



**MOTOROLA**

**Portable Cellular Phone SAR Test Report**

**Test Report #:** 20426-1F  
**Date of Report:** 5/25/2007  
**Date of Test:** 5/4/2007 to 5/22/2007  
**FCC ID #:** **IHDT56HW1**  
**Generic Name:** **MRQ6-334411A11**  
**Laboratory:** Motorola Mobile Devices Business Product Safety & Compliance Laboratory  
600 N. US Highway 45  
Libertyville, Illinois 60048

Paul Ma

**Report Author:**

RF Engineer

This laboratory is accredited to ISO/IEC 17025-1999 to perform the following tests:

Tests:  
Electromagnetic Specific Absorption Rate

Procedures:  
IEC 62209-1  
RSS-102  
IEEE 1528 - 2003  
FCC OET Bulletin 65 (including Supplement C)  
Australian Communications Authority Radio  
Communications (Electromagnetic Radiation – Human  
Exposure) Standard 2003  
CENELEC EN 50360 (2001)  
CENELEC EN 50361 (2001)  
ARIB Std. T-56 (2002)

**Accreditation:**



On the following products or types of products:

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

A2LA certificate # 2518-02

**Statement of Compliance:**

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

(none)

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The results and statements contained herein relate only to the items tested. The names of individuals involved may be mentioned only in connection with the statements or results from this report.

Motorola encourages all feedback, both positive and negative, on this test report.

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## 1. Introduction

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

For ANSI / IEEE C95.1 (1g), the final SAR reading for this phone is 1.29 W/kg for head adjacent use and 1.53 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

<b>Type</b>	Internal	
<b>Location</b>	Bottom of Transceiver	
<b>Dimensions</b>	Length	15.6 mm
	Width	61.3 mm
<b>Configuration</b>	FICA	

### 2.2 Device description

<b>Serial Number</b>	<b>1NR0890114</b>														
<b>Mode(s) of Operation</b>	UMTS 800	UMTS 1900	GSM 850	GSM 900	GSM 1800	GSM 1900	GPRS 850	GPRS 900	GPRS 1800	GPRS 1900	EDGE 850	EDGE 900	EDGE 1800	EDGE 1900	Bluetooth
<b>Modulation Mode(s)</b>	QPSK	QPSK	GMSK	GMSK	GMSK	GMSK	GMSK	GMSK	GMSK	GMSK	8PSK	8PSK	8PSK	8PSK	GFSK
<b>Maximum Output Power Setting</b>	24.00 dBm	24.00 dBm	33.00 dBm	33.00 dBm	30.00 dBm	30.00 dBm	33.00 dBm	33.00 dBm	30.00 dBm	30.00 dBm	27.50 dBm	27.50 dBm	26.50 dBm	26.50 dBm	4.0 dBm
<b>Duty Cycle</b>	1:1	1:1	1:8	1:8	1:8	1:8	2:8	2:8	2:8	2:8	2:8	2:8	2:8	2:8	1:1
<b>Transmitting Frequency Range(s)</b>	826.4-846.6 MHz	1852.4-1907.6 MHz	824.2-848.8 MHz	880.2-914.8 MHz	1710.2-1784.8 MHz	1850.2-1909.8 MHz	824.2-848.8 MHz	880.2-914.8 MHz	1710.2-1784.8 MHz	1850.2-1909.8 MHz	824.2-848.8 MHz	880.2-914.8 MHz	1710.2-1784.8 MHz	1850.2-1909.8 MHz	2400.0-2483.5 MHz
<b>Production Unit or Identical Prototype (47 CFR §2.908)</b>	Identical Prototype														
<b>Device Category</b>	Portable														
<b>RF Exposure Limits</b>	General Population / Uncontrolled														

### 3. Test Equipment Used

#### 3.1 Dosimetric System

The Motorola Mobile Devices Business Product Safety & Compliance Laboratory utilizes a Dosimetric Assessment System (Dasy4™ v4.7) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure. The overall 10g RSS uncertainty of the measurement system is  $\pm 10.8\%$  (K=1) with an expanded uncertainty of  $\pm 21.6\%$  (K=2). The overall 1g RSS uncertainty of the measurement system is  $\pm 11.1\%$  (K=1) with an expanded uncertainty of  $\pm 22.2\%$  (K=2). The measurement uncertainty budget is given in Appendix 6. Per IEEE 1528, this uncertainty budget is applicable to the SAR range of 0.4W/kg to 10W/kg.

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

Description	Serial Number	Cal Due Date
DASY4™ DAE4	661	9/1/2007
E-Field Probe ES3DV3	3037	11/23/2007
Dipole Validation Kit, D900V2	091	
S.A.M. Phantom used for 800/900MHz	TP-1005	
Dipole Validation Kit, D1800V2	259TR	
S.A.M. Phantom used for 1800/1900	TP-1139	

#### 3.2 Additional Equipment

Description	Serial Number	Cal Due Date
Signal Generator HP8648C	3847A04822	6/30/2007
Signal Generator HP8648C	3847A04832	6/30/2007
Power Meter E4419B	GB39510961	7/5/2007
Power Meter E4419B	GB39511084	12/27/2007
Power Sensor #1 - 9301A	US39211008	6/28/2007
Power Sensor #2 - 9301A	US39211009	6/28/2007
Power Sensor #1 - 9301A	US39210929	9/7/2007
Power Sensor #2 - 9301A	US39210930	8/17/2007
Network Analyzer HP8753ES	US39172529	9/26/2007
Dielectric Probe Kit HP85070B	US99360070	

**4. Electrical parameters of the tissue simulating liquid**

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

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			$\epsilon_r$	$\sigma$ (S/m)	Temp (°C)
835	Head	Measured, 5/16/2007	42.8	0.92	19.6
		Measured, 5/17/2007	42.8	0.93	19.8
		Measured, 5/21/2007	42.1	0.91	19.0
		Recommended Limits	41.5 ±5%	0.90 ±5%	18-25
	Body	Measured, 5/16/2007	53.6	0.98	19.3
		Recommended Limits	55.2 ±5%	0.97 ±5%	18-25
900	Head	Measured, 5/16/2006	42.1	0.99	19.6
		Measured, 5/21/2006	41.3	0.98	19.6
		Recommended Limits	41.5 ±5%	0.97 ±5%	18-25
	Body	Measured, 5/16/2007	52.9	1.05	19.3
		Recommended Limits	55.0 ±5%	1.05 ±5%	18-25
1750	Head	Measured, 5/13/2007	38.7	1.33	19.0
		Measured, 5/16/2007	38.8	1.31	18.8
		Recommended Limits	40.1 ±5%	1.35 ±5%	18-25
	Body	Measured, 5/17/2007	51.4	1.42	19.1
		Recommended Limits	53.4 ±5%	1.49 ±5%	18-25
1880	Head	Measured, 5/13/2007	38.1	1.47	18.6
		Measured, 5/17/2007	39.1	1.47	19.5
		Recommended Limits	40.0 ±5%	1.40 ±5%	18-25
	Body	Measured, 5/17/2007	50.9	1.58	19.1
		Recommended Limits	53.3 ±5%	1.52 ±5%	18-25

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

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

## 5. System Accuracy Verification

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

A SAR measurement was performed to verify the measured SAR was within  $\pm 10\%$  from the target SAR indicated in Section 8.3.7 Reference SAR Values in [5] or Appendix 7 for the 900MHz target reference SAR value. These tests were done at 900MHz, 1800MHz. These frequencies are within  $\pm 10\%$  of the compliance test mid-band frequency as required in [1] and [5]. The test was conducted on the same days as the measurement of the DUT. Recommended limits for permittivity and conductivity, specified in [5], are shown in the table below. The obtained results from the system accuracy verification are also displayed in the table below. SAR values are normalized to 1W forward power delivered to the dipole. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values. The distributions of SAR compare well with those of the reference measurements (see Appendix 1). The tissue stimulant depth was verified to be 15.0cm  $\pm 0.5$ cm. Z-axis scans showing the SAR penetration are also included in Appendix 1.

f (MHz)	Description	SAR (W/kg), 1gram	Dielectric Parameters		Ambient Temp (°C)	Tissue Temp (°C)
			$\epsilon_r$	$\sigma$ (S/m)		
900	Measured, 5/16/2007	11.2	42.1	0.99	19.6	19.6
	Measured, 5/17/2007	10.7	42.0	0.99	19.8	19.8
	Measured, 5/21/2007	10.7	41.3	0.98	20.0	19.4
	Recommended Limits	11.2	41.5 $\pm 5\%$	0.97 $\pm 5\%$	18-25	18-25
1800	Measured, 5/12/2007	37.1	38.7	1.35	20.0	20.5
	Measured, 5/16/2007	39.6	38.6	1.36	19.6	19.9
	Measured, 5/17/2007	40.1	39.5	1.39	19.8	19.5
	Recommended Limits	38.1	40.0 $\pm 5\%$	1.4 $\pm 5\%$	18-25	18-25

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3037	900	6.25	8 of 9
		1810	5.17	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 setup to the proper channel, transmitter power level and transmit mode of operation. The phone was tested in the configurations stipulated in [1], [4] and [5]. The phone was positioned into these configurations using the device holder supplied with the DASY4™ SAR measurement system. The measured dielectric constant of the material used for the device holder is less than 2.9 and the loss tangent is less than 0.02 ( $\pm 30\%$ ) at 850MHz. The default settings for the “coarse” and “cube” scans were chosen and used for measurements. The grid spacing of the course scan was set to 15cm 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 SNN5759A – 1640 mAH Battery

Model SNN5771A – 850 mAH Battery

Model SNN5782A – 1100 mAH Battery

The battery with the highest capacity is the SNN5759A. This battery was used to do most of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery.

Per the “Preliminary Guidance for Reviewing Applications for Certifications of 3G Devices” released on May 9, 2006, RC1, RC3 and RC3 (FCH + SCH) CDMA modes were considered. The conducted power measurements (per steps 3, 4 & 10 of section 4.4.5.2 of 3GPP2 C.5.011 / TIA -98-E) for each mode are shown in the table below.

	<b>Channel</b>	<b>RB Test Mode</b>	<b>AMR Voice</b>
<b>WCDMA 850</b>	<b>4132</b>	<b>23.94</b>	<b>23.93</b>
	<b>4180</b>	<b>24.02</b>	<b>24.03</b>
	<b>4233</b>	<b>23.92</b>	<b>23.94</b>
<b>WCDMA 1900</b>	<b>9262</b>	<b>24.00</b>	<b>23.99</b>
	<b>9400</b>	<b>24.01</b>	<b>23.99</b>
	<b>9538</b>	<b>23.98</b>	<b>23.94</b>

### 6.1 Head Adjacent Test Results

The SAR results shown in tables 1 through 8 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to the [6]. Also shown are the measured conducted output power levels, the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is  $\text{New SAR} = \text{Old SAR} * 10^{(-\text{drift}/10)}$ . The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The left head and right head SAR contour distributions are similar. Because of this similarity, the cheek/touch and 15° tilt test conditions with the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 2. All other test conditions measured lower SAR values than those included in Appendix 2.

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

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3037	900	6.25	8 of 9
		1810	5.17	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	32.96						
	Channel 190	32.90	19.0	-0.16	0.43	0.45	0.59	0.61
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	18.6	0.16	0.39	0.39	0.65	0.65
	Channel 810	29.82						
UMTS 800	Channel 4132	23.93						
	Channel 4180	24.03	19.0	-0.21	0.47	0.50	0.65	0.68
	Channel 4233	23.94						
UMTS 1900	Channel 9262	23.99	19.5	-0.03	0.54	0.54	0.86	0.86
	Channel 9400	23.99	19.5	-0.04	0.55	0.55	0.88	0.89
	Channel 9538	23.94	19.5	-0.05	0.55	0.56	0.89	0.90

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

Right Head Cheek Position								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.96						
	Channel 190	32.90	19.0	0.13	0.44	0.44	0.60	0.60
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	18.7	0.24	0.37	0.37	0.58	0.58
	Channel 810	29.82						
UMTS 800	Channel 4132	23.93						
	Channel 4180	24.03	19.0	0.05	0.47	0.47	0.64	0.64
	Channel 4233	23.94						
UMTS 1900	Channel 9262	23.99	19.5	-0.13	0.56	0.58	0.86	0.88
	Channel 9400	23.99	19.5	0.15	0.53	0.53	0.83	0.83
	Channel 9538	23.94	19.5	-0.23	0.77	0.81	1.16	1.22

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

Highest Cheek Configuration with Battery SNN5771A								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850 Left Head	Channel 128	32.96						
	Channel 190	32.90	19.6	-0.24	0.45	0.47	0.60	0.64
	Channel 251	32.98						
GSM 1900 Left Head	Channel 512	29.92						
	Channel 661	29.96	18.8	0.07	0.32	0.32	0.51	0.51
	Channel 810	29.82						
UMTS 800 Left Head	Channel 4132	23.93						
	Channel 4180	24.03	19.8	-0.54	0.47	0.53	0.63	0.71
	Channel 4233	23.94						
UMTS 1900 Right Head	Channel 9262	23.99						
	Channel 9400	23.99						
	Channel 9538	23.94	19.5	-0.1	0.81	0.83	1.26	1.29

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

<b>Highest Cheek Configuration with Battery SNN5782A</b>								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850 Left Head	Channel 128	32.96						
	Channel 190	32.90	19.6	-0.12	0.44	0.45	0.60	0.61
	Channel 251	32.98						
GSM 1900 Left Head	Channel 512	29.92						
	Channel 661	29.96	18.8	0.15	0.31	0.31	0.51	0.51
	Channel 810	29.82						
UMTS 800 Left Head	Channel 4132	23.93						
	Channel 4180	24.03	19.8	-0.04	0.46	0.47	0.63	0.64
	Channel 4233	23.94						
UMTS 1900 Right Head	Channel 9262	23.99						
	Channel 9400	23.99						
	Channel 9538	23.94	19.5	-0.1	0.80	0.81	1.24	1.27

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

<b>Left Head 15° Tilt Position</b>								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.96						
	Channel 190	32.90	19.0	0	0.16	0.16	0.21	0.21
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	<b>18.6</b>	<b>0.04</b>	<b>0.15</b>	<b>0.15</b>	<b>0.23</b>	<b>0.23</b>
	Channel 810	29.82						
UMTS 800	Channel 4132	23.93						
	Channel 4180	24.03	19.0	-0.16	0.15	0.16	0.20	0.21
	Channel 4233	23.94						
UMTS 1900	Channel 9262	23.99						
	Channel 9400	23.99	19.5	-0.01	0.27	0.27	0.43	0.43
	Channel 9538	23.94						

**Table 5: SAR measurement results at the highest possible output power, measured in a head 15° Tilt position against the ICNIRP and ANSI SAR Limit.**

Right Head 15° Tilt Position								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.96						
	Channel 190	32.90	19.0	-0.07	0.16	0.17	0.21	0.21
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	18.7	-0.06	0.14	0.14	0.23	0.23
	Channel 810	29.82						
UMTS 800	Channel 4132	23.93						
	Channel 4180	24.03	19.0	0.19	0.09	0.09	0.18	0.18
	Channel 4233	23.94						
UMTS 1900	Channel 9262	23.99						
	Channel 9400	23.99	19.0	0.07	0.25	0.25	0.41	0.41
	Channel 9538	23.94						

**Table 6: SAR measurement results at the highest possible output power, measured in a head 15° Tilt position against the ICNIRP and ANSI SAR Limit.**

Highest Tilt Configuration with Battery SNN5771A								
<i>f</i> (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 Right Head	Channel 128	32.96						
	Channel 190	32.90	19.6	-0.1	0.16	0.16	0.21	0.21
	Channel 251	32.98						
GSM 1900 Left Head	Channel 512	29.92						
	Channel 661	29.96	19.8	0.01	0.13	0.13	0.22	0.22
	Channel 810	29.82						
UMTS 800 Left Head	Channel 4132	23.93						
	Channel 4180	24.03	19.8	0.02	0.16	0.16	0.21	0.21
	Channel 4233	23.94						
UMTS 1900 Left Head	Channel 9262	23.99						
	Channel 9400	23.99	19.5	-0.09	0.32	0.33	0.52	0.53
	Channel 9538	23.94						

**Table 7: SAR measurement results at the highest possible output power, measured in a head 15° Tilt position against the ICNIRP and ANSI SAR Limit.**

Highest Tilt Configuration with Battery SNN5782A								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
<b>GSM 850 Right Head</b>	<b>Channel 128</b>	32.96						
	<b>Channel 190</b>	32.90	19.6	-0.03	0.08	0.08	0.17	0.17
	<b>Channel 251</b>	32.98						
<b>GSM 1900 Left Head</b>	<b>Channel 512</b>	29.92						
	<b>Channel 661</b>	29.96	18.8	-0.1	0.14	0.14	0.23	0.23
	<b>Channel 810</b>	29.82						
<b>UMTS 800 Left Head</b>	<b>Channel 4132</b>	23.93						
	<b>Channel 4180</b>	24.03	19.8	-0.03	0.15	0.15	0.20	0.20
	<b>Channel 4233</b>	23.94						
<b>UMTS 1900 Left Head</b>	<b>Channel 9262</b>	23.99						
	<b>Channel 9400</b>	23.99	19.5	-0.06	0.30	0.30	0.47	0.48
	<b>Channel 9538</b>	23.94						

**Table 8: SAR measurement results at the highest possible output power, measured in a head 15° Tilt position against the ICNIRP and ANSI SAR Limit**

## 6.2 Body Worn Test Results

The SAR results shown in tables 9 through 15 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.

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

A “flat” phantom was for the body-worn tests. This “flat” phantom is made out of 1” thick natural High Density Polyethylene with a thickness at the bottom equal to 2.0mm. It measures 52.7cm(long) x 26.7cm(wide) x 21.2cm(tall). The 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 2.184GHz.

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

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facing the phantom. For voice mode operation, the phone was placed as a distance of 15mm from the phantom. For data mode operation, the phone was placed as a distance of 25mm from the phantom. 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:

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3037	900	6.07	8 of 9
		1810	4.73	8 of 9

Body-Worn; Front of Phone 15mm 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	32.96						
	Channel 190	32.90	19.0	-0.18	0.26	0.27	0.35	0.37
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	19.9	0.01	0.16	0.16	0.25	0.25
	Channel 810	29.82						
UMTS 800	Channel 4132	23.93						
	Channel 4180	24.03	19.0	-0.02	0.25	0.25	0.35	0.35
	Channel 4233	23.94						
UMTS 1900	Channel 9262	23.99						
	Channel 9400	23.99	19.9	-0.11	0.34	0.35	0.55	0.56
	Channel 9538	23.94						

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

Body-Worn; Back of Phone 15mm from Phantom								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.96						
	Channel 190	32.90	19.0	0	0.37	0.37	0.50	0.50
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	19.9	0.03	0.18	0.18	0.30	0.30
	Channel 810	29.82						
UMTS 800	Channel 4132	23.93						
	Channel 4180	24.03	19.0	0	0.37	0.37	0.50	0.50
	Channel 4233	23.94						
UMTS 1900	Channel 9262	23.99						
	Channel 9400	23.99	19.9	-0.02	0.38	0.38	0.62	0.62
	Channel 9538	23.94						

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

Body-Worn; Back of Phone 15 mm from Phantom with Bluetooth Mode Enabled								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.96						
	Channel 190	32.90	19.0	-0.01	0.43	0.43	0.58	0.58
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	19.9	-0.01	0.24	0.24	0.39	0.39
	Channel 810	29.82						
UMTS 800	Channel 4132	23.93						
	Channel 4180	24.03	18.9	-0.06	0.47	0.48	0.64	0.65
	Channel 4233	23.94						
UMTS 1900	Channel 9262	23.99						
	Channel 9400	23.99	19.9	-0.03	0.46	0.46	0.76	0.77
	Channel 9538	23.94						

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

<b>Body-Worn; Back of Phone 25 mm from Phantom with GPRS Class 12 Mode Enabled</b>								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.96						
	Channel 190	32.90	19.0	-0.13	0.17	0.17	0.22	0.23
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	19.9	-0.04	0.22	0.22	0.36	0.36
	Channel 810	29.82						

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

<b>Body-Worn; Back of Phone 25 mm from Phantom with EDGE Class 12 Mode Enabled</b>								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.96						
	Channel 190	32.90	19.0	-0.04	0.05	0.05	0.07	0.07
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	19.9	-0.08	0.09	0.09	0.15	0.15
	Channel 810	29.82						

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

Body-Worn Configuration with Bluetooth Mode Enabled; Back of Phone 15 mm from Phantom with Battery SNN5771A								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.96						
	Channel 190	32.90	19.3	-0.02	0.53	0.53	0.71	0.72
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	19.1	0.02	0.45	0.45	0.80	0.80
	Channel 810	29.82						
UMTS 800	Channel 4132	23.93						
	Channel 4180	24.03	19.3	-0.09	0.59	0.60	0.80	0.81
	Channel 4233	23.94						
UMTS 1900	Channel 9262	23.99						
	Channel 9400	23.99	19.1	-0.09	0.77	0.78	1.37	1.40
	Channel 9538	23.94						

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

Body-Worn Configuration with Bluetooth Mode Enabled; Back of Phone 15 mm from Phantom with Battery SNN5782A								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
GSM 850	Channel 128	32.96						
	Channel 190	32.90	19.3	0	0.55	0.55	0.74	0.74
	Channel 251	32.98						
GSM 1900	Channel 512	29.92						
	Channel 661	29.96	19.1	-0.03	0.43	0.43	0.76	0.77
	Channel 810	29.82						
UMTS 800	Channel 4132	23.93						
	Channel 4180	24.03	19.3	-0.06	0.60	0.61	0.82	0.83
	Channel 4233	23.94						
UMTS 1900	Channel 9262	23.99						
	Channel 9400	23.99	19.1	-0.12	0.84	0.86	1.49	1.53
	Channel 9538	23.94						

Table 15: 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**

## Test Laboratory: Motorola

### 051207 1800MHz Good at -2.9%

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:259TR**

Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 259tr PM1 Power = 200 mW

Sim.Temp@meas = 20.5 Sim.Temp@SPC = 20.5 Room Temp @ SPC = 20.0

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

Medium: VALIDATION Only; Medium parameters used:  $f = 1800$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 38.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.17, 5.17, 5.17); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Glycol SAM; Type: SAM; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

### Daily SPC Check/Dipole Area Scan (4x9x1):

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

Maximum value of SAR (measured) = 5.97 mW/g

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

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

Reference Value = 78.4 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 13.3 W/kg

**SAR(1 g) = 7.34 mW/g; SAR(10 g) = 3.9 mW/g**

Maximum value of SAR (measured) = 8.16 mW/g

### Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

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

Reference Value = 78.4 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 13.7 W/kg

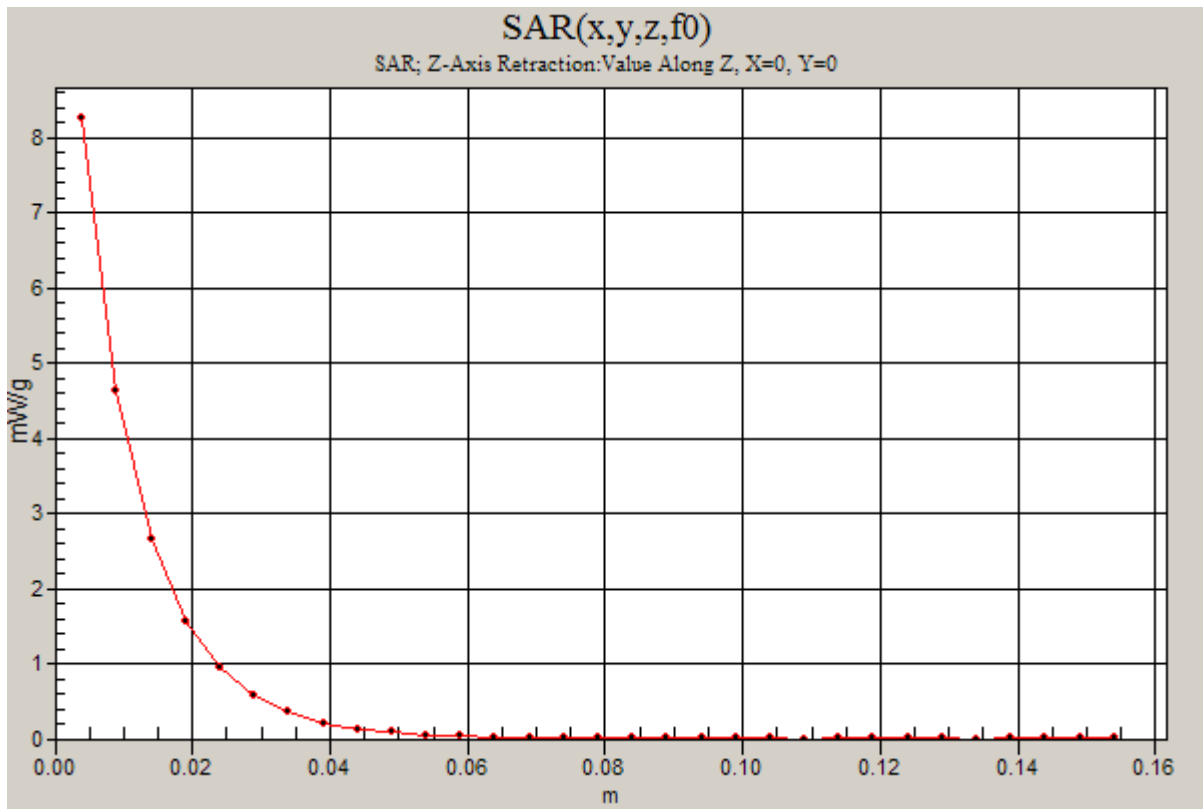
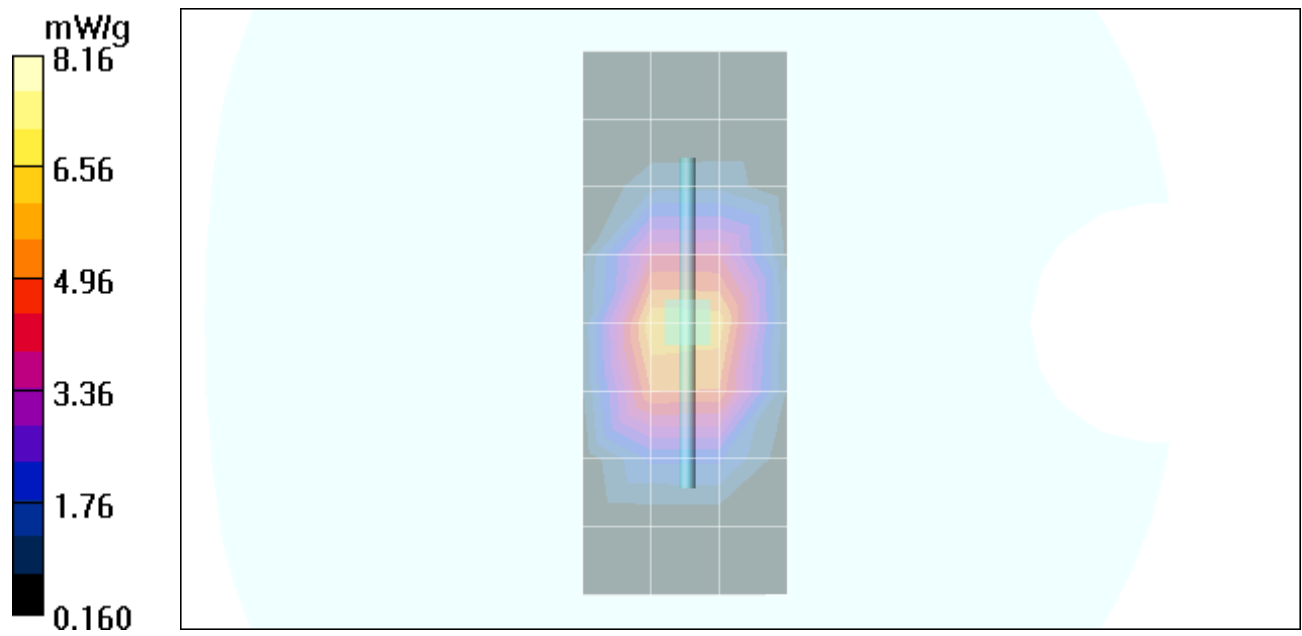
**SAR(1 g) = 7.5 mW/g; SAR(10 g) = 3.99 mW/g**

Maximum value of SAR (measured) = 8.23 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 8.26 mW/g



## Test Laboratory: Motorola

### 051607 900MHz Good at -.1%

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:091**

Procedure Notes: 900 MHz System Performance Check / Dipole Sn# 91 PM1 Power = 200 mW

Sim.Temp@meas = 19.6 Sim.Temp@SPC = 19.6 Room Temp @ SPC = 19.6

Communication System: CW - Dipole; Frequency: 900 MHz; Channel Number: 4; Duty Cycle: 1:1

Medium: VALIDATION Only; Medium parameters used:  $f = 900$  MHz;  $\sigma = 0.99$  mho/m;  $\epsilon_r = 42.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sugar SAM; Type: SAM; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

### Daily SPC Check/Dipole Area Scan (4x9x1):

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

Maximum value of SAR (measured) = 2.33 mW/g

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

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

Reference Value = 48.3 V/m; Power Drift = 0.042 dB

Peak SAR (extrapolated) = 3.37 W/kg

**SAR(1 g) = 2.22 mW/g; SAR(10 g) = 1.42 mW/g**

Maximum value of SAR (measured) = 2.40 mW/g

### Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

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

Reference Value = 48.3 V/m; Power Drift = 0.042 dB

Peak SAR (extrapolated) = 3.46 W/kg

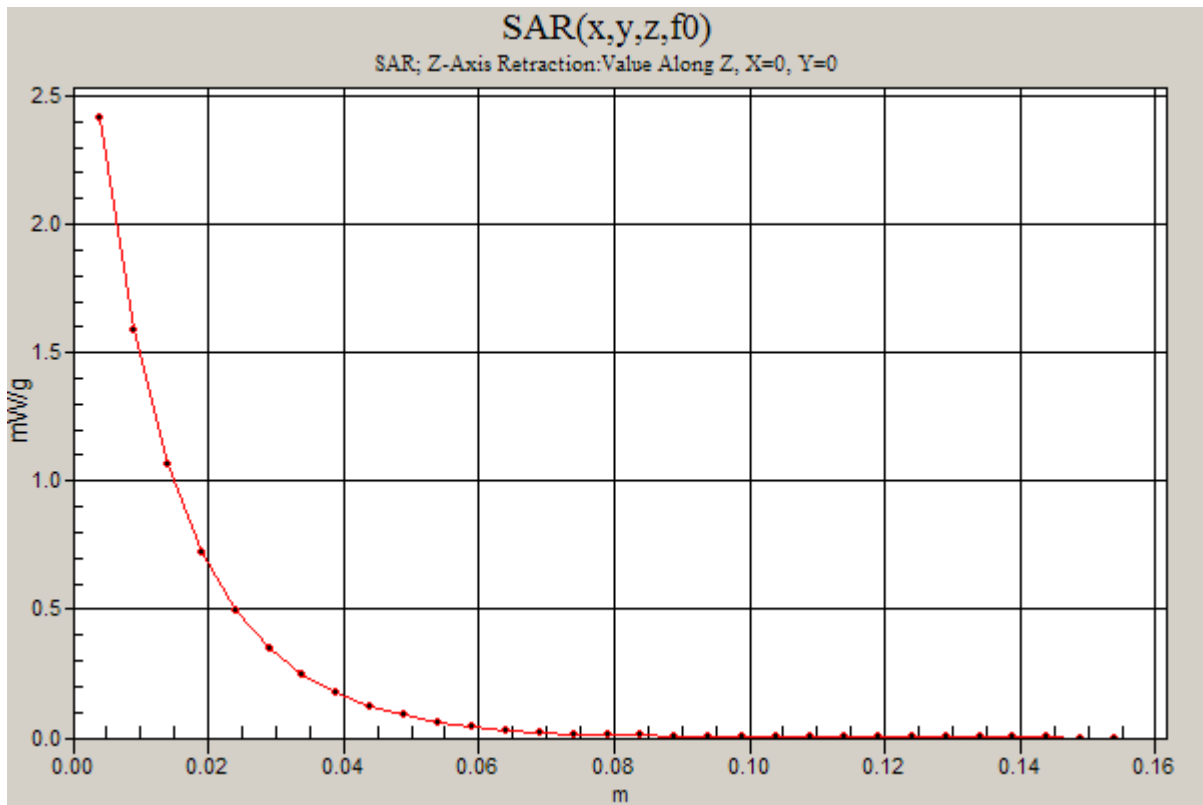
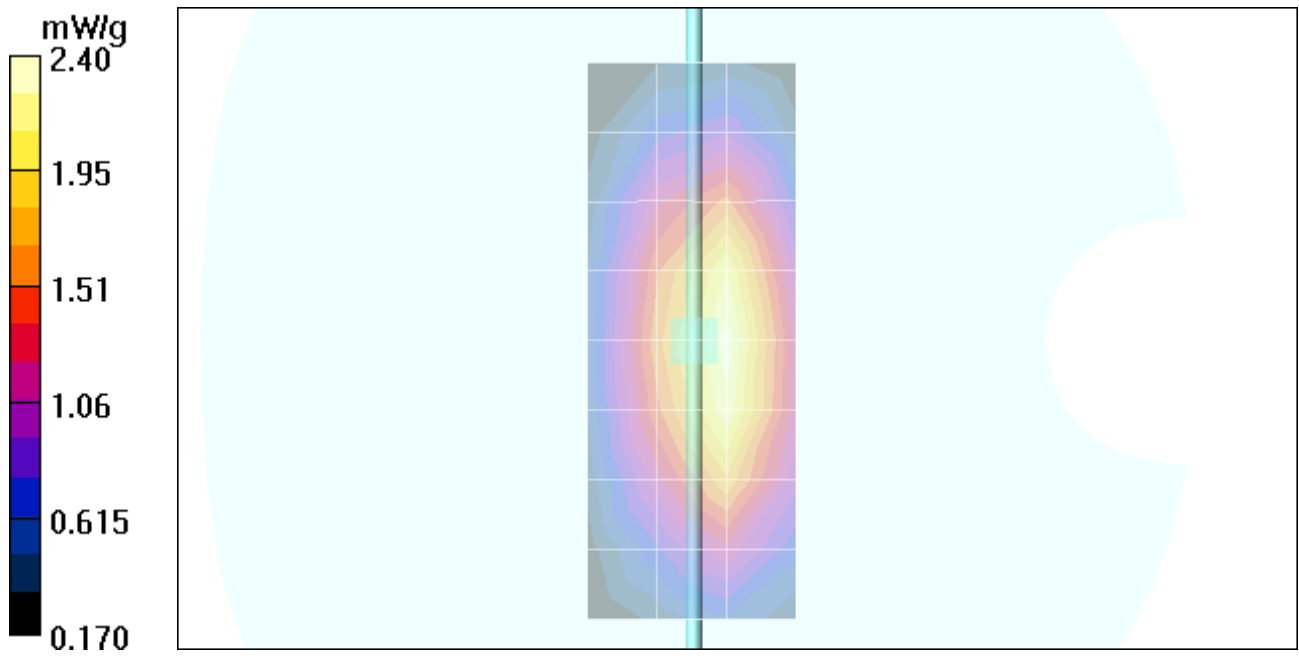
**SAR(1 g) = 2.27 mW/g; SAR(10 g) = 1.45 mW/g**

Maximum value of SAR (measured) = 2.46 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 2.41 mW/g



## Test Laboratory: Motorola

### 051707 1800MHz Good at 5.3%

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:259TR**

Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 259tr PM1 Power = 200 mW

Sim.Temp@meas = 18.7 Sim.Temp@SPC = 19.5 Room Temp @ SPC = 19.8

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

Medium: VALIDATION Only; Medium parameters used:  $f = 1800$  MHz;  $\sigma = 1.39$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.17, 5.17, 5.17); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Glycol SAM; Type: SAM; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

### Daily SPC Check/Dipole Area Scan (4x9x1):

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

Maximum value of SAR (measured) = 7.07 mW/g

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

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

Reference Value = 79.2 V/m; Power Drift = 0.027 dB

Peak SAR (extrapolated) = 14.3 W/kg

**SAR(1 g) = 7.91 mW/g; SAR(10 g) = 4.2 mW/g**

Maximum value of SAR (measured) = 8.82 mW/g

### Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

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

Reference Value = 79.2 V/m; Power Drift = 0.027 dB

Peak SAR (extrapolated) = 14.9 W/kg

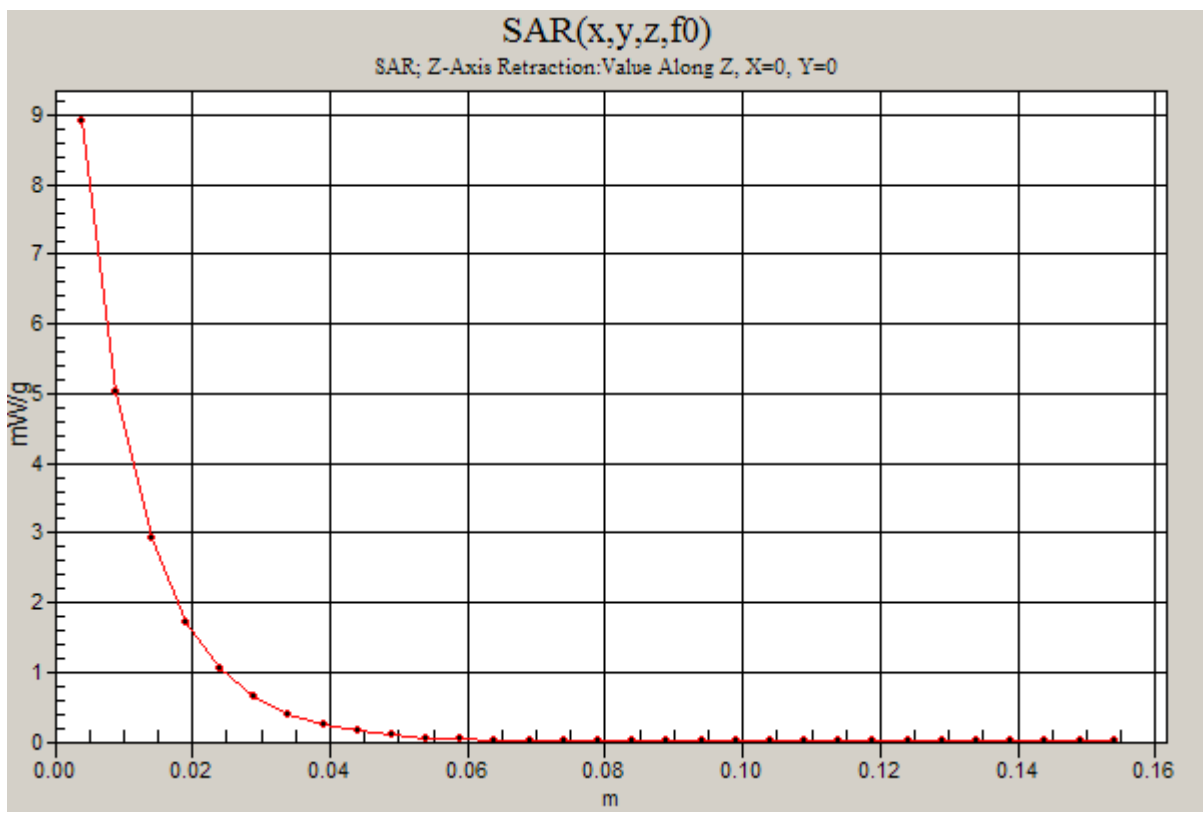
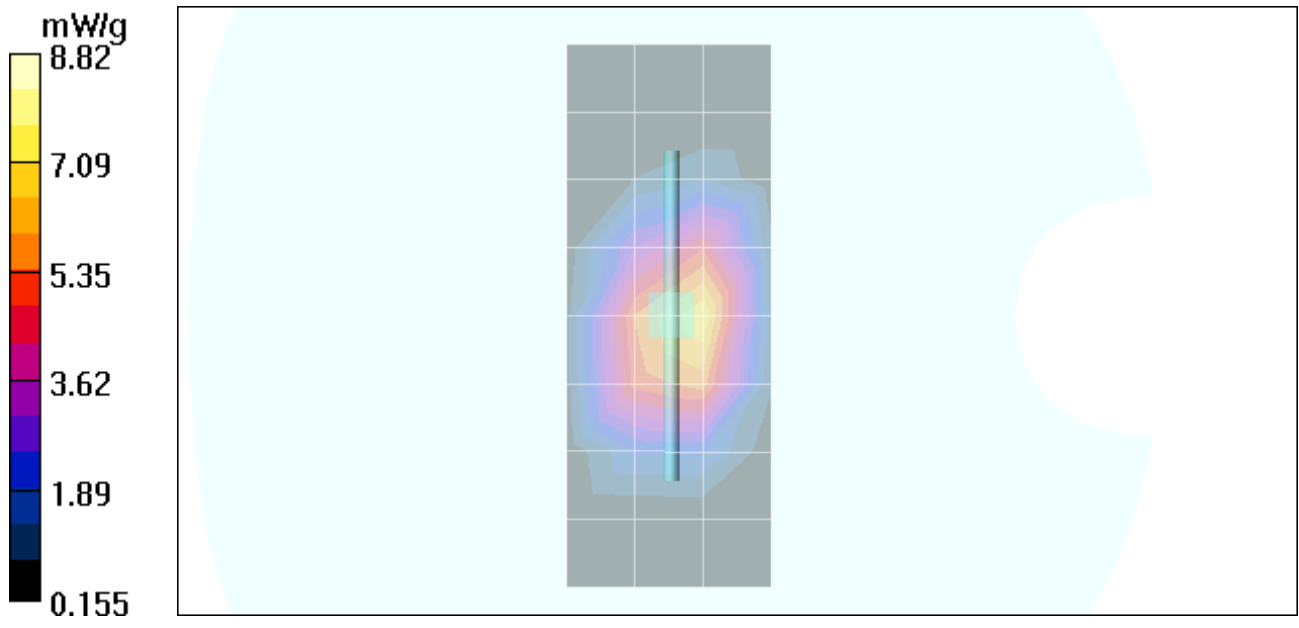
**SAR(1 g) = 8.14 mW/g; SAR(10 g) = 4.28 mW/g**

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

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 8.92 mW/g



## Test Laboratory: Motorola

### 051707 900MHz Good at -4.8%

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:091**

Procedure Notes: 900 MHz System Performance Check / Dipole Sn# 91 PM1 Power = 200 mW

Sim.Temp@meas = 19.8 Sim.Temp@SPC = 19.8 Room Temp @ SPC = 19.8

Communication System: CW - Dipole; Frequency: 900 MHz; Channel Number: 4; Duty Cycle: 1:1

Medium: VALIDATION Only; Medium parameters used:  $f = 900$  MHz;  $\sigma = 0.99$  mho/m;  $\epsilon_r = 42$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sugar SAM; Type: SAM; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

### 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 = 47.9 V/m; Power Drift = 0.004 dB

Peak SAR (extrapolated) = 3.21 W/kg

**SAR(1 g) = 2.12 mW/g; SAR(10 g) = 1.36 mW/g**

Maximum value of SAR (measured) = 2.29 mW/g

### Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

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

Reference Value = 47.9 V/m; Power Drift = 0.004 dB

Peak SAR (extrapolated) = 3.29 W/kg

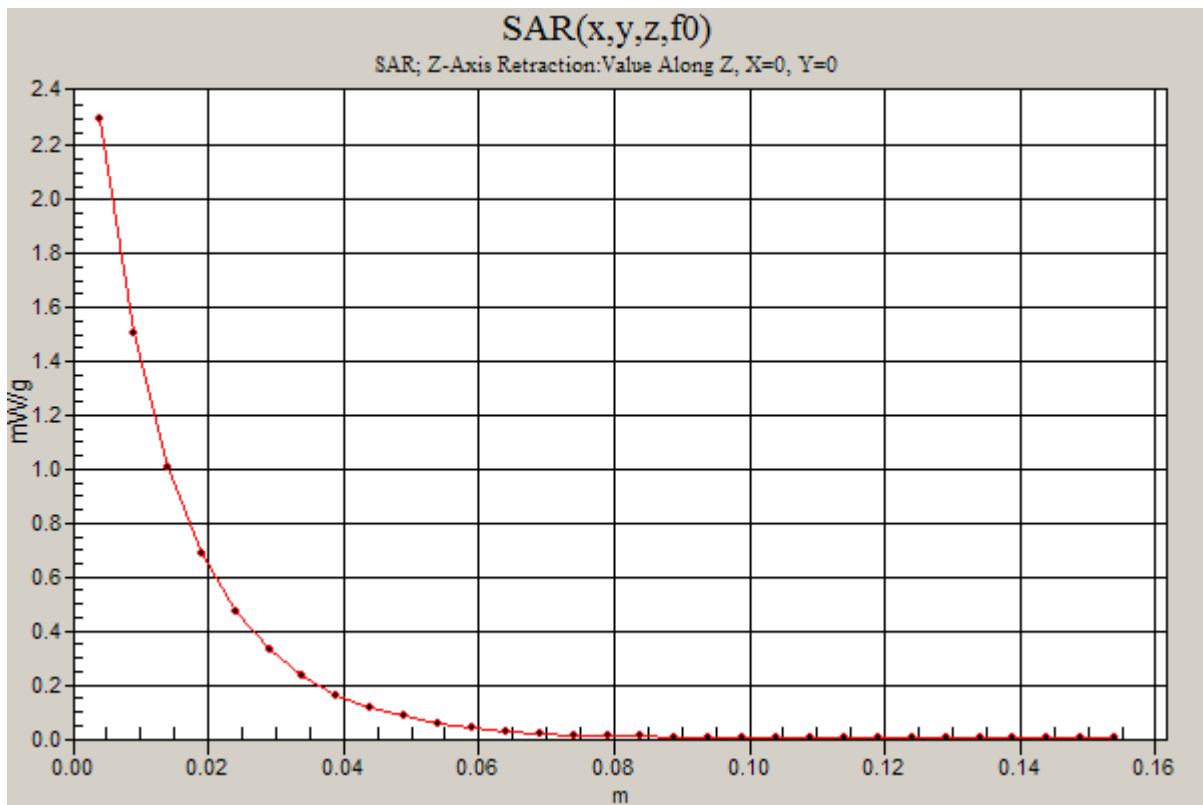
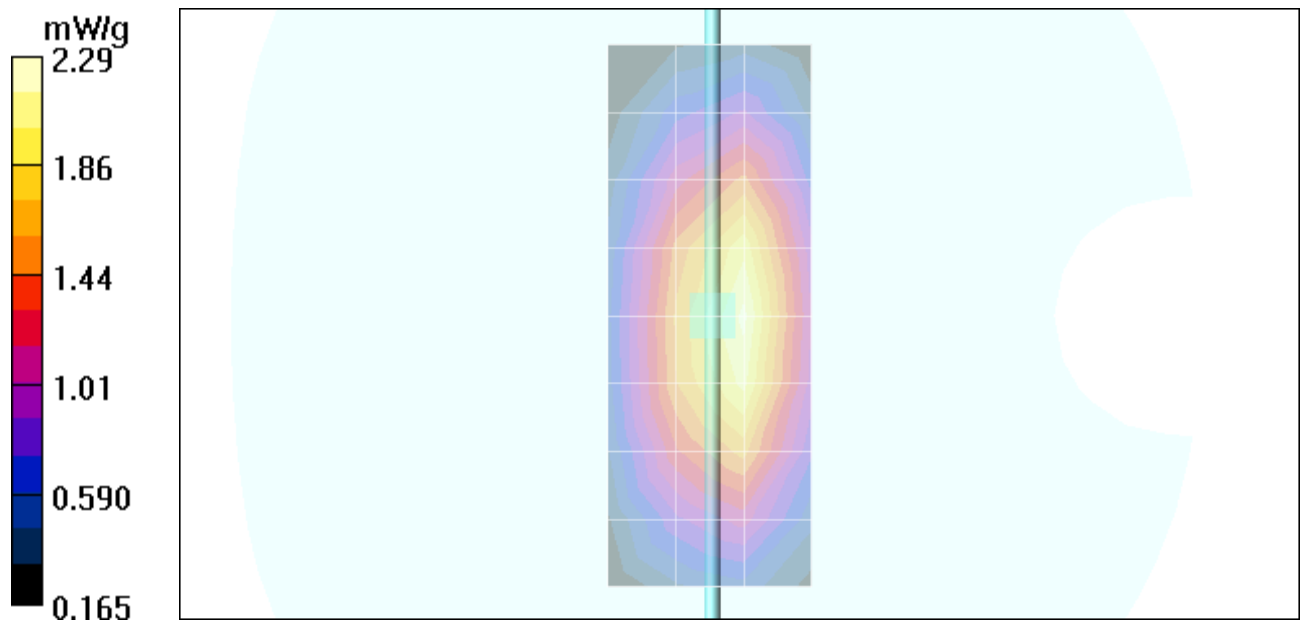
**SAR(1 g) = 2.16 mW/g; SAR(10 g) = 1.38 mW/g**

Maximum value of SAR (measured) = 2.27 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 2.30 mW/g



## Test Laboratory: Motorola

### 052107 900MHz Good at -5.0%

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:091**

Procedure Notes: 900 MHz System Performance Check / Dipole Sn# 91 PM1 Power = 200mW

Sim.Temp@meas = 19.4 Sim.Temp@SPC = 19.4 Room Temp @ SPC = 20.0

Communication System: CW - Dipole; Frequency: 900 MHz; Channel Number: 4; Duty Cycle: 1:1

Medium: VALIDATION Only; Medium parameters used:  $f = 900$  MHz;  $\sigma = 0.98$  mho/m;  $\epsilon_r = 41.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sugar SAM; Type: SAM; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

#### 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 = 47.0 V/m; Power Drift = -0.048 dB

Peak SAR (extrapolated) = 3.22 W/kg

**SAR(1 g) = 2.11 mW/g; SAR(10 g) = 1.35 mW/g**

Maximum value of SAR (measured) = 2.28 mW/g

#### Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

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

Reference Value = 47.0 V/m; Power Drift = -0.048 dB

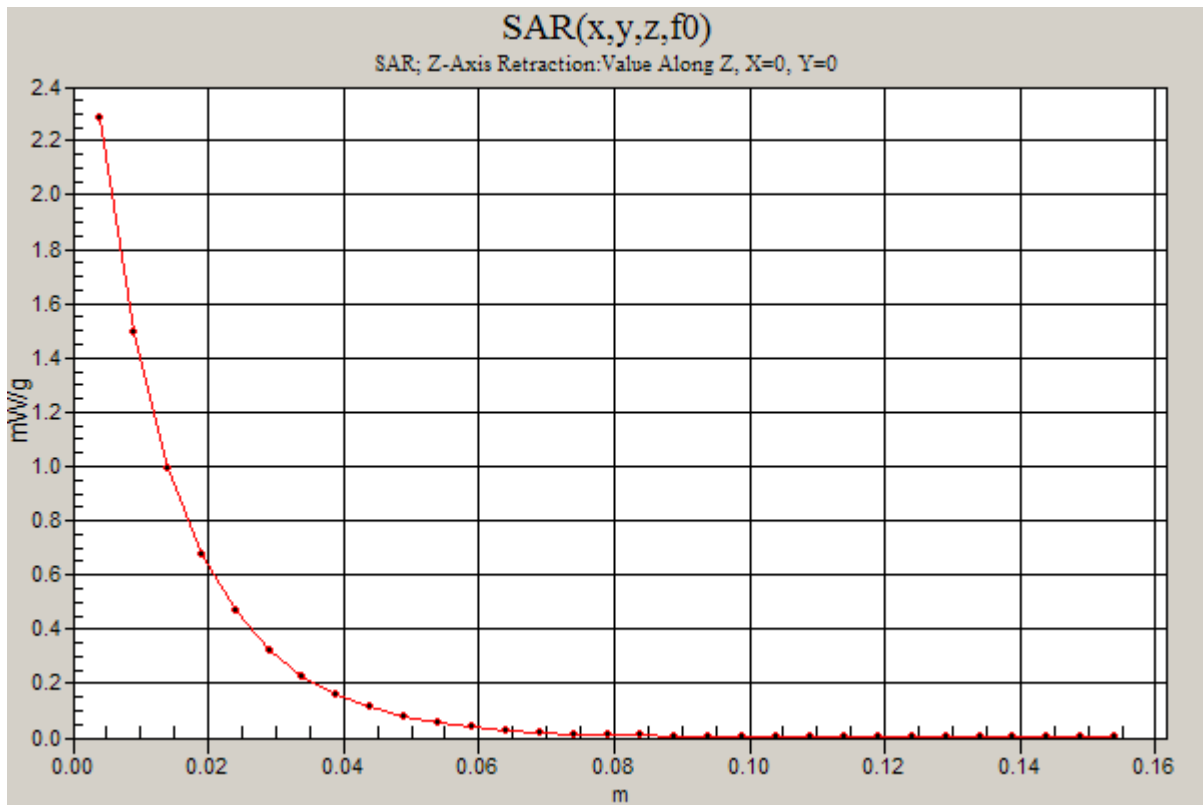
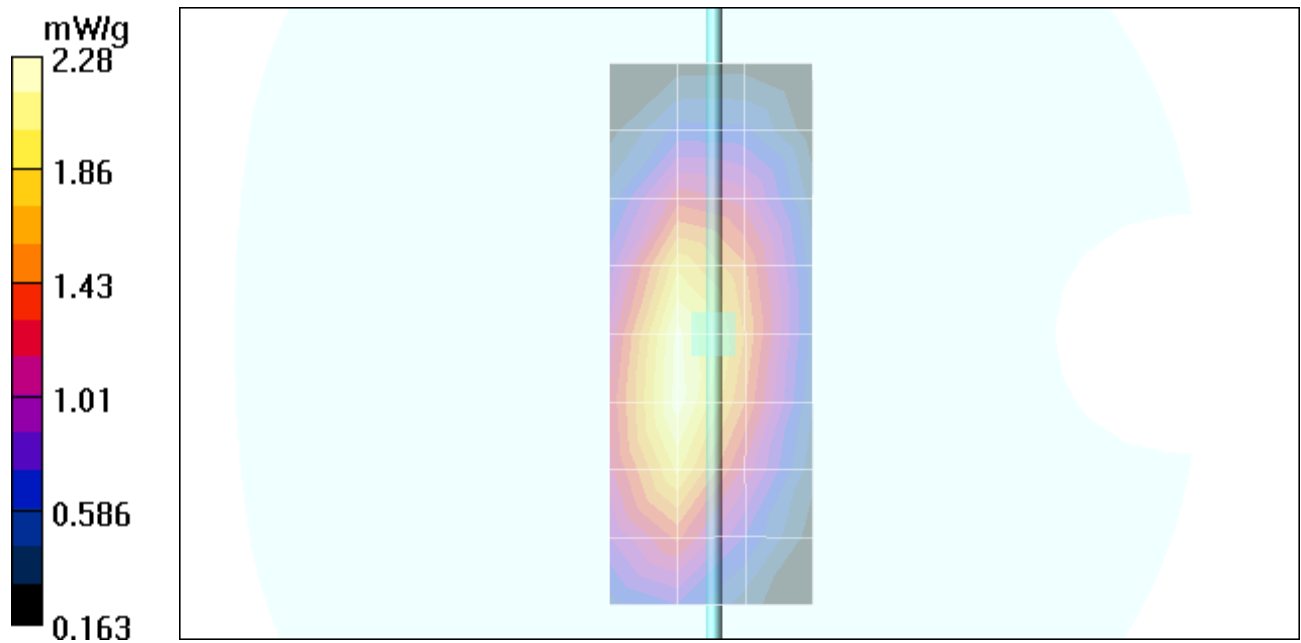
Peak SAR (extrapolated) = 3.29 W/kg

**SAR(1 g) = 2.16 mW/g; SAR(10 g) = 1.38 mW/g**

Maximum value of SAR (measured) = 2.33 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm



**Appendix 2**

**SAR distribution plots for Phantom Head Adjacent Use**

# Test Laboratory: Motorola

850 Cheek

Serial: 1NR0890114

Procedure Notes: Pwr Step: 05      Antenna Position: internal

## LEFT HEAD CHEEK with SNN5771A Battery

DEVICE POSITION (cheek or rotated): 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;  $\sigma = 0.92$  mho/m;  $\epsilon_r = 42.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sugar SAM; Type: SAM; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

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

Maximum value of SAR (measured) = 0.626 mW/g

## Left Head Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

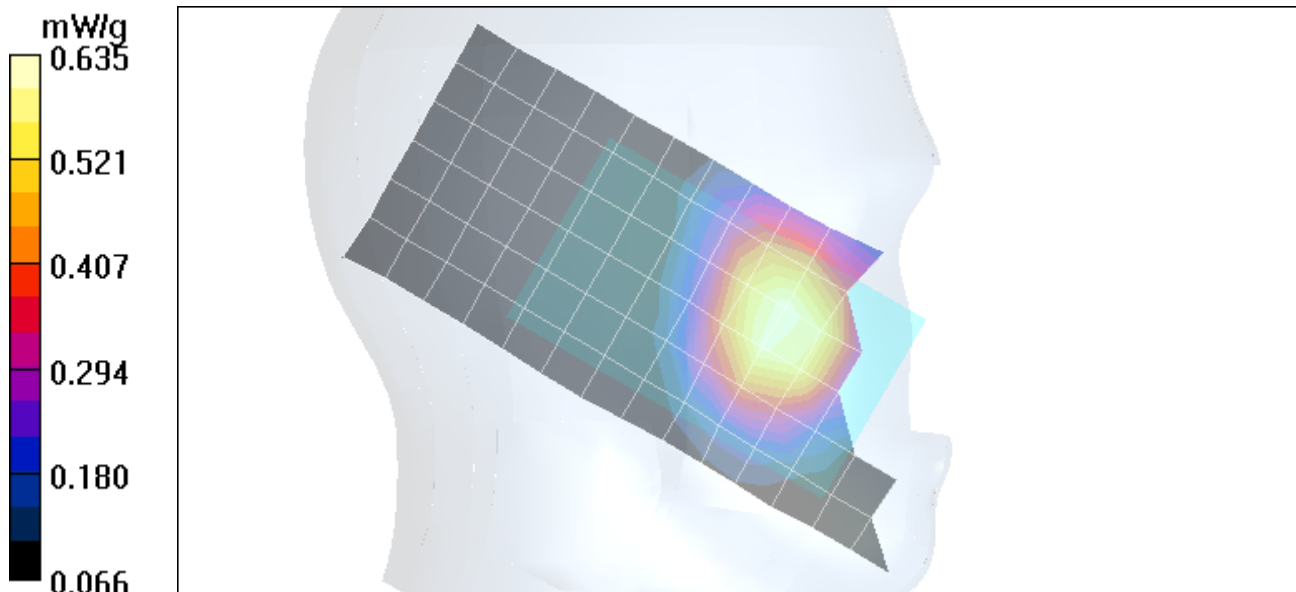
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.8 V/m; Power Drift = -0.237 dB

Peak SAR (extrapolated) = 0.778 W/kg

**SAR(1 g) = 0.604 mW/g; SAR(10 g) = 0.445 mW/g**

Maximum value of SAR (measured) = 0.635 mW/g



**Test Laboratory: Motorola****850 Tilt**

Serial: 1NR0890114

**Procedure Notes: Pwr Step: 5     Antenna Position: internal****Battery Model #: SNN5759A     DEVICE POSITION (cheek or rotated): tilted**

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;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 42.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sugar SAM; Type: SAM; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Right Head Template/Area Scan - Normal (10mm) (10x25x1):**

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.218 mW/g

**Right Head Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:**

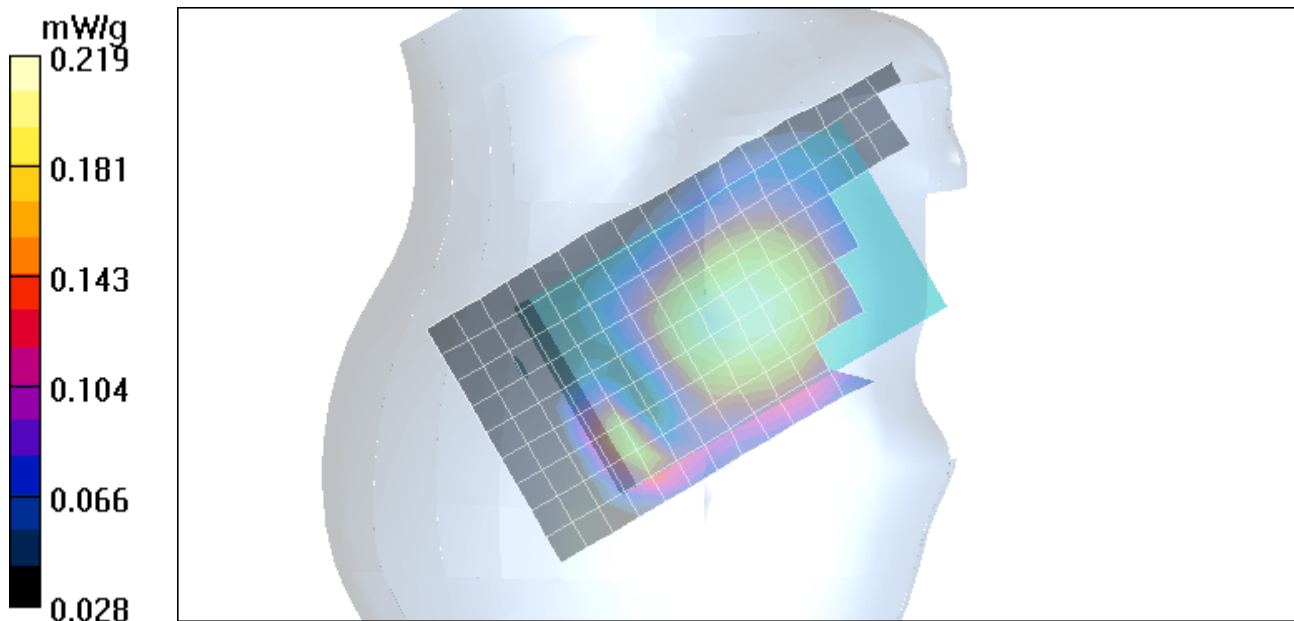
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.4 V/m; Power Drift = -0.069 dB

Peak SAR (extrapolated) = 0.255 W/kg

**SAR(1 g) = 0.209 mW/g; SAR(10 g) = 0.163 mW/g**

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



# Test Laboratory: Motorola

1900 Cheek

Serial: 1NR0890114

**Procedure Notes: Pwr Step: 0      Antenna Position: internal**

**Battery Model #: SNN5759A      DEVICE POSITION (cheek or rotated): cheek**

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8  
Medium: Backup Glycol Head; Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.47 \text{ mho/m}$ ;  $\epsilon_r = 38.1$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

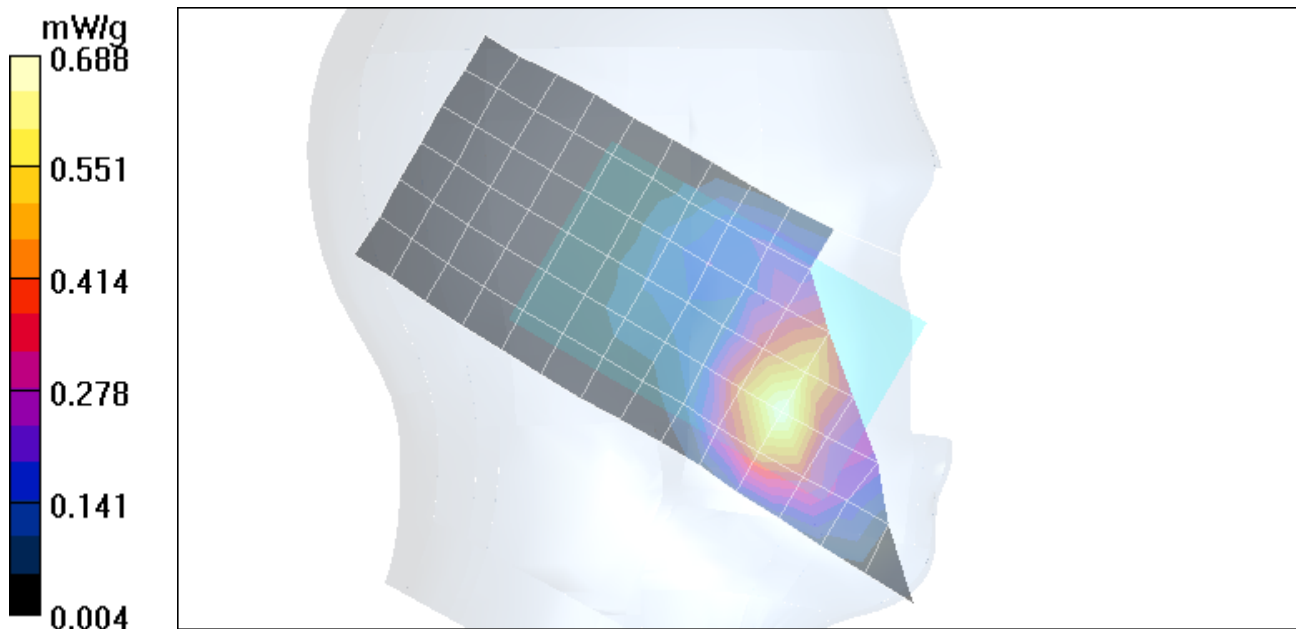
- Probe: ES3DV3 - SN3037; ConvF(5.17, 5.17, 5.17); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Glycol SAM; Type: SAM; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (measured) = 0.701 mW/g

## Left Head Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 20.7 V/m; Power Drift = 0.156 dB  
Peak SAR (extrapolated) = 0.951 W/kg  
**SAR(1 g) = 0.649 mW/g; SAR(10 g) = 0.394 mW/g**  
Maximum value of SAR (measured) = 0.688 mW/g



# Test Laboratory: Motorola

1900 Tilt

Serial: 1NR0890114

**Procedure Notes: Pwr Step: 0    Antenna Position: internal**

**Battery Model #: SNN5759A    DEVICE POSITION (cheek or rotated): tilted**

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8

Medium: Backup Glycol Head; Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.47 \text{ mho/m}$ ;  $\epsilon_r = 38.1$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.17, 5.17, 5.17); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Glycol SAM; Type: SAM; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.231 mW/g

## Left Head Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

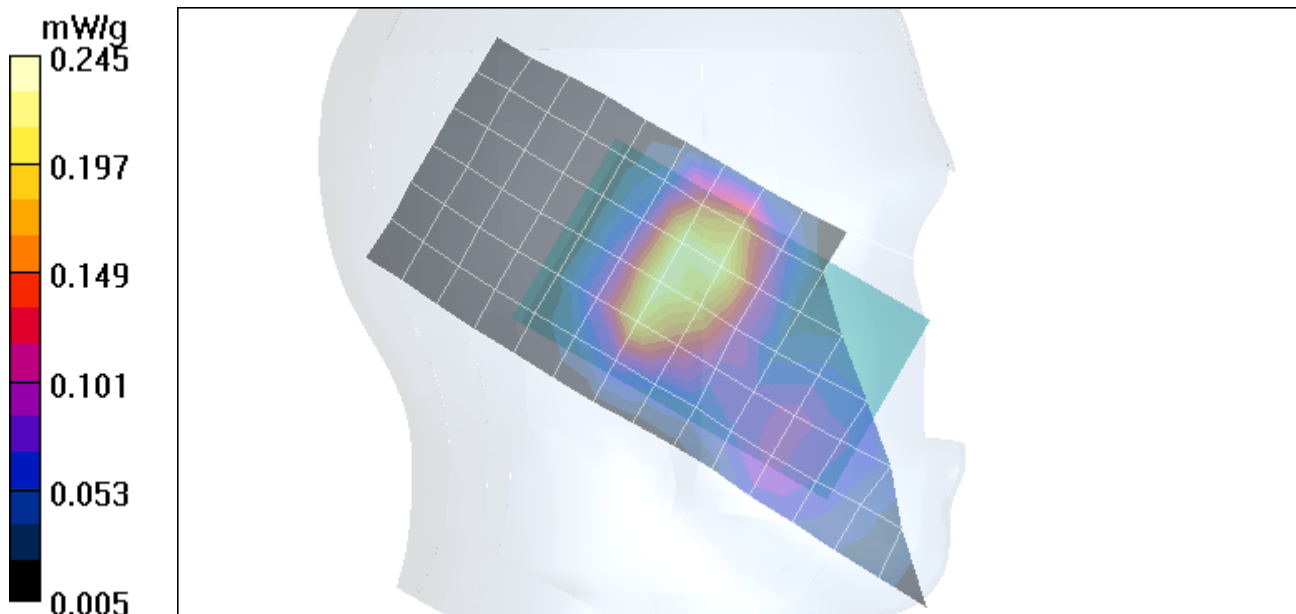
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 12.4 V/m; Power Drift = 0.039 dB

Peak SAR (extrapolated) = 0.351 W/kg

**SAR(1 g) = 0.231 mW/g; SAR(10 g) = 0.147 mW/g**

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



# Test Laboratory: Motorola

## WCDMA 850 Cheek

Serial: 1NR0890114

**Procedure Notes: Pwr Step: all bits up      Antenna Position: internal**

### Left Head Cheek Configuration with SNN5771A Battery

Communication System: 3G-WCDMA 850; Frequency: 836 MHz; Channel Number: 4180; Duty Cycle: 1:1  
Medium: Low Freq Head; Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.93$  mho/m;  $\epsilon_r = 42.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

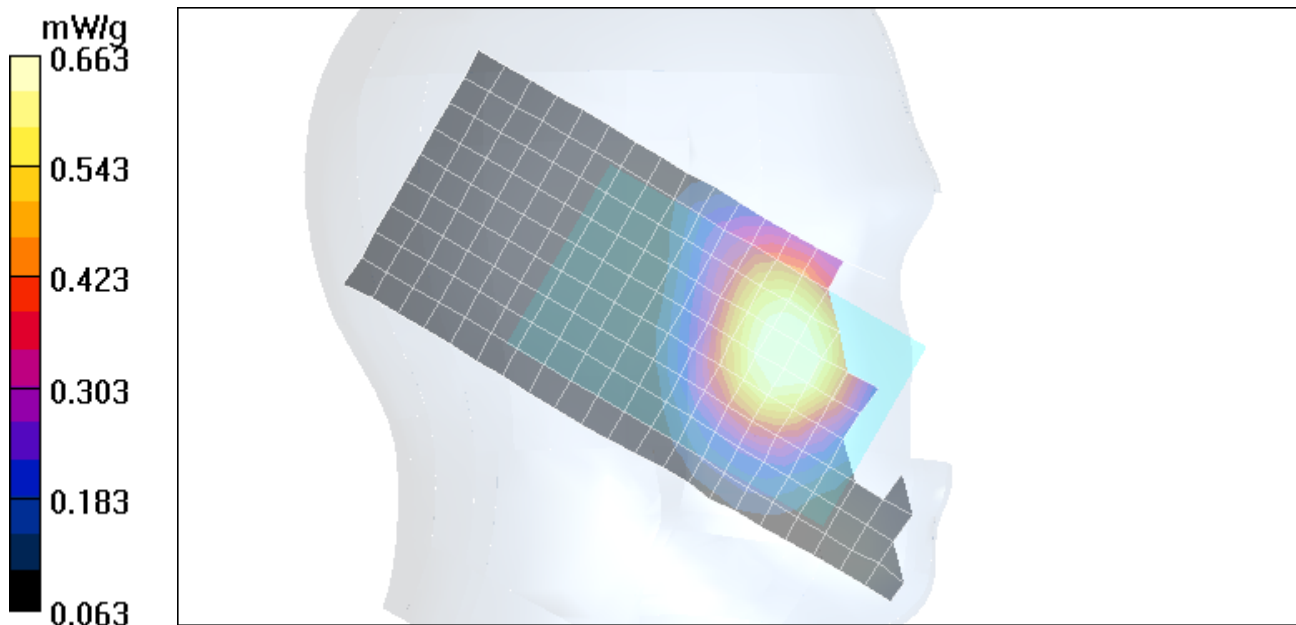
- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sugar SAM; Type: SAM; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

### Left Head Template/Area Scan - Normal (10mm) (10x25x1):

Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.697 mW/g

### Left Head Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 27.9 V/m; Power Drift = -0.541 dB  
Peak SAR (extrapolated) = 0.812 W/kg  
**SAR(1 g) = 0.631 mW/g; SAR(10 g) = 0.465 mW/g**  
Maximum value of SAR (measured) = 0.663 mW/g



# Test Laboratory: Motorola

## WCDMA 850 Tilt

Serial: 1NR0890114

**Procedure Notes: Pwr Step: all bits up      Antenna Position: internal**

### Left Head Tilt Configuration with SNN5771A Battery

Communication System: 3G-WCDMA 850; Frequency: 836 MHz; Channel Number: 4180; Duty Cycle: 1:1  
Medium: Low Freq Head; Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.93$  mho/m;  $\epsilon_r = 42.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

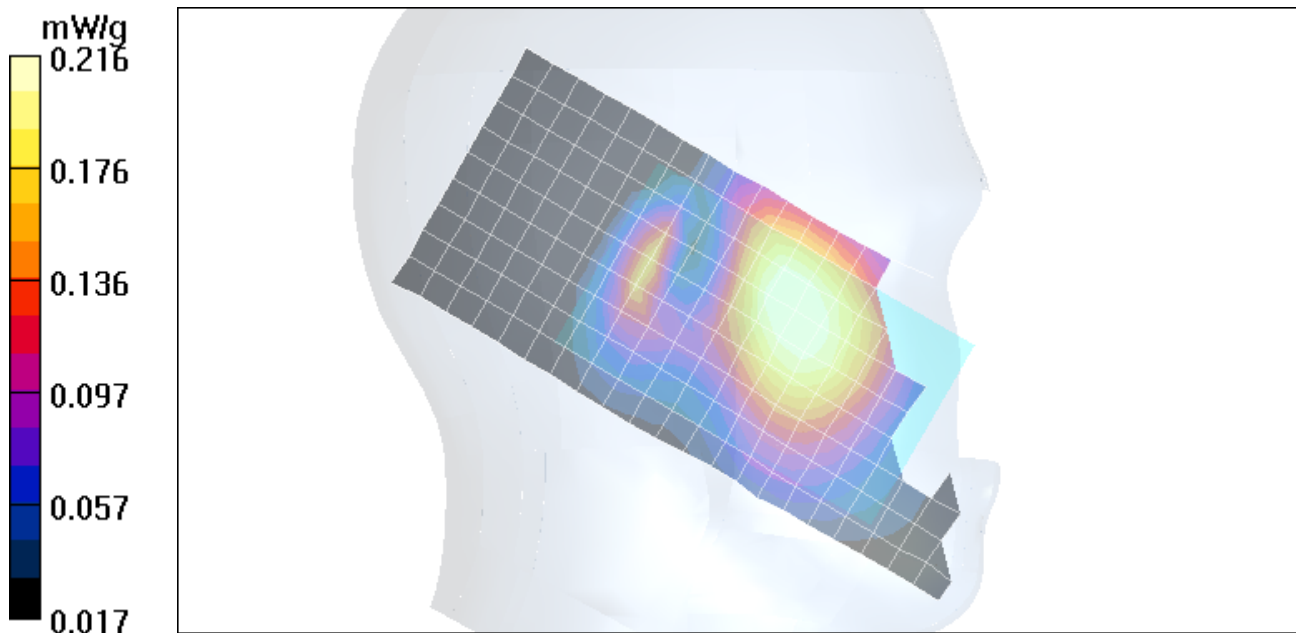
- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sugar SAM; Type: SAM; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

### Left Head Template/Area Scan - Normal (10mm) (10x25x1):

Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.225 mW/g

### Left Head Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 15.4 V/m; Power Drift = 0.017 dB  
Peak SAR (extrapolated) = 0.251 W/kg  
**SAR(1 g) = 0.206 mW/g; SAR(10 g) = 0.155 mW/g**  
Maximum value of SAR (measured) = 0.216 mW/g



# Test Laboratory: Motorola

## WCDMA 1900 Cheek

Serial: 1NR0890114

**Procedure Notes: Pwr Step: all bits up      Antenna Position: Internal**

### Right Head Cheek Configuration with SNN5771A Battery

Communication System: 3G/WCDMA 1900; Frequency: 1907.5 MHz; Channel Number: 9538; Duty Cycle: 1:1  
Medium: Regular Glycol Head; Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.47$  mho/m;  $\epsilon_r = 39.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

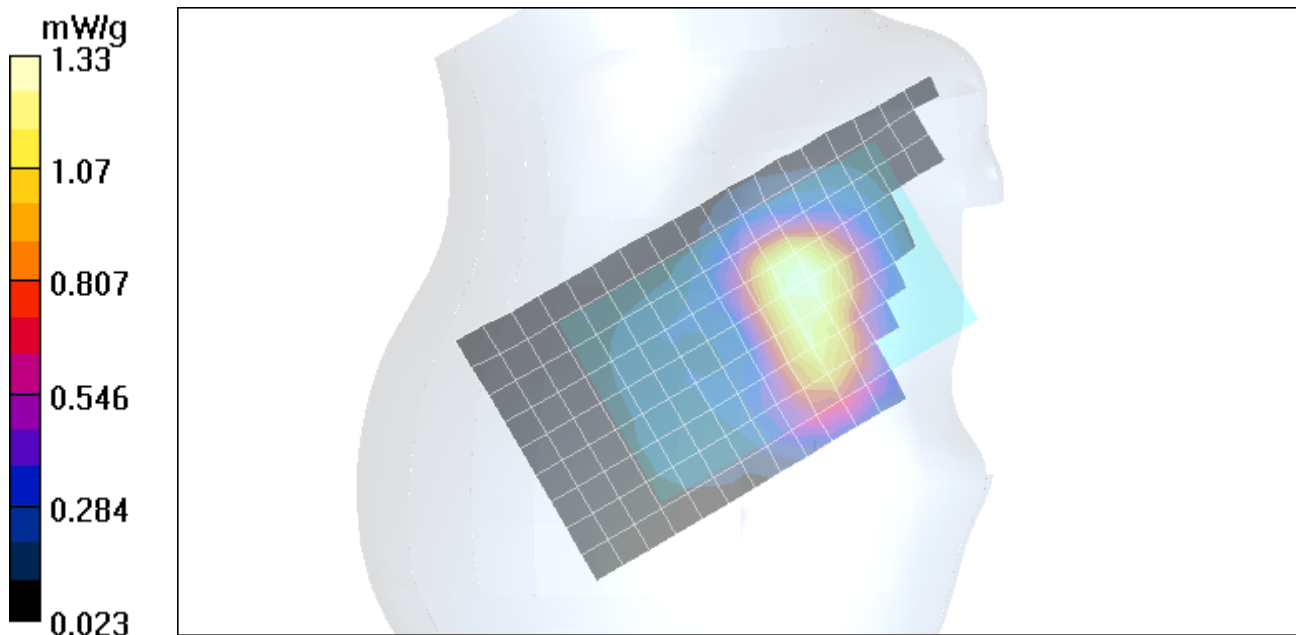
- Probe: ES3DV3 - SN3037; ConvF(5.17, 5.17, 5.17); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Glycol SAM; Type: SAM; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

### Right Head Template/Area Scan - Normal (10mm) (10x25x1):

Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 1.35 mW/g

### Right Head Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 30.8 V/m; Power Drift = -0.104 dB  
Peak SAR (extrapolated) = 1.78 W/kg  
**SAR(1 g) = 1.26 mW/g; SAR(10 g) = 0.808 mW/g**  
Maximum value of SAR (measured) = 1.33 mW/g



# Test Laboratory: Motorola

## WCDMA 1900 Tilt

Serial: 1NR0890114

**Procedure Notes: Pwr Step: all bits up    Antenna Position: Internal**

### Left Head Tilt Configuration with SNN5771A Battery

Communication System: 3G/WCDMA 1900; Frequency: 1880 MHz; Channel Number: 9400; Duty Cycle: 1:1  
Medium: Regular Glycol Head; Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.47$  mho/m;  $\epsilon_r = 39.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.17, 5.17, 5.17); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Glycol SAM; Type: SAM; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

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

Maximum value of SAR (measured) = 0.525 mW/g

### Left Head Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

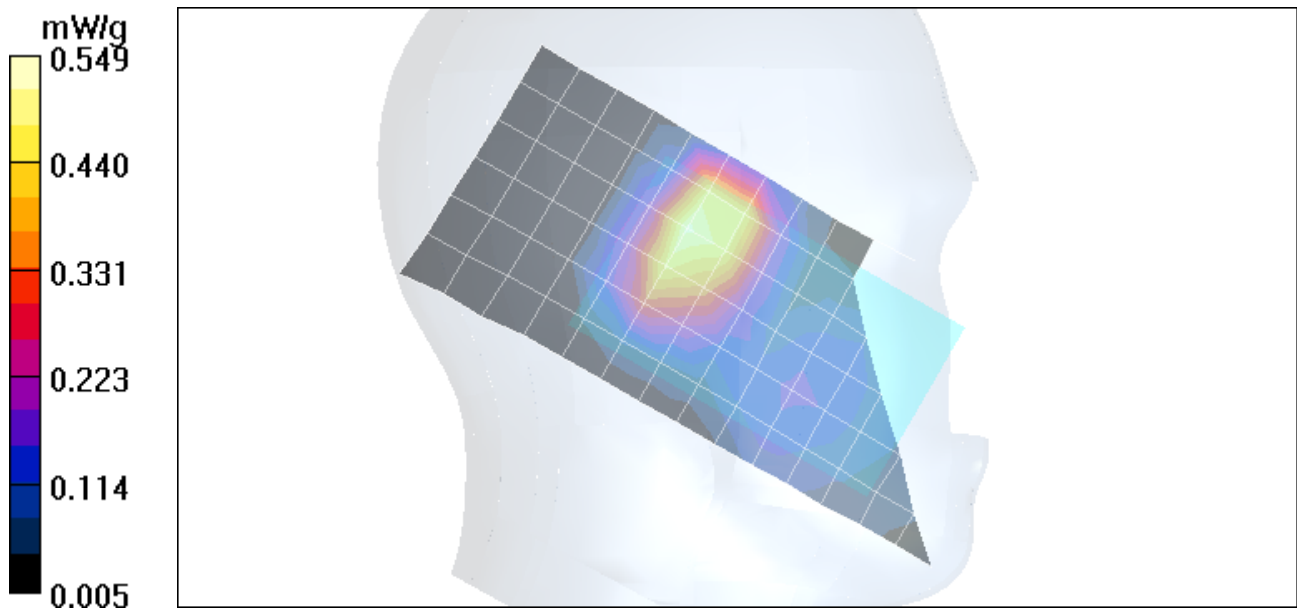
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.7 V/m; Power Drift = -0.086 dB

Peak SAR (extrapolated) = 0.785 W/kg

**SAR(1 g) = 0.521 mW/g; SAR(10 g) = 0.319 mW/g**

Maximum value of SAR (measured) = 0.549 mW/g



**Appendix 3**

**SAR distribution plots for Body Worn Configuration**

# Test Laboratory: Motorola

850 Bodyworn

Serial: 1NR0890114

**Procedure Notes: Pwr Step: 5    Antenna Position: internal**

## Bluetooth Back of Phone 15mm Bodyworn Configuration with SNN5782A Battery

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8

Medium: Low Freq Body; Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.98$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.07, 6.07, 6.07); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

### Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):

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

Maximum value of SAR (measured) = 0.782 mW/g

### Amy Twin Phone Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

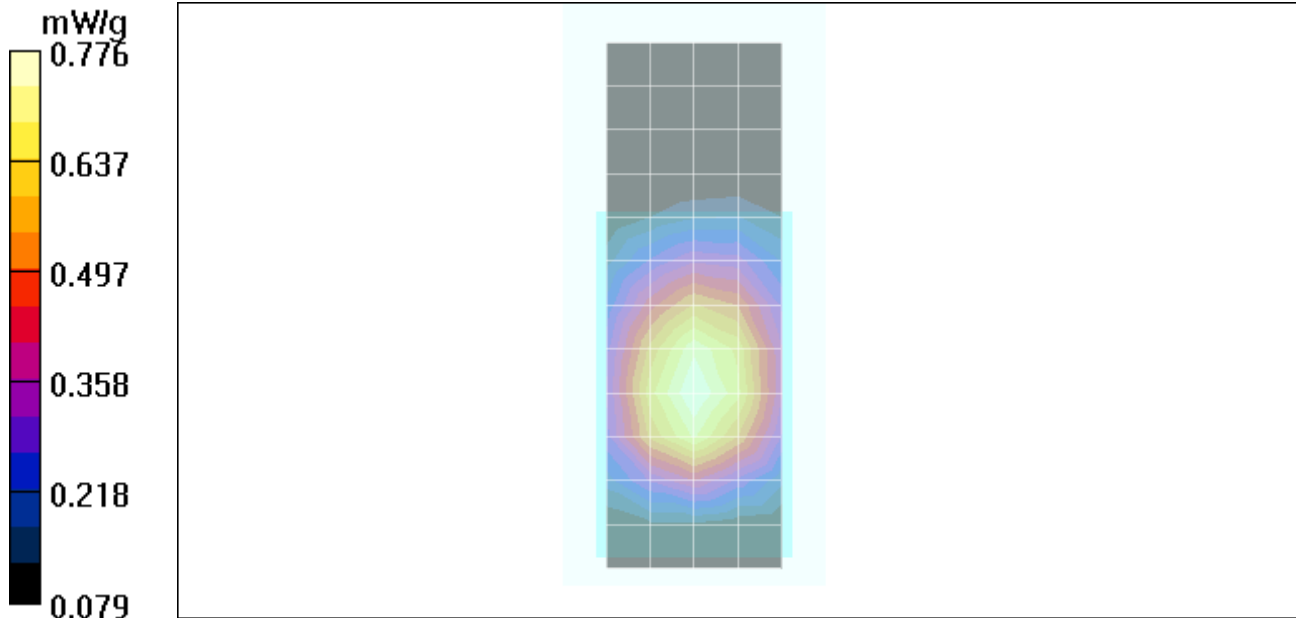
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.5 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 0.940 W/kg

**SAR(1 g) = 0.737 mW/g; SAR(10 g) = 0.545 mW/g**

Maximum value of SAR (measured) = 0.776 mW/g



# Test Laboratory: Motorola

1900 Bodyworn

Serial: 1NR0890114

**Procedure Notes: Pwr Step: 0    Antenna Position: internal**

## Bluetooth Back of Phone 15mm Configuration with SNN5771A Battery

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8

Medium: Regular Glycol Body; Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 50.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.73, 4.73, 4.73); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sect.2, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

## Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):

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

Maximum value of SAR (measured) = 0.791 mW/g

## Amy Twin Phone Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

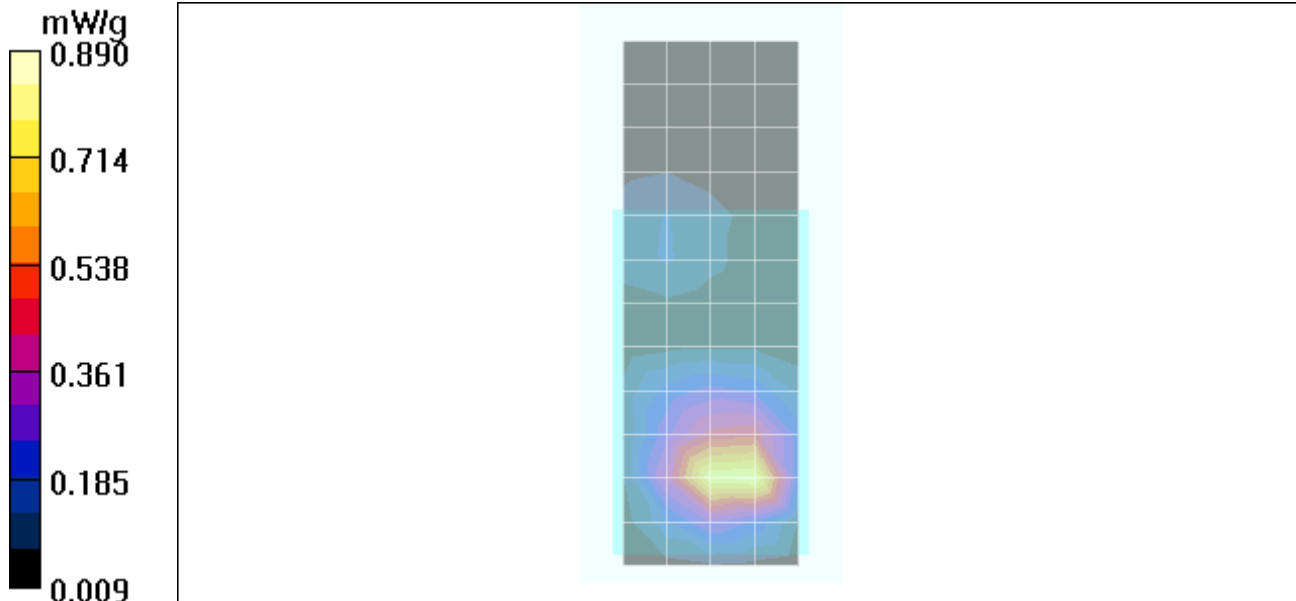
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.5 V/m; Power Drift = 0.017 dB

Peak SAR (extrapolated) = 1.33 W/kg

**SAR(1 g) = 0.797 mW/g; SAR(10 g) = 0.445 mW/g**

Maximum value of SAR (measured) = 0.890 mW/g



# Test Laboratory: Motorola

## WCDMA 850 Bodyworn

Serial: 1NR0890114

**Procedure Notes: Pwr Step: all up bits    Antenna Position: internal**

### Bluetooth Back of Phone 15mm Bodyworn Configuration with SNN5782A Battery

Communication System: 3G-WCDMA 850; Frequency: 836 MHz; Channel Number: 4180; Duty Cycle: 1:1  
Medium: Low Freq Body; Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.98$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

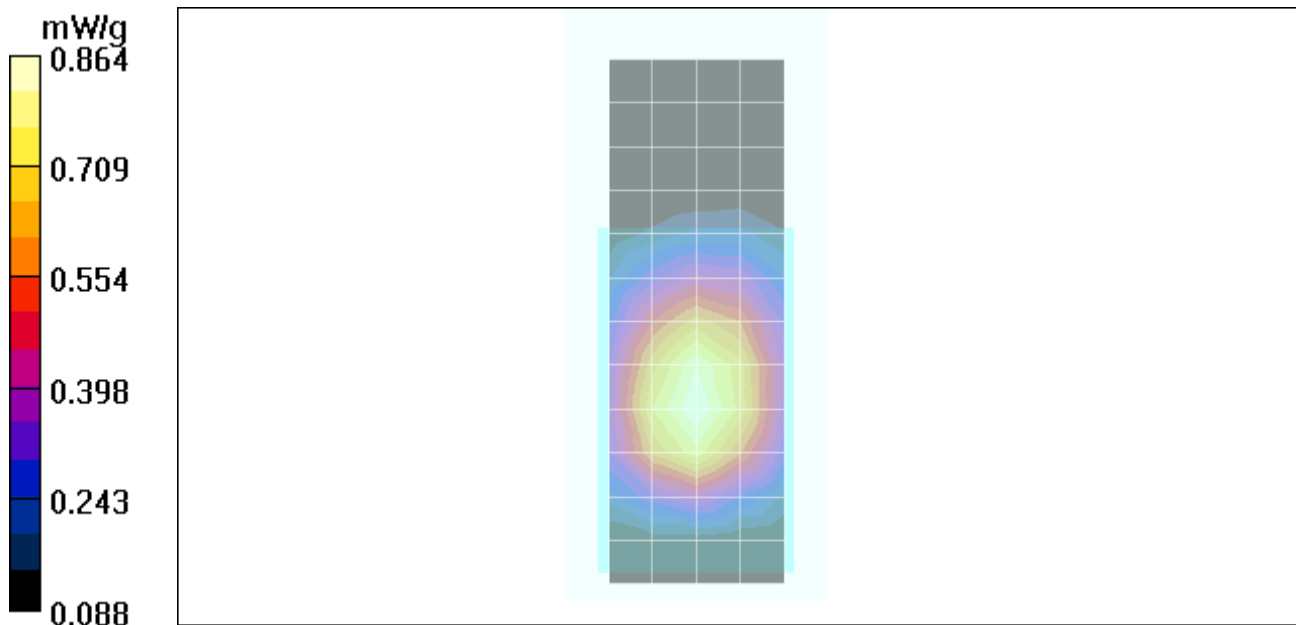
- Probe: ES3DV3 - SN3037; ConvF(6.07, 6.07, 6.07); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

### Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):

Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (measured) = 0.869 mW/g

### Amy Twin Phone Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 30.2 V/m; Power Drift = -0.056 dB  
Peak SAR (extrapolated) = 1.05 W/kg  
**SAR(1 g) = 0.820 mW/g; SAR(10 g) = 0.604 mW/g**  
Maximum value of SAR (measured) = 0.864 mW/g



# Test Laboratory: Motorola

## WCDMA 1900 Bodyworn

Serial: 1NR0890114

**Procedure Notes: Pwr Step:all up bits    Antenna Position: internal**

### Bluetooth Back 15mm Bodyworn Configuration with SNN5782A Battery

Communication System: 3G/WCDMA 1900; Frequency: 1880 MHz; Channel Number: 9400; Duty Cycle: 1:1  
Medium: Regular Glycol Body; Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 50.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

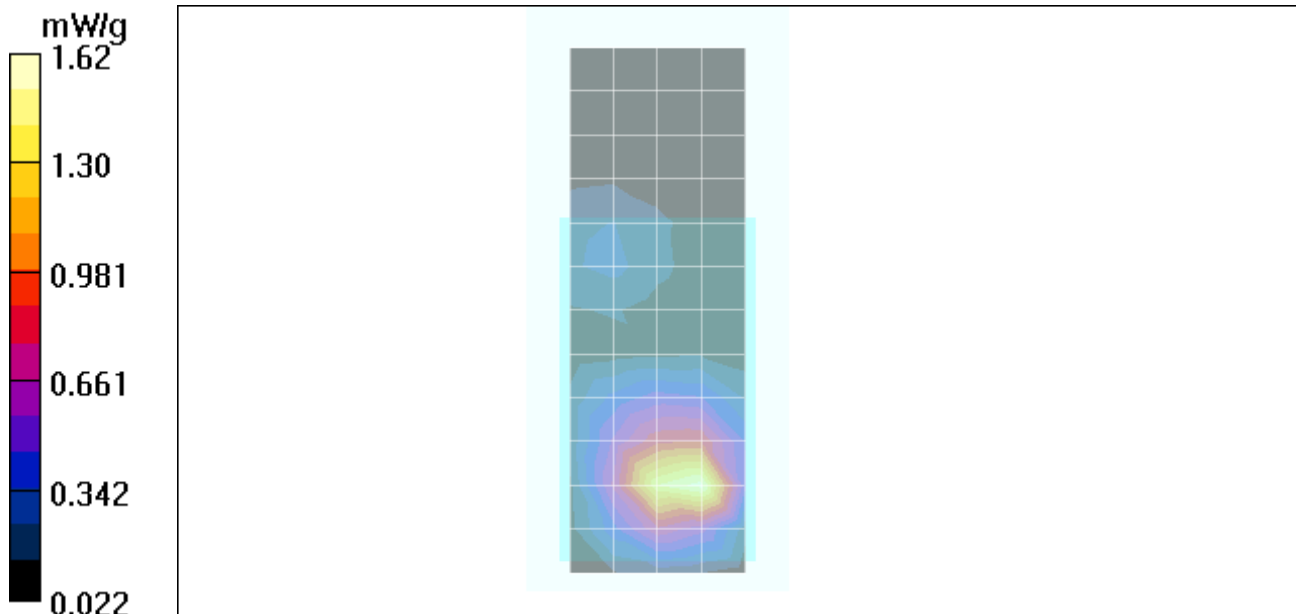
- Probe: ES3DV3 - SN3037; ConvF(4.73, 4.73, 4.73); Calibrated: 11/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn661; Calibrated: 9/1/2006
- Phantom: R1: Sect.2, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

### Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):

Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (measured) = 1.57 mW/g

### Amy Twin Phone Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 28.6 V/m; Power Drift = -0.118 dB  
Peak SAR (extrapolated) = 2.49 W/kg  
**SAR(1 g) = 1.49 mW/g; SAR(10 g) = 0.841 mW/g**  
Maximum value of SAR (measured) = 1.62 mW/g



**Appendix 4**

**Probe Calibration Certificate**



Accredited by the Swiss Federal Office of Metrology and Accreditation  
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: **ES3-3037\_Nov06**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3037**

Calibration procedure(s) **QA CAL-01.v5  
Calibration procedure for dosimetric E-field probes**

Calibration date: **November 23, 2006**

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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

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

Issued: November 23, 2006

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

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



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

Accredited by the Swiss Federal Office of Metrology and Accreditation  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

#### Glossary:

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
Polarization $\phi$	$\phi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

#### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

#### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* *frequency\_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>**: 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 NORM<sub>x,y,z</sub> \* *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  $\pm 50$  MHz to  $\pm 100$  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:3037

Manufactured:	August 21, 2003
Last calibrated:	November 17, 2005
Recalibrated:	November 23, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

**DASY - Parameters of Probe: ES3DV3 SN:3037****Sensitivity in Free Space<sup>A</sup>****Diode Compression<sup>B</sup>**

NormX	1.16 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	99 mV
NormY	0.82 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	101 mV
NormZ	0.96 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	98 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		<b>3.0 mm</b>	<b>4.0 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	5.1	2.3
SAR <sub>be</sub> [%]	With Correction Algorithm	0.0	0.1

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

Sensor Center to Phantom Surface Distance		<b>3.0 mm</b>	<b>4.0 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	8.4	5.2
SAR <sub>be</sub> [%]	With Correction Algorithm	0.0	0.1

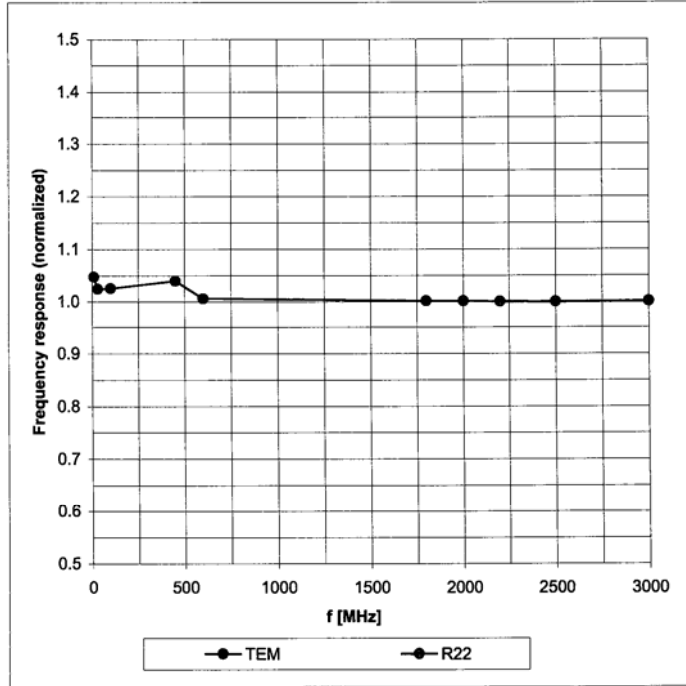
**Sensor Offset**Probe Tip to Sensor Center                    **2.0 mm**

**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%.**

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).<sup>B</sup> Numerical linearization parameter: uncertainty not required.

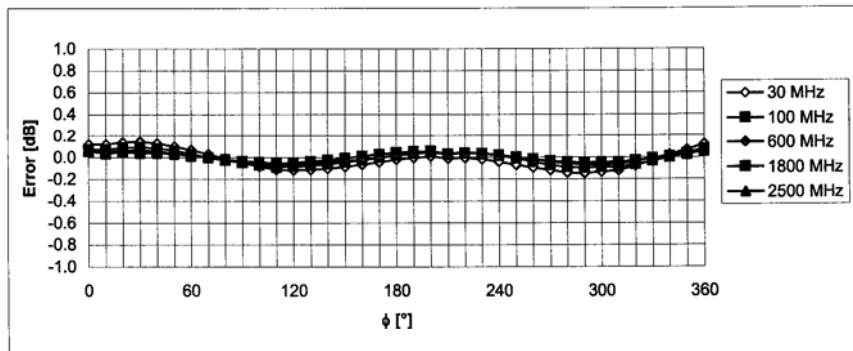
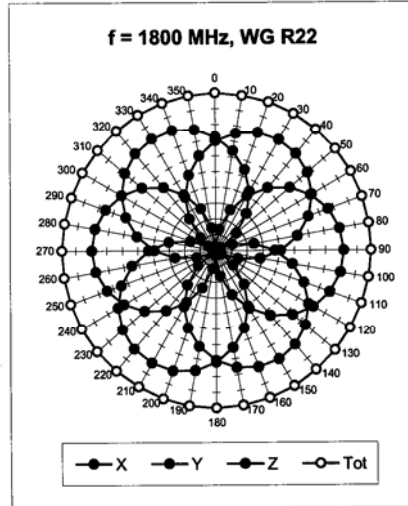
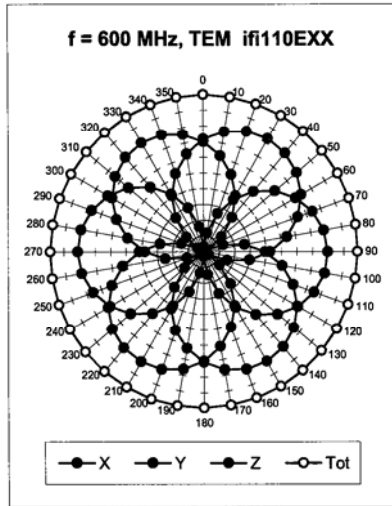
### Frequency Response of E-Field

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



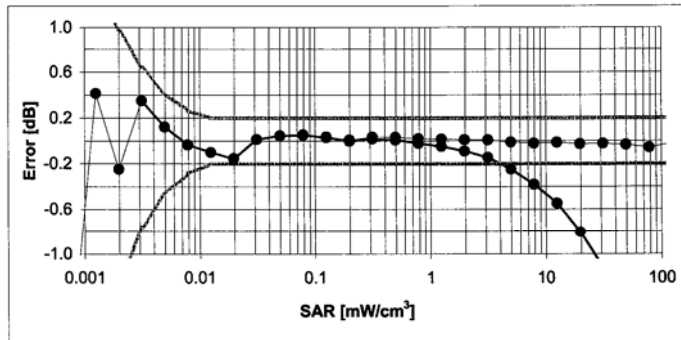
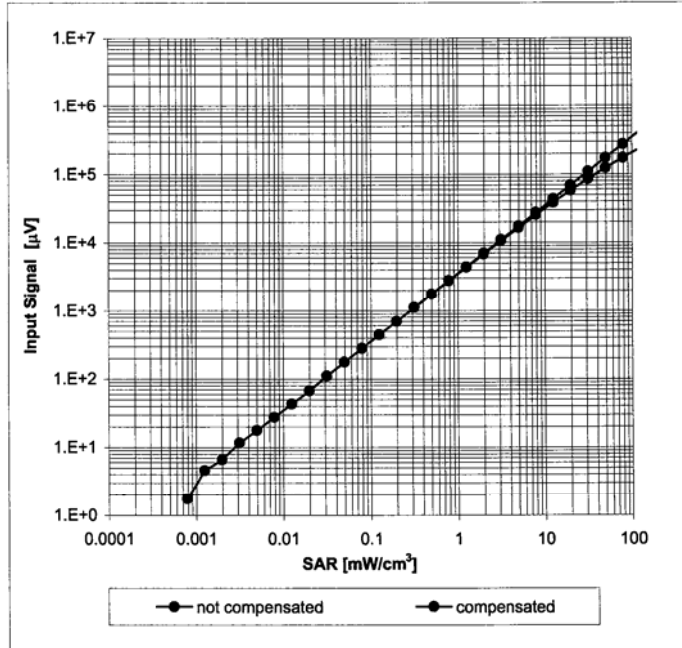
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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



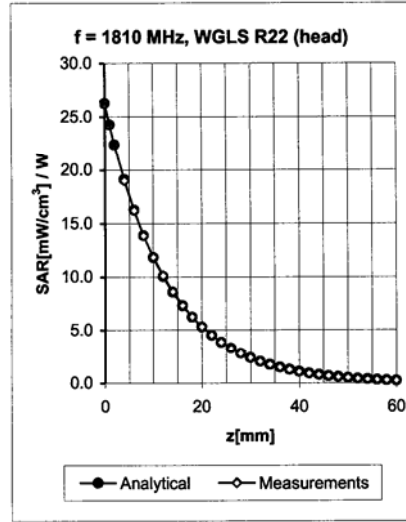
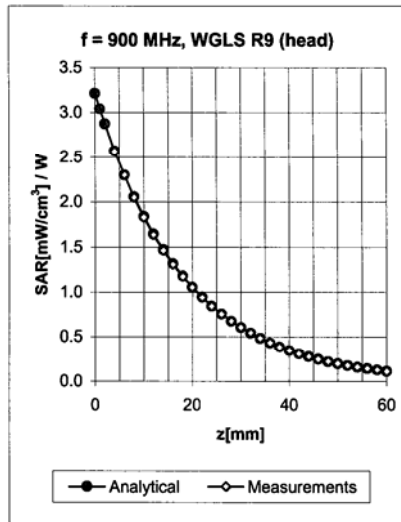
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

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



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

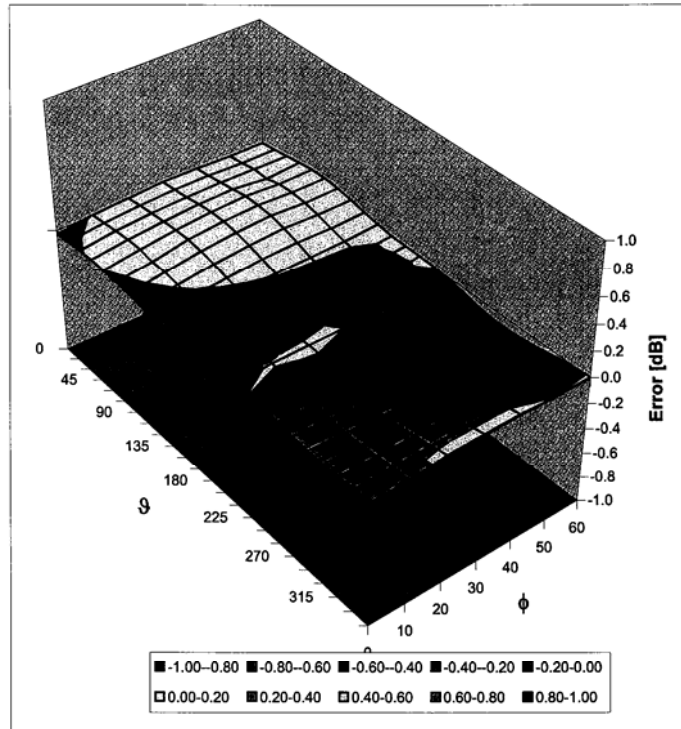
### Conversion Factor Assessment



f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	1.00	1.07	6.25 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.73	1.26	5.17 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.76	1.23	4.81 ± 11.0% (k=2)
2300	± 50 / ± 100	Head	39.4 ± 5%	1.71 ± 5%	0.62	1.40	4.45 ± 11.8% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.71	1.25	4.39 ± 11.8% (k=2)
2600	± 50 / ± 100	Head	39.0 ± 5%	1.96 ± 5%	0.82	1.09	4.31 ± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	1.00	1.11	6.07 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.70	1.31	4.73 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.63	1.44	4.58 ± 11.0% (k=2)
2300	± 50 / ± 100	Body	52.8 ± 5%	1.85 ± 5%	0.64	1.37	4.44 ± 11.8% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.45	1.37	4.32 ± 11.8% (k=2)
2600	± 50 / ± 100	Body	52.5 ± 5%	2.16 ± 5%	0.89	1.00	4.21 ± 11.8% (k=2)

<sup>c</sup> 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 ( $\phi, \theta$ ), $f = 900$ MHz



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

**Appendix 5**

**Measurement Uncertainty Budget**

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

**Appendix 6**

**Photographs of the device under test**

**>>> PHOTOS WERE MOVED TO FCC EXHIBIT 7B <<<**

**Appendix 7**

**Dipole Characterization Certificate**

# Certification of System Performance Check Targets

Based on WI-0396

-Historical Data-

900MHz	
IEEE/IEC Target:	10.8 (W/kg)
Measurement Uncertainty (k=1):	9.0%
Measurement Period:	10-May-06 to 18-April-07
# of tests performed:	1,562
Grand Average:	11.24 (W/kg)
% Delta (Average - IEEE1528 Target)	4.1%
Is % Delta <= Expanded Measurement Uncertainty (k=2)?	Yes
Accept/Reject <u>Average</u> as new system performance check target?	ACCEPT
<b>Applies to Dipole SN's:</b> 55, 69, 77, 78, 79, 80, 91, 92, 93, 94, 95, 96, 97, 1d034, 1d035	

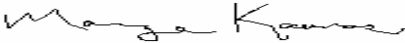
-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

Frequency	SAR Target (W/kg)	Permittivity	Conductivity (S/m)
900MHz	11.24	41.5 ± 5%	0.97 ± 5%

-Approvals-

Submitted by:  Date:

Signed: 

Comments:

Approved by:  Date:

Signed: 

Comments: