



OET 65

TEST REPORT

Product Name	DC-HSPA+ USB Stick
Model	K4606
FCC ID	QISK4606
Client	Huawei Technologies Co., Ltd.
Manufacturer	Huawei Technologies Co., Ltd.
Date of issue	April 17,2013

TA Technology (Shanghai) Co., Ltd.

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GENERAL SUMMARY

Reference Standard(s)	FCC 47CFR §2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices ANSI C95.1, 1992: Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.(IEEE Std C95.1-1991) 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. RSS-102 Issue 4 March 2010: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands). KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01 SAR Measurement Requirements for 100 MHz to 6 GHz KDB 447498 D01 Mobile Portable RF Exposure v05: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies KDB 941225 D01 SAR test for 3G devices v02: SAR Measurement Procedures CDMA 20001x RTT, 1x Ev-Do, WCDMA, HSDPA/HSPA KDB 941225 D02 Guidance for 3GPP R6 and R7 HSPA v02r02: SAR Guidance for HSPA, HSPA+, DC-HSDPA and 1x-Advanced KDB 941225 D03 SAR Test Reduction GSM/GPRS/EDGE v01: Recommended SAR Test Reduction Procedures for GSM/GPRS/EDGE KDB 447498 D02 SAR Procedures for Dongle Xmtr v02: SAR Measurement Procedures for USB Dongle Transmitters.
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 for the tested bands only. General Judgment: Pass
Comment	The test result only responds to the measured sample.

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1. General Information

1.1. Notes of the Test Report

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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.

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

1.2. Testing Laboratory

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1.3. Applicant Information

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Postal Code: 518129
Country: P.R. China

1.4. Manufacturer Information

Company: Huawei Technologies Co., Ltd.
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City: Shenzhen
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Country: P.R.China

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1.5. Information of EUT

General Information

Device Type:	Portable Device		
Exposure Category:	Uncontrolled Environment / General Population		
State of Sample:	Prototype Unit		
IMEI:	/		
Hardware Version:	CH2E3251SM		
Software Version:	22.146.11.00.5011		
Antenna Type:	Internal Antenna		
Device Operating Configurations:			
Operating Mode(s):	GSM 850/ GSM 1900; (tested) UMTS Band V; (tested)		
Test Modulation:	(GSM)GMSK; (UMTS)QPSK		
Device Class:	B		
HSDPA UE Category:	14		
DC-HSDPA UE Category:	24		
HSUPA UE Category:	6		
GPRS Multislot Class(12):	Max Number of Timeslots in Uplink	4	
	Max Number of Timeslots in Downlink	4	
	Max Total Timeslot	5	
EGPRS Multislot Class(12):	Max Number of Timeslots in Uplink	4	
	Max Number of Timeslots in Downlink	4	
	Max Total Timeslot	5	
Power Class:	GSM 850: 4		
	GSM 1900: 1		
	UMTS Band V: 3		
Power Level:	GSM 850: tested with power level 5		
	GSM 1900: tested with power level 0		
	UMTS Band V: tested with power control all up bits		
Test Channel: (Low - Middle - High)	128 -190 - 251 (GSM 850) (tested) 512 - 661 - 810 (GSM 1900) (tested) 4132 - 4182 - 4233 (UMTS Band V) (tested)		
Operating Frequency Range(s):	Mode	Tx (MHz)	Rx (MHz)
	GSM 850	824.2 ~ 848.8	869.2 ~ 893.8
	GSM 1900	1850.2 ~ 1909.8	1930.2 ~ 1989.8
	UMTS Band V	826.4 ~ 846.6	871.4 ~ 891.6
Used Host Products:	IBM T61		

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Equipment Under Test (EUT) has a GSM/UMTS antenna that is used for Tx/Rx. During SAR test of the EUT, it was connected to a portable computer.

The sample undergoing test was selected by the Client.

Components list please refer to documents of the manufacturer.

1.6. The Maximum Reported SAR_{1g}

Body Worn Configuration

Mode	Test Position	Channel /Frequency(MHz)	Limit SAR _{1g} 1.6 W/kg	
			Measured SAR _{1g} (W/kg)	Reported SAR _{1g} (W/kg)
GSM 850	Test Position 1 / Back Side	251/848.8	0.666	0.770
GSM 1900	Test Position 2 / Front Side	810/1909.8	0.983	1.171
UMTS Band V	Test Position 2 / Front Side	4182/836.4	0.725	0.956

1.7. Maximum Conducted Power of Each Tested Mode

Mode		Maximum Burst Conducted Power (dBm)	Maximum Average Power (dBm)
GSM 850	GPRS, 2 Txslots	31.37	25.35
	EGPRS, 2 Txslots	31.37	25.35
GSM 1900	GPRS, 2 Txslots	28.32	22.30
	EGPRS, 2 Txslots	28.32	22.30

Mode	Maximum Conducted Power (dBm)
UMTS Band V	22

Note: The detail Power refers to Table 12 (Conducted Power Measurement Results).

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1.8. Test Date

The test performed on April 14, 2013.

2. SAR Measurements System Configuration

2.1. SAR Measurement Set-up

The DASY5 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 DASY5 measurement server.
- The DASY5 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
- DASY5 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.

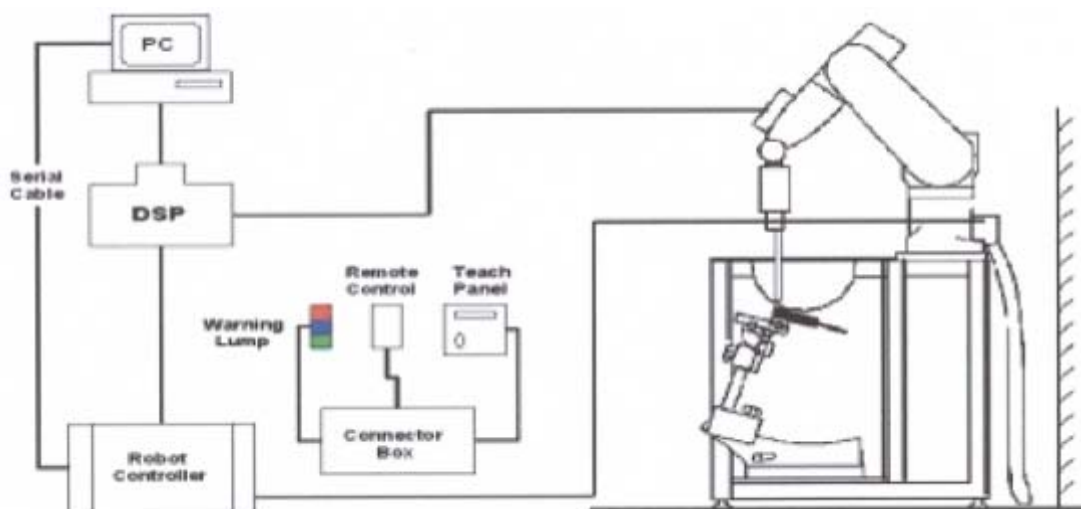


Figure 1. SAR Lab Test Measurement Set-up

2.2. DASY5 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.

2.2.1. 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)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



Figure 2. EX3DV4 E-field Probe



Figure 3. EX3DV4 E-field probe

2.2.2. E-field Probe Calibration

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

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

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

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

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

Or

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

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

2.3. Other Test Equipment

2.3.1. 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

2.3.2. Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden Figure. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

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



Figure 4 Generic Twin Phantom

2.4. Scanning Procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. $\pm 5\%$.
- The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above $\pm 0.1\text{mm}$). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within $\pm 30^\circ$.)
- Area Scan
The Area Scan is used as a fast scan in two dimensions to find the area of high field values

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before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing is set according to FCC KDB Publication 865664. During 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

After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm.

- 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 DASY5 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.

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

Table 1: Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01

Frequency	Maximum Area Scan Resolution (mm) ($\Delta x_{\text{area}}, \Delta y_{\text{area}}$)	Maximum Zoom Scan Resolution (mm) ($\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$)	Maximum Zoom Scan Spatial Resolution (mm) $\Delta z_{\text{zoom}}(n)$	Minimum Zoom Scan Volume (mm) (x,y,z)
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≥ 22

2.5. Data Storage and Evaluation

2.5.1. Data Storage

The DASY5 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 “.DAE4”. 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.

2.5.2. 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 DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

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

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

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

cf = crest factor of exciting field (DASY parameter)

dcp_i = diode compression point (DASY parameter)

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

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

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

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

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)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.

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

with SAR = local specific absorption rate in mW/g

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

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

ρ = equivalent tissue density in g/cm³

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/cm²

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

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

3. Laboratory Environment

Table 2: The Requirements of the Ambient Conditions

Temperature	Min. = 18°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.	

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4. Tissue-equivalent Liquid

4.1. Tissue-equivalent Liquid Ingredients

The liquid is consisted of water, salt, Glycol, Sugar, Preventol and Cellulose. The liquid has previously been proven to be suited for worst-case. Table 3 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the OET 65.

Table 3: Composition of the Body Tissue Equivalent Matter

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

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

4.2. Tissue-equivalent Liquid Properties

Table 4: Dielectric Performance of Tissue Simulating Liquid

Frequency	Test Date	Temp ℃	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within $\pm 5\%$)	
			ϵ_r	$\sigma(\text{s/m})$	ϵ_r	$\sigma(\text{s/m})$	Dev $\epsilon_r(\%)$	Dev $\sigma(\%)$
835MHz (body)	2013-4-14	21.5	54.35	1.012	55.20	0.97	-1.6	4.3
1900MHz (body)	2013-4-14	21.5	52.56	1.524	53.30	1.52	-1.4	0.3

5. System Check

5.1. Description of 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 5.

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

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.

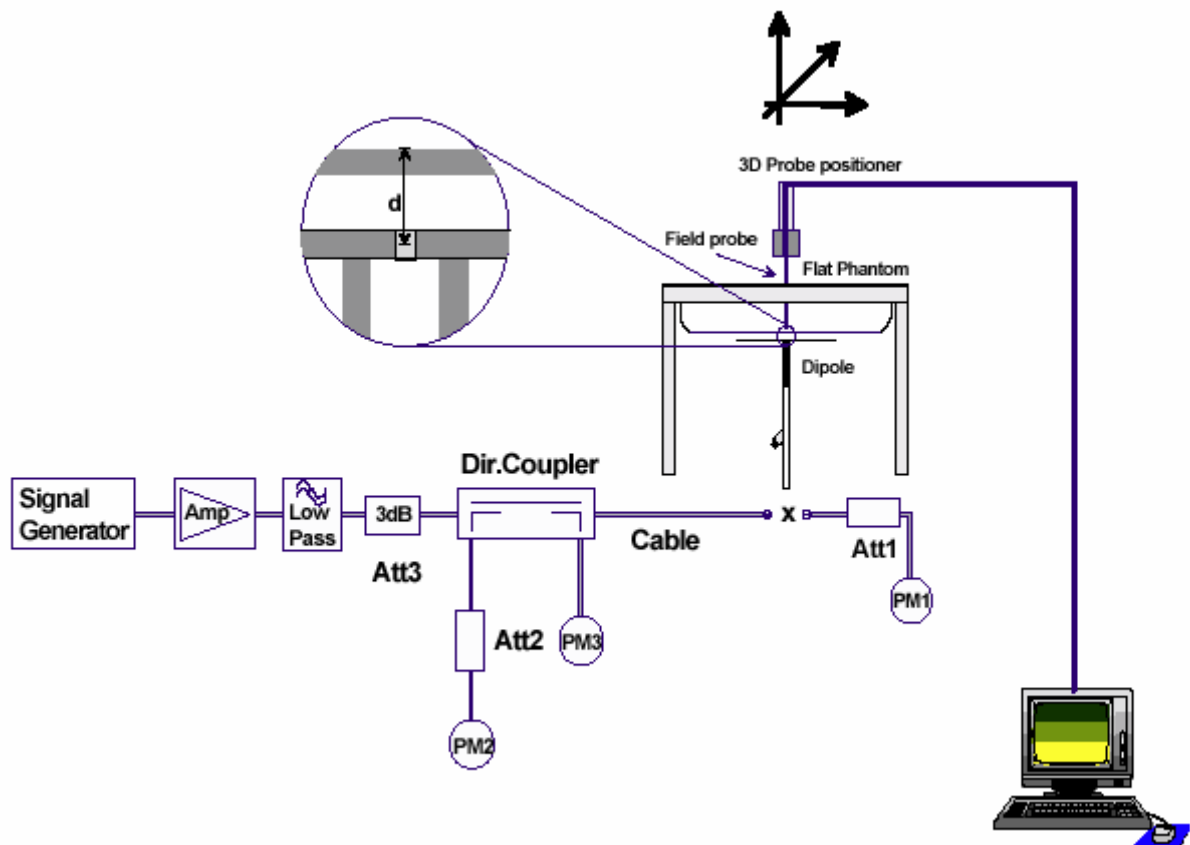


Figure 5. System Check Set-up

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Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 2 years ago but more than 1 year ago were confirmed in maintaining return loss (< -20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 450824:

Dipole D835V2 SN: 4d020				
Body Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
8/26/2011	-25.1	/	48.7	/
8/25/2012	-24.3	3.2%	50.6	1.9 Ω

Dipole D1900V2 SN: 5d060				
Body Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
8/31/2011	-21.3	/	47.3	/
8/30/2012	-20.9	1.9%	45.9	1.4 Ω

5.2. System Check Results

Table 5: System Check in Body Tissue Simulating Liquid

Frequency	Test Date	Dielectric Parameters		Temp	250mW Measured SAR _{1g}	1W Normalized SAR _{1g}	1W Target SAR _{1g}	Limit(%) (±10% Deviation)
		ε _r	σ(s/m)	(°C)	(W/kg)			
835MHz	2013-4-14	54.35	1.012	21.5	2.50	10.00	9.46	5.7
1900MHz	2013-4-14	52.56	1.524	21.5	10.50	42.00	41.70	0.7

Note: 1. The graph results see ANNEX B.

2. Target Values used derive from the calibration certificate

6. Operational Conditions during Test

6.1. 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 UMTS. 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.

The measurements were performed in combination with a host product (IBM T61). IBM T61 laptop has horizontal USB slot and vertical USB slot.

6.2. Test Configuration

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

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

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

GSM 850

GPRS (GMSK) :

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

EGPRS(8PSK):

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

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EGPRS(GMSK):

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

GSM 1900

GPRS (GMSK) :

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

EGPRS(8PSK):

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

EGPRS(GMSK):

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

6.2.2. UMTS Test Configuration

6.2.2.1. WCDMA Test Configuration

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

- 1) 12.2kbps RMC, 64,144,384 kbps RMC with TPC set to all up bits
- 2) Test loop Mode 1

For the output power, the configurations for the DPCCH and DPDCH₁ are as followed (EUT do not support the DPDCH_{2-n})

Table 6: The configurations for the DPCCH and DPDCH₁

	Channel Bit Rate(kbps)	Channel Symbol Rate(kcps)	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.

6.2.3. HSDPA Test Configuration

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

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

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configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(β_c, β_d), and HS-DPCCH power offset parameters(Δ_{ACK} , Δ_{NACK} , Δ_{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 7: 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: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$

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

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

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

Table 8: 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

6.2.4. DC-HSDPA Test Configuration

body SAR is also measured for DC-HSDPA when the maximum average output of each RF channel with DC-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 DC-HSDPA is measured using the highest body SAR configuration in 12.2 kbps RMC without HSDPA.

Configure DC-HSDPA parameters for base station

a) Set up the HSDPA RB Test Mode Parameters

- RB Test HS-DSCH Configuration Type = User Defined
- RB Test User Defined HS-DSCH MAC entity = MAC-ehs (Note 1)
- RB Test User Defined HARQ Processes = 6 (Note 2)
- RB Test User Defined UE IR Buffer Allocation = Implicit
- RB Test User Defined DC-HSDPA State = On
- RB Test Mode DC-HSDPA DPCH Loopback State = On

b) Set up the Serving Cell Parameters

- RB Test User Defined 64QAM State = On
- RB Test User Defined Active HS-PDSCHs = 15
- RB Test User Def Transport Block Size Index = 62
- RB Test User Defined Modulation Type = 64QAM
- RB Test User Defined Inter-TTI Interval = 1

c) Set up the Secondary Serving Cell Parameters

- RB Test User Def Secondary Cell 64QAM State = On
- RBTM User Def Sec Cell Active HS-PDSCHs = 15
- RBTM User Def Sec Cell TB Size Index = 62
- RBTM User Def Sec Cell Modulation Type = 64QAM
- RBTM User Def Sec Cell Inter-TTI Interval = 1

d) Set the HSDPA Conn DL Channel Levels

- HSDPA Cell 1 Connected CPICH Level = -8
- HSDPA Cell 1 Connected P-CCPCH/SCH Level = -20
- HSDPA Cell 1 Connected PICH Level = off
- HSDPA Cell 1 Connected DPCH Level = -30
- HSDPA Cell 1 Connected HS-PDSCH Level (Sum) = -1 dBm
- HSDPA Cell 1 Connected HS-SCCH 1 to 4 Level = -20,-20,off,off
- Secondary Cell HSDPA Conn CPICH Level = -8
- Secondary Cell HSDPA Conn PCCPCH/SCH Level = -20
- Secondary Cell HSDPA Conn PICH Level = off
- Secondary Cell HSDPA Conn HS-PDSCHs Lvl (Sum) = -1 dBm
- Secondary Cell HSDPA Conn HS-SCCH 1 to 4 Level = -20,-20,off,off

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Table 9: HS-DSCH UE category

Table 5.1a: FDD HS-DSCH physical layer categories

HS-DSCH category	Maximum number of HS-DSCH codes received	Minimum inter-TTI interval	Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI NOTE 1	Total number of soft channel bits	Supported modulations without MIMO operation or dual cell operation	Supported modulations with MIMO operation and without dual cell operation	Supported modulations with dual cell operation
Category 1	5	3	7298	19200	QPSK, 16QAM	Not applicable (MIMO not supported)	Not applicable (dual cell operation not supported)
Category 2	5	3	7298	28800			
Category 3	5	2	7298	28800			
Category 4	5	2	7298	38400			
Category 5	5	1	7298	57600			
Category 6	5	1	7298	67200			
Category 7	10	1	14411	115200			
Category 8	10	1	14411	134400			
Category 9	15	1	20251	172800			
Category 10	15	1	27952	172800			
Category 11	5	2	3630	14400	QPSK		
Category 12	5	1	3630	28800			
Category 13	15	1	35280	259200	QPSK, 16QAM, 64QAM		
Category 14	15	1	42192	259200			
Category 15	15	1	23370	345600	QPSK, 16QAM		
Category 16	15	1	27952	345600			
Category 17 NOTE 2	15	1	35280	259200	QPSK, 16QAM, 64QAM	–	
			23370	345600	–	QPSK, 16QAM	
Category 18 NOTE 3	15	1	42192	259200	QPSK, 16QAM, 64QAM	–	
			27952	345600	–	QPSK, 16QAM	
Category 19	15	1	35280	518400	QPSK, 16QAM, 64QAM		
Category 20	15	1	42192	518400			
Category 21	15	1	23370	345600	-	-	QPSK, 16QAM
Category 22	15	1	27952	345600			QPSK, 16QAM, 64QAM
Category 23	15	1	35280	518400			
Category 24	15	1	42192	518400			

6.2.5. 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.

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

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Table 10: Sub-Test 5 Setup for Release 6 HSUPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	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 $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-

DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d 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 $\beta_c = 10/15$ and $\beta_d = 15/15$.

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

signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.

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: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Table 11: 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)

6.3. Measurement Variability

Per FCC KDB Publication 865664 D01v01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

- 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
- 2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
- 3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .
- 4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

6.4. Test Positions

The measurements were performed in IBM T61. IBM T61 laptop has horizontal USB slot and vertical USB slot

A test distance of 5mm or less, according to KDB 447498 D02, should be considered for the orientation that can satisfy such requirements.

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

- Test Position 1: The EUT is connected to the portable computer with horizontal USB slot. The back side of the EUT towards to the bottom of the flat phantom. The distance from back side of the EUT to the bottom of the flat phantom is 5mm. (ANNEX H Picture 6)
- Test Position 2: The EUT is connected to the portable computer through a 19 cm USB cable. The front side of the EUT towards the bottom of the flat phantom. The distance from front side of the EUT to the bottom of the flat phantom is 5mm. (ANNEX H Picture 7)
- Test Position 3: The EUT is connected to the portable computer through a 19 cm USB cable. The left edge of the EUT towards the bottom of the flat phantom. The distance from left edge of the EUT to the bottom of the flat phantom is 5mm. (ANNEX H Picture 8)
- Test Position 4: The EUT is connected to the portable computer with vertical USB slot. The right edge of the EUT towards the bottom of the flat phantom. The distance from right edge of the EUT to the bottom of the flat phantom is 5mm. (ANNEX H Picture 9)
- Test Position 5: The EUT is connected to the portable computer with vertical USB slot. The top edge of the EUT towards the bottom of the flat phantom. The distance from top edge of the EUT to the bottom of the flat phantom is 5mm. (ANNEX H Picture 10)

6.5. Picture of Host Product

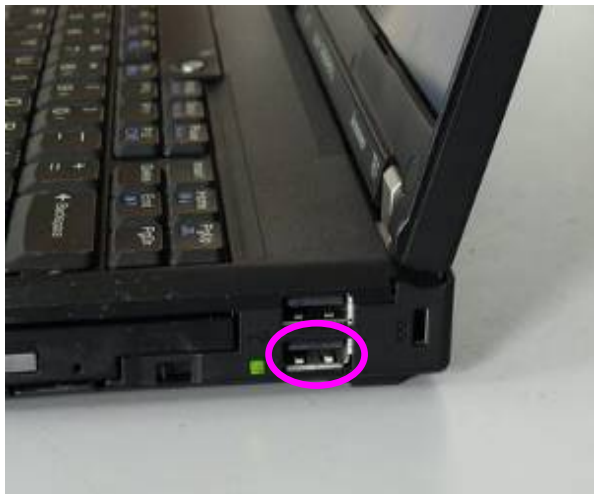
During the test, IBM T61 laptop were used as an assistant to help to setup communication. (See Picture 1)



Picture 1-a: IBM T61 Close



Picture 1-b: IBM T61 Open



Picture 1-c: IBM T61 with horizontal USB slot



Picture 1-d: IBM T61 with Vertical USB slot



Picture 1-e: a 19 cm USB cable

Picture 1: Computer as a test assistant

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7. Test Results

7.1. Conducted Power Results

Table 12: Conducted Power Measurement Results

GSM 850		Burst Conducted Power(dBm)				Average power(dBm)		
		Channel 128	Channel 190	Channel 251		Channel 128	Channel 190	Channel 251
GPRS (GMSK)	1Txslot	32.19	32.19	32.15	-9.03dB	23.16	23.16	23.12
	2Txslots	31.35	31.37	31.34	-6.02dB	25.33	25.35	25.32
	3Txslots	29.47	29.43	29.42	-4.26dB	25.21	25.17	25.16
	4Txslots	27.53	27.48	27.5	-3.01dB	24.52	24.47	24.49
EGPRS (GMSK)	1Txslot	32.19	32.19	32.15	-9.03dB	23.16	23.16	23.12
	2Txslots	31.35	31.37	31.34	-6.02dB	25.33	25.35	25.32
	3Txslots	29.47	29.43	29.42	-4.26dB	25.21	25.17	25.16
	4Txslots	27.53	27.48	27.5	-3.01dB	24.52	24.47	24.49
EGPRS (8PSK)	1Txslot	25.96	25.96	26.15	-9.03dB	16.93	16.93	17.12
	2Txslots	25.42	25.44	25.52	-6.02dB	19.4	19.42	19.5
	3Txslots	23.52	23.5	23.72	-4.26dB	19.26	19.24	19.46
	4Txslots	21.43	21.44	21.7	-3.01dB	18.42	18.43	18.69
GSM 1900		Burst Conducted Power(dBm)				Average power(dBm)		
		Channel 512	Channel 661	Channel 810		Channel 512	Channel 661	Channel 810
GPRS (GMSK)	1Txslot	29.31	29.23	29.19	-9.03dB	20.28	20.2	20.16
	2Txslots	28.32	28.27	28.24	-6.02dB	22.30	22.25	22.22
	3Txslots	26.41	26.31	26.3	-4.26dB	22.15	22.05	22.04
	4Txslots	24.39	24.37	24.38	-3.01dB	21.38	21.36	21.37
EGPRS (GMSK)	1Txslot	29.31	29.23	29.19	-9.03dB	20.28	20.2	20.16
	2Txslots	28.32	28.27	28.24	-6.02dB	22.30	22.25	22.22
	3Txslots	26.41	26.31	26.3	-4.26dB	22.15	22.05	22.04
	4Txslots	24.39	24.37	24.38	-3.01dB	21.38	21.36	21.37
EGPRS (8PSK)	1Txslot	25.24	24.95	25.01	-9.03dB	16.21	15.92	15.98
	2Txslots	24.56	24.35	24.37	-6.02dB	18.54	18.33	18.35
	3Txslots	22.52	22.21	22.37	-4.26dB	18.26	17.95	18.11
	4Txslots	20.33	20.09	20.26	-3.01dB	17.32	17.08	17.25

Note:

1) Division Factors

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

1Txslot = 1 transmit time slot out of 8 time slots

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

2Txslots = 2 transmit time slots out of 8 time slots

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

3Txslots = 3 transmit time slots out of 8 time slots

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

4Txslots = 4 transmit time slots out of 8 time slots

=> conducted power divided by (8/4) => -3.01 dB

2) Average power numbers

The maximum power numbers are marks in bold.

UMTS Band V		Conducted Power (dBm)		
		Channel 4132	Channel 4183	Channel 4233
RMC	12.2kbps RMC	21.94	21.8	21.79
	64kbps RMC	21.97	21.82	21.84
	144kbps RMC	21.99	21.83	21.82
	384kbps RMC	22.00	21.84	21.8
HSDPA	Sub - Test 1	21.86	21.79	21.91
	Sub - Test 2	21.87	21.82	21.74
	Sub - Test 3	21.18	21.26	21.34
	Sub - Test 4	21.33	21.27	21.32
DC-HSDPA	Sub - Test 1	21.83	21.88	21.81
	Sub - Test 2	21.97	21.79	21.73
	Sub - Test 3	21.21	21.32	21.35
	Sub - Test 4	21.36	21.29	21.33
HSUPA	Sub - Test 1	21.17	21.1	21.11
	Sub - Test 2	20.26	20.28	19.99
	Sub - Test 3	20.24	20.2	20.06
	Sub - Test 4	20.14	20.08	19.82
	Sub - Test 5	21.27	21.26	21.14

4. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.

7.2.2. GSM 1900 (GPRS/EGPRS)

Table 14: SAR Values [GSM 1900 (GPRS/EGPRS)]

Test Position	Channel/ Frequency (MHz)	Time slot	Duty Cycle	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift ± 0.21dB	Limit SAR _{1g} 1.6 W/kg			
						Drift (dB)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Graph Results
IBM T61(Distance 5mm)										
Test Position 1	810/1909.8	2Txslot	1:4.15	29	28.24	0.030	0.920	1.19	1.096	Figure 14
	661/1880	2Txslot	1:4.15	29	28.27	-0.039	0.937	1.18	1.109	Figure 15
	512/1850.2	2Txslot	1:4.15	29	28.32	-0.029	0.863	1.17	1.009	Figure 16
Test Position 2	810/1909.8	2Txslot	1:4.15	29	28.24	0.072	0.976	1.19	1.163	Figure 17
	661/1880	2Txslot	1:4.15	29	28.27	-0.061	0.968	1.18	1.145	Figure 18
	512/1850.2	2Txslot	1:4.15	29	28.32	0.137	0.965	1.17	1.129	Figure 19
Test Position 3	661/1880	2Txslot	1:4.15	29	28.27	0.133	0.373	1.18	0.441	Figure 20
Test Position 4	661/1880	2Txslot	1:4.15	29	28.27	-0.073	0.554	1.18	0.655	Figure 21
Test Position 5	661/1880	2Txslot	1:4.15	29	28.27	0.083	0.042	1.18	0.049	Figure 22
Worst Case Position of GPRS with EGPRS (GMSK, Distance 5mm)										
Test Position 2	810/1909.8	2Txslot	1:4.15	29	28.24	0.154	0.983	1.19	1.171	Figure 23
1 st Repeated Measurement Variability Results (Distance 5mm)										
Test Position 2	810/1909.8	2Txslot	1:4.15	29	28.24	0.129	0.982	1.19	1.170	Figure 24

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

2. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

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

4. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.

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Table 15: SAR Measurement Variability Results [GSM 1900 (GPRS/EGPRS)]

Test Position	Timeslots	Channel/ Frequency (MHz)	Measured SAR (1g)	1 st Repeated SAR (1g)	Ratio	2 nd Repeated SAR (1g)	3 rd Repeated SAR (1g)
Test Position 2	2Txslot	810/1909.8	0.983	0.982	1.001	NA	NA

1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.

2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg ($\sim 10\%$ from the 1-g SAR limit).

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

4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

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7.2.3. UMTS Band V (WCDMA/HSDPA/HSUPA)

Table 16: SAR Values [UMTS Band V (WCDMA/HSDPA/HSUPA)]

Test Position	Channel/ Frequency (MHz)	Channel Type	Duty Cycle	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift ± 0.21dB	Limit SAR _{1g} 1.6 W/kg			
						Drift (dB)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Graph Results
IBM T61(Distance 5mm)										
Test Position 1	4233/846.6	RMC 12.2k	1:1	23	21.79	0.068	0.659	1.32	0.871	Figure 25
	4182/836.4	RMC 12.2k	1:1	23	21.8	-0.044	0.612	1.32	0.807	Figure 26
	4132/826.4	RMC 12.2k	1:1	23	21.94	-0.010	0.616	1.28	0.786	Figure 27
Test Position 2	4233/846.6	RMC 12.2k	1:1	23	21.79	0.192	0.657	1.32	0.868	Figure 28
	4182/836.4	RMC 12.2k	1:1	23	21.8	0.130	0.725	1.32	0.956	Figure 29
	4132/826.4	RMC 12.2k	1:1	23	21.94	-0.168	0.572	1.28	0.730	Figure 30
Test Position 3	4182/836.4	RMC 12.2k	1:1	23	21.8	0.042	0.215	1.32	0.283	Figure 31
Test Position 4	4182/836.4	RMC 12.2k	1:1	23	21.8	0.032	0.515	1.32	0.679	Figure 32
Test Position 5	4182/836.4	RMC 12.2k	1:1	23	21.8	-0.154	0.017	1.32	0.022	Figure 33

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

- Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).
- WCDMA mode was tested under RMC 12.2kbps with HSPA (HSDPA/HSUPA) inactive per KDB Publication 941225 D01. HSPA (HSDPA/HSUPA) SAR for body was not required since the average output power of the HSPA (HSDPA/HSUPA) subtests was not more than 0.25 dB higher than the RMC level or the maximum SAR for 12.2kbps RMC was less than 75% SAR limit.
- When the maximum average output power of each RF channel with (uplink) HSPA+ or DC-HSDPA active is $\leq \frac{1}{4}$ dB higher than that measured without HSPA+ or DC-HSDPA using 12.2 kbps RMC, or the maximum SAR for 12.2 kbps RMC without HSPA+ or DC-HSDPA is $\leq 75\%$ of the SAR limit, SAR evaluation for HSPA+ or DC-HSDPA is not required.

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8. 700MHz to 3GHz Measurement Uncertainty

No.	source	Type	Uncertainty Value (%)	Probability Distribution	k	c _i	Standard uncertainty 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	6.0	N	1	1	6.0	∞
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	71
18	-Device Holder Uncertainty	A	4.1	N	1	1	4.1	5
19	-Output Power Variation - SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.9	∞
Physical parameter								
20	-phantom	B	4.0	R	$\sqrt{3}$	1	2.3	∞
21	-liquid conductivity (deviation from target)	B	5.0	R	$\sqrt{3}$	0.64	1.8	∞

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22	-liquid conductivity (measurement uncertainty)	B	2.5	N	1	0.64	1.6	9
23	-liquid permittivity (deviation from target)	B	5.0	R	$\sqrt{3}$	0.6	1.7	∞
24	-liquid permittivity (measurement uncertainty)	B	2.5	N	1	0.6	1.5	9
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{24} c_i^2 u_i^2}$					11.50	
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$		N	k=2		23.00	

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9. Main Test Instruments

Table 17: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	Agilent 8753E	US37390326	September 11, 2012	One year
02	Dielectric Probe Kit	Agilent 85070E	US44020115	No Calibration Requested	
03	Power meter	Agilent E4417A	GB41291714	March 10, 2013	One year
04	Power sensor	Agilent N8481H	MY50350004	September 24, 2012	One year
05	Power sensor	E9327A	US40441622	January 2, 2013	One year
06	Signal Generator	HP 8341B	2730A00804	September 10, 2012	One year
07	Dual directional coupler	778D-012	50519	March 24, 2013	One year
08	Dual directional coupler	777D	50146	March 25, 2013	One year
09	Amplifier	IXA-020	0401	No Calibration Requested	
10	BTS	E5515C	MY48360988	December 1, 2012	One year
11	E-field Probe	EX3DV4	3578	June 21, 2012	One year
12	DAE	DAE4	1317	January 25, 2013	One year
13	Validation Kit 835MHz	D835V2	4d020	August 26, 2011	Two years
14	Validation Kit 1900MHz	D1900V2	5d060	August 31, 2011	Two years
15	Temperature Probe	JM222	AA1009129	March 14, 2013	One year
16	Hygrothermograph	WS-1	64591	September 27, 2012	One year

***END OF REPORT ***

ANNEX A: Test Layout



Picture 2: Specific Absorption Rate Test Layout

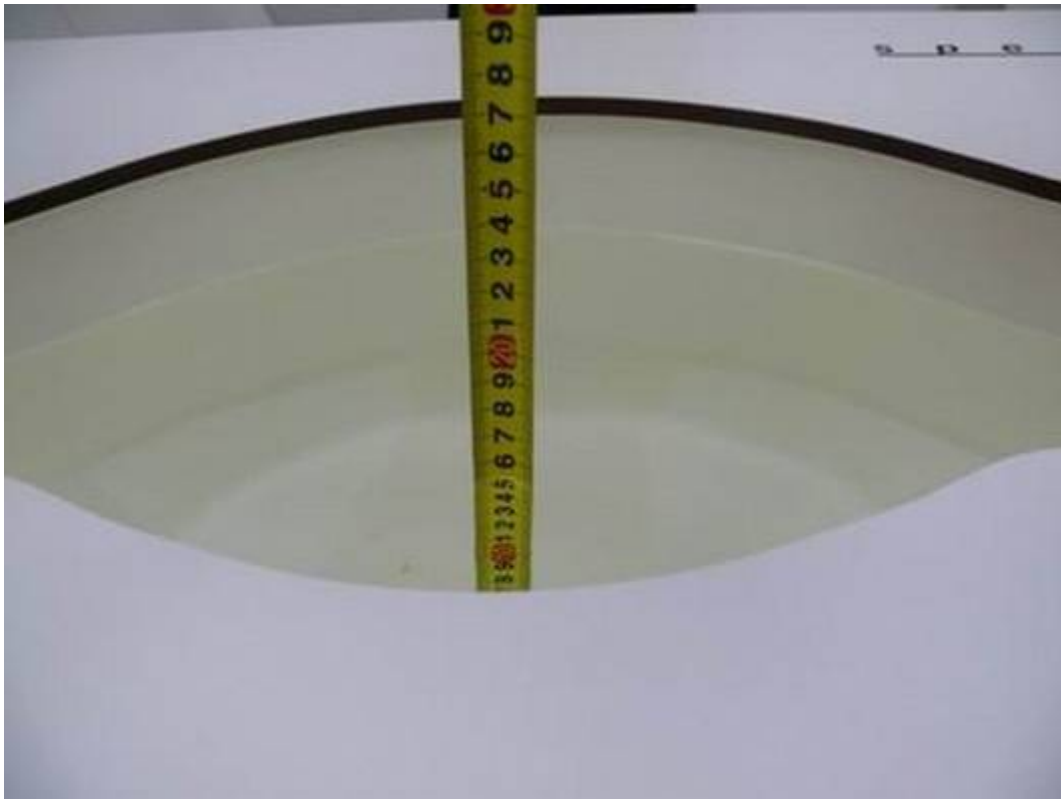


Picture 3: Liquid depth in the Flat Phantom (835 MHz, 15.4cm depth)

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Picture 4: Liquid depth in the Flat Phantom (1900 MHz, 15.2cm depth)

ANNEX B: System Check Results

System Performance Check at 835 MHz

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

Date/Time: 4/14/2013 2:30:37 PM

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.012 \text{ mho/m}$; $\epsilon_r = 54.35$; $\rho = 1000 \text{ kg/m}^3$

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

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Sensor-Surface: 4mm (Mechanical Surface Detection)

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 2.61 mW/g

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

Reference Value = 52.09 V/m ; Power Drift = -0.032 dB

Peak SAR (extrapolated) = 3.48 W/kg

SAR(1 g) = 2.5 mW/g ; SAR(10 g) = 1.65 mW/g

Maximum value of SAR (measured) = 2.69 mW/g

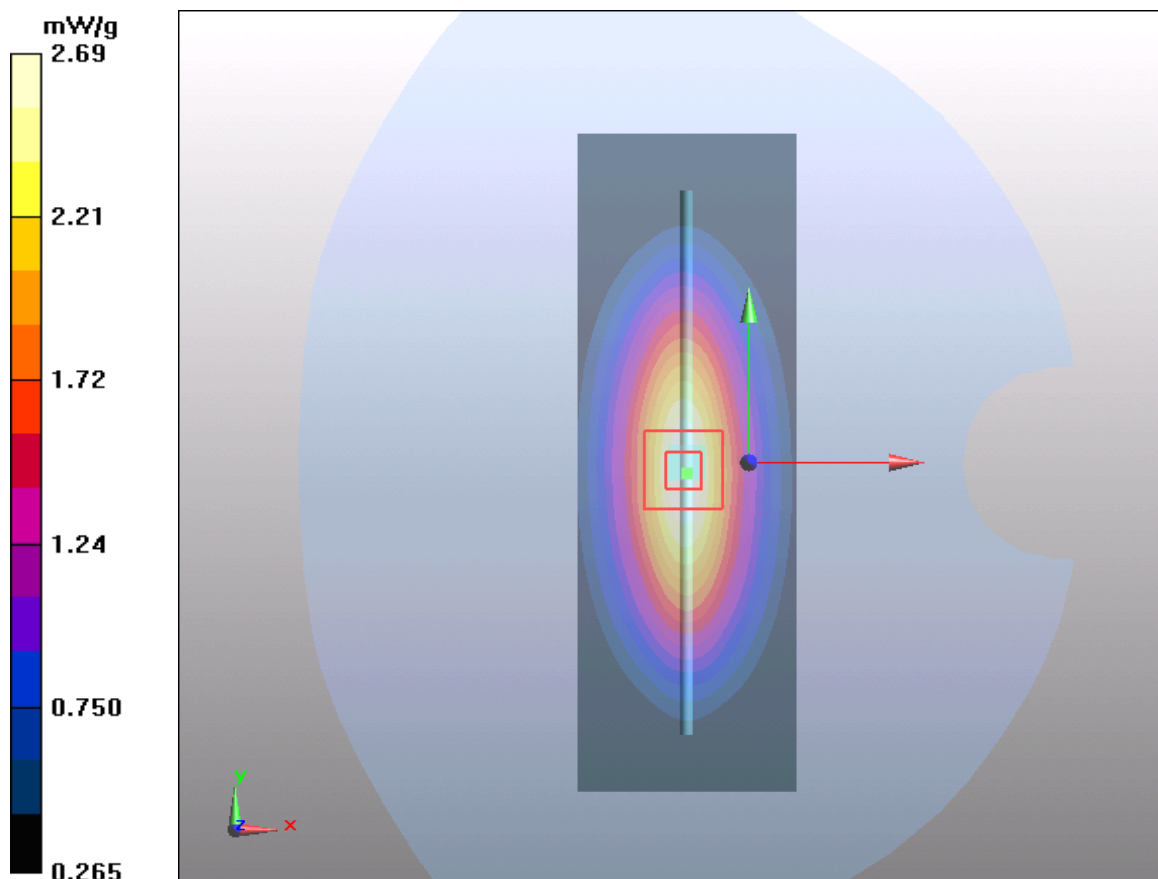


Figure 6 System Performance Check 835MHz 250mW

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System Performance Check at 1900 MHz

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

Date/Time: 4/14/2013 6:32:01 PM

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.52$ mho/m; $\epsilon_r = 52.56$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2012

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

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

Maximum value of SAR (interpolated) = 11.8 mW/g

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

Reference Value = 83.1 V/m; Power Drift = 0.056 dB

Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.48 mW/g

Maximum value of SAR (measured) = 11.8 mW/g

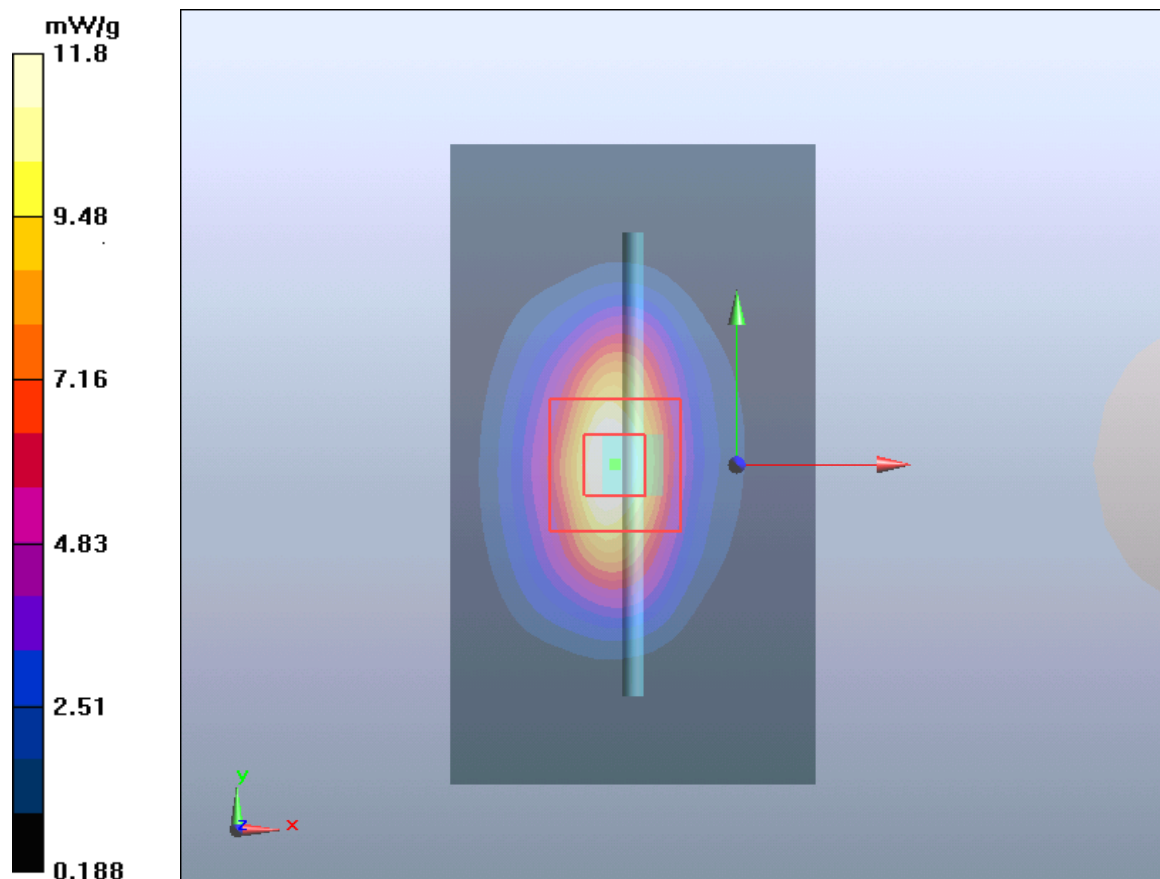


Figure 7 System Performance Check 1900MHz 250mW

ANNEX C: Graph Results

GSM 850 GPRS (2TXslots) with IBM T61 Test Position 1 Middle

Date/Time: 4/14/2013 4:08:07 PM

Communication System: GPRS 2TX ; Frequency: 836.6 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 837$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 1 Middle /Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.718 mW/g

Test Position 1 Middle /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.3 V/m; Power Drift = -0.100 dB

Peak SAR (extrapolated) = 0.971 W/kg

SAR(1 g) = 0.656 mW/g; SAR(10 g) = 0.443 mW/g

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

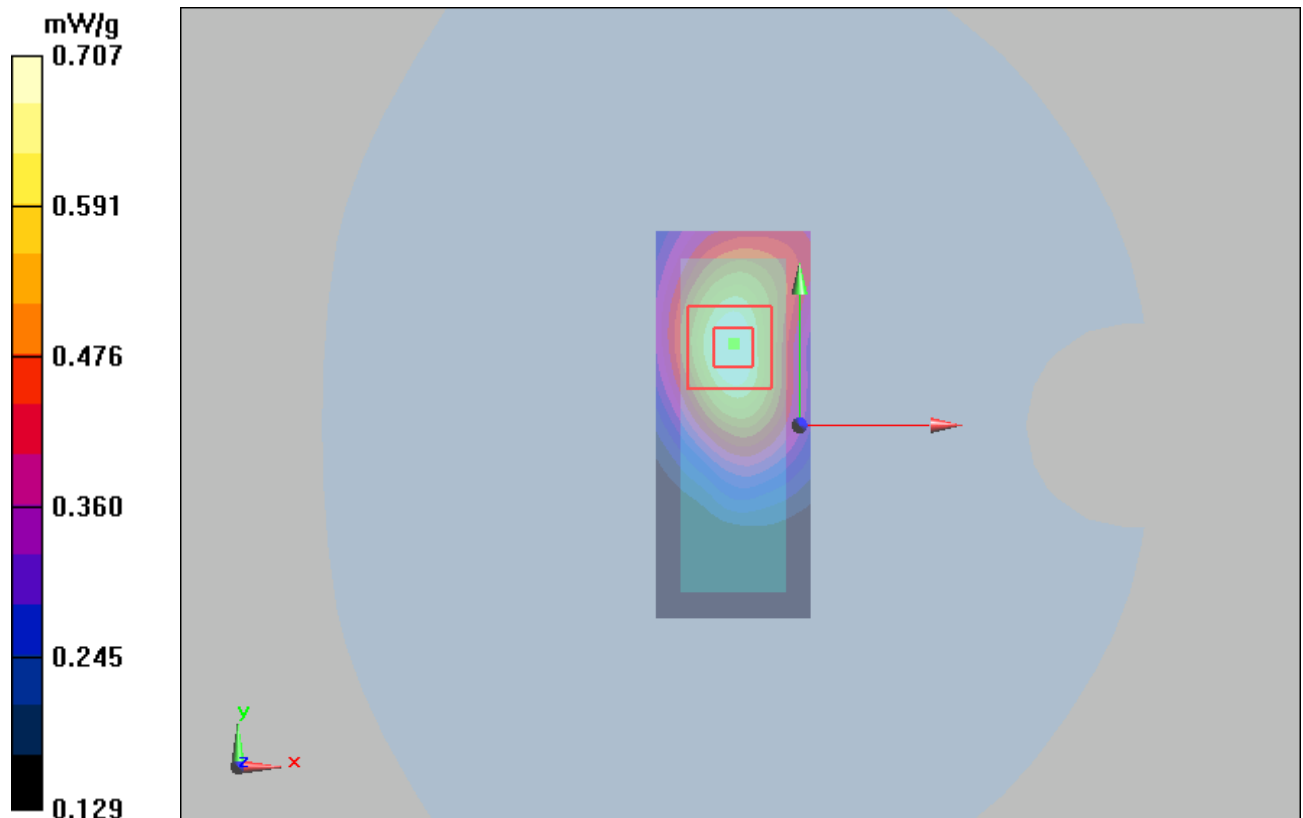


Figure 8 GSM 850 GPRS (2TXslots) with IBM T61 Test Position 1 Channel 190

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GSM 850 GPRS (2TXslots) with IBM T61 Test Position 2 Middle

Date/Time: 4/14/2013 4:47:33 PM

Communication System: GPRS 2TX ; Frequency: 836.6 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 837$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 2 Middle/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.613 mW/g

Test Position 2 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 19.6 V/m; Power Drift = 0.050 dB

Peak SAR (extrapolated) = 0.893 W/kg

SAR(1 g) = 0.552 mW/g; SAR(10 g) = 0.338 mW/g

Maximum value of SAR (measured) = 0.608 mW/g

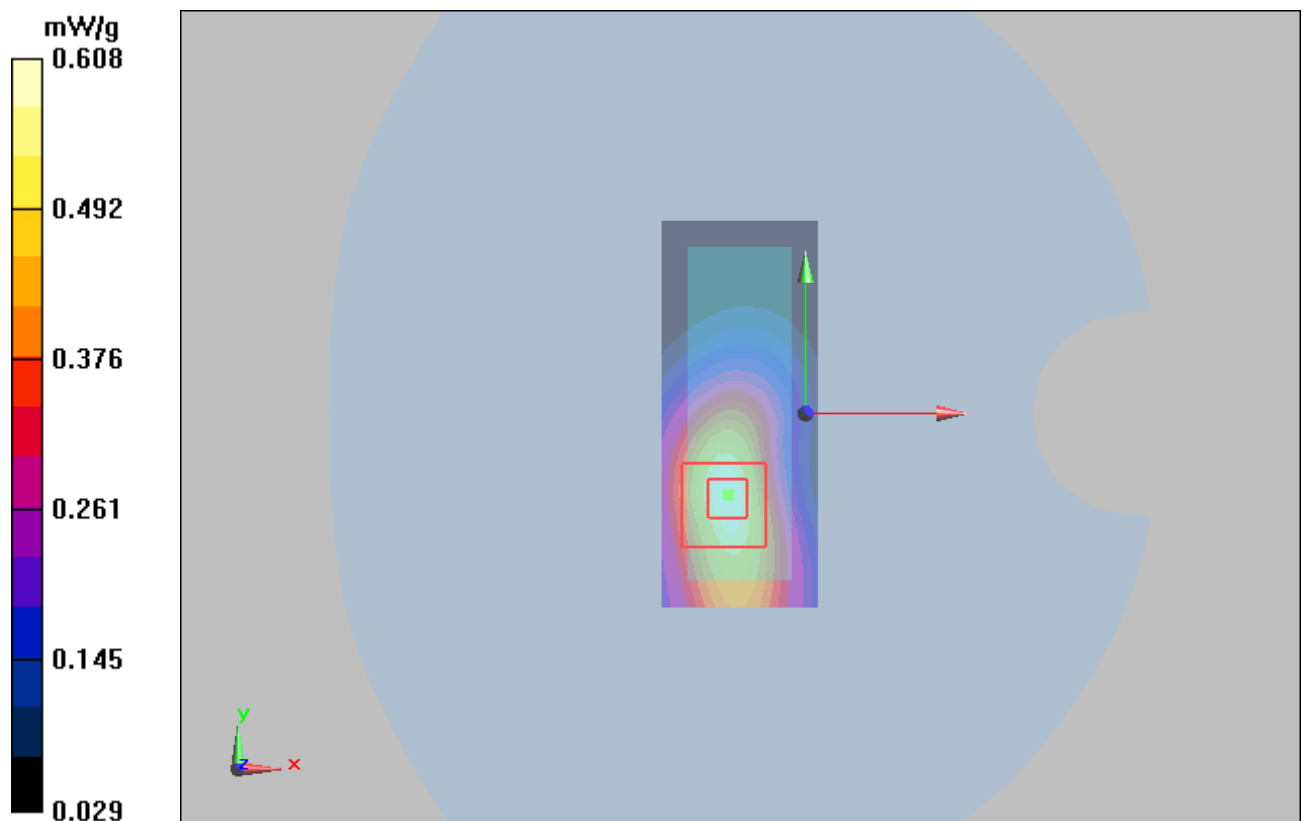


Figure 9 GSM 850 GPRS (2TXslots) with IBM T61 Test Position 2 Channel 190

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GSM 850 GPRS (2TXslots) with IBM T61 Test Position 3 Middle

Date/Time: 4/14/2013 5:25:41 PM

Communication System: GPRS 2TX ; Frequency: 836.6 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 837$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 3 Middle/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.240 mW/g

Test Position 3 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.8 V/m; Power Drift = -0.025 dB

Peak SAR (extrapolated) = 0.289 W/kg

SAR(1 g) = 0.210 mW/g; SAR(10 g) = 0.149 mW/g

Maximum value of SAR (measured) = 0.224 mW/g

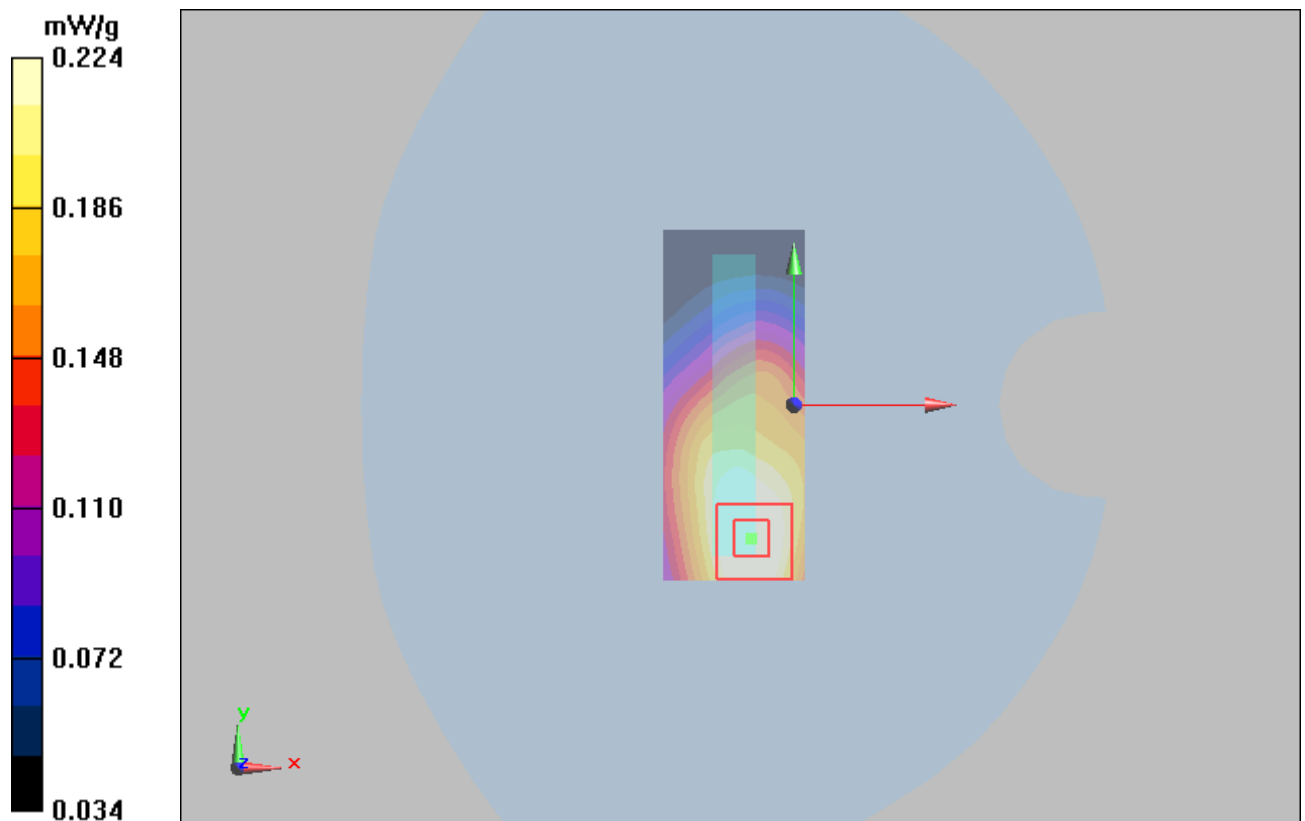


Figure 10 GSM 850 GPRS (2TXslots) with IBM T61 Test Position 3 Channel 190

GSM 850 GPRS (2TXslots) with IBM T61 Test Position 4 Middle

Date/Time: 4/14/2013 5:44:11 PM

Communication System: GPRS 2TX ; Frequency: 836.6 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 837$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 4 Middle/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.561 mW/g

Test Position 4 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.1 V/m; Power Drift = 0.026dB

Peak SAR (extrapolated) = 0.795 W/kg

SAR(1 g) = 0.535 mW/g; SAR(10 g) = 0.359 mW/g

Maximum value of SAR (measured) = 0.574 mW/g

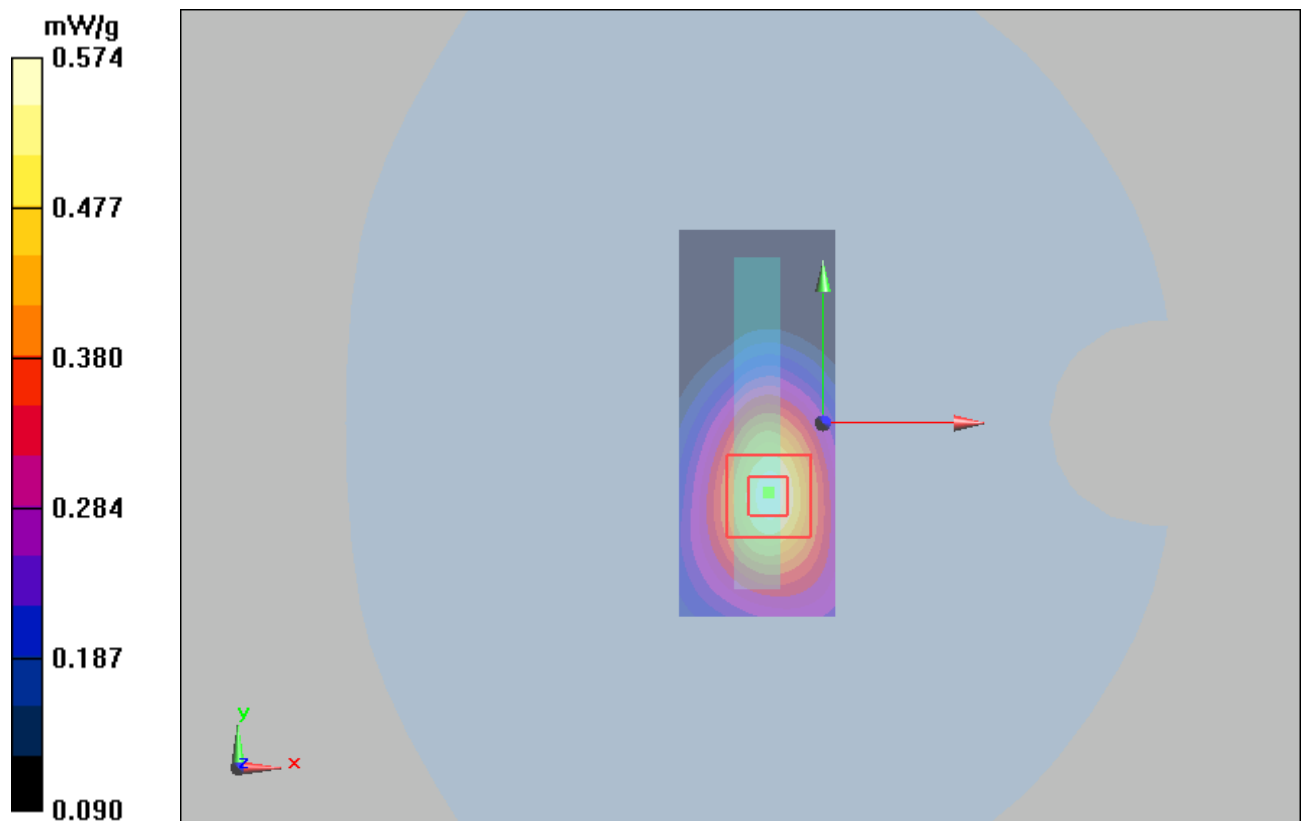


Figure 11 GSM 850 GPRS (2TXslots) with IBM T61 Test Position 4 Channel 190

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GSM 850 GPRS (2TXslots) with IBM T61 Test Position 5 Middle

Date/Time: 4/14/2013 6:02:21 PM

Communication System: GPRS 2TX ; Frequency: 836.6 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 837$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 5 Middle/Area Scan (41x51x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.027 mW/g

Test Position 5 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.64 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 0.044 W/kg

SAR(1 g) = 0.024 mW/g; SAR(10 g) = 0.015 mW/g

Maximum value of SAR (measured) = 0.027 mW/g

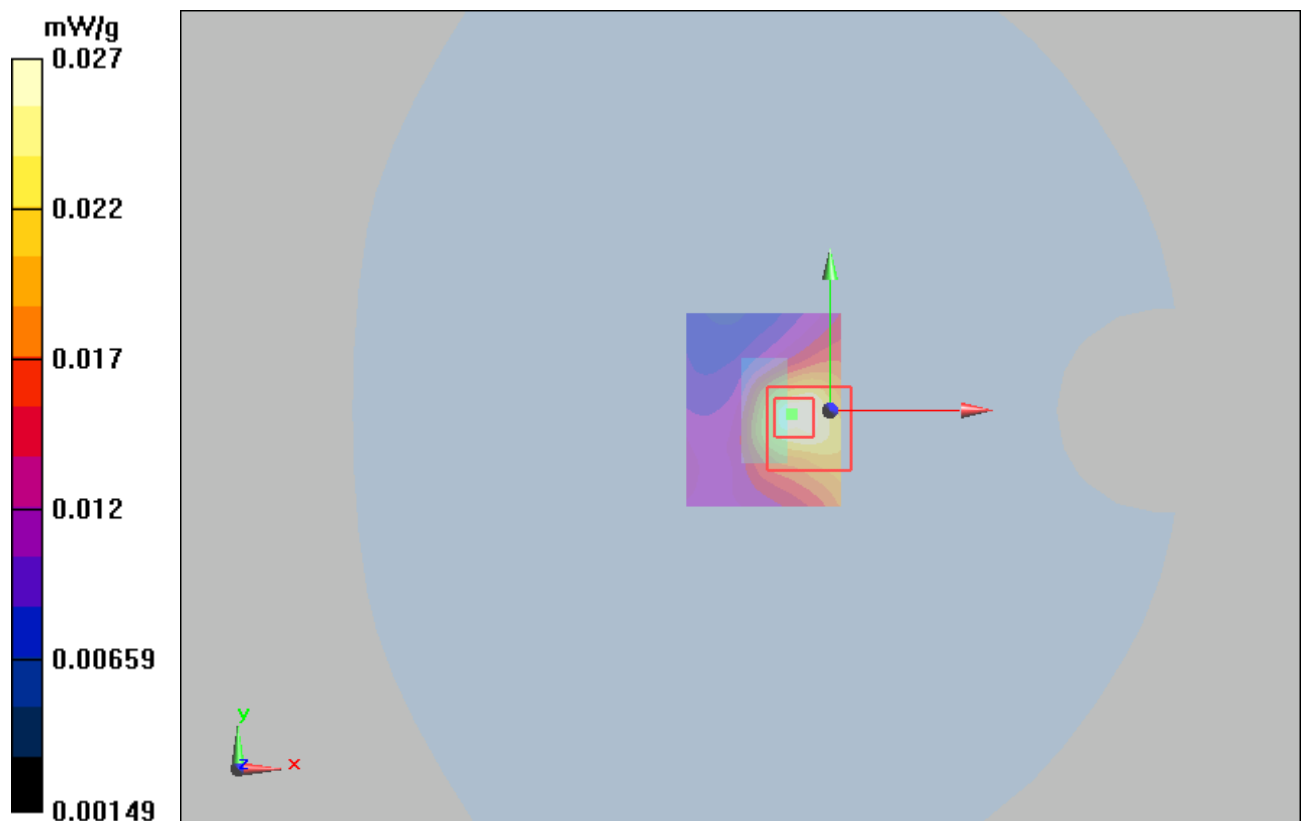


Figure 12 GSM 850 GPRS (2TXslots) with IBM T61 Test Position 5 Channel 190

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GSM 850 EGPRS (2TXslots) with IBM T61 Test Position 1 Middle

Date/Time: 4/14/2013 6:19:58 PM

Communication System: EGPRS 2TX; Frequency: 836.6 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 837$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 1 Middle /Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.733 mW/g

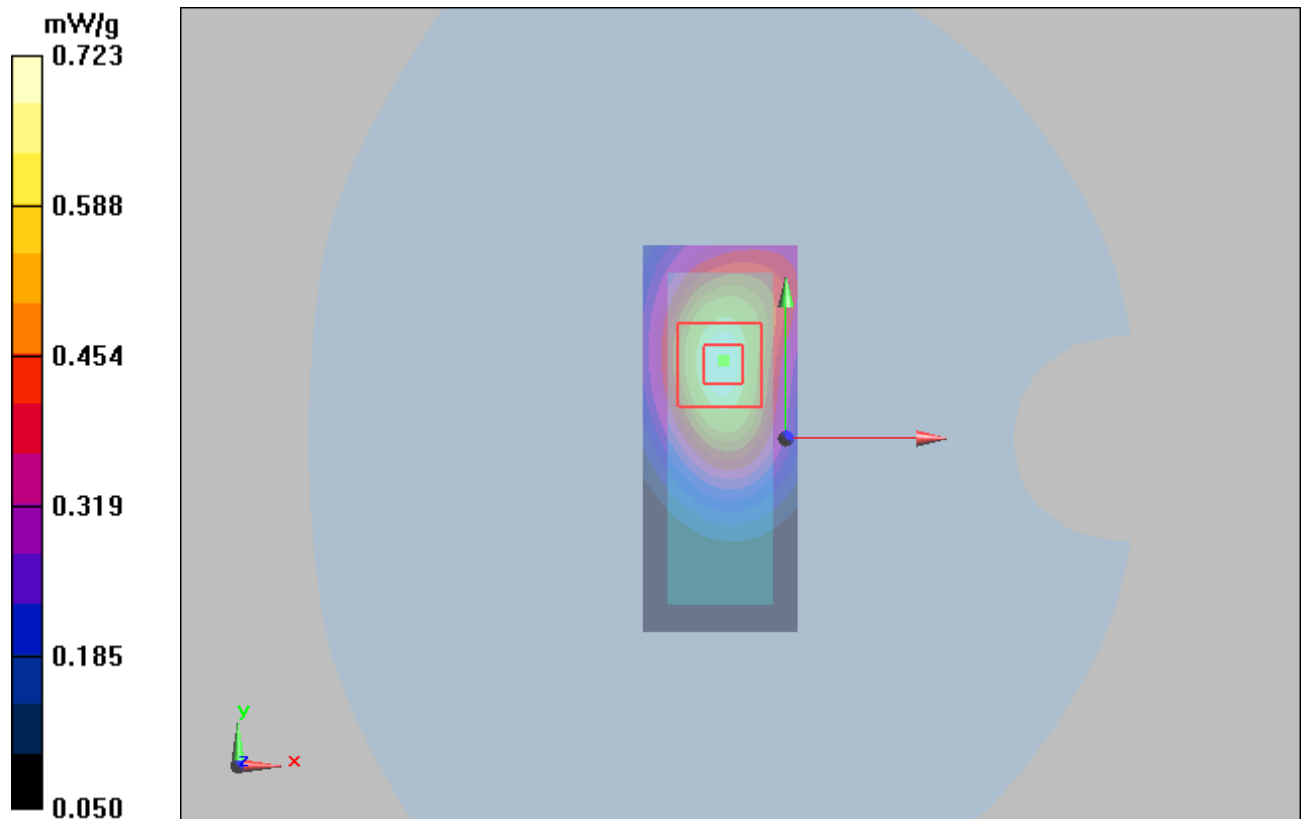
Test Position 1 Middle /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.6 V/m; Power Drift = 0.016 dB

Peak SAR (extrapolated) = 1.03 W/kg

SAR(1 g) = 0.666 mW/g; SAR(10 g) = 0.416 mW/g

Maximum value of SAR (measured) = 0.723 mW/g



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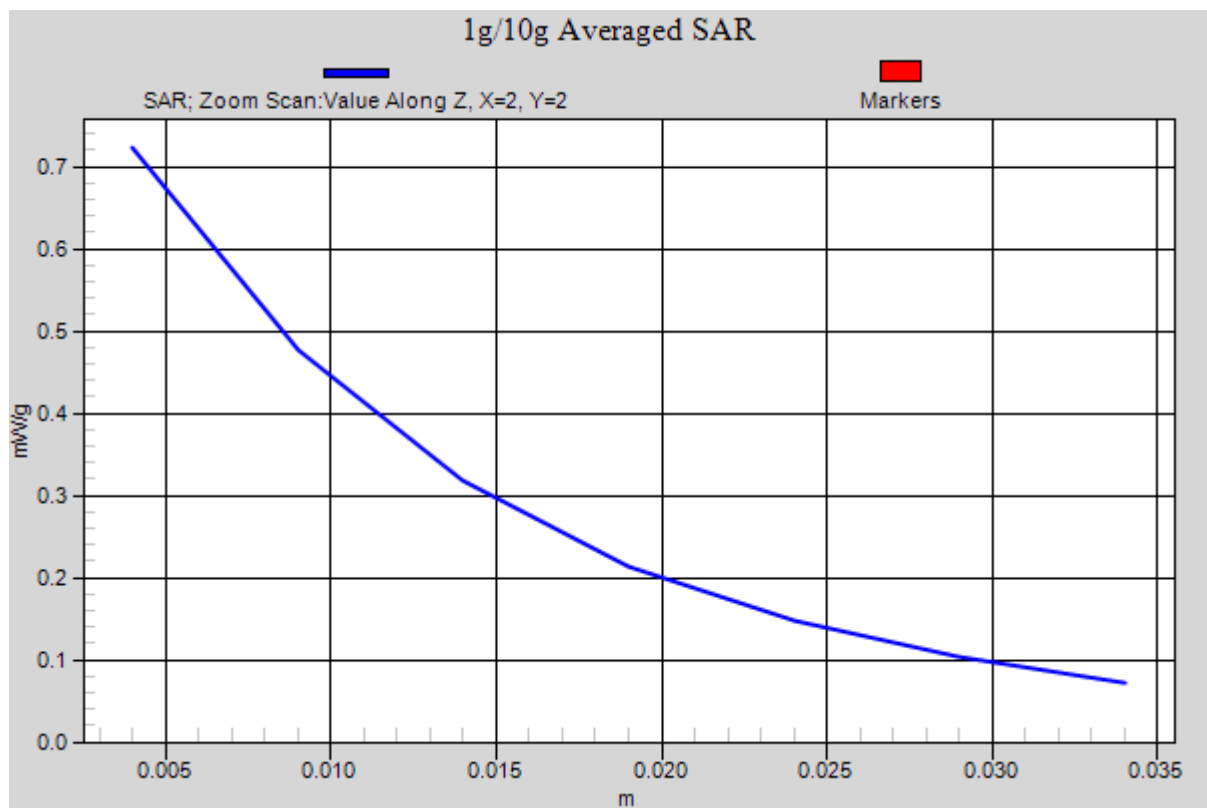


Figure 13 GSM 850 EGPRS (2TXslots) with IBM T61 Test Position 1 Channel 190

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GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 1 High

Date/Time: 4/14/2013 8:18:06 PM

Communication System: GPRS 2TX ; Frequency: 1909.8 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 52.5$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 1 High/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.993 mW/g

Test Position 1 High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

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

Peak SAR (extrapolated) = 1.57 W/kg

SAR(1 g) = 0.920 mW/g; SAR(10 g) = 0.541 mW/g

Maximum value of SAR (measured) = 0.996 mW/g

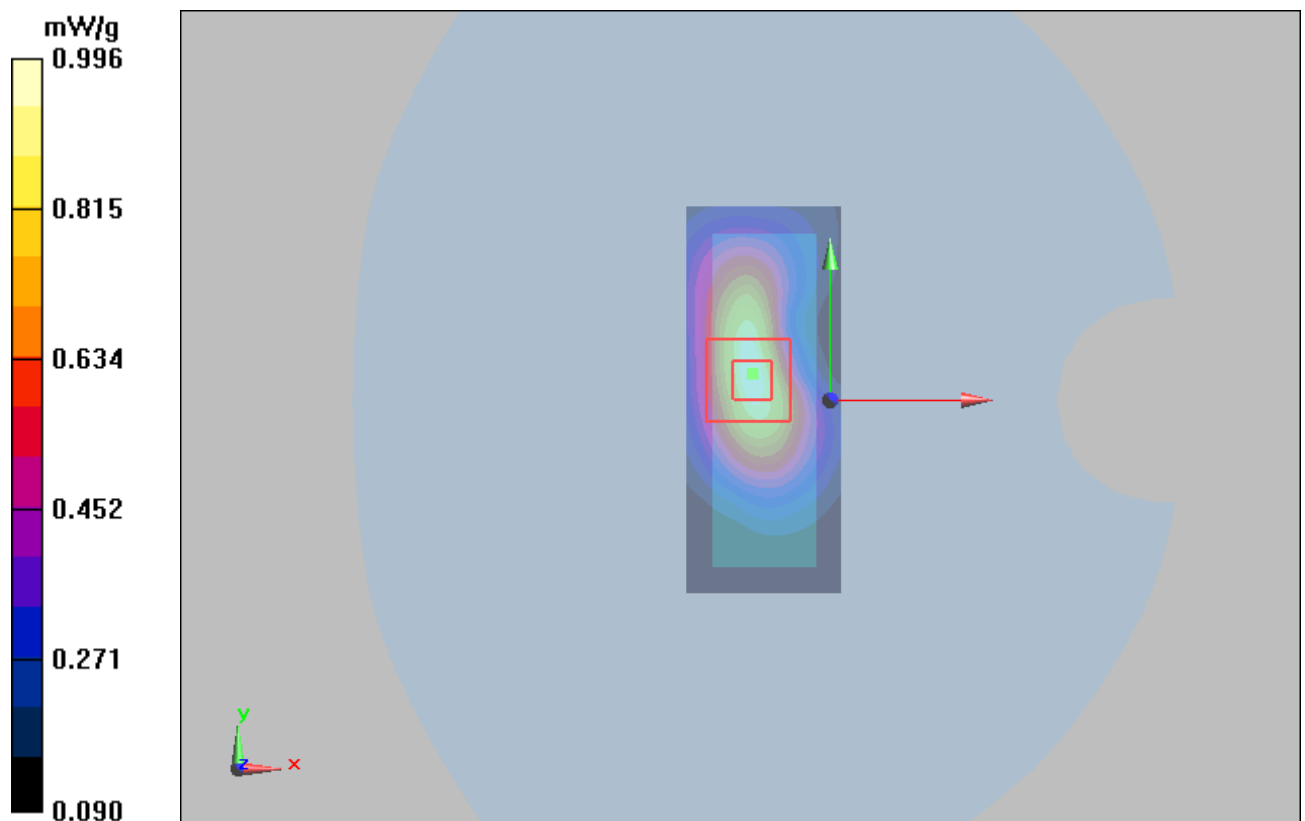


Figure 14 GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 1 Channel 810

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GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 1 Middle

Date/Time: 4/14/2013 8:02:38 PM

Communication System: GPRS 2TX ; Frequency: 1880 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 52.6$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 1 Middle/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

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

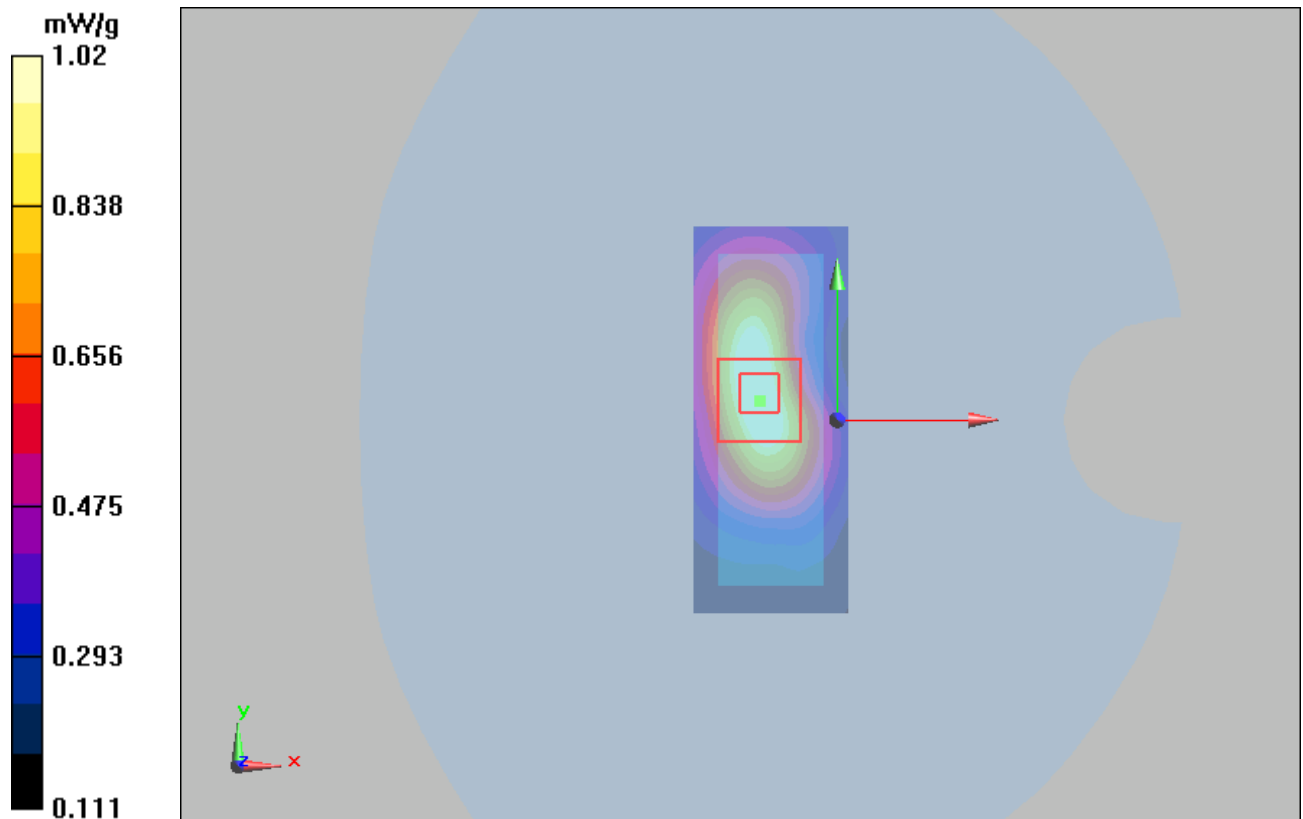
Test Position 1 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 26.2 V/m; Power Drift = -0.039 dB

Peak SAR (extrapolated) = 1.58 W/kg

SAR(1 g) = 0.937 mW/g; SAR(10 g) = 0.574 mW/g

Maximum value of SAR (measured) = 1.02 mW/g



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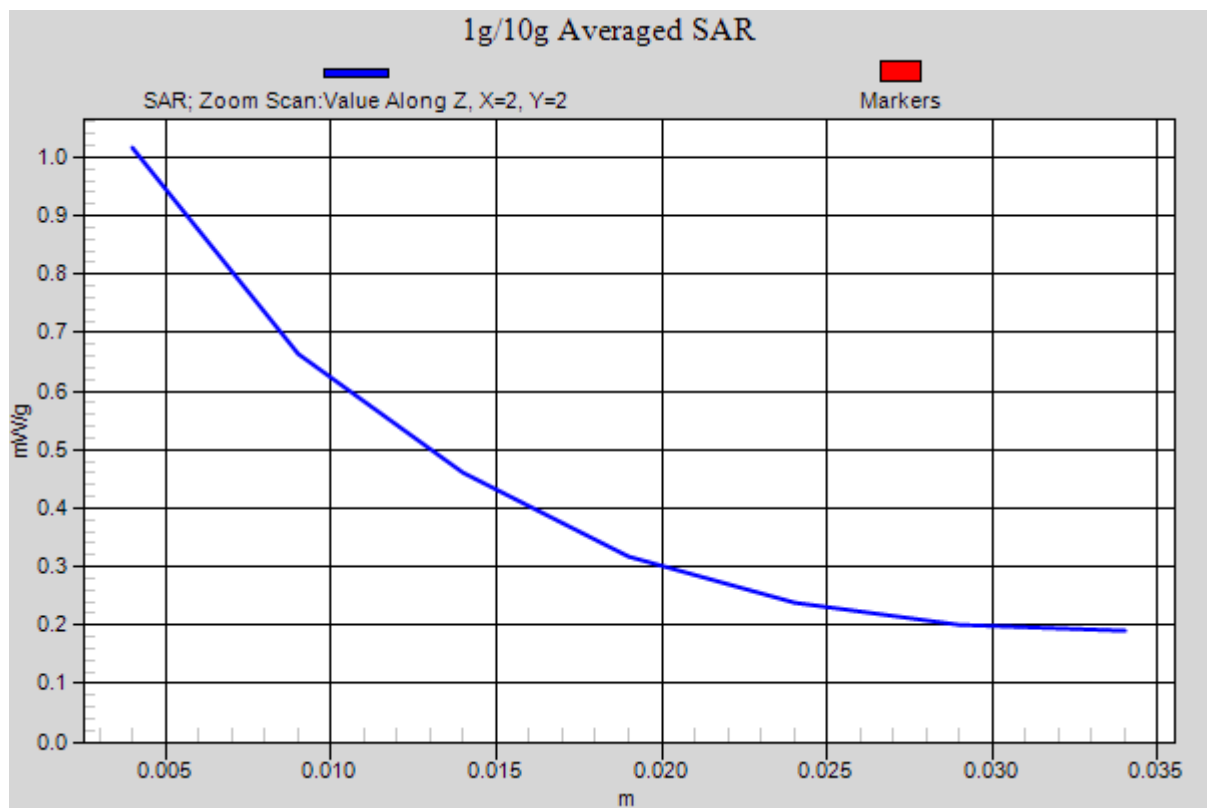


Figure 15 GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 1 Channel 661

GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 1 Low

Date/Time: 4/14/2013 8:32:44 PM

Communication System: GPRS 2TX ; Frequency: 1850.2 MHz; Duty Cycle: 1:4.14954

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 52.7$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 1 Low/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.975 mW/g

Test Position 1 Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.5 V/m; Power Drift = -0.029 dB

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 0.863 mW/g; SAR(10 g) = 0.508 mW/g

Maximum value of SAR (measured) = 0.933 mW/g

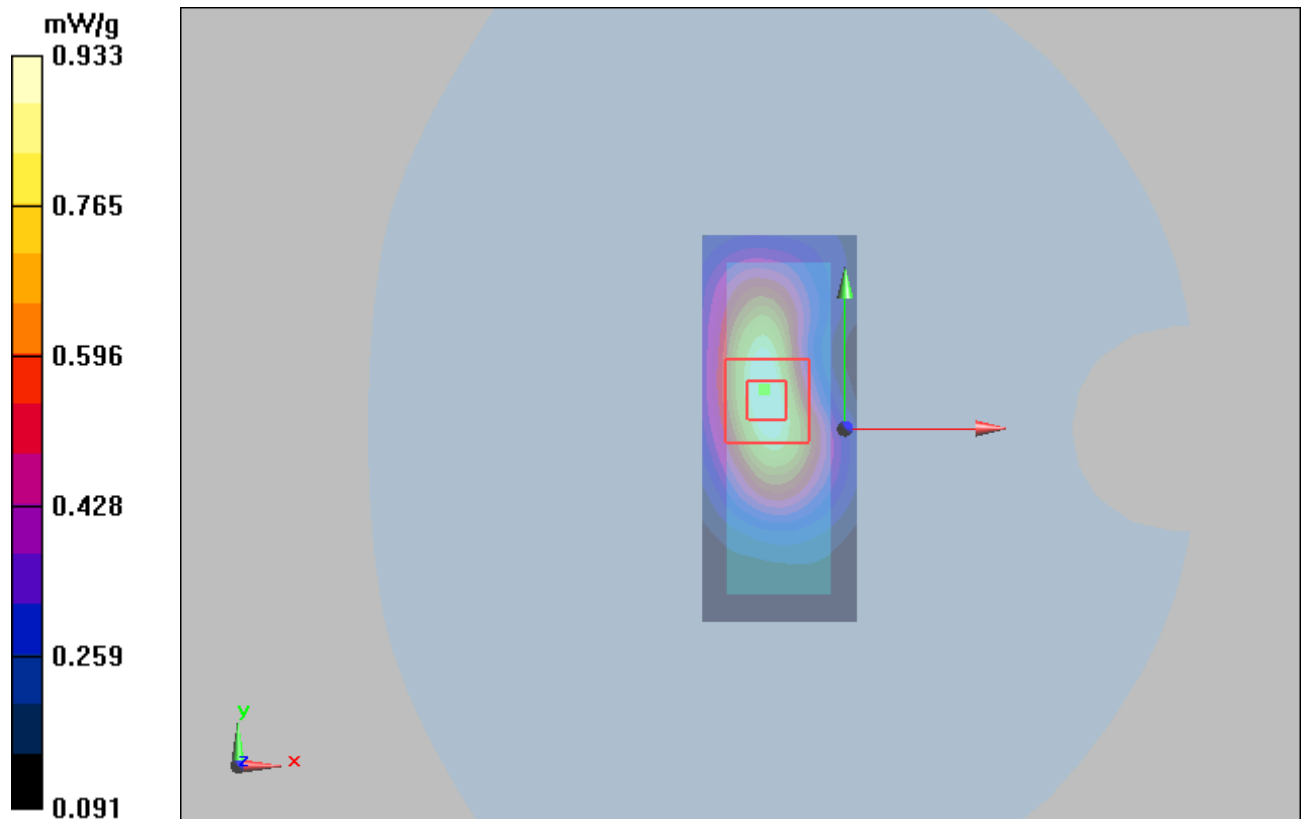


Figure 16 GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 1 Channel 512

GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 2 High

Date/Time: 4/14/2013 10:18:47 PM

Communication System: GPRS 2TX ; Frequency: 1909.8 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 52.5$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 2 High/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.09 mW/g

Test Position 2 High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.8 V/m; Power Drift = 0.072 dB

Peak SAR (extrapolated) = 1.65 W/kg

SAR(1 g) = 0.976 mW/g; SAR(10 g) = 0.543 mW/g

Maximum value of SAR (measured) = 1.08 mW/g

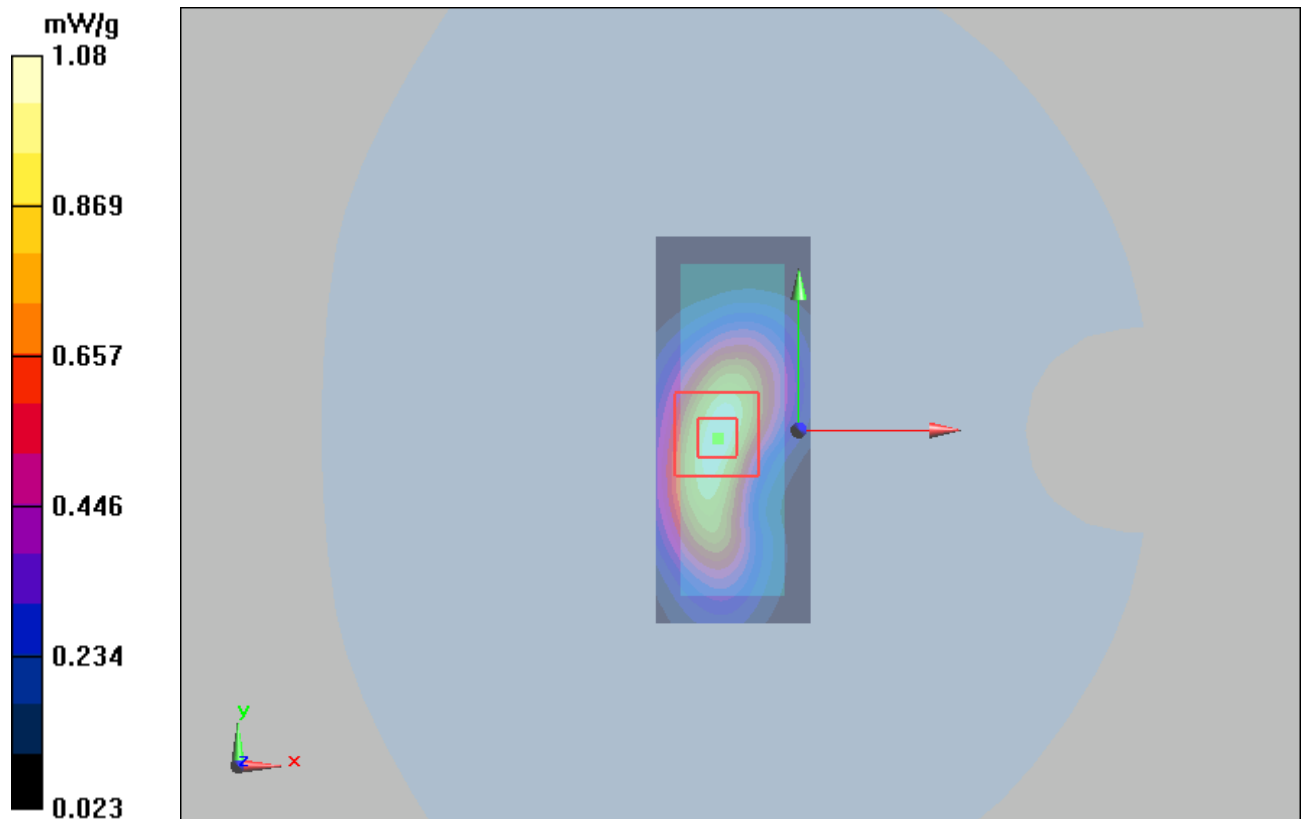


Figure 17 GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 2 Channel 810

GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 2 Middle

Date/Time: 4/14/2013 10:04:01 PM

Communication System: GPRS 2TX ; Frequency: 1880 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 52.6$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 2 Middle 2/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.13 mW/g

Test Position 2 Middle 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 26.4 V/m; Power Drift = -0.061 dB

Peak SAR (extrapolated) = 1.64 W/kg

SAR(1 g) = 0.968 mW/g; SAR(10 g) = 0.540 mW/g

Maximum value of SAR (measured) = 1.07 mW/g

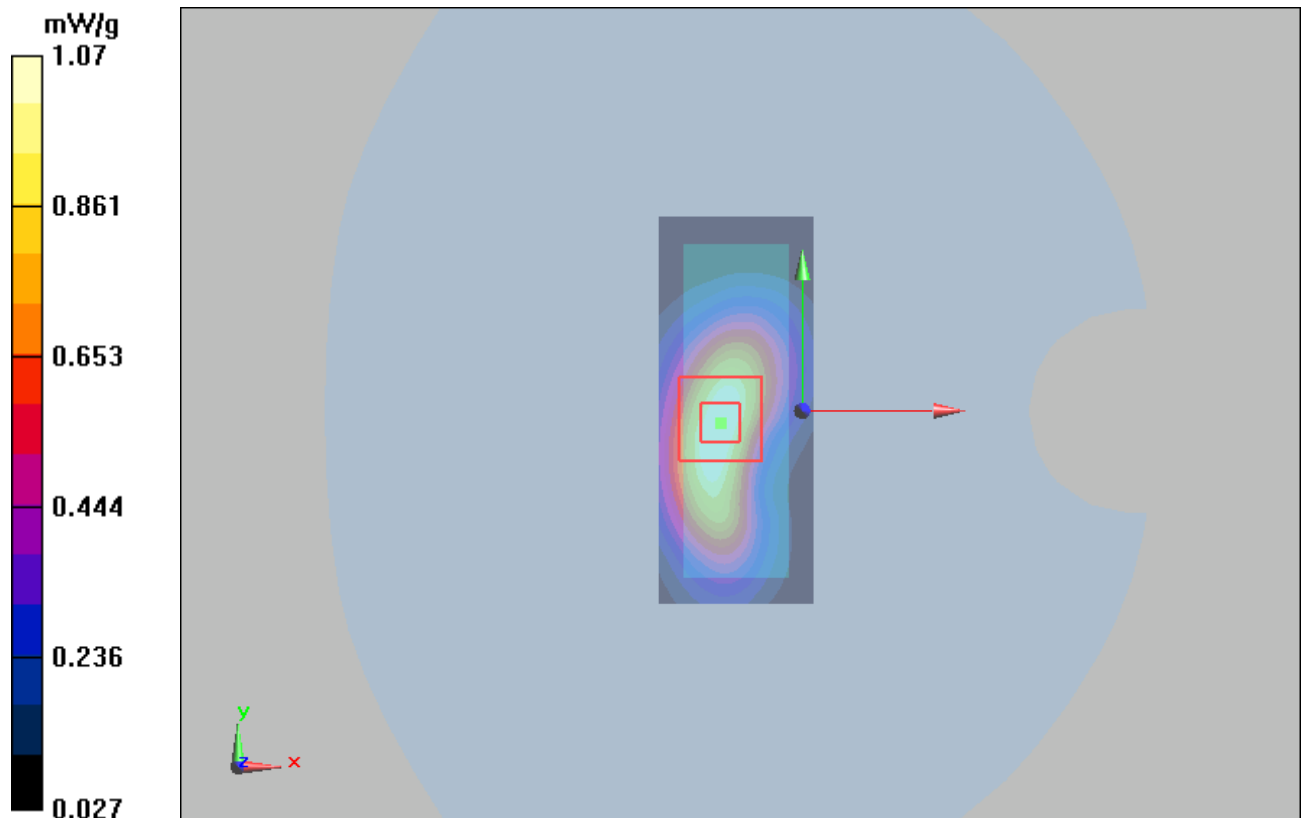


Figure 18 GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 2 Channel 661

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GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 2 Low

Date/Time: 4/14/2013 10:32:30 PM

Communication System: GPRS 2TX ; Frequency: 1850.2 MHz; Duty Cycle: 1:4.14954

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 52.7$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 2 Low/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.08 mW/g

Test Position 2 Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.8 V/m; Power Drift = 0.137 dB

Peak SAR (extrapolated) = 1.62 W/kg

SAR(1 g) = 0.965 mW/g; SAR(10 g) = 0.541 mW/g

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

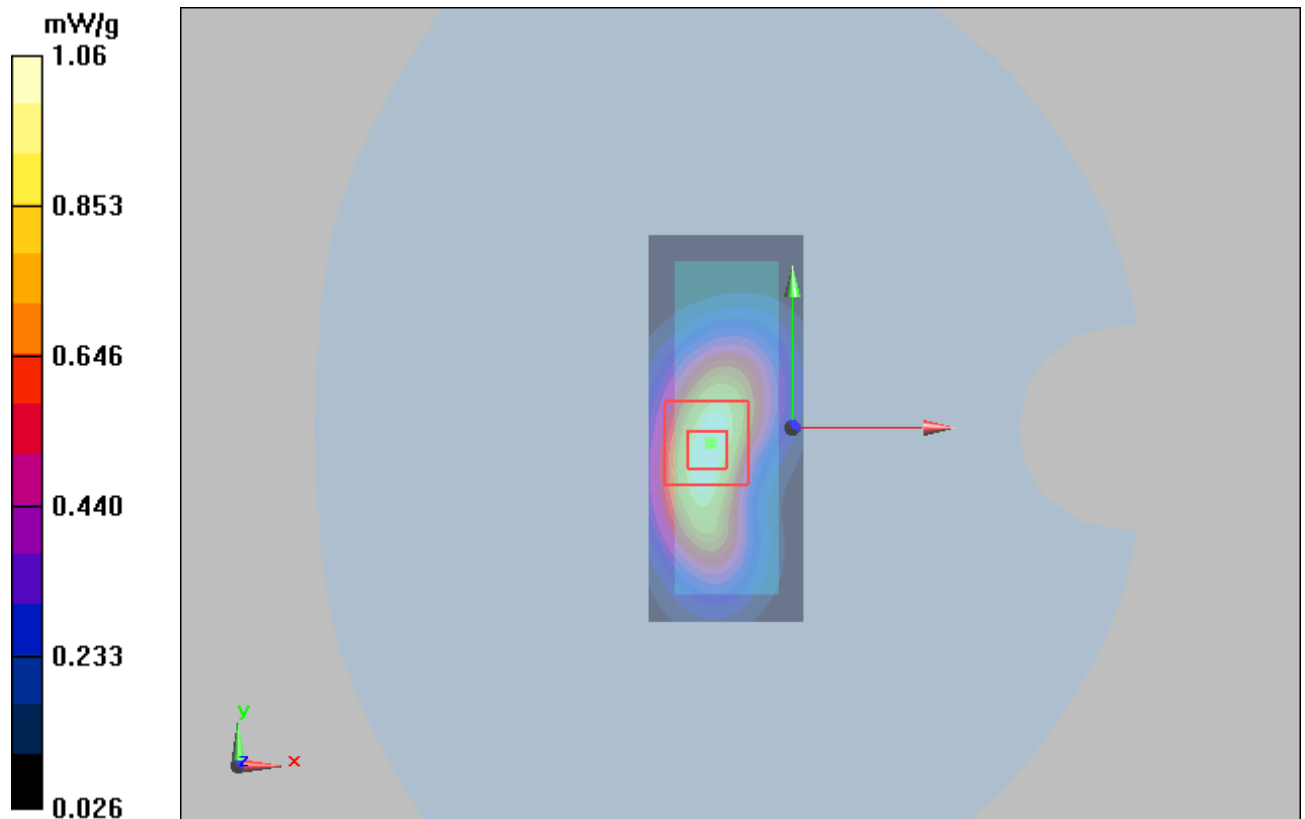


Figure 19 GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 2 Channel 512

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GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 3 Middle

Date/Time: 4/14/2013 9:37:53 PM

Communication System: GPRS 2TX ; Frequency: 1880 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 52.6$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 3 Middle/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.422 mW/g

Test Position 3 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.3 V/m; Power Drift = 0.133 dB

Peak SAR (extrapolated) = 0.628 W/kg

SAR(1 g) = 0.373 mW/g; SAR(10 g) = 0.215 mW/g

Maximum value of SAR (measured) = 0.408 mW/g

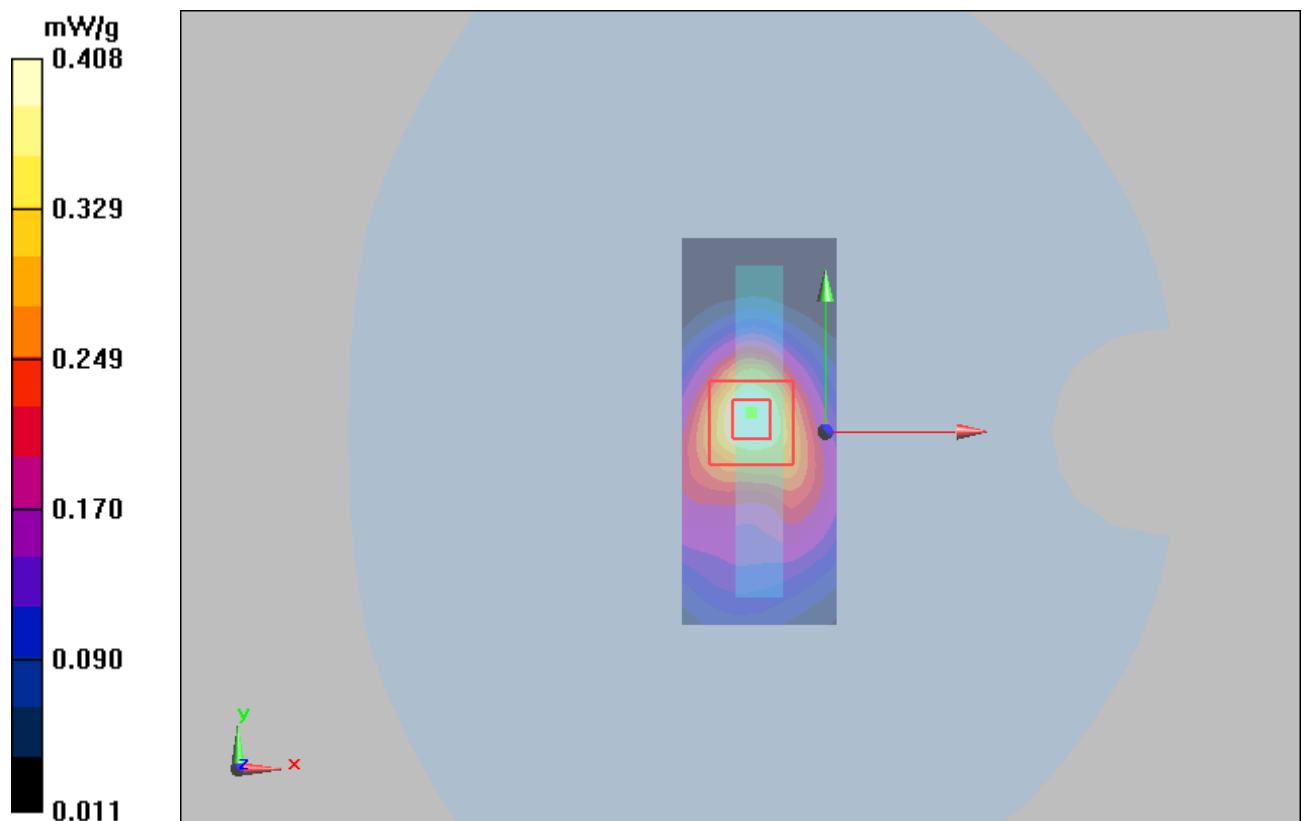


Figure 20 GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 3 Channel 661

GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 4 Middle

Date/Time: 4/14/2013 9:19:50 PM

Communication System: GPRS 2TX ; Frequency: 1880 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 52.6$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 4 Middle/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.631 mW/g

Test Position 4 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 19.2 V/m; Power Drift = -0.073 dB

Peak SAR (extrapolated) = 0.942 W/kg

SAR(1 g) = 0.554 mW/g; SAR(10 g) = 0.315 mW/g

Maximum value of SAR (measured) = 0.612 mW/g

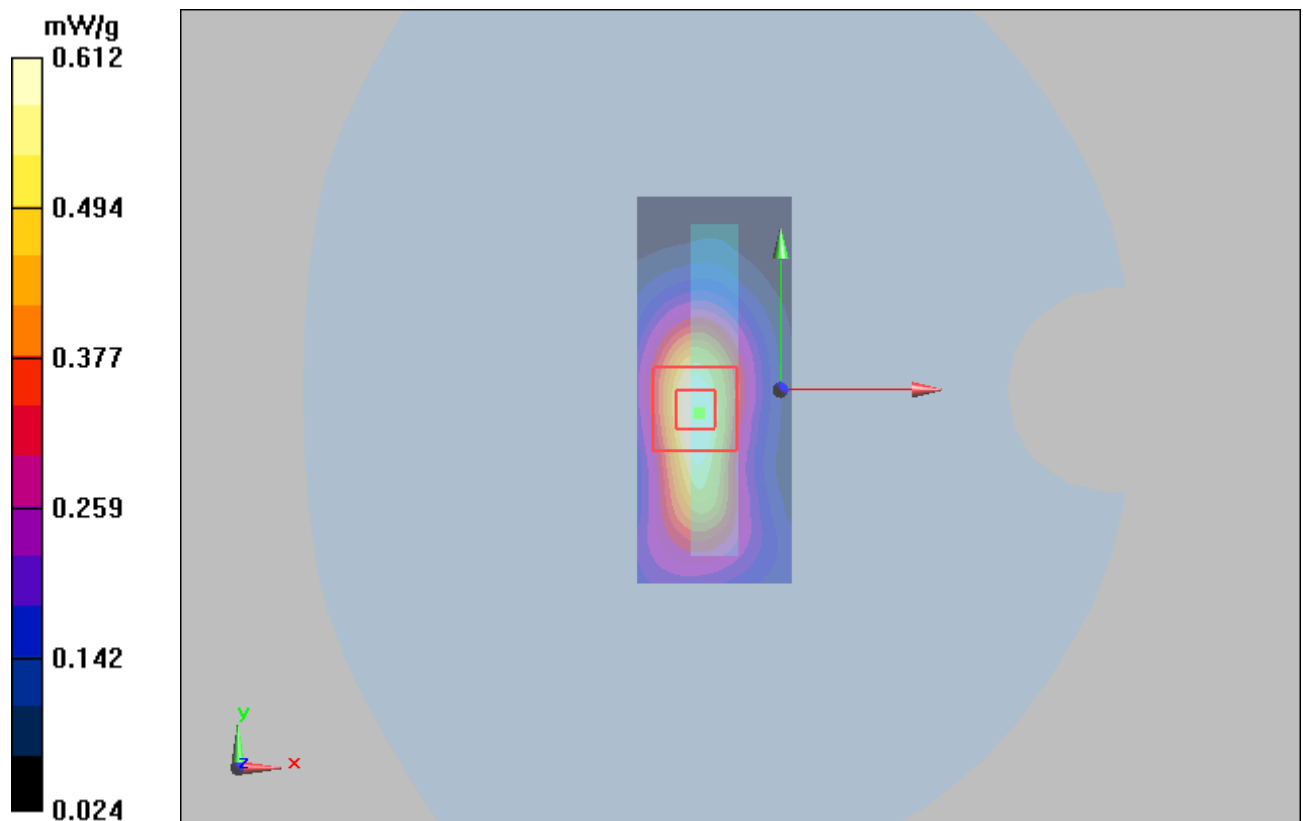


Figure 21 GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 4 Channel 661

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GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 5 Middle

Date/Time: 4/14/2013 11:32:09 PM

Communication System: GPRS 2TX ; Frequency: 1880 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.5 \text{ mho/m}$; $\epsilon_r = 52.6$; $\rho = 1000 \text{ kg/m}^3$

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 5 Middle 2/Area Scan (51x51x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 0.042 mW/g

Test Position 5 Middle 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 5.33 V/m ; Power Drift = 0.083 dB

Peak SAR (extrapolated) = 0.062 W/kg

SAR(1 g) = 0.042 mW/g ; SAR(10 g) = 0.028 mW/g

Maximum value of SAR (measured) = 0.044 mW/g

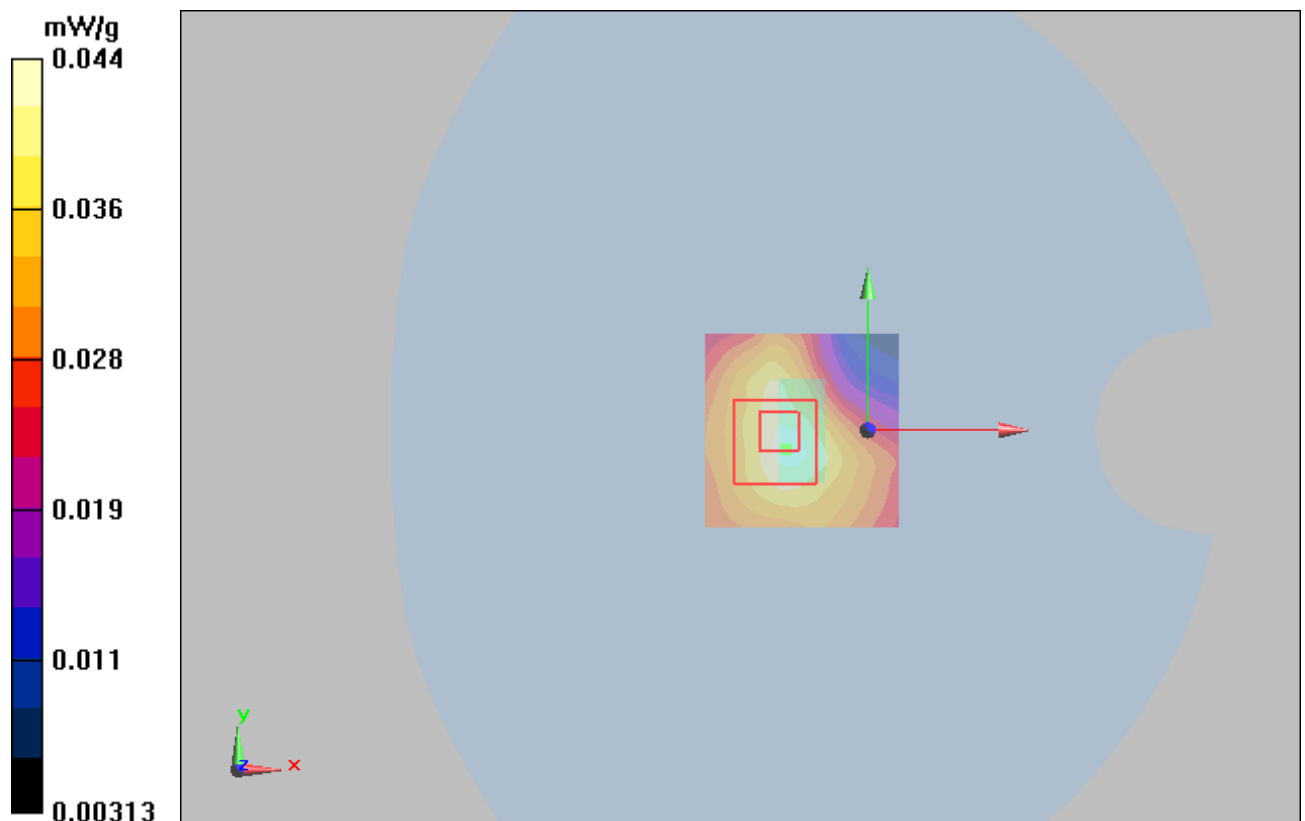


Figure 22 GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 5 Channel 661

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GSM 1900 EGPRS (2TXslots) with IBM T61 Test Position 2 High

Date/Time: 4/14/2013 11:00:52 PM

Communication System: EGPRS 2TX; Frequency: 1909.8 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 52.5$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 2 High /Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.1 mW/g

Test Position 2 High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.7 V/m; Power Drift = 0.154 dB

Peak SAR (extrapolated) = 1.67 W/kg

SAR(1 g) = 0.983 mW/g; SAR(10 g) = 0.548 mW/g

Maximum value of SAR (measured) = 1.09 mW/g

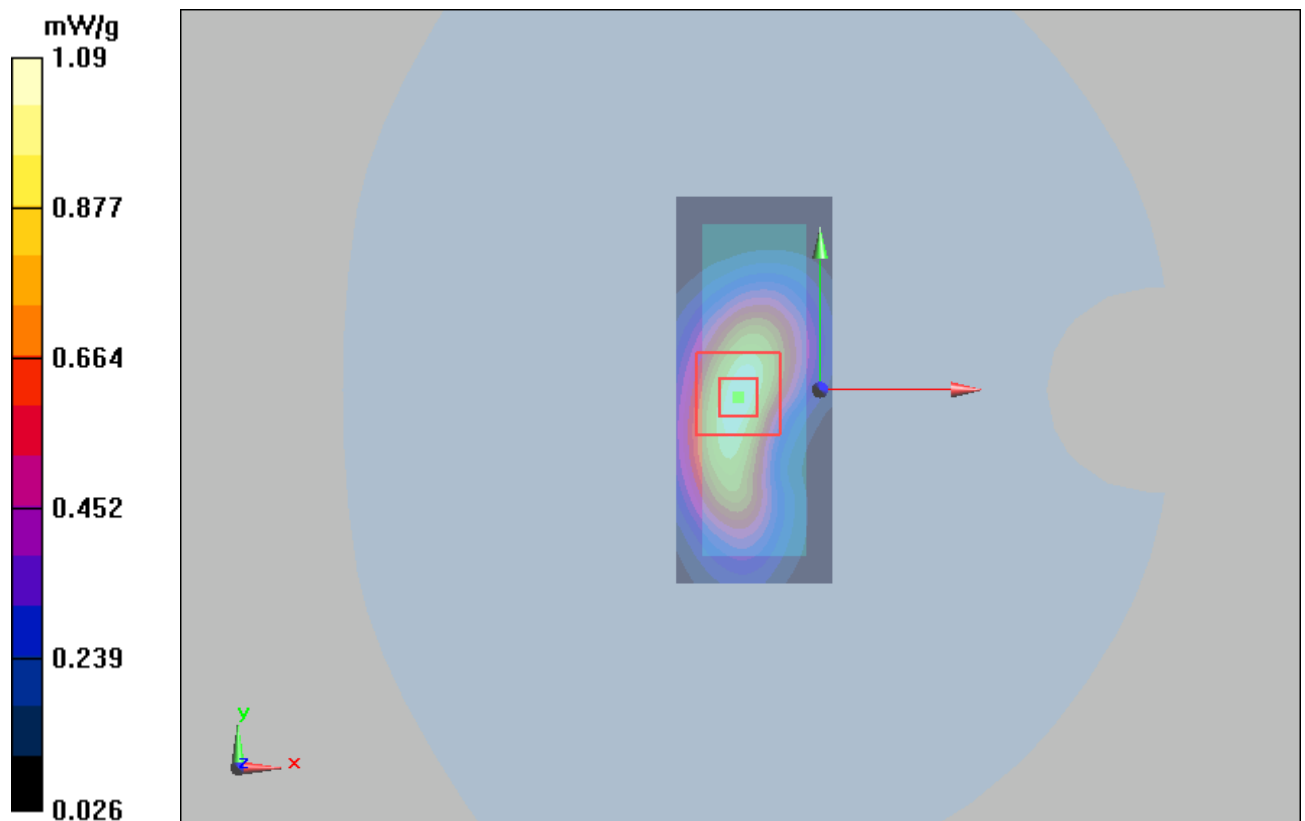


Figure 23 GSM 1900 EGPRS (2TXslots) with IBM T61 Test Position 2 Channel 810

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GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 2 High (1st Repeated SAR)

Date/Time: 4/14/2013 10:46:51 PM

Communication System: GPRS 2TX ; Frequency: 1909.8 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 52.5$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(6.69, 6.69, 6.69); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 2 High/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.09 mW/g

Test Position 2 High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.8 V/m; Power Drift = 0.129 dB

Peak SAR (extrapolated) = 1.68 W/kg

SAR(1 g) = 0.982 mW/g; SAR(10 g) = 0.547 mW/g

Maximum value of SAR (measured) = 1.09 mW/g

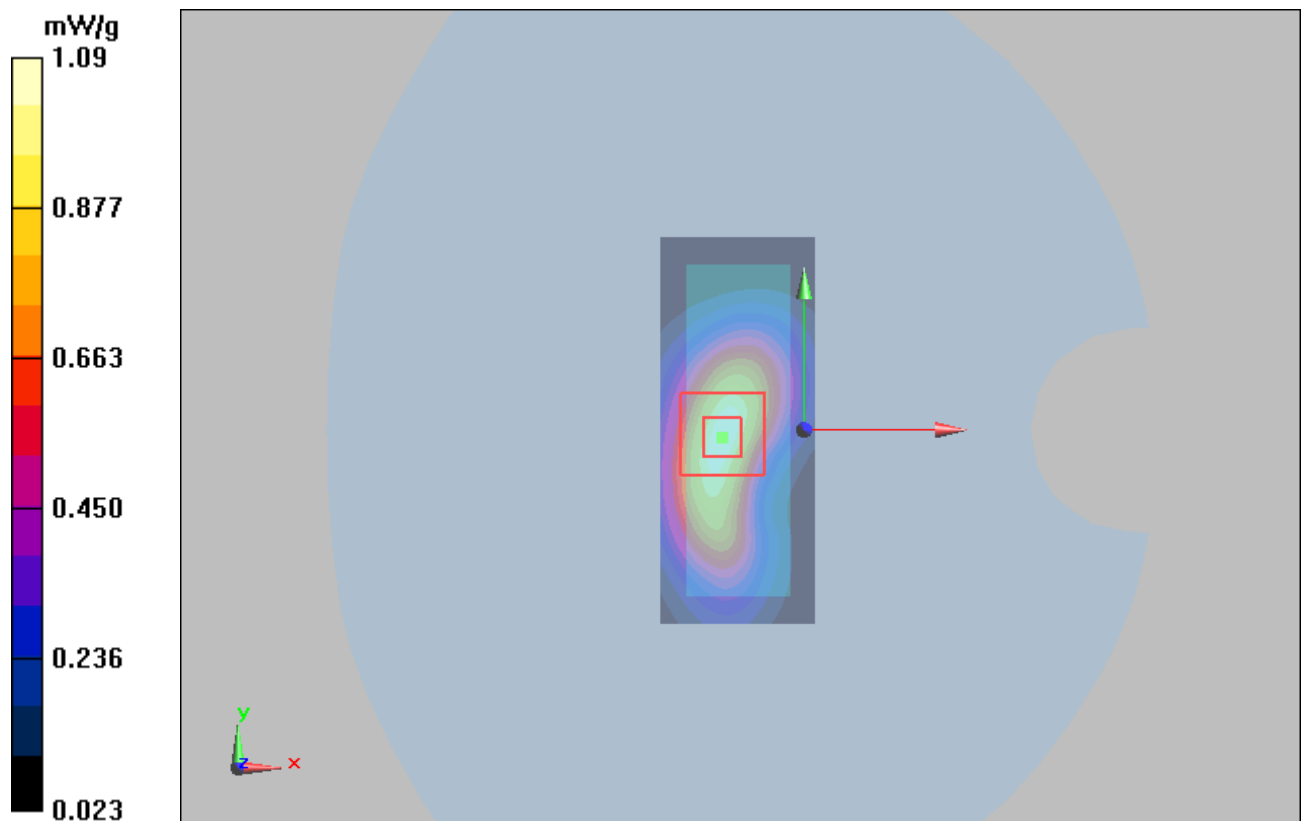


Figure 24 GSM 1900 GPRS (2TXslots) with IBM T61 Test Position 2 Channel 810

UMTS Band V with IBM T61 Test Position 1 High

Date/Time: 4/14/2013 6:38:22 PM

Communication System: WCDMA ; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 847$ MHz; $\sigma = 1.02$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 1 High/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.703 mW/g

Test Position 1 High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.1 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 1.03 W/kg

SAR(1 g) = 0.659 mW/g; SAR(10 g) = 0.407 mW/g

Maximum value of SAR (measured) = 0.719 mW/g

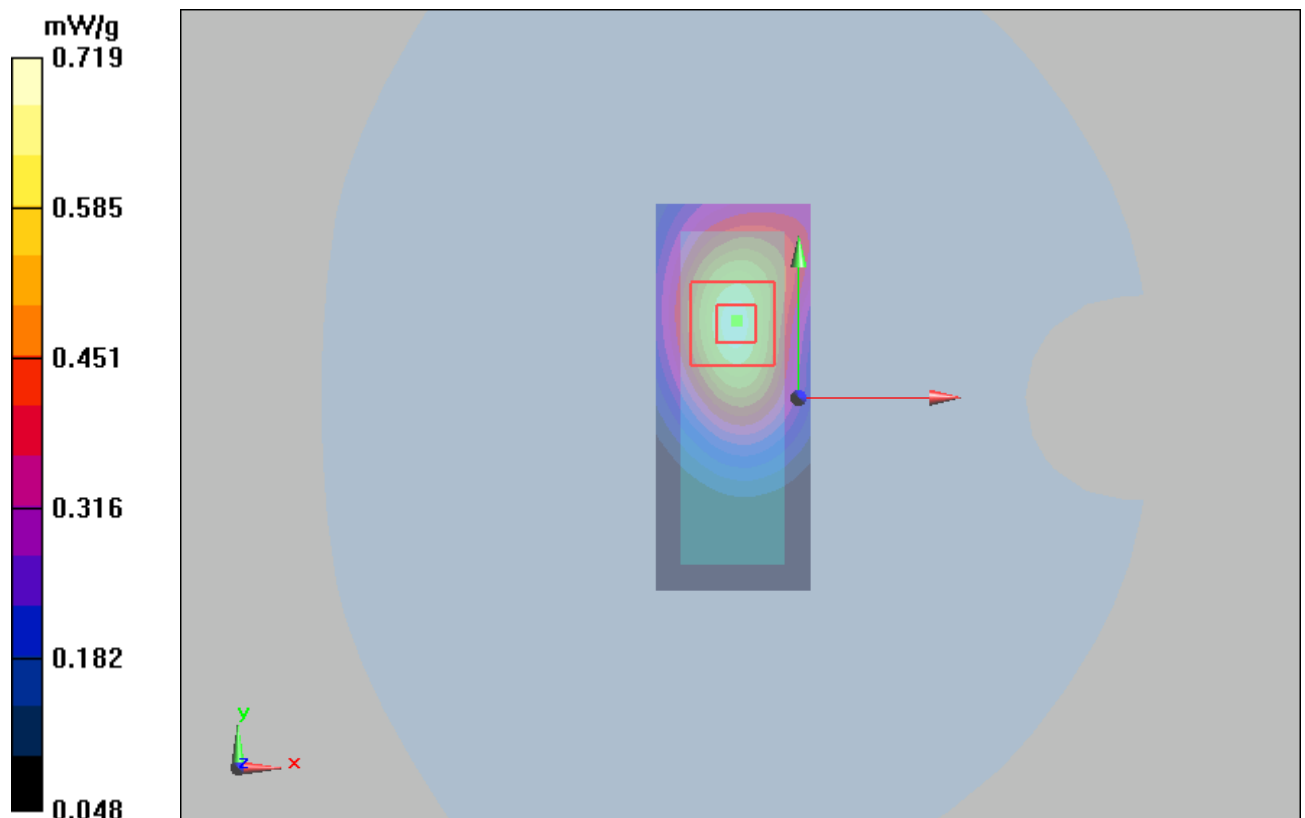


Figure 25 UMTS Band V with IBM T61 Test Position 1 Channel 4233

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UMTS Band V with IBM T61 Test Position 1 Middle

Date/Time: 4/14/2013 12:16:52 PM

Communication System: WCDMA ; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 1 Middle/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.663 mW/g

Test Position 1 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.8 V/m; Power Drift = -0.044 dB

Peak SAR (extrapolated) = 0.948 W/kg

SAR(1 g) = 0.612 mW/g; SAR(10 g) = 0.382 mW/g

Maximum value of SAR (measured) = 0.669 mW/g

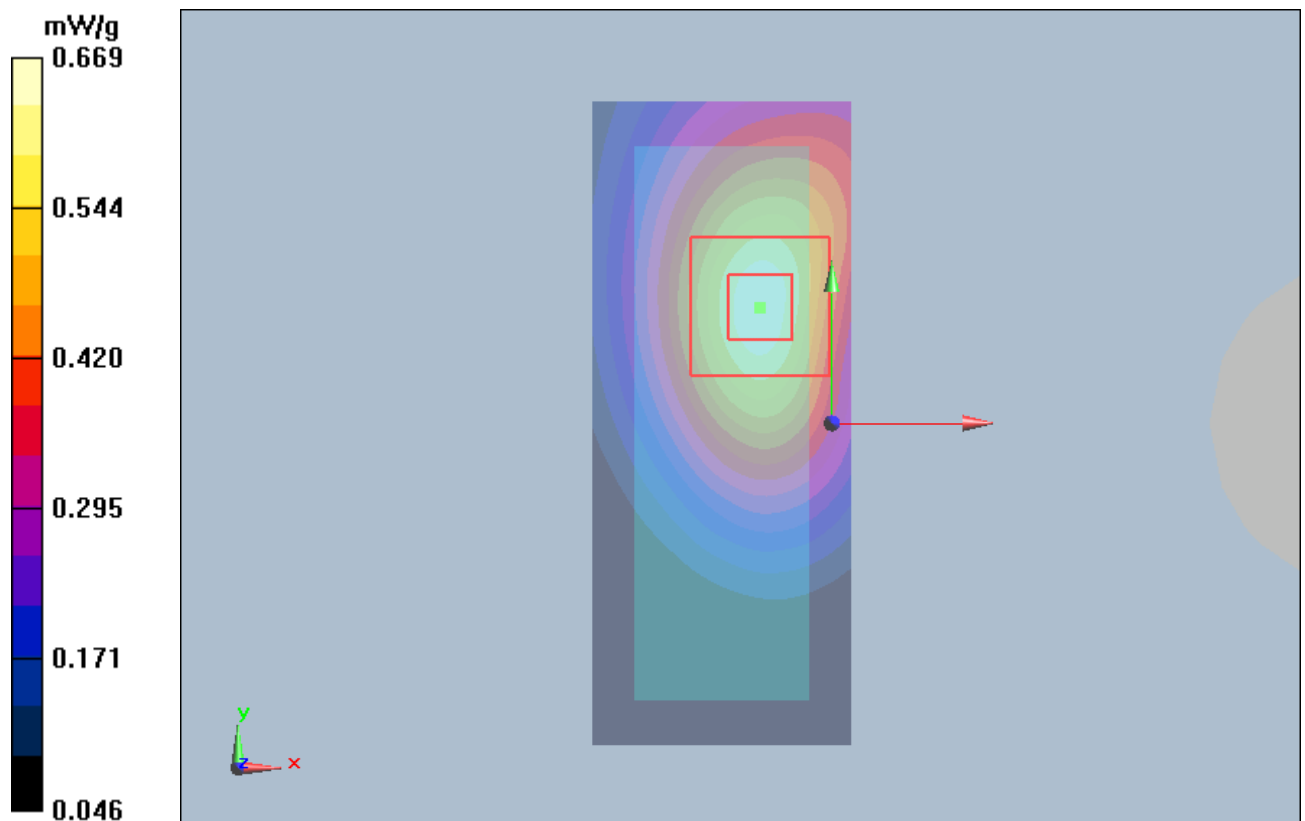


Figure 26 UMTS Band V with IBM T61 Test Position 1 Channel 4182

UMTS Band V with IBM T61 Test Position 1 Low

Date/Time: 4/14/2013 6:53:14 PM

Communication System: WCDMA ; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 1$ mho/m; $\epsilon_r = 54.4$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 1 Low/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.675 mW/g

Test Position 1 Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.4 V/m; Power Drift = -0.00955 dB

Peak SAR (extrapolated) = 0.957 W/kg

SAR(1 g) = 0.616 mW/g; SAR(10 g) = 0.384 mW/g

Maximum value of SAR (measured) = 0.671 mW/g

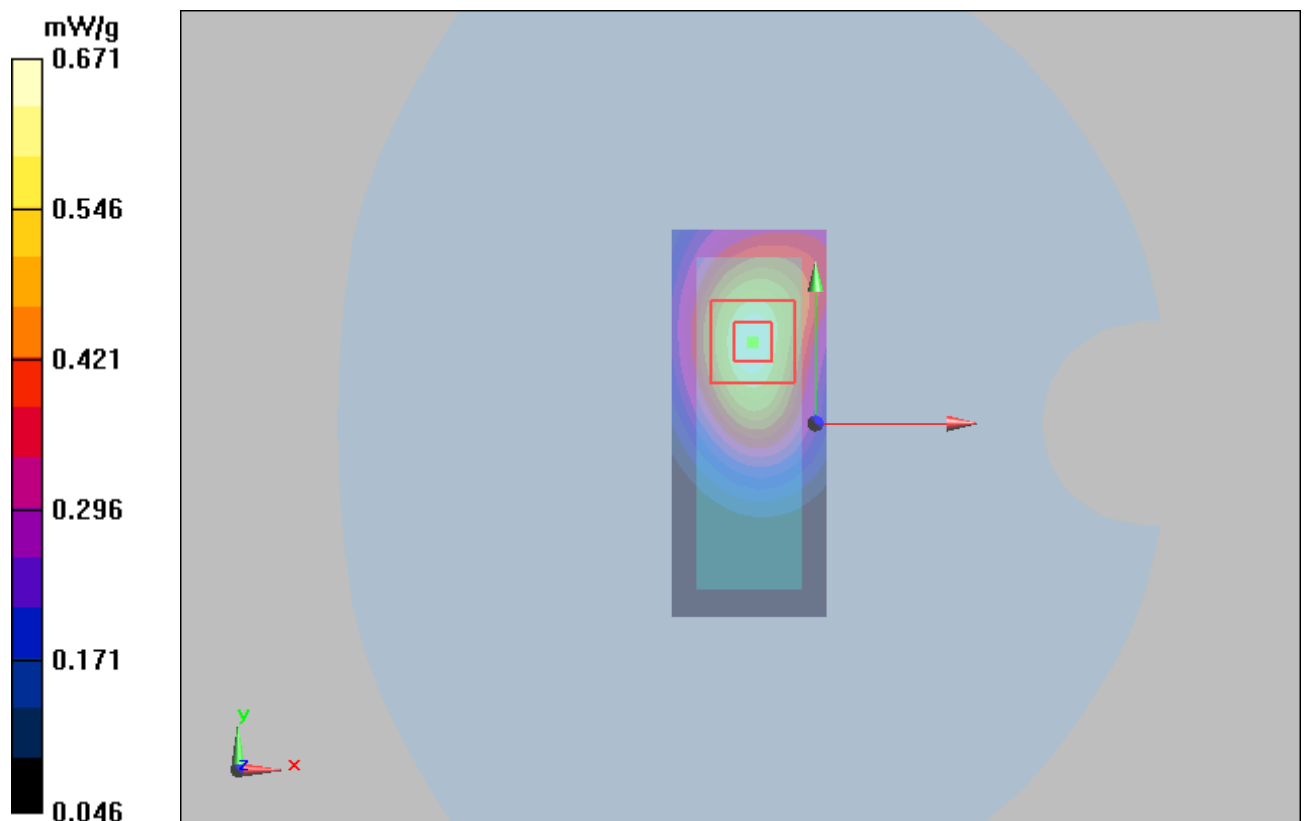


Figure 27 UMTS Band V with IBM T61 Test Position 1 Channel 4132

UMTS Band V with IBM T61 Test Position 2 High

Date/Time: 4/14/2013 12:51:51 PM

Communication System: WCDMA ; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 847$ MHz; $\sigma = 1.02$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 2 High/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.712 mW/g

Test Position 2 High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.9 V/m; Power Drift = 0.192 dB

Peak SAR (extrapolated) = 1.06 W/kg

SAR(1 g) = 0.657 mW/g; SAR(10 g) = 0.410 mW/g

Maximum value of SAR (measured) = 0.713 mW/g

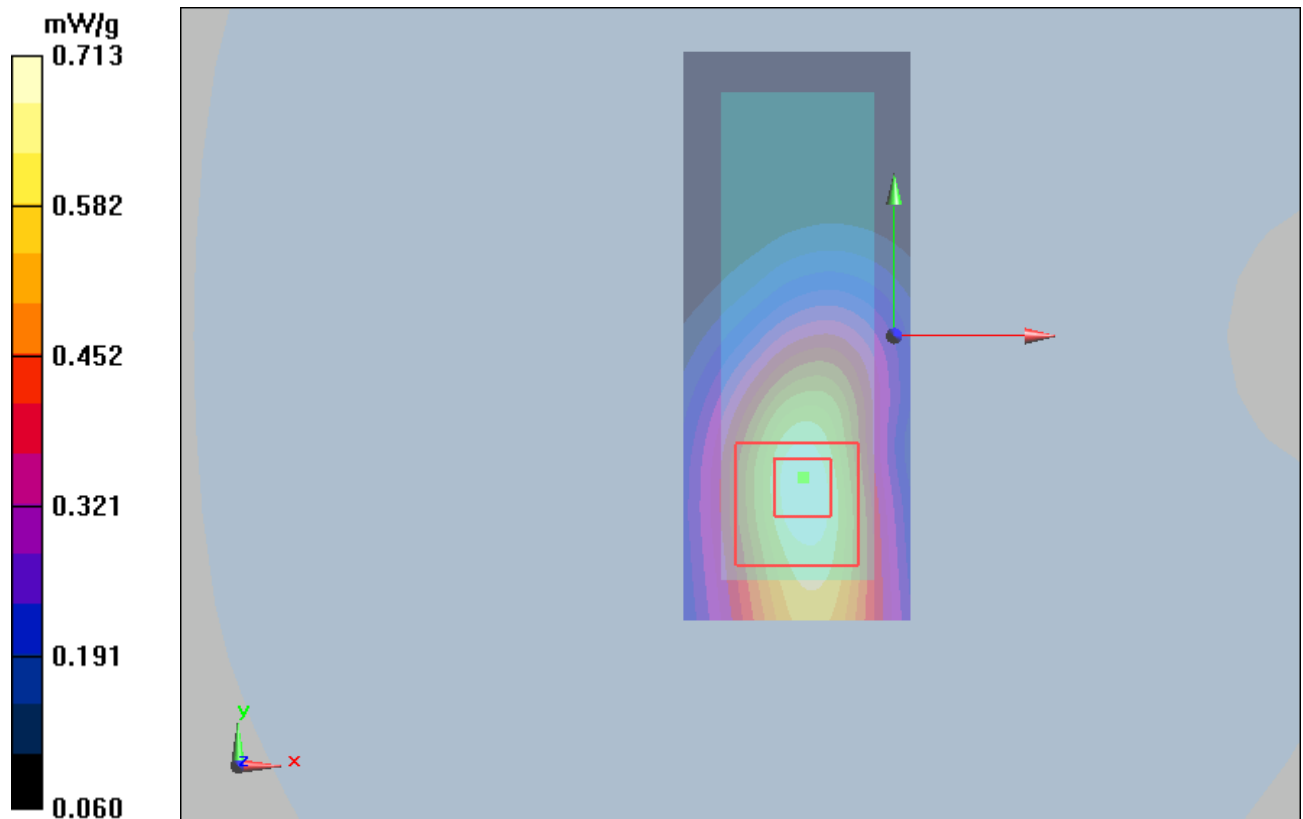


Figure 28 UMTS Band V with IBM T61 Test Position 2 Channel 4233

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UMTS Band V with IBM T61 Test Position 2 Middle

Date/Time: 4/14/2013 12:36:40 PM

Communication System: WCDMA ; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 2 Middle/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

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

Test Position 2 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.8 V/m; Power Drift = 0.130 dB

Peak SAR (extrapolated) = 1.17 W/kg

SAR(1 g) = 0.725 mW/g; SAR(10 g) = 0.444 mW/g

Maximum value of SAR (measured) = 0.789 mW/g

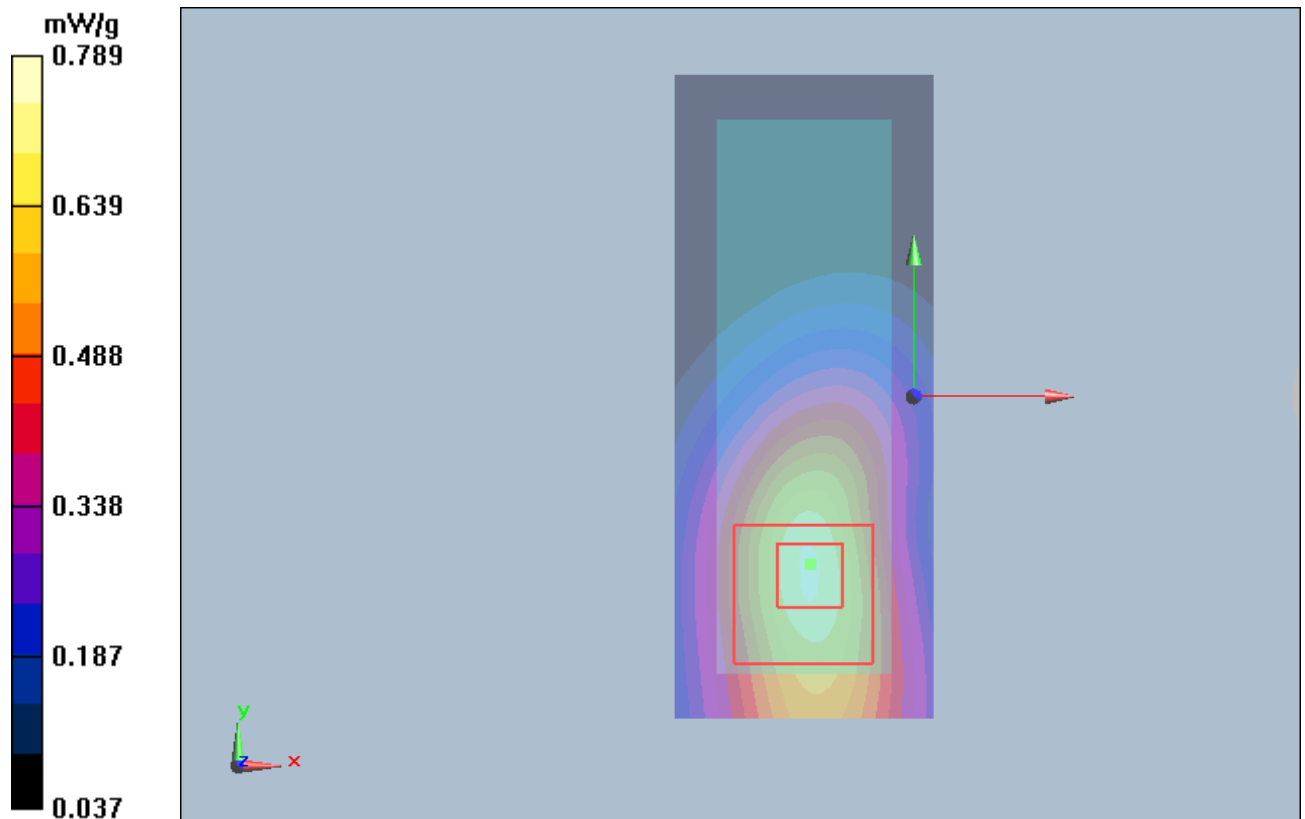


Figure 29 UMTS Band V with IBM T61 Test Position 2 Channel 4182

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UMTS Band V with IBM T61 Test Position 2 Low

Date/Time: 4/14/2013 1:07:05 PM

Communication System: WCDMA ; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 1$ mho/m; $\epsilon_r = 54.4$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 2 Low/Area Scan (41x101x1): Measurement grid: dx=10mm, dy=10mm

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

Test Position 2 Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.1 V/m; Power Drift = -0.168 dB

Peak SAR (extrapolated) = 0.910 W/kg

SAR(1 g) = 0.572 mW/g; SAR(10 g) = 0.359 mW/g

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

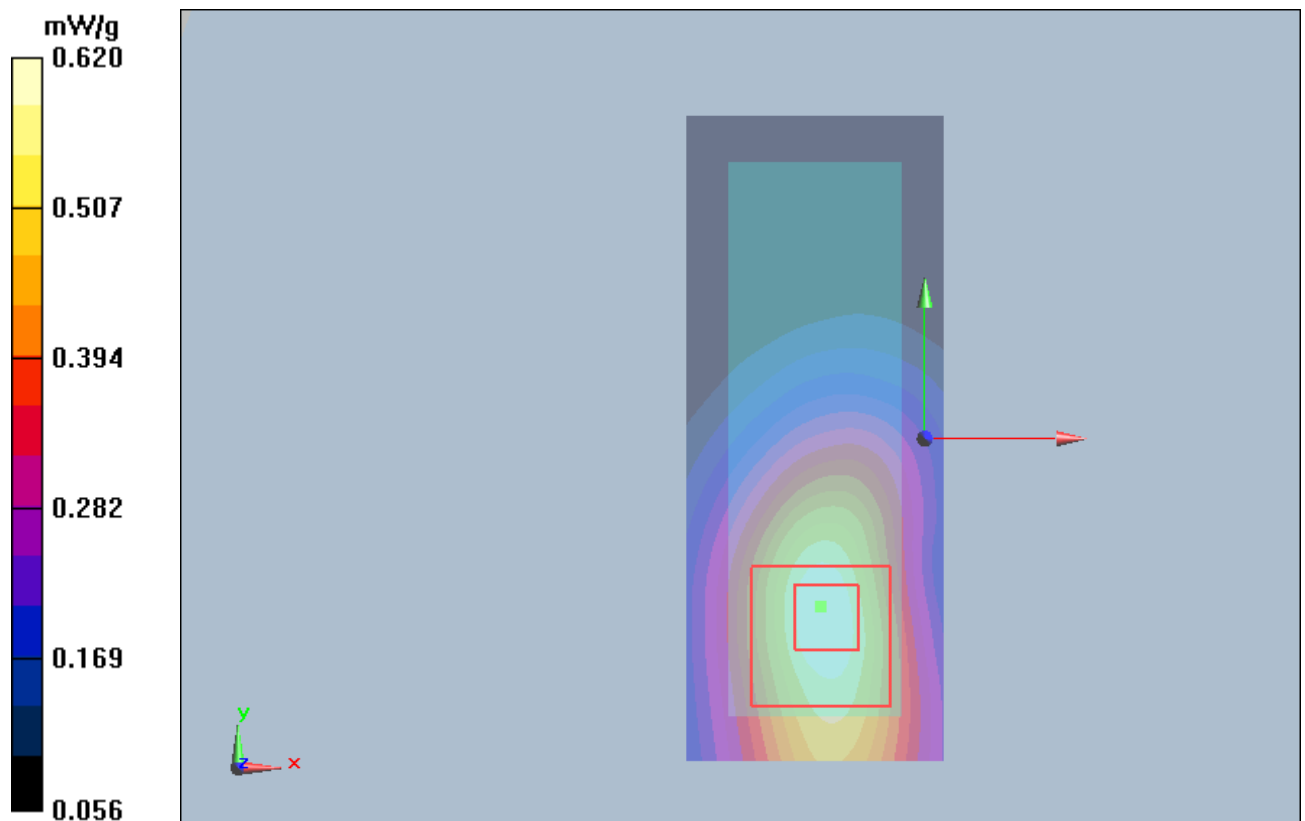


Figure 30 UMTS Band V with IBM T61 Test Position 2 Channel 4132

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UMTS Band V with IBM T61 Test Position 3 Middle

Date/Time: 4/14/2013 1:59:16 PM

Communication System: WCDMA ; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 3 Middle/Area Scan (31x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.223 mW/g

Test Position 3 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.8 V/m; Power Drift = 0.042 dB

Peak SAR (extrapolated) = 0.315 W/kg

SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.148 mW/g

Maximum value of SAR (measured) = 0.230 mW/g

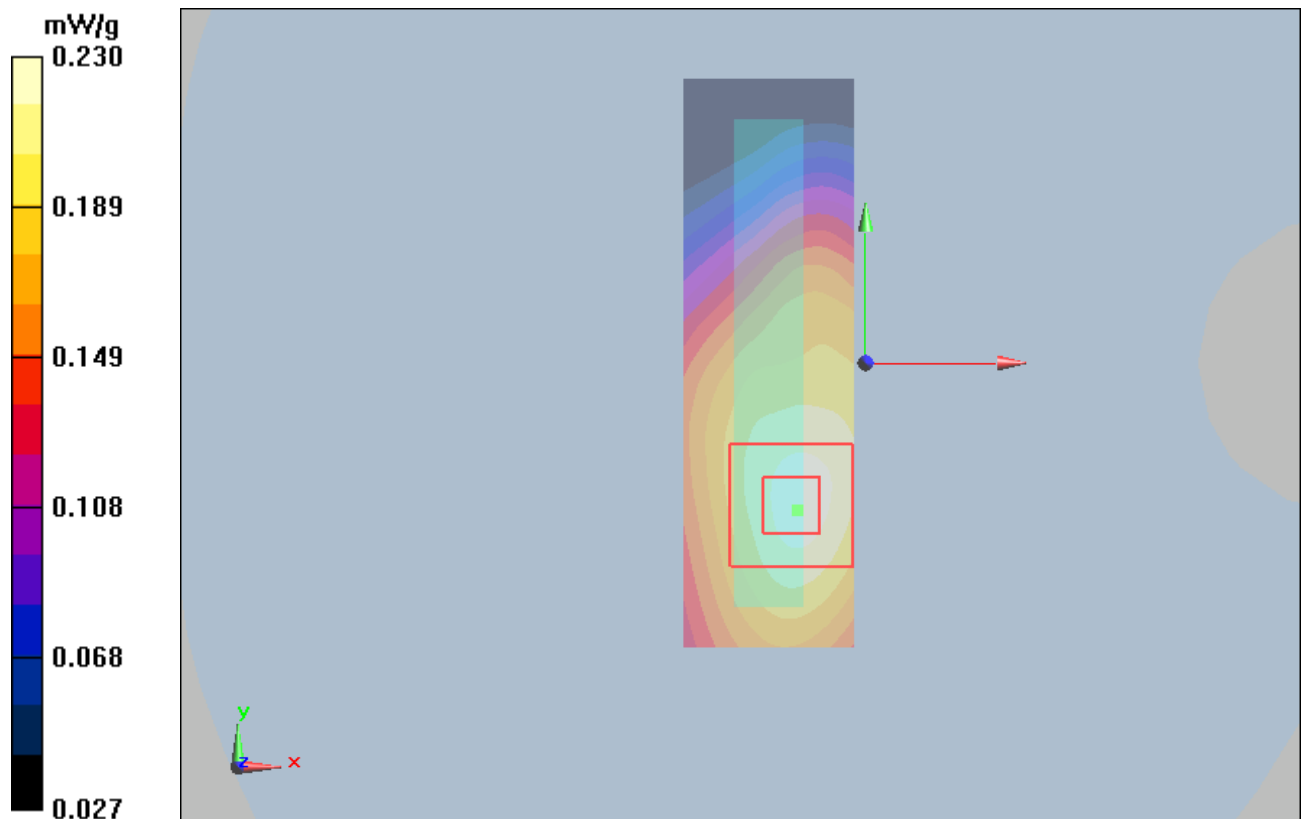


Figure 31 UMTS Band V with IBM T61 Test Position 3 Channel 4182

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UMTS Band V with IBM T6 Test Position 4 Middle

Date/Time: 4/14/2013 2:16:44 PM

Communication System: WCDMA ; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 4 Middle/Area Scan (31x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.558 mW/g

Test Position 4 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.7 V/m; Power Drift = 0.032 dB

Peak SAR (extrapolated) = 0.781 W/kg

SAR(1 g) = 0.515 mW/g; SAR(10 g) = 0.328 mW/g

Maximum value of SAR (measured) = 0.560 mW/g

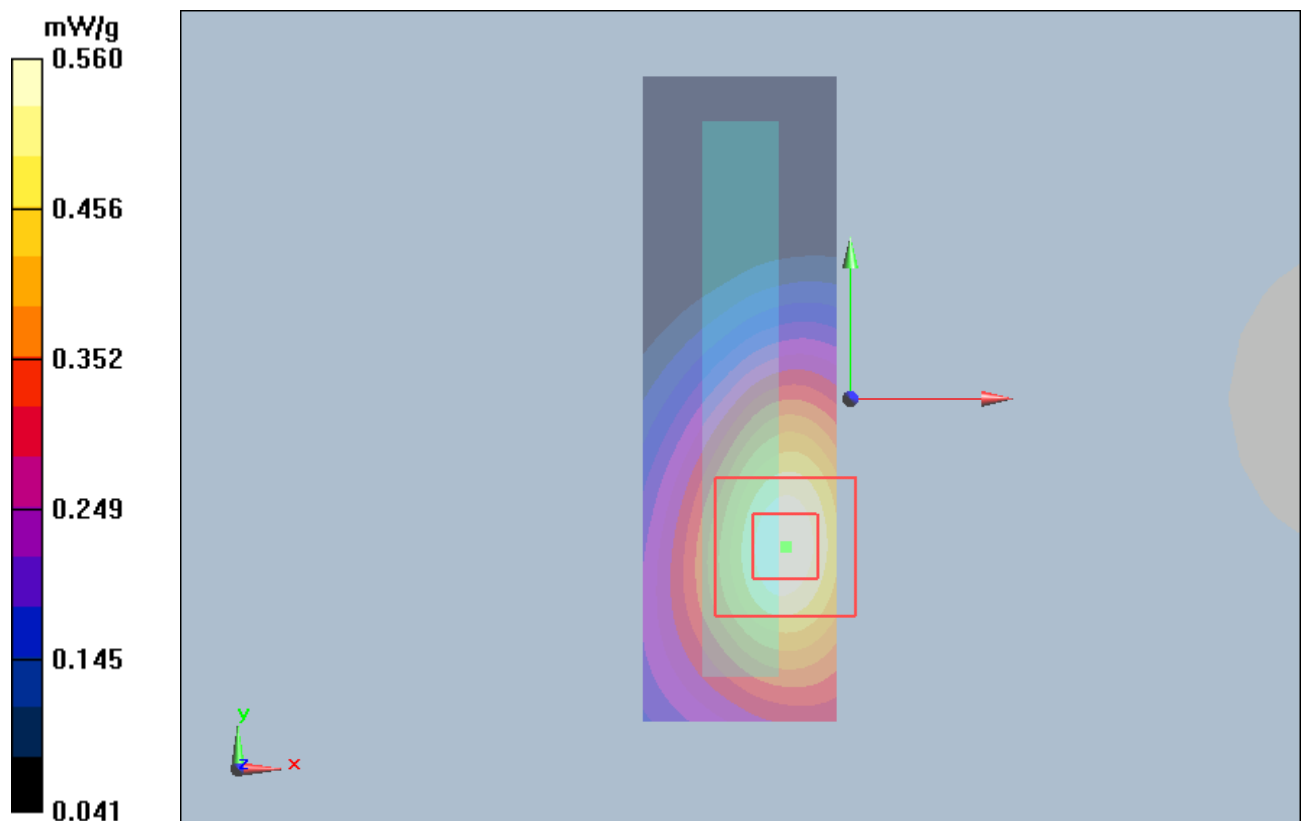


Figure 32 UMTS Band V with IBM T61 Test Position 4 Channel 4182

UMTS Band V with IBM T6 Test Position 5 Middle

Date/Time: 4/14/2013 2:47:11 PM

Communication System: WCDMA ; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3578; ConvF(8.45, 8.45, 8.45); Calibrated: 6/21/2012

Electronics: DAE4 Sn1317; Calibrated: 1/25/2013

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

Test Position 5 Middle/Area Scan (51x51x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.021 mW/g

Test Position 5 Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.35 V/m; Power Drift = -0.154 dB

Peak SAR (extrapolated) = 0.029 W/kg

SAR(1 g) = 0.017 mW/g; SAR(10 g) = 0.011 mW/g

Maximum value of SAR (measured) = 0.019 mW/g

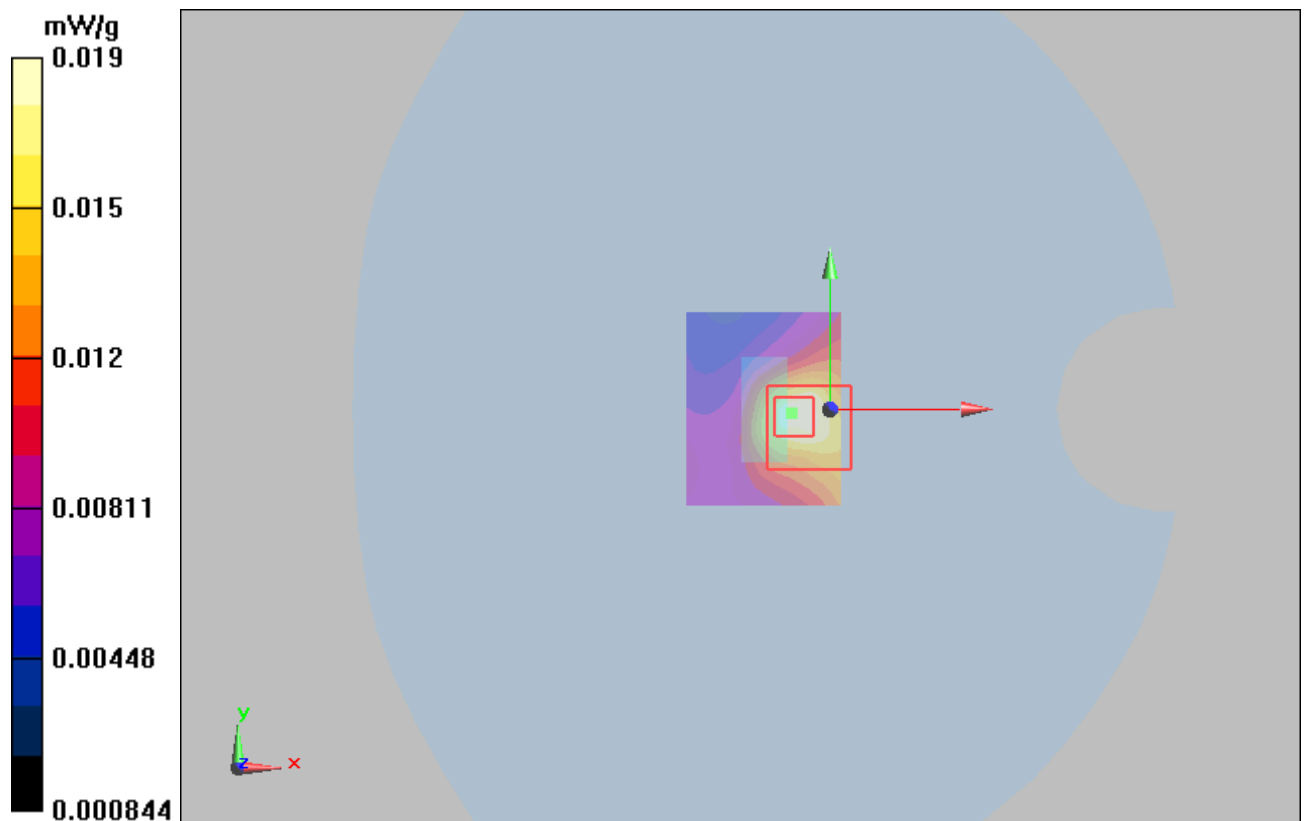


Figure 33 UMTS Band V with IBM T61 Test Position 5 Channel 4182

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ANNEX D: Probe Calibration Certificate

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



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

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

Accreditation No.: **SCS 108**

Client **Auden**

Certificate No: **EX3-3578_Jun12**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3578**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4**
Calibration procedure for dosimetric E-field probes

Calibration date: **June 21, 2012**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	10-Jan-12 (No. DAE4-660_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: June 22, 2012			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

TA Technology (Shanghai) Co., Ltd.

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



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

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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,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.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,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.

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EX3DV4 – SN:3578

June 21, 2012

Probe EX3DV4

SN:3578

Manufactured: November 4, 2005
Calibrated: June 21, 2012

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

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EX3DV4- SN:3578

June 21, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3578

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.53	0.50	0.55	$\pm 10.1 \%$
DCP (mV) ^B	102.4	101.5	103.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
0	CW	0.00	X	0.00	0.00	1.00	166.9	$\pm 2.2 \%$
			Y	0.00	0.00	1.00	173.1	
			Z	0.00	0.00	1.00	178.2	

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 Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

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

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EX3DV4- SN:3578

June 21, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3578

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	8.77	8.77	8.77	0.80	0.64	± 12.0 %
835	41.5	0.90	8.30	8.30	8.30	0.29	0.99	± 12.0 %
900	41.5	0.97	8.35	8.35	8.35	0.58	0.75	± 12.0 %
1750	40.1	1.37	7.50	7.50	7.50	0.80	0.62	± 12.0 %
1900	40.0	1.40	7.19	7.19	7.19	0.75	0.65	± 12.0 %
2000	40.0	1.40	7.13	7.13	7.13	0.77	0.58	± 12.0 %
2450	39.2	1.80	6.43	6.43	6.43	0.28	1.01	± 12.0 %
5200	36.0	4.66	4.55	4.55	4.55	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.39	4.39	4.39	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.07	4.07	4.07	0.50	1.80	± 13.1 %
5600	35.5	5.07	3.92	3.92	3.92	0.50	1.80	± 13.1 %
5800	35.3	5.27	3.72	3.72	3.72	0.55	1.80	± 13.1 %

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

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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EX3DV4- SN:3578

June 21, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3578

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	8.52	8.52	8.52	0.42	0.88	± 12.0 %
835	55.2	0.97	8.45	8.45	8.45	0.32	1.06	± 12.0 %
900	55.0	1.05	8.33	8.33	8.33	0.36	0.95	± 12.0 %
1750	53.4	1.49	7.10	7.10	7.10	0.39	0.89	± 12.0 %
1900	53.3	1.52	6.69	6.69	6.69	0.69	0.68	± 12.0 %
2000	53.3	1.52	6.86	6.86	6.86	0.70	0.67	± 12.0 %
2450	52.7	1.95	6.43	6.43	6.43	0.80	0.50	± 12.0 %
5200	49.0	5.30	3.93	3.93	3.93	0.50	1.90	± 13.1 %
5300	48.9	5.42	3.66	3.66	3.66	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.45	3.45	3.45	0.55	1.90	± 13.1 %
5600	48.5	5.77	3.25	3.25	3.25	0.55	1.90	± 13.1 %
5800	48.2	6.00	3.43	3.43	3.43	0.55	1.90	± 13.1 %

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

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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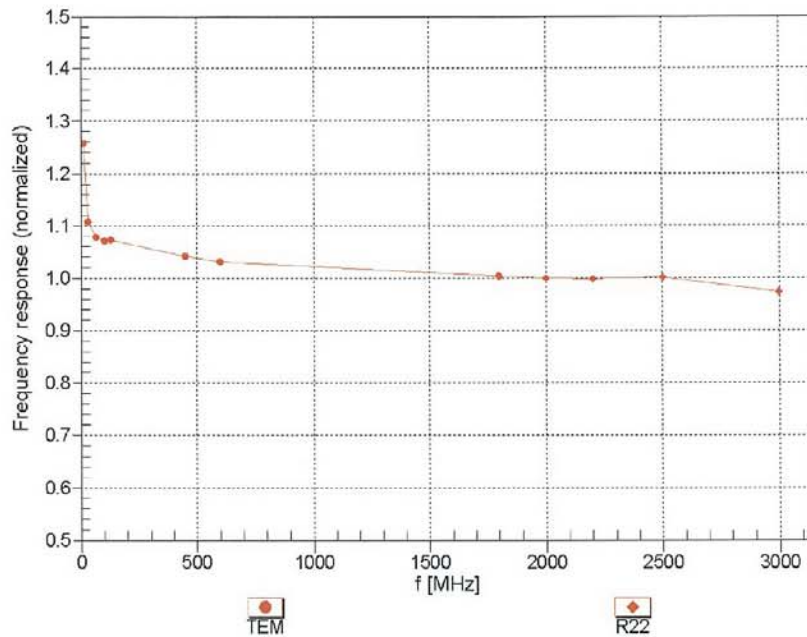
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EX3DV4- SN:3578

June 21, 2012

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

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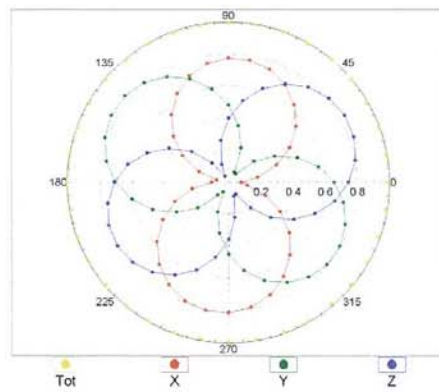
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EX3DV4- SN:3578

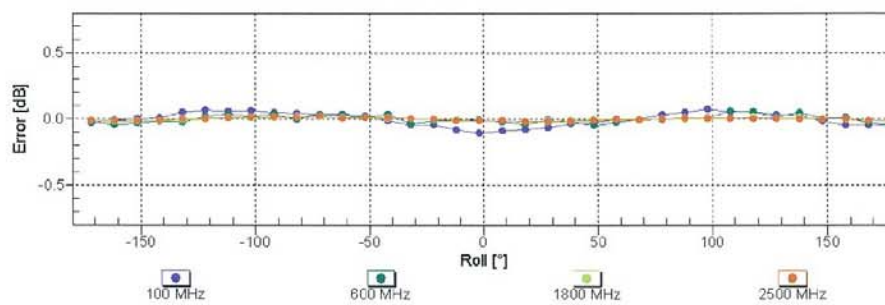
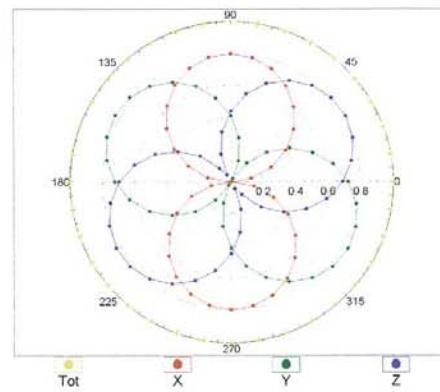
June 21, 2012

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

f=600 MHz,TEM



f=1800 MHz,R22

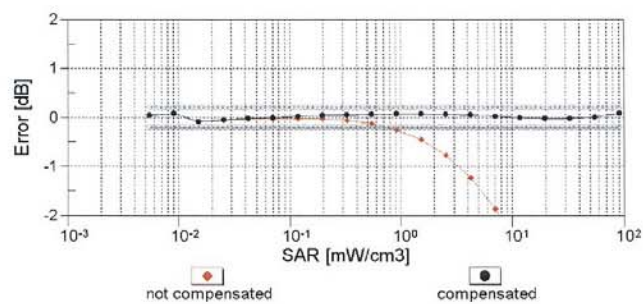
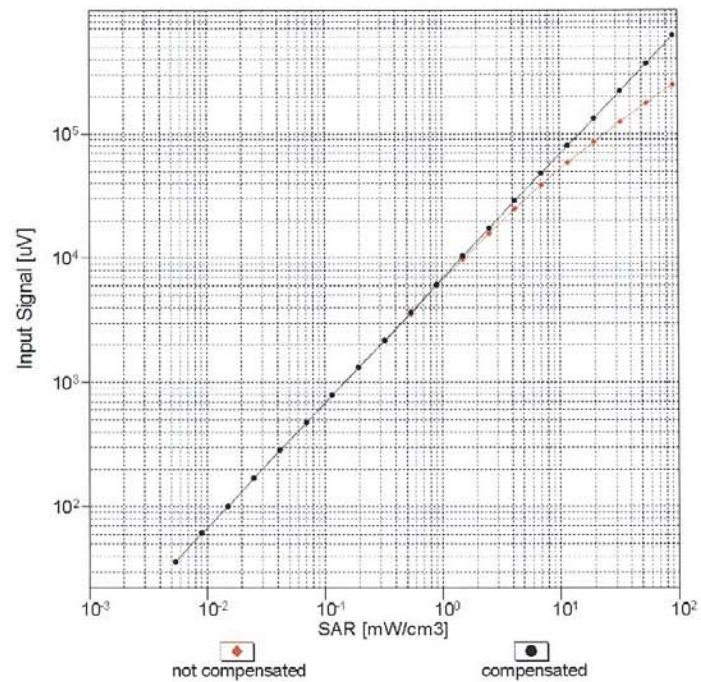


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

EX3DV4- SN:3578

June 21, 2012

Dynamic Range $f(\text{SAR}_{\text{head}})$
(TEM cell , $f = 900 \text{ MHz}$)

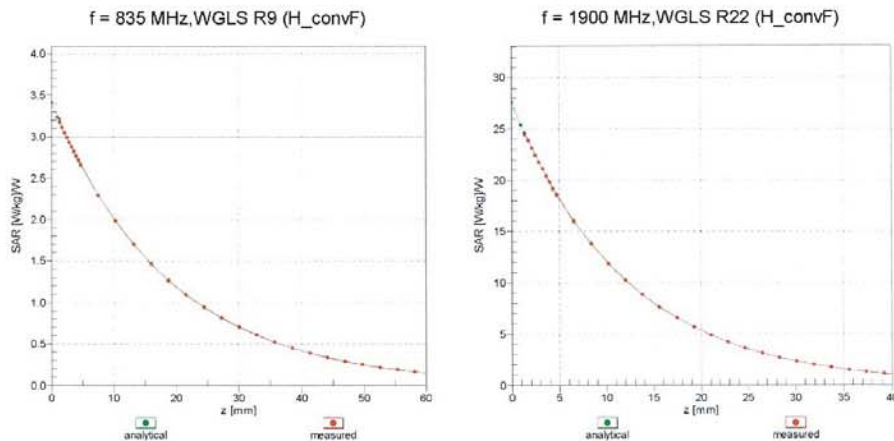


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

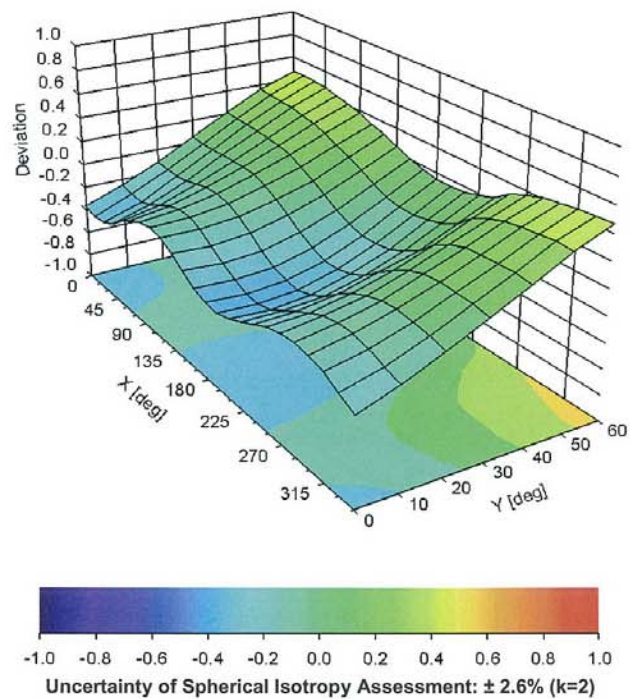
EX3DV4- SN:3578

June 21, 2012

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ, θ), $f = 900 \text{ MHz}$



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EX3DV4- SN:3578

June 21, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3578

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	68.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

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ANNEX E: D835V2 Dipole Calibration Certificate

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



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

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

Accreditation No.: **SCS 108**

Client **TA-Shanghai (Auden)**

Certificate No: **D835V2-4d020_Aug11**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d020**

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

Calibration date: **August 26, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100006	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: August 26, 2011

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

Certificate No: D835V2-4d020_Aug11

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



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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

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

SAR result with Head TSL

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

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.52 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.11 mW / g $\pm$ 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 $\pm$ 0.2) °C	53.4 $\pm$ 6 %	0.99 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

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

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

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.9 Ω - 3.1 j Ω
Return Loss	- 27.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.7 Ω - 5.4 j Ω
Return Loss	- 25.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	April 22, 2004

DASY5 Validation Report for Head TSL

Date: 25.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.89 \text{ mho/m}$; $\epsilon_r = 41.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

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

Dipole Calibration for Head Tissue/ $P_{in}=250 \text{ mW}$, $d=15\text{mm}$ /Zoom Scan (7x7x7)/Cube 0:

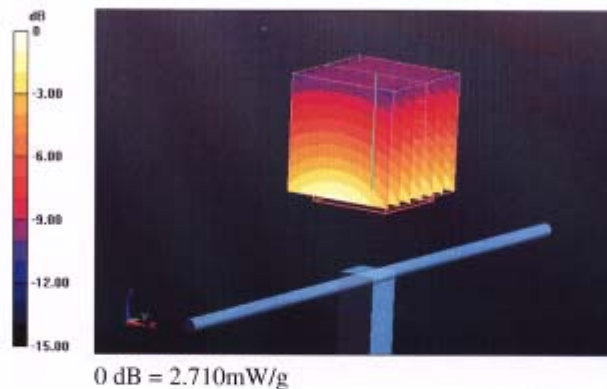
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 56.930 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.421 W/kg

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

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

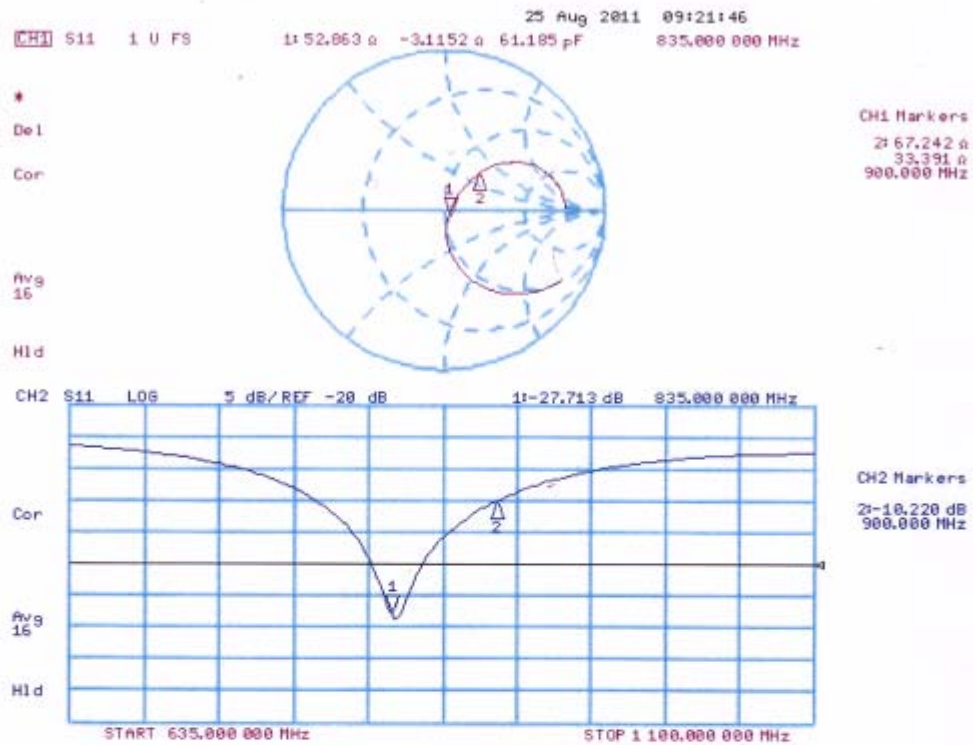


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Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 26.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz

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

Phantom section: Flat Section

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

DASY52 Configuration:

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

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

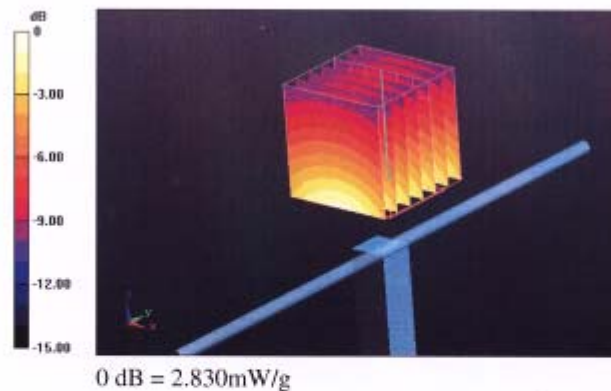
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 3.509 W/kg

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

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



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Impedance Measurement Plot for Body TSL

