FCC SAR Test Report

APPLICANT	:	Novatel Wireless
EQUIPMENT	:	Mini-PCIe wireless WAN card
BRAND NAME	:	Novatel Wireless
MODEL NAME	:	E396
FCC ID	:	PKRNVWE396-D
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 – Novatel Wireless Mini-PCIe wireless WAN card E396, is installed into the Tablet PC (Brand Name: Dell, Model Name: T02G) during the test.

The product was received on Sep. 08, 2011 and completely tested on Oct. 18, 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

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

Table of Contents

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA190847	Rev. 01	Initial issue of report	Oct. 21, 2011
FA190847	Rev. 02	1. Add output power versus distance-to-phantom plot, for Secondary Landscape position, at page 11. 2. List WCDMA band 4, 1700MHz, tissue verification data at page 25. 3. Remove unnecessary simultaneous transmission analysis, of Secondary Landscape and Primary Portrait, at page 51 4. Scale measured SAR, based on output power tune-up limit, in Section 12.2	Nov. 24, 2011

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Novatel Wireless Mini-PCIe wireless WAN CARD Novatel WIRELESS E396** are as follows.

0 cm SAR test results

Band	Position	SAR_{1g} (W/kg)
GSM850	Body (0 cm Gap)* with reduction power	1.166
GSM1900	Body (0 cm Gap)* with reduction power	1.13
WCDMA Band V	Body (0 cm Gap)* with reduction power	0.958
WCDMA Band IV	Body (0 cm Gap)* with reduction power	1.229
WCDMA Band II	Body (0 cm Gap)* with reduction power	1.488
CDMA2000 BC0	Body (0 cm Gap)* with reduction power	0.930
CDMA2000 BC1	Body (0 cm Gap)* with reduction power	1.535

Note:

1. (*) : The distance from DUT to phantom is 0 cm, and the distance from WWAN antenna to phantom is 3.3 mm.
2. The results that show in above are the maximum SAR in each band.

Reference SAR for user is away from DUT

Band	Position	SAR_{1g} (W/kg)
GSM850	Body (1 cm Gap)	0.638
GSM1900	Body (1 cm Gap)	1.351
WCDMA Band V	Body (1 cm Gap)	0.309
WCDMA Band IV	Body (1 cm Gap)	1.443
WCDMA Band II	Body (1 cm Gap)	1.288
CDMA2000 BC0	Body (1 cm Gap)	0.361
CDMA2000 BC1	Body (1 cm Gap)	1.575

Note:

1. The test records with distance 1 cm, from DUT 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.
2. The results that show in above are the maximum SAR in each band.

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).

2. Administration Data

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

Applicant

Company Name	Novatel Wireless
Address	6715 8th Street N.E. Suite 200, Calgary, Alberta, Canada T2E 7H7

Manufacturer

Company Name	Novatel Wireless
Address	6715 8th Street N.E. Suite 200, Calgary, Alberta, Canada T2E 7H7

Application Details

Date of Receipt of Application	Sep. 08, 2011
Date of Start during the Test	Oct. 07, 2011
Date of End during the Test	Oct. 18, 2011

3. General Information

3.1 Description of Device Under Test (DUT)

Product Feature & Specification	
DUT Type	Mini-PCIe wireless WAN CARD
Model Name	E396
FCC ID	PKRNVWE396-D
Host Tablet PC	Brand Name: Dell Model Name: T02G
Tx Frequency	GSM850 : 824 MHz ~ 849 MHz GSM1900 : 1850 MHz ~ 1910 MHz WCDMA Band V : 824 MHz ~ 849 MHz WCDMA Band IV : 1710 MHz ~ 1755 MHz WCDMA Band II : 1850 MHz ~ 1910 MHz CDMA2000 BC0 : 824 MHz ~ 849 MHz CDMA2000 BC1 : 1850 MHz ~ 1910 MHz
Rx Frequency	GSM850 : 869 MHz ~ 894 MHz GSM1900 : 1930 MHz ~ 1990 MHz WCDMA Band V : 869 MHz ~ 894 MHz WCDMA Band IV : 2110 MHz ~ 2155 MHz WCDMA Band II : 1930 MHz ~ 1990 MHz CDMA2000 BC0 : 869 MHz ~ 894 MHz CDMA2000 BC1 : 1930 MHz ~ 1990 MHz
Maximum Average Output Power to Antenna	GSM850 : 32.99 dBm GSM1900 : 30.65 dBm WCDMA Band V : 24.32 dBm WCDMA Band IV : 20.57 dBm WCDMA Band II : 22.60 dBm CDMA2000 BC0 : 24.39 dBm CDMA2000 BC1 : 23.61 dBm
Antenna Type	Fixed Internal Antenna
Type of Modulation	GPRS: GMSK EDGE: GMSK / 8PSK WCDMA : QPSK (uplink) HSDPA : QPSK (uplink) HSUPA : QPSK (uplink) CDMA2000: QPSK
DUT Stage	Production Unit

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. Voice function or DTM mode will not be supported in the Tablet Host.
3. The product is installed into the host tablet PC and collocated with WLAN module (FCC ID: PPD-ARS263).

WLAN Module Feature & Specification	
DUT Type	1x1 802.11 a/b/g/n + BT SDIO-WLAN/USB-BT Card
Brand Name	Atheros
Model Name	ARS263
FCC ID	PPD-ARS263
Host Tablet PC	Brand Name : Dell Model Name : T02G
Tx Frequency	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	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	802.11b : 17.21 dBm 802.11g : 17.11 dBm 802.11n (2.4GHz) : 16.60 dBm (BW 20MHz) 802.11a : 16.91 dBm 802.11n (5GHz) : 16.59 dBm (BW 20MHz) 802.11n (5GHz) : 14.10 dBm (BW 40MHz) Bluetooth : 8.2 dBm
Antenna Type	PIFA Antenna
Type of Modulation	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	Production Unit

Remark: WLAN SAR information is provided in the report, to address co-location simultaneous transmission exposure in the Tablet Host.

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 616217 D03 v01
- FCC KDB 941225 D01 v02
- FCC KDB 941225 D03 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 WWAN SAR testing, the DUT is in GPRS or WCDMA or CDMA2000 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 CDMA2000/WCDMA/HSDPA/HSUPA.

Proximity Sensor Trigger Distance:

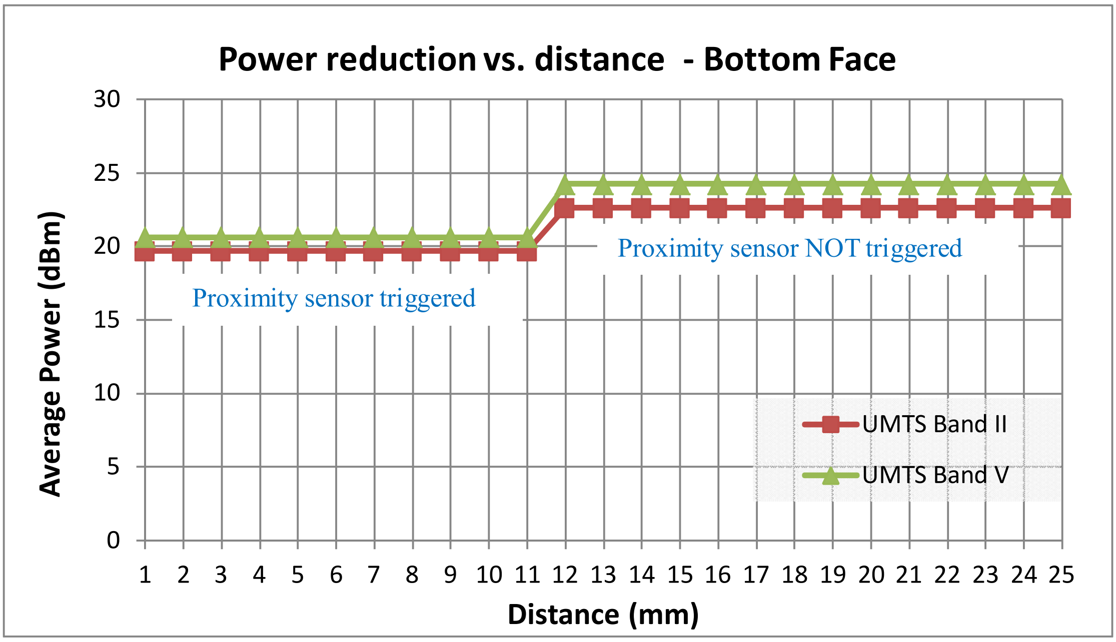
Distance (mm)	Proximity Sensor Status - Bottom Face of DUT to the phantom	Proximity Sensor Status – Secondary Landscape of DUT to the phantom
8	On	On
9	On	On
10	On	On
11	On	On
12	On	Off
13	On	Off
14	Off	Off
15	Off	Off
16	Off	Off
17	Off	Off
18	Off	Off

From the figures above, the trigger distance is 13 mm for bottom (bottom 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 0 mm in power reduction mode (Sensor Activating), and tested at conservative distance 12 mm for bottom (bottom 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.

The complete description of sensor implementation is provided in “SAR Technical Description” exhibit.

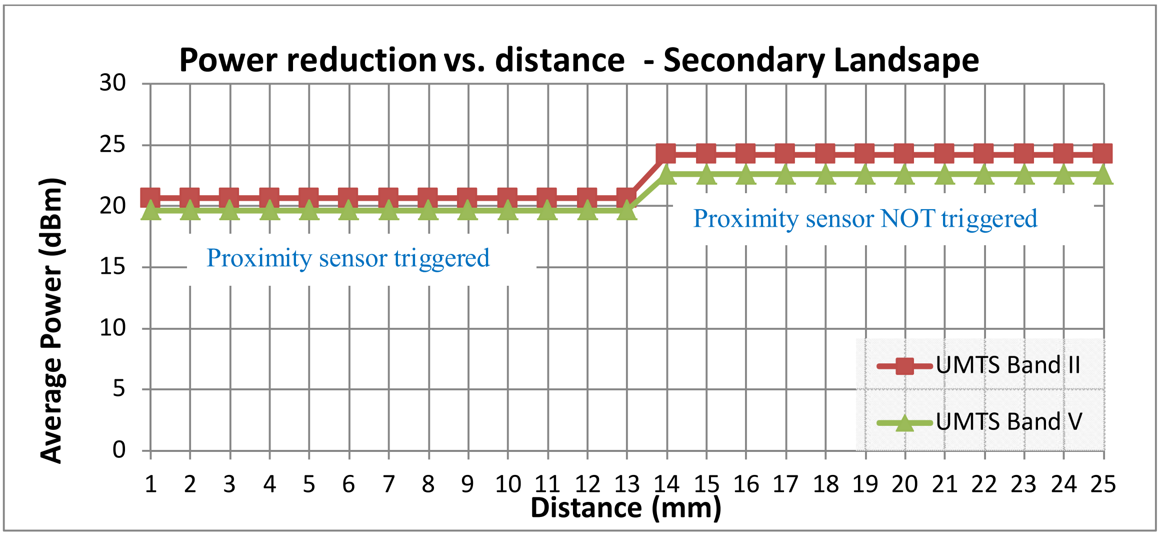
The target power reduction level and activated exposure positions:

	Primary Landscape	Secondary Landscape	Primary Portrait	Secondary Portrait	Front Face	Bottom Face
(E)GPRS 850 GMSK , 1 UL slot	X	2 dB	X	X	X	2 dB
(E)GPRS 850 GMSK , 2 UL slot	X	5 dB	X	X	X	5 dB
EDGE 850 8PSK , 1 UL slot	X	2 dB	X	X	X	2 dB
EDGE 850 8PSK , 2 UL slot	X	5 dB	X	X	X	5 dB
(E)GPRS 1900 GMSK , 1 UL slot	X	1.5 dB	X	X	X	1.5 dB
(E)GPRS 1900 GMSK , 1 UL slot	X	4 dB	X	X	X	4 dB
EDGE 1900 8PSK , 1 UL slot	X	1.5 dB	X	X	X	1.5 dB
EDGE 1900 8PSK , 2 UL slot	X	4 dB	X	X	X	4 dB
CDMA 850	X	4 dB	X	X	X	4 dB
CDMA 1900	X	4 dB	X	X	X	4 dB
WCDMA 850	X	4 dB	X	X	X	4 dB
WCDMA 1700	X	3 dB	X	X	X	3 dB
WCDMA 1900	X	3 dB	X	X	X	3 dB



Remark:

1. WCDMA Band 5, CH 4182, RMC 12.2kbps. Full power: 24.23dBm, Reduced power: 20.64dBm. The power reduction level is 3.59 dB.
2. WCDMA Band 2, CH 9400, RMC 12.2kbps. Full power: 22.6dBm, Reduced power: 19.68dBm. The power reduction level is 2.92dB.
3. Regarding other wireless modes power reduction level, refer to Section 12.1.



Remark:

1. WCDMA Band 5, CH 4182, RMC 12.2kbps. Full power: 24.23dBm, Reduced power: 20.64dBm. The power reduction level is 3.59 dB.
2. WCDMA Band 2, CH 9400, RMC 12.2kbps. Full power: 22.6dBm, Reduced power: 19.68dBm. The power reduction level is 2.92dB.
3. Regarding other wireless modes power reduction level, refer to Section 12.1.

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.

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

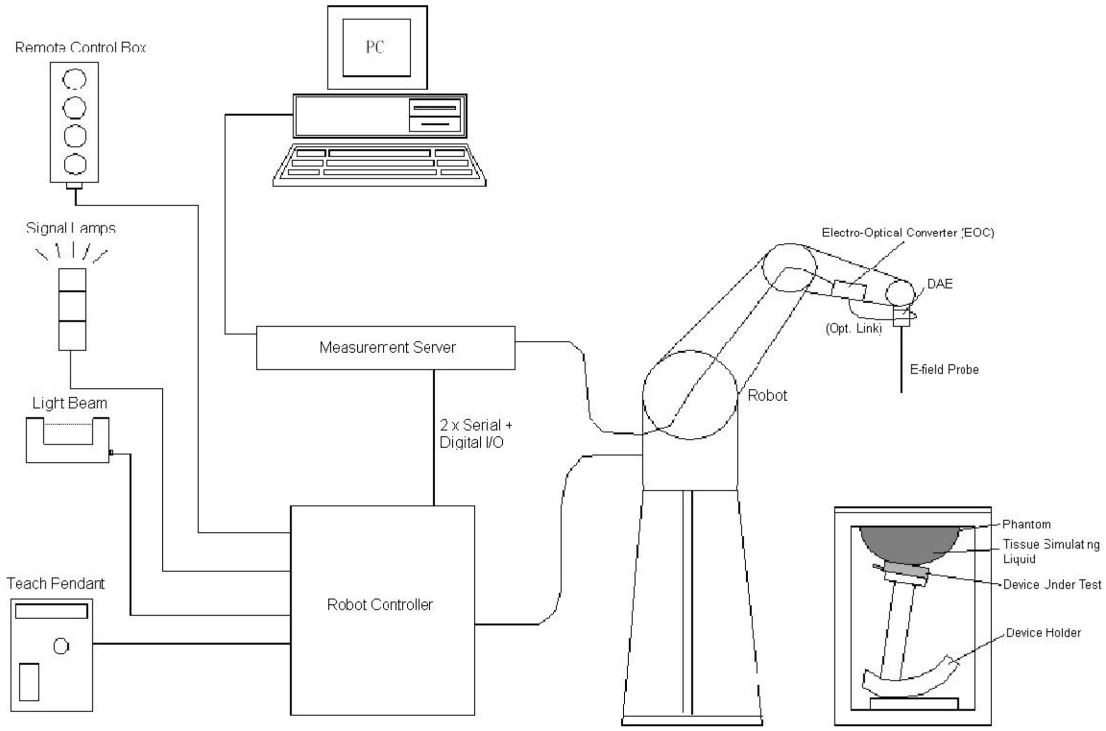


Fig 5.1 SPEAG DASY5 System Configurations

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

<ET3DV6 Probe >

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 3 GHz; Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	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 ± 0.25 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 5.4 Photo of DAE

5.3 Robot

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

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

Fig 5.1 Photo of DASY4

Fig 5.2 Photo of DASY5

5.4 Measurement Server

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

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

Fig 5.1 Photo of Server for DASY4

Fig 5.2 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 5.3 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

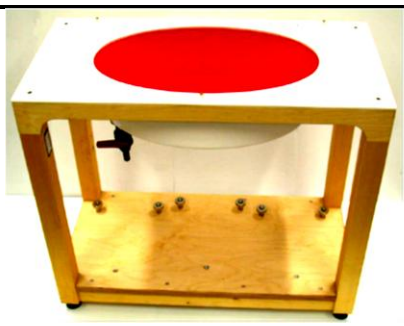


Fig 5.4 Photo of ELI4 Phantom

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 5.5 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.

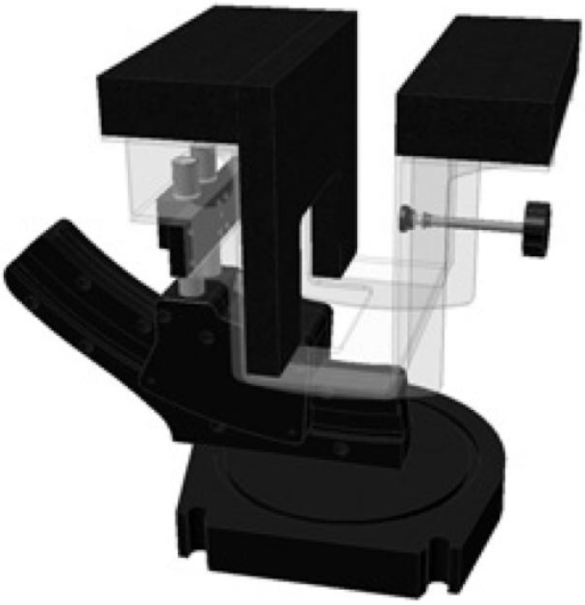


Fig 5.6 Laptop Extension Kit

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：

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

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：$\mathbf{E_i} = \sqrt{\frac{\mathbf{V_i}}{\mathbf{Norm_i \cdot ConvF}}}$

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

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

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

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

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

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

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	Sep. 02, 2011	Sep. 01, 2012
SPEAG	Dosimetric E-Filed Probe	EX3DV4	3754	Jan.11.2011	Jan.10.2012
SPEAG	Dosimetric E-Filed Probe	EX3DV4	3792	Jun. 20, 2011	Jun. 19, 2012
SPEAG	Dosimetric E-Filed Probe	ES3DV3	3270	Sep. 12, 2011	Sep. 11, 2012
SPEAG	835MHz System Validation Kit	D835V2	499	Mar. 22, 2010	Mar. 21, 2012
SPEAG	1800MHz System Validation Kit	D1800V2	2d076	Jul. 22, 2011	Jul. 21, 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	5GHz System Validation Kit	D5GHzV2	1040	Jun. 21, 2011	Jun. 20, 2012
SPEAG	Data Acquisition Electronics	DAE3	577	Jun. 20, 2011	Jun. 19, 2012
SPEAG	Data Acquisition Electronics	DAE4	905	Jun. 24, 2011	Jun. 23, 2012
SPEAG	Data Acquisition Electronics	DAE3	495	Apr. 28, 2011	Apr. 27, 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	SAM Phantom	QD 000 P41 C	TP-1150	NCR	NCR
SPEAG	SAM Phantom	QD 000 P40 CD	TP-1644	NCR	NCR
SPEAG	SAM Phantom	SM 000 T01 DA	TP-1542	NCR	NCR
SPEAG	ELI4 Phantom	QD 0VA 001 BB	1026	NCR	NCR
SPEAG	ELI4 Phantom	QD 0VA 001 BA	1029	NCR	NCR
SPEAG	ELI4 Phantom	QD 0VA 002 AA	TP-1127	NCR	NCR
SPEAG	ELI4 Phantom	QD 0VA 002 AA	TP-1131	NCR	NCR
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
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	FSP7	101131	Jul. 29, 2011	Jul. 28, 2012
R&S	Spectrum Analyzer	FSP30	101329	May. 03, 2011	May. 02, 2012

Table 5.1 Test Equipment List

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. Dipoles (D835V2, SN: 499; D1900V2, SN: 5d041) calibration interval is extended, the justification is included in Appendix C, per KDB 450824 D02. The measured return loss is < -20dB and within 20% variation of the prior calibration data, the impedance is also within 5ohm variation of the prior calibration data.

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.

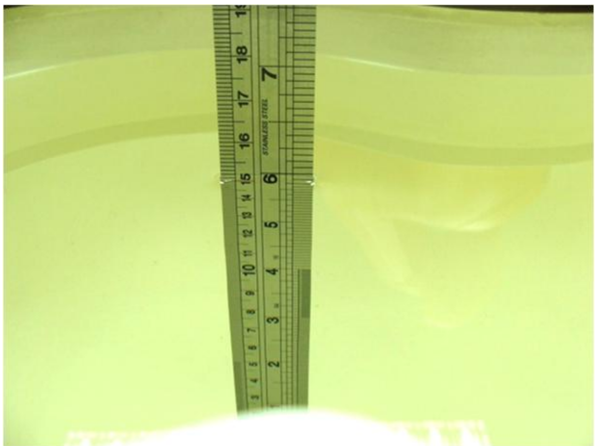


Fig 6.1 Photo of Liquid Height for Head SAR

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								
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
For Body								
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7

Table 6.1 Recipes of Tissue Simulating Liquid

The following table gives the targets for tissue simulating liquid.

Frequency (MHz)	Liquid Type	Conductivity (σ)	±5% Range	Permittivity (ε_r)	±5% Range
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
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
5200	Body	5.30	5.04 ~ 5.57	49.0	46.6 ~ 51.5
5500	Body	5.65	5.37 ~ 5.93	48.6	46.2 ~ 51.0
5800	Body	6.00	5.70 ~ 6.30	48.2	45.8 ~ 50.6

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.

Freq.	Liquid Type	Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
835	Body	21.5	0.955	52.7	0.97	55.2	-1.55	-4.53	±5	Oct. 07, 2011
835	Body	21.5	0.996	54.8	0.97	55.2	2.68	-0.72	±5	Oct. 08, 2011
835	Body	21.5	0.994	56	0.97	55.2	2.47	1.45	±5	Oct. 14, 2011
1712.4	Body	21.5	1.46	52.3	1.47	53.5	-0.42	-2.20	±5	Oct. 08, 2011
1732.6	Body	21.5	1.48	52.3	1.48	53.4	0.07	-2.12	±5	Oct. 08, 2011
1752.6	Body	21.5	1.5	52.3	1.49	53.4	0.56	-2.05	±5	Oct. 08, 2011
1712.4	Body	21.3	1.45	53.5	1.47	53.5	-1.10	0.05	±5	Oct. 11, 2011
1732.6	Body	21.3	1.47	53.5	1.48	53.4	-0.61	0.12	±5	Oct. 11, 2011
1752.6	Body	21.3	1.49	53.5	1.49	53.4	-0.11	0.20	±5	Oct. 11, 2011
1800	Body	21.5	1.55	52.2	1.52	53.3	1.97	-2.06	±5	Oct. 08, 2011
1800	Body	21.3	1.54	53.3	1.52	53.3	1.32	0.00	±5	Oct. 11, 2011
1900	Body	21.6	1.5	53	1.52	53.3	-1.32	-0.56	±5	Oct. 07, 2011
1900	Body	21.5	1.52	54.6	1.52	53.3	0.00	2.44	±5	Oct. 08, 2011
1900	Body	21.5	1.5	53.3	1.52	53.3	-1.32	0.00	±5	Oct. 13, 2011
1900	Body	21.4	1.54	53.9	1.52	53.3	1.32	1.13	±5	Oct. 14, 2011
1900	Body	21.3	1.53	54.2	1.52	53.3	0.66	1.69	±5	Oct. 18, 2011
2450	Body	21.4	1.96	51.5	1.95	52.7	0.51	-2.28	±5	Aug. 05, 2011
5200	Body	21.4	5.325	47.518	5.3	49	0.47	-3.02	±5	Aug. 05, 2011
5500	Body	21.4	5.723	46.972	5.65	48.6	1.29	-3.35	±5	Aug. 05, 2011
5800	Body	21.4	6.229	46.417	6	48.2	3.82	-3.70	±5	Aug. 05, 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	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					± 10.99 %
Coverage Factor for 95 %					K = 2
Expanded Uncertainty					**± 21.97 %**

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

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)
Measurement System					
Probe Calibration	6.55	Normal	1	1	± 6.55 %
Axial Isotropy	4.7	Rectangular	√3	0.7	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	± 3.9 %
Boundary Effects	2.0	Rectangular	√3	1	± 1.2 %
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	0.8	Rectangular	√3	1	± 0.5 %
Probe Positioning	9.9	Rectangular	√3	1	± 5.7 %
Max. SAR Eval.	4.0	Rectangular	√3	1	± 2.3 %
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					± 12.79 %
Coverage Factor for 95 %					K = 2
Expanded Uncertainty					**± 25.58 %**

Table 7.3 Uncertainty Budget of DASY for frequency range 3 GHz to 6 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:

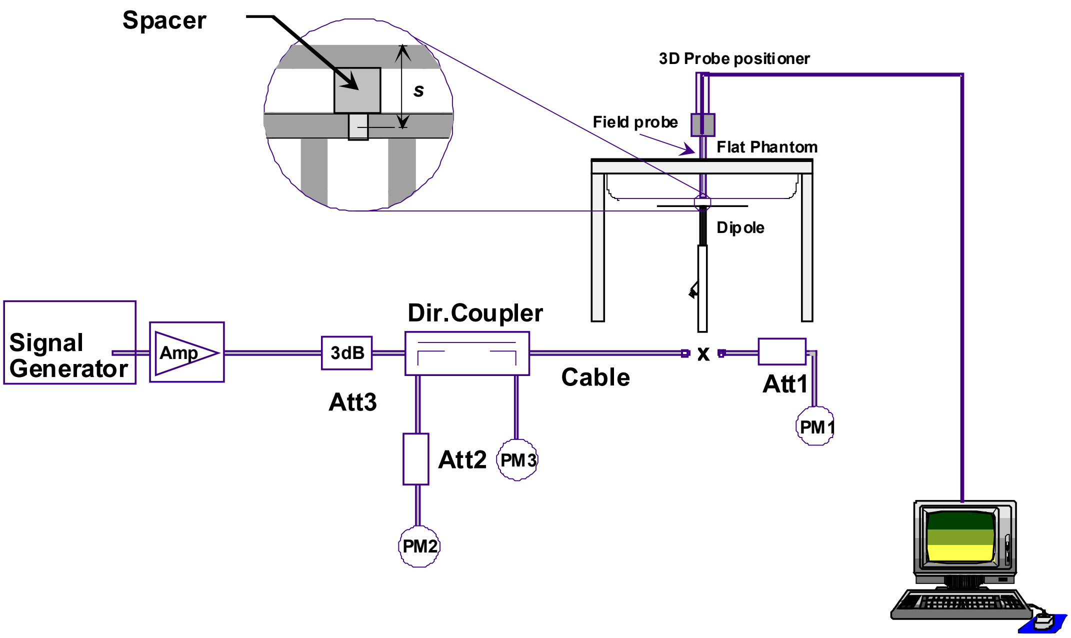


Fig 8.1 System Setup for System Evaluation

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.

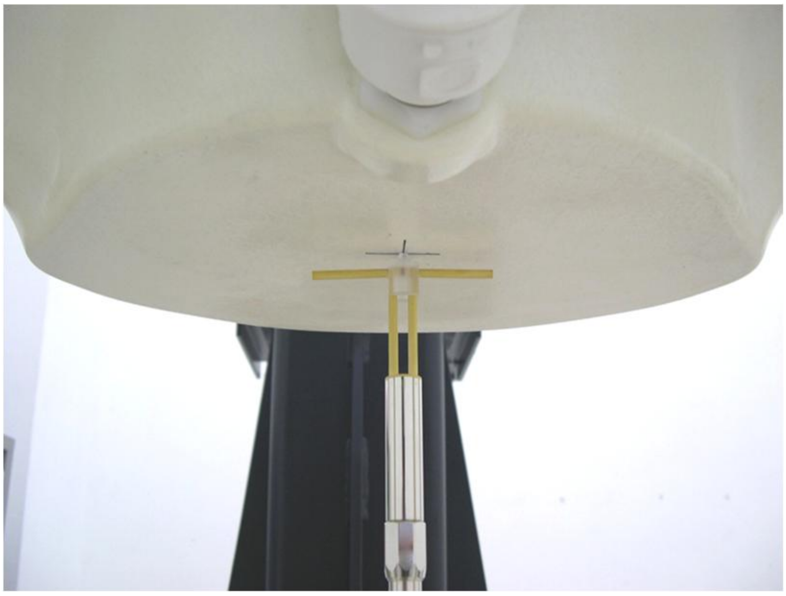


Fig 8.2 Photo of Dipole Setup

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.

The 1800 dipole is used for system check, using the same liquid and same probe in the 1700MHz SAR measurement.

Measurement Date	Frequency (MHz)	Liquid Type	Targeted SAR_{1g} (W/kg)	Measured SAR_{1g} (W/kg)	Normalized SAR_{1g} (W/kg)	Deviation (%)
Oct. 07, 2011	835	Body	9.820	2.360	9.44	-3.87
Oct. 08, 2011	835	Body	9.820	2.480	9.92	1.02
Oct. 14, 2011	835	Body	9.820	2.290	9.16	-6.72
Oct. 08, 2011	1800	Body	38.800	10.100	40.40	4.12
Oct. 11, 2011	1800	Body	38.800	9.680	38.72	-0.21
Oct. 07, 2011	1900	Body	40.000	10.200	40.80	2.00
Oct. 08, 2011	1900	Body	40.000	10.400	41.60	4.00
Oct. 13, 2011	1900	Body	40.000	10.300	41.20	3.00
Oct. 14, 2011	1900	Body	40.000	10.500	42.00	5.00
Oct. 18, 2011	1900	Body	40.000	10.700	42.80	7.00
Aug. 05, 2011	2450	Body	51.200	12.400	49.60	-3.13
Aug. 05, 2011	5200	Body	76.000	18.200	72.80	-4.21
Aug. 05, 2011	5500	Body	81.700	19.000	76.00	-6.98
Aug. 05, 2011	5800	Body	75.400	17.800	71.20	-5.57

Table 8.1 Target and Measurement SAR after Normalized

Note:

1. The probe 3792 is used for 1700MHz measurement, and it is calibrated at 1750MHz. The SAR measurement frequency is within 50MHz of the calibration frequency, and meets requirement in KDB 450824 D01.
2. The liquid parameter is also compared to the 1700MHz target, which is interpolated from 1610MHz and 1800MHz target parameter, and shows error < 5%.
3. SAR probe 3792 calibration is valid at 1800MHz frequency, and the same tissue-equivalent medium is used for both system verification and routine measurement. The same probe is used for dipole and routine measurement.

9. DUT Testing Position

This DUT was tested in five different positions. They are bottom face of tablet PC with phantom 0 cm gap, bottom face of tablet PC with phantom 1.2 cm gap, Primary Portrait with phantom 0 cm gap, Secondary Landscape with phantom 0 cm gap, and Secondary Landscape with phantom 1 cm gap. Fig 9.1 shows the demonstration of two types of positions (bottom face and edge). Please refer to Appendix E for the test setup photos.

10. Measurement Procedures

The measurement procedures are as follows:

(a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous Tx) in the highest power channel
(b) Measure output power through RF cable and power meter
(c) Place the DUT in the positions described in the last section
(d) Set scan area, grid size and other setting on the DASY software
(e) Measure SAR results for the highest power channel on each testing position
(f) Find out the largest SAR result on these testing positions of each band
(g) 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.

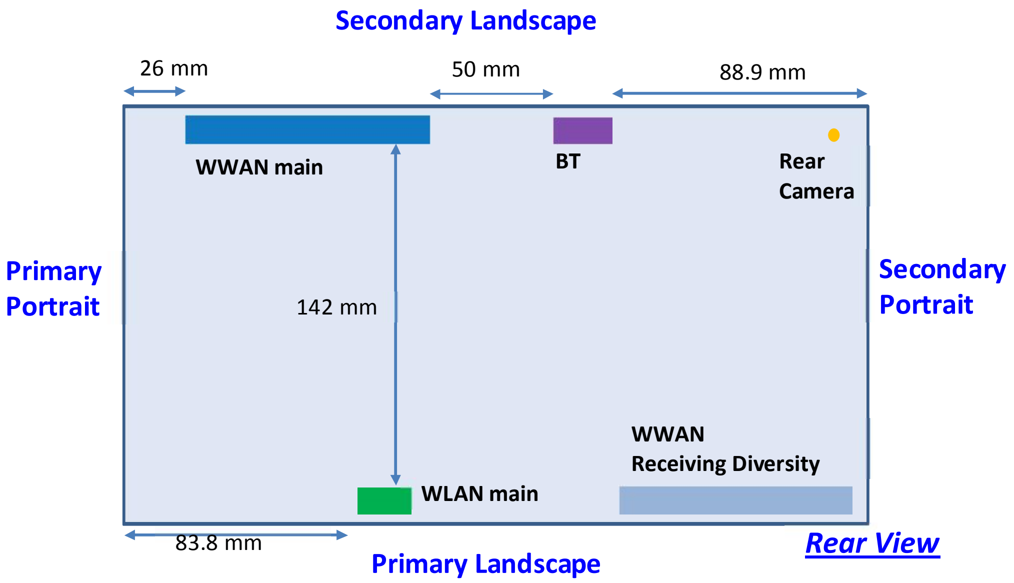
Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty 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



Module	Wireless Mode	Antenna
Novatel Wireless E396	GSM850: GPRS/EDGE PCS1900: GPRS/EDGE WCDMA Band II: WCDMA/HSDPA/HSUPA, QPSK uplink WCDMA Band V: WCDMA/HSDPA/HSUPA, QPSK uplink WCDMA Band IV: WCDMA/HSDPA/HSUPA, QPSK uplink CDMA2000 BC0 : 1xRTT/EV-DO CDMA2000 BC1 : 1xRTT/EV-DO	WWAN Main WWAN Receiving Diversity (RX only)
Atheros ARS263	2.4GHz: Bluetooth 2.4GHz: 802.11 b/ g/ n(HT20M,40M) 5GHz: 802.11 a/ n(HT20M,40M)	WLAN Main BT

Sides for SAR tests; Tablet (> 20cm diagonal)						
Exposure Position	Bottom Face	Front Face	Secondary Landscape	Primary Landscape	Primary Portrait	Secondary Portrait
GPRS/EDGE/ WCDMA/HSPA/CDMA2000	0mm, 12mm	x	0mm, 10mm	x	0mm	x
WLAN 11 a/b/g/n	0mm	x	x	0mm	x	x

Note:

1. The DUT diagonal dimension is 262 mm; per KDB 941225 D07, the DUT diagonal > 20 cm and Mini-Tablet procedure is not applied. Therefore, SAR tests follow the Tablet Mode in KDB447498, with test distance 0cm to the phantom.
2. Per KDB 447498, WWAN SAR should be evaluated at Bottom Face. WWAN SAR should also be evaluated at Secondary-Landscape/Primary-Portrait positions due to the WWAN antenna to the user at those exposure positions is < 5cm.
3. Per KDB 447498, Front Face and Secondary-Portrait/Primary-Landscape (antenna to the user >5cm) positions WWAN SAR is excluded.
4. There is no screen orientation limitation in DUT; that is 4 orientations are supported. The power reduction for WWAN SAR compliance is not triggered by the screen orientation, but triggered by proximity sensor when the user is close to the DUT. Therefore, SAR test setup and test result is conservative for real life usage.
5. The test distance 10 mm and 12 mm is for verifying the conservative condition, whichever DUT proximity sensor maximum activated distance is 13 mm for bottom face and 11 mm for secondary landscape. The DUT is set in full-power mode at 12 mm for bottom face and 10 mm for secondary landscape test distance to the phantom. During the test, specific test SW is used for disabling proximity sensor and the test SW is not available to end users.
6. The proximity sensor is designed to be triggered for Bottom Face and Secondary-Landscape exposure positions. During SAR tests for DUT other edges, the sensor is disabled via software setting. The test SW is not available to end users.
7. DUT does not support voice call function; therefore GSM SAR is not required.

11.2 Simultaneous Transmitting Configurations

< Simultaneous Transmission – Body SAR >

Simultaneous Transmission						
Exposure Position	Bottom Face	Front Face	Secondary Landscape	Primary Landscape	Primary Portrait	Secondary Portrait
GPRS/EDGE/ WCDMA/HSPA/CDMA2000 - Reduced Power	0mm	x	x	x	x	x
WLAN 11 a/b/g/n	0mm	x	x	x	x	x
GPRS/EDGE/ WCDMA/HSPA/CDMA2000 - Full power	12mm	x	x	x	x	x
WLAN 11 a/b/g/n	0mm	x	x	x	x	x

Note:

1. Per KDB 447498 D01, Bluetooth output power 8.2dBm < 60/f thus standalone SAR is not required; Simultaneous SAR is also not required due to the distance to other antennas ≥ 5cm.
2. The GPRS/EDGE, WCDMA, and CDMA2000 shares the WWAN transmitting antenna, and GPRS/EDGE will not transmit simultaneously with WCDMA nor CDMA2000.
3. For simultaneous SAR evaluation at Bottom Face, 12mm distance, since WLAN SAR value 0mm will be worse than 12mm data; therefore 0mm WLAN SAR data is used here.

12. SAR Test Results

12.1 Conducted Power (Unit: dBm)

< Full Power GPRS / EDGE 850, 1900>

GPRS/EDGE Burst Average Power						
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) – CS1	32.94	32.91	32.99	30.65	30.48	30.52
GPRS 10 (2 Uplink) – CS1	32.87	32.84	32.96	30.60	30.42	30.44
EDGE 8 (GMSK, 1 Uplink) – MCS1	32.84	32.72	32.87	30.51	30.48	30.47
EDGE 10 (GMSK, 2 Uplink) – MCS1	32.74	32.61	32.81	30.50	30.43	30.43
EDGE 8 (8PSK, 1 Uplink) – MCS9	27.18	27.16	27.13	26.44	26.39	26.35
EDGE 10 (8PSK, 2 Uplink) – MCS9	27.09	27.08	27.10	26.32	26.27	26.25

Source-Based Time-Averaged Power						
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) – CS1	23.94	23.91	23.99	21.65	21.48	21.52
GPRS 10 (2 Uplink) – CS1	26.87	26.84	26.96	24.60	24.42	24.44
EDGE 8 (GMSK, 1 Uplink) – MCS1	23.84	23.72	23.87	21.51	21.48	21.47
EDGE 10 (GMSK, 2 Uplink) – MCS1	26.74	26.61	26.81	24.50	24.43	24.43
EDGE 8 (8PSK, 1 Uplink) – MCS9	18.18	18.16	18.13	17.44	17.39	17.35
EDGE 10 (8PSK, 2 Uplink) – MCS9	21.09	21.08	21.10	20.32	20.27	20.25

Remark:
The source-based time-averaged power is linearly scaled the maximum burst averaged power based on time slots. 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. Following KDB 941225 D03, for Body-worn SAR testing, the DUT was set in GPRS10 for GSM850 and for GSM1900 due to its highest source-based time-average power.
2. Per 2010/10 workshop, the maximum output power channel is used for SAR testing and for further SAR test reduction.

< Reduction Power - GPRS / EDGE 850, 1900>

GPRS/EDGE Burst Average Power												
Band	GSM850						GSM1900					
Channel	128		189		251		512		661		810	
Frequency (MHz)	824.2		836.4		848.8		1850.2		1880.0		1909.8	
	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)
GPRS 8 (1 Uplink) CS1	31.34	1.60	31.10	1.81	31.26	1.73	29.24	1.41	29.29	1.19	29.05	1.47
GPRS 10 (2 Uplink) CS1	28.00	4.87	27.91	4.93	28.02	4.94	26.70	3.90	26.53	3.89	26.48	3.96
EDGE 8 (GMSK, 1 Uplink) MCS1	31.23	1.61	30.98	1.74	31.11	1.76	29.10	1.41	29.12	1.36	28.87	1.60
EDGE 10 (GMSK, 2 Uplink) MCS1	27.89	4.85	27.76	4.85	27.88	4.93	26.66	3.84	26.25	4.18	26.23	4.20
EDGE 8 (8PSK, 1 Uplink) MCS9	24.71	2.47	24.71	2.45	24.72	2.41	25.05	1.39	25.16	1.23	25.07	1.28
EDGE 10 (8PSK, 2 Uplink) MCS9	22.30	4.79	22.30	4.78	22.31	4.79	22.48	3.84	22.46	3.81	22.42	3.83

Source-Based Time-Averaged Power						
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) – CS1	22.34	22.10	22.26	20.24	20.29	20.05
GPRS 10 (2 Uplink) – CS1	22.00	21.91	22.02	20.70	20.53	20.48
EDGE 8 (GMSK, 1 Uplink) – MCS1	22.23	21.98	22.11	20.10	20.12	19.87
EDGE 10 (GMSK, 2 Uplink) – MCS1	21.89	21.76	21.88	20.66	20.25	20.23
EDGE 8 (8PSK, 1 Uplink) – MCS9	15.71	15.71	15.72	16.05	16.16	16.07
EDGE 10 (8PSK, 2 Uplink) – MCS9	16.30	16.30	16.31	16.48	16.46	16.42

Remark: The source-based time-averaged power is linearly scaled the maximum burst averaged power based on time slots. 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. Following KDB 941225 D03, the DUT was set in GPRS8 for GSM850 and GPRS10 for GSM1900 due to its highest source-based time-average power.
2. Per 2010/10 workshop, the maximum output power channel is used for SAR testing and for further SAR test reduction.

Measured Power Reduction Level

Band	GSM850				GSM1900			
Channel	128	189	251	Target Reduction (dB)	512	661	810	Target Reduction (dB)
Frequency	824.2	836.4	848.8		1850.2	1880	1909.8	
GPRS 8 (1 Uplink) CS1	1.60	1.81	1.73	2	1.41	1.19	1.47	1.5
GPRS 10 (2 Uplink) CS1	4.87	4.93	4.94	5	3.90	3.89	3.96	4
EDGE 8 (GMSK, 1 Uplink) MCS1	1.61	1.74	1.76	2	1.41	1.36	1.60	1.5
EDGE 10 (GMSK, 2 Uplink) MCS1	4.85	4.85	4.93	5	3.84	4.18	4.20	4
EDGE 8 (8PSK, 1 Uplink) MCS9	2.47	2.45	2.41	2	1.39	1.23	1.28	1.5
EDGE 10 (8PSK, 2 Uplink) MCS9	4.79	4.78	4.79	5	3.84	3.81	3.83	4

< Full Power WCDMA>

Band	WCDMA Band V			WCDMA Band II		
Channel	4132	4182	4233	9262	9400	9538
Frequency (MHz)	826.4	836.4	846.6	1852.4	1880.0	1907.6
RMC 12.2K	**24.32**	24.23	24.19	22.47	**22.60**	22.41
HSDPA Subtest-1	23.77	23.72	23.74	22.06	22.14	22.02
HSDPA Subtest-2	23.80	23.68	23.75	22.06	22.14	22.02
HSDPA Subtest-3	23.34	23.35	23.28	21.71	21.73	21.49
HSDPA Subtest-4	23.38	23.27	23.29	21.59	21.69	21.45
HSUPA Subtest-1	22.77	22.99	23.01	21.09	21.31	21.36
HSUPA Subtest-2	21.68	21.67	21.76	20.00	20.14	20.26
HSUPA Subtest-3	22.25	22.00	22.11	20.23	20.38	20.39
HSUPA Subtest-4	22.00	22.20	22.21	20.35	20.46	20.54
HSUPA Subtest-5	22.71	22.94	23.06	21.13	21.31	21.42

Band	WCDMA Band IV		
Channel	1312	1413	1513
Frequency (MHz)	1712.4	1732.6	1752.6
RMC 12.2K	20.48	20.47	**20.57**
HSDPA Subtest-1	20.09	20.07	20.10
HSDPA Subtest-2	20.02	20.01	20.07
HSDPA Subtest-3	19.54	19.60	19.72
HSDPA Subtest-4	19.60	19.58	19.64
HSUPA Subtest-1	19.39	19.53	19.99
HSUPA Subtest-2	18.40	18.31	18.55
HSUPA Subtest-3	18.66	18.51	18.99
HSUPA Subtest-4	19.17	18.74	19.00
HSUPA Subtest-5	19.27	19.61	20.04

MPR							
3GPP Requirement		**WCDMA band V**			**WCDMA band II**		
0	**HSDPA Subtest-1**	0.00	0.00	0.00	0.00	0.00	0.00
0	**HSDPA Subtest-2**	-0.03	0.04	-0.01	0.00	0.00	0.00
0.5	**HSDPA Subtest-3**	0.43	0.37	0.46	0.35	0.41	0.53
0.5	**HSDPA Subtest-4**	0.39	0.45	0.45	0.47	0.45	0.57
0	**HSUPA Subtest-1**	-0.06	-0.05	0.05	0.04	0.00	0.06
1	**HSUPA Subtest-2**	1.03	1.27	1.30	1.13	1.17	1.16
1	**HSUPA Subtest-3**	0.46	0.94	0.95	0.90	0.93	1.03
1	**HSUPA Subtest-4**	0.71	0.74	0.85	0.78	0.85	0.88
0	**HSUPA Subtest-5**	0.00	0.00	0.00	0.00	0.00	0.00

MPR				
3GPP Requirement		**WCDMA band IV**		
0	**HSDPA Subtest-1**	0.00	0.00	0.00
0	**HSDPA Subtest-2**	0.07	0.06	0.03
0.5	**HSDPA Subtest-3**	0.55	0.47	0.38
0.5	**HSDPA Subtest-4**	0.49	0.49	0.46
0	**HSUPA Subtest-1**	-0.12	0.08	0.05
2	**HSUPA Subtest-2**	0.87	1.30	1.49
1	**HSUPA Subtest-3**	0.61	1.10	1.05
2	**HSUPA Subtest-4**	0.10	0.87	1.04
0	**HSUPA Subtest-5**	0.00	0.00	0.00

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 follows 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.

< Reduction Power - WCDMA>

Band	WCDMA Band V						WCDMA Band II					
Channel	4132		4182		4132		9262		9400		9538	
Frequency (MHz)	826.4		836.4		826.4		1852.4		1880		1907.6	
	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)
RMC 12.2K	20.70	3.62	20.64	3.59	20.68	3.51	19.48	2.99	19.68	2.92	19.40	3.01
HSDPA Subtest-1	20.25	3.52	20.18	3.54	20.06	3.68	19.15	2.91	19.26	2.88	19.01	3.01
HSDPA Subtest-2	20.19	3.61	20.13	3.55	20.21	3.54	19.14	2.92	19.11	3.03	19.03	2.99
HSDPA Subtest-3	19.81	3.53	19.62	3.73	19.71	3.57	18.63	3.08	18.57	3.16	18.38	3.11
HSDPA Subtest-4	19.88	3.50	19.82	3.45	19.78	3.51	18.65	2.94	18.78	2.91	18.41	3.04
HSUPA Subtest-1	19.90	2.87	20.08	2.91	19.97	3.04	19.05	2.04	19.07	2.24	18.22	3.14
HSUPA Subtest-2	18.55	3.13	18.77	2.90	18.63	3.13	17.72	2.28	17.52	2.62	17.49	2.77
HSUPA Subtest-3	18.78	3.47	18.61	3.39	18.96	3.15	17.97	2.26	17.94	2.44	17.65	2.74
HSUPA Subtest-4	19.04	2.96	19.02	3.18	19.28	2.93	18.01	2.34	18.05	2.41	18.10	2.44
HSUPA Subtest-5	19.87	2.84	20.07	2.87	19.30	3.76	19.10	2.03	19.18	2.13	18.28	3.14

Band	WCDMA Band IV					
Channel	1312		1413		1513	
Frequency (MHz)	1712.4		1732.6		1752.6	
	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)	Output Power (dBm)	Reduction (dB)
RMC 12.2K	17.44	3.04	17.41	3.06	17.60	2.97
HSDPA Subtest-1	16.93	3.16	16.89	3.18	16.97	3.13
HSDPA Subtest-2	16.88	3.14	16.83	3.18	16.93	3.14
HSDPA Subtest-3	16.49	3.05	16.40	3.20	16.52	3.20
HSDPA Subtest-4	16.46	3.14	16.37	3.21	16.47	3.17
HSUPA Subtest-1	17.28	2.11	17.37	2.16	17.79	2.20
HSUPA Subtest-2	16.32	2.08	16.15	2.16	16.40	2.15
HSUPA Subtest-3	16.56	2.10	16.44	2.07	16.91	2.08
HSUPA Subtest-4	17.16	2.01	16.57	2.17	16.81	2.19
HSUPA Subtest-5	17.26	2.01	17.47	2.14	17.90	2.14

MPR							
3GPP Requirement		WCDMA band V			WCDMA band II		
0	HSDPA Subtest-1	0.00	0.00	0.00	0.00	0.00	0.00
0	HSDPA Subtest-2	0.06	0.05	-0.15	0.01	0.15	-0.02
0.5	HSDPA Subtest-3	0.44	0.56	0.35	0.52	0.69	0.63
0.5	HSDPA Subtest-4	0.37	0.36	0.28	0.50	0.48	0.60
0	HSUPA Subtest-1	-0.03	-0.01	-0.67	0.05	0.11	0.06
2	HSUPA Subtest-2	1.32	1.30	0.67	1.38	1.66	0.79
1	HSUPA Subtest-3	1.09	1.46	0.34	1.13	1.24	0.63
2	HSUPA Subtest-4	0.83	1.05	0.02	1.09	1.13	0.18
0	HSUPA Subtest-5	0.00	0.00	0.00	0.00	0.00	0.00

MPR				
3GPP Requirement		WCDMA band IV		
0	HSDPA Subtest-1	0.00	0.00	0.00
0	HSDPA Subtest-2	0.05	0.06	0.04
0.5	HSDPA Subtest-3	0.44	0.49	0.45
0.5	HSDPA Subtest-4	0.47	0.52	0.50
0	HSUPA Subtest-1	-0.02	0.10	0.11
2	HSUPA Subtest-2	0.94	1.32	1.50
1	HSUPA Subtest-3	0.70	1.03	0.99
2	HSUPA Subtest-4	0.10	0.90	1.09
0	HSUPA Subtest-5	0.00	0.00	0.00

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.

Measured Power Reduction Level

Band	WCDMA Band V				WCDMA Band II			
Channel	4132	4182	4233	Target Reduction (dB)	9262	9400	9538	Target Reduction (dB)
Frequency	826.4	836.4	846.6		1852.4	1880	1907.6	
RMC 12.2K	3.62	3.59	3.51	4	2.99	2.92	3.01	3
HSDPA Subtest-1	3.52	3.54	3.68	4	2.91	2.88	3.01	3
HSDPA Subtest-2	3.61	3.55	3.54	4	2.92	3.03	2.99	3
HSDPA Subtest-3	3.53	3.73	3.57	4	3.08	3.16	3.11	3
HSDPA Subtest-4	3.50	3.45	3.51	4	2.94	2.91	3.04	3
HSUPA Subtest-1	2.87	2.91	3.04	4	2.04	2.24	3.14	3
HSUPA Subtest-2	3.13	2.90	3.13	4	2.28	2.62	2.77	3
HSUPA Subtest-3	3.47	3.39	3.15	4	2.26	2.44	2.74	3
HSUPA Subtest-4	2.96	3.18	2.93	4	2.34	2.41	2.44	3
HSUPA Subtest-5	2.84	2.87	3.76	4	2.03	2.13	3.14	3

Band	WCDMA Band IV			
Channel	1312	1413	1513	Target Reduction (dB)
Frequency	1712.4	1732.6	1752.6	
RMC 12.2K	3.04	3.06	2.97	3
HSDPA Subtest-1	3.16	3.18	3.13	3
HSDPA Subtest-2	3.14	3.18	3.14	3
HSDPA Subtest-3	3.05	3.20	3.20	3
HSDPA Subtest-4	3.14	3.21	3.17	3
HSUPA Subtest-1	2.11	2.16	2.20	3
HSUPA Subtest-2	2.08	2.16	2.15	3
HSUPA Subtest-3	2.10	2.07	2.08	3
HSUPA Subtest-4	2.01	2.17	2.19	3
HSUPA Subtest-5	2.01	2.14	2.14	3

< Full Power CDMA2000>

Band	CDMA2000 BC0			CDMA2000 BC1		
Channel	1013	384	777	25	600	1175
Frequency	824.7	836.52	848.31	1851.25	1880	1908.75
RC3+SO32(+SCH)	24.12	24.16	24.15	23.50	23.37	23.35
RTAP 153.6	24.31	24.39	24.38	23.61	23.53	23.40
RETAP 4096	24.27	24.35	24.32	23.59	23.49	23.37

Note: Referring to KDB 941225 D01, DUT is treated as data device and SAR is tested with RTAP 153.6 kbps (Ev-Do). If RC3+SO32 power is less than 1/4dB higher than Ev-Do, SAR tests with RC3+SO32 setting are not necessary.

< Reduction Power – CDMA2000>

Band	CDMA2000 BC0			CDMA2000 BC1		
Channel	1013	384	777	25	600	1175
Frequency	824.7	836.52	848.31	1851.25	1880	1908.75
RC3+SO32(+SCH)	20.19	20.27	20.10	19.41	19.14	19.13
RTAP 153.6	20.22	20.37	20.31	19.41	19.24	19.18
RETAP 4096	20.34	20.35	20.23	19.38	19.26	19.21

Note: Referring to KDB 941225 D01, DUT is treated as data device and SAR is tested with RTAP 153.6 kbps (Ev-Do). If RC3+SO32 power is less than 1/4dB higher than Ev-Do, SAR tests with RC3+SO32 setting are not necessary.

Measured Power Reduction Level

Band	CDMA2000 BC0				CDMA2000 BC1			
Channel	1013	384	777	Target Reduction (dB)	25	600	1175	Target Reduction (dB)
Frequency	824.7	836.52	848.31		1851.25	1880	1908.75	
RC3+SO32(+SCH)	3.93	3.89	4.05	4	4.09	4.23	4.22	4
RTAP 153.6	4.09	4.02	4.07	4	4.2	4.29	4.22	4
RETAP 4096	3.93	4	4.09	4	4.21	4.23	4.16	4

<2.4GHz WLAN>

Band	802.11b			802.11g		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Average Power	17.07	17.02	17.21	11.71	17.11	12.93

Band	802.11n (BW 20MHz)		
Channel	1	6	11
Frequency (MHz)	2412	2437	2462
Average Power	10.72	16.60	11.42

<5GHz WLAN>

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	13.88	13.85	13.89	13.84	16.91	16.86	16.76	16.73	15.01	15.32	15.26	15.11

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	15.20	15.07	15.27	15.29	15.26	15.13	12.87	16.07	16.38	16.42	16.30	16.34

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	13.77	13.74	13.78	13.73	16.59	16.50	16.22	16.23	14.79	15.26	15.15	15.03

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	15.11	14.98	15.22	15.25	15.20	14.98	12.78	15.99	16.27	16.31	16.22	16.23

Band	802.11n (BW 40MHz)								
Channel	38	46	54	62	102	118	134	151	159
Frequency (MHz)	5190	5230	5270	5310	5510	5590	5670	5755	5795
Average Power	13.88	13.77	13.99	13.95	12.08	14.10	13.96	13.71	14.01

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. 5GHz 11n SAR is also excluded due to the output power is less than 1/4dB higher than 11a.
2. Per 2010/10 TCB workshop, choose the highest output power channel to test SAR and determine further SAR exclusion, and 11b CH11 is chosen here.

12.2 Test Records for Body SAR Test

<0 cm 2G/3G SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Conductive Power (dBm)	Power Drift (dB)	Pen	Ant.	SAR_{1g} (W/kg)	Tune-up Power (dBm)	Scaling Factor	Scaled 1g SAR
110	GSM850	GPRS Class8	Bottom Face	0	128	31.34	-0.091	x	1	0.608	31.8	1.11	0.676
111	GSM850	GPRS Class8	Secondary Landscape	0	128	31.34	0.070	x	1	0.428	31.8	1.11	0.476
112	GSM850	GPRS Class8	Bottom Face	0	128	31.34	-0.186	x	2	0.89	31.8	1.11	0.989
113	GSM850	GPRS Class8	Bottom Face	0	189	31.10	0.119	x	2	0.982	31.8	1.17	1.154
114	**GSM850**	**GPRS Class8**	**Bottom Face**	**0**	**251**	**31.26**	**-0.183**	x	**2**	**1.03**	**31.8**	**1.13**	**1.166**
115	GSM850	GPRS Class8	Bottom Face	0	251	31.26	0.153	v	2	1.03	31.8	1.13	1.166
116	GSM850	GPRS Class8	Bottom Face	0	128	31.34	0.012	v	2	0.929	31.8	1.11	1.033
117	GSM850	GPRS Class8	Bottom Face	0	189	31.10	0.196	v	2	0.923	31.8	1.17	1.084
30	GSM850	GPRS Class10	Primary Portrait	0	251	32.96	0.114	x	1	0.247	33.8	1.21	0.300
100	GSM1900	GPRS Class10	Bottom Face	0	512	26.70	0.09	x	1	0.749	26.8	1.02	0.766
101	GSM1900	GPRS Class10	Secondary Landscape	0	512	26.70	0.137	x	1	1.03	26.8	1.02	1.054
102	GSM1900	GPRS Class10	Secondary Landscape	0	661	26.53	0.110	x	1	0.97	26.8	1.06	1.032
103	GSM1900	GPRS Class10	Secondary Landscape	0	810	26.48	0.119	x	1	1.01	26.8	1.08	1.087
104	GSM1900	GPRS Class10	Secondary Landscape	0	512	26.70	-0.162	x	2	0.933	26.8	1.02	0.955
105	GSM1900	GPRS Class10	Secondary Landscape	0	661	26.53	-0.153	x	2	0.799	26.8	1.06	0.850
106	GSM1900	GPRS Class10	Secondary Landscape	0	810	26.48	-0.103	x	2	0.75	26.8	1.08	0.807
107	GSM1900	GPRS Class10	Secondary Landscape	0	512	26.70	0.174	v	1	0.97	26.8	1.02	0.993
108	GSM1900	GPRS Class10	Secondary Landscape	0	661	26.53	0.142	v	1	1.03	26.8	1.06	1.096
109	**GSM1900**	**GPRS Class10**	**Secondary Landscape**	**0**	**810**	**26.48**	**0.117**	**v**	**1**	**1.05**	**26.8**	**1.08**	**1.130**
21	GSM1900	GPRS Class10	Primary Portrait	0	512	30.60	0.130	x	1	0.252	30.8	1.05	0.264
64	WCDMA Band V	RMC12.2K	Bottom Face	0	4132	20.70	0.163	x	1	0.613	21	1.07	0.657
65	WCDMA Band V	RMC12.2K	Secondary Landscape	0	4132	20.70	-0.125	x	1	0.396	21	1.07	0.424
66	WCDMA Band V	RMC12.2K	Bottom Face	0	4132	20.70	0.165	x	2	0.751	21	1.07	0.805
67	WCDMA Band V	RMC12.2K	Bottom Face	0	4132	20.70	0.187	v	2	0.809	21	1.07	0.867
68	**WCDMA Band V**	**RMC12.2K**	**Bottom Face**	**0**	**4182**	**20.64**	**-0.017**	**v**	**2**	**0.882**	**21**	**1.09**	**0.958**
69	WCDMA Band V	RMC12.2K	Bottom Face	0	4233	20.68	0.150	v	2	0.887	21	1.08	0.955

35	WCDMA Band V	RMC12.2K	Primary Portrait	0	4132	24.32	0.105	x	1	0.184	25	1.17	0.215

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Conductive Power (dBm)	Power Drift (dB)	Pen	Ant.	SAR_{1g} (W/kg)	Tune-up Power (dBm)	Scaling Factor	Scaled 1g SAR
88	WCDMA Band IV	RMC12.2K	Bottom Face	0	1513	17.60	0.01	x	1	0.66	18	1.10	0.724
89	WCDMA Band IV	RMC12.2K	Secondary Landscape	0	1513	17.60	0.16	x	1	1	18	1.10	1.096
90	**WCDMA Band IV**	**RMC12.2K**	**Secondary Landscape**	**0**	**1312**	**17.44**	**0.166**	**x**	**1**	**1.08**	**18**	**1.14**	**1.229**
91	WCDMA Band IV	RMC12.2K	Secondary Landscape	0	1413	17.41	0.188	x	1	0.988	18	1.15	1.132
94	WCDMA Band IV	RMC12.2K	Secondary Landscape	0	1312	17.44	0.126	x	2	0.997	18	1.14	1.134
95	WCDMA Band IV	RMC12.2K	Secondary Landscape	0	1413	17.41	0.110	x	2	0.935	18	1.15	1.071
96	WCDMA Band IV	RMC12.2K	Secondary Landscape	0	1513	17.60	0.107	x	2	0.956	18	1.10	1.048
97	WCDMA Band IV	RMC12.2K	Secondary Landscape	0	1312	17.44	0.111	v	1	0.806	18	1.14	0.917
98	WCDMA Band IV	RMC12.2K	Secondary Landscape	0	1413	17.41	0.102	v	1	0.755	18	1.15	0.865
99	WCDMA Band IV	RMC12.2K	Secondary Landscape	0	1513	17.60	0.073	v	1	0.688	18	1.10	0.754
57	WCDMA Band IV	RMC12.2K	Primary Portrait	0	1513	20.57	0.198	x	1	0.157	21	1.10	0.173
43	WCDMA Band II	RMC12.2K	Bottom Face	0	9400	19.68	0.01	x	1	0.933	20	1.08	1.004
44	WCDMA Band II	RMC12.2K	Secondary Landscape	0	9400	19.68	0.195	x	1	1.28	20	1.08	1.378
45	WCDMA Band II	RMC12.2K	Bottom Face	0	9262	19.48	-0.158	x	1	1.06	20	1.13	1.195
46	WCDMA Band II	RMC12.2K	Bottom Face	0	9538	19.40	0.182	x	1	0.923	20	1.15	1.060
47	**WCDMA Band II**	**RMC12.2K**	**Secondary Landscape**	**0**	**9262**	**19.48**	**0.122**	**x**	**1**	**1.32**	**20**	**1.13**	**1.488**
48	WCDMA Band II	RMC12.2K	Secondary Landscape	0	9538	19.40	0.139	x	1	1.25	20	1.15	1.435
49	WCDMA Band II	RMC12.2K	Secondary Landscape	0	9262	19.48	0.011	x	2	1.15	20	1.13	1.296
50	WCDMA Band II	RMC12.2K	Secondary Landscape	0	9400	19.68	0.118	x	2	1.01	20	1.08	1.087
51	WCDMA Band II	RMC12.2K	Secondary Landscape	0	9538	19.40	0.108	x	2	0.915	20	1.15	1.051
52	WCDMA Band II	RMC12.2K	Secondary Landscape	0	9262	19.48	0.123	v	1	0.89	20	1.13	1.003
53	WCDMA Band II	RMC12.2K	Secondary Landscape	0	9400	19.68	0.164	v	1	1.11	20	1.08	1.195
54	WCDMA Band II	RMC12.2K	Secondary Landscape	0	9538	19.40	0.187	v	1	1.23	20	1.15	1.412
3	WCDMA Band II	RMC12.2K	Primary Portrait	0	9400	22.60	0.019	x	1	0.262	23	1.10	0.287

70	CDMA2000 BC0	RTAP153.6	Bottom Face	0	384	20.37	0.175	x	1	0.582	21	1.16	0.673
71	CDMA2000 BC0	RTAP153.6	Secondary Landscape	0	384	20.37	-0.076	x	1	0.363	21	1.16	0.420
72	CDMA2000 BC0	RTAP153.6	Bottom Face	0	384	20.37	0.158	x	2	0.753	21	1.16	0.871
73	**CDMA2000 BC0**	**RTAP153.6**	**Bottom Face**	**0**	**384**	**20.37**	**0.174**	**v**	**2**	**0.804**	**21**	**1.16**	**0.930**
74	CDMA2000 BC0	RTAP153.6	Bottom Face	0	1013	20.22	0.169	v	2	0.716	21	1.20	0.857
75	CDMA2000 BC0	RTAP153.6	Bottom Face	0	777	20.31	0.179	v	2	0.787	21	1.17	0.923
40	CDMA2000 BC0	RTAP153.6	Primary Portrait	0	384	24.39	-0.118	x	1	0.168	25	1.15	0.193
76	CDMA2000 BC1	RTAP153.6	Bottom Face	0	25	19.41	0.012	x	1	0.962	20	1.15	1.102
77	**CDMA2000 BC1**	**RTAP153.6**	**Secondary Landscape**	**0**	**25**	**19.41**	**0.150**	**x**	**1**	**1.34**	**20**	**1.15**	**1.535**
78	CDMA2000 BC1	RTAP153.6	Bottom Face	0	600	19.24	0.016	x	1	0.834	20	1.19	0.993
79	CDMA2000 BC1	RTAP153.6	Bottom Face	0	1175	19.18	0.15	x	1	0.809	20	1.21	0.977
80	CDMA2000 BC1	RTAP153.6	Secondary Landscape	0	600	19.24	0.107	x	1	1.11	20	1.19	1.322
81	CDMA2000 BC1	RTAP153.6	Secondary Landscape	0	1175	19.18	0.136	x	1	1.13	20	1.21	1.365
82	CDMA2000 BC1	RTAP153.6	Secondary Landscape	0	25	19.41	0.188	x	2	1.24	20	1.15	1.420
83	CDMA2000 BC1	RTAP153.6	Secondary Landscape	0	600	19.24	0.172	x	2	0.951	20	1.19	1.133
84	CDMA2000 BC1	RTAP153.6	Secondary Landscape	0	1175	19.18	0.185	x	2	0.868	20	1.21	1.048
85	CDMA2000 BC1	RTAP153.6	Secondary Landscape	0	25	19.41	0.112	v	1	0.84	20	1.15	0.962
86	CDMA2000 BC1	RTAP153.6	Secondary Landscape	0	600	19.24	0.185	v	1	1.03	20	1.19	1.227
87	CDMA2000 BC1	RTAP153.6	Secondary Landscape	0	1175	19.18	0.099	v	1	1.16	20	1.21	1.401
10	CDMA2000 BC1	RTAP153.6	Primary Portrait	0	25	23.61	0.144	x	1	0.42	24	1.09	0.459

Note:

1. During SAR testing for Primary-Portrait position, proximity sensor power reduction is disabled to avoid any unexpected trigger. The specific SW utility is used to disable the proximity sensor for SAR testing only, and the SW is not available for end users.
2. There are two WWAN antenna sources, mark with antenna 1 and 2 respectively. The detailed antenna specification is provided in "WWAN antenna specification exhibit"

< 2G/3G SAR for verifying power reduction scheme>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Conductive Power (dBm)	Power Drift (dB)	Pen	Ant.	SAR_{1g} (W/kg)	Tune-up Power (dBm)	Scaling Factor	Scaled 1g SAR
28	GSM850	GPRS Class 10	Bottom Face	1.2	251	32.99	0.076	x	1	0.274	33.8	1.21	0.332
29	GSM850	GPRS Class 10	Secondary Landscape	1	251	32.99	0.110	x	1	0.291	33.8	1.21	0.353
31	GSM850	GPRS Class 10	Secondary Landscape	1	251	32.99	0.155	x	2	0.324	33.8	1.21	0.393
32	**GSM850**	**GPRS Class 10**	**Secondary Landscape**	**1**	**251**	**32.99**	**0.093**	**v**	**2**	**0.526**	**33.8**	**1.21**	**0.638**
19	GSM1900	GPRS Class 10	Bottom Face	1.2	512	30.65	-0.09	x	1	0.154	30.8	1.05	0.161
20	GSM1900	GPRS Class 10	Secondary Landscape	1	512	30.65	0.127	x	1	0.755	30.8	1.05	0.791
22	**GSM1900**	**GPRS Class 10**	**Secondary Landscape**	**1**	**512**	**30.65**	**0.120**	**x**	**2**	**1.29**	**30.8**	**1.05**	**1.351**
23	GSM1900	GPRS Class 10	Secondary Landscape	1	661	30.48	-0.011	x	2	1.13	30.8	1.09	1.233
24	GSM1900	GPRS Class 10	Secondary Landscape	1	810	30.52	0.054	x	2	1.14	30.8	1.09	1.239
25	GSM1900	GPRS Class 10	Secondary Landscape	1	512	30.65	0.052	v	2	0.861	30.8	1.05	0.902
26	GSM1900	GPRS Class 10	Secondary Landscape	1	661	30.48	0.184	v	2	0.844	30.8	1.09	0.921
27	GSM1900	GPRS Class 10	Secondary Landscape	1	810	30.52	0.151	v	2	0.882	30.8	1.09	0.958
33	WCDMA Band V	RMC12. 2K	Bottom Face	1.2	4132	24.32	0.103	x	1	0.164	25	1.17	0.192
34	WCDMA Band V	RMC12. 2K	Secondary Landscape	1	4132	24.32	0.092	x	1	0.206	25	1.17	0.241
36	WCDMA Band V	RMC12. 2K	Secondary Landscape	1	4132	24.32	0.046	x	2	0.208	25	1.17	0.243
37	**WCDMA Band V**	**RMC12. 2K**	**Secondary Landscape**	**1**	**4132**	**24.32**	**0.017**	**v**	**2**	**0.264**	**25**	**1.17**	**0.309**
55	WCDMA Band IV	RMC12. 2K	Bottom Face	1.2	1513	20.57	0.00635	x	1	0.19	21	1.10	0.210
56	WCDMA Band IV	RMC12. 2K	Secondary Landscape	1	1513	20.57	0.175	x	1	0.784	21	1.10	0.866
58	WCDMA Band IV	RMC12. 2K	Secondary Landscape	1	1513	20.57	-0.116	x	2	1.06	21	1.10	1.170
59	WCDMA Band IV	RMC12. 2K	Secondary Landscape	1	1312	20.48	0.023	x	2	1.06	21	1.13	1.195
60	WCDMA Band IV	RMC12. 2K	Secondary Landscape	1	1413	20.47	0.011	x	2	1.04	21	1.13	1.175
61	**WCDMA Band IV**	**RMC12. 2K**	**Secondary Landscape**	**1**	**1312**	**20.48**	**0.135**	**v**	**2**	**1.28**	**21**	**1.13**	**1.443**
62	WCDMA Band IV	RMC12. 2K	Secondary Landscape	1	1413	20.47	-0.038	v	2	1.21	21	1.13	1.367
63	WCDMA Band IV	RMC12. 2K	Secondary Landscape	1	1513	20.57	0.076	v	2	1.17	21	1.10	1.292

1	WCDMA Band II	RMC12.2K	Bottom Face	1.2	9400	22.60	-0.149	x	1	0.235	23	1.10	0.258
2	WCDMA Band II	RMC12.2K	Secondary Landscape	1	9400	22.60	0.171	x	1	0.777	23	1.10	0.852
4	WCDMA Band II	RMC12.2K	Secondary Landscape	1	9400	22.60	0.179	x	2	1.16	23	1.10	1.272
5	**WCDMA Band II**	**RMC12.2K**	**Secondary Landscape**	**1**	**9262**	**22.47**	**0.123**	**x**	**2**	**1.14**	**23**	**1.13**	**1.288**
6	WCDMA Band II	RMC12.2K	Secondary Landscape	1	9538	22.41	0.164	x	2	0.928	23	1.15	1.063
7	WCDMA Band II	RMC12.2K	Secondary Landscape	1	9400	22.60	0.138	v	2	0.756	23	1.10	0.829

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Average Power (dBm)	Power Drift (dB)	Pen	Ant.	SAR_{1g} (W/kg)	Tune-up Power (dBm)	Scaling Factor	Scaled 1g SAR
38	CDMA2000 BC0	RTAP153.6	Bottom Face	1.2	384	24.39	0.108	x	1	0.183	25	1.15	0.211
39	CDMA2000 BC0	RTAP153.6	Secondary Landscape	1	384	24.39	0.00792	x	1	0.192	25	1.15	0.221
41	CDMA2000 BC0	RTAP153.6	Secondary Landscape	1	384	24.39	0.126	x	2	0.207	25	1.15	0.238
42	**CDMA2000 BC0**	**RTAP153.6**	**Secondary Landscape**	**1**	**384**	**24.39**	**0.030**	**v**	**2**	**0.314**	**25**	**1.15**	**0.361**
8	CDMA2000 BC1	RTAP153.6	Bottom Face	1.2	25	23.61	0.12	x	1	0.363	24	1.09	0.397
9	CDMA2000 BC1	RTAP153.6	Secondary Landscape	1	25	23.61	-0.141	x	1	1.13	24	1.09	1.236
11	CDMA2000 BC1	RTAP153.6	Secondary Landscape	1	600	23.53	-0.175	x	1	0.854	24	1.11	0.952
12	CDMA2000 BC1	RTAP153.6	Secondary Landscape	1	1175	23.40	-0.174	x	1	0.716	24	1.15	0.822
13	**CDMA2000 BC1**	**RTAP153.6**	**Secondary Landscape**	**1**	**25**	**23.61**	**-0.110**	**x**	**2**	**1.44**	**24**	**1.09**	**1.575**
14	CDMA2000 BC1	RTAP153.6	Secondary Landscape	1	600	23.53	-0.199	x	2	1.29	24	1.11	1.437
15	CDMA2000 BC1	RTAP153.6	Secondary Landscape	1	1175	23.40	-0.173	x	2	1.02	24	1.15	1.171
16	CDMA2000 BC1	RTAP153.6	Secondary Landscape	1	25	23.61	-0.135	v	2	1.13	24	1.09	1.236
17	CDMA2000 BC1	RTAP153.6	Secondary Landscape	1	600	23.53	0.123	v	2	0.965	24	1.11	1.075
18	CDMA2000 BC1	RTAP153.6	Secondary Landscape	1	1175	23.40	-0.160	v	2	0.899	24	1.15	1.032

Note:

1. 1 cm and 1.2 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. During the test, specific test SW is used for disabling proximity-sensor/power-reduction, and the test SW is not available to end users.
3. There are two WWAN antenna sources, mark with antenna 1 and 2 respectively. The detailed antenna specification is provided in "WWAN antenna specification exhibit"

<0 cm WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Channel	Average Power (dBm)	Power Drift (dB)	SAR_{1g} (W/kg)
1	802.11b	-	Bottom Face	0	11	17.21	0.137	0.155
2	**802.11b**	**-**	**Primary Landscape**	**0**	**11**	**17.21**	-0.031	**0.203**
3	802.11a	-	Bottom Face	0	44	13.89	0.157	0.107
4	802.11a	-	Primary Landscape	0	44	13.89	0.1	0.315
5	802.11a	-	Bottom Face	0	52	16.91	0.013	0.346
6	802.11a	-	Primary Landscape	0	52	16.91	0.13	0.66
7	802.11a	-	Bottom Face	0	104	15.32	0.143	0.269
8	**802.11a**	**-**	**Primary Landscape**	**0**	**104**	**15.32**	0.138	**0.736**
9	802.11a	-	Bottom Face	0	157	16.42	0.0114	0.27
10	802.11a	-	Primary Landscape	0	157	16.42	0.124	0.727

Note: WLAN SAR date comes from the WLAN module – Atheros ARS263 SAR test (FCC ID: PPD-ARS263), which was also installed in the Tablet PC Dell T02G during the WWAN SAR test.

12.3 Simultaneous Transmission SAR Analysis and Measurements

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

Position	GSM 850	GSM 1900	WCDMA Band V	WCDMA Band II	WCDMA Band IV	CDMA2000 BC0	CDMA2000 BC1	802.11 b	802.11a	Max. SAR Summation	Volume Scan
Bottom Face	1.166	0.766	0.958	**1.195**	0.724	0.930	1.102	0.155	**0.346**	**1.541**	**No**

Note:

1. If 1g-SAR scalar summation < 1.6W/kg, simultaneous SAR measurement is not necessary.
2. Per Section 11.2, simultaneous transmission consideration will only occur in Bottom Face exposure position.

<Test distance 12 mm to the phantom; DUT with Full Power SAR>

Position	GSM 850	GSM 1900	WCDMA Band V	WCDMA Band II	WCDMA Band IV	CDMA2000 BC0	CDMA2000 BC1	802.11 b	802.11a	Max. SAR Summation	Volume Scan
Bottom Face	0.332	0.161	0.192	0.258	0.210	0.211	**0.397**	0.155	**0.346**	**0.709**	**No**

Note:

1. 12 mm 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 0 mm is applied here, and it will represent more conservative situation than WLAN SAR data at 12 mm.

Test Engineer： Nick Tour and Michael Yang and Angelo Chang and Ted Sun and Niels Ouyang and San Lin and Bevis Chang

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 616217 D03 v01, “SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet Computers”, November 2009

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

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

[11] FCC KDB 941225 D04 v01, “Evaluating SAR for GSM/(E)GPRS Dual Transfer Mode”, January 27 2010

[12] FCC KDB 941225 D07 01, "SAR Evaluation Procedure for UMPC Mini-Tablet Devices", April 2011

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.