Portable Cellular Phone SAR Test Report

Tests Requested By:	Motorola Mobile Devices 600 N. US Highway 45 Libertyville, IL 60048
Test Report #:	23397-2F
Date of Report:	Oct-22-2009
Date of Test:	Sep-18-2009 to Sep-27-2009, Oct-08-2009 to Oct-15-2009
FCC ID #:	IHDP56KD2
Generic Name:	MVRQ7-3334411B12
Test Laboratory:	Motorola Mobile Devices Business Product Safety & Compliance Laboratory 600 N. US Highway 45 Libertyville, IL 60048
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Accreditation:

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

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

TESTING CERT #2518-02

Statement of Compliance:

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 1 g average set in [3] and 2.0 W/kg in a 10 g average set in [2].

For ANSI / IEEE C95.1 (1 g), the final SAR reading for this phone is 1.34 W/kg for head-adjacent use and 0.72 W/kg for body-worn use. These measurements were performed using a Dasy4™ 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 Rear of Transceiver	
Dimensions	Width	54 mm
	Length	13 mm
Configuration	Cadillac	

2.2 Device description

Serial Number(s)	**004401027323845, 004401027323746, 356922020016221**									
Mode(s) of Operation	GSM 850	GSM 900	GSM 1800	GSM 1900			WCDMA 900	WCDMA 1900	WCDMA 2100	Wi-Fi 802.11b/g	Bluetooth
Modulation Mode(s)	GSMK	GSMK	GSMK	GSMK			QPSK	QPSK	QPSK	BPSK	GFSK
Maximum Output Power Setting	33.0 dBm	33.0 dBm	31.0 dBm	*Chan. 512* 31.0 dBm	*Chan. 661* 31.0 dBm	*Chan. 810* 30.5 dBm	25.0 dBm	25.0 dBm	25.0 dBm	18 dBm	10 dBm
Duty Cycle	1:8	1:8	1:8	1:8			1:1	1:1	1:1	1:1	1:1
Transmitting Frequency Range(s)	824.2 - 848.8 MHz	880.2 - 914.8 MHz	1710.2 - 1784.8 MHz	1850.2 - 1909.8 MHz			882.4 - 912.6 MHz	1852.4 - 1907.6 MHz	1922.4 - 1977.6 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										

Mode(s) of Operation	GPRS 850				GPRS 900				GPRS 1800				GPRS 1900			
Modulation	GMSK				GMSK				GMSK				GMSK			
Maximum Output Power Setting	33.0	**31.0**	29.0	27.0	33.0	**31.0**	29.0	27.0	31.0	**29.5**	27.5	25.5	31.0	**29.5**	27.5	25.5
Duty Cycle	1:8	**2:8**	3:8	4:8	1:8	**2:8**	3:8	4:8	1:8	**2:8**	3:8	4:8	1:8	**2:8**	3:8	4:8
Transmitting Frequency Range(s)	824.2 - 848.8 MHz				880.2 - 914.8 MHz				1710.2 - 1784.8 MHz				1850.2 - 1909.8 MHz			

Mode(s) of Operation	EDGE 850				EDGE 900				EDGE 1800				EDGE 1900			
Modulation	8PSK				8PSK				8PSK				8PSK			
Maximum Output Power Setting	28.5	**26.0**	24.0	22.0	28.5	**26.0**	24.0	22.0	27.5	**26.0**	24.0	22.0	27.5	**26.0**	24.0	22.0
Duty Cycle	1:8	**2:8**	3:8	4:8	1:8	**2:8**	3:8	4:8	1:8	**2:8**	3:8	4:8	1:8	**2:8**	3:8	4:8
Transmitting Frequency Range(s)	824.2 - 848.8 MHz				880.2 - 914.8 MHz				1710.2 - 1784.8 MHz				1850.2 - 1909.8 MHz			

Note: Bolded entries indicate data mode configurations of highest time-average power output per band and data mode type.

3. Test Equipment Used

3.1 Dosimetric System

The Motorola Mobile Devices Business Product Safety & Compliance Laboratory utilizes a Dosimetric Assessment System (Dasy4™ v4.7) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure. The overall 10 g RSS uncertainty of the measurement system is ±10.8% (K=1) with an expanded uncertainty of ±21.6% (K=2). The overall 1 g RSS uncertainty of the measurement system is ±11.1% (K=1) with an expanded uncertainty of ±22.2% (K=2). The measurement uncertainty budget is given in Appendix 5. Per IEEE 1528, this uncertainty budget is applicable to the SAR range of 0.4 W/kg to 10 W/kg.

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

Description	Serial Number	Cal Due Date
DASY4™ DAE V1	387	Apr-01-2010
E-Field Probe ET3DV6	1524	Feb-12-2010
DASY4™ DAE V1	434	Feb-06-2010
E-Field Probe ES3DV3	3124	Apr-21-2010
S.A.M. Phantom used for 800/900 MHz	TP-1005	
S.A.M. Phantom used for 800/900 MHz	TP-1131	
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1139	
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1250	
Dipole Validation Kit, DV900V2	78	Apr-01-2009
Dipole Validation Kit, DV900V2	91	Apr-01-2009
Dipole Validation Kit, DV1800V2	259TR	Apr-01-2009
Dipole Validation Kit, DV1800V2	272TR	Apr-01-2009
Dipole Validation Kit, DV2450V2	740	Apr-01-2009

3.2 Additional Equipment

Description	Serial Number	Cal Due Date
Signal Generator HP8648C	3847A04822	Apr-22-2010
Power Meter E4419B	GB39510961	Jan-24-2010
Power Sensor #1 - E9301A	US39210917	Jun-04-2010
Power Sensor #2 - E9301A	US39210918	Jun-04-2010
Signal Generator HP8648C	3847A04844	Jan-29-2010
Power Meter E4419B	GB39511086	Jun-12-2010
Power Sensor #1 - E9301A	US39210934	Apr-23-2010
Power Sensor #2 - E9301A	US39211006	Apr-22-2010
Network Analyzer HP8753ES	US39172529	Jun-11-2010
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 $\rho = 1\ ^{g}/_{cm^3}$ 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,** Sep-20-2009	42.8	0.93	18.9
		Recommended Limits	41.5 ±5%	0.90 ±5%	18-25
	Body	**Measured,** Sep-20-2009	54.3	0.98	18.7
		Recommended Limits	55.2 ±5%	0.97 ±5%	18-25
1880	Head	**Measured,** Sep-18-2009	38.9	1.46	19.2
		Measured, Oct-09-2009	38.3	1.46	19.7
		Recommended Limits	40.0 ±5%	1.40 ±5%	18-25
	Body	**Measured,** Sep-22-2009	51.7	1.59	19.2
		Measured, Oct-09-2009	52.7	1.59	18.9
		Recommended Limits	53.3 ±5%	1.52 ±5%	18-25
2450	Head	**Measured,** Sep-26-2009	37.1	1.83	19.1
		Recommended Limits	39.2 ±10%	1.80 ±5%	18-25
	Body	**Measured,** Sep-26-2009	50.7	1.99	19.1
		Measured, Sep-27-2009	49.6	1.94	18.8
		Recommended Limits	52.7 ±10%	1.95 ±5%	18-25

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

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

5. System Accuracy Verification

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

A SAR measurement was performed to verify the measured SAR was within ±10% from the target SAR indicated in Appendix 6. These frequencies are within ±10% of the compliance test mid-band frequency as required in [1] and [5]. The test was conducted on the same days as the measurement of the DUT. Recommended limits for permittivity and conductivity, specified in [5], are shown in the table below. The obtained results from the system accuracy verification are also displayed in the table below. SAR values are normalized to 1 W forward power delivered to the dipole. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values. The distributions of SAR compare well with those of the reference measurements (see Appendix 1). The tissue stimulant depth was verified to be 15.0 cm ± 0.5 cm. Z-axis scans showing the SAR penetration are also included in Appendix 1.

f (MHz)	Description	SAR (W/kg), 1 gram	Dielectric Parameters ε_r	Dielectric Parameters σ (S/m)	Ambient Temp (°C)	Tissue Temp (°C)
900	**Measured,** Sep-20-2009	11.65	42.0	0.99	19.6	18.9
	Measured, Sep-22-2009	11.575	41.4	0.98	20.0	19.1
	Measured, Oct-08-2009	11.10	39.8	0.96	19.8	20.5
	Measured, Oct-15-2009	11.225	40.2	0.97	19.7	19.1
	Recommended Limits	11.19	41.5 ±5%	0.97 ±5%	18-25	18-25
1800	**Measured,** Sep-18-2009	38.70	39.3	1.37	19.8	19.2
	Measured, Sep-21-2009	38.10	38.9	1.37	19.6	19.1
	Measured, Sep-22-2009	37.475	39.1	1.37	19.9	19.0
	Measured, Oct-09-2009	38.85	38.6	1.38	19.4	18.6
	Measured, Oct-15-2009	38.575	39.5	1.37	20.1	18.9
	Recommended Limits	37.91	40.0 ±5%	1.4 ±5%	18-25	18-25
2450	**Measured,** Sep-26-2009	57.75	37.1	1.83	19.7	19.2
	Measured, Sep-26-2009	54.50	37.1	1.83	19.8	19.1
	Recommended Limits	56.68	39.2 ±10%	1.80 ±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 ET3DV6	1524	900	5.23	8 of 9
		1810	4.43	8 of 9
		2450	3.89	8 of 9
E-Field Probe ES3DV3	3124	900	5.73	8 of 9
		1810	4.95	8 of 9

6. Test Results

The test sample was operated using an actual transmission through a base station simulator. The base station simulator was set up 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 (± 30%) at 850 MHz. 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:
Model SNN5851A - 1380 mAH Battery

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

Per the "SAR Measurement Procedures for 3G Devices" released in October, 2007, 12.2 kbps RMC, 12.2 kbps AMR, HS-DPCCH Sub-test 1-4, and E-DCH Sub-test 1-5 modes were considered. The conducted power measurements (per section 5.2 of 3GPP TS 34.121) for each mode are shown in the table below.

Band	Channel	Conducted power (dBm) for WCDMA modes		Conducted Power (dBm) for WCDMA – HSDPA (Rel 5) Modes				Conducted Power (dBm) for WCDMA – HSPA (HSUPA/HSDPA-Rel 6) Modes				
		RMC	AMR	Subtest 1	Subtest 2	Subtest 3	Subtest 4	Subtest 1	Subtest 2	Subtest 3	Subtest 4	Subtest 5
WCDMA 1900	9262	25.05	25.10	25.19	25.08	25.18	25.08	25.12	25.09	25.12	25.06	25.18
	9400	24.87	24.83	24.88	24.92	24.89	24.95	24.85	24.90	24.83	24.85	24.86
	9538	24.94	24.76	24.86	24.95	24.84	24.95	24.84	24.99	24.82	24.91	24.78

<u>This product utilizes the following mechanism for Maximum Power Reduction (MPR)</u>

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to-average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of the device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (a function of the combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH).

When E-DPDCH channels are present, the beta gains on those channels are reduced first to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

The SW currently recalculates the cubic metric every time the beta gains on the E-DPDCH are reduced. The cubic metric will likely get lower each time this is done. However, there is no reported reduction of maximum output power in the HSUPA mode since the device also provides a mechanism to compensate for the power back-off by increasing the gain of TX_AGC in the transceiver (PA) device.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

6.1 Head Adjacent Test Results

The SAR results shown in tables 1 through 5 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, the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is New SAR = Old SAR * $10^{(-drift/10)}$. The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test. Note that 800 MHz digital mode SAR measurements were performed in accordance with [4].

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 tables below also include the highest SAR value summations for primary and secondary co-located transmitters, with the results indicated in italics.

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 15.0 cm ± 0.5 cm.

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ET3DV6	1524	900	5.23	8 of 9
		1810	4.43	8 of 9
		1950	4.24	8 of 9
		2450	3.89	8 of 9
E-Field Probe ES3DV3	3124	900	5.73	8 of 9
		1810	4.95	8 of 9
		1950	4.78	8 of 9

Left Head Cheek Position								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10 g SAR value*		*1 g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.82						
	Channel 190	32.83	18.9	-0.143	0.237	0.24	0.322	0.33
	Channel 251	32.84						
GSM 1900	Channel 512	30.90						
	Channel 661	30.85	**19.0**	**-0.028**	**0.235**	**0.24**	**0.378**	**0.38**
	Channel 810	30.91						
WCDMA 1900	Channel 9262	25.05	**19.7**	**-0.559**	**0.549**	**0.62**	**0.919**	**1.05**
	Channel 9400	24.87	19.3	-0.420	0.511	0.56	0.852	0.94
	Channel 9538	24.94	19.7	-0.317	0.373	0.40	0.623	0.67
WI-FI 2450	Channel 1							
	Channel 6	18.23	19.0	0.028	0.158	0.16	0.294	0.29
	Channel 11							
GSM 850 + WI-FI						*0.40*		*0.62*
GSM 1900 + WI-FI						*0.40*		*0.67*
WCDMA 1900 +WI-FI						*0.78*		*1.34*

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								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10 g SAR value*		*1 g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.82						
	Channel 190	32.83	**18.9**	**-0.006**	**0.256**	**0.26**	**0.342**	**0.34**
	Channel 251	32.84						
GSM 1900	Channel 512	30.90						
	Channel 661	30.85	19.0	0.007	0.160	0.16	0.239	0.24
	Channel 810	30.91						
WCDMA 1900	Channel 9262	25.05						
	Channel 9400	24.87	19.2	-0.698	0.379	0.45	0.586	0.69
	Channel 9538	24.94						
WI-FI 2450	Channel 1							
	Channel 6	18.23	**19.0**	**-0.109**	**0.178**	**0.18**	**0.349**	**0.36**
	Channel 11							
GSM 850 + WI-FI						*0.42*		*0.70*
GSM 1900 + WI-FI						*0.34*		*0.60*
WCDMA 1900 +WI-FI						*0.63*		*1.05*

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								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10 g SAR value*		*1 g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.82						
	Channel 190	32.83	**18.9**	**-0.040**	**0.228**	**0.23**	**0.307**	**0.31**
	Channel 251	32.84						
GSM 1900	Channel 512	30.90						
	Channel 661	30.85	**19.0**	**-0.004**	**0.145**	**0.15**	**0.236**	**0.24**
	Channel 810	30.91						
WCDMA 1900	Channel 9262	25.05						
	Channel 9400	24.87	**19.7**	**-0.454**	**0.280**	**0.31**	**0.442**	**0.49**
	Channel 9538	24.94						
WI-FI 2450	Channel 1							
	Channel 6	18.23	19.0	-0.023	0.232	0.23	0.437	0.44
	Channel 11							
GSM 850 + WI-FI						*0.46*		*0.75*
GSM 1900 + WI-FI						*0.38*		*0.68*
WCDMA 1900 +WI-FI						*0.54*		*0.93*

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								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10 g SAR value*		*1 g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.82						
	Channel 190	32.83	18.9	-0.049	0.220	0.22	0.295	0.30
	Channel 251	32.84						
GSM 1900	Channel 512	30.90						
	Channel 661	30.85	19.0	0.025	0.125	0.13	0.218	0.22
	Channel 810	30.91						
WCDMA 1900	Channel 9262	25.05						
	Channel 9400	24.87	19.3	-0.850	0.224	0.27	0.394	0.48
	Channel 9538	24.94						
WI-FI 2450	Channel 1							
	Channel 6	18.23	**19.0**	**-0.068**	**0.251**	**0.25**	**0.499**	**0.51**
	Channel 11							
GSM 850 + WI-FI						*0.47*		*0.81*
GSM 1900 + WI-FI						*0.38*		*0.73*
WCDMA 1900 +WI-FI						*0.52*		*0.99*

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.

The below SAR results were corrected for tissue permittivity that was measured above the nominal target. Corrections were performed using the data provided in FCC KDB 450824. No correction was made for conductivity, since the measured tissue value already represents a conservative result in the measured SAR.

Highest Head SAR Configurations, Corrected SAR for Tissue Dielectric Parameters					
***f* (MHz)**	**Description**	***10 g SAR value***		***1 g SAR value***	
		Extrapolated Measurement (W/kg)	**Corrected Measurement (W/kg)**	**Extrapolated Measurement (W/kg)**	**Corrected Measurement (W/kg)**
GSM 850	Right Head Cheek Position, Channel 190	0.26	0.26	0.34	0.35
GSM 850 + WI-FI			*0.42*		*0.71*
GSM 850	Right Head 15° Tilt Position, Channel 190	0.22	0.22	0.30	0.31
GSM 850 + WI-FI			*0.47*		*0.82*

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

6.2 Body Worn Test Results

The SAR results shown in tables 6 through 9 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, 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 New SAR = Old SAR * $10^{(-drift/10)}$. The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test. Note that 800 MHz digital mode SAR measurements were performed in accordance with [4].

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. The tables below also include the highest SAR value summations for primary and secondary co-located transmitters, with the results indicated in italics.

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 measured dielectric constant of the material used is less than 2.3 and the loss tangent is less than 0.0046 all the way up to 2.184 GHz.

The tissue stimulant depth was verified to be 15.0 cm ± 0.5 cm. 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 thus the device was tested per the Supplement C testing guidelines for devices that do not have body-worn accessories. A separation distance of 25 mm 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.

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 body-worn measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ET3DV6	1524	900	5.14	8 of 9
		1810	4.03	8 of 9
		2450	3.40	8 of 9
E-Field Probe ES3DV3	3124	900	5.73	8 of 9
		1810	4.75	8 of 9
		1950	4.69	8 of 9

Body-Worn; Front of Phone 25 mm from Phantom								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10 g SAR value*		*1 g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.82						
	Channel 190	32.83	18.8	-0.050	0.080	0.08	0.105	0.11
	Channel 251	32.84						
GSM 1900	Channel 512	30.90						
	Channel 661	30.85	18.4	0.035	0.048	0.05	0.0733	0.07
	Channel 810	30.91						
WCDMA 1900	Channel 9262	25.05						
	Channel 9400	24.87	18.9	-0.321	0.102	0.11	0.155	0.17
	Channel 9538	24.94						
WI-FI 2450	Channel 1							
	Channel 6	18.23	19.0	-0.117	0.027	0.03	0.046	0.05
	Channel 11							
GSM 850 + WI-FI						*0.11*		*0.16*
GSM 1900 + WI-FI						*0.08*		*0.12*
WCDMA 1900 +WI-FI						*0.14*		*0.22*

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; Back of Phone 25 mm from Phantom								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10 g SAR value*		*1 g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.82						
	Channel 190	32.83	18.9	-0.006	0.115	0.12	0.152	0.15
	Channel 251	32.84						
GSM 1900	Channel 512	30.90						
	Channel 661	30.85	18.4	-0.005	0.265	0.27	0.454	0.45
	Channel 810	30.91						
WCDMA 1900	Channel 9262	25.05						
	Channel 9400	24.87	**18.9**	**-0.096**	**0.242**	**0.25**	**0.388**	**0.40**
	Channel 9538	24.94						
WI-FI 2450	Channel 1							
	Channel 6	18.23	**19.0**	**0.053**	**0.058**	**0.06**	**0.102**	**0.10**
	Channel 11							
Bluetooth 2450	Channel 0							
	Channel 39	8.75	**19.0**	**-0.325**	**0.00173**	**0.00**	**0.00208**	**0.00**
	Channel 78							
GSM 850 + WI-FI						*0.18*		*0.25*
GSM 1900 + WI-FI						*0.33*		*0.55*
WCDMA 1900 +WI-FI						*0.31*		*0.50*

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

GPRS Class 10 (2 Uplink Timeslots) Body-Worn; Back of Phone 25 mm from Phantom								
f **(MHz)**	**Description**	**Conducted Output Power (dBm)**	**Temp (°C)**	**Drift (dB)**	***10 g SAR value***		***1 g SAR value***	
					Measured (W/kg)	**Extrapolated (W/kg)**	**Measured (W/kg)**	**Extrapolated (W/kg)**
GSM 850	**Channel 128**	31.01						
	Channel 190	31.04	**18.9**	**-0.038**	**0.243**	**0.25**	**0.328**	**0.33**
	Channel 251	30.90						
GSM 1900	**Channel 512**	29.66						
	Channel 661	29.48	**18.4**	**-0.031**	**0.360**	**0.36**	**0.614**	**0.62**
	Channel 810	29.57						
GSM 850 + WI-FI						*0.31*		*0.43*
GSM 1900 + WI-FI						*0.42*		*0.72*

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

EDGE Class 10 (2 Uplink Timeslots) Body-Worn; Back of Phone 25 mm from Phantom								
f **(MHz)**	**Description**	**Conducted Output Power (dBm)**	**Temp (°C)**	**Drift (dB)**	***10 g SAR value***		***1 g SAR value***	
					Measured (W/kg)	**Extrapolated (W/kg)**	**Measured (W/kg)**	**Extrapolated (W/kg)**
GSM 850	**Channel 128**	25.88						
	Channel 190	26.03	18.9	-0.359	0.119	0.13	0.19	0.21
	Channel 251	25.93						
GSM 1900	**Channel 512**	26.18						
	Channel 661	25.83	18.4	-0.025	0.227	0.23	0.385	0.39
	Channel 810	26.03						
GSM 850 + WI-FI						*0.19*		*0.31*
GSM 1900 + WI-FI						*0.29*		*0.49*

Table 9: 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: 9/20/2009 11:35:57 AM

Test Laboratory: Motorola - Sep-20-09 900 MHz

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 78; FCC ID: IHDP56KD2
Procedure Notes: 900 MHz System Performance Check; Dipole Sn# 78; Input Power = 200 mW
Sim.Temp@meas = 18.9*C; Sim.Temp@SPC = 18.9*C; Room Temp @ SPC = 19.6*C
Communication System: CW - Dipole; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only
Medium parameters used: f = 900 MHz; σ = 0.99 mho/m; ε_r = 42; ρ = 1000 kg/m^3

DASY4 Configuration:

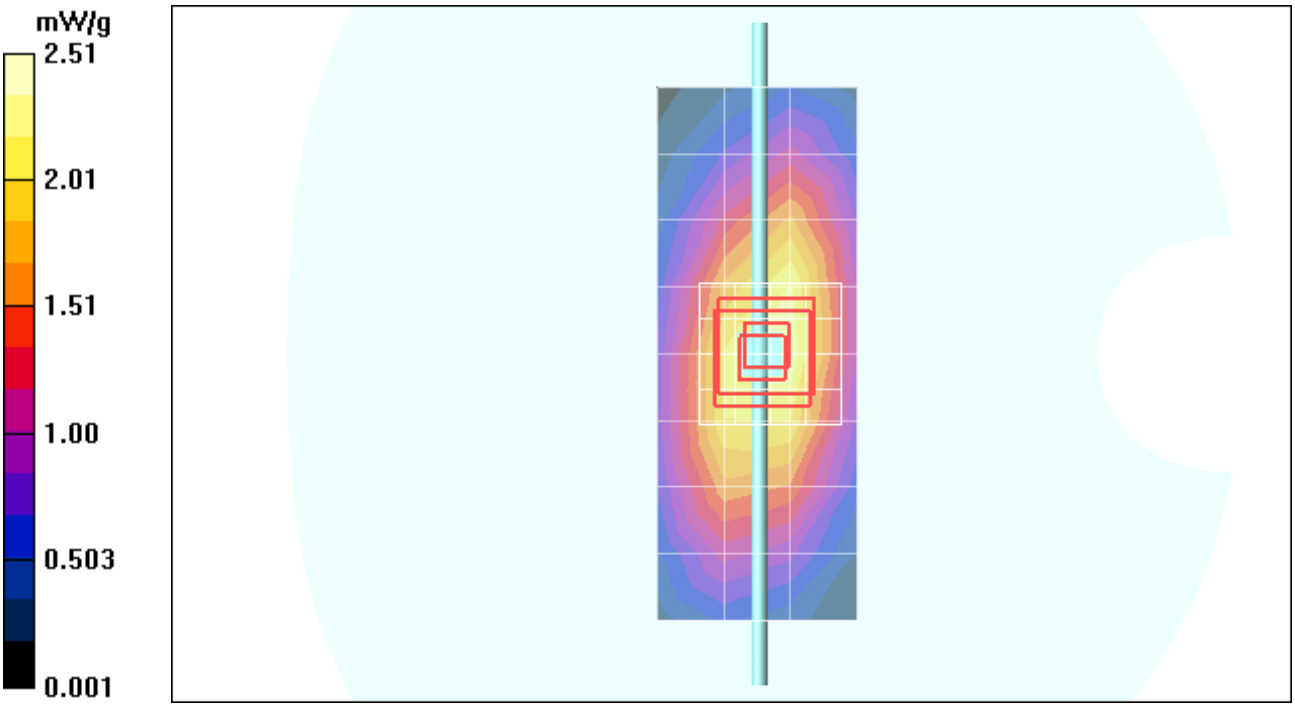
- Probe: ET3DV6 - SN1524; ConvF(5.23, 5.23, 5.23); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

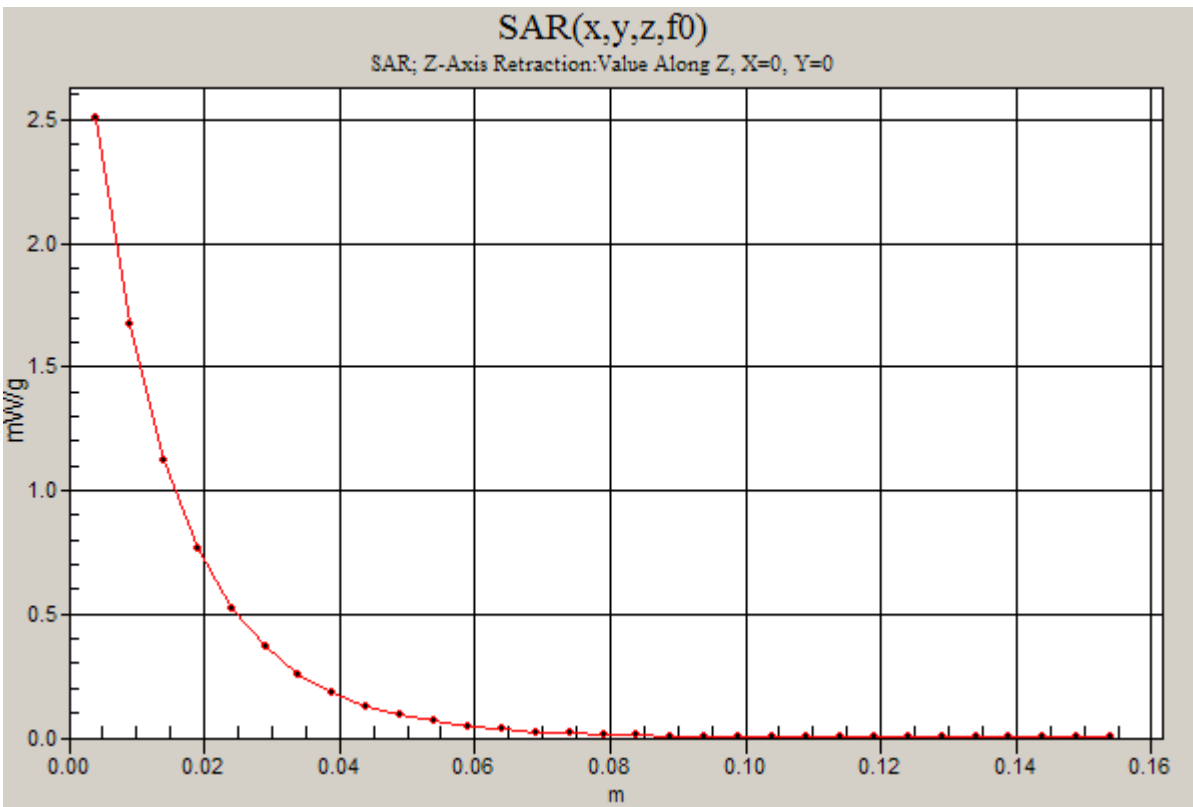
Daily SPC Check/Dipole Area Scan (4x9x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 2.32 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.5 V/m; Power Drift = -0.090 dB; Peak SAR (extrapolated) = 3.43 W/kg
SAR(1 g) = 2.33 mW/g; SAR(10 g) = 1.5 mW/g; Maximum value of SAR (measured) = 2.52 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.5 V/m; Power Drift = -0.090 dB; Peak SAR (extrapolated) = 3.44 W/kg
SAR(1 g) = 2.33 mW/g; SAR(10 g) = 1.5 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31):
Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 2.51 mW/g


mW/g
2.51
2.01
1.51
1.00
0.503
0.001


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date/Time: 9/22/2009 8:32:47 AM

Test Laboratory: Motorola - Sep-22-09 900 MHz

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 78; FCC ID: IHDP56KD2
Procedure Notes: 900 MHz System Performance Check; Dipole Sn# 78; Input Power = 200 mW
Sim.Temp@meas = 19.1*C; Sim.Temp@SPC = 19.1*C; Room Temp @ SPC = 20*C
Communication System: CW - Dipole; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only
Medium parameters used: f = 900 MHz; σ = 0.98 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3

DASY4 Configuration:

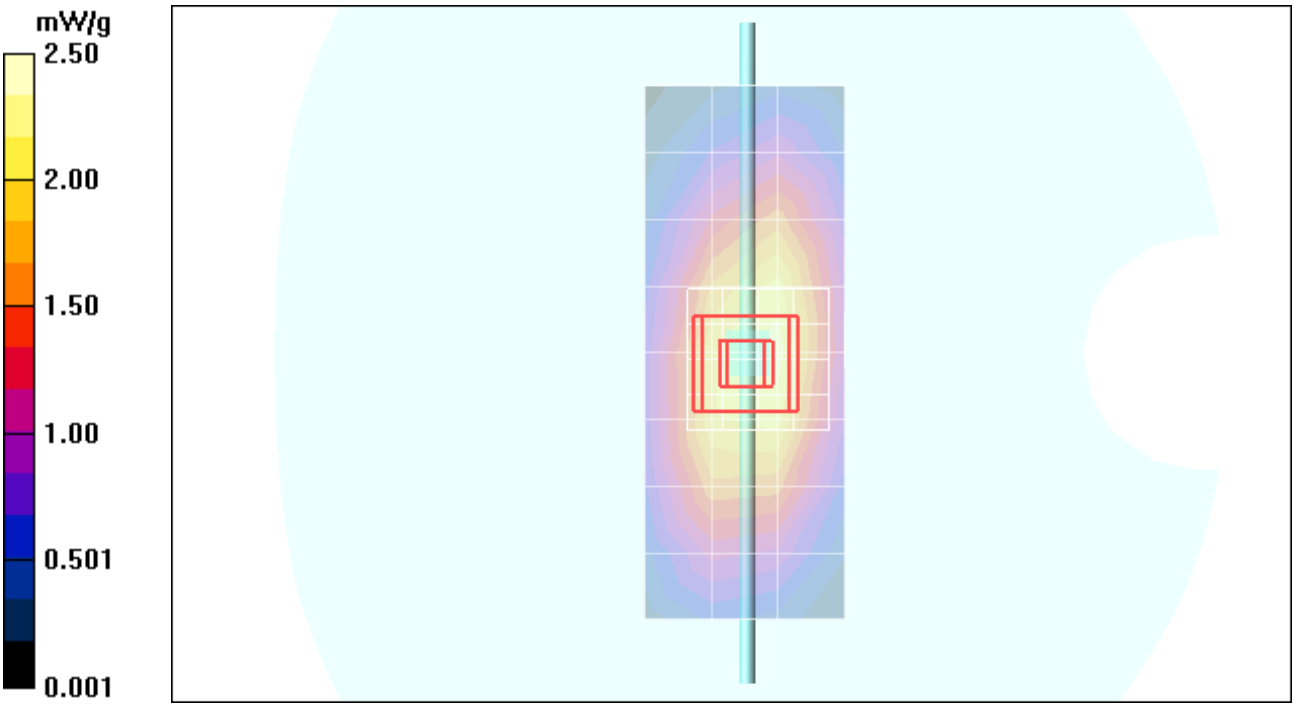
- Probe: ET3DV6 - SN1524; ConvF(5.23, 5.23, 5.23); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

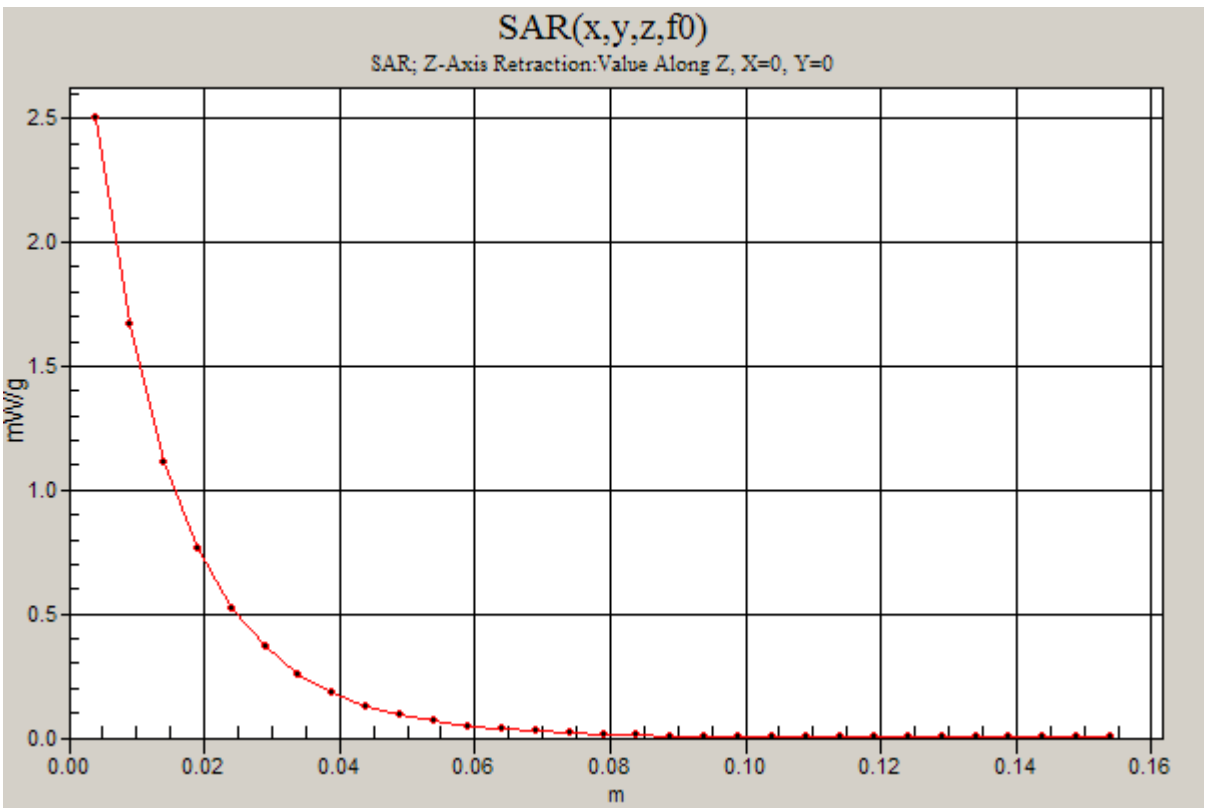
Daily SPC Check/Dipole Area Scan (4x9x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 2.27 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.7 V/m; Power Drift = -0.018 dB; Peak SAR (extrapolated) = 3.40 W/kg
SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.48 mW/g; Maximum value of SAR (measured) = 2.50 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.7 V/m; Power Drift = -0.018 dB; Peak SAR (extrapolated) = 3.46 W/kg
SAR(1 g) = 2.32 mW/g; SAR(10 g) = 1.49 mW/g; Maximum value of SAR (measured) = 2.46 mW/g

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


mW/g
2.50
2.00
1.50
1.00
0.501
0.001


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date/Time: 10/8/2009 8:57:00 AM

Test Laboratory: Motorola - Oct-08-09 900 MHz

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 91; FCC ID: IHDP56KD2
Procedure Notes: 900 MHz System Performance Check; Dipole Sn# 91; Input Power = 200 mW
Sim.Temp@meas = 20.5 ┌C; Sim.Temp@SPC = 20.5 ┌C; Room Temp @ SPC = 19.8 ┌C
Communication System: CW - Dipole; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only
Medium parameters used: f = 900 MHz; σ = 0.96 mho/m; ε_r = 39.8; ρ = 1000 kg/m^3

DASY4 Configuration:

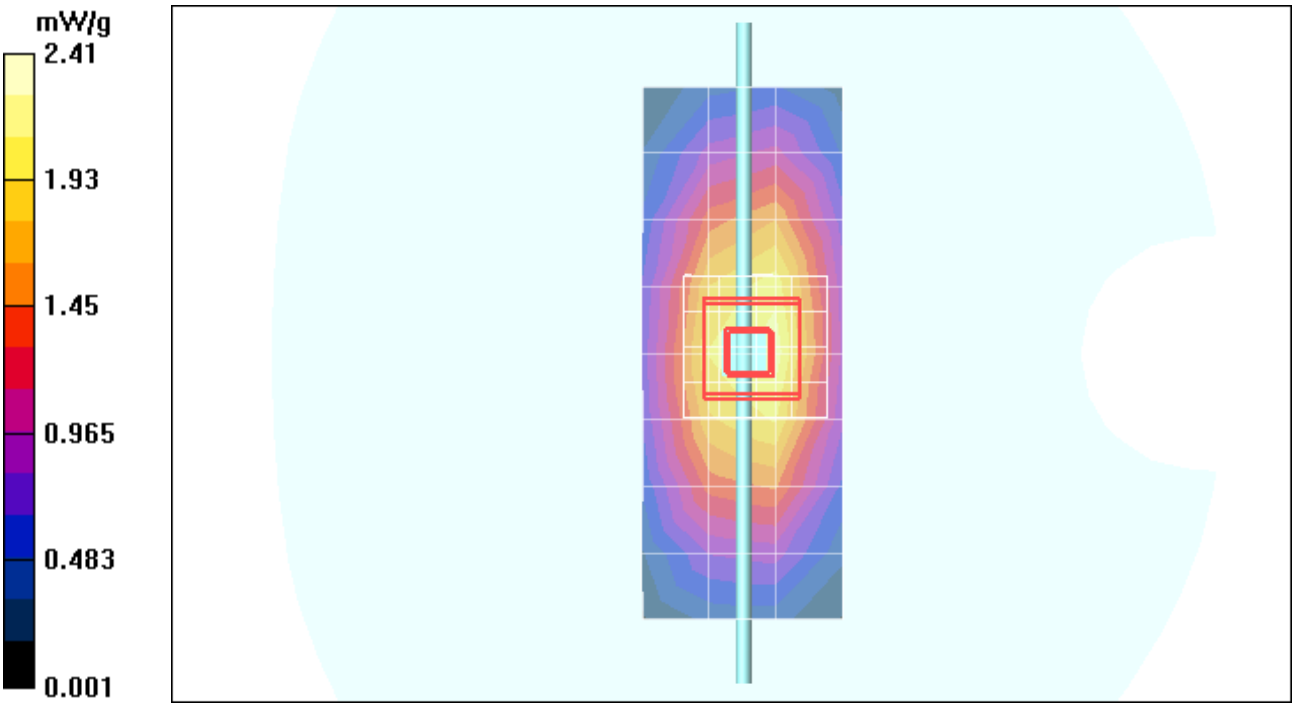
- Probe: ES3DV3 - SN3124; ConvF(5.73, 5.73, 5.73); Calibrated: 4/21/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn434; Calibrated: 2/9/2009
- Phantom: R#4 Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1131;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

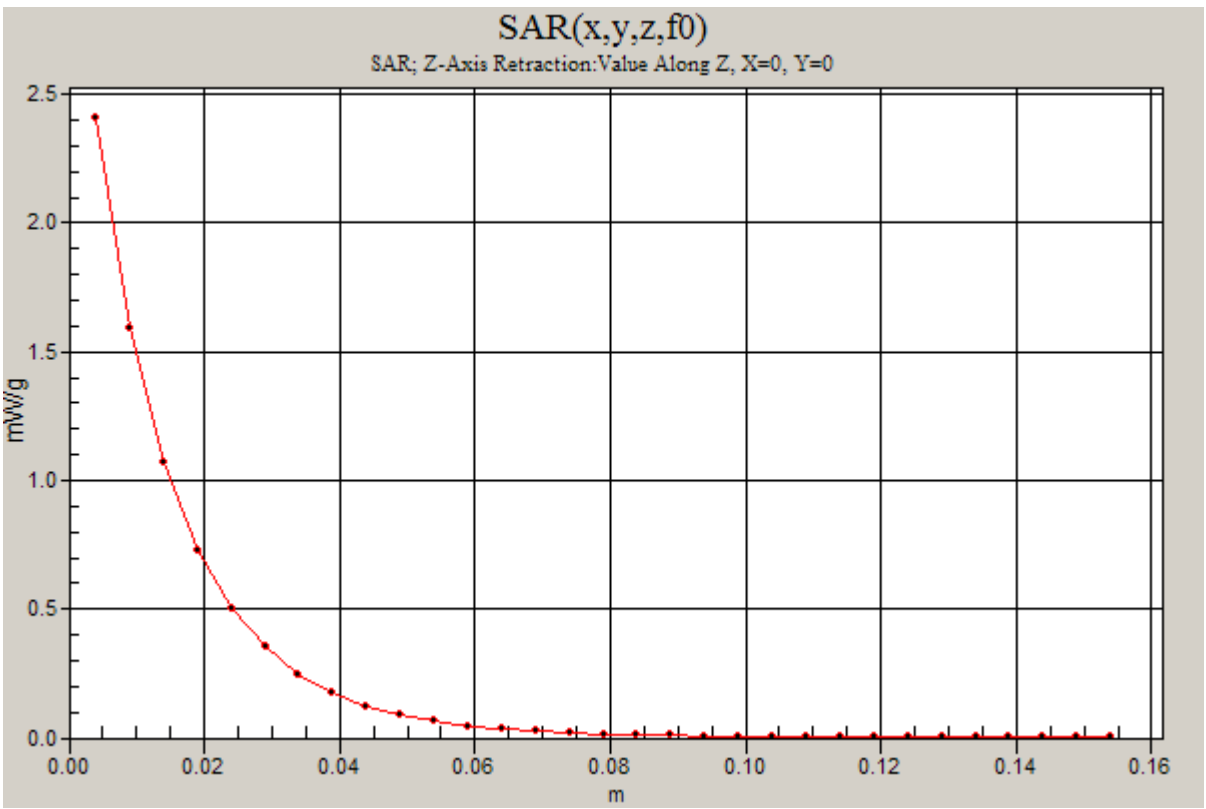
Daily SPC Check/Dipole Area Scan (4x9x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 2.19 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 50.3 V/m; Power Drift = -0.025 dB; Peak SAR (extrapolated) = 3.35 W/kg
SAR(1 g) = 2.22 mW/g; SAR(10 g) = 1.42 mW/g; Maximum value of SAR (measured) = 2.39 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 50.3 V/m; Power Drift = -0.025 dB; Peak SAR (extrapolated) = 3.36 W/kg
SAR(1 g) = 2.22 mW/g; SAR(10 g) = 1.43 mW/g; Maximum value of SAR (measured) = 2.40 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31):
Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 2.41 mW/g


mW/g
2.41
1.93
1.45
0.965
0.483
0.001


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date/Time: 10/15/2009 8:20:14 AM

Test Laboratory: Motorola - Oct-15-09 900 MHz

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 78; FCC ID: IHDP56KD2
Procedure Notes: 900 MHz System Performance Check; Dipole Sn# 78; Input Power = 200 mW
Sim.Temp@meas = 19.1*C; Sim.Temp@SPC = 19.1*C; Room Temp @ SPC = 19.7*C
Communication System: CW - Dipole; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only
Medium parameters used: f = 900 MHz; σ = 0.97 mho/m; ε_r = 40.2; ρ = 1000 kg/m^3

DASY4 Configuration:

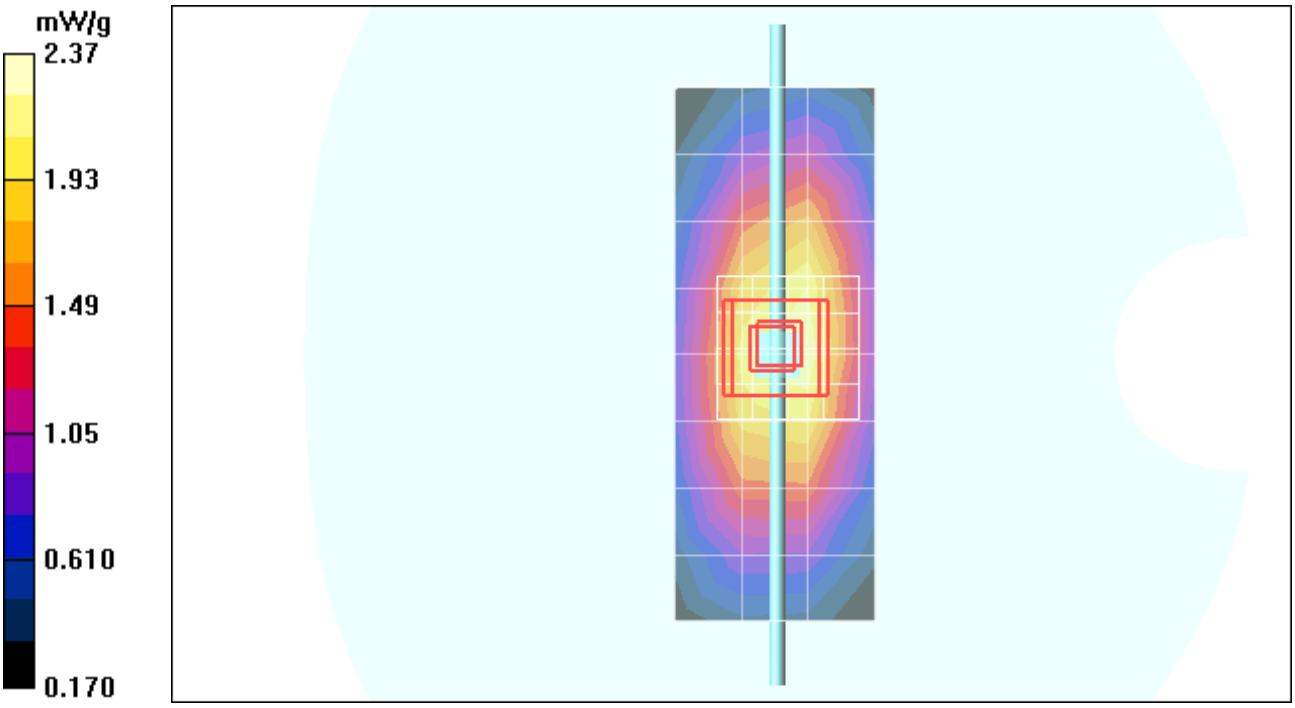
- Probe: ET3DV6 - SN1524; ConvF(5.23, 5.23, 5.23); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

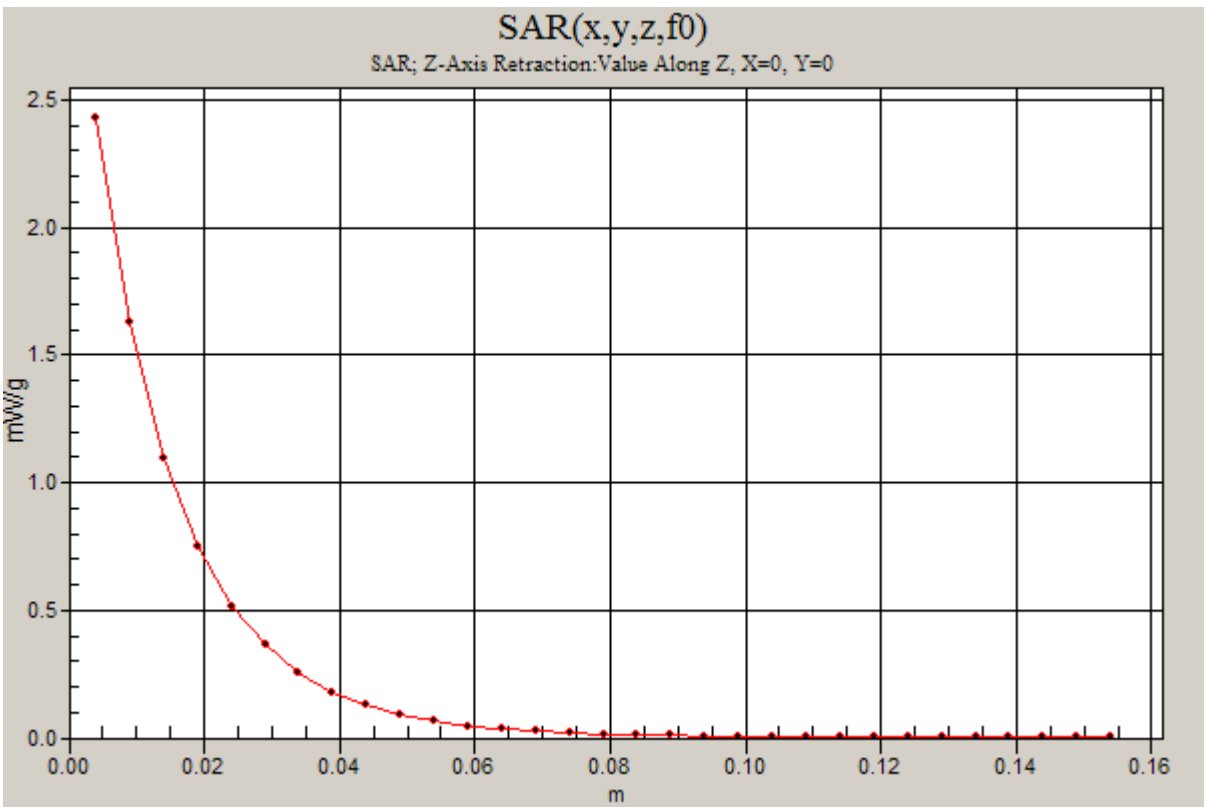
Daily SPC Check/Dipole Area Scan (4x9x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 2.22 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.4 V/m; Power Drift = -0.017 dB; Peak SAR (extrapolated) = 3.27 W/kg
SAR(1 g) = 2.24 mW/g; SAR(10 g) = 1.45 mW/g; Maximum value of SAR (measured) = 2.41 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.4 V/m; Power Drift = -0.017 dB; Peak SAR (extrapolated) = 3.34 W/kg
SAR(1 g) = 2.25 mW/g; SAR(10 g) = 1.45 mW/g; Maximum value of SAR (measured) = 2.37 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31):
Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 2.43 mW/g


mW/g
2.37
1.93
1.49
1.05
0.610
0.170


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date/Time: 9/18/2009 7:47:40 AM

Test Laboratory: Motorola - Sep-18-09 1800 MHz

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 259TR; FCC ID: IHDP56KD2
Procedure Notes: 1800 MHz System Performance Check; Dipole Sn# 259TR; Input Power = 200 mW
Sim.Temp@meas = 19.2 ┌C; Sim.Temp@SPC = 19.2 ┌C; Room Temp @ SPC = 19.8 ┌C
Communication System: CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only
Medium parameters used: f = 1800 MHz; σ = 1.37 mho/m; ε_r = 39.3; ρ = 1000 kg/m^3

DASY4 Configuration:

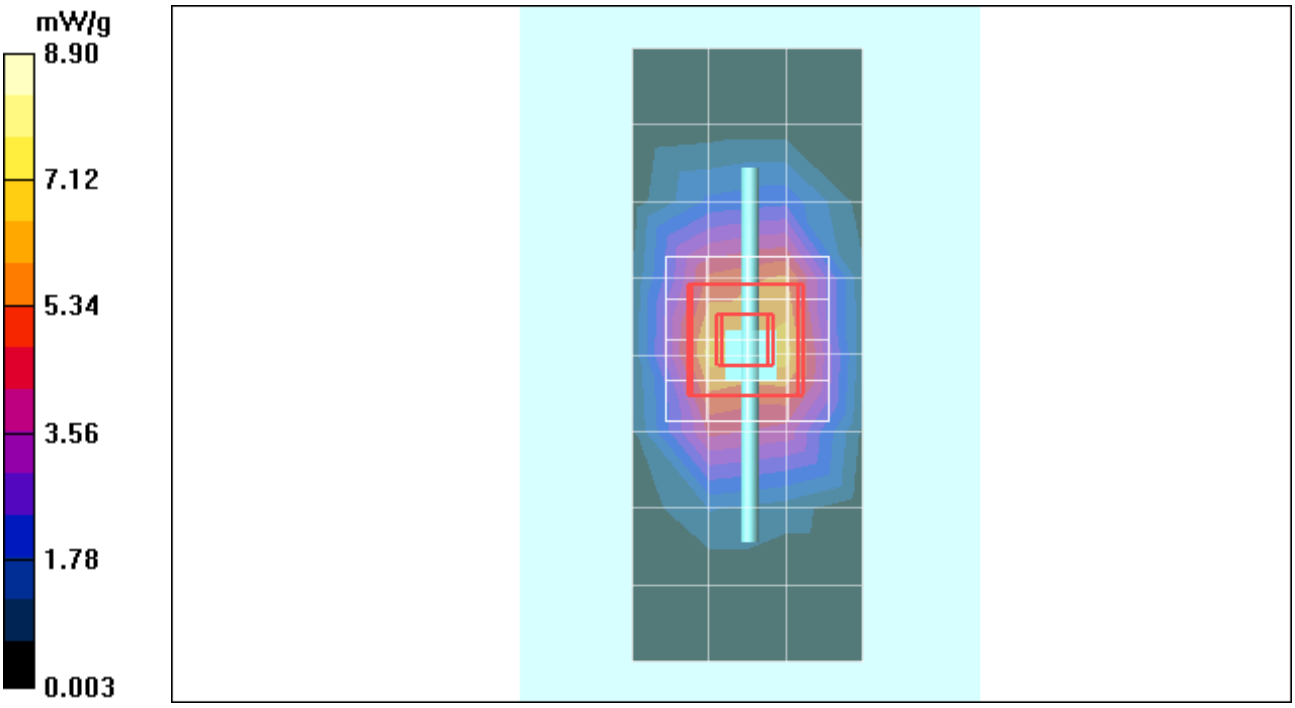
- Probe: ET3DV6 - SN1524; ConvF(4.43, 4.43, 4.43); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

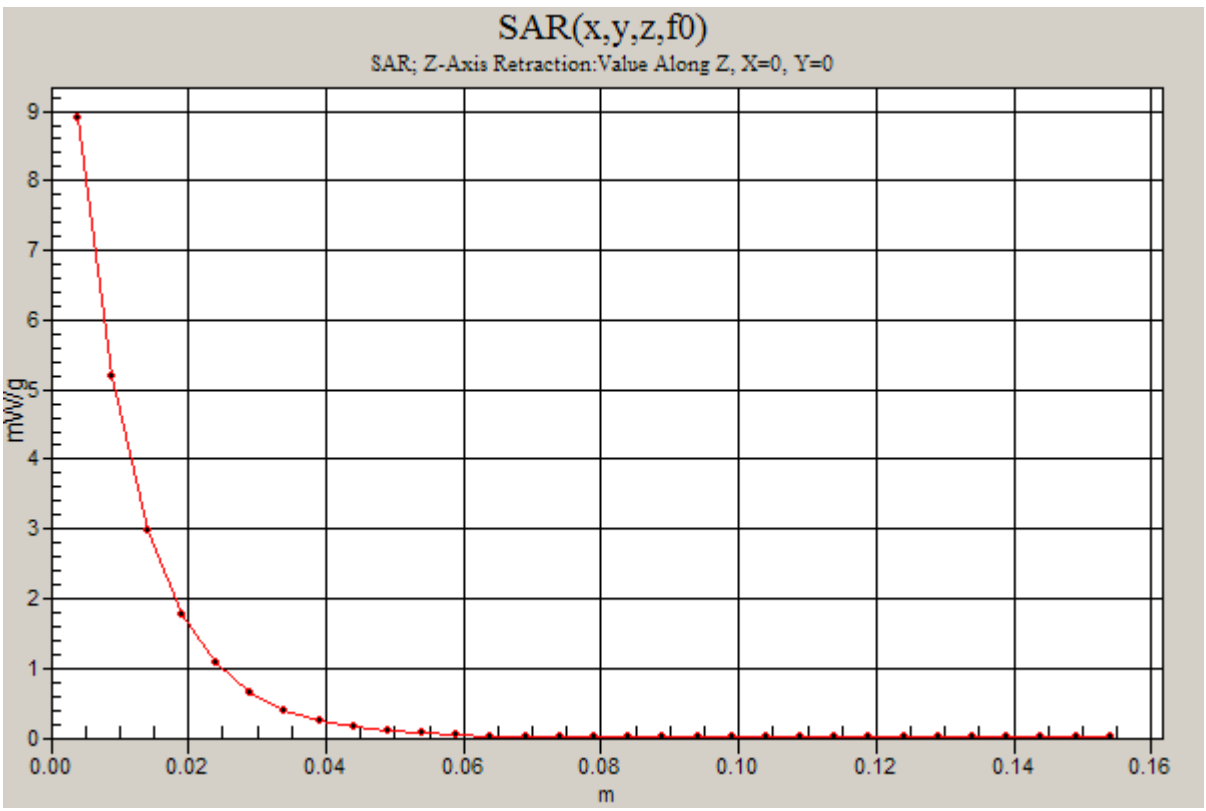
Daily SPC Check/Dipole Area Scan (9x4x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 6.31 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 85.2 V/m; Power Drift = -0.044 dB; Peak SAR (extrapolated) = 13.0 W/kg
SAR(1 g) = 7.78 mW/g; SAR(10 g) = 4.18 mW/g; Maximum value of SAR (measured) = 8.77 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 85.2 V/m; Power Drift = -0.044 dB; Peak SAR (extrapolated) = 13.0 W/kg
SAR(1 g) = 7.7 mW/g; SAR(10 g) = 4.12 mW/g; Maximum value of SAR (measured) = 8.64 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31):
Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 8.90 mW/g


mW/g
8.90
7.12
5.34
3.56
1.78
0.003


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
8
9
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16

Date/Time: 9/21/2009 7:21:42 AM

Test Laboratory: Motorola - Sep-21-09 1800 MHz

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 259TR; FCC ID: IHDP56KD2
Procedure Notes: 1800 MHz System Performance Check; Dipole Sn# 259TR; Input Power = 200 mW
Sim.Temp@meas = 19.1 ┌C; Sim.Temp@SPC = 19.1 ┌C; Room Temp @ SPC = 19.6 ┌C
Communication System: CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only
Medium parameters used: f = 1800 MHz; σ = 1.37 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3

DASY4 Configuration:

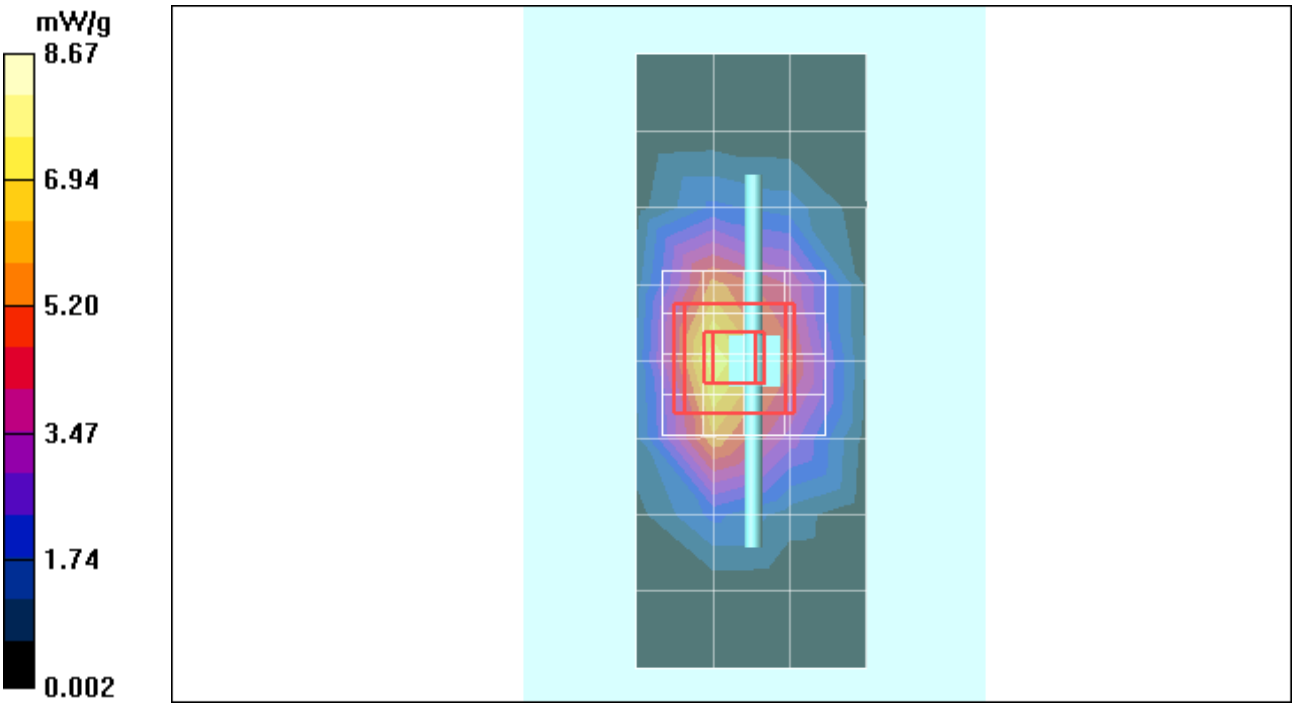
- Probe: ET3DV6 - SN1524; ConvF(4.43, 4.43, 4.43); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

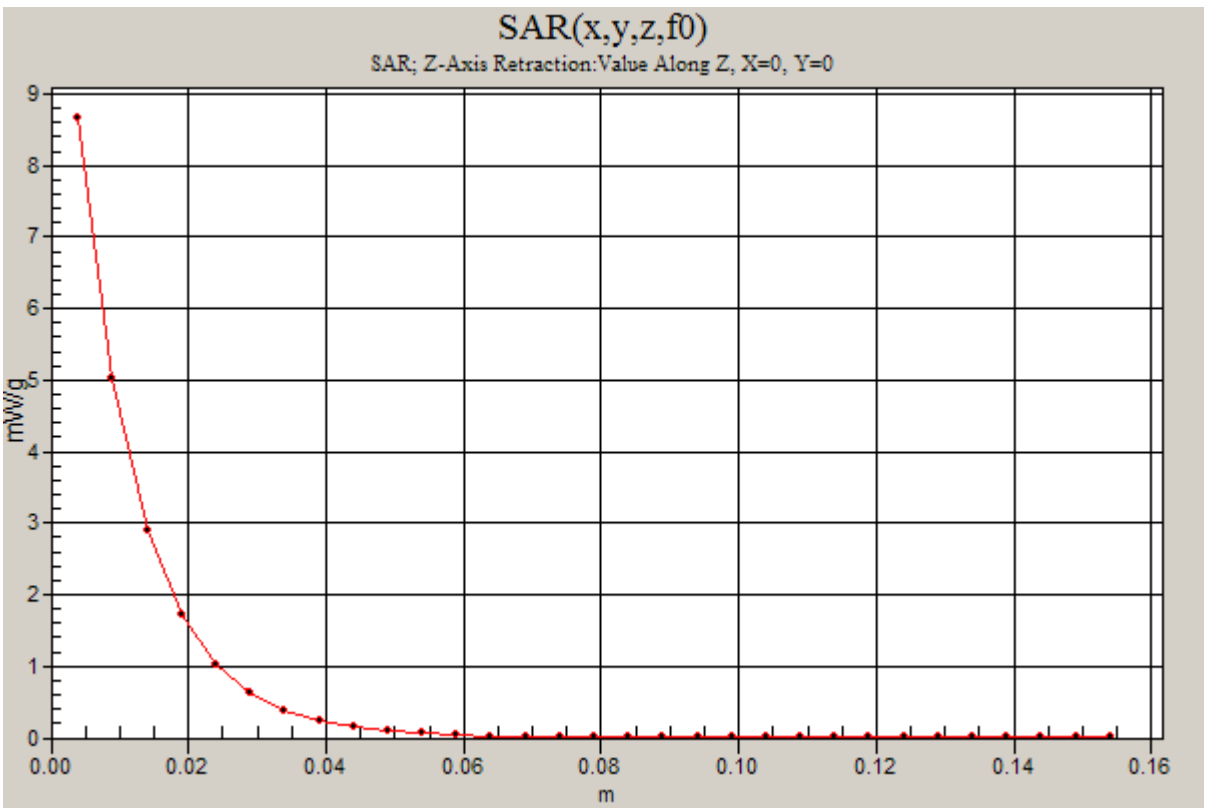
Daily SPC Check/Dipole Area Scan (9x4x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 7.47 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 82.0 V/m; Power Drift = -0.020 dB; Peak SAR (extrapolated) = 12.8 W/kg
SAR(1 g) = 7.62 mW/g; SAR(10 g) = 4.1 mW/g; Maximum value of SAR (measured) = 8.57 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 82.0 V/m; Power Drift = -0.020 dB; Peak SAR (extrapolated) = 12.9 W/kg
SAR(1 g) = 7.62 mW/g; SAR(10 g) = 4.08 mW/g; Maximum value of SAR (measured) = 8.30 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31):
Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 8.67 mW/g


mW/g
8.67
6.94
5.20
3.47
1.74
0.002


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
8
9
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16

Date/Time: 9/22/2009 7:14:58 AM

Test Laboratory: Motorola - Sep-22-09 1800 MHz

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 259TR; FCC ID: IHDP56KD2
Procedure Notes: 1800 MHz System Performance Check; Dipole Sn# 259TR; Input Power = 200 mW
Sim.Temp@meas = 19.0 ┌C; Sim.Temp@SPC = 19.0 ┌C; Room Temp @ SPC = 19.9 ┌C
Communication System: CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only
Medium parameters used: f = 1800 MHz; σ = 1.37 mho/m; ε_r = 39.1; ρ = 1000 kg/m^3

DASY4 Configuration:

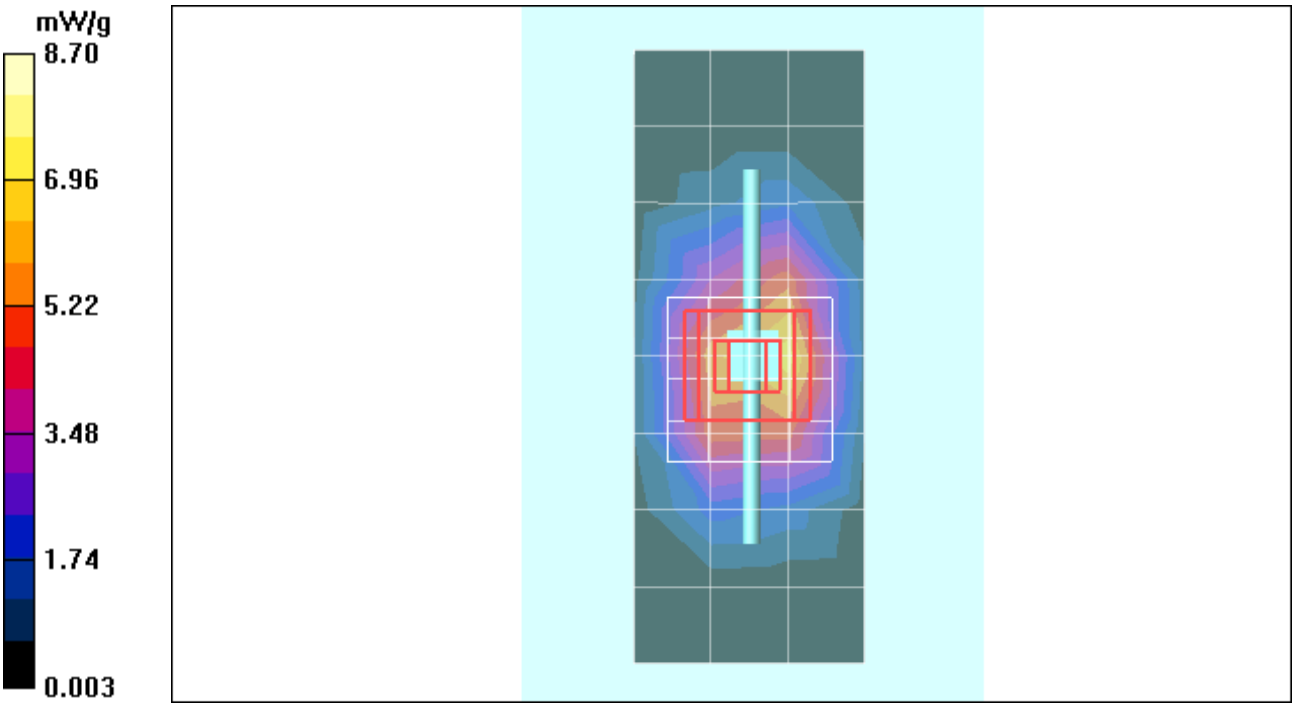
- Probe: ET3DV6 - SN1524; ConvF(4.43, 4.43, 4.43); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

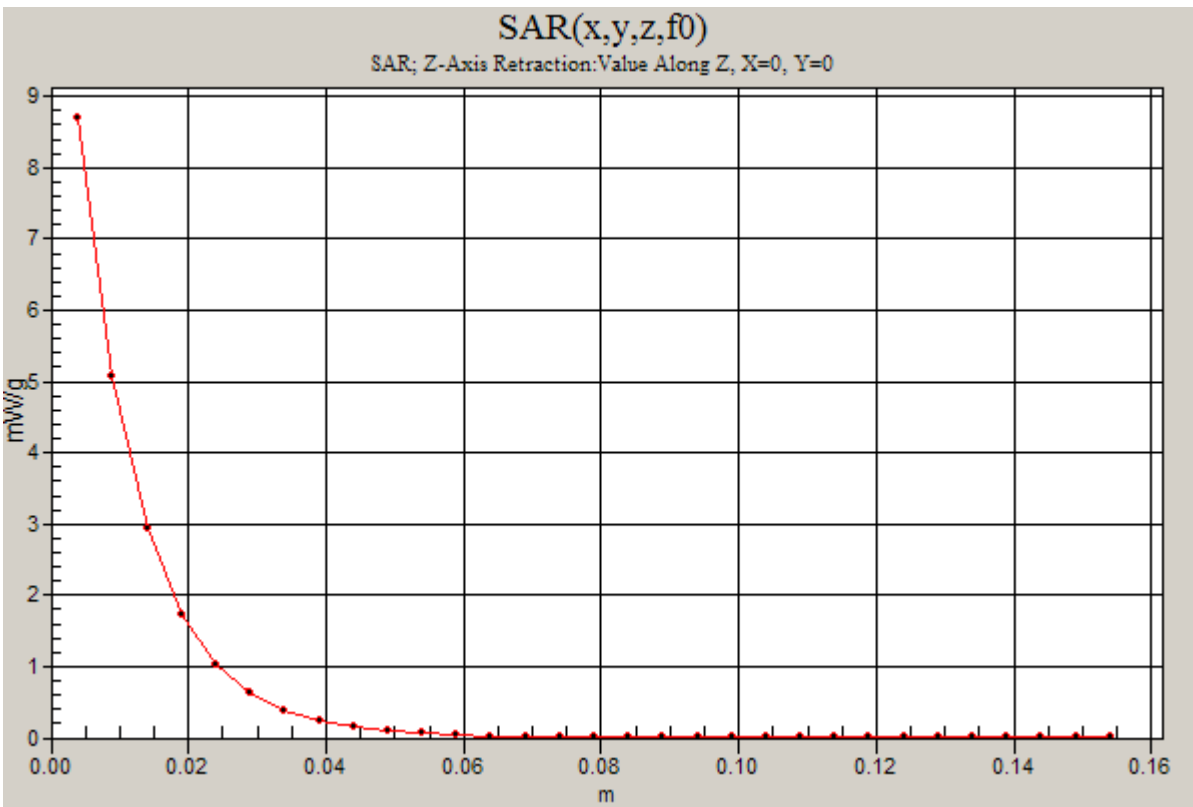
Daily SPC Check/Dipole Area Scan (9x4x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 6.79 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 84.1 V/m; Power Drift = -0.007 dB; Peak SAR (extrapolated) = 12.8 W/kg
SAR(1 g) = 7.66 mW/g; SAR(10 g) = 4.12 mW/g; Maximum value of SAR (measured) = 8.57 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 84.1 V/m; Power Drift = -0.007 dB; Peak SAR (extrapolated) = 12.9 W/kg
SAR(1 g) = 7.63 mW/g; SAR(10 g) = 4.09 mW/g; Maximum value of SAR (measured) = 8.30 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31):
Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 8.70 mW/g


mW/g
8.70
6.96
5.22
3.48
1.74
0.003


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
8
9
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16

Date/Time: 10/9/2009 8:31:36 AM

Test Laboratory: Motorola - Oct-09-09 1800 MHz

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 272TR; FCC ID: IHDP56KD2
Procedure Notes: 1800 MHz System Performance Check; Dipole Sn# 272TR; Input Power = 200 mW
Sim.Temp@meas = 18.6*C; Sim.Temp@SPC = 18.6*C; Room Temp @ SPC = 19.4*C
Communication System: CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only
Medium parameters used: f = 1800 MHz; σ = 1.38 mho/m; ε_r = 38.6; ρ = 1000 kg/m^3

DASY4 Configuration:

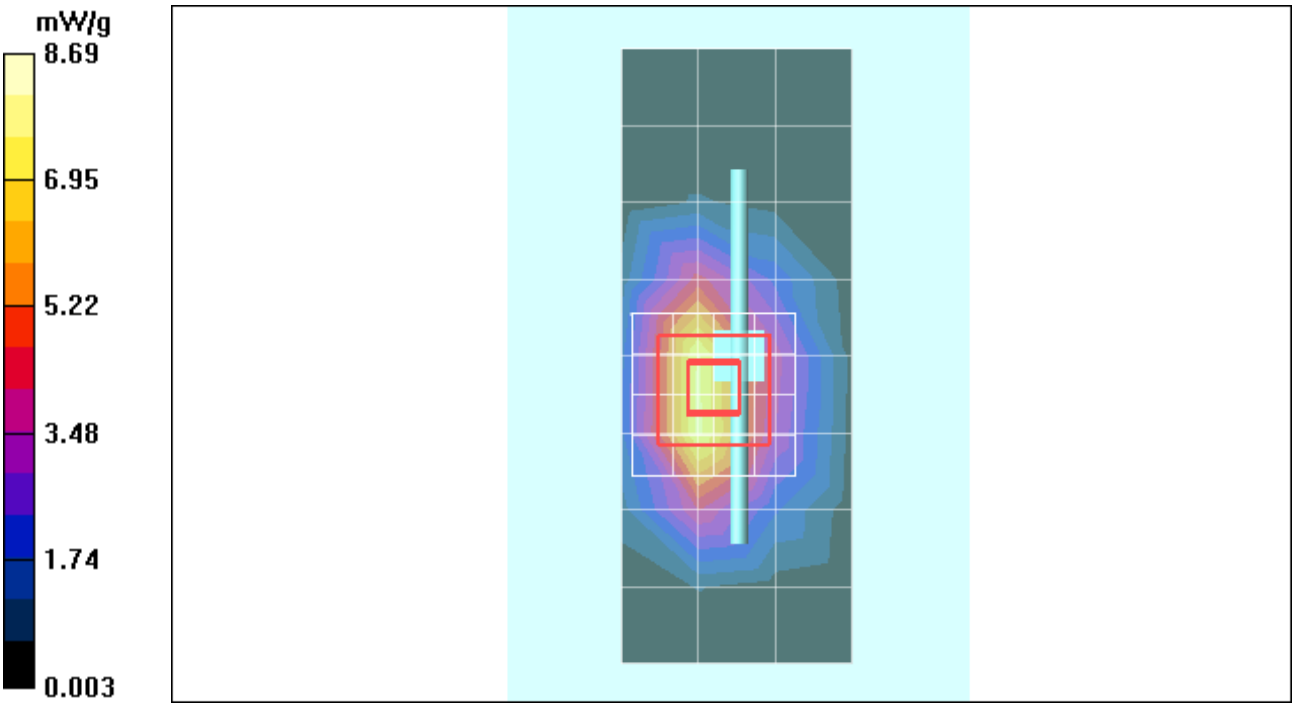
- Probe: ES3DV3 - SN3124; ConvF(4.95, 4.95, 4.95); Calibrated: 4/21/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn434; Calibrated: 2/9/2009
- Phantom: R4 : Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

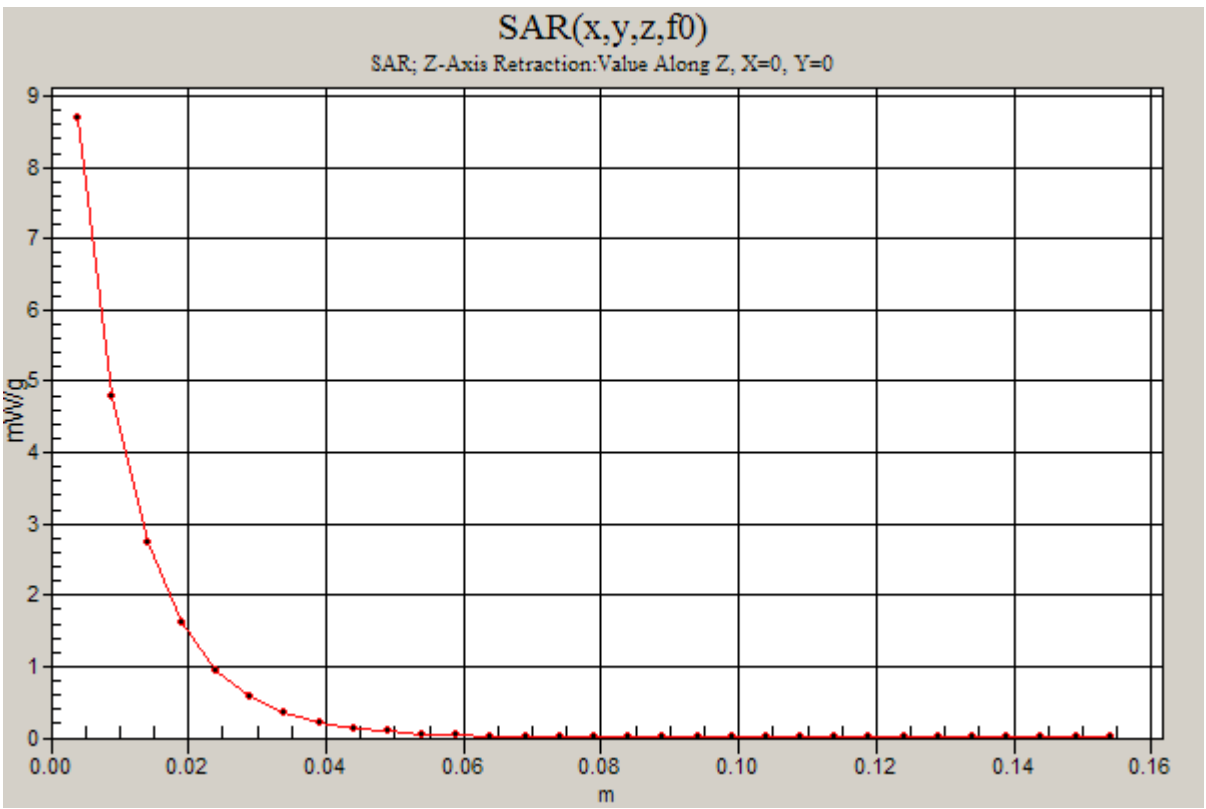
Daily SPC Check/Dipole Area Scan (9x4x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 7.73 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 73.4 V/m; Power Drift = -0.014 dB; Peak SAR (extrapolated) = 14.2 W/kg
SAR(1 g) = 7.76 mW/g; SAR(10 g) = 4.1 mW/g; Maximum value of SAR (measured) = 8.70 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 73.4 V/m; Power Drift = -0.014 dB; Peak SAR (extrapolated) = 14.3 W/kg
SAR(1 g) = 7.78 mW/g; SAR(10 g) = 4.1 mW/g; Maximum value of SAR (measured) = 8.71 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31):
Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 8.69 mW/g


mW/g
8.69
6.95
5.22
3.48
1.74
0.003


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
8
9
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16

Date/Time: 10/15/2009 2:04:25 PM

Test Laboratory: Motorola - Oct-15-09 1800 MHz

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 259TR; FCC ID: IHDP56KD2
Procedure Notes: 1800 MHz System Performance Check; Dipole Sn# 259tr; Input Power = 200 mW
Sim.Temp@meas = 18.8*C; Sim.Temp@SPC = 18.9*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; σ = 1.37 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3

DASY4 Configuration:

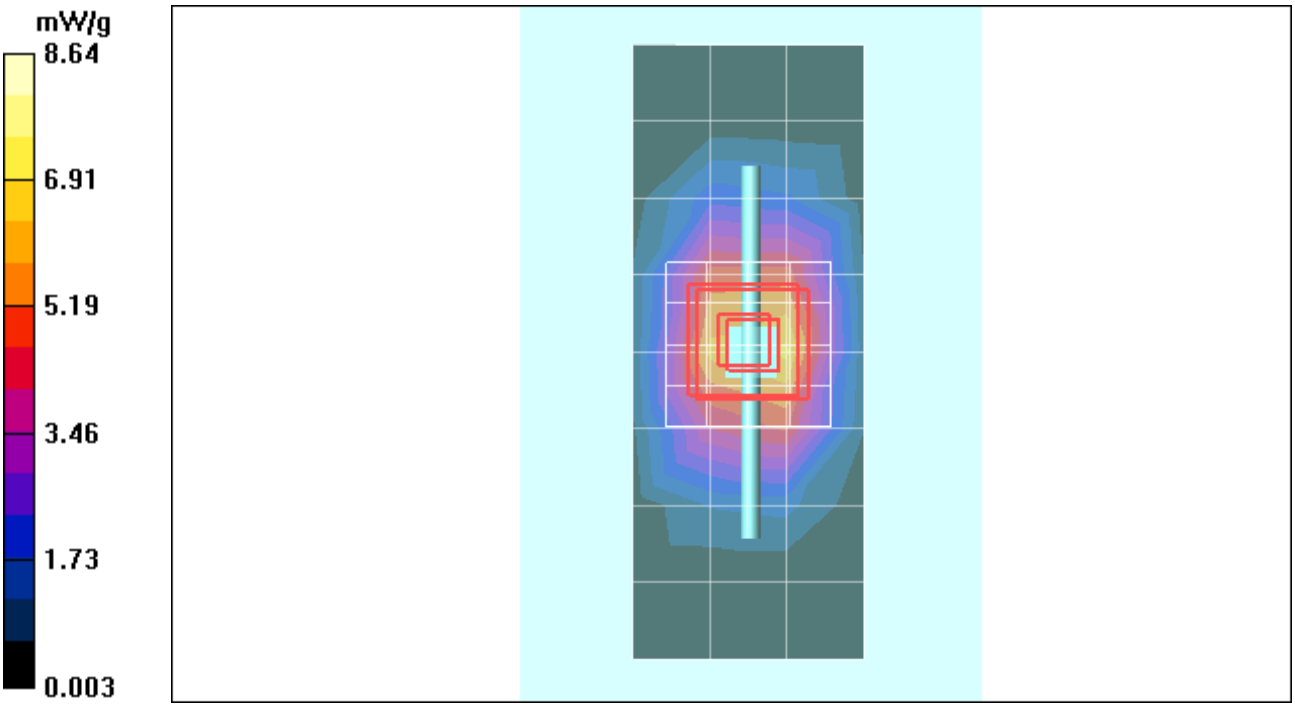
- Probe: ET3DV6 - SN1524; ConvF(4.43, 4.43, 4.43); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

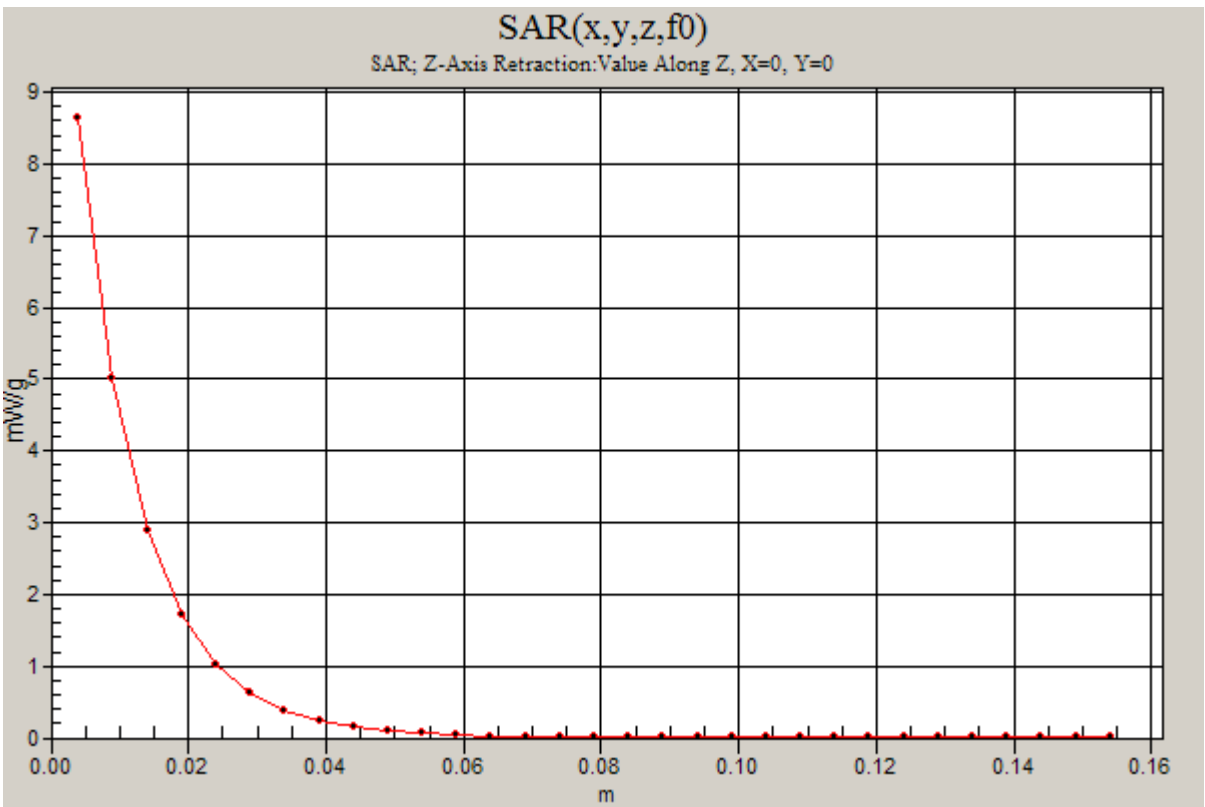
Daily SPC Check/Dipole Area Scan (4x9x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 6.52 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 84.6 V/m; Power Drift = -0.048 dB; Peak SAR (extrapolated) = 13.1 W/kg
SAR(1 g) = 7.73 mW/g; SAR(10 g) = 4.13 mW/g; Maximum value of SAR (measured) = 8.79 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 84.6 V/m; Power Drift = -0.048 dB; Peak SAR (extrapolated) = 13.1 W/kg
SAR(1 g) = 7.7 mW/g; SAR(10 g) = 4.12 mW/g; Maximum value of SAR (measured) = 8.69 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31):
Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 8.64 mW/g


mW/g
8.64
6.91
5.19
3.46
1.73
0.003


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
8
9
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16

Date/Time: 9/26/2009 12:54:20 AM

Test Laboratory: Motorola - Sep-26-09 2450 MHz

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 740; FCC ID: IHDP56KD2
Procedure Notes: 2450 MHz System Performance Check; Dipole Sn# 740; Input Power = 200 mW
Sim.Temp@meas = 19.1*C; Sim.Temp@SPC = 19.2*C; Room Temp @ SPC = 19.7*C
Communication System: CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only
Medium parameters used: f = 2450 MHz; σ = 1.83 mho/m; ε_r = 37.1; ρ = 1000 kg/m^3

DASY4 Configuration:

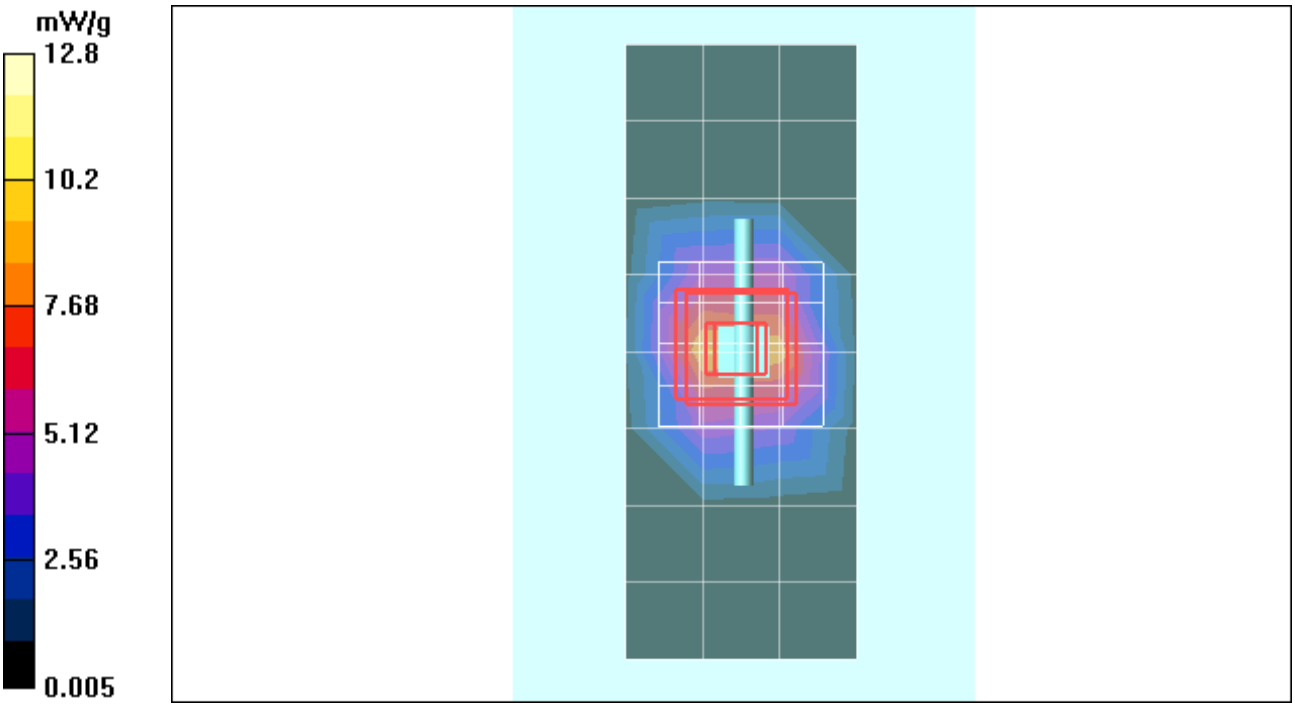
- Probe: ET3DV6 - SN1524; ConvF(3.89, 3.89, 3.89); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

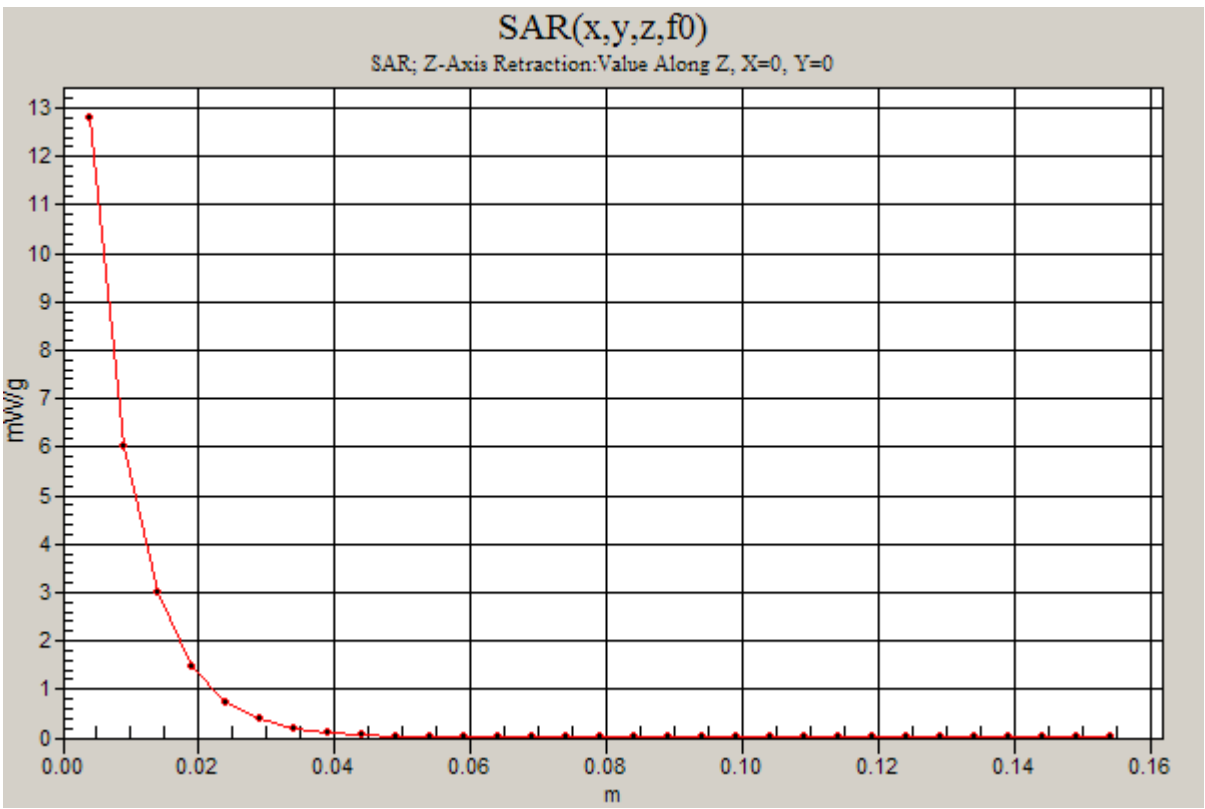
Daily SPC Check/Dipole Area Scan (9x4x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 8.73 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 87.2 V/m; Power Drift = -0.027 dB; Peak SAR (extrapolated) = 26.2 W/kg
SAR(1 g) = 11.5 mW/g; SAR(10 g) = 5.19 mW/g; Maximum value of SAR (measured) = 12.8 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 87.2 V/m; Power Drift = -0.027 dB; Peak SAR (extrapolated) = 27.2 W/kg
SAR(1 g) = 11.6 mW/g; SAR(10 g) = 5.2 mW/g;

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


mW/g
12.8
10.2
7.68
5.12
2.56
0.005


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
8
9
10
11
12
13
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16

Date/Time: 9/26/2009 5:22:44 PM

Test Laboratory: Motorola - Sep-26-09 2450 MHz

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 740; FCC ID: IHDP56KD2
Procedure Notes: 2450 MHz System Performance Check; Dipole Sn# 740; Input Power = 200 mW
Sim.Temp@meas = 19.1*C; Sim.Temp@SPC = 19.1*C; Room Temp @ SPC = 19.8*C
Communication System: CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only
Medium parameters used: f = 2450 MHz; σ = 1.83 mho/m; ε_r = 37.1; ρ = 1000 kg/m^3

DASY4 Configuration:

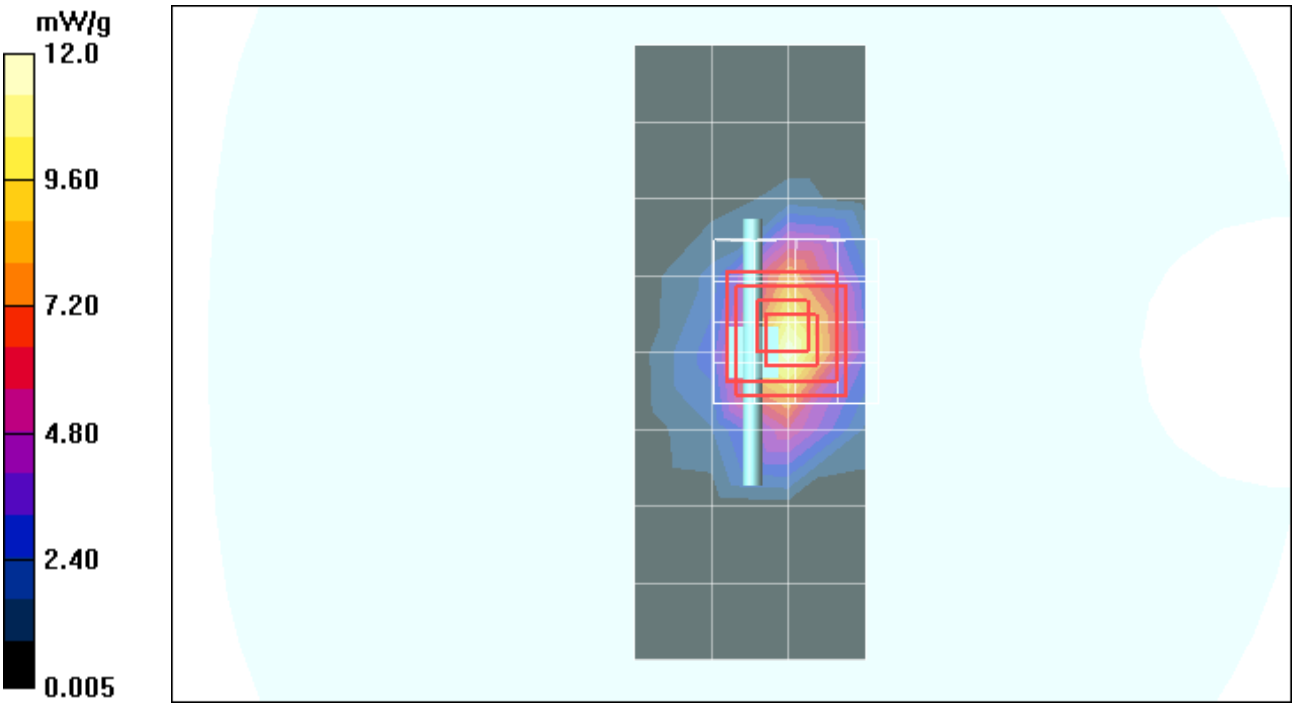
- Probe: ET3DV6 - SN1524; ConvF(3.89, 3.89, 3.89); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

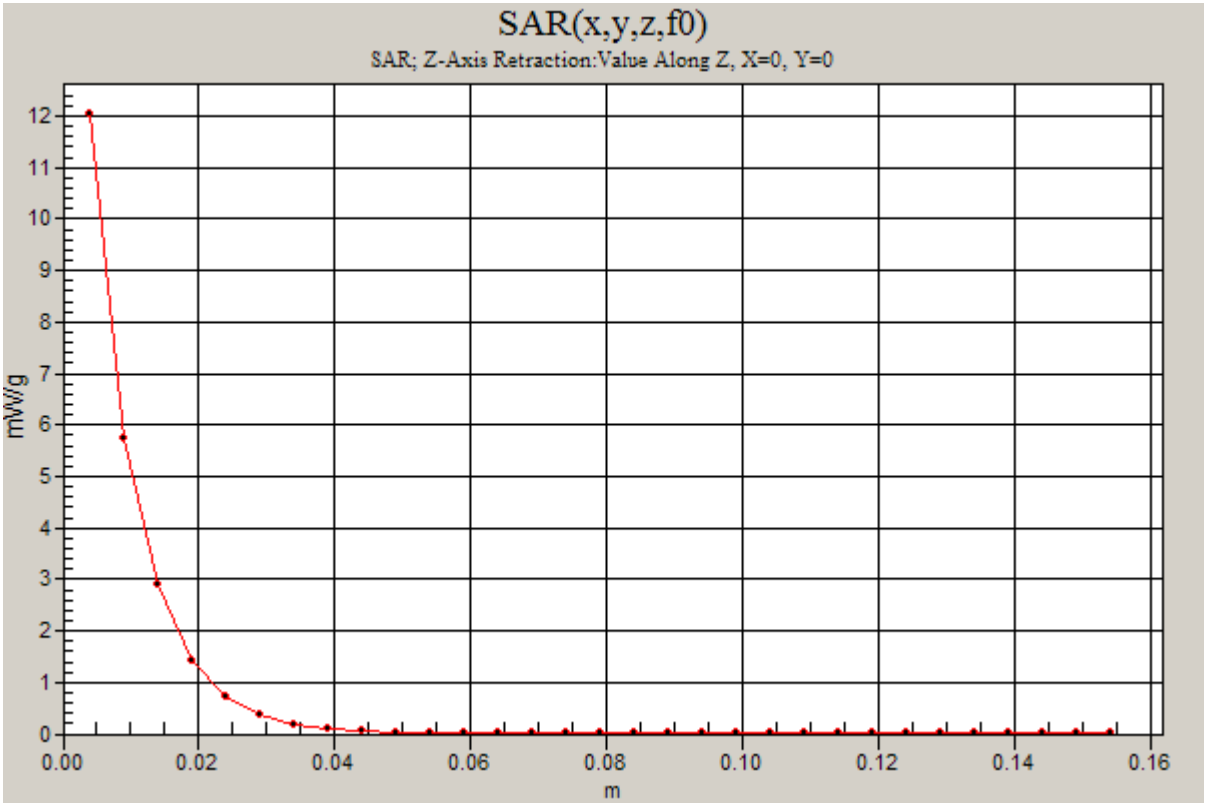
Daily SPC Check/Dipole Area Scan (4x9x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 11.9 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 70.2 V/m; Power Drift = -0.114 dB; Peak SAR (extrapolated) = 24.2 W/kg
SAR(1 g) = 10.8 mW/g; SAR(10 g) = 4.97 mW/g; Maximum value of SAR (measured) = 11.6 mW/g

Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 70.2 V/m; Power Drift = -0.114 dB; Peak SAR (extrapolated) = 25.1 W/kg
SAR(1 g) = 11 mW/g; SAR(10 g) = 5 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


mW/g
12.0
9.60
7.20
4.80
2.40
0.005


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
0
1
2
3
4
5
6
7
8
9
10
11
12
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Appendix 2

SAR distribution plots for Phantom Head Adjacent Use

Date/Time: 9/20/2009 12:35:07 PM

Test Laboratory: Motorola - GSM 850 Cheek

Serial: 004401027323845; FCC ID: IHDP56KD2
Procedure Notes: Pwr Step: 5; Antenna Position: Internal; Accessory Model #: None
Battery Model #: SNN5851A; DEVICE POSITION: Cheek
Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8

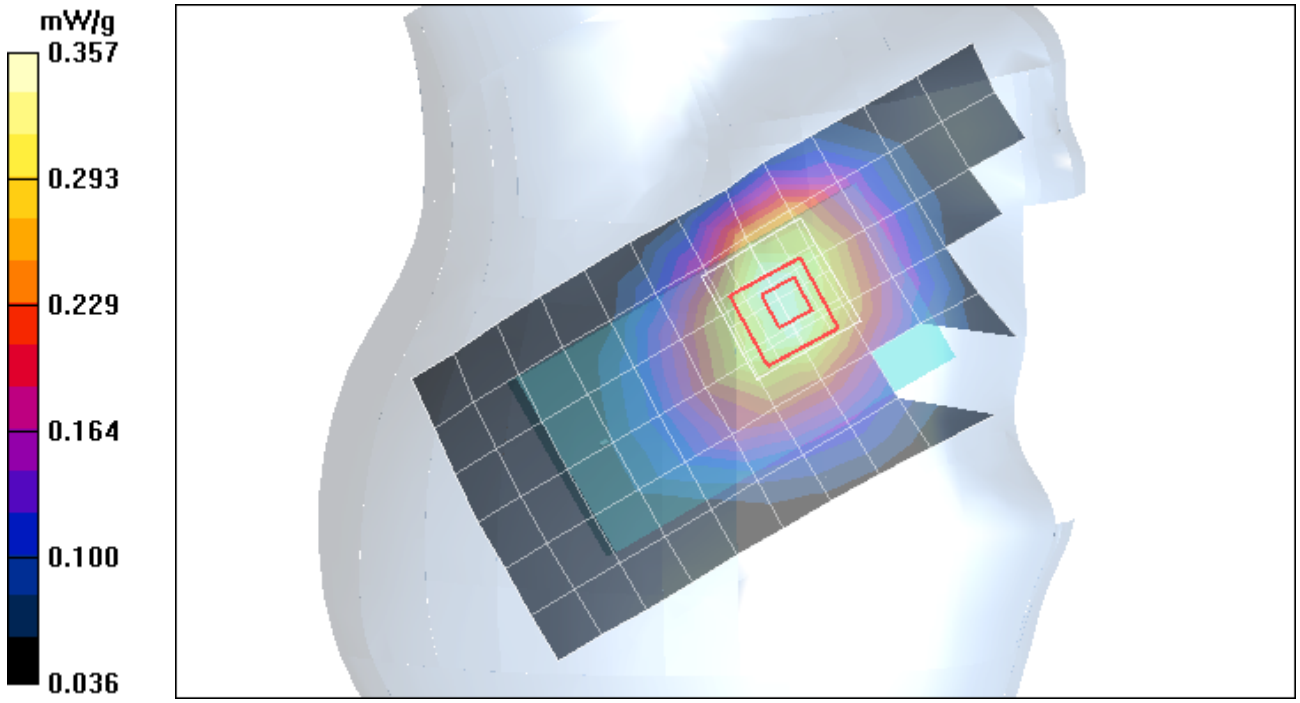
Medium: Low Freq Head
Medium parameters used: f = 835 MHz; σ = 0.93 mho/m; ε_r = 42.8; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6 - SN1524; ConvF(5.23, 5.23, 5.23); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Right Head Template/Area Scan - Normal (15mm) (7x17x1):
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 0.366 mW/g

Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.7 V/m; Power Drift = -0.006 dB; Peak SAR (extrapolated) = 0.440 W/kg
SAR(1 g) = 0.342 mW/g; SAR(10 g) = 0.256 mW/g; Maximum value of SAR (measured) = 0.357 mW/g



Date/Time: 9/18/2009 3:22:30 PM

Test Laboratory: Motorola - GSM 1900 Cheek

Serial: 004401027323845; FCC ID: IHDP56KD2
Procedure Notes: Pwr Step: 0; Antenna Position: Internal; Accessory Model #: N/A
Battery Model #: SNN5851A; DEVICE POSITION: Cheek
Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8

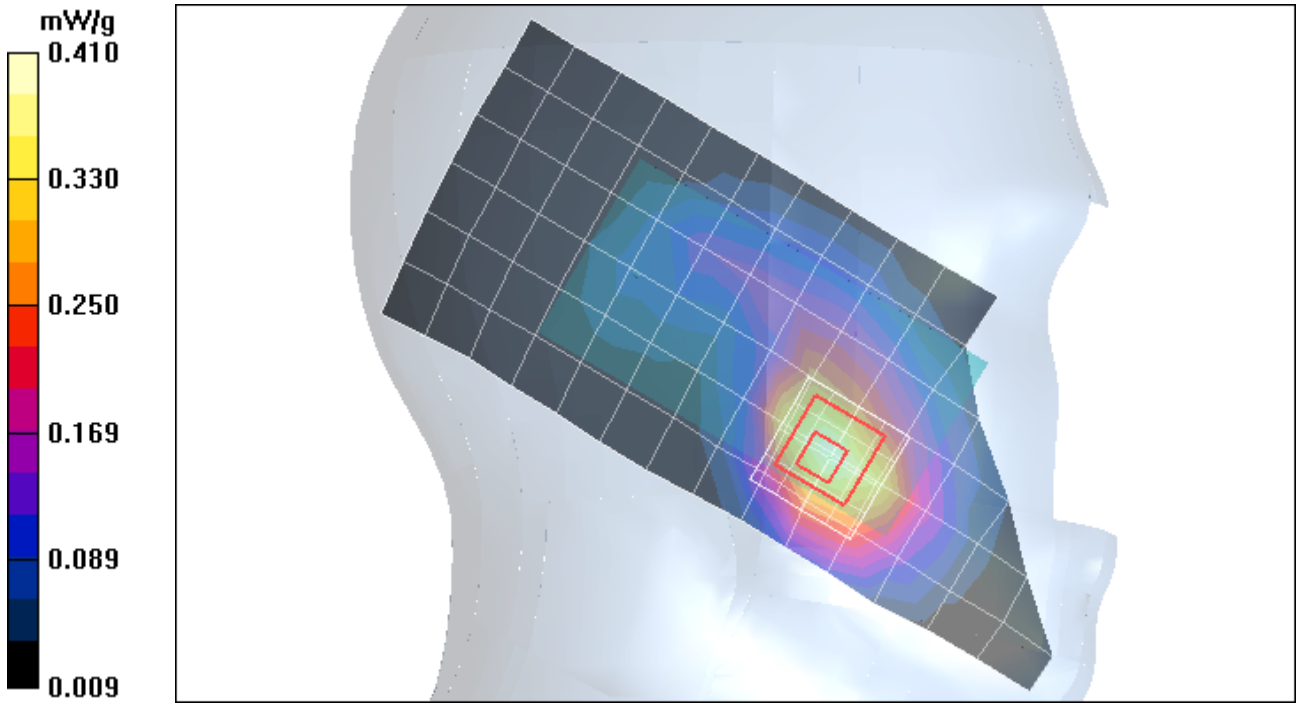
Medium: Regular Glycol Head 1750/1880
Medium parameters used: f = 1880 MHz; σ = 1.46 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6 - SN1524; ConvF(4.43, 4.43, 4.43); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- 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) = 0.413 mW/g

Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.8 V/m; Power Drift = -0.028 dB; Peak SAR (extrapolated) = 0.568 W/kg
SAR(1 g) = 0.378 mW/g; SAR(10 g) = 0.235 mW/g; Maximum value of SAR (measured) = 0.410 mW/g



Date/Time: 10/9/2009 7:49:45 PM

Test Laboratory: Motorola - WCDMA 1900 Cheek

Serial: 356922020016221; FCC ID: IHDP56KD2

Procedure Notes: Pwr Step: All up Bits; Antenna Position: Internal; Accessory Model #: N/A
Battery Model #: SNN5851A; DEVICE POSITION (cheek or rotated): Cheek
Communication System: WCDMA 1900; Frequency: 1852.5 MHz; Channel Number: 9262; Duty Cycle: 1:1

Medium: Regular Glycol Head 1750/1880
Medium parameters used: f = 1880 MHz; σ = 1.46 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3

DASY4 Configuration:

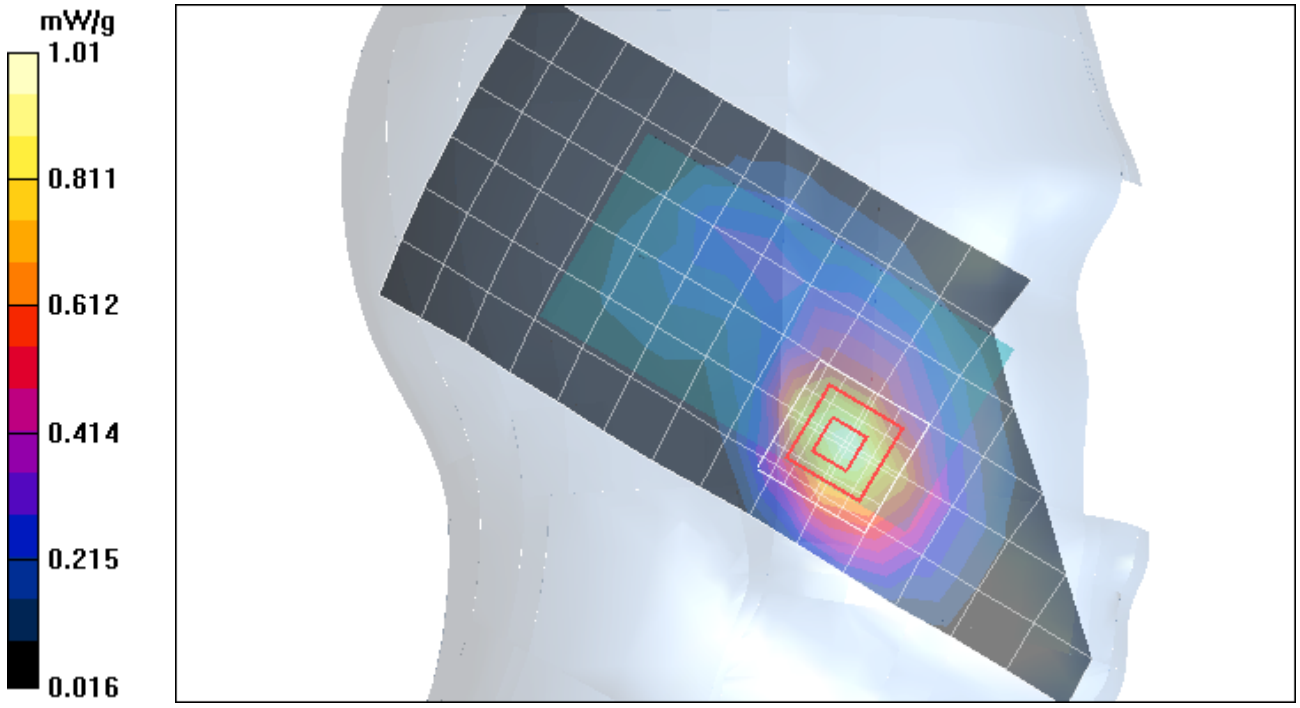
- Probe: ES3DV3 - SN3124; ConvF(4.95, 4.95, 4.95); Calibrated: 4/21/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn434; Calibrated: 2/9/2009
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Left Head Template/Area Scan - Normal (15mm) (7x17x1):

Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 1.05 mW/g

Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.9 V/m; Power Drift = -0.559 dB; Peak SAR (extrapolated) = 1.44 W/kg
SAR(1 g) = 0.919 mW/g; SAR(10 g) = 0.549 mW/g; Maximum value of SAR (measured) = 1.01 mW/g



Date/Time: 9/26/2009 9:05:24 AM

Test Laboratory: Motorola - Wi-Fi 2450 MHz Cheek

Serial: 004401027323746; FCC ID: IHDP56KD2

Procedure Notes: Pwr Step: N/A; Antenna Position: Internal; Accessory Model #: N/A
Battery Model #: SNN5851A; DEVICE POSITION: Cheek
Communication System: Wi-Fi 2450; Frequency: 2437 MHz; Channel Number: 6; Duty Cycle: 1:1

Medium: 2450 Glycol Head
Medium parameters used: f = 2450 MHz; σ = 1.83 mho/m; ε_r = 37.1; ρ = 1000 kg/m^3

DASY4 Configuration:

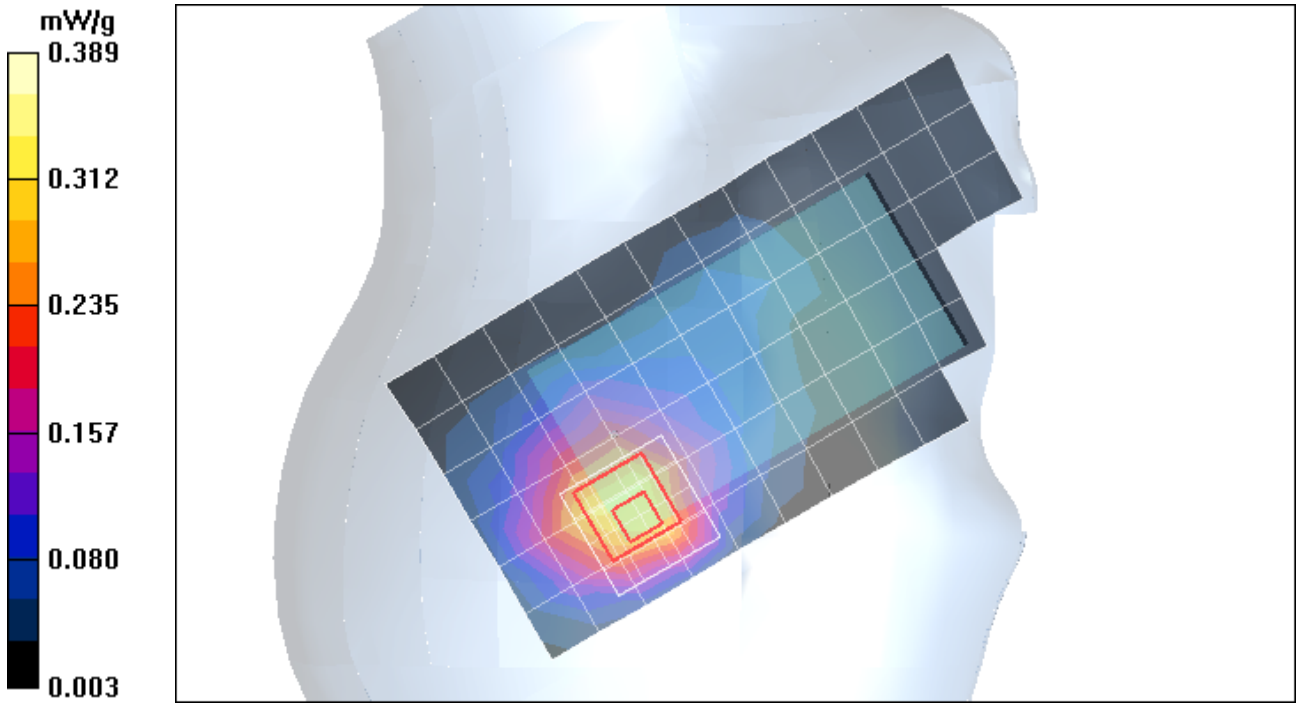
- Probe: ET3DV6 - SN1524; ConvF(3.89, 3.89, 3.89); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Glycol SAM (EXTRA-extended range), Rev.2 (04-Jan-08); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Right Head Template/Area Scan - Normal (15mm) (7x17x1):

Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 0.317 mW/g

Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.7 V/m; Power Drift = -0.109 dB; Peak SAR (extrapolated) = 0.799 W/kg
SAR(1 g) = 0.349 mW/g; SAR(10 g) = 0.178 mW/g; Maximum value of SAR (measured) = 0.389 mW/g



Date/Time: 9/20/2009 12:17:28 PM

Test Laboratory: Motorola - GSM 850 Tilt

Serial: 004401027323845; FCC ID: IHDP56KD2
Procedure Notes: Pwr Step: 5; Antenna Position: Internal; Accessory Model #: N/A
Battery Model #: SNN5851A; DEVICE POSITION: Tilt
Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8

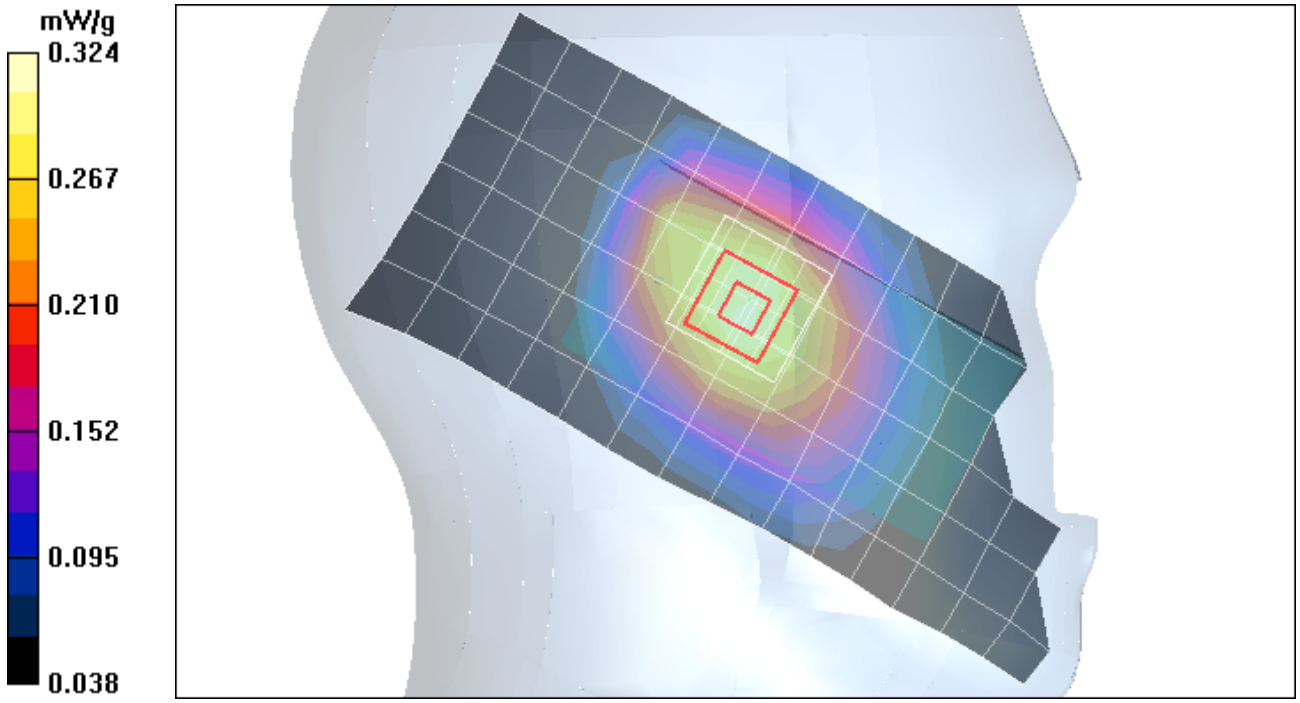
Medium: Low Freq Head
Medium parameters used: f = 835 MHz; σ = 0.93 mho/m; ε_r = 42.8; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6 - SN1524; ConvF(5.23, 5.23, 5.23); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- 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) = 0.314 mW/g

Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.4 V/m; Power Drift = -0.040 dB; Peak SAR (extrapolated) = 0.380 W/kg
SAR(1 g) = 0.307 mW/g; SAR(10 g) = 0.228 mW/g; Maximum value of SAR (measured) = 0.324 mW/g



Date/Time: 9/18/2009 3:42:37 PM

Test Laboratory: Motorola - GSM 1900 Tilt

Serial: 004401027323845; FCC ID: IHDP56KD2
Procedure Notes: Pwr Step: 0; Antenna Position: Internal; Accessory Model #: N/A
Battery Model #: SNN5851A; DEVICE POSITION: Tilt
Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8

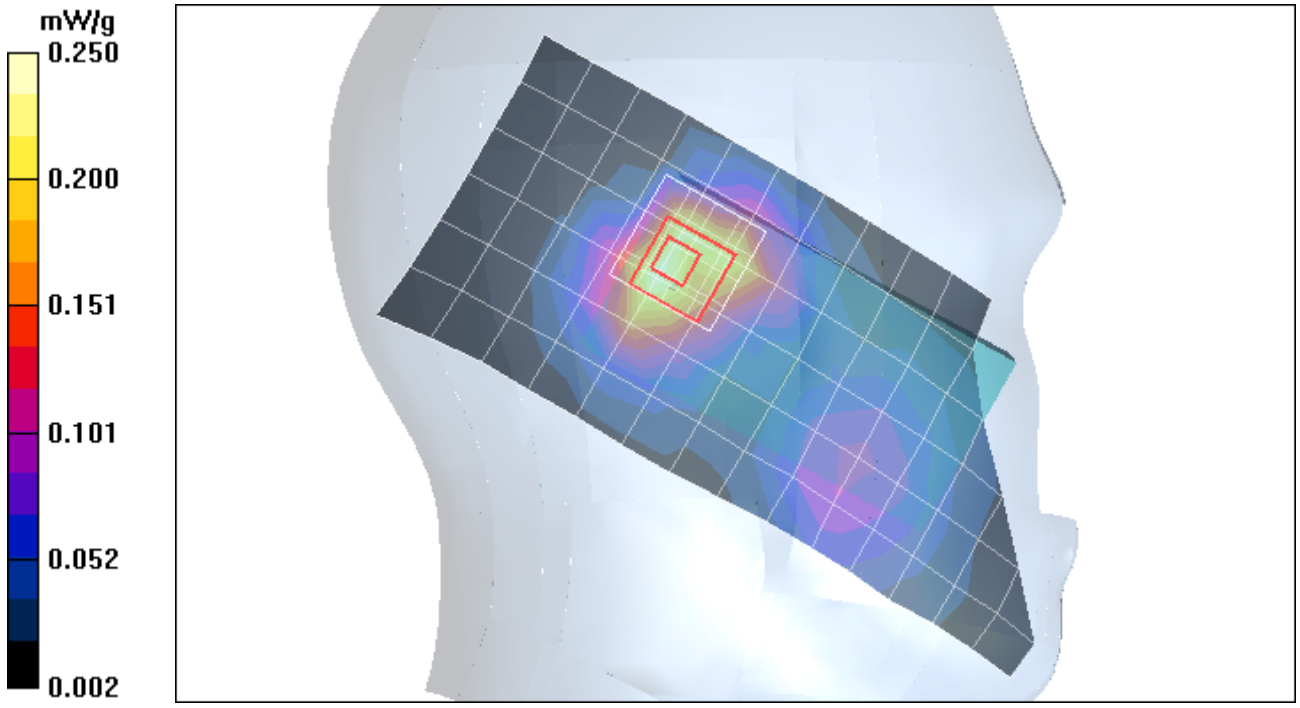
Medium: Regular Glycol Head 1750/1880
Medium parameters used: f = 1880 MHz; σ = 1.46 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6 - SN1524; ConvF(4.43, 4.43, 4.43); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- 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) = 0.249 mW/g

Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.9 V/m; Power Drift = -0.004 dB; Peak SAR (extrapolated) = 0.381 W/kg
SAR(1 g) = 0.236 mW/g; SAR(10 g) = 0.145 mW/g; Maximum value of SAR (measured) = 0.250 mW/g



Date/Time: 10/9/2009 7:20:59 PM

Test Laboratory: Motorola - WCDMA 1900 Tilt

Serial: 356922020016221; FCC ID: IHDP56KD2
Procedure Notes: Pwr Step: All up Bits; Antenna Position: Internal; Accessory Model #: N/A
Battery Model #: SNN5851A; DEVICE POSITION (cheek or rotated): Rotated
Communication System: WCDMA 1900; Frequency: 1880 MHz; Channel Number: 9400; Duty Cycle: 1:1

Medium: Regular Glycol Head 1750/1880
Medium parameters used: f = 1880 MHz; σ = 1.46 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3

DASY4 Configuration:

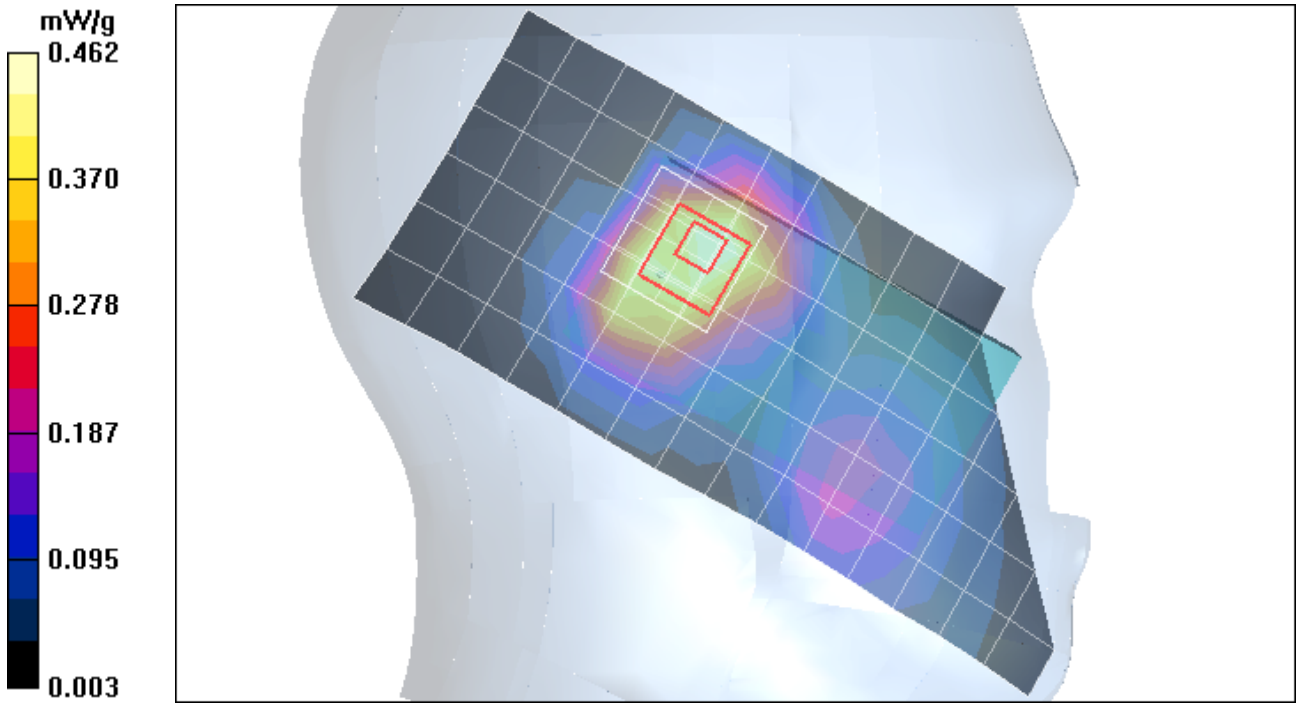
- Probe: ES3DV3 - SN3124; ConvF(4.95, 4.95, 4.95); Calibrated: 4/21/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn434; Calibrated: 2/9/2009
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Left Head Template/Area Scan - Normal (15mm) (7x17x1):

Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 0.503 mW/g

Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.5 V/m; Power Drift = -0.454 dB; Peak SAR (extrapolated) = 0.654 W/kg
SAR(1 g) = 0.442 mW/g; SAR(10 g) = 0.280 mW/g; Maximum value of SAR (measured) = 0.462 mW/g



Date/Time: 9/26/2009 9:24:11 AM

Test Laboratory: Motorola - Wi-Fi 2450 MHz Tilt

Serial: 004401027323746; FCC ID: IHDP56KD2

Procedure Notes: Pwr Step: N/A; Antenna Position: Internal; Accessory Model #: N/A
Battery Model #: SNN5851A; DEVICE POSITION: Tilt
Communication System: Wi-Fi 2450; Frequency: 2437 MHz; Channel Number: 6; Duty Cycle: 1:1

Medium: 2450 Glycol Head
Medium parameters used: f = 2450 MHz; σ = 1.83 mho/m; ε_r = 37.1; ρ = 1000 kg/m^3

DASY4 Configuration:

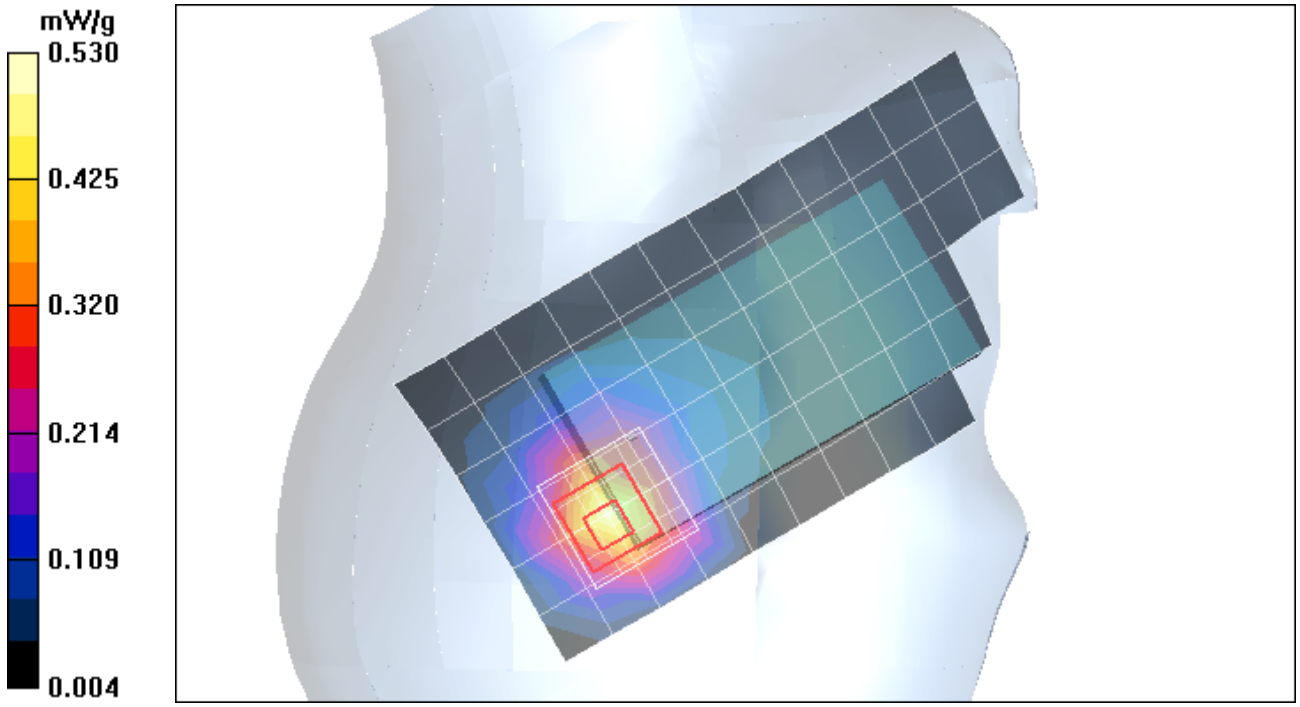
- Probe: ET3DV6 - SN1524; ConvF(3.89, 3.89, 3.89); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Glycol SAM (EXTRA-extended range), Rev.2 (04-Jan-08); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Right Head Template/Area Scan - Normal (15mm) (7x17x1):

Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 0.515 mW/g

Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.5 V/m; Power Drift = -0.068 dB; Peak SAR (extrapolated) = 1.13 W/kg
SAR(1 g) = 0.499 mW/g; SAR(10 g) = 0.251 mW/g; Maximum value of SAR (measured) = 0.530 mW/g



Appendix 3

SAR distribution plots for Body Worn Configuration

Date/Time: 9/20/2009 2:10:00 PM

Test Laboratory: Motorola - GSM 850 Body-Worn

Serial: 004401027323845; FCC ID: IHDP56KD2

Procedure Notes: Pwr Step: 5; Antenna Position: Internal; Battery Model #: SNN5851A
Device Position: Body Worn, Back of Phone 25 mm from Phantom
Communication System: GPRS 850 Cl. 10; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:4

Medium: Low Freq Body
Medium parameters used: f = 835 MHz; σ = 0.98 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3

DASY4 Configuration:

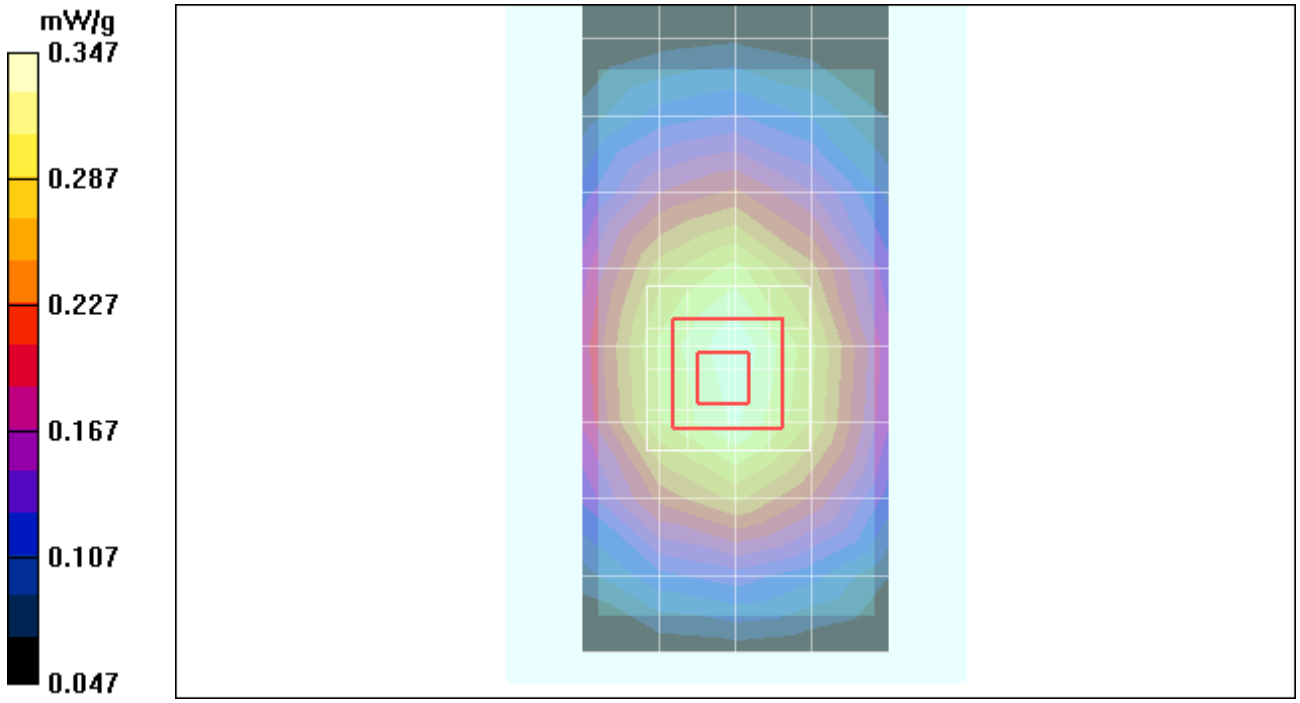
- Probe: ET3DV6 - SN1524; ConvF(5.14, 5.14, 5.14); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Section 1, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; 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) = 0.346 mW/g

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

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.2 V/m; Power Drift = -0.038 dB; Peak SAR (extrapolated) = 0.398 W/kg
SAR(1 g) = 0.328 mW/g; SAR(10 g) = 0.243 mW/g; Maximum value of SAR (measured) = 0.347 mW/g



Date/Time: 9/22/2009 3:19:05 PM

Test Laboratory: Motorola - GSM 1900 Body-Worn

Serial: 004401027323845; FCC ID: IHDP56KD2

Procedure Notes: Pwr Step: 0; Antenna Position: Internal; Battery Model #: SNN5851A
Device Position: Body Worn, Back of Phone 25 mm from Phantom
Communication System: GPRS 1900 Cl. 10; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:4

Medium: Regular Glycol Body 1750/1880
Medium parameters used: f = 1880 MHz; σ = 1.59 mho/m; ε_r = 51.7; ρ = 1000 kg/m^3

DASY4 Configuration:

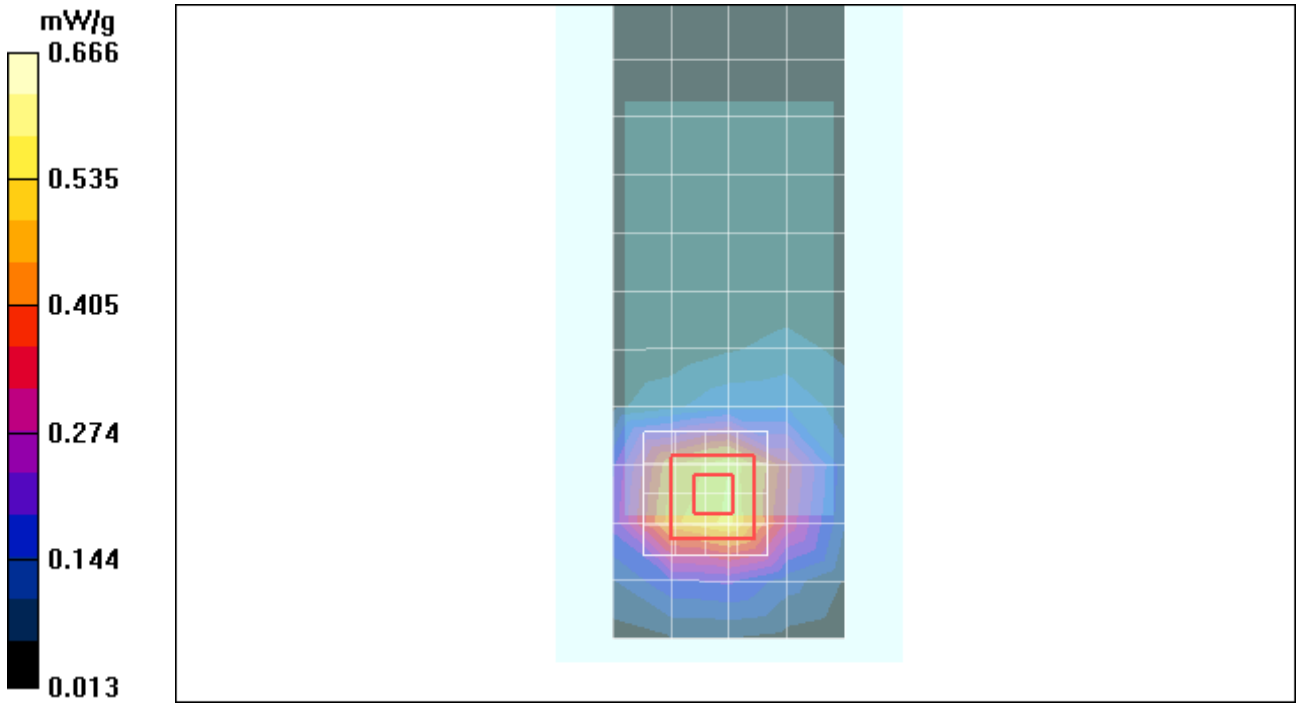
- Probe: ET3DV6 - SN1524; ConvF(4.03, 4.03, 4.03); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; 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) = 0.551 mW/g

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

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.3 V/m; Power Drift = -0.031 dB; Peak SAR (extrapolated) = 0.990 W/kg
SAR(1 g) = 0.614 mW/g; SAR(10 g) = 0.360 mW/g; Maximum value of SAR (measured) = 0.666 mW/g



Date/Time: 10/9/2009 9:47:02 AM

Test Laboratory: Motorola - WCDMA 1900 Body-Worn

Serial: 356922020016221; FCC ID: IHDP56KD2

Procedure Notes: Pwr Step: All up Bits; Antenna Position: Internal; Battery Model #: SNN5851A
Device Position: Body Worn, Back of Phone 25 mm from Phantom
Communication System: WCDMA 1900; Frequency: 1880 MHz; Channel Number: 9400; Duty Cycle: 1:1

Medium: Regular Glycol Body 1750/1880
Medium parameters used: f = 1880 MHz; σ = 1.59 mho/m; ε_r = 52.7; ρ = 1000 kg/m^3

DASY4 Configuration:

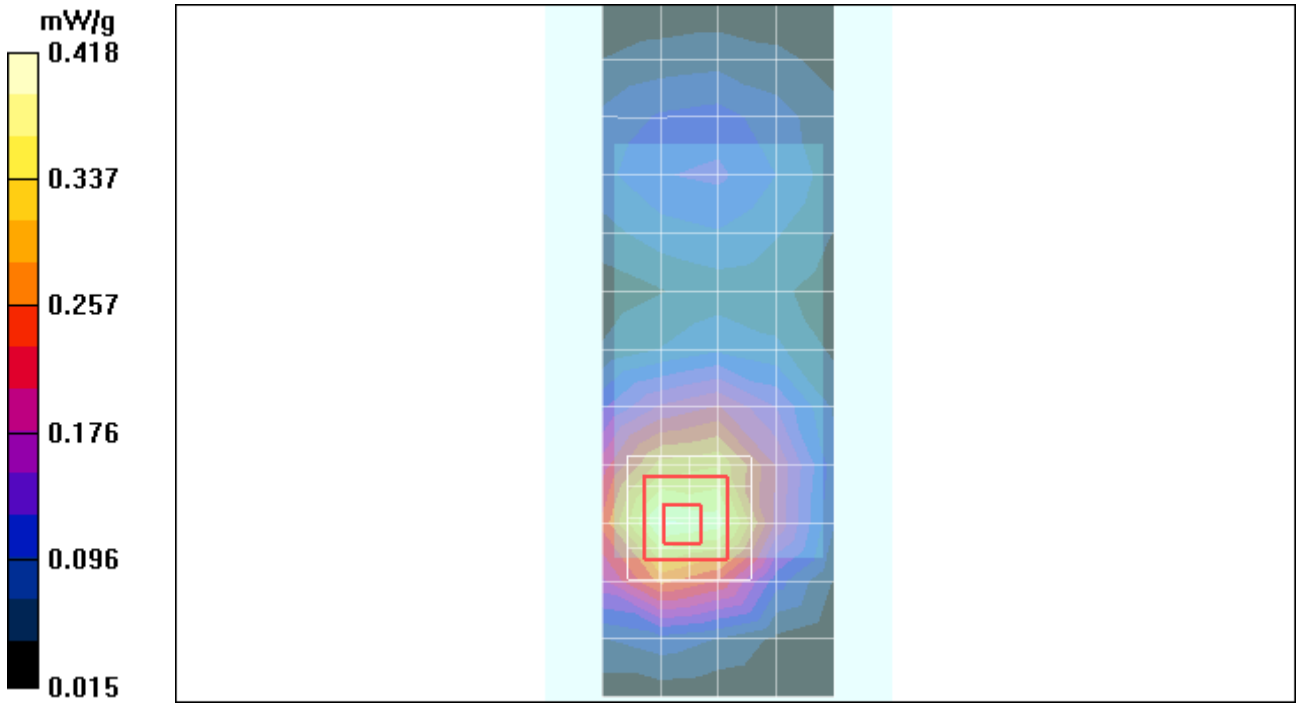
- Probe: ES3DV3 - SN3124; ConvF(4.75, 4.75, 4.75); Calibrated: 4/21/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn434; Calibrated: 2/9/2009
- Phantom: R4 : Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: 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) = 0.399 mW/g

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

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.8 V/m; Power Drift = -0.096 dB; Peak SAR (extrapolated) = 0.594 W/kg
SAR(1 g) = 0.388 mW/g; SAR(10 g) = 0.242 mW/g; Maximum value of SAR (measured) = 0.418 mW/g



Date/Time: 9/26/2009 12:56:34 PM

Test Laboratory: Motorola - Wi-Fi 2450 MHz Body-Worn

Serial: 004401027323746; FCC ID: IHDP56KD2

Procedure Notes: Pwr Step: N/A; Antenna Position: Internal; Battery Model #: SNN5851A
Device Position: Body Worn, Back of Phone 25 mm from Phantom
Communication System: Wi-Fi 2450; Frequency: 2437 MHz; Channel Number: 6; Duty Cycle: 1:1

Medium: 2450 Glycol Body
Medium parameters used: f = 2450 MHz; σ = 1.99 mho/m; ε_r = 50.7; ρ = 1000 kg/m^3

DASY4 Configuration:

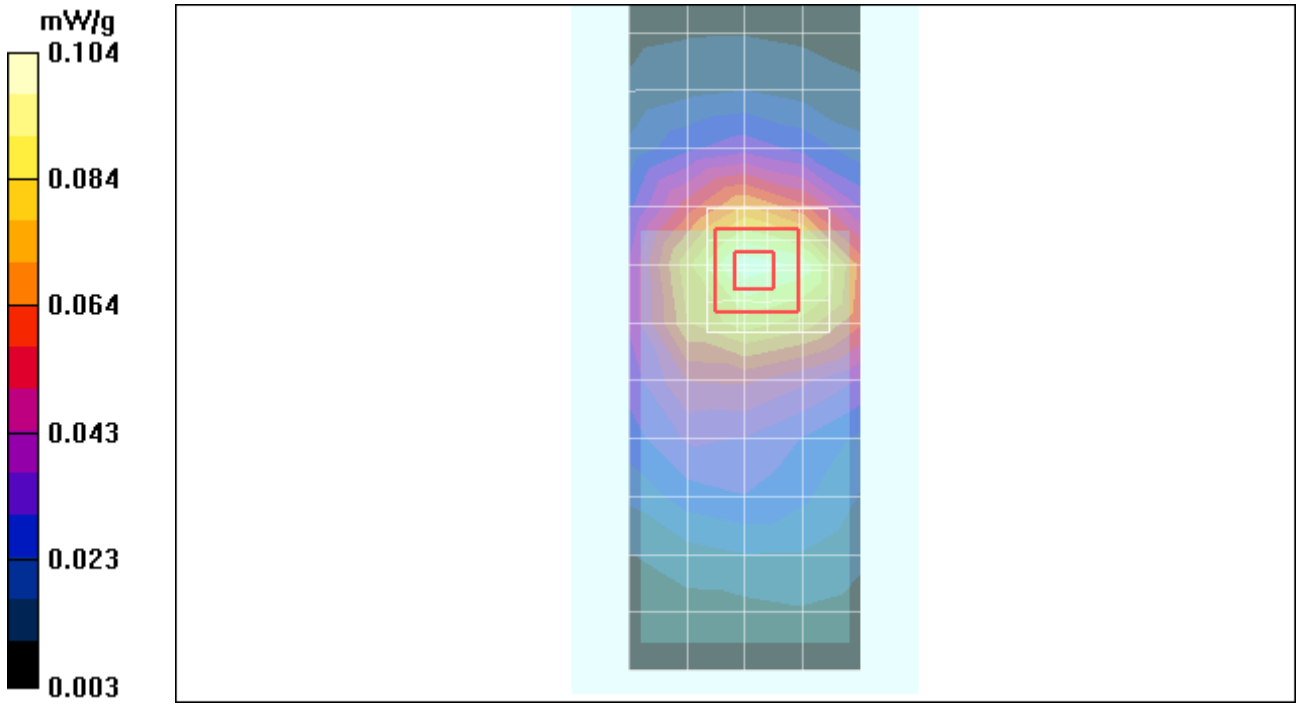
- Probe: ET3DV6 - SN1524; ConvF(3.4, 3.4, 3.4); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing 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) = 0.102 mW/g

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

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.90 V/m; Power Drift = 0.053 dB; Peak SAR (extrapolated) = 0.231 W/kg
SAR(1 g) = 0.102 mW/g; SAR(10 g) = 0.058 mW/g; Maximum value of SAR (measured) = 0.104 mW/g



Date/Time: 9/27/2009 2:47:10 PM

Test Laboratory: Motorola - Bluetooth Body-Worn

Serial: 004401027323746; FCC ID: IHDP56KD2

Procedure Notes: Pwr Step: N/A; Antenna Position: Internal; Battery Model #: SNN5851A
Device Position: Body Worn, Back of Phone 25 mm from Phantom
Communication System: Bluetooth; Frequency: 2441 MHz; Channel Number: 39; Duty Cycle: 1:1

Medium: 2450 Glycol Body
Medium parameters used: f = 2450 MHz; σ = 1.94 mho/m; ε_r = 49.6; ρ = 1000 kg/m^3

DASY4 Configuration:

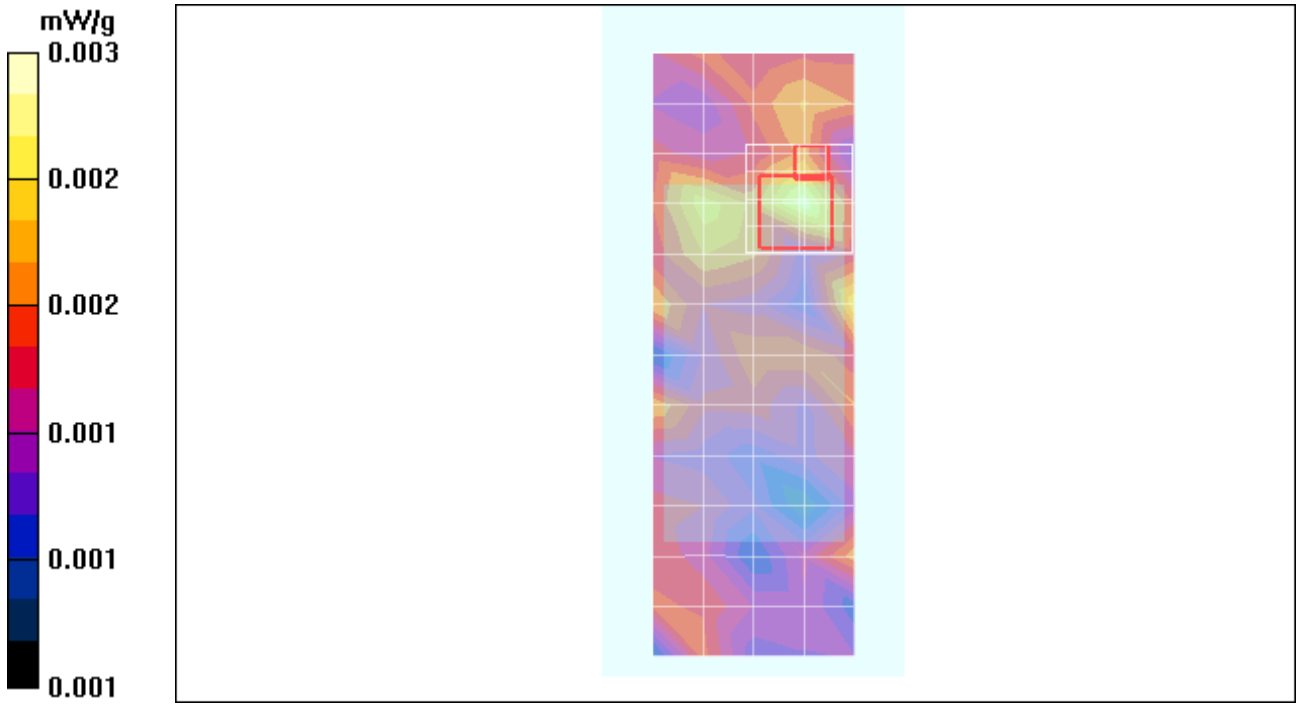
- Probe: ET3DV6 - SN1524; ConvF(3.4, 3.4, 3.4); Calibrated: 2/12/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 4/1/2009
- Phantom: R1_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing 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) = 0.003 mW/g

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

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.880 V/m; Power Drift = -0.325 dB; Peak SAR (extrapolated) = 0.009 W/kg
SAR(1 g) = 0.00208 mW/g; SAR(10 g) = 0.00173 mW/g;



Appendix 4

Probe Calibration Certificate

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

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

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

Accreditation No.: SCS 108

Client **Motorola MDb**

Certificate No: ET3-1524_Feb09

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1524
Calibration procedure(s)	QA CAL-01.v6 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	February 12, 2009
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

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

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: February 12, 2009

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ET3DV6

SN:1524

Manufactured:	March 21, 2000
Last calibrated:	May 31, 2007
Recalibrated:	February 12, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1524

Sensitivity in Free Space[A]

NormX	**2.16** ± 10.1%	$\mu V/(V/m)^2$
NormY	**2.44** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**2.36** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	**93** mV
DCP Y	**91** mV
DCP Z	**90** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	11.5	7.1
SAR_{be} [%]	With Correction Algorithm	0.9	0.6

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	10.6	5.9
SAR_{be} [%]	With Correction Algorithm	0.8	0.5

Sensor Offset

Probe Tip to Sensor Center **2.7** mm

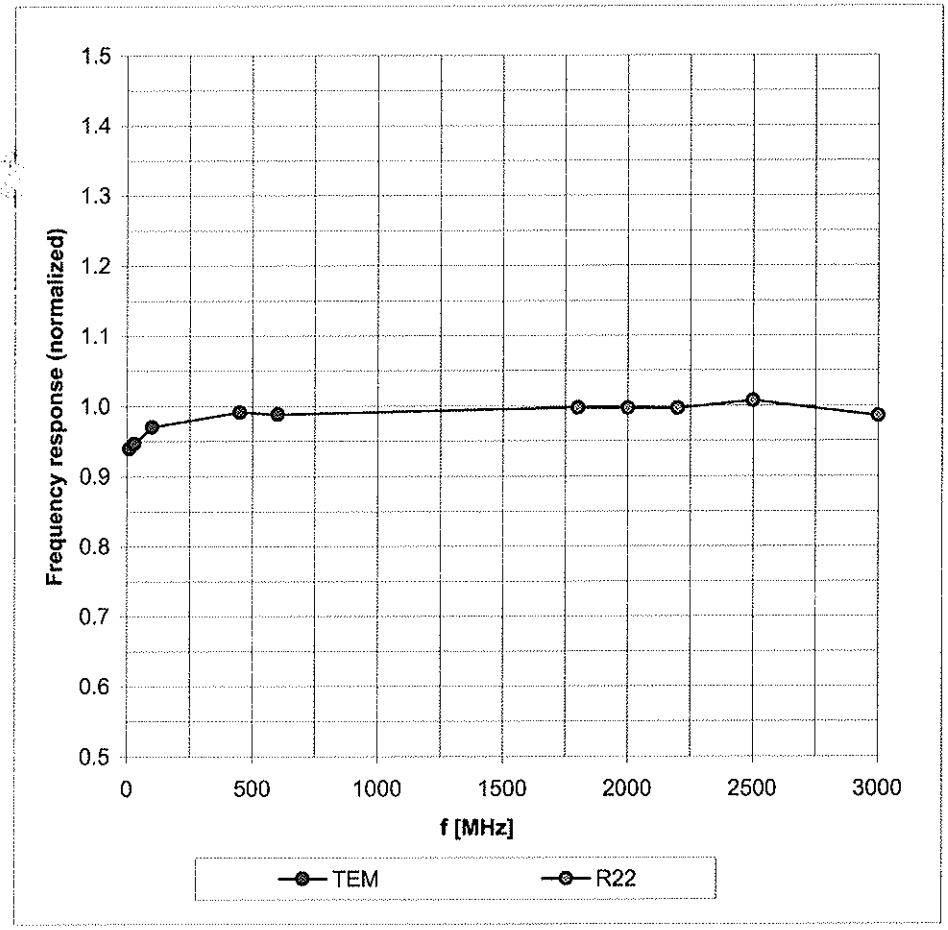
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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

[B] Numerical linearization parameter: uncertainty not required.

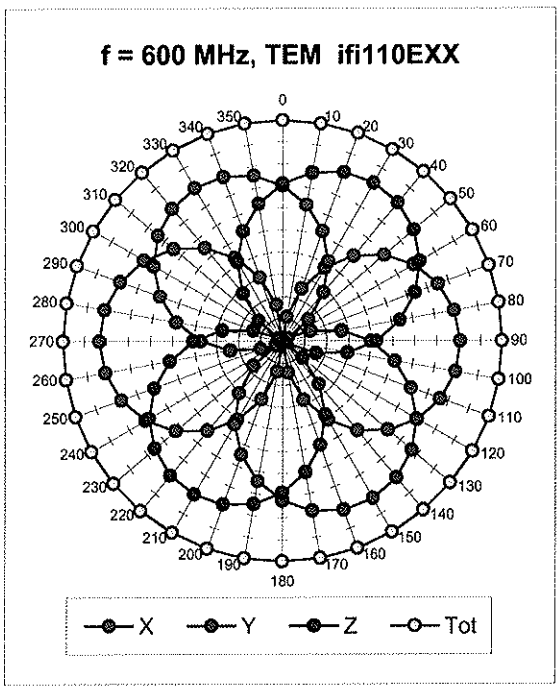
Frequency Response of E-Field

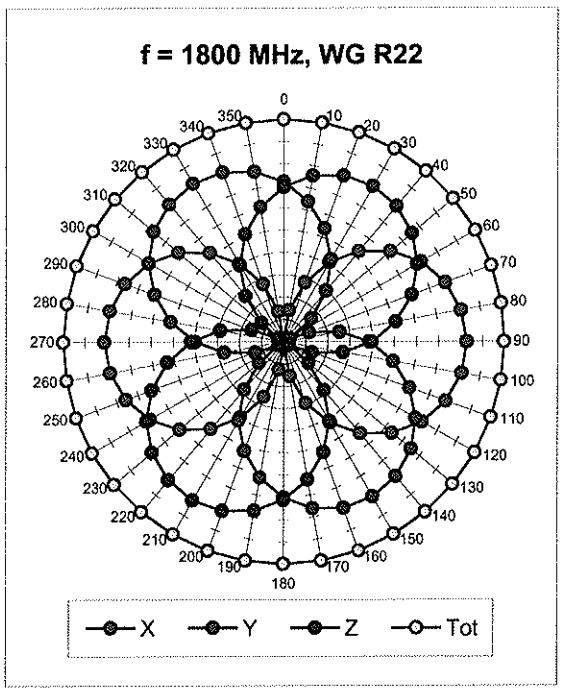
(TEM-Cell:ifi110 EXX, Waveguide: R22)

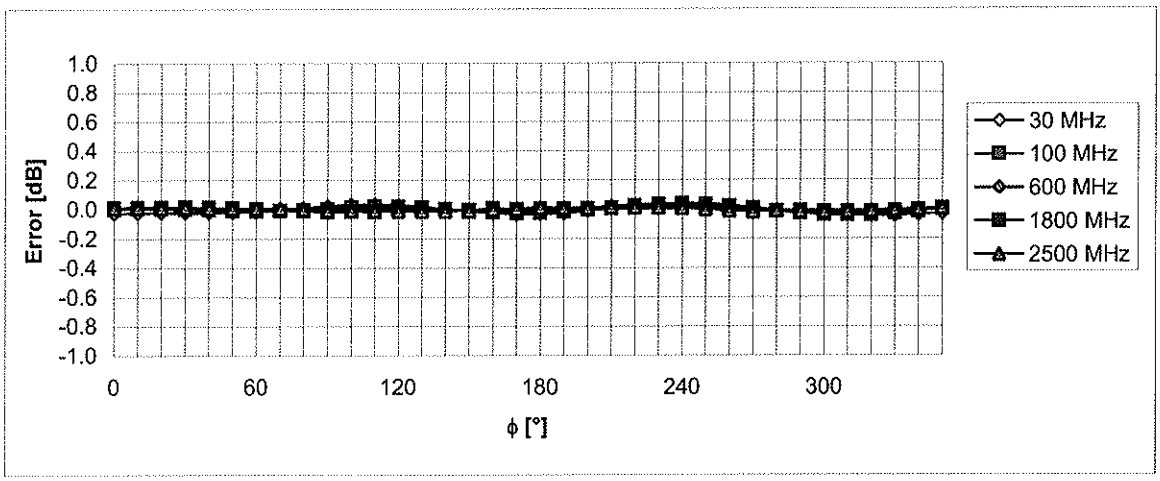


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



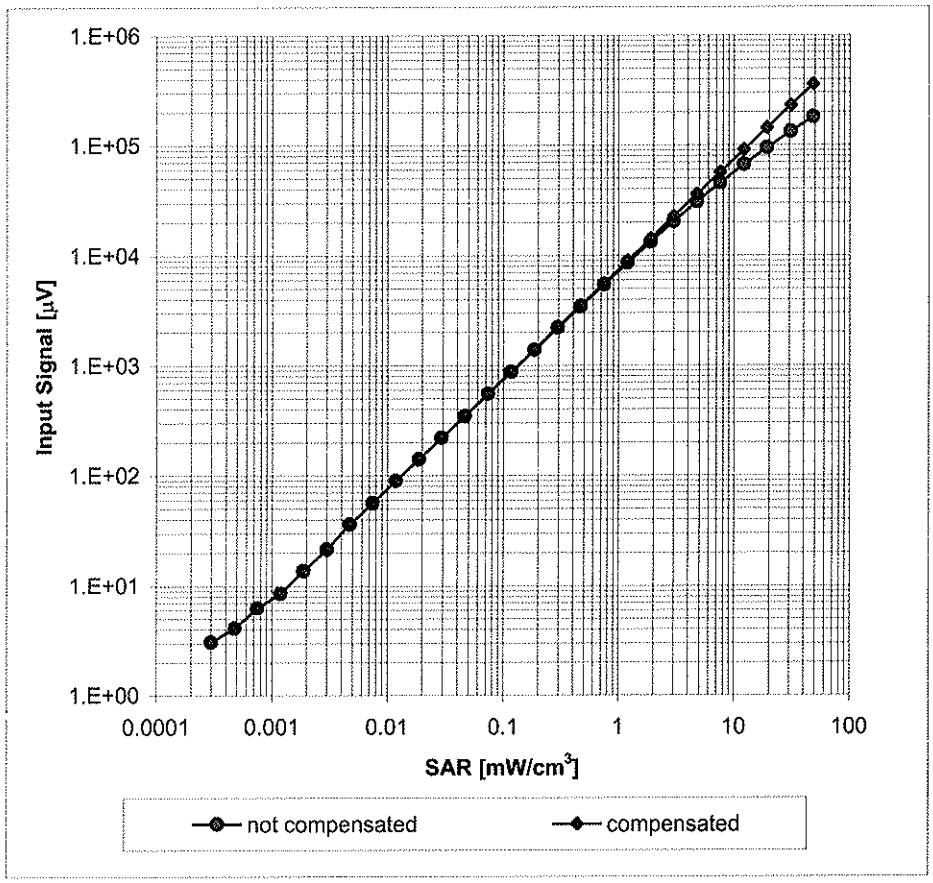


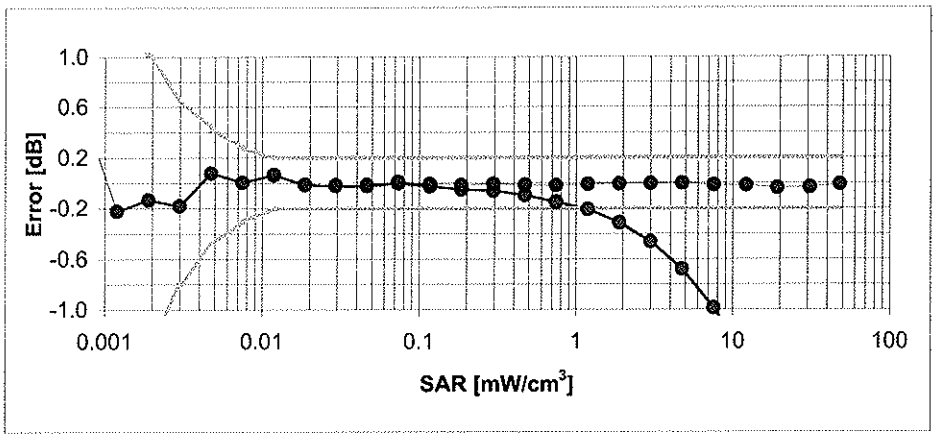


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

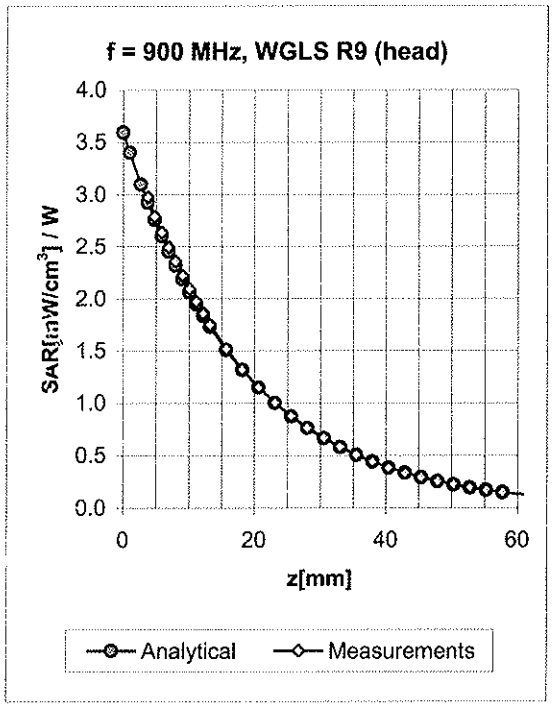
(Waveguide R22, f = 1800 MHz)

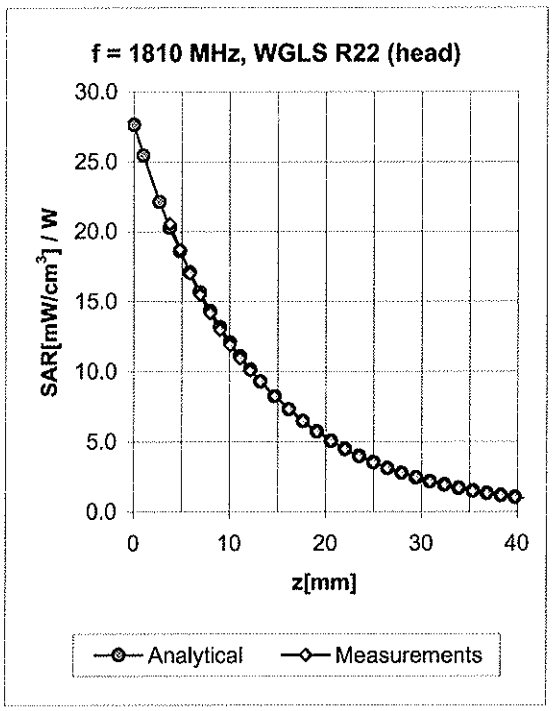




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



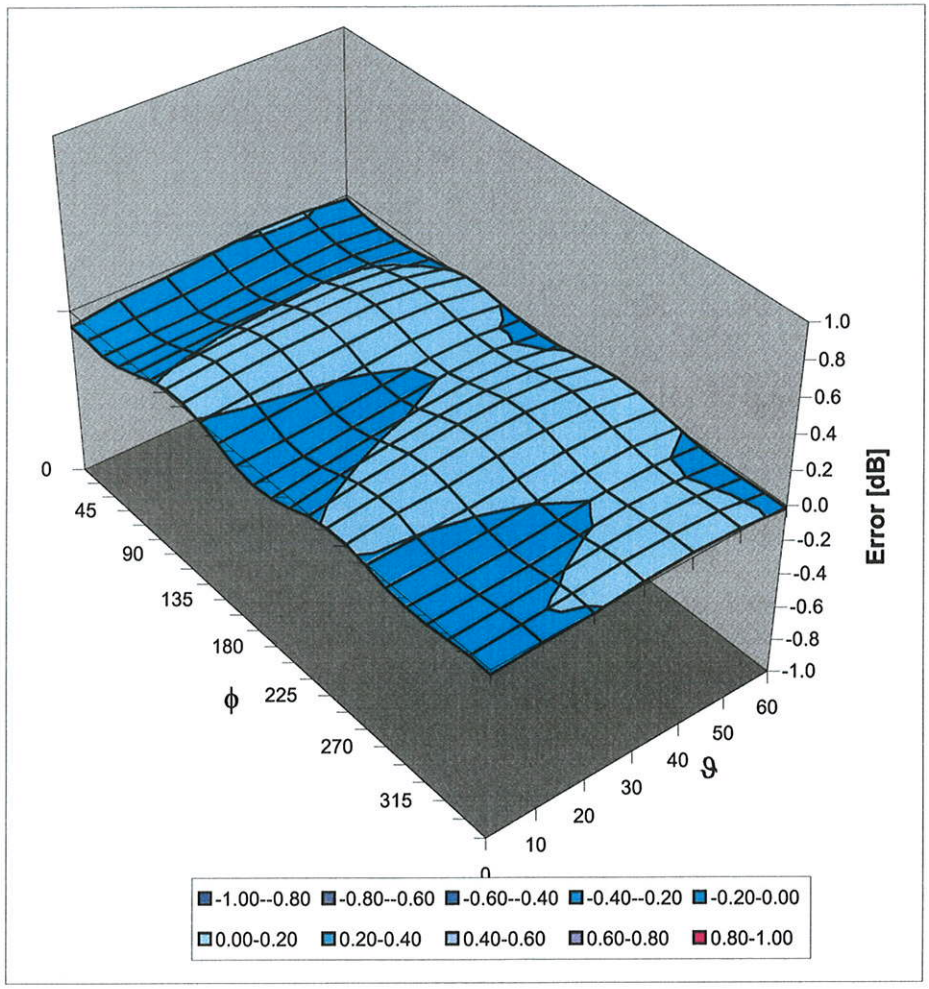


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.41	2.41	5.23 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.61	2.40	4.43 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.81	2.03	4.24 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.99	1.65	3.89 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.41	2.62	5.14 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.90	2.02	4.03 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.99	1.75	4.00 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.99	1.30	3.40 ± 11.0% (k=2)

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

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

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

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

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

Accreditation No.: SCS 108

Client **Motorola MDb**

Certificate No: ES3-3124_Apr09

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3124
Calibration procedure(s)	QA CAL-01.v6 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	April 21, 2009
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bomholt	R&D Director	

Issued: April 22, 2009

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV3

SN:3124

Manufactured:	July 11, 2006
Last calibrated:	March 17, 2008
Recalibrated:	April 21, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV3 SN:3124

Sensitivity in Free Space[A]

NormX	**1.26** ± 10.1%	$\mu V/(V/m)^2$
NormY	**1.33** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**1.34** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	**95** mV
DCP Y	**96** mV
DCP Z	**95** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

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

Sensor Center to Phantom Surface Distance		**3.0 mm**	**4.0 mm**
SAR_{be} [%]	Without Correction Algorithm	9.5	5.3
SAR_{be} [%]	With Correction Algorithm	0.8	0.5

TSL **1810 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**3.0 mm**	**4.0 mm**
SAR_{be} [%]	Without Correction Algorithm	9.7	5.6
SAR_{be} [%]	With Correction Algorithm	0.8	0.3

Sensor Offset

Probe Tip to Sensor Center **2.0** mm

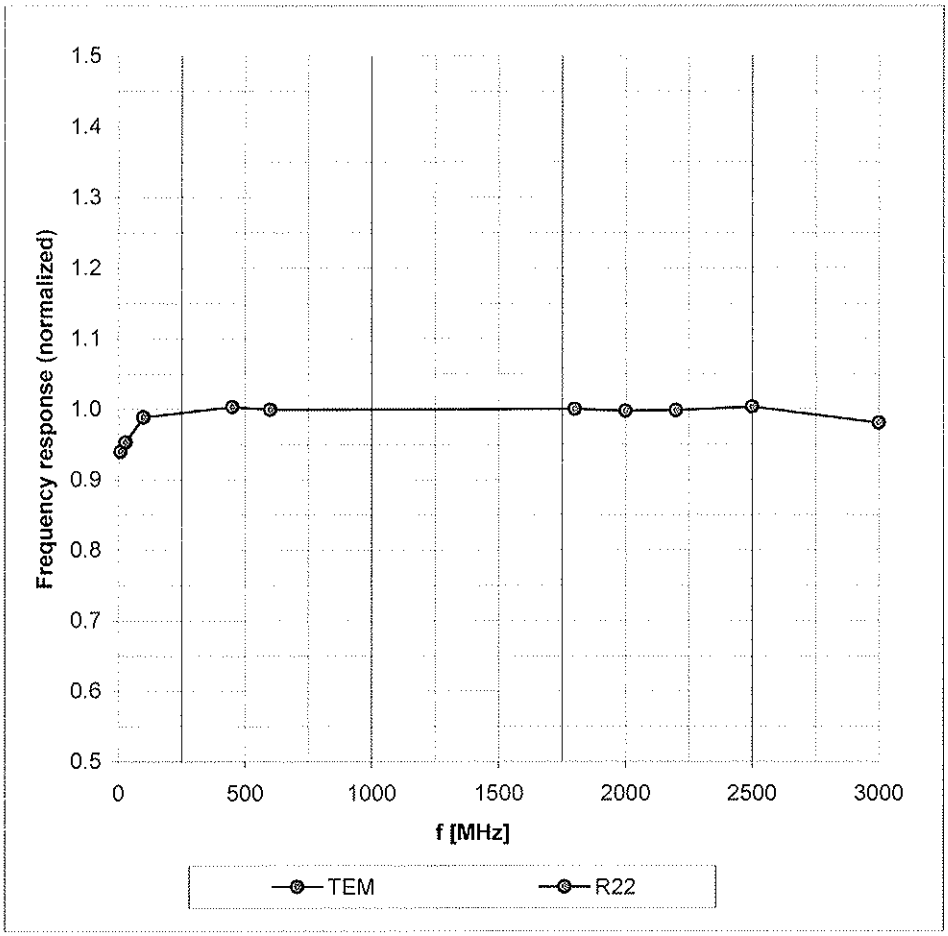
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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

[B] Numerical linearization parameter: uncertainty not required.

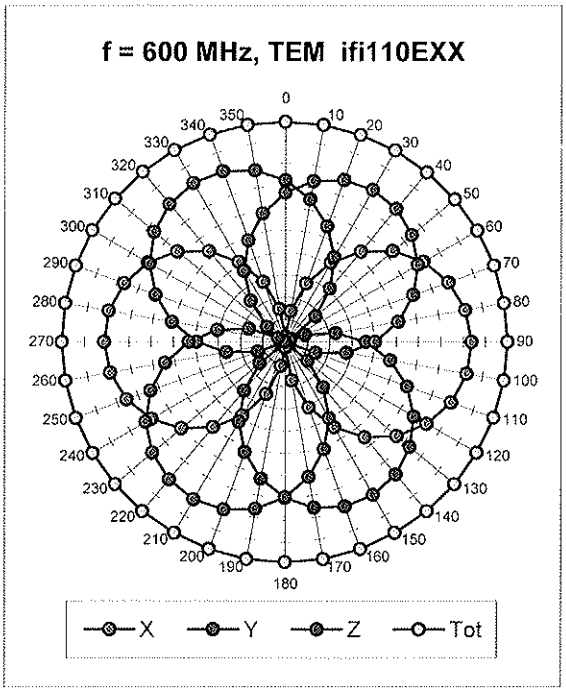
Frequency Response of E-Field

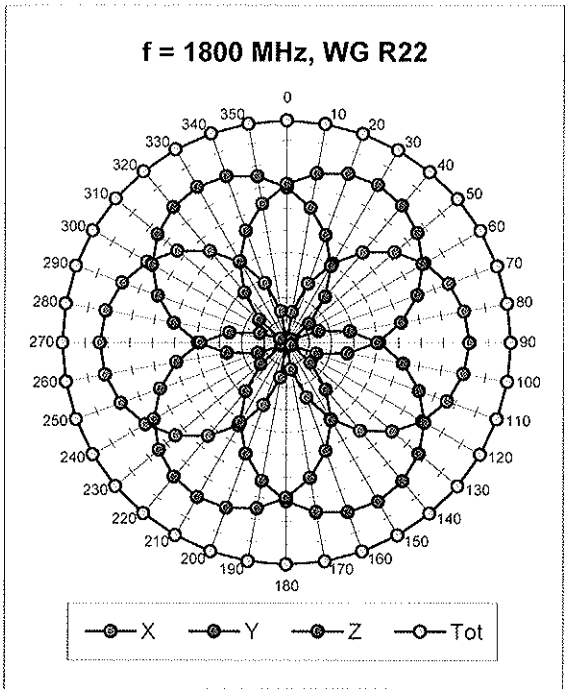
(TEM-Cell:ifi110 EXX, Waveguide: R22)

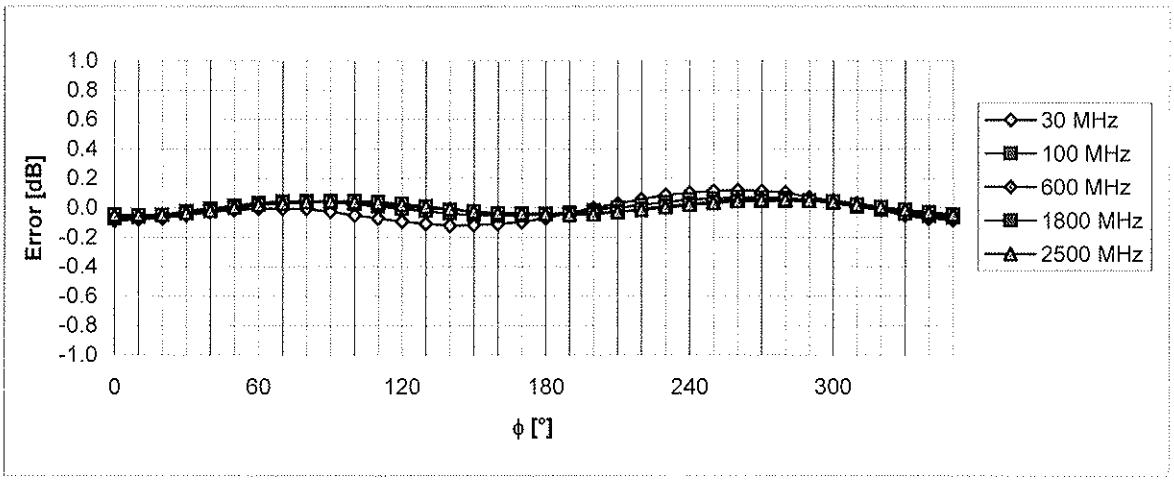


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



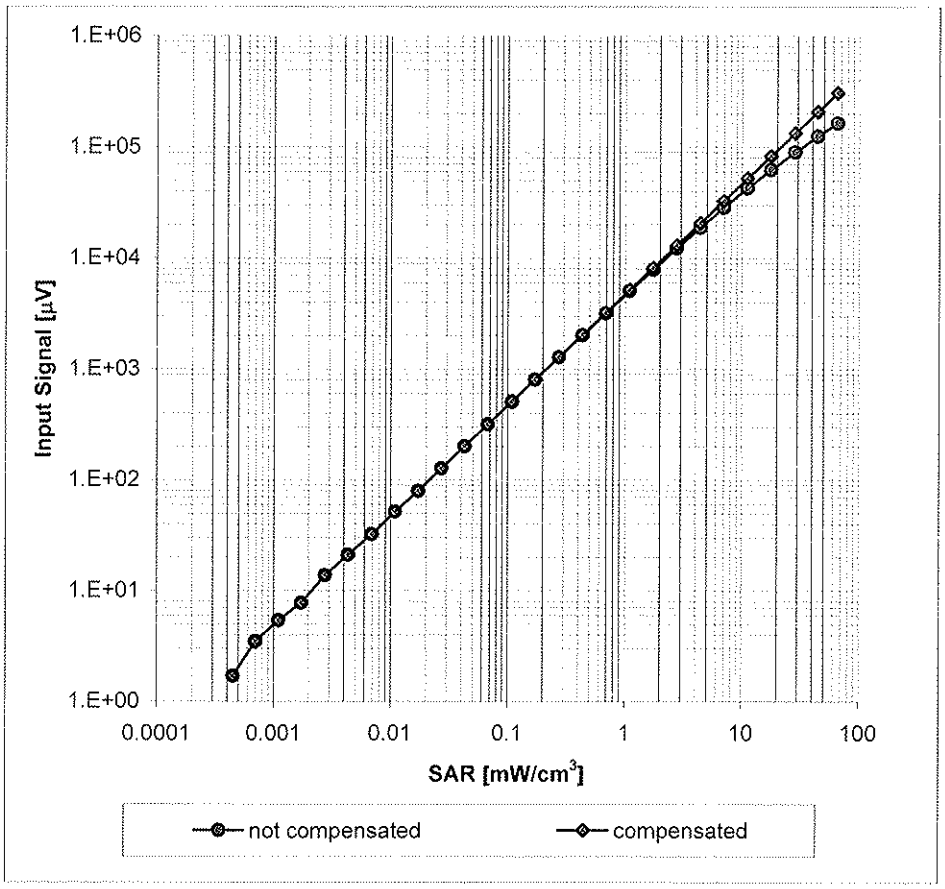


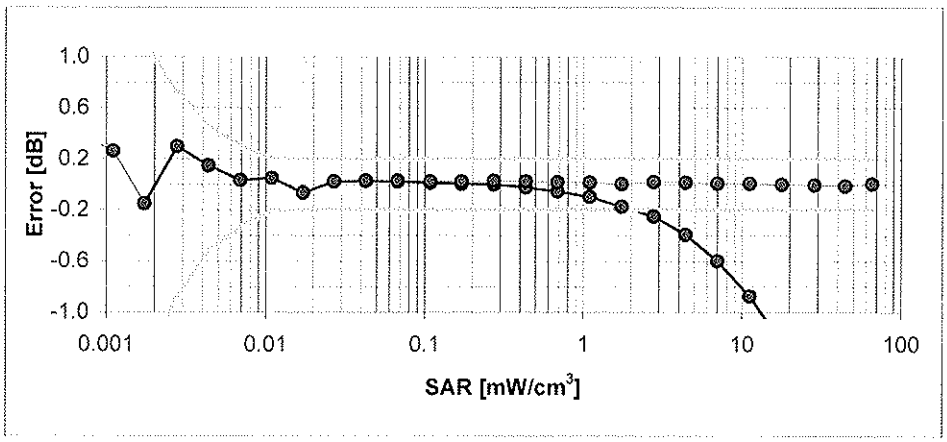


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

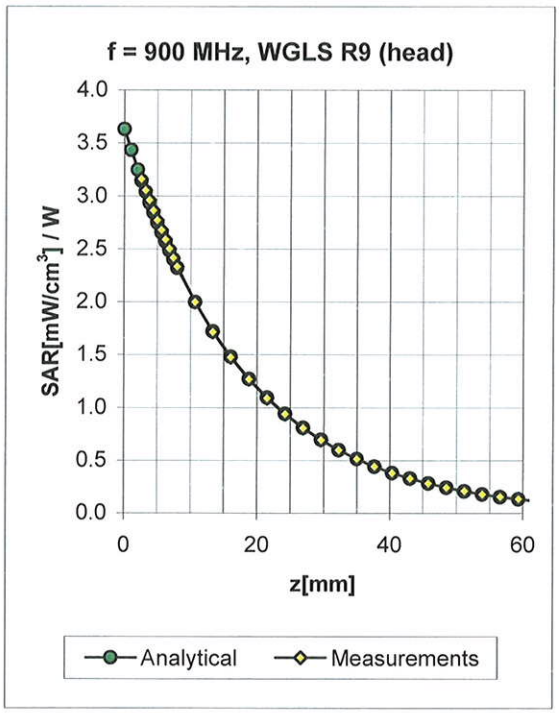
(Waveguide R22, f = 1800 MHz)

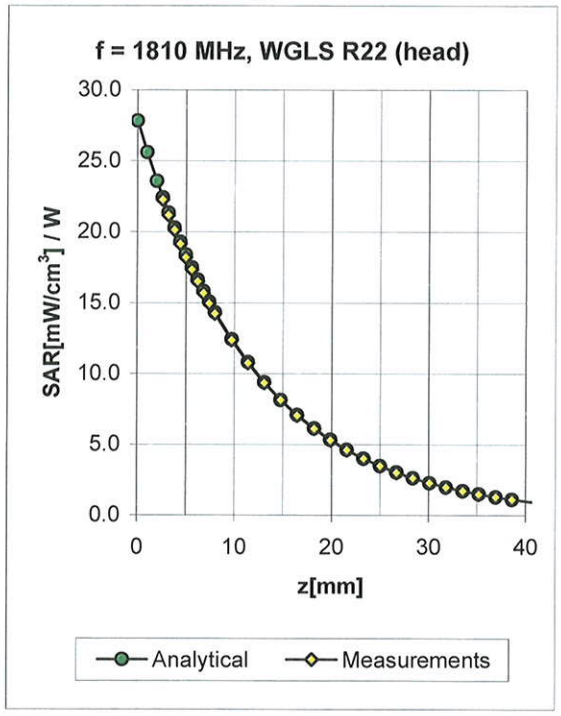




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



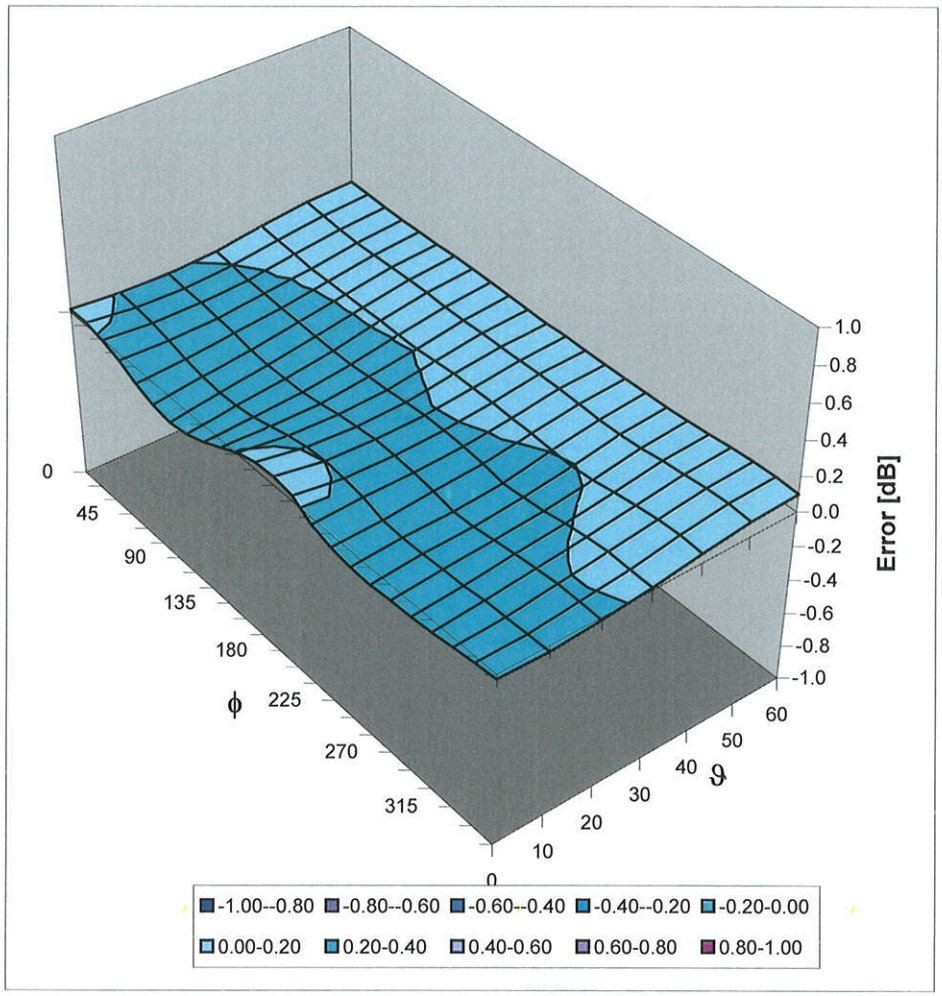


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.91	1.07	5.73	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.53	1.44	4.95	± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.49	1.51	4.78	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.59	1.47	4.42	± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.92	1.12	5.73	± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.49	1.70	4.75	± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.53	1.73	4.69	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.99	1.09	4.05	± 11.0% (k=2)

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

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Appendix 5

Measurement Uncertainty Budget

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	**IEEE 1528 section**	**Tol. (± %)**	**Prob Dist**	**Div.**	**c_i (1 g)**	**c_i (10 g)**	**1 g u_i (±%)**	**10 g u_i (±%)**	**v_i**
Measurement System									
Probe Calibration	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)			*k*=2				22.2	21.6	

Appendix 6

Dipole Characterization Certificate

Certification of System Performance Check Targets

FCD-1806, rev-1

-Historical Data-

	900 MHz	
Reference Target:	10.9	**(W/kg)**
Measurement Uncertainty (k=1):	9.0%	
Measurement Period:	*15April08 - 26March09*	
# of tests performed:	1,099	
Grand Average:	11.19	**(W/kg)**
% Delta (Average - Reference Target)	2.7%	
Is % Delta <= Expanded Measurement Uncertainty (k=2)?	**Yes**	
Accept/Reject Average as new system performance check target?	**ACCEPT**	
	Applies to Dipole SN's: 55, 69, 77, 78, 79, 80, 91, 92, 93, 94, 95, 96, 97, 1d034, 1d035	

-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

Frequency	SAR Target (W/kg)	Permittivity Target +/- %	Conductivity (S/m) Target +/- %
900 MHz	**11.19**	41.5 +/- 5%	0.97 +/- 5%

-Approvals-

Submitted by: Marge Kaunas Date: 1-Apr-09

Signed: Marge Kaunas

Comments: Data file available upon request.

Approved by: Steve Hauswirth **Date:** 1-Apr-09

Signed: Steven Hauswirth

Comments:

Certification of System Performance Check Targets

FCD-1806, rev-1

-Historical Data-

	1800 MHz	
Reference Target:	38.4	**(W/kg)**
Measurement Uncertainty (k=1):	9.0%	
Measurement Period:	*15April08 - 26March09*	
# of tests performed:	929	
Grand Average:	37.91	**(W/kg)**
% Delta (Average - Reference Target)	-1.3%	
Is % Delta <= Expanded Measurement Uncertainty (k=2)?	**Yes**	
Accept/Reject Average as new system performance check target?	**ACCEPT**	
	Applies to Dipole SN's: 246tr, 250tr, 251tr, 259tr, 263tr, 271tr, 272tr, 276tr, 277tr, 279tr, 280tr, 281tr, 283tr, 284tr, 2d128, 2d129	

-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

Frequency	SAR Target (W/kg)	Permittivity Target +/- %	Conductivity (S/m) Target +/- %
1800 MHz	**37.91**	40.0 +/- 5%	1.40 +/- 5%

-Approvals-

Submitted by: Marge Kaunas Date: 1-Apr-09

Signed: Marge Kaunas

Comments: Data file available upon request.

Approved by: Steve Hauswirth **Date:** 1-Apr-09

Signed: Steven Hauswirth

Comments:

Certification of System Performance Check Targets

FCD-1806, rev-1

-Historical Data-

	2450 MHz	
Reference Target:	52.4	**(W/kg)**
Measurement Uncertainty (k=1):	9.0%	
Measurement Period:	*15April08 - 26March09*	
# of tests performed:	150	
Grand Average:	56.68	**(W/kg)**
% Delta (Average - Reference Target)	8.2%	
Is % Delta <= Expanded Measurement Uncertainty (k=2)?	**Yes**	
Accept/Reject Average as new system performance check target?	**ACCEPT**	
	Applies to Dipole SN's: **740, 766, 767, 788, 789**	

-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

Frequency	SAR Target (W/kg)	Permittivity Target +/- %	Conductivity (S/m) Target +/- %
2450 MHz	**56.68**	39.2 +/- 10%	1.80 +/- 5%

-Approvals-

Submitted by: Marge Kaunas Date: 1-Apr-09

Signed: Marge Kaunas

Comments: Data file available upon request.

Approved by: Steve Hauswirth **Date:** 1-Apr-09

Signed: Steven Hauswirth

Comments:

END OF REPORT