



MOTOROLA

Portable Cellular Phone SAR Test Report

Tests Requested By: Motorola Mobile Devices
600 N. US Highway 45
Libertyville, IL 60048

Test Report #: 24341-1F

Date of Report: Feb 14, 2011

Date of Test: Feb 5 – Feb 10, 2011

FCC ID #: IHDT56MJ1

Generic Name: N/A

Test Laboratory: Motorola Mobile Devices Business Product Safety & Compliance Laboratory
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This laboratory is accredited to ISO/IEC 17025-2005 to perform the following tests:

Accreditation:



Testing Laboratory
No. 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)

Statement of Compliance:

On the following products or types of products:

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

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:

(none)

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1. Introduction

The Motorola Mobile Devices Business Product Safety 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 1g average set in [3] and 2.0W/kg in a 10g average set in [2].

For ANSI / IEEE C95.1 (1g), the final stand-alone SAR reading for this phone is 0.74 W/kg for head adjacent use, 1.40 W/kg for body worn use, and 1.50 W/kg in mobile hotspot mode. These measurements were performed using a Dasy4TM v4.7 system manufactured by Schmid & Partner Engineering AG (SPEAG), of Zurich Switzerland.

2. Description of the Device Under Test

2.1 Antenna description

Type	Internal	
Location	Bottom of Transceiver	
Dimensions	Length	51.6 mm
	Width	6.2 mm

2.2 Device description¹

Serial Number(s)	A0000022B36C41 (CDMA conducted power measurements, CDMA/800/1900/WIFI SAR testing, CDMA 800 Mobile Hotspot SAR testing), A0000022B3746E (CDMA 1900 Mobile Hotspot SAR testing) A0000022B36975 (Wi-Fi / Bluetooth conducted power measurements)					
Mode(s) of Operation	CDMA 800	CDMA 1900	EV-DO Rev. A 800	EV-DO Rev. A 1900	Wi-Fi 802.11b/g/n	Bluetooth
Modulation Mode(s)	QPSK	QPSK	QPSK	QPSK	BPSK	GFSK
Maximum Output Power Setting	25.0 dBm	25.0 dBm	25.0 dBm	25.0 dBm	18.6 dBm	8.39 dBm
Duty Cycle	1:1	1:1	1:1	1:1	1:1	1:1
Transmitting Frequency Range(s)	824.70 - 848.31 MHz	1851.20 - 1908.75 MHz	824.70 - 848.31 MHz	1851.20 - 1908.75 MHz	2412.0 - 2462.5 MHz	2402.0 - 2483.5 MHz
Production Unit or Identical Prototype (47 CFR §2.908)	Identical Prototype					
Device Category	Portable					
RF Exposure Limits	General Population / Uncontrolled					

¹ The DUT utilizes a reduced limit for the maximum transmit power 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 631391.

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 10g RSS uncertainty of the measurement system is $\pm 10.8\%$ (K=1) with an expanded uncertainty of $\pm 21.6\%$ (K=2). The overall 1g 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 6. Per IEEE 1528, this uncertainty budget is applicable to the SAR range of 0.4W/kg to 10W/kg.

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

Description	Serial Number	Cal Due Date
DASY4™ DAE V1	SN 702	5/18/2011
DASY4™ DAE V1	SN 434	1/13/2012
E-Field Probe ES3DV3	SN 3183	7/14/2011
E-Field Probe ES3DV3	SN 3124	8/11/2011
S.A.M. Phantom used for 800/900MHz	TP-1156	
S.A.M. Phantom used for 1800/1900/2450MHz	TP-1139	
S.A.M. Phantom used for 2450MHz	TP-1250	
Dipole Validation Kit, DV835V2	424tr	10/14/2011
Dipole Validation Kit, DV1800V2	281tr	1/13/2012
Dipole Validation Kit, DV2450V2	740	10/13/2011
Dipole Validation Kit, DV2450V2	766	10/13/2011

3.2 Additional Equipment

Description	Serial Number	Cal Due Date
Signal Generator HP8648C	3847A04822	4/22/2011
Power Meter E4419B	GB39511082	4/24/2011
Power Sensor #1 - E9301A	US39210917	10/25/2011
Power Sensor #2 - E9301A	US39210918	10/25/2011
Network Analyzer HP8753ES	US39172529	6/4/2011
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].

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ϵ_r	σ (S/m)	Temp (°C)
835	Head	Measured, 2/8/2011	42.2	0.92	18.8
		Recommended Limits	41.5 $\pm$ 5%	0.90 $\pm$ 5%	18-25
	Body	Measured, 2/9/2011	54.1	0.98	18.7
		Recommended Limits	55.2 $\pm$ 5%	0.97 $\pm$ 5%	18-25
1880	Head	Measured, 2/8/2011	38.8	1.46	18.9
		Recommended Limits	40.0 $\pm$ 5%	1.40 $\pm$ 5%	18-25
	Body	Measured, 2/8/2011	51.2	1.57	18.8
		Measured, 2/10/2011	51.7	1.53	19.7
		Recommended Limits	53.3 $\pm$ 5%	1.52 $\pm$ 5%	18-25
2450	Head	Measured, 2/5/2011	36.1	1.85	19.4
		Measured, 2/7/2011	36.1	1.84	19.3
		Recommended Limits	39.2 $\pm$ 10%	1.80 $\pm$ 5%	18-25
	Body	Measured, 2/10/2011	49.1	2.04	19.1
		Recommended Limits	52.7 $\pm$ 10%	1.95 $\pm$ 5%	18-25

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

Ingredient	835MHz / 900 MHz Head	835MHz / 900 MHz Body	1800MHz / 1900 MHz Head	1800 MHz / 1900 MHz Body	2450MHz 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 7. 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 1W 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). The tissue stimulant depth was verified to be 15.0cm ± 0.5 cm. Z-axis scans showing the SAR penetration are also included in Appendix 1.

f (MHz)	Description	SAR (W/kg), 1gram	Dielectric Parameters		Ambient Temp (°C)	Tissue Temp (°C)
			ϵ_r	σ (S/m)		
835	Measured, 2/8/2011	9.35	42.2	0.92	20.0	19.3
	Measured, 2/9/2011	9.45	41.8	0.92	20.1	19.0
	Recommended Limits	9.49	41.5 $\pm 5\%$	0.90 $\pm 5\%$	18-25	18-25
1800	Measured, 2/8/2011	37.15	39.2	1.36	20.2	19.0
	Measured, 2/10/2011	37.7	40.5	1.41	20.1	18.8
	Recommended Limits	38.90	40.0 $\pm 5\%$	1.4 $\pm 5\%$	18-25	18-25
2450	Measured, 2/5/2011	54.0	36.1	1.85	20.0	19.3
	Measured, 2/6/2011	53.5	36.1	1.84	20.2	19.1
	Recommended Limits	52.60	39.2 $\pm 10\%$	1.80 $\pm 5\%$	18-25	18-25
	Measured, 2/10/2011	56.50	35.9	1.85	20.2	19.1
	Recommended Limits	52.20	39.2 $\pm 10\%$	1.80 $\pm 5\%$	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	SN 3183	835	6.11	5 of 11
		1810	5.05	5 of 11
		2450	4.49	5 of 11
	SN 3124	2450	4.35	5 of 11

6. Test Results

The test sample was operated using an actual transmission through a base station simulator. The base station simulator was setup to the proper channel, transmitter power level and transmit mode 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 measured dielectric constant of the material used for the device holder is less than 2.9 and the loss tangent is less than 0.02 ($\pm 30\%$) at 850MHz. The default settings for the “coarse” and “cube” scans were chosen and used for measurements. The grid spacing of the course scan was set to 15 mm as shown in the SAR plots included in Appendix 2 and 3. Please refer to the DASY4™ manual for additional information on SAR scanning procedures and algorithms used.

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

SNN5865A - 1500 mAH Battery

Per the “SAR Measurement Procedures for 3G Devices” released in October, 2007, RC1, RC3 and RC3 (FCH + SCH) CDMA modes, EVDO Rev O, EVDO Rev A were considered. The conducted power measurements (per steps 3, 4 & 10 of section 4.4.5.2 of 3GPP2 C.5.011 / TIA -98-E) for each mode are shown in the table below.

Conducted power (dBm) for CDMA modes						
	Channel	RC1		RC3		RC3 (FCH + SCH)
		SO2	SO55	SO2	SO55	
CDMA 800	1013	25.01	24.95	24.91	24.93	Per Motorola designs, the maximum power, when in a mode that allows supplemental channels, will always be less than the RC3/RC1 maximum conducted power limit.
	384	24.94	24.93	24.90	24.93	
	777	24.89	24.89	24.88	24.88	
CDMA 1900	25	24.98	24.99	24.94	24.97	
	600	25.12	25.12	25.09	25.14	
	1175	24.94	24.96	24.94	24.92	

Conducted power (dBm) for EVDO modes					
	Channel	Rev 0		Rev A	
		FTAP 307.2k	RTAP 153.6k	Subtype 2 FETAP	Subtype 2 RETAP
CDMA 800	1013	25.20	25.19	26.04	25.27
	384	25.33	25.17	25.96	25.25
	777	25.30	25.10	25.50	25.20
CDMA 1900	25	26.50	25.44	25.20	25.24
	600	26.17	25.72	25.45	25.47
	1175	25.81	25.52	25.30	25.31

Evaluation of Wi-Fi 802.11 Modes

Per “SAR Measurement Procedures for 802.11 a/b/g Transmitters” (FCC KDB 248227), power measurements were performed for 802.11 operational modes. The conducted power measurements for each mode are shown in the table below. SAR testing for 802.11 modes was performed with the transmitter mode and data rate set to the configurations highlighted in bold below.

Band	Channel	Conducted Power (dBm) for 802.11b Mode Data Rates			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
Wi-Fi 2450 MHz	1	17.78	18.16	18.44	18.41
	6	17.88	18.36	18.47	18.6
	11	17.44	18.09	18.36	18.4

Band	Channel	Conducted Power (dBm) for 802.11g Mode Data Rates							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
Wi-Fi 2450 MHz	1	17.58	17.57	17.6	17.14	17.21	17.24	17.16	17.21
	6	17.61	17.57	17.05	17.09	17.29	17.42	17.32	17.33
	11	15.44	15.45	15.39	15.05	15.28	15.24	15.08	15.17

Band	Channel	Conducted Power (dBm) for 802.11n Mode Data Rates (20 MHz Channel, 800 ns Guard Interval)							
		6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
Wi-Fi 2450 MHz	1	16.37	16.33	15.18	16.08	16	15.95	15.85	14.59
	6	16.45	16.2	15.23	16.03	15.79	15.78	16.05	14.5
	11	15.86	15.48	15.25	15.46	15.26	15.28	15.21	14.34

Band	Channel	Conducted Power (dBm) for 802.11n Mode Data Rates (20 MHz Channel, 400 ns Guard Interval)							
		7.2 Mbps	14.4 Mbps	21.6 Mbps	28.8 Mbps	43.3 Mbps	57.7 Mbps	65 Mbps	72.2 Mbps
Wi-Fi 2450 MHz	1	16.48	16.12	15.4	16.35	15.92	15.81	15.8	14.31
	6	16.38	16.18	15.44	16.23	16	15.96	15.96	14.29
	11	15.79	15.36	15.1	15.19	15.29	15.07	15.15	14.31

Evaluation of Bluetooth

Per "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas" (FCC KDB 648474), the necessity of stand-alone and simultaneous SAR testing was evaluated for the Bluetooth transmitter of the device under test. Note that Bluetooth mode is not intended for use in configurations against the head, and this evaluation considers only the body-worn configurations.

The conditions under which the device under test can be excluded from stand-alone and simultaneous SAR testing, per FCC KDB 648474, are summarized as follows:

Table 1 – Output Power Thresholds for Unlicensed Transmitters

	2.45	5.15 - 5.35	5.47 - 5.85	GHz
P_{Ref}	12	6	5	mW

Device output power should be rounded to the nearest mW to compare with values specified in this table.

Table 2 – Summary of SAR Evaluation Requirements for a Cell Phone with Multiple Transmitters

	Individual Transmitter	Simultaneous Transmission
Licensed Transmitters	Routine evaluation required.	SAR not required.
Unlicensed Transmitters	Unlicensed only When there is no simultaneous transmission – - output ≤ 60 f: SAR not required - output > 60 f: stand-alone SAR required When there is simultaneous transmission – Stand-alone SAR not required when - output $\leq 2 P_{Ref}$ and antenna is ≥ 5.0 cm from other antennas - output $\leq P_{Ref}$ and antenna is ≥ 2.5 cm from other antennas Otherwise stand-alone SAR is required When stand-alone SAR is required - test SAR on highest output channel for each wireless mode and exposure condition - if SAR for highest output channel is $> 50\%$ of SAR limit, evaluate all channels according to normal procedures	Licensed & Unlicensed - when stand-alone 1-g SAR is not required and antenna is ≥ 5 cm from other antennas - when the sum of the 1-g SAR is < 1.6 W/kg for all simultaneous transmitting antennas - when SAR to peak location separation ratio of simultaneous transmitting antenna pair is < 0.3 SAR required: Licensed & Unlicensed antenna pairs with SAR to peak location separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in stand-alone configuration for each wireless mode and exposure condition Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply

Per the highlighted criteria:

- The highest output conducted power measured for Bluetooth on the device under test is 6.9 mW [< 12 mW].
- The separation distance between the Bluetooth antenna and the main antenna is 11.1 cm [> 2.5 cm].

Based on the output power of the Bluetooth transmitter and its antenna separation distance from the primary antenna, neither stand-alone nor simultaneous SAR measurements are required for the device under test. Pictorial representation of the antenna locations and separation distance are given in Exhibit 7d.

6.1 Head Adjacent Test Results

The SAR results shown in tables 1 through 4 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 the [6]. Also shown are the measured conducted output power levels for the CDMA RC3/SO55 mode, the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. 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 left head and right head SAR contour distributions are similar. Because of this similarity, the cheek/touch and 15° tilt test conditions with the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 2. All other test conditions measured lower SAR values than those included in Appendix 2.

The SAR measurements were performed using the SAM phantoms listed in section 3.1. Since the same phantoms and simulated tissue were used for the system accuracy verification and the device SAR measurements, the Z-axis scans included in Appendix 1 are applicable for verification of simulated tissue depth to be 15.0cm ±0.5cm.

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	SN 3183	835	6.11	5 of 11
		1810	5.05	5 of 11
		2450	4.49	5 of 11
	SN 3124	2450	4.35	5 of 11

Left Head Cheek Position								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 800	Channel 1013	24.93						
	Channel 384	24.93	18.8	-0.055	0.493	0.50	0.649	0.66
	Channel 777	24.88						
CDMA 1900	Channel 25	24.97						
	Channel 600	25.14	18.9	0.166	0.232	0.23	0.381	0.38
	Channel 1175	24.92						
WI-FI 2450 1 Mbps	Channel 1	17.78						
	Channel 6	17.88	19.4	0.119	0.107	0.11	0.220	0.22
	Channel 11	17.44						
WIFI + CDMA 800						0.61		0.88
WIFI + CDMA 1900						0.34		0.60

Table 1: SAR measurement results at the highest possible output power, measured in a head cheek position against the ICNIRP and ANSI SAR Limit.

Right Head Cheek Position								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 800	Channel 1013	24.93						
	Channel 384	24.93	18.0	-0.082	0.541	0.55	0.722	0.74
	Channel 777	24.88						
CDMA 1900	Channel 25	24.97						
	Channel 600	25.14	18.7	-0.233	0.159	0.17	0.293	0.31
	Channel 1175	24.92						
WI-FI 2450 1 Mbps	Channel 1	17.78						
	Channel 6	17.88	19.3	-0.050	0.074	0.07	0.132	0.13
	Channel 11	17.44						
WIFI + CDMA 800						0.62		0.87
WIFI + CDMA 1900						0.24		0.44

Table 2: SAR measurement results at the highest possible output power, measured in a head cheek position against the ICNIRP and ANSI SAR Limit.

Left Head 15° Tilt Position								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 800	Channel 1013	24.93						
	Channel 384	24.93	18.4	0.010	0.319	0.32	0.414	0.41
	Channel 777	24.88						
CDMA 1900	Channel 25	24.97						
	Channel 600	25.14	18.7	0.036	0.125	0.13	0.225	0.23
	Channel 1175	24.92						
WI-FI 2450 1 Mbps	Channel 1	17.78	19.1	-0.244	0.102	0.11	0.216	0.23
	Channel 6	17.88	19.3	0.114	0.104	0.10	0.223	0.22
	Channel 11	17.44	19.1	-0.039	0.072	0.07	0.150	0.15
WI-FI 2450 5.5 Mbps	Channel 1	18.44	19.2	0.014	0.096	0.10	0.201	0.20
WI-FI 2450 11 Mbps	Channel 6	18.60	19.7	-0.044	0.103	0.10	0.217	0.22
	Channel 11	18.40	19.3	-0.047	0.095	0.10	0.198	0.20
WIFI + CDMA 800						0.43		0.64
WIFI + CDMA 1900						0.24		0.46

Table 3: SAR measurement results at the highest possible output power, measured in a head 15° Tilt position against the ICNIRP and ANSI SAR Limit.

Right Head 15° Tilt Position								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 800	Channel 1013	24.93						
	Channel 384	24.93	18.0	-0.015	0.320	0.32	0.415	0.42
	Channel 777	24.88						
CDMA 1900	Channel 25	24.97						
	Channel 600	25.14	18.2	-0.073	0.114	0.12	0.209	0.21
	Channel 1175	24.92						
WI-FI 2450 1 Mbps	Channel 1	17.78						
	Channel 6	17.88	19.1	-0.070	0.072	0.07	0.142	0.14
	Channel 11	17.44						
WIFI + CDMA 800						0.39		0.56
WIFI + CDMA 1900						0.19		0.35

Table 4: SAR measurement results at the highest possible output power, measured in a head 15° Tilt position against the ICNIRP and ANSI SAR Limit.

6.2 Body Worn Test Results

The SAR results shown in tables 5 through 8 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 the [6]. Also shown are the measured conducted output power levels for the CDMA RC3/SO55 mode, the temperature of the test facility during the test, the temperature of the tissue simulate after the test, the measured drift and the extrapolated SAR. 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 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 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 2.0mm. It measures 52.7cm(long) x 26.7cm(wide) x 21.2cm(tall).

The tissue stimulant depth was verified to be 15.0cm ±0.5cm. The same device holder described in section 6 was used for positioning the phone. The functional accessories were divided into two categories, the ones with metal components and the ones with non-metal components. For non-metallic component accessories, testing was performed on the accessory that displayed the closest proximity to the flat phantom. Each metallic component accessory, if any, was checked for uniqueness of metal component so that each is tested with the device. If multiple accessories shared an identical metal component, only the accessory that dictates the closest spacing to the body was tested. The cellular phone was tested with a headset connected to the device for all body-worn SAR measurements.

There are no Body-Worn Accessories available for this phone at the time of testing hence the device was tested per the supplement C testing guidelines for devices that do not have body worn accessories. A separation distance of 25mm between the device and the flat phantom was used for testing body-worn SAR. The device was tested with the front and back of the device facing the phantom. Both sides of the device were tested for Body SAR for the purpose of including the SAR evaluation for body-worn accessories that support the device with the front side facing the user.

The cellular phone was also tested in data mode operations. For these tests, a separation distance of 25 mm between the device and the flat phantom was used. The device was tested in the worst-case SAR position and channel configuration from the voice-mode body-worn testing.

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	SN 3183	835	6.15	6 of 11
		1810	4.84	6 of 11
		2450	4.36	6 of 11
	SN 3124	2450	4.19	6 of 11

Body-Worn; Front of Phone 25mm from Phantom								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 800	Channel 1013	24.93						
	Channel 384	24.93	18.1	-0.028	0.279	0.28	0.365	0.37
	Channel 777	24.88						
CDMA 1900	Channel 25	24.97						
	Channel 600	25.14	18.8	-0.071	0.227	0.23	0.379	0.39
	Channel 1175	24.92						
WI-FI 2450 1 Mbps	Channel 1	17.78						
	Channel 6	17.88	19.1	0.089	0.012	0.01	0.019	0.02
	Channel 11	17.44						
WIFI + CDMA 800						0.29		0.39
WIFI + CDMA 1900						0.24		0.41

Table 5: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

Body-Worn; Back of Phone 25mm from Phantom								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 800	Channel 1013	24.93						
	Channel 384	24.93	18.2	0.009	0.222	0.22	0.292	0.29
	Channel 777	24.88						
CDMA 1900	Channel 25	24.97	18.8	0.135	0.464	0.46	0.770	0.77
	Channel 600	25.14	18.8	0.139	0.577	0.58	0.964	0.96
	Channel 1175	24.92	18.8	0.094	0.729	0.73	1.22	1.22
WI-FI 2450 1 Mbps	Channel 1	17.78	19.0	0.022	0.016	0.02	0.026	0.03
	Channel 6	17.88	19.1	-0.127	0.016	0.02	0.027	0.03
	Channel 11	17.44	19.0	-0.077	0.015	0.03	0.024	0.02
WI-FI 2450 5.5 Mbps	Channel 1	18.44	19.0	-0.025	0.016	0.02	0.026	0.03
WI-FI 2450 11 Mbps	Channel 6	18.60	18.7	-0.175	0.017	0.02	0.028	0.03
	Channel 11	18.40	18.8	0.777	0.011	0.01	0.018	0.02
WIFI + CDMA 800						0.25		0.32
WIFI + CDMA 1900						0.76		1.25

Table 6: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

Body-Worn; Highest Body EVDO REV O at 25mm from Phantom								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
EVDO 800 FTAP (front)	Channel 1013	25.20						
	Channel 384	25.33	18.7	-0.069	0.348	0.35	0.456	0.46
	Channel 777	25.30						
EVDO 1900 FTAP (back)	Channel 25	26.50	18.8	0.250	0.486	0.49	0.812	0.81
	Channel 600	26.17	18.8	0.035	0.717	0.72	1.23	1.23
	Channel 1175	25.81	18.8	-0.214	0.786	0.83	1.33	1.40
WI-FI 2450 1 Mbps (front)	Channel 6	17.88	19.1	0.089	0.012	0.01	0.019	0.02
WI-FI 2450 11 Mbps (back)	Channel 6	18.60	18.7	-0.175	0.017	0.02	0.028	0.03
WIFI + CDMA 800						0.36		0.48
WIFI + CDMA 1900						0.85		1.43

Table 7: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

Body-Worn; Highest Body EVDO REV A at 25mm from Phantom								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
EVDO 800 Subtest 2 FETAP (front)	Channel 1013	26.04						
	Channel 384	25.96	18.7	-0.053	0.371	0.38	0.487	0.49
	Channel 777	25.50						
EVDO 1900 Subtest 2 RETAP (back)	Channel 25	25.24	18.8	0.040	0.484	0.48	0.814	0.81
	Channel 600	25.47	18.8	0.115	0.604	0.60	1.02	1.02
	Channel 1175	25.31	18.8	-0.152	0.782	0.81	1.33	1.38
WI-FI 2450 1 Mbps (front)	Channel 6	17.88	19.1	0.089	0.012	0.01	0.019	0.02
WI-FI 2450 11 Mbps (back)	Channel 6	18.60	18.7	-0.175	0.017	0.02	0.028	0.03
WIFI + CDMA 800						0.39		0.51
WIFI + CDMA 1900						0.83		1.41

Table 8: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

6.3 Mobile Hotspot Test Results

The DUT is capable of functioning as a Wi-Fi to Cellular mobile hotspot. Additional SAR testing was performed according to the interim test guidelines provided at the October 2010 TCB Workshop. Testing was performed with a separation of 1 cm between the DUT and the “flat” phantom. The DUT was positioned for SAR tests with the front and back surfaces facing the phantom, and also with the edges facing the phantom in which the transmitting antenna is < 2.5 cm from the edge. Each transmit band was utilized for SAR testing, but only the “mode” within each band that exhibited the highest SAR results from section 6.2 was used.

The SAR results shown in tables 9 through 14 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 $\text{Extrapolated SAR} = \text{Measured SAR} * 10^{(\text{drift}/10)}$. 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 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 631391.

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 4. All other test conditions measured lower SAR values than those included in Appendix 4.

The guidelines provided in “SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas” (KDB publication 648474 - D01 v01r05) were utilized for evaluation of the need for simultaneous transmission SAR testing. These guidelines direct that if the sum of the 1 g SAR measured for the individual simultaneously transmitting antennas is less than the SAR limit, SAR evaluation for simultaneous transmission is not required. Further, if the SAR-to-peak-location separation ratio for two simultaneously transmitting antennas is less than 0.3 then SAR evaluation for simultaneous transmission is likewise not required. Evaluations for the simultaneous SAR sums are presented in the tables below.

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 same device holder described in section 6 was used for positioning the phone.

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	SN 3183	835	6.15	6 of 11
		1810	4.84	6 of 11
		2450	4.36	6 of 11
	SN 3124	2450	4.19	6 of 11

Body-Worn; Front of Phone 10mm from Phantom								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Tem p (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolate d (W/kg)	Measured (W/kg)	Extrapolate d (W/kg)
EV-DO 800 REVA, Subtest 2, FETAP	Channel 1013	26.04	18.0	-0.055	0.611	0.62	0.786	0.80
	Channel 384	25.96	18.2	-0.083	0.664	0.68	0.855	0.87
	Channel 777	25.50	18.1	0.012	0.826	0.83	1.07	1.07
EV-DO 1900 REV O, FTAP	Channel 25	26.50						
	Channel 600	26.17	18.0	0.603	0.339	0.34	0.668	0.67
	Channel 1175	25.81						
WI-FI 2450 11 Mbps	Channel 1	18.41						
	Channel 6	18.60	18.8	-0.052	0.036	0.04	0.063	0.06
	Channel 11	18.40						
WIFI + EVDO 800						0.87		1.13
WIFI + EVDO 1900						0.38		0.73

Table 9: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

Body-Worn; Back of Phone 10mm from Phantom								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Tem p (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolate d (W/kg)	Measured (W/kg)	Extrapolate d (W/kg)
EV-DO 800 REVA, Subtest 2, FETAP	Channel 1013	26.04	18.0	0.058	0.709	0.71	0.923	0.92
	Channel 384	25.96	18.1	0.095	0.760	0.76	1.00	1.00
	Channel 777	25.50	18.2	0.025	0.878	0.88	1.15	1.15
EV-DO 1900 REV O, FTAP	Channel 25	26.50	19.7	0.015	0.636	0.64	1.34	1.34
	Channel 600	26.17	18.0	0.347	0.697	0.70	1.42	1.42
	Channel 1175	25.81	18.2	0.252	0.692	0.69	1.42	1.42
WI-FI 2450 11 Mbps	Channel 1	18.41						
	Channel 6	18.60	18.8	-0.005	0.070	0.07	0.126	0.13
	Channel 11	18.40						
WIFI + EVDO 800						0.95		1.28
WIFI + EVDO 1900						0.77		1.55

Table 10: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

Body-Worn; Bottom EDGE of Phone 10mm from Phantom								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Tem p (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolate d (W/kg)	Measured (W/kg)	Extrapolate d (W/kg)
EV-DO 800 REVA, Subtest 2, FETAP	Channel 1013	26.04						
	Channel 384	25.96	18.0	-0.084	0.070	0.07	0.124	0.13
	Channel 777	25.50						
EV-DO 1900 REV O, FTAP	Channel 25	26.50	19.6	-0.044	0.521	0.53	1.02	1.03
	Channel 600	26.17	19.6	0.005	0.644	0.64	1.26	1.26
	Channel 1175	25.81	19.6	-0.082	0.676	0.87	1.33	1.36

Table 11: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

Body-Worn; Right EDGE of Phone 10mm from Phantom								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Tem p (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolate d (W/kg)	Measured (W/kg)	Extrapolate d (W/kg)
EV-DO 800 REVA, Subtest 2, FETAP	Channel 1013	26.04	18.1	-0.142	0.716	0.74	1.06	1.10
	Channel 384	25.96	18.7	-0.049	0.890	0.90	1.33	1.35
	Channel 777	25.50	18.2	-0.010	0.966	0.97	1.43	1.43
EV-DO 1900 REV O, FTAP	Channel 25	26.50						
	Channel 600	26.17	19.6	0.069	0.041	0.04	0.070	0.07
	Channel 1175	25.81						
WI-FI 2450 11 Mbps	Channel 1	18.41						
	Channel 6	18.60	18.8	-0.092	0.055	0.06	0.113	0.12
	Channel 11	18.40						
WIFI + EVDO 800						1.03		1.55
WIFI + EVDO 1900						0.10		0.19

Table 12: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

Body-Worn; Left EDGE of Phone 10mm from Phantom								
f (MHz)	Description	Conducted Output Power (dBm)	Tem p (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolate d (W/kg)	Measured (W/kg)	Extrapolate d (W/kg)
EV-DO 800 REVA, Subtest 2, FETAP	Channel 1013	26.04	18.0	-0.192	0.710	0.74	1.06	1.11
	Channel 384	25.96	18.1	-0.020	0.802	0.81	1.21	1.22
	Channel 777	25.50	18.7	-0.001	1.00	1.00	1.50	1.50
EV-DO 1900 REV O, FTAP	Channel 25	26.50						
	Channel 600	26.17	19.7	0.054	0.027	0.03	0.049	0.05
	Channel 1175	25.81						

Table 13: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

Body-Worn; TOP EDGE of Phone 10mm from Phantom								
f (MHz)	Description	Conducted Output Power (dBm)	Tem p (°C)	Drift (dB)	10g SAR value		1g SAR value	
					Measured (W/kg)	Extrapolate d (W/kg)	Measured (W/kg)	Extrapolate d (W/kg)
WI-FI 2450 11 Mbps	Channel 1	18.41						
	Channel 6	18.60	18.8	-0.007	0.065	0.07	0.121	0.12
	Channel 11	18.40						

Table 14: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

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 (300MHz – 3GHz)”.
- [3] ANSI / IEEE, C95.1 1999 Edition “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz”
- [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: 2/8/2011 8:20:26 AM

DUT: Dipole 835 MHz; Type: D835V2;

Procedure Notes: 835 MHz System Performance Check / Dipole Sn# 424tr; PM1 Power = 200 mW
 Sim.Temp@ meas = 19.3°C; Sim.Temp@ SPC = 19.3°C; Room Temp@ SPC = 20.0°C

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

Medium: VALIDATION Only; Medium parameters used: $f = 835$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 42.2$; $\rho = 1000$ kg/m³

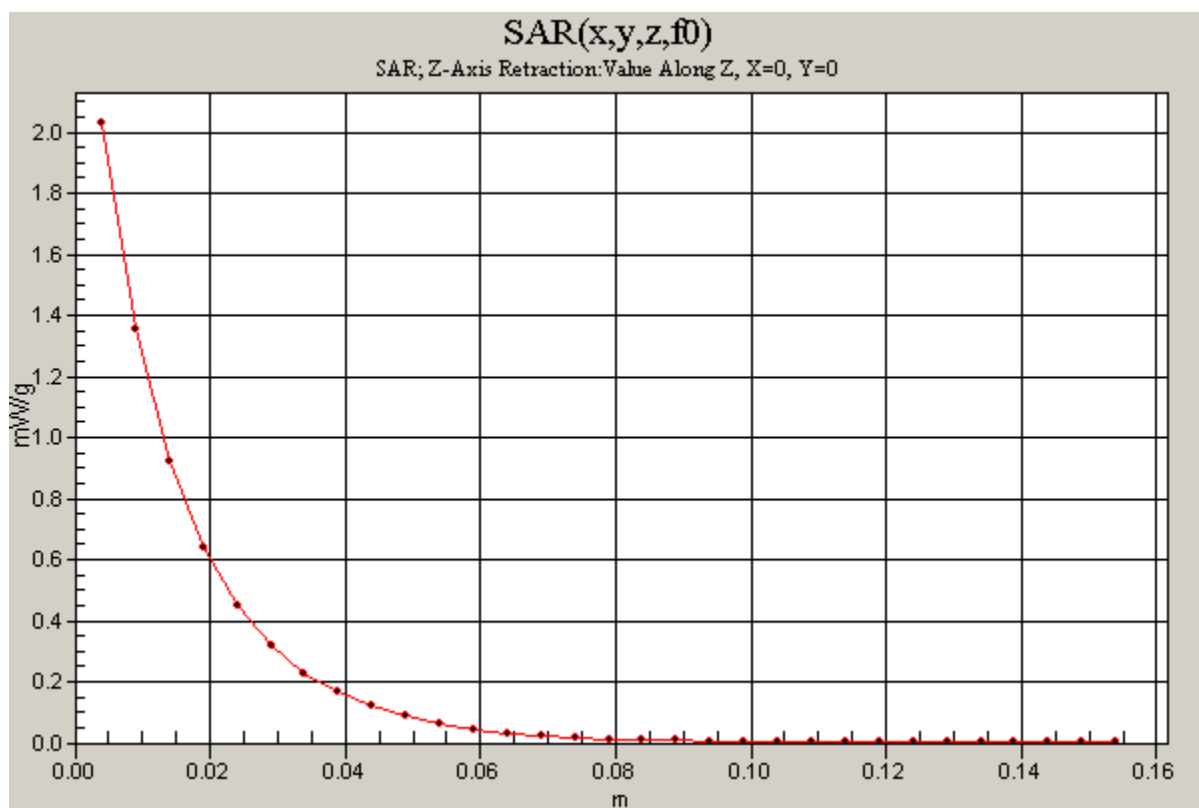
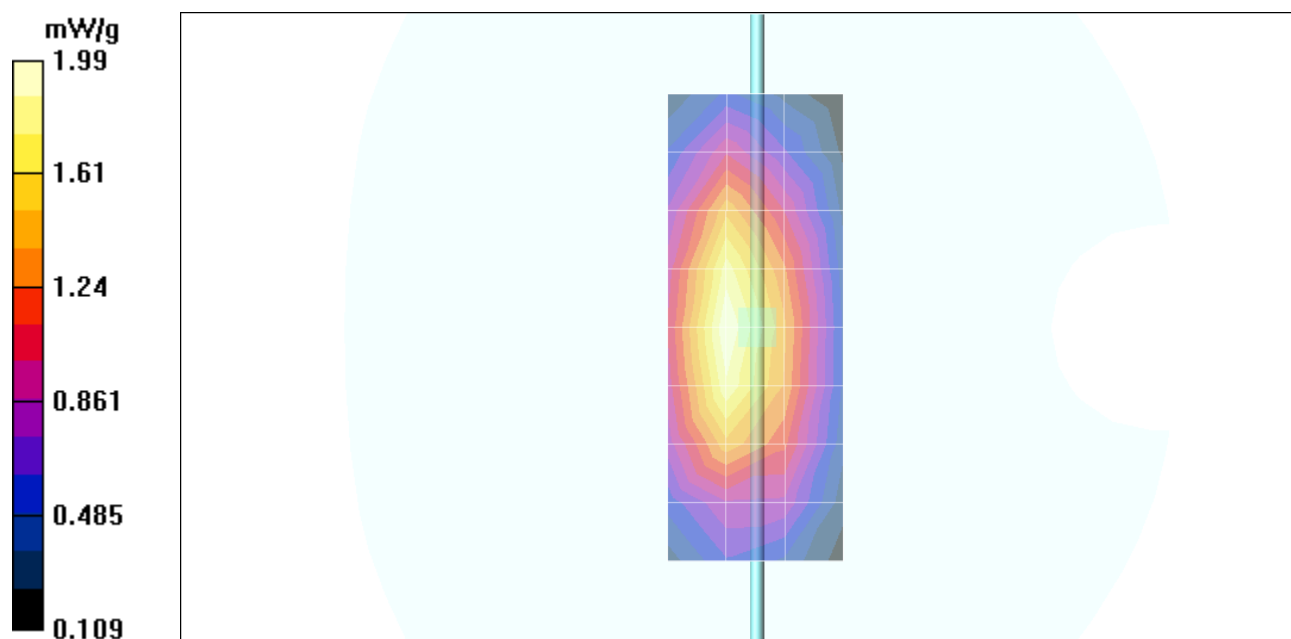
DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.11, 6.11, 6.11); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- Phantom: R1_Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1156;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Daily SPC Check/Dipole Area Scan (4x9x1): Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (measured) = 1.99 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
 Reference Value = 45.8 V/m; Power Drift = -0.001 dB
 Peak SAR (extrapolated) = 2.81 W/kg
SAR(1 g) = 1.87 mW/g; SAR(10 g) = 1.22 mW/g
 Maximum value of SAR (measured) = 2.01 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
 Maximum value of SAR (measured) = 2.03 mW/g



Date/Time: 2/9/2011 8:10:58 AM

DUT: Dipole 835 MHz; Type: D835V2;

Procedure Notes: 835 MHz System Performance Check / Dipole Sn# 424tr; PM1 Power = 200 mW
 Sim.Temp@ meas = 19.0°C; Sim.Temp@ SPC = 19.0°C; Room Temp@ SPC = 20.1°C

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

Medium: VALIDATION Only; Medium parameters used: $f = 835$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 41.8$; $\rho = 1000$ kg/m³

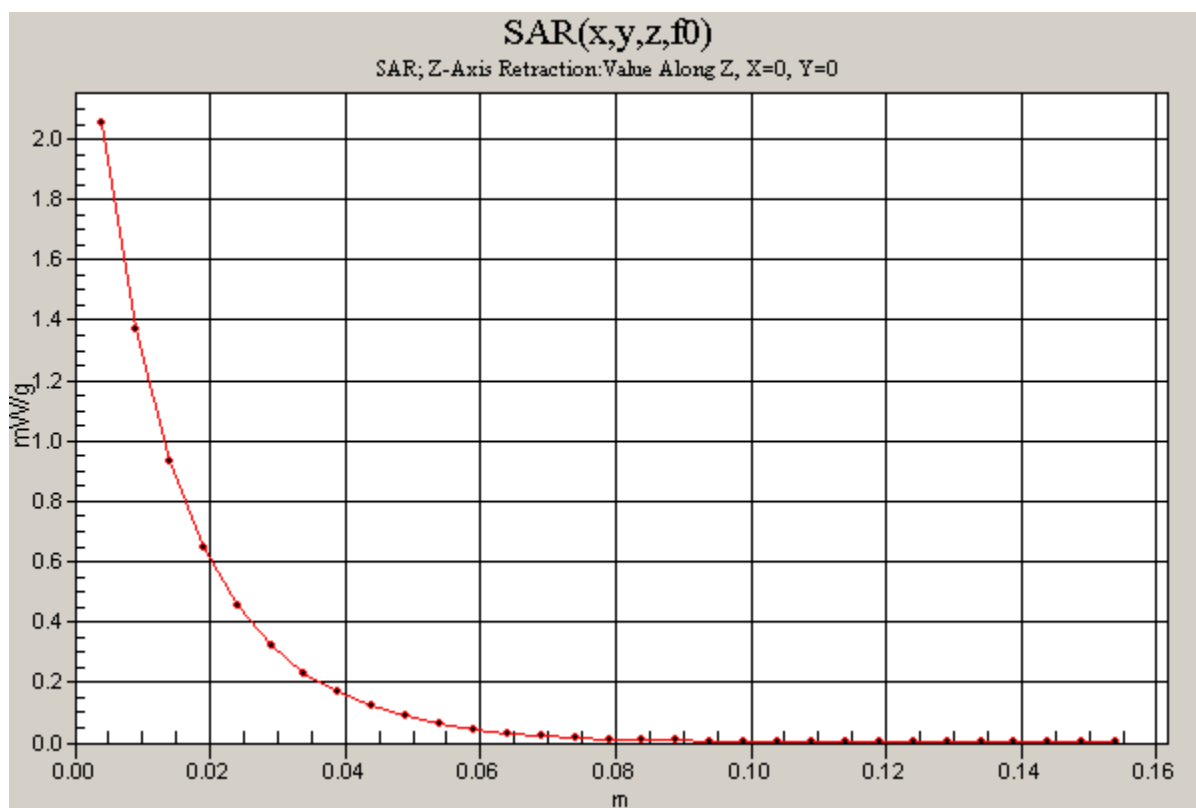
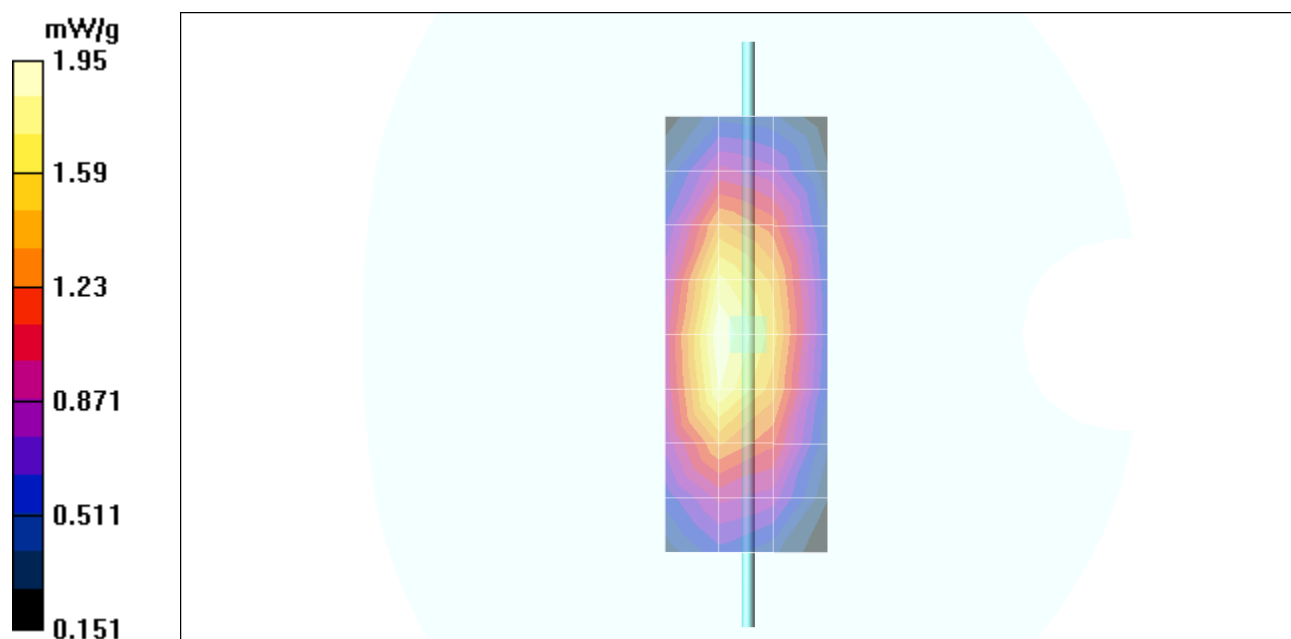
DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.11, 6.11, 6.11); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- Phantom: R1_Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1156;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Daily SPC Check/Dipole Area Scan (4x9x1): Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (measured) = 1.95 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
 Reference Value = 46.8 V/m; Power Drift = 0.005 dB
 Peak SAR (extrapolated) = 2.83 W/kg
SAR(1 g) = 1.89 mW/g; SAR(10 g) = 1.23 mW/g
 Maximum value of SAR (measured) = 2.03 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
 Maximum value of SAR (measured) = 2.05 mW/g



Date/Time: 2/8/2011 6:51:23 AM

DUT: Dipole 1800 MHz; Type: D1800V2;

Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 281tr; PM1 Power = 200 mW
 Sim.Temp@ meas = 19.0°C; Sim.Temp@ SPC = 19.0°C; Room Temp@ SPC = 20.2°C

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

Medium: VALIDATION Only; Medium parameters used: $f = 1800$ MHz; $\sigma = 1.36$ mho/m; $\epsilon_r = 39.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(5.05, 5.05, 5.05); 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

Daily SPC Check/Dipole Area Scan (9x4x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 8.05 mW/g

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

Reference Value = 71.8 V/m; Power Drift = -0.010 dB

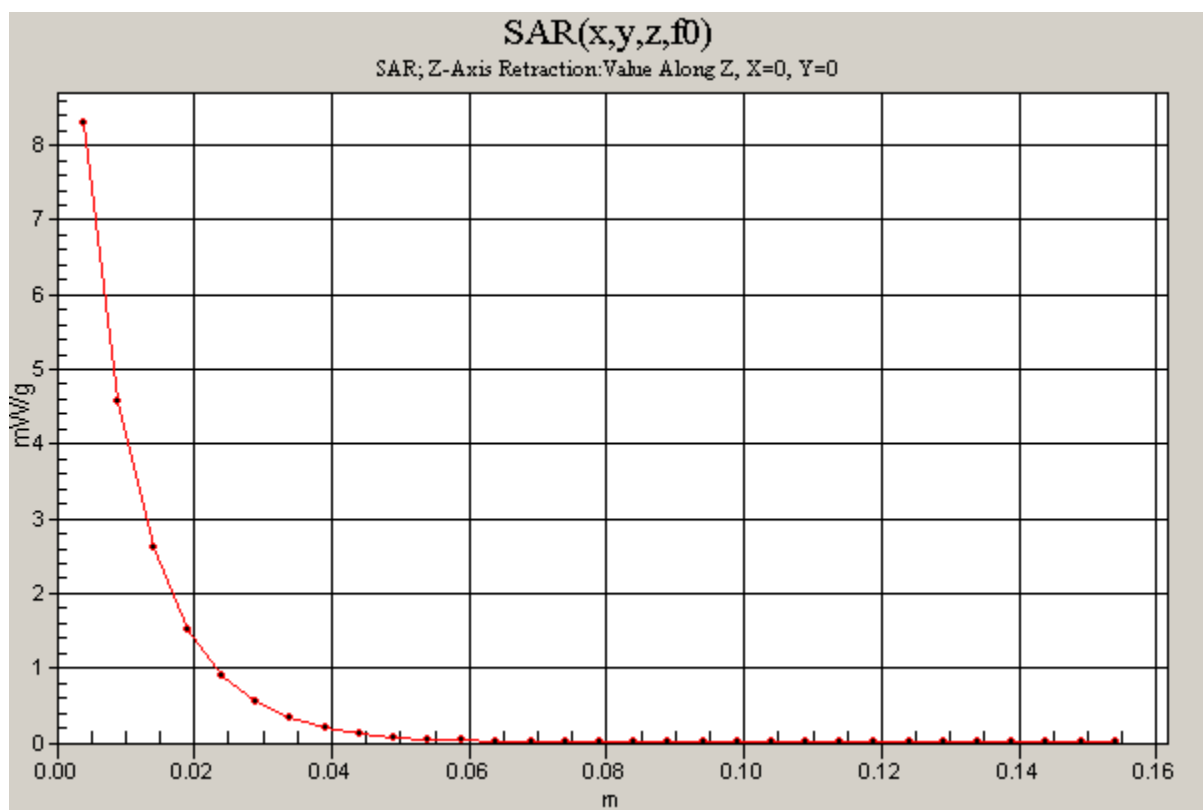
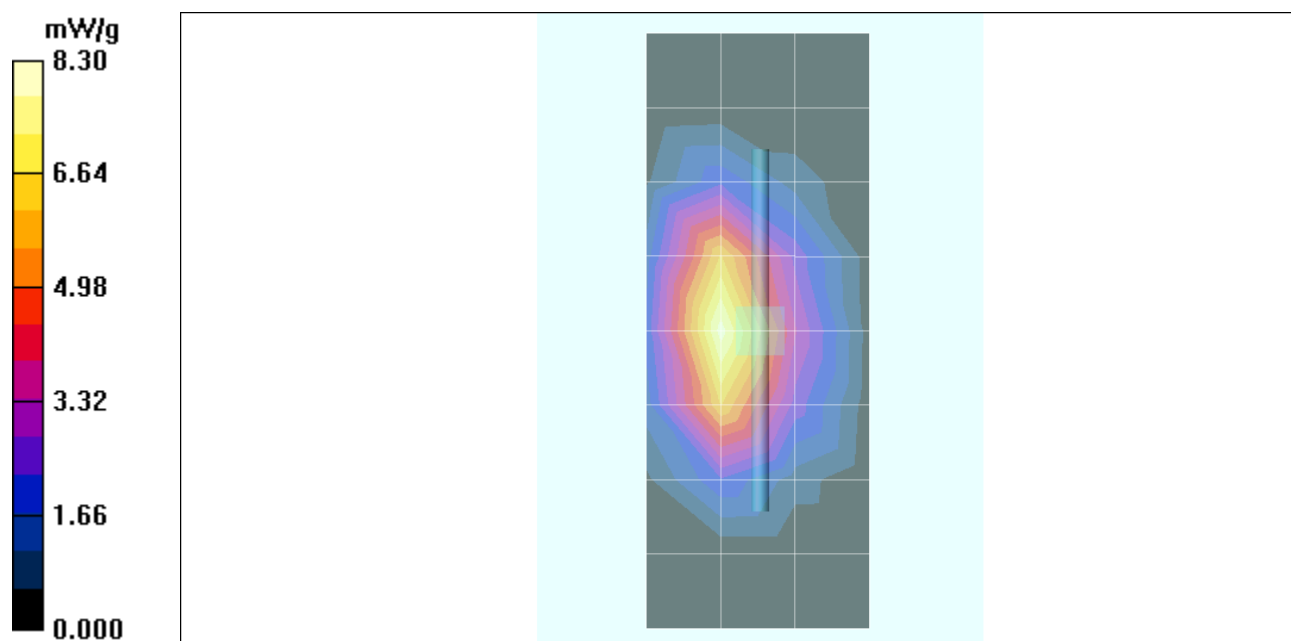
Peak SAR (extrapolated) = 13.7 W/kg

SAR(1 g) = 7.43 mW/g; SAR(10 g) = 3.91 mW/g

Maximum value of SAR (measured) = 8.15 mW/g

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

Maximum value of SAR (measured) = 8.30 mW/g



Date/Time: 2/10/2011 7:07:10 AM

DUT: Dipole 1800 MHz; Type: D1800V2; Procedure Notes: 1800 MHz System Performance Check /
 Dipole Sn# 281tr PM1 Power = 200 mW
 Sim.Temp@ meas = 18.8°C; Sim.Temp@ SPC = 18.8°C; Room Temp@ SPC = 20.1°C

Communication System: CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1
 Medium: VALIDATION Only; Medium parameters used: $f = 1800$ MHz; $\sigma = 1.41$ mho/m; $\epsilon_r = 40.5$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(5.05, 5.05, 5.05); 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

Daily SPC Check/Dipole Area Scan (9x4x1): Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (measured) = 6.12 mW/g

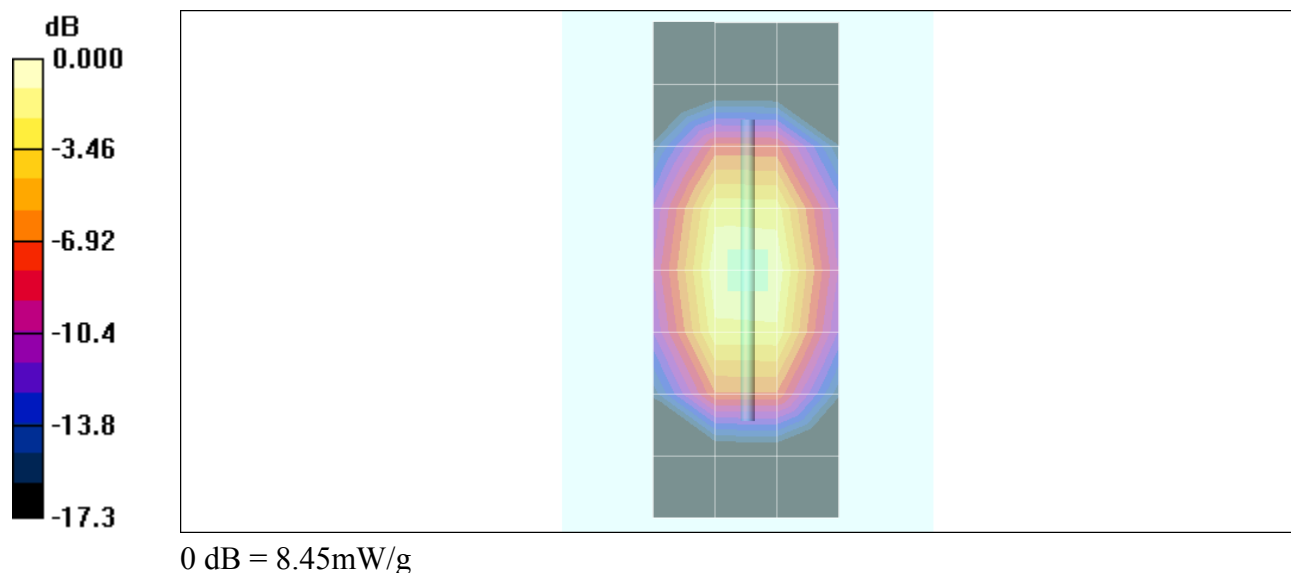
Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

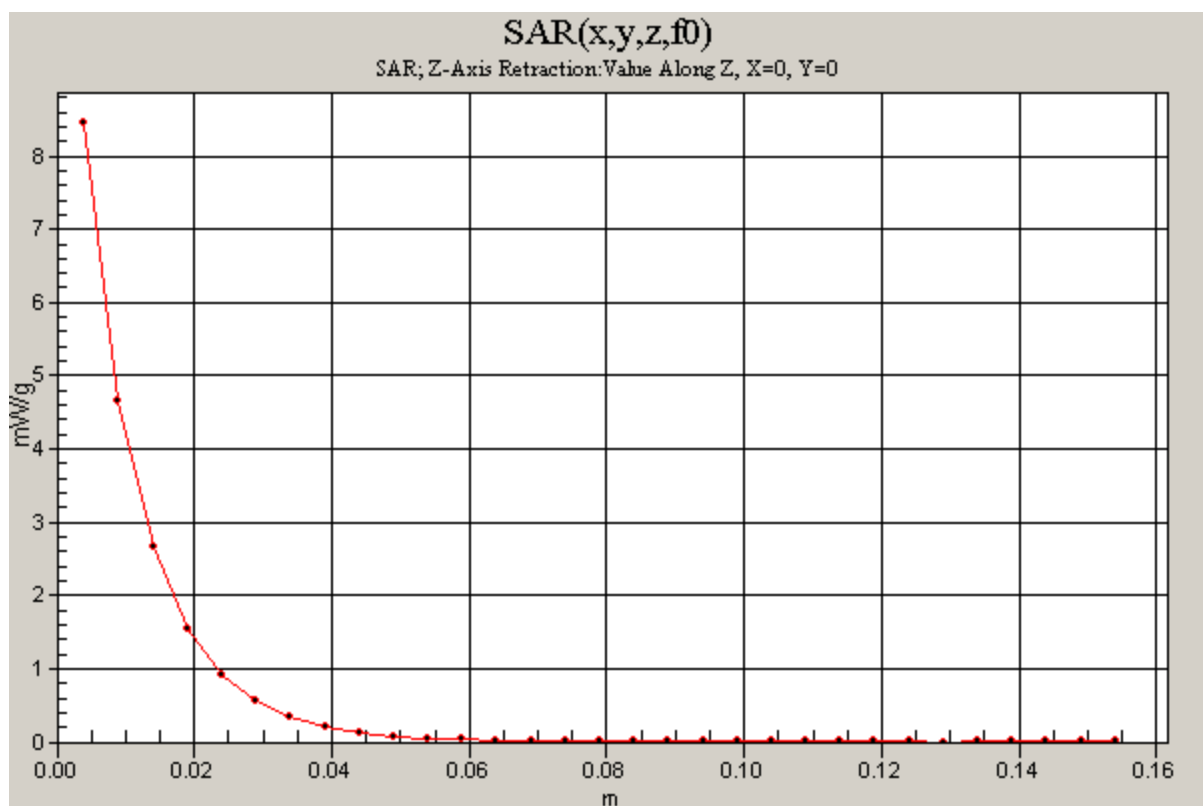
Reference Value = 78.5 V/m; Power Drift = -0.023 dB

Peak SAR (extrapolated) = 13.9 W/kg

SAR(1 g) = 7.54 mW/g; SAR(10 g) = 3.97 mW/g

Maximum value of SAR (measured) = 8.35 mW/g





Date/Time: 2/5/2011 11:41:32 AM

DUT: Dipole 2450 MHz; Type: D2450V2; Procedure Notes: 2450 MHz System Performance Check /
 Dipole Sn# 740; PM1 Power = 200mW
 Sim.Temp@ meas = 19.3°C; Sim.Temp@ SPC = 19.3°C; Room Temp@ SPC = 20.0°C

Communication System: CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1
 Medium: VALIDATION Only; Medium parameters used: $f = 2450$ MHz; $\sigma = 1.85$ mho/m; $\epsilon_r = 36.1$; $\rho = 1000$ kg/m³

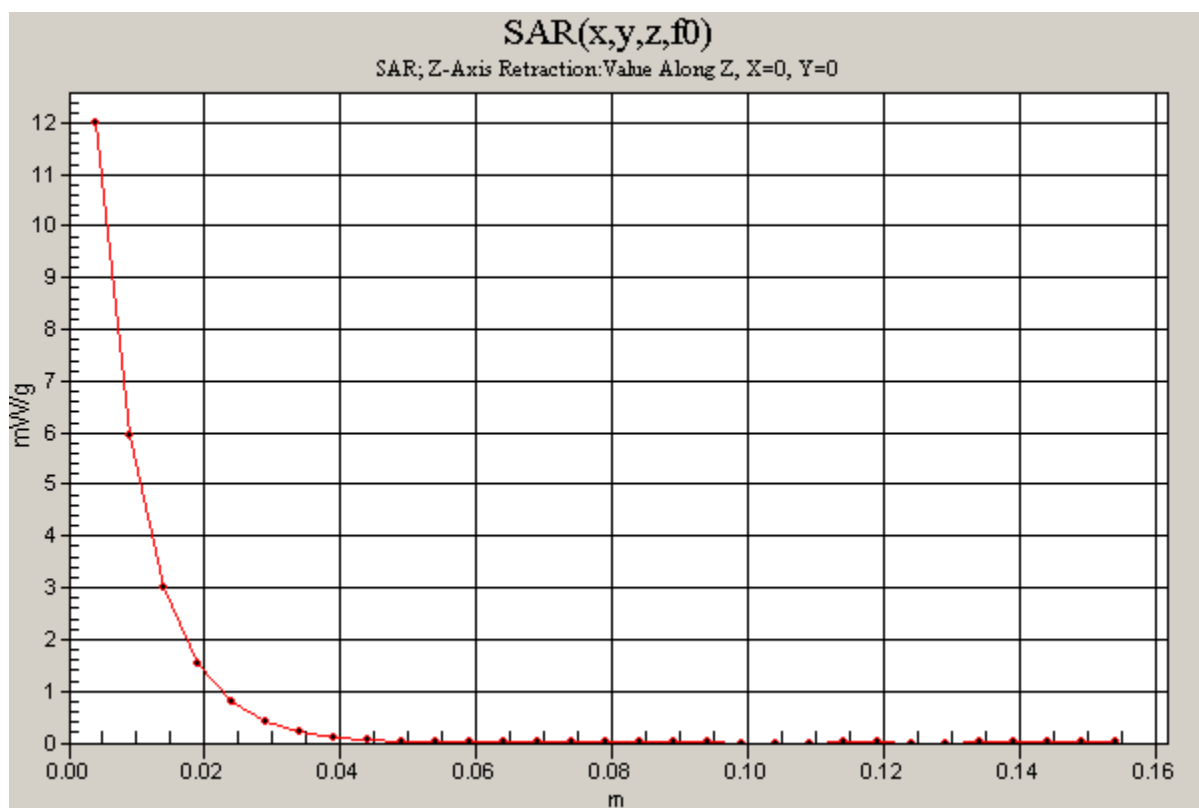
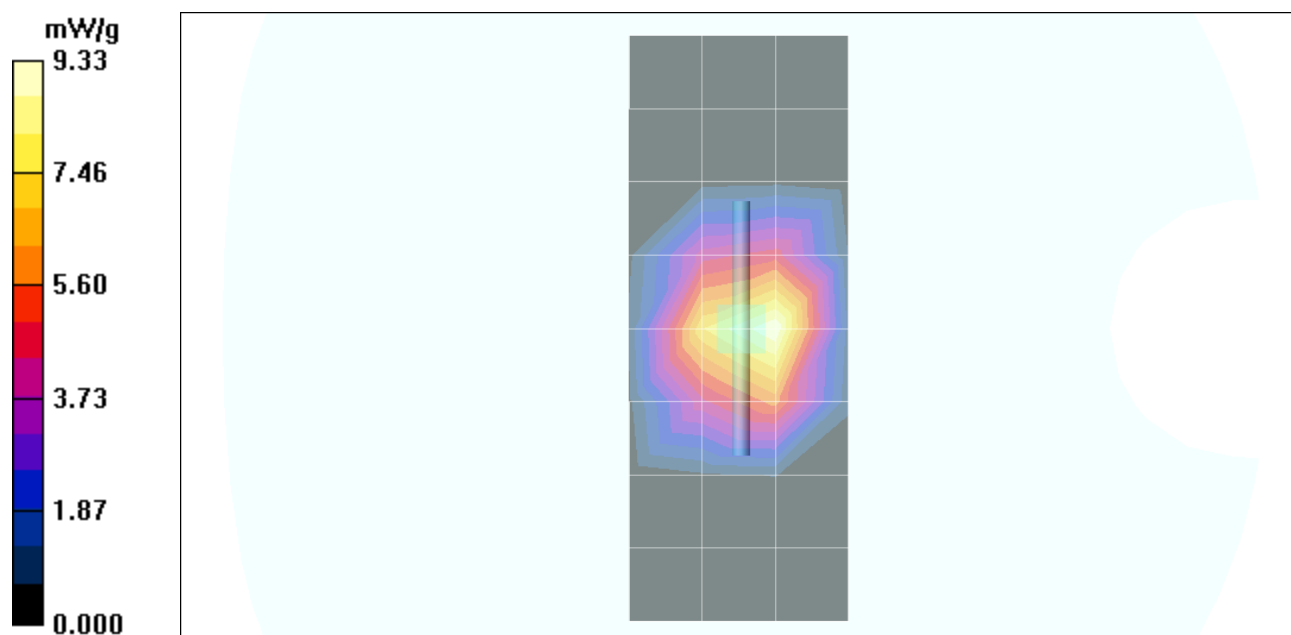
DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.49, 4.49, 4.49); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- 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=15mm, dy=15mm
 Maximum value of SAR (measured) = 9.33 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
 Reference Value = 82.1 V/m; Power Drift = -0.025 dB
 Peak SAR (extrapolated) = 22.3 W/kg
SAR(1 g) = 10.8 mW/g; SAR(10 g) = 5.01 mW/g
 Maximum value of SAR (measured) = 12.2 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
 Maximum value of SAR (measured) = 12.0 mW/g



Date/Time: 2/6/2011 11:27:27 AM

DUT: Dipole 2450 MHz; Type: D2450V2; Procedure Notes: 2450 MHz System Performance Check /
 Dipole Sn# 740; PM1 Power = 200 mW
 Sim.Temp@ meas = 19.1°C; Sim.Temp@ SPC = 19.1°C; Room Temp@ SPC = 20.2°C

Communication System: CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1
 Medium: VALIDATION Only; Medium parameters used: $f = 2450$ MHz; $\sigma = 1.84$ mho/m; $\epsilon_r = 36.1$; $\rho = 1000$ kg/m³

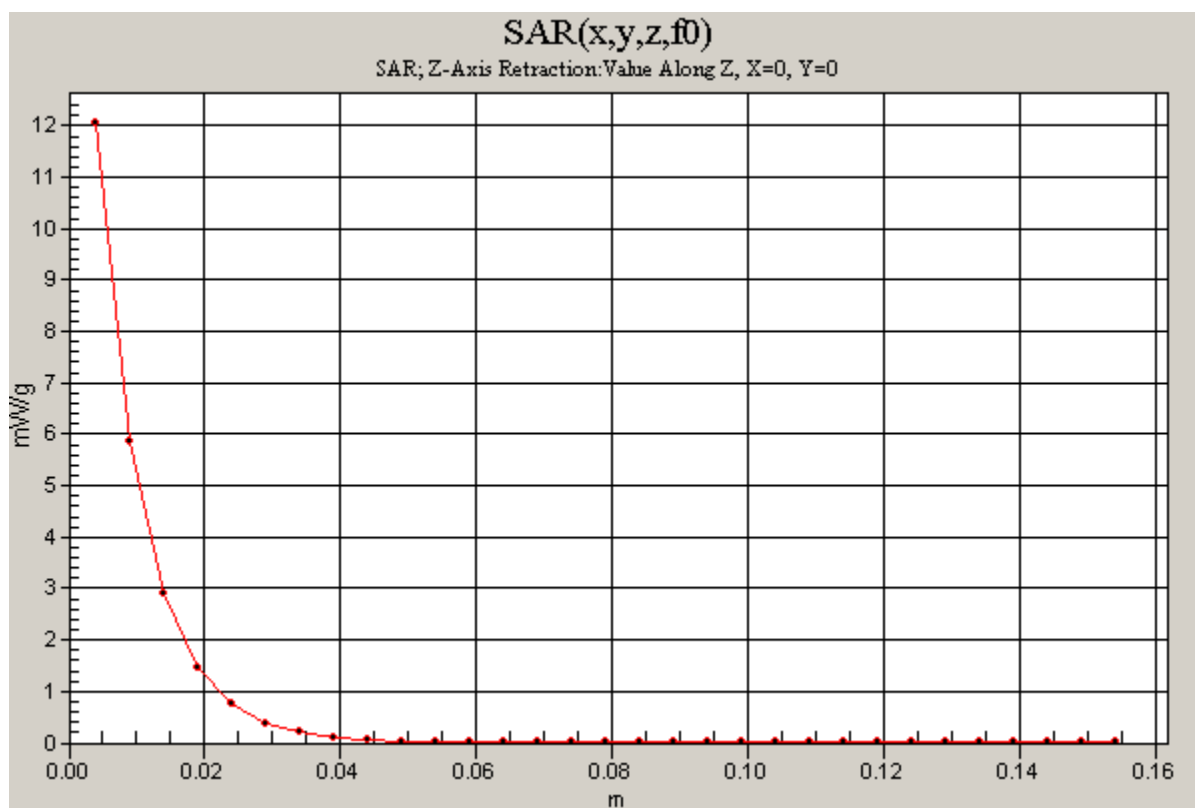
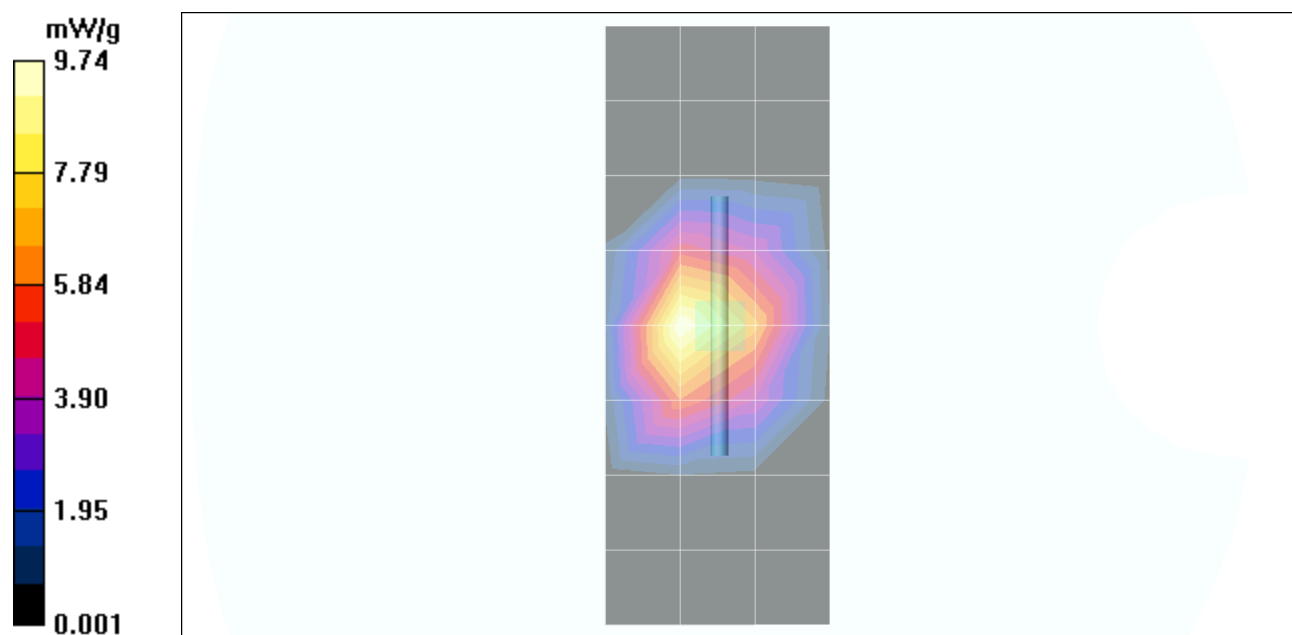
DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.49, 4.49, 4.49); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- 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=15mm, dy=15mm
 Maximum value of SAR (measured) = 9.74 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
 Reference Value = 81.3 V/m; Power Drift = -0.023 dB
 Peak SAR (extrapolated) = 22.4 W/kg
SAR(1 g) = 10.7 mW/g; SAR(10 g) = 4.94 mW/g
 Maximum value of SAR (measured) = 12.0 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
 Maximum value of SAR (measured) = 12.1 mW/g



Date/Time: 2/10/2011 8:39:16 AM

DUT: Dipole 2450 MHz; Type: D2450V2; Procedure Notes: 2450 MHz System Performance Check /
 Dipole Sn# 766; PM1 Power = 200 mW
 Sim.Temp@ meas = 19.1°C ;Sim.Temp@ SPC = 19.1°C; Room Temp@ SPC = 20.2°C

Communication System: CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1
 Medium: VALIDATION Only; Medium parameters used: $f = 2450$ MHz; $\sigma = 1.85$ mho/m; $\epsilon_r = 35.9$; $\rho = 1000$ kg/m³

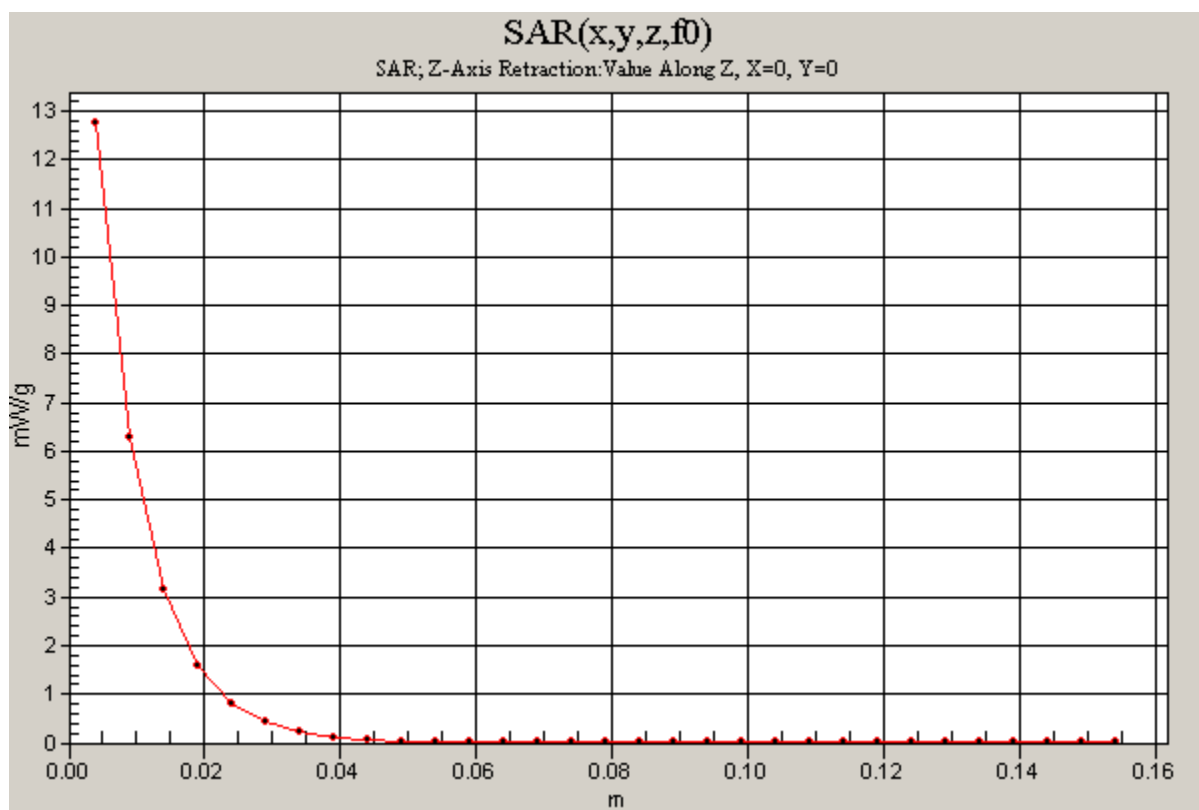
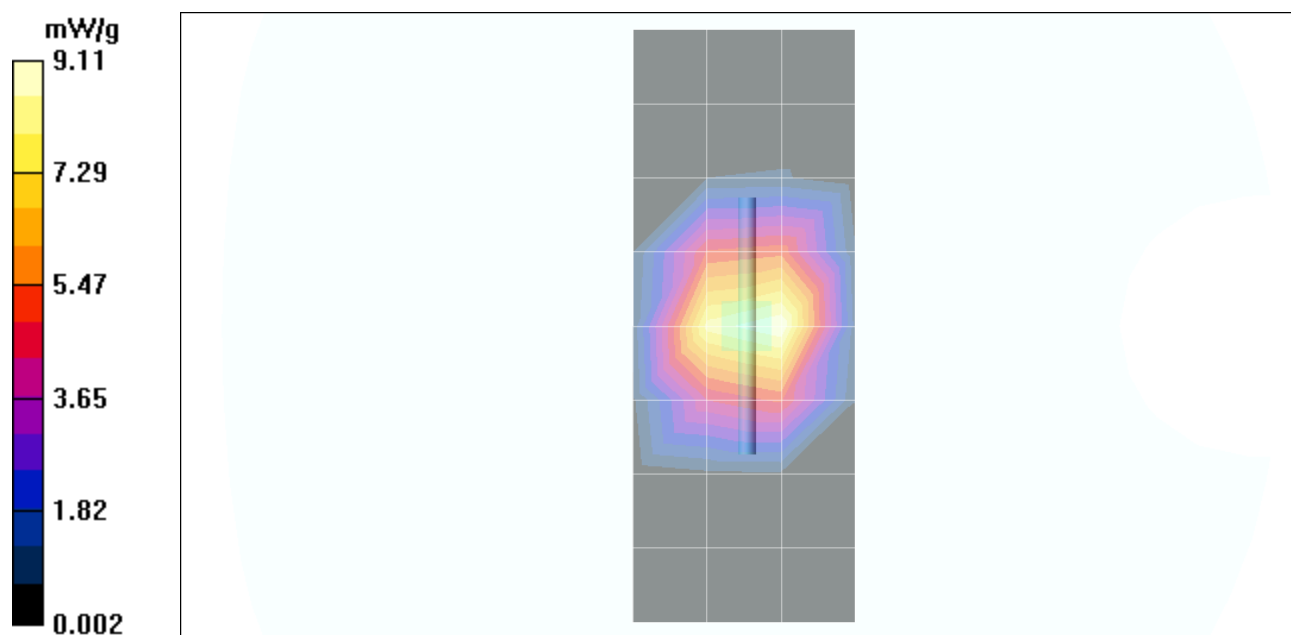
DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(4.35, 4.35, 4.35); Calibrated: 8/11/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn434; Calibrated: 1/13/2011
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Daily SPC Check/Dipole Area Scan (4x9x1): Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (measured) = 9.11 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
 Reference Value = 85.7 V/m; Power Drift = -0.114 dB
 Peak SAR (extrapolated) = 23.4 W/kg
SAR(1 g) = 11.3 mW/g; SAR(10 g) = 5.22 mW/g
 Maximum value of SAR (measured) = 12.9 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
 Maximum value of SAR (measured) = 12.8 mW/g



Appendix 2

SAR distribution plots for Phantom Head Adjacent Use

Date/Time: 2/8/2011 6:36:46 PM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: All Up; Antenna Position: Internal; Battery Model #: SNN5865A; DEVICE POSITION: Cheek

Communication System: CDMA 835; Frequency: 836.52 MHz; Communication System Channel Number: 384; Duty Cycle: 1:1

Medium: Low Freq Head; Medium parameters used: $f = 835$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 42.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.11, 6.11, 6.11); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- Phantom: R1_ Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1156;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Right Head Template/Area Scan - Normal Extended (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.756 mW/g

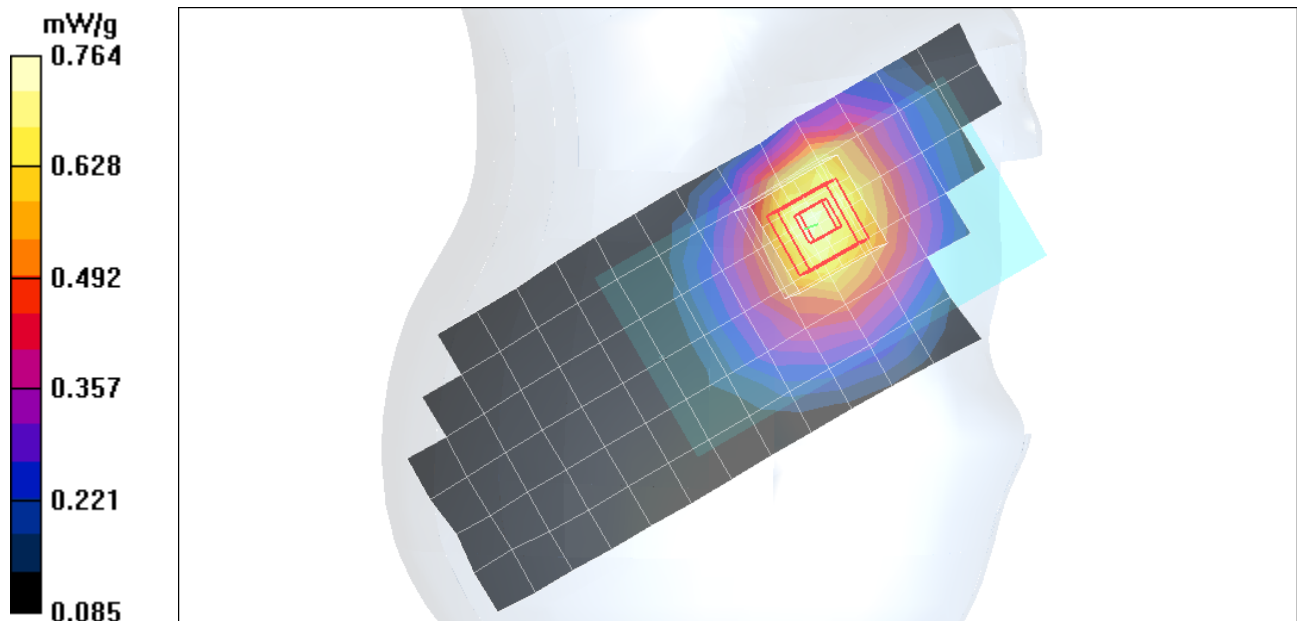
Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.7 V/m; Power Drift = -0.082 dB

Peak SAR (extrapolated) = 0.919 W/kg

SAR(1 g) = 0.722 mW/g; SAR(10 g) = 0.541 mW/g

Maximum value of SAR (measured) = 0.764 mW/g



Date/Time: 2/8/2011 11:56:55 PM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: All Up; Antenna Position: Internal; Battery Model #: SNN5865A; DEVICE POSITION: Cheek

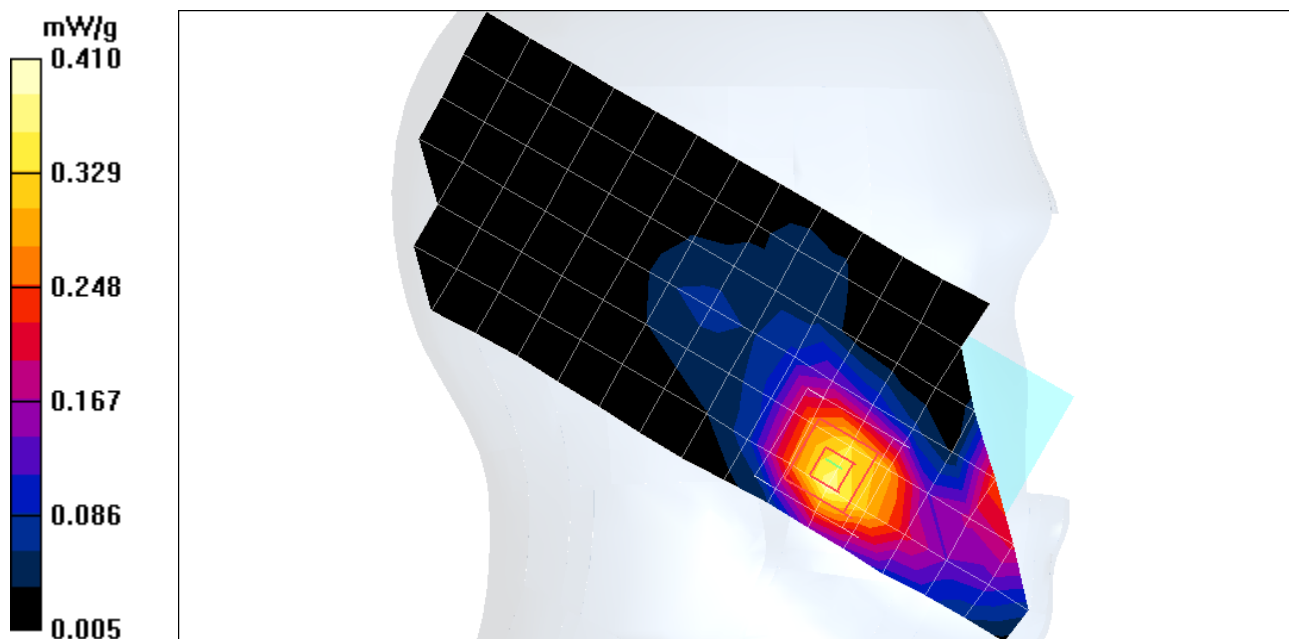
Communication System: CDMA 1900; Frequency: 1880 MHz; Communication System Channel Number: 600; Duty Cycle: 1:1
 Medium: Regular Glycol Head 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.46$ mho/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(5.05, 5.05, 5.05); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- 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

Left Head Template/Area Scan - Normal Extended (15mm) (7x17x1): Measurement grid: $dx=15$ mm, $dy=15$ mm
 Maximum value of SAR (measured) = 0.378 mW/g

Left Head Template/5x5x7 Zoom Scan (≤ 3 GHz) (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm
 Reference Value = 13.2 V/m; Power Drift = 0.166 dB
 Peak SAR (extrapolated) = 0.609 W/kg
SAR(1 g) = 0.381 mW/g; SAR(10 g) = 0.232 mW/g
 Maximum value of SAR (measured) = 0.410 mW/g



Date/Time: 2/5/2011 12:55:54 PM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: continuous; Antenna Position: INTERNAL;
Battery Model #: SNN5865A DEVICE POSITION: CHEEK; Data Rate: 1 Mbps

Communication System: Wi-Fi 2450; Frequency: 2437 MHz; Communication System Channel
Number: 6; Duty Cycle: 1:1

Medium: 2450 Glycol Head; Medium parameters used: $f = 2450$ MHz; $\sigma = 1.85$ mho/m; $\epsilon_r = 36.1$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.49, 4.49, 4.49); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- 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

Left Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.227 mW/g

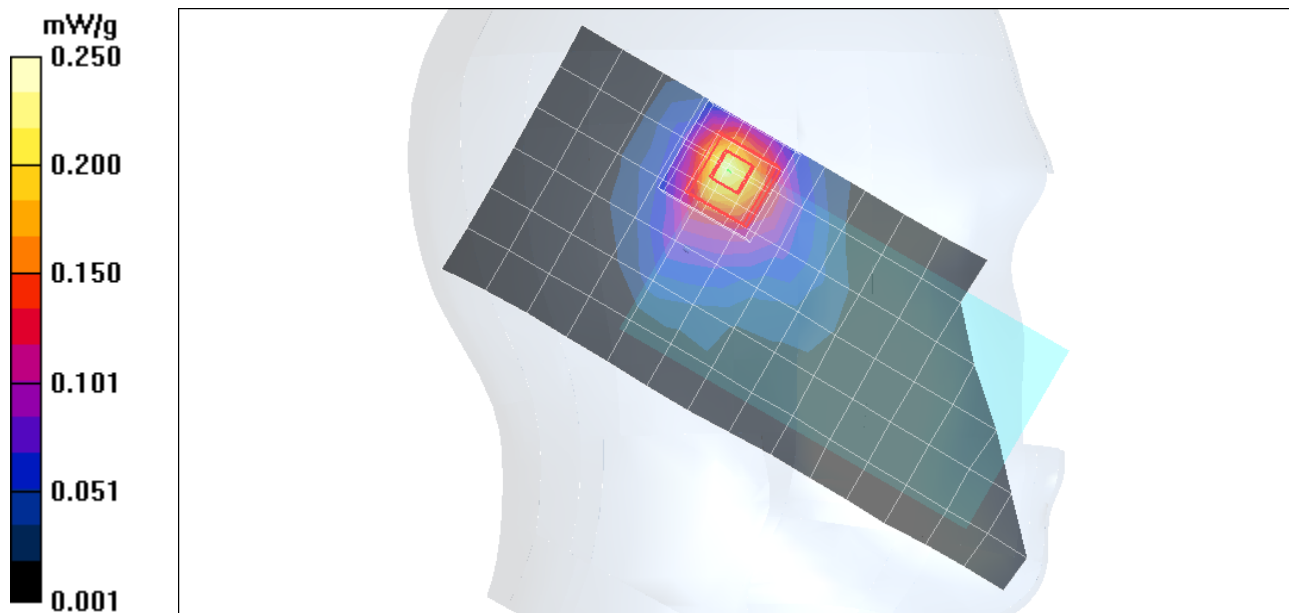
Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.41 V/m; Power Drift = 0.119 dB

Peak SAR (extrapolated) = 0.465 W/kg

SAR(1 g) = 0.220 mW/g; SAR(10 g) = 0.107 mW/g

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



Date/Time: 2/8/2011 8:56:11 PM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: All Up; Antenna Position: Internal; Battery Model #: SNN5865A; DEVICE POSITION: Tilt

Communication System: CDMA 835; Frequency: 836.52 MHz; Communication System Channel Number: 384; Duty Cycle: 1:1

Medium: Low Freq Head; Medium parameters used: $f = 835$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 42.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(6.11, 6.11, 6.11); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- Phantom: R1_ Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1156;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Right Head Template/Area Scan - Normal Extended (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.419 mW/g

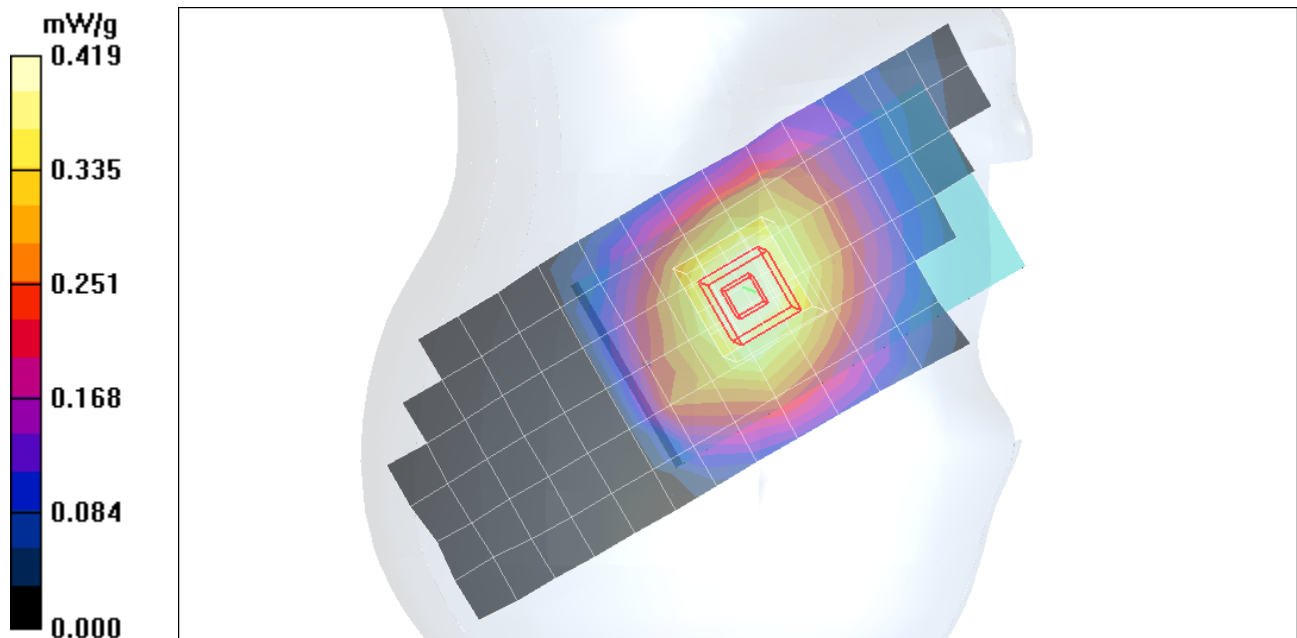
Right Head Template/5x5x7 Zoom Scan (≤ 3 GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.1 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 0.510 W/kg

SAR(1 g) = 0.415 mW/g; SAR(10 g) = 0.320 mW/g

Maximum value of SAR (measured) = 0.436 mW/g



Date/Time: 2/9/2011 12:22:16 AM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: All Up; Antenna Position: Internal; Battery Model #: SNN5865A; DEVICE POSITION: Tilt

Communication System: CDMA 1900; Frequency: 1880 MHz; Communication System Channel Number: 600; Duty Cycle: 1:1

Medium: Regular Glycol Head 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.46$ mho/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(5.05, 5.05, 5.05); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- 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

Left Head Template/Area Scan - Normal Extended (15mm) (7x17x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 0.199 mW/g

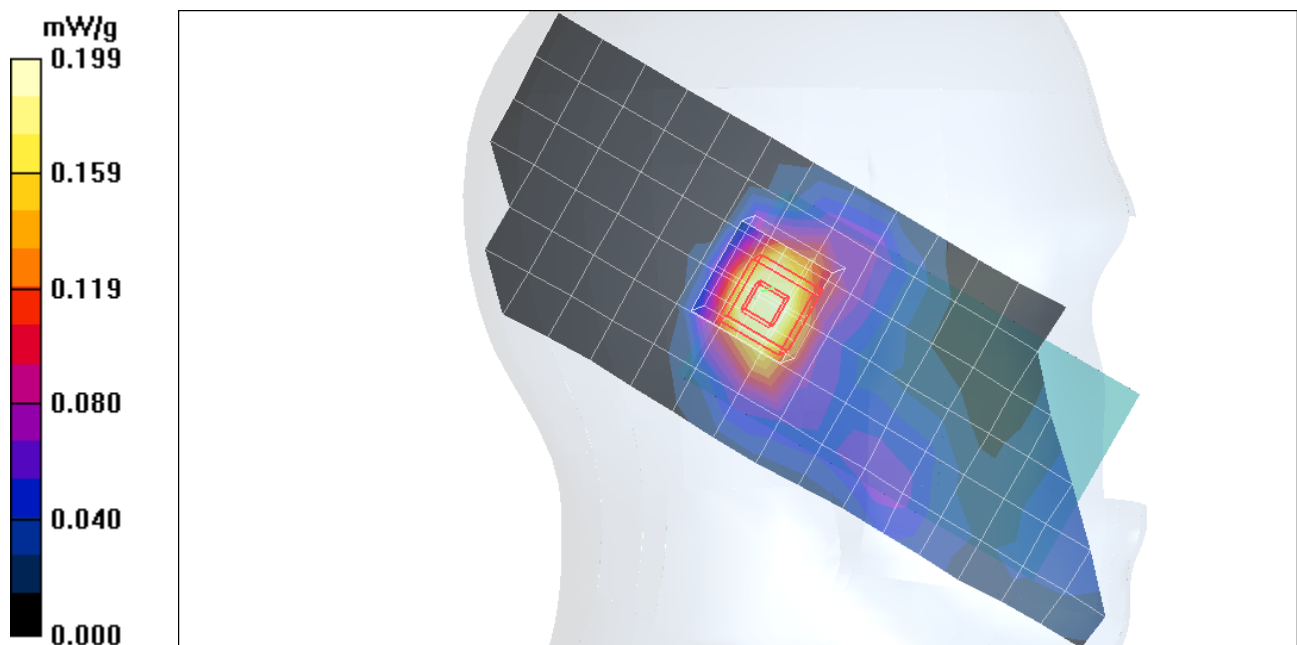
Left Head Template/5x5x7 Zoom Scan (≤ 3 GHz) (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 11.9 V/m; Power Drift = 0.035 dB

Peak SAR (extrapolated) = 0.386 W/kg

SAR(1 g) = 0.225 mW/g; SAR(10 g) = 0.125 mW/g

Maximum value of SAR (measured) = 0.245 mW/g



Date/Time: 2/7/2011 10:25:06 AM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: continuous; Battery Model #: SNN5865A;
 DEVICE POSITION: Tilt; Data Rate: 1 Mbps

Communication System: Wi-Fi 2450; Frequency: 2412 MHz; Communication System Channel
 Number: 1; Duty Cycle: 1:1

Medium: 2450 Glycol Head; Medium parameters used: $f = 2450$ MHz; $\sigma = 1.84$ mho/m; $\epsilon_r = 36.1$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3183; ConvF(4.49, 4.49, 4.49); Calibrated: 7/14/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn702; Calibrated: 5/18/2010
- 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

Left Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.219 mW/g

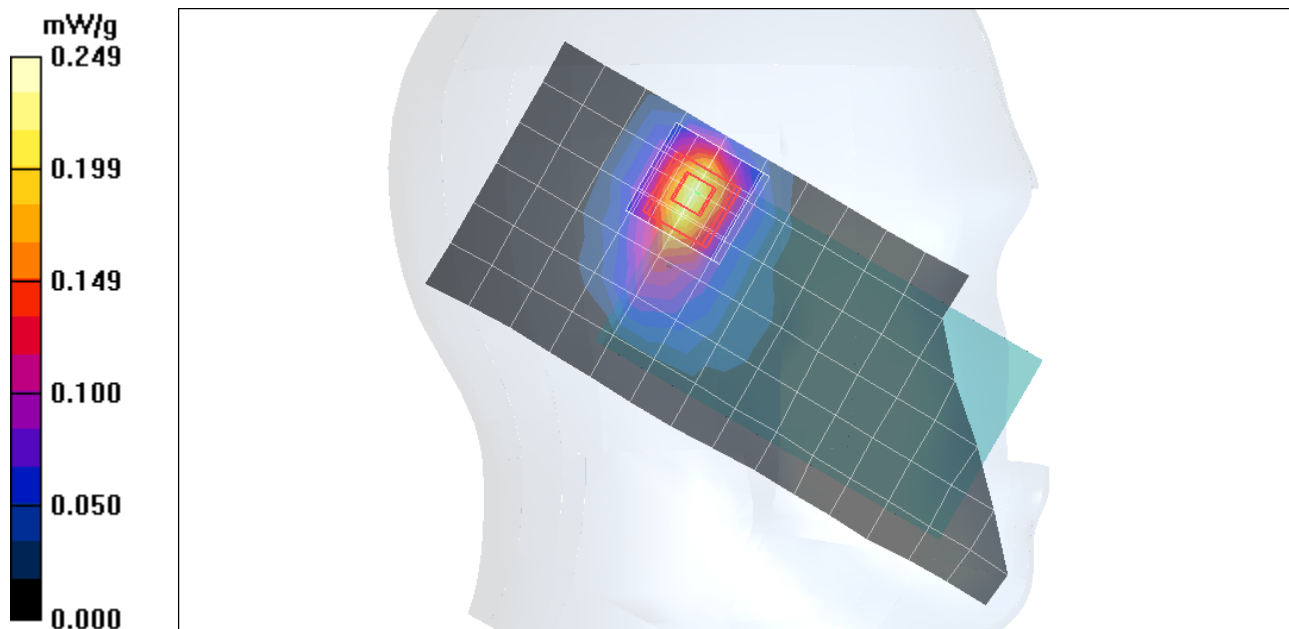
Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.75 V/m; Power Drift = -0.244 dB

Peak SAR (extrapolated) = 0.477 W/kg

SAR(1 g) = 0.216 mW/g; SAR(10 g) = 0.102 mW/g

Maximum value of SAR (measured) = 0.249 mW/g



Appendix 3

SAR distribution plots for Body Worn Configuration

Date/Time: 2/9/2011 10:25:28 AM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: always up; Antenna Position: Internal; Battery Model #:SNN5865A; DEVICE POSITION: Front 25mm away from phantom EVDO REV A, Subtest 2, FETAP

Communication System: CDMA 835; Frequency: 836.52 MHz; Communication System Channel Number: 384; Duty Cycle: 1:1

Medium: Low Freq Body; Medium parameters used: $f = 835$ MHz; $\sigma = 0.98$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ 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: 5/18/2010
- 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 (15mm) (16x7x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.494 mW/g

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

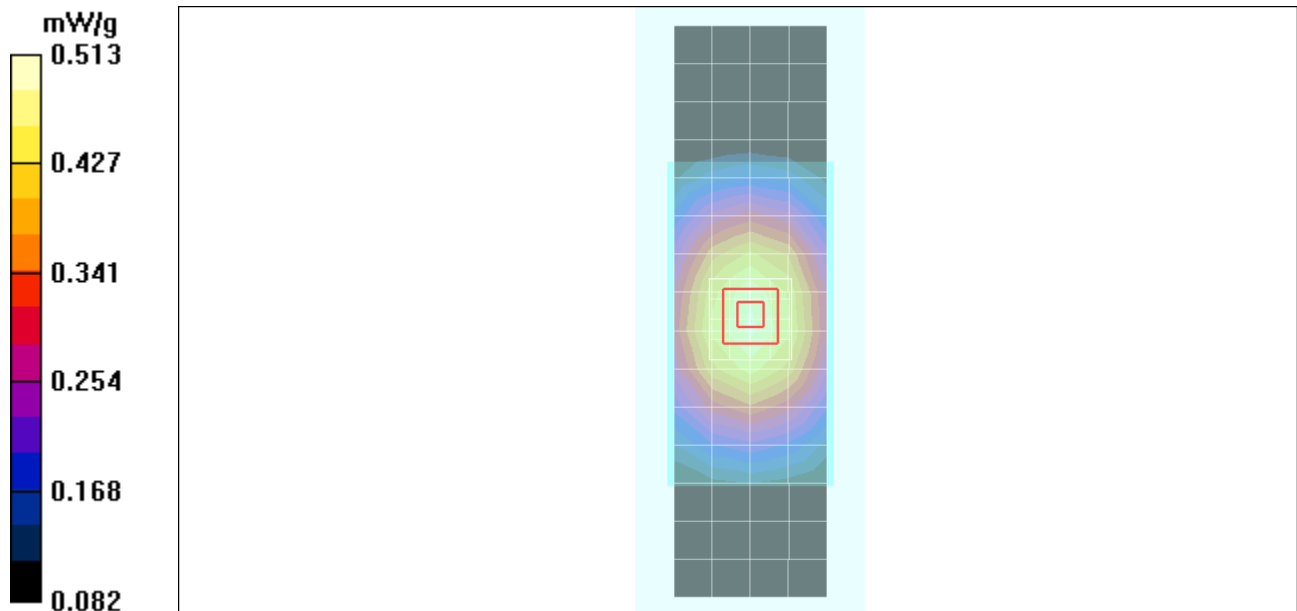
grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.6 V/m; Power Drift = -0.053 dB

Peak SAR (extrapolated) = 0.614 W/kg

SAR(1 g) = 0.487 mW/g; SAR(10 g) = 0.371 mW/g

Maximum value of SAR (measured) = 0.513 mW/g



Date/Time: 2/8/2011 1:58:46 PM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: always up; Antenna Position: Internal; Battery Model #: SNN5865A; DEVICE POSITION: Back of Phone 25mm away from phantom EVDO REV O, FTAP

Communication System: CDMA 1900; Frequency: 1908.75 MHz; Communication System Channel Number: 1175; Duty Cycle: 1:1

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.57$ 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: 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 - 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 (<=3GHz) (5x5x7)/Cube 0: Measurement

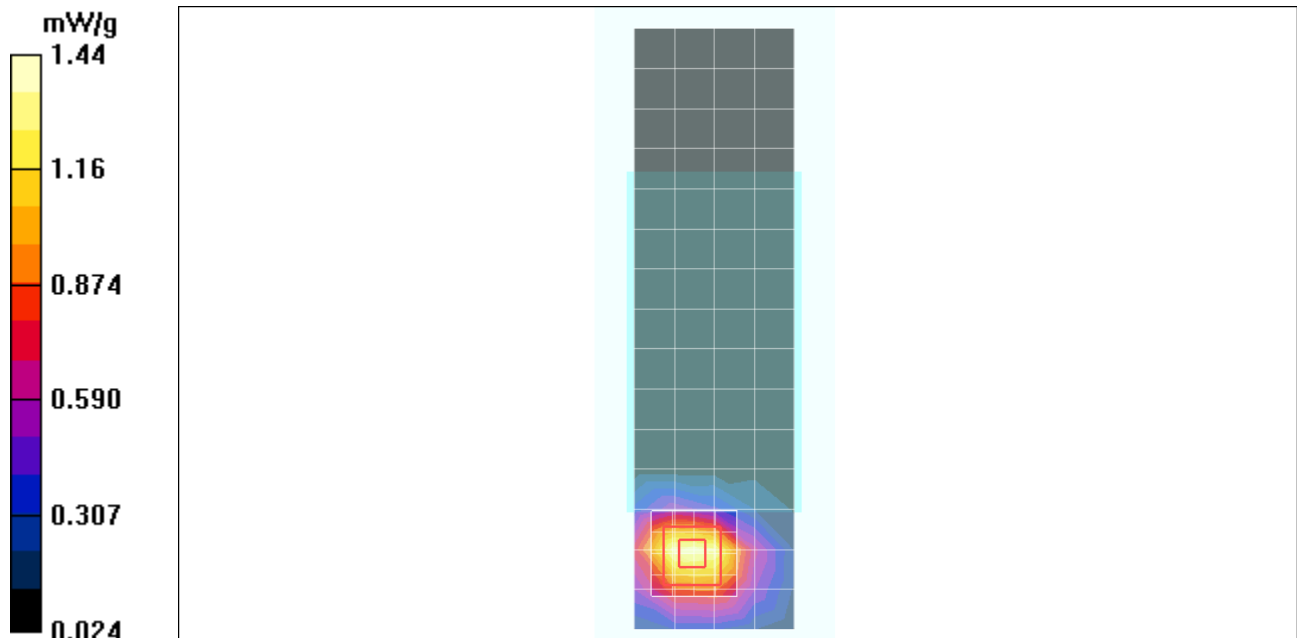
grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.4 V/m; Power Drift = -0.214 dB

Peak SAR (extrapolated) = 2.06 W/kg

SAR(1 g) = 1.33 mW/g; SAR(10 g) = 0.786 mW/g

Maximum value of SAR (measured) = 1.44 mW/g



Date/Time: 2/10/2011 12:23:29 PM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: continuous; Antenna Position: INTERNAL;
 Battery Model #: SNN5865A; DEVICE POSITION: Back of Phone 25mm away from Phantom; Data
 Rate: 11 Mbps

Communication System: Wi-Fi 2450; Frequency: 2437 MHz; Communication System Channel
 Number: 6; Duty Cycle: 1:1

Medium: 2450 Glycol Body; Medium parameters used: $f = 2450$ MHz; $\sigma = 2.04$ mho/m; $\epsilon_r = 49.1$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(4.19, 4.19, 4.19); 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 Body (15mm) (13x7x1): Measurement
 grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.029 mW/g

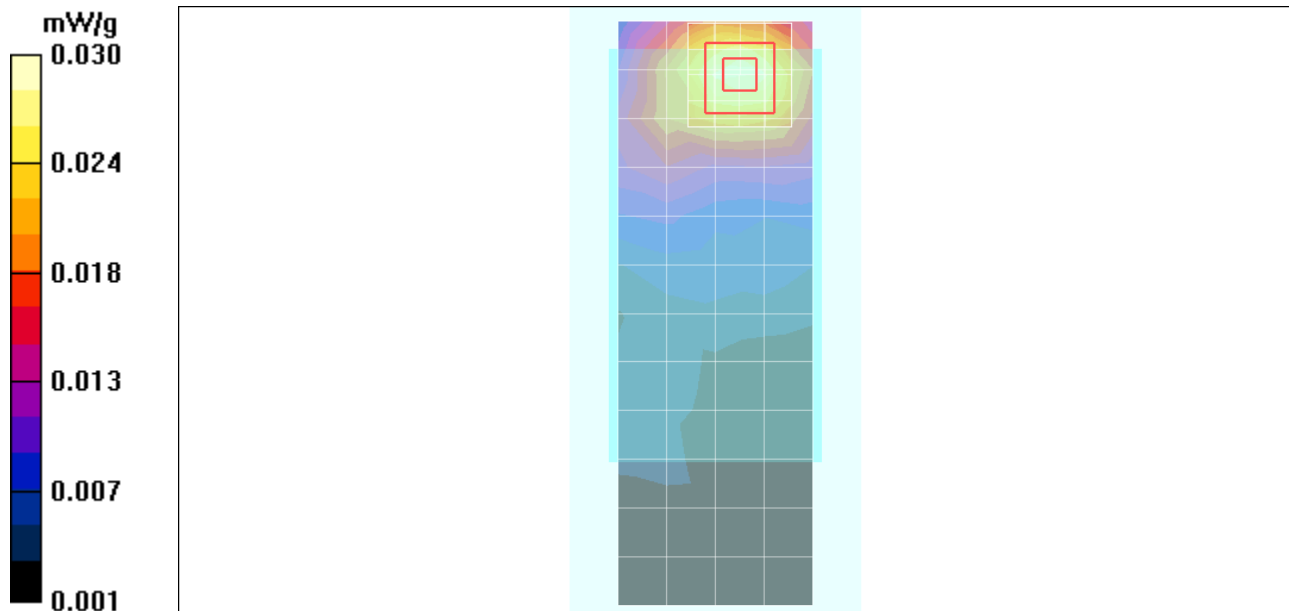
Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement
 grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.65 V/m; Power Drift = -0.175 dB

Peak SAR (extrapolated) = 0.049 W/kg

SAR(1 g) = 0.028 mW/g; SAR(10 g) = 0.016 mW/g

Maximum value of SAR (measured) = 0.030 mW/g



Appendix 4

SAR distribution plots for Mobile Hotspot Configuration

Date/Time: 2/10/2011 2:14:07 AM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: All Up Bits; Antenna Position: Internal; Battery Model #: SNN5865A; DEVICE POSITION: Left Edge of Phone 10mm from Flat Phantom EVDO REV A (Subtest 2, FETAP)

Communication System: CDMA 835; Frequency: 848.31 MHz; Communication System Channel Number: 777; Duty Cycle: 1:1

Medium: Low Freq Body; Medium parameters used: $f = 835$ MHz; $\sigma = 0.98$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ 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: 5/18/2010
- 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) = 1.43 mW/g

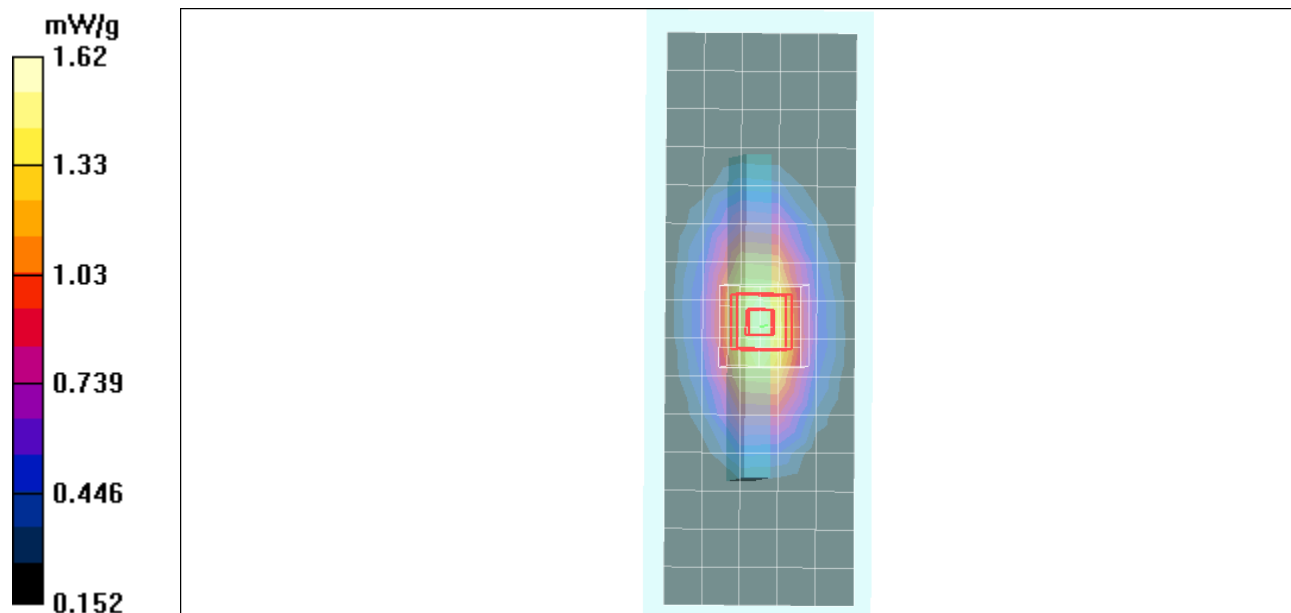
Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 39.6 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 2.19 W/kg

SAR(1 g) = 1.5 mW/g; SAR(10 g) = 1.000 mW/g

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



Date/Time: 2/10/2011 5:05:48 PM

Serial: A0000022B3746E; Procedure Notes: Pwr Step: All Up Bits; Antenna Position: Internal; Battery Model #: SNN5865A; DEVICE POSITION: Back of Phone 10mm from Flat Phantom EVDO REV 0 FTAP

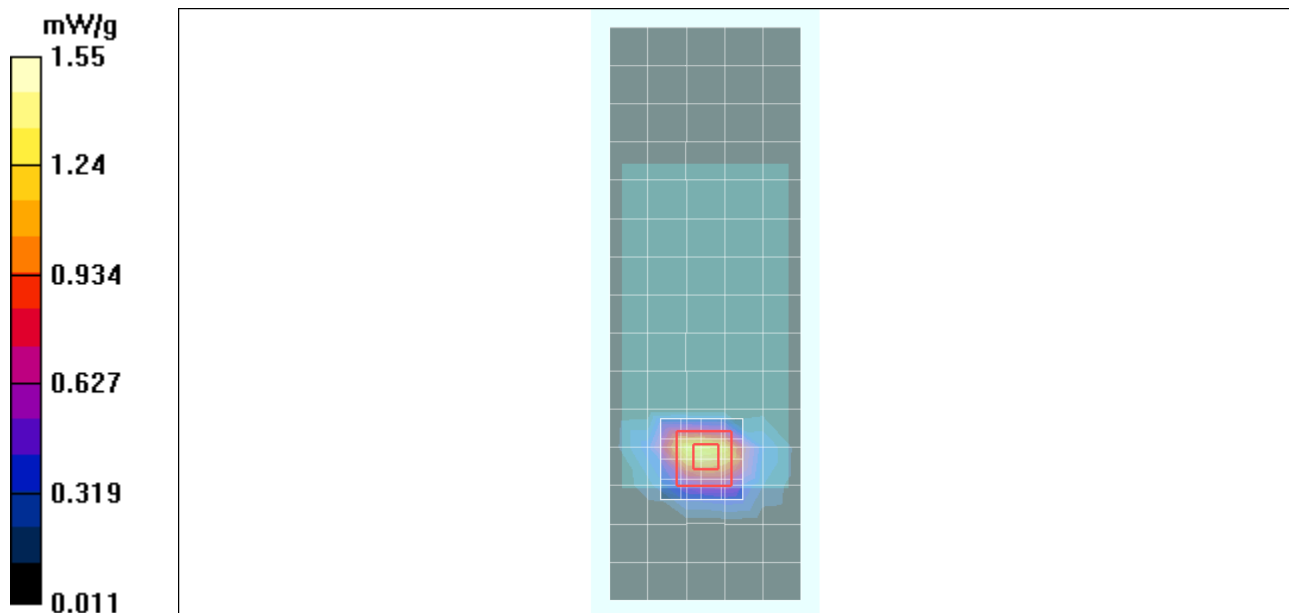
Communication System: CDMA 1900; Frequency: 1880 MHz; Communication System Channel Number: 600; Duty Cycle: 1:1
Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³

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: 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) = 1.31 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.7 V/m; Power Drift = 0.347 dB
Peak SAR (extrapolated) = 2.59 W/kg
SAR(1 g) = 1.42 mW/g; SAR(10 g) = 0.697 mW/g
Maximum value of SAR (measured) = 1.55 mW/g



Date/Time: 2/10/2011 3:18:54 PM

Serial: A0000022B36C41; Procedure Notes: Pwr Step: continuous; Antenna Position: INTERNAL;
 Battery Model #: SNN5865A; DEVICE POSITION: Back of Phone 10mm away from Phantom; Data
 Rate: 11 Mbps

Communication System: Wi-Fi 2450; Frequency: 2437 MHz; Communication System Channel
 Number: 6; Duty Cycle: 1:1

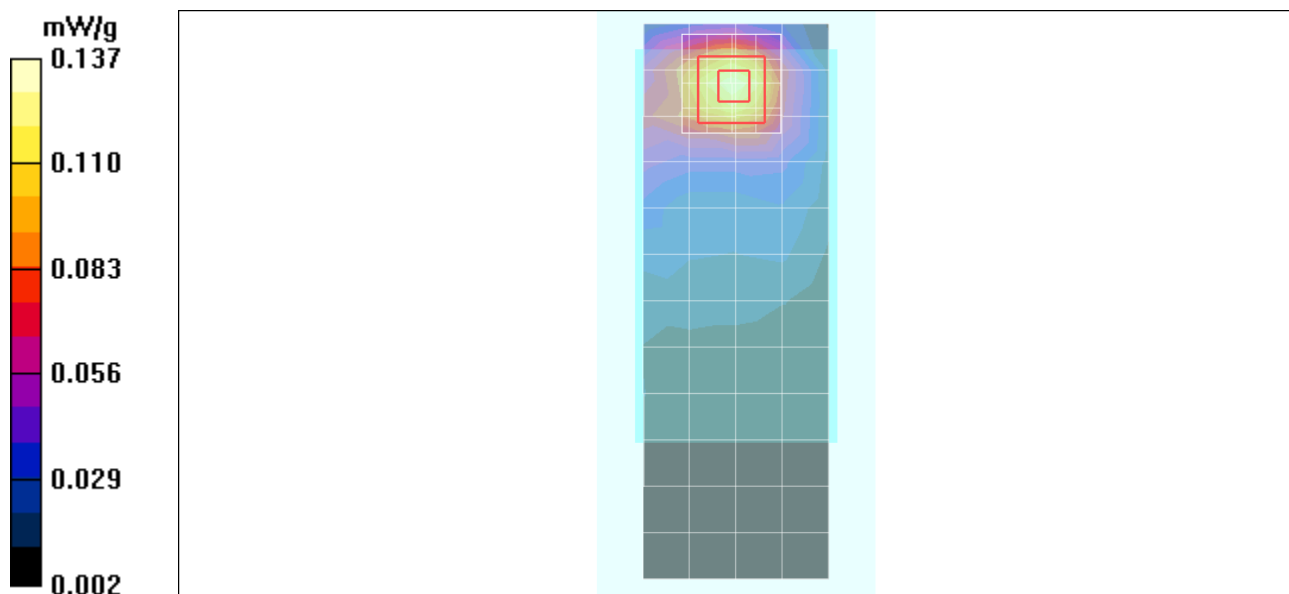
Medium: 2450 Glycol Body; Medium parameters used: $f = 2450$ MHz; $\sigma = 2.04$ mho/m; $\epsilon_r = 49.1$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(4.19, 4.19, 4.19); 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 Body (15mm) (13x7x1): Measurement
 grid: dx=15mm, dy=15mm
 Maximum value of SAR (measured) = 0.124 mW/g

Amy Twin Phone Template/5x5x7 Zoom Scan (≤ 3 GHz) (5x5x7)/Cube 0: Measurement
 grid: dx=8mm, dy=8mm, dz=5mm
 Reference Value = 7.96 V/m; Power Drift = -0.005 dB
 Peak SAR (extrapolated) = 0.231 W/kg
SAR(1 g) = 0.126 mW/g; SAR(10 g) = 0.069 mW/g
 Maximum value of SAR (measured) = 0.137 mW/g



Appendix 5
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

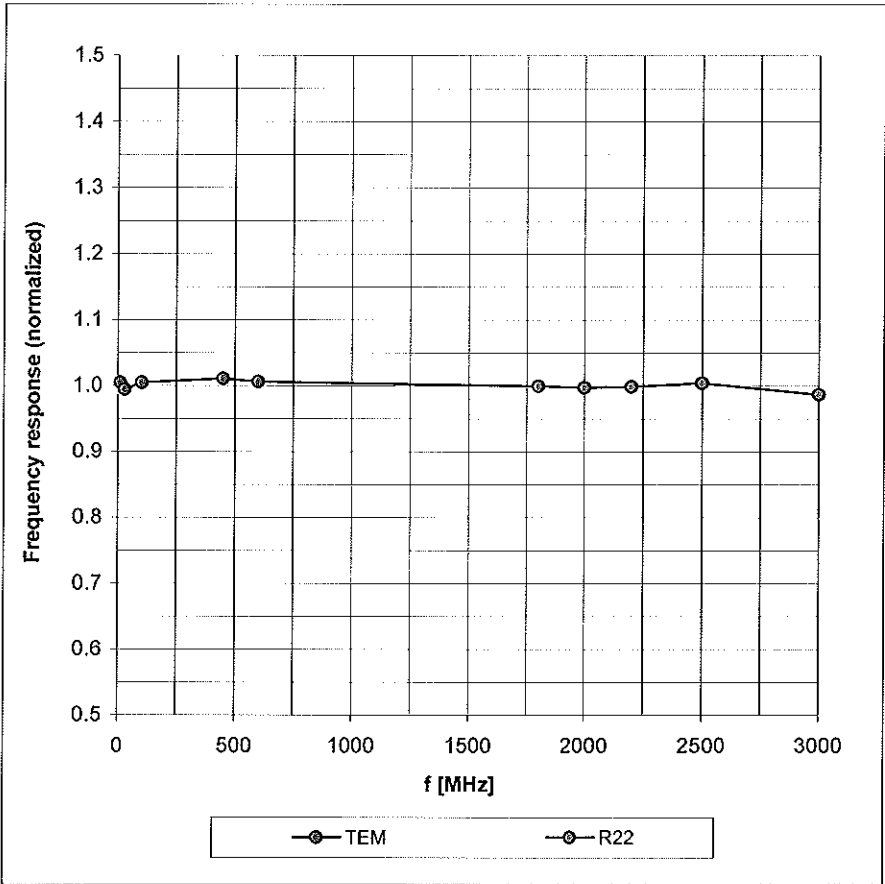
Calibration Parameter Determined in Body Tissue Simulating Media

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.

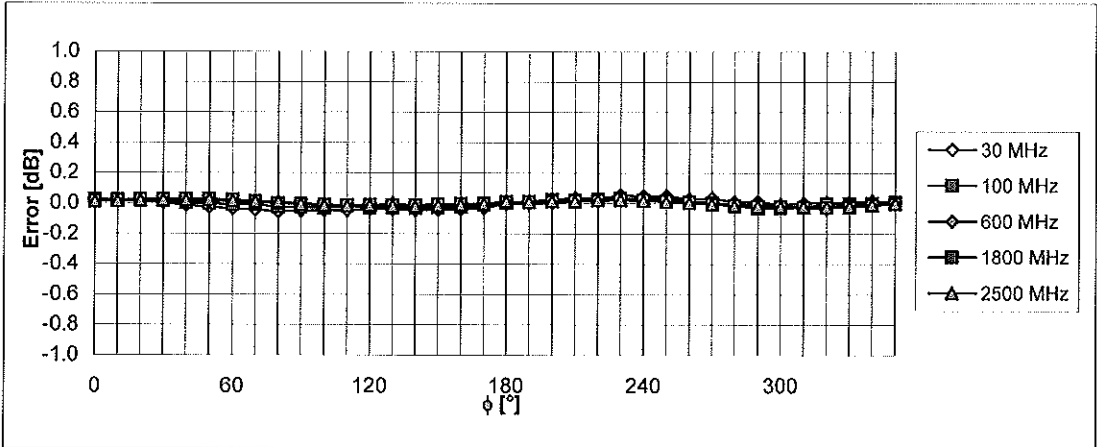
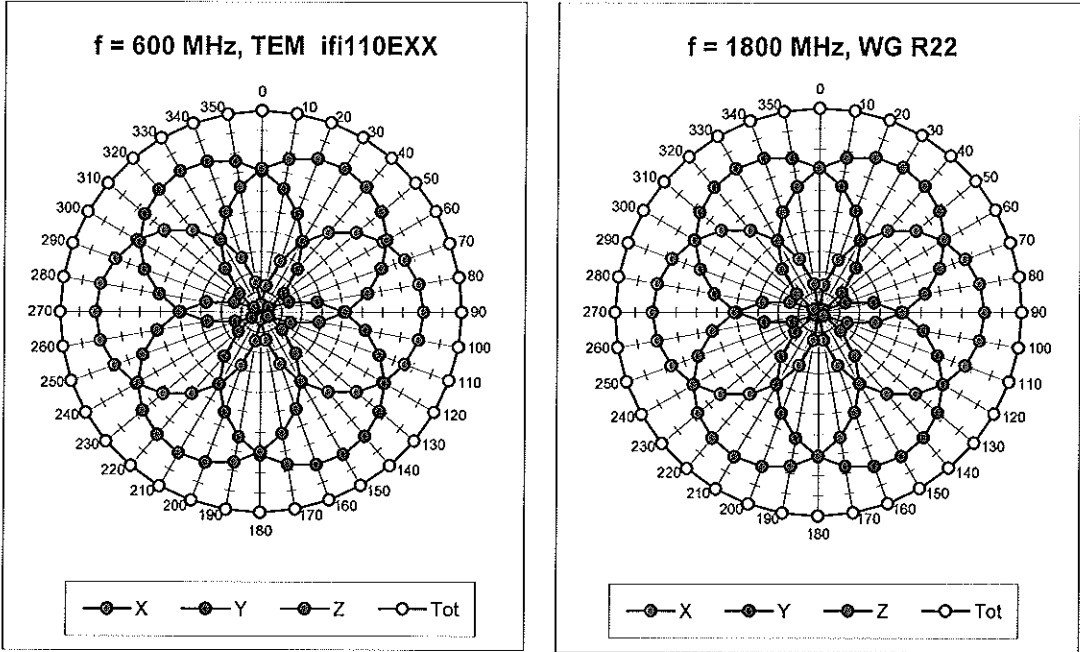
Frequency Response of E-Field

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



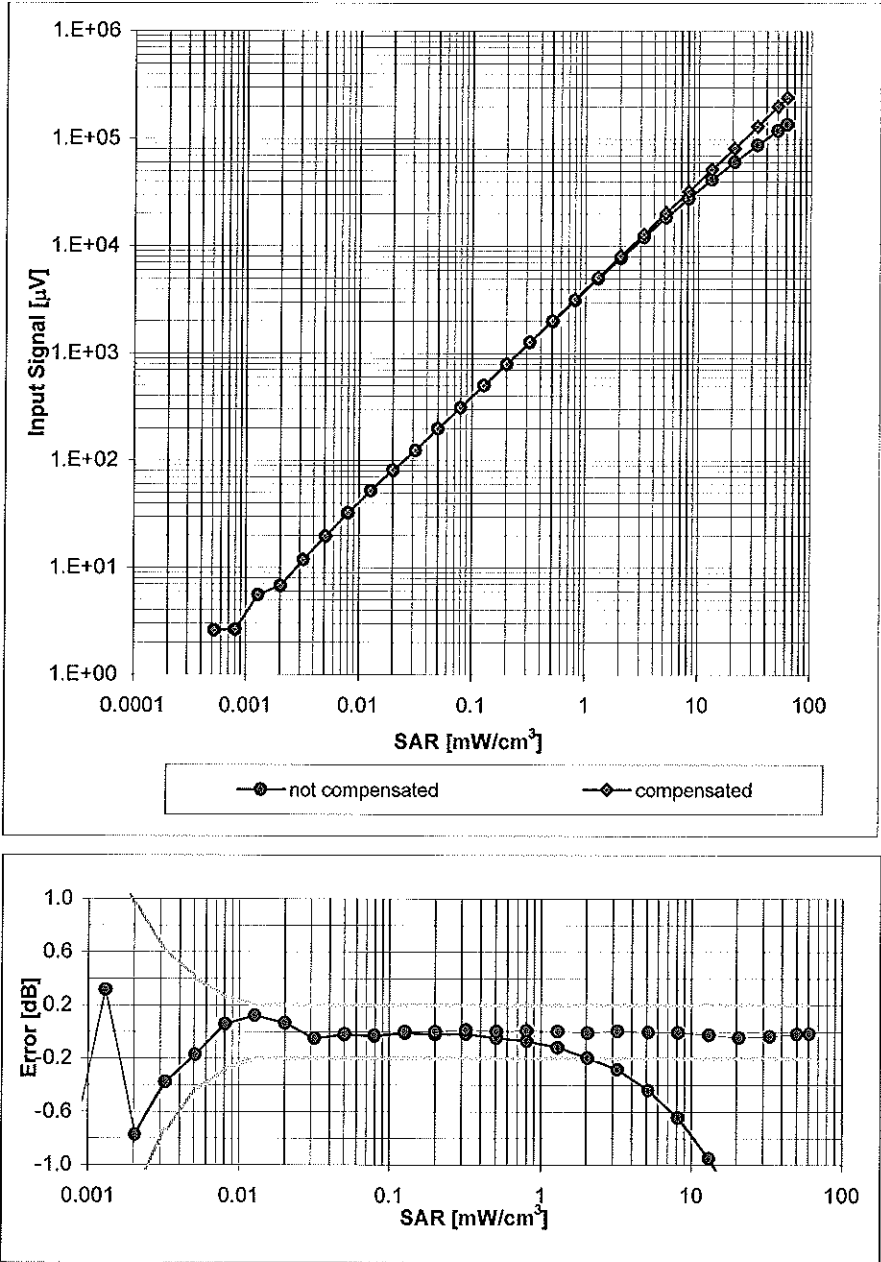
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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



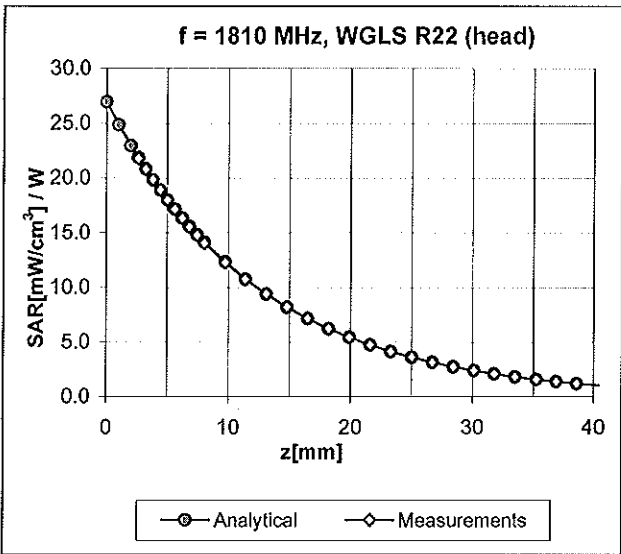
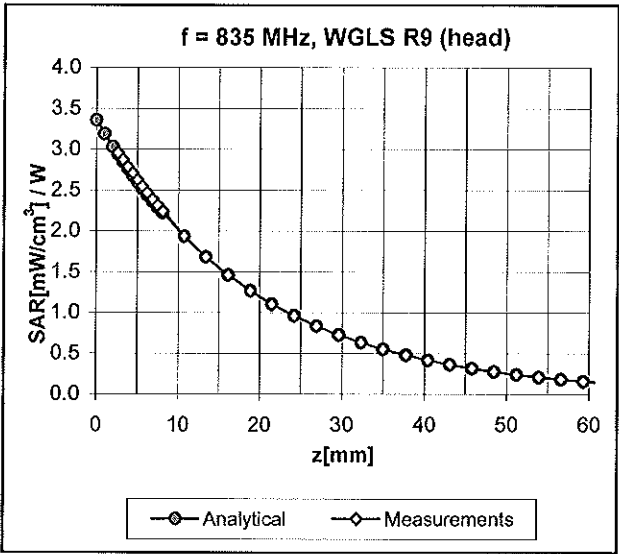
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



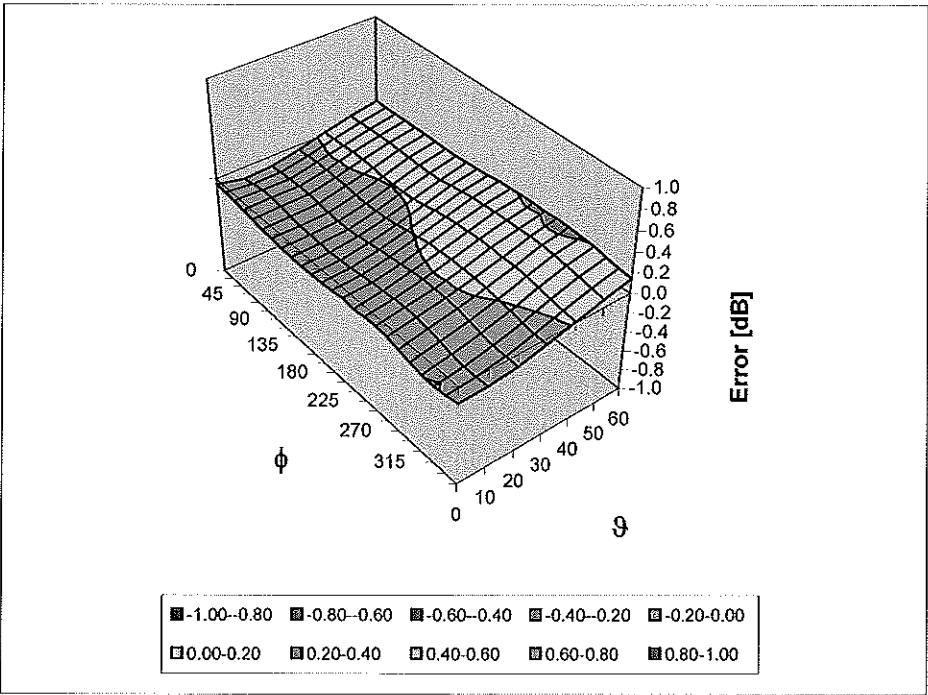
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ, θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 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



Accredited by the Swiss Accreditation Service (SAS)
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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:	Name Claudio Leubler	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Technical Manager	

Issued: August 14, 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 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

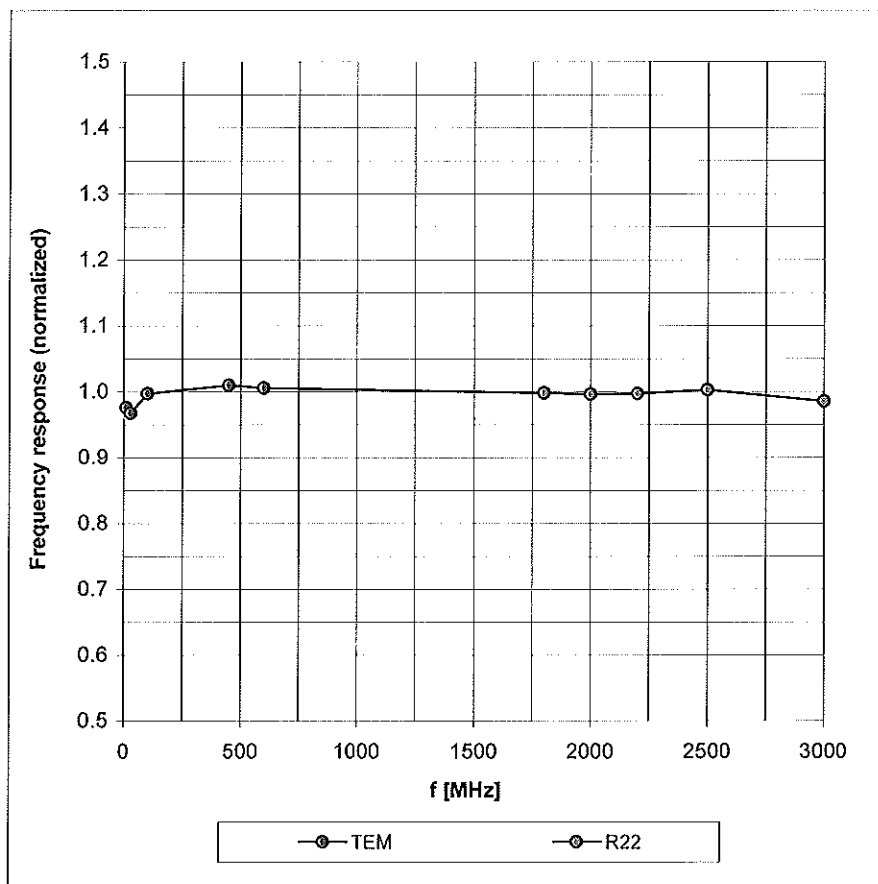
Calibration Parameter Determined in Body Tissue Simulating Media

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.

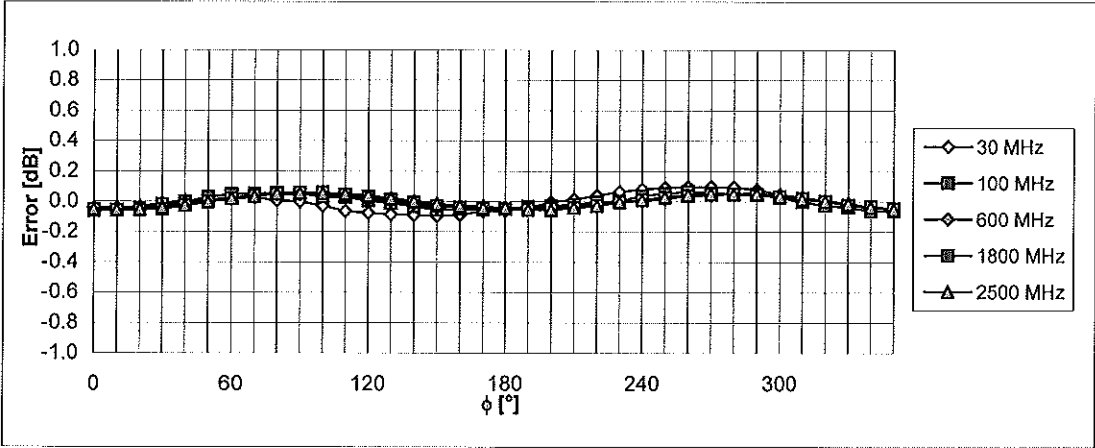
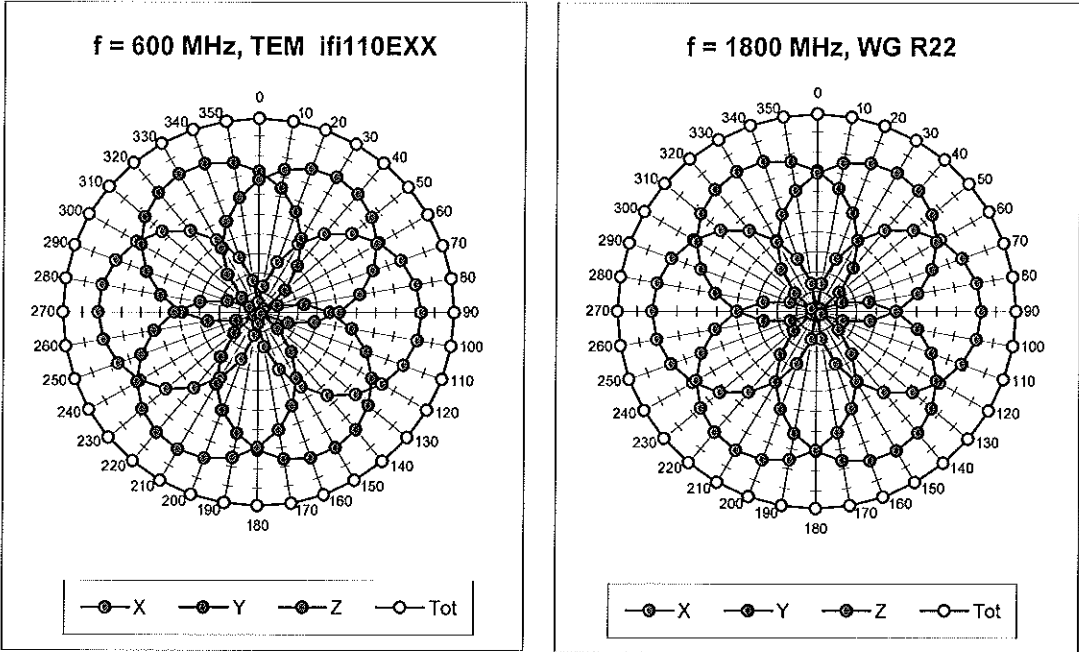
Frequency Response of E-Field

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



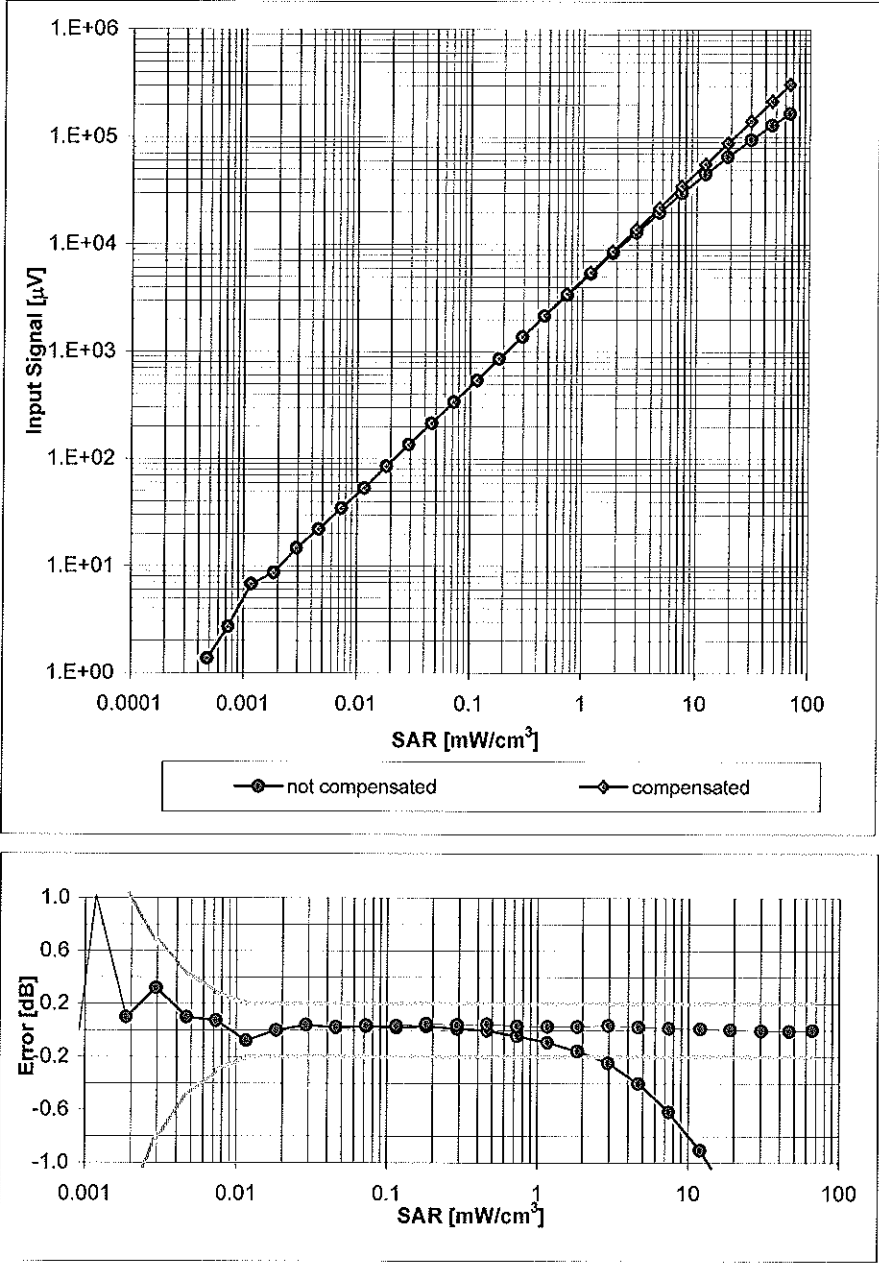
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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



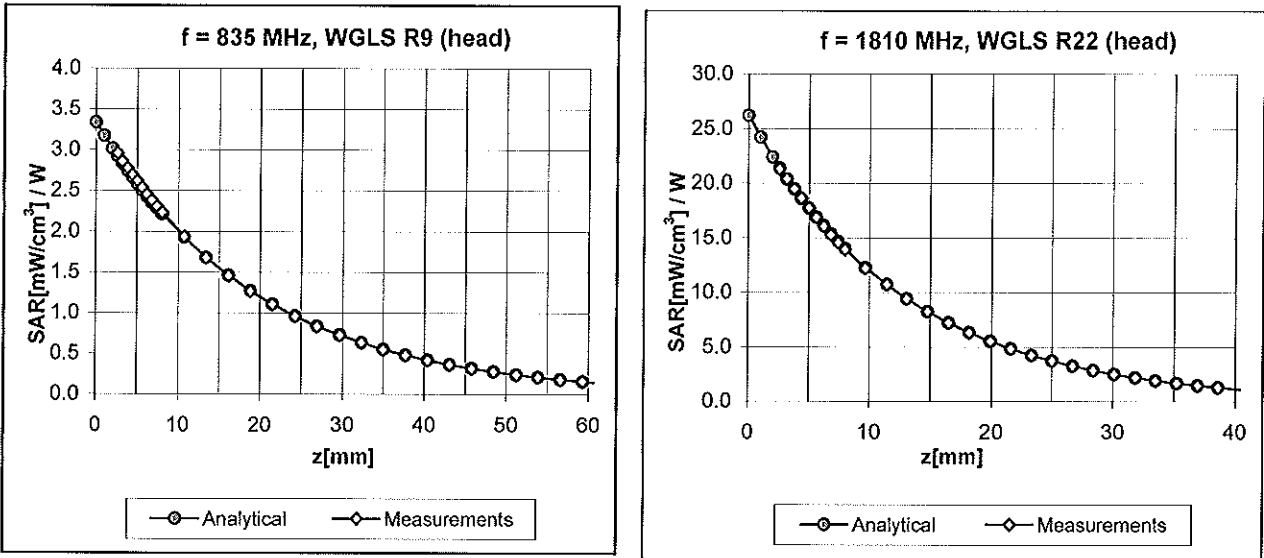
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



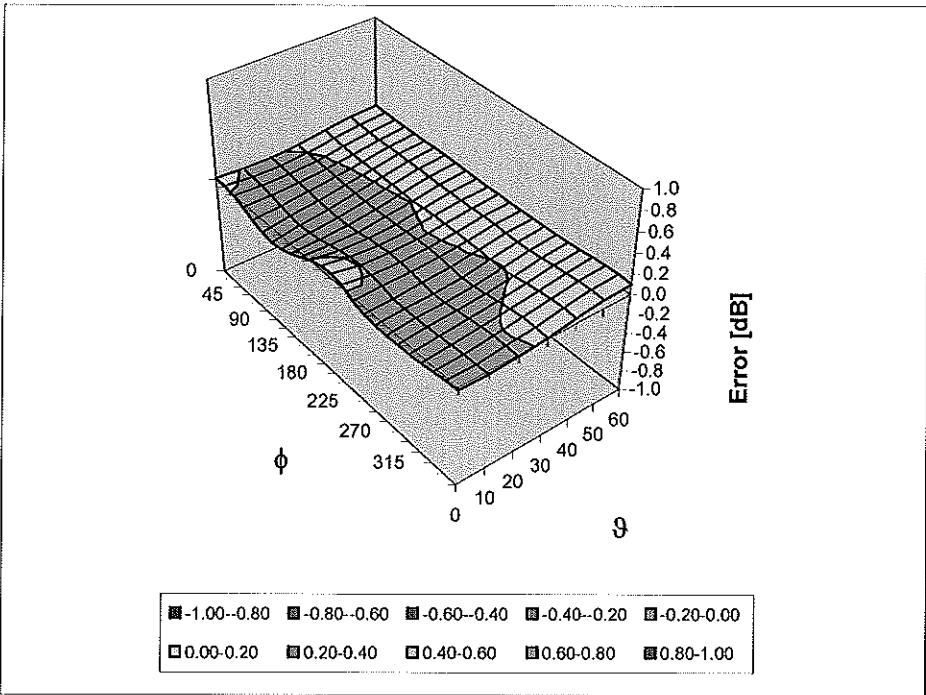
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

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

Appendix 6
Measurement Uncertainty Budget

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e = f(d,k)</i>	<i>f</i>	<i>g</i>	<i>h = c x f / e</i>	<i>i = c x g / 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 7

Dipole Characterization 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: **D835V2-424_Oct10**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 424**

Calibration procedure(s) **QA CAL-05.v7**
Calibration procedure for dipole validation kits

Calibration date: **October 14, 2010**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-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)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

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

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

Issued: October 14, 2010

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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	V52.2
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 $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	42.3 $\pm$ 6 %	0.90 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.5 $\pm$ 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	2.36 mW / g
SAR normalized	normalized to 1W	9.44 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.49 mW /g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 mW / g
SAR normalized	normalized to 1W	6.16 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.18 mW /g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.9\ \Omega + 3.8\ j\Omega$
Return Loss	- 26.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.393 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	August 24, 2000

DASY5 Validation Report for Head TSL

Date/Time: 14.10.2010 10:07:31

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:424

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

Medium: HSL900

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.9 \text{ mho/m}$; $\epsilon_r = 42.5$; $\rho = 1000 \text{ kg/m}^3$

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, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

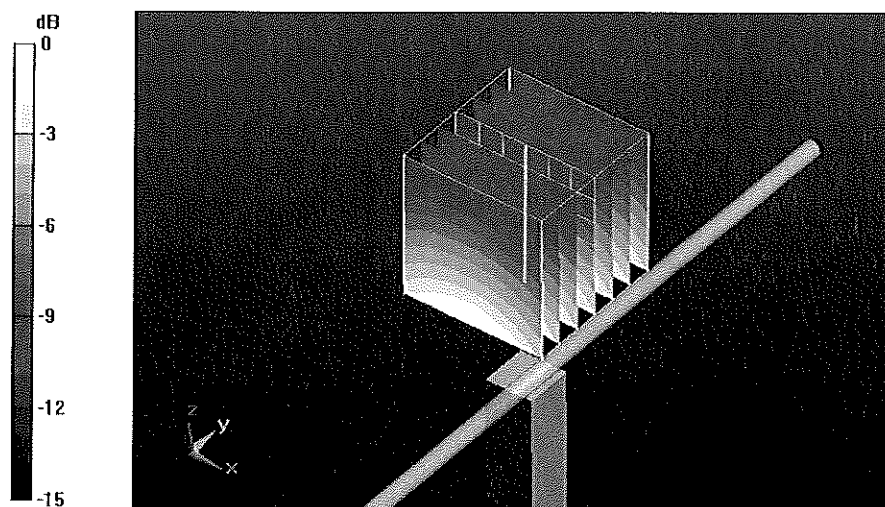
Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.7 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 3.56 W/kg

SAR(1 g) = 2.36 mW/g; SAR(10 g) = 1.54 mW/g

Maximum value of SAR (measured) = 2.75 mW/g



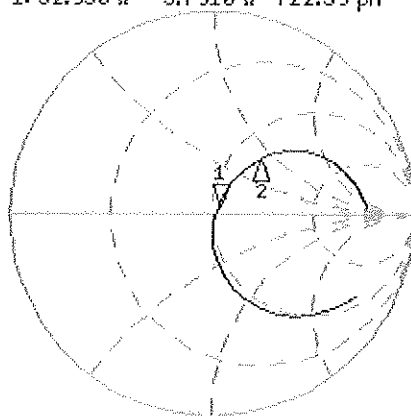
0 dB = 2.75mW/g

Impedance Measurement Plot for Head TSL

14 Oct 2010 08:47:41
 [CH1] S11 1 U FS 1: 52.930 Ω 3.7910 Ω 722.59 μ H 835.000 000 MHz

*
 Del
 Cor

Avg
 16

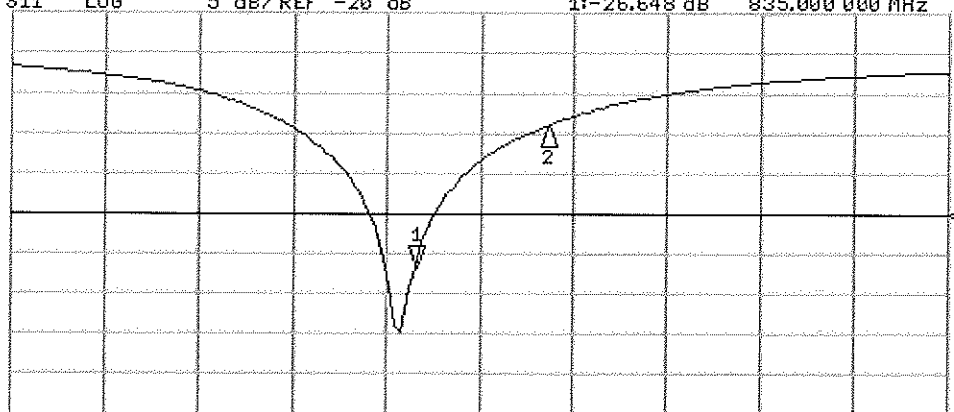


CH1 Markers
 2: 65.734 Ω
 40.102 Ω
 900.000 MHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -26.648 dB 835.000 000 MHz

Cor

Avg
 16



CH2 Markers
 2: -9.0765 dB
 900.000 MHz

START 635.000 000 MHz

STOP 1 100.000 000 MHz



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Motorola MDb**

Certificate No: **D1800V2-281_Jan11**

CALIBRATION CERTIFICATE

Object **D1800V2 - SN: 281**

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

Calibration date: **January 13, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter 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)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: January 13, 2011

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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
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 $\pm$ 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 $\pm$ 0.2) °C	38.6 $\pm$ 6 %	1.38 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.3 $\pm$ 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	9.70 mW / g
SAR normalized	normalized to 1W	38.8 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	38.9 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.10 mW / g
SAR normalized	normalized to 1W	20.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	20.4 mW / g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1 Ω + 0.3 j Ω
Return Loss	- 39.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.198 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	November 25, 2000

DASY5 Validation Report for Head TSL

Date/Time: 13.01.2011 12:13:44

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:281

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: HSL U12 BB

Medium parameters used: $f = 1800 \text{ MHz}$; $\sigma = 1.38 \text{ mho/m}$; $\epsilon_r = 38.7$; $\rho = 1000 \text{ kg/m}^3$

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, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

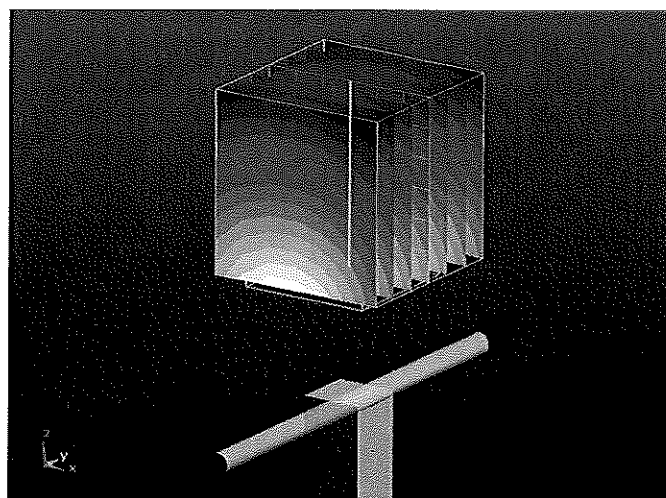
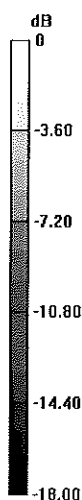
Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.760 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 17.662 W/kg

SAR(1 g) = 9.7 mW/g; SAR(10 g) = 5.1 mW/g

Maximum value of SAR (measured) = 12.037 mW/g

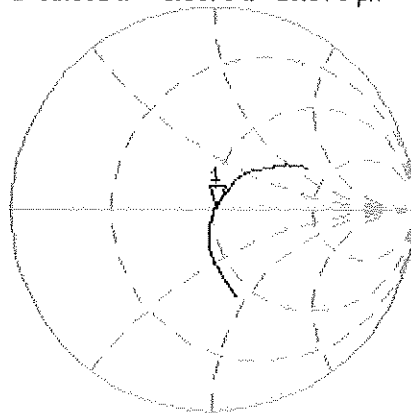


0 dB = 12.040mW/g

Impedance Measurement Plot for Head TSL

13 Jan 2011 10:28:22
[CH1] S11 1 U FS 1: 51.051 Ω 0.3379 Ω 29.876 μ H 1 800.000 000 MHz

*
De1
Cor



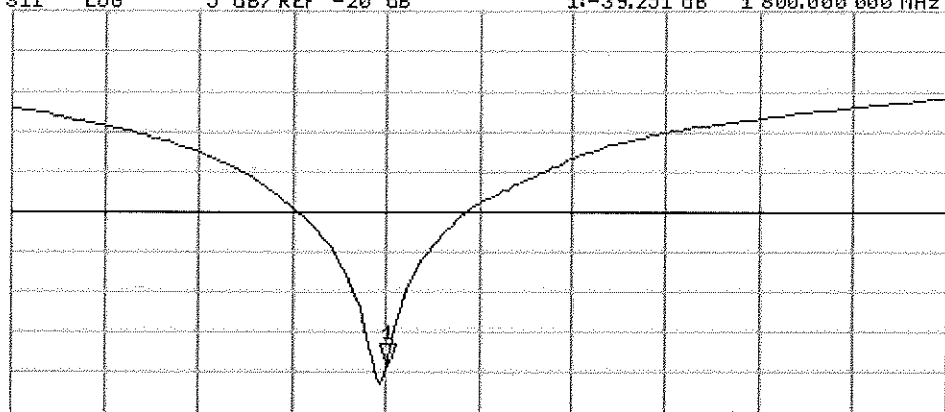
Avg
16
↑

CH2 S11 LOG 5 dB/REF -20 dB 1: -39.251 dB 1 800.000 000 MHz

Cor

Avg
16

↑



START 1 800.000 000 MHz

STOP 2 100.000 000 MHz



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Accreditation No.: **SCS 108**

Client **Motorola MDb**

Certificate No: **D2450V2-766_Oct10**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 766**

Calibration procedure(s) **QA CAL-05.v7
Calibration procedure for dipole validation kits**

Calibration date: **October 13, 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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter 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)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

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

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	

Approved by:	Katja Pokovic	Technical Manager
--------------	---------------	-------------------

Issued: October 14, 2010

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	38.3 $\pm$ 6 %	1.71 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.4 $\pm$ 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	12.8 mW / g
SAR normalized	normalized to 1W	51.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	52.2 mW /g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.98 mW / g
SAR normalized	normalized to 1W	23.9 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.0 mW /g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 0.7 j Ω
Return Loss	- 33.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.156 ns
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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	August 10, 2004

DASY5 Validation Report for Head TSL

Date/Time: 13.10.2010 14:19:04

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:766

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL U12 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.71$ mho/m; $\epsilon_r = 38.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

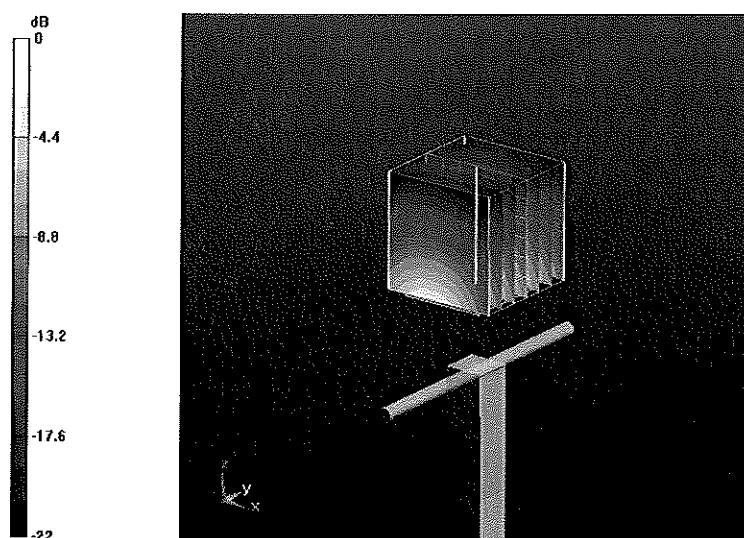
Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.6 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 26 W/kg

SAR(1 g) = 12.8 mW/g; SAR(10 g) = 5.98 mW/g

Maximum value of SAR (measured) = 16 mW/g



0 dB = 16mW/g

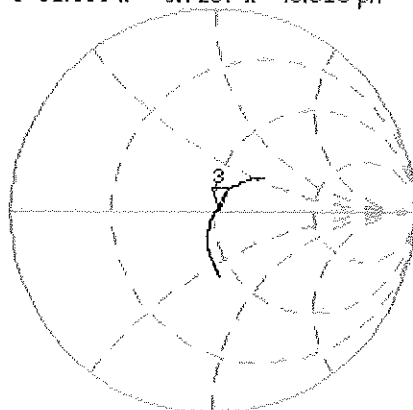
Impedance Measurement Plot for Head TSL

13 Oct 2010 09:07:19
 [CH1] S11 1 U FS 3: 52.096 Ω 0.7207 Ω 46.818 μ H 2 450.000 000 MHz

*
 De1
 CA

Avg
 16

↑

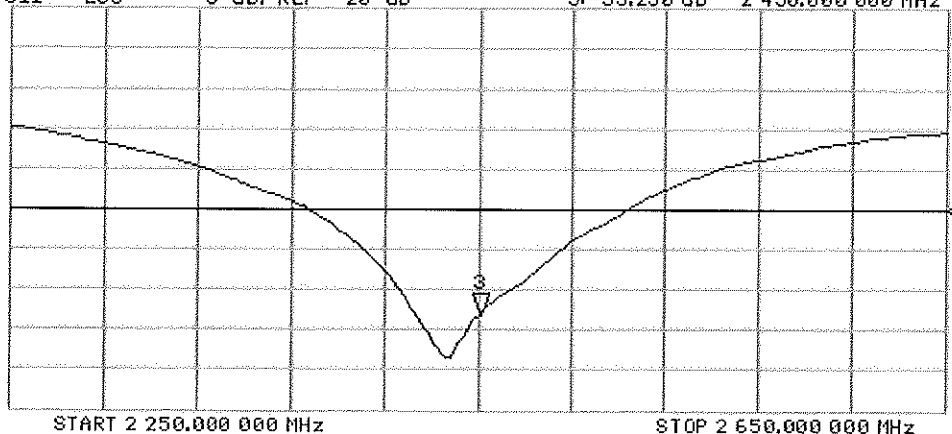


CH2 S11 LOG 5 dB/REF -20 dB 3:-33.250 dB 2 450.000 000 MHz

CA

Avg
 16

↑



START 2 250.000 000 MHz

STOP 2 650.000 000 MHz



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: **D2450V2-740_Oct10**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 740**

Calibration procedure(s) **QA CAL-05.v7
Calibration procedure for dipole validation kits**

Calibration date: **October 13, 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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter 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)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	

Approved by:	Katja Pokovic	Technical Manager
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Issued: October 14, 2010

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



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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	38.3 $\pm$ 6 %	1.71 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.4 $\pm$ 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	12.9 mW / g
SAR normalized	normalized to 1W	51.6 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	52.6 mW /g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.08 mW / g
SAR normalized	normalized to 1W	24.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.4 mW /g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$54.5 \Omega + 4.2 j\Omega$
Return Loss	- 24.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.161 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 18, 2003

DASY5 Validation Report for Head TSL

Date/Time: 13.10.2010 13:56:13

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:740

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1;1

Medium: HSL U12 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.71$ mho/m; $\epsilon_r = 38.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

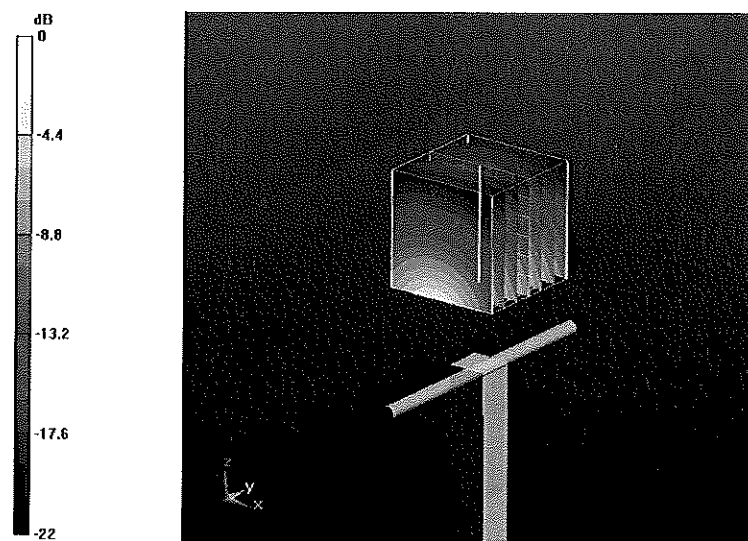
Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.3 V/m; Power Drift = 0.047 dB

Peak SAR (extrapolated) = 26.3 W/kg

SAR(1 g) = 12.9 mW/g; SAR(10 g) = 6.08 mW/g

Maximum value of SAR (measured) = 16.2 mW/g



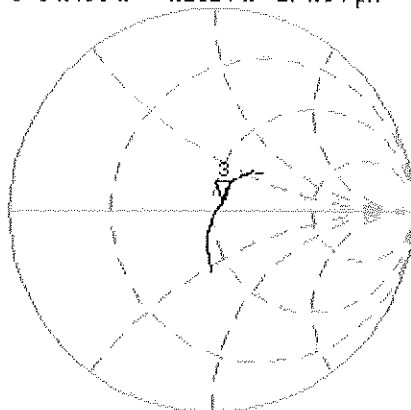
0 dB = 16.2mW/g

Impedance Measurement Plot for Head TSL

13 Oct 2010 09:04:53
 [CH1] S11 1 U FS 3: 54.459 Ω 4.2324 Ω 274.94 μH 2 450.000 000 MHz

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 Del
 CA

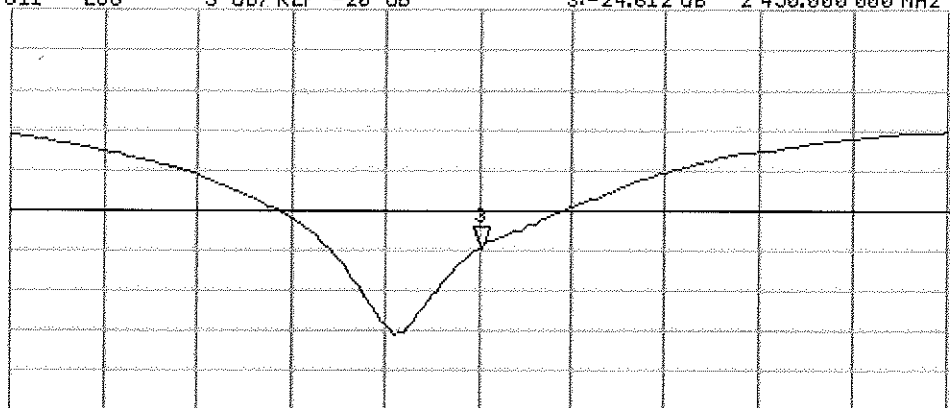
Avg
 16



CH2 S11 LOG 5 dB/REF -20 dB 3:-24.612 dB 2 450.000 000 MHz

CA

Avg
 16



START 2 250.000 000 MHz

STOP 2 650.000 000 MHz

END OF REPORT