FCC SAR Test Report

APPLICANT	:	**ZTE CORPORATION**
EQUIPMENT	:	**GSM/WCDMA/LTE Multi-Mode Digital Mobile Phone**
BRAND NAME	:	**ZTE**
MODEL NAME	:	**Z998**
FCC ID	:	**Q78-Z998**
STANDARD	:	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2003** **FCC OET Bulletin 65 Supplement C (Edition 01-01)**

The product was completely tested on Apr. 12, 2013. We, SPORTON INTERNATIONAL (KUNSHAN) 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 (KUNSHAN) INC., the test report shall not be reproduced except in full.

Eric Huang

Reviewed by: Eric Huang / Vice Manager

Jones Tsai

Approved by: Jones Tsai / Manager

ilac-MRA TAF Testing Laboratory 1190

SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA320406	Rev. 01	Initial issue of report	Apr. 10, 2013

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **ZTE CORPORATION DUT: GSM/WCDMA/LTE Multi-Mode Digital Mobile Phone, Brand Name: ZTE, Model Name: Z998** are as follows.

<Highest Reported Standalone SAR Summary>

Exposure Position	Frequency Band	Reported 1g-SAR (W/kg)	Equipment Class	Highest Reported 1g-SAR (W/kg)
Head	GSM850	0.54	PCE	0.73
	GSM1900	0.41		
	WCDMA Band V	0.57		
	WCDMA Band II	0.66		
	LTE Band 2	0.65		
	LTE Band 4	0.73		
	LTE Band 5	0.56		
	LTE Band 17	0.47		
	WLAN 2.4GHz Band	0.15	DTS	0.15
Hotspot (1cm Gap)	GSM850	1.38	PCE	1.38
	GSM1900	1.32		
	WCDMA Band V	1.23		
	WCDMA Band II	1.34		
	LTE Band 2	1.16		
	LTE Band 4	1.33		
	LTE Band 5	0.79		
	LTE Band 17	0.61		
	WLAN 2.4GHz Band	0.12	DTS	0.12
Body-worn (1cm Gap)	GSM850	0.72	PCE	1.33
	GSM1900	0.57		
	WCDMA Band V	0.71		
	WCDMA Band II	0.76		
	LTE Band 2	1.06		
	LTE Band 4	1.33		
	LTE Band 5	0.70		
	LTE Band 17	0.61		
	WLAN 2.4GHz Band	0.12	DTS	0.12

<Highest Simultaneous Transmission SAR>

Frequency Band	Equipment Class	Exposure Position	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
LTE Band 4	PCE	Back (1cm Gap)	1.45
WLAN 2.4GHz Band	DTS		

Frequency Band	Equipment Class	Exposure Position	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
GSM850	PCE	Left Side (1cm Gap)	1.41
2.4GHz Bluetooth	DSS		

Remark:
The highest simultaneous transmission is scalar summation of reported standalone SAR per FCC KDB 690783 D01 v01r02, and scalar SAR summation of all possible simultaneous transmission scenarios are < 1.6W/kg.

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 and FCC OET Bulletin 65 Supplement C (Edition 01-01).

2. Administration Data

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958

2.2 Applicant

Company Name	ZTE CORPORATION
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

2.3 Manufacturer

Company Name	ZTE CORPORATION
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

2.4 Application Details

Date of Start during the Test	Feb. 25, 2013
Date of End during the Test	Apr. 12, 2013

3. General Information

3.1 Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT	GSM/WCDMA/LTE Multi-Mode Digital Mobile Phone
Brand Name	ZTE
Model Name	Z998
FCC ID	Q78-Z998
IMEI Code	004401782569210
TX Frequency	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Antenna Type	WWAN: PIFA Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna
HW Version	w9bA
SW Version	Z998V1.0.0B04
Uplink Modulations	GSM: GMSK GPRS: GMSK EDGE: GMSK / 8PSK WCDMA (Rel 99): QPSK HSDPA (Rel 6): QPSK HSUPA (Rel 6): QPSK HSPA+ (Rel 7): 16QAM (Downlink Only) DC-HSDPA (Rel 8): 64QAM (Uplink) LTE: QPSK, 16QAM 802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11g/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) Bluetooth BDR (1Mbps): GFSK Bluetooth EDR (2Mbps): π /4-DQPSK Bluetooth EDR (3Mbps): 8-DPSK Bluetooth v4.0 - LE: GFSK
Transfer Mode Category	Class B – DUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
DUT Stage	Identical Prototype
Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.	

3.2 Maximum RF output power among production units

Maximum Target Burst Average Power for Production Unit		
Mode / Band	GSM 850	GSM 1900
GSM (GMSK, 1 Tx slot)	33	30.5
GPRS/ EDGE (GMSK, 1 Tx slot)	33	30.5
GPRS/ EDGE (GMSK, 2 Tx slots)	33	30.5
EDGE (8PSK, 1 Tx slot)	27.5	26
EDGE (8PSK, 2 Tx slots)	27.5	26

Maximum Target Power for Production Unit		
Mode / Band	WCDMA Band V	WCDMA Band II
AMR 12.2K	25	23
RMC 12.2K	25	23
HSDPA Subtest-1	24	21.5
HSDPA Subtest-2	24	21.5
HSDPA Subtest-3	24	21.5
HSDPA Subtest-4	24	21.5
DC-HSDPA Subtest-1	23.5	21
DC-HSDPA Subtest-2	23.5	21
DC-HSDPA Subtest-3	23.5	21
DC-HSDPA Subtest-4	23.5	21
HSUPA Subtest-1	24	21.5
HSUPA Subtest-2	23	20.5
HSUPA Subtest-3	23	20.5
HSUPA Subtest-4	23	21.5
HSUPA Subtest-5	24	21.5

LTE Band 2				
Modulation	**BW (MHz)**	**RB size**	**Target MPR**	**Maximum Power**
QPSK	20	≤ 18	0	23.5
QPSK	20	> 18	0	23.5
16QAM	20	≤ 18	0	23.5
16QAM	20	> 18	1	22.5
QPSK	15	≤ 16	0	23.5
QPSK	15	> 16	0	23.5
16QAM	15	≤ 16	0	23.5
16QAM	15	> 16	1	22.5
QPSK	10	≤ 12	0	23.5
QPSK	10	> 12	0	23.5
16QAM	10	≤ 12	0	23.5
16QAM	10	> 12	1	22.5
QPSK	5	≤ 8	0	23.5
QPSK	5	> 8	0	23.5
16QAM	5	≤ 8	0	23.5
16QAM	5	> 8	1	22.5
QPSK	3	≤ 4	0	23.5
QPSK	3	> 4	0	23.5
16QAM	3	≤ 4	0	23.5
16QAM	3	> 4	1	22.5
QPSK	1.4	≤ 5	0	23.5
QPSK	1.4	> 5	0	23.5
16QAM	1.4	≤ 5	0	23.5
16QAM	1.4	> 5	1	22.5

LTE Band 4				
Modulation	**BW (MHz)**	**RB size**	**Target MPR**	**Maximum Power**
QPSK	20	≤ 18	**0**	**24.5**
QPSK	20	> 18	**0.5**	**24.0**
16QAM	20	≤ 18	**0.5**	**24.0**
16QAM	20	> 18	**0.5**	**24.0**
QPSK	15	≤ 16	**0**	**24.5**
QPSK	15	> 16	**0.5**	**24.0**
16QAM	15	≤ 16	**0.5**	**24.0**
16QAM	15	> 16	**0.5**	**24.0**
QPSK	10	≤ 12	**0**	**24.5**
QPSK	10	> 12	**0.5**	**24.0**
16QAM	10	≤ 12	**0.5**	**24.0**
16QAM	10	> 12	**0.5**	**24.0**
QPSK	5	≤ 8	**0**	**24.5**
QPSK	5	> 8	**0.5**	**24.0**
16QAM	5	≤ 8	**0.5**	**24.0**
16QAM	5	> 8	**0.5**	**24.0**
QPSK	3	≤ 4	**0**	**24.5**
QPSK	3	> 4	**0.5**	**24.0**
16QAM	3	≤ 4	**0.5**	**24.0**
16QAM	3	> 4	**0.5**	**24.0**
QPSK	1.4	≤ 5	**0**	**24.5**
QPSK	1.4	> 5	**0.5**	**24.0**
16QAM	1.4	≤ 5	**0.5**	**24.0**
16QAM	1.4	> 5	**0.5**	**24.0**

LTE Band 5				
Modulation	**BW (MHz)**	**RB size**	**Target MPR**	**Maximum Power**
QPSK	10	≤ 12	0	24
QPSK	10	> 12	0	24
16QAM	10	≤ 12	0	24
16QAM	10	> 12	1	23
QPSK	5	≤ 8	0	24
QPSK	5	> 8	0	24
16QAM	5	≤ 8	0	24
16QAM	5	> 8	1	23
QPSK	3	≤ 4	0	24
QPSK	3	> 4	0	24
16QAM	3	≤ 4	0	24
16QAM	3	> 4	1	23
QPSK	1.4	≤ 5	0	24
QPSK	1.4	> 5	0	24
16QAM	1.4	≤ 5	0	24
16QAM	1.4	> 5	1	23

LTE Band 17				
Modulation	**BW (MHz)**	**RB size**	**Target MPR**	**Maximum Power**
QPSK	10	≤ 12	0	24.5
QPSK	10	> 12	0.5	24
16QAM	10	≤ 12	0.5	24
16QAM	10	> 12	2	23
QPSK	5	≤ 8	0	24.5
QPSK	5	> 8	0.5	24
16QAM	5	≤ 8	0.5	24
16QAM	5	> 8	2	23

Remark:

1. By design, maximum LTE RF power of smaller supported bandwidth does not exceed the RF power of largest supported bandwidth; the information is included in "tune-up procedure" exhibit.

IEEE 802.11 Maximum Power (dBm)				
Mode/Band	**a**	**b**	**g**	**n-HT20**
WLAN 2.4GHz Band		12.5	14	12.5

Mode / Band	**Bluetooth Maximum Power (dBm)**			
	1Mbps (GFSK)	**2Mbps (π/4-DQPSK)**	**3Mbps (8-DPSK)**	**BT4.0-LE (GFSK)**
Bluetooth	-0.5	-2	-2	1

The table below summarized necessary items addressed in KDB 941225 D05 v02.

FCC ID	Q78-Z998
EUT	GSM/WCDMA/LTE Multi-Mode Digital Mobile Phone
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz
Channel Bandwidth	1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz (LTE Band 2/Band 4) 1.4MHz / 3MHz / 5MHz/ 10MHz (LTE Band 5) 5MHz / 10MHz (LTE Band 17)

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

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 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 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

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

<table>
<tr><td>E category, uplink modulations used</td><td>Category 3, QPSK, and 16QAM</td></tr>
<tr><td>LTE transmitter and antenna implementation (standalone or sharing hardware components / antennas)</td><td>A primary antenna is used for LTE and other wireless interfaces (GSM/WCDMA) for transmitting and receiving
A 2nd antenna is used for LTE for receiving only</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Data only</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>Yes, per 3GPP TS 36.101 v11.0.0
Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth configuration [RB]</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
</table></td></tr>
<tr><td>LTE A-MPR</td><td>In the base simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing.</td></tr>
<tr><td>Base station simulator used for Testing</td><td>Anritsu MT8820C</td></tr>
</table>

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 OET Bulletin 65 Supplement C (Edition 01-01)
- FCC KDB 447498 D01 v05
- FCC KDB 648474 D04v01
- FCC KDB 248227 D01 v01r02
- FCC KDB 941225 D01 v02
- FCC KDB 941225 D03 v01
- FCC KDB 941225 D05 v02
- FCC KDB 941225 D06 v01
- FCC KDB 865664 D01 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.

During WLAN SAR testing EUT is configured with the WLAN continuous TX tool, and the transmission duty factor was monitored on the spectrum analyzer with zero-span setting.

Duty factor observed as below:

802.11b, 1Mbps: 97.67%

802.11g, 1Mbps: 70.35%

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

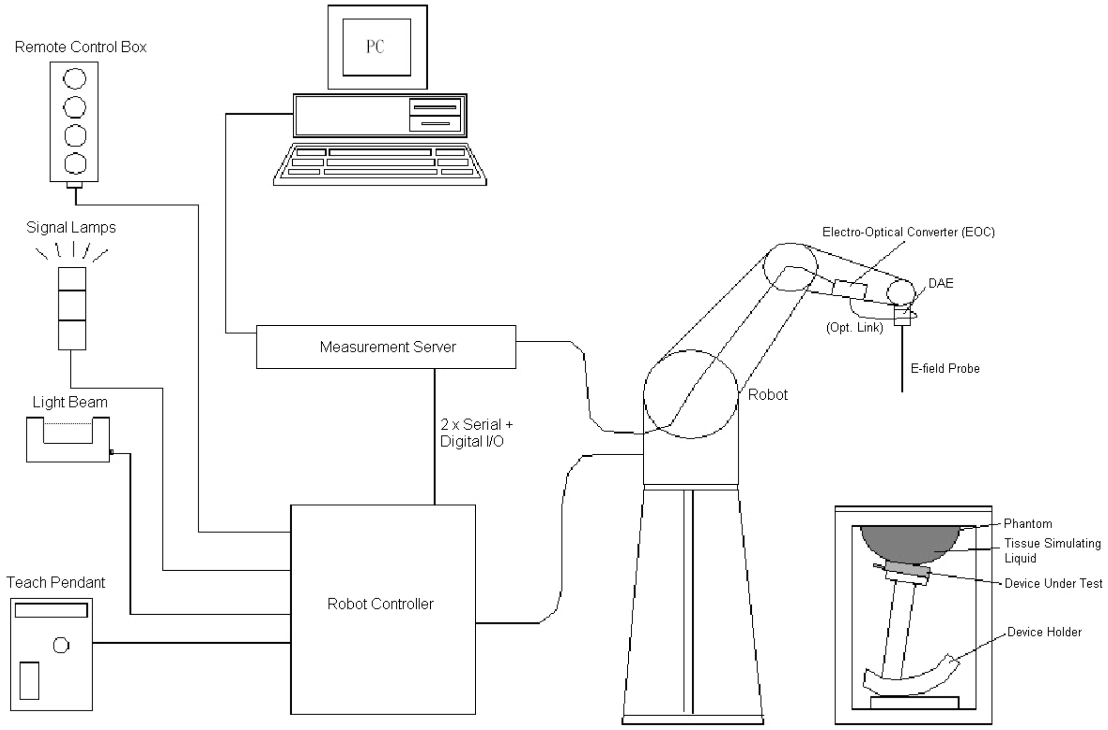


Fig 5.1 SPEAG DASY System Configurations

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

<EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
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

Fig 5.2 Photo of EX3DV4

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 5.3 Photo of DAE

5.3 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (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 5.4 Photo of DASY5

5.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY5: 400 MHz, Intel Celeron), chipdisk (DASY5: 128 MB), RAM (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 5.5 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

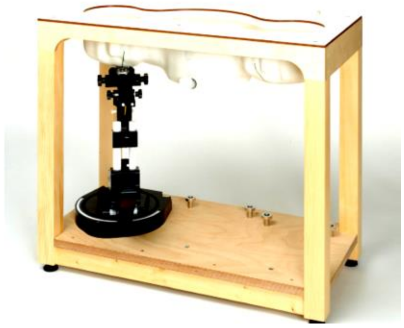


Fig 5.6 Photo of SAM Phantom

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.

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 $\varepsilon = 3$ and loss tangent $\delta = 0.02$. 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 5.7 Device Holder

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	735MHz System Validation Kit	D750V3	1065	Jul. 12, 2012	Jul. 11, 2013
SPEAG	835MHz System Validation Kit	D835V2	4d091	Nov. 18, 2011	Nov. 16, 2013
SPEAG	1750MHz System Validation Kit	D1750V2	1069	Jul. 13, 2012	Jul. 12, 2013
SPEAG	1900MHz System Validation Kit	D1900V2	5d118	Nov. 21, 2011	Nov. 16, 2013
SPEAG	2450MHz System Validation Kit	D2450V2	736	Jul. 25, 2011	Jul. 24, 2013
SPEAG	Data Acquisition Electronics	DAE4	1210	Dec. 05, 2012	Dec. 04, 2013
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	Jun. 20, 2012	Jun. 19, 2013
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1477	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1479	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201074235	May. 06, 2012	May. 05, 2013
Agilent	Wireless Communication Test Set	E5515E	MY52112100	Oct. 25, 2012	Oct. 24, 2013
Agilent	Wireless Communication Test Set	E5515C	MY48367160	Oct. 25, 2012	Oct. 24, 2013
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	Apr. 13, 2012	Apr. 12, 2013
Agilent	Power Meter	E4416A	MY45101555	Aug. 22, 2012	Aug. 21, 2013
Agilent	Power Sensor	E9327A	MY44421198	Aug. 22, 2012	Aug. 21, 2013
Woken	Attenuator 1	WK0602-XX	N/A	Note 4	
PE	Attenuator 2	PE7005-10	N/A	Note 4	
PE	Attenuator 3	PE7005- 3	N/A	Note 4	
Agilent	Dual Directional Coupler	778D	50422	Note 4	
Agilent	Dielectric Probe Kit	85070D	US01440205	Note 5	
AR	Power Amplifier	5S1G4M2	0328767	Note 6	
R&S	Spectrum Analyzer	FSP30	101399	Jun. 01, 2012	May 31, 2013

Table 5.1 Test Equipment List

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. Referring to KDB 865664 D01v01, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole D835V2, SN: 4d091, D1900V2, SN: 5d118 and D2450V2, SN: 736 can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.
4. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
5. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure (calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Agilent.
6. 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
7. Attenuator 1 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.

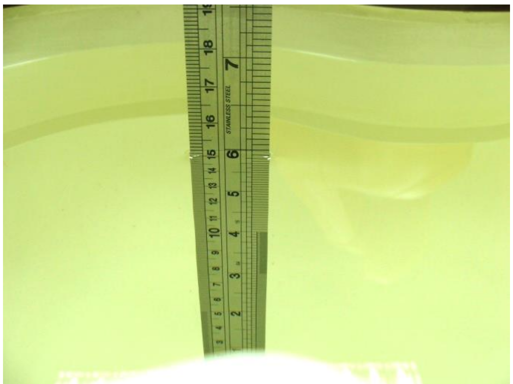


Fig 6.1 Photo of Liquid Height for Head SAR

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
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
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
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

Table 6.1 Recipes of Tissue Simulating Liquid

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid.

Frequency (MHz)	Liquid Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Head	21.1	0.89	40.918	0.89	41.9	0.00	-2.34	±5	Mar. 10, 2013
835	Head	21.2	0.88	40.851	0.9	41.5	-2.22	-1.56	±5	Mar. 10, 2013
1750	Head	21.5	1.373	41.392	1.37	40.1	0.22	3.22	±5	Mar. 08, 2013
1900	Head	21.3	1.425	38.906	1.4	40	1.79	-2.74	±5	Mar. 08, 2013
2450	Head	21.2	1.842	39.923	1.8	39.2	2.33	1.84	±5	Mar. 01, 2013
750	Body	21.1	0.97	54.646	0.96	55.5	1.04	-1.54	±5	Feb. 25, 2013
835	Body	21.4	0.982	54.848	0.97	55.2	1.24	-0.64	±5	Feb. 25, 2013
835	Body	21.0	0.983	55.176	0.97	55.2	1.34	-0.04	±5	Apr. 12, 2013
1750	Body	21.5	1.512	55.273	1.49	53.4	1.48	3.51	±5	Mar. 07, 2013
1900	Body	21.2	1.551	53.249	1.52	53.3	2.04	-0.10	±5	Mar. 06, 2013
1900	Body	21.5	1.551	53.257	1.52	53.3	2.04	-0.08	±5	Apr. 12, 2013
2450	Body	21.1	1.949	53.894	1.95	52.7	-0.05	2.27	±5	Mar. 01, 2013

Table 6.2 Measuring Results for Simulating Liquid

7. SAR System Verification

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:

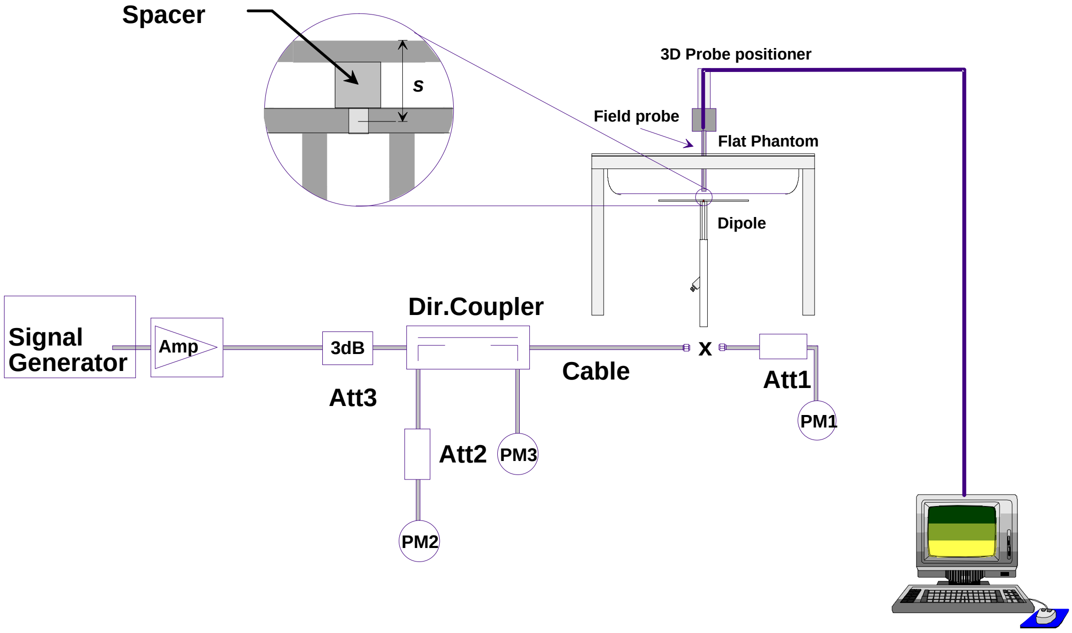


Fig 7.1 System Setup for System Evaluation

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

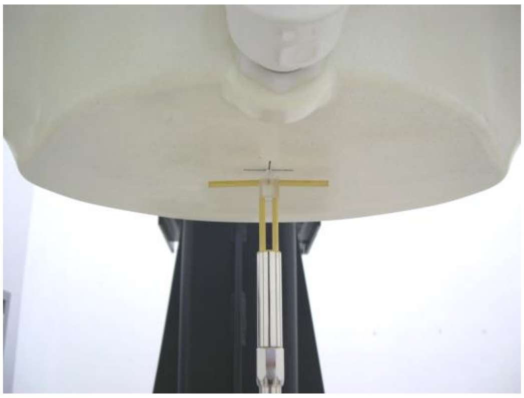


Fig 7.2 Photo of Dipole Setup

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)	Liquid Type	Power fed onto reference dipole (mW)	Target SAR_{1g} (W/kg)	Measured SAR_{1g} (W/kg)	Normalized SAR_{1g} (W/kg)	Deviation (%)
Mar. 10, 2013	750	Head	250	8.37	2.13	8.52	1.79
Mar. 10, 2013	835	Head	250	9.4	2.28	9.12	-2.98
Mar. 08, 2013	1750	Head	250	36.4	9.17	36.68	0.77
Mar. 08, 2013	1900	Head	250	40.3	10	40	-0.74
Mar. 01, 2013	2450	Head	250	54.8	13.5	54	-1.46
Feb. 25, 2013	750	Body	250	8.71	2.22	8.88	1.95
Feb. 25, 2013	835	Body	250	9.42	2.26	9.04	-4.03
Apr. 12, 2013	835	Body	250	9.42	2.27	9.08	-3.61
Mar. 07, 2013	1750	Body	250	37.1	8.98	35.92	-3.18
Mar. 06, 2013	1900	Body	250	41.8	10.4	41.6	-0.48
Apr. 12, 2013	1900	Body	250	41.8	10.3	41.2	-1.44
Mar. 01, 2013	2450	Body	250	52.3	13.1	52.4	0.19

Table 7.1 Target and Measurement SAR after Normalized

8. EUT Testing Position

This EUT was tested in nine different positions. They are right cheek, right tilted, left cheek, left tilted, Front of the EUT with phantom 1 cm gap, Back of the EUT with phantom 1 cm gap, Bottom Side of the EUT with phantom 1 cm gap, Right Side of the EUT with phantom 1 cm gap, and Left Side of the EUT with phantom 1 cm gap, as illustrated below.

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.

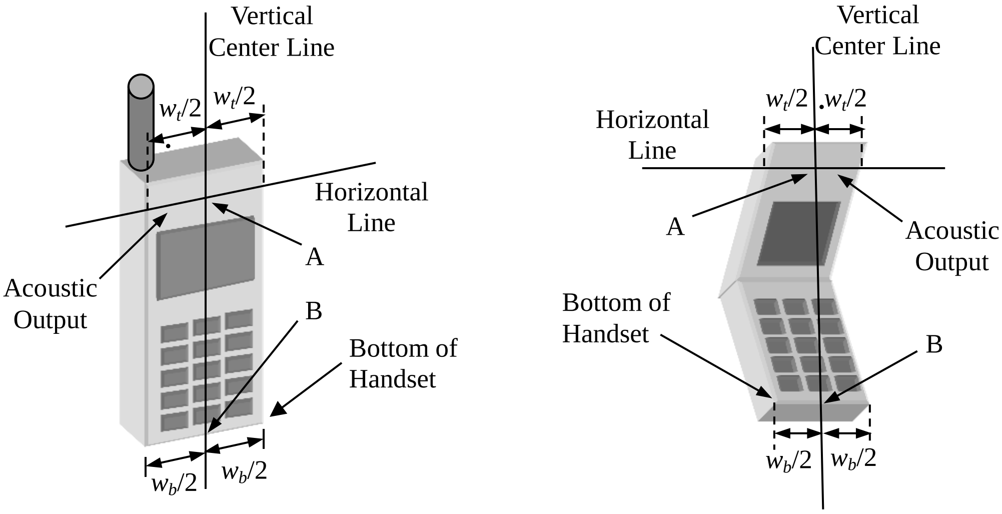


Fig 8.1 Illustration for Handset Vertical and Horizontal Reference Lines

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).

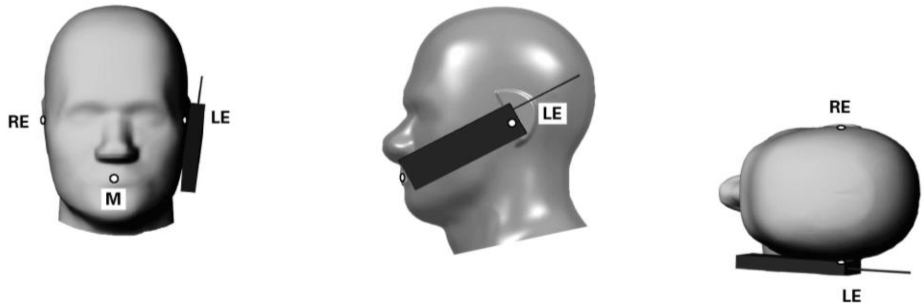


Fig 8.2 Illustration for Cheek Position

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).

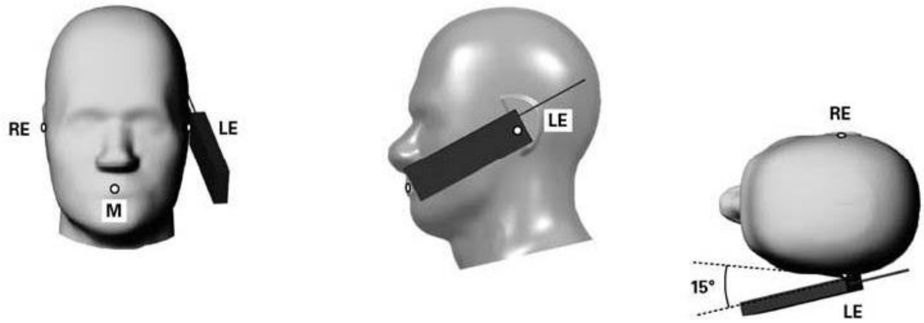


Fig 8.3 Illustration for Tilted Position

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 cm.

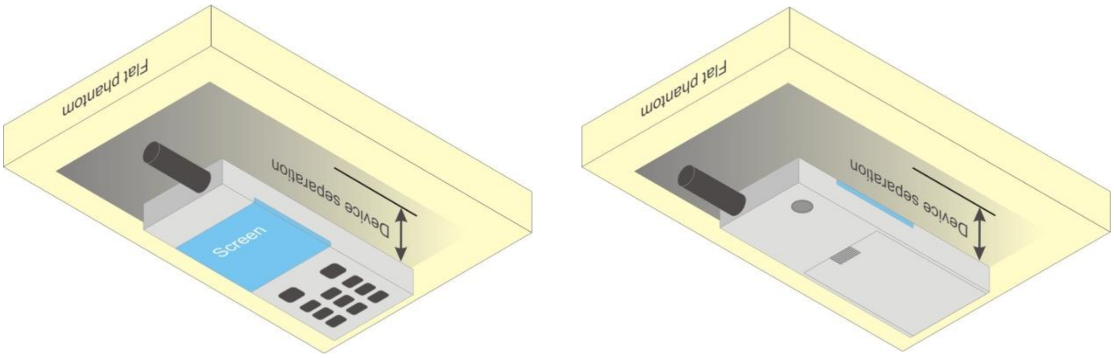


Fig 8.4 Illustration for Body Worn Position

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 cm.

<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 D01v01 quoted below.

For any secondary peaks found in the area scan which are within 2 dB of the maximum peak and are not within this zoom scan, the zoom scan should be repeated

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

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>

General Note:

1. Per KDB 447498 D01v05, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. The DUT do not support DTM function.
3. For Head SAR testing, the EUT was set in GSM Voice for GSM850 and GSM1900.
4. For Body worn SAR testing, GSM should be evaluated, therefore the EUT was set in GSM Voice for GSM850 and GSM1900.
5. For Hotspot mode SAR testing, GPRS and EDGE should be evaluated, therefore the EUT was set in GPRS 2 Tx slots for GSM850 and GSM1900 due to its highest frame-average power.

Band: GSM850	**Burst Average Power (dBm)**			**Frame-Average Power (dBm)**		
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)	**32.75**	32.69	32.54	23.75	23.69	23.54
GPRS (GMSK, 1 Tx slot) – CS1	32.72	32.71	32.57	23.72	23.71	23.57
GPRS (GMSK, 2 Tx slots) – CS1	32.58	32.54	32.44	**26.58**	26.54	26.44
EDGE (GMSK, 1 Tx slot) – MCS1	32.74	32.70	32.55	23.74	23.70	23.55
EDGE (GMSK, 2 Tx slots) – MCS1	32.57	32.55	32.44	26.57	26.55	26.44
EDGE (8PSK, 1 Tx slot) – MCS5	26.98	27.00	26.93	17.98	18.00	17.93
EDGE (8PSK, 2 Tx slots) – MCS5	26.84	26.87	26.90	20.84	20.87	20.90
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						

Band: GSM1900	**Burst Average Power (dBm)**			**Frame-Average Power (dBm)**		
Channel	**512**	**661**	**810**	**512**	**661**	**810**
Frequency (MHz)	**1850.2**	**1880.0**	**1909.8**	**1850.2**	**1880.0**	**1909.8**
GSM (GMSK, 1 Tx slot)	30.13	**30.33**	30.20	21.13	21.33	21.20
GPRS (GMSK, 1 Tx slot) – CS1	30.12	30.32	30.19	21.12	21.32	21.19
GPRS (GMSK, 2 Tx slots) – CS1	30.06	30.27	30.13	24.06	**24.27**	24.13
EDGE (GMSK, 1 Tx slot) – MCS1	30.10	30.30	30.16	21.10	21.30	21.16
EDGE (GMSK, 2 Tx slots) – MCS1	30.04	30.26	30.09	24.04	24.26	24.09
EDGE (8PSK, 1 Tx slot) – MCS5	25.51	25.60	25.83	16.51	16.60	16.83
EDGE (8PSK, 2 Tx slots) – MCS5	25.50	25.57	25.80	19.50	19.57	19.80
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						

<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 $\beta_{hs} = 30/15 * \beta_c$.

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

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

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

Setup Configuration

HSUPA Setup Configuration:

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

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 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	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (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 $\beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: 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

DC-HSDPA 3GPP release 8 Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration below
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 RMC 12.2Kbps + HSDPA mode.
   ii. Set Cell Power = -25 dBm
   iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
   iv. Select HSDPA Uplink Parameters
   v. Set Gain Factors (β_c and β_d) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
      a). Subtest 1: β_c/β_d=2/15
      b). Subtest 2: β_c/β_d=12/15
      c). Subtest 3: β_c/β_d=15/8
      d). Subtest 4: β_c/β_d=15/4
   vi. Set Delta ACK, Delta NACK and Delta CQI = 8
   vii. Set Ack-Nack Repetition Factor to 3
   viii. Set CQI Feedback Cycle (k) to 4 ms
   ix. Set CQI Repetition Factor to 2
   x. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

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:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

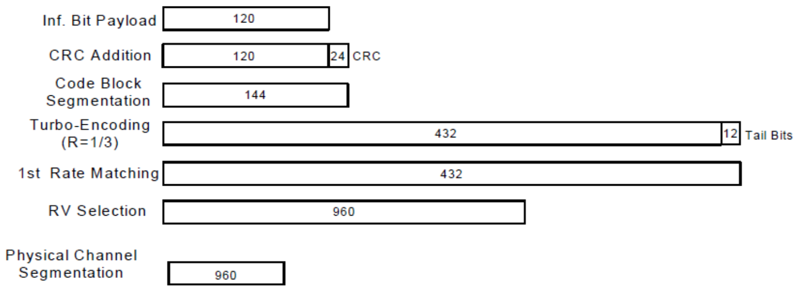


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

<WCDMA Conducted Power>

General Note

1. Per KDB 941225 D01, RMC 12.2kbps setting is used to evaluate SAR. If AMR 12.2kbps power is < 0.25dB higher than RMC 12.2kbps, SAR tests with AMR 12.2kbps can be excluded.
2. By design, AMR, and HSDPA/DC-HSDPA/HSUPA RF power will not be larger than RMC 12.2kbps.
3. It is expected by the manufacturer that MPR for some HSDPA/DC-HSDPA/HSUPA subtests may differ from the specification of 3GPP, according to the chipset implementation in this model. The implementation and expected deviation are detailed in tune-up procedure exhibit.

WCDMA Average power (dBm)							
Band		WCDMA Band V			WCDMA Band II		
Channel		4132	4182	4233	9262	9400	9538
Frequency (MHz)		826.4	836.4	846.6	1852.4	1880.0	1907.6
3GPP Rel 99	AMR 12.2K	24.54	24.56	24.62	22.29	22.52	22.49
3GPP Rel 99	RMC 12.2K	24.55	24.58	24.63	22.31	22.54	22.52
3GPP Rel 6	HSDPA Subtest-1	23.21	23.01	23.35	20.83	20.95	20.99
3GPP Rel 6	HSDPA Subtest-2	23.18	22.96	23.31	20.81	20.93	20.95
3GPP Rel 6	HSDPA Subtest-3	23.08	23.00	23.30	20.89	20.90	20.96
3GPP Rel 6	HSDPA Subtest-4	23.04	22.97	23.21	20.83	20.95	20.98
3GPP Rel 8	DC-HSDPA Subtest-1	23.03	23.05	23.11	20.75	20.68	20.76
3GPP Rel 8	DC-HSDPA Subtest-2	23.02	22.90	22.86	20.68	20.63	20.62
3GPP Rel 8	DC-HSDPA Subtest-3	23.00	22.86	22.78	20.56	20.48	20.60
3GPP Rel 8	DC-HSDPA Subtest-4	22.92	22.79	22.79	20.66	20.50	20.59
3GPP Rel 6	HSUPA Subtest-1	22.80	22.87	23.08	20.82	21.16	20.97
3GPP Rel 6	HSUPA Subtest-2	22.43	22.39	21.94	20.25	19.97	20.54
3GPP Rel 6	HSUPA Subtest-3	22.05	22.02	21.58	19.84	19.48	20.08
3GPP Rel 6	HSUPA Subtest-4	22.70	22.58	22.12	20.38	20.95	20.71
3GPP Rel 6	HSUPA Subtest-5	23.04	22.94	23.09	20.89	21.10	21.17

MPR (dB)								
3GPP MPR	Subtest		WCDMA Band V			WCDMA Band II		
0	3GPP Rel 6	HSDPA Subtest-1	0.00	0.00	0.00	0.00	0.00	0.00
0	3GPP Rel 6	HSDPA Subtest-2	0.03	0.05	0.04	0.02	0.02	0.04
≤ 0.5	3GPP Rel 6	HSDPA Subtest-3	0.13	0.01	0.05	-0.06	0.05	0.03
≤ 0.5	3GPP Rel 6	HSDPA Subtest-4	0.17	0.04	0.14	0.00	0.00	0.01
0	3GPP Rel 8	DC-HSDPA Subtest-1	0.00	0.00	0.00	0.00	0.00	0.00
0	3GPP Rel 8	DC-HSDPA Subtest-2	0.01	0.15	0.25	0.07	0.05	0.14
≤ 0.5	3GPP Rel 8	DC-HSDPA Subtest-3	0.00	0.19	0.33	0.19	0.20	0.16
≤ 0.5	3GPP Rel 8	DC-HSDPA Subtest-4	0.08	0.26	0.32	0.09	0.18	0.17
0	3GPP Rel 6	HSUPA Subtest-1	0.24	0.07	0.01	0.07	0.01	0.13
≤ 2	3GPP Rel 6	HSUPA Subtest-2	0.61	0.55	1.15	0.64	1.20	0.56
≤ 1	3GPP Rel 6	HSUPA Subtest-3	0.99	0.92	1.51	1.05	1.69	1.02
≤ 2	3GPP Rel 6	HSUPA Subtest-4	0.34	0.36	0.97	0.51	0.22	0.39
0	3GPP Rel 6	HSUPA Subtest-5	0.00	0.00	0.00	0.00	0.00	0.00

<LTE Conducted Power>

General Note

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02, 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 D05v02, 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 D05v02, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. 16QAM output power for each RB allocation configuration is not > ½ dB higher than the same configuration in QPSK
6. Smaller bandwidth output power for each RB allocation configuration is not > ½ dB higher than the same configuration in the largest supported bandwidth.

<LTE Conducted Power >

		LTE Band 2						
BW [MHz]	Mod / RB (Size - Offset)	Average Power. (dBm)			3GPP MPR	MPR Result (dB)		
		Low Ch	Mid Ch	High Ch		Low Ch	Mid Ch	High Ch
Channel		18700	18900	19100		18700	18900	19100
Frequency (MHz)		1860	1880	1900		1860	1880	1900
20	QPSK 1-0	23.18	23.19	23.17	0	0.00	0.00	0.00
20	QPSK 1-49	22.96	23.09	23.09		0.22	0.10	0.08
20	QPSK 1-99	23.13	22.97	23.03		0.05	0.22	0.14
20	QPSK 50-0	22.75	22.96	22.91	≤ 1	0.43	0.23	0.26
20	QPSK 50-24	22.68	22.85	22.93		0.50	0.34	0.24
20	QPSK 50-49	22.71	22.88	22.90		0.47	0.31	0.27
20	QPSK 100-0	22.77	22.94	22.92		0.41	0.25	0.25
20	16QAM 1-0	23.15	23.17	23.05	≤ 1	0.03	0.02	0.12
20	16QAM 1-49	22.82	23.06	23.03		0.36	0.13	0.14
20	16QAM 1-99	22.96	22.96	23.02		0.22	0.23	0.15
20	16QAM 50-0	21.80	21.88	21.95	≤ 2	1.38	1.31	1.22
20	16QAM 50-24	21.64	21.90	21.97		1.54	1.29	1.20
20	16QAM 50-49	21.68	21.89	21.85		1.50	1.30	1.32
20	16QAM 100-0	21.69	21.95	21.92		1.49	1.24	1.25
Channel		18675	18900	19125		18675	18900	19125
Frequency (MHz)		1857.5	1880	1902.5		1857.5	1880	1902.5
15	QPSK 1-0	23.16	23.19	23.17	0	0.00	0.00	0.00
15	QPSK 1-37	23.07	23.16	23.16		0.09	0.03	0.01
15	QPSK 1-74	22.94	23.06	23.12		0.22	0.13	0.05
15	QPSK 36-0	22.94	22.93	23.00	≤ 1	0.22	0.26	0.17
15	QPSK 36-19	22.84	23.01	22.96		0.32	0.18	0.21
15	QPSK 36-39	22.82	23.03	22.77		0.34	0.16	0.40
15	QPSK 75-0	22.68	22.93	22.92		0.48	0.26	0.25
15	16QAM 1-0	23.03	23.17	22.94	≤ 1	0.13	0.02	0.23
15	16QAM 1-37	23.01	22.97	22.82		0.15	0.22	0.35
15	16QAM 1-74	23.00	23.16	22.90		0.16	0.03	0.27
15	QPSK 36-0	21.88	22.05	22.01	≤ 2	1.28	1.14	1.16
15	QPSK 36-19	21.75	22.03	21.96		1.41	1.16	1.21
15	QPSK 36-39	21.72	22.01	21.89		1.44	1.18	1.28
15	16QAM 75-0	21.71	21.93	21.86		1.45	1.26	1.31

LTE Band 2								
Channel		18650	18900	19150		18650	18900	19150
Frequency (MHz)		1855	1880	1905		1855	1880	1905
10	QPSK 1-0	23.26	23.23	23.25	0	0.00	0.00	0.00
10	QPSK 1-24	23.05	23.16	23.15		0.21	0.07	0.10
10	QPSK 1-49	22.87	23.11	23.03		0.39	0.12	0.22
10	QPSK 25-0	22.82	23.02	23.14	≤ 1	0.44	0.21	0.11
10	QPSK 25-12	22.75	22.98	22.99		0.51	0.25	0.26
10	QPSK 25-24	22.75	23.04	23.23		0.51	0.19	0.02
10	QPSK 50-0	22.76	22.91	22.92		0.50	0.32	0.33
10	16QAM 1-0	22.64	23.23	23.25	≤ 1	0.62	0.00	0.00
10	16QAM 1-24	22.61	23.09	23.21		0.65	0.14	0.04
10	16QAM 1-49	22.57	23.20	23.24		0.69	0.03	0.01
10	16QAM 25-0	21.91	22.05	22.00	≤ 2	1.35	1.18	1.25
10	16QAM 25-12	21.95	22.02	22.02		1.31	1.21	1.23
10	16QAM 25-24	21.86	21.96	22.35		1.40	1.27	0.90
10	16QAM 50-0	21.78	21.94	21.96		1.48	1.29	1.29
Channel		18625	18900	19175		18625	18900	19175
Frequency (MHz)		1852.5	1880	1907.5		1852.5	1880	1907.5
5	QPSK 1-0	23.13	23.18	23.26	0	0.00	0.00	0.00
5	QPSK 1-12	22.99	23.16	23.06		0.14	0.02	0.20
5	QPSK 1-24	22.90	23.01	22.95		0.23	0.17	0.31
5	QPSK 12-0	22.94	23.05	23.18	≤ 1	0.19	0.13	0.08
5	QPSK 12-6	23.01	23.12	23.25		0.12	0.06	0.01
5	QPSK 12-11	22.90	23.09	23.21		0.23	0.09	0.05
5	QPSK 25-0	22.89	23.04	22.93		0.24	0.14	0.33
5	16QAM 1-0	23.12	23.14	23.22	≤ 1	0.01	0.04	0.04
5	16QAM 1-12	23.03	23.00	23.18		0.10	0.18	0.08
5	16QAM 1-24	23.09	23.04	23.15		0.04	0.14	0.11
5	16QAM 12-0	21.97	22.12	22.13	≤ 2	1.16	1.06	1.13
5	16QAM 12-6	21.98	22.17	22.12		1.15	1.01	1.14
5	16QAM 12-11	22.16	22.15	21.99		0.97	1.03	1.27
5	16QAM 25-0	21.93	22.10	21.94		1.20	1.08	1.32
Channel		18615	18900	19185		18615	18900	19185
Frequency (MHz)		1851.5	1880	1908.5		1851.5	1880	1908.5
3	QPSK 1-0	23.04	23.24	23.25	0	0.00	0.00	0.00
3	QPSK 1-7	23.02	23.13	23.16		0.02	0.11	0.09
3	QPSK 1-14	22.95	23.23	23.05		0.09	0.01	0.20
3	QPSK 8-0	22.96	23.21	23.19	≤ 1	0.08	0.03	0.06
3	QPSK 8-4	23.03	23.22	23.02		0.01	0.02	0.23
3	QPSK 8-7	23.00	23.14	22.91		0.04	0.10	0.34
3	QPSK 15-0	22.90	23.13	22.94		0.14	0.11	0.31
3	16QAM 1-0	23.03	23.19	23.03	≤ 1	0.01	0.05	0.22
3	16QAM 1-7	22.70	23.07	23.02		0.34	0.17	0.23
3	16QAM 1-14	23.02	23.18	22.97		0.02	0.06	0.28
3	16QAM 8-0	21.82	22.13	22.19	≤ 2	1.22	1.11	1.06
3	16QAM 8-4	21.90	22.08	22.09		1.14	1.16	1.16
3	16QAM 8-7	21.94	22.09	22.02		1.10	1.15	1.23
3	16QAM 15-0	21.92	22.12	22.03		1.12	1.12	1.22
Channel		18607	18900	19193		18607	18900	19193
Frequency (MHz)		1850.7	1880	1909.3		1850.7	1880	1909.3
1.4	QPSK 1-0	23.11	23.18	23.10	0	0.00	0.00	0.00
1.4	QPSK 1-2	22.99	23.15	23.09		0.12	0.03	0.01
1.4	QPSK 1-5	23.02	23.11	22.94		0.09	0.07	0.16
1.4	QPSK 3-0	23.09	23.17	23.01		0.02	0.01	0.09
1.4	QPSK 3-1	23.05	23.06	23.07		0.06	0.12	0.03
1.4	QPSK 3-2	23.03	23.07	23.04		0.08	0.11	0.06
1.4	QPSK 6-0	23.00	23.07	23.00	≤ 1	0.11	0.11	0.10
1.4	16QAM 1-0	23.13	23.12	23.13	≤ 1	-0.02	0.06	-0.03
1.4	16QAM 1-2	22.88	23.05	23.11		0.23	0.13	-0.01
1.4	16QAM 1-5	22.81	22.81	22.77		0.30	0.37	0.33
1.4	16QAM 3-0	22.97	22.94	23.02		0.14	0.24	0.08
1.4	16QAM 3-1	23.08	23.10	23.11		0.03	0.08	-0.01
1.4	16QAM 3-2	23.11	23.10	23.10		0.00	0.08	0.00
1.4	16QAM 6-0	21.99	22.29	22.12	≤ 2	1.12	0.89	0.98

LTE Band 4								
BW [MHz]	Mod / RB (Size - Offset)	Average Power. (dBm)			3GPP MPR	MPR Result (dB)		
		Low Ch	Mid Ch	High Ch		Low Ch	Mid Ch	High Ch
Channel		20050	20175	20300		20050	20175	20300
Frequency (MHz)		1720	1732.5	1745		1720	1732.5	1745
20	QPSK 1-0	24.06	24.17	23.72		0.00	0.00	0.00
20	QPSK 1-49	23.84	23.96	23.59	0	0.22	0.21	0.13
20	QPSK 1-99	23.84	23.88	23.59		0.22	0.29	0.13
20	QPSK 50-0	23.65	23.67	23.63		0.41	0.50	0.09
20	QPSK 50-24	23.62	23.57	23.15	≤ 1	0.44	0.60	0.57
20	QPSK 50-49	23.64	23.62	23.51		0.42	0.55	0.21
20	QPSK 100-0	23.75	23.97	23.54		0.31	0.20	0.18
20	16QAM 1-0	24.16	24.15	23.78		-0.10	0.02	-0.06
20	16QAM 1-49	24.14	23.84	23.74	≤ 1	-0.08	0.33	-0.02
20	16QAM 1-99	23.48	23.73	23.37		0.58	0.44	0.35
20	16QAM 50-0	23.75	23.63	23.51		0.31	0.54	0.21
20	16QAM 50-24	23.65	23.54	23.42	≤ 2	0.41	0.63	0.30
20	16QAM 50-49	23.56	23.68	23.43		0.50	0.49	0.29
20	16QAM 100-0	23.71	23.54	23.43		0.35	0.63	0.29
Channel		20025	20175	20325		20025	20175	20325
Frequency (MHz)		1717.5	1732.5	1747.5		1717.5	1732.5	1747.5
15	QPSK 1-0	24.11	24.16	24.07		0.00	0.00	0.00
15	QPSK 1-37	24.05	23.90	24.03	0	0.06	0.26	0.04
15	QPSK 1-74	23.93	23.87	23.87		0.18	0.29	0.20
15	QPSK 36-0	23.87	23.81	23.83		0.24	0.35	0.24
15	QPSK 36-19	23.85	23.76	23.40	≤ 1	0.26	0.40	0.67
15	QPSK 36-39	23.92	23.79	23.96		0.19	0.37	0.11
15	QPSK 75-0	23.88	23.57	23.77		0.23	0.59	0.30
15	16QAM 1-0	24.08	24.17	23.65		0.03	-0.01	0.42
15	16QAM 1-37	23.82	23.75	23.64	≤ 1	0.29	0.41	0.43
15	16QAM 1-74	24.05	23.66	23.53		0.06	0.50	0.54
15	QPSK 36-0	23.03	23.28	22.89		1.08	0.88	1.18
15	QPSK 36-19	23.00	23.06	22.88	≤ 2	1.11	1.10	1.19
15	QPSK 36-39	22.96	23.02	22.90		1.15	1.14	1.17
15	16QAM 75-0	23.76	23.60	23.52		0.35	0.56	0.55
Channel		20000	20175	20350		20000	20175	20350
Frequency (MHz)		1715	1732.5	1750		1715	1732.5	1750
10	QPSK 1-0	23.98	23.85	23.87		0.13	0.00	0.00
10	QPSK 1-24	23.81	23.73	23.74	0	0.30	0.12	0.13
10	QPSK 1-49	24.11	23.74	23.85		0.00	0.11	0.02
10	QPSK 25-0	23.90	23.72	23.69		0.21	0.13	0.18
10	QPSK 25-12	23.82	23.72	23.84	≤ 1	0.29	0.13	0.03
10	QPSK 25-24	23.86	23.49	23.67		0.25	0.36	0.20
10	QPSK 50-0	23.72	23.56	23.66		0.39	0.29	0.21
10	16QAM 1-0	23.97	23.88	23.83		0.14	-0.03	0.04
10	16QAM 1-24	23.97	23.86	23.72	≤ 1	0.14	-0.01	0.15
10	16QAM 1-49	24.01	23.62	23.51		0.10	0.23	0.36
10	16QAM 25-0	23.96	23.74	23.66		0.15	0.11	0.21
10	16QAM 25-12	23.88	23.69	23.57	≤ 2	0.23	0.16	0.30
10	16QAM 25-24	23.84	23.61	23.64		0.27	0.24	0.23
10	16QAM 50-0	23.70	23.54	23.51		0.41	0.31	0.36

LTE Band 4								
Channel		19975	20175	20375		19975	20175	20375
Frequency (MHz)		1712.5	1732.5	1752.5		1712.5	1732.5	1752.5
5	QPSK 1-0	24.15	23.96	24.13	0	0.00	0.00	0.00
5	QPSK 1-12	24.09	23.89	23.89		0.06	0.07	0.24
5	QPSK 1-24	23.87	23.87	23.92		0.28	0.09	0.21
5	QPSK 12-0	23.96	23.78	23.98	≤ 1	0.19	0.18	0.15
5	QPSK 12-6	23.94	23.76	23.90		0.21	0.20	0.23
5	QPSK 12-11	23.98	23.83	23.98		0.17	0.13	0.15
5	QPSK 25-0	23.96	23.79	23.72		0.19	0.17	0.41
5	16QAM 1-0	24.10	23.90	23.82	≤ 1	0.05	0.06	0.31
5	16QAM 1-12	23.90	23.82	23.80		0.25	0.14	0.33
5	16QAM 1-24	24.00	23.83	23.68		0.15	0.13	0.45
5	16QAM 12-0	23.85	23.87	23.71	≤ 2	0.30	0.09	0.42
5	16QAM 12-6	23.89	23.89	23.73		0.26	0.07	0.40
5	16QAM 12-11	23.95	23.88	23.75		0.20	0.08	0.38
5	16QAM 25-0	23.91	23.71	23.77		0.24	0.25	0.36
Channel		19965	20175	20385		19965	20175	20385
Frequency (MHz)		1711.5	1732.5	1753.5		1711.5	1732.5	1753.5
3	QPSK 1-0	23.98	23.95	24.01	0	0.00	0.00	0.00
3	QPSK 1-7	23.92	23.65	23.97		0.06	0.30	0.04
3	QPSK 1-14	23.88	23.89	23.87		0.10	0.06	0.14
3	QPSK 8-0	23.90	23.77	23.86	≤ 1	0.08	0.18	0.15
3	QPSK 8-4	23.88	23.77	23.90		0.10	0.18	0.11
3	QPSK 8-7	23.95	23.94	23.82		0.03	0.01	0.19
3	QPSK 15-0	23.89	23.69	23.81		0.09	0.26	0.20
3	16QAM 1-0	23.97	23.85	23.98	≤ 1	0.01	0.10	0.03
3	16QAM 1-7	23.81	23.69	23.97		0.17	0.26	0.04
3	16QAM 1-14	23.81	23.77	23.66		0.17	0.18	0.35
3	16QAM 8-0	23.96	23.73	23.67	≤ 2	0.02	0.22	0.34
3	16QAM 8-4	23.91	23.72	23.67		0.07	0.23	0.34
3	16QAM 8-7	23.87	23.84	23.66		0.11	0.11	0.35
3	16QAM 15-0	23.84	23.77	23.72		0.14	0.18	0.29
Channel		19957	20175	20393		19957	20175	20393
Frequency (MHz)		1710.7	1732.5	1754.3		1710.7	1732.5	1754.3
1.4	QPSK 1-0	24.15	23.95	23.97	0	0.00	0.00	0.00
1.4	QPSK 1-2	24.07	23.77	23.80		0.08	0.18	0.17
1.4	QPSK 1-5	24.00	23.84	23.96		0.15	0.11	0.01
1.4	QPSK 3-0	24.11	23.88	23.50		0.04	0.07	0.47
1.4	QPSK 3-1	24.06	23.84	23.90		0.09	0.11	0.07
1.4	QPSK 3-2	24.01	23.85	23.91		0.14	0.10	0.06
1.4	QPSK 6-0	23.94	23.82	23.44	≤ 1	0.21	0.13	0.53
1.4	16QAM 1-0	24.04	23.91	23.94	≤ 1	0.11	0.04	0.03
1.4	16QAM 1-2	23.88	23.88	23.70		0.27	0.07	0.27
1.4	16QAM 1-5	23.56	23.90	23.72		0.59	0.05	0.25
1.4	16QAM 3-0	24.00	23.90	23.78		0.15	0.05	0.19
1.4	16QAM 3-1	24.03	23.89	23.89		0.12	0.06	0.08
1.4	16QAM 3-2	23.93	23.88	23.87		0.22	0.07	0.10
1.4	16QAM 6-0	23.98	23.82	23.77	≤ 2	0.17	0.13	0.20

LTE Band 5								
BW [MHz]	Mod / RB (Size - Offset)	Average Power. (dBm)			3GPP MPR	MPR Result (dB)		
		Low Ch	Mid Ch	High Ch		Low Ch	Mid Ch	High Ch
Channel		20450	20525	20600		20450	20525	20600
Frequency (MHz)		829	836.5	844		829	836.5	844
10	QPSK 1-0	23.63	23.64	23.60	0	0.00	0.00	0.00
10	QPSK 1-24	23.54	23.44	23.33		0.09	0.20	0.27
10	QPSK 1-49	23.57	23.52	23.55		0.06	0.12	0.05
10	QPSK 25-0	23.52	23.57	23.36	≤ 1	0.11	0.07	0.24
10	QPSK 25-12	23.50	23.51	23.25		0.13	0.13	0.35
10	QPSK 25-24	23.51	23.41	23.04		0.12	0.23	0.56
10	QPSK 50-0	23.40	23.42	23.18		0.23	0.22	0.42
10	16QAM 1-0	23.49	23.50	23.44	≤ 1	0.14	0.14	0.16
10	16QAM 1-24	23.48	23.44	23.43		0.15	0.20	0.17
10	16QAM 1-49	23.45	23.45	23.04		0.18	0.19	0.56
10	16QAM 25-0	22.63	22.42	22.41	≤ 2	1.00	1.22	1.19
10	16QAM 25-12	22.59	22.40	22.19		1.04	1.24	1.41
10	16QAM 25-24	22.42	22.67	22.06		1.21	0.97	1.54
10	16QAM 50-0	22.29	22.17	22.09		1.34	1.47	1.51
Channel		20425	20525	20625		20425	20525	20625
Frequency (MHz)		826.5	836.5	846.5		826.5	836.5	846.5
5	QPSK 1-0	23.74	23.62	23.36	0	0.00	0.00	0.00
5	QPSK 1-12	23.66	23.33	23.34		0.08	0.29	0.02
5	QPSK 1-24	23.67	23.61	23.13		0.07	0.01	0.23
5	QPSK 12-0	23.69	23.52	23.26	≤ 1	0.05	0.10	0.10
5	QPSK 12-6	23.71	23.48	23.22		0.03	0.14	0.14
5	QPSK 12-11	23.61	23.48	23.29		0.13	0.14	0.07
5	QPSK 25-0	23.61	23.39	23.04		0.13	0.23	0.32
5	16QAM 1-0	23.71	23.60	23.27	≤ 1	0.03	0.02	0.09
5	16QAM 1-12	23.68	23.53	23.06		0.06	0.09	0.30
5	16QAM 1-24	23.48	23.56	23.26		0.26	0.06	0.10
5	16QAM 12-0	22.58	22.52	22.32	≤ 2	1.16	1.10	1.04
5	16QAM 12-6	22.63	22.58	22.20		1.11	1.04	1.16
5	16QAM 12-11	22.67	22.54	22.30		1.07	1.08	1.06
5	16QAM 25-0	22.42	22.32	22.03		1.32	1.30	1.33
Channel		20415	20525	20635		20415	20525	20635
Frequency (MHz)		825.5	836.5	847.5		825.5	836.5	847.5
3	QPSK 1-0	23.72	23.57	23.50	0	0.00	0.00	0.00
3	QPSK 1-7	23.64	23.43	23.19		0.08	0.14	0.31
3	QPSK 1-14	23.63	23.48	23.21		0.09	0.09	0.29
3	QPSK 8-0	23.62	23.52	23.17	≤ 1	0.10	0.05	0.33
3	QPSK 8-4	23.56	23.42	23.36		0.16	0.15	0.14
3	QPSK 8-7	23.62	23.41	23.25		0.10	0.16	0.25
3	QPSK 15-0	23.62	23.46	23.26		0.10	0.11	0.24
3	16QAM 1-0	23.70	23.44	23.40	≤ 1	0.02	0.13	0.10
3	16QAM 1-7	23.54	23.35	23.34		0.18	0.22	0.16
3	16QAM 1-14	23.69	23.36	23.10		0.03	0.21	0.40
3	16QAM 8-0	22.56	22.47	22.16	≤ 2	1.16	1.10	1.34
3	16QAM 8-4	22.41	22.31	22.22		1.31	1.26	1.28
3	16QAM 8-7	22.59	22.30	22.21		1.13	1.27	1.29
3	16QAM 15-0	22.36	22.48	22.18		1.36	1.09	1.32
Channel		20407	20525	20643		20407	20525	20643
Frequency (MHz)		824.7	836.5	848.3		824.7	836.5	848.3
1.4	QPSK 1-0	23.78	23.54	23.38	0	0.00	0.00	0.00
1.4	QPSK 1-2	23.71	23.44	23.37		0.07	0.10	0.01
1.4	QPSK 1-5	23.72	23.40	23.21		0.06	0.14	0.17
1.4	QPSK 3-0	23.66	23.48	23.31		0.12	0.06	0.07
1.4	QPSK 3-1	23.67	23.51	23.32		0.11	0.03	0.06
1.4	QPSK 3-2	23.70	23.41	23.24		0.08	0.13	0.14
1.4	QPSK 6-0	23.75	23.45	23.25	≤ 1	0.03	0.09	0.13
1.4	16QAM 1-0	23.77	23.47	23.37	≤ 1	0.01	0.07	0.01
1.4	16QAM 1-2	23.47	23.12	23.29		0.31	0.42	0.09
1.4	16QAM 1-5	23.67	23.41	23.25		0.11	0.13	0.13
1.4	16QAM 3-0	23.66	23.24	23.32		0.12	0.30	0.06
1.4	16QAM 3-1	23.64	23.39	23.35		0.14	0.15	0.03
1.4	16QAM 3-2	23.76	23.38	23.24		0.02	0.16	0.14
1.4	16QAM 6-0	22.61	22.56	22.17	≤ 2	1.17	0.98	1.21

LTE Band 17								
BW [MHz]	Mod / RB (Size - Offset)	Average Power. (dBm)			3GPP MPR	MPR Result (dB)		
		Low Ch	Mid Ch	High Ch		Low Ch	Mid Ch	High Ch
Channel		23780	23790	23800		23780	23790	23800
Frequency (MHz)		709	710	711		709	710	711
10	QPSK 1-0	23.62	23.73	23.63	0	0.32	0.30	0.06
10	QPSK 1-24	23.86	23.63	23.48		0.08	0.40	0.21
10	QPSK 1-49	23.94	24.03	23.69		0.00	0.00	0.00
10	QPSK 25-0	23.26	23.67	23.00	≤ 1	0.68	0.36	0.69
10	QPSK 25-12	23.30	23.25	23.31		0.64	0.78	0.38
10	QPSK 25-24	23.50	23.47	23.32		0.44	0.56	0.37
10	QPSK 50-0	23.26	23.29	23.15		0.68	0.74	0.54
10	16QAM 1-0	23.33	23.40	23.13	≤ 1	0.61	0.63	0.56
10	16QAM 1-24	23.38	23.42	23.46		0.56	0.61	0.23
10	16QAM 1-49	23.62	23.75	23.50		0.32	0.28	0.19
10	16QAM 25-0	22.24	22.68	22.65	≤ 2	1.70	1.35	1.04
10	16QAM 25-12	22.61	22.27	22.28		1.33	1.76	1.41
10	16QAM 25-24	22.49	22.45	22.41		1.45	1.58	1.28
10	16QAM 50-0	22.31	22.22	22.19		1.63	1.81	1.50
Channel		23755	23790	23825		23755	23790	23825
Frequency (MHz)		706.5	710	713.5		706.5	710	713.5
5	QPSK 1-0	24.02	23.52	23.31	0	0.04	0.19	0.45
5	QPSK 1-12	23.59	23.65	23.41		0.47	0.06	0.35
5	QPSK 1-24	24.06	23.71	23.76		0.00	0.00	0.00
5	QPSK 12-0	23.36	23.64	23.40	≤ 1	0.70	0.07	0.36
5	QPSK 12-6	23.27	23.62	23.37		0.79	0.09	0.39
5	QPSK 12-11	23.69	23.31	23.74		0.37	0.40	0.02
5	QPSK 25-0	23.76	23.15	23.12		0.30	0.56	0.64
5	16QAM 1-0	23.55	23.50	23.10	≤ 1	0.51	0.21	0.66
5	16QAM 1-12	23.85	23.42	23.29		0.21	0.29	0.47
5	16QAM 1-24	23.87	23.51	23.54		0.19	0.20	0.22
5	16QAM 12-0	22.80	22.60	22.40	≤ 2	1.26	1.11	1.36
5	16QAM 12-6	22.79	22.80	22.44		1.27	0.91	1.32
5	16QAM 12-11	22.63	22.39	22.06		1.43	1.32	1.70
5	16QAM 25-0	22.12	22.25	22.14		1.94	1.46	1.62

<WLAN 2.4GHz Conducted Power>

General 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. Per KDB 248227 D01 v01r02, 11g average output power is higher than 1/4dB higher than 11b mode, thus the SAR will be verified at the highest RF exposure position found in 802.11b SAR testing.
4. Per KDB 248227 D01 v01r02, 11n-HT20 output power is less than 1/4dB higher than 11b mode, thus the SAR can be excluded.

WLAN 2.4GHz Band 802.11b Average Power (dBm)					
Channel	Frequency (MHz)	Data Rate (bps)			
		1M bps	2M bps	5.5M bps	11M bps
CH 01	2412	10.95	11.12	11.04	10.90
CH 06	2437	12.11	12.15	12.15	12.16
CH 11	2462	12.22	12.21	11.95	12.10

WLAN 2.4GHz Band 802.11g Average Power (dBm)									
Channel	Frequency (MHz)	Data Rate (bps)							
		6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
CH 01	2412	12.41	12.49	12.43	12.32	11.42	12.56	12.36	12.62
CH 06	2437	13.04	12.89	13.30	12.96	13.41	13.24	13.08	13.16
CH 11	2462	13.47	13.52	13.60	13.62	13.76	13.56	13.55	13.27

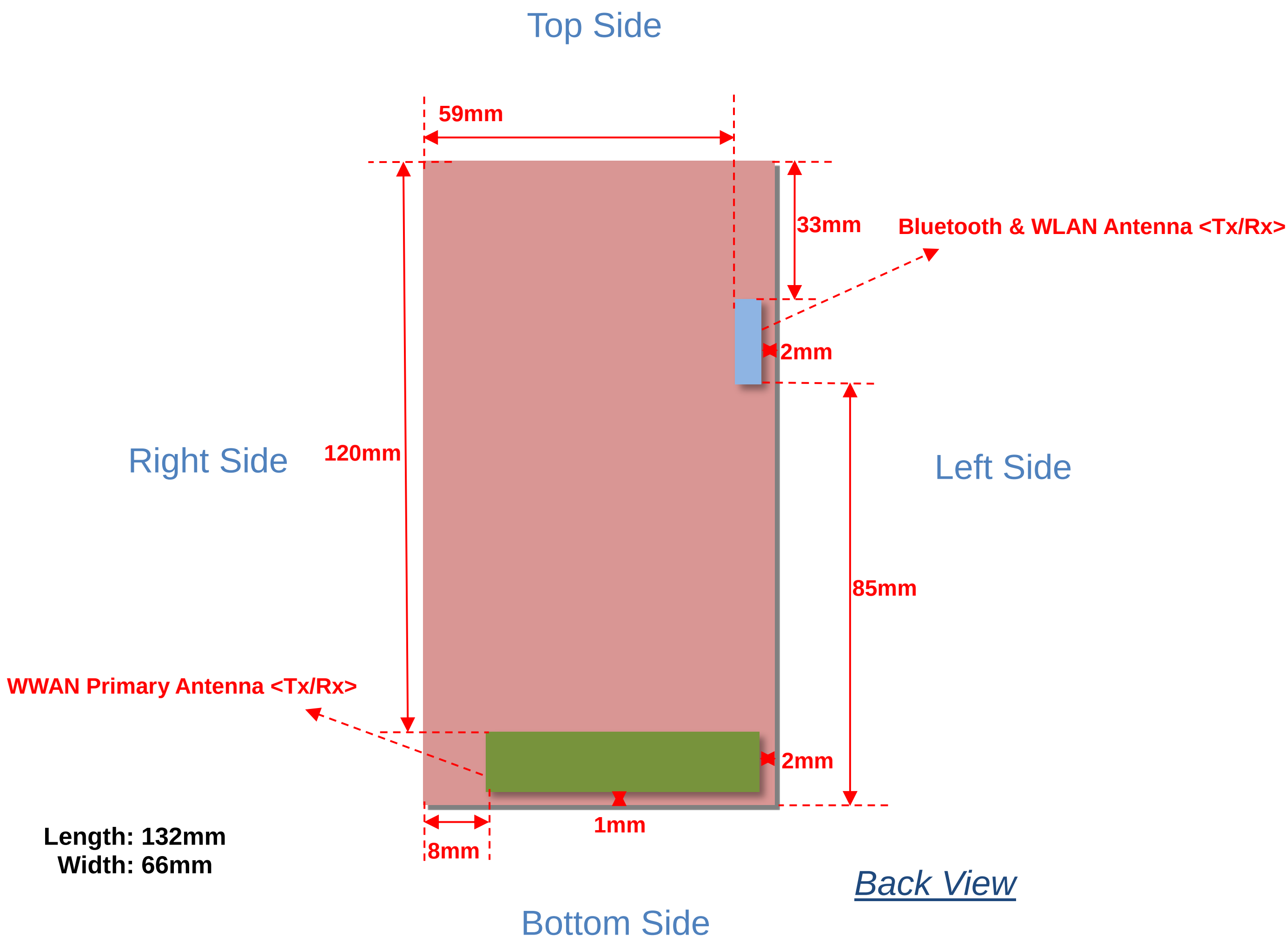
WLAN 2.4GHz Band 802.11n-HT20 Average Power (dBm)									
Channel	Frequency (MHz)	MCS Index							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 01	2412	11.06	11.35	10.79	10.89	11.30	11.25	11.24	11.36
CH 06	2437	11.93	11.95	12.12	12.29	12.16	12.35	12.31	12.15
CH 11	2462	11.73	11.85	12.15	11.95	12.19	12.15	12.07	12.16

<Bluetooth Conducted Power>

Bluetooth Average Power (dBm)										
Channel	Frequency (MHz)	Data Rate								
		DH1	DH3	DH5	2DH1	2DH3	2DH5	3DH1	3DH3	3DH5
CH 00	2402	-2.79	-2.64	-2.70	-3.05	-3.06	-3.08	-3.05	-3.08	-2.92
CH 39	2441	-1.07	-0.94	-0.92	-2.24	-2.44	-2.25	-2.20	-2.25	-2.29
CH 78	2480	-1.20	-1.07	-0.98	-2.46	-2.45	-2.53	-2.32	-2.49	-2.43

Channel	Frequency (MHz)	Average power (dBm)
		Mode
		BT v4.0 LE, GFSK
CH 00	2402	-1.74
CH 19	2440	0.44
CH 39	2480	-0.49

11. Exposure Positions Consideration



Antennas	Wireless Interface
WWAN Primary Antenna <Tx / Rx>	GSM850 GSM1900 WCDMA Band V WCDMA Band II LTE Band 2 LTE Band 4 LTE Band 5 LTE Band 17
Bluetooth&WLAN Antenna <Tx / Rx>	WLAN 2.4GHz Band Bluetooth

Distance of the Antenna to the EUT surface/edge Test distance: 10 mm						
Antennas	**Back**	**Front**	**Top Side**	**Bottom Side**	**Right Side**	**Left Side**
WWAN Primary	≤ 25mm	≤ 25mm	120mm	≤ 25mm	≤ 25mm	≤ 25mm
Bluetooth & WLAN	≤ 25mm	≤ 25mm	33mm	85mm	59mm	≤ 25mm

Positions for SAR tests; Hotspot mode Test distance: 10 mm						
Antennas	**Back**	**Front**	**Top Side**	**Bottom Side**	**Right Side**	**Left Side**
WWAN Primary	Yes	Yes	NO	Yes	Yes	Yes
Bluetooth & WLAN	Yes	Yes	NO	NO	NO	Yes

Note:

1. Head/Body-worn/Hotspot mode SAR assessments are required.
2. Referring to KDB 941225 D06 v01, 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
3. Per KDB 447498 D01v05, for handsets the *test separation distance* is determined by the smallest distance between the outer surface of the device and the user; which is 0mm for head SAR, 10mm for hotspot SAR and 10mm for body-worn SAR.
4. If the test separation distance (antenna-user) is < 5mm, 5mm is used for excluded SAR calculation
5. For minimum test separation distance ≤50mm, Bluetooth standalone SAR test exclusion power threshold is 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. The formula sets the maximum RF power threshold, and the transmitter with RF power equal or less than the power threshold, SAR testing is not required

Exposure Position	Wireless Interface	**Bluetooth**
	Tune-up Maximum power (dBm)	1
Head	Antenna to user (mm)	5
	SAR exclusion threshold	0.4
	SAR testing required?	NO
Body 1 cm(Hotspot)	Antenna to user (mm)	10
	SAR exclusion threshold	0.2
	SAR testing required?	NO
Body 1 cm(Body Worn)	Antenna to user (mm)	10
	SAR exclusion threshold	0.2
	SAR testing required?	NO

12. SAR Test Results

General Note:

1. Per KDB 447498 D01v05, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   Scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   Reported SAR(W/kg)= Measured SAR(W/kg) Scaling Factor*
2. Per KDB 447498 D01v05, for each exposure position, if the highest output channel reported SAR ≤0.8W/kg, other channels SAR testing are not necessary

12.1 Test Records for Head SAR Test

<GSM SAR>

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#01	GSM850	GSM	Right Cheek	128	824.2	32.75	33	1.059	0.06	0.464	0.491
#02	GSM850	GSM	Right Tilted	128	824.2	32.75	33	1.059	-0.04	0.380	0.403
#03	**GSM850**	**GSM**	**Left Cheek**	**128**	**824.2**	**32.75**	**33**	**1.059**	**0.07**	**0.514**	**0.544**
#04	GSM850	GSM	Left Tilted	128	824.2	32.75	33	1.059	0.13	0.378	0.400
#05	**GSM1900**	**GSM**	**Right Cheek**	**661**	**1880**	**30.33**	**30.5**	**1.040**	**0.02**	**0.389**	**0.405**
#06	GSM1900	GSM	Right Tilted	661	1880	30.33	30.5	1.040	0.04	0.130	0.135
#07	GSM1900	GSM	Left Cheek	661	1880	30.33	30.5	1.040	0.03	0.185	0.192
#08	GSM1900	GSM	Left Tilted	661	1880	30.33	30.5	1.040	-0.09	0.142	0.148

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#09	WCDMA Band V	RMC 12.2K	Right Cheek	4233	846.6	24.63	25	1.089	0.03	0.474	0.516
#10	WCDMA Band V	RMC 12.2K	Right Tilted	4233	846.6	24.63	25	1.089	0.09	0.410	0.446
#11	**WCDMA Band V**	**RMC 12.2K**	**Left Cheek**	**4233**	**846.6**	**24.63**	**25**	**1.089**	**0.15**	**0.521**	**0.567**
#12	WCDMA Band V	RMC 12.2K	Left Tilted	4233	846.6	24.63	25	1.089	0.06	0.400	0.436
#13	**WCDMA Band II**	**RMC 12.2K**	**Right Cheek**	**9400**	**1880**	**22.54**	**23**	**1.112**	**-0.06**	**0.591**	**0.657**
#14	WCDMA Band II	RMC 12.2K	Right Tilted	9400	1880	22.54	23	1.112	0.01	0.184	0.205
#15	WCDMA Band II	RMC 12.2K	Left Cheek	9400	1880	22.54	23	1.112	0.05	0.254	0.282
#16	WCDMA Band II	RMC 12.2K	Left Tilted	9400	1880	22.54	23	1.112	-0.01	0.194	0.216

<LTE SAR>

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#17	LTE Band 2	QPSK	20M	1	0	Right Cheek	18900	1880	23.19	23.5	1.074	0.02	0.605	0.650
#18	LTE Band 2	QPSK	20M	1	0	Right Tilted	18900	1880	23.19	23.5	1.074	0.14	0.191	0.205
#19	LTE Band 2	QPSK	20M	1	0	Left Cheek	18900	1880	23.19	23.5	1.074	0.06	0.282	0.303
#20	LTE Band 2	QPSK	20M	1	0	Left Tilted	18900	1880	23.19	23.5	1.074	-0.02	0.227	0.244
#21	**LTE Band 2**	**QPSK**	**20M**	**50**	**0**	**Right Cheek**	**18900**	**1880**	**22.96**	**23.5**	**1.132**	**0.02**	**0.577**	**0.653**
#22	LTE Band 2	QPSK	20M	50	0	Right Tilted	18900	1880	22.96	23.5	1.132	0.14	0.182	0.206
#23	LTE Band 2	QPSK	20M	50	0	Left Cheek	18900	1880	22.96	23.5	1.132	0.03	0.270	0.306
#24	LTE Band 2	QPSK	20M	50	0	Left Tilted	18900	1880	22.96	23.5	1.132	0.08	0.207	0.234
#25	**LTE Band 4**	**QPSK**	**20M**	**1**	**0**	**Right Cheek**	**20175**	**1732.5**	**24.17**	**24.5**	**1.079**	**0.13**	**0.679**	**0.733**
#26	LTE Band 4	QPSK	20M	1	0	Right Tilted	20175	1732.5	24.17	24.5	1.079	-0.07	0.300	0.324
#27	LTE Band 4	QPSK	20M	1	0	Left Cheek	20175	1732.5	24.17	24.5	1.079	0.05	0.534	0.576
#28	LTE Band 4	QPSK	20M	1	0	Left Tilted	20175	1732.5	24.17	24.5	1.079	0.04	0.344	0.371
#29	LTE Band 4	QPSK	20M	50	0	Right Cheek	20175	1732.5	23.67	24	1.079	-0.08	0.650	0.701
#30	LTE Band 4	QPSK	20M	50	0	Right Tilted	20175	1732.5	23.67	24	1.079	0.05	0.276	0.298
#31	LTE Band 4	QPSK	20M	50	0	Left Cheek	20175	1732.5	23.67	24	1.079	-0.06	0.513	0.553
#32	LTE Band 4	QPSK	20M	50	0	Left Tilted	20175	1732.5	23.67	24	1.079	0.04	0.327	0.353
#33	LTE Band 5	QPSK	10M	1	0	Right Cheek	20525	836.5	23.64	24	1.086	0.08	0.446	0.485
#34	LTE Band 5	QPSK	10M	1	0	Right Tilted	20525	836.5	23.64	24	1.086	0.06	0.370	0.402
#35	**LTE Band 5**	**QPSK**	**10M**	**1**	**0**	**Left Cheek**	**20525**	**836.5**	**23.64**	**24**	**1.086**	**0.03**	**0.519**	**0.564**
#36	LTE Band 5	QPSK	10M	1	0	Left Tilted	20525	836.5	23.64	24	1.086	0.10	0.367	0.399
#37	LTE Band 5	QPSK	10M	25	0	Right Cheek	20525	836.5	23.57	24	1.104	0.06	0.378	0.417
#38	LTE Band 5	QPSK	10M	25	0	Right Tilted	20525	836.5	23.57	24	1.104	0.11	0.322	0.356
#39	LTE Band 5	QPSK	10M	25	0	Left Cheek	20525	836.5	23.57	24	1.104	0.02	0.431	0.476
#40	LTE Band 5	QPSK	10M	25	0	Left Tilted	20525	836.5	23.57	24	1.104	0.09	0.324	0.358
#41	LTE Band 17	QPSK	10M	1	49	Right Cheek	23790	710	24.03	24.5	1.114	0.04	0.318	0.354
#42	LTE Band 17	QPSK	10M	1	49	Right Tilted	23790	710	24.03	24.5	1.114	0.01	0.202	0.225
#43	LTE Band 17	QPSK	10M	1	49	Left Cheek	23790	710	24.03	24.5	1.114	0.13	0.329	0.367
#44	LTE Band 17	QPSK	10M	1	49	Left Tilted	23790	710	24.03	24.5	1.114	0.04	0.189	0.211
#45	LTE Band 17	QPSK	10M	25	0	Right Cheek	23790	710	23.67	24	1.079	0.08	0.413	0.446
#46	LTE Band 17	QPSK	10M	25	0	Right Tilted	23790	710	23.67	24	1.079	0.06	0.264	0.285
#47	**LTE Band 17**	**QPSK**	**10M**	**25**	**0**	**Left Cheek**	**23790**	**710**	**23.67**	**24**	**1.079**	**0.01**	**0.434**	**0.468**
#48	LTE Band 17	QPSK	10M	25	0	Left Tilted	23790	710	23.67	24	1.079	0.02	0.260	0.281

Note:

1. Per KDB 941225 D05v02, 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.
2. 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 D05v02, 16QAM SAR testing is not required.
3. Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth.

<WLAN 2.4GHz Band SAR>

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Duty Cycle %	Duty Cycle Compensate Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#49	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	11	2462	12.22	12.5	1.067	97.67	1.024	-0.07	0.088	0.096
#50	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	11	2462	12.22	12.5	1.067	97.67	1.024	0.05	0.051	0.055
#51	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	11	2462	12.22	12.5	1.067	97.67	1.024	-0.05	0.054	0.059
#52	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	11	2462	12.22	12.5	1.067	97.67	1.024	0.03	0.034	0.036
#53	**WLAN2.4GHz**	**802.11g 24Mbps**	**Right Cheek**	**11**	**2462**	**13.76**	**14**	**1.057**	**70.35**	**1.421**	**-0.02**	**0.100**	**0.150**

12.2 Test Records for Hotspot SAR Test

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#54	GSM850	GPRS (2 Tx slots)	Front	1	128	824.2	32.58	33	1.102	-0.05	1.020	1.124
#55	GSM850	GPRS (2 Tx slots)	Back	1	128	824.2	32.58	33	1.102	-0.15	1.190	1.311
#56	GSM850	GPRS (2 Tx slots)	Left Side	1	128	824.2	32.58	33	1.102	-0.01	1.250	1.377
#58	GSM850	GPRS (2 Tx slots)	Right Side	1	128	824.2	32.58	33	1.102	-0.07	1.070	1.179
#59	GSM850	GPRS (2 Tx slots)	Bottom Side	1	128	824.2	32.58	33	1.102	0.01	0.180	0.198
#60	GSM850	GPRS (2 Tx slots)	Front	1	189	836.4	32.54	33	1.112	0.03	0.936	1.041
#61	GSM850	GPRS (2 Tx slots)	Front	1	251	848.8	32.44	33	1.138	0.06	0.800	0.910
#62	GSM850	GPRS (2 Tx slots)	Back	1	189	836.4	32.54	33	1.112	0.05	1.110	1.234
#63	GSM850	GPRS (2 Tx slots)	Back	1	251	848.8	32.44	33	1.138	0.03	0.795	0.904
#64	**GSM850**	**GPRS (2 Tx slots)**	**Left Side**	**1**	**189**	**836.4**	**32.54**	**33**	**1.112**	**0.02**	**1.240**	**1.379**
#65	GSM850	GPRS (2 Tx slots)	Left Side	1	251	848.8	32.44	33	1.138	0.08	1.120	1.274
#66	GSM850	GPRS (2 Tx slots)	Right Side	1	189	836.4	32.54	33	1.112	-0.03	1.020	1.134
#67	GSM850	GPRS (2 Tx slots)	Right Side	1	251	848.8	32.44	33	1.138	-0.09	0.856	0.974
#69	GSM1900	GPRS (2 Tx slots)	Front	1	661	1880	30.27	30.5	1.054	0.06	0.679	0.716
#70	GSM1900	GPRS (2 Tx slots)	Back	1	661	1880	30.27	30.5	1.054	0.08	0.872	0.919
#71	GSM1900	GPRS (2 Tx slots)	Left Side	1	661	1880	30.27	30.5	1.054	0.09	0.177	0.187
#72	GSM1900	GPRS (2 Tx slots)	Right Side	1	661	1880	30.27	30.5	1.054	0.03	0.429	0.452
#73	GSM1900	GPRS (2 Tx slots)	Bottom Side	1	661	1880	30.27	30.5	1.054	-0.01	0.908	0.957
#74	GSM1900	GPRS (2 Tx slots)	Back	1	512	1850.2	30.06	30.5	1.107	0.15	1.050	1.162
#75	GSM1900	GPRS (2 Tx slots)	Back	1	810	1909.8	30.13	30.5	1.089	0.14	0.960	1.045
#76	GSM1900	GPRS (2 Tx slots)	Bottom Side	1	512	1850.2	30.06	30.5	1.107	0.04	0.885	0.979
#77	**GSM1900**	**GPRS (2 Tx slots)**	**Bottom Side**	**1**	**810**	**1909.8**	**30.13**	**30.5**	**1.089**	**0.09**	**1.210**	**1.318**

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#80	WCDMA Band V	RMC 12.2K	Front	1	4233	846.6	24.63	25	1.089	-0.04	0.605	0.659
#81	WCDMA Band V	RMC 12.2K	Back	1	4233	846.6	24.63	25	1.089	-0.12	0.654	0.712
#82	WCDMA Band V	RMC 12.2K	Left Side	1	4233	846.6	24.63	25	1.089	-0.08	0.885	0.964
#83	WCDMA Band V	RMC 12.2K	Right Side	1	4233	846.6	24.63	25	1.089	-0.05	0.662	0.721
#84	WCDMA Band V	RMC 12.2K	Bottom Side	1	4233	846.6	24.63	25	1.089	0.16	0.145	0.158
#85	**WCDMA Band V**	**RMC 12.2K**	**Left Side**	**1**	**4132**	**826.4**	**24.55**	**25**	**1.109**	**0.04**	**1.110**	**1.231**
#87	WCDMA Band V	RMC 12.2K	Left Side	1	4182	836.4	24.58	25	1.102	-0.07	0.919	1.012
#174	WCDMA Band V	HSDPA Subtest-1	Left Side	1	4233	846.6	23.35	24	1.161	0.02	0.661	0.768
#181	WCDMA Band V	DC-HSDPA Subtest-1	Left Side	1	4233	846.6	23.11	24	1.227	0.06	0.599	0.735
#175	WCDMA Band V	HSUPA Subtest-5	Left Side	1	4233	846.6	23.09	24	1.233	-0.03	0.621	0.766
#88	WCDMA Band II	RMC 12.2K	Front	1	9400	1880	22.54	23	1.112	-0.01	0.624	0.694
#89	WCDMA Band II	RMC 12.2K	Back	1	9400	1880	22.54	23	1.112	0.04	0.681	0.757
#90	WCDMA Band II	RMC 12.2K	Left Side	1	9400	1880	22.54	23	1.112	0.17	0.144	0.160
#91	WCDMA Band II	RMC 12.2K	Right Side	1	9400	1880	22.54	23	1.112	0.08	0.382	0.425
#92	WCDMA Band II	RMC 12.2K	Bottom Side	1	9400	1880	22.54	23	1.112	0.02	0.939	1.044
#93	WCDMA Band II	RMC 12.2K	Bottom Side	1	9262	1852.4	22.31	23	1.172	0.04	0.801	0.939
#94	**WCDMA Band II**	**RMC 12.2K**	**Bottom Side**	**1**	**9538**	**1907.6**	**22.52**	**23**	**1.117**	**0.13**	**1.200**	**1.340**
#97	WCDMA Band II	HSDPA Subtest-1	Bottom Side	1	9538	1907.6	20.99	21.5	1.125	0.01	0.98	1.102
#179	WCDMA Band II	HSDPA Subtest-1	Bottom Side	1	9262	1852.4	20.83	21.5	1.167	0.05	0.633	0.739
#180	WCDMA Band II	HSDPA Subtest-1	Bottom Side	1	9400	1880	20.95	21.5	1.135	0.09	0.709	0.805
#182	WCDMA Band II	DC-HSDPA Subtest-1	Bottom Side	1	9538	1907.6	20.76	21	1.057	0.02	0.724	0.765
#98	WCDMA Band II	HSUPA Subtest-5	Bottom Side	1	9538	1907.6	21.10	21.5	1.096	0.07	0.723	0.793

Note: Per KDB 941225 D01, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/DC-HSDPA/HSUPA output power is < 0.25dB higher than RMC, and reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/DC-HSDPA/HSUPA SAR evaluation can be excluded. If Reported SAR with RMC 12.2kbps setting is > 1.2W/kg, HSDPA/DC-HSDPA subtest-1 and HSUPA subtest-5 SAR is additionally tested at that exposure position.

<LTE SAR>

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#99	LTE Band 2	QPSK	20M	1	0	Front	1	18900	1880	23.19	23.5	1.074	0.12	0.663	0.712
#100	LTE Band 2	QPSK	20M	1	0	Back	1	18900	1880	23.19	23.5	1.074	0.08	0.839	0.901
#101	LTE Band 2	QPSK	20M	1	0	Left Side	1	18900	1880	23.19	23.5	1.074	0.11	0.152	0.163
#102	LTE Band 2	QPSK	20M	1	0	Right Side	1	18900	1880	23.19	23.5	1.074	0.07	0.449	0.482
#103	LTE Band 2	QPSK	20M	1	0	Bottom Side	1	18900	1880	23.19	23.5	1.074	0.06	1.06	1.138
#104	LTE Band 2	QPSK	20M	1	0	Back	1	18700	1860	23.18	23.5	1.076	0.14	0.959	1.032
#105	LTE Band 2	QPSK	20M	1	0	Back	1	19100	1900	23.17	23.5	1.079	0.01	0.854	0.921
#106	LTE Band 2	QPSK	20M	1	0	Bottom Side	1	18700	1860	23.18	23.5	1.076	0.07	0.779	0.839
#107	LTE Band 2	QPSK	20M	1	0	Bottom Side	1	19100	1900	23.17	23.5	1.079	0.06	1.050	1.133
#109	LTE Band 2	QPSK	20M	50	0	Front	1	18900	1880	22.96	23.5	1.132	0.07	0.622	0.704
#110	LTE Band 2	QPSK	20M	50	0	Back	1	18900	1880	22.96	23.5	1.132	0.01	0.748	0.847
#111	LTE Band 2	QPSK	20M	50	0	Left Side	1	18900	1880	22.96	23.5	1.132	-0.09	0.154	0.174
#112	LTE Band 2	QPSK	20M	50	0	Right Side	1	18900	1880	22.96	23.5	1.132	0.02	0.413	0.468
#113	LTE Band 2	QPSK	20M	50	0	Bottom Side	1	18900	1880	22.96	23.5	1.132	0.14	1.000	1.132
#114	LTE Band 2	QPSK	20M	50	0	Back	1	18700	1860	22.75	23.5	1.189	-0.03	0.890	1.058
#115	LTE Band 2	QPSK	20M	50	0	Back	1	19100	1900	22.91	23.5	1.146	0.01	0.765	0.876
#116	LTE Band 2	QPSK	20M	50	0	Bottom Side	1	18700	1860	22.75	23.5	1.189	0.04	0.700	0.832
#117	**LTE Band 2**	**QPSK**	**20M**	**50**	**0**	**Bottom Side**	**1**	**19100**	**1900**	**22.91**	**23.5**	**1.146**	**0.09**	**1.010**	**1.157**
#118	LTE Band 2	QPSK	20M	100	0	Front	1	18900	1880	22.94	23.5	1.138	-0.08	0.667	0.759
#119	LTE Band 2	QPSK	20M	100	0	Back	1	18900	1880	22.94	23.5	1.138	0.11	0.761	0.866
#120	LTE Band 2	QPSK	20M	100	0	Left Side	1	18900	1880	22.94	23.5	1.138	0.13	0.151	0.172
#121	LTE Band 2	QPSK	20M	100	0	Right Side	1	18900	1880	22.94	23.5	1.138	0.01	0.444	0.505
#122	LTE Band 2	QPSK	20M	100	0	Bottom Side	1	18900	1880	22.94	23.5	1.138	0.17	1.000	1.138
#123	LTE Band 4	QPSK	20M	1	0	Front	1	20175	1732.5	24.17	24.5	1.079	0.06	0.937	1.011
#124	LTE Band 4	QPSK	20M	1	0	Back	1	20175	1732.5	24.17	24.5	1.079	-0.07	1.120	1.208
#125	LTE Band 4	QPSK	20M	1	0	Left Side	1	20175	1732.5	24.17	24.5	1.079	0.09	0.157	0.169
#126	LTE Band 4	QPSK	20M	1	0	Right Side	1	20175	1732.5	24.17	24.5	1.079	-0.02	0.408	0.440
#127	LTE Band 4	QPSK	20M	1	0	Bottom Side	1	20175	1732.5	24.17	24.5	1.079	0.04	0.447	0.482
#128	LTE Band 4	QPSK	20M	1	0	Front	1	20050	1720	24.06	24.5	1.107	0.08	1.050	1.162
#129	LTE Band 4	QPSK	20M	1	0	Front	1	20300	1745	23.72	24.5	1.197	0.06	0.993	1.188
#130	LTE Band 4	QPSK	20M	1	0	Back	1	20050	1720	24.06	24.5	1.107	0.12	1.190	1.317
#132	**LTE Band 4**	**QPSK**	**20M**	**1**	**0**	**Back**	**1**	**20300**	**1745**	**23.72**	**24.5**	**1.197**	**-0.11**	**1.110**	**1.328**
#133	LTE Band 4	QPSK	20M	50	0	Front	1	20175	1732.5	23.67	24	1.079	0.01	0.899	0.970
#134	LTE Band 4	QPSK	20M	50	0	Back	1	20175	1732.5	23.67	24	1.079	0.07	1.030	1.111
#135	LTE Band 4	QPSK	20M	50	0	Left Side	1	20175	1732.5	23.67	24	1.079	-0.04	0.146	0.158
#136	LTE Band 4	QPSK	20M	50	0	Right Side	1	20175	1732.5	23.67	24	1.079	0.09	0.383	0.413
#137	LTE Band 4	QPSK	20M	50	0	Bottom Side	1	20175	1732.5	23.67	24	1.079	0.05	0.412	0.445
#138	LTE Band 4	QPSK	20M	50	0	Front	1	20050	1720	23.65	24	1.084	0.06	0.917	0.994
#139	LTE Band 4	QPSK	20M	50	0	Front	1	20300	1745	23.63	24	1.089	0.08	0.929	1.012
#140	LTE Band 4	QPSK	20M	50	0	Back	1	20050	1720	23.65	24	1.084	-0.05	1.020	1.106
#141	LTE Band 4	QPSK	20M	50	0	Back	1	20300	1745	23.63	24	1.089	0.04	1.050	1.143
#142	LTE Band 4	QPSK	20M	100	0	Front	1	20175	1732.5	23.97	24	1.007	0.05	0.914	0.920
#143	LTE Band 4	QPSK	20M	100	0	Back	1	20175	1732.5	23.97	24	1.007	0.12	1.040	1.047
#144	LTE Band 4	QPSK	20M	100	0	Left Side	1	20175	1732.5	23.97	24	1.007	0.09	0.148	0.149
#145	LTE Band 4	QPSK	20M	100	0	Right Side	1	20175	1732.5	23.97	24	1.007	-0.06	0.391	0.394
#146	LTE Band 4	QPSK	20M	100	0	Bottom Side	1	20175	1732.5	23.97	24	1.007	0.04	0.425	0.428

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#147	LTE Band 5	QPSK	10M	1	0	Front	1	20525	836.5	23.64	24	1.086	0.05	0.565	0.614
#148	LTE Band 5	QPSK	10M	1	0	Back	1	20525	836.5	23.64	24	1.086	0.06	0.640	0.695
#149	**LTE Band 5**	**QPSK**	**10M**	**1**	**0**	**Left Side**	**1**	**20525**	**836.5**	**23.64**	**24**	**1.086**	**-0.01**	**0.730**	**0.793**
#150	LTE Band 5	QPSK	10M	1	0	Right Side	1	20525	836.5	23.64	24	1.086	-0.07	0.587	0.638
#151	LTE Band 5	QPSK	10M	1	0	Bottom Side	1	20525	836.5	23.64	24	1.086	0.05	0.107	0.116
#152	LTE Band 5	QPSK	10M	25	0	Front	1	20525	836.5	23.57	24	1.104	0.09	0.499	0.551
#153	LTE Band 5	QPSK	10M	25	0	Back	1	20525	836.5	23.57	24	1.104	0.07	0.589	0.650
#154	LTE Band 5	QPSK	10M	25	0	Left Side	1	20525	836.5	23.57	24	1.104	-0.03	0.677	0.747
#155	LTE Band 5	QPSK	10M	25	0	Right Side	1	20525	836.5	23.57	24	1.104	-0.04	0.531	0.586
#156	LTE Band 5	QPSK	10M	25	0	Bottom Side	1	20525	836.5	23.57	24	1.104	0.03	0.100	0.110
#157	LTE Band 17	QPSK	10M	1	49	Front	1	23790	710	24.03	24.5	1.114	-0.09	0.344	0.383
#158	LTE Band 17	QPSK	10M	1	49	Back	1	23790	710	24.03	24.5	1.114	-0.04	0.501	0.558
#159	LTE Band 17	QPSK	10M	1	49	Left Side	1	23790	710	24.03	24.5	1.114	0.01	0.290	0.323
#160	LTE Band 17	QPSK	10M	1	49	Right Side	1	23790	710	24.03	24.5	1.114	0.03	0.299	0.333
#161	LTE Band 17	QPSK	10M	1	49	Bottom Side	1	23790	710	24.03	24.5	1.114	0.05	0.038	0.042
#162	LTE Band 17	QPSK	10M	25	0	Front	1	23790	710	23.67	24	1.079	-0.1	0.428	0.462
#163	**LTE Band 17**	**QPSK**	**10M**	**25**	**0**	**Back**	**1**	**23790**	**710**	**23.67**	**24**	**1.079**	**0.01**	**0.568**	**0.613**
#164	LTE Band 17	QPSK	10M	25	0	Left Side	1	23790	710	23.67	24	1.079	0.15	0.348	0.375
#165	LTE Band 17	QPSK	10M	25	0	Right Side	1	23790	710	23.67	24	1.079	-0.05	0.367	0.396
#166	LTE Band 17	QPSK	10M	25	0	Bottom Side	1	23790	710	23.67	24	1.079	0.04	0.049	0.053

Note:

1. Per KDB 941225 D05v02, 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.
2. Per KDB 941225 D05v02, 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.
3. 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 D05v02, 16QAM SAR testing is not required.
4. 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 D05v02, 16QAM SAR testing is not required.

<WLAN 2.4GHz Band SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Duty Cycle %	Duty Cycle Compensate Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#167	WLAN2.4GHz	802.11b 1Mbps	Front	1	11	2462	12.22	12.5	1.067	97.67	1.024	0.09	0.022	0.025
#168	WLAN2.4GHz	802.11b 1Mbps	Back	1	11	2462	12.22	12.5	1.067	97.67	1.024	0.02	0.062	0.067
#169	WLAN2.4GHz	802.11b 1Mbps	Left Side	1	11	2462	12.22	12.5	1.067	97.67	1.024	-0.09	0.055	0.061
#172	**WLAN2.4GHz**	**802.11g 24Mbps**	**Back**	**1**	**11**	**2462**	**13.76**	**14**	**1.057**	**70.35**	**1.421**	**-0.05**	**0.081**	**0.122**

12.3 Test Records for Body-worn SAR Test

General Note:

1. Body-worn SAR testing was performed at 10mm separation, and this distance is determined by the handset manufacturer that there will be body-worn accessories that users may acquire at the time of equipment certification, to enable users to purchase aftermarket body-worn accessories with the required minimum separation.
2. Per KDB 941225 D06, 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. In this report, the worst exposure position is the back exposure position of the device.
3. Body-worn exposure conditions are intended to voice call operations, therefore GSM voice call mode is selected to be tested at the back exposure position.
4. Pre KDB648474 D04v01, when the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.
5. LTE band 4 body-worn accessory reported SAR > 1.2W/kg and SAR testing with headset connected was performed, and WLAN SAR testing with headset connected was also performed for simultaneous transmission analysis.

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#68	**GSM850**	**GSM**	**Back**	**1**	**-**	**128**	**824.2**	**32.75**	**33**	**1.059**	**0.02**	**0.681**	**0.721**
#79	**GSM1900**	**GSM**	**Back**	**1**	**-**	**512**	**1850.2**	**30.13**	**30.5**	**1.089**	**-0.01**	**0.523**	**0.570**

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#80	WCDMA Band V	RMC 12.2K	Front	1	-	4233	846.6	24.63	25	1.089	-0.04	0.605	0.659
#81	**WCDMA Band V**	**RMC 12.2K**	**Back**	**1**	**-**	**4233**	**846.6**	**24.63**	**25**	**1.089**	**-0.12**	**0.654**	**0.712**
#88	WCDMA Band II	RMC 12.2K	Front	1	-	9400	1880	22.54	23	1.112	-0.01	0.624	0.694
#89	**WCDMA Band II**	**RMC 12.2K**	**Back**	**1**	**-**	**9400**	**1880**	**22.54**	**23**	**1.112**	**0.04**	**0.681**	**0.757**

<LTE SAR>

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Gap (cm)	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#99	LTE Band 2	QPSK	20M	1	0	Front	1	-	18900	1880	23.19	23.5	1.074	0.12	0.663	0.712
#100	LTE Band 2	QPSK	20M	1	0	Back	1	-	18900	1880	23.19	23.5	1.074	0.08	0.839	0.901
#104	LTE Band 2	QPSK	20M	1	0	Back	1	-	18700	1860	23.18	23.5	1.076	0.14	0.959	1.032
#105	LTE Band 2	QPSK	20M	1	0	Back	1	-	19100	1900	23.17	23.5	1.079	0.01	0.854	0.921
#109	LTE Band 2	QPSK	20M	50	0	Front	1	-	18900	1880	22.96	23.5	1.132	0.07	0.622	0.704
#110	LTE Band 2	QPSK	20M	50	0	Back	1	-	18900	1880	22.96	23.5	1.132	0.01	0.748	0.847
#114	**LTE Band 2**	**QPSK**	**20M**	**50**	**0**	**Back**	**1**	**-**	**18700**	**1860**	**22.75**	**23.5**	**1.189**	**-0.03**	**0.890**	**1.058**
#115	LTE Band 2	QPSK	20M	50	0	Back	1	-	19100	1900	22.91	23.5	1.146	0.01	0.765	0.876
#118	LTE Band 2	QPSK	20M	100	0	Front	1	-	18900	1880	22.94	23.5	1.138	-0.08	0.667	0.759
#119	LTE Band 2	QPSK	20M	100	0	Back	1	-	18900	1880	22.94	23.5	1.138	0.11	0.761	0.866
#123	LTE Band 4	QPSK	20M	1	0	Front	1	-	20175	1732.5	24.17	24.5	1.079	0.06	0.937	1.011
#124	LTE Band 4	QPSK	20M	1	0	Back	1	-	20175	1732.5	24.17	24.5	1.079	-0.07	1.120	1.208
#128	LTE Band 4	QPSK	20M	1	0	Front	1	-	20050	1720	24.06	24.5	1.107	0.08	1.050	1.162
#129	LTE Band 4	QPSK	20M	1	0	Front	1	-	20300	1745	23.72	24.5	1.197	0.06	0.993	1.188
#130	LTE Band 4	QPSK	20M	1	0	Back	1	-	20050	1720	24.06	24.5	1.107	0.12	1.190	1.317
#132	**LTE Band 4**	**QPSK**	**20M**	**1**	**0**	**Back**	**1**	**-**	**20300**	**1745**	**23.72**	**24.5**	**1.197**	**-0.11**	**1.110**	**1.328**
#133	LTE Band 4	QPSK	20M	50	0	Front	1	-	20175	1732.5	23.67	24	1.079	0.01	0.899	0.970
#134	LTE Band 4	QPSK	20M	50	0	Back	1	-	20175	1732.5	23.67	24	1.079	0.07	1.030	1.111
#138	LTE Band 4	QPSK	20M	50	0	Front	1	-	20050	1720	23.65	24	1.084	0.06	0.917	0.994
#139	LTE Band 4	QPSK	20M	50	0	Front	1	-	20300	1745	23.63	24	1.089	0.08	0.929	1.012
#140	LTE Band 4	QPSK	20M	50	0	Back	1	-	20050	1720	23.65	24	1.084	-0.05	1.020	1.106
#141	LTE Band 4	QPSK	20M	50	0	Back	1	-	20300	1745	23.63	24	1.089	0.04	1.050	1.143
#142	LTE Band 4	QPSK	20M	100	0	Front	1	-	20175	1732.5	23.97	24	1.007	0.05	0.914	0.920
#143	LTE Band 4	QPSK	20M	100	0	Back	1	-	20175	1732.5	23.97	24	1.007	0.12	1.040	1.047
#176	LTE Band 4	QPSK	20M	1	0	Back	1	Headset	20050	1720	24.06	24.5	1.107	-0.06	1.040	1.151
#177	LTE Band 4	QPSK	20M	1	0	Back	1	Headset	20175	1732.5	24.17	24.5	1.079	0.06	0.988	1.066
#178	LTE Band 4	QPSK	20M	1	0	Back	1	Headset	20300	1745	23.72	24.5	1.197	0.04	1.050	1.257
#147	LTE Band 5	QPSK	10M	1	0	Front	1	-	20525	836.5	23.64	24	1.086	0.05	0.565	0.614
#148	**LTE Band 5**	**QPSK**	**10M**	**1**	**0**	**Back**	**1**	**-**	**20525**	**836.5**	**23.64**	**24**	**1.086**	**0.06**	**0.640**	**0.695**
#152	LTE Band 5	QPSK	10M	25	0	Front	1	-	20525	836.5	23.57	24	1.104	0.09	0.499	0.551
#153	LTE Band 5	QPSK	10M	25	0	Back	1	-	20525	836.5	23.57	24	1.104	0.07	0.589	0.650
#157	LTE Band 17	QPSK	10M	1	49	Front	1	-	23790	710	24.03	24.5	1.114	-0.09	0.344	0.383
#158	LTE Band 17	QPSK	10M	1	49	Back	1	-	23790	710	24.03	24.5	1.114	-0.04	0.501	0.558
#162	LTE Band 17	QPSK	10M	25	0	Front	1	-	23790	710	23.67	24	1.079	-0.1	0.428	0.462
#163	**LTE Band 17**	**QPSK**	**10M**	**25**	**0**	**Back**	**1**	**-**	**23790**	**710**	**23.67**	**24**	**1.079**	**0.01**	**0.568**	**0.613**

<WLAN 2.4GHz Band SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Duty Cycle %	Duty Cycle Compensate Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#167	WLAN2.4GHz	802.11b 1Mbps	Front	1	-	11	2462	12.22	12.5	1.067	97.67	1.024	0.09	0.022	0.025
#168	WLAN2.4GHz	802.11b 1Mbps	Back	1	-	11	2462	12.22	12.5	1.067	97.67	1.024	0.02	0.062	0.067
#171	WLAN2.4GHz	802.11b 1Mbps	Back	1	Headset	11	2462	12.22	12.5	1.067	97.67	1.024	-0.07	0.061	0.067
#172	**WLAN2.4GHz**	**802.11g 24Mbps**	**Back**	**1**	**-**	**11**	**2462**	**13.76**	**14**	**1.057**	**70.35**	**1.421**	**-0.05**	**0.081**	**0.122**

12.4 Repeated SAR Measurement

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Ratio	Reported SAR_{1g} (W/kg)
#56	GSM850	GPRS (2 Tx slots)	-	-	-	Left Side	1	128	824.2	32.58	33	1.102	-0.01	1.250	1	1.377
#57	GSM850	GPRS (2 Tx slots)	-	-	-	Left Side	1	128	824.2	32.58	33	1.102	0.09	1.210	1.033	1.333
#77	GSM1900	GPRS (2 Tx slots)	-	-	-	Bottom Side	1	810	1909.8	30.13	30.5	1.089	0.09	1.210	1	1.318
#78	GSM1900	GPRS (2 Tx slots)	-	-	-	Bottom Side	1	810	1909.8	30.13	30.5	1.089	0.02	1.200	1.008	1.307
#85	WCDMA Band V	RMC 12.2K	-	-	-	Left Side	1	4132	826.4	24.55	25	1.109	0.04	1.110	1	1.231
#86	WCDMA Band V	RMC 12.2K	-	-	-	Left Side	1	4132	826.4	24.55	25	1.109	-0.03	1.050	1.057	1.165
#94	WCDMA Band II	RMC 12.2K	-	-	-	Bottom Side	1	9538	1907.6	22.52	23	1.117	0.13	1.200	1	1.340
#95	WCDMA Band II	RMC 12.2K	-	-	-	Bottom Side	1	9538	1907.6	22.52	23	1.117	0.10	1.190	1.008	1.329
#103	LTE Band 2	QPSK	20M	1	0	Bottom Side	1	18900	1880	23.19	23.5	1.074	0.06	1.060	1	1.138
#108	LTE Band 2	QPSK	20M	1	0	Bottom Side	1	18900	1880	23.19	23.5	1.074	0.11	1.060	1	1.138
#130	LTE Band 4	QPSK	20M	1	0	Back	1	20050	1720	24.06	24.5	1.107	0.12	1.190	1	1.317
#131	LTE Band 4	QPSK	20M	1	0	Back	1	20050	1720	24.06	24.5	1.107	0.17	1.180	1.008	1.306

Note:

1. Per KDB 865664 D01v01, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg
2. Per KDB 865664 D01v01, 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 difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

12.5 Highest SAR Plot

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
#64	GSM850	GPRS (2 Tx slots)	-	-	-	Left Side	1	189	836.4	32.54	33	1.112	0.02	1.240	1.379
#77	GSM1900	GPRS (2 Tx slots)	-	-	-	Bottom Side	1	810	1909.8	30.13	30.5	1.089	0.09	1.210	1.318
#85	WCDMA Band V	RMC 12.2K	-	-	-	Left Side	1	4132	826.4	24.55	25	1.109	0.04	1.110	1.231
#94	WCDMA Band II	RMC 12.2K	-	-	-	Bottom Side	1	9538	1907.6	22.52	23	1.117	0.13	1.200	1.340
#117	LTE Band 2	QPSK	20M	50	0	Bottom Side	1	19100	1900	22.91	23.5	1.146	0.09	1.010	1.157
#132	LTE Band 4	QPSK	20M	1	0	Back	1	20300	1745	23.72	24.5	1.197	-0.11	1.110	1.328
#149	LTE Band 5	QPSK	10M	1	0	Left Side	1	20525	836.5	23.64	24	1.086	-0.01	0.730	0.793
#163	LTE Band 17	QPSK	10M	25	0	Back	1	23790	710	23.67	24	1.079	0.01	0.568	0.613
#53	WLAN2.4GHz	802.11g 24Mbps	-	-	-	Right Cheek	-	11	2462	13.76	14	1.057	-0.02	0.100	0.150

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013-2-25

#64 GSM850_GPRS (2 Tx slots)_Left Side 1cm_Ch189

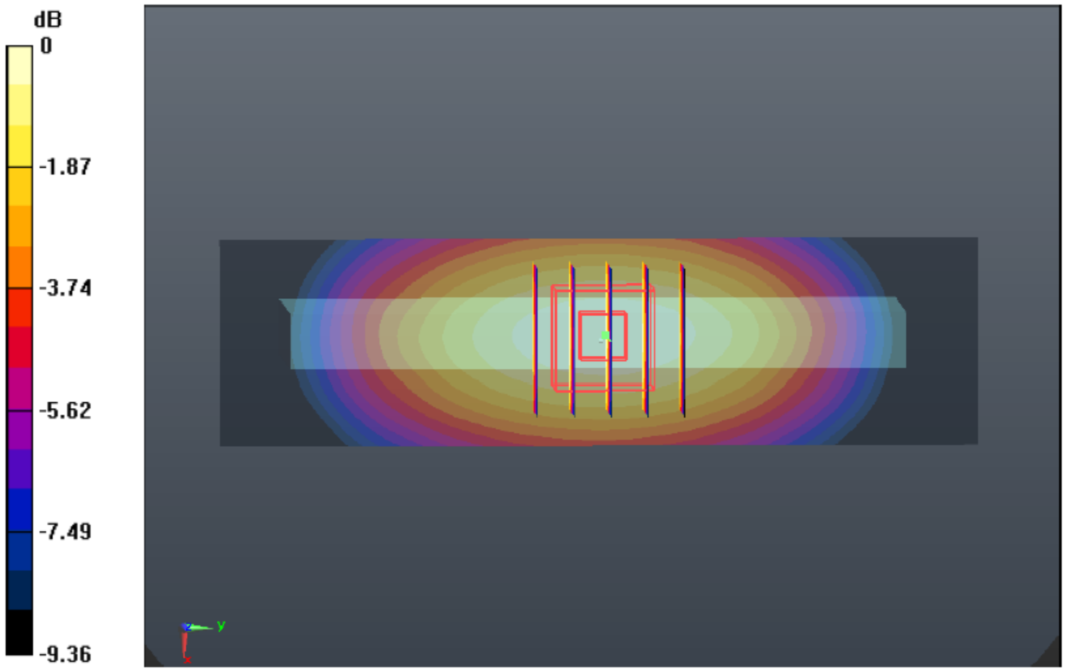
DUT: 320406

Communication System: GPRS/EDGE (2 Tx slots); Frequency: 836.4 MHz;Duty Cycle: 1:4
Medium: MSL_835_130225 Medium parameters used: f = 836.4 MHz; $\sigma = 0.984$ mho/m; $\varepsilon_r = 54.833$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(8.98, 8.98, 8.98); Calibrated: 2012-6-20
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2012-12-5
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.4.5 (3634)

Ch189/Area Scan (31x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.500 mW/g

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 36.934 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.726 W/kg
SAR(1 g) = 1.240 mW/g; SAR(10 g) = 0.863 mW/g
Maximum value of SAR (measured) = 1.516 mW/g



0 dB = 1.520mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013-3-6

#77 **GSM1900_GPRS (2 Tx slots)_Bottom Side 1cm_Ch810**

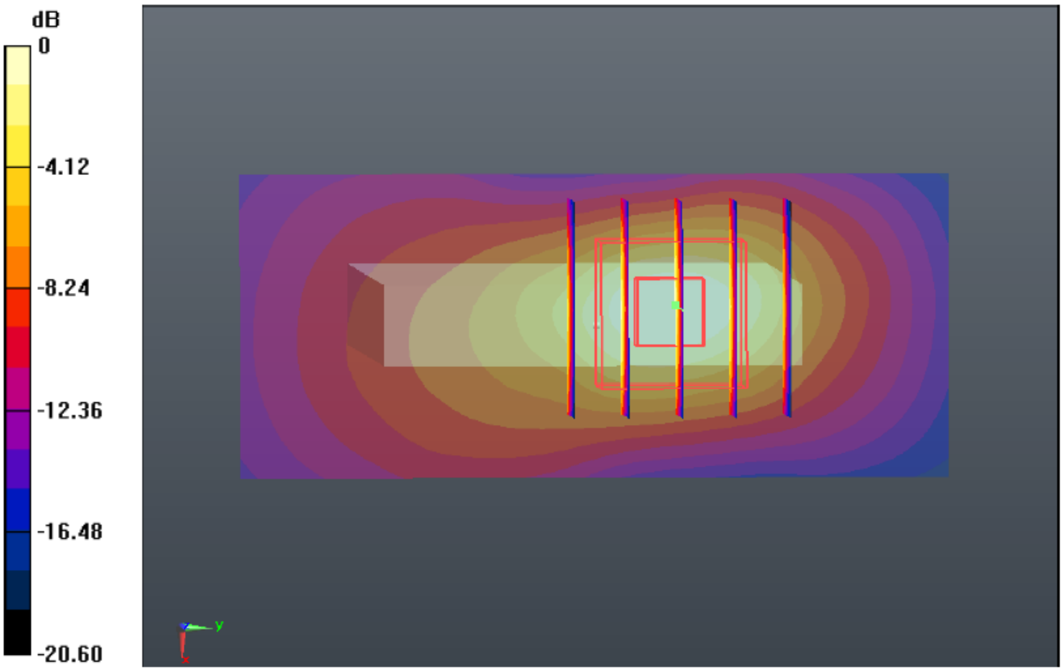
DUT: 320406

Communication System: GPRS/EDGE (2 Tx slots); Frequency: 1909.8 MHz;Duty Cycle: 1:4
Medium: MSL_1900_130306 Medium parameters used: f = 1910 MHz; σ = 1.562 mho/m; ε_r = 53.221; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.35, 7.35, 7.35); Calibrated: 2012-6-20
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2012-12-5
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.4.5 (3634)

Ch810/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.814 mW/g

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.841 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 2.175 W/kg
SAR(1 g) = 1.210 mW/g; SAR(10 g) = 0.582 mW/g
Maximum value of SAR (measured) = 1.733 mW/g



0 dB = 1.730mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013-2-25

#85 WCDMA Band V_RMC12.2K_Left Side 1cm_Ch4132

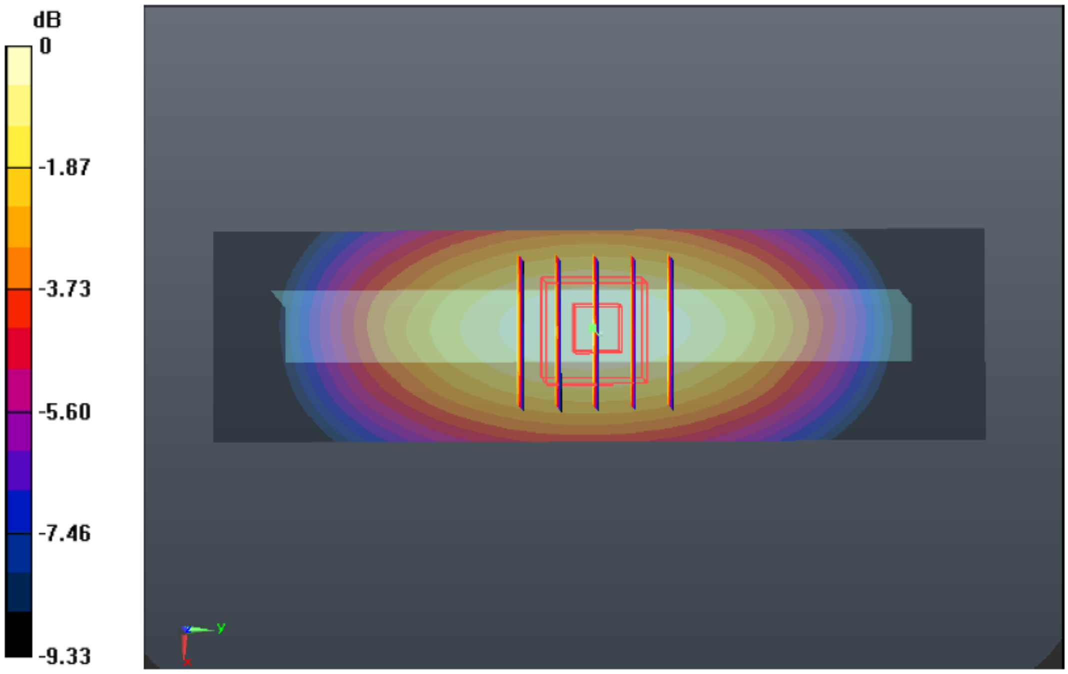
DUT: 320406

Communication System: UMTS; Frequency: 826.4 MHz;Duty Cycle: 1:1
Medium: MSL_835_130225 Medium parameters used: f = 826.4 MHz; σ = 0.974 mho/m; ε_r = 54.926; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(8.98, 8.98, 8.98); Calibrated: 2012-6-20
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2012-12-5
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.4.5 (3634)

Ch4132/Area Scan (31x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.364 mW/g

Ch4132/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.132 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.552 W/kg
SAR(1 g) = 1.110 mW/g; SAR(10 g) = 0.770 mW/g
Maximum value of SAR (measured) = 1.359 mW/g



0 dB = 1.360mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013-3-6

#94 WCDMA Band II RMC12.2K_Bottom Side 1cm_Ch9538

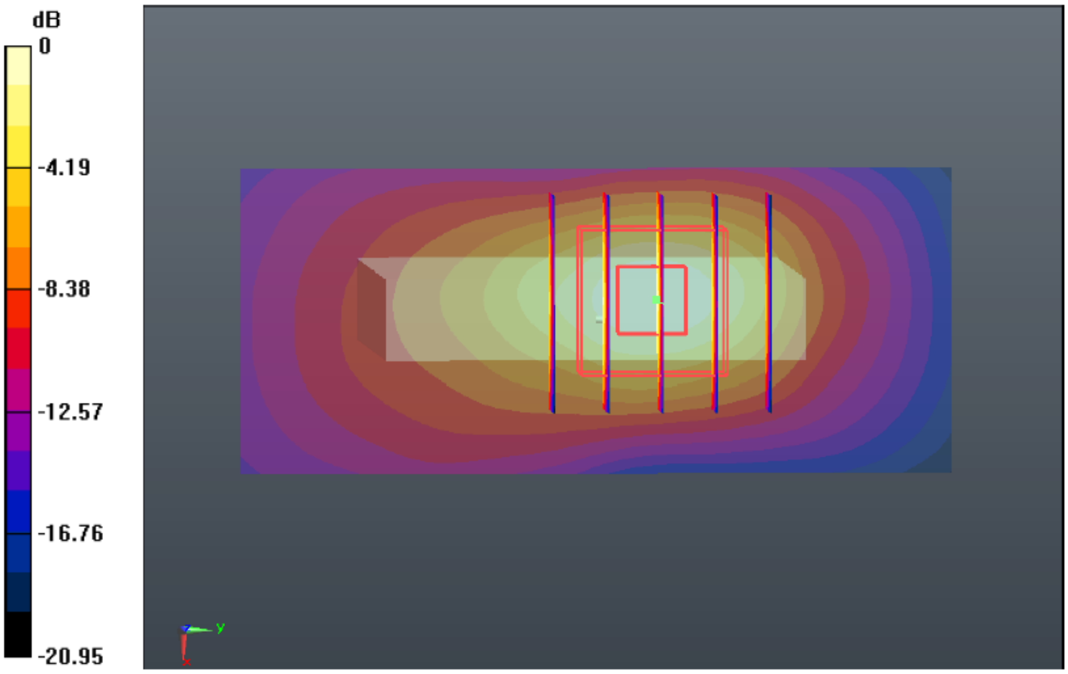
DUT: 320406

Communication System: UMTS; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: MSL_1900_130306 Medium parameters used: f = 1908 MHz; σ = 1.56 mho/m; ε_r = 53.228; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.35, 7.35, 7.35); Calibrated: 2012-6-20
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2012-12-5
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.4.5 (3634)

Ch9538/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.713 mW/g

Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.556 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 2.177 W/kg
SAR(1 g) = 1.200 mW/g; SAR(10 g) = 0.581 mW/g
Maximum value of SAR (measured) = 1.739 mW/g



0 dB = 1.740mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013-3-6

#117 LTE Band 2_20M QPSK 50RB 0offset_Bottom Side 1cm_Ch19100

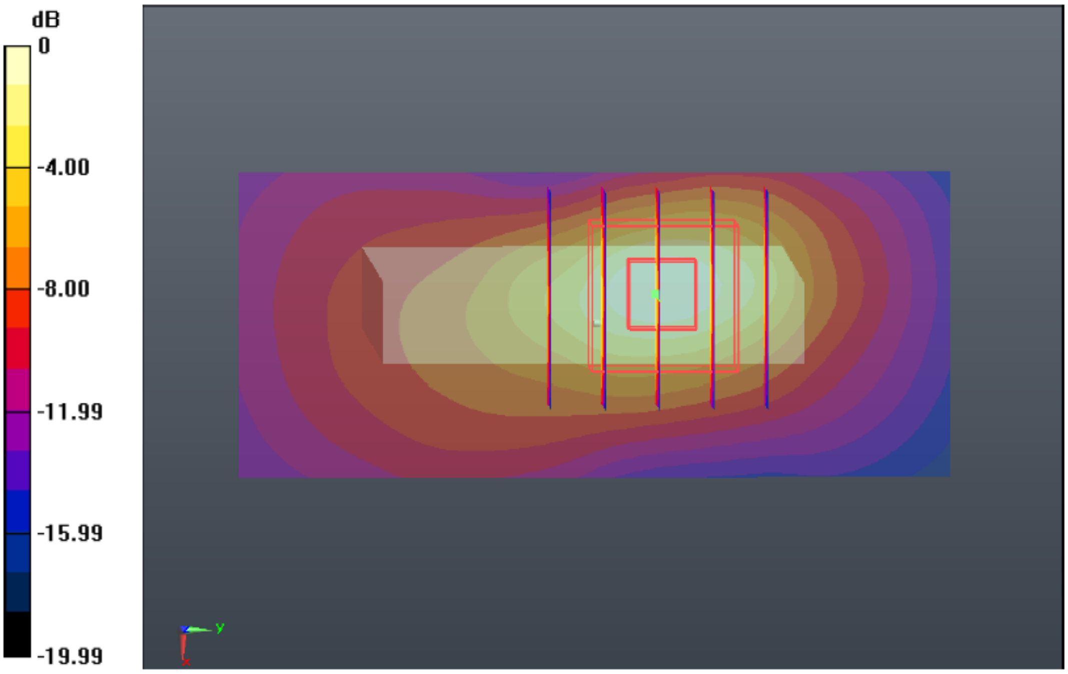
DUT: 320406

Communication System: LTE; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_130306 Medium parameters used: f = 1900 MHz; σ = 1.551 mho/m; ε_r = 53.249; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.35, 7.35, 7.35); Calibrated: 2012-6-20
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2012-12-5
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.4.5 (3634)

Ch18700/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.462 mW/g

Ch18700/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.717 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.842 W/kg
SAR(1 g) = 1.010 mW/g; SAR(10 g) = 0.488 mW/g
Maximum value of SAR (measured) = 1.471 mW/g



0 dB = 1.470mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013-3-7

#132 LTE Band 4_20M QPSK 1RB 0offset_Back 1cm_Ch20300

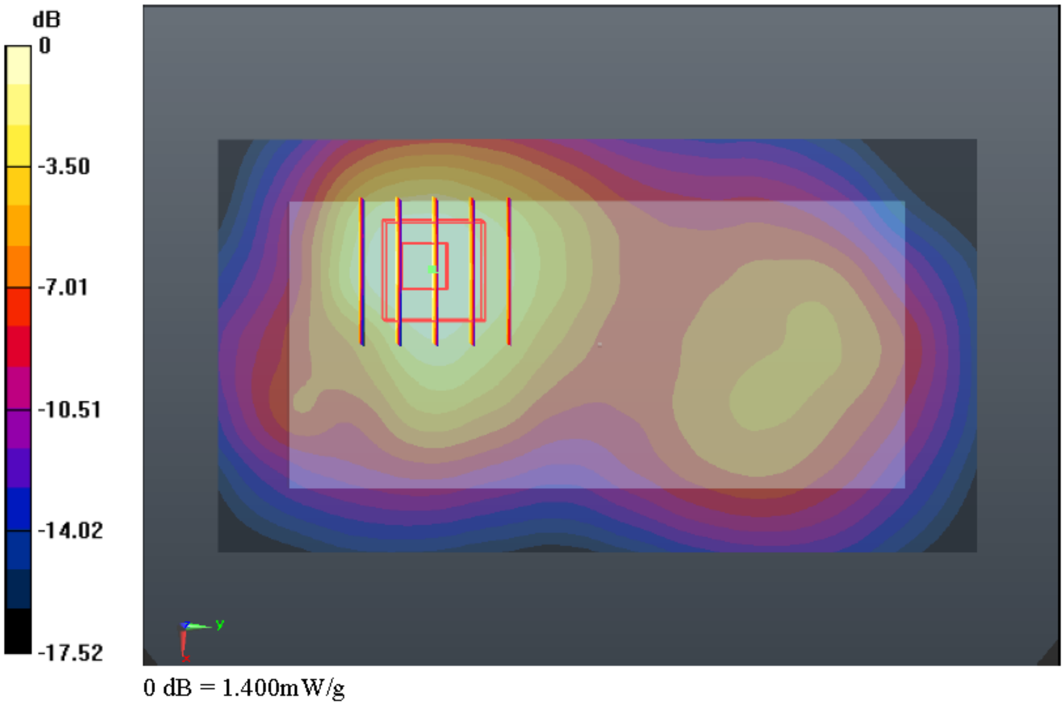
DUT: 320406

Communication System: LTE; Frequency: 1745 MHz;Duty Cycle: 1:1
Medium: MSL_1750_130307 Medium parameters used: f = 1745 MHz; σ = 1.506 mho/m; ε_r = 55.282; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.68, 7.68, 7.68); Calibrated: 2012-6-20
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2012-12-5
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.4.5 (3634)

Ch20300/Area Scan (61x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.525 mW/g

Ch20300/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.428 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 1.687 W/kg
SAR(1 g) = 1.110 mW/g; SAR(10 g) = 0.670 mW/g
Maximum value of SAR (measured) = 1.403 mW/g



0 dB = 1.400mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013-2-25

#149 LTE Band 5_10M QPSK 1RB 0offset_Left Side 1cm_Ch20525

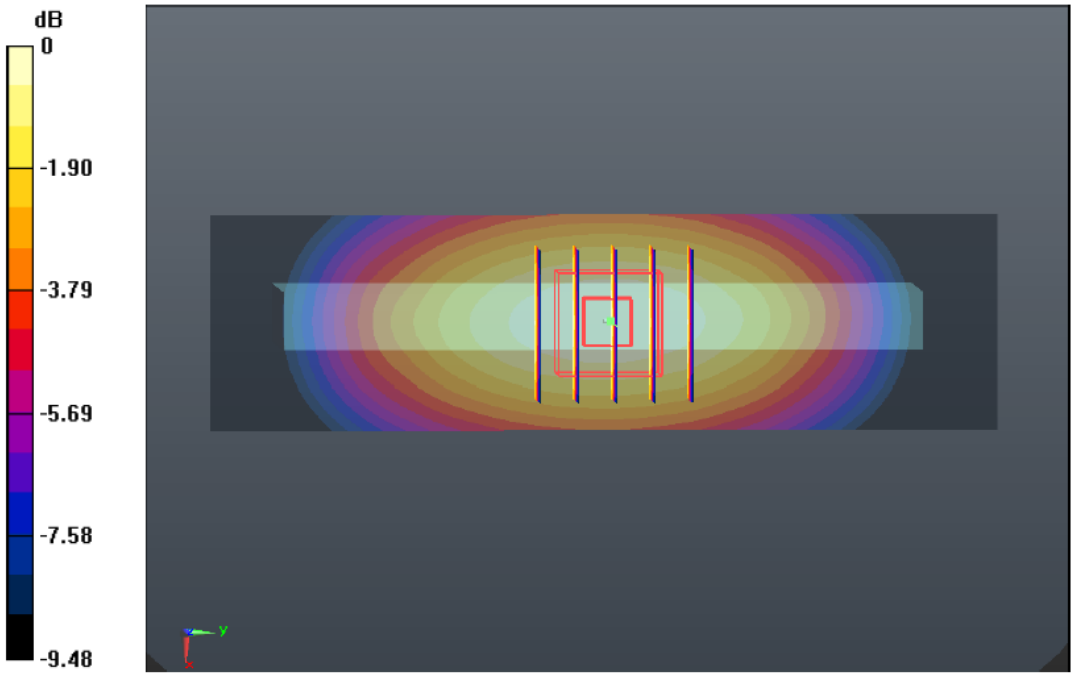
DUT: 320406

Communication System: LTE; Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: MSL_835_130225 Medium parameters used: f = 836.5 MHz; σ = 0.984 mho/m; ε_r = 54.832; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(8.98, 8.98, 8.98); Calibrated: 2012-6-20
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2012-12-5
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.4.5 (3634)

Ch20525/Area Scan (31x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.888 mW/g

Ch20525/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.321 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.019 W/kg
SAR(1 g) = 0.730 mW/g; SAR(10 g) = 0.506 mW/g
Maximum value of SAR (measured) = 0.893 mW/g



0 dB = 0.890mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013-2-25

#163 LTE Band 17_10M QPSK 25RB 0offset_Back 1cm_Ch23790

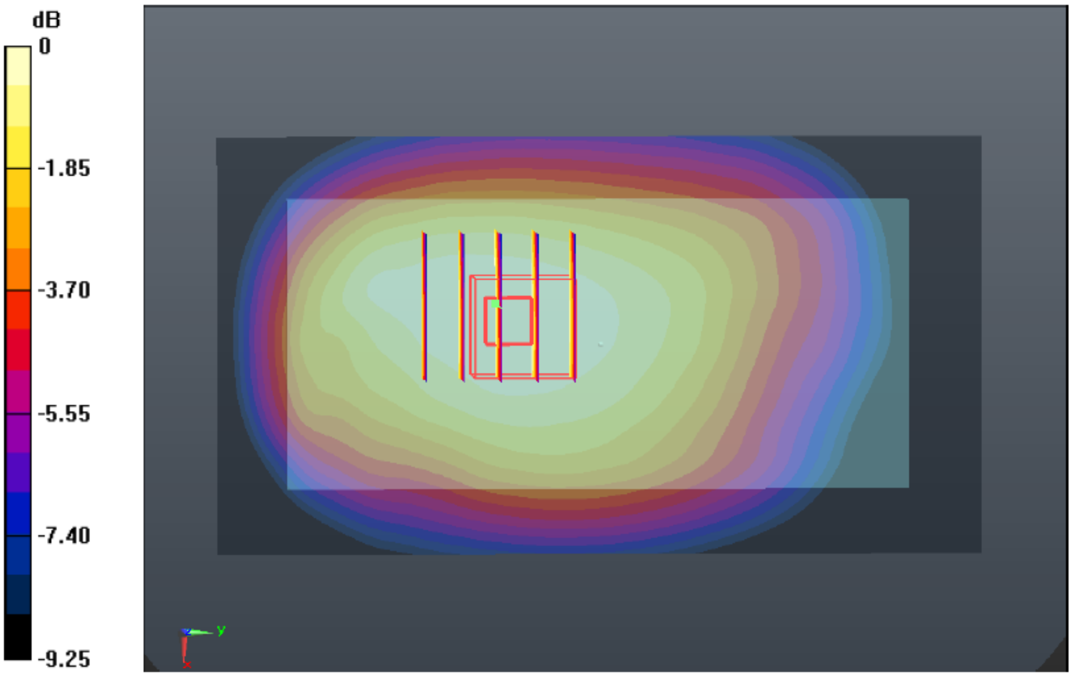
DUT: 320406

Communication System: LTE; Frequency: 710 MHz;Duty Cycle: 1:1
Medium: MSL_750_130225 Medium parameters used: f = 710 MHz; σ = 0.942 mho/m; ε_r = 55.542; ρ = 1000 kg/m^3
Ambient Temperature：23.1 ℃; Liquid Temperature：21.1 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(9.18, 9.18, 9.18); Calibrated: 2012-6-20
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2012-12-5
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.4.5 (3634)

Ch23790/Area Scan (61x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.658 mW/g

Ch23790/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.806 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.710 W/kg
SAR(1 g) = 0.568 mW/g; SAR(10 g) = 0.435 mW/g
Maximum value of SAR (measured) = 0.648 mW/g



0 dB = 0.650mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013-3-1

#53 WLAN 2.4GHz Band_802.11g_Right Cheek_Ch11

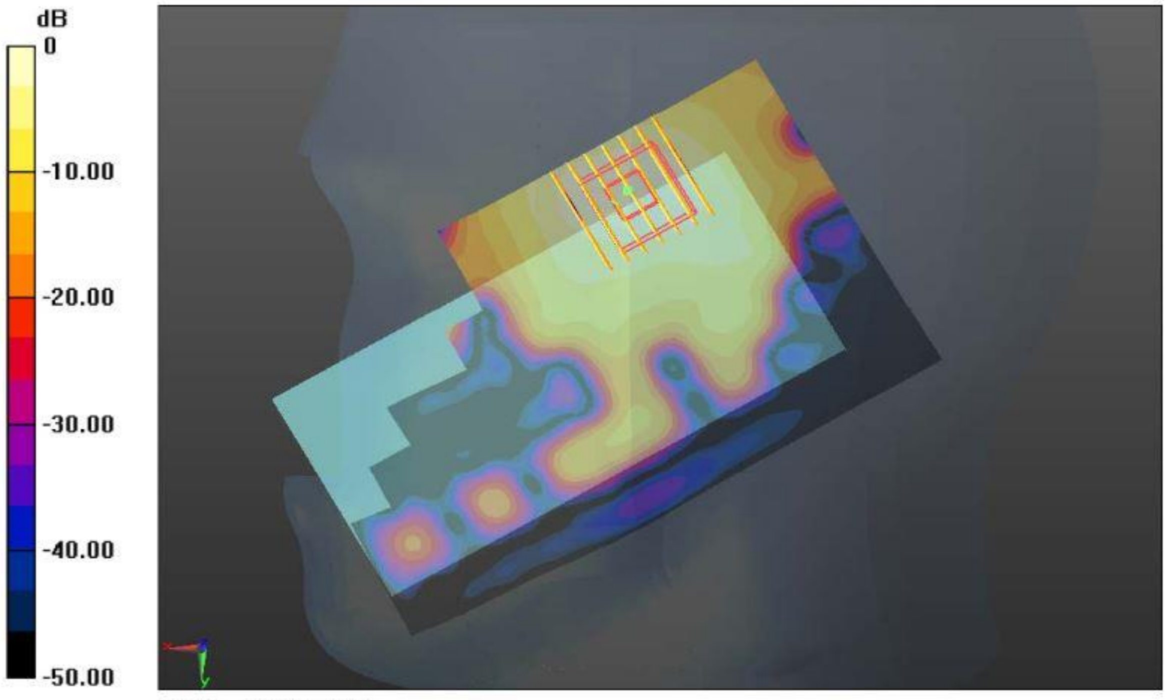
DUT: 320406

Communication System: WIFI; Frequency: 2462 MHz;Duty Cycle: 1:1.421
Medium: HSL_2450_130301 Medium parameters used: f = 2462 MHz; σ = 1.856 mho/m; ε_r = 39.882; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(6.87, 6.87, 6.87); Calibrated: 2012-6-20
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2012-12-5
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.4.5 (3634)

Ch11/Area Scan (81x141x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.161 mW/g

Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.257 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.238 W/kg
SAR(1 g) = 0.100 mW/g; SAR(10 g) = 0.049 mW/g
Maximum value of SAR (measured) = 0.155 mW/g



0 dB = 0.150mW/g

12.6 Simultaneous Multi-band Transmission Analysis

	Position	Applicable Combination
Simultaneous Transmission	Head	WWAN (voice) + WLAN 2.4GHz Band
		WWAN (voice) + Bluetooth
	Hotspot	WWAN (data) + WLAN 2.4GHz Band
		WWAN (data) + Bluetooth
	Body-worn	WWAN (voice) + WLAN 2.4GHz Band
		WWAN (voice) + Bluetooth

Note:

1. WLAN 2.4GHz Band and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. GSM/WCDMA/LTE share the same antenna, and cannot transmit simultaneously
3. The Reported SAR summation is calculated based on the same configuration and test position.
4. Simultaneous transmission analysis for hotspot mode 1cm separation to the body represents the compliance for hand-held and near-body use conditions. Simultaneous transmission of Hotspot mode for head and body-worn conditions was covered under simultaneous transmission analysis of head and body-worn positions, due to the possible WWAN voice call and data transmission SAR was considered in standalone SAR measurement for those exposure positions
5. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05 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) 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.

Maximum Power	Exposure Position	Head	Hotspot 1cm	Body-worn 1cm
	Test separation	0 mm	10 mm	10 mm
	Antenna to user distance (mm)	5 mm	10 mm	10 mm
1 dBm	Estimated SAR (W/kg)	0.053W/kg	0.026W/kg	0.026W/kg

6. Per KDB 447498 D01v05, simultaneous transmission SAR is compliant if,
   (i) Scalar SAR summation < 1.6W/kg.
   (ii) SPLSR = (SAR1 + SAR2)1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan
   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

<Head SAR>

	WWAN (voice)			WLAN 2.4GHz Band		WWAN + WLAN 2.4GHz Band (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Plot No	Max. WLAN 2.4GHz Band (W/kg)			
Right Cheek	GSM850	#01	0.491	#53	0.150	0.64	-	-
	GSM1900	#05	0.405	#53	0.150	0.56	-	-
	WCDMA Band V	#09	0.516	#53	0.150	0.67	-	-
	WCDMA Band II	#13	0.657	#53	0.150	0.81	-	-
	LTE Band 2	#21	0.653	#53	0.150	0.80	-	-
	LTE Band 4	#25	0.733	#53	0.150	0.88	-	-
	LTE Band 5	#33	0.485	#53	0.150	0.64	-	-
	LTE Band 17	#45	0.446	#53	0.150	0.60	-	-
Right Tilted	GSM850	#02	0.403	#50	0.055	0.46	-	-
	GSM1900	#06	0.135	#50	0.055	0.19	-	-
	WCDMA Band V	#10	0.446	#50	0.055	0.50	-	-
	WCDMA Band II	#14	0.205	#50	0.055	0.26	-	-
	LTE Band 2	#22	0.206	#50	0.055	0.26	-	-
	LTE Band 4	#26	0.324	#50	0.055	0.38	-	-
	LTE Band 5	#34	0.402	#50	0.055	0.46	-	-
	LTE Band 17	#46	0.285	#50	0.055	0.34	-	-
Left Cheek	GSM850	#03	0.544	#51	0.059	0.60	-	-
	GSM1900	#07	0.192	#51	0.059	0.25	-	-
	WCDMA Band V	#11	0.567	#51	0.059	0.63	-	-
	WCDMA Band II	#15	0.282	#51	0.059	0.34	-	-
	LTE Band 2	#23	0.306	#51	0.059	0.37	-	-
	LTE Band 4	#27	0.576	#51	0.059	0.64	-	-
	LTE Band 5	#35	0.564	#51	0.059	0.62	-	-
	LTE Band 17	#47	0.468	#51	0.059	0.53	-	-
Left Tilted	GSM850	#04	0.400	#52	0.036	0.44	-	-
	GSM1900	#08	0.148	#52	0.036	0.18	-	-
	WCDMA Band V	#12	0.436	#52	0.036	0.47	-	-
	WCDMA Band II	#16	0.216	#52	0.036	0.25	-	-
	LTE Band 2	#20	0.244	#52	0.036	0.28	-	-
	LTE Band 4	#28	0.371	#52	0.036	0.41	-	-
	LTE Band 5	#36	0.399	#52	0.036	0.44	-	-
	LTE Band 17	#48	0.281	#52	0.036	0.32	-	-

Position	WWAN (voice) WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Bluetooth Max. Bluetooth SAR (W/kg)	WWAN + Bluetooth (W/kg)	SPLSR	Case No
Right Cheek	GSM850	#01	0.491	0.053	0.54	-	-
	GSM1900	#05	0.405	0.053	0.46	-	-
	WCDMA Band V	#09	0.516	0.053	0.57	-	-
	WCDMA Band II	#13	0.657	0.053	0.71	-	-
	LTE Band 2	#21	0.653	0.053	0.71	-	-
	LTE Band 4	#25	0.733	0.053	0.79	-	-
	LTE Band 5	#33	0.485	0.053	0.54	-	-
	LTE Band 17	#45	0.446	0.053	0.50	-	-
Right Tilted	GSM850	#02	0.403	0.053	0.46	-	-
	GSM1900	#06	0.135	0.053	0.19	-	-
	WCDMA Band V	#10	0.446	0.053	0.50	-	-
	WCDMA Band II	#14	0.205	0.053	0.26	-	-
	LTE Band 2	#22	0.206	0.053	0.26	-	-
	LTE Band 4	#26	0.324	0.053	0.38	-	-
	LTE Band 5	#34	0.402	0.053	0.46	-	-
	LTE Band 17	#46	0.285	0.053	0.34	-	-
Left Cheek	GSM850	#03	0.544	0.053	0.60	-	-
	GSM1900	#07	0.192	0.053	0.25	-	-
	WCDMA Band V	#11	0.567	0.053	0.62	-	-
	WCDMA Band II	#15	0.282	0.053	0.34	-	-
	LTE Band 2	#23	0.306	0.053	0.36	-	-
	LTE Band 4	#27	0.576	0.053	0.63	-	-
	LTE Band 5	#35	0.564	0.053	0.62	-	-
	LTE Band 17	#47	0.468	0.053	0.52	-	-
Left Tilted	GSM850	#04	0.400	0.053	0.45	-	-
	GSM1900	#08	0.148	0.053	0.20	-	-
	WCDMA Band V	#12	0.436	0.053	0.49	-	-
	WCDMA Band II	#16	0.216	0.053	0.27	-	-
	LTE Band 2	#20	0.244	0.053	0.30	-	-
	LTE Band 4	#28	0.371	0.053	0.42	-	-
	LTE Band 5	#36	0.399	0.053	0.45	-	-
	LTE Band 17	#48	0.281	0.053	0.33	-	-

<Hotspot SAR>

	WWAN (data)			WLAN 2.4GHz Band		WWAN + WLAN 2.4GHz Band (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Plot No	Max. WLAN 2.4GHz Band (W/kg)			
Front	GSM850	#54	1.124	#167	0.025	1.15	-	-
	GSM1900	#69	0.716	#167	0.025	0.74	-	-
	WCDMA Band V	#80	0.659	#167	0.025	0.68	-	-
	WCDMA Band II	#88	0.694	#167	0.025	0.72	-	-
	LTE Band 2	#118	0.759	#167	0.025	0.78	-	-
	LTE Band 4	#129	1.188	#167	0.025	1.21	-	-
	LTE Band 5	#147	0.614	#167	0.025	0.64	-	-
	LTE Band 17	#162	0.462	#167	0.025	0.49	-	-
Back	GSM850	#55	1.311	#172	0.122	1.43	-	-
	GSM1900	#74	1.162	#172	0.122	1.28	-	-
	WCDMA Band V	#81	0.712	#172	0.122	0.83	-	-
	WCDMA Band II	#89	0.757	#172	0.122	0.88	-	-
	LTE Band 2	#114	1.058	#172	0.122	1.18	-	-
	LTE Band 4	#132	1.328	#172	0.122	1.45	-	-
	LTE Band 5	#148	0.695	#172	0.122	0.82	-	-
	LTE Band 17	#163	0.613	#172	0.122	0.74	-	-
Left Side	GSM850	#64	1.379	#169	0.061	1.44	-	-
	GSM1900	#71	0.187	#169	0.061	0.25	-	-
	WCDMA Band V	#85	1.231	#169	0.061	1.29	-	-
	WCDMA Band II	#90	0.160	#169	0.061	0.22	-	-
	LTE Band 2	#111	0.174	#169	0.061	0.24	-	-
	LTE Band 4	#125	0.169	#169	0.061	0.23	-	-
	LTE Band 5	#149	0.793	#169	0.061	0.85	-	-
	LTE Band 17	#164	0.375	#169	0.061	0.44	-	-
Right Side	GSM850	#58	1.179	-	-	1.18	-	-
	GSM1900	#72	0.452	-	-	0.45	-	-
	WCDMA Band V	#83	0.721	-	-	0.72	-	-
	WCDMA Band II	#91	0.425	-	-	0.43	-	-
	LTE Band 2	#121	0.505	-	-	0.51	-	-
	LTE Band 4	#126	0.440	-	-	0.44	-	-
	LTE Band 5	#150	0.638	-	-	0.64	-	-
	LTE Band 17	#165	0.396	-	-	0.40	-	-
Bottom Side	GSM850	#59	0.198	-	-	0.20	-	-
	GSM1900	#77	1.318	-	-	1.32	-	-
	WCDMA Band V	#84	0.158	-	-	0.16	-	-
	WCDMA Band II	#94	1.340	-	-	1.34	-	-
	LTE Band 2	#117	1.157	-	-	1.16	-	-
	LTE Band 4	#127	0.482	-	-	0.48	-	-
	LTE Band 5	#151	0.116	-	-	0.12	-	-
	LTE Band 17	#166	0.053	-	-	0.05	-	-

Position	WWAN (data)			Bluetooth	WWAN + Bluetooth (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Max. Bluetooth SAR (W/kg)			
Front	GSM850	#54	1.124	0.026	1.15	-	-
	GSM1900	#69	0.716	0.026	0.74	-	-
	WCDMA Band V	#80	0.659	0.026	0.69	-	-
	WCDMA Band II	#88	0.694	0.026	0.72	-	-
	LTE Band 2	#118	0.759	0.026	0.79	-	-
	LTE Band 4	#129	1.188	0.026	1.21	-	-
	LTE Band 5	#147	0.614	0.026	0.64	-	-
	LTE Band 17	#162	0.462	0.026	0.49	-	-
Back	GSM850	#55	1.311	0.026	1.34	-	-
	GSM1900	#74	1.162	0.026	1.19	-	-
	WCDMA Band V	#81	0.712	0.026	0.74	-	-
	WCDMA Band II	#89	0.757	0.026	0.78	-	-
	LTE Band 2	#114	1.058	0.026	1.08	-	-
	LTE Band 4	#132	1.328	0.026	1.35	-	-
	LTE Band 5	#148	0.695	0.026	0.72	-	-
	LTE Band 17	#163	0.613	0.026	0.64	-	-
Left Side	GSM850	#64	1.379	0.026	1.41	-	-
	GSM1900	#71	0.187	0.026	0.21	-	-
	WCDMA Band V	#85	1.231	0.026	1.26	-	-
	WCDMA Band II	#90	0.160	0.026	0.19	-	-
	LTE Band 2	#111	0.174	0.026	0.20	-	-
	LTE Band 4	#125	0.169	0.026	0.20	-	-
	LTE Band 5	#149	0.793	0.026	0.82	-	-
	LTE Band 17	#164	0.375	0.026	0.40	-	-
Right Side	GSM850	#58	1.179	-	1.18	-	-
	GSM1900	#72	0.452	-	0.45	-	-
	WCDMA Band V	#83	0.721	-	0.72	-	-
	WCDMA Band II	#91	0.425	-	0.43	-	-
	LTE Band 2	#121	0.505	-	0.51	-	-
	LTE Band 4	#126	0.440	-	0.44	-	-
	LTE Band 5	#150	0.638	-	0.64	-	-
	LTE Band 17	#165	0.396	-	0.40	-	-
Bottom Side	GSM850	#59	0.198	-	0.20	-	-
	GSM1900	#77	1.318	-	1.32	-	-
	WCDMA Band V	#84	0.158	-	0.16	-	-
	WCDMA Band II	#94	1.340	-	1.34	-	-
	LTE Band 2	#117	1.157	-	1.16	-	-
	LTE Band 4	#127	0.482	-	0.48	-	-
	LTE Band 5	#151	0.116	-	0.12	-	-
	LTE Band 17	#166	0.053	-	0.05	-	-

<Body-worn SAR>

Position	WWAN (voice) WWAN Band	Plot No	Max. WWAN SAR (W/kg)	WLAN 2.4GHz Band Plot No	Max. WLAN 2.4GHz Band (W/kg)	WWAN + WLAN 2.4GHz Band (W/kg)	SPLSR	Case No
Front	WCDMA Band V	#80	0.659	#167	0.025	0.68	-	-
	WCDMA Band II	#88	0.694	#167	0.025	0.72	-	-
	LTE Band 2	#118	0.759	#167	0.025	0.78	-	-
	LTE Band 4	#129	1.188	#167	0.025	1.21	-	-
	LTE Band 5	#147	0.614	#167	0.025	0.64	-	-
	LTE Band 17	#162	0.462	#167	0.025	0.49	-	-
Back	GSM850	#68	0.721	#172	0.122	0.84	-	-
	GSM1900	#79	0.570	#172	0.122	0.69	-	-
	WCDMA Band V	#81	0.712	#172	0.122	0.83	-	-
	WCDMA Band II	#89	0.757	#172	0.122	0.88	-	-
	LTE Band 2	#114	1.058	#172	0.122	1.18	-	-
	LTE Band 4	#132	1.328	#172	0.122	1.45	-	-
	LTE Band 5	#148	0.695	#172	0.122	0.82	-	-
	LTE Band 17	#163	0.613	#172	0.122	0.74	-	-
Back (with / headset)	LTE Band 4	#178	1.257	#171	0.067	1.32	-	-

Position	WWAN (voice) WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Bluetooth Max. Bluetooth SAR (W/kg)	WWAN + Bluetooth (W/kg)	SPLSR	Case No
Front	WCDMA Band V	#80	0.659	0.026	0.69	-	-
	WCDMA Band II	#88	0.694	0.026	0.72	-	-
	LTE Band 2	#118	0.759	0.026	0.79	-	-
	LTE Band 4	#129	1.188	0.026	1.21	-	-
	LTE Band 5	#147	0.614	0.026	0.64	-	-
	LTE Band 17	#162	0.462	0.026	0.49	-	-
Back	GSM850	#68	0.721	0.026	0.75	-	-
	GSM1900	#79	0.570	0.026	0.60	-	-
	WCDMA Band V	#81	0.712	0.026	0.74	-	-
	WCDMA Band II	#89	0.757	0.026	0.78	-	-
	LTE Band 2	#114	1.058	0.026	1.08	-	-
	LTE Band 4	#132	1.328	0.026	1.35	-	-
	LTE Band 5	#148	0.695	0.026	0.72	-	-
	LTE Band 17	#163	0.613	0.026	0.64	-	-
Back (with / headset)	LTE Band 4	#178	1.257	0.026	1.28	-	-

Test Engineer： Fulu Hu

13. 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 12.1

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 13.1 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 13.2 Uncertainty Budget of DASY for frequency range 300 MHz to 3 GHz from IEEE Std 1528™-2003

14. References

[1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"

[2] ANSI/IEEE Std. C95.1-1992, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", September 1992

[3] IEEE Std. 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003

[4] FCC OET Bulletin 65 (Edition 97-01) Supplement C (Edition 01-01), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", June 2001

[5] SPEAG DASY System Handbook

[6] FCC KDB 248227 D01 v01r02, "SAR Measurement Procedures for 802.11 a/b/g Transmitters", May 2007

[7] FCC KDB 447498 D01 v05, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", October 2012

[8] FCC KDB 648474 D04 v01, "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas", October 2012

[9] FCC KDB 941225 D01 v02, "SAR Measurement Procedures for 3G Devices – CDMA 2000 / Ev-Do / WCDMA / HSDPA / HSPA", October 2007

[10] FCC KDB 941225 D05 v02, "SAR Evaluation Considerations for LTE Devices", October 2012

[11] FCC KDB 941225 D06 v01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", April 2011

[12] FCC KDB 865664 D01 v01, "SAR Measurement Requirements for 100MHz to 6 GHz", October 2012