



No. DAT-P-114/01-10

TEST REPORT

No. SAR2005018

Test name Electromagnetic Field (Specific Absorption Rate)

Product GSM Triple Frequency Mobile Station

Model T218

Client TCL Mobile Communication Co., Ltd

Type of test Non Type Approval



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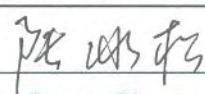
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Product Name	GSM Triple Frequency Mobile Station		
Client	TCL Mobile Communication Co., Ltd.	Type of test	Non Type Approval
Factory	TCL Mobile Communication Co., Ltd.	Sampling arrival date	September 22 nd , 2005
Manufacturer	TCL Mobile Communication Co., Ltd.		
Sampling/ Sending sample	Sending sample	Sample sent by	Luo Jian
Sampling location	/	Sampling person	/
Sample quantity	1	Sample matrix	/
Series number of the Sample	356835000012345		
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: 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>		
Note	<p>TX Freq. Band: 824-849MHz (GSM) 1850-1910 MHz (PCS)</p> <p>Max. Power: 2 Watt (GSM) 1 Watt (PCS)</p> <p>Antenna Character: /</p> <p>The test results relate only to the items tested of the sample(s).</p>		

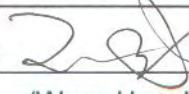
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(Lu Bingsong)



Reviewed by

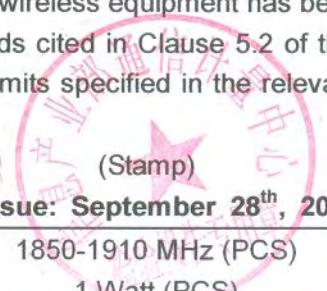
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Tested by

(Qi Dianyuan)


(Stamp)

Date of issue: September 28th, 2005

1 COMPETENCE AND WARRANTIES

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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.

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3 DESCRIPTION OF EUT

3.1 Addressing Information Related to EUT

Table 1: Applicant (The Client)

Name or Company	TCL Mobile Communication Co., Ltd.
Address/Post	No.23 Zone, Zhongkai High Technology Development Zone, Huizhou, Guangdong
City	Hui Zhou
Postal Code	516006
Country	China
Telephone	0752-2636729
Fax	0752-2636525

Table 2: Manufacturer

Name or Company	TCL Mobile Communication Co., Ltd.
Address/Post	No.23 Zone, Zhongkai High Technology Development Zone, Huizhou, Guangdong
City	Hui Zhou
Postal Code	516006
Country	China
Telephone	0752-2636729
Fax	0752-2636525

3.2 Constituents of EUT

Table 3: Constituents of Samples

Description	Model	Serial Number	Manufacturer
Handset	T218	356835000012345	TCL Mobile Communication Co., Ltd.
Lithium Battery	TJ-04A	TJ04AK500347	Huizhou Weiyeshun Electronics Co., Ltd
AC/DC Adapter	WYS-036	WYQ5101795108	TCL Mobile Communication Co., Ltd.



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

3.3 General Description

Equipment Under Test (EUT) is a model of GSM Phase III portable Mobile Station (MS) with integrated antenna. It consists of Handset and normal options: Lithium Battery and AC/DC Adapter as Table 3 and Fig. 1. Since it is a Dual-Band MS (GSM 850MHz/PCS 1900MHz), SAR is tested respectively for those two bands. Its GPRS function is class10.

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

During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. 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 128,190 and 251 respectively in the case of GSM 850 MHz, or 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.

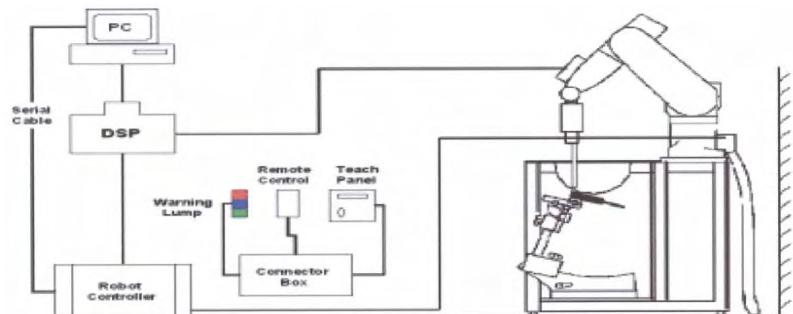


Figure2. SAR Lab Test Measurement Set-up

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)
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: ± 0.2 dB (30 MHz to 3 GHz)
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 $> 100\text{mW/g}$; Linearity: $\pm 0.2\text{dB}$
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 diarneter: 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

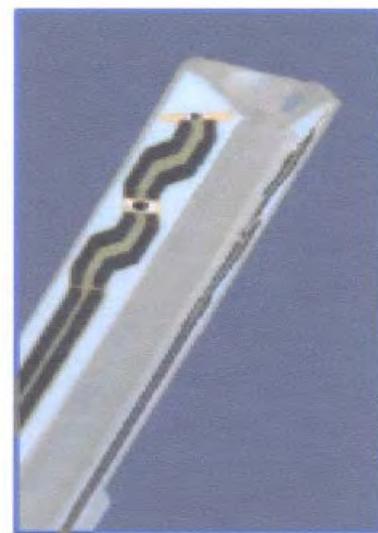


Figure3. ET3DV6 E-field Probe



Figure4. 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.

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

Where: Δt = Exposure time (30 seconds),

\mathbf{C} = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

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

Or

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m³).



Figure5. Device Holder

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

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).

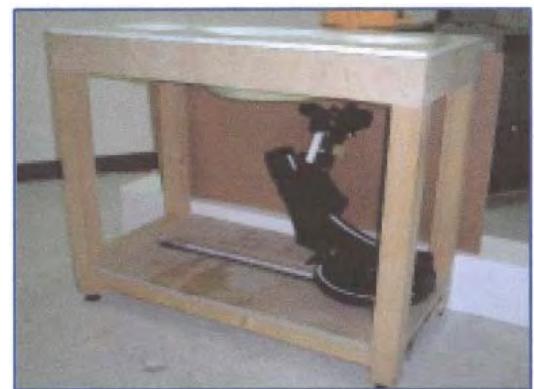


Figure6. Generic Twin Phantom

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 the complete setup of all predefined phantom positions and measurement grids by 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.

Table 4. Composition of the Head Tissue Equivalent Matter

MIXTURE %	FREQUENCY 850MHz
Water	41.45
Sugar	56.0
Salt	1.45
Preventol	0.1
Cellulose	1.0
Dielectric Parameters Target Value	f=850MHz ε=41.5 σ=0.90

MIXTURE %	FREQUENCY 1900MHz
Water	55.242
Glycol monobutyl	44.452
Salt	0.306
Dielectric Parameters Target Value	f=1900MHz ε=40.0 σ=1.40

Table 5. Composition of the Body Tissue Equivalent Matter

MIXTURE %	FREQUENCY 850MHz
Water	52.4
Sugar	45.0
Salt	1.4
Preventol	0.1
Cellulose	1.0
Dielectric Parameters Target Value	$f=850\text{MHz}$ $\epsilon=55.2$ $\sigma=0.97$

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

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: 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.

5.3 Character of the Test

Since it may be used for body-worn situation, the EUT is test with the flat phantom to simulate this case. The test also include another two items: GSM 850MHz Body with GPRS and PCS 1900MHz Body with GPRS.

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 TEST RESULTS

7.1 Dielectric Performance

Table 7: Dielectric Performance of Head Tissue Simulating Liquid

Measurement is made at temperature 22 °C and relative humidity 40%.			
/	Frequency	Permittivity ϵ	Conductivity σ (S/m)
Target value	850 MHz	41.5	0.90
	1900 MHz	40.0	1.40
Measurement value (Average of 10 tests)	850 MHz	41.5	0.93
	1900 MHz	40.27	1.45

Table 8: Dielectric Performance of Body Tissue Simulating Liquid

Measurement is made at temperature 22 °C and relative humidity 40%.			
/	Frequency	Permittivity ϵ	Conductivity σ (S/m)
Target value	850 MHz	55.2	0.97
	1900 MHz	53.3	1.52
Measurement value (Average of 10 tests)	850 MHz	53.84	1.00
	1900 MHz	55.85	1.55

7.2 System Validation

Table 9: System Validation

Measurement is made at temperature 23 °C, relative humidity 40%, input power 250 mW.				
Liquid parameters		Frequency	Permittivity ϵ	Conductivity σ (S/m)
		850 MHz	41.5	0.93
		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
	850 MHz	1.55	2.375	1.62
	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).

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7.3 Summary of Measurement Results(Head, GSM 850 MHz Band)

Table 10: SAR Values (GSM 850 MHz Band)

Temperature: 22 °C, humidity: 50%.

Liquid temperature during the test: 22.2°C

Limit of SAR (W/kg)	10 g Average	1 g Average	Conducted Power before/after each test (dBm)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		Conducted Power before/after each test (dBm)
	10 g Average	1 g Average	
Left hand, Touch cheek, Top frequency (See ANNEX C GRAPH RESULTS Fig.1)	0.533	0.779	32.87/32.86
Left hand, Touch cheek, Mid frequency (See ANNEX C GRAPH RESULTS Fig.3)	0.530	0.776	32.97/32.96
Left hand, Touch cheek, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.5)	0.504	0.743	32.96/32.97
Left hand, Tilt 15 Degree, Top frequency (See ANNEX C GRAPH RESULTS Fig.7)	0.255	0.394	32.86/32.87
Left hand, Tilt 15 Degree, Mid frequency (See ANNEX C GRAPH RESULTS Fig.9)	0.262	0.403	32.98/32.99
Left hand, Tilt 15 Degree, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.11)	0.275	0.423	32.96/32.95
Right hand, Touch cheek, Top frequency (See ANNEX C GRAPH RESULTS Fig.13)	0.503	0.734	32.88/32.89
Right hand, Touch cheek, Mid frequency (See ANNEX C GRAPH RESULTS Fig.15)	0.519	0.745	32.97/32.96
Right hand, Touch cheek, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.17)	0.535	0.777	32.98/32.97
Right hand, Tilt 15 Degree, Top frequency (See ANNEX C GRAPH RESULTS Fig.19)	0.221	0.376	32.88/32.87
Right hand, Tilt 15 Degree, Mid frequency (See ANNEX C GRAPH RESULTS Fig.21)	0.220	0.375	32.98/32.99
Right hand, Tilt 15 Degree, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.23)	0.308	0.504	32.97/32.95

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7.4 Summary of Measurement Results (Body-Worn, GSM 850 MHz Band)

Table 11: SAR Values (GSM 850 MHz Band, body-worn)

Temperature: 22 °C, humidity: 50%.

Liquid temperature during the test: 22.2°C

Limit of SAR (W/kg)	10 g Average	1 g Average	Conducted Power before/after each test (dBm)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		32.88/32.87
	10 g Average	1 g Average	
Display of EUT towards the ground, Top frequency (See ANNEX C GRAPH RESULTS Fig.25)	0.353	0.557	32.88/32.87
Display of EUT towards the ground, Mid frequency (See ANNEX C GRAPH RESULTS Fig.27)	0.350	0.548	32.99/32.98
Display of EUT towards the ground, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.29)	0.366	0.581	32.95/32.96
Display of EUT towards the phantom, Top frequency (See ANNEX C GRAPH RESULTS Fig.31)	0.130	0.202	32.89/32.88
Display of EUT towards the phantom, Mid frequency (See ANNEX C GRAPH RESULTS Fig.33)	0.138	0.214	32.99/32.98
Display of EUT towards the phantom, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.35)	0.131	0.203	32.97/32.96

7.5 Summary of Measurement Results (Body-Worn, GSM 850 MHz Band with GPRS)

Table 12: SAR Values (GSM 850 MHz Band, body-worn with GPRS)

Temperature: 22 °C, humidity: 50%. Liquid temperature during the test: 22.2°C				
Limit of SAR (W/kg)	10 g Average	1 g Average	Conducted Power before/after each test (dBm)	
	2.0	1.6		
Test Case	Measurement Result (W/kg)			
	10 g Average	1 g Average		
Display of EUT towards the ground, Top frequency (See ANNEX C GRAPH RESULTS Fig.37)	0.536	0.742	32.87/32.88	
Display of EUT towards the ground, Mid frequency (See ANNEX C GRAPH RESULTS Fig.39)	0.625	0.861	32.98/32.99	
Display of EUT towards the ground, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.41)	0.650	0.898	32.95/32.96	
Display of EUT towards the phantom, Top frequency (See ANNEX C GRAPH RESULTS Fig.43)	0.186	0.266	32.88/32.89	
Display of EUT towards the phantom, Mid frequency (See ANNEX C GRAPH RESULTS Fig.45)	0.231	0.326	32.99/32.97	
Display of EUT towards the phantom, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.47)	0.269	0.377	32.98/32.96	

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7.6 Summary of Measurement Results (Head, PCS 1900 MHz Band)

Table 13: SAR Values (PCS 1900 MHz Band, head)

Temperature: 22 °C, humidity: 50%.

Liquid temperature during the test: 22.2°C

Limit of SAR (W/kg)	10 g Average	1 g Average	Conducted Power before/after each test (dBm)	
	2.0	1.6		
Test Case	Measurement Result (W/kg)			
	10 g Average	1 g Average		
Left hand, Touch cheek, Top frequency (See ANNEX C GRAPH RESULTS Fig.49)	0.078	0.141	29.28/29.29	
Left hand, Touch cheek, Mid frequency (See ANNEX C GRAPH RESULTS Fig.51)	0.128	0.224	29.35/29.34	
Left hand, Touch cheek, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.53)	0.192	0.333	30.09/30.08	
Left hand, Tilt 15 Degree, Top frequency (See ANNEX C GRAPH RESULTS Fig.55)	0.082	0.151	29.27/29.28	
Left hand, Tilt 15 Degree, Mid frequency (See ANNEX C GRAPH RESULTS Fig.57)	0.135	0.249	29.34/29.35	
Left hand, Tilt 15 Degree, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.59)	0.202	0.369	30.07/30.08	
Right hand, Touch cheek, Top frequency (See ANNEX C GRAPH RESULTS Fig.61)	0.114	0.258	29.29/29.27	
Right hand, Touch cheek, Mid frequency (See ANNEX C GRAPH RESULTS Fig.63)	0.190	0.367	29.35/29.36	
Right hand, Touch cheek, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.65)	0.308	0.589	30.09/30.10	
Right hand, Tilt 15 Degree, Top frequency (See ANNEX C GRAPH RESULTS Fig.67)	0.120	0.234	29.29/29.29	
Right hand, Tilt 15 Degree, Mid frequency (See ANNEX C GRAPH RESULTS Fig.69)	0.184	0.355	29.35/29.36	
Right hand, Tilt 15 Degree, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.71)	0.290	0.556	30.08/30.07	

7.7 Summary of Measurement Results (Body-Worn, PCS 1900 MHz Band)

Table 14: SAR Values (PCS 1900 MHz Band, body-worn)

Temperature: 22 °C, humidity: 50%.

Liquid temperature during the test: 22.2°C

Limit of SAR (W/kg)	10 g Average	1 g Average	Conducted Power before/after each test (dBm)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		Conducted Power before/after each test (dBm)
	10 g Average	1 g Average	
Display of EUT towards the ground, Top frequency (See ANNEX C GRAPH RESULTS Fig.73)	0.107	0.169	29.29/29.29
Display of EUT towards the ground, Mid frequency (See ANNEX C GRAPH RESULTS Fig.75)	0.162	0.254	29.36/29.37
Display of EUT towards the ground, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.77)	0.216	0.335	30.09/30.08
Display of EUT towards the phantom, Top frequency (See ANNEX C GRAPH RESULTS Fig.79)	0.037	0.057	29.28/29.27
Display of EUT towards the phantom, Mid frequency (See ANNEX C GRAPH RESULTS Fig.81)	0.061	0.092	29.34/29.33
Display of EUT towards the phantom, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.83)	0.094	0.142	30.10/30.09

7.8 Summary of Measurement Results (Body-Worn, PCS 1900 MHz Band with GPRS)

Table 15: SAR Values (PCS 1900 MHz Band, body-worn with GPRS)

Temperature: 22 °C, humidity: 50%. Liquid temperature during the test: 22.2°C			
Limit of SAR (W/kg)	10 g Average	1 g Average	Conducted Power before/after each test (dBm)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		
	10 g Average	1 g Average	
Display of EUT towards the ground, Top frequency (See ANNEX C GRAPH RESULTS Fig.85)	0.156	0.243	29.28/29.29
Display of EUT towards the ground, Mid frequency (See ANNEX C GRAPH RESULTS Fig.87)	0.230	0.360	29.37/29.36
Display of EUT towards the ground, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.89)	0.455	0.734	30.10/30.08
Display of EUT towards the phantom, Top frequency (See ANNEX C GRAPH RESULTS Fig.91)	0.056	0.087	29.29/29.27
Display of EUT towards the phantom, Mid frequency (See ANNEX C GRAPH RESULTS Fig.93)	0.101	0.157	29.33/29.32
Display of EUT towards the phantom, Bottom frequency (See ANNEX C GRAPH RESULTS Fig.95)	0.153	0.236	30.10/30.11

7.9 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.

8 MEASUREMENT UNCERTAINTY

SN	a	Type	c	d	e = f(d,k)	f	$h =$ $c \times f$ $/ e$	k
	Uncertainty Component		Tol. (\pm %)	Prob. Dist.	Div.	c_i (1 g)	$1 g$ u_i (\pm %)	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	$\sqrt{3}$	$(1-c_p)$ $^{1/2}$	4.3	∞
4	Hemispherical Isotropy	B	9.4	R	$\sqrt{3}$	$\sqrt{c_p}$		∞
5	Boundary Effect	B	0.4	R	$\sqrt{3}$	1	0.23	∞
6	Linearity	B	4.7	R	$\sqrt{3}$	1	2.7	∞
7	System Detection Limits	B	1.0	R	$\sqrt{3}$	1	0.6	∞
8	Readout Electronics	B	1.0	N	1	1	1.0	∞
9	RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1.73	∞
10	Probe Positioner Mechanical Tolerance	B	0.4	R	$\sqrt{3}$	1	0.2	∞
11	Probe Positioning with respect to Phantom Shell	B	2.9	R	$\sqrt{3}$	1	1.7	∞
12	Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	B	3.9	R	$\sqrt{3}$	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	$N-1$

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15	Output Power Variation - SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.9	∞
Phantom and Tissue Parameters								
16	Phantom Uncertainty (shape and thickness tolerances)	B	1.0	R	$\sqrt{3}$	1	0.6	∞
17	Liquid Conductivity - deviation from target values	B	5.0	R	$\sqrt{3}$	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	$\sqrt{3}$	0.6	1.7	∞
20	Liquid Permittivity - measurement uncertainty	B	5.0	N	1	0.6	1.7	M
	Combined Standard Uncertainty			RSS			11.2 5	
	Expanded Uncertainty (95% CONFIDENCE INTERVAL)			K=2			22.5	

9 MAIN TEST INSTRUMENTS

Table 16: 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	Dielectric Probe Kit	Agilent 85070C	US99360113	No Calibration Requested	
03	Power meter	NRVD	101253	June 3,2005	One year
04	Power sensor	NRV-Z5	100331	June 20,2005	
05	Power sensor	NRV-Z6	100011	December 12,2004	
06	Signal Generator	MG 3633A	M73386	No Calibration Requested	
07	Amplifier	AT 50S1G4A	26549	No Calibration Requested	
08	BTS	CMU 200	105948	August 15,2005	One year
09	E-field Probe	SPEAG ET3DV6	1736	July 14, 2005	One year
10	DAE	SPEAG DAE3	536	July 11, 2005	One year

10 TEST PERIOD

The test is performed from September 22nd, 2005 to September 27th, 2005

11 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.

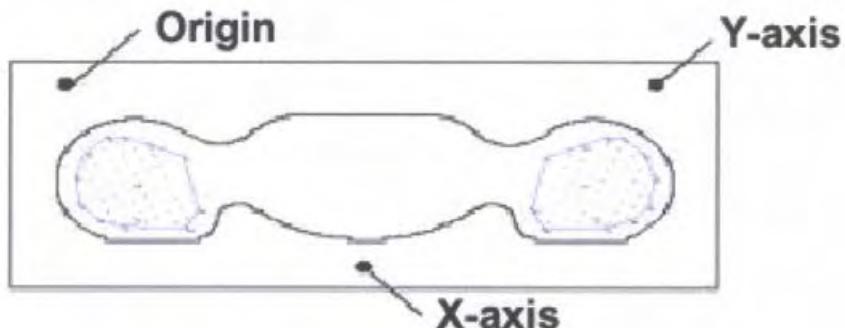


Figure 1 SAR Measurement Points in Area Scan

ANNEX B TEST LAYOUT



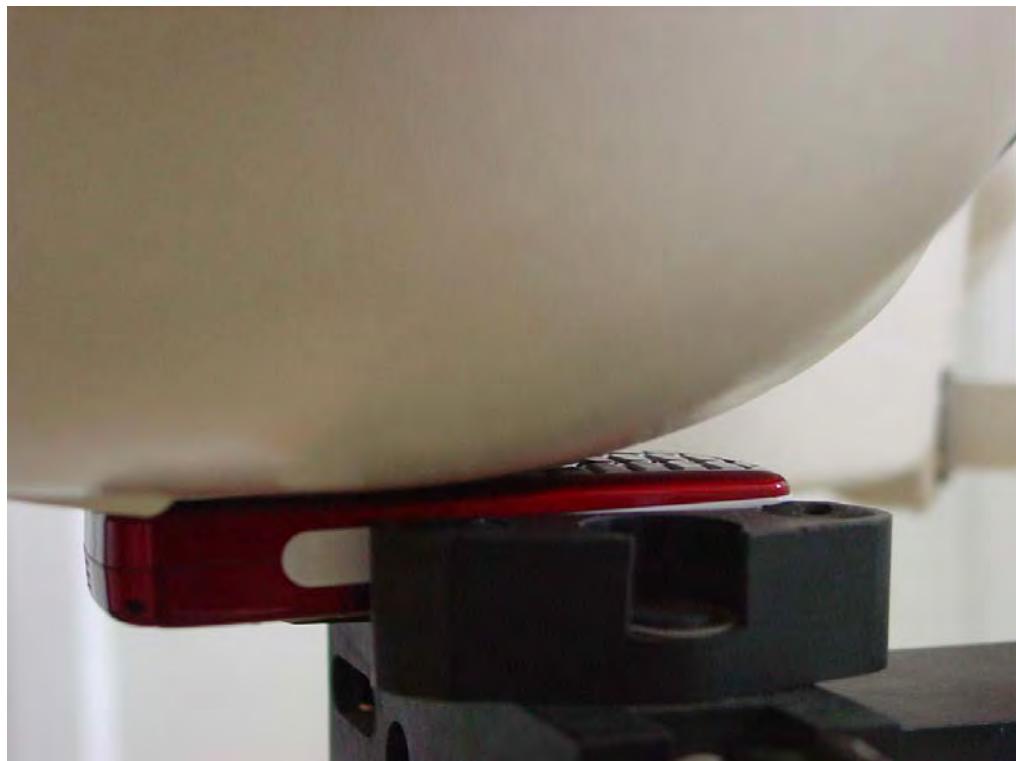
Picture 1 Specific Absorption Rate Test Layout



Picture 2 Left Hand Touch Cheek Position



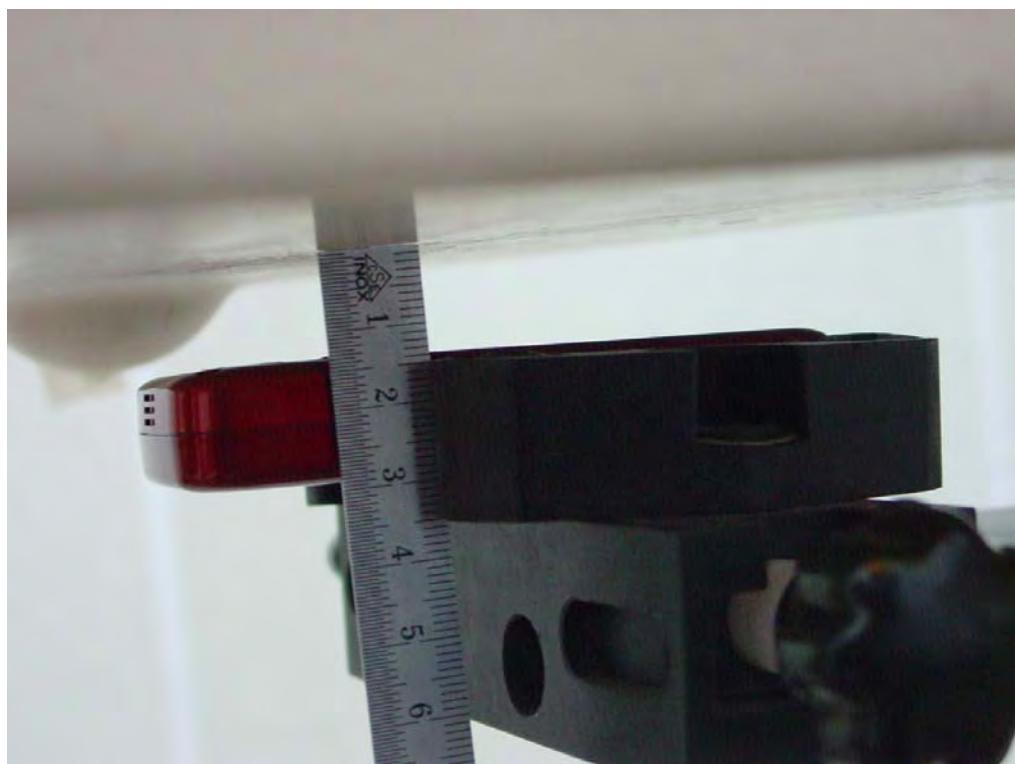
Picture 3 Left Hand Tilt 15° Position



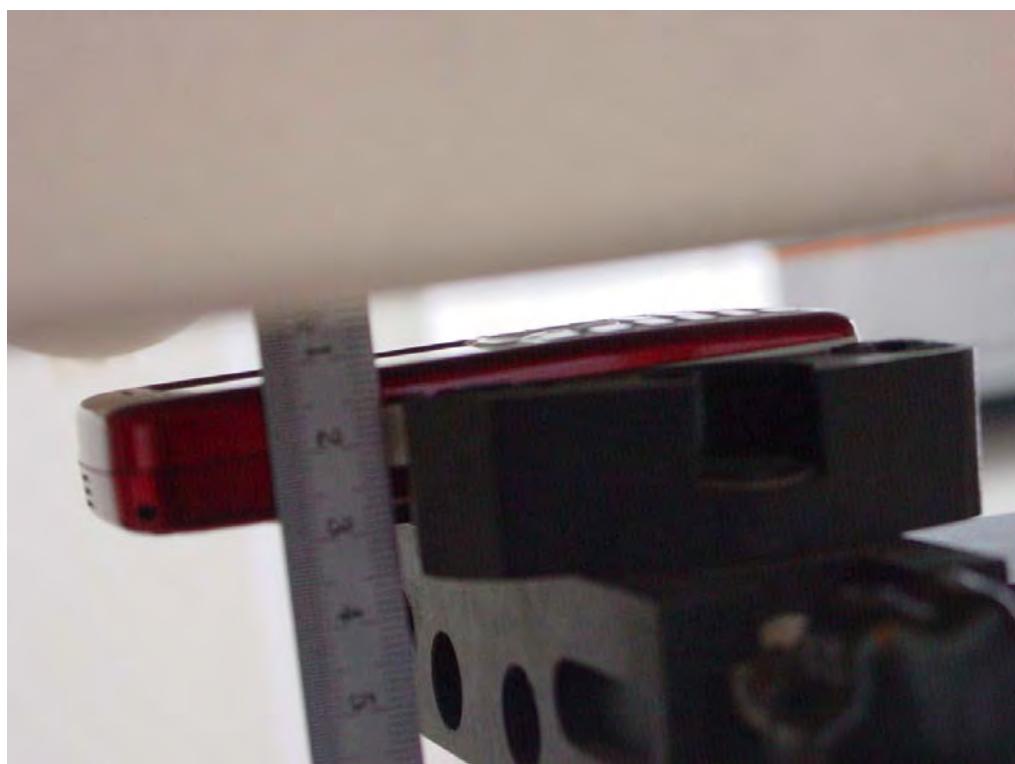
Picture 4 Right Hand Touch Cheek Position



Picture 5 Right Hand Tilt 15° Position



Picture 6 Flat Phantom -- Body-worn Position (towards ground, the distance from handset to the bottom of the Phantom is 1.5cm)



Picture 7 Flat Phantom -- Body-worn Position (towards phantom, the distance from handset to the bottom of the Phantom is 1.5cm)

ANNEX C GRAPH RESULTS

850 Left Cheek High

Electronics: DAE3 Sn536

Communication System: GSM 850 Frequency: 848.8 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

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

Reference Value = 25.9 V/m; Power Drift = -0.2 dB

Maximum value of SAR (interpolated) = 0.865 mW/g

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

Reference Value = 25.9 V/m; Power Drift = -0.2 dB

Maximum value of SAR (measured) = 0.815 mW/g

Peak SAR (extrapolated) = 1.07 W/kg

SAR(1 g) = 0.779 mW/g; SAR(10 g) = 0.533 mW/g

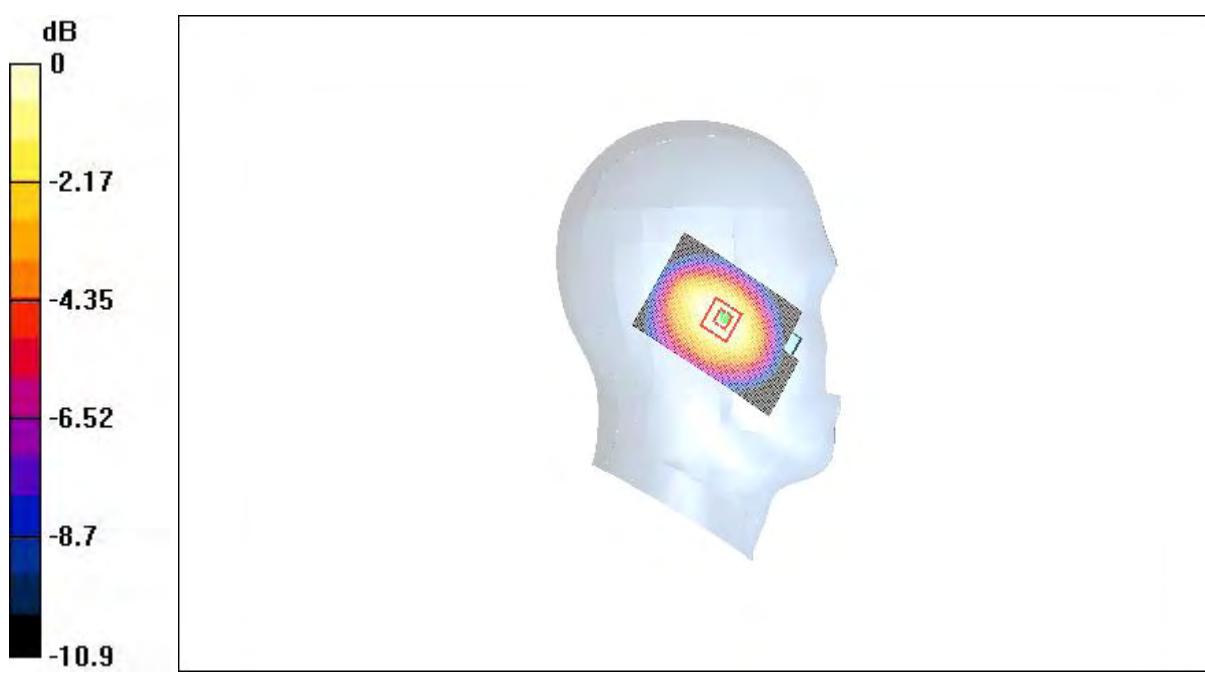


Fig. 1 Left Hand Touch Cheek 850MHz CH251

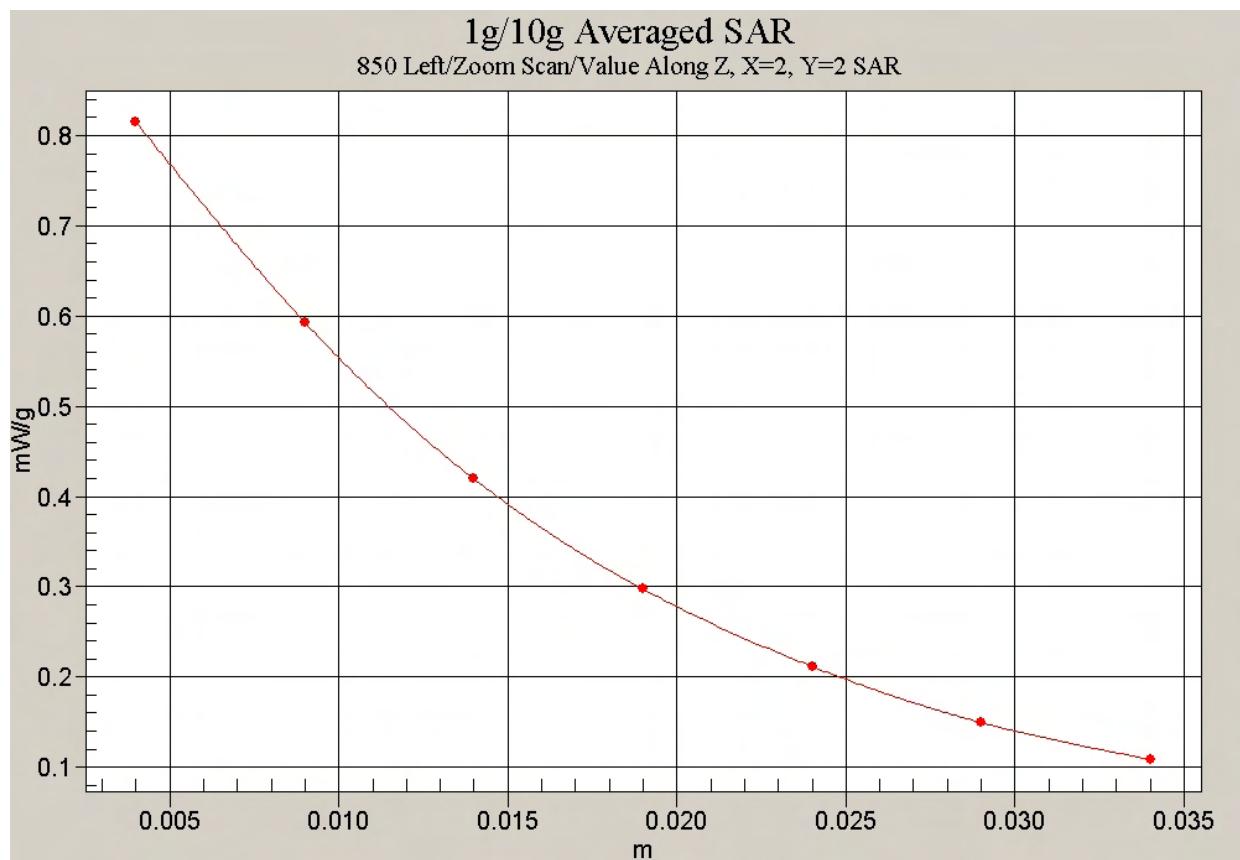


Fig. 2 Z-Scan at power reference point (Left Hand Touch Cheek 850MHz CH251)

850 Left Cheek Middle

Electronics: DAE3 Sn536

Communication System: GSM 850 Frequency: 836.6 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

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

Reference Value = 26.5 V/m; Power Drift = -0.1 dB

Maximum value of SAR (interpolated) = 0.855 mW/g

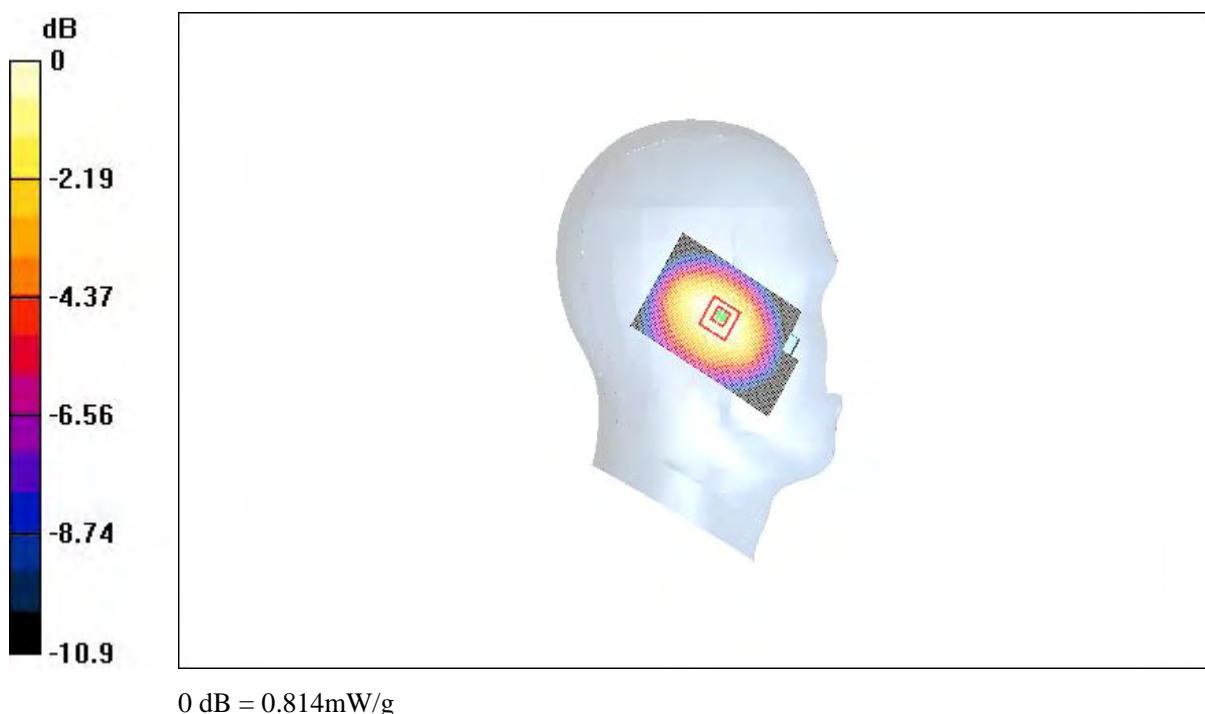
Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 26.5 V/m; Power Drift = -0.1 dB

Maximum value of SAR (measured) = 0.814 mW/g

Peak SAR (extrapolated) = 1.07 W/kg

SAR(1 g) = 0.776 mW/g; SAR(10 g) = 0.530 mW/g



0 dB = 0.814mW/g

Fig. 3 Left Hand Touch Cheek 850MHz CH190

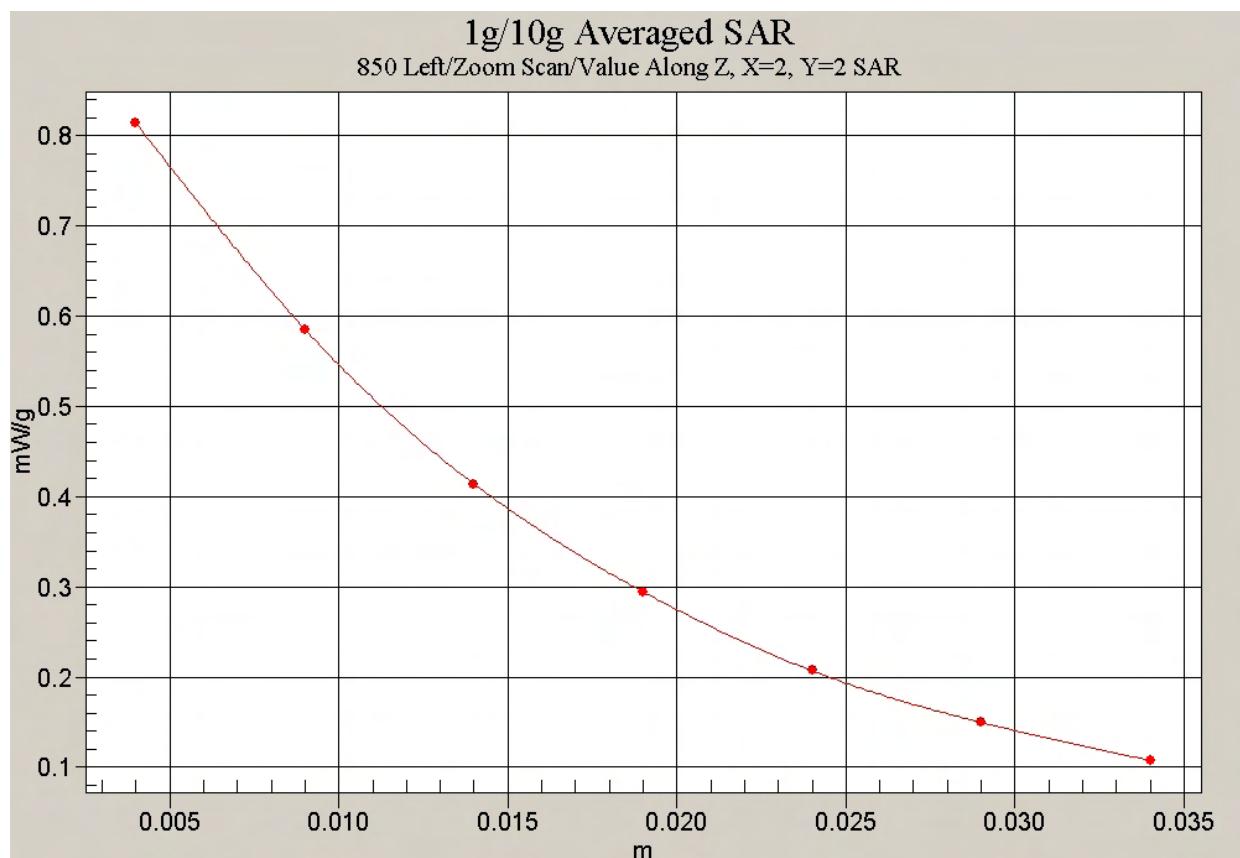


Fig. 4 Z-Scan at power reference point (Left Hand Touch Cheek 850MHz CH190)

850 Left Cheek Low

Electronics: DAE3 Sn536

Communication System: GSM 850 Frequency: 824.2 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

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

Reference Value = 26.4 V/m; Power Drift = -0.1 dB

Maximum value of SAR (interpolated) = 0.823 mW/g

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

Reference Value = 26.4 V/m; Power Drift = -0.1 dB

Maximum value of SAR (measured) = 0.782 mW/g

Peak SAR (extrapolated) = 1.02 W/kg

SAR(1 g) = 0.743 mW/g; SAR(10 g) = 0.504 mW/g

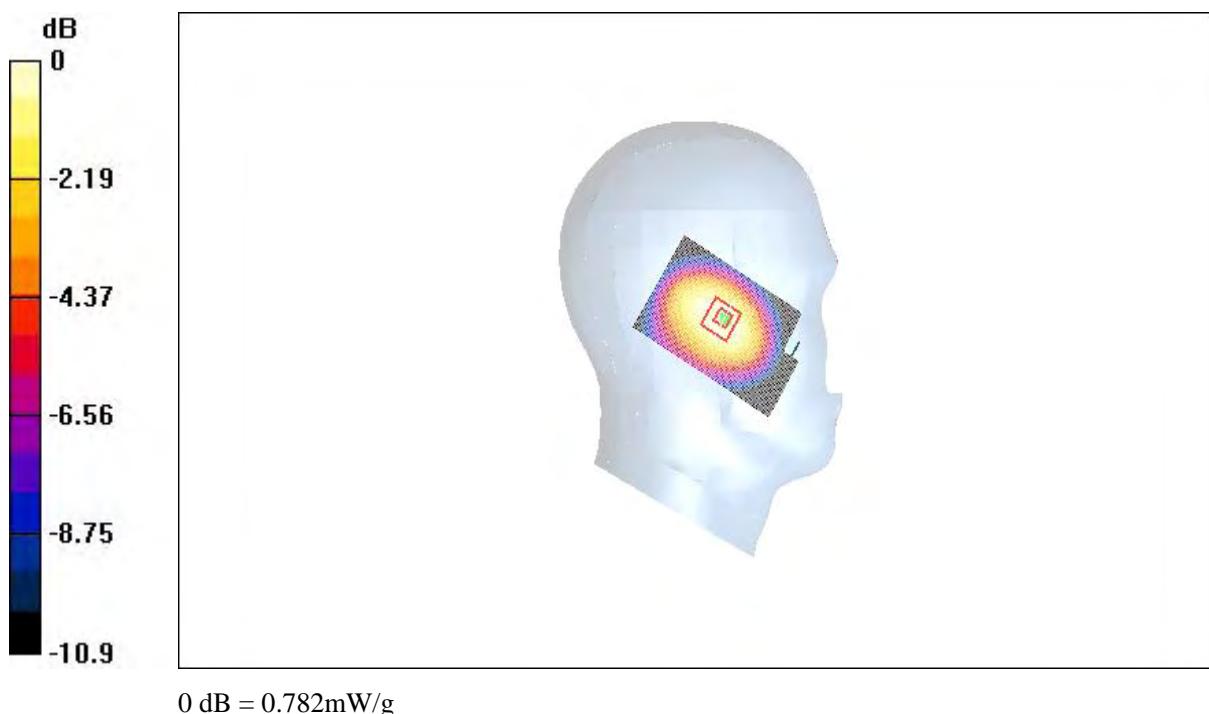


Fig. 5 Left Hand Touch Cheek 850MHz CH128

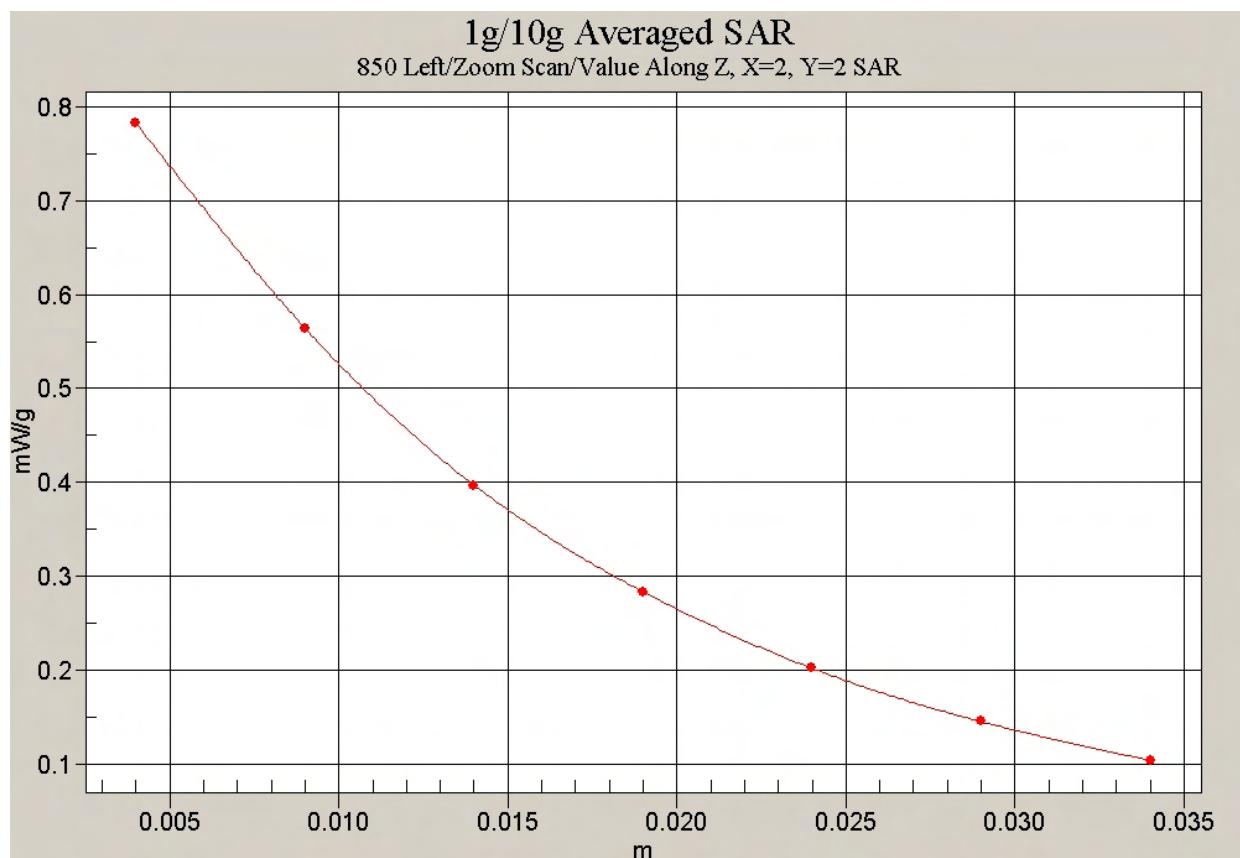


Fig. 6 Z-Scan at power reference point (Left Hand Touch Cheek 850MHz CH128)

850 Left Tilt High

Electronics: DAE3 Sn536

Communication System: GSM 850 Frequency: 848.8 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

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

Reference Value = 22.2 V/m; Power Drift = 0.0 dB

Maximum value of SAR (interpolated) = 0.423 mW/g

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

Reference Value = 22.2 V/m; Power Drift = 0.0 dB

Maximum value of SAR (measured) = 0.418 mW/g

Peak SAR (extrapolated) = 0.637 W/kg

SAR(1 g) = 0.394 mW/g; SAR(10 g) = 0.255 mW/g

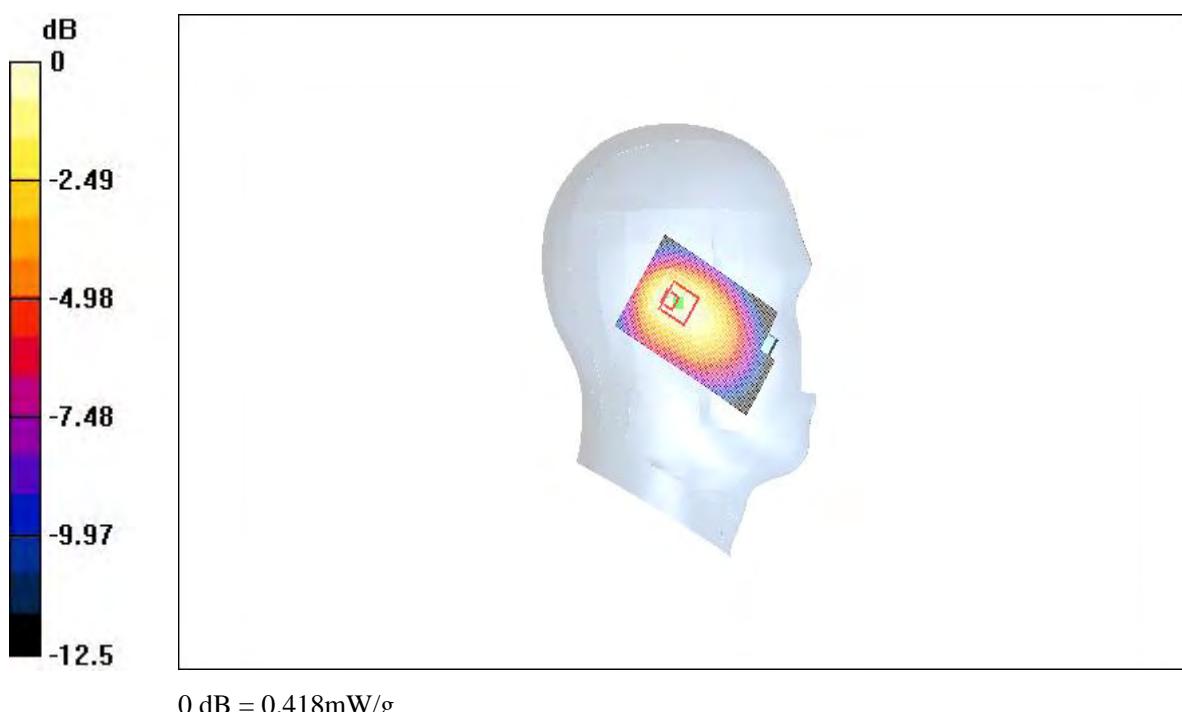


Fig. 7 Left Hand Tilt 15° 850MHz CH251

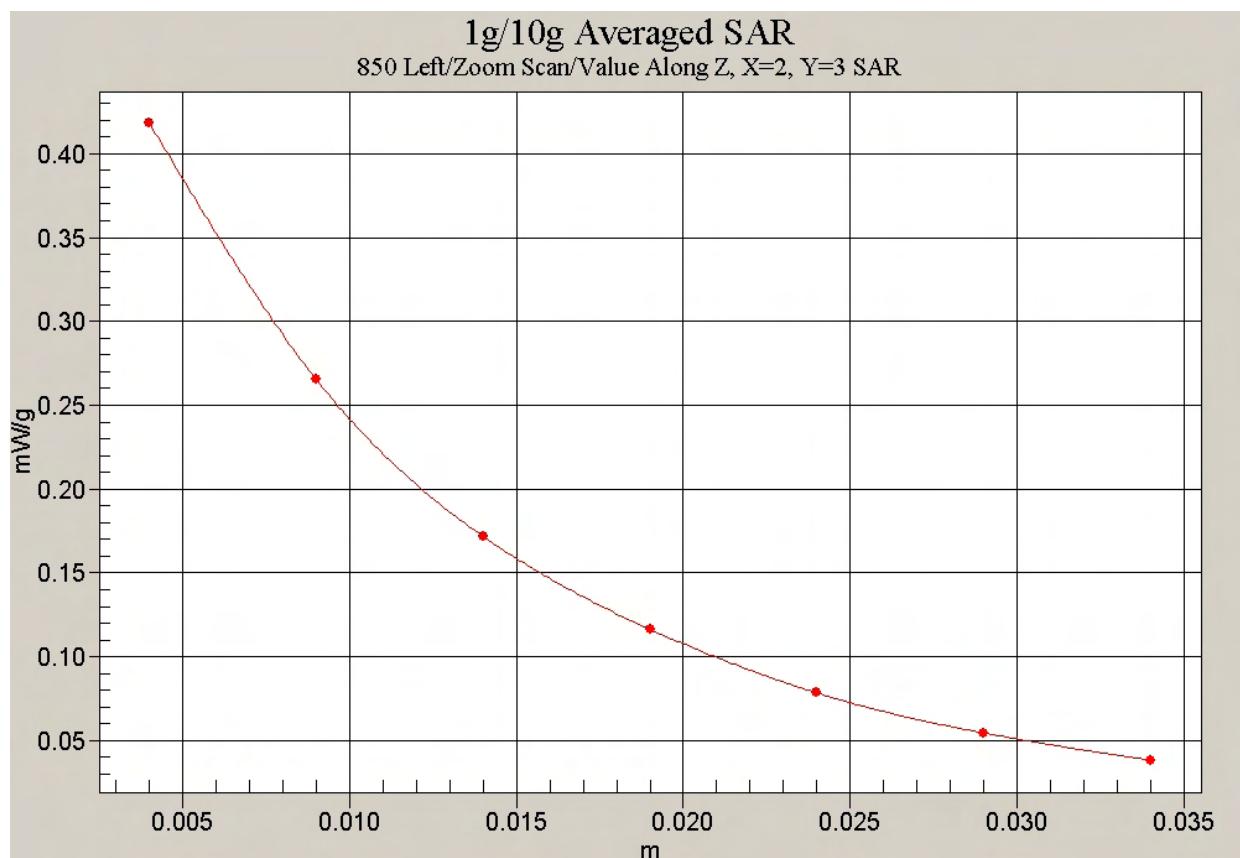


Fig. 8 Z-Scan at power reference point (Left Hand Tilt 15° 850MHz CH251)

850 Left Tilt Middle

Electronics: DAE3 Sn536

Communication System: GSM 850 Frequency: 836.6 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

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

Reference Value = 22.7 V/m; Power Drift = -0.1 dB

Maximum value of SAR (interpolated) = 0.435 mW/g

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

Reference Value = 22.7 V/m; Power Drift = -0.1 dB

Maximum value of SAR (measured) = 0.432 mW/g

Peak SAR (extrapolated) = 0.651 W/kg

SAR(1 g) = 0.403 mW/g; SAR(10 g) = 0.262 mW/g

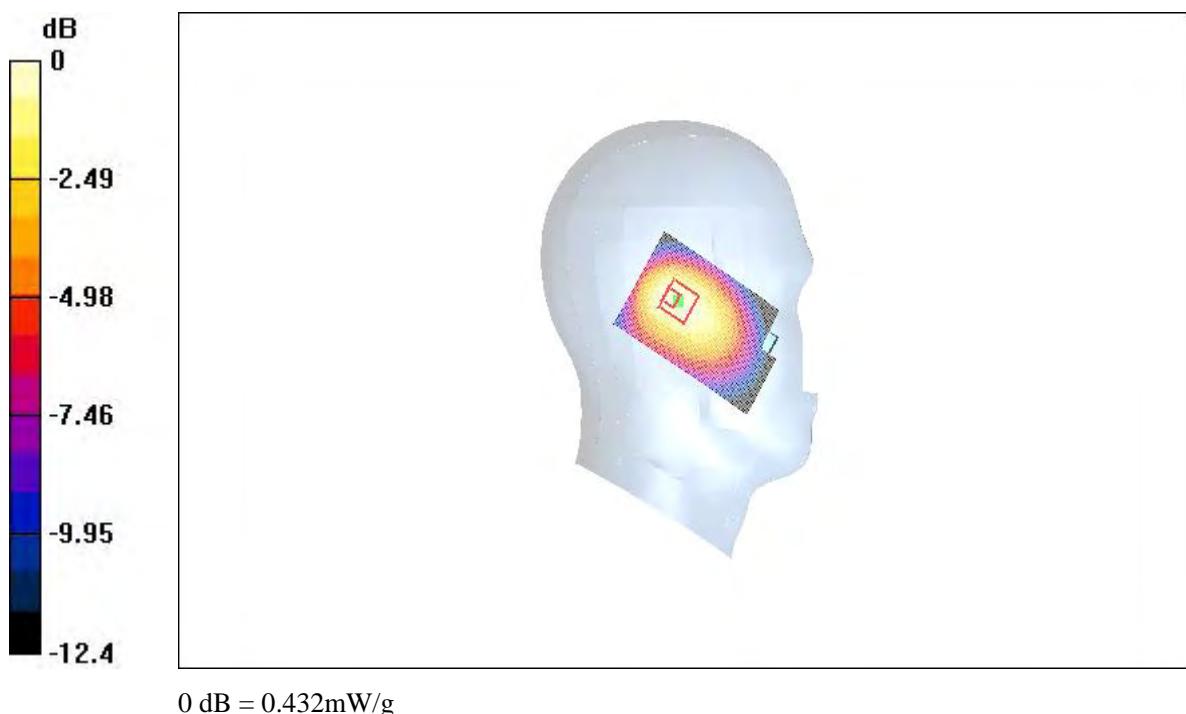


Fig. 9 Left Hand Tilt 15° 850MHz CH190

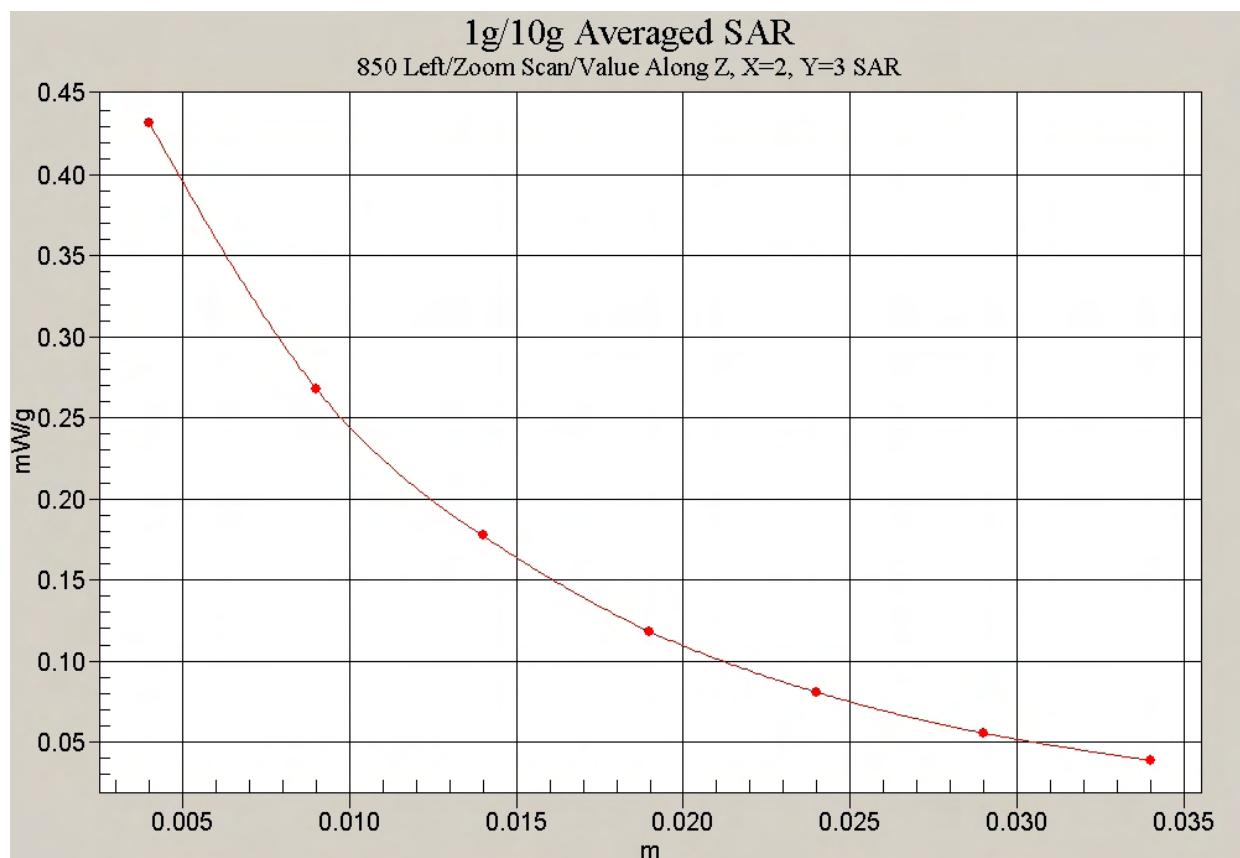


Fig. 10 Z-Scan at power reference point (Left Hand Tilt 15° 850MHz CH190)

850 Left Tilt Low

Electronics: DAE3 Sn536

Communication System: GSM 850 Frequency: 824.2 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

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

Reference Value = 23.6 V/m; Power Drift = -0.1 dB

Maximum value of SAR (interpolated) = 0.466 mW/g

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

Reference Value = 23.6 V/m; Power Drift = -0.1 dB

Maximum value of SAR (measured) = 0.448 mW/g

Peak SAR (extrapolated) = 0.675 W/kg

SAR(1 g) = 0.423 mW/g; SAR(10 g) = 0.275 mW/g

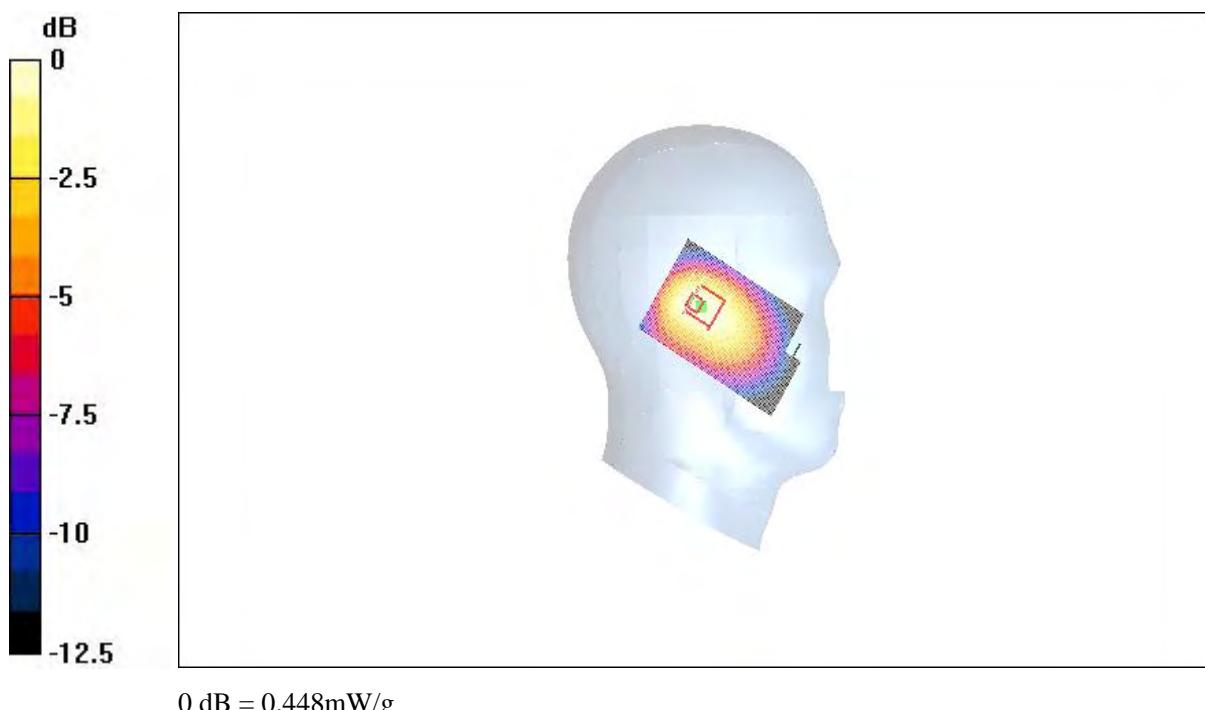


Fig. 11 Left Hand Tilt 15° 850MHz CH128

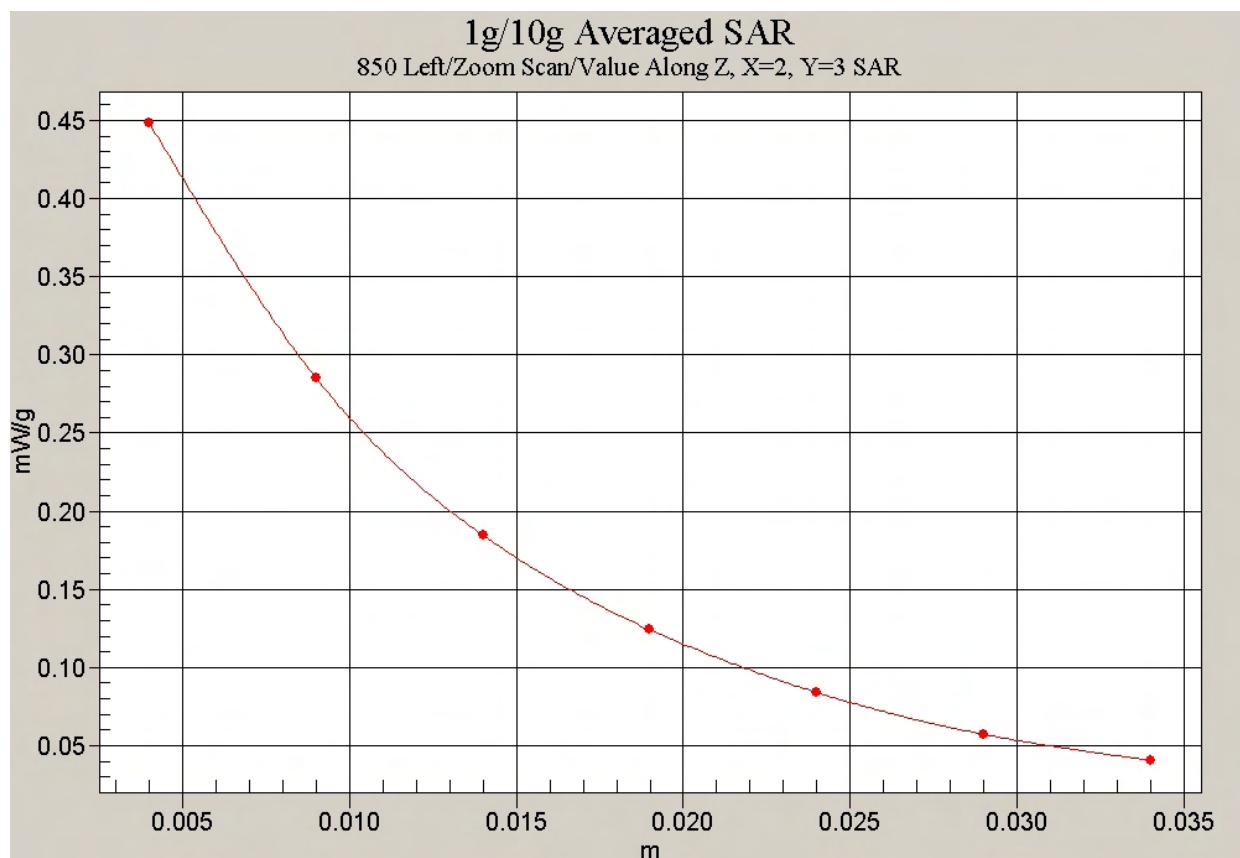


Fig. 12 Z-Scan at power reference point (Left Hand Tilt 15° 850MHz CH128)

850 Right Cheek High

Electronics: DAE3 Sn536

Communication System: GSM 850 Frequency: 848.8 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

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

Reference Value = 24.2 V/m; Power Drift = -0.2 dB

Maximum value of SAR (interpolated) = 0.790 mW/g

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

Reference Value = 24.2 V/m; Power Drift = -0.2 dB

Maximum value of SAR (measured) = 0.782 mW/g

Peak SAR (extrapolated) = 0.997 W/kg

SAR(1 g) = 0.734 mW/g; SAR(10 g) = 0.503 mW/g

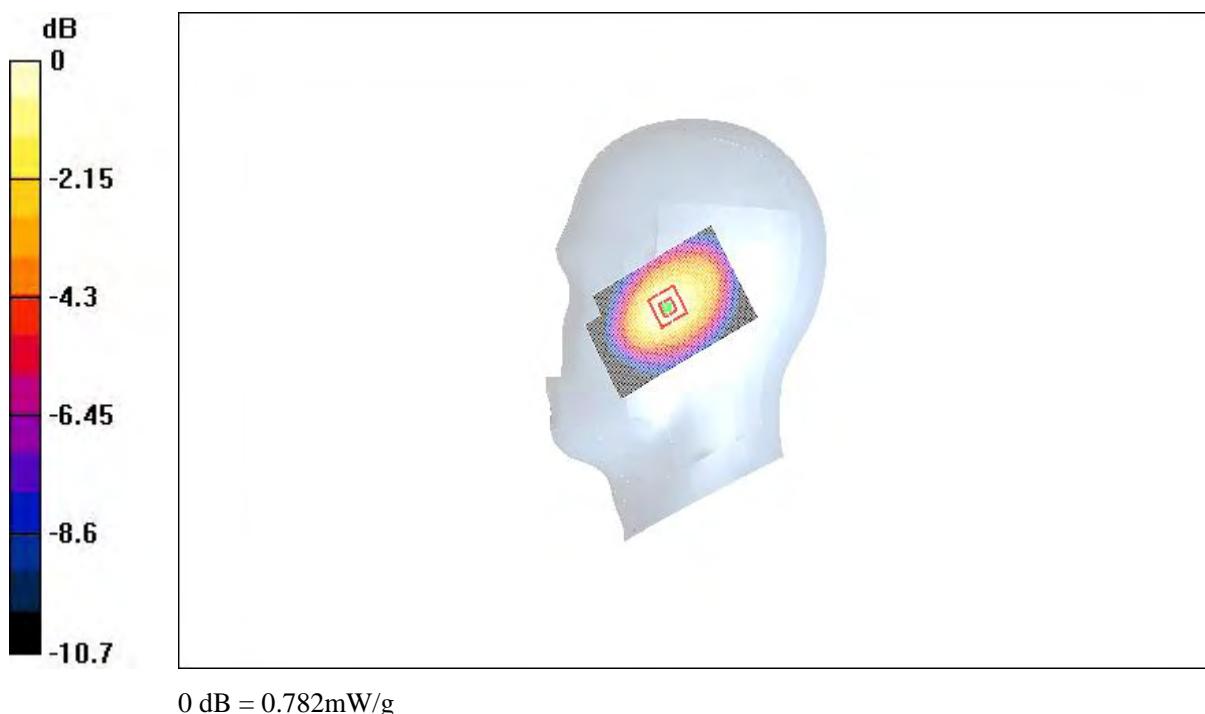


Fig. 13 Right Hand Touch Cheek 850MHz CH251

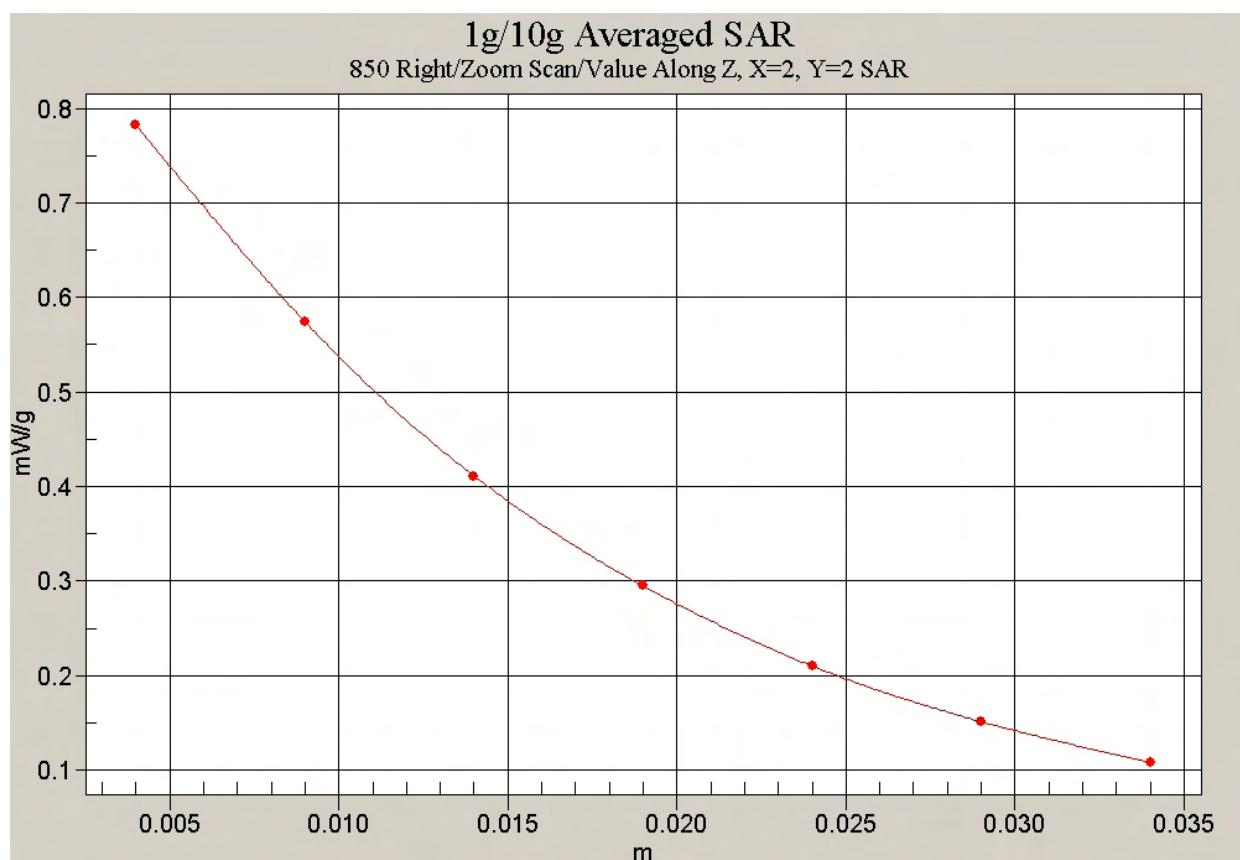


Fig. 14 Z-Scan at power reference point (Right Hand Touch Cheek 850MHz CH251)

850 Right Cheek Middle

Electronics: DAE3 Sn536

Communication System: GSM 850 Frequency: 836.6 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

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

Reference Value = 23.1 V/m; Power Drift = 0.1 dB

Maximum value of SAR (interpolated) = 0.807 mW/g

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

Reference Value = 23.1 V/m; Power Drift = 0.1 dB

Maximum value of SAR (measured) = 0.787 mW/g

Peak SAR (extrapolated) = 0.994 W/kg

SAR(1 g) = 0.745 mW/g; SAR(10 g) = 0.519 mW/g

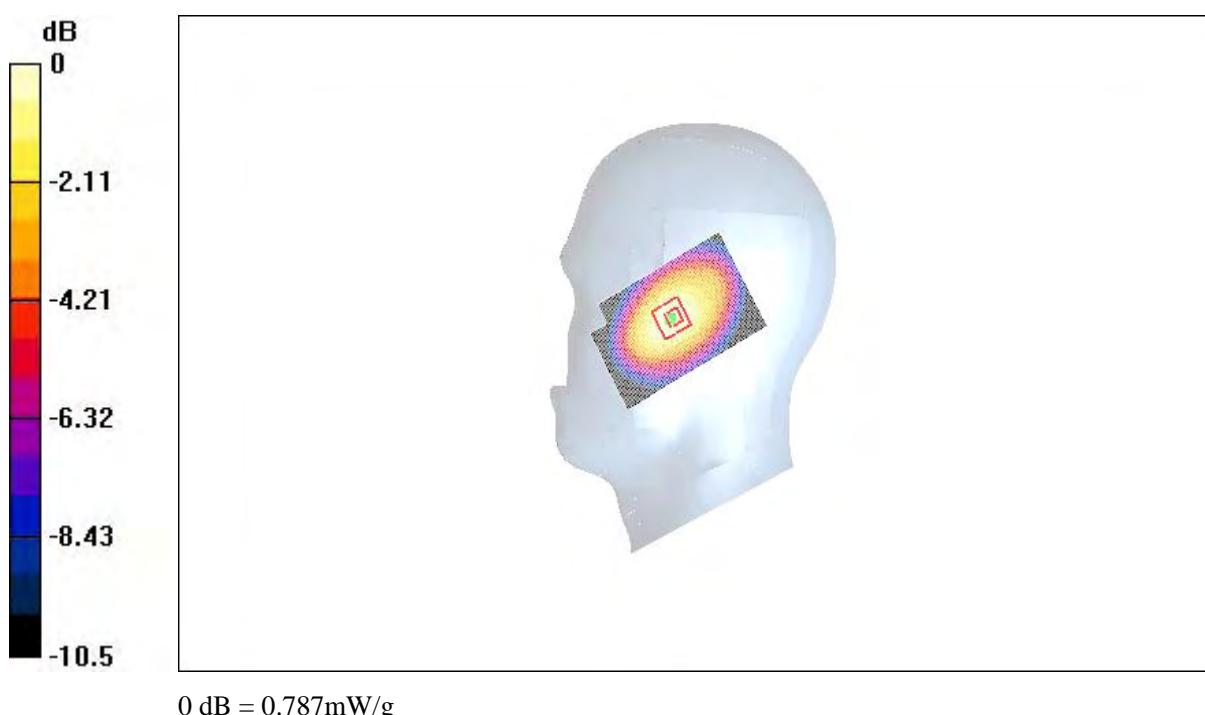


Fig.15 Right Hand Touch Cheek 850MHz CH190

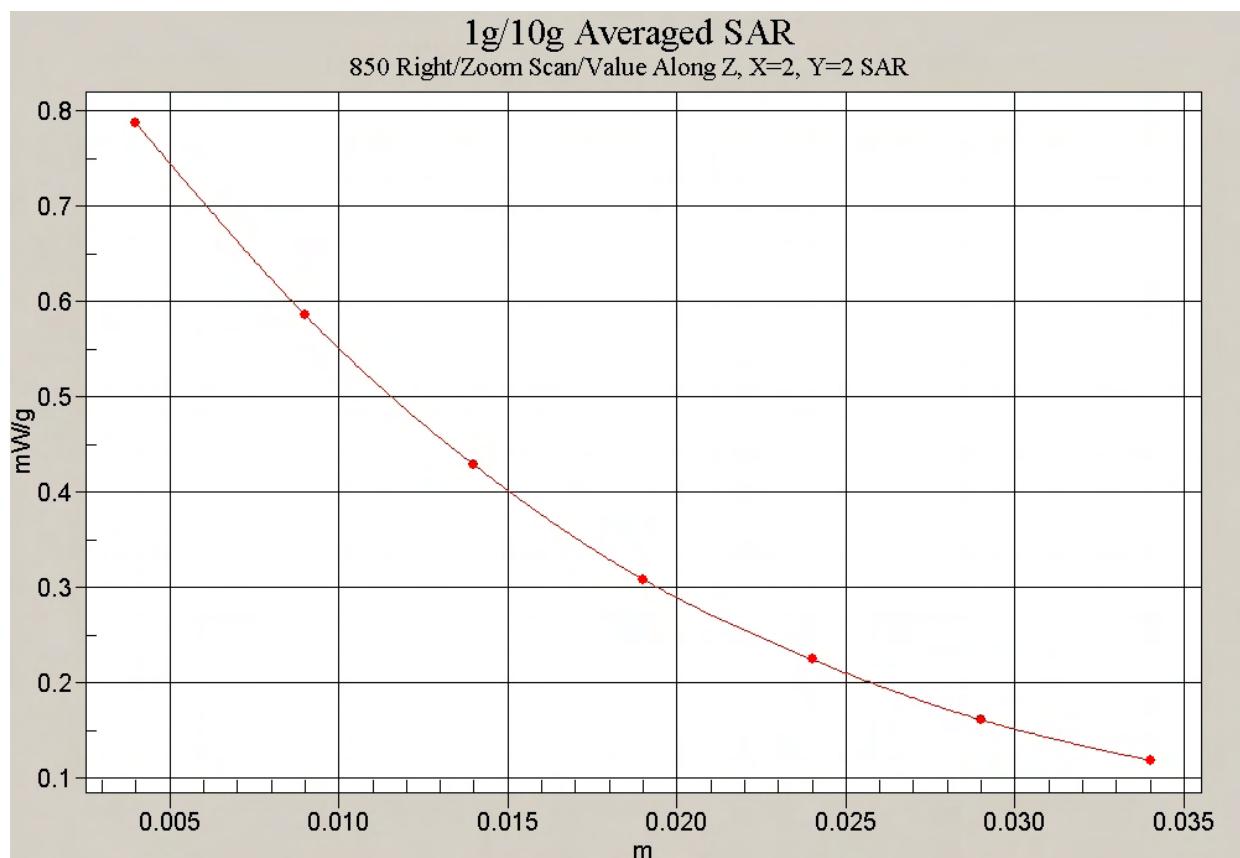


Fig. 16 Z-Scan at power reference point (Right Hand Touch Cheek 850MHz CH190)

850 Right Cheek Low

Electronics: DAE3 Sn536

Communication System: GSM 850 Frequency: 824.2 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

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

Reference Value = 27.3 V/m; Power Drift = -0.1 dB

Maximum value of SAR (interpolated) = 0.839 mW/g

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

Reference Value = 27.3 V/m; Power Drift = -0.1 dB

Maximum value of SAR (measured) = 0.821 mW/g

Peak SAR (extrapolated) = 1.05 W/kg

SAR(1 g) = 0.777 mW/g; SAR(10 g) = 0.535 mW/g

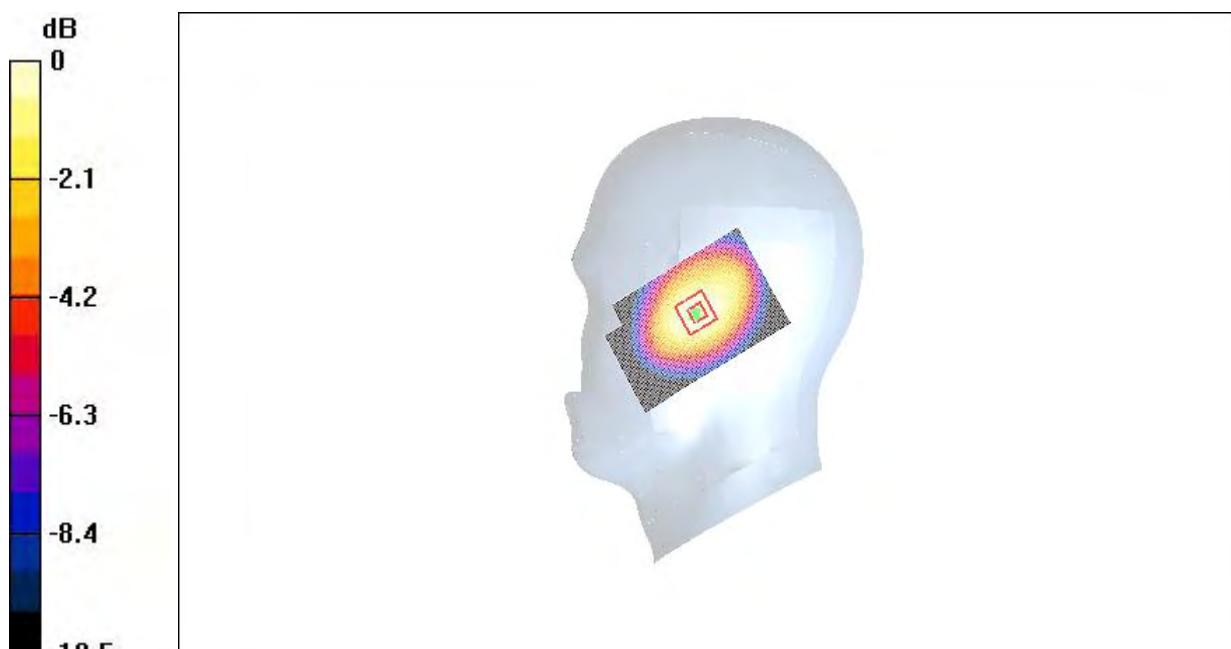


Fig. 17 Right Hand Touch Cheek 850MHz CH128

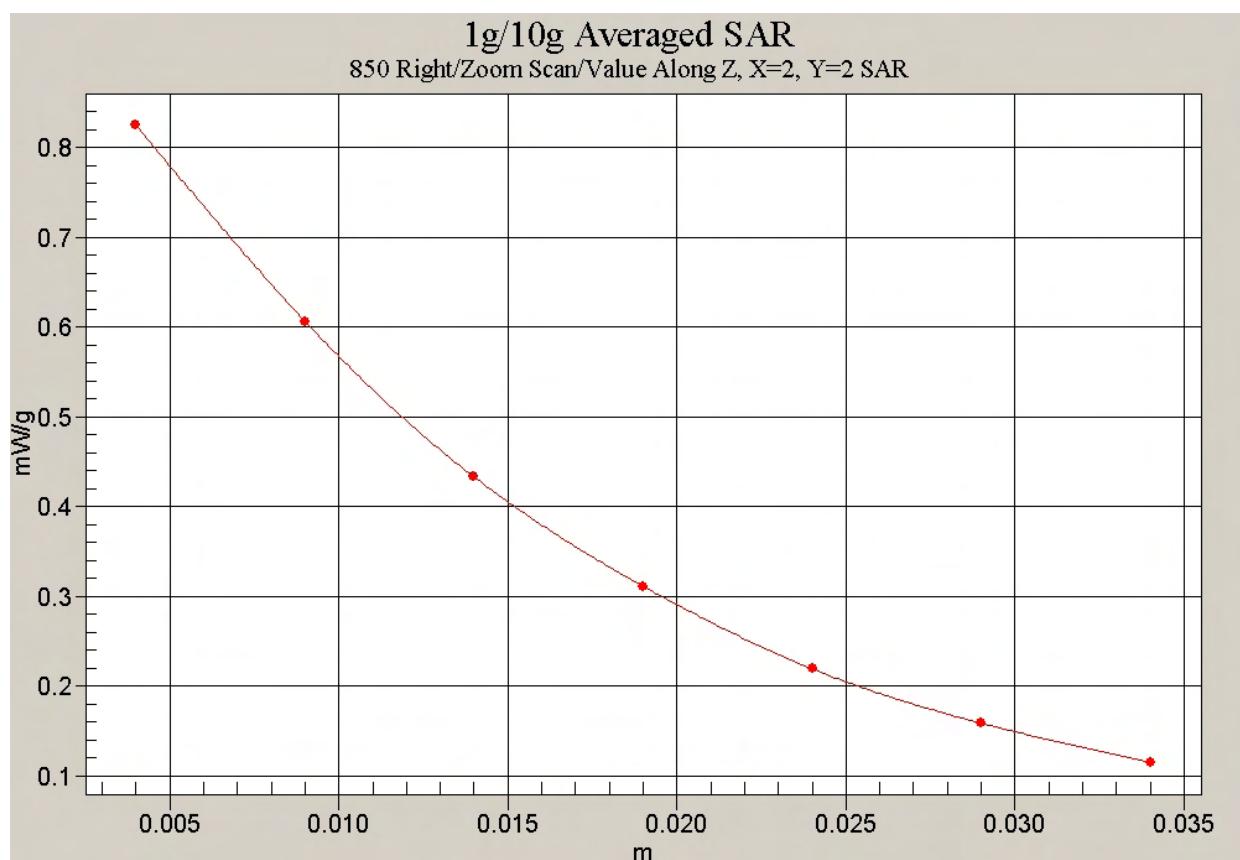


Fig. 18 Z-Scan at power reference point (Right Hand Touch Cheek 850MHz CH128)

850 Right Tilt High

Electronics: DAE3 Sn536

Communication System: GSM 850 Frequency: 848.8 MHz Duty Cycle: 1:8.3

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

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

Reference Value = 20.4 V/m; Power Drift = -0.0 dB

Maximum value of SAR (interpolated) = 0.416 mW/g

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

Reference Value = 20.4 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 0.421 mW/g

Peak SAR (extrapolated) = 0.666 W/kg

SAR(1 g) = 0.376 mW/g; SAR(10 g) = 0.221 mW/g



Fig. 19 Right Hand Tilt 15°850MHz CH251