MOTOROLA

Portable Cellular Phone SAR Test Report

Tests Requested By:	Motorola Mobility, Inc. 600 N. US Highway 45 Libertyville, IL 60048
Test Report #:	24971-1F
Date of Report:	Apr-23-2012
Date of Test:	Mar-28-2012 to Apr-19-2012
FCC ID #:	IHDT56NH3
Generic Name:	M0CD9
Test Laboratory:	Motorola Mobility, Inc. - ADR Test Services Laboratory No.1 Wang Jing East Road, Chaoyang District Beijing, P. R. China, 100102
Report Author:	HaiLiang Tang RF Engineer

Accreditation:

This laboratory is accredited to ISO/IEC 17025-2005 to perform the following tests:

Tests:	Procedures:
Electromagnetic Specific Absorption Rate	IEC 62209-1 RSS-102 IEEE 1528 - 2003 FCC OET Bulletin 65 (*including Supplement C*) Australian Communications Authority Radio Communications (Electromagnetic Radiation – Human Exposure) Standard 2003 CENELEC EN 50360 ARIB Std. T-56 (2002)

2404

On the following products or types of products:
Wireless Communications Devices (Examples): Two Way Radios; Portable Phones (including Cellular, Licensed Non-Broadcast and PCS); Low Frequency Readers; and Pagers

Statement of Compliance:

Motorola declares under its sole responsibility that the portable cellular telephone model to which this declaration relates, is in conformity with the appropriate General Population/Uncontrolled RF exposure standards, recommendations and guidelines (FCC 47 CFR §2.1093) as well as with CENELEC en50360:2001 and ANSI / IEEE C95.1. It also declares that the product was tested in accordance with IEEE 1528 / CENELEC EN62209-1 (2006), as well as other appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

Motorola's ISO 17025 accreditation scope does not currently include SAR testing in the 5 GHz band. Therefore, SAR testing performed in this band was performed outside of our ISO 17025 accreditation. The general procedures and guidelines provided within; FCC KDB 248227 D01, FCC KDB 648474 D01, FCC KDB 865664 D01 and IEC 62209-2 were utilized for testing.

Table of Contents

Revision History

Revision Version	Date	Notes
Rev. 0	02-May-2012	Initial report release

1. Introduction

The Motorola Mobility ADR Test Services Laboratory has performed measurements of the maximum potential exposure to the user of the portable cellular phone covered by this test report. The Specific Absorption Rate (SAR) of this product was measured. The portable cellular phone was tested in accordance with [1], [4] and [5]. The SAR values measured for the portable cellular phone are below the maximum recommended levels of 1.6 W/kg in a 1 g average set in [3] and 2.0 W/kg in a 10 g average set in [2].

Per direction of the FCC, the following SAR test data is being provided to demonstrate the device's effective utilization of power reduction conditions specified in Exhibit 12 - Operational Description. The values in the table in Section 6.0 are provided solely for purposes of confirming compliant power reduction operation and do not represent maximum SAR values of the product. For maximum reported SAR compliance values, refer to the Exhibit 11 SAR test report.

2. Description of the Device Under Test

2.1 Device Signaling

Serial Number(s) (Functional Use)	352205050010585 (GSM/WCDMA mobile hotspot SAR testing)
Production Unit or Identical Prototype (47 CFR §2..908)	Identical Prototype
Device Category	Portable (Mobile Station Class B)
RF Exposure Limits	General Population / Uncontrolled

Mode(s) of Operation	Modulation Mode(s)	Maximum Output Power Setting	Duty Cycle	Transmitting Frequency Range(s)
GSM 850	GMSK	33.5 dBm	1:8	824.2 - 848.8 MHz
GSM 1900	GMSK	30.5 dBm	1:8	1850.2 - 1909.8 MHz
WCDMA 850	QPSK	24.0 dBm	1:1	826.4 - 846.6 MHz
WCDMA 1900	QPSK	24.0 dBm	1:1	1852.4 - 1907.6 MHz
Wi-Fi 802.11b/g/n	BPSK	19.26 dBm	1:1	2412.0 - 2462.0 MHz
Bluetooth	GFSK	9.78 dBm	1:1	2402.0 – 2480.0 MHz

GSM Data Functionality	GPRS/EDGE Class 12 (4 uplink timeslots; 4 downlink timeslots; 5 total timeslots per frame)
	Class B (DTM not supported)

Mode(s) of Operation	GPRS/EDGE 850				GPRS/EDGE 1900			
Modulation	GMSK				GMSK			
Maximum Output Power Setting (dBm)	33.5	30.5	28.5	27.5	30.5	27.5	25.5	24.5
Time Average Output Power Setting (dBm)	24.5	24.5	24.3	24.5	21.5	21.5	21.3	21.5
Duty Cycle	1:8	2:8	3:8	4:8	1:8	2:8	3:8	4:8
Transmitting Frequency Range(s)	824.2 - 848.8 MHz				1850.2 - 1909.8 MHz			

Mode(s) of Operation	EDGE 850				EDGE 1900			
Modulation	8PSK				8PSK			
Maximum Output Power Setting (dBm)	28.1	25.2	23	22.2	27.2	24.2	22.2	21.2
Time Average Output Power Setting (dBm)	19.1	19.2	18.8	19.2	18.2	18.2	18	18.2
Duty Cycle	1:8	2:8	3:8	4:8	1:8	2:8	3:8	4:8
Transmitting Frequency Range(s)	824.2 - 848.8 MHz				1850.2 - 1909.8 MHz			

2.1.1 Power limit reduction for Mobile Hotspot functionality

The DUT utilizes reduced limits for the maximum transmit power when the mobile hotspot functionality is enabled. A table of the reduced limits used for testing are given below. A complete description of this functionality is provided in the "Operational Description" contained within Exhibit 12. The implementation to trigger the reduction in power requires the device to be radiating, which prevents conducted power measurements of this functionality without modification to the unit.

Mode(s) of Operation	WCDMA 850	WCDMA 1900
Channel Ranges	4132 - 4233	9262 - 9538
Maximum Output Power Setting (dBm)	24.0	24.0
Reduced Maximum Output Power Setting (dBm)	21.0	16.5

Mode(s) of Operation	GPRS/EDGE 850				GPRS/EDGE 1900			
Modulation	GMSK				GMSK			
Duty Cycle	1:8	2:8	3:8	4:8	1:8	2:8	3:8	4:8
Maximum Output Power Setting (dBm)	33.5	30.5	28.5	27.5	30.5	27.5	25.5	24.5
Time Average Output Power Setting (dBm)	24.5	24.5	24.3	24.5	21.5	21.5	21.3	21.5
Reduced Maximum Output Power Setting (dBm)	30.5	27.5	25.5	24.5	27.5	24.5	22.5	21.5
Reduced Time Average Output Power Setting (dBm)	21.5	21.5	21.3	21.5	18.5	18.5	18.3	18.5

Mode(s) of Operation	EDGE 850				EDGE 1900			
Modulation	8PSK				8PSK			
Duty Cycle	1:8	2:8	3:8	4:8	1:8	2:8	3:8	4:8
Maximum Output Power Setting (dBm)	28.1	25.2	23	22.2	27.2	24.2	22.2	21.2
Time Average Output Power Setting (dBm)	19.1	19.2	18.8	19.2	18.2	18.2	18	18.2
Reduced Maximum Output Power Setting (dBm)	25.1	22.2	20	19.2	24.2	21.2	19.2	18.2
Reduced Time Average Output Power Setting (dBm)	16.1	16.2	15.8	16.2	15.2	15.2	15	15.2

3. Test Equipment Used

3.1 Dosimetric System

The Motorola Mobility ADR Test Services Laboratory utilizes a Dosimetric Assessment System (DASY4™ v4.7 or DASY52™) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure. The overall 10 g RSS uncertainty of the measurement system is ±10.8% (K=1) with an expanded uncertainty of ±21.6% (K=2). The overall 1 g RSS uncertainty of the measurement system is ±11.1% (K=1) with an expanded uncertainty of ±22.2% (K=2). The measurement uncertainty budget is given in Appendix 6. Per IEEE 1528, this uncertainty budget is applicable to the SAR range of 0.4 W/kg to 10 W/kg.

The list of calibrated equipment used for the measurements is shown in the following table.

Description	Serial Number	Cal Date	Cal Due Date
DASY4™ DAE V1	437	Feb-9-2012	Feb-9-2013
E-Field Probe ES3DV3	3178	Jan-11-2012	Jan-11-2013
S.A.M. Phantom used for 800/900 MHz	TP-1407		
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1160		
Dipole Validation Kit, DV835V2	421TR	Apr-04-2011	Apr-04-2013
Dipole Validation Kit, DV1800V2	2d128	Apr-06-2011	Apr-06-2013
Dipole Validation Kit, DV2450V2	788	Jul-12-2011	Jul-12-2012

3.2 Additional Equipment

Description	Serial Number	Cal Date	Cal Due Date
Power Meter E4419B	GB43310686	Feb-23-2012	Feb-23-2013
Power Meter 437B	3125U09525	Feb-23-2012	Feb-23-2013
Power Sensor #1 - E9301A	MY41495336	Feb-23-2012	Feb-23-2013
Power Sensor #2 - E9301A	MY41497905	Feb-23-2012	Feb-23-2013
Signal Generator HP8648C	3847U02385	Feb-21-2012	Feb-21-2013
Network Analyzer E5071B	MY42301800	Jan-28-2012	Jan-28-2013
Dielectric Probe Kit HP85070E	MY44300245		

4. Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, ε_r, and the conductivity, σ, of the tissue simulating liquids were measured with a HP85070 Dielectric Probe Kit These values, along with the temperature of the simulated tissue are shown in the table below. The recommended limits for permittivity and conductivity are also shown. A mass density of $\rho = 1\ ^{g}/_{cm^3}$ was entered into the system in all the cases. It can be seen that the measured parameters are within tolerance of the recommended limits specified in [1] and [5].

E-field probes calibrated at 1810 MHz were used for "1900 MHz" band (1850 MHz - 1910 MHz) SAR measurements. FCC KDB 450824 provides additional requirements on page 3 of 6 for SAR testing that is performed with probe calibration points that are more than 50 MHz removed from the measured bands. The KDB requires; "(2) When nominal tissue dielectric parameters are specified in the probe calibration data, the tissue dielectric parameters measured for routine measurements should be less than the target Er and higher than the target Sigma values to minimize SAR underestimations". The 1900 MHz simulated tissues listed below meet this criteria.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ε_r	σ (S/m)	Temp (°C)
835	**Body**	**Measured,** Apr-19-2012	53.1	0.96	21.8
		Recommended Limits	55.4 ±5%	0.966 ±5%	18-25
1880		**Measured,** Apr-17-2012	51.2	1.59	20.5
		Measured, Apr-18-2012	51.1	1.59	20.5
		Recommended Limits	53.3 ±5%	1.52 ±5%	18-25

The list of ingredients and the percent composition used for the simulated tissues are indicated in the table below.

Ingredient	782 / 835 / 900 MHz Head	782 / 835 / 900 MHz Body	1800 MHz / 1900 MHz Head	1800 MHz / 1900 MHz Body	2450 MHz Head	2450 MHz Body
Sugar	57	44.9	--	--	--	--
DGBE	--	--	47	30.8	--	30
Diacetin	--	--	--	--	51	--
Water	40.45	53.06	52.62	68.8	48.75	70
Salt	1.45	0.94	0.38	0.4	0.15	--
HEC	1	1	--	--	--	--
Bact.	0.1	0.1	--	--	0.1	--

5. System Accuracy Verifications

A system accuracy verification of the DASY4™ was performed using the measurement equipment listed in Section 3.1. The daily system accuracy verification occurs within the flat section of the SAM phantom.

A SAR measurement was performed to verify the measured SAR was within ±10% from the target SAR indicated in Appendix 7. These frequencies are within ±10% of the compliance test mid-band frequency as required in [1] and [5]. The test was conducted on the same days as the measurement of the DUT. Recommended limits for permittivity and conductivity, specified in [5], are shown in the table below. The obtained results from the system accuracy verification are also displayed in the table below. SAR values are normalized to 1 W forward power delivered to the dipole. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values. The distributions of SAR compare well with those of the reference measurements (see Appendix 1). For frequencies below 3 GHz, the simulated tissue depth was verified to be 15.0 cm ± 0.5 cm. Z-axis scans showing the SAR penetration are also included in Appendix 1.

System Accuracy Verification Measurements for Body SAR Measurements						
f (MHz)	Description	SAR (W/kg), 1 gram	Dielectric Parameters		Ambient Temp (°C)	Tissue Temp (°C)
			ε_r	σ (S/m)		
835	**Measured,** Apr-19-2012	9.35	53.1	0.96	21.7	21.8
	Recommended Limits	9.77	55.2 ±5%	0.97 ±5%	18-25	18-25
1800	**Measured,** Apr-17-2012	36.15	51.2	1.59	21.7	20.7
	Measured, Apr-18-2012	35.4	51.1	1.59	21.7	20.7
	Recommended Limits	37.9	53.3 ±5%	1.52 ±5%	18-25	18-25

The following probe conversion factors were used on the E-Field probe(s) used with the system accuracy verification measurements for body SAR measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3178	835	5.70	6 of 11
		1810	4.72	6 of 11
		2450	4.13	6 of 11

6. Test Results

The test sample was operated using an actual transmission through a base station simulator. Wi-Fi testing was conducted using manufacturer test mode software, per guidance given in FCC KDB 248227. The base station simulator or test software was set up for the proper channels, transmitter power levels and transmit modes of operation.

The phone was tested in the configurations stipulated in [1], [4] and [5]. The phone was positioned into these configurations using the device holder supplied with the DASY4™ SAR measurement system The default settings for the "coarse" and "cube" scans were chosen and used for measurements. The grid spacing of the coarse scan was set to 15 mm or less as shown in the SAR plots included in Appendices 2 through 4. Please refer to the DASY4™ manual for additional information on SAR scanning procedures and algorithms used.

The DUT covered by this report has an integrated battery (p/n SNN5899A – 1780mAH) that is not intended for removal by the end user.

This battery was used to do all of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery.

The SAR results shown in tables 5 through 6 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to [6]. Also shown are the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is:

$$Extrapolated\ SAR = (Measured\ or\ Corrected\ SAR) * 10^{(-drift/10)}$$

The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The test conditions that produced the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 3. All other test conditions measured lower SAR values than those included in Appendix 3.

A "flat" phantom was used for the body-worn tests. This "flat" phantom is made out of 1" thick natural High Density Polyethylene with a thickness at the bottom of 2.0 mm. It measures 52.7 cm(long) by 26.7 cm(wide) by 21.2 cm(tall). The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm.

The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm for frequencies less than 3 GHz, or 10.0 cm ± 0.5 cm for frequencies greater than 3 GHz.

The following probe conversion factors were used on the E-Field probe(s) used for the body-worn measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3178	835	5.70	6 of 11
		1810	4.72	6 of 11
		2450	4.13	6 of 11

Per direction of the FCC, the following SAR test data is being provided to demonstrate the device's effective utilization of power reduction conditions specified in Exhibit 12 - Operational Description. The values in the table are provided solely for purposes of confirming compliant power reduction operation and do not represent maximum SAR values of the product. For maximum reported SAR compliance values, refer to the Exhibit 11 SAR test report.

Mobile Hotspot, Phone 10 mm from Phantom									
				1 g SAR value w/o Pwr Reduction		***1 g SAR value w/ Pwr Reduction***		**Pwr Reduction Specification (dB)**	**Measured Pwr Reduction (dB)**
***F* (MHz)**	**Mode**	**Test Configuration**	**Channel**	**Measured (W/kg)**	**Extrapolated (W/kg)**	**Measured (W/kg)**	**Extrapolated (W/kg)**		
835	**GPRS 850 class 12 (4 Upslots)**	Front of Device 10 mm from Phantom	128						
			190	0.762	0.77	0.426	0.43	-3	-2.5
			251						
	WCDMA 800, HSPA Rel 6, Sub 1	Back of Device 10 mm from Phantom	4132						
			4180	0.826	0.83	0.423	0.42	-3	-3
			4233						
1880	**GPRS 1900 class 12 (4 Upslots)**	Bottom Edge of Device 10 mm from Phantom	512						
			661	1.76	1.76	0.673	0.69	-3	-4.1
			810						
	WCDMA 1900, HSPA Rel 6, Sub 1	Bottom Edge of Device 10 mm from Phantom	9262						
			9400	3.52	3.58	0.611	0.62	-7.5	-7.6
			9538						

References

[1] CENELEC, en62209-1:2006 “Human Exposure to Radio Frequency Fields From Hand - Held and Body - Mounted Wireless Communication Devices – Human Models, Instrumentation, and Procedures”

[2] CENELEC, en50360:2001 “Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)”.

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

[4] FCC OET Bulletin 65 Supplement C 01-01

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

[6] ICNIRP Guidelines “Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)”

Appendix 1

SAR distribution comparison for the system accuracy verification

Date/Time: 4/19/2012 7:56:34 AM

Test Laboratory:MOTOROLA - Apr-19-2012 835 MHz Body

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:421TR; FCC ID:IHDT56NH3

Procedure Notes: 835 MHz System Performance Check; Dipole Sn# 421TR; Input Power = 200 mW;
Sim.Temp@meas = 21.8; Sim.Temp@SPC = 21.8; Room Temp @ SPC = 21.7
Communication System: CW - Dipole; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Validation *BODY Tissue* ;
Medium parameters used: f = 835 MHz; σ = 0.96 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3178; ConvF(5.7, 5.7, 5.7); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Daily SPC Check/Z-Axis Retraction (1x1x31):

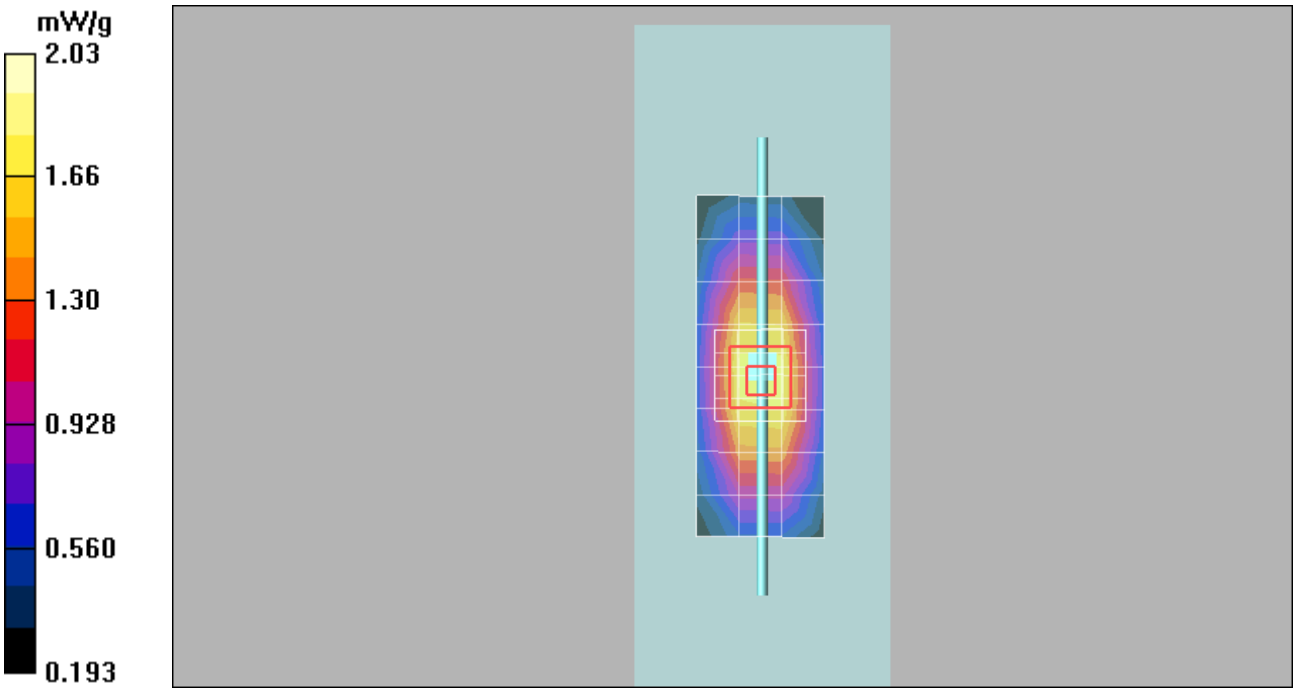
Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 2.04 mW/g

Daily SPC Check/Dipole Area Scan (9x4x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.71 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 46.4 V/m; Power Drift = 0.025 dB
Peak SAR (extrapolated) = 2.74 W/kg
SAR(1 g) = 1.87 mW/g; SAR(10 g) = 1.23 mW/g
Maximum value of SAR (measured) = 2.03 mW/g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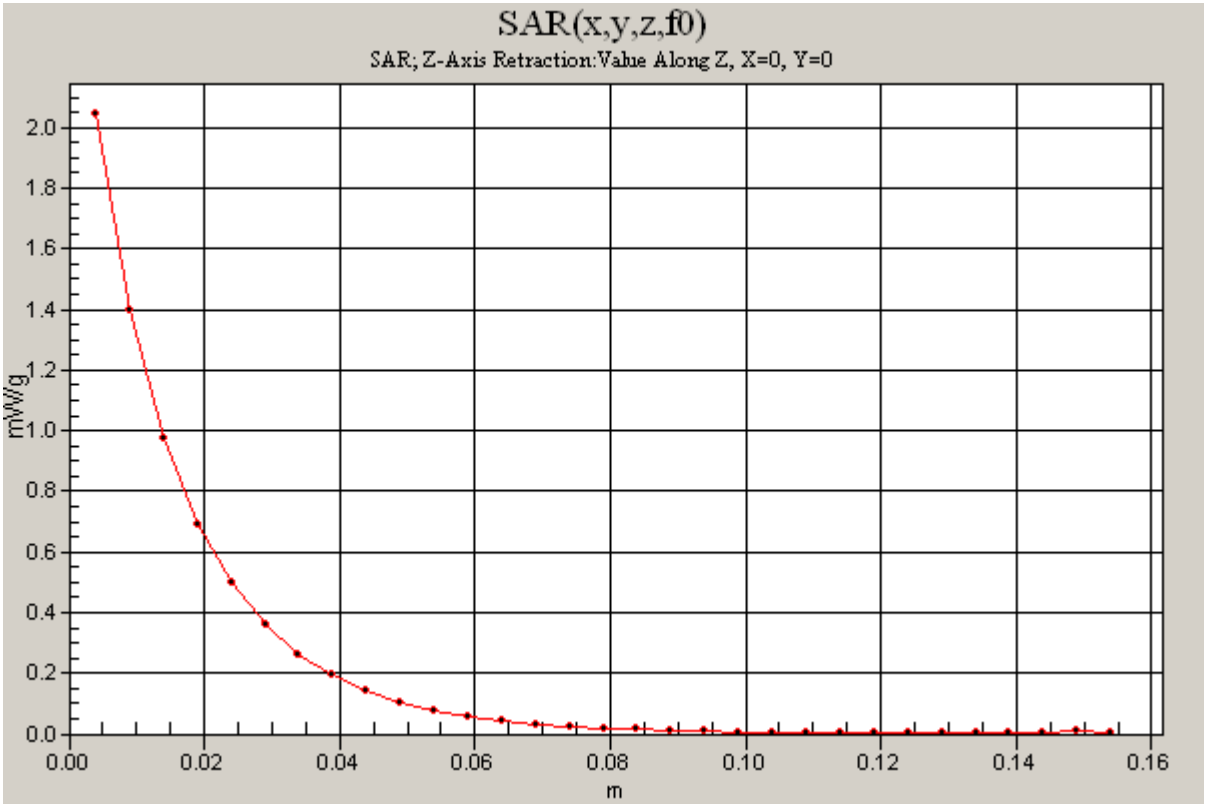
1.66
1.30
0.928
0.560
0.193


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date/Time: 4/17/2012 10:23:12 AM

Test Laboratory:MOTOROLA - Apr-17-2012 1800 MHz Body

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d128; FCC ID:IHDT56NH3
Procedure Notes: 1800MHz System Performance Check; Dipole Sn# 2d128; Input Power =200mW; Sim.Temp@meas = 20.5; Sim.Temp@SPC = 20.7; Room Temp @ SPC = 21.7
Communication System: CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: Validation *BODY Tissue* ;
Medium parameters used: f = 1800 MHz; σ = 1.5 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3178; ConvF(4.72, 4.72, 4.72); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Daily SPC Check/Z-Axis Retraction (1x1x31):

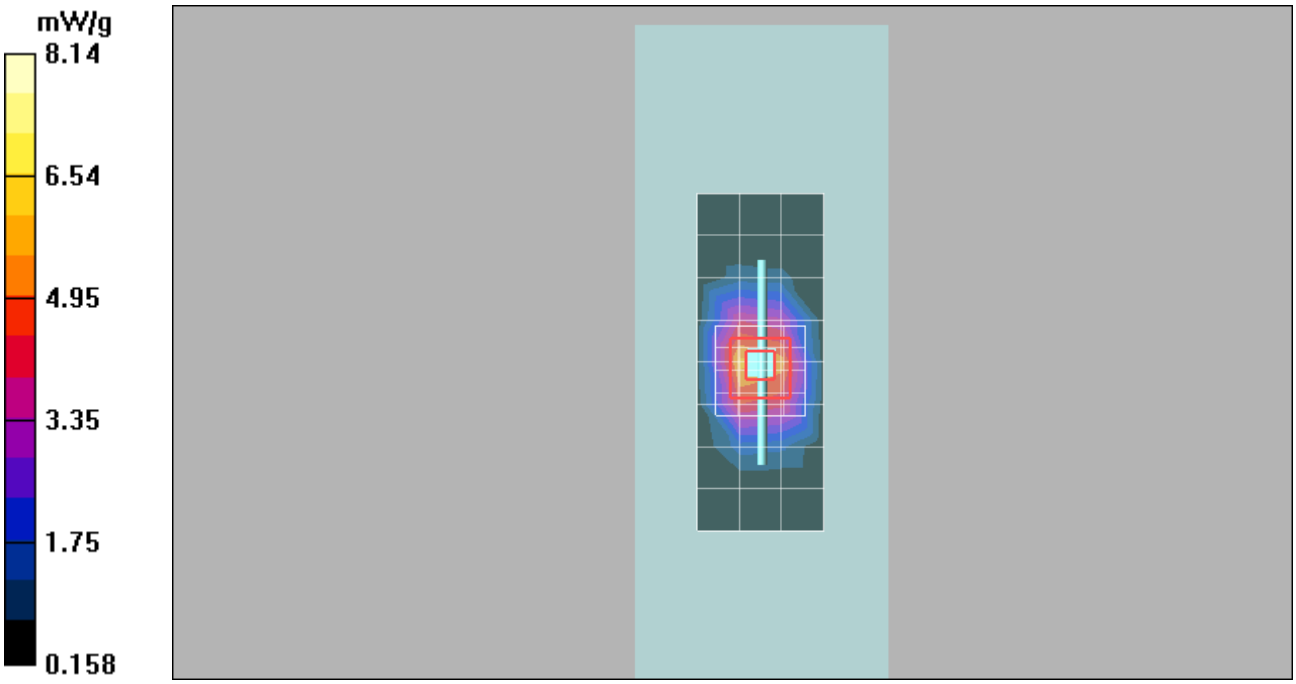
Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.23 mW/g

Daily SPC Check/Dipole Area Scan (9x4x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.71 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 74.9 V/m; Power Drift = 0.081 dB
Peak SAR (extrapolated) = 12.7 W/kg
SAR(1 g) = 7.23 mW/g; SAR(10 g) = 3.81 mW/g
Maximum value of SAR (measured) = 8.14 mW/g


mW/g
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4.95
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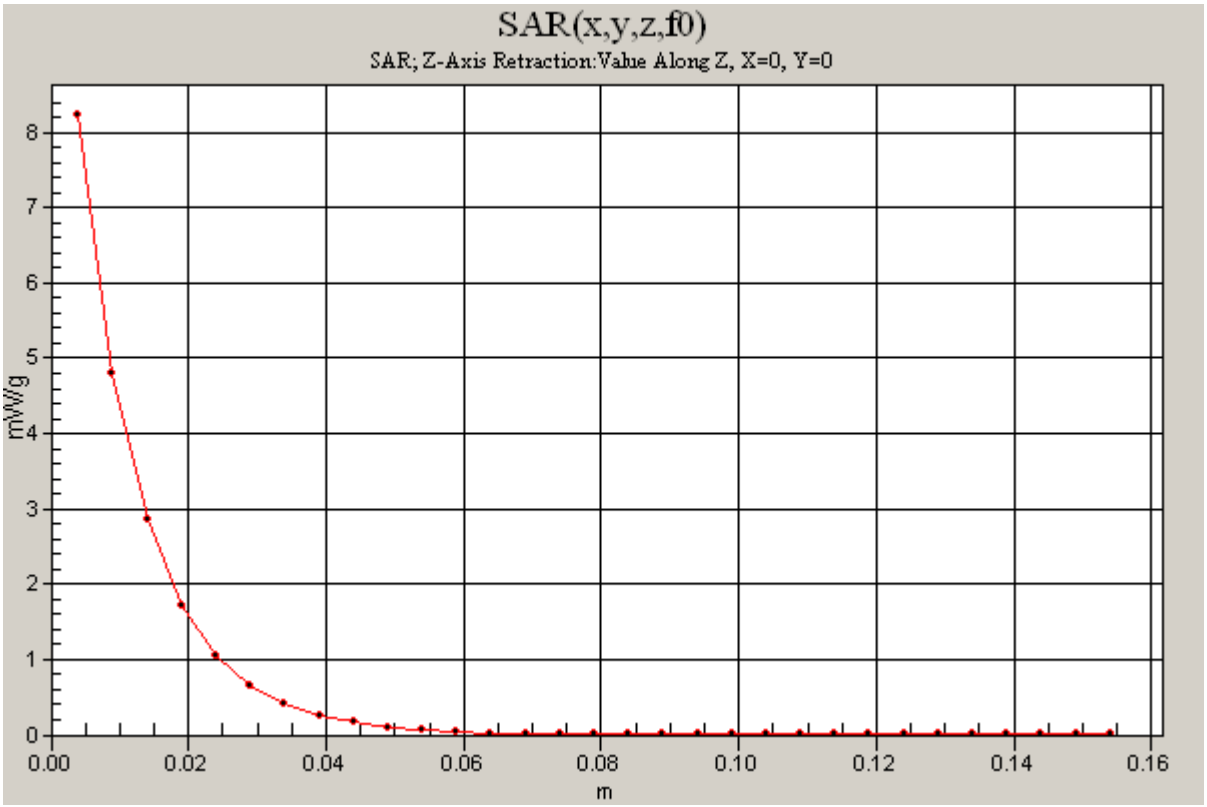
1.75
0.158


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
8
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16

Date/Time: 4/18/2012 4:02:28 PM

Test Laboratory:MOTOROLA - Apr-18-2012 1800 MHz Body

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d128; FCC ID:IHDT56NH3
Procedure Notes: 1800MHz System Performance Check; Dipole Sn# 2d128; Input Power =200mW; Sim.Temp@meas = 20.5; Sim.Temp@SPC = 20.7; Room Temp @ SPC = 21.7
Communication System: CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: Validation *BODY Tissue* ;
Medium parameters used: f = 1800 MHz; σ = 1.5 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3178; ConvF(4.72, 4.72, 4.72); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Daily SPC Check/Z-Axis Retraction (1x1x31):

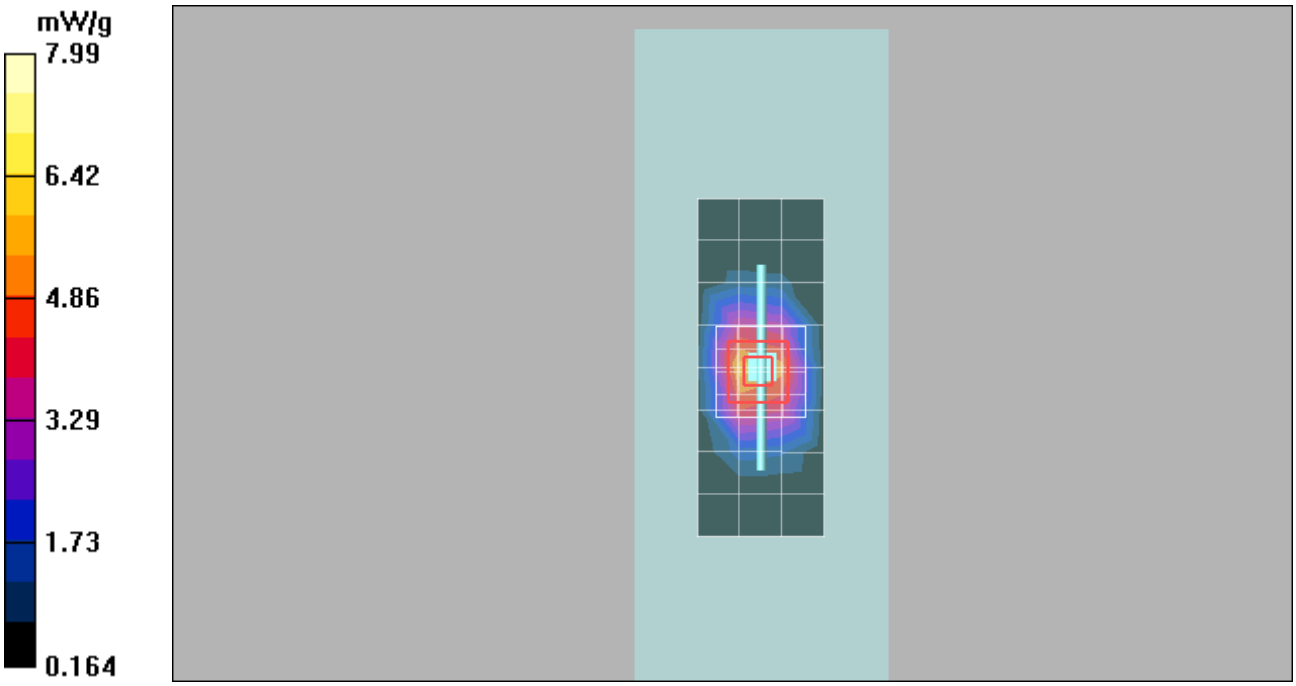
Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.05 mW/g

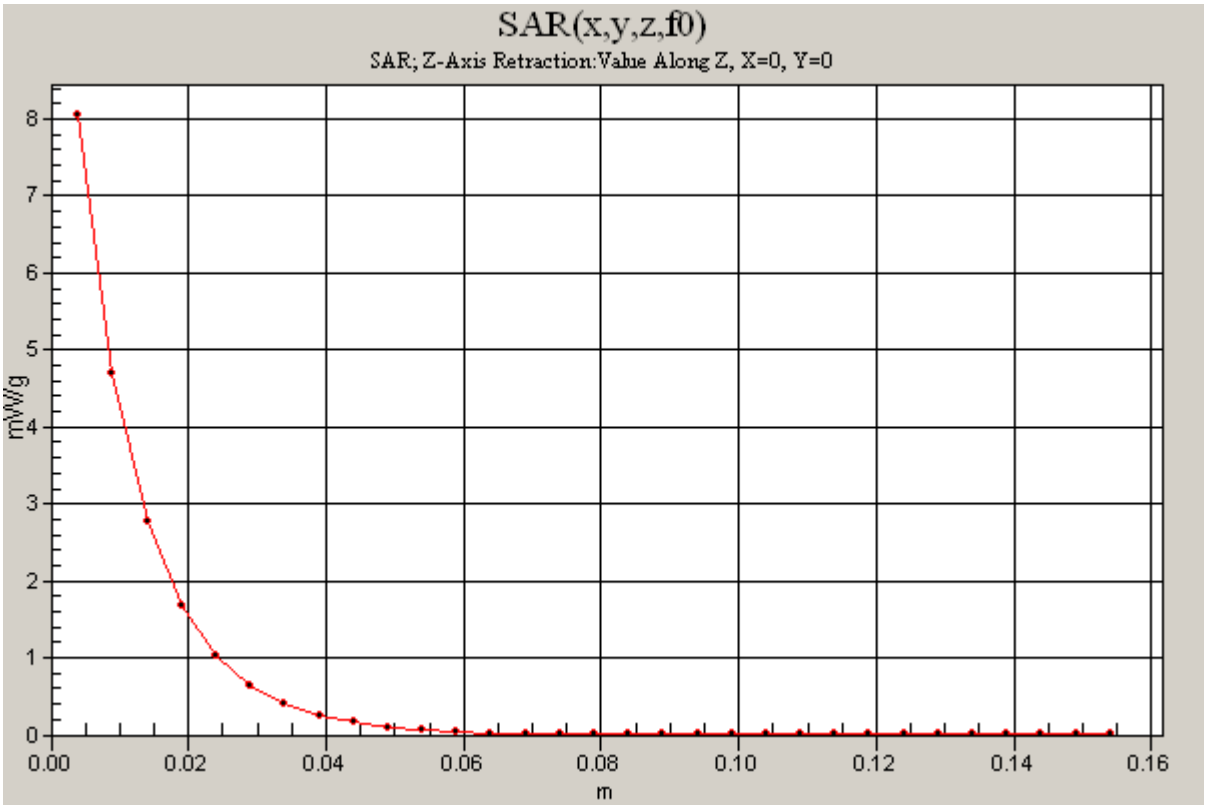
Daily SPC Check/Dipole Area Scan (9x4x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.68 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 73.9 V/m; Power Drift = 0.101 dB
Peak SAR (extrapolated) = 12.4 W/kg
SAR(1 g) = 7.08 mW/g; SAR(10 g) = 3.73 mW/g
Maximum value of SAR (measured) = 7.99 mW/g


mW/g
7.99
6.42
4.86
3.29
1.73
0.164


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
8
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16

Appendix 2

SAR distribution plots for Mobile Hotspot Configuration

Date/Time: 4/19/2012 9:36:37 AM

Test Laboratory: MOTOROLA - GPRS 850 Mobile Hotspot

Serial: 352205050010585; FCC ID:IHDT56NH3
Unit Operating at Non-Reduced Power for Verification of Power Reduction
Procedure Notes: Pwr Step: 05; Antenna Position: Internal; Battery Model #: Internal;
DEVICE POSITION: Body Worn, Front of phone 10mm from phantom
Communication System: GPRS 850 - Class 12; Frequency: 836.6 MHz;
Communication System Channel Number: 190; Duty Cycle: 1:2.075
Medium: Low Freq Body;
Medium parameters used: f = 835 MHz; σ = 0.96 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

DASY4 Configuration:

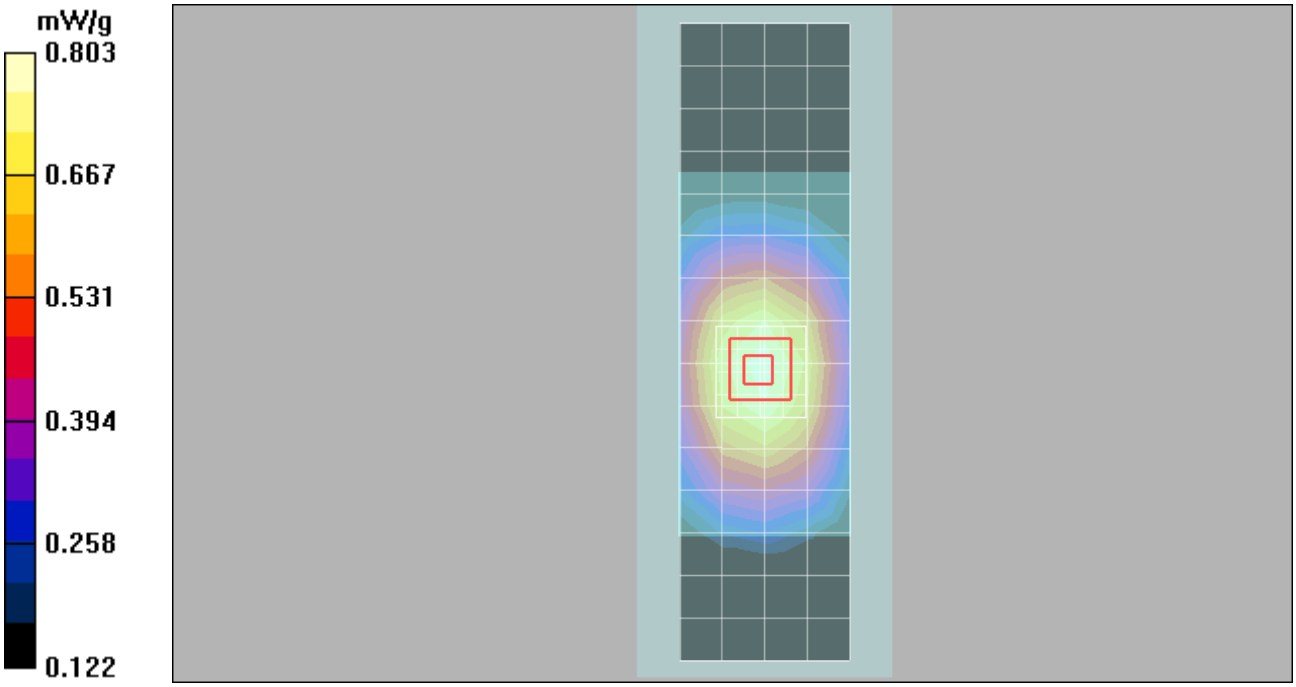
- Probe: ES3DV3 - SN3178; ConvF(5.7, 5.7, 5.7); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (16x7x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.795 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.9 V/m; Power Drift = -0.023 dB
Peak SAR (extrapolated) = 0.924 W/kg
SAR(1 g) = 0.762 mW/g; SAR(10 g) = 0.582 mW/g
Maximum value of SAR (measured) = 0.803 mW/g



Date/Time: 4/19/2012 9:01:54 AM

Test Laboratory: MOTOROLA - GPRS 850 Mobile Hotspot

Serial: 352205050010585; FCC ID:IHDT56NH3

Procedure Notes: Pwr Step: 05; Antenna Position: Internal; Battery Model #: Internal;
Device Position: Body Worn, Front of Phone 10mm from Phantom
Communication System: GPRS 850 - Class 12; Frequency: 836.6 MHz;
Communication System Channel Number: 190; Duty Cycle: 1:2.075
Medium: Low Freq Body;
Medium parameters used: f = 835 MHz; σ = 0.96 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

DASY4 Configuration:

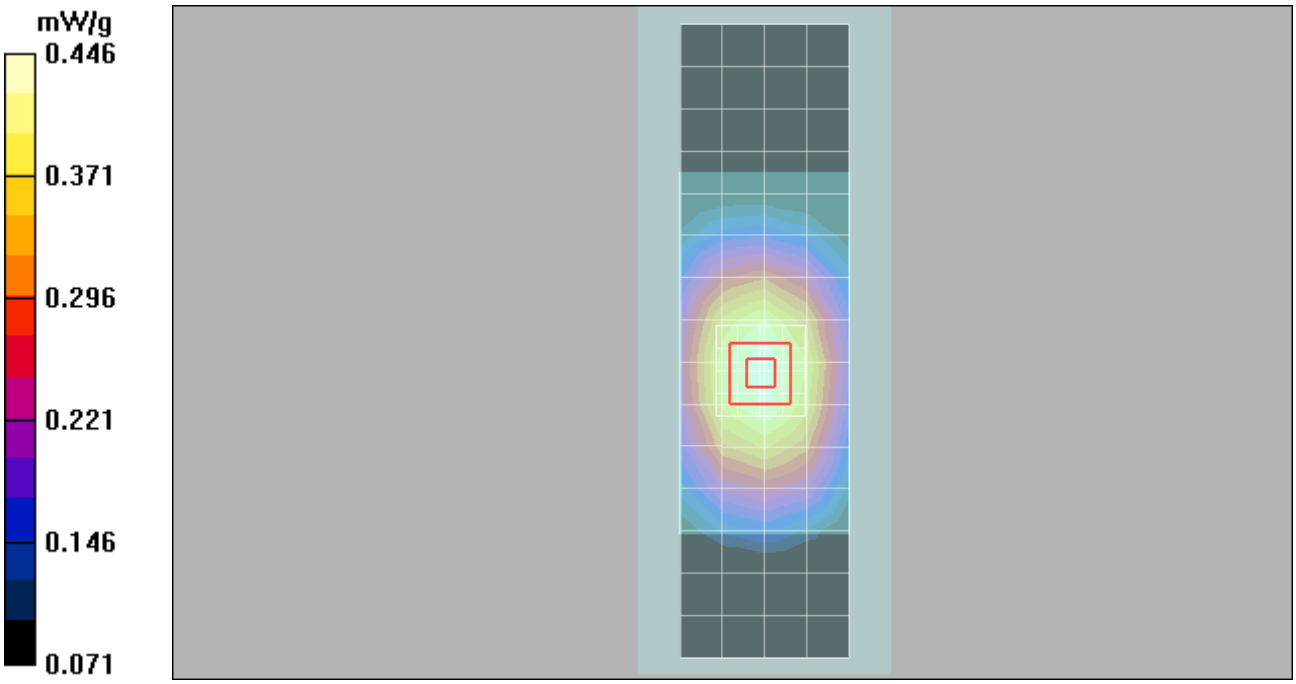
- Probe: ES3DV3 - SN3178; ConvF(5.7, 5.7, 5.7); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (16x7x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.446 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.8 V/m; Power Drift = -0.035 dB
Peak SAR (extrapolated) = 0.517 W/kg
SAR(1 g) = 0.426 mW/g; SAR(10 g) = 0.326 mW/g



Date/Time: 4/19/2012 3:06:00 PM

Test Laboratory: MOTOROLA WCDMA 850 Mobile Hotspot

Serial: 352205050010585; FCC ID:IHDT56NH3

Unit Operating at Non-Reduced Power for Verification of Power Reduction

Procedure Notes: Pwr Step: All Up; Antenna Position: Internal; Battery Model #: Internal;
DEVICE POSITION: Body Worn, Back of phone 10mm from phantom
Communication System: 3G-WCDMA 850; Frequency: 836 MHz;
Communication System Channel Number: 4180; Duty Cycle: 1:1
Medium: Low Freq Body;
Medium parameters used: f = 835 MHz; σ = 0.96 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

DASY4 Configuration:

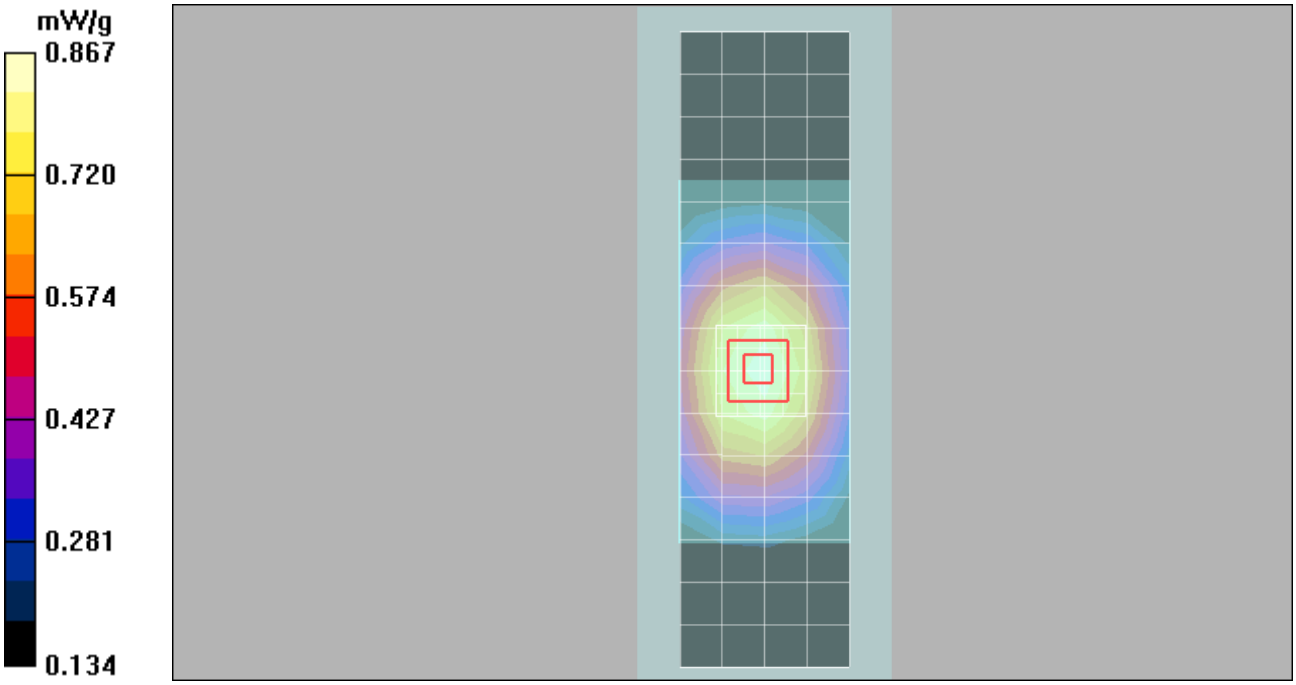
- Probe: ES3DV3 - SN3178; ConvF(5.7, 5.7, 5.7); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (16x7x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.859 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.8 V/m; Power Drift = 0.019 dB
Peak SAR (extrapolated) = 1.01 W/kg
SAR(1 g) = 0.826 mW/g; SAR(10 g) = 0.629 mW/g
Maximum value of SAR (measured) = 0.867 mW/g



Date/Time: 4/19/2012 2:50:54 PM

Test Laboratory: MOTOROLA - WCDMA 850 Mobile Hotspot

Serial: 352206050003182; FCC ID:IHDT56NH3

Procedure Notes: Pwr Step: All up; Antenna Position: Internal; Battery Model #: Internal; Device Position: Body Worn, Back of Phone 10mm from Phantom
Communication System: 3G-WCDMA 850; Frequency: 836 MHz;
Communication System Channel Number: 4180; Duty Cycle: 1:1
Medium: Low Freq Body;
Medium parameters used: f = 835 MHz; σ = 0.96 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

DASY4 Configuration:

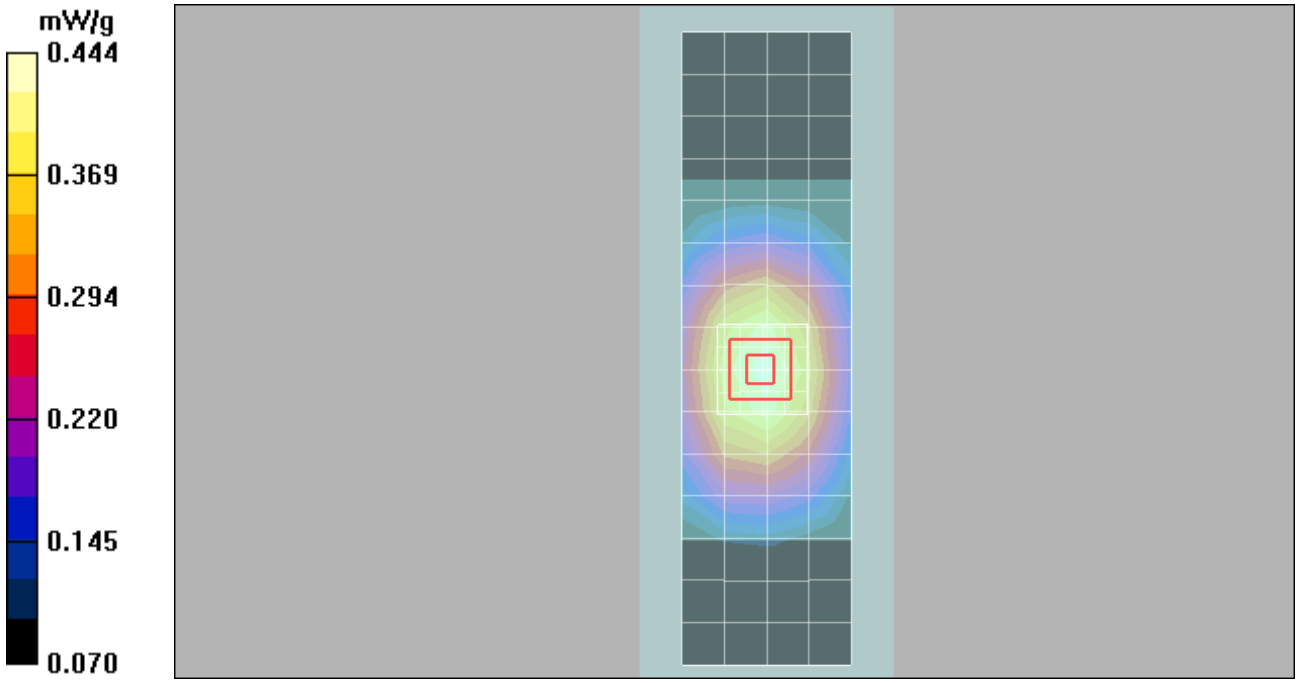
- Probe: ES3DV3 - SN3178; ConvF(5.7, 5.7, 5.7); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (16x7x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.438 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.2 V/m; Power Drift = 0.062 dB
Peak SAR (extrapolated) = 0.516 W/kg
SAR(1 g) = 0.423 mW/g; SAR(10 g) = 0.322 mW/g
Maximum value of SAR (measured) = 0.444 mW/g



Date/Time: 4/18/2012 6:22:18 PM

Test Laboratory: MOTOROLA - GPRS 1900 Mobile Hotspot

Serial: 352205050010585; FCC ID:IHDT56NH3
Unit Operating at Non-Reduced Power for Verification of Power Reduction
Procedure Notes: Pwr Step: 00; Antenna Position: Internal; Battery Model #: Internal;
DEVICE POSITION: Body Worn, Bottom Edge of phone 10mm from phantom
Communication System: GPRS 1900 - Class 12; Frequency: 1880 MHz;
Communication System Channel Number: 661; Duty Cycle: 1:2.075
Medium: Regular Glycol Body 1750/1880;
Medium parameters used: f = 1880 MHz; σ = 1.59 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3

DASY4 Configuration:

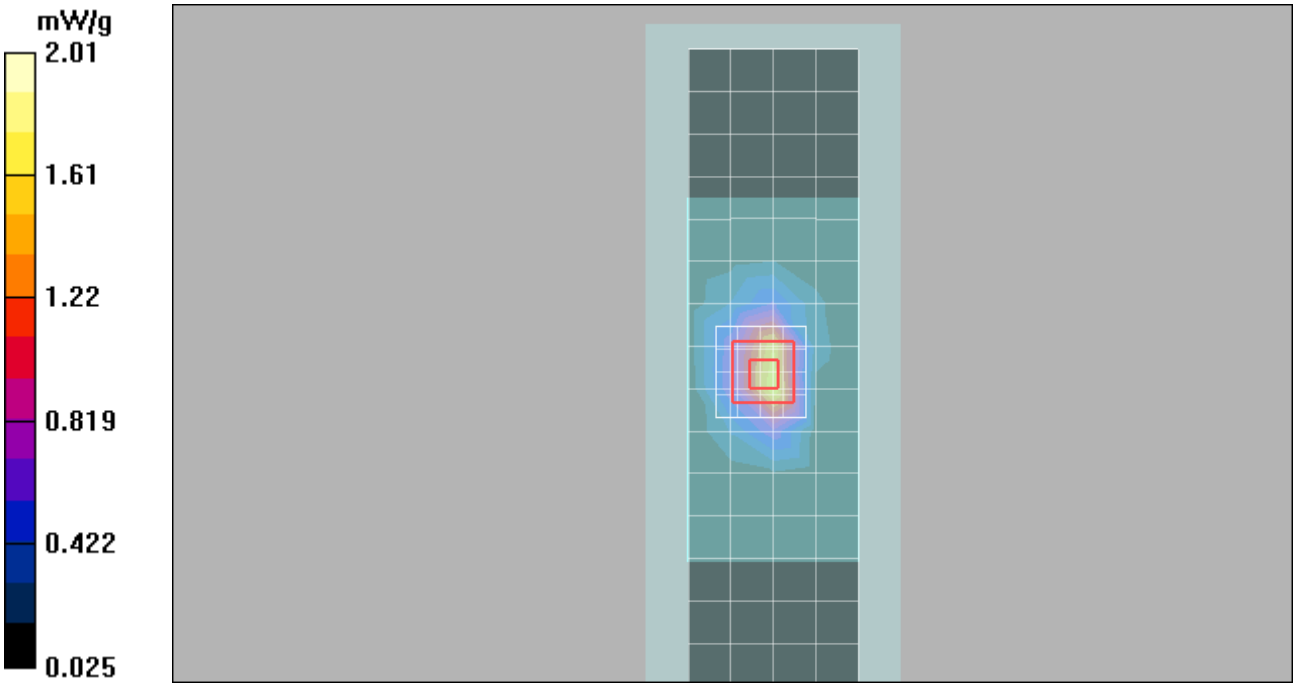
- Probe: ES3DV3 - SN3178; ConvF(4.72, 4.72, 4.72); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (16x7x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.64 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.8 V/m; Power Drift = 0.038 dB
Peak SAR (extrapolated) = 3.11 W/kg
SAR(1 g) = 1.76 mW/g; SAR(10 g) = 0.885 mW/g
Maximum value of SAR (measured) = 2.01 mW/g



Date/Time: 4/18/2012 4:19:59 PM

Test Laboratory: MOTOROLA - GPRS 1900 Mobile Hotspot

Serial: 352205050010585; FCC ID:IHDT56NH3

Procedure Notes: Pwr Step: 00; Antenna Position: Internal; Battery Model #: Internal;
Device Position: Body Worn, Bottom edge of Phone 10mm from Phantom
Communication System: GPRS 1900 - Class 12; Frequency: 1880 MHz;
Communication System Channel Number: 661; Duty Cycle: 1:2.075
Medium: Regular Glycol Body 1750/1880;
Medium parameters used: f = 1880 MHz; σ = 1.59 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3

DASY4 Configuration:

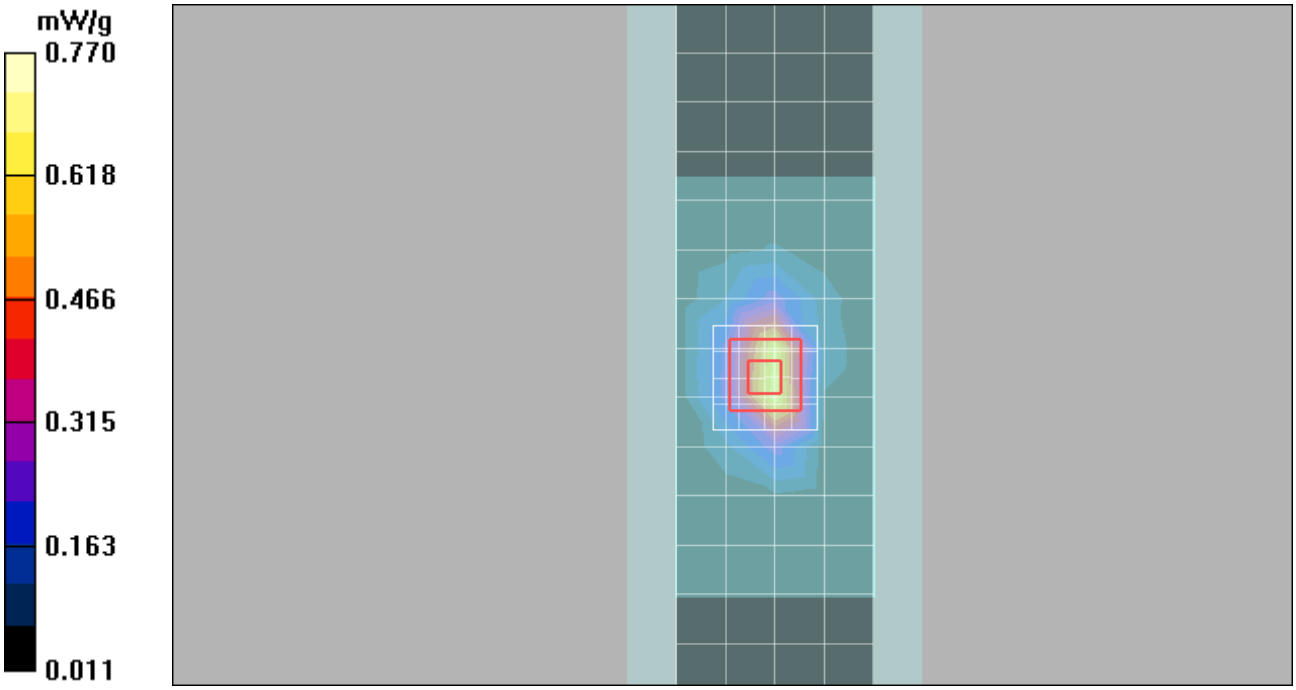
- Probe: ES3DV3 - SN3178; ConvF(4.72, 4.72, 4.72); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (16x7x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.664 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.7 V/m; Power Drift = -0.084 dB
Peak SAR (extrapolated) = 1.18 W/kg
SAR(1 g) = 0.673 mW/g; SAR(10 g) = 0.340 mW/g
Maximum value of SAR (measured) = 0.770 mW/g



Date/Time: 4/17/2012 5:24:35 PM

Test Laboratory: MOTOROLA - WCDMA 1900 Mobile Hotspot

Serial: 352205050010585; FCC ID:IHDT56NH3
Unit Operating at Non-Reduced Power for Verification of Power Reduction
Procedure Notes: Pwr Step: All Up; Antenna Position: Internal; Battery Model #: Internal;
DEVICE POSITION: Body Worn, Bottom Edge of phone 10mm from phantom
Communication System: 3G/WCDMA 1900; Frequency: 1880 MHz;
Communication System Channel Number: 9400; Duty Cycle: 1:1
Medium: Regular Glycol Body 1750/1880;
Medium parameters used: f = 1880 MHz; σ = 1.59 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3

DASY4 Configuration:

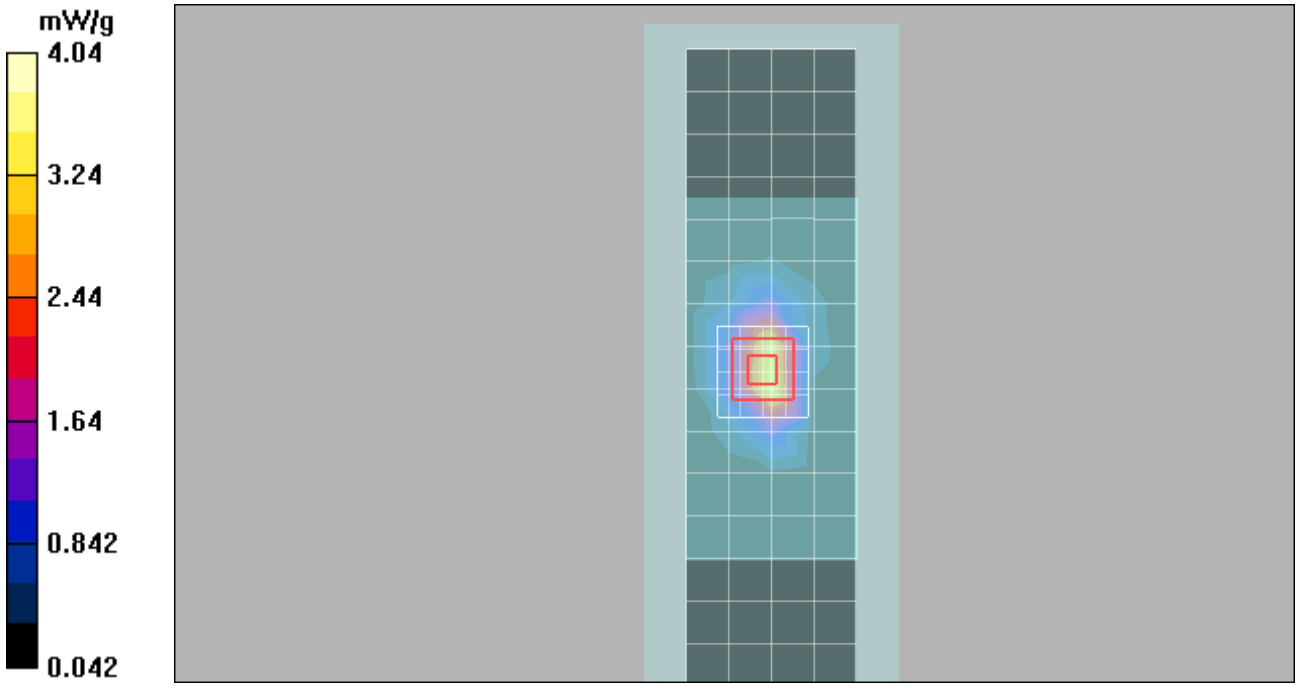
- Probe: ES3DV3 - SN3178; ConvF(4.72, 4.72, 4.72); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (16x7x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.46 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 42.7 V/m; Power Drift = -0.071 dB
Peak SAR (extrapolated) = 6.39 W/kg
SAR(1 g) = 3.52 mW/g; SAR(10 g) = 1.75 mW/g
Maximum value of SAR (measured) = 4.04 mW/g



Date/Time: 4/17/2012 11:00:55 AM

Test Laboratory: MOTOROLA - WCDMA 1900 Mobile Hotspot

Serial: 352206050003182; FCC ID:IHDT56NH3
Procedure Notes: Pwr Step: All up; Antenna Position: Internal; Battery Model #: Internal;
Device Position: Body Worn, Bottom edge of Phone 10mm from Phantom
Communication System: 3G/WCDMA 1900; Frequency: 1880 MHz;
Communication System Channel Number: 9400; Duty Cycle: 1:1
Medium: Regular Glycol Body 1750/1880;
Medium parameters used: f = 1880 MHz; σ = 1.59 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3

DASY4 Configuration:

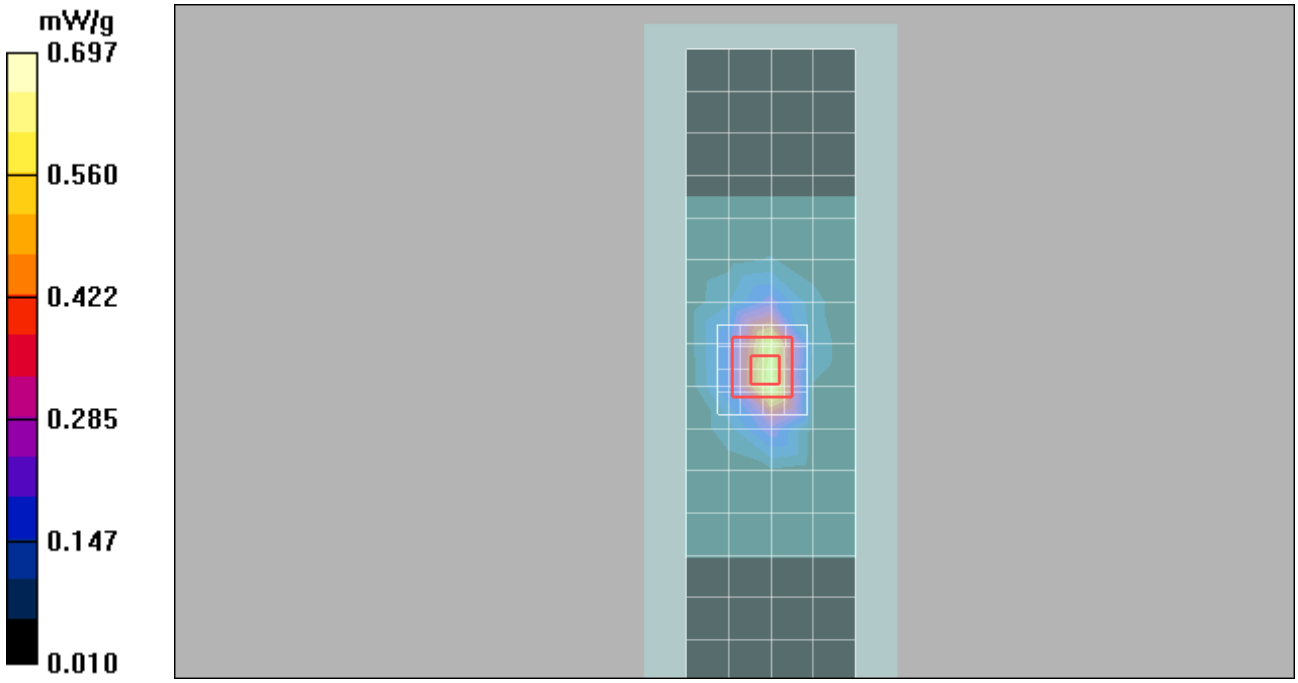
- Probe: ES3DV3 - SN3178; ConvF(4.72, 4.72, 4.72); Calibrated: 1/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn437; Calibrated: 2/9/2012
- Phantom: R11_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (16x7x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.613 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.8 V/m; Power Drift = -0.045 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.611 mW/g; SAR(10 g) = 0.307 mW/g
Maximum value of SAR (measured) = 0.697 mW/g



Appendix 3

Measurement Uncertainty Budget

Uncertainty Budget for Device Under Test, for 735 MHz to 2 GHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	Description IEEE1528(2003) / IEC62209-1(2005)	**Tol. (± %)**	**Prob Dist**	**Div.**	**c_i (1 g)**	**c_i (10 g)**	**1 g u_i (±%)**	**10 g u_i (±%)**	**v_i**
Measurement System									
Probe Calibration [ES3DV3]	E.2.1 / 7.2.1	5.5	N	1.00	1	1	5.5	5.5	∞
Axial Isotropy	E.2.2 / 7.2.1.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2 / 7.2.1.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3 / 7.2.1.5	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4 / 7.2.1.3	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5 / 7.2.1.4	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6 / 7.2.1.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7 / 7.2.1.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8 / 7.2.1.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1 / 7.2.3.6	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1 / 7.2.3.6	3.0	R	1.73	1	1	1.7	1.7	∞
Probe Positioner Mech. Tolerance	E.6.2 / 7.2.2.1	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t Phantom	E.6.3 / 7.2.2.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5 / 7.2.4	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2 / 7.2.2.4	3.4	N	1.00	1	1	3.4	3.4	79
Device Holder Uncertainty	E.4.1 / 7.2.2.4.2	4.5	N	1.00	1	1	4.5	4.5	11
SAR drift	6.6.2 / 7.2.3.5	0.0	R	1.73	1	1	0.0	0.0	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1 / 7.2.2.2	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2 / 7.2.3.3	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3 / 7.2.3.3	2.5	N	1.00	0.64	0.43	1.6	1.1	6
Liquid Permittivity (target)	E.3.2 / 7.2.3.4	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.2 / 7.2.3.4	2.3	N	1.00	0.6	0.49	1.4	1.1	6
Combined Standard Uncertainty			RSS				11	11	338
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				22	21	

Appendix 4

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
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 **Motorola Beijing**

Certificate No: ES3-3178_Jan12

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3178

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

Calibration date: January 11, 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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check 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: January 12, 2012

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

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

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

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
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:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep 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
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ 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 *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV3

SN:3178

Manufactured: January 23, 2008
Calibrated: January 11, 2012

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3178

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.31	1.24	1.36	± 10.1 %
DCP (mV)[B]	101.4	94.9	101.0	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	111.2	±2.2 %
			Y	0.00	0.00	1.00	114.8	
			Z	0.00	0.00	1.00	112.7	

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

[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.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3178

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	5.85	5.85	5.85	0.25	2.03	± 12.0 %
835	41.5	0.90	5.65	5.65	5.65	0.27	1.99	± 12.0 %
1810	40.0	1.40	4.88	4.88	4.88	0.80	1.19	± 12.0 %
1950	40.0	1.40	4.69	4.69	4.69	0.73	1.23	± 12.0 %
2450	39.2	1.80	4.29	4.29	4.29	0.80	1.26	± 12.0 %

[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.

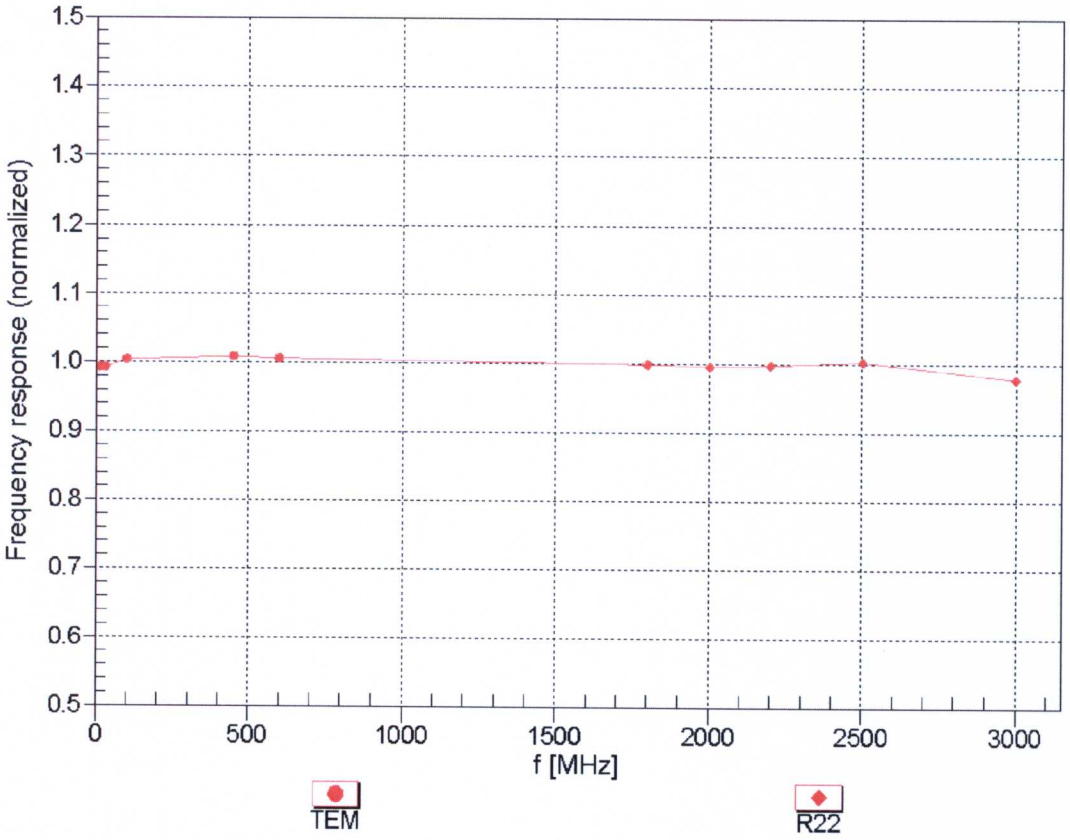
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3178

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	5.73	5.73	5.73	0.29	1.89	± 12.0 %
835	55.2	0.97	5.70	5.70	5.70	0.57	1.34	± 12.0 %
1810	53.3	1.52	4.72	4.72	4.72	0.66	1.53	± 12.0 %
1950	53.3	1.52	4.64	4.64	4.64	0.46	1.77	± 12.0 %
2450	52.7	1.95	4.13	4.13	4.13	0.68	1.13	± 12.0 %

[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.

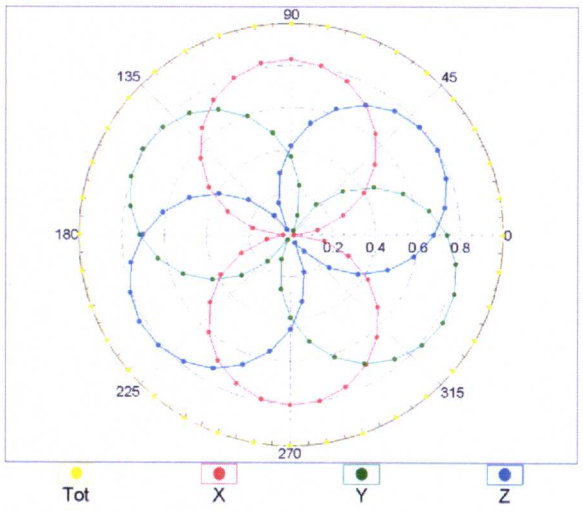
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



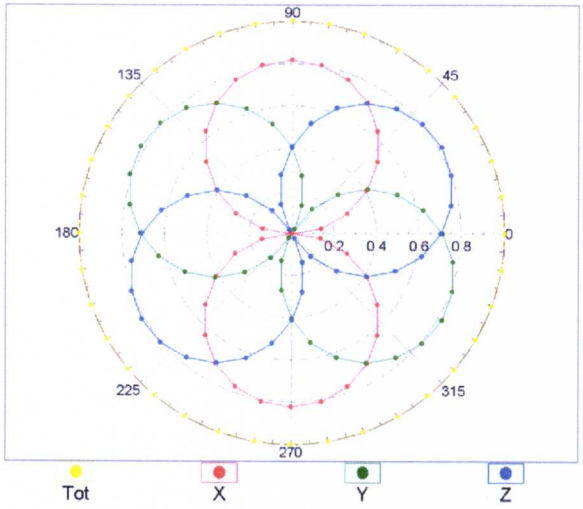
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

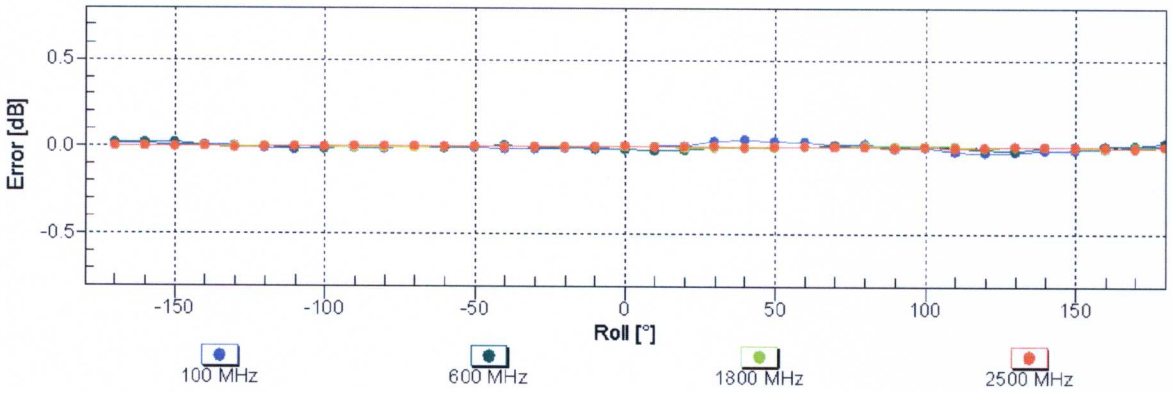
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



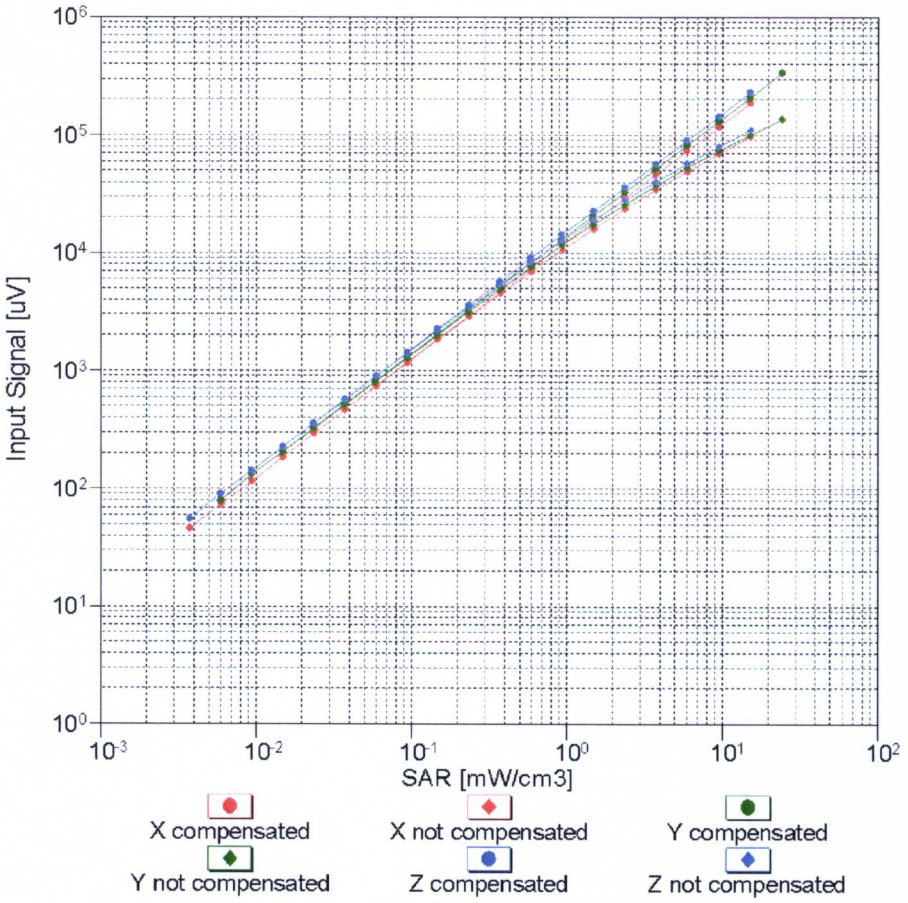
f=1800 MHz,R22

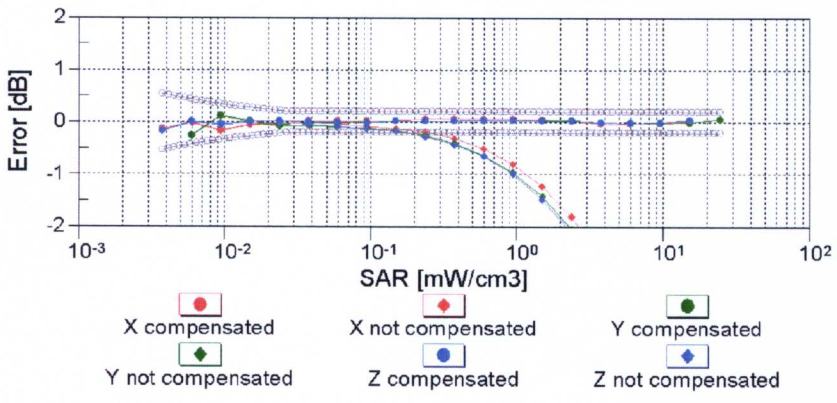




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

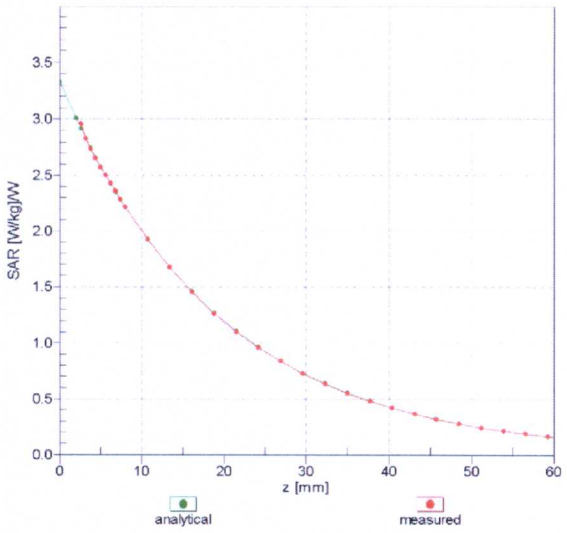




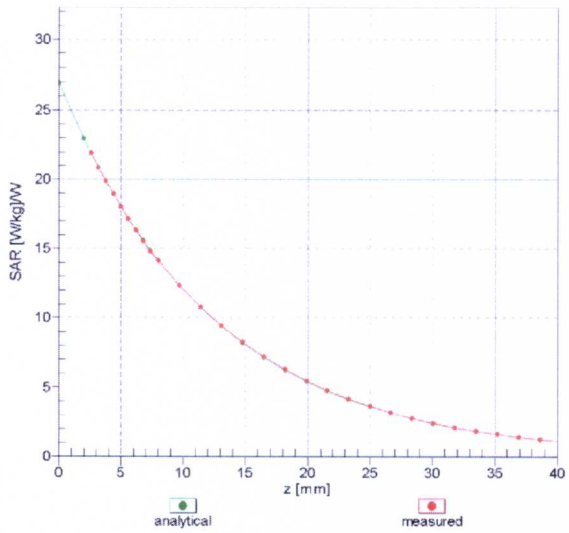
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

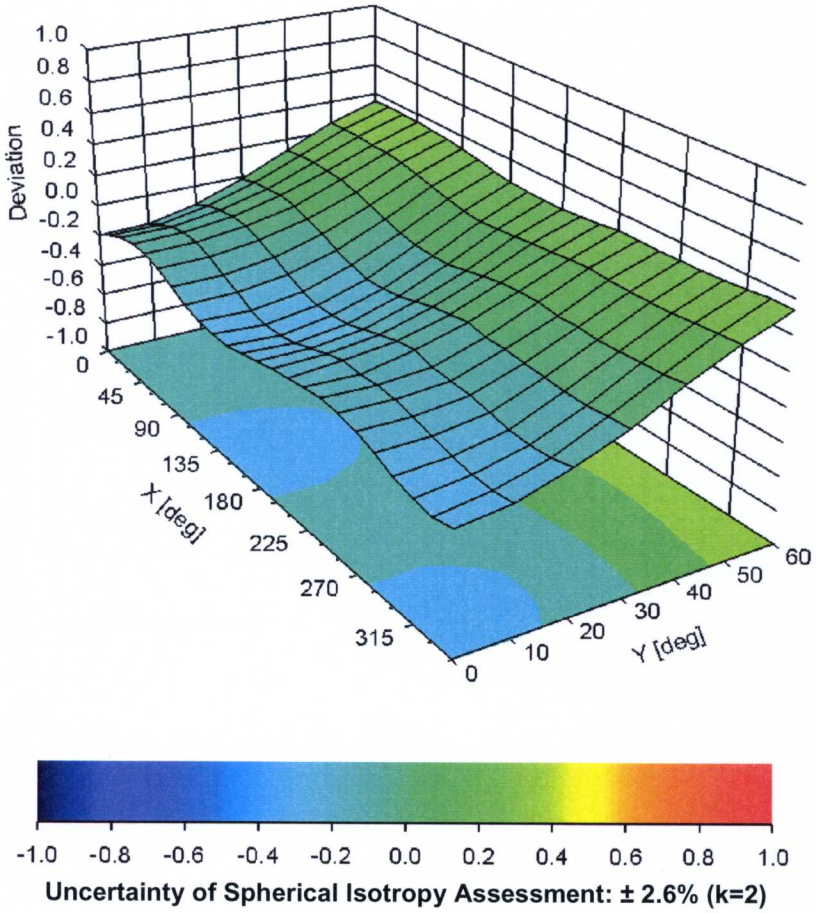


f = 1810 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3178

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Appendix 5

Dipole Characterization 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
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 **Motorola Beijing**

Certificate No: D835V2-421_Apr11

CALIBRATION CERTIFICATE

Object: D835V2 - SN: 421

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

Calibration date: April 04, 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: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: April 5, 2011

Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	0.88 mho/m ± 6 %
Head TSL temperature during test	(21.7 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.31 mW / g
SAR normalized	normalized to 1W	9.24 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.34 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.51 mW / g
SAR normalized	normalized to 1W	6.04 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.10 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.1 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.49 mW / g
SAR normalized	normalized to 1W	10.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.76 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.63 mW / g
SAR normalized	normalized to 1W	6.52 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.43 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.3 Ω + 0.7 jΩ
Return Loss	- 29.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.0 Ω - 1.0 jΩ
Return Loss	- 36.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.424 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.

Design Modification by End User

The dipole has been modified with Teflon Rings (TR) placed within identified markings close to the end of each dipole arm. Calibration has been performed with TR attached to the dipole.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 24, 2000

DASY5 Validation Report for Head TSL

Date/Time: 04.04.2011 10:09:12

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:421

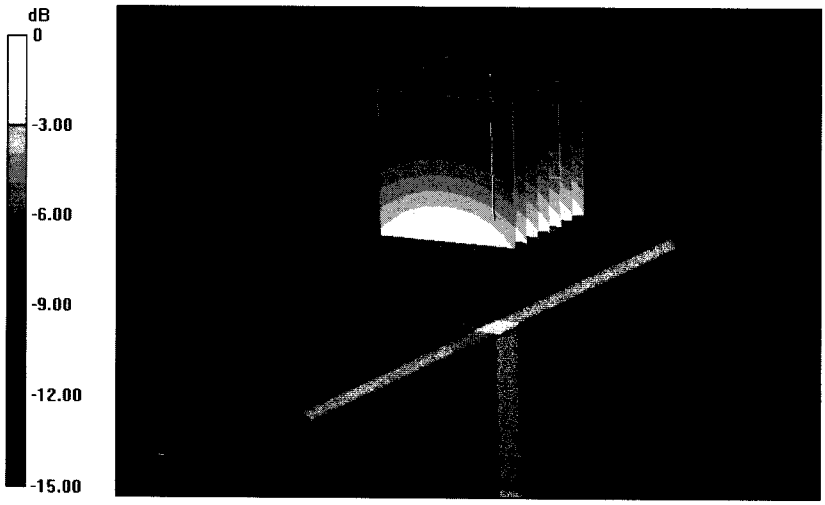
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL900
Medium parameters used: f = 835 MHz; σ = 0.88 mho/m; ε_r = 40.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.03, 6.03, 6.03); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

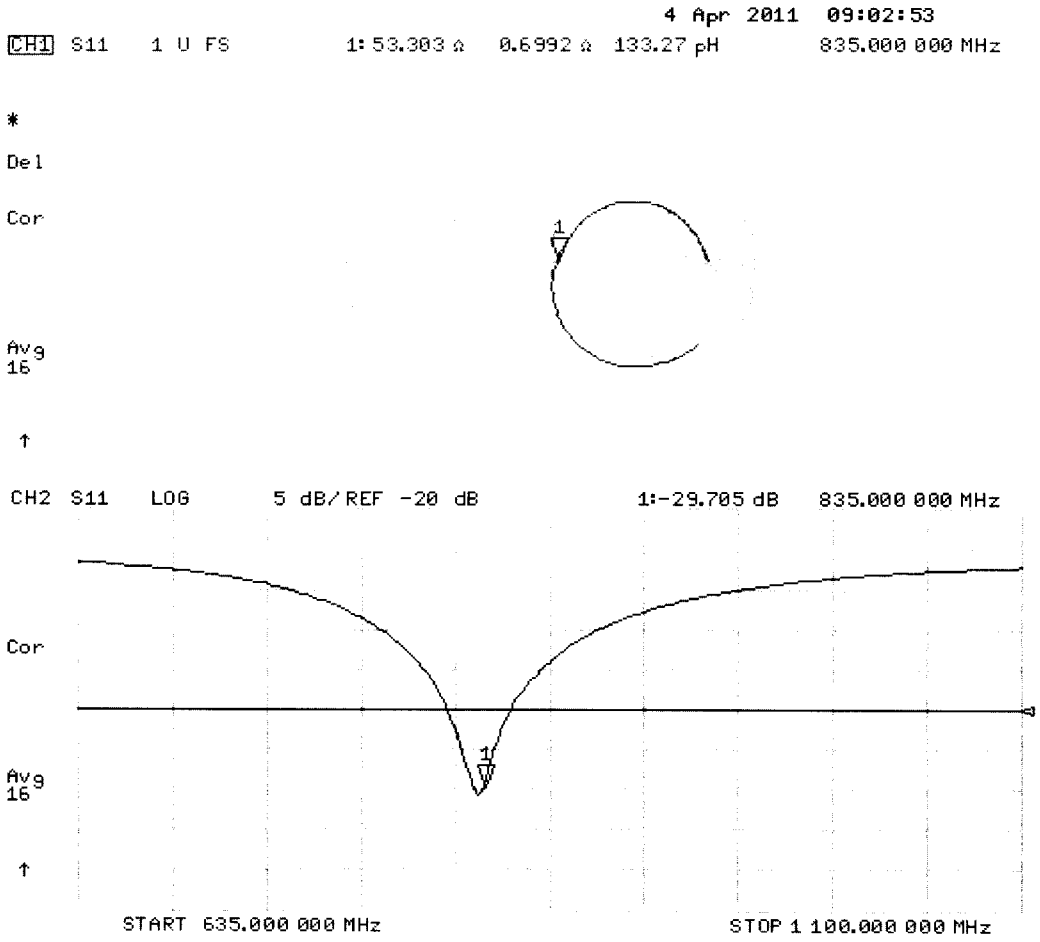
Pin=250 mW /d=15mm/Zoom Scan (7x7x7) /Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.966 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.449 W/kg
SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.51 mW/g
Maximum value of SAR (measured) = 2.699 mW/g



0 dB = 2.700mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 04.04.2011 13:48:48

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:421

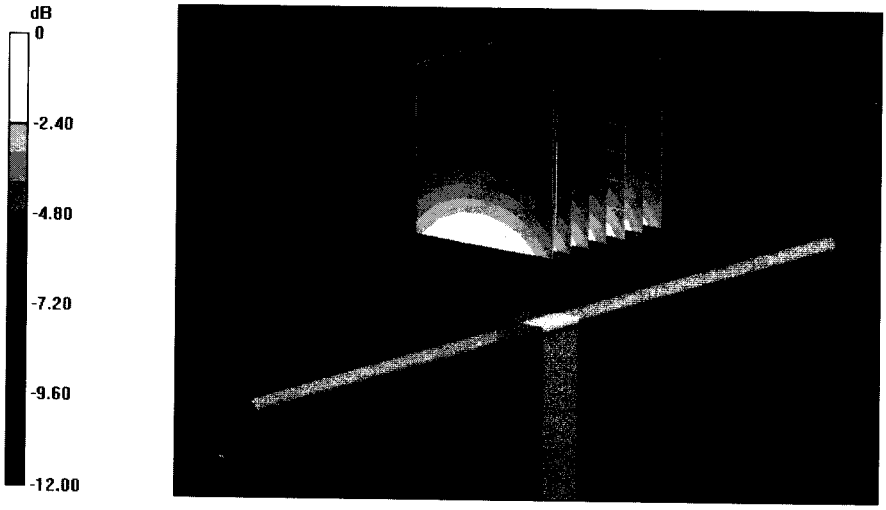
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL900
Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.86, 5.86, 5.86); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

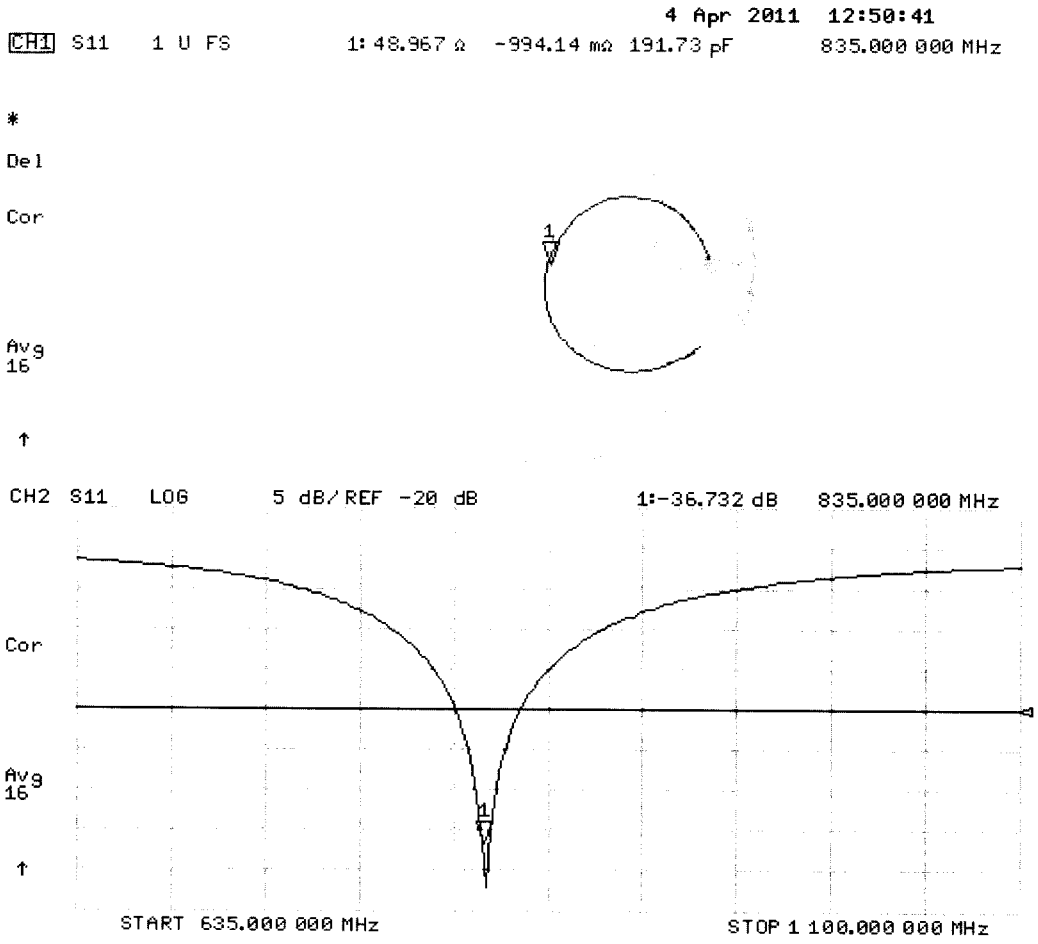
Pin=250 mW /d=15mm/Zoom Scan (7x7x7) /Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.878 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.683 W/kg
SAR(1 g) = 2.49 mW/g; SAR(10 g) = 1.63 mW/g
Maximum value of SAR (measured) = 2.902 mW/g



0 dB = 2.900mW/g

Impedance Measurement Plot for Body TSL



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 **Motorola Beijing**

Certificate No: D1800V2-2d128_Apr11

CALIBRATION CERTIFICATE

Object	D1800V2 - SN: 2d128
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits
Calibration date:	April 6, 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: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 6, 2011

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

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

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

Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.1 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.85 mW / g
SAR normalized	normalized to 1W	39.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**39.9 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.16 mW / g
SAR normalized	normalized to 1W	20.6 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.8 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.3 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature during test	(21.8 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.58 mW / g
SAR normalized	normalized to 1W	38.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**38.8 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.08 mW / g
SAR normalized	normalized to 1W	20.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.4 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.6 Ω - 2.7 jΩ
Return Loss	- 30.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.7 Ω - 3.3 jΩ
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.210 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	July 27, 2005

DASY5 Validation Report for Head TSL

Date/Time: 05.04.2011 11:30:22

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d128

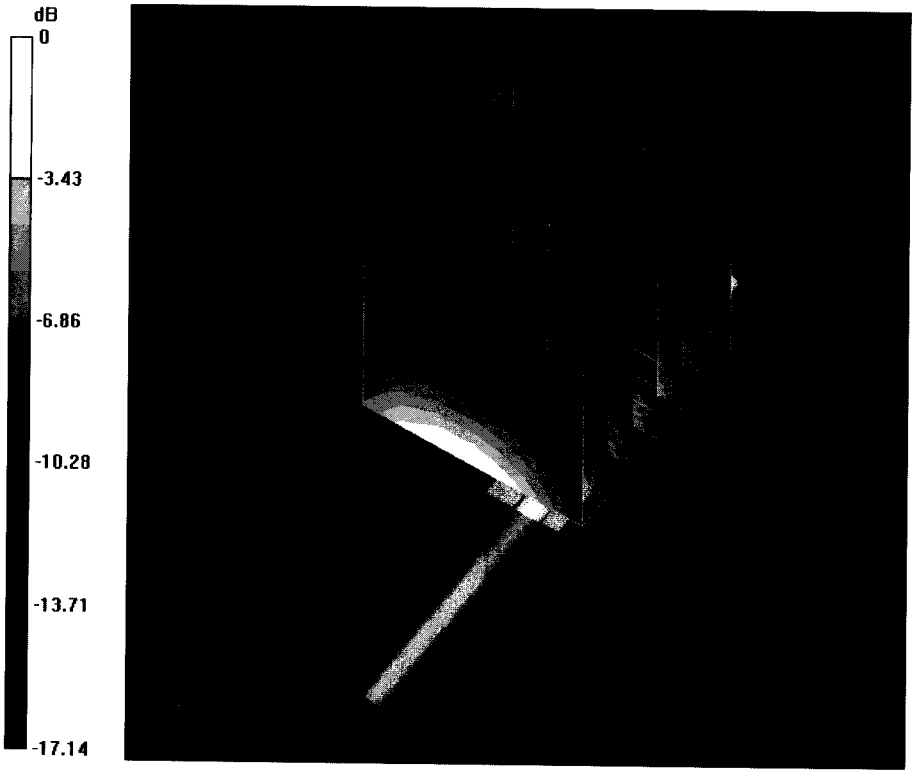
Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: HSL U12 BB
Medium parameters used: f = 1800 MHz; σ = 1.36 mho/m; ε_r = 39.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.05, 5.05, 5.05); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

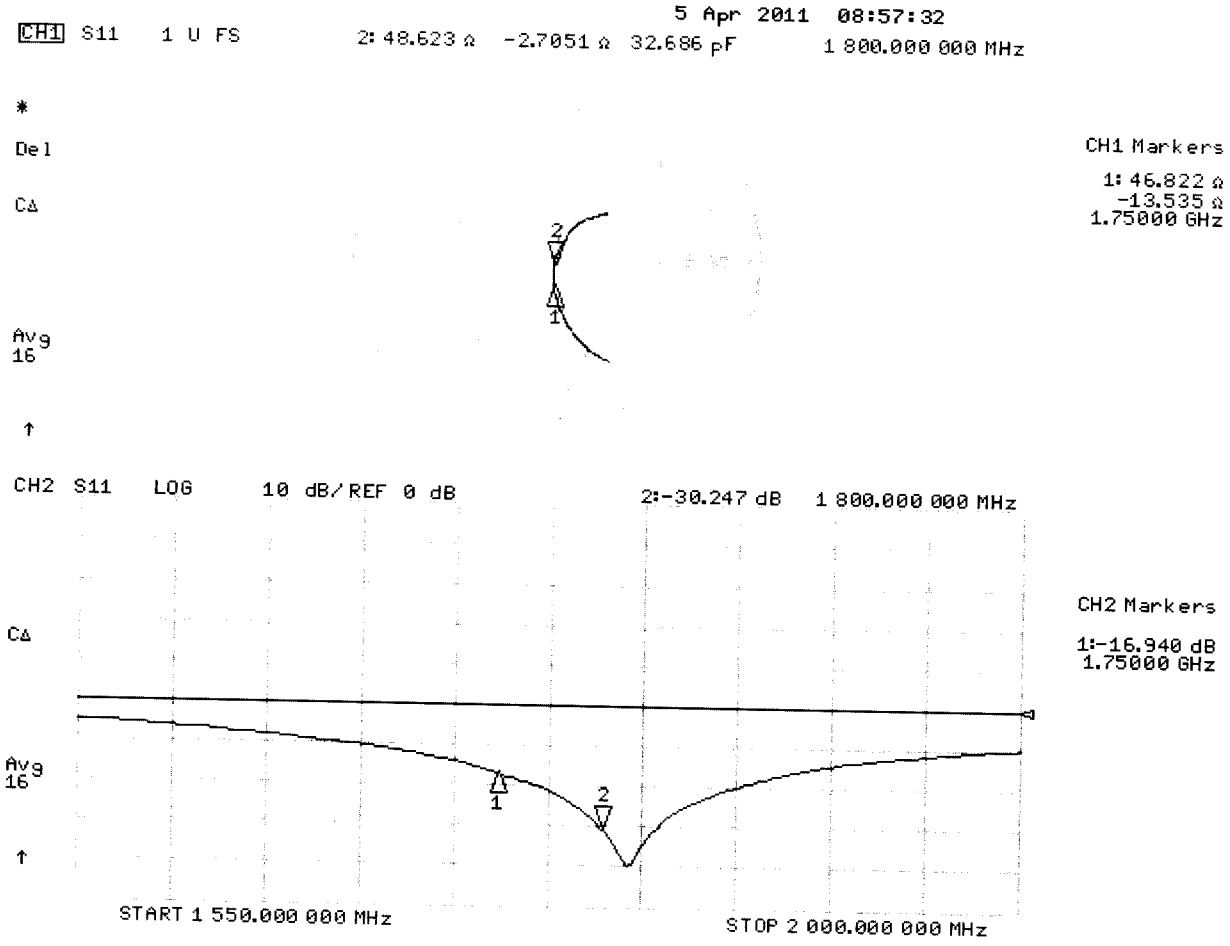
Head / d=10mm, Pin=250 mW / Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.381 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 17.979 W/kg
SAR(1 g) = 9.85 mW/g; SAR(10 g) = 5.16 mW/g
Maximum value of SAR (measured) = 12.263 mW/g



0 dB = 12.260mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 06.04.2011 11:16:27

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d128

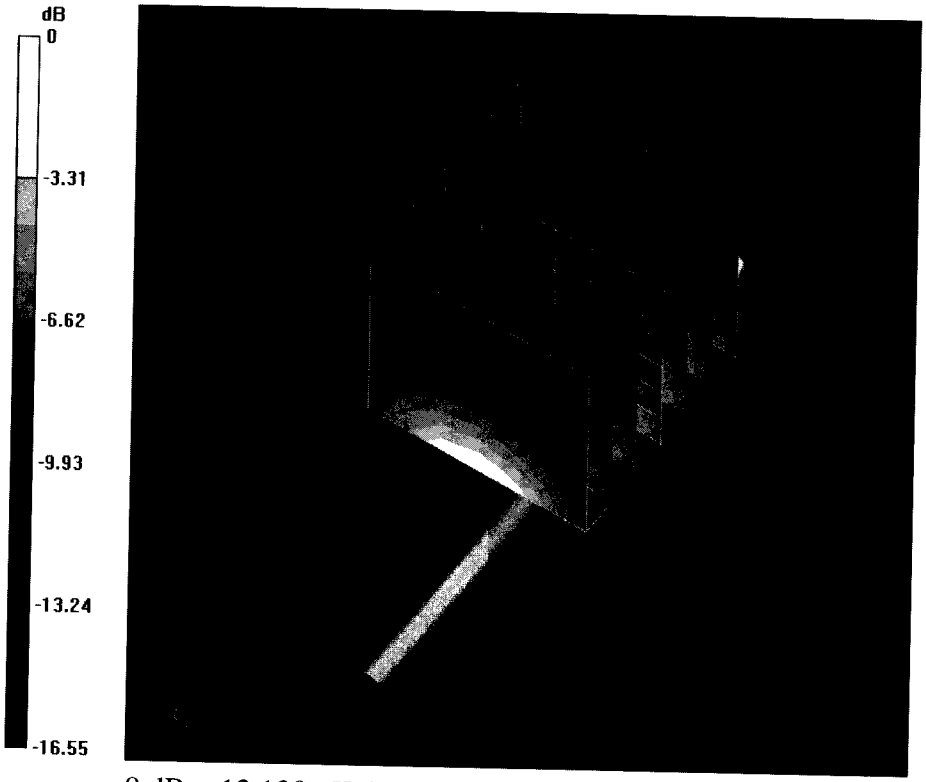
Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: MSL U12 BB
Medium parameters used: f = 1800 MHz; σ = 1.47 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.74, 4.74, 4.74); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

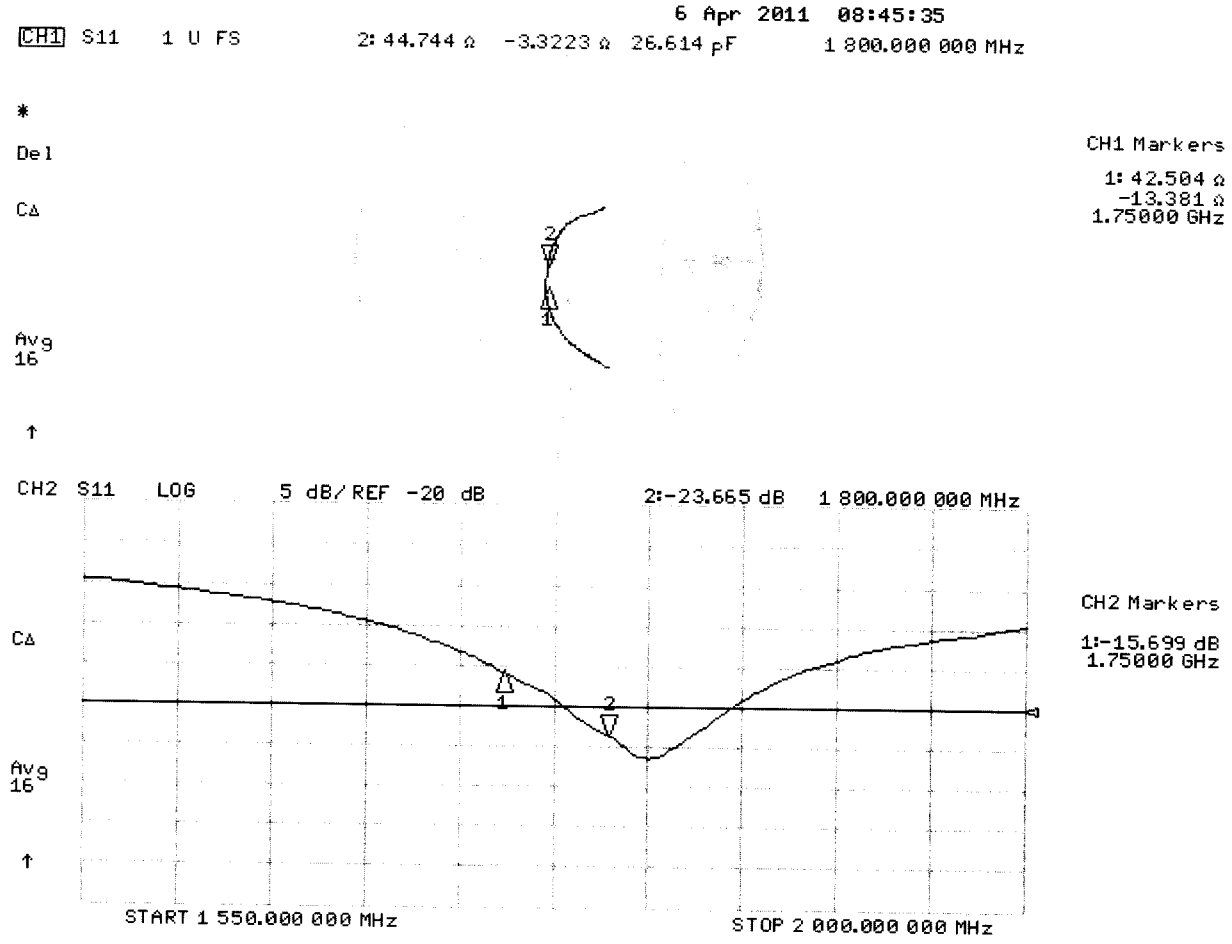
Body / d=10mm, Pin=250 mW / Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.624 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 16.489 W/kg
SAR(1 g) = 9.58 mW/g; SAR(10 g) = 5.08 mW/g
Maximum value of SAR (measured) = 12.121 mW/g



0 dB = 12.120mW/g

Impedance Measurement Plot for Body TSL



END OF REPORT