
5	16QAM	12	6	18.92	18.96	18.95		
5	16QAM	12	11	18.96	18.94	18.97		
5	16QAM	25	0	18.91	18.94	18.96		
Channel				18615	18900	19185	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	20.88	20.87	20.96	22	0
3	QPSK	1	7	20.88	20.86	20.88		
3	QPSK	1	14	20.89	20.82	20.95		
3	QPSK	8	0	19.96	19.92	19.97	21	1
3	QPSK	8	4	19.93	19.97	19.97		
3	QPSK	8	7	19.95	19.96	19.99		
3	QPSK	15	0	19.94	19.95	19.95		
3	16QAM	1	0	19.85	19.83	19.84	21	1
3	16QAM	1	7	19.81	19.82	19.87		
3	16QAM	1	14	19.89	19.76	19.89		
3	16QAM	8	0	18.98	18.94	18.96	20	2
3	16QAM	8	4	18.98	18.94	18.95		
3	16QAM	8	7	18.91	18.93	18.97		
3	16QAM	15	0	18.93	18.98	18.91		
Channel				18607	18900	19193	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	20.88	20.89	20.92	22	0
1.4	QPSK	1	2	20.86	20.87	20.87		
1.4	QPSK	1	5	20.90	20.90	20.91		
1.4	QPSK	3	0	20.88	20.89	20.86		
1.4	QPSK	3	1	20.89	20.87	20.88		
1.4	QPSK	3	2	20.83	20.88	20.85		
1.4	QPSK	6	0	19.97	19.97	19.94	21	1
1.4	16QAM	1	0	19.83	19.89	19.85	21	1
1.4	16QAM	1	2	19.88	19.87	19.86		
1.4	16QAM	1	5	19.89	19.88	19.83		
1.4	16QAM	3	0	19.86	19.88	19.84		
1.4	16QAM	3	1	19.85	19.86	19.87		
1.4	16QAM	3	2	19.85	19.85	19.85		
1.4	16QAM	6	0	18.83	18.86	18.88	20	2

<LTE Band 7 Conducted Power>

<Full power mode>

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				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	23.22	23.62	23.46	24	0
20	QPSK	1	49	23.08	23.52	23.45		
20	QPSK	1	99	22.95	23.24	23.31		
20	QPSK	50	0	22.20	22.65	22.35	23	1
20	QPSK	50	24	22.45	22.52	22.31		
20	QPSK	50	49	22.48	22.47	22.29		
20	QPSK	100	0	22.42	22.56	22.17		
20	16QAM	1	0	21.98	22.33	22.41	23	1
20	16QAM	1	49	22.25	22.38	22.00		
20	16QAM	1	99	22.16	22.14	21.97		
20	16QAM	50	0	21.32	21.78	21.39	22	2
20	16QAM	50	24	21.42	21.55	21.33		
20	16QAM	50	49	21.53	21.48	21.33		
20	16QAM	100	0	21.42	21.62	21.20		
Channel				20825	21100	21375	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	23.12	23.61	23.12	24	0
15	QPSK	1	37	23.38	23.37	23.11		
15	QPSK	1	74	23.59	23.17	23.20		
15	QPSK	36	0	22.28	22.53	22.11	23	1
15	QPSK	36	18	22.30	22.49	22.14		
15	QPSK	36	37	22.38	22.37	22.28		
15	QPSK	75	0	22.30	22.47	22.16		
15	16QAM	1	0	22.41	22.34	21.98	23	1
15	16QAM	1	37	22.19	22.29	21.97		
15	16QAM	1	74	22.01	22.14	22.10		
15	16QAM	36	0	21.30	21.67	21.24	22	2
15	16QAM	36	18	21.33	21.55	21.16		
15	16QAM	36	37	21.47	21.39	21.23		
15	16QAM	75	0	21.46	21.58	21.22		
Channel				20800	21100	21400	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	23.14	23.59	23.21	24	0
10	QPSK	1	24	23.11	23.40	23.28		
10	QPSK	1	49	22.98	23.21	23.33		
10	QPSK	25	0	22.40	22.43	22.09	23	1
10	QPSK	25	12	22.01	22.43	22.28		
10	QPSK	25	24	21.98	22.24	22.30		
10	QPSK	50	0	21.91	22.40	22.20		
10	16QAM	1	0	21.93	22.37	22.04	23	1
10	16QAM	1	24	22.21	22.21	22.12		
10	16QAM	1	49	22.20	22.22	22.11		
10	16QAM	25	0	21.39	21.51	21.16	22	2
10	16QAM	25	12	21.46	21.50	21.29		
10	16QAM	25	24	21.39	21.34	21.28		
10	16QAM	50	0	21.29	21.41	21.20		

Channel				20775	21100	21425	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	23.11	23.36	23.30	24	0
5	QPSK	1	12	23.01	23.17	23.31		
5	QPSK	1	24	22.98	23.17	23.30		
5	QPSK	12	0	22.51	22.35	22.27	23	1
5	QPSK	12	6	22.12	22.30	22.29		
5	QPSK	12	11	22.12	22.27	22.26		
5	QPSK	25	0	22.04	22.30	22.28		
5	16QAM	1	0	22.21	22.16	22.12	23	1
5	16QAM	1	12	22.02	22.10	22.13		
5	16QAM	1	24	21.93	22.09	22.12		
5	16QAM	12	0	21.02	21.39	21.24	22	2
5	16QAM	12	6	21.11	21.32	21.26		
5	16QAM	12	11	21.18	21.31	21.26		
5	16QAM	25	0	21.13	21.41	21.32		

LTE Carrier Aggregation Conducted Power

Note:

1. According to KDB941225 D05A v01, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.
2. Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.

LTE Band 4(full power mode) with LTE Band17

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod.	without CA	with CA 4A + 17A (10MHz + 10MHz)	with CA 4A + 17A (10MHz + 5MHz)
						Average Power [dBm]	Average Power [dBm]	Average Power [dBm]
1715	20000	10	1	0	QPSK	23.34	23.26	23.31
1715	20000	10	1	24		23.37	23.33	23.31
1715	20000	10	1	49		23.35	23.30	23.34
1715	20000	10	1	0	16-QAM	22.34	22.28	22.31
1715	20000	10	1	24		22.32	22.30	22.33
1715	20000	10	1	49		22.33	22.30	22.35
1732.5	20175	10	1	0	QPSK	23.49	23.46	23.50
1732.5	20175	10	1	24		23.44	23.43	23.42
1732.5	20175	10	1	49		23.43	23.43	23.45
1732.5	20175	10	1	0	16-QAM	22.40	22.36	22.36
1732.5	20175	10	1	24		22.38	22.30	22.32
1732.5	20175	10	1	49		22.39	22.34	22.32
1750	20350	10	1	0	QPSK	23.50	23.48	23.53
1750	20350	10	1	24		23.49	23.49	23.53
1750	20350	10	1	49		23.49	23.41	23.43
1750	20350	10	1	0	16-QAM	22.50	22.45	22.47
1750	20350	10	1	24		22.46	22.42	22.49
1750	20350	10	1	49		22.44	22.36	22.45

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod.	without CA	with CA 4A + 17A (5MHz + 10MHz)	with CA 4A + 17A (5MHz + 5MHz)
						Average Power [dBm]	Average Power [dBm]	Average Power [dBm]
1712.5	19975	5	1	0	QPSK	23.35	23.36	23.30
1712.5	19975	5	1	12		23.34	23.25	23.31
1712.5	19975	5	1	24		23.39	23.38	23.40
1712.5	19975	5	1	0	16-QAM	22.33	22.29	22.32
1712.5	19975	5	1	12		22.30	22.24	22.29
1712.5	19975	5	1	24		22.32	22.38	22.34
1732.5	20175	5	1	0	QPSK	23.47	23.45	23.44
1732.5	20175	5	1	12		23.34	23.38	23.33
1732.5	20175	5	1	24		23.38	23.37	23.35
1732.5	20175	5	1	0	16-QAM	22.40	22.42	22.36
1732.5	20175	5	1	12		22.29	22.22	22.25
1732.5	20175	5	1	24		22.29	22.24	22.23
1752.5	20375	5	1	0	QPSK	23.53	23.55	23.51
1752.5	20375	5	1	12		23.52	23.45	23.55
1752.5	20375	5	1	24		23.49	23.46	23.53
1752.5	20375	5	1	0	16-QAM	22.51	22.47	22.50
1752.5	20375	5	1	12		22.48	22.46	22.43
1752.5	20375	5	1	24		22.45	22.44	22.40

LTE Band 2(full power mode) with LTE Band17

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod.	without CA	with CA 2A + 17A (10MHz + 10MHz)	with CA 2A + 17A (10MHz + 5MHz)
						Average Power [dBm]	Average Power [dBm]	Average Power [dBm]
1855	18650	10	1	0	QPSK	23.07	23.02	23.13
1855	18650	10	1	24		23.13	23.08	23.04
1855	18650	10	1	49		23.27	23.19	23.35
1855	18650	10	1	0	16-QAM	22.36	22.28	22.38
1855	18650	10	1	24		22.41	22.38	22.33
1855	18650	10	1	49		22.57	22.54	22.59
1880	18900	10	1	0	QPSK	23.42	23.38	23.44
1880	18900	10	1	24		23.30	23.25	23.32
1880	18900	10	1	49		23.30	23.29	23.26
1880	18900	10	1	0	16-QAM	22.66	22.64	22.65
1880	18900	10	1	24		22.55	22.51	22.64
1880	18900	10	1	49		22.57	22.54	22.48
1905	19150	10	1	0	QPSK	22.97	22.89	22.95
1905	19150	10	1	24		22.88	22.82	22.89
1905	19150	10	1	49		22.82	22.75	22.83
1905	19150	10	1	0	16-QAM	22.22	22.18	22.26
1905	19150	10	1	24		22.15	22.05	22.15
1905	19150	10	1	49		22.16	22.09	22.18

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod.	without CA	with CA 4A + 17A (5MHz + 10MHz)	with CA 4A + 17A (5MHz + 5MHz)
						Average Power [dBm]	Average Power [dBm]	Average Power [dBm]
1852.5	18625	5	1	0	QPSK	23.05	23.01	23.02
1852.5	18625	5	1	12		22.95	22.94	22.95
1852.5	18625	5	1	24		22.91	22.90	22.89
1852.5	18625	5	1	0	16-QAM	22.32	22.23	22.22
1852.5	18625	5	1	12		22.41	22.31	22.38
1852.5	18625	5	1	24		22.43	22.30	22.40
1880	18900	5	1	0	QPSK	23.38	23.38	22.39
1880	18900	5	1	12		23.29	23.28	23.27
1880	18900	5	1	24		23.34	23.23	23.31
1880	18900	5	1	0	16-QAM	22.60	22.58	22.56
1880	18900	5	1	12		22.57	22.48	22.47
1880	18900	5	1	24		22.59	22.58	22.56
1907.5	19175	5	1	0	QPSK	22.91	22.90	22.87
1907.5	19175	5	1	12		22.86	22.85	22.87
1907.5	19175	5	1	24		22.90	22.91	22.85
1907.5	19175	5	1	0	16-QAM	22.12	22.10	22.11
1907.5	19175	5	1	12		22.16	22.14	22.13
1907.5	19175	5	1	24		22.21	22.24	22.21

LTE Band 2(Hotspot active - reduced power mode) with LTE Band17

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod.	without CA	with CA 2A + 17A (10MHz + 10MHz)	with CA 2A + 17A (10MHz + 5MHz)
						Average Power [dBm]	Average Power [dBm]	Average Power [dBm]
1855	18650	10	1	0	QPSK	20.75	20.68	20.73
1855	18650	10	1	24		20.71	20.79	20.77
1855	18650	10	1	49		20.79	20.80	20.75
1855	18650	10	1	0	16-QAM	19.79	19.81	19.78
1855	18650	10	1	24		19.77	19.67	19.68
1855	18650	10	1	49		19.88	19.84	19.92
1880	18900	10	1	0	QPSK	20.82	20.81	20.78
1880	18900	10	1	24		20.86	20.85	20.85
1880	18900	10	1	49		20.78	20.83	20.75
1880	18900	10	1	0	16-QAM	19.83	19.83	19.80
1880	18900	10	1	24		19.84	19.85	19.85
1880	18900	10	1	49		19.77	19.79	19.76
1905	19150	10	1	0	QPSK	20.95	20.99	21.05
1905	19150	10	1	24		20.94	20.92	20.89
1905	19150	10	1	49		20.91	20.98	20.87
1905	19150	10	1	0	16-QAM	19.84	19.80	19.93
1905	19150	10	1	24		19.82	19.79	19.85
1905	19150	10	1	49		19.87	19.89	19.92

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod.	without CA	with CA 4A + 17A (5MHz + 10MHz)	with CA 4A + 17A (5MHz + 5MHz)
						Average Power [dBm]	Average Power [dBm]	Average Power [dBm]
1852.5	18625	5	1	0	QPSK	20.78	20.86	20.73
1852.5	18625	5	1	12		20.77	20.79	20.74
1852.5	18625	5	1	24		20.73	20.69	20.74
1852.5	18625	5	1	0	16-QAM	19.84	19.80	19.75
1852.5	18625	5	1	12		19.82	19.84	19.85
1852.5	18625	5	1	24		19.78	19.81	19.87
1880	18900	5	1	0	QPSK	20.90	20.88	20.84
1880	18900	5	1	12		20.88	20.95	20.88
1880	18900	5	1	24		20.80	20.89	20.73
1880	18900	5	1	0	16-QAM	19.82	19.81	19.75
1880	18900	5	1	12		19.84	19.80	19.91
1880	18900	5	1	24		19.75	19.65	19.68
1907.5	19175	5	1	0	QPSK	20.96	21.01	21.00
1907.5	19175	5	1	12		20.89	20.88	20.93
1907.5	19175	5	1	24		20.94	20.89	20.94
1907.5	19175	5	1	0	16-QAM	19.96	19.94	19.93
1907.5	19175	5	1	12		19.87	19.92	19.89
1907.5	19175	5	1	24		19.90	19.95	19.83

<WLAN 2.4GHz Conducted Power>

Note:

1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate
3. Apply the test exclusion rule in KDB 248227 D01 v01r02 11g, 11n-HT20 output power is less than 1/4dB higher than 11b mode, thus the SAR can be excluded.

WLAN 2.4GHz 802.11b Average Power (dBm)					
Power vs. Channel			Power vs. Data Rate		
Channel	Frequency (MHz)	Data Rate	2Mbps	5.5Mbps	11Mbps
		1Mbps			
CH 1	2412	17.21	17.13	17.18	17.15
CH 6	2437	17.15			
CH 11	2462	17.00			

WLAN 2.4GHz 802.11g Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps							
CH 1	2412	15.62	17.17	17.16	17.19	17.16	17.19	17.18	17.18
CH 6	2437	17.20							
CH 11	2462	15.34							

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0							
CH 1	2412	15.15	16.99	16.99	16.99	17.00	16.89	16.96	16.99
CH 6	2437	17.01							
CH 11	2462	14.02							

<WLAN 5GHz Conducted Power>

Note:

1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate.
3. For frequency 5180MHz ~ 5240MHz, apply the test exclusion rule in KDB 248227 D01 v01r02, 11n-HT20 and 11ac-VHT20 output power is less than 1/4dB higher than 802.11a mode, thus the SAR can be excluded.
4. For frequency 5180MHz ~ 5240MHz, per KDB 248227 D01 v01r02, 11n-HT40 and 11ac-VHT40 average output power is higher than 1/4dB higher than 802.11a mode, these modes SAR will be verified at the highest RF exposure position found in 802.11a SAR testing.
5. For frequency 5745MHz ~ 5825MHz, apply the test exclusion rule in KDB 248227 D01 v01r02, 11n-HT20/HT40 and 11ac-VHT20/VHT40 output power is less than 1/4dB higher than 802.11a mode, thus the SAR can be excluded.
6. For 802.11ac SAR evaluation for each frequency band, 802.11n VHT80 was verified at the worst case found in 802.11a SAR testing.

WLAN 5GHz 802.11a Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps							
CH 36	5180	14.80	14.75	14.78	14.66	14.72	14.70	14.68	14.68
CH 40	5200	14.70							
CH 44	5220	14.71							
CH 48	5240	14.67							
CH 149	5745	18.90	18.91	18.87	18.91	18.85	18.87	18.85	18.83
CH 153	5765	18.63							
CH 157	5785	18.88							
CH 161	5805	18.91							
CH 165	5825	18.98							

WLAN 5GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0							
CH 36	5180	14.72	14.65	14.73	14.78	14.76	14.75	14.77	14.76
CH 40	5200	14.76							
CH 44	5220	14.78							
CH 48	5240	14.73							
CH 149	5745	18.83	18.94	18.92	18.93	18.88	18.91	18.94	18.87
CH 153	5765	18.62							
CH 157	5785	18.96							
CH 161	5805	18.94							
CH 165	5825	18.97							

WLAN 5GHz 802.11n-HT40 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0							
CH 38	5190	16.49	16.67	16.63	16.65	16.68	16.67	16.67	16.65
CH 46	5230	16.78							
CH 151	5755	18.95	18.89	18.88	18.82	18.91	18.80	18.82	18.81
CH 159	5795	18.92							

WLAN 5GHz 802.11ac-VHT20 Average Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
		MCS0								
CH 36	5180	14.79	14.77	14.69	14.68	14.69	14.76	14.74	14.68	14.66
CH 40	5200	17.65								
CH 44	5220	14.69								
CH 48	5240	14.78								
CH 149	5745	18.92	18.92	18.93	18.92	18.89	18.91	18.93	18.88	18.92
CH 153	5765	18.72								
CH 157	5785	18.94								
CH 161	5805	18.89								
CH 165	5825	18.61								

WLAN 5GHz 802.11ac-VHT40 Average Power (dBm)											
Power vs. Channel			Power vs. MCS Index								
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
		MCS0									
CH 38	5190	16.43	16.67	16.68	16.65	16.68	16.66	16.71	16.68	16.61	16.64
CH 46	5230	16.78									
CH 151	5755	18.97	18.96	18.83	18.88	18.94	18.95	18.87	18.88	18.91	18.90
CH 159	5795	18.96									

WLAN 5GHz 802.11ac-VHT80 Average Power (dBm)											
Power vs. Channel			Power vs. MCS Index								
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
		MCS0									
CH 42	5210	14.74	14.60	14.62	14.67	14.66	14.65	14.67	14.67	14.67	14.67
CH 155	5775	18.96	18.88	18.77	18.84	18.71	18.84	18.73	18.84	18.75	18.84

11. Bluetooth Exclusions Applied

Band / Mode	Average power (dBm)			
	v3.0+EDR			v4.0-LE
	1Mbps	2Mbps	3Mbps	
2.4 GHz Bluetooth	9.0	8.0	8.0	2.0

Note:

1. Per KDB 447498 D01v05r02, 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 extremity 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
9.0	0	2.48	2.52

Note:

Per KDB 447498 D01v05r02, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 2.52 which is <= 3, SAR testing is not required.

12. Exposure Position Conditions

Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Primary	≤ 25mm	≤ 25mm	128mm	≤ 25mm	≤ 25mm	≤ 25mm
BT&WLAN	≤ 25mm	≤ 25mm	≤ 25mm	117mm	≤ 25mm	36mm

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

Note:

1. Referring to KDB 941225 D06 v01r01, 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. The detail antenna location which can be referred to setup photo.

13. SAR Test Results

Note:

1. Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   b. 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.
   c. For WWAN / WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
2. Per KDB 447498 D01v05r02, 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 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA /HSUPA output power is < 0.25dB higher than RMC12.2Kbps, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA /HSUPA SAR evaluation can be excluded.
4. Per KDB 941225 D05v02r03, when reported SAR of 1RB and 50%RB allocation for QPSK ≤0.8W/kg, and 100%RB with QPSK output power is less than 1RB and 50%RB, 100%RB allocation for QPSK is not required.
5. Per KDB 941225 D05v02r03, when reported SAR of 1RB and 50%RB allocation for QPSK >0.8W/kg for any exposure position, SAR testing of 100%RB allocation for QPSK is performed at the highest power channel.
6. 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 D05v02r03, 16QAM SAR testing is not required.
7. 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 D05v02r03, smaller bandwidth SAR testing is not required.
8. Per KDB 941225 D06v01r01, when the same wireless mode and device transmission configurations are required for testing body-worn accessories and hotspot mode, it is not necessary to test body-worn accessory SAR for the same device orientation if the test separation distance for hotspot mode is more conservative than that used for body-worn accessories, due to the Body-worn and Hotspot SAR testing in different separation, therefore, when in high frequency band (1750/1900/2600MHz) Body-worn SAR testing of high frequency band was selected worst position of front and back from Hotspot mode.
9. Per KDB 648474 D04v01r02, 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.
10. Additional 2.4GHz WLAN back 1.5cm and 5.8GHz front 1.5cm SAR testing was performed for simultaneous transmission analysis.
11. This device supports 2.4GHz / 5.8GHz WLAN Hotspot operation.
12. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of WCDMA band 2 and LTE band 2.
13. Antenna tuning is implemented to vary according to the IR proximity sensor trigger and is implemented in the low frequency bands (700/800 MHz), and details are illustrated in the operational description.
14. The IR proximity sensor trigger is not affecting on the WLAN / BT operation and the cellular operation of GSM/UMTS/LTE above 1GHz.

13.1 Head SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	IR p-sensor Triggered	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	GSM Voice	Right Cheek	Triggered	251	848.8	32.96	33.00	1.009	0.08	0.242	0.244
01	GSM850	GPRS(2 Tx slots)	Right Cheek	Triggered	189	836.4	32.76	33.00	1.057	0.17	0.294	**0.311**
	GSM850	GSM Voice	Right Tilted	Triggered	251	848.8	32.96	33.00	1.009	-0.02	0.148	0.149
	GSM850	GSM Voice	Left Cheek	Triggered	251	848.8	32.96	33.00	1.009	0.05	0.245	0.247
	GSM850	GSM Voice	Left Tilted	Triggered	251	848.8	32.96	33.00	1.009	0.07	0.164	0.166
	GSM1900	GSM Voice	Right Cheek	N/A	661	1880	29.96	30.00	1.009	-0.03	0.137	0.138
	GSM1900	GSM Voice	Right Tilted	N/A	661	1880	29.96	30.00	1.009	0.14	0.042	0.042
	GSM1900	GSM Voice	Left Cheek	N/A	661	1880	29.96	30.00	1.009	-0.09	0.254	0.256
02	GSM1900	GPRS (2 Tx slots)	Left Cheek	N/A	512	1850.2	29.90	30.00	1.023	-0.04	0.470	**0.481**
	GSM1900	GSM Voice	Left Tilted	N/A	661	1880	29.96	30.00	1.009	0.08	0.035	0.035

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	IR p-sensor Triggered	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	RMC12.2Kbps	Right Cheek	Triggered	4182	836.4	23.50	23.50	1.000	-0.02	0.305	0.305
	WCDMA V	RMC12.2Kbps	Right Tilted	Triggered	4182	836.4	23.50	23.50	1.000	0.05	0.190	0.190
03	WCDMA V	RMC12.2Kbps	Left Cheek	Triggered	4182	836.4	23.50	23.50	1.000	0.15	0.343	**0.343**
	WCDMA V	RMC12.2Kbps	Left Tilted	Triggered	4182	836.4	23.50	23.50	1.000	0.03	0.197	0.197
04	WCDMA IV	RMC12.2Kbps	Right Cheek	N/A	1312	1712.4	23.45	23.50	1.012	0.04	0.261	**0.264**
	WCDMA IV	RMC12.2Kbps	Right Tilted	N/A	1312	1712.4	23.45	23.50	1.012	-0.05	0.042	0.042
	WCDMA IV	RMC12.2Kbps	Left Cheek	N/A	1312	1712.4	23.45	23.50	1.012	0.01	0.145	0.147
	WCDMA IV	RMC12.2Kbps	Left Tilted	N/A	1312	1712.4	23.45	23.50	1.012	-0.02	0.071	0.072
	WCDMA II	RMC12.2Kbps	Right Cheek	N/A	9262	1852.4	23.49	23.50	1.002	-0.04	0.242	0.243
	WCDMA II	RMC12.2Kbps	Right Tilted	N/A	9262	1852.4	23.49	23.50	1.002	-0.02	0.044	0.044
05	WCDMA II	RMC12.2Kbps	Left Cheek	N/A	9262	1852.4	23.49	23.50	1.002	0.14	0.519	**0.520**
	WCDMA II	RMC12.2Kbps	Left Tilted	N/A	9262	1852.4	23.49	23.50	1.002	0	0.058	0.058

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	IR p-sensor Triggered	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 17	10M	QPSK	1	0	Right Cheek	Triggered	23790	710	22.92	24.00	1.282	-0.01	0.165	0.212
	LTE Band 17	10M	QPSK	25	0	Right Cheek	Triggered	23790	710	22.31	23.00	1.172	-0.06	0.107	0.125
	LTE Band 17	10M	QPSK	1	0	Right Tilted	Triggered	23790	710	22.92	24.00	1.282	0.06	0.110	0.141
	LTE Band 17	10M	QPSK	25	0	Right Tilted	Triggered	23790	710	22.31	23.00	1.172	-0.03	0.070	0.082
06	LTE Band 17	10M	QPSK	1	0	Left Cheek	Triggered	23790	710	22.92	24.00	1.282	0.01	0.192	**0.246**
	LTE Band 17	10M	QPSK	25	0	Left Cheek	Triggered	23790	710	22.31	23.00	1.172	0.03	0.125	0.147
	LTE Band 17	10M	QPSK	1	0	Left Tilted	Triggered	23790	710	22.92	24.00	1.282	0.05	0.110	0.141
	LTE Band 17	10M	QPSK	25	0	Left Tilted	Triggered	23790	710	22.31	23.00	1.172	0.03	0.071	0.083
	LTE Band 5	10M	QPSK	1	0	Right Cheek	Triggered	20600	844	22.94	24.00	1.276	0.08	0.234	0.299
	LTE Band 5	10M	QPSK	25	12	Right Cheek	Triggered	20525	836.5	21.95	23.00	1.274	0.05	0.181	0.231
	LTE Band 5	10M	QPSK	1	0	Right Tilted	Triggered	20600	844	22.94	24.00	1.276	0.12	0.158	0.202
	LTE Band 5	10M	QPSK	25	12	Right Tilted	Triggered	20525	836.5	21.95	23.00	1.274	0.16	0.121	0.154
07	LTE Band 5	10M	QPSK	1	0	Left Cheek	Triggered	20600	844	22.94	24.00	1.276	0.1	0.269	**0.343**
	LTE Band 5	10M	QPSK	25	12	Left Cheek	Triggered	20525	836.5	21.95	23.00	1.274	0.11	0.209	0.266
	LTE Band 5	10M	QPSK	1	0	Left Tilted	Triggered	20600	844	22.94	24.00	1.276	0.04	0.155	0.198
	LTE Band 5	10M	QPSK	25	12	Left Tilted	Triggered	20525	836.5	21.95	23.00	1.274	0.08	0.120	0.153
	LTE Band 4	20M	QPSK	1	0	Right Check	N/A	20175	1732.5	23.75	24.00	1.059	0.07	0.198	0.210
	LTE Band 4	20M	QPSK	50	0	Right Check	N/A	20175	1732.5	22.94	23.00	1.014	0.03	0.162	0.164
	LTE Band 4	20M	QPSK	1	0	Right Tilted	N/A	20175	1732.5	23.75	24.00	1.059	0.11	0.040	0.042
	LTE Band 4	20M	QPSK	50	0	Right Tilted	N/A	20175	1732.5	22.94	23.00	1.014	0.11	0.035	0.035
08	LTE Band 4	20M	QPSK	1	0	Left Cheek	N/A	20175	1732.5	23.75	24.00	1.059	0	0.280	**0.297**
	LTE Band 4	20M	QPSK	50	0	Left Cheek	N/A	20175	1732.5	22.94	23.00	1.014	-0.01	0.244	0.247
	LTE Band 4	20M	QPSK	1	0	Left Tilted	N/A	20175	1732.5	23.75	24.00	1.059	0.11	0.062	0.066
	LTE Band 4	20M	QPSK	50	0	Left Tilted	N/A	20175	1732.5	22.94	23.00	1.014	0.1	0.053	0.054
	LTE Band 2	20M	QPSK	1	0	Right Check	N/A	18900	1880	23.44	24.00	1.138	0.03	0.203	0.231
	LTE Band 2	20M	QPSK	50	24	Right Cheek	N/A	18900	1880	22.56	23.00	1.107	0.03	0.334	0.370
	LTE Band 2	20M	QPSK	1	0	Right Tilted	N/A	18900	1880	23.44	24.00	1.138	-0.03	0.052	0.059
	LTE Band 2	20M	QPSK	50	24	Right Tilted	N/A	18900	1880	22.56	23.00	1.107	-0.05	0.040	0.044
09	LTE Band 2	20M	QPSK	1	0	Left Check	N/A	18900	1880	23.44	24.00	1.138	0.02	0.420	**0.478**
	LTE Band 2	20M	QPSK	50	24	Left Cheek	N/A	18900	1880	22.56	23.00	1.107	0.03	0.195	0.216
	LTE Band 2	20M	QPSK	1	0	Left Tilted	N/A	18900	1880	23.44	24.00	1.138	0.04	0.060	0.068
	LTE Band 2	20M	QPSK	50	24	Left Tilted	N/A	18900	1880	22.56	23.00	1.107	0.1	0.048	0.053
10	LTE Band 7	20M	QPSK	1	0	Right Cheek	N/A	21100	2535	23.62	24.00	1.091	0.09	0.428	**0.467**
	LTE Band 7	20M	QPSK	50	0	Right Cheek	N/A	21100	2535	22.65	23.00	1.084	-0.03	0.384	0.416
	LTE Band 7	20M	QPSK	1	0	Right Tilted	N/A	21100	2535	23.62	24.00	1.091	-0.09	0.336	0.367
	LTE Band 7	20M	QPSK	50	0	Right Tilted	N/A	21100	2535	22.65	23.00	1.084	0	0.283	0.307
	LTE Band 7	20M	QPSK	1	0	Left Cheek	N/A	21100	2535	23.62	24.00	1.091	0.08	0.331	0.361
	LTE Band 7	20M	QPSK	50	0	Left Cheek	N/A	21100	2535	22.65	23.00	1.084	0.04	0.374	0.405
	LTE Band 7	20M	QPSK	1	0	Left Tilted	N/A	21100	2535	23.62	24.00	1.091	0.01	0.223	0.243
	LTE Band 7	20M	QPSK	50	0	Left Tilted	N/A	21100	2535	22.65	23.00	1.084	-0.04	0.182	0.197

<WLAN SAR DTS>

Plot No.	Band	Mode	Test Position	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)
	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	1	2412	17.21	17.50	1.069	0.15	0.740	0.791
	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	1	2412	17.21	17.50	1.069	0.1	0.736	0.787
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	1	2412	17.21	17.50	1.069	0.04	1.000	1.069
11	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	6	2437	17.15	17.50	1.084	-0.07	1.060	**1.149**
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	11	2462	17.00	17.50	1.122	0.03	1.020	1.144
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	1	2412	17.21	17.50	1.069	-0.03	0.929	0.993
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	6	2437	17.15	17.50	1.084	-0.01	0.913	0.990
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	11	2462	17.00	17.50	1.122	0.05	0.883	0.991
	WLAN5GHz	802.11a 6Mbps	Right Cheek	165	5825	18.98	19.00	1.005	-0.06	0.771	0.775
	WLAN 5GHz	802.11a 6Mbps	Right Tilted	165	5825	18.98	19.00	1.005	0.08	0.581	0.584
	WLAN5GHz	802.11a 6Mbps	Left Cheek	165	5825	18.98	19.00	1.005	0.01	1.290	1.296
	WLAN5GHz	802.11a 6Mbps	Left Cheek	157	5785	18.88	19.00	1.028	-0.01	1.270	1.306
12	WLAN5GHz	802.11a 6Mbps	Left Cheek	153	5765	18.63	19.00	1.089	0.09	1.230	**1.339**
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Cheek	155	5775	18.96	19.00	1.009	0.01	1.060	1.069
	WLAN5GHz	802.11a 6Mbps	Left Tilted	165	5825	18.98	19.00	1.005	0	0.952	0.956
	WLAN5GHz	802.11a 6Mbps	Left Tilted	157	5785	18.88	19.00	1.028	-0.06	0.902	0.927
	WLAN5GHz	802.11a 6Mbps	Left Tilted	153	5765	18.63	19.00	1.089	0.03	0.932	1.015

<WLAN SAR NII>

Plot No.	Band	Mode	Test Position	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)
	WLAN5GHz	802.11a 6Mbps	Right Cheek	36	5180	14.80	15.00	1.047	0.05	0.372	0.390
	WLAN5GHz	802.11a 6Mbps	Right Tilted	36	5180	14.80	15.00	1.047	-0.08	0.238	0.249
	WLAN5GHz	802.11a 6Mbps	Left Cheek	36	5180	14.80	15.00	1.047	0.07	0.420	0.440
	WLAN5GHz	802.11n-HT40 MCS0	Left Cheek	46	5230	16.78	17.5	1.180	-0.18	0.615	0.726
13	WLAN5GHz	802.11ac-VHT40 MCS0	Left Cheek	46	5230	16.78	17.5	1.182	-0.1	0.646	**0.763**
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Cheek	42	5210	14.74	15.00	1.061	0.14	0.407	0.432
	WLAN5GHz	802.11a 6Mbps	Left Tilted	36	5180	14.80	15.00	1.047	-0.09	0.246	0.258

13.2 Hotspot SAR

Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	≤ 25mm	≤ 25mm	128mm	≤ 25mm	≤ 25mm	≤ 25mm
BT&WLAN	≤ 25mm	≤ 25mm	≤ 25mm	117mm	≤ 25mm	36mm

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

Note:

1. Referring to KDB 941225 D06 v01r01, 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.

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	IR p-sensor Triggered	Ch.	Freq. (MHz)	Hotspot Power Reduction	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 (2 Tx slots)	Front	1cm	Non-Triggered	189	836.4	OFF	32.76	33.00	1.057	0.03	0.416	0.440
	GSM850	GPRS (2 Tx slots)	Back	1cm	Non-Triggered	189	836.4	OFF	32.76	33.00	1.057	0.06	0.449	0.475
14	GSM850	GPRS (2 Tx slots)	Left Side	1cm	Non-Triggered	189	836.4	OFF	32.76	33.00	1.057	0	0.594	**0.628**
	GSM850	GPRS (2 Tx slots)	Right Side	1cm	Non-Triggered	189	836.4	OFF	32.76	33.00	1.057	0.03	0.399	0.422
	GSM850	GPRS (2 Tx slots)	Bottom Side	1cm	Non-Triggered	189	836.4	OFF	32.76	33.00	1.057	-0.05	0.283	0.299
	GSM850	GPRS (2 Tx slots)	Front	1cm	Triggered	189	836.4	OFF	32.76	33.00	1.057	0	0.366	0.387
	GSM850	GPRS (2 Tx slots)	Back	1cm	Triggered	189	836.4	OFF	32.76	33.00	1.057	0.07	0.449	0.475
	GSM850	GPRS (2 Tx slots)	Left Side	1cm	Triggered	189	836.4	OFF	32.76	33.00	1.057	0.04	0.580	0.613
	GSM850	GPRS (2 Tx slots)	Right Side	1cm	Triggered	189	836.4	OFF	32.76	33.00	1.057	-0.02	0.406	0.429
	GSM850	GPRS (2 Tx slots)	Bottom Side	1cm	Triggered	189	836.4	OFF	32.76	33.00	1.057	0.04	0.254	0.268
	GSM1900	GPRS (2 Tx slots)	Front	1cm	N/A	512	1850.2	OFF	29.90	30.00	1.023	0	0.788	0.806
	GSM1900	GPRS (2 Tx slots)	Front	1cm	N/A	661	1880	OFF	29.65	30.00	1.084	-0.07	1.020	1.106
	GSM1900	GPRS (2 Tx slots)	Front	1cm	N/A	810	1909.8	OFF	29.89	30.00	1.026	-0.04	1.020	1.046
	GSM1900	GPRS (2 Tx slots)	Back	1cm	N/A	512	1850.2	OFF	29.90	30.00	1.023	-0.04	1.230	1.259
	GSM1900	GPRS (2 Tx slots)	Back	1cm	N/A	661	1880	OFF	29.65	30.00	1.084	-0.13	1.140	1.236
15	GSM1900	GPRS (2 Tx slots)	Back	1cm	N/A	810	1909.8	OFF	29.89	30.00	1.026	-0.02	1.270	**1.303**
	GSM1900	GPRS (2 Tx slots)	Left Side	1cm	N/A	512	1850.2	OFF	29.90	30.00	1.023	0.01	0.209	0.214
	GSM1900	GPRS (2 Tx slots)	Right Side	1cm	N/A	512	1850.2	OFF	29.90	30.00	1.023	0.01	0.412	0.422
	GSM1900	GPRS (2 Tx slots)	Bottom Side	1cm	N/A	512	1850.2	OFF	29.90	30.00	1.023	-0.01	1.080	1.105
	GSM1900	GPRS (2 Tx slots)	Bottom Side	1cm	N/A	661	1880	OFF	29.65	30.00	1.084	-0.06	1.170	1.268
	GSM1900	GPRS (2 Tx slots)	Bottom Side	1cm	N/A	810	1909.8	OFF	29.89	30.00	1.026	-0.08	1.200	1.231

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	IR p-sensor Triggered	Ch.	Freq. (MHz)	Hotspot Power Reduction	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	1cm	Non-Triggered	4182	836.4	OFF	23.50	23.50	1.000	0.01	0.384	0.384
	WCDMA V	RMC 12.2Kbps	Back	1cm	Non-Triggered	4182	836.4	OFF	23.50	23.50	1.000	-0.07	0.452	0.452
	WCDMA V	RMC 12.2Kbps	Left Side	1cm	Non-Triggered	4182	836.4	OFF	23.50	23.50	1.000	-0.01	0.620	0.620
	WCDMA V	RMC 12.2Kbps	Right Side	1cm	Non-Triggered	4182	836.4	OFF	23.50	23.50	1.000	-0.03	0.370	0.370
	WCDMA V	RMC 12.2Kbps	Bottom Side	1cm	Non-Triggered	4182	836.4	OFF	23.50	23.50	1.000	-0.03	0.261	0.261
	WCDMA V	RMC 12.2Kbps	Front	1cm	Triggered	4182	836.4	OFF	23.50	23.50	1.000	-0.03	0.401	0.401
	WCDMA V	RMC 12.2Kbps	Back	1cm	Triggered	4182	836.4	OFF	23.50	23.50	1.000	0.09	0.448	0.448
16	WCDMA V	RMC 12.2Kbps	Left Side	1cm	Triggered	4182	836.4	OFF	23.50	23.50	1.000	-0.04	0.682	**0.682**
	WCDMA V	RMC 12.2Kbps	Right Side	1cm	Triggered	4182	836.4	OFF	23.50	23.50	1.000	-0.03	0.440	0.440
	WCDMA V	RMC 12.2Kbps	Bottom Side	1cm	Triggered	4182	836.4	OFF	23.50	23.50	1.000	0	0.269	0.269
	WCDMA IV	RMC 12.2Kbps	Front	1cm	N/A	1312	1712.4	OFF	23.45	23.50	1.012	-0.02	0.565	0.572
	WCDMA IV	RMC 12.2Kbps	Back	1cm	N/A	1312	1712.4	OFF	23.45	23.50	1.012	-0.01	1.180	1.194
	WCDMA IV	RMC 12.2Kbps	Back	1cm	N/A	1413	1732.6	OFF	23.38	23.50	1.028	-0.01	1.230	1.264
17	WCDMA IV	RMC 12.2Kbps	Back	1cm	N/A	1513	1752.6	OFF	23.37	23.50	1.030	0	1.280	**1.319**
	WCDMA IV	RMC 12.2Kbps	Left Side	1cm	N/A	1312	1712.4	OFF	23.45	23.50	1.012	0.11	0.075	0.076
	WCDMA IV	RMC 12.2Kbps	Right Side	1cm	N/A	1312	1712.4	OFF	23.45	23.50	1.012	-0.08	0.353	0.357
	WCDMA IV	RMC 12.2Kbps	Bottom Side	1cm	N/A	1312	1712.4	OFF	23.45	23.50	1.012	-0.09	0.574	0.581
	WCDMA II	RMC 12.2Kbps	Front	1cm	N/A	9400	1880	ON	21.52	22.00	1.117	0	0.475	0.531
	WCDMA II	RMC 12.2Kbps	Back	1cm	N/A	9400	1880	ON	21.52	22.00	1.117	-0.07	0.983	1.098
18	WCDMA II	RMC 12.2Kbps	Back	1cm	N/A	9262	1852.4	ON	21.42	22.00	1.143	-0.06	0.989	**1.130**
	WCDMA II	RMC 12.2Kbps	Back	1cm	N/A	9538	1907.6	ON	21.43	22.00	1.140	-0.07	0.898	1.024
	WCDMA II	RMC 12.2Kbps	Left Side	1cm	N/A	9400	1880	ON	21.52	22.00	1.117	0.08	0.149	0.166
	WCDMA II	RMC 12.2Kbps	Right Side	1cm	N/A	9400	1880	ON	21.52	22.00	1.117	0.1	0.228	0.255
	WCDMA II	RMC 12.2Kbps	Bottom Side	1cm	N/A	9400	1880	ON	21.52	22.00	1.117	0.1	0.771	0.861

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (cm)	IR p-sensor Triggered	Ch.	Freq. (MHz)	Hotspot Power Reduction	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 17	10M	QPSK	1	0	Front	1cm	Non-Triggered	23790	710	OFF	22.92	24.00	1.282	-0.05	0.205	0.263
	LTE Band 17	10M	QPSK	25	0	Front	1cm	Non-Triggered	23790	710	OFF	22.31	23.00	1.172	-0.01	0.132	0.155
	LTE Band 17	10M	QPSK	1	0	Back	1cm	Non-Triggered	23790	710	OFF	22.92	24.00	1.282	0	0.241	0.309
	LTE Band 17	10M	QPSK	25	0	Back	1cm	Non-Triggered	23790	710	OFF	22.31	23.00	1.172	-0.02	0.155	0.182
19	LTE Band 17	10M	QPSK	1	0	Left Side	1cm	Non-Triggered	23790	710	OFF	22.92	24.00	1.282	0.01	0.269	**0.345**
	LTE Band 17	10M	QPSK	25	0	Left Side	1cm	Non-Triggered	23790	710	OFF	22.31	23.00	1.172	0.02	0.174	0.204
	LTE Band 17	10M	QPSK	1	0	Right Side	1cm	Non-Triggered	23790	710	OFF	22.92	24.00	1.282	0.07	0.115	0.147
	LTE Band 17	10M	QPSK	25	0	Right Side	1cm	Non-Triggered	23780	710	OFF	22.31	23.00	1.172	-0.02	0.073	0.086
	LTE Band 17	10M	QPSK	1	0	Bottom Side	1cm	Non-Triggered	23790	710	OFF	22.92	24.00	1.282	0.01	0.148	0.190
	LTE Band 17	10M	QPSK	25	0	Bottom Side	1cm	Non-Triggered	23790	710	OFF	22.31	23.00	1.172	0.05	0.096	0.113
	LTE Band 17	10M	QPSK	1	0	Front	1cm	Triggered	23790	710	OFF	22.92	24.00	1.282	0	0.221	0.283
	LTE Band 17	10M	QPSK	25	0	Front	1cm	Triggered	23790	710	OFF	22.31	23.00	1.172	0.02	0.141	0.165
	LTE Band 17	10M	QPSK	1	0	Back	1cm	Triggered	23790	710	OFF	22.92	24.00	1.282	0	0.254	0.326
	LTE Band 17	10M	QPSK	25	0	Back	1cm	Triggered	23790	710	OFF	22.31	23.00	1.172	0.04	0.162	0.190
	LTE Band 17	10M	QPSK	1	0	Left Side	1cm	Triggered	23790	710	OFF	22.92	24.00	1.282	0.02	0.264	0.339
	LTE Band 17	10M	QPSK	25	0	Left Side	1cm	Triggered	23790	710	OFF	22.31	23.00	1.172	-0.01	0.169	0.198
	LTE Band 17	10M	QPSK	1	0	Right Side	1cm	Triggered	23790	710	OFF	22.92	24.00	1.282	0.02	0.110	0.141
	LTE Band 17	10M	QPSK	25	0	Right Side	1cm	Triggered	23790	710	OFF	22.31	23.00	1.172	0.05	0.071	0.083
	LTE Band 17	10M	QPSK	1	0	Bottom Side	1cm	Triggered	23790	710	OFF	22.92	24.00	1.282	-0.03	0.159	0.204
	LTE Band 17	10M	QPSK	25	0	Bottom Side	1cm	Triggered	23790	710	OFF	22.31	23.00	1.172	-0.05	0.105	0.123
	LTE Band 5	10M	QPSK	1	0	Front	1cm	Non-Triggered	20600	844	OFF	22.94	24.00	1.276	0.03	0.304	0.388
	LTE Band 5	10M	QPSK	25	12	Front	1cm	Non-Triggered	20525	836.5	OFF	21.95	23.00	1.274	-0.08	0.249	0.317
	LTE Band 5	10M	QPSK	1	0	Back	1cm	Non-Triggered	20600	844	OFF	22.94	24.00	1.276	-0.14	0.359	0.458
	LTE Band 5	10M	QPSK	25	12	Back	1cm	Non-Triggered	20525	836.5	OFF	21.95	23.00	1.274	0.01	0.300	0.382
20	LTE Band 5	10M	QPSK	1	0	Left Side	1cm	Non-Triggered	20600	844	OFF	22.94	24.00	1.276	-0.01	0.544	**0.694**
	LTE Band 5	10M	QPSK	25	12	Left Side	1cm	Non-Triggered	20525	836.5	OFF	21.95	23.00	1.274	0.01	0.422	0.537
	LTE Band 5	10M	QPSK	1	0	Right Side	1cm	Non-Triggered	20600	844	OFF	22.94	24.00	1.276	0.03	0.336	0.429
	LTE Band 5	10M	QPSK	25	12	Right Side	1cm	Non-Triggered	20525	836.5	OFF	21.95	23.00	1.274	-0.01	0.272	0.346
	LTE Band 5	10M	QPSK	1	0	Bottom Side	1cm	Non-Triggered	20600	844	OFF	22.94	24.00	1.276	0.16	0.231	0.295
	LTE Band 5	10M	QPSK	25	12	Bottom Side	1cm	Non-Triggered	20525	836.5	OFF	21.95	23.00	1.274	0.01	0.182	0.232
	LTE Band 5	10M	QPSK	1	0	Front	1cm	Triggered	20600	844	OFF	22.94	24.00	1.276	0	0.302	0.385
	LTE Band 5	10M	QPSK	25	12	Front	1cm	Triggered	20525	836.5	OFF	21.95	23.00	1.274	0.02	0.239	0.304
	LTE Band 5	10M	QPSK	1	0	Back	1cm	Triggered	20600	844	OFF	22.94	24.00	1.276	0.01	0.349	0.445
	LTE Band 5	10M	QPSK	25	12	Back	1cm	Triggered	20525	836.5	OFF	21.95	23.00	1.274	0.02	0.281	0.358
	LTE Band 5	10M	QPSK	1	0	Left Side	1cm	Triggered	20600	844	OFF	22.94	24.00	1.276	-0.01	0.486	0.620
	LTE Band 5	10M	QPSK	25	12	Left Side	1cm	Triggered	20525	836.5	OFF	21.95	23.00	1.274	0.03	0.381	0.485
	LTE Band 5	10M	QPSK	1	0	Right Side	1cm	Triggered	20600	844	OFF	22.94	24.00	1.276	0.03	0.311	0.397
	LTE Band 5	10M	QPSK	25	12	Right Side	1cm	Triggered	20525	836.5	OFF	21.95	23.00	1.274	0	0.250	0.318
	LTE Band 5	10M	QPSK	1	0	Bottom Side	1cm	Triggered	20600	844	OFF	22.94	24.00	1.276	-0.04	0.213	0.272
	LTE Band 5	10M	QPSK	25	12	Bottom Side	1cm	Triggered	20525	836.5	OFF	21.95	23.00	1.274	-0.04	0.162	0.206

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Hotspot Power Reduction	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 4	20M	QPSK	1	0	Front	1cm	20175	1732.5	OFF	23.75	24.00	1.059	-0.01	0.590	0.625
	LTE Band 4	20M	QPSK	50	0	Front	1cm	20175	1732.5	OFF	22.94	23.00	1.014	0.03	0.505	0.512
	LTE Band 4	20M	QPSK	1	0	Back	1cm	20175	1732.5	OFF	23.75	24.00	1.059	0.04	1.100	1.165
21	LTE Band 4	20M	QPSK	1	0	Back	1cm	20050	1720	OFF	23.70	24.00	1.072	0.01	1.250	**1.339**
	LTE Band 4	20M	QPSK	1	0	Back	1cm	20300	1745	OFF	23.74	24.00	1.062	0.03	1.200	1.274
	LTE Band 4	20M	QPSK	50	0	Back	1cm	20175	1732.5	OFF	22.94	23.00	1.014	0	1.090	1.105
	LTE Band 4	20M	QPSK	50	0	Back	1cm	20050	1720	OFF	22.70	23.00	1.072	0.03	1.040	1.114
	LTE Band 4	20M	QPSK	50	0	Back	1cm	20300	1745	OFF	22.90	23.00	1.023	0.04	1.200	1.228
	LTE Band 4	20M	QPSK	100	0	Back	1cm	20175	1732.5	OFF	22.84	23.00	1.038	0.1	1.060	1.100
	LTE Band 4	20M	QPSK	1	0	Left Side	1cm	20175	1732.5	OFF	23.75	24.00	1.059	0.05	0.103	0.109
	LTE Band 4	20M	QPSK	50	0	Left Side	1cm	20175	1732.5	OFF	22.94	23.00	1.014	0.04	0.092	0.093
	LTE Band 4	20M	QPSK	1	0	Right Side	1cm	20175	1732.5	OFF	23.75	24.00	1.059	-0.02	0.217	0.230
	LTE Band 4	20M	QPSK	50	0	Right Side	1cm	20175	1732.5	OFF	22.94	23.00	1.014	-0.01	0.201	0.204
	LTE Band 4	20M	QPSK	1	0	Bottom Side	1cm	20175	1732.5	OFF	23.75	24.00	1.059	-0.01	0.808	0.856
	LTE Band 4	20M	QPSK	1	0	Bottom Side	1cm	20050	1720	OFF	23.70	24.00	1.072	-0.01	0.738	0.791
	LTE Band 4	20M	QPSK	1	0	Bottom Side	1cm	20300	1745	OFF	23.74	24.00	1.062	0	0.891	0.946
	LTE Band 4	20M	QPSK	50	0	Bottom Side	1cm	20175	1732.5	OFF	22.94	23.00	1.014	0	0.688	0.698
	LTE Band 4	20M	QPSK	100	0	Bottom Side	1cm	20175	1732.5	OFF	22.84	23.00	1.038	0.04	0.699	0.725
	LTE Band 2	20M	QPSK	1	0	Front	1cm	18900	1880	ON	20.98	22.00	1.265	0.02	0.486	0.615
	LTE Band 2	20M	QPSK	50	24	Front	1cm	18900	1880	ON	19.92	21.00	1.282	0.06	0.357	0.458
	LTE Band 2	20M	QPSK	1	0	Back	1cm	18900	1880	ON	20.98	22.00	1.265	0.13	0.928	1.174
22	LTE Band 2	20M	QPSK	1	0	Back	1cm	18700	1860	ON	20.77	22.00	1.327	-0.08	0.926	**1.229**
	LTE Band 2	20M	QPSK	1	0	Back	1cm	19100	1900	ON	20.61	22.00	1.377	-0.08	0.880	1.212
	LTE Band 2	20M	QPSK	50	24	Back	1cm	18900	1880	ON	19.92	21.00	1.282	0.05	0.706	0.905
	LTE Band 2	20M	QPSK	50	24	Back	1cm	18700	1860	ON	19.85	21.00	1.303	0.05	0.691	0.900
	LTE Band 2	20M	QPSK	50	24	Back	1cm	19100	1900	ON	19.82	21.00	1.312	0.05	0.721	0.946
	LTE Band 2	20M	QPSK	100	0	Back	1cm	18900	1880	ON	19.79	21.00	1.321	0.11	0.713	0.942
	LTE Band 2	20M	QPSK	1	0	Left Side	1cm	18900	1880	ON	20.98	22.00	1.265	0.04	0.129	0.163
	LTE Band 2	20M	QPSK	50	24	Left Side	1cm	18900	1880	ON	19.92	21.00	1.282	0.11	0.101	0.130
	LTE Band 2	20M	QPSK	1	0	Right Side	1cm	18900	1880	ON	20.98	22.00	1.265	0.03	0.220	0.278
	LTE Band 2	20M	QPSK	50	24	Right Side	1cm	18900	1880	ON	19.92	21.00	1.282	0.04	0.170	0.218
	LTE Band 2	20M	QPSK	1	0	Bottom Side	1cm	18900	1880	ON	20.98	22.00	1.265	0.07	0.631	0.798
	LTE Band 2	20M	QPSK	50	24	Bottom Side	1cm	18900	1880	ON	19.92	21.00	1.282	0.08	0.507	0.650
	LTE Band 7	20M	QPSK	1	0	Front	1cm	21100	2535	OFF	23.62	24.00	1.091	0.09	0.667	0.728
	LTE Band 7	20M	QPSK	50	0	Front	1cm	21100	2535	OFF	22.65	23.00	1.084	-0.1	0.632	0.685
23	LTE Band 7	20M	QPSK	1	0	Back	1cm	21100	2535	OFF	23.62	24.00	1.091	0.07	0.720	**0.786**
	LTE Band 7	20M	QPSK	50	0	Back	1cm	21100	2535	OFF	22.65	23.00	1.084	0.02	0.664	0.720
	LTE Band 7	20M	QPSK	1	0	Left Side	1cm	21100	2535	OFF	23.62	24.00	1.091	-0.09	0.141	0.154
	LTE Band 7	20M	QPSK	50	0	Left Side	1cm	21100	2535	OFF	22.65	23.00	1.084	-0.07	0.115	0.125
	LTE Band 7	20M	QPSK	1	0	Right Side	1cm	21100	2535	OFF	23.62	24.00	1.091	-0.17	0.214	0.234
	LTE Band 7	20M	QPSK	50	0	Right Side	1cm	21100	2535	OFF	22.65	23.00	1.084	-0.17	0.214	0.232
	LTE Band 7	20M	QPSK	1	0	Bottom Side	1cm	21100	2535	OFF	23.62	24.00	1.091	-0.04	0.584	0.637
	LTE Band 7	20M	QPSK	50	0	Bottom Side	1cm	21100	2535	OFF	22.65	23.00	1.084	0	0.553	0.599

<WLAN SAR DTS>

Plot No.	Band	Mode	Test Position	Gap (cm)	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)
24	WLAN2.4GHz	802.11b 1Mbps	Front	1cm	1	2412	17.21	17.50	1.069	0.12	0.211	**0.226**
	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	1	2412	17.21	17.50	1.069	0.04	0.171	0.183
	WLAN2.4GHz	802.11b 1Mbps	Right side	1cm	1	2412	17.21	17.50	1.069	-0.14	0.016	0.017
	WLAN2.4GHz	802.11b 1Mbps	Top Side	1cm	1	2412	17.21	17.50	1.069	-0.15	0.174	0.186
	WLAN5GHz	802.11a 6Mbps	Front	1cm	165	5825	18.98	19.00	1.005	0.01	0.176	0.177
25	WLAN5GHz	802.11a 6Mbps	Back	1cm	165	5825	18.98	19.00	1.005	0.11	0.204	**0.205**
	WLAN5GHz	802.11ac-VHT80 MCS0	Back	1cm	155	5775	18.96	19.00	1.009	0.01	0.151	0.152
	WLAN5GHz	802.11a 6Mbps	Top Side	1cm	165	5825	18.98	19.00	1.005	0.13	0.158	0.159
	WLAN5GHz	802.11a 6Mbps	Right Side	1cm	165	5825	18.98	19.00	1.005	-0.01	0.031	0.031

13.3 Body Worn SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	IR p-sensor Triggered	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	GSM Voice	Front	1.5cm	Triggered	251	848.8	32.76	33.00	1.057	-0.01	0.307	0.324
	GSM850	GPRS (2 Tx slots)	Front	1.5cm	Triggered	189	836.4	32.96	33.00	1.009	0.02	0.359	0.362
	GSM850	GSM Voice	Back	1.5cm	Non-Triggered	251	848.8	32.76	33.00	1.057	0.01	0.347	0.367
26	GSM850	GPRS (2 Tx slots)	Back	1.5cm	Non-Triggered	189	836.4	32.96	33.00	1.009	0	0.429	**0.433**
	GSM1900	GSM Voice	Back	1.5cm	N/A	661	1880	29.96	30.00	1.009	0.02	0.347	0.350
27	GSM1900	GPRS (2 Tx slots)	Back	1.5cm	N/A	512	1850.2	29.90	30.00	1.023	-0.05	0.696	**0.712**

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	IR p-sensor Triggered	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)
28	WCDMA V	RMC12.2Kbps	Front	1.5cm	Triggered	4182	836.4	23.50	23.50	1.000	-0.03	0.418	**0.418**
	WCDMA V	RMC 12.2Kbps	Back	1.5cm	Non-Triggered	4182	836.4	23.50	23.50	1.000	-0.01	0.407	0.407
29	WCDMA IV	RMC 12.2Kbps	Back	1.5cm	N/A	1513	1752.6	23.37	23.50	1.030	0.04	0.354	**0.365**
30	WCDMA II	RMC 12.2Kbps	Back	1.5cm	N/A	9262	1852.4	23.49	23.50	1.002	-0.02	0.459	**0.460**

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (cm)	IR p-sensor Triggered	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 17	10M	QPSK	1	0	Front	1.5cm	Triggered	23790	710	22.92	24.00	1.282	0.01	0.174	0.223
	LTE Band 17	10M	QPSK	25	0	Front	1.5cm	Triggered	23790	710	22.31	23.00	1.172	0	0.114	0.134
31	LTE Band 17	10M	QPSK	1	0	Back	1.5cm	Non-Triggered	23790	710	22.92	24.00	1.282	-0.03	0.199	**0.255**
	LTE Band 17	10M	QPSK	25	0	Back	1.5cm	Non-Triggered	23790	710	22.31	23.00	1.172	-0.04	0.130	0.152
	LTE Band 5	10M	QPSK	1	0	Front	1.5cm	Triggered	20600	844	22.94	24.00	1.276	-0.01	0.320	0.408
	LTE Band 5	10M	QPSK	25	12	Front	1.5cm	Triggered	20525	836.5	21.95	23.00	1.274	0.01	0.252	0.321
32	LTE Band 5	10M	QPSK	1	0	Back	1.5cm	Non-Triggered	20600	844	22.94	24.00	1.276	0	0.342	**0.437**
	LTE Band 5	10M	QPSK	25	12	Back	1.5cm	Non-Triggered	20525	836.5	21.95	23.00	1.274	0.02	0.278	0.354
33	LTE Band 4	20M	QPSK	1	0	Back	1.5cm	N/A	20175	1732.5	23.75	24.00	1.059	0.05	0.659	**0.698**
	LTE Band 4	20M	QPSK	50	0	Back	1.5cm	N/A	20175	1732.5	22.94	23.00	1.014	0	0.558	0.566
34	LTE Band 2	20M	QPSK	1	0	Back	1.5cm	N/A	18900	1880	23.44	24.00	1.138	0.02	0.462	**0.526**
	LTE Band 2	20M	QPSK	50	24	Back	1.5cm	N/A	18900	1880	22.56	23.00	1.107	0	0.379	0.419
35	LTE Band 7	20M	QPSK	1	0	Back	1.5cm	N/A	21100	2535	23.62	24.00	1.091	-0.03	0.360	**0.393**
	LTE Band 7	20M	QPSK	50	0	Back	1.5cm	N/A	21100	2535	22.65	23.00	1.084	-0.01	0.283	0.307

<WLAN SAR DTS>

Plot No.	Band	Mode	Test Position	Gap (cm)	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)
36	WLAN2.4GHz	802.11b 1Mbps	Front	1.5cm	1	2412	17.21	17.50	1.069	0.09	0.078	**0.083**
	WLAN2.4GHz	802.11b 1Mbps	Back	1.5cm	1	2412	17.21	17.50	1.069	0	< 0.001	< 0.001
37	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	165	5825	18.98	19.00	1.005	0.15	0.043	**0.043**
	WLAN5GHz	802.11ac-VHT80 MCS0	Back	1.5cm	155	5775	18.96	19.00	1.009	0.05	0.042	0.042

<WLAN SAR NII>

Plot No.	Band	Mode	Test Position	Gap (cm)	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)
	WLAN5GHz	802.11a 6Mbps	Front	1.5cm	36	5180	14.80	15.00	1.047	-0.03	0.035	0.037
	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	36	5180	14.80	15.00	1.047	0.12	0.052	0.054
38	WLAN5GHz	802.11n-HT40 MCS0	Back	1.5cm	46	5230	16.78	17.50	1.180	-0.04	0.104	**0.123**
	WLAN5GHz	802.11ac-VHT40 MCS0	Back	1.5cm	46	5230	16.78	17.50	1.182	0.11	0.085	0.100
	WLAN5GHz	802.11ac-VHT80 MCS0	Back	1.5cm	42	5210	14.74	15.00	1.061	0.01	0.054	0.057

13.4 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	GSM1900	GPRS (2 Tx slots)	Back	1cm	810	1909.8	29.89	30.00	1.026	-0.02	1.270	-	1.303
2nd	GSM1900	GPRS (2 Tx slots)	Back	1cm	810	1909.8	29.89	30.00	1.026	-0.13	1.180	1.08	1.210
1st	WCDMA IV	RMC 12.2Kbps	Back	1cm	1513	1752.6	23.37	23.50	1.030	0	1.280	-	1.319
2nd	WCDMA IV	RMC 12.2Kbps	Back	1cm	1513	1752.6	23.37	23.50	1.030	0.14	1.190	1.07	1.226
1st	WLAN2.4GHz	802.11b 1Mbps	Left Cheek		6	2437	17.15	17.50	1.084	-0.07	1.060	-	1.149
2nd	WLAN2.4GHz	802.11b 1Mbps	Left Cheek		6	2437	17.15	17.50	1.084	-0.01	1.040	1.02	1.127
1st	WLAN5GHz	802.11a 6Mbps	Left Cheek		165	5825	18.98	19.00	1.005	0.01	1.290	-	1.296
2nd	WLAN5GHz	802.11a 6Mbps	Left Cheek		165	5825	18.98	19.00	1.005	0.08	1.280	1.01	1.286

Note:

1. Per KDB 865664 D01v01r03, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg
2. Per KDB 865664 D01v01r03, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the largest SAR to the smallest SAR among original and repeated measurement.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

14. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Portable Handset			Note
		Head	Body-worn	Hotspot	
1.	GSM(Voice) + WLAN2.4GHz(data)	Yes	Yes		
2.	WCDMA(Voice) + WLAN2.4GHz(data)	Yes	Yes		
3.	GSM(Voice) + Bluetooth(data)	Yes	Yes		
4.	WCDMA((Voice) + Bluetooth(data)	Yes	Yes		
5.	GSM(Voice) + WLAN5GHz(data)	Yes	Yes		
6.	WCDMA(Voice) + WLAN5GHz(data)	Yes	Yes		
7.	GPRS/EDGE(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
8.	WCDMA(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
9.	LTE(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
10.	GPRS/EDGE(Data) + Bluetooth(data)	Yes	Yes	Yes	Bluetooth Tethering
11.	WCDMA(Data) + Bluetooth(data)	Yes	Yes	Yes	Bluetooth Tethering
12.	LTE(Data) + Bluetooth(data)	Yes	Yes	Yes	Bluetooth Tethering
13.	GPRS/EDGE(data) + WLAN5.8GHz(data)	Yes	Yes	Yes	5.8GHz Hotspot
14.	WCDMA(data) + WLAN5.8GHz(data)	Yes	Yes	Yes	5.8GHz Hotspot
15.	LTE(data) + WLAN5.8GHz(data)	Yes	Yes	Yes	5.8GHz Hotspot

Note:

1. This device supports 2.4GHz / 5.8GHz WLAN Hotspot operation.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
4. The Scaled SAR summation is calculated based on the same configuration and test position.
5. Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*), and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the zoom scan
   If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary
   iii) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg
6. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r02 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[$\sqrt{f(GHz)/x}$] 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 test 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.

Max Power	Exposure Position	Head	Hotspot	Body Worn
	Test separation	0 mm	10 mm	15mm
9 dBm	Estimated SAR (W/kg)	0.336 W/kg	0.168 W/kg	0.112 W/kg

14.1 Head Exposure Conditions

<WWAN + WLAN 2.4GHz Band>

	WWAN		WLAN	**Summed SAR (W/kg)**	SPLSR Result	Case No
Position	WWAN Band	SAR (W/kg)	SAR (W/kg)			
Right Cheek	GSM850	0.311	0.791	**1.10**		
	GSM1900	0.138	0.791	**0.93**		
	WCDMA V	0.305	0.791	**1.10**		
	WCDMA IV	0.264	0.791	**1.06**		
	WCDMA II	0.243	0.791	**1.03**		
	LTE Band 17	0.212	0.791	**1.00**		
	LTE Band 5	0.299	0.791	**1.09**		
	LTE Band 4	0.210	0.791	**1.00**		
	LTE Band 2	0.370	0.791	**1.16**		
	LTE Band 7	0.467	0.787	**1.25**		
Right Tilted	GSM850	0.149	0.787	**0.94**		
	GSM1900	0.042	0.787	**0.83**		
	WCDMA V	0.190	0.787	**0.98**		
	WCDMA IV	0.042	0.787	**0.83**		
	WCDMA II	0.044	0.787	**0.83**		
	LTE Band 17	0.141	0.787	**0.93**		
	LTE Band 5	0.202	0.787	**0.99**		
	LTE Band 4	0.042	0.787	**0.83**		
	LTE Band 2	0.059	0.787	**0.85**		
	LTE Band 7	0.367	0.787	**1.15**		
Left Cheek	GSM850	0.247	1.149	**1.40**		
	GSM1900	0.481	1.149	**1.63**	**0.02**	Case 1
	WCDMA V	0.343	1.149	**1.49**		
	WCDMA IV	0.147	1.149	**1.30**		
	WCDMA II	0.520	1.149	**1.67**	**0.02**	Case 2
	LTE Band 17	0.246	1.149	**1.40**		
	LTE Band 5	0.343	1.149	**1.49**		
	LTE Band 4	0.297	1.149	**1.45**		
	LTE Band 2	0.478	1.149	**1.63**	**0.03**	Case 3
	LTE Band 7	0.405	1.149	**1.55**		
Left Tilted	GSM850	0.166	0.993	**1.16**		
	GSM1900	0.035	0.993	**1.03**		
	WCDMA V	0.197	0.993	**1.19**		
	WCDMA IV	0.072	0.993	**1.07**		
	WCDMA II	0.058	0.993	**1.05**		
	LTE Band 17	0.141	0.993	**1.13**		
	LTE Band 5	0.198	0.993	**1.19**		
	LTE Band 4	0.066	0.993	**1.06**		
	LTE Band 2	0.068	0.993	**1.06**		
	LTE Band 7	0.243	0.993	**1.24**		

<WWAN + WLAN 5.2GHz Band>

Position	WWAN		WLAN	Summed SAR (W/kg)	SPLSR Result	Case No
	WWAN Band	SAR (W/kg)	SAR (W/kg)			
Right Cheek	GSM850	0.311	0.390	**0.70**		
	GSM1900	0.138	0.390	**0.53**		
	WCDMA V	0.305	0.390	**0.70**		
	WCDMA IV	0.264	0.390	**0.65**		
	WCDMA II	0.243	0.390	**0.63**		
	LTE Band 17	0.212	0.390	**0.60**		
	LTE Band 5	0.299	0.390	**0.69**		
	LTE Band 4	0.210	0.390	**0.60**		
	LTE Band 2	0.370	0.390	**0.76**		
	LTE Band 7	0.467	0.390	**0.86**		
Right Tilted	GSM850	0.149	0.249	**0.40**		
	GSM1900	0.042	0.249	**0.29**		
	WCDMA V	0.190	0.249	**0.44**		
	WCDMA IV	0.042	0.249	**0.29**		
	WCDMA II	0.044	0.249	**0.29**		
	LTE Band 17	0.141	0.249	**0.39**		
	LTE Band 5	0.202	0.249	**0.45**		
	LTE Band 4	0.042	0.249	**0.29**		
	LTE Band 2	0.059	0.249	**0.31**		
	LTE Band 7	0.367	0.249	**0.62**		
Left Cheek	GSM850	0.247	0.763	**1.01**		
	GSM1900	0.481	0.763	**1.24**		
	WCDMA V	0.343	0.763	**1.11**		
	WCDMA IV	0.147	0.763	**0.91**		
	WCDMA II	0.520	0.763	**1.28**		
	LTE Band 17	0.246	0.763	**1.01**		
	LTE Band 5	0.343	0.763	**1.11**		
	LTE Band 4	0.297	0.763	**1.06**		
	LTE Band 2	0.478	0.763	**1.24**		
	LTE Band 7	0.405	0.763	**1.17**		
Left Tilted	GSM850	0.166	0.258	**0.42**		
	GSM1900	0.035	0.258	**0.29**		
	WCDMA V	0.197	0.258	**0.46**		
	WCDMA IV	0.072	0.258	**0.33**		
	WCDMA II	0.058	0.258	**0.32**		
	LTE Band 17	0.141	0.258	**0.40**		
	LTE Band 5	0.198	0.258	**0.46**		
	LTE Band 4	0.066	0.258	**0.32**		
	LTE Band 2	0.068	0.258	**0.33**		
	LTE Band 7	0.243	0.258	**0.50**		

<WWAN + WLAN 5.8GHz Band>

Position	WWAN		WLAN	Summed SAR (W/kg)	SPLSR Result	Case No
	WWAN Band	SAR (W/kg)	SAR (W/kg)			
Right Cheek	GSM850	0.311	0.775	**1.09**		
	GSM1900	0.138	0.775	**0.91**		
	WCDMA V	0.305	0.775	**1.08**		
	WCDMA IV	0.264	0.775	**1.04**		
	WCDMA II	0.243	0.775	**1.02**		
	LTE Band 17	0.212	0.775	**0.99**		
	LTE Band 5	0.299	0.775	**1.07**		
	LTE Band 4	0.210	0.775	**0.99**		
	LTE Band 2	0.370	0.775	**1.15**		
	LTE Band 7	0.467	0.775	**1.24**		
Right Tilted	GSM850	0.149	0.584	**0.73**		
	GSM1900	0.042	0.584	**0.63**		
	WCDMA V	0.190	0.584	**0.77**		
	WCDMA IV	0.042	0.584	**0.63**		
	WCDMA II	0.044	0.584	**0.63**		
	LTE Band 17	0.141	0.584	**0.73**		
	LTE Band 5	0.202	0.584	**0.79**		
	LTE Band 4	0.042	0.584	**0.63**		
	LTE Band 2	0.059	0.584	**0.64**		
	LTE Band 7	0.367	0.584	**0.95**		
Left Cheek	GSM850	0.247	1.339	**1.59**		
	GSM1900	0.481	1.339	**1.82**	**0.03**	Case 4
	WCDMA V	0.343	1.339	**1.68**	**0.03**	Case 5
	WCDMA IV	0.147	1.339	**1.49**		
	WCDMA II	0.520	1.339	**1.86**	**0.03**	Case 6
	LTE Band 17	0.246	1.339	**1.59**		
	LTE Band 5	0.343	1.339	**1.68**	**0.03**	Case 7
	LTE Band 4	0.297	1.339	**1.64**	**0.03**	Case 8
	LTE Band 2	0.478	1.339	**1.82**	**0.03**	Case 9
	LTE Band 7	0.405	1.339	**1.74**	**0.03**	Case 10
Left Tilted	GSM850	0.166	1.015	**1.18**		
	GSM1900	0.035	1.015	**1.05**		
	WCDMA V	0.197	1.015	**1.21**		
	WCDMA IV	0.072	1.015	**1.09**		
	WCDMA II	0.058	1.015	**1.07**		
	LTE Band 17	0.141	1.015	**1.16**		
	LTE Band 5	0.198	1.015	**1.21**		
	LTE Band 4	0.066	1.015	**1.08**		
	LTE Band 2	0.068	1.015	**1.08**		
	LTE Band 7	0.243	1.015	**1.26**		

<WWAN + Bluetooth>

Position	WWAN		Bluetooth	**Summed SAR (W/kg)**	SPLSR Result	Case No
	WWAN Band	SAR (W/kg)	Estimated SAR (W/kg)			
Right Cheek	GSM850	0.311	0.336	**0.65**		
	GSM1900	0.138	0.336	**0.47**		
	WCDMA V	0.305	0.336	**0.64**		
	WCDMA IV	0.264	0.336	**0.60**		
	WCDMA II	0.243	0.336	**0.58**		
	LTE Band 17	0.212	0.336	**0.55**		
	LTE Band 5	0.299	0.336	**0.64**		
	LTE Band 4	0.210	0.336	**0.55**		
	LTE Band 2	0.370	0.336	**0.71**		
	LTE Band 7	0.467	0.336	**0.80**		
Right Tilted	GSM850	0.149	0.336	**0.49**		
	GSM1900	0.042	0.336	**0.38**		
	WCDMA V	0.190	0.336	**0.53**		
	WCDMA IV	0.042	0.336	**0.38**		
	WCDMA II	0.044	0.336	**0.38**		
	LTE Band 17	0.141	0.336	**0.48**		
	LTE Band 5	0.202	0.336	**0.54**		
	LTE Band 4	0.042	0.336	**0.38**		
	LTE Band 2	0.059	0.336	**0.40**		
	LTE Band 7	0.367	0.336	**0.70**		
Left Cheek	GSM850	0.247	0.336	**0.58**		
	GSM1900	0.481	0.336	**0.82**		
	WCDMA V	0.343	0.336	**0.68**		
	WCDMA IV	0.147	0.336	**0.48**		
	WCDMA II	0.520	0.336	**0.86**		
	LTE Band 17	0.246	0.336	**0.58**		
	LTE Band 5	0.343	0.336	**0.68**		
	LTE Band 4	0.297	0.336	**0.63**		
	LTE Band 2	0.478	0.336	**0.81**		
	LTE Band 7	0.405	0.336	**0.74**		
Left Tilted	GSM850	0.166	0.336	**0.50**		
	GSM1900	0.035	0.336	**0.37**		
	WCDMA V	0.197	0.336	**0.53**		
	WCDMA IV	0.072	0.336	**0.41**		
	WCDMA II	0.058	0.336	**0.39**		
	LTE Band 17	0.141	0.336	**0.48**		
	LTE Band 5	0.198	0.336	**0.53**		
	LTE Band 4	0.066	0.336	**0.40**		
	LTE Band 2	0.068	0.336	**0.40**		
	LTE Band 7	0.243	0.336	**0.58**		

14.2 Hotspot Exposure Conditions

Note:

For low frequency bands (700/800 MHz), the higher SAR test results selected from IR P-sensor trigger and non-trigger status were used for simultaneous transmission analysis.

Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Primary	≤ 25mm	≤ 25mm	128mm	≤ 25mm	≤ 25mm	≤ 25mm
BT&WLAN	≤ 25mm	≤ 25mm	≤ 25mm	117mm	≤ 25mm	36mm
Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Primary	Yes	Yes	No	Yes	Yes	Yes
BT&WLAN	Yes	Yes	Yes	No	Yes	No
Simultaneous Transmission						
WWAN + BT&WLAN	Yes	Yes	No	No	Yes	No

<WWAN + WLAN 2.4GHz Band>

	WWAN		WLAN	**Summed SAR (W/kg)**	SPLSR Result	Case No
Position	WWAN Band	SAR (W/kg)	SAR (W/kg)			
Front	GSM850	0.440	0.226	**0.67**		
	GSM1900	1.106	0.226	**1.33**		
	WCDMA V	0.401	0.226	**0.63**		
	WCDMA IV	0.572	0.226	**0.80**		
	WCDMA II	0.531	0.226	**0.76**		
	LTE Band 17	0.283	0.226	**0.51**		
	LTE Band 5	0.388	0.226	**0.61**		
	LTE Band 4	0.625	0.226	**0.85**		
	LTE Band 2	0.615	0.226	**0.84**		
	LTE Band 7	0.728	0.226	**0.95**		
Back	GSM850	0.475	0.183	**0.66**		
	GSM1900	1.303	0.183	**1.49**		
	WCDMA V	0.452	0.183	**0.64**		
	WCDMA IV	1.319	0.183	**1.50**		
	WCDMA II	1.130	0.183	**1.31**		
	LTE Band 17	0.326	0.183	**0.51**		
	LTE Band 5	0.458	0.183	**0.64**		
	LTE Band 4	1.339	0.183	**1.52**		
	LTE Band 2	1.229	0.183	**1.41**		
	LTE Band 7	0.786	0.183	**0.97**		
Right Side	GSM850	0.429	0.017	**0.45**		
	GSM1900	0.422	0.017	**0.44**		
	WCDMA V	0.440	0.017	**0.46**		
	WCDMA IV	0.357	0.017	**0.37**		
	WCDMA II	0.255	0.017	**0.27**		
	LTE Band 17	0.147	0.017	**0.16**		
	LTE Band 5	0.429	0.017	**0.45**		
	LTE Band 4	0.230	0.017	**0.25**		
	LTE Band 2	0.278	0.017	**0.30**		
	LTE Band 7	0.234	0.017	**0.25**		

<WWAN + WLAN 5.8GHz Band>

Position	WWAN		WLAN	**Summed SAR (W/kg)**	SPLSR Result	Case No
	WWAN Band	SAR (W/kg)	SAR (W/kg)			
Front	GSM850	0.440	0.177	**0.62**		
	GSM1900	1.106	0.177	**1.28**		
	WCDMA V	0.401	0.177	**0.58**		
	WCDMA IV	0.572	0.177	**0.75**		
	WCDMA II	0.531	0.177	**0.71**		
	LTE Band 17	0.283	0.177	**0.46**		
	LTE Band 5	0.388	0.177	**0.57**		
	LTE Band 4	0.625	0.177	**0.80**		
	LTE Band 2	0.615	0.177	**0.79**		
	LTE Band 7	0.728	0.177	**0.91**		
Back	GSM850	0.475	0.205	**0.68**		
	GSM1900	1.303	0.205	**1.51**		
	WCDMA V	0.452	0.205	**0.66**		
	WCDMA IV	1.319	0.205	**1.52**		
	WCDMA II	1.130	0.205	**1.34**		
	LTE Band 17	0.326	0.205	**0.53**		
	LTE Band 5	0.458	0.205	**0.66**		
	LTE Band 4	1.339	0.205	**1.54**		
	LTE Band 2	1.229	0.205	**1.43**		
	LTE Band 7	0.786	0.205	**0.99**		
Right Side	GSM850	0.429	0.031	**0.46**		
	GSM1900	0.422	0.031	**0.45**		
	WCDMA V	0.440	0.031	**0.47**		
	WCDMA IV	0.357	0.031	**0.39**		
	WCDMA II	0.255	0.031	**0.29**		
	LTE Band 17	0.147	0.031	**0.18**		
	LTE Band 5	0.429	0.031	**0.46**		
	LTE Band 4	0.230	0.031	**0.26**		
	LTE Band 2	0.278	0.031	**0.31**		
	LTE Band 7	0.234	0.031	**0.27**		

<WWAN + Bluetooth>

Position	WWAN		Bluetooth	**Summed SAR (W/kg)**	SPLSR Result	Case No
	WWAN Band	SAR (W/kg)	Estimated SAR (W/kg)			
Front	GSM850	0.440	0.168	**0.61**		
	GSM1900	1.106	0.168	**1.27**		
	WCDMA V	0.401	0.168	**0.57**		
	WCDMA IV	0.572	0.168	**0.74**		
	WCDMA II	0.531	0.168	**0.70**		
	LTE Band 17	0.283	0.168	**0.45**		
	LTE Band 5	0.388	0.168	**0.56**		
	LTE Band 4	0.625	0.168	**0.79**		
	LTE Band 2	0.615	0.168	**0.78**		
	LTE Band 7	0.728	0.168	**0.90**		
Back	GSM850	0.475	0.168	**0.64**		
	GSM1900	1.303	0.168	**1.47**		
	WCDMA V	0.452	0.168	**0.62**		
	WCDMA IV	1.319	0.168	**1.49**		
	WCDMA II	1.130	0.168	**1.30**		
	LTE Band 17	0.326	0.168	**0.49**		
	LTE Band 5	0.458	0.168	**0.63**		
	LTE Band 4	1.339	0.168	**1.51**		
	LTE Band 2	1.229	0.168	**1.40**		
	LTE Band 7	0.786	0.168	**0.95**		
Right Side	GSM850	0.429	0.168	**0.60**		
	GSM1900	0.422	0.168	**0.59**		
	WCDMA V	0.440	0.168	**0.61**		
	WCDMA IV	0.357	0.168	**0.53**		
	WCDMA II	0.255	0.168	**0.42**		
	LTE Band 17	0.147	0.168	**0.32**		
	LTE Band 5	0.429	0.168	**0.60**		
	LTE Band 4	0.230	0.168	**0.40**		
	LTE Band 2	0.278	0.168	**0.45**		
	LTE Band 7	0.234	0.168	**0.40**		

14.3 Body-Worn Exposure Conditions

<WWAN + WLAN 2.4GHz Band>

	WWAN		WLAN	**Summed SAR (W/kg)**	SPLSR Result	Case No
Position	WWAN Band	SAR (W/kg)	SAR (W/kg)			
Front 1.5cm	GSM850	0.324	0.083	**0.41**		
	WCDMA V	0.418	0.083	**0.50**		
	LTE Band 17	0.223	0.083	**0.31**		
	LTE Band 5	0.408	0.083	**0.49**		
Back 1.5cm	GSM850	0.433	0.001	**0.43**		
	GSM1900	0.712	0.001	**0.71**		
	WCDMA V	0.407	0.001	**0.41**		
	WCDMA IV	0.365	0.001	**0.37**		
	WCDMA II	0.460	0.001	**0.46**		
	LTE Band 17	0.255	0.001	**0.26**		
	LTE Band 5	0.437	0.001	**0.44**		
	LTE Band 4	0.698	0.001	**0.70**		
	LTE Band 2	0.526	0.001	**0.53**		
	LTE Band 7	0.393	0.001	**0.39**		

<WWAN + WLAN 5.2GHz Band>

	WWAN		WLAN	**Summed SAR (W/kg)**	SPLSR Result	Case No
Position	WWAN Band	SAR (W/kg)	SAR (W/kg)			
Front 1.5cm	GSM850	0.324	0.037	**0.36**		
	WCDMA V	0.418	0.037	**0.46**		
	LTE Band 17	0.223	0.037	**0.26**		
	LTE Band 5	0.408	0.037	**0.45**		
Back 1.5cm	GSM850	0.433	0.123	**0.56**		
	GSM1900	0.712	0.123	**0.84**		
	WCDMA V	0.419	0.123	**0.54**		
	WCDMA IV	0.365	0.123	**0.49**		
	WCDMA II	0.460	0.123	**0.58**		
	LTE Band 17	0.255	0.123	**0.38**		
	LTE Band 5	0.437	0.123	**0.56**		
	LTE Band 4	0.698	0.123	**0.82**		
	LTE Band 2	0.526	0.123	**0.65**		
	LTE Band 7	0.393	0.123	**0.52**		

<WWAN + WLAN 5.8GHz Band>

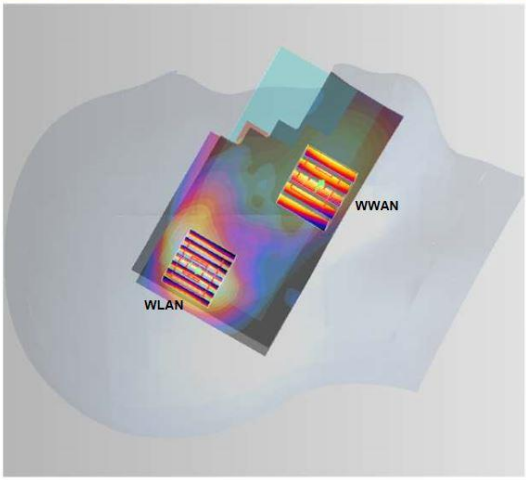
Position	WWAN		WLAN	Summed SAR (W/kg)	SPLSR Result	Case No
	WWAN Band	SAR (W/kg)	SAR (W/kg)			
Front 1.5cm	GSM850	0.324	0.028	**0.35**		
	WCDMA V	0.418	0.028	**0.45**		
	LTE Band 17	0.223	0.028	**0.25**		
	LTE Band 5	0.408	0.028	**0.44**		
Back 1.5cm	GSM850	0.433	0.043	**0.48**		
	GSM1900	0.712	0.043	**0.76**		
	WCDMA V	0.419	0.043	**0.46**		
	WCDMA IV	0.365	0.043	**0.41**		
	WCDMA II	0.460	0.043	**0.50**		
	LTE Band 17	0.255	0.043	**0.30**		
	LTE Band 5	0.437	0.043	**0.48**		
	LTE Band 4	0.698	0.043	**0.74**		
	LTE Band 2	0.526	0.043	**0.57**		
	LTE Band 7	0.393	0.043	**0.44**		

<WWAN + Bluetooth>

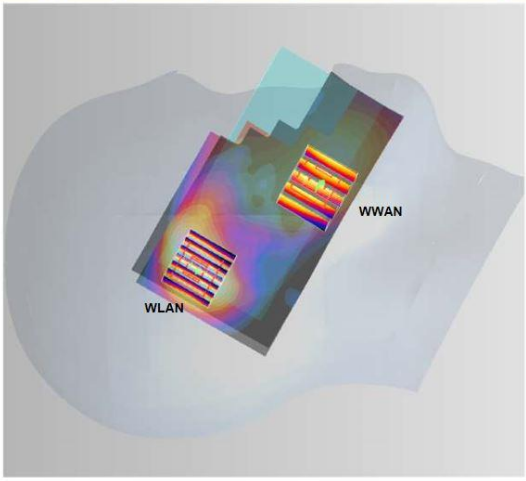
Position	WWAN		Bluetooth	Summed SAR (W/kg)	SPLSR Result	Case No
	WWAN Band	SAR (W/kg)	Estimated SAR (W/kg)			
Front 1.5cm	GSM850	0.324	0.112	**0.44**		
	WCDMA V	0.418	0.112	**0.53**		
	LTE Band 17	0.223	0.112	**0.34**		
	LTE Band 5	0.408	0.112	**0.52**		
Back 1.5cm	GSM850	0.433	0.112	**0.55**		
	GSM1900	0.712	0.112	**0.82**		
	WCDMA V	0.407	0.112	**0.52**		
	WCDMA IV	0.365	0.112	**0.48**		
	WCDMA II	0.460	0.112	**0.57**		
	LTE Band 17	0.255	0.112	**0.37**		
	LTE Band 5	0.437	0.112	**0.55**		
	LTE Band 4	0.698	0.112	**0.81**		
	LTE Band 2	0.526	0.112	**0.64**		
	LTE Band 7	0.393	0.112	**0.51**		

14.4 SPLSR Evaluation and Analysis

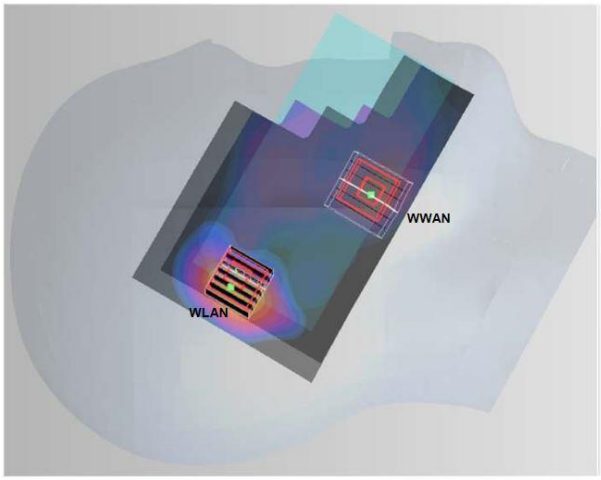
Case 1	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Result	Simultaneous SAR
	GSM1900	Left Cheek	0.481	0	0.0682	0.252	-0.171	85.8	1.63	0.02	Not required
	WLAN2.4GHz		1.149	0	0.0215	0.324	-0.171				



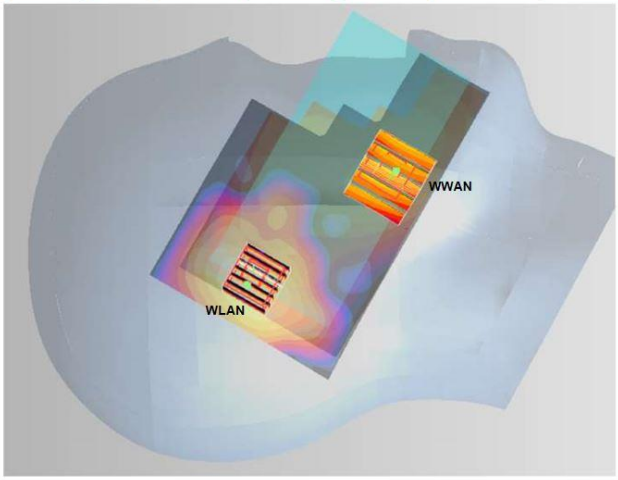
Case 2	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Result	Simultaneous SAR
	WCDMA II	Left Cheek	0.520	0	0.0704	0.25	-0.169	88.7	1.67	0.02	Not required
	WLAN2.4GHz		1.149	0	0.0215	0.324	-0.171				



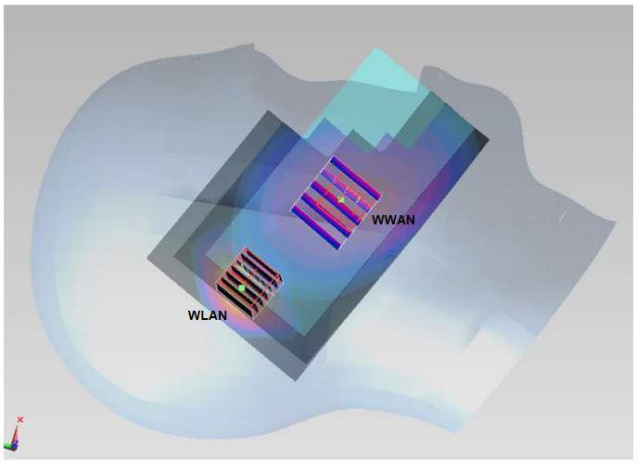
Case 3	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Result	Simultaneous SAR
	LTE Band 2	Left Cheek	0.478	0	0.0636	0.254	-0.171	81.7	1.63	0.03	Not required
	WLAN2.4GHz		1.149	0	0.0215	0.324	-0.171				



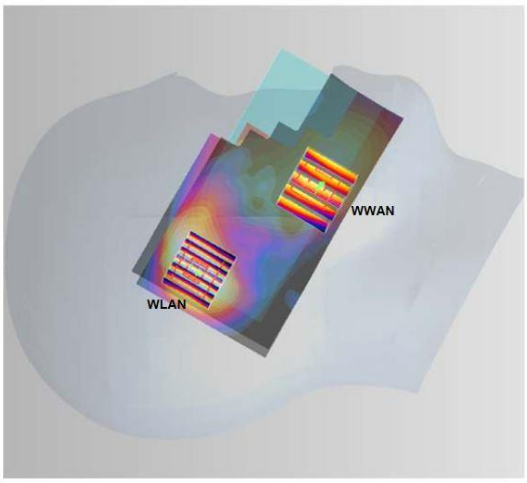
Case 4	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Result	Simultaneous SAR
	GSM1900	Left Cheek	0.481	0	0.0682	0.252	-0.171	85.1	1.82	0.03	Not required
	WLAN5.8GHz		1.339	0	0.0184	0.321	-0.173				



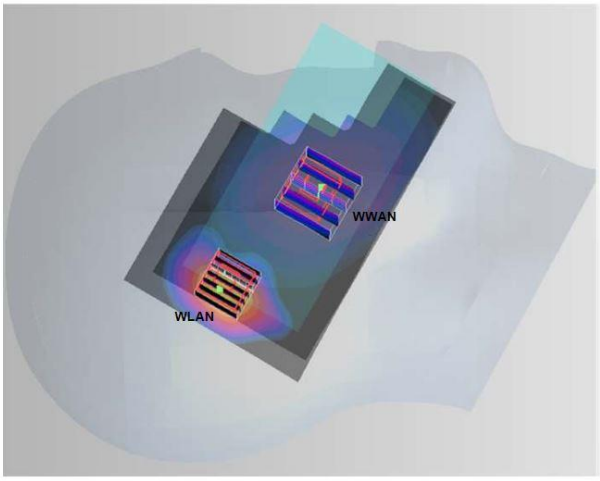
Case 5	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Result	Simultaneous SAR
	WCDMA V	Left Cheek	0.343	0	0.0659	0.268	-0.174	71.2	1.68	0.03	Not required
	WLAN5.8GHz		1.339	0	0.0184	0.321	-0.173				



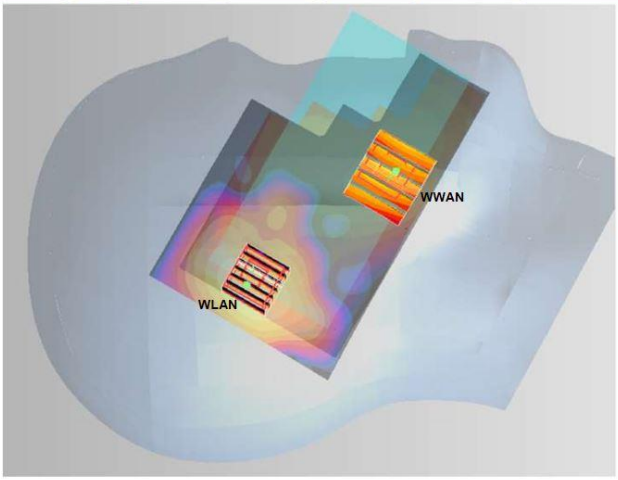
Case 6	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Result	Simultaneous SAR
	WCDMA II	Left Cheek	0.520	0	0.0704	0.25	-0.169	88.1	1.86	0.03	Not required
	WLAN5.8GHz		1.339	0	0.0184	0.321	-0.173				



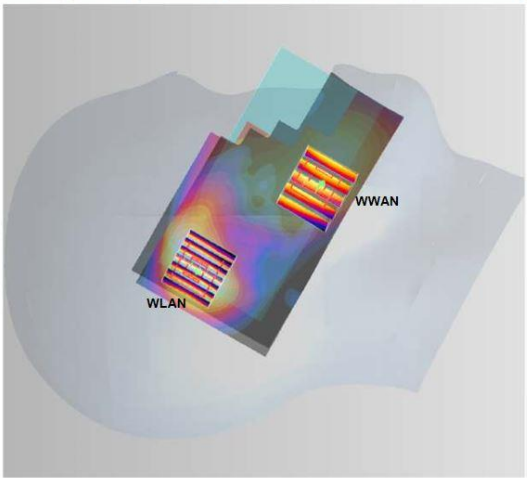
Case 7	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Result	Simultaneous SAR
	LTE Band 5	Left Cheek	0.343	0	0.0682	0.252	-0.171	85.1	1.68	0.03	Not required
	WLAN5.8GHz		1.339	0	0.0184	0.321	-0.173				



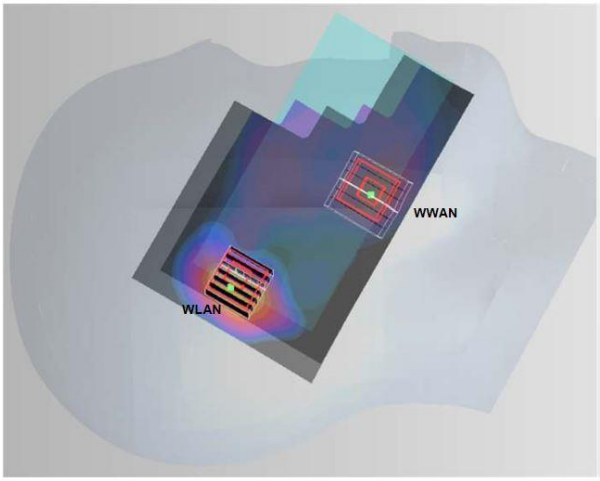
Case 8	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Result	Simultaneous SAR
	LTE Band 4	Left Cheek	0.297	0	0.0663	0.253	-0.168	83.3	1.64	0.03	Not required
	WLAN5.8GHz		1.339	0	0.0184	0.321	-0.173				



Case 9	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Result	Simultaneous SAR
	LTE Band 2	Left Cheek	0.478	0	0.0636	0.254	-0.171	80.8	1.82	0.03	Not required
	WLAN5.8GHz		1.339	0	0.0184	0.321	-0.173				



Case 10	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Result	Simultaneous SAR
	LTE Band 7	Left Cheek	0.405	0	0.0563	0.256	-0.174	75.2	1.74	0.03	Not required
	WLAN5.8GHz		1.339	0	0.0184	0.321	-0.173				



Test Engineer： Aaron Chen, Ted Sun, Nick Yu, Mood Huang, San Lin, Tom Jiang, Bevis Chang, Frank Wu, Angelo Chang, and Galen Zhang

15. 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 15.1

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 15.1. 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 Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.0	Normal	1	1	1	± 6.0 %	± 6.0 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.4	Rectangular	√3	1	1	± 0.2 %	± 0.2 %
Probe Positioning	2.9	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Max. SAR Eval.	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 11.0 %	± 10.8 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						**± 22.0 %**	**± 21.5 %**

Table 15.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.55	Normal	1	1	1	± 6.55 %	± 6.55 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Probe Positioning	9.9	Rectangular	√3	1	1	± 5.7 %	± 5.7 %
Max. SAR Eval.	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 12.8 %	± 12.6 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						**± 25.6 %**	**± 25.2 %**

Table 15.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

16. References

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