FCC SAR Test Report

APPLICANT	**:**	**FUJITSU LIMITED**
EQUIPMENT	**:**	**PCIe wireless WAN card**
BRAND NAME	**:**	**AirPrime**
MODEL NAME	**:**	**EM7355**
FCC ID	**:**	**EJE-EM7355D**
STANDARD	**:**	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2003**

The product was completely tested on Oct. 16, 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.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

ilac-MRA

TAF
Testing Laboratory
1190

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

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA3O0418	Rev. 01	Initial issue of report	Oct. 28, 2013
FA3O0418	Rev. 02	1. Added antenna distance to bottom surface on page39. 2. Added overall diagonal distance on page39. 3. Revised highest simultaneous transmission SAR on page4.	Nov. 13, 2013
FA3O0418	Rev. 03	1. Revised note4 and the exclusion table on page 40.	Nov. 20, 2013

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **FUJITSU LIMITED PCIe wireless WAN card EM7355** 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	0.84	PCB	0.84
	GPRS1900	0.29		
	WCDMA Band V	0.51		
	WCDMA Band IV	0.38		
	WCDMA Band II	0.33		
	CDMA 2000 BC10	0.55		
	CDMA 2000 BC0	0.58		
	CDMA 2000 BC1	0.38		
	LTE Band 17	0.34		
	LTE Band 13	0.61		
	LTE Band 4	0.67		
	LTE Band 25	0.68		

<Highest Simultaneous transmission SAR>

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Body	GPRS850	PCB	1.01
	Bluetooth	DSS	

Exposure Position	Frequency Band	Equipment Class	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
Body	GPRS850	PCB	0.89
	WLAN2.4GHz	DTS	

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	FUJITSU LIMITED
Address	1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki, 211-8588 Japan

2.3 Application Details

Date of Start during the Test	Oct. 13, 2013
Date of End during the Test	Oct. 16, 2013

3. General Information

3.1 Description of Equipment Under Test (EUT)

Testing was performed on the Fujitsu Convertible Swivel Tablet PC, Model: T734/TH734 with Sierra WWAN Module EM7355 and INTEL 802.11a/b/g/n Wireless LAN and Bluetooth Combo Module. The Intel WLAN and Bluetooth combo Model: 7260HMW is certified under the FCC ID: EJE-WB0086 and IC: 337J-WB0086. The Sierra WWAN module is a multi-band wireless modem supporting GSM/GPRS/EGPRS 850/1900 bands, WCDMA/HSDPA/HSUPA FDD II/V/IV bands, LTE FDD 4/13/17/25 (bands 2 & 5 are disabled), and CDMA 1X/EVDO 850/1900/800 bands. For GPRS and EGPRS, the multi class is 12 (maximum 4 up timeslots).

Product Feature & Specification	
EUT	PCIe wireless WAN card
Brand Name	AirPrime
Model Name	EM7355
FCC ID	EJE-EM7355D
IMEI Code	356196050044854
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 CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC10: 817.9 MHz ~ 823.1 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 25: 1850.7 MHz ~ 1914.3 MHz
Mode	• GPRS/EGPRS • RMC 12.2Kbps Rel 99 • HSDPA Rel 7, Cat14 • HSUPA Rel 6, Cat6 • DC-HSDPA Rel 8 Cat24 • CDMA2000: 1xRTT/1xEv-Do(Rel.0)/1xEv-Do(Rev.A) • LTE: QPSK, 16QAM
EUT Stage	Pre-Production

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 is also integrated into this host, Bluetooth power and WLAN SAR testing data which can be refer to EMC Technologies Pty Ltd SAR Report, FCC ID: EJE-WB0086, Report No.: M130809_FCC_7260HMW_SAR_2.4R.

Host Information	
Host Name	LIFEBOOK T series
Brand Name	Fujitsu
Model Name	T734, TH734
FCC ID	EJE-WB0086
Antenna Information	Antenna type: Main: Monopole, AUX: PIFA Antenna Manufacturer: NISSEI ELECTRIC CO. LTD. Antenna Part Number: Main: CP519214, AUX: CP519215 Antenna gain: Please refer antenna data provided separately.

3.2 Maximum RF output power among production units

Band / Mode	average power (dBm)	
	GSM 850	GSM 1900
GPRS (GMSK, 1 Tx slot)	33.0	30.0
GPRS (GMSK, 2 Tx slots)	33.0	30.0
EDGE (8PSK, 1 Tx slot)	28.0	27.0
EDGE (8PSK, 2 Tx slots)	28.0	27.0
EDGE (8PSK, 3 Tx slots)	27.0	26.0
EDGE (8PSK, 4 Tx slots)	27.0	26.0

Band / Mode	average power(dBm)		
	WCDMA Band V	WCDMA Band II	WCDMA Band IV
RMC 12.2Kbps	24.0	24.0	24.0
HSDPA Subtest-1	24.0	24.0	24.0
HSUPA Subtest-5	24.0	24.0	24.0

Band / Mode	average power(dBm)		
	CDMA BC10	CDMA BC0	CDMA BC1
1xRTT RC3 SO55	24.5	24.5	24.5
1xRTT RC3 SO32	24.5	24.5	24.5
1xEV-DO Rev 0 (RTAP 153.6kbps)	24.5	24.5	24.5
1xEV-DO Rev A (RETAP 4096 bits)	24.5	24.5	24.5

LTE Band 4				
Modulation	BW (MHz)	RB size	Target Power	MPR (dB)
QPSK	20	≤ 18	24.0	0
QPSK	20	> 18	23.0	1
16QAM	20	≤ 18	23.0	1
16QAM	20	> 18	22.0	2
QPSK	15	≤ 16	24.0	0
QPSK	15	> 16	23.0	1
16QAM	15	≤ 16	23.0	1
16QAM	15	> 16	22.0	2
QPSK	10	≤ 12	24.0	0
QPSK	10	> 12	23.0	1
16QAM	10	≤ 12	23.0	1
16QAM	10	> 12	22.0	2
QPSK	5	≤ 8	24.0	0
QPSK	5	> 8	23.0	1
16QAM	5	≤ 8	23.0	1
16QAM	5	> 8	22.0	2

LTE Band 13				
Modulation	BW (MHz)	RB size	Target Power	MPR (dB)
QPSK	10	≤ 12	24.0	0
QPSK	10	> 12	23.0	1
16QAM	10	≤ 12	23.0	1
16QAM	10	> 12	22.0	2
QPSK	5	≤ 8	24.0	0
QPSK	5	> 8	23.0	1
16QAM	5	≤ 8	23.0	1
16QAM	5	> 8	22.0	2

LTE Band 17				
Modulation	BW (MHz)	RB size	Target Power	MPR (dB)
QPSK	10	≤ 12	24.0	0
QPSK	10	> 12	23.0	1
16QAM	10	≤ 12	23.0	1
16QAM	10	> 12	22.0	2
QPSK	5	≤ 8	24.0	0
QPSK	5	> 8	23.0	1
16QAM	5	≤ 8	23.0	1
16QAM	5	> 8	22.0	2

LTE Band 25				
Modulation	BW (MHz)	RB size	Target Power	MPR (dB)
QPSK	20	≤ 18	24.0	0
QPSK	20	> 18	23.0	1
16QAM	20	≤ 18	23.0	1
16QAM	20	> 18	22.0	2
QPSK	15	≤ 16	24.0	0
QPSK	15	> 16	23.0	1
16QAM	15	≤ 16	23.0	1
16QAM	15	> 16	22.0	2
QPSK	10	≤ 12	24.0	0
QPSK	10	> 12	23.0	1
16QAM	10	≤ 12	23.0	1
16QAM	10	> 12	22.0	2
QPSK	5	≤ 8	24.0	0
QPSK	5	> 8	23.0	1
16QAM	5	≤ 8	23.0	1
16QAM	5	> 8	22.0	2

Remark:

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

The table below summarized necessary items addressed in KDB 941225 D05 v02.

FCC ID	EJE-EM7355D
EUT	PCIe wireless WAN card
Operating Frequency Range of each LTE transmission band	LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 25: 1850.7 MHz ~ 1914.3 MHz
Channel Bandwidth	LTE Band 17: 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz LTE Band 4: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 25: 5MHz, 10MHz, 15MHz, 20MHz

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

Band 17

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Frequency (MHz)	Channel #	Frequency (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

Band 13

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Frequency (MHz)	Channel #	Frequency (MHz)
L	23205	779.5		
M	23230	782	23230	782
H	23255	784.5		

LTE Band 4

	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 25

	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26065	1852.5	26090	1855	26115	1857.5	26140	1860
M	26365	1882.5	26365	1882.5	26365	1882.5	26365	1882.5
H	26665	1912.5	26640	1910	26615	1907.5	26590	1905

E category, uplink modulations used	Category 3, QPSK, and 16QAM
LTE transmitter and antenna implementation (standalone or sharing hardware components / antennas)	A primary antenna is used for LTE and other wireless interfaces (GSM/CDMA/WCDMA) for transmitting and receiving. LTE and other wireless interfaces (GSM/CDMA/WCDMA) share the same antenna, and cannot transmit simultaneously A 2nd antenna is used for LTE and other wireless interfaces (GSM/CDMA/WCDMA) for receiving only
LTE Voice / Data requirements	1. Data only
LTE MPR permanently built-in by design	Yes, per 3GPP TS 36.101 v11.0.0

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

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

LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing.
Base station simulator used for Testing	Anritsu MT8820C

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
- FCC KDB 941225 D05 v02r02

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.

4. Specific Absorption Rate (SAR)

4.1 Introduction

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

4.2 SAR Definition

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

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

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

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

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

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

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

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

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

5. SAR Measurement System

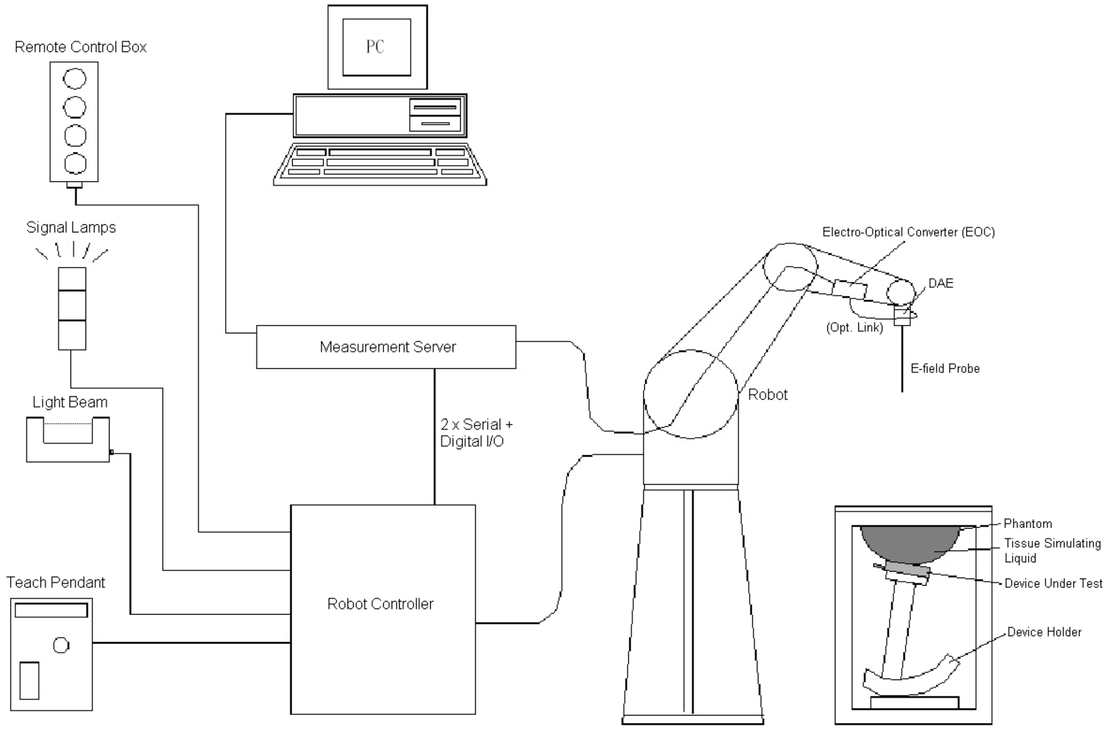


Fig 5.1 SPEAG DASY System Configurations

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

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

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

5.1 E-Field Probe

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

5.1.1 E-Field Probe Specification

<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)

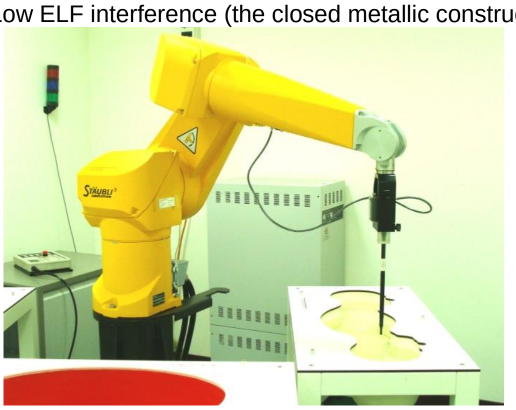


Fig 5.5 Photo of DASY4

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

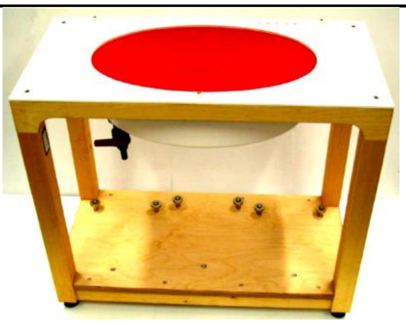
5.5 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	 **Fig 5.9 Photo of SAM Phantom**
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat 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%)	 **Fig 5.10 Photo of ELI4 Phantom**
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

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 $\varepsilon = 3$ and loss tangent $\delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

Fig 5.11 Device Holder

<Laptop Extension Kit>

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

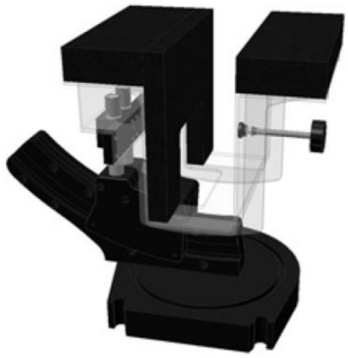


Fig 5.12 Laptop Extension Kit

5.7 Data Storage and Evaluation

5.7.1 Data Storage

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

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

5.7.2 Data Evaluation

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

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

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

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

The formula for each channel can be given as：

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

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

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

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

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

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

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

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

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

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

with SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

5.8 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1012	May. 28, 2013	May. 27, 2014
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. 21, 2013	Aug. 20, 2014
SPEAG	Data Acquisition Electronics	DAE4	1279	Jan. 28, 2013	Jan. 27, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3801	Jun. 20, 2013	Jun. 19, 2014
SPEAG	Dosimetric E-Field Probe	ES3DV3	3071	Jun. 18, 2013	Jun. 17, 2014
Wisewind	Thermometer	ETP-101	TM685	Nov. 13, 2012	Nov. 12, 2013
Anritsu	Radio Communication Analyzer	MT8820C	6201074414	Dec. 11, 2012	Dec. 10, 2014
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 06, 2013	May. 05, 2015
R&S	Radio communication Tester	CMW500	116160	Jan. 09, 2013	Jan. 08, 2014
SPEAG	Device Holder	N/A	N/A	NCR	NCR
R&S	Signal Generator	SMF 100A	101107	May. 27, 2013	May. 26, 2014
Agilent	ENA Network Analyzer	E5071C	MY46316648	Feb. 07, 2013	Feb. 06, 2014
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Jul. 23, 2013	Jul. 22, 2014
Anritsu	Power Meter	ML2495A	1132003	Aug. 28, 2013	Aug. 27, 2014
Anritsu	Power Sensor	MA2411B	1126017	Aug. 27, 2013	Aug. 26, 2014
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	Jul. 09, 2013	Jul. 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.

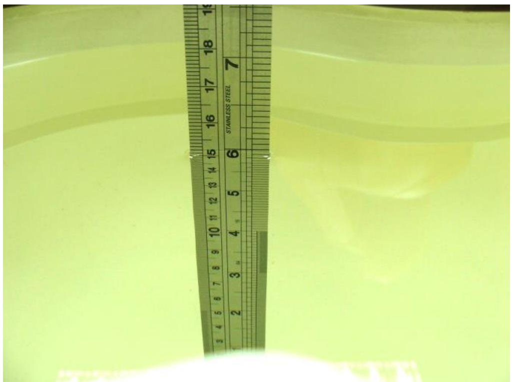


Fig 6.1 Photo of Liquid Height for Head SAR

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)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Body	22.6	0.973	54.284	0.96	55.50	1.35	-2.19	±5	2013/10/13
750	Body	22.6	0.973	54.284	0.96	55.50	1.35	-2.19	±5	2013/10/13
835	Body	22.5	0.997	55.120	0.97	55.20	2.78	-0.14	±5	2013/10/13
835	Body	22.5	0.997	55.120	0.97	55.20	2.78	-0.14	±5	2013/10/13
835	Body	22.7	0.965	54.846	0.97	55.20	-0.52	-0.64	±5	2013/10/16
1750	Body	22.5	1.494	51.651	1.52	53.30	-1.71	-3.09	±5	2013/10/14
1750	Body	22.4	1.528	51.762	1.52	53.30	0.53	-2.89	±5	2013/10/15
1900	Body	22.5	1.532	52.328	1.52	53.30	0.79	-1.82	±5	2013/10/14
1900	Body	22.4	1.535	52.471	1.52	53.30	0.99	-1.56	±5	2013/10/15

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:

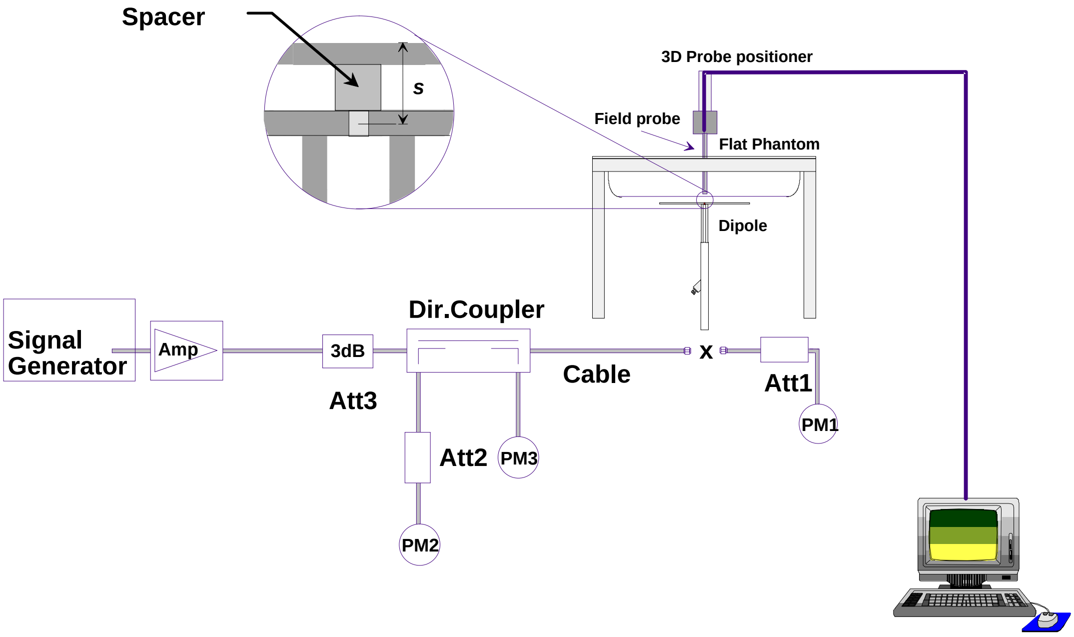


Fig 7.1 System Setup for System Evaluation

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

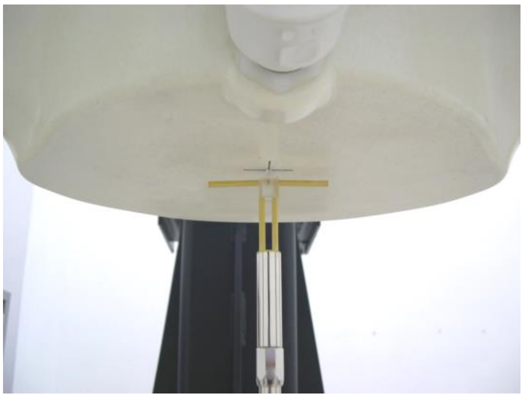


Fig 7.2 Photo of Dipole Setup

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)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured SAR (W/kg)	Targeted SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
2013/10/13	750	Body	250	1012	3801	778	2.07	8.83	8.28	-6.23
2013/10/13	750	Body	250	1012	3071	1279	2.21	8.83	8.84	0.11
2013/10/13	835	Body	250	499	3801	778	2.48	9.63	9.92	3.01
2013/10/13	835	Body	250	499	3071	1279	2.40	9.63	9.60	-0.31
2013/10/16	835	Body	250	499	3071	1279	2.53	9.63	10.12	5.09
2013/10/14	1750	Body	250	1068	3071	1279	9.90	36.80	39.60	7.61
2013/10/15	1750	Body	250	1068	3071	1279	9.62	36.80	38.48	4.57
2013/10/14	1900	Body	250	5d041	3071	1279	11.00	40.80	44.00	7.84
2013/10/15	1900	Body	250	5d041	3071	1279	10.92	40.80	43.68	7.06

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><th colspan="3"></th><th>≤ 3 GHz</th><th>> 3 GHz</th></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>½·δ·ln(2) ± 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>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 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 ≤ 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>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 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>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 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>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 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 ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</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 was set in GPRS (2 Tx slots) due to its highest frame-average power.

Band GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
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	31.99	31.91	31.82	33.00	22.99	22.91	22.82	24.00
GPRS (GMSK, 2 Tx slots) – CS1	31.61	31.54	31.43	33.00	25.61	25.54	25.43	27.00
EDGE (8PSK, 1 Tx slot) – MCS5	26.64	26.74	26.75	28.00	17.64	17.74	17.75	19.00
EDGE (8PSK, 2 Tx slots) – MCS5	26.71	26.72	26.59	28.00	20.71	20.72	20.59	22.00
EDGE (8PSK, 3 Tx slots) – MCS5	26.56	26.65	26.62	27.00	22.30	22.39	22.36	22.74
EDGE (8PSK, 4 Tx slots) – MCS5	26.53	26.50	26.43	27.00	23.53	23.50	23.43	24.00

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

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
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	28.97	28.96	28.96	30.00	19.97	19.96	19.96	21.00
GPRS (GMSK, 2 Tx slots) – CS1	28.90	28.88	28.86	30.00	22.90	22.88	22.86	24.00
EDGE (8PSK, 1 Tx slot) – MCS5	25.55	25.37	25.61	27.00	16.55	16.37	16.61	18.00
EDGE (8PSK, 2 Tx slots) – MCS5	25.50	25.28	25.49	27.00	19.50	19.28	19.49	21.00
EDGE (8PSK, 3 Tx slots) – MCS5	25.35	25.25	25.46	26.00	21.09	20.99	21.20	21.74
EDGE (8PSK, 4 Tx slots) – MCS5	25.31	25.12	25.30	26.00	22.31	22.12	22.30	23.00

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

<WCDMA Conducted Power>

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

DC-HSDPA 3GPP release 8 Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration below
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 RMC 12.2Kbps + HSDPA mode.
   ii. Set Cell Power = -25 dBm
   iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
   iv. Select HSDPA Uplink Parameters
   v. Set Gain Factors (β_c and β_d) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
      a). Subtest 1: β_c/β_d=2/15
      b). Subtest 2: β_c/β_d=12/15
      c). Subtest 3: β_c/β_d=15/8
      d). Subtest 4: β_c/β_d=15/4
   vi. Set Delta ACK, Delta NACK and Delta CQI = 8
   vii. Set Ack-Nack Repetition Factor to 3
   viii. Set CQI Feedback Cycle (k) to 4 ms
   ix. Set CQI Repetition Factor to 2
   x. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

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:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

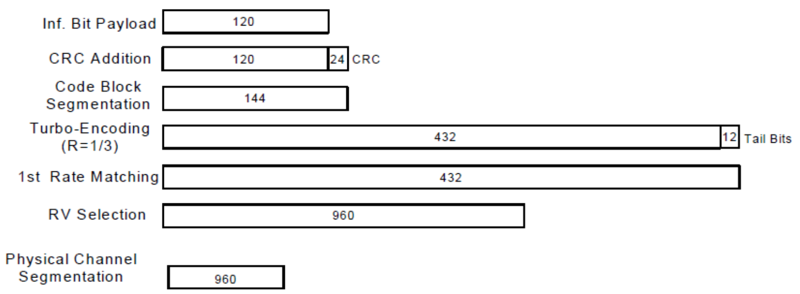


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

<WCDMA Conducted Power>

Note:

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

Band			WCDMA V			Tune-up Limit (dBm)	WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)
TX Channel			4132	4182	4233		9262	9400	9538		1312	1413	1513	
Frequency (MHz)			826.4	836.4	846.6		1852.4	1880	1907.6		1712.4	1732.6	1752.6	
MPR (dB)	3GPP Rel 99	RMC 12.2Kbps	22.71	22.83	22.86	24.00	22.91	23.10	23.07	24.00	22.90	22.93	22.95	24.00
0	3GPP Rel 6	HSDPA Subtest-1	22.69	22.73	22.72	24.00	22.88	23.08	23.04	24.00	22.88	22.91	22.94	24.00
0	3GPP Rel 6	HSDPA Subtest-2	22.65	22.68	22.71	24.00	22.77	23.01	22.95	24.00	22.87	22.90	22.91	24.00
0.5	3GPP Rel 6	HSDPA Subtest-3	22.62	22.65	22.65	23.50	22.71	22.97	22.91	23.50	22.37	22.38	22.41	23.50
0.5	3GPP Rel 6	HSDPA Subtest-4	22.56	22.60	22.60	23.50	22.65	22.94	22.85	23.50	22.32	22.36	22.36	23.50
0	3GPP Rel 8	DC-HSDPA Subtest-1	22.59	22.63	22.72	24.00	22.48	22.68	22.64	24.00	22.87	22.89	22.93	24.00
0	3GPP Rel 8	DC-HSDPA Subtest-2	22.55	22.61	22.72	24.00	22.40	22.61	22.55	24.00	22.85	22.86	22.91	24.00
0.5	3GPP Rel 8	DC-HSDPA Subtest-3	22.32	22.35	22.35	23.50	22.26	22.52	22.46	23.50	22.36	22.36	22.37	23.50
0.5	3GPP Rel 8	DC-HSDPA Subtest-4	22.26	22.30	22.30	23.50	22.20	22.49	22.40	23.50	22.33	22.31	22.35	23.50
0	3GPP Rel 6	HSUPA Subtest-1	22.69	22.80	22.83	24.00	22.89	23.05	23.05	24.00	22.86	22.88	22.91	24.00
2	3GPP Rel 6	HSUPA Subtest-2	21.05	21.13	21.19	22.00	21.16	21.34	21.49	22.00	21.32	21.41	21.47	22.00
1	3GPP Rel 6	HSUPA Subtest-3	21.91	21.98	22.05	23.00	22.28	22.53	22.45	23.00	21.88	21.94	22.01	23.00
2	3GPP Rel 6	HSUPA Subtest-4	20.78	20.85	20.92	22.00	21.26	21.27	21.46	22.00	21.22	21.35	21.40	22.00
0	3GPP Rel 6	HSUPA Subtest-5	22.70	22.79	22.81	24.00	22.92	23.09	23.07	24.00	22.88	22.91	22.94	24.00

<CDMA2000 Conducted Power>

Note:

1. Referring to KDB 941225 D01v02, the data device SAR is tested with Ev-Do Rev 0 (RTAP 153.6kbps). If 1xRTT and Ev-Do Rev A (RETAP 4096 bits) power is less than 1/4dB higher than Re v0, SAR tests with those settings are not necessary.

Band	CDMA2000 BC0			Tune-up Limit (dBm)	CDMA2000 BC1			Tune-up Limit (dBm)	CDMA2000 BC10			Tune-up Limit (dBm)
TX Channel	1013	384	777		25	600	1175		476	580	684	
Frequency (MHz)	824.7	836.52	848.31		1851.25	1880	1908.75		817.9	820.5	823.1	
1xRTT RC1 SO55	23.21	23.19	23.00	24.50	23.56	23.39	23.40	24.50	23.34	23.31	23.29	24.50
1xRTT RC3 SO55	23.23	23.20	23.02	24.50	23.55	23.45	23.46	24.50	23.17	23.25	23.34	24.50
1xEVDO RTAP 153.6Kbps	23.26	23.23	23.03	24.50	23.57	23.43	23.49	24.50	23.35	23.26	23.31	24.50
1xEVDO RETAP 4096Bits	23.21	23.20	23.20	24.50	23.55	23.45	23.50	24.50	23.16	23.17	23.33	24.50

<LTE Conducted Power>

Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r02, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r02, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r02, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r02, when reported SAR of 1RB and 50%RB allocation for QPSK ≤0.8W/kg, and 100%RB with QPSK output power is less than 1RB and 50%RB, 100%RB allocation for QPSK is not required.
6. Per KDB 941225 D05v02r02, when reported SAR of 1RB and 50%RB allocation for QPSK >0.8W/kg for any exposure position, SAR testing of 100%RB allocation for QPSK is performed at the highest power channel.
7. 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02, 16QAM SAR testing is not required.
8. Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r02, smaller bandwidth SAR testing is not required.

<LTE Band 17 Conducted Power>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				23780	23790	23800		
Frequency (MHz)				709	710	711		
10	QPSK	1	0	22.75	22.69	22.80	24.0	0
10	QPSK	1	24	22.84	23.15	22.93		
10	QPSK	1	49	22.90	22.97	22.66		
10	QPSK	25	0	21.96	21.99	22.02	23.0	1
10	QPSK	25	12	21.93	22.03	22.09		
10	QPSK	25	24	22.02	21.85	21.83		
10	QPSK	50	0	21.81	21.93	21.91		
10	16QAM	1	0	22.10	22.10	22.16	23.0	1
10	16QAM	1	24	21.88	22.13	21.64		
10	16QAM	1	49	22.04	21.96	22.05		
10	16QAM	25	0	20.94	21.09	21.11	22.0	2
10	16QAM	25	12	21.18	21.09	21.09		
10	16QAM	25	24	21.11	21.07	20.73		
10	16QAM	50	0	20.76	20.88	20.76		
Channel				23755	23790	23825	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				706.5	710	713.5		
5	QPSK	1	0	23.04	22.64	22.59	24.0	0
5	QPSK	1	12	22.73	22.80	22.54		
5	QPSK	1	24	23.14	23.01	22.64		
5	QPSK	12	0	21.95	22.13	21.83	23.0	1
5	QPSK	12	6	22.22	22.23	21.84		
5	QPSK	12	11	21.94	22.17	21.88		
5	QPSK	25	0	21.94	22.15	21.88		
5	16QAM	1	0	22.30	22.10	22.03	23.0	1
5	16QAM	1	12	21.99	22.00	21.80		
5	16QAM	1	24	22.34	22.20	21.99		
5	16QAM	12	0	21.07	21.20	20.90	22.0	2
5	16QAM	12	6	21.37	21.48	21.30		
5	16QAM	12	11	21.26	21.25	20.82		
5	16QAM	25	0	20.95	20.86	20.60		

<LTE Band 13 Conducted Power>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel					23230			
Frequency (MHz)					782			
10	QPSK	1	0		22.60		24.0	0
10	QPSK	1	24		22.36			
10	QPSK	1	49		22.31			
10	QPSK	25	0		21.22		23.0	1
10	QPSK	25	12		21.23			
10	QPSK	25	24		21.12			
10	QPSK	50	0		21.21			
10	16QAM	1	0		21.41		23.0	1
10	16QAM	1	24		21.34			
10	16QAM	1	49		21.16			
10	16QAM	25	0		20.13		22.0	2
10	16QAM	25	12		20.11			
10	16QAM	25	24		20.16			
10	16QAM	50	0		20.14			
Channel				23205	23230	23255	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	22.51	22.50	22.59	24.0	0
5	QPSK	1	12	22.58	22.46	22.50		
5	QPSK	1	24	22.45	22.45	22.58		
5	QPSK	12	0	22.02	21.88	21.98	23.0	1
5	QPSK	12	6	21.79	21.77	21.70		
5	QPSK	12	11	22.14	22.08	21.96		
5	QPSK	25	0	21.87	21.92	21.88		
5	16QAM	1	0	21.86	21.92	21.94	23.0	1
5	16QAM	1	12	21.98	22.13	21.81		
5	16QAM	1	24	21.90	21.88	21.89		
5	16QAM	12	0	20.90	21.08	21.07	22.0	2
5	16QAM	12	6	21.04	21.14	21.22		
5	16QAM	12	11	21.28	21.16	21.20		
5	16QAM	25	0	20.97	21.01	20.93		

<LTE Band 4 Conducted Power>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	22.42	22.49	22.70	24.0	0
20	QPSK	1	49	22.56	22.69	22.65		
20	QPSK	1	99	22.52	22.96	22.64		
20	QPSK	50	0	21.62	21.64	21.75	23.0	1
20	QPSK	50	24	21.60	21.62	21.60		
20	QPSK	50	49	21.59	21.65	21.52		
20	QPSK	100	0	21.58	21.66	21.49		
20	16QAM	1	0	21.80	22.04	22.12	23.0	1
20	16QAM	1	49	21.38	21.86	21.81		
20	16QAM	1	99	21.79	21.79	21.75		
20	16QAM	50	0	20.60	20.69	20.75	22.0	2
20	16QAM	50	24	20.65	20.71	20.80		
20	16QAM	50	49	20.46	20.69	20.75		
20	16QAM	100	0	20.53	20.69	20.77		
Channel				20025	20175	20325	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.40	22.51	22.61	24.0	0
15	QPSK	1	37	22.53	22.66	22.81		
15	QPSK	1	74	22.48	22.69	22.66		
15	QPSK	36	0	21.65	21.60	21.89	23.0	1
15	QPSK	36	18	21.52	21.70	21.80		
15	QPSK	36	37	21.66	21.88	21.70		
15	QPSK	75	0	21.53	21.68	21.56		
15	16QAM	1	0	21.81	22.00	21.92	23.0	1
15	16QAM	1	37	21.83	22.07	21.70		
15	16QAM	1	74	21.82	21.85	21.70		
15	16QAM	36	0	20.73	20.84	20.96	22.0	2
15	16QAM	36	18	20.67	20.84	20.96		
15	16QAM	36	37	20.48	20.78	20.76		
15	16QAM	75	0	20.44	20.72	20.87		
Channel				20000	20175	20350	Tune up Limit (dBm)	Target MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.39	22.56	22.56	24.0	0
10	QPSK	1	24	22.66	22.58	22.70		
10	QPSK	1	49	22.54	22.84	22.72		
10	QPSK	25	0	21.89	21.79	22.05	23.0	1
10	QPSK	25	12	21.70	21.78	22.13		
10	QPSK	25	24	21.79	22.02	21.83		
10	QPSK	50	0	21.44	21.75	21.49		
10	16QAM	1	0	21.90	22.06	21.95	23.0	1
10	16QAM	1	24	21.88	21.92	21.84		
10	16QAM	1	49	21.85	21.80	21.70		
10	16QAM	25	0	20.81	20.84	21.12	22.0	2
10	16QAM	25	12	20.77	20.89	20.96		
10	16QAM	25	24	20.75	21.08	20.80		
10	16QAM	50	0	20.50	20.73	20.80		

Channel				19975	20175	20375	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.50	22.51	22.69	24.0	0
5	QPSK	1	12	22.70	22.70	22.71		
5	QPSK	1	24	22.68	22.89	22.75		
5	QPSK	12	0	21.94	21.91	22.04	23.0	1
5	QPSK	12	6	22.00	21.93	22.13		
5	QPSK	12	11	21.94	22.10	21.90		
5	QPSK	25	0	21.76	21.92	21.75		
5	16QAM	1	0	21.95	22.04	21.98	23.0	1
5	16QAM	1	12	21.89	22.01	21.75		
5	16QAM	1	24	21.90	21.98	21.76		
5	16QAM	12	0	20.96	21.20	21.26	22.0	2
5	16QAM	12	6	21.05	21.11	21.18		
5	16QAM	12	11	20.97	21.15	20.95		
5	16QAM	25	0	20.78	20.87	21.03		

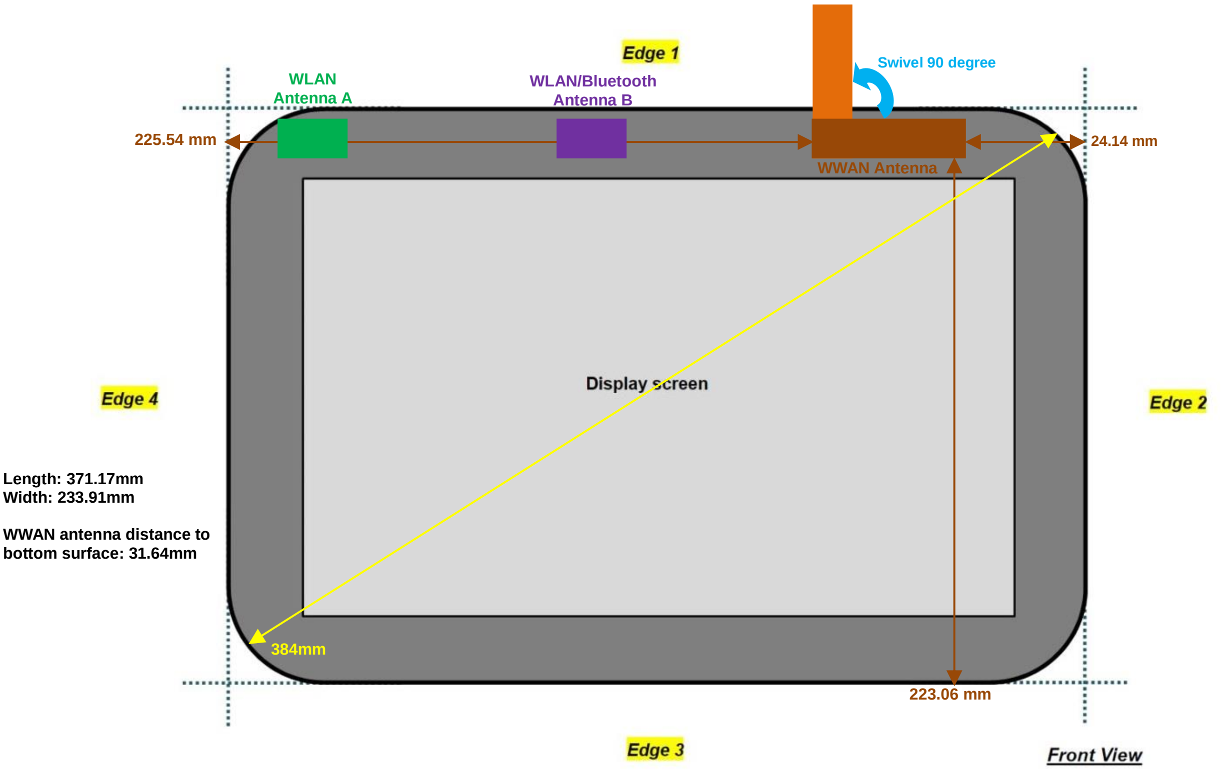
<u><LTE Band 25 Conducted Power></u>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				26140	26365	26590		
Frequency (MHz)				1860	1882.5	1905		
20	QPSK	1	0	22.75	22.85	22.70	24.0	0
20	QPSK	1	49	22.93	22.73	22.70		
20	QPSK	1	99	22.79	23.21	23.20		
20	QPSK	50	0	21.73	21.69	21.55	23.0	1
20	QPSK	50	24	21.73	21.71	21.69		
20	QPSK	50	49	21.74	21.59	21.77		
20	QPSK	100	0	21.74	21.67	21.60		
20	16QAM	1	0	21.79	22.07	21.98	23.0	1
20	16QAM	1	49	21.84	21.67	21.89		
20	16QAM	1	99	21.70	21.60	21.90		
20	16QAM	50	0	20.73	20.75	20.61	22.0	2
20	16QAM	50	24	20.69	20.69	20.65		
20	16QAM	50	49	20.65	20.64	20.89		
20	16QAM	100	0	20.77	20.76	20.78		
Channel				26115	26365	26615	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1882.5	1907.5		
15	QPSK	1	0	22.87	23.06	22.75	24.0	0
15	QPSK	1	37	22.71	22.73	22.93		
15	QPSK	1	74	22.96	22.87	23.10		
15	QPSK	36	0	21.76	21.89	21.47	23.0	1
15	QPSK	36	18	21.67	21.94	21.67		
15	QPSK	36	37	21.75	21.77	22.00		
15	QPSK	75	0	21.66	21.57	21.73		
15	16QAM	1	0	21.91	22.22	21.91	23.0	1
15	16QAM	1	37	21.77	21.71	21.86		
15	16QAM	1	74	21.74	21.48	21.93		
15	16QAM	36	0	20.79	20.90	20.65	22.0	2
15	16QAM	36	18	20.66	20.82	20.76		
15	16QAM	36	37	20.79	20.77	21.14		
15	16QAM	75	0	20.67	20.71	20.69		
Channel				26090	26365	26640	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1882.5	1910		
10	QPSK	1	0	22.81	23.00	22.69	24.0	0
10	QPSK	1	24	22.76	22.74	22.95		
10	QPSK	1	49	22.89	22.87	23.09		
10	QPSK	25	0	21.83	21.97	21.77	23.0	1
10	QPSK	25	12	21.70	21.99	21.80		
10	QPSK	25	24	21.64	21.90	21.95		
10	QPSK	50	0	21.72	21.59	21.72		
10	16QAM	1	0	21.80	22.24	21.91	23.0	1
10	16QAM	1	24	21.90	21.77	22.00		
10	16QAM	1	49	21.78	21.50	21.94		
10	16QAM	25	0	21.01	21.00	21.01	22.0	2
10	16QAM	25	12	20.76	20.96	20.97		
10	16QAM	25	24	20.58	20.81	21.05		
10	16QAM	50	0	20.62	20.61	20.82		

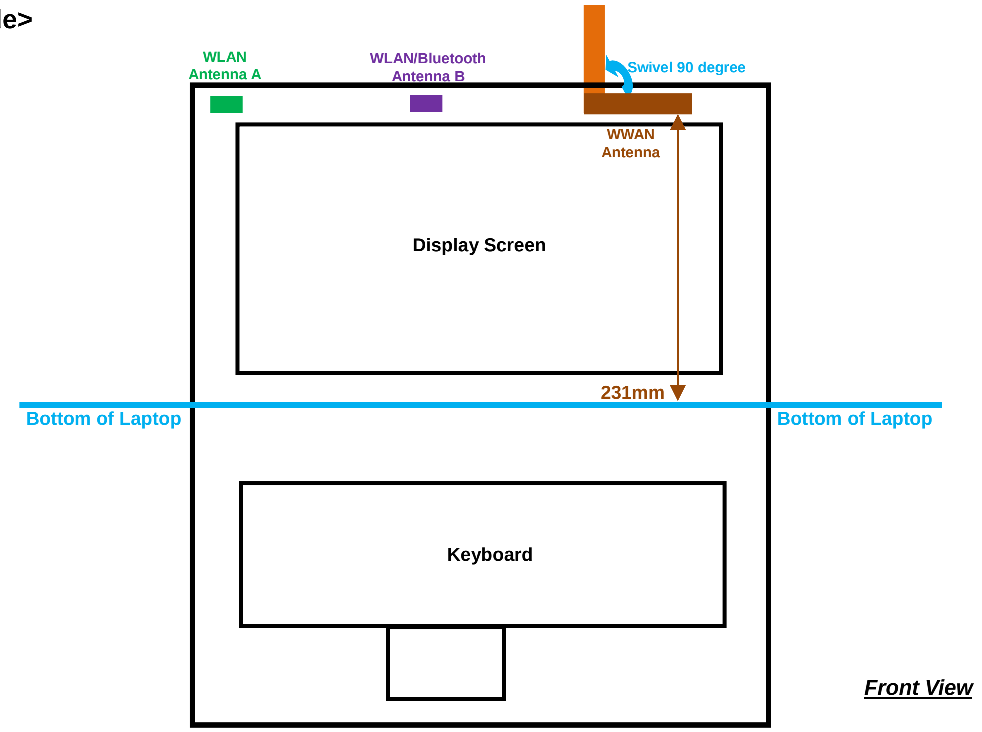
Channel				26065	26365	26665	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1882.5	1912.5		
5	QPSK	1	0	22.76	22.84	22.79	24.0	0
5	QPSK	1	12	22.72	22.71	22.98		
5	QPSK	1	24	22.84	22.88	22.80		
5	QPSK	12	0	21.84	21.98	21.89	23.0	1
5	QPSK	12	6	21.87	22.10	21.95		
5	QPSK	12	11	21.74	21.95	22.08		
5	QPSK	25	0	21.78	21.73	21.89		
5	16QAM	1	0	21.78	22.03	21.99	23.0	1
5	16QAM	1	12	21.75	21.70	22.06		
5	16QAM	1	24	21.60	21.66	21.97		
5	16QAM	12	0	20.91	21.18	20.99	22.0	2
5	16QAM	12	6	20.84	20.97	21.01		
5	16QAM	12	11	20.82	21.06	21.14		
5	16QAM	25	0	20.82	20.72	21.10		

11. Antenna Location

<Tablet Mode>



<Laptop Mode>



<SAR test exclusion table>

Exposure Position	Wireless Interface	GPRS 850 Class 10	GPRS 1900 Class 10	WCDMA Band V	WCDMA Band IV	WCDMA Band II	CDMA 2000 BC10	CDMA 2000 BC0	CDMA 2000 BC1	LTE Band 17	LTE Band 13	LTE Band 4	LTE Band 25
Exposure Position	Maximum power	27	24	24	24	24	24.5	24.5	24.5	24	24	24	24
	Maximum rated power(mW)	501.00	251.00	251.00	251.00	251.00	282.00	282.00	282.00	251.00	251.00	251.00	251.00
Bottom Face	Test Separation Distance(mm)	5											
	SAR exclusion threshold (Ratio)	92.27	69.36	46.17	66.41	69.32	51.88	51.94	77.89	42.39	44.45	66.48	69.45
	SAR testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Edge 1	Test Separation Distance(mm)	5											
	SAR exclusion threshold (Ratio)	92.27	69.36	46.17	66.41	69.32	51.88	51.94	77.89	42.39	44.45	66.48	69.45
	SAR testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Edge 2	Test Separation Distance(mm)	24.14											
	SAR exclusion threshold (Ratio)	19.11	14.37	9.56	13.75	14.36	10.74	10.76	16.13	8.78	9.21	13.77	14.38
	SAR testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Edge 3	Test Separation Distance(mm)	223.06											
	SAR exclusion threshold (mW)	1141.26	1839.16	1139.14	1843.99	1839.22	1139.14	1141.26	1839.22	1000.25	1073.93	1843.86	1839.02
	SAR testing required?	No	No	No	No	No	No	No	No	No	No	No	No
Edge 4	Test Separation Distance(mm)	225.54											
	SAR exclusion threshold (mW)	1155.28	1863.96	1153.13	1868.79	1864.02	1153.13	1155.28	1864.02	1012.04	1086.9	1868.66	1863.82
	SAR testing required?	No	No	No	No	No	No	No	No	No	No	No	No
Bottom of Laptop	Test Separation Distance(mm)	231											
	SAR exclusion threshold (mW)	1186.14	1918.56	1183.92	1923.39	1918.62	1183.92	1186.14	1918.62	1038.00	1115.43	1923.26	1918.42
	SAR testing required?	No	No	No	No	No	No	No	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 test separation distance 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*)] ·[$\sqrt{f(GHz)}$] ≤ 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. Per KDB 447498 D01v05r01, for each exposure position, if the highest output channel reported SAR ≤0.8W/kg, other channels SAR testing is not necessary.
3. Per KDB 865664 D01v01r01, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
4. Per KDB 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/HSUPA/DC-HSDPA output power is < 0.25dB higher than RMC12.2Kbps, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA/DC-HSDPA SAR evaluation can be excluded.
5. Referring to KDB 941225 D01v02, the data device SAR is tested with Ev-Do Rev 0 (RTAP 153.6kbps). If 1xRTT and Ev-Do Rev A (RETAP 4096 bits) power is less than 1/4dB higher than Re v0, SAR tests with those settings are not necessary.
6. Per KDB 941225 D05v02r02, when reported SAR of 1RB and 50%RB allocation for QPSK ≤0.8W/kg, and 100%RB with QPSK output power is less than 1RB and 50%RB, 100%RB allocation for QPSK is not required.
7. Per KDB 941225 D05v02r02, when reported SAR of 1RB and 50%RB allocation for QPSK >0.8W/kg for any exposure position, SAR testing of 100%RB allocation for QPSK is performed at the highest power channel.
8. 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02, 16QAM SAR testing is not required.
9. Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r02, smaller bandwidth SAR testing is not required.

12.1 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Antenna configure	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
1	GSM850	GPRS (2 Tx slots)	Bottom Face	0cm	Swivel 0	128	824.2	31.61	33	1.377	0.05	0.00311	0.004
2	GSM850	GPRS (2 Tx slots)	Edge1	0cm	Swivel 0	128	824.2	31.61	33	1.377	-0.16	0.156	0.215
3	GSM850	GPRS (2 Tx slots)	Edge2	0cm	Swivel 0	128	824.2	31.61	33	1.377	0.12	0.00499	0.007
5	GSM850	GPRS (2 Tx slots)	Bottom Face	0cm	Swivel 90	128	824.2	31.61	33	1.377	-0.01	0.599	0.825
7	GSM850	GPRS (2 Tx slots)	Bottom Face	0cm	Swivel 90	189	836.4	31.54	33	1.400	-0.15	0.598	0.837
15	GSM850	GPRS (2 Tx slots)	Bottom Face	0cm	Swivel 90	251	848.8	31.43	33	1.435	0.02	0.588	**0.844**
117	GSM850	GPRS (2 Tx slots)	Edge 2	0cm	Swivel 90	128	824.2	31.61	33	1.377	-0.05	0.208	0.286
146	GSM1900	GPRS (2 Tx slots)	Bottom Face	0cm	Swivel 0	512	1850.2	28.9	30	1.288	0.16	0.015	0.019
147	GSM1900	GPRS (2 Tx slots)	Edge 1	0cm	Swivel 0	512	1850.2	28.9	30	1.288	0.02	0.202	0.260
148	GSM1900	GPRS (2 Tx slots)	Edge 2	0cm	Swivel 0	512	1850.2	28.9	30	1.288	-0.18	0.014	0.018
150	GSM1900	GPRS (2 Tx slots)	Bottom Face	0cm	Swivel 90	512	1850.2	28.9	30	1.288	-0.03	0.221	**0.285**
153	GSM1900	GPRS (2 Tx slots)	Edge 2	0cm	Swivel 0	512	1850.2	28.9	30	1.288	0.08	0.205	0.264

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Antenna configure	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
9	WCDMA V	RMC12.2Kbps	Bottom Face	0cm	Swivel 0	4233	846.6	22.86	24	1.300	0.07	0.00175	0.002
11	WCDMA V	RMC12.2Kbps	Edge 1	0cm	Swivel 0	4233	846.6	22.86	24	1.300	-0.17	0.111	0.144
12	WCDMA V	RMC12.2Kbps	Edge 2	0cm	Swivel 0	4233	846.6	22.86	24	1.300	0.13	0.00239	0.003
16	WCDMA V	RMC12.2Kbps	Bottom Face	0cm	Swivel 90	4233	846.6	22.86	24	1.300	-0.06	0.395	0.514
118	WCDMA V	RMC12.2Kbps	Edge 2	0cm	Swivel 90	4233	846.6	22.86	24	1.300	-0.03	0.137	0.178
119	WCDMA IV	RMC12.2Kbps	Bottom Face	0cm	Swivel 0	1513	1752.6	22.95	24	1.274	0.04	0.013	0.017
120	WCDMA IV	RMC12.2Kbps	Edge 1	0cm	Swivel 0	1513	1752.6	22.95	24	1.274	0.12	0.163	0.208
121	WCDMA IV	RMC12.2Kbps	Edge 2	0cm	Swivel 0	1513	1752.6	22.95	24	1.274	-0.04	0.011	0.014
123	WCDMA IV	RMC12.2Kbps	Bottom Face	0cm	Swivel 90	1513	1752.6	22.95	24	1.274	-0.07	0.297	0.378
126	WCDMA IV	RMC12.2Kbps	Edge 2	0cm	Swivel 90	1513	1752.6	22.95	24	1.274	0.17	0.243	0.309
128	WCDMA II	RMC12.2Kbps	Bottom Face	0cm	Swivel 0	9400	1880	23.1	24	1.230	0.04	0.034	0.042
129	WCDMA II	RMC12.2Kbps	Edge 1	0cm	Swivel 0	9400	1880	23.1	24	1.230	-0.08	0.218	0.268
130	WCDMA II	RMC12.2Kbps	Edge 2	0cm	Swivel 0	9400	1880	23.1	24	1.230	0.01	0.011	0.014
132	WCDMA II	RMC12.2Kbps	Bottom Face	0cm	Swivel 90	9400	1880	23.1	24	1.230	-0.04	0.269	0.331
135	WCDMA II	RMC12.2Kbps	Edge 2	0cm	Swivel 90	9400	1880	23.1	24	1.230	0.12	0.241	0.296

<CDMA2000>

Plot No.	Band	Mode	Test Position	Gap (cm)	Antenna configure	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
157	CDMA2000 BC0	RTAP 153.6Kbps	Bottom Face	0cm	Swivel 0	1013	824.7	23.26	24.5	1.330	0.16	0.00672	0.009
158	CDMA2000 BC0	RTAP 153.6Kbps	Edge 1	0cm	Swivel 0	1013	824.7	23.26	24.5	1.330	-0.11	0.158	0.210
159	CDMA2000 BC0	RTAP 153.6Kbps	Edge 2	0cm	Swivel 0	1013	824.7	23.26	24.5	1.330	0.19	0.00802	0.011
161	CDMA2000 BC0	RTAP 153.6Kbps	Bottom Face	0cm	Swivel 90	1013	824.7	23.26	24.5	1.330	-0.03	0.437	0.581
164	CDMA2000 BC0	RTAP 153.6Kbps	Edge 2	0cm	Swivel 90	1013	824.7	23.26	24.5	1.330	-0.12	0.126	0.168
167	CDMA2000 BC10	RTAP 153.6Kbps	Bottom Face	0cm	Swivel 0	476	817.9	23.35	24.5	1.303	0.16	0.00665	0.009
168	CDMA2000 BC10	RTAP 153.6Kbps	Edge 1	0cm	Swivel 0	476	817.9	23.35	24.5	1.303	-0.11	0.157	0.205
169	CDMA2000 BC10	RTAP 153.6Kbps	Edge 2	0cm	Swivel 0	476	817.9	23.35	24.5	1.303	0.19	0.00794	0.010
166	CDMA2000 BC10	RTAP 153.6Kbps	Bottom Face	0cm	Swivel 90	476	817.9	23.35	24.5	1.303	-0.08	0.423	0.551
170	CDMA2000 BC10	RTAP 153.6Kbps	Edge 2	0cm	Swivel 90	476	817.9	23.35	24.5	1.303	-0.12	0.124	0.162
137	CDMA2000 BC1	RTAP 153.6Kbps	Bottom Face	0cm	Swivel 0	25	1851.25	23.57	24.5	1.239	0.13	0.00869	0.011
138	CDMA2000 BC1	RTAP 153.6Kbps	Edge 1	0cm	Swivel 0	25	1851.25	23.57	24.5	1.239	-0.04	0.275	0.341
139	CDMA2000 BC1	RTAP 153.6Kbps	Edge 2	0cm	Swivel 0	25	1851.25	23.57	24.5	1.239	0.15	0.012	0.015
141	CDMA2000 BC1	RTAP 153.6Kbps	Bottom Face	0cm	Swivel 90	25	1851.25	23.57	24.5	1.239	-0.03	0.308	0.382
145	CDMA2000 BC1	RTAP 153.6Kbps	Edge 2	0cm	Swivel 90	25	1851.25	23.57	24.5	1.239	-0.05	0.308	0.382

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (cm)	Antenna configure	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
35	LTE Band 17	10M	QPSK	1	24	Bottom Face	0cm	Swivel 0	23790	710	23.15	24	1.216	0.16	0.00373	0.005
36	LTE Band 17	10M	QPSK	25	12	Bottom Face	0cm	Swivel 0	23800	711	22.09	23	1.233	0.11	0.00325	0.004
43	LTE Band 17	10M	QPSK	1	24	Edge 1	0cm	Swivel 0	23790	710	23.15	24	1.216	-0.13	0.149	0.181
44	LTE Band 17	10M	QPSK	25	12	Edge 1	0cm	Swivel 0	23800	711	22.09	23	1.233	-0.13	0.115	0.142
45	LTE Band 17	10M	QPSK	1	24	Edge 2	0cm	Swivel 0	23790	710	23.15	24	1.216	0.12	0.00504	0.006
46	LTE Band 17	10M	QPSK	25	12	Edge 2	0cm	Swivel 0	23800	711	22.09	23	1.233	0.17	0.00396	0.005
37	LTE Band 17	10M	QPSK	1	24	Bottom Face	0cm	Swivel 90	23790	710	23.15	24	1.216	0.01	0.276	**0.336**
38	LTE Band 17	10M	QPSK	25	12	Bottom Face	0cm	Swivel 90	23800	711	22.09	23	1.233	0	0.21	0.259
113	LTE Band 17	10M	QPSK	1	24	Edge 2	0cm	Swivel 90	23790	710	23.15	24	1.216	-0.13	0.094	0.114
114	LTE Band 17	10M	QPSK	25	12	Edge 2	0cm	Swivel 90	23800	711	22.09	23	1.233	-0.18	0.074	0.091
51	LTE Band 13	10M	QPSK	1	0	Bottom Face	0cm	Swivel 0	23230	782	22.6	24	1.380	0.09	0.00297	0.004
52	LTE Band 13	10M	QPSK	25	12	Bottom Face	0cm	Swivel 0	23230	782	21.23	23	1.503	-0.15	0.00279	0.004
55	LTE Band 13	10M	QPSK	1	0	Edge 1	0cm	Swivel 0	23230	782	22.6	24	1.380	-0.11	0.095	0.131
56	LTE Band 13	10M	QPSK	25	12	Edge 1	0cm	Swivel 0	23230	782	21.23	23	1.503	-0.17	0.083	0.125
57	LTE Band 13	10M	QPSK	1	0	Edge 2	0cm	Swivel 0	23230	782	22.6	24	1.380	0.15	0.00444	0.006
58	LTE Band 13	10M	QPSK	25	12	Edge 2	0cm	Swivel 0	23230	782	21.23	23	1.503	0.11	0.00401	0.006
53	LTE Band 13	10M	QPSK	1	0	Bottom Face	0cm	Swivel 90	23230	782	22.6	24	1.380	-0.02	0.442	**0.610**
54	LTE Band 13	10M	QPSK	25	12	Bottom Face	0cm	Swivel 90	23230	782	21.23	23	1.503	0.02	0.324	0.487
115	LTE Band 13	10M	QPSK	1	0	Edge 2	0cm	Swivel 90	23230	782	22.6	24	1.380	-0.02	0.121	0.167
116	LTE Band 13	10M	QPSK	25	12	Edge 2	0cm	Swivel 90	23230	782	21.23	23	1.503	-0.14	0.108	0.162
63	LTE Band 4	20M	QPSK	1	99	Bottom Face	0cm	Swivel 0	20175	1732.5	22.96	24	1.271	0.04	0.00472	0.006
64	LTE Band 4	20M	QPSK	50	0	Bottom Face	0cm	Swivel 0	20300	1745	21.75	23	1.334	-0.13	0.00414	0.006
83	LTE Band 4	20M	QPSK	1	99	Edge 1	0cm	Swivel 0	20175	1732.5	22.96	24	1.271	-0.02	0.203	0.258
84	LTE Band 4	20M	QPSK	50	0	Edge 1	0cm	Swivel 0	20300	1745	21.75	23	1.334	0.13	0.191	0.255
95	LTE Band 4	20M	QPSK	1	99	Edge 2	0cm	Swivel 0	20175	1732.5	22.96	24	1.271	0.18	0.00816	0.010
96	LTE Band 4	20M	QPSK	50	0	Edge 2	0cm	Swivel 0	20300	1745	21.75	23	1.334	0.1	0.00706	0.009
75	LTE Band 4	20M	QPSK	1	99	Bottom Face	0cm	Swivel 90	20175	1732.5	22.96	24	1.271	-0.04	0.528	**0.671**
76	LTE Band 4	20M	QPSK	50	0	Bottom Face	0cm	Swivel 90	20300	1745	21.75	23	1.334	-0.02	0.46	0.613
97	LTE Band 4	20M	QPSK	1	99	Edge 2	0cm	Swivel 90	20175	1732.5	22.96	24	1.271	0.01	0.258	0.328
98	LTE Band 4	20M	QPSK	50	0	Edge 2	0cm	Swivel 90	20300	1745	21.75	23	1.334	0.05	0.203	0.271
79	LTE Band 25	20M	QPSK	1	99	Bottom Face	0cm	Swivel 0	26365	1882.5	23.21	24	1.199	0.08	0.016	0.019
80	LTE Band 25	20M	QPSK	50	49	Bottom Face	0cm	Swivel 0	26590	1905	21.77	23	1.327	0.07	0.016	0.021
81	LTE Band 25	20M	QPSK	1	99	Edge 1	0cm	Swivel 0	26365	1882.5	23.21	24	1.199	0.11	0.362	0.434
82	LTE Band 25	20M	QPSK	50	49	Edge 1	0cm	Swivel 0	26590	1905	21.77	23	1.327	0.13	0.345	0.458
93	LTE Band 25	20M	QPSK	1	99	Edge 2	0cm	Swivel 0	26365	1882.5	23.21	24	1.199	0.11	0.01	0.012
94	LTE Band 25	20M	QPSK	50	49	Edge 2	0cm	Swivel 0	26590	1905	21.77	23	1.327	-0.14	0.00947	0.013
71	LTE Band 25	20M	QPSK	1	99	Bottom Face	0cm	Swivel 90	26365	1882.5	23.21	24	1.199	-0.06	0.557	0.668
72	LTE Band 25	20M	QPSK	50	49	Bottom Face	0cm	Swivel 90	26590	1905	21.77	23	1.327	0.01	0.511	**0.678**
91	LTE Band 25	20M	QPSK	1	99	Edge 2	0cm	Swivel 90	26365	1882.5	23.21	24	1.199	-0.14	0.248	0.297
92	LTE Band 25	20M	QPSK	50	49	Edge 2	0cm	Swivel 90	26590	1905	21.77	23	1.327	-0.14	0.215	0.285

12.2 Highest SAR Plot

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/13

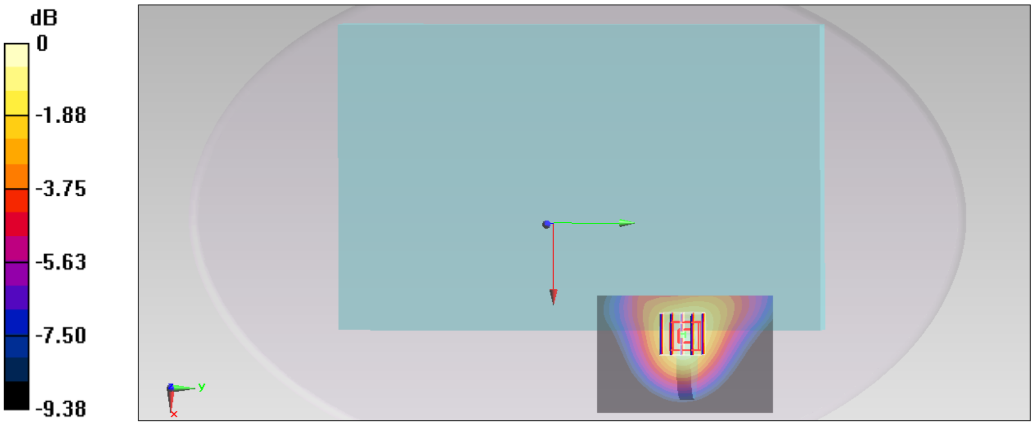
#15_GSM850_GPRS (2 Tx slots)_Bottom Face_0cm_Ch251;Ant Open

Communication System: GSM850; Frequency: 848.8 MHz;Duty Cycle: 1:4.15
Medium: MSL_850_131013 Medium parameters used: f = 849 MHz; σ = 1.01 mho/m; ε_r = 55.032; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3801; ConvF(9.13, 9.13, 9.13); Calibrated: 2013/6/20;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2013/8/21
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch251/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.722 mW/g

Configuration/Ch251/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.948 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.826 mW/g
SAR(1 g) = 0.588 mW/g; SAR(10 g) = 0.409 mW/g
Maximum value of SAR (measured) = 0.714 mW/g



0 dB = 0.714 mW/g = -2.93 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/15

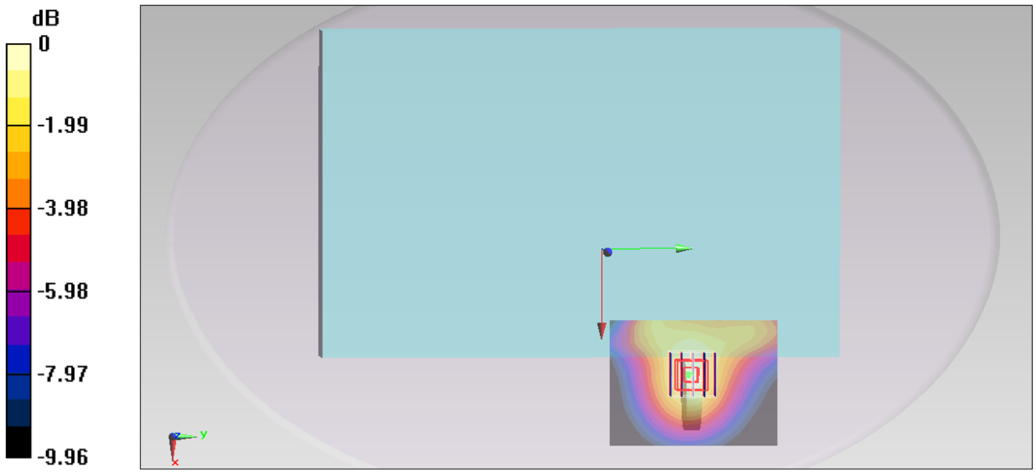
#150_GSM1900_GPRS (2 Tx slots)_Bottom Face_0cm_Ch512;Ant Open

Communication System: PCS; Frequency: 1850.2 MHz;Duty Cycle: 1:4.15
Medium: MSL_1900_131015 Medium parameters used: f = 1850.2 MHz; σ = 1.493 mho/m; ε_r = 52.683; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3071; ConvF(4.29, 4.29, 4.29); Calibrated: 2013/6/18;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch512/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.258 mW/g

Configuration/Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.756 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.324 mW/g
SAR(1 g) = 0.221 mW/g; SAR(10 g) = 0.144 mW/g
Maximum value of SAR (measured) = 0.258 mW/g



0 dB = 0.258 mW/g = -11.77 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/13

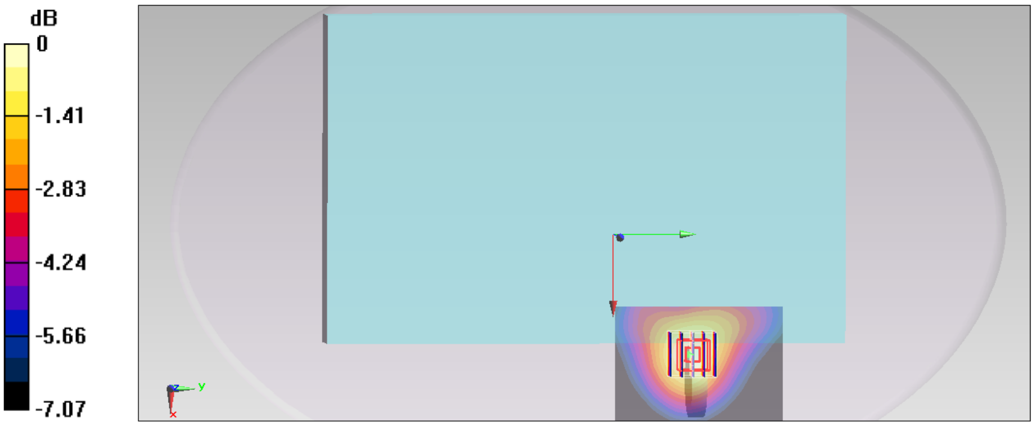
#16_WCDMA V_RMC12.2Kbps_Bottom Face_0cm_Ch4233;Ant Open

Communication System: WCDMA; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium: MSL_850_131013 Medium parameters used: f = 847 MHz; σ = 1.009 mho/m; ε_r = 55.045; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3801; ConvF(9.13, 9.13, 9.13); Calibrated: 2013/6/20;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2013/8/21
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch4233/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.492 mW/g

Configuration/Ch4233/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.061 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.529 mW/g
SAR(1 g) = 0.395 mW/g; SAR(10 g) = 0.288 mW/g
Maximum value of SAR (measured) = 0.469 mW/g



0 dB = 0.469 mW/g = -6.58 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/15

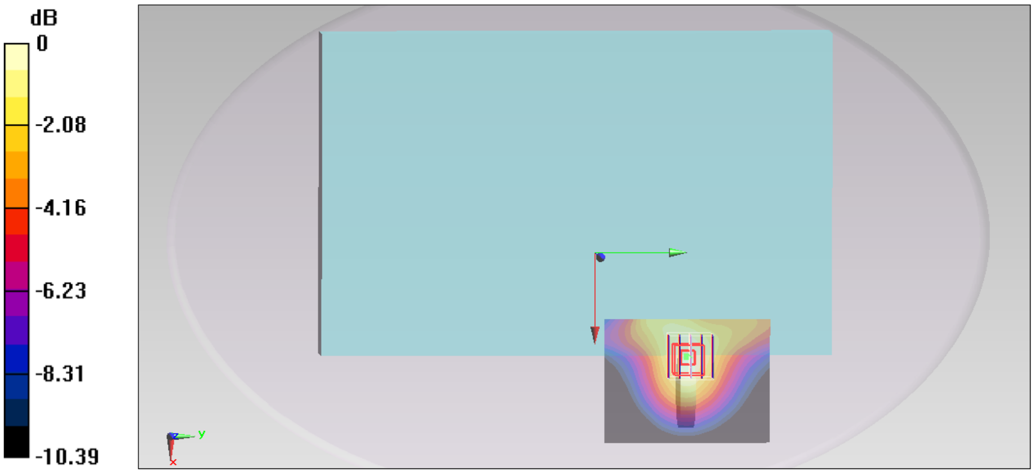
#123_WCDMA IV_RMC12.2Kbps_Bottom Face_0cm_Ch1513;Ant Open

Communication System: WCDMA; Frequency: 1752.6 MHz;Duty Cycle: 1:1
Medium: MSL_1750_131015 Medium parameters used: f = 1753 MHz; σ = 1.531 mho/m; ε_r = 51.754; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3071; ConvF(4.49, 4.49, 4.49); Calibrated: 2013/6/18;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch1513/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.352 mW/g

Configuration/Ch1513/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.084 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.405 mW/g
SAR(1 g) = 0.297 mW/g; SAR(10 g) = 0.198 mW/g
Maximum value of SAR (measured) = 0.341 mW/g



0 dB = 0.341 mW/g = -9.34 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/15

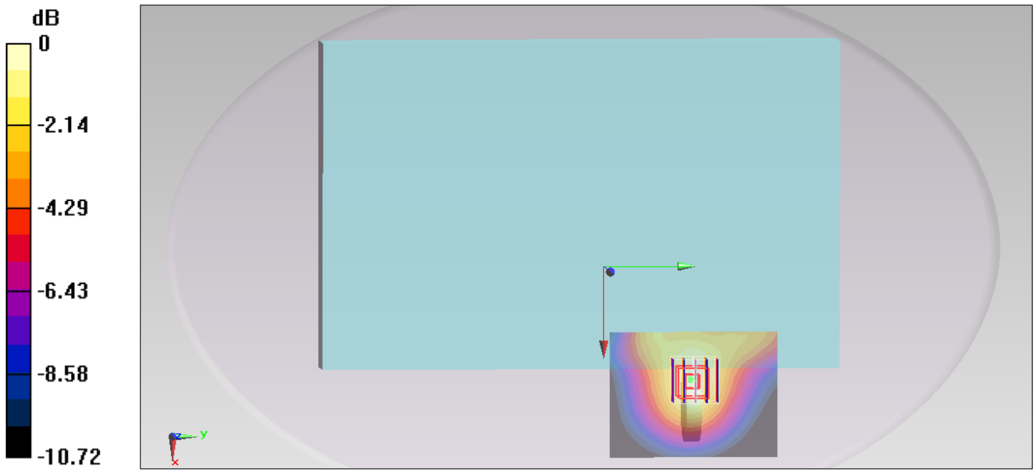
#132_WCDMA II_RMC12.2Kbps_Bottom Face_0cm_Ch9400;Ant Open

Communication System: WCDMA; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: MSL_1900_131015 Medium parameters used: f = 1880 MHz; σ = 1.518 mho/m; ε_r = 52.569; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3071; ConvF(4.29, 4.29, 4.29); Calibrated: 2013/6/18;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch9400/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.323 mW/g

Configuration/Ch9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.217 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.393 mW/g
SAR(1 g) = 0.269 mW/g; SAR(10 g) = 0.174 mW/g
Maximum value of SAR (measured) = 0.315 mW/g



0 dB = 0.315 mW/g = -10.03 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/16

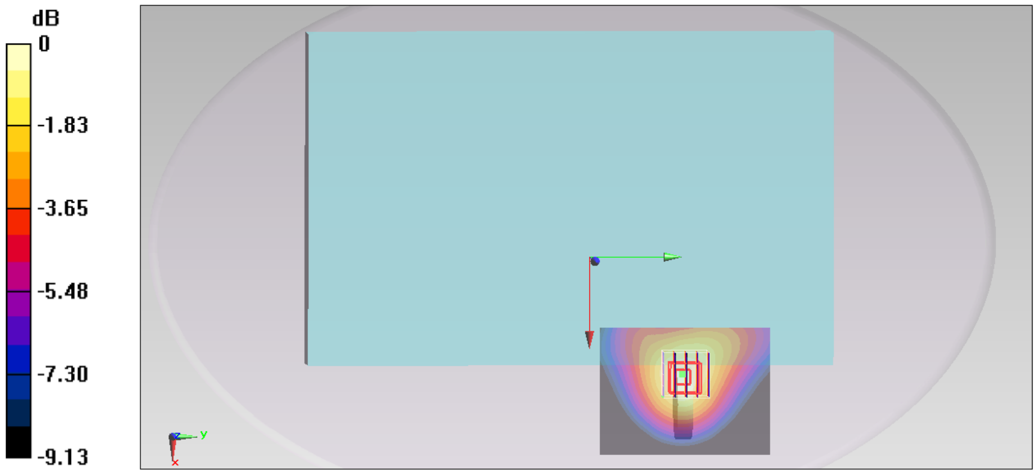
#161_CDMA2000 BC0_RTAP 153.6Kbps_Bottom Face_0cm_Ch1013;Ant Open

Communication System: CDMA ; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: MSL_850_131016 Medium parameters used: f = 825 MHz; σ = 0.955 mho/m; ε_r = 54.944; ρ = 1000 kg/m^3
Ambient Temperature：23.7 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3071; ConvF(5.8, 5.8, 5.8); Calibrated: 2013/6/18;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch1013/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.504 mW/g

Configuration/Ch1013/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.608 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.604 mW/g
SAR(1 g) = 0.437 mW/g; SAR(10 g) = 0.304 mW/g
Maximum value of SAR (measured) = 0.496 mW/g



0 dB = 0.496 mW/g = -6.09 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/16

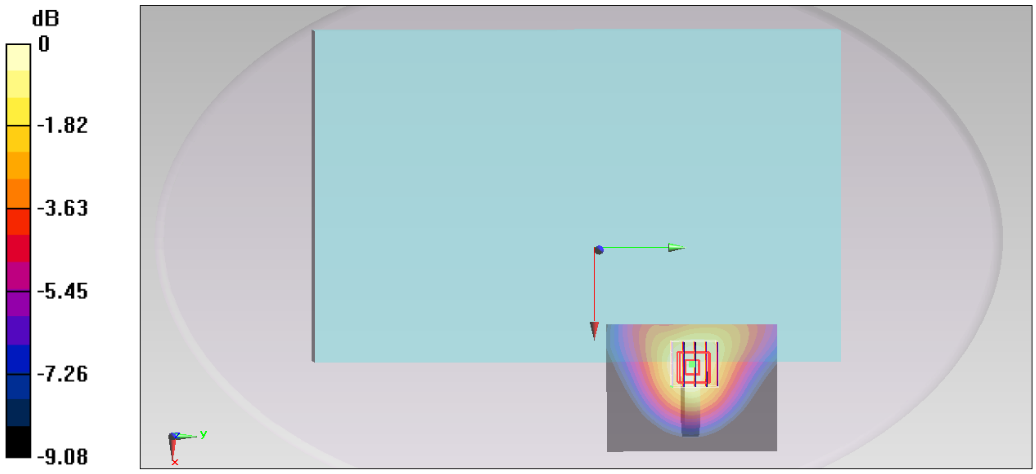
#166_CDMA2000 BC10_RTAP 153.6Kbps_Bottom Face_0cm_Ch476;Ant Open

Communication System: CDMA ; Frequency: 817.9 MHz;Duty Cycle: 1:1
Medium: MSL_850_131016 Medium parameters used : f = 817.9 MHz; σ = 0.948 mho/m; ε_r = 55.014; ρ = 1000 kg/m^3
Ambient Temperature：23.7 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3071; ConvF(5.8, 5.8, 5.8); Calibrated: 2013/6/18;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch476/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.495 mW/g

Configuration/Ch476/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.299 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.579 mW/g
SAR(1 g) = 0.423 mW/g; SAR(10 g) = 0.298 mW/g
Maximum value of SAR (measured) = 0.476 mW/g



0 dB = 0.476 mW/g = -6.45 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/15

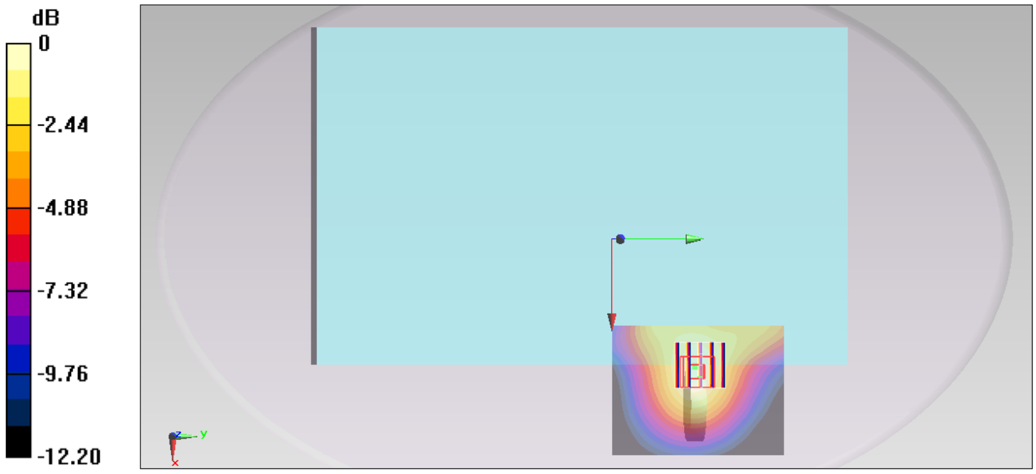
#141_CDMA2000 BC1_RTAP 153.6Kbps_Bottom Face_0cm_Ch25;Ant Open

Communication System: CDMA ; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: MSL_1900_131015 Medium parameters used : f = 1851.25 MHz; σ = 1.494 mho/m; ε_r = 52.681; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3071; ConvF(4.29, 4.29, 4.29); Calibrated: 2013/6/18;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch25/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.366 mW/g

Configuration/Ch25/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.340 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.458 mW/g
SAR(1 g) = 0.308 mW/g; SAR(10 g) = 0.196 mW/g
Maximum value of SAR (measured) = 0.358 mW/g



0 dB = 0.358 mW/g = -8.92 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/13

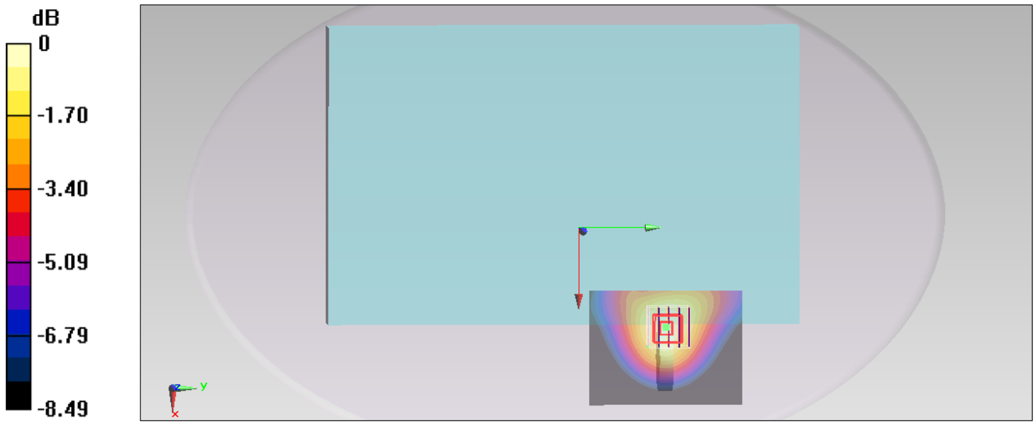
#37_LTE Band 17_10M_QPSK_1RB_24Offeset_Bottom Face_0cm_Ch23790;Ant Open

Communication System: LTE; Frequency: 710 MHz;Duty Cycle: 1:1
Medium: MSL_750_131013 Medium parameters used: f = 710 MHz; σ = 0.934 mho/m; ε_r = 54.766; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3801; ConvF(9.31, 9.31, 9.31); Calibrated: 2013/6/20;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2013/8/21
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch23790/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.340 mW/g

Configuration/Ch23790/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.227 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.375 mW/g
SAR(1 g) = 0.276 mW/g; SAR(10 g) = 0.197 mW/g
Maximum value of SAR (measured) = 0.330 mW/g



0 dB = 0.330 mW/g = -9.63 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/13

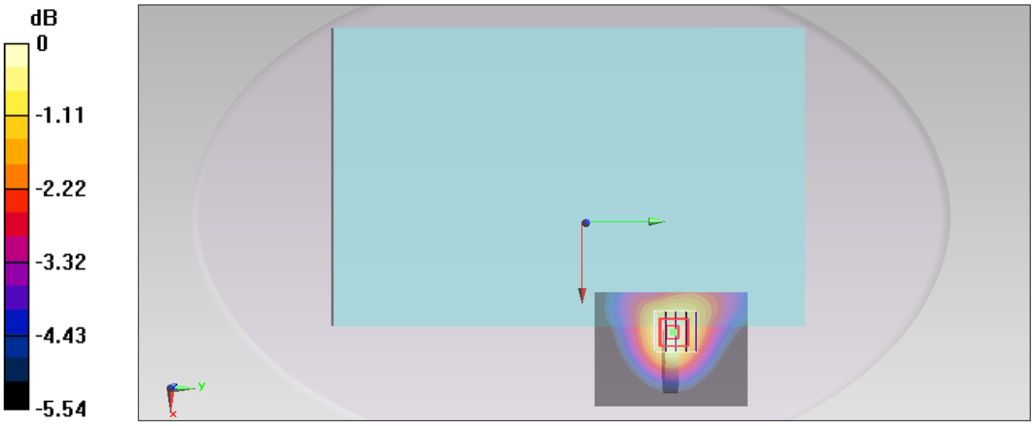
#53_LTE Band 13_10M_QPSK_1RB_0Offeset_Bottom Face_0cm_Ch23230;Ant Open

Communication System: LTE; Frequency: 782 MHz;Duty Cycle: 1:1
Medium: MSL_750_131013 Medium parameters used: f = 782 MHz; σ = 1.004 mho/m; ε_r = 53.923; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3801; ConvF(9.31, 9.31, 9.31); Calibrated: 2013/6/20;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2013/8/21
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch23230/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.523 mW/g

Configuration/Ch23230/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.081 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.575 mW/g
SAR(1 g) = 0.442 mW/g; SAR(10 g) = 0.337 mW/g
Maximum value of SAR (measured) = 0.513 mW/g



0 dB = 0.513 mW/g = -5.80 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/14

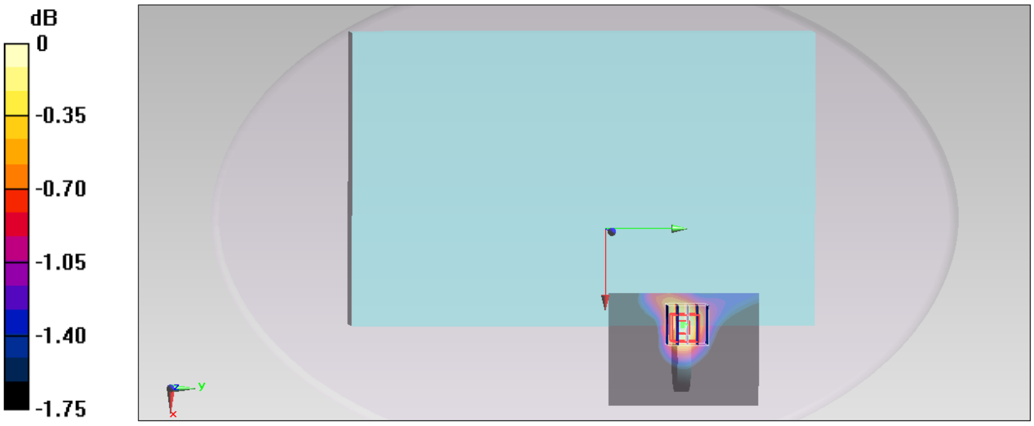
#75_LTE Band 4_20M_QPSK_1RB_99Offeset_Bottom Face_0cm_Ch20175;Ant Open

Communication System: LTE; Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: MSL_1750_131014 Medium parameters used: f = 1732.5 MHz; σ = 1.477 mho/m; ε_r = 51.737; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3071; ConvF(4.49, 4.49, 4.49); Calibrated: 2013/6/18;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch20175/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.553 mW/g

Configuration/Ch20175/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.769 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.556 mW/g
SAR(1 g) = 0.528 mW/g; SAR(10 g) = 0.461 mW/g
Maximum value of SAR (measured) = 0.550 mW/g



0 dB = 0.550 mW/g = -5.19 dB mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2013/10/14

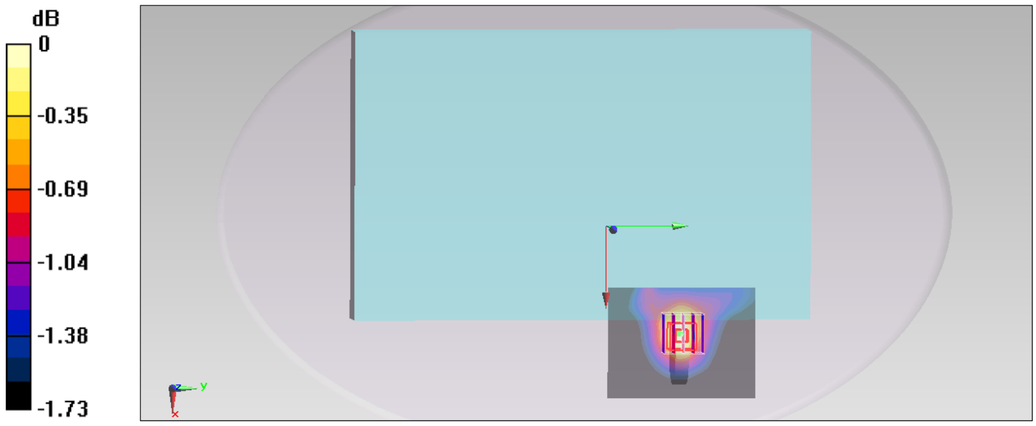
#72_LTE Band 25_20M_QPSK_50RB_49Offeset_Bottom Face_0cm_Ch26590;Ant Open

Communication System: LTE; Frequency: 1905 MHz;Duty Cycle: 1:1
Medium: MSL_1900_131014 Medium parameters used: f = 1905 MHz; σ = 1.536 mho/m; ε_r = 52.302; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3071; ConvF(4.29, 4.29, 4.29); Calibrated: 2013/6/18;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2013/1/28
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1029
- Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.5 (6469)

Configuration/Ch26590/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.534 mW/g

Configuration/Ch26590/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.595 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.546 mW/g
SAR(1 g) = 0.511 mW/g; SAR(10 g) = 0.458 mW/g
Maximum value of SAR (measured) = 0.534 mW/g



0 dB = 0.534 mW/g = -5.45 dB mW/g

13. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Portable Tablet	Note
		Body	
1.	GPRS/EDGE(Data) + WLAN2.4GHz(data)	Yes	2.4GHz Hotspot
2.	WCDMA(Data) + WLAN2.4GHz(data)	Yes	2.4GHz Hotspot
3.	CDMA(Data) + WLAN2.4GHz(data)	Yes	2.4GHz Hotspot
4.	LTE(Data) + WLAN2.4GHz(data)	Yes	2.4GHz Hotspot
5.	GPRS/EDGE(Data) + Bluetooth(data)	Yes	
6.	WCDMA(Data) + Bluetooth(data)	Yes	
7.	CDMA(Data) + Bluetooth(data)	Yes	
8.	LTE(Data) + Bluetooth(data)	Yes	
9.	GPRS/EDGE(data) + WLAN5GHz(data)	No	
10.	WCDMA(data) + WLAN5GHz(data)	No	
11.	CDMA(data) + WLAN5 GHz(data)	No	
12.	LTE(data) + WLAN5GHz(data)	No	

Note:

1. WLAN/Bluetooth module is also integrated into this host, Bluetooth power and WLAN SAR testing data which can be refer to EMC Technologies Pty Ltd SAR Report, FCC ID: EJE-WB0086, Report No.: M130809_FCC_7260HMW_SAR_2.4R.
2. For co-location analysis:
   i) For WWAN SAR testing was performed on bottom face, Edge1 and Edge2, according to KDB 447498 D01v05r01 exclusion thresholds which can be referred to page44.
   ii) The WLAN SAR testing was performed on bottom face, Edge1, Edge 2 and Edge4, which can be referred to EMC Technologies Pty Ltd SAR Report, FCC ID: EJE-WB0086, Report No:M130809_FCC_7260HMW_SAR_2.4R page18.
   iii) For co-location analysis was performed at the same exposure positions, which are bottom face, Edge1 and Edge2, where both WWAN standalone SAR and WLAN standalone SAR was assessed.
3. 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.
4. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r01 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[$\sqrt{f(GHz)}/x$] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.
   iv) Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions.

Intel 7260 HMW		
Bluetooth Max Power	Exposure Position	All Position
6 dBm	Estimated SAR (W/kg)	0.168 W/kg

13.1 Body Exposure Conditions

<WWAN + WLAN 2.4GHz_Antenna A>

	WWAN			WLAN Ant A	**Summed SAR (W/kg)**
Position	Band	Plot No	SAR (W/kg)	SAR (W/kg)	
Bottom Face At 0cm Antenna Swivel 0	GSM850	1	0.004	0.0487	**0.05**
	GSM1900	146	0.019	0.0487	**0.07**
	WCDMA V	9	0.002	0.0487	**0.05**
	WCDMA IV	119	0.017	0.0487	**0.07**
	WCDMA II	128	0.042	0.0487	**0.09**
	CDMA BC0	157	0.009	0.0487	**0.06**
	CDMA BC10	167	0.009	0.0487	**0.06**
	CDMA BC1	137	0.011	0.0487	**0.06**
	LTE Band 17	35	0.005	0.0487	**0.05**
	LTE Band 13	51	0.004	0.0487	**0.05**
	LTE Band 4	63	0.006	0.0487	**0.06**
	LTE Band 25	80	0.021	0.0487	**0.07**
Bottom Face At 0cm Antenna Swivel 90	GSM850	15	0.844	0.0487	**0.89**
	GSM1900	150	0.285	0.0487	**0.33**
	WCDMA V	16	0.514	0.0487	**0.56**
	WCDMA IV	123	0.378	0.0487	**0.43**
	WCDMA II	132	0.331	0.0487	**0.38**
	CDMA BC0	161	0.581	0.0487	**0.63**
	CDMA BC10	166	0.551	0.0487	**0.60**
	CDMA BC1	141	0.382	0.0487	**0.43**
	LTE Band 17	37	0.336	0.0487	**0.39**
	LTE Band 13	53	0.610	0.0487	**0.66**
	LTE Band 4	75	0.671	0.0487	**0.72**
	LTE Band 25	72	0.678	0.0487	**0.73**
Edge1 At 0cm Antenna Swivel 0	GSM850	2	0.215	0.431	**0.65**
	GSM1900	147	0.260	0.431	**0.69**
	WCDMA V	11	0.144	0.431	**0.58**
	WCDMA IV	120	0.208	0.431	**0.64**
	WCDMA II	129	0.268	0.431	**0.70**
	CDMA BC0	158	0.210	0.431	**0.64**
	CDMA BC10	168	0.205	0.431	**0.64**
	CDMA BC1	138	0.341	0.431	**0.77**
	LTE Band 17	43	0.181	0.431	**0.61**
	LTE Band 13	55	0.131	0.431	**0.56**
	LTE Band 4	83	0.258	0.431	**0.69**
	LTE Band 25	82	0.458	0.431	**0.89**

Position	WWAN Band	WWAN Plot No	WWAN SAR (W/kg)	WLAN Ant A SAR (W/kg)	Summed SAR (W/kg)
Edge2 At 0cm Antenna Swivel 0	GSM850	3	0.007	0.162	**0.17**
	GSM1900	148	0.018	0.162	**0.18**
	WCDMA V	12	0.003	0.162	**0.17**
	WCDMA IV	121	0.014	0.162	**0.18**
	WCDMA II	130	0.014	0.162	**0.18**
	CDMA BC0	159	0.011	0.162	**0.17**
	CDMA BC10	169	0.010	0.162	**0.17**
	CDMA BC1	139	0.015	0.162	**0.18**
	LTE Band 17	45	0.006	0.162	**0.17**
	LTE Band 13	57	0.006	0.162	**0.17**
	LTE Band 4	95	0.010	0.162	**0.17**
	LTE Band 25	94	0.013	0.162	**0.18**
Edge 2 At 0cm Antenna Swivel 90	GSM850	117	0.286	0.162	**0.45**
	GSM1900	153	0.264	0.162	**0.43**
	WCDMA V	118	0.178	0.162	**0.34**
	WCDMA IV	126	0.309	0.162	**0.47**
	WCDMA II	135	0.296	0.162	**0.46**
	CDMA BC0	164	0.168	0.162	**0.33**
	CDMA BC10	170	0.162	0.162	**0.32**
	CDMA BC1	145	0.382	0.162	**0.54**
	LTE Band 17	113	0.114	0.162	**0.28**
	LTE Band 13	115	0.167	0.162	**0.33**
	LTE Band 4	97	0.328	0.162	**0.49**
	LTE Band 25	91	0.297	0.162	**0.46**

<WWAN + WLAN 2.4GHz_Antenna B>

	WWAN			WLAN Ant B	Summed SAR (W/kg)
Position	Band	Plot No	SAR (W/kg)	SAR (W/kg)	
Bottom Face At 0cm Antenna Swivel 0	GSM850	1	0.004	0.0271	**0.03**
	GSM1900	146	0.019	0.0271	**0.05**
	WCDMA V	9	0.002	0.0271	**0.03**
	WCDMA IV	119	0.017	0.0271	**0.04**
	WCDMA II	128	0.042	0.0271	**0.07**
	CDMA BC0	157	0.009	0.0271	**0.04**
	CDMA BC10	167	0.009	0.0271	**0.04**
	CDMA BC1	137	0.011	0.0271	**0.04**
	LTE Band 17	35	0.005	0.0271	**0.03**
	LTE Band 13	51	0.004	0.0271	**0.03**
	LTE Band 4	63	0.006	0.0271	**0.03**
	LTE Band 25	80	0.021	0.0271	**0.05**
Bottom Face At 0cm Antenna Swivel 90	GSM850	15	0.844	0.0271	**0.87**
	GSM1900	150	0.285	0.0271	**0.31**
	WCDMA V	16	0.514	0.0271	**0.54**
	WCDMA IV	123	0.378	0.0271	**0.41**
	WCDMA II	132	0.331	0.0271	**0.36**
	CDMA BC0	161	0.581	0.0271	**0.61**
	CDMA BC10	166	0.551	0.0271	**0.58**
	CDMA BC1	141	0.382	0.0271	**0.41**
	LTE Band 17	37	0.336	0.0271	**0.36**
	LTE Band 13	53	0.610	0.0271	**0.64**
	LTE Band 4	75	0.671	0.0271	**0.70**
	LTE Band 25	72	0.678	0.0271	**0.71**
Edge1 At 0cm Antenna Swivel 0	GSM850	2	0.215	0.117	**0.33**
	GSM1900	147	0.260	0.117	**0.38**
	WCDMA V	11	0.144	0.117	**0.26**
	WCDMA IV	120	0.208	0.117	**0.33**
	WCDMA II	129	0.268	0.117	**0.39**
	CDMA BC0	158	0.210	0.117	**0.33**
	CDMA BC10	168	0.205	0.117	**0.32**
	CDMA BC1	138	0.341	0.117	**0.46**
	LTE Band 17	43	0.181	0.117	**0.30**
	LTE Band 13	55	0.131	0.117	**0.25**
	LTE Band 4	83	0.258	0.117	**0.38**
	LTE Band 25	82	0.458	0.117	**0.58**

Position	WWAN			WLAN Ant B	Summed SAR (W/kg)
Position	Band	Plot No	SAR (W/kg)	SAR (W/kg)	
Edge2 At 0cm Antenna Swivel 0	GSM850	3	0.007		**0.01**
	GSM1900	148	0.018		**0.02**
	WCDMA V	12	0.003		**0.00**
	WCDMA IV	121	0.014		**0.01**
	WCDMA II	130	0.014		**0.01**
	CDMA BC0	159	0.011		**0.01**
	CDMA BC10	169	0.010		**0.01**
	CDMA BC1	139	0.015		**0.02**
	LTE Band 17	45	0.006		**0.01**
	LTE Band 13	57	0.006		**0.01**
	LTE Band 4	95	0.010		**0.01**
	LTE Band 25	94	0.013		**0.01**
Edge 2 At 0cm Antenna Swivel 90	GSM850	117	0.286		**0.29**
	GSM1900	153	0.264		**0.26**
	WCDMA V	118	0.178		**0.18**
	WCDMA IV	126	0.309		**0.31**
	WCDMA II	135	0.296		**0.30**
	CDMA BC0	164	0.168		**0.17**
	CDMA BC10	170	0.162		**0.16**
	CDMA BC1	145	0.382		**0.38**
	LTE Band 17	113	0.114		**0.11**
	LTE Band 13	115	0.167		**0.17**
	LTE Band 4	97	0.328		**0.33**
	LTE Band 25	91	0.297		**0.30**

<WWAN + Bluetooth>

	WWAN			Bluetooth	**Summed SAR (W/kg)**
Position	Band	Plot No	SAR (W/kg)	Estimated SAR (W/kg)	
Bottom Face At 0cm Antenna Swivel 0	GSM850	1	0.004	0.168	**0.17**
	GSM1900	146	0.019	0.168	**0.19**
	WCDMA V	9	0.002	0.168	**0.17**
	WCDMA IV	119	0.017	0.168	**0.19**
	WCDMA II	128	0.042	0.168	**0.21**
	CDMA BC0	157	0.009	0.168	**0.18**
	CDMA BC10	167	0.009	0.168	**0.18**
	CDMA BC1	137	0.011	0.168	**0.18**
	LTE Band 17	35	0.005	0.168	**0.17**
	LTE Band 13	51	0.004	0.168	**0.17**
	LTE Band 4	63	0.006	0.168	**0.17**
	LTE Band 25	80	0.021	0.168	**0.19**
Bottom Face At 0cm Antenna Swivel 90	GSM850	15	0.844	0.168	**1.01**
	GSM1900	150	0.285	0.168	**0.45**
	WCDMA V	16	0.514	0.168	**0.68**
	WCDMA IV	123	0.378	0.168	**0.55**
	WCDMA II	132	0.331	0.168	**0.50**
	CDMA BC0	161	0.581	0.168	**0.75**
	CDMA BC10	166	0.551	0.168	**0.72**
	CDMA BC1	141	0.382	0.168	**0.55**
	LTE Band 17	37	0.336	0.168	**0.50**
	LTE Band 13	53	0.610	0.168	**0.78**
	LTE Band 4	75	0.671	0.168	**0.84**
	LTE Band 25	72	0.678	0.168	**0.85**
Edge1 At 0cm Antenna Swivel 0	GSM850	2	0.215	0.168	**0.38**
	GSM1900	147	0.260	0.168	**0.43**
	WCDMA V	11	0.144	0.168	**0.31**
	WCDMA IV	120	0.208	0.168	**0.38**
	WCDMA II	129	0.268	0.168	**0.44**
	CDMA BC0	158	0.210	0.168	**0.38**
	CDMA BC10	168	0.205	0.168	**0.37**
	CDMA BC1	138	0.341	0.168	**0.51**
	LTE Band 17	43	0.181	0.168	**0.35**
	LTE Band 13	55	0.131	0.168	**0.30**
	LTE Band 4	83	0.258	0.168	**0.43**
	LTE Band 25	82	0.458	0.168	**0.63**

	WWAN			Bluetooth	**Summed SAR (W/kg)**
Position	Band	Plot No	SAR (W/kg)	Estimated SAR (W/kg)	
Edge2 At 0cm Antenna Swivel 0	GSM850	3	0.007	0.168	**0.18**
	GSM1900	148	0.018	0.168	**0.19**
	WCDMA V	12	0.003	0.168	**0.17**
	WCDMA IV	121	0.014	0.168	**0.18**
	WCDMA II	130	0.014	0.168	**0.18**
	CDMA BC0	159	0.011	0.168	**0.18**
	CDMA BC10	169	0.010	0.168	**0.18**
	CDMA BC1	139	0.015	0.168	**0.18**
	LTE Band 17	45	0.006	0.168	**0.17**
	LTE Band 13	57	0.006	0.168	**0.17**
	LTE Band 4	95	0.010	0.168	**0.18**
	LTE Band 25	94	0.013	0.168	**0.18**
Edge 2 At 0cm Antenna Swivel 90	GSM850	117	0.286	0.168	**0.45**
	GSM1900	153	0.264	0.168	**0.43**
	WCDMA V	118	0.178	0.168	**0.35**
	WCDMA IV	126	0.309	0.168	**0.48**
	WCDMA II	135	0.296	0.168	**0.46**
	CDMA BC0	164	0.168	0.168	**0.34**
	CDMA BC10	170	0.162	0.168	**0.33**
	CDMA BC1	145	0.382	0.168	**0.55**
	LTE Band 17	113	0.114	0.168	**0.28**
	LTE Band 13	115	0.167	0.168	**0.34**
	LTE Band 4	97	0.328	0.168	**0.50**
	LTE Band 25	91	0.297	0.168	**0.47**

Test Engineer： Jack Wu, Ted Sun, Frank Wu, and Nick Yu

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)]	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

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

(b) κ is the coverage factor

Table 14.1. Standard Uncertainty for Assumed Distribution

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

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

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

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

15. References

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

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

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

[4] SPEAG DASY System Handbook

[5] FCC KDB 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 D05 v02r02, “SAR Evaluation Considerations for LTE Devices”, May 2013

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

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

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

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