Portable Cellular Phone SAR Test Report

Tests Requested By:	Motorola Mobility, Inc. 600 N. US Highway 45 Libertyville, IL 60048
Test Report #:	25079-1F Rev 1
Date of Report:	Aug 28, 2012
Date of Test:	July 5 – July 25, 2012
FCC ID #:	IHDT56NJ1
Generic Name:	M0CE5
Test Laboratory:	Motorola Mobility, Inc. - ADR Test Services Laboratory 600 N. US Highway 45 Libertyville, IL 60048
Report Author:	Katerina Bruggemann Engineer

Accreditation:

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

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

2404

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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Revision History

Revision Version	Date	Notes
Rev. 0	01-Aug-2012	Initial report release
Rev. 1	28-Aug-2012	updated

1. Introduction

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

For ANSI / IEEE C95.1 (1 g), the final stand-alone SAR readings for this phone are given in the table below. For ANSI / IEEE C95.1 (1 g), the final simultaneous-transmission SAR readings for this phone are 1.35 W/kg for head-adjacent use. These measurements were performed using a DASY4™ v4.7 or DASY52™ system manufactured by Schmid & Partner Engineering AG (SPEAG), of Zurich Switzerland.

Transmit Band	Head SAR (1 g $^{W}/_{kg}$)	Body SAR (1 g $^{W}/_{kg}$)	Mobile Hotspot SAR (1 g $^{W}/_{kg}$)
WCDMA 1700	**1.07**	**0.24**	**0.42**
WCDMA 1900	**1.23**	**0.20**	**0.34**
GSM 850	**0.49**	**0.42**	**0.27**
GSM 1900	**0.45**	**0.11**	**0.16**
Wi-Fi 2.45 GHz	**0.38**	**0.04**	**0.22**

2. Description of the Device Under Test

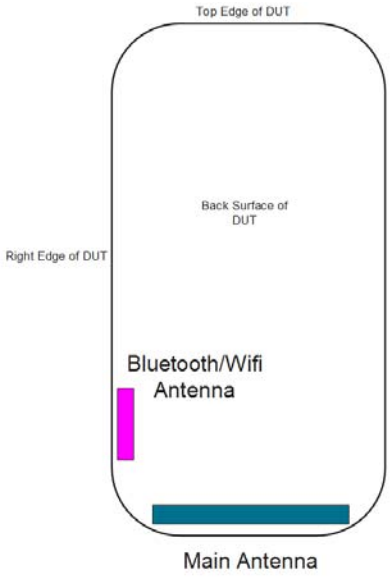
2.1 Antenna description

Main Antenna

Type	Internal	
Location	Bottom of Transceiver	
Dimensions	Width	47.5 mm
	Length	10.5 mm

Bluetooth/Wi-Fi 2 GHz Antenna

Type	Internal	
Location	Right-Side Rear of Transceiver	
Dimensions	Width	9.0 mm
	Length	19.0 mm



2.2 Device Signaling[1]

Serial Number(s) (Functional Use)	352507050007739 (GSM//WCDMA conducted power measurements, GSM/WCDMA head/body SAR testing/ mobile hotspot SAR testing, Wi-Fi 2.4 GHz SAR testing) 352507050010832 (Wi-Fi 2.4 GHz conducted power measurements)
Production Unit or Identical Prototype (47 CFR §2..908)	Identical Prototype
Device Category	Portable (Mobile Station Class B)
RF Exposure Limits	General Population / Uncontrolled

Mode(s) of Operation	Modulation Mode(s)	Maximum Output Power Setting	Duty Cycle	Transmitting Frequency Range(s)
GSM 850	GMSK	33.5 dBm	1:8	824.2 - 848.8 MHz
GSM 900	GMSK	33.5 dBm	1:8	880.2 - 914.8 MHz
GSM 1800	GMSK	30.5 dBm	1:8	1710.2 - 1784.8 MHz
GSM 1900	GMSK	30.5 dBm	1:8	1850.2 - 1909.8 MHz
WCDMA 1700	QPSK	24.0 dBm	1:1	1712.4 – 1752.6 MHz
WCDMA 1900	QPSK	24.0 dBm	1:1	1852.4 - 1907.6 MHz
WCDMA 2100	QPSK	24.0 dBm	1:1	1922.4 - 1977.6 MHz
Wi-Fi 802.11b/g/n	BPSK	19.13 dBm	1:1	2412.0 - 2462.0 MHz
Bluetooth	GFSK	10.38 dBm	1:1	2402.0 – 2480.0 MHz

GSM Data Functionality	GPRS/EDGE Class 12 (4 uplink timeslots; 4 downlink timeslots; 5 total timeslots per frame)
	Class B (DTM not supported)

Mode(s) of Operation	GPRS 850				GPRS 900				GPRS 1800				GPRS 1900			
Modulation	GMSK				GMSK				GMSK				GMSK			
Maximum Output Power Setting (dBm)	33.5	30.5	28.7	**27.5**	33.5	30.5	28.7	**27.5**	30.5	27.5	25.7	**24.5**	30.5	27.5	25.7	**24.5**
Time Average Output Power Setting (dBm)	24.5	24.5	24.5	**24.5**	24.5	24.5	24.5	**24.5**	21.5	21.5	21.5	**21.5**	21.5	21.5	21.5	**21.5**
Duty Cycle	1:8	2:8	3:8	**4:8**	1:8	2:8	3:8	**4:8**	1:8	2:8	3:8	**4:8**	1:8	2:8	3:8	**4:8**
Transmitting Frequency Range(s)	824.2 - 848.8 MHz				880.2 - 914.8 MHz				1710.2 - 1784.8 MHz				1850.2 - 1909.8 MHz			

Mode(s) of Operation	EDGE 850				EDGE 900				EDGE 1800				EDGE 1900			
Modulation	8PSK				8PSK				8PSK				8PSK			
Maximum Output Power Setting (dBm)	28.0	**27.0**	25.0	23.0	28.0	**27.0**	25.0	23.0	27.0	**27.0**	25.0	23.0	27.0	**27.0**	25.0	23.0
Time Average Output Power Setting (dBm)	19.0	**21.0**	20.7	20.0	19.0	**21.0**	20.7	20.0	18.0	**21.0**	20.7	20.0	18.0	**21.0**	20.7	20.0
Duty Cycle	1:8	**2:8**	3:8	4:8	1:8	**2:8**	3:8	4:8	1:8	**2:8**	3:8	4:8	1:8	**2:8**	3:8	4:8
Transmitting Frequency Range(s)	824.2 - 848.8 MHz				880.2 - 914.8 MHz				1710.2 - 1784.8 MHz				1850.2 - 1909.8 MHz			

[1] **Bolded** entries indicate data mode configurations of highest time-average power output per band and data mode type, and thus were utilized for SAR testing in this report.

2.2.1 Transmitter power reduction conditions and modes

The DUT utilizes reduced limits for the maximum transmit power when the mobile hotspot functionality is enabled. A table of the reduced limits used for testing are given below. A complete description of this functionality is provided in the "Operational Description" contained within Exhibit 12. The implementation to trigger the reduction in power requires the device to be radiating, which prevents conducted power measurements of this functionality without modification to the unit.

Mode(s) of Operation	WCDMA 1700	WCDMA 1900
Channel Ranges	1312 - 1513	9262 - 9538
Maximum Output Power Setting (dBm)	24.0	24.0
Reduced Maximum Output Power Setting (dBm)	19.0	19.0

Mode(s) of Operation	GPRS 850				GPRS 1900			
Modulation	GMSK				GMSK			
Duty Cycle	1:8	2:8	3:8	4:8	1:8	2:8	3:8	4:8
Maximum Output Power Setting (dBm)	33.5	30.5	28.7	**27.5**	30.5	27.5	25.7	**24.5**
Time Average Output Power Setting (dBm)	24.5	24.5	24.4	**24.5**	21.5	21.5	21.4	**21.5**
Reduced Maximum Output Power Setting (dBm)	27.5	24.5	22.7	**21.5**	24.5	21.5	19.7	**18.5**
Reduced Time Average Output Power Setting (dBm)	18.5	18.5	18.4	**18.5**	15.5	15.5	15.4	**15.5**

2.3 Device Conducted Power Measurements

2.3.1 GSM modes

Band	Channel	Conducted power (dBm) for GSM modes[2] (Burst Average Power)								
		GSM *CS Voice* (1 Slot)	GPRS *PS Data* (1 Slot)	GPRS *PS Data* (2 Slots)	GPRS *PS Data* (3 Slots)	GPRS *PS Data* (4 Slots)	EDGE *PS Data* (1 Slot)	EDGE *PS Data* (2 Slots)	EDGE *PS Data* (3 Slots)	EDGE *PS Data* (4 Slots)
GSM 850	128	33.60	33.69	30.63	28.52	27.53	27.96	26.96	24.92	22.85
	190	33.56	33.64	30.52	28.65	27.67	27.94	26.84	24.84	22.93
	251	33.38	33.47	30.66	28.73	27.68	27.89	26.84	25.00	22.80
GSM 900	975	33.50	33.38	30.30	28.79	27.64	27.95	26.80	24.96	23.01
	1	33.45	33.30	30.52	28.76	27.67	27.96	27.14	25.06	23.07
	62	33.36	33.50	30.70	28.65	27.62	28.04	27.16	25.08	23.14
	124	33.52	33.46	30.30	28.63	27.42	27.97	26.80	25.07	22.93
GSM 1800	512	30.53	30.45	27.60	25.90	24.70	26.87	27.09	25.20	23.14
	700	30.62	30.53	27.46	25.68	24.45	26.94	27.08	24.93	22.87
	885	30.66	30.56	27.30	25.50	24.30	26.84	26.96	24.88	22.93
GSM 1900	512	30.48	30.37	27.33	25.73	24.43	26.89	27.01	25.02	22.90
	661	30.64	30.56	27.58	25.75	24.40	26.93	26.99	25.04	22.80
	810	30.34	30.32	27.49	25.90	24.53	26.82	27.02	24.98	22.85

Band	Channel	Conducted power (dBm) for GSM modes[2] (Source-Based Time-Averaged Power)								
		GSM *CS Voice* (1 Slot)	GPRS *PS Data* (1 Slot)	GPRS *PS Data* (2 Slots)	GPRS *PS Data* (3 Slots)	GPRS *PS Data* (4 Slots)	EDGE *PS Data* (1 Slot)	EDGE *PS Data* (2 Slots)	EDGE *PS Data* (3 Slots)	EDGE *PS Data* (4 Slots)
GSM 850	128	24.6	24.69	24.63	24.22	24.53	18.96	20.96	20.62	19.85
	190	24.56	24.64	24.52	24.35	24.67	18.94	20.84	20.54	19.93
	251	24.38	24.47	24.66	24.43	24.68	18.89	20.84	20.7	19.8
GSM 900	975	24.5	24.38	24.3	24.49	24.64	18.95	20.8	20.66	20.01
	1	24.45	24.3	24.52	24.46	24.67	18.96	21.14	20.76	20.07
	62	24.36	24.5	24.7	24.35	24.62	19.04	21.16	20.78	20.14
	124	24.52	24.46	24.3	24.33	24.42	18.97	20.8	20.77	19.93
GSM 1800	512	21.53	21.45	21.6	21.6	21.7	17.87	21.09	20.9	20.14
	700	21.62	21.53	21.46	21.38	21.45	17.94	21.08	20.63	19.87
	885	21.66	21.56	21.3	21.2	21.3	17.84	20.96	20.58	19.93
GSM 1900	512	21.48	21.37	21.33	21.43	21.43	17.89	21.01	20.72	19.9
	661	21.64	21.56	21.58	21.45	21.4	17.93	20.99	20.74	19.8
	810	21.34	21.32	21.49	21.6	21.53	17.82	21.02	20.68	19.85

[2] *CS Voice* denotes circuit-switched transmission for voice calling, and *PS Data* denotes packet-switched transmission for data sessions.

2.3.2 WCDMA modes

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

Band	Channel	Conducted power (dBm) for WCDMA modes		Conducted Power (dBm) for WCDMA – HSDPA (Rel 5) Modes				Conducted Power (dBm) for WCDMA – HSPA (HSUPA/HSDPA-Rel 6) Modes				
		RMC	AMR	Subtest 1	Subtest 2	Subtest 3	Subtest 4	Subtest 1	Subtest 2	Subtest 3	Subtest 4	Subtest 5
WCDMA 1700	1312	24.04	24.09	23.99	24	24.14	24.18	24.09	24.09	24.19	24.11	24.18
	1413	23.94	23.91	23.92	23.85	24.01	24.03	23.93	24.03	24.04	24.03	24.1
	1513	23.95	23.9	23.92	23.92	24.08	24.05	23.93	24.03	24.11	24.1	24.13
WCDMA 1900	9262	23.94	23.94	24	24.07	24.08	24.16	23.98	24.14	24.19	24.12	24.14
	9400	23.94	23.95	24.06	24.13	24.1	24.12	24.07	24.15	24.13	24.12	24.11
	9538	23.94	23.94	24.02	24.14	24.04	24.15	24.08	24.07	24.11	24.03	24.11
WCDMA 2100	9612	24.09	24.09	24.07	24.2	24.2	24.21	24.18	24.13	24.21	24.13	24.23
	9750	24.11	24.14	24.16	24.16	24.2	24.22	24.23	24.22	24.19	24.21	24.26
	9888	24.08	24.04	24.1	24.09	24.11	24.13	24.12	24.14	24.13	24.1	24.11

Maximum Power Reduction (MPR)

According to 3GPP 25.101 sub-clause 6.2.2, the maximum output power is allowed to be reduced by following the table.

Table 6.1A: UE maximum output power with HS-DPCCH and E-DCH

UE transmit channel configuration	CM (dB)	MPR (dB)
For all combinations of; DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH	$0 \leq CM \leq 3.5$	MAX (CM-1, 0)
Note 1: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

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

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

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

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

2.3.3 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 average conducted power measurements for each mode are shown in the tables below. SAR testing for 802.11 was performed with the transmitter set to the lowest data rate on the default test channels **highlighted in bold** in the tables below. The head and body positions that resulted in the highest SAR values were further tested on the additional channels and higher data rates **highlighted in pink** in the tables below.

Band	Channel	Average Conducted Power (dBm) for 802.11b Mode Data Rates			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
Wi-Fi 2450 MHz	1	**17.47**	17.88	18.42	18.45
	6	**18.06**	18.26	18.95	19.13
	11	**17.67**	17.77	18.69	18.64

Band	Channel	Average 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	17.23	17.15	16.86	16.99	15.5	15.66	14.05	13.91
	6	17.86	17.81	17.55	17.55	15.81	15.86	14.37	14.35
	11	17.02	16.94	17.11	17.18	15.41	15.35	14.03	13.87

Band	Channel	Average Conducted Power (dBm) for 802.11n Mode Data Rates (20 MHz Channel, 800 ns Guard Interval)							
		6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
Wi-Fi 2450 MHz	1	17.21	16.86	16.92	15.49	15.32	13.92	13.96	12.93
	6	17.67	17.32	17.35	15.81	15.75	14.32	14.18	13.28
	11	16.78	16.84	16.91	15.24	15.42	13.71	13.77	12.79

Band	Channel	Average Conducted Power (dBm) for 802.11n Mode Data Rates (20 MHz Channel, 400 ns Guard Interval)							
		7.2 Mbps	14.4 Mbps	21.6 Mbps	28.8 Mbps	43.3 Mbps	57.7 Mbps	65 Mbps	72.2 Mbps
Wi-Fi 2450 MHz	1	17.22	16.88	16.91	15.36	15.19	13.91	13.76	12.89
	6	17.55	17.16	17.3	15.66	15.61	14.18	14.1	13.23
	11	16.75	16.73	16.82	15.15	15.18	13.63	13.68	12.63

Bluetooth modes and test exclusion

The Bluetooth transmitter of the device under test can be excluded from stand-alone and simultaneous SAR evaluation, per the highlighted requirements from FCC KDB 648474 D01, as follows:

1. The highest output conducted power measured for Bluetooth on the device under test is 10.91 mW [≤ 12 mW]
2. The separation distance between the Bluetooth antenna and the main voice antenna is 2.2 cm. [< 2.5 cm]
   The highest 1-g Body-Worn SAR values for primary transmitters are:
   WCDMA 1700 (0.24 W/kg); WCDMA 1900 (0.20 W/kg), GSM 850 (0.42 W/kg), [< 1.2 W/kg]
   GSM 1900 (0.11 W/kg)

Pictorial representation of the antenna locations and separation distances are given in Exhibit 7d.

3. Test Equipment Used

3.1 Dosimetric System

The Motorola Mobility ADR Test Services Laboratory utilizes a Dosimetric Assessment System (DASY4™ v4.7 or DASY52™) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure. The overall 10 g RSS uncertainty of the measurement system is ±10.8% (K=1) with an expanded uncertainty of ±21.6% (K=2). The overall 1 g RSS uncertainty of the measurement system is ±11.1% (K=1) with an expanded uncertainty of ±22.2% (K=2). The measurement uncertainty budget is given in Appendix 5. Per IEEE 1528, this uncertainty budget is applicable to the SAR range of 0.4 W/kg to 10 W/kg.

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

Description	Serial Number	Cal Date	Cal Due Date
DASY4™ DAE V1	376	Aug-31-2011	Aug-31-2012
E-Field Probe ES3DV3	3124	Aug-23-2011	Aug-23-2012
DASY4™ DAE V1	699	Sept-22-2011	Sept-22-2012
E-Field Probe ES3DV3	3115	Jan-11-2012	Jan-11-2013
DASY4™ DAE V1	1312	May-29-2012	May-29-2013
E-Field Probe EX3DV4	3728	Apr-24-2012	Apr-24-2013
DASY4™ DAE V1	1310	Jan-11-2012	Jan-11-2013
E-Field Probe ES3DV3	3284	Jan-10-2012	Jan-10-2013
S.A.M. Phantom used for 800/900 MHz	TP-1156		
.A.M. Phantom used for 1800/1900/2450 MHz	TP-1319		
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1153		
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1162		
Dipole Validation Kit, DV835V2	436tr	Mar-18-2011	Mar-18-2013
Dipole Validation Kit, DV835V2	4d128	Jan-11-2012	Jan-11-2013
Dipole Validation Kit, DV1800V2	2d191	Jan-05-2012	Jan-05-2013
Dipole Validation Kit, DV1800V2	259tr	Oct-20-2011	Oct-20-2013
Dipole Validation Kit, DV1800V2	2d190	Jan-05-2012	Jan-05-2013
Dipole Validation Kit, DV2450V2	863	Mar-17-2011	Mar-17-2013

3.2 Additional Equipment

Description	Serial Number	Cal Date	Cal Due Date
Signal Generator HP8648C	3847A04810	Sept-26-2011	Sept-26-2013
Power Meter E4419B	GB39511090	Aug-12-2011	Aug-12-2013
Power Sensor #1 - E9301A	US39210917	Nov-16-2011	Nov-16-2012
Power Sensor #2 - E9301A	US39210918	Nov-16-2011	Nov-16-2012
Network Analyzer HP8753ES	MY46212851	May-10-2012	May-10-2013
Dielectric Probe Kit DAK-3.5	1030		

4. Electrical parameters of the tissue simulating liquid

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

E-field probes calibrated at 1810 MHz were used for "1900 MHz" band (1850 MHz - 1910 MHz) and and "1700 MHz" band (1712.4 MHz – 1752.6 MHz) SAR measurements. FCC KDB 450824 provides additional requirements on page 3 of 6 for SAR testing that is performed with probe calibration points that are more than 50 MHz removed from the measured bands. The KDB requires; "(2) When nominal tissue dielectric parameters are specified in the probe calibration data, the tissue dielectric parameters measured for routine measurements should be less than the target Er and higher than the target Sigma values to minimize SAR underestimations". The 1880 MHz and 1730 MHz simulated tissues listed below meet this criteria.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ε_r	σ (S/m)	Temp (°C)
835	**Head**	**Measured,** Jul-24-2012	40.0	0.93	19.7
		Recommended Limits	41.5 ±5%	0.90 ±5%	18-25
	Body	**Measured,** Jul-23-2012	54.7	0.99	19.0
		Recommended Limits	55.2 ±5%	0.97 ±5%	18-25
1730	**Head**	**Measured,** Jul-5-2012	39.2	1.38	20.2
		Measured, Jul-6-2012	39.3	1.37	20.1
		Recommended Limits	40.1 ±5%	1.36 ±5%	18-25
	Body	**Measured,** Jul-6-2012	53.3	1.49	19.1
		Measured, Jul-10-2012	53.0	1.53	18.9
		Recommended Limits	53.5 ±5%	1.48 ±5%	18-25
1880	**Head**	**Measured,** Jul-7-2012	39.5	1.46	18.8
		Measured, Jul-24-2012	38.2	1.44	19.0
		Recommended Limits	40.0 ±5%	1.40 ±5%	18-25
	Body	**Measured,** Jul-6-2012	51.8	1.57	19.1
		Measured, Jul-9-2012	51.0	1.59	19.1
		Measured, Jul-23-2012	52.2	1.58	20.1
		Measured, Jul-25-2012	51.1	1.58	20.1
		Recommended Limits	53.3 ±5%	1.52 ±5%	18-25
2450	**Head**	**Measured,** Jul-07-2012	37.6	1.78	20.5
		Recommended Limits	39.2 ±5%	1.80 ±5%	18-25
	Body	**Measured,** Jul-10-2012	51.2	2.04	19.2
		Recommended Limits	52.7 ±5%	1.95 ±5%	18-25

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

Ingredient	782 / 835 / 900 MHz Head	782 / 835 / 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 Verifications

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

A SAR measurement was performed to verify the measured SAR was within ±10% from the target SAR indicated in Appendix 7. These frequencies are within ±10% of the compliance test mid-band frequency as required in [1] and [5]. The test was conducted on the same days as the measurement of the DUT. Recommended limits for permittivity and conductivity, specified in [5], are shown in the table below. The obtained results from the system accuracy verification are also displayed in the table below. SAR values are normalized to 1 W forward power delivered to the dipole. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values. The distributions of SAR compare well with those of the reference measurements (see Appendix 1). For frequencies below 3 GHz, the simulated tissue depth was verified to be 15.0 cm ± 0.5 cm.
Z-axis scans showing the SAR penetration are also included in Appendix 1.

System Accuracy Verification Measurements for Head SAR Measurements							
f (MHz)	Description	Dipole	SAR (W/kg), 1 gram	Dielectric Parameters		Ambient Temp (°C)	Tissue Temp (°C)
				ε_r	σ (S/m)		
835	**Measured,** Jul-24-2012	4d128	9.95	40.0	0.93	21.1	20.1
	Recommended Limits		9.45	41.5 ±5%	0.90 ±5%	18-25	18-25
1800	**Measured,** Jul-05-2012	2d191	36.8	39.4	1.38	21.1	20.4
	Measured, Jul-06-2012	2d191	36.7	39.9	1.38	21.4	20.3
	Recommended Limits		39.2	40.0 ±5%	1.40 ±5%	18-25	18-25
	Measured, Jul-24-2011	259tr	38.0	38.5	1.36	21.1	19.5
	Recommended Limits		38.1	40.0 ±5%	1.40 ±5%	18-25	18-25
2450	**Measured,** Jul-07-2012	863	56.5	37.6	1.78	21.1	19.0
	Recommended Limits		54.2	39.2 ±5%	1.80 ±5%	18-25	18-25

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3124	835	6.08	5 of 11
		1810	5.03	5 of 11
		2450	4.40	5 of 11
E- Field Probe ES3DV3	3115	835	5.83	5 of 11
		1810	5.17	5 of 11
		2450	4.35	5 of 11
E- Field Probe ES3DV3	3284	835	6.18	5 of 11
		1810	5.33	5 of 11
		2450	4.56	5 of 11
E-Field Probe EX3DV4	3728	835	8.83	5 of 11
		1810	7.61	5 of 11
		2450	6.86	5 of 11

System Accuracy Verification Measurements for Body SAR Measurements							
f (MHz)	Description	Dipole	SAR (W/kg), 1 gram	Dielectric Parameters		Ambient Temp (°C)	Tissue Temp (°C)
				ε_r	σ (S/m)		
835	**Measured,** Jul-23-2012	436tr	10.2	54.7	0.99	21.2	19.1
	Recommended Limits		10.1	55.2 ±5%	0.97 ±5%	18-25	18-25
1800	**Measured,** Jul-06-2012	2d191	34.2	52.2	1.48	21.3	20.1
	Measured, Jul-09-2012	2d191	35.6	50.8	1.51	20.9	18.9
	Recommended Limits		37.8	53.3 ±5%	1.52 ±5%	18-25	18-25
	Measured, Jul-23-2012	259tr	39.2	52.5	1.49	21.1	18.8
	Recommended Limits		39.1	53.3 ±5%	1.52 ±5%	18-25	18-25
	Measured, Jul-25-2011	2d190	38.7	51.4	1.48	20.8	20.1
	Recommended Limits		37.8	53.3 ±5%	1.52 ±5%	18-25	18-25
2450	**Measured,** Jul-10-2012	863	55.5	51.2	2.04	22.0	19.2
	Recommended Limits		52.8	52.7 ±5%	1.95 ±5%	18-25	18-25

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3124	835	6.04	6 of 11
		1810	4.69	6 of 11
		2450	4.21	6 of 11
E- Field Probe ES3DV3	3115	835	5.89	6 of 11
		1810	4.72	6 of 11
		2450	4.12	6 of 11
E- Field Probe ES3DV3	3284	835	6.28	6 of 11
		1810	5.28	6 of 11
		2450	4.56	6 of 11
E-Field Probe EX3DV4	3728	835	9.05	6 of 11
		1810	7.29	6 of 11
		2450	6.84	6 of 11

6. Test Results

For WCDMA/GSM modes, the test sample was operated using an actual transmission through a base station simulator. Wi-Fi testing was conducted using manufacturer test mode software, per guidance given in FCC KDB 248227. The base station simulator or test software was set up for the proper channels, transmitter power levels and transmit modes 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 default settings for the "coarse" and "cube" scans were chosen and used for measurements. The grid spacing of the coarse scan was set to 15 mm or less as shown in the SAR plots included in Appendices 2 through 4. Please refer to the DASY4™ manual for additional information on SAR scanning procedures and algorithms used.

6.1 Head Adjacent Test Results

The SAR results shown in tables 1 through 7 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to the [6]. Also shown are the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is:

$$Extrapolated\ SAR = (Measured\ SAR) * 10^{(-drift/10)}$$

The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The 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.

This phone has dispatch/push-to-talk mode in WCDMA bands only. For dispatch/Push-to-Talk modes, the DUT was placed with the front of the device positioned at 2.5 cm from the flat portion of the SAM phantom, as per Supplement C 01-01. The plots are included in Appendix 2.

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3124	835	6.08	5 of 11
		1810	5.03	5 of 11
		2450	4.40	5 of 11
E- Field Probe ES3DV3	3115	835	5.83	5 of 11
		1810	5.17	5 of 11
		2450	4.35	5 of 11
E- Field Probe ES3DV3	3284	835	6.18	5 of 11
		1810	5.33	5 of 11
		2450	4.56	5 of 11
E-Field Probe EX3DV4	3728	835	8.83	5 of 11
		1810	7.61	5 of 11
		2450	6.86	5 of 11

Left Head Cheek Position

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850 CS Voice	128								
		190	**19.7**	**-0.15**	**0.357**	**0.37**	**0.475**	**0.49**	**5x5x7**	**A-27**
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312								
		1413	20.1	0.09	0.460	0.46	0.709	0.71		
		1513								
1880	WCDMA 1900 12.2 kbps RMC	9262								
		9400	18.8	0.09	0.395	0.40	0.651	0.65		
		9538								
	GSM 1900 CS Voice	512								
		661	19.0	-0.03	0.188	0.19	0.304	0.31		
		810								
2450	802.11b, 1 Mbps	1								
		6	20.5	0.40	0.097	0.10	0.183	0.18		
		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)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850 CS Voice	128								
		190	19.6	-0.02	0.334	0.34	0.459	0.46		
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312	20.2	0.01	0.450	0.45	0.759	0.76		
		1413	**20.2**	**0.06**	**0.637**	**0.64**	**1.07**	**1.07**	**5x5x7**	**A-28**
		1513	20.2	0.02	0.584	0.58	0.987	0.99		
1880	WCDMA 1900 12.2 kbps RMC	9262	**18.8**	**0.05**	**0.728**	**0.73**	**1.23**	**1.23**	**5x5x7**	**A-29**
		9400	18.7	0.11	0.623	0.62	1.06	1.06		
		9538	18.8	-0.02	0.550	0.55	0.944	0.95		
	GSM 1900 CS Voice	512								
		661	**19.0**	**0.51**	**0.261**	**0.26**	**0.450**	**0.45**	**5x5x7**	**A-30**
		810								
2450	802.11b, 1 Mbps	1	20.5	0.05	0.156	0.16	0.293	0.29		
		6	20.5	0.10	0.159	0.16	0.296	0.30		
		11	**20.5**	**0.49**	**0.184**	**0.18**	**0.379**	**0.38**	**5x5x7**	**A-31**
	802.11b, 2 Mbps	1	19.0	-0.21	0.142	0.15	0.268	0.28		
	802.11b, 5.5 Mbps	1	19.4	0.26	0.158	0.16	0.296	0.30		
		6	19.4	0.27	0.158	0.16	0.295	0.30		
		11	19.1	-0.15	0.146	0.15	0.276	0.29		
	802.11b, 11 Mbps	1	19.6	0.19	0.176	0.18	0.333	0.33		
		6	19.6	0.16	0.176	0.18	0.334	0.33		
		11	19.1	0.28	0.153	0.15	0.303	0.30		

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

Left Head 15° Tilt Position

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850 CS Voice	128								
		190	19.7	-0.17	0.205	0.21	0.272	0.28		
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312								
		1413	20.1	-0.07	0.172	0.17	0.287	0.29		
		1513								
1880	WCDMA 1900 12.2 kbps RMC	9262								
		9400	18.8	0.06	0.169	0.17	0.295	0.30		
		9538								
	GSM 1900 CS Voice	512								
		661	**19.0**	**-0.13**	**0.082**	**0.08**	**0.143**	**0.15**	**5x5x7**	**A-35**
		810								
2450	802.11b, 1 Mbps	1								
		6	**20.5**	**0.10**	**0.041**	**0.04**	**0.077**	**0.08**	**5x5x7**	**A-36**
		11								

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

Right Head 15° Tilt Position

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850 CS Voice	128								
		190	**19.6**	**-0.07**	**0.226**	**0.23**	**0.307**	**0.31**	**5x5x7**	**A-32**
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312								
		1413	**20.2**	**-0.07**	**0.228**	**0.23**	**0.352**	**0.36**	**5x5x7**	**A-33**
		1513								
1880	WCDMA 1900 12.2 kbps RMC	9262								
		9400	**18.7**	**-0.01**	**0.195**	**0.20**	**0.328**	**0.33**	**5x5x7**	**A-34**
		9538								
	GSM 1900 CS Voice	512								
		661	19.0	-0.02	0.076	0.08	0.126	0.13		
		810								
2450	802.11b, 1 Mbps	1								
		6	20.5	-0.08	0.033	0.03	0.064	0.06		
		11								

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

Push-To-Talk

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
1732	**WCDMA 1700 12.2 kbps RMC**	1312								
		1413	**19.2**	**0.15**	**0.161**	**0.16**	**0.250**	**0.25**	**5x5x7**	**A-37**
		1513								
1880	**WCDMA 1900 12.2 kbps RMC**	9262								
		9400	**18.8**	**0.02**	**0.161**	**0.16**	**0.258**	**0.26**	**5x5x7**	**A-38**
		9538								

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

GPRS Class 12, Highest Head

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	**GPRS 850**	128								
		190	19.5	-0.19	0.347	0.36	0.459	0.48		
		251								
1880	**GPRS 1900**	512								
		661	19.0	-0.04	0.193	0.19	0.352	0.36		
		810								

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

EDGE Class 10, Highest Head

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
1880	**EDGE 1900**	512								
		661	20.2	0.35	0.227	0.23	0.391	0.39		
		810								

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

6.2 Body Worn Test Results

The SAR results shown in tables 8 through 11 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to [6]. Also shown are the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is:

$$Extrapolated\ SAR = (Measured\ SAR) * 10^{(-drift/10)}$$

The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

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

A SPEAG™ MFP V5.1 C Triple Modular Phantom was used for the body-worn tests. The triple modular phantom consists of three identical modules that can be installed and removed separately without emptying the liquid. Each module of the triple phantom is constructed of glass-fiber reinforced vinylester (VG-GF) with a thickness at the bottom of 2.0 mm. It measures 29.2 cm(long) by 17.8 cm(wide) by 17.8 cm(tall).

The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm for frequencies less than 3 GHz, or 10.0 cm ± 0.5 cm for frequencies greater than 3 GHz. The same device holder described in section 6 was used for positioning the phone. Functional accessories were divided into two categories, the ones with metal components and the ones with non-metal components. For non-metallic component accessories, testing was performed on the accessory that displayed the closest proximity to the flat phantom. Each metallic component accessory, if any, was checked for uniqueness of metal component so that each is tested with the device. If multiple accessories shared an identical metal component, only the accessory that dictates the closest spacing to the body was tested. The cellular phone was tested with a headset connected to the device for all body-worn SAR measurements.

There are no body-worn accessories available for this phone at the time of testing thus the device was tested per the Supplement C testing guidelines for devices that do not have body-worn accessories. A separation distance of 25 mm between the device and the flat phantom was used for testing body-worn SAR. The chosen separation distance of 25 mm is utilized in order to support any case or holder accessories offered or to be offered by Motorola for this product. The device was tested with the front and back of the device facing the phantom. Both sides of the device were tested for Body SAR for the purpose of including the SAR evaluation for body-worn accessories that support the device with the front side facing the user.

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

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3124	835	6.04	6 of 11
		1810	4.69	6 of 11
		2450	4.21	6 of 11
E- Field Probe ES3DV3	3115	835	5.89	6 of 11
		1810	4.72	6 of 11
		2450	4.12	6 of 11
E- Field Probe ES3DV3	3284	835	6.28	6 of 11
		1810	5.28	6 of 11
		2450	4.56	6 of 11
E-Field Probe EX3DV4	3728	835	9.05	6 of 11
		1810	7.29	6 of 11
		2450	6.84	6 of 11

Body-Worn, Front of Phone 25 mm from Phantom

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850 CS Voice	128								
		190	19.0	-0.02	0.269	0.27	0.361	0.36		
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312								
		1413	18.9	0.19	0.143	0.14	0.214	0.21		
		1513								
1880	WCDMA 1900 12.2 kbps RMC	9262								
		9400	19.0	0.14	0.125	0.13	0.192	0.19		
		9538								
	GSM 1900 CS Voice	512								
		661	**19.1**	**-0.01**	**0.068**	**0.07**	**0.106**	**0.11**	**5x5x7**	**A-43**
		810								
2450	802.11b, 1 Mbps	1	19.0	0.07	0.015	0.01	0.026	0.03		
		6	19.0	-0.25	0.018	0.02	0.030	0.03		
		11	18.8	0.02	0.017	0.02	0.029	0.03		
	802.11b, 2 Mbps	1	19.2	0.00	0.019	0.02	0.032	0.03		
	802.11b, 5.5 Mbps	1	19.1	-0.04	0.019	0.02	0.034	0.03		
		6	**19.1**	**0.05**	**0.021**	**0.02**	**0.038**	**0.04**	**5x5x7**	**A-44**
		11	19.1	0.11	0.017	0.02	0.032	0.03		
	802.11b, 11 Mbps	1	19.2	-0.26	0.019	0.02	0.034	0.04		
		6	19.2	-0.02	0.020	0.02	0.036	0.04		
		11	19.2	0.07	0.017	0.02	0.030	0.03		

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

Body-Worn, Back of Phone 25 mm from Phantom

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850 CS Voice	128								
		190	**19.0**	**-0.04**	**0.306**	**0.31**	**0.414**	**0.42**	**5x5x7**	**A-40**
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312								
		1413	**19.1**	**-0.04**	**0.157**	**0.16**	**0.237**	**0.24**	**5x5x7**	**A-41**
		1513								
1880	WCDMA 1900 12.2 kbps RMC	9262								
		9400	**19.1**	**0.01**	**0.126**	**0.13**	**0.195**	**0.20**	**5x5x7**	**A-42**
		9538								
	GSM 1900 CS Voice	512								
		661	19.1	-0.06	0.062	0.06	0.096	0.10		
		810								
2450	802.11b, 1 Mbps	1								
		6	19.0	0.02	0.010	0.01	0.017	0.02		
		11								

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, GPRS Class 12 Highest Body 25 mm from Phantom

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850	128								
		190	19.0	-0.13	0.271	0.28	0.376	0.39		
		251								
1880	GPRS 1900	512								
		661	19.1	-0.20	0.053	0.06	0.083	0.09		
		810								

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

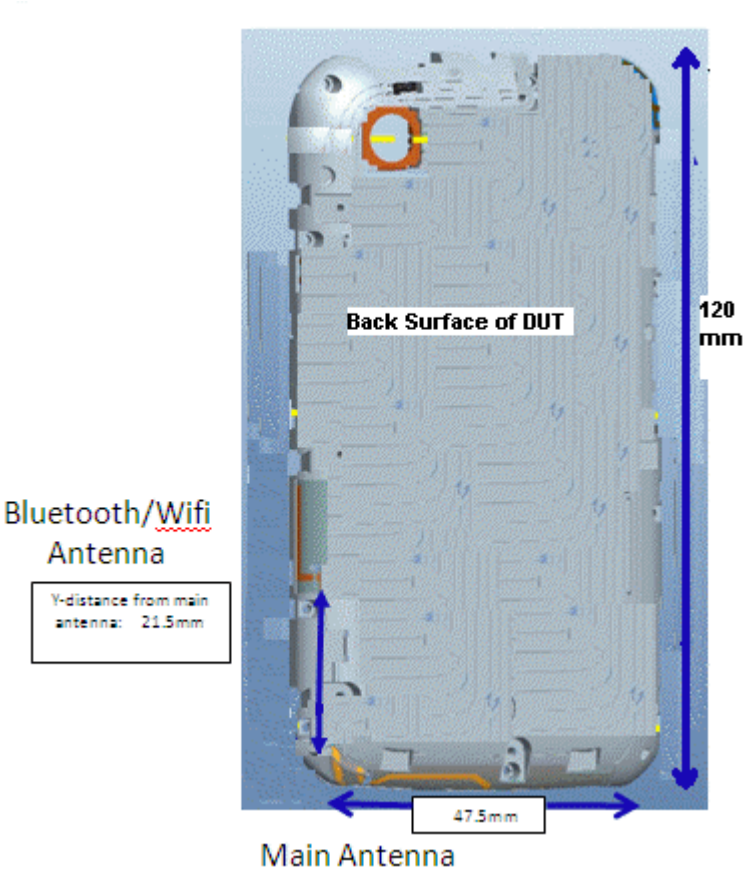
Body-Worn, EDGE Class 10 Highest Body 25 mm from Phantom

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
1880	EDGE 1900	512								
		661	20.1	-0.01	0.061	0.06	0.094	0.09		
		810								

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

6.4 Mobile Hotspot Test Results

The DUT is capable of functioning as a Wi-Fi to Cellular mobile hotspot. Additional SAR testing was performed according to the test guidelines provided per FCC KDB 941225 D06. Testing was performed with a separation of 1 cm between the DUT and the "flat" phantom. The DUT was positioned for SAR tests with the front and back surfaces facing the phantom, and also with the edges facing the phantom in which the transmitting antenna is less than 2.5 cm from the edge.



Mobile Hotspot Surfaces for SAR testing						
Mode	Front	Back	Left	Right	Top	Bottom
GSM/ WCDMA	Yes	Yes	Yes	Yes	No	Yes
Wi-Fi	Yes	Yes	No	Yes	No	Yes

The SAR results shown in tables 12 through 16 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to [6]. Also shown are the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is:

$$\textit{Extrapolated SAR} = (\textit{Measured or Corrected SAR}) * 10^{(-drift/10)}$$

The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The DUT utilizes a reduced limit for the maximum transmit power when the mobile hotspot functionality is enabled, as described above in 2.2.2. A complete description of this functionality is provided in the "Operational Description" contained within Exhibit 12.

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 4. All other test conditions measured lower SAR values than those included in Appendix 4.

A SPEAG™ MFP V5.1 C Triple Modular Phantom was used for the body-worn tests. The triple modular phantom consists of three identical modules that can be installed and removed separately without emptying the liquid. Each module of the triple phantom is constructed of glass-fiber reinforced vinylester (VG-GF) with a thickness at the bottom of 2.0 mm. It measures 29.2 cm(long) by 17.8 cm(wide) by 17.8 cm(tall).

The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm for frequencies below 3 GHz, or 10.0 cm ± 0.5 cm for frequencies greater than 3 GHz. The same device holder described in section 6 was used for positioning the phone.

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3124	835	6.04	6 of 11
		1810	4.69	6 of 11
		2450	4.21	6 of 11
E- Field Probe ES3DV3	3115	835	5.89	6 of 11
		1810	4.72	6 of 11
		2450	4.12	6 of 11
E- Field Probe ES3DV3	3284	835	6.28	6 of 11
		1810	5.28	6 of 11
		2450	4.56	6 of 11
E-Field Probe EX3DV4	3728	835	9.05	6 of 11
		1810	7.29	6 of 11
		2450	6.84	6 of 11

Mobile Hotspot, Front of Phone 10 mm from Phantom

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850 Class 12	128								
		190	19.9	-0.05	0.151	0.15	0.207	0.21		
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312								
		1413	18.8	0.10	0.204	0.20	0.342	0.34		
		1513								
1880	WCDMA 1900 12.2 kbps RMC	9262								
		9400	18.6	-0.01	0.163	0.16	0.274	0.27		
		9538								
	GPRS 1900 Class 12	512								
		661	20.1	0.00	0.051	0.05	0.086	0.09		
		810								
2450	802.11b, 1 Mbps	1	19.2	0.07	0.073	0.07	0.148	0.15		
		6	18.6	0.00	0.073	0.07	0.145	0.15		
		11	**19.2**	**-0.26**	**0.095**	**0.10**	**0.210**	**0.22**	**5x5x7**	**A-50**
	802.11b, 2 Mbps	1	19.2	0.03	0.076	0.08	0.156	0.16		
	802.11b, 5.5 Mbps	1	19.1	-0.04	0.073	0.07	0.150	0.15		
		6	19.1	0.01	0.089	0.09	0.180	0.18		
		11	19.1	0.11	0.093	0.09	0.203	0.20		
	802.11b, 11 Mbps	1	19.2	0.02	0.074	0.07	0.153	0.15		
		6	19.2	-0.01	0.085	0.09	0.182	0.18		
		11	19.2	0.05	0.086	0.09	0.188	0.19		

Table 12: SAR measurement results at the highest possible output power, measured in a mobile hotspot position against the ICNIRP and ANSI SAR Limit.

Mobile Hotspot, Back of Phone 10 mm from Phantom

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850 Class 12	128								
		190	**19.0**	**-0.07**	**0.189**	**0.19**	**0.269**	**0.27**	**5x5x7**	**A-46**
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312								
		1413	**18.8**	**0.17**	**0.250**	**0.25**	**0.424**	**0.42**	**5x5x7**	**A-47**
		1513								
1880	WCDMA 1900 12.2 kbps RMC	9262								
		9400	18.6	-0.06	0.154	0.16	0.253	0.26		
		9538								
	GPRS 1900 Class 12	512								
		661	20.1	0.04	0.050	0.05	0.083	0.08		
		810								
2450	802.11b, 1 Mbps	1								
		6	18.6	-0.05	0.065	0.07	0.137	0.14		
		11								

Table 13: SAR measurement results at the highest possible output power, measured in a mobile hotspot position against the ICNIRP and ANSI SAR Limit.

Mobile Hotspot, Bottom Edge of Phone 10 mm from Phantom

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850 Class 12	128								
		190	19.0	-0.09	0.022	0.02	0.041	0.04		
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312								
		1413	18.8	-0.09	0.233	0.24	0.414	0.42		
		1513								
1880	WCDMA 1900 12.2 kbps RMC	9262								
		9400	**18.8**	**-0.12**	**0.187**	**0.19**	**0.328**	**0.34**	**5x5x7**	**A-48**
		9538								
	GPRS 1900 Class 12	512								
		661	**20.1**	**0.00**	**0.086**	**0.09**	**0.156**	**0.16**	**5x5x7**	**A-49**
		810								
2450	802.11b, 1 Mbps	1								
		6	18.6	-0.19	0.049	0.05	0.099	0.10		
		11								

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

Mobile Hotspot, Right Edge of Phone 10 mm from Phantom

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850 Class 12	128								
		190	19.0	-0.09	0.116	0.12	0.167	0.17		
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312								
		1413	18.8	0.15	0.063	0.06	0.113	0.11		
		1513								
1880	WCDMA 1900 12.2 kbps RMC	9262								
		9400	18.8	0.01	0.038	0.04	0.069	0.07		
		9538								
	GPRS 1900 Class 12	512								
		661	18.5	-0.08	0.013	0.01	0.026	0.03		
		810								
2450	802.11b, 1 Mbps	1								
		6	18.6	-0.22	0.042	0.04	0.083	0.09		
		11								

Table 15: SAR measurement results at the highest possible output power, measured in a mobile hotspot position against the ICNIRP and ANSI SAR Limit.

Mobile Hotspot, Left Edge of Phone 10 mm from Phantom

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	10 g SAR value		1 g SAR value		Test Plot	
					Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850 Class 12	128								
		190	19.0	0.03	0.091	0.09	0.131	0.13		
		251								
1732	WCDMA 1700 12.2 kbps RMC	1312								
		1413	18.8	0.12	0.043	0.04	0.070	0.07		
		1513								
1880	WCDMA 1900 12.2 kbps RMC	9262								
		9400	18.6	-0.02	0.021	0.02	0.035	0.03		
		9538								
	GPRS 1900 Class 12	512								
		661	18.6	-0.16	0.007	0.01	0.014	0.01		
		810								

Table 16: SAR measurement results at the highest possible output power, measured in a mobile hotspot position against the ICNIRP and ANSI SAR Limit.

6.5 Description and Evaluation of Simultaneous Transmitters

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

By device design the GSM/WCDMA transmitters may operate simultaneously with either the Wi-Fi 802.11 transmitter or the Bluetooth transmitter. The separation distance between the Wi-Fi 802.11/Bluetooth antenna and the main antenna is 2.2 cm. Pictorial representation of the antenna locations and separation distances are given in Exhibit 7d. The Wi-Fi and the Bluetooth cannot transmit simultaneously, so there is no co-location test requirement for Wi-Fi and Bluetooth.

For the transmitters requiring stand-alone SAR testing (GSM, WCDMA and Wi-Fi 802.11), the KDB guidelines direct that if the sum of the 1 g SAR measured for the simultaneously transmitting antennas is less than the SAR limit, SAR measurement for simultaneous transmission is not required.

Evaluations for Simultaneous SAR (Head, Body, Mobile Hotspot)									
Position	Transmitter Stand-Alone 1 g SAR Values (W/kg)					1 g SAR Summations (W/kg)			
	GSM 850	WCDMA 1700	WCDMA 1900	GSM 1900	Wi-Fi 2450 GHz	GSM 850+ Wi-Fi	WCDMA 1700+ Wi-Fi	WCDMA 1900+ Wi-Fi	GSM 1900+ Wi-Fi
Left Head Cheek	0.49	0.71	0.65	0.31	0.18	0.67	0.89	0.83	0.49
Right Head Cheek	0.46	1.07	1.23	0.45	0.38	0.84	1.45	>1.60[3]	0.83
Left Head 15° Tilt	0.28	0.29	0.30	0.15	0.08	0.36	0.37	0.38	0.23
Right Head 15° Tilt	0.31	0.36	0.33	0.13	0.06	0.37	0.42	0.39	0.19
Body Worn, Front of Phone 25 from Phantom	0.36	0.21	0.19	0.11	0.04	0.4	0.25	0.23	0.15
Body Worn, Back of Phone 25 from Phantom (GPRS for 1900)	0.42	0.24	0.20	0.10	0.02	0.44	0.26	0.22	0.12
Mobile Hotspot, Front of Phone 10mm from Phantom	0.21	0.34	0.27	0.09	0.22	0.43	0.56	0.49	0.31
Mobile Hotspot, Back of Phone 10mm from Phantom	0.27	0.42	0.26	0.08	0.14	0.41	0.56	0.4	0.22
Mobile Hotspot, Bottom Edge of Phone 10mm from Phantom	0.04	0.42	0.34	0.16	0.10	0.14	0.52	0.44	0.26
Mobile Hotspot, Right Edge of Phone 10mm from Phantom	0.17	0.11	0.07	0.03	0.09	0.26	0.2	0.16	0.12

[3] Requires simultaneous SAR evaluation

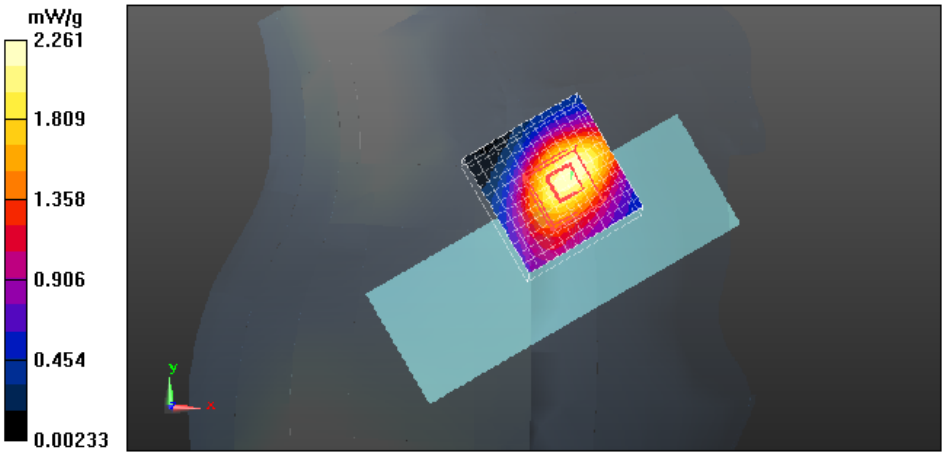
For the configurations noted as requiring simultaneous SAR evaluation, combined SAR measurements were required to determine the aggregate 1 g SAR. The results of these measurements are given in the table below, with additional SAR plots of the combined measurements provided on the next page.

Additional SAR measurements for simultaneous transmission evaluation were performed for each of the single transmitters using an extended zoom scan. This extended zoom scan was created to encompass the zoom scan volumes that were found previously in each of the stand-alone transmit SAR tests. For the head position, the outer dimensions of the extended zoom scan were X = 48 mm, Y = 48 mm, Z = 30 mm with a step size of X = 8 mm, Y = 8 mm, and Z = 5 mm.

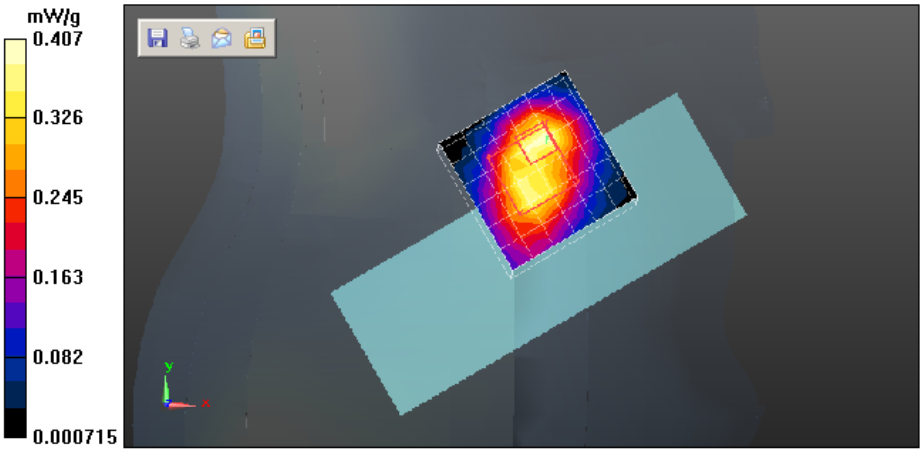
The location of these extended zoom scans was established by using X, Y grid offsets from the "Grid Reference Point" in DASY4.7. The results were then combined via the DASY5 Multi-Band Combiner feature. A comparison can be performed between the stand-alone measurements for each noted transmitter and the measurements provided for simultaneous transmission. The measurements were not performed sequentially and thus may show slightly different results due to a number of reasons including, but not limited to, measurement system performance, slight differences in DUT positioning, or variations in simulated tissue parameters.

Measurements for Simultaneous SAR					
Cellular Mode	**Wi-Fi Mode**	**Configuration**	**WCDMA Mode 1 g SAR Value (W/kg)**	**Wi-Fi Mode 1 g SAR Value (W/kg)**	**Simultaneous 1 g SAR Value (W/kg)**
WCDMA 1900, 12.2 kbps RMC Ch 9262	Wi-Fi 2450 802.11b, 1 Mbps Ch 11	RH Cheek	1.06	0.38	1.35

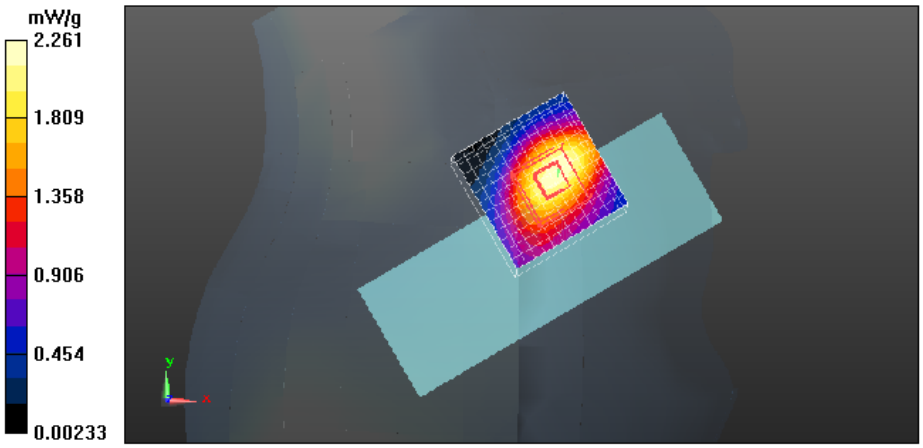
Extended Zoom, WCDMA 1900 - Ch 9262



Extended Zoom, WIFI - Ch 11



Extended Zoom, Combined WCDMA + WIFI



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 1992 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 comparisons for System Accuracy Verifications

System Accuracy Verification Measurements for Head SAR Measurements

Date/Time: 7/24/2012 8:23:02 AM

DUT: Dipole 835 MHz; Type: D835V2; Procedure Notes: 835 MHz System Performance Check / Dipole Sn# 4D128; PM1 Power = 200 mW
Sim.Temp@ meas = 20.1*C; Sim.Temp@ SPC = 20.1*C; Room Temp@ SPC = 21.1*C

Communication System: _CW - Dipole; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Validation *HEAD Tissue* ; Medium parameters used: f = 835 MHz; σ = 0.93 mho/m; ε_r = 40; ρ = 1000 kg/m^3

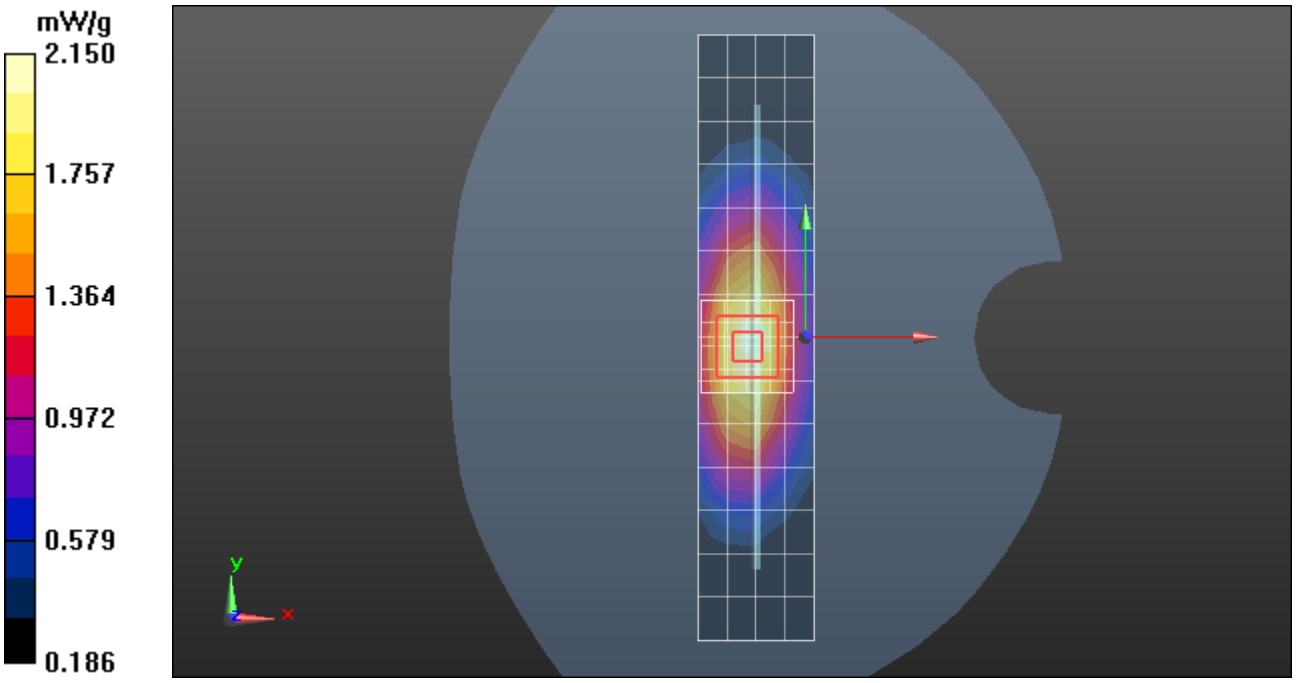
DASY4 Configuration:

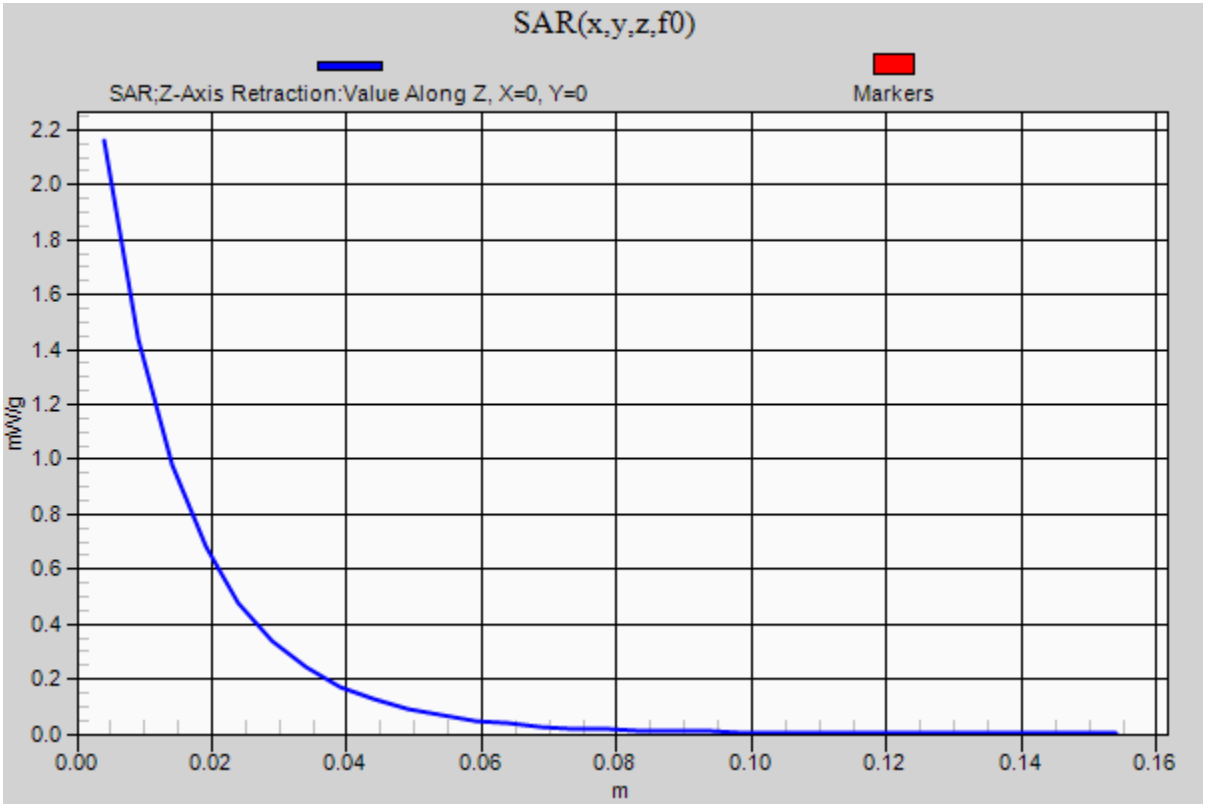
- Probe: ES3DV3 - SN3124; ConvF(6.08, 6.08, 6.08); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#1 - Sugar SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1156;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (5x15x1): Measurement grid: dx=10mm, dy=15mm
Maximum value of SAR (measured) = 2.12 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 48.190 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.017 mW/g
SAR(1 g) = 1.99 mW/g; SAR(10 g) = 1.29 mW/g
Maximum value of SAR (measured) = 2.15 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 2.16 mW/g


mW/g
2.150
1.757
1.364
0.972
0.579
0.186
y
x


SAR(x,y,z,f0)
SAR;Z-Axis Retraction:Value Along Z, X=0, Y=0
Markers
mW/g
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date/Time: 7/5/2012 7:56:29 PM

DUT: Dipole 1800 MHz; Type: D1800V2; Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 2D191; PM1 Power = 200 mW;
Sim.Temp@ meas = 19.5*C; Sim.Temp@ SPC = 20.4*C; Room Temp@ SPC = 21.1*C

Communication System: _CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: Validation *HEAD Tissue* ; Medium parameters used: f = 1800 MHz; σ = 1.38 mho/m; ε_r = 39.4; ρ = 1000 kg/m^3

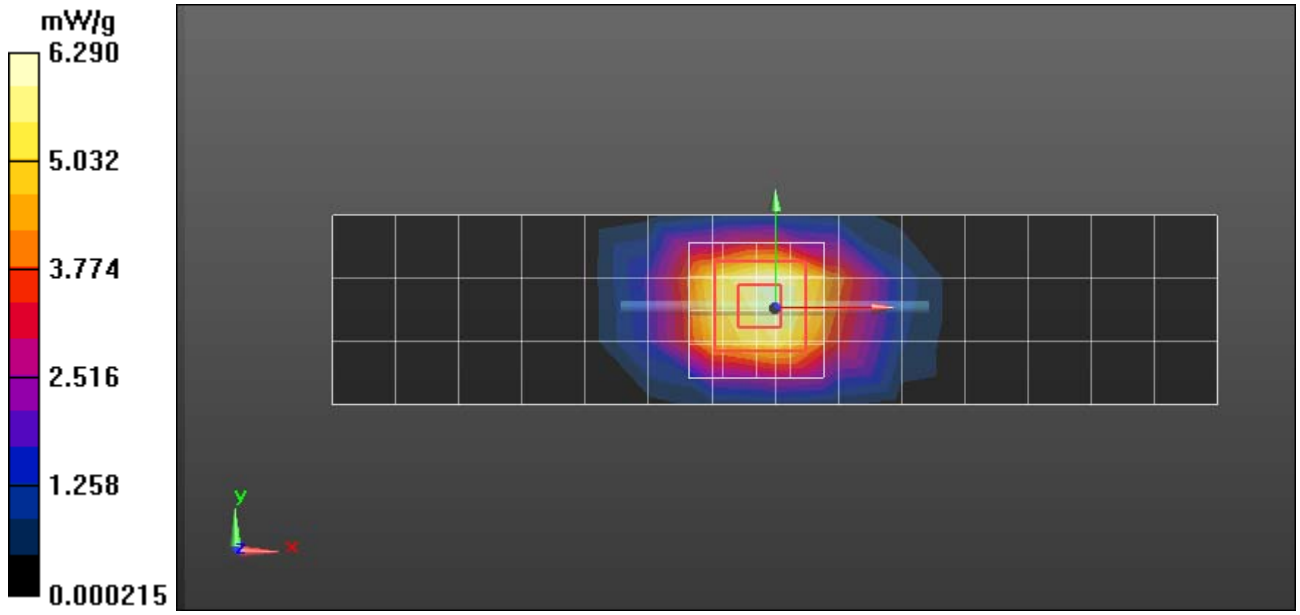
DASY4 Configuration:

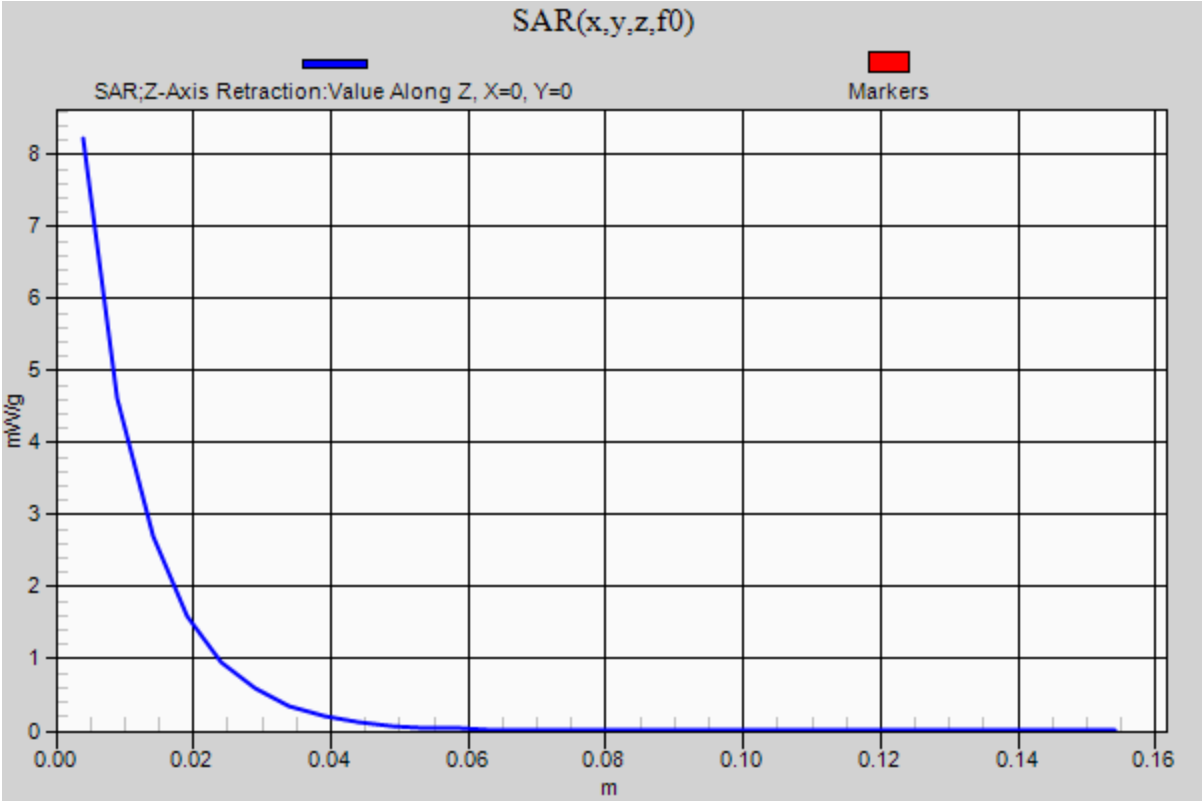
- Probe: ES3DV3 - SN3284; ConvF(5.33, 5.33, 5.33); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (4x15x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 6.29 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 77.872 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 13.235 mW/g
SAR(1 g) = 7.35 mW/g; SAR(10 g) = 3.89 mW/g
Maximum value of SAR (measured) = 8.22 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.23 mW/g




SAR(x,y,z,f0)
SAR;Z-Axis Retraction:Value Along Z, X=0, Y=0
Markers
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

Date/Time: 7/6/2012 11:32:15 AM

DUT: Dipole 1800 MHz; Type: D1800V2; Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 2D191; PM1 Power = 200 mW
Sim.Temp@ meas = 19.1*C; Sim.Temp@ SPC = 20.3*C; Room Temp@ SPC = 21.4*C

Communication System: _CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: Validation *HEAD Tissue* ; Medium parameters used: f = 1800 MHz; σ = 1.38 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3

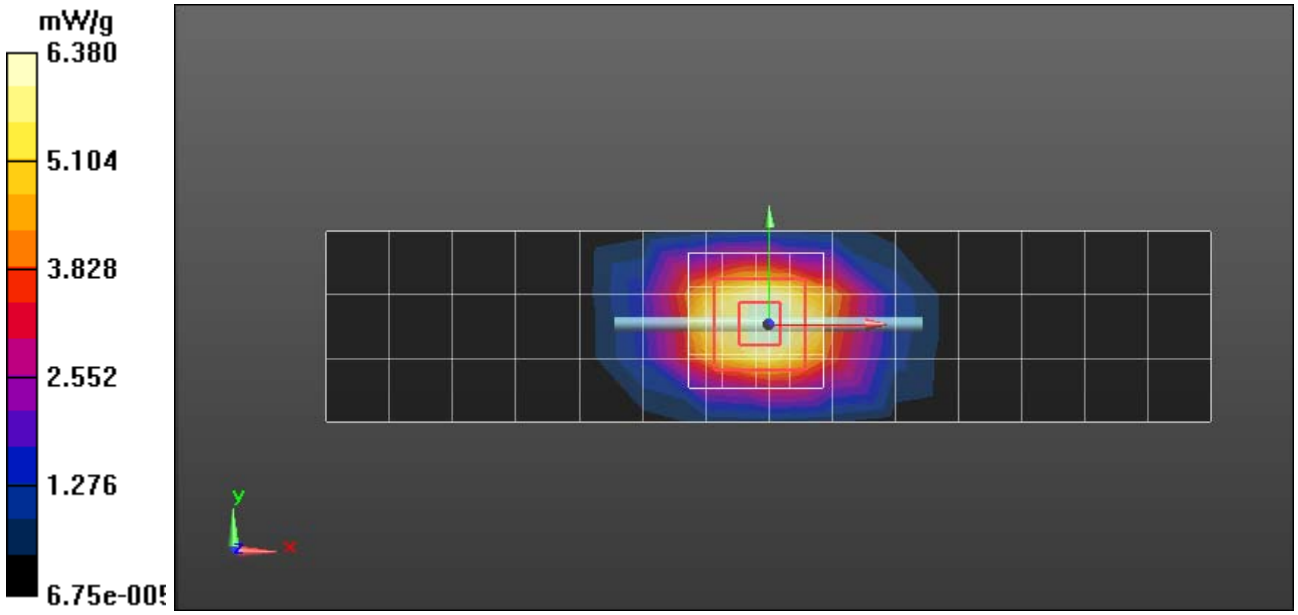
DASY4 Configuration:

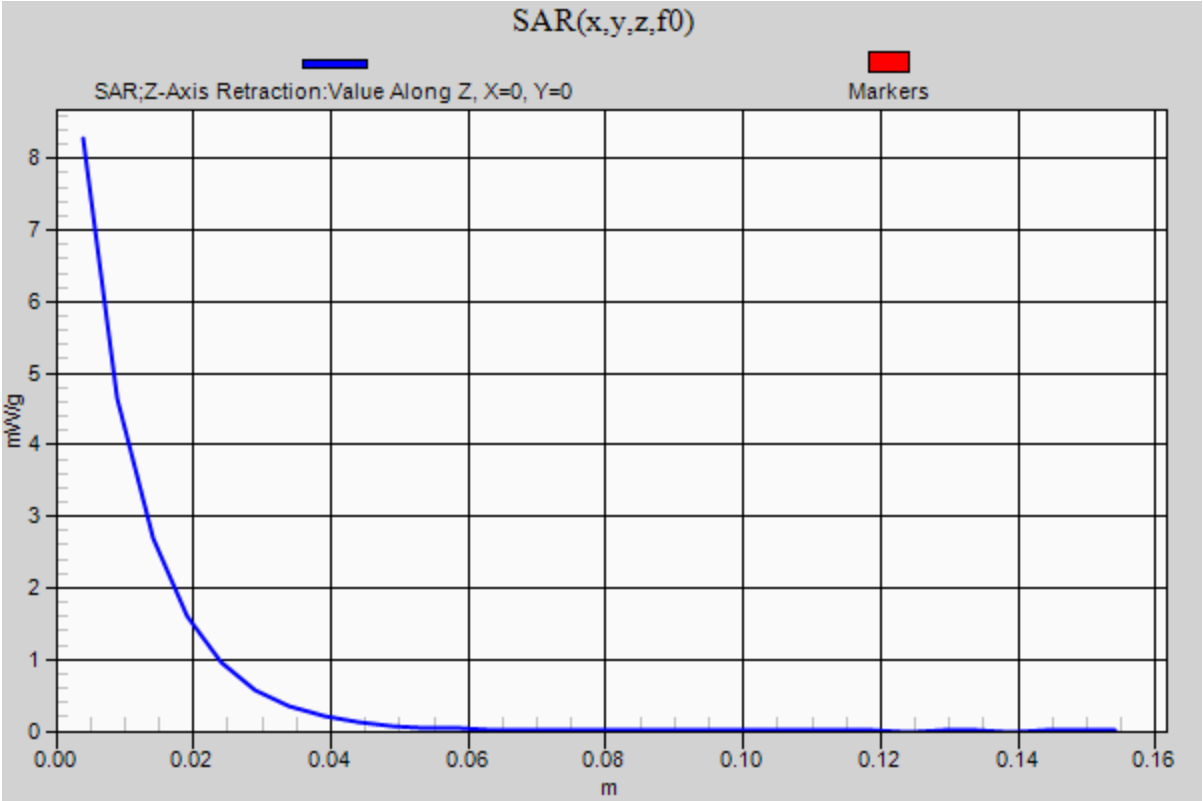
- Probe: ES3DV3 - SN3284; ConvF(5.33, 5.33, 5.33); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (4x15x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 6.38 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 78.360 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 13.188 mW/g
SAR(1 g) = 7.33 mW/g; SAR(10 g) = 3.89 mW/g
Maximum value of SAR (measured) = 8.20 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.28 mW/g




SAR(x,y,z,f0)
SAR;Z-Axis Retraction:Value Along Z, X=0, Y=0
Markers
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

Date/Time: 7/24/2012 8:58:11 AM

DUT: Dipole 1800 MHz; Type: D1800V2; Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 259TR; PM1 Power = 200 mW
Sim.Temp@ meas = 19.5*C; Sim.Temp@ SPC = 19.5*C; Room Temp@ SPC = 21.1*C

Communication System: _CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: Validation *HEAD Tissue* ; Medium parameters used: f = 1800 MHz; σ = 1.36 mho/m; ε_r = 38.5; ρ = 1000 kg/m^3

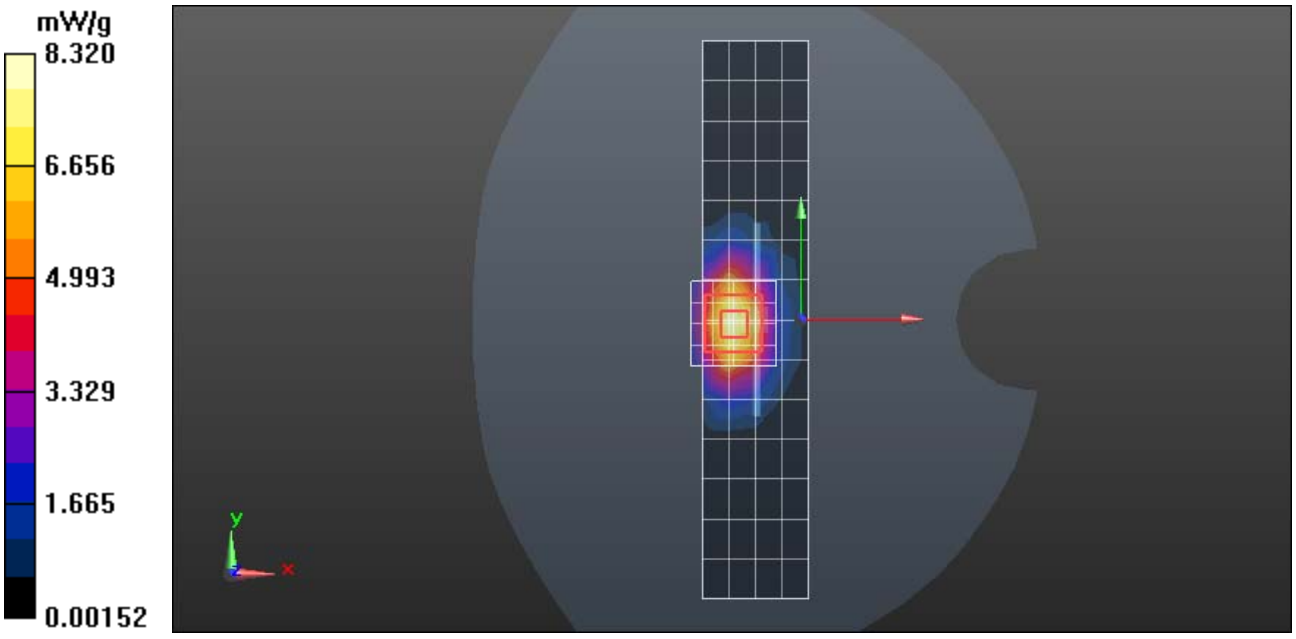
DASY4 Configuration:

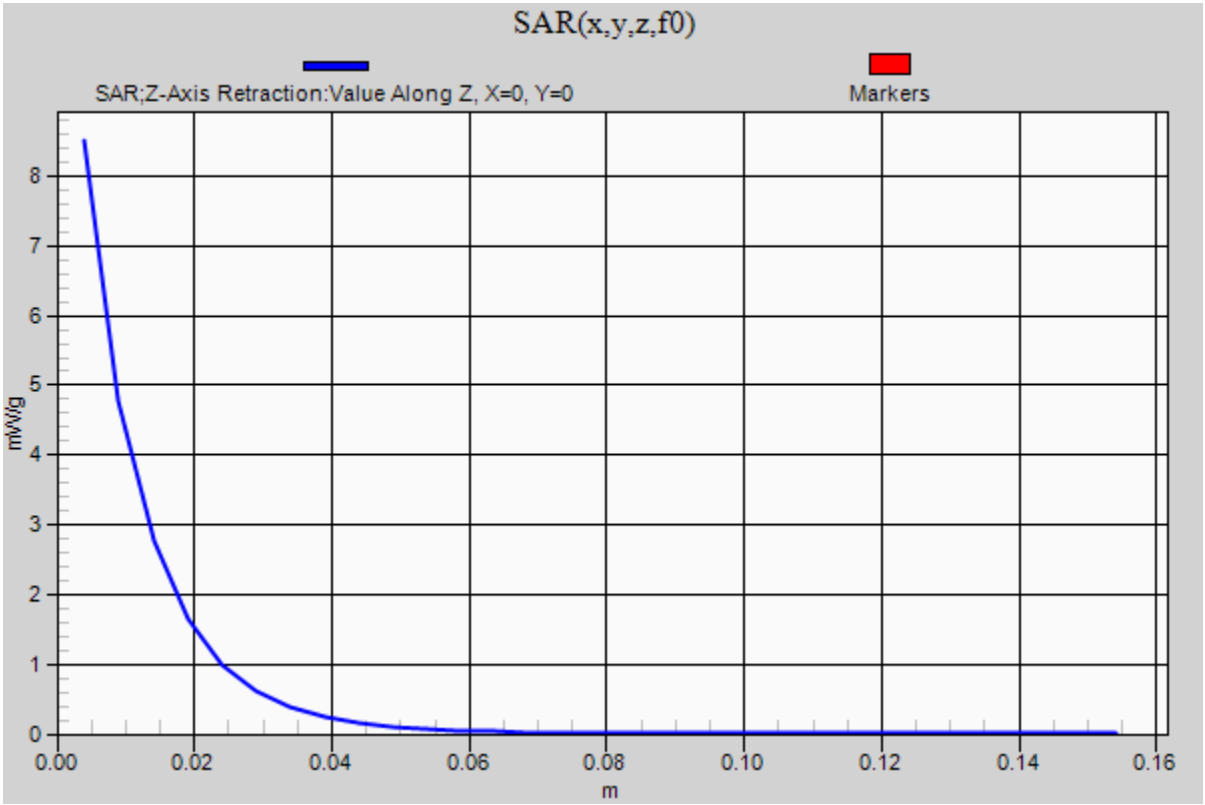
- Probe: ES3DV3 - SN3124; ConvF(5.03, 5.03, 5.03); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#1 - Glycol SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1319;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (5x15x1): Measurement grid: dx=10mm, dy=15mm
Maximum value of SAR (measured) = 8.32 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 66.136 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 13.840 mW/g
SAR(1 g) = 7.6 mW/g; SAR(10 g) = 4.02 mW/g
Maximum value of SAR (measured) = 8.55 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.51 mW/g


mW/g
8.320
6.656
4.993
3.329
1.665
0.00152
y
x


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

Date/Time: 7/7/2012 11:38:12 AM

DUT: Dipole 2450 MHz; Type: D2450V2; Procedure Notes: 2450 MHz System Performance Check / Dipole Sn# 863; PM1 Power = 200mW
Sim.Temp@ meas = 20.5*C; Sim.Temp@ SPC = 19.0*C; Room Temp@ SPC = 21.1*C

Communication System: _CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Validation *HEAD Tissue* TRITON; Medium parameters used: f = 2450 MHz; σ = 1.78 mho/m; ε_r = 37.6; ρ = 1000 kg/m^3

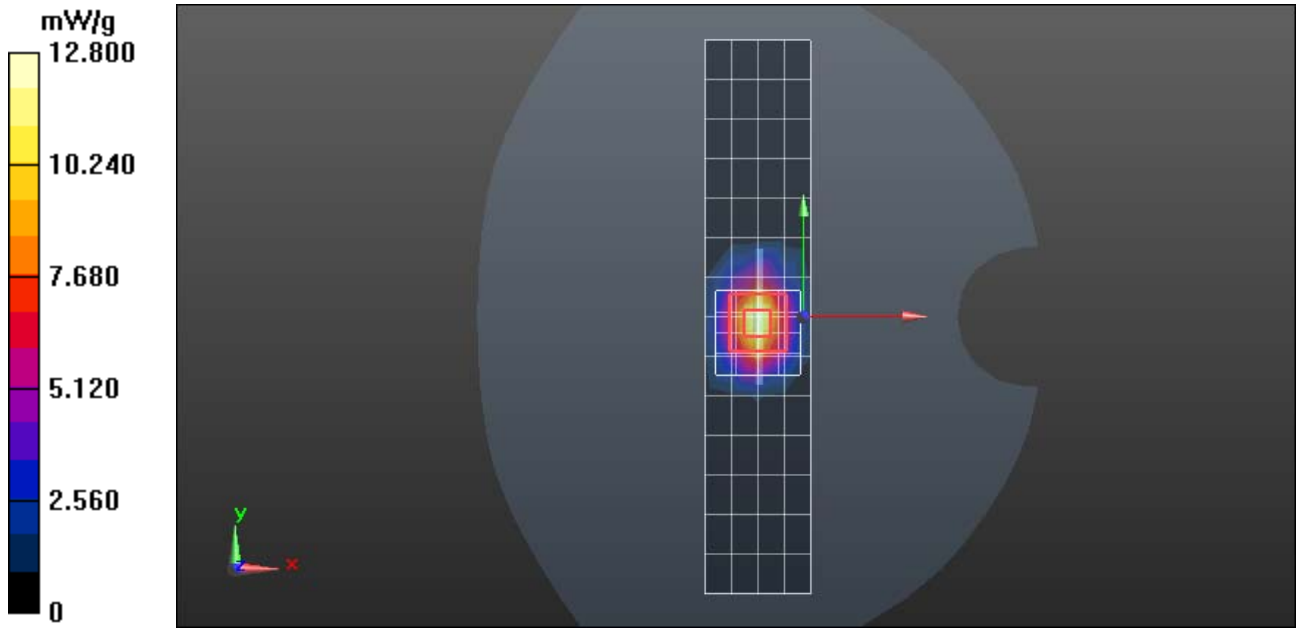
DASY4 Configuration:

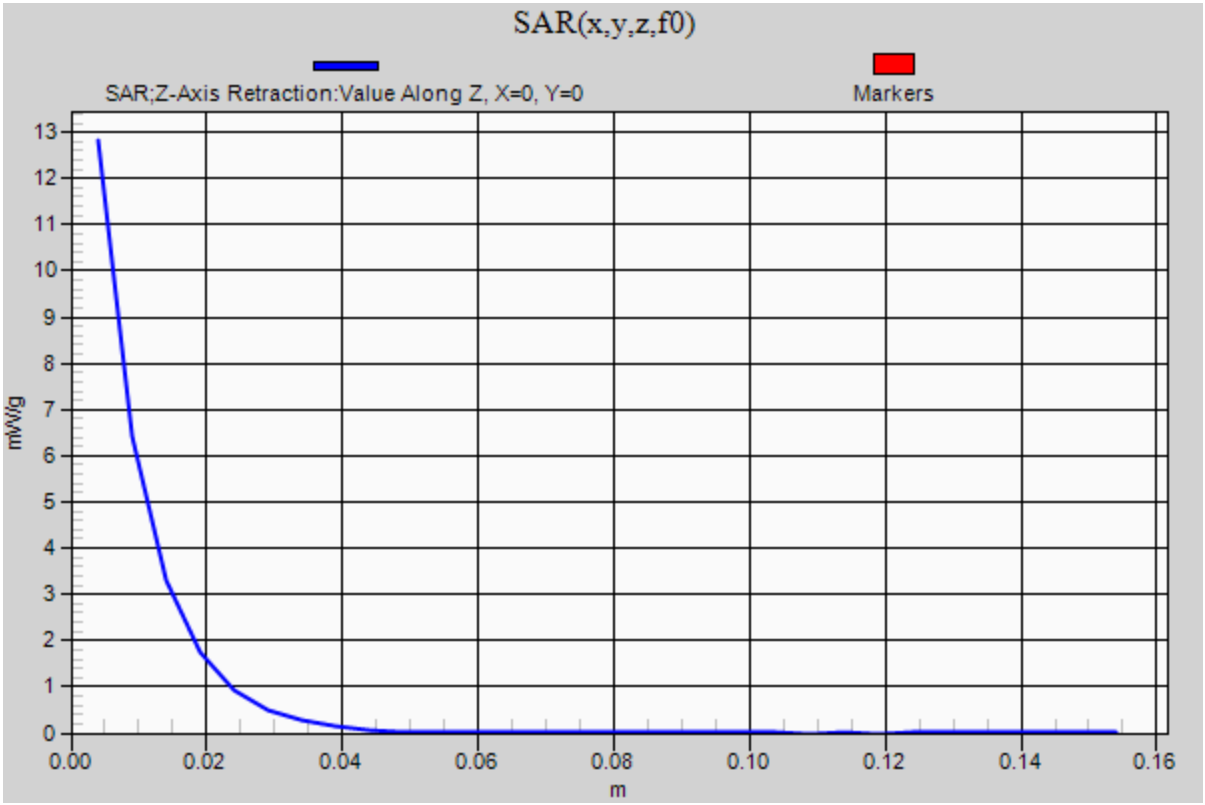
- Probe: EX3DV4 - SN3728; ConvF(6.86, 6.86, 6.86); Calibrated: 4/24/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1312; Calibrated: 5/29/2012
- Phantom: R#3 5G/2450 WiFi SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1153;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (5x15x1): Measurement grid: dx=10mm, dy=15mm
Maximum value of SAR (measured) = 12.8 mW/g

Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 84.811 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 23.289 mW/g
SAR(1 g) = 11.3 mW/g; SAR(10 g) = 5.27 mW/g
Maximum value of SAR (measured) = 12.4 mW/g

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




SAR(x,y,z,f0)
SAR;Z-Axis Retraction:Value Along Z, X=0, Y=0
Markers
mW/g
13
12
11
10
9
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

System Accuracy Verification Measurements for Body SAR Measurements

Date/Time: 7/23/2012 4:17:13 AM

DUT: Dipole 835 MHz; Type: D835V2; Procedure Notes: 835 MHz System Performance Check / Dipole Sn# 436TR; PM1 Power = 200 mW
Sim.Temp@ meas = 19.1*C; Sim.Temp@ SPC = 19.1*C; Room Temp@ SPC = 21.2*C

Communication System: _CW - Dipole; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Validation *BODY Tissue* ; Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 54.7; ρ = 1000 kg/m^3

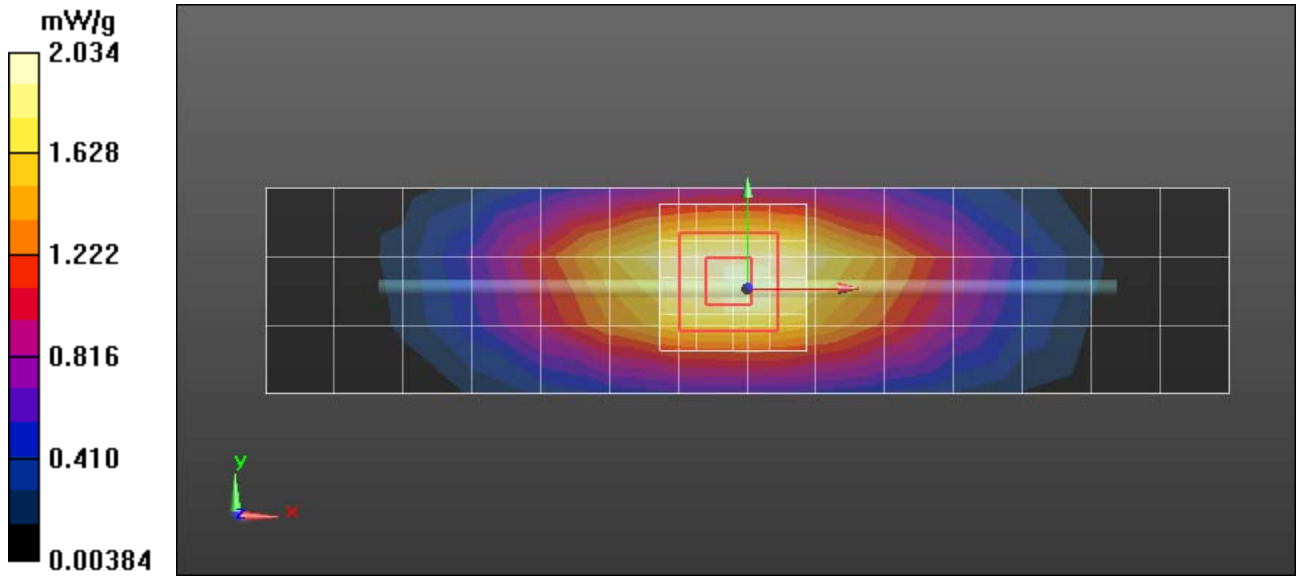
DASY4 Configuration:

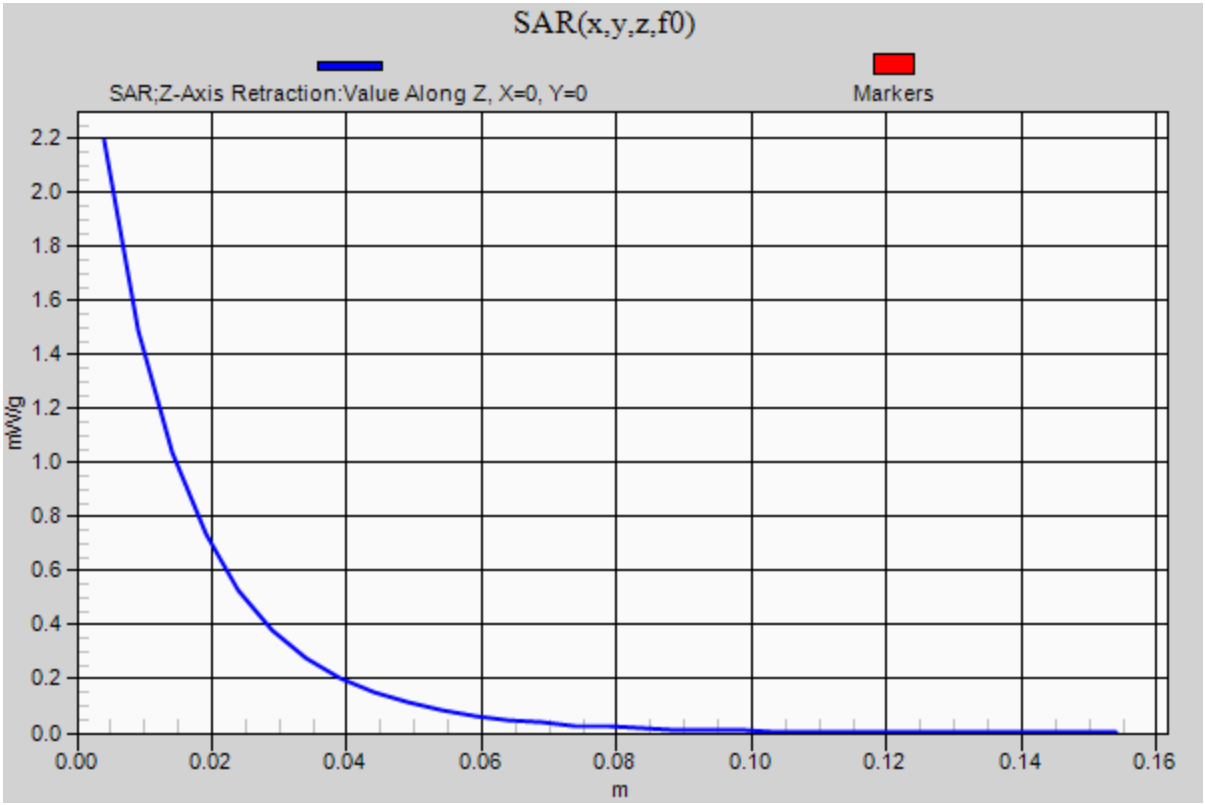
- Probe: ES3DV3 - SN3124; ConvF(6.04, 6.04, 6.04); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#-1, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (4x15x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.03 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 47.197 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.016 mW/g
SAR(1 g) = 2.04 mW/g; SAR(10 g) = 1.34 mW/g
Maximum value of SAR (measured) = 2.20 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 2.19 mW/g




SAR(x,y,z,f0)
SAR;Z-Axis Retraction:Value Along Z, X=0, Y=0
Markers
mW/g
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date/Time: 7/6/2012 12:05:15 PM

DUT: Dipole 1800 MHz; Type: D1800V2; Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 2d191; PM1 Power = 200 mW;
Sim.Temp@ meas = 19.0*C; Sim.Temp@ SPC = 20.1*C; Room Temp@ SPC = 21.3*C

Communication System: _CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: Validation *BODY Tissue* ; Medium parameters used: f = 1800 MHz; σ = 1.48 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3

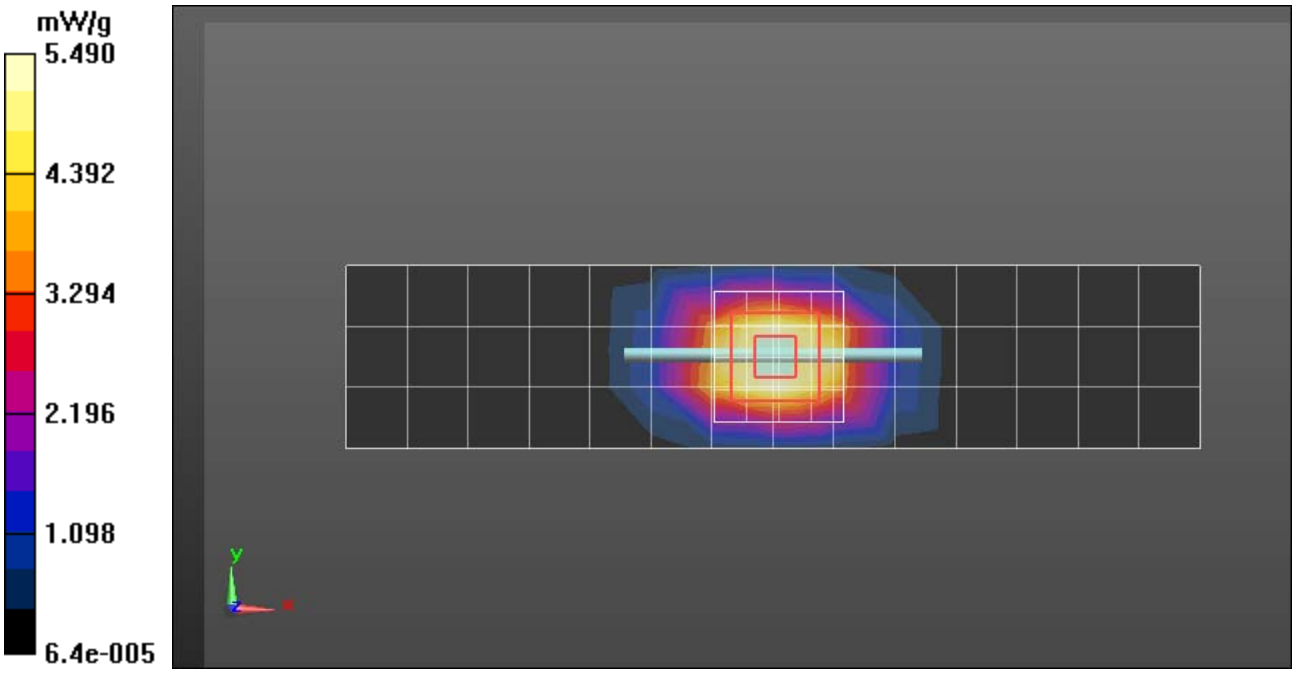
DASY4 Configuration:

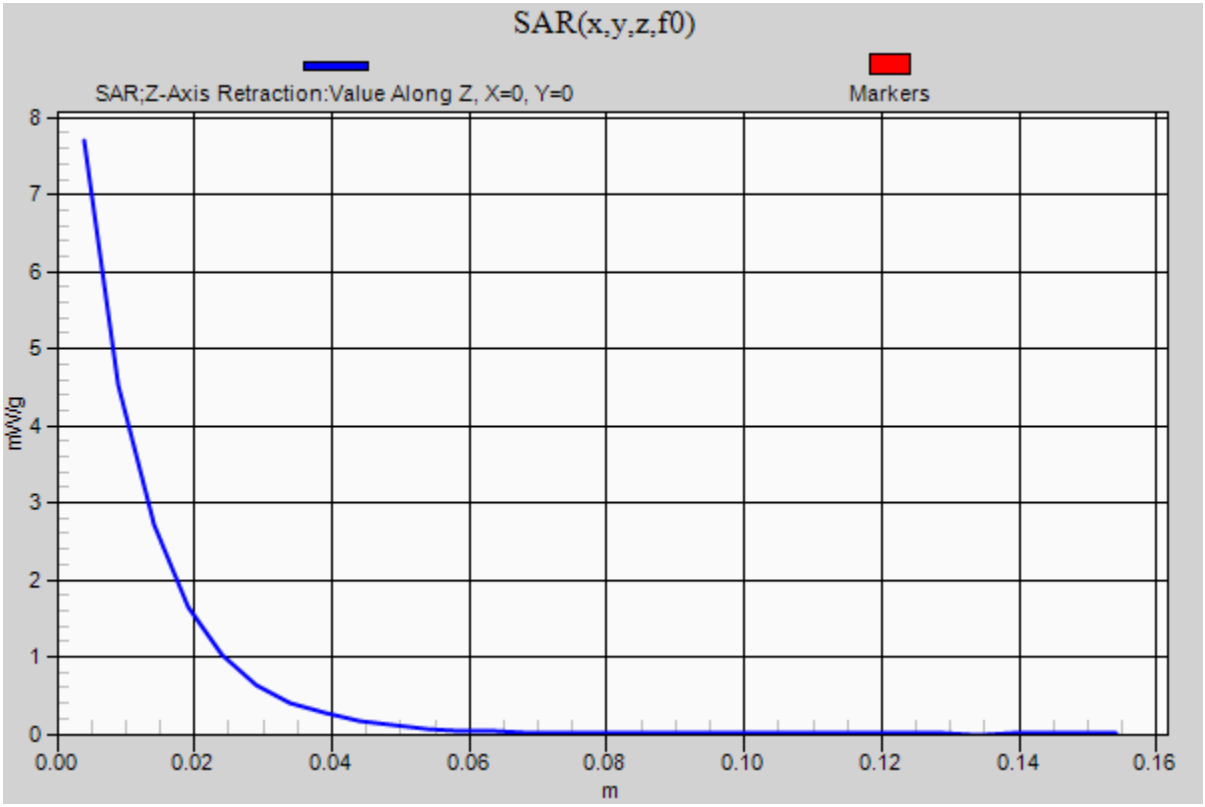
- Probe: ES3DV3 - SN3284; ConvF(5.28, 5.28, 5.28); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (4x15x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.49 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 74.020 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 11.896 mW/g
SAR(1 g) = 6.84 mW/g; SAR(10 g) = 3.65 mW/g
Maximum value of SAR (measured) = 7.72 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 7.70 mW/g


mW/g
5.490
4.392
3.294
2.196
1.098
6.4e-005
y
x


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

Date/Time: 7/9/2012 3:19:21 PM

DUT: Dipole 1800 MHz; Type: D1800V2; Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 2D191; PM1 Power = 200 mW
Sim.Temp@ meas = 18.9*C; Sim.Temp@ SPC = 18.9*C; Room Temp@ SPC = 20.9*C

Communication System: _CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: Validation *BODY Tissue* ; Medium parameters used: f = 1800 MHz; σ = 1.51 mho/m; ε_r = 50.8; ρ = 1000 kg/m^3

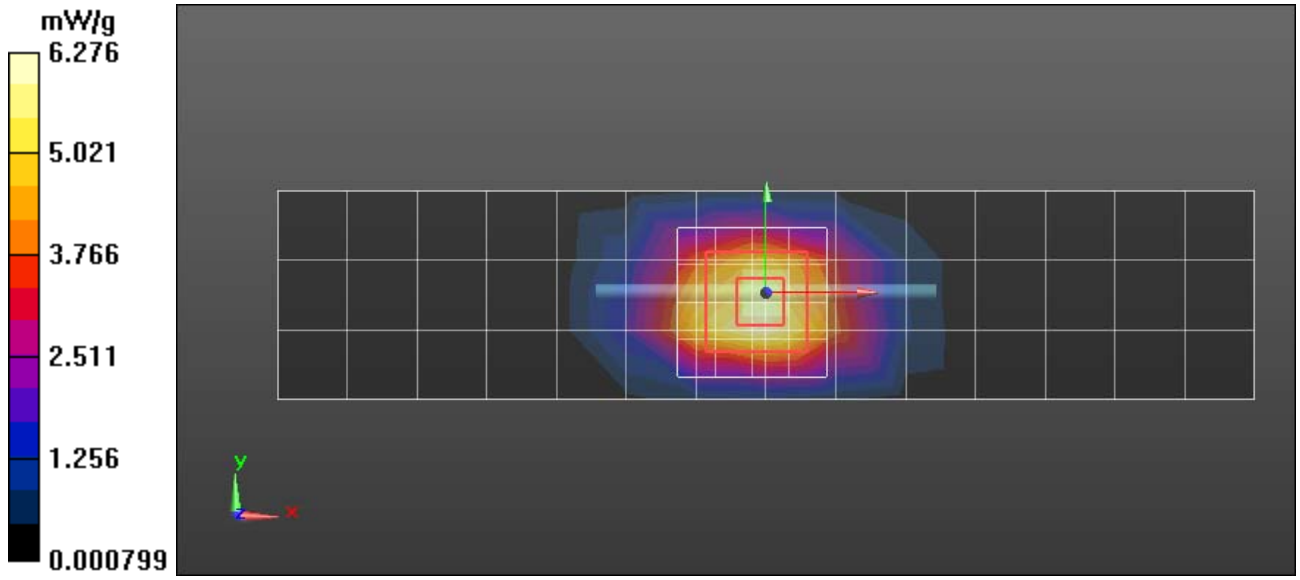
DASY4 Configuration:

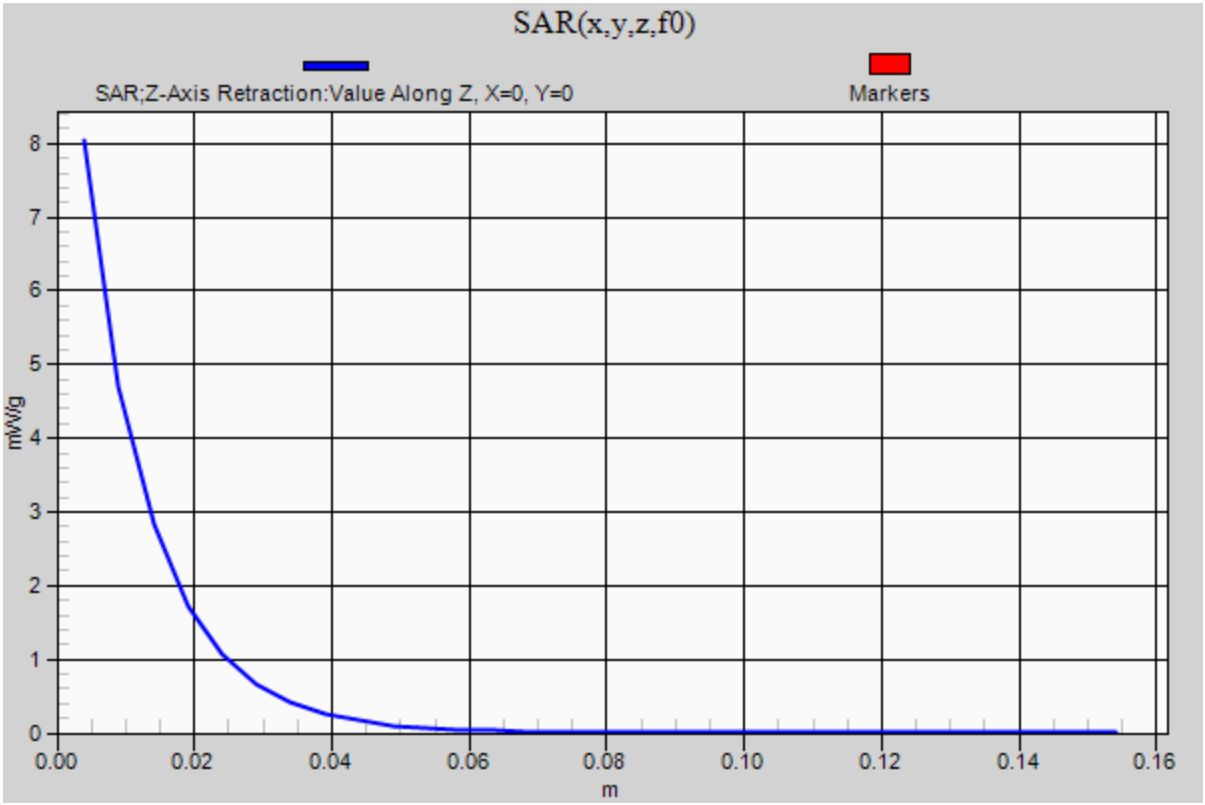
- Probe: ES3DV3 - SN3284; ConvF(5.28, 5.28, 5.28); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (4x15x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 6.28 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 73.639 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 12.378 mW/g
SAR(1 g) = 7.12 mW/g; SAR(10 g) = 3.81 mW/g
Maximum value of SAR (measured) = 8.00 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.04 mW/g




SAR(x,y,z,f0)
SAR;Z-Axis Retraction:Value Along Z, X=0, Y=0
Markers
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

Date/Time: 7/23/2012 12:07:42 PM

DUT: Dipole 1800 MHz; Type: D1800V2; Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 259TR; PM1 Power =200 mW;
Sim.Temp@ meas = 18.8*C; Sim.Temp@ SPC = 18.8*C; Room Temp@ SPC = 21.1*C

Communication System: _CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: Validation *BODY Tissue* ; Medium parameters used: f = 1800 MHz; σ = 1.49 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3

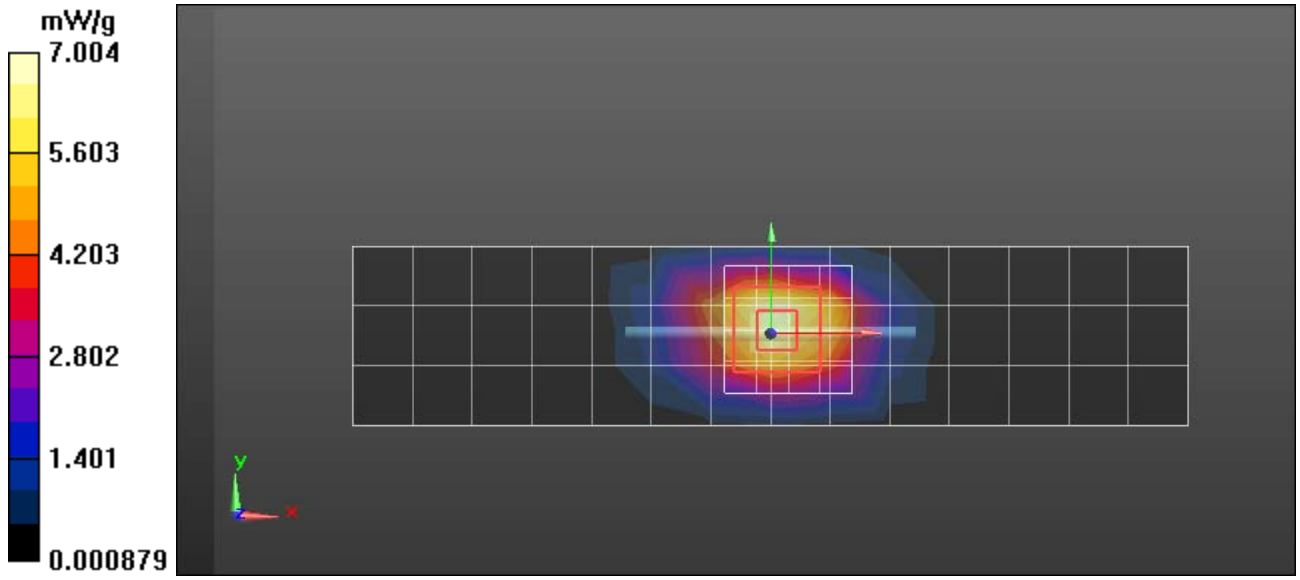
DASY4 Configuration:

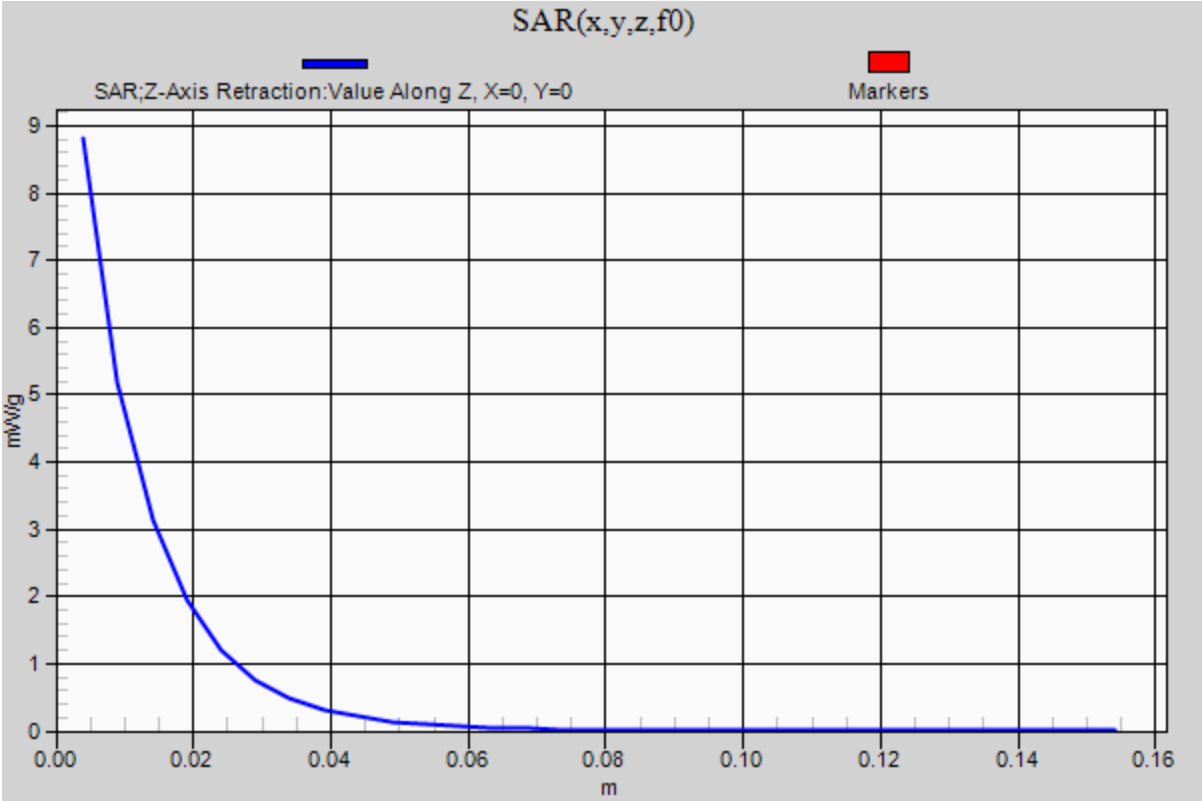
- Probe: ES3DV3 - SN3124; ConvF(4.69, 4.69, 4.69); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#-1, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (4x15x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 7.00 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 77.561 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 13.801 mW/g
SAR(1 g) = 7.84 mW/g; SAR(10 g) = 4.21 mW/g
Maximum value of SAR (measured) = 8.74 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.81 mW/g




SAR(x,y,z,f0)
SAR;Z-Axis Retraction:Value Along Z, X=0, Y=0
Markers
mW/g
9
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

Date/Time: 7/25/2012 8:39:42 AM

DUT: Dipole 1800 MHz; Type: D1800V2; Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 2d190; PM1 Power = 200 mW
Sim.Temp@meas = 19.5*C; Sim.Temp@ SPC = 20.1*C; Room Temp@ SPC = 20.8*C

Communication System: _CW - Dipole; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: Validation *BODY Tissue* ; Medium parameters used: f = 1800 MHz; σ = 1.48 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

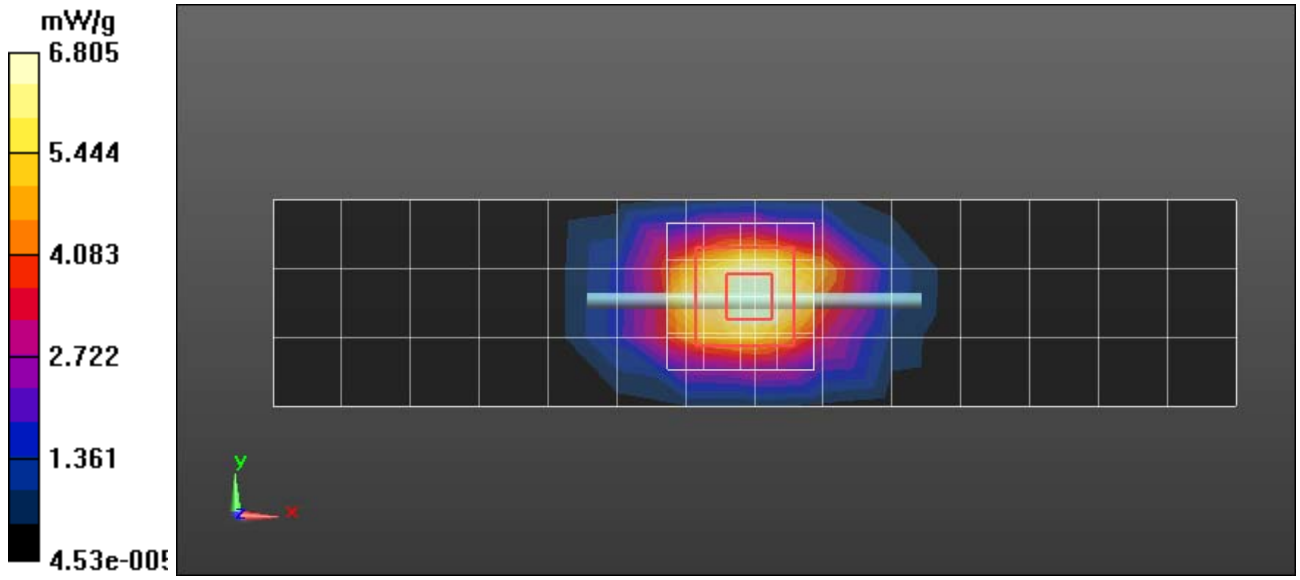
DASY4 Configuration:

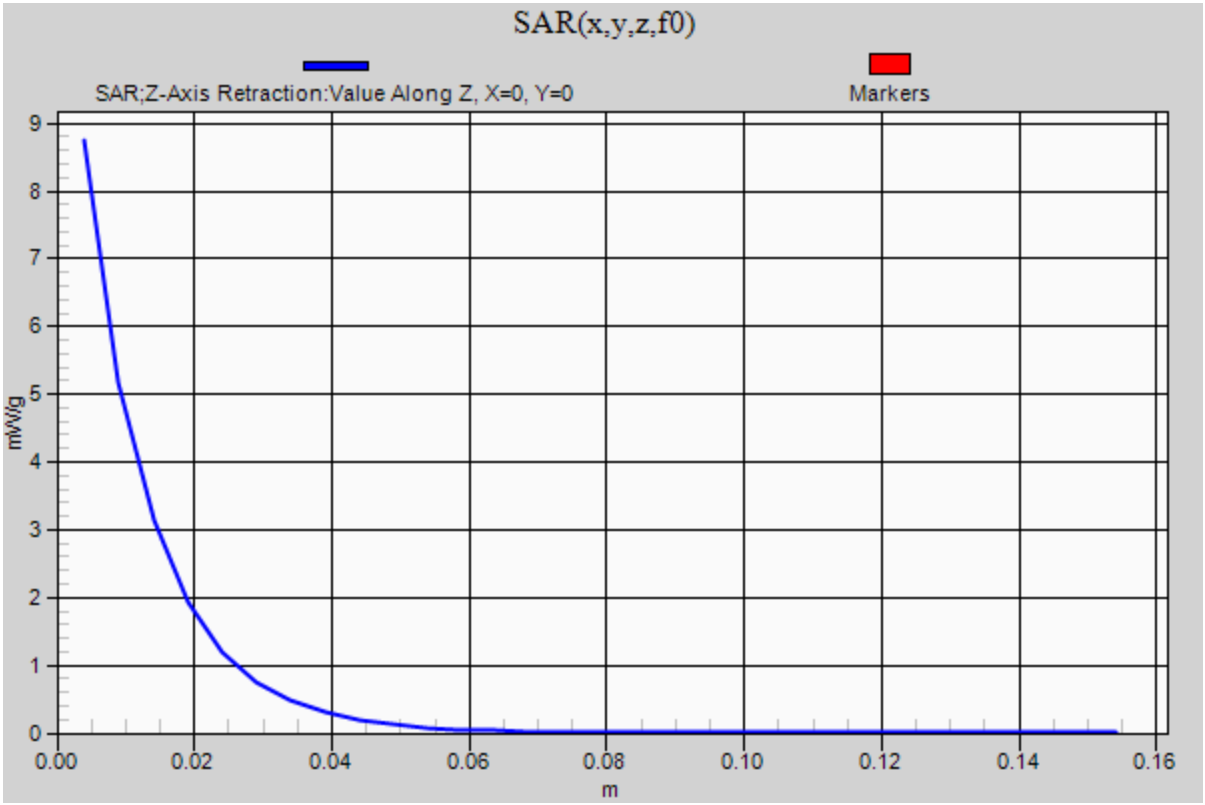
- Probe: ES3DV3 - SN3115; ConvF(4.72, 4.72, 4.72); Calibrated: 1/11/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn699; Calibrated: 9/22/2011
- Phantom: R#2 Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (4x15x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 6.81 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 77.749 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 13.447 mW/g
SAR(1 g) = 7.74 mW/g; SAR(10 g) = 4.15 mW/g
Maximum value of SAR (measured) = 8.69 mW/g

Daily SPC Check/Z-Axis Retraction (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.75 mW/g




SAR(x,y,z,f0)
SAR;Z-Axis Retraction:Value Along Z, X=0, Y=0
Markers
mW/g
9
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

Date/Time: 7/10/2012 1:51:25 PM

DUT: Dipole 2450 MHz; Type: D2450V2; Procedure Notes: 2450 MHz System Performance Check / Dipole Sn# 863; PM1 Power = 200mW;
Sim.Temp@ meas = 19.4*C; Sim.Temp@ SPC = 19.2*C; Room Temp@ SPC = 22.0*C

Communication System: _CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Validation *BODY Tissue* TRITON; Medium parameters used: f = 2450 MHz; σ = 2.04 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3

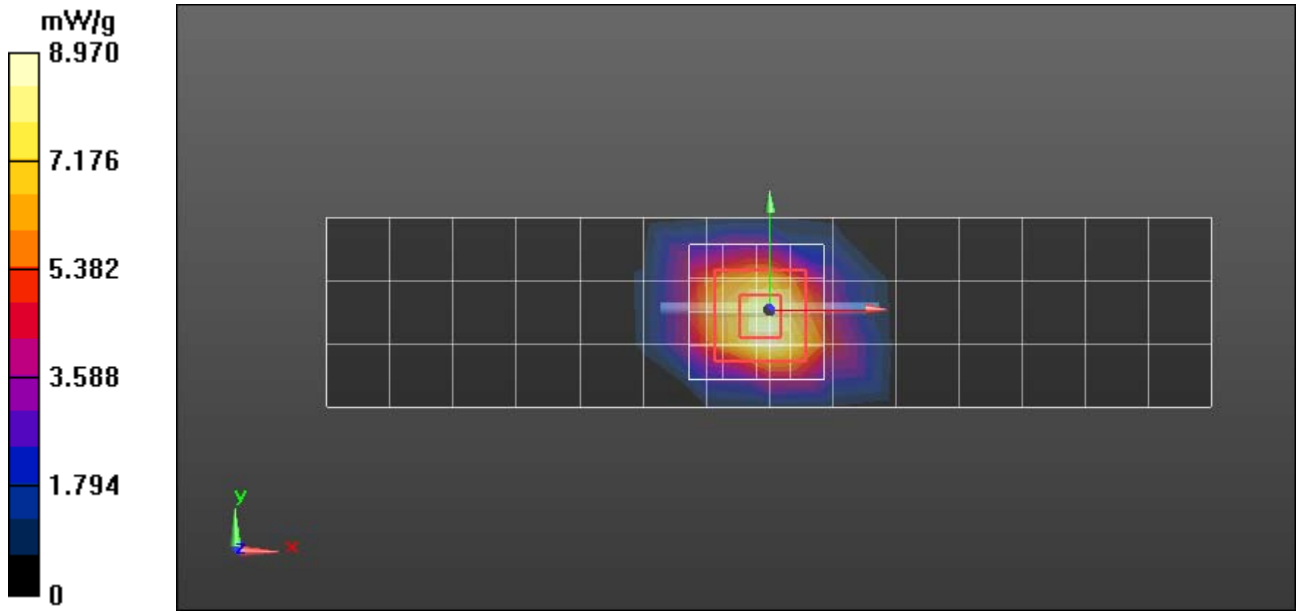
DASY4 Configuration:

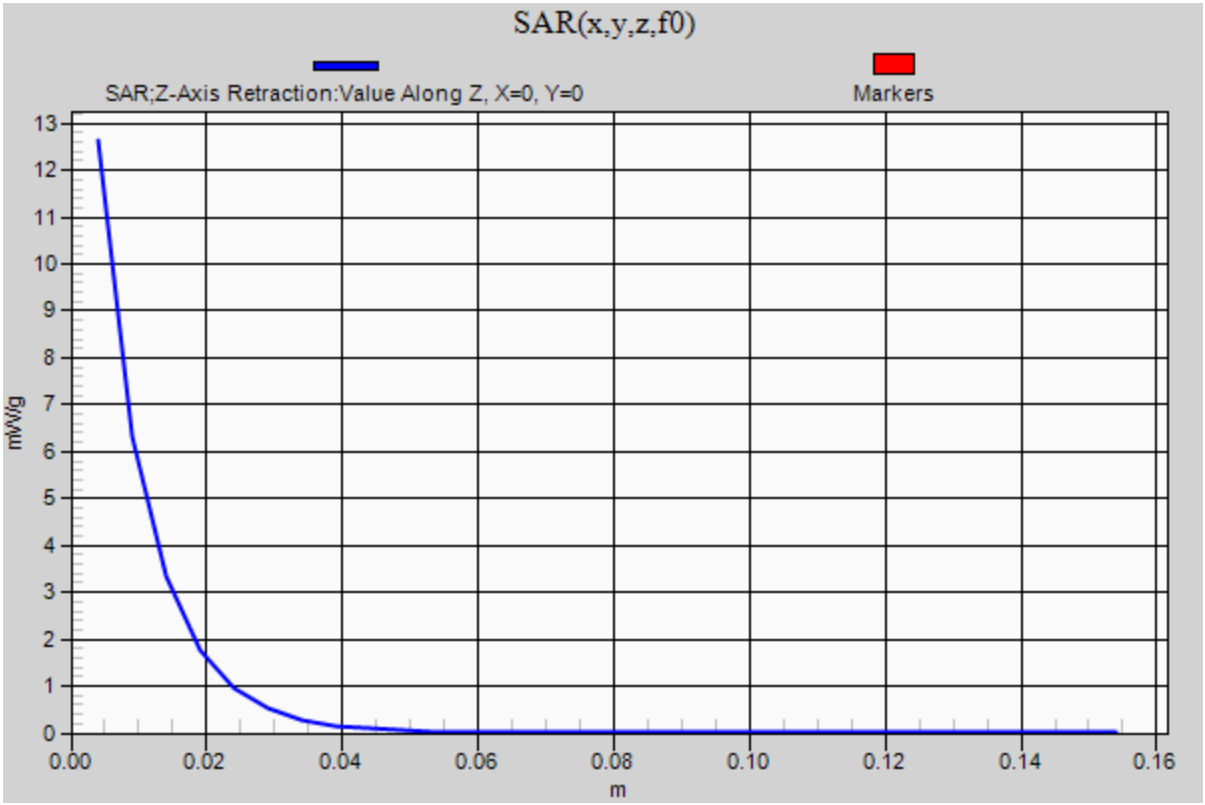
- Probe: ES3DV3 - SN3115; ConvF(4.12, 4.12, 4.12); Calibrated: 1/11/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn699; Calibrated: 9/22/2011
- Phantom: R#2 Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Daily SPC Check/Dipole Area Scan (4x15x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 8.97 mW/g

Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 78.077 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 23.407 mW/g
SAR(1 g) = 11.1 mW/g; SAR(10 g) = 5.13 mW/g
Maximum value of SAR (measured) = 12.6 mW/g

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




SAR(x,y,z,f0)
SAR;Z-Axis Retraction:Value Along Z, X=0, Y=0
Markers
mW/g
13
12
11
10
9
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 Head Adjacent Test Results

Date/Time: 7/24/2012 5:40:37 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: 5; Battery Model #: SNN5875A; DEVICE POSITION: CHEEK

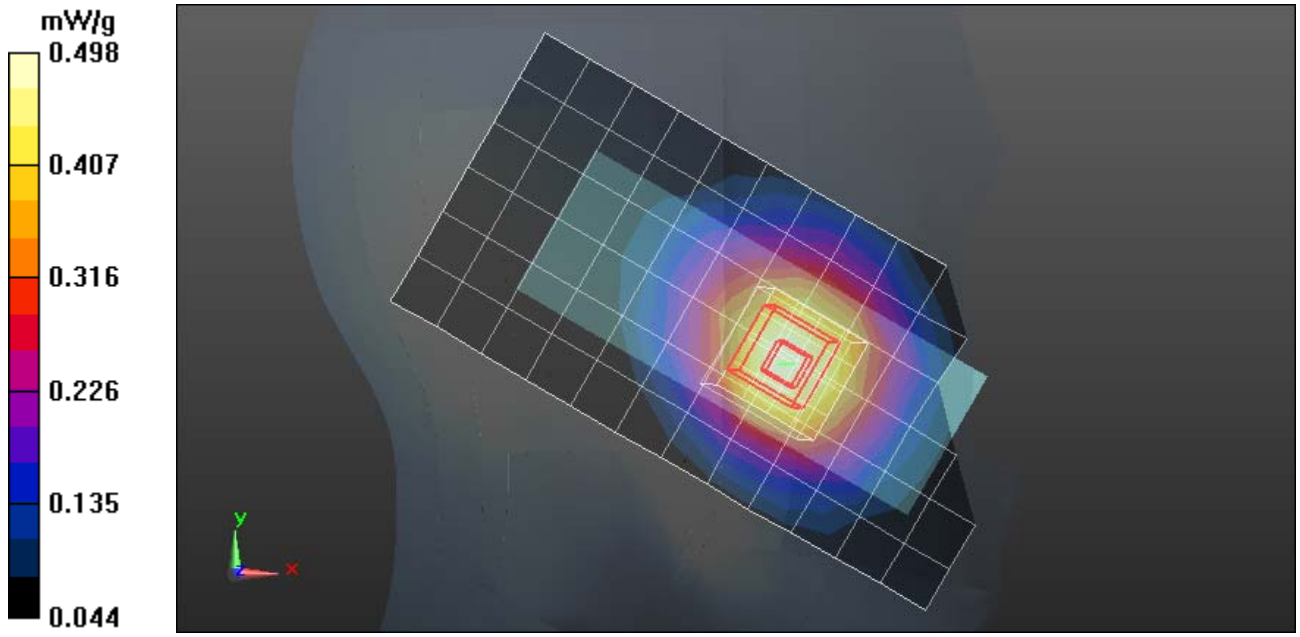
Communication System: _GSM; Frequency: 836.6 MHz; Communication System Channel Number: 190; Duty Cycle: 1:8.30042
Medium: Low Freq Head; Medium parameters used: f = 835 MHz; σ = 0.93 mho/m; ε_r = 40; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(6.08, 6.08, 6.08); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#1 - Sugar SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1156;
- ; SEMCAD X Version 14.6.5 (6469)

Left Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.507 mW/g

Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.763 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.591 mW/g
SAR(1 g) = 0.475 mW/g; SAR(10 g) = 0.357 mW/g
Maximum value of SAR (measured) = 0.498 mW/g



Date/Time: 7/5/2012 11:14:52 PM

Serial: 352507050007739 ; Procedure Notes: Pwr Step: ALL UP; Battery Model #: SNN5875A; DEVICE POSITION: Cheek

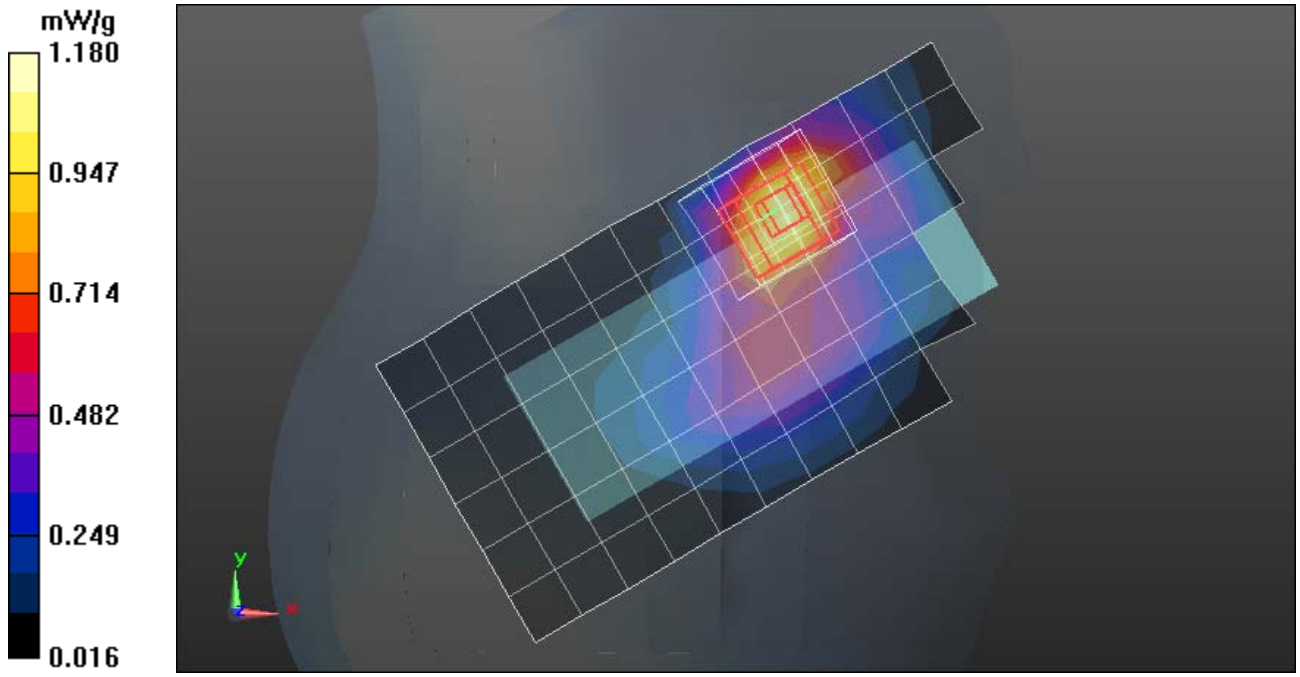
Communication System: _WCDMA; Frequency: 1732 MHz; Communication System Channel Number: 1413; Duty Cycle: 1:1
Medium: 1730 Glycol Head; Medium parameters used: f = 1730 MHz; σ = 1.38 mho/m; ε_r = 39.2; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3284; ConvF(5.33, 5.33, 5.33); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4 Glycol SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1162;
- ; SEMCAD X Version 14.6.5 (6469)

Right Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.09 mW/g

Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.298 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 1.713 mW/g
SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.637 mW/g
Maximum value of SAR (measured) = 1.18 mW/g



Cheek WCDMA 1700

Date/Time: 7/7/2012 3:08:42 AM

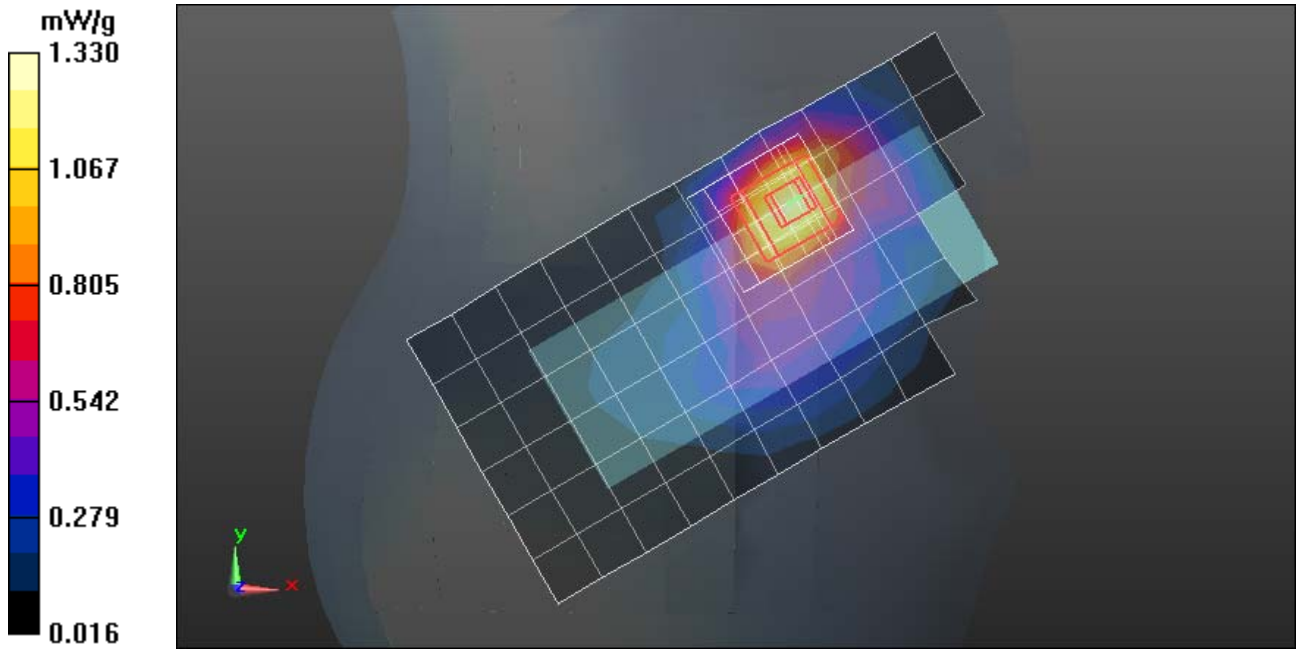
Serial: 352507050007739; Procedure Notes: Pwr Step:ALL UP; Battery Model #: SNN5875A; DEVICE POSITION: Cheek
Communication System: _WCDMA; Frequency: 1852.4 MHz; Communication System Channel Number: 9262; Duty Cycle: 1:1
Medium: Regular Glycol Head 1750/1880; Medium parameters used: f = 1880 MHz; σ = 1.46 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3284; ConvF(5.33, 5.33, 5.33); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4 Glycol SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1162;
- ; SEMCAD X Version 14.6.5 (6469)

Right Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.17 mW/g

Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.500 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.996 mW/g
SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.728 mW/g
Maximum value of SAR (measured) = 1.33 mW/g



Cheek WCDMA 1900

Date/Time: 7/24/2012 2:33:03 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: 0; Battery Model #: SNN5875A; DEVICE POSITION: CHEEK

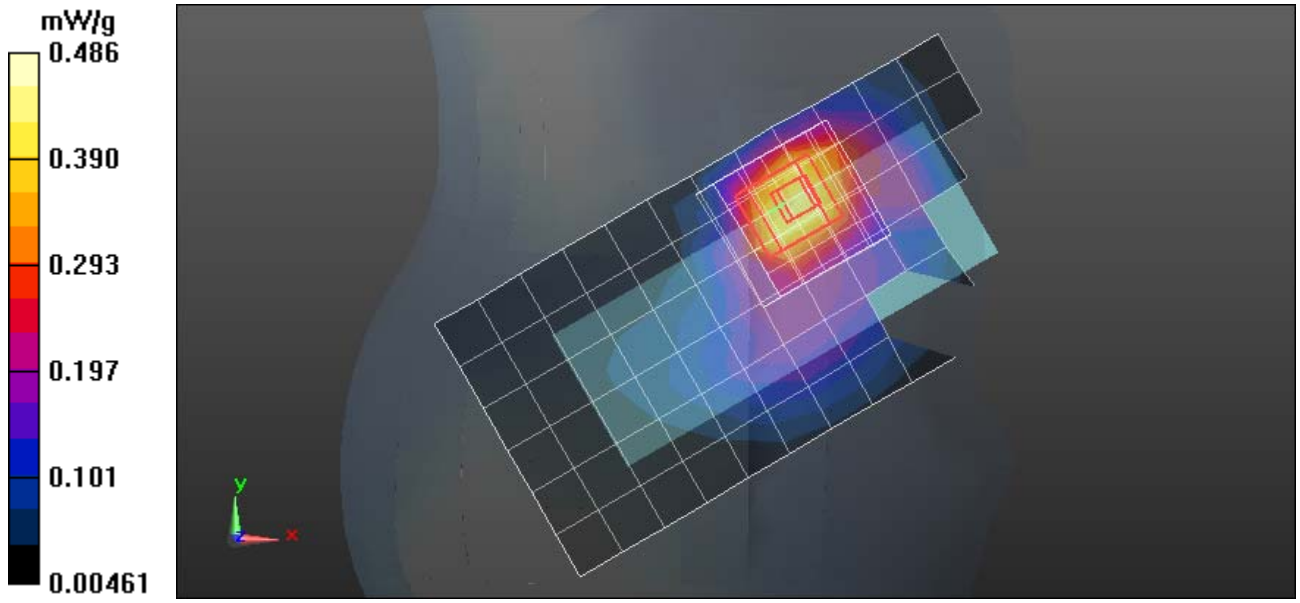
Communication System: _GSM; Frequency: 1880 MHz; Communication System Channel Number: 661; Duty Cycle: 1:8.30042
Medium: Regular Glycol Head 1750/1880; Medium parameters used: f = 1880 MHz; σ = 1.44 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(5.03, 5.03, 5.03); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#1 - Glycol SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1319;
- ; SEMCAD X Version 14.6.5 (6469)

Right Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.424 mW/g

Right Head Template/5x5x7 Zoom Scan (<=3GHz) (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.416 V/m; Power Drift = 0.51 dB
Peak SAR (extrapolated) = 0.746 mW/g
SAR(1 g) = 0.450 mW/g; SAR(10 g) = 0.261 mW/g
Maximum value of SAR (measured) = 0.486 mW/g



Date/Time: 7/7/2012 1:49:20 PM

Serial: 352507050007739; Procedure Notes: Battery Model #: SNN5875A; DEVICE POSITION: CHEEK;

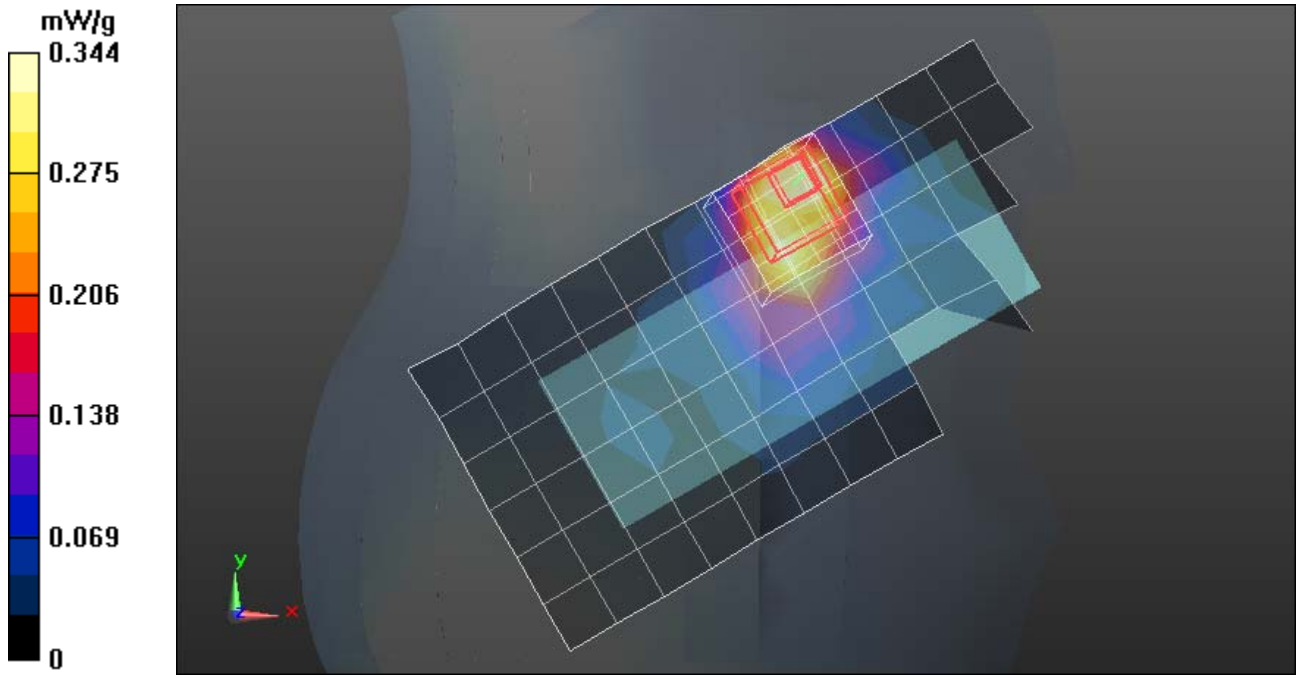
Communication System: _Wi-Fi 2450MHz; Frequency: 2462 MHz; Communication System Channel Number: 11; Duty Cycle: 1:1
Medium: 2450 TRITON Head; Medium parameters used: f = 2450 MHz; σ = 1.78 mho/m; ε_r = 37.6; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: EX3DV4 - SN3728; ConvF(6.86, 6.86, 6.86); Calibrated: 4/24/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1312; Calibrated: 5/29/2012
- Phantom: R#3 5G/2450 WiFi SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1153;
- ; SEMCAD X Version 14.6.5 (6469)

Right Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.344 mW/g

Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.624 V/m; Power Drift = 0.49 dB
Peak SAR (extrapolated) = 0.837 mW/g
SAR(1 g) = 0.379 mW/g; SAR(10 g) = 0.184 mW/g
Maximum value of SAR (measured) = 0.428 mW/g



Cheek WIFI

Date/Time: 7/24/2012 6:40:37 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: 5; Battery Model #: SNN5875A; DEVICE POSITION: Tilt

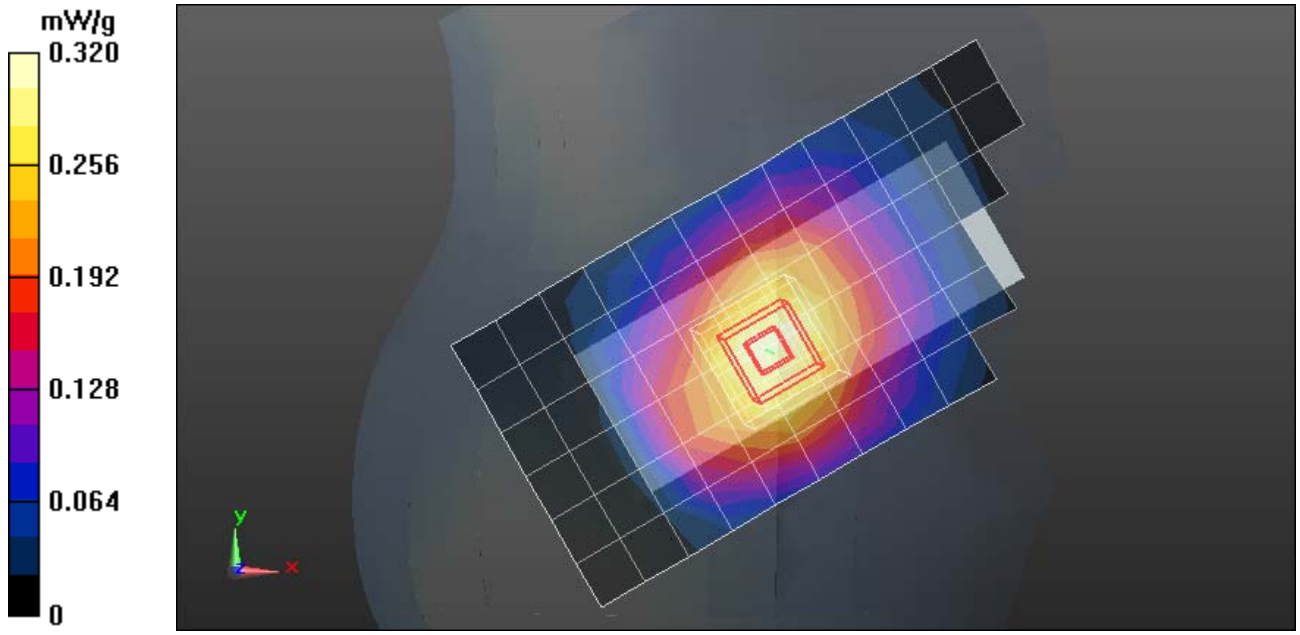
Communication System: _GSM; Frequency: 836.6 MHz; Communication System Channel Number: 190; Duty Cycle: 1:8.30042
Medium: Low Freq Head; Medium parameters used: f = 835 MHz; σ = 0.93 mho/m; ε_r = 40; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(6.08, 6.08, 6.08); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#1 - Sugar SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1156;
- ; SEMCAD X Version 14.6.5 (6469)

Right Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.320 mW/g

Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.182 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.393 mW/g
SAR(1 g) = 0.307 mW/g; SAR(10 g) = 0.226 mW/g
Maximum value of SAR (measured) = 0.335 mW/g



Date/Time: 7/5/2012 11:39:33 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: ALL UP; Battery Model #: SNN5875A; DEVICE POSITION: TILT

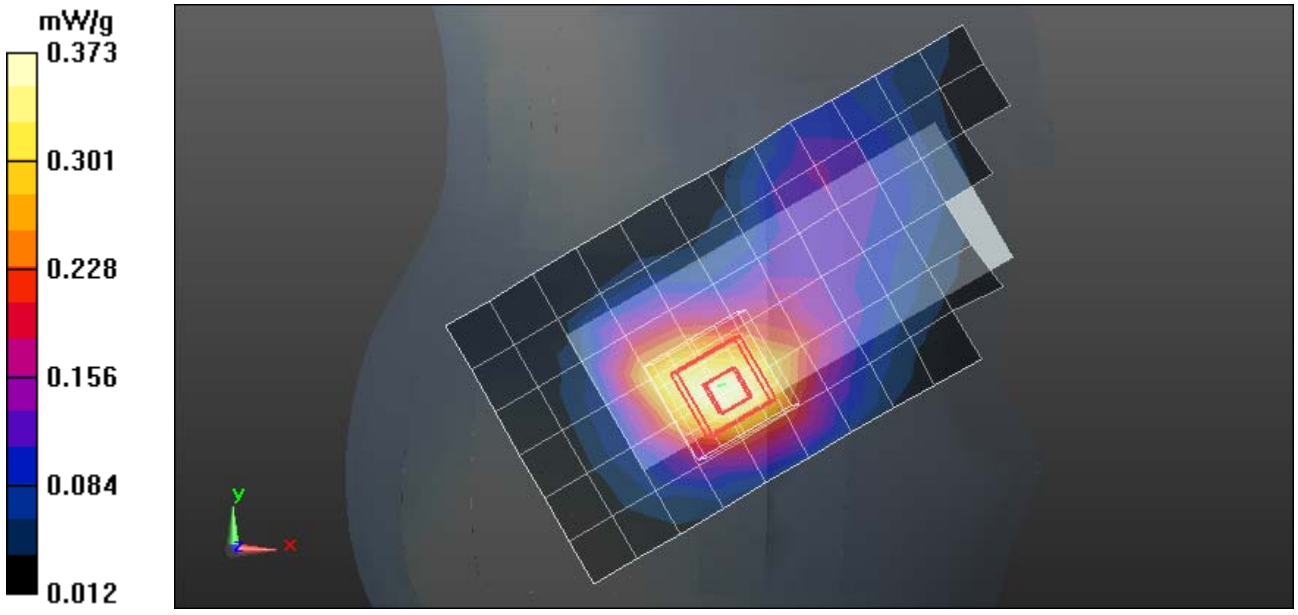
Communication System: _WCDMA; Frequency: 1732 MHz; Communication System Channel Number: 1413; Duty Cycle: 1:1
Medium: 1730 Glycol Head; Medium parameters used: f = 1730 MHz; σ = 1.38 mho/m; ε_r = 39.2; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3284; ConvF(5.33, 5.33, 5.33); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4 Glycol SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1162;
- ; SEMCAD X Version 14.6.5 (6469)

Right Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.380 mW/g

Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.593 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.519 mW/g
SAR(1 g) = 0.352 mW/g; SAR(10 g) = 0.228 mW/g
Maximum value of SAR (measured) = 0.373 mW/g



Date/Time: 7/7/2012 3:46:57 AM

Serial: 352507050007739; Procedure Notes: Pwr Step:ALL UP; Battery Model #: SNN5875A DEVICE POSITION: TILT

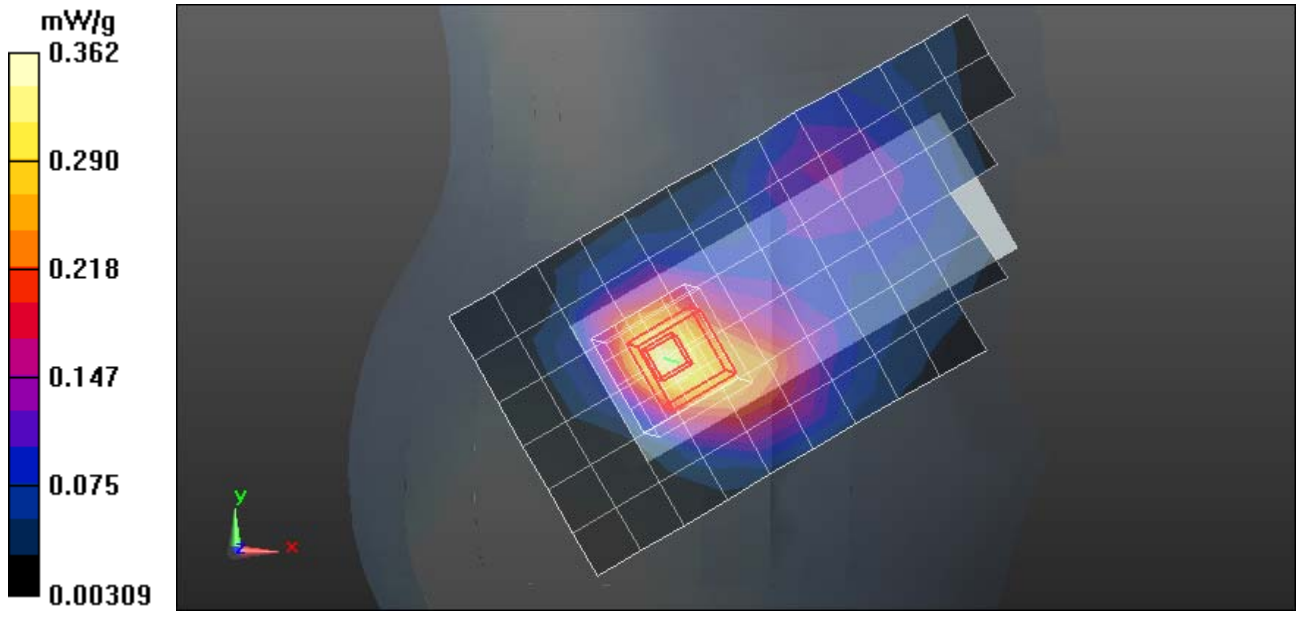
Communication System: _WCDMA; Frequency: 1880 MHz; Communication System Channel Number: 9400; Duty Cycle: 1:1
Medium: Regular Glycol Head 1750/1880; Medium parameters used: f = 1880 MHz; σ = 1.46 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3284; ConvF(5.33, 5.33, 5.33); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4 Glycol SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1162;
- ; SEMCAD X Version 14.6.5 (6469)

Right Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.323 mW/g

Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.569 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.534 mW/g
SAR(1 g) = 0.328 mW/g; SAR(10 g) = 0.195 mW/g
Maximum value of SAR (measured) = 0.362 mW/g



Date/Time: 7/24/2012 1:50:52 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: 0; Battery Model #: SNN5875A; DEVICE POSITION: TILT

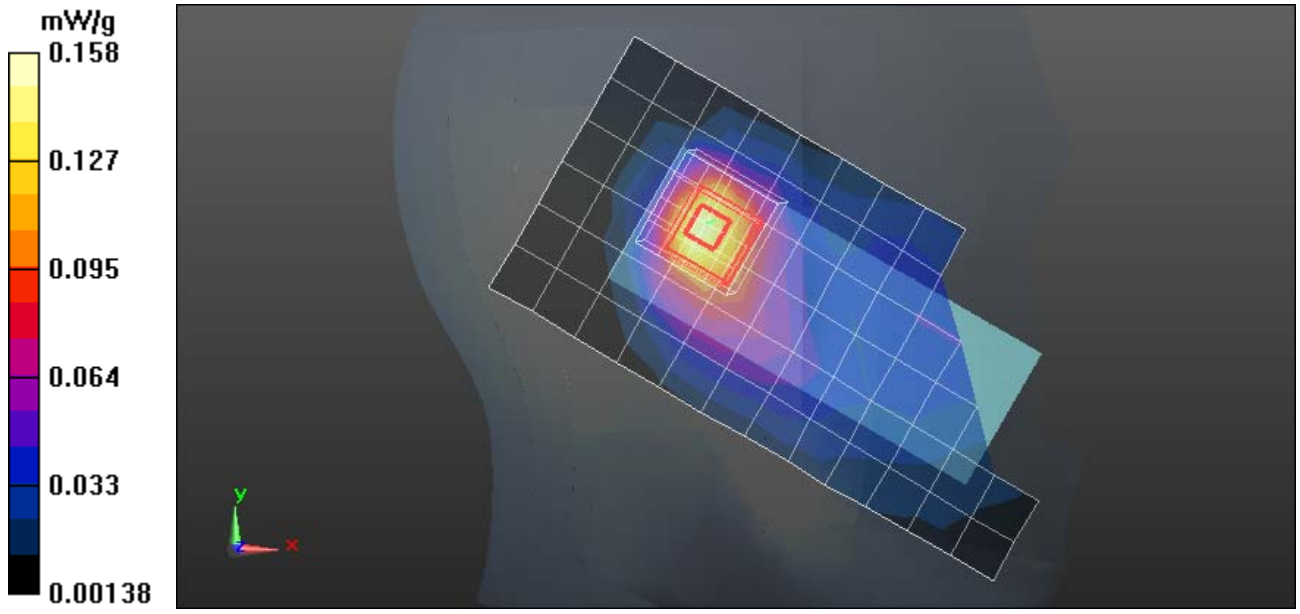
Communication System: _GSM; Frequency: 1880 MHz; Communication System Channel Number: 661; Duty Cycle: 1:8.30042
Medium: Regular Glycol Head 1750/1880; Medium parameters used: f = 1880 MHz; σ = 1.44 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(5.03, 5.03, 5.03); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#1 - Glycol SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1319;
- ; SEMCAD X Version 14.6.5 (6469)

Left Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.149 mW/g

Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.196 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.236 mW/g
SAR(1 g) = 0.143 mW/g; SAR(10 g) = 0.082 mW/g
Maximum value of SAR (measured) = 0.158 mW/g



Date/Time: 7/7/2012 12:36:57 PM

Serial: 352507050007739; Procedure Notes: Battery Model #: SNN5875A; DEVICE POSITION: TILT

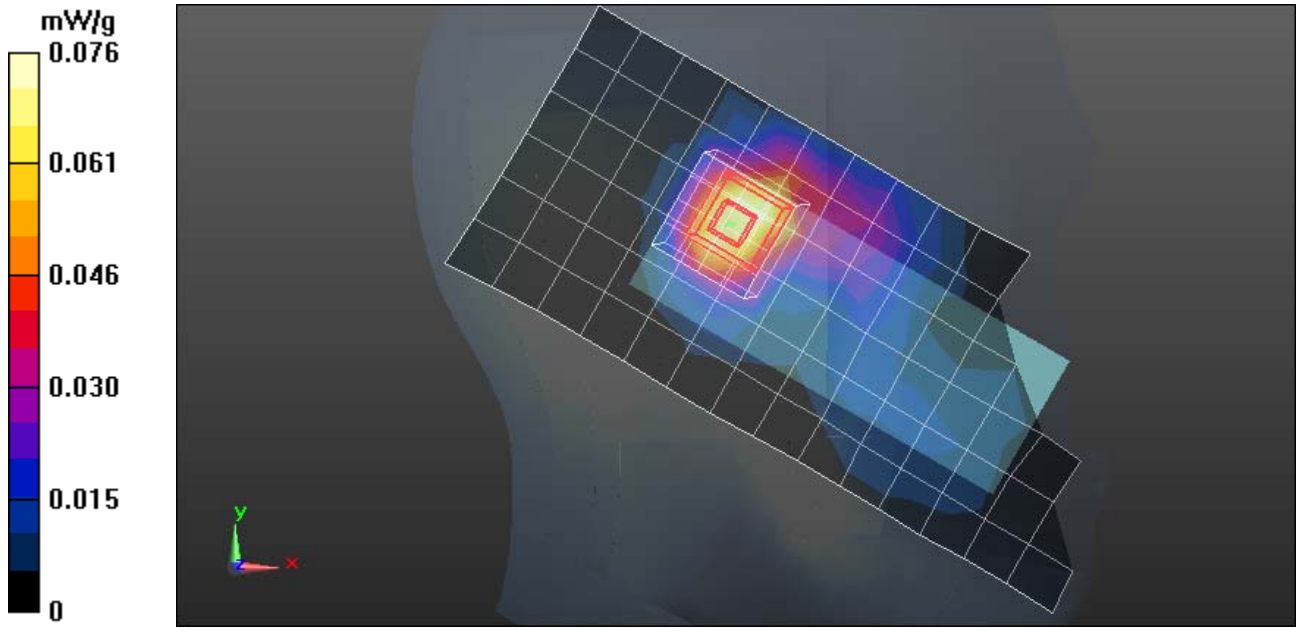
Communication System: _Wi-Fi 2450MHz; Frequency: 2437 MHz; Communication System Channel Number: 6; Duty Cycle: 1:1
Medium: 2450 TRITON Head; Medium parameters used: f = 2450 MHz; σ = 1.78 mho/m; ε_r = 37.6; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: EX3DV4 - SN3728; ConvF(6.86, 6.86, 6.86); Calibrated: 4/24/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1312; Calibrated: 5/29/2012
- Phantom: R#3 5G/2450 WiFi SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1153;
- ; SEMCAD X Version 14.6.5 (6469)

Left Head Template/Area Scan - Normal (15mm) (7x17x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.0762 mW/g

Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.869 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.132 mW/g
SAR(1 g) = 0.077 mW/g; SAR(10 g) = 0.040 mW/g
Maximum value of SAR (measured) = 0.0877 mW/g



Tilt WIFI

Date/Time: 7/6/2012 4:55:22 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: ALL UP; Battery Model #: SNN5875A; DEVICE POSITION: PTT 25mm away from phantom

Communication System: _WCDMA; Frequency: 1732 MHz; Communication System Channel Number: 1413; Duty Cycle: 1:1
Medium: 1730 Glycol Head; Medium parameters used: f = 1730 MHz; σ = 1.37 mho/m; ε_r = 39.3; ρ = 1000 kg/m^3

DASY4 Configuration:

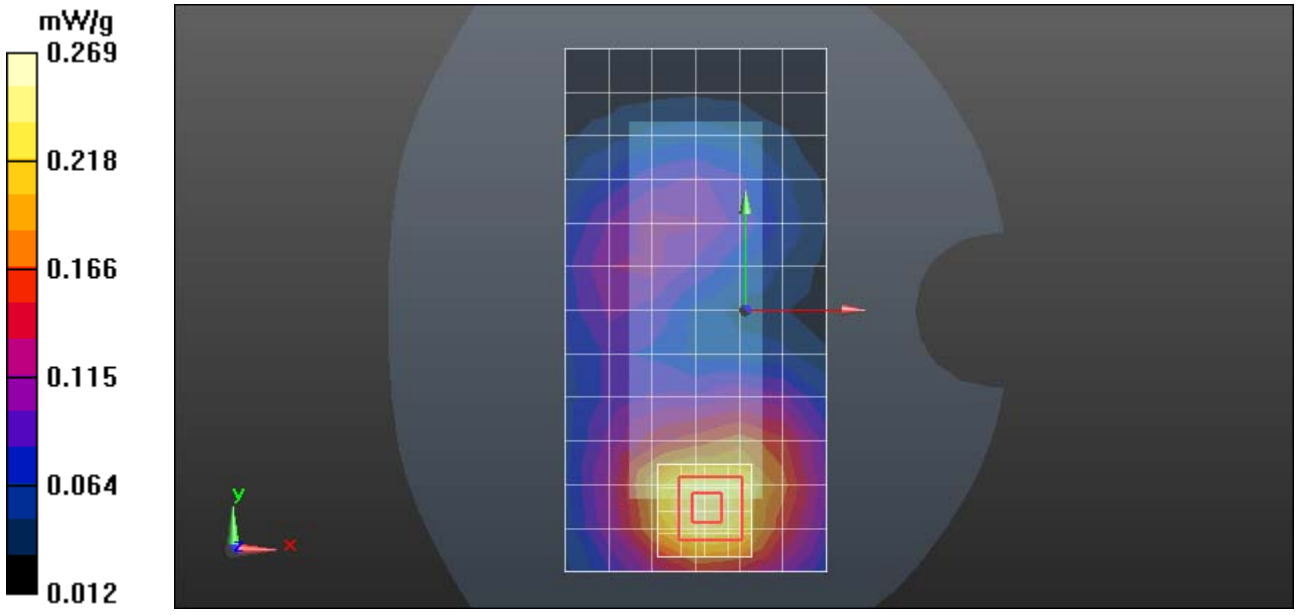
- Probe: ES3DV3 - SN3284; ConvF(5.33, 5.33, 5.33); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4 Glycol SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1162;
- ; SEMCAD X Version 14.6.5 (6469)

SAM Phone Against Flat Section/Area Scan - Normal Body (15mm) (13x7x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.240 mW/g

SAM Phone Against Flat Section/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.450 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 0.381 mW/g
SAR(1 g) = 0.250 mW/g; SAR(10 g) = 0.161 mW/g
Maximum value of SAR (measured) = 0.269 mW/g



Date/Time: 7/7/2012 12:29:43 AM

Serial: 352507050007739; Procedure Notes: Pwr Step: ALL UP; Battery Model #: SNN5875A; DEVICE POSITION: PTT 25mm away from phantom

Communication System: _WCDMA; Frequency: 1880 MHz; Communication System Channel Number: 9400; Duty Cycle: 1:1
Medium: Regular Glycol Head 1750/1880; Medium parameters used: f = 1880 MHz; σ = 1.46 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3

DASY4 Configuration:

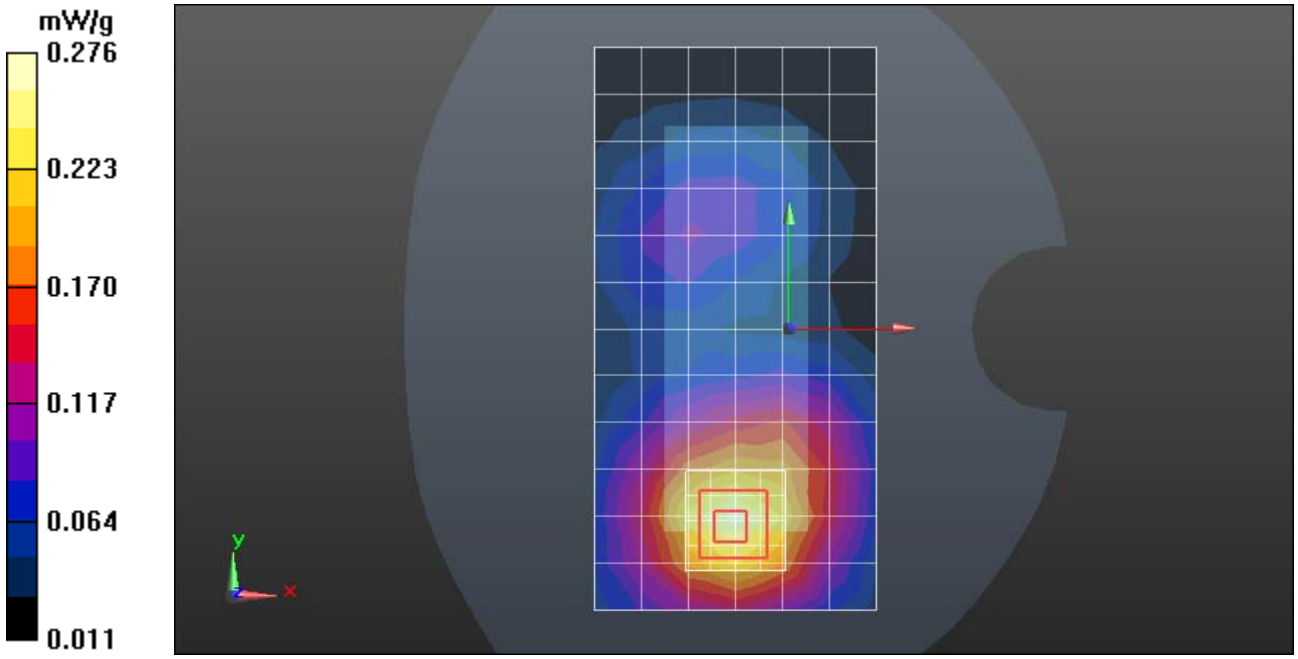
- Probe: ES3DV3 - SN3284; ConvF(5.33, 5.33, 5.33); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4 Glycol SAM (extended range), Rev.2 (24-Feb-12); Type: SAM v4.0; Serial: TP-1162;
- ; SEMCAD X Version 14.6.5 (6469)

SAM Phone Against Flat Section/Area Scan - Normal Body (15mm) (13x7x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.267 mW/g

SAM Phone Against Flat Section/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.632 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.410 mW/g
SAR(1 g) = 0.258 mW/g; SAR(10 g) = 0.161 mW/g
Maximum value of SAR (measured) = 0.276 mW/g



Appendix 3

SAR distribution plots for Body Worn Test Results

Date/Time: 7/24/2012 12:29:18 AM

Serial: 352507050007739; Procedure Notes: Pwr Step: 5; Battery Model #: SNN5875A; DEVICE POSITION: BodyWorn Back of Phone 25mm away from phantom

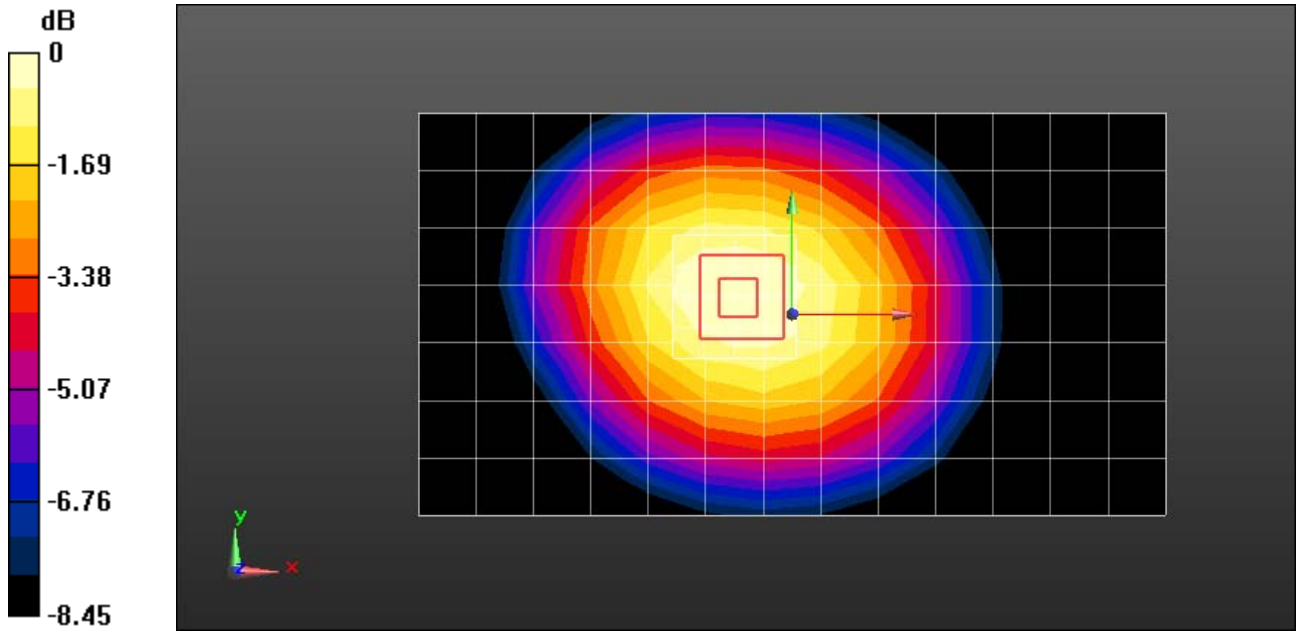
Communication System: _GSM; Frequency: 836.6 MHz; Communication System Channel Number: 190; Duty Cycle: 1:8.30042
Medium: Low Freq Body; Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 54.7; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(6.04, 6.04, 6.04); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#-1, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (14x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.427 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.012 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.545 mW/g
SAR(1 g) = 0.414 mW/g; SAR(10 g) = 0.306 mW/g
Maximum value of SAR (measured) = 0.436 mW/g



0 dB = 0.436 mW/g = -7.21 dB mW/g

Date/Time: 7/6/2012 8:18:33 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: ALL BITS; Battery Model #: SNN5875A; DEVICE POSITION: BodyWorn Back of Phone 25mm away from phantom

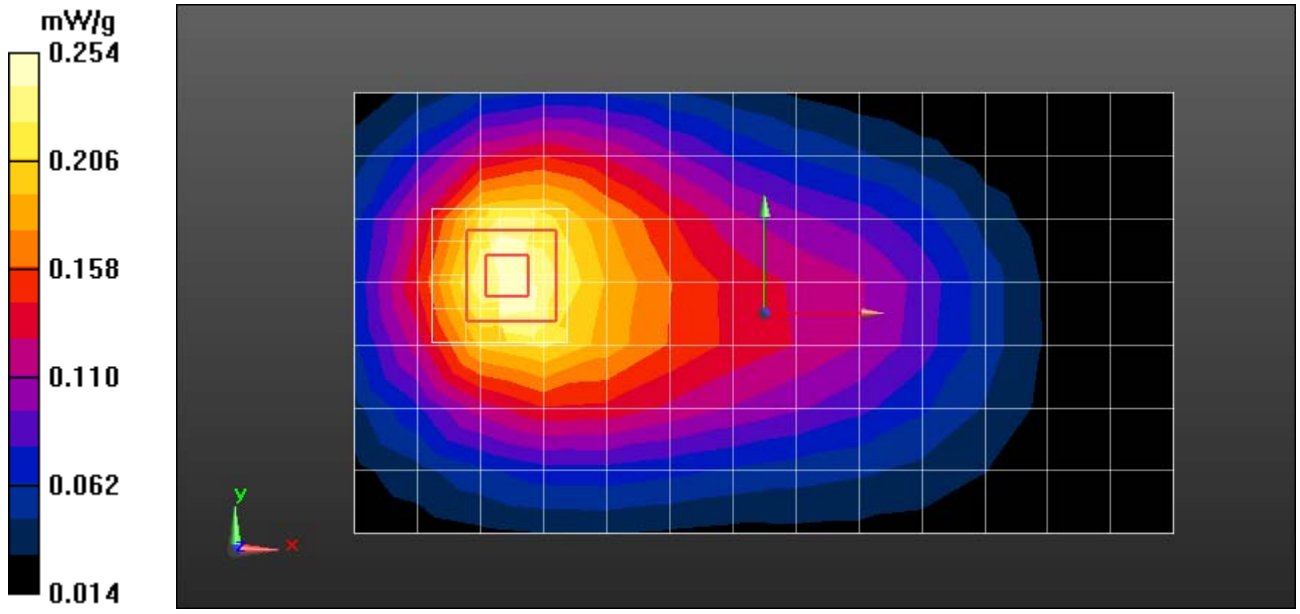
Communication System: _WCDMA; Frequency: 1732 MHz; Communication System Channel Number: 1413; Duty Cycle: 1:1
Medium: 1730 Glycol Body; Medium parameters used: f = 1730 MHz; σ = 1.49 mho/m; ε_r = 53.3; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3284; ConvF(5.28, 5.28, 5.28); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (14x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.236 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.197 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.352 mW/g
SAR(1 g) = 0.237 mW/g; SAR(10 g) = 0.157 mW/g
Maximum value of SAR (measured) = 0.254 mW/g



Date/Time: 7/6/2012 10:40:34 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: ALL BITS; Battery Model #: SNN5875A; DEVICE POSITION: BodyWorn Back of Phone 25mm away from phantom

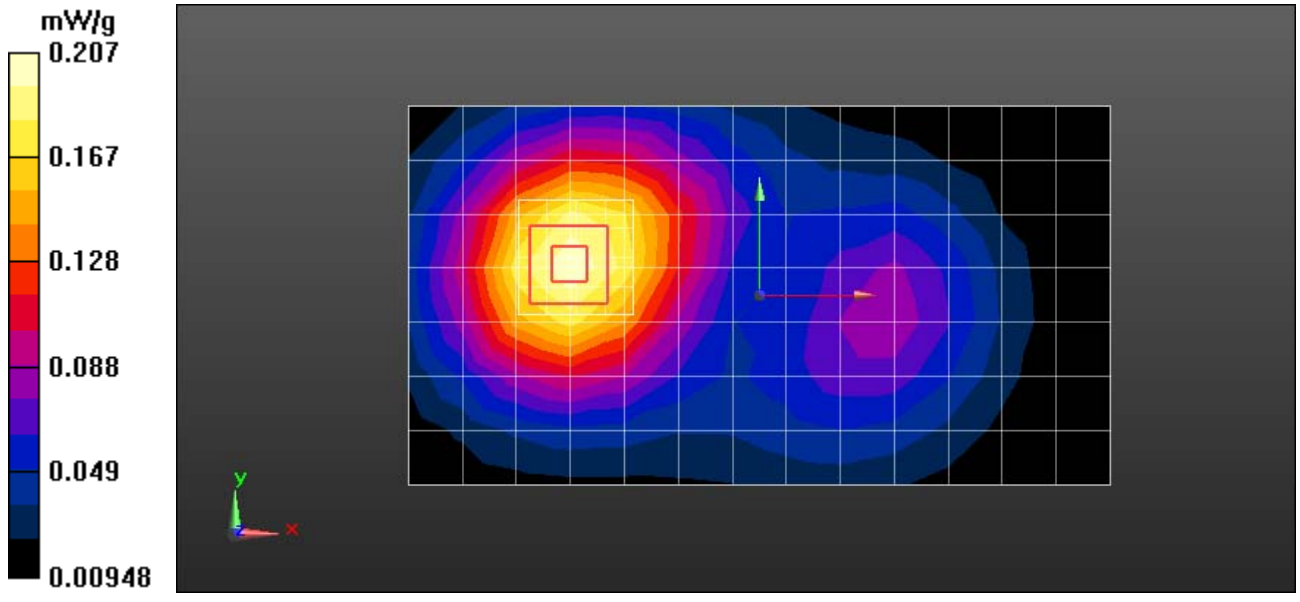
Communication System: _WCDMA; Frequency: 1880 MHz; Communication System Channel Number: 9400; Duty Cycle: 1:1
Medium: Regular Glycol Body 1750/1880; Medium parameters used: f = 1880 MHz; σ = 1.57 mho/m; ε_r = 51.8; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3284; ConvF(5.28, 5.28, 5.28); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (14x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.207 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.096 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.298 mW/g
SAR(1 g) = 0.195 mW/g; SAR(10 g) = 0.126 mW/g



Date/Time: 7/24/2012 2:56:20 AM

Serial: 352507050007739; Procedure Notes: Pwr Step: 0; Battery Model #: SNN5875A; DEVICE POSITION: BodyWorn Front of Phone 25mm away from phantom

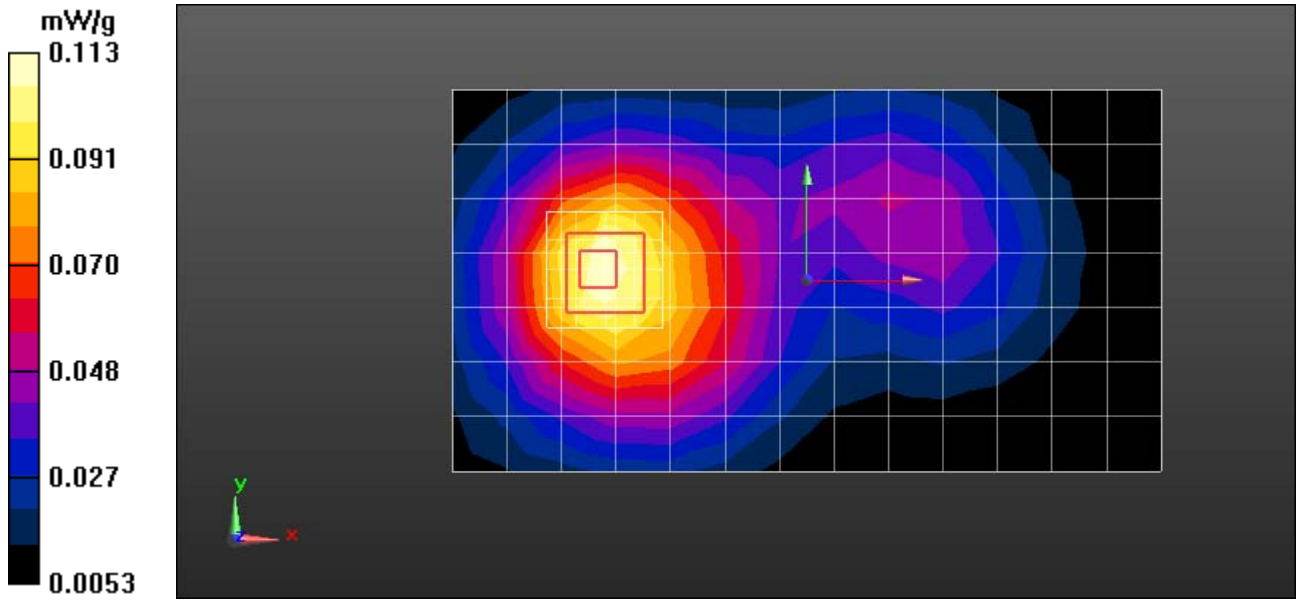
Communication System: _GSM; Frequency: 1880 MHz; Communication System Channel Number: 661; Duty Cycle: 1:8.30042
Medium: Regular Glycol Body 1750/1880; Medium parameters used: f = 1880 MHz; σ = 1.58 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(4.69, 4.69, 4.69); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#-1, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (14x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.110 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.027 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.164 mW/g
SAR(1 g) = 0.106 mW/g; SAR(10 g) = 0.068 mW/g
Maximum value of SAR (measured) = 0.113 mW/g



Date/Time: 7/10/2012 6:38:47 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: Battery Model #: SNN5875A; DEVICE POSITION: BODYWORN, FRONT OF PHONE 25MM AWAY FROM PHANTOM

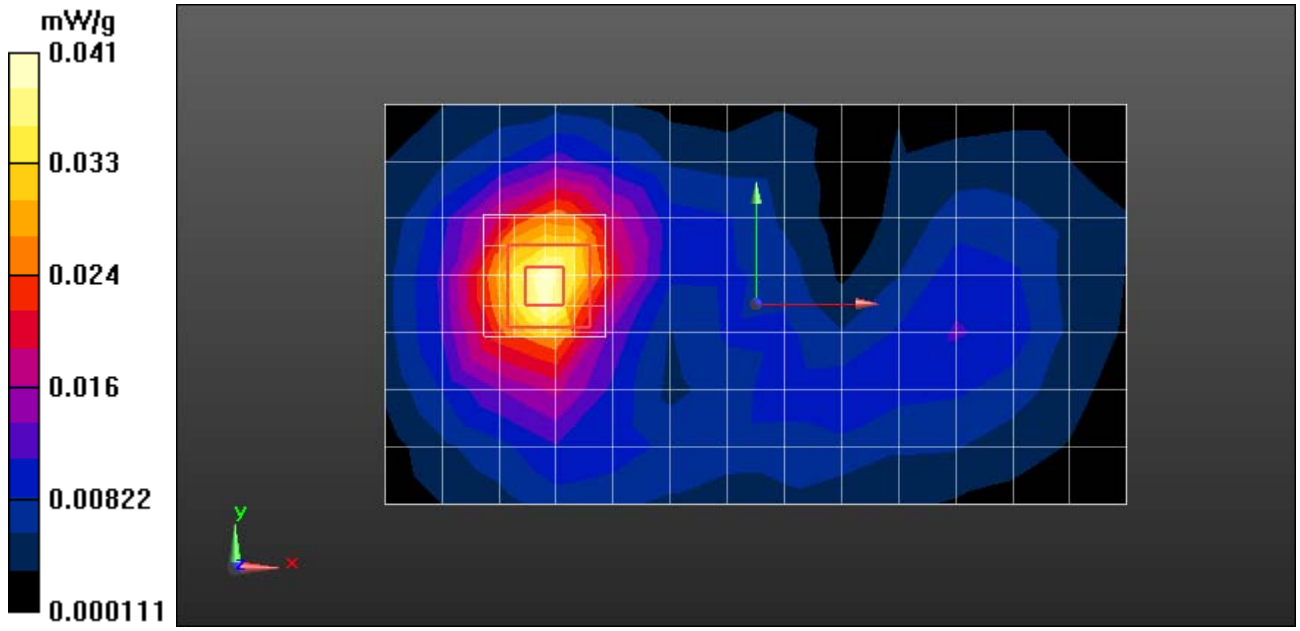
Communication System: _Wi-Fi 2450MHz; Frequency: 2437 MHz; Communication System Channel Number: 6; Duty Cycle: 1:1
Medium: 2450 Triton Body; Medium parameters used: f = 2450 MHz; σ = 2.04 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3115; ConvF(4.12, 4.12, 4.12); Calibrated: 1/11/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn699; Calibrated: 9/22/2011
- Phantom: R#2 Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (14x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.0397 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.807 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.071 mW/g
SAR(1 g) = 0.038 mW/g; SAR(10 g) = 0.021 mW/g
Maximum value of SAR (measured) = 0.0407 mW/g



Appendix 4

SAR distribution plots for Mobile Hotspot Test Results

Date/Time: 7/23/2012 9:56:21 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: 5; Battery Model #: SNN5875A; DEVICE POSITION: Mobile Hotspot, Back of Phone 10mm from phantom Mobile Hotspot

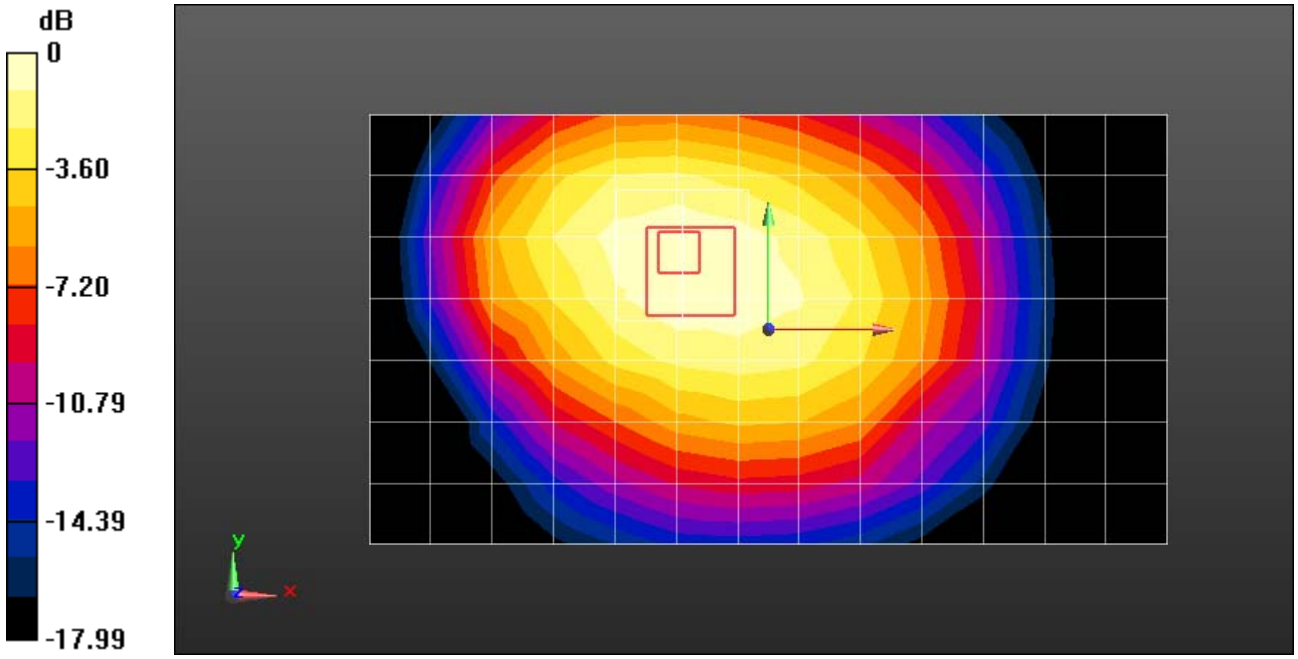
Communication System: _GPRS Class 12; Frequency: 836.6 MHz; Communication System Channel Number: 190; Duty Cycle: 1:2.07491
Medium: Low Freq Body; Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 54.7; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(6.04, 6.04, 6.04); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#-1, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (14x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.269 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.293 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.380 mW/g
SAR(1 g) = 0.269 mW/g; SAR(10 g) = 0.189 mW/g
Maximum value of SAR (measured) = 0.275 mW/g



0 dB = 0.275 mW/g = -11.21 dB mW/g

Date/Time: 7/10/2012 9:44:34 AM

Serial: 352507050007739; Procedure Notes: Pwr Step: ALL UP; Battery Model #: SNN5875A; DEVICE POSITION: Mobile Hotspot Back of Phone 10mm from Phantom

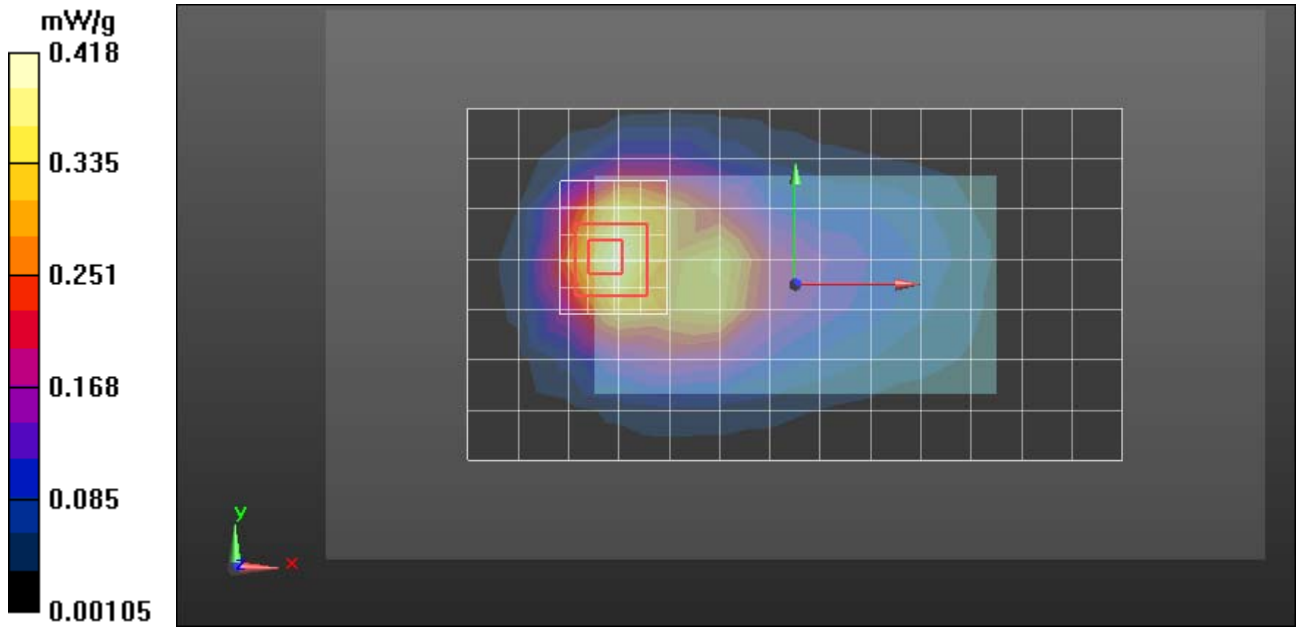
Communication System: _WCDMA; Frequency: 1732 MHz; Communication System Channel Number: 1413; Duty Cycle: 1:1
Medium: 1730 Glycol Body; Medium parameters used: f = 1730 MHz; σ = 1.53 mho/m; ε_r = 53; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3284; ConvF(5.28, 5.28, 5.28); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (14x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.418 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.493 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.662 mW/g
SAR(1 g) = 0.424 mW/g; SAR(10 g) = 0.250 mW/g
Maximum value of SAR (measured) = 0.458 mW/g



Date/Time: 7/9/2012 9:07:32 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: ALL UP; Battery Model #: SNN5875A; DEVICE POSITION: Mobile Hotspot, Bottom EDGE of Phone 10mm from phantom

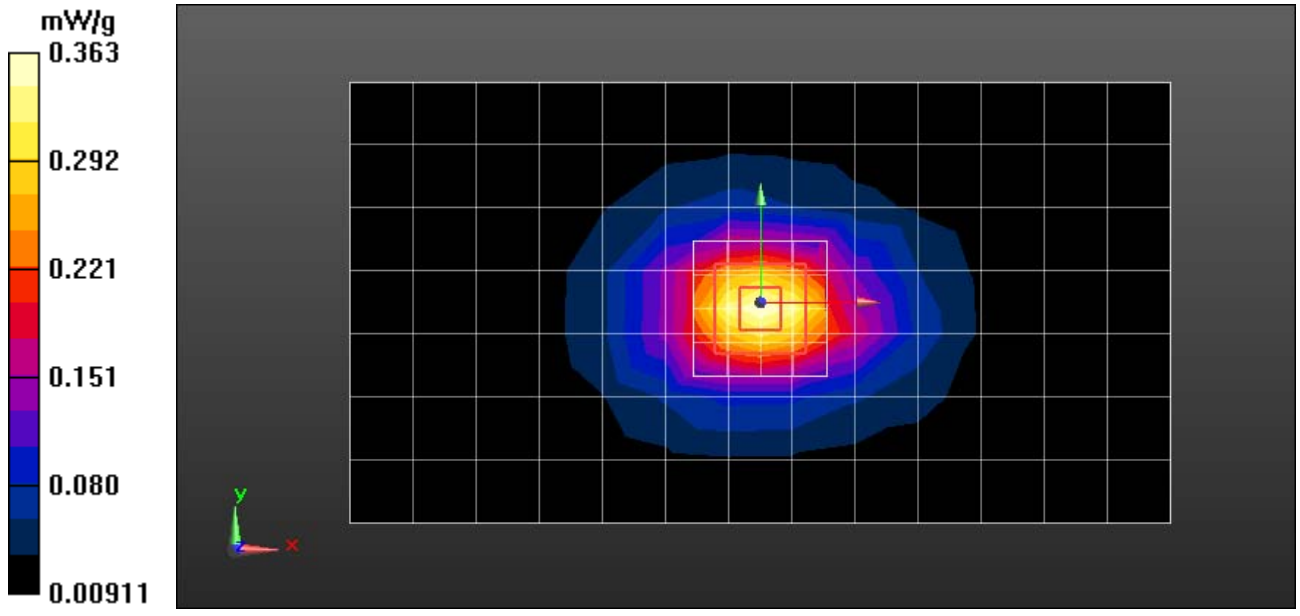
Communication System: _WCDMA; Frequency: 1880 MHz; Communication System Channel Number: 9400; Duty Cycle: 1:1
Medium: Regular Glycol Body 1750/1880; Medium parameters used: f = 1880 MHz; σ = 1.59 mho/m; ε_r = 51; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3284; ConvF(5.28, 5.28, 5.28); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (14x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.288 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.227 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.537 mW/g
SAR(1 g) = 0.328 mW/g; SAR(10 g) = 0.187 mW/g
Maximum value of SAR (measured) = 0.363 mW/g



Date/Time: 7/25/2012 9:35:06 PM

Serial: 352507050007739; Procedure Notes: Pwr Step: 0; Battery Model #: SNN5875A; DEVICE POSITION: Mobile Hotspot, Bottom Edge of Phone 10mm from phantom Hotspot

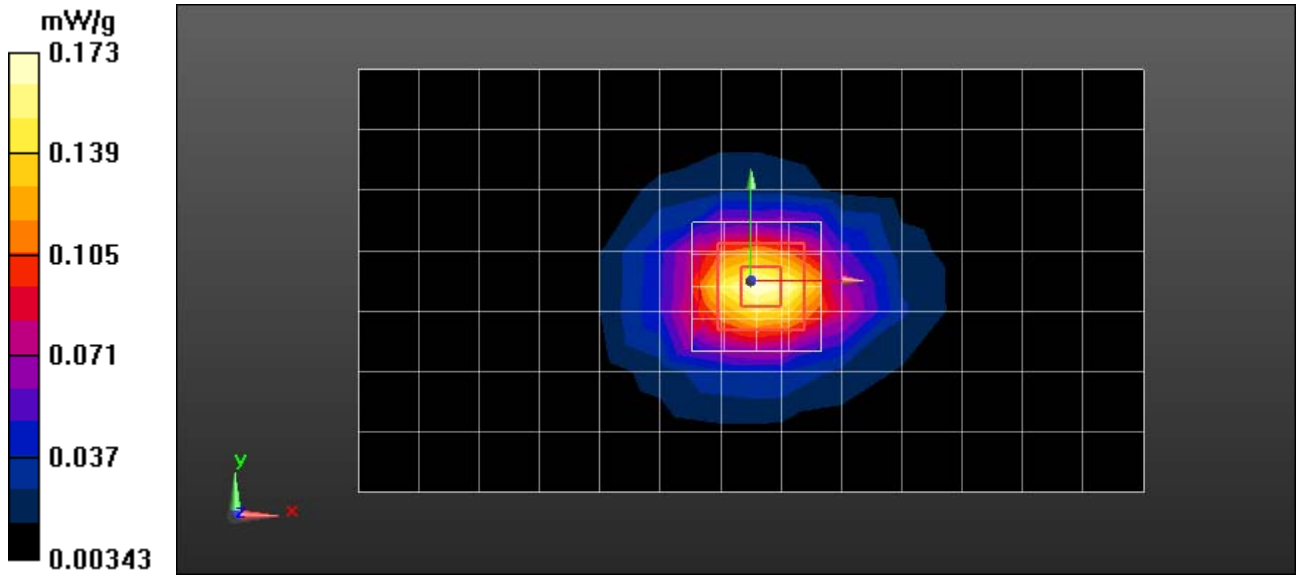
Communication System: _GPRS Class 12; Frequency: 1880 MHz; Communication System Channel Number: 661; Duty Cycle: 1:2.07491
Medium: Regular Glycol Body 1750/1880; Medium parameters used: f = 1880 MHz; σ = 1.58 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3115; ConvF(4.72, 4.72, 4.72); Calibrated: 1/11/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn699; Calibrated: 9/22/2011
- Phantom: R#2 Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (14x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.146 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.308 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 0.263 mW/g
SAR(1 g) = 0.156 mW/g; SAR(10 g) = 0.086 mW/g
Maximum value of SAR (measured) = 0.173 mW/g



Date/Time: 7/10/2012 3:48:16 PM

Serial: 352507050007739; Procedure Notes: Battery Model #: SNN5875A; DEVICE POSITION: MOBILE HOTSPOT, FRONT OF PHONE 10MM AWAY FROM PHANTOM

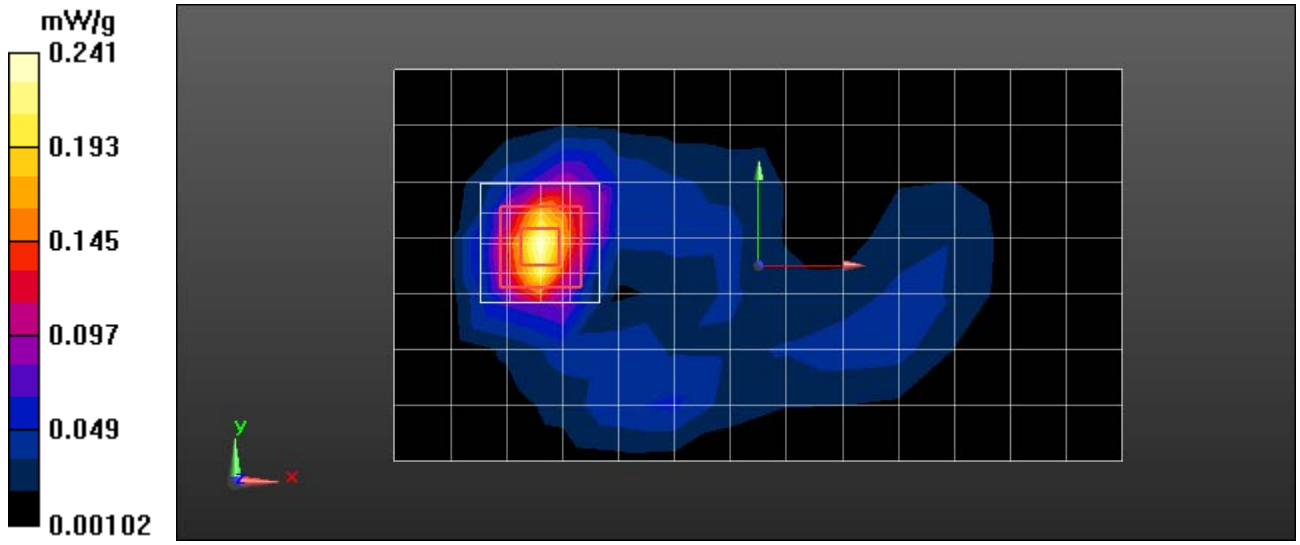
Communication System: _Wi-Fi 2450MHz; Frequency: 2462 MHz; Communication System Channel Number: 11; Duty Cycle: 1:1
Medium: 2450 Triton Body; Medium parameters used: f = 2450 MHz; σ = 2.04 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ES3DV3 - SN3115; ConvF(4.12, 4.12, 4.12); Calibrated: 1/11/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn699; Calibrated: 9/22/2011
- Phantom: R#2 Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (14x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.188 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.077 V/m; Power Drift = -0.26 dB
Peak SAR (extrapolated) = 0.451 mW/g
SAR(1 g) = 0.210 mW/g; SAR(10 g) = 0.095 mW/g
Maximum value of SAR (measured) = 0.241 mW/g



Appendix 5

Measurement Uncertainty Budget

{note: SAR drift = 0% due to correction for drift in SAR results, fcd being updated}

Uncertainty Budget for Device Under Test, for 735 MHz to 3 GHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	Description IEEE1528(2003) / IEC62209-1(2005)	**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 [ES3DV3]	E.2.1 / 7.2.1	6.0	N	1.00	1	1	6.0	6.0	∞
Axial Isotropy	E.2.2 / 7.2.1.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2 / 7.2.1.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3 / 7.2.1.5	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4 / 7.2.1.3	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5 / 7.2.1.4	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6 / 7.2.1.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7 / 7.2.1.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8 / 7.2.1.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1 / 7.2.3.6	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1 / 7.2.3.6	3.0	R	1.73	1	1	1.7	1.7	∞
Probe Positioner Mech. Tolerance	E.6.2 / 7.2.2.1	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t Phantom	E.6.3 / 7.2.2.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5 / 7.2.4	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2 / 7.2.2.4	3.4	N	1.00	1	1	3.4	3.4	79
Device Holder Uncertainty	E.4.1 / 7.2.2.4.2	4.5	N	1.00	1	1	4.5	4.5	11
SAR drift	6.6.2 / 7.2.3.5	0.0	R	1.73	1	1	0.0	0.0	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1 / 7.2.2.2	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2 / 7.2.3.3	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3 / 7.2.3.3	2.5	N	1.00	0.64	0.43	1.6	1.1	6
Liquid Permittivity (target)	E.3.2 / 7.2.3.4	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.2 / 7.2.3.4	2.3	N	1.00	0.6	0.49	1.4	1.1	6
Combined Standard Uncertainty			RSS				11	11	372
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				22	22	

Uncertainty Budget for Device Under Test for 3 to 6 GHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	Description IEC62209-2(2010)	**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 [EX3DV4]	7.2.2.1	6.6	N	1.00	1	1	6.6	6.6	∞
Axial Isotropy	7.2.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	7.2.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	7.2.2.6	2.0	R	1.73	1	1	1.2	1.2	∞
Linearity	7.2.2.5	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	7.2.2	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	7.2.2.7	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	7.2.2.8	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	7.2.2.9	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	7.2.4.5	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	7.2.4.5	3.0	R	1.73	1	1	1.7	1.7	∞
Probe Positioner Mech. Tolerance	7.2.3.1	1.0	R	1.73	1	1	0.6	0.6	∞
Probe Positioning w.r.t Phantom	7.2.3.3	4.0	R	1.73	1	1	2.3	2.3	∞
Max. SAR Evaluation (ext., int., avg.)	7.2.5.3	4.0	R	1.73	1	1	2.3	2.3	∞
Test sample Related									
Test Sample Positioning	7.2.3.4	3.4	N	1.00	1	1	3.4	3.4	79
Device Holder Uncertainty	7.2.3.4	4.5	N	1.00	1	1	4.5	4.5	11
SAR drift	7.2.2.10	0.0	R	1.73	1	1	0.0	0.0	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	7.2.3.2	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)		5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	7.2.4.3	3.4	N	1.00	0.64	0.43	2.2	1.5	6
Liquid Permittivity (target)		10.0	R	1.73	0.6	0.49	3.5	2.8	∞
Liquid Permittivity (measurement)	7.2.4.3	2.6	N	1.00	0.6	0.49	1.6	1.3	6
Combined Standard Uncertainty			RSS				12	12	508
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				24	24	

Appendix 6

Probe Calibration Certificate

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

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

Accredited by the Swiss 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: **ES3-3284_Jan12**

CALIBRATION CERTIFICATE

Object ES3DV3 - SN:3284

Calibration procedure(s) QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: January 10, 2012

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: January 10, 2012

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

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

Accredited by the Swiss Accreditation Service (SAS) **Accreditation No.: SCS 108**
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect 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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *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 ES3DV3

SN:3284

Manufactured: June 7, 2010
Calibrated: January 10, 2012

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3284

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.24	1.22	1.10	± 10.1 %
DCP (mV)[B]	104.0	99.5	102.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	109.4	±2.5 %
			Y	0.00	0.00	1.00	110.9	
			Z	0.00	0.00	1.00	105.7	

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 Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3284

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.44	6.44	6.44	0.80	1.20	± 12.0 %
835	41.5	0.90	6.18	6.18	6.18	0.80	1.18	± 12.0 %
1810	40.0	1.40	5.33	5.33	5.33	0.80	1.22	± 12.0 %
1950	40.0	1.40	5.08	5.08	5.08	0.80	1.24	± 12.0 %
2450	39.2	1.80	4.56	4.56	4.56	0.80	1.25	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3284

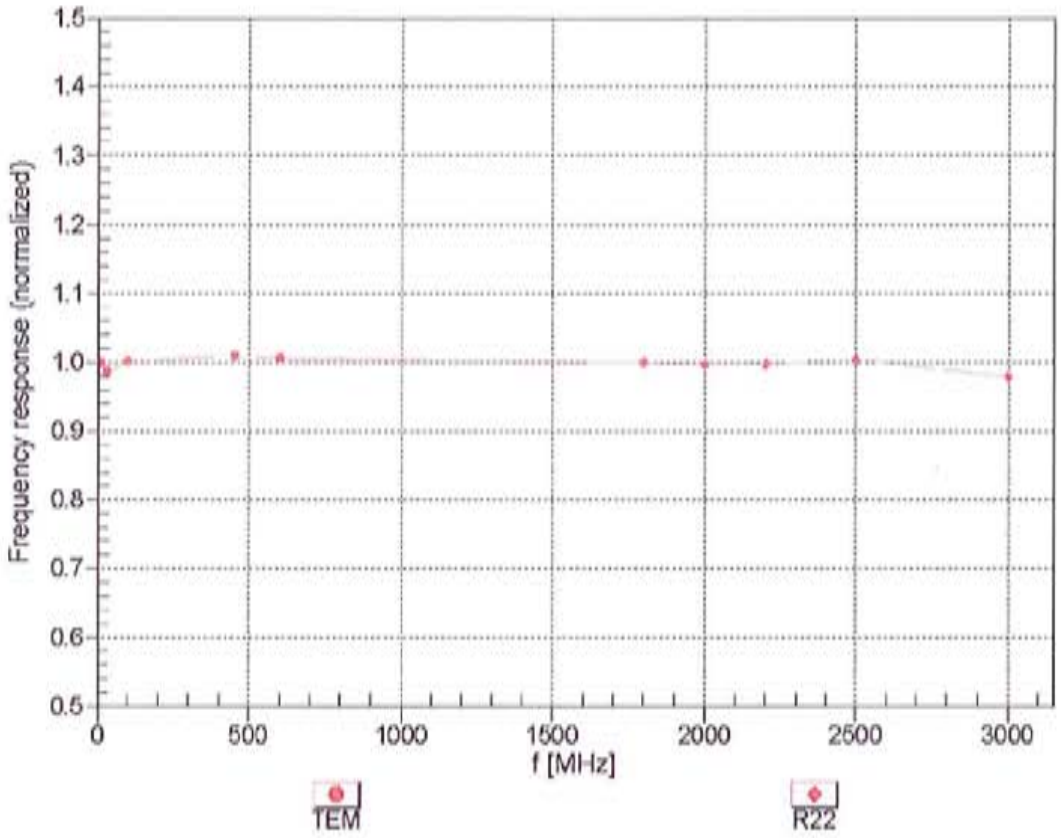
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.36	6.36	6.36	0.80	1.00	± 12.0 %
835	55.2	0.97	6.28	6.28	6.28	0.80	1.00	± 12.0 %
1810	53.3	1.52	5.28	5.28	5.28	0.80	1.40	± 12.0 %
1950	53.3	1.52	5.20	5.20	5.20	0.69	1.49	± 12.0 %
2450	52.7	1.95	4.56	4.56	4.56	0.80	1.00	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

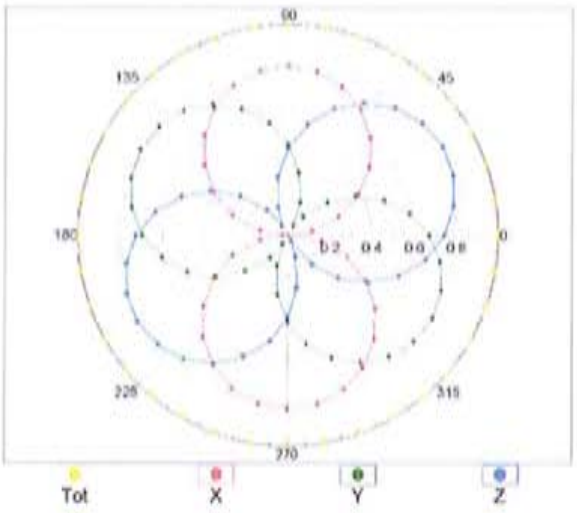
(TEM-Cell:ifi110 EXX, Waveguide: R22)



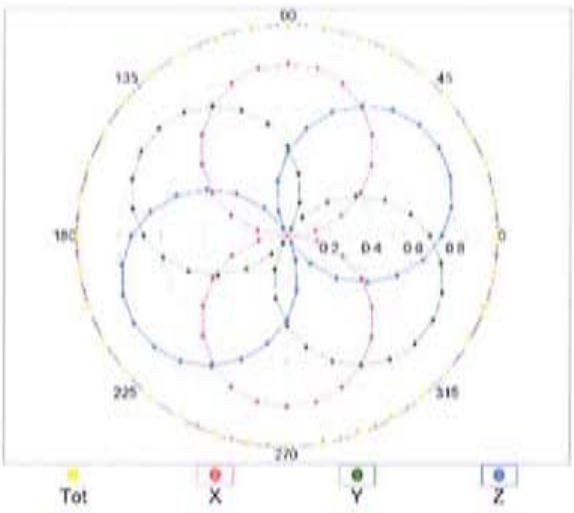
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

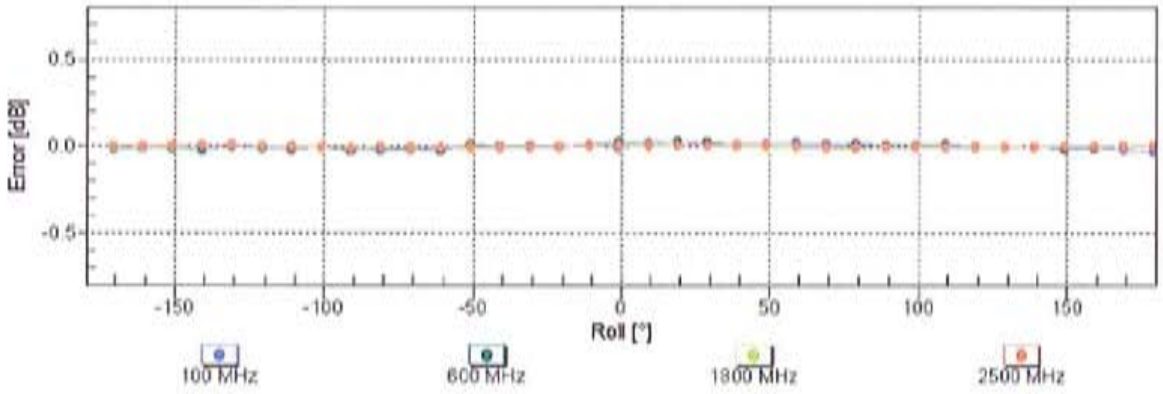
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



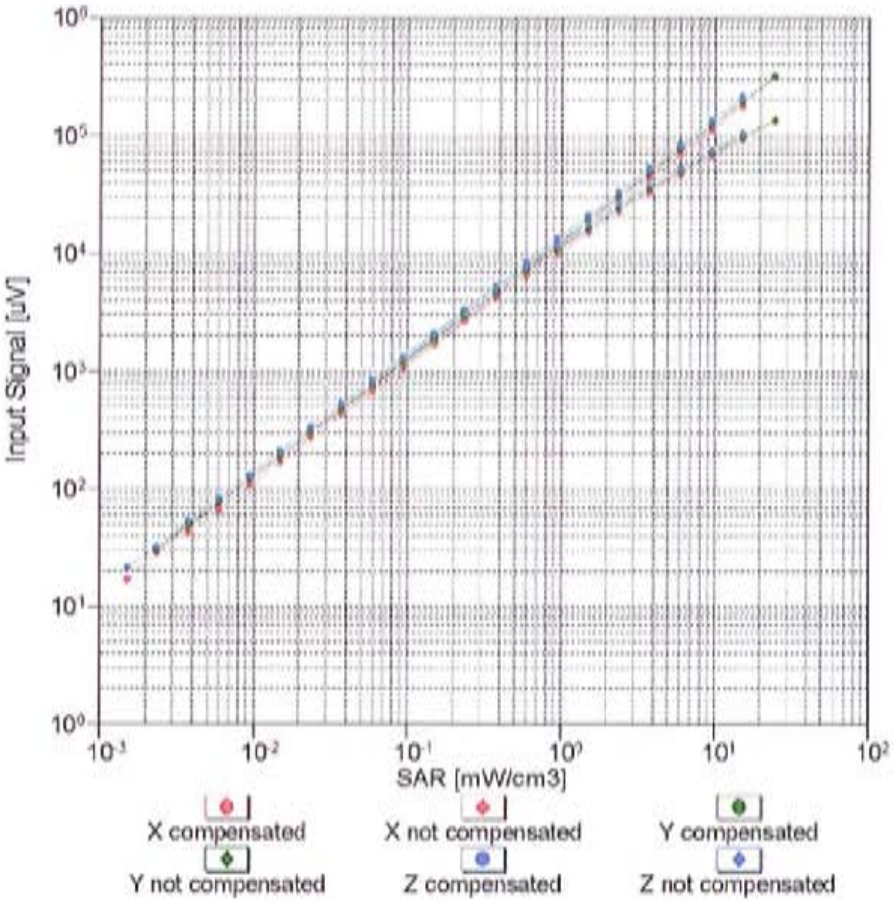
f=1800 MHz,R22

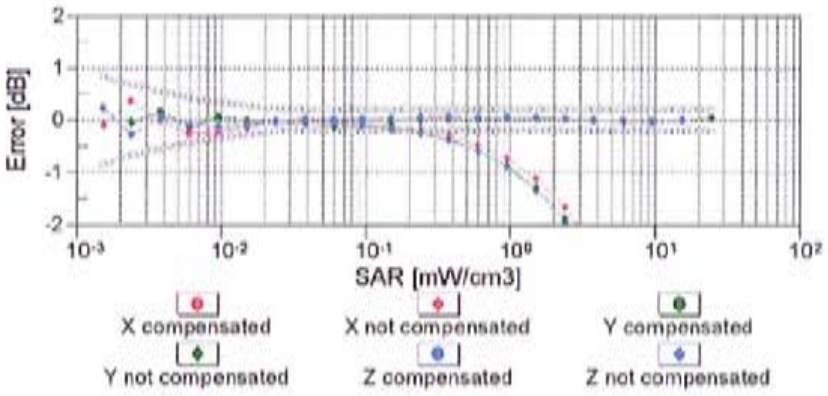




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)
(TEM cell , f = 900 MHz)

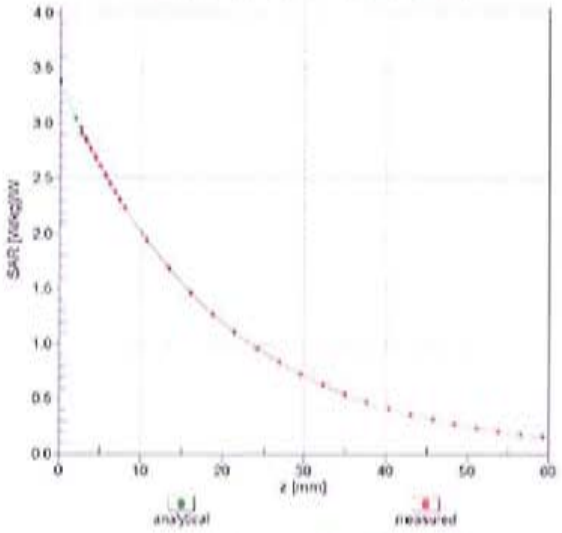




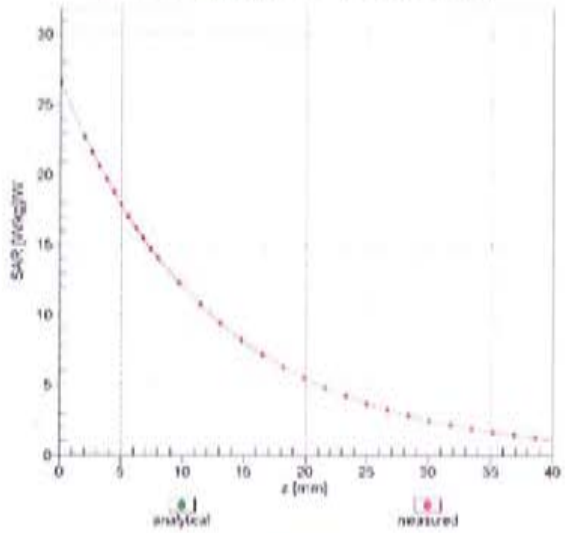
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

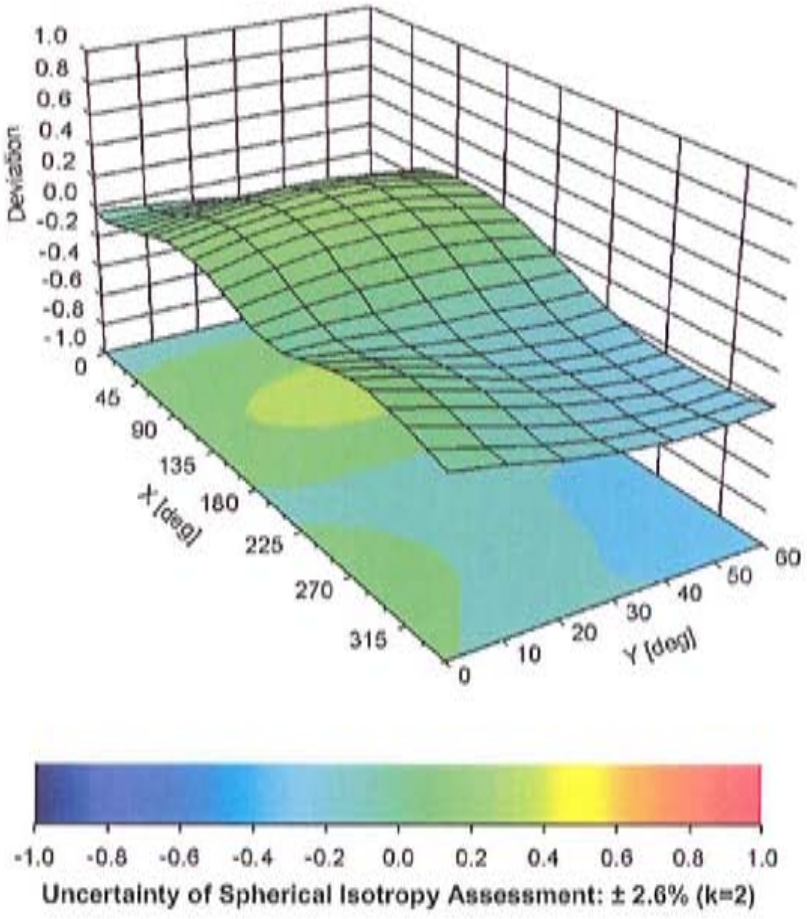


f = 1810 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3284

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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S Swiss Calibration Service

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Accreditation No.: **SCS 108**

Client **Motorola MDb**

Certificate No: **ES3-3124_Aug11**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3124
Calibration procedure(s)	QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	August 23, 2011

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: August 23, 2011

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

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z*: Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect 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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *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 ES3DV3

SN:3124

Manufactured: July 11, 2006
Calibrated: August 23, 2011

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3124

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.26	1.30	1.30	± 10.1 %
DCP (mV)[B]	100.9	98.2	100.9	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	116.0	±2.7 %
			Y	0.00	0.00	1.00	109.7	
			Z	0.00	0.00	1.00	115.4	

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 Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3124

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.26	6.26	6.26	1.00	1.00	± 12.0 %
835	41.5	0.90	6.08	6.08	6.08	1.00	1.00	± 12.0 %
1810	40.0	1.40	5.03	5.03	5.03	1.00	1.12	± 12.0 %
1950	40.0	1.40	4.83	4.83	4.83	1.00	1.12	± 12.0 %
2450	39.2	1.80	4.40	4.40	4.40	1.00	1.12	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: ES3DV3- SN:3124

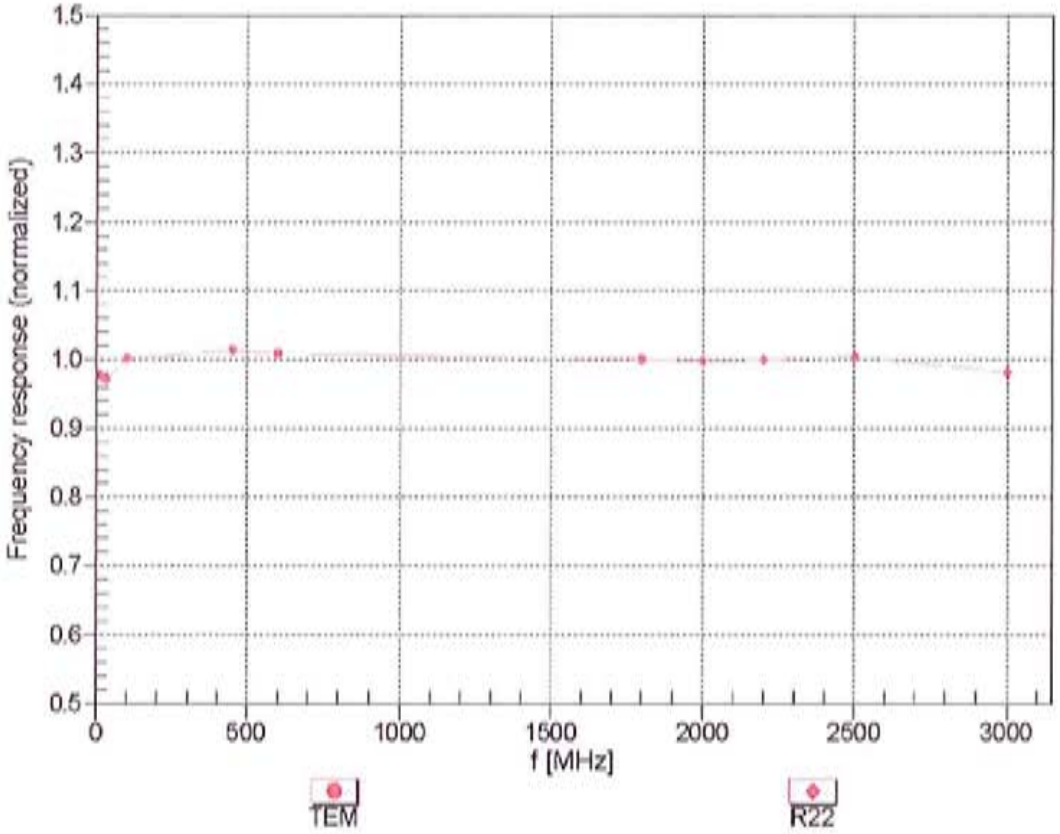
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.09	6.09	6.09	1.00	1.00	± 12.0 %
835	55.2	0.97	6.04	6.04	6.04	1.00	1.00	± 12.0 %
1810	53.3	1.52	4.69	4.69	4.69	1.00	1.18	± 12.0 %
1950	53.3	1.52	4.70	4.70	4.70	1.00	1.16	± 12.0 %
2450	52.7	1.95	4.21	4.21	4.21	1.00	1.00	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

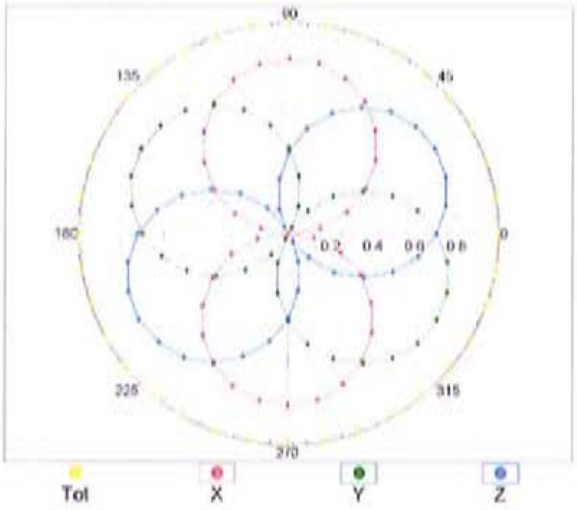
(TEM-Cell:ifi110 EXX, Waveguide: R22)



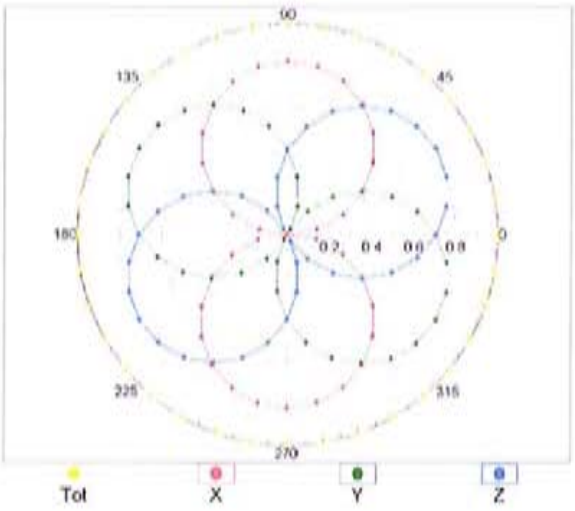
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

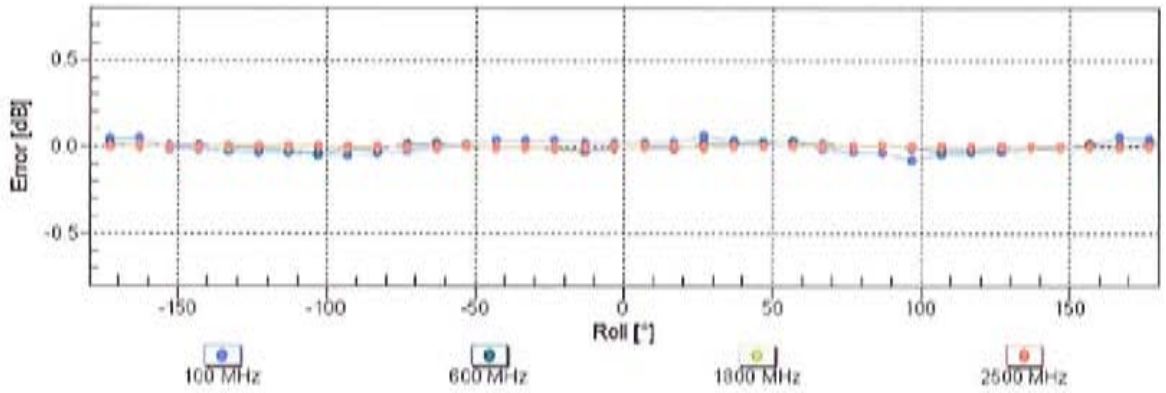
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



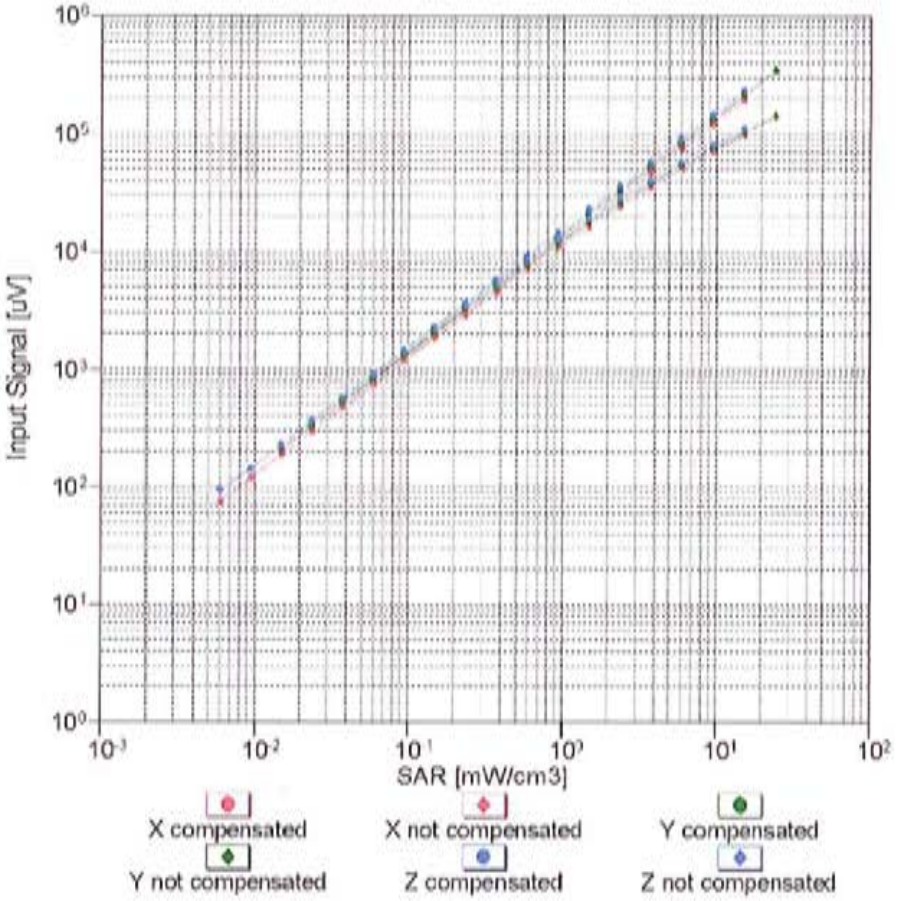
f=1800 MHz,R22

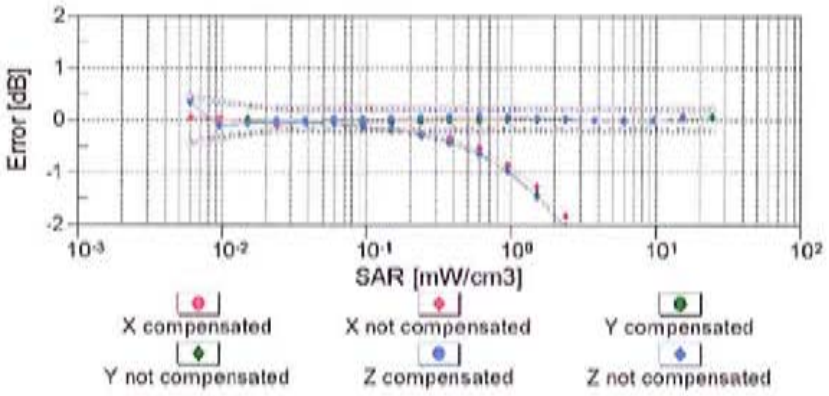




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

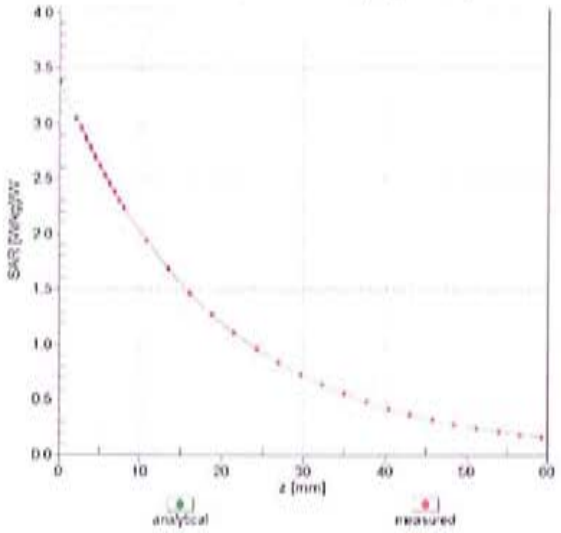




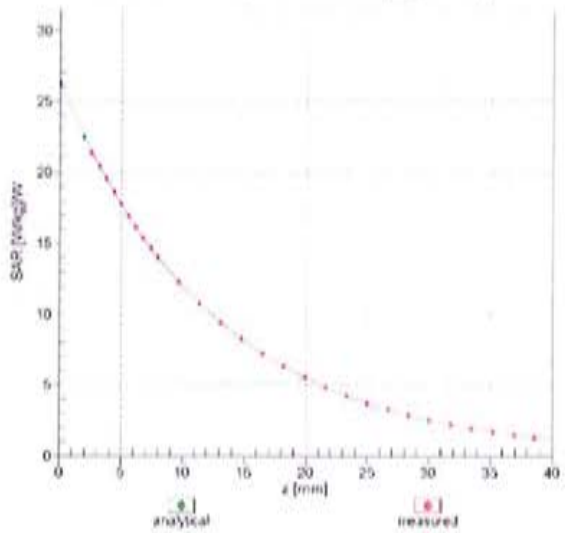
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

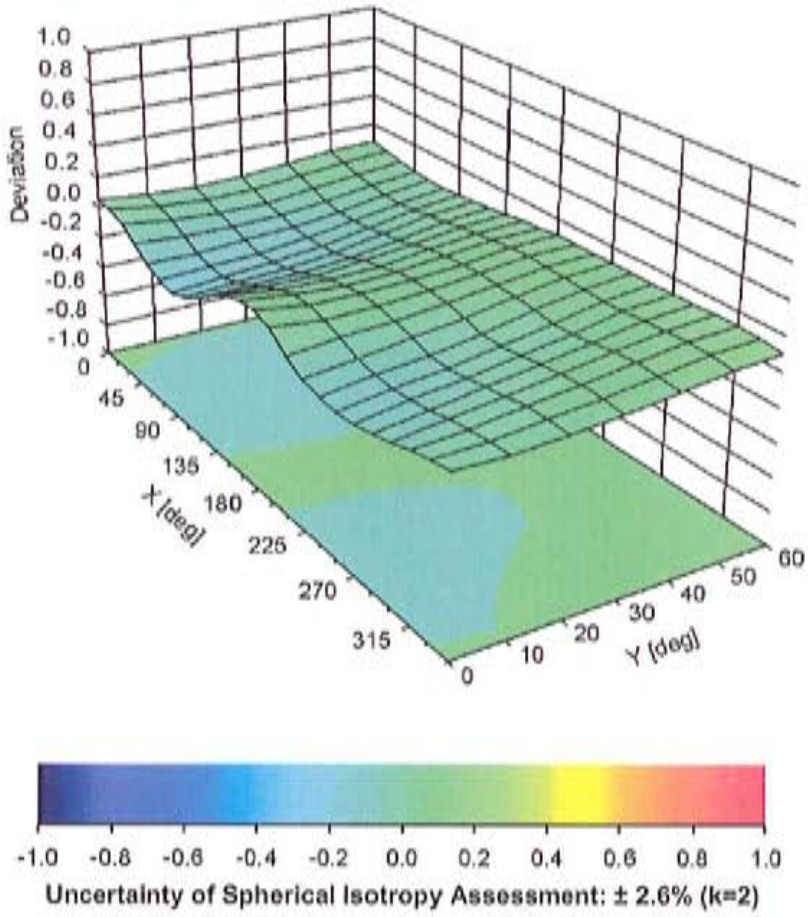


f = 1810 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3124

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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Accreditation No.: SCS 108

Client: Motorola MDb

Certificate No: ES3-3115_Jan12

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3115

Calibration procedure(s): QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: January 11, 2012

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: January 12, 2012

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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
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect 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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV3

SN:3115

Manufactured: March 6, 2006
Calibrated: January 11, 2012

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3115

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.30	1.26	1.17	± 10.1 %
DCP (mV)[B]	105.1	102.3	102.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	118.8	±3.0 %
			Y	0.00	0.00	1.00	107.0	
			Z	0.00	0.00	1.00	110.1	

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 Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3115

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.05	6.05	6.05	0.35	1.73	± 12.0 %
835	41.5	0.90	5.83	5.83	5.83	0.69	1.20	± 12.0 %
1810	40.0	1.40	5.17	5.17	5.17	0.80	1.19	± 12.0 %
1950	40.0	1.40	4.81	4.81	4.81	0.72	1.26	± 12.0 %
2450	39.2	1.80	4.35	4.35	4.35	0.80	1.32	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3115

Calibration Parameter Determined in Body Tissue Simulating Media

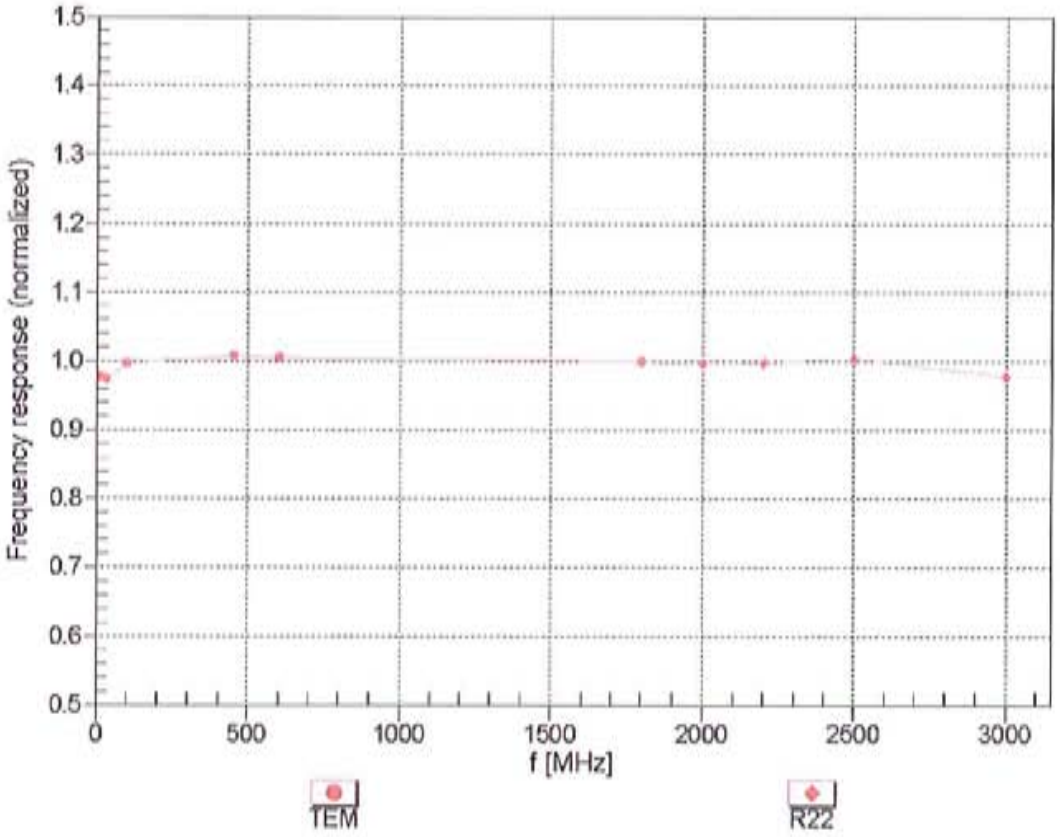
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	5.97	5.97	5.97	0.43	1.57	± 12.0 %
835	55.2	0.97	5.89	5.89	5.89	0.67	1.27	± 12.0 %
1810	53.3	1.52	4.72	4.72	4.72	0.56	1.49	± 12.0 %
1950	53.3	1.52	4.67	4.67	4.67	0.37	1.87	± 12.0 %
2450	52.7	1.95	4.12	4.12	4.12	0.80	1.05	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

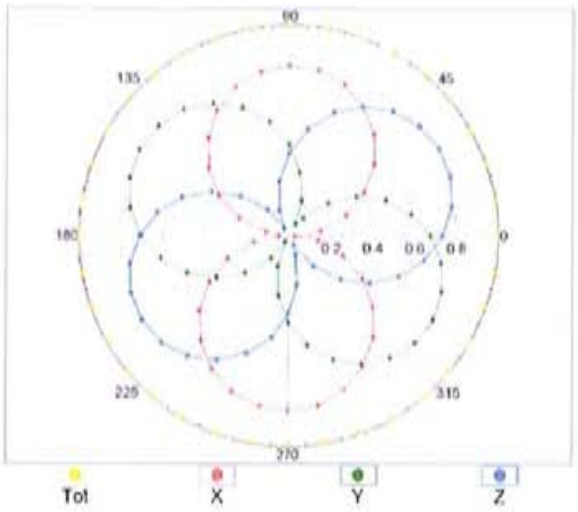
(TEM-Cell:ifi110 EXX, Waveguide: R22)



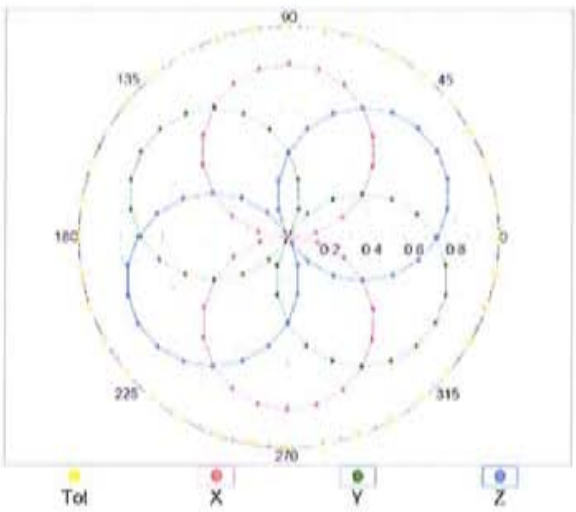
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

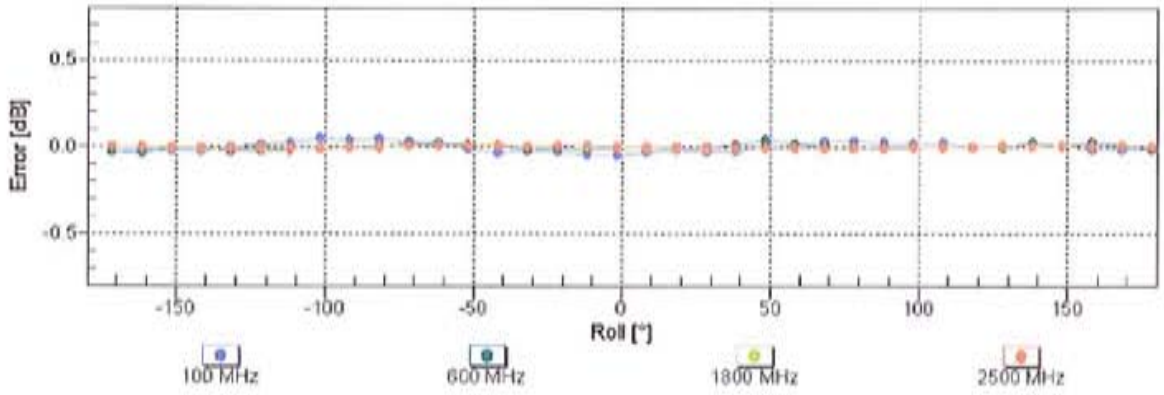
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



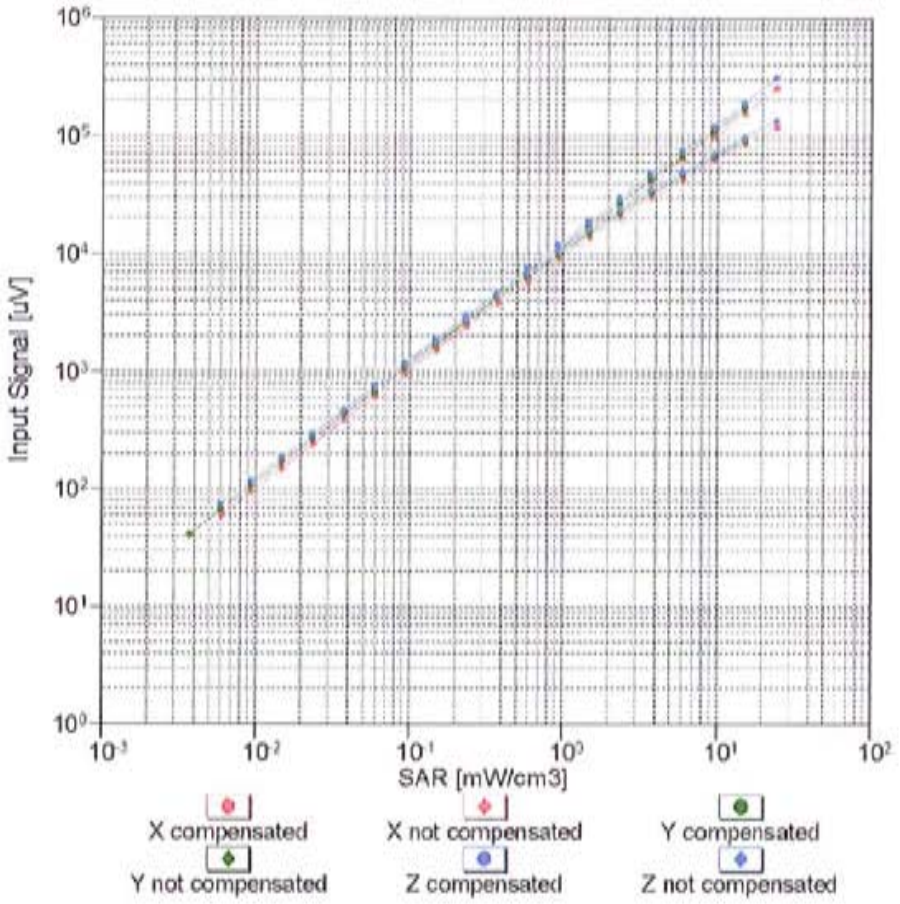
f=1800 MHz,R22

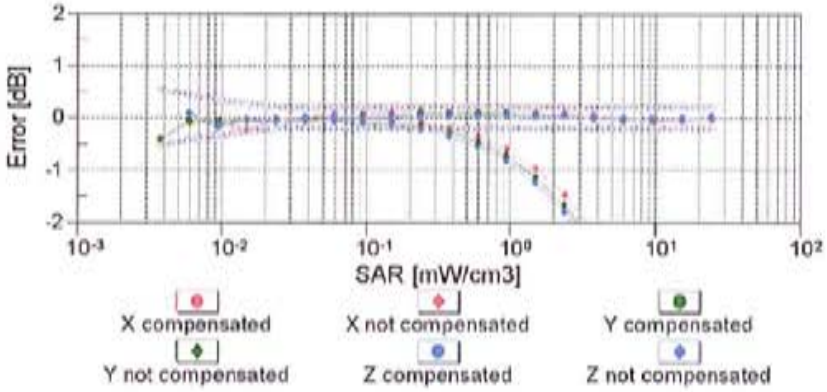




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

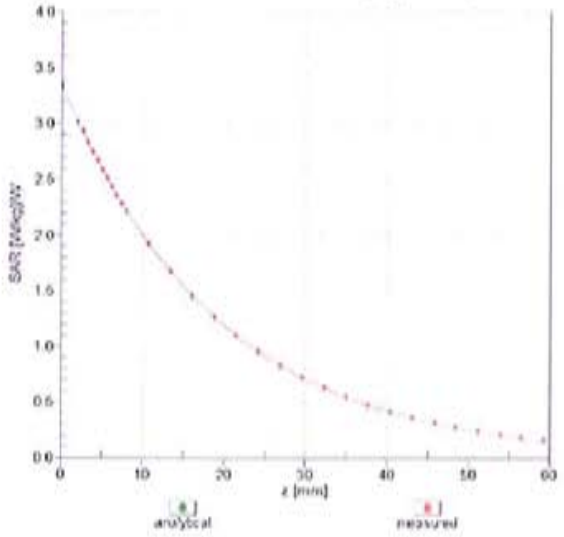




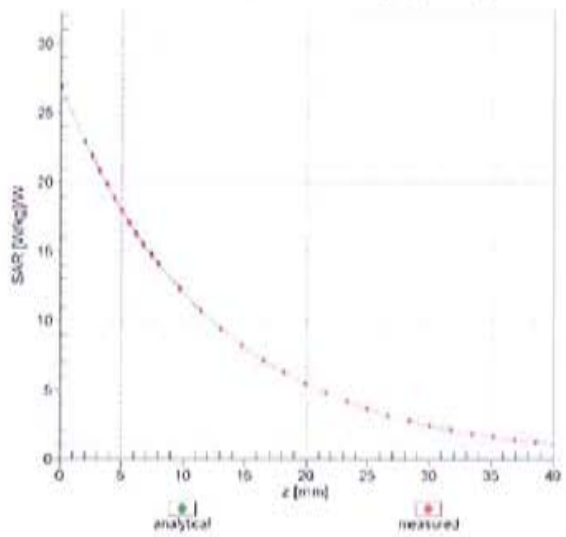
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

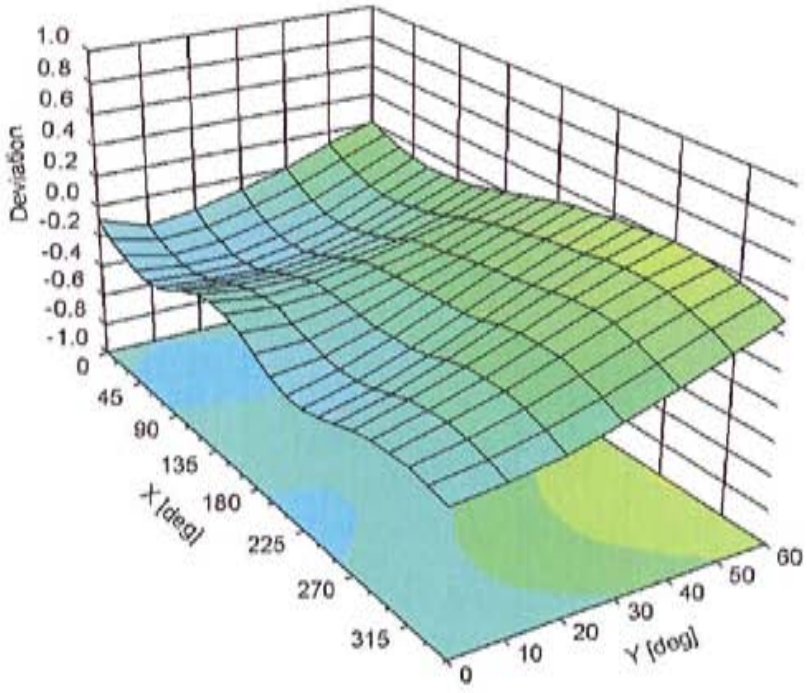


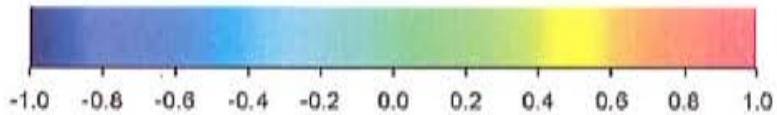
f = 1810 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3115

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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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: EX3-3728_Apr12

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3728

Calibration procedure(s): QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: April 24, 2012

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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	10-Jan-12 (No. DAE4-660_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: April 25, 2012

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S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) **Accreditation No.: SCS 108**
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect 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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *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 EX3DV4

SN:3728

Manufactured: October 19, 2009
Calibrated: April 24, 2012

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3728

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.48	0.45	0.50	± 10.1 %
DCP (mV)[B]	99.3	100.3	102.1	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	155.3	±3.3 %
			Y	0.00	0.00	1.00	155.9	
			Z	0.00	0.00	1.00	120.3	

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 Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3728

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	9.24	9.24	9.24	0.50	0.76	± 12.0 %
835	41.5	0.90	8.83	8.83	8.83	0.32	0.97	± 12.0 %
1810	40.0	1.40	7.61	7.61	7.61	0.80	0.58	± 12.0 %
1950	40.0	1.40	7.43	7.43	7.43	0.77	0.57	± 12.0 %
2450	39.2	1.80	6.86	6.86	6.86	0.25	0.98	± 12.0 %
2600	39.0	1.96	6.71	6.71	6.71	0.35	0.86	± 12.0 %
5200	36.0	4.66	4.74	4.74	4.74	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.43	4.43	4.43	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.14	4.14	4.14	0.50	1.80	± 13.1 %
5800	35.3	5.27	4.23	4.23	4.23	0.45	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3728

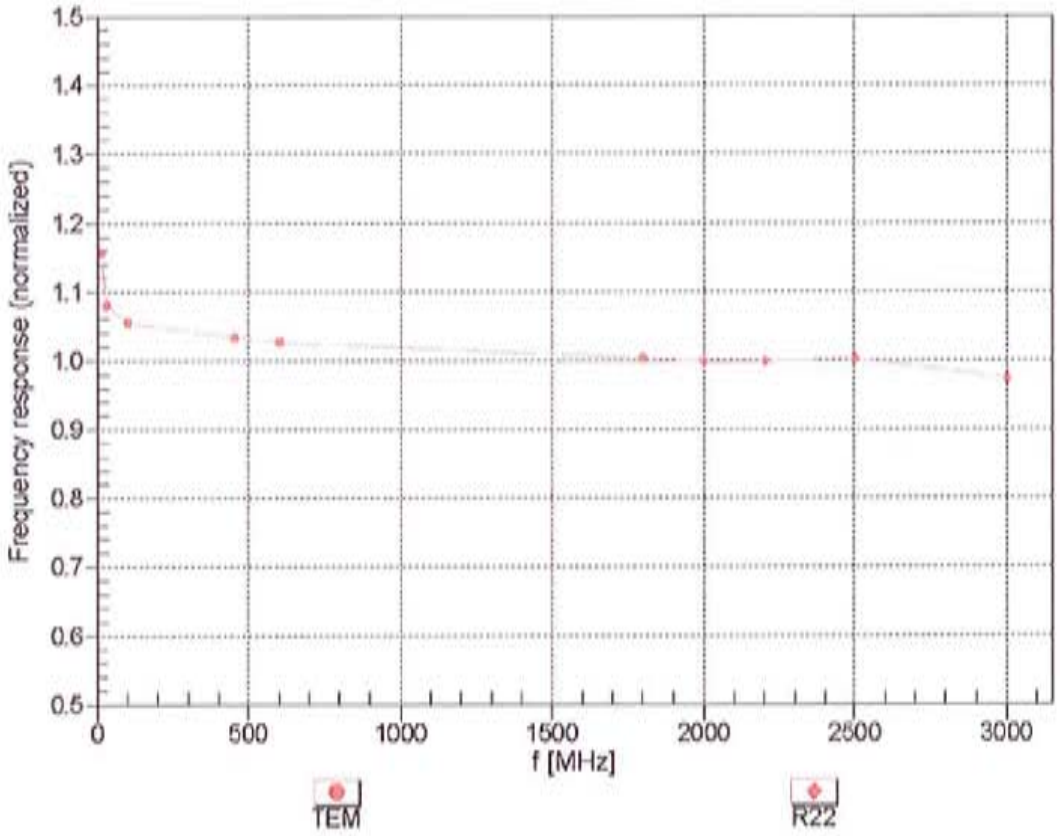
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	9.16	9.16	9.16	0.25	1.16	± 12.0 %
835	55.2	0.97	9.05	9.05	9.05	0.36	0.97	± 12.0 %
1810	53.3	1.52	7.29	7.29	7.29	0.28	1.10	± 12.0 %
1950	53.3	1.52	7.31	7.31	7.31	0.40	0.89	± 12.0 %
2450	52.7	1.95	6.84	6.84	6.84	0.80	0.50	± 12.0 %
2600	52.5	2.16	6.45	6.45	6.45	0.80	0.57	± 12.0 %
5200	49.0	5.30	4.22	4.22	4.22	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.11	4.11	4.11	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.37	3.37	3.37	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.71	3.71	3.71	0.60	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

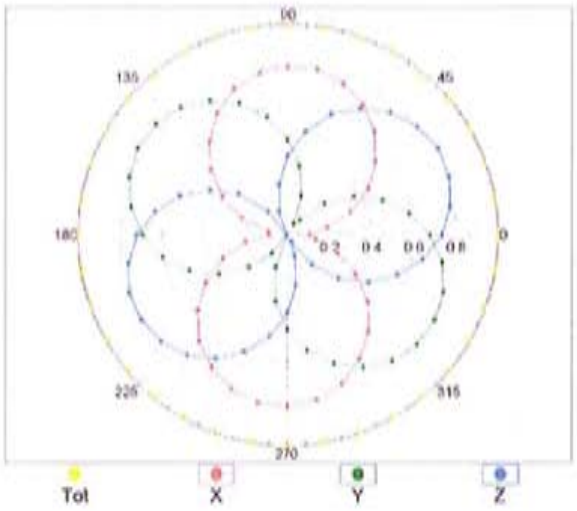
(TEM-Cell:ifi110 EXX, Waveguide: R22)



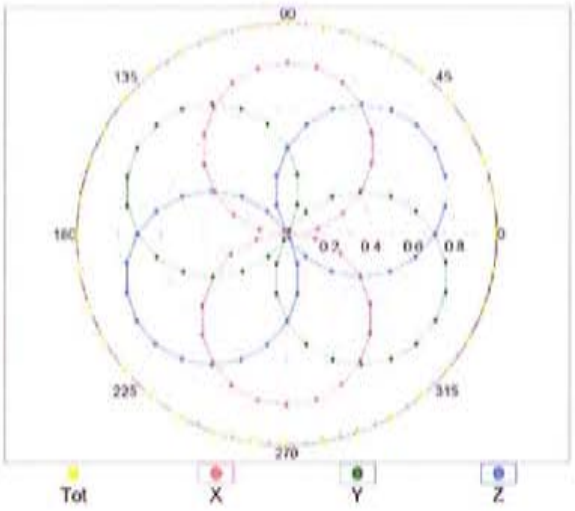
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

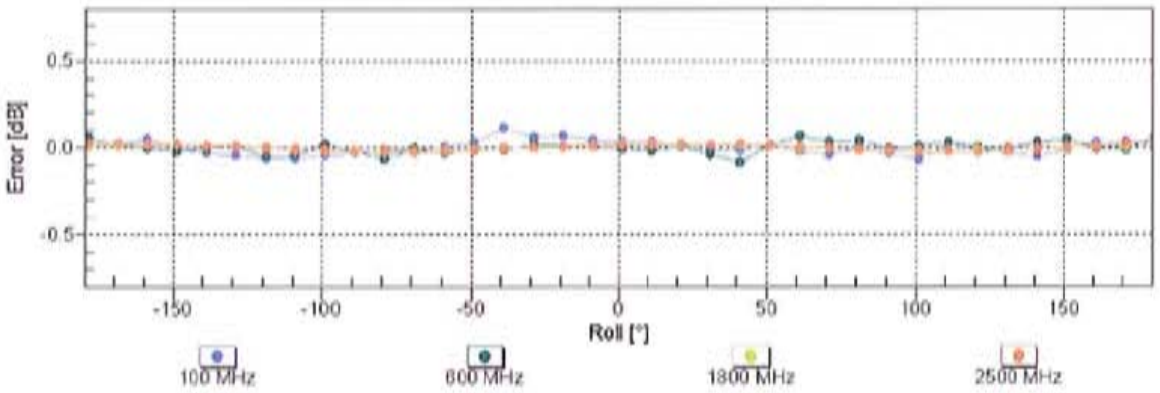
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



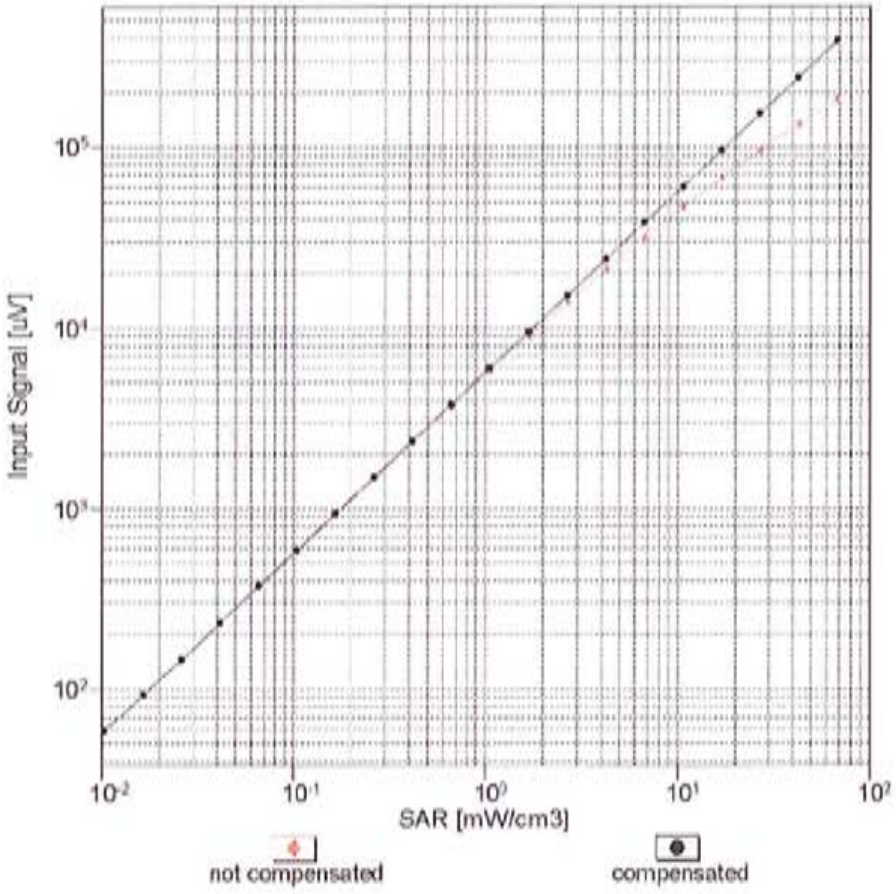
f=1800 MHz,R22

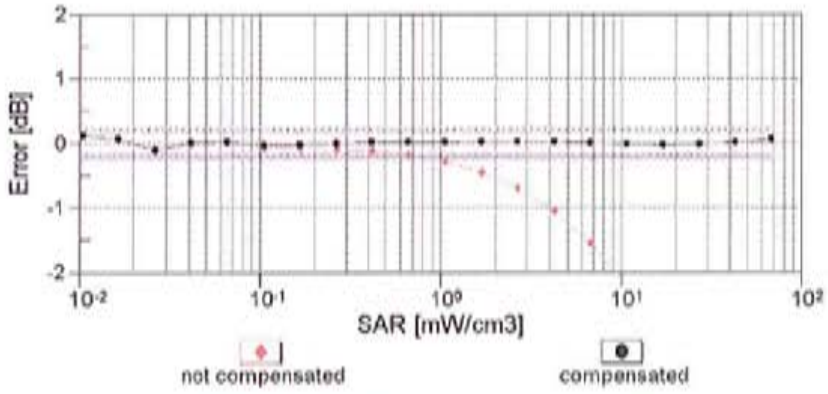




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

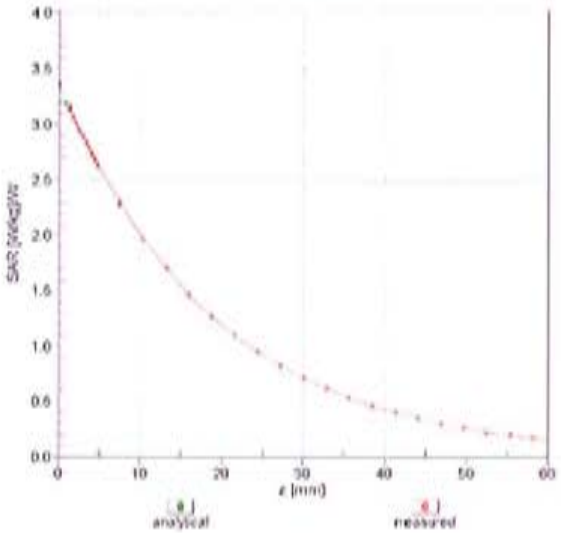




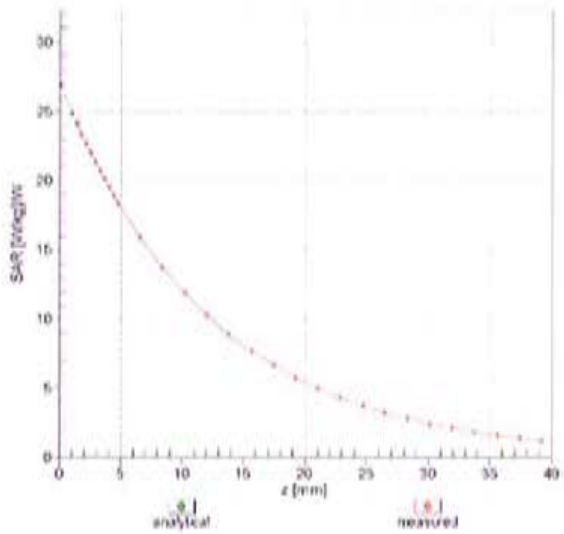
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

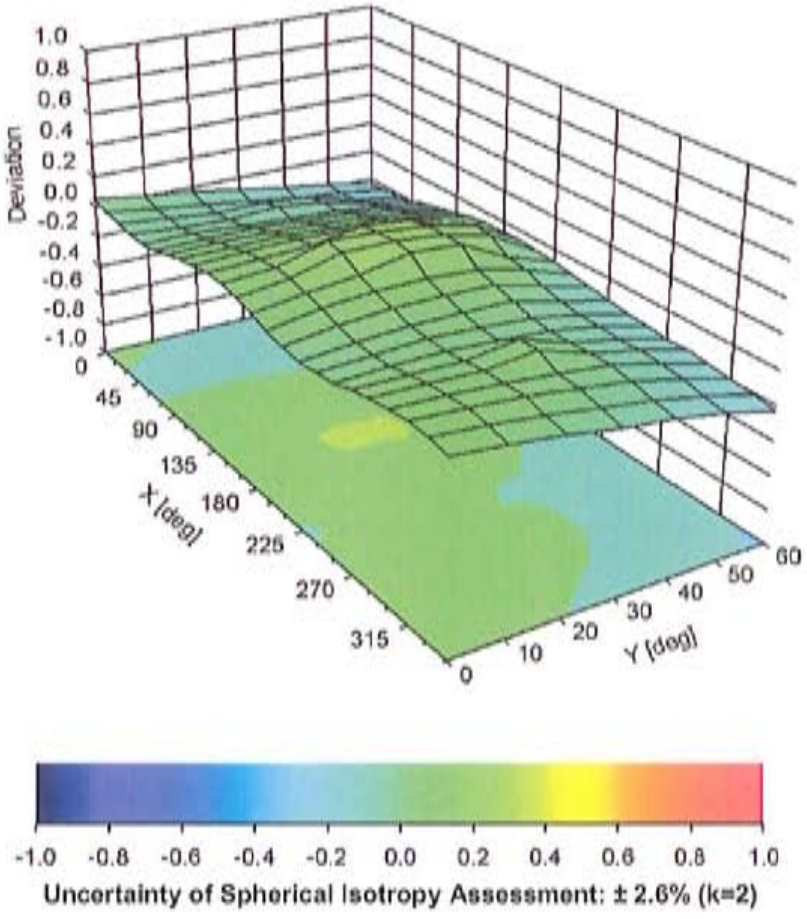


f = 1810 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3728

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	151.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm