

信息产业部通信计量中心

Telecommunication Metrology Center of MII



No. DAT-P-114/01-01



No. L0442

# TEST REPORT

No. 2007EEE01883

<b>FCC ID</b>	QISU120e
<b>Test name</b>	Electromagnetic Field (Specific Absorption Rate)
<b>Product</b>	WCDMA/GPRS/GSM/EDGE Mobile Phone with Bluetooth
<b>Model</b>	HUAWEI U120e
<b>Client</b>	HUAWEI Technologies Co., Ltd.
<b>Type of test</b>	Non Type Approval

Telecommunication Metrology Center  
of Ministry of Information Industry



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Product Name	WCDMA/GPRS/GSM/EDGE Mobile Phone with Bluetooth	Sample Model	HUAWEI U120e
Client	HUAWEI Technologies Co., Ltd.	Type of test	Non Type Approval
Factory	HUAWEI Technologies Co., Ltd.	Sampling arrival date	July 6 <sup>th</sup> , 2007
Manufacturer	HUAWEI Technologies Co., Ltd.		
Sampling/ Sending sample	Sending sample	Sample sent by	Xie Yan
Sampling location	/	Sampling person	/
Sample quantity	1	Sample matrix	/
Series number of the Sample	354953010009498		
Test basis	<p><b>EN 50360-2001:</b> Product standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.</p> <p><b>EN 50361-2001:</b> Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.</p> <p><b>ANSI C95.1-1999:</b> IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.</p> <p><b>IEEE 1528-2003:</b> Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.</p> <p><b>OET Bulletin 65 (Edition 97-01) and Supplement C(Edition 01-01):</b> Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits.</p> <p><b>IEC 62209-1-2005:</b> Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)</p> <p><b>IEC 62209-2 (Draft):</b> Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the Specific Absorption Rate (SAR) in the head and body for 30MHz to 6GHz Handheld and Body-Mounted Devices used in close proximity to the Body.</p>		
Test conclusion	<p>Localized Specific Absorption Rate (SAR) of this portable wireless equipment has been measured in all cases requested by the relevant standards cited in Clause 5.2 of this test report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 5.1 of this test report.</p> <p>General Judgment: <b>Pass</b></p> <p style="text-align: center;">(Stamp)</p> <p style="text-align: right;">Date of issue: August 7<sup>th</sup>, 2007</p>		
Note	The test results relate only to the items tested of the sample(s).		

Approved by

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## 1 COMPETENCE AND WARRANTIES

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## 3 DESCRIPTION OF EUT

### 3.1 Addressing Information Related to EUT

**Table 1: Applicant (The Client)**

Name or Company	HUAWEI Technologies Co., Ltd.
Address/Post	Bantian, Longgang District, Shenzhen, Guangdong
City	Shenzhen
Postal Code	518129
Country	China
Telephone	0755-28780808
Fax	0755-28780808

**Table 2: Manufacturer**

Name or Company	HUAWEI Technologies Co., Ltd.
Address/Post	Bantian, Longgang District, Shenzhen, Guangdong
City	Shenzhen
Postal Code	518129
Country	China
Telephone	0755-28780808
Fax	0755-28780808

**3.2 Constituents of EUT**

Description	Model	Serial Number	Manufacturer
Handset	HUAWEI U120e	354953010009498	HUAWEI Technologies Co., Ltd
Lithium Battery	HBU83S	FMT732600235Y	Shenzhen BYD Co., Ltd.
AC/DC Adapter	TPCA-053065	TPI732717436	TECH-POWER Electronics(Shenzhen) Co., Ltd.

**Table 3: Constituents of Samples****Picture 1: Constituents of the sample (Lithium Battery is in the Handset)****3.3 General Description**

Equipment Under Test (EUT) is a model of WCDMA/GPRS/GSM/EDGE mobile phone with integrated antenna. It consists of Handset and normal options: Lithium Battery and AC/DC Adapter as Table 3 and Picture 1. With the request of the client, SAR is tested for PCS 1900MHz. Its GPRS class is 10 and it has Bluetooth function.

The sample undergoing test was selected by the Client.

Components list please refer to documents of the manufacturer

## **4 OPERATIONAL CONDITIONS DURING TEST**

### **4.1 Schematic Test Configuration**

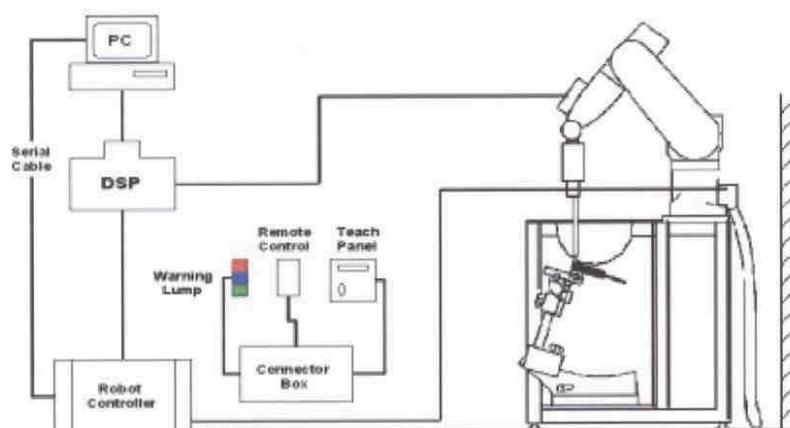
A communication link is set up with a System Simulator (SS) by air link, and a call is established. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 512, 661 and 810 respectively in the case of PCS 1900 MHz. The EUT is commanded to operate at maximum transmitting power.

The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the manufacturer. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. If a wireless link is used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the handset. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the handset by at least 30 dB.

### **4.2 SAR Measurement Set-up**

These measurements were performed with the automated near-field scanning system DASY4 Professional from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than  $\pm 0.02\text{mm}$ . Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length =300mm) to the data acquisition unit.

A cell controller system contains the power supply, robot controller, teaches pendant (Joystick), and remote control, is used to drive the robot motors. The PC consists of the Micron Pentium III 800 MHz computer with Windows 2000 system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.



**Picture 2: SAR Lab Test Measurement Set-up**

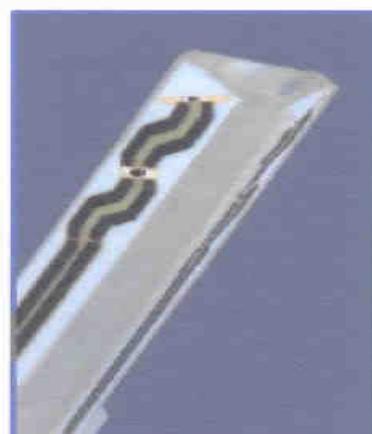
The DAE consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

### 4.3 Dasy4 E-field Probe System

The SAR measurements were conducted with the dosimetric probe ET3DV6 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the standard procedure with an accuracy of better than  $\pm 10\%$ . The spherical isotropy was evaluated and found to be better than  $\pm 0.25\text{dB}$ .

#### ET3DV6 Probe Specification

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System(ET3DV6 only) Built-in shielding against static charges PEEK enclosure material(resistant to organic solvents, e.q., glycol)
Calibration	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at frequencies of 450MHz, 900MHz and 1.8GHz (accuracy $\pm 8\%$ ) Calibration for other liquids and frequencies upon request
Frequency	10 MHz to > 6 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 3 GHz)



**Picture 3: ET3DV6 E-field Probe**

Directivity	±0.2 dB in brain tissue (rotation around probe axis) ±0.4 dB in brain tissue (rotation normal probe axis)
Dynamic Range	5u W/g to > 100mW/g; Linearity: ±0.2dB
Surface Detection	±0.2 mm repeatability in air and clear liquids over diffuse reflecting surface(ET3DV6 only)
Dimensions	Overall length: 330mm Tip length: 16mm Body diameter: 12mm Tip diameter: 6.8mm Distance from probe tip to dipole centers: 2.7mm
Application	General dosimetry up to 3GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms



Picture4:ET3DV6 E-field probe

#### 4.4 E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C \frac{\Delta T}{\Delta t}$$

Where:  $\Delta t$  = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

$\Delta T$  = Temperature increase due to RF exposure.

Or

$$SAR = \frac{|E|^2 \sigma}{\rho}$$

Where:  $\sigma$  = Simulated tissue conductivity,

$\rho$  = Tissue density (kg/m<sup>3</sup>).

Note: Please see Annex E to check the probe calibration certificate.



Picture 5:Device Holder

## 4.5 Other Test Equipment

### 4.5.1 Device Holder for Transmitters

In combination with the Generic Twin Phantom V3.0, the Mounting Device (POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeat ably positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

### 4.5.2 Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow all predefined phantom positions and measurement grids by the complete setup of manually teaching three points in the robot.

Shell Thickness	2±0.1 mm
Filling Volume	Approx. 20 liters
Dimensions	810 x 1000 x 500 mm (H x L x W)
Available	Special



## 4.6 Equivalent Tissues

**Picture6:Generic Twin Phantom**

The liquid used for the frequency range of 800-2000 MHz consisted of water, sugar, salt and Cellulose. The liquid has previously been proven to be suited for worst-case. The Table 4 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and OET Bulletin 65 (Edition 97-01) and Supplement C (Edition 01-01).

**Table 4. Composition of the Head Tissue Equivalent Matter**

MIXTURE %	FREQUENCY 1900MHz		
Water	55.242		
Glycol monobutyl	44.452		
Salt	0.306		
Dielectric Parameters Target Value	f=1900MHz	$\epsilon=40.0$	$\sigma=1.40$

Table 5. Composition of the Body Tissue Equivalent Matter

MIXTURE %	FREQUENCY 1900MHz		
Water	69.91		
Glycol monobutyl	29.96		
Salt	0.13		
Dielectric Parameters Target Value	f=1900MHz	$\epsilon=53.3$	$\sigma=1.52$

## 4.7 System Specifications

### 4.7.1 Robotic System Specifications

#### Specifications

**Positioner:** Stäubli Unimation Corp. Robot Model: RX90L

**Repeatability:**  $\pm 0.02$  mm

**No. of Axis:** 6

#### Data Acquisition Electronic (DAE) System

##### Cell Controller

**Processor:** Pentium III

**Clock Speed:** 800 MHz

**Operating System:** Windows 2000

##### Data Converter

**Features:** Signal Amplifier, multiplexer, A/D converter, and control logic

**Software:** DASY4 software

**Connecting Lines:** Optical downlink for data and status info.

Optical uplink for commands and clock

## 5 CHARACTERISTICS OF THE TEST

### 5.1 Applicable Limit Regulations

**EN 50360–2001:** Product standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.

It specifies the maximum exposure limit of **2.0 W/kg** as averaged over any 10 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

**ANSI C95.1–1999:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

## 5.2 Applicable Measurement Standards

**EN 50361–2001:** Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.

**IEEE 1528–2003:** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.

**OET Bulletin 65 (Edition 97-01) and Supplement C (Edition 01-01):** Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits.

**IEC 62209-1-2005:** Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)

**IEC 62209-2 (Draft):** Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 2: Procedure to determine the Specific Absorption Rate (SAR) in the head and body for 30MHz to 6GHz Handheld and Body-Mounted Devices used in close proximity to the body.

They specify the measurement method for demonstration of compliance with the SAR limits for such equipments.

## 6 LABORATORY ENVIRONMENT

**Table 6: The Ambient Conditions during EMF Test**

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 $\Omega$
Ambient noise is checked and found very low and in compliance with requirement of standards.	
Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

## 7 CONDUCTED OUTPUT POWER MEASUREMENT

### 7.1 Summary

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMU-200) to ensure the maximum power transmission and proper modulation. This result contains conducted output power and ERP for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

## 7.2 Conducted Power

### 7.2.1 Measurement Methods

The EUT was set up for the maximum output power. The channel power was measured with Agilent Spectrum Analyzer E4440A. These measurements were done at 3 channels, 512, 661 and 810 before SAR test and after SAR test.

### 7.2.2 Measurement result

**Table 7: Conducted Power Measurement Results**

	Conducted Power		
	Channel 512 (1850.2MHz)	Channel 661 (1880MHz)	Channel 810 (1909.8MHz)
Before Test (dBm)	30.2	29.7	29.6
After Test (dBm)	29.9	29.8	29.8

### 7.2.3 Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Table 11 to Table 14 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

## 8 TEST RESULTS

### 8.1 Dielectric Performance

**Table 8: Dielectric Performance of Head Tissue Simulating Liquid**

Measurement is made at temperature 23.3 °C and relative humidity 49%. Liquid temperature during the test: 22.5°C			
/	Frequency	Permittivity $\epsilon$	Conductivity $\sigma$ (S/m)
<b>Target value</b>	1900MHz	40.0	1.40
<b>Measurement value (Average of 10 tests)</b>	1900MHz	39.6	1.37

**Table 9: Dielectric Performance of Body Tissue Simulating Liquid**

Measurement is made at temperature 23.3 °C and relative humidity 49%. Liquid temperature during the test: 22.5°C			
/	Frequency	Permittivity $\epsilon$	Conductivity $\sigma$ (S/m)
<b>Target value</b>	1900MHz	53.3	1.52
<b>Measurement value (Average of 10 tests)</b>	1900MHz	52.0	1.54

## 8.2 System Validation

**Table 10: System Validation**

Measurement is made at temperature 23.3 °C, relative humidity 47%, input power 250 mW. Liquid temperature during the test: 22.5°C							
<b>Liquid parameters</b>		<b>Frequency</b>		<b>Permittivity <math>\epsilon</math></b>		<b>Conductivity <math>\sigma</math> (S/m)</b>	
		1900 MHz		39.6		1.37	
<b>Verification results</b>	<b>Frequency</b>	<b>Target value (W/kg)</b>			<b>Measurement value (W/kg)</b>		
		<b>10 g Average</b>		<b>1 g Average</b>	<b>10 g Average</b>		<b>1 g Average</b>
	<b>1900 MHz</b>		5.125		9.925	5.27	

Note: Target Values used are one fourth of those in IEEE Std 1528-2003 (feeding power is normalized to 1 Watt), i.e. 250 mW is used as feeding power to the validation dipole (SPEAG using).

## 8.3 Summary of Measurement Results (PCS1900MHz)

**Table 11: SAR Values (Head, 1900 MHz Band)**

<b>Limit of SAR (W/kg)</b>	<b>10 g Average</b>		<b>1 g Average</b>		<b>Power Drift (dB)</b>
	2.0		1.6		
	<b>Test Case</b>				
	<b>10 g Average</b>		<b>1 g Average</b>		
Left hand, Touch cheek, Top frequency(See Fig.1)	0.187		0.325		0.148
Left hand, Touch cheek, Mid frequency(See Fig.3)	0.109		0.184		-0.012
Left hand, Touch cheek, Bottom frequency(See Fig.5)	0.091		0.152		-0.108
Left hand, Tilt 15 Degree, Top frequency(See Fig.7)	0.175		0.305		-0.041
Left hand, Tilt 15 Degree, Mid frequency(See Fig.9)	0.095		0.165		-0.054
Left hand, Tilt 15 Degree, Bottom frequency(See Fig.11)	0.077		0.134		-0.006
Right hand, Touch cheek, Top frequency(See Fig.13)	0.240		0.431		-0.104
Right hand, Touch cheek, Mid frequency(See Fig.15)	0.159		0.284		0.068
Right hand, Touch cheek, Bottom frequency(See Fig.17)	0.114		0.204		-0.018
Right hand, Tilt 15 Degree, Top frequency(See Fig.19)	0.138		0.257		0.200
Right hand, Tilt 15 Degree, Mid frequency(See Fig.21)	0.139		0.263		0.006
Right hand, Tilt 15 Degree, Bottom frequency(See Fig.23)	0.102		0.189		0.056

Table 12: SAR Values (Body, 1900 MHz Band)

Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
Body, Towards Ground, Top frequency(See Fig.25)	0.219	0.369	0.011
Body, Towards Ground, Mid frequency(See Fig.27)	0.178	0.296	0.067
Body, Towards Ground, Bottom frequency(See Fig.29)	0.152	0.252	0.012
Body, Towards Phantom, Top frequency(See Fig.31)	0.056	0.088	-0.104
Body, Towards Phantom, Mid frequency(See Fig.33)	0.036	0.058	0.200
Body, Towards Phantom, Bottom frequency(See Fig.35)	0.026	0.041	-0.189

Table 13: SAR Values (Body, 1900 MHz Band with GPRS)

Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
Body, Towards Ground, Top frequency(See Fig.37)	0.412	0.702	-0.060
Body, Towards Ground, Mid frequency(See Fig.39)	0.318	0.544	-0.200
Body, Towards Ground, Bottom frequency(See Fig.41)	0.275	0.467	-0.044
Body, Towards Phantom, Top frequency(See Fig.43)	0.115	0.184	-0.198
Body, Towards Phantom, Mid frequency(See Fig.45)	0.075	0.121	0.029
Body, Towards Phantom, Bottom frequency(See Fig.47)	0.054	0.083	0.157

Table 14: SAR Values (Body, 1900 MHz Band with EGPRS)

Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
Body, Towards Ground, Top frequency(See Fig.49)	0.195	0.334	0.055

### 8.4 Summary of Measurement Results (with Bluetooth function)

Since the EUT is tested in body position with the dominant transmitter ON and co-located Bluetooth transmitter OFF first, with the results in section 8.3 Table 12. After that, the worst case can be derived, and the test is repeated with dominant transmitter and co-located Bluetooth transmitter both ON under the same conditions. The following result is derived from the EUT with its Bluetooth function under the same conditions with the worst cases.

**Table 15: SAR Values (Body, 1900 MHz Band with Bluetooth)**

Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		
	10 g Average	1 g Average	
Body, Towards Ground, Top frequency (See Fig.51)	0.224	0.384	-0.063

### 8.5 Conclusion

Localized Specific Absorption Rate (SAR) of this portable wireless device has been measured in all cases requested by the relevant standards cited in Clause 5.2 of this report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 5.1 of this test report.

## 9 Measurement Uncertainty

SN	a	Type	c	d	e = f(d,k)	f	h = c x f / e	k
	Uncertainty Component		Tol. (± %)	Prob. Dist.	Div.	c <sub>i</sub> (1 g)	1 g u <sub>i</sub> (±%)	v <sub>i</sub>
1	System repetivity	A	0.5	N	1	1	0.5	9
Measurement System								
2	Probe Calibration	B	5	N	2	1	2.5	∞
3	Axial Isotropy	B	4.7	R	√3	(1-cp) <sup>1/2</sup>	4.3	∞
4	Hemispherical Isotropy	B	9.4	R	√3	√c <sub>p</sub>		∞
5	Boundary Effect	B	0.4	R	√3	1	0.23	∞
6	Linearity	B	4.7	R	√3	1	2.7	∞
7	System Detection Limits	B	1.0	R	√3	1	0.6	∞
8	Readout Electronics	B	1.0	N	1	1	1.0	∞
9	RF Ambient Conditions	B	3.0	R	√3	1	1.73	∞
10	Probe Positioner Mechanical Tolerance	B	0.4	R	√3	1	0.2	∞

11	Probe Positioning with respect to Phantom Shell	B	2.9	R	$\sqrt{3}$	1	1.7	$\infty$
12	Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	B	3.9	R	$\sqrt{3}$	1	2.3	$\infty$
Test sample Related								
13	Test Sample Positioning	A	4.9	N	1	1	4.9	N-1
14	Device Holder Uncertainty	A	6.1	N	1	1	6.1	N-1
15	Output Power Variation - SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.9	$\infty$
Phantom and Tissue Parameters								
16	Phantom Uncertainty (shape and thickness tolerances)	B	1.0	R	$\sqrt{3}$	1	0.6	$\infty$
17	Liquid Conductivity - deviation from target values	B	5.0	R	$\sqrt{3}$	0.64	1.7	$\infty$
18	Liquid Conductivity - measurement uncertainty	B	5.0	N	1	0.64	1.7	M
19	Liquid Permittivity - deviation from target values	B	5.0	R	$\sqrt{3}$	0.6	1.7	$\infty$
20	Liquid Permittivity - measurement uncertainty	B	5.0	N	1	0.6	1.7	M
Combined Standard Uncertainty					RSS			11.25
Expanded Uncertainty (95% CONFIDENCE INTERVAL)					K=2			22.5

## 10 MAIN TEST INSTRUMENTS

Table16: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	HP 8753E	US38433212	August 30,2006	One year
02	Power meter	NRVD	101253	June 21, 2007	One year
03	Power sensor	NRV-Z5	100333		
04	Power sensor	NRV-Z6	100011	September 2, 2006	One year
05	Signal Generator	E4433B	US37230472	September 4, 2006	One Year
06	Amplifier	VTL5400	0505	No Calibration Requested	
07	BTS	CMU 200	105948	August 15, 2006	One year
08	E-field Probe	SPEAG ET3DV6	1736	December 1, 2006	One year
09	DAE	SPEAG DAE3	536	July 12, 2007	One year

## 11 TEST PERIOD

The test is performed from July 29<sup>th</sup>, 2007 to July 30<sup>th</sup>, 2007.

## **12 TEST LOCATION**

The test is performed at Radio Communication & Electromagnetic Compatibility Laboratory of Telecommunication Metrology Center

\*\*\*END OF REPORT BODY\*\*\*

## ANNEX A MEASUREMENT PROCESS

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the reference point was measured and was used as a reference value for assessing the power drop.

Step 2: The SAR distribution at the exposed side of the phantom was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the flat phantom and the horizontal grid spacing was 10 mm x 10 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

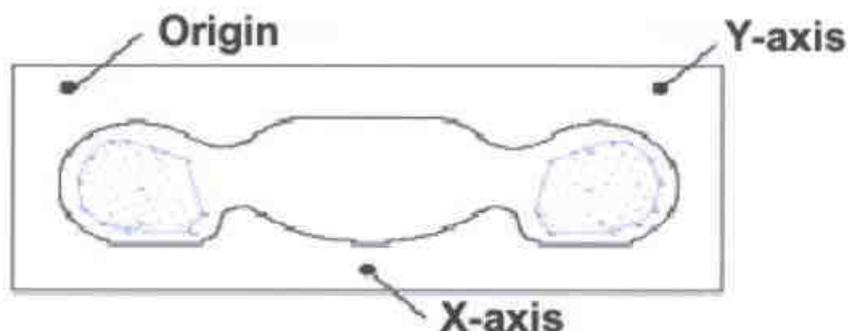
Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7 x 7 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

b. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot"-condition (in x ~ y and z-directions). The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation is repeated.



Picture A: SAR Measurement Points in Area Scan

**ANNEX B TEST LAYOUT**



**Picture B1: Specific Absorption Rate Test Layout**



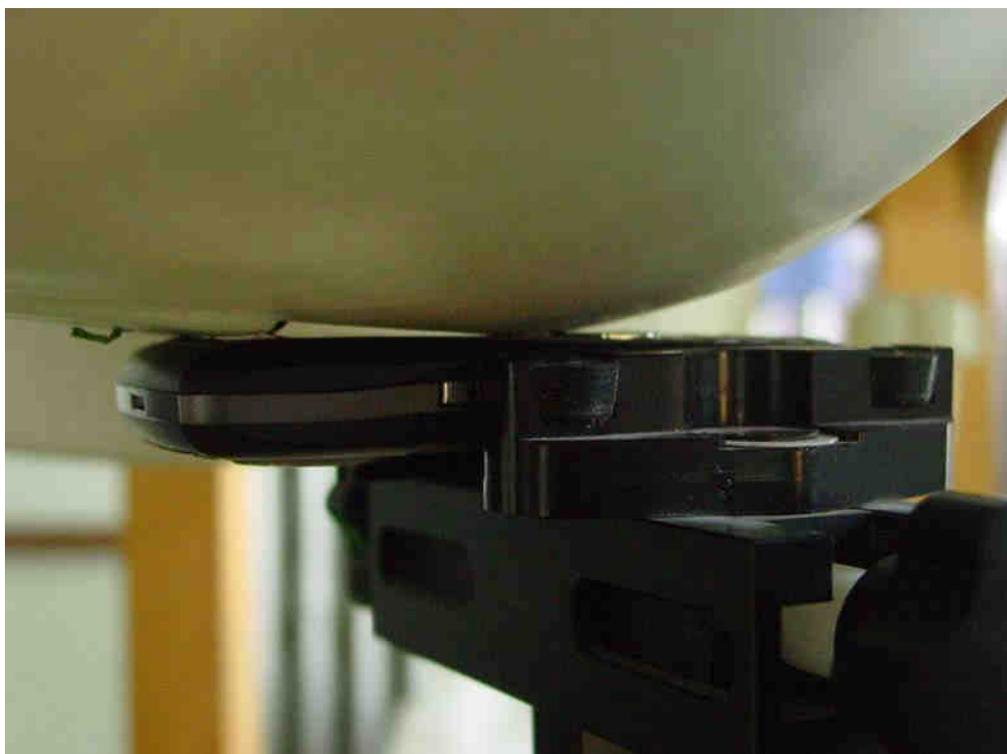
**Picture B2: Liquid depth in the Flat Phantom (PCS 1900MHz)**



**Picture B3: Left Hand Touch Cheek Position**



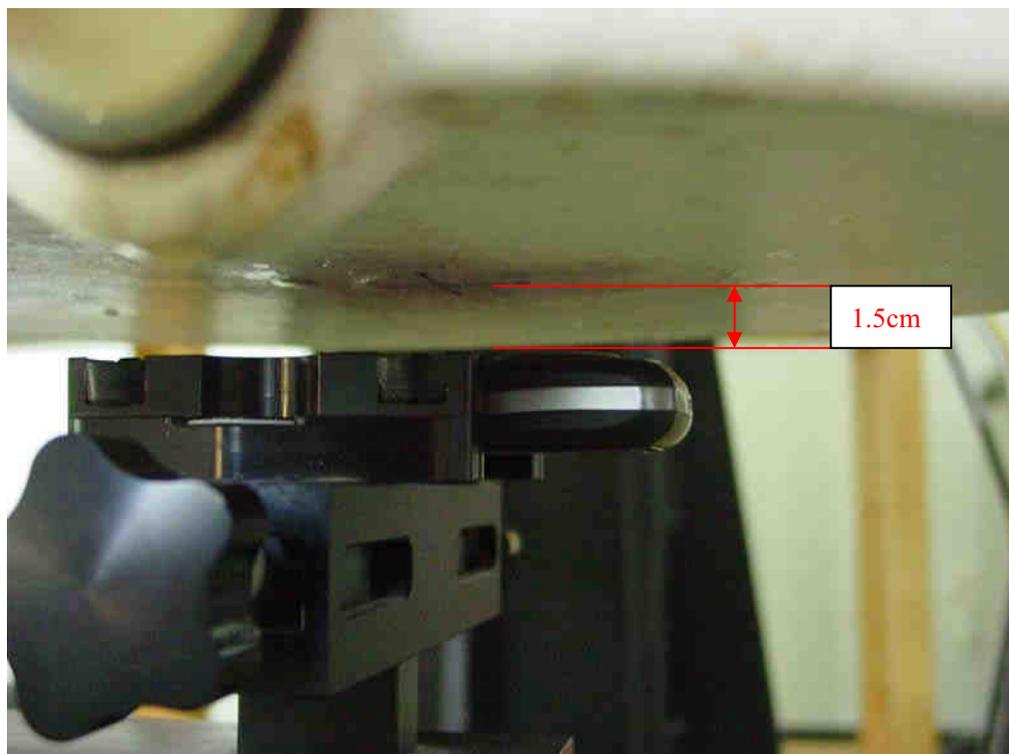
**Picture B4: Left Hand Tilt 15° Position**



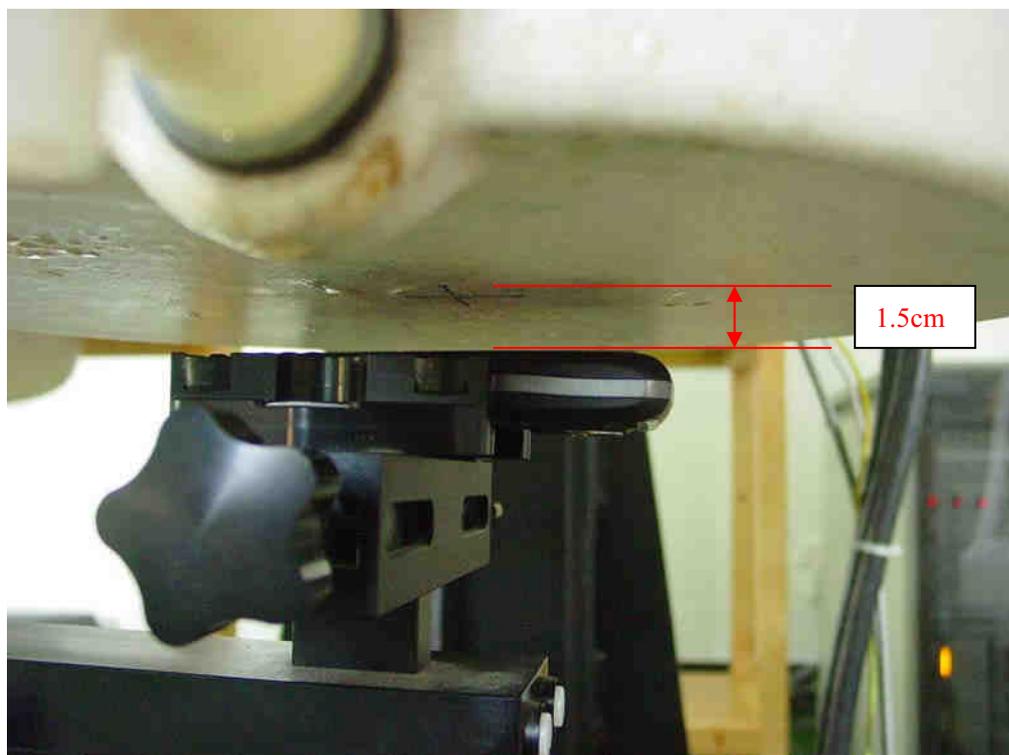
**Picture B5: Right Hand Touch Cheek Position**



**Picture B6: Right Hand Tilt 15° Position**



**Picture B7: Body-worn Position (toward ground, the distance from handset to the bottom of the Phantom is 1.5cm)**



**Picture B8: Body-worn Position (toward phantom, the distance from handset to the bottom of the Phantom is 1.5cm)**



**Picture B9: GPRS Body-worn Position with Bluetooth transmitter on (the distance from handset to the bottom of the Phantom is 1.5cm)**

## ANNEX C GRAPH RESULTS

### 1900 Left Cheek High

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1909.8 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Cheek High/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.357 mW/g

**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.4 V/m; Power Drift = 0.148 dB

Peak SAR (extrapolated) = 0.488 W/kg

**SAR(1 g) = 0.325 mW/g; SAR(10 g) = 0.187 mW/g**

Maximum value of SAR (measured) = 0.352 mW/g

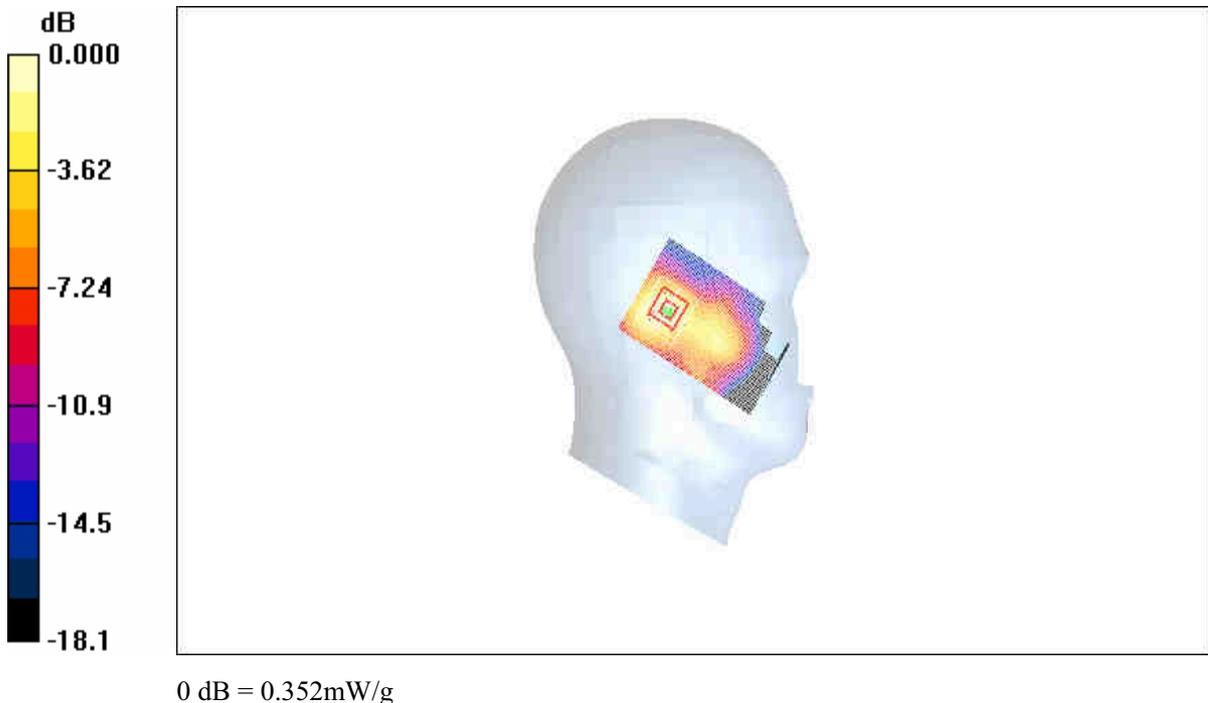


Fig. 1 Left Hand Touch Cheek PCS 1900MHz CH810

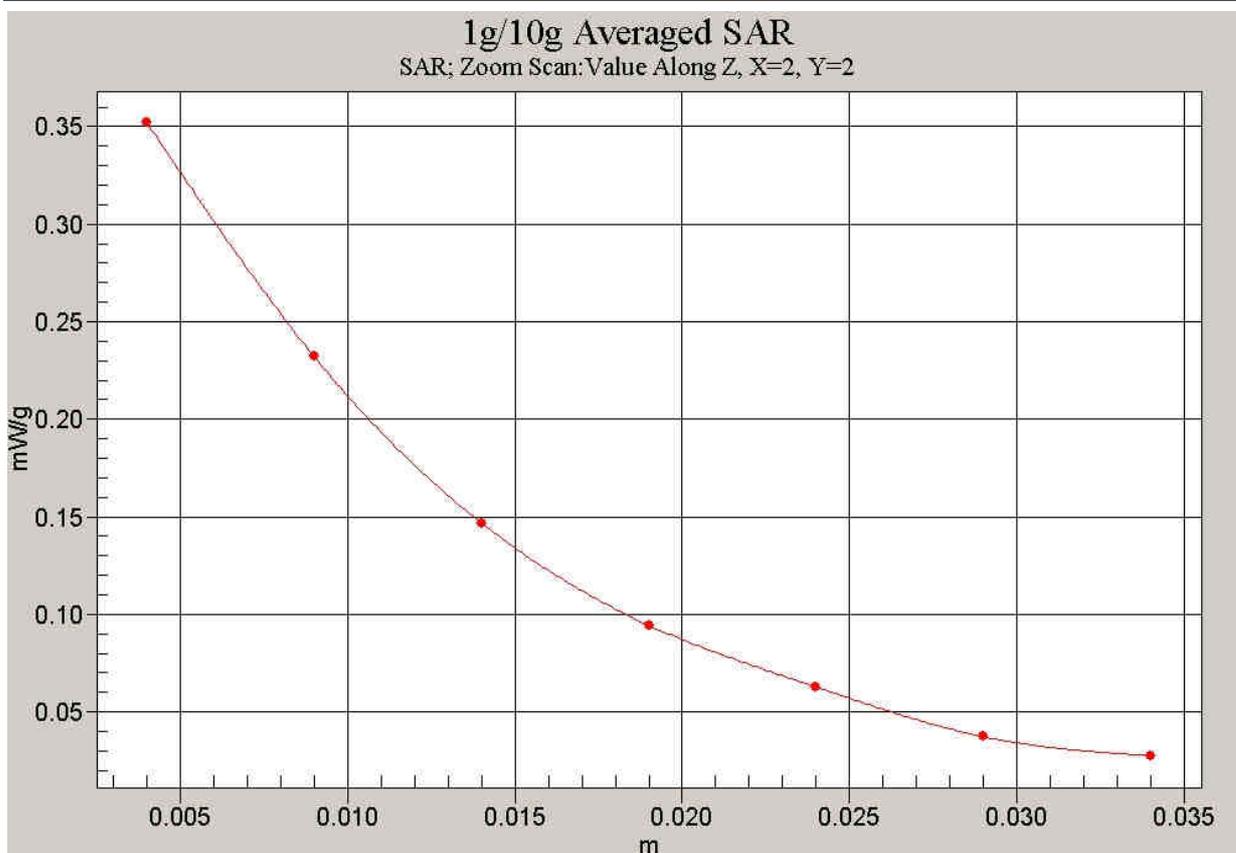


Fig. 2 Z-Scan at power reference point (PCS 1900MHz CH810)

**1900 Left Cheek Middle**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.35 \text{ mho/m}$ ;  $\epsilon_r = 39.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $23.3^\circ\text{C}$       Liquid Temperature:  $22.5^\circ\text{C}$

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Cheek Middle/Area Scan (51x81x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 0.201 mW/g

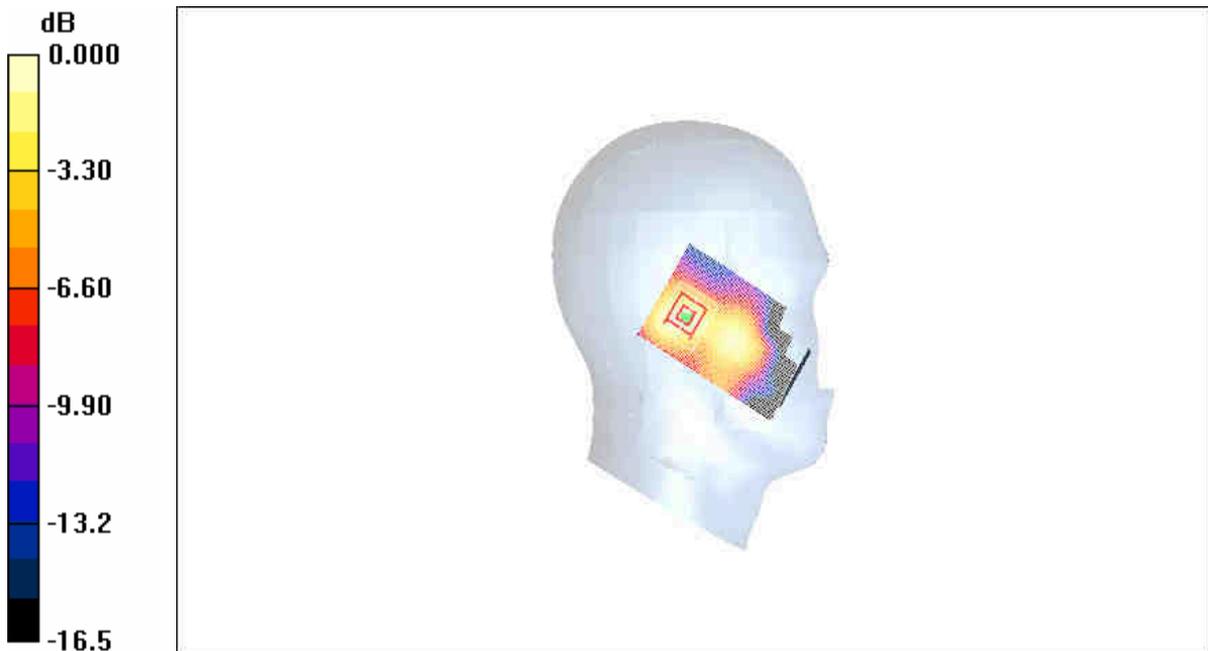
**Cheek Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 10.5 V/m; Power Drift = -0.012 dB

Peak SAR (extrapolated) = 0.276 W/kg

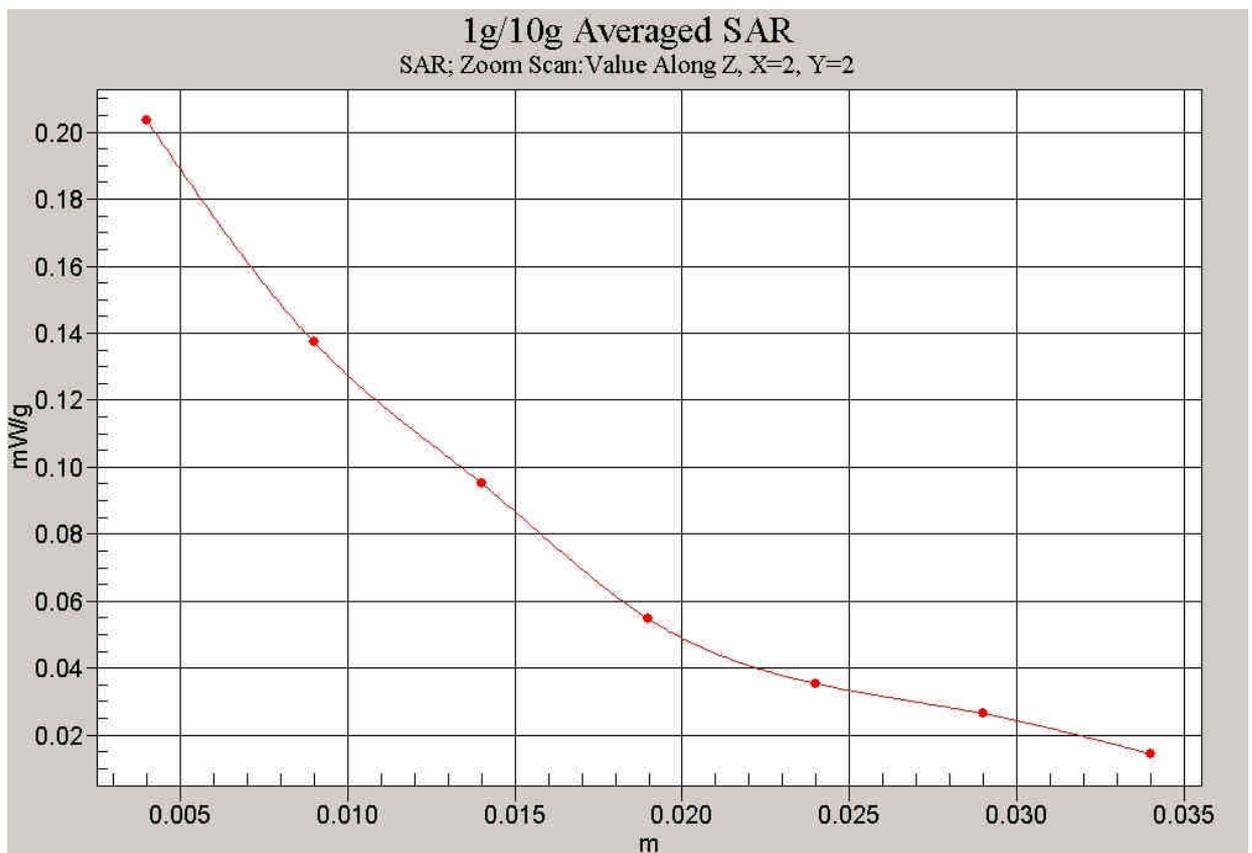
**SAR(1 g) = 0.184 mW/g; SAR(10 g) = 0.109 mW/g**

Maximum value of SAR (measured) = 0.202 mW/g



0 dB = 0.202mW/g

**Fig. 3 Left Hand Touch Cheek PCS 1900MHz CH661**



**Fig. 4 Z-Scan at power reference point (PCS 1900MHz CH661)**

**1900 Left Cheek Low**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Cheek Low/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.166 mW/g

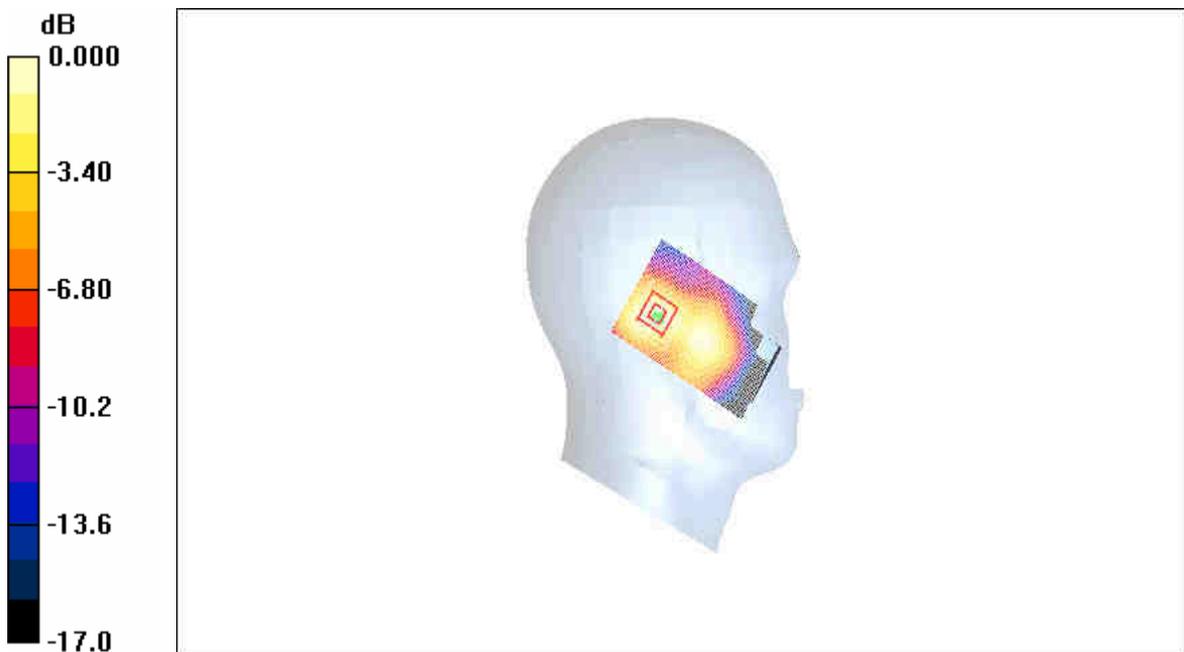
**Cheek Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.45 V/m; Power Drift = -0.108 dB

Peak SAR (extrapolated) = 0.227 W/kg

**SAR(1 g) = 0.152 mW/g; SAR(10 g) = 0.091 mW/g**

Maximum value of SAR (measured) = 0.166 mW/g



**Fig. 5 Left Hand Touch Cheek PCS 1900MHz CH512**

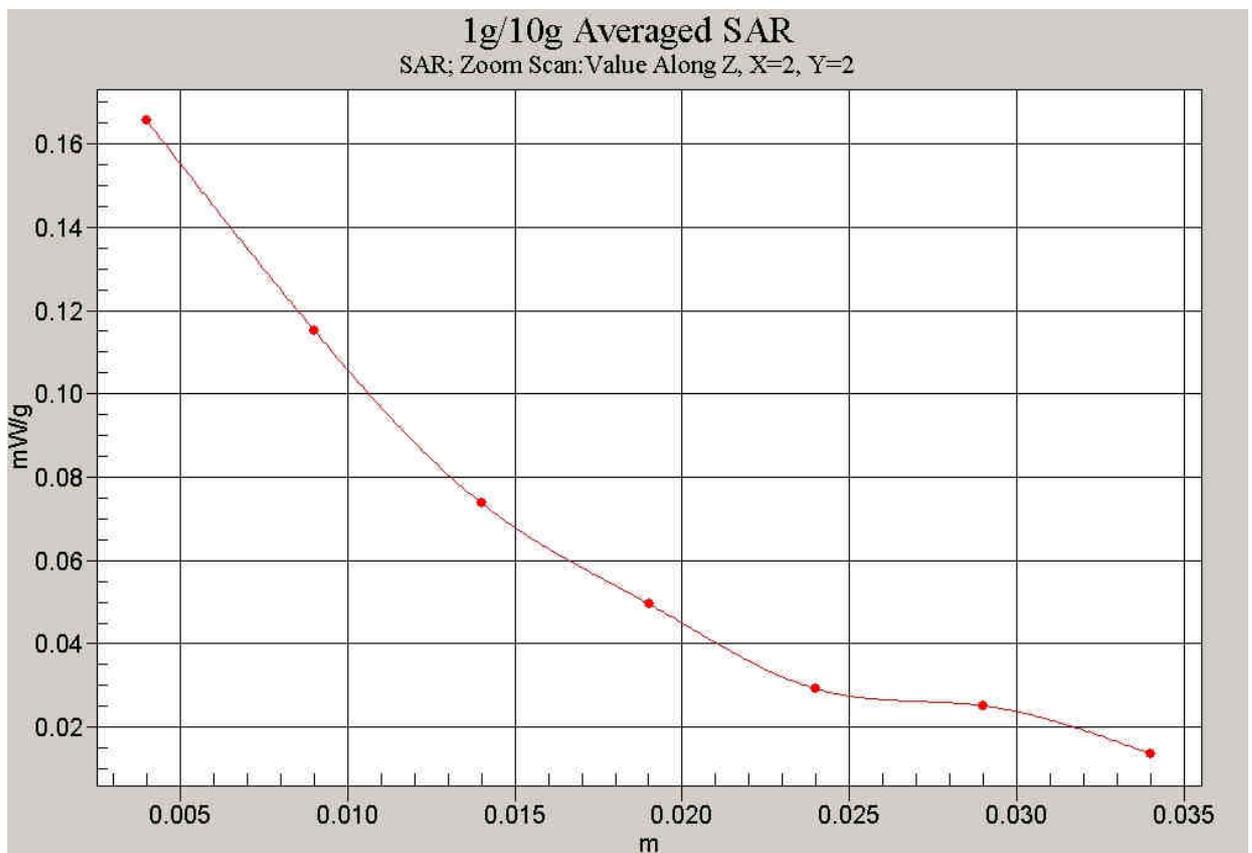


Fig. 6 Z-Scan at power reference point (PCS 1900MHz CH512)

**1900 Left Tilt High**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1909.8 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Tilt High/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.360 mW/g

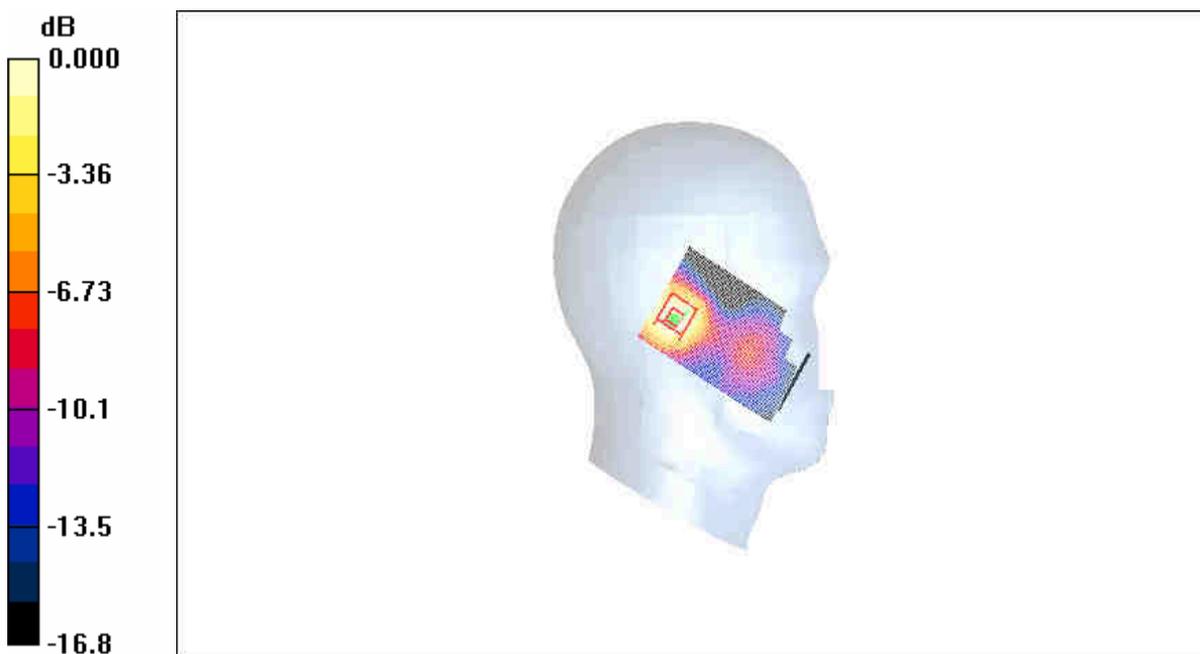
**Tilt High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

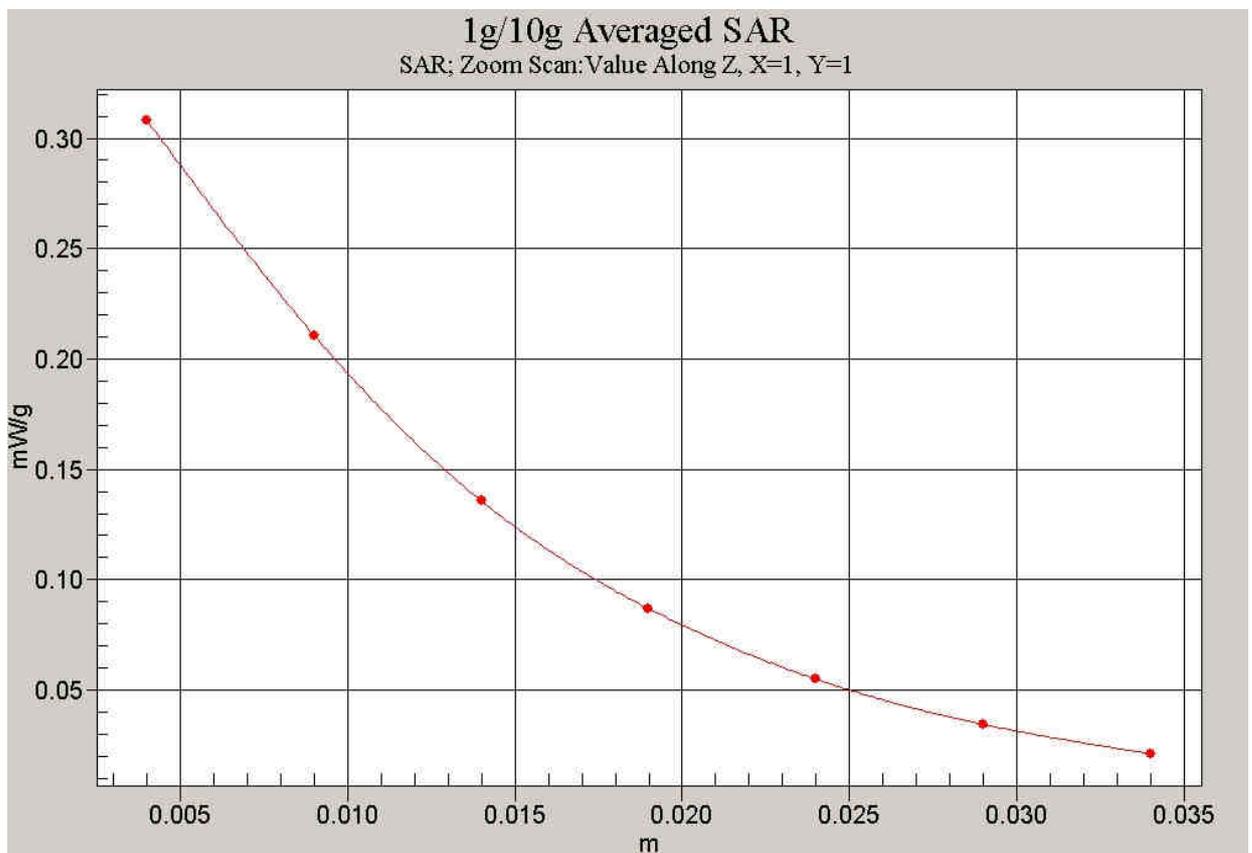
Reference Value = 13.9 V/m; Power Drift = -0.041 dB

Peak SAR (extrapolated) = 0.486 W/kg

**SAR(1 g) = 0.305 mW/g; SAR(10 g) = 0.175 mW/g**

Maximum value of SAR (measured) = 0.308 mW/g

**Fig. 7 Left Hand Tilt 15° PCS 1900MHz CH810**



**Fig. 8 Z-Scan at power reference point (PCS 1900MHz CH810)**

**1900 Left Tilt Middle**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 39.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Tilt Middle/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.196 mW/g

**Tilt Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.2 V/m; Power Drift = -0.054 dB

Peak SAR (extrapolated) = 0.258 W/kg

**SAR(1 g) = 0.165 mW/g; SAR(10 g) = 0.095 mW/g**

Maximum value of SAR (measured) = 0.171 mW/g



0 dB = 0.171mW/g

**Fig. 9 Left Hand Tilt 15°PCS 1900MHz CH661**

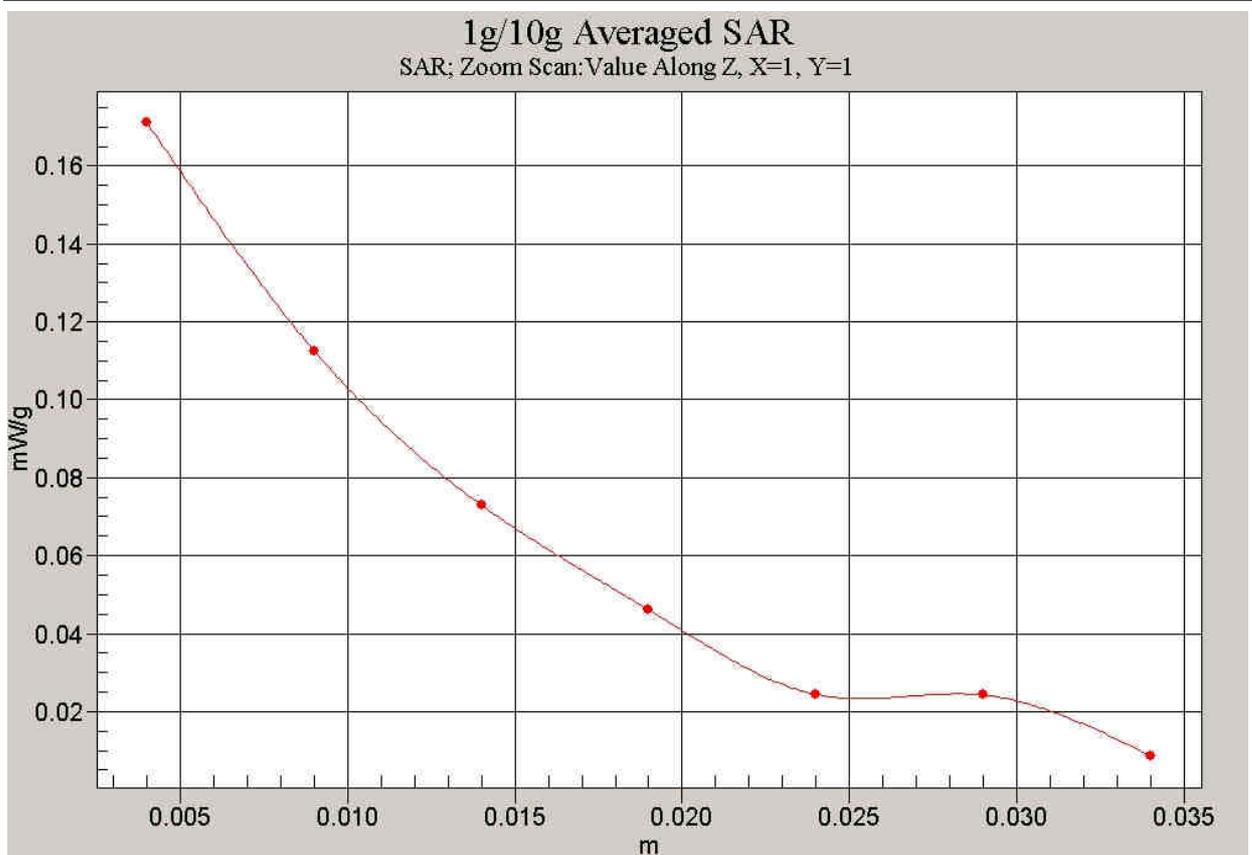


Fig. 10 Z-Scan at power reference point (PCS 1900MHz CH661)

**1900 Left Tilt Low**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Tilt Low/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.149 mW/g

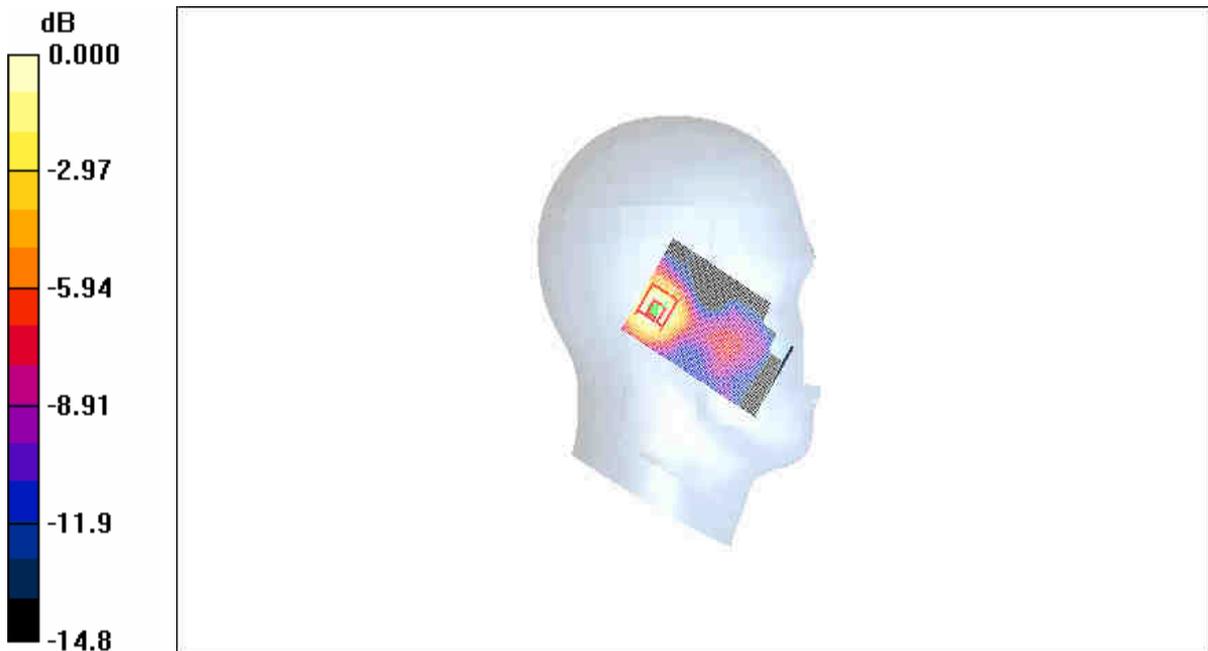
**Tilt Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.17 V/m; Power Drift = -0.006 dB

Peak SAR (extrapolated) = 0.218 W/kg

**SAR(1 g) = 0.134 mW/g; SAR(10 g) = 0.077 mW/g**

Maximum value of SAR (measured) = 0.135 mW/g



0 dB = 0.135mW/g

**Fig. 11 Left Hand Tilt 15°PCS 1900MHz CH512**

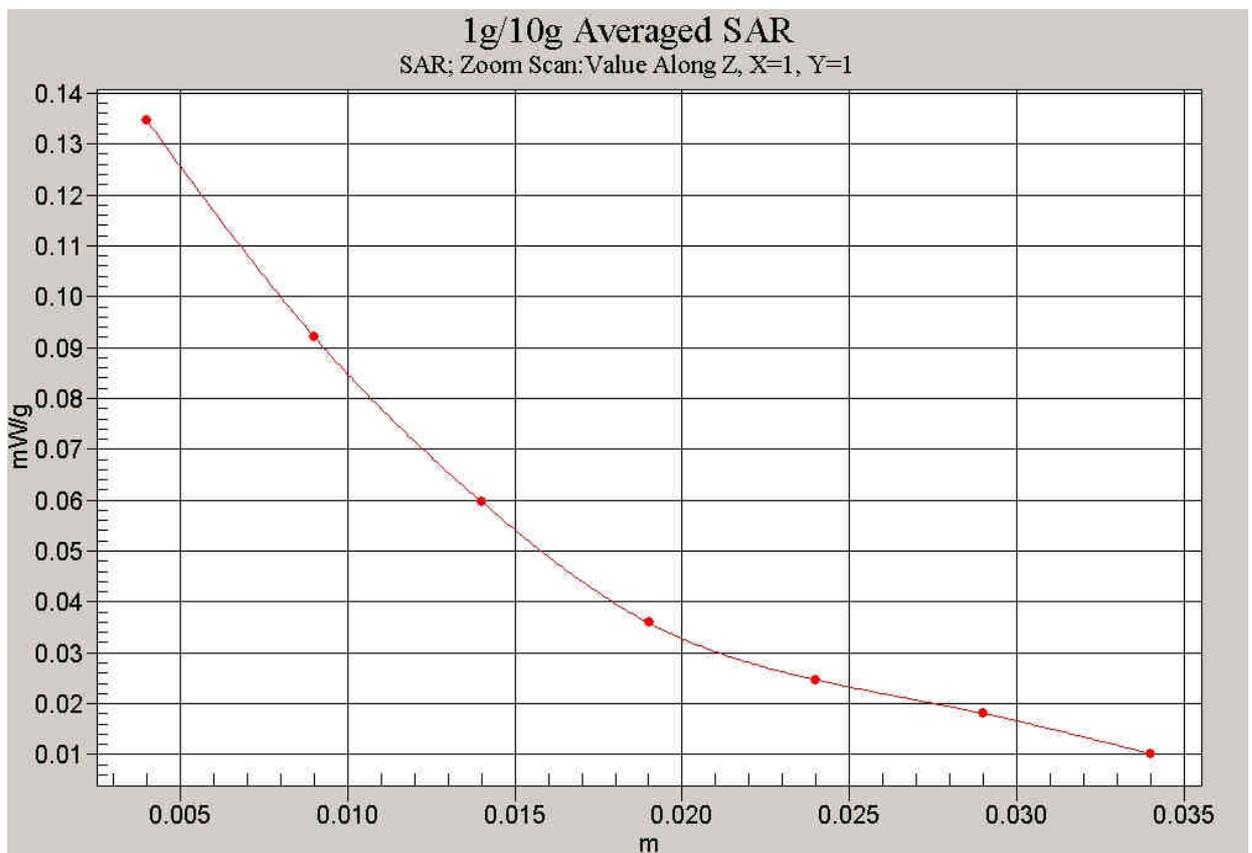


Fig. 12 Z-Scan at power reference point (PCS 1900MHz CH512)

**1900 Right Cheek High**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1909.8 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Cheek High/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.498 mW/g

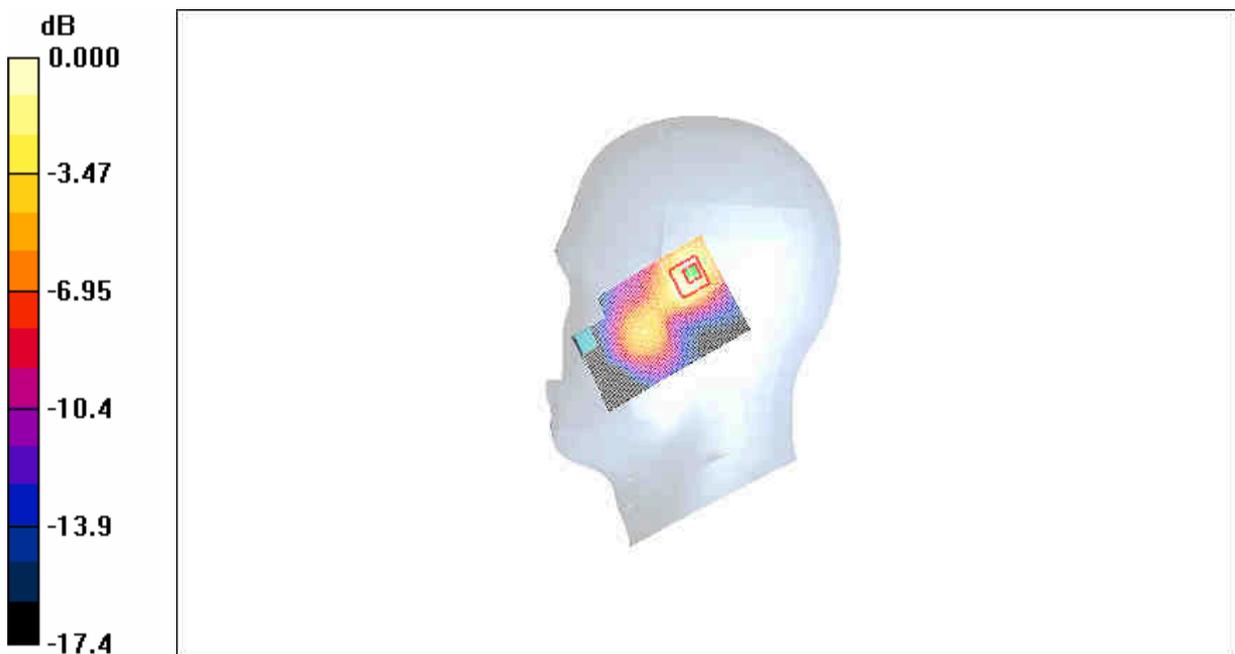
**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.57 V/m; Power Drift = -0.104 dB

Peak SAR (extrapolated) = 0.727 W/kg

**SAR(1 g) = 0.431 mW/g; SAR(10 g) = 0.240 mW/g**

Maximum value of SAR (measured) = 0.481 mW/g



0 dB = 0.481mW/g

**Fig. 13 Right Hand Touch Cheek PCS 1900MHz CH810**

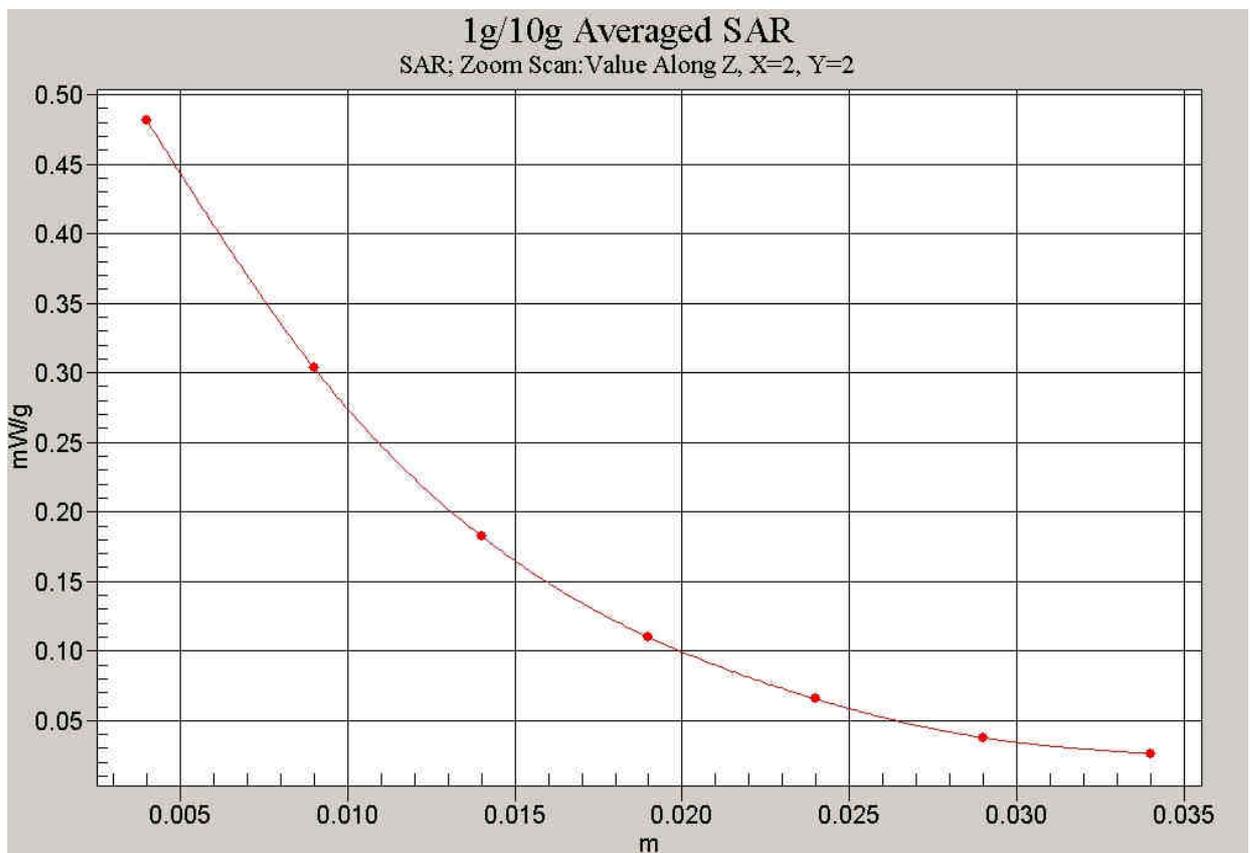


Fig. 14 Z-Scan at power reference point (PCS 1900MHz CH810)

**1900 Right Cheek Middle**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.35 \text{ mho/m}$ ;  $\epsilon_r = 39.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $23.3^\circ\text{C}$       Liquid Temperature:  $22.5^\circ\text{C}$

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Cheek Middle/Area Scan (51x81x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

Maximum value of SAR (interpolated) =  $0.318 \text{ mW/g}$

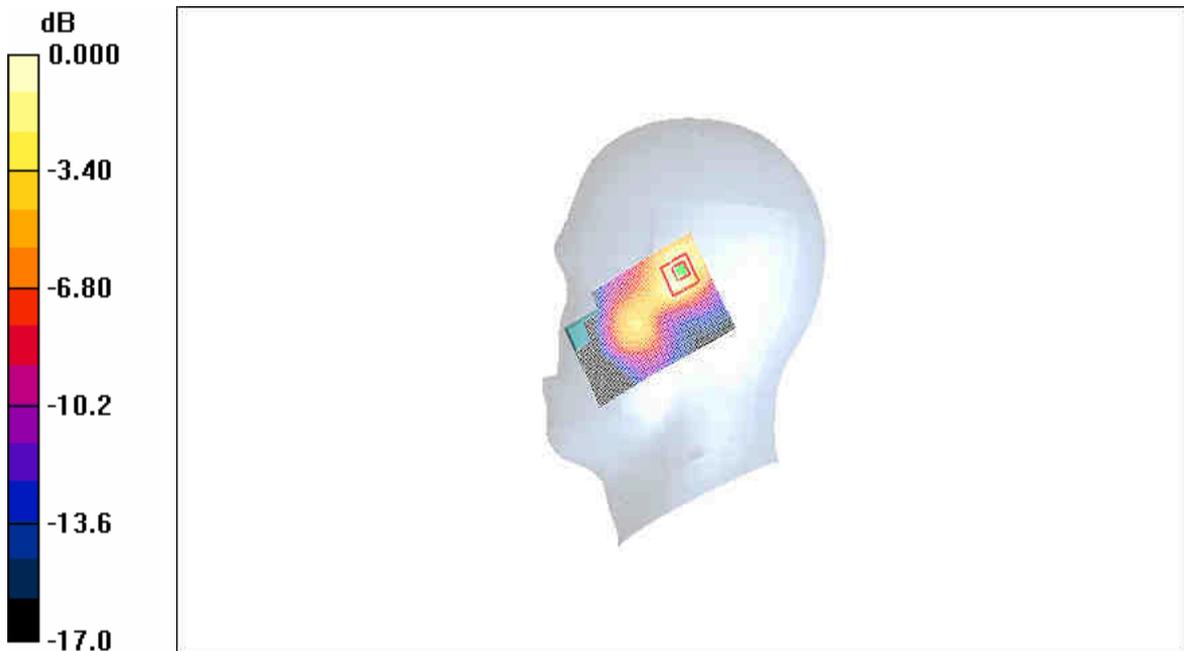
**Cheek Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value =  $7.80 \text{ V/m}$ ; Power Drift =  $0.068 \text{ dB}$

Peak SAR (extrapolated) =  $0.480 \text{ W/kg}$

**SAR(1 g) =  $0.284 \text{ mW/g}$ ; SAR(10 g) =  $0.159 \text{ mW/g}$**

Maximum value of SAR (measured) =  $0.297 \text{ mW/g}$



**Fig.15 Right Hand Touch Cheek PCS 1900MHz CH661**

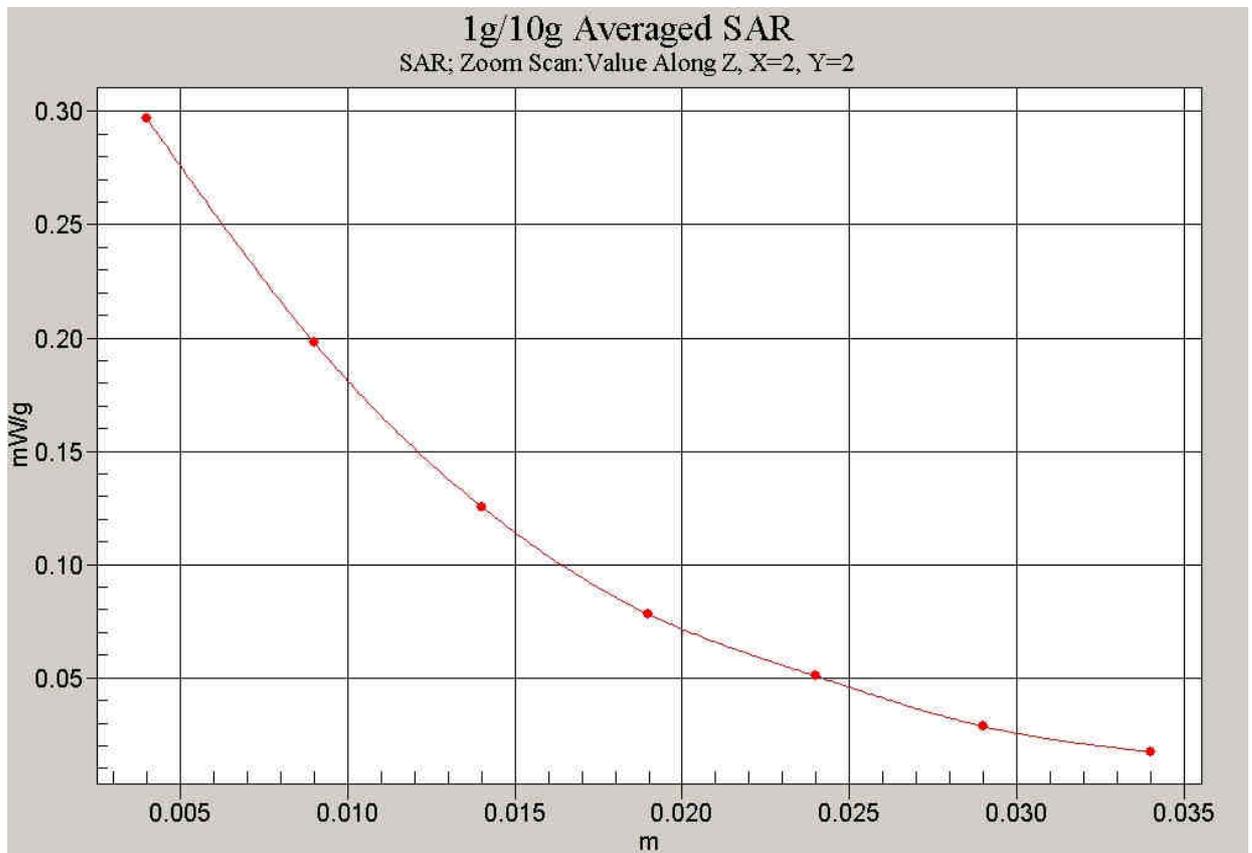


Fig. 16 Z-Scan at power reference point (PCS 1900MHz CH661)

**1900 Right Cheek Low**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Cheek Low/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.232 mW/g

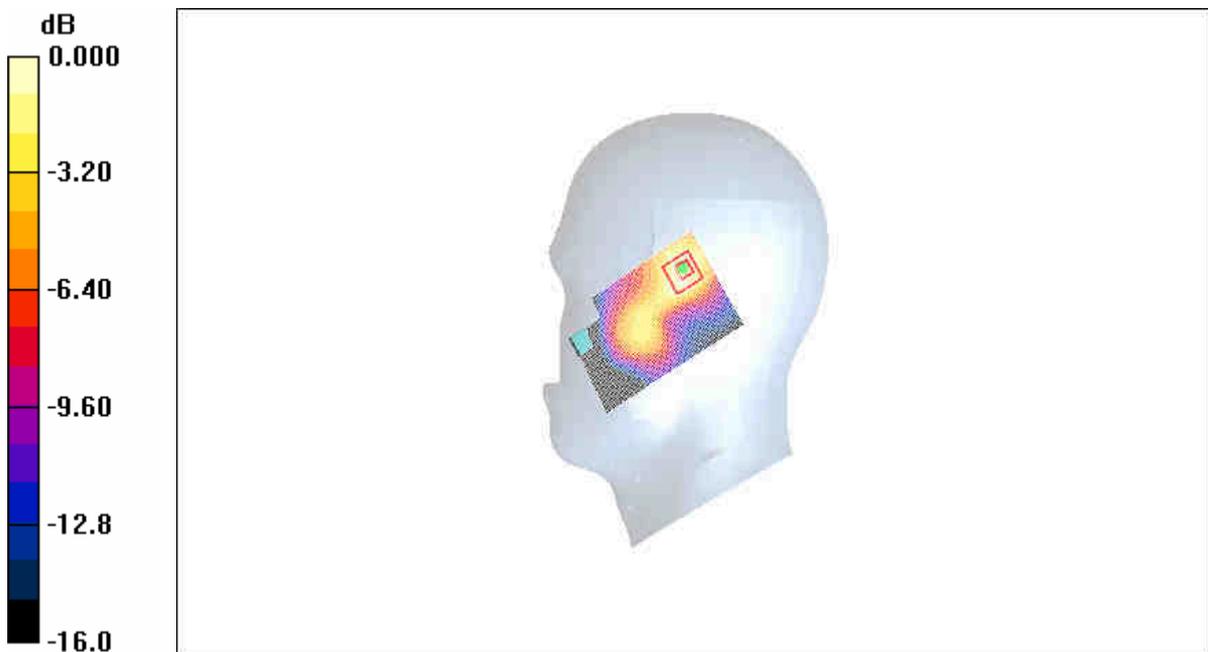
**Cheek Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.03 V/m; Power Drift = -0.018 dB

Peak SAR (extrapolated) = 0.346 W/kg

**SAR(1 g) = 0.204 mW/g; SAR(10 g) = 0.114 mW/g**

Maximum value of SAR (measured) = 0.212 mW/g



0 dB = 0.212mW/g

**Fig. 17 Right Hand Touch Cheek PCS 1900MHz CH512**

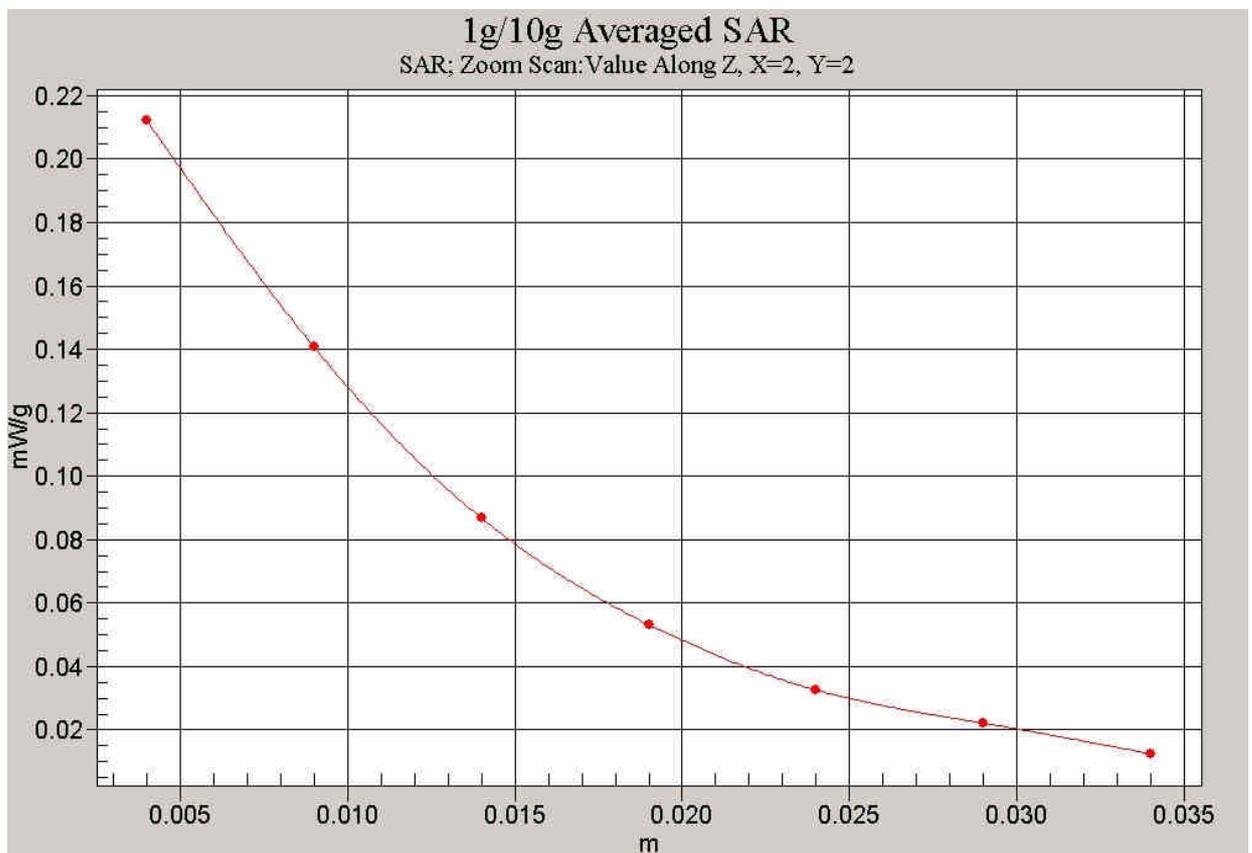


Fig. 18 Z-Scan at power reference point (PCS 1900MHz CH512)

**1900 Right Tilt High**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1909.8 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Tilt High/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.672 mW/g

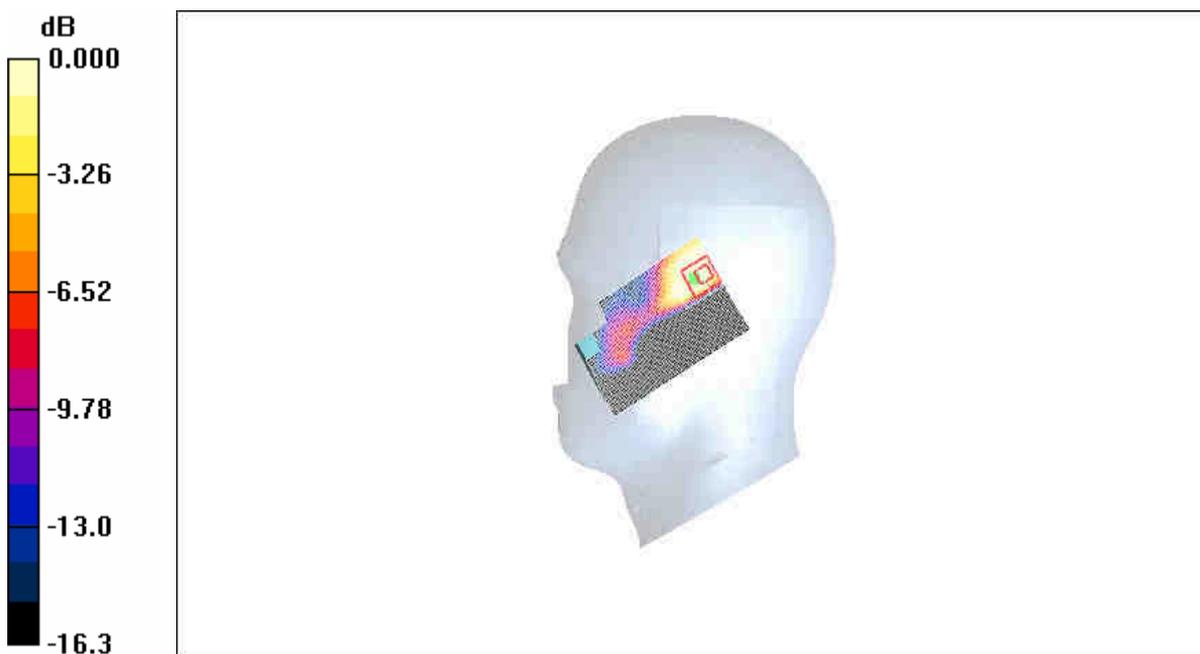
**Tilt High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.21 V/m; Power Drift = 0.200 dB

Peak SAR (extrapolated) = 0.434 W/kg

**SAR(1 g) = 0.257 mW/g; SAR(10 g) = 0.138 mW/g**

Maximum value of SAR (measured) = 0.264 mW/g



0 dB = 0.264mW/g

**Fig. 19 Right Hand Tilt 15°PCS 1900MHz CH810**

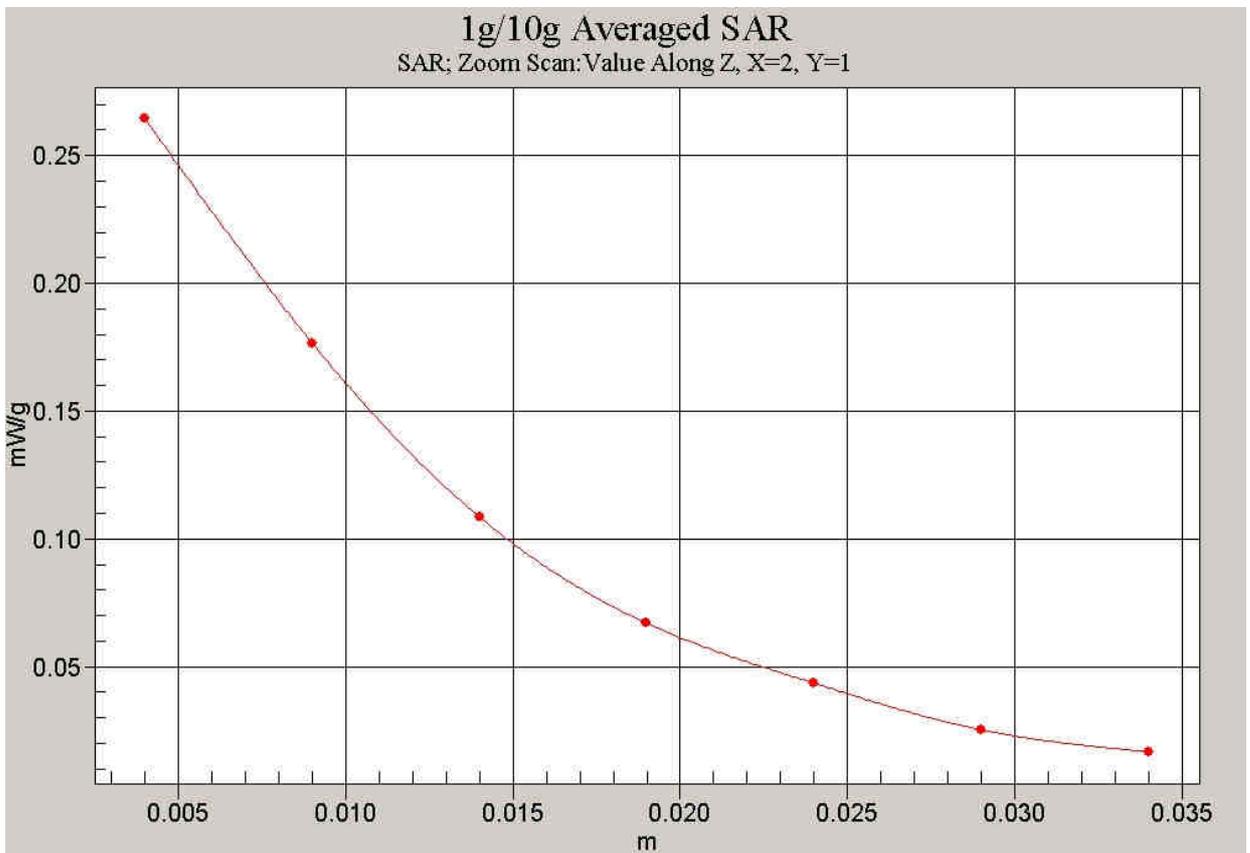


Fig. 20 Z-Scan at power reference point (PCS 1900MHz CH810)

**1900 Right Tilt Middle**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 39.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Tilt Middle/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.298 mW/g

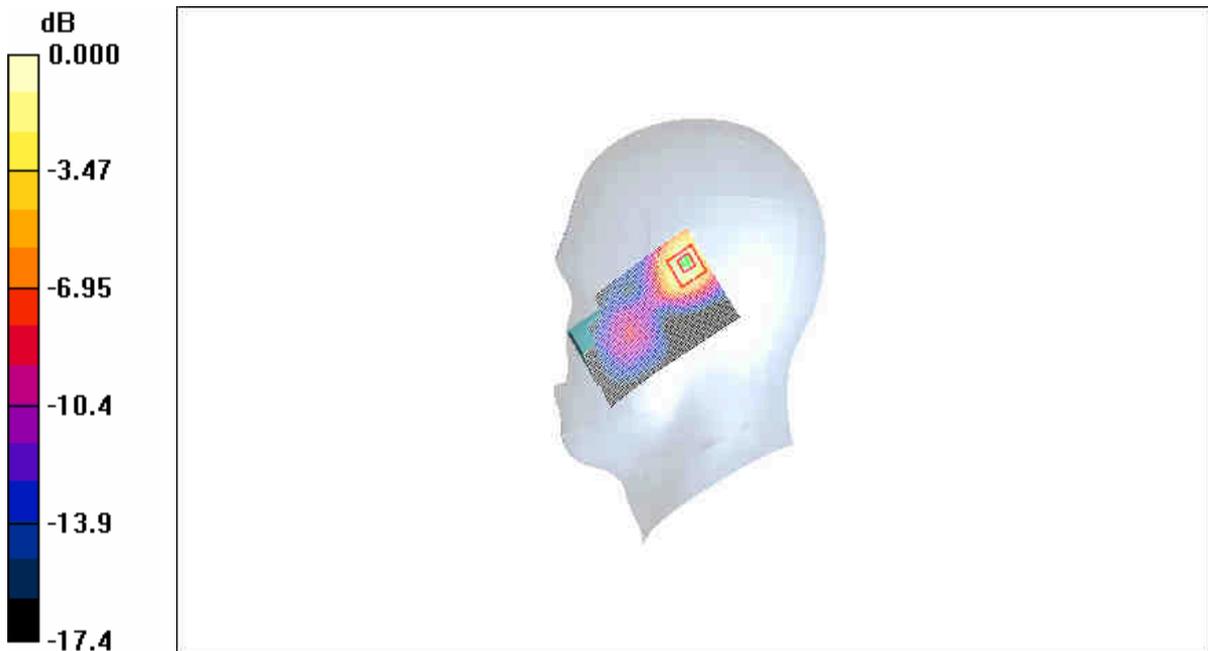
**Tilt Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.11 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 0.471 W/kg

**SAR(1 g) = 0.263 mW/g; SAR(10 g) = 0.139 mW/g**

Maximum value of SAR (measured) = 0.296 mW/g

**Fig. 21 Right Hand Tilt 15°PCS 1900MHz CH661**

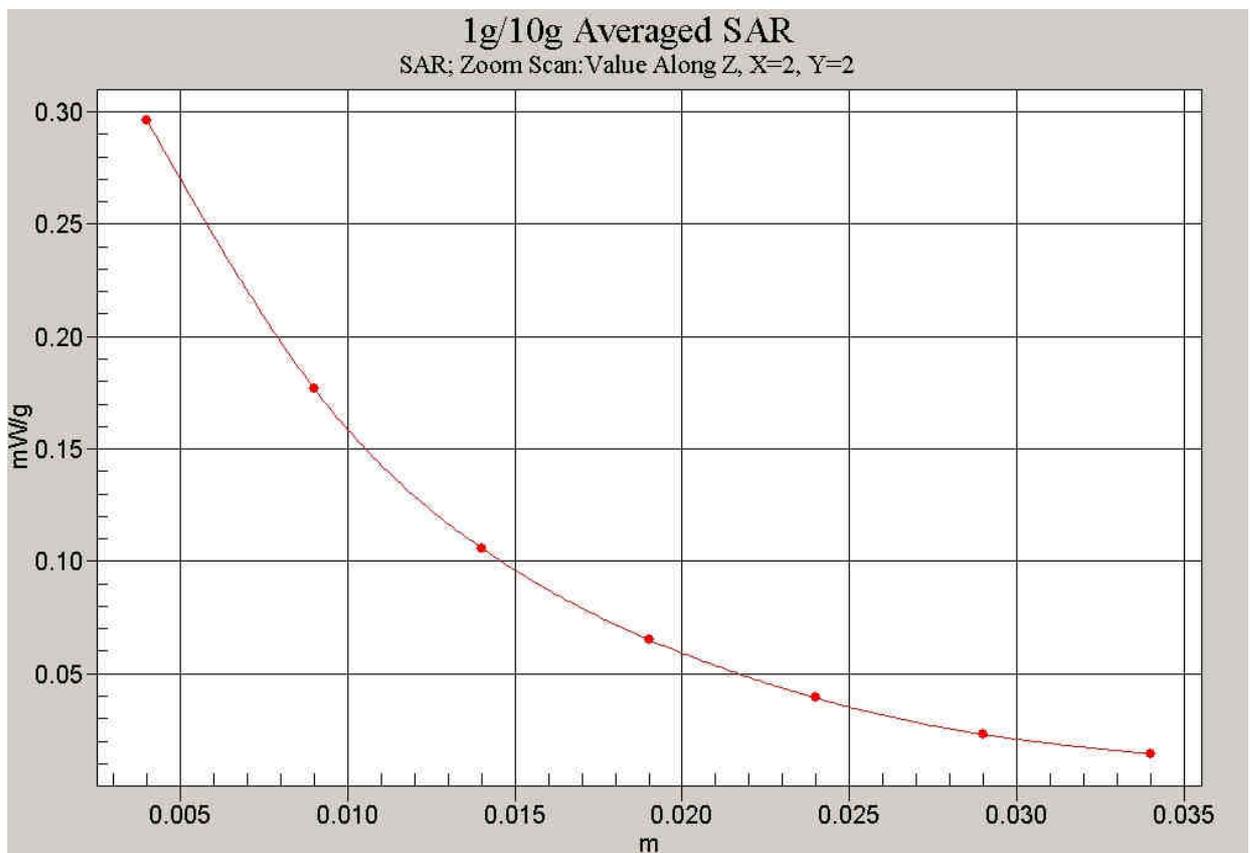


Fig. 22 Z-Scan at power reference point (PCS 1900MHz CH661)

**1900 Right Tilt Low**

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.33$  mho/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**Tilt Low/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.212 mW/g

**Tilt Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.08 V/m; Power Drift = 0.056 dB

Peak SAR (extrapolated) = 0.326 W/kg

**SAR(1 g) = 0.189 mW/g; SAR(10 g) = 0.102 mW/g**

Maximum value of SAR (measured) = 0.211 mW/g



0 dB = 0.211mW/g

**Fig. 23 Right Hand Tilt 15°PCS 1900MHz CH512**

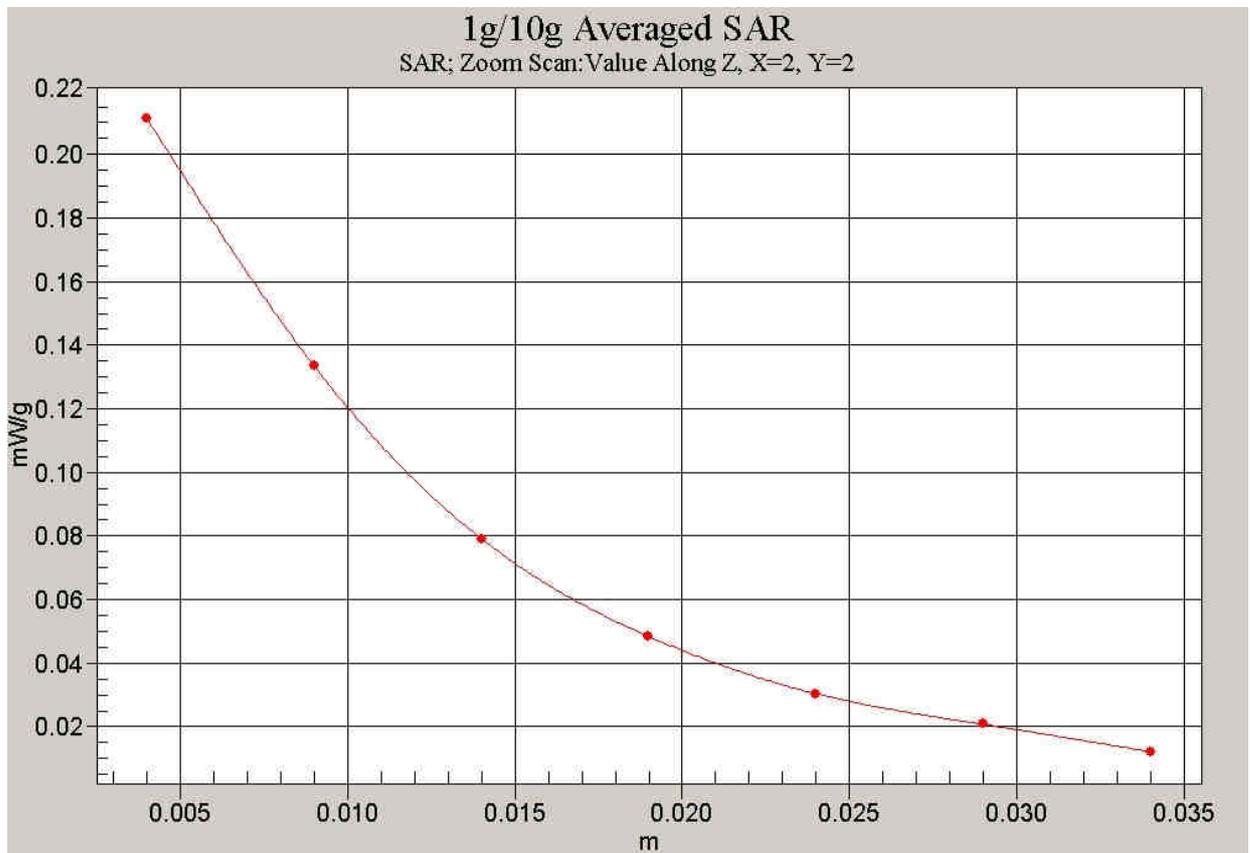


Fig. 24 Z-Scan at power reference point (PCS 1900MHz CH512)

**1900 Body Toward Ground High**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1909.8 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Ground High/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm  
 Maximum value of SAR (interpolated) = 0.422 mW/g

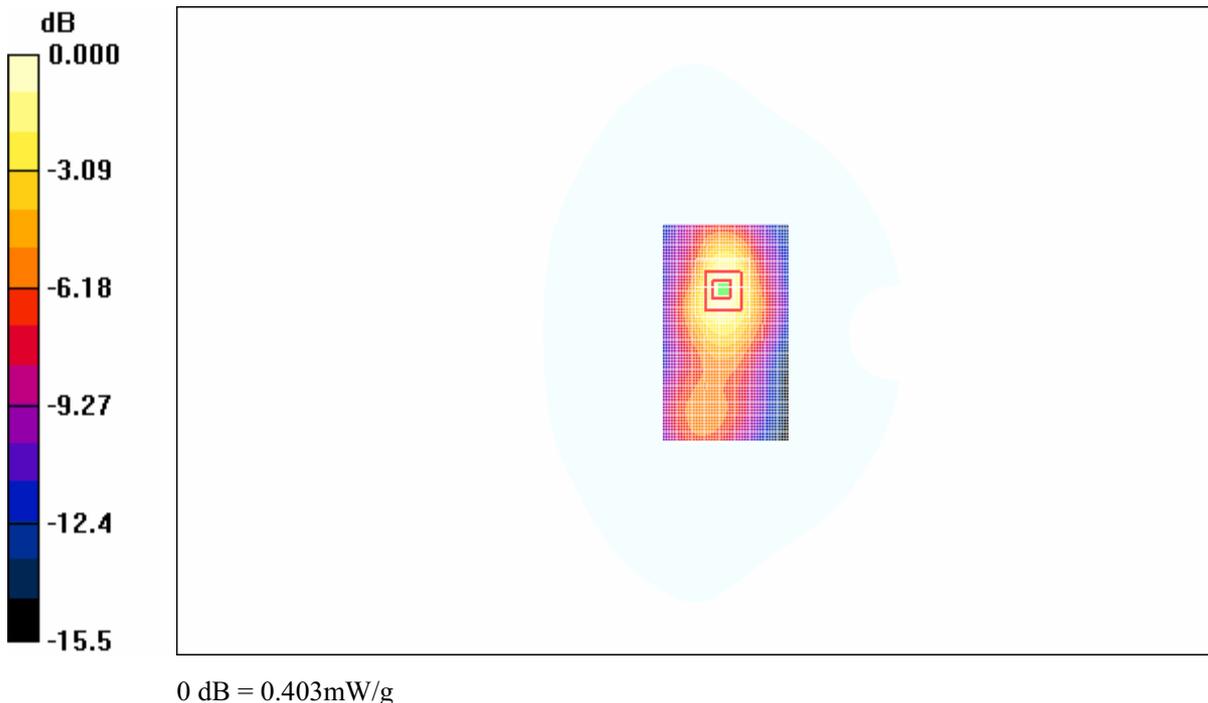
**Toward Ground High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.1 V/m; Power Drift = 0.011 dB

Peak SAR (extrapolated) = 0.593 W/kg

**SAR(1 g) = 0.369 mW/g; SAR(10 g) = 0.219 mW/g**

Maximum value of SAR (measured) = 0.403 mW/g



**Fig. 25 PCS 1900MHz, Body, Towards Ground, CH810**

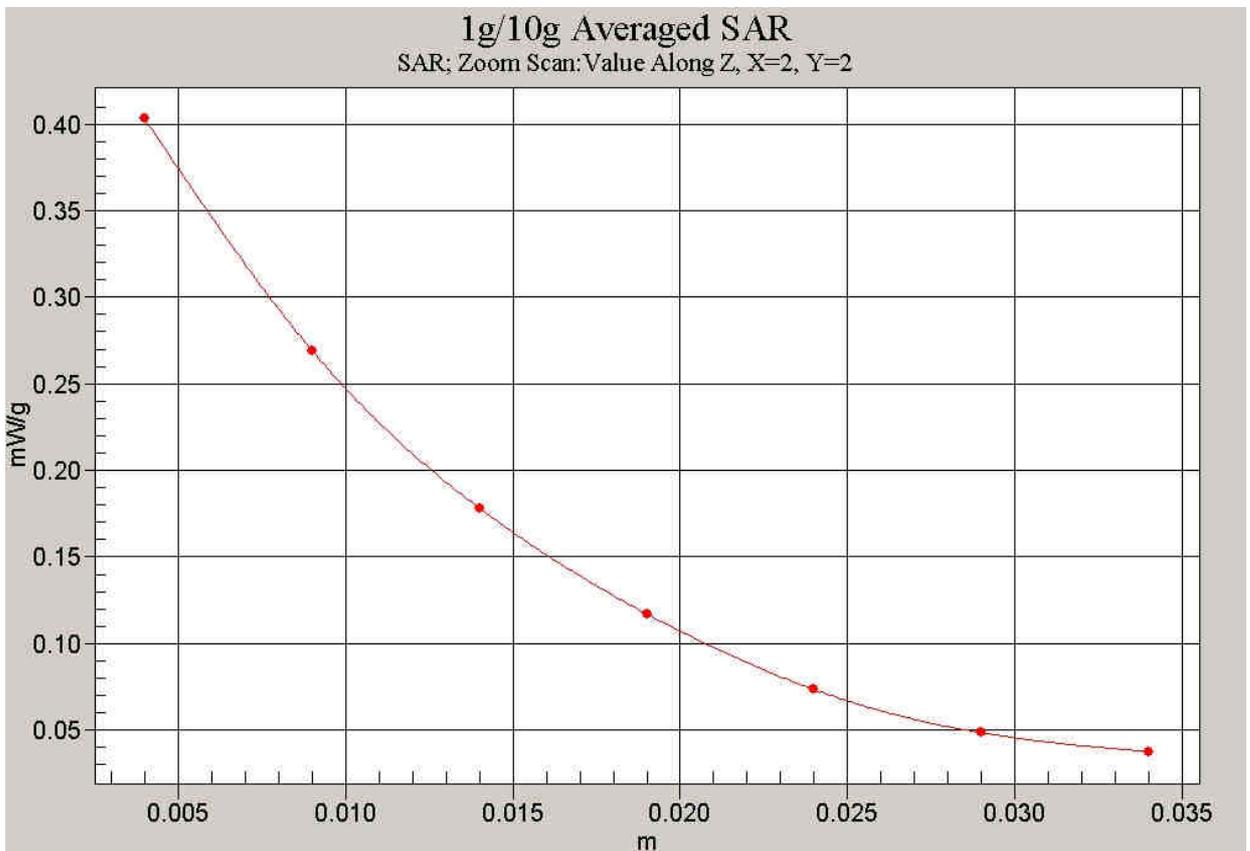


Fig. 26 Z-Scan at power reference point (PCS 1900MHz, Body Towards Ground, CH810)

**1900 Body Toward Ground Middle**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.51 \text{ mho/m}$ ;  $\epsilon_r = 52.1$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $23.3^\circ\text{C}$       Liquid Temperature:  $22.5^\circ\text{C}$

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Ground Middle/Area Scan (51x81x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 0.338 mW/g

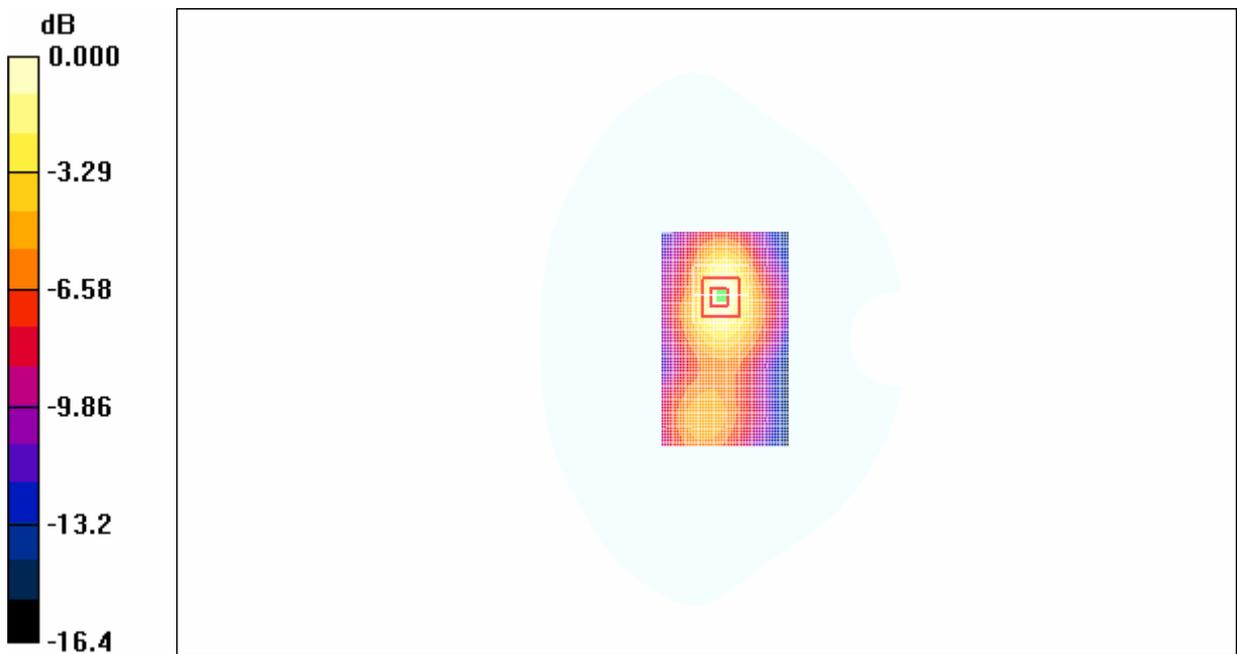
**Toward Ground Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 10.5 V/m; Power Drift = 0.067 dB

Peak SAR (extrapolated) = 0.482 W/kg

**SAR(1 g) = 0.296 mW/g; SAR(10 g) = 0.178 mW/g**

Maximum value of SAR (measured) = 0.324 mW/g



0 dB = 0.324mW/g

**Fig. 27 PCS 1900MHz, Body, Towards Ground, CH661**

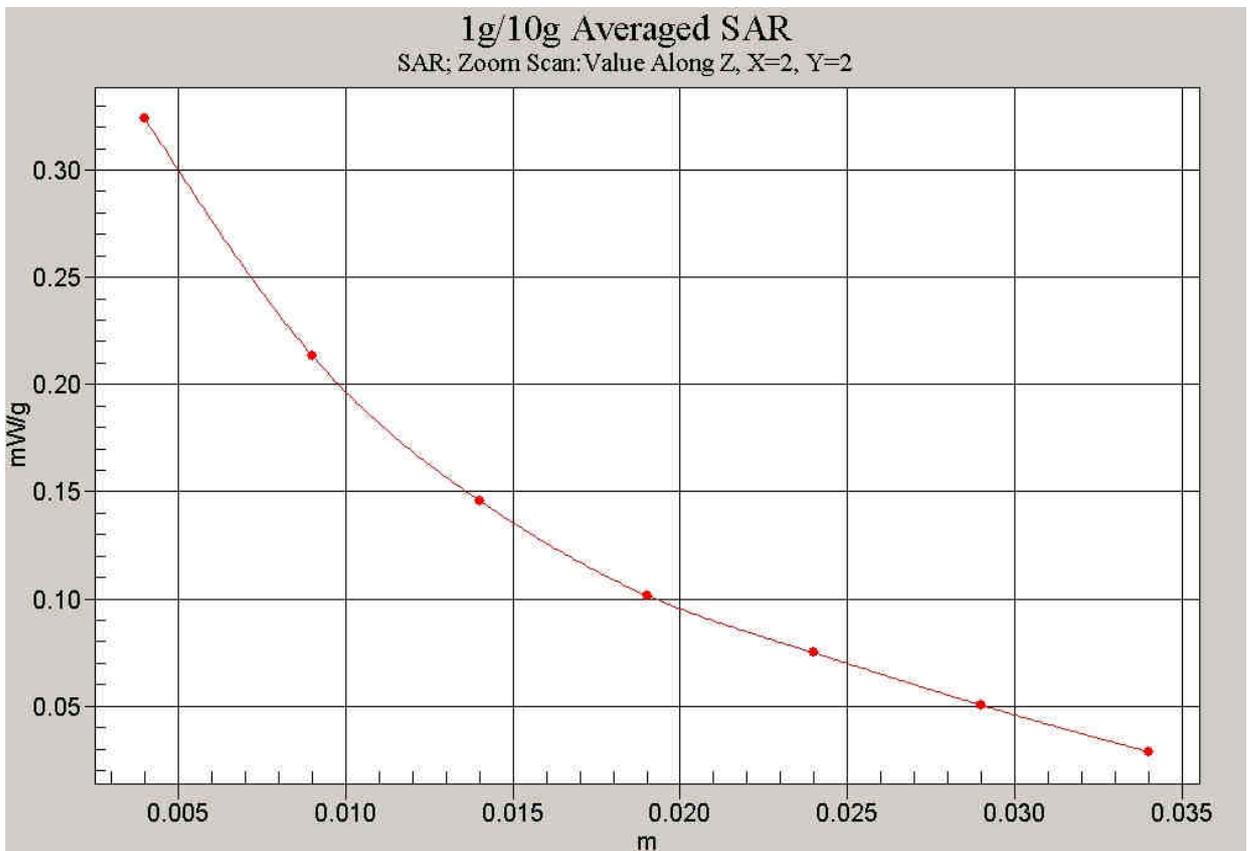


Fig. 28 Z-Scan at power reference point (PCS 1900MHz, Body Towards Ground, CH661)

**1900 Body Toward Ground Low**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.48$  mho/m;  $\epsilon_r = 52.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Ground Low/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.288 mW/g

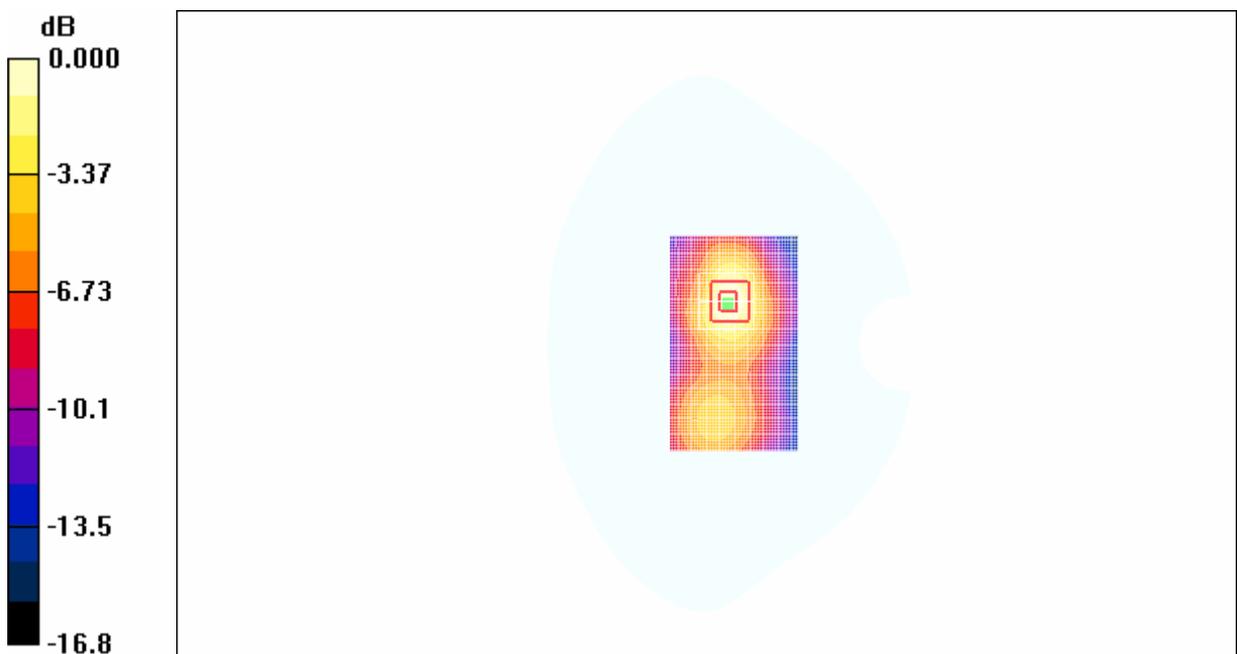
**Toward Ground Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.37 V/m; Power Drift = 0.012 dB

Peak SAR (extrapolated) = 0.386 W/kg

**SAR(1 g) = 0.252 mW/g; SAR(10 g) = 0.152 mW/g**

Maximum value of SAR (measured) = 0.277 mW/g



0 dB = 0.277mW/g

Fig. 29 PCS 1900MHz, Body, Towards Ground, CH512

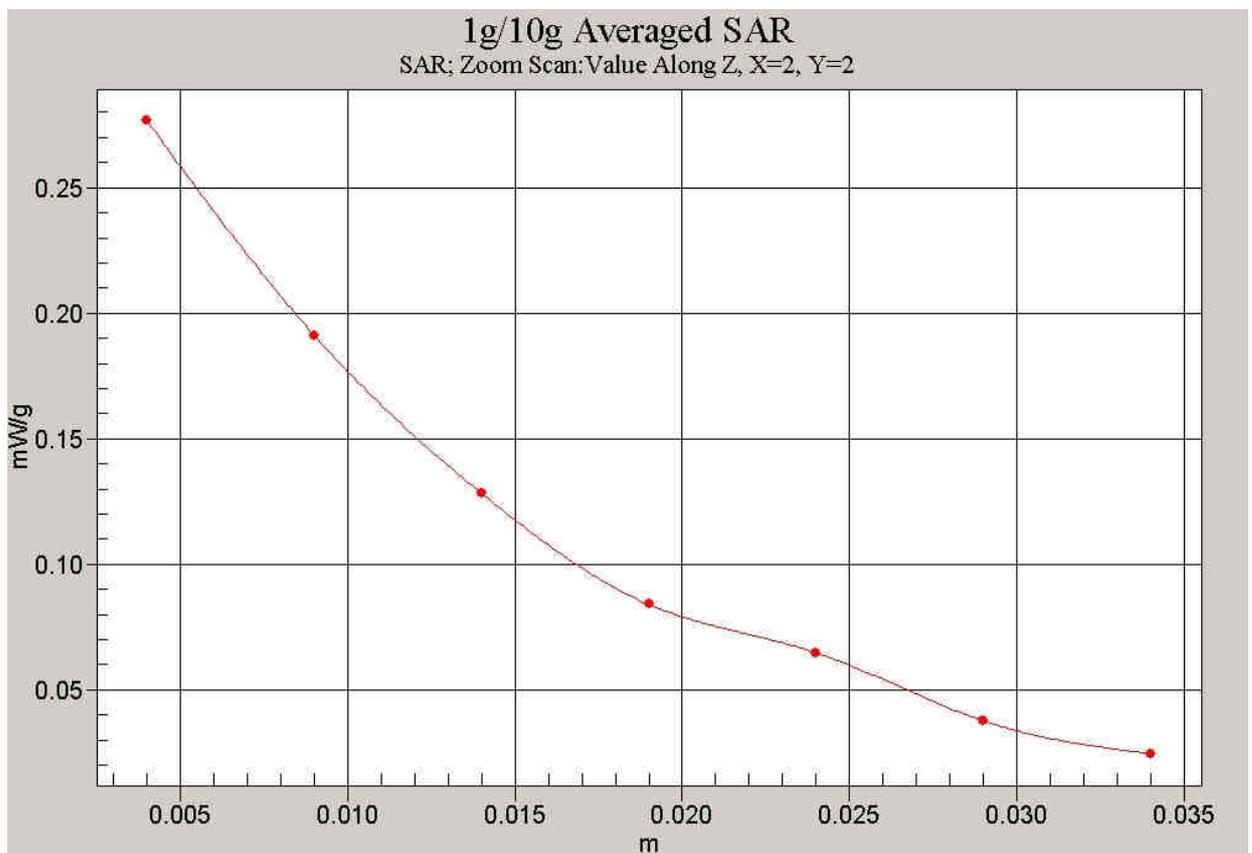


Fig. 30 Z-Scan at power reference point (PCS 1900MHz, Body Towards Ground, CH512)

**1900 Body Toward Phantom High**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1909.8 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Phantom High/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm  
 Maximum value of SAR (interpolated) = 0.095 mW/g

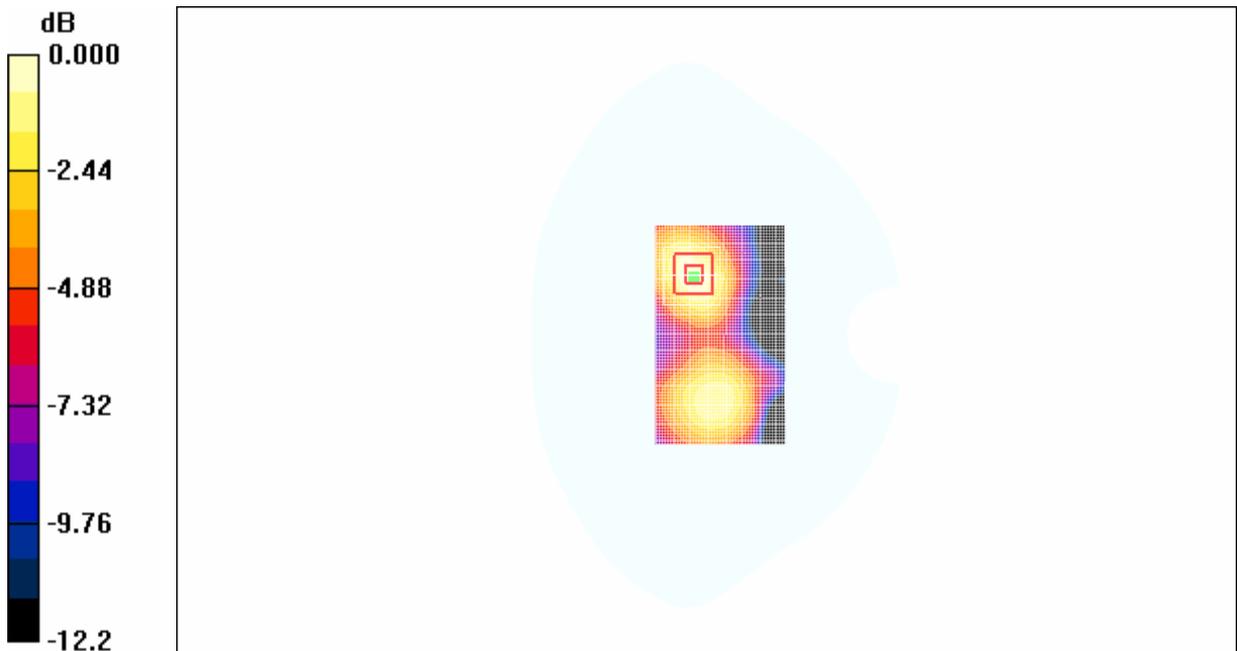
**Toward Phantom High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.33 V/m; Power Drift = -0.104 dB

Peak SAR (extrapolated) = 0.144 W/kg

**SAR(1 g) = 0.088 mW/g; SAR(10 g) = 0.056 mW/g**

Maximum value of SAR (measured) = 0.097 mW/g



0 dB = 0.097mW/g

**Fig. 31 PCS 1900MHz, Body, Towards Phantom, CH810**

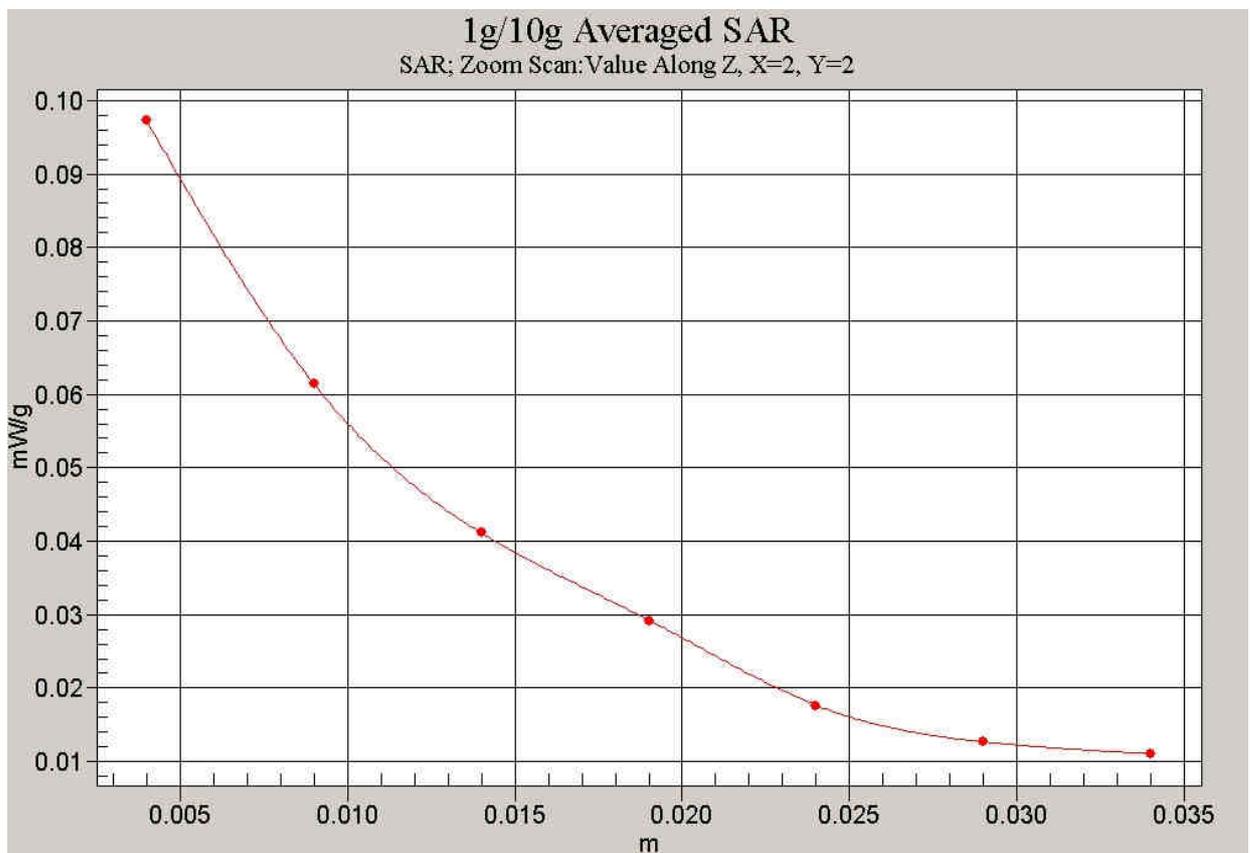


Fig. 32 Z-Scan at power reference point (PCS 1900MHz, Body Towards Phantom, CH810)

**1900 Body Toward Phantom Middle**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 52.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Phantom Middle/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.064 mW/g

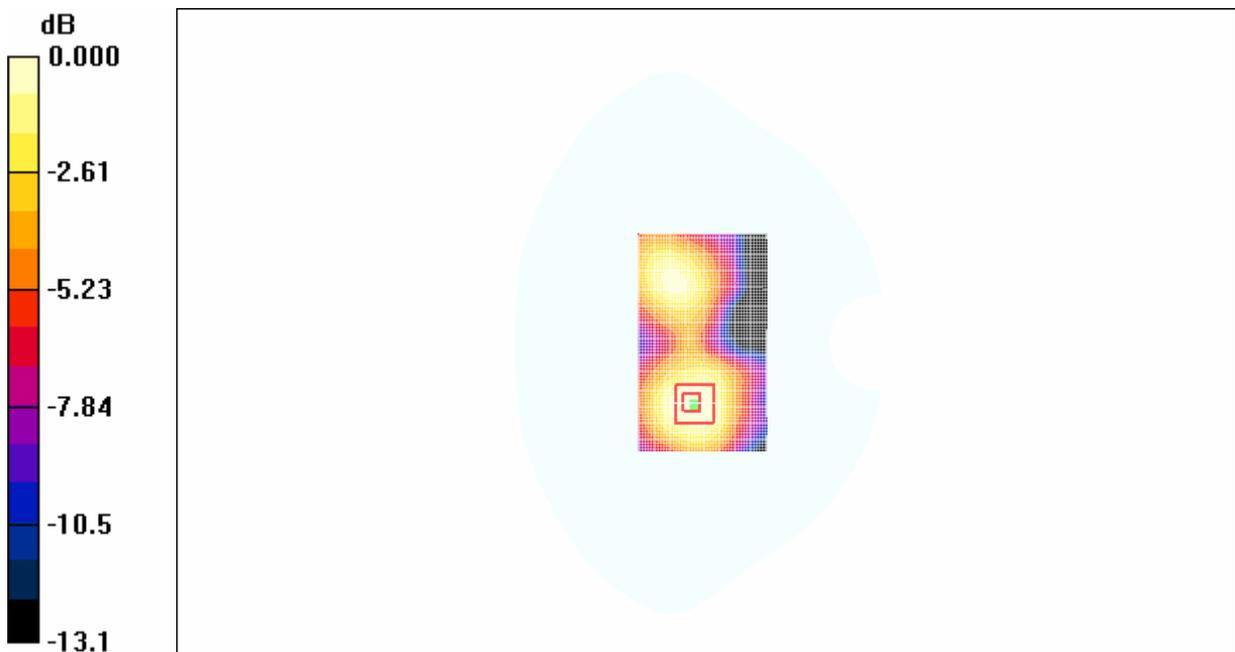
**Toward Phantom Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.64 V/m; Power Drift = 0.200 dB

Peak SAR (extrapolated) = 0.085 W/kg

**SAR(1 g) = 0.058 mW/g; SAR(10 g) = 0.036 mW/g**

Maximum value of SAR (measured) = 0.062 mW/g



0 dB = 0.062mW/g

**Fig. 33 PCS 1900MHz, Body, Towards Phantom, CH661**

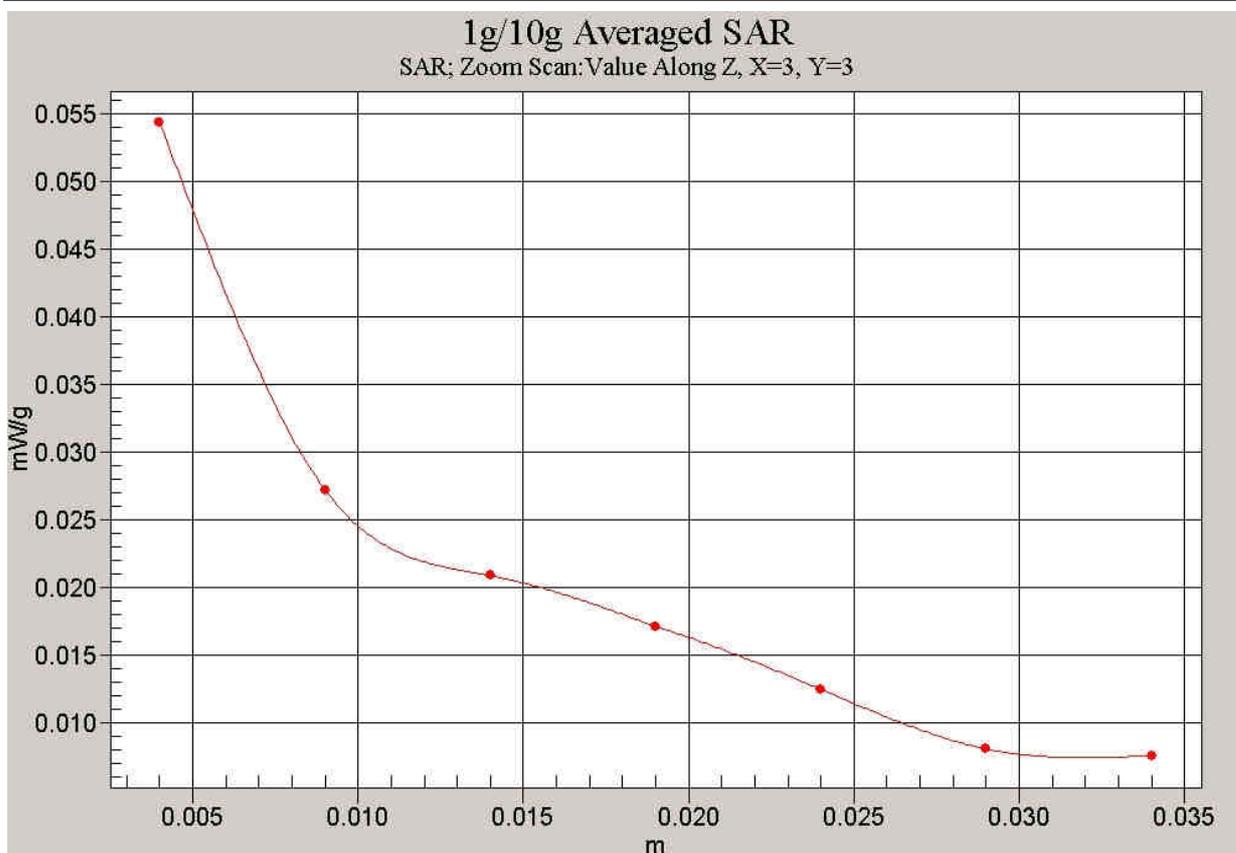


Fig. 34 Z-Scan at power reference point (PCS 1900MHz, Body Towards Phantom, CH661)

**1900 Body Toward Phantom Low**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.48$  mho/m;  $\epsilon_r = 52.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Phantom Low/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm  
 Maximum value of SAR (interpolated) = 0.044 mW/g

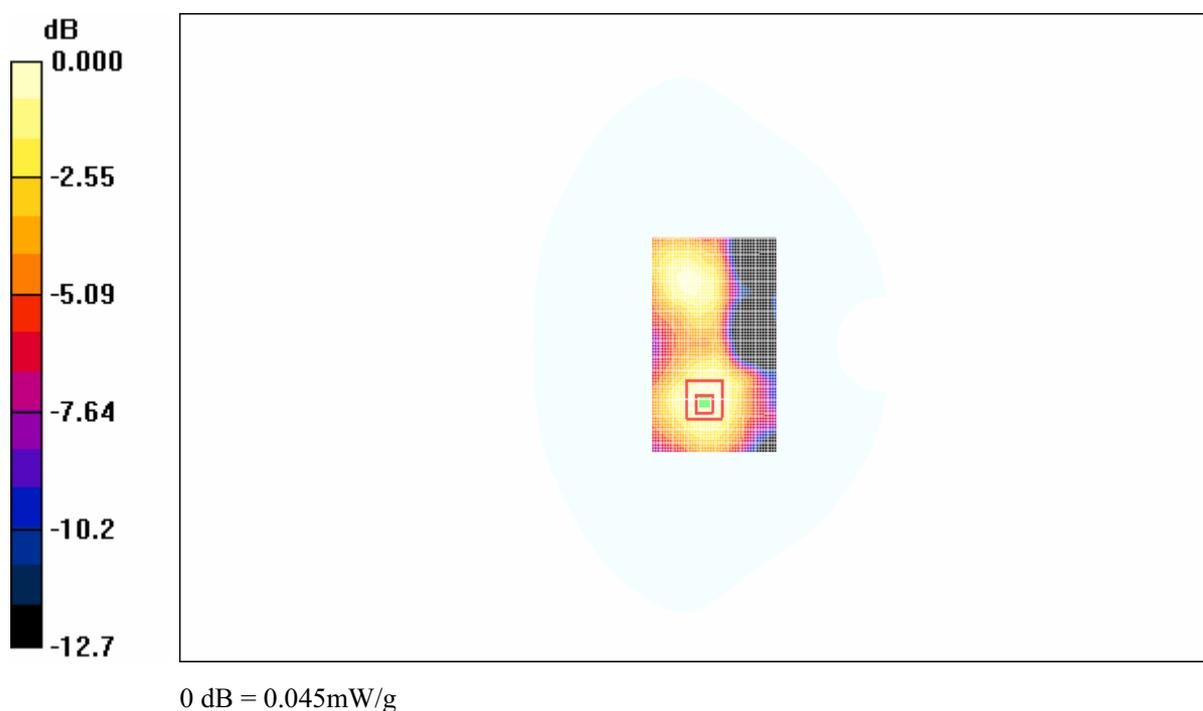
**Toward Phantom Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.46 V/m; Power Drift = -0.189 dB

Peak SAR (extrapolated) = 0.064 W/kg

**SAR(1 g) = 0.041 mW/g; SAR(10 g) = 0.026 mW/g**

Maximum value of SAR (measured) = 0.045 mW/g



**Fig. 35 PCS 1900MHz, Body, Towards Phantom, CH512**

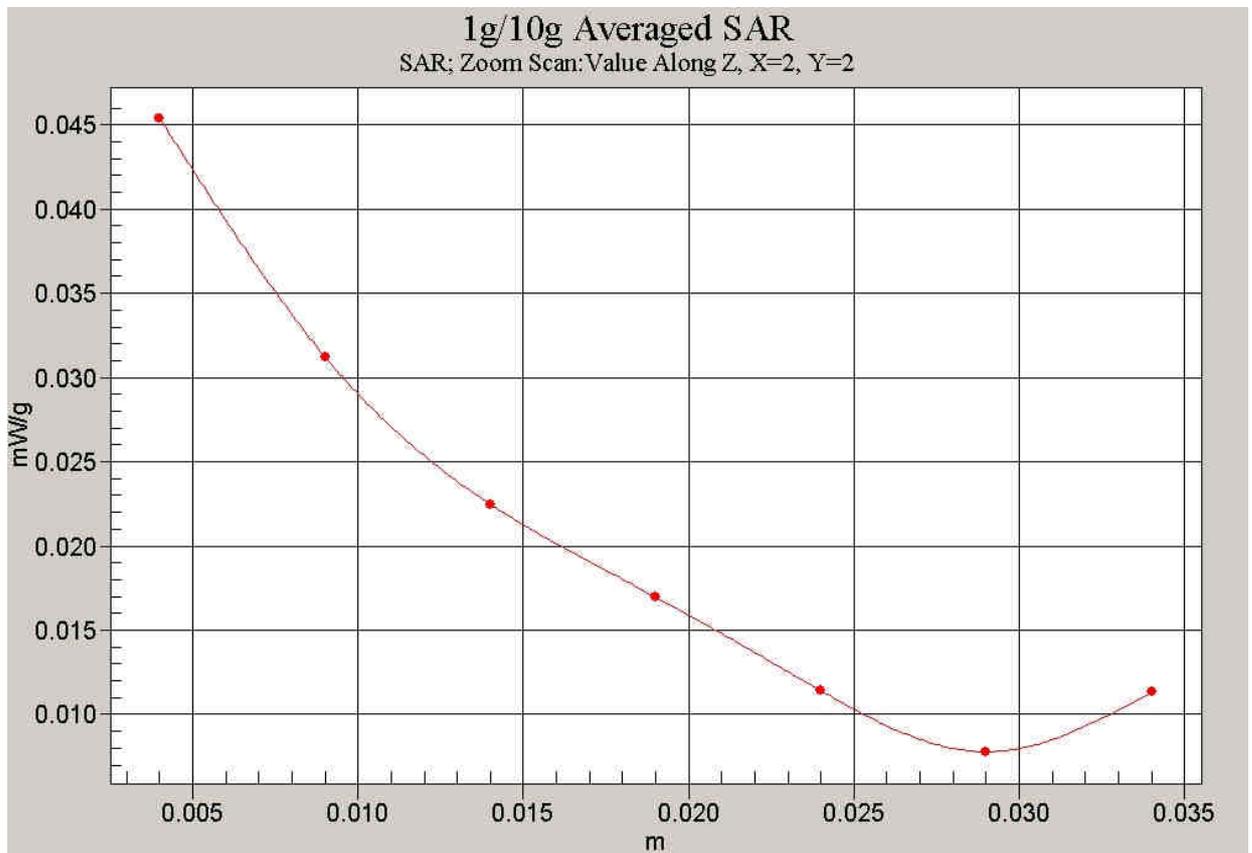


Fig. 36 Z-Scan at power reference point (PCS 1900MHz, Body Towards Phantom, CH512)

**1900 Body Toward Ground High with GPRS**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Frequency: 1909.8 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Ground High/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.802 mW/g

**Toward Ground High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.5 V/m; Power Drift = -0.060 dB

Peak SAR (extrapolated) = 1.18 W/kg

**SAR(1 g) = 0.702 mW/g; SAR(10 g) = 0.412 mW/g**

Maximum value of SAR (measured) = 0.765 mW/g

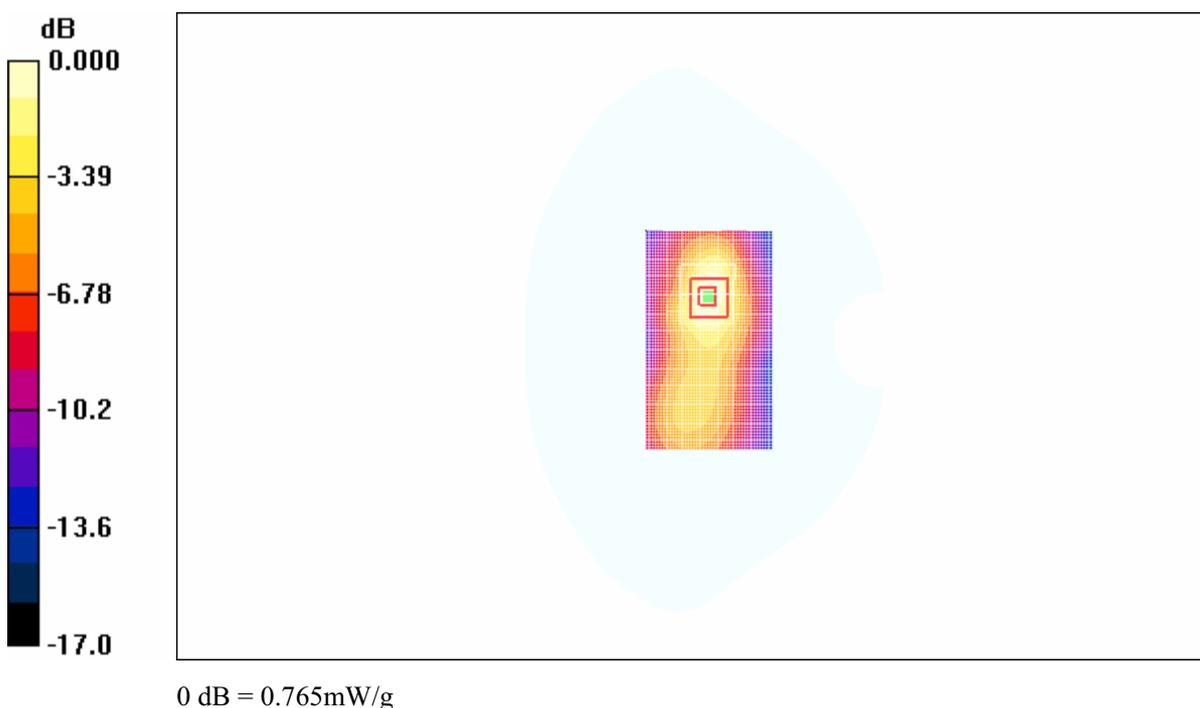
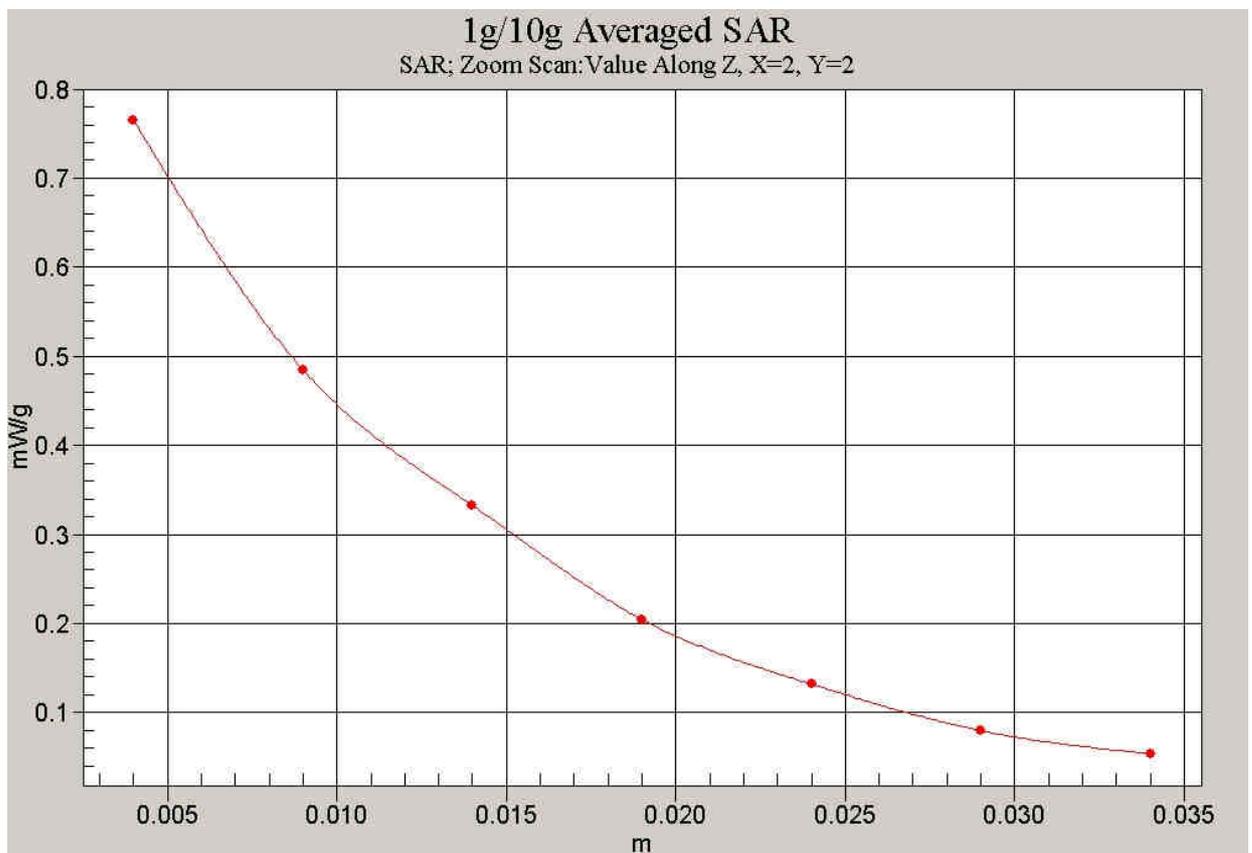


Fig. 37 PCS 1900MHz, Body, Towards Ground with GPRS, CH810



**Fig. 38 Z-Scan at power reference point  
(PCS 1900MHz, Body Towards Ground with GPRS, CH810)**

**1900 Body Toward Ground Middle with GPRS**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.51 \text{ mho/m}$ ;  $\epsilon_r = 52.1$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $23.3^\circ\text{C}$       Liquid Temperature:  $22.5^\circ\text{C}$

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Ground Middle/Area Scan (51x81x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 0.605 mW/g

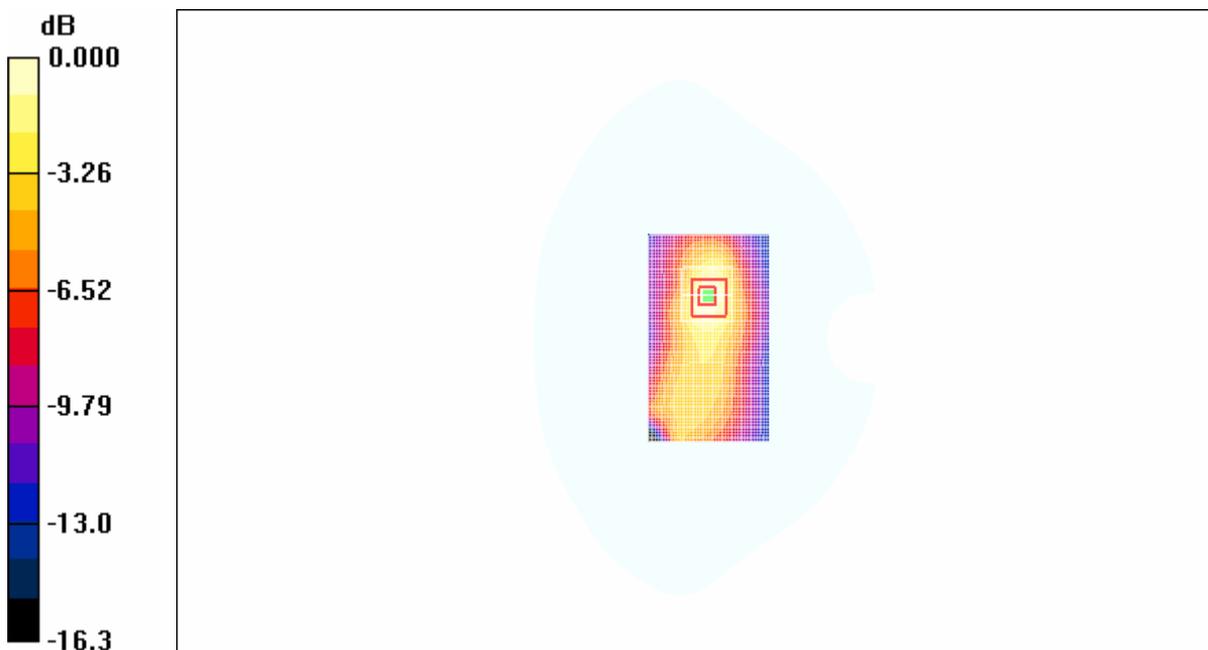
**Toward Ground Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 15.3 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.890 W/kg

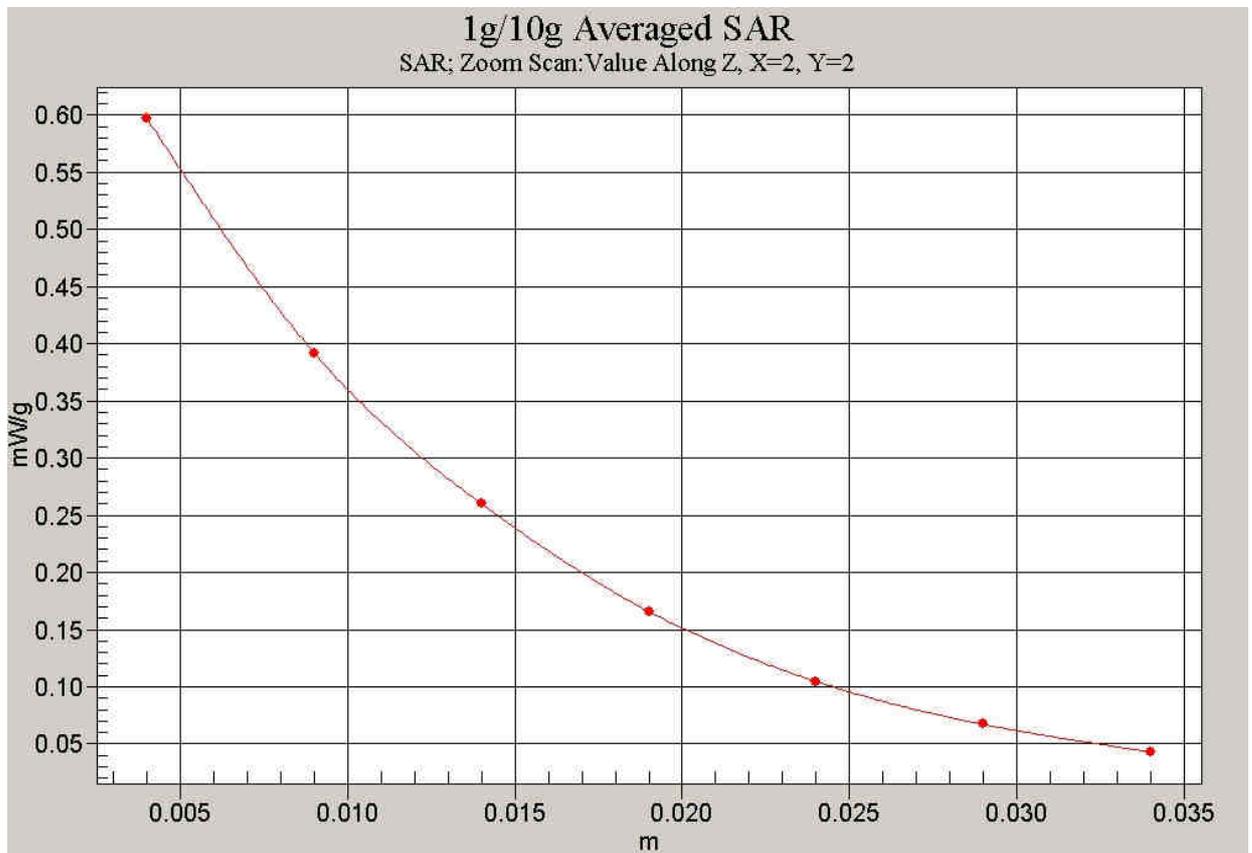
**SAR(1 g) = 0.544 mW/g; SAR(10 g) = 0.318 mW/g**

Maximum value of SAR (measured) = 0.597 mW/g



0 dB = 0.597mW/g

**Fig. 39 PCS 1900MHz, Body, Towards Ground with GPRS, CH661**



**Fig. 40 Z-Scan at power reference point  
(PCS 1900MHz, Body Towards Ground with GPRS, CH661)**

**1900 Body Toward Ground Low with GPRS**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.48$  mho/m;  $\epsilon_r = 52.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Frequency: 1850.2 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Ground Low/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm  
 Maximum value of SAR (interpolated) = 0.532 mW/g

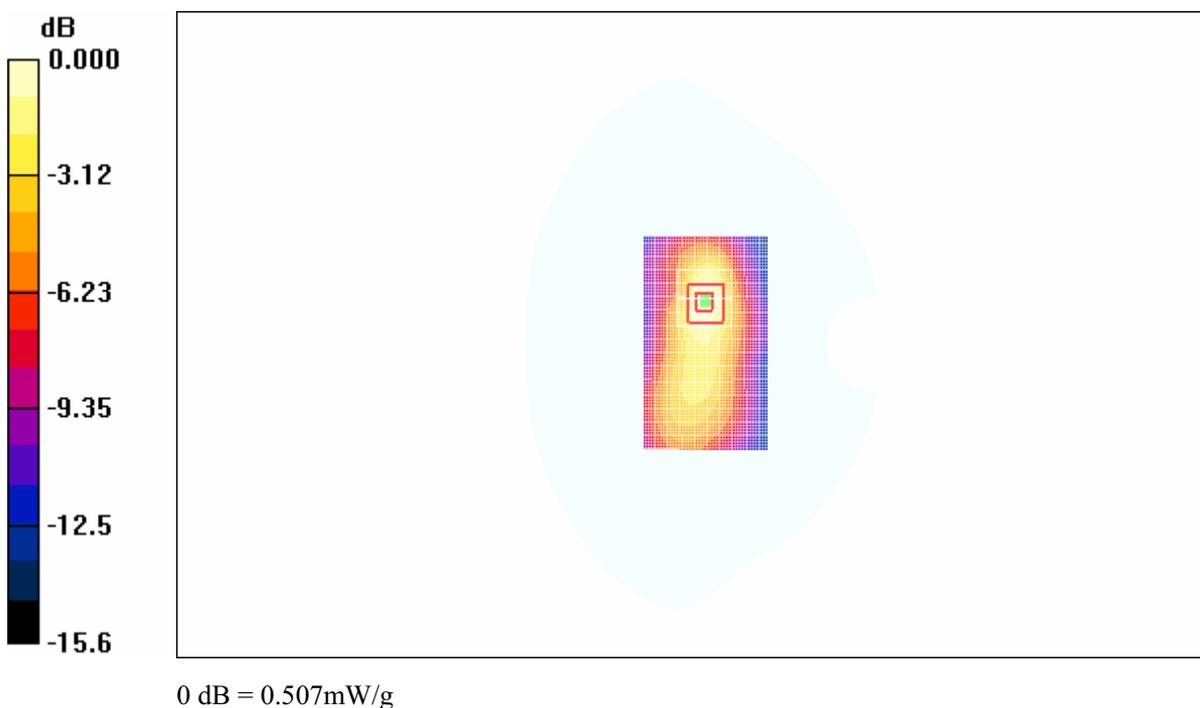
**Toward Ground Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.2 V/m; Power Drift = -0.044 dB

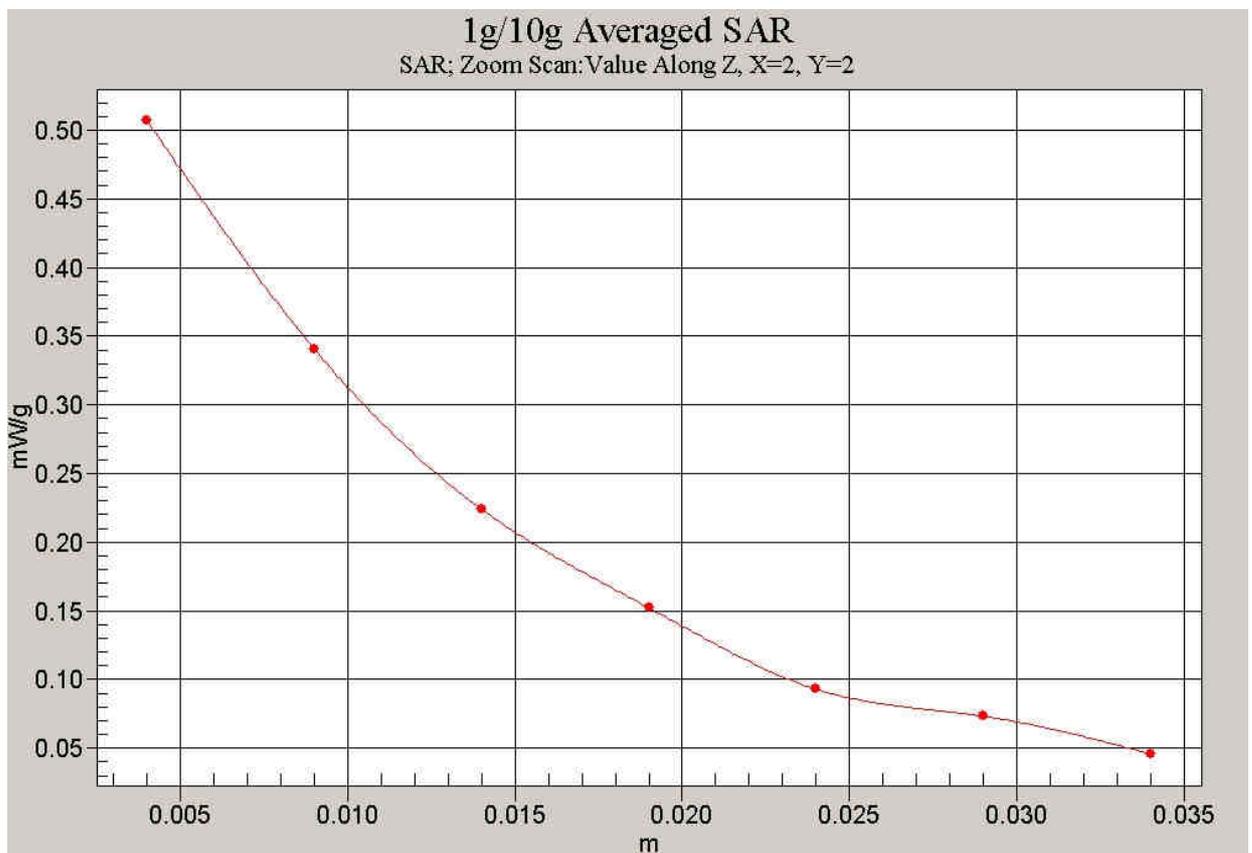
Peak SAR (extrapolated) = 0.746 W/kg

**SAR(1 g) = 0.467 mW/g; SAR(10 g) = 0.275 mW/g**

Maximum value of SAR (measured) = 0.507 mW/g



**Fig. 41 PCS 1900MHz, Body, Towards Ground with GPRS, CH512**



**Fig. 42 Z-Scan at power reference point  
(PCS 1900MHz, Body Towards Ground with GPRS, CH512)**

**1900 Body Toward Phantom High with GPRS**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Frequency: 1909.8 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

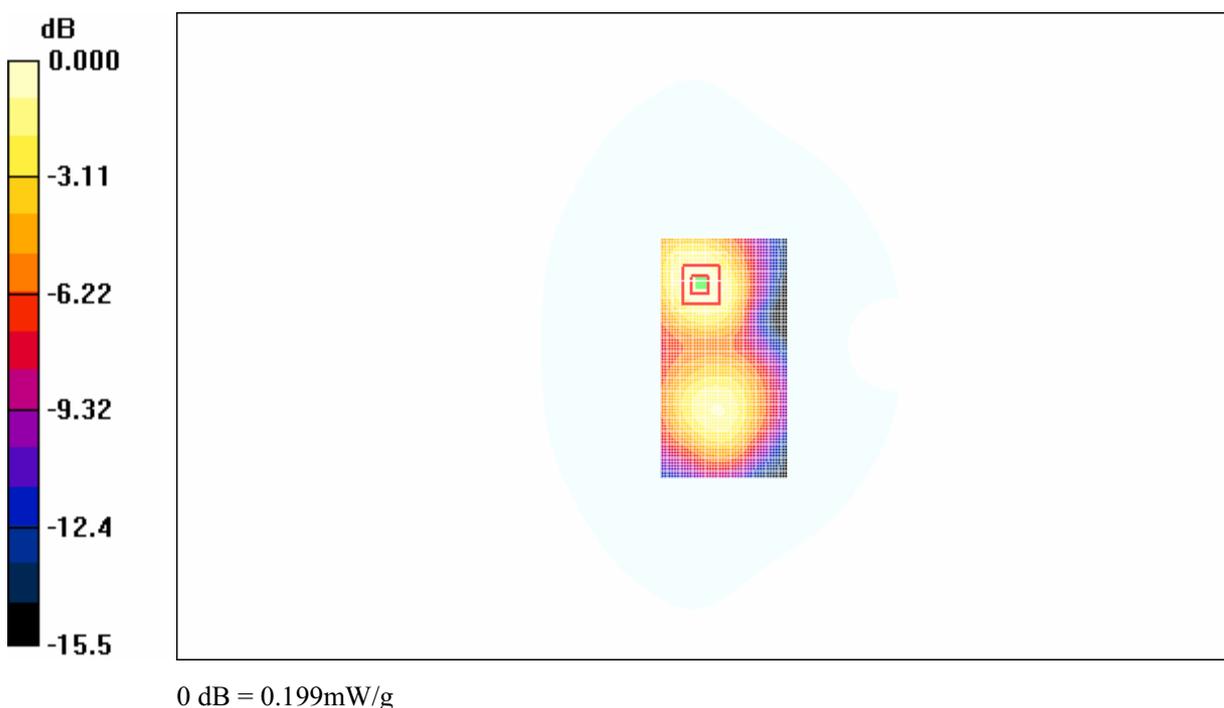
**Toward Phantom High/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.200 mW/g**Toward Phantom High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

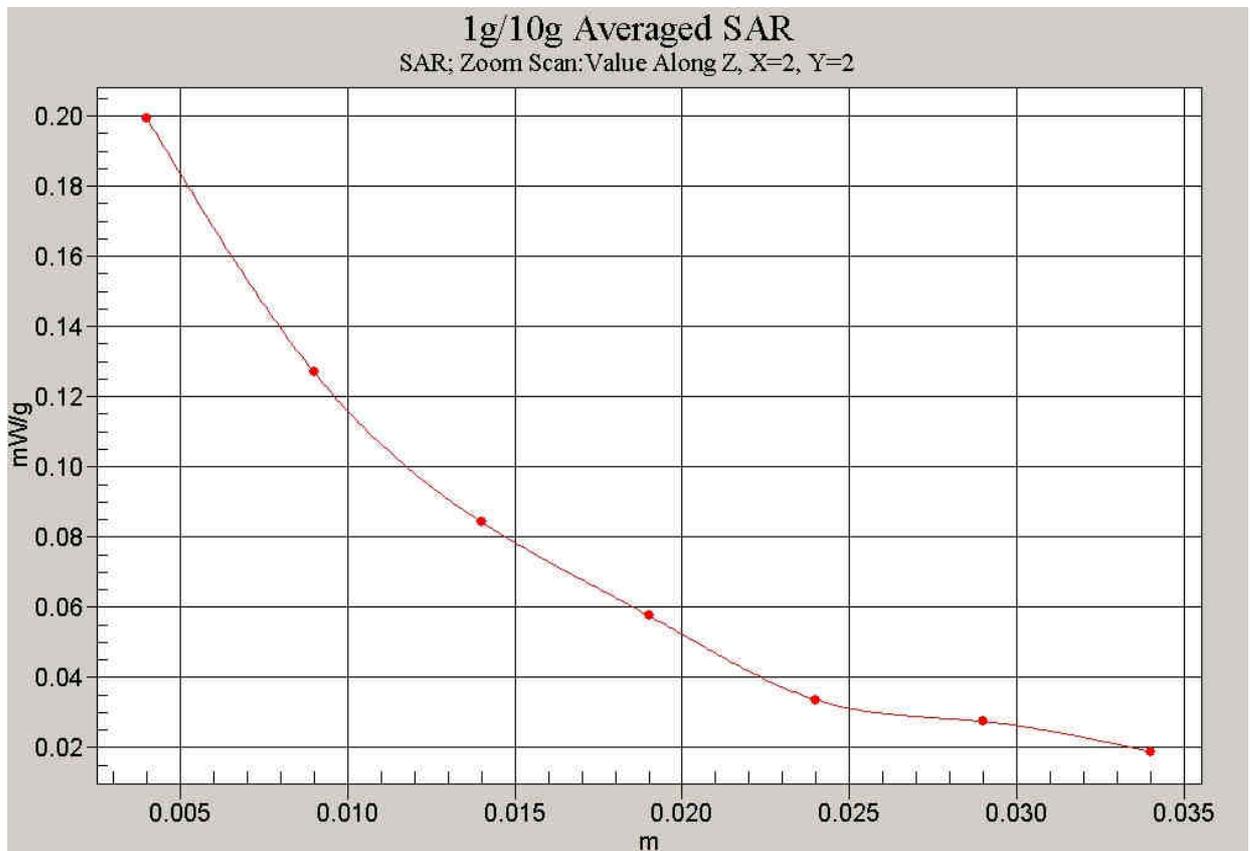
Reference Value = 6.36 V/m; Power Drift = -0.198 dB

Peak SAR (extrapolated) = 0.290 W/kg

**SAR(1 g) = 0.184 mW/g; SAR(10 g) = 0.115 mW/g**

Maximum value of SAR (measured) = 0.199 mW/g

**Fig. 43 PCS 1900MHz, Body, Towards Phantom with GPRS, CH810**



**Fig. 44 Z-Scan at power reference point  
(PCS 1900MHz, Body Towards Phantom with GPRS, CH810)**

**1900 Body Toward Phantom Middle with GPRS**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 52.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Phantom Middle/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.129 mW/g

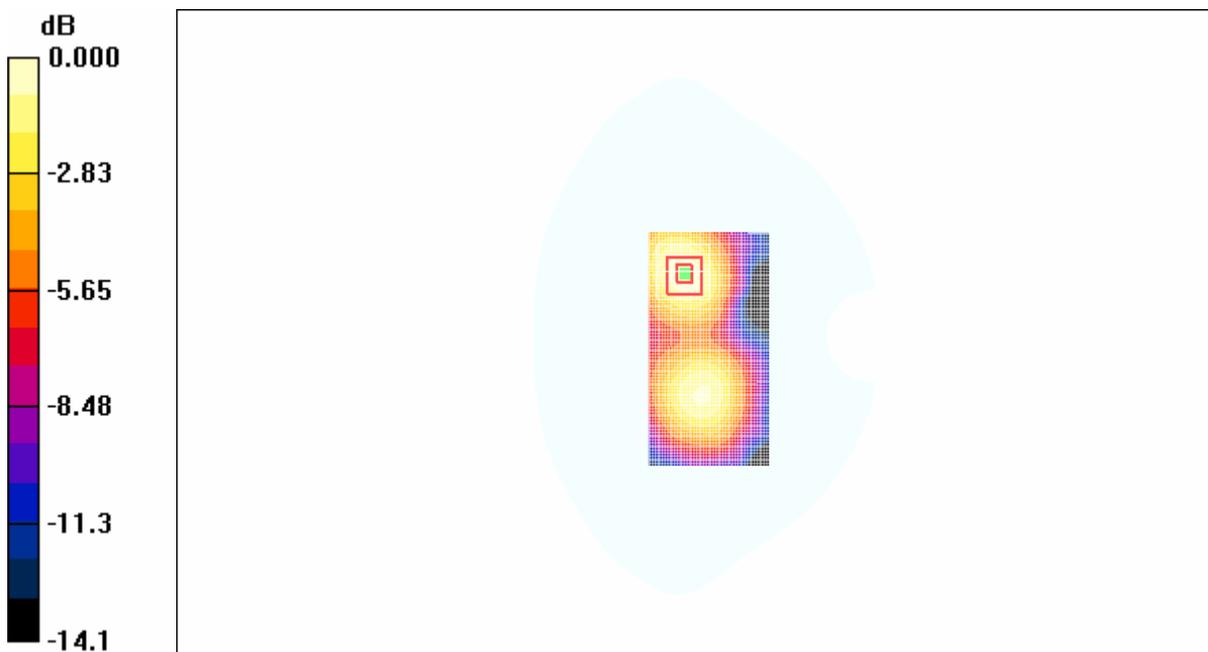
**Toward Phantom Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.05 V/m; Power Drift = 0.029 dB

Peak SAR (extrapolated) = 0.201 W/kg

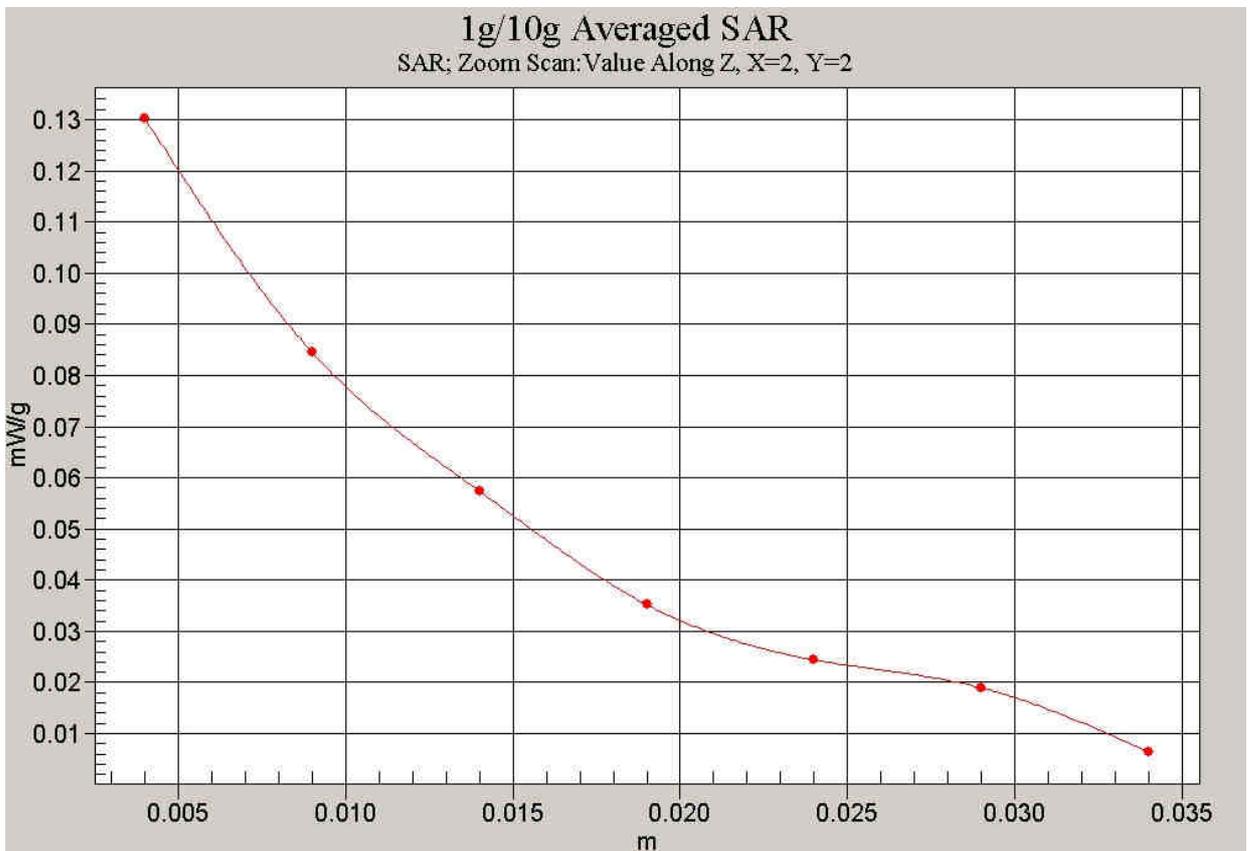
**SAR(1 g) = 0.121 mW/g; SAR(10 g) = 0.075 mW/g**

Maximum value of SAR (measured) = 0.130 mW/g



0 dB = 0.130mW/g

**Fig. 45 PCS 1900MHz, Body, Towards Phantom with GPRS, CH661**



**Fig. 46 Z-Scan at power reference point  
(PCS 1900MHz, Body Towards Phantom with GPRS, CH661)**

**1900 Body Toward Phantom Low with GPRS**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.48$  mho/m;  $\epsilon_r = 52.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Frequency: 1850.2 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Phantom Low/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.090 mW/g

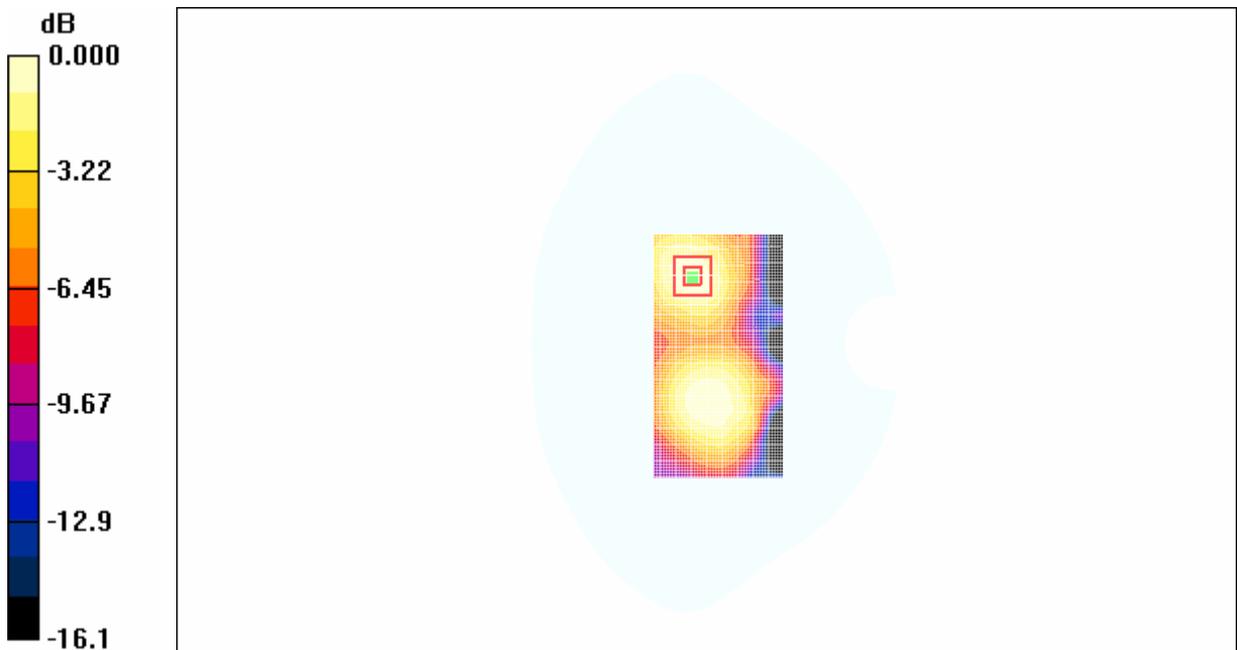
**Toward Phantom Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.55 V/m; Power Drift = 0.157 dB

Peak SAR (extrapolated) = 0.130 W/kg

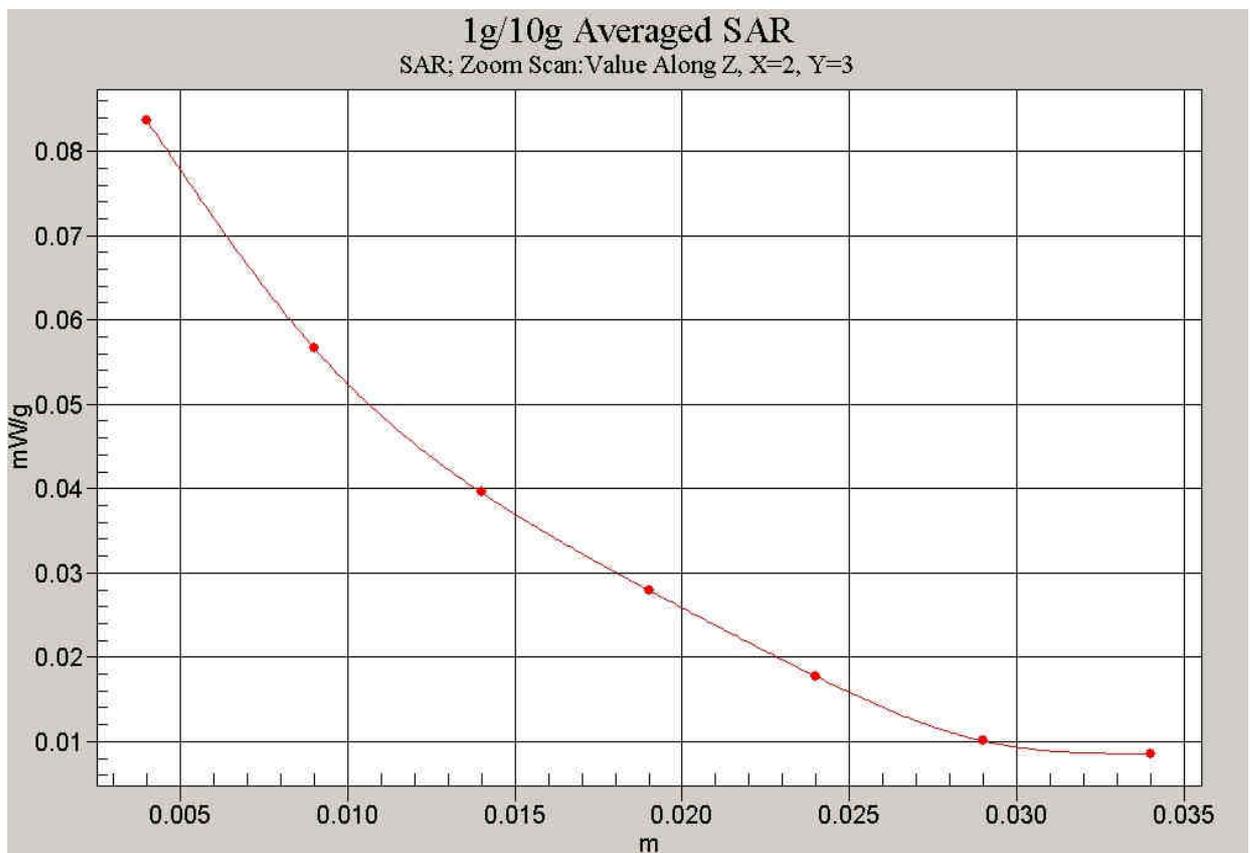
**SAR(1 g) = 0.083 mW/g; SAR(10 g) = 0.054 mW/g**

Maximum value of SAR (measured) = 0.092 mW/g



0 dB = 0.092mW/g

**Fig. 47 PCS 1900MHz, Body, Towards Phantom with GPRS, CH512**



**Fig. 48 Z-Scan at power reference point  
(PCS 1900MHz, Body Towards Phantom with GPRS, CH512)**

**1900 Body Toward Ground High with EGPRS**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Frequency: 1909.8 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Ground High/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm  
 Maximum value of SAR (interpolated) = 0.371 mW/g

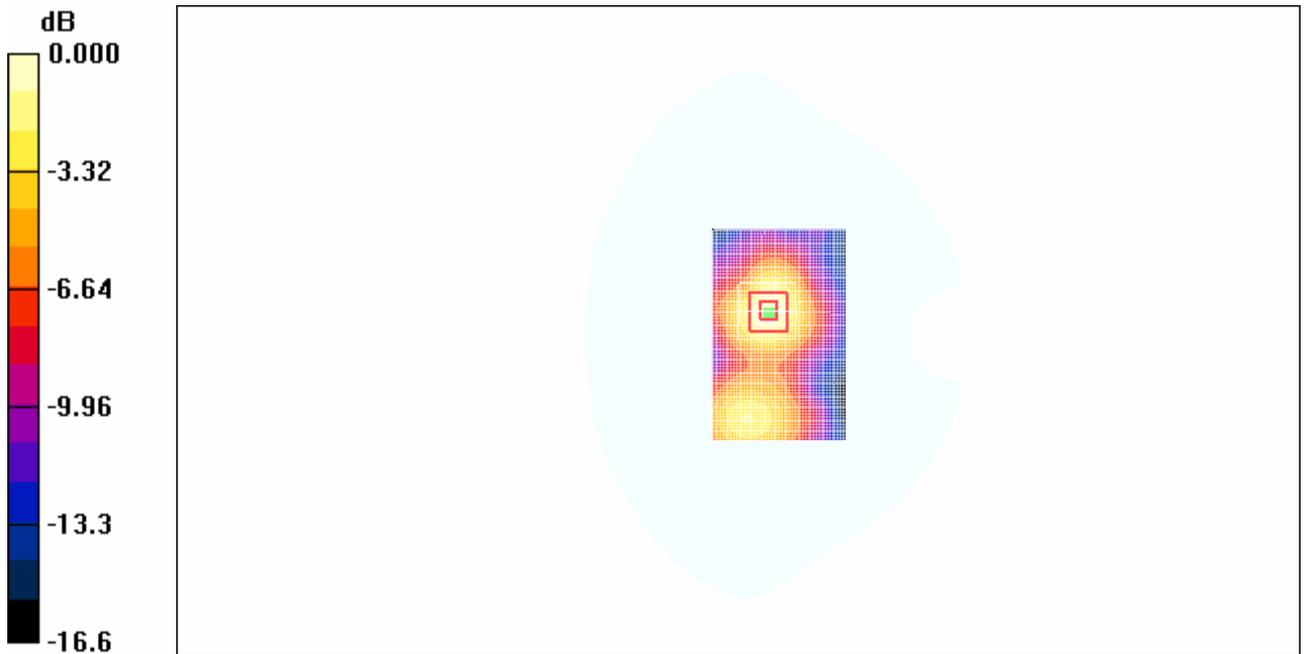
**Toward Ground High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.74 V/m; Power Drift = 0.055 dB

Peak SAR (extrapolated) = 0.519 W/kg

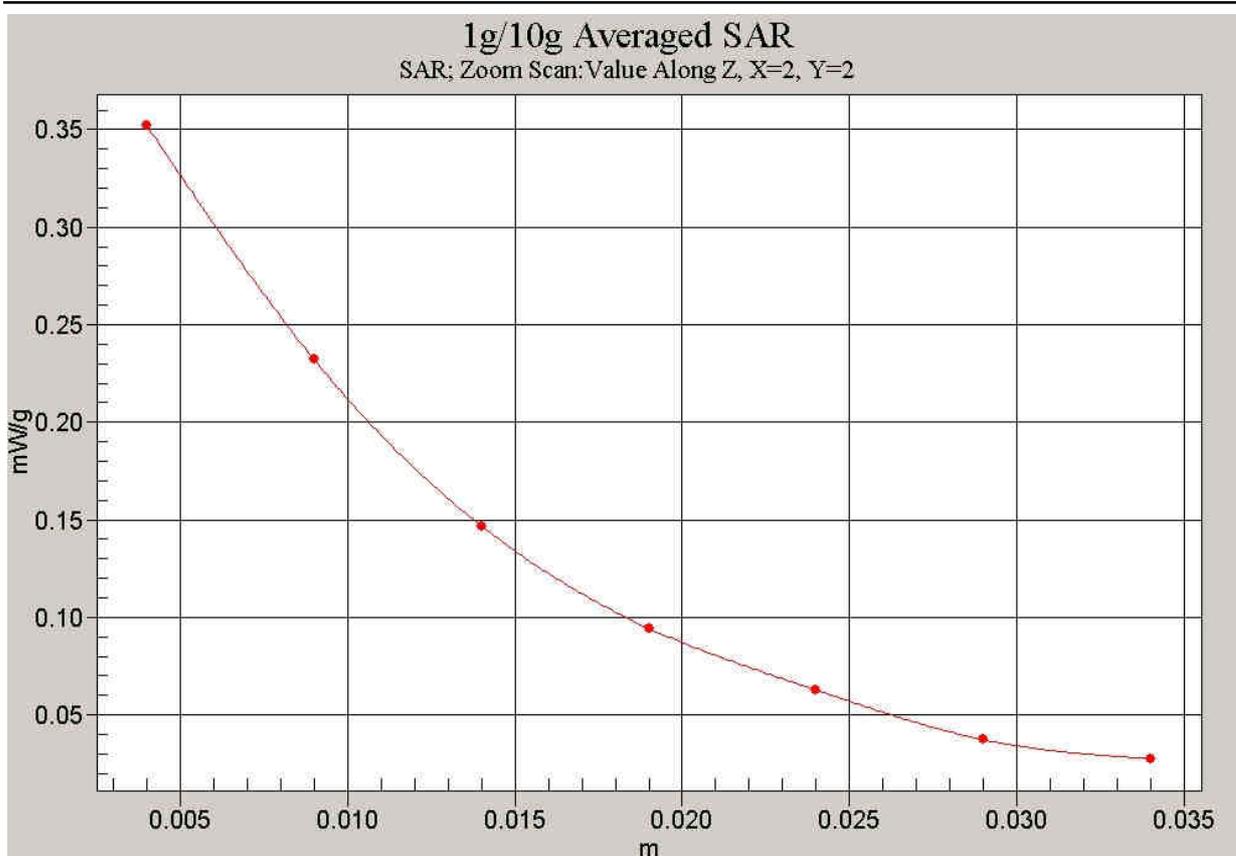
**SAR(1 g) = 0.334 mW/g; SAR(10 g) = 0.195 mW/g**

Maximum value of SAR (measured) = 0.351 mW/g



0 dB = 0.367mW/g

**Fig. 49 PCS 1900MHz, Body, Towards Ground with EGPRS, CH810**



**Fig. 50 Z-Scan at power reference point  
(PCS 1900MHz, Body, Towards Ground with EGPRS, CH810)**

**1900 Body Toward Ground High with Bluetooth Function**

Electronics: DAE3 Sn536

Medium: 1900 Body

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

**Toward Ground High/Area Scan (51x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.429 mW/g

**Toward Ground High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.1 V/m; Power Drift = -0.063 dB

Peak SAR (extrapolated) = 0.617 W/kg

**SAR(1 g) = 0.384 mW/g; SAR(10 g) = 0.224 mW/g**

Maximum value of SAR (measured) = 0.422 mW/g

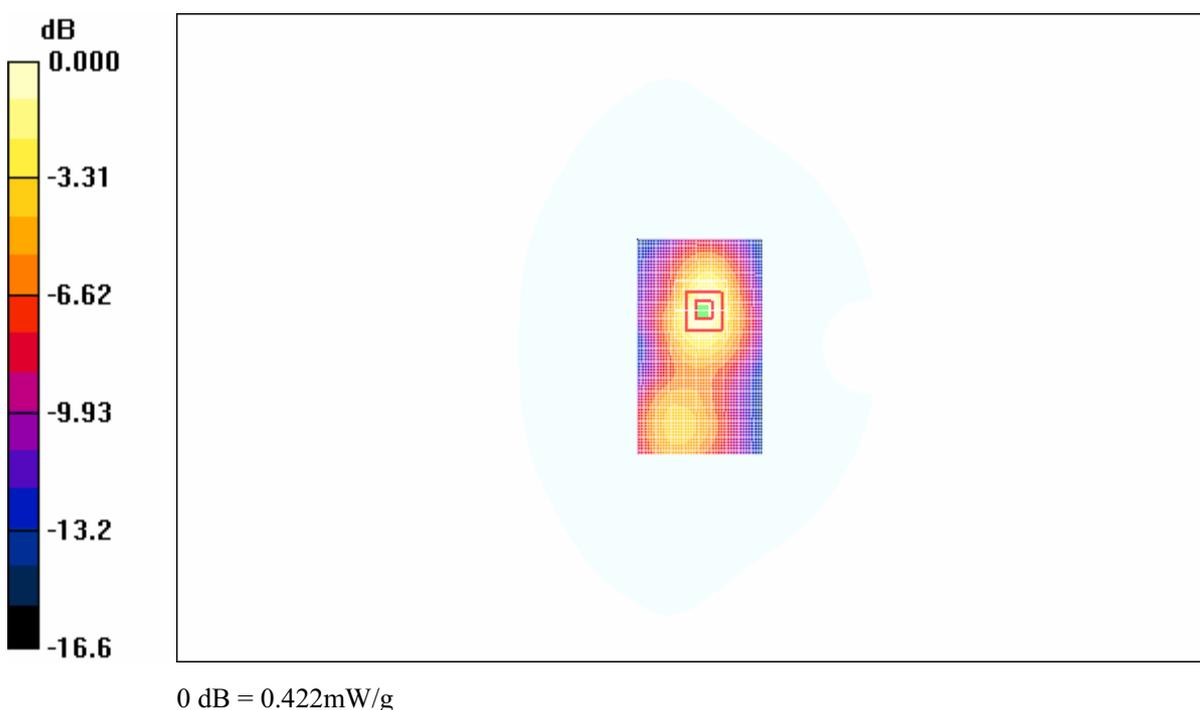
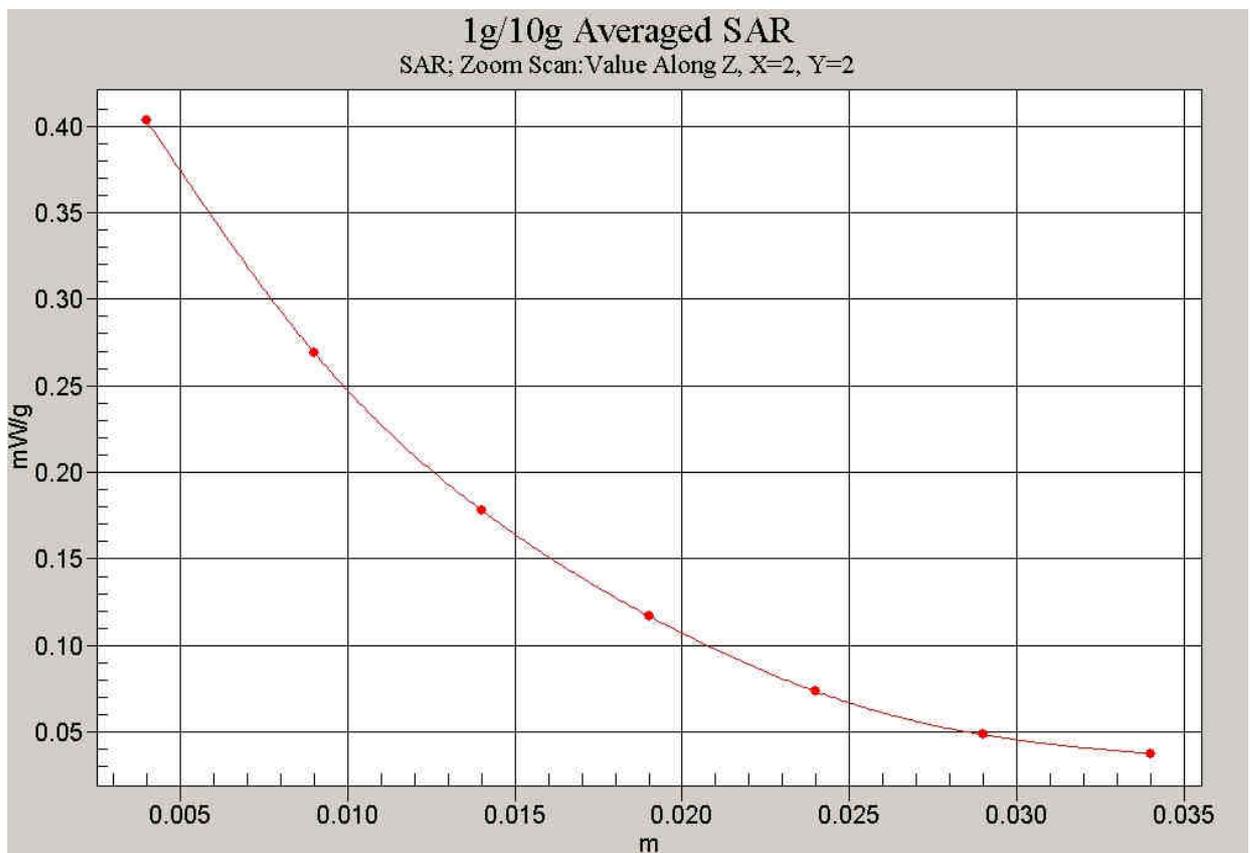


Fig. 51 PCS 1900MHz, Body, Towards Ground with Bluetooth, CH810



**Fig. 52 Z-Scan at power reference point  
(PCS 1900MHz, Body, Towards Ground with Bluetooth, CH810)**

## ANNEX D SYSTEM VALIDATION RESULTS

### 1900MHzDAE536Probe1736

Electronics: DAE3 Sn536

Medium: 1900 Head

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.3°C      Liquid Temperature: 22.5°C

Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

**System Validation/Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 11.2 mW/g

**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm,  
dz=5mm

Reference Value = 92.1 V/m; Power Drift = 0.1 dB

Peak SAR (extrapolated) = 16.9 W/kg

**SAR(1 g) = 9.91 mW/g; SAR(10 g) = 5.27 mW/g**

Maximum value of SAR (measured) = 11.3 mW/g

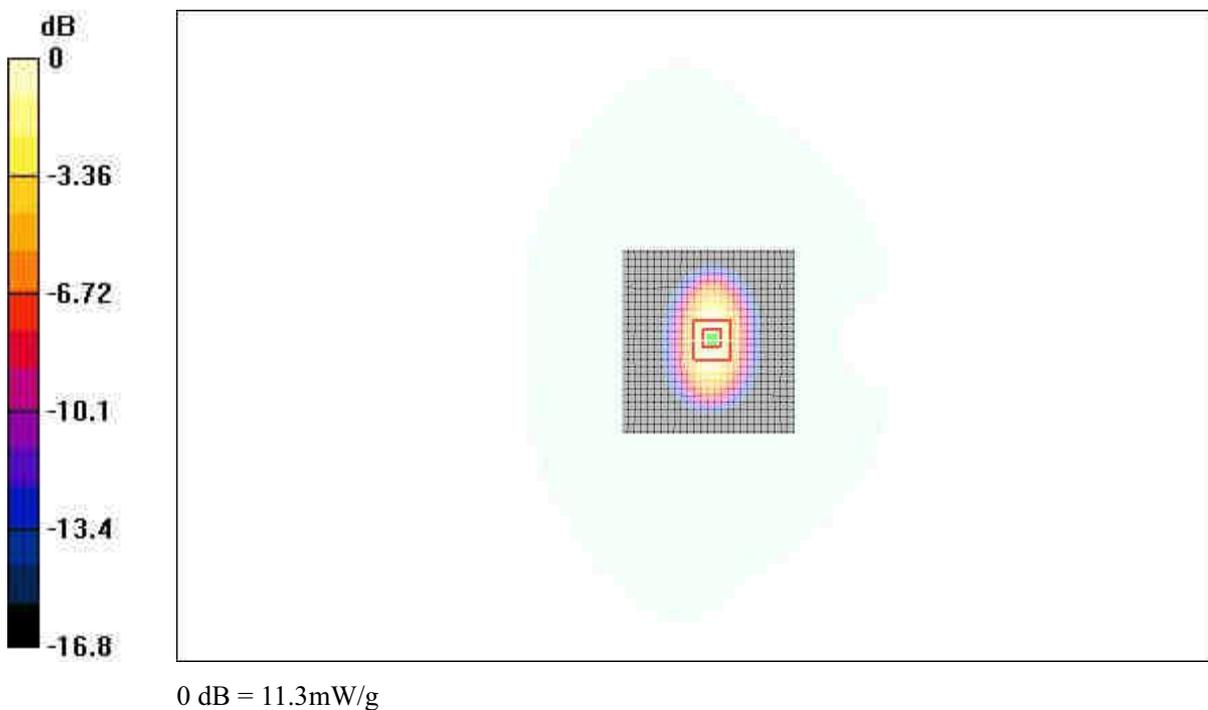


Fig.53 validation 1900MHz 250mW

# ANNEX E 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 Federal Office of metrology and Accreditation  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **TMC China**

Certificate No: **ET3DV6-1736\_Dec06**

CALIBRATION CERTIFICATE																																															
Object	ET3DV6-SN: 1736																																														
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes																																														
Calibration date:	December 1, 2006																																														
Condition of the calibrated item	In Tolerance																																														
<p>This calibration certify documents the traceability to national standards, which realize the physical units of measurements(SI). All calibrations have been conducted at an environment temperature (22±3)°C and humidity&lt;70%</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID#</th> <th>Cal Data (Calibrated by, Certification NO.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter E4419B</td> <td>GB341293874</td> <td>22-May-06 (METAS, NO. 251-00466)</td> <td>May-07</td> </tr> <tr> <td>Power sensor E4412A</td> <td>MY41495277</td> <td>22-May-06 (METAS, NO. 251-00466)</td> <td>May-07</td> </tr> <tr> <td>Power sensor E4412A</td> <td>MY41498087</td> <td>22-May-06 (METAS, NO. 251-00466)</td> <td>May-07</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN:S5086 (20b)</td> <td>22-May-06 (METAS, NO. 251-00467)</td> <td>May-07</td> </tr> <tr> <td>Reference Probe ES3DV2</td> <td>SN:S5086 (20b)</td> <td>22-May-06 (METAS, NO. 251-00467)</td> <td>May-07</td> </tr> <tr> <td>DAE4</td> <td>SN:3013</td> <td>13-Jan-06 (SPEAG, NO. ES3-3013_Jan06)</td> <td>Jan-07</td> </tr> <tr> <td>Reference Probe ES3DV2</td> <td>SN: 907</td> <td>11-Jun-06 (SPEAG, NO.DAE4-907_Jun06)</td> <td>Jun-07</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th> <th>ID#</th> <th>Check Data (in house)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>RF generator HP8648C</td> <td>US3642U01700</td> <td>4-Dec-05(SPEAG, in house check Dec-03)</td> <td>In house check: Dec-09</td> </tr> <tr> <td>Network Analyzer HP 8753E</td> <td>US37390585</td> <td>10-Nov-05(SPEAG, NO. DAE4-901_Nov-04)</td> <td>In house check: Nov-09</td> </tr> </tbody> </table>				Primary Standards	ID#	Cal Data (Calibrated by, Certification NO.)	Scheduled Calibration	Power meter E4419B	GB341293874	22-May-06 (METAS, NO. 251-00466)	May-07	Power sensor E4412A	MY41495277	22-May-06 (METAS, NO. 251-00466)	May-07	Power sensor E4412A	MY41498087	22-May-06 (METAS, NO. 251-00466)	May-07	Reference 20 dB Attenuator	SN:S5086 (20b)	22-May-06 (METAS, NO. 251-00467)	May-07	Reference Probe ES3DV2	SN:S5086 (20b)	22-May-06 (METAS, NO. 251-00467)	May-07	DAE4	SN:3013	13-Jan-06 (SPEAG, NO. ES3-3013_Jan06)	Jan-07	Reference Probe ES3DV2	SN: 907	11-Jun-06 (SPEAG, NO.DAE4-907_Jun06)	Jun-07	Secondary Standards	ID#	Check Data (in house)	Scheduled Calibration	RF generator HP8648C	US3642U01700	4-Dec-05(SPEAG, in house check Dec-03)	In house check: Dec-09	Network Analyzer HP 8753E	US37390585	10-Nov-05(SPEAG, NO. DAE4-901_Nov-04)	In house check: Nov-09
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Calibrated by:	Name Nico Vetterli	Function Laboratory Technician	Signature 																																												
Approved by:	Name Katja Pokovic	Function Technical Director	Signature 																																												
Issued: December 1, 2006																																															
This calibration certificate shall not be reported except in full without written approval of the laboratory.																																															

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



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

Accredited by the Swiss Federal Office of Metrology and Accreditation  
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

**Glossary:**

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

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

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

**Methods Applied and Interpretation of Parameters:**

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

ET3DV6 SN: 1736

December 1, 2006

# Probe ET3DV6

## SN: 1736

Manufactured: September 27, 2002

Last calibrated: November 25, 2005

Recalibrated: December 1, 2006

Calibrated for DASY System

ET3DV6 SN: 1736

December 1, 2006

**DASY - Parameters of Probe: ET3DV6 SN:1736**

Sensitivity in Free Space<sup>A</sup>

Diode Compression<sup>B</sup>

NormX	1.97 ± 10.1%	$\mu V/(V/m)^2$	DCP X	93 mV
NormY	1.75 ± 10.1%	$\mu V/(V/m)^2$	DCP Y	93 mV
NormZ	1.97 ± 10.1%	$\mu V/(V/m)^2$	DCP Z	93 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL                    900 MHz      Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	9.6	5.0
SAR <sub>be</sub> [%]	With Correction Algorithm	0.1	0.3

TSL                    1810 MHz      Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	13.2	8.8
SAR <sub>be</sub> [%]	With Correction Algorithm	0.6	0.1

Sensor Offset

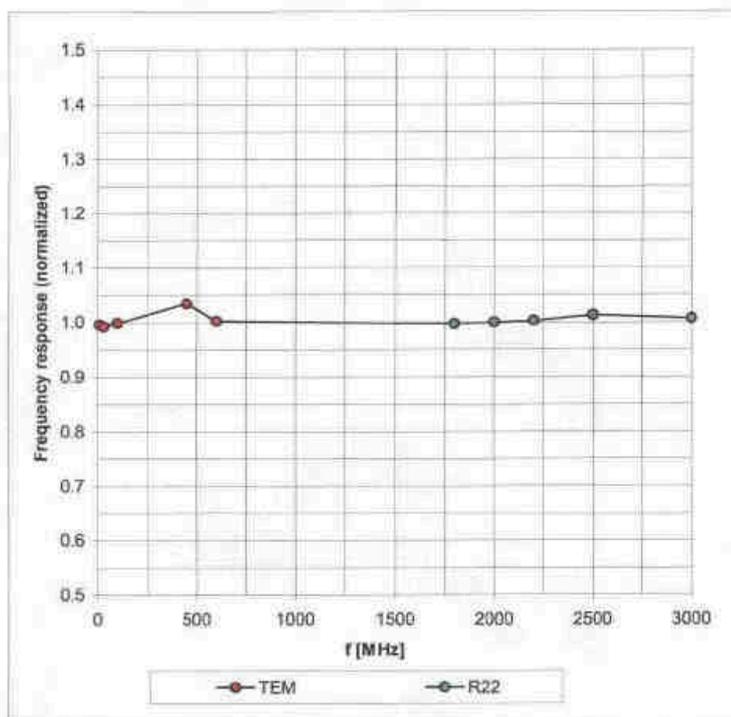
Probe Tip to Sensor Center                    2.7 mm

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December 1, 2006

### Frequency Response of E-Field

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

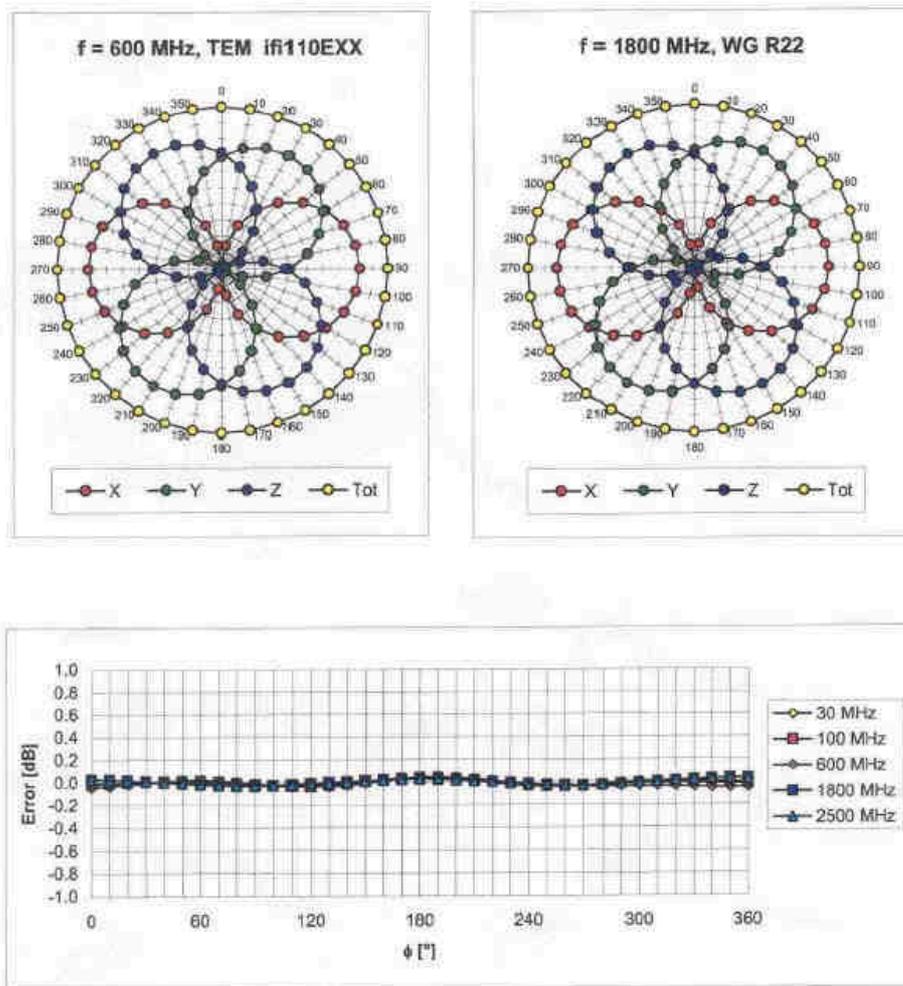


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

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

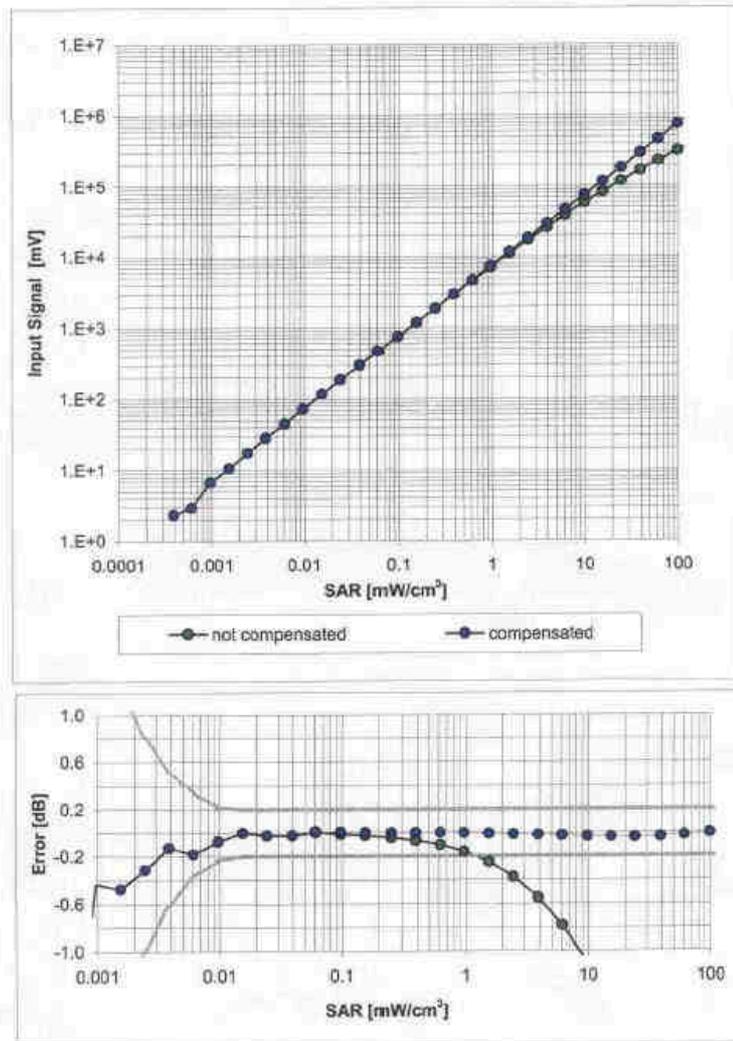


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

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

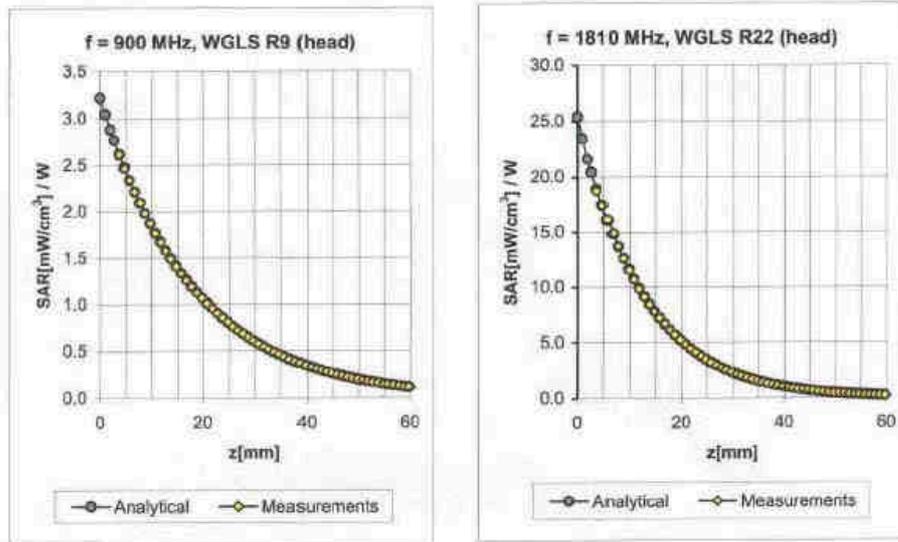


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

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December 1, 2006

### Conversion Factor Assessment



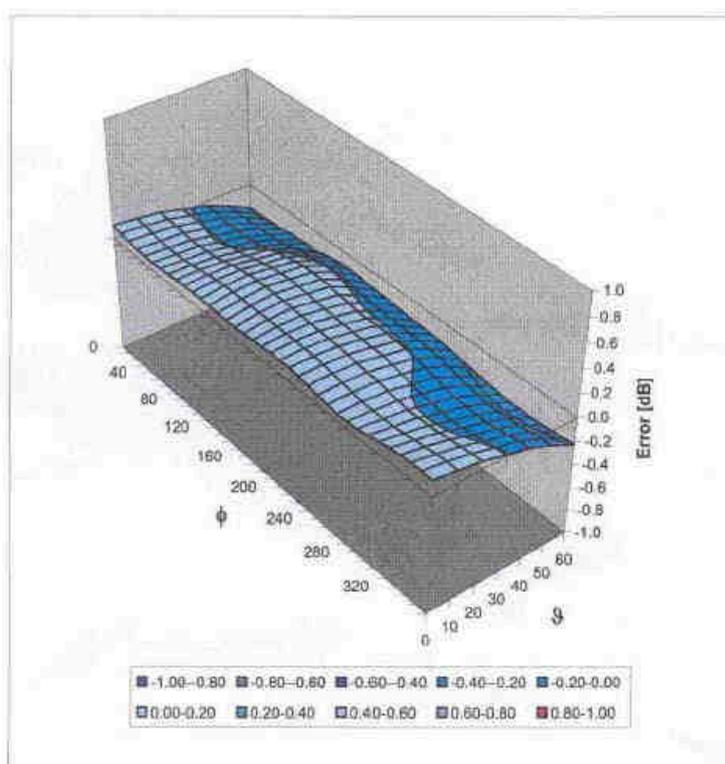
f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.56	1.85	6.51 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.57	2.47	5.40 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.62	2.29	4.67 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.12	1.61	7.74 ± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.47	2.15	6.45 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.53	2.78	4.88 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.65	2.11	4.35 ± 11.8% (k=2)

ET3DV6 SN: 1736

December 1, 2006

### Deviation from Isotropy in HSL

Error ( $\phi$ ,  $\theta$ ),  $f = 900$  MHz



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