FCC SAR Test Report

APPLICANT	:	**Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd.**
EQUIPMENT	:	**mobile phone**
BRAND NAME	:	**Coolpad**
MODEL NAME	:	**Coolpad 801EM**
FCC ID	:	**R38YL801EM**
STANDARD	:	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2003**

The product was completely tested on Aug. 29, 2013. We, SPORTON INTERNATIONAL (XI'AN) 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 (XI'AN) INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
2627

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA311602-01	Rev. 01	Initial issue of report	Sep. 18, 2013

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd. DUT: mobile phone, Brand Name: Coolpad, Model Name: Coolpad 801EM,** are as follows.

<Highest SAR Summary>

Exposure Position	Frequency Band	Highest Reported 1g-SAR (W/kg)	Equipment Class	Highest Reported 1g-SAR (W/kg)
Head	CDMA 2000 BC0	0.28	PCE	0.40
	CDMA 2000 BC1	0.40		
	LTE Band 13	0.24		
	WLAN 2.4GHz Band	0.21	DTS	0.21
Hotspot (1cm Gap)	CDMA 2000 BC0	0.48	PCE	1.40
	CDMA 2000 BC1	1.40		
	LTE Band 13	0.64		
	WLAN 2.4GHz Band	0.15	DTS	0.15
Body-worn (1cm Gap)	CDMA 2000 BC0	0.54	PCE	1.45
	CDMA 2000 BC1	1.45		
	LTE Band 13	0.64		
	WLAN 2.4GHz Band	0.15	DTS	0.15

<Highest Simultaneous transmission SAR>

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Body-worn (1cm Gap)	CDMA2000 BC1	PCE	1.59
	WLAN 2.4GHz Band	DTS	
Body-worn (1cm Gap)	CDMA2000 BC1	PCE	1.49
	Bluetooth	DSS	

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

2. Administration Data

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL (XI'AN) INC.
Test Site Location	1F, Building A3, No. 39 Chuangye Rd., Xi'an Hi-tech Zone, Shanxi Province, P. R. C. TEL: +86-029-8860-8767

2.2 Applicant

Company Name	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd.
Address	Coolpad Information Harbor, 2nd Mengxi Road, Northern Part of Science&Technology Park, Nanshan district, Shenzhen, P.R.China

2.3 Manufacturer

Company Name	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd.
Address	Coolpad Information Harbor, 2nd Mengxi Road, Northern Part of Science&Technology Park, Nanshan district, Shenzhen, P.R.China

2.4 Application Details

Date of Start during the Test	Aug. 26, 2013
Date of End during the Test	Aug. 29, 2013

3. General Information

3.1 Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT	mobile phone
Brand Name	Coolpad
Model Name	Coolpad 801EM
FCC ID	R38YL801EM
Wireless Technology and Frequency Range	CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	•CDMA2000 : 1xRTT/1xEv-Do(Rel.0)/1xEv-Do(Rev.A) •LTE: QPSK, 16QAM •802.11b/g/n HT20 •Bluetooth v3.0 + EDR, Bluetooth v4.0
Antenna Type	WWAN: PIFA Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna
HW Version	P0
SW Version	4.1.003.P0.130809.801EM
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.** LTE supports VOIP function	

3.2 Maximum RF output power among production units

Maximum Average Power for Production Unit (dBm)		
Mode / Band	CDMA2000 BC0	CDMA2000 BC1
1xRTT RC1 SO55	24	24
1xRTT RC3 SO55	24	24
1xRTT RC3 SO32 (+ F-SCH)	24	24
1xRTT RC3 SO32 (+SCH)	24	24
1xEV-DO Rev 0 (RTAP 153.6kbps)	24	24
1xEV-DO Rev A (RETAP 4096bits)	24	24

LTE Band 13				
Modulation	BW (MHz)	RB size	Target MPR	Maximum Power
QPSK	10	≤ 12	0	23
QPSK	10	> 12	1	22
16QAM	10	≤ 12	1	22
16QAM	10	> 12	2	21
QPSK	5	≤ 8	0	23
QPSK	5	> 8	1	22
16QAM	5	≤ 8	1	22
16QAM	5	> 8	2	21

Remark:

1. By design, maximum LTE RF power of smaller supported bandwidth does not exceed the RF power of largest supported bandwidth; the information is included in “tune-up procedure” exhibit
2. LTE MPR implementation is the same for normal mode.

Maximum Target Average Power for Production Unit			
Mode / Band	IEEE 802.11		
	11b	11g	11n-HT20
WLAN 2.4GHz Band	15	13	13

Mode / Band	Maximum Target Average Power for Production Unit			
	1Mbps (GFSK)	2Mbps (π/4-DQPSK)	3Mbps (8-DPSK)	BT4.0-LE (GFSK)
Bluetooth	2	1	1	1

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

FCC ID	R38YL801EM			
EUT	mobile phone			
Operating Frequency Range of each LTE transmission band	LTE Band 13: 779.5 MHz ~ 784.5 MHz			
Channel Bandwidth	5MHz, 10MHz			
Transmission (H, M, L) channel numbers and frequencies in each LTE band				
Band 13				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Frequency (MHz)	Channel #	Frequency (MHz)
L	23205	779.5	23230	782
M	23230	782		
H	23255	784.5		

UE 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 transmitting and receiving, standalone. A 2nd antenna is used for LTE receiving only, standalone.
LTE Voice / Data requirements	Data only
LTE MPR permanently built-in by design	Yes, per 3GPP TS 36.101 v11.0.0 (see Table 6.2.3-1 below)

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

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

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
Other U.S. wireless operating modes / bands	CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Simultaneous transmission configurations	In Section 13
Power reduction applied to satisfy SAR compliance	NO, The EUT doesn't support power reduction.

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 D05 v02r02
- FCC KDB 941225 D06 v01r01
- FCC KDB 865664 D01 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

3.5.1 Ambient Condition

Ambient Temperature	20 to 24 ℃
Humidity	< 60 %

3.5.2 Test Configuration

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

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

Duty factor observed as below:

802.11b, 1Mbps: 97.63%

802.11g, 6Mbps: 87.34%

802.11n-HT20, MCS0: 86.49%

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

4. Specific Absorption Rate (SAR)

4.1 Introduction

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

4.2 SAR Definition

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

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

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

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

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

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

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

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

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

5. SAR Measurement System

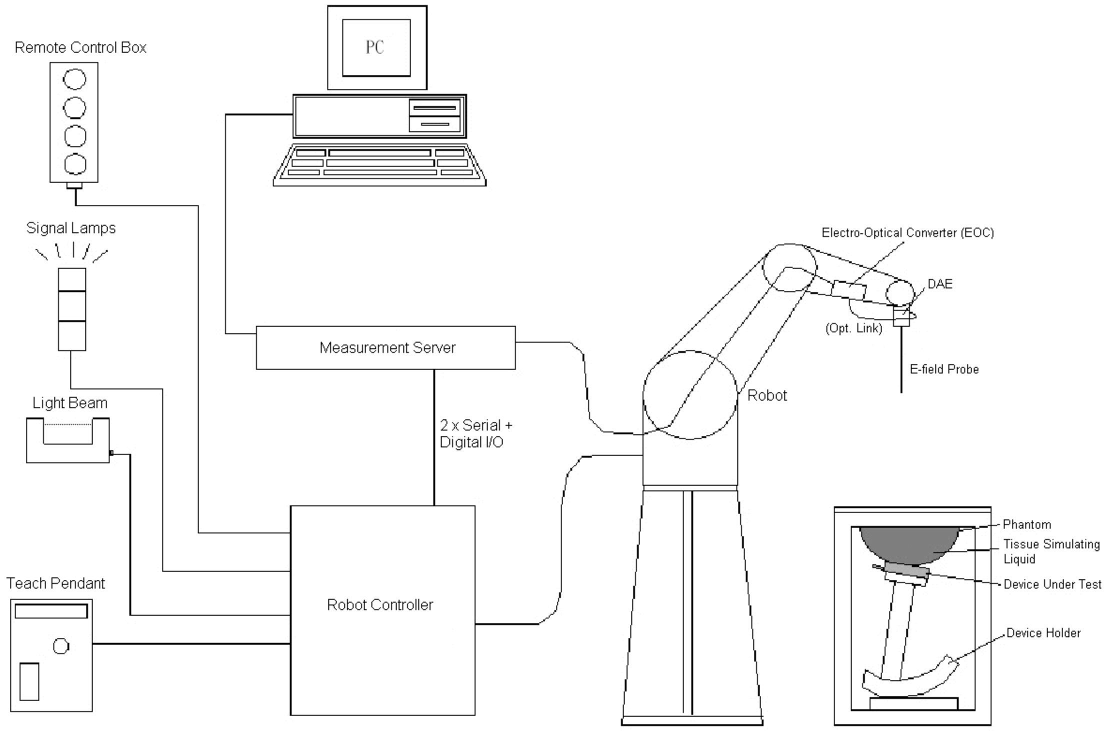


Fig 5.1 SPEAG DASY System Configurations

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

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

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

5.1 E-Field Probe

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

5.1.1 E-Field Probe Specification

<EX3DV4 Probe>

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

Fig 5.2 Photo of EX3DV4

5.1.2 E-Field Probe Calibration

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

5.2 Data Acquisition Electronics (DAE)

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

Fig 5.3 Photo of DAE

5.3 Robot

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

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

Fig 5.4 Photo of DASY5

5.4 Measurement Server

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

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

Fig 5.5 Photo of Server for DASY5

5.5 Phantom

<SAM Twin Phantom>

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

Fig 5.6 Photo of SAM Phantom

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

5.6 Device Holder

<Device Holder for SAM Twin Phantom>

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

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

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity 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 5.7 Device Holder

5.7 Data Storage and Evaluation

5.7.1 Data Storage

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

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

5.7.2 Data Evaluation

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

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

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

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

The formula for each channel can be given as：

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

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

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

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

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

with V_i = compensated signal of channel i, (i = x, y, z)
$Norm_i$ = sensor sensitivity of channel i, (i = x, y, z), $\mu V/(V/m)^2$ 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	1087	Apr. 09, 2013	Apr. 08, 2014
SPEAG	835MHz System Validation Kit	D835V2	4d151	Mar. 25, 2013	Mar. 24, 2014
SPEAG	1900MHz System Validation Kit	D1900V2	5d170	Mar. 27, 2013	Mar. 26, 2014
SPEAG	2450MHz System Validation Kit	D2450V2	908	Mar. 26. 2013	Mar. 25. 2014
SPEAG	Data Acquisition Electronics	DAE4	1358	Apr. 08, 2013	Apr. 07, 2014
SPEAG	Data Acquisition Electronics	DAE4	1303	Nov. 22, 2012	Nov. 21, 2013
SPEAG	Dosimetric E-Field Probe	EX3DV4	3911	Apr. 11, 2013	Apr. 10, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3819	Nov. 26, 2012	Nov. 25, 2013
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1753	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1754	NCR	NCR
Agilent	Base Station	E5515C	MY52102600	Nov. 17, 2012	Nov. 16, 2013
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	May 24, 2013	May 23, 2014
Anritsu	Radio Communication Analyzer	MT8820C	6201107506	Apr. 01, 2013	Mar. 31, 2014
Anritsu	Power Meter	ML2495A	1218010	Mar. 28, 2013	Mar. 27, 2014
Anritsu	Power Sensor	MA2411B	1207253	Mar. 28, 2013	Mar. 27, 2014
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	Dual Directional Coupler	778D	50422	Note 2	
Woken	Attenuator 1	WK0602-XX	N/A	Note 2	
PE	Attenuator 2	PE7005-10	N/A	Note 2	
PE	Attenuator 3	PE7005- 3	N/A	Note 2	
Agilent	Dielectric Probe Kit	85070D	US01440205	Note 3	
AR	Power Amplifier	5S1G4M2	328767	Note 4	
R&S	Spectrum Analyzer	FSP30	100818	Aug. 21, 2013	Aug. 20, 2014

Table 5.1 Test Equipment List

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
3. 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.
4. 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
5. Attenuator 1 insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.

6. Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.2.

Fig 6.1 Photo of Liquid Height for Head SAR

Fig 6.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ε_r)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7

Table 6.1 Recipes of Tissue Simulating Liquid

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

The following table shows the measuring results for simulating liquid.

Frequency (MHz)	Liquid Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Head	22.6	0.88	40.936	0.89	41.9	-1.12	-2.30	±5	Aug. 26, 2013
835	Head	22.6	0.915	41.529	0.90	41.5	1.67	0.07	±5	Aug. 27, 2013
1900	Head	22.6	1.419	40.609	1.40	40.0	1.36	1.52	±5	Aug. 27, 2013
2450	Head	22.7	1.823	37.961	1.8	39.2	1.28	-3.16	±5	Aug. 29, 2013
750	Body	22.7	0.941	56.383	0.96	55.5	-1.98	1.59	±5	Aug. 26, 2013
835	Body	22.7	0.994	55.57	0.97	55.2	2.47	0.67	±5	Aug. 27, 2013
1900	Body	22.7	1.535	54.565	1.52	53.3	0.99	2.37	±5	Aug. 27, 2013
2450	Body	22.7	1.991	52.313	1.95	52.7	2.10	-0.73	±5	Aug. 29, 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:

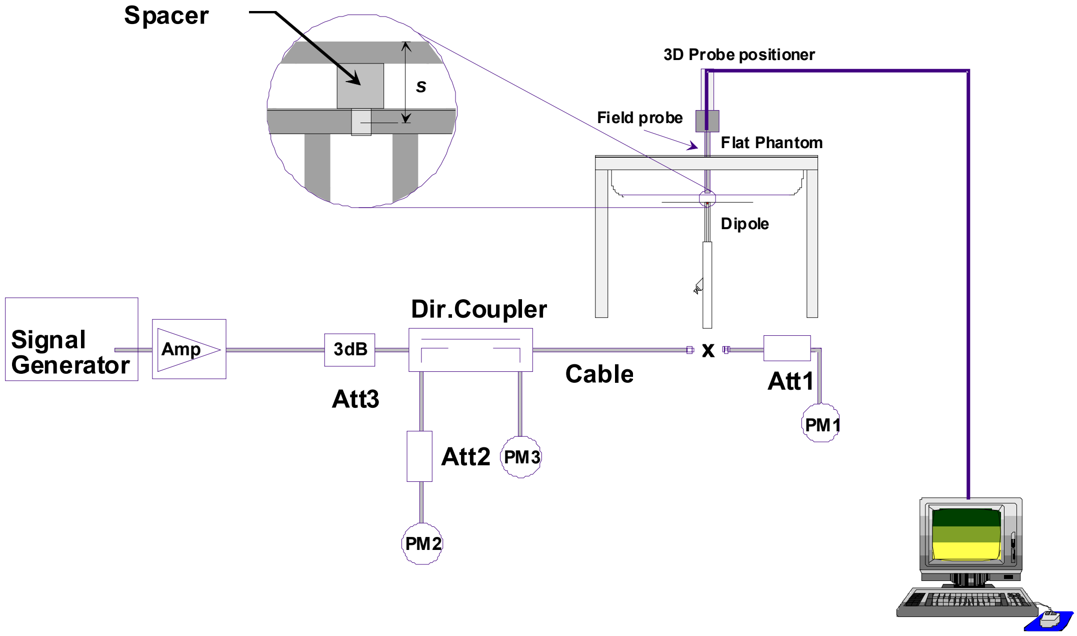


Fig 7.1 System Setup for System Evaluation

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_{1g} (W/kg)	Measured SAR_{1g} (W/kg)	Normalized SAR_{1g} (W/kg)	Deviation (%)
Aug. 26, 2013	750	Head	250	8.42	2.03	8.12	-3.56
Aug. 27, 2013	835	Head	250	9.49	2.32	9.28	-2.21
Aug. 27, 2013	1900	Head	250	40.2	9.9	39.6	-1.49
Aug. 29, 2013	2450	Head	250	54	12.7	50.8	-5.93
Aug. 26, 2013	750	Body	250	8.58	2.1	8.4	-2.10
Aug. 27, 2013	835	Body	250	9.43	2.47	9.88	4.77
Aug. 27, 2013	1900	Body	250	41.2	10.3	41.2	0.00
Aug. 29, 2013	2450	Body	250	50.4	12.4	49.6	-1.59

Table 7.1 Target and Measurement SAR after Normalized

8. EUT Testing Position

This EUT was tested in ten different positions. They are right cheek/right tilted/left cheek/left tilted for Head, Front/Back/Right Side/Left Side/Top Side/Bottom Side of the EUT with phantom 1 cm gap, as illustrated below, please refer to Appendix D for the test setup photos.

8.1 Define two imaginary lines on the handset

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

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

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

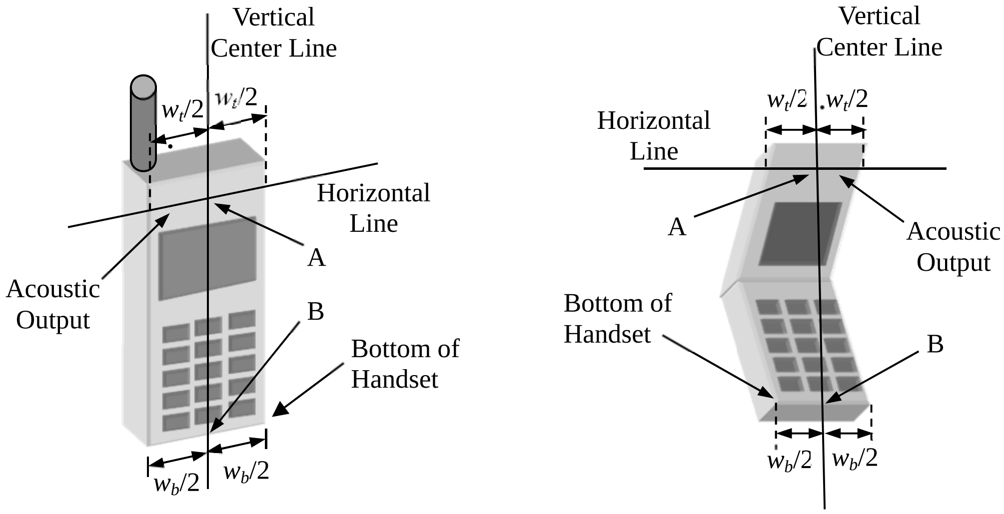


Fig 8.1 Illustration for Handset Vertical and Horizontal Reference Lines

8.2 Cheek Position

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

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

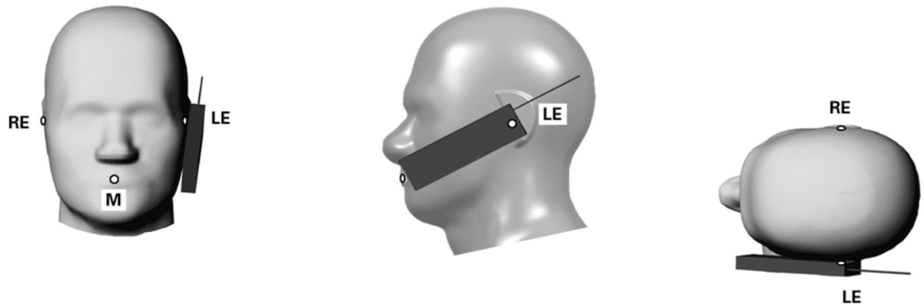


Fig 8.2 Illustration for Cheek Position

8.3 Tilted Position

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

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

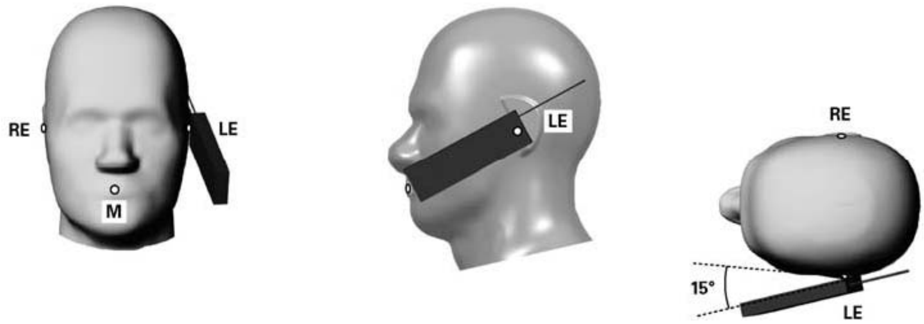


Fig 8.3 Illustration for Tilted Position

8.4 Body Worn Position

(a) To position the device parallel to the phantom surface with either keypad up or down.
(b) To adjust the device parallel to the flat phantom.
(c) To adjust the distance between the device surface and the flat phantom to 1 cm.

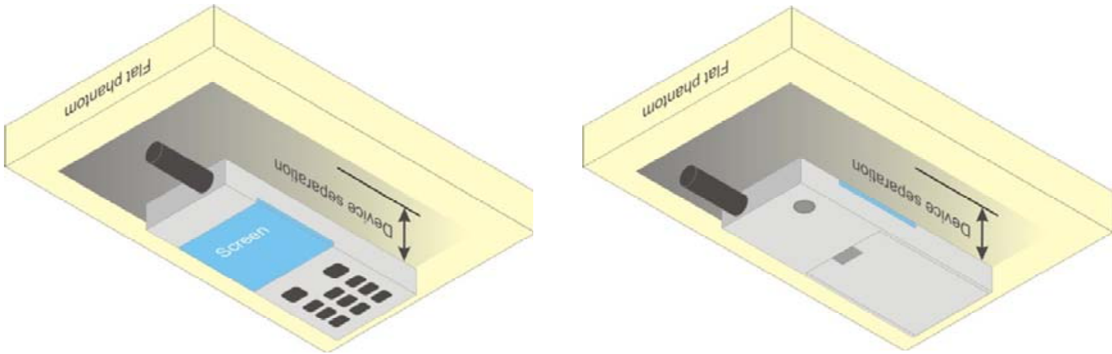


Fig 8.4 Illustration for Body Worn Position

8.5 Hotspot Position

(a) To position the device parallel to the phantom surface with all sides.
(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.

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

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

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

9.4 Volume Scan Procedures

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

9.5 SAR Averaged Methods

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

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

9.6 Power Drift Monitoring

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

10. Conducted RF Output Power (Unit: dBm)

<CDMA2000 Conducted Power>

Note:

1. Referring to KDB 941225 D01v02, the data device SAR is tested with Ev-Do Rev 0 (RTAP 153.6kbps). If 1xRTT and Ev-Do Rev A (RETAP 4096 bits) power is less than 1/4dB higher than Re v0, SAR tests with those settings are not necessary.
2. Considering VOIP capability, 1xEv-Do Rev. A SAR was repeated on the worst position of 1xRTT head SAR and body-worn SAR testing.
3. According to KDB 941225 D01v02, Head SAR for RC1+SO55 is not required because the maximum average output power of RC1 is less than 1/4 dB higher than RC3+SO55.
4. Referring to KDB 941225 D01v02, in Hotspot mode EUT is treated as data device and SAR is tested with Ev-Do Rev 0 (RTAP 153.6kbps). If 1xRTT and Ev-Do Rev A(RETAP 4096 bits) power is less than 1/4dB higher than Re v0, SAR tests with those settings are not necessary.

Band	CDMA2000 BC0			CDMA2000 BC1		
TX Channel	1013	384	777	25	600	1175
Frequency (MHz)	824.7	836.52	848.31	1851.25	1880	1908.75
1xRTT RC1 SO55	23.42	23.43	23.49	23.47	23.39	23.51
1xRTT RC3 SO55	23.48	23.50	23.46	23.41	23.31	23.54
1xRTT RC3 SO32(+ F-SCH)	23.46	23.39	23.45	23.39	23.28	23.51
1xRTT RC3 SO32(+SCH)	23.42	23.39	23.46	23.37	23.28	23.47
1xEVDO RTAP 153.6Kbps	23.37	23.33	23.36	23.38	23.25	23.49
1xEVDO RETAP 4096Bits	23.38	23.31	23.40	23.37	23.25	23.48

<LTE Conducted Power>

Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 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. Per KDB 941225 D05v02r02, 16QAM SAR testing is not required.
6. Smaller bandwidth output power for each RB allocation configuration is not > ½ dB higher than the same configuration in the largest supported bandwidth. Per KDB 941225 D05v02r02, smaller bandwidth SAR testing is not required.

<LTE Band 13 Conducted Power >

BW [MHz]	Modulation	RB Size	RB Offset	Power Ch. / Freq.	Target MPR	MPR Ch. / Freq.
Channel				23230		23230
Frequency (MHz)				782		782
10	QPSK	1	0	22.52	0	0.24
10	QPSK	1	24	22.51		0.25
10	QPSK	1	49	22.76		0.00
10	QPSK	25	0	21.28	1	1.48
10	QPSK	25	12	21.54		1.22
10	QPSK	25	24	21.46		1.30
10	QPSK	50	0	21.29		1.47
10	16QAM	1	0	21.77	1	0.99
10	16QAM	1	24	21.48		1.28
10	16QAM	1	49	21.41		1.35
10	16QAM	25	0	20.35	2	2.41
10	16QAM	25	12	20.45		2.31
10	16QAM	25	24	20.46		2.30
10	16QAM	50	0	20.30		2.46

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Target MPR	MPR Low Ch. / Freq.	MPR Middle Ch. / Freq.	MPR High Ch. / Freq.
Channel				23205	23230	23255		23205	23230	23255
Frequency (MHz)				779.5	782	784.5		779.5	782	784.5
5	QPSK	1	0	22.72	22.53	22.39	0	0.00	0.15	0.35
5	QPSK	1	12	22.57	22.54	22.56		0.15	0.14	0.18
5	QPSK	1	24	22.70	22.68	22.74		0.02	0.00	0.00
5	QPSK	12	0	21.60	21.49	21.60	1	1.12	1.19	1.14
5	QPSK	12	6	21.62	21.51	21.59		1.10	1.17	1.15
5	QPSK	12	11	21.65	21.53	21.67		1.07	1.15	1.07
5	QPSK	25	0	21.49	21.46	21.50		1.23	1.22	1.24
5	16QAM	1	0	21.79	21.72	21.92	1	0.93	0.96	0.82
5	16QAM	1	12	21.95	21.83	21.71		0.77	0.85	1.03
5	16QAM	1	24	21.86	21.65	21.85		0.86	1.03	0.89
5	16QAM	12	0	20.65	20.58	20.59	2	2.07	2.10	2.15
5	16QAM	12	6	20.52	20.54	20.74		2.20	2.14	2.00
5	16QAM	12	11	20.63	20.59	20.71		2.09	2.09	2.03
5	16QAM	25	0	20.49	20.57	20.66		2.23	2.11	2.08

<WLAN 2.4GHz Conducted Power>

WLAN 2.4GHz 802.11b Average Power (dBm)					
Channel	Frequency (MHz)	Data Rate (bps)			
		1M bps	2M bps	5.5M bps	11M bps
CH 01	2412	12.58	12.43	12.56	12.54
CH 06	2437	13.42	13.12	13.36	13.24
CH 11	2462	14.03	13.84	13.97	13.98

WLAN 2.4GHz 802.11g Average Power (dBm)									
Channel	Frequency (MHz)	Data Rate (bps)							
		6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
CH 01	2412	11.32	11.10	11.14	11.09	11.19	11.30	11.24	11.13
CH 06	2437	11.77	11.63	11.68	11.68	11.67	11.72	11.74	11.70
CH 11	2462	12.51	12.42	12.44	12.45	12.46	12.45	12.38	12.42

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)									
Channel	Frequency (MHz)	MCS Index							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 01	2412	11.18	11.09	11.13	11.06	11.12	11.09	11.13	11.15
CH 06	2437	11.98	11.92	11.91	11.93	11.95	11.95	11.88	11.92
CH 11	2462	12.72	12.64	12.65	12.61	12.67	12.65	12.65	12.67

Note:

1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate
3. Per KDB 248227 D01 v01r02, 11g and 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)										
Channel	Frequency (MHz)	Data Rate								
		DH1	DH3	DH5	2DH1	2DH3	2DH5	3DH1	3DH3	3DH5
CH 00	2402	0.20	0.19	0.03	-0.86	-1.69	-1.39	-0.75	-1.59	-1.36
CH 39	2441	1.59	1.45	1.62	0.71	0.05	0.30	0.78	-0.10	0.45
CH 78	2480	-1.47	-1.73	-1.66	-1.85	-2.77	-3.38	-2.26	-3.06	-2.99

Channel	Frequency (MHz)	Average power (dBm)
		Mode
		BT v4.0 LE, GFSK
CH 00	2402	-0.17
CH 19	2440	0.37
CH 39	2480	-1.60

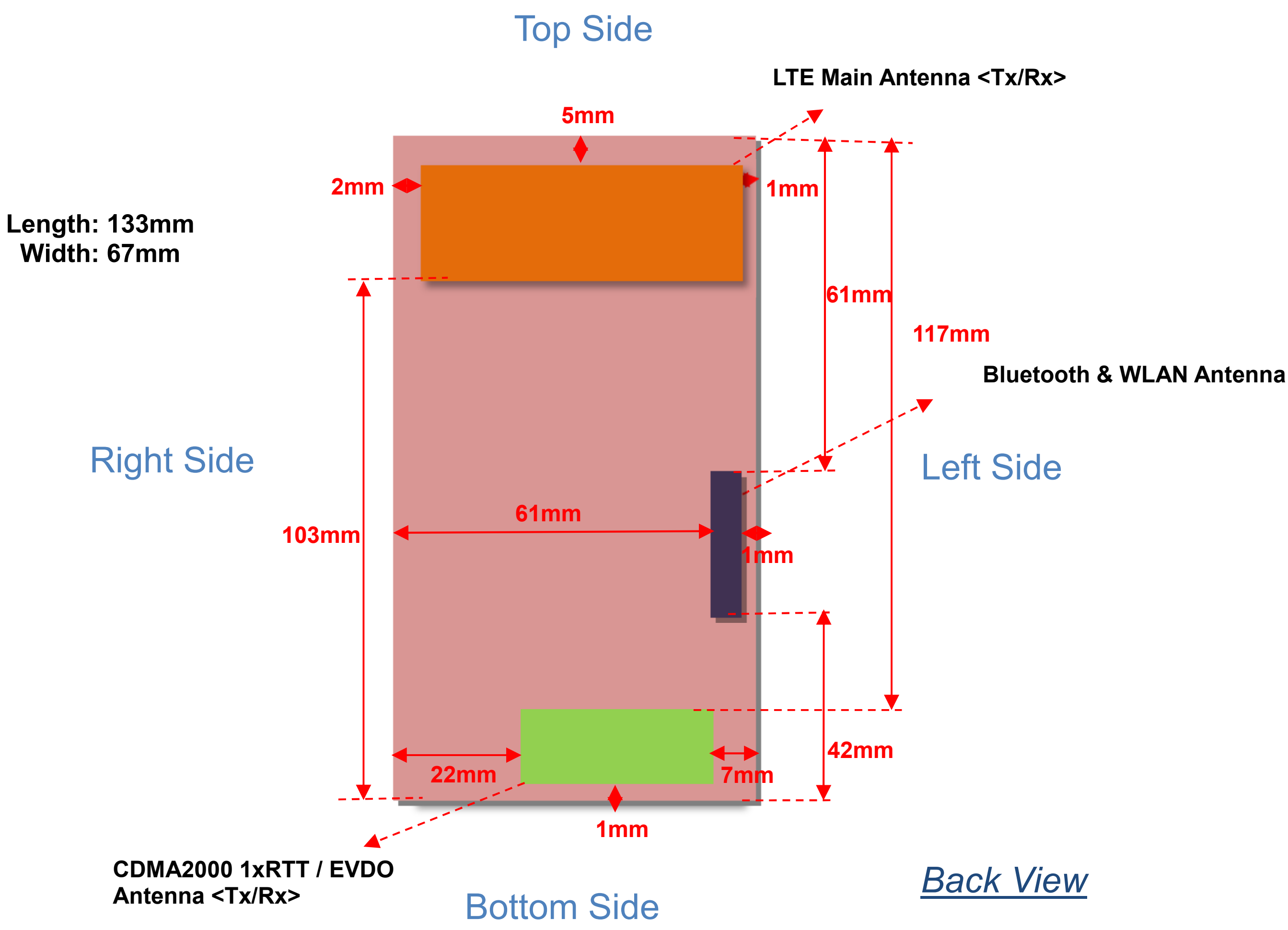
Note:

1. Per KDB 447498 D01v05r01, the 1-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*)] ·[$\sqrt{f(GHz)}$] ≤ 3.0 for 1-g 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
   - If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold

Bluetooth Max Power (dBm)	mW	Test Distance (mm)	Frequency (GHz)	exclusion thresholds
2	1.58	0	2.48	0.50
		10	2.48	0.25

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

11. DUT Antenna Location



Antennas	Wireless Interface
LTE Main Antenna <Tx / PRx>	LTE: band 13
CDMA2000 1xRTT / EVDO <Tx / Rx>	CDMA2000 1xRTT and EV-DO BC 0/1
WLAN & Bluetooth Antenna <Tx / Rx>	WLAN 2.4GHz, Bluetooth

Note:

1. This product has three antenna paths, one for LTE, one for 1xRTT and EVDO, and one for BT/WiFi. Each antenna path can transmit simultaneously.
2. The 1xRTT and EVDO share the same antenna path and cannot transmit simultaneously.
3. The Bluetooth and WLAN 2.4GHz share the same antenna path and cannot transmit simultaneously.

Distance of the Antenna to the EUT surface/edge Test distance: 10 mm						
Antennas	**Back**	**Front**	**Top Side**	**Bottom Side**	**Right Side**	**Left Side**
CDMA 1xRTT / EVDO	≤ 25mm	≤ 25mm	117mm	≤ 25mm	≤ 25mm	≤ 25mm
LTE	≤ 25mm	≤ 25mm	≤ 25mm	103mm	≤ 25mm	≤ 25mm
Bluetooth & WLAN	≤ 25mm	≤ 25mm	61mm	42mm	61mm	≤ 25mm

Positions for SAR tests; Hotspot mode Test distance: 10 mm						
Antennas	**Back**	**Front**	**Top Side**	**Bottom Side**	**Right Side**	**Left Side**
CDMA 1xRTT / EVDO	Yes	Yes	NO	Yes	Yes	Yes
LTE	Yes	Yes	Yes	NO	Yes	Yes
Bluetooth & WLAN	Yes	Yes	NO	NO	NO	Yes

1. Head/Body-worn/Hotspot mode SAR assessments are required.
2. Referring to KDB 941225 D06 v01r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge
3. Per KDB 447498 D01v05r01, for handsets the *test separation distance* is determined by the smallest distance between the outer surface of the device and the user; which is 0mm for head SAR, 10mm for hotspot SAR, 10mm for body-worn SAR.

12. SAR Test Results

Note:

1. Per KDB 447498 D01v05r01, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   Scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   Reported SAR(W/kg)= Measured SAR(W/kg) Scaling Factor*
2. Per KDB 447498 D01v05r01, for each exposure position, if the highest output channel reported SAR ≤0.8W/kg, other channels SAR testing is not necessary.
3. For Hotspot SAR testing, per KDB 941225 D06v01r01, for EUT dimension ≥ 9cm*5cm, the test distance is 1cm. SAR must be measured for all surfaces and sides with a transmitting antenna located within 2.5cm from that surface or edge.
4. Considering the possibility of VOIP operation, per KDB 941225 D01v02 1xEv-Do RevA (4096 bits) SAR for the head exposure positions and body-worn positions are performed.

12.1 Test Records for Head SAR Test

<CDMA SAR>

Plot No.	Antenna	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
47	**1xRTT/EVDO**	**CDMA2000 BC0**	**RC3 SO55**	**Right Cheek**	**384**	**836.52**	**23.5**	**24**	**1.122**	**-0.03**	**0.247**	**0.277**
48	1xRTT/EVDO	CDMA2000 BC0	RC3 SO55	Right Tilted	384	836.52	23.5	24	1.122	0.02	0.116	0.130
49	1xRTT/EVDO	CDMA2000 BC0	RC3 SO55	Left Cheek	384	836.52	23.5	24	1.122	0.08	0.159	0.178
50	1xRTT/EVDO	CDMA2000 BC0	RC3 SO55	Left Tilted	384	836.52	23.5	24	1.122	-0.09	0.123	0.138
51	1xRTT/EVDO	CDMA2000 BC0	RETAP 4096	Right Cheek	777	848.31	23.4	24	1.148	-0.09	0.237	0.272
52	**1xRTT/EVDO**	**CDMA2000 BC1**	**RC3 SO55**	**Right Cheek**	**1175**	**1908.75**	**23.54**	**24**	**1.112**	**-0.04**	**0.355**	**0.395**
53	1xRTT/EVDO	CDMA2000 BC1	RC3 SO55	Right Tilted	1175	1908.75	23.54	24	1.112	-0.09	0.099	0.110
54	1xRTT/EVDO	CDMA2000 BC1	RC3 SO55	Left Cheek	1175	1908.75	23.54	24	1.112	-0.01	0.333	0.370
55	1xRTT/EVDO	CDMA2000 BC1	RC3 SO55	Left Tilted	1175	1908.75	23.54	24	1.112	-0.06	0.118	0.131
56	1xRTT/EVDO	CDMA2000 BC1	RETAP 4096	Right Cheek	1175	1908.75	23.48	24	1.127	-0.07	0.347	0.391

<LTE SAR>

Plot No.	Antenna	Band	Mode	BW (MHz)	RB Size	RB Offset	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
1	LTE	LTE Band 13	QPSK	10	1	49	Right Cheek	23230	782	22.76	23	1.057	0.03	0.220	0.232
2	LTE	LTE Band 13	QPSK	10	1	49	Right Tilted	23230	782	22.76	23	1.057	0.05	0.164	0.173
3	**LTE**	**LTE Band 13**	**QPSK**	**10**	**1**	**49**	**Left Cheek**	**23230**	**782**	**22.76**	**23**	**1.057**	**-0.06**	**0.229**	**0.242**
4	LTE	LTE Band 13	QPSK	10	1	49	Left Tilted	23230	782	22.76	23	1.057	-0.02	0.179	0.189
5	LTE	LTE Band 13	QPSK	10	25	12	Right Cheek	23230	782	21.54	22	1.112	-0.05	0.205	0.228
6	LTE	LTE Band 13	QPSK	10	25	12	Right Tilted	23230	782	21.54	22	1.112	0.07	0.152	0.169
7	LTE	LTE Band 13	QPSK	10	25	12	Left Cheek	23230	782	21.54	22	1.112	-0.18	0.203	0.226
8	LTE	LTE Band 13	QPSK	10	25	12	Left Tilted	23230	782	21.54	22	1.112	-0.03	0.161	0.179

Note:

1. Per KDB 941225 D05v02r02, when reported SAR of 1RB and 50%RB allocation for QPSK ≤0.8W/kg, and 100%RB with QPSK output power is less than 1RB and 50%RB, 100%RB allocation for QPSK is not required.
2. 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the *reported* SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02, 16QAM SAR testing is not required.
3. Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the *reported* SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r02, smaller bandwidth SAR testing is not required.

<WLAN2.4GHz SAR>

Plot No.	Antenna	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Duty Cycle %	Duty Cycle Compensate Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
61	WLAN/BT	WLAN 2.4GHz	802.11b, 1Mbps	Right Cheek	11	2462	14.03	15	1.250	97.63	1.024	0.08	0.086	0.110
62	WLAN/BT	WLAN 2.4GHz	802.11b, 1Mbps	Right Tilted	11	2462	14.03	15	1.250	97.63	1.024	-0.08	0.041	0.053
63	**WLAN/BT**	**WLAN 2.4GHz**	**802.11b, 1Mbps**	**Left Cheek**	**11**	**2462**	**14.03**	**15**	**1.250**	**97.63**	**1.024**	**0.01**	**0.165**	**0.211**
64	WLAN/BT	WLAN 2.4GHz	802.11b, 1Mbps	Left Tilted	11	2462	14.03	15	1.250	97.63	1.024	0.02	0.050	0.064

12.2 Test Records for Hotspot SAR Test

<CDMA SAR>

Plot No.	Antenna	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
39	1xRTT/EVDO	CDMA2000 BC0	RTAP 153.6	Front	1	1013	824.7	23.37	24	1.156	-0.11	0.239	0.276
40	**1xRTT/EVDO**	**CDMA2000 BC0**	**RTAP 153.6**	**Back**	**1**	**1013**	**824.7**	**23.37**	**24**	**1.156**	**-0.01**	**0.412**	**0.476**
41	1xRTT/EVDO	CDMA2000 BC0	RTAP 153.6	Left Side	1	1013	824.7	23.37	24	1.156	-0.06	0.329	0.380
42	1xRTT/EVDO	CDMA2000 BC0	RTAP 153.6	Right Side	1	1013	824.7	23.37	24	1.156	-0.13	0.379	0.438
43	1xRTT/EVDO	CDMA2000 BC0	RTAP 153.6	Bottom Side	1	1013	824.7	23.37	24	1.156	-0.01	0.047	0.054
19	1xRTT/EVDO	CDMA2000 BC1	RTAP 153.6	Front	1	1175	1908.75	23.49	24	1.125	0.06	0.484	0.544
20	1xRTT/EVDO	CDMA2000 BC1	RTAP 153.6	Back	1	1175	1908.75	23.49	24	1.125	0.09	1.090	1.226
21	1xRTT/EVDO	CDMA2000 BC1	RTAP 153.6	Left Side	1	1175	1908.75	23.49	24	1.125	-0.15	0.265	0.298
22	1xRTT/EVDO	CDMA2000 BC1	RTAP 153.6	Right Side	1	1175	1908.75	23.49	24	1.125	-0.07	0.084	0.094
23	1xRTT/EVDO	CDMA2000 BC1	RTAP 153.6	Bottom Side	1	1175	1908.75	23.49	24	1.125	-0.03	0.913	1.027
24	1xRTT/EVDO	CDMA2000 BC1	RTAP 153.6	Back	1	25	1851.25	23.38	24	1.153	0.02	0.956	1.103
25	**1xRTT/EVDO**	**CDMA2000 BC1**	**RTAP 153.6**	**Back**	**1**	**600**	**1880**	**23.25**	**24**	**1.189**	**0.11**	**1.180**	**1.402**
26	1xRTT/EVDO	CDMA2000 BC1	RTAP 153.6	Bottom Side	1	25	1851.25	23.38	24	1.153	-0.08	0.831	0.959
27	1xRTT/EVDO	CDMA2000 BC1	RTAP 153.6	Bottom Side	1	600	1880	23.25	24	1.189	-0.08	1.020	1.212

<LTE SAR>

Plot No.	Antenna	Band	Mode	BW (MHz)	RB Size	RB Offset	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
9	LTE	LTE Band 13	QPSK	10	1	49	Front	1	23230	782	22.76	23	1.057	-0.01	0.230	0.243
10	**LTE**	**LTE Band 13**	**QPSK**	**10**	**1**	**49**	**Back**	**1**	**23230**	**782**	**22.76**	**23**	**1.057**	**-0.07**	**0.605**	**0.639**
11	LTE	LTE Band 13	QPSK	10	1	49	Left Side	1	23230	782	22.76	23	1.057	-0.14	0.303	0.320
12	LTE	LTE Band 13	QPSK	10	1	49	Right Side	1	23230	782	22.76	23	1.057	-0.02	0.336	0.355
13	LTE	LTE Band 13	QPSK	10	1	49	Top Side	1	23230	782	22.76	23	1.057	-0.05	0.083	0.088
14	LTE	LTE Band 13	QPSK	10	25	12	Front	1	23230	782	21.54	22	1.112	-0.13	0.193	0.215
15	LTE	LTE Band 13	QPSK	10	25	12	Back	1	23230	782	21.54	22	1.112	-0.07	0.469	0.521
16	LTE	LTE Band 13	QPSK	10	25	12	Left Side	1	23230	782	21.54	22	1.112	-0.11	0.244	0.271
17	LTE	LTE Band 13	QPSK	10	25	12	Right Side	1	23230	782	21.54	22	1.112	-0.16	0.270	0.300
18	LTE	LTE Band 13	QPSK	10	25	12	Top Side	1	23230	782	21.54	22	1.112	-0.07	0.068	0.076

Note:

1. Per KDB 941225 D05v02r02, when reported SAR of 1RB and 50%RB allocation for QPSK ≤0.8W/kg, and 100%RB with QPSK output power is less than 1RB and 50%RB, 100%RB allocation for QPSK is not required.
2. 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the *reported* SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r02, 16QAM SAR testing is not required.
3. Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the *reported* SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r02, smaller bandwidth SAR testing is not required.

<WLAN2.4GHz SAR>

Plot No.	Antenna	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Duty Cycle %	Duty Cycle Compensate Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
57	WLAN/BT	WLAN 2.4GHz	802.11b, 1Mbps	Front	1	11	2462	14.03	15	1.250	97.63	1.024	-0.05	0.047	0.060
58	**WLAN/BT**	**WLAN 2.4GHz**	**802.11b, 1Mbps**	**Back**	**1**	**11**	**2462**	**14.03**	**15**	**1.250**	**97.63**	**1.024**	**-0.02**	**0.117**	**0.150**
59	WLAN/BT	WLAN 2.4GHz	802.11b, 1Mbps	Left Side	1	11	2462	14.03	15	1.250	97.63	1.024	-0.07	0.083	0.106

12.3 Test Records for Body Worn SAR Test

Note:

1. Body-worn SAR testing was performed at 10mm separation, and this distance is determined by the handset manufacturer that there will be body-worn accessories that users may acquire at the time of equipment certification, to enable users to purchase aftermarket body-worn accessories with the required minimum separation.
2. Per KDB 941225 D06v01r01, when the same wireless modes and device transmission configurations are required for testing body-worn accessories and hotspot mode, it is not necessary to test body-worn accessory SAR for the same device orientation if the test separation distance for hotspot mode is more conservative than that used for body-worn accessories.
3. Though per KDB 648474 D04v01r01, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, the SAR testing with a headset connected to the handset is not required, but considered the simultaneous SAR for body-worn, we still perform the WLAN SAR with headset mode.

<CDMA SAR>

Plot No.	Antenna	Band	Mode	Test Position	Gap (cm)	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
44	1xRTT/EVDO	CDMA2000 BC0	RC3 SO32	Front	1	-	1013	824.7	23.46	24	1.132	-0.14	0.145	0.164
45	1xRTT/EVDO	CDMA2000 BC0	RC3 SO32	Back	1	-	1013	824.7	23.46	24	1.132	-0.06	0.441	0.499
46	**1xRTT/EVDO**	**CDMA2000 BC0**	**RETAP 4096**	**Back**	**1**	**-**	**777**	**848.31**	**23.4**	**24**	**1.148**	**-0.07**	**0.474**	**0.544**
28	1xRTT/EVDO	CDMA2000 BC1	RC3 SO32	Front	1	-	1175	1908.75	23.51	24	1.119	-0.04	0.555	0.621
29	1xRTT/EVDO	CDMA2000 BC1	RC3 SO32	Back	1	-	1175	1908.75	23.51	24	1.119	-0.18	1.120	1.254
30	1xRTT/EVDO	CDMA2000 BC1	RC3 SO32	Back	1	-	25	1851.25	23.39	24	1.151	-0.18	0.979	1.127
31	1xRTT/EVDO	CDMA2000 BC1	RC3 SO32	Back	1	-	600	1880	23.28	24	1.180	-0.01	1.170	1.381
32	**1xRTT/EVDO**	**CDMA2000 BC1**	**RC3 SO32**	**Back**	**1**	**Headset**	**600**	**1880**	**23.28**	**24**	**1.180**	**-0.06**	**1.230**	**1.452**
33	1xRTT/EVDO	CDMA2000 BC1	RC3 SO32	Back	1	Headset	25	1851.25	23.39	24	1.151	-0.01	1.040	1.197
34	1xRTT/EVDO	CDMA2000 BC1	RC3 SO32	Back	1	Headset	1175	1908.75	23.51	24	1.119	-0.03	1.100	1.231
35	1xRTT/EVDO	CDMA2000 BC1	RETAP 4096	Back	1	-	1175	1908.75	23.48	24	1.127	-0.16	1.010	1.138
36	1xRTT/EVDO	CDMA2000 BC1	RETAP 4096	Back	1	-	25	1851.25	23.37	24	1.156	-0.01	0.970	1.121
37	1xRTT/EVDO	CDMA2000 BC1	RETAP 4096	Back	1	-	600	1880	23.25	24	1.189	-0.01	1.150	1.367
65	1xRTT/EVDO	CDMA2000 BC1	RETAP 4096	Back	1	Headset	600	1880	23.25	24	1.189	0.03	1.090	1.295
66	1xRTT/EVDO	CDMA2000 BC1	RETAP 4096	Back	1	Headset	25	1851.25	23.37	24	1.156	-0.02	0.969	1.120
67	1xRTT/EVDO	CDMA2000 BC1	RETAP 4096	Back	1	Headset	1175	1908.75	23.48	24	1.127	-0.03	1.130	1.274

<LTE SAR>

Plot No.	Antenna	Band	Mode	BW (MHz)	RB Size	RB Offset	Test Position	Gap (cm)	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
9	LTE	LTE Band 13	QPSK	10	1	49	Front	1	-	23230	782	22.76	23	1.057	-0.01	0.230	0.243
10	**LTE**	**LTE Band 13**	**QPSK**	**10**	**1**	**49**	**Back**	**1**	**-**	**23230**	**782**	**22.76**	**23**	**1.057**	**-0.07**	**0.605**	**0.639**
14	LTE	LTE Band 13	QPSK	10	25	12	Front	1	-	23230	782	21.54	22	1.112	-0.13	0.193	0.215
15	LTE	LTE Band 13	QPSK	10	25	12	Back	1	-	23230	782	21.54	22	1.112	-0.07	0.469	0.521

<WLAN2.4GHz SAR>

Plot No.	Antenna	Band	Mode	Test Position	Gap (cm)	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Duty Cycle %	Duty Cycle Compensate Factor	Power Drift (dB)	Measured SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
57	WLAN/BT	WLAN 2.4GHz	802.11b, 1Mbps	Front	1	-	11	2462	14.03	15	1.250	97.63	1.024	-0.05	0.047	0.060
58	**WLAN/BT**	**WLAN 2.4GHz**	**802.11b, 1Mbps**	**Back**	**1**	**-**	**11**	**2462**	**14.03**	**15**	**1.250**	**97.63**	**1.024**	**-0.02**	**0.117**	**0.150**
60	WLAN/BT	WLAN 2.4GHz	802.11b,1Mbps	Back	1	Headset	11	2462	14.03	15	1.250	97.63	1.024	-0.09	0.110	0.141

12.4 Repeated SAR Measurement

Plot No.	Antenna	Band	Mode	Test Position	Gap (cm)	Headset	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR1g (W/kg)	Ratio	Reported SAR_{1g} (W/kg)
32	1xRTT/EVDO	CDMA2000 BC1	RC3 SO32	Back	1	Headset	600	1880	23.28	24	1.180	-0.06	1.230	1	1.452
38	1xRTT/EVDO	CDMA2000 BC1	RC3 SO32	Back	1	Headset	600	1880	23.28	24	1.180	-0.08	1.200	1.025	1.416

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: 27.08.2013

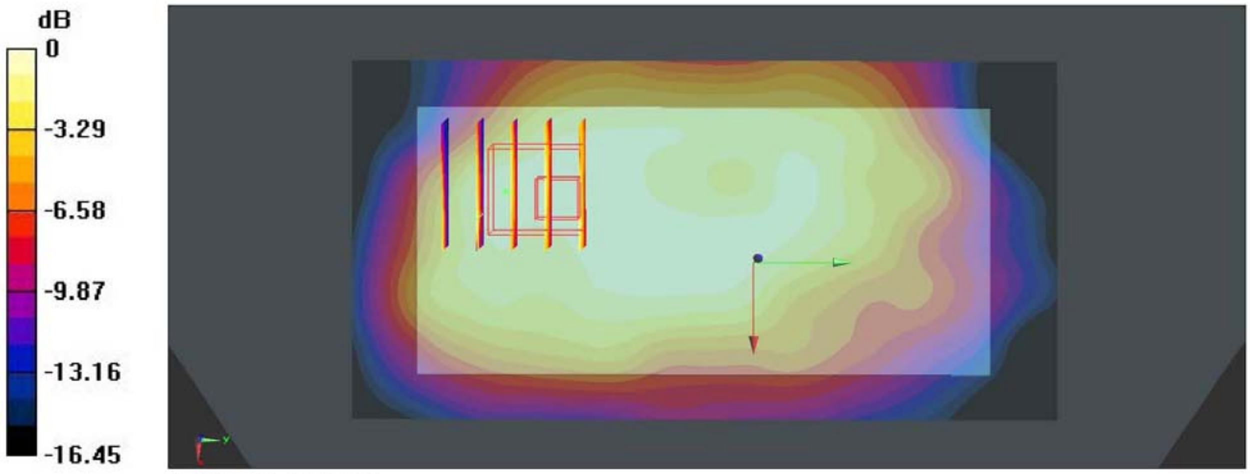
46 CDMA2000 BC0_RETAP 4096_Back_1Cm_Ch777

Communication System: CDMA2000; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: MSL_835_130827 Medium parameters used: f = 848.31 MHz; σ = 1.006 S/m; ε_r = 55.451; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(9.93, 9.93, 9.93); Calibrated: 11.04.2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 08.04.2013
- Phantom: SAM 1; Type: QD 000 P40 C; Serial: TP-1753
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Ch777/Area Scan (61x111x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.607 W/kg

Ch777/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.626 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.474 W/kg; SAR(10 g) = 0.306 W/kg
Maximum value of SAR (measured) = 0.613 W/kg



0 dB = 0.613 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 27.08.2013

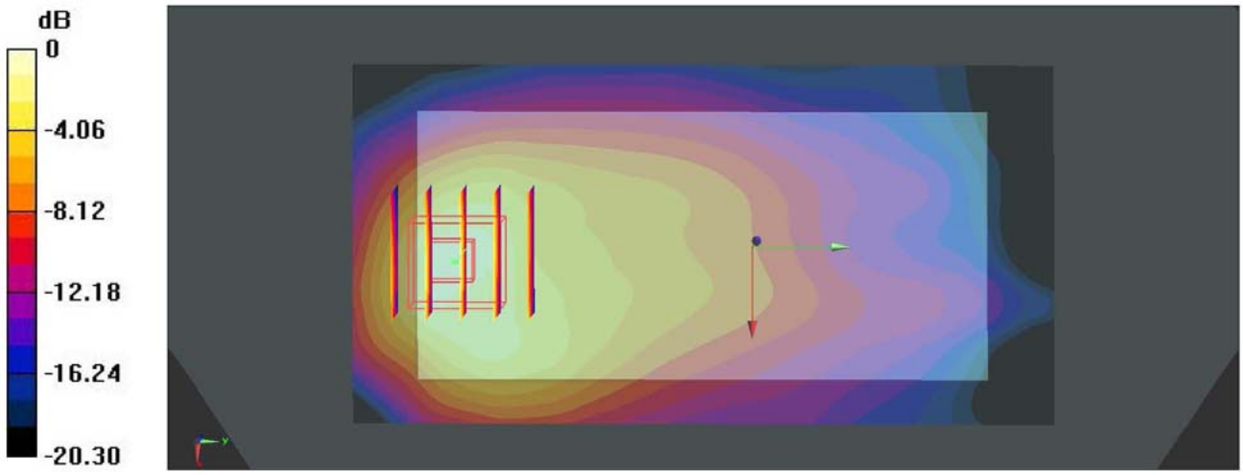
32 CDMA2000 BC1_RC3 SO32_Back_1Cm_Ch600_Headset

Communication System: CDMA2000; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: MSL_1900_130827 Medium parameters used: f = 1880 MHz; $\sigma = 1.513$ S/m; $\varepsilon_r = 54.594$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.7, 7.7, 7.7); Calibrated: 11.04.2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 08.04.2013
- Phantom: SAM 2; Type: QD 000 P40 C; Serial: TP-1754
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Ch600/Area Scan (61x111x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.42 W/kg

Ch600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.052 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.94 W/kg
SAR(1 g) = 1.230 W/kg; SAR(10 g) = 0.687 W/kg
Maximum value of SAR (measured) = 1.63 W/kg



0 dB = 1.63 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 26.08.2013

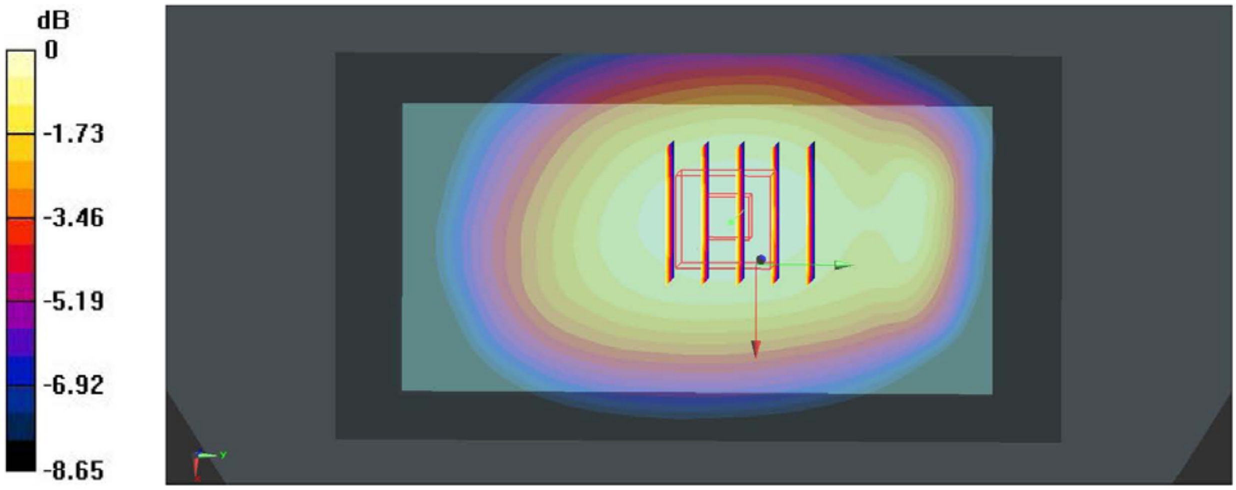
10 LTE Band 13_10M_RB(1,49)_QPSK_Back_1Cm_Ch23230

Communication System: LTE; Frequency: 782 MHz;Duty Cycle: 1:1
Medium: MSL_750_130826 Medium parameters used: f = 782 MHz; $\sigma = 0.971$ S/m; $\varepsilon_r = 56.056$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(10.21, 10.21, 10.21); Calibrated: 11.04.2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 08.04.2013
- Phantom: SAM 1; Type: QD 000 P40 C; Serial: TP-1753
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Ch23230/Area Scan (61x111x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.689 W/kg

Ch23230/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.809 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.772 W/kg
SAR(1 g) = 0.605 W/kg; SAR(10 g) = 0.459 W/kg
Maximum value of SAR (measured) = 0.693 W/kg



0 dB = 0.693 W/kg

TestLaboratory: Sporton International Inc. SAR/HAC TestingLab Date: 2013.08.29

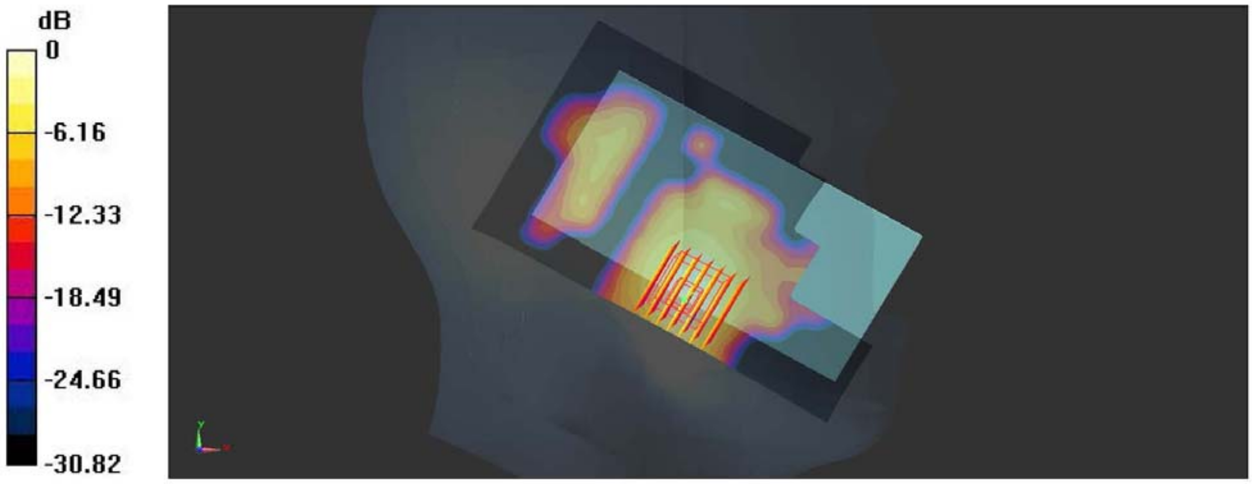
63 WLAN2.4GHz_802.11b_Left Cheek_Ch11

Communication System: WIFI;Frequency: 2462 MHz;Duty Cycle: 1:1.024
Medium: HSL_2450_130829 Medium parameters used: f = 2462 MHz; σ = 1.838 S/m; ε_r = 37.893; ρ = 1000 kg/m^3
Ambient Temperature: 23.6 ℃; Liquid Temperature : 22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(6.99, 6.99, 6.99); Calibrated: 2012.11.26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2012.11.22
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.9 (7117)

Ch11/Area Scan (81x141x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.266 W/kg

Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.358 W/kg
SAR(1 g) = 0.165 W/kg; SAR(10 g) = 0.078 W/kg
Maximum value of SAR (measured) = 0.253 W/kg



0 dB = 0.253 W/kg

13. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Phone			Note
		Head	Body-worn	Hotspot	
1.	CDMA(Voice) + WLAN2.4GHz(data)	Yes	Yes		
2.	CDMA((Voice) + Bluetooth(data)	Yes	Yes		
3.	CDMA(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
4.	LTE(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
5.	CDMA(Data) + Bluetooth(data)	Yes	Yes	Yes	Bluetooth Tethering
6.	LTE(Data) + Bluetooth(data)	Yes	Yes	Yes	Bluetooth Tethering

Note:

1. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. EUT will choose either CDMA/LTE according to the network signal condition; therefore, CDMA/LTE cannot transmit simultaneously.
3. The reported SAR summation is calculated based on the same configuration and test position.
4. 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
5. 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) 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.

In this report, 50mm separation is applied to conservatively estimate SAR value for separation distance > 50mm

   iii) If the test separation distance (antenna-user) is < 5mm, 5mm is used to determine SAR exclusion threshold

Maximum Power	Exposure Position	Head	Hotspot	Body-worn
	Test separation	0 mm	10 mm	10 mm
2 dBm	Estimated SAR (W/kg)	0.067W/kg	0.033W/kg	0.033W/kg

13.1 Head Exposure Conditions

	WWAN-PCE			WLAN 2.4GHz -DTS		Summed SAR (W/kg)	SPLSR ≤ 0.04	Case No
Position	WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Plot No	Max. WLAN SAR (W/kg)			
Right Cheek	CDMA2000 BC0	47	0.277	61	0.110	**0.39**		
	CDMA2000 BC1	52	0.395	61	0.110	**0.51**		
	LTE Band 13	1	0.232	61	0.110	**0.34**		
Right Tilted	CDMA2000 BC0	48	0.130	62	0.053	**0.18**		
	CDMA2000 BC1	53	0.110	62	0.053	**0.16**		
	LTE Band 13	2	0.173	62	0.053	**0.23**		
Left Cheek	CDMA2000 BC0	49	0.178	63	0.211	**0.39**		
	CDMA2000 BC1	54	0.370	63	0.211	**0.58**		
	LTE Band 13	3	0.242	63	0.211	**0.45**		
Left Tilted	CDMA2000 BC0	50	0.138	64	0.064	**0.20**		
	CDMA2000 BC1	55	0.131	64	0.064	**0.20**		
	LTE Band 13	4	0.189	64	0.064	**0.25**		

	WWAN-PCE			Bluetooth-DSS	Summed SAR (W/kg)	SPLSR ≤ 0.04	Case No
Position	WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Estimated SAR (W/kg)			
Right Cheek	CDMA2000 BC0	47	0.277	0.067	**0.34**		
	CDMA2000 BC1	52	0.395	0.067	**0.46**		
	LTE Band 13	1	0.232	0.067	**0.30**		
Right Tilted	CDMA2000 BC0	48	0.130	0.067	**0.20**		
	CDMA2000 BC1	53	0.110	0.067	**0.18**		
	LTE Band 13	2	0.173	0.067	**0.24**		
Left Cheek	CDMA2000 BC0	49	0.178	0.067	**0.25**		
	CDMA2000 BC1	54	0.370	0.067	**0.44**		
	LTE Band 13	3	0.242	0.067	**0.31**		
Left Tilted	CDMA2000 BC0	50	0.138	0.067	**0.21**		
	CDMA2000 BC1	55	0.131	0.067	**0.20**		
	LTE Band 13	4	0.189	0.067	**0.26**		

13.2 Hotspot Exposure Conditions

	WWAN-PCE			WLAN 2.4GHz -DTS		Summed SAR (W/kg)	SPLSR ≤ 0.04	Case No
Position	WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Plot No	Max. WLAN SAR (W/kg)			
Front	CDMA2000 BC0	39	0.276	57	0.060	**0.34**		
	CDMA2000 BC1	19	0.544	57	0.060	**0.60**		
	LTE Band13	9	0.243	57	0.060	**0.30**		
Back	CDMA2000 BC0	40	0.476	58	0.150	**0.63**		
	CDMA2000 BC1	25	1.402	58	0.150	**1.55**		
	LTE Band13	10	0.639	58	0.150	**0.79**		
Left Side	CDMA2000 BC0	41	0.380	59	0.106	**0.49**		
	CDMA2000 BC1	21	0.298	59	0.106	**0.40**		
	LTE Band13	11	0.320	59	0.106	**0.43**		
Right Side	CDMA2000 BC0	42	0.438			**0.44**		
	CDMA2000 BC1	22	0.094			**0.09**		
	LTE Band13	12	0.355			**0.36**		
Top Side	LTE Band13	13	0.088			**0.09**		
Bottom Side	CDMA2000 BC0	43	0.054			**0.05**		
	CDMA2000 BC1	27	1.212			**1.21**		

	WWAN-PCE			Bluetooth-DSS	Summed SAR (W/kg)	SPLSR ≤ 0.04	Case No
Position	WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Estimated SAR (W/kg)			
Front	CDMA2000 BC0	39	0.276	0.033	**0.31**		
	CDMA2000 BC1	19	0.544	0.033	**0.58**		
	LTE Band13	9	0.243	0.033	**0.28**		
Back	CDMA2000 BC0	40	0.476	0.033	**0.51**		
	CDMA2000 BC1	25	1.402	0.033	**1.44**		
	LTE Band13	10	0.639	0.033	**0.67**		
Left Side	CDMA2000 BC0	41	0.380	0.033	**0.41**		
	CDMA2000 BC1	21	0.298	0.033	**0.33**		
	LTE Band13	11	0.320	0.033	**0.35**		
Right Side	CDMA2000 BC0	42	0.438		**0.44**		
	CDMA2000 BC1	22	0.094		**0.09**		
	LTE Band13	12	0.355		**0.36**		
Top Side	LTE Band13	13	0.088		**0.09**		
Bottom Side	CDMA2000 BC0	43	0.054		**0.05**		
	CDMA2000 BC1	27	1.212		**1.21**		

13.3 Body-Worn Exposure Conditions

	WWAN-PCE			WLAN 2.4GHz -DTS				
Position	WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Plot No	Max. WLAN SAR (W/kg)	Summed SAR (W/kg)	SPLSR ≤ 0.04	Case No
Front	CDMA2000 BC0	44	0.164	57	0.060	**0.22**		
	CDMA2000 BC1	28	0.621	57	0.060	**0.68**		
	LTE Band13	9	0.243	57	0.060	**0.30**		
Back	CDMA2000 BC0	46	0.544	58	0.150	**0.69**		
	CDMA2000 BC1	31	1.381	58	0.150	**1.53**		
	LTE Band13	10	0.639	58	0.150	**0.79**		
Back (with/ Headset)	CDMA2000 BC1	32	1.452	60	0.141	**1.59**		

	WWAN-PCE			Bluetooth-DSS			
Position	WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Estimated SAR (W/kg)	Summed SAR (W/kg)	SPLSR ≤ 0.04	Case No
Front	CDMA2000 BC0	44	0.164	0.033	**0.20**		
	CDMA2000 BC1	28	0.621	0.033	**0.65**		
	LTE Band13	9	0.243	0.033	**0.28**		
Back	CDMA2000 BC0	46	0.544	0.033	**0.58**		
	CDMA2000 BC1	31	1.381	0.033	**1.41**		
	LTE Band13	10	0.639	0.033	**0.67**		
Back (with/ Headset)	CDMA2000 BC1	32	1.452	0.033	**1.49**		

Test Engineer： Jone Wang and Luke Lu

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 12.1

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

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

(b) κ is the coverage factor

Table 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

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

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

[4] SPEAG DASY System Handbook

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

[6] FCC KDB 447498 D01 v05r01, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", May 2013

[7] FCC KDB 648474 D04 v01r01, "SAR Evaluation Considerations for Wireless Handsets", May 2013

[8] FCC KDB 941225 D05 v02r02, "SAR Evaluation Considerations for LTE Devices", May 2013

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

[10] FCC KDB 941225 D06 v01r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", May 2013