



# MOTOROLA

## Portable Cellular Phone SAR Test Report

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

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**Date of Report:** 21 Mar, 2011 Rev. A  
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**Generic Name:**

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

**Accreditation:**



2404

<p><u>Tests:</u> Electromagnetic Specific Absorption Rate</p>	<p><u>Procedures:</u> IEC 62209-1 RSS-102 IEEE 1528 - 2003 FCC OET Bulletin 65 (<i>including Supplement C</i>) Australian Communications Authority Radio Communications (Electromagnetic Radiation – Human Exposure) Standard 2003 CENELEC EN 50360 ARIB Std. T-56 (2002)</p>
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On the following products or types of products:

Wireless Communications Devices (Examples): Two Way Radios; Portable Phones (including Cellular, Licensed Non-Broadcast and PCS); Low Frequency Readers; and Pagers

**Statement of Compliance:**

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

(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 1.21 W/kg for head-adjacent use and 1.37 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 Device description

Serial Number(s)	A0000022FC14F1
Production Unit or Identical Prototype (47 CFR §2.908)	Identical Prototype
Device Category	Portable
RF Exposure Limits	General Population / Uncontrolled

Mode(s) of Operation	1900 CDMA	Bluetooth
Modulation Mode(s)	QPSK	GFSK
Maximum Output Power Setting	24.5 dBm	10 dBm
Duty Cycle	1:1	1:1
Transmitting Frequency Range(s)	1851-1909 MHz	2402.0 - 2483.5 MHz

## 2.2 Evaluation of CDMA Mode Power Levels

Per the “SAR Measurement Procedures for 3G Devices” released in October, 2007, 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.

Conducted power (dBm) for CDMA modes						
	Channel	RC1		RC3		RC3 (FCH + SCH)
		SO2	SO55	SO2	SO55	
CDMA 800	25	24.56	24.52	24.56	24.66	Per Motorola designs, the maximum power, when in a mode that allows supplemental channels, will always be less than the RC3/RC1 maximum conducted power limit.
	600	24.44	24.45	24.51	24.57	
	1175	24.59	24.62	24.70	24.70	

### 2.3 Evaluation of Bluetooth

Per "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas" (FCC KDB 648474), the necessity of stand-alone and simultaneous SAR testing was evaluated for the Bluetooth transmitter of the device under test.

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

Table 1 – Output Power Thresholds for Unlicensed Transmitters

	2.45	5.15 - 5.35	5.47 - 5.85	GHz
$P_{\text{max}}$	12	6	5	mW

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

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

	Individual Transmitter	Simultaneous Transmission
Licensed Transmitters	Routine evaluation required.	SAR not required. Unlicensed only.
Unlicensed Transmitters	When there is no simultaneous transmission – o output $\leq 60$ f: SAR not required o output $> 60$ f: stand-alone SAR required When there is simultaneous transmission – Stand-alone SAR not required when o output $\leq 2 \cdot P_{\text{max}}$ and antenna is $\geq 5.0$ cm from other antennas o output $\leq P_{\text{max}}$ and antenna is $\geq 2.5$ cm from other antennas o output $\leq P_{\text{max}}$ and antenna is $< 2.5$ cm from other antennas, each with either output power $\leq P_{\text{max}}$ or 1-g SAR $< 1.2$ W/kg Otherwise stand-alone SAR is required When stand-alone SAR is required o test SAR on highest output channel for each wireless mode and exposure condition o if SAR for highest output channel is $> 50\%$ of SAR limit, evaluate all channels according to normal procedures	o when stand-alone 1-g SAR is not required and antenna is $\geq 5$ cm from other antennas Licensed & Unlicensed o when the sum of the 1-g SAR is $< 1.6$ W/kg for all simultaneous transmitting antennas o when SAR to peak location separation ratio of simultaneous transmitting antenna pair is $< 0.3$ SAR required. Licensed & Unlicensed antenna pairs with SAR to peak location separation ratio $\geq 0.3$ ; test is only required for the configuration that results in the highest SAR in stand-alone configuration for each wireless mode and exposure condition. Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply

Per the highlighted criteria:

1. The highest output conducted power measured for Bluetooth on the device under test is 10.2 mW [ $< 12$  mW]
2. The separation distance between the Bluetooth antenna and the main antenna is 1.395 cm [ $< 2.5$  cm]

Based on the output power of the Bluetooth transmitter and its antenna separation distance from the primary antenna, SAR measurements will be performed for configurations that result in SAR  $> 1.2$  W/kg for the CDMA transmitter. Pictorial representation of the antenna locations and separation distances are given in Exhibit 7d.

### 3. Test Equipment Used

#### 3.1 Dosimetric System

The Motorola Mobile Devices Business Product Safety & Compliance Laboratory utilizes a Dosimetric Assessment System (Dasy4™ v4.7) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure. The overall 10 g RSS uncertainty of the measurement system is  $\pm 10.8\%$  (K=1) with an expanded uncertainty of  $\pm 21.6\%$  (K=2). The overall 1 g RSS uncertainty of the measurement system is  $\pm 11.1\%$  (K=1) with an expanded uncertainty of  $\pm 22.2\%$  (K=2). The measurement uncertainty budget is given in Appendix 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	719	22 Mar, 2011
E-Field Probe ES3DV3	3180	20 May, 2011
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1160	
Dipole Validation Kit, DV1800V2	283TR	10 Nov, 2012
Dipole Validation Kit, DV2450V2	788	11 Nov, 2012

#### 3.2 Additional Equipment

Description	Serial Number	Cal Date	Cal Due Date
Signal Generator HP8648C	3847A04822	Apr-22-2009	Apr-22-2011
Power Meter E4419B	GB39511082	Apr-24-2009	Apr-24-2011
Power Sensor #1 - E9301A	US39210917	Oct-25-2010	Oct-25-2011
Power Sensor #2 - E9301A	US39210918	Oct-25-2010	Oct-25-2011
Signal Generator HP8648C	3847A04810	Oct-30-2009	Oct-30-2011
Power Meter E4419B	GB39511087	Dec-22-2009	Dec-22-2011
Power Sensor #1 - E9301A	US39210934	Oct-25-2010	Oct-25-2011
Power Sensor #2 - E9301A	US39211006	Oct-25-2010	Oct-25-2011
Network Analyzer HP8753ES	US39172529	Jun-04-2010	Jun-04-2011
Dielectric Probe Kit HP85070C	US99360070		

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

Prior to conducting SAR measurements, the relative permittivity,  $\epsilon_r$ , 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. The recommended limits and tolerances for the head tissue are taken from IEEE 1528 section 5.3.1. The recommended limits at tolerances for the body tissue are taken from OET Bulletin 65 Supplement C appendix C. 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 ( $^{\circ}\text{C}$ )
1880	Head	Measured, 2 Mar, 2011	39.1	1.44	21.0
		Measured, 3 Mar, 2011	38.7	1.44	20.5
		Measured, 7 Mar, 2011	38.1	1.45	20.1
		Measured, 8 Mar, 2011	38.1	1.45	21.1
		Recommended Limits	40.0 $\pm$ 5%	1.40 $\pm$ 5%	18-25
	Body	Measured, 3 Mar, 2011	51.9	1.53	21.1
		Measured, 7 Mar, 2011	51.8	1.58	20.8
		Recommended Limits	53.3 $\pm$ 5%	1.52 $\pm$ 5%	18-25
2450	Head	Measured, 11-Mar-2011	35.4	1.77	20.7
		Recommended Limits	39.2 $\pm$ 10%	1.80 $\pm$ 5%	18-25
	Body	Measured, 7-Mar-2011	51.6	2.01	20.6
		Recommended Limits	52.7 $\pm$ 10%	1.95 $\pm$ 5%	18-25

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

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

## 5. System Accuracy Verification

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

A SAR measurement was performed to verify the measured SAR was within  $\pm 10\%$  from the target SAR indicated in Appendix 6. These frequencies are within  $\pm 10\%$  of the compliance test mid-band frequency as required in [1] and [5]. The test was conducted on the same days as the measurement of the DUT. Recommended limits for permittivity and conductivity, specified in [5], are shown in the table below. The obtained results from the system accuracy verification are also displayed in the table below. SAR values are normalized to 1 W forward power delivered to the dipole. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values. The distributions of SAR compare well with those of the reference measurements (see Appendix 1). The tissue stimulant depth was verified to be 15.0 cm  $\pm$  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		Ambient Temp (°C)	Tissue Temp (°C)
			$\epsilon_r$	$\sigma$ (S/m)		
1800	Measured, 2 Mar, 2011	39.05	39.5	1.36	21.7	20.8
	Measured, 3 Mar, 2011	37.10	39.1	1.36	21.7	20.9
	Measured, 7 Mar, 2011	37.85	38.4	1.36	22.3	21.4
	Recommended Limits	38.30	40.0 $\pm 5\%$	1.40 $\pm 5\%$	18-25	18-25
2450	Measured, 7-Mar-2011	56.5	35.7	1.80	22.7	21.1
	Measured, 11-Mar-2011	58.0	35.4	1.77	22.7	21.3
	Recommended Limits	53.4	39.2 $\pm 10\%$	1.80 $\pm 5\%$	18-25	18-25

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3180	1810	5.03	8 of 9
		2450	4.42	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 ( $\pm 30\%$ ) at 850 MHz. The default settings for the “coarse” and “cube” scans were chosen and used for measurements. The grid spacing of the coarse scan was set to 15 mm or less as shown in the SAR plots included in Appendix 2 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 SNN5804A - 910 mAH Battery

Model SNN5771B - 910 mAH Battery

Model SNN5819B - 1130 mAH Battery

BatterySNN5804A will be shipped with the phone and was used to do most of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery. The configurations that resulted in the highest SAR values were tested using the other batteries listed above.

### 6.1 Head Adjacent Test Results

The SAR results shown in tables 1 through 7 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  $\text{Extrapolated SAR} = \text{Measured SAR} * 10^{(-\text{drift}/10)}$ . The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The left head and right head SAR contour distributions are similar. Because of this similarity, the cheek/touch and 15° tilt test conditions with the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 2. All other test conditions measured lower SAR values than those included in Appendix 2. The 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  $\pm$  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 ES3DV3	3180	1810	5.03	8 of 9
		2450	4.42	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)
CDMA 1900	Channel 25	24.56	20.4	0.0743	0.579	0.58	0.963	0.96
	Channel 600	24.44	20.5	0.127	0.589	0.59	0.986	0.99
	Channel 1175	24.59	20.1	-0.0655	0.685	0.70	1.16	1.18

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)
CDMA 1900	Channel 25	24.56	20.8	-0.0477	0.553	0.56	0.891	0.90
	Channel 600	24.44	21.0	-0.01	0.582	0.58	0.953	0.96
	Channel 1175	24.59	20.6	0.0207	0.669	0.67	1.11	1.11

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 Degree 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)
CDMA 1900	Channel 25	24.56						
	Channel 600	24.44	20.0	0.0373	0.421	0.42	0.664	0.66
	Channel 1175	24.59						

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

Right Head 15 Degree 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)
CDMA 1900	Channel 25	24.56						
	Channel 600	24.44	20.3	0.0397	0.43	0.43	0.694	0.69
	Channel 1175	24.59						

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

Left Head Cheek Position with additional batteries								
f (MHz)	Description	Battery Model	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 1900	Channel 25	SNN5771B						
	Channel 600							
	Channel 1175		20.1	-0.15	0.692	0.72	1.17	1.21
CDMA 1900	Channel 25	SNN5819B						
	Channel 600							
	Channel 1175		20.0	0.0121	0.706	0.71	1.19	1.19

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

Left Head Cheek Position with additional battery SNN5771B								
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)
Bluetooth	Channel 0							
	Channel 39		20.7	0.796	0.00296	0.00	0.0077	0.01
	Channel 78							

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

Right Head 15 Degree Tilt Position with additional batteries								
f (MHz)	Description	Battery Model	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 1900	Channel 25	SNN5771B						
	Channel 600		21.1	-0.113	0.447	0.46	0.718	0.74
	Channel 1175							
CDMA 1900	Channel 25	SNN5819B						
	Channel 600		19.8	-0.102	0.444	0.45	0.716	0.73
	Channel 1175							

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

## 6.2 Body Worn Test Results

The SAR results shown in tables 8 through 11 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to [6]. Also shown are the 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  $\text{Extrapolated SAR} = \text{Measured SAR} * 10^{(-\text{drift}/10)}$ . The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The test conditions that produced the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 3. All other test conditions measured lower SAR values than those included in Appendix 3. 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 at frequencies 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 15 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. Both sides of the device were tested for Body SAR for the purpose of including the SAR evaluation for body-worn accessories that support the device with the front side facing the user.

The 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	3180	1810	4.71	8 of 9
		2450	4.22	8 of 9

Body Worn, Front of Phone 15 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)
CDMA 1900	Channel 25	24.56						
	Channel 600	24.44	21.1	-0.0642	0.428	0.43	0.685	0.70
	Channel 1175	24.59						

Table 8: 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								
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)
CDMA 1900	Channel 25	24.56	20.9	0.007	0.68	0.68	1.12	1.12
	Channel 600	24.44	20.9	0.0352	0.772	0.77	1.27	1.27
	Channel 1175	24.59	20.9	-0.0148	0.769	0.77	1.28	1.28

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 15 mm from Phantom with additional batteries								
f (MHz)	Description	Battery Model	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 1900	Channel 25	SNN5771B						
	Channel 600							
	Channel 1175		21.3	0.106	0.781	0.78	1.29	1.29
CDMA 1900	Channel 25	SNN5819B						
	Channel 600							
	Channel 1175		20.8	0.0743	0.833	0.83	1.37	1.37

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

Body Worn, Back of Phone 15 mm from Phantom with additional battery SNN5819B								
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)
Bluetooth	Channel 0							
	Channel 39		20.6	0.0272	0.000567	0.00	0.00239	0.00
	Channel 78							

Table 11: SAR measurement results at the highest possible output power, measured in a head cheek 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 (300 MHz – 3 GHz)”.
- [3] ANSI / IEEE, C95.1 1999 Edition “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”
- [4] FCC OET Bulletin 65 Supplement C 01-01
- [5] IEEE 1528 2003 Edition “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”
- [6] ICNIRP Guidelines “Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)”

## **Appendix 1**

### **SAR distribution comparison for the system accuracy verification**

## Test Laboratory: MOTOROLA 1800 MHz System Performance Check

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:283tr;**

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -31.4dB [Sim.Temp@SPC](#) = 20.8 Room Temp @ SPC = 21.7

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

Medium: VALIDATION Only; Medium parameters used:  $\sigma = 1.36$  mho/m,  $\epsilon_r = 39.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3180; ConvF(5.03, 5.03, 5.03); Calibrated: 5/20/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn719; Calibrated: 3/22/2010
- Phantom: R11\_Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1160;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 145

**Daily SPC Check/Dipole Area Scan (4x9x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 6.67 mW/g

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

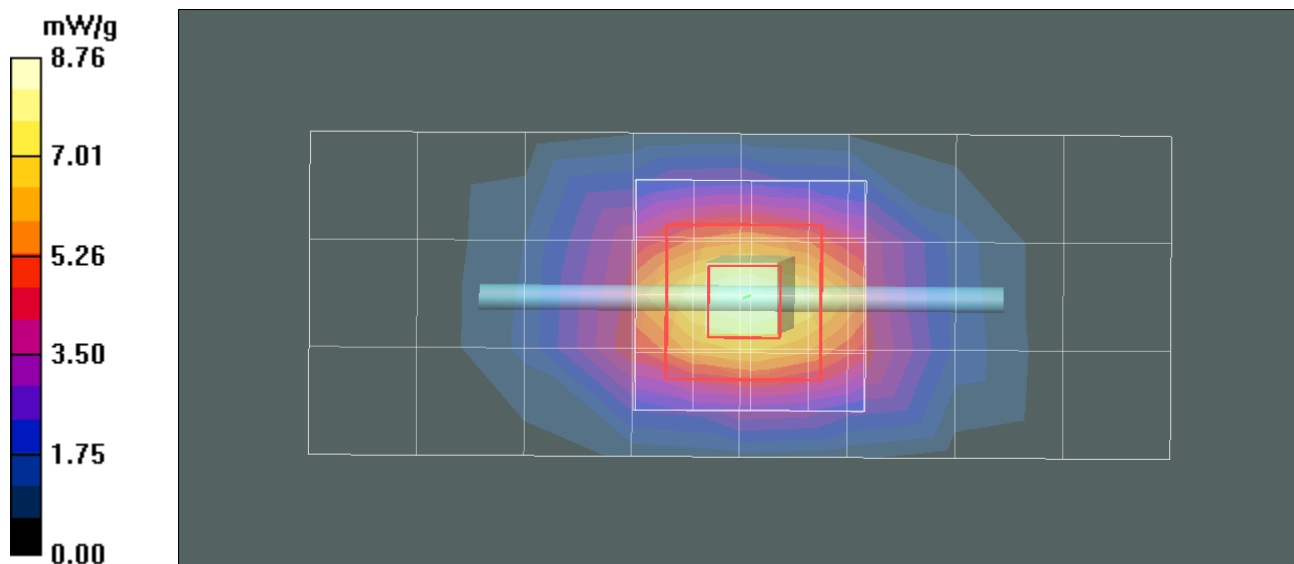
Reference Value = 80.6 V/m; Power Drift = 0.025 dB

Peak SAR (extrapolated) = 14.4 W/kg

**SAR(1 g) = 7.81 mW/g; SAR(10 g) = 4.09 mW/g**

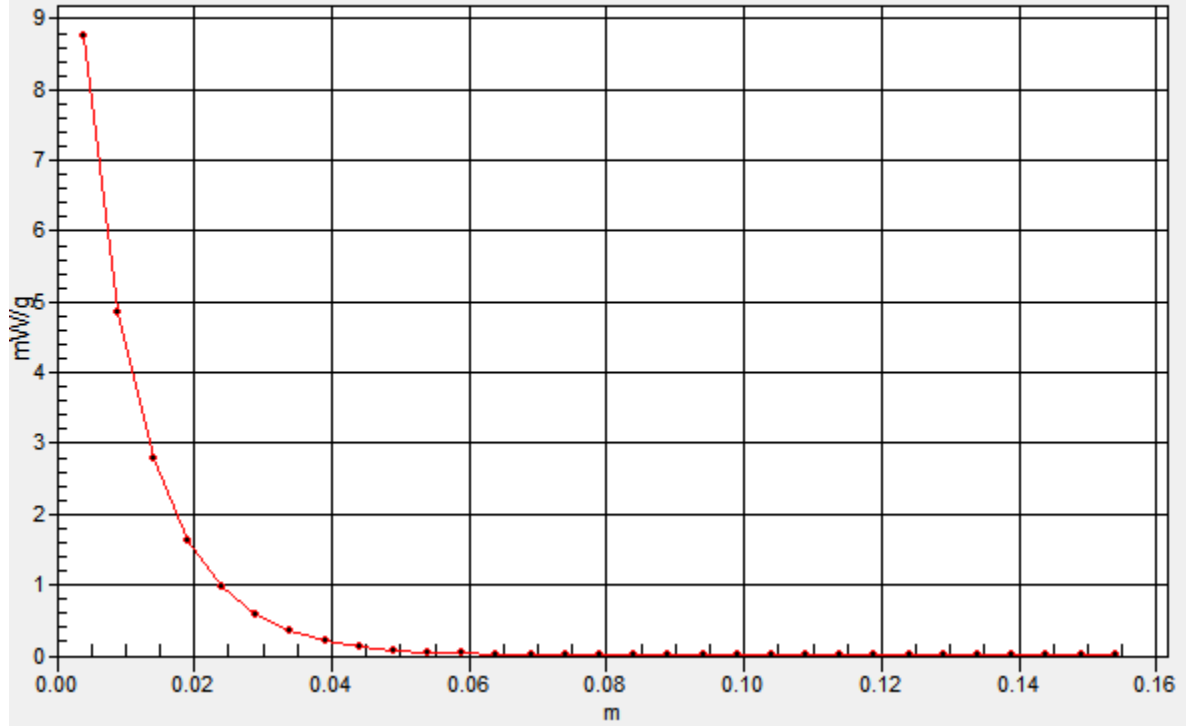
Maximum value of SAR (measured) = 8.76 mW/g

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



# SAR(x,y,z,f0)

SAR; Z-Axis Retraction: Value Along Z, X=0, Y=0



## Test Laboratory: MOTOROLA 1800 MHz System Performance Check

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:283tr;**

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -30.2dB [Sim.Temp@SPC](#) = 20.9 Room Temp @ SPC = 21.7

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

Medium: VALIDATION Only; Medium parameters used:  $\sigma = 1.36$  mho/m,  $\epsilon_r = 39.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3180; ConvF(5.03, 5.03, 5.03); Calibrated: 5/20/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn719; Calibrated: 3/22/2010
- Phantom: R11\_Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1160;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 145

**Daily SPC Check/Dipole Area Scan (4x9x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 6.41 mW/g

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

Reference Value = 78.9 V/m; Power Drift = 0.025 dB

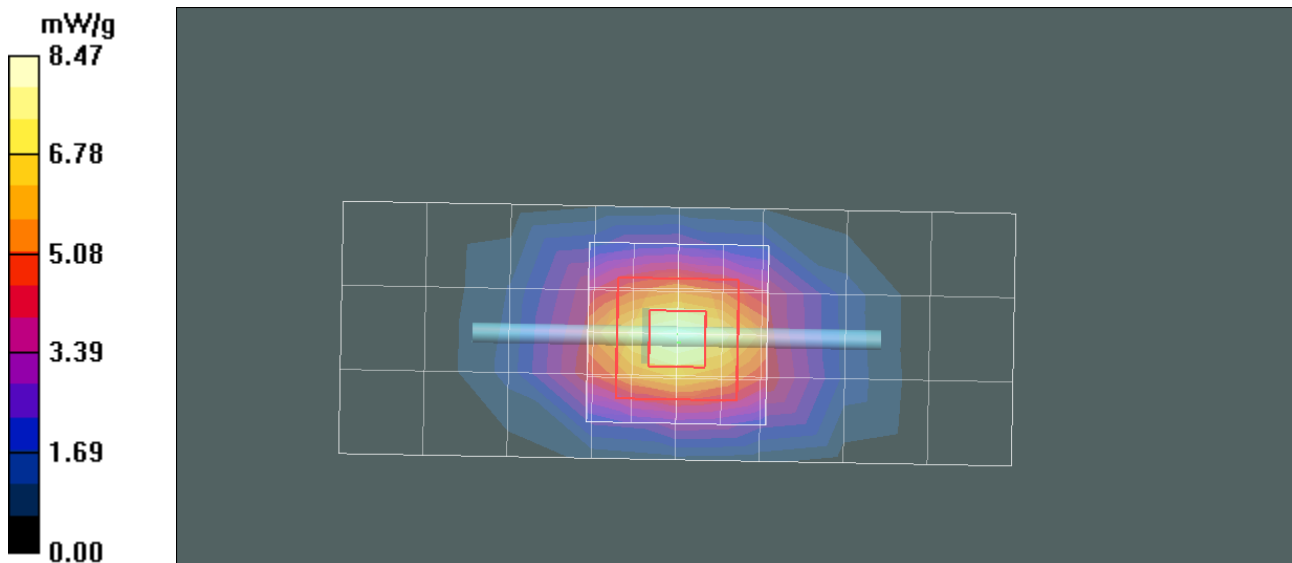
Peak SAR (extrapolated) = 13.6 W/kg

**SAR(1 g) = 7.42 mW/g; SAR(10 g) = 3.92 mW/g**

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

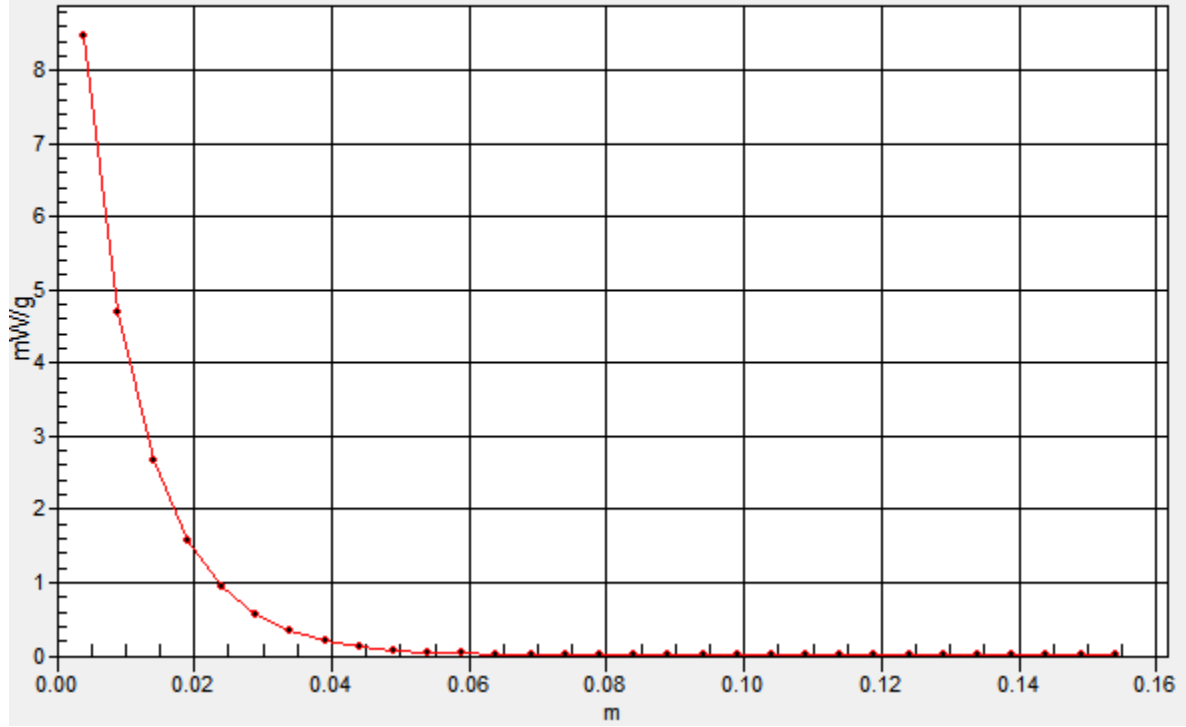
**Daily SPC Check/Z-Axis Retraction (1x1x31):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 8.47 mW/g



# SAR(x,y,z,f0)

SAR; Z-Axis Retraction: Value Along Z, X=0, Y=0



## Test Laboratory: MOTOROLA 1800 MHz System Performance Check

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:283tr;**

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -28.1dB [Sim.Temp@SPC](#) = 21.4 Room Temp @ SPC = 22.3

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

Medium: VALIDATION Only; Medium parameters used:  $\sigma = 1.36$  mho/m,  $\epsilon_r = 38.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3180; ConvF(5.03, 5.03, 5.03); Calibrated: 5/20/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn719; Calibrated: 3/22/2010
- Phantom: R11\_Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1160;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 145

**Daily SPC Check/Dipole Area Scan (4x9x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 6.38 mW/g

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

Reference Value = 80.0 V/m; Power Drift = 0.040 dB

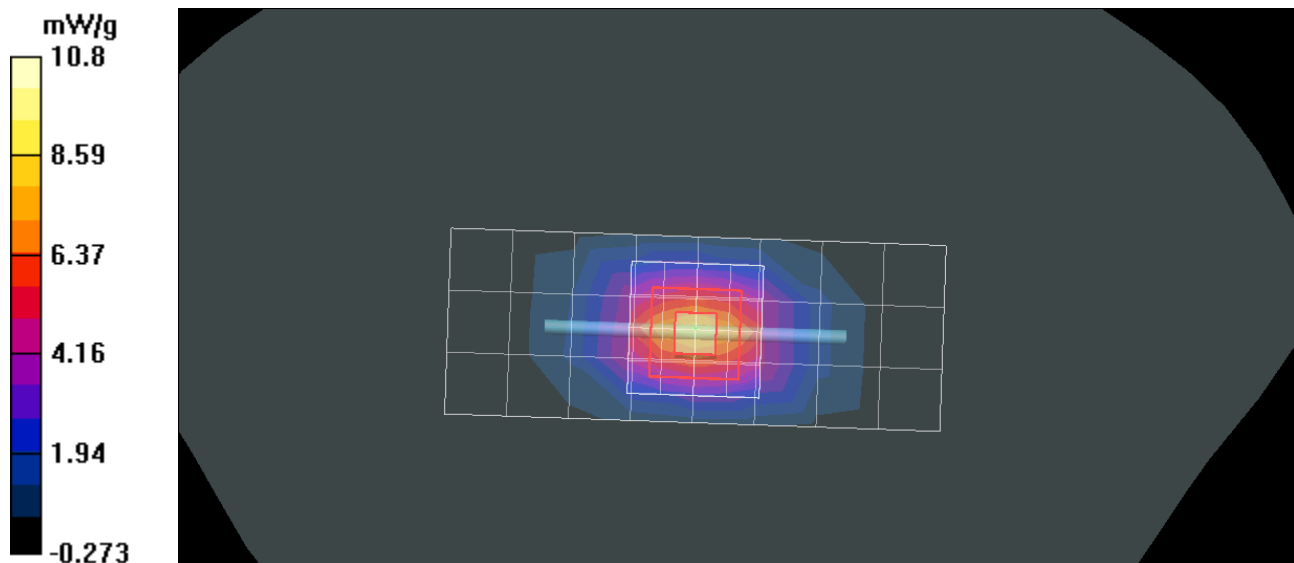
Peak SAR (extrapolated) = 13.9 W/kg

**SAR(1 g) = 7.57 mW/g; SAR(10 g) = 3.99 mW/g**

Maximum value of SAR (measured) = 8.48 mW/g

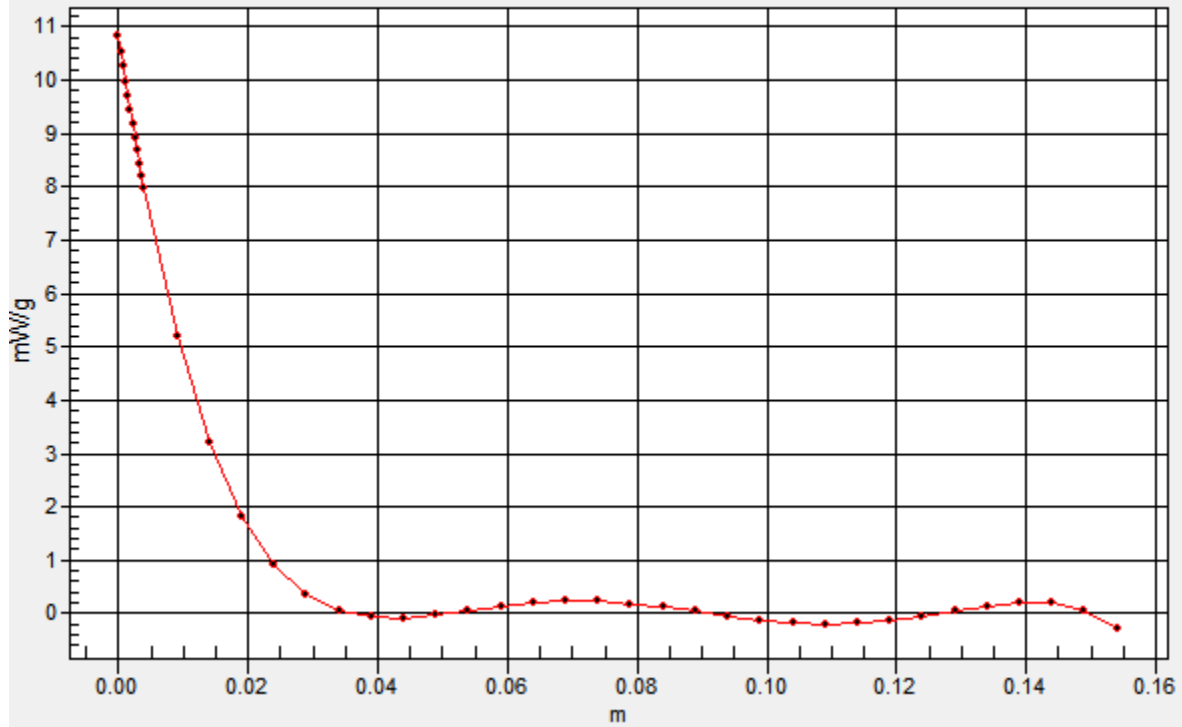
**Daily SPC Check/Z-Axis Retraction (1x1x42):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (interpolated) = 10.8 mW/g



# Interpolated SAR(x,y,z,f0)

SAR; Z-Axis Retraction: Value Along Z, X=0, Y=0



## Test Laboratory: MOTOROLA 2450 MHz System Performance Check

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:788;**

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -25.7dB [Sim.Temp@SPC](#) = 21.1 Room Temp @ SPC = 22.7

Communication System: CW - Dipole; Frequency: 2450 MHz; Communication System Channel Number: 11; Duty Cycle: 1:1

Medium: VALIDATION Only; Medium parameters used:  $\sigma = 1.8$  mho/m,  $\epsilon_r = 35.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3180; ConvF(4.42, 4.42, 4.42); Calibrated: 5/20/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn719; Calibrated: 3/22/2010
- Phantom: R11\_Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1160;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 145

**Daily SPC Check/Dipole Area Scan (4x9x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 9.53 mW/g

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

Reference Value = 85.8 V/m; Power Drift = 0.065 dB

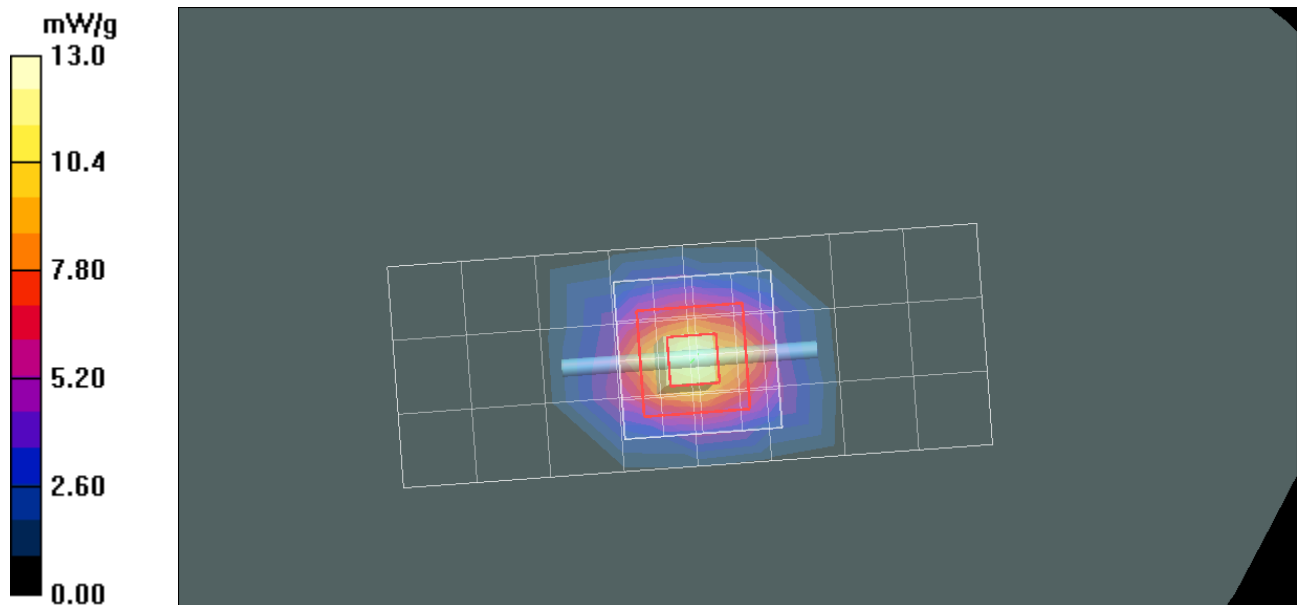
Peak SAR (extrapolated) = 23.7 W/kg

**SAR(1 g) = 11.3 mW/g; SAR(10 g) = 5.25 mW/g**

Maximum value of SAR (measured) = 12.8 mW/g

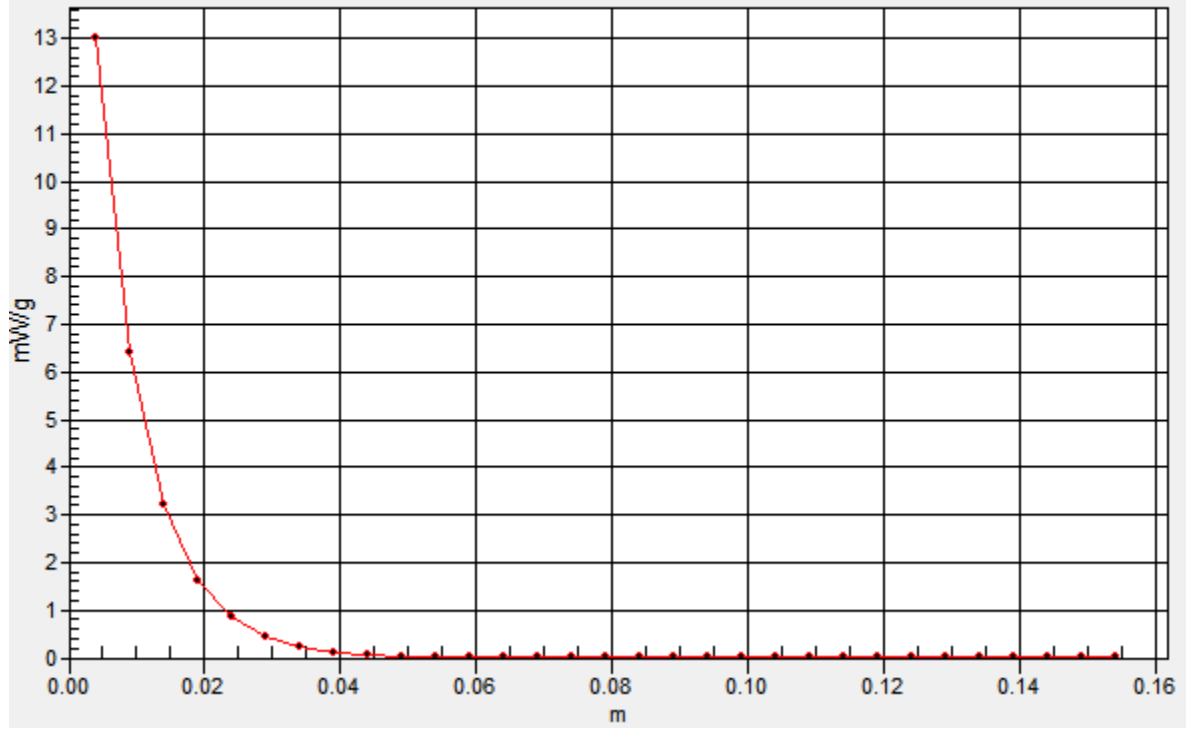
**Daily SPC Check/Z-Axis Retraction (1x1x31):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 13.0 mW/g



# SAR(x,y,z,f0)

SAR; Z-Axis Retraction: Value Along Z, X=0, Y=0



## Test Laboratory: MOTOROLA 2450 MHz System Performance Check

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:788;**

Procedure Notes: PM1 Power = 200 mW Refl.Pwr PM3 = -24.7dB [Sim.Temp@SPC](#) = 21.3 Room Temp @ SPC = 22.7

Communication System: CW - Dipole; Frequency: 2450 MHz; Communication System Channel Number: 11; Duty Cycle: 1:1

Medium: VALIDATION Only; Medium parameters used:  $\sigma = 1.77$  mho/m,  $\epsilon_r = 35.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3180; ConvF(4.42, 4.42, 4.42); Calibrated: 5/20/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn719; Calibrated: 3/22/2010
- Phantom: R11\_Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1160;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 145

**Daily SPC Check/Dipole Area Scan (4x9x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 9.07 mW/g

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

Reference Value = 87.3 V/m; Power Drift = 0.071 dB

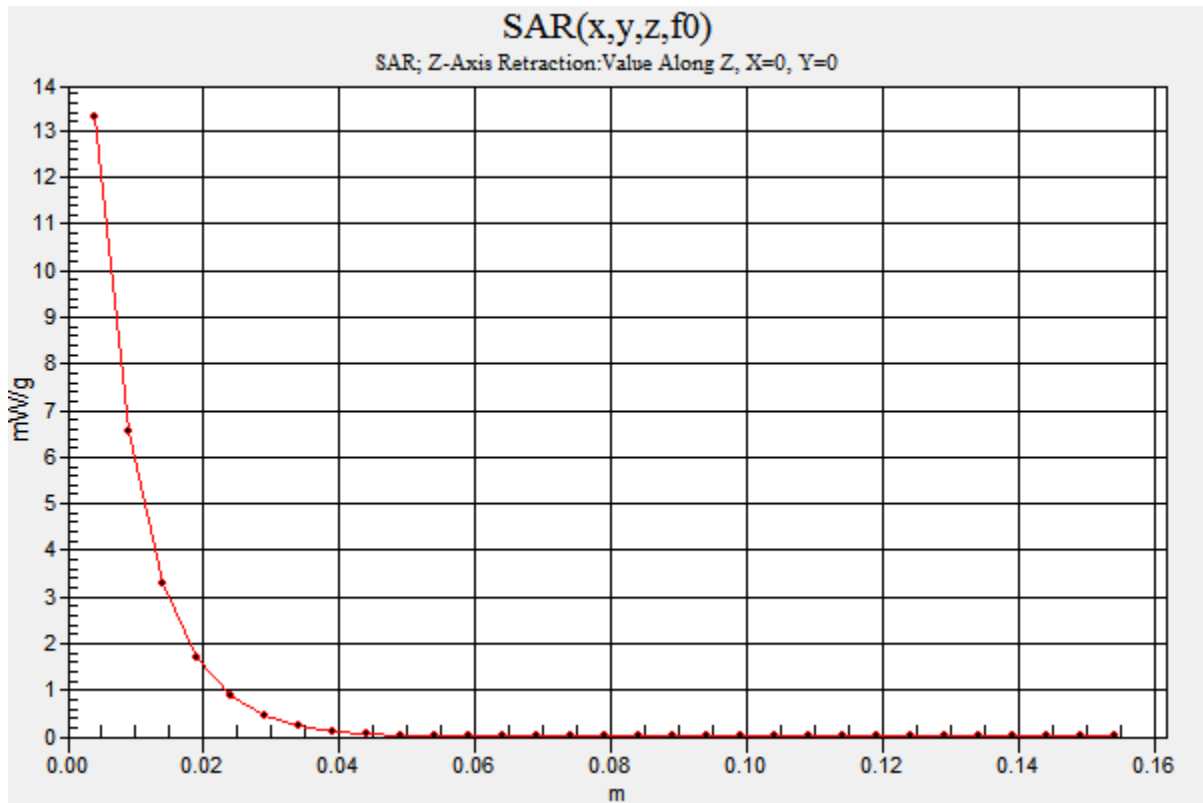
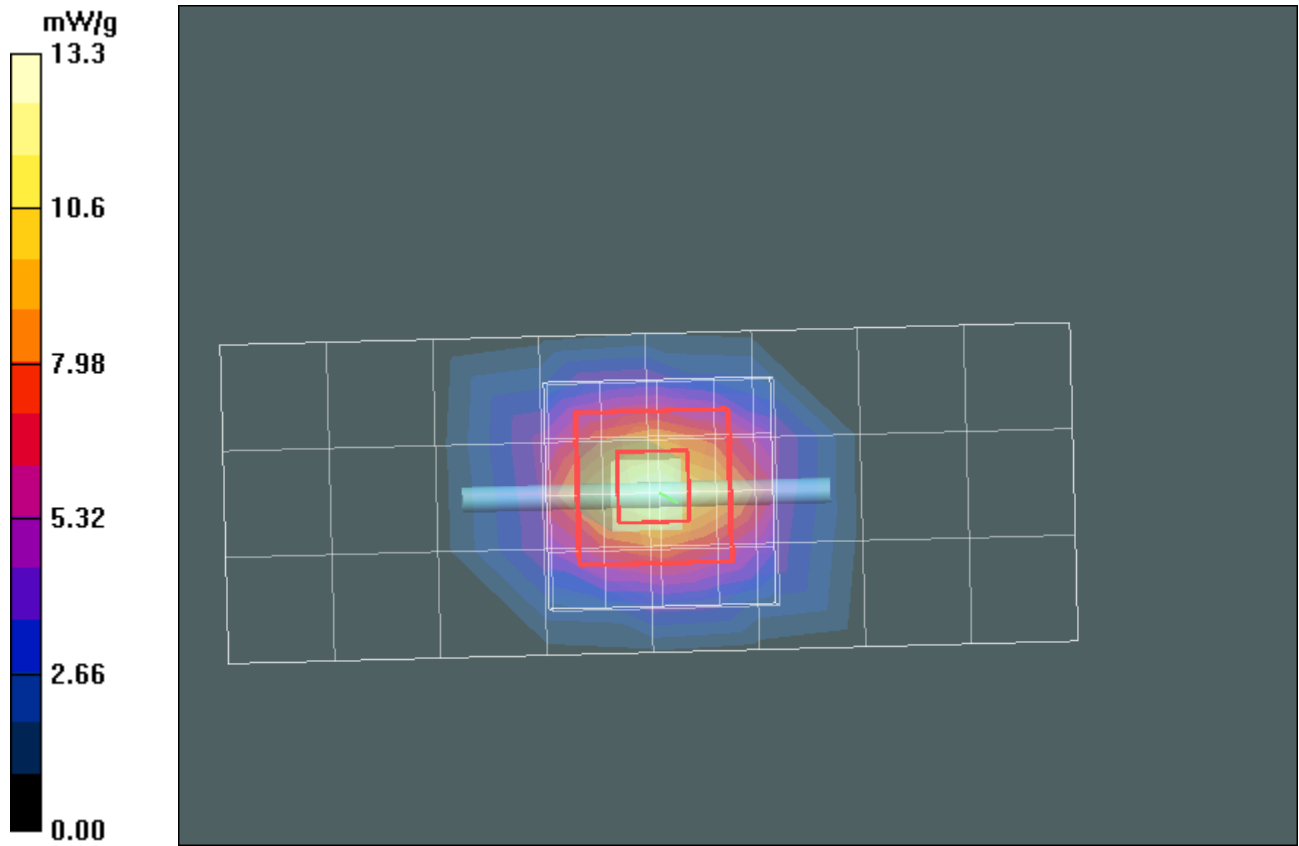
Peak SAR (extrapolated) = 24.4 W/kg

**SAR(1 g) = 11.6 mW/g; SAR(10 g) = 5.35 mW/g**

Maximum value of SAR (measured) = 13.2 mW/g

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

Maximum value of SAR (measured) = 13.3 mW/g



## **Appendix 2**

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

## Test Laboratory: MOTOROLA 1900 MHz Left Head Cheek

**Serial: A0000022FC14F1; FCC ID: IHDT56MU1**

Procedure Notes: Pwr Step: ALL Up Battery Model #: SNN5771B DEVICE POSITION (cheek or rotated): Cheek  
Communication System: CDMA 1900; Frequency: 1908.75 MHz; Communication System Channel Number: 1175;  
Duty Cycle: 1:1

Medium: Regular Glycol Head 1750/1880; Medium parameters used:  $\sigma = 1.45$  mho/m,  $\epsilon_r = 38.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3180; ConvF(5.03, 5.03, 5.03); Calibrated: 5/20/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn719; Calibrated: 3/22/2010
- Phantom: R11\_Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1160;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 145

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

Maximum value of SAR (measured) = 1.31 mW/g

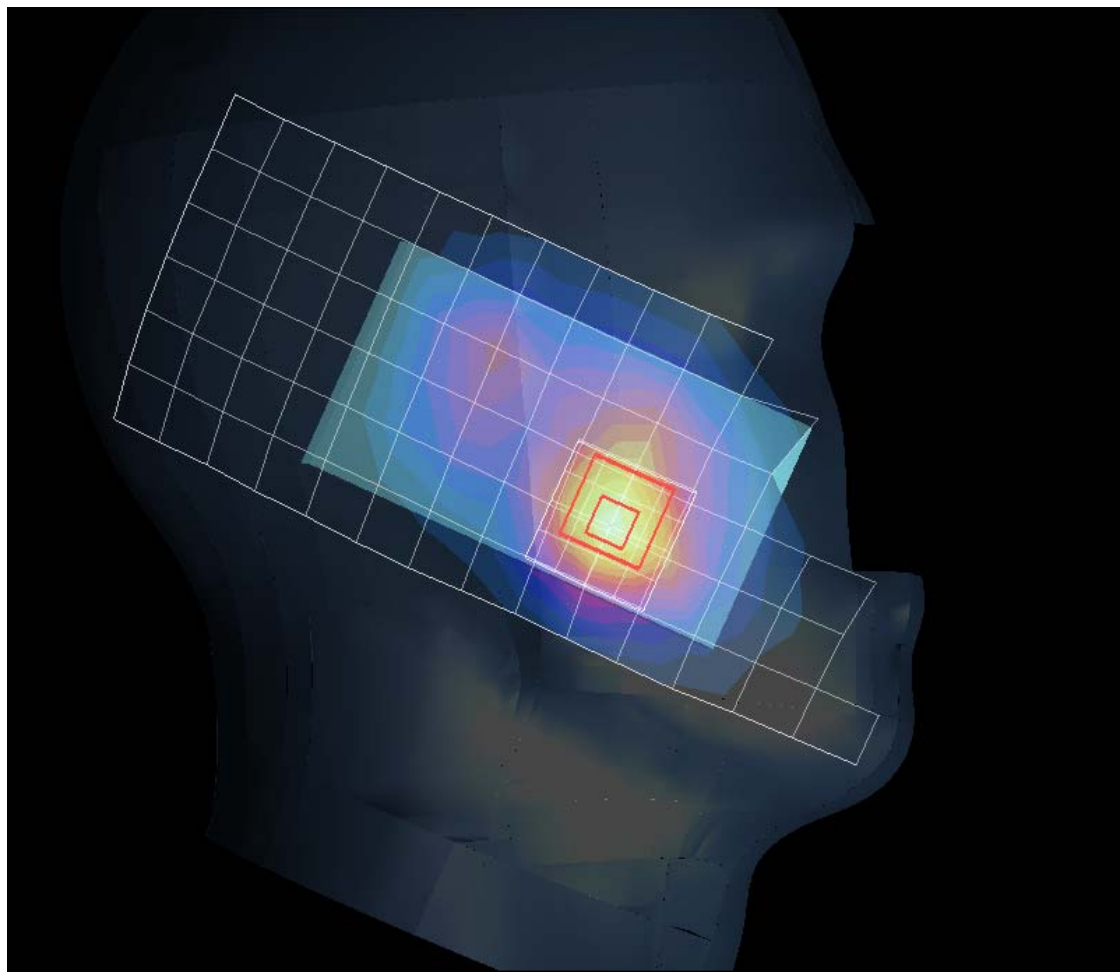
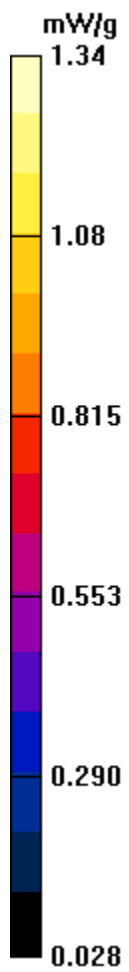
**Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 27.8 V/m; Power Drift = -0.078 dB

Peak SAR (extrapolated) = 1.91 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.716 mW/g**

Maximum value of SAR (measured) = 1.34 mW/g



## Test Laboratory: MOTOROLA 1900 MHz Right Head Tilt

**Serial: A0000022FC14F1; FCC ID: IHDT56MU1**

Procedure Notes: Pwr Step: All Up Battery Model #: SNN5771B DEVICE POSITION (check or rotated): Rotated  
 Communication System: CDMA 1900; Frequency: 1880 MHz; Communication System Channel Number: 600; Duty Cycle: 1:1

Medium: Regular Glycol Head 1750/1880; Medium parameters used:  $\sigma = 1.45$  mho/m,  $\epsilon_r = 38.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3180; ConvF(5.03, 5.03, 5.03); Calibrated: 5/20/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn719; Calibrated: 3/22/2010
- Phantom: R11\_Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1160;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 145

**Right Head Template/Area Scan - Normal (15mm) (7x17x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (measured) = 0.754 mW/g

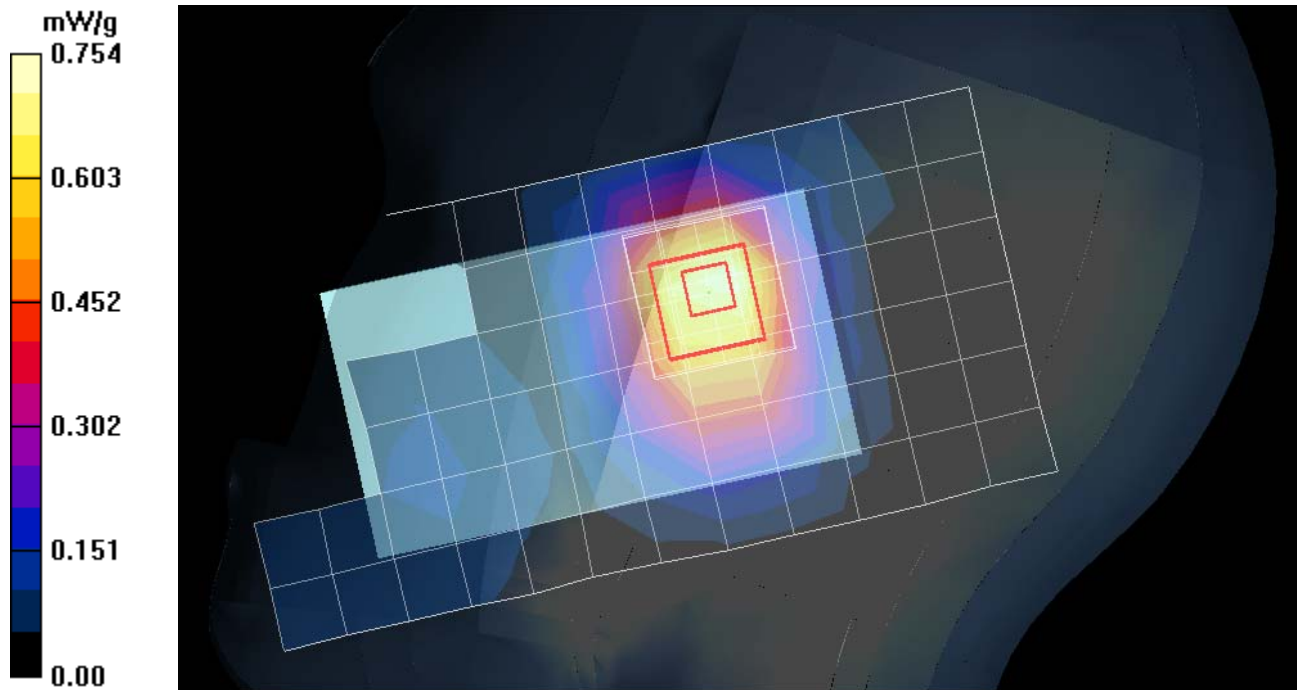
**Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.9 V/m; Power Drift = -0.113 dB

Peak SAR (extrapolated) = 1.08 W/kg

**SAR(1 g) = 0.719 mW/g; SAR(10 g) = 0.448 mW/g**

Maximum value of SAR (measured) = 0.775 mW/g



## Test Laboratory: MOTOROLA Bluetooth Left Head Check

**Serial: A0000022FC14F1; FCC ID: IHDT56MU1**

Procedure Notes: Battery Model #: SNN5771B DEVICE POSITION (cheek or rotated): Cheek

Communication System: Bluetooth; Frequency: 2441 MHz; Communication System Channel Number: 39; Duty Cycle: 1:1

Medium: 2450 Glycol Head; Medium parameters used:  $\sigma = 1.77$  mho/m,  $\epsilon_r = 35.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3180; ConvF(4.42, 4.42, 4.42); Calibrated: 5/20/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn719; Calibrated: 3/22/2010
- Phantom: R11\_Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1160;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 145

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

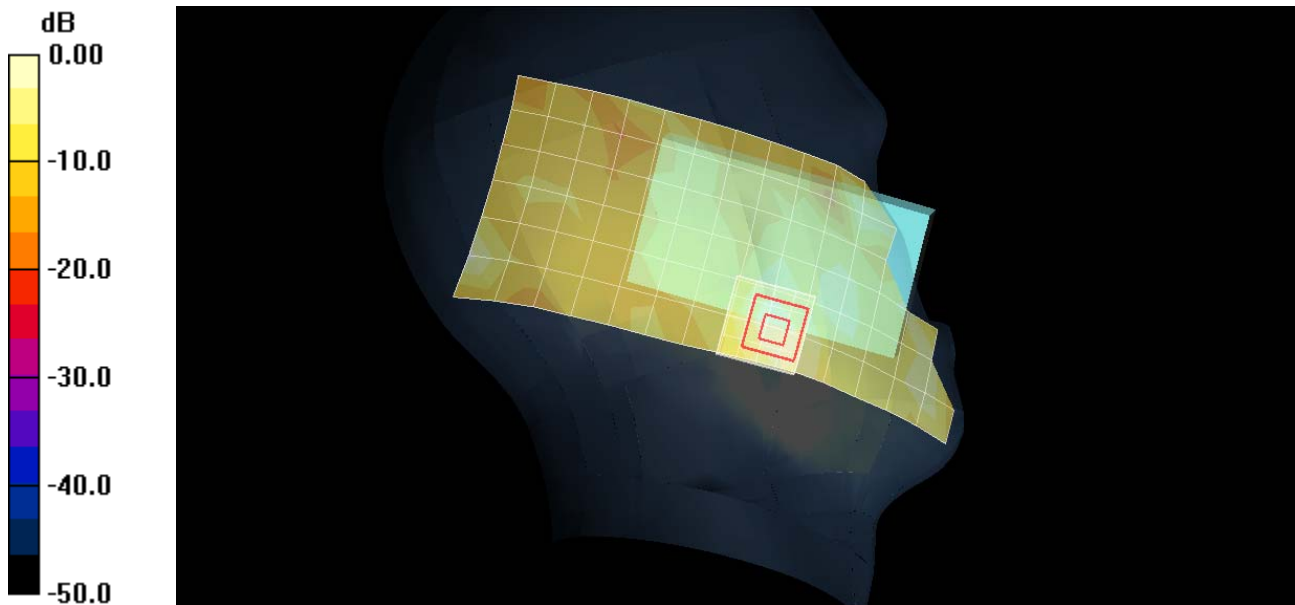
Maximum value of SAR (measured) = 0.01 mW/g

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

Reference Value = 1.44 V/m; Power Drift = 0.796 dB

Peak SAR (extrapolated) = 0.018 W/kg

**SAR(1 g) = 0.0077 mW/g; SAR(10 g) = 0.00296 mW/g**



0 dB = 0.010mW/g

## **Appendix 3**

### **SAR distribution plots for Body Worn Configuration**

## Test Laboratory: Motorola 1900 MHz Body Worn

**Serial: A0000022FC14F1; FCC ID: IHDT56MU1**

Procedure Notes: Pwr Step: All Up Battery Model #: SNN5819B Accessory Model # = Back of phone 15mm from phantom

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

Medium: Regular Glycol Head 1750/1880; Medium parameters used:  $\sigma = 1.58$  mho/m,  $\epsilon_r = 51.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3180; ConvF(4.71, 4.71, 4.71); Calibrated: 5/20/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn719; Calibrated: 3/22/2010
- Phantom: R11\_ Section 2, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

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

dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.39 mW/g

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

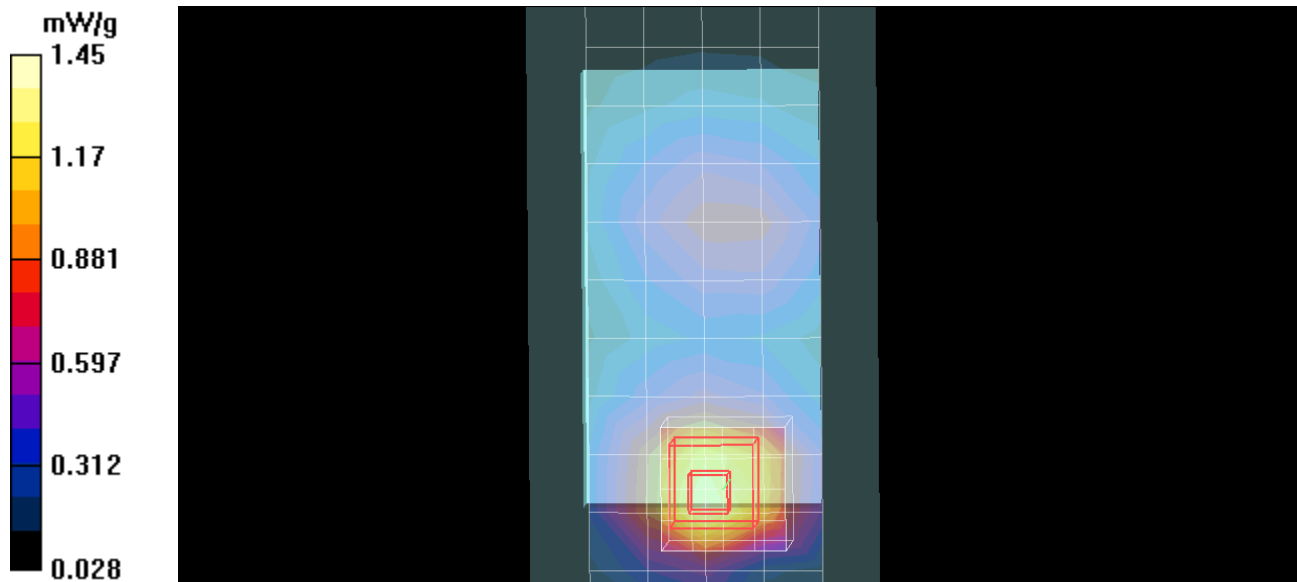
dx=8mm, dy=8mm, dz=5mm

Reference Value = 30.9 V/m; Power Drift = 0.074 dB

Peak SAR (extrapolated) = 2.18 W/kg

**SAR(1 g) = 1.37 mW/g; SAR(10 g) = 0.833 mW/g**

Maximum value of SAR (measured) = 1.45 mW/g



## Test Laboratory: MOTOROLA Bluetooth Body Worn

**Serial: A0000022FC14F1; FCC ID: IHDT56MU1**

Procedure Notes: Battery Model #: SNN5819B Accessory Model # = Back of phone 15mm from phantom

Communication System: Bluetooth; Frequency: 2441 MHz; Communication System Channel Number: 39; Duty Cycle: 1:1

Medium: 2450 Glycol Body; Medium parameters used:  $\sigma = 2.01$  mho/m,  $\epsilon_r = 51.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3180; ConvF(4.22, 4.22, 4.22); Calibrated: 5/20/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn719; Calibrated: 3/22/2010
- Phantom: R11\_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 145

**Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (16x7x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.01 mW/g

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

Reference Value = 1.22 V/m; Power Drift = 0.027 dB

Peak SAR (extrapolated) = 0.01 W/kg

**SAR(1 g) = 0.00239 mW/g; SAR(10 g) = 0.000567 mW/g**

