FCC SAR Test Report

APPLICANT	:	**HTC Corporation**
EQUIPMENT	:	**Smartphone**
MODEL NAME	:	**PH39150**
FCC ID	:	**NM8PH39150**
STANDARD	:	**FCC 47 CFR Part 2 (2.1093)** **IEEE C95.1-1991** **IEEE 1528-2003** **FCC OET Bulletin 65 Supplement C (Edition 01-01)**

The product was received on May. 09, 2011 and completely tested on Sep. 3, 2011. 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 INTERNATIONALINC., the test report shall not be reproduced except in full.

Reviewed by:

Jones Tsai / Manager

Testing Laboratory
1190

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA172733	Rev. 01	Initial issue of report	Sep. 5, 2011
FA172733	Rev. 02	1. Remove the SAR data with ear-phone in Hotspot SAR at page 52, 53, 54, 55, 56. 2. Remove the LTE band 4 with bandwidth 10 MHz SAR data for Head/Body-worn/Hotspot SAR.	Sep. 19, 2011

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **HTC Corporation SmartphonePH39150** are as follows (with expanded uncertainty 21.4% for 300 MHz to 3 GHz).

Band	Position	SAR_{1g} (W/kg)
GSM 850	Head	0.204
	Body-worn (1cm Gap)	0.836
	Hotspot (1cm Gap)	0.836
GSM 1900	Head	0.398
	Body (1cm Gap)	0.638
	Hotspot (1cm Gap	0.638
WCDMA V	Head	0.3
	Body (1cm Gap)	0.523
	Hotspot (1cm Gap)	0.523
WCDMA II	Head	1.2
	Body (1cm Gap)	1
	Hotspot (1cm Gap)	0.899
LTE Band 4	Head	0.611
	Body (1cm Gap)	0.808
	Hotspot (1cm Gap)	0.808
LTE Band 17	Head	0.702
	Body (1cm Gap)	0.14
	Hotspot (1cm Gap)	0.156
802.11b/g/n	Head	0.727
	Body (1cm Gap)	0.12
	Hotspot (1cm Gap)	0.12
Bluetooth	Head	N/A
	Body	N/A
	Hotspot (1cm Gap)	N/A

Note:

1. Per KDB 648474, Bluetooth power 1.07dBm is < P(Ref), P(Ref)= 10.8dBm, and the distance to Phone01 antenna is 10.27cm > 5cm.
2. Per KDB 648474, Bluetooth power 1.07dBm is < P(Ref), P(Ref)= 10.8dBm, the distance to Phone02 antenna is < 2.5cm, the Phone02 antenna LTE band 17 maximum SAR =0.615W/kg < 1.2W/kg.
3. Therefore, Bluetooth can be excluded from standalone and simultaneous SAR consideration.

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 C95.1-1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003 and FCC OET Bulletin 65 Supplement C (Edition 01-01).

The table below summarized necessary items addressed in KDB 941225 D05 v01.

FCC ID	NM8PH39150
DUT Type	Smartphone (Handset)
Operating Frequency Range of each LTE transmission band	Band 4: TX: 1710~1755 MHz, RX: 2110~ 2155 MHz Band 17: TX: 704~ 716 MHz, RX: 734 ~ 746 MHz
Channel Bandwidth	5MHz, 10MHz
Transmission (H, M, L) channel numbers and frequencies in each LTE band	(see below)

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

Band 4					
Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz	
Channel #	Frequency (MHz)	Channel #	Frequency (MHz)	Channel #	Frequency (MHz)
19975	1712.5	20000	1715	20025	1717.5
20175	1732.5	20175	1732.5	20175	1732.5
19975	1752.5	20350	1750	20325	1747.5

Band 17			
Bandwidth 5 MHz		Bandwidth 10 MHz	
Channel #	Frequency (MHz)	Channel #	Frequency (MHz)
23755	706.5	23780	709
23790	710	23790	710
23825	713.5	23800	711

UE category, uplink modulations used	Category 3, QPSK, and 16QAM	
LTE transmitter and antenna implementation (standalone or sharing hardware components / antennas)	LTE band 17 transmitting, it shares the same antenna with 2G/3G TX/RX antenna LTE band 4 transmitting, it shares the same antenna with 2G/3G diversity RX antenna	
LTE Voice / Data requirements	1. Data only 2. Considering the users may install 3rd party software to enable VOIP, LTE Head SAR is also evaluated.	
LTE MPR permanently built-in by design	Yes	
LTE A-MPR	Disabled during SAR testing. With CMW500, set NS value to NS_01 to disable A-MPR.	
LTE maximum averaged conducted output power	LTE Band 4 : 23.17 dBm LTE Band 17 : 23.03 dBm	
Other U.S. wireless operating modes / bands	GSM/GPRS/EDGE	GSM850: UL:824~849MHz/DL:869~894MHz PCS : UL:1850~1910MHz/DL:1930~1990MHz
	WCDMA	WCDMA Band II: UL:1852.5~1907.6MHz/ DL:1932.5~1987.6MHz WCDMA Band V: UL:826.5~846.6MHz/ DL:871.5~891.6MHz
Simultaneous transmission configurations	Details are In Section 12.2. The possible combinations are 2G/3G +WLAN and LTE+WLAN.	
Power reduction applied to satisfy SAR compliance	No	

2. Administration Data

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, HwaYa 1st Rd., HwaYaTechnologyPark, 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	HTC Corporation
Address	No. 23, Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan

2.3 Manufacturer

Company Name	HTC Corporation
Address	No. 23, Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan

2.4 Application Details

Date of Receipt of Application	May. 09, 2011
Date of Start during the Test	May. 15, 2011
Date of End during the Test	Sep. 3, 2011

3. General Information

3.1 Description of Device Under Test (DUT)

Product Feature & Specification	
DUT Type	Smartphone
Model Name	PH39150
Tx Frequency	GSM850 : 824 MHz ~ 849 MHz GSM1900 : 1850 MHz ~ 1910 MHz WCDMA 2 : 1852.5 MHz ~ 1907.6MHz WCDMA 5 : 826.5 MHz ~ 846.6 MHz LTE Band 4 : 1710MHz ~ 1755 MHz LTE Band 17 : 704 MHz ~ 716 MHz 802.11b/g/n : 2400 MHz ~ 2483.5 MHz Bluetooth : 2400 MHz ~ 2483.5 MHz
Rx Frequency	GSM850 : 869 MHz ~ 894 MHz GSM1900 : 1930 MHz ~ 1990 MHz WCDMA 2 : 1932.5 MHz ~ 1987.6 MHz WCDMA 5 : 871.5 MHz ~ 891.6 MHz LTE Band 4 : 2100 MHz ~ 2155 MHz LTE Band 17 : 734 MHz ~ 746 MHz 802.11b/g/n : 2400 MHz ~ 2483.5 MHz Bluetooth : 2400 MHz ~ 2483.5 MHz
Maximum Output Power to Antenna	GSM850 : 32.13 dBm GSM1900 : 29.67 dBm WCDMA Band V : 23.58 dBm WCDMA Band II : 23.28 dBm LTE Band 4 : 23.17 dBm LTE Band 17 : 23.03 dBm 802.11b : 18.19 dBm 802.11g : 13.21 dBm 802.11n (BW 20MHz) : 13.10 dBm Bluetooth : 1.07 dBm
Antenna Type	Fixed Internal Antenna
Type of Modulation	GSM : GMSK WCDMA : QPSK (uplink) HSDPA : QPSK (uplink) HSUPA : QPSK (uplink) LTE: QPSK / 16QAM (uplink) 802.11b : DSSS (BPSK / QPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π/4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK
DUT Stage	Identical Prototype

Remark:

1. The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. Device does not support Dual Transfer Mode (DTM).
3. Regarding GPRS/EDGE, DUT only supports up to class 10.

3.2 Applied Standards

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)
- IEEE C95.1-1991
- IEEE 1528-2003
- FCC OET Bulletin 65 Supplement C (Edition 01-01)
- FCC KDB 648474 D01 v01r05
- FCC KDB 248227 D01 v01r02
- FCC KDB 941225 D01 v02
- FCC KDB 941225 D03 v01
- FCC KDB 941225 D06 v01
- FCC KDB 941225 D05 v01

3.3 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.

3.4 Test Conditions

3.4.1 Ambient Condition

Ambient Temperature	20 to 24℃
Humidity	<60 %

3.4.2 Test Configuration

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 DUT 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 DUT. The DUT was set from the emulator to radiate maximum output power during all tests.

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

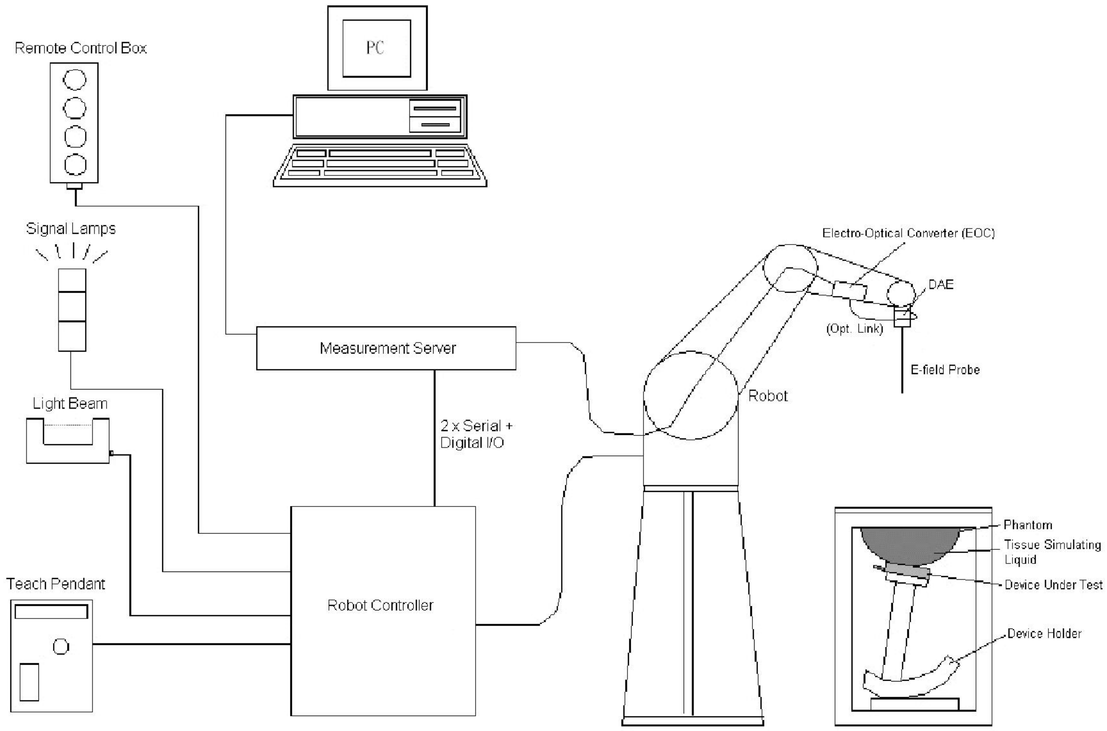


Fig 5.1 SPEAG DASY4 or DASY5 System Configurations

The DASY4 or DASY5system 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 (ECO) 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
- DASY4 or DASY5 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

Some of the components are described in details 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

<ET3DV6>

Construction	Symmetrical design with triangular coreBuilt-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	5 μW/g to 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 6.8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.7 mm

Fig 5.2 Photo of ET3DV6

<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

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 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

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 Stäublirobot 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)

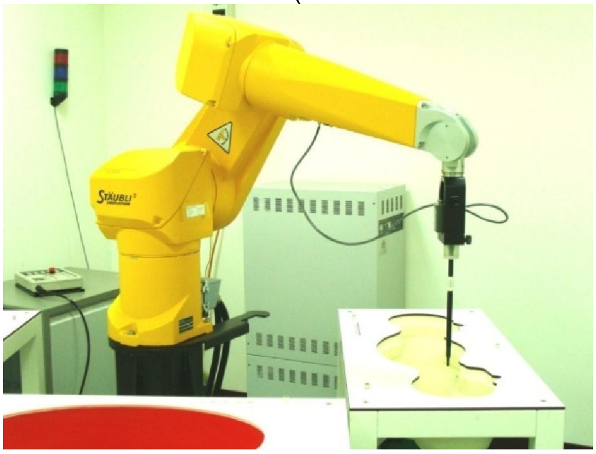


Fig 5.5 Photo of DASY4

Fig 5.6 Photo of DASY5

5.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY4: 166MHz, Intel Pentium; DASY5: 400MHz, 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 16bit 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

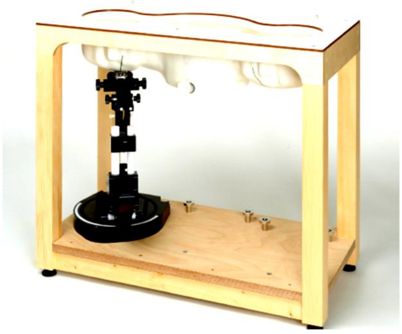


Fig 5.9 Photo of SAM Phantom

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

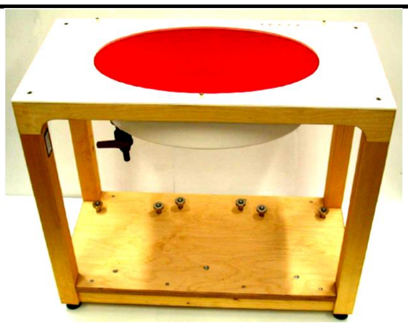


Fig 5.10 Photo of ELI4 Phantom

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 at5 mm distance, a positioning uncertainty of ±0.5mm 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 (EPR).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.

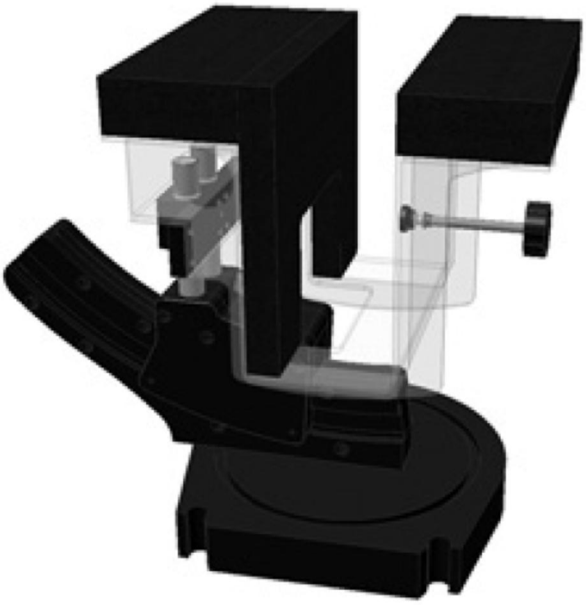


Fig 5.12 Laptop Extension Kit

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), $\mu V/(V/m)^2$ 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	Dosimetric E-Field Probe	EX3DV4	3731	Sep. 20, 2010	Sep. 19, 2011
SPEAG	Dosimetric E-Field Probe	EX3DV4	3697	Apr. 19, 2011	Apr. 18, 2012
SPEAG	Dosimetric E-Field Probe	ET3DV6	1787	May. 20, 2011	May. 19, 2012
SPEAG	Dosimetric E-Filed Probe	EX3DV4	3792	Jun. 20, 2011	Jun. 19, 2012
SPEAG	750MHz System Validation Kit	D750V3	1012	Jun.11, 2010	Jun. 10, 2012
SPEAG	835MHz System Validation Kit	D835V2	4d082	Jul. 20, 2010	Jul. 19, 2011
SPEAG	835MHz System Validation Kit	D835V2	499	Mar. 22, 2010	Mar. 21, 2012
SPEAG	1800MHz System Validation Kit	D1800V2	2d052	Jun. 16, 2011	Jun. 15, 2013
SPEAG	1800MHz System Validation Kit	D1800V2	2d076	Jul. 22, 2011	Jul. 21, 2013
SPEAG	1900MHz System Validation Kit	D1900V2	5d018	Jun.15, 2010	Jun. 14, 2012
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Mar. 23, 2010	Mar. 22, 2012
SPEAG	2450MHz System Validation Kit	D2450V2	735	Jun. 22, 2011	Jun. 21, 2012
SPEAG	Data Acquisition Electronics	DAE4	778	Oct. 22, 2010	Oct. 21, 2011
SPEAG	Data Acquisition Electronics	DAE3	495	Apr. 28, 2011	Apr. 27, 2012
SPEAG	Data Acquisition Electronics	DAE4	1249	Feb. 21, 2011	Feb. 20, 2012
SPEAG	Data Acquisition Electronics	DAE3	577	Jun. 20, 2011	Jun. 19, 2012
SPEAG	Data Acquisition Electronics	DAE4	1279	Jun. 17, 2011	Jun. 16, 2012
SPEAG	Device Holder	N/A	N/A	NCR	NCR
SPEAG	SAM Phantom	QD 000 P40 C	TP-1303	NCR	NCR
SPEAG	SAM Phantom	QD 000 P40 C	TP-1383	NCR	NCR
SPEAG	SAM Phantom	QD 000 P40 C	TP-1446	NCR	NCR
SPEAG	SAM Phantom	QD 000 P40 C	TP-1478	NCR	NCR
SPEAG	ELI4 Phantom	QD 0VA 001 BB	1026	NCR	NCR
SPEAG	ELI4 Phantom	QD 0VA 001 BA	1029	NCR	NCR
Agilent	ENA Series Network Analyzer	E5071C	MY46106933	Jul. 06, 2010	Jul. 05, 2011
Agilent	ENA Series Network Analyzer	E5071C	MY46100746	Jun. 10, 2011	Jun. 09, 2012
Agilent	Wireless Communication Test Set	E5515C	MY48360820	Jan. 12, 2010	Jan. 11, 2012
Agilent	Wireless Communication Test Set	E5515C	GB46311322	Mar. 23, 2011	Mar. 22, 2013
Agilent	Wireless Communication Test Set	E5515C	MY50264370	Apr. 19, 2011	Apr. 18, 2013
R&S	Universal Radio Communication Tester	CMU200	114256	Feb. 08, 2010	Feb. 07, 2012

R&S	Universal Radio Communication Tester	CMW500	102159	Sep. 09, 2010	Sep. 08, 2011
Agilent	Dielectric Probe Kit	85070D	US01440205	NCR	NCR
Agilent	Dual Directional Coupler	778D	50422	NCR	NCR
AR	Power Amplifier	5S1G4M2	0328767	NCR	NCR
R&S	Spectrum Analyzer	FSP40	100055	Jun. 11, 2010	Jun. 10, 2011
R&S	Spectrum Analyzer	FSP30	101329	May. 03, 2011	May. 02, 2012
R&S	Spectrum Analyzer	FSP7	101131	Jul. 29, 2011	Jul. 28, 2012

Table 5.1 Test Equipment List

Note: The calibration certificate of DASY can be referred to appendix C of this report.

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.

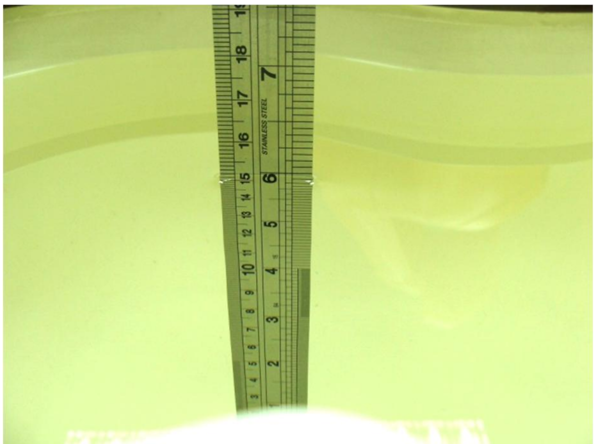


Fig 6.1 Photo of Liquid Height for Head SAR

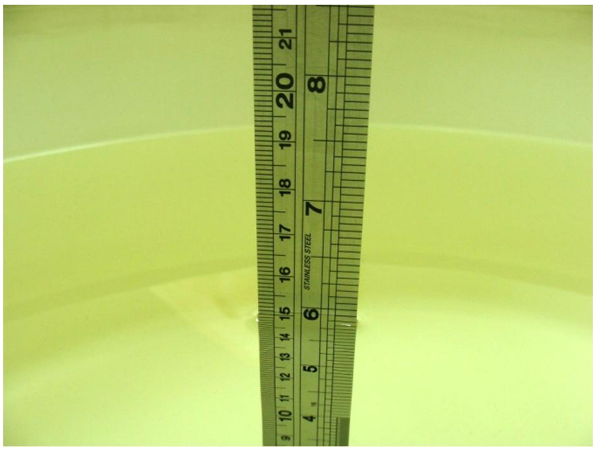


Fig 6.2 Photo of Liquid Height for Body SAR

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

The following table gives the targets for tissue simulating liquid.

Frequency (MHz)	Liquid Type	Conductivity (σ)	±5%Range	Permittivity (ε_r)	±5%Range
750	Head	0.89	0.84 ~ 0.93	41.9	39.9 ~ 43.9
835	Head	0.90	0.86 ~ 0.95	41.5	39.4 ~ 43.6
1800, 1900, 2000	Head	1.40	1.33 ~ 1.47	40.0	38.0 ~ 42.0
2450	Head	1.80	1.71 ~ 1.89	39.2	37.2 ~ 41.2
750	Body	0.96	0.92 ~ 1.0	55.5	52.8 ~ 58.2
835	Body	0.97	0.92 ~ 1.02	55.2	52.4 ~ 58.0
1800, 1900, 2000	Body	1.52	1.44 ~ 1.60	53.3	50.6 ~ 56.0
2450	Body	1.95	1.85 ~ 2.05	52.7	50.1 ~ 55.3

Table 6.2 Targets 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	Temperature (℃)	Conductivity (σ)	Permittivity (ε_r)	Measurement Date
709	Head	21.5	0.782	37.8	Jun. 02, 2011
710	Head	21.5	0.802	37.7	Jun. 02, 2011
711	Head	21.5	0.823	37.7	Jun. 02, 2011
750	Head	21.5	0.886	40.28	Jun. 02, 2011
709	Head	21.5	0.784	37.7	Jun. 04, 2011
710	Head	21.5	0.802	37.7	Jun. 04, 2011
711	Head	21.5	0.811	37.6	Jun. 04, 2011
750	Head	21.5	0.89	40.32	Jun. 04, 2011
709	Head	21.5	0.84	41.7	Aug. 08, 2011
710	Head	21.5	0.86	41.7	Aug. 08, 2011
711	Head	21.5	0.87	41.5	Aug. 08, 2011
750	Head	21.5	0.895	41.004	Aug. 08, 2011
709	Body	21.4	0.913	52.6	Jun. 02, 2011
710	Body	21.4	0.921	52.5	Jun. 02, 2011
711	Body	21.4	0.928	52.5	Jun. 02, 2011
750	Body	21.4	0.958	53.11	Jun. 02, 2011
709	Body	21.3	0.921	52.9	Jun. 04, 2011
710	Body	21.3	0.928	52.92	Jun. 04, 2011
711	Body	21.3	0.93	52.92	Jun. 04, 2011
750	Body	21.3	0.964	53.16	Jun. 04, 2011
709	Body	21.6	0.935	55.192	Aug. 08, 2011
710	Body	21.6	0.936	55.156	Aug. 08, 2011
711	Body	21.6	0.942	54.932	Aug. 08, 2011
750	Body	21.6	0.963	54.231	Aug. 08, 2011

Frequency (MHz)	Liquid Type	Temperature (℃)	Conductivity (σ)	Permittivity (ε_r)	Measurement Date
1717.5	Head	21.4	1.37	39.6	Sep. 02, 2011
1732.5	Head	21.4	1.38	39.5	Sep. 02, 2011
1747.5	Head	21.4	1.4	39.5	Sep. 02, 2011
1800	Head	21.4	1.45	39.3	Sep. 02, 2011
1717.5	Head	21.3	1.36	40.7	Sep. 03, 2011
1732.5	Head	21.3	1.38	40.6	Sep. 03, 2011
1747.5	Head	21.3	1.39	40.6	Sep. 03, 2011
1800	Head	21.3	1.45	40.4	Sep. 03, 2011
1717.5	Body	21.2	1.51	51.8	Sep. 03, 2011
1732.5	Body	21.2	1.52	51.8	Sep. 03, 2011
1747.5	Body	21.2	1.54	51.7	Sep. 03, 2011
1800	Body	21.2	1.6	51.6	Sep. 03, 2011
835	Head	21.3	0.902	43.3	May. 29, 2011
835	Head	21.5	0.912	43.4	May. 30, 2011
835	Head	21.7	0.912	40.6	Aug. 07, 2011
835	Head	21.5	0.886	41.325	Aug. 09, 2011
835	Body	21.5	0.976	52.9	May. 30, 2011
835	Body	21.7	0.979	52.7	Jun. 06, 2011
835	Body	21.4	0.977	53.2	Aug. 07, 2011
835	Body	21.7	0.994	56.197	Aug. 09, 2011
1900	Head	21.7	1.44	38.1	May. 29, 2011
1900	Head	21.3	1.46	39	Jun. 01, 2011
1900	Head	21.5	1.43	39	Aug. 07, 2011
1900	Head	21.5	1.42	41.1	Aug. 18, 2011
1900	Body	21.5	1.53	52.5	May. 30, 2011
1900	Body	21.5	1.54	52.6	Jun. 01, 2011
1900	Body	21.4	1.54	52.5	Aug. 07, 2011
1900	Body	21.2	1.515	55.045	Aug. 09, 2011
2450	Head	21.5	1.84	39.3	Jun. 02, 2011
2450	Head	21.6	1.84	39.4	Aug. 09, 2011
2450	Body	21.6	2.02	53.9	Jun. 02, 2011
2450	Body	21.6	1.965	51.649	Aug. 08, 2011

Table 6.3 Measuring Results for Simulating Liquid

Note:

1. Considering LTE band 4 measurement, the probe is calibrated at 1750MHz and the calibration frequency is within 50MHz of the SAR measurement. During the system check with 1800MHz dipole, the same liquid/probe for SAR measurement were used.
2. Considering LTE band 17 measurement, the probe is calibrated at 750MHz and the calibration frequency is within 50MHz of the SAR measurement. During the system check with 750MHz dipole, the same liquid/probe for SAR measurement were used.

7. 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 7.1

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 7.1 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 showed in Table 7.2.

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

Table 7.2 Uncertainty Budget of DASY for frequency range 300 MHz to 3 GHz

8. SAR Measurement Evaluation

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.

8.1 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.

8.2 System Setup

In the simplified setup for system evaluation, the DUT 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:

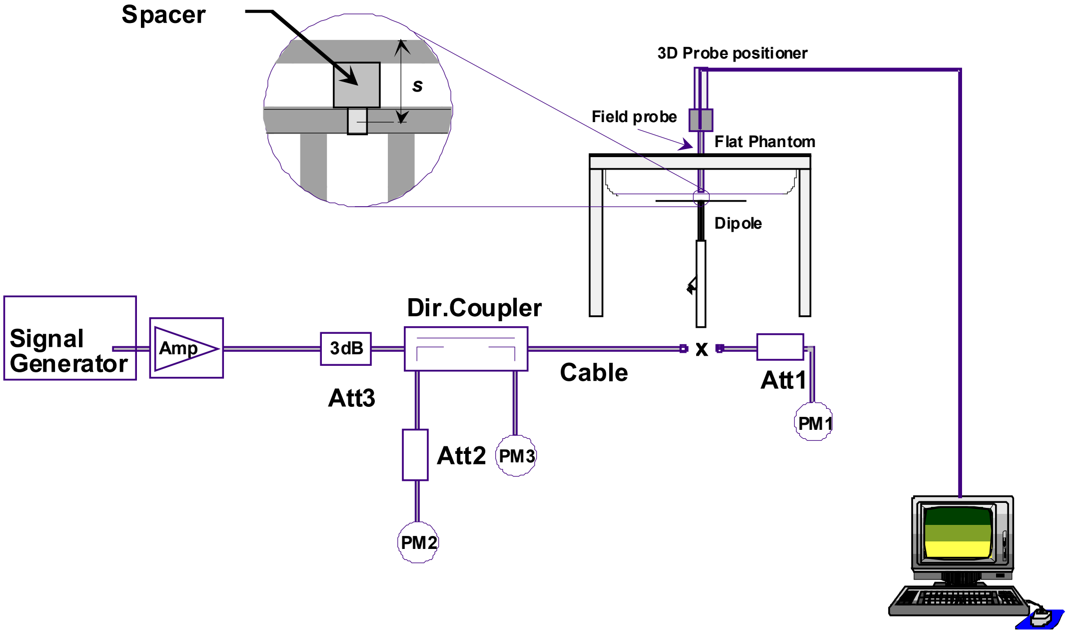


Fig 8.1 System Setup for System Evaluation

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

The output power on dipole port must be calibrated to 24 dBm (250mW) before dipole is connected.

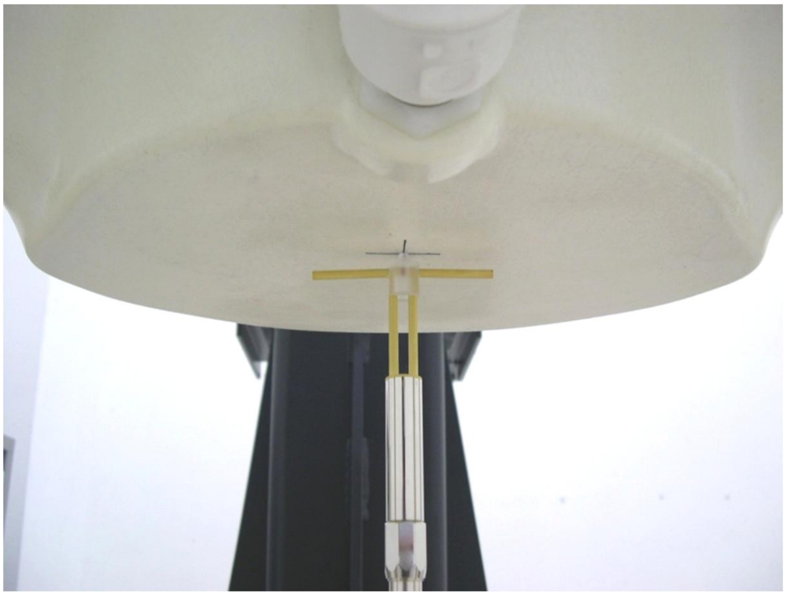


Fig 8.2 Photo of Dipole Setup

8.3 Validation Results

Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %. Table 8.1 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.

Measurement Date	Frequency (MHz)	Liquid Type	Targeted SAR_{1g} (W/kg)	Measured SAR_{1g} (W/kg)	Normalized SAR_{1g} (W/kg)	Deviation (%)
Jun. 02, 2011	750	Head	8.280	2.080	8.32	0.48
Jun. 04, 2011	750	Head	8.280	2.060	8.24	-0.48
Aug. 08, 2011	750	Head	8.280	1.990	7.96	-3.86
Jun. 02, 2011	750	Body	8.860	2.280	9.12	2.93
Jun. 04, 2011	750	Body	8.860	2.210	8.84	-0.23
Aug. 08, 2011	750	Body	8.860	2.180	8.72	-1.58
May. 29, 2011	835	Head	9.650	2.400	9.60	-0.52
May. 30, 2011	835	Head	9.650	2.350	9.40	-2.59

Measurement Date	Frequency (MHz)	Liquid Type	Targeted SAR_{1g} (W/kg)	Measured SAR_{1g} (W/kg)	Normalized SAR_{1g} (W/kg)	Deviation (%)
Aug. 07, 2011	835	Head	9.710	2.380	9.52	-1.96
Aug. 09, 2011	835	Head	9.710	2.490	9.96	2.57
May. 30, 2011	835	Body	10.000	2.670	10.68	6.80
Jun. 06, 2011	835	Body	10.000	2.680	10.72	7.20
Aug. 07, 2011	835	Body	9.820	2.450	9.80	-0.20
Aug. 09, 2011	835	Body	9.820	2.440	9.76	-0.61
Jun. 01, 2011	1800	Head	38.800	9.570	38.28	-1.34
Jun. 05, 2011	1800	Head	38.800	9.530	38.12	-1.75
Sep. 02, 2011	1800	Head	38.600	9.860	39.44	2.18
Sep. 03, 2011	1800	Head	38.600	9.720	38.88	0.73
Jun. 02, 2011	1800	Body	38.900	9.370	37.48	-3.65
Jun. 05, 2011	1800	Body	38.900	9.390	37.56	-3.44
Sep. 03, 2011	1800	Body	38.800	10.200	40.80	5.15
May. 29, 2011	1900	Head	39.200	9.410	37.64	-3.98
Jun. 01, 2011	1900	Head	39.200	9.600	38.40	-2.04
Aug. 07, 2011	1900	Head	39.200	9.380	37.52	-4.29
Aug. 18, 2011	1900	Head	39.800	10.100	40.40	1.51
May. 30, 2011	1900	Body	40.900	9.720	38.88	-4.94
Jun. 01, 2011	1900	Body	40.900	9.590	38.36	-6.21
Aug. 07, 2011	1900	Body	40.900	10.200	40.80	-0.24
Aug. 09, 2011	1900	Body	40.900	10.300	41.20	0.73
Jun. 02, 2011	2450	Head	52.200	13.600	54.40	4.21
Aug. 09, 2011	2450	Head	53.300	13.500	54.00	1.31
Jun. 02, 2011	2450	Body	53.500	14.400	57.60	7.66
Aug. 08, 2011	2450	Body	51.200	13.000	52.00	-2.80

Table 8.1 Target and Measurement SAR after Normalized

9. DUT Testing Position

This DUT was tested in 10 different positions. They are right cheek, right tilted, left cheek, left tilted, and front face of the DUT with phantom 1.0 cm gap, rear face of the DUT with phantom 1.0 cm gap, right side of the DUT with phantom 1.0 cm gap, left side of the DUT with phantom 1.0 cm gap, top side of the DUT with phantom 1.0 cm gap, and down side of the DUT with phantom 1.0 cm gap as illustrated below:

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.

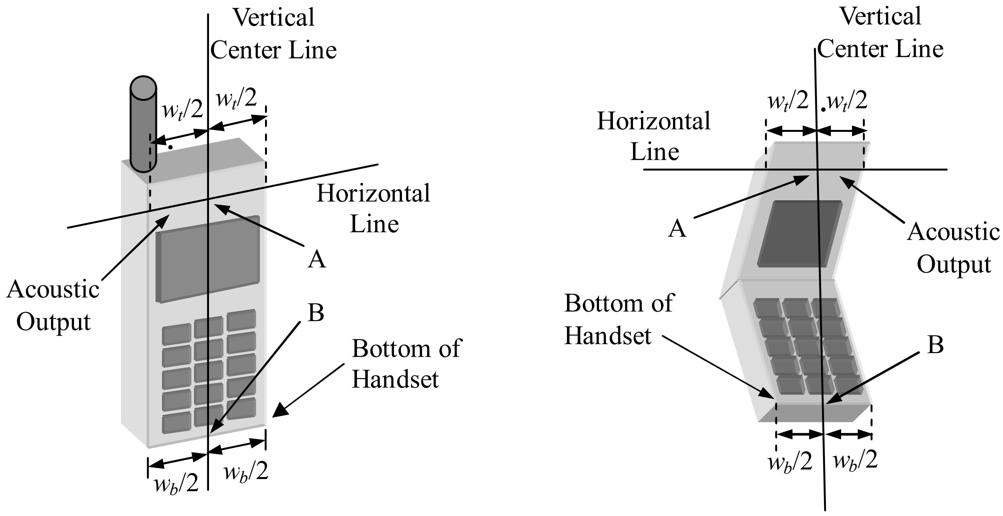


Fig 9.1 Illustration for Handset Vertical and Horizontal Reference Lines

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. 9.2).

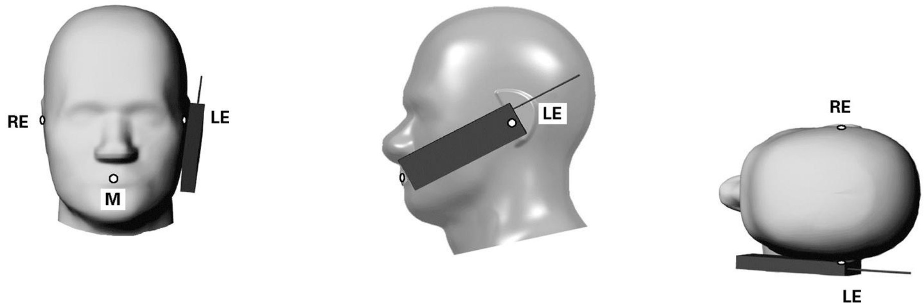


Fig 9.2 Illustration for Cheek Position

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. 9.3).

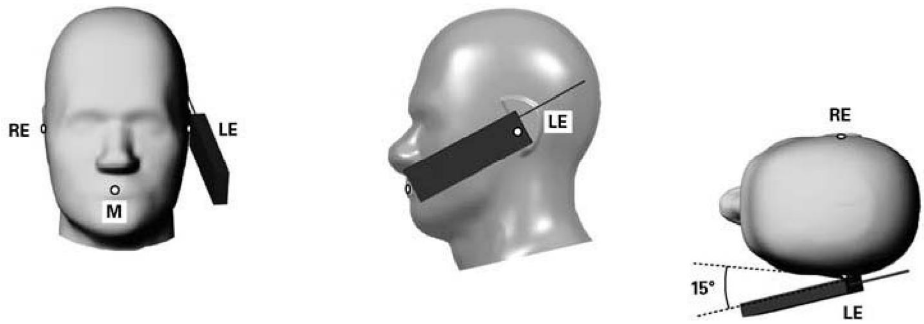


Fig 9.3 Illustration for Tilted Position

4. Body Worn Position

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

(b) To adjust the device parallel to the flat phantom.

(c) To adjust the distance between the device surface and the flat phantom to 1.0 cm.

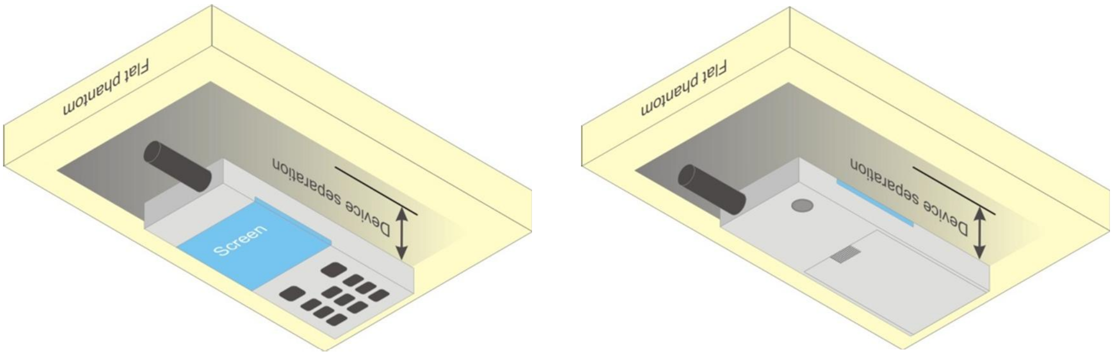
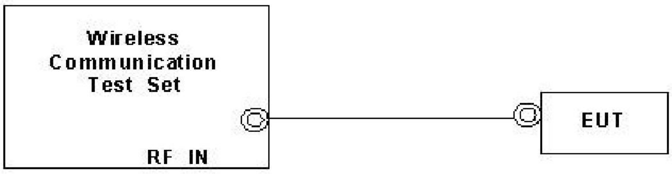


Fig 9.4 Illustration for Body Worn Position

10. 3G SAR Measurement Procedures

The EUT was configured and tested according to the requirements of the FCC 3G procedures/TS 34.121, /KDB941225.



Setup Configuration

WCDMA configuration settings:

a. The DUT was connected to Wireless Communication Test Set referred to the drawing of Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between DUT and Base Station with following setting
   i. Data rates: Varied from RMC 12.2Kbps.
   ii. RMC Test Loop = Loop Mode 1
   iii. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

HSDPA configuration settings:

a. The DUT was connected to Wireless Communication Test Set referred to the drawing of Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between DUT 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 RMC12.2Kbps + 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 DeltaACK, DeltaNACK and DeltaCQI = 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.

HSPA (HSUPA & HSPDA) configuration settings:

a. The DUT was connected to Wireless Communication Test Set referred to the drawing of Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between DUT and Test Set 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.

11. Measurement Procedures

The measurement procedures are as follows:

(a) For WWAN function, link DUT with base station emulator in highest power channel
(b) Set base station emulator to allow DUT to radiate maximum output power
(c) Measure output power through RF cable and power meter
(d) Place the DUT in the positions described in the last section
(e) Set scan area, grid size and other setting on the DASY software
(f) Taking data for the middle channel on each testing position
(g) Find out the largest SAR result on these testing positions of each band
(h) Measure SAR results for other channels in worst SAR testing position if the 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
(e)

11.1 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 valuesand 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 distancefrom sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

11.2 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 measures 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz, and 8x8x8 points with step size 4, 4 and 2.5 mm for 3 GHz to 6 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 1 g.

11.3 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 DUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing (step-size is 4, 4 and 2.5 mm). When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

11.4 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.

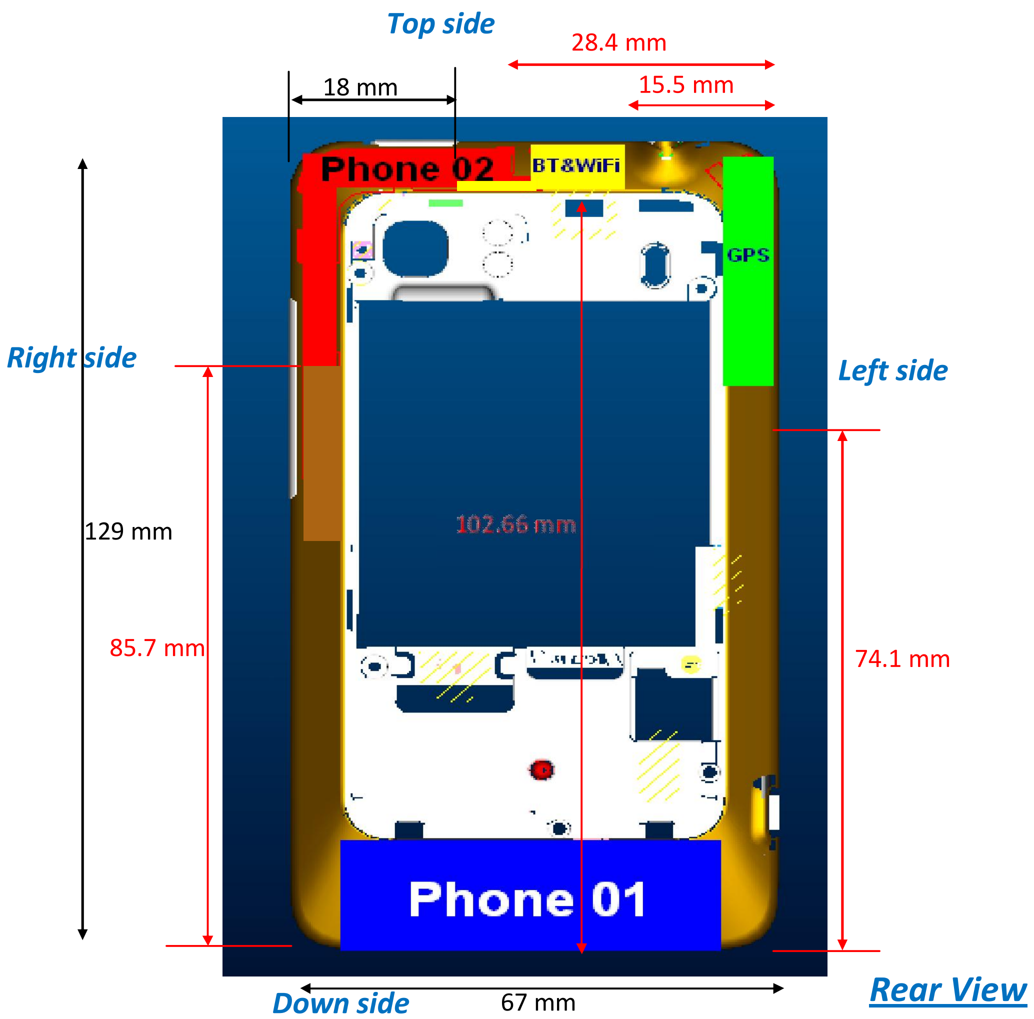
Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty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

11.5 Power Drift Monitoring

All SAR testing is under the DUT 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 DUT 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 drift more than 5%, the SAR will be retested.

12. SAR Test Configurations

12.1 Exposure Positions Consideration



Phone 01 antenna	GSM850/900/1800/1900, TX/RX WCDMA Band 2/5, TX/RX LTE Band 4, TX/RX LTE Band 17, secondary antenna (Receiving only)
Phone 02 antenna	WCDMA Band 2/5, Diversity RX only LTE Band 17, TX/RX LTE Band 4, secondary antenna (Receiving only)
WLAN & BT antenna	WLAN and Bluetooth TX/RX
GPS antenna	GPS receiving only

Sides for SAR tests; Hotspot mode Test distance: 10 mm						
	Rear Face	Front Face	Top Side	Down Side	Right Side	Left Side
GSM/GPRS/EDGE/WCDMA/HSPA LTE Band 4	✓	✓	x	✓	✓	✓
LTE Band 17	✓	✓	✓	x	✓	x
WLAN 11b/g/n 2.4GHz	✓	✓	✓	x	✓	✓

Note:

1. Referring to KDB 941225 D06, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.
2. Therefore, for Phone 01 antenna, top-side SAR can be excluded; for phone02 antenna, left-side and down-side SAR can be excluded; for WLAN antenna, down-side SAR can be excluded

Sides for SAR tests; Body-worn configuration Test distance: 10 mm						
	Rear Face	Front Face	Top Side	Down Side	Right Side	Left Side
GSM/GPRS/EDGE/WCDMA/HSPA LTE Band 4	✓	✓	x	x	x	x
LTE Band 17	✓	✓	x	x	x	x
WLAN 11b/g/n 2.4GHz	✓	✓	x	x	x	x

Note:

For Body-worn configuration, SAR is measured with 10 mm test distance, for both Front Face and Rear Face.

Head SAR				
	Right Cheek	Right Tilt	Left Cheek	Left Tilt
GSM/GPRS/EDGE/WCDMA/HSPA LTE Band 4	✓	✓	✓	✓
LTE Band 17	✓	✓	✓	✓
WLAN 11b/g/n 2.4GHz	✓	✓	✓	✓

Note:

1. LTE and WLAN may support VOIP via certain application utilities, so Head SAR is evaluated.
2. Because FCC has not published uniform procedures for VOIP in LTE, therefore all channels and modes and modulations required under the other KDB pub 941225 D05 FCC LTE procedures were used for the held-near-head testing

12.2 Simultaneous Transmitting Configurations

Simultaneous SAR consideration

	Combinations	Head	Body-worn	Hotspot	Remark
1	GSM/GPRS/EDGE WLAN 2.4GHz	✓	✓	✓	
2	WCDMA/HSPA WLAN 2.4GHz	✓	✓	✓	
3	LTE WLAN 2.4GHz	✓	✓	✓	LTE VOIP may be supported via certain 3rd party software
4	GSM/GPRS/EDGE LTE	x	x	x	Note: 1, 2
5	WCDMA/HSPA LTE	x	x	x	Note: 1, 2
6	GSM/GPRS/EDGE LTE WLAN 2.4GHz	x	x	x	Note: 1, 2
7	WCDMA/HSPA LTE WLAN 2.4GHz	x	x	x	Note: 1, 2

Note:

1. The handset supports CSFB (CS call fallback to 2G/3G); LTE and 2G/3G will not transmit simultaneously when there is voice call on 2G/3G
2. The handset will choose either 2G/3G or LTE network for data connection; LTE and 2G/3G will not transmit simultaneously in data connection.

13. SAR Test Results

13.1 Conducted Power (Unit: dBm)

<LTE Band 4>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power [dBm]	3GPP MPR (dB)	Target MPR (dB)	MPR Result (dB)
1717.5	**20025**	15	1	0	QPSK	23.07	0	0	0.00
1717.5	**20025**	15	1	74	QPSK	23.05	0	0	0.02
1717.5	**20025**	15	36	18	QPSK	22.93	1	0.5	0.14
1717.5	**20025**	15	75	0	QPSK	23.00	1	0.5	0.07
1717.5	**20025**	15	1	0	16-QAM	22.82	1	0.5	0.25
1717.5	**20025**	15	1	74	16-QAM	22.76	1	0.5	0.31
1717.5	**20025**	15	36	18	16-QAM	22.77	2	1	0.30
1717.5	**20025**	15	75	0	16-QAM	22.75	2	1	0.32
1715	**20000**	10	1	0	QPSK	23.01	0	0	0.00
1715	**20000**	10	1	49	QPSK	22.95	0	0	0.06
1715	**20000**	10	25	13	QPSK	22.33	1	0.5	0.68
1715	**20000**	10	50	0	QPSK	22.31	1	0.5	0.70
1715	**20000**	10	1	0	16-QAM	22.69	1	0.5	0.32
1715	**20000**	10	1	49	16-QAM	22.62	1	0.5	0.39
1715	**20000**	10	25	13	16-QAM	22.37	2	1	0.64
1715	**20000**	10	50	0	16-QAM	22.06	2	1	0.95
1712.5	**19975**	5	1	0	QPSK	23.17	0	0	0.00
1712.5	**19975**	5	1	24	QPSK	22.90	0	0	0.27
1712.5	**19975**	5	12	6	QPSK	22.25	1	0.5	0.92
1712.5	**19975**	5	25	0	QPSK	22.32	1	0.5	0.85
1712.5	**19975**	5	1	0	16-QAM	22.60	1	0.5	0.57
1712.5	**19975**	5	1	24	16-QAM	22.64	1	0.5	0.53
1712.5	**19975**	5	12	6	16-QAM	22.13	2	1	1.04
1712.5	**19975**	5	25	0	16-QAM	22.37	2	1	0.80
1732.5	**20175**	15	1	0	QPSK	23.12	0	0	0.00
1732.5	**20175**	15	1	74	QPSK	23.10	0	0	0.02
1732.5	**20175**	15	36	18	QPSK	23.01	1	0.5	0.11
1732.5	**20175**	15	75	0	QPSK	23.03	1	0.5	0.09
1732.5	**20175**	15	1	0	16-QAM	22.85	1	0.5	0.27
1732.5	**20175**	15	1	74	16-QAM	22.78	1	0.5	0.34
1732.5	**20175**	15	36	18	16-QAM	22.81	2	1	0.31
1732.5	**20175**	15	75	0	16-QAM	22.79	2	1	0.33
1732.5	**20175**	10	1	0	QPSK	23.06	0	0	0.00
1732.5	**20175**	10	1	49	QPSK	22.92	0	0	0.14
1732.5	**20175**	10	25	13	QPSK	22.40	1	0.5	0.66
1732.5	**20175**	10	50	0	QPSK	22.39	1	0.5	0.67
1732.5	**20175**	10	1	0	16-QAM	22.83	1	0.5	0.23
1732.5	**20175**	10	1	49	16-QAM	22.52	1	0.5	0.54

1732.5	**20175**	10	25	13	16-QAM	22.45	2	1	0.61
1732.5	**20175**	10	50	0	16-QAM	22.09	2	1	0.97
1732.5	**20175**	5	1	0	QPSK	22.94	0	0	0.04
1732.5	**20175**	5	1	24	QPSK	22.98	0	0	0.00
1732.5	**20175**	5	12	6	QPSK	22.31	1	0.5	0.67
1732.5	**20175**	5	25	0	QPSK	22.41	1	0.5	0.57
1732.5	**20175**	5	1	0	16-QAM	22.62	1	0.5	0.36
1732.5	**20175**	5	1	24	16-QAM	22.58	1	0.5	0.40
1732.5	**20175**	5	12	6	16-QAM	22.89	2	1	1.09
1732.5	**20175**	5	25	0	16-QAM	22.41	2	1	0.57
1747.5	**20325**	15	1	0	QPSK	23.08	0	0	0.00
1747.5	**20325**	15	1	74	QPSK	23.02	0	0	0.06
1747.5	**20325**	15	36	18	QPSK	22.94	1	0.5	0.14
1747.5	**20325**	15	75	0	QPSK	22.98	1	0.5	0.10
1747.5	**20325**	15	1	0	16-QAM	22.79	1	0.5	0.29
1747.5	**20325**	15	1	74	16-QAM	22.72	1	0.5	0.36
1747.5	**20325**	15	36	18	16-QAM	22.76	2	1	0.32
1747.5	**20325**	15	75	0	16-QAM	22.74	2	1	0.34
1750	**20350**	10	1	0	QPSK	22.85	0	0	0.21
1750	**20350**	10	1	49	QPSK	23.06	0	0	0.00
1750	**20350**	10	25	13	QPSK	22.29	1	0.5	0.77
1750	**20350**	10	50	0	QPSK	22.36	1	0.5	0.70
1750	**20350**	10	1	0	16-QAM	22.56	1	0.5	0.50
1750	**20350**	10	1	49	16-QAM	22.78	1	0.5	0.28
1750	**20350**	10	25	13	16-QAM	22.47	2	1	0.59
1750	**20350**	10	50	0	16-QAM	22.06	2	1	1.00
1752.5	**20375**	5	1	0	QPSK	22.94	0	0	0.17
1752.5	**20375**	5	1	24	QPSK	23.11	0	0	0.00
1752.5	**20375**	5	12	6	QPSK	22.38	1	0.5	0.73
1752.5	**20375**	5	25	0	QPSK	22.30	1	0.5	0.81
1752.5	**20375**	5	1	0	16-QAM	22.62	1	0.5	0.49
1752.5	**20375**	5	1	24	16-QAM	22.74	1	0.5	0.37
1752.5	**20375**	5	12	6	16-QAM	22.03	2	1	1.08
1752.5	**20375**	5	25	0	16-QAM	22.59	2	1	0.52

Note:

1. Per KDB 941225, if the output power variation across the band < 0.5dB, test middle channel SAR first and determine further test reduction based on the SAR results.

<LTE Band 17>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power [dBm]	3GPP MPR (dB)	Target MPR (dB)	MPR Result (dB)
709	**23780**	10	1	0	QPSK	22.95	0	0	0.00
709	**23780**	10	1	49	QPSK	22.84	0	0	0.11
709	**23780**	10	25	13	QPSK	22.42	1	0.5	0.53
709	**23780**	10	50	0	QPSK	22.20	1	0.5	0.75
709	**23780**	10	1	0	16-QAM	22.67	1	0.5	0.28
709	**23780**	10	1	49	16-QAM	22.58	1	0.5	0.37
709	**23780**	10	25	13	16-QAM	22.50	2	1	0.45
709	**23780**	10	50	0	16-QAM	21.99	2	1	0.96
706.5	**23755**	5	1	0	QPSK	23.03	0	0	0.00
706.5	**23755**	5	1	24	QPSK	22.93	0	0	0.10
706.5	**23755**	5	12	6	QPSK	22.16	1	0.5	0.87
706.5	**23755**	5	25	0	QPSK	22.25	1	0.5	0.78
706.5	**23755**	5	1	0	16-QAM	22.62	1	0.5	0.41
706.5	**23755**	5	1	24	16-QAM	22.59	1	0.5	0.44
706.5	**23755**	5	12	6	16-QAM	21.86	2	1	1.17
706.5	**23755**	5	25	0	16-QAM	22.46	2	1	0.57
710	**23790**	10	1	0	QPSK	22.75	0	0	0.08
710	**23790**	10	1	49	QPSK	22.83	0	0	0.00
710	**23790**	10	25	13	QPSK	22.23	1	0.5	0.60
710	**23790**	10	50	0	QPSK	22.12	1	0.5	0.71
710	**23790**	10	1	0	16-QAM	22.43	1	0.5	0.40
710	**23790**	10	1	49	16-QAM	22.53	1	0.5	0.30
710	**23790**	10	25	13	16-QAM	22.45	2	1	0.38
710	**23790**	10	50	0	16-QAM	21.80	2	1	1.03
710	**23790**	5	1	0	QPSK	22.79	0	0	0.00
710	**23790**	5	1	24	QPSK	22.75	0	0	0.04
710	**23790**	5	12	6	QPSK	22.13	1	0.5	0.66
710	**23790**	5	25	0	QPSK	22.11	1	0.5	0.68
710	**23790**	5	1	0	16-QAM	22.56	1	0.5	0.23
710	**23790**	5	1	24	16-QAM	22.51	1	0.5	0.28
710	**23790**	5	12	6	16-QAM	21.80	2	1	0.99
710	**23790**	5	25	0	16-QAM	22.38	2	1	0.41
711	**23800**	10	1	0	QPSK	22.88	0	0	0.00
711	**23800**	10	1	49	QPSK	22.80	0	0	0.08
711	**23800**	10	25	13	QPSK	22.13	1	0.5	0.75
711	**23800**	10	50	0	QPSK	22.06	1	0.5	0.82
711	**23800**	10	1	0	16-QAM	22.61	1	0.5	0.27
711	**23800**	10	1	49	16-QAM	22.41	1	0.5	0.47
711	**23800**	10	25	13	16-QAM	22.25	2	1	0.63
711	**23800**	10	50	0	16-QAM	21.74	2	1	1.14
713.5	**23825**	5	1	0	QPSK	22.80	0	0	0.00

713.5	**23825**	5	1	24	QPSK	22.77	0	0	0.03
713.5	**23825**	5	12	6	QPSK	22.06	1	0.5	0.74
713.5	**23825**	5	25	0	QPSK	22.20	1	0.5	0.60
713.5	**23825**	5	1	0	16-QAM	22.50	1	0.5	0.30
713.5	**23825**	5	1	24	16-QAM	22.46	1	0.5	0.34
713.5	**23825**	5	12	6	16-QAM	21.79	2	1	1.01
713.5	**23825**	5	25	0	16-QAM	22.23	2	1	0.57

Note:
1. Per KDB 941225, if the output power variation across the band < 0.5dB, test middle channel SAR first and determine further test reduction based on the SAR results.
2. In Appendix E, the LTE spectrum plots for different RB allocations are for demonstrating correct RB setting during output power and SAR measurement.

LTE Target MPR level

Modulation	**Channel bandwidth / Transmission bandwidth configuration [RB]**			**MPR (dB) Target**	**3GPP MPR (dB)**
	5 MHz	**10 MHz**	**15 MHz**		
QPSK	> 8	> 12	> 16	0.5	≤ 1
16 QAM	≤ 8	≤ 12	≤ 16	0.5	≤ 1
16 QAM	> 8	> 12	> 16	1	≤ 2

Note: The measurement result showed some difference from the target MPR level, due to expected 0.5dB measurement tolerance

<GSM/GPRS/EDGE>

GSM/GPRS/EDGE Burst Average Power						
Band	**GSM850**			**GSM1900**		
Channel	**128**	**189**	**251**	**512**	**661**	**810**
Frequency	**824.2**	**836.4**	**848.8**	**1850.2**	**1880**	**1909.8**
GSM	32.05	32.12	32.08	29.64	29.61	29.66
GPRS 8 (CS1)	32.07	32.13	32.11	29.63	29.67	29.66
GPRS 10 (CS1)	31.19	31.27	31.23	28.51	28.64	28.77
EDGE 8 (MCS1)	32.01	32.07	32.00	29.55	29.65	29.63
EDGE 10 (MCS1)	31.09	31.14	31.15	28.76	28.77	28.73
EDGE 8 (MCS9)	26.84	27.04	27.13	26.29	26.39	26.35
EDGE 10 (MCS9)	26.12	26.18	26.26	24.97	25.08	25.12
Source-Based Time-Averaged Power						
Band	**GSM850**			**GSM1900**		
Channel	**128**	**189**	**251**	**512**	**661**	**810**
GSM	23.05	23.12	23.08	20.64	20.61	20.66
GPRS 8 (CS1)	23.07	23.13	23.11	20.63	20.67	20.66
GPRS 10 (CS1)	25.19	**25.27**	25.23	22.51	22.64	**22.77**
EDGE 8(MCS1)	23.01	23.07	23.00	20.55	20.65	20.63
EDGE 10(MCS1)	25.09	25.14	25.15	22.76	22.77	22.73
EDGE 8(MCS9)	17.84	18.04	18.13	17.29	17.39	17.35
EDGE 10(MCS9)	20.12	20.18	20.26	18.97	19.08	19.12

Note:
1. Following KDB 941225 D03, GPRS10 is used for Body-worn/Hotspot SAR testing due to its highest source-based time-averaged power.
2. Per 2010/10 workshop, the maximum output power channel is used for SAR testing and for further SAR test reduction.

<WCDMA/HSDPA/HSUPA>

Band	WCDMA V			WCDMA II		
Channel	4132	4182	4233	9262	9400	9538
Rx Channel	4357	4407	4458	9662	9800	9938
Frequency	826.4	836.4	846.6	1852.4	1880	1907.6
AMR	23.51	23.47	23.53	23.21	23.16	23.04
RMC 12.2K	23.58	23.54	23.55	23.25	23.28	23.07
HSDPA Subtest-1	23.48	23.42	23.46	23.01	23.02	23.05
HSDPA Subtest-2	23.47	23.43	23.45	23.19	23.14	23.09
HSDPA Subtest-3	23.00	22.94	22.99	22.51	22.53	22.48
HSDPA Subtest-4	23.03	22.91	22.95	22.48	22.50	22.48
HSUPA Subtest-1	22.72	22.60	22.89	22.32	22.61	22.26
HSUPA Subtest-2	21.61	21.49	21.71	21.14	21.16	21.03
HSUPA Subtest-3	22.56	22.50	22.53	22.01	21.99	21.61
HSUPA Subtest-4	21.76	21.66	21.75	21.28	21.26	21.29
HSUPA Subtest-5	22.95	22.74	23.01	22.89	23.01	22.73

MPR							
3GPP Requirement		WCDMA band 5			WCDMA band 2		
0	HSDPA Subtest-1	0.00	0.00	0.00	0.00	0.00	0.00
0	HSDPA Subtest-2	0.01	-0.01	0.01	-0.18	-0.12	-0.04
0.5	HSDPA Subtest-3	0.48	0.48	0.47	0.50	0.49	0.57
0.5	HSDPA Subtest-4	0.45	0.51	0.51	0.53	0.52	0.57
0	HSUPA Subtest-1	0.23	0.14	0.12	0.57	0.40	0.47
2	HSUPA Subtest-2	1.34	1.25	1.30	1.75	1.85	1.70
1	HSUPA Subtest-3	0.39	0.24	0.48	0.88	1.02	1.12
2	HSUPA Subtest-4	1.19	1.08	1.26	1.61	1.75	1.44
0	HSUPA Subtest-5	0.00	0.00	0.00	0.00	0.00	0.00

Note:

1. For Head SAR, Pre KDB 941225, RMC 12.2kbps setting is used to evaluate SAR. If AMR 12.2kbps power is < 1/4dB higher than RMC, SAR tests with AMR 12.2kbps can be excluded.
2. For Body SAR, Pre KDB 941225, RMC 12.2kbps setting is used to evaluate WCDMA/HSDPA/HSUPA. If HSDPA subtest-1 and HSUPA subtest-5 output power is < 1/4dB higher than RMC, and SAR with RMC 12.2kbps setting is ≤1.2W/kg, HSDPA and HSUPA SAR evaluation can be excluded.

<WLAN>

Data Rate	11b-1Mbps			11g-6Mbps		
Channel	1	6	11	1	6	11
Frequency	2412	2437	2462	2412	2437	2462
Avg. Power	17.78	17.68	18.19	12.77	12.96	13.21

Mode	11n-20M BW		
Data Rate	MCS0		
Channel	1	6	11
Frequency	2412	2437	2462
Avg. Power	12.75	12.83	13.10

Note:

1. Per KDB 248227, SAR tests with 11b mode due to highest output power; 11g/11n SAR tests can be excluded.
2. Per 2010/10 TCB workshop, the maximum output power channel is used for SAR testing and further SAR test reduction determination. Therefore, CH11 in 11b mode is selected.

13.2 Test Records for Head SAR Test

<GSM>

Plot No.	Band	Mode	Test Position	Channel	SAR_{1g} (W/kg)
1	**GSM850**	**GSM**	**Right Cheek**	**189**	**0.204**
2	GSM850	GSM	Right Tilted	189	0.175
201	GSM850	GSM	Left Cheek	189	0.195
4	GSM850	GSM	Left Tilted	189	0.16
202	**GSM1900**	**GSM**	**Right Cheek**	**810**	**0.398**
12	GSM1900	GSM	Right Tilted	810	0.191
13	GSM1900	GSM	Left Cheek	810	0.313
14	GSM1900	GSM	Left Tilted	810	0.226

Note:
Per KDB 648474, SAR ≤ 0.8W/kg and remaining channels SAR tests can be excluded.

<WCDMA>

Plot No.	Band	Mode	Test Position	Channel	SAR_{1g} (W/kg)
6	WCDMA V	RMC12.2K	Right Cheek	4132	0.292
7	WCDMA V	RMC12.2K	Right Tilted	4132	0.234
203	**WCDMA V**	**RMC12.2K**	**Left Cheek**	**4132**	**0.3**
9	WCDMA V	RMC12.2K	Left Tilted	4132	0.247
204	WCDMA II	RMC12.2K	Right Cheek	9400	1.15
205	WCDMA II	RMC12.2K	Right Cheek	9262	1.14
206	**WCDMA II**	**RMC12.2K**	**Right Cheek**	**9538**	**1.2**
17	WCDMA II	RMC12.2K	Right Tilted	9400	0.345
18	WCDMA II	RMC12.2K	Left Cheek	9400	0.515
19	WCDMA II	RMC12.2K	Left Tilted	9400	0.389

Note:
Per KDB 648474, SAR ≤ 0.8W/kg and remaining channels SAR tests can be excluded.

<LTE>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Channel	LTE Output Power (dBm)	LTE Target MPR (dB)	SAR_{1g} (W/kg)
218	**LTE Band 4**	**15**	**QPSK**	**36**	**18**	**Right Cheek**	**20175**	**23.01**	**0.5**	**0.611**
219	LTE Band 4	15	QPSK	1	0	Right Cheek	20175	23.12	0	0.608
220	LTE Band 4	15	QPSK	1	74	Right Cheek	20175	23.10	0	0.582
221	LTE Band 4	15	16QAM	36	18	Right Cheek	20175	22.81	1	0.576
222	LTE Band 4	15	16QAM	1	0	Right Cheek	20175	22.85	0.5	0.585
223	LTE Band 4	15	16QAM	1	74	Right Cheek	20175	22.78	0.5	0.553
79	**LTE Band 17**	**10**	**QPSK**	**25**	**13**	**Right Cheek**	**23790**	**22.23**	**0.5**	**0.348**
113	LTE Band 17	10	QPSK	1	0	Right Cheek	23790	22.75	0	0.29
114	LTE Band 17	10	QPSK	1	49	Right Cheek	23790	22.83	0	0.293
121	LTE Band 17	10	16QAM	25	13	Right Cheek	23790	22.45	1	0.286
122	LTE Band 17	10	16QAM	1	0	Right Cheek	23790	22.43	0.5	0.293
123	LTE Band 17	10	16QAM	1	49	Right Cheek	23790	22.53	0.5	0.297
224	LTE Band 4	15	QPSK	36	18	Right Tilted	20175	23.01	0.5	0.284
225	**LTE Band 4**	**15**	**QPSK**	**1**	**0**	**Right Tilted**	**20175**	**23.12**	**0**	**0.307**
226	LTE Band 4	15	QPSK	1	74	Right Tilted	20175	23.10	0	0.294
227	LTE Band 4	15	16QAM	36	18	Right Tilted	20175	22.81	1	0.277
228	LTE Band 4	15	16QAM	1	0	Right Tilted	20175	22.85	0.5	0.281
229	LTE Band 4	15	16QAM	1	74	Right Tilted	20175	22.78	0.5	0.275
80	LTE Band 17	10	QPSK	25	13	Right Tilted	23790	22.23	0.5	0.322
115	**LTE Band 17**	**10**	**QPSK**	**1**	**0**	**Right Tilted**	**23790**	**22.75**	**0**	**0.344**
116	LTE Band 17	10	QPSK	1	49	Right Tilted	23790	22.83	0	0.319
124	LTE Band 17	10	16QAM	25	13	Right Tilted	23790	22.45	1	0.333
125	LTE Band 17	10	16QAM	1	0	Right Tilted	23790	22.43	0.5	0.341
126	LTE Band 17	10	16QAM	1	49	Right Tilted	23790	22.53	0.5	0.344
230	LTE Band 4	15	QPSK	36	18	Left Cheek	20175	23.01	**0.5**	0.492
231	LTE Band 4	15	QPSK	1	0	Left Cheek	20175	23.12	0	0.526
232	LTE Band 4	15	QPSK	1	74	Left Cheek	20175	23.10	0	0.506
233	LTE Band 4	15	16QAM	36	18	Left Cheek	20175	22.81	1	0.539
234	**LTE Band 4**	**15**	**16QAM**	**1**	**0**	**Left Cheek**	**20175**	**22.85**	**0.5**	**0.545**
235	LTE Band 4	15	16QAM	1	74	Left Cheek	20175	22.78	0.5	0.533
81	LTE Band 17	10	QPSK	25	13	Left Cheek	23790	22.23	0.5	0.529
117	LTE Band 17	10	QPSK	1	0	Left Cheek	23790	22.75	0	0.562
118	LTE Band 17	10	QPSK	1	49	Left Cheek	23790	22.83	0	0.579
127	LTE Band 17	10	16QAM	25	13	Left Cheek	23790	22.45	1	0.561
128	LTE Band 17	10	16QAM	1	0	Left Cheek	23790	22.43	0.5	0.559
129	**LTE Band 17**	**10**	16QAM	1	49	**Left Cheek**	**23790**	**22.53**	**0.5**	**0.58**
236	LTE Band 4	15	QPSK	36	18	Left Tilted	20175	23.01	0.5	0.153
237	**LTE Band 4**	**15**	**QPSK**	**1**	**0**	**Left Tilted**	**20175**	**23.12**	**0**	**0.165**
238	LTE Band 4	15	QPSK	1	74	Left Tilted	20175	23.10	0	0.163
239	LTE Band 4	15	16QAM	36	18	Left Tilted	20175	22.81	1	0.148

240	LTE Band 4	15	16QAM	1	0	Left Tilted	20175	22.85	0.5	0.151
241	LTE Band 4	15	16QAM	1	74	Left Tilted	20175	22.78	0.5	0.153
82	LTE Band 17	10	QPSK	25	13	Left Tilted	23790	22.23	0.5	0.598
119	LTE Band 17	10	QPSK	1	0	Left Tilted	23790	22.75	0	0.614
242	**LTE Band 17**	**10**	**QPSK**	**1**	**49**	**Left Tilted**	**23790**	**22.83**	**0**	**0.702**
130	LTE Band 17	10	16QAM	25	13	Left Tilted	23790	22.45	1	0.587
131	LTE Band 17	10	16QAM	1	0	Left Tilted	23790	22.43	0.5	0.599
132	LTE Band 17	10	16QAM	1	49	Left Tilted	23790	22.53	0.5	0.607

Note:

3. Considering the users may install 3rd party software to enable VOIP, LTE Head SAR is also evaluated. Because FCC has not published uniform procedures for VOIP in LTE, therefore all channels and modes and modulations required under the other KDB pub 941225 D05 FCC LTE procedures were used for the held-near-head testing.
4. Per KDB 941225 D05, for LTE, if the smaller bandwidth output power is within +/- ½dB of the largest bandwidth, and the maximum SAR of the largest bandwidth is ≤ 1.45 W/kg, SAR for smaller bandwidth can be excluded.
5. Per KDB 941225 D05, if the measured 50%-RB QPSK 1g-SAR for the middle or highest output power channel is ≤ 0.8W/kg, remaining 2 channels SAR tests can be excluded. Otherwise, 50% RB allocation of the remaining 2 channels SAR tests are necessary.
6. Per KDB 941225 D05, for LTE, if 50%-RB QPSK SAR ≤ 1.45 W/kg, 100%-RB QPSK SAR can be excluded; if 50%-RB 16QAM SAR ≤ 1.45 W/kg, 100%-RB 16QAM SAR can be excluded.
7. If SAR of 1 RB allocation is ≤ 1.45W/kg, SAR of 1 RB allocation of remaining channels can be excluded.
8. Per KDB 648474, if the highest output channel SAR for each exposure position is ≤ 0.8 W/kg, other channels SAR tests are not necessary.

<WLAN>

Plot No.	Band	Mode	Test Position	Channel	SAR_{1g} (W/kg)
83	802.11b	-	Right Cheek	11	0.483
283	**802.11b**	**-**	**Right Tilted**	**11**	**0.727**
85	802.11b	-	Left Cheek	11	0.316
86	802.11b	-	Left Tilted	11	0.43

Note:

If the highest output channel SAR for each exposure position is < 0.8 W/kg, other channels SAR tests are not necessary.

13.3 Test Records for Body-worn SAR Test

<GSM>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Ear-phone	SAR_{1g} (W/kg)
23	GSM850	GPRS10	Front Face	1	189	-	0.550
207	GSM850	GPRS10	Rear Face	1	189	-	0.56
29	GSM850	GPRS10	Rear Face	1	128	-	0.604
30	GSM850	GPRS10	Rear Face	1	251	-	0.576
208	GSM850	GPRS10	Rear Face	1	189	v	0.246
197	GSM850	EDGE10	Rear Face	1	189	-	0.83
198	**GSM850**	**EDGE10**	**Rear Face**	**1**	**128**	**-**	**0.836**
199	GSM850	EDGE10	Rear Face	1	251	-	0.691
209	GSM1900	GPRS10	Front Face	1	810	-	0.592
210	GSM1900	GPRS10	Front Face	1	810	v	0.621
42	**GSM1900**	**GPRS10**	**Rear Face**	**1**	**810**	**-**	**0.638**

Note:
1. For Body-worn configuration, GPRS class 10 is used for SAR tests due to highest source-based time-averaged output power between all modes.
2. For Front Face, the highest output channel SAR for each exposure position is ≤ 0.8 W/kg, other channels SAR tests are not necessary.
3. If GPRS class 10 measured SAR is > 0.8W/kg, EDGE class 10 (MCS1) SAR is measured following KDB 941225 D03 and IEEE std-1528 footnote 11.

<WCDMA>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Ear-phone	SAR_{1g} (W/kg)
33	WCDMA V	RMC12.2K	Front Face	1	4132	-	0.401
211	**WCDMA V**	**RMC12.2K**	**Rear Face**	**1**	**4132**	**-**	**0.523**
212	WCDMA V	RMC12.2K	Rear Face	1	4132	v	0.311
213	WCDMA II	RMC12.2K	Front Face	1	9400	-	0.88
214	WCDMA II	RMC12.2K	Front Face	1	9262	-	0.843
215	WCDMA II	RMC12.2K	Front Face	1	9538	-	0.899
216	WCDMA II	RMC12.2K	Front Face	1	9400	v	0.76
63	**WCDMA II**	**RMC12.2K**	**Front Face**	**1**	**9262**	**v**	**1**
64	WCDMA II	RMC12.2K	Front Face	1	9538	v	0.933
50	WCDMA II	RMC12.2K	Rear Face	1	9400	-	0.833
57	WCDMA II	RMC12.2K	Rear Face	1	9262	-	0.815
58	WCDMA II	RMC12.2K	Rear Face	1	9538	-	0.837

Note:
1. For Body SAR, Pre KDB 941225, RMC 12.2kbps setting is used to evaluate WCDMA/HSDPA/HSUPA. If HSDPA subtest-1 and HSUPA subtest-5 output power is < 1/4dB higher than RMC, and SAR with RMC 12.2kbps setting is ≤1.2W/kg, HSDPA and HSUPA SAR evaluation can be excluded.

<LTE>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Separation Distance (cm)	Ch.	LTE Output Power	Target MPR (dB)	Ear-phone	SAR_{1g} (W/kg)
243	**LTE Band 17**	**10**	**QPSK**	**25**	**13**	**Front Face**	**1**	**23790**	**22.23**	**0.5**	**-**	**0.14**
133	LTE Band 17	10	QPSK	1	0	Front Face	1	23790	22.75	0	-	0.124
134	LTE Band 17	10	QPSK	1	49	Front Face	1	23790	22.83	0	-	0.125
143	LTE Band 17	10	QPSK	25	13	Front Face	1	23790	22.23	0.5	v	0.085
144	LTE Band 17	10	QPSK	1	0	Front Face	1	23790	22.75	0	v	0.088
145	LTE Band 17	10	QPSK	1	49	Front Face	1	23790	22.83	0	v	0.083
161	LTE Band 17	10	16QAM	25	13	Front Face	1	23790	22.58	1	-	0.113
162	LTE Band 17	10	16QAM	1	0	Front Face	1	23790	22.65	0.5	-	0.118
163	LTE Band 17	10	16QAM	1	49	Front Face	1	23790	22.76	0.5	-	0.121
246	LTE Band 4	15	QPSK	36	18	Front Face	1	20175	23.01	0.5	-	0.786
247	**LTE Band 4**	**15**	**QPSK**	**1**	**0**	**Front Face**	**1**	**20175**	**23.12**	**0**	**-**	**0.808**
248	LTE Band 4	15	QPSK	1	74	Front Face	1	20175	23.10	0	-	0.754
249	LTE Band 4	15	16QAM	36	18	Front Face	1	20175	22.81	1	-	0.675
250	LTE Band 4	15	16QAM	1	0	Front Face	1	20175	22.85	0.5	-	0.705
251	LTE Band 4	15	16QAM	1	74	Front Face	1	20175	22.78	0.5	-	0.657
252	LTE Band 4	15	QPSK	36	18	Front Face	1	20175	23.01	0.5	v	0.665
253	LTE Band 4	15	QPSK	1	0	Front Face	1	20175	23.12	0	v	0.778
254	LTE Band 4	15	QPSK	1	74	Front Face	1	20175	23.10	0	v	0.672
255	LTE Band 4	15	16QAM	36	18	Front Face	1	20175	22.81	1	v	0.639
256	LTE Band 4	15	16QAM	1	0	Front Face	1	20175	22.85	0.5	v	0.68
257	LTE Band 4	15	16QAM	1	74	Front Face	1	20175	22.78	0.5	v	0.619
258	LTE Band 17	10	QPSK	25	13	Rear Face	1	23790	22.23	0.5	-	0.112
135	LTE Band 17	10	QPSK	1	0	Rear Face	1	23790	22.75	0	-	0.128
136	LTE Band 17	10	QPSK	1	49	Rear Face	1	23790	22.83	0	-	0.123
164	LTE Band 17	10	16QAM	25	13	Rear Face	1	23790	22.58	1	-	0.126
165	**LTE Band 17**	**10**	**16QAM**	**1**	**0**	**Rear Face**	**1**	**23790**	**22.65**	**0.5**	**-**	**0.13**
166	LTE Band 17	10	16QAM	1	49	Rear Face	1	23790	22.76	0.5	-	0.122
176	LTE Band 17	10	16QAM	25	13	Rear Face	1	23790	22.45	1	v	0.105
177	LTE Band 17	10	16QAM	1	0	Rear Face	1	23790	22.65	0.5	v	0.107
178	LTE Band 17	10	16QAM	1	49	Rear Face	1	23790	22.76	0.5	v	0.101
259	LTE Band 4	15	QPSK	36	18	Rear Face	1	20175	23.01	0.5	-	0.738
260	LTE Band 4	15	QPSK	1	0	Rear Face	1	20175	23.12	0	-	0.768
261	LTE Band 4	15	QPSK	1	74	Rear Face	1	20175	23.10	0	-	0.702
262	LTE Band 4	15	16QAM	36	18	Rear Face	1	20175	23.03	1	-	0.713
263	**LTE Band 4**	**15**	**16QAM**	**1**	**0**	**Rear Face**	**1**	**20175**	**22.81**	**0.5**	**-**	**0.775**
264	LTE Band 4	15	16QAM	1	74	Rear Face	1	20175	22.85	0.5	-	0.731

Note:

1. Per KDB 941225 D05, for LTE, if the smaller bandwidth output power is within +/- ½dB of the largest bandwidth, and the maximum SAR of the largest bandwidth is ≤ 1.45 W/kg, SAR for smaller bandwidth can be excluded.

2. Per KDB 941225 D05, if the measured 50%-RB 1g-SAR for the middle or highest output power channel is ≤ 0.8W/kg, remaining 2 channels SAR tests can be excluded. Otherwise, 50% RB allocation of the remaining 2 channels SAR tests are necessary.
3. Per KDB 941225 D05, for LTE, if 50%-RB QPSK SAR ≤ 1.45 W/kg, 100%-RB QPSK SAR can be excluded; if 50%-RB 16QAM SAR ≤ 1.45 W/kg, 100%-RB 16QAM SAR can be excluded.
4. If SAR of 1 RB allocation is ≤ 1.45W/kg, SAR of 1 RB allocation of remaining channels can be excluded.
5. Per KDB 648474, if the highest output channel SAR for each exposure position is ≤ 0.8 W/kg, other channels SAR tests are not necessary.

<WLAN>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Ear-phone	SAR_{1g} (W/kg)
87	802.11b	-	Front Face	1	11	-	0.066
284	**802.11b**	**-**	**Rear Face**	**1**	**11**	-	**0.12**
285	802.11b	-	Rear Face	1	11	v	0.079

Note:
Per KDB 648474, if the highest output channel SAR for each exposure position is ≤ 0.8 W/kg, other channels SAR tests are not necessary.

13.4 Test Records for Hotspot SAR Test

<GSM>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Ear-phone	SAR_{1g} (W/kg)
23	GSM850	GPRS10	Front Face	1	189	-	0.550
207	GSM850	GPRS10	Rear Face	1	189	-	0.56
29	GSM850	GPRS10	Rear Face	1	128	-	0.604
30	GSM850	GPRS10	Rear Face	1	251	-	0.576
197	GSM850	EDGE10	Rear Face	1	189	-	0.83
198	**GSM850**	**EDGE10**	**Rear Face**	**1**	**128**	**-**	**0.836**
199	GSM850	EDGE10	Rear Face	1	251	-	0.691
26	GSM850	GPRS10	Down Side	1	189	-	0.091
27	GSM850	GPRS10	Left Side	1	189	-	0.499
28	GSM850	GPRS10	Right Side	1	189	-	0.408
209	GSM1900	GPRS10	Front Face	1	810	-	0.592
42	**GSM1900**	**GPRS10**	**Rear Face**	**1**	**810**	**-**	**0.638**
44	GSM1900	GPRS10	Down Side	1	810	-	0.287
45	GSM1900	GPRS10	Left Side	1	810	-	0.235
46	GSM1900	GPRS10	Right Side	1	810	-	0.52

Note:

1. For Hotspot mode configuration, GPRS class 10 is used for SAR tests due to highest source-based time-averaged output power between all modes.
2. Per KDB 941225 D06, for DUT 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.
3. As in (2), SAR for Front Face / Rear Face / Right Side / Left Side / Down Side is necessary.
4. For Front Face, the highest output channel SAR for each exposure position is ≤ 0.8 W/kg, other channels SAR tests are not necessary.
5. If GPRS class 10 measured SAR is > 0.8W/kg, EDGE class 10 (MCS1) SAR is measured following KDB 941225 D03 and IEEE std-1528 footnote 11.

<WCDMA>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Ear-phone	SAR_{1g} (W/kg)
33	WCDMA V	RMC12.2K	Front Face	1	4132	-	0.401
211	**WCDMA V**	**RMC12.2K**	**Rear Face**	**1**	**4132**	**-**	**0.523**
36	WCDMA V	RMC12.2K	Down Side	1	4132	-	0.076
37	WCDMA V	RMC12.2K	Left Side	1	4132	-	0.431
38	WCDMA V	RMC12.2K	Right Side	1	4132	-	0.329
213	WCDMA II	RMC12.2K	Front Face	1	9400	-	0.88
214	WCDMA II	RMC12.2K	Front Face	1	9262	-	0.843
215	**WCDMA II**	**RMC12.2K**	**Front Face**	**1**	**9538**	**-**	**0.899**
50	WCDMA II	RMC12.2K	Rear Face	1	9400	-	0.833
57	WCDMA II	RMC12.2K	Rear Face	1	9262	-	0.815
58	WCDMA II	RMC12.2K	Rear Face	1	9538	-	0.837
52	WCDMA II	RMC12.2K	Down Side	1	9400	-	0.474
53	WCDMA II	RMC12.2K	Left Side	1	9400	-	0.294
54	WCDMA II	RMC12.2K	Right Side	1	9400	-	0.667

Note:

1. For Hotspot mode configuration, RMC 12.2kbps is used for SAR tests following KDB 941225 D01.
2. Per KDB 941225 D01, HSDPA/HSUPA SAR can be excluded due to the power is less than RMC 12.2kbps.
3. Per KDB 941225 D06, for DUT 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. As in (3), SAR for Front Face / Rear Face / Right Side / Left Side / Down Side is necessary.
5. For Right Side / Left Side / Down Side, the highest output channel SAR is ≤ 0.8 W/kg, other channels SAR tests are not necessary.

<LTE>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Separation Distance (cm)	Ch.	LTE Output Power (dBm)	Target MPR (dB)	Ear-phone	SAR_{1g} (W/kg)
243	**LTE Band 17**	**10**	**QPSK**	**25**	**13**	**Front Face**	**1**	**23790**	**22.23**	**0.5**	**-**	**0.14**
133	LTE Band 17	10	QPSK	1	0	Front Face	1	23790	22.75	0	-	0.124
134	LTE Band 17	10	QPSK	1	49	Front Face	1	23790	22.83	0	-	0.125
161	LTE Band 17	10	16QAM	25	13	Front Face	1	23790	22.45	1	-	0.113
162	LTE Band 17	10	16QAM	1	0	Front Face	1	23790	22.43	0.5	-	0.118
163	LTE Band 17	10	16QAM	1	49	Front Face	1	23790	22.53	0.5	-	0.121
246	LTE Band 4	15	QPSK	36	18	Front Face	1	20175	23.01	0.5	-	0.786
247	**LTE Band 4**	**15**	**QPSK**	**1**	**0**	**Front Face**	**1**	**20175**	**23.12**	**0**	**-**	**0.808**
248	LTE Band 4	15	QPSK	1	74	Front Face	1	20175	23.10	0	-	0.754
249	LTE Band 4	15	16QAM	36	18	Front Face	1	20175	22.81	1	-	0.675
250	LTE Band 4	15	16QAM	1	0	Front Face	1	20175	22.85	0.5	-	0.705
251	LTE Band 4	15	16QAM	1	74	Front Face	1	20175	22.78	0.5	-	0.657
258	LTE Band 17	10	QPSK	25	13	Rear Face	1	23790	22.23	0.5	-	0.112
135	LTE Band 17	10	QPSK	1	0	Rear Face	1	23790	22.75	0	-	0.128
136	LTE Band 17	10	QPSK	1	49	Rear Face	1	23790	22.83	0	-	0.123
164	LTE Band 17	10	16QAM	25	13	Rear Face	1	23790	22.45	1	-	0.126
165	**LTE Band 17**	**10**	**16QAM**	**1**	**0**	**Rear Face**	**1**	**23790**	**22.43**	**0.5**	**-**	**0.13**
166	LTE Band 17	10	16QAM	1	49	Rear Face	1	23790	22.53	0.5	-	0.122
259	LTE Band 4	15	QPSK	36	18	Rear Face	1	20175	23.01	0.5	-	0.738
260	LTE Band 4	15	QPSK	1	0	Rear Face	1	20175	23.12	0	-	0.768
261	LTE Band 4	15	QPSK	1	74	Rear Face	1	20175	23.10	0	-	0.702
262	LTE Band 4	15	16QAM	36	18	Rear Face	1	20175	22.81	1	-	0.713
263	**LTE Band 4**	**15**	**16QAM**	**1**	**0**	**Rear Face**	**1**	**20175**	**22.85**	**0.5**	**-**	**0.775**
264	LTE Band 4	15	16QAM	1	74	Rear Face	1	20175	22.78	0.5	-	0.731
265	LTE Band 4	15	QPSK	36	18	Left Side	1	20175	23.01	0.5	-	0.175
266	LTE Band 4	15	QPSK	1	0	Left Side	1	20175	23.12	0	-	0.192
267	LTE Band 4	15	QPSK	1	74	Left Side	1	20175	23.10	0	-	0.177
268	LTE Band 4	15	16QAM	36	18	Left Side	1	20175	22.81	1	-	0.172
269	LTE Band 4	15	16QAM	1	0	Left Side	1	20175	22.85	0.5	-	0.194
270	LTE Band 4	15	16QAM	1	74	Left Side	1	20175	22.78	0.5	-	0.177
77	**LTE Band 17**	**10**	**QPSK**	**25**	**13**	**Right Side**	**1**	**23790**	**22.23**	**0.5**	**-**	**0.156**
139	LTE Band 17	10	QPSK	1	0	Right Side	1	23790	22.75	0	-	0.117
140	LTE Band 17	10	QPSK	1	49	Right Side	1	23790	22.83	0	-	0.111
170	LTE Band 17	10	16QAM	25	13	Right Side	1	23790	22.45	1	-	0.116
171	LTE Band 17	10	16QAM	1	0	Right Side	1	23790	22.43	0.5	-	0.119
172	LTE Band 17	10	16QAM	1	49	Right Side	1	23790	22.53	0.5	-	0.11
271	LTE Band 4	15	QPSK	36	18	Right Side	1	20175	23.01	0.5	-	0.362
272	**LTE Band 4**	**15**	**QPSK**	**1**	**0**	**Right Side**	**1**	**20175**	**23.12**	**0**	**-**	**0.38**
273	LTE Band 4	15	QPSK	1	74	Right Side	1	20175	23.10	0	-	0.336
274	LTE Band 4	15	16QAM	36	18	Right Side	1	20175	22.81	1	-	0.349
275	LTE Band 4	15	16QAM	1	0	Right Side	1	20175	22.85	0.5	-	0.35

276	LTE Band 4	15	16QAM	1	74	Right Side	1	20175	22.78	0.5	-	0.359
78	**LTE Band 17**	**10**	**QPSK**	**25**	**13**	**Top Side**	**1**	**23790**	**22.23**	**0.5**	**-**	**0.088**
141	LTE Band 17	10	QPSK	1	0	Top Side	1	23790	22.75	0	-	0.062
142	LTE Band 17	10	QPSK	1	49	Top Side	1	23790	22.83	0	-	0.059
173	LTE Band 17	10	16QAM	25	13	Top Side	1	23790	22.45	1	-	0.063
174	LTE Band 17	10	16QAM	1	0	Top Side	1	23790	22.43	0.5	-	0.066
175	LTE Band 17	10	16QAM	1	49	Top Side	1	23790	22.53	0.5	-	0.062
277	LTE Band 4	15	QPSK	36	18	Down Side	1	20175	23.01	0.5	-	0.502
278	**LTE Band 4**	**15**	**QPSK**	**1**	**0**	**Down Side**	**1**	**20175**	**23.12**	**0**	**-**	**0.515**
279	LTE Band 4	**15**	QPSK	1	74	Down Side	1	20175	23.10	0	-	0.513
280	LTE Band 4	**15**	16QAM	36	18	Down Side	1	20175	22.81	1	-	0.51
281	LTE Band 4	**15**	16QAM	**1**	**0**	Down Side	1	20175	22.85	0.5	-	0.502
282	LTE Band 4	**15**	16QAM	1	74	Down Side	1	20175	22.78	0.5	-	0.498

Note:

1. Per KDB 941225 D06, for DUT 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.
2. As in (1), SAR for Front Face / Rear Face / Right Side / Left Side / Down Side is necessary for LTE Band 4; SAR for Front Face / Rear Face / Right Side / Top Side is necessary for LTE Band 17.
3. Per KDB 941225 D05, for LTE, if the smaller bandwidth output power is within +/- ½dB of the largest bandwidth, and the maximum SAR of the largest bandwidth is ≤ 1.45 W/kg, SAR for smaller bandwidth can be excluded.
4. Per KDB 941225 D05, if the measured 50%-RB 1g-SAR for the middle or highest output power channel is ≤ 0.8W/kg, remaining 2 channels SAR tests can be excluded. Otherwise, 50% RB allocation of the remaining 2 channels SAR tests are necessary.
5. Per KDB 941225 D05, for LTE, if 50%-RB QPSK SAR ≤ 1.45 W/kg, 100%-RB QPSK SAR can be excluded; if 50%-RB 16QAM SAR ≤ 1.45 W/kg, 100%-RB 16QAM SAR can be excluded.
6. If SAR of 1 RB allocation is ≤ 1.45W/kg, SAR of 1 RB allocation of remaining channels can be excluded.
7. Per KDB 648474, if the highest output channel SAR for each exposure position is ≤ 0.8 W/kg, other channels SAR tests are not necessary

<WLAN>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Ear-phone	SAR_{1g} (W/kg)
87	802.11b	-	Front Face	1	11		0.066
284	**802.11b**	**-**	**Rear Face**	**1**	**11**		**0.12**
89	802.11b	-	Left Side	1	11		0.011
90	802.11b	-	Right Side	1	11		0.011
91	802.11b	-	Top Side	1	11		0.063

Note:

1. Per KDB 941225 D06, for DUT 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.
2. As in (1), SAR for Front Face / Rear Face / Right Side / Top Side / Left Side is necessary for WLAN
3. Per KDB 648474, if the highest output channel SAR for each exposure position is ≤ 0.8 W/kg, other channels SAR tests are not necessary

13.5 Simultaneous Transmission SAR Analysis and Measurements

13.5.1 Simultaneous analysis - SAR summation

<Simultaneous Transmission – Head SAR>

Position	GSM 850	GSM 1900	WCDMA Band V	WCDMA Band II	802.11b	Max. SAR Summation
Right Cheek	0.204	0.398	0.292	**1.2**	**0.483**	**1.68**
Right Tilted	0.175	0.191	0.234	**0.345**	**0.727**	**1.07**
Left Cheek	0.195	0.313	0.3	**0.515**	**0.316**	**0.83**
Left Tilted	0.16	0.226	0.247	**0.389**	**0.43**	**0.82**

Position	LTE Band 4	LTE Band 17	802.11b	Max. SAR Summation
Right Cheek	**0.611**	0.348	**0.483**	**1.09**
Right Tilted	0.307	**0.344**	**0.727**	**1.07**
Left Cheek	**0.545**	0.58	**0.316**	**0.90**
Left Tilted	0.165	**0.702**	**0.43**	**1.13**

Note:

1. For 1g-SAR scalar summation < 1.6 W/kg, simultaneous SAR measurement is not necessary,
2. Since the handset supports Circuit Switched Fall Back (CSFB) function, LTE transmission will not exist with 2G/3G transmission at the same time, therefore LTE+WLAN simultaneous transmission is considered separately.

<Simultaneous Transmission –Body-worn SAR>

Position	GSM 850	GSM 1900	WCDMA Band V	WCDMA Band II	802.11b	Max. SAR Summation
Front Face	0.550	0.621	0.401	**1**	**0.066**	**1.07**
Rear Face	**0.836**	0.638	0.523	**0.837**	**0.12**	**0.96**

Position	LTE Band 4	LTE Band 17	802.11b	Max. SAR Summation
Front Face	**0.808**	0.14	**0.066**	**0.87**
Rear Face	**0.775**	0.13	**0.12**	**0.90**

Note:

1. Since the handset supports CSFB, LTE transmission will not exist with 2G/3G transmission at the same time, therefore LTE+WLAN simultaneous transmission is considered separately.
2. Simultaneous SAR measurement is not necessary, since the summation is < 1.6W/kg.

< Simultaneous Transmission – Hotspot mode SAR >

Position	GSM 850	GSM 1900	WCDMA Band V	WCDMA Band II	802.11b	Max. SAR Summation
Front Face	0.550	0.592	0.40	**0.899**	**0.066**	**0.97**
Rear Face	0.836	0.638	0.523	**0.837**	**0.12**	**0.96**
Top Side	0	0	0	**0**	**0.063**	-
Down Side	0.091	0.287	0.076	**0.474**	0	-
Left Side	**0.499**	0.235	0.431	0.294	**0.011**	**0.51**
Right Side	0.408	0.52	0.329	**0.667**	**0.011**	**0.68**

Position	LTE Band 4	LTE Band 17	802.11b	Max. SAR Summation
Front Face	**0.808**	0.14	**0.066**	**0.87**
Rear Face	**0.775**	0.13	**0.12**	**0.90**
Top Side	0	**0.088**	**0.063**	**0.15**
Down Side	**0.515**	0	0	-
Left Side	**0.194**	0	**0.011**	**0.21**
Right Side	**0.38**	0.156	**0.011**	**0.39**

Note:

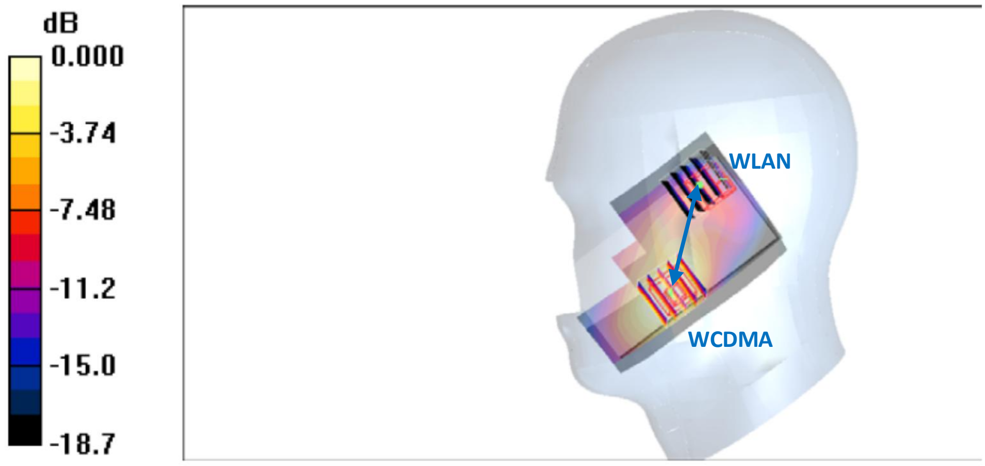
1. Since the handset supports CSFB, LTE transmission will not exist with 2G/3G transmission at the same time, therefore LTE+WLAN simultaneous transmission is considered separately.
2. Simultaneous SAR measurement is not necessary, since the summation is < 1.6W/kg.

13.5.2 Simultaneous analysis - SPLSR calculation

Head	TX		SAR peak location (m) X	Y	Z	SAR (W/kg)	Ant Pair	Peak distance (cm)	pair SAR sum (W/kg)	SPLSR
Right Cheek	1	WCDMA, Band 2, CH 9400	0.066	-0.253	-0.17	1.15	1+2	8.4	1.63	0.19
	2	WLAN, CH 11	0.0205	-0.323	-0.167	0.483				
Right Cheek	1	WCDMA, Band 2, CH 9538	0.066	-0.253	-0.17	1.2	1+2	8.4	1.68	0.20
	2	WLAN, CH 11	0.0205	-0.323	-0.167	0.483				
Right Cheek	1	WCDMA, Band 2, CH 9262	0.067	-0.255	-0.17	1.14	1+2	8.2	1.62	0.20
	2	WLAN, CH 11	0.0205	-0.323	-0.167	0.483				

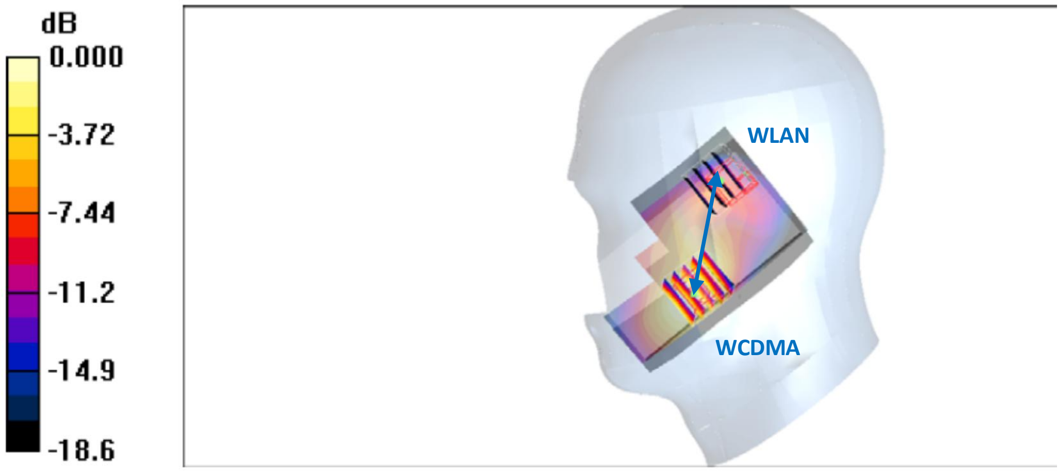
<The peak location is shown in the overlapped SAR plots>

Head- Right Cheek,
WCDMA Band2 CH9538 + WLAN CH11

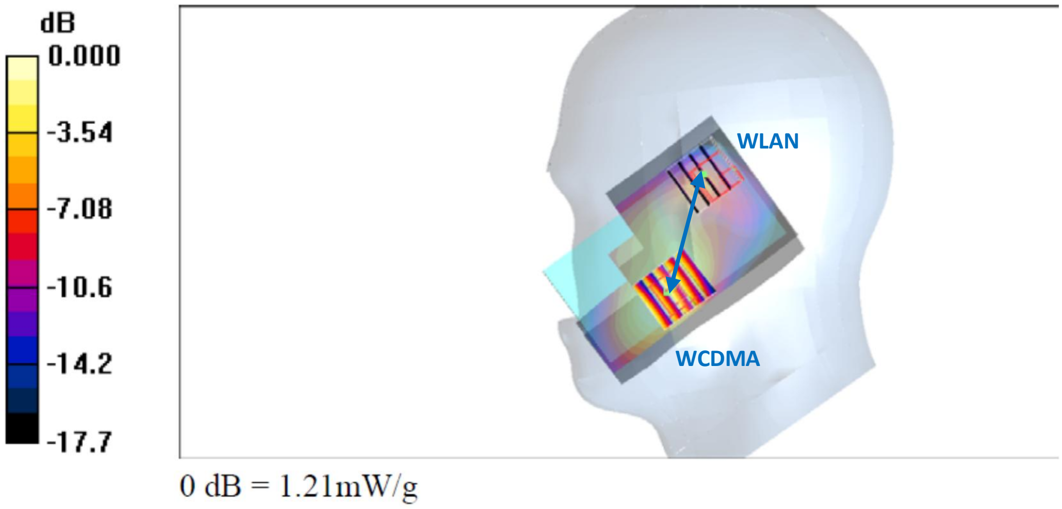


0 dB = 1.29mW/g

Head- Right Cheek,
WCDMA Band2 CH9400 + WLAN CH11



0 dB = 1.26mW/g

Head- Right Cheek, WCDMA Band2 CH9262 + WLAN CH11


Note:

1. Considering SPLSR analysis, for WCDMA Band 2 + WLAN at Right-Cheek position, the 3 WCDMA channels resulting 1g-SAR summation ≥ 1.6W/kg are analyzed here.
2. For Table 13.5.2, the SAR peak coordinates and SAR peaks distance are extracted and calculated following Speag TN-110209
3. SPLSR < 0.3, so volume scan is not necessary; referring to KDB 648474

14. References

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

[2] IEEE Std. C95.1-1991, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, 1991

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

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

[5] SPEAG DASY System Handbook

[6] FCC KDB 248227 D01v01r02, “SAR Measurement Procedures for 802.11 a/b/g Transmitters”, May 2007

[7] FCC KDB 447498 D01 v04, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, November 2009

[8] FCC KDB 447498 D02 v02, “SAR Measurement Procedures for USB Dongle Transmitters”, November 2009

[9] FCC KDB 616217 D01 v01r01, “SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens”, November 2009

[10] FCC KDB 616217 D03 v01, “SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet Computers”, November 2009

[11] FCC KDB 648474 D01v01r05, “SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas”, September 2008

[12] FCC KDB 941225 D01 v02, “SAR Measurement Procedures for3G Devices– CDMA2000 / Ev-Do / WCDMA / HSDPA / HSPA”, October 2007

[13] FCC KDB 941225 D03 v01, “Recommended SAR Test Reduction Procedures for GSM/GPRS/EDGE”, December 2008

[14] FCC KDB 941225 D04 v01, “Evaluating SAR for GSM/(E)GPRS Dual Transfer Mode”, January 272010

[15] FCC KDB 941225 D05 v01, “SAR Test Considerations for LTE Handsets and Data Modems”

Appendix A. Plots of System Performance Check

The plots are shown as follows.

Appendix B. Plots of SAR Measurement

The plots are shown as follows.

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.