



No. DAT-P-114/01-01

TEST REPORT

No. 2006E00684-SAR

Test name	Electromagnetic Field (Specific Absorption Rate)
Product	GSM/GPRS Mobile Phone with Bluetooth Function
Model	CTS900
Client	CEC Wireless R&D Ltd
Type of test	Non Type Approval

**Telecommunication Metrology Center
of Ministry of Information Industry**

Notes

1. . The test report shall be invalid if there is no “specified stamp for the test report” or the stamp of the test organization on it.
2. Copies of the test report shall be invalid if there is no “specified stamp for the test report” or the stamp of the test organization on it.
3. The test report shall be invalid if there are no signatures of the testing person, reviewing person and approving person on it.
4. The test report shall be invalid if it is altered.
5. Any demurrals about the test shall be put forward to the testing organization within 15 days after the receiving of the test report.
6. This test report standalone does not constitute or imply by its own an approval of the product by any Certification Authorities or Competent Bodies.
7. This report is only valid if complete, and test report shall not be reproduced except in full, without written approval of the laboratory.
8. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of Telecommunication Metrology Center of MII and the Accreditation Bodies, if it applies.

Address: No. 52, Huayuan Bei Road, Haidian District, Beijing, P. R. China
(Telecommunication Metrology Center of MII)

Post code: 100083

Telephone: +86 10 62302041

Fax: +86 10 62304793

Web site: <http://www.emcite.com>

E-mail: welcome@emcite.com

TABLE OF CONTENT

1 COMPETENCE AND WARRANTIES	6
2 GENERAL CONDITIONS	6
3 DESCRIPTION OF EUT	6
3.1 ADDRESSING INFORMATION RELATED TO EUT	6
3.2 CONSTITUENTS OF EUT	7
3.3 GENERAL DESCRIPTION	7
4 OPERATIONAL CONDITIONS DURING TEST	8
4.1 SCHEMATIC TEST CONFIGURATION.....	8
4.2 SAR MEASUREMENT SET-UP	8
4.3 DASY4 E-FIELD PROBE SYSTEM.....	9
4.4 E-FIELD PROBE CALIBRATION	9
4.5 OTHER TEST EQUIPMENT	10
4.6 EQUIVALENT TISSUES.....	11
4.7 SYSTEM SPECIFICATIONS.....	11
5 CHARACTERISTICS OF THE TEST.....	12
5.1 APPLICABLE LIMIT REGULATIONS	12
5.2 APPLICABLE MEASUREMENT STANDARDS.....	12
6 LABORATORY ENVIRONMENT.....	12
7 CONDUCTED OUTPUT POWER MEASUREMENT	13
7.1 SUMMARY	13
7.2 CONDUCTED POWER	13
8 TEST RESULTS.....	13
8.1 DIELECTRIC PERFORMANCE	13
8.2 SYSTEM VALIDATION.....	14
8.3 SUMMARY OF MEASUREMENT RESULTS	14
8.4 SUMMARY OF BLUETOOTH MEASUREMENT RESULTS.....	15

**Telecommunication Metrology Center
of Ministry of Information Industry**

No.2006E00684-SAR

Page 4 of 87

8.5 CONCLUSION.....	16
9 MEASUREMENT UNCERTAINTY	17
10 MAIN TEST INSTRUMENTS	18
11 TEST PERIOD	18
12 TEST LOCATION	18
ANNEX A MEASUREMENT PROCESS	18
ANNEX B TEST LAYOUT.....	20
ANNEX C GRAPH RESULTS	24
ANNEX D SYSTEM VALIDATION RESULTS	78
ANNEX E PROBE CALIBRATION CERTIFICATE	79

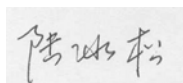
**Telecommunication Metrology Center
of Ministry of Information Industry**

No.2006E00684-SAR

Page 5 of 87

Product Name	GSM/GPRS Mobile Phone with Bluetooth Function	Sample Model	CTS900
Client	CEC Wireless R&D Ltd	Type of test	Non Type Approval
Factory	CEC Wireless R&D Ltd	Sampling arrival date	June 5 th , 2006
Manufacturer	CEC Wireless R&D Ltd		
Sampling/ Sending sample	Sending sample	Sample sent by	Xinglan Yu
Sampling location	/	Sampling person	/
Sample quantity	1	Sample matrix	/
Series number of the Sample	/		
Test basis	<p>EN 50360–2001: Product standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.</p> <p>EN 50361–2001: Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.</p> <p>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)</p> <p>ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz</p> <p>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.</p> <p>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.</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: Pass</p> <p style="text-align: right;">(Stamp) Date of issue: June 22nd, 2006</p>		
Note	The test results relate only to the items tested of the sample(s).		

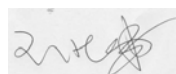
Approved by



(Lu Bingsong)

Deputy Director of the laboratory

Reviewed by



(Wang Hongbo)

Tested by



(Qi Dianyuan)

1 COMPETENCE AND WARRANTIES

Telecommunication Metrology Center of Ministry of Information Industry is a test laboratory accredited by DAR (DATech) – Deutschen Akkreditierungs Rat (Deutsche Akkreditierungsstelle Technik) for the tests indicated in the Certificate No. **DAT-P-114/01-01**.

Telecommunication Metrology Center of Ministry of Information Industry is a test laboratory competent to carry out the tests described in this test report.

Telecommunication Metrology Center of Ministry of Information Industry guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at **Telecommunication Metrology Center of Ministry of Information Industry** at the time of execution of the test.

Telecommunication Metrology Center of Ministry of Information Industry is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test.

2 GENERAL CONDITIONS

- 2.1 This report only refers to the item that has undergone the test.
- 2.2 This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities.
- 2.3 This document is only valid if complete; no partial reproduction can be made without written approval of Telecommunication Metrology Center of Ministry of Information Industry.
- 2.4 This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of Telecommunication Metrology Center of Ministry of Information Industry and the Accreditation Bodies, if it applies.

3 DESCRIPTION OF EUT

3.1 Addressing Information Related to EUT

Table 1: Applicant (The Client)

Name or Company	CEC Wireless R&D Ltd
Address/Post	P.O.Box 707-27 West M5 Building ,No.1 East Road Jiuxianqiao ChaoYang District, Beijing,
City	Beijing
Postal Code	/
Country	CHINA
Telephone	010-58270277
Fax	010-84568718

Table 2: Manufacturer

Name or Company	CEC Wireless R&D Ltd
Address/Post	P.O.Box 707-27 West M5 Building ,No.1 East Road Jiuxianqiao ChaoYang District, Beijing,
City	Beijing
Postal Code	/
Country	CHINA
Telephone	010-58270277
Fax	010-84568718

3.2 Constituents of EUT

Table 3: Constituents of Samples

Description	Model	Serial Number	Manufacturer
Handset	CTS900	/	CEC Wireless R&D Ltd.
Lithium Battery	A20KCP/OZC	FMA0000214	Scudcn Co., Ltd.
AC/DC Adapter	A1F2CL/OZP	/	DEE VAN enterprise CO., Ltd.



Picture 1: Constituents of the sample (Lithium Battery is in the Handset)

3.3 General Description

Equipment Under Test (EUT) is a model of GSM Tri-band Smartphone (MS) 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.

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

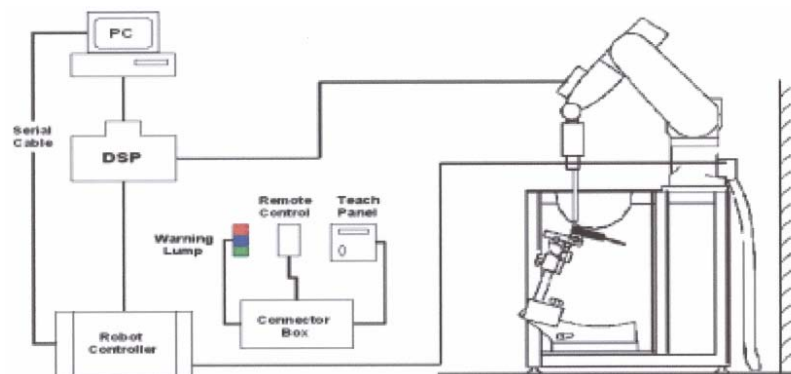
A communication link is set up with a System Simulator (SS) by air link, and a call is established. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 512, 661 and 810 respectively in the case of PCS 1900 MHz. The EUT is commanded to operate at maximum transmitting power.

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

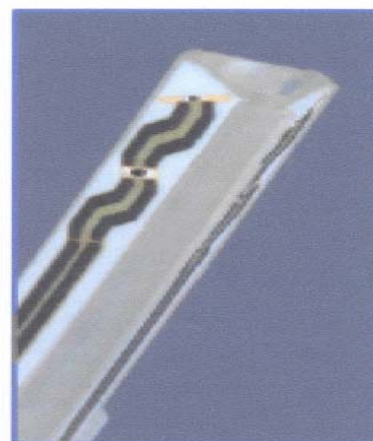
unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for 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: $\pm 0.2\text{ dB}$ (30 MHz to 3 GHz)
Directivity	$\pm 0.2\text{ dB}$ in brain tissue (rotation around probe axis) $\pm 0.4\text{ dB}$ in brain tissue (rotation normal probe axis)
Dynamic Range	5u W/g to > 100mW/g; Linearity: $\pm 0.2\text{ dB}$
Surface Detection	$\pm 0.2\text{ mm}$ 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



Picture 3: ET3DV6 E-field Probe



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 $\pm 10\%$. The spherical isotropy was evaluated and found to be better than $\pm 0.25\text{dB}$. 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: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

Or

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m³).

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



Picture 6: Generic Twin Phantom

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

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: ± 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 mm 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 mm 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.

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)

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.

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 Ω
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)	28.7	28.5	28.5
After Test (dBm)	28.6	28.5	28.6

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 16 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 22.5 °C and relative humidity 49%.			
Liquid temperature during the test: 21.4°C			
/	Frequency	Permittivity ϵ	Conductivity σ (S/m)
Target value	1900MHz	40.0	1.40
Measurement value (Average of 10 tests)	1900MHz	40.27	1.45

Table 9: Dielectric Performance of Body Tissue Simulating Liquid

Measurement is made at temperature 22.5 °C and relative humidity 49%.			
Liquid temperature during the test: 21.4°C			
/	Frequency	Permittivity ϵ	Conductivity σ (S/m)
Target value	1900MHz	53.3	1.52
Measurement value (Average of 10 tests)	1900MHz	55.85	1.55

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					
Liquid parameters		Frequency	Permittivity ϵ	Conductivity σ (S/m)	
		1900 MHz	40.27	1.45	
Verification results	Frequency	Target value (W/kg)		Measurement value (W/kg)	
		10 g Average	1 g Average	10 g Average	1 g Average
	1900 MHz	5.125	9.925	5.27	9.91

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

Table 11: SAR Values (Head, 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)		
	10 g Average	1 g Average	
Left hand, Touch cheek, Top frequency(See Fig.1)	0.378	0.695	0.086
Left hand, Touch cheek, Mid frequency(See Fig.3)	0.321	0.590	0.041
Left hand, Touch cheek, Bottom frequency(See Fig.5)	0.258	0.465	-0.034
Left hand, Tilt 15 Degree, Top frequency(See Fig.7)	0.113	0.192	-0.014
Left hand, Tilt 15 Degree, Mid frequency(See Fig.9)	0.100	0.168	-0.002
Left hand, Tilt 15 Degree, Bottom frequency(See Fig.11)	0.067	0.111	-0.118
Right hand, Touch cheek, Top frequency(See Fig.13)	0.459	0.840	-0.064
Right hand, Touch cheek, Mid frequency(See Fig.15)	0.392	0.710	-0.145
Right hand, Touch cheek, Bottom frequency(See Fig.17)	0.309	0.559	-0.098
Right hand, Tilt 15 Degree, Top frequency(See Fig.19)	0.115	0.193	0.054
Right hand, Tilt 15 Degree, Mid frequency(See Fig.21)	0.099	0.161	-0.024
Right hand, Tilt 15 Degree, Bottom frequency(See Fig.23)	0.076	0.122	0.129

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)		
	10 g Average	1 g Average	
Body, Towards Ground, Top frequency(See Fig.25)	0.152	0.258	-0.176
Body, Towards Ground, Mid frequency(See Fig.27)	0.128	0.215	-0.055
Body, Towards Ground, Bottom frequency(See Fig.29)	0.096	0.164	0.056
Body, Towards Phantom, Top frequency(See Fig.31)	0.135	0.223	-0.146
Body, Towards Phantom, Mid frequency(See Fig.33)	0.110	0.182	-0.028
Body, Towards Phantom, Bottom frequency(See Fig.35)	0.096	0.157	-0.200

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)		
	10 g Average	1 g Average	
Body, Towards Ground, Top frequency(See Fig.37)	0.353	0.610	-0.053
Body, Towards Ground, Mid frequency(See Fig.39)	0.287	0.503	0.005
Body, Towards Ground, Bottom frequency(See Fig.41)	0.212	0.364	0.000
Body, Towards Phantom, Top frequency(See Fig.43)	0.272	0.455	0.089
Body, Towards Phantom, Mid frequency(See Fig.45)	0.243	0.403	-0.096
Body, Towards Phantom, Bottom frequency(See Fig.47)	0.170	0.281	0.063

8.4 Summary of Bluetooth Measurement Results

According to the results above in 8.3, the configurations with the highest SAR value when dominant transmitter is ON and Bluetooth transmitter is OFF are determined. Then the following test results are in the same configurations with dominant transmitter and co-located Bluetooth transmitter both

ON.

Table 14: SAR Values (Head, 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	
Right hand, Touch cheek, Top frequency(See Fig.49)	0.460	0.840	-0.056

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)	0.151	0.257	-0.091

Table 16: SAR Values (Body, 1900 MHz Band with GPRS and 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.53)	0.353	0.611	-0.025

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.

**Telecommunication Metrology Center
of Ministry of Information Industry**

No.2006E00684-SAR

Page 17 of 87

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 _i (1 g)	1 g u _i (±%)	v _i
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) 1/2	4.3	∞
4	Hemispherical Isotropy	B	9.4	R	√3	√c _p		∞
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	√3	1	1.7	∞
12	Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	B	3.9	R	√3	1	2.3	∞
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	√3	1	2.9	∞
Phantom and Tissue Parameters								
16	Phantom Uncertainty (shape and thickness tolerances)	B	1.0	R	√3	1	0.6	∞
17	Liquid Conductivity - deviation from target values	B	5.0	R	√3	0.64	1.7	∞
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	√3	0.6	1.7	∞
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

Table17: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	HP 8753E	US38433212	August 29,2005	One year
02	Power meter	NRVD	101253	June 20, 2005	One year
03	Power sensor	NRV-Z5	100333		
04	Power sensor	NRV-Z6	100011	September 3, 2005	One year
05	Signal Generator	E4433B	US37230472	September 5, 2005	One Year
06	Amplifier	VTL5400	0505	No Calibration Requested	
07	BTS	CMU 200	105948	August 15, 2005	One year
08	E-field Probe	SPEAG ET3DV6	1736	November 25, 2005	One year
09	DAE	SPEAG DAE3	536	July 11, 2005	One year

11 TEST PERIOD

The test is performed from June 16th, 2006 to June 20th, 2006.

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.

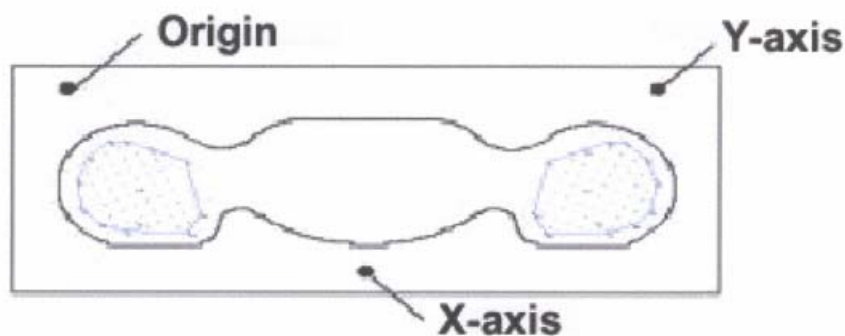
Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7 x 7x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

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.

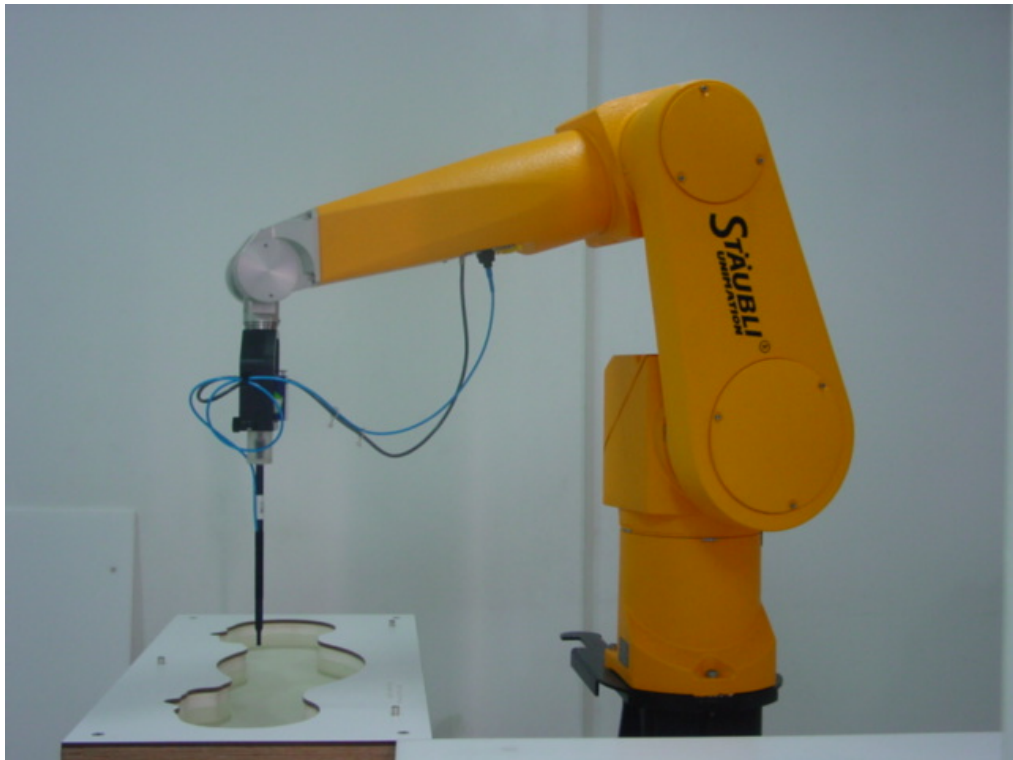
c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

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

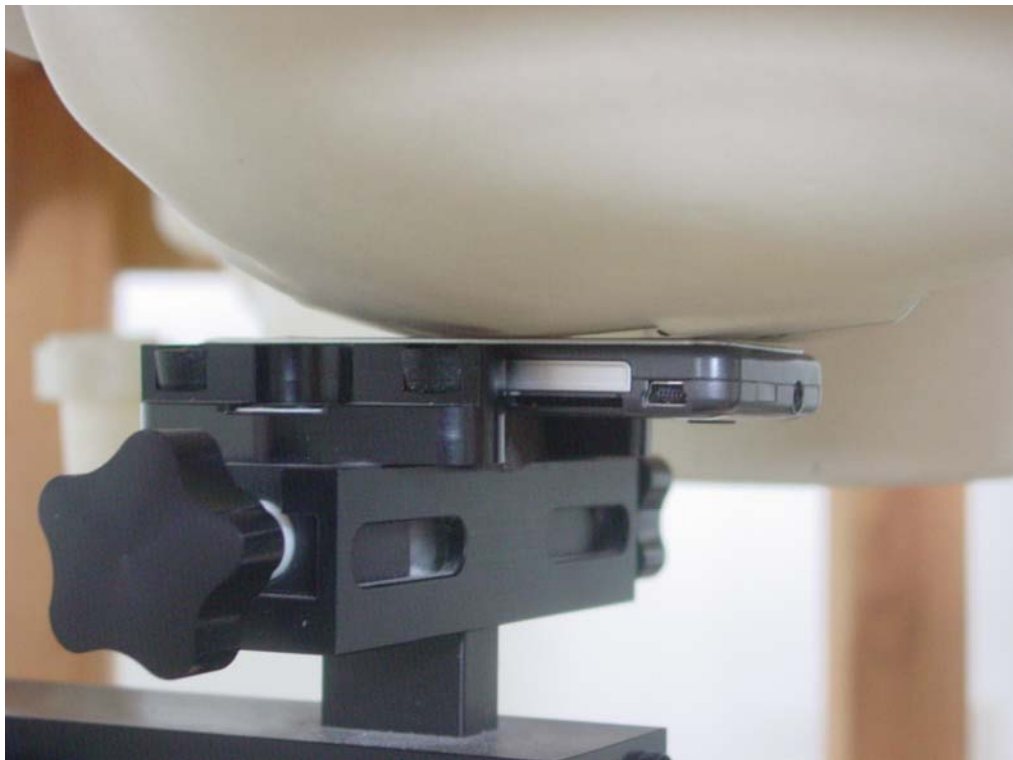
ANNEX B TEST LAYOUT



Picture B1: Specific Absorption Rate Test Layout



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



Picture B4: Left Hand Touch Cheek Position



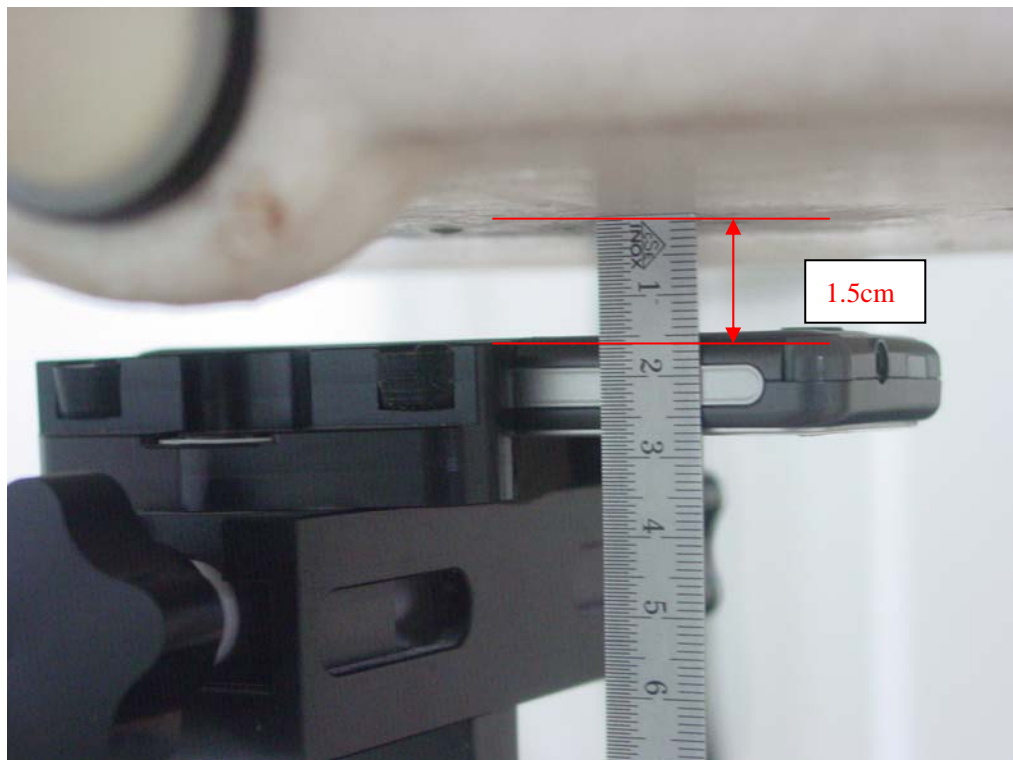
Picture B5: Left Hand Tilt 15° Position



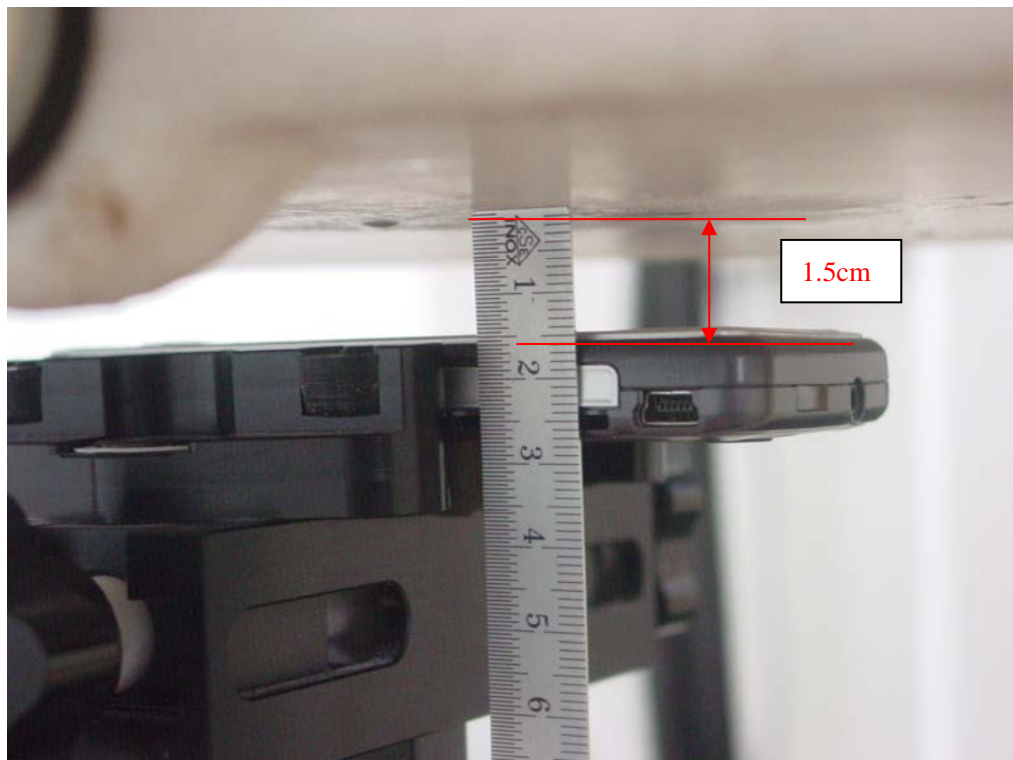
Picture B6: Right Hand Touch Cheek Position



Picture B7: Right Hand Tilt 15° Position



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



Picture B9: Body-worn Position (toward phantom, the distance from handset to the bottom of the Phantom is 1.5cm)

ANNEX C GRAPH RESULTS

1900 Left Cheek High

Electronics: DAE3 Sn536

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) = 0.679 mW/g

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

Reference Value = 8.51 V/m; Power Drift = 0.086 dB

Peak SAR (extrapolated) = 1.16 W/kg

SAR(1 g) = 0.695 mW/g; SAR(10 g) = 0.378 mW/g

Maximum value of SAR (measured) = 0.764 mW/g

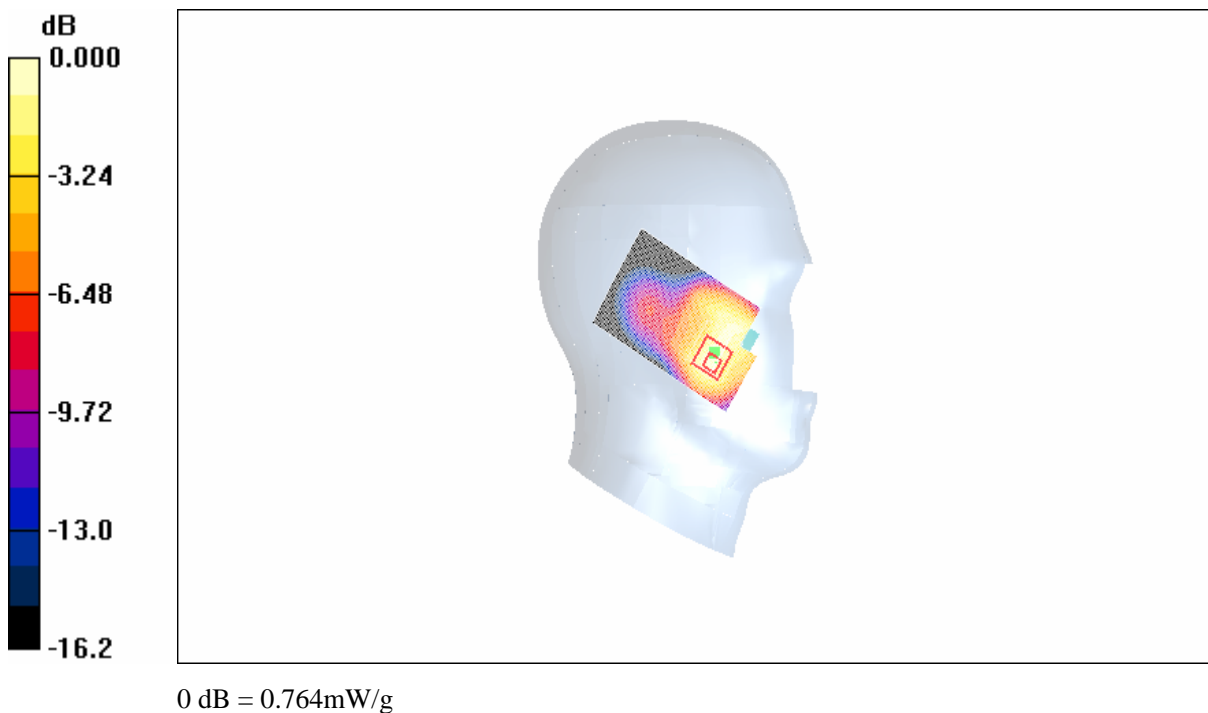


Fig. 1 Left Hand Touch Cheek PCS 1900MHz CH810

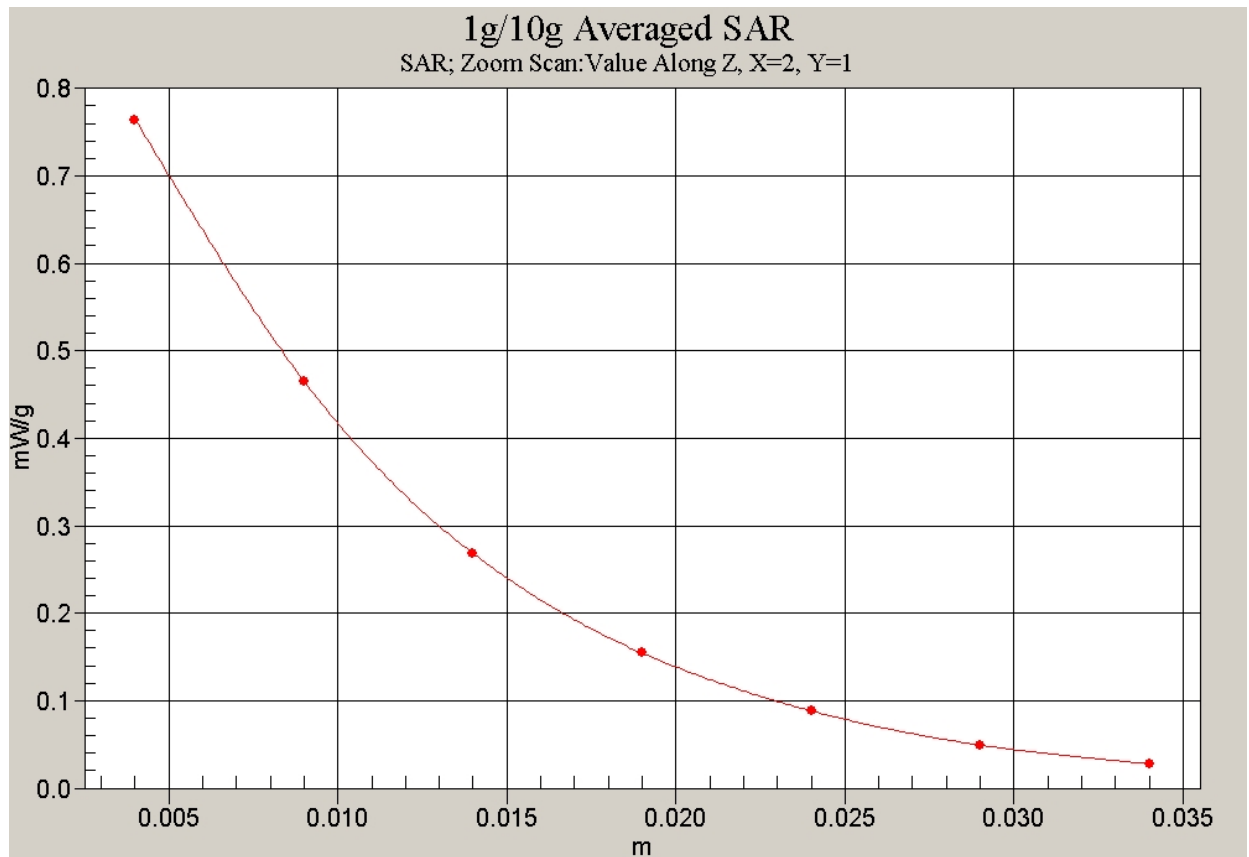


Fig. 2 Z-Scan at power reference point (PCS 1900MHz CH810)

1900 Left Cheek Middle

Electronics: DAE3 Sn536

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=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.582 mW/g

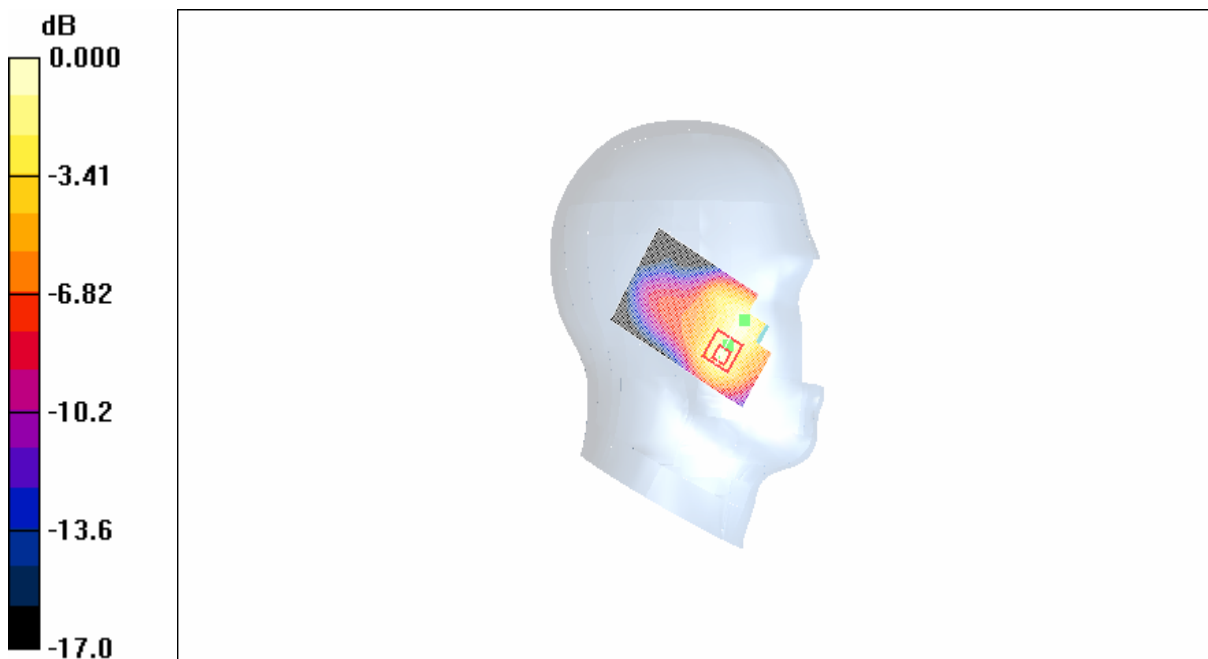
Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.90 V/m; Power Drift = 0.041 dB

Peak SAR (extrapolated) = 1.00 W/kg

SAR(1 g) = 0.590 mW/g; SAR(10 g) = 0.321 mW/g

Maximum value of SAR (measured) = 0.667 mW/g



0 dB = 0.667mW/g

Fig. 3 Left Hand Touch Cheek PCS 1900MHz CH661

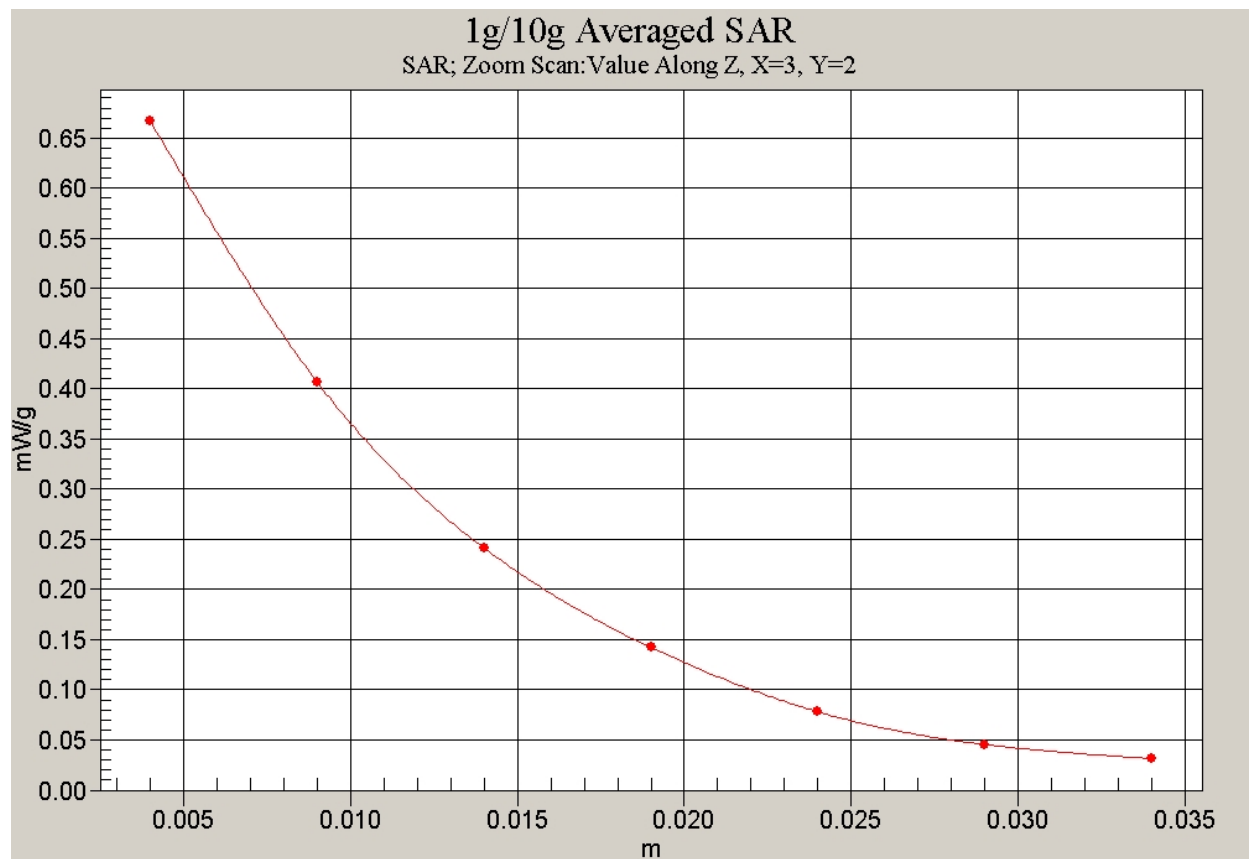


Fig. 4 Z-Scan at power reference point (PCS 1900MHz CH661)

1900 Left Cheek Low

Electronics: DAE3 Sn536

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) = 0.467 mW/g

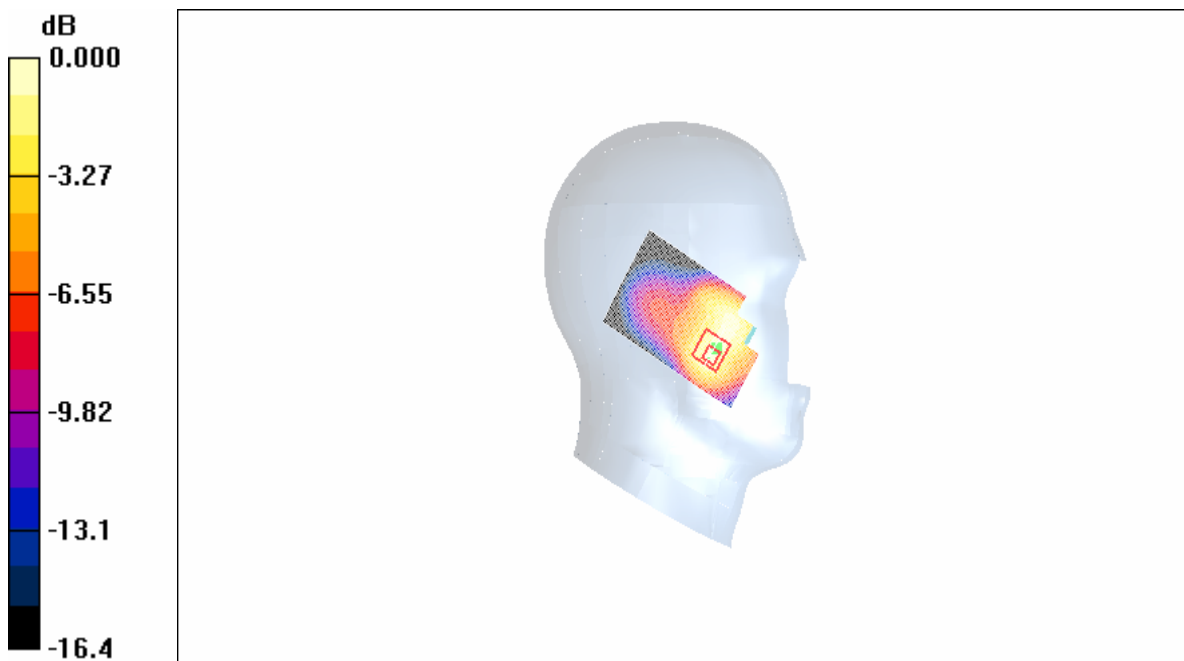
Cheek Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.04 V/m; Power Drift = -0.034 dB

Peak SAR (extrapolated) = 0.768 W/kg

SAR(1 g) = 0.465 mW/g; SAR(10 g) = 0.258 mW/g

Maximum value of SAR (measured) = 0.518 mW/g



0 dB = 0.518mW/g

Fig. 5 Left Hand Touch Cheek PCS 1900MHz CH512

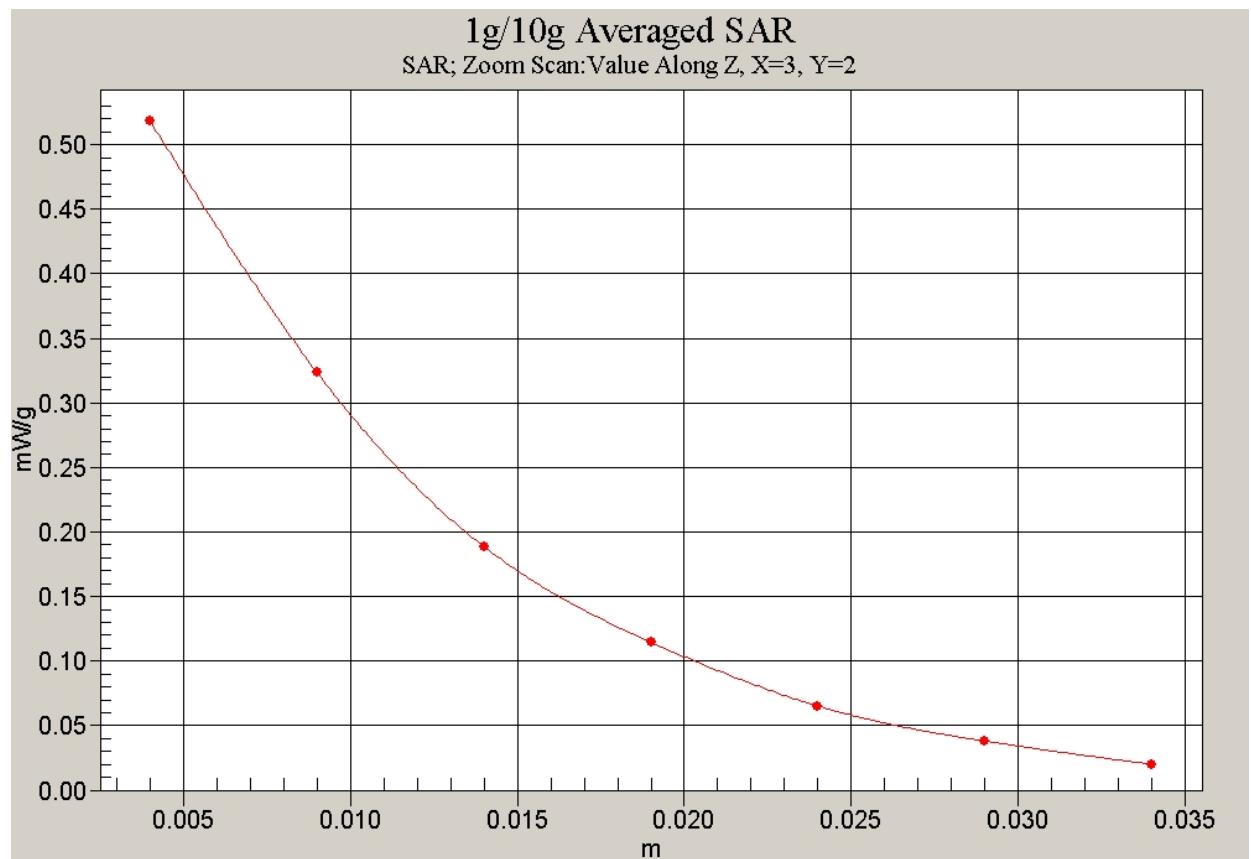


Fig. 6 Z-Scan at power reference point (PCS 1900MHz CH512)

1900 Left Tilt High

Electronics: DAE3 Sn536

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) = 0.226 mW/g

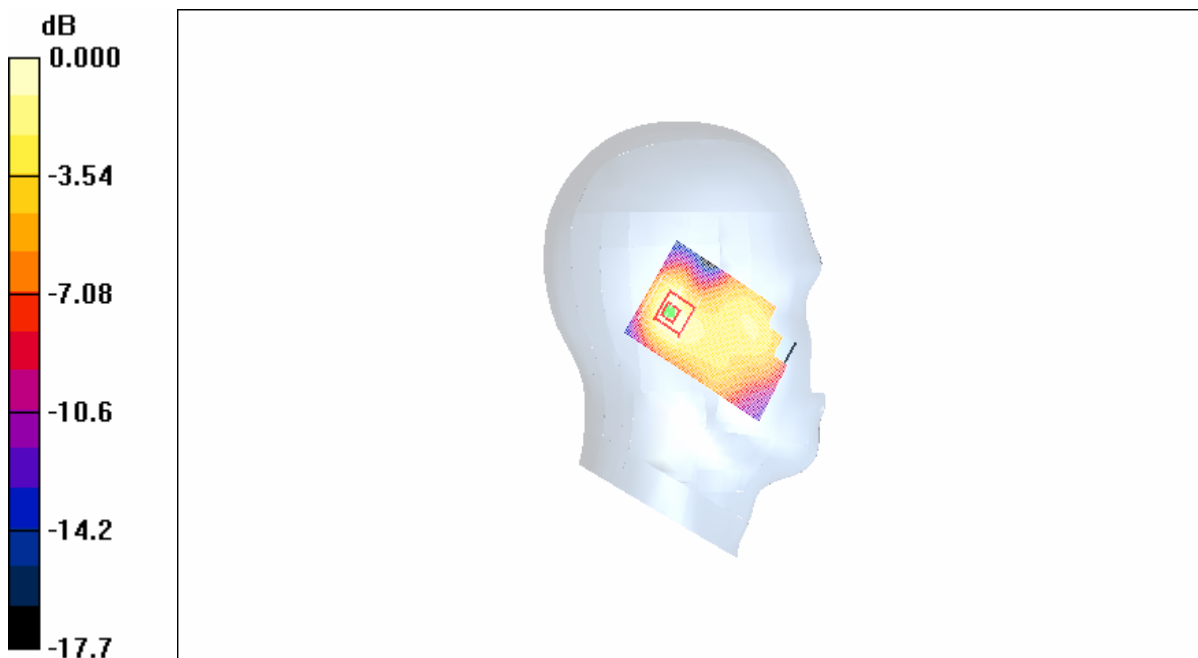
Tilt High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.1 V/m; Power Drift = -0.014 dB

Peak SAR (extrapolated) = 0.307 W/kg

SAR(1 g) = 0.192 mW/g; SAR(10 g) = 0.113 mW/g

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



0 dB = 0.212mW/g

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

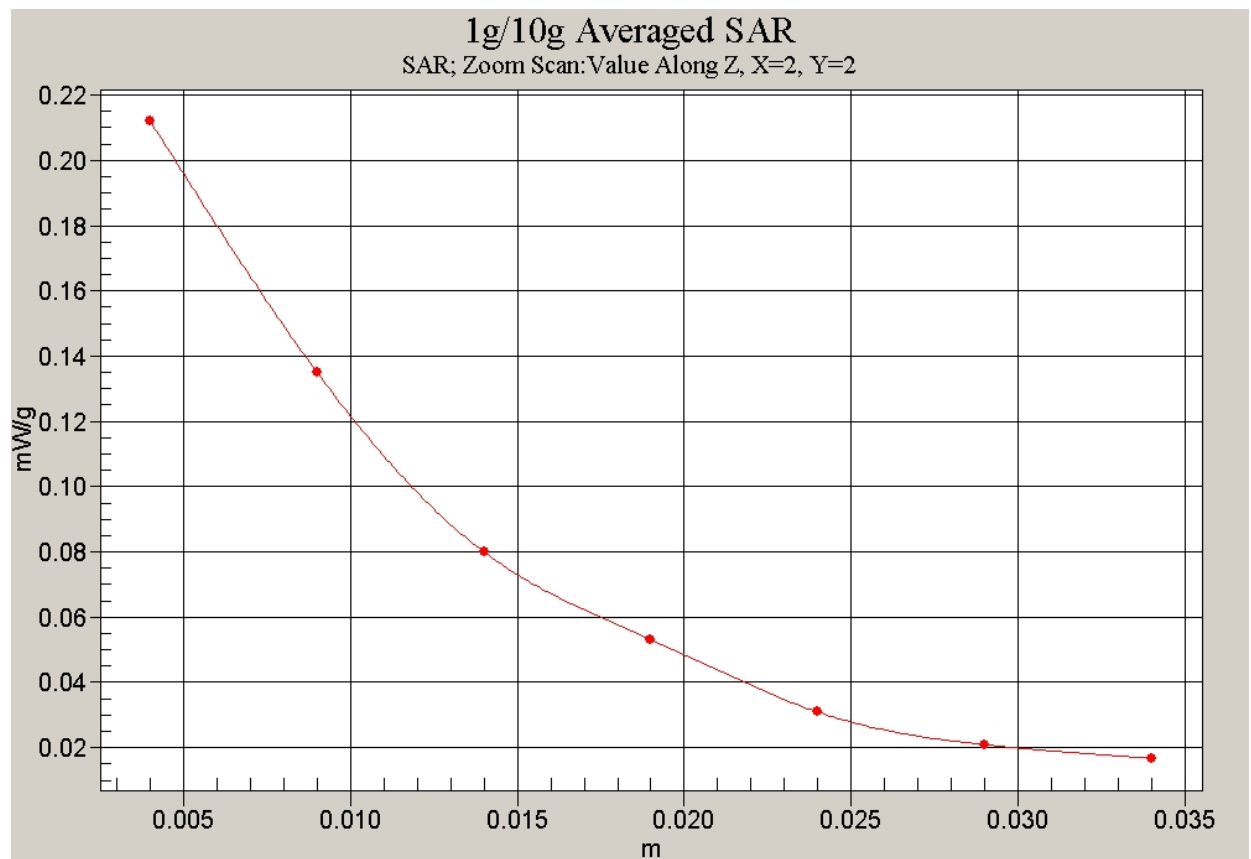


Fig. 8 Z-Scan at power reference point (PCS 1900MHz CH810)

1900 Left Tilt Middle

Electronics: DAE3 Sn536

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) = 0.189 mW/g

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

Reference Value = 11.3 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 0.271 W/kg

SAR(1 g) = 0.168 mW/g; SAR(10 g) = 0.100 mW/g

Maximum value of SAR (measured) = 0.185 mW/g

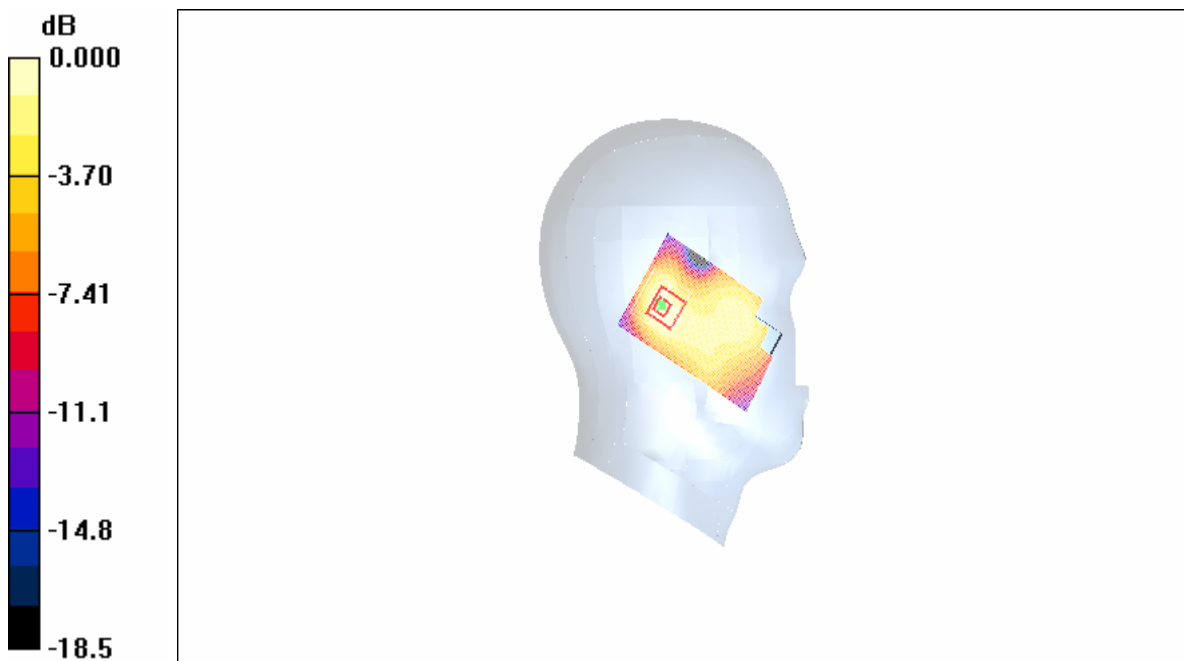


Fig. 9 Left Hand Tilt 15°PCS 1900MHz CH661

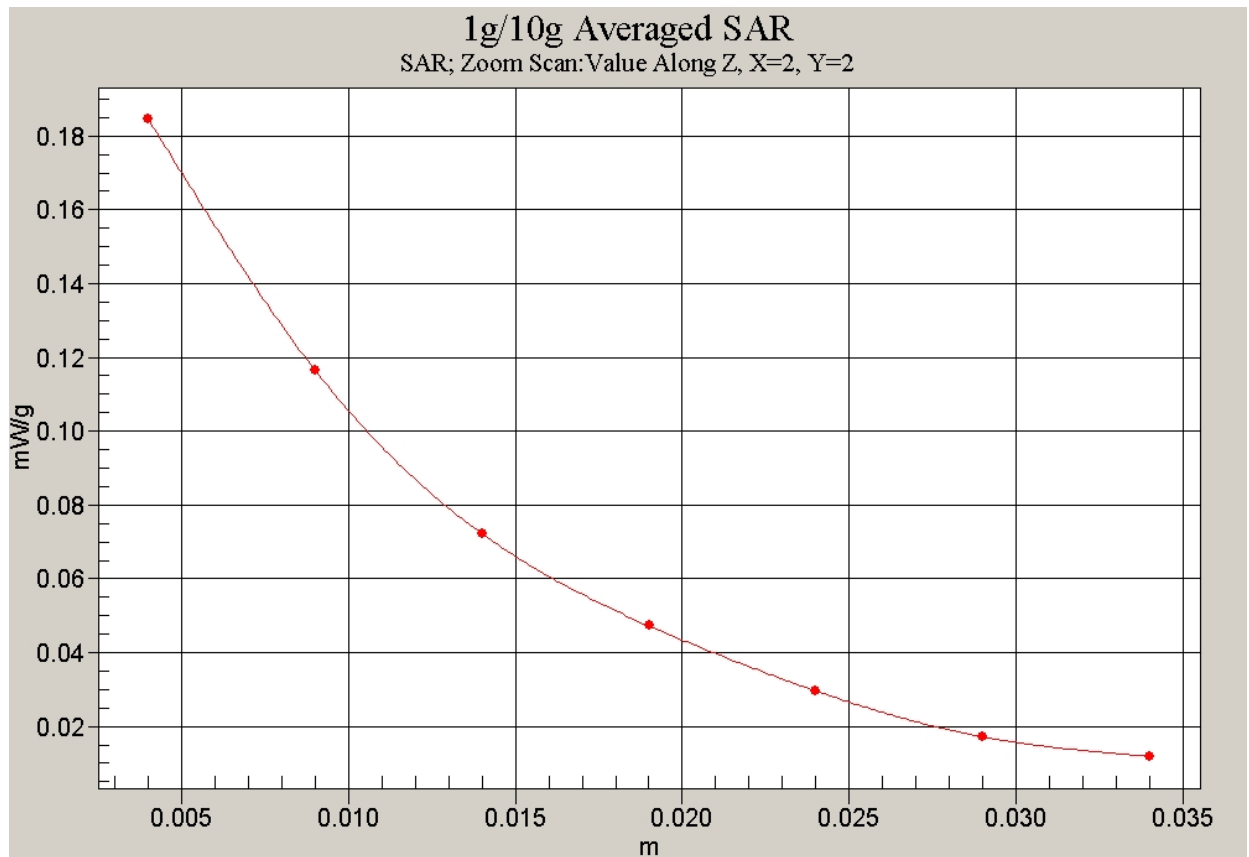


Fig. 10 Z-Scan at power reference point (PCS 1900MHz CH661)

1900 Left Tilt Low

Electronics: DAE3 Sn536

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) = 0.125 mW/g

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

Reference Value = 9.48 V/m; Power Drift = -0.118 dB

Peak SAR (extrapolated) = 0.187 W/kg

SAR(1 g) = 0.111 mW/g; SAR(10 g) = 0.067 mW/g

Maximum value of SAR (measured) = 0.121 mW/g

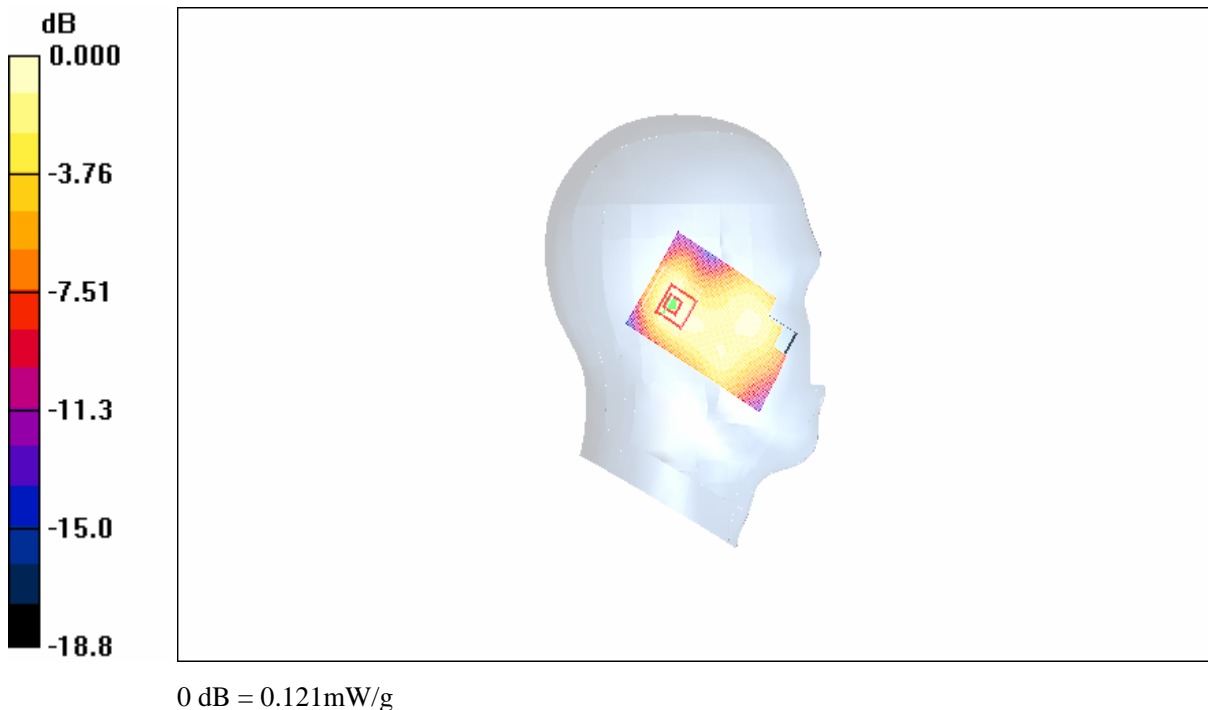


Fig. 11 Left Hand Tilt 15°PCS 1900MHz CH512

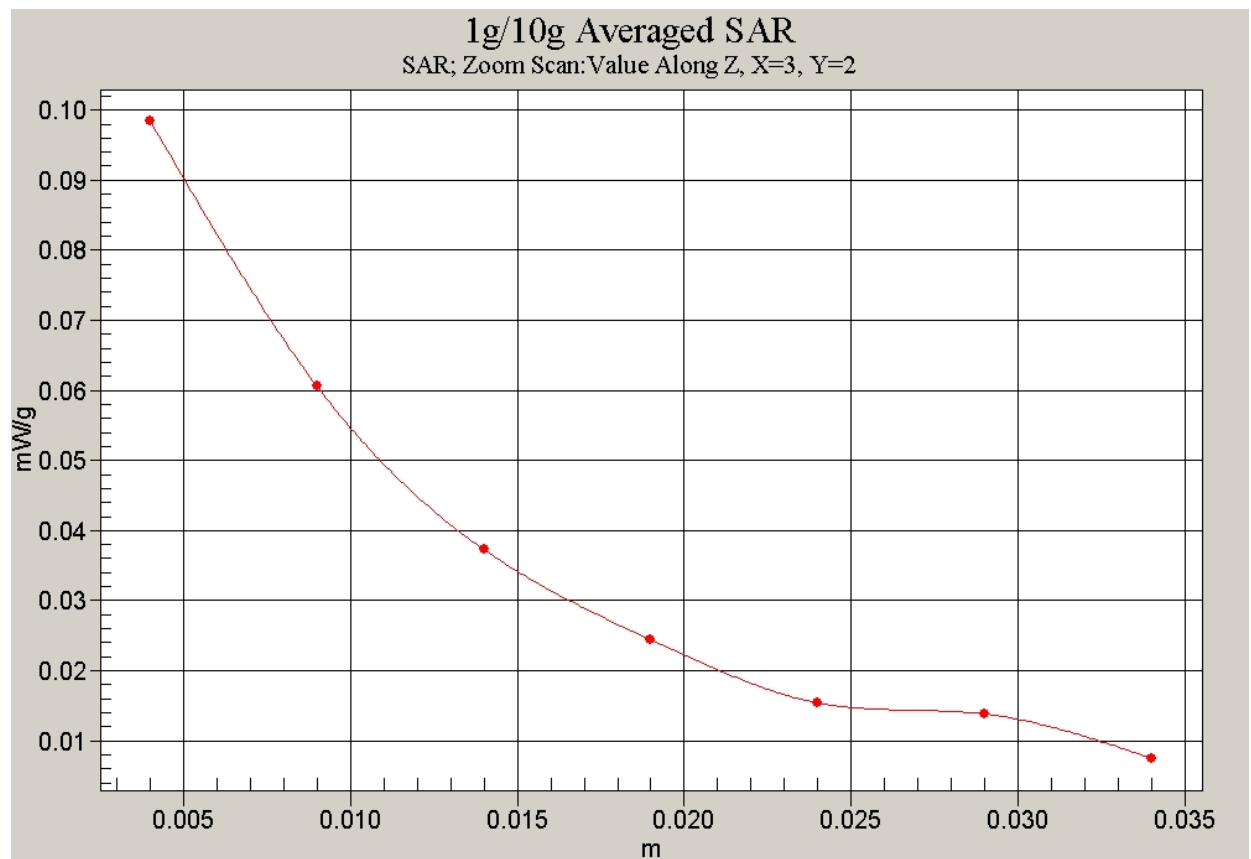


Fig. 12 Z-Scan at power reference point (PCS 1900MHz CH512)

1900 Right Cheek High

Electronics: DAE3 Sn536

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) = 0.946 mW/g

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

Reference Value = 7.13 V/m; Power Drift = -0.064 dB

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.840 mW/g; SAR(10 g) = 0.459 mW/g

Maximum value of SAR (measured) = 0.948 mW/g

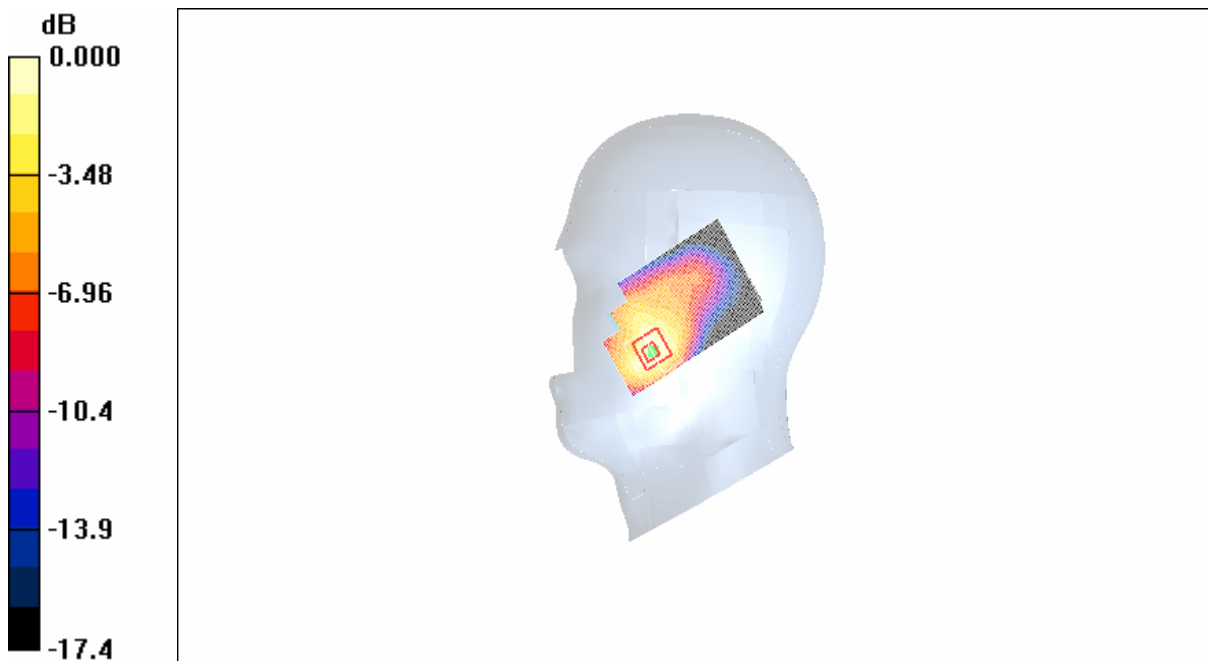


Fig. 13 Right Hand Touch Cheek PCS 1900MHz CH810

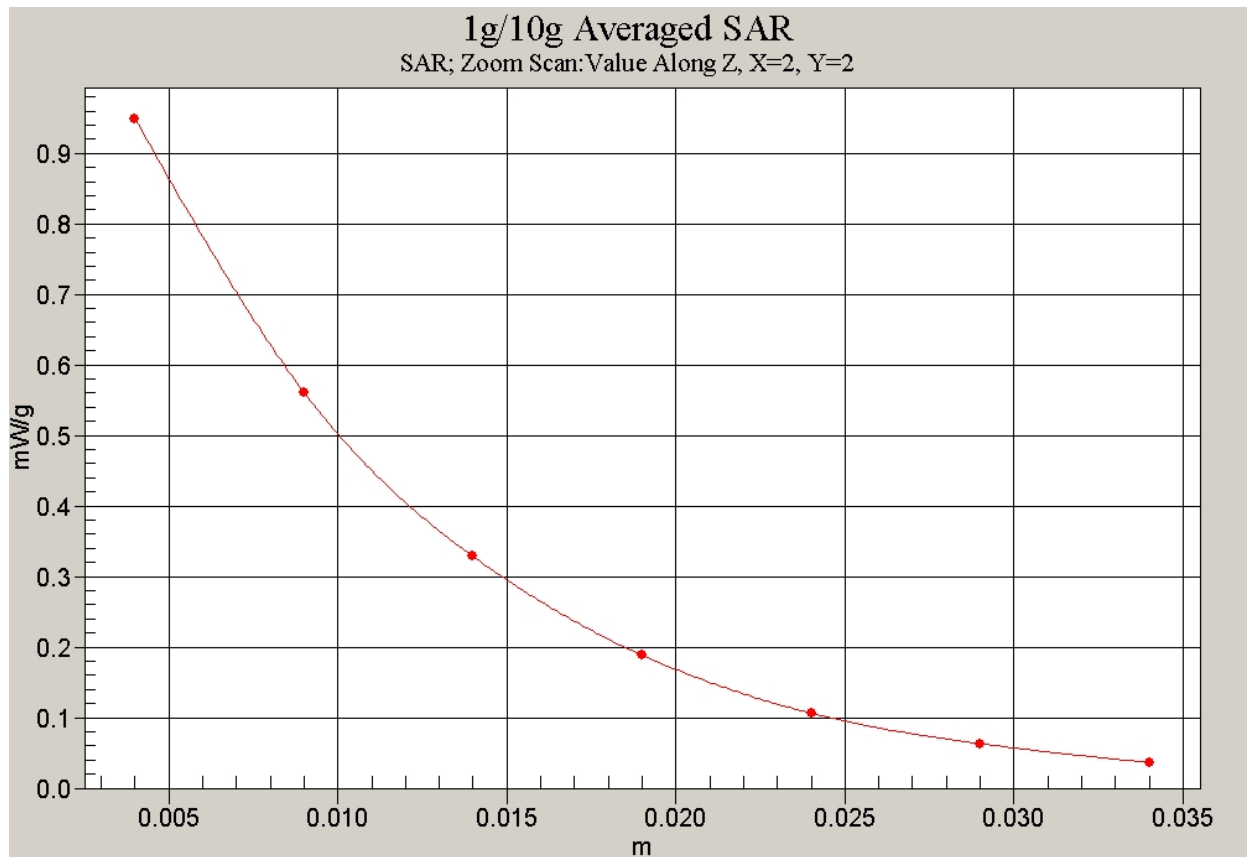


Fig. 14 Z-Scan at power reference point (PCS 1900MHz CH810)

1900 Right Cheek Middle

Electronics: DAE3 Sn536

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=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.819 mW/g

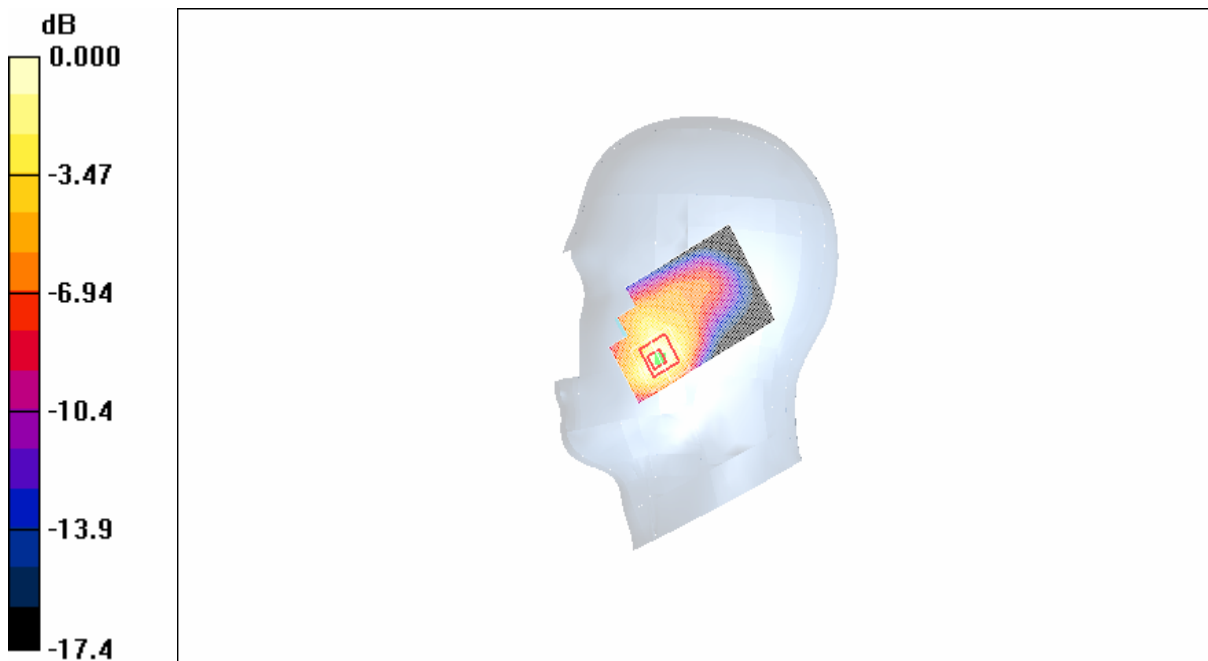
Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.71 V/m; Power Drift = -0.145 dB

Peak SAR (extrapolated) = 1.19 W/kg

SAR(1 g) = 0.710 mW/g; SAR(10 g) = 0.392 mW/g

Maximum value of SAR (measured) = 0.795 mW/g



0 dB = 0.795mW/g

Fig.15 Right Hand Touch Cheek PCS 1900MHz CH661

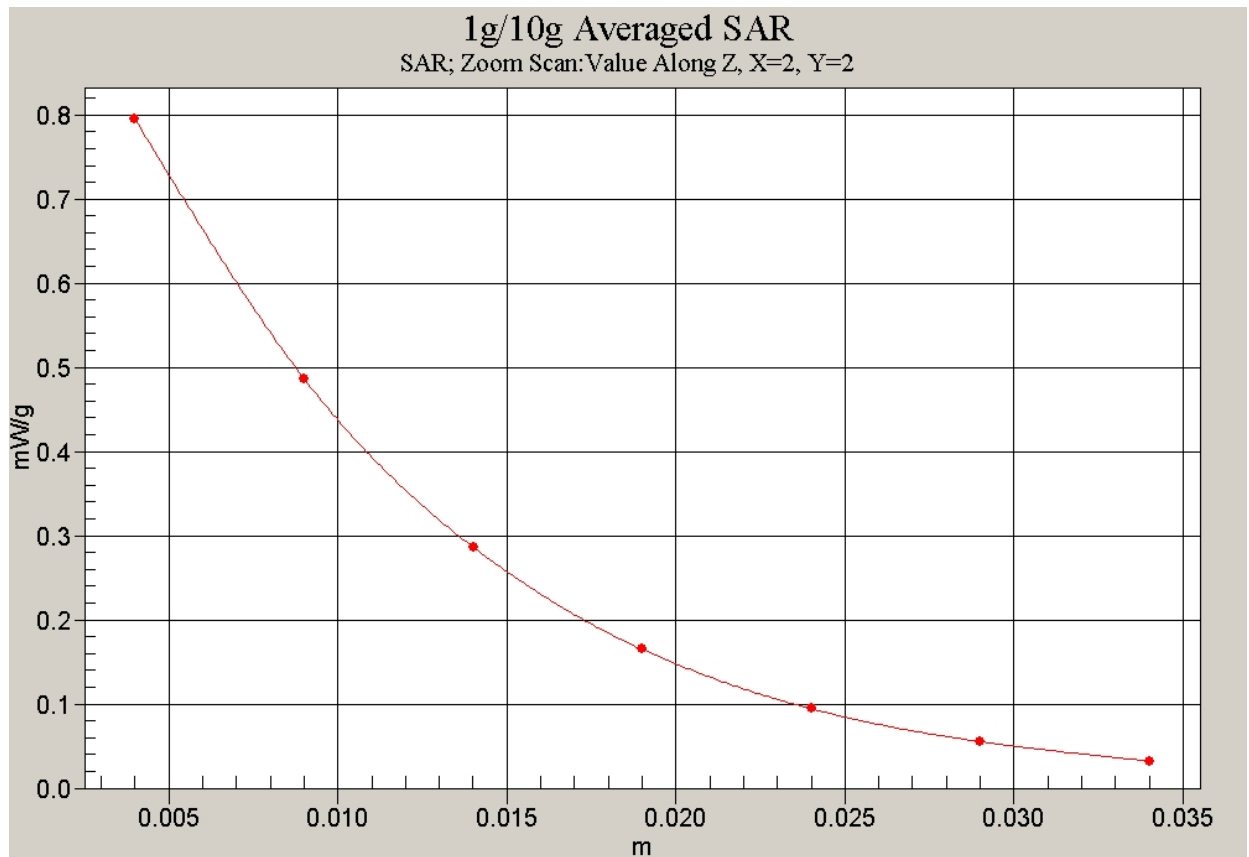


Fig. 16 Z-Scan at power reference point (PCS 1900MHz CH661)

1900 Right Cheek Low

Electronics: DAE3 Sn536

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) = 0.639 mW/g

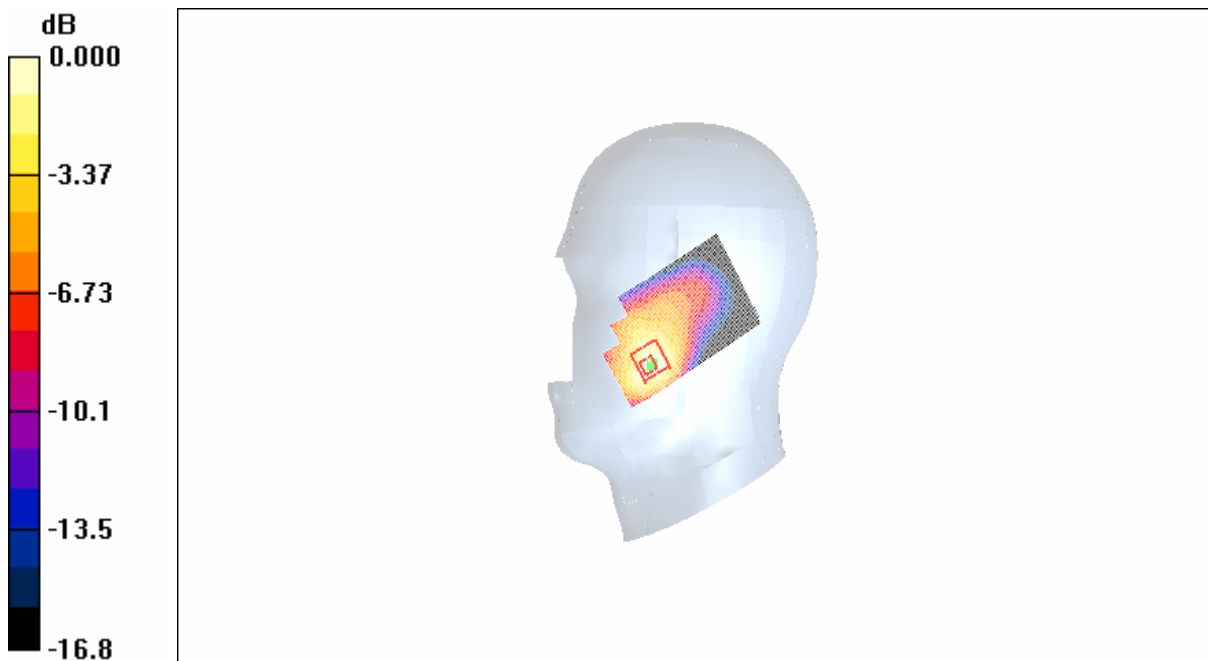
Cheek Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.90 V/m; Power Drift = -0.098 dB

Peak SAR (extrapolated) = 0.937 W/kg

SAR(1 g) = 0.559 mW/g; SAR(10 g) = 0.309 mW/g

Maximum value of SAR (measured) = 0.631 mW/g



0 dB = 0.631mW/g

Fig. 17 Right Hand Touch Cheek PCS 1900MHz CH512

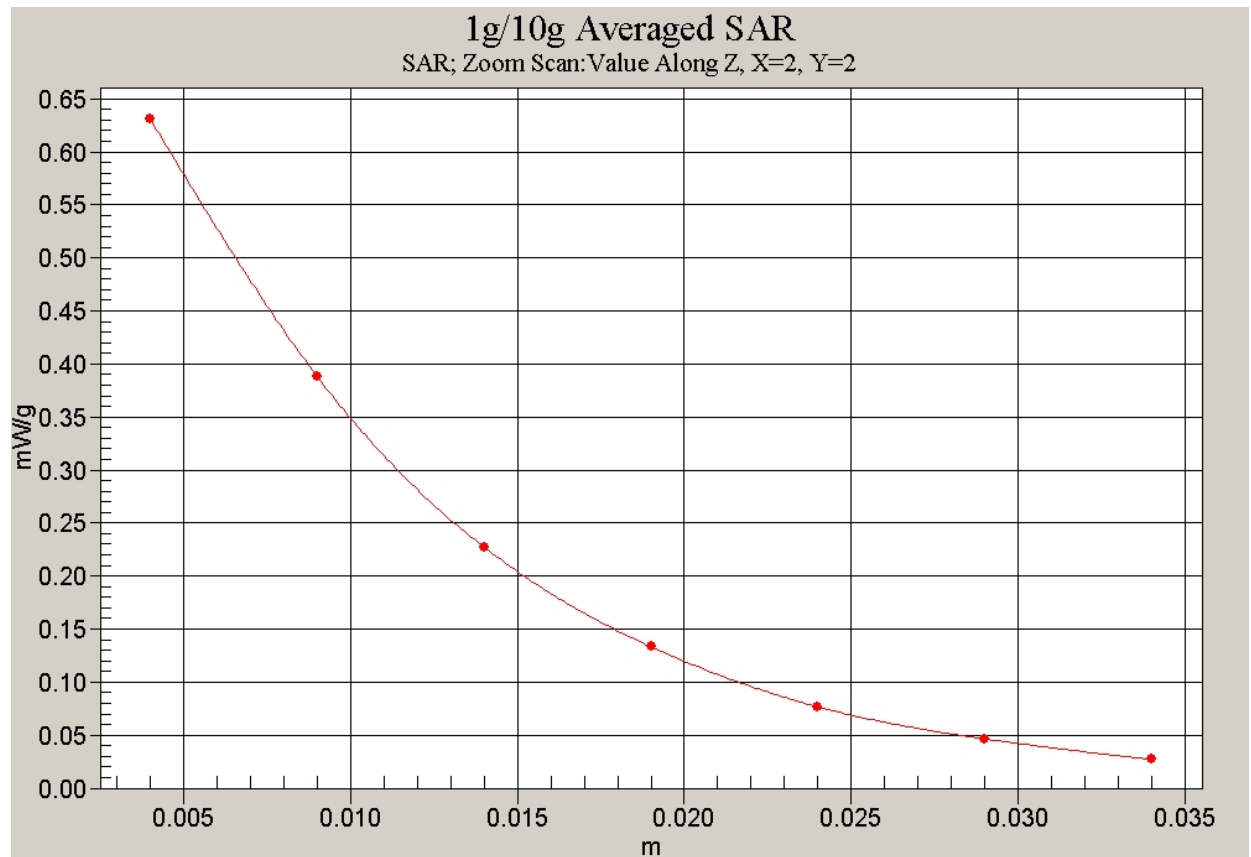


Fig. 18 Z-Scan at power reference point (PCS 1900MHz CH512)

1900 Right Tilt High

Electronics: DAE3 Sn536

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) = 0.218 mW/g

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

Reference Value = 10.9 V/m; Power Drift = 0.054 dB

Peak SAR (extrapolated) = 0.309 W/kg

SAR(1 g) = 0.193 mW/g; SAR(10 g) = 0.115 mW/g

Maximum value of SAR (measured) = 0.210 mW/g

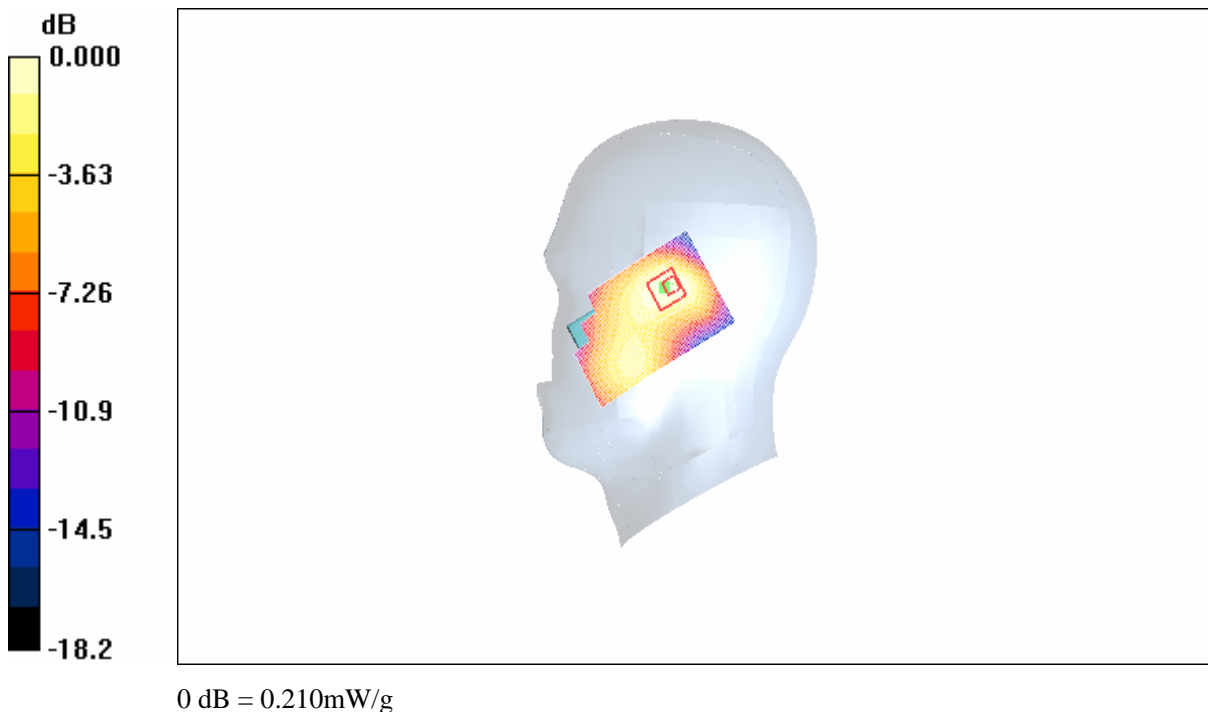


Fig. 19 Right Hand Tilt 15°PCS 1900MHz CH810

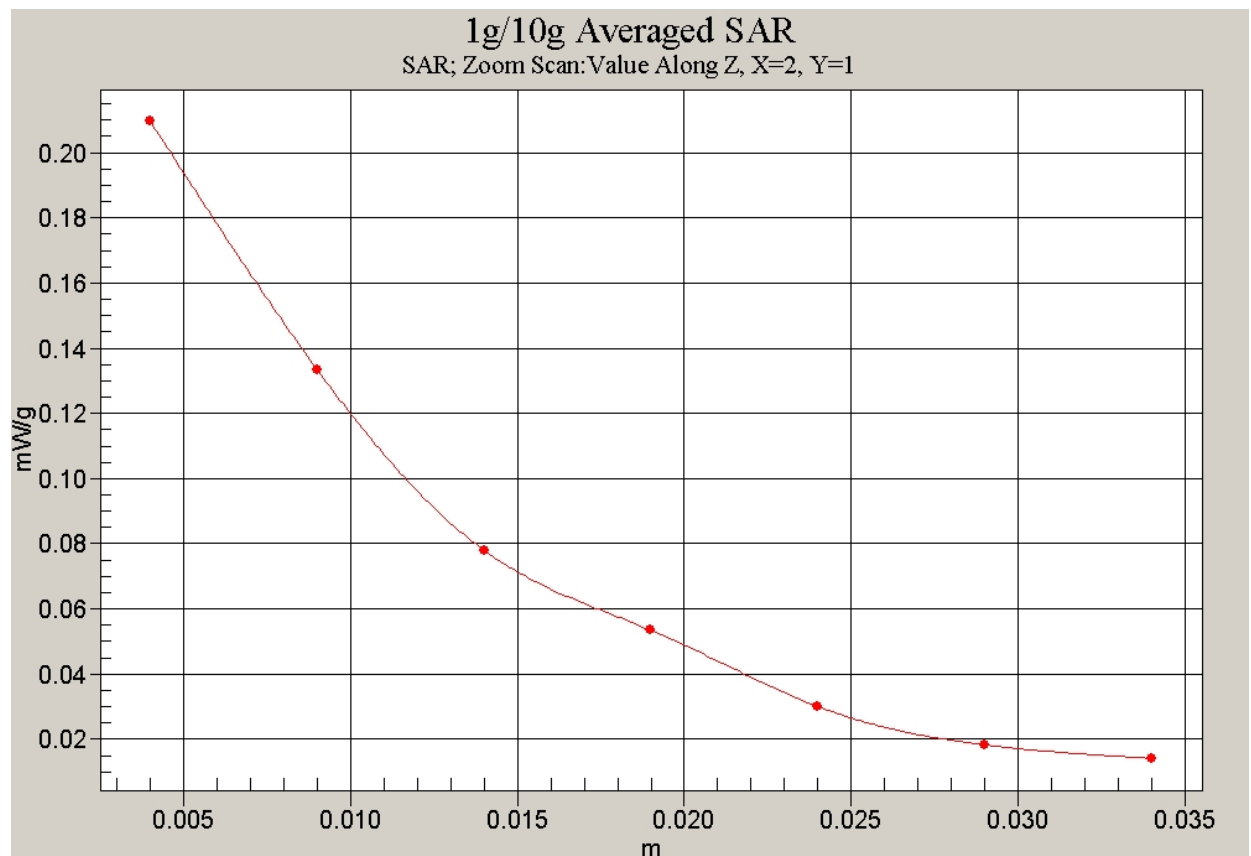


Fig. 20 Z-Scan at power reference point (PCS 1900MHz CH810)

1900 Right Tilt Middle

Electronics: DAE3 Sn536

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) = 0.187 mW/g

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

Reference Value = 9.76 V/m; Power Drift = -0.024 dB

Peak SAR (extrapolated) = 0.260 W/kg

SAR(1 g) = 0.161 mW/g; SAR(10 g) = 0.099 mW/g

Maximum value of SAR (measured) = 0.172 mW/g



0 dB = 0.172mW/g

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

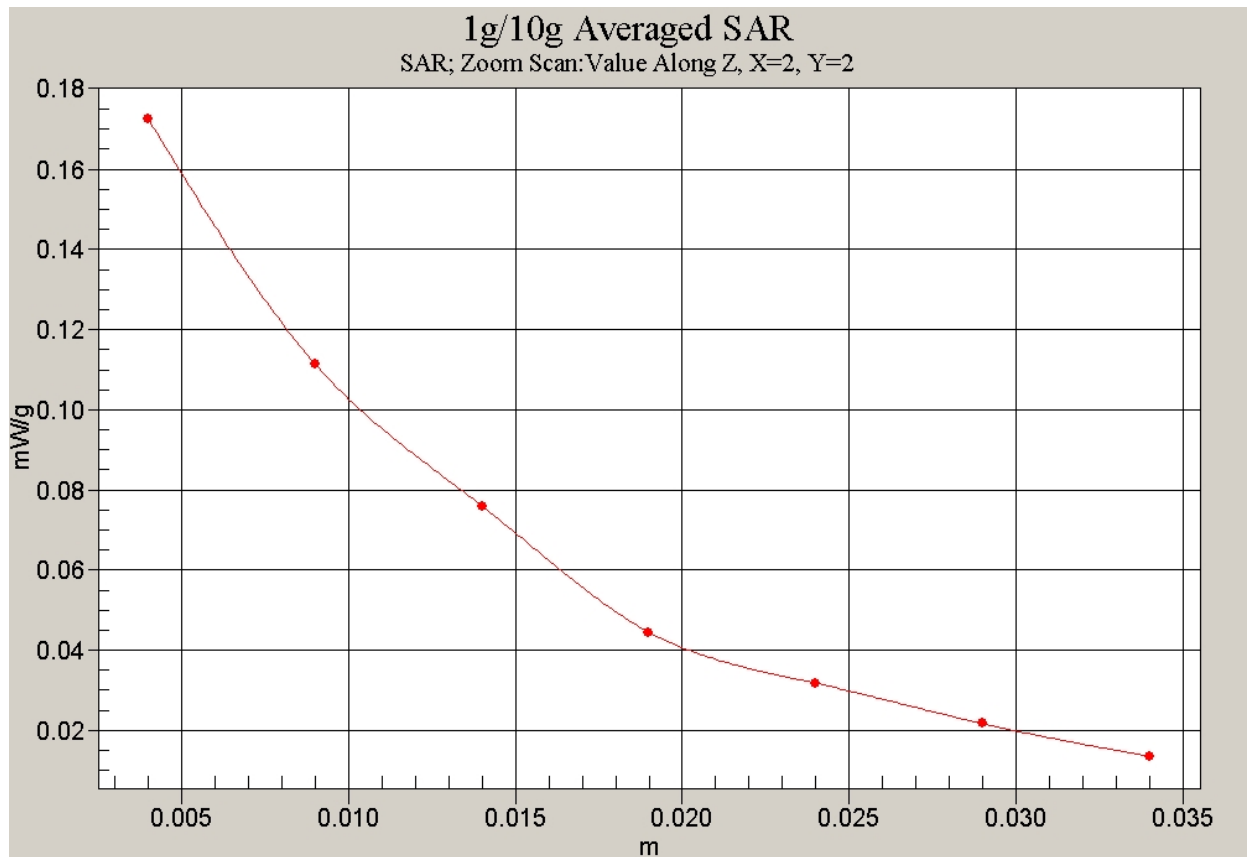


Fig. 22 Z-Scan at power reference point (PCS 1900MHz CH661)

1900 Right Tilt Low

Electronics: DAE3 Sn536

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) = 0.140 mW/g

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

Reference Value = 8.36 V/m; Power Drift = 0.129 dB

Peak SAR (extrapolated) = 0.185 W/kg

SAR(1 g) = 0.122 mW/g; SAR(10 g) = 0.076 mW/g

Maximum value of SAR (measured) = 0.133 mW/g

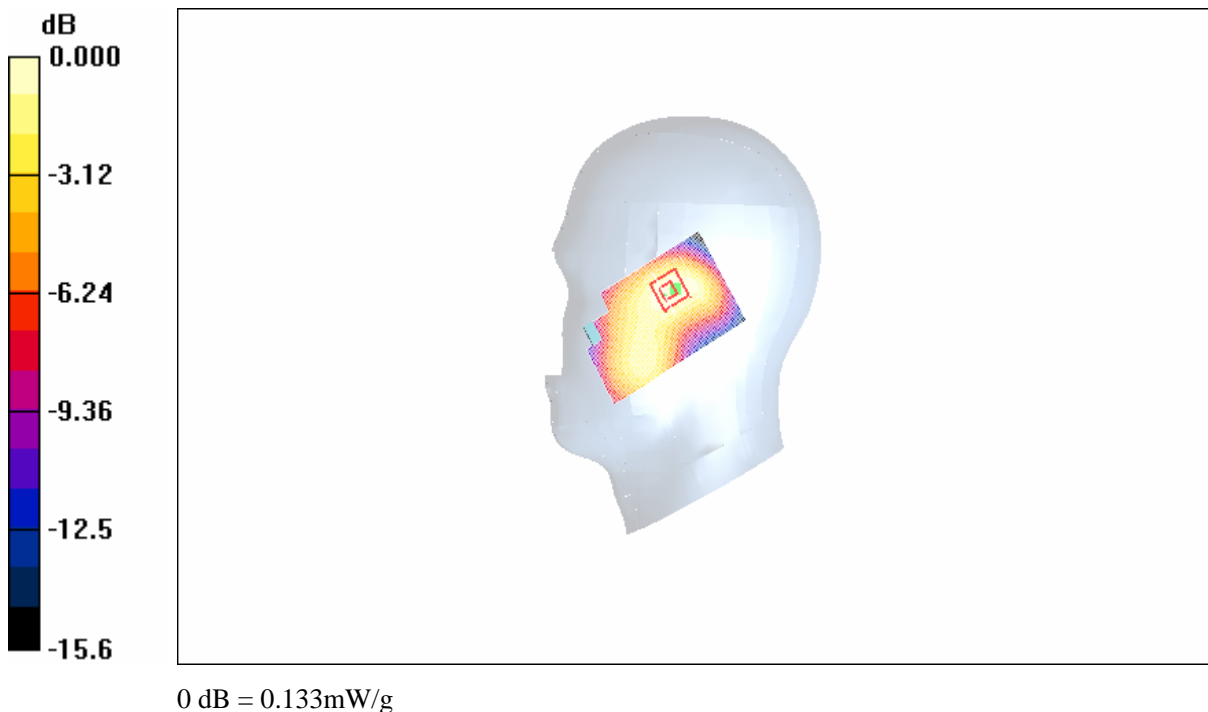


Fig. 23 Right Hand Tilt 15°PCS 1900MHz CH512

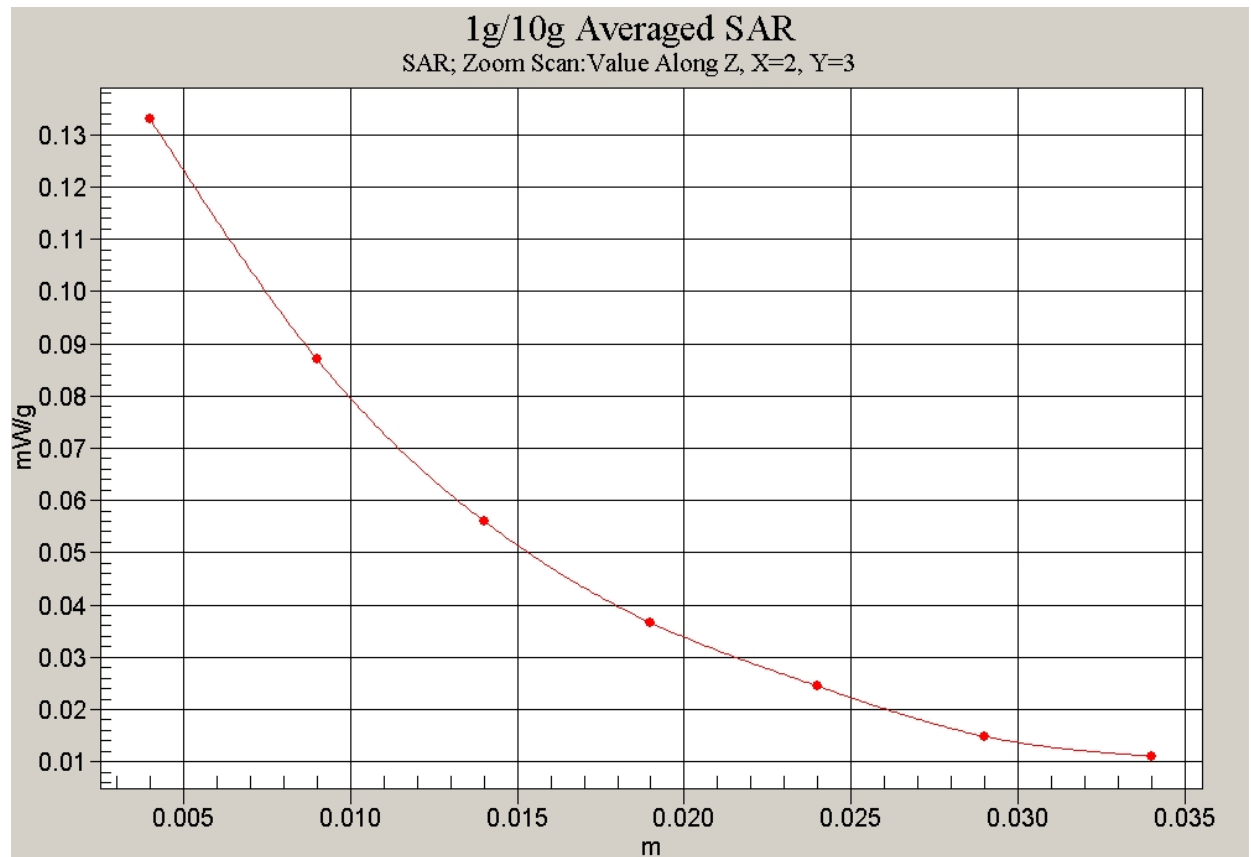


Fig. 24 Z-Scan at power reference point (PCS 1900MHz CH512)

1900 Body Toward Ground High

Electronics: DAE3 Sn536

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 (71x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.285 mW/g

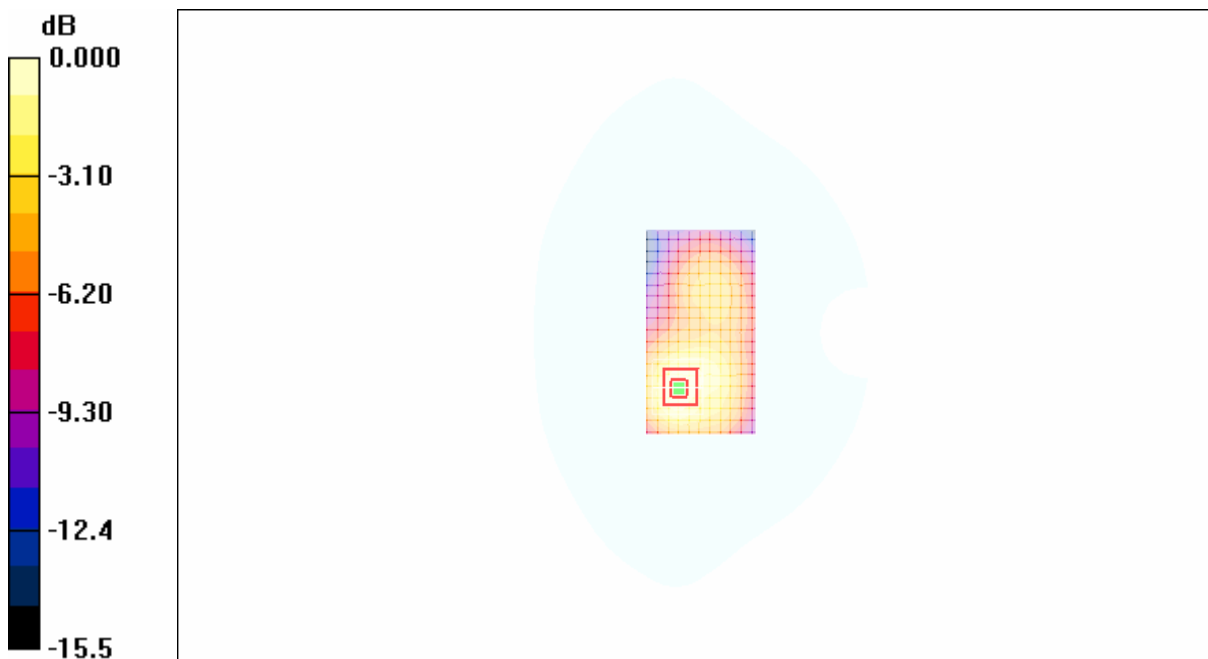
Toward Ground High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.57 V/m; Power Drift = -0.176 dB

Peak SAR (extrapolated) = 0.454 W/kg

SAR(1 g) = 0.258 mW/g; SAR(10 g) = 0.152 mW/g

Maximum value of SAR (measured) = 0.278 mW/g



0 dB = 0.278mW/g

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

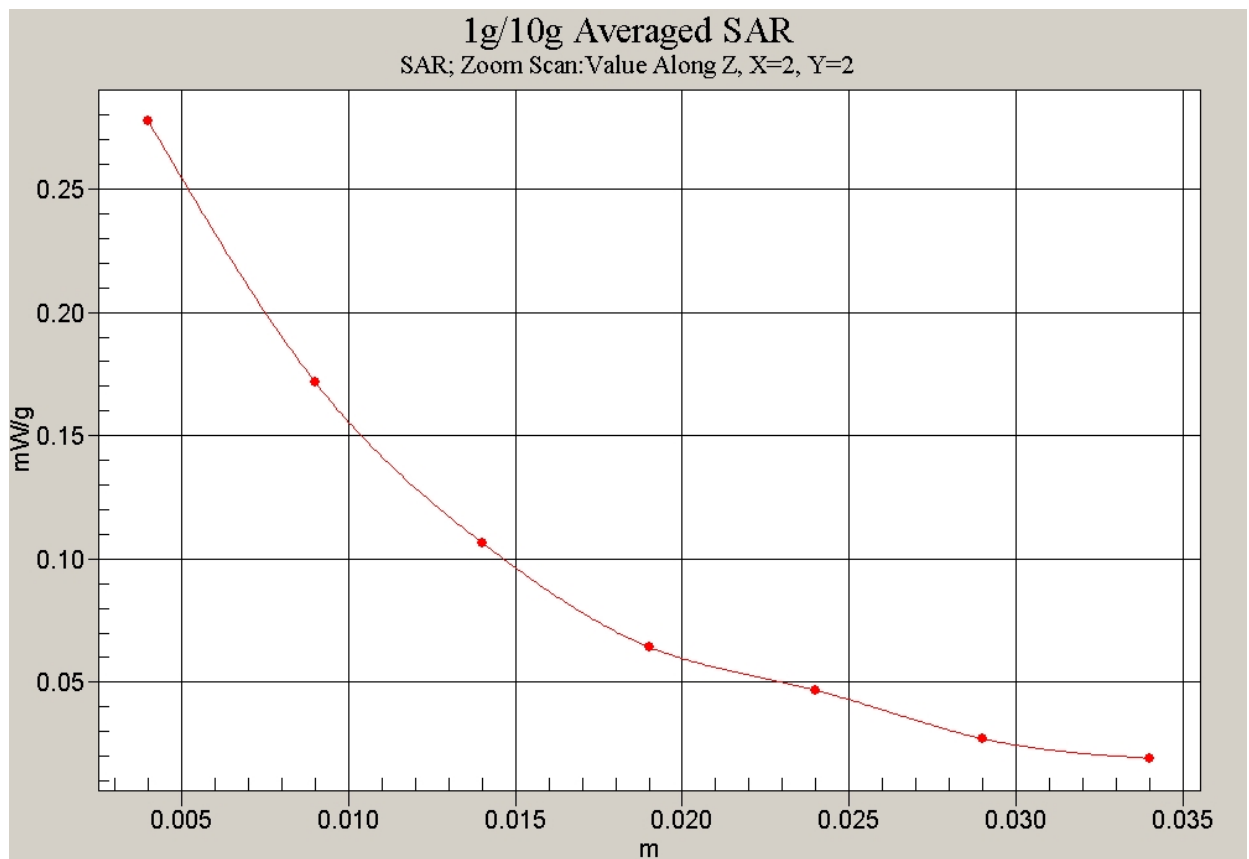


Fig. 26 Z-Scan at power reference point (PCS 1900MHz, Body Towards Ground, CH810)

1900 Body Toward Ground Middle

Electronics: DAE3 Sn536

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 (71x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.239 mW/g

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

Reference Value = 7.98 V/m; Power Drift = -0.055 dB

Peak SAR (extrapolated) = 0.369 W/kg

SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.128 mW/g

Maximum value of SAR (measured) = 0.235 mW/g

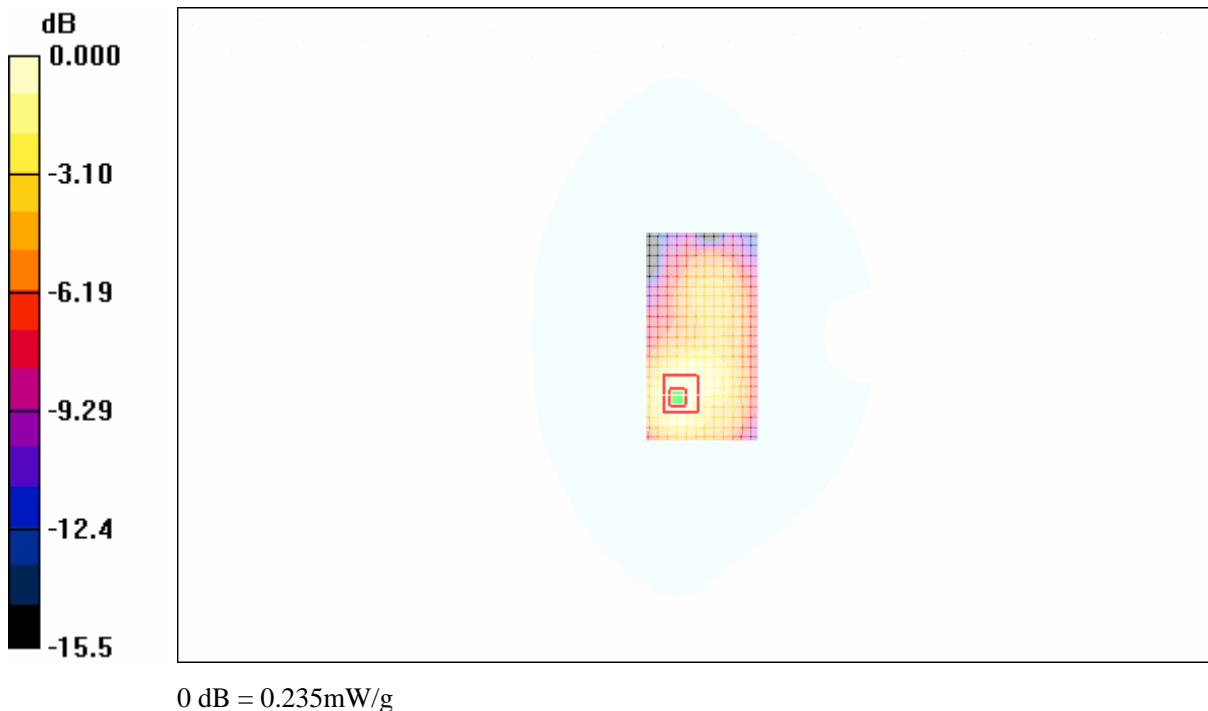


Fig. 27 PCS 1900MHz, Body, Towards Ground, CH661