FCC SAR Test Report

APPLICANT	**:**	**Hewlett-Packard Company**
EQUIPMENT	**:**	**Notebook PC**
BRAND NAME	**:**	**HP**
MODEL NAME	**:**	**TPN-W110**
FCC ID	**:**	**B94TNW110HWWR**
STANDARD	**:**	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2003**

The product was completely tested on Sep. 04, 2013. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

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

Eric Huang

Reviewed by: Eric Huang / Deputy Manager

Jones Tsai

Approved by: Jones Tsai / Manager

ilac-MRA

TAF Testing Laboratory 1190

SPORTON INTERNATIONAL INC.

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA391601	Rev. 01	Initial issue of report	Oct. 15, 2013
FA391601	Rev. 02	Revised maximum power of GPRS1900 (GMSK4TXslots) in page 7.	Nov. 08, 2013

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Hewlett-Packard Company Notebook PC** are as follows.

<Highest SAR Summary>

Exposure Position	Frequency Band	Reported 1g-SAR (W/kg)	Equipment Class	Highest Reported 1g-SAR (W/kg)
Body	GPRS850	0.96	PCB	1.43
	GPRS1900	1.23		
	WCDMA Band V	0.96		
	WCDMA Band IV	1.41		
	WCDMA Band II	1.43		

<Highest Simultaneous transmission SAR>

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Body	WCDMA V	PCB	1.59
	WLAN2.4GHz Band	DTS	

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Body	WCDMA II	PCB	1.47
	Bluetooth	DSS	

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

2. Administration Data

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL 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	Hewlett-Packard Company
Address	3000 Hanover Street, Palo Alto, California 94304, USA

2.3 Application Details

Date of Start during the Test	Jun. 18, 2013
Date of End during the Test	Sep. 04, 2013

3. General Information

3.1 Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT	Notebook PC
Brand Name	HP
Model Name	TPN-W110
FCC ID	B94TNW110HWWR
IMEI Code	886274010189284
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz
Mode	• GPRS/EGPRS • RMC 12.2Kbps Rel 99 • HSDPA Rel 7, Cat14 • HSUPA Rel 6, Cat6
Antenna Type	PIFA Antenna
EUT Stage	Identical Prototype

Remark:
1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. WLAN/Bluetooth module FCC ID: PD97260H is also integrated into this host, and C2PC filing was granted on 2013/07/23. Bluetooth and WLAN SAR test results are refer to RF Exposure Lab FCC SAR Report, Report No: SAR.20130701, available on FCC website.

3.2 Maximum RF output power among production units

Band	average power (dBm)			
	GSM 850		GSM 1900	
Output Power Status	Full power mode	Reduced Power mode	Full power mode	Reduced Power mode
GPRS (GMSK, 1 Tx slot)	33.5	30.0	30.5	26.0
GPRS (GMSK, 2 Tx slots)	31.0	27.5	28.0	23.5
GPRS (GMSK, 3 Tx slots)	29.5	26.0	26.5	22.0
GPRS (GMSK, 4 Tx slots)	28.0	24.5	25.0	20.5
EDGE (8PSK, 1 Tx slot)	28.0	24.5	27.0	22.5
EDGE (8PSK, 2 Tx slots)	25.5	22.0	24.5	20.0
EDGE (8PSK, 3 Tx slots)	24.0	20.5	23.0	18.5
EDGE (8PSK, 4 Tx slots)	22.5	19.0	21.5	17.0

Band	average power(dBm)					
	WCDMA Band V		WCDMA Band II		WCDMA Band IV	
Output Power Status	Full power mode	Reduced Power mode	Full power mode	Reduced Power mode	Full power mode	Reduced Power mode
RMC 12.2Kbps	24.5	21.0	24.5	18.0	24.5	18.0
HSDPA Subtest-1	24.5	21.0	24.5	18.0	24.5	18.0
HSUPA Subtest-5	24.5	21.0	24.5	18.0	24.5	18.0

3.3 Applied Standard

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

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2003
- FCC KDB 865664 D01 v01r01
- FCC KDB 447498 D01 v05r01
- FCC KDB 616217 D04 v01r01
- FCC KDB 941225 D01 v02
- FCC KDB 941225 D02 v02r02
- FCC KDB 941225 D03 v01

3.4 Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

3.5 Test Conditions

3.5.1 Ambient Condition

Ambient Temperature	20 to 24 ℃
Humidity	< 60 %

3.5.2 Test Configuration

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

The EUT was set from the emulator to radiate maximum WWAN output power during all tests. For Bottom-Face testing at 0cm separation, the proximity sensor will activate the power reduction and the maximum power is limited at the pre-defined level implemented in this device.

Target Power reduction applied for each wireless mode and orientation

Exposure Position / wireless mode	Bottom Face(1)	Edge 1(1)	Edge 2	Edge 3	Edge 4
GSM850 GPRS (GMSK 1 Tx slot) - CS1	3.5 dB	3.5 dB	0 dB	0 dB	0 dB
GSM850 GPRS (GMSK 2 Tx slots) - CS1	3.5 dB	3.5 dB	0 dB	0 dB	0 dB
GSM850 GPRS (GMSK 3 Tx slots) - CS1	3.5 dB	3.5 dB	0 dB	0 dB	0 dB
GSM850 GPRS (GMSK 4 Tx slots) - CS1	3.5 dB	3.5 dB	0 dB	0 dB	0 dB
GSM850 EDGE (8PSK 1 Tx slot) - MCS5	3.5 dB	3.5 dB	0 dB	0 dB	0 dB
GSM850 EDGE (8PSK 2 Tx slots) - MCS5	3.5 dB	3.5 dB	0 dB	0 dB	0 dB
GSM850 EDGE (8PSK 3 Tx slots) - MCS5	3.5 dB	3.5 dB	0 dB	0 dB	0 dB
GSM850 EDGE (8PSK 4 Tx slots) - MCS5	3.5 dB	3.5 dB	0 dB	0 dB	0 dB
GSM1900 GPRS (GMSK 1 Tx slot) - CS1	4.5 dB	4.5 dB	0 dB	0 dB	0 dB
GSM1900 GPRS (GMSK 2 Tx slots) - CS1	4.5 dB	4.5 dB	0 dB	0 dB	0 dB
GSM1900 GPRS (GMSK 3 Tx slots) - CS1	4.5 dB	4.5 dB	0 dB	0 dB	0 dB
GSM1900 GPRS (GMSK 4 Tx slots) - CS1	4.5 dB	4.5 dB	0 dB	0 dB	0 dB
GSM1900 EDGE (8PSK 1 Tx slot) - MCS5	4.5 dB	4.5 dB	0 dB	0 dB	0 dB
GSM1900 EDGE (8PSK 2 Tx slots) - MCS5	4.5 dB	4.5 dB	0 dB	0 dB	0 dB
GSM1900 EDGE (8PSK 3 Tx slots) - MCS5	4.5 dB	4.5 dB	0 dB	0 dB	0 dB
GSM1900 EDGE (8PSK 4 Tx slots) - MCS5	4.5 dB	4.5 dB	0 dB	0 dB	0 dB
WCDMA V RMC12.2Kbps	3.5 dB	3.5 dB	0 dB	0 dB	0 dB
WCDMA II RMC12.2Kbps	6.5 dB	6.5 dB	0 dB	0 dB	0 dB
WCDMA IV RMC12.2Kbps	6.5 dB	6.5 dB	0 dB	0 dB	0 dB

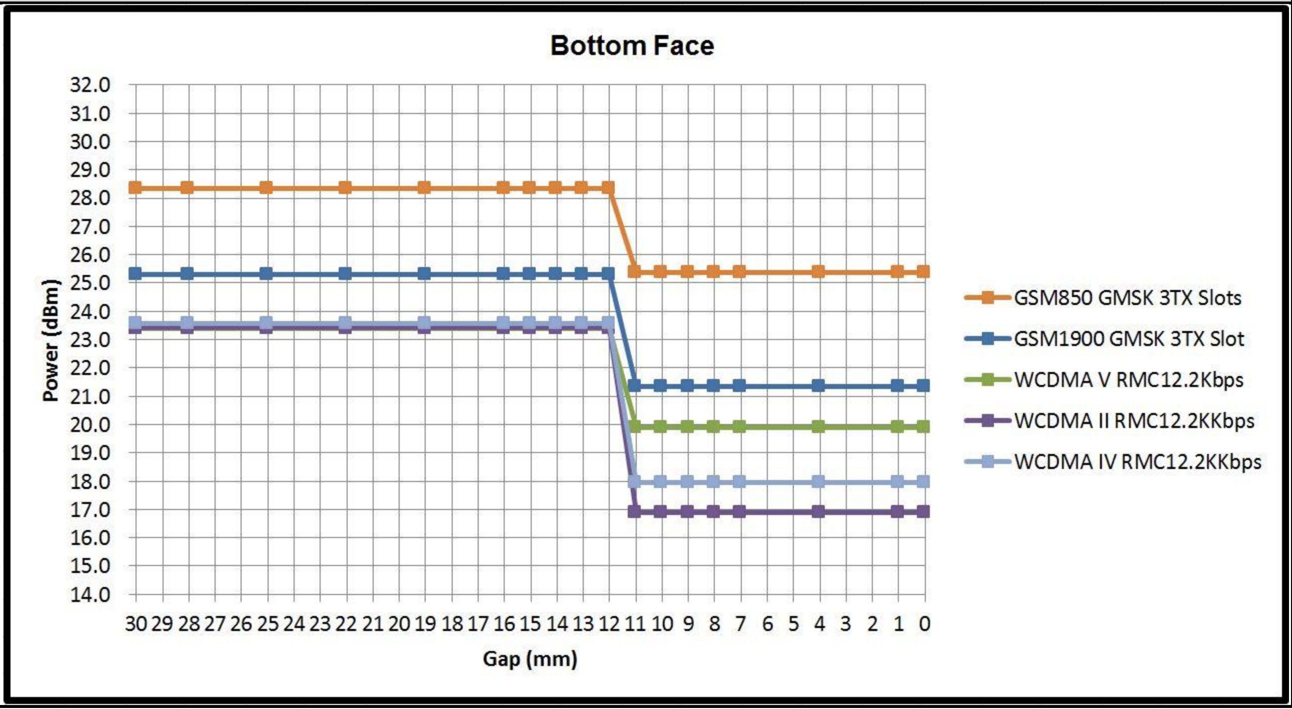
Remark:

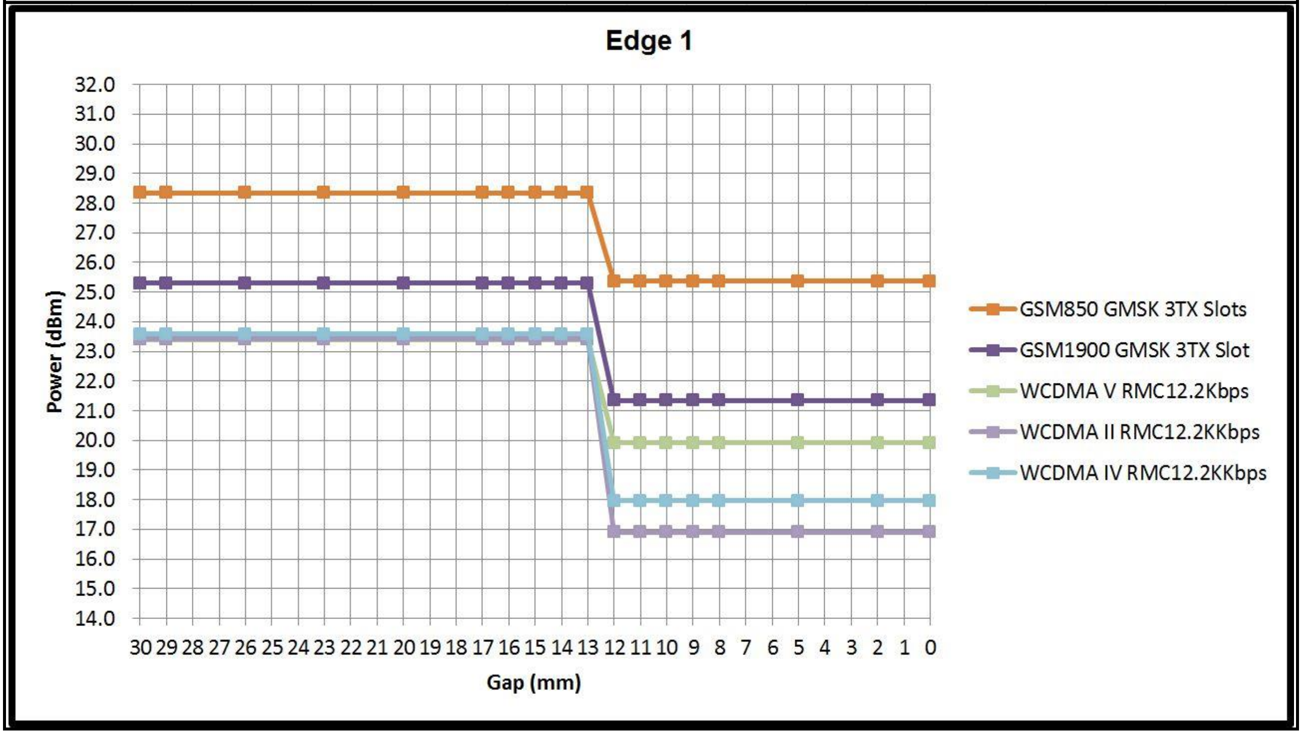
1. (1): Reduced maximum limit applied by activation of proximity sensor.

Measurement on EUT:

Band/Mode	Ch #	Measured power reduction (dBm)		Reduction Levels
		w/o power back-off	w/ power back-off	(dB)
GSM850 GPRS (GMSK 3 Tx slots) - CS1	251	28.33	25.36	2.97
GSM1900 GPRS (GMSK 3 Tx slots) - CS1	512	25.29	21.35	3.94
WCDMA V (RMC 12.2Kbps)	4132	23.40	19.91	3.49
WCDMA II (RMC 12.2Kbps)	9262	23.41	16.89	6.52
WCDM IV (RMC 12.2Kbps)	1312	23.58	17.96	5.62

Proximity Sensor for Bottom Face detection



Proximity Sensor for Edge 1 detection


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:

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

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

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

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

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

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

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

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

5. SAR Measurement System

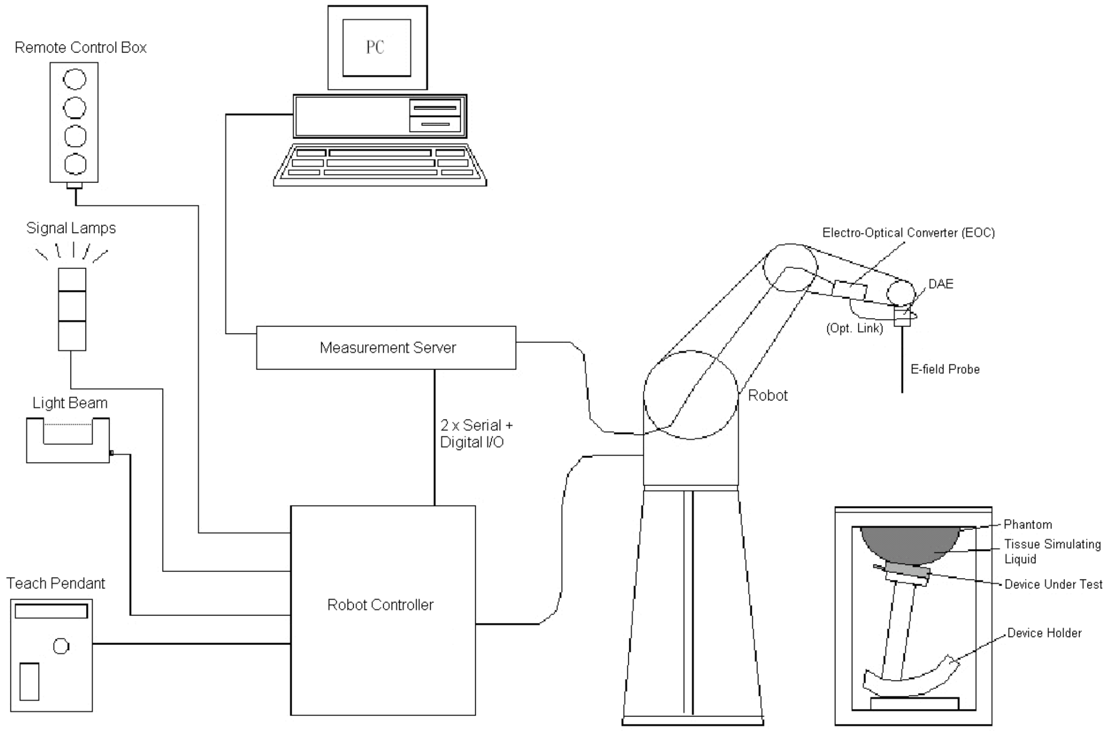


Fig 5.1 SPEAG DASY System Configurations

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

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

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

5.1 E-Field Probe

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

5.1.1 E-Field Probe Specification

<ES3DV3 Probe >

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 3 GHz; Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 µW/g to 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 10 mm) Tip diameter: 4 mm (Body: 10 mm) Distance from probe tip to dipole centers: 3 mm

Fig 5.2 Photo of ES3DV3

<EX3DV4 Probe>

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

Fig 5.3 Photo of EX3DV4/ES3DV4

5.1.2 E-Field Probe Calibration

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

5.2 Data Acquisition Electronics (DAE)

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

Fig 5.4 Photo of DAE

5.3 Robot

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

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

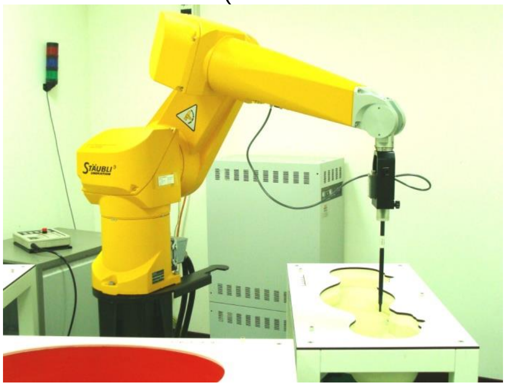


Fig 5.5 Photo of DASY4

Fig 5.6 Photo of DASY5

5.4 Measurement Server

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

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

Fig 5.7 Photo of Server for DASY4

Fig 5.8 Photo of Server for DASY5

5.5 Phantom

<SAM Twin Phantom>

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

Fig 5.9 Photo of SAM Phantom

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

<ELI4 Phantom>

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

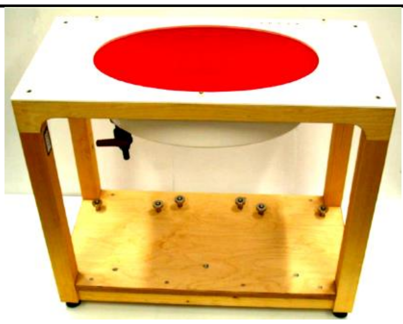


Fig 5.10 Photo of ELI4 Phantom

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

5.6 Device Holder

<Device Holder for SAM Twin Phantom>

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

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

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

Fig 5.11 Device Holder

<Laptop Extension Kit>

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

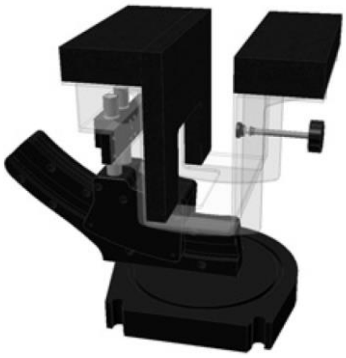


Fig 5.12 Laptop Extension Kit

5.7 Data Storage and Evaluation

5.7.1 Data Storage

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

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

5.7.2 Data Evaluation

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

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

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

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

The formula for each channel can be given as：

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

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), $\mu V/(V/m)^2$ 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)：

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

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	835MHz System Validation Kit	D835V2	499	Mar. 18, 2013	Mar. 17, 2014
SPEAG	1750MHz System Validation Kit	D1750V2	1068	Jun. 20, 2012	Jun. 19, 2014
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Mar. 20, 2013	Mar. 19, 2014
SPEAG	Data Acquisition Electronics	DAE4	778	Aug. 27, 2012	Aug. 26, 2013
SPEAG	Data Acquisition Electronics	DAE3	495	May. 08, 2013	May. 07, 2014
SPEAG	Data Acquisition Electronics	DAE4	1279	Jan. 28, 2013	Jan. 27, 2014
SPEAG	Data Acquisition Electronics	DAE4	1338	May. 28, 2013	May. 27, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3697	Sep. 28, 2012	Sep. 27, 2013
SPEAG	Dosimetric E-Field Probe	EX3DV4	3792	Jun. 04, 2013	Jun. 03, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3925	Jun. 12, 2013	Jun. 11, 2014
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 28, 2012	Sep. 27, 2013
Wisewind	Thermometer	ETP-101	TM560	Nov. 13, 2012	Nov. 12, 2013
Wisewind	Thermometer	ETP-101	TM685	Nov. 13, 2012	Nov. 12, 2013
Wisewind	Thermometer	HTC-1	TM281	Nov. 13, 2012	Nov. 12, 2013
H.M.IRIS	Thermometer	TH-08	TM658	Nov. 13, 2012	Nov. 12, 2013
Agilent	Wireless Communication Test Set	E5515C	MY50264370	Apr. 30, 2013	Apr. 29, 2015
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 06, 2013	May. 05, 2015
SPEAG	Device Holder	N/A	N/A	NCR	NCR
Agilent	ESG Vector Series Signal Generator	E4438C	MY49070755	Oct. 02, 2012	Oct. 01, 2013
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	May. 23, 2013	May. 22, 2014
Agilent	ENA Network Analyzer	E5071C	MY46316648	Feb. 07, 2013	Feb. 06, 2014
Anritsu	Power Meter	ML2495A	1218006	Oct. 22, 2012	Oct. 21, 2013
Anritsu	Power Sensor	MA2411B	1207363	Oct. 24, 2012	Oct. 23, 2013
Agilent	Dual Directional Coupler	778D	50422	Note 4	
Woken	Attenuator 1	WK0602-XX	N/A	Note 4	
PE	Attenuator 2	PE7005-10	N/A	Note 4	
PE	Attenuator 3	PE7005- 3	N/A	Note 4	
AR	Power Amplifier	5S1G4M2	328767	Note 5	
R&S	Spectrum Analyzer	FSP 7	101131	Jun. 09, 2013	Jun. 08, 2014

Table 5.1 Test Equipment List

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. Referring to KDB 865664 D01v01r01, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole D1750V2, SN: 1068 can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.
4. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
5. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it
6. Attenuator 1 insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.

6. Tissue Simulating Liquids

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

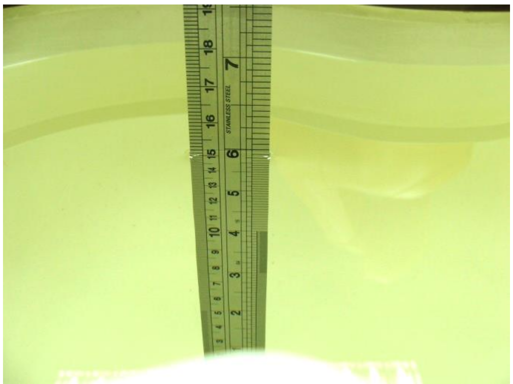


Fig 6.1 Photo of Liquid Height for Head SAR

Fig 6.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ε_r)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7

Table 6.1 Recipes of Tissue Simulating Liquid

Simulating Liquid for 5G, Manufactured by SPEAG

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

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an SPEAG DAK-3.5 Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid.

Frequency (MHz)	Liquid Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
835	Body	22.3	0.963	54.541	0.97	55.2	-0.72	-1.19	±5	2013/6/21
835	Body	22.6	0.941	54.532	0.97	55.2	-2.99	-1.21	±5	2013/8/1
835	Body	22.1	0.987	54.126	0.97	55.2	1.75	-1.95	±5	2013/8/5
835	Body	22.4	0.964	54.532	0.97	55.2	-0.62	-1.21	±5	2013/9/4
1750	Body	22.6	1.493	53.164	1.52	53.3	-1.78	-0.26	±5	2013/6/18
1750	Body	22.6	1.516	52.234	1.52	53.3	-0.26	-2.00	±5	2013/9/3
1900	Body	22.4	1.573	51.747	1.52	53.3	3.49	-2.91	±5	2013/6/19
1900	Body	22.1	1.532	52.328	1.52	53.3	0.79	-1.82	±5	2013/8/5
1900	Body	22.5	1.546	52.216	1.52	53.3	1.71	-2.03	±5	2013/9/3

Table 6.2 Measuring Results for Simulating Liquid

7. System Verification Procedures

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

7.1 Purpose of System Performance check

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

7.2 System Setup

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

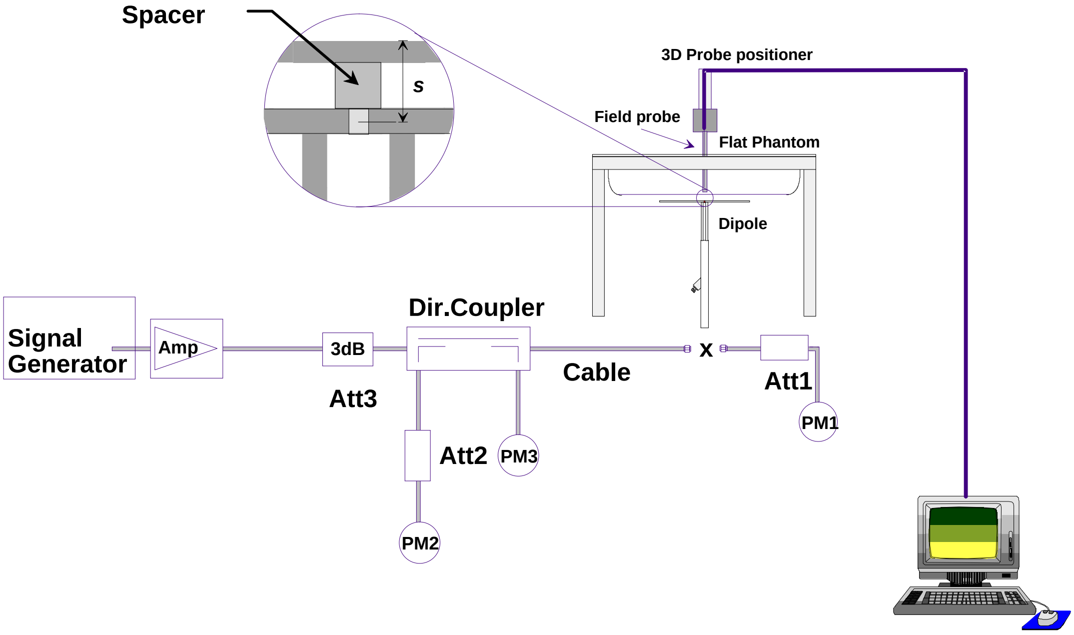


Fig 7.1 System Setup for System Evaluation

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

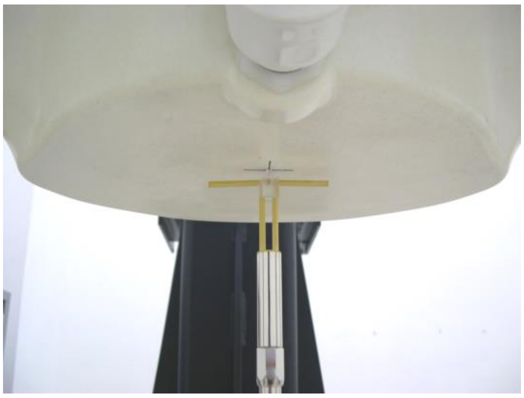


Fig 7.2 Photo of Dipole Setup

7.3 SAR System Verification Results

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

Date	Frequency (MHz)	Liquid Type	Power fed onto reference dipole (mW)	Targeted SAR (W/kg)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
2013/6/21	835	Body	250	9.63	2.43	9.72	0.93
2013/8/1	835	Body	250	9.63	2.52	10.08	4.67
2013/8/5	835	Body	250	9.63	2.41	9.64	0.10
2013/9/4	835	Body	250	9.63	2.29	9.16	-4.88
2013/6/18	1750	Body	250	36.8	8.57	34.28	-6.85
2013/9/3	1750	Body	250	36.8	9.38	37.52	1.96
2013/6/19	1900	Body	250	40.8	10.2	40.80	0.00
2013/8/5	1900	Body	250	40.8	9.89	39.56	-3.04
2013/9/3	1900	Body	250	40.8	9.98	39.92	-2.16

Table 7.1 Target and Measurement SAR after Normalized

8. EUT Testing Position

Please refer to Appendix D for the test setup photos.

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

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

<SAR measurement>

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

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

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

9.1 Spatial Peak SAR Evaluation

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

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

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

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

9.2 Power Reference Measurement

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

9.3 Area & Zoom Scan Procedures

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

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

<table>
<tr><td colspan="3"></td><td>$\leq$ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>$\leq$ 2 GHz: $\leq$ 15 mm
2 – 3 GHz: $\leq$ 12 mm</td><td>3 – 4 GHz: $\leq$ 12 mm
4 – 6 GHz: $\leq$ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>$\leq$ 2 GHz: $\leq$ 8 mm
2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*
4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm
4 – 5 GHz: $\leq$ 3 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm
4 – 5 GHz: $\leq$ 2.5 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm
4 – 5 GHz: $\geq$ 25 mm
5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

9.4 Volume Scan Procedures

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

9.5 SAR Averaged Methods

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

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

9.6 Power Drift Monitoring

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

10. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

Note:

1. Per KDB 447498 D01v05r01, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. According to KDB 941225 D03v01, for Body SAR testing, the EUT operating without power back-off was set in GPRS (3 Tx slots) and the EUT operating with power back-off was set in GPRS (3 Tx slots) due to its highest frame-average power.

Full Power mode (Proximity Sensor Inactive)

Band GSM850	Burst Average Power (dBm)			Tune-up Limit	Frame-Average Power (dBm)			Tune-up Limit
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GPRS (GMSK, 1 Tx slot) – CS1	31.97	31.98	32.13	33.50	22.97	22.98	23.13	24.50
GPRS (GMSK, 2 Tx slots) – CS1	29.65	29.65	29.78	31.00	23.65	23.65	23.78	25.00
GPRS (GMSK, 3 Tx slots) – CS1	28.18	28.17	28.33	29.50	23.92	23.91	24.07	25.24
GPRS (GMSK, 4 Tx slots) – CS1	26.73	26.71	26.86	28.00	23.73	23.71	23.86	25.00
EDGE (8PSK, 1 Tx slot) – MCS5	26.24	26.23	26.38	28.00	17.24	17.23	17.38	19.00
EDGE (8PSK, 2 Tx slots) – MCS5	23.98	23.97	24.12	25.50	17.98	17.97	18.12	19.50
EDGE (8PSK, 3 Tx slots) – MCS5	22.52	22.50	22.64	24.00	18.26	18.24	18.38	19.74
EDGE (8PSK, 4 Tx slots) – MCS5	21.06	21.05	21.17	22.50	18.06	18.05	18.17	19.50

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

Reduced Power Mode (Proximity Sensor active)

Band GSM850	Burst Average Power (dBm)			Tune-up Limit	Frame-Average Power (dBm)			Tune-up Limit
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GPRS (GMSK, 1 Tx slot) – CS1	29.72	29.71	29.86	30.00	20.72	20.71	20.86	21.00
GPRS (GMSK, 2 Tx slots) – CS1	26.79	26.78	26.94	27.50	20.79	20.78	20.94	21.50
GPRS (GMSK, 3 Tx slots) – CS1	25.20	25.19	25.36	26.00	20.94	20.93	21.10	21.74
GPRS (GMSK, 4 Tx slots) – CS1	23.89	23.87	24.04	24.50	20.89	20.87	21.04	21.50
EDGE (8PSK, 1 Tx slot) – MCS5	24.11	24.10	24.26	24.50	15.11	15.10	15.26	15.50
EDGE (8PSK, 2 Tx slots) – MCS5	21.32	21.31	21.44	22.00	15.32	15.31	15.44	16.00
EDGE (8PSK, 3 Tx slots) – MCS5	19.32	19.31	19.49	20.50	15.06	15.05	15.23	16.24
EDGE (8PSK, 4 Tx slots) – MCS5	18.44	18.39	18.59	19.00	15.44	15.39	15.59	16.00

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

Full Power mode (Proximity Sensor Inactive)

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit	Frame-Average Power (dBm)			Tune-up Limit
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GPRS (GMSK, 1 Tx slot) – CS1	29.34	29.07	28.99	30.50	20.34	20.07	19.99	21.50
GPRS (GMSK, 2 Tx slots) – CS1	26.77	26.52	26.45	28.00	20.77	20.52	20.45	22.00
GPRS (GMSK, 3 Tx slots) – CS1	25.29	25.05	24.99	26.50	21.03	20.79	20.73	22.24
GPRS (GMSK, 4 Tx slots) – CS1	23.84	23.60	23.52	25.00	20.84	20.60	20.52	22.00
EDGE (8PSK, 1 Tx slot) – MCS5	25.64	25.37	25.28	27.00	16.64	16.37	16.28	18.00
EDGE (8PSK, 2 Tx slots) – MCS5	23.37	23.10	23.01	24.50	17.37	17.10	17.01	18.50
EDGE (8PSK, 3 Tx slots) – MCS5	21.87	21.60	21.52	23.00	17.61	17.34	17.26	18.74
EDGE (8PSK, 4 Tx slots) – MCS5	20.34	20.08	20.02	21.50	17.34	17.08	17.02	18.50

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

Reduced Power Mode (Proximity Sensor active)

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit	Frame-Average Power (dBm)			Tune-up Limit
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GPRS (GMSK, 1 Tx slot) – CS1	25.87	25.65	25.58	26.00	16.87	16.65	16.58	17.00
GPRS (GMSK, 2 Tx slots) – CS1	22.95	22.68	22.63	23.50	16.95	16.68	16.63	17.50
GPRS (GMSK, 3 Tx slots) – CS1	21.35	21.12	21.05	22.00	17.09	16.86	16.79	17.74
GPRS (GMSK, 4 Tx slots) – CS1	19.94	19.69	19.70	20.50	16.94	16.69	16.70	17.50
EDGE (8PSK, 1 Tx slot) – MCS5	22.49	22.30	22.24	22.50	13.49	13.30	13.24	13.50
EDGE (8PSK, 2 Tx slots) – MCS5	19.70	19.45	19.39	20.00	13.70	13.45	13.39	14.00
EDGE (8PSK, 3 Tx slots) – MCS5	17.68	17.37	17.34	18.50	13.42	13.11	13.08	14.24
EDGE (8PSK, 4 Tx slots) – MCS5	16.76	16.55	16.47	17.00	13.76	13.55	13.47	14.00

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

<u><WCDMA Conducted Power></u>

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

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

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

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

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

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

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

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

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

Setup Configuration

HSUPA Setup Configuration:

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

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

<WCDMA Conducted Power>

Note:

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

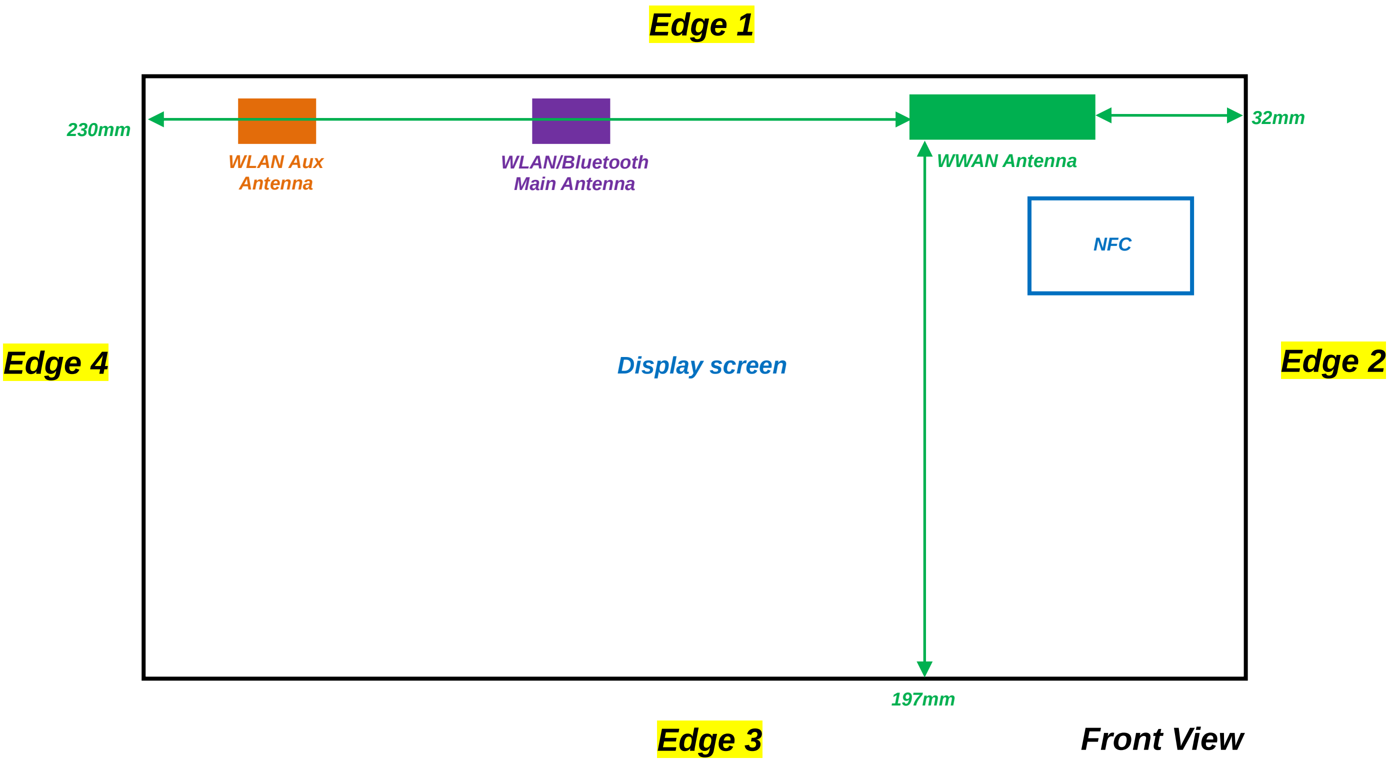
Full Power Mode (Proximity Sensor Inactive)

Band			WCDMA V			Tune-up Limit	WCDMA II			Tune-up Limit	WCDMA IV			Tune-up Limit
TX Channel			4132	4182	4233		9262	9400	9538		1312	1413	1513	
Rx Channel			4357	4407	4458		9662	9800	9938		1537	1638	1738	
Frequency (MHz)			826.4	836.4	846.6		1852.4	1880	1907.6		1712.4	1732.6	1752.6	
MPR	3GPP Rel 99	RMC 12.2Kbps	23.40	23.00	22.95	24.50	23.41	23.12	23.09	24.50	23.58	23.50	23.12	24.50
0	3GPP Rel 6	HSDPA Subtest-1	22.90	22.74	22.65	24.50	22.84	22.85	22.51	24.50	23.14	22.80	22.77	24.50
0	3GPP Rel 6	HSDPA Subtest-2	22.07	21.77	21.64	23.50	21.86	21.96	21.64	24.00	22.12	21.86	21.77	24.00
0.5	3GPP Rel 6	HSDPA Subtest-3	21.83	21.46	21.40	23.00	21.66	21.75	21.35	23.50	21.91	21.61	21.56	23.50
0.5	3GPP Rel 6	HSDPA Subtest-4	21.55	21.27	21.14	23.00	21.37	21.45	21.14	23.50	21.71	21.39	21.32	23.50
0	3GPP Rel 6	HSUPA Subtest-1	22.49	22.15	22.06	24.50	21.92	21.97	21.58	24.50	22.13	21.87	21.82	24.50
2	3GPP Rel 6	HSUPA Subtest-2	20.07	19.73	19.67	22.25	19.82	19.88	19.47	22.75	20.12	19.79	19.77	22.75
1	3GPP Rel 6	HSUPA Subtest-3	20.84	20.49	20.38	23.25	20.57	20.68	20.37	23.75	20.89	20.63	20.53	23.75
2	3GPP Rel 6	HSUPA Subtest-4	20.34	20.04	19.94	22.50	20.05	20.16	19.85	23.00	20.34	20.04	20.01	23.00
0	3GPP Rel 6	HSUPA Subtest-5	21.97	21.87	21.51	24.50	21.78	21.82	21.46	24.50	22.01	21.86	21.82	24.50

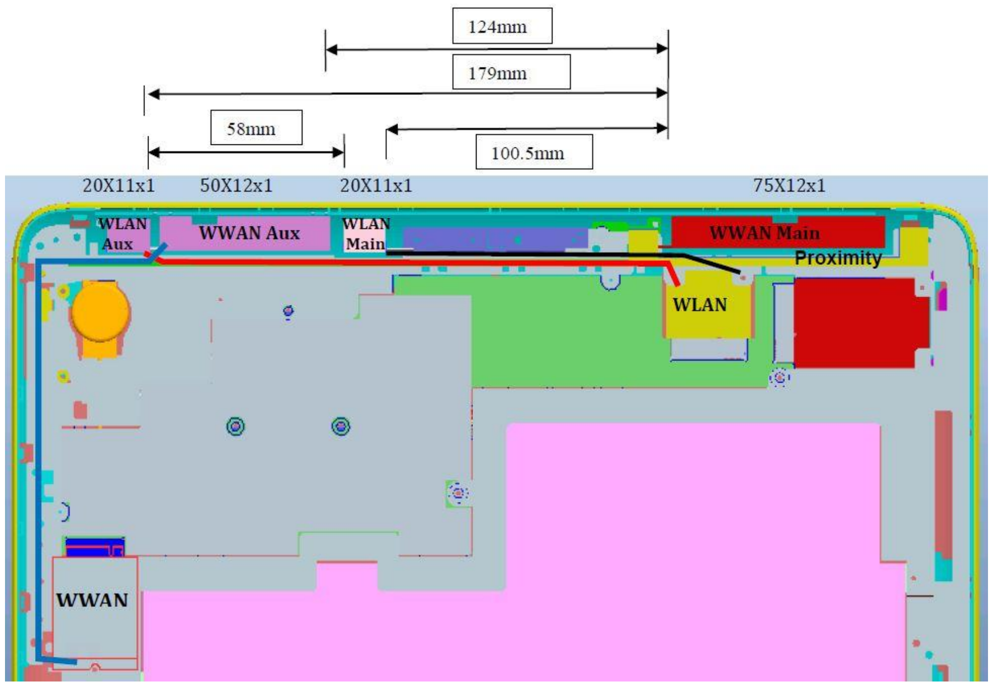
Reduced Power Mode (Proximity Sensor active)

Band			WCDMA V			Tune-up Limit	WCDMA II			Tune-up Limit	WCDMA IV			Tune-up Limit
TX Channel			4132	4182	4233		9262	9400	9538		1312	1413	1513	
Rx Channel			4357	4407	4458		9662	9800	9938		1537	1638	1738	
Frequency (MHz)			826.4	836.4	846.6		1852.4	1880	1907.6		1712.4	1732.6	1752.6	
MPR	3GPP Rel 99	RMC 12.2Kbps	19.91	19.59	19.52	21.00	16.89	16.80	16.45	18.00	17.96	17.68	17.63	18.00
0	3GPP Rel 6	HSDPA Subtest-1	19.89	19.63	19.58	21.00	16.79	16.83	16.41	18.00	17.94	17.58	17.60	18.00
0	3GPP Rel 6	HSDPA Subtest-2	19.87	19.55	19.52	21.00	16.81	16.77	16.37	18.00	17.92	17.59	17.64	18.00
0.5	3GPP Rel 6	HSDPA Subtest-3	19.85	19.57	19.50	21.00	16.71	16.78	16.40	18.00	17.90	17.66	17.63	18.00
0.5	3GPP Rel 6	HSDPA Subtest-4	19.85	19.56	19.50	21.00	16.76	16.80	16.45	18.00	17.92	17.57	17.66	18.00
0	3GPP Rel 6	HSUPA Subtest-1	19.27	19.01	18.93	21.00	16.27	15.93	15.85	18.00	17.21	16.82	16.78	18.00
2	3GPP Rel 6	HSUPA Subtest-2	19.40	18.95	19.05	21.00	16.35	16.30	16.00	18.00	17.49	17.12	17.11	18.00
1	3GPP Rel 6	HSUPA Subtest-3	19.58	18.91	19.13	21.00	16.04	16.08	15.65	18.00	17.23	16.92	16.87	18.00
2	3GPP Rel 6	HSUPA Subtest-4	19.22	19.23	19.22	21.00	16.45	16.52	16.15	18.00	17.71	17.34	17.29	18.00
0	3GPP Rel 6	HSUPA Subtest-5	19.67	19.70	19.64	21.00	16.83	16.88	16.51	18.00	17.95	17.66	17.68	18.00

11. Antenna Location



Front View



<SAR test exclusion table>

Exposure Position	Wireless Interface	GPRS850 Class 11	GPRS1900 Class 11	WCDMA V	WCDMA IV	WCDMA II
	Tune-up Maximum power	25.24	22.24	24.5	24.5	24.5
	Tune-up Maximum rated power(mW)	334.20	167.49	281.84	281.84	281.84
Bottom Face	Antenna to user (mm)	5				
	SAR exclusion threshold	61.55	46.28	51.85	74.57	77.84
	SAR testing required?	Yes	Yes	Yes	Yes	Yes
Edge 1	Antenna to user (mm)	12.79				
	SAR exclusion threshold	24.06	18.09	20.27	29.15	30.43
	SAR testing required?	Yes	Yes	Yes	Yes	Yes
Edge 2	Antenna to user (mm)	33.24				
	SAR exclusion threshold	9.26	6.96	7.8	11.22	11.71
	SAR testing required?	Yes	Yes	Yes	Yes	Yes
Edge 3	Antenna to user (mm)	189.13				
	SAR exclusion threshold	949.44	1499.86	947.78	1504.69	1499.92
	SAR testing required?	No	No	No	No	No
Edge 4	Antenna to user (mm)	268.11				
	SAR exclusion threshold	1395.94	2289.66	1393.22	2294.49	2289.72
	SAR testing required?	No	No	No	No	No

Note:

1. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
2. Per KDB 447498 D01v05r01, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
3. Per KDB 447498 D01v05r01, standalone SAR test exclusion threshold is applied; If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold
4. Per KDB 447498 D01v05r01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
5. Per KDB 447498 D01v05r01, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following.
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

12. SAR Test Results

Note:

1. Per KDB 447498 D01v05r01, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
2. For the exposure positions that proximity sensor power reduction is applied for SAR compliance, additional SAR testing with EUT transmitting full power in normal mode was performed; 0.8cm for bottom face, 0.6cm for edge1.
3. Per KDB 616217 D04v01r01, the additional separation introduced by the contour against a flat phantom is < 5 mm on this device and reported SAR is > 1.2 W/kg, a curved or contoured back surface or edge SAR is required, more detail information please refer to the setup photo.
4. For SAR testing of the curved region of the device, the device was placed directly against the phantom at the point where the distance between the antenna and device exterior is a minimum.
5. Per KDB 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/HSUPA output power is < 0.25dB higher than RMC12.2Kbps, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA SAR evaluation can be excluded.

12.1 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
36	GSM850	GPRS (3 Tx slots)	Bottom Face	0.8cm	251	848.8	OFF	28.33	29.5	1.309	-0.01	0.581	0.761
59	GSM850	GPRS (3 Tx slots)	Edge1	0.6cm	251	848.8	OFF	28.33	29.5	1.309	-0.04	0.660	0.864
60	GSM850	GPRS (3 Tx slots)	Edge1	0.6cm	128	824.2	OFF	28.18	29.5	1.355	-0.06	0.602	0.816
61	GSM850	GPRS (3 Tx slots)	Edge1	0.6cm	189	836.4	OFF	28.17	29.5	1.358	-0.03	0.636	0.864
37	GSM850	GPRS (3 Tx slots)	Edge 2	0cm	251	848.8	OFF	28.33	29.5	1.309	-0.12	0.135	0.177
38	GSM850	GPRS (3 Tx slots)	Bottom Face	0cm	251	848.8	ON	25.36	26.0	1.159	0.02	0.663	0.768
39	GSM850	GPRS (3 Tx slots)	Edge1	0cm	251	848.8	ON	25.36	26.0	1.159	-0.02	0.674	0.781
30	GSM850	GPRS (3 Tx slots)	Curved surface of Edge1	0cm	251	848.8	ON	25.36	26.0	1.159	-0.08	0.826	0.957
31	GSM850	GPRS (3 Tx slots)	Curved surface of Edge1	0cm	128	824.2	ON	25.2	26.0	1.202	-0.03	0.777	0.934
32	GSM850	GPRS (3 Tx slots)	Curved surface of Edge1	0cm	189	836.4	ON	25.19	26.0	1.205	0	0.792	0.954
29	GSM1900	GPRS (3 Tx slots)	Bottom Face	0.8cm	512	1850.2	OFF	25.29	26.5	1.321	0.05	0.477	0.630
51	GSM1900	GPRS (3 Tx slots)	Edge1	0.6cm	512	1850.2	OFF	25.29	26.5	1.321	-0.03	0.452	0.597
28	GSM1900	GPRS (3 Tx slots)	Edge 2	0cm	512	1850.2	OFF	25.29	26.5	1.321	0.08	0.110	0.145
25	GSM1900	GPRS (3 Tx slots)	Bottom Face	0cm	512	1850.2	ON	21.35	22.0	1.161	-0.09	0.927	1.077
26	GSM1900	GPRS (3 Tx slots)	Bottom Face	0cm	661	1880	ON	21.12	22.0	1.225	-0.02	0.932	1.141
27	GSM1900	GPRS (3 Tx slots)	Bottom Face	0cm	810	1909.8	ON	21.05	22.0	1.245	0	0.744	0.926
22	GSM1900	GPRS (3 Tx slots)	Edge1	0cm	512	1850.2	ON	21.35	22.0	1.161	-0.08	0.420	0.488
19	GSM1900	GPRS (3 Tx slots)	Curved surface of Edge1	0cm	512	1850.2	ON	21.35	22.0	1.161	0.03	0.971	1.128
20	GSM1900	GPRS (3 Tx slots)	Curved surface of Edge1	0cm	661	1880	ON	21.12	22.0	1.225	-0.06	1.000	1.225
21	GSM1900	GPRS (3 Tx slots)	Curved surface of Edge1	0cm	810	1909.8	ON	21.05	22.0	1.245	0.08	0.889	1.106

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
40	WCDMA V	RMC 12.2Kbps	Bottom Face	0.8cm	4132	826.4	OFF	23.40	24.5	1.288	0.09	0.480	0.618
58	WCDMA V	RMC 12.2Kbps	Edge1	0.6cm	4132	826.4	OFF	23.40	24.5	1.288	-0.03	0.550	0.709
41	WCDMA V	RMC 12.2Kbps	Edge 2	0cm	4132	826.4	OFF	23.40	24.5	1.288	-0.1	0.160	0.206
42	WCDMA V	RMC 12.2Kbps	Bottom Face	0cm	4132	826.4	ON	19.91	21.0	1.285	0.03	0.641	0.824
44	WCDMA V	RMC 12.2Kbps	Bottom Face	0cm	4182	836.4	ON	19.59	21.0	1.384	0.01	0.647	0.895
45	WCDMA V	RMC 12.2Kbps	Bottom Face	0cm	4233	846.6	ON	19.52	21.0	1.406	0.06	0.674	0.948
43	WCDMA V	RMC 12.2Kbps	Edge1	0cm	4132	826.4	ON	19.91	21.0	1.285	-0.12	0.546	0.702
33	WCDMA V	RMC 12.2Kbps	Curved surface of Edge1	0cm	4132	826.4	ON	19.91	21.0	1.285	-0.02	0.731	0.940
34	WCDMA V	RMC 12.2Kbps	Curved surface of Edge1	0cm	4182	836.4	ON	19.59	21.0	1.384	-0.03	0.650	0.899
35	WCDMA V	RMC 12.2Kbps	Curved surface of Edge1	0cm	4233	846.6	ON	19.52	21.0	1.406	-0.03	0.682	**0.959**
1	WCDMA IV	RMC 12.2Kbps	Bottom Face	0.8cm	1312	1712.4	OFF	23.58	24.5	1.236	0.01	0.751	0.928
2	WCDMA IV	RMC 12.2Kbps	Bottom Face	0.8cm	1413	1732.6	OFF	23.50	24.5	1.259	-0.04	0.746	0.939
3	WCDMA IV	RMC 12.2Kbps	Bottom Face	0.8cm	1513	1752.6	OFF	23.12	24.5	1.374	0.01	0.673	0.925
55	WCDMA IV	RMC 12.2Kbps	Edge 1	0.6cm	1312	1712.4	OFF	23.58	24.5	1.236	-0.05	1.140	**1.409**
56	WCDMA IV	RMC 12.2Kbps	Edge 1	0.6cm	1413	1732.6	OFF	23.50	24.5	1.259	0.03	1.070	1.347
57	WCDMA IV	RMC 12.2Kbps	Edge 1	0.6cm	1513	1752.6	OFF	23.12	24.5	1.374	0.01	0.983	1.351
4	WCDMA IV	RMC 12.2Kbps	Edge 2	0cm	1312	1712.4	OFF	23.58	24.5	1.236	-0.03	0.103	0.127
5	WCDMA IV	RMC 12.2Kbps	Bottom Face	0cm	1312	1712.4	ON	17.96	18.0	1.009	0	0.709	0.716
6	WCDMA IV	RMC 12.2Kbps	Edge 1	0cm	1312	1712.4	ON	17.96	18.0	1.009	0	0.617	0.623
49	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge1	0cm	1312	1712.4	ON	17.96	18.0	1.009	0	1.150	1.161
8	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge1	0cm	1413	1732.6	ON	17.68	18.0	1.076	0.01	1.060	1.141
9	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge1	0cm	1513	1752.6	ON	17.63	18.0	1.089	0.03	1.000	1.089
10	WCDMA II	RMC 12.2Kbps	Bottom Face	0.8cm	9262	1852.4	OFF	23.41	24.5	1.285	0.09	0.813	1.045
11	WCDMA II	RMC 12.2Kbps	Bottom Face	0.8cm	9400	1880	OFF	23.12	24.5	1.374	0.07	0.761	1.046
12	WCDMA II	RMC 12.2Kbps	Bottom Face	0.8cm	9538	1907.6	OFF	23.09	24.5	1.384	0.05	0.825	1.141
52	WCDMA II	RMC 12.2Kbps	Edge1	0.6cm	9262	1852.4	OFF	23.41	24.5	1.285	-0.01	0.837	1.076
53	WCDMA II	RMC 12.2Kbps	Edge1	0.6cm	9400	1880	OFF	23.12	24.5	1.374	-0.04	0.799	1.098
54	WCDMA II	RMC 12.2Kbps	Edge1	0.6cm	9538	1907.6	OFF	23.09	24.5	1.384	-0.03	0.903	1.249
13	WCDMA II	RMC 12.2Kbps	Edge 2	0cm	9262	1852.4	OFF	23.41	24.5	1.285	-0.18	0.141	0.181
14	WCDMA II	RMC 12.2Kbps	Bottom Face	0cm	9262	1852.4	ON	16.89	18.0	1.291	0.01	0.742	0.958
46	WCDMA II	RMC 12.2Kbps	Bottom Face	0cm	9400	1880	ON	16.80	18.0	1.318	-0.01	0.750	0.989
47	WCDMA II	RMC 12.2Kbps	Bottom Face	0cm	9538	1907.6	ON	16.45	18.0	1.429	0.11	0.818	1.169
15	WCDMA II	RMC 12.2Kbps	Edge 1	0cm	9262	1852.4	ON	16.89	18.0	1.291	-0.1	0.354	0.457
16	WCDMA II	RMC 12.2Kbps	Curved surface of Edge1	0cm	9262	1852.4	ON	16.89	18.0	1.291	0.03	1.010	1.304
17	WCDMA II	RMC 12.2Kbps	Curved surface of Edge1	0cm	9400	1880	ON	16.80	18.0	1.318	-0.01	0.956	1.260
18	WCDMA II	RMC 12.2Kbps	Curved surface of Edge1	0cm	9538	1907.6	ON	16.45	18.0	1.429	-0.03	1.000	**1.429**

12.2 Repeated SAR Measurement

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
30	GSM850	GPRS (3 Tx slots)	Curved surface of Edge1	0cm	251	848.8	ON	25.36	26.0	1.159	-0.08	0.826	1	0.957
48	GSM850	GPRS (3 Tx slots)	Curved surface of Edge1	0cm	251	848.8	ON	25.36	26.0	1.159	-0.13	0.823	1.01	0.954
49	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge1	0cm	1312	1712.4	ON	17.96	18.0	1.009	0	1.150	1	1.161
7	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge1	0cm	1312	1712.4	ON	17.96	18.0	1.009	0.04	1.140	1.01	1.151
16	WCDMA II	RMC 12.2Kbps	Curved surface of Edge1	0cm	9262	1852.4	ON	16.89	18.0	1.291	0.03	1.010	1	1.304
50	WCDMA II	RMC 12.2Kbps	Curved surface of Edge1	0cm	9262	1852.4	ON	16.89	18.0	1.291	-0.07	0.990	1.02	1.278

Note:

1. Per KDB 865664 D01v01r01, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg
2. Per KDB 865664 D01v01r01, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

12.3 Highest SAR Plot

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/6/21

#30_GSM850_GPRS (3 Tx slots)_Curved surface of Edge1_0cm_Ch251

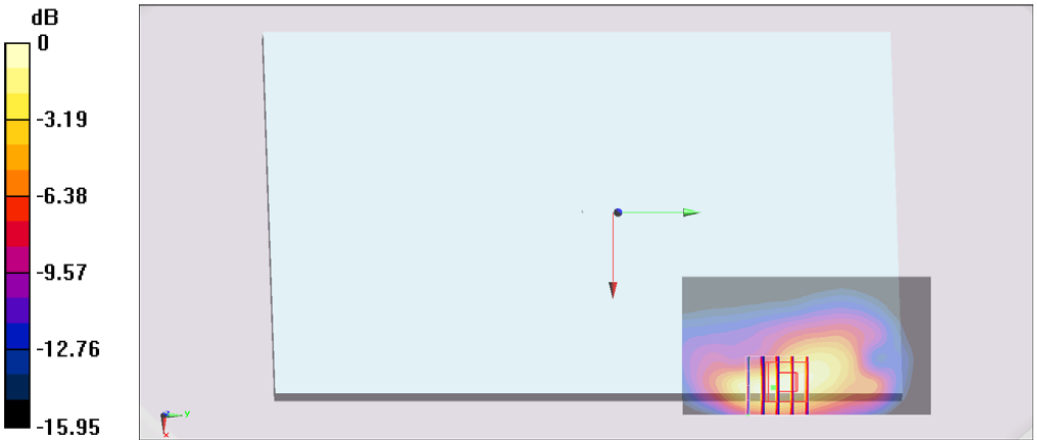
DUT: 362806

Communication System: GSM850; Frequency: 848.8 MHz;Duty Cycle: 1:2.67
Medium: MSL_850_130621 Medium parameters used: f = 849 MHz; σ = 0.976 S/m; ε_r = 54.414; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3697; ConvF(8.65, 8.65, 8.65); Calibrated: 2012/9/28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1173
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch251/Area Scan (51x91x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.15 W/kg

Configuration/Ch251/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.212 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 0.826 W/kg; SAR(10 g) = 0.458 W/kg
Maximum value of SAR (measured) = 1.15 W/kg



0 dB = 1.15 W/kg = 0.61 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/6/19

#20_GSM1900_GPRS (3 Tx slots)_Curved surface of Edge1_0cm_Ch661

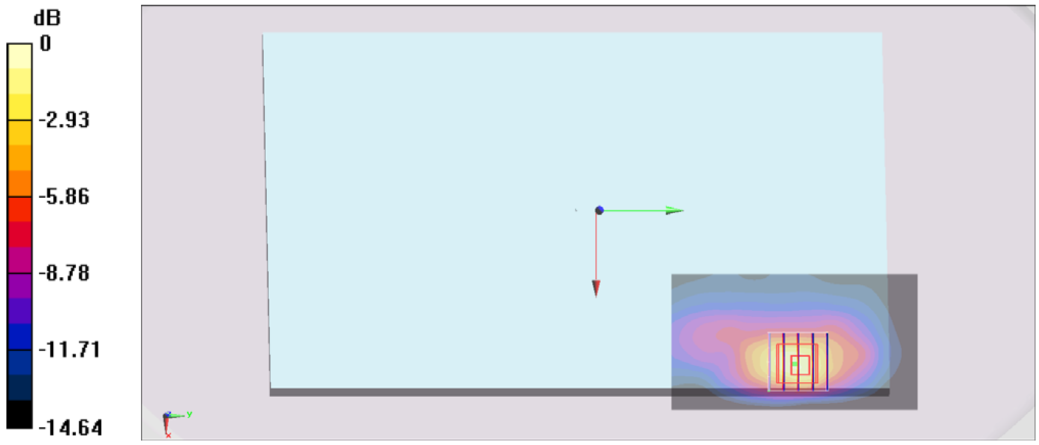
DUT: 362806

Communication System:PCS; Frequency: 1880 MHz;Duty Cycle: 1:2.67
Medium: MSL_1900_130619 Medium parameters used: f = 1880 MHz; σ = 1.552 S/m; ε_r = 51.853; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3697; ConvF(6.96, 6.96, 6.96); Calibrated: 2012/9/28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1173
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch661/Area Scan (51x91x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.19 W/kg

Configuration/Ch661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.956 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.89 W/kg
SAR(1 g) = 1 W/kg; SAR(10 g) = 0.505 W/kg
Maximum value of SAR (measured) = 1.43 W/kg



0 dB = 1.43 W/kg = 1.55 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/6/21

#35_WCDMA V_RMC 12.2Kbps_Curved surface of Edge1_0cm_Ch4233

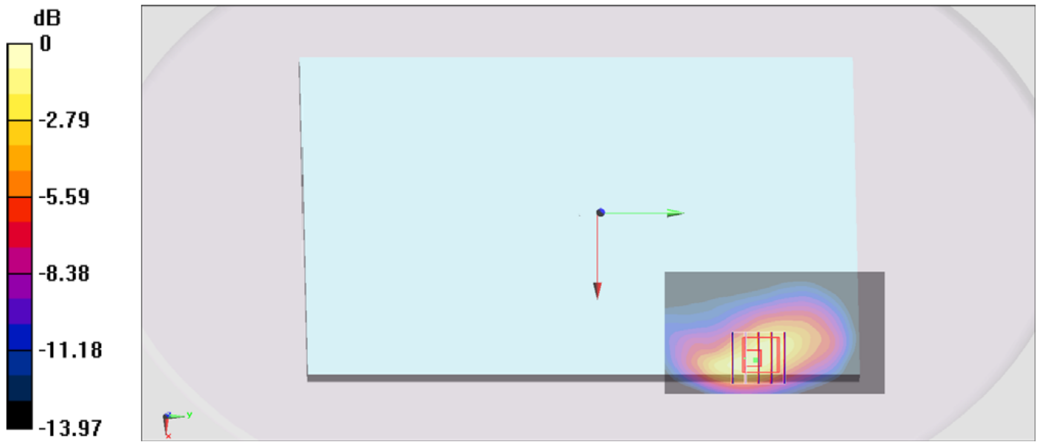
DUT: 362806

Communication System: WCDMA; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium: MSL_850_130621 Medium parameters used: f = 847 MHz; σ = 0.974 S/m; ε_r = 54.432; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3697; ConvF(8.65, 8.65, 8.65); Calibrated: 2012/9/28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1173
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch4233/Area Scan (51x91x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.799 W/kg

Configuration/Ch4233/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.948 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.23 W/kg
SAR(1 g) = 0.682 W/kg; SAR(10 g) = 0.390 W/kg
Maximum value of SAR (measured) = 0.986 W/kg



0 dB = 0.986 W/kg = -0.06 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/9/3

#55_WCDMA IV_RMC 12.2Kbps_Edge 1_0.6cm_Ch1312

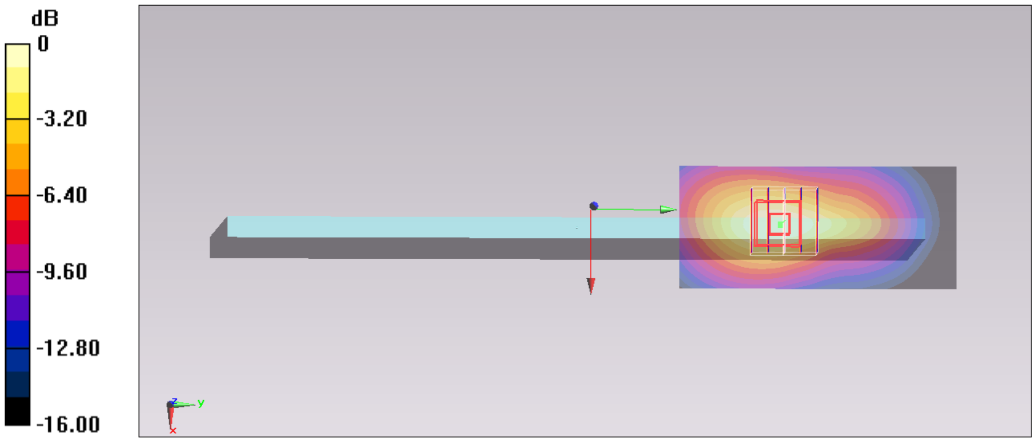
DUT: 362806

Communication System: WCDMA; Frequency: 1712.4 MHz;Duty Cycle: 1:1
Medium: MSL_1750_130903 Medium parameters used: f = 1712.4 MHz; σ = 1.474 mho/m; ε_r = 52.335; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:0
- Probe: EX3DV4 - SN3792; ConvF(7.61, 7.61, 7.61); Calibrated: 2013/6/4;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2013/5/28
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch1312/Area Scan (41x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.53 mW/g

Configuration/Ch1312/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.687 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.819 mW/g
SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.671 mW/g
Maximum value of SAR (measured) = 1.50 mW/g



0 dB = 1.50 mW/g = 3.52 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/6/19

#18_WCDMA II_RMC 12.2Kbps_Curved surface of Edge1_0cm_Ch9538

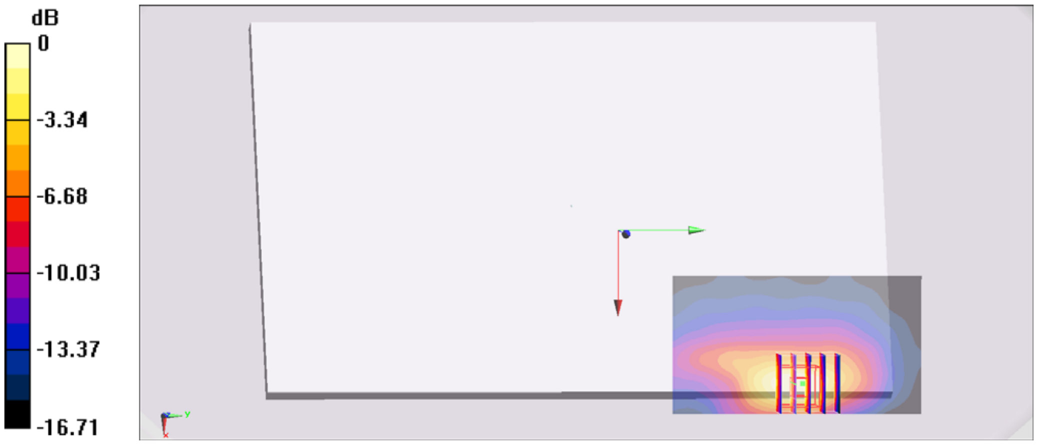
DUT: 362806

Communication System: WCDMA; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: MSL_1900_130619 Medium parameters used: f = 1908 MHz; σ = 1.581 S/m; ε_r = 51.702; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3697; ConvF(6.96, 6.96, 6.96); Calibrated: 2012/9/28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1173
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

Configuration/Ch9538/Area Scan (51x91x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.41 W/kg

Configuration/Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.433 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.91 W/kg
SAR(1 g) = 1 W/kg; SAR(10 g) = 0.500 W/kg
Maximum value of SAR (measured) = 1.17 W/kg



0 dB = 1.17 W/kg = 0.68 dBW/kg

13. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Portable Tablet
		Supported
1.	GPRS/EDGE(Data) + WLAN2.4GHz(data)	Yes
2.	WCDMA(Data) + WLAN2.4GHz(data)	Yes
3.	GPRS/EDGE(Data) + Bluetooth(data)	Yes
4.	WCDMA(Data) + Bluetooth(data)	Yes
5.	GPRS/EDGE(Data) + WLAN5GHz(data)	No
6.	WCDMA(Data) + WLAN5GHz(data)	No

Note:

1. WLAN/Bluetooth module FCC ID: PD97260H is also integrated into this host, and C2PC filing was granted on 2013/07/23. Bluetooth and WLAN SAR test results are refer to RF Exposure Lab FCC SAR Report, Report No: SAR.20130701, available on FCC website.
2. For simultaneous transmission analysis for exposure position of edge 0.6cm and bottom face 0.8cm, WLAN/Bluetooth SAR tested at 0mm separation is worse and the test results are used for conservative SAR summation.
3. According to the section11 antenna location, the minimum distance between each antenna was used for conservative SPLSR calculation.
4. By design, WLAN 5GHz frequency band does not support mobile hotspot and WiFi Direct operation.
5. The Scaled SAR summation is calculated based on the same configuration and test position.
6. Per KDB 447498 D01v05r01, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary
   iii) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg
   iv) The SPLSR calculated results please refer to section 13.2.

13.1 Body Exposure Conditions

<WWAN + WLAN2.4GHz_Main Antenna>

	WWAN			WLAN			
Position	WWAN Band	Plot No	SAR (W/kg)	SAR (W/kg)	**Summed SAR (W/kg)**	SPLSR Results	Case No
Bottom Face at 0.8 cm	GSM850	36	0.761	1.180	**1.94**	0.03	Case 1
	GSM1900	29	0.630	1.180	**1.81**	0.02	Case 2
	WCDMA V	40	0.618	1.180	**1.80**	0.02	Case 3
	WCDMA IV	2	0.939	1.180	**2.12**	0.03	Case 4
	WCDMA II	12	1.141	1.180	**2.32**	0.04	Case 5
Edge1 at 0.5 cm	GSM850	59	0.864	0.980	**1.84**	0.02	Case 6
	GSM1900	51	0.597	0.980	**1.58**		
	WCDMA V	58	0.709	0.980	**1.69**	0.02	Case 7
	WCDMA IV	55	1.409	0.980	**2.39**	0.04	Case 8
	WCDMA II	54	1.249	0.980	**2.23**	0.03	Case 9
Bottom Face at 0cm	GSM850	38	0.768	1.180	**1.95**	0.03	Case 10
	GSM1900	26	1.141	1.180	**2.32**	0.04	Case 11
	WCDMA V	45	0.948	1.180	**2.13**	0.03	Case 12
	WCDMA IV	5	0.716	1.180	**1.90**	0.03	Case 13
	WCDMA II	47	1.169	1.180	**2.35**	0.04	Case 14
Edge1 at 0cm	GSM850	39	0.781	0.980	**1.76**	0.02	Case 15
	GSM1900	22	0.488	0.980	**1.47**		
	WCDMA V	43	0.702	0.980	**1.68**	0.02	Case 16
	WCDMA IV	6	0.623	0.980	**1.60**	0.02	Case 17
	WCDMA II	15	0.457	0.980	**1.44**		
Curved surface of Edge1 at 0cm	GSM850	30	0.957	1.200	**2.16**	0.03	Case 18
	GSM1900	20	1.225	1.200	**2.43**	0.04	Case 19
	WCDMA V	35	0.959	1.200	**2.16**	0.03	Case 20
	WCDMA IV	49	1.161	1.200	**2.36**	0.04	Case 21
	WCDMA II	18	1.429	1.200	**2.63**	0.04	Case 22

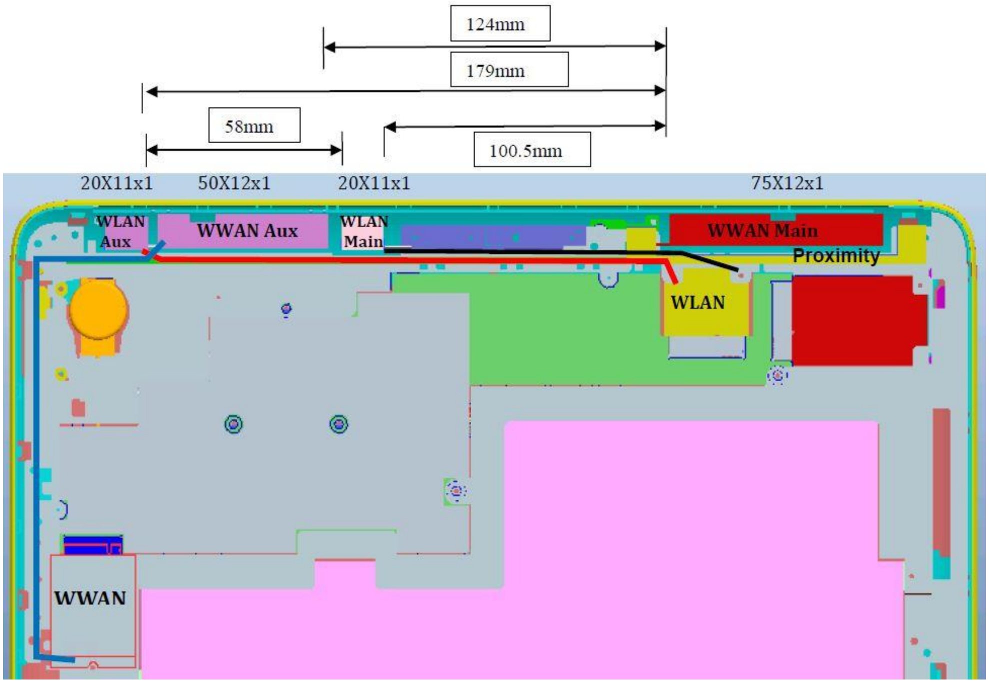
<WWAN + WLAN2.4GHz_Aux Antenna>

	WWAN			WLAN			
Position	WWAN Band	Plot No	SAR (W/kg)	SAR (W/kg)	**Summed SAR (W/kg)**	SPLSR Results	Case No
Bottom Face at 0.8 cm	GSM850	36	0.761	1.190	**1.95**	0.02	Case 23
	GSM1900	29	0.630	1.190	**1.82**	0.01	Case 24
	WCDMA V	40	0.618	1.190	**1.81**	0.01	Case 25
	WCDMA IV	2	0.939	1.190	**2.13**	0.02	Case 26
	WCDMA II	12	1.141	1.190	**2.33**	0.02	Case 27
Edge1 at 0.5 cm	GSM850	59	0.864	0.890	**1.75**	0.01	Case 28
	GSM1900	51	0.597	0.890	**1.49**		
	WCDMA V	58	0.709	0.890	**1.60**	0.01	Case 29
	WCDMA IV	55	1.409	0.890	**2.30**	0.02	Case 30
	WCDMA II	54	1.249	0.890	**2.14**	0.02	Case 31
Bottom Face at 0cm	GSM850	38	0.768	1.190	**1.96**	0.02	Case 32
	GSM1900	26	1.141	1.190	**2.33**	0.02	Case 33
	WCDMA V	45	0.948	1.190	**2.14**	0.02	Case 34
	WCDMA IV	5	0.716	1.190	**1.91**	0.01	Case 35
	WCDMA II	47	1.169	1.190	**2.36**	0.02	Case 36
Edge1 at 0cm	GSM850	39	0.781	0.890	**1.67**	0.01	Case 37
	GSM1900	22	0.488	0.890	**1.38**		
	WCDMA V	43	0.702	0.890	**1.59**		
	WCDMA IV	6	0.623	0.890	**1.51**		
	WCDMA II	15	0.457	0.890	**1.35**		
Curved surface of Edge1 at 0cm	GSM850	30	0.957	1.190	**2.15**	0.02	Case 38
	GSM1900	20	1.225	1.190	**2.42**	0.02	Case 39
	WCDMA V	35	0.959	1.190	**2.15**	0.02	Case 40
	WCDMA IV	49	1.161	1.190	**2.35**	0.02	Case 41
	WCDMA II	18	1.429	1.190	**2.62**	0.02	Case 42

<WWAN + Bluetooth>

Position	WWAN			Bluetooth	Summed SAR (W/kg)	SPLSR Results	Case No
	WWAN Band	Plot No	SAR (W/kg)	SAR (W/kg)			
Bottom Face at 0.8 cm	GSM850	36	0.761	0.010	**0.77**		
	GSM1900	29	0.630	0.010	**0.64**		
	WCDMA V	40	0.618	0.010	**0.63**		
	WCDMA IV	2	0.939	0.010	**0.95**		
	WCDMA II	12	1.141	0.010	**1.15**		
Edge1 at 0.5 cm	GSM850	59	0.864	0.020	**0.88**		
	GSM1900	51	0.597	0.020	**0.62**		
	WCDMA V	58	0.709	0.020	**0.73**		
	WCDMA IV	55	1.409	0.020	**1.43**		
	WCDMA II	54	1.249	0.020	**1.27**		
Bottom Face at 0cm	GSM850	38	0.768	0.010	**0.78**		
	GSM1900	26	1.141	0.010	**1.15**		
	WCDMA V	45	0.948	0.010	**0.96**		
	WCDMA IV	5	0.716	0.010	**0.73**		
	WCDMA II	47	1.169	0.010	**1.18**		
Edge1 at 0cm	GSM850	39	0.781	0.020	**0.80**		
	GSM1900	22	0.488	0.020	**0.51**		
	WCDMA V	43	0.702	0.020	**0.72**		
	WCDMA IV	6	0.623	0.020	**0.64**		
	WCDMA II	15	0.457	0.020	**0.48**		
Curved surface of Edge1 at 0cm	GSM850	30	0.957	0.040	**1.00**		
	GSM1900	20	1.225	0.040	**1.27**		
	WCDMA V	35	0.959	0.040	**1.00**		
	WCDMA IV	49	1.161	0.040	**1.20**		
	WCDMA II	18	1.429	0.040	**1.47**		

13.2 SPLSR Evaluation and Analysis



Note:

1. WLAN/Bluetooth module of FCC ID: PD97260H would be integrated into this host.
2. For SPLSR analysis of colocation with PD97260H, the minimum distances between each antenna pair was used for conservative SPLSR calculation.
3. SPLSR = (SAR1 + SAR2)1.5 / (min. separation distance, mm). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary

Case 1	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
36	GSM850	Bottom Face	0.761	0.8	100.5	1.94	0.03	Not required
WLAN2.4GHz(main ant)			1.180	0				

Case 2	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
29	GSM1900	Bottom Face	0.630	0.8	100.5	1.81	0.02	Not required
WLAN2.4GHz(main ant)			1.180	0				

Case 3	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
40	WCDMA V	Bottom Face	0.618	0.8	100.5	1.80	0.02	Not required
WLAN2.4GHz(main ant)			1.180	0				

Case 4 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
2	WCDMA IV	Bottom Face	0.939	0.8	100.5	2.12	0.03	Not required
WLAN2.4GHz(main ant)			1.180	0				

Case 5 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
12	WCDMA II	Bottom Face	1.141	0.8	100.5	2.32	0.04	Not required
WLAN2.4GHz(main ant)			1.180	0				

Case 6 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
59	GSM850	Edge 1	0.864	0.5	100.5	1.84	0.02	Not required
WLAN2.4GHz(main ant)			0.980	0				

Case 7 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
58	WCDMA V	Edge 1	0.709	0.5	100.5	1.69	0.02	Not required
WLAN2.4GHz(main ant)			0.980	0				

Case 8 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
55	WCDMA IV	Edge 1	1.409	0.5	100.5	2.39	0.04	Not required
WLAN2.4GHz(main ant)			0.980	0				

Case 9 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
54	WCDMA II	Edge 1	1.249	0.5	100.5	2.23	0.03	Not required
WLAN2.4GHz(main ant)			0.980	0				

Case 10 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
38	GSM850	Bottom Face	0.768	0	100.5	1.95	0.03	Not required
WLAN2.4GHz(main ant)			1.180	0				

Case 11	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
26	GSM1900	Bottom Face	1.141	0	100.5	2.32	0.04	Not required
WLAN2.4GHz(main ant)			1.180	0				

Case 12	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
45	WCDMA V	Bottom Face	0.948	0	100.5	2.13	0.03	Not required
WLAN2.4GHz(main ant)			1.180	0				

Case 13	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
5	WCDMA IV	Bottom Face	0.716	0	100.5	1.90	0.03	Not required
WLAN2.4GHz(main ant)			1.180	0				

Case 14	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
47	WCDMA II	Bottom Face	1.169	0	100.5	2.35	0.04	Not required
WLAN2.4GHz(main ant)			1.180	0				

Case 15	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
39	GSM850	Edge 1	0.781	0	100.5	1.76	0.02	Not required
WLAN2.4GHz(main ant)			0.980	0				

Case 16	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
43	WCDMA V	Edge 1	0.702	0	100.5	1.68	0.02	Not required
WLAN2.4GHz(main ant)			0.980	0				

Case 17	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
6	WCDMA IV	Edge 1	0.623	0	100.5	1.60	0.02	Not required
WLAN2.4GHz(main ant)			0.98	0				

Case 18	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
30	GSM850	Curved surface of Edge1	0.957	0	100.5	2.16	0.03	Not required
WLAN2.4GHz(main ant)			1.200	0				

Case 19	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
20	GSM1900	Curved surface of Edge1	1.225	0	100.5	2.43	0.04	Not required
WLAN2.4GHz(main ant)			1.200	0				

Case 20	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
35	WCDMA V	Curved surface of Edge1	0.959	0	100.5	2.16	0.03	Not required
WLAN2.4GHz(main ant)			1.200	0				

Case 21	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
49	WCDMA IV	Curved surface of Edge1	1.161	0	100.5	2.36	0.04	Not required
WLAN2.4GHz(main ant)			1.200	0				

Case 22	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
18	WCDMA II	Curved surface of Edge1	1.429	0	100.5	2.63	0.04	Not required
WLAN2.4GHz(main ant)			1.200	0				

Case 23	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
36	GSM850	Bottom Face	0.761	0	179.0	1.95	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 24	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
29	GSM1900	Bottom Face	0.63	0	179.0	1.82	0.01	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 25	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
40	WCDMA V	Bottom Face	0.618	0	179.0	1.81	0.01	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 26	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
2	WCDMA IV	Bottom Face	0.939	0	179.0	2.13	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 27	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
12	WCDMA II	Bottom Face	1.141	0	179.0	2.33	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 28	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
59	GSM850	Edge 1	0.864	0	179.0	1.75	0.01	Not required
WLAN2.4GHz (Aux ant)			0.890	0				

Case 29	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
58	WCDMA V	Edge 1	0.709	0	179.0	1.60	0.01	Not required
WLAN2.4GHz (Aux ant)			0.890	0				

Case 30	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
55	WCDMA IV	Edge 1	1.409	0	179.0	2.30	0.02	Not required
WLAN2.4GHz (Aux ant)			0.890	0				

Case 31	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
54	WCDMA II	Edge 1	1.249	0	179.0	2.14	0.02	Not required
WLAN2.4GHz (Aux ant)			0.890	0				

Case 32 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
38	GSM850	Bottom Face	0.768	0	179.0	1.96	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 33 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
26	GSM1900	Bottom Face	1.141	0	179.0	2.33	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 34 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
45	WCDMA V	Bottom Face	0.948	0	179.0	2.14	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 35 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
5	WCDMA IV	Bottom Face	0.716	0	179.0	1.91	0.01	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 36 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
47	WCDMA II	Bottom Face	1.169	0	179.0	2.36	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 37 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
39	GSM850	Edge 1	0.781	0	179.0	1.67	0.01	Not required
WLAN2.4GHz (Aux ant)			0.890	0				

Case 38 / Plot No	Band	Position	SAR (W/kg)	Gap (cm)	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
30	GSM850	Curved surface of Edge1	0.957	0	179.0	2.15	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 39	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
20	GSM1900	Curved surface of Edge1	1.225	0	179.0	2.42	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 40	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
35	WCDMA V	Curved surface of Edge1	0.959	0	179.0	2.15	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 41	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
49	WCDMA IV	Curved surface of Edge1	1.161	0	179.0	2.35	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

Case 42	Band	Position	SAR (W/kg)	Gap	Minimum distance (mm)	Summed SAR (W/kg)	SPLSR Calculated	Simultaneous SAR
Plot No				(cm)				
18	WCDMA II	Curved surface of Edge1	1.429	0	179.0	2.62	0.02	Not required
WLAN2.4GHz (Aux ant)			1.190	0				

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14. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table 14.1

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor(a)	1/k(b)	1/√3	1/√6	1/√2

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

(b) κ is the coverage factor

Table 14.1. Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.0	Normal	1	1	1	± 6.0 %	± 6.0 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.4	Rectangular	√3	1	1	± 0.2 %	± 0.2 %
Probe Positioning	2.9	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Max. SAR Eval.	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 11.0 %	± 10.8 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						**± 22.0 %**	**± 21.5 %**

Table 14.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

15. References

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

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

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

[4] SPEAG DASY System Handbook

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

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

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

[8] FCC KDB 941225 D02 v02r02, “SAR Guidance for HSPA, HSPA+, DC-HSDPA and 1x-Advanced”, May 2013.

[9] FCC KDB 616217 D04 v01r01, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, May 2013

[10] FCC KDB 865664 D01 v01r01, "SAR Measurement Requirements for 100 MHz to 6 GHz", May 2013.