FCC SAR Test Report

APPLICANT	:	Motorola Solutions, Inc.
EQUIPMENT	:	Touch Computer
BRAND NAME	:	Motorola
MODEL NAME	:	TC55AH
FCC ID	:	UZ7TC55AH
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2003

The product was completely tested on Jul. 07, 2013. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA322304-07	Rev. 01	Initial issue of report	Aug. 14, 2013

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Motorola Solutions, Inc. Touch Computer, TC55AH** are as follows.

<Highest SAR Summary>

Exposure Position	Frequency Band	Reported 1g-SAR (W/kg)	Equipment Class	Highest Reported 1g-SAR (W/kg)
Head	GSM850	0.64	PCE	0.88
	GSM1900	0.25		
	WCDMA Band V	0.71		
	WCDMA Band IV	0.43		
	WCDMA Band II	0.49		
	LTE Band 17	0.39		
	LTE Band 5	0.88		
	LTE Band 4	0.41		
	LTE Band 2	0.42		
	WLAN 5.2GHz Band	0.60	NII	0.66
	WLAN 5.3GHz Band	0.52		
	WLAN 5.5GHz Band	0.66		
	WLAN 5.8GHz Band	0.56	DTS	0.84
	WLAN 2.4GHz Band	0.84		
Hotspot (Separation 1cm)	GPRS850	1.32	PCE	1.32
	GPRS1900	1.32		
	WCDMA Band V	1.03		
	WCDMA Band IV	1.26		
	WCDMA Band II	1.14		
	LTE Band 17	0.87		
	LTE Band 5	1.12		
	LTE Band 4	1.20		
	LTE Band 2	1.07		
	WLAN 2.4GHz Band	0.25	DTS	0.25
Body-worn (Separation 1.5cm)	GPRS850	0.75	PCE	1.32
	GPRS1900	0.49		
	WCDMA Band V	0.85		
	WCDMA Band IV	1.32		
	WCDMA Band II	1.32		
	LTE Band 17	0.67		
	LTE Band 5	0.87		
	LTE Band 4	1.32		
	LTE Band 2	1.16		
	WLAN 5.2GHz Band	0.48	NII	0.48
	WLAN 5.3GHz Band	0.36		
	WLAN 5.5GHz Band	0.33		
	WLAN 5.8GHz Band	0.19	DTS	0.19
	WLAN 2.4GHz Band	0.14		

<Highest Simultaneous transmission SAR>

Frequency Band	Equipment Class	Exposure Position	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
GSM850	PCE	Hotspot	1.36
Bluetooth	DSS		

Frequency Band	Equipment Class	Exposure Position	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
GSM850	PCE	Hotspot	1.57
WLAN 2.4GHz Band	DTS		

Frequency Band	Equipment Class	Exposure Position	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
WCDMA V	PCE	Body-worn	1.33
WLAN 5.2GHz Band	NII		

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003.

2. Administration Data

2.1 Testing Laboratory

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

2.2 Applicant

Company Name	Motorola Solutions, Inc.
Address	One Motorola Plaza, Holtsville, NY 11742-1300 USA

2.3 Manufacturer

Company Name	Motorola Solutions, Inc.
Address	One Motorola Plaza, Holtsville, NY 11742-1300 USA

2.4 Application Details

Date of Start during the Test	Jun. 25, 2013
Date of End during the Test	Jul. 07, 2013

3. General Information

3.1 Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT	Touch Computer
Brand Name	Motorola
Model Name	TC55AH
FCC ID	UZ7TC55AH
Sample / IMEI	Sample 1 with scanner / 57404050000481 Sample 2 without scanner / 357404050002834
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2472 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	• GSM/GPRS/EGPRS • WCDMA Rel 99 • HSDPA Rel 7, Cat14 • HSUPA Rel 6, Cat6 • LTE: QPSK, 16QAM • 802.11a/b/g/n HT20/HT40 • Bluetooth 2.0+EDR，Bluetooth 2.1+EDR，Bluetooth 3.0，Bluetooth 4.0 • NFC:ASK
Antenna Type	WWAN / LTE: Monopole Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna NFC: Loop Antenna
HW Version	DV1
FW Version	Android 4.1.2
SW Version	BSP 1.27
Transfer Mode Category	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. 802.11n- HT40 is not supported in 2.4GHz frequency band.
3. Hotspot mode is supported in WLAN 2.4GHz frequency band, not supported in all 5GHz frequency bands
4. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of GPRS 1900 band, UMTS band 2 and 4, LTE band 2 and 4.
5. Considering the possibility of 3rd party VoIP app installation by end users. Therefore RF exposure was performed evaluation.

The device supports 2 battery options:

Battery 1	Brand Name	MOTOROLA
	Model Name	82-164807-01
	Capacity	2940 mAh
Battery 2	Brand Name	MOTOROLA
	Model Name	82-172087-01
	Capacity	4410 mAh

3.2 Maximum RF output power among production units

Mode	Burst RMS Power (dBm)		
	GSM 850	GSM 1900	
	Full power mode	Full power mode	Reduced power mode
GSM (GMSK, 1 Tx slot)	33.5	30.5	30.5
GPRS/EDGE (GMSK, 1 Tx slot)	33.5	30.5	30.5
GPRS/EDGE (GMSK, 2 Tx slots)	31	30.5	26.5
GPRS/EDGE (GMSK, 3 Tx slots)	31	30.5	26.5
GPRS/EDGE (GMSK, 4 Tx slots)	31	29.5	26.5
EDGE (8PSK, 1 Tx slot)	27.5	26.5	26.5
EDGE (8PSK, 2 Tx slots)	27.5	26.5	26.5
EDGE (8PSK, 3 Tx slots)	27.5	26.5	26.5
EDGE (8PSK, 4 Tx slots)	27.5	26.5	26.5

Mode	RMS Power (dBm)				
	WCDMA V	WCDMA IV		WCDMA II	
	Full power mode	Full power mode	Reduced power mode	Full power mode	Reduced power mode
RMC 12.2K	24.5	24.5	21.5	24.5	21.5
HSDPA Subtest-1	24.5	24.5	21.5	24.5	21.5
HSUPA Subtest-5	24.5	24.5	21.5	24.5	21.5

LTE Band 17				
RMS Power (dBm)				
Modulation	BW (MHz)	RB size	Full power mode MPR	Full Power
QPSK	10	≤ 12	0	24.5
QPSK	10	> 12	1	23.5
16QAM	10	≤ 12	1	23.5
16QAM	10	> 12	2	22.5
QPSK	5	≤ 8	0	24.5
QPSK	5	> 8	1	23.5
16QAM	5	≤ 8	1	23.5
16QAM	5	> 8	2	22.5

LTE Band 5				
RMS Power (dBm)				
Modulation	BW (MHz)	RB size	Full power mode MPR	Full Power
QPSK	10	≤ 12	0	24.5
QPSK	10	> 12	1	23.5
16QAM	10	≤ 12	1	23.5
16QAM	10	> 12	2	22.5
QPSK	5	≤ 8	0	24.5
QPSK	5	> 8	1	23.5
16QAM	5	≤ 8	1	23.5
16QAM	5	> 8	2	22.5

LTE Band 4						
RMS Power (dBm)						
Modulation	BW (MHz)	RB size	Full power mode MPR	Full Power	Reduced power mode MPR	Reduced
QPSK	10	≤ 12	0	24.5	0	21.5
QPSK	10	> 12	1	23.5	0	21.5
16QAM	10	≤ 12	1	23.5	0	21.5
16QAM	10	> 12	2	22.5	0	21.5
QPSK	5	≤ 8	0	24.5	0	21.5
QPSK	5	> 8	1	23.5	0	21.5
16QAM	5	≤ 8	1	23.5	0	21.5
16QAM	5	> 8	2	22.5	0	21.5

LTE Band 2						
RMS Power (dBm)						
Modulation	BW (MHz)	RB size	Full power mode MPR	Full Power	Reduced power mode MPR	Reduced
QPSK	10	≤ 12	0	24.5	0	21.5
QPSK	10	> 12	1	23.5	0	21.5
16QAM	10	≤ 12	1	23.5	0	21.5
16QAM	10	> 12	2	22.5	0	21.5
QPSK	5	≤ 8	0	24.5	0	21.5
QPSK	5	> 8	1	23.5	0	21.5
16QAM	5	≤ 8	1	23.5	0	21.5
16QAM	5	> 8	2	22.5	0	21.5

WLAN2.4GHz	IEEE 802.11 Average Power (dBm)		
	11b	11g	11n-HT20
Ch01	19.5	14.5	13.5
Ch02	19.5	16.5	15.5
Ch06	20.0	18.0	17.0
CH07	20.0	18.0	17.0
Ch11	18.0	12.0	11.0
Ch12	15.5	10.0	9.0
Ch13	10.0	6.0	5.0

WLAN5GHz Band	IEEE 802.11 Average Power (dBm)		
	11a	11n-HT20	11n-HT40
Ch36	14	13	
Ch38			12
Ch40	17	16	
Ch44	17	16	
Ch46			15
Ch48	17	16	
Ch52	17	16	
Ch54			15
Ch56	17	16	
Ch60	17	16	
Ch62			11.5
Ch64	13.5	12.5	
Ch100	15.5	14.5	
Ch102			10.5
Ch104	17	16	
Ch108	17	16	
Ch110			15
Ch112	17	16	
Ch116	17	16	
Ch118			15
Ch120	17	16	
Ch124	17	16	
Ch126			15
Ch128	17	16	
Ch132	17	16	
Ch134			14.5
Ch136	17	16	
Ch140	14.5	13.5	
Ch149	17	16	
Ch151			14.5
Ch153	17	16	
Ch157	17	16	
Ch159			14.5
Ch161	17	16	
Ch165	17	16	

Mode / Band	Average Power (dBm)			
	1Mbps (GFSK)	2Mbps (π/4-DQPSK)	3Mbps (8-DPSK)	BT4.0-LE (GFSK)
2.4 GHz Bluetooth	2.0	1.0	1.0	2.0

The table below summarized necessary items addressed in KDB 941225 D05 v02r02.

FCC ID	UZ7TC55AH
EUT	Touch Computer
Operating Frequency Range of each LTE transmission band	LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz
Channel Bandwidth	LTE Band 17: 5MHz, 10MHz LTE Band 5: 5MHz, 10MHz LTE Band 4: 5MHz, 10MHz LTE Band 2: 5MHz, 10MHz

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

Band 17

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

LTE Band 5

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20425	826.5	20450	829
M	20525	836.5	20525	836.5
H	20625	846.5	20600	844

LTE Band 4

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19975	1712.5	20000	1715
M	20175	1732.5	20175	1732.5
H	20375	1752.5	20350	1750

LTE Band 2

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18625	1852.5	18650	1855
M	18900	1880	18900	1880
H	19175	1907.5	19150	1905

LTE category, uplink modulations used	Category 3, QPSK, and 16QAM
LTE transmitter and antenna implementation (standalone or sharing hardware components / antennas)	A primary antenna is used for LTE and other wireless interfaces (GSM/WCDMA) for transmitting and receiving. LTE and other wireless interfaces (GSM/WCDMA) share the same antenna, and cannot transmit simultaneously A 2nd antenna is used for LTE and other wireless interfaces (GSM/WCDMA) for receiving only
LTE Voice / Data requirements	1. Data only
LTE MPR permanently built-in by design	Yes, per 3GPP TS 36.101 v11.0.0 **Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3**
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing.
Base station simulator used for Testing	Anritsu MT8820C
Power reduction applied to satisfy SAR compliance	Yes, When operating in hotspot mode that LTE band 2 and Ban4 power reduction applied to satisfy SAR compliance.

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

Target Power reduction applied for each wireless mode

Exposure Position / wireless mode	Hotspot(1)
GSM1900 GPRS (GMSK 1 Tx slot) - CS1	0 dB
GSM1900 GPRS (GMSK 2 Tx slots) - CS1	4.0 dB
GSM1900 GPRS (GMSK 3 Tx slots) - CS1	4.0 dB
GSM1900 GPRS (GMSK 4 Tx slots) - CS1	3.0 dB
GSM1900 EDGE (8PSK 1 Tx slot) - MCS5	0 dB
GSM1900 EDGE (8PSK 2 Tx slots) - MCS5	0 dB
GSM1900 EDGE (8PSK 3 Tx slots) - MCS5	0 dB
GSM1900 EDGE (8PSK 4 Tx slots) - MCS5	0 dB
WCDMA Band 2	3.0 dB
WCDMA Band 4	3.0 dB
LTE band 4	3.0 dB
LTE band 2	3.0 dB

Remark:
1. (1): Reduced maximum limit applied by activation of Hotspot operation
2. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of GPRS 1900 band, UMTS band 2 and 4, LTE band 2 and 4.
3. Power reduction is not applicable for WLAN and Bluetooth.

3.3 Applied Standard

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

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2003
- FCC KDB 447498 D01 v05r01
- FCC KDB 648474 D04 v01r01
- FCC KDB 248227 D01 v01r02
- FCC KDB 941225 D01 v02
- FCC KDB 941225 D02 v02r02
- FCC KDB 941225 D03 v01
- FCC KDB 941225 D05 v02r02
- FCC KDB 941225 D06 v01r01

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

Ambient Condition

Ambient Temperature	20 to 24 ℃
Humidity	< 60 %

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: 97.63%

802.11a, 6Mbps: 87.26%

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

4. Specific Absorption Rate (SAR)

4.1 Introduction

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

4.2 SAR Definition

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

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

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

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

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

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

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

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

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

5. SAR Measurement System

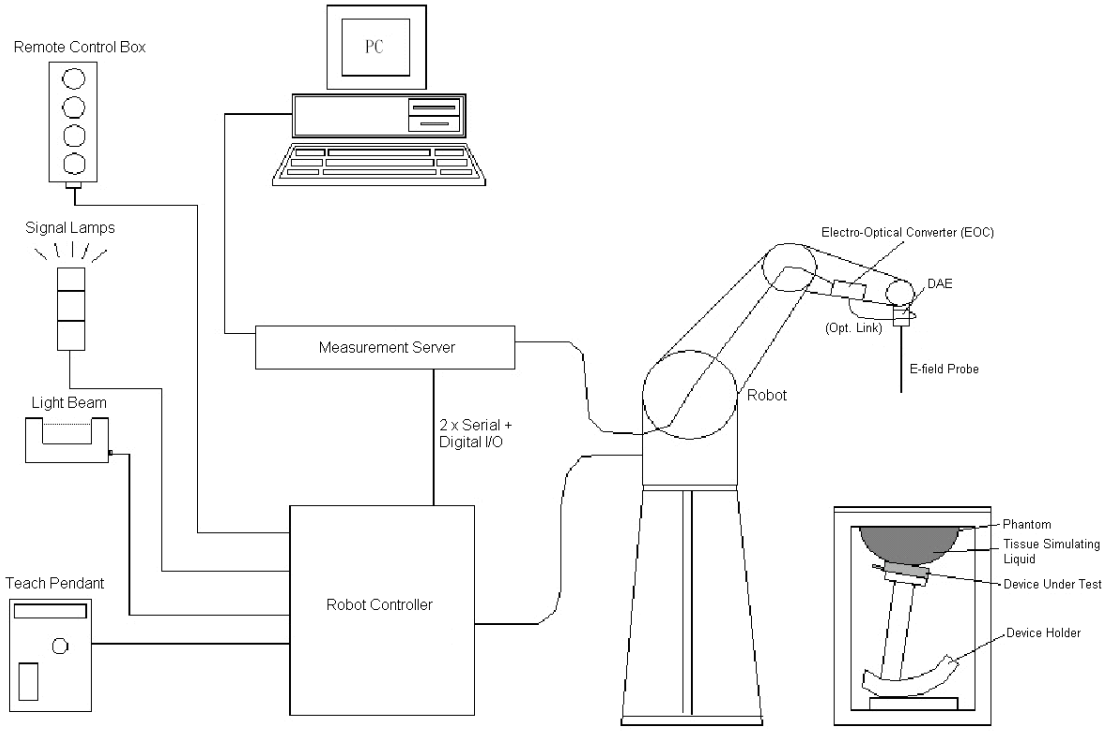


Fig 5.1 SPEAG DASY System Configurations

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

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

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

5.1 E-Field Probe

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

5.1.1 E-Field Probe Specification

<ES3DV3 Probe >

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

Fig 5.2 Photo of ES3DV3

<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 5.3 Photo of EX3DV4/ES3DV4

5.1.2 E-Field Probe Calibration

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

5.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.4 Photo of DAE

5.3 Robot

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

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

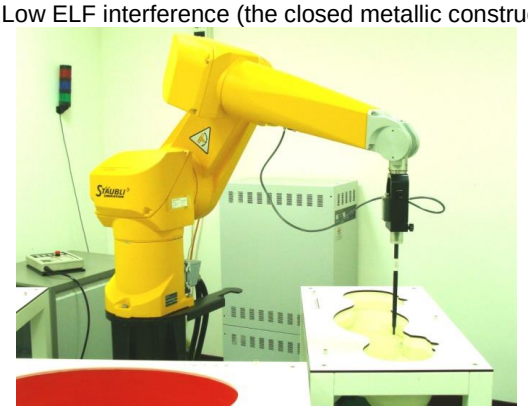


Fig 5.5 Photo of DASY4

Fig 5.6 Photo of DASY5

5.4 Measurement Server

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

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

Fig 5.7 Photo of Server for DASY4

Fig 5.8 Photo of Server for DASY5

5.5 Phantom

<SAM Twin Phantom>

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

Fig 5.9 Photo of SAM Phantom

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

<ELI4 Phantom>

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

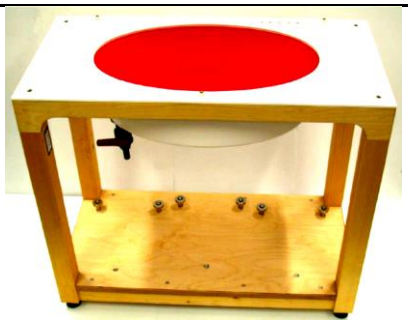


Fig 5.10 Photo of ELI4 Phantom

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

5.6 Device Holder

<Device Holder for SAM Twin Phantom>

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

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

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

Fig 5.11 Device Holder

<Laptop Extension Kit>

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

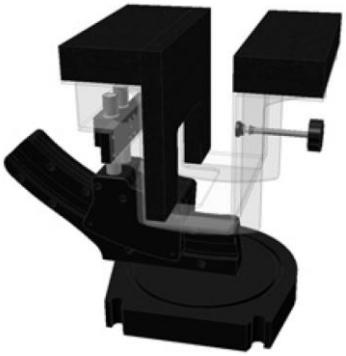


Fig 5.12 Laptop Extension Kit

5.7 Data Storage and Evaluation

5.7.1 Data Storage

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

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

5.7.2 Data Evaluation

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

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

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

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

The formula for each channel can be given as：

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

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

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

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

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

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

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

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

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

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

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

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

5.8 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1012	May. 28, 2013	May. 27, 2014
SPEAG	835MHz System Validation Kit	D835V2	499	Mar. 18, 2013	Mar. 19, 2014
SPEAG	1750MHz System Validation Kit	D1750V2	1068	Jun. 20, 2012	Jun. 19, 2014
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Mar. 20, 2013	Mar. 19, 2014
SPEAG	2450MHz System Validation Kit	D2450V2	736	Jul. 25, 2011	Jul. 24, 2013
SPEAG	5GHz System Validation Kit	D5GHzV2	1006	Dec. 11, 2012	Dec. 10, 2013
SPEAG	Data Acquisition Electronics	DAE4	778	Aug. 27, 2012	Aug. 26, 2013
SPEAG	Data Acquisition Electronics	DAE4	1279	Jan. 28, 2013	Jan. 27, 2014
SPEAG	Data Acquisition Electronics	DAE4	1338	May. 28, 2013	May. 27, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3697	Sep. 28, 2012	Sep. 27, 2013
SPEAG	Dosimetric E-Field Probe	EX3DV4	3792	Jun. 04, 2013	Jun. 03, 2014
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 28, 2012	Sep. 27, 2013
Wisewind	Thermometer	ETP-101	TM560	Nov. 13, 2012	Nov. 12, 2013
Wisewind	Thermometer	ETP-101	TM685	Nov. 13, 2012	Nov. 12, 2013
Wisewind	Thermometer	HTC-1	TM281	Nov. 13, 2012	Nov. 12, 2013
Anritsu	Radio Communication Analyzer	MT8820C	6201074414	Dec. 11, 2012	Dec. 10, 2014
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 06, 2013	May. 05, 2015
SPEAG	Device Holder	N/A	N/A	NCR	NCR
Agilent	ESG Vector Series Signal Generator	E4438C	MY49070755	Oct. 02, 2012	Oct. 01, 2013
Agilent	ENA Network Analyzer	E5071C	MY46316648	Feb. 07, 2013	Feb. 06, 2014
Anritsu	Power Meter	ML2495A	1132003	Aug. 14, 2012	Aug. 13, 2013
Agilent	Dual Directional Coupler	778D	50422	Note 4	
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	Dielectric Probe Kit	85070D	US01440205	Note 5	
AR	Power Amplifier	5S1G4M2	328767	Note 6	
R&S	Spectrum Analyzer	FSP 40	100055	Jun. 07, 2013	Jun. 06, 2014

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 D01v01r01, 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 D1750V2, SN: 1068, 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.

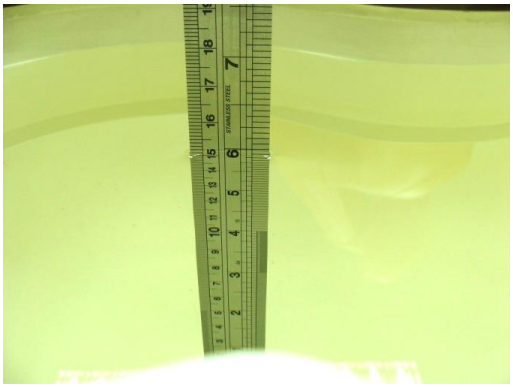


Fig 6.1 Photo of Liquid Height for Head SAR

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
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7

Table 6.1 Recipes of Tissue Simulating Liquid

Simulating Liquid for 5G, Manufactured by SPEAG

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

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an 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	21.7	0.902	43.26	0.89	41.9	1.35	3.25	±5	Jun. 27, 2013
750	Body	21.5	0.97	54.633	0.96	55.5	1.04	-1.56	±5	Jun. 26, 2013
750	Body	21.5	0.963	54.233	0.96	55.5	0.31	-2.28	±5	Jul. 03, 2013
835	Head	21.6	0.928	42.981	0.9	41.5	3.11	3.57	±5	Jun. 27, 2013
835	Body	21.5	0.963	54.498	0.97	55.2	-0.72	-1.27	±5	Jun. 25, 2013
835	Body	21.3	0.975	52.745	0.97	55.2	0.52	-4.45	±5	Jun. 26, 2013
835	Body	21.4	0.964	54.489	0.97	55.2	-0.62	-1.29	±5	Jul. 02, 2013
1750	Head	21.5	1.394	38.51	1.4	40	-0.43	-3.73	±5	Jun. 27, 2013
1750	Body	21.4	1.525	51.728	1.52	53.3	0.33	-2.95	±5	Jun. 25, 2013
1750	Body	21.3	1.528	51.762	1.52	53.3	0.53	-2.89	±5	Jul. 02, 2013
1900	Head	21.5	1.404	41.112	1.4	40	0.29	2.78	±5	Jun. 27, 2013
1900	Body	21.4	1.532	52.328	1.52	53.3	0.79	-1.82	±5	Jun. 25, 2013
1900	Body	21.6	1.53	52.859	1.52	53.3	0.66	-0.83	±5	Jun. 28, 2013
1900	Body	21.3	1.501	54.839	1.52	53.3	-1.25	2.89	±5	Jul. 02, 2013
2450	Head	22.5	1.839	39.306	1.8	39.2	2.17	0.27	±5	Jul. 04, 2013
2450	Body	22.6	2.02	53.936	1.95	52.7	3.59	2.35	±5	Jul. 05, 2013
5200	Head	22.6	4.786	35.42	4.66	36	2.70	-1.61	±5	Jul. 07, 2013
5200	Body	22.7	5.138	47.493	5.3	49	-3.06	-3.08	±5	Jul. 06, 2013
5300	Head	22.6	4.889	35.285	4.76	35.9	2.71	-1.63	±5	Jul. 07, 2013
5300	Body	22.7	5.27	47.255	5.42	48.9	-2.77	-3.32	±5	Jul. 06, 2013
5600	Head	22.6	5.192	34.709	5.06	35.5	2.61	-2.31	±5	Jul. 07, 2013
5600	Body	22.7	5.653	46.801	5.77	48.5	-2.03	-3.44	±5	Jul. 06, 2013
5800	Head	22.6	5.383	34.361	5.27	35.3	2.14	-2.66	±5	Jul. 07, 2013
5800	Body	22.7	5.991	46.521	6	48.2	-0.15	-3.48	±5	Jul. 06, 2013

Table 6.2 Measuring Results for Simulating Liquid

7. System Verification Procedures

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

7.1 Purpose of System Performance check

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

7.2 System Setup

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

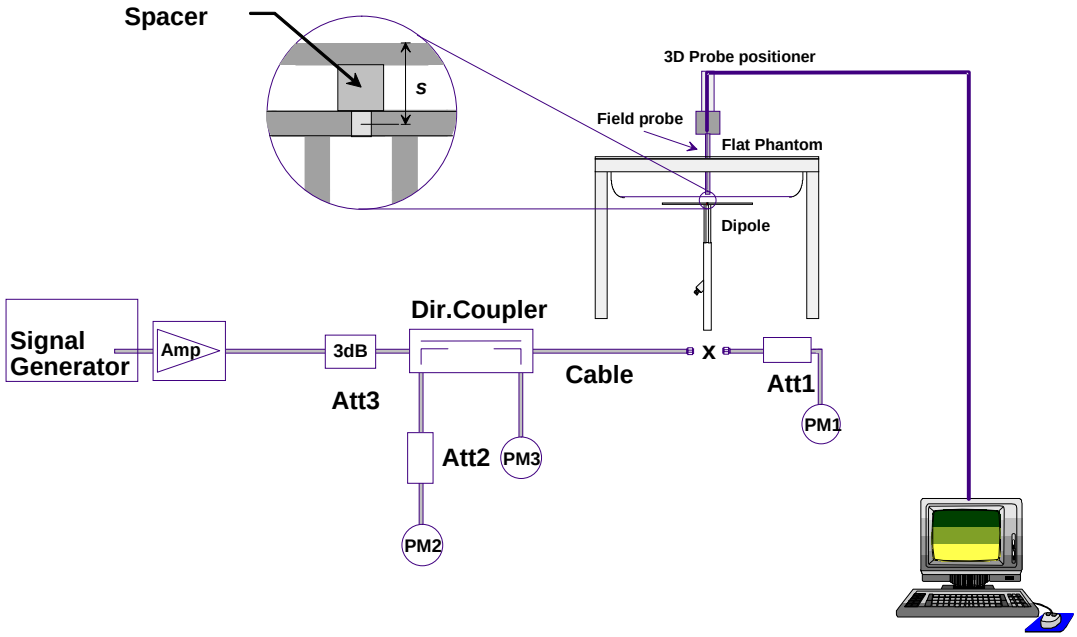


Fig 7.1 System Setup for System Evaluation

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

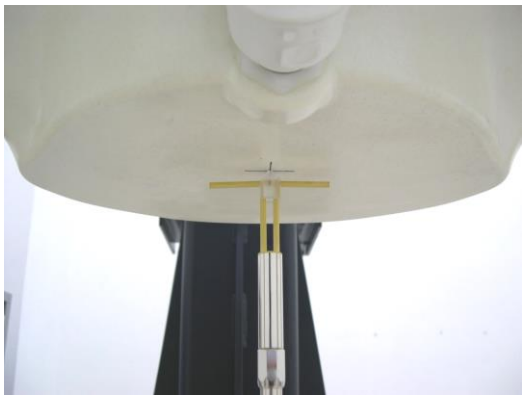


Fig 7.2 Photo of Dipole Setup

7.3 SAR System Verification Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Table 7.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Liquid Type	Power fed onto reference dipole (mW)	Targeted SAR (W/kg)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
Jun. 27, 2013	750	Head	250	8.56	2.2	8.8	2.80
Jun. 27, 2013	750	Body	250	8.83	2.21	8.84	0.11
Jul. 03, 2013	750	Body	250	8.83	2.19	8.76	-0.79
Jun. 27, 2013	835	Head	250	9.57	2.42	9.68	1.15
Jun. 25, 2013	835	Body	250	9.63	2.29	9.16	-4.88
Jun. 26, 2013	835	Body	250	9.63	2.46	9.84	2.18
Jul. 02, 2013	835	Body	250	9.63	2.41	9.64	0.10
Jun. 27, 2013	1750	Head	250	36.1	8.74	34.96	-3.16
Jun. 25, 2013	1750	Body	250	36.8	9.72	38.88	5.65
Jul. 02, 2013	1750	Body	250	36.8	8.77	35.08	-4.67
Jun. 27, 2013	1900	Head	250	40.6	9.5	38	-6.40
Jun. 25, 2013	1900	Body	250	40.8	10.4	41.6	1.96
Jun. 28, 2013	1900	Body	250	40.8	9.49	37.96	-6.96
Jul. 02, 2013	1900	Body	250	40.8	9.56	38.24	-6.27
Jul. 04, 2013	2450	Head	250	54.8	13.6	54.4	-0.73
Jul. 05, 2013	2450	Body	250	52.3	13.9	55.6	6.31
Jul. 07, 2013	5200	Head	100	79.8	7.69	76.9	-3.63
Jul. 06, 2013	5200	Body	100	71.4	7.09	70.9	-0.70
Jul. 07, 2013	5300	Head	100	82.6	8.67	86.7	4.96
Jul. 06, 2013	5300	Body	100	73.5	7.43	74.3	1.09
Jul. 07, 2013	5600	Head	100	83.6	8.97	89.7	7.30
Jul. 06, 2013	5600	Body	100	76.8	8.12	81.2	5.73
Jul. 07, 2013	5800	Head	100	78.9	8.26	82.6	4.69
Jul. 06, 2013	5800	Body	100	71.7	7.72	77.2	7.67

Table 7.1 Target and Measurement SAR after Normalized

8. EUT Testing Position

8.1 Define two imaginary lines on the handset

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

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

(c) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

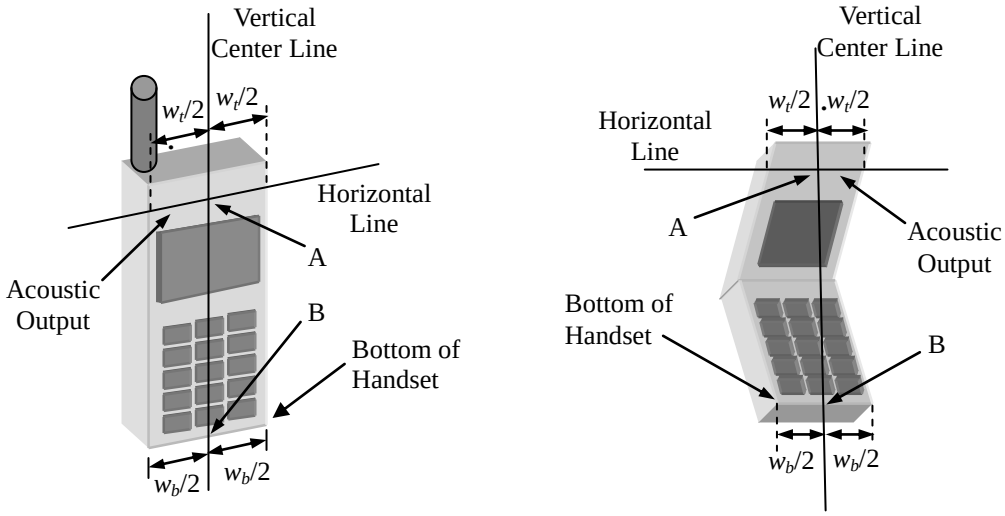


Fig 8.1 Illustration for Handset Vertical and Horizontal Reference Lines

8.2 Cheek Position

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

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

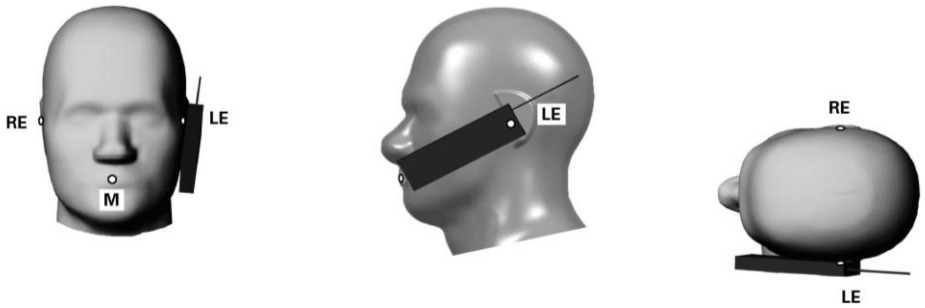


Fig 8.2 Illustration for Cheek Position

8.3 Tilted Position

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

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

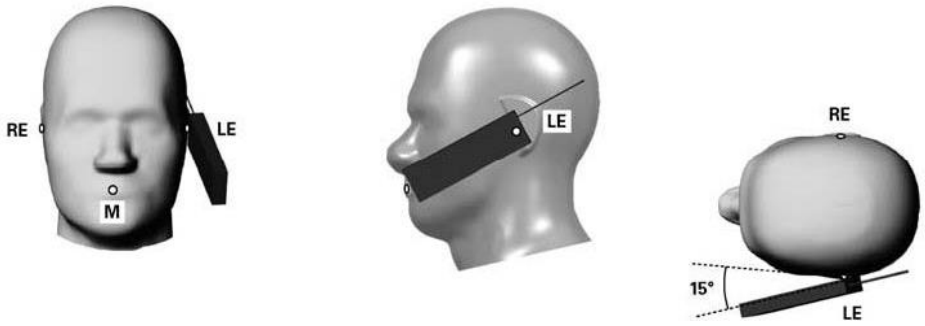


Fig 8.3 Illustration for Tilted Position

8.4 Body Worn Position

(a) To position the device parallel to the phantom surface with either keypad up or down.
(b) To adjust the device parallel to the flat phantom.
(c) To adjust the distance between the device surface and the flat phantom to 1.5cm.
(d) To adjust the distance between the device with Holster and the flat phantom to 0cm.

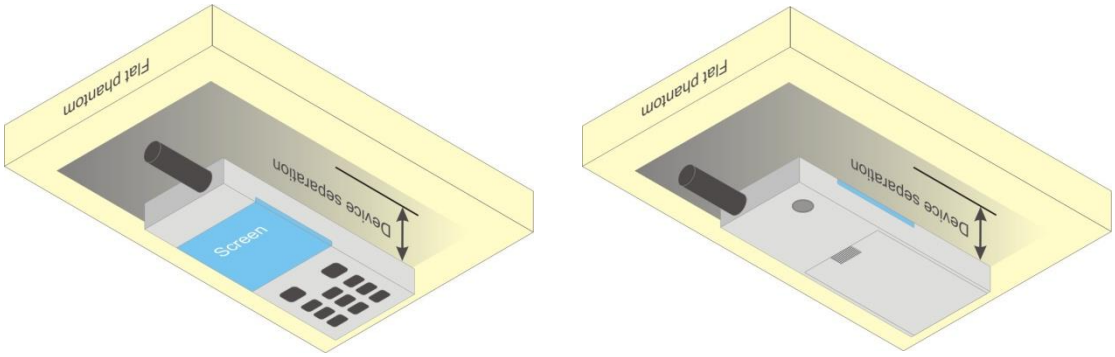


Fig 8.4 Illustration for Body Worn Position

8.5 Hotspot Position

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

<EUT Setup Photos>

Please refer to Appendix D for the test setup photos.

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

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

<SAR measurement>

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

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

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

9.1 Spatial Peak SAR Evaluation

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

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

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

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

9.2 Power Reference Measurement

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

9.3 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r01 quoted below.

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

<table>
<tr><td colspan="3"></td><td>≤ 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>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 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 ≤ 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>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 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>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 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>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 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 reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</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 RMS Conducted Power>

Note:

1. For Head and Body-worn SAR testing, the EUT was set in GSM Voice for GSM850/GSM1900 due to its highest frame-average power.
2. For hotspot mode SAR testing, GPRS and EDGE should be evaluated, therefore the EUT was set in GPRS 4 Tx slots for GSM850/GSM1900 due to its highest frame-average power.

Band GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM (GMSK, 1 Tx slot)	33.28	33.35	33.44	33.50	24.28	24.35	24.44	24.50
GPRS (GMSK, 1 Tx slot) – CS1	33.26	33.37	33.43	33.50	24.26	24.37	24.43	24.50
GPRS (GMSK, 2 Tx slots) – CS1	30.26	30.28	30.44	31.00	24.26	24.28	24.44	25.00
GPRS (GMSK, 3 Tx slots) – CS1	30.11	30.15	30.34	31.00	25.85	25.89	26.08	26.74
GPRS (GMSK, 4 Tx slots) – CS1	30.72	30.58	30.86	31.00	27.72	27.58	27.86	28.00
EDGE (GMSK, 1 Tx slot) – MCS1	33.25	33.34	33.43	33.50	24.25	24.34	24.43	24.50
EDGE (GMSK, 2 Tx slots) – MCS1	30.23	30.25	30.41	31.00	24.23	24.25	24.41	25.00
EDGE (GMSK, 3 Tx slots) – MCS1	30.06	30.14	30.31	31.00	25.80	25.88	26.05	26.74
EDGE (GMSK, 4 Tx slots) – MCS1	30.67	30.68	30.73	31.00	27.67	27.68	27.73	28.00
EDGE (8PSK, 1 Tx slot) – MCS5	26.80	26.76	26.90	27.50	17.80	17.76	17.90	18.50
EDGE (8PSK, 2 Tx slots) – MCS5	26.68	26.64	26.78	27.50	20.68	20.64	20.78	21.50
EDGE (8PSK, 3 Tx slots) – MCS5	26.48	26.46	26.65	27.50	22.22	22.20	22.39	23.24
EDGE (8PSK, 4 Tx slots) – MCS5	26.36	26.31	26.53	27.50	23.36	23.31	23.53	24.50

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

Hotspot inactive - full power mode

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)	30.20	30.08	30.40	30.50	21.20	21.08	21.40	21.50
GPRS (GMSK, 1 Tx slot) – CS1	30.19	30.08	30.39	30.50	21.19	21.08	21.39	21.50
GPRS (GMSK, 2 Tx slots) – CS1	29.82	29.44	29.70	30.50	23.82	23.44	23.70	24.50
GPRS (GMSK, 3 Tx slots) – CS1	29.64	29.26	29.48	30.50	25.38	25.00	25.22	26.24
GPRS (GMSK, 4 Tx slots) – CS1	29.34	29.27	29.49	29.50	26.34	26.27	26.49	26.50
EDGE (GMSK, 1 Tx slot) – MCS1	30.18	30.06	30.35	30.50	21.18	21.06	21.35	21.50
EDGE (GMSK, 2 Tx slots) – MCS1	29.81	29.42	29.70	30.50	23.81	23.42	23.70	24.50
EDGE (GMSK, 3 Tx slots) – MCS1	29.62	29.25	29.47	30.50	25.36	24.99	25.21	26.24
EDGE (GMSK, 4 Tx slots) – MCS1	29.33	29.25	29.45	29.50	26.33	26.25	26.45	26.50
EDGE (8PSK, 1 Tx slot) – MCS5	25.66	25.47	25.50	26.50	16.66	16.47	16.50	17.50
EDGE (8PSK, 2 Tx slots) – MCS5	25.60	25.27	25.41	26.50	19.60	19.27	19.41	20.50
EDGE (8PSK, 3 Tx slots) – MCS5	25.42	25.07	25.17	26.50	21.16	20.81	20.91	22.24
EDGE (8PSK, 4 Tx slots) – MCS5	25.17	24.84	24.96	26.50	22.17	21.84	21.96	23.50

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

Hotspot active - reduced power mode

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)	30.20	30.08	30.40	30.50	21.20	21.08	21.40	21.50
GPRS (GMSK, 1 Tx slot) – CS1	30.19	30.08	30.39	30.50	21.19	21.08	21.39	21.50
GPRS (GMSK, 2 Tx slots) – CS1	26.46	26.43	26.44	26.50	20.46	20.43	20.44	20.50
GPRS (GMSK, 3 Tx slots) – CS1	26.47	26.35	26.49	26.50	22.21	22.09	22.23	22.24
GPRS (GMSK, 4 Tx slots) – CS1	26.38	26.21	26.43	26.50	23.38	23.21	23.43	23.50
EDGE (GMSK, 1 Tx slot) – MCS1	30.30	30.16	30.36	30.50	21.30	21.16	21.36	21.50
EDGE (GMSK, 2 Tx slots) – MCS1	26.49	26.41	26.43	26.50	20.49	20.41	20.43	20.50
EDGE (GMSK, 3 Tx slots) – MCS1	26.45	26.32	26.47	26.50	22.19	22.06	22.21	22.24
EDGE (GMSK, 4 Tx slots) – MCS1	26.36	26.19	26.41	26.50	23.36	23.19	23.41	23.50
EDGE (8PSK, 1 Tx slot) – MCS5	25.97	25.72	25.84	26.50	16.97	16.72	16.84	17.50
EDGE (8PSK, 2 Tx slots) – MCS5	25.77	25.52	25.63	26.50	19.77	19.52	19.63	20.50
EDGE (8PSK, 3 Tx slots) – MCS5	25.51	25.34	25.41	26.50	21.25	21.08	21.15	22.24
EDGE (8PSK, 4 Tx slots) – MCS5	25.38	25.14	25.33	26.50	22.38	22.14	22.33	23.50

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

<WCDMA RMS Conducted Power>

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

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

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

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

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

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

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

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

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

Setup Configuration

HSUPA Setup Configuration:

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

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	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 β_{hs} = 30/15 * β_c.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

<WCDMA RMS Conducted Power>

Note:

1. Per KDB 941225 D01v02, 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. Per KDB 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/HSUPA output power is < 0.25dB higher than RMC12.2Kbps, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA SAR evaluation can be excluded.

Hotspot inactive – full power mode

Band			WCDMA V				WCDMA II				WCDMA IV			
TX Channel			4132	4182	4233	Tune-up Limit (dBm)	9262	9400	9538	Tune-up Limit (dBm)	1312	1413	1513	Tune-up Limit (dBm)
Rx Channel			4357	4407	4458		9662	9800	9938		1537	1638	1738	
Frequency (MHz)			826.4	836.4	846.6		1852.4	1880	1907.6		1712.4	1732.6	1752.6	
3GPP MPR (dB)	3GPP Rel 99	**AMR 12.2Kbps**	24.32	24.24	24.27	24.50	24.20	24.17	24.04	24.50	24.31	24.15	24.38	24.50
	3GPP Rel 99	**RMC 12.2Kbps**	24.35	24.25	24.30	24.50	24.21	24.19	24.08	24.50	24.33	24.18	24.40	24.50
0	3GPP Rel 6	**HSDPA Subtest-1**	23.36	23.37	23.45	24.50	23.26	23.41	23.20	24.50	23.35	23.23	23.43	24.50
0	3GPP Rel 6	**HSDPA Subtest-2**	23.30	23.31	23.26	24.50	23.23	23.24	23.11	24.50	23.28	23.19	23.40	24.50
0.5	3GPP Rel 6	**HSDPA Subtest-3**	22.92	22.86	22.83	24.00	22.68	22.73	22.66	24.00	22.90	22.84	22.87	24.00
0.5	3GPP Rel 6	**HSDPA Subtest-4**	22.89	22.77	22.81	24.00	22.65	22.71	22.61	24.00	22.82	22.78	22.81	24.00
0	3GPP Rel 6	**HSUPA Subtest-1**	23.24	22.92	22.87	24.50	22.72	22.98	22.96	24.50	23.10	23.08	23.06	24.50
2	3GPP Rel 6	**HSUPA Subtest-2**	22.00	21.98	21.78	22.50	21.75	21.80	21.66	22.50	21.62	21.54	21.46	22.50
1	3GPP Rel 6	**HSUPA Subtest-3**	22.38	22.10	22.00	23.50	21.94	22.06	22.01	23.50	22.18	22.14	22.08	23.50
2	3GPP Rel 6	**HSUPA Subtest-4**	22.01	21.90	20.97	22.50	21.68	21.70	21.59	22.50	21.54	21.46	21.37	22.50
0	3GPP Rel 6	**HSUPA Subtest-5**	23.33	23.31	23.27	24.50	23.26	23.22	23.07	24.50	23.29	23.12	23.09	24.50

Hotspot active - reduced power mode

Band			WCDMA II				WCDMA IV			
TX Channel			9262	9400	9538	Tune-up Limit (dBm)	1312	1413	1513	Tune-up Limit (dBm)
Rx Channel			9662	9800	9938		1537	1638	1738	
Frequency (MHz)			1852.4	1880	1907.6		1712.4	1732.6	1752.6	
3GPP MPR(dB)	3GPP Rel 99	**AMR 12.2Kbps**	21.03	21.20	21.18	21.50	21.15	21.06	21.27	21.50
	3GPP Rel 99	**RMC 12.2Kbps**	21.05	21.21	21.00	21.50	21.17	21.11	21.30	21.50
0	3GPP Rel 6	**HSDPA Subtest-1**	20.03	20.20	19.91	21.50	20.20	20.17	20.30	21.50
0	3GPP Rel 6	**HSDPA Subtest-2**	19.99	20.16	19.85	21.50	20.16	20.15	20.27	21.50
0.5	3GPP Rel 6	**HSDPA Subtest-3**	19.50	19.64	19.47	21.00	19.69	19.61	19.80	21.00
0.5	3GPP Rel 6	**HSDPA Subtest-4**	19.48	19.75	19.44	21.00	19.66	19.59	19.74	21.00
0	3GPP Rel 6	**HSUPA Subtest-1**	19.52	19.65	19.63	21.50	20.05	19.96	19.90	21.50
2	3GPP Rel 6	**HSUPA Subtest-2**	18.50	18.57	18.46	19.50	18.60	18.50	18.39	19.50
1	3GPP Rel 6	**HSUPA Subtest-3**	18.77	18.92	18.88	20.50	19.10	19.01	18.93	20.50
2	3GPP Rel 6	**HSUPA Subtest-4**	18.45	18.49	18.37	19.50	18.52	18.37	18.22	19.50
0	3GPP Rel 6	**HSUPA Subtest-5**	20.11	20.16	19.71	21.50	20.19	20.05	20.01	21.50

<LTE RMS Conducted Power>

Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r02, 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 D05v02r02, 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 D05v02r02, 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 Band 17 Conducted Power>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				23780	23790	23800		
Frequency (MHz)				709	710	711		
10	QPSK	1	0	23.99	23.97	24.13	24.5	0
10	QPSK	1	24	24.15	24.11	24.30		
10	QPSK	1	49	24.49	24.34	24.42		
10	QPSK	25	0	23.13	23.03	23.07	23.5	1
10	QPSK	25	12	23.19	23.11	23.21		
10	QPSK	25	24	23.33	23.30	23.40		
10	QPSK	50	0	23.18	23.22	23.32		
10	16QAM	1	0	23.05	23.06	23.18	23.5	1
10	16QAM	1	24	23.24	23.27	23.39		
10	16QAM	1	49	23.40	23.30	23.45		
10	16QAM	25	0	22.05	21.99	22.00	22.5	2
10	16QAM	25	12	22.21	22.18	22.25		
10	16QAM	25	24	22.37	22.36	22.45		
10	16QAM	50	0	22.13	22.12	22.26		
Channel				23755	23790	23825	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				706.5	710	713.5		
5	QPSK	1	0	24.08	24.01	24.31	24.5	0
5	QPSK	1	12	24.26	24.27	24.43		
5	QPSK	1	24	24.21	24.32	24.30		
5	QPSK	12	0	23.12	23.22	23.41	23.5	1
5	QPSK	12	6	23.26	23.32	23.46		
5	QPSK	12	11	23.22	23.29	23.49		
5	QPSK	25	0	23.13	23.26	23.45		
5	16QAM	1	0	23.11	23.12	23.39	23.5	1
5	16QAM	1	12	23.36	23.35	23.47		
5	16QAM	1	24	23.25	23.39	23.43		
5	16QAM	12	0	22.19	22.20	22.45	22.5	2
5	16QAM	12	6	22.27	22.42	22.39		
5	16QAM	12	11	22.20	22.42	22.41		
5	16QAM	25	0	22.11	22.25	22.48		

<LTE Band 5 Conducted Power>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	24.36	24.30	24.09	24.5	0
10	QPSK	1	24	24.31	24.29	23.82		
10	QPSK	1	49	24.35	23.95	23.97		
10	QPSK	25	0	23.33	23.25	22.95	23.5	1
10	QPSK	25	12	23.26	23.21	22.83		
10	QPSK	25	24	23.24	23.09	22.81		
10	QPSK	50	0	23.24	23.10	22.86		
10	16QAM	1	0	23.33	23.31	23.11	23.5	1
10	16QAM	1	24	23.37	23.30	22.97		
10	16QAM	1	49	23.38	22.93	23.04		
10	16QAM	25	0	22.19	22.19	21.84	22.5	2
10	16QAM	25	12	22.20	22.13	21.79		
10	16QAM	25	24	22.19	22.00	21.76		
10	16QAM	50	0	22.09	21.99	21.76		
Channel				20425	20525	20625	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	24.30	24.28	23.90	24.5	0
5	QPSK	1	12	24.27	24.27	23.95		
5	QPSK	1	24	24.31	24.21	23.95		
5	QPSK	12	0	23.41	23.36	22.99	23.5	1
5	QPSK	12	6	23.36	23.20	23.01		
5	QPSK	12	11	23.30	23.15	23.04		
5	QPSK	25	0	23.35	23.20	22.92		
5	16QAM	1	0	23.23	23.30	22.93	23.5	1
5	16QAM	1	12	23.30	23.34	23.00		
5	16QAM	1	24	23.33	23.21	23.00		
5	16QAM	12	0	22.38	22.35	21.89	22.5	2
5	16QAM	12	6	22.34	22.21	21.95		
5	16QAM	12	11	22.29	22.16	21.99		
5	16QAM	25	0	22.23	22.15	21.81		

<LTE Band 4 Conducted Power>

Hotspot inactive - full power mode

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				20000	20175	20350		
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	24.40	24.32	23.94	24.5	0
10	QPSK	1	24	24.34	24.10	23.92		
10	QPSK	1	49	24.39	24.01	23.93		
10	QPSK	25	0	23.33	23.14	22.88	23.5	1
10	QPSK	25	12	23.38	23.05	22.93		
10	QPSK	25	24	23.44	23.04	22.97		
10	QPSK	50	0	23.22	22.97	22.77		
10	16QAM	1	0	23.41	23.38	23.00	23.5	1
10	16QAM	1	24	23.42	23.19	23.09		
10	16QAM	1	49	23.32	23.07	22.98		
10	16QAM	25	0	22.30	22.10	21.88	22.5	2
10	16QAM	25	12	22.42	22.00	21.93		
10	16QAM	25	24	22.45	22.01	21.97		
10	16QAM	50	0	22.26	21.95	21.79		
Channel				19975	20175	20375	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	24.32	24.15	23.87	24.5	0
5	QPSK	1	12	24.26	24.10	23.95		
5	QPSK	1	24	24.38	24.02	23.94		
5	QPSK	12	0	23.41	23.24	22.97	23.5	1
5	QPSK	12	6	23.32	23.13	22.99		
5	QPSK	12	11	23.32	23.11	22.94		
5	QPSK	25	0	23.28	23.09	22.93		
5	16QAM	1	0	23.35	23.18	22.90	23.5	1
5	16QAM	1	12	23.31	23.10	22.99		
5	16QAM	1	24	23.30	23.04	22.92		
5	16QAM	12	0	22.45	22.19	21.98	22.5	2
5	16QAM	12	6	22.37	22.21	22.02		
5	16QAM	12	11	22.40	22.16	22.03		
5	16QAM	25	0	22.32	22.07	21.92		

<LTE Band 4 Conducted Power>

Hotspot active - reduced power mode

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				20000	20175	20350		
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	21.38	21.18	20.91	21.5	0
10	QPSK	1	24	21.30	21.12	20.86		
10	QPSK	1	49	21.22	20.94	20.82		
10	QPSK	25	0	21.25	21.17	20.84	21.5	0
10	QPSK	25	12	21.27	21.02	20.80		
10	QPSK	25	24	21.25	20.91	20.75		
10	QPSK	50	0	21.22	20.93	20.90		
10	16QAM	1	0	21.31	21.16	20.88	21.5	0
10	16QAM	1	24	21.01	21.15	20.85		
10	16QAM	1	49	21.30	21.12	20.81		
10	16QAM	25	0	21.09	21.05	20.78	21.5	0
10	16QAM	25	12	21.28	20.88	20.80		
10	16QAM	25	24	21.20	20.84	20.79		
10	16QAM	50	0	21.20	20.91	20.77		
Channel				19975	20175	20375	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	21.30	21.09	20.89	21.5	0
5	QPSK	1	12	21.13	21.01	20.80		
5	QPSK	1	24	21.17	20.90	20.79		
5	QPSK	12	0	21.29	21.03	20.81	21.5	0
5	QPSK	12	6	21.24	21.08	20.88		
5	QPSK	12	11	21.27	21.05	20.84		
5	QPSK	25	0	21.23	21.00	20.73		
5	16QAM	1	0	21.29	21.07	20.87	21.5	0
5	16QAM	1	12	20.96	21.01	20.80		
5	16QAM	1	24	20.94	21.04	20.74		
5	16QAM	12	0	21.28	21.06	20.86	21.5	0
5	16QAM	12	6	21.27	21.04	20.84		
5	16QAM	12	11	21.17	21.05	20.75		
5	16QAM	25	0	21.09	20.90	20.79		

<LTE Band 2 Conducted Power>

Hotspot inactive - full power mode

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				18650	18900	19150		
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	24.41	24.33	24.32	24.5	0
10	QPSK	1	24	24.30	24.31	24.12		
10	QPSK	1	49	24.35	24.19	24.14		
10	QPSK	25	0	23.21	23.33	23.18	23.5	1
10	QPSK	25	12	23.09	23.24	23.17		
10	QPSK	25	24	23.18	23.30	23.19		
10	QPSK	50	0	22.96	23.15	23.01		
10	16QAM	1	0	23.22	23.41	23.24	23.5	1
10	16QAM	1	24	23.14	23.33	23.23		
10	16QAM	1	49	23.12	23.26	23.16		
10	16QAM	25	0	22.19	22.32	22.25	22.5	2
10	16QAM	25	12	22.14	22.30	22.13		
10	16QAM	25	24	22.13	22.29	22.17		
10	16QAM	50	0	21.96	22.14	22.02		
Channel				18625	18900	19175	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	24.15	24.28	24.10	24.5	0
5	QPSK	1	12	24.19	24.25	24.11		
5	QPSK	1	24	24.05	24.20	24.07		
5	QPSK	12	0	23.28	23.34	23.14	23.5	1
5	QPSK	12	6	23.39	23.31	23.19		
5	QPSK	12	11	23.30	23.29	23.14		
5	QPSK	25	0	23.33	23.23	23.11		
5	16QAM	1	0	23.24	23.33	23.19	23.5	1
5	16QAM	1	12	23.26	23.33	23.14		
5	16QAM	1	24	23.13	23.33	23.14		
5	16QAM	12	0	22.33	22.36	22.27	22.5	2
5	16QAM	12	6	22.44	22.29	22.28		
5	16QAM	12	11	22.36	22.39	22.16		
5	16QAM	25	0	22.22	22.23	22.11		

<LTE Band 2 Conducted Power>

Hotspot active - reduced power mode

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				18650	18900	19150		
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	21.19	21.20	21.44	21.5	0
10	QPSK	1	24	21.03	21.06	21.20		
10	QPSK	1	49	21.03	21.05	21.14		
10	QPSK	25	0	21.12	21.02	21.26	21.5	0
10	QPSK	25	12	21.06	21.01	21.19		
10	QPSK	25	24	21.01	20.93	21.23		
10	QPSK	50	0	21.03	20.97	21.05		
10	16QAM	1	0	21.16	21.03	21.42	21.5	0
10	16QAM	1	24	21.06	20.95	21.25		
10	16QAM	1	49	21.05	20.93	21.16		
10	16QAM	25	0	21.03	20.98	21.20	21.5	0
10	16QAM	25	12	21.13	20.94	21.13		
10	16QAM	25	24	21.10	20.97	21.25		
10	16QAM	50	0	21.09	20.99	21.05		
Channel				18625	18900	19175	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	20.98	20.95	21.27	21.5	0
5	QPSK	1	12	20.97	20.94	21.13		
5	QPSK	1	24	20.96	20.93	21.15		
5	QPSK	12	0	20.86	20.89	21.16	21.5	0
5	QPSK	12	6	20.87	20.87	21.18		
5	QPSK	12	11	20.83	20.84	21.26		
5	QPSK	25	0	20.79	20.91	21.21		
5	16QAM	1	0	20.96	20.92	21.37	21.5	0
5	16QAM	1	12	20.86	20.89	20.91		
5	16QAM	1	24	20.79	20.75	20.70		
5	16QAM	12	0	20.75	20.91	21.19	21.5	0
5	16QAM	12	6	20.87	20.83	21.20		
5	16QAM	12	11	20.83	20.82	21.17		
5	16QAM	25	0	20.74	20.79	21.18		

<WLAN 2.4GHz Conducted Power>

Mode	Channel	Frequency (MHz)	Average power (dBm)				Tune-Up Limit (dBm)
			Data Rate				
			1Mbps	2Mbps	5.5Mbps	11Mbps	
802.11b	CH 1	2412	19.40	19.24	19.36	19.39	19.5
	CH 2	2417	19.21	19.12	19.17	19.04	19.5
	CH 6	2437	19.64	19.46	19.60	19.48	20.0
	CH 7	2442	20.00	19.87	19.98	19.96	20.0
	CH 11	2462	17.61	17.52	17.58	17.60	18.0
	CH 12	2467	15.23	15.21	15.20	15.17	15.5
	CH 13	2472	9.78	9.74	9.72	9.72	10.0

Mode	Channel	Frequency (MHz)	Average power (dBm)								Tune-Up Limit (dBm)
			Data Rate								
			6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps	
802.11g	CH 1	2412	14.40	14.13	14.21	14.22	14.22	14.38	14.35	14.33	14.5
	CH 2	2417	16.30	16.10	16.18	16.05	16.03	16.18	16.14	16.23	16.5
	CH 6	2437	17.68	17.61	17.64	17.55	17.51	17.64	17.65	17.60	18.0
	CH 7	2442	17.53	17.52	17.50	17.49	17.47	17.47	17.50	17.49	18.0
	CH 11	2462	11.92	11.86	11.86	11.84	11.91	11.85	11.88	11.81	12.0
	CH 12	2467	9.93	9.66	9.72	9.91	9.82	9.85	9.89	9.82	10.0
	CH 13	2472	-1.99	-1.91	-1.72	-1.58	-1.44	-1.14	-0.92	-0.73	6.0

Mode	Channel	Frequency (MHz)	Average power (dBm)								Tune-Up Limit (dBm)
			MCS Index								
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
802.11n-HT20	CH 1	2412	13.02	13.00	12.78	12.81	12.81	12.76	12.87	12.86	13.5
	CH 2	2417	15.31	15.19	15.21	15.30	15.26	15.26	15.23	15.26	15.5
	CH 6	2437	16.96	16.91	16.91	16.89	16.85	16.85	16.90	16.89	17.0
	CH 7	2442	16.69	16.67	16.55	16.62	16.64	16.61	16.61	16.68	17.0
	CH 11	2462	10.75	10.70	10.71	10.64	10.74	10.62	10.71	10.74	11.0
	CH 12	2467	8.94	8.82	8.85	8.89	8.93	8.86	8.91	8.90	9.0
	CH 13	2472	-2.74	-2.44	-2.29	-2.00	-1.69	-1.56	-1.28	-1.17	5.0

Note:

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

<Bluetooth Conducted Power>

Bluetooth average power (dBm)				
Mode	GFSK	π/4-DQPSK	8-DPSK	BT4.0 LE, GFSK
Measured Power	1.87	0.60	0.54	1.92
Tune Up Limit (dBm)	2.0	1.0	1.0	2.0

Note:

1. Per KDB 447498 D01v05r01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison

Bluetooth Max Power (dBm)	mW	Test Distance (mm)	Frequency (GHz)	exclusion thresholds
2.0	1.59	5	2.48	0.50

2. Per KDB 447498 D01v05r01 exclusion thresholds is 0.50 < 3, RF exposure evaluation is not required.

<WLAN 5GHz Conducted Power>

Mode	Channel	Frequency (MHz)	Average Power (dBm)								Tune-Up Limit (dBm)
			Data Rate								
			6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps	
802.11a	CH 36	5180	13.89	13.88	13.86	13.88	13.83	13.81	13.85	13.86	14.0
	CH 40	5200	16.52	16.51	16.48	16.43	16.51	16.48	16.41	16.36	17.0
	CH 44	5220	16.90	16.84	16.87	16.86	16.83	16.89	16.88	16.83	17.0
	CH 48	5240	16.97	16.66	16.60	16.65	16.62	16.49	16.53	16.58	17.0
	CH 52	5260	16.45	16.41	16.38	16.38	16.31	16.42	16.42	16.37	17.0
	CH 56	5280	16.57	16.53	16.44	16.45	16.54	16.44	16.45	16.46	17.0
	CH 60	5300	16.51	16.46	16.44	16.49	16.40	16.46	16.45	16.38	17.0
	CH 64	5320	13.24	13.12	13.10	13.23	13.20	13.21	13.20	13.11	13.5
	CH 100	5500	15.15	15.13	15.11	15.13	15.15	15.04	15.13	15.08	15.5
	CH 104	5520	16.70	16.55	16.52	16.47	16.55	16.52	16.45	16.40	17.0
	CH 108	5540	16.63	16.54	16.46	16.47	16.56	16.46	16.47	16.48	17.0
	CH 112	5560	16.68	16.52	16.43	16.44	16.53	16.43	16.44	16.45	17.0
	CH 116	5580	17.00	16.79	16.75	16.81	16.86	16.93	16.94	16.94	17.0
	CH 120	5600	16.51	16.41	16.32	16.50	16.47	16.45	16.45	16.50	17.0
	CH 124	5620	16.52	16.38	16.29	16.47	16.44	16.42	16.42	16.47	17.0
	CH 128	5640	16.54	16.40	16.32	16.48	16.46	16.41	16.44	16.49	17.0
	CH 132	5660	16.74	16.53	16.54	16.62	16.59	16.57	16.57	16.62	17.0
	CH 136	5680	16.61	16.51	16.55	16.55	16.57	16.53	16.52	16.59	17.0
	CH 140	5700	14.27	14.24	14.25	14.23	14.16	14.16	14.21	14.21	14.5
	CH 149	5745	16.56	16.45	16.40	16.40	16.46	16.51	16.44	16.42	17.0
	CH 153	5765	16.93	16.83	16.79	16.89	16.90	16.80	16.81	16.83	17.0
	CH 157	5785	16.97	16.72	16.70	16.58	16.57	16.64	16.68	16.66	17.0
	CH 161	5805	16.73	16.64	16.60	16.70	16.71	16.61	16.62	16.64	17.0
	CH 165	5825	16.90	16.77	16.72	16.78	16.79	16.65	16.66	16.70	17.0

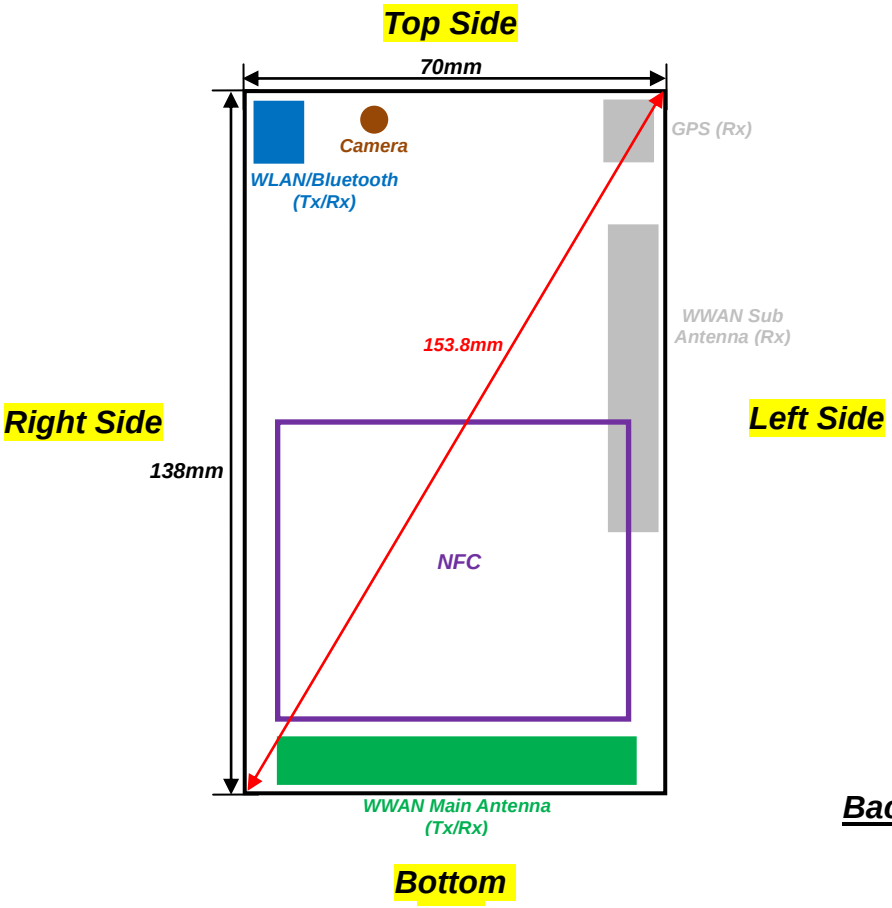
Mode	Channel	Frequency (MHz)	Average Power (dBm)								Tune-Up Limit (dBm)
			MCS Index								
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
802.11n-HT20	CH 36	5180	12.97	12.81	12.93	12.91	12.96	12.91	12.83	12.94	13.0
	CH 40	5200	15.54	15.51	15.48	15.50	15.53	15.51	15.45	15.47	16.0
	CH 44	5220	15.99	15.98	15.95	15.84	15.93	15.93	15.80	15.85	16.0
	CH 48	5240	15.58	15.51	15.48	15.37	15.46	15.46	15.33	15.38	16.0
	CH 52	5260	15.67	15.54	15.51	15.40	15.49	15.49	15.36	15.41	16.0
	CH 56	5280	15.64	15.56	15.58	15.54	15.58	15.60	15.44	15.58	16.0
	CH 60	5300	15.66	15.45	15.42	15.31	15.40	15.40	15.27	15.32	16.0
	CH 64	5320	12.11	12.07	11.94	11.89	12.06	12.11	11.95	12.05	12.5
	CH 100	5500	14.24	14.21	14.23	14.09	14.20	14.14	14.11	14.13	14.5
	CH 104	5520	15.75	15.66	15.64	15.66	15.71	15.73	15.56	15.72	16.0
	CH 108	5540	15.65	15.56	15.63	15.62	15.60	15.61	15.64	15.52	16.0
	CH 112	5560	15.71	15.57	15.65	15.65	15.64	15.62	15.68	15.70	16.0
	CH 116	5580	15.99	15.96	15.94	15.92	15.91	15.89	15.94	15.93	16.0
	CH 120	5600	15.95	15.73	15.80	15.79	15.77	15.78	15.81	15.69	16.0
	CH 124	5620	15.66	15.53	15.55	15.51	15.55	15.57	15.41	15.55	16.0
	CH 128	5640	15.92	15.89	15.86	15.79	15.86	15.84	15.77	15.85	16.0
	CH 132	5660	15.77	15.76	15.74	15.70	15.66	15.74	15.76	15.76	16.0
	CH 136	5680	15.67	15.60	15.57	15.50	15.57	15.65	15.65	15.56	16.0
	CH 140	5700	13.46	13.44	13.38	13.44	13.43	13.43	13.34	13.45	13.5
	CH 149	5745	15.95	15.87	15.88	15.85	15.93	15.92	15.91	15.90	16.0
	CH 153	5765	15.81	15.79	15.74	15.79	15.74	15.78	15.74	15.80	16.0
	CH 157	5785	15.99	15.91	15.90	15.89	15.98	15.94	15.95	15.93	16.0
	CH 161	5805	15.55	15.44	15.48	15.37	15.53	15.54	15.44	15.50	16.0
	CH 165	5825	15.97	15.71	15.73	15.75	15.83	15.71	15.69	15.78	16.0

Mode	Channel	Frequency (MHz)	Average Power (dBm)								Tune-Up Limit (dBm)
			MCS Index								
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
802.11n-HT40	CH 38	5190	11.71	11.67	11.65	11.69	11.64	11.63	11.60	11.68	12.0
	CH 46	5230	14.88	14.71	14.74	14.71	14.87	14.79	14.64	14.67	15.0
	CH 54	5270	14.94	14.91	14.85	14.83	14.89	14.80	14.81	14.85	15.0
	CH 62	5310	11.32	11.27	11.29	11.18	11.20	11.19	11.17	11.20	11.5
	CH 102	5510	10.24	10.18	10.09	10.07	10.17	10.15	10.23	10.17	10.5
	CH 110	5550	14.97	14.91	14.84	14.81	14.89	14.89	14.91	14.85	15.0
	CH 118	5590	14.97	14.89	14.86	14.88	14.89	14.89	14.91	14.82	15.0
	CH 126	5630	14.97	14.89	14.86	14.88	14.89	14.89	14.91	14.82	15.0
	CH 134	5670	14.42	14.27	14.37	14.39	14.39	14.31	14.28	14.21	14.5
	CH 151	5755	14.47	14.41	14.32	14.30	14.38	14.20	14.44	14.45	14.5
	CH 159	5795	14.38	14.36	14.24	14.28	14.35	14.26	14.29	14.31	14.5

Note:

1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate.
3. Apply the test exclusion rule in KDB 248227 D01 v01r02, 11n-HT20/HT40 output power is less than 1/4dB higher than 802.11a mode, thus the SAR can be excluded.

11. Antenna Location



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	≤ 25mm	≤ 25mm	119mm	≤ 25mm	≤ 25mm	≤ 25mm
BT&WLAN	≤ 25mm	≤ 25mm	≤ 25mm	126mm	≤ 25mm	53mm

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

Note:

1. Per KDB 941225 D06 v01r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

12. SAR Test Results

Note:

1. Per KDB 447498 D01v05r01, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Tune-up Scaling Factor
   d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA /HSUPA output power is < 0.25dB higher than RMC, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA /HSUPA SAR evaluation can be excluded.
3. Per KDB 941225 D05v02r02, 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.
4. Per KDB 941225 D05v02r02, 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.
5. Per KDB 941225 D05v02r02, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth.
6. 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
7. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
8. The device does not have limitation to operate VOIP in EGPRS wireless interface; considering the data rate of EGPRS to support VOIP quality and realistic operation, SAR testing was not performed evaluation VOIP operation in EGPRS mode.
9. According to reduction plan to perform SAR testing, related SAR test procedures refer to “reduction plan”.

12.1 Test Records for Head SAR Test

<GSM SAR>

Plot No.	Band	Mode	Test Position	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
51	GSM850	GSM Voice	Right Cheek	Battery1	With Scanner	189	836.4	33.35	33.5	1.035	-0.01	0.460	0.476
66	GSM850	GSM Voice	Left Cheek	Battery1	With Scanner	189	836.4	33.35	33.5	1.035	0.11	0.456	0.472
64	GSM850	GSM Voice	Left Cheek	Battery1	With Scanner	128	824.2	33.28	33.5	1.052	-0.14	0.473	0.498
65	GSM850	GSM Voice	Left Cheek	Battery1	With Scanner	251	848.8	33.44	33.5	1.014	0	0.634	**0.643**
52	GSM1900	GSM Voice	Right Cheek	Battery1	With Scanner	661	1880	30.08	30.5	1.102	0.17	0.224	**0.247**
69	GSM1900	GSM Voice	Left Cheek	Battery1	With Scanner	661	1880	30.08	30.5	1.102	0.08	0.091	0.100
70	GSM1900	GSM Voice	Left Cheek	Battery1	With Scanner	512	1850.2	30.20	30.5	1.072	0.08	0.098	0.105
71	GSM1900	GSM Voice	Left Cheek	Battery1	With Scanner	810	1909.8	30.40	30.5	1.023	0.07	0.080	0.082

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
48	WCDMA V	RMC 12.2Kbps	Right Cheek	Battery1	With Scanner	4182	836.4	24.25	24.5	1.059	1.000	0.03	0.646	0.684
53	WCDMA V	RMC 12.2Kbps	Right Tilted	Battery1	With Scanner	4182	836.4	24.25	24.5	1.059	1.000	0.06	0.424	0.449
54	WCDMA V	RMC 12.2Kbps	Left Cheek	Battery1	With Scanner	4182	836.4	24.25	24.5	1.059	1.000	0.02	0.673	**0.713**
55	WCDMA V	RMC 12.2Kbps	Left Tilted	Battery1	With Scanner	4182	836.4	24.25	24.5	1.059	1.000	0	0.455	0.482
56	WCDMA V	RMC 12.2Kbps	Left Cheek	Battery2	With Scanner	4182	836.4	24.25	24.5	1.059	1.000	0.06	0.604	0.640
57	WCDMA V	RMC 12.2Kbps	Left Cheek	Battery1	Without Scanner	4182	836.4	24.25	24.5	1.059	1.000	-0.03	0.660	0.699
58	WCDMA V	RMC 12.2Kbps	Left Cheek	Battery1	With Scanner	4132	826.4	24.35	24.5	1.035	1.000	-0.01	0.602	0.623
59	WCDMA V	RMC 12.2Kbps	Left Cheek	Battery1	With Scanner	4233	846.6	24.30	24.5	1.047	1.000	0.1	0.511	0.535
49	WCDMA IV	RMC 12.2Kbps	Right Cheek	Battery1	With Scanner	1413	1732.6	24.18	24.5	1.076	1.000	0.01	0.396	**0.426**
68	WCDMA IV	RMC 12.2Kbps	Left Cheek	Battery1	With Scanner	1413	1732.6	24.18	24.5	1.076	1.000	-0.07	0.307	0.330
60	WCDMA IV	RMC 12.2Kbps	Left Cheek	Battery1	With Scanner	1312	1712.4	24.33	24.5	1.040	1.000	-0.04	0.364	0.379
61	WCDMA IV	RMC 12.2Kbps	Left Cheek	Battery1	With Scanner	1513	1752.6	24.40	24.5	1.023	1.000	0.12	0.289	0.296
50	WCDMA II	RMC 12.2Kbps	Right Cheek	Battery1	With Scanner	9400	1880	24.19	24.5	1.074	1.000	0	0.453	**0.487**
67	WCDMA II	RMC 12.2Kbps	Left Cheek	Battery1	With Scanner	9400	1880	24.19	24.5	1.074	1.000	0.06	0.238	0.256
62	WCDMA II	RMC 12.2Kbps	Left Cheek	Battery1	With Scanner	9262	1852.4	24.21	24.5	1.069	1.000	0.06	0.222	0.237
63	WCDMA II	RMC 12.2Kbps	Left Cheek	Battery1	With Scanner	9538	1907.6	24.08	24.5	1.102	1.000	0.13	0.198	0.218

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
75	LTE Band 17	10M	QPSK	1	49	Right Cheek	Battery1	With Scanner	23790	710	24.34	24.5	1.038	0.12	0.299	0.310
101	LTE Band 17	10M	QPSK	1	49	Left Cheek	Battery1	With Scanner	23790	710	24.34	24.5	1.038	-0.11	0.376	0.390
102	LTE Band 17	10M	QPSK	1	49	Left Cheek	Battery1	With Scanner	23780	709	24.49	24.5	1.002	-0.07	0.355	0.356
103	LTE Band 17	10M	QPSK	1	49	Left Cheek	Battery1	With Scanner	23800	711	24.42	24.5	1.019	-0.04	0.386	**0.393**
104	LTE Band 17	10M	QPSK	25	24	Left Cheek	Battery1	With Scanner	23790	710	23.30	23.5	1.047	-0.02	0.274	0.287
74	LTE Band 5	10M	QPSK	1	0	Right Cheek	Battery1	With Scanner	20525	836.5	24.30	24.5	1.047	-0.02	0.475	0.497
76	LTE Band 5	10M	QPSK	1	0	Right Tilted	Battery1	With Scanner	20525	836.5	24.30	24.5	1.047	0.02	0.325	0.340
77	LTE Band 5	10M	QPSK	1	0	Left Cheek	Battery1	With Scanner	20525	836.5	24.30	24.5	1.047	-0.01	0.570	0.597
78	LTE Band 5	10M	QPSK	1	0	Left Tilted	Battery1	With Scanner	20525	836.5	24.30	24.5	1.047	-0.02	0.376	0.394
79	LTE Band 5	10M	QPSK	1	0	Left Cheek	Battery2	With Scanner	20525	836.5	24.30	24.5	1.047	-0.11	0.461	0.483
80	LTE Band 5	10M	QPSK	1	0	Left Cheek	Battery1	Without Scanner	20525	836.5	24.30	24.5	1.047	-0.03	0.464	0.486
81	LTE Band 5	10M	QPSK	1	0	Left Cheek	Battery1	With Scanner	20450	829	24.36	24.5	1.033	0.05	0.672	0.694
82	LTE Band 5	10M	QPSK	1	0	Left Cheek	Battery1	With Scanner	20600	844	24.09	24.5	1.099	-0.11	0.804	**0.884**
83	LTE Band 5	10M	QPSK	25	0	Left Cheek	Battery1	With Scanner	20525	836.5	23.25	23.5	1.059	0.01	0.501	0.531
91	LTE Band 5	10M	QPSK	50	0	Left Cheek	Battery1	With Scanner	20450	829	23.24	23.5	1.062	-0.01	0.434	0.461
73	LTE Band 4	10M	QPSK	1	0	Right Cheek	Battery1	With Scanner	20175	1732.5	24.32	24.5	1.042	-0.11	0.393	**0.410**
87	LTE Band 4	10M	QPSK	1	0	Left Cheek	Battery1	With Scanner	20175	1732.5	24.32	24.5	1.042	-0.01	0.287	0.299
88	LTE Band 4	10M	QPSK	1	0	Left Cheek	Battery1	With Scanner	20000	1715	24.40	24.5	1.023	0.1	0.338	0.346
89	LTE Band 4	10M	QPSK	1	0	Left Cheek	Battery1	With Scanner	20350	1750	23.94	24.5	1.138	0.01	0.266	0.303
93	LTE Band 4	10M	QPSK	25	24	Left Cheek	Battery1	With Scanner	20175	1732.5	23.04	23.5	1.112	0.06	0.220	0.245
72	LTE Band 2	10M	QPSK	1	0	Right Cheek	Battery1	With Scanner	18900	1880	24.33	24.5	1.040	0.01	0.402	**0.418**
84	LTE Band 2	10M	QPSK	1	0	Left Cheek	Battery1	With Scanner	18900	1880	24.33	24.5	1.040	-0.02	0.214	0.223
85	LTE Band 2	10M	QPSK	1	0	Left Cheek	Battery1	With Scanner	18650	1855	24.41	24.5	1.021	-0.03	0.196	0.200
86	LTE Band 2	10M	QPSK	1	0	Left Cheek	Battery1	With Scanner	19150	1905	24.32	24.5	1.042	0	0.219	0.228
92	LTE Band 2	10M	QPSK	25	0	Left Cheek	Battery1	With Scanner	18900	1880	23.33	23.5	1.040	0.01	0.163	0.170

<WLAN SAR DTS>

Plot No.	Band	Mode	Test Position	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
200	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	Battery1	With Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	0	0.458	0.509
201	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	Battery1	With Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	-0.01	0.537	0.597
202	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	Battery1	With Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	0.01	0.751	**0.835**
203	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	Battery1	With Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	0.06	0.565	0.628
204	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	Battery2	With Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	0.05	0.708	0.787
205	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	Battery1	Without Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	0	0.695	0.773
206	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	Battery1	With Scanner	1	2412	19.40	19.5	1.022	97.63	1.024	-0.01	0.741	0.776
207	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	Battery1	With Scanner	11	2462	17.61	18.0	1.093	97.63	1.024	0.02	0.665	0.744
319	WLAN5GHz	802.11a 6Mbps	Right Cheek	Battery1	With Scanner	157	5785	16.97	17.0	1.007	87.26	1.146	0.06	0.289	0.333
332	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	149	5745	16.56	17.0	1.106	87.26	1.146	0.08	0.444	**0.563**
333	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	157	5785	16.97	17.0	1.007	87.26	1.146	0.02	0.422	0.487
334	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	165	5825	16.90	17.0	1.023	87.26	1.146	0.1	0.341	0.400

<WLAN SAR NII>

Plot No.	Band	Mode	Test Position	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
316	WLAN5GHz	802.11a 6Mbps	Right Cheek	Battery1	With Scanner	48	5240	16.97	17.0	1.007	87.26	1.146	-0.03	0.376	0.434
326	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	48	5240	16.97	17.0	1.007	87.26	1.146	0.06	0.502	0.579
342	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	40	5200	16.52	17.0	1.116	87.26	1.146	0.05	0.466	**0.596**
341	WLAN5GHz	802.11a 6Mbps	Right Cheek	Battery1	With Scanner	56	5280	16.57	17.0	1.104	87.26	1.146	0.15	0.348	0.440
343	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	56	5280	16.57	17.0	1.104	87.26	1.146	0.16	0.405	0.512
344	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	60	5300	16.51	17.0	1.119	87.26	1.146	0.07	0.405	**0.519**
318	WLAN5GHz	802.11a 6Mbps	Right Cheek	Battery1	With Scanner	116	5580	17.00	17.0	1.000	87.26	1.146	0.03	0.440	0.504
320	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	116	5580	17.00	17.0	1.000	87.26	1.146	0	0.556	0.637
321	WLAN5GHz	802.11a 6Mbps	Left Cheek	Battery1	With Scanner	116	5580	17.00	17.0	1.000	87.26	1.146	-0.15	0.467	0.535
322	WLAN5GHz	802.11a 6Mbps	Left Tilted	Battery1	With Scanner	116	5580	17.00	17.0	1.000	87.26	1.146	0.11	0.494	0.566
323	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery2	With Scanner	116	5580	17.00	17.0	1.000	87.26	1.146	0.12	0.517	0.592
324	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	Without Scanner	116	5580	17.00	17.0	1.000	87.26	1.146	0.1	0.518	0.594
329	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	104	5520	16.70	17.0	1.071	87.26	1.146	0	0.453	0.556
330	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	124	5620	16.52	17.0	1.116	87.26	1.146	-0.01	0.519	**0.664**
331	WLAN5GHz	802.11a 6Mbps	Right Tilted	Battery1	With Scanner	136	5680	16.61	17.0	1.093	87.26	1.146	-0.1	0.519	0.651

12.2 Test Records for Hotspot SAR Test

Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	≤ 25mm	≤ 25mm	119mm	≤ 25mm	≤ 25mm	≤ 25mm
BT&WLAN	≤ 25mm	≤ 25mm	≤ 25mm	126mm	≤ 25mm	53mm

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

Note:

1. Per KDB 941225 D06 v01r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
6	GSM850	GPRS (4 Tx slots)	Front	1cm	Battery1	With Scanner	189	836.4	30.58	31.0	1.102	-0.01	0.802	0.883
5	GSM850	GPRS (4 Tx slots)	Back	1cm	Battery1	With Scanner	189	836.4	30.58	31.0	1.102	-0.05	1.200	**1.322**
7	GSM850	GPRS (4 Tx slots)	Left Side	1cm	Battery1	With Scanner	189	836.4	30.58	31.0	1.102	0.01	0.983	1.083
8	GSM850	GPRS (4 Tx slots)	Right Side	1cm	Battery1	With Scanner	189	836.4	30.58	31.0	1.102	-0.01	1.000	1.102
9	GSM850	GPRS (4 Tx slots)	Bottom Side	1cm	Battery1	With Scanner	189	836.4	30.58	31.0	1.102	0.03	0.134	0.148
10	GSM850	GPRS (4 Tx slots)	Back	1cm	Battery2	With Scanner	189	836.4	30.58	31.0	1.102	-0.05	1.050	1.157
11	GSM850	GPRS (4 Tx slots)	Back	1cm	Battery1	Without Scanner	189	836.4	30.58	31.0	1.102	0.11	1.180	1.300
12	GSM850	GPRS (4 Tx slots)	Back	1cm	Battery1	With Scanner	128	824.2	30.72	31.0	1.067	-0.01	1.230	1.312
13	GSM850	GPRS (4 Tx slots)	Back	1cm	Battery1	With Scanner	251	848.8	30.86	31.0	1.033	-0.04	1.160	1.198
4	GSM1900	GPRS (4 Tx slots)	Back	1cm	Battery1	With Scanner	661	1880	26.21	26.5	1.069	0.09	1.230	**1.315**
16	GSM1900	GPRS (4 Tx slots)	Back	1cm	Battery1	With Scanner	512	1850.2	26.38	26.5	1.028	0.13	1.190	1.223
17	GSM1900	GPRS (4 Tx slots)	Back	1cm	Battery1	With Scanner	810	1909.8	26.43	26.5	1.016	0.08	1.160	1.179

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
1	WCDMA V	RMC 12.2Kbps	Back	1cm	Battery1	With Scanner	4182	836.4	24.25	24.5	1.059	0.06	0.976	**1.034**
14	WCDMA V	RMC 12.2Kbps	Back	1cm	Battery1	With Scanner	4132	826.4	24.35	24.5	1.035	-0.02	0.956	0.990
15	WCDMA V	RMC 12.2Kbps	Back	1cm	Battery1	With Scanner	4233	846.6	24.30	24.5	1.047	0.01	0.854	0.894
2	WCDMA IV	RMC 12.2Kbps	Back	1cm	Battery1	With Scanner	1413	1732.6	21.11	21.5	1.094	0	1.150	1.258
20	WCDMA IV	RMC 12.2Kbps	Back	1cm	Battery1	With Scanner	1312	1712.4	21.17	21.5	1.079	0.1	1.170	**1.262**
21	WCDMA IV	RMC 12.2Kbps	Back	1cm	Battery1	With Scanner	1513	1752.6	21.30	21.5	1.047	0.16	1.080	1.131
3	WCDMA II	RMC 12.2Kbps	Back	1cm	Battery1	With Scanner	9400	1880	21.21	21.5	1.069	0.05	1.070	**1.144**
18	WCDMA II	RMC 12.2Kbps	Back	1cm	Battery1	With Scanner	9262	1852.4	21.05	21.5	1.109	0.15	0.915	1.015
19	WCDMA II	RMC 12.2Kbps	Back	1cm	Battery1	With Scanner	9538	1907.6	21.00	21.5	1.122	0.09	0.967	1.085

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (cm)	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
25	LTE Band 17	10M	QPSK	1	49	Back	1cm	Battery1	With Scanner	23790	710	24.34	24.5	1.038	0.14	0.775	0.804
97	LTE Band 17	10M	QPSK	1	49	Back	1cm	Battery1	With Scanner	23780	709	24.49	24.5	1.002	-0.04	0.808	0.810
98	LTE Band 17	10M	QPSK	1	49	Back	1cm	Battery1	With Scanner	23800	711	24.42	24.5	1.019	-0.04	0.850	**0.866**
99	LTE Band 17	10M	QPSK	25	24	Back	1cm	Battery1	With Scanner	23790	710	23.30	23.5	1.047	-0.01	0.621	0.650
100	LTE Band 17	10M	QPSK	50	0	Back	1cm	Battery1	With Scanner	23800	711	23.32	23.5	1.042	0.02	0.580	0.605
24	LTE Band 5	10M	QPSK	1	0	Back	1cm	Battery1	With Scanner	20525	836.5	24.30	24.5	1.047	0.06	0.891	0.933
44	LTE Band 5	10M	QPSK	1	0	Back	1cm	Battery1	With Scanner	20450	829	24.36	24.5	1.033	-0.04	1.040	1.074
45	LTE Band 5	10M	QPSK	1	0	Back	1cm	Battery1	With Scanner	20600	844	24.09	24.5	1.099	0	1.020	**1.121**
46	LTE Band 5	10M	QPSK	25	0	Back	1cm	Battery1	With Scanner	20525	836.5	23.25	23.5	1.059	0.04	0.718	0.761
47	LTE Band 5	10M	QPSK	50	0	Back	1cm	Battery1	With Scanner	20450	829	23.24	23.5	1.062	0.13	0.638	0.677
26	LTE Band 4	10M	QPSK	1	0	Front	1cm	Battery1	With Scanner	20175	1732.5	21.18	21.5	1.076	-0.07	0.342	0.368
23	LTE Band 4	10M	QPSK	1	0	Back	1cm	Battery1	With Scanner	20175	1732.5	21.18	21.5	1.076	-0.03	1.100	1.184
27	LTE Band 4	10M	QPSK	1	0	Left Side	1cm	Battery1	With Scanner	20175	1732.5	21.18	21.5	1.076	0.01	0.057	0.061
28	LTE Band 4	10M	QPSK	1	0	Right Side	1cm	Battery1	With Scanner	20175	1732.5	21.18	21.5	1.076	-0.09	0.104	0.112
29	LTE Band 4	10M	QPSK	1	0	Bottom Side	1cm	Battery1	With Scanner	20175	1732.5	21.18	21.5	1.076	0.14	0.829	0.892
30	LTE Band 4	10M	QPSK	1	0	Back	1cm	Battery2	With Scanner	20175	1732.5	21.18	21.5	1.076	-0.09	0.464	0.499
31	LTE Band 4	10M	QPSK	1	0	Back	1cm	Battery1	Without Scanner	20175	1732.5	21.18	21.5	1.076	0	1.070	1.152
32	LTE Band 4	10M	QPSK	1	0	Back	1cm	Battery1	With Scanner	20000	1715	21.38	21.5	1.028	0.09	1.170	**1.203**
33	LTE Band 4	10M	QPSK	1	0	Back	1cm	Battery1	With Scanner	20350	1750	20.91	21.5	1.146	-0.08	1.040	1.191
40	LTE Band 4	10M	QPSK	25	12	Back	1cm	Battery1	With Scanner	20175	1732.5	21.17	21.5	1.079	0.05	0.973	1.050
41	LTE Band 4	10M	QPSK	25	12	Back	1cm	Battery1	With Scanner	20000	1715	21.25	21.5	1.059	-0.04	1.110	1.176
42	LTE Band 4	10M	QPSK	25	12	Back	1cm	Battery1	With Scanner	20350	1750	20.84	21.5	1.164	-0.03	1.000	1.164
43	LTE Band 4	10M	QPSK	50	0	Back	1cm	Battery1	With Scanner	20000	1715	21.22	21.5	1.067	-0.03	1.08	1.152
22	LTE Band 2	10M	QPSK	1	0	Back	1cm	Battery1	With Scanner	18900	1880	21.2	21.5	1.072	-0.07	0.939	1.006
34	LTE Band 2	10M	QPSK	1	0	Back	1cm	Battery1	With Scanner	18650	1855	21.19	21.5	1.074	0.05	0.827	0.888
35	LTE Band 2	10M	QPSK	1	0	Back	1cm	Battery1	With Scanner	19150	1905	21.44	21.5	1.014	0	1.050	**1.065**
36	LTE Band 2	10M	QPSK	25	0	Back	1cm	Battery1	With Scanner	18900	1880	21.02	21.5	1.117	0.04	0.862	0.963
37	LTE Band 2	10M	QPSK	25	0	Back	1cm	Battery1	With Scanner	18650	1855	21.12	21.5	1.091	-0.03	0.808	0.882
38	LTE Band 2	10M	QPSK	25	0	Back	1cm	Battery1	With Scanner	19150	1905	21.26	21.5	1.057	-0.14	0.989	1.045
39	LTE Band 2	10M	QPSK	50	0	Back	1cm	Battery1	With Scanner	19150	1905	21.05	21.5	1.109	0	0.960	1.065

<WLAN SAR DTS>

Plot No.	Band	Mode	Test Position	Gap (cm)	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
208	WLAN2.4GHz	802.11b 1Mbps	Front	1cm	Battery1	With Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	0.07	0.169	0.188
209	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	Battery1	With Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	0.03	0.225	**0.250**
210	WLAN2.4GHz	802.11b 1Mbps	Right Side	1cm	Battery1	With Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	-0.01	0.203	0.226
211	WLAN2.4GHz	802.11b 1Mbps	Top Side	1cm	Battery1	With Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	-0.04	0.192	0.214
212	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	Battery2	With Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	-0.03	0.121	0.135
219	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	Battery1	Without Scanner	6	2437	19.64	20.0	1.085	97.63	1.024	0	0.207	0.230
213	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	Battery1	With Scanner	1	2412	19.40	19.5	1.022	97.63	1.024	0	0.211	0.221
214	WLAN2.4GHz	802.11b 1Mbps	Back	1cm	Battery1	With Scanner	11	2462	17.61	18.0	1.093	97.63	1.024	-0.19	0.173	0.193

12.3 Test Records for Body Worn SAR Test

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Battery	Scanner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
106	GSM850	GSM Voice	Back	1.5cm	Battery1	With Scanner	189	836.4	33.35	33.5	1.035	-0.02	0.691	0.715
118	GSM850	GSM Voice	Back	1.5cm	Battery1	With Scanner	128	824.2	33.28	33.5	1.052	-0.02	0.717	**0.754**
105	GSM850	GSM Voice	Back	1.5cm	Battery1	With Scanner	251	848.8	33.44	33.5	1.014	-0.01	0.720	0.730
110	GSM1900	GSM Voice	Back	1.5cm	Battery1	With Scanner	661	1880	30.08	30.5	1.102	-0.09	0.444	**0.489**
116	GSM1900	GSM Voice	Back	1.5cm	Battery1	With Scanner	512	1850.2	30.20	30.5	1.072	0.01	0.419	0.449
117	GSM1900	GSM Voice	Back	1.5cm	Battery1	With Scanner	810	1909.8	30.40	30.5	1.023	-0.01	0.460	0.471

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Battery	Scanner	Holster	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
107	WCDMA V	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner			4182	836.4	24.25	24.5	1.059	0	0.801	**0.848**
119	WCDMA V	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner			4132	826.4	24.35	24.5	1.035	-0.06	0.772	0.799
120	WCDMA V	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner			4233	846.6	24.30	24.5	1.047	-0.01	0.564	0.591
109	WCDMA IV	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner			1413	1732.6	24.18	24.5	1.076	-0.14	1.150	1.238
111	WCDMA IV	RMC 12.2Kbps	Back	0cm	Battery1	With Scanner	Holster		1413	1732.6	24.18	24.5	1.076	0.03	0.716	0.771
112	WCDMA IV	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner			1312	1712.4	24.33	24.5	1.040	-0.14	1.270	**1.321**
113	WCDMA IV	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner			1513	1752.6	24.40	24.5	1.023	0.04	1.260	1.289
152	WCDMA IV	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner		Headset	1413	1732.6	24.18	24.5	1.076	-0.17	1.140	1.227
153	WCDMA IV	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner		Headset	1312	1712.4	24.33	24.5	1.040	-0.11	1.160	1.206
154	WCDMA IV	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner		Headset	1513	1752.6	24.40	24.5	1.023	-0.19	1.170	1.197
108	WCDMA II	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner			9400	1880	24.19	24.5	1.074	0.04	1.070	1.149
114	WCDMA II	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner			9262	1852.4	24.21	24.5	1.069	-0.04	1.040	1.112
115	WCDMA II	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner			9538	1907.6	24.08	24.5	1.102	0.12	1.190	1.311
151	WCDMA II	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner		Headset	9400	1880	24.19	24.5	1.074	0.01	1.110	1.192
150	WCDMA II	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner		Headset	9262	1852.4	24.21	24.5	1.069	0	1.060	1.133
149	WCDMA II	RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner		Headset	9538	1907.6	24.08	24.5	1.102	-0.01	1.200	**1.322**

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (cm)	Battery	Scanner	Holster	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
130	LTE Band 17	10M	QPSK	1	49	Back	1.5cm	Battery1	With Scanner			23790	710	24.34	24.5	1.038	0	0.642	0.666
131	LTE Band 17	10M	QPSK	1	49	Back	1.5cm	Battery1	With Scanner			23780	709	24.49	24.5	1.002	0.02	0.610	0.611
132	LTE Band 17	10M	QPSK	1	49	Back	1.5cm	Battery1	With Scanner			23780	711	24.42	24.5	1.019	0.01	0.658	**0.670**
133	LTE Band 17	10M	QPSK	25	24	Back	1.5cm	Battery1	With Scanner			23790	710	23.30	23.5	1.047	0.05	0.467	0.489
121	LTE Band 5	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner			20525	836.5	24.30	24.5	1.047	0.02	0.680	0.712
122	LTE Band 5	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner			20450	829	24.36	24.5	1.033	0.01	0.823	0.850
123	LTE Band 5	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner			20600	844	24.09	24.5	1.099	-0.01	0.789	**0.867**
134	LTE Band 5	10M	QPSK	25	0	Back	1.5cm	Battery1	With Scanner			20525	836.5	23.25	23.5	1.059	0.12	0.598	0.633
136	LTE Band 5	10M	QPSK	50	0	Back	1.5cm	Battery1	With Scanner			20450	829	23.24	23.5	1.062	-0.08	0.569	0.604
127	LTE Band 4	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner			20175	1732.5	24.32	24.5	1.042	-0.03	1.160	1.209
128	LTE Band 4	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner			20000	1715	24.40	24.5	1.023	-0.1	1.190	1.218
129	LTE Band 4	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner			20350	1750	23.94	24.5	1.138	0.01	1.120	1.274
135	LTE Band 4	10M	QPSK	1	0	Back	0cm	Battery1	With Scanner	Holster		20175	1732.5	24.32	24.5	1.042	-0.09	0.910	0.949
137	LTE Band 4	10M	QPSK	25	24	Back	1.5cm	Battery1	With Scanner			20175	1732.5	23.04	23.5	1.112	0.05	0.872	0.969
138	LTE Band 4	10M	QPSK	25	24	Back	1.5cm	Battery1	With Scanner			20000	1715	23.44	23.5	1.014	-0.02	1.050	1.065
139	LTE Band 4	10M	QPSK	25	24	Back	1.5cm	Battery1	With Scanner			20350	1750	22.97	23.5	1.130	-0.02	0.884	0.999
140	LTE Band 4	10M	QPSK	50	0	Back	1.5cm	Battery1	With Scanner			20000	1715	23.22	23.5	1.067	-0.1	0.989	1.055
141	LTE Band 4	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner		Headset	20175	1732.5	24.32	24.5	1.042	-0.05	1.130	1.178
142	LTE Band 4	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner		Headset	20000	1715	24.40	24.5	1.023	-0.01	1.200	1.228
143	LTE Band 4	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner		Headset	20350	1750	23.94	24.5	1.138	0	1.160	**1.320**
124	LTE Band 2	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner			18900	1880	24.33	24.5	1.040	-0.06	0.981	1.020
125	LTE Band 2	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner			18650	1855	24.41	24.5	1.021	-0.05	0.855	0.873
126	LTE Band 2	10M	QPSK	1	0	Back	1.5cm	Battery1	With Scanner			19150	1905	24.32	24.5	1.042	-0.02	1.110	**1.157**
144	LTE Band 2	10M	QPSK	25	0	Back	1.5cm	Battery1	With Scanner			18900	1880	23.33	23.5	1.040	-0.08	0.752	0.782
147	LTE Band 2	10M	QPSK	50	0	Back	1.5cm	Battery1	With Scanner			18900	1880	23.15	23.5	1.084	0.03	0.665	0.721

<WLAN SAR DTS>

Plot No.	Band	Mode	Test Position	Gap (cm)	Battery	Scanner	Holster	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
215	WLAN2.4GHz	802.11b 1Mbps	Back	1.5cm	Battery1	With Scanner			6	2437	19.64	20.0	1.085	97.63	1.024	0.11	0.129	**0.143**
216	WLAN2.4GHz	802.11b 1Mbps	Back	0cm	Battery1	With Scanner	Holster		6	2437	19.64	20.0	1.085	97.63	1.024	-0.04	0.119	0.132
217	WLAN2.4GHz	802.11b 1Mbps	Back	1.5cm	Battery1	With Scanner			1	2412	19.40	19.5	1.022	97.63	1.024	0.1	0.117	0.123
218	WLAN2.4GHz	802.11b 1Mbps	Back	1.5cm	Battery1	With Scanner			11	2462	17.61	18.0	1.093	97.63	1.024	0.07	0.124	0.139
220	WLAN2.4GHz	802.11b 1Mbps	Back	1.5cm	Battery1	With Scanner		Headset	6	2437	19.64	20.0	1.085	97.63	1.024	-0.01	0.122	0.136
303	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			157	5785	16.97	17.0	1.007	87.26	1.146	-0.1	0.118	0.136
314	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			149	5745	16.56	17.0	1.106	87.26	1.146	-0.16	0.152	**0.192**
315	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			165	5825	16.90	17.0	1.023	87.26	1.146	0.16	0.104	0.122

<WLAN SAR NII>

Plot No.	Band	Mode	Test Position	Gap (cm)	Battery	Scanner	Holster	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)
304	WLAN5GHz	802.11a 6Mbps	Front	1.5cm	Battery1	With Scanner			48	5240	16.97	17.0	1.007	87.26	1.146	0.18	0.047	0.054
300	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			48	5240	16.97	17.0	1.007	87.26	1.146	-0.02	0.420	**0.484**
305	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery2	With Scanner			48	5240	16.97	17.0	1.007	87.26	1.146	-0.07	0.228	0.263
306	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	Without Scanner			48	5240	16.97	17.0	1.007	87.26	1.146	0.06	0.401	0.463
307	WLAN5GHz	802.11a 6Mbps	Back	0cm	Battery1	With Scanner	Holster		48	5240	16.97	17.0	1.007	87.26	1.146	0.17	0.337	0.389
345	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			40	5200	16.52	17.0	1.116	87.26	1.146	-0.03	0.183	0.234
309	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner		Headset	48	5240	16.97	17.0	1.007	87.26	1.146	0.1	0.320	0.369
346	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			56	5280	16.57	17.0	1.104	87.26	1.146	0	0.281	**0.355**
347	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			60	5300	16.51	17.0	1.119	87.26	1.146	0.03	0.235	0.301
302	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			116	5580	17.00	17.0	1.000	87.26	1.146	-0.12	0.280	0.321
312	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			104	5520	16.70	17.0	1.071	87.26	1.146	-0.15	0.269	**0.330**
311	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			124	5620	16.52	17.0	1.116	87.26	1.146	-0.07	0.220	0.281
313	WLAN5GHz	802.11a 6Mbps	Back	1.5cm	Battery1	With Scanner			136	5680	16.61	17.0	1.093	87.26	1.146	-0.08	0.216	0.271

12.4 Repeated SAR Measurement

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (cm)	Battery	Scanner	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Scaled 1g SAR (W/kg)
12	GSM850					GPRS (4 Tx slots)	Back	1cm	Battery1	With Scanner		128	824.2	30.72	31.0	1.067	-0.01	1.230	1	1.312
95	GSM850					GPRS (4 Tx slots)	Back	1cm	Battery1	With Scanner		128	824.2	30.72	31.0	1.067	0.04	1.220	1.01	1.301
4	GSM1900					GPRS (4 Tx slots)	Back	1cm	Battery1	With Scanner		661	1880	26.21	26.5	1.069	0.09	1.230	1	1.315
94	GSM1900					GPRS (4 Tx slots)	Back	1cm	Battery1	With Scanner		661	1880	26.21	26.5	1.069	-0.11	1.200	1.03	1.283
112	WCDMA IV					RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner		1312	1712.4	24.33	24.5	1.040	-0.14	1.270	1	1.321
335	WCDMA IV					RMC 12.2Kbps	Back	1.5cm	Battery1	With Scanner		1312	1712.4	24.33	24.5	1.040	0.1	1.220	1.01	1.269
98	LTE Band 17	10M	QPSK	1	49		Back	1cm	Battery1	With Scanner		23800	711	24.42	24.5	1.019	-0.04	0.850	1	0.866
336	LTE Band 17	10M	QPSK	1	49		Back	1cm	Battery1	With Scanner		23800	711	24.42	24.5	1.019	-0.04	0.847	1.01	0.863
142	LTE Band 4	10M	QPSK	1	0		Back	1.5cm	Battery1	With Scanner	Headset	20000	1715	24.40	24.5	1.023	-0.01	1.200	1	1.228
148	LTE Band 4	10M	QPSK	1	0		Back	1.5cm	Battery1	With Scanner	Headset	20000	1715	24.40	24.5	1.023	-0.15	1.200	1	1.228

Note:

1. Per KDB 865664 D01v01r01, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg
2. Per KDB 865664 D01v01r01, 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

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/6/25

#05_GSM850_GPRS (4 Tx slots)_Back_1cm_Ch189;Battery1_With Scanner

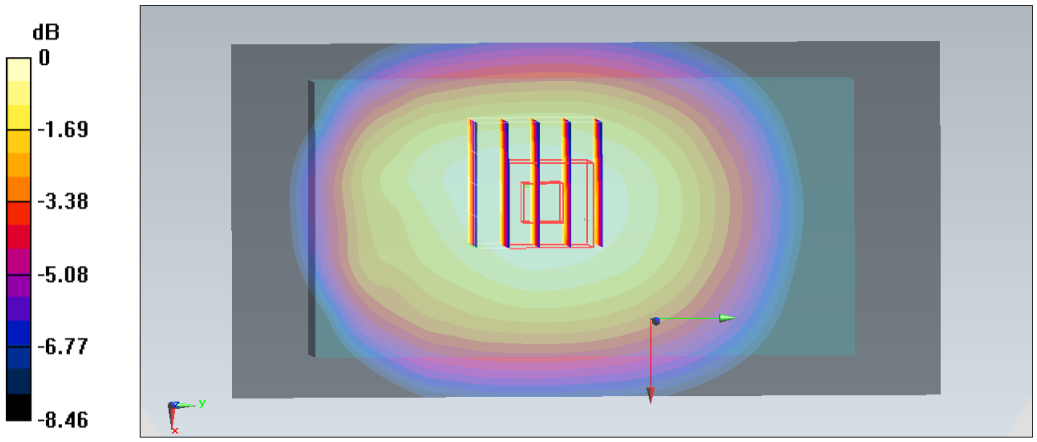
DUT: 322304-07

Communication System: GSM850; Frequency: 836.4 MHz;Duty Cycle: 1:2
Medium: MSL_850_130625 Medium parameters used: f = 836.4 MHz; σ = 0.965 mho/m; ε_r = 54.481; ρ = 1000 kg/m^3
Ambient Temperature：22.5 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3792; ConvF(9.15, 9.15, 9.15); Calibrated: 2013/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2013/5/28
- Phantom: SAM Left; Type: QD000P40CD; Serial: TP:1542
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch189/Area Scan (61x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.44 mW/g

Configuration/Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 38.838 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.537 mW/g
SAR(1 g) = 1.2 mW/g; SAR(10 g) = 0.911 mW/g
Maximum value of SAR (measured) = 1.38 mW/g



0 dB = 1.38 mW/g = 2.80 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/6/25

#04_GSM1900_GPRS (4 Tx slots)_Back_1cm_Ch661;Battery1_With Scanner

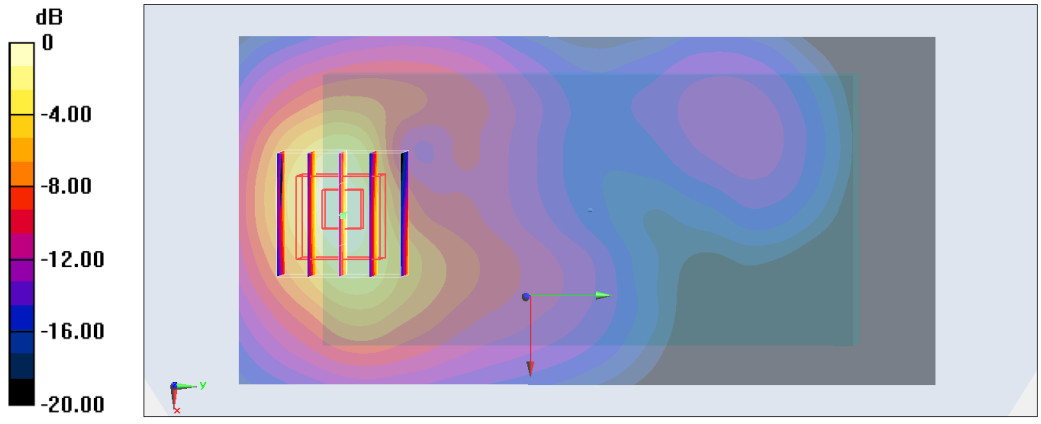
DUT: 322304-07

Communication System: PCS; Frequency: 1880 MHz;Duty Cycle: 1:2
Medium: MSL_1900_130625 Medium parameters used: f = 1880 MHz; σ = 1.515 mho/m; ε_r = 52.419; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3792; ConvF(7.26, 7.26, 7.26); Calibrated: 2013/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2013/5/28
- Phantom: SAM Right; Type: QD000P40CC; Serial: TP:1383
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch661/Area Scan (61x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.66 mW/g

Configuration/Ch661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.612 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 2.052 mW/g
SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.655 mW/g
Maximum value of SAR (measured) = 1.67 mW/g



0 dB = 1.67 mW/g = 4.45 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/6/25

#01_WCDMA V_RMC 12.2Kbps_Back_1cm_Ch4182;Battery1_With Scanner

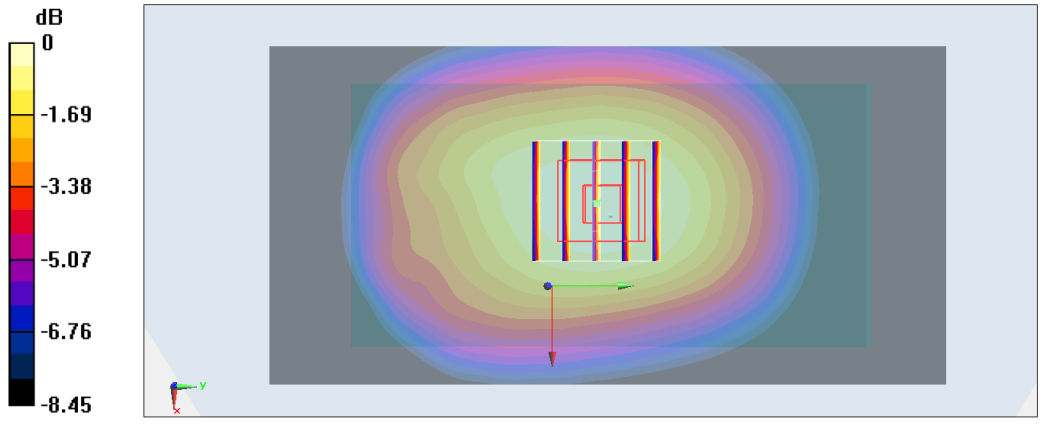
DUT: 322304-07

Communication System: WCDMA; Frequency: 836.4 MHz;Duty Cycle: 1:1
Medium: MSL_850_130625 Medium parameters used: f = 836.4 MHz; σ = 0.965 mho/m; ε_r = 54.481; ρ = 1000 kg/m^3
Ambient Temperature：22.5 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3792; ConvF(9.15, 9.15, 9.15); Calibrated: 2013/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2013/5/28
- Phantom: SAM Left; Type: QD000P40CD; Serial: TP:1542
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch4182/Area Scan (61x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.12 mW/g

Configuration/Ch4182/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.580 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 1.246 mW/g
SAR(1 g) = 0.976 mW/g; SAR(10 g) = 0.732 mW/g
Maximum value of SAR (measured) = 1.13 mW/g



0 dB = 1.13 mW/g = 1.06 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/7/2

#112_WCDMA IV_RMC 12.2Kbps_Back_1.5cm_Ch1312;Battery1_With Scanner

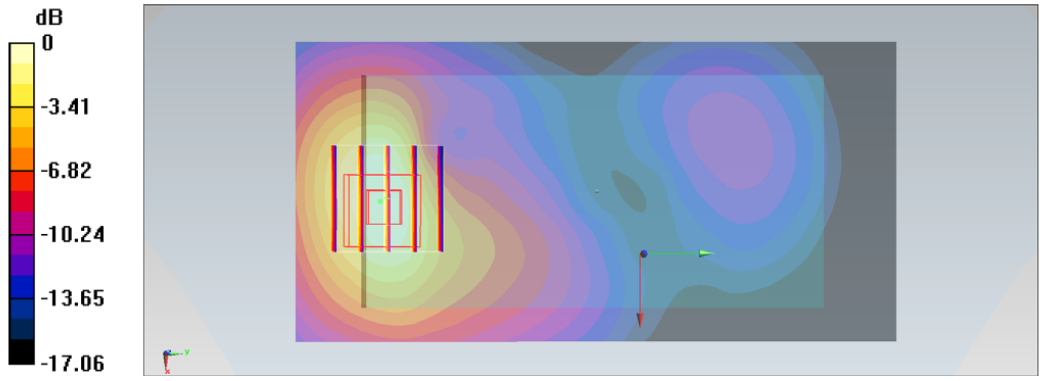
DUT: 322304-07

Communication System: WCDMA; Frequency: 1712.4 MHz;Duty Cycle: 1:1
Medium: MSL_1750_130702 Medium parameters used: f = 1712.4 MHz; σ = 1.49 S/m; ε_r = 51.879; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3270; ConvF(4.98, 4.98, 4.98); Calibrated: 2012/9/28;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2012/8/27
- Phantom: SAM-Left; Type: QD 000 P40 C; Serial: TP-1478
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch1312/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.63 W/kg

Configuration/Ch1312/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.495 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 1.96 W/kg
SAR(1 g) = 1.27 W/kg; SAR(10 g) = 0.759 W/kg
Maximum value of SAR (measured) = 1.51 W/kg



0 dB = 1.51 W/kg = 1.79 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/7/2

#149_WCDMA II_RMC 12.2Kbps_Back_1.5cm_Ch9538;Battery1_With Scanner_Headset

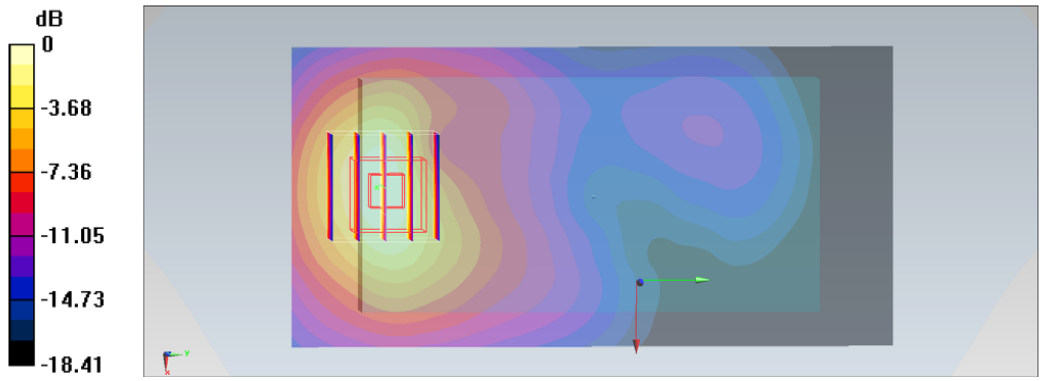
DUT: 322304-07

Communication System: WCDMA; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: MSL_1900_130702 Medium parameters used: f = 1908 MHz; σ = 1.511 S/m; ε_r = 54.834; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3270; ConvF(4.67, 4.67, 4.67); Calibrated: 2012/9/28;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2012/8/27
- Phantom: SAM-Left; Type: QD 000 P40 C; Serial: TP-1478
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch9538/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.42 W/kg

Configuration/Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.771 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 2.05 W/kg
SAR(1 g) = 1.2 W/kg; SAR(10 g) = 0.664 W/kg
Maximum value of SAR (measured) = 1.44 W/kg



0 dB = 1.44 W/kg = 1.58 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/6/26

#98_LTE Band 17_10M_QPSK_1RB_49Offset_Back_1cm_Ch23800;Battery1_With Scanner

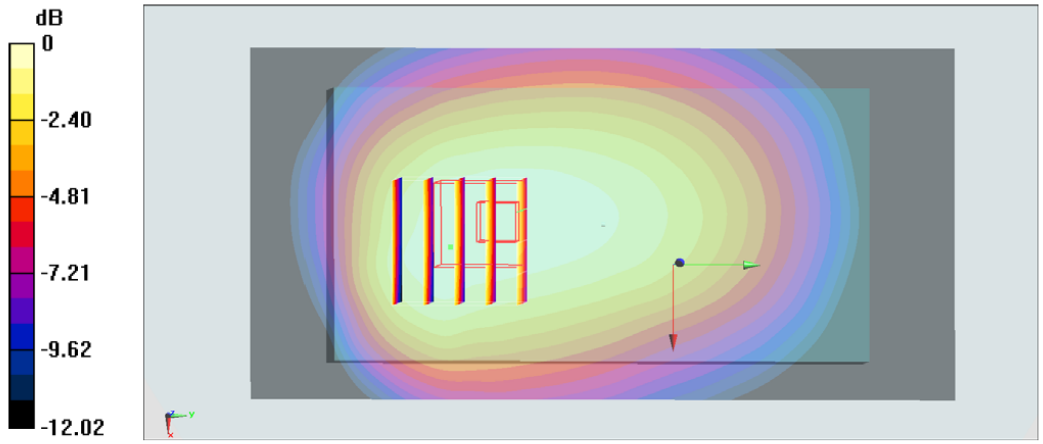
DUT: 322304-07

Communication System: LTE; Frequency: 711 MHz;Duty Cycle: 1:1
Medium: MSL_750_130626 Medium parameters used: f = 711 MHz; σ = 0.944 S/m; ε_r = 55.542; ρ = 1000 kg/m^3
Ambient Temperature：22.5 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3697; ConvF(8.86, 8.86, 8.86); Calibrated: 2012/9/28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: SAM LEFT; Type: QD000P40CD; Serial: TP:1718
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch23800/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.00 W/kg

Configuration/Ch23800/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.546 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.850 W/kg; SAR(10 g) = 0.611 W/kg
Maximum value of SAR (measured) = 0.997 W/kg



0 dB = 0.997 W/kg = -0.01 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/6/26

#45_LTE Band 5_10M_QPSK_1RB_0Offset_Back_1cm_Ch20600;Battery1_With Scanner

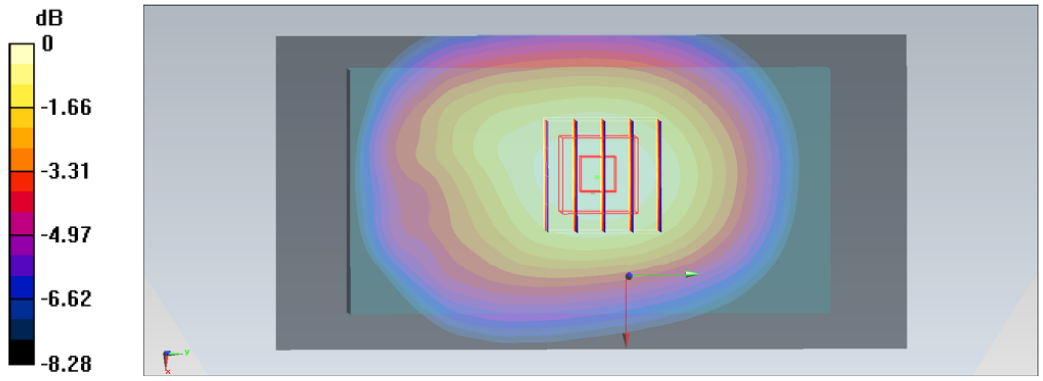
DUT: 322304-07

Communication System: LTE; Frequency: 844 MHz;Duty Cycle: 1:1
Medium: MSL_850_130626 Medium parameters used: f = 844 MHz; σ = 0.984 S/m; ε_r = 52.672; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3270; ConvF(6.16, 6.16, 6.16); Calibrated: 2012/9/28;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2012/8/27
- Phantom: SAM-Left; Type: QD 000 P40 C; Serial: TP-1478
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch20600/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.13 W/kg

Configuration/Ch20600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.031 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 1.28 W/kg
SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.763 W/kg
Maximum value of SAR (measured) = 1.13 W/kg



0 dB = 1.13 W/kg = 0.53 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/7/2

#143_LTE Band 4_10M_QPSK_1RB_0Offset_Back_1.5cm_Ch20350;Battery1_With Scanner_Headset

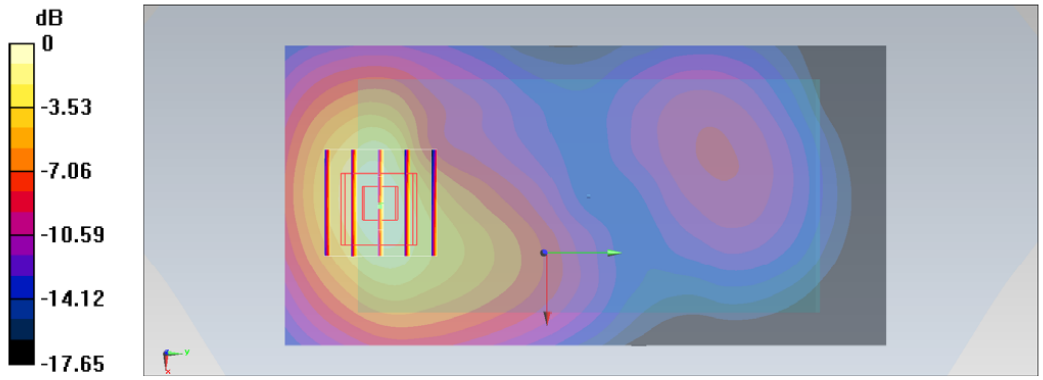
DUT: 322304-07

Communication System: LTE; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: MSL_1750_130702 Medium parameters used: f = 1750 MHz; σ = 1.528 S/m; ε_r = 51.762; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3270; ConvF(4.98, 4.98, 4.98); Calibrated: 2012/9/28;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2012/8/27
- Phantom: SAM-Left; Type: QD 000 P40 C; Serial: TP-1478
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch20350/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.39 W/kg

Configuration/Ch20350/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.514 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 1.82 W/kg
SAR(1 g) = 1.16 W/kg; SAR(10 g) = 0.683 W/kg
Maximum value of SAR (measured) = 1.39 W/kg



0 dB = 1.39 W/kg = 1.43 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/7/2

#126_LTE Band 2_10M_QPSK_1RB_0Offset_Back_1.5cm_Ch19150;Battery1_With Scanner

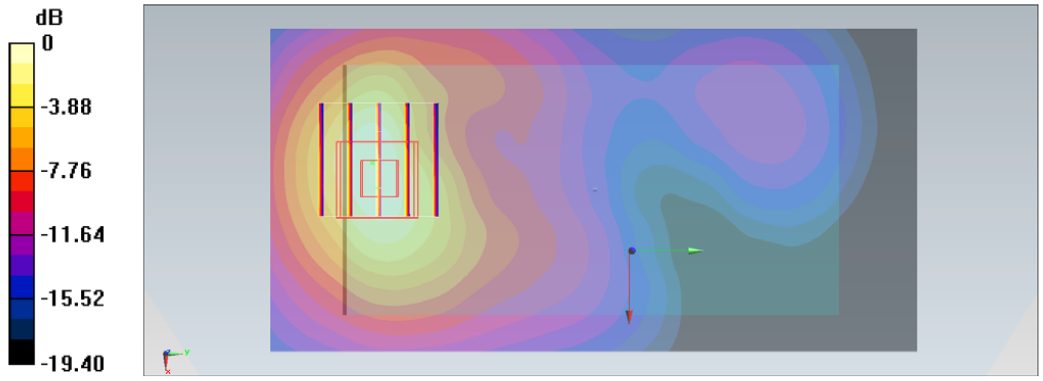
DUT: 322304-07

Communication System:LTE; Frequency: 1905 MHz;Duty Cycle: 1:1
Medium: MSL_1900_130702 Medium parameters used: f = 1905 MHz; σ = 1.507 S/m; ε_r = 54.834; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3270; ConvF(4.67, 4.67, 4.67); Calibrated: 2012/9/28;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2012/8/27
- Phantom: SAM-Left; Type: QD 000 P40 C; Serial: TP-1478
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch19150/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.36 W/kg

Configuration/Ch19150/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.614 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.88 W/kg
SAR(1 g) = 1.11 W/kg; SAR(10 g) = 0.620 W/kg
Maximum value of SAR (measured) = 1.34 W/kg



0 dB = 1.34 W/kg = 1.27 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/7/4

#202_WLAN2.4GHz_802.11b 1Mbps_Left Cheek_Ch6;Battery1_With Scanner

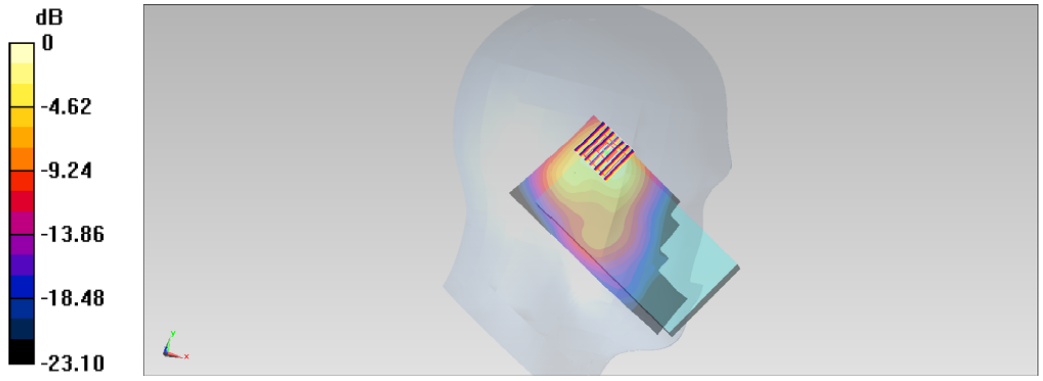
DUT: 322304-07

Communication System:802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1.024
Medium: HSL_2450_130704 Medium parameters used: f = 2437 MHz; σ = 1.824 S/m; ε_r = 39.365; ρ = 1000 kg/m^3
Ambient Temperature：22.5 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3270; ConvF(4.45, 4.45, 4.45); Calibrated: 2012/9/28;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2012/8/27
- Phantom: SAM-Right; Type: QD 000 P40 C; Serial: TP-1446
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch6/Area Scan (71x131x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.01 W/kg

Configuration/Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 23.971 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.62 W/kg
SAR(1 g) = 0.751 W/kg; SAR(10 g) = 0.358 W/kg
Maximum value of SAR (measured) = 0.991 W/kg



0 dB = 0.991 W/kg = -0.04 dBW/kg

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

#330_WLAN5GHz_802.11a 6Mbps_Right Tilted_Ch124;Battery1_With Scanner

DUT: 322304-07

Communication System: 802.11a; Frequency: 5620 MHz;Duty Cycle: 1:1.146
Medium: HSL_5G_130707 Medium parameters used : f = 5620 MHz; σ = 5.213 mho/m; ε_r = 34.676; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3792; ConvF(4.54, 4.54, 4.54); Calibrated: 2013/6/4;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2013/5/28
- Phantom: SAM Left; Type: QD000P40CD; Serial: TP:1542
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch124/Area Scan (101x161x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.20 mW/g

Configuration/Ch124/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 14.986 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.902 mW/g
SAR(1 g) = 0.519 mW/g; SAR(10 g) = 0.166 mW/g
Maximum value of SAR (measured) = 1.18 mW/g

0 dB = 1.18 mW/g = 1.44 dB mW/g

13. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Phone			Note
		Head	Body-worn	Hotspot	
1.	GSM(Voice) + WLAN2.4GHz(data)	Yes	Yes		
2.	WCDMA(Voice) + WLAN2.4GHz(data)	Yes	Yes		
3.	GSM(Voice) + Bluetooth(data)	Yes	Yes		
4.	WCDMA((Voice) + Bluetooth(data)	Yes	Yes		
5.	GSM(Voice) + WLAN5GHz(data)	Yes	Yes		
6.	WCDMA((Voice) + WLAN5GHz(data)	Yes	Yes		
7.	GPRS/EDGE(Data) + WLAN2.4GHz(data)	Yes(1)	Yes(1)	Yes	2.4GHz Hotspot
8.	WCDMA(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
9.	LTE(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
10.	GPRS/EDGE(Data) + Bluetooth(data)	Yes(1)	Yes(1)	Yes	
11.	WCDMA(Data) + Bluetooth(data)	Yes	Yes	Yes	
12.	LTE(Data) + Bluetooth(data)	Yes	Yes	Yes	
13.	GPRS/EDGE(Data) + WLNA5GHz(data)	No	No	No	
14.	WCDMA(Data) + WLNA5GHz(data)	No	No	No	
15.	LTE(Data) + WLNA5GHz(data)	No	No	No	

Note:

1. Considering the possibility of 3rd party VoIP app installation by end users and the device does not have limitation to operate VoIP in EGPRS wireless interface; considering the data rate of EGPRS to support VOIP quality and realistic operation, SAR testing was not performed evaluation VOIP operation in EGPRS mode.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. By design, WLAN 5GHz frequency band does not support mobile hotspot or WiFi Direct operation, therefore, when GSM/WCDMA/LTE operate in data mode cannot transmit simultaneously with WLAN 5GHz.
4. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, they will not transmit simultaneously.
5. The Scaled SAR summation is calculated based on the same configuration and test position.
6. For simultaneous transmission analysis was chosen worst configuration of battery 1 with scanner performed evaluation.
7. Per KDB 447498 D01v05r01, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*), and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the zoom scan
   If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary
   iii) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg
8. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r01 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[$\sqrt{}$f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum test separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.

Bluetooth Max Power	Exposure Position	Head	Hotspot	Body worn	Body worn (with Holster)
	Test separation	0 mm	10 mm	15 mm	12 mm
2.0 dBm	Estimated SAR (W/kg)	0.067 W/kg	0.033 W/kg	0.022 W/kg	0.028 W/kg

13.1 Head Exposure Conditions

<WWAN + WLAN 2.4 GHz Band>

	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Right Cheek	GSM850	51	0.476	200	0.509	**0.99**		
	GSM1900	52	0.247	200	0.509	**0.76**		
	WCDMA V	48	0.684	200	0.509	**1.19**		
	WCDMA IV	49	0.426	200	0.509	**0.94**		
	WCDMA II	50	0.487	200	0.509	**1.00**		
	LTE Band17	75	0.310	200	0.509	**0.82**		
	LTE Band5	74	0.497	200	0.509	**1.01**		
	LTE Band4	73	0.410	200	0.509	**0.92**		
	LTE Band2	72	0.418	200	0.509	**0.93**		
Right Tilted	WCDMA V	53	0.449	201	0.597	**1.05**		
	LTE Band5	76	0.340	201	0.597	**0.94**		
Left Cheek	GSM850	65	0.643	202	0.835	**1.48**		
	GSM1900	70	0.105	202	0.835	**0.94**		
	WCDMA V	54	0.713	202	0.835	**1.55**		
	WCDMA IV	60	0.379	202	0.835	**1.21**		
	WCDMA II	67	0.256	202	0.835	**1.09**		
	LTE Band17	103	0.393	202	0.835	**1.23**		
	LTE Band5	82	0.884	202	0.835	**1.72**	0.04	Case1
	LTE Band5	82	0.884	206	0.776	**1.66**	0.04	Case2
	LTE Band5	82	0.884	207	0.744	**1.63**	0.04	Case3
	LTE Band4	88	0.346	202	0.835	**1.18**		
	LTE Band2	86	0.228	202	0.835	**1.06**		
Left Tilted	WCDMA V	55	0.482	203	0.628	**1.11**		
	LTE Band5	78	0.394	203	0.628	**1.02**		

<WWAN + WLAN 5.2GHz Band>

	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Right Cheek	GSM850	51	0.476	316	0.434	**0.91**		
	GSM1900	52	0.247	316	0.434	**0.68**		
	WCDMA V	48	0.684	316	0.434	**1.12**		
	WCDMA IV	49	0.426	316	0.434	**0.86**		
	WCDMA II	50	0.487	316	0.434	**0.92**		
Right Tilted	WCDMA V	53	0.449	342	0.596	**1.05**		

<WWAN + WLAN 5.3GHz Band>

	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Right Cheek	GSM850	51	0.476	341	0.440	**0.92**		
	GSM1900	52	0.247	341	0.440	**0.69**		
	WCDMA V	48	0.684	341	0.440	**1.12**		
	WCDMA IV	49	0.426	341	0.440	**0.87**		
	WCDMA II	50	0.487	341	0.440	**0.93**		
Right Tilted	WCDMA V	53	0.449	344	0.519	**0.97**		

<WWAN + WLAN 5.5GHz Band>

	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Right Cheek	GSM850	51	0.476	318	0.504	**0.98**		
	GSM1900	52	0.247	318	0.504	**0.75**		
	WCDMA V	48	0.684	318	0.504	**1.19**		
	WCDMA IV	49	0.426	318	0.504	**0.93**		
	WCDMA II	50	0.487	318	0.504	**0.99**		
Right Tilted	WCDMA V	53	0.449	330	0.664	**1.11**		
Left Cheek	GSM850	65	0.643	321	0.535	**1.18**		
	GSM1900	70	0.105	321	0.535	**0.64**		
	WCDMA V	54	0.713	321	0.535	**1.25**		
	WCDMA IV	60	0.379	321	0.535	**0.91**		
	WCDMA II	67	0.256	321	0.535	**0.79**		
Left Tilted	WCDMA V	55	0.482	322	0.566	**1.05**		

<WWAN + WLAN 5.8GHz Band>

	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Right Cheek	GSM850	51	0.476	319	0.333	**0.81**		
	GSM1900	52	0.247	319	0.333	**0.58**		
	WCDMA V	48	0.684	319	0.333	**1.02**		
	WCDMA IV	49	0.426	319	0.333	**0.76**		
	WCDMA II	50	0.487	319	0.333	**0.82**		
Right Tilted	WCDMA V	53	0.449	332	0.563	**1.01**		

<WWAN + Bluetooth>

	WWAN			Bluetooth	Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Estimated SAR (W/kg)			
Right Cheek	GSM850	51	0.476	0.067	**0.54**		
	GSM1900	52	0.247	0.067	**0.31**		
	WCDMA V	48	0.684	0.067	**0.75**		
	WCDMA IV	49	0.426	0.067	**0.49**		
	WCDMA II	50	0.487	0.067	**0.55**		
	LTE Band17	75	0.310	0.067	**0.38**		
	LTE Band5	74	0.497	0.067	**0.56**		
	LTE Band4	73	0.410	0.067	**0.48**		
	LTE Band2	72	0.418	0.067	**0.49**		
Right Tilted	WCDMA V	53	0.449	0.067	**0.52**		
	LTE Band5	76	0.340	0.067	**0.41**		
Left Cheek	GSM850	65	0.643	0.067	**0.71**		
	GSM1900	70	0.105	0.067	**0.17**		
	WCDMA V	54	0.713	0.067	**0.78**		
	WCDMA IV	60	0.379	0.067	**0.45**		
	WCDMA II	67	0.256	0.067	**0.32**		
	LTE Band17	103	0.393	0.067	**0.46**		
	LTE Band5	82	0.884	0.067	**0.95**		
	LTE Band4	88	0.346	0.067	**0.41**		
	LTE Band2	86	0.228	0.067	**0.30**		
Left Tilted	WCDMA V	55	0.482	0.067	**0.55**		
	LTE Band5	78	0.394	0.067	**0.46**		

13.2 Hotspot Exposure Conditions

<WWAN + WLAN 2.4 GHz >

	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Front	GSM850	6	0.883	208	0.188	**1.07**		
	LTE Band4	26	0.368	208	0.188	**0.56**		
Back	GSM850	12	1.322	209	0.250	**1.57**		
	GSM1900	4	1.315	209	0.250	**1.57**		
	WCDMA V	1	1.034	209	0.250	**1.28**		
	WCDMA IV	20	1.262	209	0.250	**1.51**		
	WCDMA II	3	1.144	209	0.250	**1.39**		
	LTE Band17	98	0.866	209	0.250	**1.12**		
	LTE Band5	45	1.121	209	0.250	**1.37**		
	LTE Band4	32	1.203	209	0.250	**1.45**		
	LTE Band2	35	1.065	209	0.250	**1.32**		
Right Side	GSM850	8	1.102	210	0.226	**1.33**		
	LTE Band4	28	0.112	210	0.226	**0.34**		

<WWAN + Bluetooth>

	WWAN			Bluetooth	Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Estimated SAR (W/kg)			
Front	GSM850	6	0.883	0.033	**0.92**		
	LTE Band4	26	0.368	0.033	**0.40**		
Back	GSM850	12	1.322	0.033	**1.36**		
	GSM1900	4	1.315	0.033	**1.35**		
	WCDMA V	1	1.034	0.033	**1.07**		
	WCDMA IV	20	1.262	0.033	**1.30**		
	WCDMA II	3	1.144	0.033	**1.18**		
	LTE Band17	98	0.866	0.033	**0.90**		
	LTE Band5	45	1.121	0.033	**1.15**		
	LTE Band4	32	1.203	0.033	**1.24**		
	LTE Band2	35	1.065	0.033	**1.10**		
Right Side	GSM850	8	1.102	0.033	**1.14**		
	LTE Band4	28	0.112	0.033	**0.15**		

13.3 Body-Worn Exposure Conditions

<WWAN + WLAN 2.4 GHz>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Back	GSM850	118	0.754	215	0.143	**0.90**		
	GSM1900	110	0.489	215	0.143	**0.63**		
	WCDMA V	107	0.848	215	0.143	**0.99**		
	WCDMA IV	112	1.321	215	0.143	**1.46**		
	WCDMA II	115	1.311	215	0.143	**1.45**		
	LTE Band17	132	0.670	215	0.143	**0.81**		
	LTE Band5	123	0.867	215	0.143	**1.01**		
	LTE Band4	129	1.274	215	0.143	**1.42**		
	LTE Band2	126	1.157	215	0.143	**1.30**		
Back (with Headset)	WCDMA IV	152	1.227	220	0.136	**1.36**		
	WCDMA II	149	1.322	220	0.136	**1.46**		
	LTE Band4	143	1.320	220	0.136	**1.46**		
Back (with Holster)	WCDMA IV	111	0.771	216	0.132	**0.90**		
	LTE Band4	135	0.949	216	0.132	**1.08**		

<WWAN + WLAN 5.2GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Back	GSM850	118	0.754	300	0.484	**1.24**		
	GSM1900	110	0.489	300	0.484	**0.97**		
	WCDMA V	107	0.848	300	0.484	**1.33**		
	WCDMA IV	112	1.321	300	0.484	**1.81**	0.02	Case 4
	WCDMA IV	109	1.238	300	0.484	**1.72**	0.02	Case 5
	WCDMA IV	113	1.289	300	0.484	**1.77**	0.02	Case 6
	WCDMA II	115	1.311	300	0.484	**1.80**	0.02	Case 7
	WCDMA II	114	1.112	300	0.484	**1.60**	0.02	Case 8
	WCDMA II	108	1.149	300	0.484	**1.63**	0.02	Case 9
Back (with Headset)	WCDMA IV	152	1.227	309	0.369	**1.60**	0.02	Case 10
	WCDMA II	149	1.322	309	0.369	**1.69**	0.02	Case 11
Back (with Holster)	WCDMA IV	111	0.771	307	0.389	**1.16**		

<WWAN + WLAN 5.3GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Back	GSM850	118	0.754	346	0.355	**1.11**		
	GSM1900	110	0.489	346	0.355	**0.84**		
	WCDMA V	107	0.848	346	0.355	**1.20**		
	WCDMA IV	112	1.321	346	0.355	**1.68**	0.02	Case 12
	WCDMA IV	113	1.289	346	0.355	**1.64**	0.02	Case 13
	WCDMA IV	112	1.321	347	0.301	**1.62**	0.02	Case 14
	WCDMA II	115	1.311	346	0.355	**1.67**	0.02	Case 15
	WCDMA II	115	1.311	346	0.301	**1.61**	0.02	Case 16

<WWAN + WLAN 5.5GHz Band>

	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Back	GSM850	118	0.754	312	0.330	**1.08**		
	GSM1900	110	0.489	312	0.330	**0.82**		
	WCDMA V	107	0.848	312	0.330	**1.18**		
	WCDMA IV	112	1.321	312	0.330	**1.65**	0.02	Case 17
	WCDMA IV	113	1.289	312	0.330	**1.62**	0.02	Case 18
	WCDMA IV	112	1.321	302	0.321	**1.64**	0.02	Case 19
	WCDMA IV	113	1.289	302	0.321	**1.61**	0.02	Case 20
	WCDMA IV	112	1.321	311	0.281	**1.60**	0.02	Case 21
	WCDMA II	115	1.311	312	0.330	**1.64**	0.02	Case 22
	WCDMA II	115	1.311	302	0.321	**1.63**	0.02	Case 23

<WWAN + WLAN 5.8GHz Band>

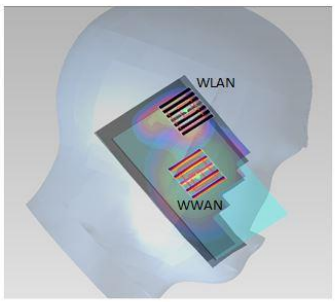
	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Back	GSM850	118	0.754	314	0.192	**0.95**		
	GSM1900	110	0.489	314	0.192	**0.68**		
	WCDMA V	107	0.848	314	0.192	**1.04**		
	WCDMA IV	112	1.321	314	0.192	**1.51**		
	WCDMA II	115	1.311	314	0.192	**1.50**		

<WWAN + Bluetooth>

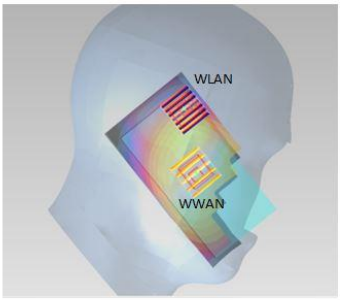
	WWAN			Bluetooth	Summed SAR (W/kg)	SPLSR	Case No
Position	WWAN Band	Plot No	SAR (W/kg)	Estimated SAR (W/kg)			
Back	GSM850	118	0.754	0.022	**0.78**		
	GSM1900	110	0.489	0.022	**0.51**		
	WCDMA V	107	0.848	0.022	**0.87**		
	WCDMA IV	112	1.321	0.022	**1.34**		
	WCDMA II	115	1.311	0.022	**1.33**		
	LTE Band17	132	0.670	0.022	**0.69**		
	LTE Band5	123	0.867	0.022	**0.89**		
	LTE Band4	129	1.274	0.022	**1.30**		
	LTE Band2	126	1.157	0.022	**1.18**		
Back (with Headset)	WCDMA IV	152	1.227	0.022	**1.25**		
	WCDMA II	149	1.322	0.022	**1.34**		
	LTE Band4	143	1.320	0.022	**1.34**		
Back (with Holster)	WCDMA IV	111	0.771	0.028	**0.80**		
	LTE Band4	135	0.949	0.028	**0.98**		

13.4 SPLSR Evaluation and Analysis

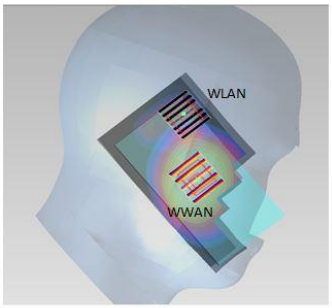
Case 1 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
82	LTE Band 5	Left Cheek	0.884	0	0.0672	0.278	-0.17	60.2	1.72	0.04	Not required
202	WLAN 2.4GHz		0.835	0	0.0336	0.328	-0.171				



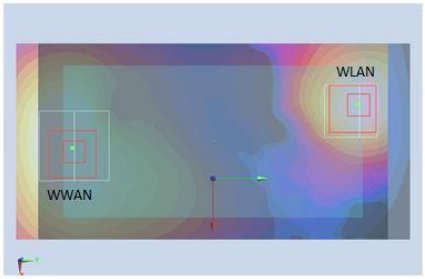
Case 2 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
82	LTE Band 5	Left Cheek	0.884	0	0.0672	0.278	-0.17	58.9	1.66	0.04	Not required
206	WLAN 2.4GHz		0.776	0	0.0346	0.327	-0.172				



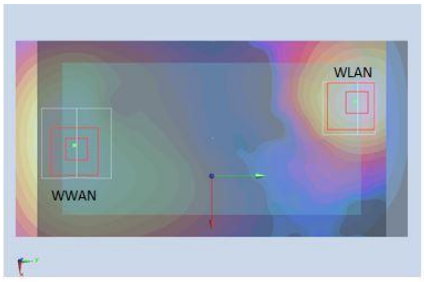
Case 3 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
82	LTE Band 5	Left Cheek	0.884	0	0.0672	0.278	-0.17	58.9	1.63	0.04	Not required
207	WLAN 2.4GHz		0.744	0	0.0346	0.327	-0.172				



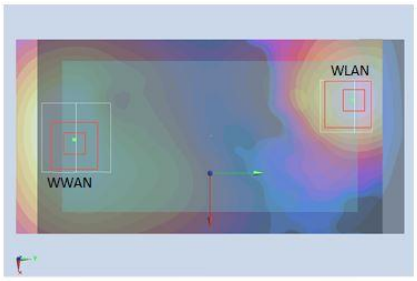
Case 4 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
112	WCDMA IV	Back	1.321	1.5	-0.015	-0.0635	-0.201	132.1	1.81	0.02	Not required
300	WLAN5GHz		0.484	1.5	-0.035	0.067	-0.205				



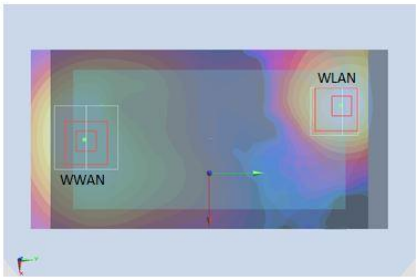
Case 5 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
109	WCDMA IV	Back	1.238	1.5	-0.015	-0.062	-0.201	130.6	1.72	0.02	Not required
300	WLAN5GHz		0.484	1.5	-0.035	0.067	-0.205				



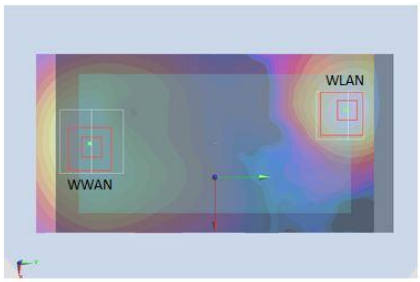
Case 6 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
113	WCDMA IV	Back	1.289	1.5	-0.0165	-0.062	-0.201	130.4	1.77	0.02	Not required
300	WLAN5GHz		0.484	1.5	-0.035	0.067	-0.205				



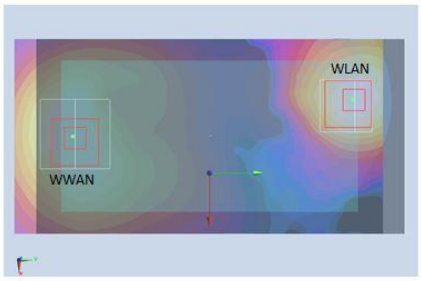
Case 7 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
115	WCDMA II	Back	1.311	1.5	-0.018	-0.062	-0.201	130.2	1.80	0.02	Not required
300	WLAN5GHz		0.484	1.5	-0.035	0.067	-0.205				



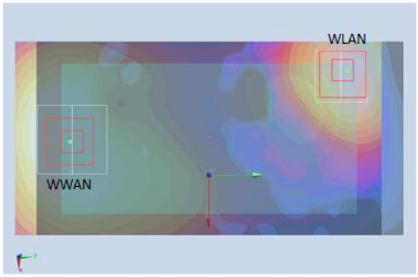
Case 8 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
114	WCDMA II	Back	1.112	1.5	-0.018	-0.062	-0.201	130.2	1.60	0.02	Not required
300	WLAN5GHz		0.484	1.5	-0.035	0.067	-0.205				



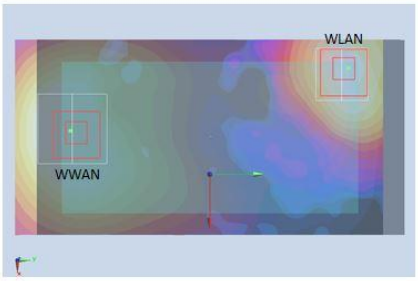
Case 9 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
108	WCDMA II	Back	1.149	1.5	-0.018	-0.062	-0.201	130.2	1.63	0.02	Not required
300	WLAN5GHz		0.484	1.5	-0.035	0.067	-0.205				



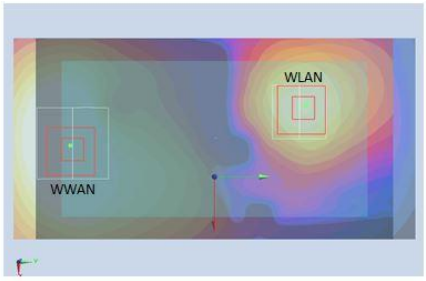
Case 10 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
152	WCDMA IV	Back	1.227	1.5	-0.0165	-0.0635	-0.201	129.0	1.60	0.02	Not required
309	WLAN5GHz		0.369	1.5	-0.05	0.061	-0.205				



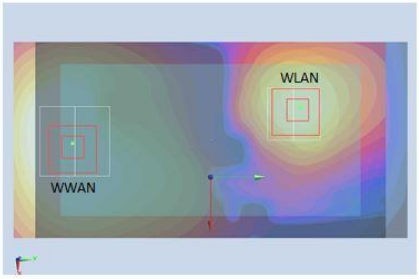
Case 11 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
149	WCDMA II	Back	1.322	1.5	-0.0209	-0.0635	-0.201	127.9	1.69	0.02	Not required
309	WLAN5GHz		0.369	1.5	-0.05	0.061	-0.205				



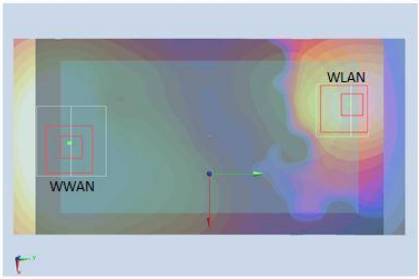
Case 12 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
112	WCDMA IV	Back	1.321	1.5	-0.015	-0.0635	-0.201	103.1	1.68	0.02	Not required
346	WLAN5GHz		0.355	1.5	-0.033	0.038	-0.203				



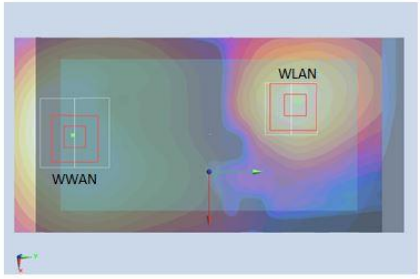
Case 13 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
113	WCDMA IV	Back	1.289	1.5	-0.0165	-0.062	-0.201	101.4	1.64	0.02	Not required
346	WLAN5GHz		0.355	1.5	-0.033	0.038	-0.203				



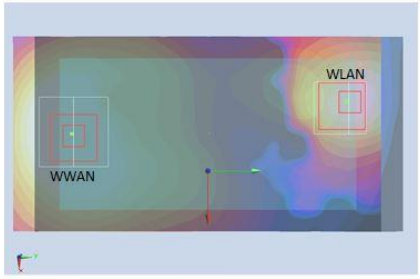
Case 14 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
112	WCDMA IV	Back	1.321	1.5	-0.015	-0.0635	-0.201	129.3	1.62	0.02	Not required
347	WLAN5GHz		0.301	1.5	-0.029	0.065	-0.203				



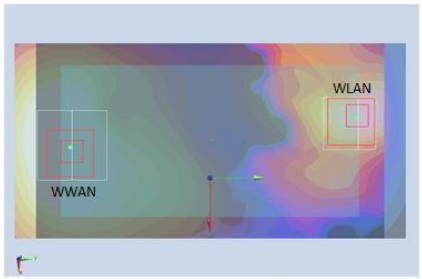
Case 15 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
115	WCDMA II	Back	1.311	1.5	-0.018	-0.062	-0.201	101.1	1.67	0.02	Not required
346	WLAN5GHz		0.355	1.5	-0.033	0.038	-0.203				



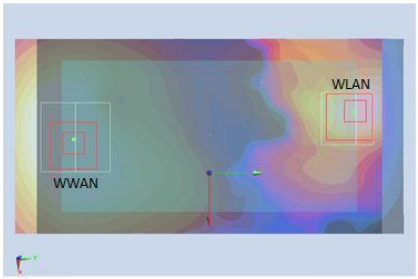
Case 16 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
115	WCDMA II	Back	1.311	1.5	-0.018	-0.062	-0.201	127.5	1.61	0.02	Not required
347	WLAN5GHz		0.301	1.5	-0.029	0.065	-0.203				



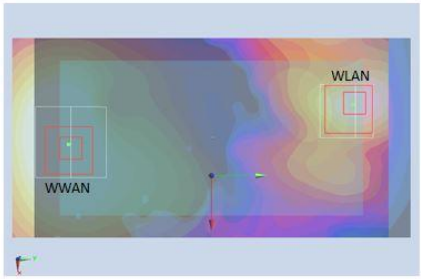
Case 17 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
112	WCDMA IV	Back	1.321	1.5	-0.015	-0.0635	-0.201	132.3	1.65	0.02	Not required
312	WLAN5GHz		0.33	1.5	-0.029	0.068	-0.205				



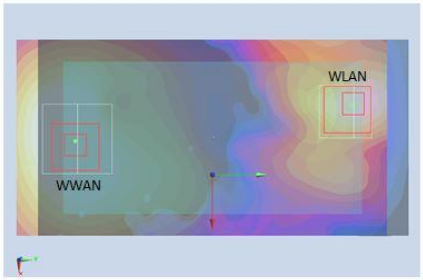
Case 18 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
113	WCDMA IV	Back	1.289	1.5	-0.0165	-0.062	-0.201	130.7	1.62	0.02	Not required
312	WLAN5GHz		0.33	1.5	-0.029	0.068	-0.205				



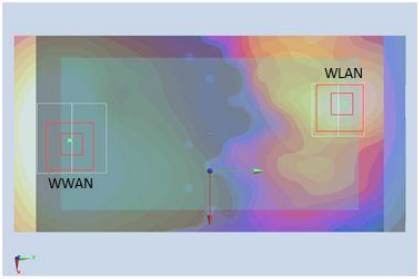
Case 19 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
112	WCDMA IV	Back	1.321	1.5	-0.015	-0.0635	-0.201	129.8	1.64	0.02	Not required
302	WLAN5GHz		0.321	1.5	-0.033	0.065	-0.205				



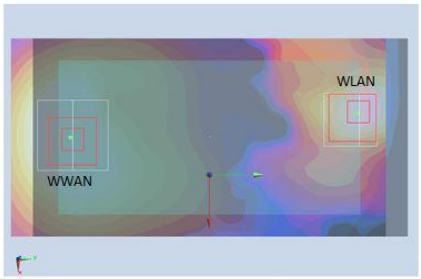
Case 20 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
113	WCDMA IV	Back	1.289	1.5	-0.0165	-0.062	-0.201	128.1	1.61	0.02	Not required
302	WLAN5GHz		0.321	1.5	-0.033	0.065	-0.205				



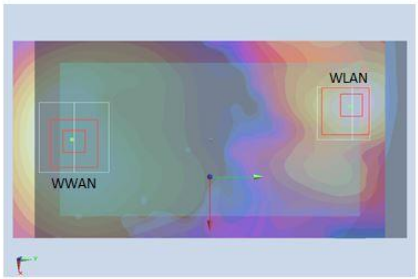
Case 21 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
112	WCDMA IV	Back	1.321	1.5	-0.015	-0.0635	-0.201	123.7	1.60	0.02	Not required
311	WLAN5GHz		0.281	1.5	-0.032	0.059	-0.205				



Case 22 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
115	WCDMA II	Back	1.311	1.5	-0.018	-0.062	-0.201	130.5	1.64	0.02	Not required
312	WLAN5GHz		0.33	1.5	-0.029	0.068	-0.205				



Case 23 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
115	WCDMA II	Back	1.311	1.5	-0.018	-0.062	-0.201	127.9	1.63	0.02	Not required
302	WLAN5GHz		0.321	1.5	-0.033	0.065	-0.205				



Test Engineer： San Lin, Ken Li, Nick Yu, Jack Wu, Frank Wu, Angel Chang, Bevis Chang, Vic Yang

14. 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 14.1

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	1/k[(b)]	1/√3	1/√6	1/√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 14.1. 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 14.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

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

Table 14.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

15. 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

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