



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

**Accreditation:**



TESTING CERT #2518-02

Tests:  
Electromagnetic Specific Absorption Rate

Procedures:

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

On the following products or types of products:

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

**Statement of Compliance:**

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

(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 ICNIRP (10 g), the final SAR reading for this phone is 0.82 W/kg for head-adjacent use and 0.85 W/kg for body-worn use. For ANSI / IEEE C95.1 (1 g), the final SAR reading for this phone is 1.51 W/kg for head-adjacent use and 1.07 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 Rear of Phone	
<b>Dimensions</b>	Length	56 mm
	Width	15 mm
	Height	4 mm
<b>Configuration</b>	FICA	

### 2.2 Device description

<b>Serial number</b>	<b>A0000022130ADB</b>					
<b>Mode(s) of Operation</b>	CDMA 800	CDMA 1900	EV-DO 800 Rev. A	EV-DO 100 Rev. A	Wi-Fi 802.11b/g	Bluetooth
<b>Modulation Mode(s)</b>	QPSK	QPSK	QPSK	QPSK	BPSK	GMSK
<b>Maximum Output Power Setting</b>	25.00 dBm	25.00 dBm	25.00 dBm	25.00 dBm	18.00 dBm	10.00 dBm
<b>Duty Cycle</b>	1:1	1:1	1:1	1:1	1:1	1:1
<b>Transmitting Frequency Range(s)</b>	824.70 – 848.31 MHz	1851.25 – 1908.75 MHz	824.70 – 848.31 MHz	1851.25 – 1908.75 MHz	2412.0 - 2462.5 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 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	703	Sep-17-2010
E-Field Probe ES3DV3	3037	Sep-18-2010
S.A.M. Phantom used for 800/900 MHz	TP-1005	
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1139	
Dipole Validation Kit, DV835V2	420TR	Mar-17-2011
Dipole Validation Kit, DV1800V2	259TR	Mar-17-2011
Dipole Validation Kit, DV2450V2	766	Mar-17-2011

#### 3.2 Additional Equipment

Description	Serial Number	Cal Due Date
Signal Generator HP8648C	3847A04822	Apr-22-2011
Power Meter E4419B	GB39511082	Apr-24-2011
Power Sensor #1 - E9301A	US39210915	Dec-04-2010
Power Sensor #2 - E9301A	US39210916	Nov-16-2010
Network Analyzer HP8753ES	US39172529	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. 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, Jul-29-2010	41.1	0.90	20.2
		Recommended Limits	41.5 ±5%	0.90 ±5%	18-25
	Body	Measured, Jul-29-2010	55.7	0.99	20.1
		Recommended Limits	55.2 ±5%	0.97 ±5%	18-25
1880	Head	Measured, Jul-29-2010	38.9	1.46	19.9
		Recommended Limits	40.0 ±5%	1.40 ±5%	18-25
	Body	Measured, Jul-29-2010	51.1	1.59	19.8
		Recommended Limits	53.3 ±5%	1.52 ±5%	18-25
2450	Head	Measured, Jul-30-2010	37.3	1.85	19.7
		Recommended Limits	39.2 ±10%	1.80 ±5%	18-25
	Body	Measured, Jul-31-2010	49.9	2.00	19.6
		Recommended Limits	52.7 ±10%	1.95 ±5%	18-25

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

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

## 5. System Accuracy Verification

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

A SAR measurement was performed to verify the measured SAR was within  $\pm 10\%$  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)		
835	Measured, Jul-29-2010	9.45	41.1	0.90	20.2	20.1
	Recommended Limits	9.59	41.5 $\pm$ 5%	0.90 $\pm$ 5%	18-25	18-25
1800	Measured, Jul-29-2010	39.78	39.2	1.37	20.3	19.8
	Recommended Limits	38.36	40.0 $\pm$ 5%	1.40 $\pm$ 5%	18-25	18-25
2450	Measured, Jul-30-2010	55.25	37.3	1.85	20.1	19.6
	Measured, Jul-31-2010	55.75	37.3	1.85	20.0	19.7
	Recommended Limits	54.55	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 ET3DV6	3037	835	6.25	8 of 9
		1810	5.05	8 of 9
		2450	4.41	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 (± 30%) at 850 MHz. The default settings for the “coarse” and “cube” scans were chosen and used for measurements. The grid spacing of the course scan was set to 15 mm 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 SNN5843A - 1390 mAH Battery

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

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

Conducted power (dBm) for CDMA modes						
	Channel	RC1		RC3		RC3 (FCH + SCH)
		SO2	SO55	SO2	SO55	
CDMA 800	1013	24.93	24.92	24.86	24.93	Per Motorola designs, the maximum power, when in a mode that allows supplemental channels, will always be less than the RC3/RC1 maximum conducted power limit.
	384	25.08	24.91	24.92	25.08	
	777	24.97	24.84	24.88	24.97	
CDMA 1900	25	24.88	24.98	24.84	24.88	
	600	24.99	25.06	24.95	24.99	
	1175	24.99	24.96	24.93	24.99	

Conducted power (dBm) for EV-DO modes					
	Channel	Rev 0		Rev A	
		FTAP 307.2k	RTAP 153.6k	Subtype 2 FETAP	Subtype 2 RETAP
CDMA 800	1013	24.90	24.95	25.04	25.14
	384	25.03	25.10	24.98	25.12
	777	24.91	24.96	24.95	25.04
CDMA 1900	25	24.89	24.96	25.09	25.12
	600	24.89	25.04	25.15	25.12
	1175	24.80	24.95	24.98	25.09

### Evaluation of Wi-Fi 802.11 Modes

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

Band	Channel	Conducted Power (dBm) for 802.11b Mode Data Rates			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
Wi-Fi 2450 MHz	1	<b>19.37</b>	19.31	19.14	19.08
	6	<b>19.26</b>	19.25	19.14	19.04
	11	<b>18.43</b>	18.5	18.26	18.53

Band	Channel	Conducted Power (dBm) for 802.11g Mode Data Rates							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
Wi-Fi 2450 MHz	1	18.35	17.42	16.63	14.09	12.46	12.11	11.94	11.12
	6	18.18	17.26	16.37	13.88	12.79	11.71	11.91	10.88
	11	17.39	16.48	15.67	13.27	12.01	11.12	11.13	10.06

### 6.1 Head Adjacent Test Results

The SAR results shown in tables 1 through 4 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to the [6]. Also shown are the measured conducted output power levels for the CDMA RC3/SO55 mode, the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is  $\text{New SAR} = \text{Old SAR} * 10^{(-\text{drift}/10)}$ . 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. Note that 800 MHz digital mode SAR measurements were performed in accordance with [4].

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

The guidelines provided in “SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas” (KDB publication 648474 - D01 v01r05) were utilized for evaluation of the need for simultaneous transmission SAR testing. These guidelines direct that if the SAR-to-peak-location separation ratio for two simultaneously transmitting antennas is < 0.3 then SAR evaluation for simultaneous transmission is not required. For CDMA 1900 and Wi-Fi in the Left Head Cheek position the SAR-to-peak-location separation ratio is 0.23, and thus no testing was performed to determine the aggregate 1 g SAR in this configuration. A SAR plot with the Wi-Fi SAR overlaid upon the CDMA 1900 SAR are provided in Appendix 2 for this configuration, to provide visual indication of the separation of the SAR hotspots for each modulation.

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

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ET3DV6	3037	835	6.25	8 of 9
		1810	5.05	8 of 9
		2450	4.41	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 800	Channel 1013	24.93						
	Channel 384	25.08	20.0	-0.093	0.438	0.45	0.578	0.59
	Channel 777	24.97						
CDMA 1900	Channel 25	24.88	19.7	-0.304	0.872	0.94	1.41	1.51
	Channel 600	24.99	19.7	0.0020	0.844	0.84	1.39	1.39
	Channel 1175	24.99	19.7	-0.226	0.848	0.89	1.40	1.47
Wi-Fi 2450 802.11b 1 Mbps	Channel 1	19.37						
	Channel 6	19.26	19.5	0.362	0.0721	0.07	0.14	0.14
	Channel 11	18.43						
CDMA 800 + WiFi						0.52		0.73
CDMA 1900 + WiFi						1.01		

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 800	Channel 1013	24.93						
	Channel 384	25.08	20.0	-0.046	0.441	0.45	0.564	0.57
	Channel 777	24.97						
CDMA 1900	Channel 25	24.88	19.7	0.0413	0.737	0.74	1.13	1.13
	Channel 600	24.99	19.7	0.134	0.639	0.64	1.04	1.04
	Channel 1175	24.99	19.7	-0.13	0.684	0.70	1.08	1.11
Wi-Fi 2450	Channel 1	19.37						
	Channel 6	19.26	19.5	0.037	0.118	0.12	0.238	0.24
	Channel 11	18.43						
CDMA 800 + WiFi						0.57		0.81
CDMA 1900 + WiFi						0.86		1.37

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

Left Head 15° Tilt Position								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 800	Channel 1013	24.93						
	Channel 384	25.08	20	0.068	0.328	0.33	0.43	0.43
	Channel 777	24.97						
CDMA 1900	Channel 25	24.88						
	Channel 600	24.99	19.7	0.10	0.426	0.43	0.67	0.67
	Channel 1175	24.99						
Wi-Fi 2450	Channel 1	19.37						
	Channel 6	19.26	19.5	-0.232	0.0617	0.07	0.123	0.13
	Channel 11	18.43						
CDMA 800 + WiFi						0.40		0.56
CDMA 1900 + WiFi						0.50		0.80

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

Right Head 15° Tilt Position								
<i>f</i> (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	<i>10 g SAR value</i>		<i>1 g SAR value</i>	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
CDMA 800	Channel 1013	24.93						
	Channel 384	25.08	20.0	0.075	0.333	0.33	0.441	0.44
	Channel 777	24.97						
CDMA 1900	Channel 25	24.88						
	Channel 600	24.99	19.7	0.035	0.458	0.46	0.73	0.73
	Channel 1175	24.99						
Wi-Fi 2450	Channel 1	19.37						
	Channel 6	19.26	19.5	-0.074	0.0809	0.08	0.161	0.16
	Channel 11	18.43						
CDMA 800 + WiFi						0.41		0.60
CDMA 1900 + WiFi						0.54		0.89

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

## 6.2 Body Worn Test Results

The SAR results shown in tables 5 through 6 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to the [6]. Also shown are the measured conducted output power levels for the CDMA RC3/SO55 mode, the temperature of the test facility during the test, the temperature of the tissue simulate after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is  $\text{New SAR} = \text{Old SAR} * 10^{(-\text{drift}/10)}$ . 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. Note that 800 MHz digital mode SAR measurements were performed in accordance with [4].

The test conditions that produced the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 3. All other test conditions measured lower SAR values than those included in Appendix 3. The tables below also include the highest SAR value summations for primary and secondary co-located transmitters, with the results indicated in italics.

A “flat” phantom was for the body-worn tests. This “flat” phantom is made out of 1” thick natural High Density Polyethylene with a thickness at the bottom equal to 2.0 mm. It measures 52.7 cm(long) x 26.7 cm(wide) x 21.2 cm(tall). The measured dielectric constant of the material used is less than 2.3 and the loss tangent is less than 0.0046 all the way up to 2.184 GHz.

The tissue stimulant depth was verified to be 15.0 cm ± 0.5 cm. The same device holder described in section 6 was used for positioning the phone. The 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.

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

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ET3DV6	3037	835	6.17	8 of 9
		1810	4.96	8 of 9
		2450	4.29	8 of 9

Body-Worn; Front of Phone 15 mm from Phantom								
<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)
CDMA 800	Channel 1013	24.93						
	Channel 384	25.08	19.8	-0.12	0.374	0.38	0.504	0.52
	Channel 777	24.97						
CDMA 1900	Channel 25	24.88						
	Channel 600	24.99	19.5	0.049	0.353	0.35	0.546	0.55
	Channel 1175	24.99						
Wi-Fi 2450	Channel 1	19.37						
	Channel 6	19.26	19.5	-0.023	0.0335	0.03	0.0549	0.06
	Channel 11	18.43						
Wi-Fi + CDMA 800						0.41		0.58
Wi-Fi + CDMA 1900						0.38		0.61

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

Body-Worn; Back of Phone 15 mm from Phantom								
<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)
CDMA 800	Channel 1013	24.93	19.8	-0.009	0.660	0.660	0.875	0.88
	Channel 384	25.08	19.8	-0.041	0.727	0.73	0.983	0.99
	Channel 777	24.97	19.8	-0.043	0.413	0.42	0.543	0.55
CDMA 1900	Channel 25	24.88						
	Channel 600	24.99	19.5	0.031	0.516	0.52	0.778	0.78
	Channel 1175	24.99						
Wi-Fi 2450	Channel 1	19.37						
	Channel 6	19.26	19.6	-0.149	0.0463	0.05	0.0778	0.08
	Channel 11	18.43						
Wi-Fi + CDMA 800						0.78		1.07
Wi-Fi + CDMA 1900						0.57		0.86

Table 6: 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 (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

## 835MHz System Performance Check

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:420tr**

Procedure Notes: PM1 Power = 200 mW PM2 Power = 200mW Refl.Pwr PM3 = -24.3dB [Sim.Temp@SPC](#) = 20.1  
Room Temp @ SPC = 20.2

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

Medium: VALIDATION Only; Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.9 \text{ mho/m}$ ;  $\epsilon_r = 41.1$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Daily SPC Check/Dipole Area Scan (31x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.04 mW/g

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

Reference Value = 48.5 V/m; Power Drift = -0.041 dB

Peak SAR (extrapolated) = 2.70 W/kg

**SAR(1 g) = 1.9 mW/g; SAR(10 g) = 1.26 mW/g**

Maximum value of SAR (measured) = 2.06 mW/g

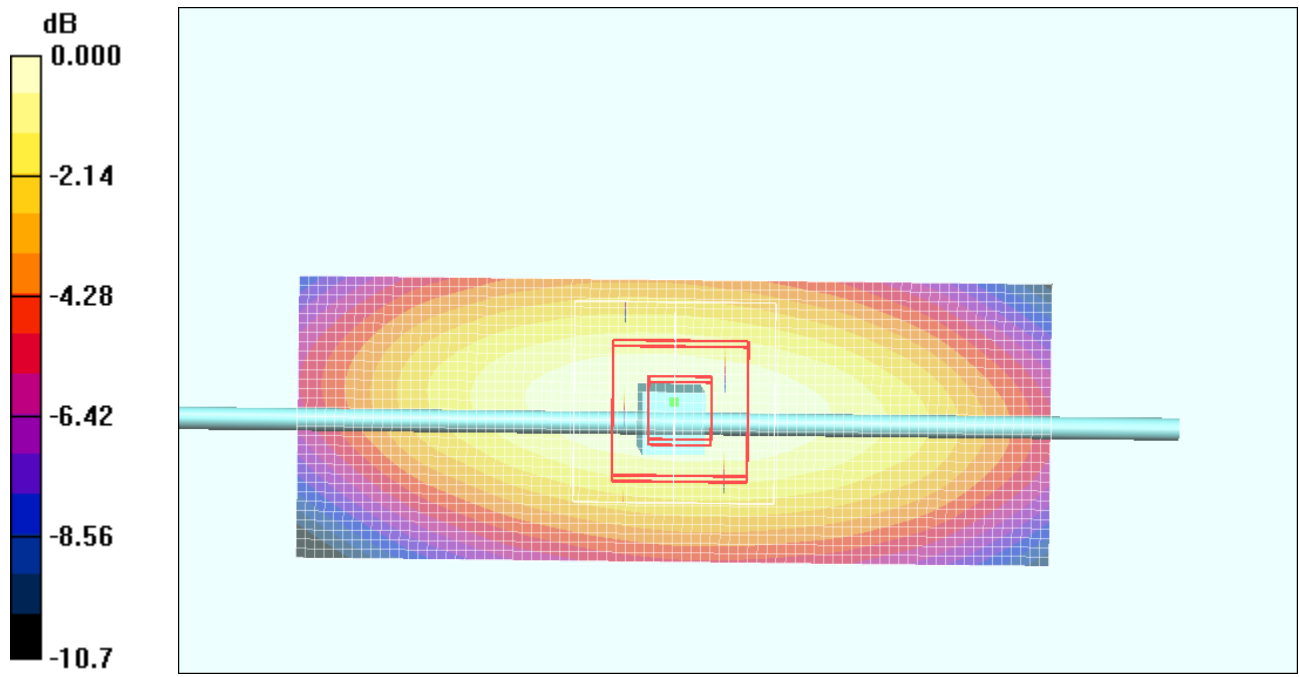
**Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 48.5 V/m; Power Drift = -0.041 dB

Peak SAR (extrapolated) = 2.72 W/kg

**SAR(1 g) = 1.88 mW/g; SAR(10 g) = 1.23 mW/g**

Maximum value of SAR (measured) = 2.02 mW/g



0 dB = 2.02mW/g

# Test Laboratory: Motorola

## 1800MHz System Performance Check

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

Procedure Notes: PM1 Power = 200 mW PM2 Power = 201 mW Refl.Pwr PM3 = -20.65 dB [Sim.Temp@SPC](#) = 19.8°C Room Temp @ SPC = 20.3°C

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

Medium: VALIDATION Only; Medium parameters used:  $f = 1800$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.05, 5.05, 5.05); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Section 2, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Daily SPC Check/Dipole Area Scan (81x31x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 9.72 mW/g

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

Reference Value = 81.9 V/m; Power Drift = -0.053 dB

Peak SAR (extrapolated) = 14.2 W/kg

**SAR(1 g) = 8.03 mW/g; SAR(10 g) = 4.28 mW/g**

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

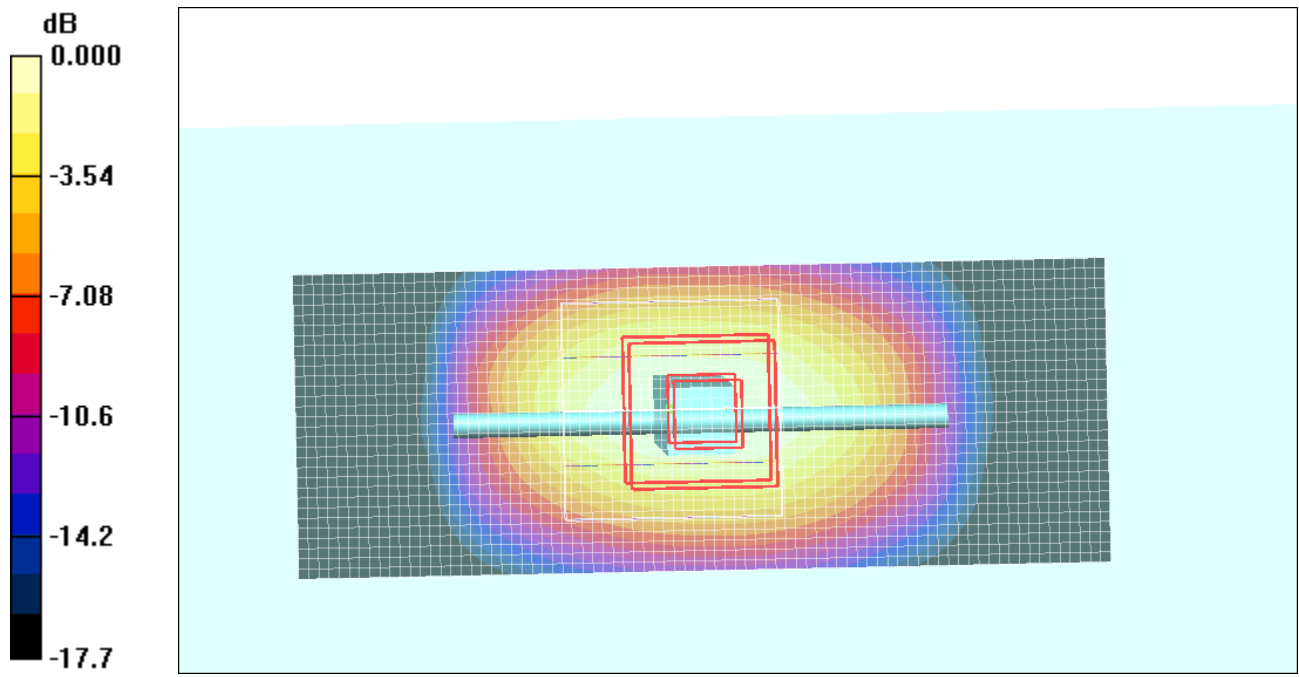
**Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 81.9 V/m; Power Drift = -0.053 dB

Peak SAR (extrapolated) = 14.3 W/kg

**SAR(1 g) = 7.88 mW/g; SAR(10 g) = 4.18 mW/g**

Maximum value of SAR (measured) = 8.73 mW/g



0 dB = 8.73mW/g

# Test Laboratory: Motorola

## 2450MHz System Performance Check

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

Procedure Notes: PM1 Power = 200mW PM2 Power = 201 mW Refl.Pwr PM3 = -21.10 dB [Sim.Temp@SPC](#) = 19.6  
Room Temp @ SPC = 20.1

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

Medium: VALIDATION Only; Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.85$  mho/m;  $\epsilon_r = 37.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.41, 4.41, 4.41); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Daily SPC Check/Dipole Area Scan (31x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 13.9 mW/g

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

Reference Value = 81.4 V/m; Power Drift = -0.031 dB

Peak SAR (extrapolated) = 22.1 W/kg

**SAR(1 g) = 11.1 mW/g; SAR(10 g) = 5.24 mW/g**

Maximum value of SAR (measured) = 12.7 mW/g

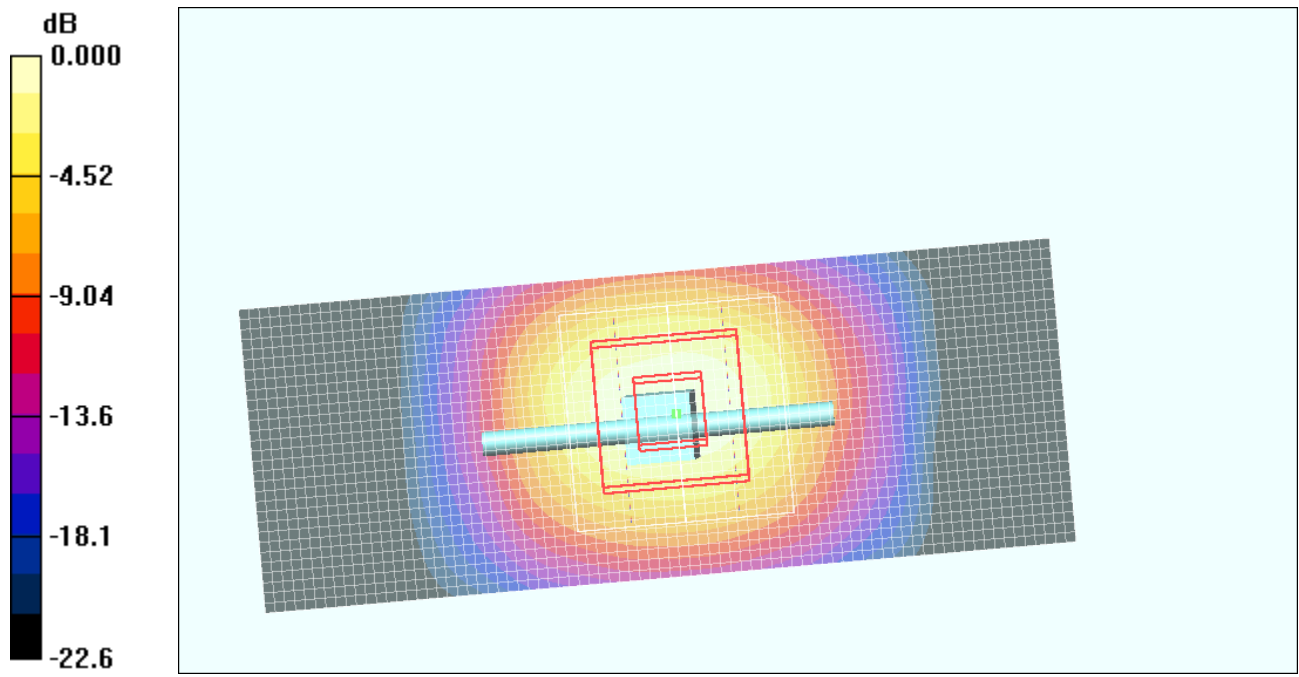
**Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 81.4 V/m; Power Drift = -0.031 dB

Peak SAR (extrapolated) = 22.5 W/kg

**SAR(1 g) = 11 mW/g; SAR(10 g) = 5.14 mW/g**

Maximum value of SAR (measured) = 12.5 mW/g



0 dB = 12.5mW/g

# Test Laboratory: Motorola

## 2450 MHz System Performance Check

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

Procedure Notes: Power = 200 mW PM2 Power = 201 mW Refl.Pwr PM3 = -19.6 dB [Sim.Temp@SPC](#) = 19.7 Room Temp @ SPC = 20

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

Medium: VALIDATION Only; Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.85$  mho/m;  $\epsilon_r = 37.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.41, 4.41, 4.41); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Daily SPC Check/Dipole Area Scan (31x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 14.6 mW/g

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

Reference Value = 83.3 V/m; Power Drift = -0.019 dB

Peak SAR (extrapolated) = 22.3 W/kg

**SAR(1 g) = 11.2 mW/g; SAR(10 g) = 5.29 mW/g**

Maximum value of SAR (measured) = 12.6 mW/g

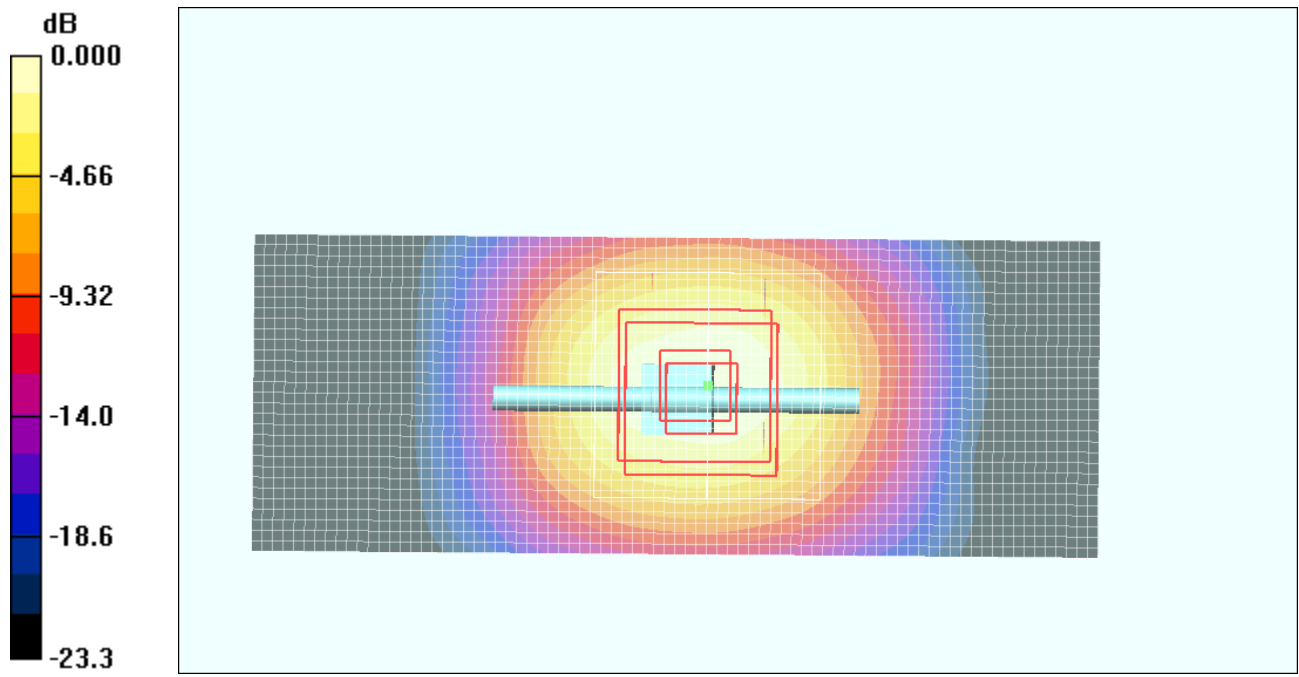
**Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 83.3 V/m; Power Drift = -0.019 dB

Peak SAR (extrapolated) = 22.7 W/kg

**SAR(1 g) = 11.1 mW/g; SAR(10 g) = 5.19 mW/g**

Maximum value of SAR (measured) = 12.2 mW/g



0 dB = 12.2mW/g

## **Appendix 2**

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

## Test Laboratory: Motorola 800 MHz Left Head Check

**DUT: IHDP56KC1 with Carry Case; Serial: A0000022130ADB;**

Procedure Notes: Pwr Step: ALWAYS UP Battery Model #: SNN5843A DEVICE POSITION (cheek or rotated):  
cheek

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

Medium: Low Freq Head; Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.9$  mho/m;  $\epsilon_r = 41.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Head Template/Area Scan - Normal (15mm) (61x161x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.600 mW/g

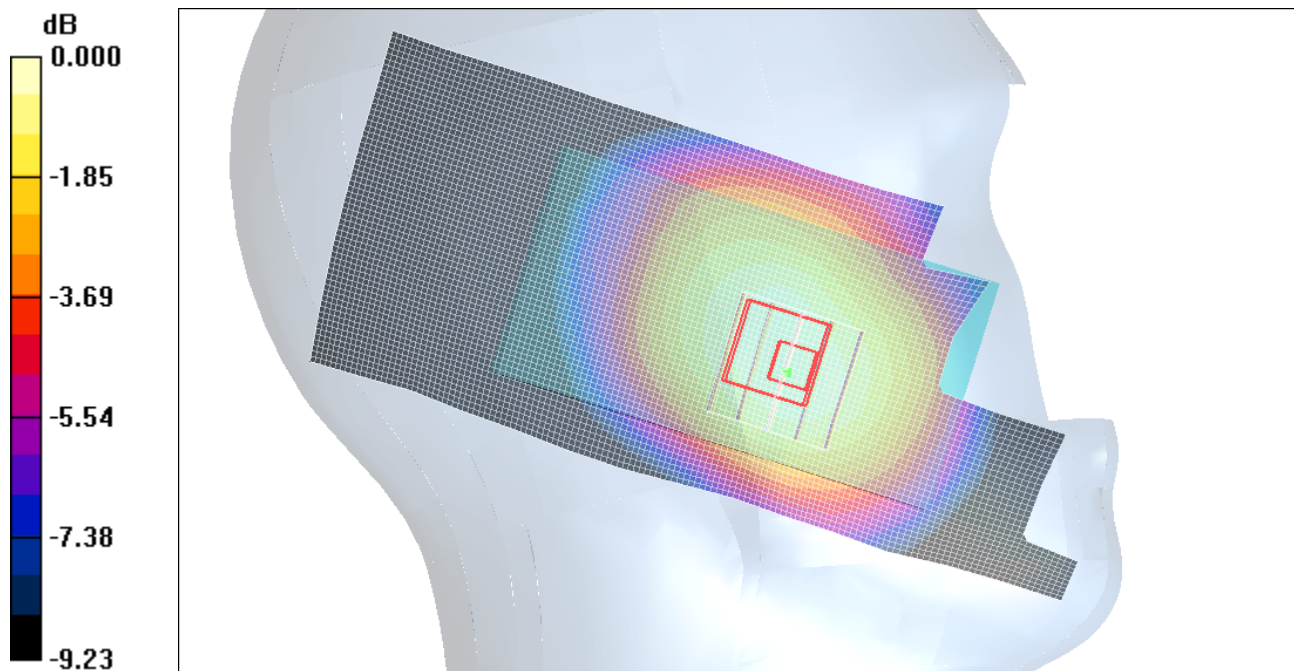
**Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm,  
dy=8mm, dz=5mm

Reference Value = 26.4 V/m; Power Drift = -0.093 dB

Peak SAR (extrapolated) = 0.720 W/kg

**SAR(1 g) = 0.578 mW/g; SAR(10 g) = 0.438 mW/g**

Maximum value of SAR (measured) = 0.610 mW/g



0 dB = 0.610mW/g

## Test Laboratory: Motorola 800MHz Right Tilt

**DUT: IHDP56KC1 with Carry Case; Serial: A0000022130ADB;**

Procedure Notes: Pwr Step: ALWAYS UP Battery Model #: SNN5843A DEVICE POSITION (cheek or rotated):  
TILT TESTER

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

Medium: Low Freq Head; Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.9$  mho/m;  $\epsilon_r = 41.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Head Template/Area Scan - Normal (15mm) (61x161x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.474 mW/g

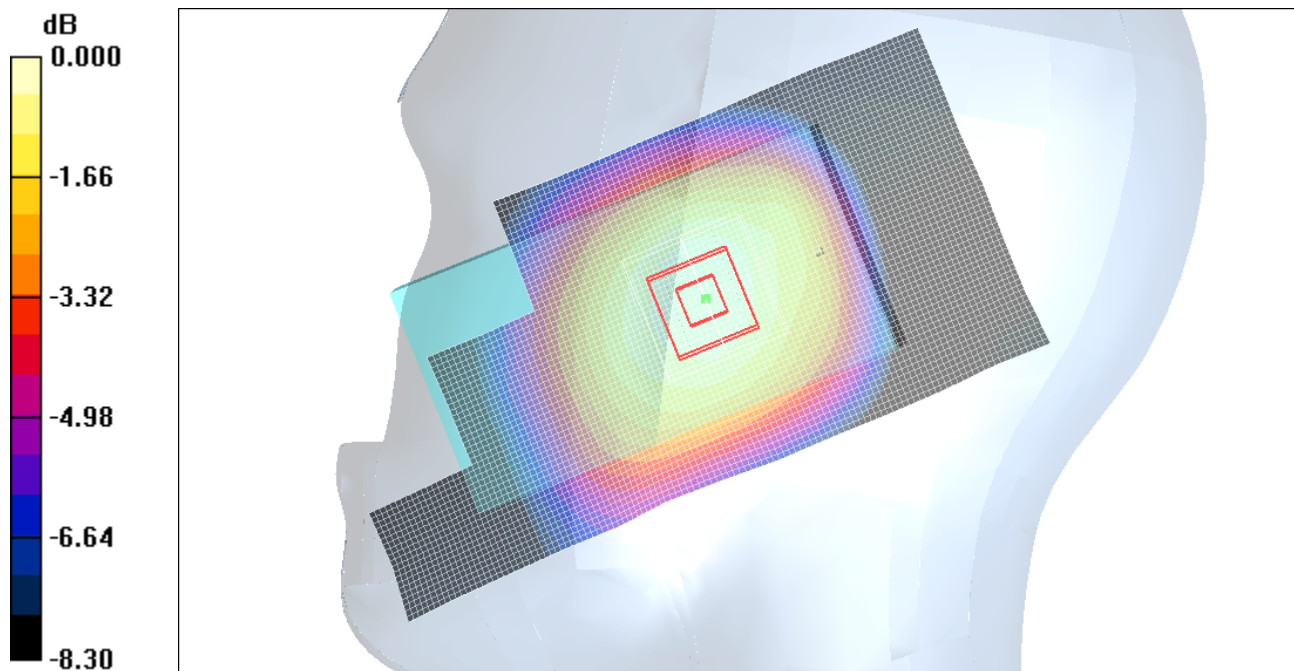
**Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.6 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 0.539 W/kg

**SAR(1 g) = 0.441 mW/g; SAR(10 g) = 0.333 mW/g**

Maximum value of SAR (measured) = 0.464 mW/g



0 dB = 0.464mW/g

## Test Laboratory: Motorola 1900MHz Left Head Cheek

**DUT: IHDP56KC1 with Carry Case; Serial: A0000022130ADB;**

Procedure Notes: Pwr Step: ALWAYS UP Battery Model #: SNN5843A DEVICE POSITION (cheek or rotated): CHEEK

Communication System: CDMA 1900; Frequency: 1851.25 MHz; Communication System Channel Number: 25; Duty Cycle: 1:1

Medium: Regular Glycol Head 1750/1880; Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 38.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.05, 5.05, 5.05); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Head Template/Area Scan - Normal (15mm) (61x161x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.70 mW/g

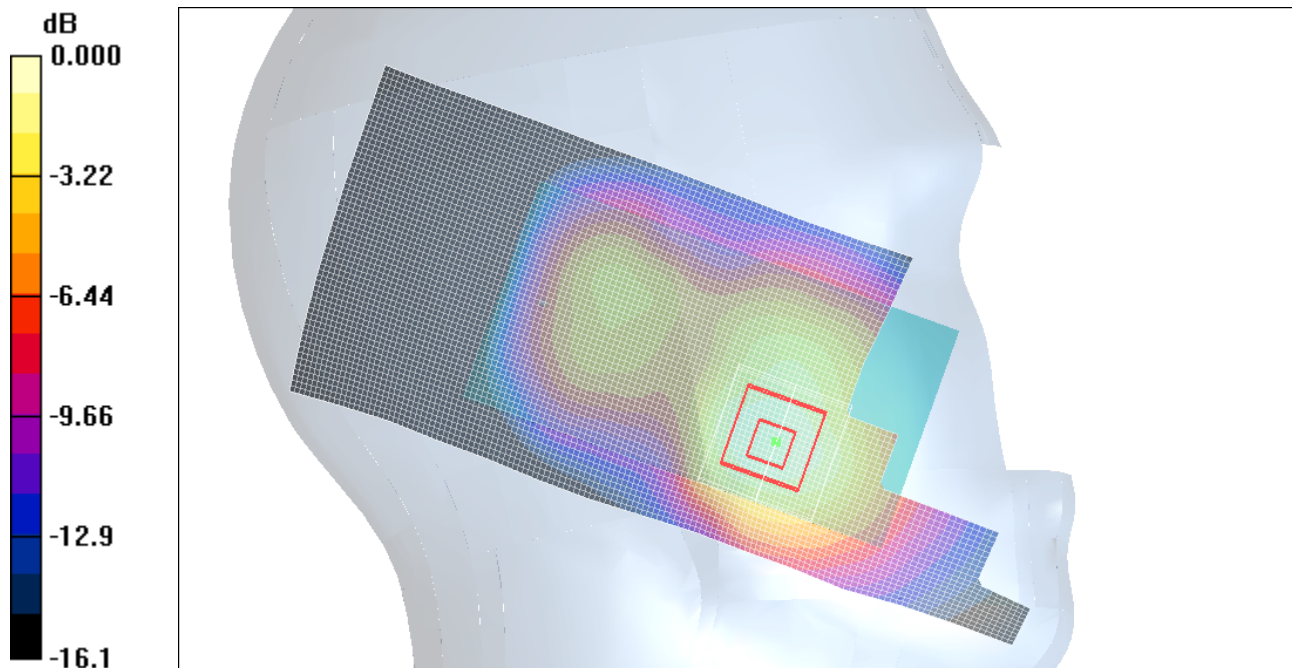
**Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 30.6 V/m; Power Drift = -0.304 dB

Peak SAR (extrapolated) = 2.04 W/kg

**SAR(1 g) = 1.41 mW/g; SAR(10 g) = 0.872 mW/g**

Maximum value of SAR (measured) = 1.57 mW/g



0 dB = 1.57mW/g

## Test Laboratory: Motorola 1900 MHz Tilt

**DUT: IHDP56KC1 with Carry Case; Serial: A0000022130ADB;**

Procedure Notes: Pwr Step: ALWAYS UP Battery Model #: SNN5843A DEVICE POSITION (cheek or rotated): TILT

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

Medium: Regular Glycol Head 1750/1880; Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 38.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.05, 5.05, 5.05); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Head Template/Area Scan - Normal (15mm) (61x161x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.846 mW/g

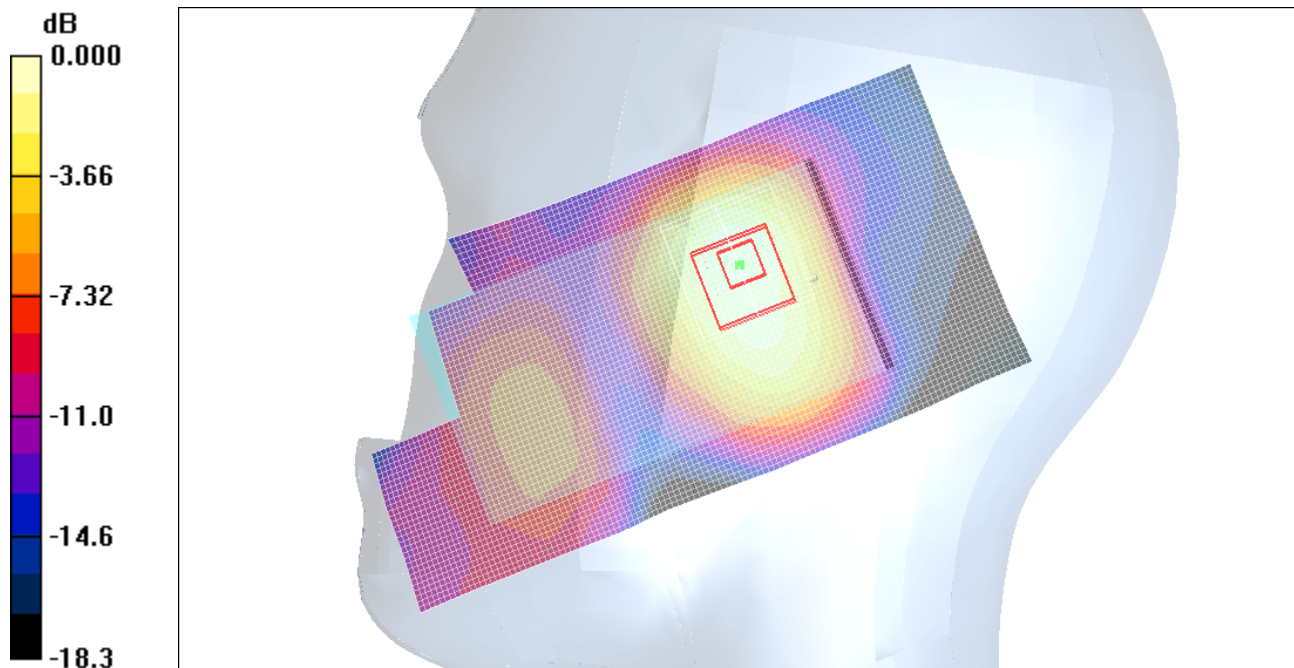
**Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.1 V/m; Power Drift = 0.035 dB

Peak SAR (extrapolated) = 1.08 W/kg

**SAR(1 g) = 0.730 mW/g; SAR(10 g) = 0.458 mW/g**

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



0 dB = 0.791mW/g

## Test Laboratory: Motorola 2450MHz Right Cheek Touch

**DUT: IHDP56KC1 with Carry Case; Serial: A0000022130ADB;**

Procedure Notes: Pwr Step: Battery Model #: SNN5843A DEVICE POSITION (cheek or rotated): CHEEK

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

Medium: 2450 Glycol Head; Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.85$  mho/m;  $\epsilon_r = 37.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.41, 4.41, 4.41); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Head Template/Area Scan - Normal (15mm) (61x161x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.277 mW/g

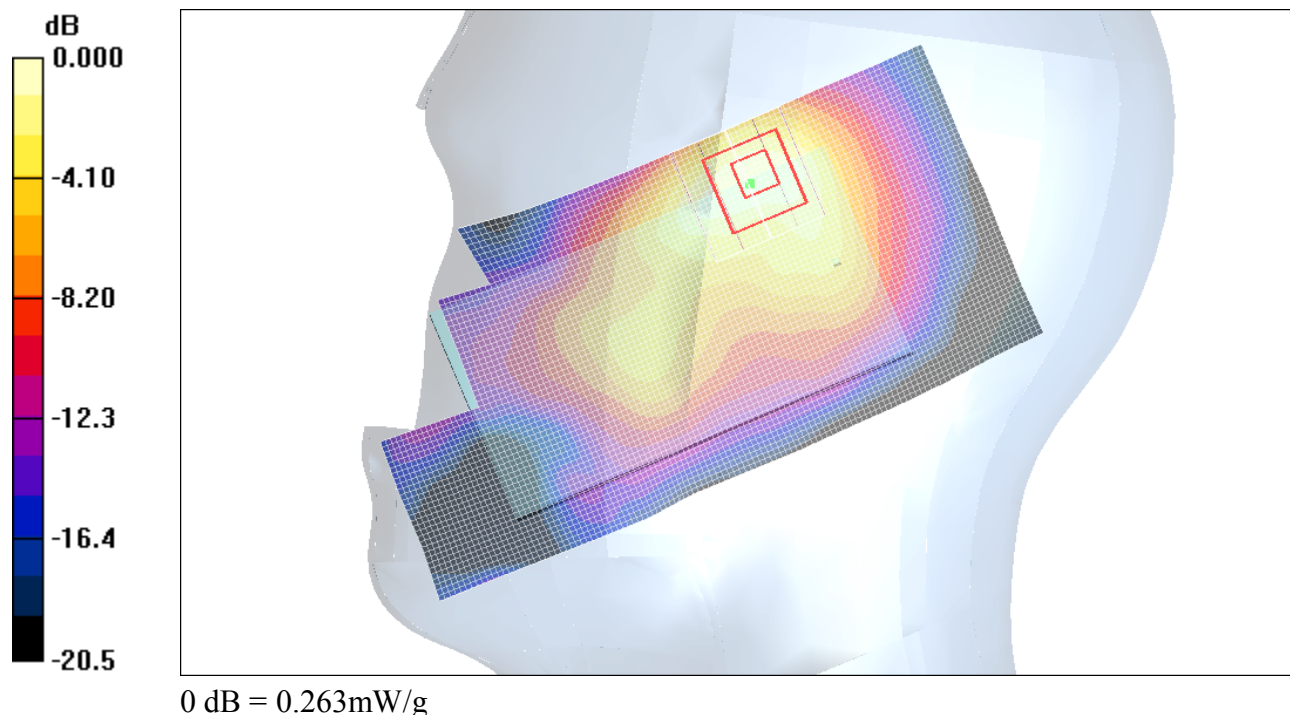
**Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.76 V/m; Power Drift = 0.037 dB

Peak SAR (extrapolated) = 0.469 W/kg

**SAR(1 g) = 0.238 mW/g; SAR(10 g) = 0.118 mW/g**

Maximum value of SAR (measured) = 0.263 mW/g



## Test Laboratory: Motorola 2450 MHz 15 Degree Tilt

**DUT: IHDP56KC1 with Carry Case; Serial: A0000022130ADB;**

Procedure Notes: Pwr Step: Battery Model #: SNN5843A DEVICE POSITION (cheek or rotated): TILT

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

Medium: 2450 Glycol Head; Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.85$  mho/m;  $\epsilon_r = 37.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.41, 4.41, 4.41); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Head Template/Area Scan - Normal (15mm) (61x161x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.189 mW/g

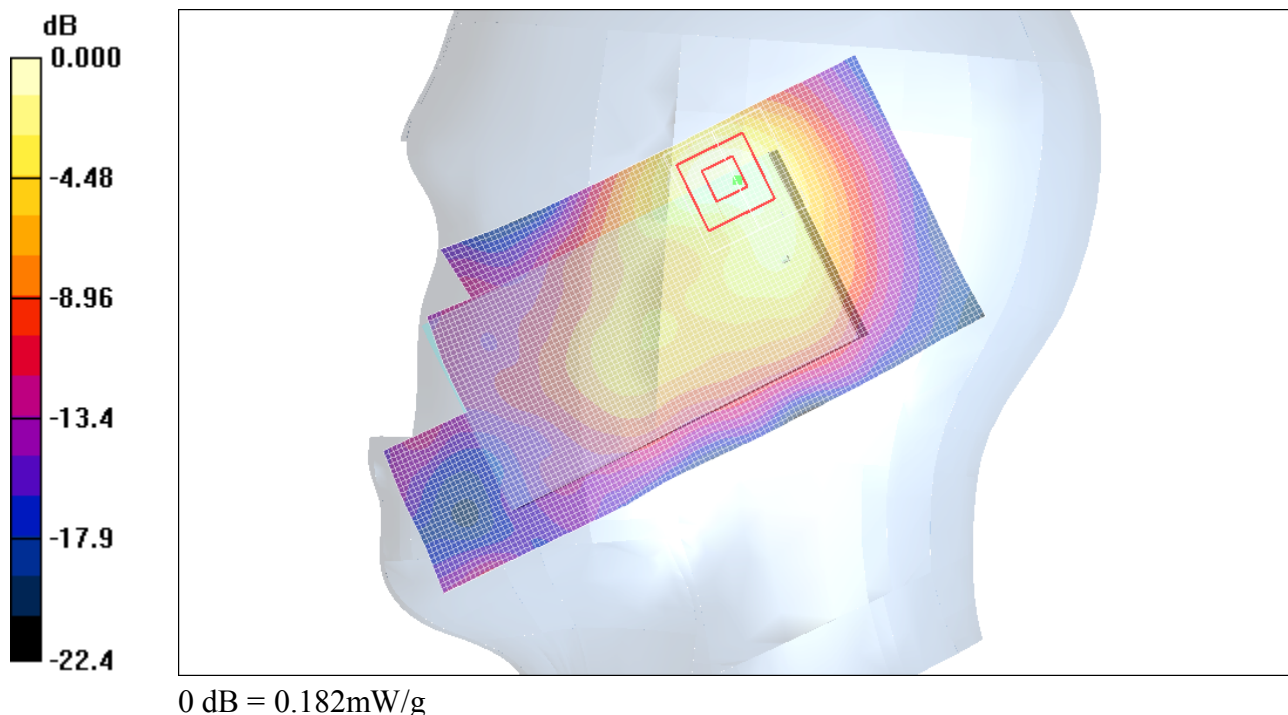
**Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.05 V/m; Power Drift = -0.074 dB

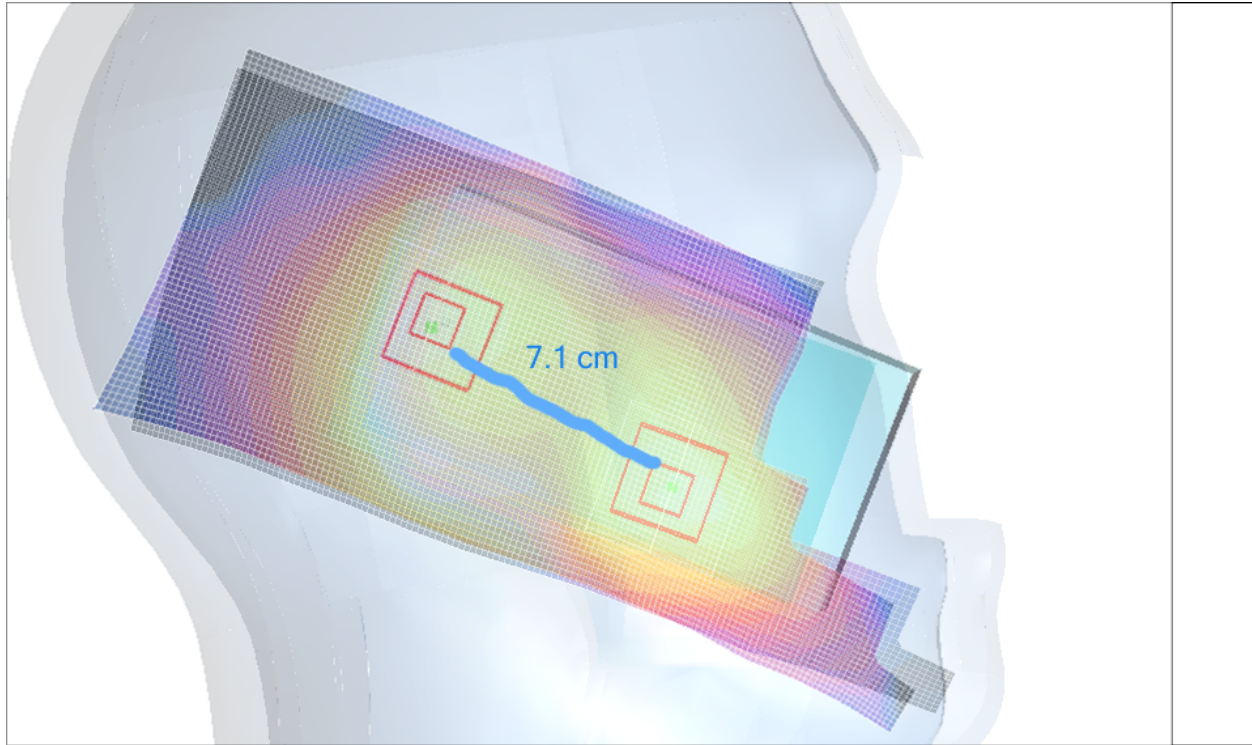
Peak SAR (extrapolated) = 0.308 W/kg

**SAR(1 g) = 0.161 mW/g; SAR(10 g) = 0.081 mW/g**

Maximum value of SAR (measured) = 0.182 mW/g



The guidelines provided in “SAR for Handsets with Multiple Transmitters” (KDB publication 648474 - D01 v01r03) were utilized for evaluation of the need for simultaneous transmission SAR testing. These guidelines direct that if the SAR-to-peak location separation ratio for the CDMA antenna and the Wi-Fi antenna is  $< 0.3$  then SAR evaluation for simultaneous transmission is not required. For CDMA 1900, the SAR-to-peak location separation ratio is 0.23. Thus, no testing was performed to determine the aggregate 1 g SAR. SAR plots with the Wi-Fi SAR overlaid upon the CDMA SAR are provided below. These summation plot provide visual indication of the separation of the SAR hotspots for each modulation.



CDMA 1900 Left Head Cheek SAR overlaid with Wi-Fi Left Head Cheek SAR

## **Appendix 3**

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

## Test Laboratory: Motorola 800MHz Body Worn

**DUT: IHDP56KC1 with Carry Case; Serial: A0000022130ADB;**

Procedure Notes: Pwr Step:ALWAYS UP Battery Model #: SNN5843A Accessory Model # = BODY WORN, BACK OF PHONE 15MM FROM PHANTOM

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

Medium: Low Freq Body; Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.99$  mho/m;  $\epsilon_r = 55.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.17, 6.17, 6.17); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Section 1, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (151x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.03 mW/g

**Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz), - to correct max out (5x5x7)/Cube 0:**

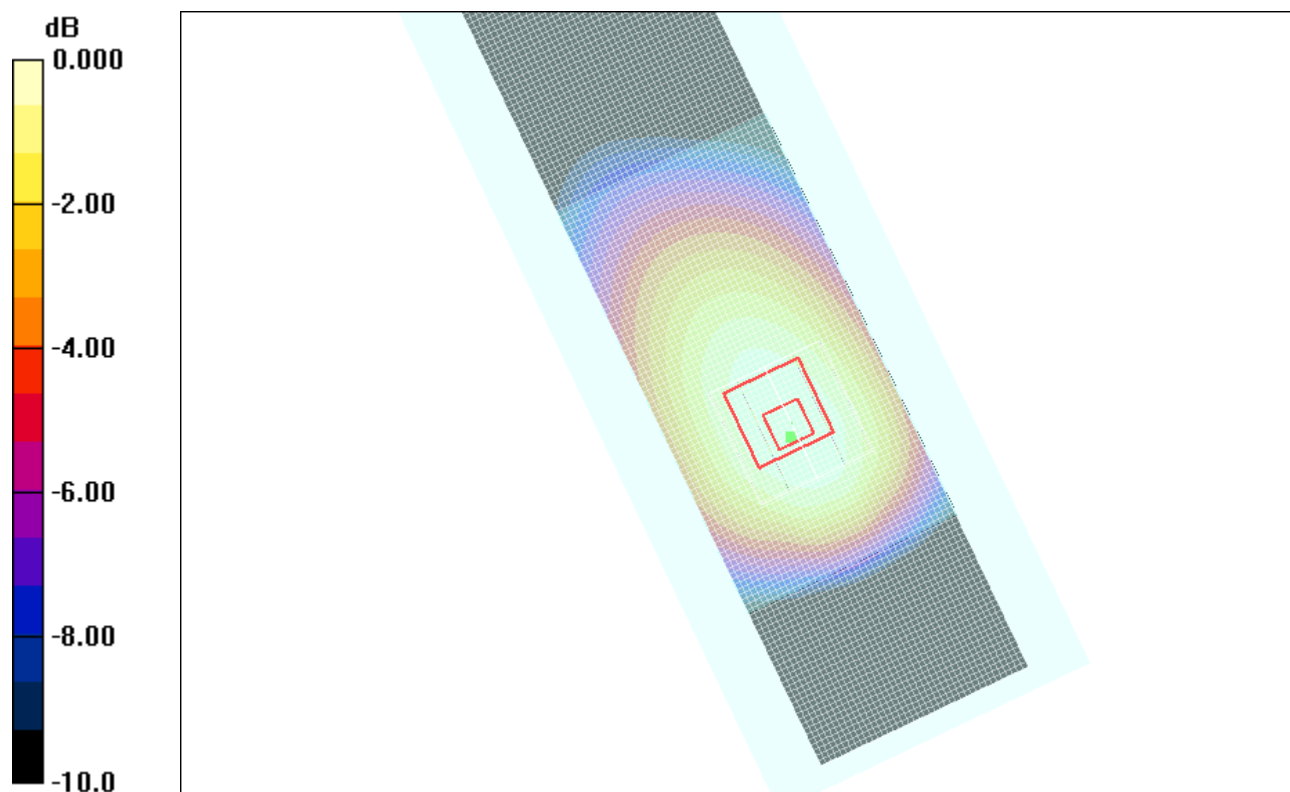
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 32.2 V/m; Power Drift = -0.041 dB

Peak SAR (extrapolated) = 1.24 W/kg

**SAR(1 g) = 0.983 mW/g; SAR(10 g) = 0.727 mW/g**

Maximum value of SAR (measured) = 1.04 mW/g



0 dB = 1.04mW/g

## Test Laboratory: Motorola 1900MHz Body Worn

**DUT: IHDP56KC1 with Carry Case; Serial: A0000022130ADB;**

Procedure Notes: Pwr Step: ALWAYS UP Battery Model #: SNN5843A Accessory Model # = BODY WORN, BACK OF PHONE 15MM FROM PHANTOM

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

Medium: Regular Glycol Body 1750/1880; Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.59$  mho/m;  $\epsilon_r = 51.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.96, 4.96, 4.96); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Section 2, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (151x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.883 mW/g

**Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz), - to correct max out (5x5x7)/Cube 0:**

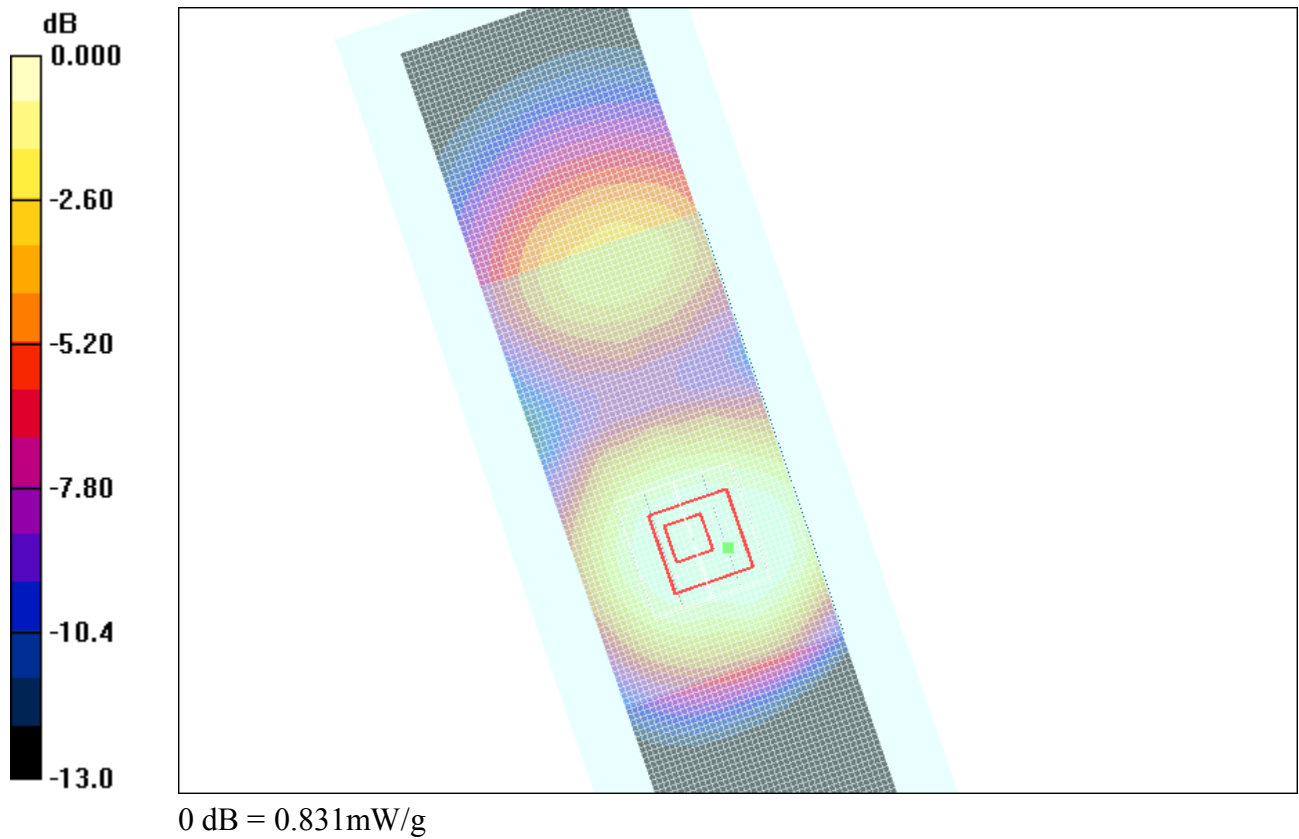
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.9 V/m; Power Drift = 0.031 dB

Peak SAR (extrapolated) = 1.14 W/kg

**SAR(1 g) = 0.778 mW/g; SAR(10 g) = 0.516 mW/g**

Maximum value of SAR (measured) = 0.831 mW/g



## Test Laboratory: Motorola 2450MHz Body Worn

**DUT: IHDP56KC1 with Carry Case; Serial: A0000022130ADB;**

Procedure Notes: Pwr Step: Battery Model #:SNN5843A Accessory Model # = BODY WORN, BACK OF PHONE  
15MM FROM PHANTOM

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

Medium: 2450 Glycol Body; Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2$  mho/m;  $\epsilon_r = 49.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.29, 4.29, 4.29); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Section 2, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Amy Twin Phone Template/Area Scan - Normal Extended Body (15mm) (151x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.084 mW/g

**Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz), - to correct max out (5x5x7)/Cube 0:**

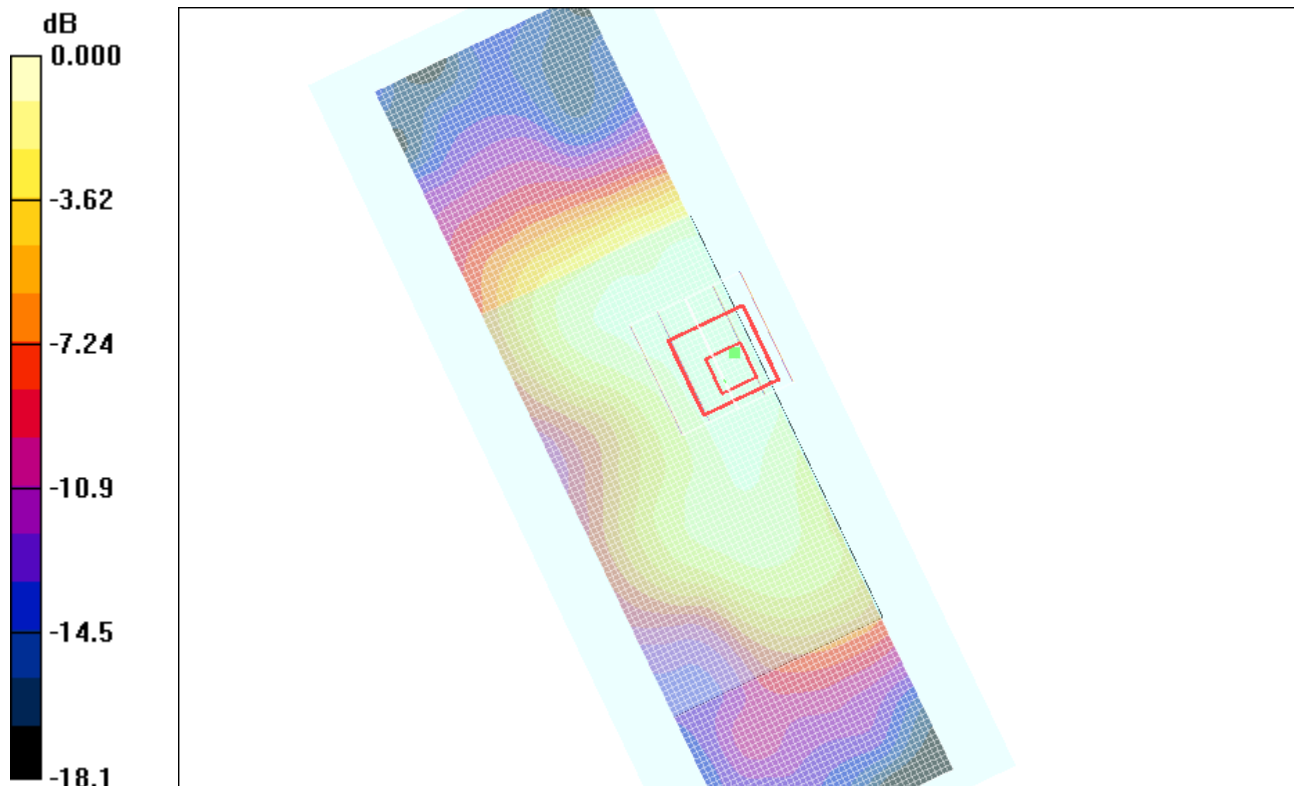
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.45 V/m; Power Drift = -0.149 dB

Peak SAR (extrapolated) = 0.134 W/kg

**SAR(1 g) = 0.078 mW/g; SAR(10 g) = 0.046 mW/g**

Maximum value of SAR (measured) = 0.083 mW/g



0 dB = 0.083mW/g

**Appendix 4**  
**Probe Calibration Certificate**



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

Accreditation No.: **SCS 108**

Client **Motorola MDb**

Certificate No: **ES3-3037\_Sep09**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3037**

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

Calibration date: **September 18, 2009**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

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

Issued: September 21, 2009

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



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

Accreditation No.: **SCS 108**

### Glossary:

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
Polarization $\varphi$	$\varphi$ 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
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

### Methods Applied and Interpretation of Parameters:

- NORM<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:	September 23, 2008
Recalibrated:	September 18, 2009

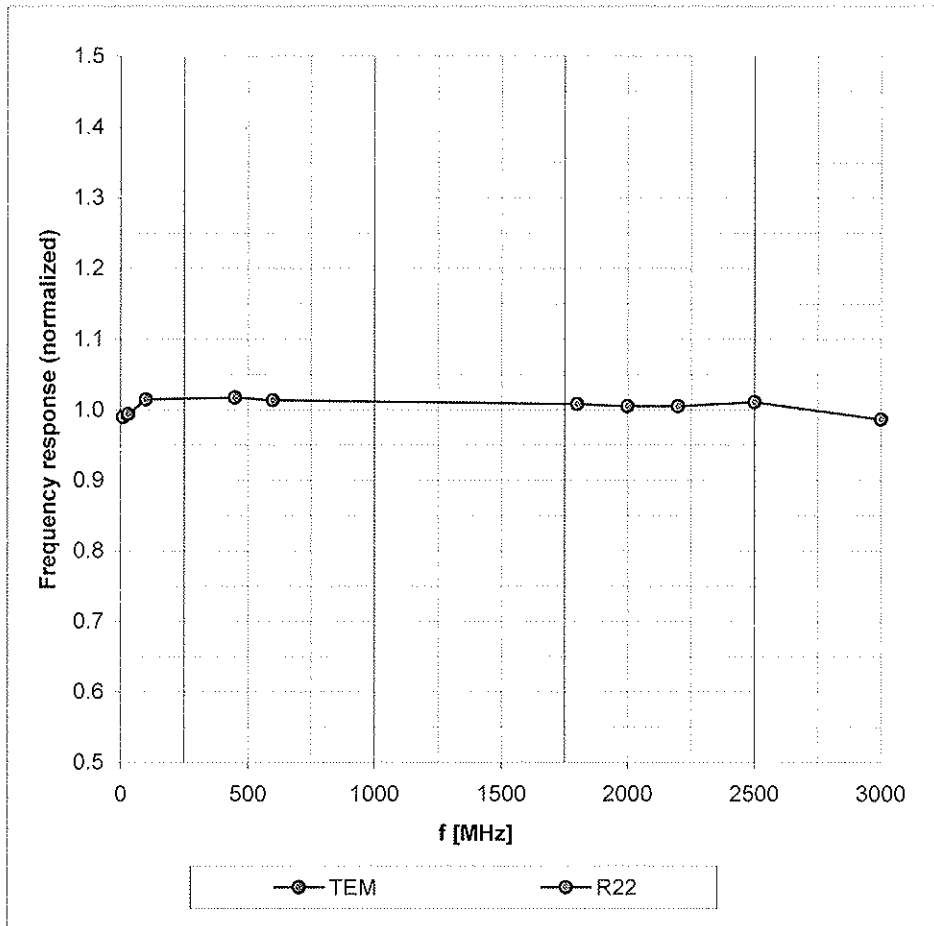
Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)



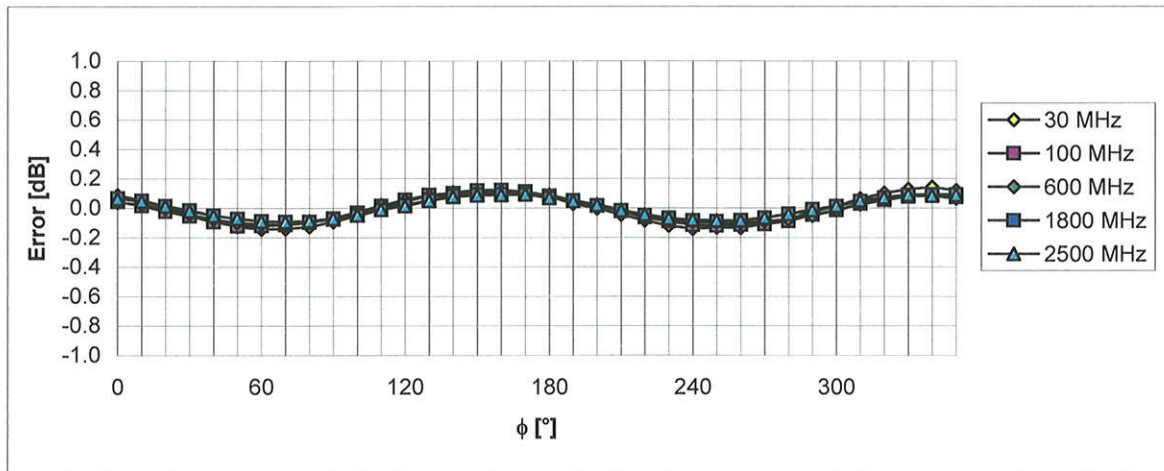
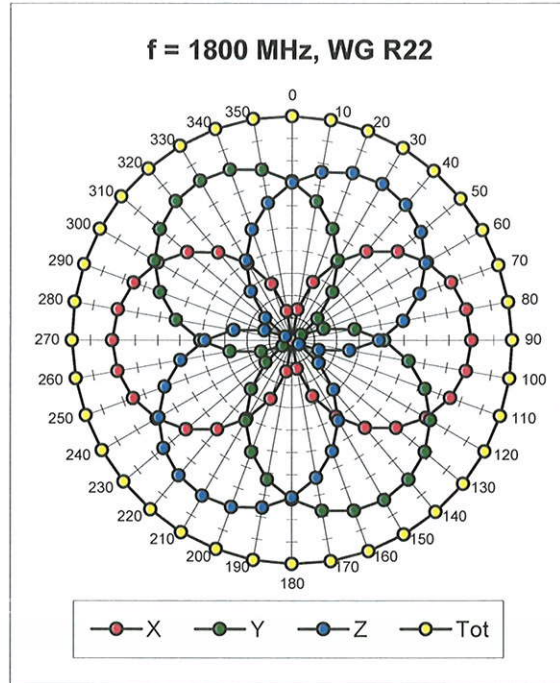
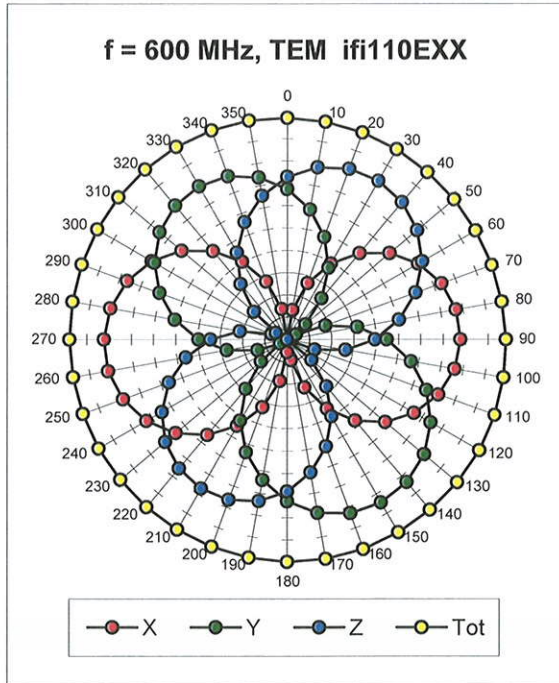
# Frequency Response of E-Field

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



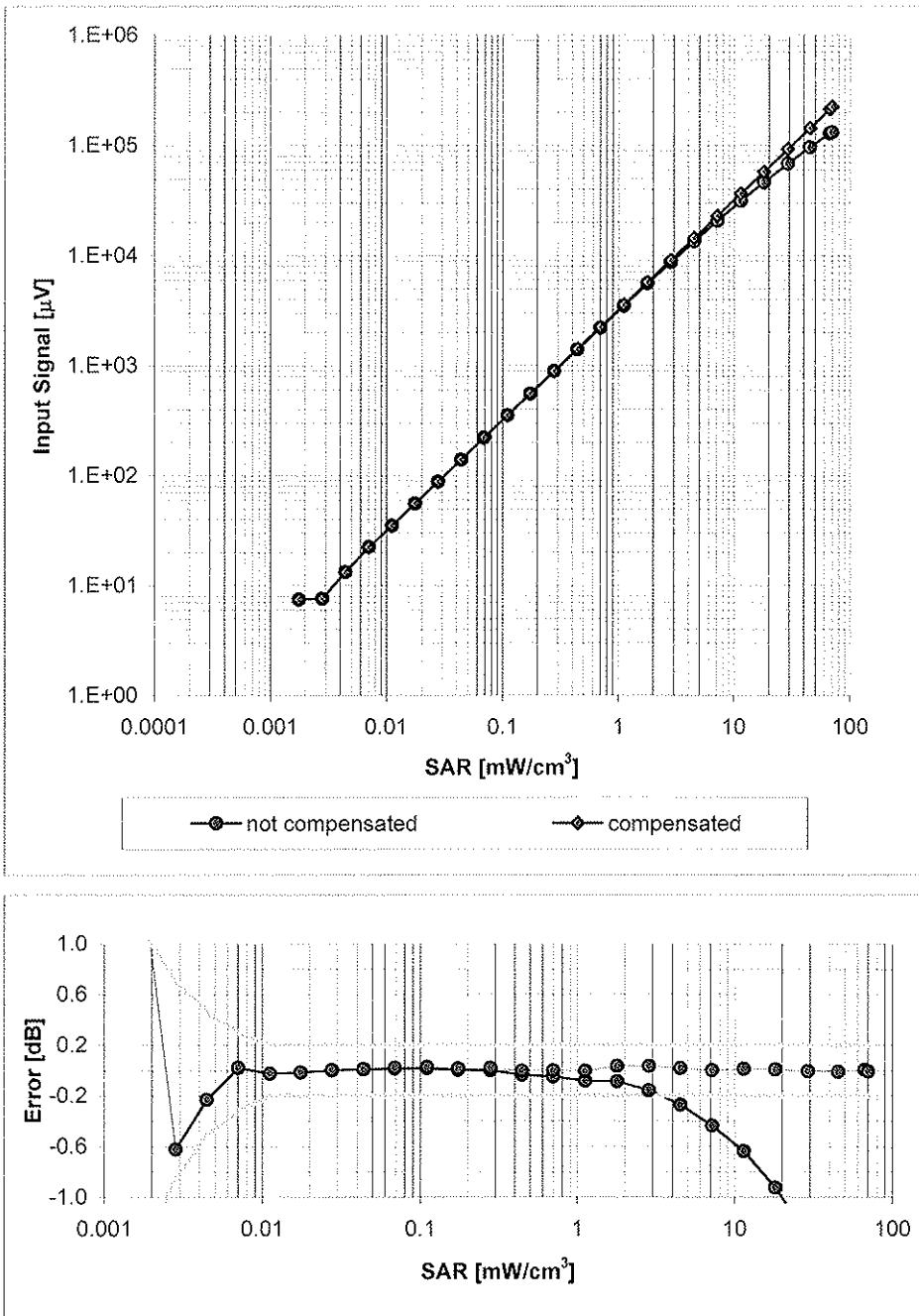
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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



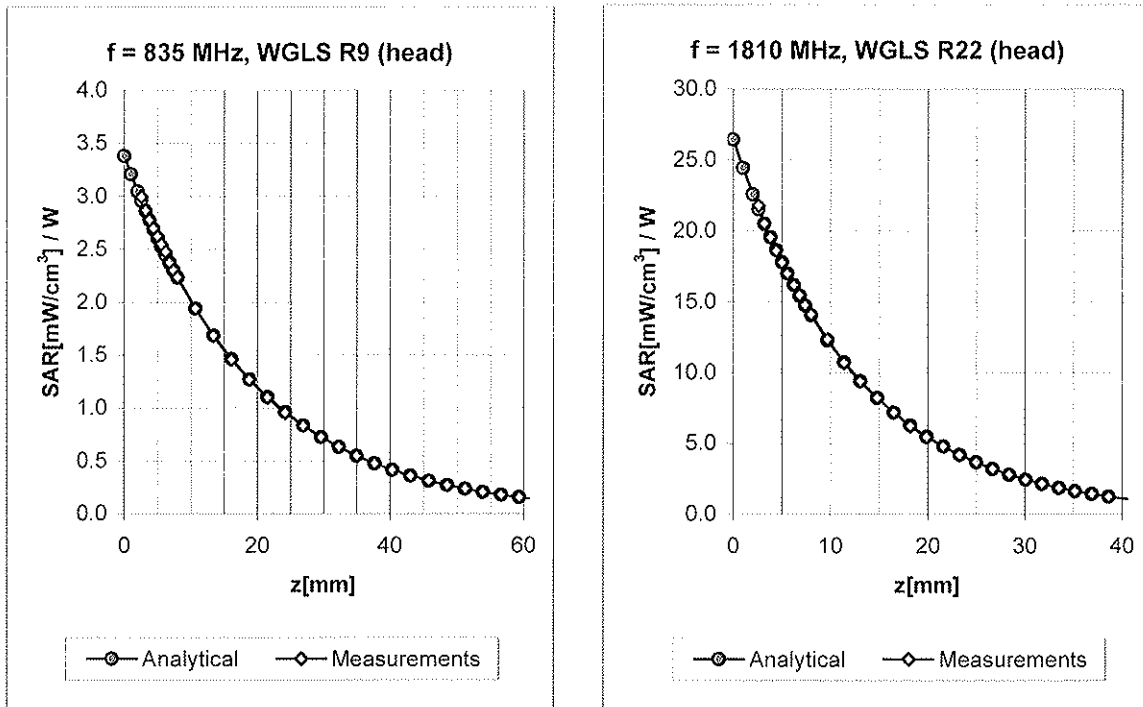
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

### Dynamic Range f(SAR<sub>head</sub>) (Waveguide R22, f = 1800 MHz)



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

## Conversion Factor Assessment

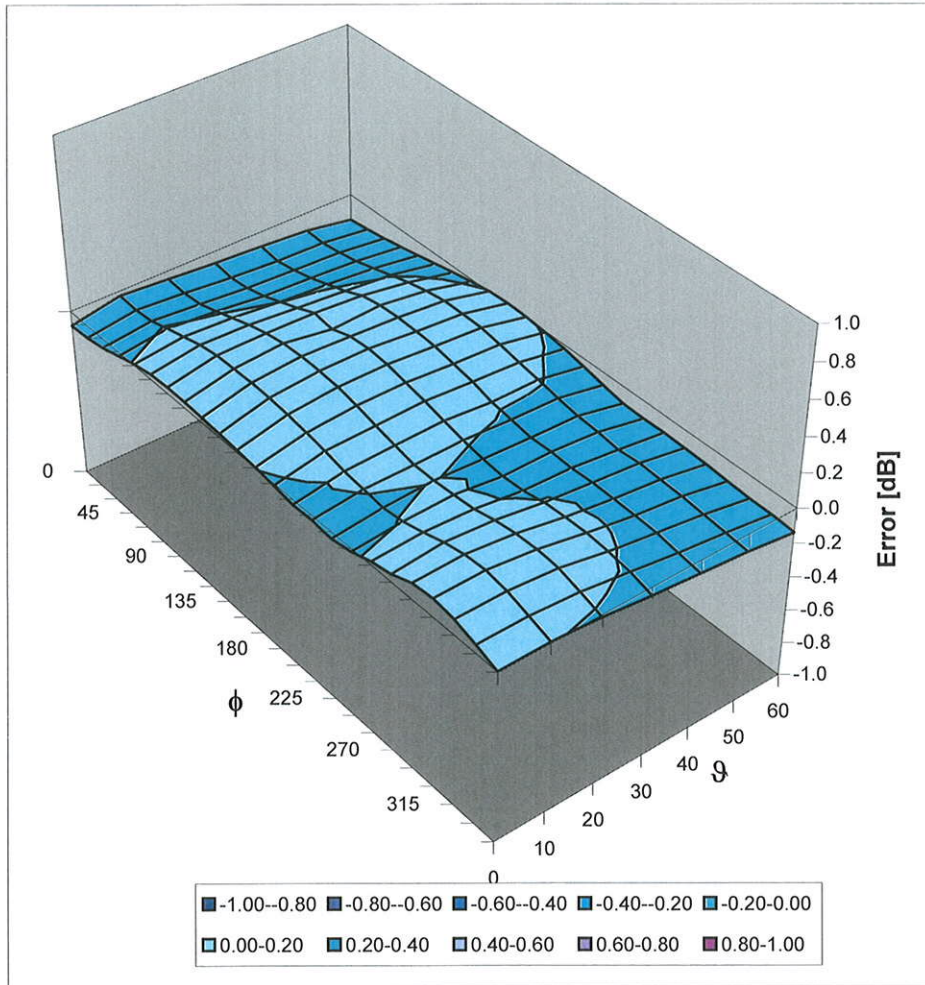


f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.34	1.78	6.25 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.37	1.74	5.05 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.40	1.62	4.87 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.35	1.96	4.41 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.75	1.16	6.17 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.36	1.94	4.96 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.27	3.10	4.78 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.70	1.18	4.29 ± 11.0% (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 ( $\phi, \vartheta$ ),  $f = 900$  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>
<b>Uncertainty Component</b>	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**  
**Dipole Characterization Certificate**

# Certification of System Performance Check Targets

FCD-1806, rev-1

-Historical Data-

835 MHz	
Reference Target:	9.56 (W/kg)
Measurement Uncertainty (k=1):	9.0%
Measurement Period:	26March09 - 15Mar10
# of tests performed:	244
Grand Average:	9.59 (W/kg)
% Delta (Average - Reference Target)	0.3%
Is % Delta <= Expanded Measurement Uncertainty (k=2)?	Yes
Accept/Reject <u>Average</u> as new system performance check target?	ACCEPT
<u>Applies to Dipole SN's:</u> 432tr, 417tr, 420tr, 422tr, 423tr, 424tr, 425tr, 431tr, 434tr, 421tr, 436tr	

-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

Frequency	SAR Target (W/kg)	Permittivity Target +/- %	Conductivity (S/m) Target +/- %
835 MHz	9.59	41.5 +/- 5%	0.90 +/- 5%


-Approvals-

Submitted by:  Date:

Signed: 

Comments:

Approved by:  Date:

Signed: 

Comments:

# Certification of System Performance Check Targets

FCD-1806, rev-1

-Historical Data-

1800 MHz	
Reference Target:	38.4 (W/kg)
Measurement Uncertainty (k=1):	9.0%
Measurement Period:	26March09 - 15Mar10
# of tests performed:	654
Grand Average:	38.36 (W/kg)
% Delta (Average - Reference Target)	-0.1%
Is % Delta <= Expanded Measurement Uncertainty (k=2)?	Yes
Accept/Reject <u>Average</u> as new system performance check target?	ACCEPT
<u>Applies to Dipole SN's:</u> 246tr, 250tr, 251tr, 259tr, 263tr, 271tr, 272tr, 276tr, 277tr, 279tr, 280tr, 281tr, 283tr, 284tr, 2d128, 2d129	

-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

Frequency	SAR Target (W/kg)	Permittivity Target +/- %	Conductivity (S/m) Target +/- %
1800 MHz	38.36	40.0 +/- 5%	1.40 +/- 5%


-Approvals-

Submitted by:  Date:

Signed: 

Comments:

Approved by:  Date:

Signed: 

Comments:

# Certification of System Performance Check Targets

FCD-1806, rev-1

-Historical Data-

2450 MHz	
Reference Target:	52.4 (W/kg)
Measurement Uncertainty (k=1):	9.0%
Measurement Period:	26March09 - 15Mar10
# of tests performed:	159
Grand Average:	54.55 (W/kg)
% Delta (Average - Reference Target)	4.1%
Is % Delta <= Expanded Measurement Uncertainty (k=2)?	Yes
Accept/Reject <u>Average</u> as new system performance check target?	ACCEPT
Applies to Dipole SN's:	
740, 766, 767, 788, 789	

-New System Performance Check Targets- per WI-0396  
(based on analysis of historical data)

Frequency	SAR Target (W/kg)	Permittivity Target +/- %	Conductivity (S/m) Target +/- %
2450 MHz	54.55	39.2 +/- 10%	1.80 +/- 5%


-Approvals-

Submitted by:  Date:

Signed: 

Comments:

Approved by:  Date:

Signed: 

Comments: