Portable Cellular Phone SAR Test Report

Test Report #: 20116-2F

Date of Report: 20-Mar-2007

Date of Test: 27-Feb-2007 through 07-Mar-2007

FCC ID #: **IHDT56HY1**

Generic Name: **C168i**

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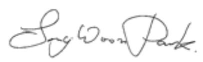

Accreditation:

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

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

On the following products or types of products:

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

A2LA certificate #2518-03

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 CENELEC en50361:2001, IEEE 1528, as well as other appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

(none)

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

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1. Introduction

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

For ANSI / IEEE C95.1 (1g), the final SAR reading for this phone is 1.44 W/kg for head adjacent use and 0.79 W/kg for body worn use. These measurements were performed using a Dasy4™ v4.7 system manufactured by Schmid & Partner Engineering AG (SPEAG), of Zurich Switzerland.

2. Description of the Device Under Test

2.1 Antenna description

Type	Internal Antenna	
Location	Bottom of the transceiver	
Dimensions	Width	18.025 mm
	Length	42.00 mm
Configuration	Mono Pole	

2.2 Device description

Serial number	011219000000144	
Mode(s) of Operation	GSM 850	GSM 1900
Modulation Mode(s)	GMSK	GMSK
Maximum Output Power Setting	32.6 dBm	30.4 dBm
Duty Cycle	1:8	1:8
Transmitting Frequency Rang(s)	824.2-848.8 MHz	1850.2-1909.8 MHz
Production Unit or Identical Prototype (47 CFR §2..908)	Identical Prototype	
Device Category	Portable	
RF Exposure Limits	General Population / Uncontrolled	

3. Test Equipment Used

3.1 Dosimetric System

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

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

Description	Serial Number	Cal Due Date
DASY4™ DAE V1	365	25-Sep-2007
E-Field Probe ETDV6	1501	23-Mar-2007
	1515	24-Aug-2007
Dipole Validation Kit, DV900V2	77	22-May-2007
S.A.M. Phantom used for 800/900MHz	TP-1155	
Dipole Validation Kit, DV1800V2	280tr	
S.A.M. Phantom used for 1800/1900MHz	TP-1086	

3.2 Additional Equipment

Description	Serial Number	Cal Due Date
Signal Generator HP8648C	3847A04630	02-Mar-2007
Power Meter E4419B	US39250623	24-May-2007
Power Sensor #1 - 8481A	3318A86935	23-May-2007
Power Sensor #2 - 8481A	US37296472	23-May-2007
Network Analyzer HP8753C	3310A03171	26-May-2007
Network Analyzer HP8753ES	US39172714	07-Mar-2007
Dielectric Probe Kit HP85070C	US99360207	
Signal Generator HP8648C	3847A04840	02-Dec-2007
Power Meter E4419B	GB39511085	05-Dec-2007
Power Sensor #1 - 8481A	MY41095450	16-Feb-2008
Power Sensor #2 - 8481A	2702A82671	05-Dec-2007

4. Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, ε_r, and the conductivity, σ, of the tissue simulating liquids were measured with a HP85070 Dielectric Probe Kit These values, along with the temperature of the simulated tissue are shown in the table below. The recommended limits for permittivity and conductivity are also shown. A mass density of ρ=1g/cm3 was entered into the system in all the cases. It can be seen that the measured parameters are within tolerance of the recommended limits specified in [1] and [5].

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ε_r	σ (S/m)	Temp (°C)
835	Head	**Measured,** Feb 28, 2007	42.5	0.93	20.7
		Measured, Mar 07, 2007	42.4	0.93	21.1
		Recommended Limits	41.5 ±5%	0.90 ±5%	18-25
	Body	**Measured,** Feb 27, 2007	55.8	0.98	21.5
		Recommended Limits	55.2 ±5%	0.97 ±5%	18-25
1880	Head	**Measured,** Feb 27, 2007	39.6	1.44	21.2
		Recommended Limits	40.0 ±5%	1.40 ±5%	18-25
	Body	**Measured,** Feb 27, 2007	52.5	1.58	21.3
		Recommended Limits	53.3 ±5%	1.52 ±5%	18-25

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

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

5. System Accuracy Verification

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

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

f (MHz)	Description	SAR (W/kg), 1gram	Dielectric Parameters ε_r	σ (S/m)	Ambient Temp (°C)	Tissue Temp (°C)
900	**Measured,** Feb 27,2007	11.00	42.3	1.00	21.3	21.0
	Measured, Feb 28, 2007	11.15	41.8	0.99	21.3	21.2
	Measured, Mar 07,2007	11.50	41.7	0.99	21.5	21.4
	Recommended Limits	11.3	41.5 ±5%	0.97 ±5%	18-25	18-25
1800	**Measured,** Feb 27, 2007	35.63	39.9	1.35	21.0	21.3
	Recommended Limits	38.1	40.0 ±5%	1.4 ±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	SN1501	900	6.02	8 of 9
		1810	4.86	8 of 9
	SN1515	900	6.31	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 850MHz. The default settings for the "coarse" and "cube" scans were chosen and used for measurements. The grid spacing of the course scan was set to 15cm as shown in the SAR plots included in Appendix 2 and 3. Please refer to the DASY 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 # SNN5782B - 1100 mAH Battery
Model # SNN5771A - 850 mAH Battery
Model # SNN5804A - 850 mAH Battery

The battery with the highest capacity is the Model # SNN5782B battery. This battery was used to do most of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery. The configuration 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 8 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to the [6]. Also shown are the measured conducted output power levels, the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is New SAR = Old SAR * 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test. Note that 800MHz 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 SAR measurements were performed using the SAM phantoms listed in section 3.1. Since the same phantoms and simulated tissue were used for the system accuracy verification and the device SAR measurements, the Z-axis scans included in Appendix 1 are applicable for verification of simulated tissue depth to be 15.0cm ±0.5cm.

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ET3DV6	SN1501	900	6.02	8 of 9
		1810	4.86	8 of 9
	SN1515	900	6.31	8 of 9

Left Head Cheek Position								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	Channel 128	32.48	20.9	-0.06	0.885	0.90	1.26	1.28
	Channel 190	32.41	20.6	-0.15	0.844	0.87	1.21	1.25
	Channel 251	32.42	21.0	-0.11	0.759	0.78	1.09	1.12
1900MHz	Channel 512	30.36	21.0	-0.01	0.656	0.66	1.12	1.12
	Channel 661	30.35	21.2	0.10	0.627	0.63	1.08	1.08
	Channel 810	30.46	20.8	-0.15	0.616	0.64	1.07	1.11

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)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	Channel 128	32.48	20.5	-0.12	0.972	1.00	1.37	1.41
	Channel 190	32.41	21.0	-0.25	0.946	1.00	1.35	1.43
	Channel 251	32.42	20.3	-0.03	0.85	0.86	1.21	1.22
1900MHz	Channel 512	30.36	20.4	-0.14	0.569	0.59	0.962	0.99
	Channel 661	30.35	20.5	-0.19	0.572	0.60	0.975	1.02
	Channel 810	30.46	20.4	-0.14	0.613	0.63	1.05	1.08

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

The highest Head Cheek Position with SNN5771A Battery								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	Channel 128	32.48						
	Channel 190	32.41	21.2	-0.11	0.91	0.93	1.30	1.33
	Channel 251	32.42						
1900MHz	Channel 512	30.36	21.4	-0.05	0.629	0.64	1.06	1.07
	Channel 661	30.35						
	Channel 810	30.46						

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

The highest Head Cheek Position with SNN5804A Battery									
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*		
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	
850MHz	Channel 128	32.48							
	Channel 190	32.41	**21.1**	**-0.16**	**0.969**	**1.01**	**1.39**	**1.44**	
	Channel 251	32.42							
1900MHz	Channel 512	30.36	**21.2**	**-0.13**	**0.663**	**0.68**	**1.13**	**1.16**	
	Channel 661	30.35							
	Channel 810	30.46							

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

Left Head 15° Tilt Position								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	Channel 128	32.48						
	Channel 190	32.41	20.9	-0.09	0.49	0.50	0.705	0.72
	Channel 251	32.42						
1900MHz	Channel 512	30.36						
	Channel 661	30.35	20.8	-0.07	0.245	0.25	0.407	0.41
	Channel 810	30.46						

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

Right Head 15° Tilt Position								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	Channel 128	32.48						
	Channel 190	32.41	20.5	-0.12	0.545	0.56	0.754	0.78
	Channel 251	32.42						
1900MHz	Channel 512	30.36						
	Channel 661	30.35	20.3	-0.17	0.209	0.22	0.343	0.36
	Channel 810	30.46						

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

The highest Head 15° Tilt Position with SNN5771A Battery								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	Channel 128	32.48						
	Channel 190	32.41	20.3	-0.12	0.544	0.56	0.755	0.78
	Channel 251	32.42						
1900MHz	Channel 512	30.36						
	Channel 661	30.35	21.1	-0.01	0.244	0.24	0.402	0.40
	Channel 810	30.46						

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

The highest Head 15° Tilt Position with SNN5804A Battery								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	Channel 128	32.48						
	Channel 190	32.41	**20.7**	**-0.11**	**0.553**	**0.57**	**0.769**	**0.79**
	Channel 251	32.42						
1900MHz	Channel 512	30.36						
	Channel 661	30.35	**21.0**	**-0.05**	**0.247**	**0.25**	**0.408**	**0.41**
	Channel 810	30.46						

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

6.2 Body Worn Test Results

The SAR results shown in tables 9 through 12 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to the [6]. Also shown are the measured conducted output power levels, the temperature of the test facility during the test, the temperature of the tissue simulate after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is New SAR = Old SAR * 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test. Note that 800MHz 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.

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

The tissue stimulant depth was verified to be 15.0cm ±0.5cm. The same device holder described in section 6 was used for positioning the phone. The functional accessories were divided into two categories, the ones with metal components and the ones with non-metal components. For non-metallic component accessories’, testing was performed on the accessory that displayed the closest proximity to the flat phantom. Each metallic component accessory, if any, was checked for uniqueness of metal component so that each is tested with the device. If multiple accessories shared an identical metal component, only the accessory that dictates the closest spacing to the body was tested. In addition to accessory testing, the cellular phone was tested with the front and back of the phone facing the phantom. For voice mode operation, the phone was placed as a distance of 15mm from the phantom. For data mode operation, the phone was placed as a distance of 25mm from the phantom. The cellular phone was tested with a headset connected to the device for all body-worn SAR measurements.

There are no Body-Worn Accessories available for this phone at the time of testing hence the device was tested per the supplement C testing guidelines for devices that do not have body worn accessories. The phone was placed a maximum of 15mm away from a flat phantom per the supplement C standard guidelines to perform SAR measurement.

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 ET3DV6	SN1501	900	5.64	8 of 9
		1810	4.36	8 of 9

Body-Worn; Front of Phone 15mm from Phantom								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	Channel 128	32.48						
	Channel 190	32.41	21.3	-0.13	0.356	0.37	0.495	0.51
	Channel 251	32.42						
1900MHz	Channel 512	30.36						
	Channel 661	30.35	21.3	-0.17	0.15	0.16	0.238	0.25
	Channel 810	30.46						

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

Body-Worn; Back of Phone 15mm from Phantom								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	Channel 128	32.48						
	Channel 190	32.41	**21.5**	**-0.12**	**0.533**	**0.55**	**0.772**	**0.79**
	Channel 251	32.42						
1900MHz	Channel 512	30.36						
	Channel 661	30.35	21.4	-0.1	0.253	0.26	0.42	0.43
	Channel 810	30.46						

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

The highest Body-Worn with SNN5771A Battery								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	Channel 128	32.48						
	Channel 190	32.41	20.4	-0.13	0.51	0.53	0.73	0.75
	Channel 251	32.42						
1900MHz	Channel 512	30.36						
	Channel 661	30.35	21.4	-0.07	0.257	0.26	0.43	0.44
	Channel 810	30.46						

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

The highest Body-Worn with SNN5804A Battery								
f (MHz)	Description	Conducted Output Power (dBm)	Temp (°C)	Drift (dB)	*10g SAR value*		*1g SAR value*	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)
850MHz	**Channel 128**	32.48						
	Channel 190	32.41	20.2	-0.17	0.455	0.47	0.653	0.68
	Channel 251	32.42						
1900MHz	**Channel 512**	30.36						
	Channel 661	30.35	**21.3**	**-0.03**	**0.264**	**0.27**	**0.445**	**0.45**
	Channel 810	30.46						

Table 12: 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, en50361:2001 "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300MHz – 3GHz)"

[2] CENELEC, en50360:2001 "Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300MHz – 3GHz)".

[3] ANSI / IEEE, C95.1 1999 Edition "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz"

[4] FCC OET Bulletin 65 Supplement C 01-01

[5] IEEE 1528 2003 Edition "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques"

[6] ICNIRP Guidelines "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)"

Appendix 1

SAR distribution comparison for the system accuracy verification

Date/Time: 02/27/2007 AM 7:25:33

Test Laboratory: Motorola

20070227 900MHz Good -2.7%

Procedure Notes: 900 MHz System Performance Check / Dipole Sn# 077 PM1 Power = 200 mW
Sim.Temp@meas = 21.27C Sim.Temp@SPC = 21C Room Temp @ SPC =21.3C
Communication System: CW - Dipole; Frequency: 900 MHz; Channel Number: 4; Duty Cycle: 1:1
Medium: VALIDATION Only;

Medium parameters used: f = 900 MHz; σ = 1 mho/m; ε_r = 42.3; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6R - SN1501; ConvF(6.02, 6.02, 6.02); Calibrated: 03/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 09/26/2006
- Phantom: PCS-10 Sugar SAM; Type: SAM; Serial: TP-1155;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.19 mW/g

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

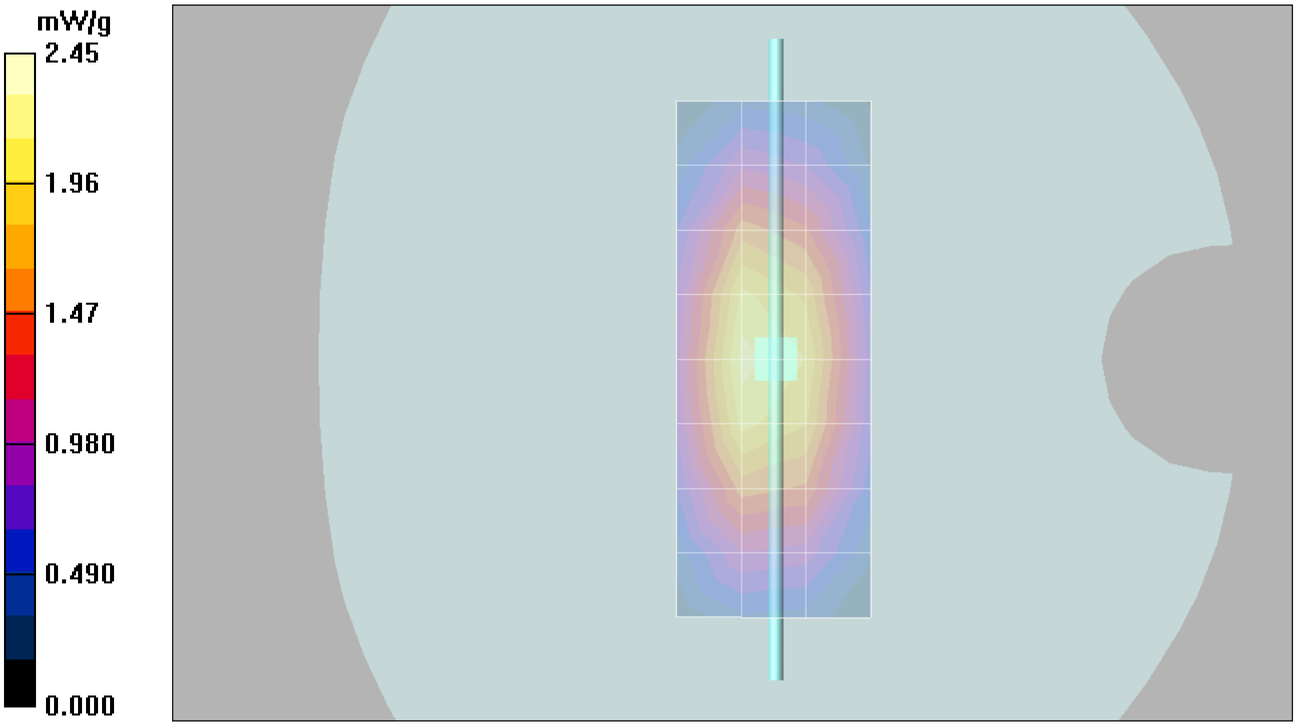
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.0 V/m; Power Drift = 0.013 dB
Peak SAR (extrapolated) = 3.35 W/kg
SAR(1 g) = 2.23 mW/g; SAR(10 g) = 1.44 mW/g
Maximum value of SAR (measured) = 2.41 mW/g

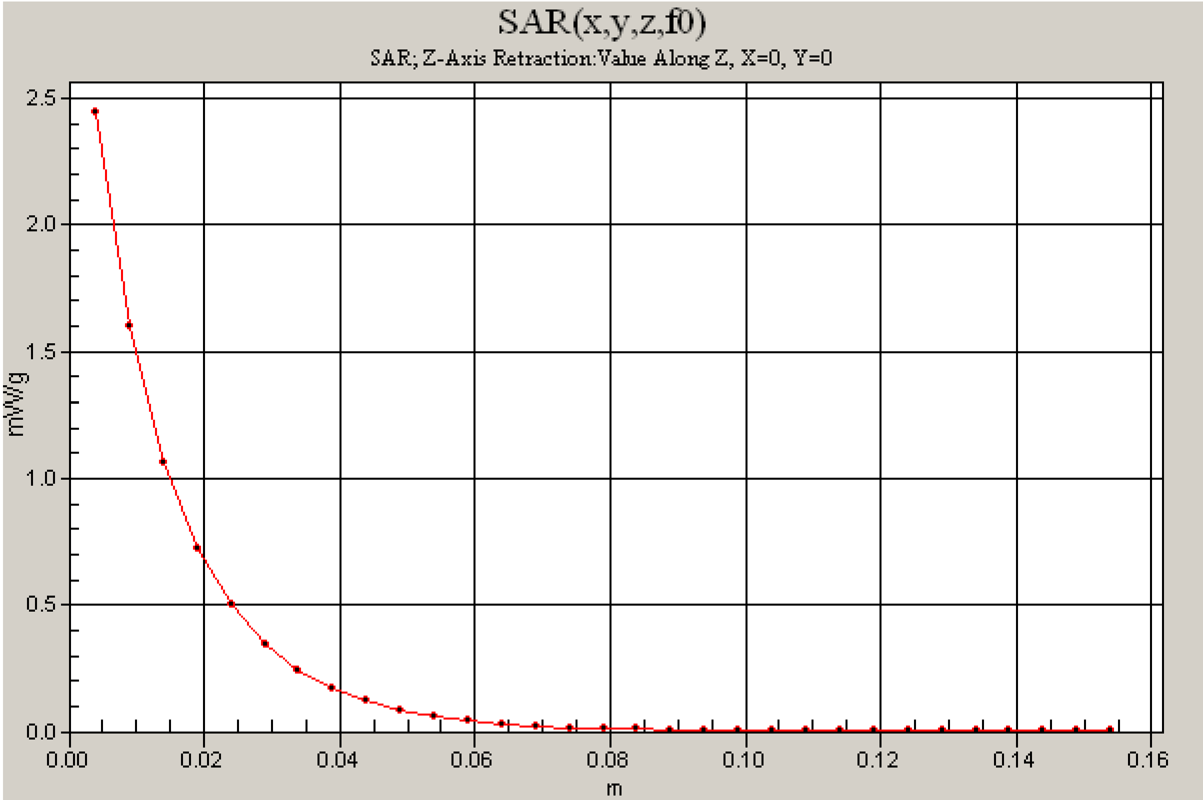
Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.0 V/m; Power Drift = 0.013 dB
Peak SAR (extrapolated) = 3.22 W/kg
SAR(1 g) = 2.17 mW/g; SAR(10 g) = 1.41 mW/g
Maximum value of SAR (measured) = 2.29 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 2.45 mW/g


mW/g
2.45
1.96
1.47
0.980
0.490
0.000


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

Date/Time: 02/28/2007 AM 7:24:27

Test Laboratory: Motorola

20070228 900MHz Good -1.3%

Procedure Notes: 900 MHz System Performance Check / Dipole Sn# 077 PM1 Power = 200 mW
Sim.Temp@meas = 21.18C Sim.Temp@SPC = 21.2C Room Temp @ SPC =21.3 C

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

Medium parameters used: f = 900 MHz; σ = 0.99 mho/m; ε_r = 41.8;ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6R - SN1501; ConvF(6.02, 6.02, 6.02); Calibrated: 03/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 09/26/2006
- Phantom: PCS-10 Sugar SAM; Type: SAM; Serial: TP-1155;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.17 mW/g

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

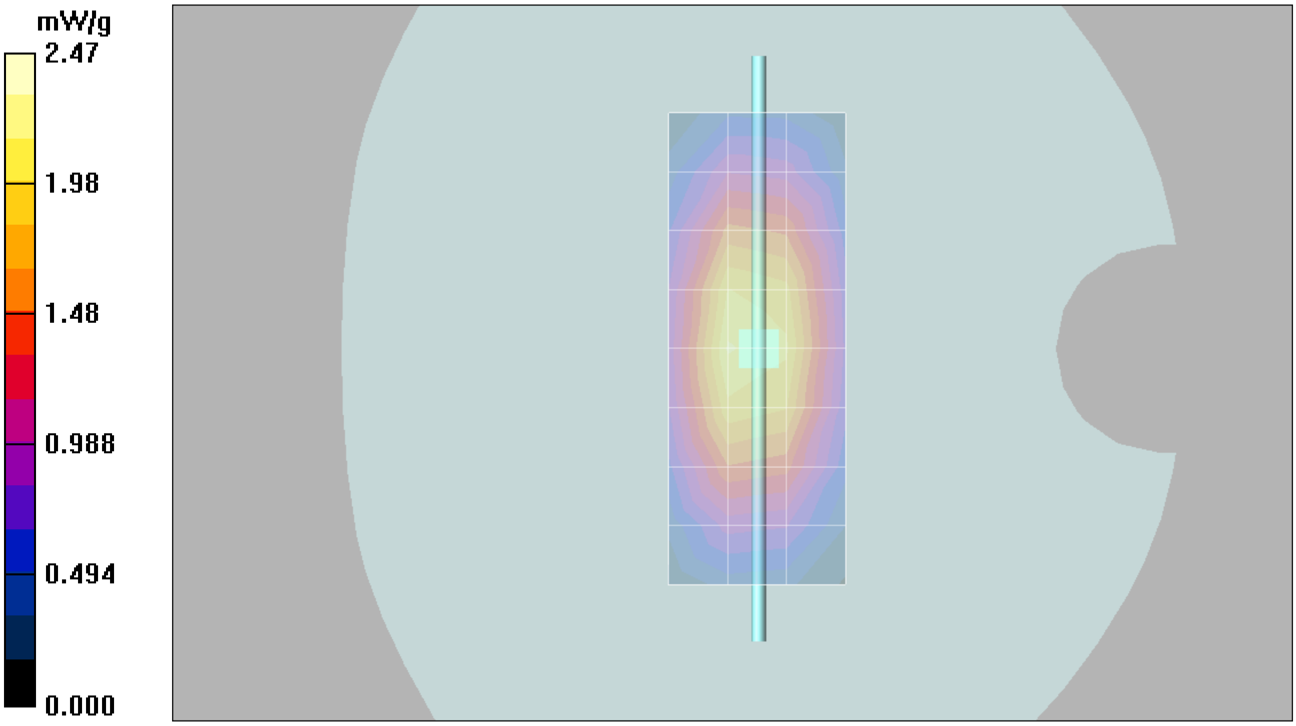
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.4 V/m; Power Drift = 0.015 dB
Peak SAR (extrapolated) = 3.39 W/kg
SAR(1 g) = 2.26 mW/g; SAR(10 g) = 1.45 mW/g
Maximum value of SAR (measured) = 2.44 mW/g

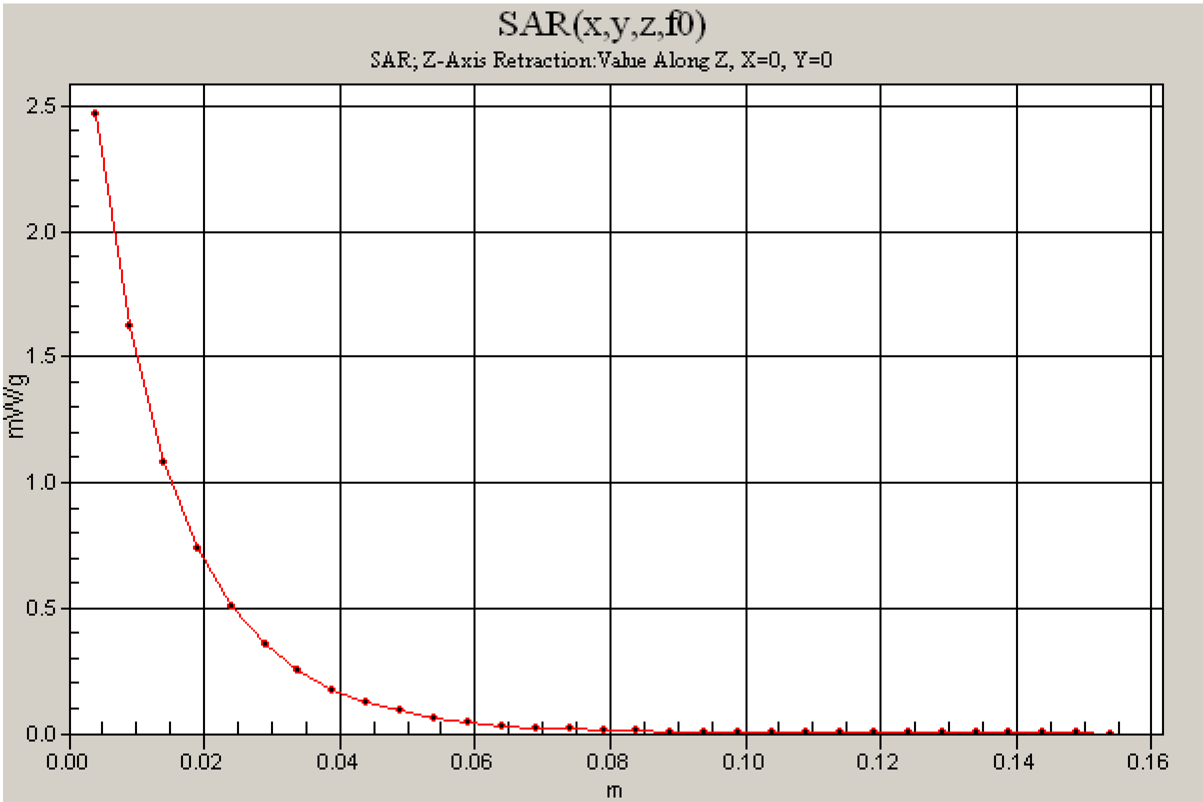
Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.4 V/m; Power Drift = 0.015 dB
Peak SAR (extrapolated) = 3.27 W/kg
SAR(1 g) = 2.2 mW/g; SAR(10 g) = 1.42 mW/g
Maximum value of SAR (measured) = 2.33 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 2.47 mW/g


mW/g
2.47
1.98
1.48
0.988
0.494
0.000


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

Date/Time: 03/07/2007 AM 7:27:44

Test Laboratory: Motorola

20070307 900MHz Good +1.8%

Procedure Notes: 900 MHz System Performance Check / Dipole Sn# 077 PM1 Power = 200 mW Sim.Temp@meas = 21.13C Sim.Temp@SPC = 21.4C Room Temp @ SPC = 21.5C

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

Medium parameters used: f = 900 MHz; σ = 0.99 mho/m; ε_r = 41.7; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6 - SN1515; ConvF(6.31, 6.31, 6.31); Calibrated: 08/24/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 09/26/2006
- Phantom: PCS-10 Sugar SAM; Type: SAM; Serial: TP-1155;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.15 mW/g

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

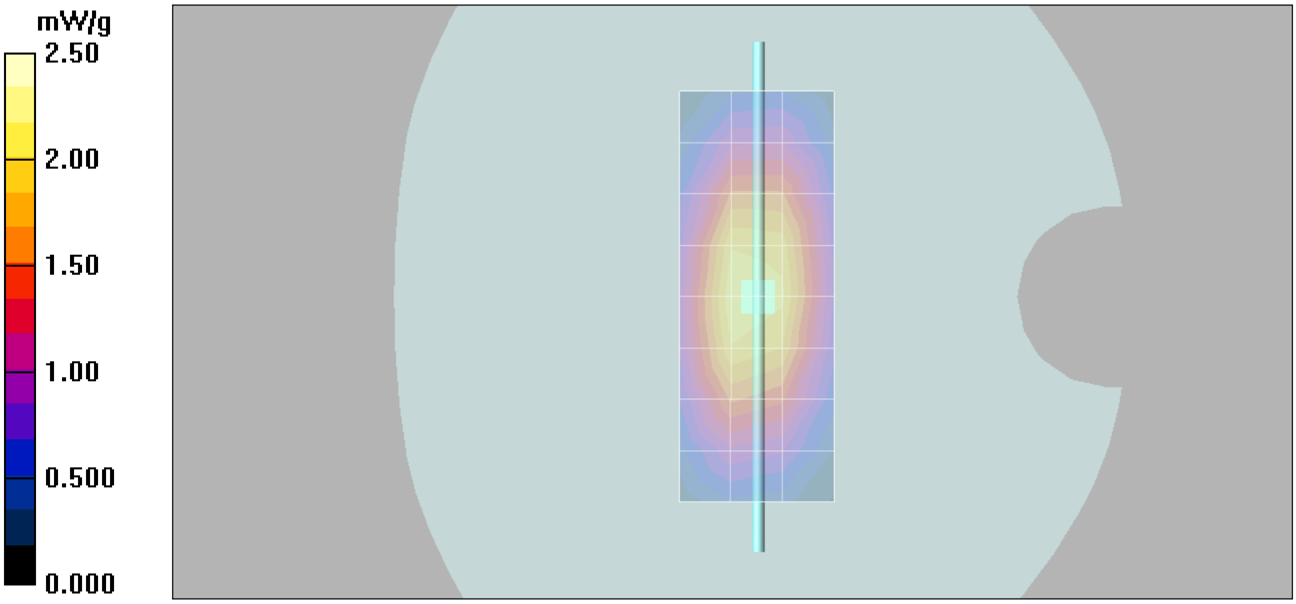
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.8 V/m; Power Drift = 0.032 dB
Peak SAR (extrapolated) = 3.46 W/kg
SAR(1 g) = 2.29 mW/g; SAR(10 g) = 1.47 mW/g
Maximum value of SAR (measured) = 2.48 mW/g

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

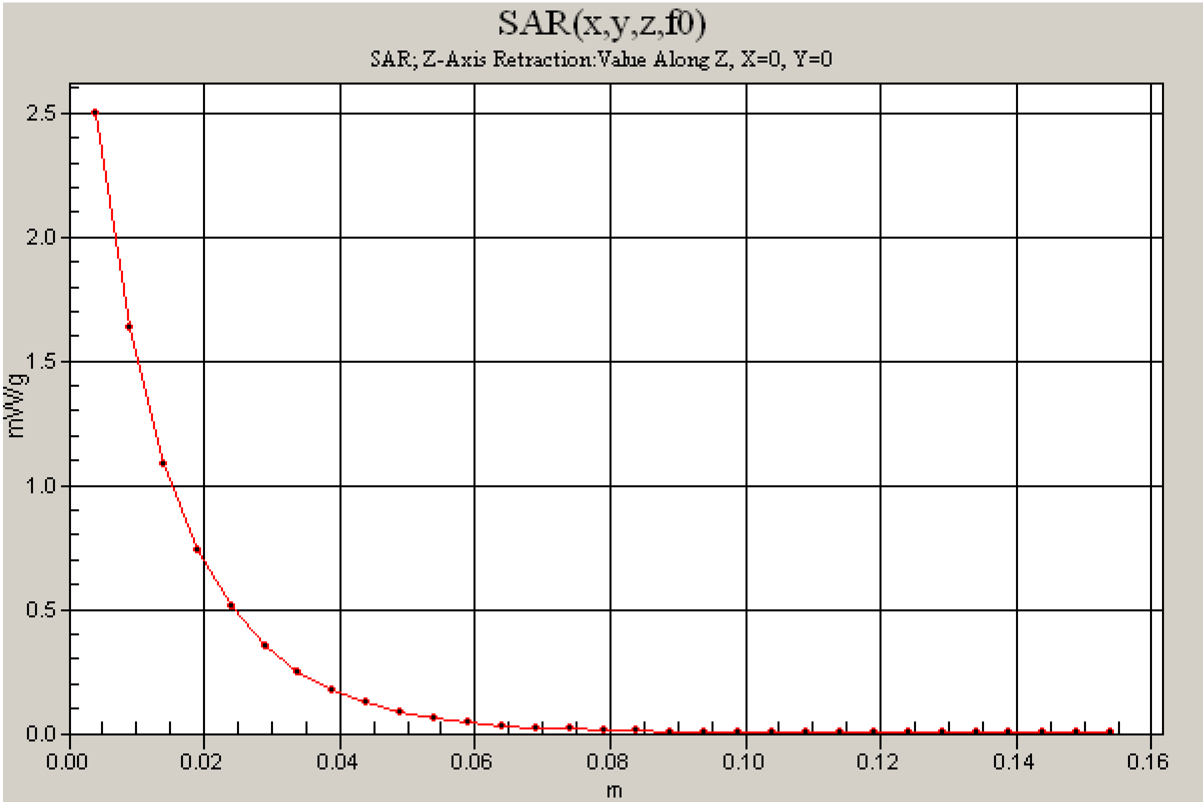
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.8 V/m; Power Drift = 0.032 dB
Peak SAR (extrapolated) = 3.51 W/kg
SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.48 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 2.50 mW/g



mW/g
2.50
2.00
1.50
1.00
0.500
0.000



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

Date/Time: 02/27/2007 PM 3:40:01

Test Laboratory: Motorola 20070227 1800MHz Good -6.5%

Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 280tr PM1 Power = 200 mW Sim.Temp@meas = 21.4C Sim.Temp@SPC = 21.3C Room Temp @ SPC = 21C

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

Medium: VALIDATION Only;

Medium parameters used: f = 1800 MHz; σ = 1.35 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6R - SN1501; ConvF(4.86, 4.86, 4.86); Calibrated: 03/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 09/26/2006
- Phantom: PCS-10 Glycol SAM; Type: SAM; Serial: TP-1086;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 7.16 mW/g

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

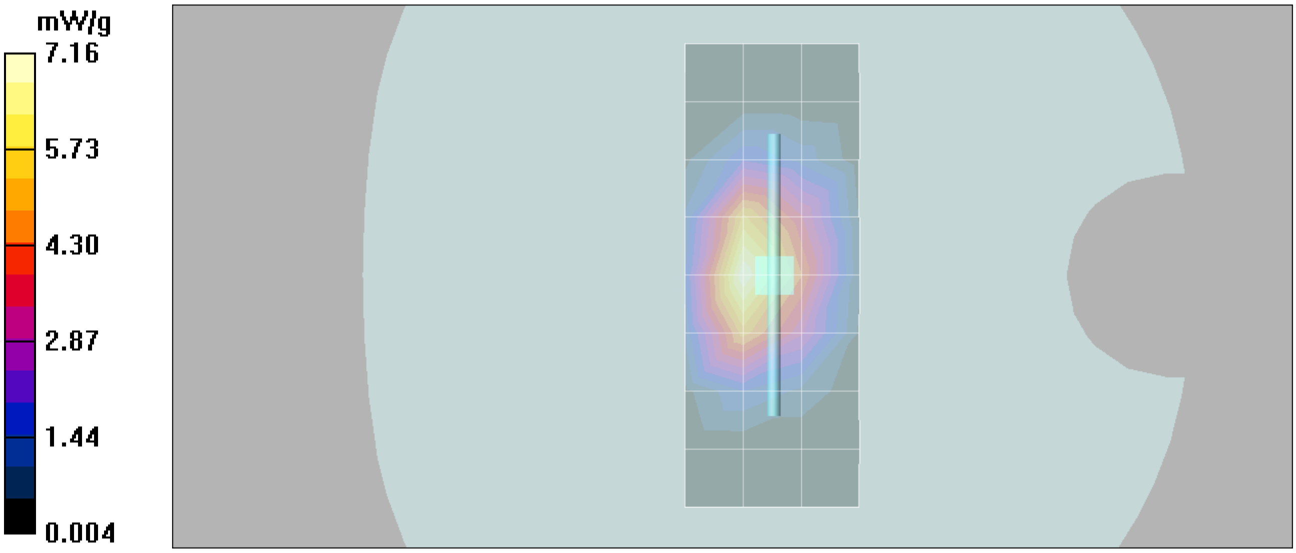
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 78.9 V/m; Power Drift = -0.077 dB
Peak SAR (extrapolated) = 12.3 W/kg
SAR(1 g) = 7.26 mW/g; SAR(10 g) = 3.92 mW/g
Maximum value of SAR (measured) = 8.12 mW/g

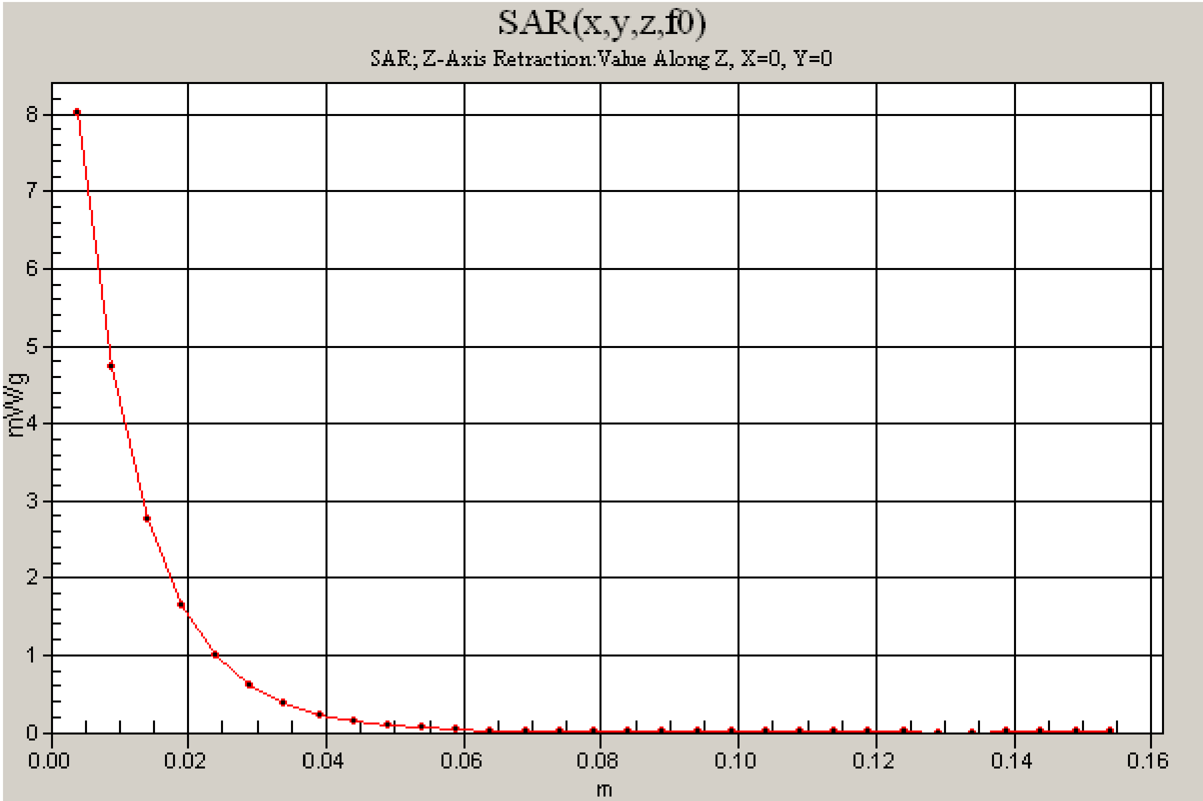
Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 78.9 V/m; Power Drift = -0.077 dB
Peak SAR (extrapolated) = 11.6 W/kg
SAR(1 g) = 6.99 mW/g; SAR(10 g) = 3.85 mW/g
Maximum value of SAR (measured) = 7.32 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.02 mW/g


mW/g
7.16
5.73
4.30
2.87
1.44
0.004


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

Appendix 2

SAR distribution plots for Phantom Head Adjacent Use

Date/Time: 03/07/2007 PM 5:15:53

Test Laboratory: Motorola

850 Cheek

11219000000144 ;

Procedure Notes: Pwr Step: 05(OTA) Antenna Position: Internal
Battery Model #: SNN5804A DEVICE POSITION (cheek or rotated): Cheek
Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8
Medium: Low Freq Head; Medium parameters used: f = 835 MHz; σ = 0.93 mho/m; ε_r = 42.4; ρ = 1000 kg/m^3

DASY4 Configuration:

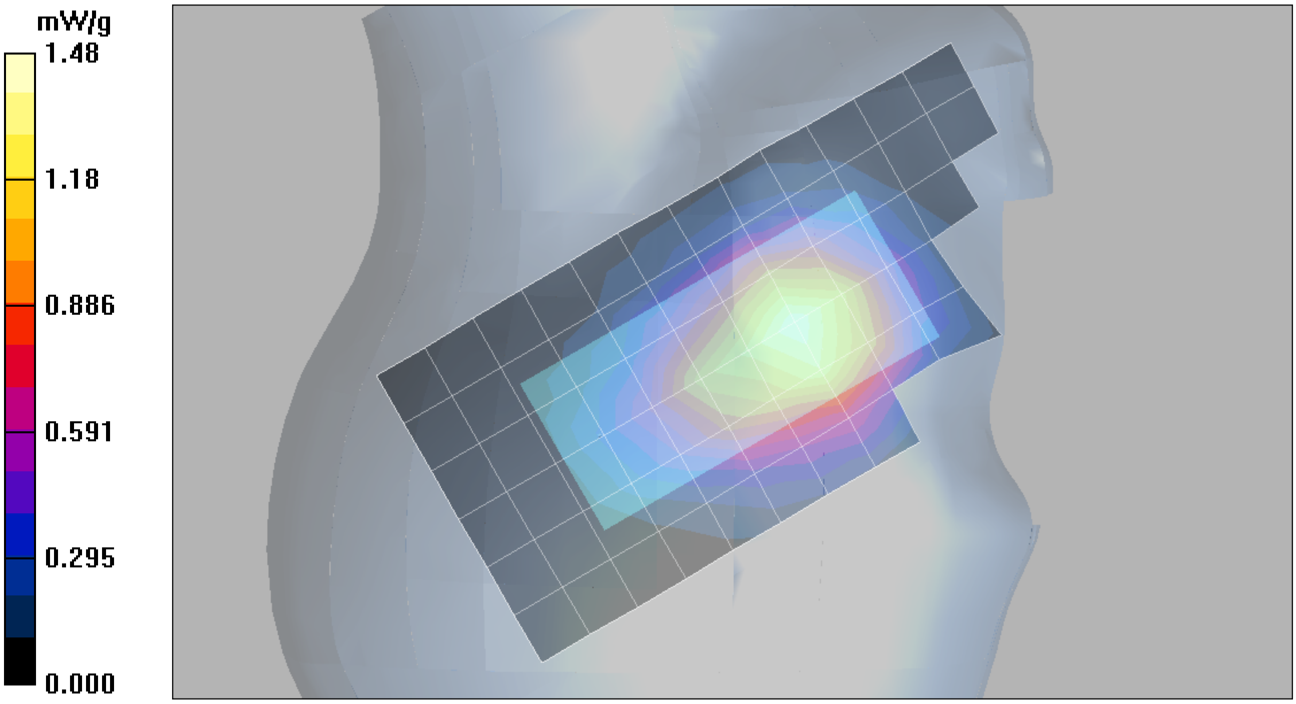
- Probe: ET3DV6 - SN1515; ConvF(6.31, 6.31, 6.31); Calibrated: 08/24/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 09/26/2006
- Phantom: PCS-10 Sugar SAM; Type: SAM; Serial: TP-1155;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.48 mW/g

Right Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 38.2 V/m; Power Drift = -0.158 dB
Peak SAR (extrapolated) = 1.88 W/kg
SAR(1 g) = 1.39 mW/g; SAR(10 g) = 0.969 mW/g
Maximum value of SAR (measured) = 1.49 mW/g



Date/Time: 02/28/2007 AM 9:40:45

Test Laboratory: Motorola 850 Tilt

11219000000144 ;
Procedure Notes: Pwr Step: 05(OTA) Antenna Position: Internal
Battery Model #: SNN57804A DEVICE POSITION (cheek or rotated): Rotated
Communication System: GSM 850; Frequency: 836.6 MHz;
Channel Number: 190; Duty Cycle: 1:8 Medium: Low Freq Head;

Medium parameters used: f = 835 MHz; $\sigma = 0.93$ mho/m; $\varepsilon_r = 42.5$; $\rho = 1000$ kg/m^3

DASY4 Configuration:

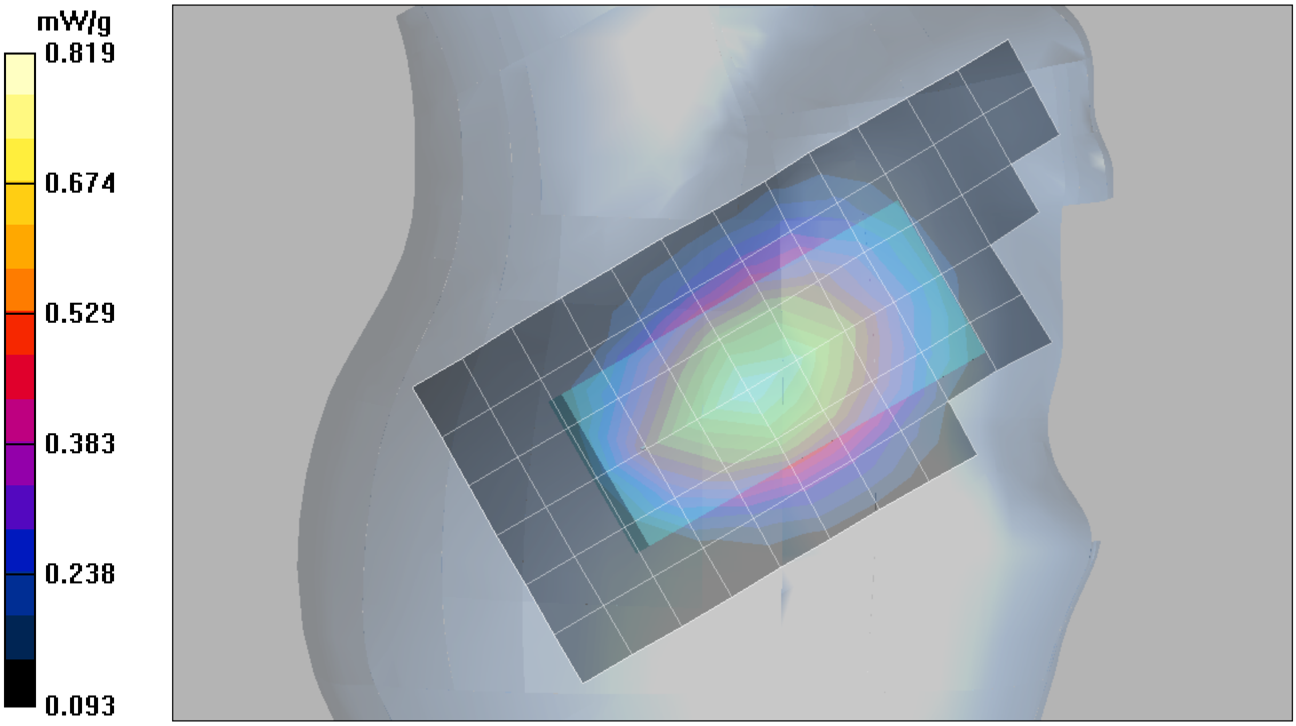
- Probe: ET3DV6R - SN1501; ConvF(6.02, 6.02, 6.02); Calibrated: 03/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 09/26/2006
- Phantom: PCS-10 Sugar SAM; Type: SAM; Serial: TP-1155;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.822 mW/g

Right Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.1 V/m; Power Drift = -0.108 dB
Peak SAR (extrapolated) = 0.984 W/kg
SAR(1 g) = 0.769 mW/g; SAR(10 g) = 0.553 mW/g
Maximum value of SAR (measured) = 0.819 mW/g



Date/Time: 02/27/2007 PM 7:48:29

Test Laboratory: Motorola **1900 Cheek**

11219000000144 ;
Procedure Notes: Pwr Step: 00(OTA) Antenna Position: Internal
Battery Model #: SNN5804A DEVICE POSITION (cheek or rotated): Cheek
Communication System: GSM 1900; Frequency: 1850.2 MHz; Channel Number: 512; Duty Cycle: 1:8
Medium: Regular Glycol Head;

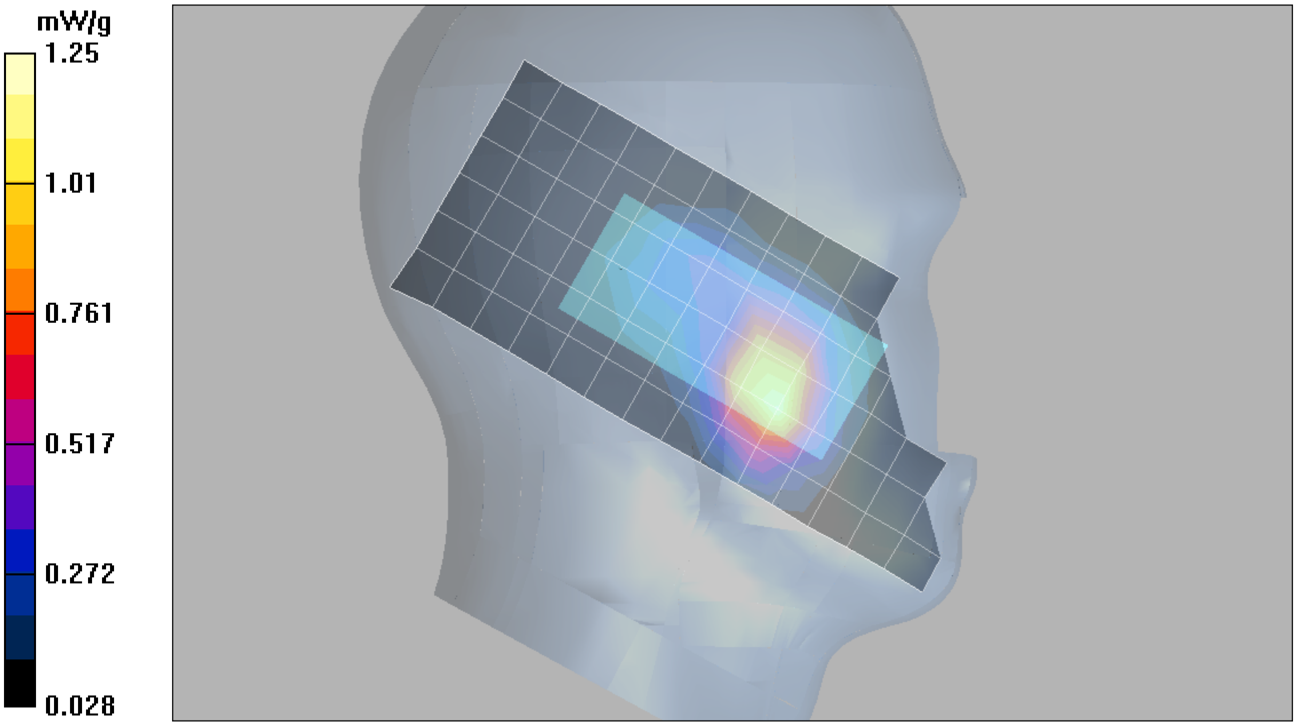
Medium parameters used: f = 1880 MHz; σ = 1.44 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6R - SN1501; ConvF(4.86, 4.86, 4.86); Calibrated: 03/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 09/26/2006
- Phantom: PCS-10 Glycol SAM; Type: SAM; Serial: TP-1086;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Left Head Template/Area Scan - Normal (15mm) (7x17x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.19 mW/g

Left Head Template/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.5 V/m; Power Drift = -0.126 dB
Peak SAR (extrapolated) = 1.82 W/kg
SAR(1 g) = 1.13 mW/g; SAR(10 g) = 0.663 mW/g
Maximum value of SAR (measured) = 1.25 mW/g



Date/Time: 02/27/2007 PM 8:52:02

Test Laboratory: Motorola **1900 Tilt**

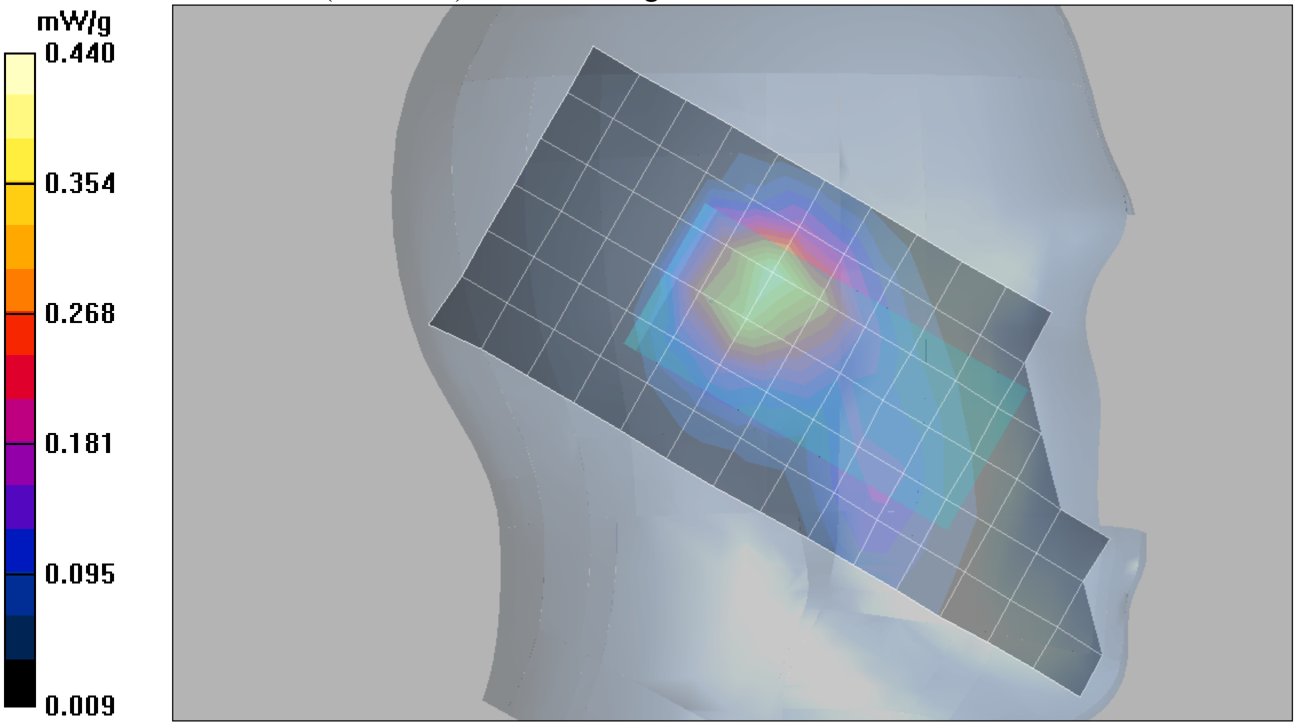
11219000000144 ;
Procedure Notes: Pwr Step: 00(OTA) Antenna Position: Internal
Battery Model #: SNN5804A DEVICE POSITION (cheek or rotated):rotated
Communication System: GSM 1900; Frequency: 1880 MHz;
Channel Number: 661; Duty Cycle: 1:8 Medium: Regular Glycol Head;
Medium parameters used: f = 1880 MHz; σ = 1.44 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6R - SN1501; ConvF(4.86, 4.86, 4.86); Calibrated: 03/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 09/26/2006
- Phantom: PCS-10 Glycol SAM; Type: SAM; Serial: TP-1086;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Left Head Template/Area Scan - Normal (15mm) (7x17x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.418 mW/g

Left Head Template/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.5 V/m; Power Drift = -0.047 dB
Peak SAR (extrapolated) = 0.599 W/kg
SAR(1 g) = 0.408 mW/g; SAR(10 g) = 0.247 mW/g
Maximum value of SAR (measured) = 0.440 mW/g



Appendix 3

SAR distribution plots for Body Worn Configuration

Date/Time: 02/27/2007 PM 5:21:55

Test Laboratory: Motorola **850 BodyWorn**

11219000000144 ;
Procedure Notes: Pwr Step: 05(OTA) Antenna Position: Internal
Battery Model #: SNN5782B Device Position: Back of phone 15mm away from Phantom
Communication System: GSM 850;
Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8 Medium: Low Freq Body;
Medium parameters used: f = 835 MHz; σ = 0.98 mho/m; ε_r = 55.8; ρ = 1000 kg/m^3

DASY4 Configuration:

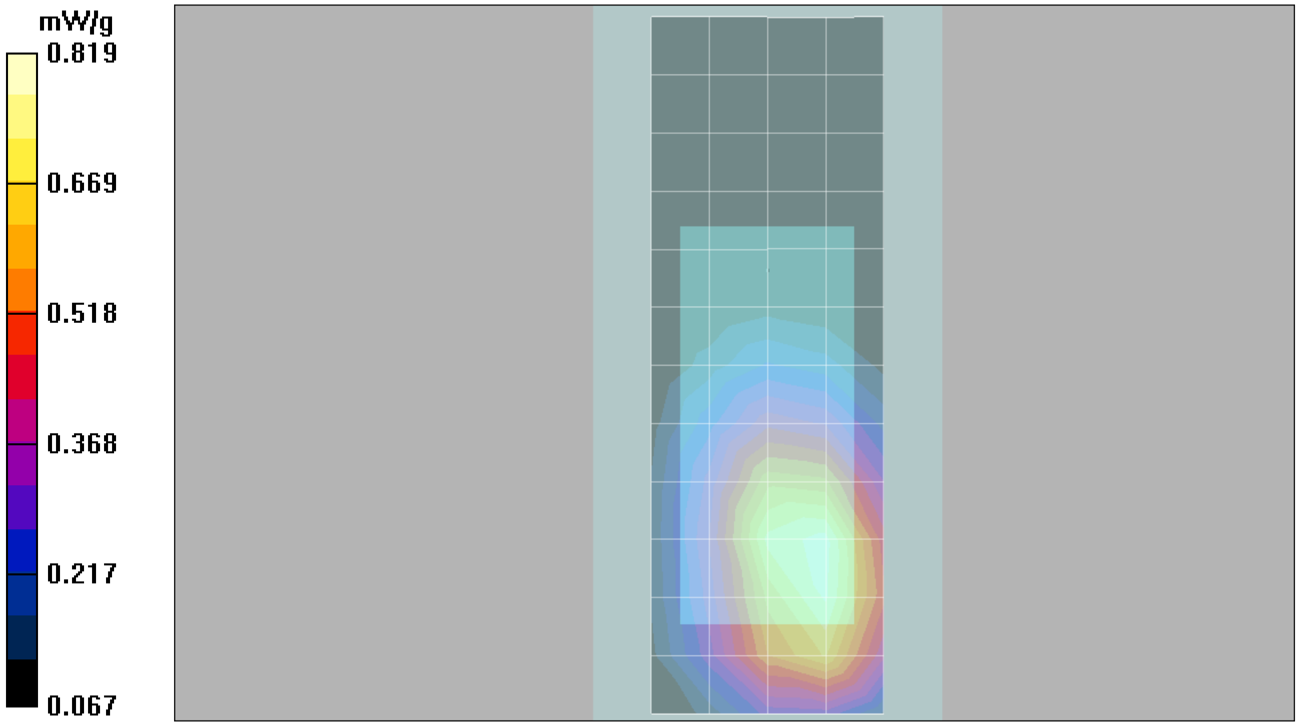
- Probe: ET3DV6R - SN1501; ConvF(5.64, 5.64, 5.64); Calibrated: 03/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 09/26/2006
- Phantom: R#10_ Section 1, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.791 mW/g

Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 27.4 V/m; Power Drift = -0.121 dB
Peak SAR (extrapolated) = 1.05 W/kg
SAR(1 g) = 0.772 mW/g; SAR(10 g) = 0.533 mW/g
Maximum value of SAR (measured) = 0.819 mW/g



Date/Time: 02/27/2007 PM 9:41:06

Test Laboratory: Motorola **1900 BodyWorn**

11219000000144 ;
Procedure Notes: Pwr Step: 00(OTA) Antenna Position: Internal
Battery Model #: SNN5804A Device Position: Back of phone 15mm away from Phantom
Communication System: GSM 1900; Frequency: 1880 MHz;
Channel Number: 661; Duty Cycle: 1:8 Medium: Regular Glycol Body;

Medium parameters used: f = 1880 MHz; σ = 1.58 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3

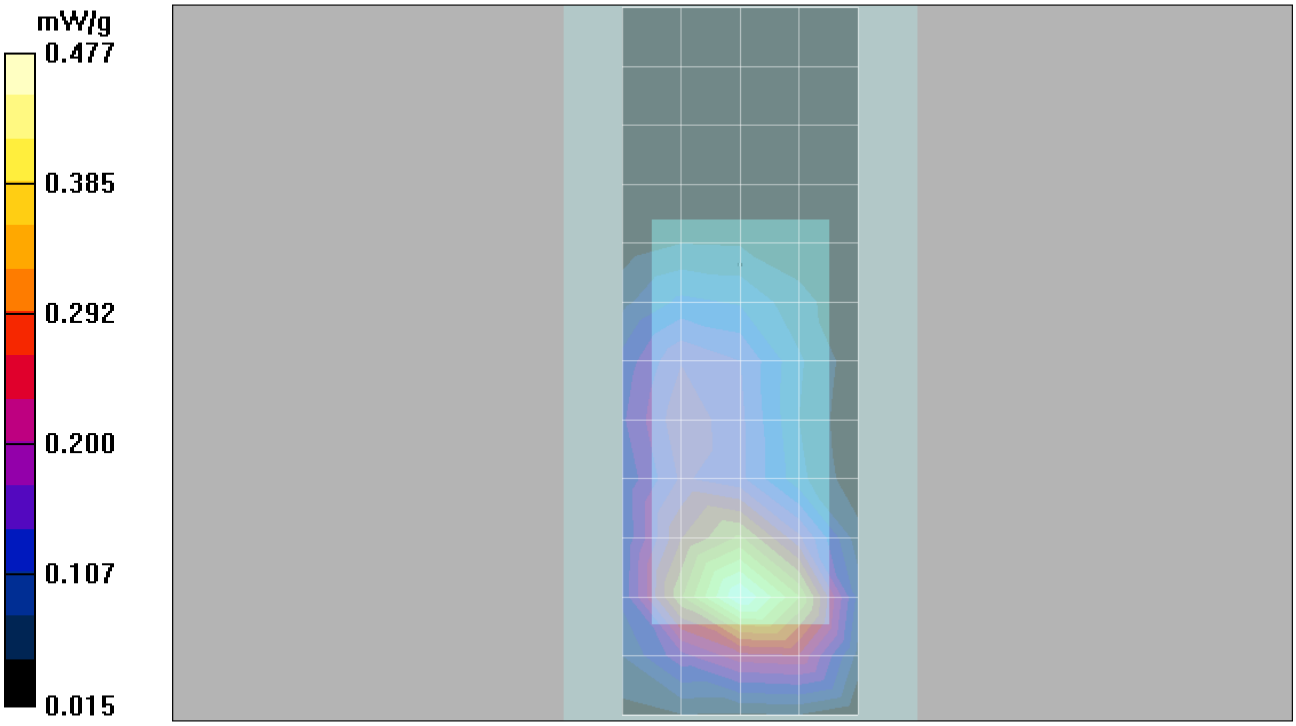
DASY4 Configuration:

- Probe: ET3DV6R - SN1501; ConvF(4.36, 4.36, 4.36); Calibrated: 03/23/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 09/26/2006
- Phantom: R#10_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;

- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.482 mW/g

Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.5 V/m; Power Drift = -0.033 dB
Peak SAR (extrapolated) = 0.732 W/kg
SAR(1 g) = 0.445 mW/g; SAR(10 g) = 0.264 mW/g
Maximum value of SAR (measured) = 0.477 mW/g



Appendix 4

Probe Calibration Certificate

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

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

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

Accreditation No.: SCS 108

Client **Motorola Korea**

Certificate No: ET3-1501_Mar06

CALIBRATION CERTIFICATE

Object	ET3DV6R - SN:1501
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	March 23, 2006
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41495277	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41498087	3-May-05 (METAS, No. 251-00466)	May-06
Reference 3 dB Attenuator	SN: S5054 (3c)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
Reference 30 dB Attenuator	SN: S5129 (30b)	11-Aug-05 (METAS, No. 251-00500)	Aug-06
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	2-Feb-06 (SPEAG, No. DAE4-654_Feb06)	Feb-07

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

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

Issued: March 23, 2006

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe ET3DV6R

SN:1501

Manufactured:	September 21, 1999
Last calibrated:	March 21, 2005
Recalibrated:	March 23, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6R SN:1501

Sensitivity in Free Space[A]

NormX	**2.17** ± 10.1%	$\mu V/(V/m)^2$
NormY	**2.18** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**2.24** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

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

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	8.5	4.6
SAR_{be} [%]	With Correction Algorithm	0.1	0.1

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	7.3	4.1
SAR_{be} [%]	With Correction Algorithm	0.2	0.4

Sensor Offset

Probe Tip to Sensor Center **2.7** mm

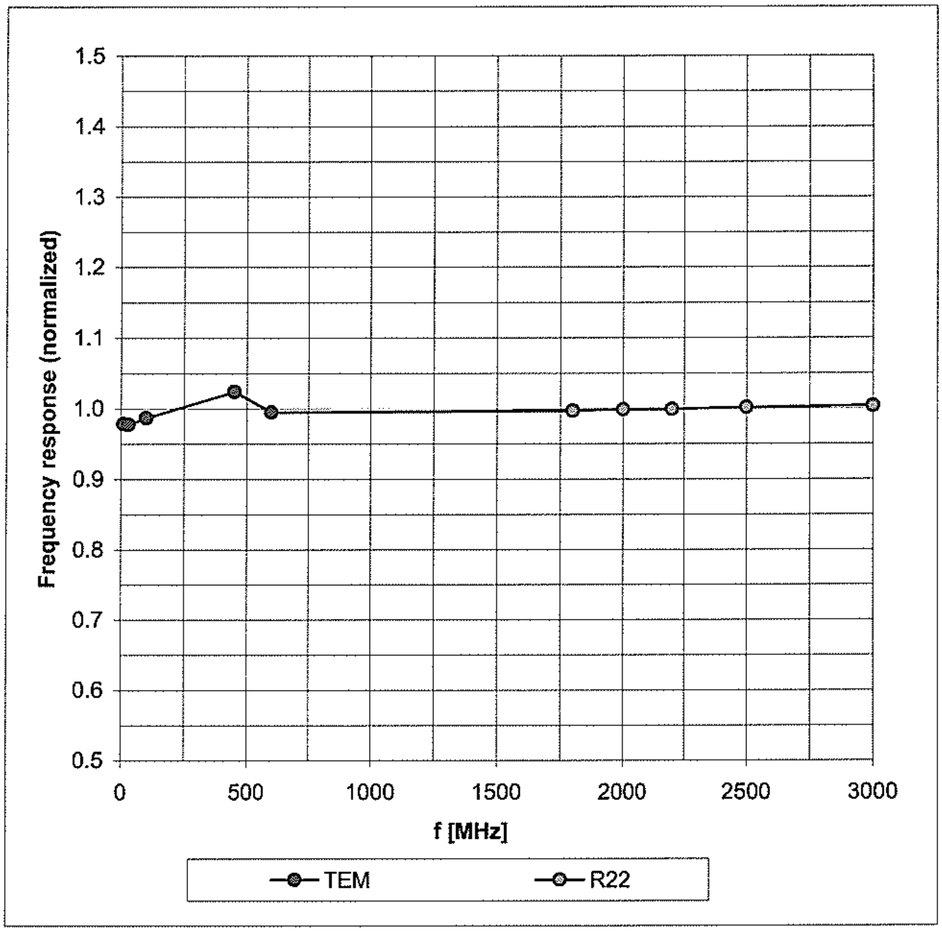
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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

[B] Numerical linearization parameter: uncertainty not required.

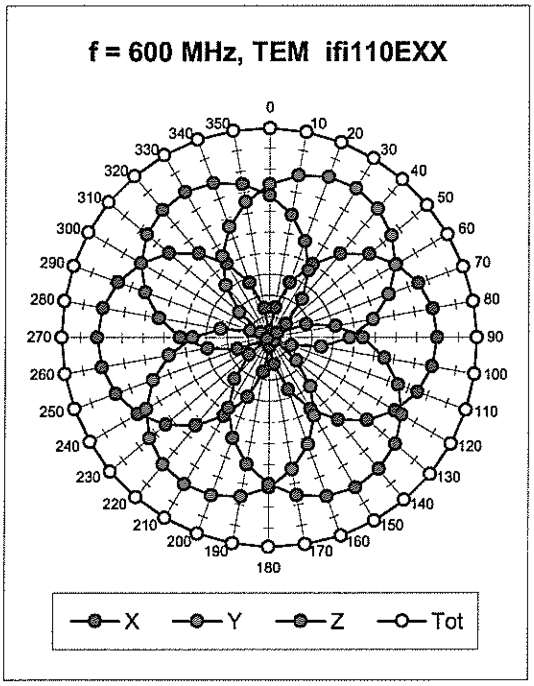
Frequency Response of E-Field

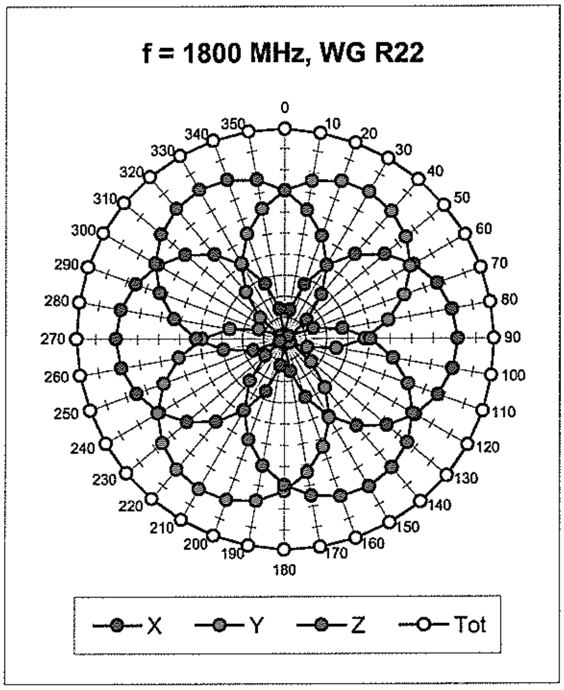
(TEM-Cell:ifi110 EXX, Waveguide: R22)

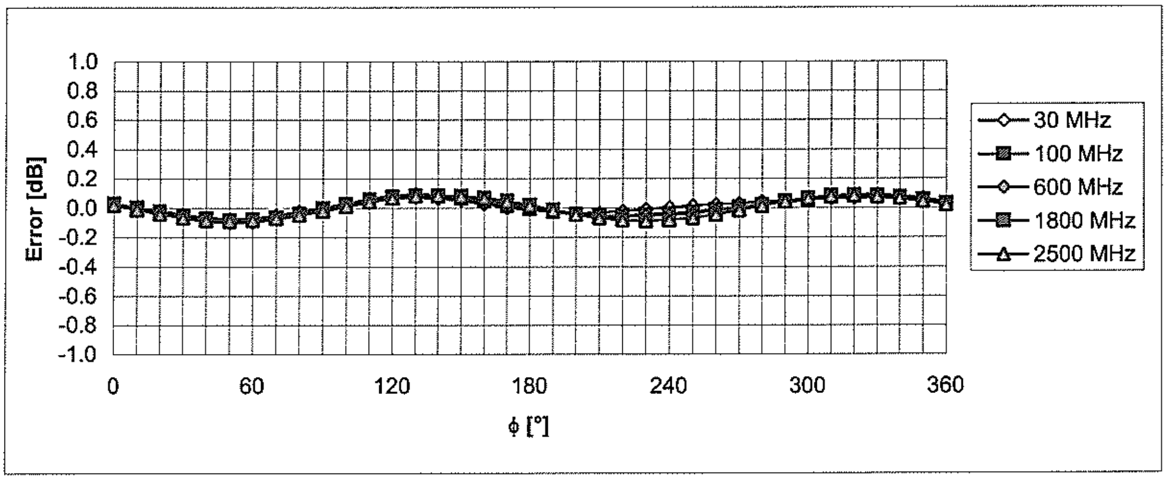


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$



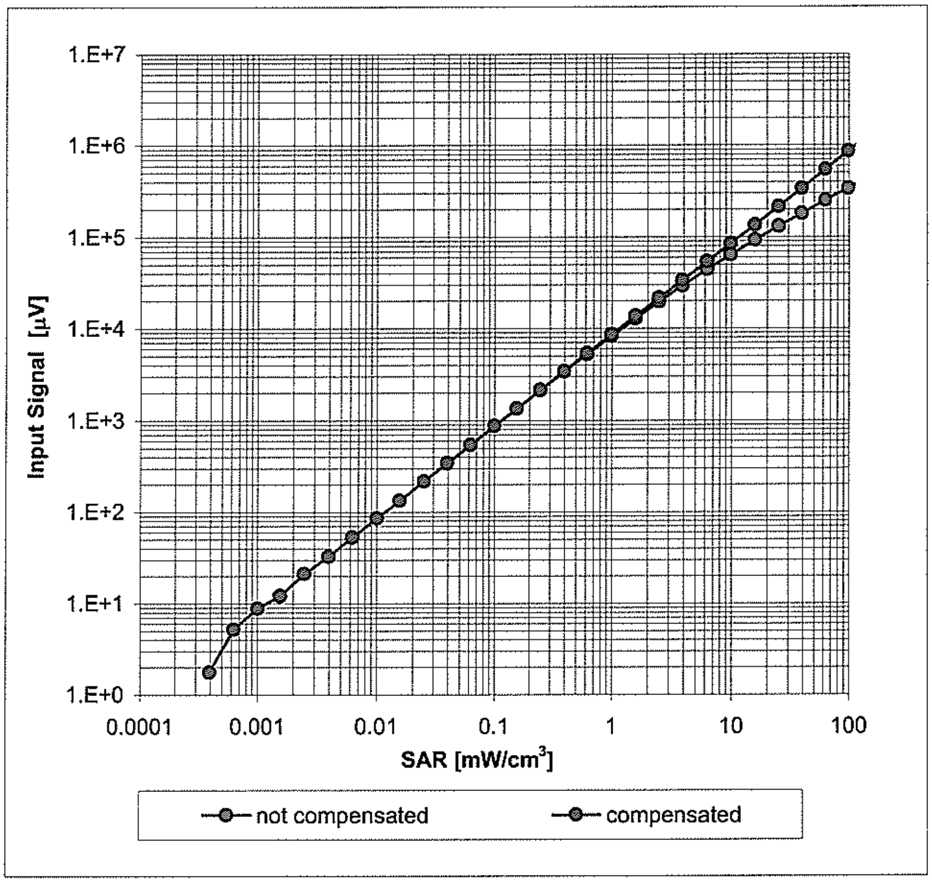


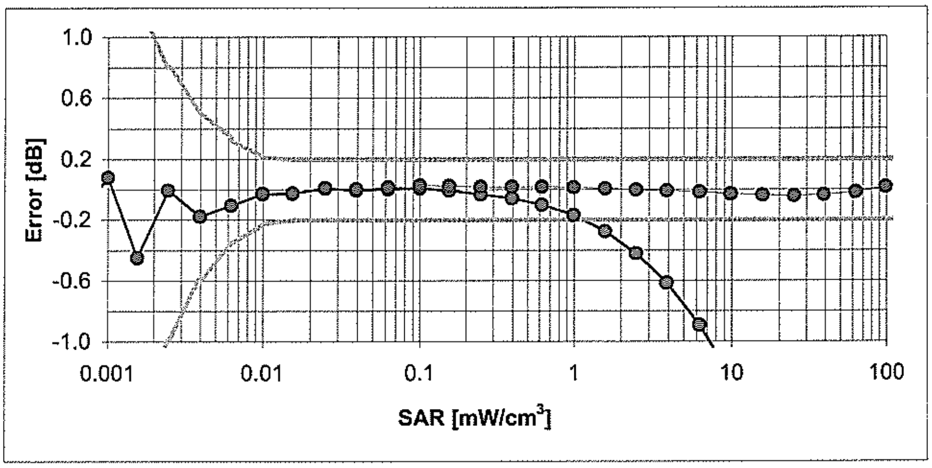


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

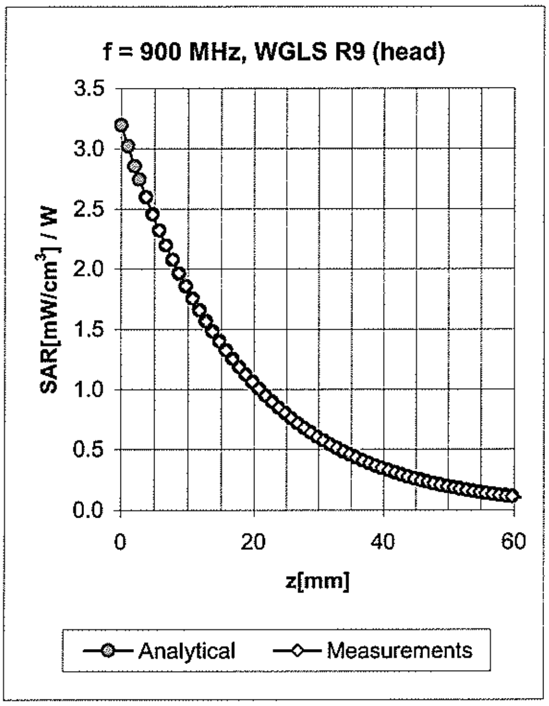
(Waveguide R22, f = 1800 MHz)

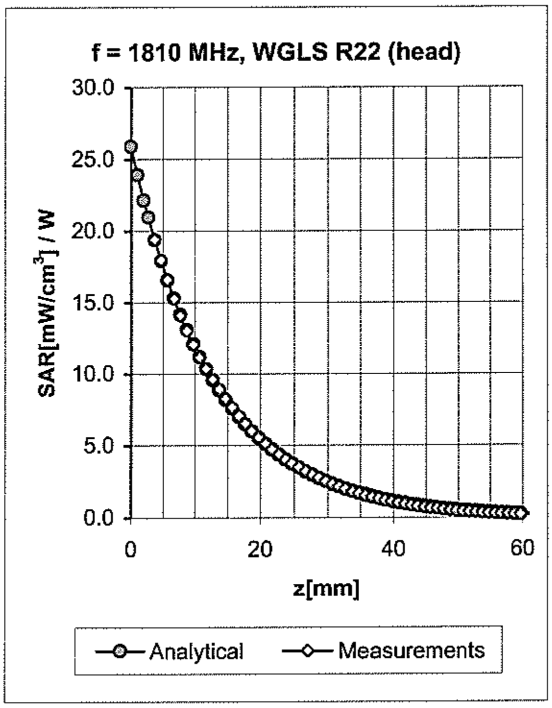




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



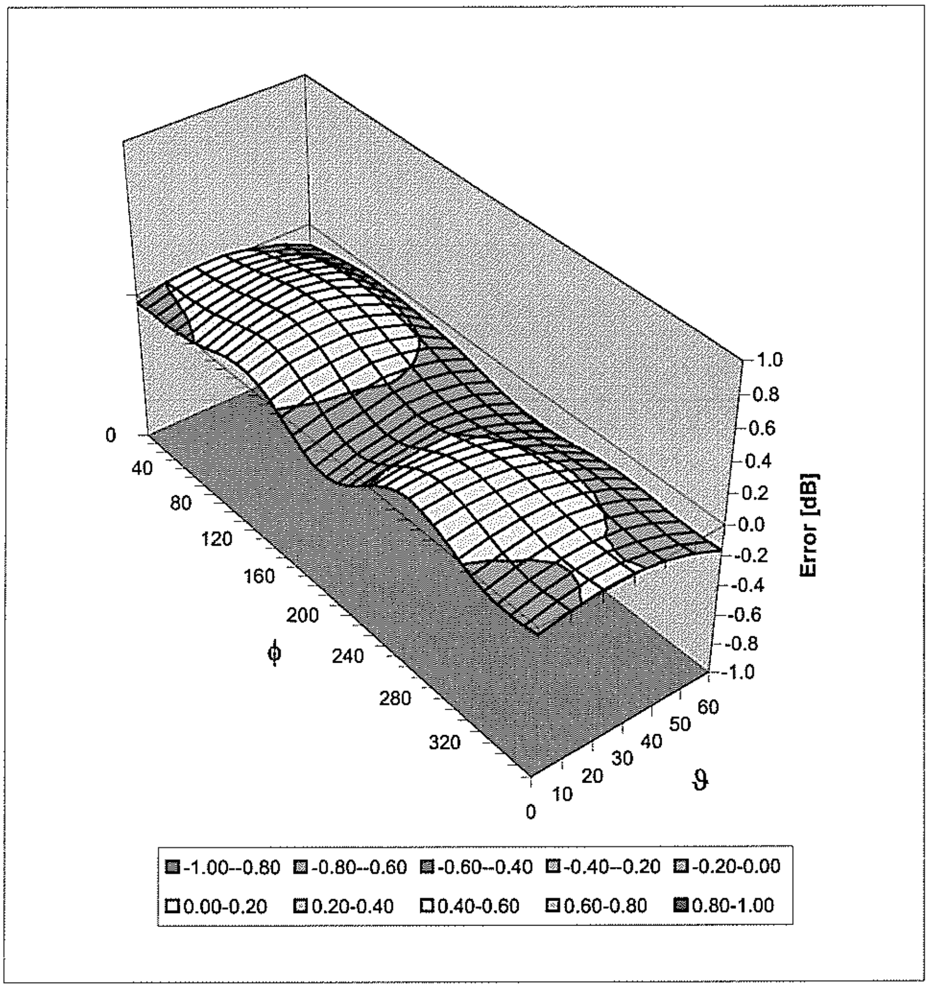


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.56	1.88	6.02	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.50	2.49	4.86	± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.50	2.60	4.65	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.59	2.29	4.10	± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.50	2.05	5.64	± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.63	2.41	4.36	± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.75	2.15	4.19	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.54	2.21	3.73	± 11.8% (k=2)

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

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

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

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

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

Accreditation No.: SCS 108

Client Motorola Korea

Certificate No: ET3-1515_Aug06

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1515
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	August 24, 2006
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

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

Issued: August 24, 2006

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe ET3DV6

SN:1515

Manufactured:	February 1, 2000
Last calibrated:	August 30, 2005
Recalibrated:	August 24, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1515

Sensitivity in Free Space[A]

NormX	**1.69** ± 10.1%	$\mu V/(V/m)^2$
NormY	**1.89** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**1.70** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	**94** mV
DCP Y	**99** mV
DCP Z	**95** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	8.5	4.6
SAR_{be} [%]	With Correction Algorithm	0.1	0.2

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	11.8	7.0
SAR_{be} [%]	With Correction Algorithm	0.2	0.4

Sensor Offset

Probe Tip to Sensor Center **2.7** mm

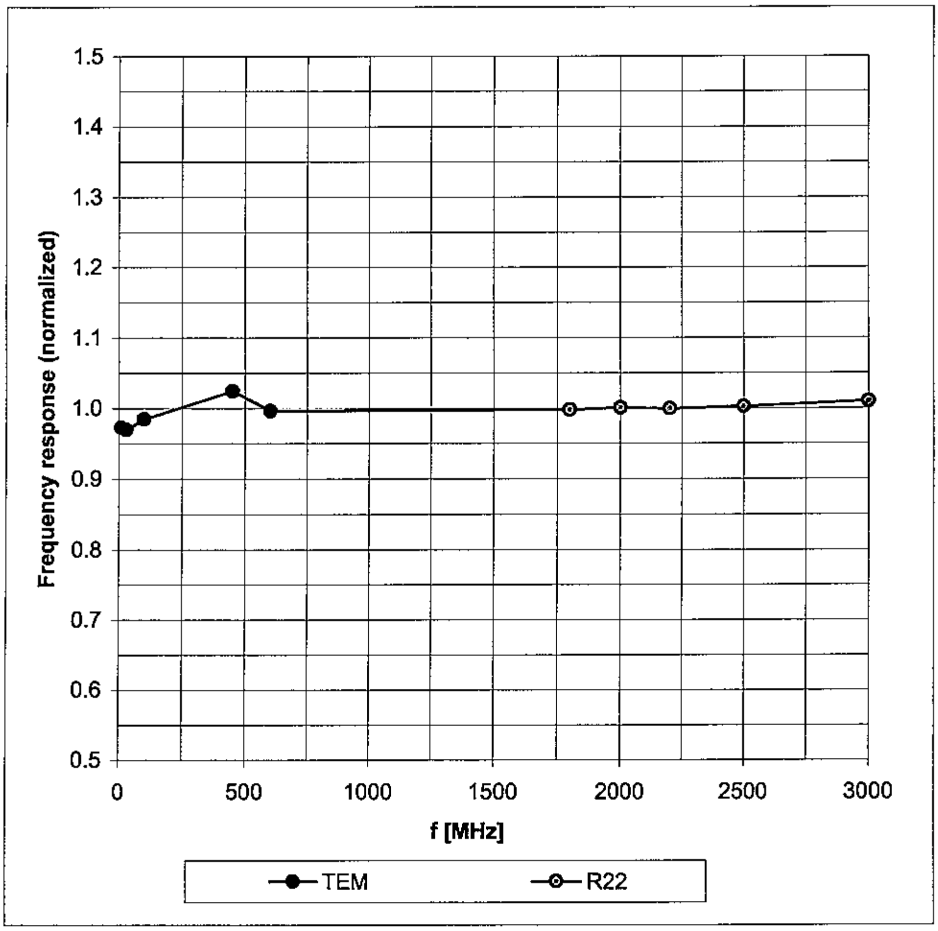
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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

[B] Numerical linearization parameter: uncertainty not required.

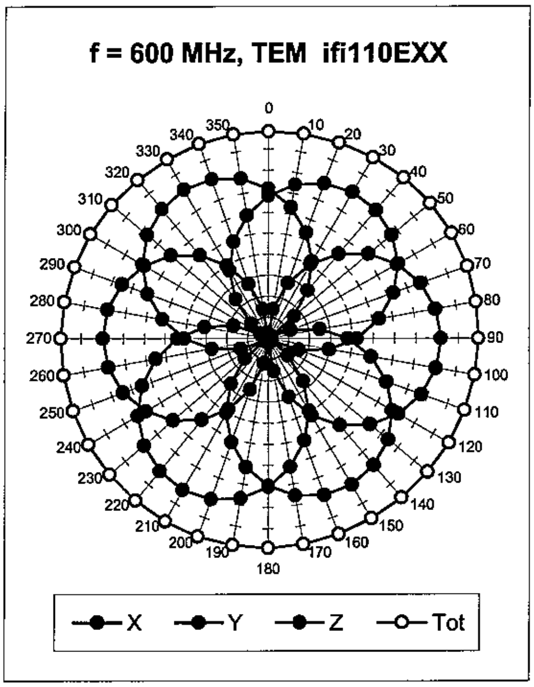
Frequency Response of E-Field

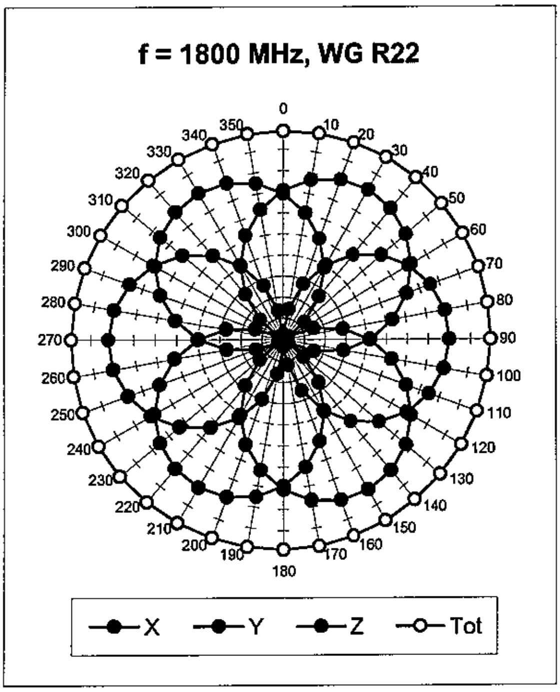
(TEM-Cell:ifi110 EXX, Waveguide: R22)

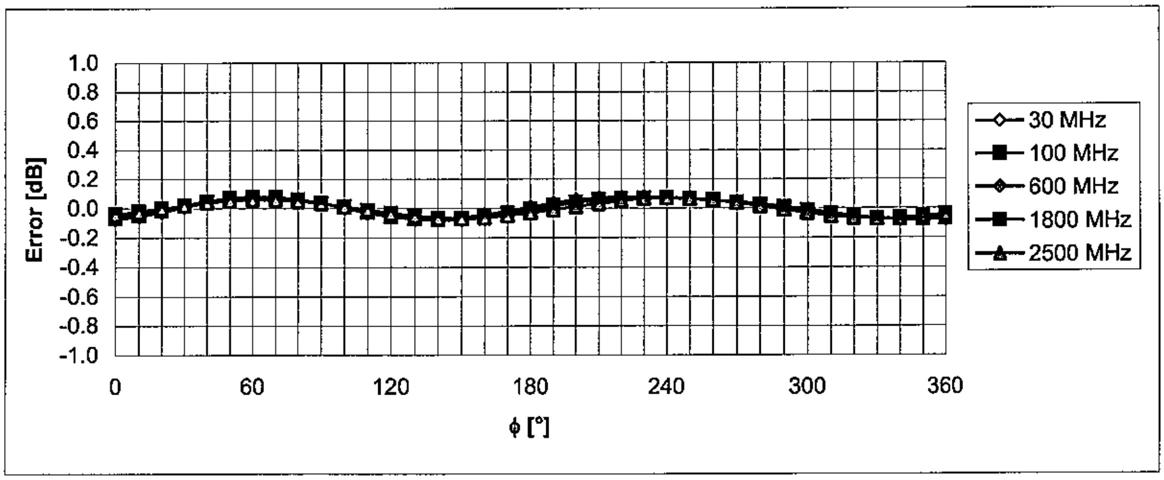


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



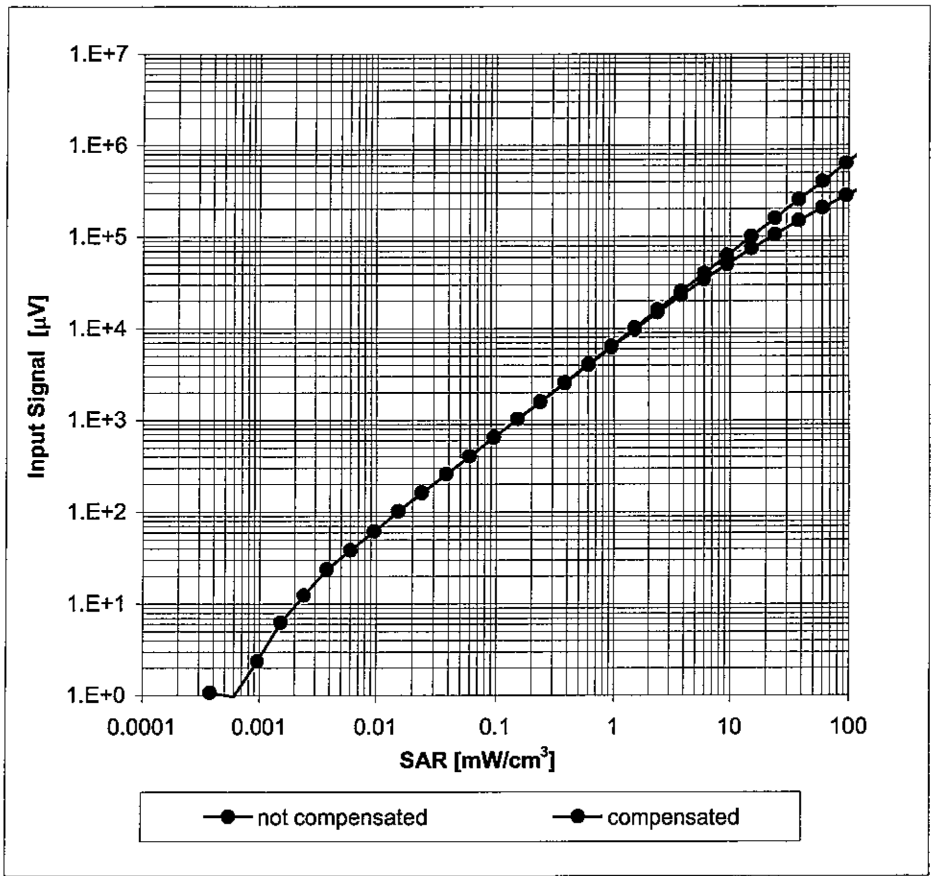


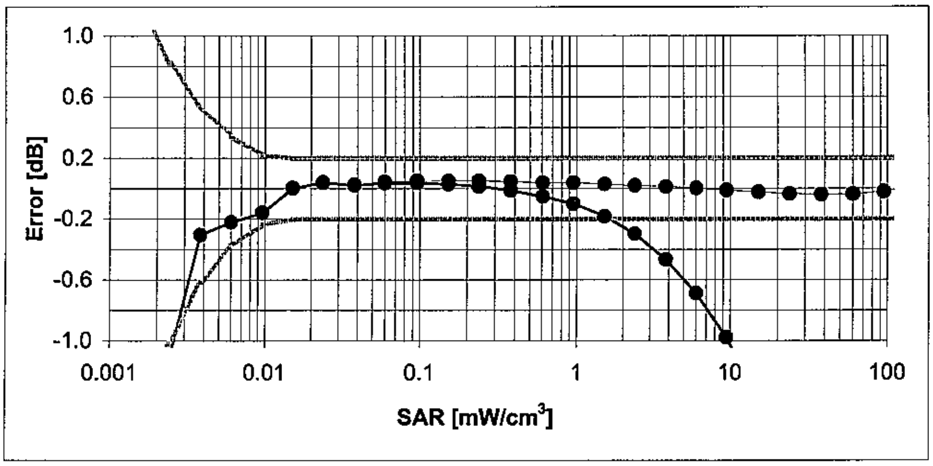


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

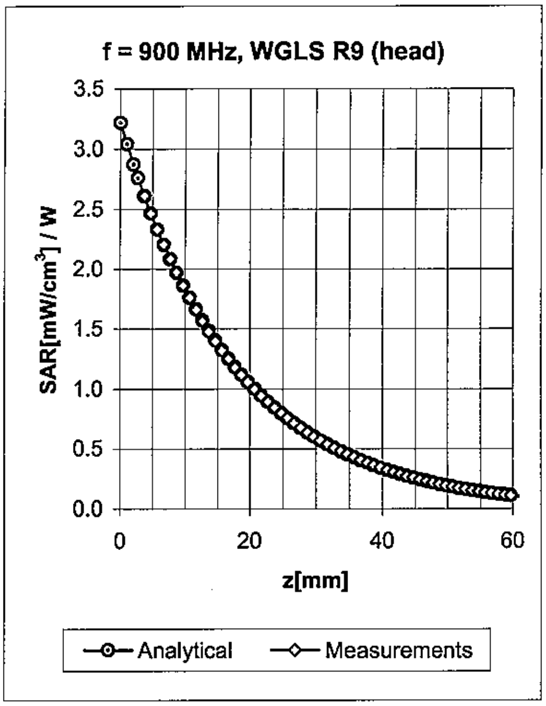
(Waveguide R22, f = 1800 MHz)

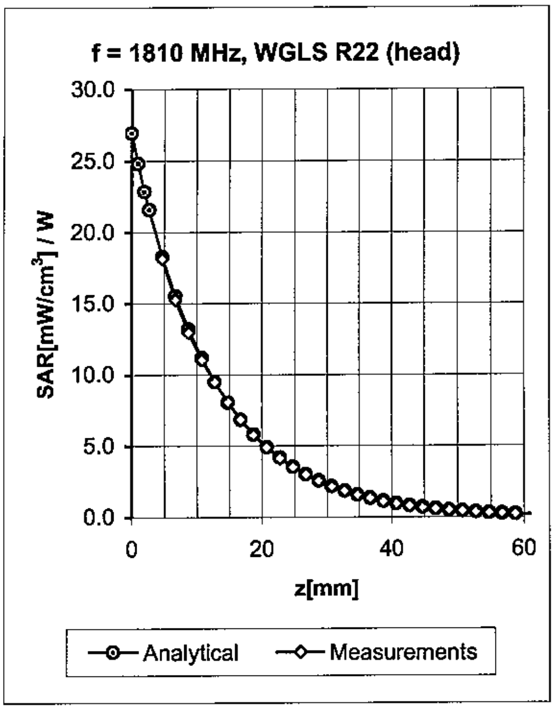




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



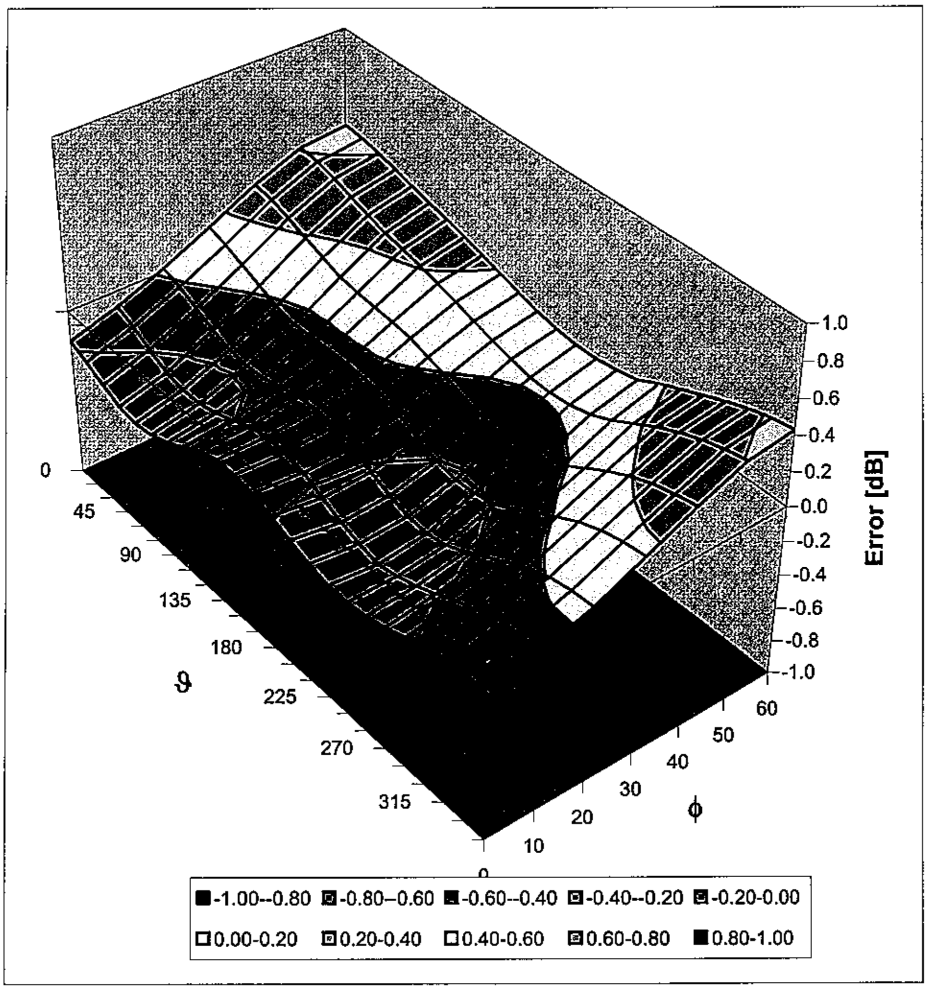


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.58	1.83	6.31	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.53	2.57	5.33	± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.52	2.76	4.90	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.45	1.61	4.53	± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.52	2.06	6.18	± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.61	2.75	4.66	± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.78	2.26	4.33	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.65	1.85	4.18	± 11.8% (k=2)

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

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Appendix 5

Measurement Uncertainty Budget

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	IEEE 1528 section	**Tol. (± %)**	Prob Dist	**Div.**	**c_i (1 g)**	**c_i (10 g)**	**1 g u_i (±%)**	**10 g u_i (±%)**	v_i
Measurement System									
Probe Calibration	E.2.1	5.9	N	1.00	1	1	5.9	5.9	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mech. Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2	3.2	N	1.00	1	1	3.2	3.2	29
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				11.1	10.8	411
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				22.2	21.6	

Appendix 6

Photographs of the device under test
>>MOVED TO FCC EXHIBIT 7 <<<<<

Appendix 7

Dipole Characterization Certificate

Certification of System Performance Check Targets

Based on WI-0396

-Historical Data-

	900MHz	
IEEE1528 Target:	10.8	**(W/kg)**
Measurement Uncertainty (k=1):	9.0%	
Measurement Period:	*3-June-05 to 10-May-06*	
# of tests performed:	1571	
Grand Average:	11.3	**(W/kg)**
% Delta (Average - IEEE1528 Target)	4.3%	
Is % Delta <= Expanded Measurement Uncertainty (k=2)?	**Yes**	
Accept/Reject Average as new system performance check target?	**ACCEPT**	
	Applies to Dipole SN's: **55, 69, 77, 78, 79, 80, 91, 92, 93, 94, 95, 96, 97**	

-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

Frequency	SAR Target (W/kg)	Permittivity	Conductivity (S/m)
900MHz	**11.3**	41.5 ± 5%	0.97 ± 5%

-Approvals-

Submitted by: Marge Kaunas — Date: 12-May-06

Signed: Marge Kaunas

Comments: Spreadsheet detailing referenced historical measurements is available upon request.

Approved by: Mark Douglas — **Date:** 22-May-06

Signed: Mark Douglas

Comments: