



# OET 65

# TEST REPORT

<b>Product Name</b>	Vodafone Mobile Wi-Fi
<b>Model</b>	R205
<b>FCC ID</b>	QISR205
<b>Client</b>	Huawei Technologies Co., Ltd.

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**GENERAL SUMMARY**

<b>Product Name</b>	Vodafone Mobile Wi-Fi	<b>Model</b>	R205
<b>FCC ID</b>	QISR205		
<b>Report No.</b>	RZA1112-2004SAR01		
<b>Client</b>	Huawei Technologies Co., Ltd.		
<b>Manufacturer</b>	Huawei Technologies Co., Ltd.		
<b>Reference Standard(s)</b>	<p><b>IEEE Std C95.1, 1999:</b> IEEE Standard for Safety Levels with Respect to Human Exposure to Radiofrequency Electromagnetic Fields, 3 kHz to 300 GHz.</p> <p><b>SUPPLEMENT C Edition 01-01 to OET BULLETIN 65 Edition 97-01 June 2001 including DA 02-1438, published June 2002:</b> Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields Additional Information for Evaluation Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions.</p> <p><b>RSS-102 Issue 4 March 2010:</b> Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)</p> <p><b>941225 D01 3G device :</b> SAR Measurement Procedures for 3G Devices—CDMA 2000 / Ev-Do — WCDMA / HSDPA / HSPA</p> <p><b>KDB 941225 D06 Hot Spot SAR v01</b> SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities</p>		
<b>Conclusion</b>	<p>This portable wireless equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 7 of this test report are below limits specified in the relevant standards.</p> <p>General Judgment: <b>Pass</b></p> <p style="text-align: right;">(Stamp) Date of issue: December 9<sup>th</sup>, 2011</p>		
<b>Comment</b>	The test result only responds to the measured sample.		

Approved by 初伟中

Director

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## 1. General Information

### 1.1. Notes of the Test Report

**TA Technology (Shanghai) Co., Ltd.** guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

**TA Technology (Shanghai) Co., Ltd.** is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. This report only refers to the item that has undergone the test.

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If the electrical report is inconsistent with the printed one, it should be subject to the latter.

### 1.2. Testing Laboratory

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**1.3. Applicant Information**

Company: Huawei Technologies Co., Ltd.  
Address: Bantian, Longgang District  
City: Shenzhen  
Postal Code: 518129  
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**1.4. Manufacturer Information**

Company: Huawei Technologies Co., Ltd.  
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### 1.5. Information of EUT

#### General Information

Device Type :	Portable Device		
Exposure Category:	Uncontrolled Environment / General Population		
State of Sample:	Prototype Unit		
Name of EUT:	Vodafone Mobile Wi-Fi		
IMEI:	860123010019015		
Hardware Version:	CH1E586E		
Software Version:	21.341.00.04.11		
Antenna Type:	Internal Antenna		
Device Operating Configurations :			
Supporting Mode(s):	GSM850/GSM1900/WCDMA Band V; (tested) GSM900/GSM1800/ WCDMA Band I/WCDMA Band VIII; (untested) WiFi(802.11b/g/n HT20); (untested)		
Test Modulation:	(GSM)GMSK; (WCDMA)QPSK		
Device Class:	B		
HSDPA UE Category:	14		
HSUPA UE Category:	6		
GPRS Multislot Class(12):	Max Number of Timeslots in Uplink	4	
	Max Number of Timeslots in Downlink	4	
	Max Total Timeslot	5	
EGPRS Multislot Class(12):	Max Number of Timeslots in Uplink	4	
	Max Number of Timeslots in Downlink	4	
	Max Total Timeslot	5	
Power Class:	GSM 850: 4, tested with power level 5		
	GSM 1900: 1, tested with power level 0		
	WCDMA Band V: 3, tested with power control all up bits		
Test Channel: (Low - Middle - High)	128 -190 - 251 (GSM 850) (tested) 512 - 661 - 810 (GSM 1900) (tested) 4132 - 4183 - 4233 (WCDMA Band V) (tested)		
Operating Frequency Range(s):	Mode	Tx (MHz)	Rx (MHz)
	GSM 850	824.2 ~ 848.8	869.2 ~ 893.8
	GSM 1900	1850.2 ~ 1909.8	1930.2 ~ 1989.8
	WCDMA Band V	826.4 ~ 846.6	871.4 ~ 891.6

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### Auxiliary Equipment Details

#### **AE:Battery**

Model: HB4F1  
Manufacturer: Huawei Technologies Co., Ltd.  
S/N: SGCB317HI1238756

Equipment Under Test (EUT) is a model of Vodafone Mobile Wi-Fi. The EUT has a GSM/WCDMA antenna that is used for Tx/Rx, and the other is Wifi antenna that can be used for Tx/Rx. It also has a diversity antenna that is only used for Rx. It has Personal Wireless Routers (hot spots) function. The detail about EUT and Lithium Battery is in chapter 1.5 in this report. SAR is tested for the EUT respectively for GSM 850, GSM 1900 and WCDMA Band V.

The sample undergoing test was selected by the Client.

Components list please refer to documents of the manufacturer.

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**1.6. The Maximum SAR<sub>1g</sub> Values**

**Body SAR Configuration**

Mode	Channel	Position	Distance(mm)	SAR <sub>1g</sub> (W/kg)
2Txslots EGPRS 850	High/251	Back Side	10	<b>1.030</b>
2Txslots EGPRS 1900	Middle/661	Back Side	10	<b>0.475</b>
WCDMA Band V	Middle/4183	Front Side	10	<b>0.618</b>

**Extrapolated SAR Values of the highest measured SAR**

Mode	Test Position	Channel	Measurement Result		Tune-up procedures MAX Power(dBm)	1g Average Limit 1.6 W/kg
			Conducted Power(dBm)	1g Average (W/kg)		Extrapolated Result (W/kg)
2Txslots GPRS 850	Test Position 1	High/251	30.84	0.988	32.5	1.448
2Txslots EGPRS 850	Test Position 1	High/251	30.86	1.030	32.5	1.503
2Txslots GPRS 1900	Test Position 1	Middle/661	28.03	0.457	29.5	0.641
2Txslots EGPRS 1900	Test Position 1	Middle/661	28.06	0.475	29.5	0.662
WCDMA Band V	Test Position 2	Middle/4183	22.18	0.618	23.7	0.877

**1.7. Test Date**

The test is performed from December 8, 2011 to December 9, 2011.

## 2. Operational Conditions during Test

### 2.1. General Description of Test Procedures

Connection to the EUT is established via air interface with E5515C, and the EUT is set to maximum output power by E5515C. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. The antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30 dB.

### 2.2. GSM Test Configuration

For the body SAR tests for GSM 850 and GSM 1900, a communication link is set up with a System Simulator (SS) by air link. The EUT is commanded to operate at maximum transmitting power. Using E5515C the power lever is set to "5" for GSM 850, set to "0" for GSM 1900.

Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. Since the EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5.

When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

Output power of reductions:

#### **GSM 850**

GPRS (GMSK) :

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	2
3	4
4	6

EGPRS(8PSK):

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	2
3	3
4	4

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EGPRS(GMSK):

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	2
3	4
4	6

**GSM 1900**

GPRS (GMSK) :

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	2
3	4
4	6

EGPRS(8PSK):

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	2
3	3
4	5

EGPRS (GMSK):

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	2
3	4
4	6

### 2.3. WCDMA Test Configuration

As the SAR body test for WCDMA Band V, we established the radio link through call processing. The maximum output power were verified on high, middle and low channels for each test band according to 3GPP TS 34.121 with the following configuration:

- 1) 12.2kbps RMC, 64,144,384 kbps RMC with TPC set to all "all '1's"
- 2) Test loop Mode 1

For the output power, the configurations for the DPCCH and DPDCH<sub>1</sub> are as followed (EUT do not support the DPDCH<sub>2-n</sub>)

**Table 1: The configurations for the DPCCH and DPDCH<sub>1</sub>**

	Channel Bit Rate(kbps)	Channel Symbol Rate(kcps)	Spreading Factor	Spreading Code Number	Bits/Slot
DPCCH	15	15	256	0	10
DPDCH <sub>1</sub>	15	15	256	64	10
	30	30	128	32	20
	60	60	64	16	40
	120	120	32	8	80
	240	240	16	4	160
	480	480	8	2	320
	960	960	4	1	640

SAR is tested with 12.2kps RMC and not required for other spreading codes (64,144, and 384 kbps RMC) and multiple DPDCH<sub>n</sub>, because the maximum output power for each of these other configurations<0.25dB higher than 12.2kbps RMC and the multiple DPDCH<sub>n</sub> is not applicable for the EUT.

### 2.4. HSDPA Test Configuration

SAR for body exposure configurations is measured according to the "Body SAR Measurements" procedures of 3G device. In addition, body SAR is also measured for HSDPA when the maximum average output of each RF channel with HSDPA active is at least 1/4 dB higher than that measured without HSDPA using 12.2kbps RMC or the maximum SAR 12.2kbps RMC is above 75% of the SAR limit. Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA.

HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission condition, QPSK is used in the H-set for SAR testing. HS-DPCCH should be

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configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors( $\beta_c, \beta_d$ ), and HS-DPCCH power offset parameters( $\Delta_{ACK}$ ,  $\Delta_{NACK}$ ,  $\Delta_{CQI}$ ) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

**Table 2: Subtests for UMTS Release 5 HSDPA**

Sub-set	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	$\beta_{hs}$ (note 1, note 2)	CM(dB) (note 3)	MPR(dB)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (note 4)	15/15 (note 4)	64	12/15 (note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note1:  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$

Note2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1.A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA,  $\Delta_{ACK}$  and  $\Delta_{NACK} = 8$  ( $A_{hs} = 30/15$ ) with  $\beta_{hs} = 30/15 * \beta_c$ , and  $\Delta_{CQI} = 7$  ( $A_{hs} = 24/15$ ) with  $\beta_{hs} = 24/15 * \beta_c$ .

Note3: CM=1 for  $\beta_c/\beta_d = 12/15$ ,  $\beta_{hs}/\beta_c = 24/15$ . For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the  $\beta_c/\beta_d$  ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TFC1, TF1) to  $\beta_c = 11/15$  and  $\beta_d = 15/15$ .

**Table 3: Settings of required H-Set 1 QPSK in HSDPA mode**

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	534
Inter-TTI Distance	TTI's	3
Number of HARQ Processes	Processes	2
Information Bit Payload ( $N_{INF}$ )	Bits	3202
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	4800
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	9600
Coding Rate	/	0.67
Number of Physical Channel Codes	Codes	5
Modulation	/	QPSK

**Table 4: HSDPA UE category**

<b>HS-DSCH Category</b>	<b>Maximum HS-DSCH Codes Received</b>	<b>Minimum Inter-TTI Interval</b>	<b>Maximum Transport Bits/HS-DSCH</b>	<b>Total Channel</b>
1	5	3	7298	19200
2	5	3	7298	28800
3	5	2	7298	28800
4	5	2	7298	38400
5	5	1	7298	57600
6	5	1	7298	67200
7	10	1	14411	115200
8	10	1	14411	134400
9	15	1	25251	172800
10	15	1	27952	172800
11	5	2	3630	14400
12	5	1	3630	28800
13	15	1	34800	259200
14	15	1	42196	259200
15	15	1	23370	345600
16	15	1	27952	345600

## 2.5. HSUPA Test Configuration

Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.2 kbps RMC without HSPA.<sup>40</sup>

Due to inner loop power control requirements in HSPA, a commercial communication test set should be used for the output power and SAR tests.<sup>41</sup> The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA should be configured according to the β values indicated below as well as other applicable procedures described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Devices' sections of 3 G device.

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**Table 5: Sub-Test 5 Setup for Release 6 HSUPA**

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	$\beta_{HS}$ (Note 1)	$\beta_{ec}$	$\beta_{ed}$ (Note 4) (Note 5)	$\beta_{ed}$ (SF)	$\beta_{ed}$ (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E- TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/25	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}$ : 47/15 $\beta_{ed2}$ : 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

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

**Table 6: HSUPA UE category**

E-DCH category	Maximum number of E-DCH codes transmitted per transport block	Minimum spreading factor	Support for 10 and 2 ms TTI EDCH	Maximum number of bits of an E-DCH transport block transmitted within a 10 ms E-DCH TTI	Maximum number of bits of an E-DCH transport block transmitted within a 2 ms E-DCH TTI
Category 1	1	SF4	10 ms TTI only	7110	-
Category 2	2	SF4	10 ms and 2 ms TTI	14484	2798
Category 3	2	SF4	10 ms TTI only	14484	-
Category 4	2	SF2	10 ms and 2 ms TTI	20000	5772
Category 5	2	SF2	10 ms TTI only	20000	-
Category 6	4	SF2	10 ms and 2 ms TTI	20000	11484
Category 7	4	SF2	10ms and 2 ms TTI	20000	22996
Category 8	4	SF2	2 ms TTI	-	11484
Category 9	4	SF2	2 ms TTI	-	22996

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4

## **2.6. Test Positions of Portable Devices**

For each channel, the EUT is tested at the following 6 test positions:

- Test Position 1: The back side of the EUT is towards the bottom of the flat phantom. The distance between them is 10mm. (ANNEX I Picture 5)
  
- Test Position 2: The front side of the EUT is towards the bottom of the flat phantom. The distance between them is 10mm. (ANNEX I Picture 6)
  
- Test Position 3: The bottom side of the EUT is towards the bottom of the flat phantom. SAR is not required for Test Position 3. Based upon KDB941225 D06, when the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested. (ANNEX I Picture 7)
  
- Test Position 4: The top side of the EUT is towards the bottom of the flat phantom. The distance between them is 10mm. (ANNEX I Picture 8)
  
- Test Position 5: The left side of the EUT is towards the bottom of the flat phantom. The distance between them is 10mm. (ANNEX I Picture 9)
  
- Test Position 6: The right side of the EUT is towards the bottom of the flat phantom. The distance between them is 10mm. (ANNEX I Picture 10)

### 3. SAR Measurements System Configuration

#### 3.1. SAR Measurement Set-up

The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronic (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.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY4 measurement server.
- The DASY4 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003
- DASY4 software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.

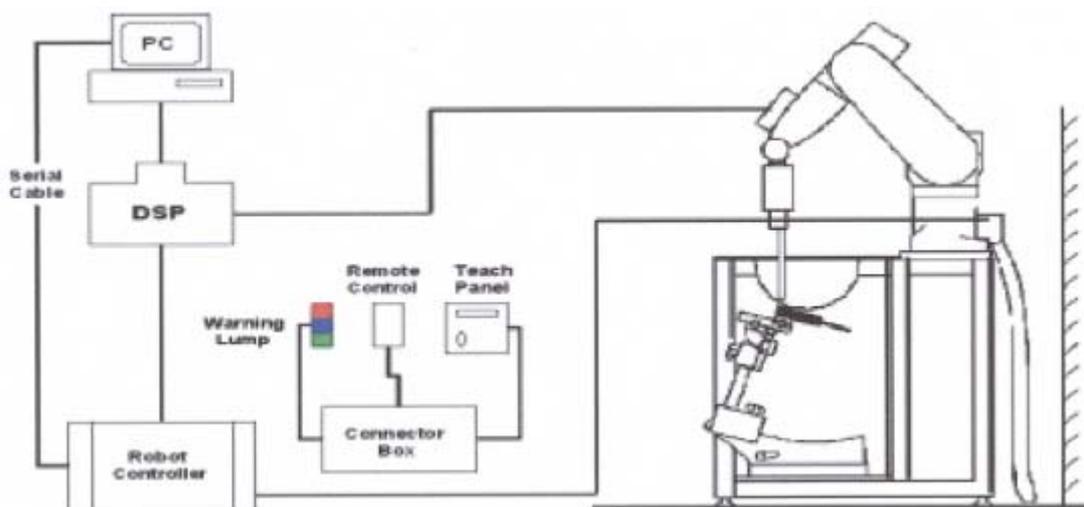


Figure 1. SAR Lab Test Measurement Set-up

### 3.2. DASY4 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

#### 3.2.1. EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)
Directivity	$\pm 0.3$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 $\mu$ W/g to > 100 mW/g Linearity: $\pm 0.2$ dB (noise: typically < 1 $\mu$ W/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



Figure 2. EX3DV4 E-field Probe



Figure 3. EX3DV4 E-field probe

### **3.2.2. E-field Probe Calibration**

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than  $\pm 10\%$ . The spherical isotropy was evaluated and found to be better than  $\pm 0.25\text{dB}$ . The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide 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.

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

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

Where:  $\Delta t$  = Exposure time (30 seconds),  
C = Heat capacity of tissue (brain or muscle),  
 $\Delta T$  = Temperature increase due to RF exposure.  
Or

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

Where:  
 $\sigma$  = Simulated tissue conductivity,  
 $\rho$  = Tissue density (kg/m<sup>3</sup>).

### **3.3. Other Test Equipment**

#### **3.3.1. Device Holder for Transmitters**

**Construction:** Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.) It is lightweight and 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, ELI4 and SAM v6.0 Phantoms.

**Material:** POM, Acrylic glass, Foam

### 3.3.2. Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden Figure. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. 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.

Shell Thickness	2±0.1 mm
Filling Volume	Approx. 20 liters
Dimensions	810 x 1000 x 500 mm (H x L x W)
Available	Special



**Figure 4. Generic Twin Phantom**

### 3.4. Scanning Procedure

The DASY4 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max.  $\pm 5\%$ .
- The “surface check” measurement tests the optical surface detection system of the DASY4 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above  $\pm 0.1\text{mm}$ ). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within  $\pm 30^\circ$ .)

- Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing of 10 mm x 10 mm is set. During the scan the distance of the probe to the phantom remains

unchanged.

After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

- **Zoom Scan**

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

- **Spatial Peak Detection**

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY4 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space.

They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

### **3.5. Data Storage and Evaluation**

#### **3.5.1. Data Storage**

The DASY4 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension “.DA4”. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm<sup>2</sup>], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

#### **3.5.2. Data Evaluation by SEMCAD**

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

Probe parameters:	- Sensitivity	Normi, a <sub>i0</sub> , a <sub>i1</sub> , a <sub>i2</sub>
	- Conversion factor	ConvF <sub>i</sub>
	- Diode compression point	Dcp <sub>i</sub>
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	
	- Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY4 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

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If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot c f / d c p_i$$

With  $V_i$  = compensated signal of channel i (i = x, y, z)

$U_i$  = input signal of channel i (i = x, y, z)

$cf$  = crest factor of exciting field (DASY parameter)

$dcp_i$  = diode compression point (DASY parameter)

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

E-field probes:  $E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$

H-field probes:  $H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$

With  $V_i$  = compensated signal of channel i (i = x, y, z)

$Norm_i$  = sensor sensitivity of channel i (i = x, y, z)  
[mV/(V/m)<sup>2</sup>] for E-field Probes

$ConvF$  = sensitivity enhancement in solution

$a_{ij}$  = sensor sensitivity factors for H-field probes

$f$  = carrier frequency [GHz]

$E_i$  = electric field strength of channel i in V/m

$H_i$  = magnetic field strength of channel i in A/m

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

$$E_{tot} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

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

$$SAR = (E_{tot}^2 \cdot \rho) / (m \cdot 1000)$$

with  $SAR$  = local specific absorption rate in mW/g

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**$E_{tot}$**  = total field strength in V/m

$\sigma$  = conductivity in [mho/m] or [Siemens/m]

$\rho$  = equivalent tissue density in g/cm<sup>3</sup>

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with  $P_{pwe}$  = equivalent power density of a plane wave in mW/cm<sup>2</sup>

**$E_{tot}$**  = total electric field strength in V/m

**$H_{tot}$**  = total magnetic field strength in A/m

### 3.6. System Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the table 11.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system ( $\pm 10\%$ ).

System check is performed regularly on all frequency bands where tests are performed with the DASY4 system.

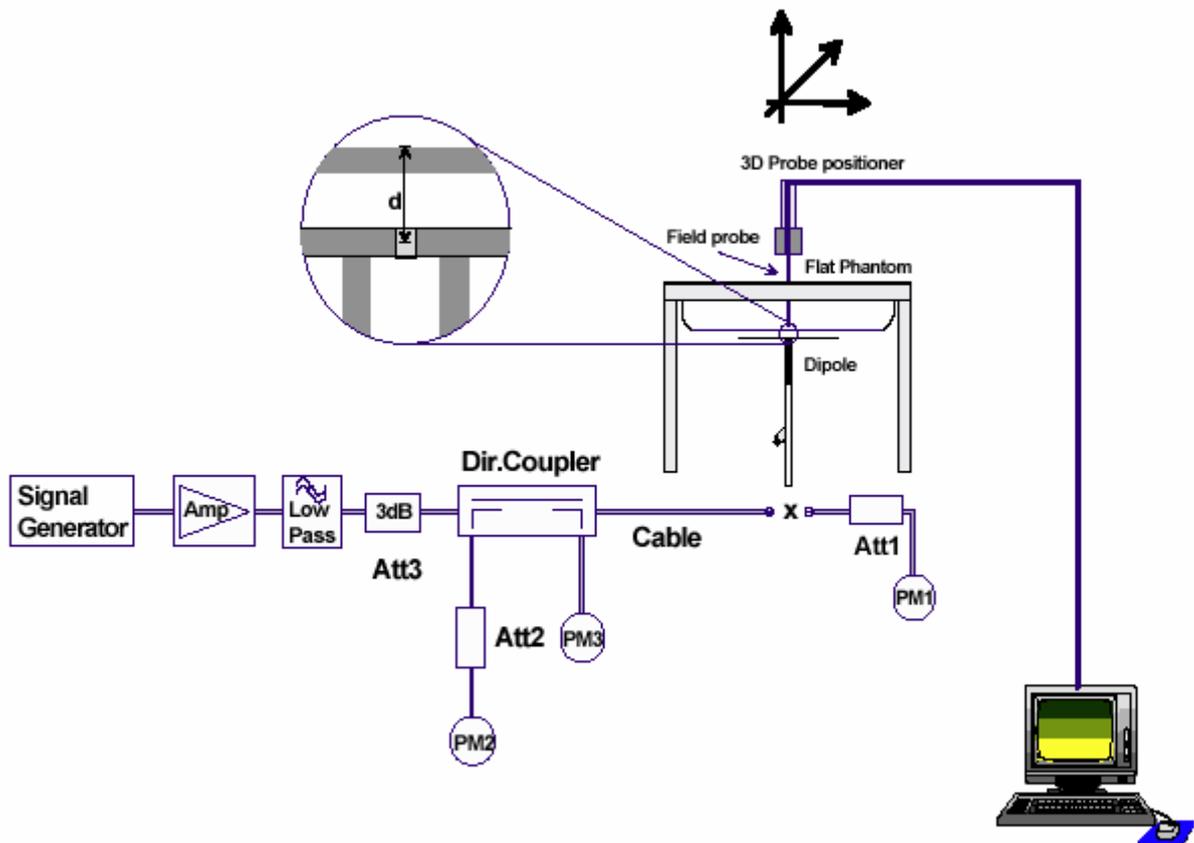


Figure 5. System Check Set-up

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**3.7. Equivalent Tissues**

The liquid is consisted of water, sugar, salt, Glycol monobutyl, Preventol and Cellulose. The liquid has previously been proven to be suited for worst-case. The Table 7 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the OET 65.

**Table 7: Composition of the Body Tissue Equivalent Matter**

MIXTURE%	FREQUENCY(Body) 835MHz		
Water	52.5		
Sugar	45		
Salt	1.4		
Preventol	0.1		
Cellulose	1.0		
Dielectric Parameters Target Value	f=835MHz	$\epsilon=55.2$	$\sigma=0.97$

MIXTURE%	FREQUENCY (Body) 1900MHz		
Water	69.91		
Glycol monobutyl	29.96		
Salt	0.13		
Dielectric Parameters Target Value	f=1900MHz	$\epsilon=53.3$	$\sigma=1.52$

## 4. Environmental Requirements

**Table 8: The Requirements of the Ambient Conditions**

Temperature	Min. = 20°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 $\Omega$
Ambient noise is checked and found very low and in compliance with requirement of standards.	
Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

## 5. Characteristics of the Test

### 5.1. Applicable Limit Regulations

**IEEE Std C95.1, 1999:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radiofrequency Electromagnetic Fields, 3 kHz to 300 GHz.

### 5.2. Applicable Measurement Standards

**SUPPLEMENT C Edition 01-01 to OET BULLETIN 65 Edition 97-01 June 2001 including DA 02-1438, published June 2002:** Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields Additional Information for Evaluation Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions.

**941225 D01 3G device :** SAR Measurement Procedures for 3G Devices— CDMA 2000 / Ev-Do — WCDMA / HSDPA / HSPA.

**KDB 941225 D06 Hot Spot SAR v01** SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

**RSS-102 Issue 4 March 2010:** Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

## 6. Conducted Output Power Measurement

### 6.1. Summary

The DUT is tested using an E5515C communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted power. Conducted output power was measured using an integrated RF connector and attached RF cable. This result contains conducted output power for the EUT.

### 6.2. Conducted Power Results

**Table 9: Conducted Power Measurement Results**

GSM 850		Burst Conducted Power(dBm)				Average power(dBm)		
		Channel 128	Channel 190	Channel 251		Channel 128	Channel 190	Channel 251
<b>GPRS (GMSK)</b>	1TXslot	32.32	32.29	32.38	-9.03dB	23.29	23.26	23.35
	2TXslots	30.83	30.77	30.84	-6.02dB	<b>24.81</b>	<b>24.75</b>	<b>24.82</b>
	3TXslots	28.85	28.81	28.83	-4.26dB	24.59	24.55	24.57
	4TXslots	26.88	26.85	26.91	-3.01dB	23.87	23.84	23.90
<b>EGPRS (GMSK)</b>	1TXslot	32.33	32.27	32.35	-9.03dB	23.3	23.24	23.32
	2TXslots	30.85	30.79	30.86	-6.02dB	<b>24.83</b>	<b>24.77</b>	<b>24.84</b>
	3TXslots	28.83	28.84	28.87	-4.26dB	24.57	24.58	24.61
	4TXslots	26.91	26.88	26.93	-3.01dB	23.9	23.87	23.92
<b>EGPRS (8PSK)</b>	1TXslot	25.12	25.22	25.31	-9.03dB	16.09	16.19	16.28
	2TXslots	24.62	24.75	24.77	-6.02dB	<b>18.6</b>	<b>18.73</b>	<b>18.75</b>
	3TXslots	22.49	22.61	22.57	-4.26dB	18.23	18.35	18.31
	4TXslots	20.35	20.51	20.52	-3.01dB	17.34	17.5	17.51
GSM 1900		Burst Conducted Power(dBm)				Average power(dBm)		
		Channel 512	Channel 661	Channel 810		Channel 512	Channel 661	Channel 810
<b>GPRS (GMSK)</b>	1TXslot	29.63	29.57	29.35	-9.03dB	20.60	20.54	20.32
	2TXslots	28.08	28.03	27.96	-6.02dB	<b>22.06</b>	<b>22.01</b>	<b>21.94</b>
	3TXslots	26.14	26.11	25.99	-4.26dB	21.88	21.85	21.73
	4TXslots	24.18	24.12	24.03	-3.01dB	21.17	21.11	21.02
<b>EGPRS (GMSK)</b>	1TXslot	29.61	29.58	29.37	-9.03dB	20.58	20.55	20.34
	2TXslots	28.05	28.06	27.98	-6.02dB	<b>22.03</b>	<b>22.04</b>	<b>21.96</b>
	3TXslots	26.12	26.13	25.95	-4.26dB	21.86	21.87	21.69
	4TXslots	24.14	24.16	24.02	-3.01dB	21.13	21.15	21.01
<b>EGPRS (8PSK)</b>	1TXslot	24.87	24.75	24.55	-9.03dB	15.84	15.72	15.52
	2TXslots	24.16	24.07	23.78	-6.02dB	<b>18.14</b>	<b>18.05</b>	<b>17.76</b>
	3TXslots	21.85	21.79	21.52	-4.26dB	17.59	17.53	17.26
	4TXslots	19.72	19.51	19.19	-3.01dB	16.71	16.50	16.18

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Note:

1) Division Factors

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

- 1 TX- slot = 1 transmit time slot out of 8 time slots  
=> conducted power divided by (8/1) => -9.03 dB
- 2 TX- slots = 2 transmit time slots out of 8 time slots  
=> conducted power divided by (8/2) => -6.02 dB
- 3TX- slots = 3 transmit time slots out of 8 time slots  
=> conducted power divided by (8/3) => -4.26 dB
- 4 TX- slots = 4 transmit time slots out of 8 time slots  
=> conducted power divided by (8/4) => -3.01 dB

2) Average power numbers

The maximum power numbers are marks in bold.

WCDMA Band V		Conducted Power (dBm)		
		Channel 4132	Channel 4183	Channel 4233
<b>RMC</b>	12.2kbps RMC	22.13	22.18	22.06
	64kbps RMC	22.14	22.21	22.12
	144kbps RMC	22.11	22.17	22.09
	384kbps RMC	22.14	22.19	22.13
<b>HSDPA</b>	Sub - Test 1	21.28	21.31	21.27
	Sub - Test 2	21.32	21.35	21.36
	Sub - Test 3	20.52	20.54	20.57
	Sub - Test 4	20.55	20.59	20.63
<b>HSUPA</b>	Sub - Test 1	20.84	20.85	20.91
	Sub - Test 2	18.45	18.33	18.44
	Sub - Test 3	19.03	19.09	19.17
	Sub - Test 4	18.21	18.35	18.3
	Sub - Test 5	20.82	20.88	20.94

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## 7. Test Results

### 7.1. Dielectric Performance

**Table 10: Dielectric Performance of Body Tissue Simulating Liquid**

Frequency	Description	Dielectric Parameters		Temp °C
		$\epsilon_r$	$\sigma$ (s/m)	
<b>849MHz (High)</b>	Target value ±5% window	55.16 52.40 — 57.92	0.99 0.94 — 1.04	/
	Measurement value 2011-12-8	55.1	1.02	21.7
<b>837MHz (Middle)</b>	Target value ±5% window	55.19 52.43 — 57.95	0.97 0.92 — 1.02	/
	Measurement value 2011-12-8	55.2	1.00	21.7
<b>824MHz (Low)</b>	Target value ±5% window	55.24 52.48 — 58.00	0.97 0.92 — 1.02	/
	Measurement value 2011-12-8	55.4	0.99	21.7
<b>1880MHz (Middle)</b>	Target value ±5% window	53.30 50.64 — 55.97	1.52 1.44 — 1.60	/
	Measurement value 2011-12-9	52.0	1.54	21.8

### 7.2. System Check

**Table 11: System Check for Body Tissue Simulating Liquid**

Frequency	Test Date	Dielectric Parameters		Temp (°C)	Input Power (W)	Measured SAR <sub>1g</sub> (W/kg)	1W Normalized SAR <sub>1g</sub> (W/kg)	1W Target SAR <sub>1g</sub> (W/kg)	Deviation (%)
		$\epsilon_r$	$\sigma$ (s/m)						
<b>835MHz</b>	2011-12-8	55.30	1.00	21.7	0.25	2.54	10.16	9.46	7.40
<b>1900MHz</b>	2011-12-9	51.98	1.56	21.8	0.25	10.20	40.80	41.70	-2.16

Note: 1. The graph results see ANNEX B.

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### 7.3. Summary of Measurement Results

#### 7.3.1. GSM 850 (GPRS/EGPRS)

**Table 12: SAR Values [GSM 850 (GPRS/EGPRS)]**

Limit of SAR			10 g Average	1g Average	Power Drift	Graph Results
			2.0 W/kg	1.6 W/kg	± 0.21 dB	
Test Case Of Body			Measurement Result (W/kg)		Power Drift (dB)	
Test Position	Timeslots	Channel	10 g Average	1 g Average		
<b>Test Position of GPRS(Distance 10mm)</b>						
Test Position 1	1Txslot	Middle/190	0.505(max.cube)	0.730(max.cube)	0.023	Figure 8
	2Txslots	High/251	0.684(max.cube)	0.988(max.cube)	0.033	Figure 9
		Middle/190	0.625(max.cube)	0.905(max.cube)	-0.006	Figure 10
		Low/128	0.530(max.cube)	0.764(max.cube)	0.034	Figure 11
	3Txslots	High/251	0.648(max.cube)	0.932(max.cube)	-0.020	Figure 12
		Middle/190	0.586(max.cube)	0.841(max.cube)	-0.125	Figure 13
		Low/128	0.497	0.715	0.030	Figure 14
	4Txslots	Middle/190	0.488	0.704	-0.058	Figure 15
Test Position 2	2Txslots	Middle/190	0.474	0.691	0.055	Figure 16
Test Position 3	N/A	N/A	N/A	N/A	N/A	N/A
Test Position 4	2Txslots	Middle/190	0.081	0.165	-0.040	Figure 17
Test Position 5	2Txslots	Middle/190	0.179	0.257	-0.001	Figure 18
Test Position 6	2Txslots	Middle/190	0.210	0.316	0.023	Figure 19
<b>Worst Case Position of GPRS with EGPRS (GMSK, Distance 10mm)</b>						
Test Position 1	2Txslots	High/251	0.710(max.cube)	1.030(max.cube)	-0.003	Figure 20

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB (< 0.8W/kg) lower than the SAR limit, testing at the high and low channels is optional.
3. When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.
4. WWAN antenna is located at top edge; antenna-to-bottom edge distance is more than 2.5 cm(see ANNEX I). Based upon KDB941225 D06, when the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.
5. The (max.cube) labeling indicates that during the grid scanning an additional peak was found

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which was within 2.0dB of the highest peak. The value of the highest cube is given in the table above; the value from the second assessed cube is given in the SAR distribution plots (See ANNEX C).

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### 7.3.2. GSM 1900 (GPRS/EGPRS)

**Table 13: SAR Values [GSM 1900 (GPRS/EGPRS)]**

Limit of SAR			10 g Average	1g Average	Power Drift	Graph Results
			2.0 W/kg	1.6 W/kg	± 0.21 dB	
Test Case Of Body			Measurement Result (W/kg)		Power Drift (dB)	
Test Position	Timeslots	Channel	10 g Average	1 g Average		
<b>Test Position of GPRS(Distance 10mm)</b>						
Test Position 1	1Txslot	Middle/661	0.220	0.352	-0.052	Figure 21
	2Txslots	Middle/661	0.287	0.457	-0.003	Figure 22
	3Txslots	Middle/661	0.268	0.428	0.005	Figure 23
	4Txslots	Middle/661	0.232	0.370	-0.004	Figure 24
Test Position 2	2Txslots	Middle/661	0.282	0.452	-0.096	Figure 25
Test Position 3	N/A	N/A	N/A	N/A	N/A	N/A
Test Position 4	2Txslots	Middle/661	0.117	0.216	-0.005	Figure 26
Test Position 5	2Txslots	Middle/661	0.177	0.301	0.059	Figure 27
Test Position 6	2Txslots	Middle/661	0.126	0.228	-0.008	Figure 28
<b>Worst Case Position of GPRS with EGPRS (GMSK, Distance 10mm)</b>						
Test Position 1	2Txslots	Middle/661	0.297	0.475	-0.042	Figure 29

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB (< 0.8W/kg) lower than the SAR limit, testing at the high and low channels is optional.
3. When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.
4. WWAN antenna is located at top edge; antenna-to-bottom edge distance is more than 2.5 cm(see ANNEX I). Based upon KDB941225 D06, when the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.

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### 7.3.3. WCDMA Band V (WCDMA)

**Table 14: SAR Values [WCDMA Band V (WCDMA)]**

Limit of SAR		10 g Average	1g Average	Power Drift	Graph Results
		2.0 W/kg	1.6 W/kg	± 0.21 dB	
Test Case Of Body		Measurement Result (W/kg)		Power Drift (dB)	
Different Test Position	Channel	10 g Average	1 g Average		
<b>Test Position of RMC (Distance 10mm)</b>					
Test Position 1	Middle/4183	0.403(max.cube)	0.579(max.cube)	-0.067	Figure 30
Test Position 2	Middle/4183	0.432	0.618	0.023	Figure 31
Test Position 3	N/A	N/A	N/A	N/A	N/A
Test Position 4	Middle/4183	0.053	0.102	-0.022	Figure 32
Test Position 5	Middle/4183	0.164	0.232	-0.044	Figure 33
Test Position 6	Middle/4183	0.194	0.288	-0.073	Figure 34

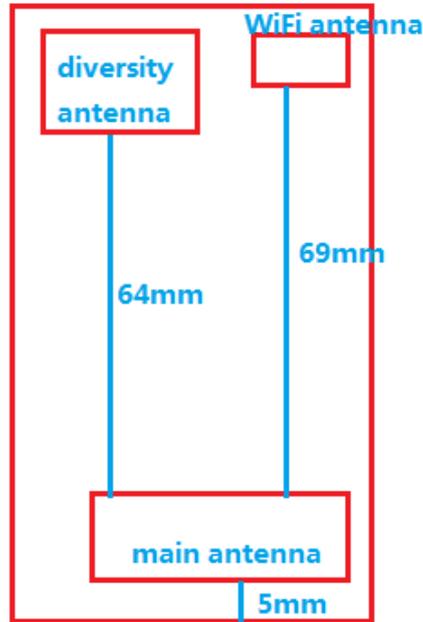
Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB (< 0.8W/kg) lower than the SAR limit, testing at the high and low channels is optional.
3. WCDMA mode were tested under RMC 12.2kbps with HSPA (HSDPA/HSUPA) inactive per KDB Publication 941225 D01. HSPA (HSDPA/HSUPA) SAR for body was not required since the average output power of the HSPA (HSDPA/HSUPA) subtests was not more than 0.25 dB higher than the RMC level and the maximum SAR for 12.2kbps RMC was less than 75% (1.2 W/kg) SAR limit.
4. The (max.cube) labeling indicates that during the grid scanning an additional peak was found which was within 2.0dB of the highest peak. The value of the highest cube is given in the table above; the value from the second assessed cube is given in the SAR distribution plots (See ANNEX C).
5. WWAN antenna is located at top edge; antenna-to-bottom edge distance is more than 2.5 cm(see ANNEX I). Based upon KDB941225 D06, when the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.

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### 7.3.4. WIFI Function

The distance between WIFI antenna and GSM/WCDMA antenna is 6.9cm. The location of the antennas inside the EUT is shown as the following (refer to ANNEX I):



The output power of WiFi antenna is as following:

Mode	Channel	Data rate (Mbps)	AV Power (dBm)
11b	1	1	9.79
		2	9.81
		5.5	8.78
		11	8.79
	6	1	8.62
		2	8.63
		5.5	7.71
		11	7.72
	11	1	8.24
		2	8.26
		5.5	6.98
		11	7.00
11g	1	6	8.55
		9	8.57
		12	8.60
		18	8.57
		24	9.84
		36	9.04
		48	9.06

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	6	54	9.10
		6	7.29
		9	7.31
		12	7.30
		18	7.34
		24	8.92
		36	8.00
		48	8.02
		54	8.06
	11	6	6.67
		9	6.68
		12	6.69
		18	6.71
		24	8.14
		36	7.22
		48	7.21
		54	7.23
		11n HT20	1
13	8.94		
19.5	8.01		
26	9.22		
39	8.22		
52	8.20		
58.5	8.19		
65	8.10		
6	6.5		7.92
	13		6.63
	19.5		6.69
	26		8.20
	39		7.21
	52		7.11
	58.5		7.09
	65		7.03
11	6.5		7.04
	13		6.11
	19.5		6.06
	26		7.39
	39		6.40
	52		6.36
	58.5		6.35
	65		6.26

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**Output Power Thresholds for Unlicensed Transmitters**

	<b>2.45</b>	<b>5.15 - 5.35</b>	<b>5.47 - 5.85</b>	<b>GHz</b>
<b>P<sub>Ref</sub></b>	12	6	5	<b>mW</b>
Device output power should be rounded to the nearest mW to compare with values specified in this table.				

**Stand-alone SAR**

According to the output power measurement result we can draw the conclusion that: stand-alone SAR are not required for WiFi, because the output power of WiFi transmitter is  $\leq$  13.8dBm.

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### Simultaneous SAR

About WIFI and GSM/WCDMA Antenna,

SAR1g(W/kg) Test Position	GSM850	GSM1900	WCDMA Band V	WIFI	MAX. $\Sigma$ SAR <sub>1g</sub>
Test Position 1	<b>1.030</b>	0.475	0.579	0	<b>1.030</b>
Test Position 2	<b>0.691</b>	0.452	0.618	0	0.691
Test Position 3	N/A	N/A	N/A	0	0
Test Position 4	0.165	<b>0.216</b>	0.102	0	0.216
Test Position 5	0.257	<b>0.301</b>	0.232	0	0.301
Test Position 6	<b>0.316</b>	0.228	0.288	0	0.316

Note: 1. The value with blue color is the maximum  $\Sigma$ SAR<sub>1g</sub> Value.

2. MAX.  $\Sigma$ SAR<sub>1g</sub> = Unlicensed SAR<sub>MAX</sub> + Licensed SAR<sub>MAX</sub>

3. According to 941225 D06, since the stand alone SAR is not required for WAN, 0 W/kg should be assumed to apply the sum of 1-g SAR exclusion

(GSM/WCDMA Antenna SAR<sub>MAX</sub>)1.030 +(WIFI Antenna SAR<sub>MAX</sub>)0 =1.030 <1.6, so Simultaneous SAR are not required for WIFI and GSM/WCDMA Antenna.

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**8. Measurement Uncertainty**

No.	source	Type	Uncertainty Value (%)	Probability Distribution	k	c <sub>i</sub>	Standard uncertainty u <sub>i</sub> (%)	Degree of freedom V <sub>eff</sub> or v <sub>i</sub>
1	System repetivity	A	0.5	N	1	1	0.5	9
Measurement system								
2	-probe calibration	B	5.9	N	1	1	5.9	∞
3	-axial isotropy of the probe	B	4.7	R	$\sqrt{3}$	$\sqrt{0.5}$	1.9	∞
4	- Hemispherical isotropy of the probe	B	9.4	R	$\sqrt{3}$	$\sqrt{0.5}$	3.9	∞
6	-boundary effect	B	1.9	R	$\sqrt{3}$	1	1.1	∞
7	-probe linearity	B	4.7	R	$\sqrt{3}$	1	2.7	∞
8	- System detection limits	B	1.0	R	$\sqrt{3}$	1	0.6	∞
9	-readout Electronics	B	1.0	N	1	1	1.0	∞
10	-response time	B	0	R	$\sqrt{3}$	1	0	∞
11	-integration time	B	4.32	R	$\sqrt{3}$	1	2.5	∞
12	-noise	B	0	R	$\sqrt{3}$	1	0	∞
13	-RF Ambient Conditions	B	3	R	$\sqrt{3}$	1	1.73	∞
14	-Probe Positioner Mechanical Tolerance	B	0.4	R	$\sqrt{3}$	1	0.2	∞
15	-Probe Positioning with respect to Phantom Shell	B	2.9	R	$\sqrt{3}$	1	1.7	∞
16	-Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	B	3.9	R	$\sqrt{3}$	1	2.3	∞
Test sample Related								
17	-Test Sample Positioning	A	2.9	N	1	1	4.92	71
18	-Device Holder Uncertainty	A	4.1	N	1	1	4.1	5
19	-Output Power Variation - SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.9	∞
Physical parameter								
20	-phantom	B	4.0	R	$\sqrt{3}$	1	2.3	∞
21	-liquid conductivity (deviation from target)	B	5.0	R	$\sqrt{3}$	0.64	1.8	∞

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22	-liquid conductivity (measurement uncertainty)	B	2.5	N	1	0.64	1.6	9
23	-liquid permittivity (deviation from target)	B	5.0	R	$\sqrt{3}$	0.6	1.7	$\infty$
24	-liquid permittivity (measurement uncertainty)	B	2.5	N	1	0.6	1.5	9
Combined standard uncertainty		$u_c = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$				12.12		
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$		N	k=2	24.24		

## 9. Main Test Instruments

**Table 15: List of Main Instruments**

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	Agilent 8753E	US37390326	September 12, 2011	One year
02	Dielectric Probe Kit	Agilent 85070E	US44020115	No Calibration Requested	
03	Power meter	Agilent E4417A	GB41291714	March 12, 2011	One year
04	Power sensor	Agilent N8481H	MY50350004	September 25, 2011	One year
05	Signal Generator	HP 8341B	2730A00804	September 12, 2011	One year
06	Amplifier	IXA-020	0401	No Calibration Requested	
07	BTS	E5515C	MY48360988	December 2, 2011	One year
08	E-field Probe	EX3DV4	3816	October 3, 2011	One year
09	DAE	DAE4	871	November 22, 2011	One year
10	Validation Kit 835MHz	D835V2	4d020	August 26, 2011	One year
11	Validation Kit 1900MHz	D1900V2	5d060	August 31, 2011	One year

\*\*\*END OF REPORT BODY\*\*\*

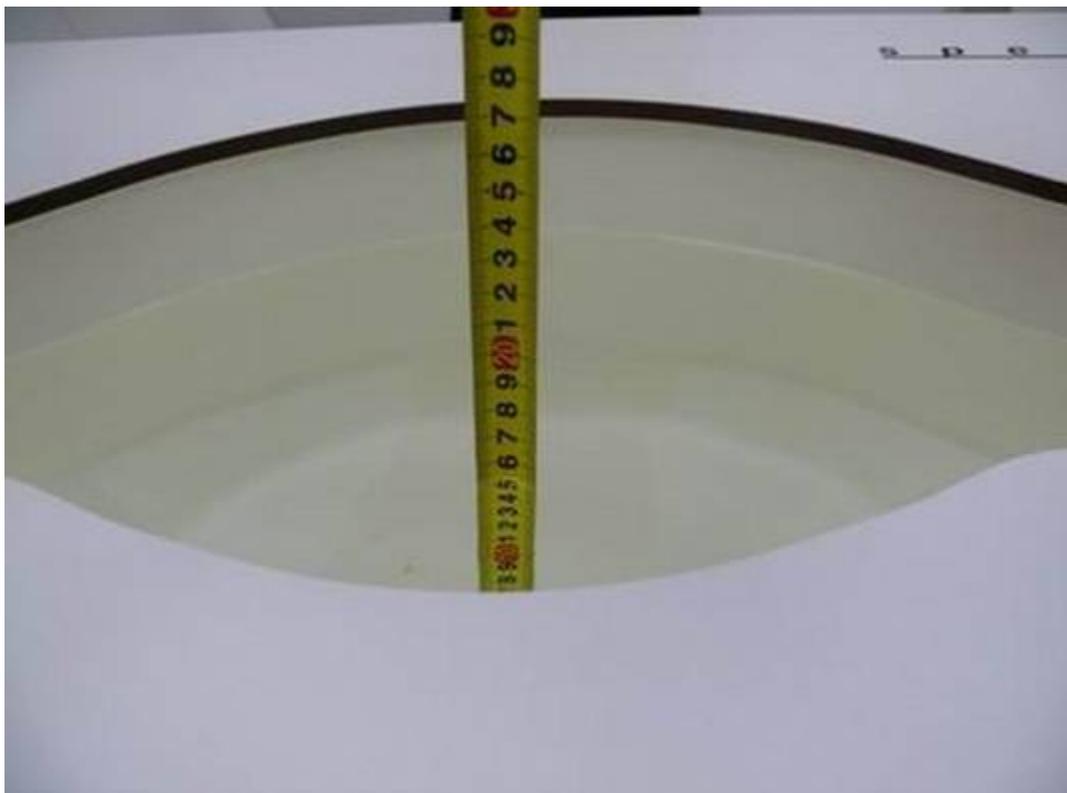
## ANNEX A: Test Layout



Picture 1: Specific Absorption Rate Test Layout



Picture 2: Liquid depth in the Flat Phantom (835 MHz, 15.4cm depth)



Picture 3: Liquid depth in the Flat Phantom (1900 MHz, 15.2cm depth)

## ANNEX B: System Check Results

### System Performance Check at 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Date/Time: 12/8/2011 5:06:20 PM

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 1.00 \text{ mho/m}$ ;  $\epsilon_r = 55.3$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.7 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**d=15mm, Pin=250mW/Area Scan (61x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.72 mW/g

**d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 50.9 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 3.63 W/kg

**SAR(1 g) = 2.54 mW/g; SAR(10 g) = 1.64 mW/g**

Maximum value of SAR (measured) = 2.72 mW/g

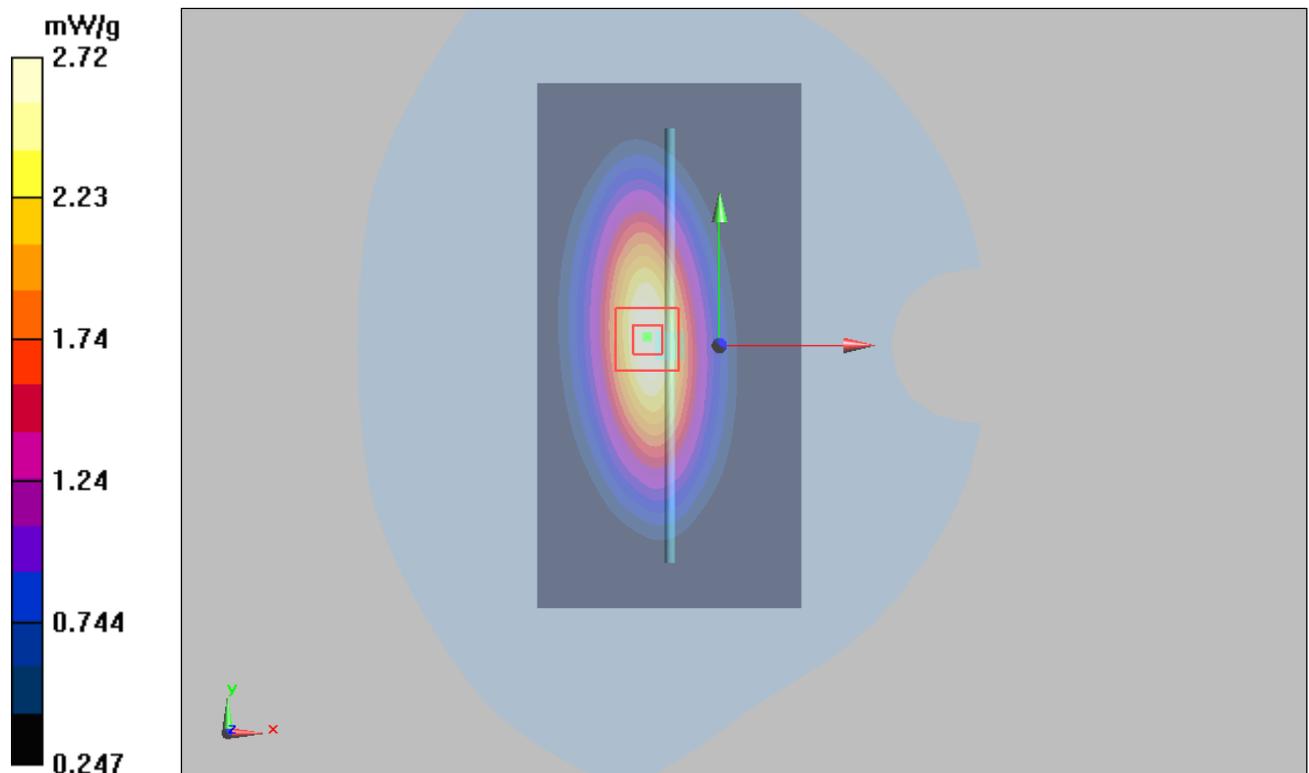


Figure 6 System Performance Check 835MHz 250mW

### System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Date/Time: 12/9/2011 7:30:19 AM

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 51.98$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.8 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(7.51, 7.51, 7.51) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**d=10mm, Pin=250mW/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 11.9 mW/g

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

Reference Value = 80.8 V/m; Power Drift = -0.063 dB

Peak SAR (extrapolated) = 17.6 W/kg

**SAR(1 g) = 10.20 mW/g; SAR(10 g) = 5.36 mW/g**

Maximum value of SAR (measured) = 11.05 mW/g

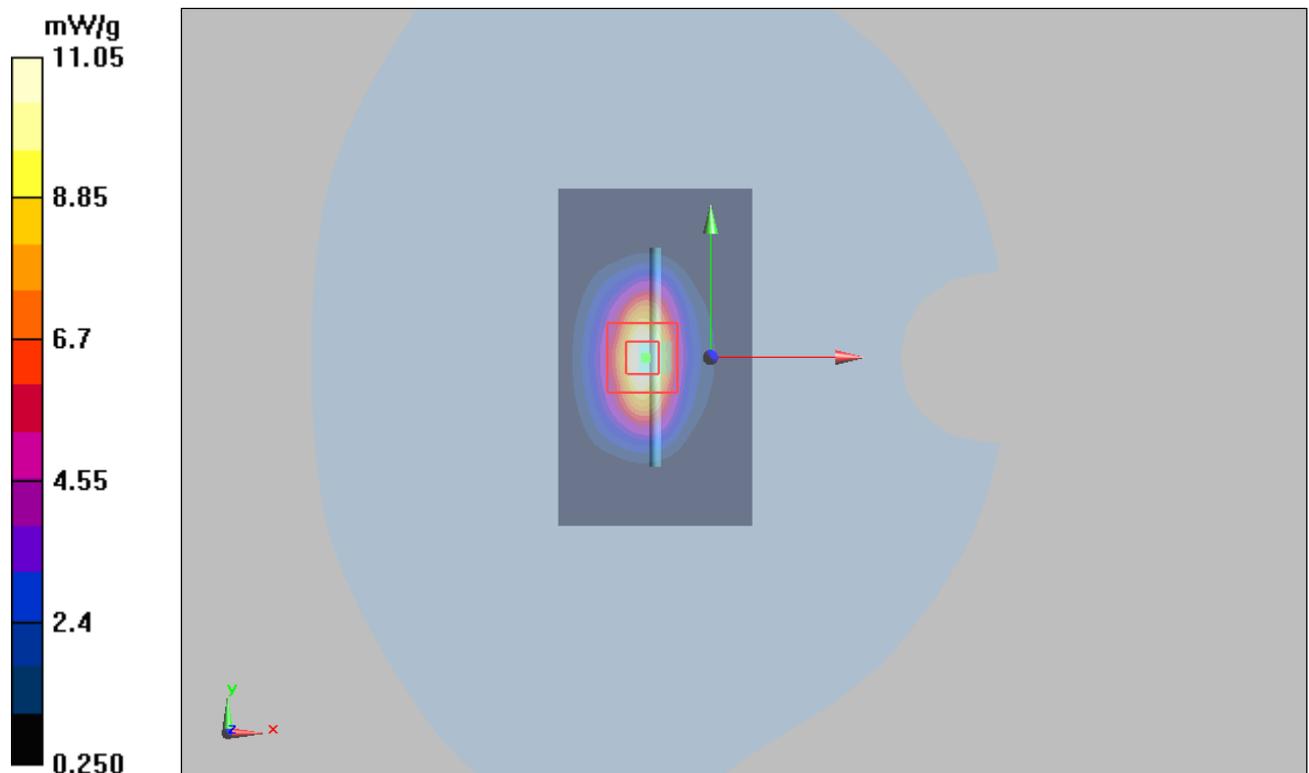


Figure 7 System Performance Check 1900MHz 250mW

## ANNEX C: Graph Results

### GSM 850 GPRS (1Txslot) Test Position 1 Middle

Date/Time: 12/8/2011 6:26:00 PM

Communication System: GSM850 + GPRS(1Up); Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.786 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 25.3 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 1.01 W/kg

**SAR(1 g) = 0.730 mW/g; SAR(10 g) = 0.505 mW/g**

Maximum value of SAR (measured) = 0.780 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 25.3 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 0.977 W/kg

**SAR(1 g) = 0.657 mW/g; SAR(10 g) = 0.432 mW/g**

Maximum value of SAR (measured) = 0.752 mW/g

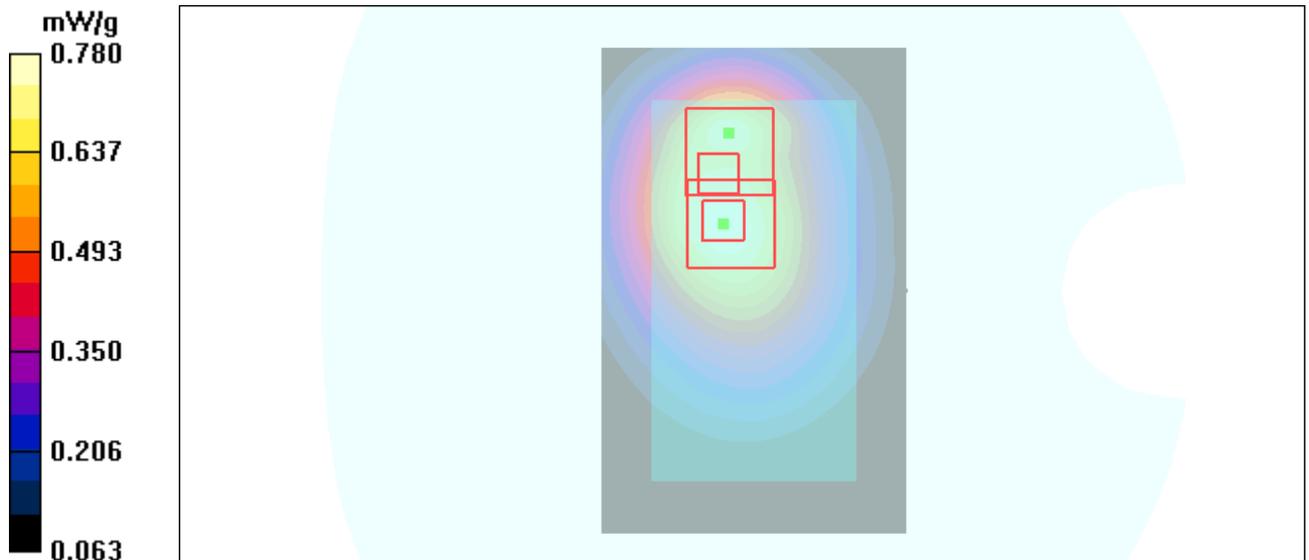


Figure 8 GSM 850 GPRS (1Txslot) Test Position 1 Channel 190

### GSM 850 GPRS (2Txslots) Test Position 1 High

Date/Time: 12/8/2011 7:36:52 PM

Communication System: GSM850 + GPRS(2Up); Frequency: 848.8 MHz; Duty Cycle: 1:4.15

Medium parameters used:  $f = 849$  MHz;  $\sigma = 1.02$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 High/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.06 mW/g

**Test Position 1 High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 29.3 V/m; Power Drift = 0.033 dB

Peak SAR (extrapolated) = 1.32 W/kg

**SAR(1 g) = 0.988 mW/g; SAR(10 g) = 0.684 mW/g**

Maximum value of SAR (measured) = 1.06 mW/g

**Test Position 1 High/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 29.3 V/m; Power Drift = 0.033 dB

Peak SAR (extrapolated) = 1.34 W/kg

**SAR(1 g) = 0.899 mW/g; SAR(10 g) = 0.587 mW/g**

Maximum value of SAR (measured) = 1.03 mW/g

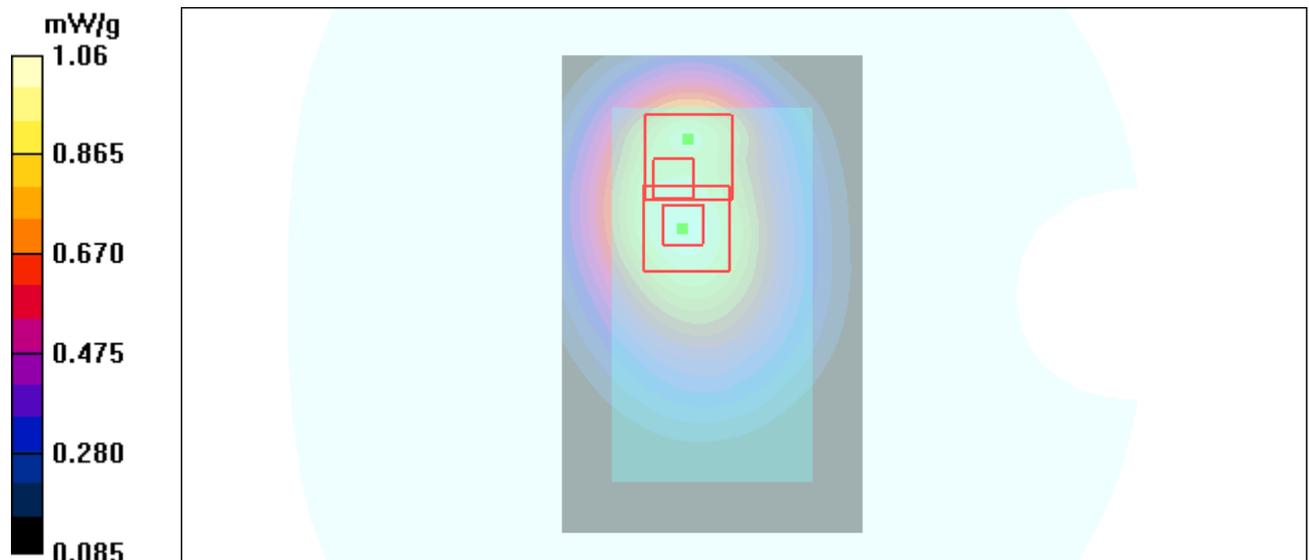


Figure 9 GSM 850 GPRS (2Txslots) Test Position 1 Channel 251

**GSM 850 GPRS (2Txslots) Test Position 1 Middle**

Date/Time: 12/8/2011 7:05:10 PM

Communication System: GSM850 + GPRS(2Up); Frequency: 836.6 MHz;Duty Cycle: 1:4.15

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.967 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 28.3 V/m; Power Drift = -0.006 dB

Peak SAR (extrapolated) = 1.22 W/kg

**SAR(1 g) = 0.905 mW/g; SAR(10 g) = 0.625 mW/g**

Maximum value of SAR (measured) = 0.971 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 28.3 V/m; Power Drift = -0.006 dB

Peak SAR (extrapolated) = 1.19 W/kg

**SAR(1 g) = 0.811 mW/g; SAR(10 g) = 0.534 mW/g**

Maximum value of SAR (measured) = 0.923 mW/g

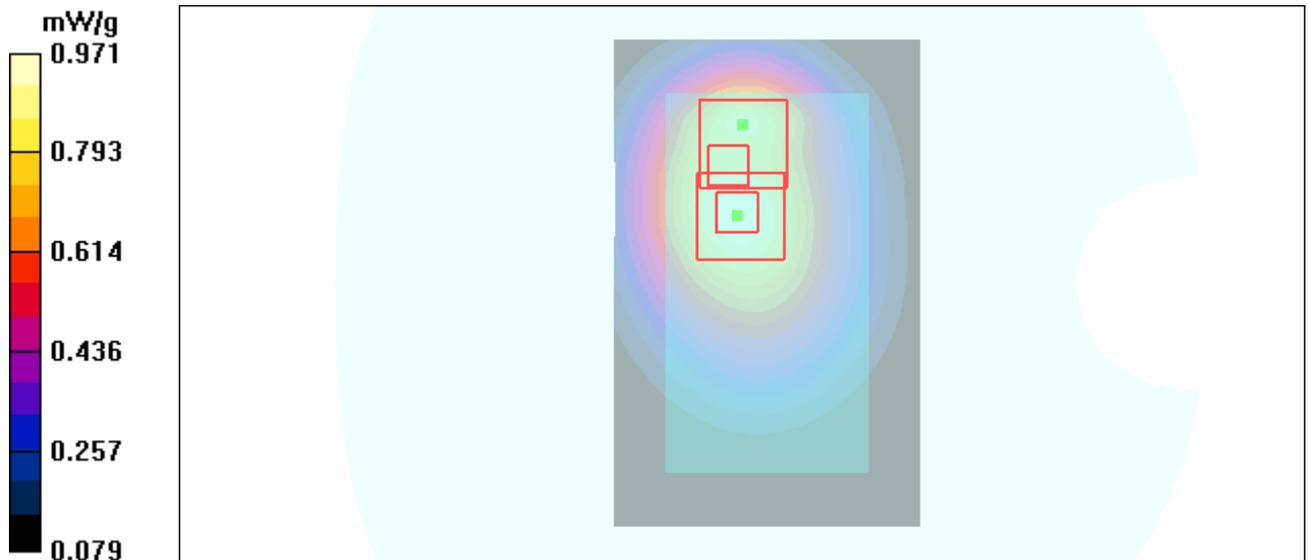


Figure 10 GSM 850 GPRS (2Txslots) Test Position 1 Channel 190

**GSM 850 GPRS (2Txslots) Test Position 1 Low**

Date/Time: 12/8/2011 8:04:54 PM

Communication System: GSM850 + GPRS(2Up); Frequency: 824.2 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated):  $f = 824.2$  MHz;  $\sigma = 0.987$  mho/m;  $\epsilon_r = 55.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Low/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.804 mW/g

**Test Position 1 Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 25.6 V/m; Power Drift = 0.034 dB

Peak SAR (extrapolated) = 1.04 W/kg

**SAR(1 g) = 0.764 mW/g; SAR(10 g) = 0.530 mW/g**

Maximum value of SAR (measured) = 0.816 mW/g

**Test Position 1 Low/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 25.6 V/m; Power Drift = 0.034 dB

Peak SAR (extrapolated) = 1.04 W/kg

**SAR(1 g) = 0.703 mW/g; SAR(10 g) = 0.464 mW/g**

Maximum value of SAR (measured) = 0.797 mW/g

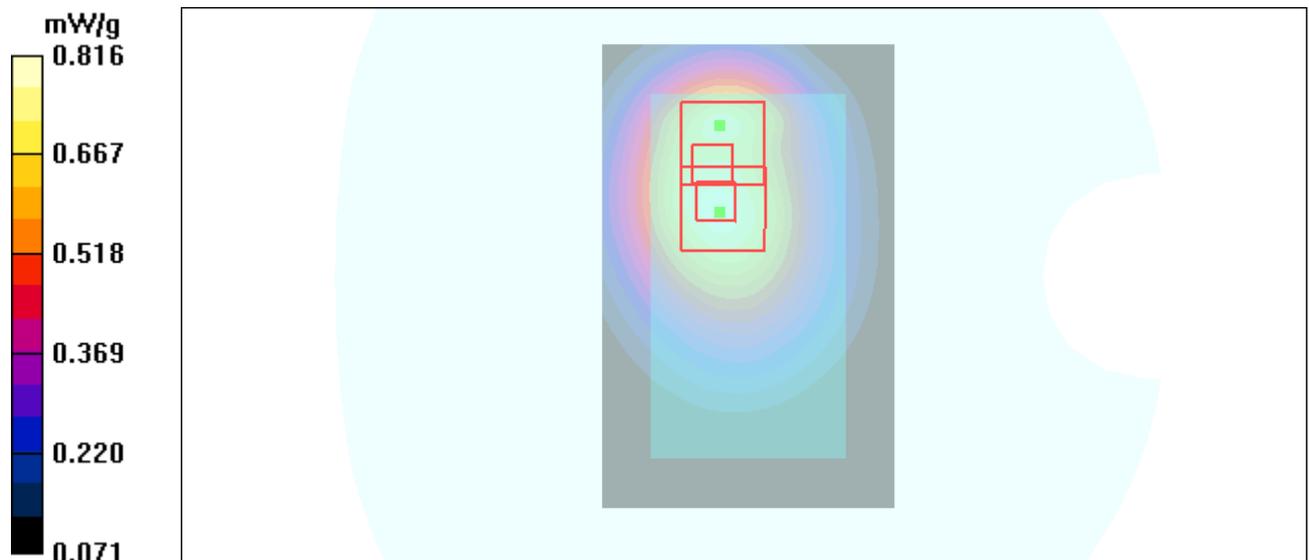


Figure 11 GSM 850 GPRS (2Txslots) Test Position 1 Channel 128

### GSM 850 GPRS (3Txslots) Test Position 1 High

Date/Time: 12/8/2011 9:20:50 PM

Communication System: GSM850 + GPRS(3Up); Frequency: 848.8 MHz; Duty Cycle: 1:2.767

Medium parameters used:  $f = 849$  MHz;  $\sigma = 1.02$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 High/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.997 mW/g

**Test Position 1 High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 28.2 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 1.27 W/kg

**SAR(1 g) = 0.932 mW/g; SAR(10 g) = 0.648 mW/g**

Maximum value of SAR (measured) = 0.991 mW/g

**Test Position 1 High/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 28.2 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 1.23 W/kg

**SAR(1 g) = 0.850 mW/g; SAR(10 g) = 0.555 mW/g**

Maximum value of SAR (measured) = 0.965 mW/g

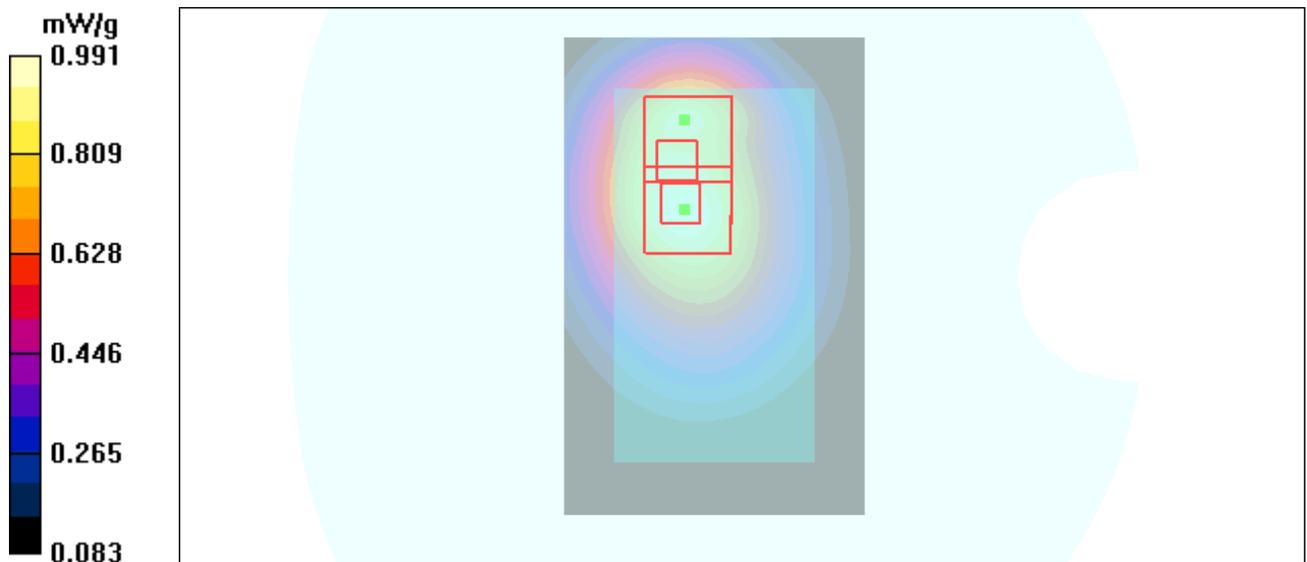


Figure 12 GSM 850 GPRS (3Txslots) Test Position 1 Channel 251

**GSM 850 GPRS (3Txslots) Test Position 1 Middle**

Date/Time: 12/8/2011 8:35:00 PM

Communication System: GSM850 + GPRS(3Up); Frequency: 836.6 MHz; Duty Cycle: 1:2.767

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.906 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 27.1 V/m; Power Drift = -0.125 dB

Peak SAR (extrapolated) = 1.13 W/kg

**SAR(1 g) = 0.841 mW/g; SAR(10 g) = 0.586 mW/g**

Maximum value of SAR (measured) = 0.895 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 27.1 V/m; Power Drift = -0.125 dB

Peak SAR (extrapolated) = 1.14 W/kg

**SAR(1 g) = 0.773 mW/g; SAR(10 g) = 0.508 mW/g**

Maximum value of SAR (measured) = 0.877 mW/g

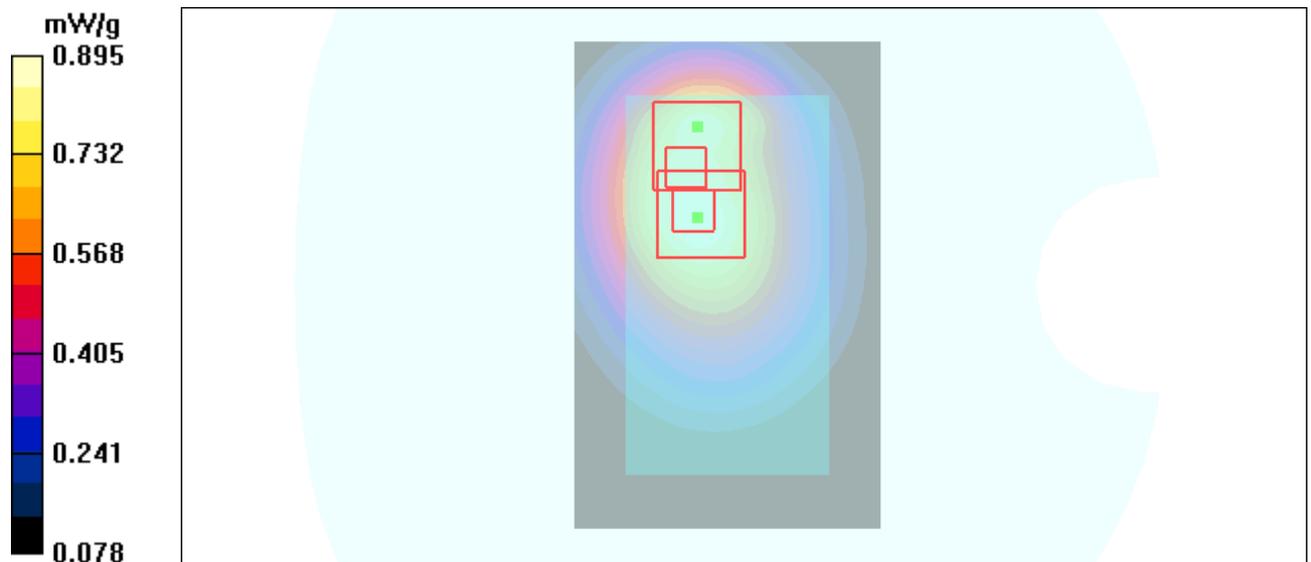


Figure 13 GSM 850 GPRS (3Txslots) Test Position 1 Channel 190

**GSM 850 GPRS (3Txslots) Test Position 1 Low**

Date/Time: 12/8/2011 9:49:07 PM

Communication System: GSM850 + GPRS(3Up); Frequency: 824.2 MHz;Duty Cycle: 1:2.767

Medium parameters used (interpolated):  $f = 824.2$  MHz;  $\sigma = 0.987$  mho/m;  $\epsilon_r = 55.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Low/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.759 mW/g

**Test Position 1 Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.8 V/m; Power Drift = 0.030 dB

Peak SAR (extrapolated) = 0.968 W/kg

**SAR(1 g) = 0.715 mW/g; SAR(10 g) = 0.497 mW/g**

Maximum value of SAR (measured) = 0.761 mW/g

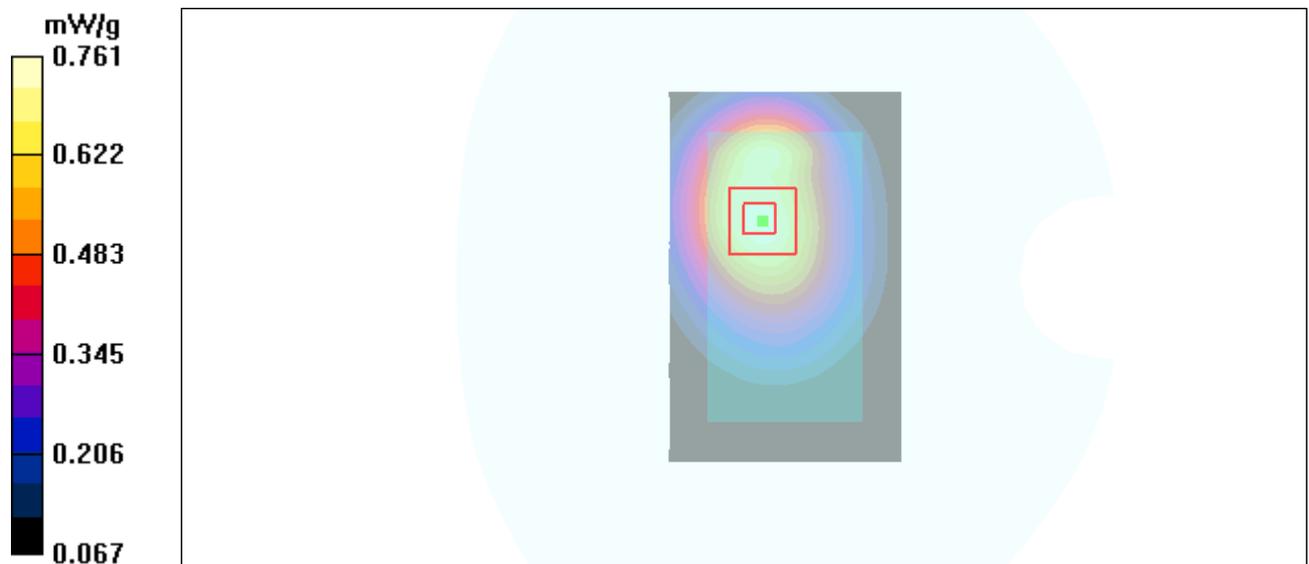


Figure 14 GSM 850 GPRS (3Txslots) Test Position 1 Channel 128

### GSM 850 GPRS (4Txslots) Test Position 1 Middle

Date/Time: 12/8/2011 10:07:13 PM

Communication System: GSM850 + GPRS(4Up); Frequency: 836.6 MHz; Duty Cycle: 1:2.075

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.758 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.9 V/m; Power Drift = -0.058 dB

Peak SAR (extrapolated) = 0.942 W/kg

**SAR(1 g) = 0.704 mW/g; SAR(10 g) = 0.488 mW/g**

Maximum value of SAR (measured) = 0.748 mW/g

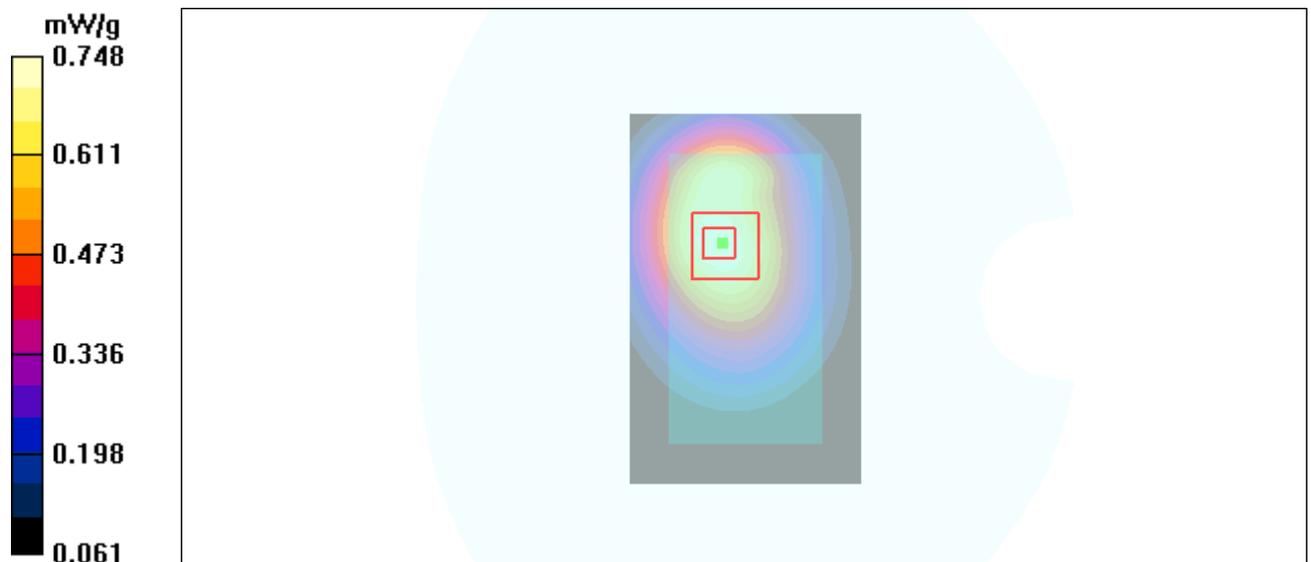


Figure 15 GSM 850 GPRS (4Txslots) Test Position 1 Channel 190

**GSM 850 GPRS (2Txslots) Test Position 2 Middle**

Date/Time: 12/8/2011 10:55:09 PM

Communication System: GSM850 + GPRS(2Up); Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 2 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.746 mW/g

**Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 21.6 V/m; Power Drift = 0.055 dB

Peak SAR (extrapolated) = 0.943 W/kg

**SAR(1 g) = 0.691 mW/g; SAR(10 g) = 0.474 mW/g**

Maximum value of SAR (measured) = 0.747 mW/g

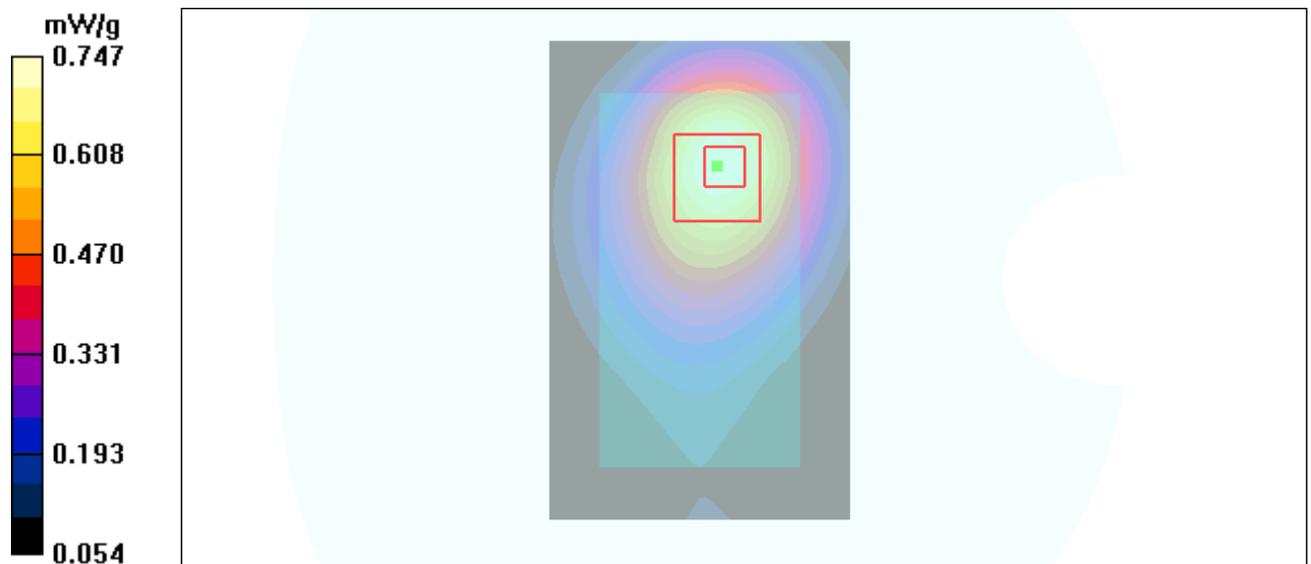


Figure 16 GSM 850 GPRS (2Txslots) Test Position 2 Channel 190

**GSM 850 GPRS (2Txslots) Test Position 4 Middle**

Date/Time: 12/9/2011 12:10:26 AM

Communication System: GSM850 + GPRS(2Up); Frequency: 836.6 MHz;Duty Cycle: 1:4.15

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 4 Middle/Area Scan (31x51x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.138 mW/g

**Test Position 4 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 14.1 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 0.504 W/kg

**SAR(1 g) = 0.165 mW/g; SAR(10 g) = 0.081 mW/g**

Maximum value of SAR (measured) = 0.184 mW/g

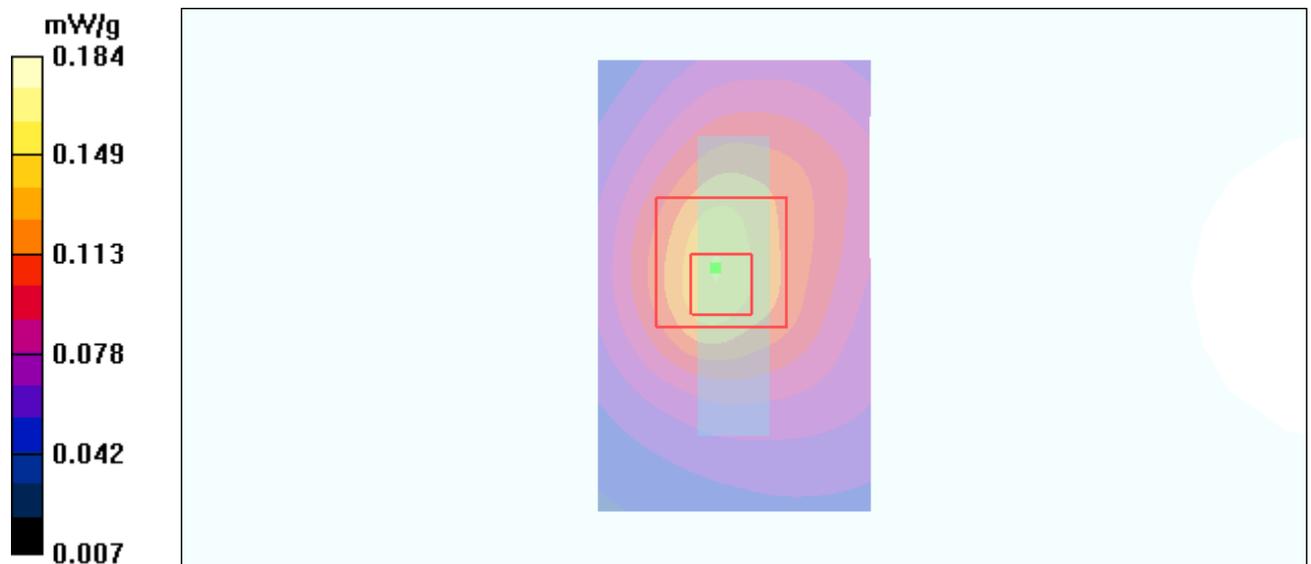


Figure 17 GSM 850 GPRS (2Txslots) Test Position 4 Channel 190

**GSM 850 GPRS (2Txslots) Test Position 5 Middle**

Date/Time: 12/8/2011 11:20:56 PM

Communication System: GSM850 + GPRS(2Up); Frequency: 836.6 MHz;Duty Cycle: 1:4.15

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 5 Middle/Area Scan (31x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.275 mW/g

**Test Position 5 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 14.9 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 0.342 W/kg

**SAR(1 g) = 0.257 mW/g; SAR(10 g) = 0.179 mW/g**

Maximum value of SAR (measured) = 0.273 mW/g

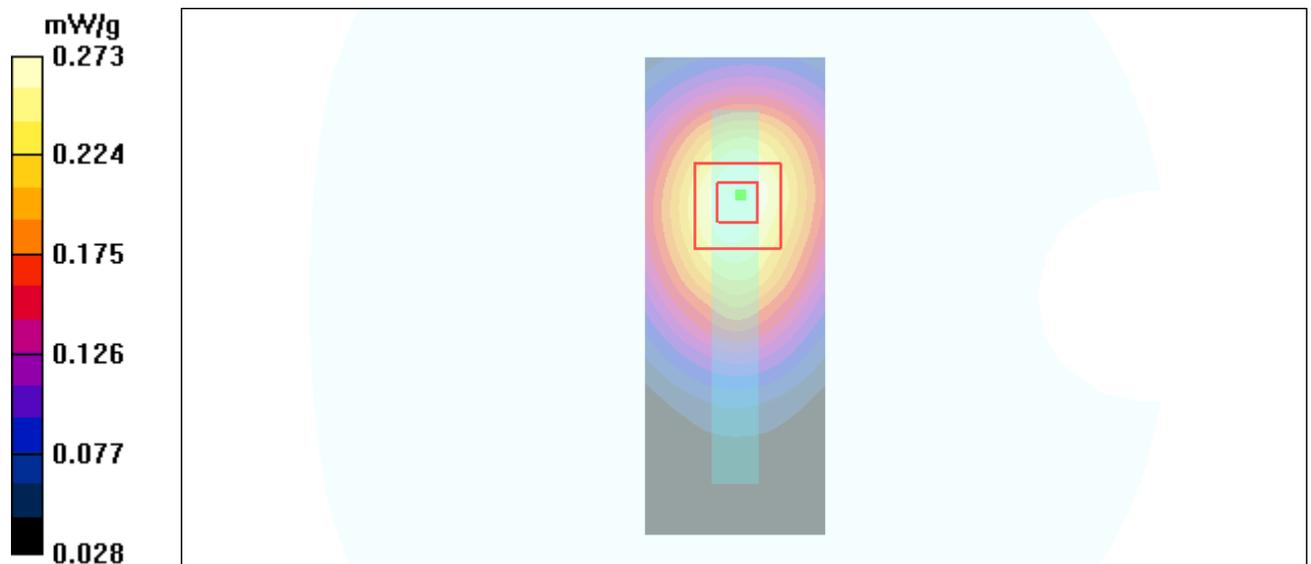


Figure 18 GSM 850 GPRS (2Txslots) Test Position 5 Channel 190

**GSM 850 GPRS (2Txslots) Test Position 6 Middle**

Date/Time: 12/8/2011 11:41:03 PM

Communication System: GSM850 + GPRS(2Up); Frequency: 836.6 MHz;Duty Cycle: 1:4.15

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 6 Middle/Area Scan (31x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.343 mW/g

**Test Position 6 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.0 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 0.443 W/kg

**SAR(1 g) = 0.316 mW/g; SAR(10 g) = 0.210 mW/g**

Maximum value of SAR (measured) = 0.342 mW/g

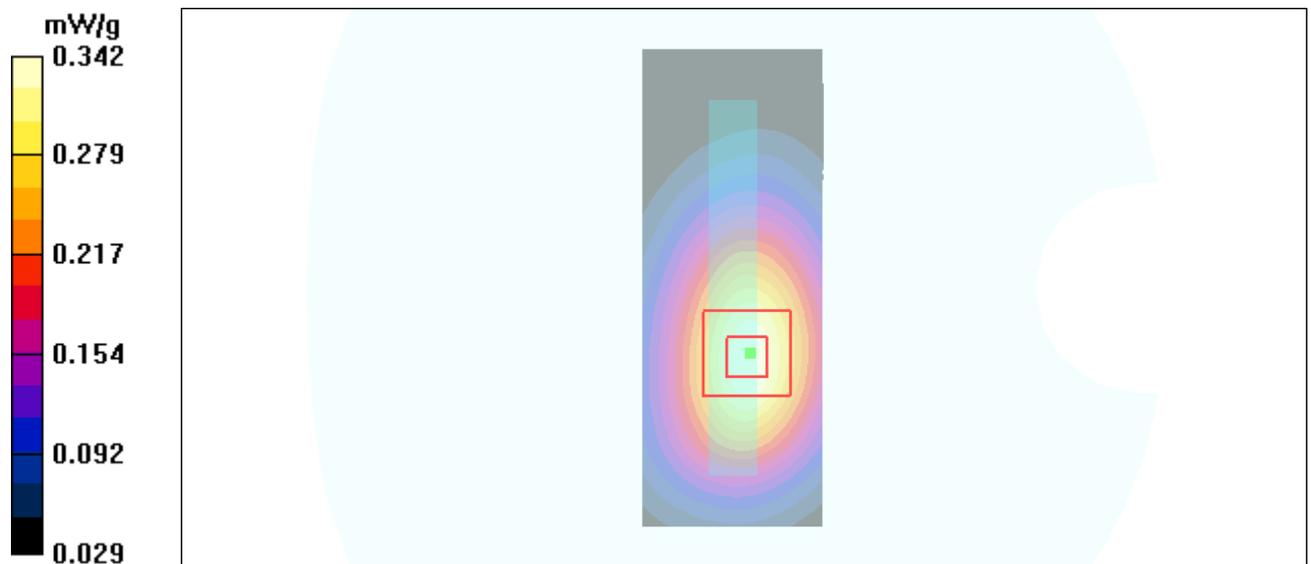


Figure 19 GSM 850 GPRS (2Txslots) Test Position 6 Channel 190

### GSM 850 EGPRS (2Txslots) Test Position 1 High

Date/Time: 12/9/2011 8:51:54 AM

Communication System: GSM850 + EGPRS(2Up); Frequency: 848.8 MHz; Duty Cycle: 1:4.15

Medium parameters used:  $f = 849$  MHz;  $\sigma = 1.02$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 High/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.12 mW/g

**Test Position 1 High/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 30.7 V/m; Power Drift = -0.003 dB

Peak SAR (extrapolated) = 1.36 W/kg

**SAR(1 g) = 0.907 mW/g; SAR(10 g) = 0.594 mW/g**

Maximum value of SAR (measured) = 1.04 mW/g

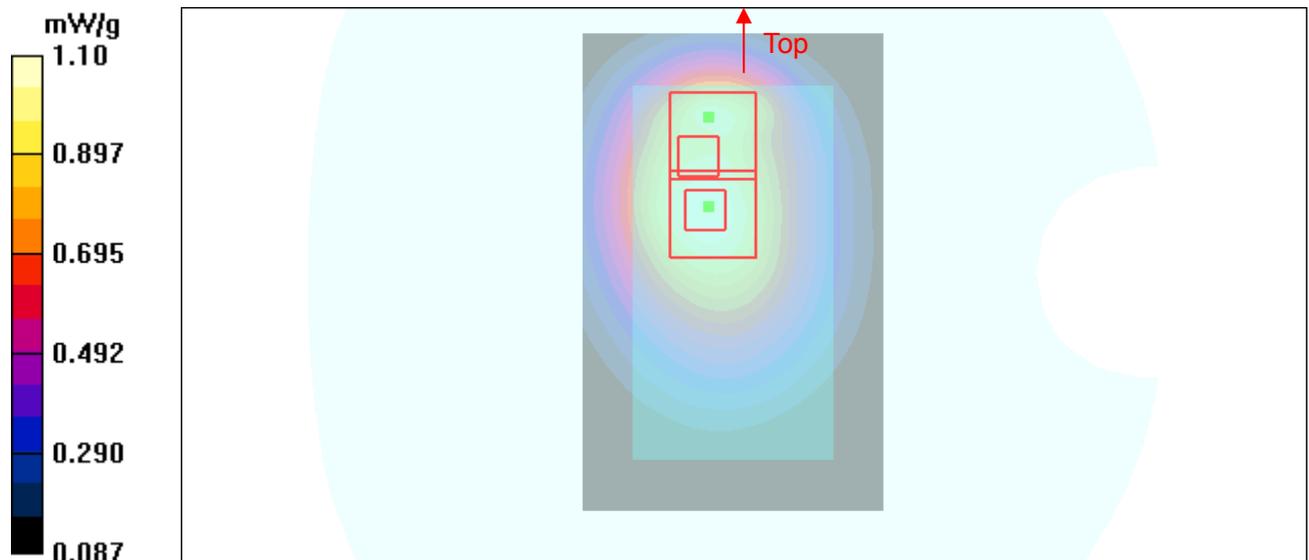
**Test Position 1 High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 30.7 V/m; Power Drift = -0.003 dB

Peak SAR (extrapolated) = 1.40 W/kg

**SAR(1 g) = 1.03 mW/g; SAR(10 g) = 0.710 mW/g**

Maximum value of SAR (measured) = 1.10 mW/g



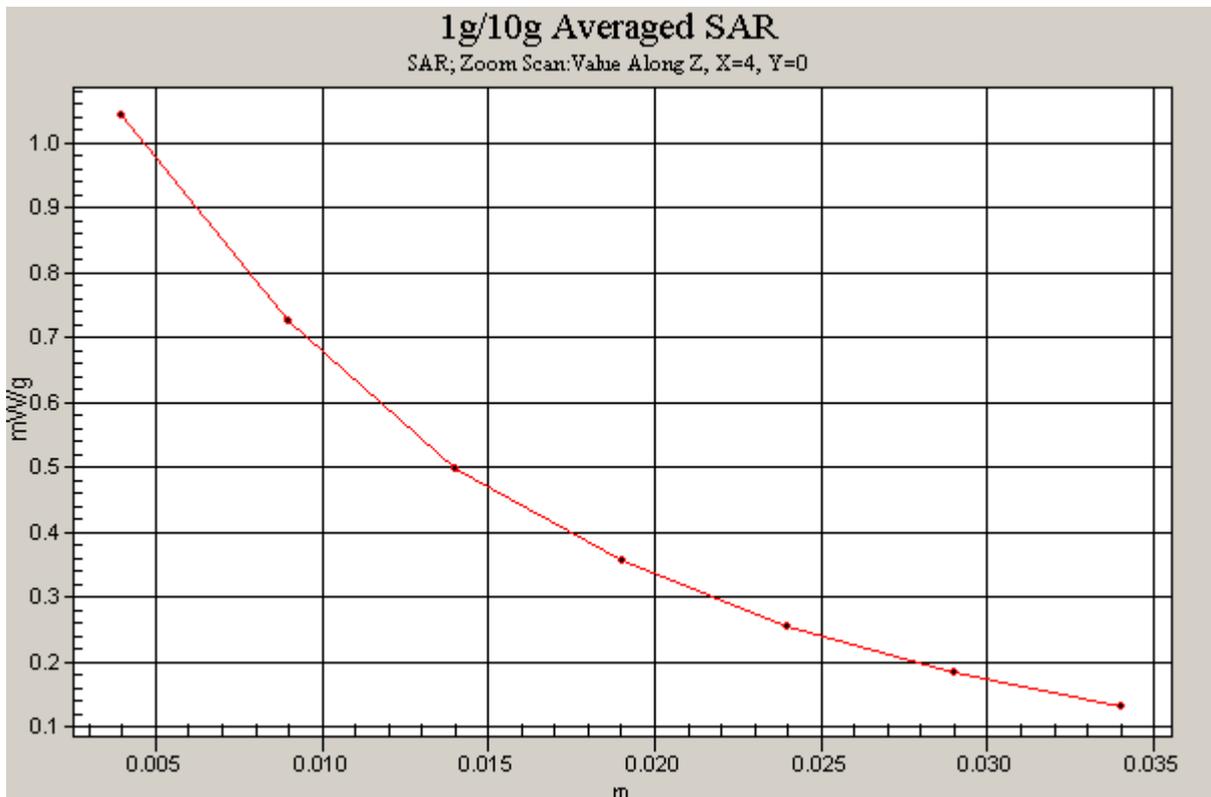
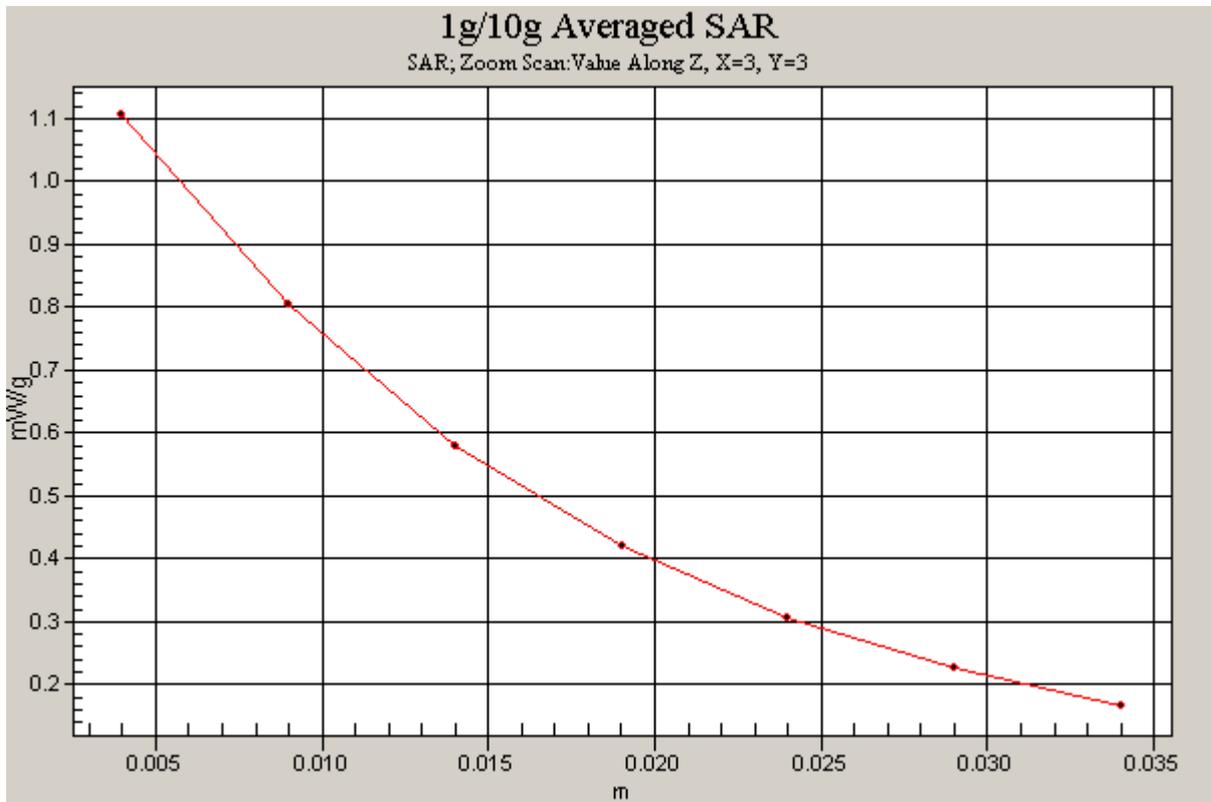


Figure 20 GSM 850 EGPRS (2Txslots) Test Position 1 Channel 251

**GSM 1900 GPRS (1Txslot) Test Position 1 Middle**

Date/Time: 12/9/2011 11:13:15 AM

Communication System: PCS 1900+GPRS(1Up); Frequency: 1880 MHz;Duty Cycle: 1:8.3

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(7.51, 7.51, 7.51) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.384 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.1 V/m; Power Drift = -0.052 dB

Peak SAR (extrapolated) = 0.608 W/kg

**SAR(1 g) = 0.352 mW/g; SAR(10 g) = 0.220 mW/g**

Maximum value of SAR (measured) = 0.374 mW/g

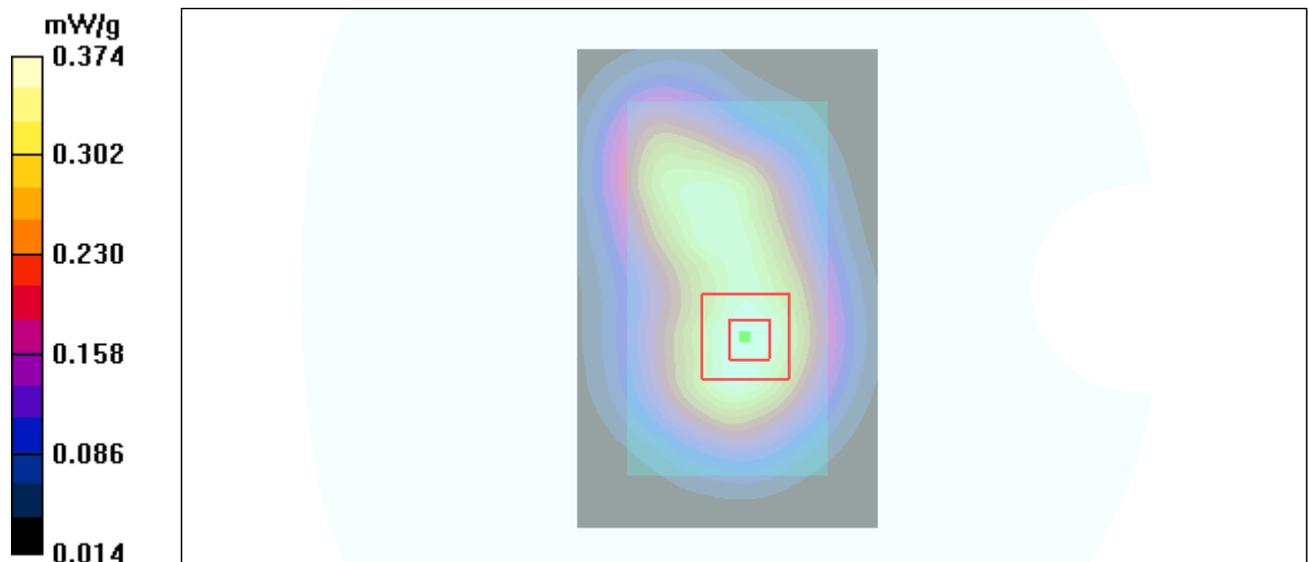


Figure 21 GSM 1900 GPRS (1Txslot) Test Position 1 Channel 661

**GSM 1900 GPRS (2Txslots) Test Position 1 Middle**

Date/Time: 12/9/2011 11:30:31 AM

Communication System: PCS 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4.15

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(7.51, 7.51, 7.51) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.502 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.2 V/m; Power Drift = -0.003 dB

Peak SAR (extrapolated) = 0.773 W/kg

**SAR(1 g) = 0.457 mW/g; SAR(10 g) = 0.287 mW/g**

Maximum value of SAR (measured) = 0.483 mW/g

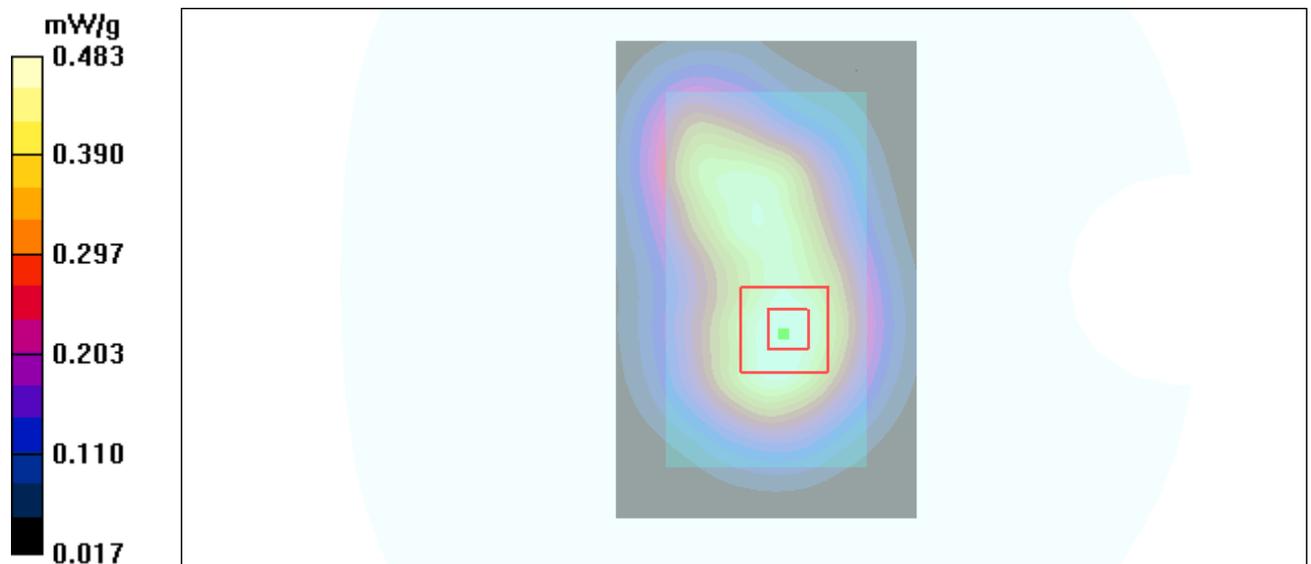


Figure 22 GSM 1900 GPRS (2Txslots) Test Position 1 Channel 661

**GSM 1900 GPRS (3Txslots) Test Position 1 Middle**

Date/Time: 12/9/2011 11:47:56 AM

Communication System: PCS 1900+GPRS(3Up); Frequency: 1880 MHz;Duty Cycle: 1:2.767

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(7.51, 7.51, 7.51) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.476 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.6 V/m; Power Drift = 0.005 dB

Peak SAR (extrapolated) = 0.739 W/kg

**SAR(1 g) = 0.428 mW/g; SAR(10 g) = 0.268 mW/g**

Maximum value of SAR (measured) = 0.454 mW/g

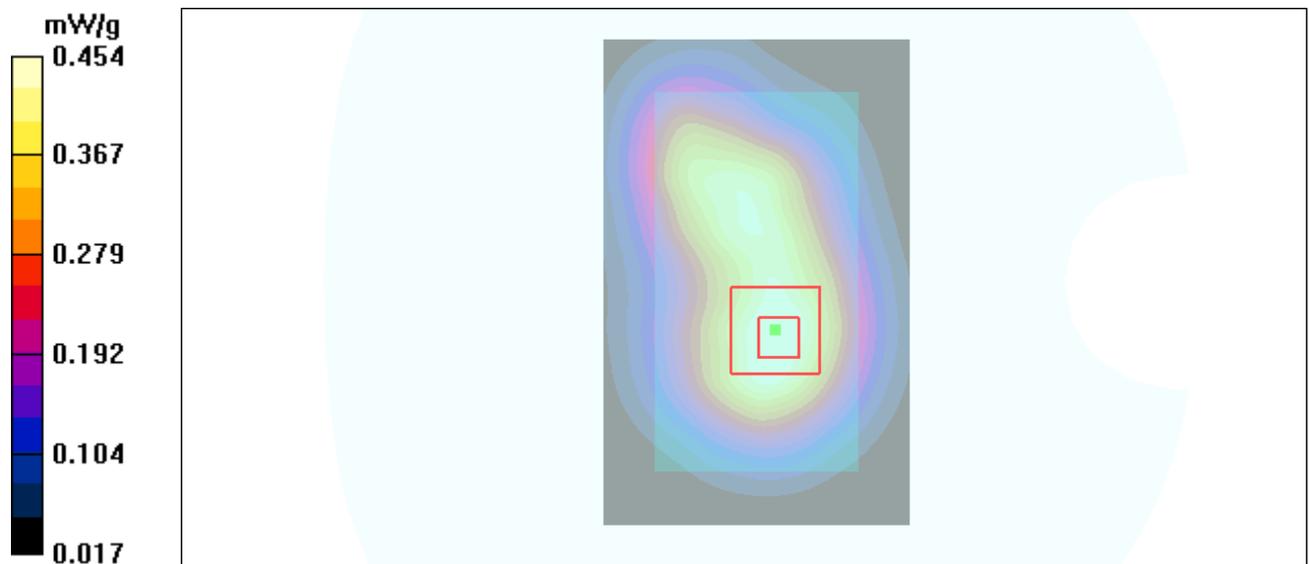


Figure 23 GSM 1900 GPRS (3Txslots) Test Position 1 Channel 661

**GSM 1900 GPRS (4Txslots) Test Position 1 Middle**

Date/Time: 12/9/2011 12:05:11 PM

Communication System: PCS 1900+GPRS(4Up); Frequency: 1880 MHz;Duty Cycle: 1:2.075

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(7.51, 7.51, 7.51) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.407 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.5 V/m; Power Drift = -0.004 dB

Peak SAR (extrapolated) = 0.634 W/kg

**SAR(1 g) = 0.370 mW/g; SAR(10 g) = 0.232 mW/g**

Maximum value of SAR (measured) = 0.391 mW/g

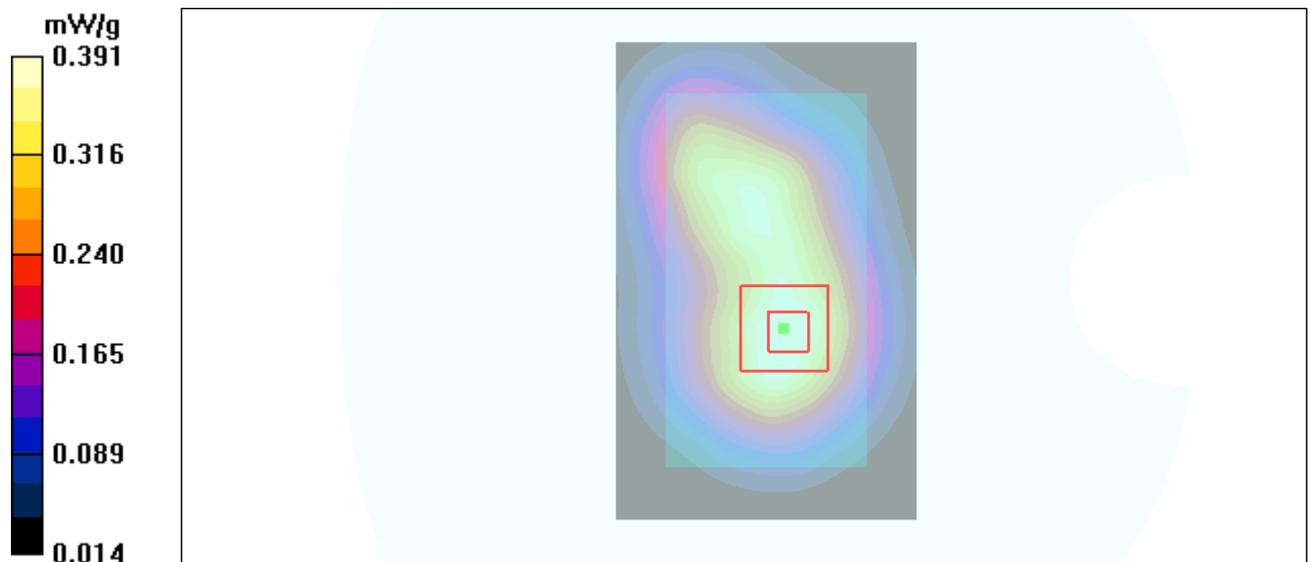


Figure 24 GSM 1900 GPRS (4Txslots) Test Position 1 Channel 661

**GSM 1900 GPRS (2Txslots) Test Position 2 Middle**

Date/Time: 12/9/2011 12:23:52 PM

Communication System: PCS 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4.15

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(7.51, 7.51, 7.51) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 2 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.505 mW/g

**Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.4 V/m; Power Drift = -0.096 dB

Peak SAR (extrapolated) = 0.773 W/kg

**SAR(1 g) = 0.452 mW/g; SAR(10 g) = 0.282 mW/g**

Maximum value of SAR (measured) = 0.482 mW/g

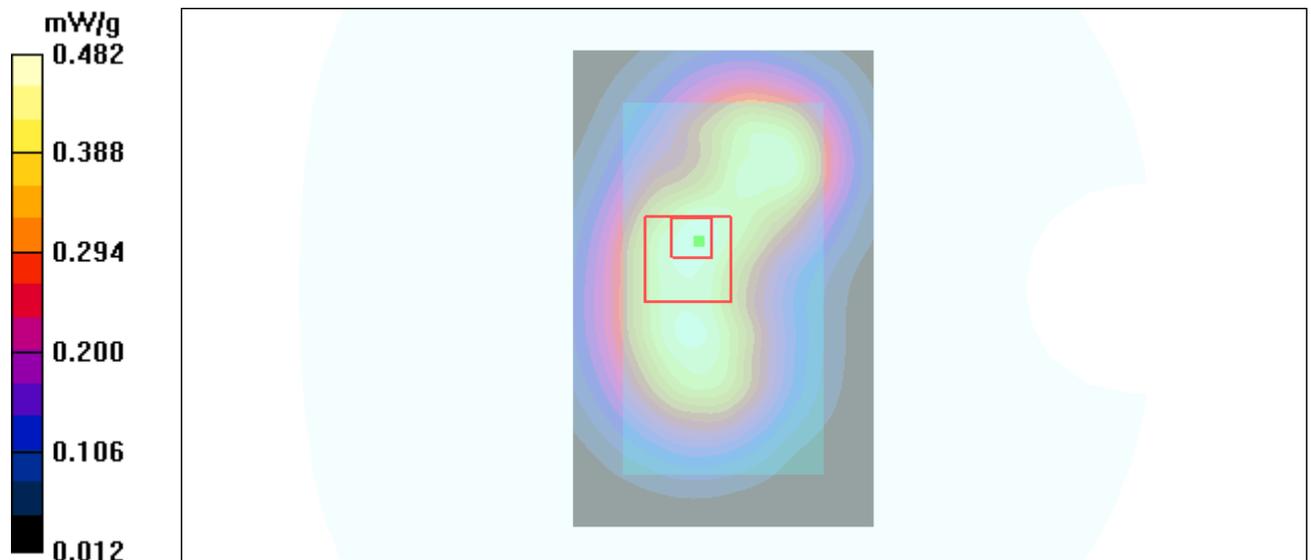


Figure 25 GSM 1900 GPRS (2Txslots) Test Position 2 Channel 661

**GSM 1900 GPRS (2Txslots) Test Position 4 Middle**

Date/Time: 12/9/2011 1:20:23 PM

Communication System: PCS 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4.15

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(7.51, 7.51, 7.51) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 4 Middle/Area Scan (31x51x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.215 mW/g

**Test Position 4 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.9 V/m; Power Drift = -0.005 dB

Peak SAR (extrapolated) = 0.422 W/kg

**SAR(1 g) = 0.216 mW/g; SAR(10 g) = 0.117 mW/g**

Maximum value of SAR (measured) = 0.236 mW/g

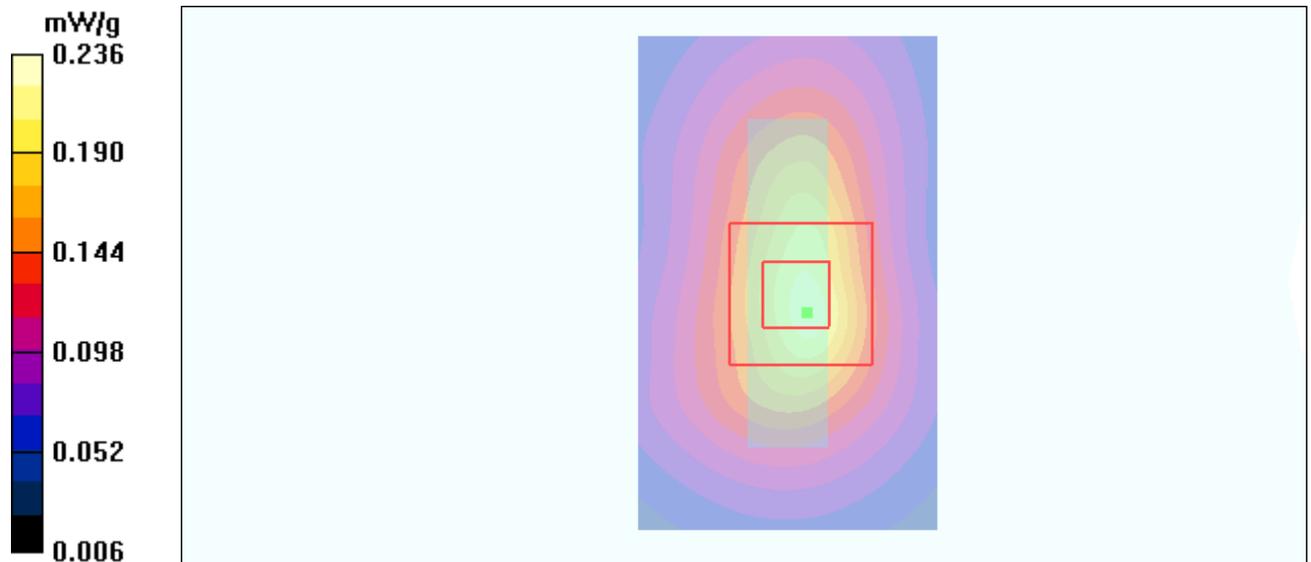


Figure 26 GSM 1900 GPRS (2Txslots) Test Position 4 Channel 661

**GSM 1900 GPRS (2Txslots) Test Position 5 Middle**

Date/Time: 12/9/2011 12:43:44 PM

Communication System: PCS 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4.15

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(7.51, 7.51, 7.51) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 5 Middle/Area Scan (31x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.328 mW/g

**Test Position 5 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 14.8 V/m; Power Drift = 0.059 dB

Peak SAR (extrapolated) = 0.537 W/kg

**SAR(1 g) = 0.301 mW/g; SAR(10 g) = 0.177 mW/g**

Maximum value of SAR (measured) = 0.324 mW/g

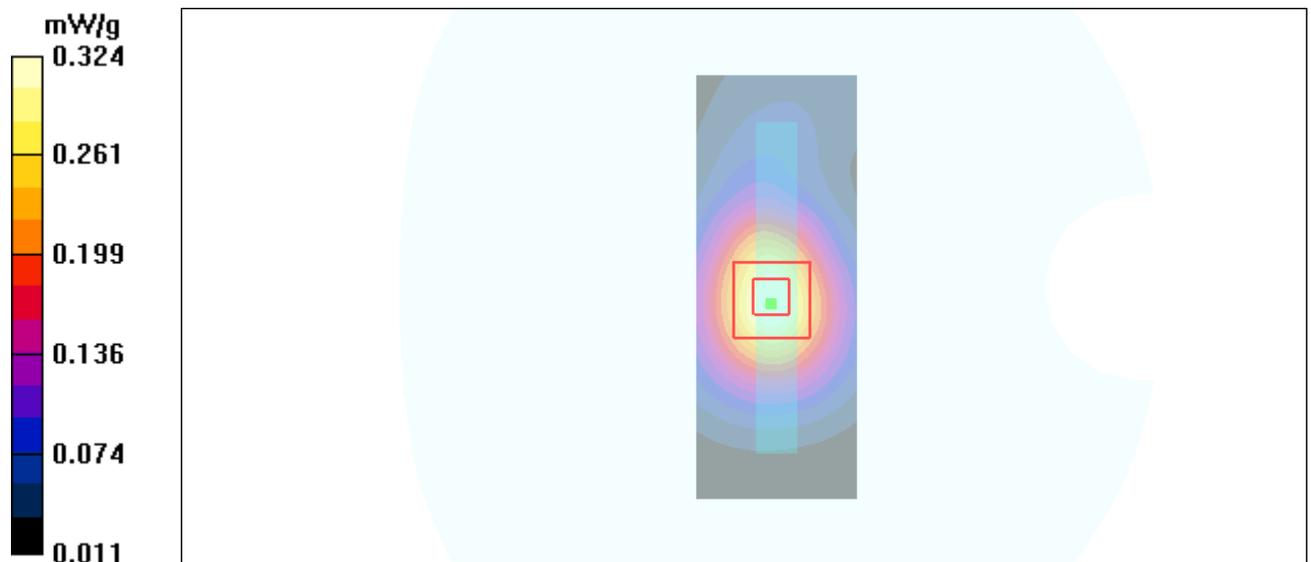


Figure 27 GSM 1900 GPRS (2Txslots) Test Position 5 Channel 661

**GSM 1900 GPRS (2Txslots) Test Position 6 Middle**

Date/Time: 12/9/2011 1:01:49 PM

Communication System: PCS 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4.15

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(7.51, 7.51, 7.51) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 6 Middle/Area Scan (31x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.259 mW/g

**Test Position 6 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.89 V/m; Power Drift = -0.008 dB

Peak SAR (extrapolated) = 0.426 W/kg

**SAR(1 g) = 0.228 mW/g; SAR(10 g) = 0.126 mW/g**

Maximum value of SAR (measured) = 0.250 mW/g

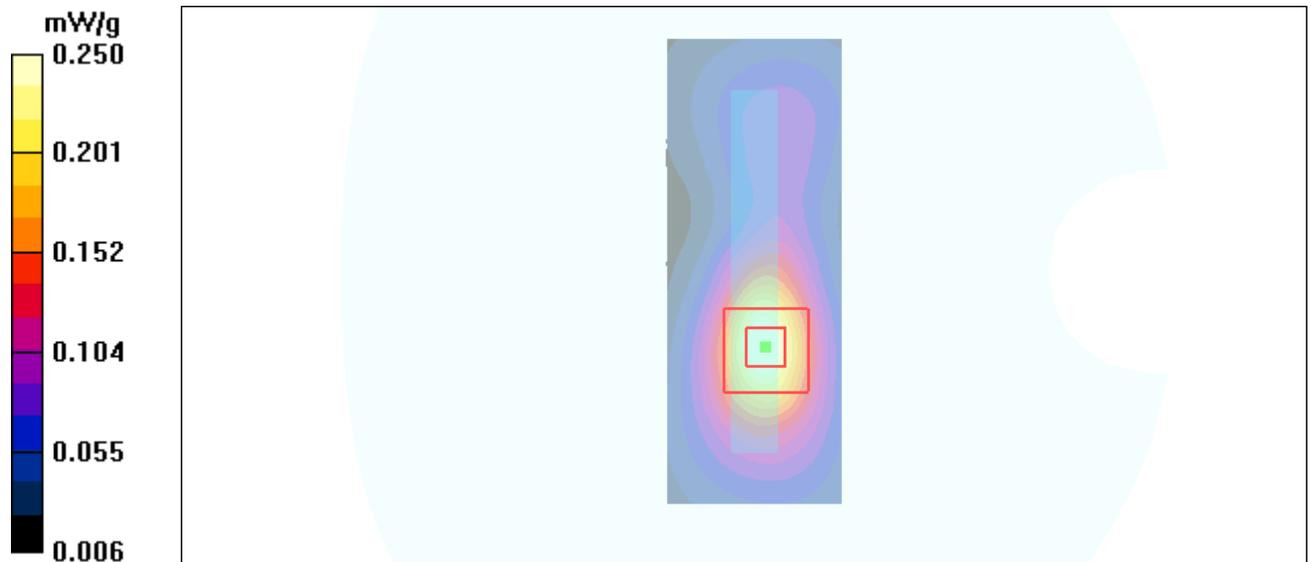


Figure 28 GSM 1900 GPRS (2Txslots) Test Position 6 Channel 661

**GSM 1900 EGPRS (2Txslots) Test Position 1 Middle**

Date/Time: 12/9/2011 1:37:20 PM

Communication System: PCS 1900+EGPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4.15

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(7.51, 7.51, 7.51) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.530 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 18.1 V/m; Power Drift = -0.042 dB

Peak SAR (extrapolated) = 0.810 W/kg

**SAR(1 g) = 0.475 mW/g; SAR(10 g) = 0.297 mW/g**

Maximum value of SAR (measured) = 0.504 mW/g



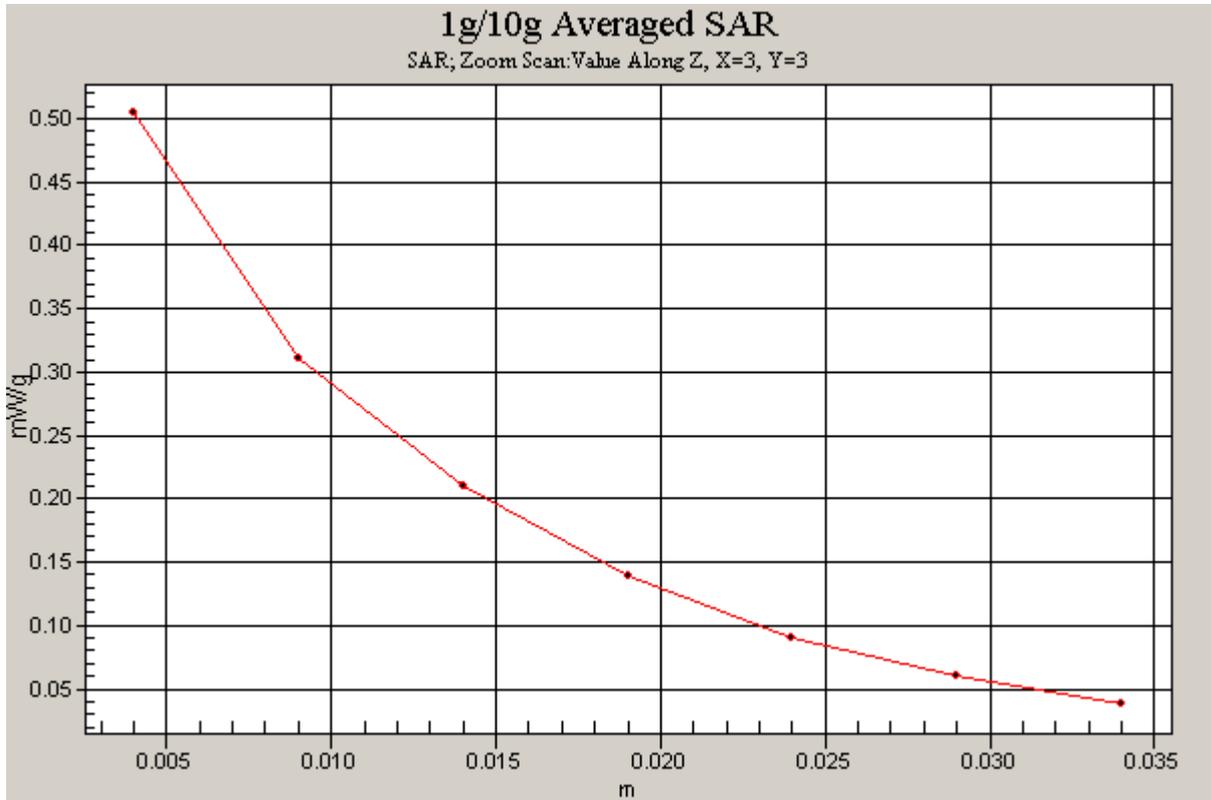


Figure 29 GSM 1900 EGPRS (2Txslots) Test Position 1 Channel 661

### WCDMA Band V Test Position 1 Middle

Date/Time: 12/9/2011 9:22:03 AM

Communication System: WCDMA Band V; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 1 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.620 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 22.9 V/m; Power Drift = -0.067 dB

Peak SAR (extrapolated) = 0.794 W/kg

**SAR(1 g) = 0.540 mW/g; SAR(10 g) = 0.360 mW/g**

Maximum value of SAR (measured) = 0.610 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 22.9 V/m; Power Drift = -0.067 dB

Peak SAR (extrapolated) = 0.781 W/kg

**SAR(1 g) = 0.579 mW/g; SAR(10 g) = 0.403 mW/g**

Maximum value of SAR (measured) = 0.622 mW/g

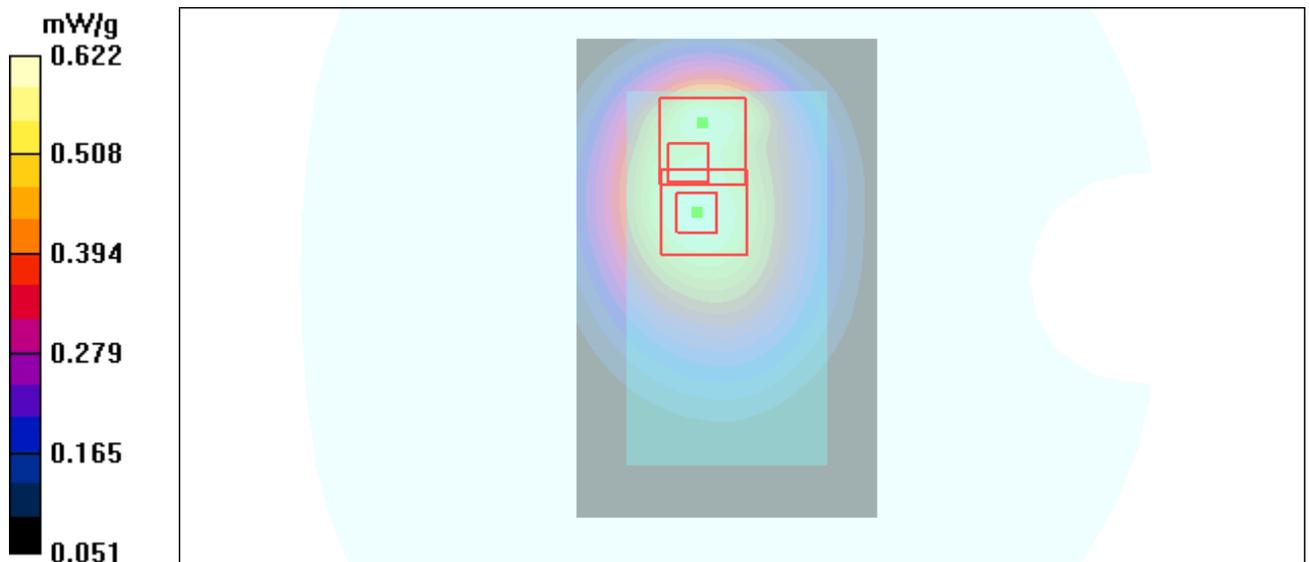


Figure 30 WCDMA Band V Test Position 1 Channel 4183

### WCDMA Band V Test Position 2 Middle

Date/Time: 12/9/2011 9:51:47 AM

Communication System: WCDMA Band V; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 2 Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.656 mW/g

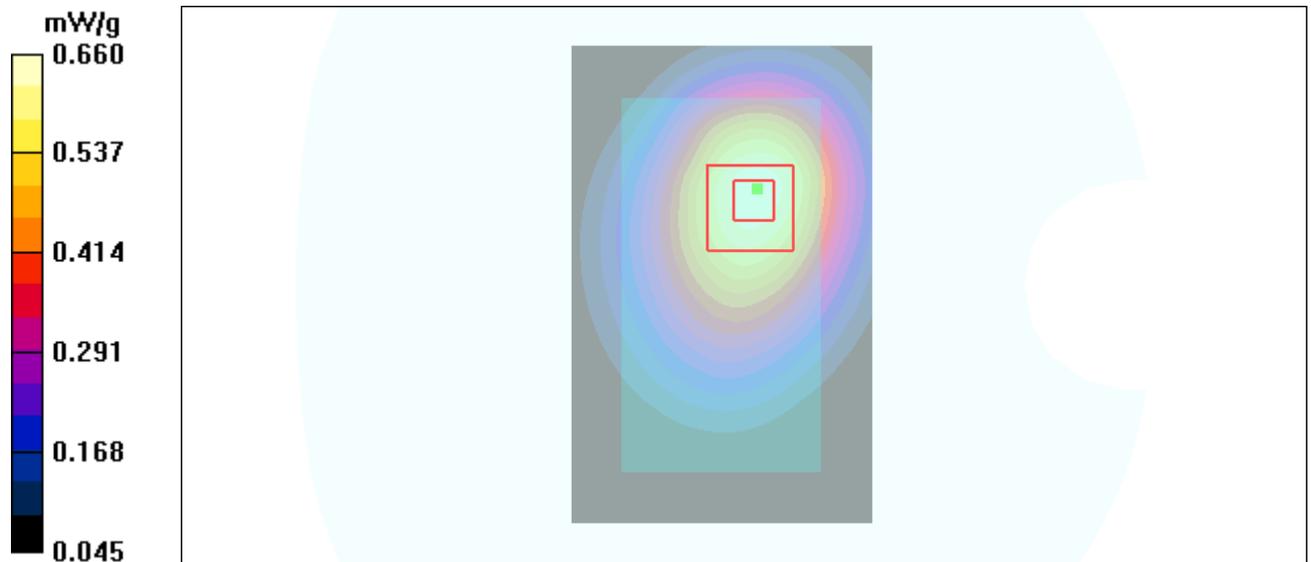
**Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 22.6 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 0.819 W/kg

**SAR(1 g) = 0.618 mW/g; SAR(10 g) = 0.432 mW/g**

Maximum value of SAR (measured) = 0.660 mW/g



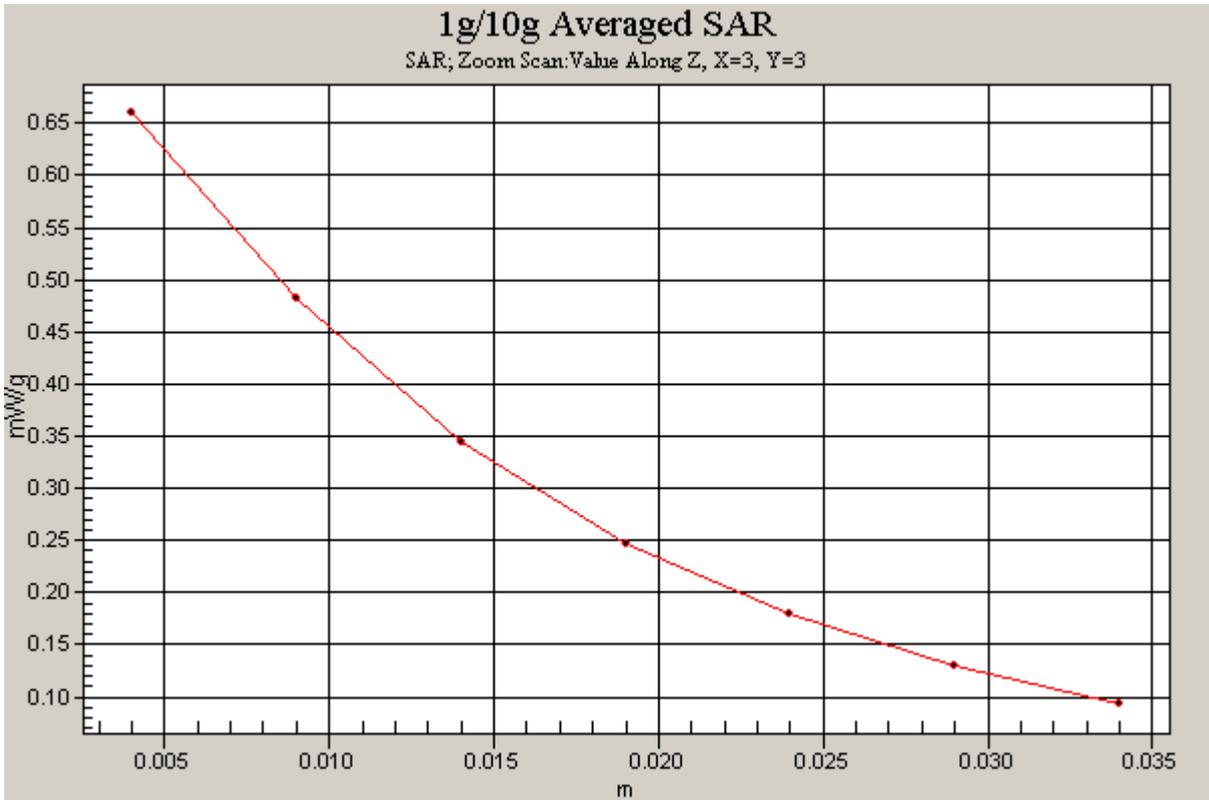


Figure 31 WCDMA Band V Test Position 2 Channel 4183

### WCDMA Band V Test Position 4 Middle

Date/Time: 12/9/2011 10:45:48 AM

Communication System: WCDMA Band V; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 4 Middle/Area Scan (31x51x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.088 mW/g

**Test Position 4 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.1 V/m; Power Drift = -0.022 dB

Peak SAR (extrapolated) = 0.279 W/kg

**SAR(1 g) = 0.102 mW/g; SAR(10 g) = 0.053 mW/g**

Maximum value of SAR (measured) = 0.108 mW/g

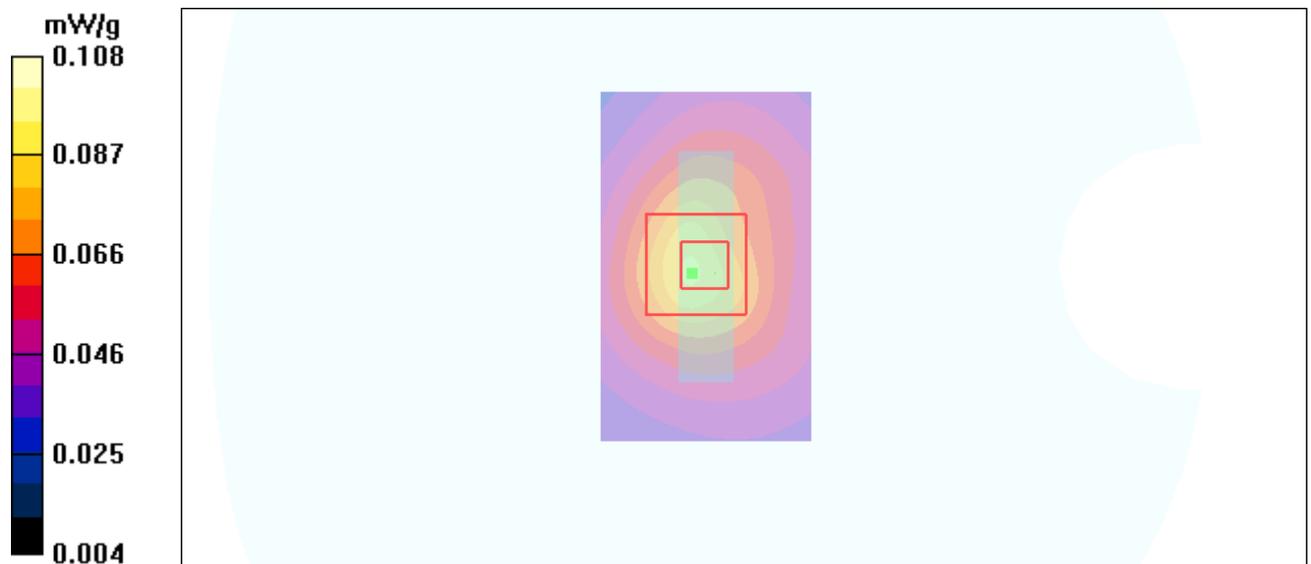


Figure 32 WCDMA Band V Test Position 4 Channel 4183

### WCDMA Band V Test Position 5 Middle

Date/Time: 12/9/2011 10:10:20 AM

Communication System: WCDMA Band V; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 5 Middle/Area Scan (31x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.251 mW/g

**Test Position 5 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.6 V/m; Power Drift = -0.044 dB

Peak SAR (extrapolated) = 0.305 W/kg

**SAR(1 g) = 0.232 mW/g; SAR(10 g) = 0.164 mW/g**

Maximum value of SAR (measured) = 0.248 mW/g

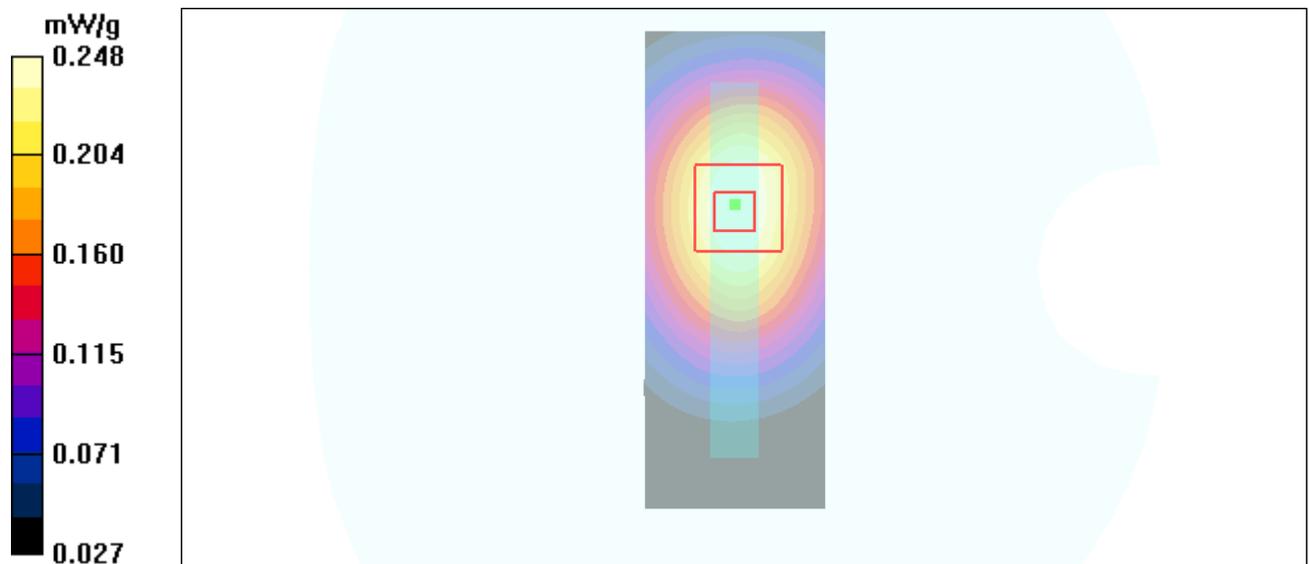


Figure 33 WCDMA Band V Test Position 5 Channel 4183

### WCDMA Band V Test Position 6 Middle

Date/Time: 12/9/2011 10:27:28 AM

Communication System: WCDMA Band V; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3816; ConvF(9.38, 9.38, 9.38) Calibrated: 10/3/2011;

Electronics: DAE4 Sn871; Calibrated: 8/29/2011

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Test Position 6 Middle/Area Scan (31x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.316 mW/g

**Test Position 6 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.3 V/m; Power Drift = -0.073 dB

Peak SAR (extrapolated) = 0.394 W/kg

**SAR(1 g) = 0.288 mW/g; SAR(10 g) = 0.194 mW/g**

Maximum value of SAR (measured) = 0.310 mW/g

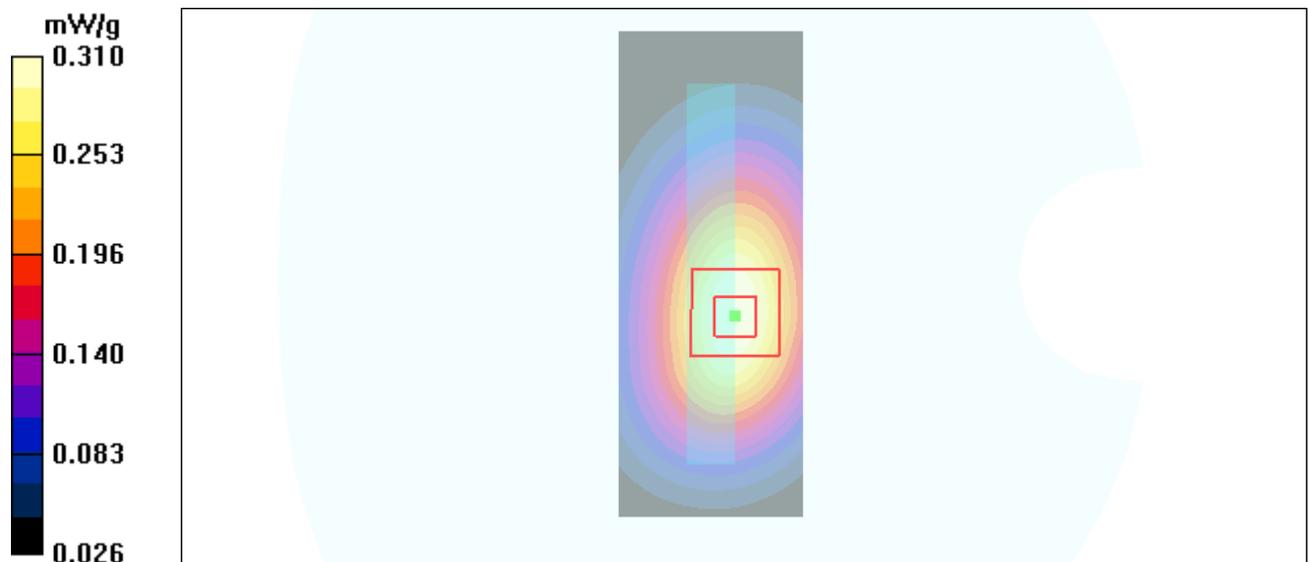


Figure 34 WCDMA Band V Test Position 6 Channel 4183

# TA Technology (Shanghai) Co., Ltd. Test Report

Report No. RZA1112-2004SAR01

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## ANNEX D: Probe Calibration Certificate

**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: **TMC Shanghai (Auden)**

Certificate No.: **EX3-3816\_Oct11**

### CALIBRATION CERTIFICATE

Object: **EX3DV4 - SN:3816**

Calibration procedure(s): **QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4  
Calibration procedure for dosimetric E-field probes**

Calibration date: **October 3, 2011**

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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Jelon Kastali	Laboratory Technician	
Approved by:	Kata Pokovic	Technical Manager	
			Issued: October 3, 2011
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

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



S Schweizerischer Kalibrierdienst  
S 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

**Glossary:**

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

**Calibration is Performed According to the Following Standards:**

- 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
- 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

**Methods Applied and Interpretation of Parameters:**

- NORM<sub>x,y,z</sub>:** Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* 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.
- DCP<sub>x,y,z</sub>:** DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (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
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>:** 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  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* 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  $\pm 50$  MHz to  $\pm 100$  MHz.
- 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.

EX3DV4 – SN:3816

October 3, 2011

# Probe EX3DV4

## SN:3816

Manufactured: September 2, 2011  
Calibrated: October 3, 2011

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# TA Technology (Shanghai) Co., Ltd.

## Test Report

EX3DV4- SN:3816

October 3, 2011

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:3816

#### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	0.48	0.56	0.61	± 10.1 %
DCP (mV) <sup>B</sup>	99.8	102.2	102.1	

#### Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	111.3	±2.7 %
			Y	0.00	0.00	1.00	127.3	
			Z	0.00	0.00	1.00	127.7	

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

# TA Technology (Shanghai) Co., Ltd.

## Test Report

EX3DV4-- SN:3816

October 3, 2011

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:3816

#### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>c</sup>	Relative Permittivity <sup>f</sup>	Conductivity (S/m) <sup>f</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	9.97	9.97	9.97	0.11	1.00	± 13.4 %
750	41.9	0.89	9.47	9.47	9.47	0.62	0.78	± 12.0 %
835	41.5	0.90	9.22	9.22	9.22	0.76	0.66	± 12.0 %
1450	40.5	1.20	8.58	8.58	8.58	0.65	0.77	± 12.0 %
1750	40.1	1.37	8.23	8.23	8.23	0.80	0.58	± 12.0 %
1900	40.0	1.40	7.90	7.90	7.90	0.80	0.57	± 12.0 %
2450	39.2	1.80	7.17	7.17	7.17	0.66	0.64	± 12.0 %
2600	39.0	1.96	7.06	7.06	7.06	0.64	0.67	± 12.0 %

<sup>c</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>f</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) 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 ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

# TA Technology (Shanghai) Co., Ltd.

## Test Report

EX3DV4- SN:3816

October 3, 2011

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:3816

#### Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	10.83	10.83	10.83	0.02	1.00	± 13.4 %
750	55.5	0.96	9.50	9.50	9.50	0.80	0.70	± 12.0 %
835	55.2	0.97	9.38	9.38	9.38	0.68	0.69	± 12.0 %
1750	53.4	1.49	7.80	7.80	7.80	0.80	0.65	± 12.0 %
1900	53.3	1.52	7.51	7.51	7.51	0.80	0.65	± 12.0 %
2450	52.7	1.95	7.19	7.19	7.19	0.80	0.60	± 12.0 %
2600	52.5	2.16	7.14	7.14	7.14	0.80	0.59	± 12.0 %

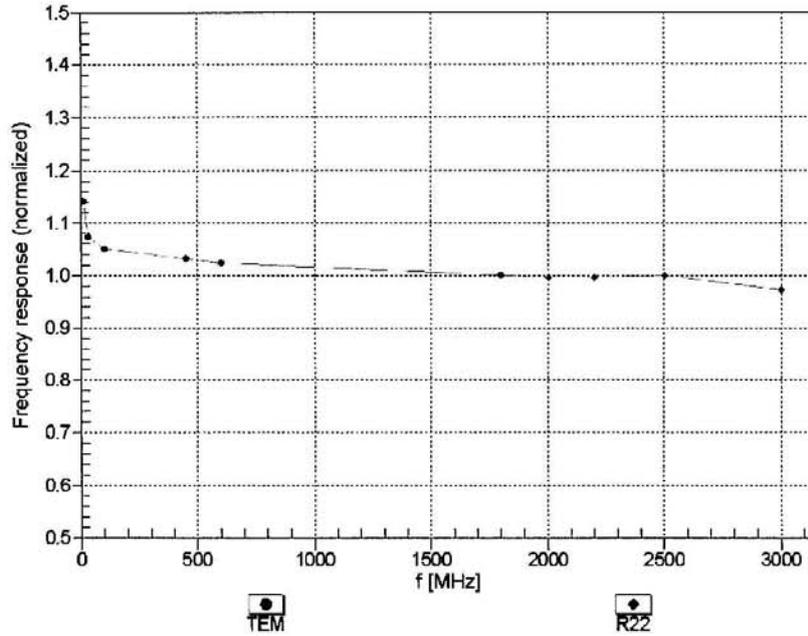
<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) 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 ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

EX3DV4- SN:3816

October 3, 2011

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



Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

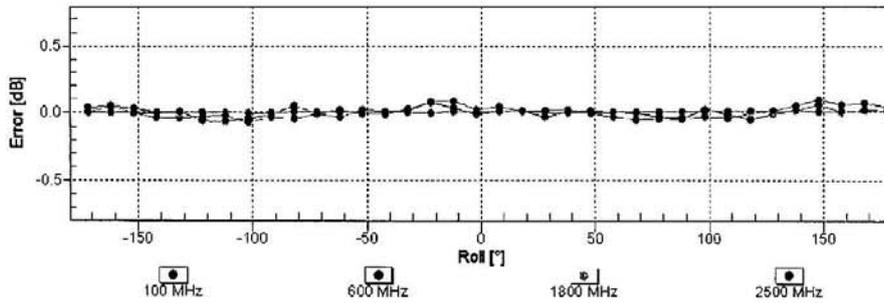
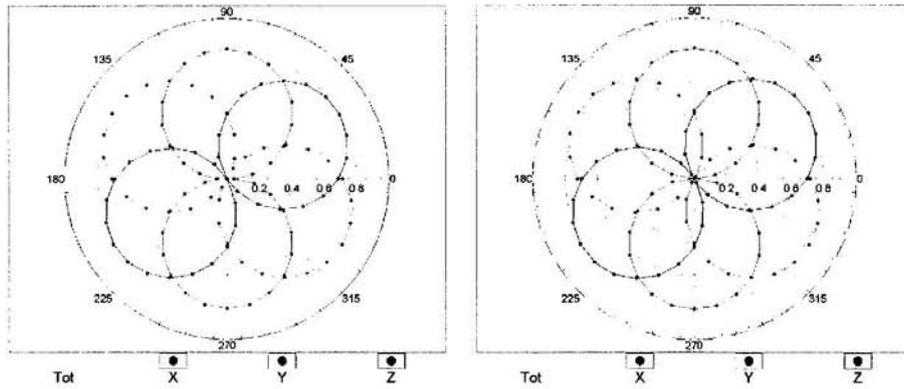
EX3DV4- SN:3816

October 3, 2011

Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$

f=600 MHz, TEM

f=1800 MHz, R22

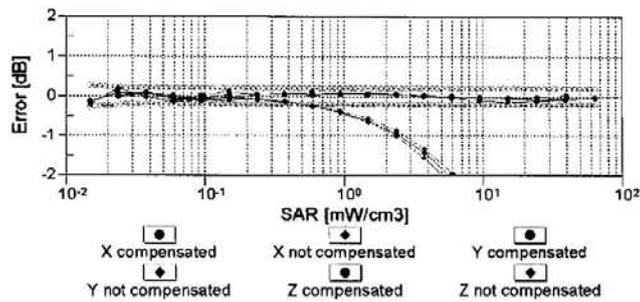
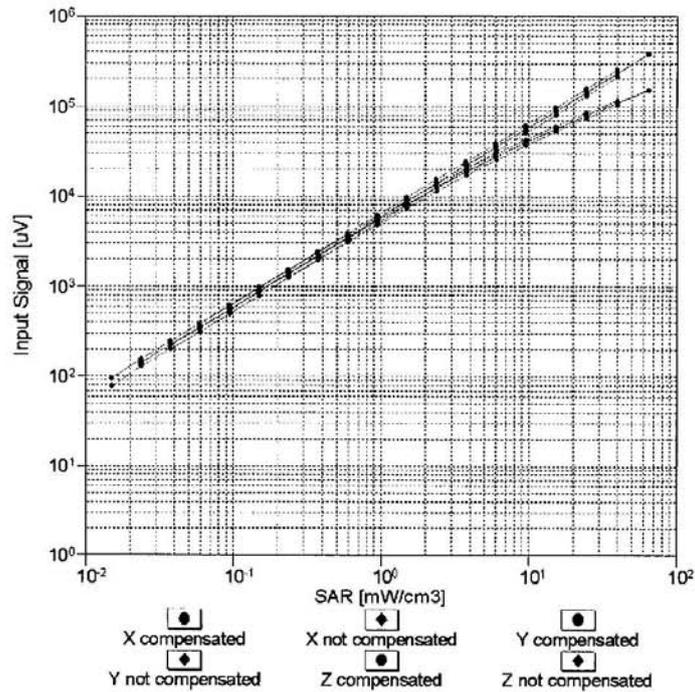


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

EX3DV4- SN:3816

October 3, 2011

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

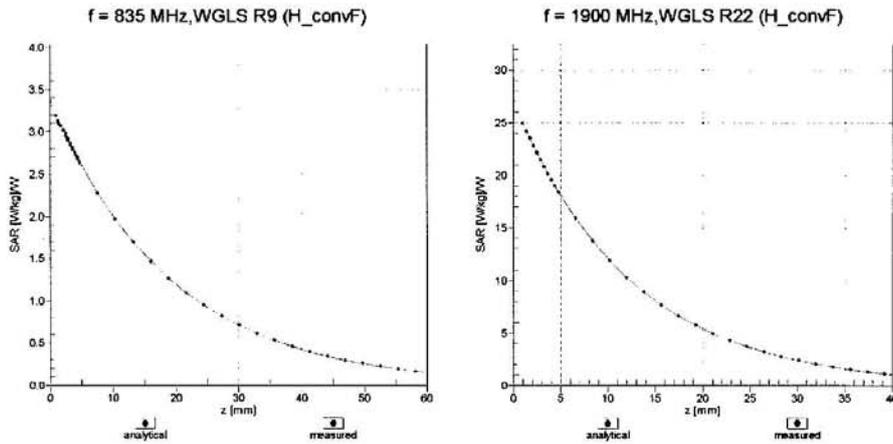


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

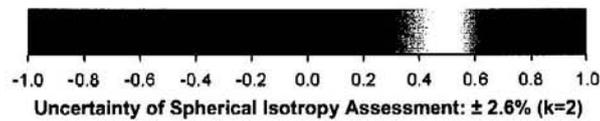
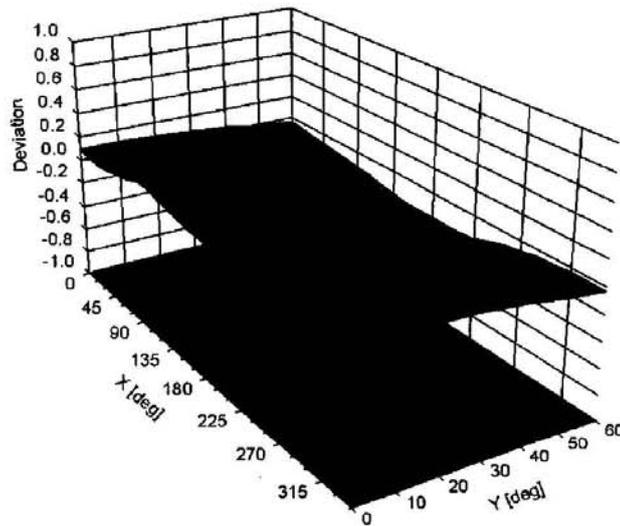
EX3DV4- SN:3816

October 3, 2011

### Conversion Factor Assessment



### Deviation from Isotropy in Liquid Error ( $\phi, \theta$ ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  (k=2)

**TA Technology (Shanghai) Co., Ltd.**  
**Test Report**

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EX3DV4-- SN:3816

October 3, 2011

**DASY/EASY - Parameters of Probe: EX3DV4 - SN:3816**

**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

# TA Technology (Shanghai) Co., Ltd. Test Report

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## ANNEX E: D835V2 Dipole Calibration Certificate

**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 **TA-Shanghai (Auden)**

Certificate No: **D835V2-4d020\_Aug11**

### CALIBRATION CERTIFICATE

Object: **D835V2 - SN: 4d020**

Calibration procedure(s): **QA CAL-05.v8  
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **August 26, 2011**

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: August 26, 2011

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

# TA Technology (Shanghai) Co., Ltd.

## Test Report

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**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**

### 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:

- 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
- 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
- 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:

- 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.

# TA Technology (Shanghai) Co., Ltd. Test Report

### Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.6.2
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	835 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	41.5	0.90 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	41.1 ± 6 %	0.89 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	2.32 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>9.34 mW / g ± 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	1.52 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>6.11 mW / g ± 16.5 % (k=2)</b>

### Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	55.2	0.97 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	53.4 ± 6 %	0.99 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Body TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	250 mW input power	2.42 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>9.46 mW / g ± 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	1.59 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>6.26 mW / g ± 16.5 % (k=2)</b>

# TA Technology (Shanghai) Co., Ltd.

## Test Report

### Appendix

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.9 $\Omega$ - 3.1 $j\Omega$
Return Loss	- 27.7 dB

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.7 $\Omega$ - 5.4 $j\Omega$
Return Loss	- 25.1 dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 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.

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 22, 2004

**DASY5 Validation Report for Head TSL**

Date: 25.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020**

Communication System: CW; Frequency: 835 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.89$  mho/m;  $\epsilon_r = 41.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

**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 = 56.930 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.421 W/kg

**SAR(1 g) = 2.32 mW/g; SAR(10 g) = 1.52 mW/g**

Maximum value of SAR (measured) = 2.708 mW/g

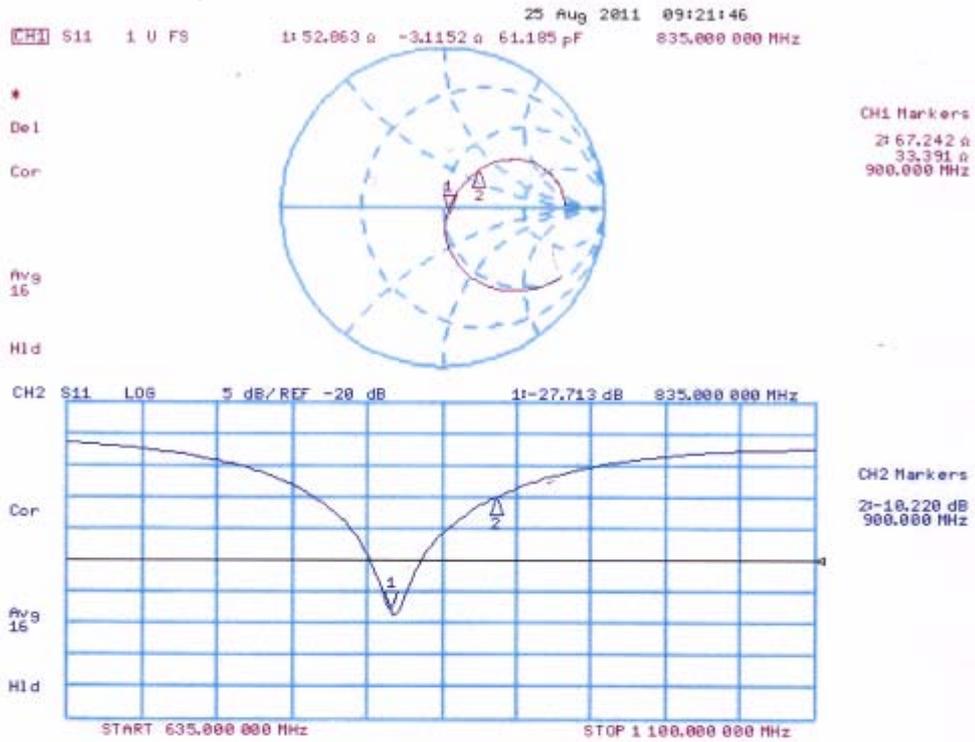


# TA Technology (Shanghai) Co., Ltd. Test Report

Report No. RZA1112-2004SAR01

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## Impedance Measurement Plot for Head TSL



**DASY5 Validation Report for Body TSL**

Date: 26.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020**

Communication System: CW; Frequency: 835 MHz

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.99 \text{ mho/m}$ ;  $\epsilon_r = 53.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**

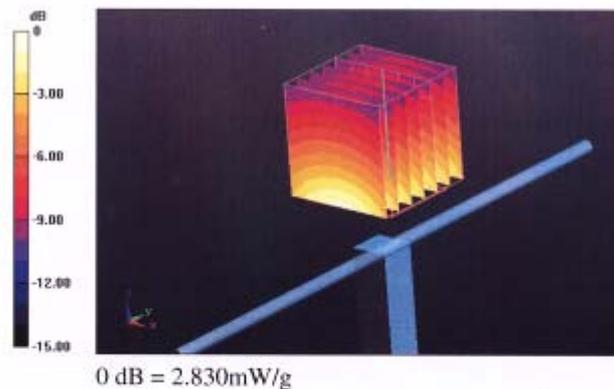
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 55.406 V/m; Power Drift = 0.02 dB

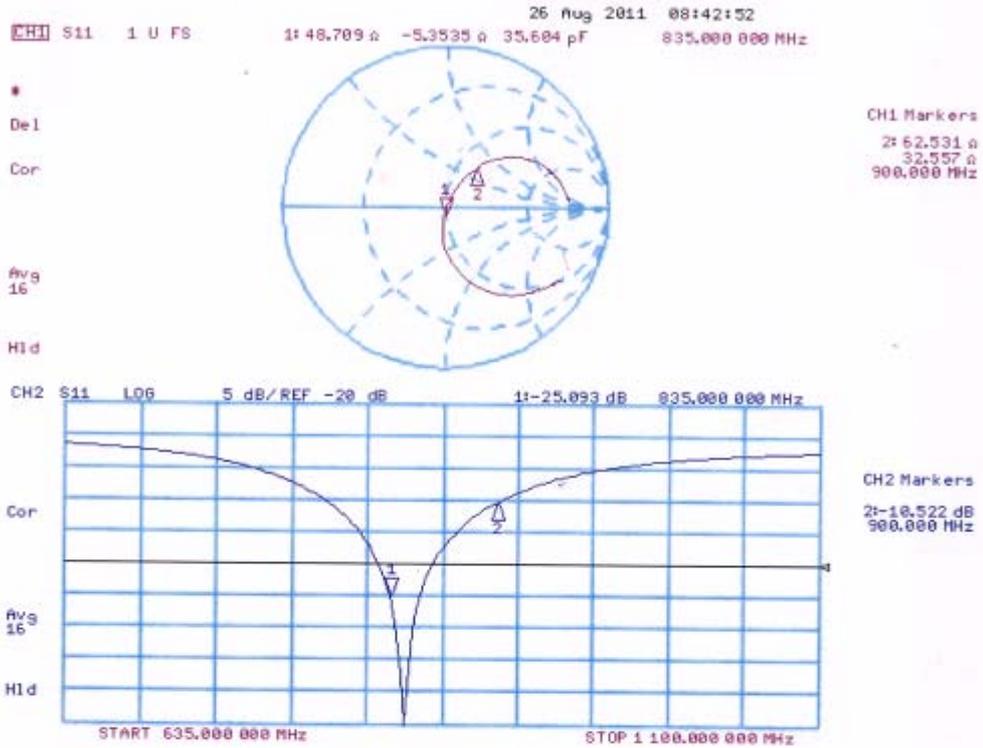
Peak SAR (extrapolated) = 3.509 W/kg

**SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.59 mW/g**

Maximum value of SAR (measured) = 2.827 mW/g



Impedance Measurement Plot for Body TSL



# TA Technology (Shanghai) Co., Ltd. Test Report

Report No. RZA1112-2004SAR01

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## ANNEX G: D1900V2 Dipole Calibration Certificate

**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 **TA-Shanghai (Auden)**

Certificate No: **D1900V2-5d060\_Aug11**

### CALIBRATION CERTIFICATE

Object: **D1900V2 - SN: 5d060**

Calibration procedure(s): **QA CAL-05.v8  
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **August 31, 2011**

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 31, 2011

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

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



**S** Schweizerischer Kalibrierdienst  
**S** Service suisse d'étalonnage  
**C** 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**

**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:**

- 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
- 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
- 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:**

- 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.

# TA Technology (Shanghai) Co., Ltd.

## Test Report

### Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.6.2
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1900 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	40.0	1.40 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	39.5 ± 6 %	1.42 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>40.3 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.30 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>21.1 mW / g ± 16.5 % (k=2)</b>

### Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	53.3	1.52 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	53.9 ± 6 %	1.57 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>41.7 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.55 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>22.0 mW / g ± 16.5 % (k=2)</b>

**Appendix**

**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	52.6 $\Omega$ + 7.5 j $\Omega$
Return Loss	- 22.3 dB

**Antenna Parameters with Body TSL**

Impedance, transformed to feed point	47.3 $\Omega$ + 7.9 j $\Omega$
Return Loss	- 21.3 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.194 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.

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	December 10, 2004

**DASY5 Validation Report for Head TSL**

Date: 30.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060**

Communication System: CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.42$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

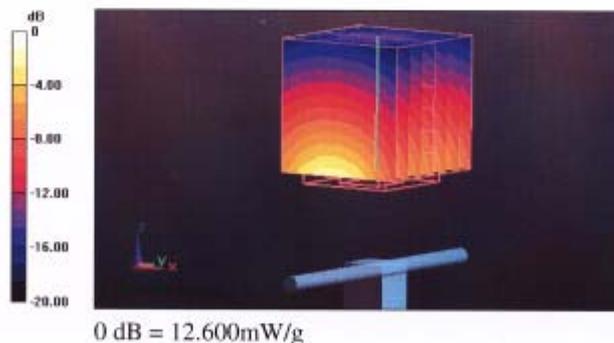
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.636 V/m; Power Drift = 0.07 dB

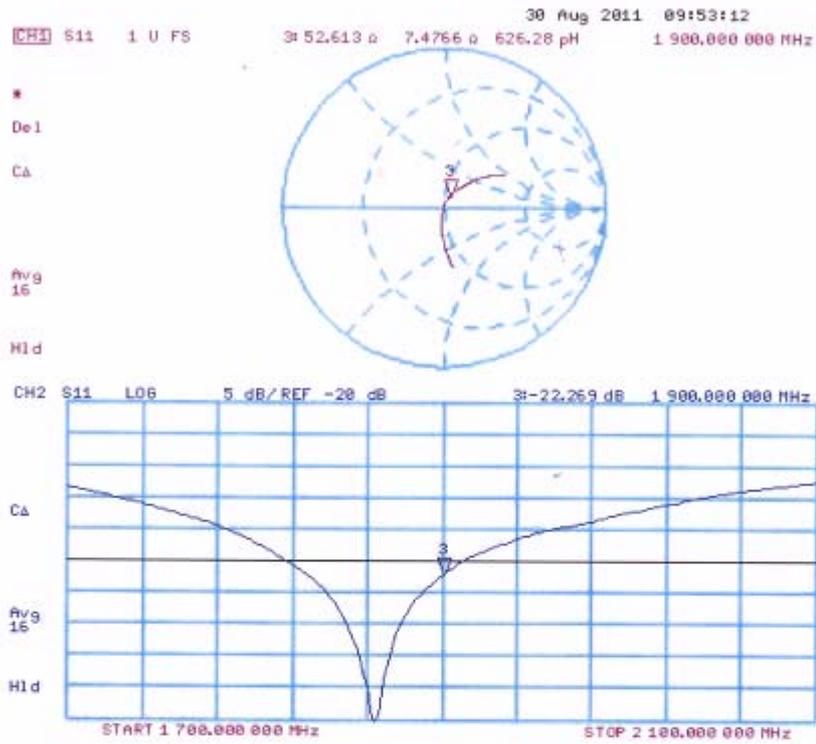
Peak SAR (extrapolated) = 18.535 W/kg

**SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.3 mW/g**

Maximum value of SAR (measured) = 12.600 mW/g



Impedance Measurement Plot for Head TSL



**DASY5 Validation Report for Body TSL**

Date: 31.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060**

Communication System: CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.57$  mho/m;  $\epsilon_r = 53.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

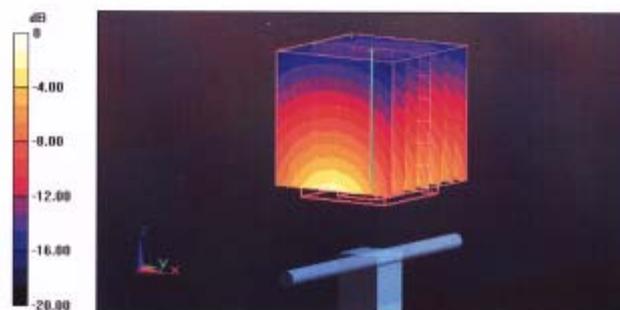
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.435 V/m; Power Drift = -0.0099 dB

Peak SAR (extrapolated) = 18.663 W/kg

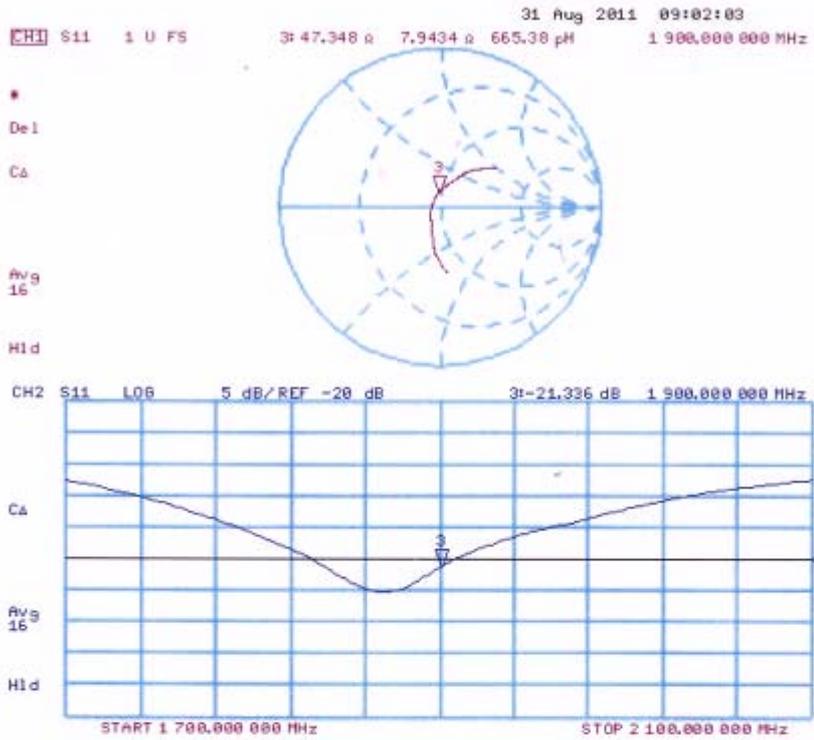
**SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.55 mW/g**

Maximum value of SAR (measured) = 13.397 mW/g



0 dB = 13.400mW/g

Impedance Measurement Plot for Body TSL



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## Test Report

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### ANNEX H: DAE4 Calibration Certificate

**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 **TA-SH (Auden)**

Certificate No: **DAE4-871\_Nov11**

CALIBRATION CERTIFICATE																			
Object	DAE4 - SD 000 D04 BJ - SN: 871																		
Calibration procedure(s)	QA CAL-06.v23 Calibration procedure for the data acquisition electronics (DAE)																		
Calibration date:	November 22, 2011																		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility; environment temperature (22 ± 3)°C and humidity &lt; 70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Primary Standards</th> <th style="width: 15%;">ID #</th> <th style="width: 30%;">Cal Date (Certificate No.)</th> <th style="width: 25%;">Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Keithley Multimeter Type 2001</td> <td>SN: 0810278</td> <td>28-Sep-11 (No:11450)</td> <td>Sep-12</td> </tr> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Check Date (in house)</th> <th>Scheduled Check</th> </tr> <tr> <td>Calibrator Box V1.1</td> <td>SE UMS 006 AB 1004</td> <td>08-Jun-11 (in house check)</td> <td>In house check: Jun-12</td> </tr> </tbody> </table>				Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration	Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No:11450)	Sep-12	Secondary Standards	ID #	Check Date (in house)	Scheduled Check	Calibrator Box V1.1	SE UMS 006 AB 1004	08-Jun-11 (in house check)	In house check: Jun-12
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration																
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No:11450)	Sep-12																
Secondary Standards	ID #	Check Date (in house)	Scheduled Check																
Calibrator Box V1.1	SE UMS 006 AB 1004	08-Jun-11 (in house check)	In house check: Jun-12																
Calibrated by:	Name Andrea Gunti	Function Technician	Signature 																
Approved by:	Fin Bornholt	R&D Director																	
			Issued: November 22, 2011																
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.																			

**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**

### 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 following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
  - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
  - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
  - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
  - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
  - **Power consumption:** Typical value for information. Supply currents in various operating modes.

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### DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V, 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	404.749 $\pm$ 0.1% (k=2)	404.733 $\pm$ 0.1% (k=2)	405.174 $\pm$ 0.1% (k=2)
Low Range	3.98175 $\pm$ 0.7% (k=2)	3.93601 $\pm$ 0.7% (k=2)	3.96830 $\pm$ 0.7% (k=2)

### Connector Angle

Connector Angle to be used in DASY system	90.0 $\pm$ 1 $^{\circ}$
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## Test Report

### Appendix

#### 1. DC Voltage Linearity

High Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	199991.9	-0.91	-0.00
Channel X + Input	20000.28	0.48	0.00
Channel X - Input	-19998.51	0.59	-0.00
Channel Y + Input	200003.0	1.24	0.00
Channel Y + Input	19999.67	0.17	0.00
Channel Y - Input	-20000.04	-0.34	0.00
Channel Z + Input	200010.1	-0.11	-0.00
Channel Z + Input	19999.33	-0.07	-0.00
Channel Z - Input	-20001.45	-0.85	0.00

Low Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	2000.0	0.05	0.00
Channel X + Input	199.81	-0.09	-0.04
Channel X - Input	-199.63	0.37	-0.19
Channel Y + Input	1999.9	-0.22	-0.01
Channel Y + Input	198.81	-1.19	-0.59
Channel Y - Input	-201.62	-1.72	0.86
Channel Z + Input	2000.4	0.48	0.02
Channel Z + Input	199.30	-0.70	-0.35
Channel Z - Input	-200.86	-1.06	0.53

#### 2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading ( $\mu\text{V}$ )	Low Range Average Reading ( $\mu\text{V}$ )
Channel X	200	14.43	13.13
	-200	-12.22	-13.72
Channel Y	200	-10.07	-9.78
	-200	9.61	8.66
Channel Z	200	-0.56	-0.83
	-200	-0.01	0.11

#### 3. Channel separation

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

	Input Voltage (mV)	Channel X ( $\mu\text{V}$ )	Channel Y ( $\mu\text{V}$ )	Channel Z ( $\mu\text{V}$ )
Channel X	200	-	3.08	0.09
Channel Y	200	3.19	-	4.59
Channel Z	200	0.90	-0.06	-

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## Test Report

#### 4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15920	15519
Channel Y	16179	17567
Channel Z	15791	15270

#### 5. Input Offset Measurement

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

Input 10M $\Omega$

	Average ( $\mu$ V)	min. Offset ( $\mu$ V)	max. Offset ( $\mu$ V)	Std. Deviation ( $\mu$ V)
Channel X	0.03	-1.16	2.66	0.46
Channel Y	-0.63	-3.22	0.29	0.46
Channel Z	-0.87	-2.03	0.28	0.46

#### 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

#### 7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

#### 8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

#### 9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9