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OET 65

TEST REPORT

Product Name	Wireless Modem
Model	E583C
FCC ID	QISE583C-52
IC	6369A-E583C
Client	Huawei Technologies Co., Ltd.

TA Technology (Shanghai) Co., Ltd.

GENERAL SUMMARY

Product Name	Wireless Modem	Model	E583C
FCC ID	QISE583C-52	IC	6369A-E583C
Report No.	RZA2010-1244-R3		
Client	Huawei Technologies Co., Ltd.		
Manufacturer	Huawei Technologies Co., Ltd.		
Reference Standard(s)	**IEEE Std C95.1, 1999:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz **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 Radio frequency Electromagnetic Fields Additional Information for Evaluation Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radio frequency Emissions **KDB 447498 D01 (2009-11-13):** Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies **RSS-102 Issue 4 March 2010:** Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)		
Conclusion	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. General Judgment: **Pass** (Stamp) **Date of issue: August 31st, 2010**		
Comment	The test result only responds to the measured sample.		

Approved by _____   **Revised by** _____   **Performed by** _____

Yang Weizhong   Ling Minbao   Zhang Sheng

TABLE OF CONTENT

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.

This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

1.2. Testing Laboratory

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1.3. Applicant Information

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Postal Code: 518129

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1.4. Manufacturer Information

Company: Huawei Technologies Co., Ltd.

Address: Bantian, Longgang District

City: Shenzhen

Postal Code: 518129

Country: P.R. China

Telephone: 0755-28780808

Fax: 0755-28780808

1.5. Information of EUT

General Information

Device Type:	Portable Device
Exposure Category:	Uncontrolled Environment / General Population
Name of EUT:	Wireless Modem
IMEI:	353718040002875
Device Operating Configurations :	
Operating Mode(s):	GSM 850; (tested) GSM 1900; (tested) WCDMA Band IV; (tested) Wifi;
Test Modulation:	(GSM)GMSK, (WCDMA)QPSK
GPRS Multislot Class:	12
EGPRS Multislot Class:	12
HSDPA UE Category:	8
HSUPA UE Category:	6

	Band	Tx (MHz)	Rx (MHz)
Operating Frequency Range(s):	GSM 850	824.2 ~ 848.8	869.2 ~ 893.8
	GSM 1900	1850.2 ~ 1909.8	1930.2 ~ 1989.8
	WCDMA Band IV	1712.4 ~ 1752.6	2112.4 ~ 2152.2

Power Class:	GSM 850: 4, tested with power level 5
	GSM 1900: 1, tested with power level 0
	WCDMA Band IV: 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) 1312 - 1413 - 1513 (WCDMA Band IV) (tested)
Hardware Version:	WL1E583CT
Software Version:	V100R001
Antenna Type:	Internal Antenna

Auxiliary Equipment Details

AE1:Battery

Model: HB7A1H

Manufacturer: Huawei Technologies Co., Ltd.

SN: YGCA517HI2123518

AE2:Travel Adapter

Model: HW-050100U1W

Manufacturer: Huawei Technologies Co., Ltd.

SN: HKAA51556214

Equipment Under Test (EUT) is Wireless Modem with internal antenna. SAR is tested for the EUT respectively for GSM 850, GSM 1900 and WCDMA Band IV. The EUT has GPRS (class 12), EGPRS (class 12), WCDMA, HSDPA and HSUPA functions.

Since the EUT only has the data transfer function, but does not have the voice transfer function, the tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS and EGPRS, the tests in the band of WCDMA Band IV is performed in the mode of WCDMA, HSDPA and HSUPA.

The sample undergoing test was selected by the Client.

Components list please refer to documents of the manufacturer.

1.6. The Maximum SAR_{1g} Values and Conducted Power of each tested band

Body Worn Configuration

Mode	Channel	distance	Test position	SAR_{1g} (W/kg)
2-slots EGPRS 850	128	10mm	Front side	**1.090**
2-slots EGPRS 1900	810	10mm	Front side	**0.896**
WCDMA Band IV	1513	10mm	Front side	**1.120**

Maximum Power

Band		Max Conducted Power (dBm)	Max Average Power (dBm)
GSM 850	GPRS,2 time-slots	**30.21**	**24.19**
	EGPRS,2 time-slots	**30.13**	**24.11**
GSM 1900	GPRS,2 time-slots	**27.85**	**21.83**
	EGPRS,2 time-slots	**27.85**	**21.83**
WCDMA Band IV		**22.49**	/

1.7. Test Date

The test is performed from August 26, 2010 to August 27, 2010.

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. Using E5515C the power lever is set to "5" in SAR of GSM 850, set to "0" in SAR of GSM 1900, power control is set "All Up Bits" of WCDMA. 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.

Since the EUT only has the data transfer function, but does not have the voice transfer function, the tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS and EGPRS, The tests in the band of WCDMA Band II are performed in the mode of WCDMA, HSDPA and HSUPA.

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. Since the EUT only has the data transfer function, but does not have the speech transfer function. The tests in the band of GSM 850 and GSM 1900 are only performed in the mode of GPRS and EGPRS. The GPRS class is 12 for this EUT; it has at most 4 timeslots in uplink. The EGPRS class is 12 for this EUT; it has at most 4 timeslots in uplink.

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:

Table 1: The allowed power reduction in the multi-slot configuration
GSM 850 (GPRS-GMSK)

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

GSM 850 (EGPRS-GMSK)

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

GSM 850 (EGPRS-8PSK)

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

GSM 1900 (GPRS-GMSK)

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

GSM 1900 (EGPRS-GMSK)

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

GSM 1900 (EGPRS-8PSK)

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

2.3. WCDMA Test Configuration

As the SAR body tests for WCDMA Band IV, 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 $DPDCH_1$ are as followed (EUT do not support the $DPDCH_{2-n}$)

Table 2: The configurations for the DPCCH and $DPDCH_1$

	Channel Bit Rate(kbps)	Channel Symbol Rate(ksps)	Spreading Factor	Spreading Code Number	Bits/Slot
DPCCH	15	15	256	0	10
$DPDCH_1$	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 $DPDCH_n$, because the maximum output power for each of these other configurations<0.25dB higher than 12.2kbps RMC and the multiple $DPDCH_n$ 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

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($\triangle$ACK, $\triangle$NACK, $\triangle$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 3: Subtests for UMTS Release 5 HSDPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	β_{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: $\triangle$ACK, $\triangle$NACK and $\triangle$CQI= 8 $\leftrightarrow$ A$_{hs}$ = β_{hs}/β_c=30/15 $\leftrightarrow$ β_{hs}=30/15*β_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, $\triangle$ACK and $\triangle$NACK= 8 (A$_{hs=}$30/15) with β_{hs}=30/15*β_c,and $\triangle$CQI= 7 (A$_{hs=}$24/15) with β_{hs}=24/15*β_c.

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

Note 4:For subtest 2 the $\beta_c\beta_d$ 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 β_c=11/15 and β_d=15/15.

Table 4: 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 5: HSDPA UE category

HS-DSCH Category	Maximum HS-DSCH Codes Received	Minimum Inter-TTI Interval	Maximum Transport Bits/HS-DSCH	Total Channel
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.[40]

Due to inner loop power control requirements in HSPA, a commercial communication test set should be used for the output power and SAR tests.[41] 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.

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

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}[1]	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (2) (dB)	MPR (dB)	AG[4] Index	E-TFCI
1	11/15[3]	15/15[3]	64	11/15[3]	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1} 47/15 β_{ed2} 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15[4]	15/15[4]	64	15/15[4]	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ A_{hs} = $\underline{\beta_{hs}}/\underline{\beta_c}$ = 30/15 ⇔ $\underline{\beta_{hs}}$ = 30/15 *β_c.

Note 2: CM = 1 for βc/βd =12/15, $\underline{\beta_{hs}}/\underline{\beta_c}$ =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 βc/βd ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the

signaled gain factors for the reference TFC (TF1, TF1) to βc = 10/15 and βd = 15/15.

Note 4: For subtest 5 the βc/βd ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the

signaled gain factors for the reference TFC (TF1, TF1) to βc = 14/15 and βd = 15/15.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Figure 5.1g.

Note 6: βed can not be set directly; it is set by Absolute Grant Value.

Table 7: HSUPA UE category

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI (ms)	Minimum Spreading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	2	2 SF2 & 2 SF4	11484	5.76
	4	4	10		20000	2.00
7 (No DPDCH)	4	8	2	2 SF2 & 2 SF4	22996	?
	4	4	10		20000	?

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

UE Categories 1 to 6 supports QPSK only. UE Category 7 supports QPSK and 16QAM. (TS25.306-7.3.0)

2.6. Position of Module in Portable Devices

For each channel, the EUT is tested at the following 5 test positions:

● Test Position 1: The back side of the EUT towards the bottom of the flat phantom. The distance is 10 mm from the back side of the EUT to the bottom of the flat phantom. (ANNEX I Picture 6)

● Test Position 2: The front side of the EUT towards the bottom of the flat phantom. The distance is 10 mm from the front side of the EUT to the bottom of the flat phantom.   (ANNEX I Picture 7)

● Test Position 3: The top side of the EUT towards the bottom of the flat phantom. The distance is 10 mm from the top side of the EUT to the bottom of the flat phantom. (ANNEX I Picture 8)

● Test Position 4: The left side of the EUT towards the bottom of the flat phantom. The distance is 10 mm from the left side of the EUT to the bottom of the flat phantom. (ANNEX I Picture 9)

● Test Position 5: The right side of the EUT towards the bottom of the flat phantom. The distance is 10 mm from the right side of the EUT to the bottom of the flat phantom. (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.
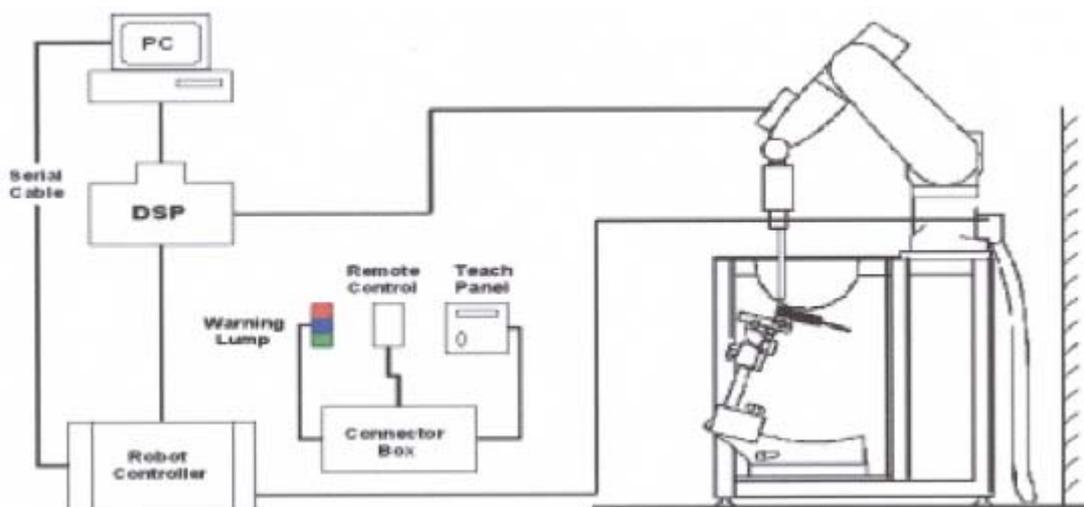- System validation dipoles allowing to validate the proper functioning of the system.

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: ± 0.2 dB
(30 MHz to 6 GHz)

Figure 2.EX3DV4 E-field Probe

Directivity
± 0.3 dB in HSL (rotation around probe axis)
± 0.5 dB in tissue material (rotation normal to probe axis)

Dynamic Range
10 µW/g to > 100 mW/g Linearity:

± 0.2dB (noise: typically < 1 µW/g)

Dimensions
Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

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 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 ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. 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 bellow 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.

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

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

Or

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

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m3).

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 l000 x 500 mm (H x L x W)
Aailable	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. ± 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 ± 0.1mm). 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 ± 30°.)

- 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 15 mm x 15 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/cm²], [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_{i0}, a_{i1}, a_{i2}
                    - Conversion factor $ConvF_i$
                    - Diode compression point Dcp_i

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.

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:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

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

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

         cf = crest factor of exciting field   (DASY parameter)

         dcp_i = diode compression point   (DASY parameter)

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

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

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)

                          $[mV/(V/m)^2]$ for E-field Probes

         $ConvF$ = sensitivity enhancement in solution

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

         f = carrier frequency [GHz]

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

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

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

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

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

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

with SAR = local specific absorption rate in mW/g

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

   = conductivity in [mho/m] or [Siemens/m]

   = equivalent tissue density in g/cm^3

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^2

     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 12.

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

System check is performed regularly on all frequency bands where tests are performed with the DASY 4 system.
.
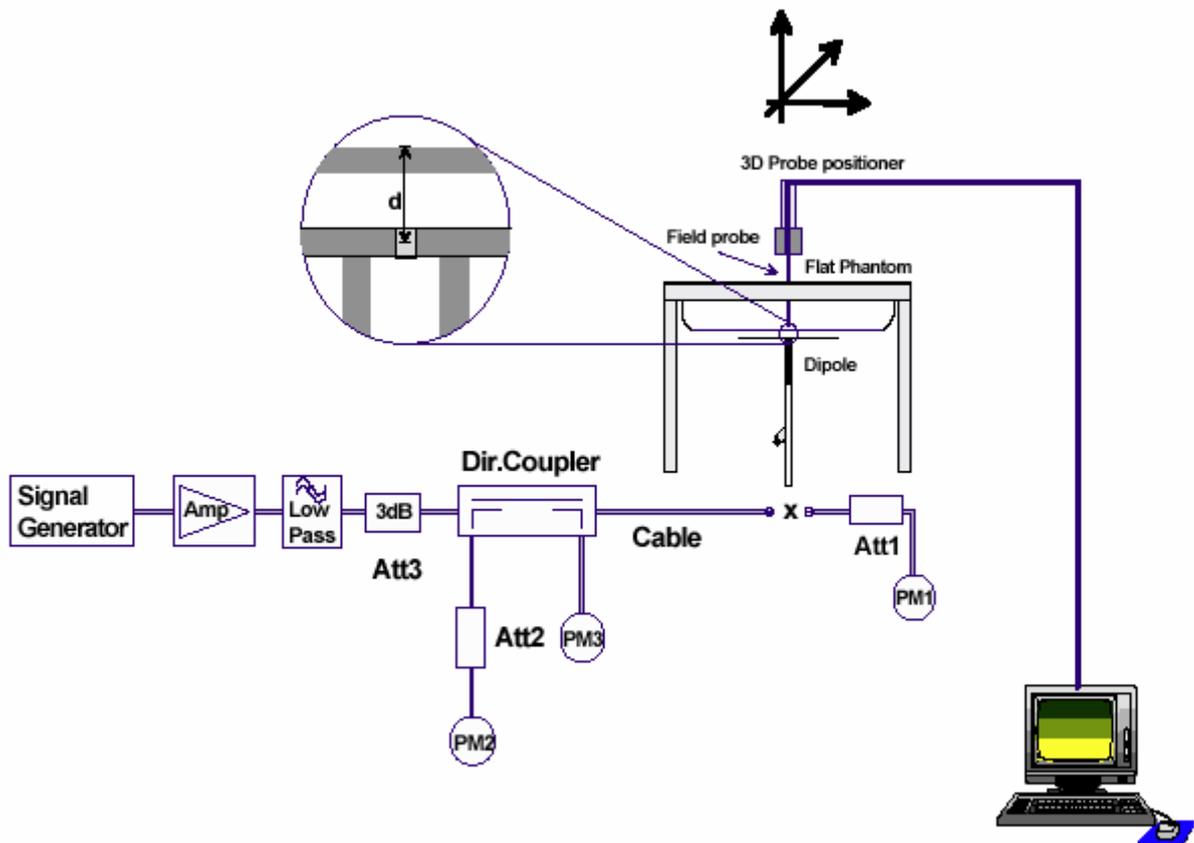
Figure 5. **System Check Set-up**

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 8 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by OET 65.

Table 8: 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 ε=55.2 σ=0.97

MIXTURE%	FREQUENCY (Body) 1900MHz
Water	69.91
Glycol monobutyl	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1900MHz ε=53.3 σ=1.52

MIXTURE%	FREQUENCY(Body) 1800MHz
Water	69.91
Glycol	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1800MHz ε=53.3 σ=1.52

4. Laboratory Environment

Table 9: The Ambient Conditions during Test

Temperature	Min. = 20°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
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 Radio Frequency 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 Radio frequency Electromagnetic Fields Additional Information for Evaluation Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radio frequency Emissions

KDB 447498 D01 (2009-11-13): Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

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 10: Conducted Power Measurement Results

WCDMA Band IV		Conducted Power(dBm)		
		Channel 1312	Channel 1413	Channel 1513
12.2kbps RMC	Before Test	22.46	22.39	22.49
	After Test	22.45	22.37	22.46
64kbps RMC	Before Test	22.45	22.34	22.47
	After Test	22.40	22.32	22.45
144kbps RMC	Before Test	22.41	22.35	22.45
	After Test	22.40	22.33	22.41
384kbps RMC	Before Test	22.43	22.36	22.41
	After Test	22.40	22.34	22.38
WCDMA Band IV HSDPA		Conducted Power(dBm)		
		Channel 1312	Channel 1413	Channel 1513
Sub Test - 1	Before Test	22.28	21.96	22.25
	After Test	22.27	21.95	22.22
Sub Test - 2	Before Test	21.37	21.19	21.49
	After Test	21.35	21.18	21.47
Sub Test - 3	Before Test	21.33	21.12	21.39
	After Test	21.32	21.10	21.37
Sub Test - 4	Before Test	21.32	21.12	21.38
	After Test	21.30	21.10	21.35
WCDMA Band IV HSUPA		Conducted Power(dBm)		
		Channel 1312	Channel 1413	Channel 1513
Sub Test - 1	Before Test	21.31	21.15	21.28
	After Test	21.30	21.14	21.27
Sub Test - 2	Before Test	20.33	20.49	20.22
	After Test	20.32	20.47	20.20
Sub Test - 3	Before Test	20.39	20.43	19.91
	After Test	20.36	20.42	19.90
Sub Test - 4	Before Test	20.32	20.21	19.76
	After Test	20.30	20.20	19.75
Sub Test - 5	Before Test	21.55	21.38	20.99
	After Test	21.54	21.37	20.98

Average power

GSM 850 GPRS (GMSK)		Conducted Power(dBm)						
		Channel 128	Channel 190	Channel 251		Channel 128	Channel 190	Channel 251
1TXslot	Before Test	32.43	32.21	32.33	-9.03dB	23.40	23.18	23.30
	After Test	32.40	32.20	32.31	-9.03dB	23.37	23.17	23.28
2TXslots	Before Test	30.14	30.18	30.21	-6.02dB	**24.12**	**24.16**	**24.19**
	After Test	30.12	30.17	30.20	-6.02dB	24.10	24.15	24.18
3TXslots	Before Test	28.13	28.22	28.38	-4.26dB	23.87	23.96	24.12
	After Test	28.11	28.20	28.36	-4.26dB	23.85	23.94	24.10
4TXslots	Before Test	26.23	26.31	26.32	-3.01dB	23.22	23.3	23.31
	After Test	26.22	26.30	26.31	-3.01dB	23.21	23.29	23.30

GSM 850 EGPRS (8PSK)		Conducted Power(dBm)						
		Channel 128	Channel 190	Channel 251		Channel 128	Channel 190	Channel 251
1TXslot	Before Test	27.35	27.29	27.26	-9.03dB	18.32	18.26	18.23
	After Test	27.34	27.28	27.25	-9.03dB	18.31	18.25	18.22
2TXslots	Before Test	25.21	25.21	25.34	-6.02dB	19.19	19.19	19.32
	After Test	25.20	25.20	25.34	-6.02dB	19.18	19.18	19.32
3TXslots	Before Test	24.23	24.37	24.31	-4.26dB	19.97	20.11	20.05
	After Test	24.22	24.35	24.30	-4.26dB	19.96	20.09	20.04
4TXslots	Before Test	23.33	23.13	23.14	-3.01dB	20.32	20.12	20.13
	After Test	23.32	23.11	23.12	-3.01dB	20.31	20.10	20.11

GSM 850 EGPRS (GMSK)		Conducted Power(dBm)						
		Channel 128	Channel 190	Channel 251		Channel 128	Channel 190	Channel 251
1TXslot	Before Test	32.34	32.39	32.48	-9.03dB	23.31	23.36	23.45
	After Test	32.33	32.38	32.47	-9.03dB	23.30	23.35	23.44
2TXslots	Before Test	30.13	30.01	30.04	-6.02dB	**24.11**	**23.99**	**24.02**
	After Test	30.12	30.00	30.03	-6.02dB	24.10	23.98	24.01
3TXslots	Before Test	28.17	28.25	28.18	-4.26dB	23.91	23.99	23.92
	After Test	28.15	28.22	28.17	-4.26dB	23.89	23.96	23.91
4TXslots	Before Test	26.32	26.23	26.24	-3.01dB	23.31	23.22	23.23
	After Test	26.31	26.22	26.22	-3.01dB	23.30	23.21	23.21

GSM 1900 GPRS (GMSK)		Conducted Power(dBm)						
		Channel 512	Channel 661	Channel 810		Channel 512	Channel 661	Channel 810
1TXslot	Before Test	29.54	29.61	29.56	-9.03dB	20.51	20.58	20.53
	After Test	29.53	29.60	29.55	-9.03dB	20.50	20.57	20.52
2TXslots	Before Test	27.73	27.72	27.85	-6.02dB	**21.71**	**21.70**	**21.83**
	After Test	27.72	27.71	27.84	-6.02dB	21.70	21.69	21.82
3TXslots	Before Test	25.67	25.68	25.57	-4.26dB	21.41	21.42	21.31

		Channel 512	Channel 661	Channel 810		Channel 512	Channel 661	Channel 810
	After Test	25.66	25.67	25.56	-4.26dB	21.40	21.41	21.30
4TXslots	Before Test	23.17	23.23	23.16	-3.01dB	20.16	20.22	20.15
	After Test	23.16	23.22	23.15	-3.01dB	20.15	20.21	20.14
GSM 1900 EGPRS (8PSK)		**Conducted Power(dBm)**						
		Channel 512	Channel 661	Channel 810		Channel 512	Channel 661	Channel 810
1TXslot	Before Test	25.85	25.81	25.93	-9.03dB	16.82	16.78	16.90
	After Test	25.84	25.80	25.92	-9.03dB	16.81	16.77	16.89
2TXslots	Before Test	23.68	23.76	23.61	-6.02dB	17.66	17.74	17.59
	After Test	23.65	23.75	23.60	-6.02dB	17.63	17.73	17.58
3TXslots	Before Test	22.61	22.75	22.61	-4.26dB	18.35	18.49	18.35
	After Test	22.60	22.74	22.60	-4.26dB	18.34	18.48	18.34
4TXslots	Before Test	20.75	20.85	20.92	-3.01dB	17.74	17.84	17.91
	After Test	20.73	20.84	20.91	-3.01dB	17.72	17.83	17.90
GSM 1900 EGPRS (GMSK)		**Conducted Power(dBm)**						
		Channel 512	Channel 661	Channel 810		Channel 512	Channel 661	Channel 810
1TXslot	Before Test	29.65	29.58	29.68	-9.03dB	20.62	20.55	20.65
	After Test	29.63	29.56	29.67	-9.03dB	20.60	20.53	20.64
2TXslots	Before Test	27.85	27.73	27.81	-6.02dB	**21.83**	**21.71**	**21.79**
	After Test	27.84	27.71	27.80	-6.02dB	21.82	21.69	21.78
3TXslots	Before Test	25.77	25.69	25.63	-4.26dB	21.51	21.43	21.37
	After Test	25.76	25.68	25.61	-4.26dB	21.50	21.42	21.35
4TXslots	Before Test	23.19	23.16	23.12	-3.01dB	20.18	20.15	20.11
	After Test	23.18	23.15	23.11	-3.01dB	20.17	20.14	20.10

Note:
1) Division Factors

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

1 TX- slot = 1 transmit tome slot out of 8 time slots

=> conducted power divided by (8/1)   => -9.03 dB

2 TX- slot = 2 transmit tome slots out of 8 time slots

=> conducted power divided by (8/2)   => -6.02 dB

3TX- slot = 3 transmit tome slots out of 8 time slots

=> conducted power divided by (8/3)   => -4.26 dB

4 TX- slot = 4 transmit tome 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.

3) For SAR testing the EUT was set to multislot class based on the maximum averaged

conducted power.

7. Test Results

7.1. Dielectric Performance

Table 11: Dielectric Performance of Body Tissue Simulating Liquid

| Frequency | Description | Dielectric Parameters | | Temp |
		ε_r	σ(s/m)	℃
835MHz **(body)**	Target value ±5% window	55.20 52.44 — 57.96	0.97 0.92 — 1.02	/
	Measurement value 2010-8-26	54.82	1.00	21.5
1750MHz **(body)**	Target value ±5% window	53.40 50.73 — 56.07	1.49 1.42 — 1.56	/
	Measurement value 2010-8-26	52.22	1.48	21.9
1900MHz **(body)**	Target value ±5% window	53.30 50.64 — 55.97	1.52 1.44 — 1.60	/
	Measurement value 2010-8-26	53.01	1.56	21.7

7.2. System Check

Table 12: System Check for Body Tissue Simulating Liquid

| Frequency | Description | SAR(W/kg) | | Dielectric Parameters | | Temp |
		10g	1g	ε_r	σ(s/m)	℃
835MHz	Recommended result ±10% window	1.63 1.47 — 1.79	2.49 2.24 — 2.74	54.6	0.98	/
	Measurement value 2010-8-26	1.68	2.56	54.82	1.00	21.5
1750MHz	Recommended value ±10% window	5.11 4.60 — 5.62	9.37 8.43 — 10.31	54.1	1.43	/
	Measurement value 2010-8-26	4.90	9.24	52.22	1.48	21.9
1900 MHz	Recommended result ±10% window	5.52 4.97 — 6.57	10.30 9.27 — 11.33	53.5	1.54	/
	Measurement value 2010-8-26	5.17	9.73	53.01	1.56	21.7

Note: 1. The graph results see ANNEX B.

     2. Target Values used derive from the calibration certificate and 250 mW is used as feeding power to the Calibrated dipole.

7.3. Summary of Measurement Results

7.3.1. GSM 850 (GPRS/EGPRS)

Table 13: SAR Values [GSM850 (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)	
Different Test Position	Different Timeslots	Channel	10 g Average	1 g Average		
Test Position 1	4 timeslots	Middle	0.445	0.626	0.023	Figure 9
	3 timeslots	Middle	0.460	0.674	-0.082	Figure 10
	2 timeslots	Middle	0.506	0.712	-0.020	Figure 11
	1 timeslot	Middle	0.451	0.638	0.080	Figure 12
Test Position 2	2 timeslots	High	0.618	0.907	0.087	Figure 13
		Middle	0.663	0.951	0.087	Figure 14
		Low	0.715	1.020	-0.077	Figure 15
Test Position 3	2 timeslots	Middle	0.122	0.223	-0.128	Figure 16
Test Position 4	2 timeslots	Middle	0.238	0.353	0.013	Figure 17
Test Position 5	2 timeslots	Middle	0.219	0.310	0.033	Figure 18
Worst Case Position of GPRS with EGPRS (GMSK)						
Test Position 2	2 timeslots	Low	0.752	1.090	-0.185	Figure 19

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. Upper and lower frequencies were measured at the worst case.

    4. 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.

Table 14: Extrapolated SAR Values of highest measured SAR [GSM 850 (GPRS/EGPRS)]

Test Position	Timeslots	Channel	Conducted Power(dBm)	1g Average (W/kg)	Tune-up procedures Max Power (dBm)	1g Average Limit 1.6 W/kg
			Measurement Result			Extrapolated Result (W/kg)
GPRS						
Test Position 2	2 timeslots	Low	30.14	1.020	30.70	1.160
EGPRS						
Test Position 2	2 timeslots	Low	30.13	1.090	30.70	1.243

7.3.2. GSM 1900 (GPRS/EGPRS)

Table 15: SAR Values [GSM1900 (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		
Test Position 1	4 timeslots	Middle	0.291	0.496	-0.125	Figure 20
	3 timeslots	Middle	0.346	0.594	-0.072	Figure 21
	2 timeslots	Middle	0.337	0.577	0.060	Figure 22
	1 timeslot	Middle	0.306	0.520	-0.135	Figure 23
Test Position 2	2 timeslots	High	0.523	0.886	0.007	Figure 24
		Middle	0.418	0.703	0.018	Figure 25
		Low	0.337	0.590	0.155	Figure 26
Test Position 3	2 timeslots	Middle	0.312	0.559	0.037	Figure 27
Test Position 4	2 timeslots	Middle	0.076(max.cube)	0.141(max.cube)	-0.033	Figure 28
Test Position 5	2 timeslots	Middle	0.030	0.048	-0.028	Figure 29
Worst Case Position of GPRS with EGPRS (GMSK)						
Test Position 2	2 timeslots	High	0.521	0.896	-0.054	Figure 30

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. Upper and lower frequencies were measured at the worst case.

4. 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.

5. 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.

Table 16: Extrapolated SAR Values of highest measured SAR [GSM 1900 (GPRS/EGPRS)]

Test Position	Timeslots	Channel	Conducted Power(dBm)	1g Average (W/kg)	Tune-up procedures Max Power (dBm)	1g Average Limit 1.6 W/kg
			Measurement Result			Extrapolated Result (W/kg)
GPRS						
Test Position 2	2 timeslots	High	27.85	0.886	28.20	0.960
EGPRS						
Test Position 2	2 timeslots	High	27.81	0.896	28.20	0.980

7.3.3. WCDMA Band IV (WCDMA/HSDPA/HSUPA)

Table 17: SAR Values [WCDMA Band IV (WCDMA/HSDPA/HSUPA)]

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		
Test Position 1	Middle	0.232	0.414	0.189	Figure 31
Test Position 2	High	0.584	1.120	0.018	Figure 32
	Middle	0.395	0.761	0.080	Figure 33
	Low	0.426	0.804	0.063	Figure 34
Test Position 3	Middle	0.264	0.468	-0.020	Figure 35
Test Position 4	Middle	0.098	0.184	-0.065	Figure 36
Test Position 5	Middle	0.085	0.141	0.011	Figure 37
Worst Case Position of RMC with HSDPA					
Test Position 2	High	0.561	1.090	0.127	Figure 38
Worst Case Position of RMC with HSUPA					
Test Position 2	High	0.419	0.809	-0.084	Figure 39

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. Upper and lower frequencies were measured at the worst case.

Table 18: Extrapolated SAR Values of highest measured SAR [WCDMA Band IV (WCDMA/HSDPA/HSUPA)]

Test Position	Channel	Conducted Power(dBm)	1g Average (W/kg)	Tune-up procedures Max Power (dBm)	1g Average Limit 1.6 W/kg
		Measurement Result			Extrapolated Result (W/kg)
Test Position 2	High	22.49	1.120	22.70	1.175

7.3.4. WIFI

The distance between wifi antenna and main antenna is ≥5cm. The location of the antennas inside device is shown below:
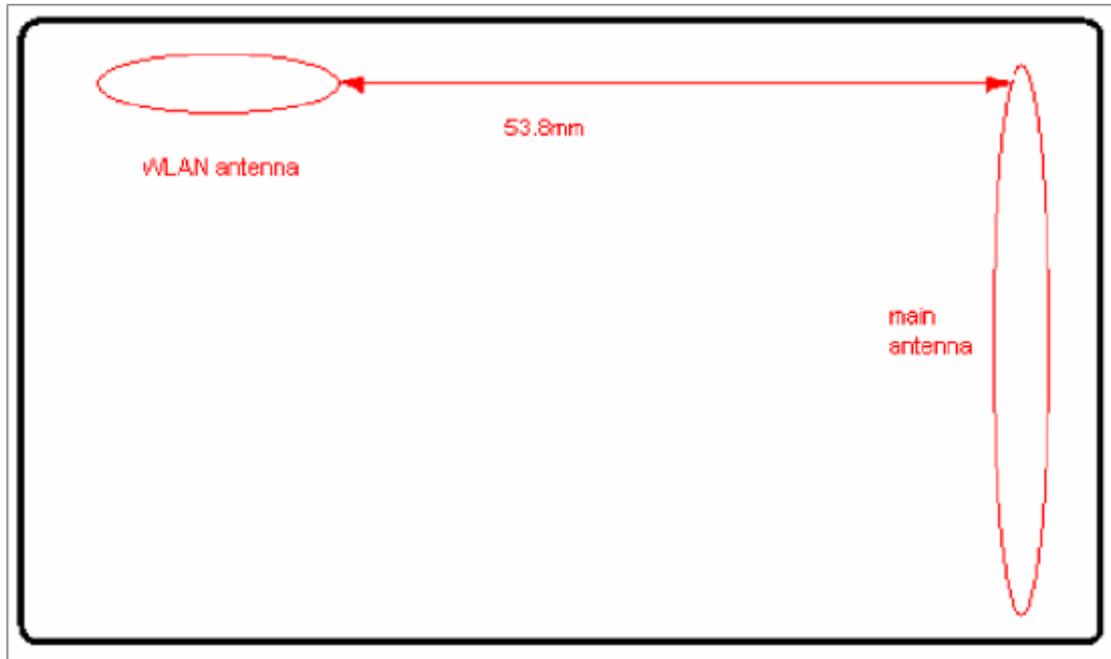
The power of E583C WLAN has two modes. The one mode is working with ac adapter which the WLAN output power is the highest, but the ac adapter does not need in SAR test, so we do not show the power in the SAR test report. WLAN power with ac adapter is 15dBm±3dBm higher. This operating mode is for mobile RF Exposure conditions only. Another mode is working without ac adapter and the output power is shown as following.

Channel	Channel 1 (2412MHz)	Channel 6 (2437MHz)	Channel 11 (2462MHz)
802.11b(dBm)	3.79	3.87	3.89
802.11g(dBm)	0.12	0.24	0.27

Stand-alone SAR

According to the output power measurement result and the distance between WIFI antenna and main antenna we can draw the conclusion that: stand-alone SAR are not required for WIFI antenna, the output power of WIFI transmitter is ≤2P$_{Ref}$ and its antenna is ≥5cm from other antenna.

Simultaneous SAR

stand-alone SAR are not required for WIFI and its antenna is ≥5cm from other antenna, so Simultaneous SAR are not required for WIFI.

8. Measurement Uncertainty

No.	source	Type	Uncertainty Value (%)	Probability Distribution	k	c_i	Standard ncertainty $u_i^{'}$ (%)	Degree of freedom V_{eff} or v_i
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	2.9	5
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	∞
22	-liquid conductivity (measurement uncertainty)	B	5.0	N	1	0.64	3.2	∞
23	-liquid permittivity (deviation from target)	B	5.0	R	$\sqrt{3}$	0.6	1.7	∞
24	-liquid permittivity (measurement uncertainty)	B	5.0	N	1	0.6	3.0	∞
Combined standard uncertainty	$u_c^{'} = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						12.0	
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$		N		k=2		24.0	

9. Main Test Instruments

Table 19: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	Agilent 8753E	US37390326	September 13, 2009	One year
02	Dielectric Probe Kit	Agilent 85070E	US44020115	No Calibration Requested	
03	Power meter	Agilent E4417A	GB41291714	March 13, 2010	One year
04	Power sensor	Agilent 8481H	MY41091316	March 26, 2010	One year
05	Signal Generator	HP 8341B	2730A00804	September 13, 2009	One year
06	Amplifier	IXA-020	0401	No Calibration Requested	
07	Validation Kit 835MHz	D835V2	4d092	January 14, 2010	One year
08	Validation Kit 1750MHz	D1750V2	1033	May 17, 2010	One year
09	Validation Kit 1900MHz	D1900V2	5d018	June 15, 2010	One year
10	BTS	E5515C	MY48360988	December 4, 2009	One year
11	E-field Probe	EX3DV4	3677	September 23, 2009	One year
12	DAE	DAE4	871	November 11, 2009	One year

END OF REPORT BODY

ANNEX A: Test Layout

Picture 1: Specific Absorption Rate Test Layout
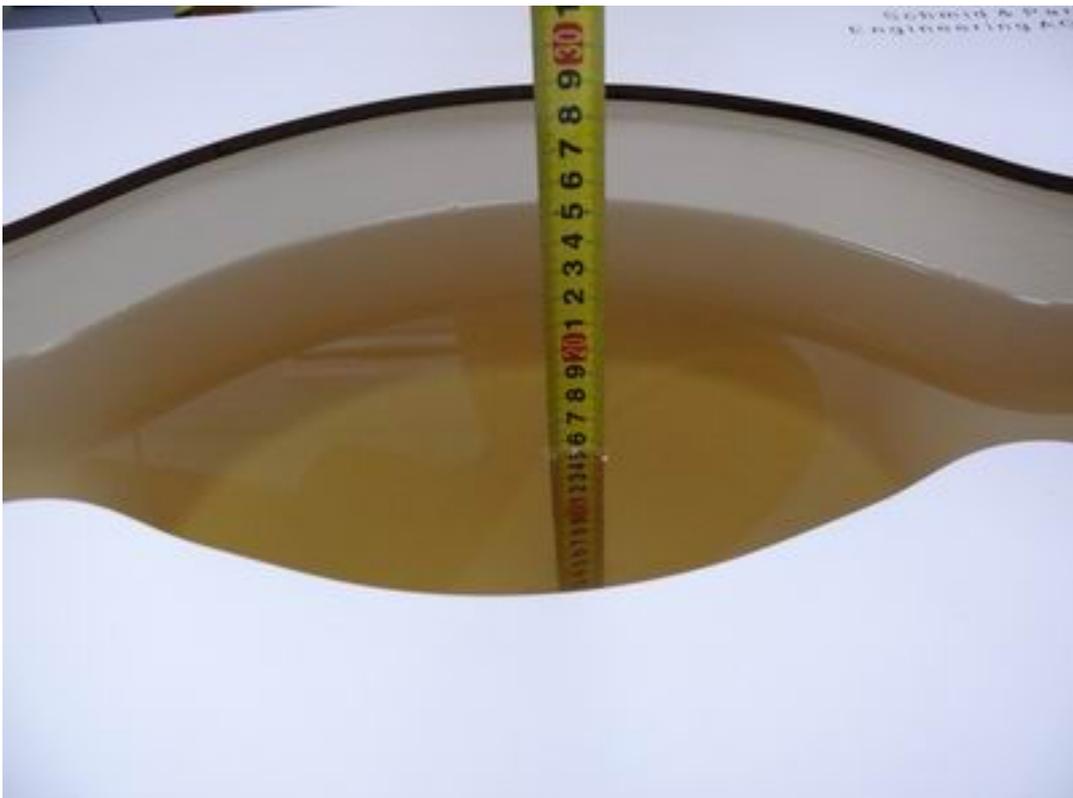
Picture 2: Liquid depth in the Flat Phantom (835 MHz, 15.4cm depth)
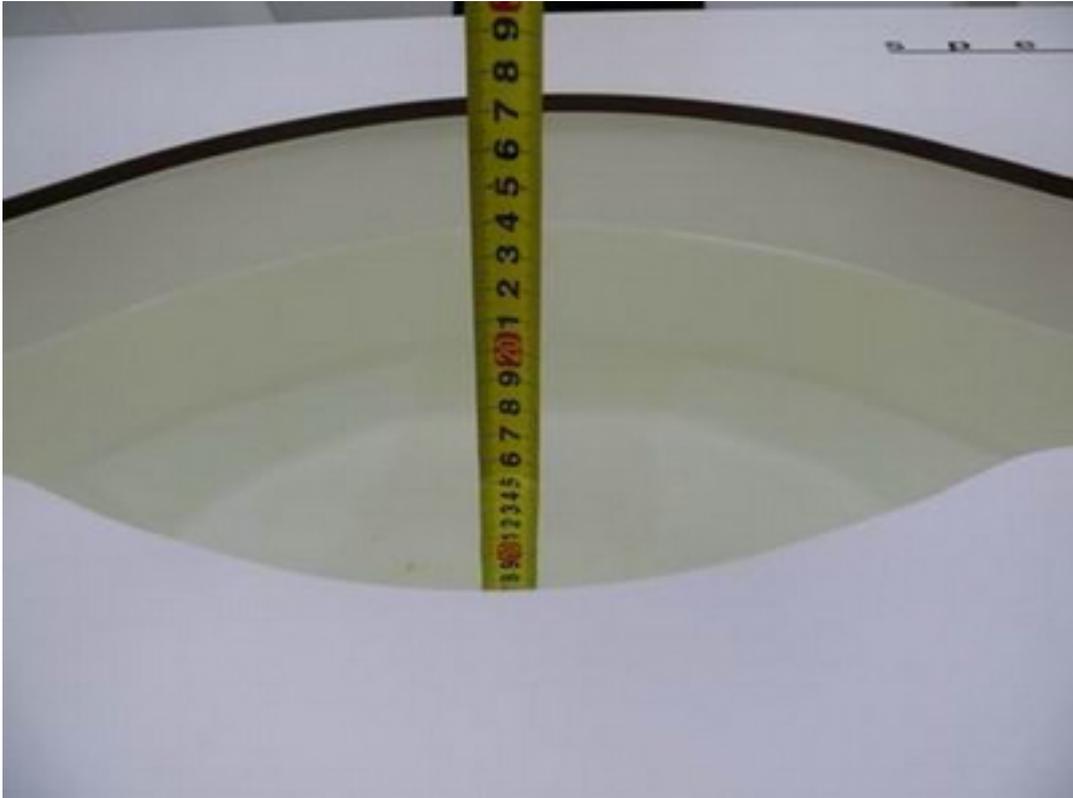
Picture 3: Liquid depth in the Flat Phantom (1750 MHz, 15.4cm depth)
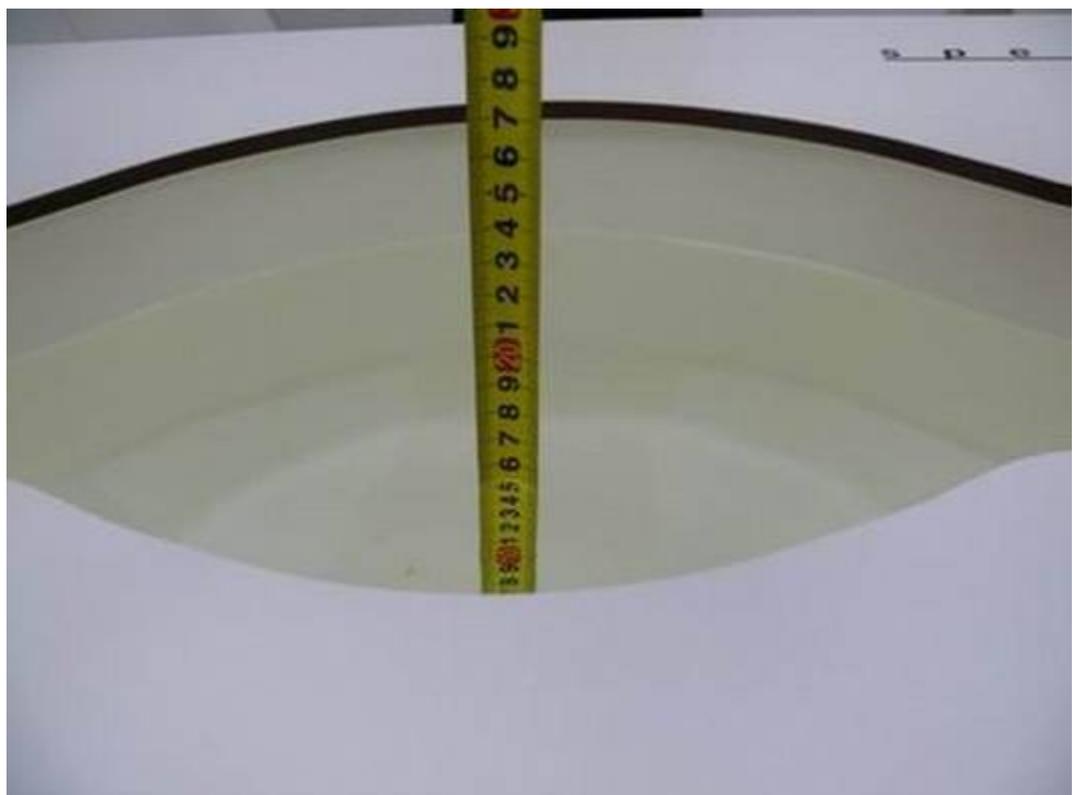
Picture 4: Liquid depth in the Flat Phantom (1900 MHz, 15.2cm depth)

ANNEX B: System Check Results

System Performance Check at 835 MHz Body TSL

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

Date/Time: 8/26/2010 9:00:49 AM

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

Medium parameters used: f = 835 MHz; σ = 1.00 mho/m; ε_r = 54.82; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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) = 2.77 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) = 3.68 W/kg

SAR(1 g) = 2.56 mW/g; SAR(10 g) = 1.68 mW/g

Maximum value of SAR (measured) = 2.77 mW/g
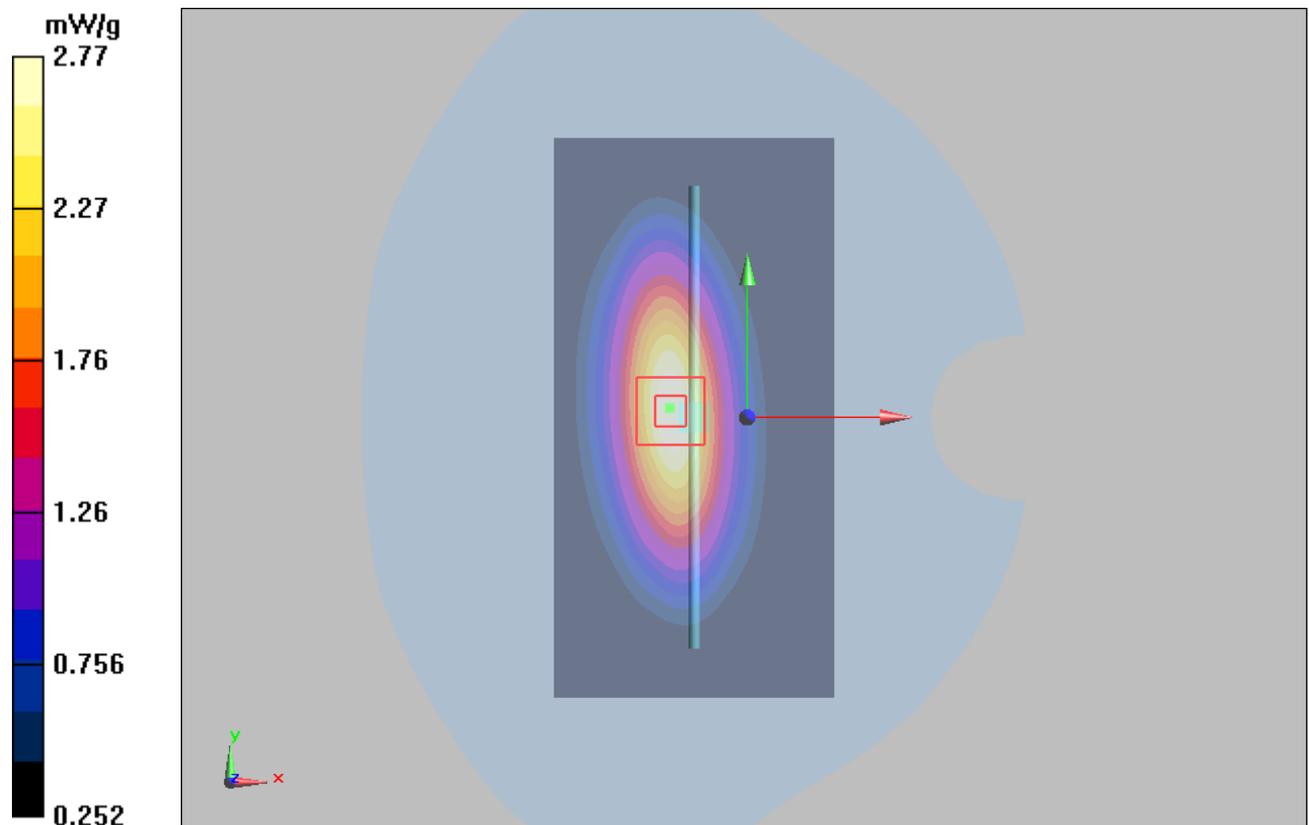
Figure 6 System Performance Check 835MHz 250mW

System Performance Check at 1750 MHz Body TSL
DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1033

Date/Time: 8/26/2010 5:21:55 PM

Communication System: CW; Frequency: 1750 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1750 MHz; σ = 1.48 mho/m; ε_r = 52.22; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (51x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 10.6 mW/g

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

Reference Value = 77.7 V/m; Power Drift = 0.097 dB

Peak SAR (extrapolated) = 16.8 W/kg

SAR(1 g) = 9.24 mW/g; SAR(10 g) = 4.9 mW/g

Maximum value of SAR (measured) = 10.3 mW/g
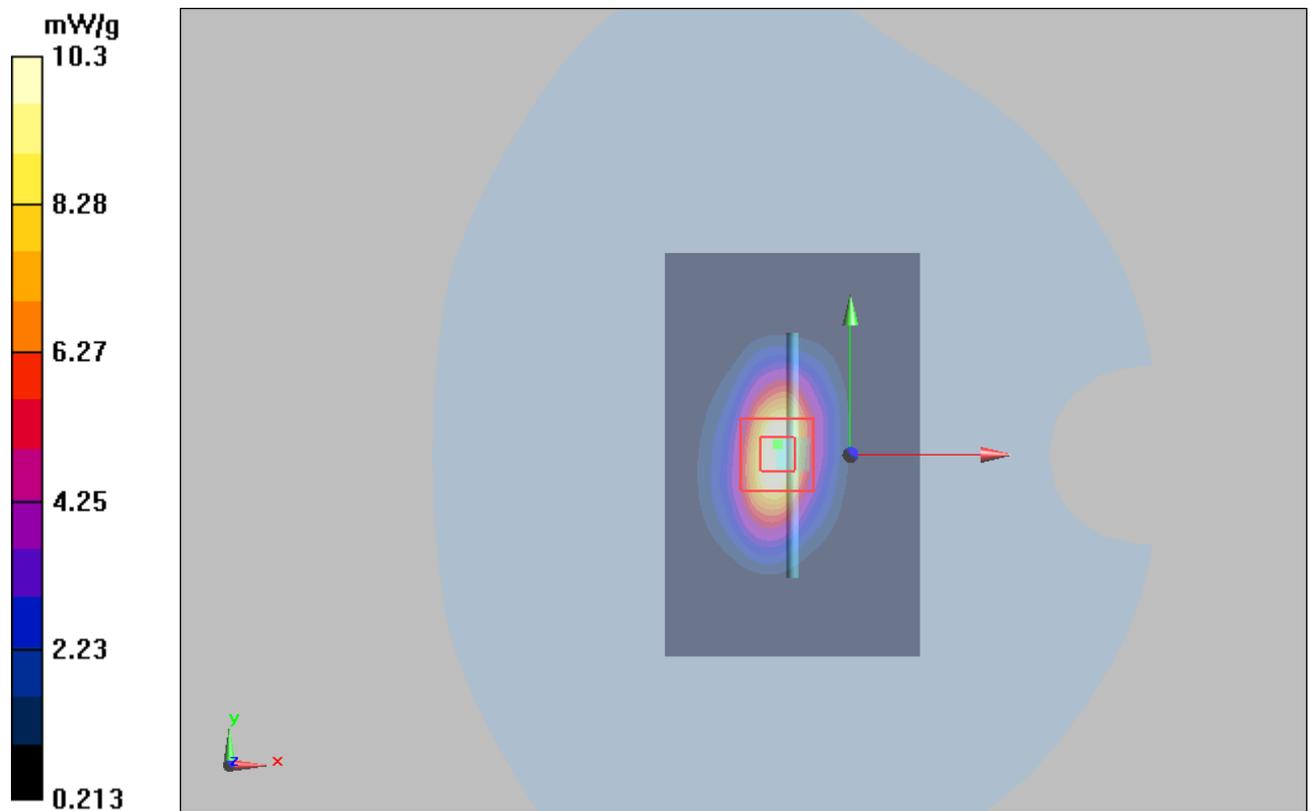
Figure 7 System Performance Check 1750MHz 250mW

System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d018

Date/Time: 8/26/2010 3:30:49 PM

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

Medium parameters used: f = 1900 MHz; σ = 1.56 mho/m; ε_r = 53.01; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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) = 12.5 mW/g

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

Reference Value = 75.9 V/m; Power Drift = 0.051 dB

Peak SAR (extrapolated) = 16.8 W/kg

SAR(1 g) = 9.73 mW/g; SAR(10 g) = 5.17 mW/g

Maximum value of SAR (measured) = 11 mW/g
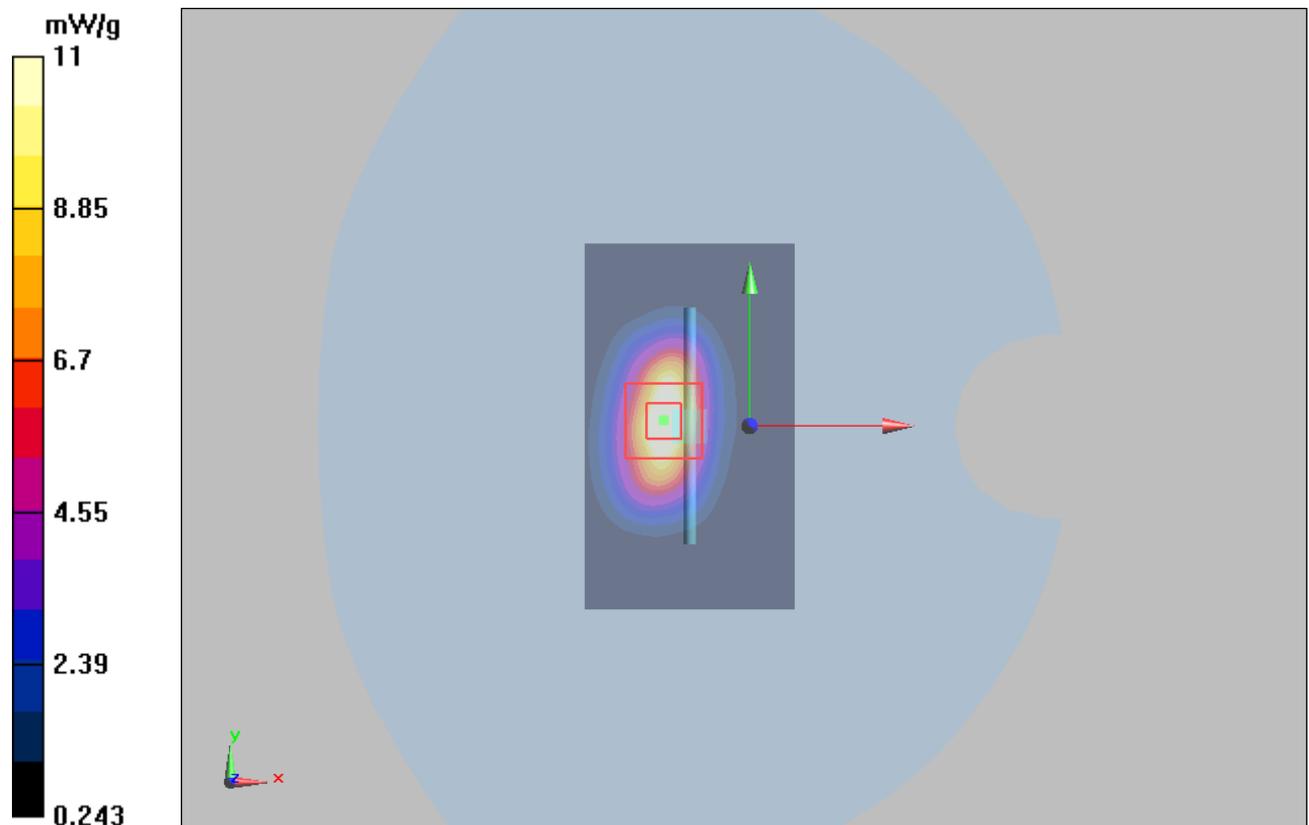
Figure 8 System Performance Check 1900MHz 250mW

ANNEX C: Graph Results

GSM 850 GPRS (4Up) Test Position 1 Middle

Date/Time: 8/26/2010 11:13:20 AM

Communication System: GSM 850+GPRS(4Up); Frequency: 836.6 MHz;Duty Cycle: 1:2.075

Medium parameters used: f = 837 MHz; σ = 1 mho/m; ε_r = 54.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.724 mW/g

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

Reference Value = 24.2 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 0.829 W/kg

SAR(1 g) = 0.626 mW/g; SAR(10 g) = 0.445 mW/g

Maximum value of SAR (measured) = 0.664 mW/g
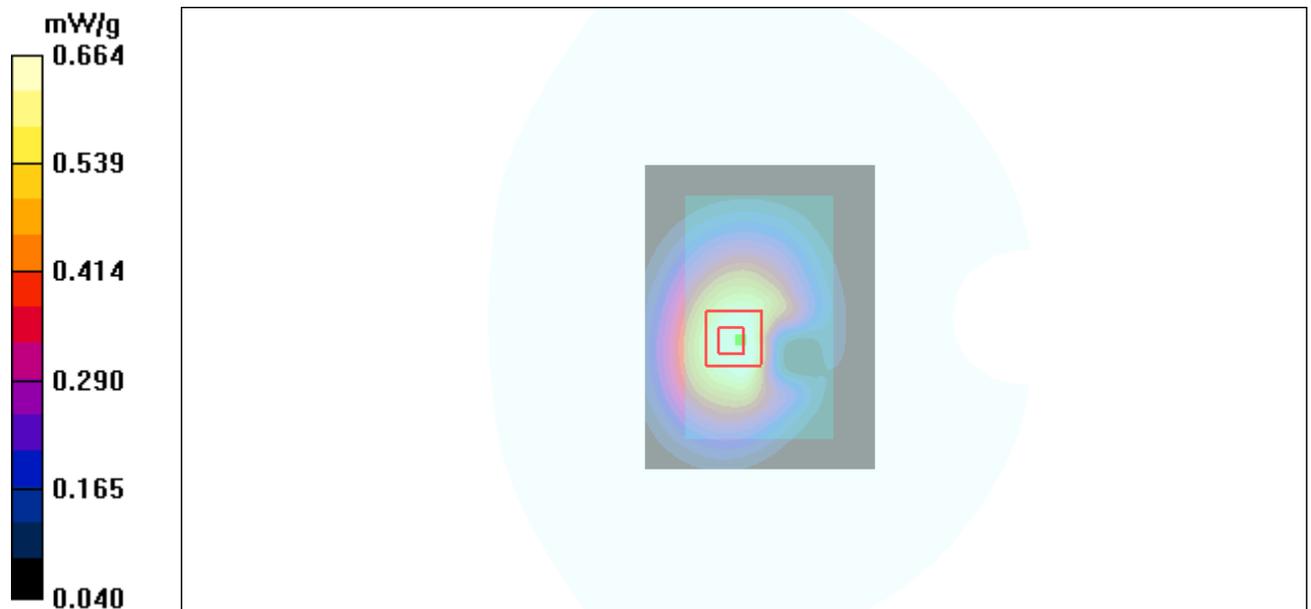
Figure 9 GSM 850 GPRS (4Up) Test Position 1 Channel 190

GSM 850 GPRS (3Up) Test Position 1 Middle

Date/Time: 8/26/2010 10:54:18 AM

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

Medium parameters used: f = 837 MHz; σ = 1 mho/m; $ε_r$ = 54.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.707 mW/g

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

Reference Value = 25.1 V/m; Power Drift = -0.082 dB

Peak SAR (extrapolated) = 0.938 W/kg

SAR(1 g) = 0.674 mW/g; SAR(10 g) = 0.460 mW/g

Maximum value of SAR (measured) = 0.705 mW/g
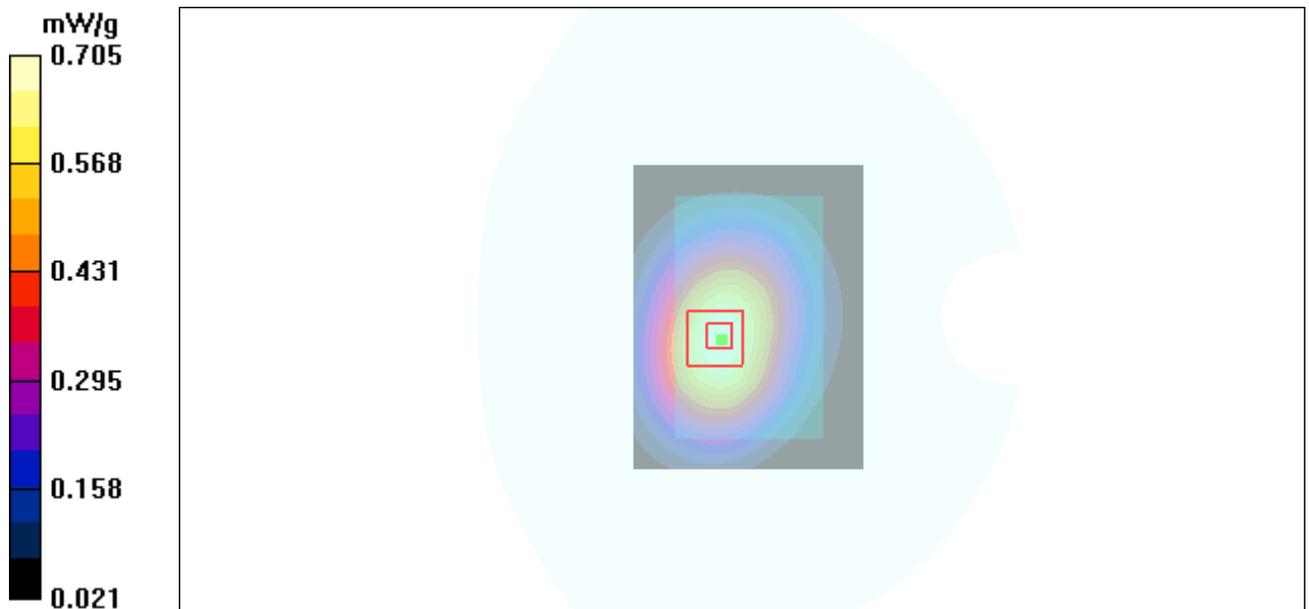
Figure 10 GSM 850 GPRS (3Up) Test Position 1 Channel 190

GSM 850 GPRS (2Up) Test Position 1 Middle

Date/Time: 8/26/2010 10:17:12 AM

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

Medium parameters used: f = 837 MHz; σ = 1 mho/m; $ε_r$ = 54.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

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

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

Reference Value = 26.4 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 0.950 W/kg

SAR(1 g) = 0.712 mW/g; SAR(10 g) = 0.506 mW/g

Maximum value of SAR (measured) = 0.757 mW/g
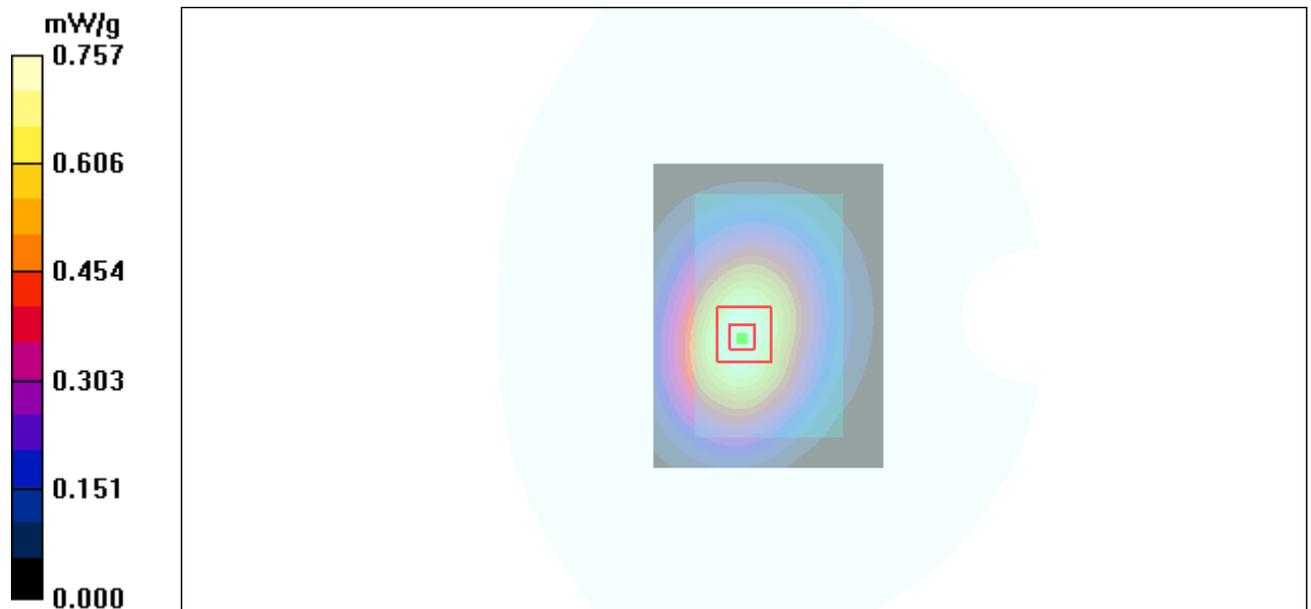
Figure 11 GSM 850 GPRS (2Up) Test Position 1 Channel 190

GSM 850 GPRS (1Up) Test Position 1 Middle

Date/Time: 8/26/2010 10:35:29 AM

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

Medium parameters used: f = 837 MHz; σ = 1 mho/m; ε_r = 54.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.672 mW/g

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

Reference Value = 24.1 V/m; Power Drift = 0.080 dB

Peak SAR (extrapolated) = 0.855 W/kg

SAR(1 g) = 0.638 mW/g; SAR(10 g) = 0.451 mW/g

Maximum value of SAR (measured) = 0.680 mW/g
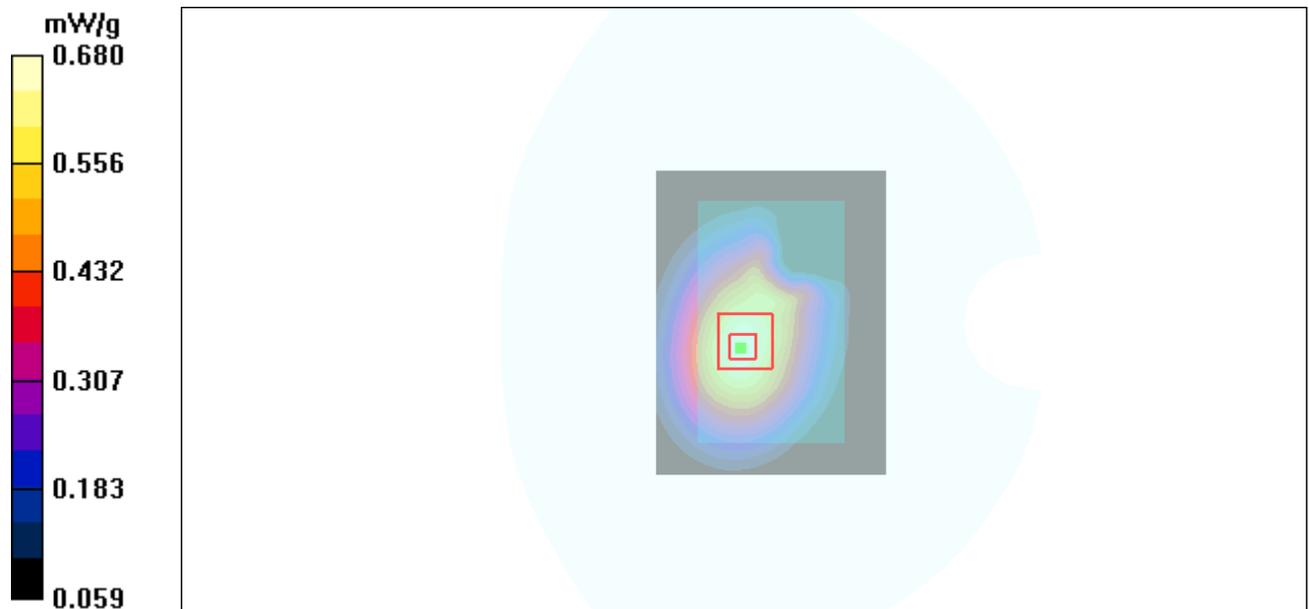
Figure 12 GSM 850 GPRS (1Up) Test Position 1 Channel 190

GSM 850 GPRS (2Up) Test Position 2 High

Date/Time: 8/26/2010 12:12:13 PM

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

Medium parameters used: f = 849 MHz; σ = 1.01 mho/m; ε_r = 54.6; ρ = 1000 kg/m³

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 High/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.963 mW/g

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

Reference Value = 29.4 V/m; Power Drift = 0.087 dB

Peak SAR (extrapolated) = 1.27 W/kg

SAR(1 g) = 0.907 mW/g; SAR(10 g) = 0.618 mW/g

Maximum value of SAR (measured) = 0.968 mW/g
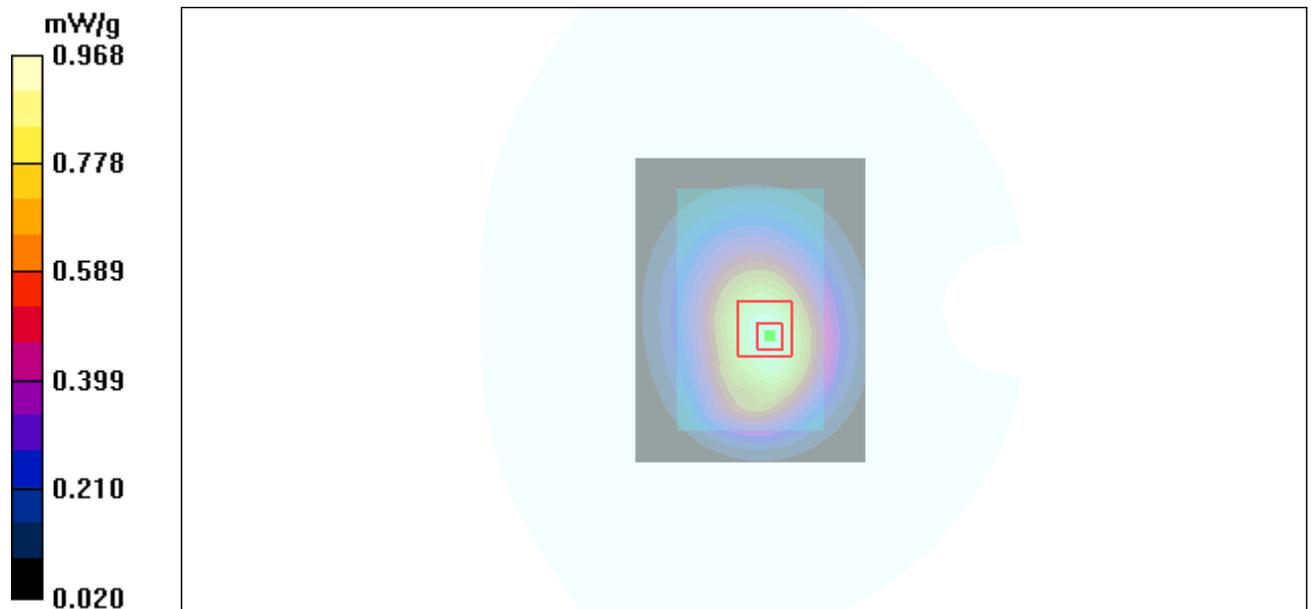
Figure 13 GSM 850 GPRS (2Up) Test Position 2 Channel 251

GSM 850 GPRS (2Up) Test Position 2 Middle

Date/Time: 8/26/2010 11:36:03 AM

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

Medium parameters used: f = 837 MHz; σ = 1 mho/m; ε_r = 54.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.998 mW/g

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

Reference Value = 30.2 V/m; Power Drift = 0.087 dB

Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.951 mW/g; SAR(10 g) = 0.663 mW/g

Maximum value of SAR (measured) = 1.01 mW/g
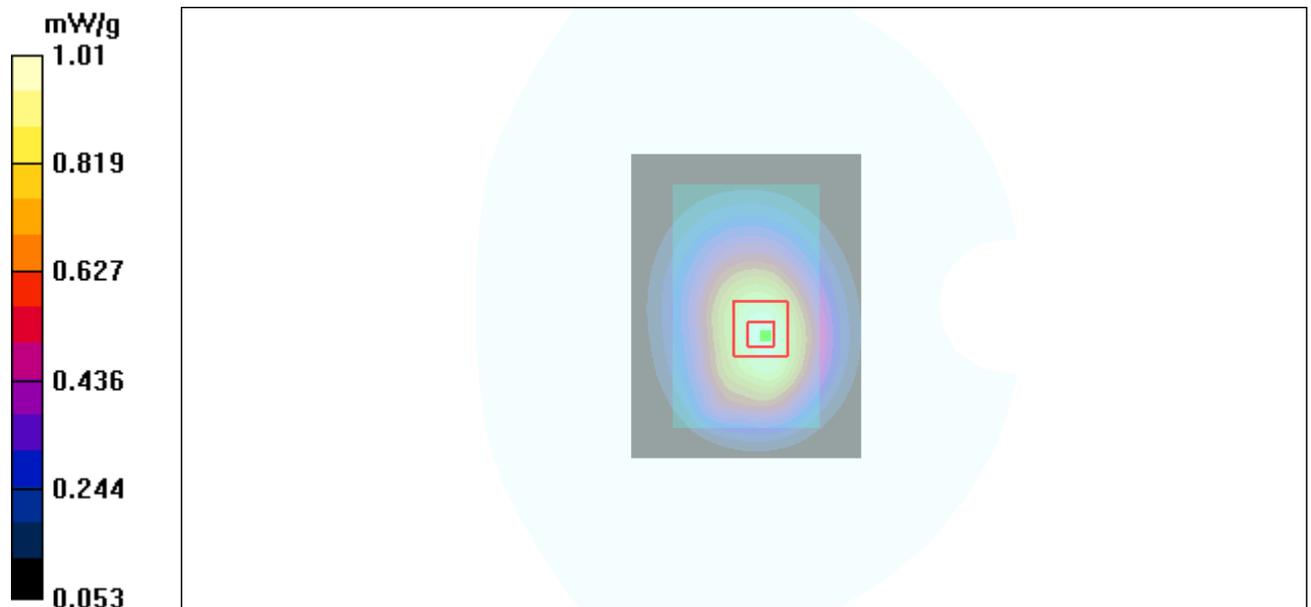
Figure 14 GSM 850 GPRS (2Up) Test Position 2 Channel 190

GSM 850 GPRS (2Up) Test Position 2 Low

Date/Time: 8/26/2010 11:53:55 AM

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

Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.99 mho/m; ε_r = 55; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 Low/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

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

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

Reference Value = 31.9 V/m; Power Drift = -0.077 dB

Peak SAR (extrapolated) = 1.38 W/kg

SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.715 mW/g

Maximum value of SAR (measured) = 1.08 mW/g
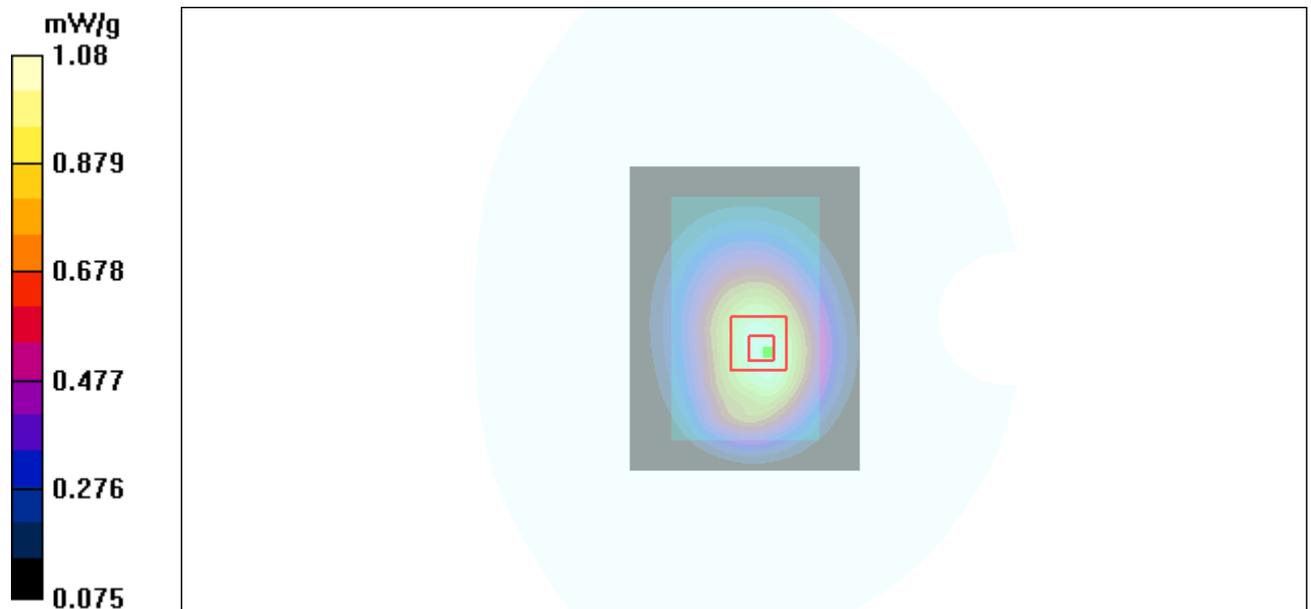
Figure 15 GSM 850 GPRS (2Up) Test Position 2 Channel 128

GSM 850 GPRS (2Up) Test Position 3 Middle

Date/Time: 8/26/2010 3:17:58 PM

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

Medium parameters used: f = 837 MHz; σ = 1 mho/m; ε_r = 54.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 3 Middle/Area Scan (31x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.226 mW/g

Test Position 3 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.2 V/m; Power Drift = -0.128 dB

Peak SAR (extrapolated) = 0.458 W/kg

SAR(1 g) = 0.223 mW/g; SAR(10 g) = 0.122 mW/g

Maximum value of SAR (measured) = 0.245 mW/g
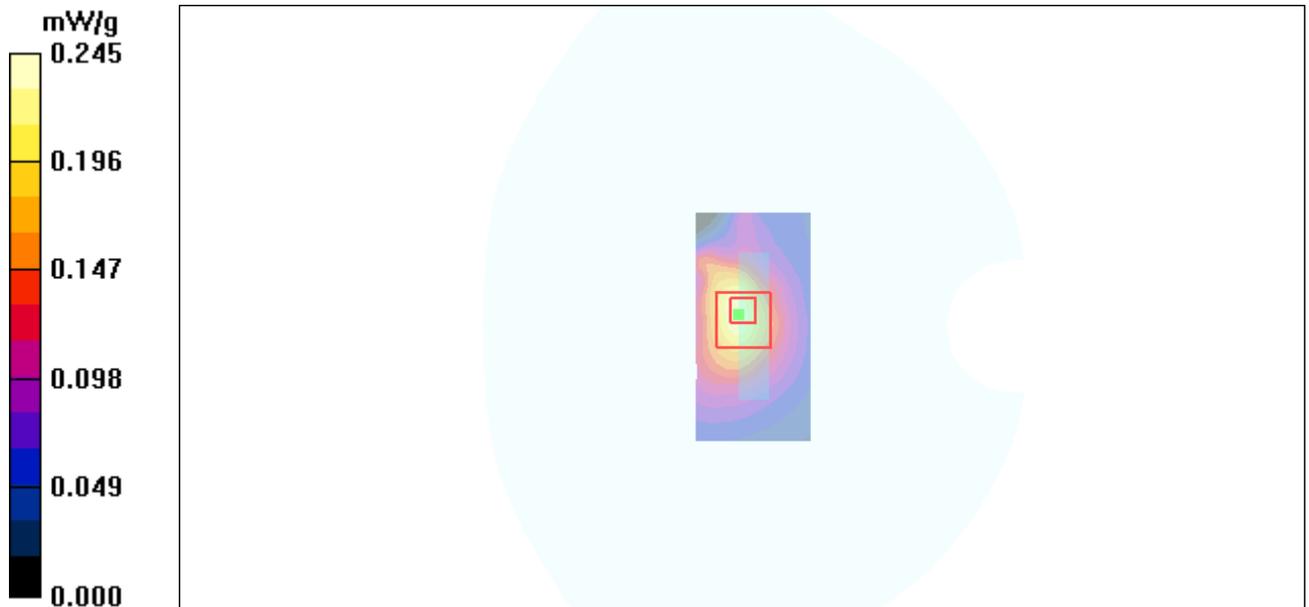
Figure 16 GSM 850 GPRS (2Up) Test Position 3 Channel 190

GSM 850 GPRS (2Up) Test Position 4 Middle

Date/Time: 8/26/2010 3:34:19 PM

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

Medium parameters used: f = 837 MHz; σ = 1 mho/m; ε_r = 54.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (31x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.376 mW/g

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

Reference Value = 19.0 V/m; Power Drift = 0.013 dB

Peak SAR (extrapolated) = 1.04 W/kg

SAR(1 g) = 0.353 mW/g; SAR(10 g) = 0.238 mW/g

Maximum value of SAR (measured) = 0.382 mW/g
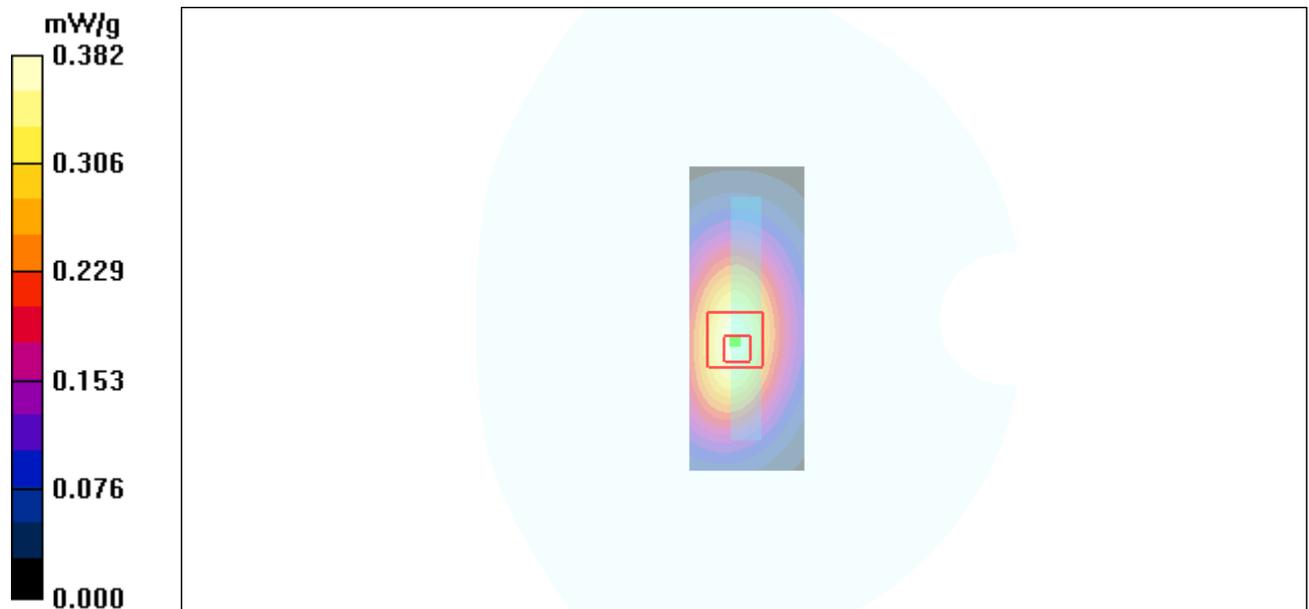
Figure 17 GSM 850 GPRS (2Up) Test Position 4 Channel 190

GSM 850 GPRS (2Up) Test Position 5 Middle

Date/Time: 8/26/2010 3:51:23 PM

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

Medium parameters used: f = 837 MHz; σ = 1 mho/m; $ε_r$ = 54.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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) = 0.329 mW/g

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

Reference Value = 17.9 V/m; Power Drift = 0.033 dB

Peak SAR (extrapolated) = 0.633 W/kg

SAR(1 g) = 0.310 mW/g; SAR(10 g) = 0.219 mW/g

Maximum value of SAR (measured) = 0.329 mW/g
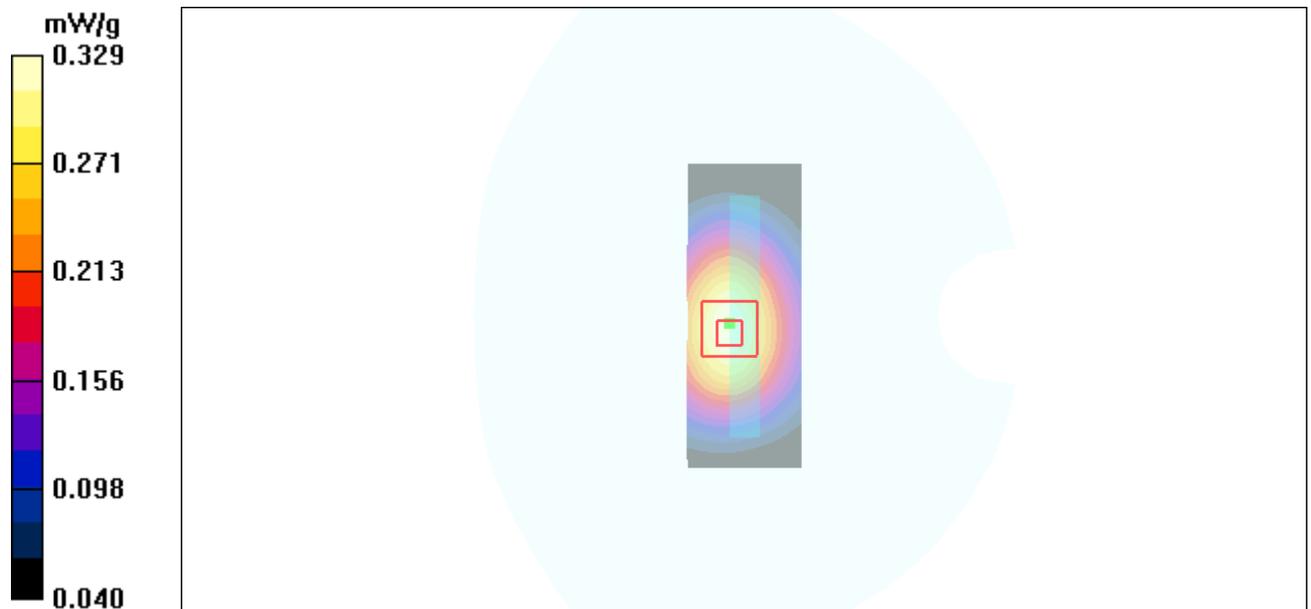
Figure 18 GSM 850 GPRS (2Up) Test Position 5 Channel 190

GSM 850 EGPRS (2Up) Test Position 2 Low

Date/Time: 8/26/2010 4:13:46 PM

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

Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.99 mho/m; ε_r = 55; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 Low/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.17 mW/g

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

Reference Value = 33.1 V/m; Power Drift = -0.185 dB

Peak SAR (extrapolated) = 1.52 W/kg

SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.752 mW/g

Maximum value of SAR (measured) = 1.15 mW/g
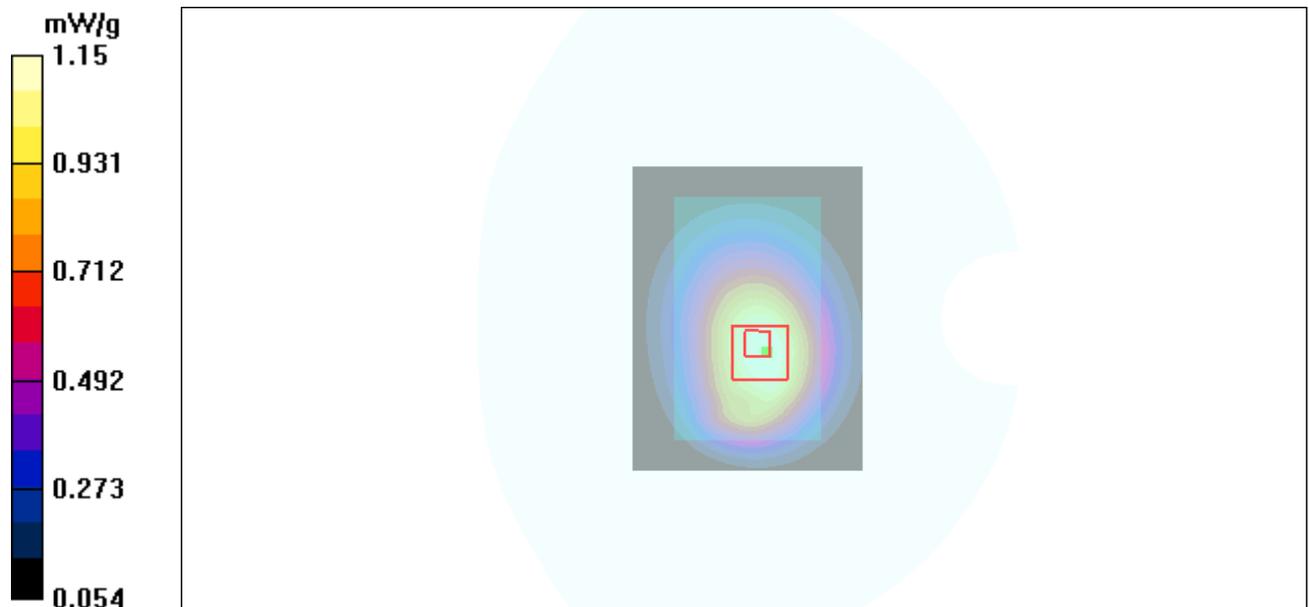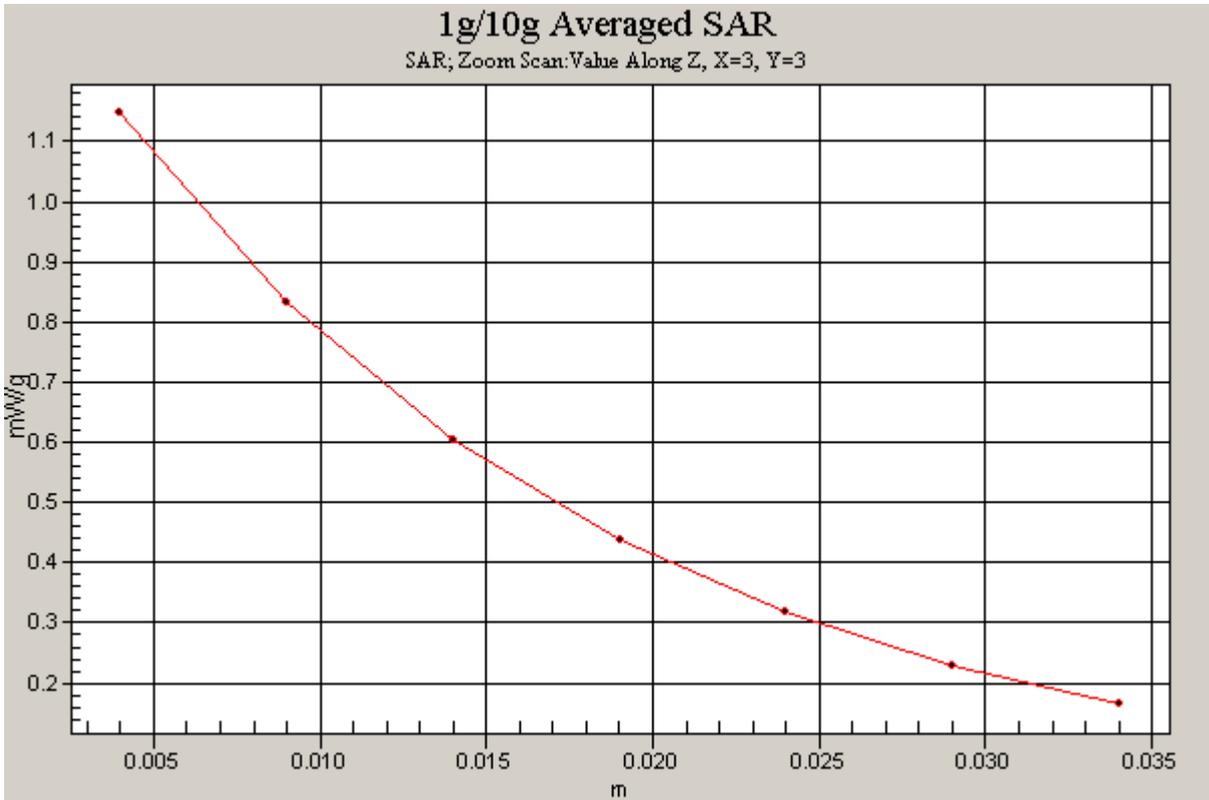
Figure 19 GSM 850 EGPRS (2Up) Test Position 2 Channel 128

GSM 1900 GPRS (4Up) Test Position 1 Middle

Date/Time: 8/26/2010 5:56:54 PM

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

Medium parameters used: f = 1880 MHz; σ = 1.54 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.552 mW/g

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

Reference Value = 6.83 V/m; Power Drift = -0.125 dB

Peak SAR (extrapolated) = 0.836 W/kg

SAR(1 g) = 0.496 mW/g; SAR(10 g) = 0.291 mW/g
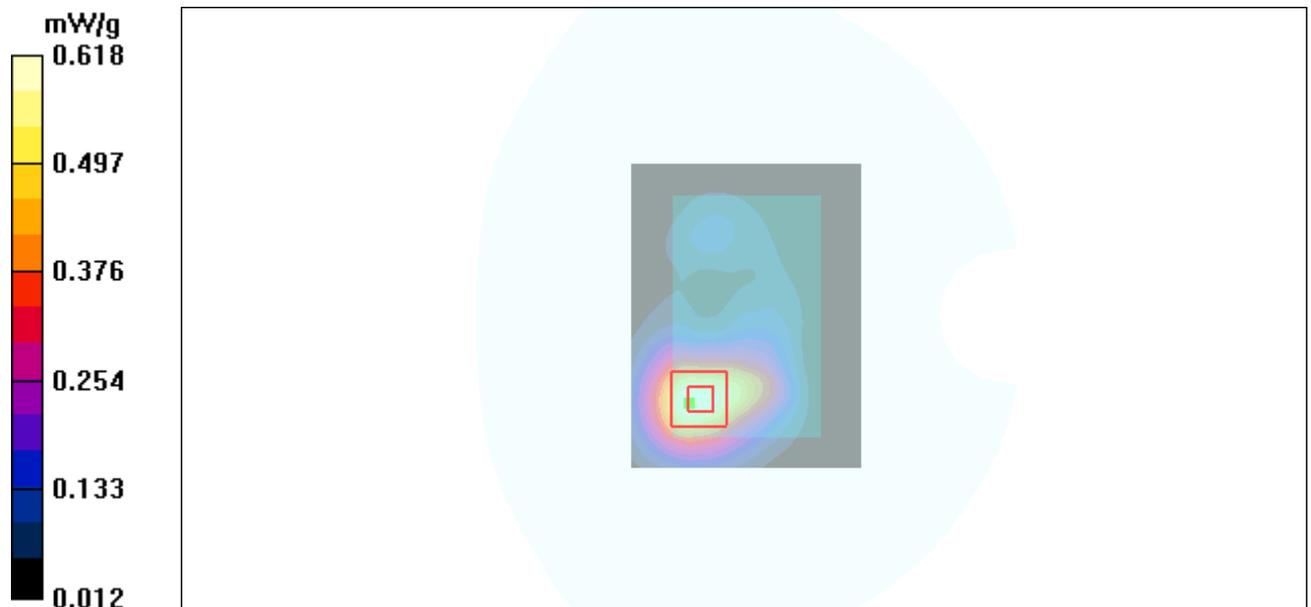
Maximum value of SAR (measured) = 0.537 mW/g
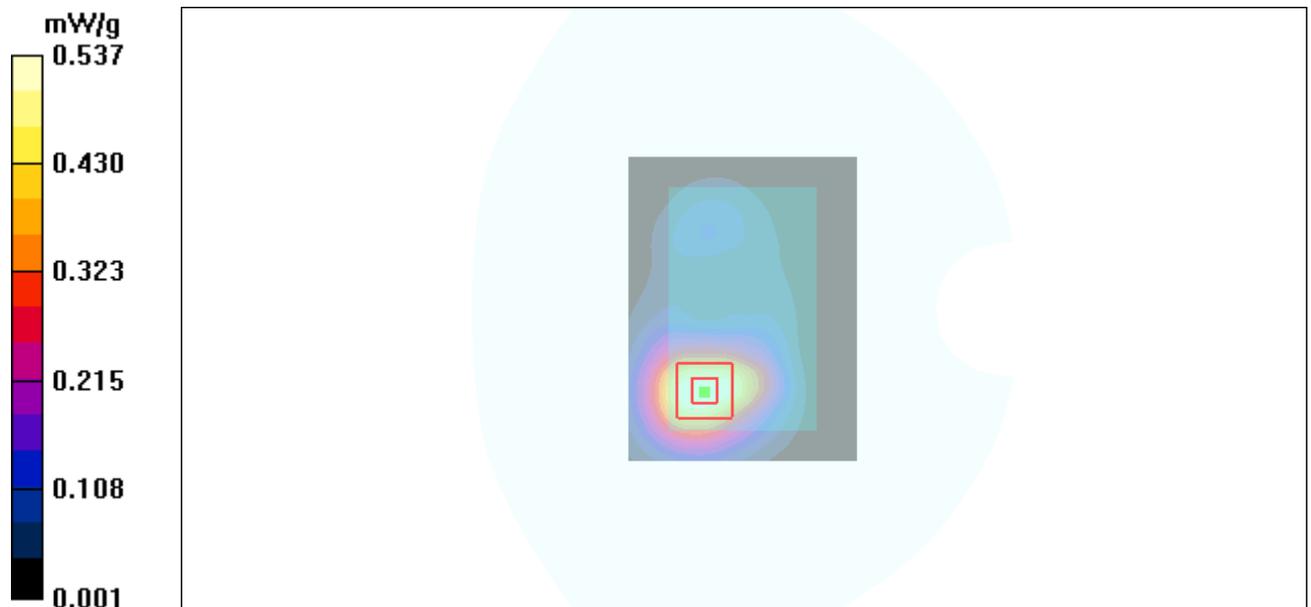
Figure 20 GSM 1900 GPRS (4Up) Test Position 1 Channel 661

GSM 1900 GPRS (3Up) Test Position 1 Middle

Date/Time: 8/26/2010 5:37:16 PM

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

Medium parameters used: f = 1880 MHz; σ = 1.54 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.665 mW/g

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

Reference Value = 7.46 V/m; Power Drift = -0.072 dB

Peak SAR (extrapolated) = 1.01 W/kg

SAR(1 g) = 0.594 mW/g; SAR(10 g) = 0.346 mW/g

Maximum value of SAR (measured) = 0.636 mW/g
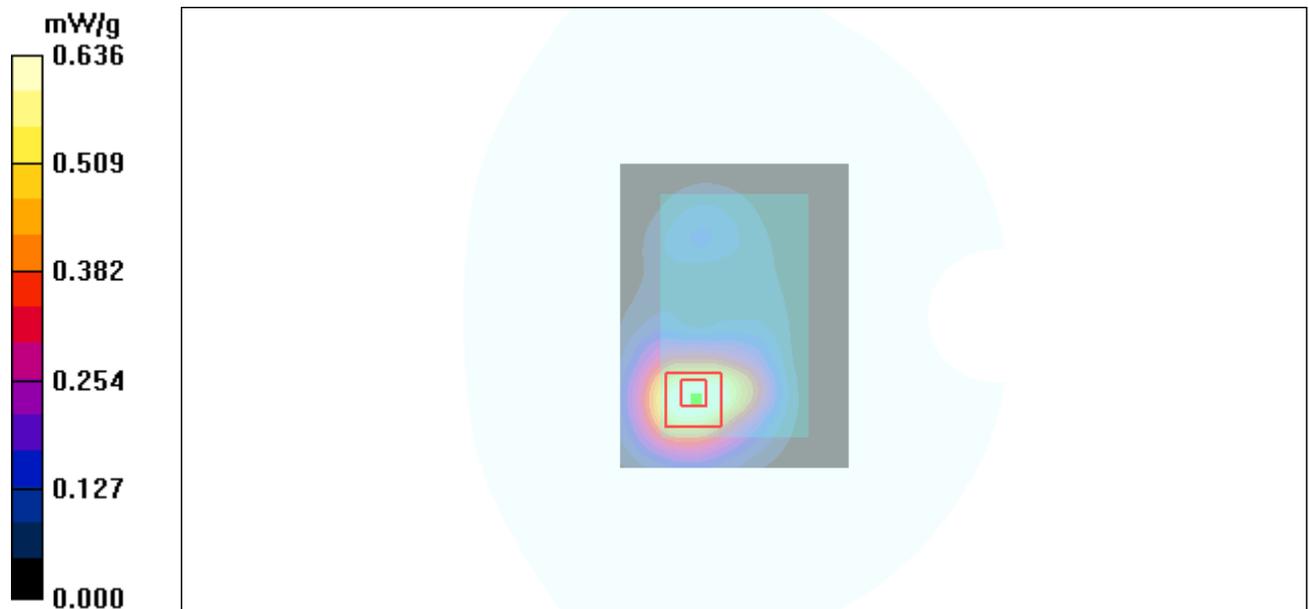
Figure 21 GSM 1900 GPRS (3Up) Test Position 1 Channel 661

GSM 1900 GPRS (2Up) Test Position 1 Middle

Date/Time: 8/26/2010 4:53:00 PM

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

Medium parameters used: f = 1880 MHz; σ = 1.54 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.626 mW/g

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

Reference Value = 8.23 V/m; Power Drift = 0.060 dB

Peak SAR (extrapolated) = 0.975 W/kg

SAR(1 g) = 0.577 mW/g; SAR(10 g) = 0.337 mW/g

Maximum value of SAR (measured) = 0.618 mW/g

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

GSM 1900 GPRS (1Up) Test Position 1 Middle

Date/Time: 8/26/2010 5:11:16 PM

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

Medium parameters used: f = 1880 MHz; σ = 1.54 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.559 mW/g

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

Reference Value = 6.99 V/m; Power Drift = -0.135 dB

Peak SAR (extrapolated) = 0.878 W/kg

SAR(1 g) = 0.520 mW/g; SAR(10 g) = 0.306 mW/g

Maximum value of SAR (measured) = 0.565 mW/g
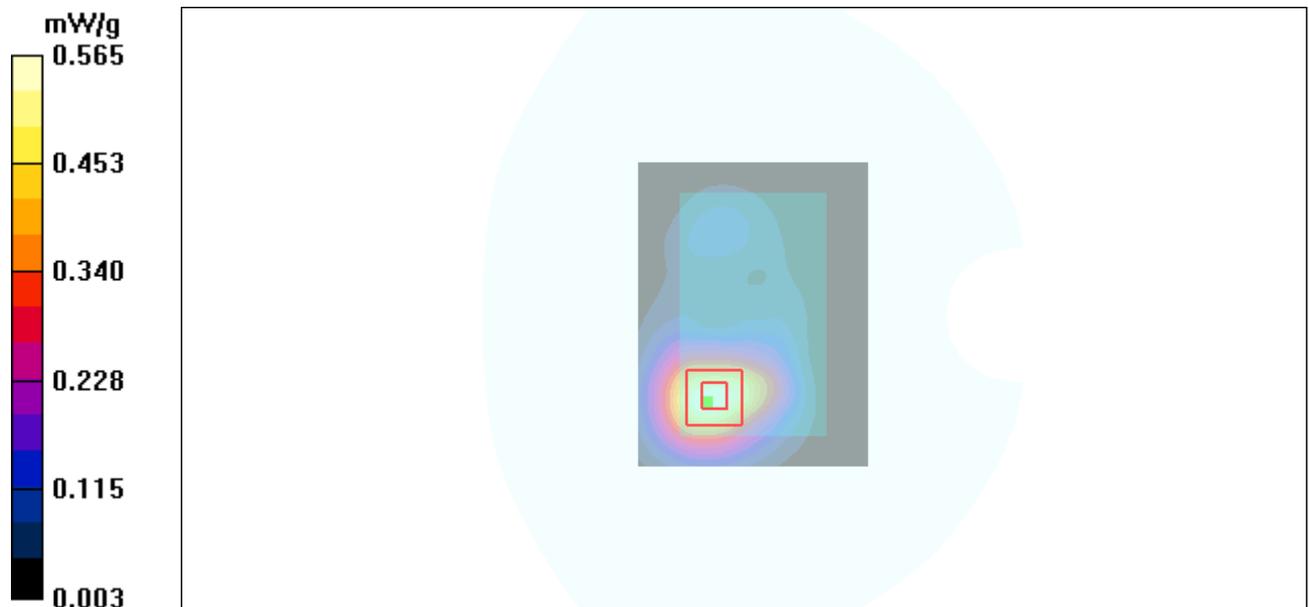
Figure 23 GSM 1900 GPRS (1Up) Test Position 1 Channel 661

GSM 1900 GPRS (2Up) Test Position 2 High

Date/Time: 8/26/2010 6:49:17 PM

Communication System: PCS 1900+GPRS(2Up); Frequency: 1909.8 MHz;Duty Cycle: 1:4.15

Medium parameters used: f = 1910 MHz; σ = 1.58 mho/m; ε_r = 53; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 High/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

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

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

Reference Value = 8.60 V/m; Power Drift = 0.007 dB

Peak SAR (extrapolated) = 1.51 W/kg

SAR(1 g) = 0.886 mW/g; SAR(10 g) = 0.523 mW/g

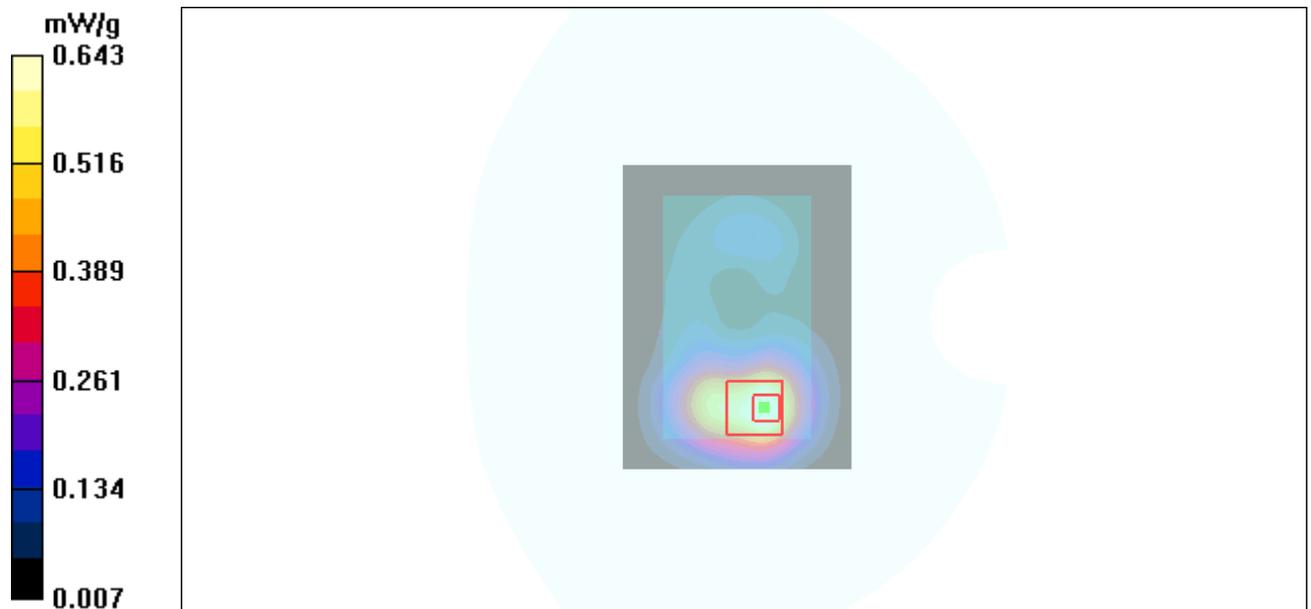Maximum value of SAR (measured) = 0.968 mW/g
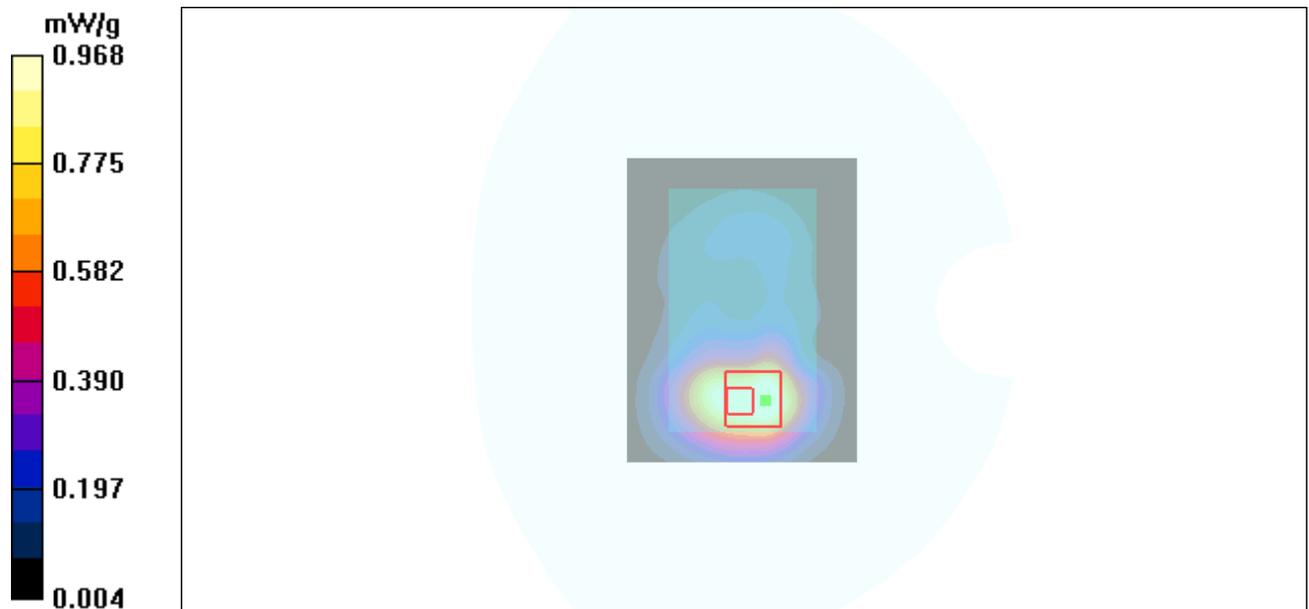
Figure 24 GSM 1900 GPRS (2Up) Test Position 2 Channel 810

GSM 1900 GPRS (2Up) Test Position 2 Middle

Date/Time: 8/26/2010 6:30:35 PM

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

Medium parameters used: f = 1880 MHz; σ = 1.54 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.857 mW/g

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

Reference Value = 6.26 V/m; Power Drift = 0.018 dB

Peak SAR (extrapolated) = 1.23 W/kg

SAR(1 g) = 0.703 mW/g; SAR(10 g) = 0.418 mW/g

Maximum value of SAR (measured) = 0.762 mW/g
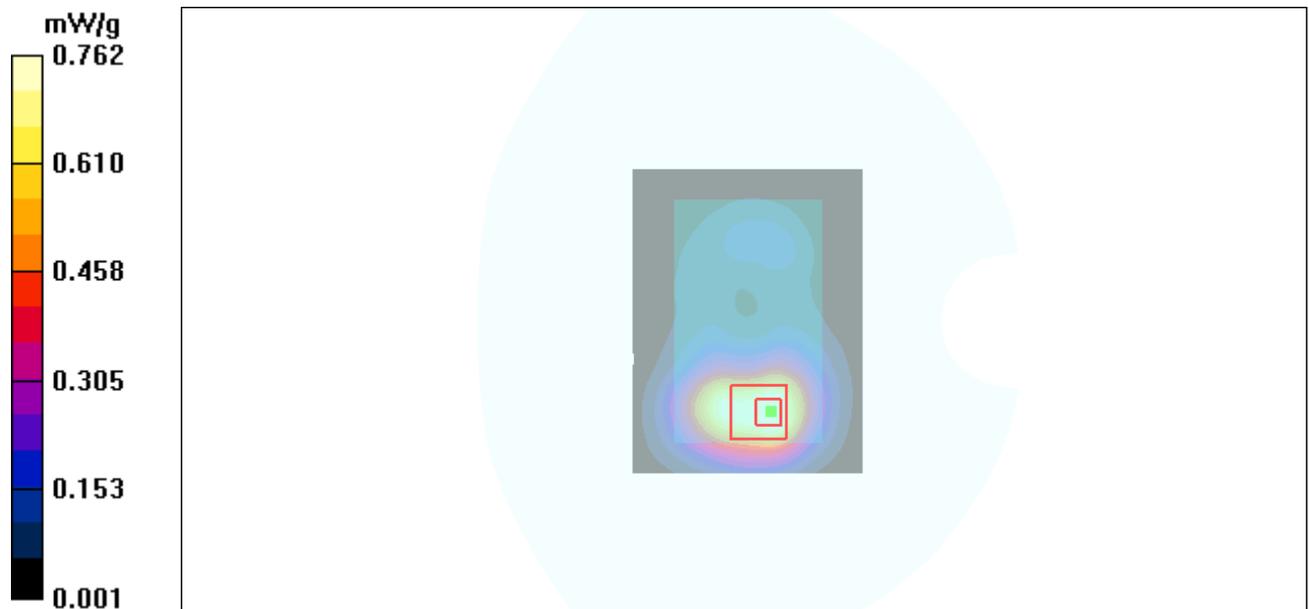
Figure 25 GSM 1900 GPRS (2Up) Test Position 2 Channel 661

GSM 1900 GPRS (2Up) Test Position 2 Low

Date/Time: 8/26/2010 7:08:16 PM

Communication System: PCS 1900+GPRS(2Up); Frequency: 1850.2 MHz;Duty Cycle: 1:4.15

Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.51 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 Low/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.714 mW/g

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

Reference Value = 4.78 V/m; Power Drift = 0.155 dB

Peak SAR (extrapolated) = 1.10 W/kg

SAR(1 g) = 0.590 mW/g; SAR(10 g) = 0.337 mW/g

Maximum value of SAR (measured) = 0.643 mW/g

Figure 26 GSM 1900 GPRS (2Up) Test Position 2 Channel 512

GSM 1900 GPRS (2Up) Test Position 3 Middle

Date/Time: 8/26/2010 9:43:50 PM

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

Medium parameters used: f = 1880 MHz; σ = 1.54 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃　　　Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 3 Middle/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.629 mW/g

Test Position 3 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 18.7 V/m; Power Drift = 0.037 dB

Peak SAR (extrapolated) = 0.947 W/kg

SAR(1 g) = 0.559 mW/g; SAR(10 g) = 0.312 mW/g

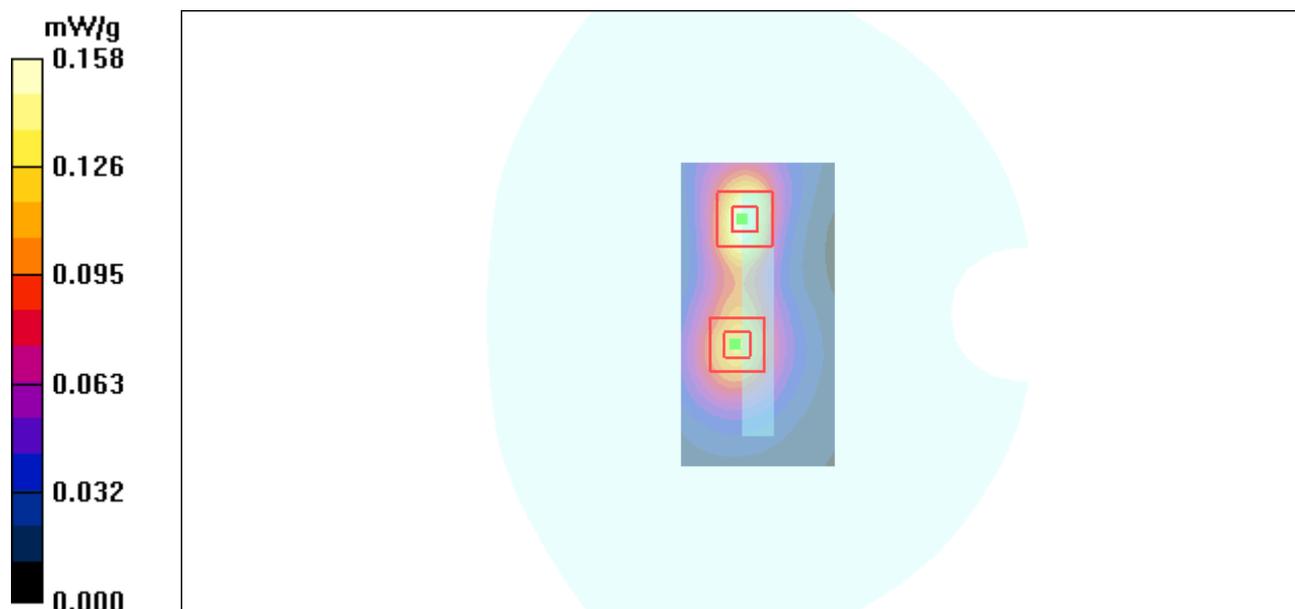Maximum value of SAR (measured) = 0.614 mW/g
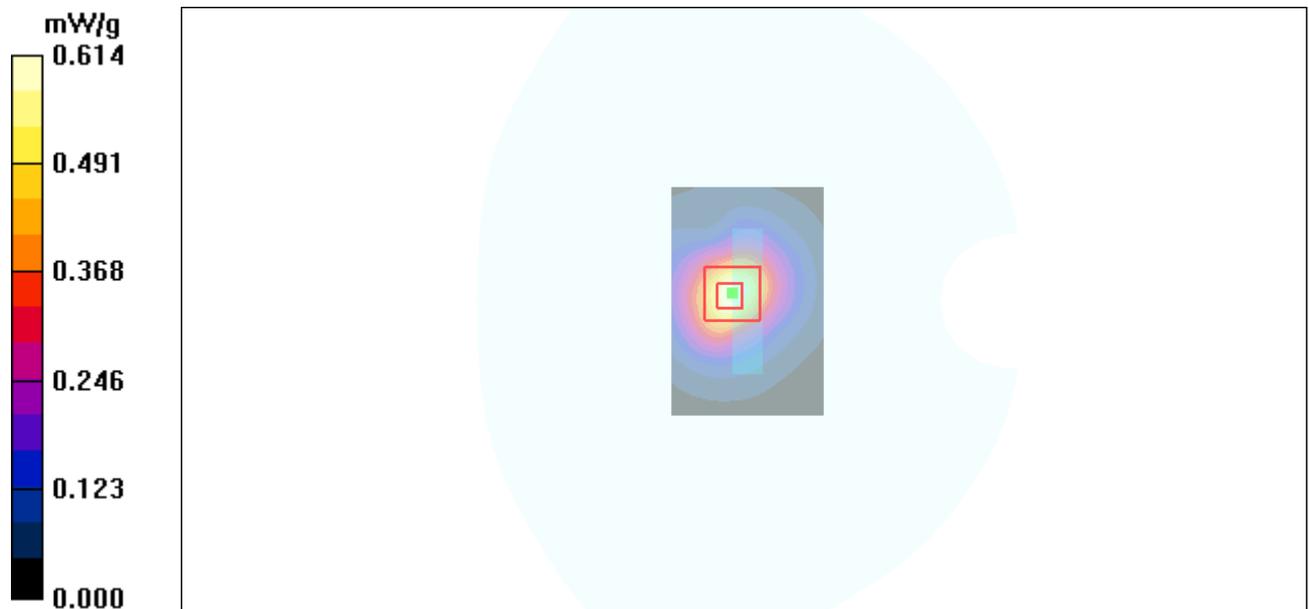
Figure 27 GSM 1900 GPRS (2Up) Test Position 3 Channel 661

GSM 1900 GPRS (2Up) Test Position 4 Middle

Date/Time: 8/26/2010 8:52:03 PM

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

Medium parameters used: f = 1880 MHz; σ = 1.54 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (41x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.164 mW/g

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

Reference Value = 8.00 V/m; Power Drift = -0.033 dB

Peak SAR (extrapolated) = 0.253 W/kg

SAR(1 g) = 0.141 mW/g; SAR(10 g) = 0.076 mW/g

Maximum value of SAR (measured) = 0.158 mW/g

Test Position 4 Middle/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.00 V/m; Power Drift = -0.033 dB

Peak SAR (extrapolated) = 0.186 W/kg

SAR(1 g) = 0.111 mW/g; SAR(10 g) = 0.065 mW/g

Maximum value of SAR (measured) = 0.121 mW/g

Figure 28 GSM 1900 GPRS (2Up) Test Position 4 Channel 661

GSM 1900 GPRS (2Up) Test Position 5 Middle

Date/Time: 8/26/2010 9:21:26 PM

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

Medium parameters used: f = 1880 MHz; σ = 1.54 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (41x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.054 mW/g

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

Reference Value = 4.82 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 0.075 W/kg

SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.030 mW/g

Maximum value of SAR (measured) = 0.051 mW/g
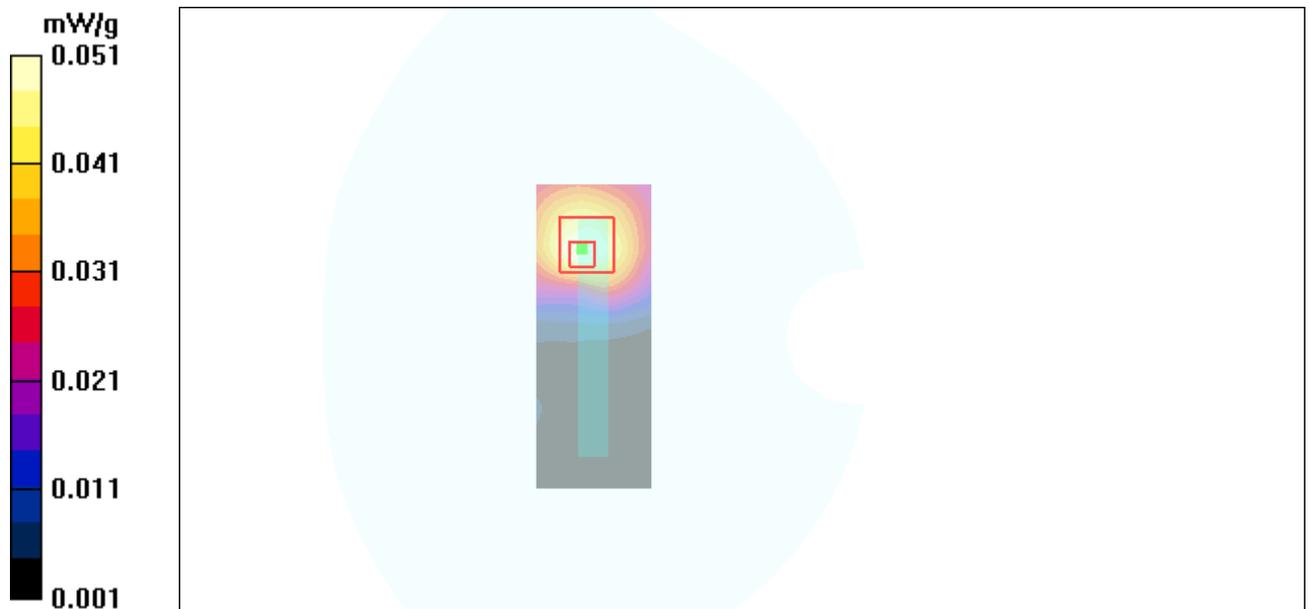
Figure 29 GSM 1900 GPRS (2Up) Test Position 5 Channel 661

GSM 1900 EGPRS (2Up) Test Position 2 High

Date/Time: 8/26/2010 7:28:31 PM

Communication System: PCS 1900+EGPRS(2Up); Frequency: 1909.8 MHz;Duty Cycle: 1:4.15

Medium parameters used: f = 1910 MHz; σ = 1.58 mho/m; ε_r = 53; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.62, 7.62, 7.62); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 High/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

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

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

Reference Value = 8.69 V/m; Power Drift = -0.054 dB

Peak SAR (extrapolated) = 1.89 W/kg

SAR(1 g) = 0.896 mW/g; SAR(10 g) = 0.521 mW/g

Maximum value of SAR (measured) = 0.961 mW/g
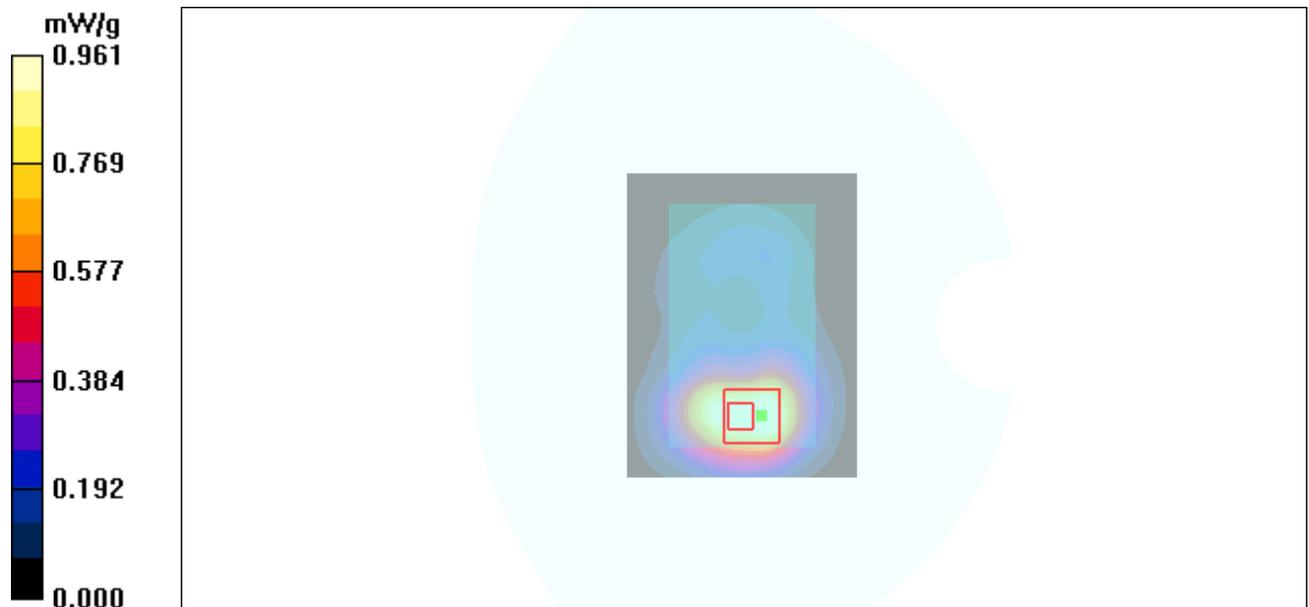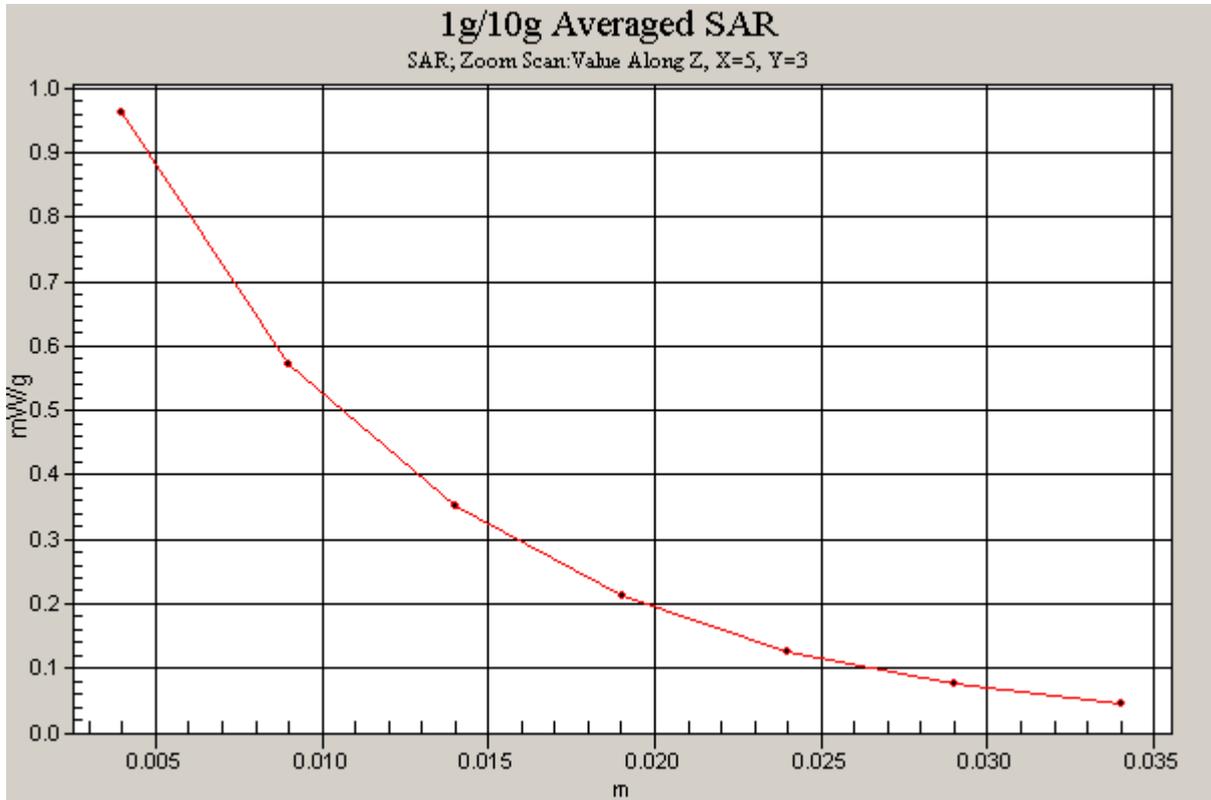
Figure 30 GSM 1900 EGPRS (2Up) Test Position 2 Channel 810

WCDMA Band IV Test Position 1 Middle

Date/Time: 8/26/2010 6:14:10 PM

Communication System: WCDMA Band IV; Frequency: 1732.6 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1732.6 MHz; σ = 1.46 mho/m; $ε_r$ = 52.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

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

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

Reference Value = 13.1 V/m; Power Drift = 0.189 dB

Peak SAR (extrapolated) = 0.729 W/kg

SAR(1 g) = 0.414 mW/g; SAR(10 g) = 0.232 mW/g

Maximum value of SAR (measured) = 0.456 mW/g
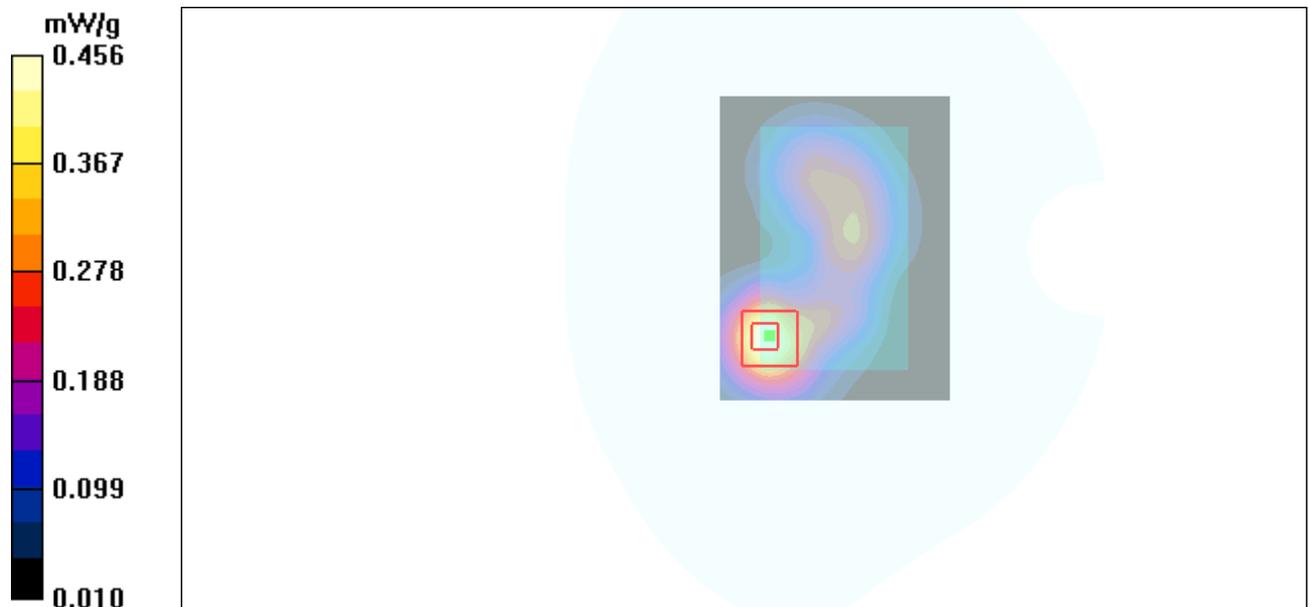
Figure 31 WCDMA Band IV Test Position 1 Channel 1413

WCDMA Band IV Test Position 2 High

Date/Time: 8/26/2010 10:57:59 PM

Communication System: WCDMA Band IV; Frequency: 1752.6 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1752.6 MHz; σ = 1.48 mho/m; $ε_r$ = 52.2; ρ = 1000 kg/m³

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 High/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.33 mW/g

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

Reference Value = 8.15 V/m; Power Drift = 0.018 dB

Peak SAR (extrapolated) = 2.11 W/kg

SAR(1 g) = 1.12 mW/g; SAR(10 g) = 0.584 mW/g
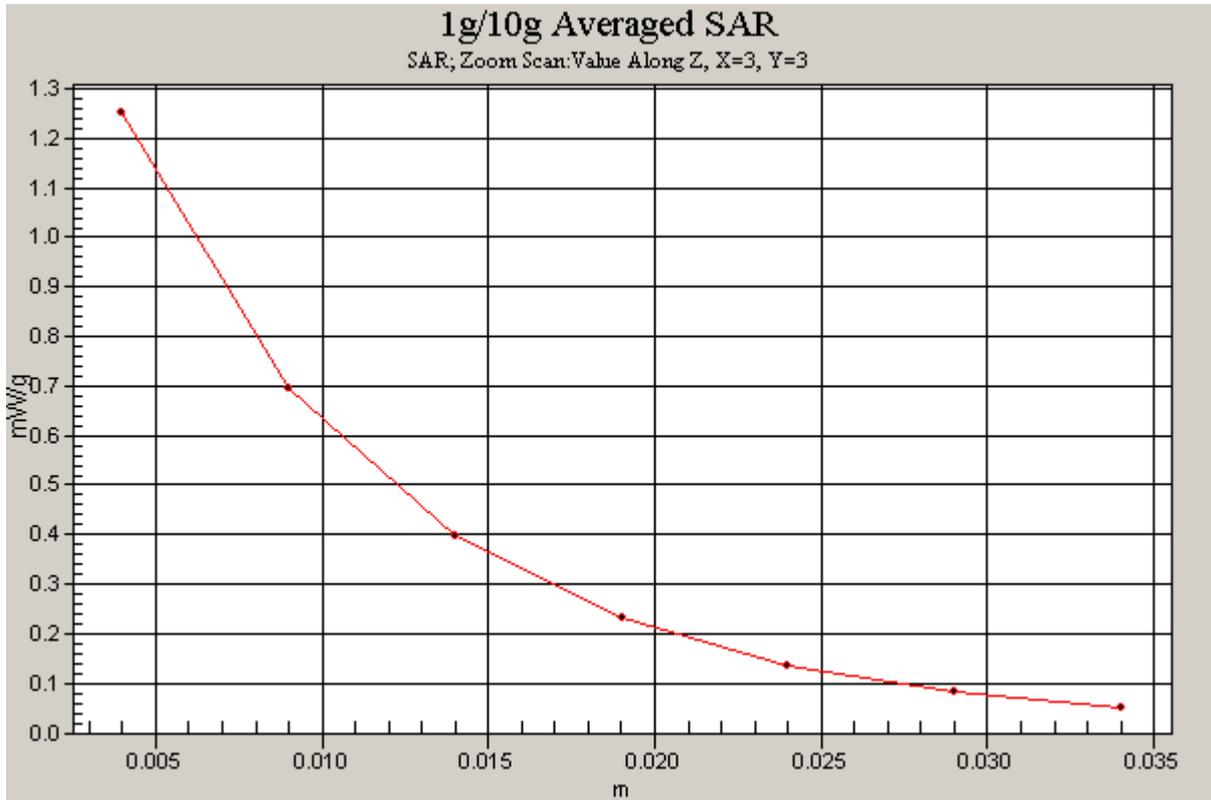
Maximum value of SAR (measured) = 1.25 mW/g
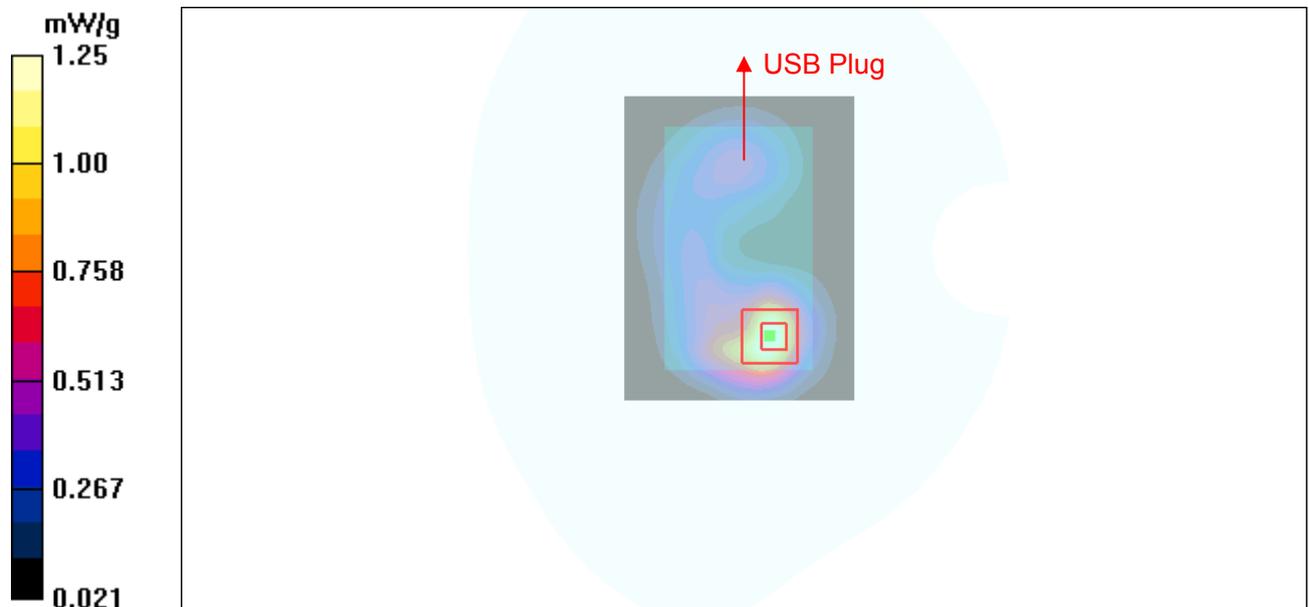
Figure 32 WCDMA Band IV Test Position 2 Channel 1513

WCDMA Band IV Test Position 2 Middle

Date/Time: 8/26/2010 11:16:55 PM

Communication System: WCDMA Band IV; Frequency: 1732.6 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1732.6 MHz; σ = 1.46 mho/m; $ε_r$ = 52.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.931 mW/g

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

Reference Value = 8.96 V/m; Power Drift = 0.080 dB

Peak SAR (extrapolated) = 1.45 W/kg

SAR(1 g) = 0.761 mW/g; SAR(10 g) = 0.395 mW/g

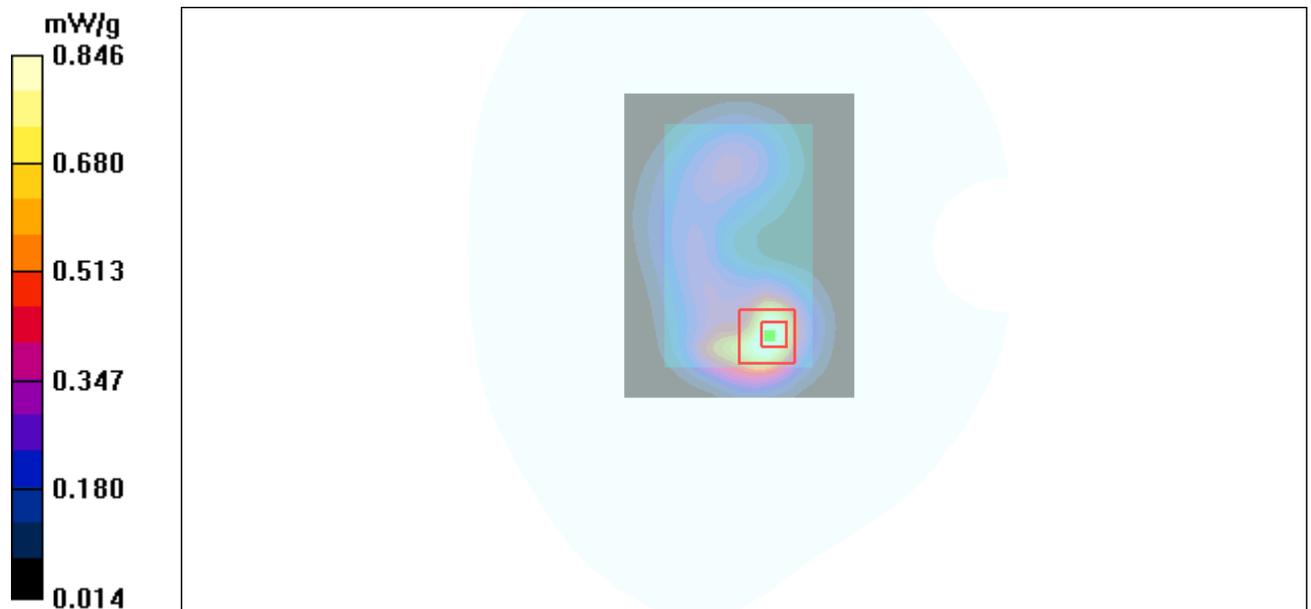Maximum value of SAR (measured) = 0.846 mW/g

Figure 33 WCDMA Band IV Test Position 2 Channel 1413

WCDMA Band IV Test Position 2 Low

Date/Time: 8/26/2010 10:27:28 PM

Communication System: WCDMA Band IV; Frequency: 1712.4 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1712.4 MHz; σ = 1.45 mho/m; $ε_r$ = 52.4; ρ = 1000 kg/m³

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 Low/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.968 mW/g

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

Reference Value = 11.0 V/m; Power Drift = 0.063 dB

Peak SAR (extrapolated) = 1.53 W/kg

SAR(1 g) = 0.804 mW/g; SAR(10 g) = 0.426 mW/g
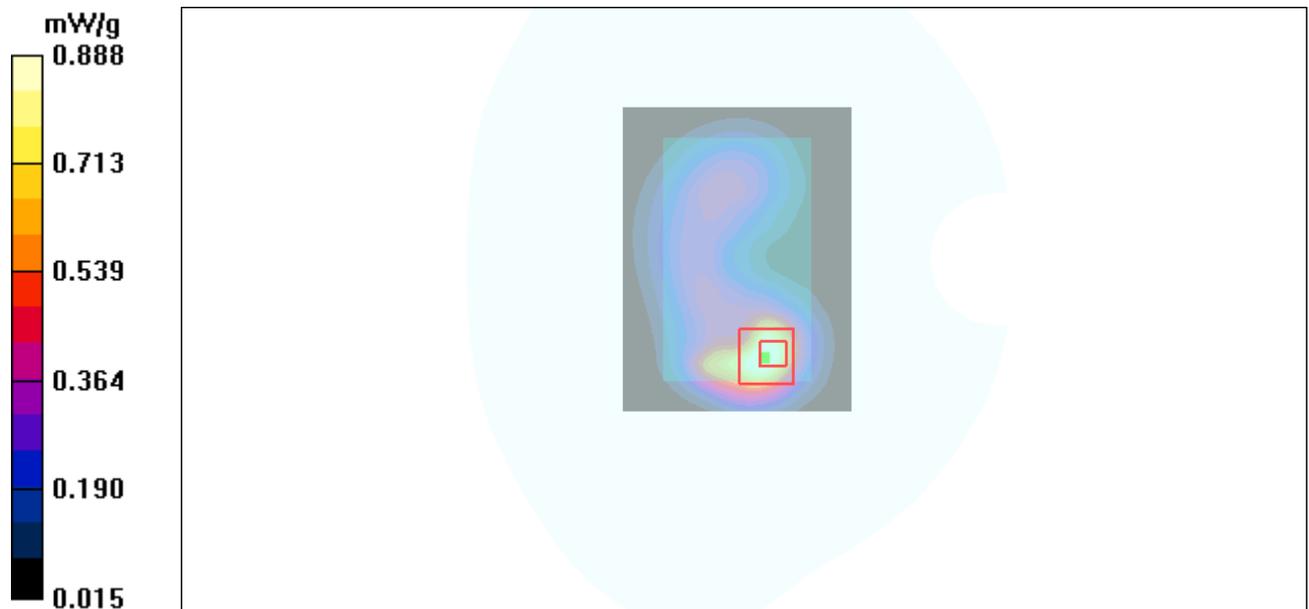
Maximum value of SAR (measured) = 0.888 mW/g

Figure 34 WCDMA Band IV Test Position 2 Channel 1312

WCDMA Band IV Test Position 3 Middle

Date/Time: 8/26/2010 11:39:44 PM

Communication System: WCDMA Band IV; Frequency: 1732.6 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1732.6 MHz; σ = 1.46 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 3 Middle/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.521 mW/g

Test Position 3 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 18.6 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 0.757 W/kg

SAR(1 g) = 0.468 mW/g; SAR(10 g) = 0.264 mW/g

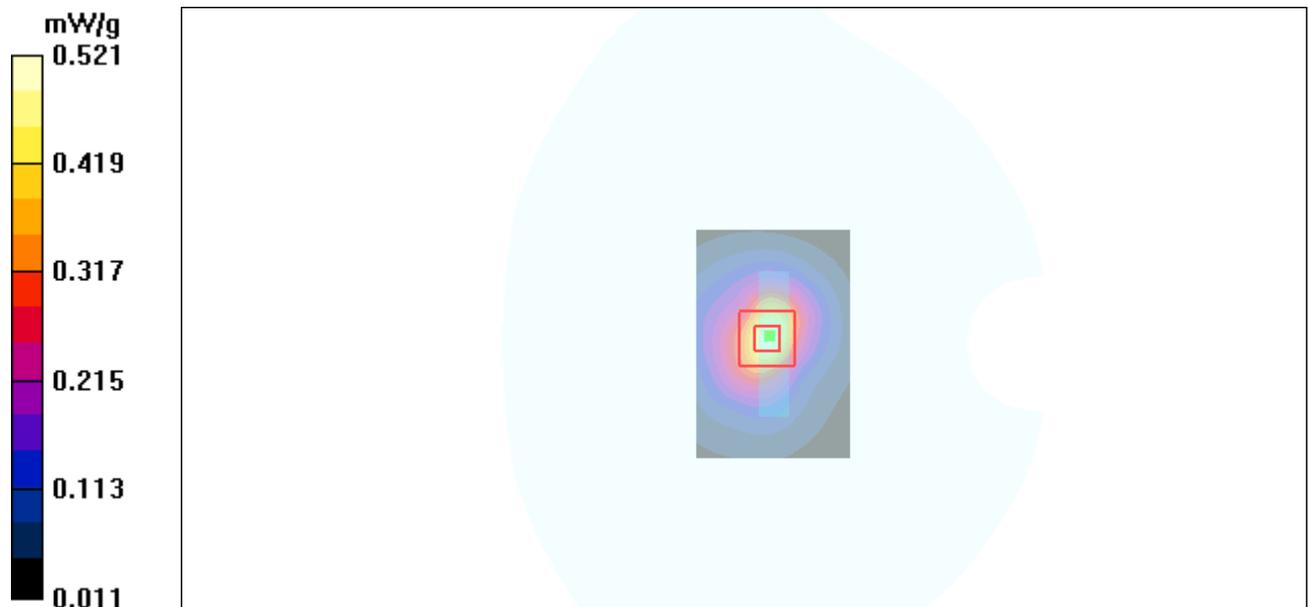Maximum value of SAR (measured) = 0.521 mW/g

Figure 35 WCDMA Band IV Test Position 3 Channel 1413

WCDMA Band IV Test Position 4 Middle

Date/Time: 8/27/2010 9:15:19 AM

Communication System: WCDMA Band IV; Frequency: 1732.6 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1732.6 MHz; σ = 1.46 mho/m; $ε_r$ = 52.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 (31x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.204 mW/g

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

Reference Value = 6.19 V/m; Power Drift = -0.065 dB

Peak SAR (extrapolated) = 0.325 W/kg

SAR(1 g) = 0.184 mW/g; SAR(10 g) = 0.098 mW/g
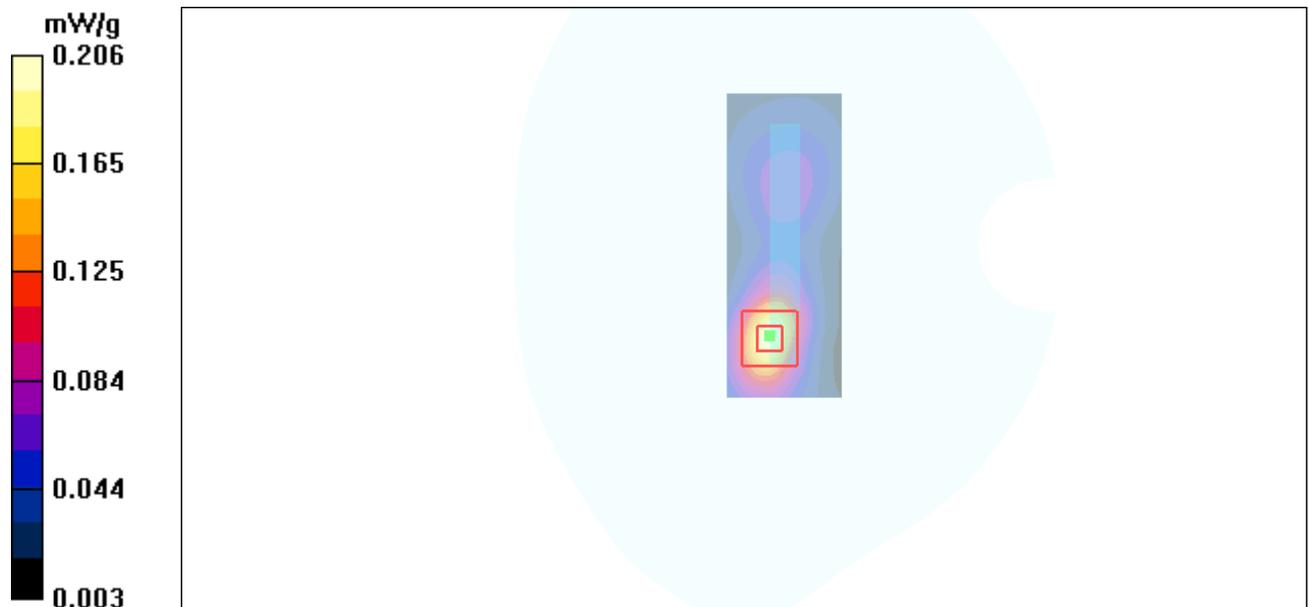
Maximum value of SAR (measured) = 0.206 mW/g

Figure 36 WCDMA Band IV Test Position 4 Channel 1413

WCDMA Band IV Test Position 5 Middle

Date/Time: 8/27/2010 9:33:57 AM

Communication System: WCDMA Band IV; Frequency: 1732.6 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1732.6 MHz; σ = 1.46 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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) = 0.158 mW/g

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

Reference Value = 9.66 V/m; Power Drift = 0.011 dB

Peak SAR (extrapolated) = 0.228 W/kg

SAR(1 g) = 0.141 mW/g; SAR(10 g) = 0.085 mW/g

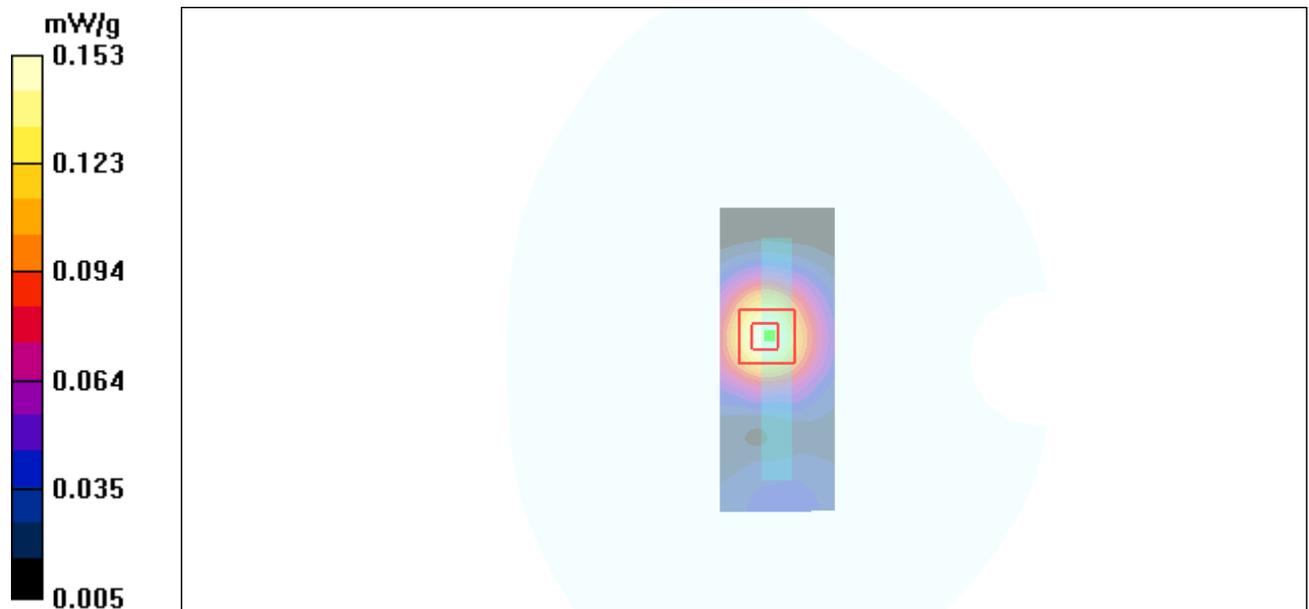Maximum value of SAR (measured) = 0.153 mW/g

Figure 37 WCDMA Band IV Test Position 5 Channel 1413

WCDMA Band IV HSDPA Test Position 2 High

Date/Time: 8/27/2010 10:02:10 AM

Communication System: WCDMA Band IV+HSDPA; Frequency: 1752.6 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1752.6 MHz; σ = 1.48 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 High/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.31 mW/g

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

Reference Value = 10.8 V/m; Power Drift = 0.127 dB

Peak SAR (extrapolated) = 2.10 W/kg

SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.561 mW/g

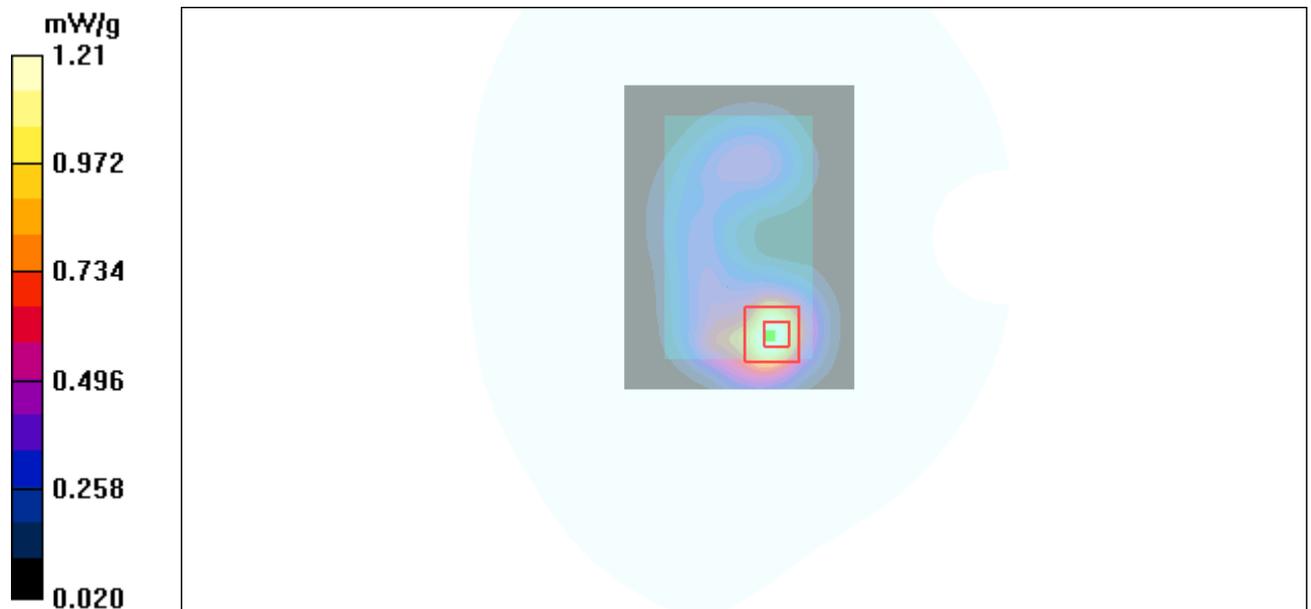Maximum value of SAR (measured) = 1.21 mW/g

Figure 38 WCDMA Band IV HSDPA Test Position 2 Channel 1513

WCDMA Band IV HSUPA Test Position 2 High

Date/Time: 8/27/2010 10:52:50 AM

Communication System: WCDMA Band IV+HSUPA; Frequency: 1752.6 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1752.6 MHz; σ = 1.48 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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 High/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

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

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

Reference Value = 9.73 V/m; Power Drift = -0.084 dB

Peak SAR (extrapolated) = 1.54 W/kg

SAR(1 g) = 0.809 mW/g; SAR(10 g) = 0.419 mW/g

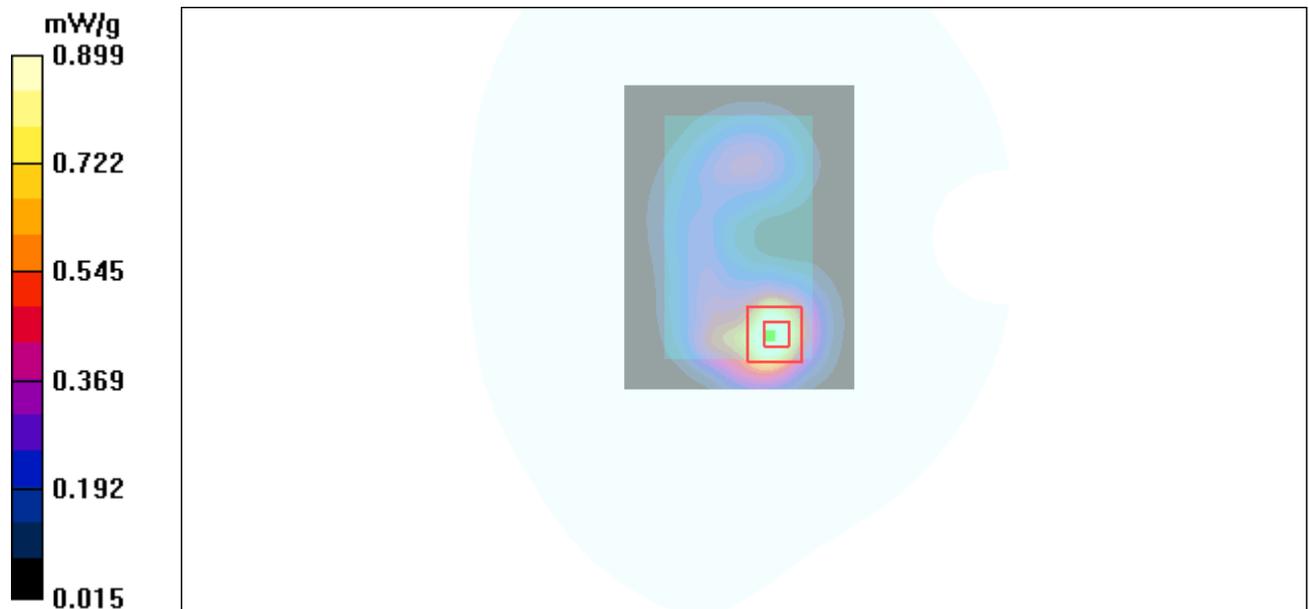Maximum value of SAR (measured) = 0.899 mW/g

Figure 39 WCDMA Band IV HSUPA Test Position 2 Channel 1513

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
   Servizio svizzero di taratura
S   Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)   Accreditation No.: **SCS 108**
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Client   **TA (Auden)**   Certificate No: **EX3-3677_Sep09**

CALIBRATION CERTIFICATE

Object	**EX3DV4 - SN:3677**
Calibration procedure(s)	**QA CAL-01.v6, QA CAL-12.v5, QA CAL-23.v3 and QA CAL-25.v2** **Calibration procedure for dosimetric E-field probes**
Calibration date:	**September 23, 2009**
Condition of the calibrated item	**In Tolerance**

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 E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 23, 2009

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

Certificate No: EX3-3677_Sep09   Page 1 of 9

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

S   Schweizerischer Kalibrierdienst
C   Service suisse d'étalonnage
    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
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., θ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

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

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).

- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.

- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.

- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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 *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 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:3677   **September 23, 2009**

Probe EX3DV4

SN:3677

Manufactured: September 9, 2008
Last calibrated: November 7, 2008
Recalibrated: September 23, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

EX3DV4 SN:3677   **September 23, 2009**

DASY - Parameters of Probe: EX3DV4 SN:3677

Sensitivity in Free Space[A]

NormX	**0.42** ± 10.1%	$\mu V/(V/m)^2$
NormY	**0.47** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**0.40** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	**91** mV
DCP Y	**92** mV
DCP Z	**93** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL   **900 MHz**   **Typical SAR gradient: 5 % per mm**

		2.0 mm	3.0 mm
Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	8.2	4.4
SAR_{be} [%]	With Correction Algorithm	0.8	0.5

TSL   **1750 MHz**   **Typical SAR gradient: 10 % per mm**

		2.0 mm	3.0 mm
Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	7.5	3.9
SAR_{be} [%]	With Correction Algorithm	0.8	0.4

Sensor Offset

Probe Tip to Sensor Center   **1.0** mm

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

EX3DV4 SN:3677

September 23, 2009

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)
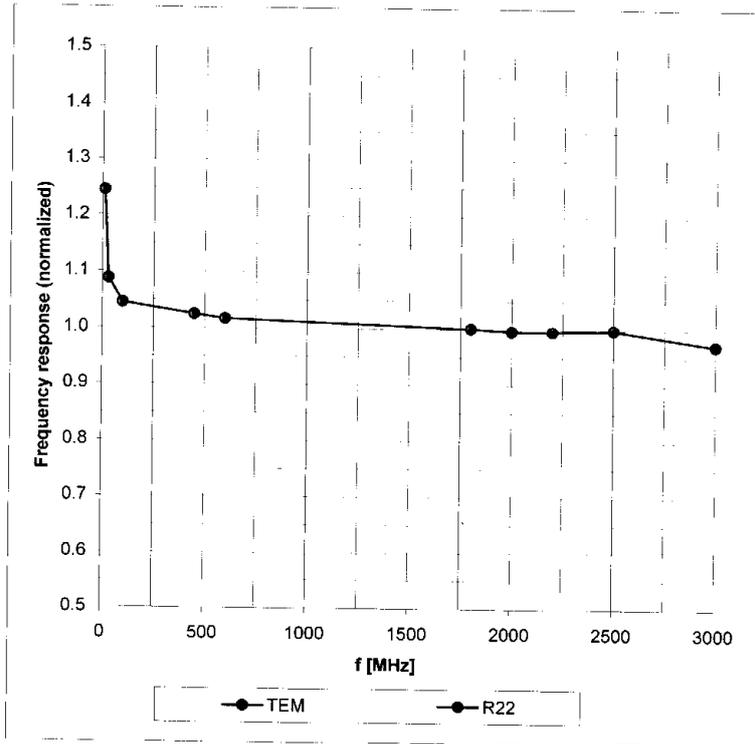
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

EX3DV4 SN:3677   **September 23, 2009**

Receiving Pattern (ϕ), ϑ = 0°

f = 600 MHz, TEM ifi110EXX

f = 1800 MHz, WG R22
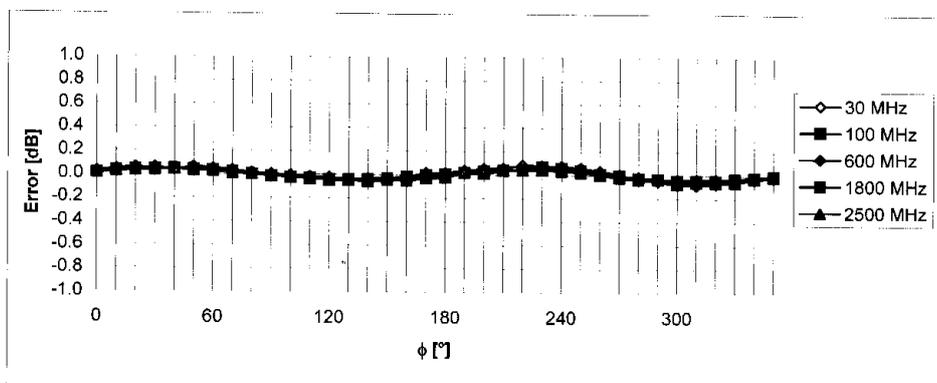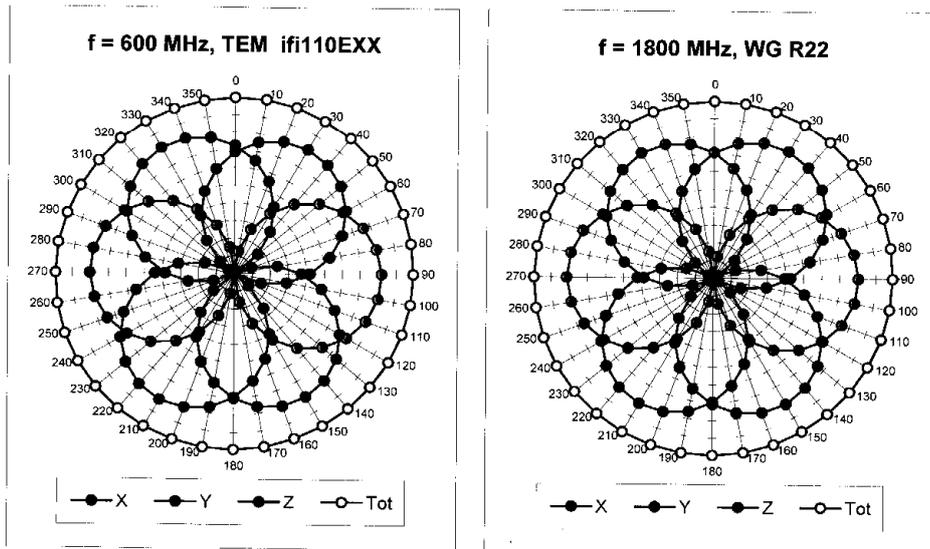
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4 SN:3677   **September 23, 2009**

Dynamic Range f(SAR$_{head}$)
(Waveguide R22, f = 1800 MHz)
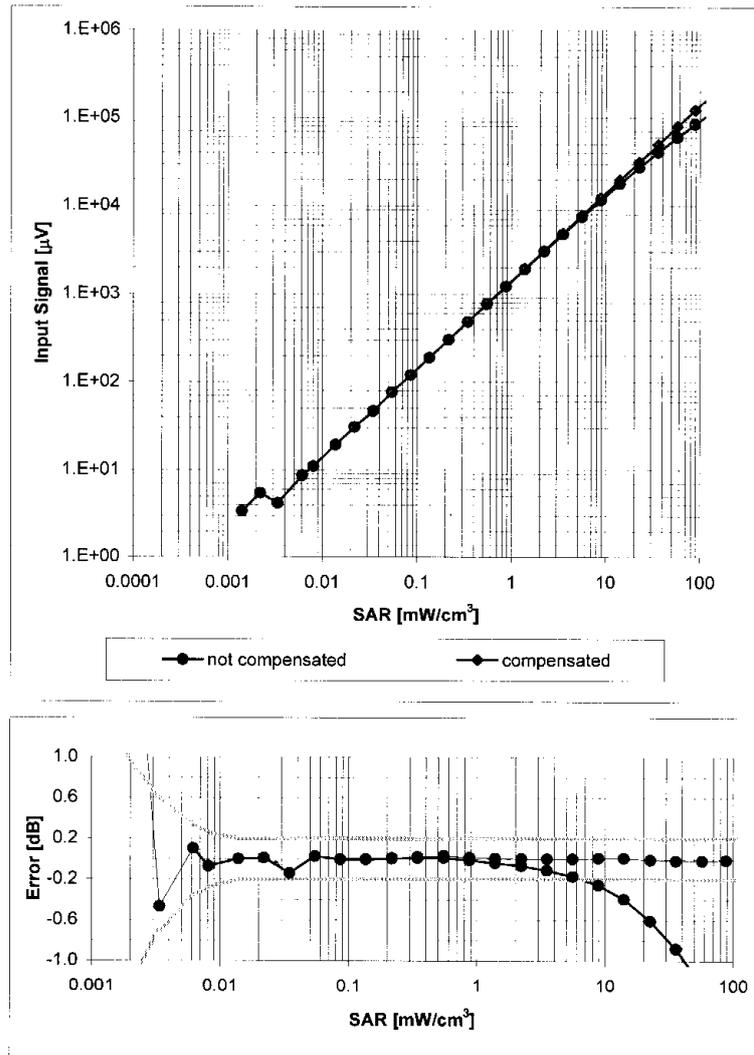
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

EX3DV4 SN:3677   **September 23, 2009**

Conversion Factor Assessment

f = 900 MHz, WGLS R9 (head)

f = 1750 MHz, WGLS R22 (head)
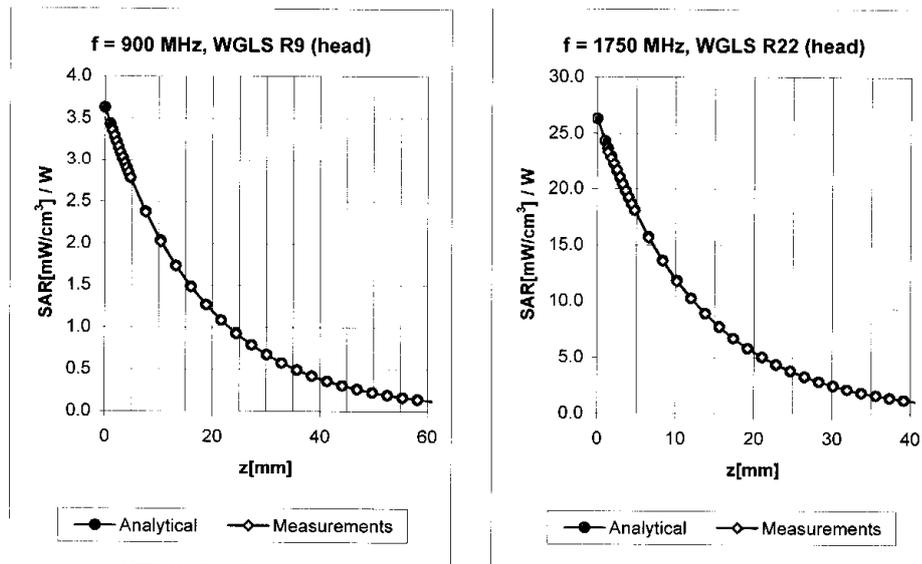
f [MHz]	Validity [MHz]^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.68	0.64	9.20	± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.71	0.62	8.91	± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.68	0.62	8.04	± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.70	0.60	7.53	± 11.0% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.32	0.49	10.43	± 13.3% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.54	0.73	9.11	± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.63	0.71	8.89	± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.55	0.74	7.70	± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.30	1.01	7.62	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.56	0.68	7.28	± 11.0% (k=2)

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

EX3DV4 SN:3677   **September 23, 2009**

Deviation from Isotropy in HSL
Error (ϕ, ϑ), f = 900 MHz

■-1.00--0.80 ■-0.80--0.60 ■-0.60--0.40 ■-0.40--0.20 ■-0.20-0.00
□0.00-0.20 ■0.20-0.40 ▤0.40-0.60 ■0.60-0.80 ■0.80-1.00
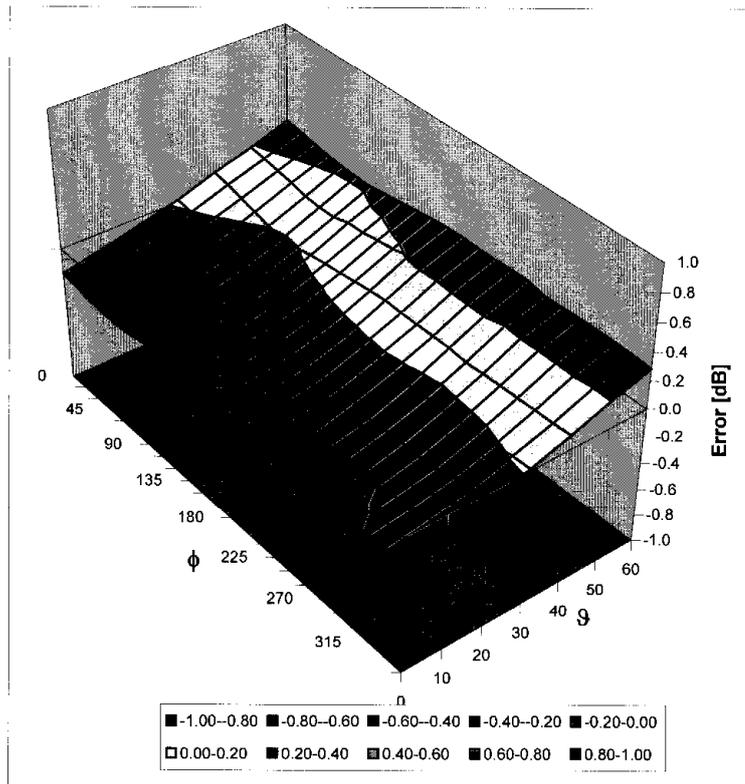
Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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   **Auden**   Certificate No: **D835V2-4d092_Jan10**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d092
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	January 14, 2010

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-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

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	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390565 54206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

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

Issued: January 18, 2010

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

Certificate No: D835V2-4d092_Jan10   Page 1 of 9

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

ilac-MRA

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:

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

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

c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.

- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.

- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.

- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.

- *SAR measured:* SAR measured at the stated antenna input power.

- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.

- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.2 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.4 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 0.2) °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 mW / g
SAR normalized	normalized to 1W	9.56 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.63 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.56 mW / g
SAR normalized	normalized to 1W	6.24 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.27 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.6 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.49 mW / g
SAR normalized	normalized to 1W	10.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.86 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.63 mW / g
SAR normalized	normalized to 1W	6.52 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.47 mW / g ± 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.2 Ω - 2.8 jΩ
Return Loss	- 30.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.6 Ω - 4.5 jΩ
Return Loss	- 25.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.392 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	September 15, 2009

DASY5 Validation Report for Head TSL

Date/Time: 11.01.2010 12:00:00

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL900
Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 41.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 26.06.2009

- Sensor-Surface: 3mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn601; Calibrated: 07.03.2009

- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001

- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement
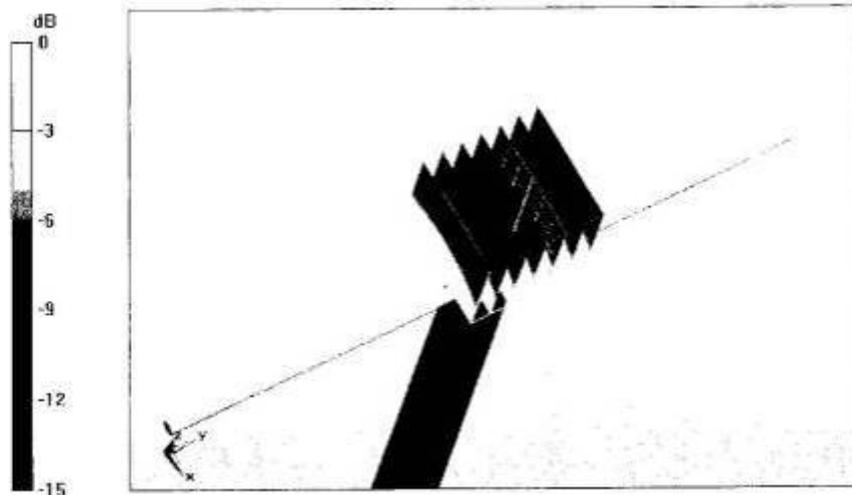grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.5 V/m; Power Drift = -0.00176 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 2.39 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.77 mW/g

0 dB = 2.77mW/g

Impedance Measurement Plot for Head TSL
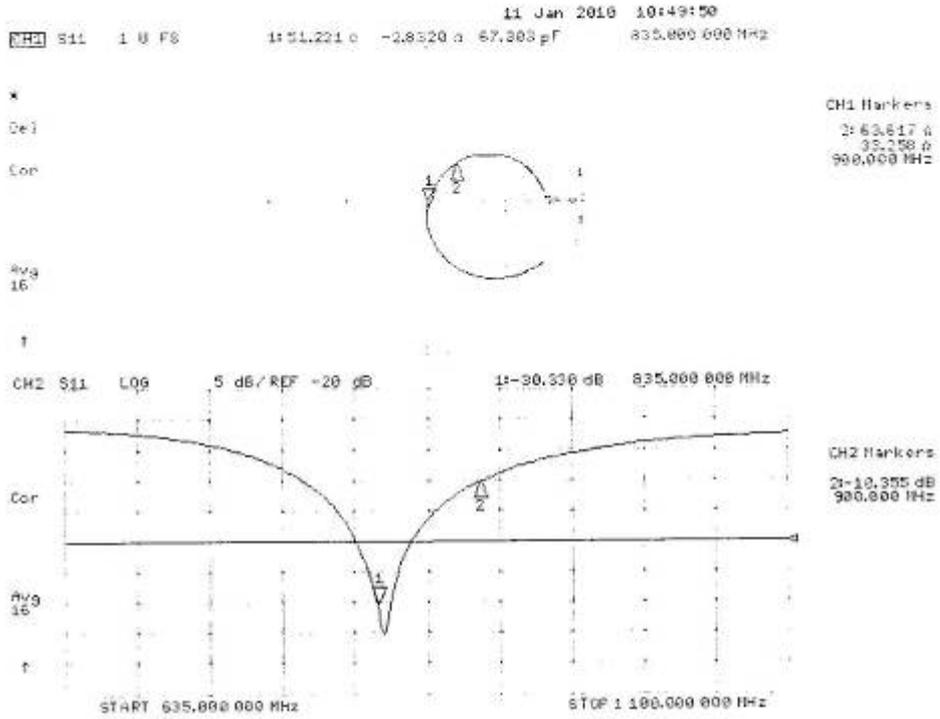
DASY5 Validation Report for Body

Date/Time: 14.01.2010 15:40:17

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL900
Medium parameters used: f = 835 MHz; σ = 0.98 mho/m; ε_r = 54.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.97, 5.97, 5.97); Calibrated: 26.06.2009

- Sensor-Surface: 3mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn601; Calibrated: 07.03.2009

- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001

- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement
grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.9 V/m; Power Drift = 0.013 dB
Peak SAR (extrapolated) = 3.67 W/kg
SAR(1 g) = 2.49 mW/g; SAR(10 g) = 1.63 mW/g
Maximum value of SAR (measured) = 2.89 mW/g
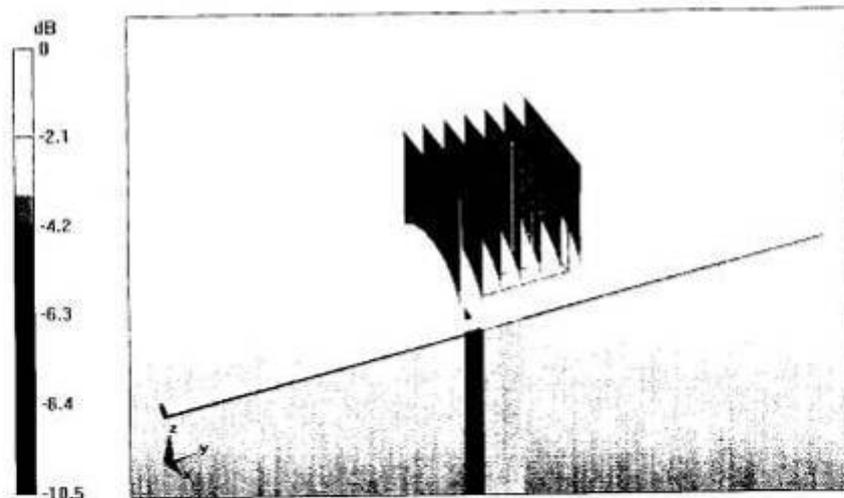
0 dB = 2.89mW/g

Impedance Measurement Plot for Body TSL

14 Jan 2010 11:42:59

MKR 911   1 U FS   1: 47.568 Ω -4.4922 Ω 42.430 pF   835.000 000 MHz

Del

Cor

CH1 Markers
2: 59.264 Ω
32.672 Ω
900.000 MHz

Avg
16

CH2 S11   LOG   5 dB/ REF -20 dB   1:-25.642 dB   835.000 000 MHz

Cor

CH2 Markers
2:-19.514 dB
900.000 MHz

Avg
16

START 835.000 000 MHz   STOP 1 100.000 000 MHz
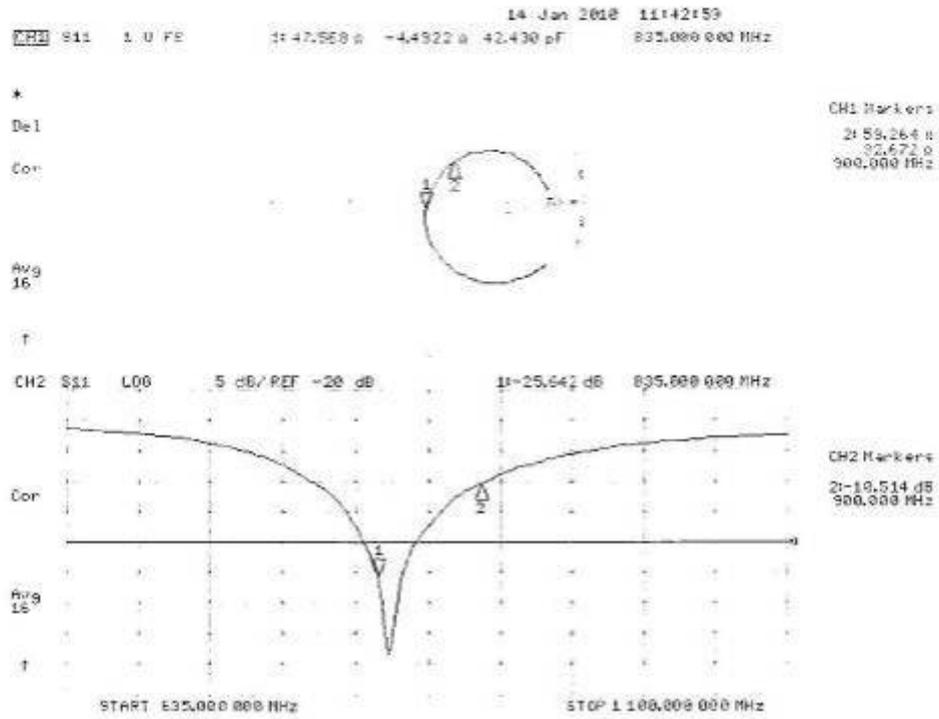
ANNEX F: D1750V2 Dipole Calibration Certificate

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

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SWISS CALIBRATION

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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   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.: **D1750V2-1033_May10**

CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1033
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	May 17, 2010

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-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	02-Mar-10 (No. DAE4-601_Mar10)	Mar-11

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	4-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-09)	In house check: Oct-10

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	*D. Iliev*
Approved by:	Katja Pokovic	Technical Manager	*(signature)*

Issued: May 19, 2010

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

Certificate No: D1750V2-1033_May10   Page 1 of 9

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)   **Accreditation No.: SCS 108**
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.

- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.

- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.

- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.

- *SAR measured:* SAR measured at the stated antenna input power.

- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.

- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.8 ± 6 %	1.33 mho/m ± 6 %
Head TSL temperature during test	(21.7 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	8.86 mW / g
SAR normalized	normalized to 1W	35.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**36.1 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.74 mW / g
SAR normalized	normalized to 1W	19.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**19.1 mW / g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.1 ± 6 %	1.43 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	condition	
SAR measured	250 mW input power	9.37 mW / g
SAR normalized	normalized to 1W	37.5 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**38.5 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.11 mW / g
SAR normalized	normalized to 1W	20.4 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.7 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.4 Ω + 1.1 jΩ
Return Loss	- 38.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.1 Ω + 0.7 jΩ
Return Loss	- 25.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.220 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 02, 2009

DASY5 Validation Report for Head TSL

Date/Time: 17.05.2010 12:37:07

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1033

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 1750 MHz; σ = 1.33 mho/m; ε_r = 39.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.25, 5.25, 5.25); Calibrated: 30.04.2010

- Sensor-Surface: 3mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn601; Calibrated: 02.03.2010

- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001

- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement
grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.6 V/m; Power Drift = 0.018 dB
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 8.86 mW/g; SAR(10 g) = 4.74 mW/g
Maximum value of SAR (measured) = 11.1 mW/g

0 dB = 11.1mW/g

Impedance Measurement Plot for Head TSL

17 May 2010 09:16:16

CH1 S11 1 U FS   2: 49.359 Ω 1.0625 Ω 96.630 pH   1 750.000 000 MHz

CH2 S11 LOG   5 dB/ REF -20 dB   2: -38.058 dB   1 750.000 000 MHz

START 1 500.000 000 MHz   STOP 1 950.000 000 MHz

DASY5 Validation Report for Body TSL

Date/Time: 14.05.2010 12:15:54

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1033

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: MSL U11 BB
Medium parameters used: f = 1750 MHz; σ = 1.43 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.8, 4.8, 4.8); Calibrated: 30.04.2010

- Sensor-Surface: 3mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn601; Calibrated: 02.03.2010

- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002

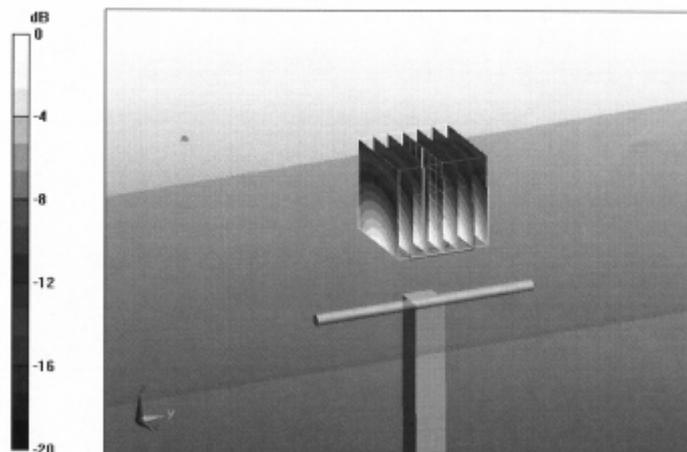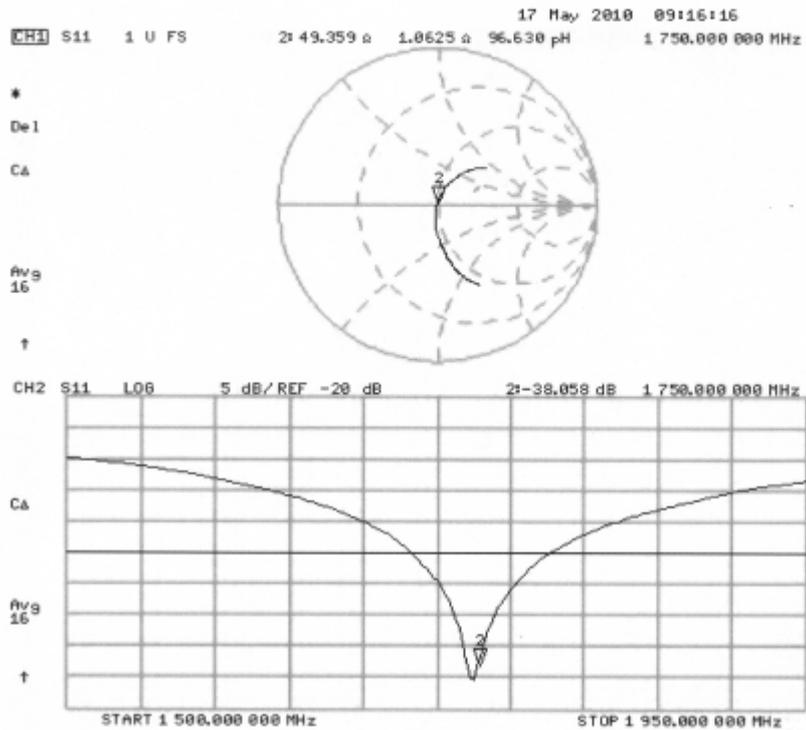- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement
grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.4 V/m; Power Drift = 0.012 dB
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 9.37 mW/g; SAR(10 g) = 5.11 mW/g
Maximum value of SAR (measured) = 11.7 mW/g
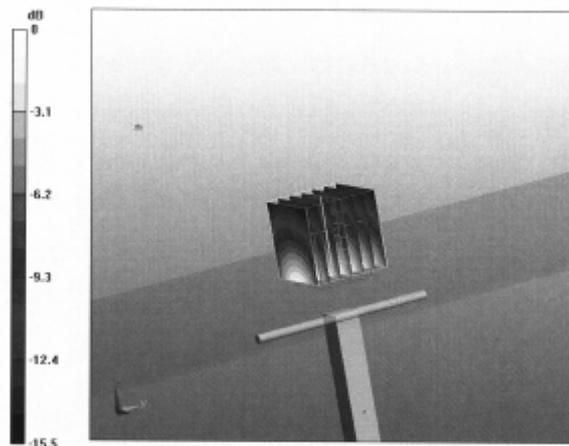
0 dB = 11.7mW/g

Impedance Measurement Plot for Body TSL

CH1 S11　1 U FS　　　　1: 45.104 Ω　0.7246 Ω　65.900 pH　　1 750.000 000 MHz

14 May 2010　11:26:02

CH2 S11　LOG　5 dB/ REF -20 dB　　　　1: -25.674 dB　1 750.000 000 MHz

START 1 550.000 000 MHz　　　　STOP 1 950.000 000 MHz

ANNEX G: D1900V2 Dipole Calibration Certificate

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

ilac-MRA

SWISS CALIBRATION

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

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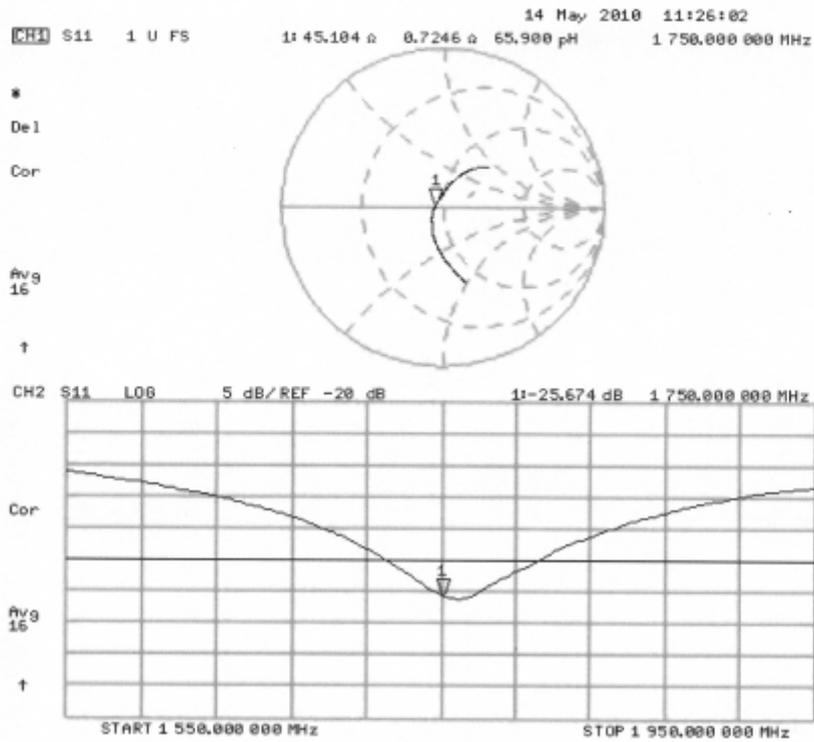Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client   **Auden**

Certificate No: **D1900V2-5d018_Jun10**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d018
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	June 15, 2010

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-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

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	4-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-09)	In house check: Oct-10

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

Issued: June 17, 2010

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Certificate No: D1900V2-5d018_Jun10   Page 1 of 9

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
	Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.

- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.

- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.

- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.

- *SAR measured:* SAR measured at the stated antenna input power.

- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.

- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

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

DASY Version	DASY5	V52.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.6 ± 6 %	1.44 mho/m ± 6 %
Head TSL temperature during test	(22.5 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.0 mW / g
SAR normalized	normalized to 1W	40.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**39.2 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.22 mW / g
SAR normalized	normalized to 1W	20.9 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.7 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.4 ± 6 %	1.54 mho/m ± 6 %
Body TSL temperature during test	(21.7 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR normalized	normalized to 1W	41.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	40.9 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.52 mW / g
SAR normalized	normalized to 1W	22.1 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	22.0 mW / g ± 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 2.6 jΩ
Return Loss	- 29.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω + 3.2 jΩ
Return Loss	- 27.6 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	June 04, 2002

DASY5 Validation Report for Head TSL

Date/Time: 15.06.2010 10:40:45

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d018

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: $f = 1900$ MHz; $\sigma = 1.44$ mho/m; $\varepsilon_r = 39.5$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 30.04.2010

- Sensor-Surface: 3mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn601; Calibrated: 10.06.2010

- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001

- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)

- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement
grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.7 V/m; Power Drift = 0.022 dB
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 10 mW/g; SAR(10 g) = 5.22 mW/g
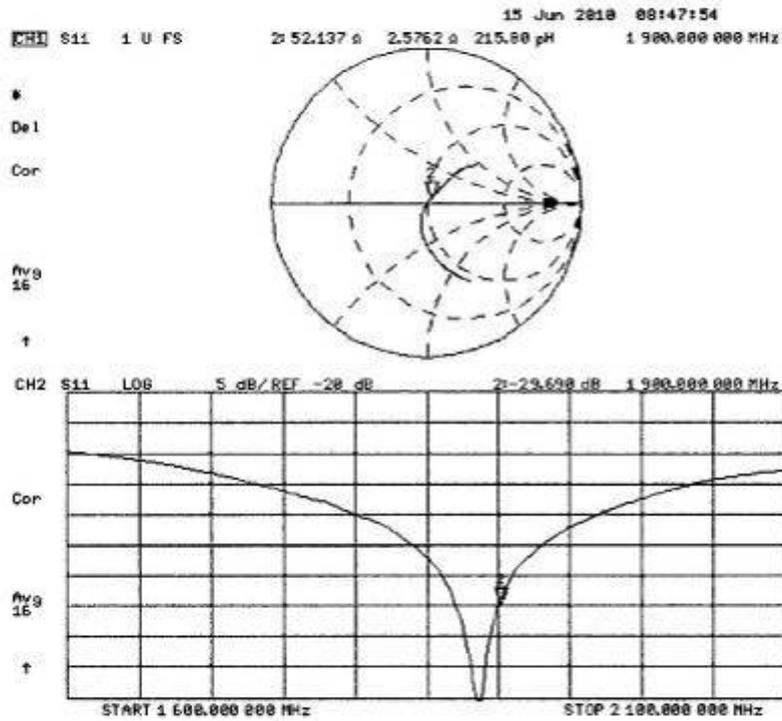Maximum value of SAR (measured) = 12.6 mW/g

0 dB = 12.6mW/g

Impedance Measurement Plot for Head TSL

DASY5 Validation Report for Body

Date/Time: 15.06.2010 14:14:27

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d018

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL U11 BB
Medium parameters used: f = 1900 MHz; σ = 1.54 mho/m; ε_r = 53.5; ρ = 1000 kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 30.04.2010

- Sensor-Surface: 3mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn601; Calibrated: 10.06.2010

- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002

- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)

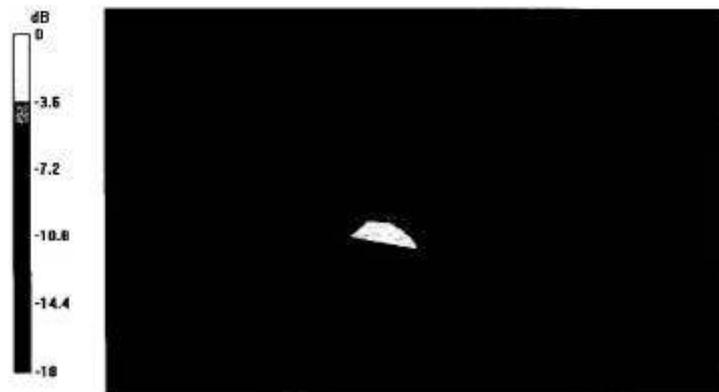- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement
grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.1 V/m; Power Drift = 0.055 dB
Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.52 mW/g
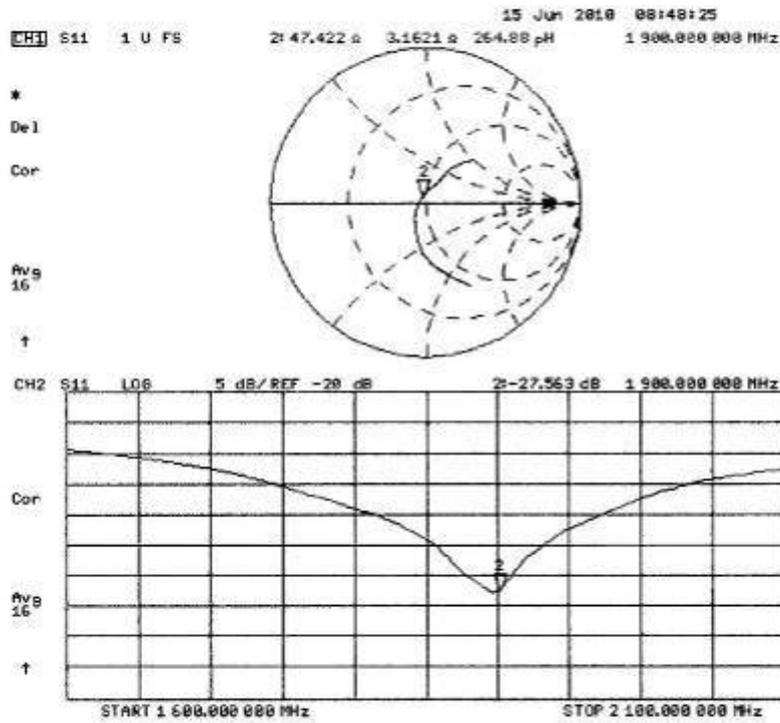Maximum value of SAR (measured) = 12.8 mW/g

0 dB = 12.8mW/g

Impedance Measurement Plot for Body TSL

ANNEX H: DAE4 Calibration Certificate

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

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Multilateral Agreement for the recognition of calibration certificates

Client   **TA – SH (Auden)**   Certificate No: **DAE4-871_Nov09**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 871
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	November 11, 2009

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
Keithley Multimeter Type 2001	SN: 0810278	1-Oct-09 (No: 9055)	Oct-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	05-Jun-09 (in house check)	In house check: Jun-10

	Name	Function	Signature
Calibrated by:	Andrea Guntli	Technician	
Approved by:	Fin Bomholt	R&D Director	i.V.

Issued: November 11, 2009

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

Certificate No: DAE4-871_Nov09   Page 1 of 5

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

Accreditation No.: **SCS 108**

Glossary

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*: 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.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1µV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.......+3mV

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

Calibration Factors	X	Y	Z
High Range	404.813 ± 0.1% (k=2)	404.794 ± 0.1% (k=2)	405.237 ± 0.1% (k=2)
Low Range	3.98191 ± 0.7% (k=2)	3.98417 ± 0.7% (k=2)	3.98912 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	90.0 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	199994.0	1.84	0.00
Channel X	+ Input	19999.85	0.05	0.00
Channel X	- Input	-19997.97	1.83	-0.01
Channel Y	+ Input	200010.3	-3.71	-0.00
Channel Y	+ Input	19999.12	-0.48	-0.00
Channel Y	- Input	-20000.18	-0.78	0.00
Channel Z	+ Input	200010.2	-2.80	-0.00
Channel Z	+ Input	19998.54	-0.86	-0.00
Channel Z	- Input	-19999.82	0.00	0.00

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2000.3	0.22	0.01
Channel X	+ Input	200.20	0.30	0.15
Channel X	- Input	-199.89	0.21	-0.10
Channel Y	+ Input	1999.8	-0.13	-0.01
Channel Y	+ Input	200.06	-0.04	-0.02
Channel Y	- Input	-200.43	-0.73	0.36
Channel Z	+ Input	1999.5	-0.57	-0.03
Channel Z	+ Input	199.58	-0.72	-0.36
Channel Z	- Input	-201.11	-1.01	0.51

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 (µV)	Low Range Average Reading (µV)
Channel X	200	13.79	12.75
	- 200	-12.26	-13.72
Channel Y	200	-11.82	-11.47
	- 200	10.67	10.68
Channel Z	200	-1.08	-1.35
	- 200	0.32	0.12

3. Channel separation

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

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	3.36	1.06
Channel Y	200	1.52	-	3.59
Channel Z	200	2.55	1.41	-

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	15928	16288
Channel Y	16188	15745
Channel Z	15790	16219

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.06	-3.43	1.18	0.52
Channel Y	-0.71	-2.66	0.96	0.57
Channel Z	-0.95	-1.94	0.04	0.41

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.1999	204.4
Channel Y	0.1999	203.6
Channel Z	0.1999	203.8

8. Low Battery Alarm Voltage (verified during pre test)

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

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	−0.01	-8	-9