Full

SAR TEST REPORT

No. ECIT-2013-0076-FCC-SAR

For

Client :	**Micron Electronics LLC**
Production :	**3G GPS tracker**
Model Name :	**VL3000**
Hardware Version:	**VL3000_V1.02**
Software Version:	**VL3000B01V03**
Issued date:	**2013-8-13**
FCC ID:	**ZKQ-0508201300001**

Note:

Test Laboratory:

ECIT Shanghai, East China Institute of Telecommunications

Add: 7F, G Area, No.668, Beijing East Road, Huangpu District, Shanghai, P. R. China

Tel: (+86)-021-63843300, E-Mail: welcome@ecit.org.cn

Revision Version

Report Number	Revision	Date	Memo
I13GW6847-FCC-SAR	00	2013/8/13	Initial creation of test report

CONTENTS

1 Test Laboratory

1.1 Testing Location

Company Name:	ECIT Shanghai, East China Institute of Telecommunications
Address:	7F, G Area,No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China
Postal Code:	200001
Telephone:	00862163843300
Fax:	00862163843301

1.2 Testing Environment

Normal Temperature:	15-35℃
Relative Humidity:	20-75%
Ambient noise & Reflection:	< 0.012 W/kg

1.3 Project Data

Project Leader:	Liu Jianquan
Testing Start Date:	Aug 9, 2013
Testing End Date:	Aug 10, 2013

1.4 Signature

Gong Yujuan
(Testing engineer)

Yu Naiping
(Reviewed this test report)

Zheng Zhongbin
Director of the laboratory
(Approved this test report)

2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for VL3000 are as follows (with expanded uncertainty 22.4%)

Table 2.1: Max. Reported SAR (1g)

Band	Position	Reported SAR 1g (W/Kg)
GSM 850	Body	0.648
GSM 1900	Body	0.325
WCDMA 850	Body	1.176
WCDMA 1900	Body	0.781

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1g tissue according to the ANSI C95.1-1992.

For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

The measurement together with the test system set-up is described in chapter 7 of this test report. A detailed description of the equipment under test can be found in chapter 3 of this test report. The maximum reported SAR value is obtained at the case of **(Table 2.1),** and the values are**: 1.176W/kg (1g).**

3 Client Information

3.1 Applicant Information

Company Name:	Micron Electronics LLC
Address /Post:	601 N. Congress Ave, Suite 439 Florida, USA
City:	Florida
Country:	USA
Telephone:	561-450-5022
Contact:	Michael Xu

3.2 Manufacturer Information

Company Name:	Shanghai SIMCOM LTD.,
Address /Post:	Building A, SIM Technology Building,No.633 Jinzhong Road, Changning District, Shanghai, China
City:	Shanghai
Country:	China
Telephone:	+86 21 32523134
Contact:	Yongsheng.li

4 Equipment Under Test (EUT) and Ancillary Equipment (AE)

4.1 About EUT

Description:	3G GPS tracker
Model name:	VL3000
Operation Model(s):	GSM835/1900,WCDMA1900/850
Tx Frequency:	824.2-848.8, 1850.2-1909.8MHz （GSM） 1852.4-1907.6 MHz, 826.4-846.6MHz (WCDMA)
Test device Production information:	Production unit
GPRS Class Mode:	B
GPRS Multislot Class:	12
Device type:	Portable device
Antenna type:	Inner antenna
Form factor:	7.5cm×4.2cm
FCC ID:	ZKQ-0508201300001

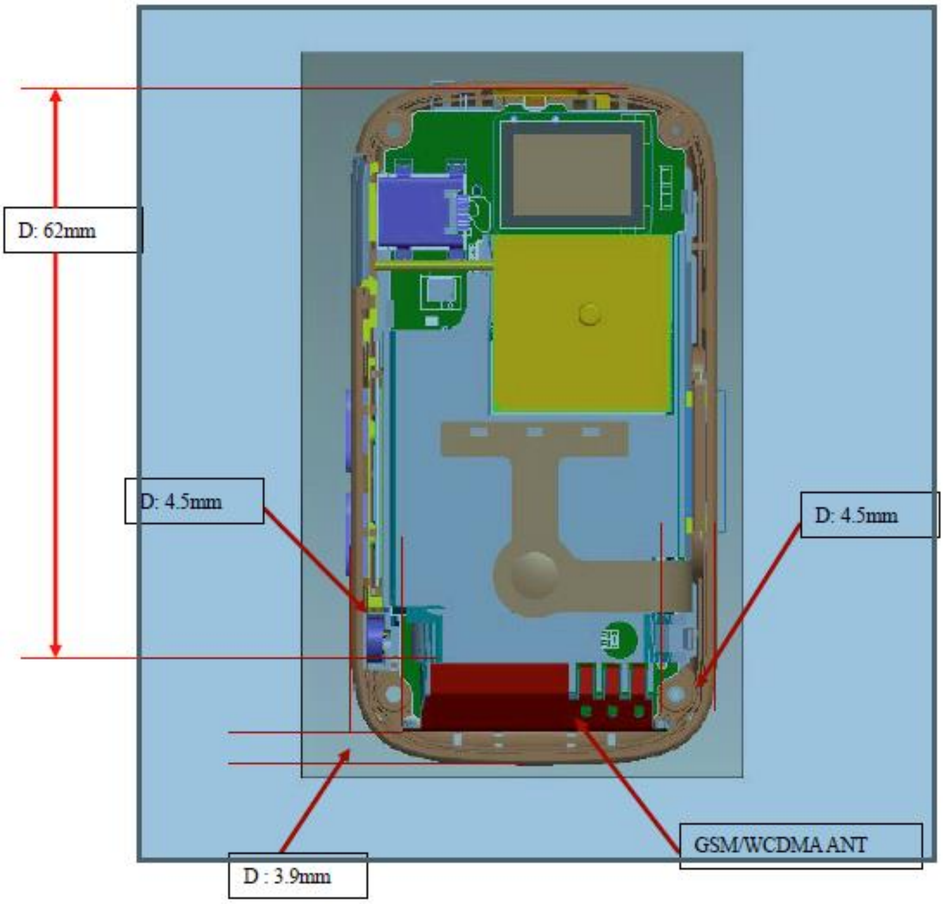


Figure:Antenna Location

4.2 Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version:
N13	IMEI:012813000559056	VL3000_V1.02	VL3000B01V03

*EUT ID: is used to identify the test sample in the lab internally.

4.3 Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
AE1	Battery	N/A	N/A	N/A
AE2	Headset	N/A	N/A	N/A

*AE ID: is used to identify the test sample in the lab internally.

5 TEST METHODOLOGY

5.1 Applicable Limit Regulations

ANSI C95.1–1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

5.2 Applicable Measurement Standards

IC RSS-102 ISSUE4: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

IEEE 1528–2003: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.

OET Bulletin 65 (Edition 97-01) and Supplement C(Edition 01-01): Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits.

KDB941225 D02 HSPA and 1x Advanced v02r02: SAR Guidance for HSPA, HSPA+, DC-HSDPA and 1x-Advanced

KDB447498 D01 General RF Exposure Guidance v05: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01: SAR Measurement Requirements for 100 MHz to 6 GHz

KDB941225 D01 SAR test for 3G devides v02: Recommended SAR Test Reduction Procedures for GSM/GPRS/EDGE.

KDB941225 D03 SAR test Redution GSM GPRS EDGE v01: Recommended SAR Test Reduction Procedures for GSM/GPRS/EDGE.

6 Specific Absorption Rate (SAR)

6.1 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.

6.2 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:

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

SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be either related to the temperature elevation in tissue by

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

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

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

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

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

7 Tissue Simulating Liquids

7.1 Targets for tissue simulating liquid

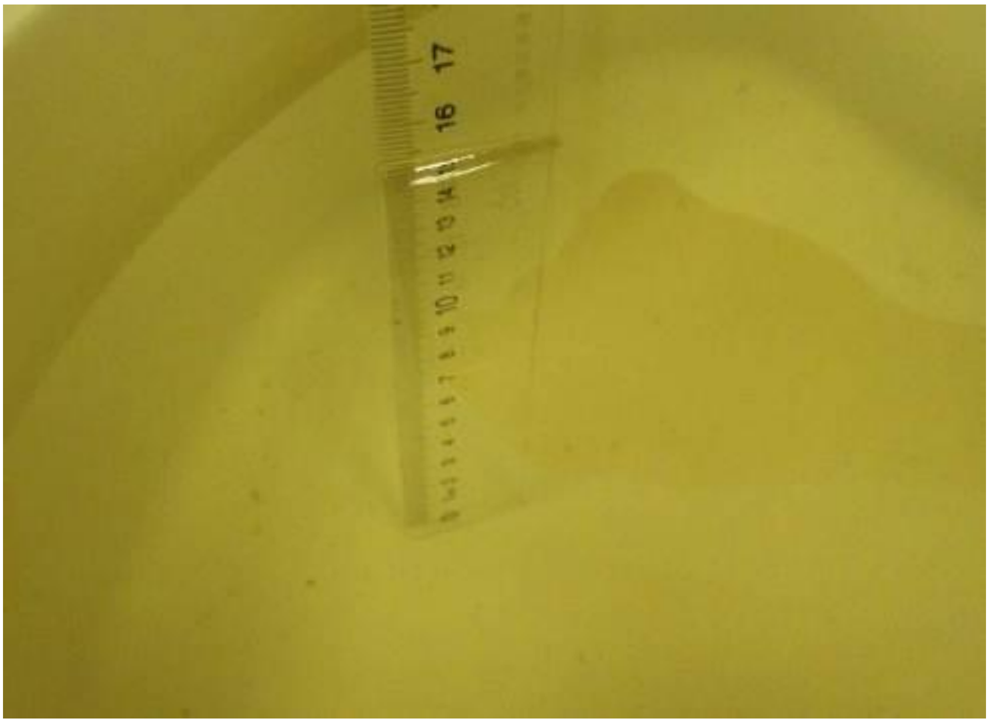
Table 7.1: Targets for tissue simulating liquid

Frequency (MHz)	Liquid Type	Conductivity (σ)	± 5% Range	Permittivity (ε)	± 5% Range
835	Body	0.97	0.92～1.02	55.2	52.4～58.0
1900	Body	1.52	1.44～1.60	53.3	50.6～56.0

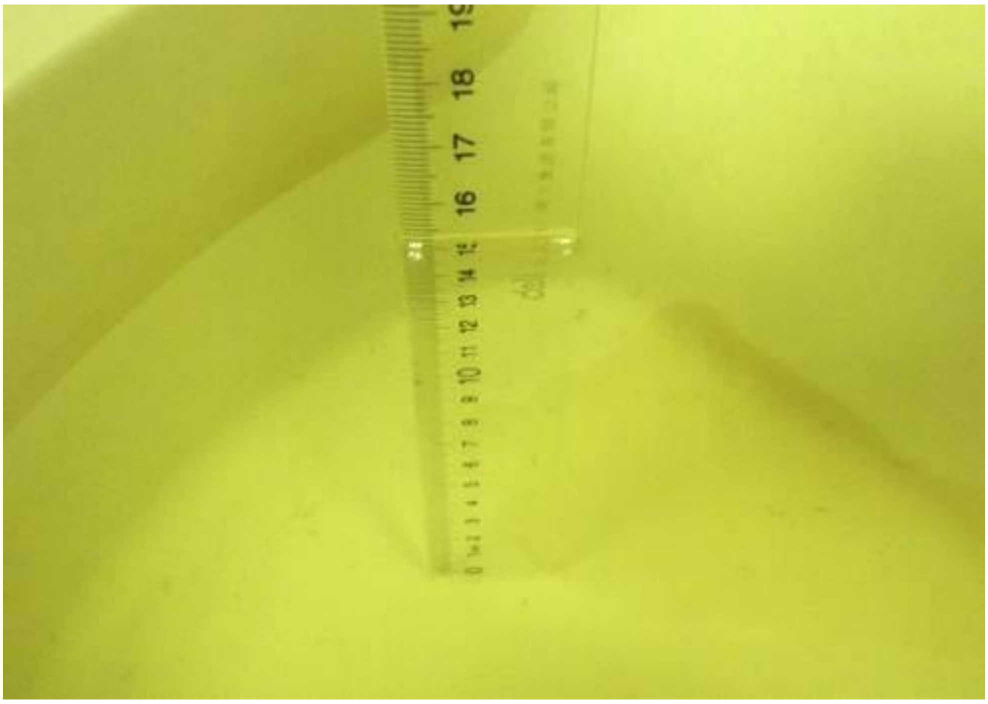
7.2 Dielectric Performance

Table 7.2: Dielectric Performance of Tissue Simulating Liquid

Measurement Date : 835 MHz Body **Aug 9, 2013** 1900 MHz Body **Aug 10, 2013**						
/	**Type**	**Frequency**	**Permittivity ε**	**Drift (%)**	**Conductivity σ (S/m)**	**Drift (%)**
Measurement value	Body	835 MHz	55.15	0.09%	0.9989	2.97%
	Body	1900 MHz	53.24	0.11%	1.524	0.26%



Picture 7-1: Liquid depth in the Flat Phantom (835 MHz Body)

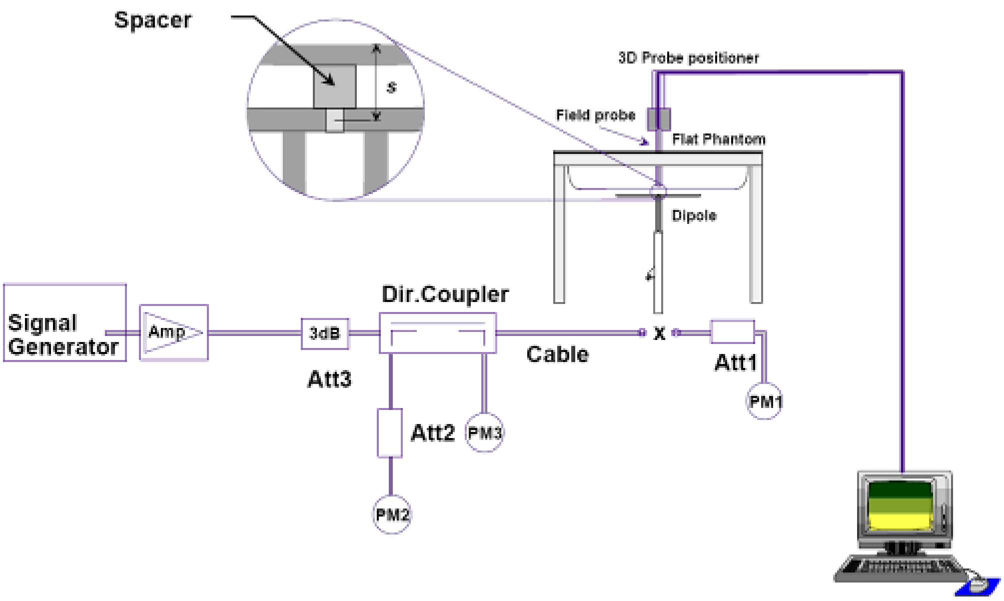


Picture 7-2: Liquid depth in the Flat Phantom (1900 MHz Body)

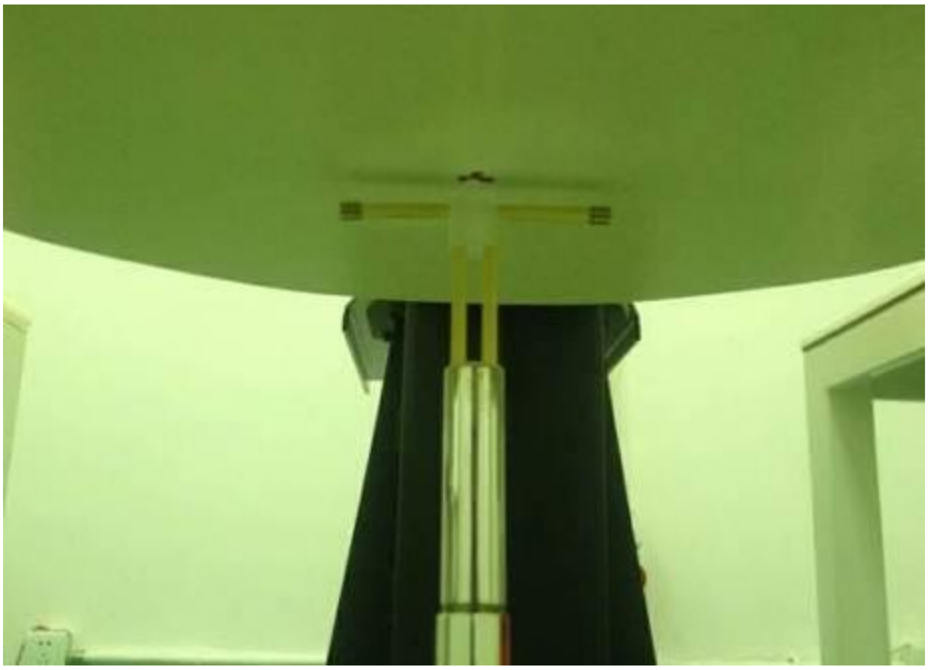
8 System verification

8.1 System Setup

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



Picture 8.1 System Setup for System Evaluation



Picture 8.2 Photo of Dipole Setup

8.2 System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

Table 8.1: System Verification of Body

Measurement Date : 835 MHz Body **Aug 9, 2013** 1900 MHz Body **Aug 10, 2013**							
Input power level: 250mW							
Verification results	**Frequency**	**Target value (W/kg)**		**Measured value (W/kg)**		**Deviation**	
		10 g Average	**1 g Average**	**10 g Average**	**1 g Average**	**10 g Average**	**1 g Average**
	835 MHz	6.29	9.50	6.60	10.12	4.93%	6.53%
	1900 MHz	21.2	40.3	21.88	41.6	3.20%	3.22%

9 Measurement Procedures

9.1 Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in Picture 11.1.

Step 1: The tests described in 11.2 shall be performed at the channel that is closest to the centre of the transmit frequency band (f_c) for:

a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in Chapter 8),

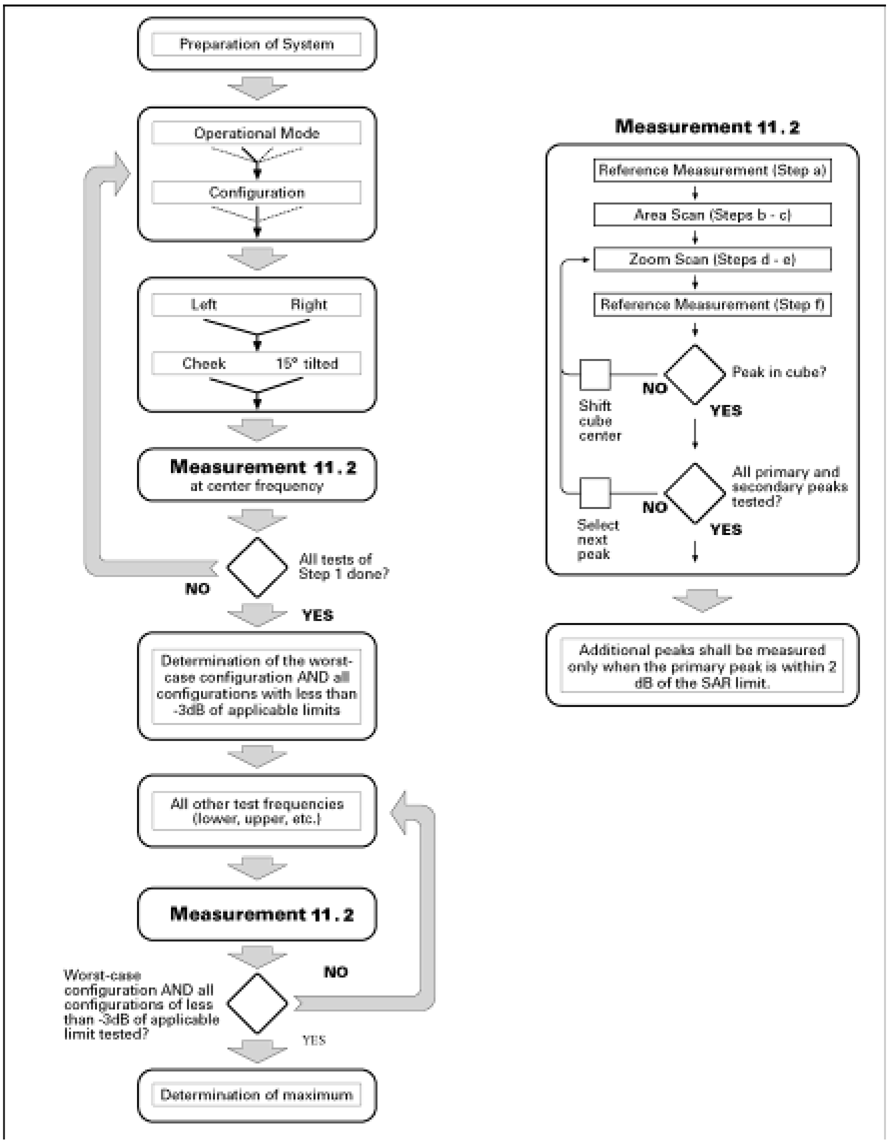
b) all configurations for each device position in a), e.g., antenna extended and retracted, and

c) all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

If more than three frequencies need to be tested according to 11.1 (i.e., N_c > 3), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

Step 2: For the condition providing highest peak spatial-average SAR determined in Step 1, perform all tests described in 11.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

Step 3: Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.



Picture 9.1 Block diagram of the tests to be performed

9.2 General Measurement Procedure

The following procedure shall be performed for each of the test conditions (see Picture 11.1) described in 11.1:

a) Measure the local SAR at a test point within 8 mm or less in the normal direction from the inner surface of the phantom.

b) Measure the two-dimensional SAR distribution within the phantom (area scan procedure). The boundary of the measurement area shall not be closer than 20 mm from the phantom side walls. The distance between the measurement points should enable the detection of the location of local maximum with an accuracy of better than half the linear dimension of the tissue cube after interpolation. A maximum grip spacing of 20 mm for frequencies below 3 GHz and (60/f [GHz]) mm for frequencies of 3GHz and greater is recommended. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz and δ In(2)/2 mm for frequencies of 3 GHz and greater, where δ is the plane wave skin depth and In(x) is the natural logarithm. The maximum variation of the sensor-phantom surface shall be ±1 mm for frequencies below 3 GHz and ±0.5 mm for frequencies of 3 GHz and greater. At all measurement points the angle of the probe with respect to the line normal to the surface should be less than 5°. If this cannot be achieved for a measurement distance to the phantom inner surface shorter than the probe diameter, additional uncertainty evaluation is needed.

c) From the scanned SAR distribution, identify the position of the maximum SAR value, in addition identify the positions of any local maxima with SAR values within 2 dB of the maximum value that are not within the zoom-scan volume; additional peaks shall be measured only when the primary peak is within 2 dB of the SAR limit. This is consistent with the 2 dB threshold already stated;

d) Measure the three-dimensional SAR distribution at the local maxima locations identified in step c). The horizontal grid step shall be (24/f[GHz]) mm or less but not more than 8 mm. The minimum zoom size of 30 mm by 30 mm and 30 mm for frequencies below 3 GHz. For higher frequencies, the minimum zoom size of 22 mm by 22 mm and 22 mm. The grip step in the vertical direction shall be (8-f[GHz]) mm or less but not more than 5 mm, if uniform spacing is used. If variable spacing is used in the vertical direction, the maximum spacing between the two closest measured points to the phantom shell shall be (12 / f[GHz]) mm or less but not more than 4 mm, and the spacing between father points shall increase by an incremental factor not exceeding 1.5. When variable spacing is used, extrapolation routines shall be tested with the same spacing as used in measurements. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz and δ In(2)/2 mm for frequencies of 3 GHz and greater, where δ is the plane wave skin depth and In(x) is the natural logarithm. Separate grids shall be centered on each of the local SAR maxima found in step c). Uncertainties due to field distortion between the media boundary and the dielectric enclosure of the probe should also be minimized, which is achieved is the distance between the phantom surface and physical tip of the probe is larger than probe tip diameter. Other methods may utilize correction procedures for these boundary effects that enable high precision measurements closer than half the probe diameter. For all measurement points, the angle of the probe with respect to the flat phantom surface shall be less than 5°. If this cannot be achieved an additional uncertainty evaluation is needed.

e) Use post processing(e.g. interpolation and extrapolation) procedures to determine the local SAR values at the spatial resolution needed for mass averaging.

9.3 WCDMA Measurement Procedures for SAR

The following procedures are applicable to WCDMA handsets operating under 3GPP Release99, Release 5 and Release 6. The default test configuration is to measure SAR with an established radio link between the DUT and a communication test set using a 12.2kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH & $DPDCH_n$), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Both uplink and downlink should be configured with the same RMC or AMR, when required. SAR for Release 5 HSDPA and Release 6 HSPA are measured using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified according to applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. When Maximum Power Reduction (MPR) is not implemented according to Cubic Metric (CM) requirements for Release 6 HSPA, the following procedures do not apply.

For Release 5 HSDPA Data Devices:

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}	CM/dB
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15	15/15	64	12/15	24/25	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

For Release 6 HSDPA Data Devices

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (dB)	MPR (dB)	AG Index	E-TFCI
1	11/15	15/15	64	11/15	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	4/15	56/75	4	1	3.0	2.0	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	1.0	0.0	21	81

9.4 Bluetooth & Wi-Fi Measurement Procedures for SAR

Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each

SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

9.5 Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Table 14.2 to Table 14.11 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

10 Conducted Output Power

10.1 Manufacturing tolerance

Table 10.1: GSM Speech

GSM 835			
Channel	Channel 251	Channel 190	Channel 128
Target (dBm)	32.0	32.0	32.0
Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900			
Channel	Channel 810	Channel 661	Channel 512
Target (dBm)	29.0	29.0	29.0
Tolerance ±(dB)	1.0	1.0	1.0

Table 10.2: GPRS (GMSK Modulation)

GSM 850 GPRS				
Channel		**251**	**190**	**128**
1 Txslots	Target (dBm)	32.0	32.0	32.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslots	Target (dBm)	31.0	31.0	31.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslots	Target (dBm)	30.0	30.0	30.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslots	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 GPRS				
Channel		**810**	**661**	**512**
1 Txslots	Target (dBm)	30.0	30.0	30.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslots	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslots	Target (dBm)	27.0	27.0	27.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslots	Target (dBm)	25.0	25.0	25.0
	Tolerance ±(dB)	1.0	1.0	1.0

Table 10.3: E-GPRS (GMSK Modulation)

GSM 850 E-GPRS				
Channel		**251**	**190**	**128**
1 Txslots	Target (dBm)	32.0	32.0	32.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslots	Target (dBm)	30.0	30.0	30.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslots	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslots	Target (dBm)	27.0	27.0	27.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 E-GPRS				
Channel		**810**	**661**	**512**
1 Txslots	Target (dBm)	30.0	30.0	30.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslots	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslots	Target (dBm)	26.0	26.0	26.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslots	Target (dBm)	25.0	25.0	25.0
	Tolerance ±(dB)	1.0	1.0	1.0

Table 10.4: E-GPRS (8PSK Modulation)

GSM 850 E-GPRS				
Channel		**251**	**190**	**128**
1 Txslots	Target (dBm)	26.0	26.0	26.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslots	Target (dBm)	25.0	25.0	25.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslots	Target (dBm)	23.0	23.0	23.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslots	Target (dBm)	22.0	22.0	22.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 E-GPRS				
Channel		**810**	**661**	**512**
1 Txslots	Target (dBm)	26.0	26.0	26.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslots	Target (dBm)	25.0	25.0	25.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslots	Target (dBm)	24.0	24.0	24.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslots	Target (dBm)	23.0	23.0	23.0
	Tolerance ±(dB)	1.0	1.0	1.0

Table 10.5: WCDMA

WCDMA 850 CS			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	22.5	22.5	22.5
Tolerance ±(dB)	1.0	1.0	1.0
WCDMA 1900 CS			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	22.0	22.0	22.0
Tolerance ±(dB)	1.0	1.0	1.0

Table 10.6: HSDPA

WCDMA 850				
Channel		4132	4182	4233
1	Target (dBm)	21.5	21.5	21.5
	Tolerance ±(dB)	1.0	1.0	1.0
2	Target (dBm)	22.0	22.0	22.0
	Tolerance ±(dB)	1.0	1.0	1.0
3	Target (dBm)	20.5	20.5	20.5
	Tolerance ±(dB)	1.0	1.0	1.0
4	Target (dBm)	21.0	21.0	21.0
	Tolerance ±(dB)	1.0	1.0	1.0
WCDMA 1900				
Channel		9262	9400	9538
1	Target (dBm)	21.0	21.0	21.0
	Tolerance ±(dB)	1.0	1.0	1.0
2	Target (dBm)	21.0	21.0	21.0
	Tolerance ±(dB)	1.0	1.0	1.0
3	Target (dBm)	21.0	21.0	21.0
	Tolerance ±(dB)	1.0	1.0	1.0
4	Target (dBm)	21.0	21.0	21.0
	Tolerance ±(dB)	1.0	1.0	1.0

10.2 GSM Measurement result

During the process of testing, the EUT was controlled via Agilent Digital Radio Communication tester (E5515C) to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

Table 11.1: The conducted power measurement results for GSM850/1900

GSM 835MHZ	Conducted Power (dBm)		
	Channel 251(848.8MHz)	Channel 190(836.6MHz)	Channel 128(824.2MHz)
	32.6	**32.5**	**32.6**
GSM 1900MHZ	Conducted Power (dBm)		
	Channel 810(1909.8MHz)	Channel 661(1880MHz)	Channel 512(1850.2MHz)
	29.8	**29.9**	**29.8**

Table 11.2: The conducted power measurement results for GPRS and EGPRS

GSM 850 GPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	251	**190**	**128**		**251**	**190**	**128**
1 Txslot	32.61	32.40	32.60	-9.03dB	23.58	23.37	23.57
2 Txslots	31.38	31.77	31.27	-6.02dB	25.36	25.76	25.25
3Txslots	29.97	30.19	29.94	-4.26dB	25.71	25.93	25.68
4 Txslots	28.89	28.92	28.82	-3.01dB	**25.88**	**25.91**	**25.81**
GSM 850 E-GPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	251	**190**	**128**		**251**	**190**	**128**
1 Txslot	32.62	32.34	32.65	-9.03dB	23.59	23.31	23.62
2 Txslots	30.12	30.03	30.06	-6.02dB	24.00	24.01	24.04
3Txslots	28.56	28.42	28.37	-4.26dB	24.30	24.16	24.11
4 Txslots	27.45	27.42	27.44	-3.01dB	**24.43**	**24.41**	**24.43**
PCS1900 GPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	810	**661**	**512**		**810**	**661**	**512**
1 Txslot	30.10	30.20	30.10	-9.03dB	21.07	21.17	21.07
2 Txslots	28.62	28.67	28.53	-6.02dB	22.60	22.65	22.51
3Txslots	26.95	26.99	26.88	-4.26dB	22.69	22.73	22.62
4 Txslots	25.97	25.99	25.93	-3.01dB	**22.96**	**22.98**	**22.92**
PCS1900 E-GPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	810	**661**	**512**		**810**	**661**	**512**
1 Txslot	30.00	30.10	30.00	-9.03dB	20.97	21.07	20.97
2 Txslots	28.44	28.46	28.33	-6.02dB	22.58	22.44	22.31
3Txslots	26.64	26.66	26.69	-4.26dB	22.37	22.40	22.33
4 Txslots	25.88	25.95	25.79	-3.01dB	**22.87**	**22.94**	**22.78**

NOTES:

1) Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

According to the conducted power as above, the body measurements are performed with 4Txslots for GSM850 and GSM1900.

10.3 WCDMA Measurement result

Table 11.3: The conducted power for WCDMA850/1900

Item	band	FDDV result(dBm)		
Item	ARFCN	4233 (846.6MHz)	4182 (836.4MHz)	4132 (826.4MHz)
WCDMA	RMC	23.21	22.66	23.06
HSDPA	1	22.37	22.29	22.40
	2	22.88	21.91	21.92
	3	20.67	20.60	20.71
	4	21.16	21.10	21.12
Item	band	FDDII result(dBm)		
Item	ARFCN	9538 (1907.6MHz)	9400 (1880MHz)	9262 (1852.4MHz)
WCDMA	RMC	21.71	22.56	23.00
HSDPA	1	21.48	21.22	21.01
	2	21.41	21.22	21.14
	3	21.50	21.19	21.02
	4	21.47	21.26	21.17

Note: HSDPA body SAR are not required, because maximum average output power of each RF channel with HSDPA active is not 1/4 dB higher than that measured without HSDPA and the maximum SAR for WCDMA850 and WCDMA1900 are not above 75% of the SAR limit.

11 SAR Test Result

Table 11.1: Duty Cycle

	Duty Cycle
GPRS for GSM835/1900	1:2
WCDMA850/1900	1:1

Table 11.2: SAR Values (GSM 835 MHz Band - Body)

Frequency		Mode (number of timeslots)	Test Position	Maximum allowed Power (dBm)	Measured average power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
836.6	190	GPRS (4)	Phantom	29.0	28.92	1.019	0.636	0.648	-0.09
836.6	190	GPRS (4)	Ground	29.0	28.92	1.019	0.396	0.403	0.06
836.6	190	GPRS (4)	Left	29.0	28.92	1.019	0.295	0.300	0.10
836.6	190	GPRS (4)	Right	29.0	28.92	1.019	0.214	0.218	-0.13
836.6	190	GPRS (4)	Bottom	29.0	28.92	1.019	0.160	0.163	0.18
836.6	190	GPRS (4)	Top	29.0	28.92	1.019	0.048	0.049	0.13
848.8	251	GPRS (4)	Phantom	29.0	28.89	1.026	0.497	0.510	0.06
824.2	128	GPRS (4)	Phantom	29.0	28.82	1.042	0.497	0.518	-0.12
836.6	190	E-GPRS (4)	Phantom	28.0	27.42	1.143	0.306	0.350	0.03

Note:

1. The distance between the EUT and the phantom bottom is 0mm.

Table 11.3: SAR Values (GSM 1900 MHz Band - Body)

Frequency		Mode (number of timeslots)	Test Position	Maximum allowed Power (dBm)	Measured average power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
1880	661	GPRS (4)	Phantom	26.0	25.99	1.002	0.296	0.296	0.06
1880	661	GPRS (4)	Ground	26.0	25.99	1.002	0.237	0.238	0.17
1880	661	GPRS (4)	Left	26.0	25.99	1.002	0.134	0.134	0.18
1880	661	GPRS (4)	Right	26.0	25.99	1.002	0.088	0.088	-0.15
1880	661	GPRS (4)	Bottom	26.0	25.99	1.002	0.246	0.246	0.16
1880	661	GPRS (4)	Top	26.0	25.99	1.002	0.012	0.012	0.18
1909.8	810	GPRS (4)	Phantom	26.0	25.97	1.007	0.323	0.325	0.15
1850.2	512	GPRS (4)	Phantom	26.0	25.93	1.016	0.296	0.300	-0.14
1909.8	810	E-GPRS (4)	Phantom	26.0	25.88	1.028	0.264	0.271	0.02

Note:The distance between the EUT and the phantom bottom is 0mm.

Table 11.4: SAR Values (WCDMA 850 MHz Band - Body)

Frequency		Test Position	Maximum allowed Power (dBm)	Measured average power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.							
836.4	4182	Phantom	23.5	22.66	1.213	0.947	1.15	0.01
836.4	4182	Ground	23.5	22.66	1.213	0.490	0.594	-0.15
836.4	4182	Left	23.5	22.66	1.213	0.461	0.559	-0.07
836.4	4182	Right	23.5	22.66	1.213	0.448	0.543	-0.10
836.4	4182	Bottom	23.5	22.66	1.213	0.293	0.356	0.11
836.4	4182	Top	23.5	22.66	1.213	0.077	0.093	0.11
846.6	4233	Phantom	23.5	23.21	1.069	1.1	1.176	0.11
826.4	4132	Phantom	23.5	23.06	1.107	0.967	1.070	0.19

Note1: The distance between the EUT and the phantom bottom is 0mm.

Table 11.5: SAR Values (WCDMA 1900 MHz Band - Body)

Frequency		Test Position	Maximum allowed Power (dBm)	Measured average power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.							
1880	9400	Phantom	23.0	22.56	1.107	0.706	0.781	0.06
1880	9400	Ground	23.0	22.56	1.107	0.612	0.677	0.17
1880	9400	Left	23.0	22.56	1.107	0.227	0.251	0.13
1880	9400	Right	23.0	22.56	1.107	0.216	0.239	0.13
1880	9400	Bottom	23.0	22.56	1.107	0.460	0.509	-0.17
1880	9400	Top	23.0	22.56	1.107	0.00935	0.010	0.15
1907.6	9538	Phantom	23.0	21.71	1.247	0.445	0.598	-0.18
1852.4	9262	Phantom	23.0	23.00	1.000	0.660	0.660	0.11

Note1: The distance between the EUT and the phantom bottom is 0mm.

12 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Table 12.1: SAR Measurement Variability for Head Value (1g)

Frequency		Side	Test Position	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio
MHz	Ch.					
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 12.2: SAR Measurement Variability for Body Value (1g)

Frequency		Mode(number of timeslots)	Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio
MHz	Ch.						
846.6	4233	Band V	Phantom	0	1.1	1.11	1.01
836.4	4182	Band V	Phantom	0	0.947	0.925	1.02
826.4	4132	Band V	Ground	0	0.967	0.958	1.01

13 Measurement Uncertainty

Error Description	Unc. value, ±%	Prob. Dist.	Div.	c_i 1g	c_i 10g	Std.Unc. ±%,1g	Std.Unc. ±%,10g	V_i v_{eff}
Measurement System								
Probe Calibration	6.0	N	1	1	1	6.0	6.0	∞
Axial Isotropy	0.5	R	$\sqrt{3}$	0.7	0.7	0.2	0.2	∞
Hemispherical Isotropy	2.6	R	$\sqrt{3}$	0.7	0.7	1.1	1.1	∞
Boundary Effects	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
Linearity	0.6	R	$\sqrt{3}$	1	1	0.3	0.3	∞
System Detection Limits	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Readout Electronics	0.7	N	1	1	1	0.7	0.7	∞
Response Time	0	R	$\sqrt{3}$	1	1	0	0	∞
Integration Time	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
RF Ambient Noise	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
RF Ambient Reflections	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
Probe Positioner	1.5	R	$\sqrt{3}$	1	1	0.9	0.9	∞
Probe Positioning	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
Max. SAR Eval.	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test Sample Related								
Device Positioning	2.9	N	1	1	1	2.9	2.9	145
Device Holder	3.6	N	1	1	1	3.6	3.6	5
Diople								
Power Drift	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Dipole Positioning	2.0	N	1	1	1	2.0	2.0	∞
Dipole Input Power	5.0	N	1	1	1	5.0	5.0	∞
Phantom and Setup								
Phantom Uncertainty	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (meas.)	2.5	N	1	0.64	0.43	1.6	1.1	∞
Liquid Permittivity (target)	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞

Liquid Permittivity (meas.)	2.5	N	1	0.6	0.49	1.5	1.2	∞
Combined Std Uncertainty						±11.2%	±10.9%	387
Expanded Std Uncertainty						**±22.4%**	**±21.8%**	

14 Main Test Instrument

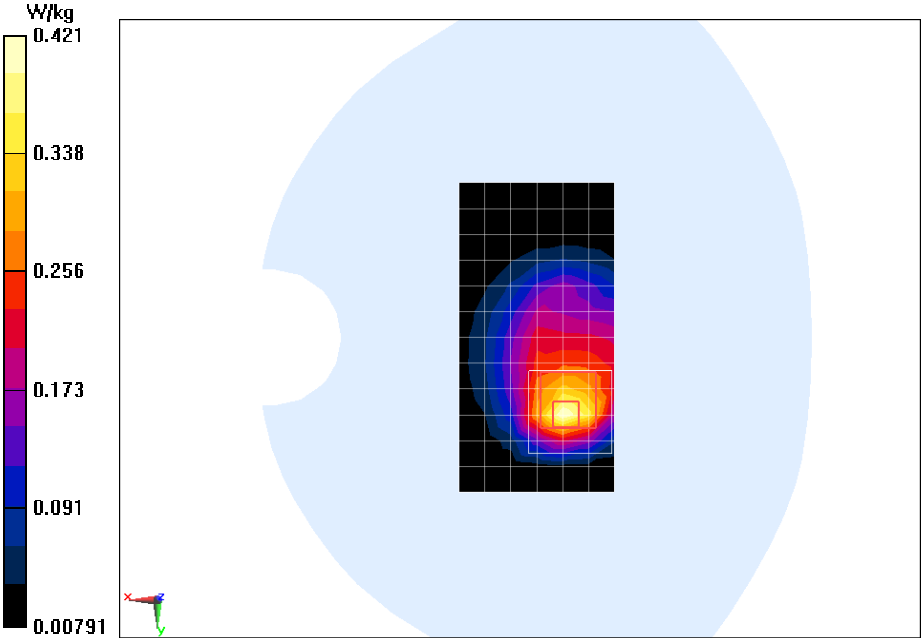
Table 14.1: List of Main Instruments

<table>
<tr><th>No.</th><th>Name</th><th>Type</th><th>Serial Number</th><th>Calibration Date</th><th>Valid Period</th></tr>
<tr><td>01</td><td>Network analyzer</td><td>N5242A</td><td>MY51221755</td><td>Aug 07, 2013</td><td>One year</td></tr>
<tr><td>02</td><td>Power meter</td><td>NRVD</td><td>102257</td><td rowspan="2">Aug 20, 2013</td><td rowspan="2">One year</td></tr>
<tr><td>03</td><td>Power sensor</td><td>NRV-Z5</td><td>100644,100241</td></tr>
<tr><td>04</td><td>Signal Generator</td><td>E4438C</td><td>MY49072044</td><td>Aug 07, 2013</td><td>One Year</td></tr>
<tr><td>05</td><td>Amplifier</td><td>NTWPA-0086010F</td><td>12023024</td><td colspan="2">No Calibration Requested</td></tr>
<tr><td>06</td><td>Coupler</td><td>778D</td><td>MY48220551</td><td>Aug 06, 2013</td><td>One year</td></tr>
<tr><td>07</td><td>BTS</td><td>E5515C</td><td>MY50266468</td><td>Aug 04, 2013</td><td>One year</td></tr>
<tr><td>09</td><td>E-field Probe</td><td>EX3DV3</td><td>3252</td><td>Aug 5, 2013</td><td>One year</td></tr>
<tr><td>10</td><td>DAE</td><td>SPEAG DAE4</td><td>1244</td><td>Jul 9, 2013</td><td>One year</td></tr>
<tr><td>11</td><td>Dipole Validation Kit</td><td>SPEAG D835V2</td><td>4d092</td><td>Jun 13, 2013</td><td>One year</td></tr>
<tr><td>12</td><td>Dipole Validation Kit</td><td>SPEAG D1900V2</td><td>5d134</td><td>Jul 12, 2013</td><td>One year</td></tr>
</table>

ANNEX A GRAPH RESULTS

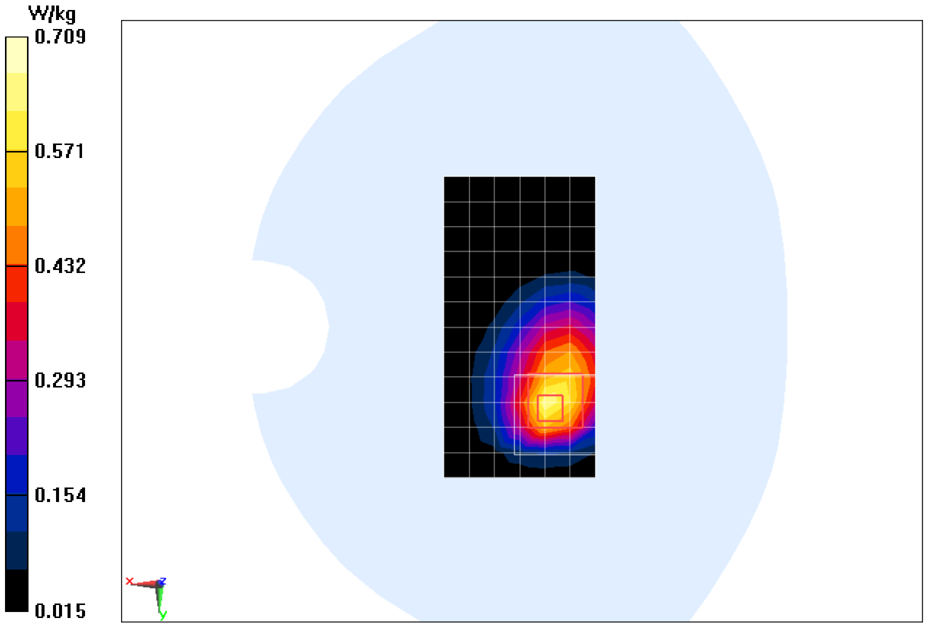
GSM 835MHz GPRS 4TS Body Toward Ground Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε_r = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 835MHz GPRS 4TS; Frequency: 836.6 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Toward Ground GPRS 4TS 850MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.424 W/kg
Middle Toward Ground GPRS 4TS 850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.030 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.817 W/kg
SAR(1 g) = 0.396 W/kg; SAR(10 g) = 0.228 W/kg
Maximum value of SAR (measured) = 0.421 W/kg



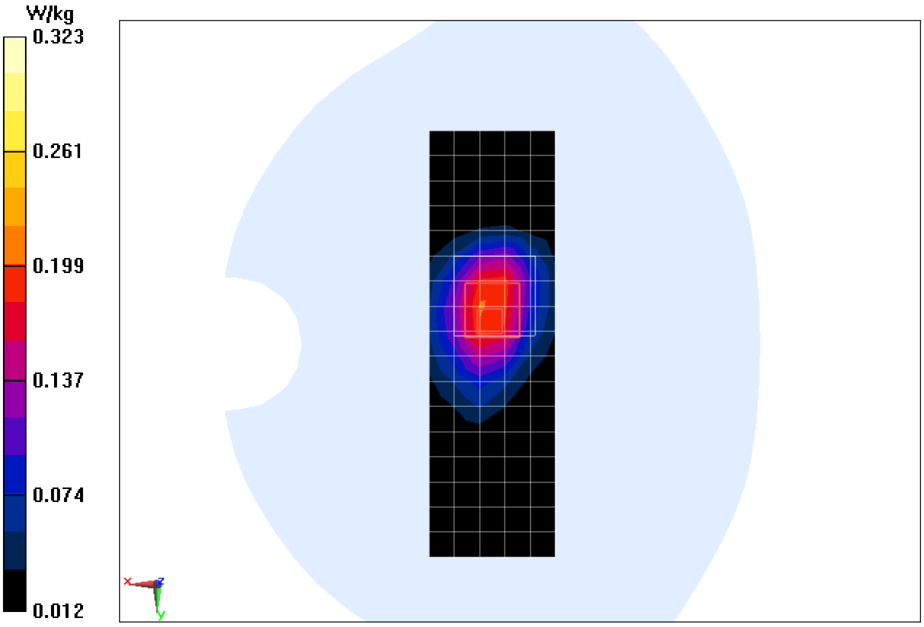
GSM 835MHz GPRS 4TS Body Toward Phantom Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 835MHz GPRS 4TS; Frequency: 836.6 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Toward Phantom GPRS 4TS 850MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.661 W/kg
Middle Toward Phantom GPRS 4TS 850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.171 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.20 W/kg
SAR(1 g) = 0.636 W/kg; SAR(10 g) = 0.366 W/kg
Maximum value of SAR (measured) = 0.709 W/kg



GSM 835MHz GPRS 4TS Body Left Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 835MHz GPRS 4TS; Frequency: 836.6 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Left GPRS 4TS 850MHz/Area Scan (6x18x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.203 W/kg
Middle Left GPRS 4TS 850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.326 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.463 W/kg
SAR(1 g) = 0.295 W/kg; SAR(10 g) = 0.182 W/kg
Maximum value of SAR (measured) = 0.323 W/kg

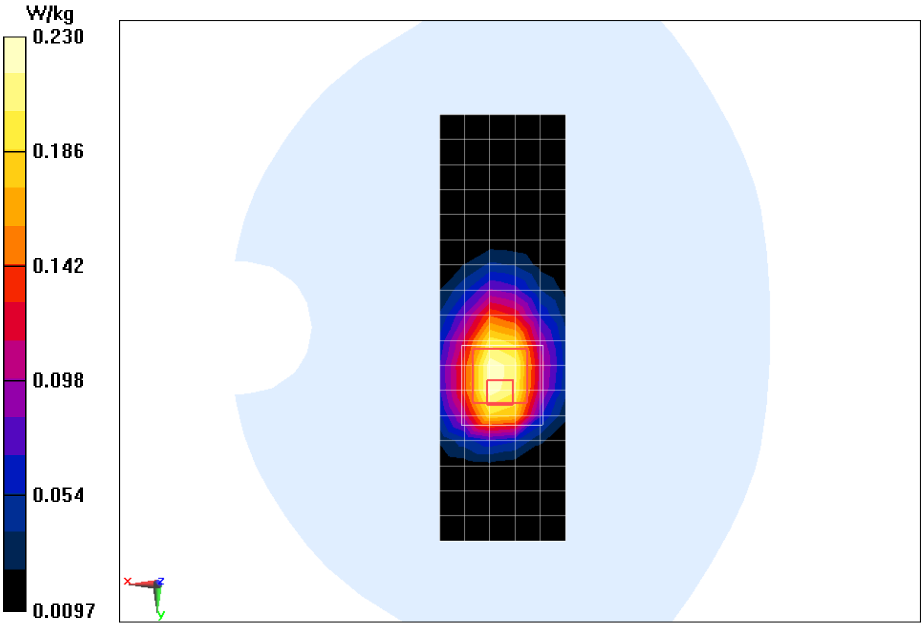


GSM 835MHz GPRS 4TS Body Right Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 835MHz GPRS 4TS; Frequency: 836.6 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)

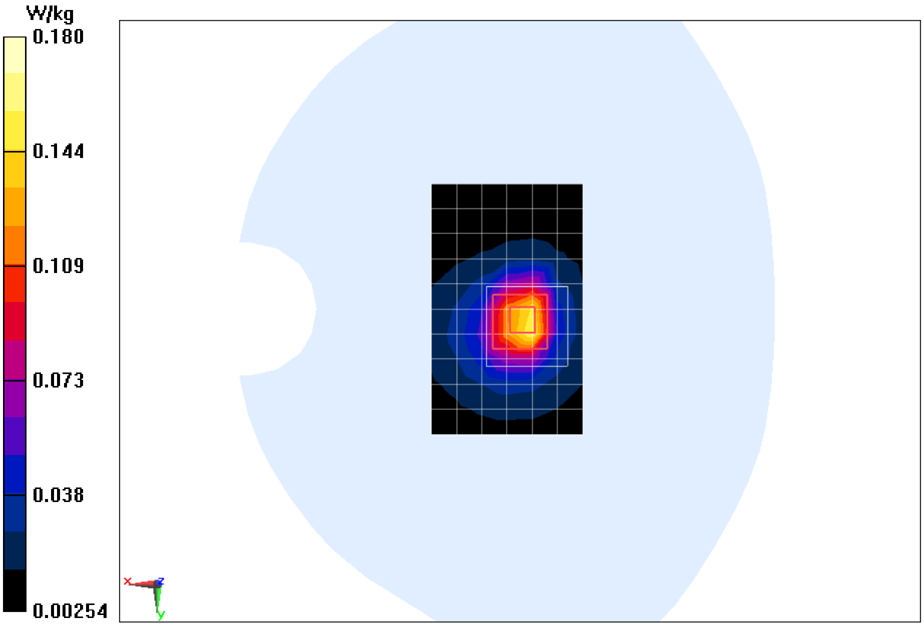
Middle Right GPRS 4TS 850MHz/Area Scan (6x18x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.225 W/kg

Middle Right GPRS 4TS 850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.950 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.392 W/kg
SAR(1 g) = 0.214 W/kg; SAR(10 g) = 0.131 W/kg
Maximum value of SAR (measured) = 0.230 W/kg



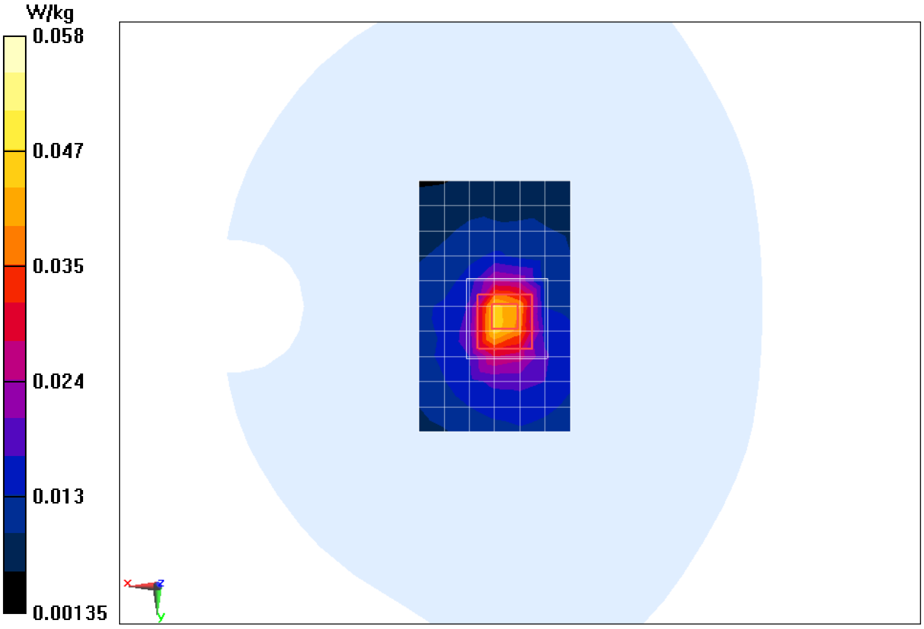
GSM 835MHz GPRS 4TS Body Bottom Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 835MHz GPRS 4TS; Frequency: 836.6 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Bottom GPRS 4TS 850MHz/Area Scan (7x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.158 W/kg
Middle Bottom GPRS 4TS 850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.178 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.472 W/kg
SAR(1 g) = 0.160 W/kg; SAR(10 g) = 0.067 W/kg
Maximum value of SAR (measured) = 0.180 W/kg



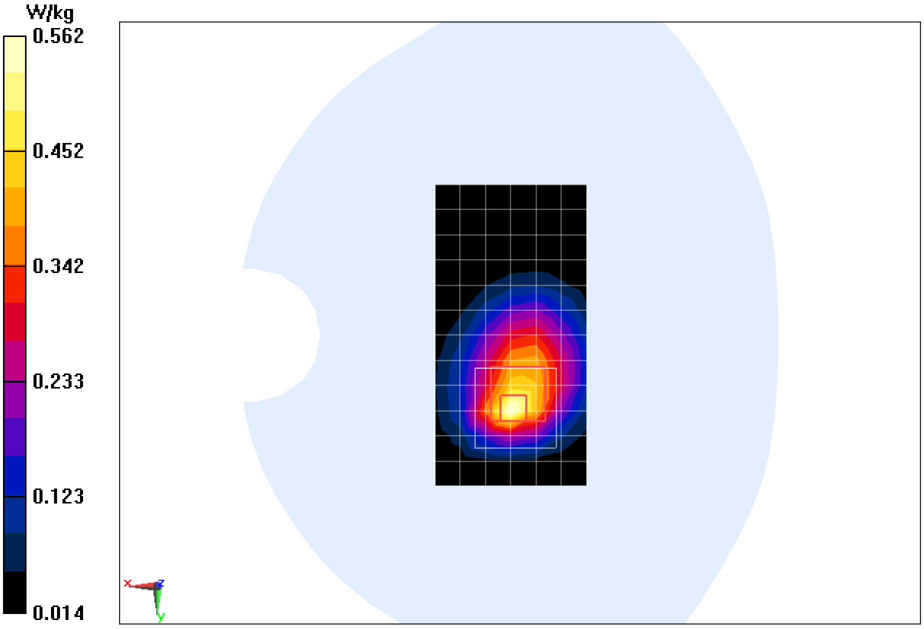
GSM 835MHz GPRS 4TS Body Top Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_{r}$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 835MHz GPRS 4TS; Frequency: 836.6 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Top GPRS 4TS 850MHz/Area Scan (7x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.0450 W/kg
Middle Top GPRS 4TS 850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.841 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.113 W/kg
SAR(1 g) = 0.048 W/kg; SAR(10 g) = 0.023 W/kg
Maximum value of SAR (measured) = 0.0582 W/kg



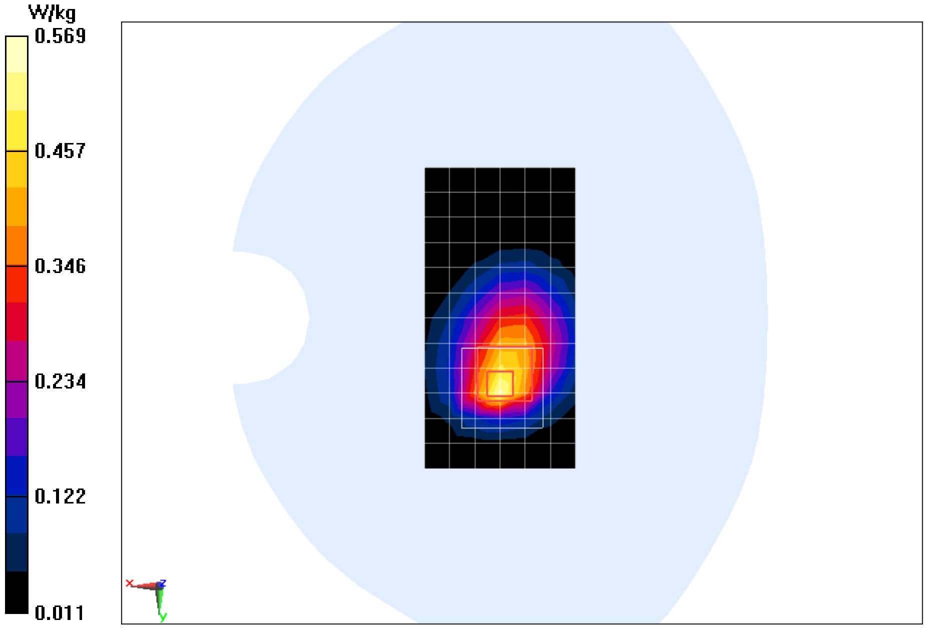
GSM 835MHz GPRS 4TS Body Toward Phantom Low

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 835MHz GPRS 4TS; Frequency: 824.2 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Low Toward Phantom GPRS 4TS 850MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.586 W/kg
Low Toward Phantom GPRS 4TS 850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.205 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.944 W/kg
SAR(1 g) = 0.497 W/kg; SAR(10 g) = 0.286 W/kg
Maximum value of SAR (measured) = 0.562 W/kg



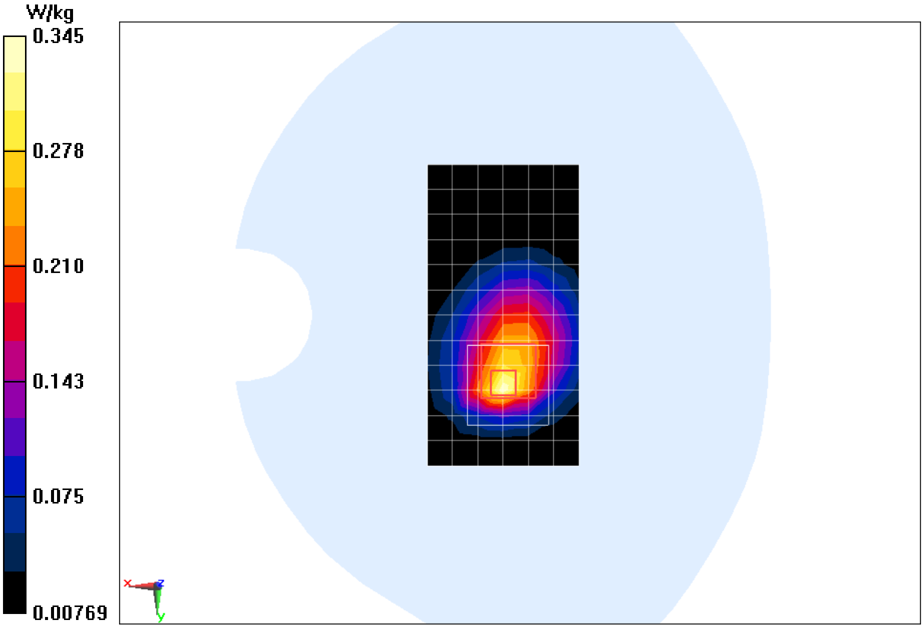
GSM 835MHz GPRS 4TS Body Toward Phantom High

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 849 MHz; σ = 1.015 S/m; ε$_r$ = 55.205; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 835MHz GPRS 4TS; Frequency: 848.8 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
High Toward Phantom GPRS 4TS 850MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.546 W/kg
High Toward Phantom GPRS 4TS 850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.174 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.940 W/kg
SAR(1 g) = 0.497 W/kg; SAR(10 g) = 0.285 W/kg
Maximum value of SAR (measured) = 0.569 W/kg



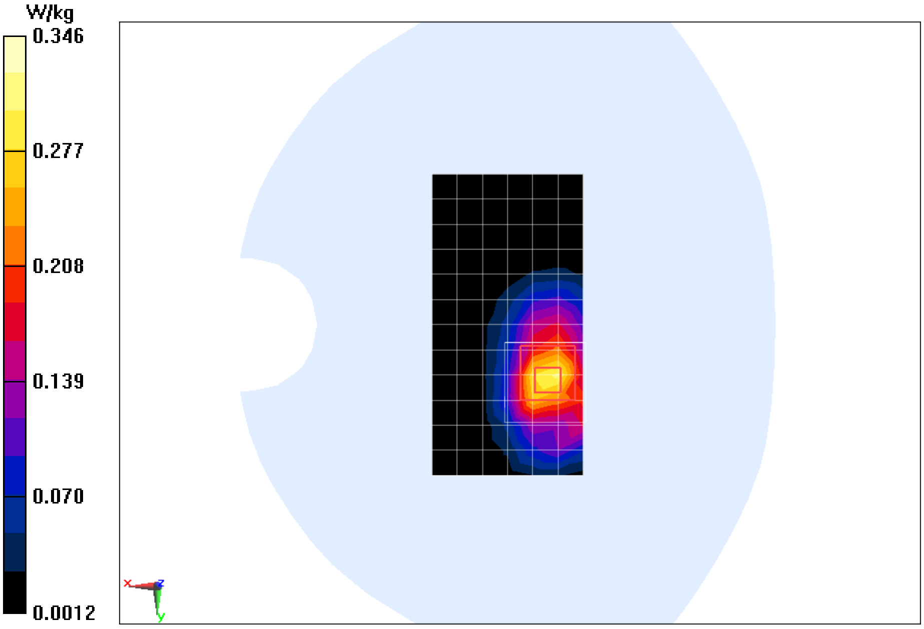
GSM 835MHz E-GPRS 4TS Body Toward Phantom Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 835MHz GPRS 4TS; Frequency: 836.6 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Toward Phantom E-GPRS 4TS 850MHz /Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.344 W/kg
Middle Toward Phantom E-GPRS 4TS 850MHz /Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.200 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.585 W/kg
SAR(1 g) = 0.306 W/kg; SAR(10 g) = 0.175 W/kg
Maximum value of SAR (measured) = 0.345 W/kg



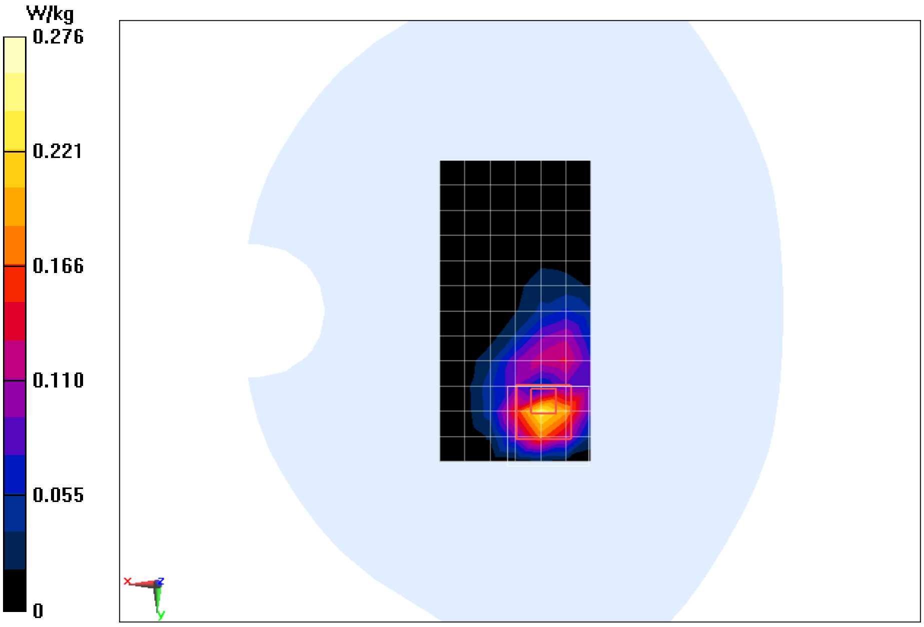
GSM 1900MHz GPRS 4TS Body Toward Phantom Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 1900MHz GPRS 4TS; Frequency: 1880 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Toward Phantom GPRS 4TS 1900MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.308 W/kg
Middle Toward Phantom GPRS 4TS 1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.682 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.524 W/kg
SAR(1 g) = 0.296 W/kg; SAR(10 g) = 0.154 W/kg
Maximum value of SAR (measured) = 0.346 W/kg



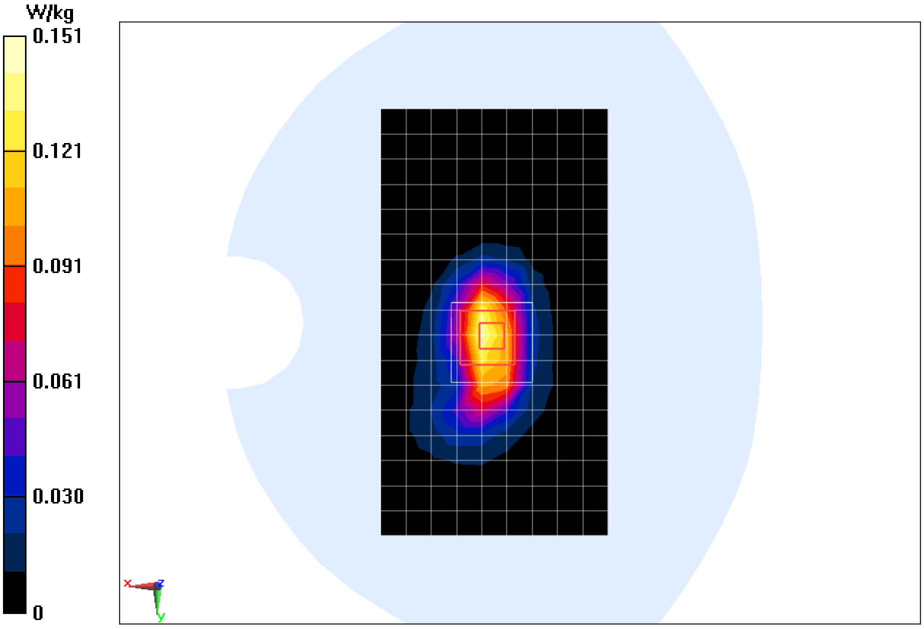
GSM 1900MHz GPRS 4TS Body Toward Ground Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃   Liquid Temperature:22.5 ℃
Communication System: GSM 1900MHz GPRS 4TS; Frequency: 1880 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Toward Ground GPRS 4TS 1900MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.237 W/kg
Middle Toward Ground GPRS 4TS 1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.667 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.487 W/kg
SAR(1 g) = 0.237 W/kg; SAR(10 g) = 0.093 W/kg
Maximum value of SAR (measured) = 0.276 W/kg



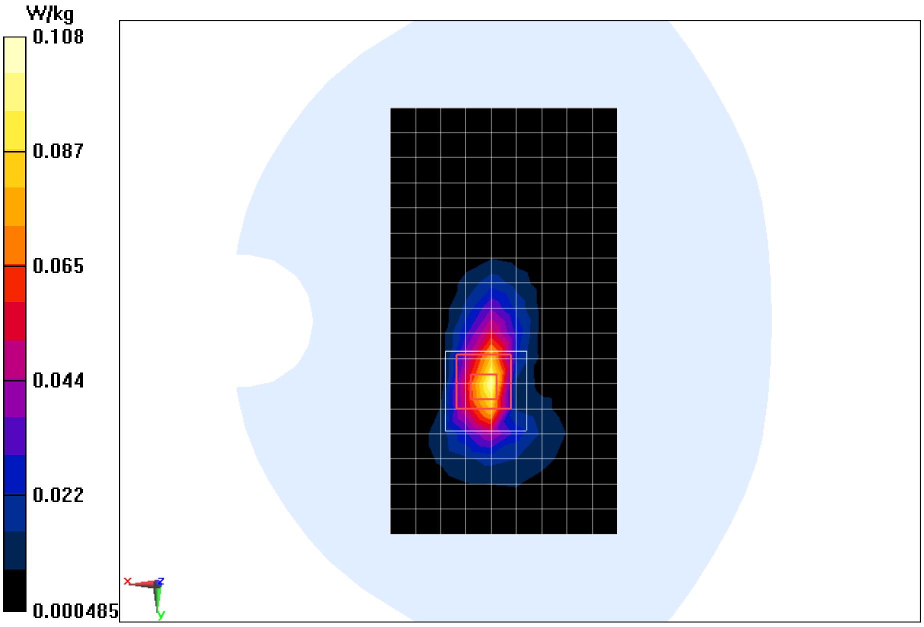
GSM 1900MHz GPRS 4TS Body Left Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 1900MHz GPRS 4TS; Frequency: 1880 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Left GPRS 4TS 1900MHz/Area Scan (10x18x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.145 W/kg
Middle Left GPRS 4TS 1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.079 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.236 W/kg
SAR(1 g) = 0.134 W/kg; SAR(10 g) = 0.073 W/kg
Maximum value of SAR (measured) = 0.151 W/kg



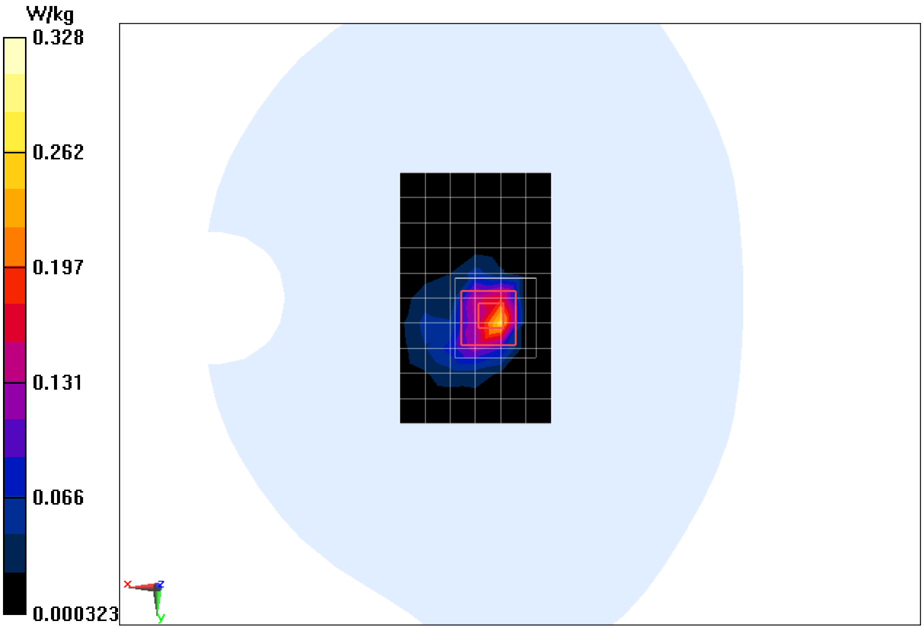
GSM 1900MHz GPRS 4TS Body Right Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 1900MHz GPRS 4TS; Frequency: 1880 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Right GPRS 4TS 1900MHz/Area Scan (10x18x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.102 W/kg
Middle Right GPRS 4TS 1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.356 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.195 W/kg
SAR(1 g) = 0.088 W/kg; SAR(10 g) = 0.037 W/kg
Maximum value of SAR (measured) = 0.108 W/kg



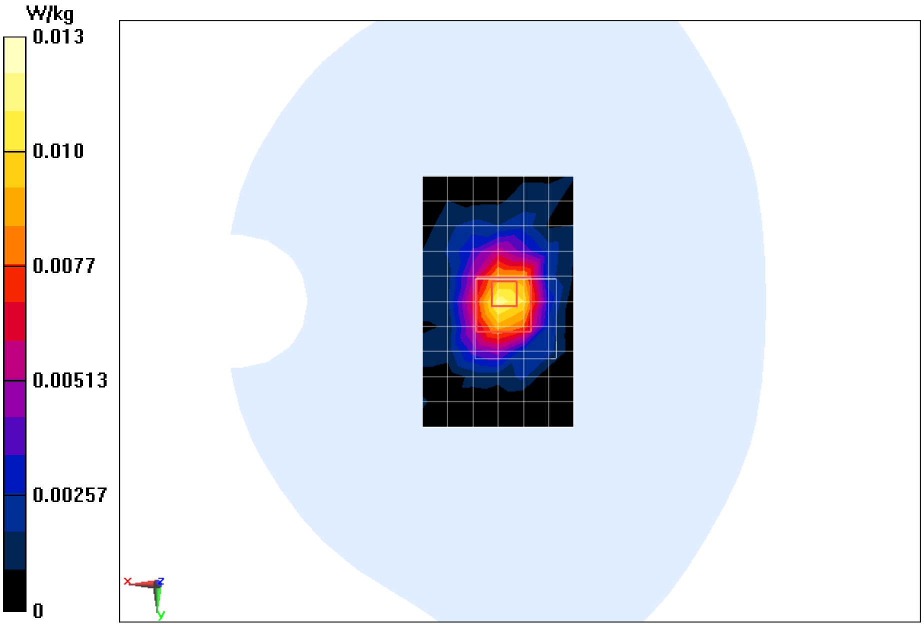
GSM 1900MHz GPRS 4TS Body Bottom Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 1900MHz GPRS 4TS; Frequency: 1880 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Bottom GPRS 4TS 1900MHz/Area Scan (7x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.259 W/kg
Middle Bottom GPRS 4TS 1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.297 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 0.535 W/kg
SAR(1 g) = 0.246 W/kg; SAR(10 g) = 0.095 W/kg
Maximum value of SAR (measured) = 0.328 W/kg



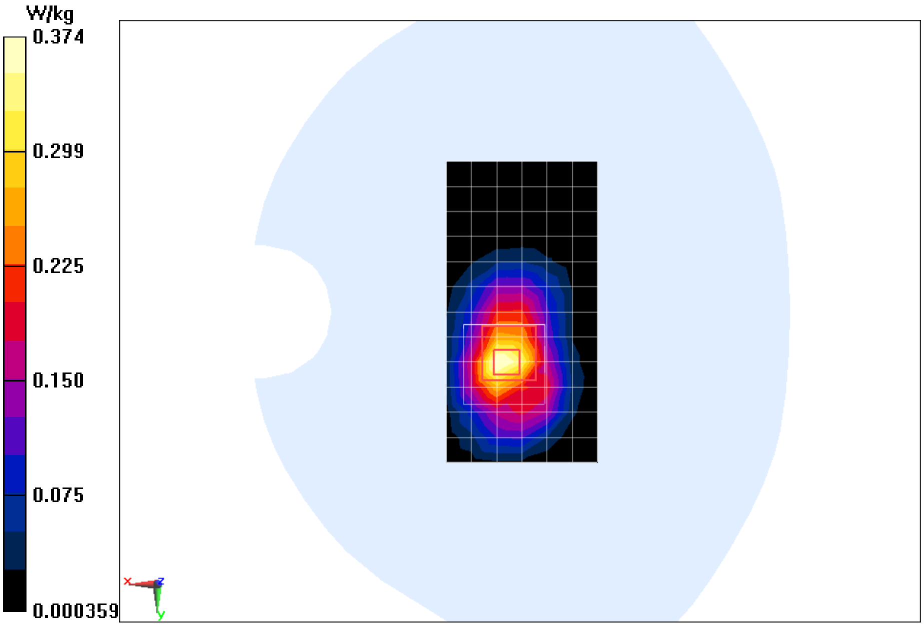
GSM 1900MHz GPRS 4TS Body Top Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 1900MHz GPRS 4TS; Frequency: 1880 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Top GPRS 4TS 1900MHz/Area Scan (7x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.0117 W/kg
Middle Top GPRS 4TS 1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.208 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.0220 W/kg
SAR(1 g) = 0.012 W/kg; SAR(10 g) = 0.00605 W/kg
Maximum value of SAR (measured) = 0.0128 W/kg



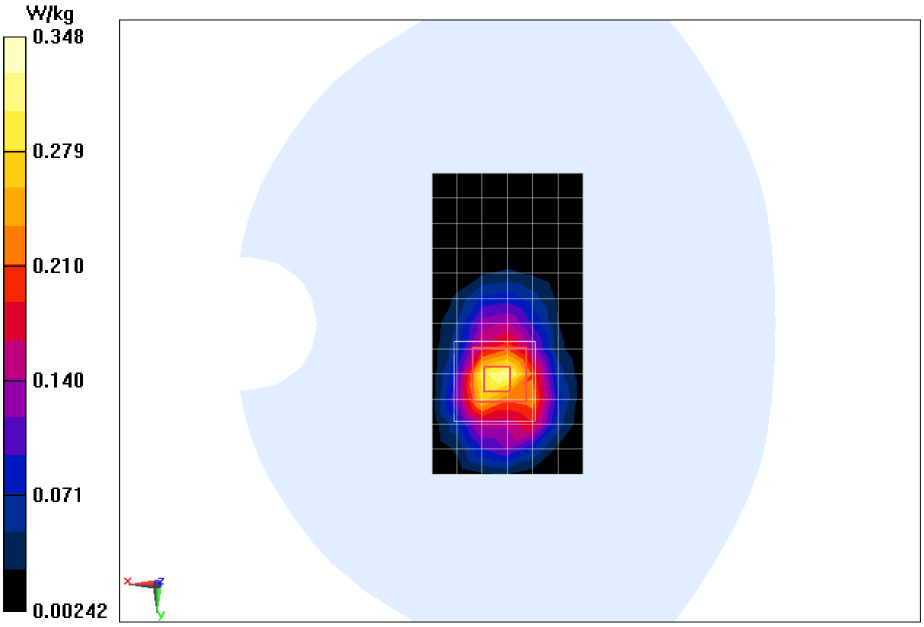
GSM 1900MHz GPRS 4TS Body Toward Phantom High

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1910 MHz; σ = 1.534 S/m; ε$_r$ = 53.187; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃   Liquid Temperature:22.5 ℃
Communication System: GSM 1900MHz
GPRS 4TS; Frequency: 1909.8 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
High Toward Phantom GPRS 4TS 1900MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.396 W/kg
High Toward Phantom GPRS 4TS 1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.040 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 0.570 W/kg
SAR(1 g) = 0.323 W/kg; SAR(10 g) = 0.172 W/kg
Maximum value of SAR (measured) = 0.374 W/kg



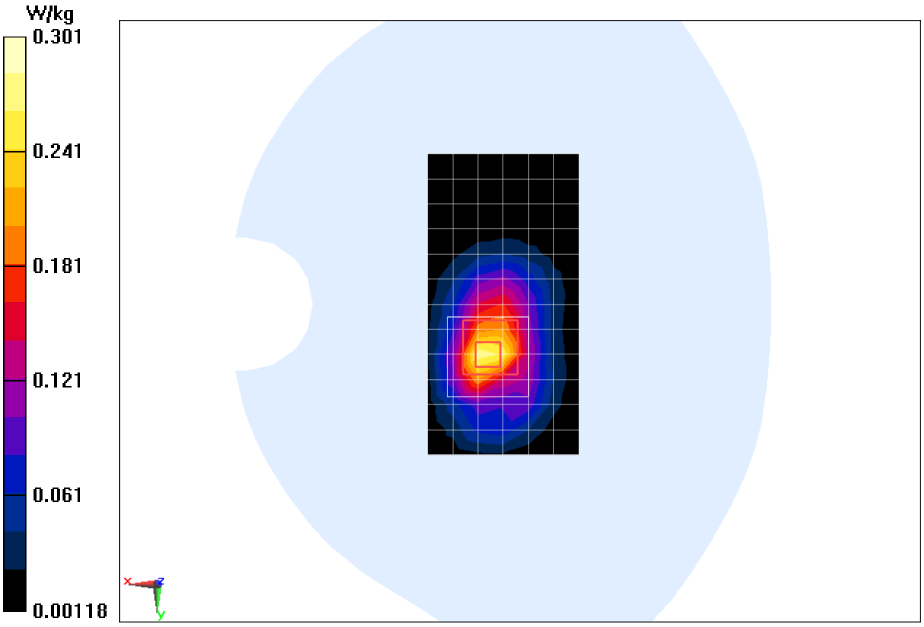
GSM 1900MHz GPRS 4TS Body Toward Phantom Low

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 1900MHz GPRS 4TS; Frequency: 1850.2 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Low Toward Phantom GPRS 4TS 1900MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.324 W/kg
Low Toward Phantom GPRS 4TS 1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.522 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 0.516 W/kg
SAR(1 g) = 0.296 W/kg; SAR(10 g) = 0.156 W/kg
Maximum value of SAR (measured) = 0.348 W/kg



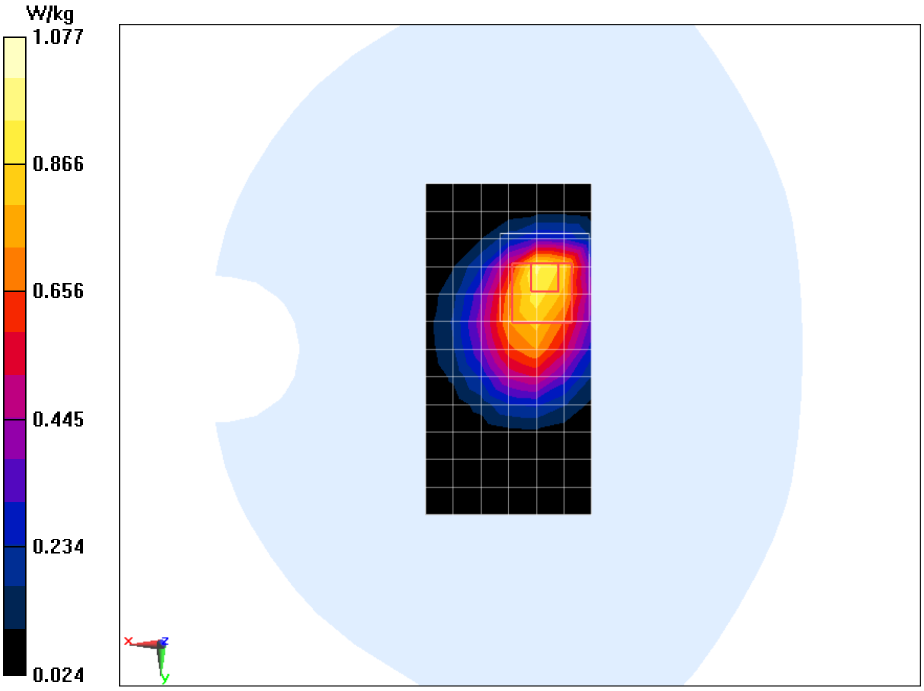
GSM 1900MHz E-GPRS 4TS Body Toward Phantom High

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1910 MHz; σ = 1.534 S/m; ε$_r$ = 53.187; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: GSM 1900MHz GPRS 4TS; Frequency: 1909.8 MHz; Duty Cycle: 1:2
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
High Toward Phantom E-GPRS 4TS 1900MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.276 W/kg
High Toward Phantom E-GPRS 4TS 1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.696 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.462 W/kg
SAR(1 g) = 0.264 W/kg; SAR(10 g) = 0.140 W/kg
Maximum value of SAR (measured) = 0.301 W/kg



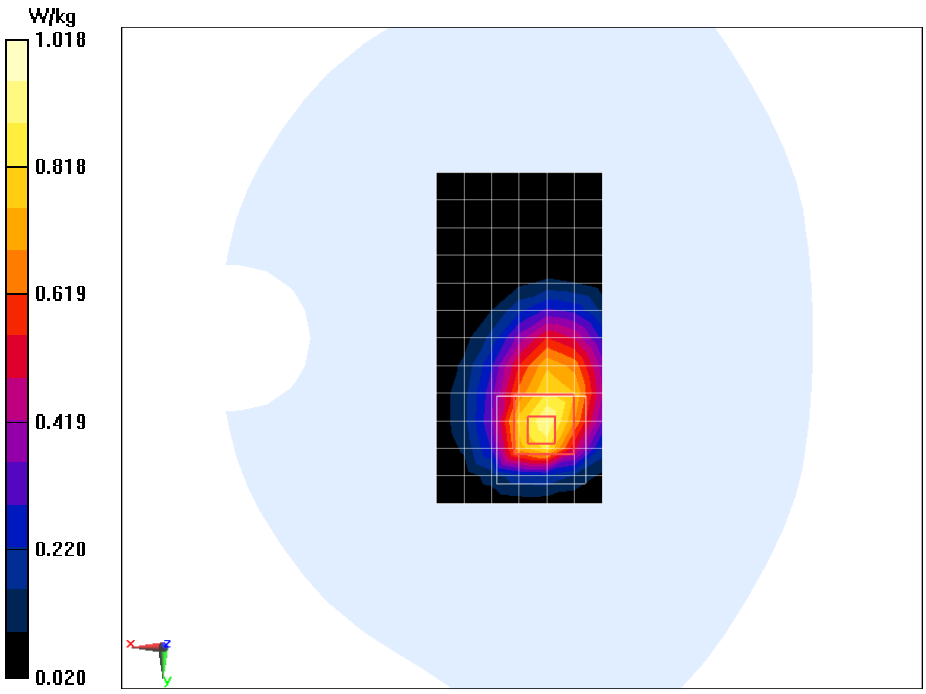
WCDMA850MHz Body Toward Phantom Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 836.6 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Toward Phantom WCDMA850MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.954 W/kg
Middle Toward Phantom WCDMA850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.889 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.69 W/kg
SAR(1 g) = 0.947 W/kg; SAR(10 g) = 0.565 W/kg
Maximum value of SAR (measured) = 1.08 W/kg



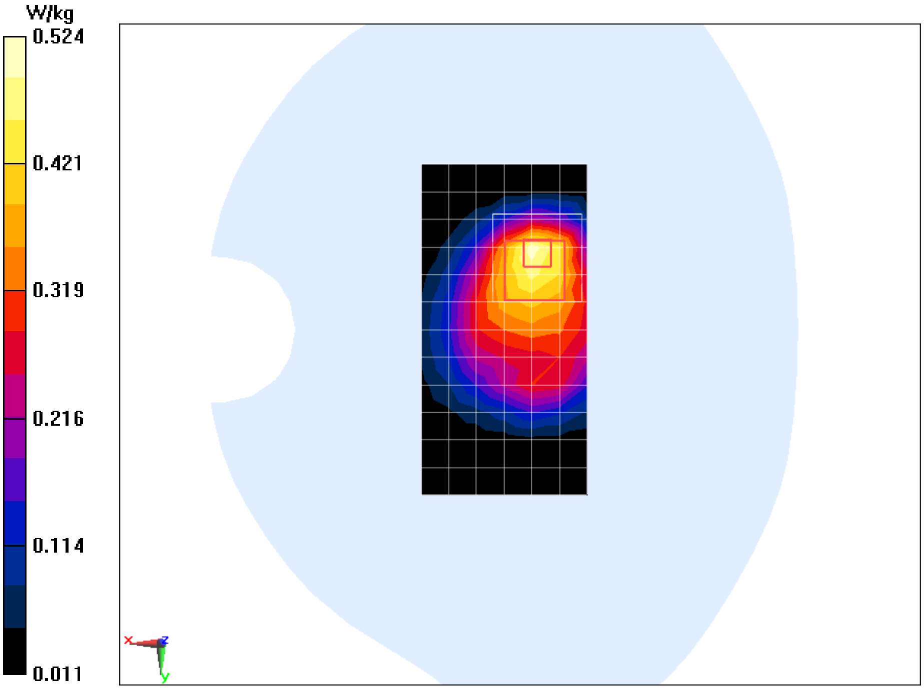
WCDMA850MHz 2 Body Toward Phantom Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε;$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 836.6 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Toward Phantom WCDMA850MHz 2/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.956 W/kg
Middle Toward Phantom WCDMA850MHz 2/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.358 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.68 W/kg
SAR(1 g) = 0.925 W/kg; SAR(10 g) = 0.542 W/kg
Maximum value of SAR (measured) = 1.02 W/kg



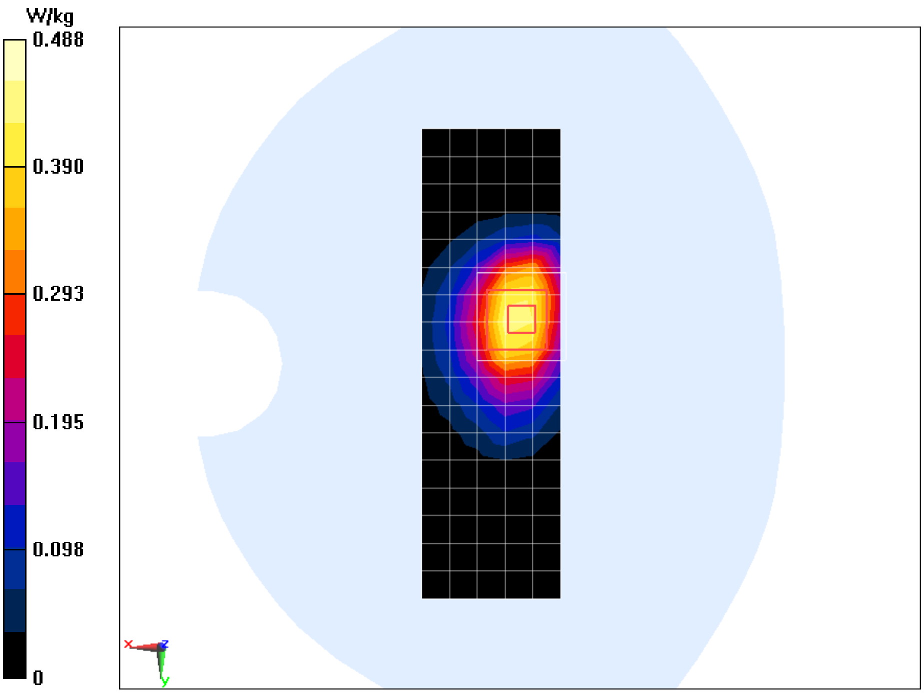
WCDMA850MHz Body Toward Ground Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 836.6 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Toward Ground WCDMA850MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.513 W/kg
Middle Toward Ground WCDMA850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.626 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.912 W/kg
SAR(1 g) = 0.490 W/kg; SAR(10 g) = 0.307 W/kg
Maximum value of SAR (measured) = 0.524 W/kg



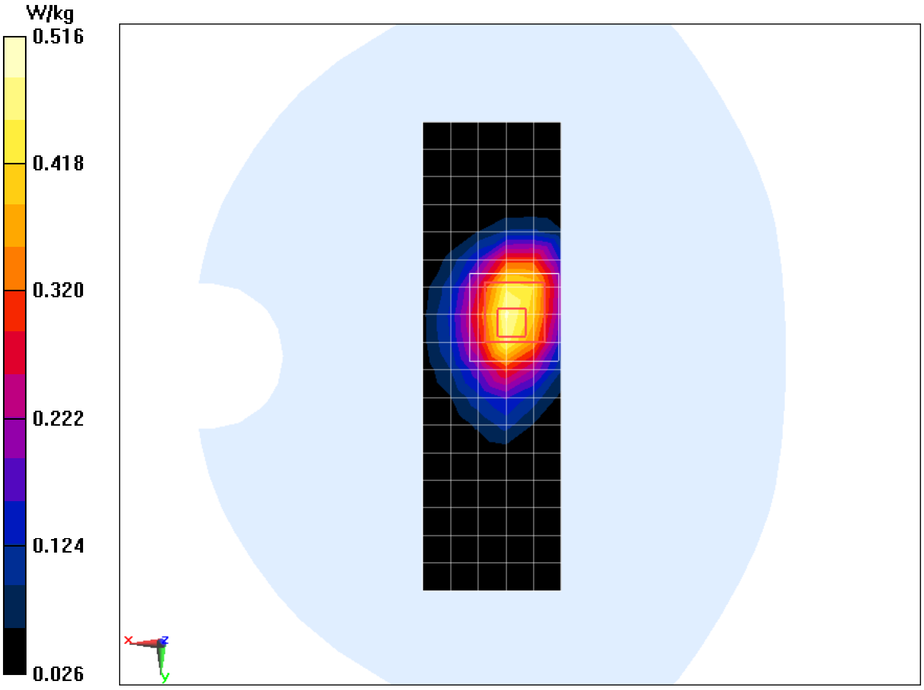
WCDMA850MHz Body Right Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 836.6 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Right WCDMA850MHz/Area Scan (6x18x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.443 W/kg
Middle Right WCDMA850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.351 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.684 W/kg
SAR(1 g) = 0.448 W/kg; SAR(10 g) = 0.274 W/kg
Maximum value of SAR (measured) = 0.488 W/kg



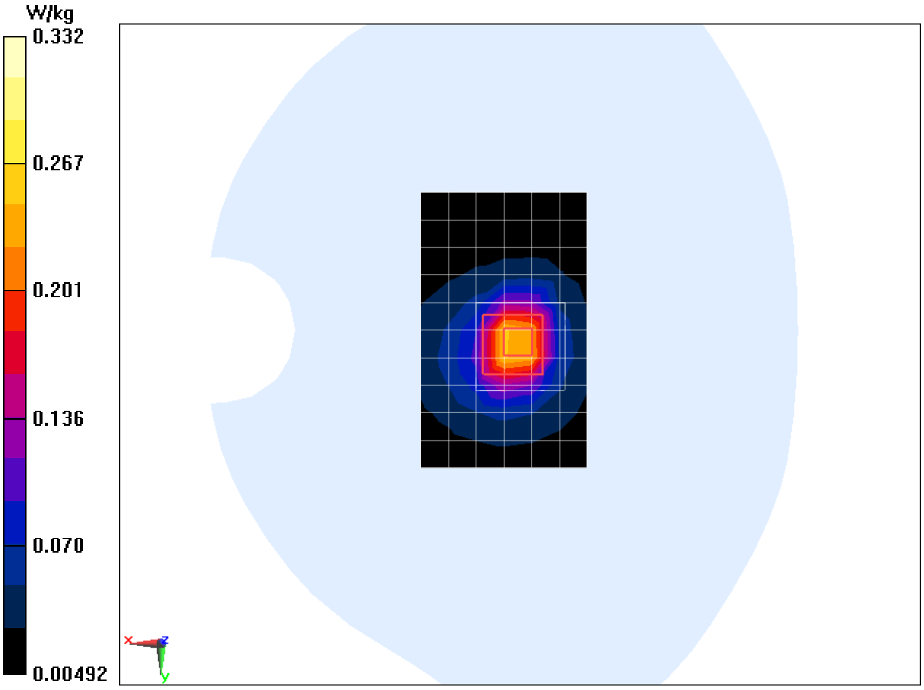
WCDMA850MHz Body Left Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 836.6 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Left WCDMA850MHz/Area Scan (6x18x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.491 W/kg
Middle Left WCDMA850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.126 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.778 W/kg
SAR(1 g) = 0.461 W/kg; SAR(10 g) = 0.276 W/kg
Maximum value of SAR (measured) = 0.516 W/kg



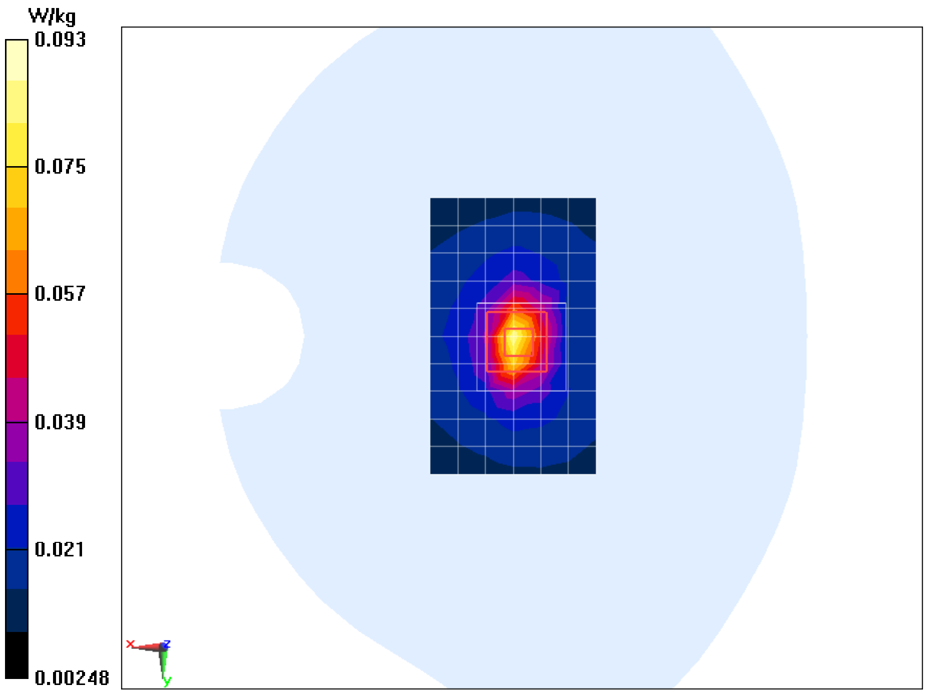
WCDMA850MHz Body Bottom Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 836.6 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Bottom WCDMA850MHz/Area Scan (7x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.249 W/kg
Middle Bottom WCDMA850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.284 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.892 W/kg
SAR(1 g) = 0.293 W/kg; SAR(10 g) = 0.121 W/kg
Maximum value of SAR (measured) = 0.332 W/kg



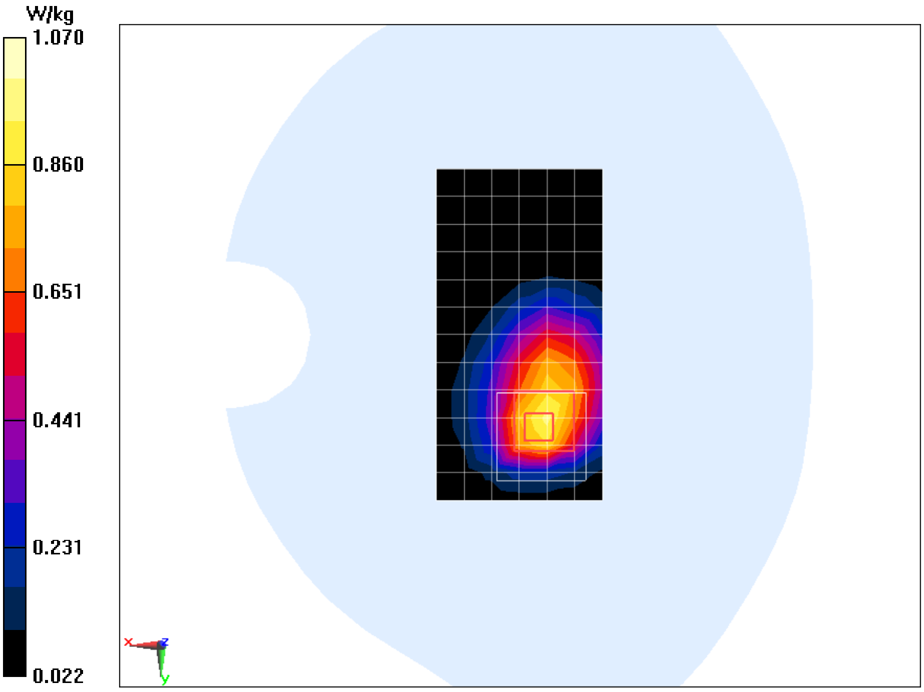
WCDMA850MHz Body Top Middle

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 837 MHz; σ = 1.001 S/m; ε$_r$ = 55.152; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 836.6 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Middle Top WCDMA850MHz/Area Scan (7x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.0872 W/kg
Middle Top WCDMA850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.425 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.180 W/kg
SAR(1 g) = 0.077 W/kg; SAR(10 g) = 0.036 W/kg
Maximum value of SAR (measured) = 0.0931 W/kg



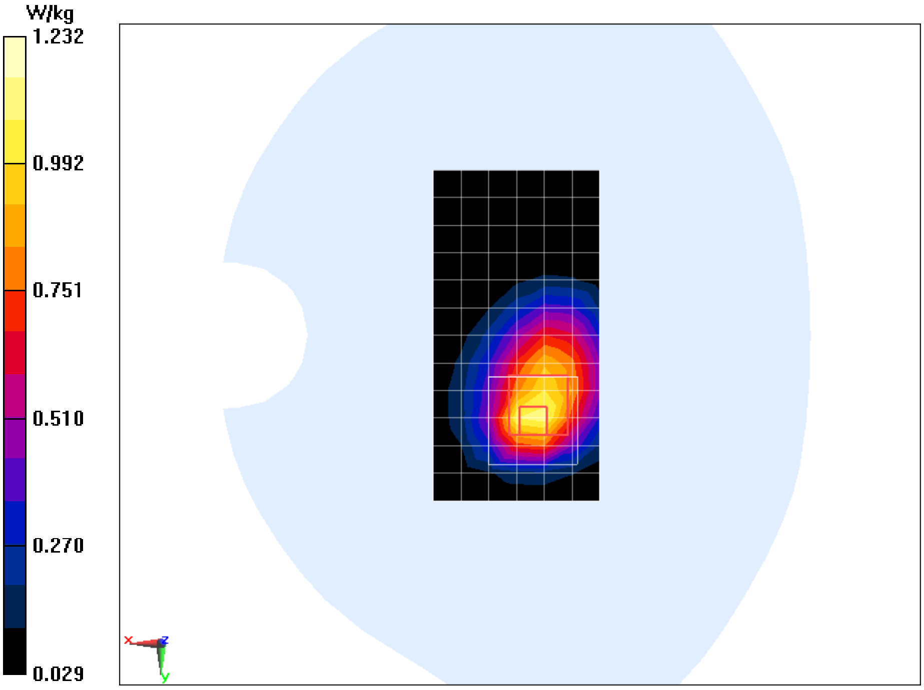
WCDMA850MHz Body Toward Phantom Low

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 826.4 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
Low Toward Phantom WCDMA850MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.963 W/kg
Low Toward Phantom WCDMA850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.691 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 1.80 W/kg
SAR(1 g) = 0.967 W/kg; SAR(10 g) = 0.563 W/kg
Maximum value of SAR (measured) = 1.07 W/kg



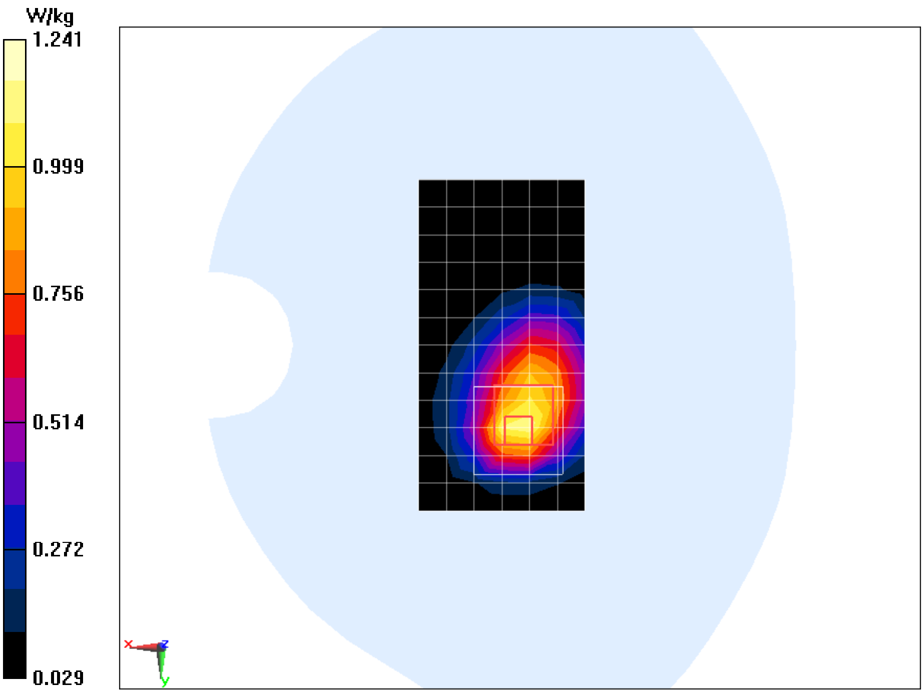
WCDMA850MHz Body Toward Phantom High

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 847 MHz; σ = 1.012 S/m; ε$_r$ = 55.214; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 846.6 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
High Toward Phantom WCDMA850MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.12 W/kg
High Toward Phantom WCDMA850MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.899 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 2.00 W/kg
SAR(1 g) = 1.1 W/kg; SAR(10 g) = 0.652 W/kg
Maximum value of SAR (measured) = 1.23 W/kg



WCDMA850MHz 2 Body Toward Phantom High

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Medium parameters used: f = 847 MHz; σ = 1.012 S/m; ε$_r$ = 55.214; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 846.6 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)
High Toward Phantom WCDMA850MHz 2/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.14 W/kg
High Toward Phantom WCDMA850MHz 2/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.516 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 2.03 W/kg
SAR(1 g) = 1.11 W/kg; SAR(10 g) = 0.660 W/kg
Maximum value of SAR (measured) = 1.24 W/kg

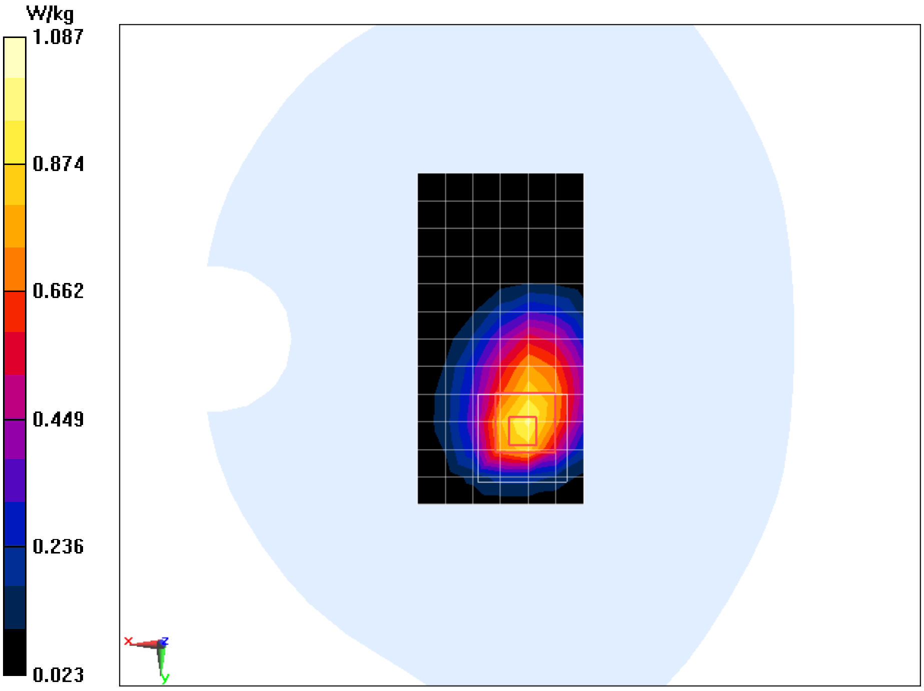


WCDMA850MHz 2 Body Toward Phantom Low

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850MHz
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅴ; Frequency: 826.4 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)

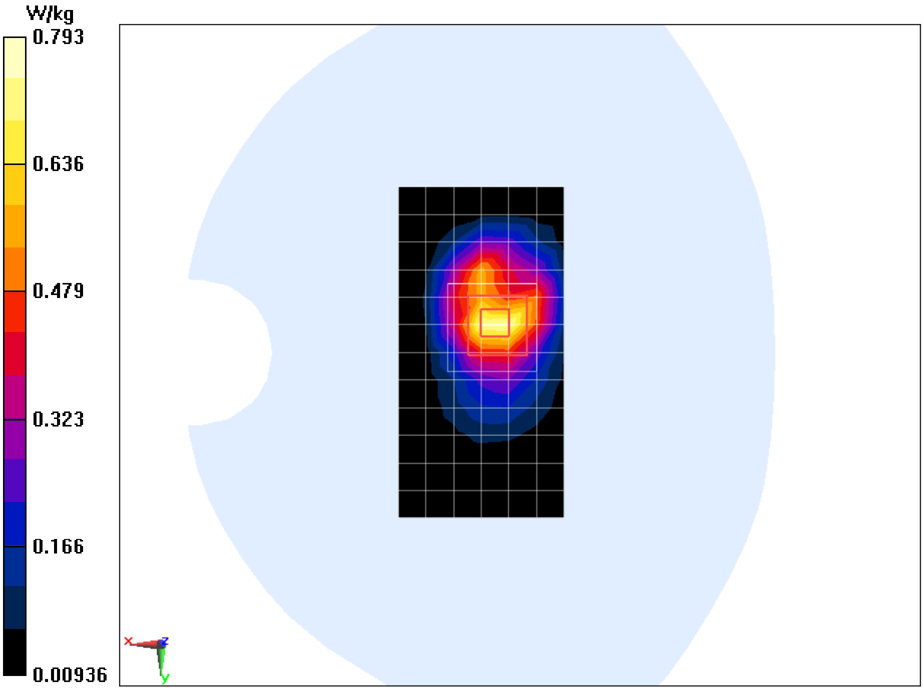
Low Toward Phantom WCDMA850MHz 2/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.970 W/kg

Low Toward Phantom WCDMA850MHz 2/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.371 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 1.77 W/kg
SAR(1 g) = 0.958 W/kg; SAR(10 g) = 0.563 W/kg
Maximum value of SAR (measured) = 1.09 W/kg



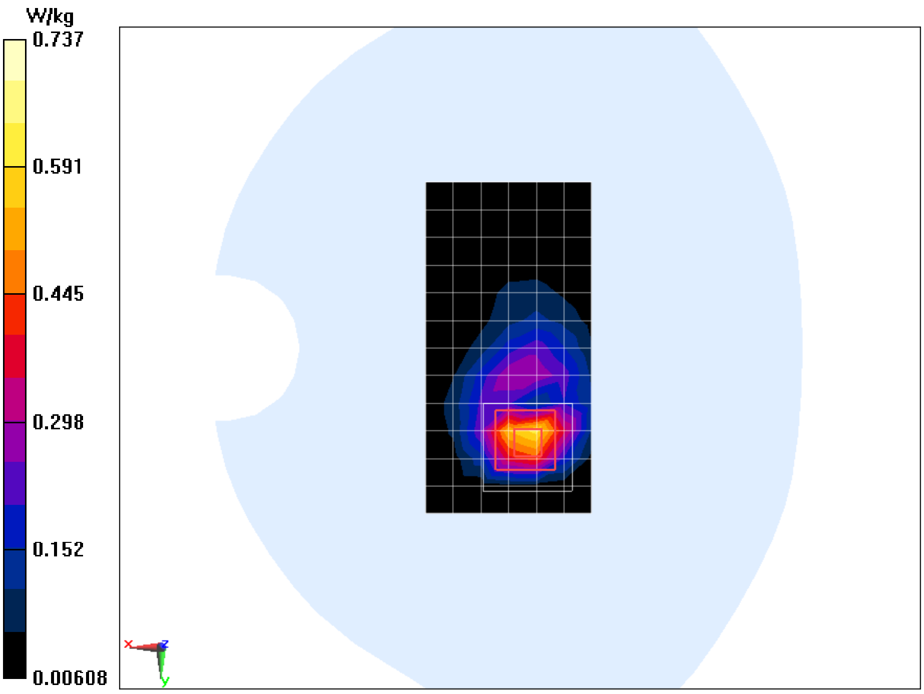
WCDMA1900MHz Body Toward Phantom Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅱ; Frequency: 1880 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Toward Phantom WCDMA1900MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.758 W/kg
Middle Toward Phantom WCDMA1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.678 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 1.35 W/kg
SAR(1 g) = 0.706 W/kg; SAR(10 g) = 0.373 W/kg
Maximum value of SAR (measured) = 0.793 W/kg



WCDMA1900MHz Body Toward Ground Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_{r}$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅱ; Frequency: 1880 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Toward Ground WCDMA1900MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.613 W/kg
Middle Toward Ground WCDMA1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.142 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 1.26 W/kg
SAR(1 g) = 0.612 W/kg; SAR(10 g) = 0.266 W/kg
Maximum value of SAR (measured) = 0.737 W/kg

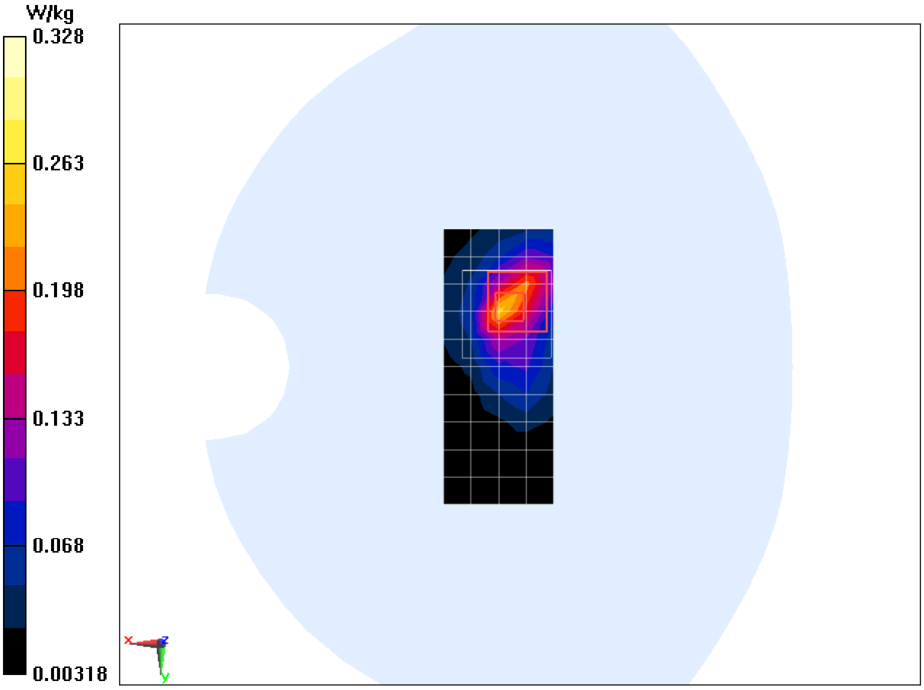


WCDMA1900MHz Body Left Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅱ; Frequency: 1880 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)

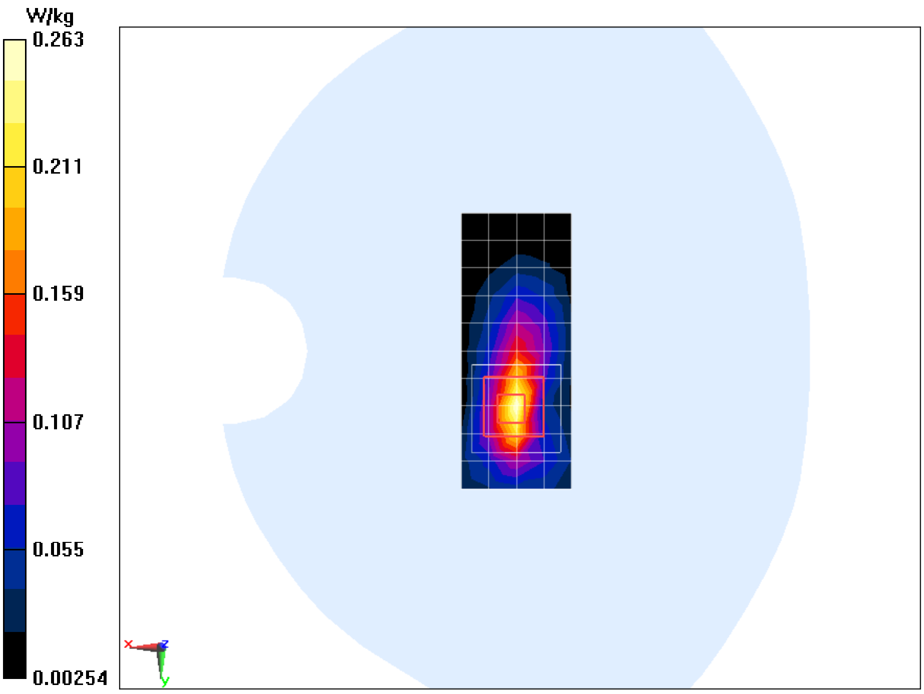
Middle Left WCDMA1900MHz/Area Scan (5x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.252 W/kg

Middle Left WCDMA1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.849 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.553 W/kg
SAR(1 g) = 0.227 W/kg; SAR(10 g) = 0.098 W/kg
Maximum value of SAR (measured) = 0.328 W/kg



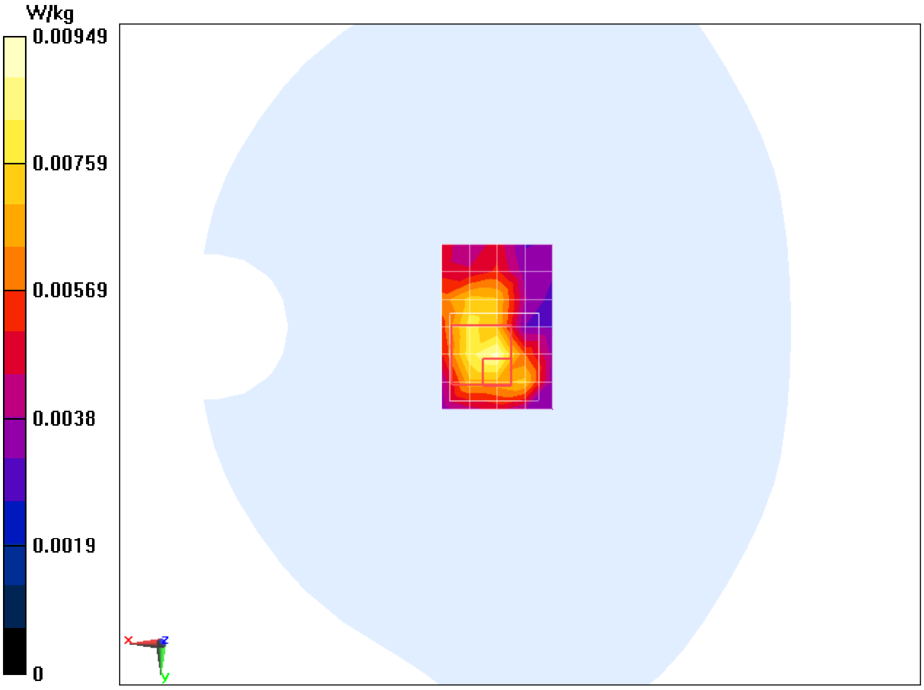
WCDMA1900MHz Body Right Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅱ; Frequency: 1880 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Right WCDMA1900MHz/Area Scan (5x11x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.265 W/kg
Middle Right WCDMA1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.141 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.491 W/kg
SAR(1 g) = 0.216 W/kg; SAR(10 g) = 0.093 W/kg
Maximum value of SAR (measured) = 0.263 W/kg



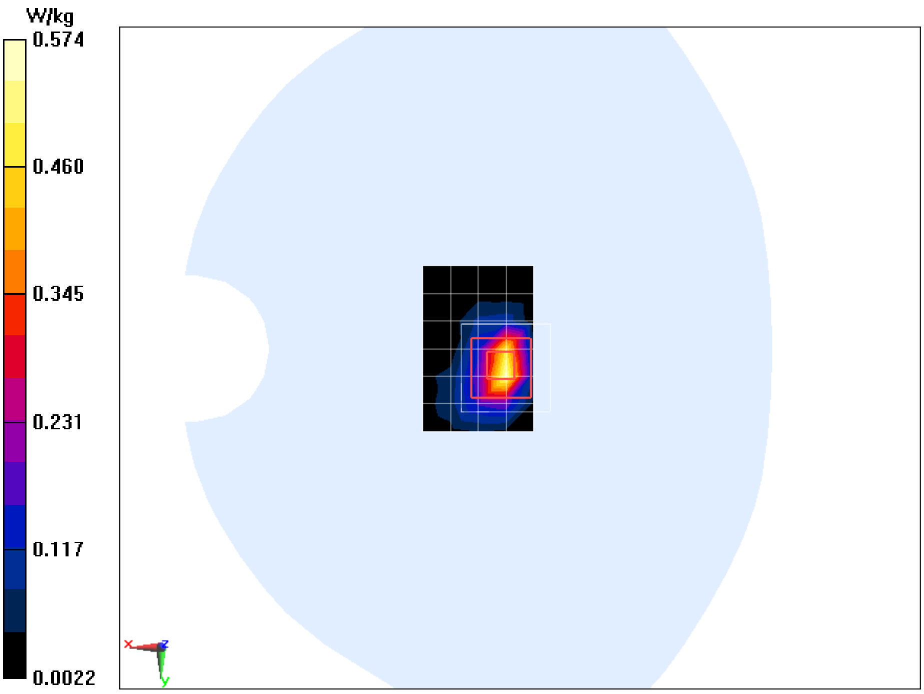
WCDMA1900MHz Body Top Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅱ; Frequency: 1880 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Top WCDMA1900MHz/Area Scan (5x7x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.00911 W/kg
Middle Top WCDMA1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.413 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 0.0350 W/kg
SAR(1 g) = 0.00935 W/kg; SAR(10 g) = 0.00484 W/kg
Maximum value of SAR (measured) = 0.00949 W/kg



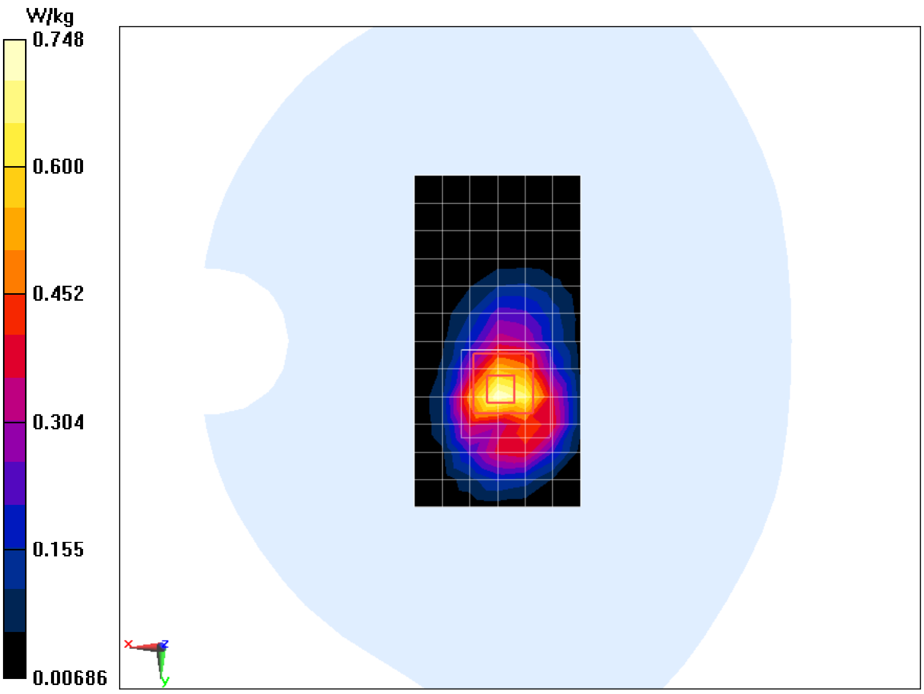
WCDMA1900MHz Body Bottom Middle

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.504 S/m; ε$_r$ = 53.319; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅱ; Frequency: 1880 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Middle Bottom WCDMA1900MHz/Area Scan (5x7x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.556 W/kg
Middle Bottom WCDMA1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.123 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.460 W/kg; SAR(10 g) = 0.177 W/kg
Maximum value of SAR (measured) = 0.574 W/kg



WCDMA1900MHz Body Toward Phantom Low

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅱ; Frequency: 1852.4 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)
Low Toward Phantom WCDMA1900MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.747 W/kg
Low Toward Phantom WCDMA1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.354 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 1.15 W/kg
SAR(1 g) = 0.660 W/kg; SAR(10 g) = 0.350 W/kg
Maximum value of SAR (measured) = 0.748 W/kg

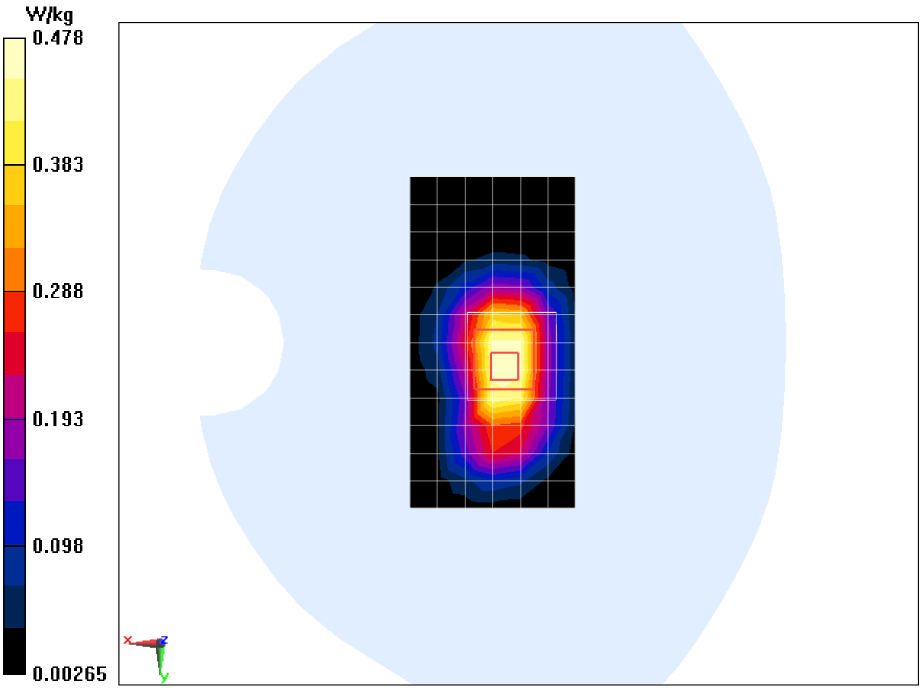


WCDMA1900MHz Body Toward Phantom High

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900MHz
Medium parameters used: f = 1908 MHz; σ = 1.532 S/m; ε$_r$ = 53.199; ρ = 1000 kg/m^3
Ambient Temperature:22.5 ℃ Liquid Temperature:22.5 ℃
Communication System: WCDMA Band Ⅱ; Frequency: 1907.6 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)

High Toward Phantom WCDMA1900MHz/Area Scan (7x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.458 W/kg

High Toward Phantom WCDMA1900MHz/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.812 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.756 W/kg
SAR(1 g) = 0.445 W/kg; SAR(10 g) = 0.261 W/kg
Maximum value of SAR (measured) = 0.478 W/kg



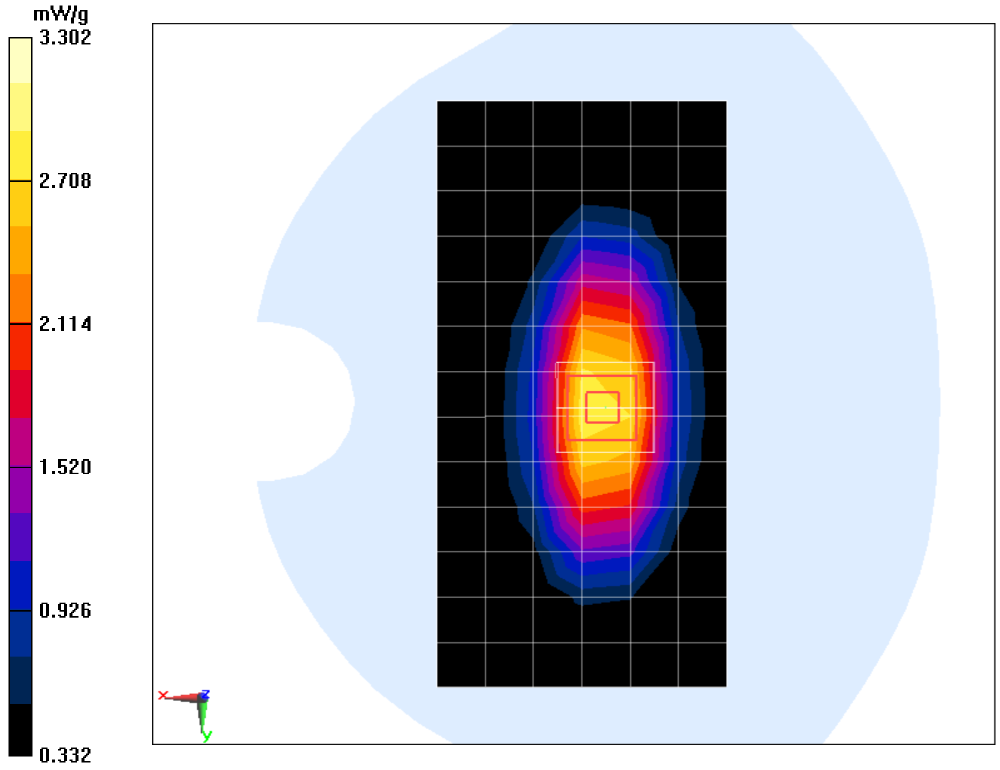
ANNEX B SYSTEM VALIDATION RESULTS

835MHz-Body

Date/Time: 8/9/2013
Electronics: DAE4 Sn1244
Medium: Body 850 MHz
Medium parameters used: f = 835 MHz; σ = 0.999 mho/m; εr = 55.15; ρ = 1000 kg/m3
Ambient Temperature:22.5° C Liquid Temperature:22.5° C
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(6.14, 6.14, 6.14)

System Validation/Area Scan(101x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.849 mW/g

System Validation/Zoom Scan(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.728 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 3.871 mW/g
SAR(1 g) = 2.53 mW/g; SAR(10 g) = 1.65 mW/g
Maximum value of SAR (measured) = 3.302 mW/g

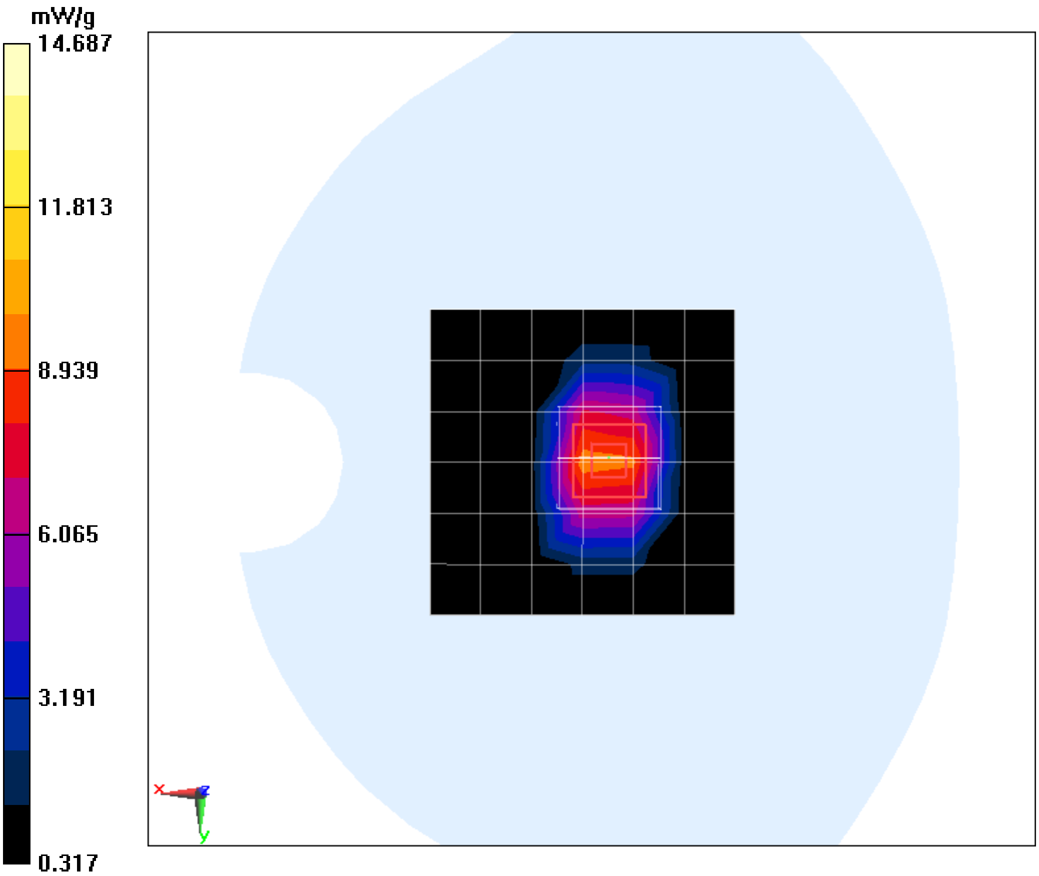


1900MHz-Body

Date/Time: 8/10/2013
Electronics: DAE4 Sn1244
Medium: Body 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.524 mho/m; εr = 53.237; ρ = 1000 kg/m3
Ambient Temperature:22.5° C   Liquid Temperature:22.5° C
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Probe: ES3DV3 - SN3252ConvF(5.03, 5.03, 5.03)

System Validation/Area Scan(101x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 9.585 mW/g

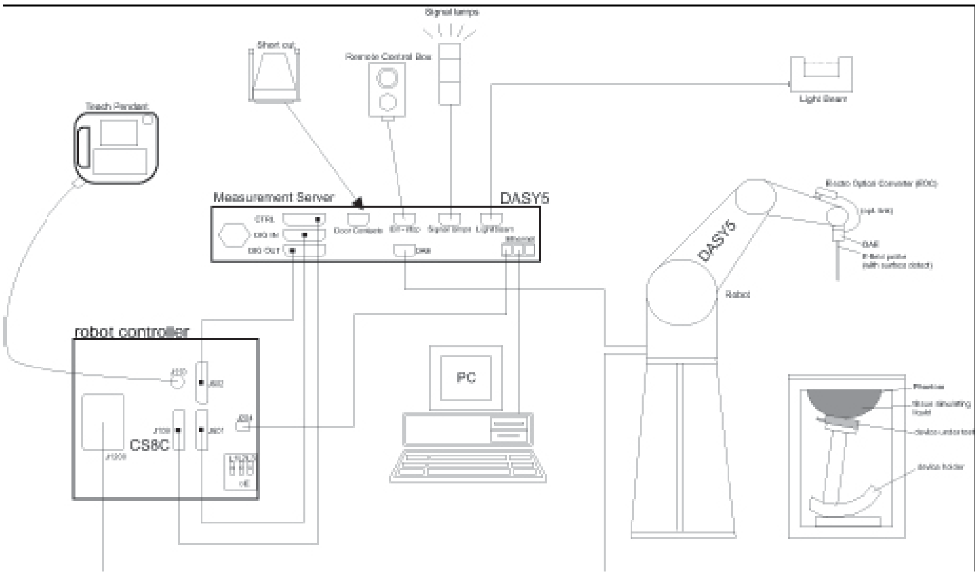
System Validation/Zoom Scan(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.021 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 18.419 mW/g
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.47 mW/g
Maximum value of SAR (measured) = 14.687 mW/g



ANNEX C SAR Measurement Setup

C.1 Measurement Set-up

The DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Picture C.1 SAR Lab Test Measurement Set-up

- A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as
- warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

C.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY5 software reads the reflection durning a software approach and looks for the maximum using 2^{nd} ord curve fitting. The approach is stopped at reaching the maximum.

Probe Specifications:

Model: ES3DV3

Frequency Range: 2.0GHz — 3.0GHz(EX3DV4)
700MHz — 2.0GHz(ES3DV3)

Calibration: In head and body simulating tissue at Frequencies from 835 up to 2450MHz

Linearity: ± 0.2 dB(2.0GHz — 3.0GHz) for EX3DV4
± 0.2 dB(700MHz — 2.0GHz) for ES3DV3

Dynamic Range: 10 mW/kg — 100W/kg

Probe Length: 330 mm

Probe Tip Length: 20 mm

Body Diameter: 12 mm

Tip Diameter: 2.5 mm (3.9 mm for ES3DV3)

Tip-Center: 1 mm (2.0mm for ES3DV3)

Application: SAR Dosimetry Testing
Compliance tests of mobile phones
Dosimetry in strong gradient fields

Picture C.2 Near-field Probe

Picture C.3 E-field Probe

C.3 E-field Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/ cm^2.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:

Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

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

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

C.4 Other Test Equipment

C.4.1 Data Acquisition Electronics(DAE)

The data acquisition electronics consist 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 with a 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 mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

PictureC.4: DAE

C.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY5: RX90L) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchron motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Picture C.5 DASY 5

C.4.3 Measurement Server

The Measurement server is based on a PC/104 CPU broad with CPU (DASY5: 400 MHz, Intel Celeron), chipdisk (DASY5: 128MB), RAM (DASY5: 128MB). 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 broad, which is directly connected to the PC/104 bus of the CPU broad.

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

Picture C.6 Server for DASY 5

C.4.4 Device Holder for 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 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

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

The DASY device holder is constructed of low-loss

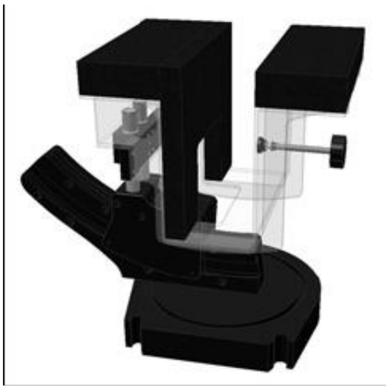
POM material having the following dielectric

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

<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 positioner. The extension is fully compatible with the Twin-SAM and ELI phantoms.

Picture C.7: Device Holder



Picture C.8: Laptop Extension Kit

C.4.5 Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to
Represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

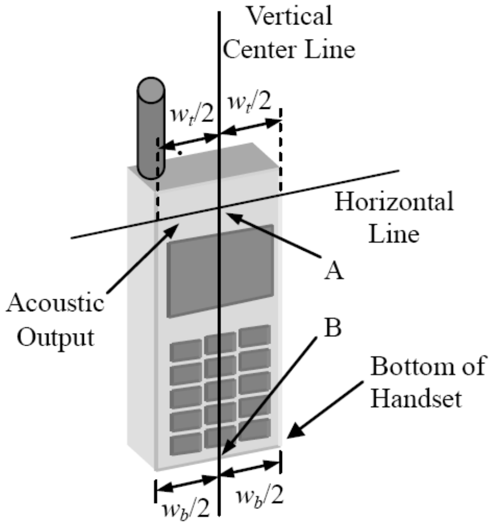
Shell Thickness: 2 ± 0. 2 mm
Filling Volume: Approx. 25 liters
Dimensions: 810 x l000 x 500 mm (H x L x W)
Available: Special

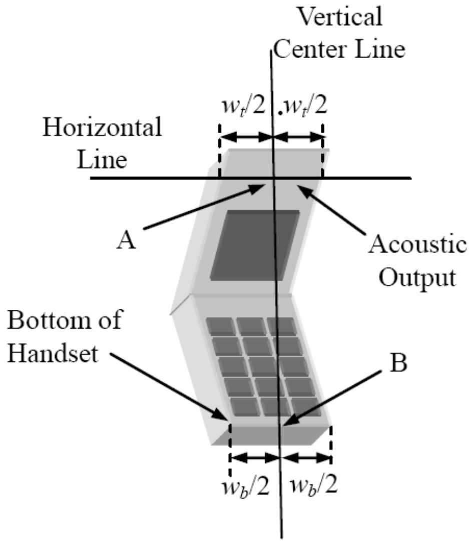
Picture C.9: SAM Twin Phantom

ANNEX D Position of the wireless device in relation to the phantom

D.1 General considerations

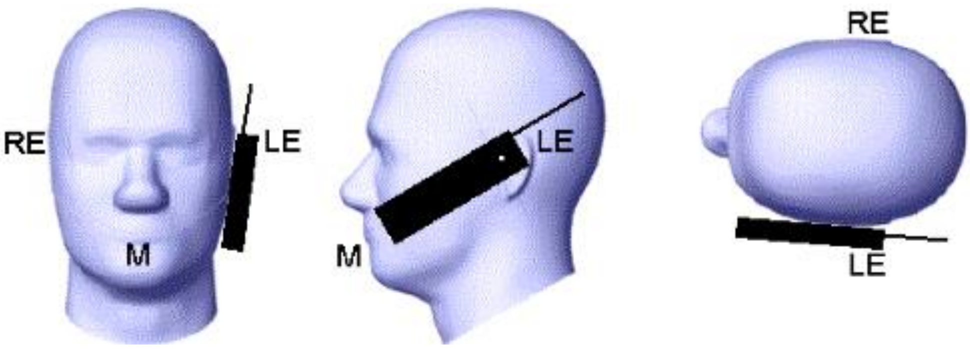
This standard specifies two handset test positions against the head phantom – the “cheek” position and the “tilt” position.



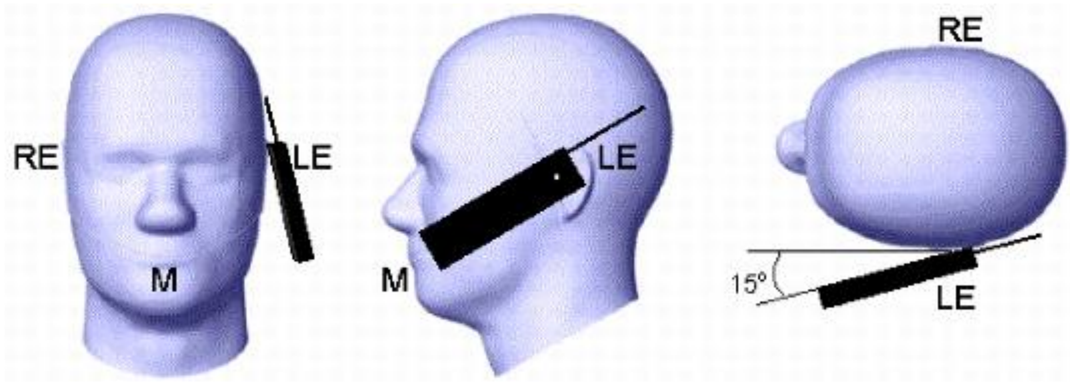


w_t	Width of the handset at the level of the acoustic
w_b	Width of the bottom of the handset
A	Midpoint of the width w_t of the handset at the level of the acoustic output
B	Midpoint of the width w_b of the bottom of the handset

Picture D.1-a Typical “fixed” case handset Picture D.1-b Typical “clam-shell” case handset



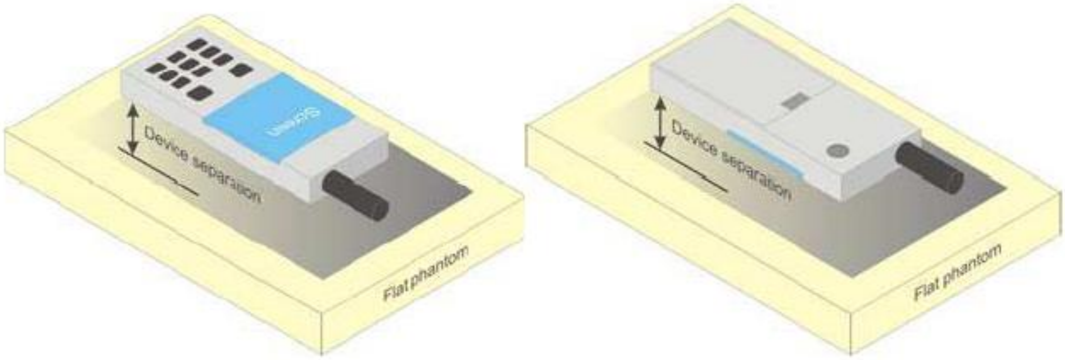
Picture D.2 Cheek position of the wireless device on the left side of SAM



Picture D.3 Tilt position of the wireless device on the left side of SAM

D.2 Body-worn device

A typical example of a body-worn device is a mobile phone, wireless enabled PDA or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer.

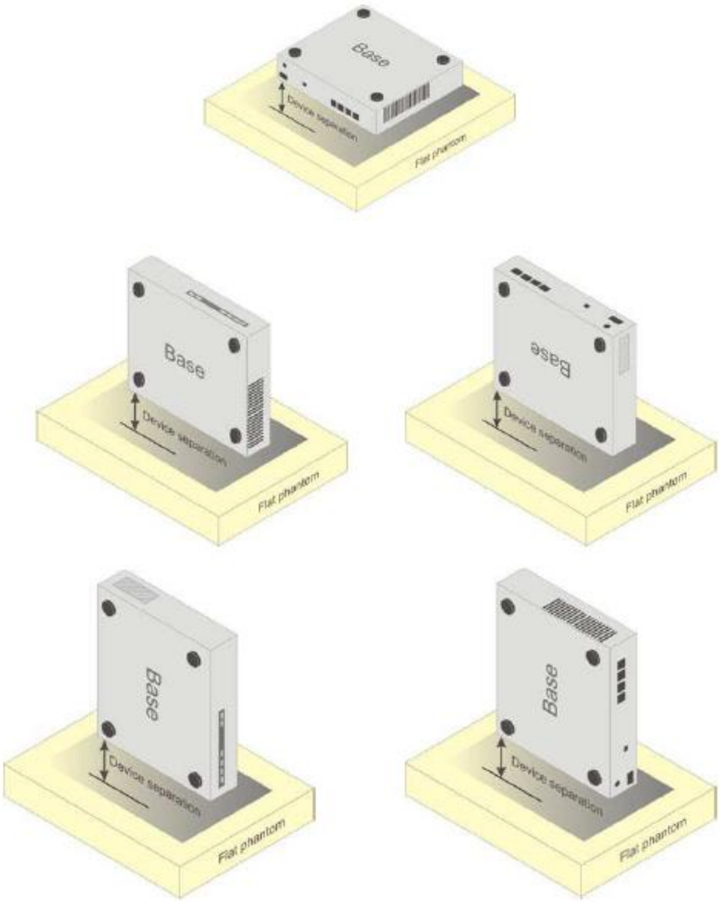


Picture D.4 Test positions for body-worn devices

D.3 Desktop device

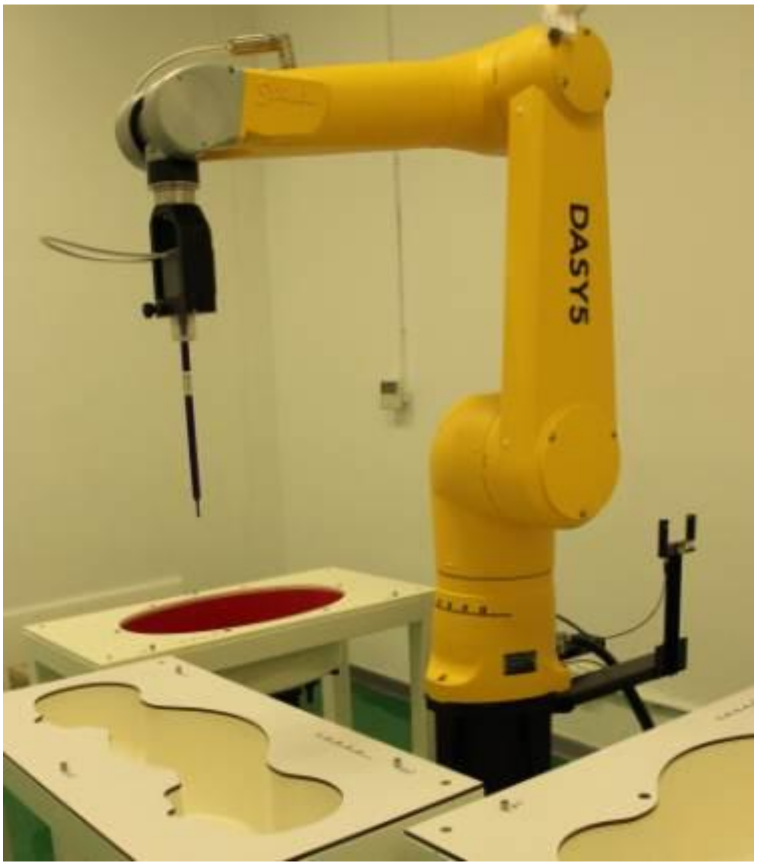
A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.

The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions, tests shall be performed for all antenna positions specified. Picture 8.5 show positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.



Picture D.5 Test positions for desktop devices

D.4 DUT Setup Photos



Picture D.6 DSY5 system Set-up

Note:

The photos of test sample and test positions show in additional document.

ANNEX E Equivalent Media Recipes

The liquid used for the frequency range of 800-3000 MHz consisted of water, sugar, salt, preventol, glycol monobutyl and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table E.1 shows the detail solution. It’s satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and IEC 62209.

Table E.1: Composition of the Tissue Equivalent Matter

Frequency (MHz)	835 Body	1900 Body
Ingredients (% by weight)		
Water	52.5	69.91
Sugar	45.0	\
Salt	1.4	0.13
Preventol	0.1	\
Cellulose	1.0	\
Glycol Monobutyl	\	29.96
Dielectric Parameters Target Value	ε=55.2 σ=0.97	ε=53.3 σ=1.52

ANNEX F System Validation

The SAR system must be validated against its performance specifications before it is deployed. When SAR probes, system components or software are changed, upgraded or recalibrated, these must be validated with the SAR system(s) that operates with such components.

Table F.1: System Validation

System No.	Probe SN.	Liquid name	Validation date	Frequency point	Status (OK or Not)
	3252	Head 835MHz	Aug 6,2013	835MHz	OK
	3252	Head 1900MHz	Aug 6,2013	1900MHz	OK
	3252	Body 835MHz	Aug 6,2013	835MHz	OK
	3252	Body 1900MHz	Aug 6,2013	1900MHz	OK

NOTE: The parameters of tissue simulating liquids can be found in chapter 7 of this test report.

ANNEX G Probe and DAE Calibration Certificate

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ilac-MRA CNAS 校准 CNAS L0442

Client : CATR-SH Certificate No:JZ13-2-2040

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1244
Calibration Procedure(s)	TMC-OS-E-01-198 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	July 9, 2013

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Documenting Process Calibrator 753	1971018	01-July-13 (TMC, No:JW13-049)	July-14

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	赵靖
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Xiao Li	Deputy Director of the laboratory	

Issued: July 24, 2013

This calibration certificate shall not be reproduced except in full without written approval of the laboratoty.

Certificate No: JZ13-2-2040 Page 1 of 3

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Glossary:

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	403.907 ± 0.15% (k=2)	403.655 ± 0.15% (k=2)	404.564 ± 0.15% (k=2)
Low Range	3.98600 ± 0.7% (k=2)	3.96971 ± 0.7% (k=2)	4.01324 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	46° ± 1 °

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CNAS L0442

Client CATR-SH Certificate No: J13-2-2042

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3252
Calibration Procedure(s)	TMC-OS-E-02-195 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	August 5, 2013

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Power sensor NRP-Z91	101547	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Power sensor NRP-Z91	101548	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Reference10dBAttenuator	BT0520	12-Dec-12(TMC,No.JZ12-867)	Dec-14
Reference20dBAttenuator	BT0267	12-Dec-12(TMC,No.JZ12-866)	Dec-14
Reference Probe EX3DV4	SN 3846	20-Dec-12(SPEAG,No.EX3-3846_Dec12)	Dec-13
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb -14
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-13 (TMC, No.JW13-045)	Jun-14
Network Analyzer E5071C	MY46110673	15-Feb-13 (TMC, No.JZ13-781)	Feb-14

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	赵菁
Reviewed by:	Qi Dianyuan	SAR Project Leader	[signature]
Approved by:	Xiao Li	Deputy Director of the laboratory	[signature]

Issued: August 7, 2013

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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Probe ES3DV3

SN: 3252

Calibrated: August 5, 2013

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: J13-2-2042 Page 3 of 11

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DASY – Parameters of Probe: ES3DV3 - SN: 3252

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)²) [A]	1.29	1.34	1.32	±10.8%
DCP(mV) [B]	103.4	104.6	102.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc [E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	207.8	±3.3%
		Y	0.0	0.0	1.0		209.7	
		Z	0.0	0.0	1.0		209.5	

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 5 and Page 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY – Parameters of Probe: ES3DV3 - SN: 3252

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
850	41.5	0.92	6.10	6.10	6.10	0.27	1.98	±12%
900	41.5	0.97	6.19	6.19	6.19	0.31	1.79	±12%
1750	40.1	1.37	5.58	5.58	5.58	0.37	1.87	±12%
1900	40.0	1.40	5.24	5.24	5.24	0.43	1.82	±12%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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DASY – Parameters of Probe: ES3DV3 - SN: 3252

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
850	55.2	0.99	6.14	6.14	6.14	0.40	1.69	±12%
900	55.0	1.05	6.11	6.11	6.11	0.39	1.60	±12%
1750	53.4	1.49	5.20	5.20	5.20	0.43	1.94	±12%
1900	53.3	1.52	5.03	5.03	5.03	0.46	1.85	±12%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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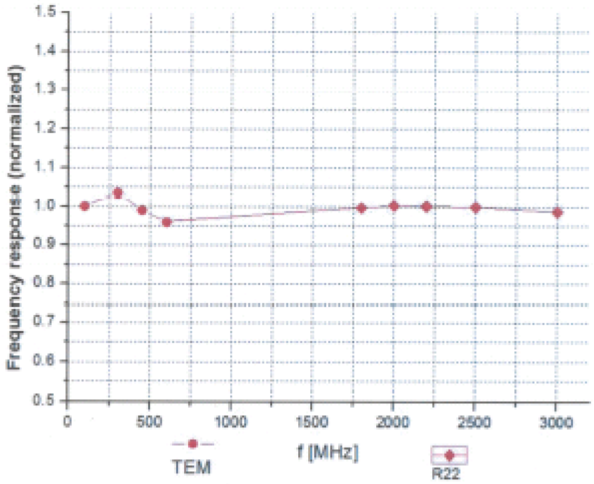
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.5% (k=2)

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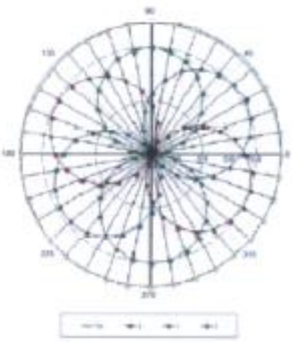
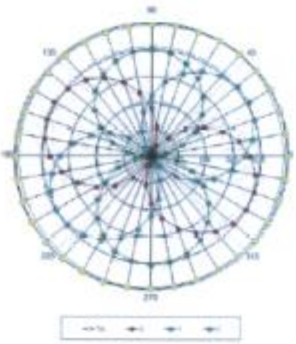
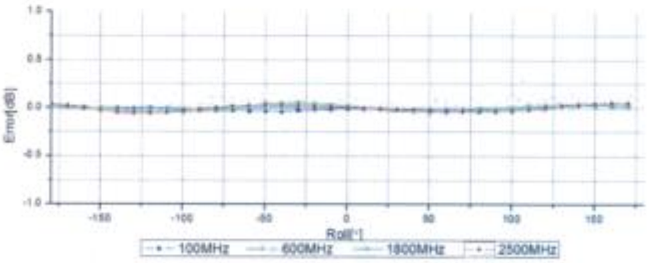
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±0.9% (k=2)

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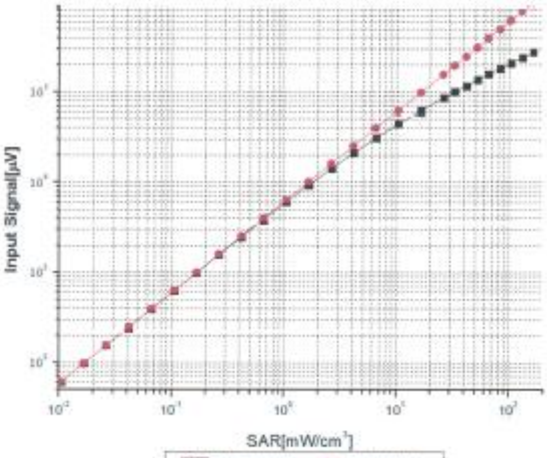
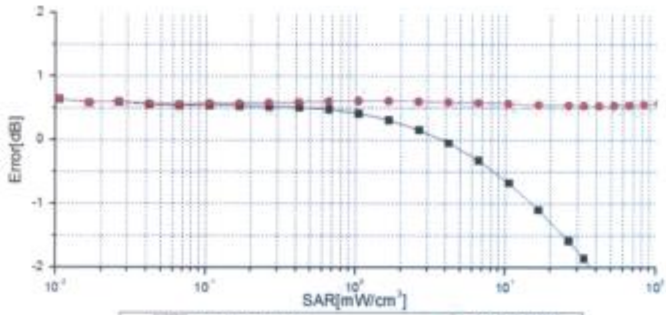
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (k=2)

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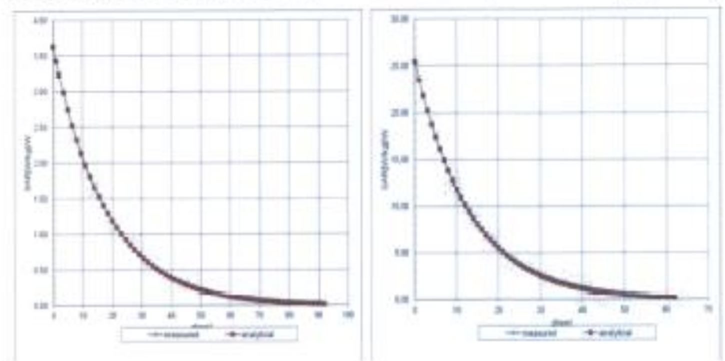
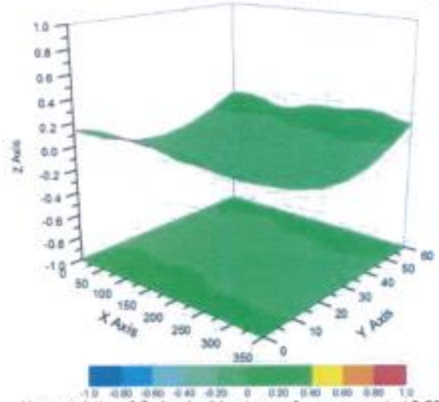
Conversion Factor Assessment



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

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DASY - Parameters of Probe: ES3DV3 - SN: 3252

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	129.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	4mm
Probe Tip to Sensor X Calibration Point	2mm
Probe Tip to Sensor Y Calibration Point	2mm
Probe Tip to Sensor Z Calibration Point	2mm
Recommended Measurement Distance from Surface	3mm

Certificate No: J13-2-2042 Page 11 of 11

ANNEX H Dipole Calibration Certificate

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CNAS L0442

Client CATR-SH Certificate No: J13-2-2035

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d134
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits
Calibration date:	July 12, 2013

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	11-Sep-12 (TMC, No.JZ12-443)	Sep-13
Power sensor NRV-Z5	100595	11-Sep-12 (TMC, No. JZ12-443)	Sep -13
Reference Probe EX3DV4	SN 3846	20- Dec-12 (SPEAG, No.EX3-3846_Dec12)	Dec-13
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb -14
Signal Generator E4438C	MY49070393	13-Nov-12 (TMC, No.JZ12-394)	Nov-13
Network Analyzer E8362B	MY43021135	19-Oct-12 (TMC, No.JZ13-278)	Oct-13

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	赵靖
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Xiao Li	Deputy Director of the laboratory	

Issued: July 26, 2013

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: info@emcite.com Http://www.emcite.com

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005

c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.7.1137
Extrapolation	Advanced Extrapolation	
Phantom	Twin Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.6 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	<0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.6 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**42.7 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.52 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**22.2 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.8 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	<0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**43.4 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**22.7 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.5Ω+0.78jΩ
Return Loss	- 26.8dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.9Ω+ 3.49jΩ
Return Loss	- 24.3dB

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	April 14, 2010

TMC In Collaboration with s p e a g CALIBRATION LABORATORY
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DASY5 Validation Report for Head TSL Date: 12.07.2013

Test Laboratory: TMC, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d134

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz; σ = 1.365 mho/m; εr = 38.576; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(8.01,8.01,8.01); Calibrated:20,12,2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: Flat Phantom; Type: QD000P40CC;
- Measurement SW: DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

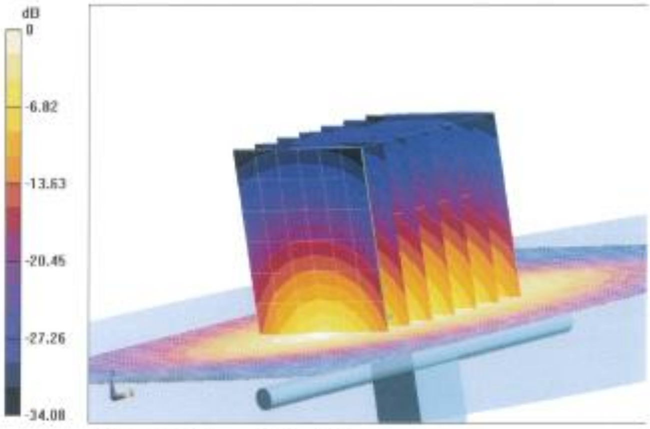
Dipole Calibration for Head Tissue/Pin=250mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.229 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 19.8 W/kg

SAR(1 g) = 10.6 W/kg; SAR(10 g) = 5.52 W/kg

Maximum value of SAR (measured) = 12.0 W/kg



0 dB = 12.3 W/kg = 10.91 dBW/kg

Certificate No: J13-2-2035 Page 5 of 8

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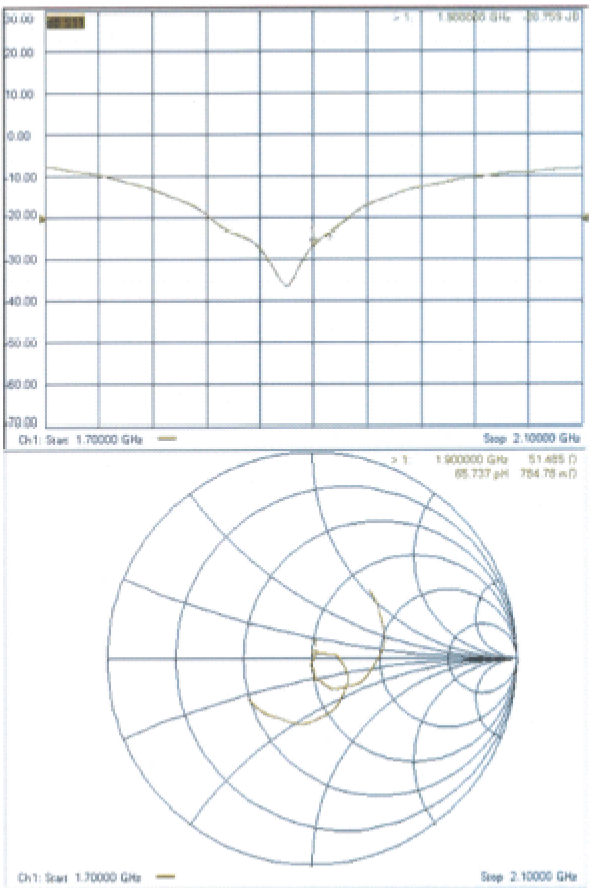
Impedance Measurement Plot for Head TSL



In Collaboration with speag CALIBRATION LABORATORY
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E-mail: Info@emcite.com Http://www.emcite.com

DASY5 Validation Report for Body TSL Date: 12.07.2013

Test Laboratory: TMC, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d134

Communication System: CW; Frequency: 1900 MHz;

Medium parameters used: f = 1900 MHz; σ = 1.502 mho/m; εr = 50.787; ρ = 1000 kg/m^3

Phantom section: Flat Phantom

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.37,7.37,7.37) ; Calibrated:20.12.2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: Flat Phantom; Type: QD000P40CC
- Measurement SW: DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

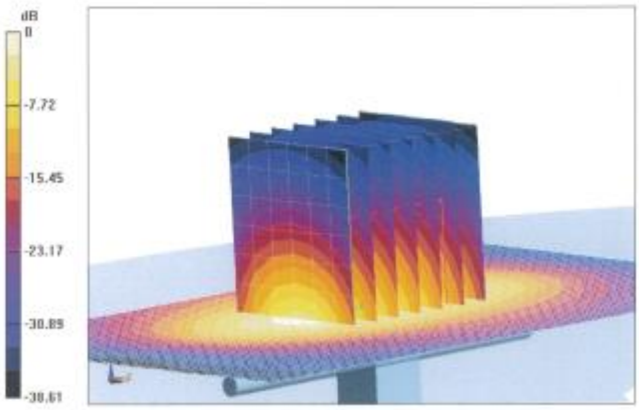
Dipole Calibration for Body Tissue/Pin=250mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 74.485 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 19.8 W/kg

SAR(1 g) = 10.9 W/kg; SAR(10 g) = 5.7 W/kg

Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.4 W/kg = 10.95 dBW/kg

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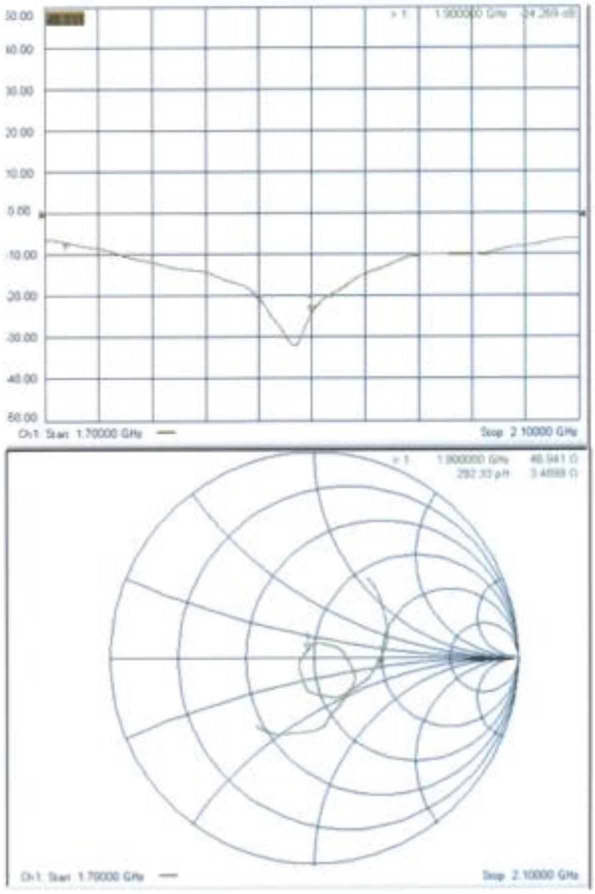
Impedance Measurement Plot for Body TSL



Acceptable Conditions for SAR Measurements Using Probes and Dipoles Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to Support FCC Equipment Certification

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MIIT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
   a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
      i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
      ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
   b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
   c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
   d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
   e) The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC.
   f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.

3) The SPEAG-TMC agreement includes specific protocols identified in the following to ensure the quality of calibration services provided by TMC under this SPEAG-TMC Dual-Logo calibration agreement are equivalent to the calibration services provided by SPEAG. TMC shall, upon request, provide copies of documentation to the FCC to substantiate program implementation.
   a) The Inter-laboratory Calibration Evaluation (ILCE) stated in the TMC QA protocol shall be performed between SPEAG and TMC at least once every 12 months. The ILCE acceptance criteria defined in the TMC QA protocol shall be satisfied for the TMC, SPEAG and FCC agreements to remain valid.
   b) Check of Calibration Certificate (CCC) shall be performed by SPEAG for all calibrations performed by TMC. Written confirmation from SPEAG is required for TMC to issue calibration certificates under the SPEAG-TMC Dual-Logo calibration program. Quarterly reports for all calibrations performed by TMC under the program are also issued by SPEAG.
   c) The calibration equipment and measurement system used by TMC shall be verified before each calibration service according to the specific reference SAR probes, dipoles, and DAE calibrated by SPEAG. The results shall be reproducible and within the defined acceptance criteria specified in the TMC QA protocol before each actual calibration can commence. TMC shall maintain records of the measurement and calibration system verification results for all calibrations.
   d) Quality Check of Calibration (QCC) certificates shall be performed by SPEAG at least once every 12 months. SPEAG shall visit TMC facilities to verify the laboratory, equipment, applied procedures and plausibility of randomly selected certificates.
4) A copy of this document, to be updated annually, shall be provided to TMC clients that accept calibration services according to the SPEAG-TMC Dual-Logo calibration program, which should be presented to a TCB (*Telecommunication Certification Body*), to facilitate FCC equipment approval.
5) TMC shall address any questions raised by its clients or TCBs relating to the SPEAG-TMC Dual-Logo calibration program and inform the FCC and SPEAG of any critical issues.

Change Note: Revised on June 26 to clarify the applicability of PMR and Bundled probe calibrations according to the requirements of KDB 865664.

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client Auden

Certificate No: **D835V2-4d092_Jun13**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d092
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	June 17, 2013

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 17, 2013

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.5 ± 6 %	0.94 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.51 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.18 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.6 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.37 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.27 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.56 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.14 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.4 Ω - 1.1 jΩ
Return Loss	- 31.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.9 Ω - 3.1 jΩ
Return Loss	- 28.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.385 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 15, 2009

DASY5 Validation Report for Head TSL

Date: 13.06.2013

Test Laboratory: Industry Canada - Certification & Engineering Bureau

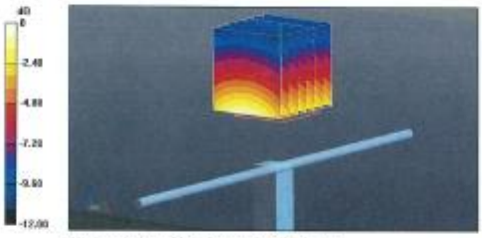
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d092

Communication System: UID 0 - CW ; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 40.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

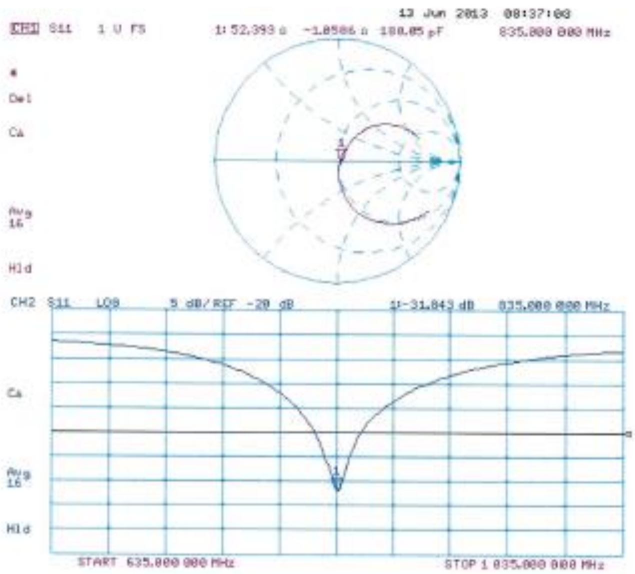
- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.874 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.75 W/kg
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 2.89 W/kg



0 dB = 2.89 W/kg = 4.61 dBW/kg

Impedance Measurement Plot for Head TSL



Certificate No: D835V2-4d092_Jun13 Page 6 of 8

DASY5 Validation Report for Body TSL

Date: 17.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

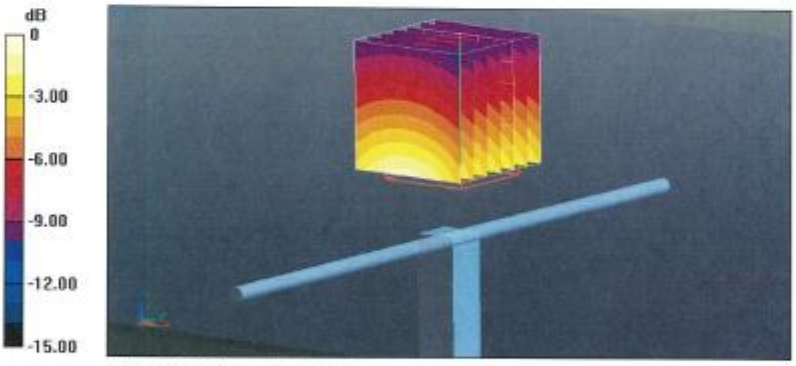
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d092

Communication System: UID 0 - CW ; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

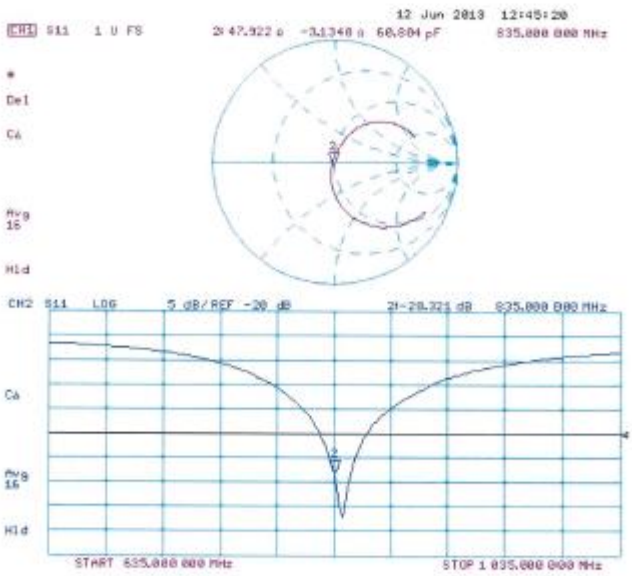
- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm 2/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.483 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.47 W/kg
SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.56 W/kg
Maximum value of SAR (measured) = 2.76 W/kg



0 dB = 2.76 W/kg = 4.41 dBW/kg

Impedance Measurement Plot for Body TSL



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The end of report