FCC SAR Test Report

APPLICANT	**:**	**HTC Corporation**
EQUIPMENT	**:**	**Tablet computer**
MODEL NAME	**:**	**PG09410**
FCC ID	**:**	**NM8PG09410**
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 Mar. 29, 2011 and completely tested on Jun. 13, 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 INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Jones Tsai

Jones Tsai / Manager

Testing Laboratory
1190

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA132945	Rev. 01	Initial issue of report	Jun. 24, 2011
FA132945	Rev. 02	1. Update the Measuring Results Simulating Liquid on page 30. 2. Add the Simultaneous analysis - SPLSR calculation on section 12.4. 3. Add dipole 750 verification data at Appendix C	Jul. 08, 2011
FA132945	Rev. 03	1. Re-arrange the SAR summary at page 4, categorized by test distance 0cm and 1cm. 2. Add the note of 802.11a and BT SAR exclusion at page 4. 3. Add the note of 1cm SAR tests, for confirming operation of power reduction scheme at page 4, 59, 61	Jul. 15, 2011

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **HTC Corporation Tablet computer PG09410** are as follows (with expanded uncertainty 21.4 % for 300 MHz to 3 GHz).

< Test distance 0 mm to the phantom>

Band	Position	SAR_{1g} (W/kg)
GSM850	Body (0 cm)	0.745
GSM1900	Body (0 cm)	1.16
WCDMA Band V	Body (0 cm)	0.777
WCDMA Band II	Body (0 cm)	1.41
LTE Band4(16QAM)	Body (0 cm)	1.27
LTE Band17(16QAM)	Body (0 cm)	0.986
LTE Band4(QPSK)	Body (0 cm)	1.24
LTE Band17(QPSK)	Body (0 cm)	1.14
802.11b/g/n	Body (0 cm)	0.75
802.11a/n	Body (0 cm)	N/A
Bluetooth	Body (0 cm)	N/A

Note: 802.11a and BT SAR not tested due to that average power is below the FCC procedure thresholds, per KDB 447498.

<Test distance 10 mm to the phantom>

Band	Position	SAR_{1g} (W/kg)
GSM850	Body (1 cm)	0.6
GSM1900	Body (1 cm)	0.841
WCDMA Band V	Body (1 cm)	0.465
WCDMA Band II	Body (1 cm)	1.53
LTE Band4(16QAM)	Body (1 cm)	1.02
LTE Band17(16QAM)	Body (1 cm)	0.342
LTE Band4(QPSK)	Body (1 cm)	1.03
LTE Band17(QPSK)	Body (1 cm)	0.377

Note: The test records with distance 1 cm to the phantom are provided for verifying the SAR compliance when user is away from DUT and proximity sensor deactivated. 1 cm test results are for confirming operation of the power reduction scheme, and are not applicable for compliance demonstration for the FCC tablet PC SAR test procedures

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.

<table>
<tr><td>FCC ID</td><td colspan="7">NM8PG09410</td></tr>
<tr><td>DUT Type</td><td colspan="7">Tablet PC</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td colspan="7">Band 4: TX: 1710~1755 MHz, RX: 2110~ 2155 MHz
Band 17: TX: 704~ 716 MHz, RX: 734 ~ 746 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td colspan="7">5MHz, 10MHz</td></tr>
<tr><td rowspan="8">Transmission (H, M, L) channel numbers and frequencies in each LTE band</td><td>Band 4:</td><td>Bandwidth 5 MHz</td><td>Channel #</td><td>Frequency (MHz)</td><td>Bandwidth 10 MHz</td><td>Channel #</td><td>Frequency (MHz)</td></tr>
<tr><td rowspan="3"></td><td></td><td>19975</td><td>1712.5</td><td rowspan="3"></td><td>20000</td><td>1715</td></tr>
<tr><td></td><td>20175</td><td>1732.5</td><td>20175</td><td>1732.5</td></tr>
<tr><td></td><td>20375</td><td>1752.5</td><td>20350</td><td>1750</td></tr>
<tr><td>Band 17:</td><td>Bandwidth 5 MHz</td><td>Channel #</td><td>Frequency (MHz)</td><td>Bandwidth 10 MHz</td><td>Channel #</td><td>Frequency (MHz)</td></tr>
<tr><td rowspan="3"></td><td></td><td>23755</td><td>706.5</td><td rowspan="3"></td><td>23780</td><td>709</td></tr>
<tr><td></td><td>23790</td><td>710</td><td>23790</td><td>710</td></tr>
<tr><td></td><td>23825</td><td>713.5</td><td>23800</td><td>711</td></tr>
<tr><td>UE category, uplink modulations used</td><td colspan="7">Category 3, QPSK, and 16QAM</td></tr>
<tr><td>LTE transmitter and antenna implementation (standalone or sharing hardware components / antennas)</td><td colspan="7">LTE owns standalone transmitter and antenna, while supporting Band 17 and Band 4.</td></tr>
<tr><td>LTE Voice / Data requirements</td><td colspan="7">Data only</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td colspan="7">Yes</td></tr>
<tr><td>LTE A-MPR</td><td colspan="7">Disabled during SAR testing. With CMW500, set NS value to NS_01 to disable A-MPR.</td></tr>
<tr><td>LTE maximum averaged conducted output power</td><td colspan="7">LTE Band 4 : 23.25 dBm
LTE Band 17 : 23.30 dBm</td></tr>
<tr><td rowspan="4">Other U.S. wireless operating modes / bands</td><td>GPRS/EDGE</td><td colspan="6">GSM850: UL:824~849MHz/DL:869~894MHz
PCS : UL:1850~1910MHz/DL:1930~1990MHz</td></tr>
<tr><td>WCDMA</td><td colspan="6">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</td></tr>
<tr><td>WLAN</td><td colspan="6">802.11b/g/n : 2400 MHz ~ 2483.5 MHz
802.11a/n : 5150 MHz ~ 5350 MHz; 5470 MHz ~ 5725 MHz; 5725 MHz ~ 5850 MHz</td></tr>
<tr><td>Bluetooth</td><td colspan="6">Bluetooth : 2400 MHz ~ 2483.5 MHz</td></tr>
<tr><td>Simultaneous transmission configurations</td><td colspan="7">In Section 11.2</td></tr>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td colspan="7">Yes. When user is close to the device, the proximity sensor will be triggered and the WWAN RF output power will be reduced.</td></tr>
</table>

2. Administration Data

2.1 Testing Laboratory

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

2.2 Applicant

Company Name	HTC Corporation
Address	6-3, Baoquang Rd., Xindian City, Taipei County, Taiwan

2.3 Manufacturer

Company Name	HTC Corporation
Address	6-3, Baoquang Rd., Xindian City, Taipei County, Taiwan

2.4 Application Details

Date of Receipt of Application	Mar. 29, 2011
Date of Start during the Test	Jun. 06, 2011
Date of End during the Test	Jun. 13, 2011

3. General Information

3.1 Description of Device Under Test (DUT)

Product Feature & Specification	
DUT Type	Tablet computer
Model Name	PG09410
FCC ID	NM8PG09410
Tx Frequency	GSM850 : 824 MHz ~ 849 MHz GSM1900 : 1850 MHz ~ 1910 MHz WCDMA Band V : 824 MHz ~ 849 MHz WCDMA Band II : 1850 MHz ~ 1910 MHz LTE Band 4 : 1710MHz ~ 1755 MHz LTE Band 17 : 704 MHz ~ 716 MHz 802.11b/g/n : 2400 MHz ~ 2483.5 MHz 802.11a/n : 5150 MHz ~ 5350 MHz; 5470 MHz ~ 5725 MHz; 5725 MHz ~ 5850 MHz Bluetooth : 2400 MHz ~ 2483.5 MHz
Rx Frequency	GSM850 : 869 MHz ~ 894 MHz GSM1900 : 1930 MHz ~ 1990 MHz WCDMA Band V : 869 MHz ~ 894 MHz WCDMA Band II : 1930 MHz ~ 1990 MHz LTE Band 4 : 2100 MHz ~ 2155 MHz LTE Band 17 : 734 MHz ~ 746 MHz 802.11b/g/n : 2400 MHz ~ 2483.5 MHz 802.11a/n : 5150 MHz ~ 5350 MHz; 5470 MHz ~ 5725 MHz; 5725 MHz ~ 5850 MHz Bluetooth : 2400 MHz ~ 2483.5 MHz
Maximum Average Output Power to Antenna	GSM850 : 33.01 dBm GSM1900 : 30.22 dBm WCDMA Band V : 24.34 dBm WCDMA Band II : 24.23 dBm LTE Band 4 : 23.25 dBm LTE Band 17 : 23.30 dBm 802.11b : 19.75 dBm 802.11g : 14.70 dBm 802.11n (2.4GHz) : 13.08 dBm (BW 20MHz) 802.11a : 9.6 dBm 802.11n (5GHz) : 9.84 dBm (BW 20MHz) Bluetooth : 5.86 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) 802.11a/g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π/4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK
DUT Stage	Identical Prototype

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 447498 D01 v04
- FCC KDB 941225 D01 v02
- FCC KDB 941225 D03 v01
- FCC KDB 941225 D03 v01
- FCC KDB 941225 D05 v01
- FCC KDB 248227 D01 v01r02

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 %

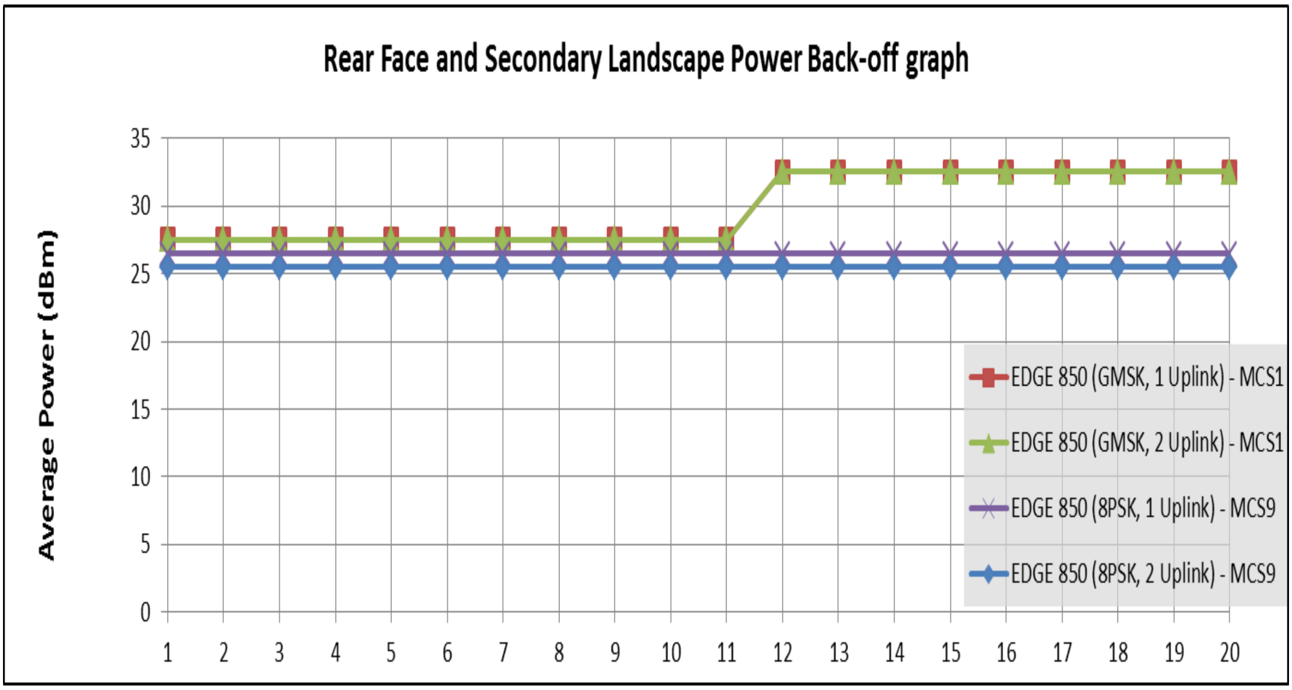
3.4.2 Test Configuration

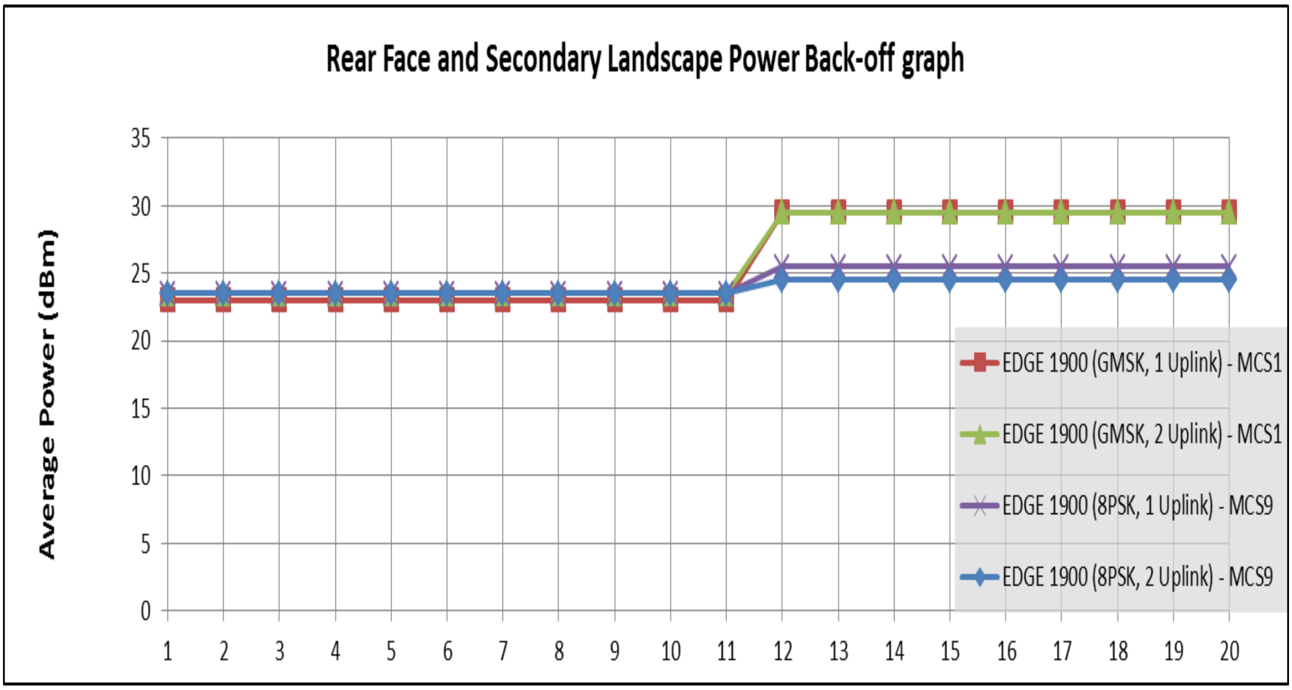
For WLAN SAR testing, WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement has almost 100% duty cycle and its crest factor is 1.

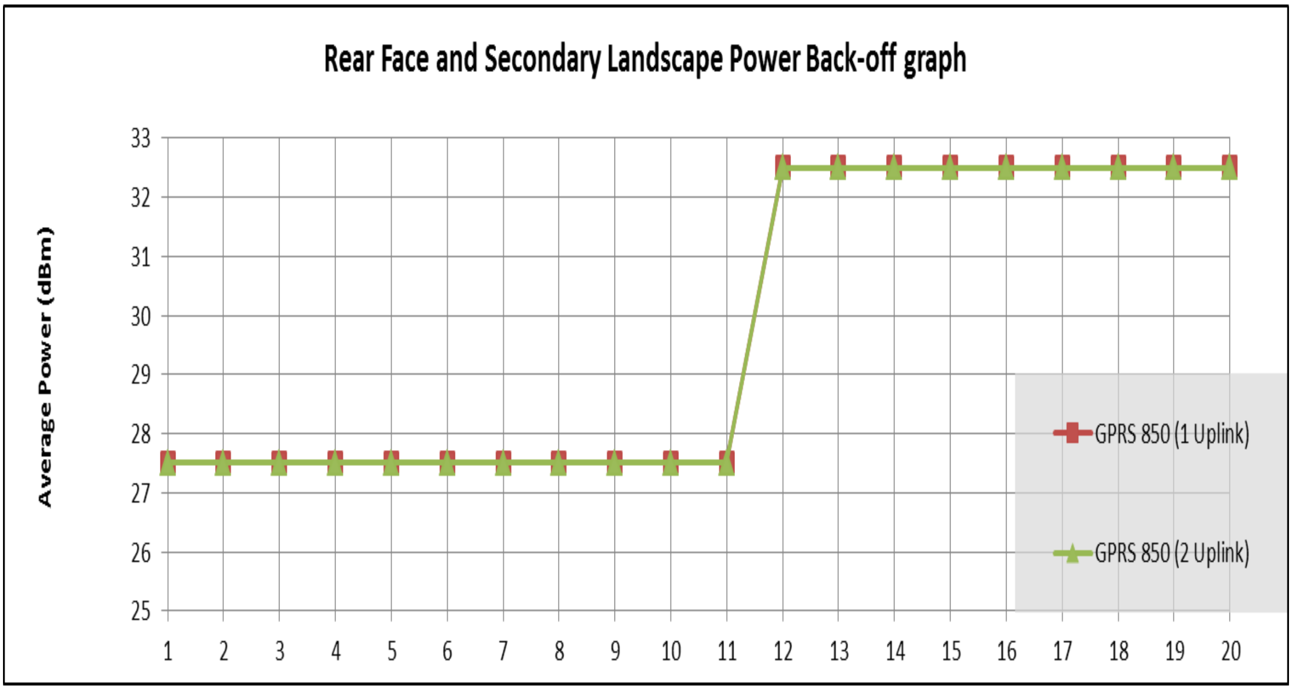
The device is 10.1" tablet PC which supports WWAN, WLAN, Bluetooth, and wireless hotspot capabilities. This tablet PC can be used for four display orientations and it is designed with the proximity sensor. The proximity sensor which allocates around main antenna is implemented by sensor plates to command power reduction while human body approaches, and the sensor itself is always available independent of display orientation. The sensor is activated then it can enable WWAN power reduction, and the WLAN and BT have no power reduction.

The details of sensors analysis can be found in a separate exhibit, PBA Technical Description.

The power vs. distance plots for bottom (rear face) of DUT and edge (secondary portrait) are shown as below.






Rear Face and Secondary Landscape Power Back-off graph
Average Power (dBm)
33
32
31
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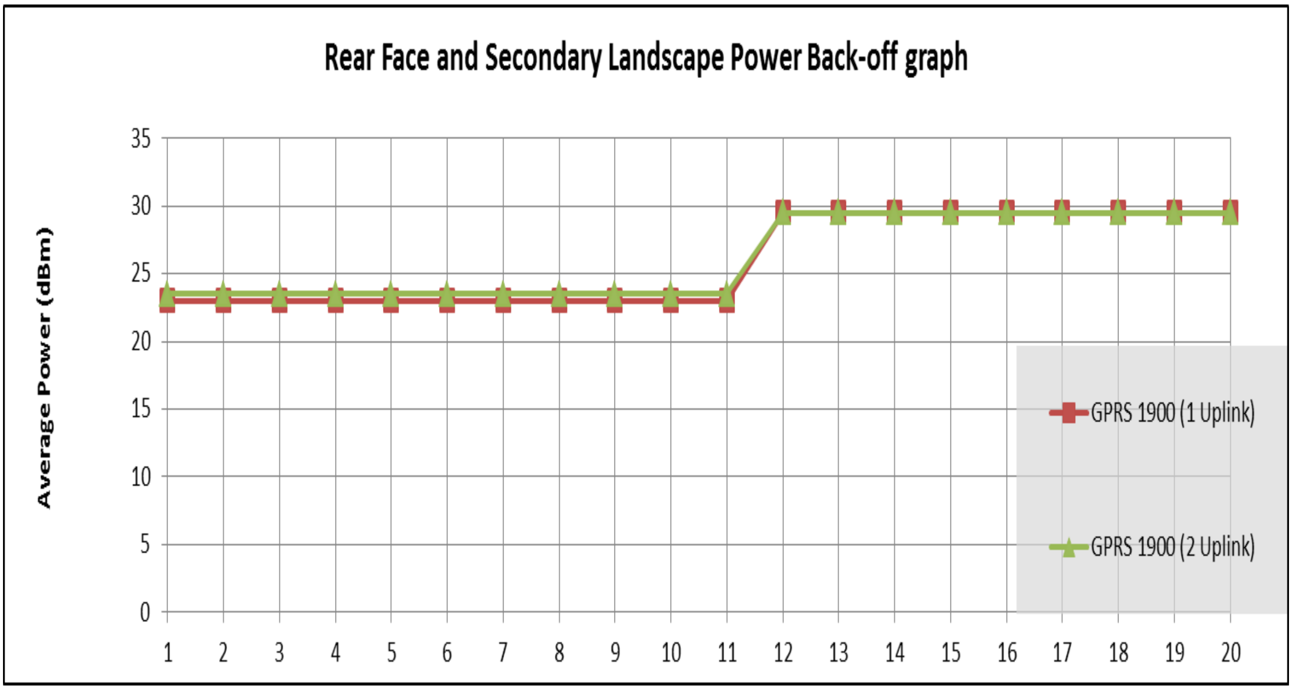
GPRS 850 (1 Uplink)
GPRS 850 (2 Uplink)


Rear Face and Secondary Landscape Power Back-off graph
Average Power (dBm)
35
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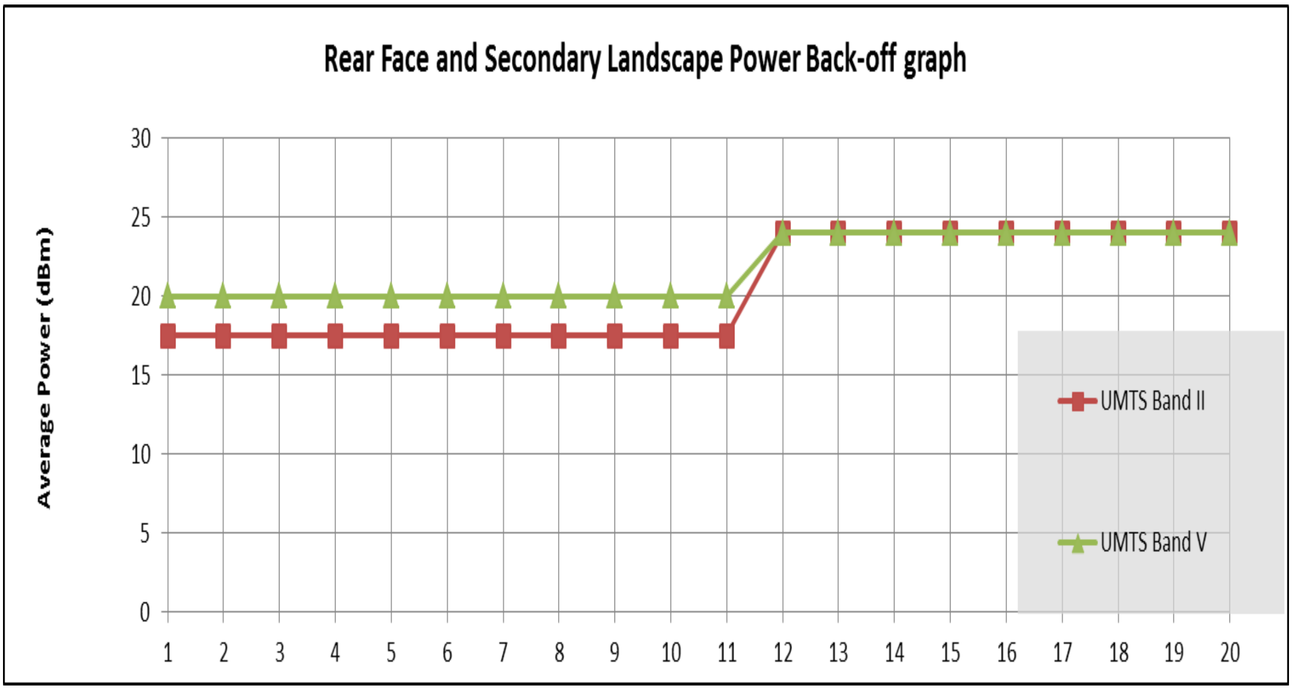
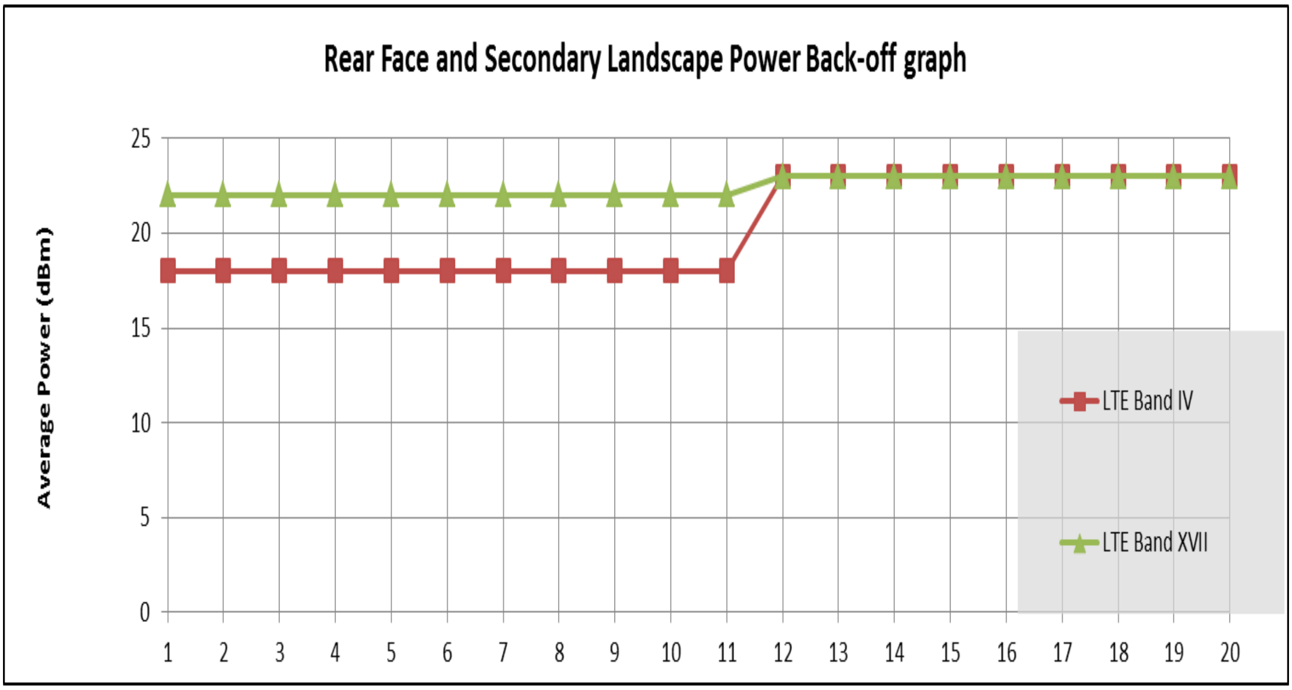
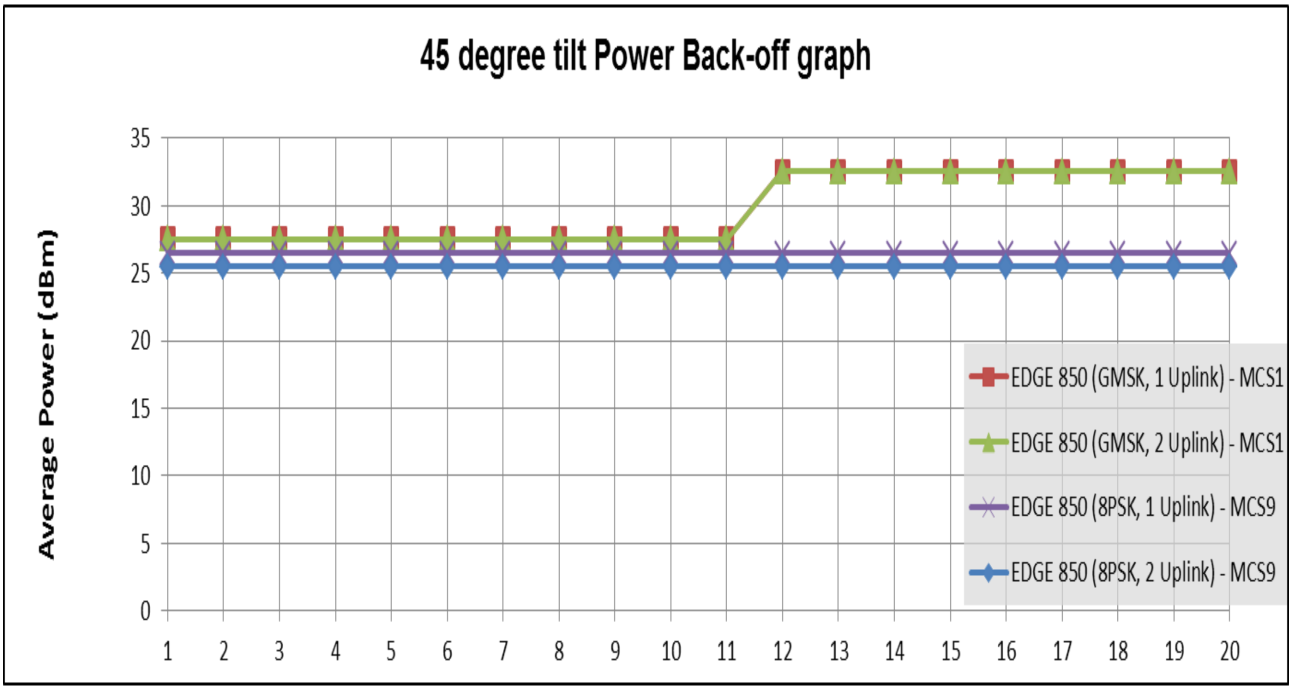
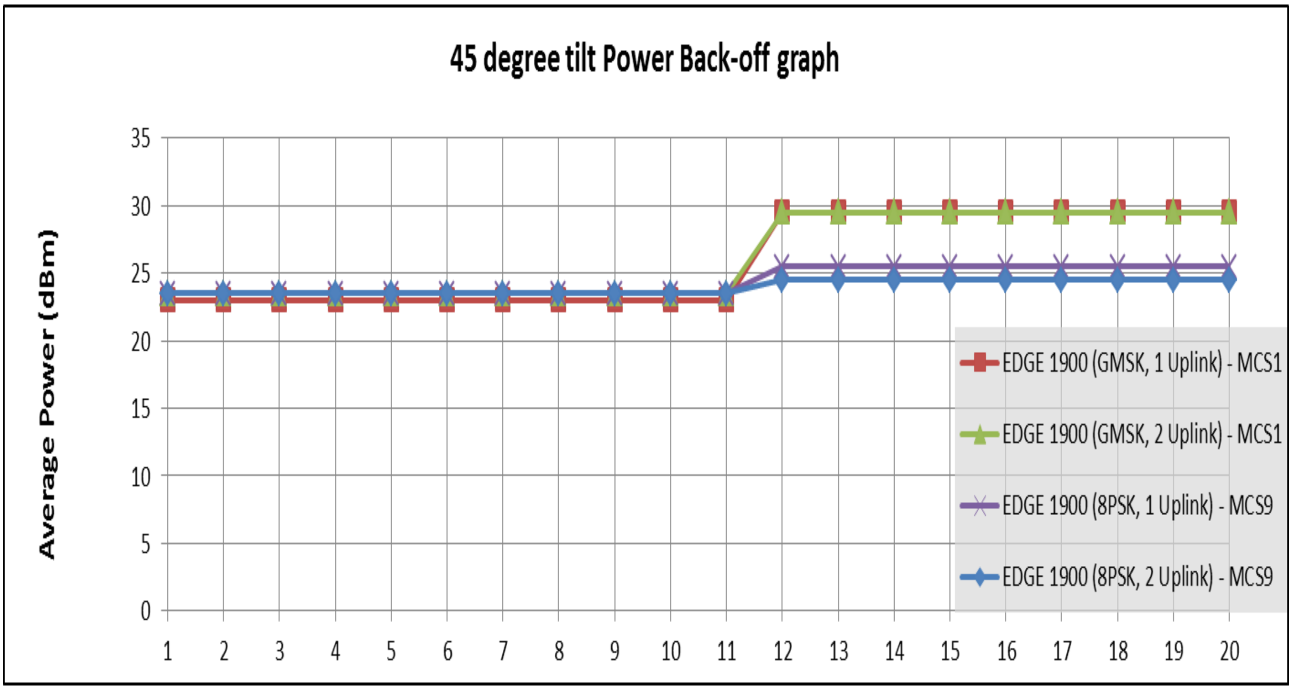
GPRS 1900 (1 Uplink)
GPRS 1900 (2 Uplink)

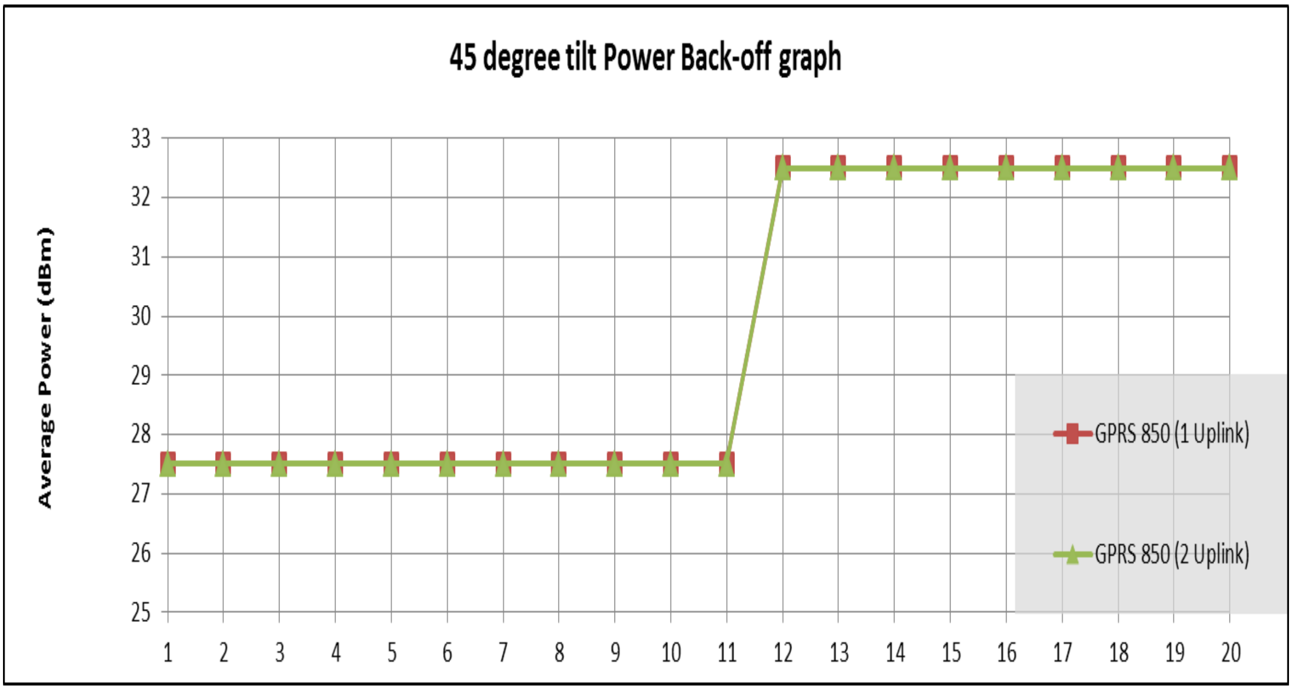

Rear Face and Secondary Landscape Power Back-off graph
Average Power (dBm)
30
25
20
15
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
UMTS Band II
UMTS Band V


Rear Face and Secondary Landscape Power Back-off graph
Average Power (dBm)
25
20
15
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
LTE Band IV
LTE Band XVII

The power vs. distance plots for 45 degree tilt of DUT are shown as below.






45 degree tilt Power Back-off graph
Average Power (dBm)
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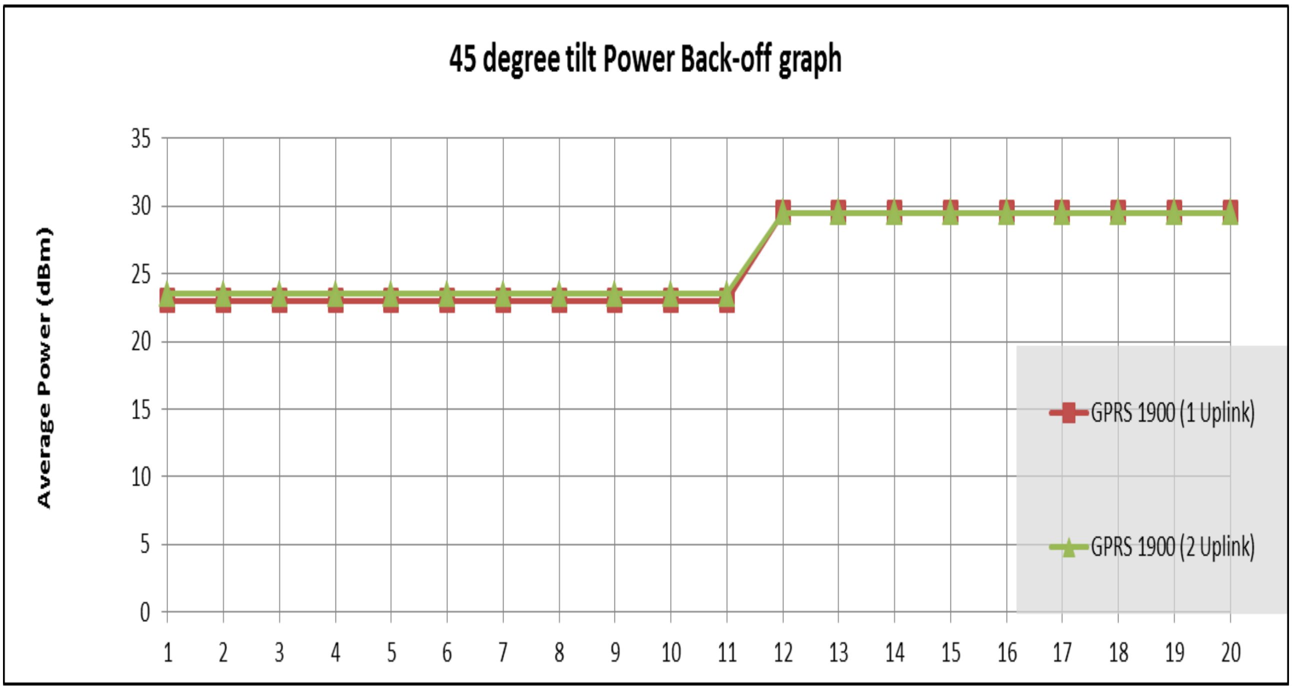
GPRS 850 (1 Uplink)
GPRS 850 (2 Uplink)


45 degree tilt Power Back-off graph
Average Power (dBm)
35
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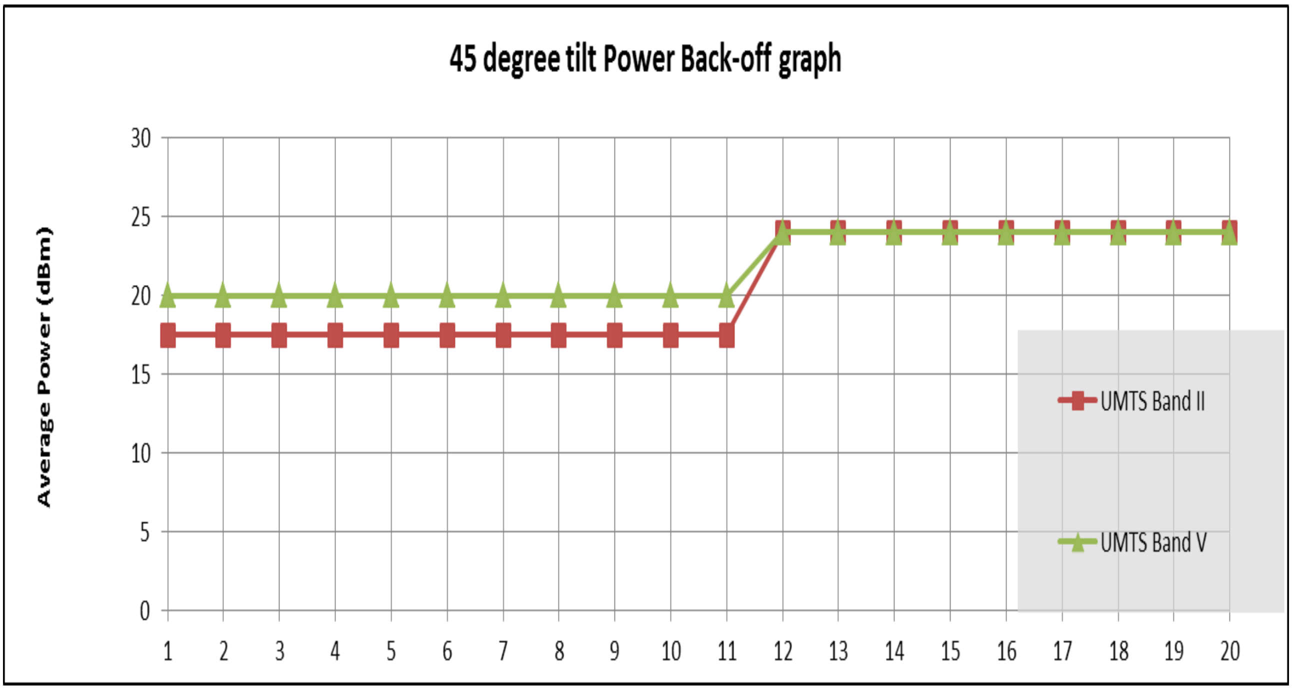
GPRS 1900 (1 Uplink)
GPRS 1900 (2 Uplink)


45 degree tilt Power Back-off graph
Average Power (dBm)
30
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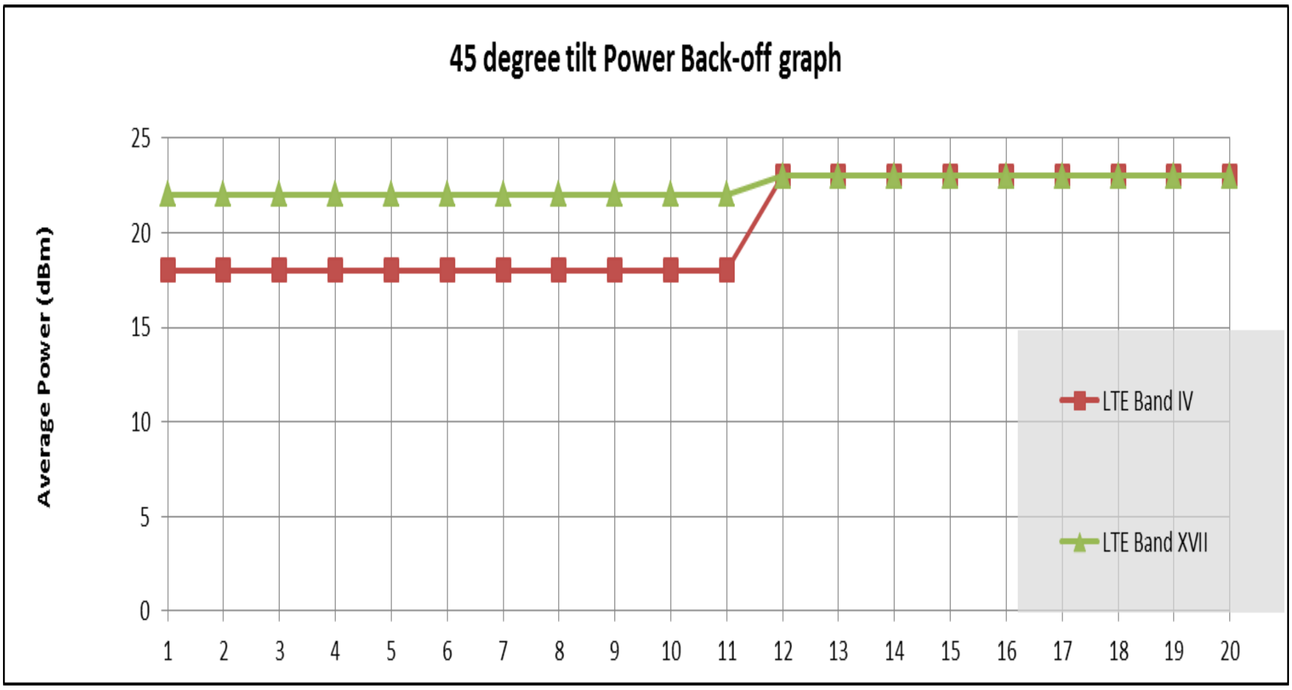
UMTS Band II
UMTS Band V


45 degree tilt Power Back-off graph
Average Power (dBm)
25
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LTE Band IV
LTE Band XVII

Distance (mm)	Condition of sensor in the Rear Face of DUT	Condition of sensor in the edge – Secondary Landscape of DUT	Condition of sensor in tilt 45 degrees at screen of DUT
5	On	On	On
6	On	On	On
7	On	On	On
8	On	On	On
9	On	On	On
10	On	On	On
11	On	On	On
12	Off	Off	Off

From the figures above, the trigger distance is 11 mm for bottom (rear face), and the trigger distance is 11 mm for edge (secondary landscape), and based on the separation distance for the sensor activating / de-activating, the device was tested at 0mm in power reduction mode (Sensor Activating), and tested at conservative distance 10 mm for bottom (rear face) of DUT, and 10 mm for edge (secondary landscape) in full power mode (Sensor deactivating). And the full power mode enabled which achieved via engineering control software (not for public), were also performed, according to Apr. 2011 FCC-TCB conference notes Chan, RF Exposure Procedures Update, page 15.

When DUT display is 45 degree to the phantom, while the screen faces the phantom, the trigger distance is 10mm. It shows negligible difference from the edge-normal and backside trigger results.

The following tables show the orientation which end users could be used and when the conduct power will be reduced at specific mode for all wireless modes, and frequency bands, and operating figuration.

Orientation \ Mode – Power Limit Activation

Orientation\Mode Power Limit Activation	GPRS/ EGPRS 850 MCS 1-4 (GMSK)-Class8/10	EGPRS 850 MCS 5-9 (8-PSK) -Class8/10	GPRS/ EGPRS 1900 MCS 1-4 (GMSK) -Class8/10	EGPRS 1900 MCS 5-9 (8-PSK) -Class8/10
Primary Landscape	X	X	X	X
Secondary Landscape	●	X	●	●
Primary Portrait	X	X	X	X
Secondary Portrait	X	X	X	X
Front Face	X	X	X	X
Rear Face	●	X	●	●

Orientation\Mode Power Limit Activation	WCDMA Band 2	WCDMA Band 5
Primary Landscape	X	X
Secondary Landscape	●	●
Primary Portrait	X	X
Secondary Portrait	X	X
Front Face	X	X
Rear Face	●	●

Orientation\Mode Power Limit Activation	LTE Band 4	LTE Band 17
Primary Landscape	X	X
Secondary Landscape	●	●
Primary Portrait	X	X
Secondary Portrait	X	X
Front Face	X	X
Rear Face	●	●

Orientation\Mode Power Limit Activation	802.11 b/g/n	802.11 a/n	Bluetooth
Primary Landscape	X	X	X
Secondary Landscape	X	X	X
Primary Portrait	X	X	X
Secondary Portrait	X	X	X
Front Face	X	X	X
Rear Face	X	X	X

● : Reduced maximum limit applied only by activation of proximity sensors.

X : No power reduction.

The power reduction level and activated exposure positions as below:

	GPRS/ EGPRS 850 MCS 1-4 (GMSK) – Class 8/10	EGPRS 850 MCS 5-9 (8-PSK) – Class 8/10	GPRS/ EGPRS 1900 MCS 1-4 (GMSK) – Class 8	GPRS/ EGPRS 1900 MCS 1-4 (GMSK) – Class 10	EGPRS 1900 MCS 5-9 (8-PSK)– Class 8	EGPRS 1900 MCS 5-9 (8-PSK)– Class 10	WCDMA/ HSPA Band 5	WCDMA/ HSPA Band 2	WLAN/ BT
Primary Landscape	x	x	x	x	x	x	x	x	x
Secondary Landscape	5 dB	x	6.5 dB	6dB	2dB	1dB	4 dB	6.5dB	x
Primary Portrait	x	x	x	x	x	x	x	x	x
Secondary Portrait	x	x	x	x	x	x	x	x	x
Front Face	x	x	x	x	x	x	x	x	x
Rear Face	5 dB	x	6.5 dB	6dB	2dB	1dB	4 dB	6.5dB	x

For LTE band 4, and 17 the Secondary Landscape, and Rear Face have below power reduction levels,

Mode	Power Reduction(dB)
LTE band 4	5
LTE band 17	1

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. For WWAN SAR testing, the DUT is in GPRS or WCDMA link mode. In general, the crest factor is 8.3 for GPRS/EDGE multi-slot class 8, 4 for GPRS/EDGE multi-slot class 10, and 1 for WCDMA/HSDPA/HSUPA.

During LTE SAR testing, the A-MPR was disabled by setting NS=01 on the R&S CMW500.
The SAR test configurations for this device were determined by consultation with FCC via KDB inquiry 246363.

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

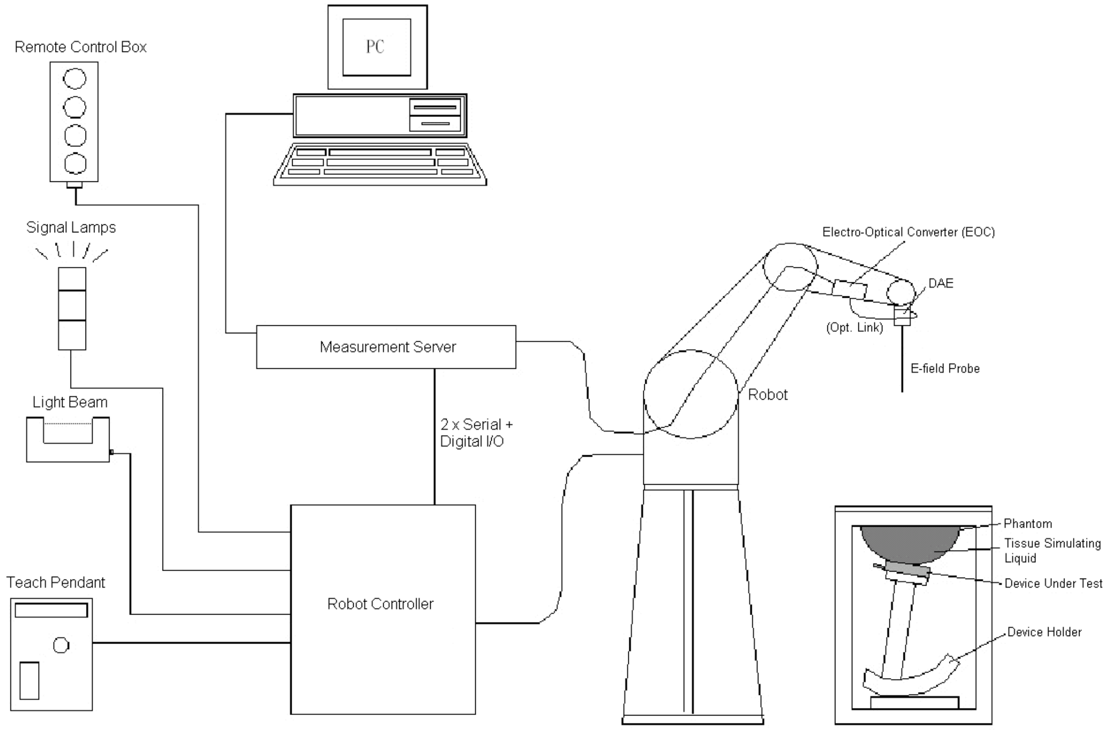


Fig 5.1 SPEAG DASY5 System Configurations

The DASY5 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 (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
- 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

<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 ± 0.25 dB. 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.

<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

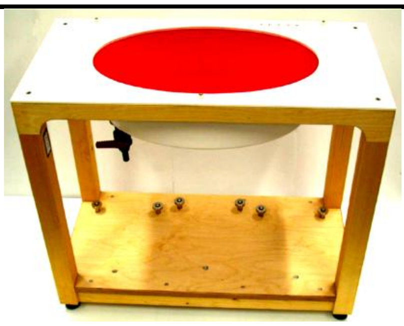


Fig 5.7 Photo of ELI4 Phantom

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

5.6 Device Holder

<Device Holder for SAM Twin Phantom>

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

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (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 5.8 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.

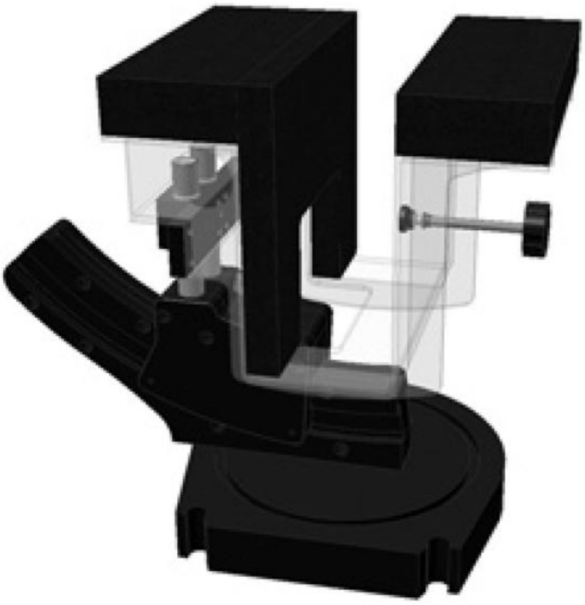


Fig 5.9 Laptop Extension Kit

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	3697	Nov. 23, 2010	Nov. 22, 2011
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, 2012
SPEAG	1800MHz System Validation Kit	D1800V2	2d052	Jun. 15, 2010	Jun. 14, 2012
SPEAG	1900MHz System Validation Kit	D1900V2	5d018	Jun. 15, 2010	Jun. 14, 2012
SPEAG	2450MHz System Validation Kit	D2450V2	735	Jun. 17, 2010	Jun. 16, 2012
SPEAG	Data Acquisition Electronics	DAE4	1249	Feb. 21, 2011	Feb. 20, 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	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
R&S	Universal Radio Communication Tester	CMU200	114256	Feb. 08, 2010	Feb. 07, 2012
Agilent	Dielectric Probe Kit	85070D	US01440205	NCR	NCR
Agilent	Dual Directional Coupler	778D	50422	NCR	NCR
AR	Power Amplifier	5S1G4M2	328767	NCR	NCR

Table 5.1 Test Equipment List

Note: The calibration certificate of DASY can be referred to appendix C of this report. Referring to KDB 450824, the justification of dipole extended calibration is needed beyond 1 year. The justification data of dipole D750V3, SN: 1012, can be found in appendix C.

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.

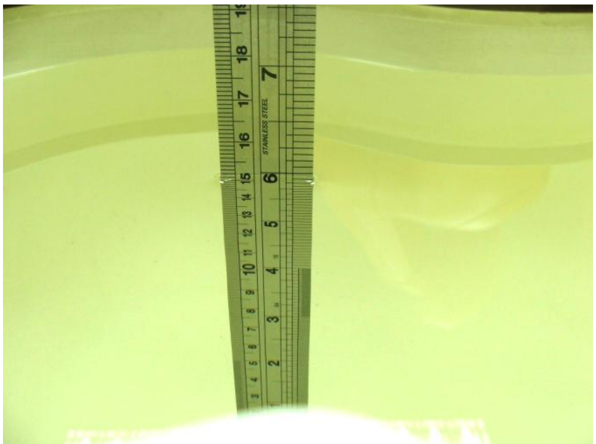


Fig 6.1 Photo of Liquid Height for Head SAR

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	0.85 ~ 0.93	41.9	39.8 ~ 44.0
835	Head	0.90	0.86 ~ 0.95	41.5	39.4 ~ 43.6
900	Head	0.97	0.92 ~ 1.02	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	0.91 ~ 1.01	55.5	52.7 ~ 58.3
835	Body	0.97	0.92 ~ 1.02	55.2	52.4 ~ 58.0
900	Body	1.05	1.00 ~ 1.10	55.0	52.3 ~ 57.8
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	Body	21.3	0.942	55.6	Jun. 11, 2011
710	Body	21.3	0.943	55.6	Jun. 11, 2011
711	Body	21.3	0.944	55.6	Jun. 11, 2011
750	Body	21.3	0.97	54.6	Jun. 11, 2011
750	Body	21.3	0.97	54.6	Jun. 11, 2011
850	Body	21.7	0.979	52.7	Jun. 06, 2011
850	Body	21.3	0.986	54.7	Jun. 08, 2011
850	Body	21.4	0.953	56.3	Jun. 11, 2011
1715	Body	21.6	1.47	52.5	Jun. 11, 2011
1732.5	Body	21.6	1.49	52.5	Jun. 11, 2011
1750	Body	21.6	1.51	52.4	Jun. 11, 2011
1800	Body	21.6	1.56	52.3	Jun. 11, 2011
1800	Body	21.6	1.56	52.3	Jun. 11, 2011
1900	Body	21.5	1.52	53.6	Jun. 07, 2011
1900	Body	21.4	1.55	51.9	Jun. 08, 2011
1900	Body	21.4	1.5	54.8	Jun. 10, 2011
2450	Body	21.5	1.92	53.2	Jun. 14, 2011

Table 6.3 Measuring Results for Simulating Liquid

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	5.5	Normal	1	1	± 5.5 %
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					± 10.7 %
Coverage Factor for 95 %					K = 2
Expanded Uncertainty					**± 21.4 %**

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:

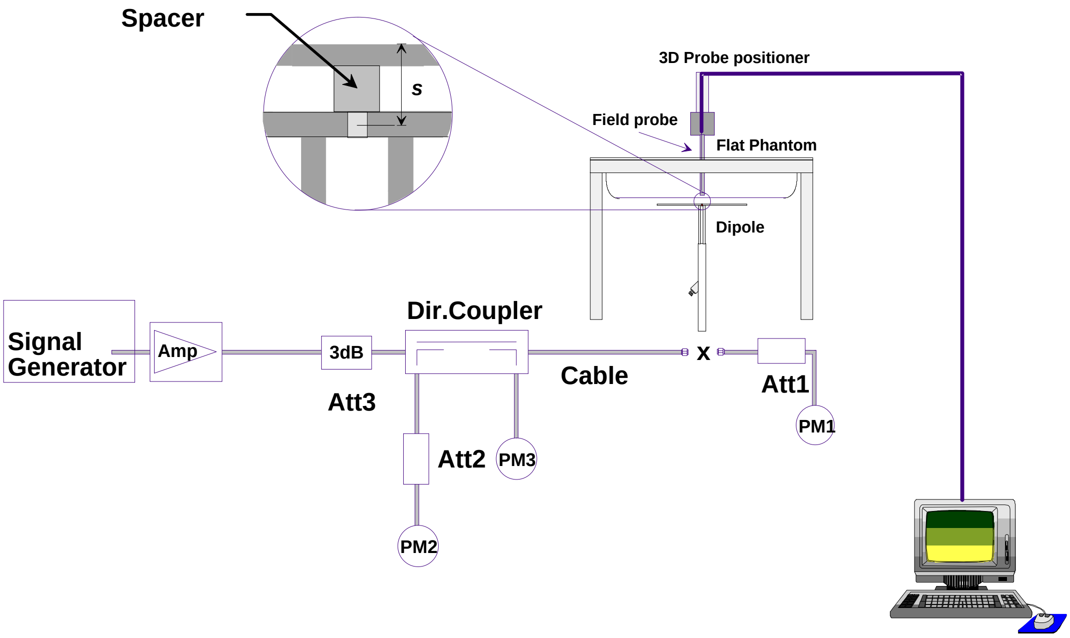


Fig 8.1 System Setup for System Evaluation

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 (250 mW) before dipole is connected.

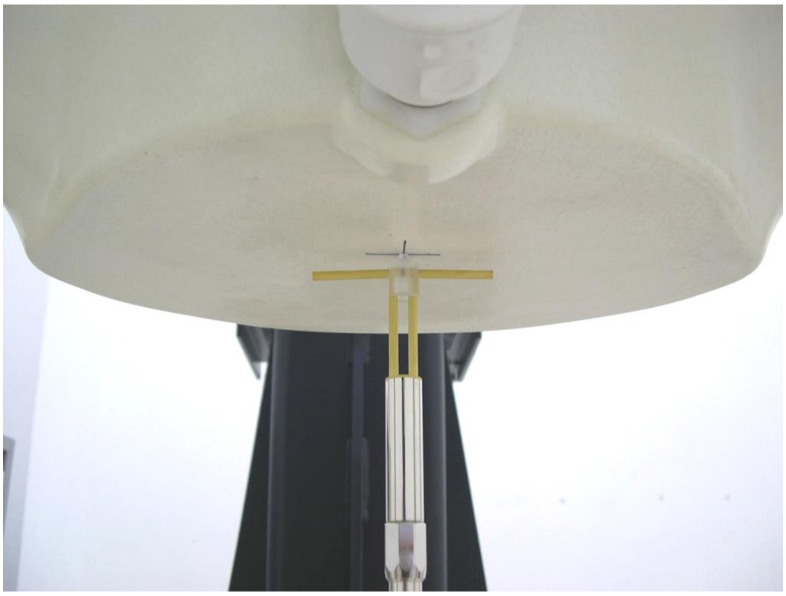


Fig 8.2 Photo of Dipole Setup

8.3 Validation Results

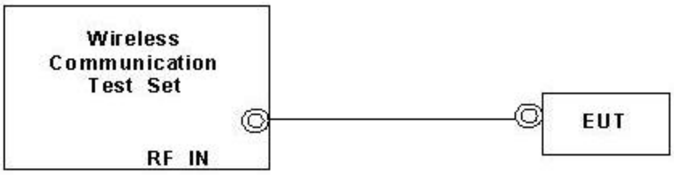
Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %. Table 8.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots 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. 11, 2011	750	Body	8.860	2.390	9.56	7.90
Jun. 06, 2011	835	Body	10.000	2.680	10.76	7.60
Jun. 08, 2011	835	Body	10.000	2.700	10.80	8.00
Jun. 11, 2011	835	Body	10.000	2.610	10.44	4.40
Jun. 11, 2011	1800	Body	38.900	9.910	39.64	1.90
Jun. 07, 2011	1900	Body	40.900	9.390	37.56	-8.17
Jun. 08, 2011	1900	Body	40.900	9.800	39.20	-4.16
Jun. 10, 2011	1900	Body	40.900	9.510	38.04	-6.99
Jun. 14, 2011	2450	Body	53.500	12.800	51.20	-4.30

Table 8.1 Target and Measurement SAR after Normalized

9. 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.

10. 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

10.1 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

10.2 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 10 g.

10.3 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.

10.4 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.

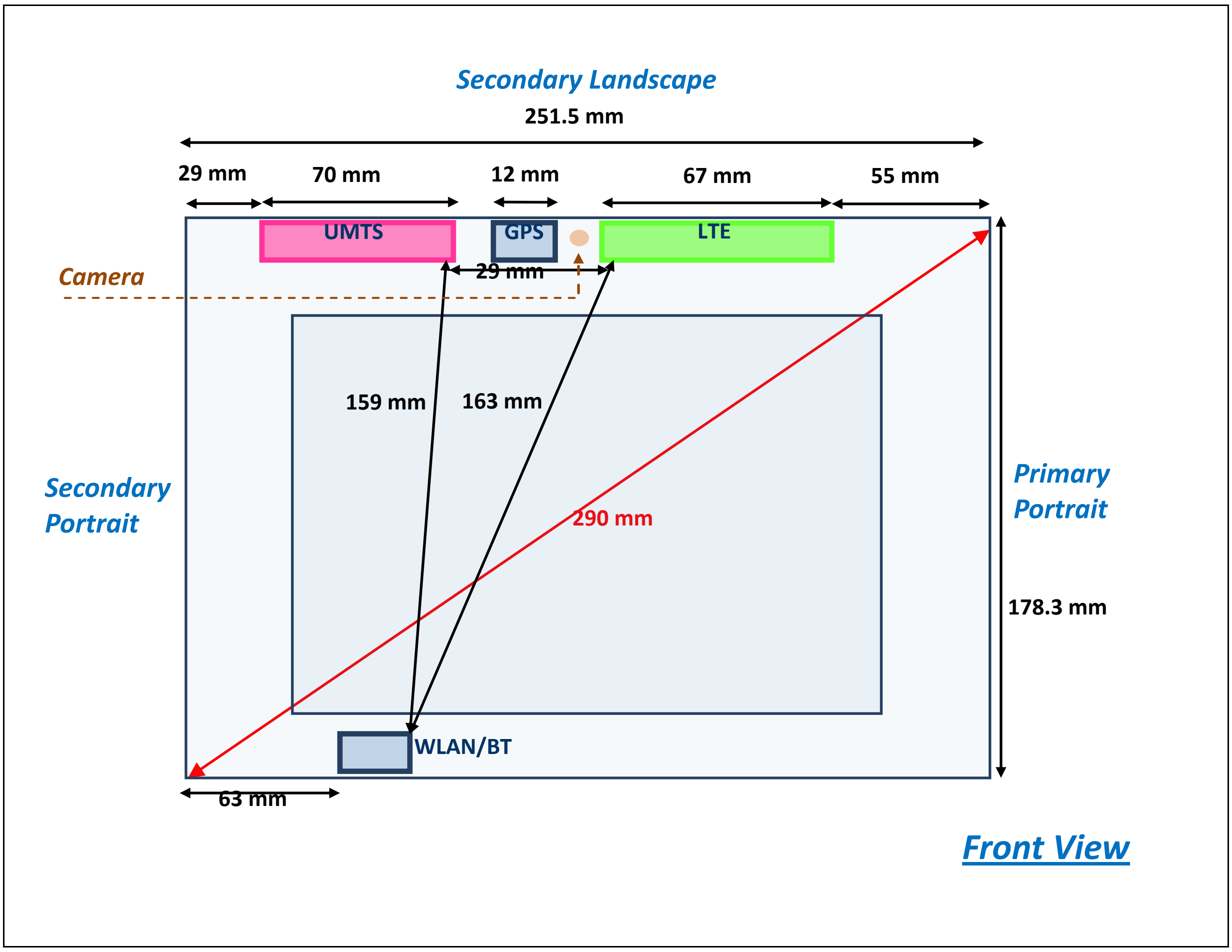
Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty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

10.5 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.

11. SAR Test Configurations

11.1 Exposure Positions Consideration



LTE antenna	Band 4: TX: 1710~1755 MHz, RX: 2110~ 2155 MHz Band 17: TX: 704~ 716 MHz, RX: 734 ~ 746 MHz
UMTS antenna	GSM850: UL:824~849MHz/DL:869~894MHz PCS : UL:1850~1910MHz/DL:1930~1990MHz 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
WLAN/BT antenna	802.11 b/g/n: 2.4GHz 802.11 a/n: 5GHz Bluetooth: 2.4GHz

Sides for SAR tests; Tablet mode						
	Rear Face	Front Face	Secondary Landscape	Primary Landscape	Secondary Portrait	Primary Portrait
UMTS	✓(0, 10mm)	x	✓(0, 10mm)	x	✓(0 mm)	X
LTE	✓(0, 10mm)	x	✓(0, 10mm)	x	X	x
WLAN/BT	✓(0 mm)	x	x	✓(0 mm)	x	x

Note:
1. The DUT diagonal dimension is 290 mm; per KDB 941225 D07, the DUT diagonal > 20cm and Mini-Tablet procedure is not applied. Therefore, SAR tests follow the Tablet Mode in KDB 447498.
2. As in (1), the test distance is 0mm to the flat phantom; SAR evaluation is required for Rear Face and the Edges with the antenna within 5cm to the user.
3. The test distance 10mm is for verifying the conservative condition, whichever DUT proximity sensor maximum activated distance is 11mm. The DUT is set in full-power mode at 10mm test distance to the phantom.
4. For LTE antenna, the antenna distance to the user in Primary Portrait position is 5.5 cm, SAR is not required for this exposure position.
5. For WLAN/BT antenna, the antenna distance to the user in Secondary Portrait position is 6.3 cm, SAR is not required for this exposure position.
6. DUT does not support voice call function; therefore GSM SAR is not required.
7. There is no screen orientation limitation in DUT; that is 4 orientations are supported. The power reduction for SAR compliance is not triggered by the screen orientation, but triggered by proximity sensor when the user is 11mm or closer to the DUT. Therefore, SAR test setup and test result is conservative for real life usage.
8. The proximity sensor is designed to be triggered for Rear Face and Secondary-Landscape exposure positions. During SAR tests for DUT other edges, the sensor is disabled via software setting.
9. Per KDB 447498 4)b)ii)2), SAR evaluation is performed for the rear face and the edge with antenna within 5cm. Screen orientation is not considered in SAR evaluation, and the most conservative exposure condition is considered.

11.2 Simultaneous Transmitting Configurations

< Simultaneous Transmission – Body SAR >

	Combinations	Tablet	Remark
1	GPRS/EDGE WLAN 2.4GHz	✓	WLAN as wireless router
2	WCDMA/HSPA WLAN 2.4GHz	✓	WLAN as wireless router
3	LTE WLAN 2.4GHz	✓	WLAN as wireless router
4	GPRS/EDGE WLAN 5GHz	✓	WLAN as wireless router
5	WCDMA/HSPA WLAN 5GHz	✓	WLAN as wireless router
6	LTE WLAN 5GHz	✓	WLAN as wireless router
7	GPRS/EDGE LTE	x	Note: 1
8	WCDMA/HSPA LTE	x	Note: 1
9	GPRS/EDGE LTE WLAN 2.4GHz	x	Note: 1
10	WCDMA/HSPA LTE WLAN 5GHz	x	Note: 1
11	GPRS/EDGE LTE WLAN 5GHz	x	Note: 1
12	WCDMA/HSPA LTE WLAN 5GHz	x	Note: 1

Note:

1. DUT will choose either LTE or GPRS/EDGE/WCDMA/HSPA according to the network signal condition, LTE network is with higher priority for data connection; therefore, LTE transmission will not exist with GPRS/EDGE or WCDMA/HSPA at the same time.
2. WLAN and Bluetooth share the same antenna and cannot transmit simultaneously
3. Bluetooth output power is < 60/f; per KDB 447498 the standalone SAR is not required, and simultaneous SAR is also not required due to the distance to LTE or 2G/3G antenna > 5cm.
4. Per KDB 447498, 5GHz 802.11a/n power < 60/f and standalone SAR is not required; simultaneous SAR is also not required due to the distance to LTE or 2G/3G antenna > 5cm.
5. 5GHz and 2.4GHz share the same antenna, and will not transmit simultaneously (the transmitting overlapping period will not exceed 30seconds during AP searching/registration).

12. SAR Test Results

12.1 Conducted Power (Unit: dBm)

< Without Power Reduction: GPRS / EDGE 850, 1900>

Band	GSM850			GSM1900		
Channel	128	189	251	512	661	810
Frequency (MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
GPRS 8 (1 Uplink)	32.81	32.79	33.01	29.90	30.08	30.22
GPRS 10 (2 Uplink)	32.23	32.32	32.18	29.37	29.57	29.29
EDGE 8 (GMSK, 1 Uplink) – MCS1	32.72	32.71	32.93	29.79	29.99	30.15
EDGE 10 (GMSK, 2 Uplink) – MCS1	32.14	32.24	32.12	29.35	29.53	29.27
EDGE 8 (8PSK, 1 Uplink) – MCS9	26.76	26.83	26.91	25.73	25.86	25.64
EDGE 10 (8PSK, 2 Uplink) – MCS9	25.70	25.76	25.84	24.68	24.77	24.55

Note:

1. Maximum burst average power in the table above.
2. EDGE tests with MCS1 setting, GMSK modulation. Burst average power with MCS9 setting, 8 PSK modulation, is provided voluntary for reference.
3. Referring to KDB 941225 D03, for GPRS/EDGE body SAR testing, the DUT was set in GPRS multi-slot class 10 with 2 uplink slots due to maximum source-based time-averaged output power as following table:

Source-Based Time-Averaged Power						
Band	GSM850			GSM1900		
Channel	128	189	251	512	661	810
GPRS 8 (1 Uplink)	23.81	23.79	24.01	20.90	21.08	21.22
GPRS 10 (2 Uplink)	26.23	26.32	26.18	23.37	23.57	23.29
EDGE 8 (GMSK, 1 Uplink) – MCS1	23.72	23.71	23.93	20.79	20.99	21.15
EDGE 10 (GMSK, 2 Uplink) – MCS1	26.14	26.24	26.12	23.35	23.53	23.27
EDGE 8 (8PSK, 1 Uplink) – MCS9	17.76	17.83	17.91	16.73	16.86	16.64
EDGE 10 (8PSK, 2 Uplink) – MCS9	19.70	19.76	19.84	18.68	18.77	18.55

Note:
The source-based time-averaged power is linearly scaled the maximum burst averaged power based on time slots, averaged over 1 TDMA frame.
The calculated method are shown as below:
Source based time averaged power = Maximum burst averaged power (1 Uplink) - 9 dB
Source based time averaged power = Maximum burst averaged power (2 Uplink) - 6 dB

<With Power Reduction: GPRS / EDGE 850, 1900>

Band	GSM850			GSM1900		
Channel	128	189	251	512	661	810
Frequency (MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
GPRS 8 (1 Uplink)	27.53	27.73	27.69	23.63	23.74	23.65
GPRS 10 (2 Uplink)	27.36	27.59	27.58	23.58	23.72	23.63
EDGE 8 (GMSK, 1 Uplink) – MCS1	27.62	27.75	27.73	23.55	23.68	23.58
EDGE 10 (GMSK, 2 Uplink) – MCS1	27.36	27.57	27.62	23.55	23.67	23.57
EDGE 8 (8PSK, 1 Uplink) – MCS9	27.20	27.28	27.34	23.62	23.75	23.40
EDGE 10 (8PSK, 2 Uplink) – MCS9	26.14	26.17	26.22	23.62	23.73	23.40

Note:

1. Burst average output power here, and the reduction difference level is from full power and reduction power.
2. The target power reduction value is listed in sec. 3.4.2. The deviation from the specification is due to the tolerance in the measurement.

Source-Based Time-Averaged Power						
Band	GSM850			GSM1900		
Channel	128	189	251	512	661	810
GPRS 8 (1 Uplink)	18.53	18.73	18.69	14.63	14.74	14.65
GPRS 10 (2 Uplink)	21.36	21.59	21.58	17.58	17.72	17.63
EDGE 8 (GMSK, 1 Uplink) – MCS1	18.62	18.75	18.73	14.55	14.68	14.58
EDGE 10 (GMSK, 2 Uplink) – MCS1	21.36	21.57	21.62	17.55	17.67	17.57
EDGE 8 (8PSK, 1 Uplink) – MCS9	18.20	18.28	18.34	14.62	14.75	14.40
EDGE 10 (8PSK, 2 Uplink) – MCS9	20.14	20.17	20.22	17.62	17.73	17.40

Note:
The source-based time-averaged power is linearly scaled the maximum burst averaged power based on time slots, averaged over 1 TDMA frame.
The calculated method are shown as below:
Source based time averaged power = Maximum burst averaged power (1 Uplink) - 9 dB
Source based time averaged power = Maximum burst averaged power (2 Uplink) - 6 dB

Note:

1. Referring to KDB 941225 D03, for GPRS/EDGE body SAR testing, the DUT was set in GPRS multi-slot class 10 with 2 uplink slots due to maximum source-based time-averaged output power for power reduction mode.

Power Reduction Delta Level – Full power and reduction power level

Band	GSM850				GSM1900			
Channel	128	189	251	Target (dB)	512	661	810	Target (dB)
Frequency (MHz)	824.2	836.4	848.8		1850.2	1880	1909.8	
GPRS 8 (1 Uplink) – CS1	5.28	5.06	5.32	5	6.27	6.34	6.57	6.5
GPRS 10 (2 Uplink) – CS1	4.87	4.73	4.6	5	5.79	5.85	5.66	6
EDGE 8 (1 Uplink) – MCS1	5.1	4.96	5.2	5	6.24	6.31	6.57	6.5
EDGE 10 (2 Uplink) – MCS1	4.78	4.67	4.5	5	5.8	5.86	5.7	6
EDGE 8 (1 Uplink) – MCS9	-0.44	-0.45	-0.43	0	2.11	2.11	2.24	2
EDGE 10 (2 Uplink) – MCS9	-0.44	-0.41	-0.38	0	1.06	1.04	1.15	1

Note:

1. Burst average output power here
2. The target power reduction value is listed in sec. 3.4.2. The deviation from the specification is due to the tolerance in the measurement.

< Without Power Reduction: WCDMA Band V, II >

Band	WCDMA V			WCDMA II		
Channel	4132	4182	4233	9262	9400	9538
Frequency	826.4	836.4	846.6	1852.4	1880	1907.6
RMC 12.2K	24.18	24.29	24.34	24.19	24.23	24.05
HSDPA Subtest-1	24.11	24.15	24.27	24.18	24.14	23.91
HSDPA Subtest-2	24.13	24.26	24.33	23.98	24.01	23.92
HSDPA Subtest-3	23.08	23.18	23.17	22.62	22.73	22.51
HSDPA Subtest-4	23.09	23.11	23.18	22.63	22.75	22.58
HSUPA Subtest-1	23.24	23.97	23.59	23.77	23.79	23.63
HSUPA Subtest-2	22.06	22.19	22.26	22.06	22.30	22.00
HSUPA Subtest-3	22.21	22.50	22.66	22.81	22.99	22.67
HSUPA Subtest-4	22.27	22.22	22.68	22.86	22.85	22.85
HSUPA Subtest-5	23.31	23.89	23.57	23.76	24.02	23.90

MPR							
0	HSDPA Subtest-1	0.00	0.00	0.00	0.00	0.00	0.00
0	HSDPA Subtest-2	-0.02	-0.11	-0.06	0.20	0.13	-0.01
0.5	HSDPA Subtest-3	1.03	0.97	1.10	1.56	1.41	1.40
0.5	HSDPA Subtest-4	1.02	1.04	1.09	1.55	1.39	1.33
0	HSUPA Subtest-1	0.00	0.00	0.00	0.00	0.00	0.00
2	HSUPA Subtest-2	1.18	1.78	1.33	1.71	1.49	1.63
1	HSUPA Subtest-3	1.03	1.47	0.93	0.96	0.80	0.96
2	HSUPA Subtest-4	0.97	1.75	0.91	0.91	0.94	0.78
0	HSUPA Subtest-5	-0.07	0.08	0.02	0.01	-0.23	-0.27

Note:

1. Referring to KDB 941225 D01, RMC 12.2kbps setting is used for all SAR tests. If HSDPA and HSUPA output power is less than 1/4 dB higher than RMC 12.2kbps, SAR tests for HSDPA and HSUPA can be excluded.
2. DUT HSUPA subtests output power is declared to follow the minimum requirement of 3GPP Table 5.2B.5 specification, HSDPA subtests output power is declared to follow the minimum requirement of 3GPP Table 5.2AA.2 specification. Since there is tolerance in measuring 3G output power, the difference between the measured value and the specification is treated as tolerance. According to KDB 941225 D02 v02, 1)b), the MPR implementation information is provided here.

<With Power Reduction: WCDMA Band V, II >

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
RMC 12.2K	20.54	20.66	20.73	18.00	18.11	17.97
HSDPA Subtest-1	20.56	20.59	20.69	17.77	17.72	17.36
HSDPA Subtest-2	20.58	20.64	20.72	17.59	17.70	17.30
HSDPA Subtest-3	19.27	19.52	19.10	16.58	16.36	16.02
HSDPA Subtest-4	19.32	19.52	19.10	16.60	16.41	16.14
HSUPA Subtest-1	20.18	20.05	20.45	17.67	17.88	17.46
HSUPA Subtest-2	18.34	18.41	18.60	15.97	16.05	15.96
HSUPA Subtest-3	18.97	18.95	18.92	16.77	16.60	16.40
HSUPA Subtest-4	18.94	19.06	18.62	16.52	16.51	16.28
HSUPA Subtest-5	20.11	19.96	19.82	17.54	17.84	17.41

MPR							
0	HSDPA Subtest-1	0.00	0.00	0.00	0.00	0.00	0.00
0	HSDPA Subtest-2	-0.02	-0.05	-0.03	0.18	0.02	0.06
0.5	HSDPA Subtest-3	1.29	1.07	1.59	1.19	1.36	1.34
0.5	HSDPA Subtest-4	1.24	1.07	1.59	1.17	1.31	1.22
0	HSUPA Subtest-1	0.00	0.00	0.00	0.00	0.00	0.00
2	HSUPA Subtest-2	1.84	1.64	1.85	1.70	1.83	1.50
1	HSUPA Subtest-3	1.21	1.10	1.53	0.90	1.28	1.06
2	HSUPA Subtest-4	1.24	0.99	1.83	1.15	1.37	1.18
0	HSUPA Subtest-5	0.07	0.09	0.63	0.13	0.04	0.05

Note:

1. Referring to KDB 941225 D01, RMC 12.2kbps setting is used for all SAR tests. If HSDPA and HSUPA output power is less than 1/4 dB higher than RMC 12.2kbps, SAR tests for HSDPA and HSUPA can be excluded.
2. In power reduction mode, testing SAR only in RMC 12.2kbps is still applicable.
   The target power reduction value is listed in sec. 3.4.2. The deviation from the specification is due to the tolerance in the measurement.

Power Reduction Delta Level – Full power and reduction power level

Band	WCDMA Band V				WCDMA Band II			
Channel	4132	4182	4233	Target Reduction (dB)	9262	9400	9538	Target Reduction (dB)
Frequency (MHz)	826.4	836.4	846.6		1852.4	1880	1907.6	
RMC 12.2K	3.64	3.63	3.61	4	6.19	6.12	6.08	6.5
HSDPA Subtest-1	3.55	3.56	3.58	4	6.41	6.42	6.55	6.5
HSDPA Subtest-2	3.55	3.62	3.61	4	6.39	6.31	6.62	6.5
HSDPA Subtest-3	3.81	3.66	4.07	4	6.04	6.37	6.49	6.5
HSDPA Subtest-4	3.77	3.59	4.08	4	6.03	6.34	6.44	6.5
HSUPA Subtest-1	3.06	3.92	3.14	4	6.1	5.91	6.17	6.5
HSUPA Subtest-2	3.72	3.78	3.66	4	6.09	6.25	6.04	6.5
HSUPA Subtest-3	3.24	3.55	3.74	4	6.04	6.39	6.27	6.5
HSUPA Subtest-4	3.33	3.16	4.06	4	6.34	6.34	6.57	6.5
HSUPA Subtest-5	3.2	3.93	3.75	4	6.22	6.18	6.49	6.5

Note:

1. The target power reduction value is listed in sec. 3.4.2. The deviation from the specification is due to the tolerance in the measurement.

<Without Power Reduction: LTE band 4>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power [dBm]	HTC MPR Target (dB)	MPR Result (dB)
1715	20000	10	1	0	QPSK	23.19	0	0
1715	20000	10	1	49	QPSK	23.14	0	0.05
1715	20000	10	25	13	QPSK	21.96	1	1.23
1715	20000	10	50	0	QPSK	21.9	1	1.29
1715	20000	10	1	0	16-QAM	22.3	1	0.89
1715	20000	10	1	49	16-QAM	22.26	1	0.93
1715	20000	10	25	13	16-QAM	21.28	2	1.91
1715	20000	10	50	0	16-QAM	20.99	2	2.2
1712.5	19975	5	1	0	QPSK	23.25	0	0
1712.5	19975	5	1	24	QPSK	23.23	0	0.02
1712.5	19975	5	12	6	QPSK	22.02	1	1.23
1712.5	19975	5	25	0	QPSK	21.99	1	1.26
1712.5	19975	5	1	0	16-QAM	22.35	1	0.9
1712.5	19975	5	1	24	16-QAM	22.23	1	1.02
1712.5	19975	5	12	6	16-QAM	21.01	2	2.24
1712.5	19975	5	25	0	16-QAM	21.47	2	1.78
1732.5	20175	10	1	0	QPSK	23.17	0	0.03
1732.5	20175	10	1	49	QPSK	23.20	0	0.00
1732.5	20175	10	25	13	QPSK	22.15	1	1.05
1732.5	20175	10	50	0	QPSK	22.17	1	1.03
1732.5	20175	10	1	0	16-QAM	22.24	1	0.96
1732.5	20175	10	1	49	16-QAM	22.34	1	0.86
1732.5	20175	10	25	13	16-QAM	21.48	2	1.72
1732.5	20175	10	50	0	16-QAM	21.12	2	2.08
1732.5	20175	5	1	0	QPSK	23.16	0	0.08
1732.5	20175	5	1	24	QPSK	23.24	0	0.00
1732.5	20175	5	12	6	QPSK	22.06	1	1.18
1732.5	20175	5	25	0	QPSK	22.03	1	1.21
1732.5	20175	5	1	0	16-QAM	22.36	1	0.88
1732.5	20175	5	1	24	16-QAM	22.36	1	0.88
1732.5	20175	5	12	6	16-QAM	20.88	2	2.36
1732.5	20175	5	25	0	16-QAM	21.42	2	1.82

1750	20350	10	1	0	QPSK	23.25	0	0
1750	20350	10	1	49	QPSK	23.09	0	0.16
1750	20350	10	25	13	QPSK	22.12	1	1.13
1750	20350	10	50	0	QPSK	22.12	1	1.13
1750	20350	10	1	0	16-QAM	22.38	1	0.87
1750	20350	10	1	49	16-QAM	22.3	1	0.95
1750	20350	10	25	13	16-QAM	21.4	2	1.85
1750	20350	10	50	0	16-QAM	21.11	2	2.14
1752.5	20375	5	1	0	QPSK	23.25	0	0
1752.5	20375	5	1	24	QPSK	23.14	0	0.11
1752.5	20375	5	12	6	QPSK	22.01	1	1.24
1752.5	20375	5	25	0	QPSK	21.97	1	1.28
1752.5	20375	5	1	0	16-QAM	22.35	1	0.9
1752.5	20375	5	1	24	16-QAM	22.3	1	0.95
1752.5	20375	5	12	6	16-QAM	20.89	2	2.36
1752.5	20375	5	25	0	16-QAM	21.51	2	1.74

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.

<With Power Reduction: LTE band 4>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power [dBm]	HTC MPR Target (dB)	MPR Result (dB)	Power Reduction by Proximity Sensor (dB)
1715	20000	10	1	0	QPSK	18.4	-	-	4.79
1715	20000	10	1	49	QPSK	18.34	-	-	4.85
1715	20000	10	25	13	QPSK	18.15	-	-	5.04
1715	20000	10	50	0	QPSK	18.13	-	-	5.06
1715	20000	10	1	0	16-QAM	18.65	-	-	4.54
1715	20000	10	1	49	16-QAM	18.57	-	-	4.62
1715	20000	10	25	13	16-QAM	18.68	-	-	4.51
1715	20000	10	50	0	16-QAM	18.22	-	-	4.97
1712.5	19975	5	1	0	QPSK	18.42	-	-	4.83
1712.5	19975	5	1	24	QPSK	18.4	-	-	4.85
1712.5	19975	5	12	6	QPSK	18.27	-	-	4.98
1712.5	19975	5	25	0	QPSK	18.23	-	-	5.02

1712.5	19975	5	1	0	16-QAM	18.63	-	-	4.62
1712.5	19975	5	1	24	16-QAM	18.58	-	-	4.67
1712.5	19975	5	12	6	16-QAM	18.15	-	-	5.1
1712.5	19975	5	25	0	16-QAM	18.78	-	-	4.47
1732.5	20175	10	1	0	QPSK	18.04	-	-	5.13
1732.5	20175	10	1	49	QPSK	18.04	-	-	5.13
1732.5	20175	10	25	13	QPSK	18.23	-	-	4.94
1732.5	20175	10	50	0	QPSK	18.22	-	-	4.95
1732.5	20175	10	1	0	16-QAM	18.49	-	-	4.68
1732.5	20175	10	1	49	16-QAM	18.48	-	-	4.69
1732.5	20175	10	25	13	16-QAM	18.6	-	-	4.57
1732.5	20175	10	50	0	16-QAM	18.36	-	-	4.81
1732.5	20175	5	1	0	QPSK	18.39	-	-	4.77
1732.5	20175	5	1	24	QPSK	18.37	-	-	4.79
1732.5	20175	5	12	6	QPSK	18.23	-	-	4.93
1732.5	20175	5	25	0	QPSK	18.2	-	-	4.96
1732.5	20175	5	1	0	16-QAM	18.53	-	-	4.63
1732.5	20175	5	1	24	16-QAM	18.55	-	-	4.61
1732.5	20175	5	12	6	16-QAM	18.15	-	-	5.01
1732.5	20175	5	25	0	16-QAM	18.69	-	-	4.47
1750	20350	10	1	0	QPSK	18.36	-	-	4.89
1750	20350	10	1	49	QPSK	18.32	-	-	4.93
1750	20350	10	25	13	QPSK	18.23	-	-	5.02
1750	20350	10	50	0	QPSK	18.22	-	-	5.03
1750	20350	10	1	0	16-QAM	18.57	-	-	4.68
1750	20350	10	1	49	16-QAM	18.5	-	-	4.75
1750	20350	10	25	13	16-QAM	18.73	-	-	4.52
1750	20350	10	50	0	16-QAM	18.3	-	-	4.95
1752.5	20375	5	1	0	QPSK	18.37	-	-	4.88
1752.5	20375	5	1	24	QPSK	18.33	-	-	4.92
1752.5	20375	5	12	6	QPSK	18.08	-	-	5.17
1752.5	20375	5	25	0	QPSK	18.17	-	-	5.08
1752.5	20375	5	1	0	16-QAM	18.57	-	-	4.68
1752.5	20375	5	1	24	16-QAM	18.51	-	-	4.74
1752.5	20375	5	12	6	16-QAM	18.02	-	-	5.23
1752.5	20375	5	25	0	16-QAM	18.61	-	-	4.64

Note: During proximity sensor activated and power reduction enabled, the LTE output is reduced to certain level, while MPR for different RB configurations is disabled. The power reduction is based on the normal maximum output power.

<Without Power Reduction: LTE band 17>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power [dBm]	HTC MPR Target (dB)	MPR Result (dB)
709	23780	10	1	0	QPSK	23.05	0	0.00
709	23780	10	1	49	QPSK	22.97	0	0.08
709	23780	10	25	13	QPSK	21.99	1	1.06
709	23780	10	50	0	QPSK	22.15	1	0.90
709	23780	10	1	0	16-QAM	22.27	1	0.78
709	23780	10	1	49	16-QAM	22.20	1	0.85
709	23780	10	25	13	16-QAM	21.45	2	1.60
709	23780	10	50	0	16-QAM	21.16	2	1.89
706.5	23755	5	1	0	QPSK	23.05	0	0.01
706.5	23755	5	1	24	QPSK	23.06	0	0.00
706.5	23755	5	12	6	QPSK	21.85	1	1.21
706.5	23755	5	25	0	QPSK	21.88	1	1.18
706.5	23755	5	1	0	16-QAM	22.21	1	0.85
706.5	23755	5	1	24	16-QAM	22.21	1	0.85
706.5	23755	5	12	6	16-QAM	20.78	2	2.28
706.5	23755	5	25	0	16-QAM	21.45	2	1.61
710	23790	10	1	0	QPSK	22.63	0	0.39
710	23790	10	1	49	QPSK	23.02	0	0
710	23790	10	25	13	QPSK	22.18	1	0.84
710	23790	10	50	0	QPSK	22	1	1.02
710	23790	10	1	0	16-QAM	22.03	1	0.99
710	23790	10	1	49	16-QAM	22.28	1	0.74
710	23790	10	25	13	16-QAM	21.55	2	1.47
710	23790	10	50	0	16-QAM	21.04	2	1.98
710	23790	5	1	0	QPSK	22.88	0	0.2
710	23790	5	1	24	QPSK	23.08	0	0
710	23790	5	12	6	QPSK	21.98	1	1.1
710	23790	5	25	0	QPSK	22	1	1.08
710	23790	5	1	0	16-QAM	22.06	1	1.02
710	23790	5	1	24	16-QAM	22.33	1	0.75
710	23790	5	12	6	16-QAM	20.98	2	2.1

710	23790	5	25	0	16-QAM	21.65	2	1.43
711	23800	10	1	0	QPSK	22.61	0	0
711	23800	10	1	49	QPSK	22.40	0	0.33
711	23800	10	25	13	QPSK	21.55	1	0.68
711	23800	10	50	0	QPSK	21.40	1	0.83
711	23800	10	1	0	16-QAM	22.09	1	0.59
711	23800	10	1	49	16-QAM	21.65	1	0.79
711	23800	10	25	13	16-QAM	21.18	2	1.14
711	23800	10	50	0	16-QAM	20.66	2	1.78
713.5	23825	5	1	0	QPSK	22.9	0	0
713.5	23825	5	1	24	QPSK	22.18	0	0.78
713.5	23825	5	12	6	QPSK	21.42	1	1.6
713.5	23825	5	25	0	QPSK	21.17	1	1.76
713.5	23825	5	1	0	16-QAM	22.37	1	0.82
713.5	23825	5	1	24	16-QAM	21.72	1	1.52
713.5	23825	5	12	6	16-QAM	20.51	2	2.58
713.5	23825	5	25	0	16-QAM	20.78	2	2.18

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.

<With Power Reduction: LTE band 17>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power [dBm]	HTC MPR Target (dB)	MPR Result (dB)	Power Reduction by Proximity Sensor (dB)
709	23780	10	1	0	QPSK	22.01	-	-	1.04
709	23780	10	1	49	QPSK	21.98	-	-	1.07
709	23780	10	25	13	QPSK	21.89	-	-	1.16
709	23780	10	50	0	QPSK	22.07	-	-	0.98
709	23780	10	1	0	16-QAM	22.18	-	-	0.87
709	23780	10	1	49	16-QAM	22.22	-	-	0.83
709	23780	10	25	13	16-QAM	21.48	-	-	1.57
709	23780	10	50	0	16-QAM	21.12	-	-	1.93
706.5	23755	5	1	0	QPSK	22.02	-	-	1.03
706.5	23755	5	1	24	QPSK	22.11	-	-	0.94
706.5	23755	5	12	6	QPSK	21.79	-	-	1.26
706.5	23755	5	25	0	QPSK	21.80	-	-	1.25
706.5	23755	5	1	0	16-QAM	22.23	-	-	0.82
706.5	23755	5	1	24	16-QAM	22.22	-	-	0.83
706.5	23755	5	12	6	16-QAM	20.73	-	-	2.32
706.5	23755	5	25	0	16-QAM	21.48	-	-	1.57
710	23790	10	1	0	QPSK	22.06	-	-	0.57
710	23790	10	1	49	QPSK	22.21	-	-	0.42
710	23790	10	25	13	QPSK	22.44	-	-	0.19
710	23790	10	50	0	QPSK	22.43	-	-	0.2
710	23790	10	1	0	16-QAM	22.17	-	-	0.46
710	23790	10	1	49	16-QAM	22.38	-	-	0.25
710	23790	10	25	13	16-QAM	21.61	-	-	1.02
710	23790	10	50	0	16-QAM	21.59	-	-	1.04
710	23790	5	1	0	QPSK	21.95	-	-	0.93
710	23790	5	1	24	QPSK	22.2	-	-	0.68
710	23790	5	12	6	QPSK	22.08	-	-	0.8
710	23790	5	25	0	QPSK	22.02	-	-	0.86
710	23790	5	1	0	16-QAM	22.11	-	-	0.77
710	23790	5	1	24	16-QAM	22.35	-	-	0.53
710	23790	5	12	6	16-QAM	21.01	-	-	1.87

710	23790	5	25	0	16-QAM	21.72	-	-	1.16
711	23800	10	1	0	QPSK	22.18	-	-	0.44
711	23800	10	1	49	QPSK	21.73	-	-	0.89
711	23800	10	25	13	QPSK	22.31	-	-	0.31
711	23800	10	50	0	QPSK	22.13	-	-	0.49
711	23800	10	1	0	16-QAM	22.35	-	-	0.27
711	23800	10	1	49	16-QAM	21.8	-	-	0.82
711	23800	10	25	13	16-QAM	21.52	-	-	1.1
711	23800	10	50	0	16-QAM	21.34	-	-	1.28
713.5	23825	5	1	0	QPSK	22.73	-	-	0.57
713.5	23825	5	1	24	QPSK	21.76	-	-	1.54
713.5	23825	5	12	6	QPSK	21.96	-	-	1.34
713.5	23825	5	25	0	QPSK	21.88	-	-	1.42
713.5	23825	5	1	0	16-QAM	22.68	-	-	0.62
713.5	23825	5	1	24	16-QAM	21.67	-	-	1.63
713.5	23825	5	12	6	16-QAM	21	-	-	2.3
713.5	23825	5	25	0	16-QAM	21.28	-	-	2.02

Note: During proximity sensor activated and power reduction enabled, the LTE output is reduced to certain level, while MPR for different RB configurations is disabled. The power reduction is based on the normal maximum output power.

LTE Target MPR level

The device implements maximum power reduction per 3GPP 36.101 requirements where the MPR target is as below table. The MPR settings are implemented configured into firmware and cannot be disabled by the end user or LTE carrier network.

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						HTC MPR (dB) Target	3GPP MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	2	≤ 2

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

<WLAN - Without Power Reduction>

Band	802.11b			802.11g		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Power	19.01	19.49	19.75	13.59	13.92	14.70

Band	802.11n (BW 20MHz)		
Channel	1	6	11
Frequency (MHz)	2412	2437	2462
Power	12.29	12.72	13.08

Band	802.11a											
Channel	36	40	44	48	52	56	60	64	100	104	108	112
Frequency (MHz)	5180	5200	5220	5240	5260	5280	5300	5320	5500	5520	5540	5560
Average Power	9.13	9.28	9.6	9.18	9.11	9.51	9.14	8.89	8.96	9.24	9.28	9.29

Band	802.11a											
Channel	116	120	124	128	132	136	140	149	153	157	161	165
Frequency (MHz)	5580	5600	5620	5640	5660	5680	5700	5745	5765	5785	5805	5825
Average Power	8.93	9.48	8.95	8.92	9.44	9.47	9.59	8.78	9.5	9.22	9.35	9.57

Band	802.11n (BW 20MHz)											
Channel	36	40	44	48	52	56	60	64	100	104	108	112
Frequency (MHz)	5180	5200	5220	5240	5260	5280	5300	5320	5500	5520	5540	5560
Average Power	9.46	9.24	9.35	9.19	9.04	9.5	9.84	9.74	9.29	9.05	9.06	9.01

Band	802.11n (BW 20MHz)											
Channel	116	120	124	128	132	136	140	149	153	157	161	165
Frequency (MHz)	5580	5600	5620	5640	5660	5680	5700	5745	5765	5785	5805	5825
Average Power	9.64	9.72	9.42	8.82	9.39	9.35	9.5	9.58	9.15	9.07	9.46	9.44

Channel	Frequency	Bluetooth RF Peak Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	1.55	4.29	2.10
Ch39	2441MHz	2.94	5.72	3.52
Ch78	2480MHz	3.12	5.86	3.47

Note:

1. Per KDB 248227, choose 11b mode to test SAR; 11g and 11n output power is less than 11b mode, and SAR can be excluded.
2. Per KDB 447498, 11a SAR is excluded due to output power < 60/f, where 60/f = 10mW = 10dBm.
3. Per 2010/4 TCB workshop, choose the highest output power channel to test SAR and determine further SAR exclusion, and 11b CH11 is chosen here.
4. Per KDB 447498 and KDB 248227, if the 1st measured SAR <0.8W/kg, remaining channels SAR can be excluded.
5. Bluetooth standalone SAR is not required because the Bluetooth peak power (5.86 dBm) is less than 60/f. Bluetooth average power will be smaller than peak power.

12.2 Test Records for Body SAR Test

<2G/3G with P-Sensor Deactivate without power reduction (Full Power) SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Average Power (dBm)	Ear-phone	SAR_{1g} (W/kg)	SAR_{10g} (W/kg)
1	GSM850	GPRS10	Rear Face	1	189	32.32	v	0.597	0.355
2	GSM850	GPRS10	Secondary Landscape	1	189	32.32	-	**0.6**	0.345
3	GSM850	GPRS10	Secondary Portrait	0	189	32.32	v	0.177	0.1
9	GSM1900	GPRS10	Rear Face	1	661	29.57	v	0.786	0.454
10	GSM1900	GPRS10	Secondary Landscape	1	661	29.57	-	0.805	0.459
11	GSM1900	GPRS10	Secondary Portrait	0	661	29.57	v	0.327	0.174
17	GSM1900	GPRS10	Secondary Landscape	1	512	29.37	-	**0.841**	0.483
18	GSM1900	GPRS10	Secondary Landscape	1	810	29.29	-	0.628	0.361
5	WCDMA V	RMC 12.2K	Rear Face	1	4233	24.34	v	**0.465**	0.293
6	WCDMA V	RMC 12.2K	Secondary Landscape	1	4233	24.34	-	0.449	0.26
7	WCDMA V	RMC 12.2K	Secondary Portrait	0	4233	24.34	v	0.146	0.083
13	WCDMA II	RMC 12.2K	Rear Face	1	9400	24.23	v	0.918	0.533
14	WCDMA II	RMC 12.2K	Secondary Landscape	1	9400	24.23	-	1.26	0.707
15	WCDMA II	RMC 12.2K	Secondary Portrait	0	9400	24.23	v	0.681	0.333
16	WCDMA II	RMC 12.2K	Secondary Landscape	1	9262	24.19	-	**1.53**	0.846
19	WCDMA II	RMC 12.2K	Secondary Landscape	1	9538	24.05	-	1.26	0.695
21	WCDMA II	RMC 12.2K	Rear Face	1	9262	24.19	v	0.716	0.417
22	WCDMA II	RMC 12.2K	Rear Face	1	9538	24.05	v	0.648	0.379

Note: 1 cm test results are for confirming operation of the power reduction scheme, and are not applicable for compliance demonstration for the FCC tablet PC SAR test procedures

<LTE with P-Sensor Deactivate without power reduction (Full Power) SAR>

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Gap (cm)	Ch.	Average Power (dBm)	MPR Target (dB)	MPR Result (dB)	Ear-phone	SAR_{1g} (W/kg)	SAR_{10g} (W/kg)
23	LTE Band17	QPSK	10M	25	13	Rear Face	1	23790	22.18	1	0.84	v	0.323	0.201
24	LTE Band17	QPSK	10M	25	13	Secondary Landscape	1	23790	22.18	1	0.84	-	0.298	0.191
27	LTE Band17	QPSK	10M	1	0	Rear Face	1	23790	22.63	0	0.39	v	0.377	0.232
28	LTE Band17	QPSK	10M	1	0	Secondary Landscape	1	23790	22.63	0	0.39	-	0.304	0.195
31	LTE Band17	QPSK	10M	1	49	Rear Face	1	23790	23.02	0	0	v	0.38	0.235
32	LTE Band17	QPSK	10M	1	49	Secondary Landscape	1	23790	23.02	0	0	-	0.304	0.195
35	LTE Band17	16QAM	10M	25	13	Rear Face	1	23790	21.55	2	1.47	v	0.328	0.205
36	LTE Band17	16QAM	10M	25	13	Secondary Landscape	1	23790	21.55	2	1.47	-	0.298	0.191
39	LTE Band17	16QAM	10M	1	0	Rear Face	1	23790	22.03	1	0.99	v	0.342	0.213
40	LTE Band17	16QAM	10M	1	0	Secondary Landscape	1	23790	22.03	1	0.99	-	0.293	0.189
43	LTE Band17	16QAM	10M	1	49	Rear Face	1	23790	22.28	1	0.74	v	0.339	0.211
44	LTE Band17	16QAM	10M	1	49	Secondary Landscape	1	23790	22.28	1	0.74	-	0.296	0.191
48	LTE Band4	QPSK	10M	25	13	Rear Face	1	20175	22.15	1	1.05	v	0.63	0.366
49	LTE Band4	QPSK	10M	25	13	Secondary Landscape	1	20175	22.15	1	1.05	-	0.927	0.529
50	LTE Band4	QPSK	10M	25	13	Secondary Portrait	0	20175	22.15	1	1.05	v	0.428	0.219
72	LTE Band4	QPSK	10M	25	13	Secondary Landscape	1	20000	21.96	1	1.23	-	0.881	0.495
73	LTE Band4	QPSK	10M	25	13	Secondary Landscape	1	20350	22.12	1	1.13	-	0.997	0.558
52	LTE Band4	QPSK	10M	1	0	Rear Face	1	20175	23.17	0	0.03	v	0.646	0.377
53	LTE Band4	QPSK	10M	1	0	Secondary Landscape	1	20350	23.25	0	0	-	1.03	0.58
54	LTE Band4	QPSK	10M	1	0	Secondary Portrait	0	20175	23.17	0	0.03	v	0.46	0.235
56	LTE Band4	QPSK	10M	1	49	Rear Face	1	20175	23.20	0	0.00	v	0.582	0.341

57	LTE Band4	QPSK	10M	1	49	Secondary Landscape	1	20350	23.09	0	0.16	-	1.02	0.572
58	LTE Band4	QPSK	10M	1	49	Secondary Portrait	0	20175	22.34	1	0.86	v	0.466	0.237
60	LTE Band4	16QAM	10M	25	13	Rear Face	1	20175	21.48	2	1.72	v	0.563	0.33
61	LTE Band4	16QAM	10M	25	13	Secondary Landscape	1	20350	21.4	2	1.85	-	0.986	0.554
62	LTE Band4	16QAM	10M	25	13	Secondary Portrait	0	20175	21.48	2	1.72	v	0.441	0.225
64	LTE Band4	16QAM	10M	1	0	Rear Face	1	20175	22.24	1	0.96	v	0.578	0.338
65	LTE Band4	16QAM	10M	1	0	Secondary Landscape	1	20350	22.38	1	0.87	-	1.02	0.57
66	LTE Band4	16QAM	10M	1	0	Secondary Portrait	0	20175	22.24	1	0.96	v	0.453	0.231
68	LTE Band4	16QAM	10M	1	49	Rear Face	1	20175	22.34	1	0.86	v	0.587	0.344
69	LTE Band4	16QAM	10M	1	49	Secondary Landscape	1	20350	22.3	1	0.95	-	1.01	0.569
70	LTE Band4	16QAM	10M	1	49	Secondary Portrait	0	20175	22.34	1	0.86	v	0.466	0.237

Note:

1. 1 cm test results are for confirming operation of the power reduction scheme, and are not applicable for compliance demonstration for the FCC tablet PC SAR test procedures
2. SAR data of Secondary Portrait position is submitted voluntarily.

<2G/3G with P-Sensor Activate with Reduction Power SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Average Power (dBm)	P Sensor (dB)	Ear-phone	SAR_{1g} (W/kg)	SAR_{10g} (W/kg)
1	GSM850	GPRS10	Rear Face	0	189	27.59	4.73	v	0.372	0.217
2	GSM850	GPRS10	Secondary Landscape	0	189	27.59	4.73	-	**0.745**	0.38
5	GSM1900	GPRS10	Rear Face	0	661	23.72	5.85	v	0.57	0.303
6	GSM1900	GPRS10	Secondary Landscape	0	661	23.72	5.85	-	**1.16**	0.56
7	GSM1900	GPRS10	Secondary Landscape	0	512	23.58	5.79	-	0.974	0.476
8	GSM1900	GPRS10	Secondary Landscape	0	810	23.63	5.66	-	1.11	0.538
3	WCDMA V	RMC 12.2K	Rear Face	0	4233	20.73	3.61	v	0.608	0.323
4	WCDMA V	RMC 12.2K	Secondary Landscape	0	4233	20.73	3.61	-	**0.777**	0.366
9	WCDMA II	RMC 12.2K	Rear Face	0	9400	18.11	6.12	v	0.596	0.317
10	WCDMA II	RMC 12.2K	Secondary Landscape	0	9400	18.11	6.12	-	**1.41**	0.687
11	WCDMA II	RMC 12.2K	Secondary Landscape	0	9262	18	6.19	-	1.23	0.602
12	WCDMA II	RMC 12.2K	Secondary Landscape	0	9538	17.97	6.08	-	1.22	0.592

<LTE with P-Sensor Activate with Reduction Power SAR >

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Gap (cm)	Ch.	Average Power (dBm)	P Sensor (dB)	MPR Target (dB)	MPR Result (dB)	Ear-phone	SAR_{1g} (W/kg)	SAR_{10g} (W/kg)
13	LTE Band17	QPSK	10M	25	13	Rear Face	0	23790	22.44	0.19	-	-	v	0.942	0.497
15	LTE Band17	QPSK	10M	25	13	Rear Face	0	23780	21.89	1.16	-	-	v	**1.14**	0.608
16	LTE Band17	QPSK	10M	25	13	Rear Face	0	23800	22.31	0.31	-	-	v	0.886	0.471
17	LTE Band17	QPSK	10M	1	0	Rear Face	0	23780	22.01	1.04	-	-	v	0.951	0.516
18	LTE Band17	QPSK	10M	1	49	Rear Face	0	23780	21.98	1.07	-	-	v	0.998	0.532
14	LTE Band17	QPSK	10M	25	13	Secondary Landscape	0	23790	22.44	0.19	-	-	-	0.818	0.448
40	LTE Band17	QPSK	10M	25	13	Secondary Landscape	0	23780	21.89	1.16	-	-	-	0.832	0.457
41	LTE Band17	QPSK	10M	25	13	Secondary Landscape	0	23800	22.31	0.31	-	-	-	0.702	0.385
19	LTE Band17	QPSK	10M	1	0	Secondary Landscape	0	23780	22.01	1.04	-	-	-	0.832	0.459
20	LTE Band17	QPSK	10M	1	49	Secondary Landscape	0	23780	21.98	1.07	-	-	-	0.836	0.46
42	LTE Band17	16QAM	10M	25	13	Rear Face	0	23780	21.48	1.57	-	-	v	0.936	0.455
43	LTE Band17	16QAM	10M	1	0	Rear Face	0	23780	22.18	0.87	-	-	v	0.985	0.507
44	LTE Band17	16QAM	10M	1	49	Rear Face	0	23780	22.22	0.83	-	-	v	**0.986**	0.508
37	LTE Band17	16QAM	10M	25	13	Secondary Landscape	0	23780	21.48	1.57	-	-	-	0.825	0.454
38	LTE Band17	16QAM	10M	1	0	Secondary Landscape	0	23780	22.18	0.87	-	-	-	0.845	0.466
39	LTE Band17	16QAM	10M	1	49	Secondary Landscape	0	23780	22.22	0.83	-	-	-	0.851	0.468
21	LTE Band4	QPSK	10M	25	13	Rear Face	0	20175	18.23	4.94	-	-	v	0.778	0.388
24	LTE Band4	QPSK	10M	1	0	Rear Face	0	20175	18.04	5.13	-	-	v	0.695	0.365
25	LTE Band4	QPSK	10M	1	49	Rear Face	0	20175	18.04	5.13	-	-	v	0.697	0.366
26	LTE Band4	QPSK	10M	25	13	Secondary Landscape	0	20175	18.23	4.94	-	-	-	1.19	0.598
35	LTE Band4	QPSK	10M	25	13	Secondary Landscape	0	20000	18.15	5.04	-	-	-	1	0.5

36	LTE Band4	QPSK	10M	25	13	Secondary Landscape	0	20350	18.23	5.02	-	-	-	1.22	0.599
27	LTE Band4	QPSK	10M	1	0	Secondary Landscape	0	20350	18.36	4.89	-	-	-	**1.24**	0.611
28	LTE Band4	QPSK	10M	1	49	Secondary Landscape	0	20350	18.32	4.93	-	-	-	1.24	0.608
29	LTE Band4	16QAM	10M	25	13	Rear Face	0	20175	18.6	4.57	-	-	v	0.727	0.382
30	LTE Band4	16QAM	10M	1	0	Rear Face	0	20175	18.49	4.68	-	-	v	0.695	0.366
31	LTE Band4	16QAM	10M	1	49	Rear Face	0	20175	18.48	4.69	-	-	v	0.696	0.366
32	LTE Band4	16QAM	10M	25	13	Secondary Landscape	0	20350	18.73	4.52	-	-	-	1.25	0.616
33	LTE Band4	16QAM	10M	1	0	Secondary Landscape	0	20350	18.57	4.68	-	-	-	**1.27**	0.624
34	LTE Band4	16QAM	10M	1	49	Secondary Landscape	0	20350	18.5	4.75	-	-	-	1.27	0.621

Note:

1. For body SAR testing, the DUT was set in GPRS multi-slot class 10 with 2 uplink slots due to maximum source-based time-averaged output power.
2. Per KDB 941225 D05, for LTE, if the smaller bandwidth output power is within +/- 0.5dB of the largest bandwidth, and the maximum SAR of the largest bandwidth is < 1.45 W/kg, SAR for smaller bandwidth can be excluded. Therefore LTE 5MHz bandwidth SAR tests are excluded..
3. Per KDB 941225 D05, for LTE, if 50%-RB QPSK/16QAM SAR < 1.45 W/kg, 100%-RB SAR can be excluded.
4. During proximity sensor activated and power reduction enabled, the LTE output is reduced to certain level, while MPR for different RB configurations is disabled. Therefore the MPR level are not applicable
5. If the highest output channel SAR for each exposure position is ≤ 0.8 W/kg, other channels SAR tests are not necessary referring to KDB 941225.

<WLAN with P-Sensor Deactivate without power reduction (Full Power) SAR>

Plot No.	Band	Mode	Test Position	Gape (cm)	Channel	Average Power(dBm)	SAR_{1g} (W/kg)
78	802.11b	-	Rear Face	0	11	19.75	0.599
79	802.11b	-	Primary Landscape	0	11	19.75	0.75
80	802.11b	-	Rear Face	1	11	19.75	0.148

Note:

1. SAR data with 1cm test distance is submitted voluntarily.

12.3 Simultaneous Transmission SAR Analysis and Measurements

<Test distance 10 mm to the phantom; DUT with Full Power SAR>

Position	GSM 850	GSM 1900	WCDMA Band V	WCDMA Band II	802.11b/g	Max. SAR Summation	Volume Scan
Rear Face	0.597	0.786	0.465	**0.918**	**0.599**	**1.52**	**No**
Secondary Landscape	0.6	0.841	0.449	**1.53**	0	**1.53**	**No**

Position	LTE Band 4	LTE Band 17	802.11b/g	Max. SAR Summation	Volume Scan
Rear Face	**0.646**	0.377	**0.599**	**1.245**	**No**
Secondary Landscape	1.03	0.304	**0**	**1.03**	**No**

Note:

1. 1 cm test results are for confirming operation of the power reduction scheme, and are not applicable for compliance demonstration for the FCC tablet PC SAR test procedures
2. WLAN SAR data at 0mm is applied here, and it will represent more conservative situation than WLAN SAR data at 10mm.

< Test distance 0 mm to the phantom; 2G/3G/LTE with power reduction activated>

Position	GSM 850	GSM 1900	WCDMA Band V	WCDMA Band II	802.11b/g	Max. SAR Summation	Volume Scan
Rear Face	0.372	0.57	0.608	0.596	**0.599**	**1.207**	**No**
Secondary Landscape	0.745	1.16	0.777	**1.41**	**0**	**1.41**	**No**
Secondary Portrait	0.177	0.327	0.146	**0.681**	0	**0.681**	**No**
Primary Landscape	0	0	0	**0**	**0.75**	**0.75**	**No**

Position	LTE Band 4	LTE Band 17	802.11b/g	Max. SAR Summation	SPLSR	Volume Scan
Rear Face	0.778	**1.14**	**0.599**	**1.739**	**0.094**	**No**
Secondary Landscape	1.27	0.851	**0**	**1.27**	**N/A**	**No**
Secondary Portrait	0.466	0	0	**0.466**	**N/A**	**No**
Primary Landscape	0	**0**	**0.75**	**0.75**	**N/A**	**No**

Note:

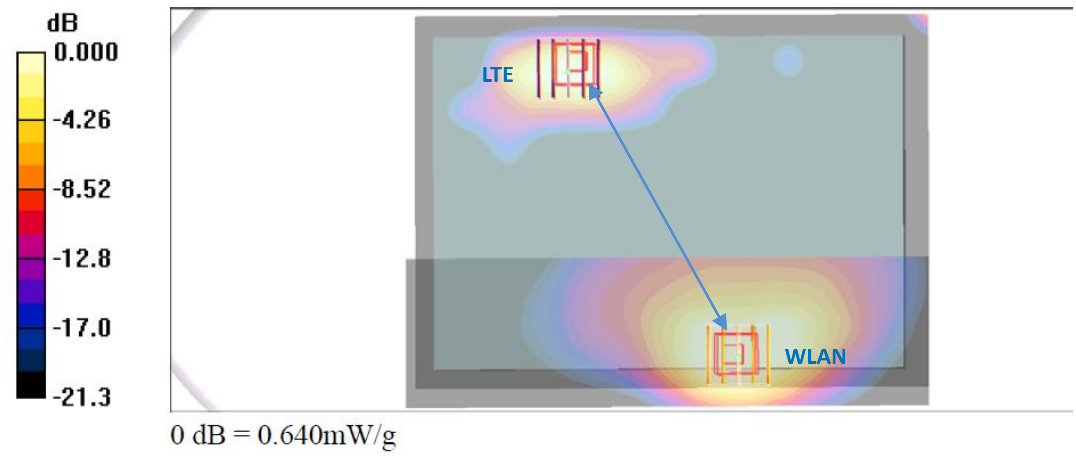
1. If 1g-SAR scalar summation < 1.6W/kg, simultaneous SAR measurement is not necessary, therefore only the LTE band 17 and 11b/g needs to consider the simultaneous SAR measurement.
2. If 1g-SAR summation >1.6W/kg, SPLSR calculation is necessary. For LTE + WLAN, the closest antenna distance is 16.3cm and SPLSR < 0.3, volume scan is not necessary; referring to KDB 447498.
3. The GPRS/EDGE and WCDMA share the same WWAN transmitting antenna, and GPRS/EDGE will not transmit simultaneously with WCDMA.

12.4 Simultaneous analysis - SPLSR calculation

Body	TX		SAR peak location (m) X	Y	Z	SAR (W/kg)	Ant Pair	Peak distance (cm)	pair SAR sum (W/kg)	SPLSR
Rear face	1	LTE, Band 17, CH 23780	0.083	0.039	-0.175	1.14	1+2	18.6	1.739	0.094
	2	WLAN, CH 11	-0.079	-0.0515	-0.174	0.599				

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

Body- Rear face,
LTE Band17 CH23780 + WLAN CH11



Note: The SAR peak coordinates and SAR peaks distance are calculated following Speag TN-110209

13. 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 D01 v01r02, “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 D01 v01r05, “SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas”, September 2008

[12] FCC KDB 941225 D01 v02, “SAR Measurement Procedures for 3G Devices – CDMA 2000 / 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 27 2010

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.