



Supplemental Portable Cellular Phone SAR Test Report

Tests Requested By: Motorola Mobility, Inc.
600 N. US Highway 45
Libertyville, IL 60048

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FCC ID #: IHDP56LS2
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Test Laboratory: Motorola Mobility, Inc. - Product Safety & Compliance Laboratory
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This laboratory is accredited to ISO/IEC 17025-2005 to perform the following tests:

Accreditation:



2404

Tests:

Electromagnetic Specific Absorption Rate

Procedures:

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)

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.

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This test report shall not be reproduced except in full, without written approval of the laboratory. The results and statements contained herein relate only to the items tested. The names of individuals involved may be mentioned only in connection with the statements or results from this report. Motorola encourages all feedback, both positive and negative, on this test report.

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1. Introduction

The Motorola Mobility Product Safety & Compliance 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 description¹

Serial Number(s) (Functional Use)	356381040017539 (GSM/WCDMA mobile hotspot SAR testing)
Production Unit or Identical Prototype (47 CFR §2.908)	Identical Prototype
Device Category	Portable
RF Exposure Limits	General Population / Uncontrolled

Mode(s) of Operation	GSM 850	GSM 1900	WCDMA 850	WCDMA 1900
Modulation Mode(s)	GMSK	GMSK	QPSK	QPSK
Maximum Output Power Setting	33.5 dBm	30.5 dBm	24.0 dBm	24.0 dBm
Duty Cycle	1:8	1:8	1:1	1:1
Transmitting Frequency Range(s)	824.2 - 848.8 MHz	1850.2 - 1909.8 MHz	826.4 - 846.6 MHz	1852.4 - 1907.6 MHz

Mode(s) of Operation	GPRS/EDGE 850				GPRS/EDGE 1900			
Modulation	GMSK				GMSK			
Maximum Output Power Setting (dBm)	33.5	31.5	29.5	27.5	30.5	30.0	28.0	26.0
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	26.0	24.0	22.0	27.3	26.0	24.0	22.0
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			

¹ **Bolded** entries indicate data mode configurations of highest time-average power output per band and data mode type, and thus were utilized for SAR testing in this report.

The DUT utilizes a reduced limit for the maximum transmit power in the GSM / EDGE modes and the WCDMA1900 mode when the mobile hotspot functionality is enabled. A table of the reduced limits used for testing is given below. A complete description of this functionality is provided in the “Operational Description” contained within Exhibit 12, and is discussed within PBA inquiry 384782. 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. WCDMA 850 does not utilize a reduced limit for the maximum transmit power.

Mode(s) of Operation	WCDMA 1900		
Test Channel	9262	9400	9538
Channel Ranges	9262-9367	9368-9455	9456-9538
Reduced Maximum Output Power Setting (dBm)	21.2	22.1	24.0
Duty Cycle	1:1	1:1	1:1

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	31.5	29.5	27.5	30.5	30.0	28.0	26.0
Time Average Output Power Setting (dBm)	24.5	25.5	25.2	24.5	21.5	24.0	23.7	23.0
Reduced Maximum Output Power Setting (dBm)	33.0	30.0	28.3	27.0	30.4	27.4	25.7	24.4
Reduced Time Average Output Power Setting (dBm)	24.0	24.0	24.0	24.0	21.4	21.4	21.4	21.4

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	26.0	24.0	22.0	27.3	26.0	24.0	22.0
Time Average Output Power Setting (dBm)	19.1	20.0	19.7	19.0	18.3	20.0	19.7	19.0
Reduced Maximum Output Power Setting (dBm)	27.6	24.6	22.9	21.6	27.2	24.2	22.5	21.2
Reduced Time Average Output Power Setting (dBm)	18.6	18.6	18.6	18.6	18.2	18.2	18.2	18.2

3. Test Equipment Used

3.1 Dosimetric System

The Motorola Mobile Devices Business Product Safety & Compliance Laboratory utilizes a Dosimetric Assessment System (Dasy4™ v4.7) 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 $\pm 10.8\%$ (K=1) with an expanded uncertainty of $\pm 21.6\%$ (K=2). The overall 1 g RSS uncertainty of the measurement system is $\pm 11.1\%$ (K=1) with an expanded uncertainty of $\pm 22.2\%$ (K=2). The measurement uncertainty budget is given in Appendix 3. 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	702	May-18-2010	May-18-2011
E-Field Probe ES3DV3	3183	Jul-14-2010	Jul-14-2011
DASY4™ DAE V1	434	Jan-13-2011	Jan-13-2012
E-Field Probe ES3DV3	3124	Aug-11-2010	Aug-11-2011
Dipole Validation Kit, DV835V2	434TR	Mar-09-2011	Mar-09-2013
Dipole Validation Kit, DV1800V2	271TR	Mar-08-2011	Mar-08-2013
	250TR	Mar-17-2011	Mar-17-2013

3.2 Additional Equipment

Description	Serial Number	Cal Date	Cal Due Date
Signal Generator HP8648C	3847A04982	Nov-18-2009	Nov-18-2011
Power Meter E4419B	GB39511082	Apr-24-2009	Apr-24-2011
Power Sensor #1 - E9301A	US39210918	Oct-25-2010	Oct-25-2011
Power Sensor #2 - E9301A	US39210917	Oct-25-2010	Oct-25-2011
Signal Generator HP8648C	3847A04810	Oct-30-2009	Oct-30-2011
Power Meter E4419B	GB39511087	Dec-22-2009	Dec-22-2011
Power Sensor #1 - E9301A	US39211006	Oct-25-2010	Oct-25-2011
Power Sensor #2 - E9301A	US39210934	Oct-25-2010	Oct-25-2011
Signal Generator HP8648C	3429A00286	Nov-23-2009	Nov-23-2011
Power Meter E4419B	US39250622	Dec-22-2009	Dec-22-2011
Power Sensor #1 - E9301A	US39210931	Oct-25-2010	Oct-25-2011
Power Sensor #2 - E9301A	US39210932	Oct-25-2010	Oct-25-2011
Network Analyzer HP8753ES	US39172529	Jun-04-2010	Jun-04-2011
Dielectric Probe Kit HP85070C	US99360070		

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 $\rho = 1 \text{ g/cm}^3$ 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 pub. 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 ϵ_r and higher than the target Sigma values to minimize SAR underestimations". The 1900 MHz simulated tissues listed below meet these criteria.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ϵ_r	σ (S/m)	Temp (°C)
835	Body	Measured, May-04-2011	53.5	0.99	19.7
		Measured, May-06-2011	53.2	0.99	20.1
		Recommended Limits	55.2 $\pm$ 5%	0.97 $\pm$ 5%	18-25
1880	Body	Measured, May-03-2011	51.3	1.58	18.9
		Measured, May-04-2011	51.2	1.59	18.6
		Measured, May-06-2011	50.7	1.59	19.1
		Measured, May-09-2011	51.2	1.59	19.4
		Recommended Limits	53.3 $\pm$ 5%	1.52 $\pm$ 5%	18-25

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

Ingredient	835 MHz / 900 MHz Head	835 MHz / 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 Verification

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 $\pm 10\%$ from the target SAR indicated in Appendix 4. These frequencies are within $\pm 10\%$ 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 $15.0 \text{ cm} \pm 0.5 \text{ cm}$. For frequencies above 3 GHz, the simulated tissue depth was verified to be $10 \text{ cm} \pm 0.5 \text{ cm}$. Z-axis scans showing the SAR penetration are also included in Appendix 1.

f (MHz)	Description	SAR (W/kg), 1 gram	Dielectric Parameters		Ambient Temp (°C)	Tissue Temp (°C)
			ϵ_r	σ (S/m)		
835	Measured, May-04-2011	9.85	53.5	0.99	20.3	19.0
	Measured, May-06-2011	9.65	53.7	0.98	20.4	19.0
	Recommended Limits	10.00	55.2 $\pm 5\%$	0.97 $\pm 5\%$	18-25	18-25
1800	Measured, May-03-2011	40.65	51.5	1.47	20.2	19.1
	Recommended Limits	37.20	53.3 $\pm 5\%$	1.52 $\pm 5\%$	18-25	18-25
	Measured, May-04-2011	38.00	51.5	1.49	20.3	18.8
	Measured, May-06-2011	39.55	51.1	1.51	20.4	19.0
	Measured, May-09-2011	37.70	51.5	1.49	20.3	19.3
	Recommended Limits	37.90	53.3 $\pm 5\%$	1.52 $\pm 5\%$	18-25	18-25

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3183	835	6.15	6 of 11
		1810	4.84	6 of 11
	3124	1810	4.76	6 of 11

6. Test Results

The test sample was operated using an actual transmission through a base station simulator. 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 configurations specified by the FCC for this device in order to demonstrate the effective utilization of power reduction conditions specified in Exhibit 12. Testing was performed with a separation of 1 cm between the DUT and the “flat” phantom. 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 Appendix 2. Please refer to the DASY4™ manual for additional information on SAR scanning procedures and algorithms used.

The SAR results shown in the table below are maximum SAR values averaged over 1 gram of phantom tissue. Also shown is the extrapolated SAR to account for drift. The exact method of extrapolation is $\text{Extrapolated SAR} = \text{Measured SAR} * 10^{(-\text{drift}/10)}$. 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 DUT utilizes a reduced limit for the maximum transmit power for the GSM / EDGE modes and the WCDMA 1900 mode when the mobile hotspot functionality is enabled. A description of this functionality is provided in the “Operational Description” contained within Exhibit 12. This description was also discussed within FCC KDB inquiry 384782.

The Cellular Phone model covered by this report has the following battery options:

Model SNN5880A - 1880 mAH Battery

The battery SNN5880A was used to do all of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery.

A “flat” phantom was for the body-worn tests. This “flat” phantom is made out of 1” thick natural High Density Polyethylene with a thickness at the bottom equal to 2.0 mm. It measures 52.7 cm(long) x 26.7 cm(wide) x 21.2 cm(tall). The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm for frequencies below 3 GHz.

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3183	835	6.15	6 of 11
		1810	4.84	6 of 11
	3124	1810	4.76	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									
<i>F</i> (MHz)	Mode	Test Configuration	Channel	<i>1 g SAR value w/o Pwr Reduction</i>		<i>1 g SAR value w/ Pwr Reduction</i>		Pwr Reduction Specification (dB)	Measured Pwr Reduction (dB)
				Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)		
835	GPRS 850, Class 10	Back of Device 10 mm from Phantom	128	1.50	1.51	1.02	1.05	1.50	1.58
			190	1.48	1.48	1.11	1.14	1.50	1.13
			251	1.44	1.54	1.07	1.07	1.50	1.58
1880	GPRS 1900, Class 10	Back of Device 10 mm from Phantom	512	2.19	2.21	1.27	1.27	2.60	2.40
			661	1.23	1.23	0.717	0.77	2.60	2.03
			810	1.22	1.22	0.706	0.71	2.60	2.35
	WCDMA 1900, 12.2 kbps RMC	Back of Device 10 mm from Phantom	9262	1.65	1.65	0.942	1.01	2.80	2.13
			9400	1.48	1.48	1.02	1.02	1.90	1.62

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

Test Laboratory: Motorola 835 MHz System Performance Check

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:434TR

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -20.25 dB [Sim.Temp@SPC](#) = 19 Room Temp @ SPC = 20.3

Communication System: CW - Dipole; Frequency: 835 MHz; Communication System Channel Number: 3; Duty Cycle: 1:1

Medium: Validation *BODY Tissue* ; Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.15, 6.15, 6.15); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ 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/Dipole Area Scan (9x4x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 2.12 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

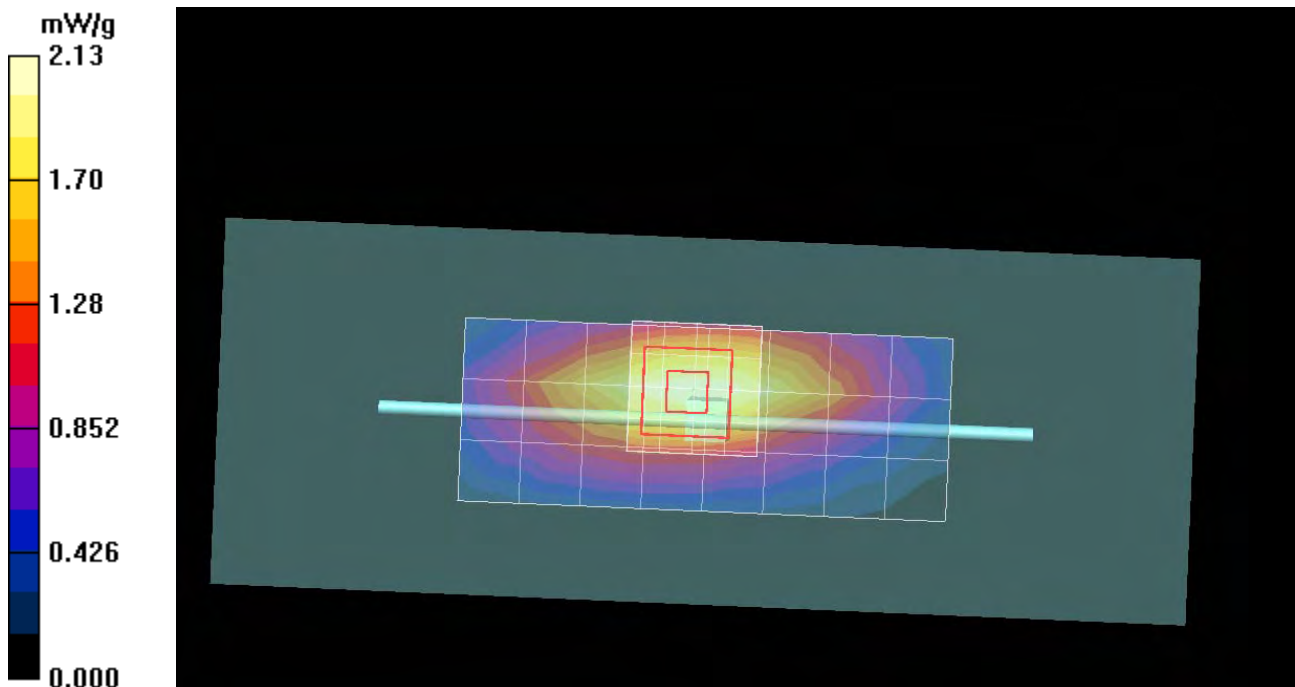
Reference Value = 43.0 V/m; Power Drift = -0.008 dB

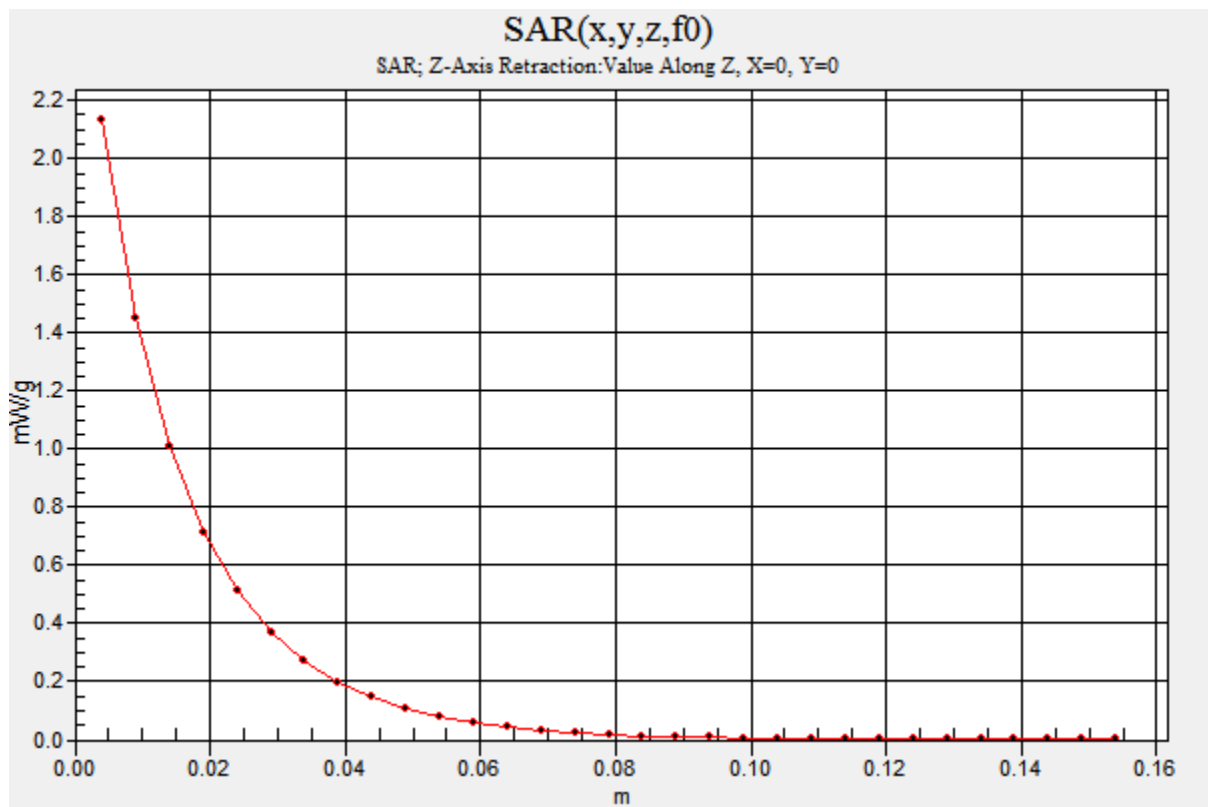
Peak SAR (extrapolated) = 2.90 W/kg

SAR(1 g) = 1.97 mW/g; SAR(10 g) = 1.29 mW/g

Maximum value of SAR (measured) = 2.13 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm





Test Laboratory: Motorola 835 MHz System Performance Check

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:434TR

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -18.2 dB [Sim.Temp@SPC](#) = 19 Room Temp @ SPC = 20.4

Communication System: CW - Dipole; Frequency: 835 MHz; Communication System Channel Number: 3; Duty Cycle: 1:1

Medium: Validation *BODY Tissue* ; Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.98 \text{ mho/m}$; $\epsilon_r = 53.7$; $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.15, 6.15, 6.15); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Daily SPC Check/Dipole Area Scan (4x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 1.87 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 46.6 V/m; Power Drift = -0.014 dB

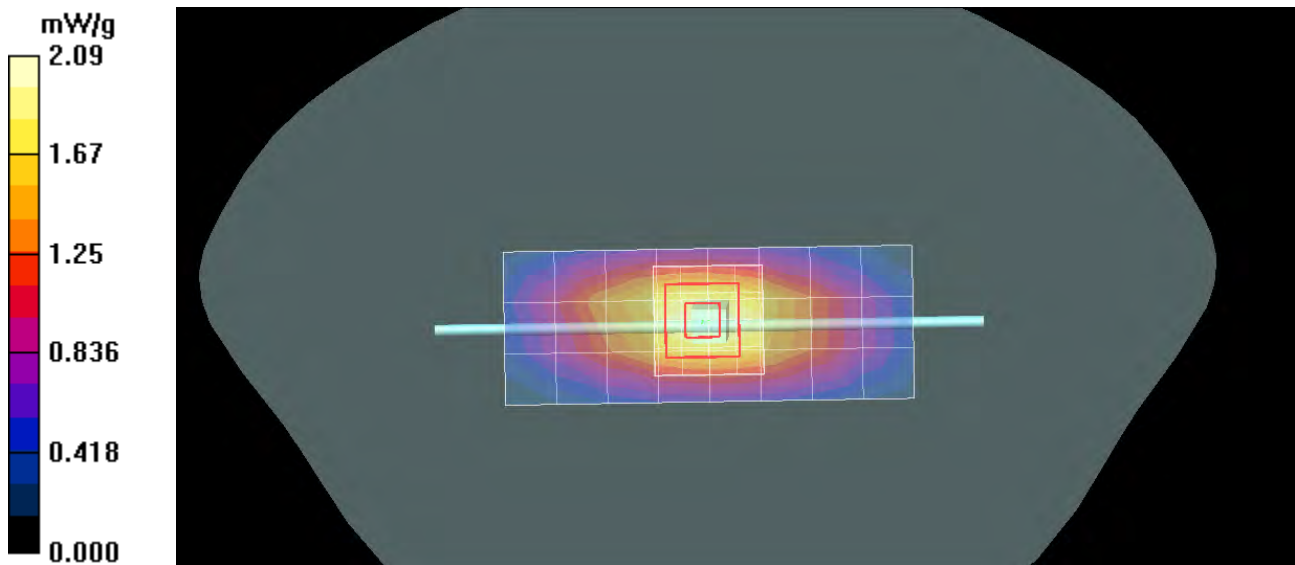
Peak SAR (extrapolated) = 2.82 W/kg

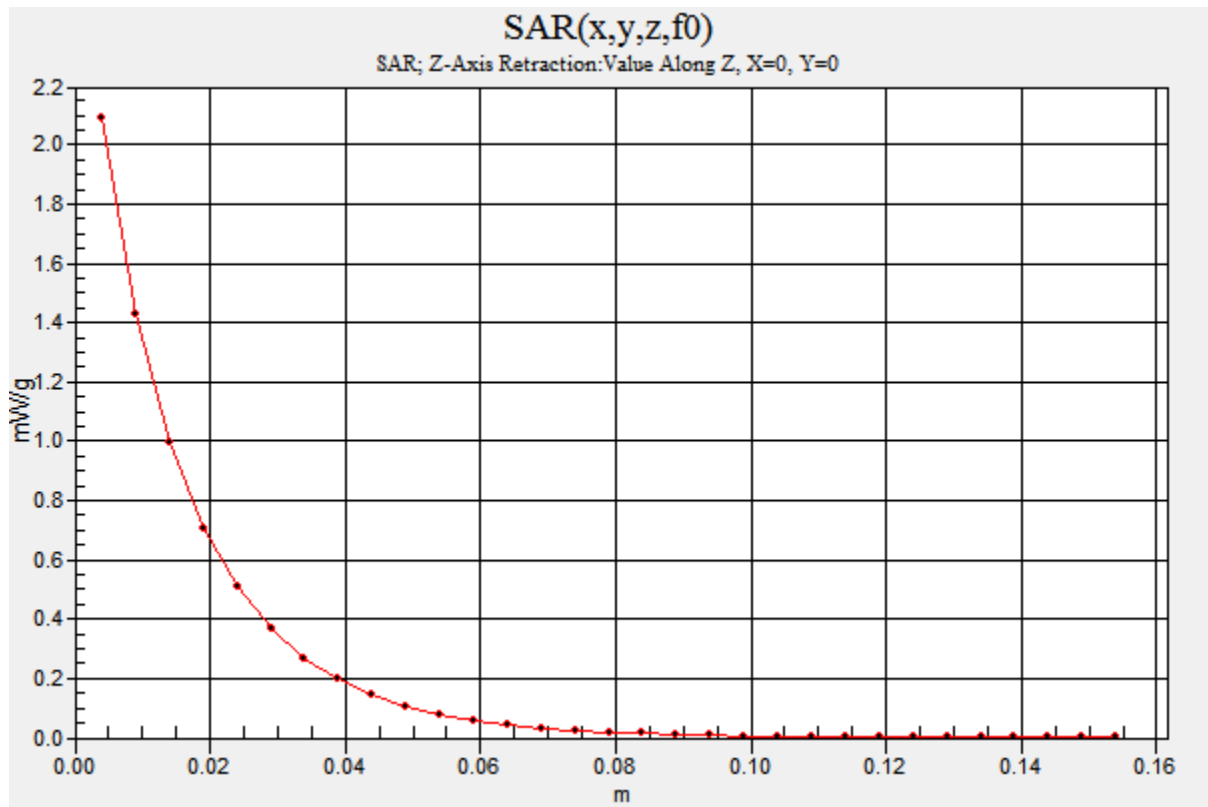
SAR(1 g) = 1.93 mW/g; SAR(10 g) = 1.28 mW/g

Maximum value of SAR (measured) = 2.08 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: $dx=20\text{mm}$, $dy=20\text{mm}$, $dz=5\text{mm}$

Maximum value of SAR (measured) = 2.09 mW/g





Test Laboratory: Motorola 1800 MHz System Performance Check

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:250TR

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -17.9dB [Sim.Temp@SPC](#) = 19.1°C Room Temp @ SPC = 20.2°C

Communication System: CW - Dipole; Frequency: 1800 MHz; Communication System Channel Number: 8; Duty Cycle: 1:1

Medium: Validation *BODY Tissue* ; Medium parameters used: $f = 1800$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(4.76, 4.76, 4.76); Calibrated: 8/11/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn434; Calibrated: 1/13/2011
- Phantom: R4 : Sect.1, Amy Twin, Rev.3 (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/Dipole Area Scan (9x4x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 8.51 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 74.6 V/m; Power Drift = -0.014 dB

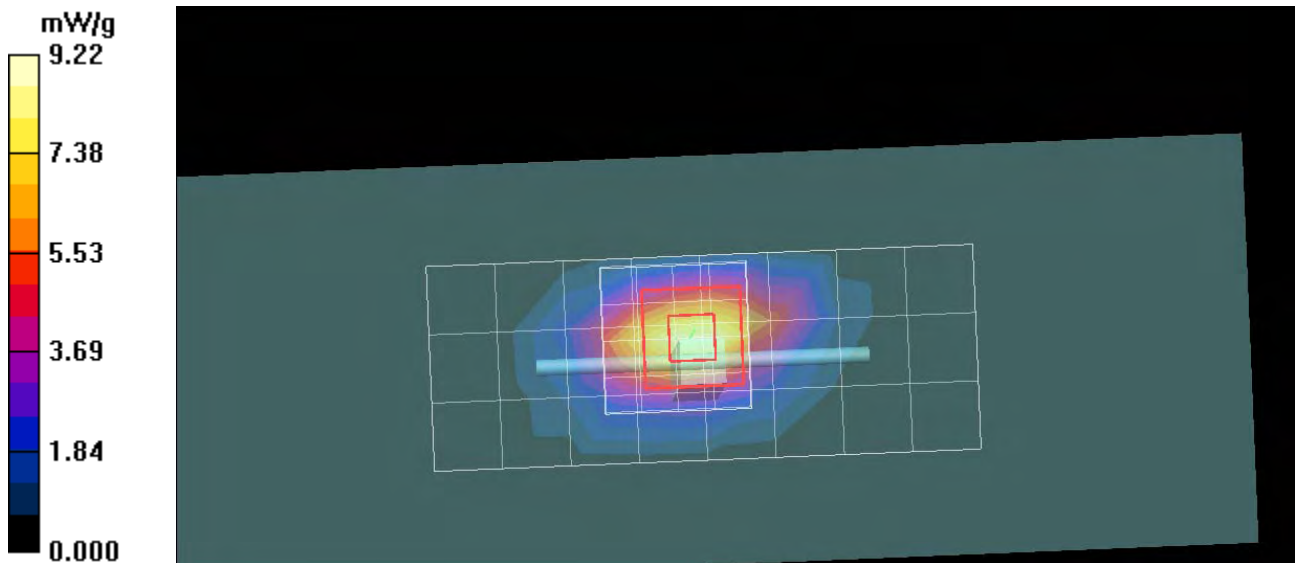
Peak SAR (extrapolated) = 14.3 W/kg

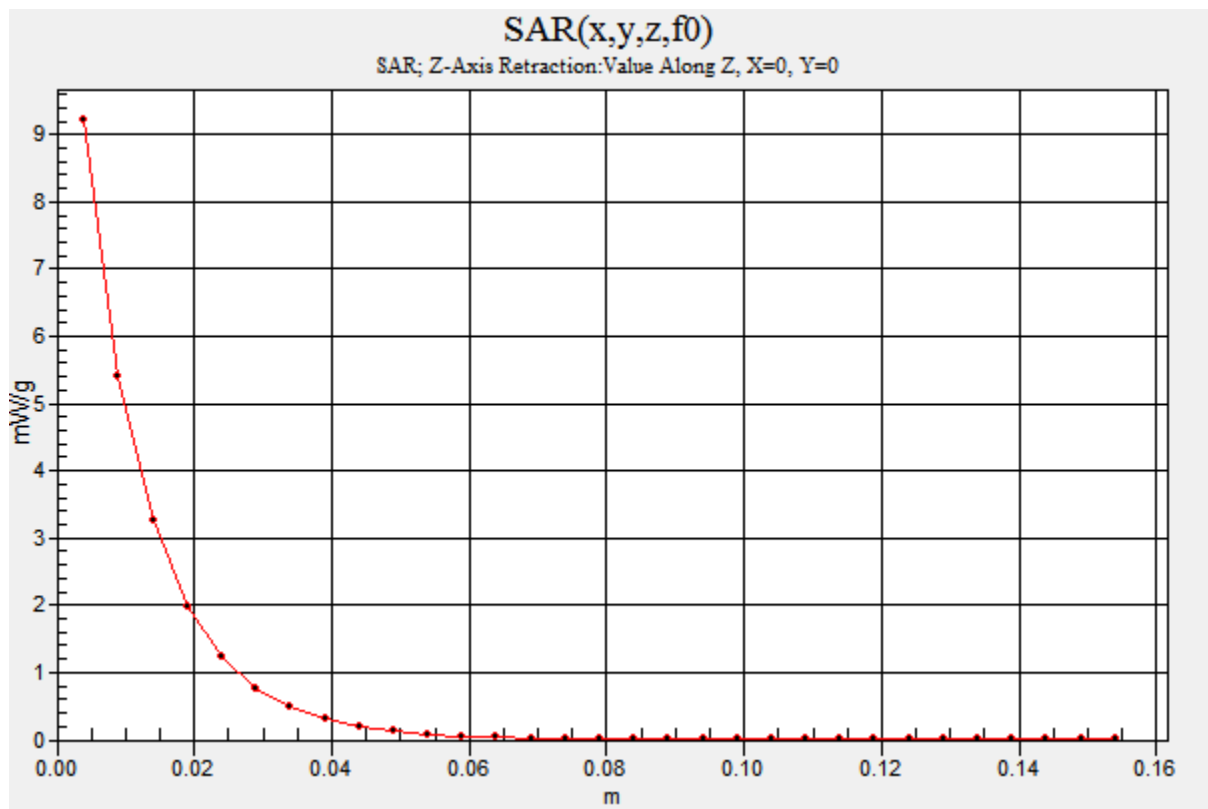
SAR(1 g) = 8.13 mW/g; SAR(10 g) = 4.31 mW/g

Maximum value of SAR (measured) = 9.01 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 9.22 mW/g





Test Laboratory: Motorola 1800 MHz System Performance Check

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:271TR

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -21.25 dB [Sim.Temp@SPC](#) = 18.8 Room Temp @ SPC = 20.3

Communication System: CW - Dipole; Frequency: 1800 MHz; Communication System Channel Number: 8; Duty Cycle: 1:1

Medium: Validation *BODY Tissue* ; Medium parameters used: $f = 1800$ MHz; $\sigma = 1.49$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Section 2, 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/Dipole Area Scan (9x4x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 6.10 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 77.2 V/m; Power Drift = -0.039 dB

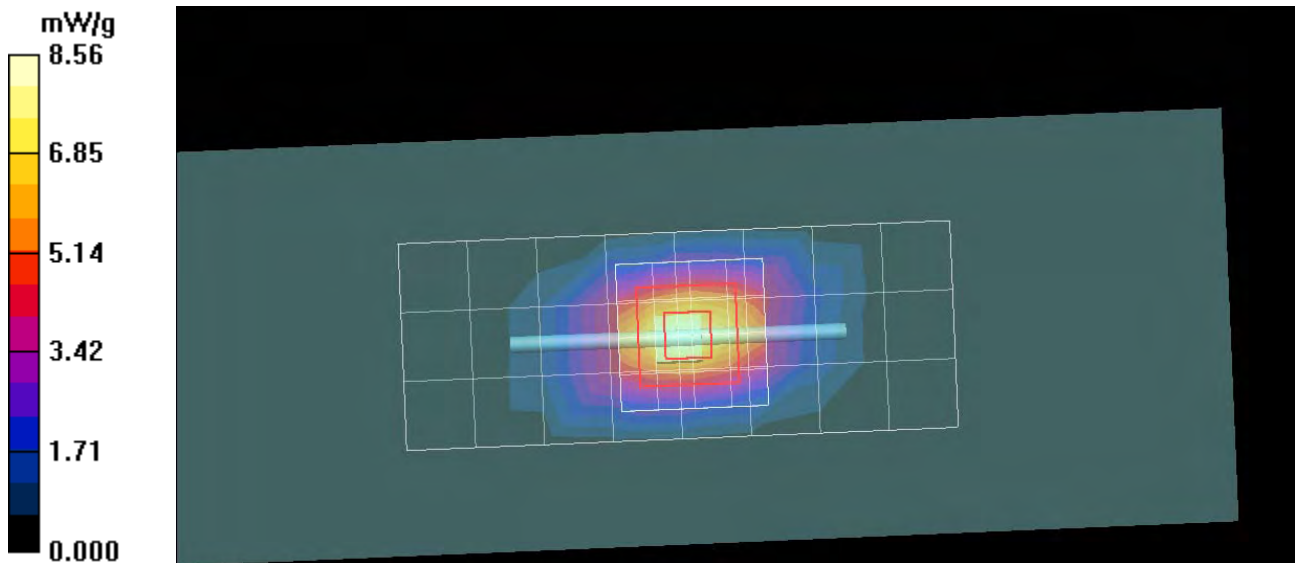
Peak SAR (extrapolated) = 13.3 W/kg

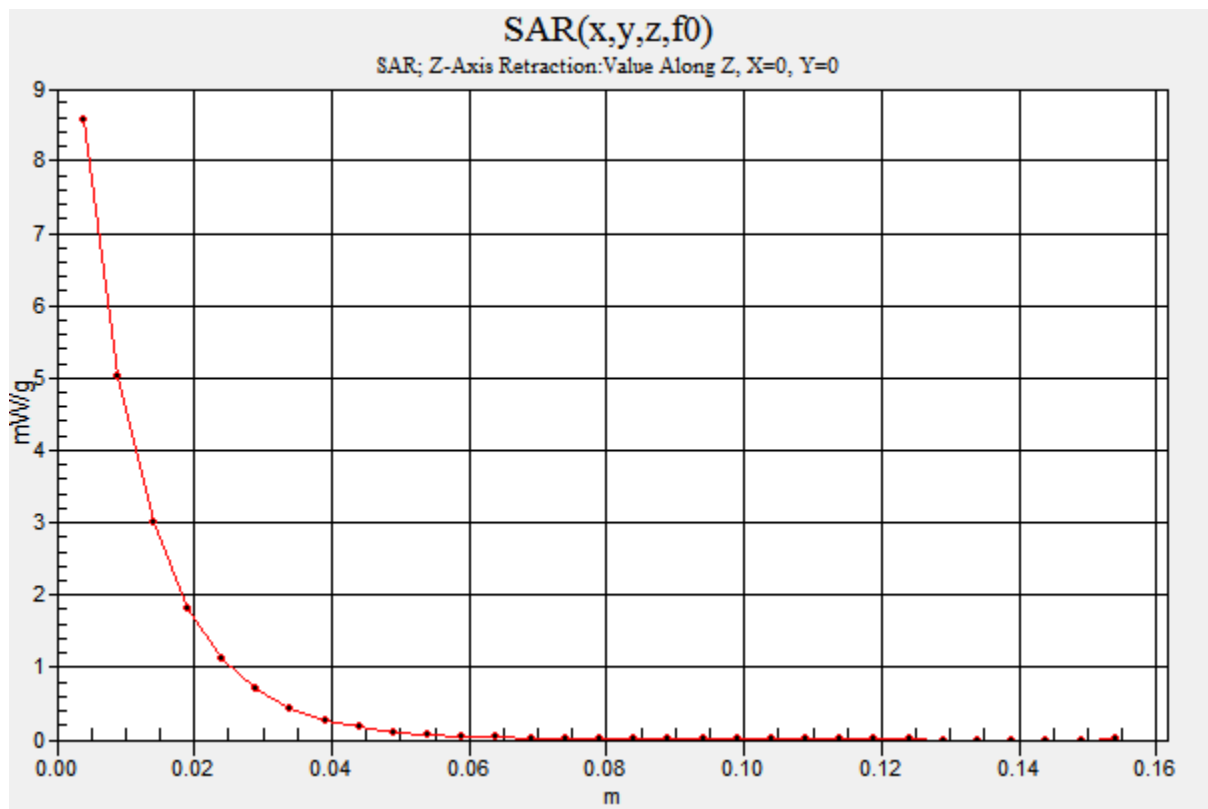
SAR(1 g) = 7.6 mW/g; SAR(10 g) = 4.06 mW/g

Maximum value of SAR (measured) = 8.54 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 8.56 mW/g





Test Laboratory: Motorola 1800 MHz System Performance Check

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:271TR

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -21.5dB [Sim.Temp@SPC](#) = 19 Room Temp @ SPC = 20.4
Communication System: CW - Dipole; Frequency: 1800 MHz; Communication System Channel Number: 8; Duty Cycle: 1:1

Medium: Validation *BODY Tissue* ; Medium parameters used: $f = 1800 \text{ MHz}$; $\sigma = 1.51 \text{ mho/m}$; $\epsilon_r = 51.1$; $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Section 2, 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/Dipole Area Scan (9x4x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 6.83 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 78.0 V/m; Power Drift = -0.033 dB

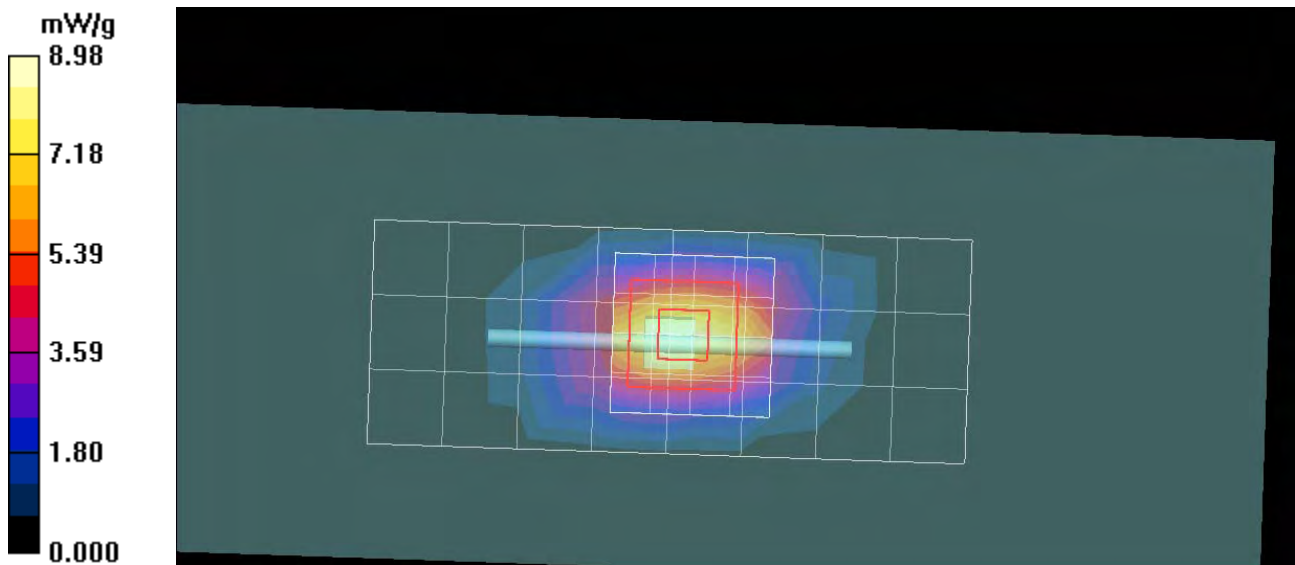
Peak SAR (extrapolated) = 13.8 W/kg

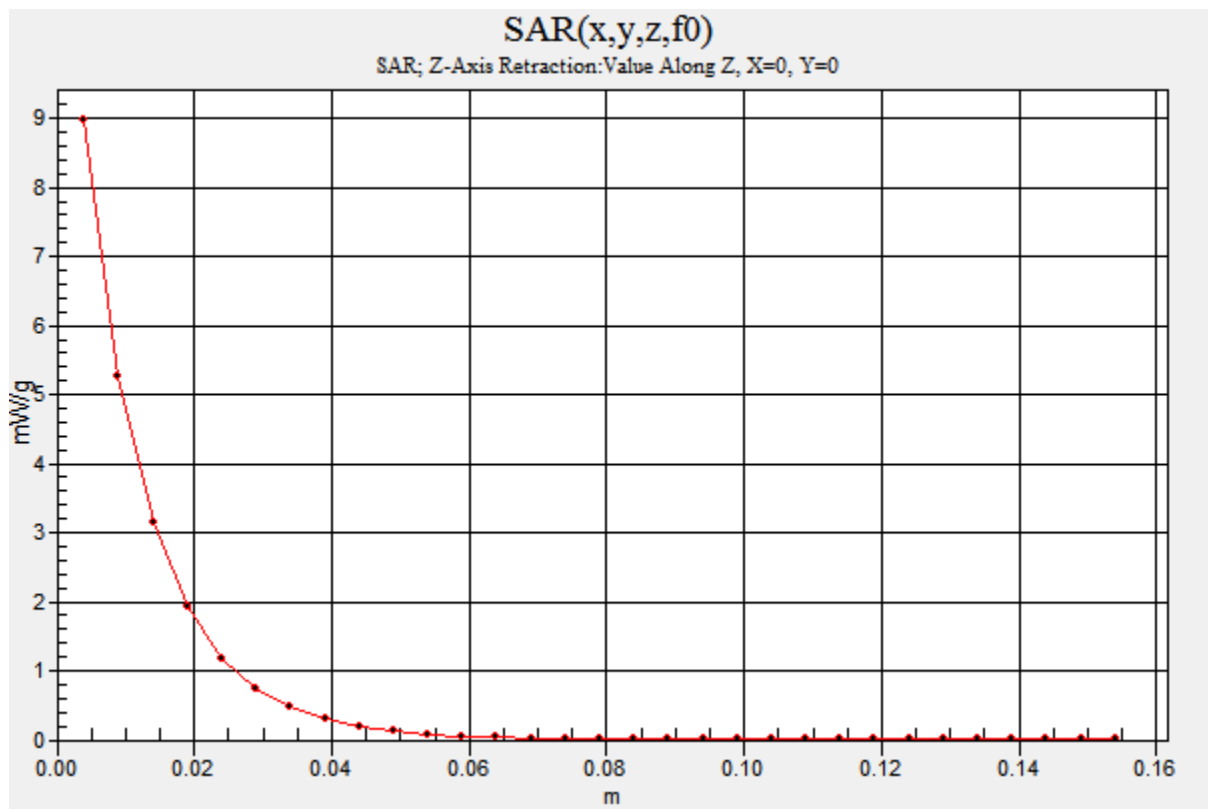
SAR(1 g) = 7.91 mW/g; SAR(10 g) = 4.22 mW/g

Maximum value of SAR (measured) = 8.86 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: $dx=20\text{mm}$, $dy=20\text{mm}$, $dz=5\text{mm}$

Maximum value of SAR (measured) = 8.98 mW/g





Test Laboratory: Motorola 1800 MHz System Performance Check

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:271TR

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -24.80 dB [Sim.Temp@SPC](#) = 19.3°C Room Temp @ SPC = 20.3°C

Communication System: CW - Dipole; Frequency: 1800 MHz; Communication System Channel Number: 8; Duty Cycle: 1:1

Medium: Validation *BODY Tissue* ; Medium parameters used: $f = 1800 \text{ MHz}$; $\sigma = 1.49 \text{ mho/m}$; $\epsilon_r = 51.5$; $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Section 2, 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/Dipole Area Scan (9x4x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 6.20 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 70.2 V/m; Power Drift = 0.010 dB

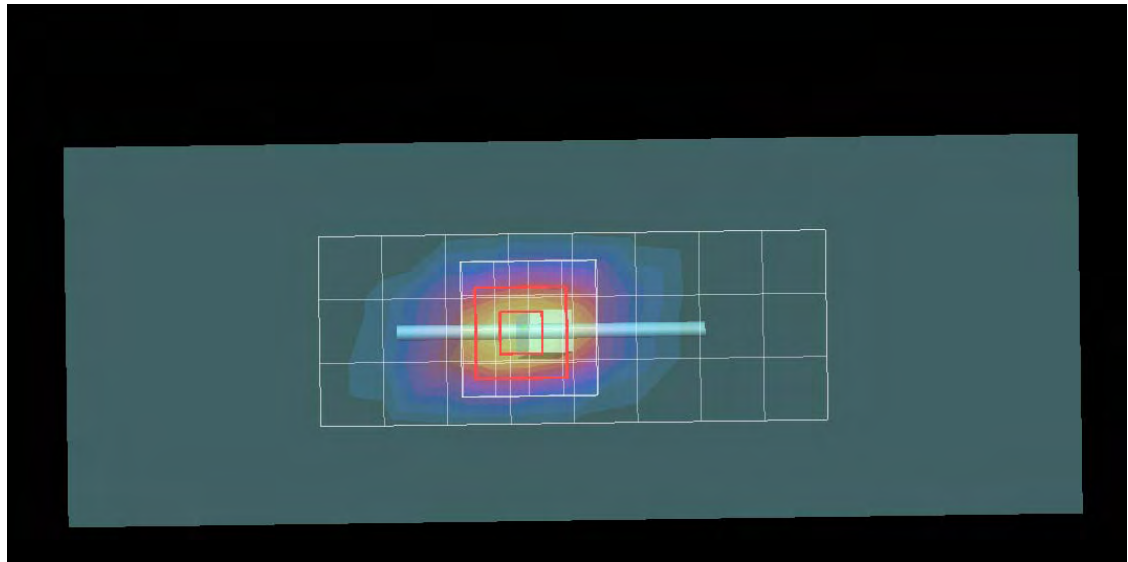
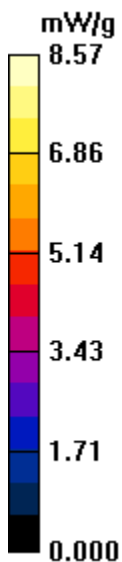
Peak SAR (extrapolated) = 13.2 W/kg

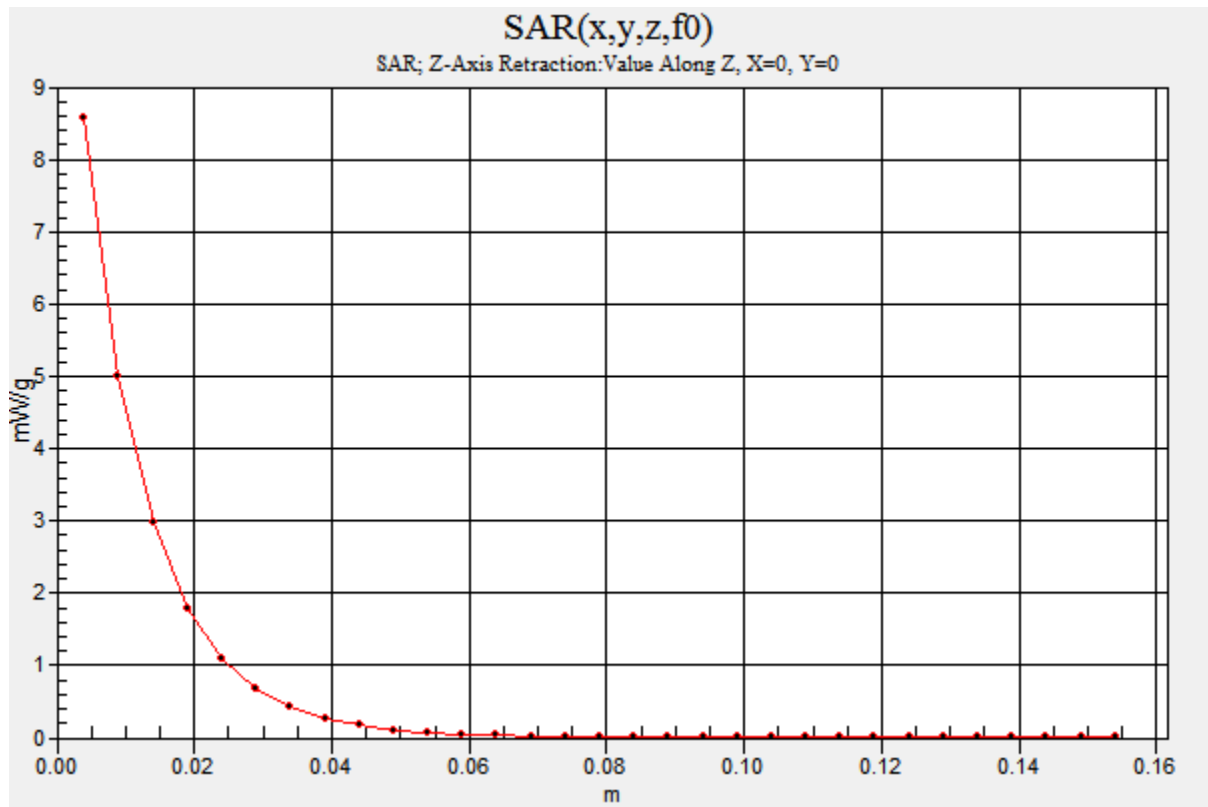
SAR(1 g) = 7.54 mW/g; SAR(10 g) = 4.03 mW/g

Maximum value of SAR (measured) = 8.43 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: $dx=20\text{mm}$, $dy=20\text{mm}$, $dz=5\text{mm}$

Maximum value of SAR (measured) = 8.57 mW/g





Appendix 2

SAR distribution plots for Mobile Hotspot Configuration

Test Laboratory: Motorola GSM 850 - Low Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2

Procedure Notes: Pwr Step: 05 Test Position = GPRS CLASS 10, BACK OF Phone 10MM FROM PHANTOM

Communication System: GPRS 850 - Class 10; Frequency: 824.2 MHz; Communication System Channel Number: 128; Duty Cycle: 1:4.15

Medium: Low Freq Body; Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.2$; $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.15, 6.15, 6.15); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ 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 - Full Body (15mm) (18x8x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

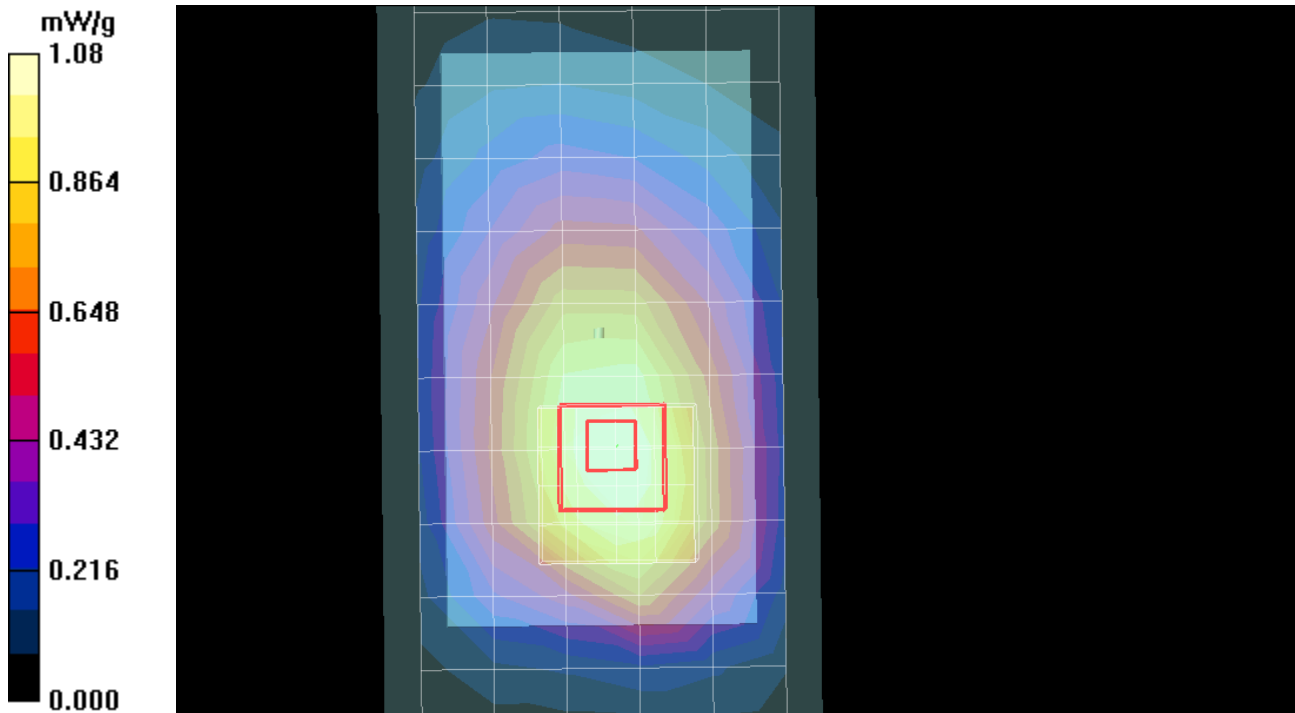
Amy Twin Phone Template/LOW CH: 5x5x7 Zoom Scan ($\leq 3\text{GHz}$) (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 33.7 V/m; Power Drift = -0.140 dB

Peak SAR (extrapolated) = 1.36 W/kg

SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.747 mW/g

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



Test Laboratory: Motorola GSM 850 - Low Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2 - Unit operating at non-reduced power for verification of utilization of reduction conditions

Procedure Notes: Pwr Step: 5 Test Position = GPRS CLASS 10, Back of Phone 10mm from Phantom

Communication System: GPRS 850 - Class 10; Frequency: 824.2 MHz; Communication System Channel Number: 128; Duty Cycle: 1:4.15

Medium: Low Freq Body; Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- - Probe: ES3DV3 - SN3183; ConvF(6.15, 6.15, 6.15); Calibrated: 7/14/2010
 - Sensor-Surface: 4mm (Mechanical Surface Detection)
 - Electronics: DAE4 Sn702; Calibrated: 4/14/2011
 - Phantom: R1_ 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 (10mm) (24x10x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 1.62 mW/g

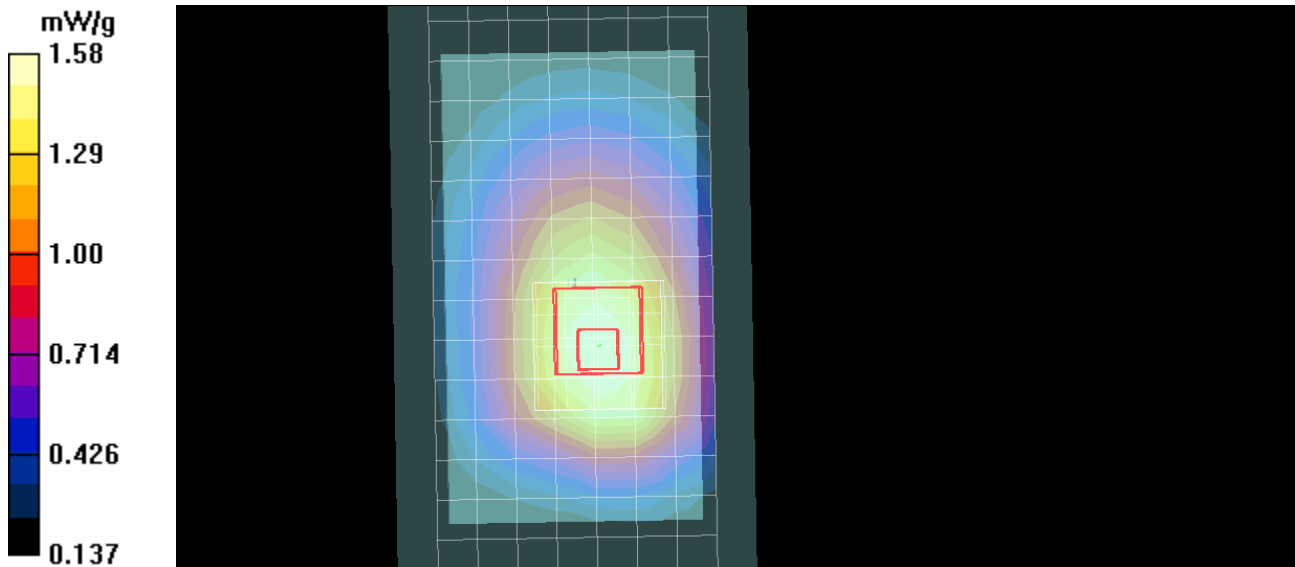
Amy Twin Phone Template/5x5x7 Zoom Scan ($\leq 3\text{GHz}$) (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 39.6 V/m; Power Drift = -0.026 dB

Peak SAR (extrapolated) = 2.01 W/kg

SAR(1 g) = 1.5 mW/g; SAR(10 g) = 1.1 mW/g

Maximum value of SAR (measured) = 1.58 mW/g



Test Laboratory: Motorola GSM 850 - Mid Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2

Procedure Notes: Pwr Step: 05 Test Position = GPRS CLASS 10, BACK OF Phone 10MM FROM PHANTOM
Communication System: GPRS 850 - Class 10; Frequency: 824.2 MHzFrequency: 836.6 MHz; Communication System Channel Number: 128

Medium: Low Freq Body; Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.2$; $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.15, 6.15, 6.15); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ 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 - Full Body (15mm) (18x8x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

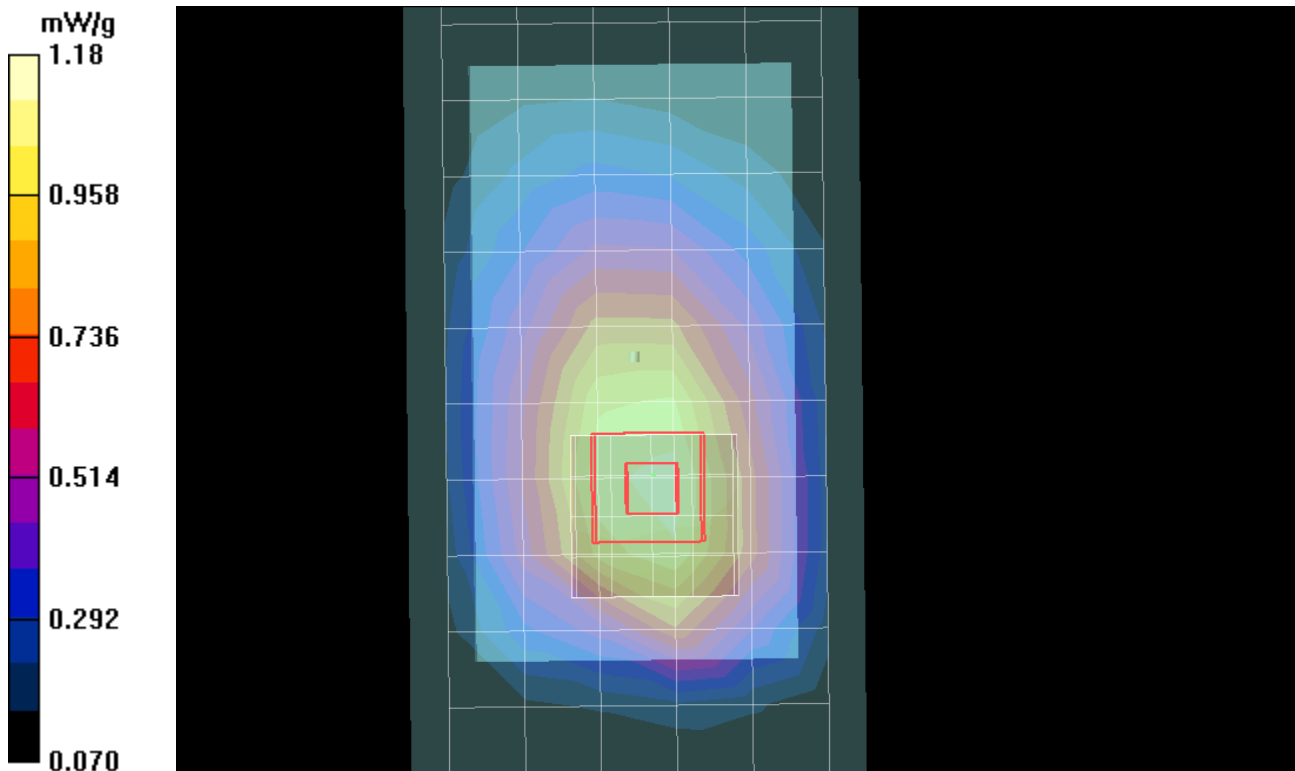
Amy Twin Phone Template/MID CH: 5x5x7 Zoom Scan ($\leq 3\text{GHz}$) (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 34.1 V/m; Power Drift = -0.129 dB

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 1.11 mW/g; SAR(10 g) = 0.794 mW/g

Maximum value of SAR (measured) = 1.18 mW/g



Test Laboratory: Motorola GSM 850 - Mid Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2 - Unit operating at non-reduced power for verification of utilization of reduction conditions

Procedure Notes: Pwr Step: 5 Test Position- GPRS CLASS 10, Back of Phone 10mm from Phantom

Communication System: GPRS 850 - Class 10; Frequency: 836.6 MHz; Communication System Channel Number: 190; Duty Cycle: 1:4.15

Medium: Low Freq Body; Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.15, 6.15, 6.15); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ 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 (10mm) (24x10x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 1.52 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan ($\leq 3\text{GHz}$), - to correct max out (5x5x7)/Cube 0:

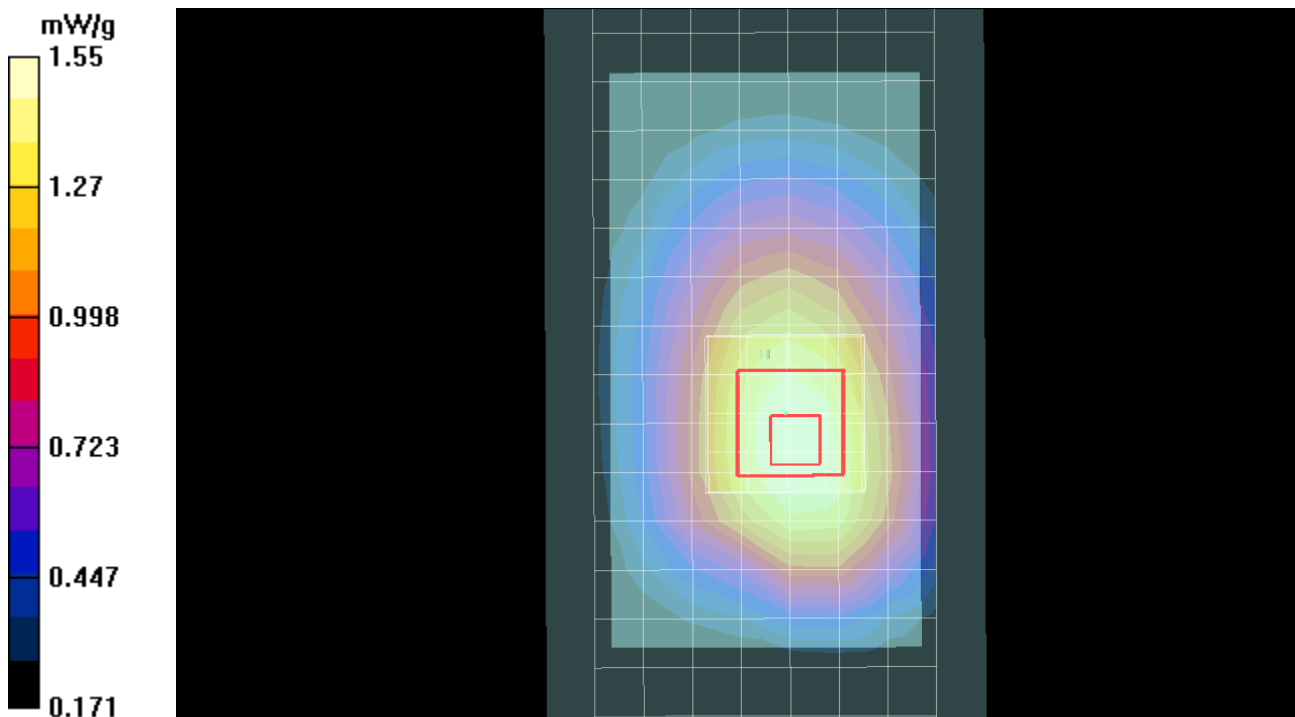
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 39.5 V/m; Power Drift = 0.019 dB

Peak SAR (extrapolated) = 1.97 W/kg

SAR(1 g) = 1.48 mW/g; SAR(10 g) = 1.1 mW/g

Maximum value of SAR (measured) = 1.55 mW/g



Test Laboratory: Motorola GSM 850 - High Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2

Procedure Notes: Pwr Step: 05 Test Position = GPRS CLASS 10, BACK OF Phone 10MM FROM PHANTOM

Communication System: GPRS 850 - Class 10; Frequency: 848.8 MHz; Communication System Channel Number: 251; Duty Cycle: 1:4.15

Medium: Low Freq Body; Medium parameters used: $f = 835$ MHz; $\sigma = 0.99$ mho/m; $\epsilon_r = 53.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.15, 6.15, 6.15); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ 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 - Full Body (15mm) (18x8x1): Measurement grid: dx=15mm, dy=15mm

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

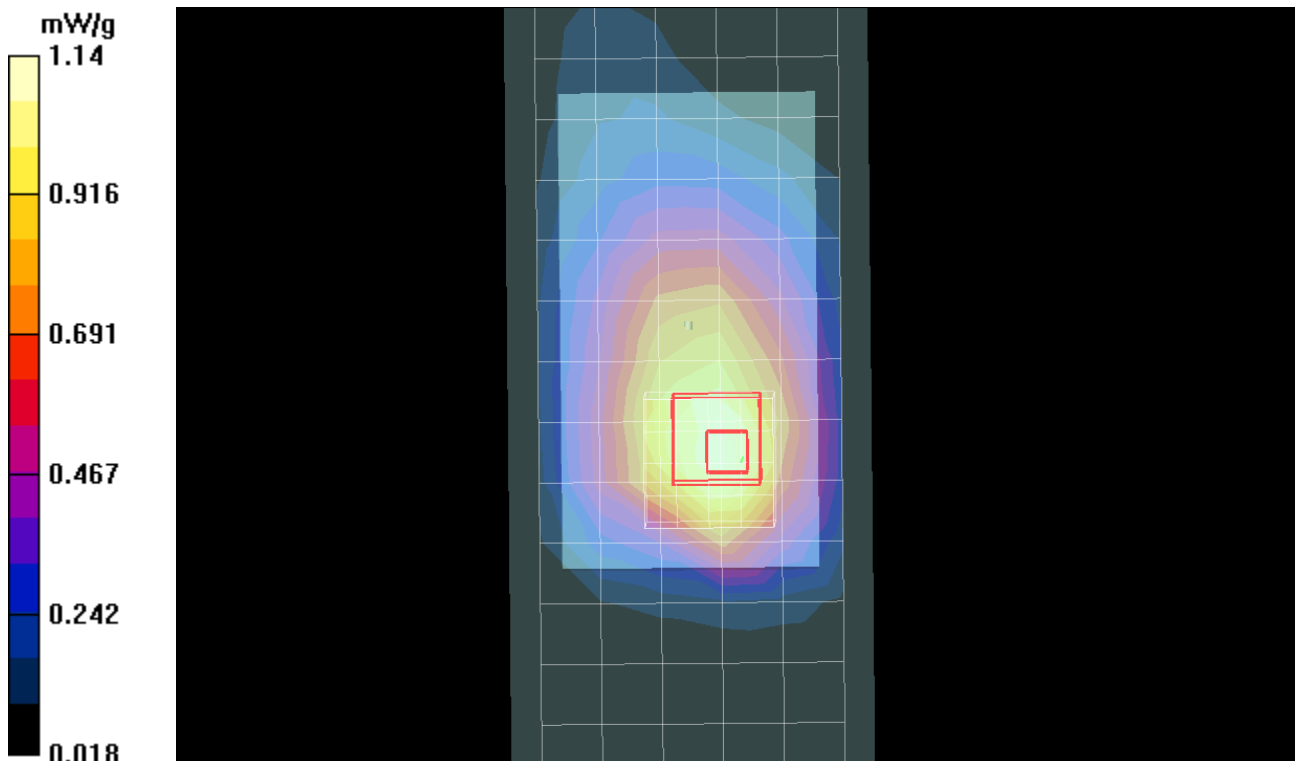
Amy Twin Phone Template/HIGH CH: 5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 32.5 V/m; Power Drift = 0.311 dB

Peak SAR (extrapolated) = 1.56 W/kg

SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.749 mW/g

Maximum value of SAR (measured) = 1.14 mW/g



Test Laboratory: Motorola GSM 850 - High Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2 - Unit operating at non-reduced power for verification of utilization of reduction conditions

Procedure Notes: Pwr Step: 5 Test Position = GPRS CLASS 10, Back of Phone 10mm from Phantom
Communication System: GPRS 850 - Class 10; Frequency: 848.8 MHz; Communication System Channel Number: 251; Duty Cycle: 1:4.15

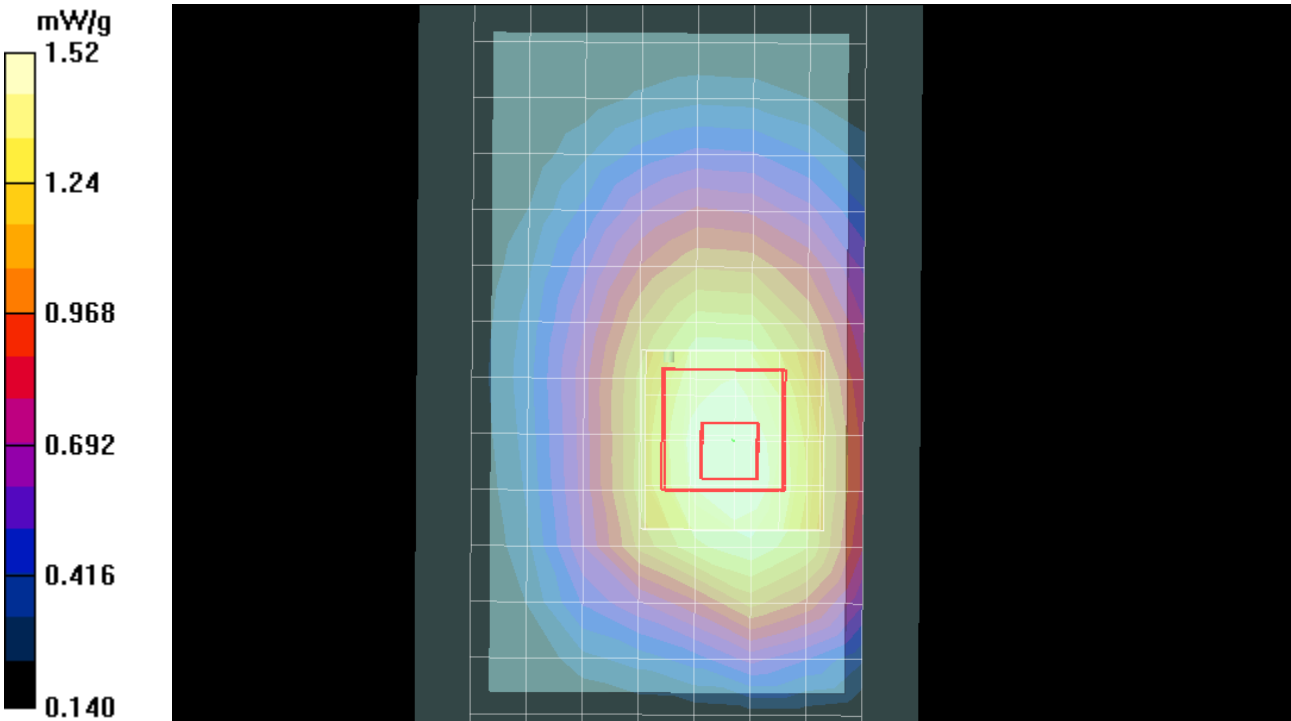
Medium: Low Freq Body; Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.15, 6.15, 6.15); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ 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 (10mm) (24x10x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
Maximum value of SAR (measured) = 1.55 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan ($\leq 3\text{GHz}$) (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 38.4 V/m; Power Drift = -0.284 dB
Peak SAR (extrapolated) = 1.85 W/kg
SAR(1 g) = 1.44 mW/g; SAR(10 g) = 1.06 mW/g
Maximum value of SAR (measured) = 1.52 mW/g



Test Laboratory: Motorola GSM 1900 - Low Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2

Procedure Notes: Pwr Step: 0 Test Position = GPRS CLASS 10, BACK OF PHONE 10MM FROM PHANTOM

Communication System: GPRS 1900 - Class 10; Frequency: 1850.2 MHz; Communication System Channel Number: 512; Duty Cycle: 1:4.15

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.59$ mho/m; $\epsilon_r = 51.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Section 2, 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 - Full Body (15mm) (18x8x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.23 mW/g

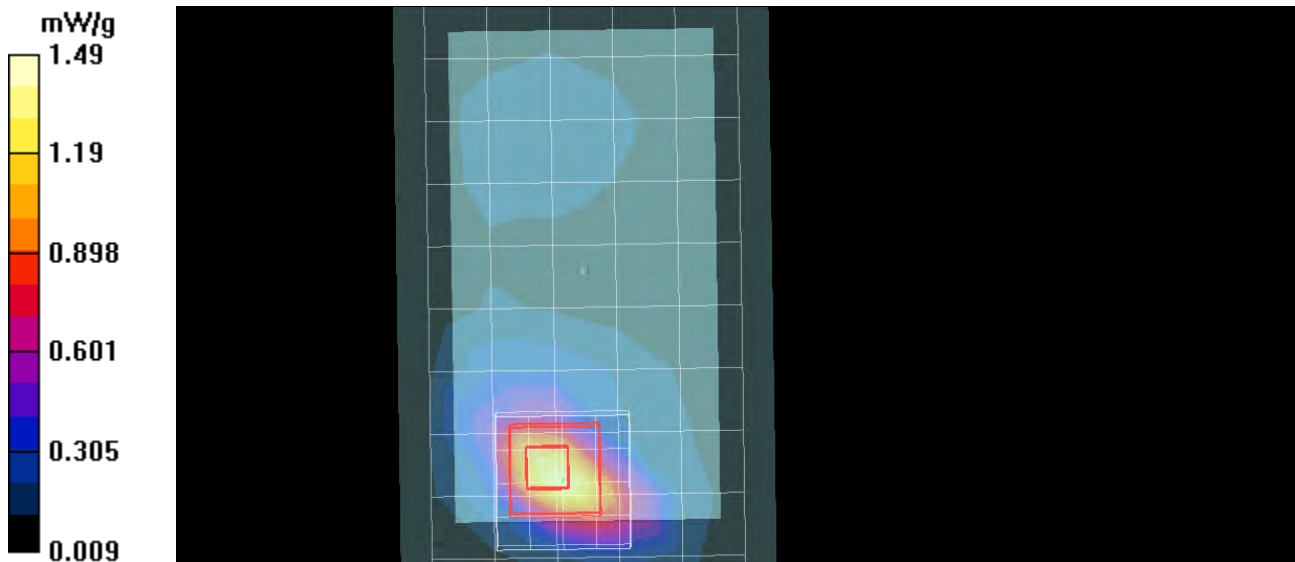
Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.3 V/m; Power Drift = 0.108 dB

Peak SAR (extrapolated) = 3.25 W/kg

SAR(1 g) = 1.27 mW/g; SAR(10 g) = 0.656 mW/g

Maximum value of SAR (measured) = 1.49 mW/g



Test Laboratory: Motorola GSM 1900 - Low Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2 - Unit operang at non-reduced power for verifcaon ofulizaon of reducon condions

Procedure Notes: Pwr Step: 0 Test Position = GPRS CLASS 10, Back of Phone 10mm from Phantom

Communication System: GPRS 1900 - Class 10; Frequency: 1850.2 MHz; Communication System Channel Number: 512; Duty Cycle: 1:4.15

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.58$ mho/m; $\epsilon_r = 51.3$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(4.76, 4.76, 4.76); Calibrated: 8/11/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn434; Calibrated: 1/13/2011
- Phantom: R4 : Sect.1, Amy Twin, Rev.3 (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 (10mm) (24x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 2.59 mW/g

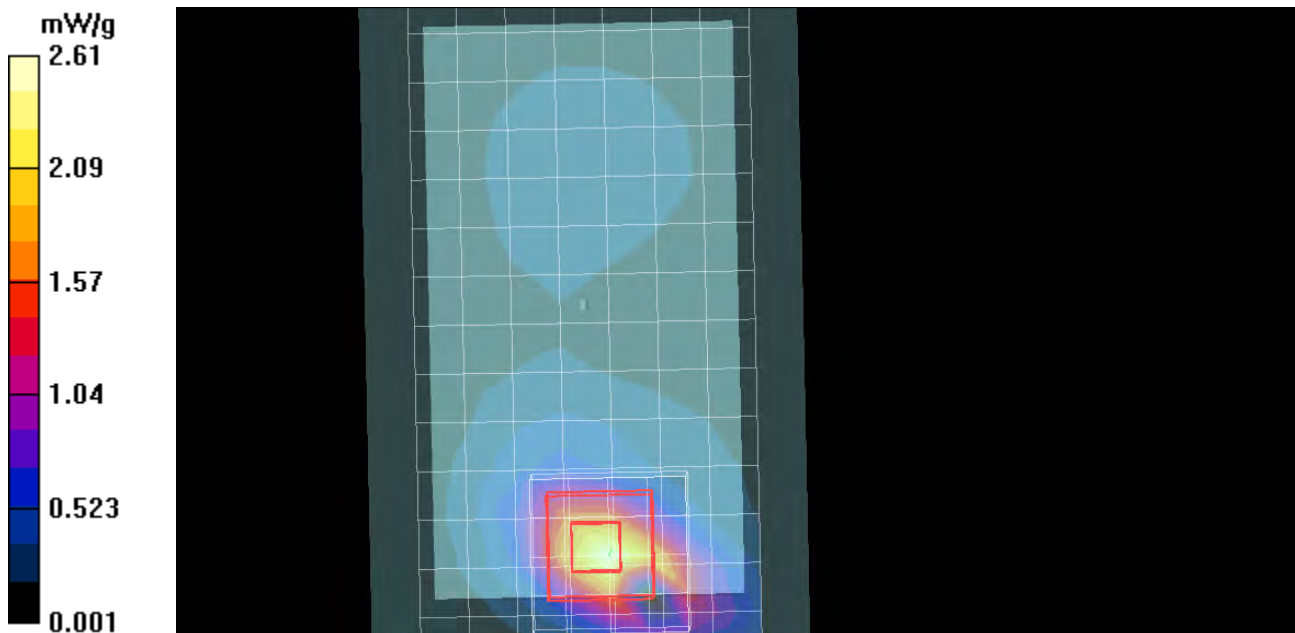
Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 40.0 V/m; Power Drift = -0.048 dB

Peak SAR (extrapolated) = 3.75 W/kg

SAR(1 g) = 2.19 mW/g; SAR(10 g) = 1.03 mW/g

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



Test Laboratory: Motorola GSM 1900 - Mid Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2

Procedure Notes: Pwr Step: 0 Test Position = GPRS Class 10, Back of Phone 10mm from Phantom

Communication System: GPRS 1900 - Class 10; Frequency: 1880 MHz; Communication System Channel Number: 661; Duty Cycle: 1:4.15

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.59$ mho/m; $\epsilon_r = 50.7$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Section 2, 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 (10mm) (24x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.768 mW/g

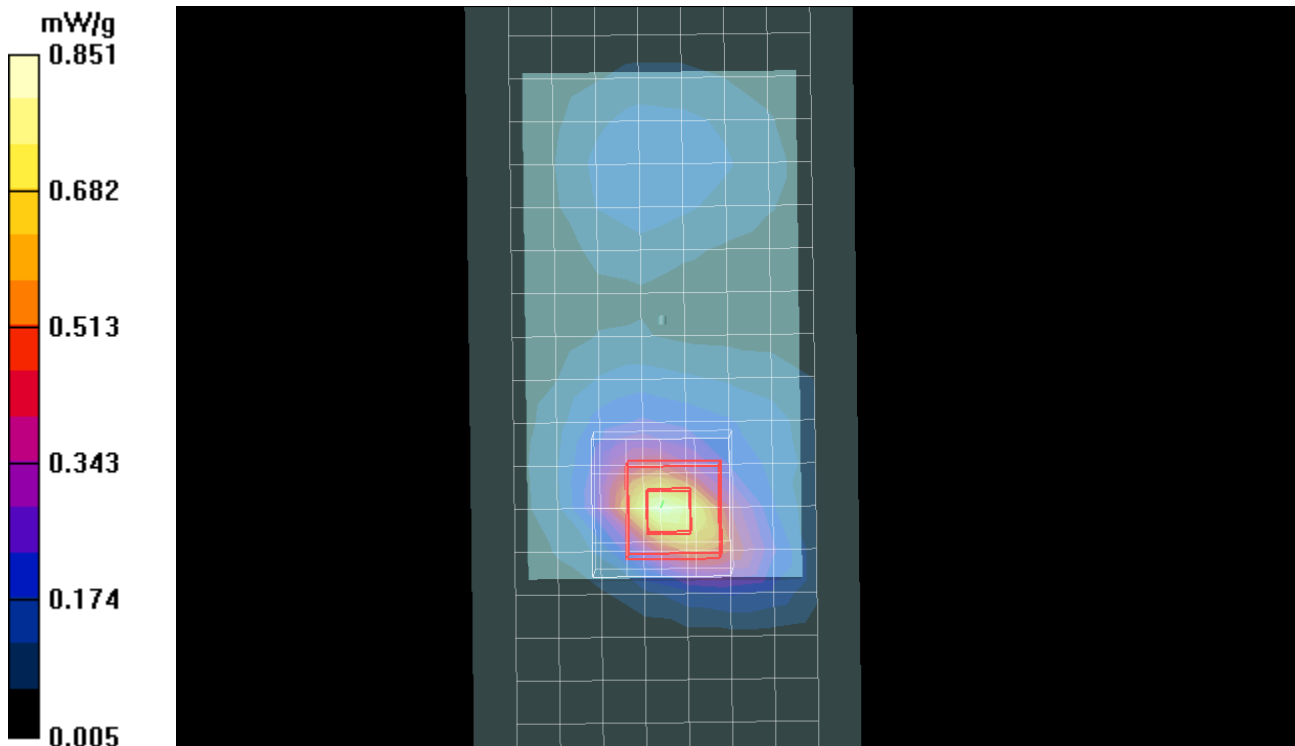
Amy Twin Phone Template/5x5x7 Zoom Scan (≤ 3 GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.7 V/m; Power Drift = -0.312 dB

Peak SAR (extrapolated) = 1.19 W/kg

SAR(1 g) = 0.717 mW/g; SAR(10 g) = 0.371 mW/g

Maximum value of SAR (measured) = 0.851 mW/g



Test Laboratory: Motorola GSM 1900 - Mid Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2- Unit operating at non-reduced power for verification of utilization of reduction conditions

Procedure Notes: Pwr Step:0 Test Position = GPRS CLASS 10, BACK OF Phone 10MM FROM PHANTOM

Communication System: GPRS 1900 - Class 10; Frequency: 1880 MHz; Communication System Channel Number: 661; Duty Cycle: 1:4.15

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.59$ mho/m; $\epsilon_r = 51.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Section 2, 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) = 1.17 mW/g

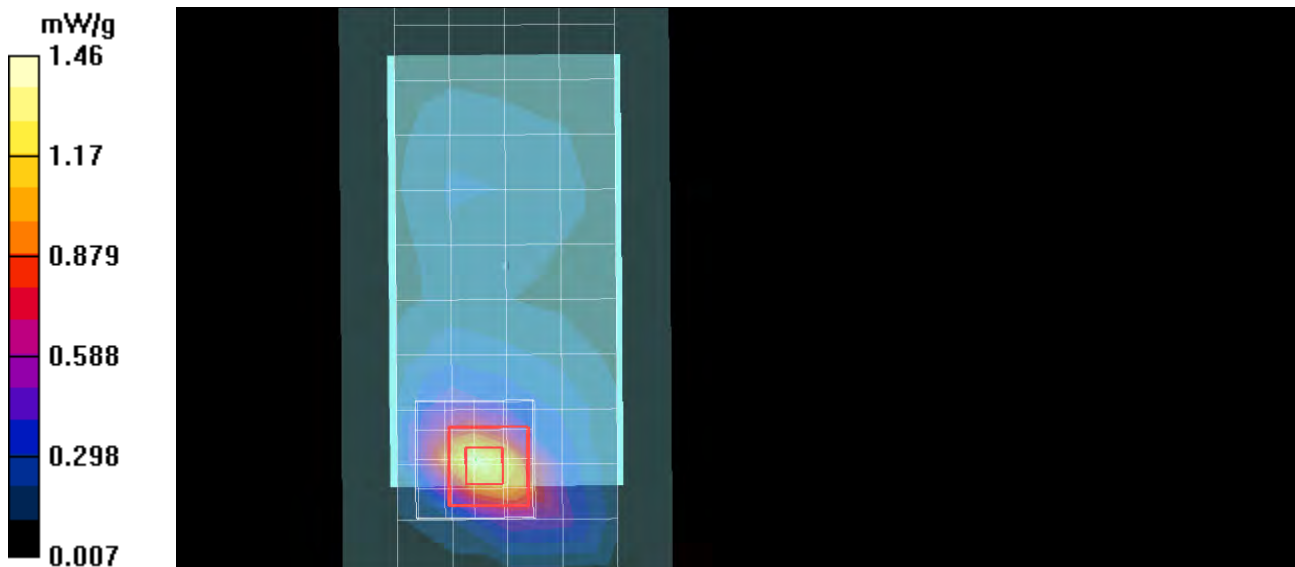
Amy Twin Phone Template/5x5x7 Zoom Scan (≤ 3 GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.7 V/m; Power Drift = 0.171 dB

Peak SAR (extrapolated) = 2.12 W/kg

SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.622 mW/g

Maximum value of SAR (measured) = 1.46 mW/g



Test Laboratory: Motorola GSM 1900 - High Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2

Procedure Notes: Pwr Step: 0 Test Position = GPRS CLASS 10, BACK OF PHONE 10MM FROM PHANTOM

Communication System: GPRS 1900 - Class 10; Frequency: 1909.8 MHz; Communication System Channel Number: 810; Duty Cycle: 1:4.15

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.59$ mho/m; $\epsilon_r = 51.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Section 2, 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 - Full Body (15mm) (18x8x1): Measurement grid: dx=15mm, dy=15mm

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

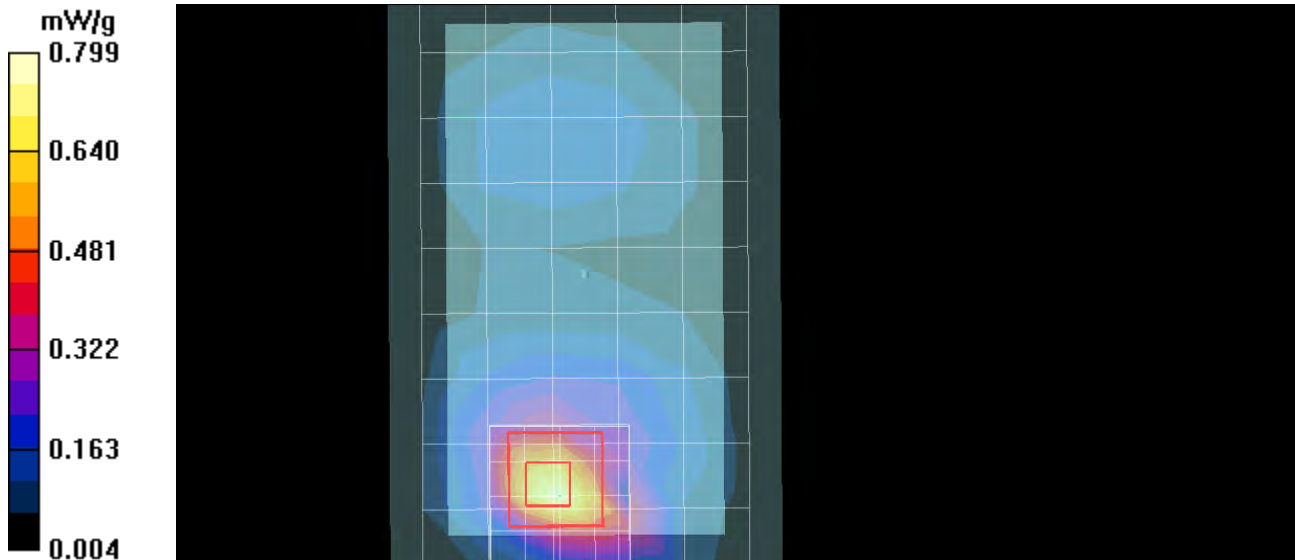
Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 19.6 V/m; Power Drift = 0.208 dB

Peak SAR (extrapolated) = 1.22 W/kg

SAR(1 g) = 0.706 mW/g; SAR(10 g) = 0.359 mW/g

Maximum value of SAR (measured) = 0.799 mW/g



Test Laboratory: Motorola GSM 1900 - High Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2 - Unit operating at non-reduced power for verification of utilization of reduction conditions

Procedure Notes: Pwr Step: 0 Test Position = GPRS Class 10, Back of Phone 10mm from Phantom

Communication System: GPRS 1900 - Class 10; Frequency: 1909.8 MHz; Communication System Channel Number: 810; Duty Cycle: 1:4.15

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.59$ mho/m; $\epsilon_r = 51.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Section 2, 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 (10mm) (24x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 1.20 mW/g

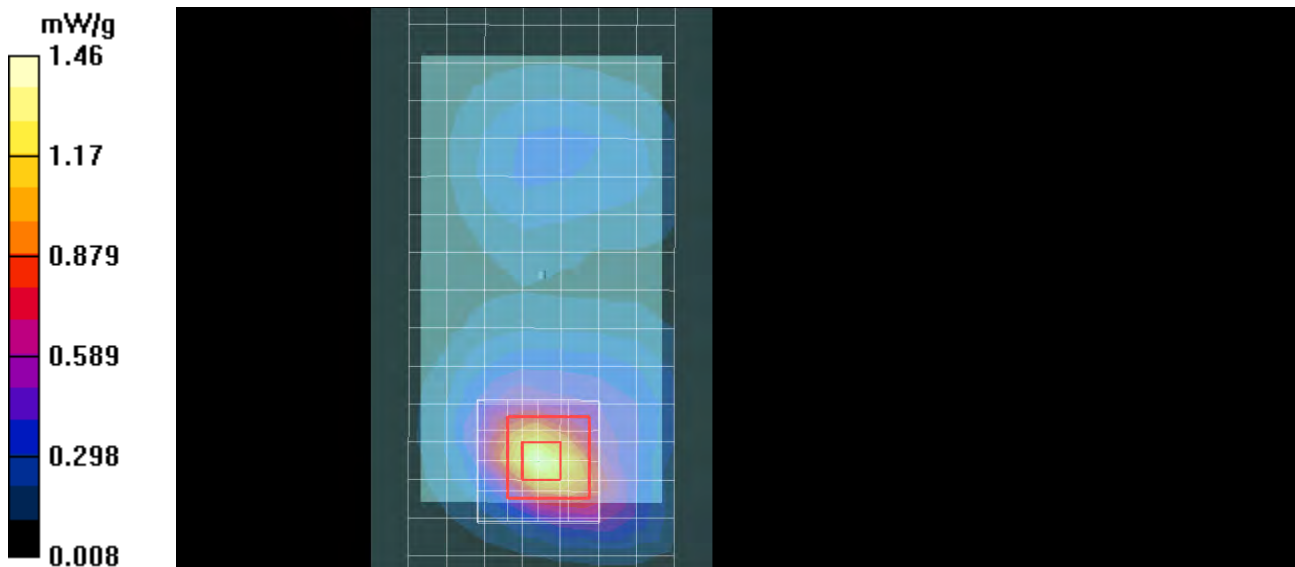
Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 29.9 V/m; Power Drift = 0.262 dB

Peak SAR (extrapolated) = 2.08 W/kg

SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.640 mW/g

Maximum value of SAR (measured) = 1.46 mW/g



Test Laboratory: Motorola WCDMA 1900 - Low Channel

DUT: 356381040017539; FCC ID: IHDP56LS2

Procedure Notes: Pwr Step: All Up Bits Test Position = Back of Phone 10mm from Phantom

Communication System: 3G/WCDMA 1900; Frequency: 1852.5 MHz; Communication System Channel Number: 9262; Duty Cycle: 1:1

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.57$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- Phantom: R1_ Section 2, 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 - Full Body (15mm) (18x8x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.943 mW/g

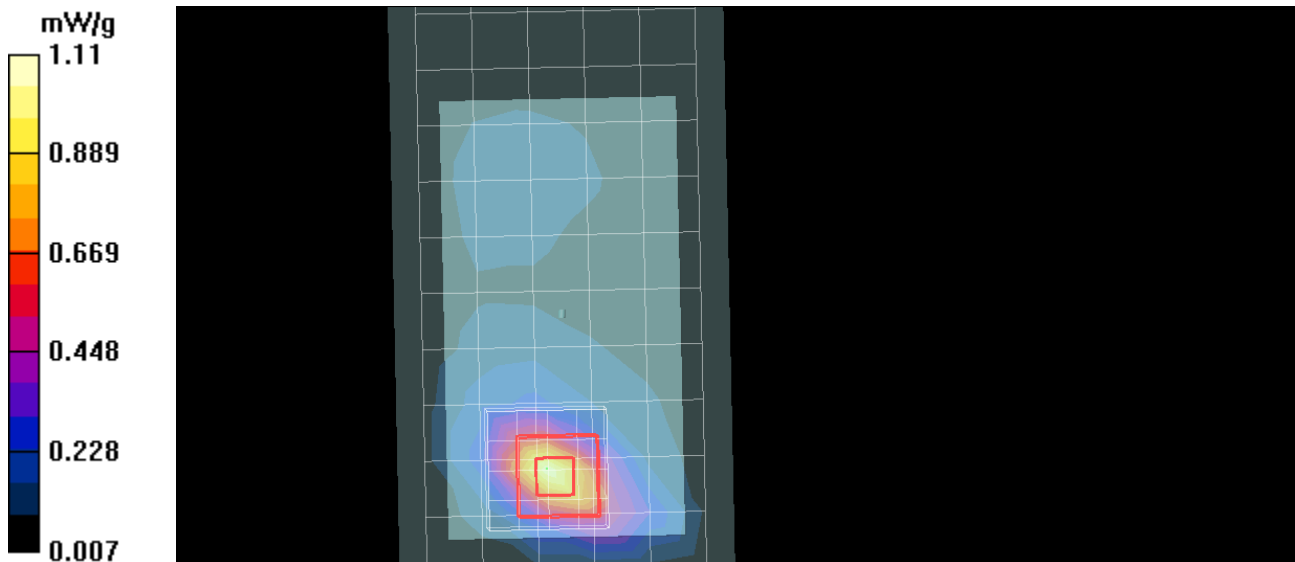
Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.8 V/m; Power Drift = -0.315 dB

Peak SAR (extrapolated) = 1.58 W/kg

SAR(1 g) = 0.942 mW/g; SAR(10 g) = 0.479 mW/g

Maximum value of SAR (measured) = 1.11 mW/g



Test Laboratory: Motorola WCDMA 1900 - Low Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2 - Unit operating at non-reduced power for verification of utilization of reduction conditions

Procedure Notes: Pwr Step: always up Test Position = BACK OF Phone 10MM FROM PHANTOM

Communication System: 3G/WCDMA 1900; Frequency: 1852.5 MHz; Communication System Channel Number: 9262; Duty Cycle: 1:1

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.59$ mho/m; $\epsilon_r = 51.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Section 2, 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) = 1.65 mW/g

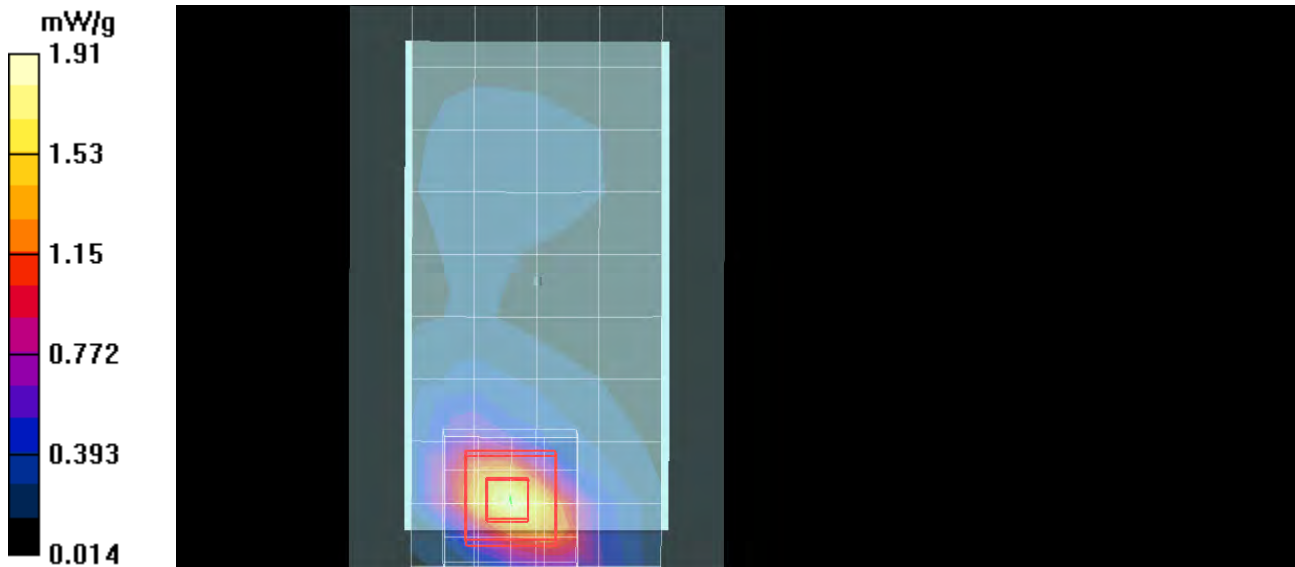
Amy Twin Phone Template/5x5x7 Zoom Scan (≤ 3 GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 29.9 V/m; Power Drift = 0.220 dB

Peak SAR (extrapolated) = 2.78 W/kg

SAR(1 g) = 1.65 mW/g; SAR(10 g) = 0.852 mW/g

Maximum value of SAR (measured) = 1.91 mW/g



Test Laboratory: Motorola WCDMA 1900 - Mid Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2

Procedure Notes: Pwr Step: All Up Bits Test Position = Back 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; $\sigma = 1.57$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- Phantom: R1_ Section 2, 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 - Full Body (15mm) (18x8x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.851 mW/g

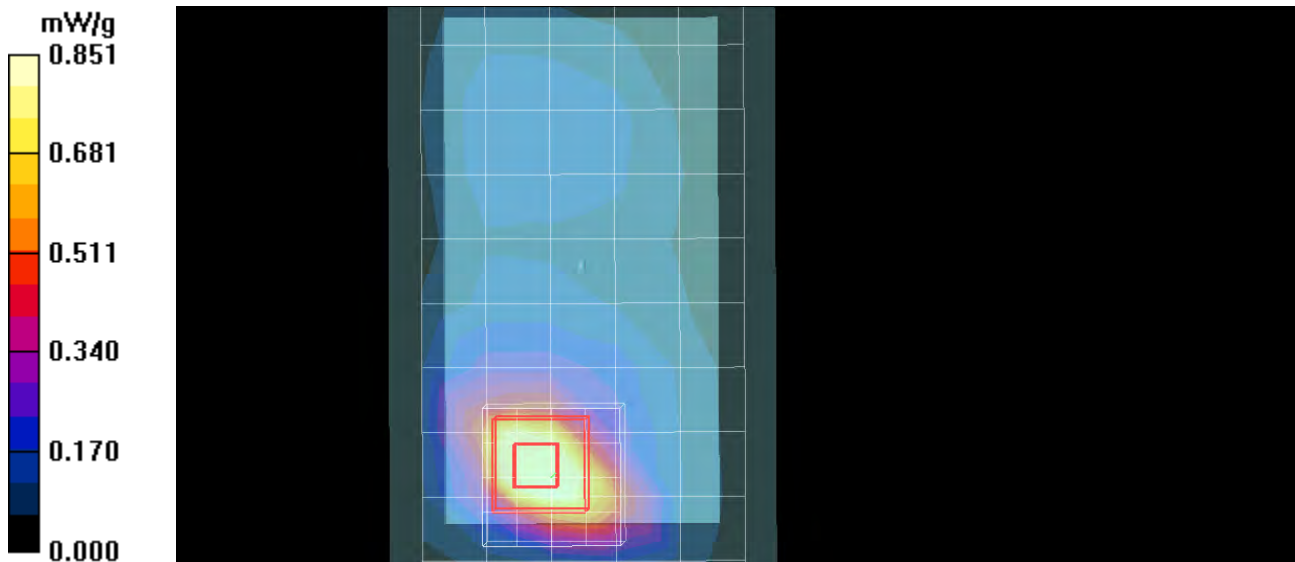
Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.7 V/m; Power Drift = 0.160 dB

Peak SAR (extrapolated) = 1.71 W/kg

SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.516 mW/g

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



Test Laboratory: Motorola WCDMA 1900 - Mid Channel

DUT: Serial: 356381040017539; FCC ID: IHDP56LS2 - Unit operating at non-reduced power for verification of utilization of reduction conditions

Procedure Notes: Pwr Step: always up Test Position = BACK 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; $\sigma = 1.59$ mho/m; $\epsilon_r = 51.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.84, 4.84, 4.84); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 4/14/2011
- Phantom: R1_ Section 2, 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) = 1.41 mW/g

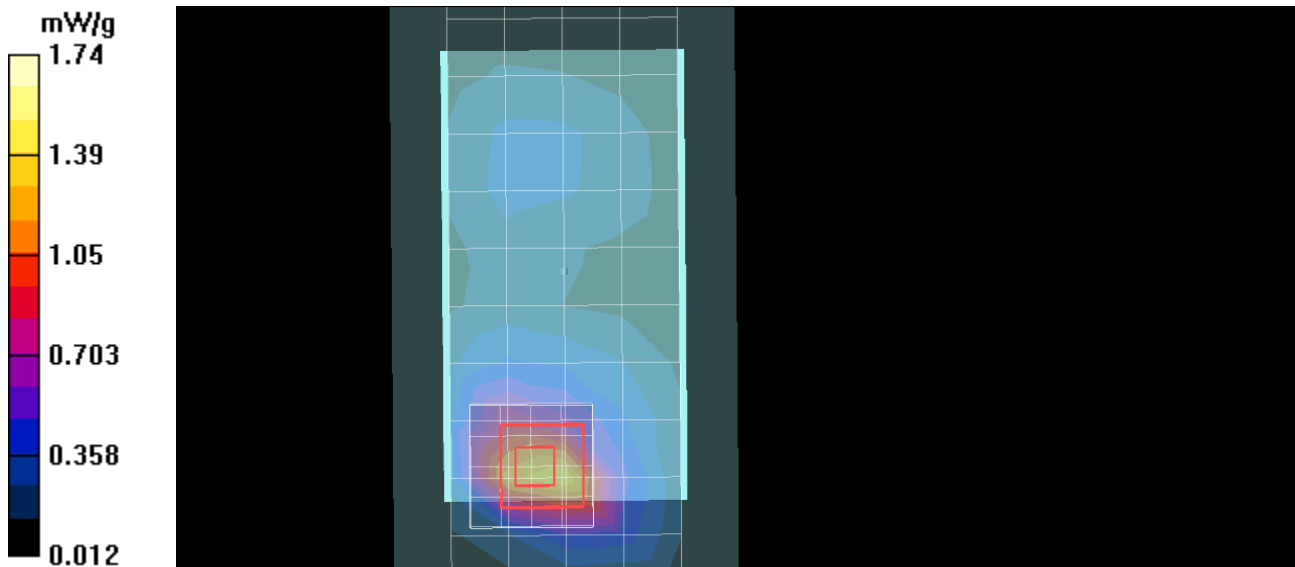
Amy Twin Phone Template/5x5x7 Zoom Scan (≤ 3 GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 29.0 V/m; Power Drift = 0.141 dB

Peak SAR (extrapolated) = 2.48 W/kg

SAR(1 g) = 1.48 mW/g; SAR(10 g) = 0.776 mW/g

Maximum value of SAR (measured) = 1.74 mW/g



Appendix 3

Measurement Uncertainty Budget

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i> = <i>f(d,k)</i>	<i>f</i>	<i>g</i>	<i>h</i> = <i>c x f</i> / <i>e</i>	<i>i</i> = <i>c x g</i> / <i>e</i>	<i>k</i>
Uncertainty Component	IEEE 1528 section	Tol. (± %)	Prob Dist	Div.	<i>c_i</i> (1 g)	<i>c_i</i> (10 g)	1 g <i>u_i</i> (±%)	10 g <i>u_i</i> (±%)	<i>v_i</i>
Measurement System									
Probe Calibration	E.2.1	5.9	N	1.00	1	1	5.9	5.9	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mech. Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2	3.2	N	1.00	1	1	3.2	3.2	29
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				11.1	10.8	411
Expanded Uncertainty (95% CONFIDENCE LEVEL)			<i>k</i> =2				22.2	21.6	

Appendix 4

Probe Calibration Certificate



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 MDb**

Certificate No: **ES3-3183_Jul10**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3183**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-23.v3 and QA CAL-25.v2
Calibration procedure for dosimetric E-field probes**

Calibration date: **July 14, 2010**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

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

Issued: July 15, 2010

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



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 effect the E²-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.
- 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.

Probe ES3DV3

SN:3183

Manufactured:	March 25, 2008
Last calibrated:	August 17, 2009
Recalibrated:	July 14, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 SN:3183**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.21	1.15	1.07	± 10.1%
DCP (mV) ^B	88.6	86.9	89.5	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300.0	± 1.5%
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

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 E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter; uncertainty not required.

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

DASY/EASY - Parameters of Probe: ES3DV3 SN:3183

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	6.11	6.11	6.11	0.99	1.04 ± 11.0%
1810	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	5.05	5.05	5.05	0.58	1.33 ± 11.0%
1950	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	4.82	4.82	4.82	0.54	1.37 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	4.49	4.49	4.49	0.44	1.70 ± 11.0%

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

DASY/EASY - Parameters of Probe: ES3DV3 SN:3183

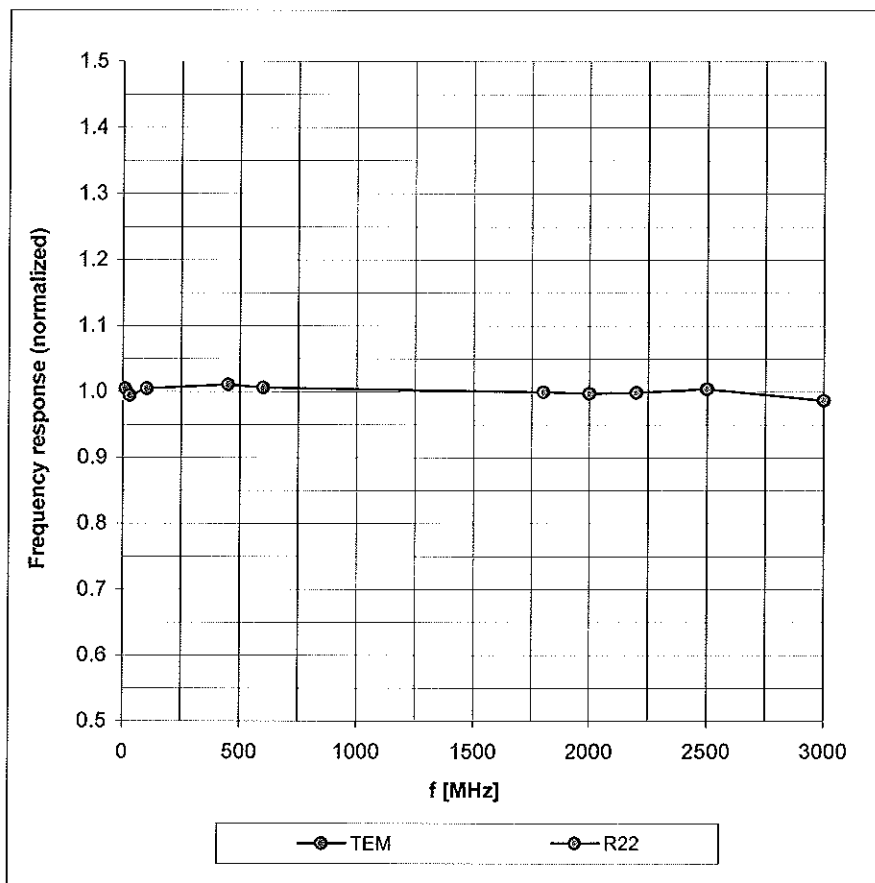
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	6.15	6.15	6.15	0.95	1.10 ± 11.0%
1810	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.84	4.84	4.84	0.39	1.87 ± 11.0%
1950	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.86	4.86	4.86	0.28	2.80 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	4.36	4.36	4.36	0.69	1.31 ± 11.0%

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

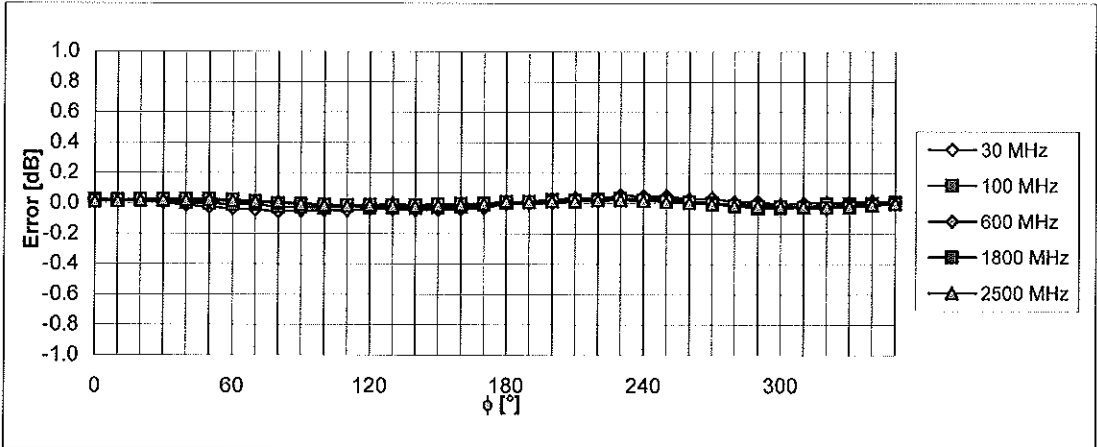
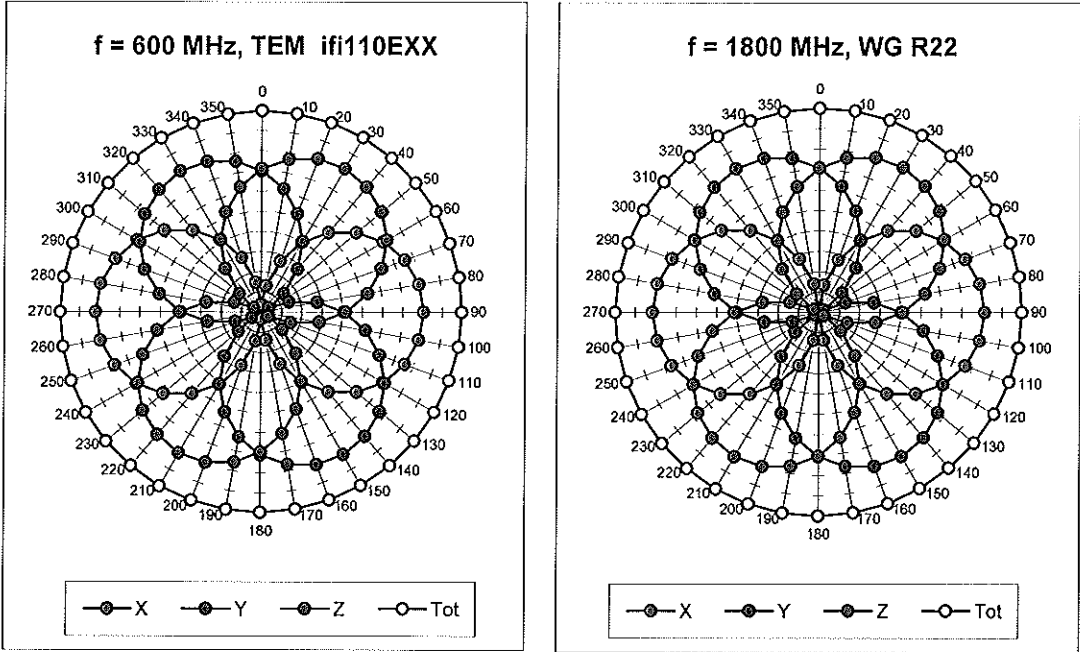
Frequency Response of E-Field

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



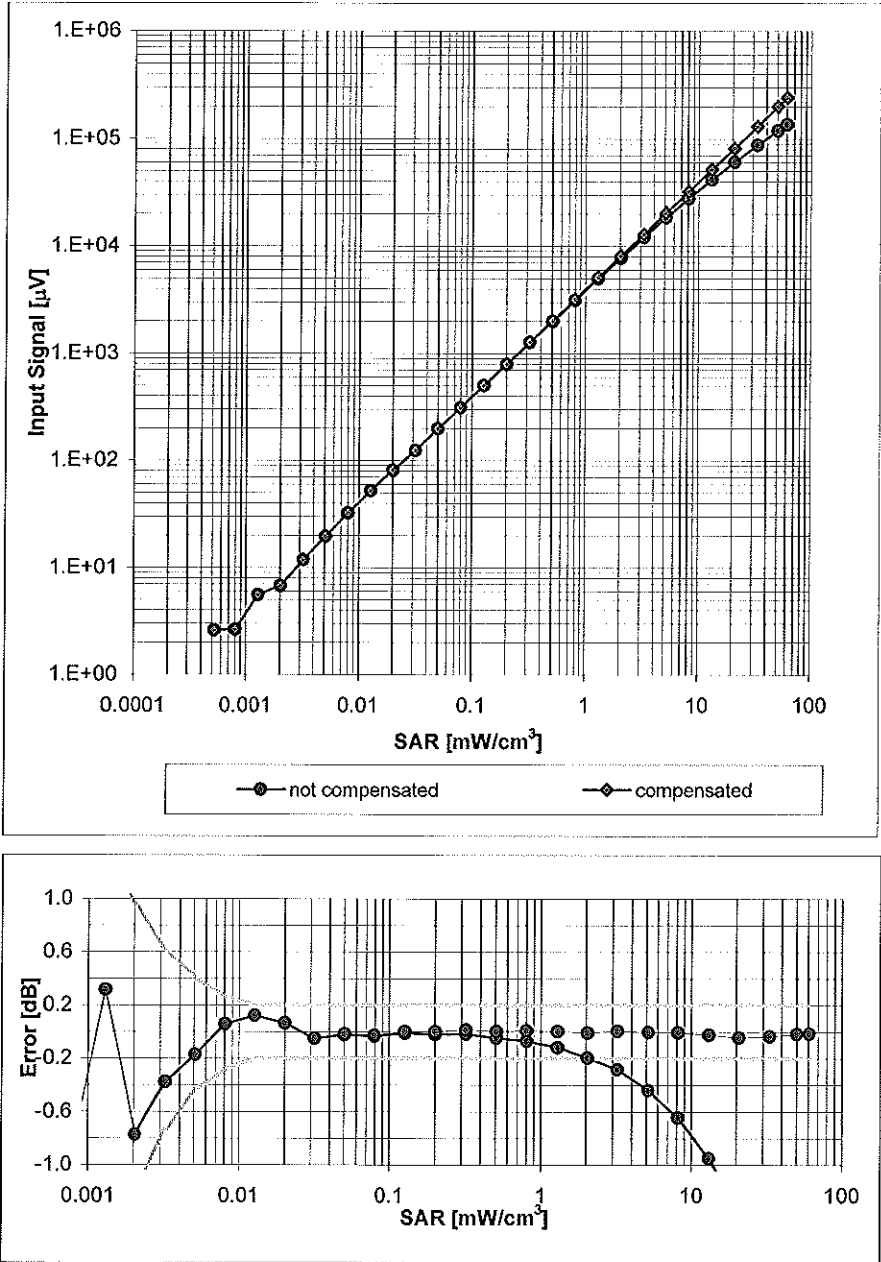
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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



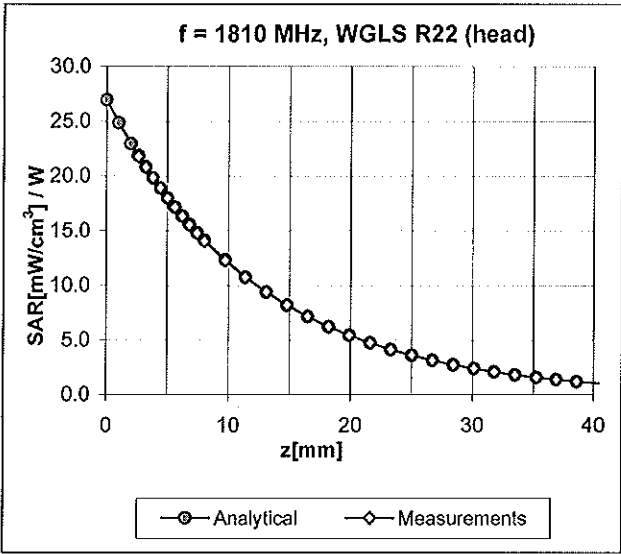
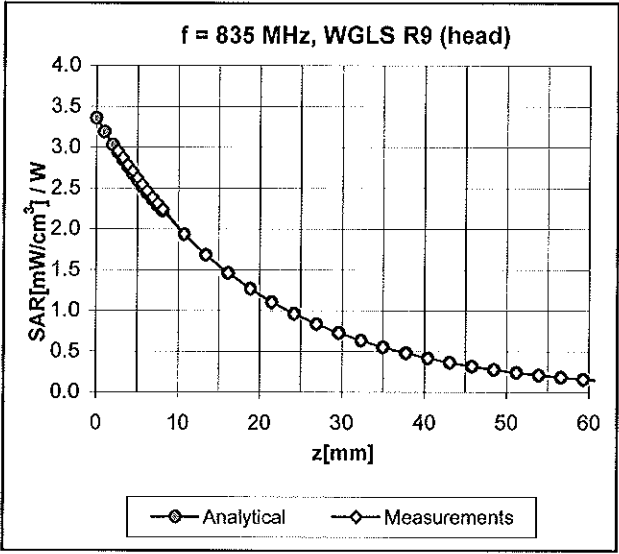
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head})
(Waveguide R22, f = 1800 MHz)



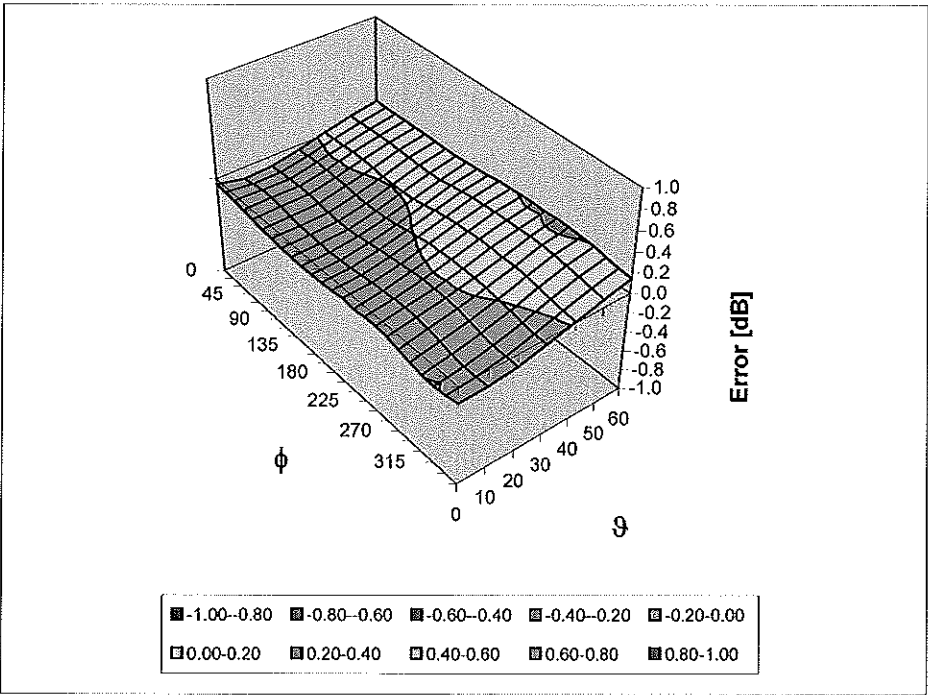
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ , θ), f = 900 MHz



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

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	4.0 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



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Motorola MDb**

Certificate No: **ES3-3124_Aug10**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3124**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-23.v3 and QA CAL-25.v2
 Calibration procedure for dosimetric E-field probes**

Calibration date: **August 11, 2010**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

Calibrated by: **Claudio Leubler** **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** **Technical Manager**

Issued: August 14, 2010

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



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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 effect 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.
- 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.

Probe ES3DV3

SN:3124

Manufactured:	July 11, 2006
Last calibrated:	April 21, 2009
Recalibrated:	August 11, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 SN:3124**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.26	1.33	1.34	± 10.1%
DCP (mV) ^B	92.9	96.4	96.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300.0	± 1.5%
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

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 E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter; uncertainty not required.

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

DASY/EASY - Parameters of Probe: ES3DV3 SN:3124

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	5.89	5.89	5.89	0.97	1.07 ± 11.0%
1810	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	4.89	4.89	4.89	0.49	1.54 ± 11.0%
1950	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	4.68	4.68	4.68	0.50	1.52 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	4.35	4.35	4.35	0.45	1.78 ± 11.0%

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

DASY/EASY - Parameters of Probe: ES3DV3 SN:3124

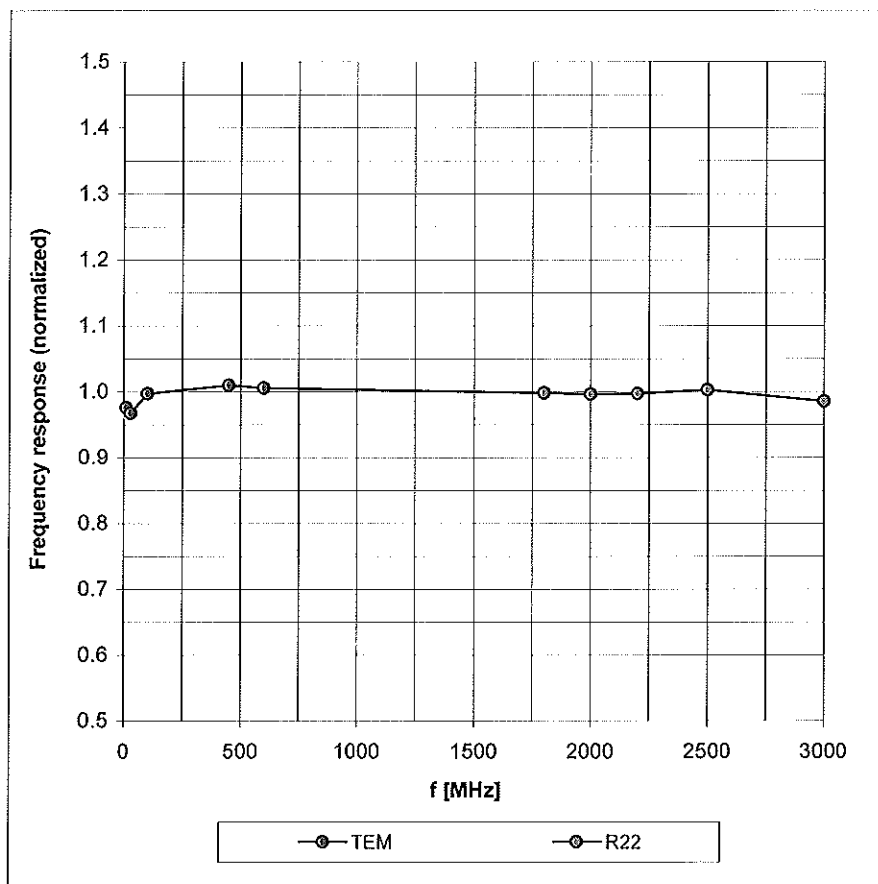
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	5.86	5.86	5.86	0.96	1.11 ± 11.0%
1810	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.76	4.76	4.76	0.41	1.84 ± 11.0%
1950	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.78	4.78	4.78	0.32	2.33 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	4.19	4.19	4.19	0.69	1.29 ± 11.0%

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

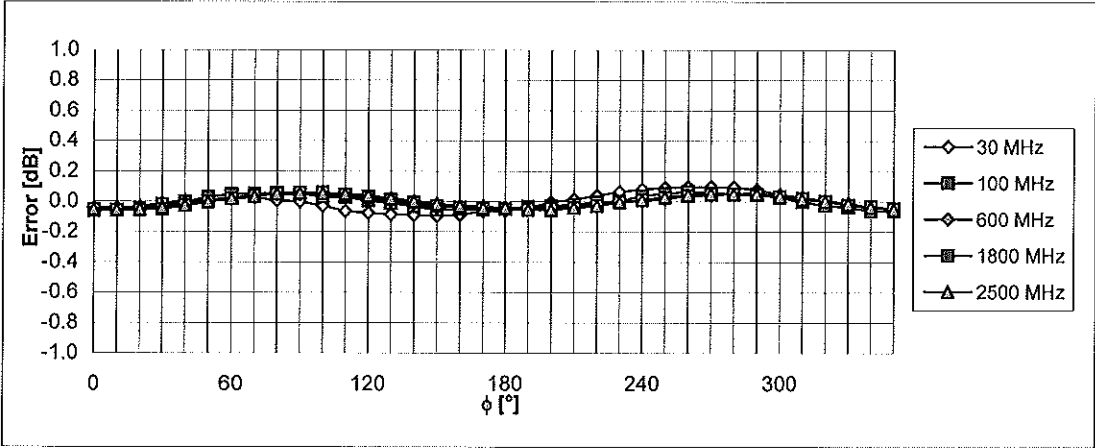
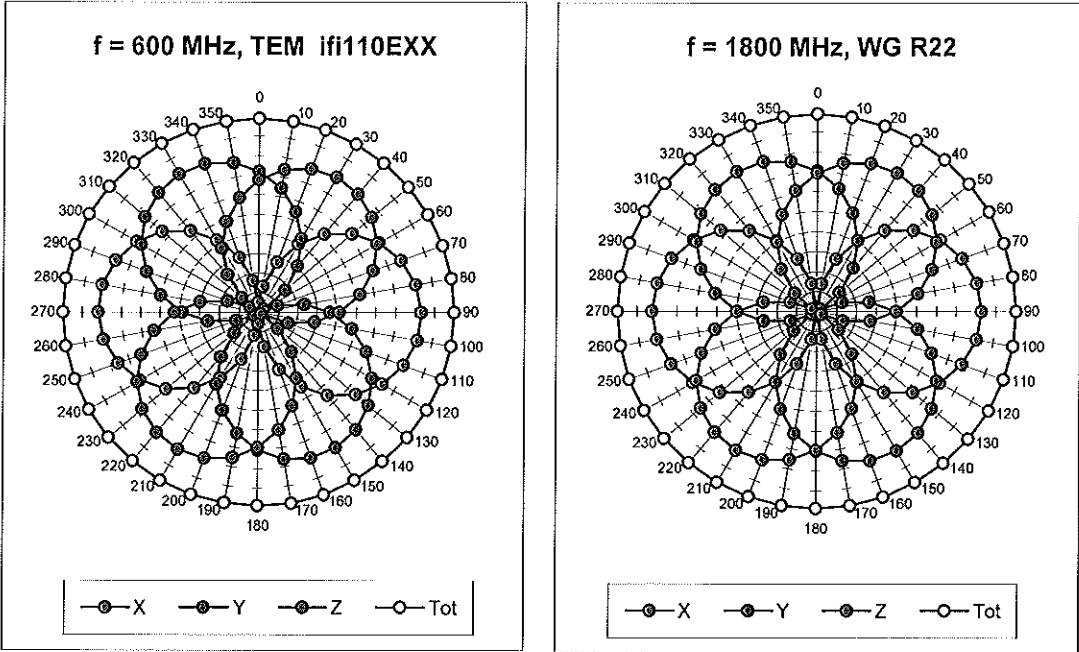
Frequency Response of E-Field

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



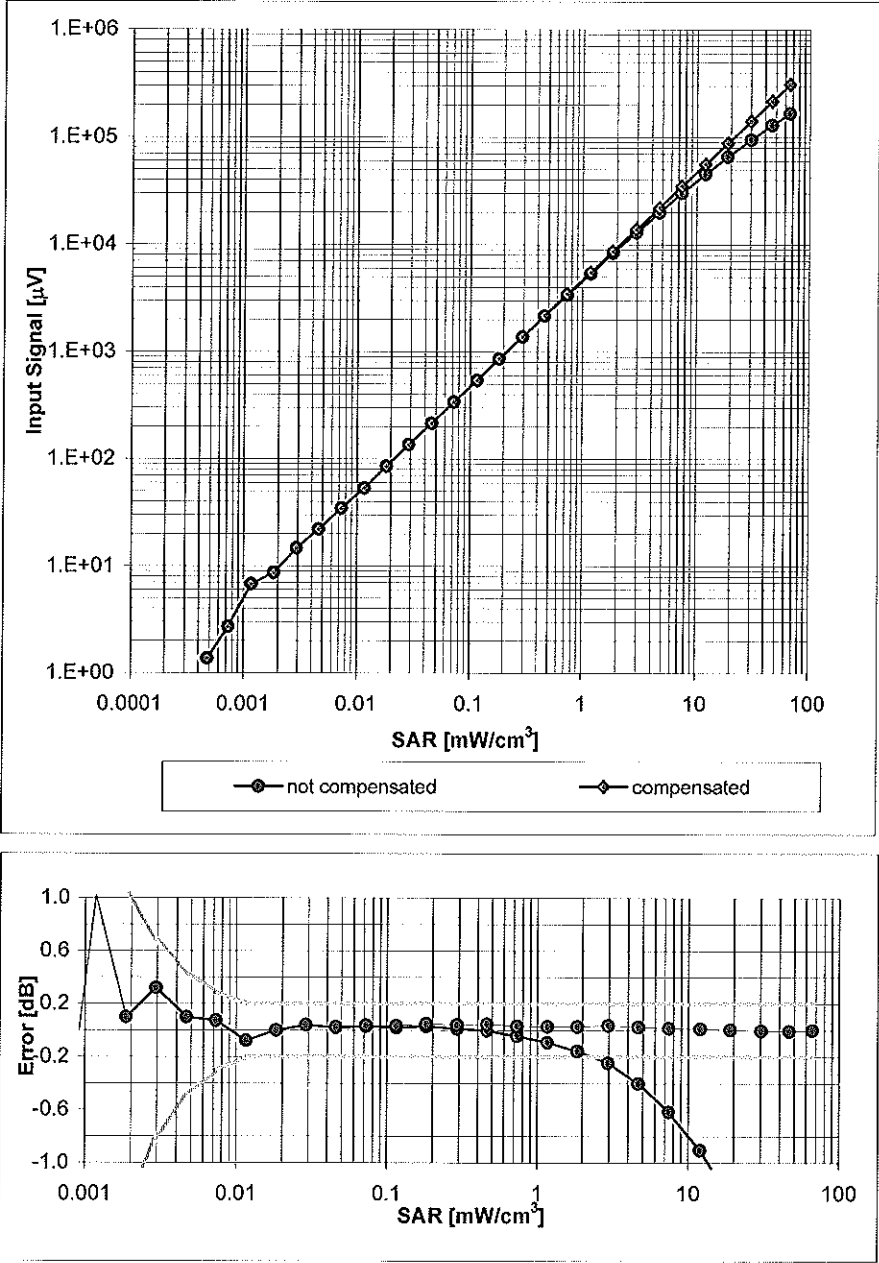
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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



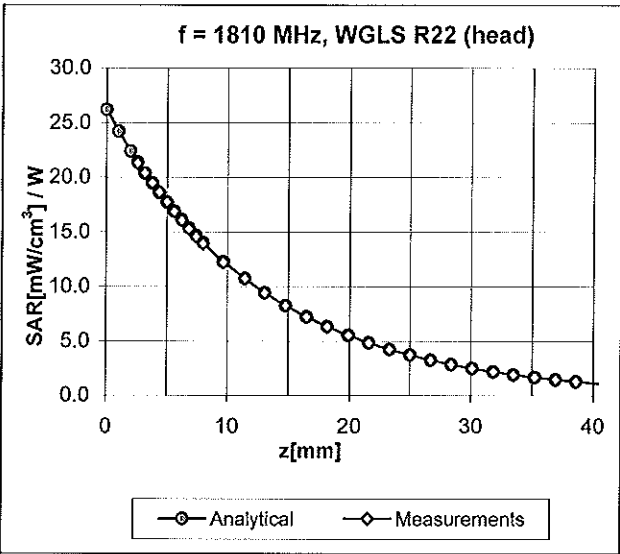
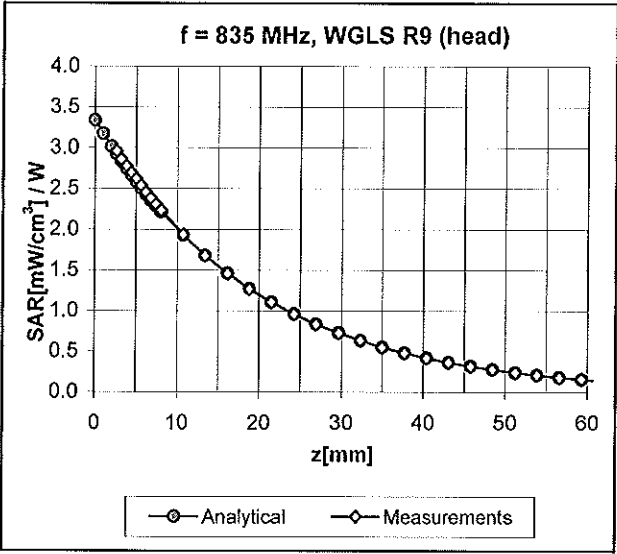
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$
(Waveguide R22, $f = 1800 \text{ MHz}$)



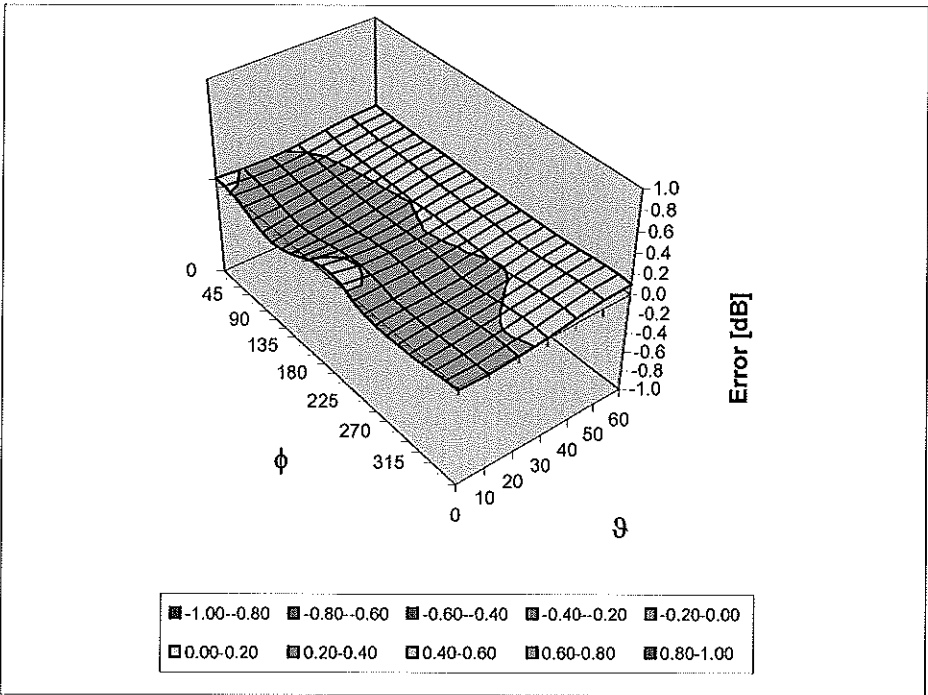
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ, θ), f = 900 MHz



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

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	4.0 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