



SAR TEST REPORT

No. 2009EEE00867

For

HUAWEI Technologies Co., Ltd.

HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth

U9107

With

Hardware Version: HD1U910Q Ver.A

Software Version: U9107V100R001ENGC01B112

FCCID: QISU9107

Issued Date: 2009-03-19



No. DAT-P-114/01-01

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of TMC Beijing.

Test Laboratory:

TMC Beijing, Telecommunication Metrology Center of Ministry of Information Industry

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1 Test Laboratory

1.1 Testing Location

Company Name: TMC Beijing, Telecommunication Metrology Center of MII
Address: No 52, Huayuan beilu, Haidian District, Beijing, P.R.China
Postal Code: 100083
Telephone: +86-10-62303288
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1.2 Testing Environment

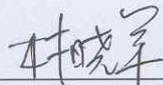
Temperature: 18°C~25 °C,
Relative humidity: 30%~ 70%
Ground system resistance: < 0.5 Ω

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.

1.3 Project Data

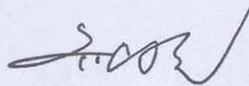
Project Leader: Qi Dianyuan
Test Engineer: Lin Xiaojun
Testing Start Date: March 2, 2009
Testing End Date: March 3, 2009

1.4 Signature



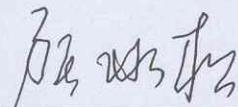
Lin Xiaojun

(Prepared this test report)



Qi Dianyuan

(Reviewed this test report)



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Deputy Director of the laboratory

(Approved this test report)

2 Client Information

2.1 Applicant Information

Company Name: HUAWEI Technologies Co., Ltd
Address /Post: Bantian, Longgang District
City: Shenzhen
Postal Code: 518129
Country: P.R. China
Telephone: 0755-28780808
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2.2 Manufacturer Information

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

3 Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1 About EUT

Description: HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth
Model: U9107
Test Frequency Band: WCDMA850/ GSM 850/GSM 1900
GPRS Class: 10

3.2 Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	359741020000903	HD1U910Q Ver.A	U9107V100R001ENGC01B112

*EUT ID: is used to identify the test sample in the lab internally.

3.3 Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
AE1	AC Adapter	HS-050040U2	HKA8A1712290	HUAWEI technologies Co., Ltd
AE2	Battery	HBP5A	FMT870702037S	HUAWEI technologies Co., Ltd

*AE ID: is used to identify the test sample in the lab internally.

4 CHARACTERISTICS OF THE TEST

4.1 Applicable Limit Regulations

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

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

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

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

4.2 Applicable Measurement Standards

EN 62209-1–2006: 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.

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)

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

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

5 OPERATIONAL CONDITIONS DURING TEST

5.1 Schematic Test Configuration

5.1.1 SAR Measurement Procedures for WCDMA 850MHz and WCDMA 1900MHZ

For the SAR tests at WCDMA 850MHz, a communication link is set up with a System Simulator (SS) by air link. The maximum output power were verified on high, middle and low channels for each test band according to section 5.2 of 3GPP TS 34.121 using 12.2kbps RMC and AMR with TPC set to all "1's"

(Please see 6.2.2 Table 3 for the above detailed power measurement results.)

Head and body SAR are both measured using the 12.2kbps RMC with TPC bits configured to all "1's", and not required for 12.2kbps AMR, because the maximum output power for 1.2kps AMR is less than 0.25dB higher than that measured in 12.2kbps RMC. For body SAR measurement, the multiple DPDCH_n configurations are also not required, because the EUT can't support it.

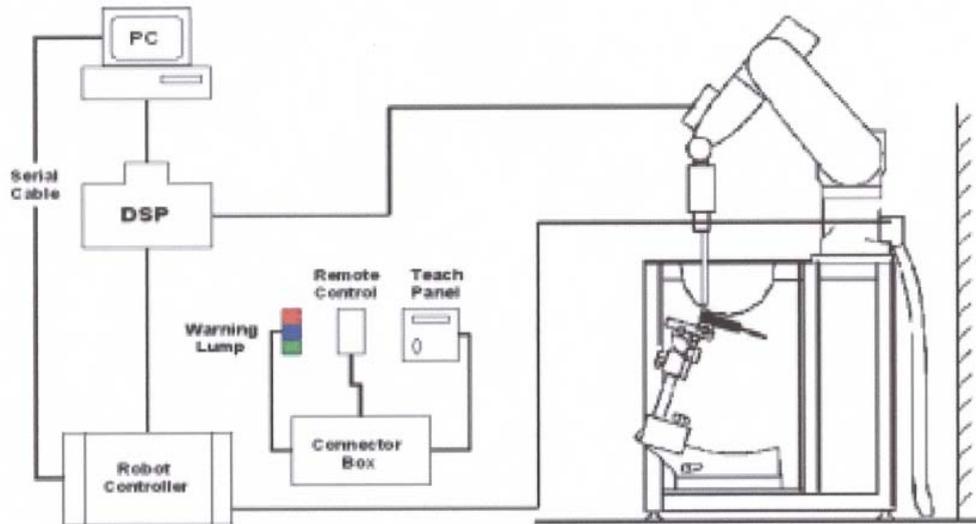
5.1.2 SAR Measurement Procedures for GSM 850MHz and GSM 1900MHZ

For the SAR tests at GSM 850 and GSM 1900, a communication link is set up with a System Simulator (SS) by air link. The EUT is commanded to operate at maximum transmitting power.

5.2 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-field 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 1: 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.

5.3 Dasy4 E-field Probe System

The SAR measurements were conducted with the dosimetric probe ES3DV3 (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 $\pm 0.25\text{dB}$.

ES3DV3 Probe Specification

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 900 and HSL 1810 Additional CF for other liquids and frequencies upon request
Frequency	10 MHz to 4 GHz; Linearity: $\pm 0.2 \text{ dB}$ (30 MHz to 4 GHz)
Directivity	$\pm 0.2 \text{ dB}$ in HSL (rotation around probe axis) $\pm 0.3 \text{ dB}$ in tissue material (rotation normal to probe axis)



Picture 2: ES3DV3 E-field Probe

Dynamic Range	5 μ W/g to > 100 mW/g; Linearity: \pm 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones



Picture3:ES3DV3 E-field probe

5.4 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 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

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

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

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

Where: 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/m^3).



Picture 4: Device Holder

5.5 Other Test Equipment

5.5.1 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 repeatably positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

5.5.2 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



5.6 Equivalent Tissues

The liquid used for the frequency range of 800-2000

MHz consisted of water, sugar, salt and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table 1 and 2 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528.

Picture 5: Generic Twin Phantom

Table 1. 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 2. Composition of the Body Tissue Equivalent Matter

MIXTURE %	FREQUENCY 850MHz
Water	52.5
Sugar	45.0
Salt	1.4
Preventol	0.1
Cellulose	1.0
Dielectric Parameters Target Value	f=850MHz $\epsilon=55.2$ $\sigma=0.97$
MIXTURE %	FREQUENCY 1900MHz
Water	69.91
Glycol monobutyl	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1900MHz $\epsilon=53.3$ $\sigma=1.52$

5.7 System Specifications

5.7.1 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

6 CONDUCTED OUTPUT POWER MEASUREMENT

6.1 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.

6.2 Conducted Power

6.2.1 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 low, middle and high channels for each test bands both before and after SAR test.

6.2.2 Measurement result

Table 3: Conducted Power Measurement Results

	Conducted Power		
WCDMA 850 (12.2kbps RMC)	Channel 4132 (826.4MHz)	Channel 4182 (836.4MHz)	Channel 4233 (846.6MHz)
Before Test (dBm)	22.61	22.75	22.58
After Test (dBm)	22.6	22.74	22.6
WCDMA 850 (64kbps AMR)	Channel 4132 (826.4MHz)	Channel 4182 (836.4MHz)	Channel 4233 (846.6MHz)
Before Test (dBm)	22.63	22.76	22.60
After Test (dBm)	22.62	22.75	22.61
WCDMA 850 (HSDPA)	Channel 4132 (826.4MHz)	Channel 4182 (836.4MHz)	Channel 4233 (846.6MHz)
Before Test (dBm)	21.01	20.95	20.98
After Test (dBm)	21.05	21	20.95
GSM 850MHz	Channel 128 (824.2MHz)	Channel 190 (836.6MHz)	Channel 251 (848.8MHz)
Before Test (dBm)	32.78	32.97	32.69
After Test (dBm)	32.77	32.98	32.70
GSM 1900MHz	Channel 512 (1850.2MHz)	Channel 661 (1880MHz)	Channel 810 (1909.8MHz)
Before Test (dBm)	29.3	29.40	29.4
After Test (dBm)	29.3	29.38	29.37
GSM 850MHz GPRS	Channel 128 (824.2MHz)	Channel 190 (836.6MHz)	Channel 251 (848.8MHz)
Before Test (dBm)	32.76	32.99	32.70
After Test (dBm)	32.78	33	32.72
GSM 1900MHz GPRS	Channel 512 (1850.2MHz)	Channel 661 (1880MHz)	Channel 810 (1909.8MHz)
Before Test (dBm)	29.33	29.34	29.28
After Test (dBm)	29.31	29.3	29.25
GSM 850MHz EGPRS	Channel 128 (824.2MHz)	Channel 190 (836.6MHz)	Channel 251 (848.8MHz)
Before Test (dBm)	27.03	27.25	26.98
After Test (dBm)	27.04	27.24	26.99
GSM 1900MHz EGPRS	Channel 512 (1850.2MHz)	Channel 661 (1880MHz)	Channel 810 (1909.8MHz)
Before Test (dBm)	25.11	25.20	25.09
After Test (dBm)	25.13	25.25	25.06

6.2.3 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 7 to Table 12 labeled as: (Power

Drift [dB]). This ensures that the power drift during one measurement is within 5%.

7 TEST RESULTS

7.1 Dielectric Performance

Table 4: Dielectric Performance of Head Tissue Simulating Liquid

Measurement is made at temperature 23.3 °C and relative humidity 49%.			
Liquid temperature during the test: 22.5°C			
Measurement Date : 850 MHz <u>Mar 2,2009</u> 1900 MHz <u>Mar 3,2009</u>			
/	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	40.3	0.92
	1900 MHz	39.2	1.42

Table 5: Dielectric Performance of Body Tissue Simulating Liquid

Measurement is made at temperature 23.3 °C and relative humidity 49%.			
Liquid temperature during the test: 22.5°C			
Measurement Date : 850 MHz <u>Mar 2,2009</u> 1900 MHz <u>Mar 3,2009</u>			
/	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	53.7	1.00
	1900 MHz	52.3	1.56

7.2 System Validation

Table 6: System Validation

Measurement is made at temperature 23.3 °C and relative humidity 49%.								
Liquid temperature during the test: 22.5°C								
Measurement Date : 850 MHz <u>Mar 2,2009</u> 1900 MHz <u>Mar 3,2009</u>								
Liquid parameters	Dipole calibration Target value	Frequency		Permittivity ϵ		Conductivity σ (S/m)		
		835 MHz		39.9		0.88		
		1900 MHz		38.9		1.38		
	Actual Measurement value	835 MHz		40.4		0.90		
		1900 MHz		39.2		1.42		
Verification results	Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation		
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average	
	835 MHz		1.60	2.48	1.62	2.50	1.25%	0.81%
	1900 MHz		5.09	9.73	5.27	9.91	3.54%	1.9%

Note: Target values are the data of the dipole validation results, please check Annex F for the Dipole Calibration Certificate.

7.3 Summary of Measurement Results (WCDMA 850)

Table 7: SAR Values (Head, WCDMA 850 MHz Band)

Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result		
	10 g Average	1 g Average	
Left hand, Touch cheek, Top frequency(See Fig.1)	0.448	0.679	0.080
Left hand, Touch cheek, Mid frequency(See Fig.3)	0.339	0.521	-0.109
Left hand, Touch cheek, Bottom frequency(See Fig.5)	0.411	0.637	-0.094
Left hand, Tilt 15 Degree, Mid frequency(See Fig.7)	0.225	0.363	0.058
Right hand, Touch cheek, Mid frequency(See Fig.9)	0.335	0.504	0.041
Right hand, Tilt 15 Degree, Mid frequency(See Fig.11)	0.243	0.385	0.052

Table 8: SAR Values (Body, WCDMA 850 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.13)	0.450	0.628	-0.021
Body, Towards Ground, Mid frequency (See Fig.15)	0.391	0.543	0.093
Body, Towards Ground, Bottom frequency (See Fig.17)	0.429	0.597	-0.023
Body, Towards Phantom, Top frequency (See Fig.19)	0.164	0.234	-0.161
Body, Towards Phantom, Mid frequency (See Fig.21)	0.129	0.197	0.055
Body, Towards Phantom, Bottom frequency (See Fig.23)	0.139	0.227	0.094
Body, Towards Ground, Top frequency with HSDPA(See Fig.25)	0.490	0.688	0.039
Body, Towards Ground, Top frequency with Headset(See Fig.27)	0.315	0.443	0.059

7.4 Summary of Measurement Results (GSM 850)

Table 9: SAR Values (Head, GSM 850 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.29)	0.501	0.750	-0.024
Left hand, Touch cheek, Mid frequency(See Fig.31)	0.516	0.785	0.013
Left hand, Touch cheek, Bottom frequency(See Fig.33)	0.421	0.666	0.027
Left hand, Tilt 15 Degree, Mid frequency(See Fig.35)	0.375	0.610	-0.029
Right hand, Touch cheek, Mid frequency(See Fig.37)	0.513	0.782	-0.053
Right hand, Tilt 15 Degree, Mid frequency(See Fig.39)	0.386	0.626	-0.156

Table 10: SAR Values (Body, GSM 850 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 with GPRS(See Fig.41)	0.747	1.04	-0.124
Body, Towards Ground, Mid frequency with GPRS (See Fig.43)	0.684	0.950	-0.038
Body, Towards Ground, Bottom frequency with GPRS (See Fig.45)	0.689	0.957	-0.051
Body, Towards Phantom, Top frequency with GPRS (See Fig.47)	0.290	0.408	0.035
Body, Towards Phantom, Mid frequency with GPRS (See Fig.49)	0.217	0.354	0.138
Body, Towards Phantom, Bottom frequency with GPRS (See Fig.51)	0.210	0.343	0.079
Body, Towards Ground, Top frequency with EGPRS (See Fig.53)	0.278	0.386	-0.014
Body, Towards Ground, Top frequency with Headset(See Fig.55)	0.389	0.555	-0.136

7.5 Summary of Measurement Results (GSM 1900)

Table 11: SAR Values (Head, GSM 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.57)	0.264	0.514	0.133
Left hand, Touch cheek, Mid frequency(See Fig.59)	0.324	0.656	0.041
Left hand, Touch cheek, Bottom frequency(See Fig.61)	0.329	0.708	-0.081
Left hand, Tilt 15 Degree, Mid frequency(See Fig.63)	0.218	0.405	0.142
Right hand, Touch cheek, Mid frequency(See Fig.65)	0.188	0.352	-0.076
Right hand, Tilt 15 Degree, Mid frequency(See Fig.67)	0.141	0.251	-0.080

Table 12: SAR Values (Body, GSM 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 with GPRS(See Fig.69)	0.394	0.670	0.042
Body, Towards Ground, Mid frequency with GPRS (See Fig.71)	0.458	0.785	-0.119
Body, Towards Ground, Bottom frequency with GPRS (See Fig.73)	0.432	0.743	-0.012
Body, Towards Phantom, Top frequency with GPRS (See Fig.75)	0.099	0.160	0.032
Body, Towards Phantom, Mid frequency with GPRS (See Fig.77)	0.119	0.194	0.030
Body, Towards Phantom, Bottom frequency with GPRS (See Fig.79)	0.109	0.180	-0.108
Body, Towards Ground, Mid frequency with EGPRS (See Fig.81)	0.277	0.477	-0.071
Body, Towards Ground, Mid frequency with Headset(See Fig.83)	0.333	0.569	0.000

7.6 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.

The maximum SAR values are obtained at the case of **GSM 850 Body, Towards Ground, Top frequency with GPRS (Table 10), and the value are: 0.747(10g), 1.04(1g)**

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
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		11.25		
Expanded Uncertainty (95% CONFIDENCE INTERVAL)				K=2		22.5		

9 MAIN TEST INSTRUMENTS

Table 13: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	HP 8753E	US38433212	August 30, 2008	One year
02	Power meter	NRVD	101253	June 20, 2008	One year
03	Power sensor	NRV-Z5	100333		
04	Power sensor	NRV-Z6	100011	September 2, 2008	One year
05	Signal Generator	E4433B	US37230472	September 4, 2008	One Year
06	Amplifier	VTL5400	0505	No Calibration Requested	
07	BTS	CMU 200	105948	August 15, 2008	One year
08	E-field Probe	SPEAG ES3DV3	3149	October 1, 2008	One year
09	DAE	SPEAG DAE4	771	November 20, 2008	One year
10	Dipole Validation Kit	SPEAG D835V2	443	February 18, 2009	Two years
11	Dipole Validation Kit	SPEAG D1900V2	541	February 19, 2009	Two years

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.

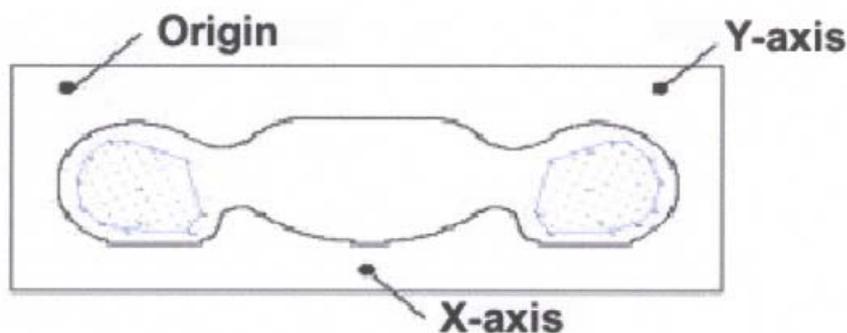
Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7 x 7x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

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.

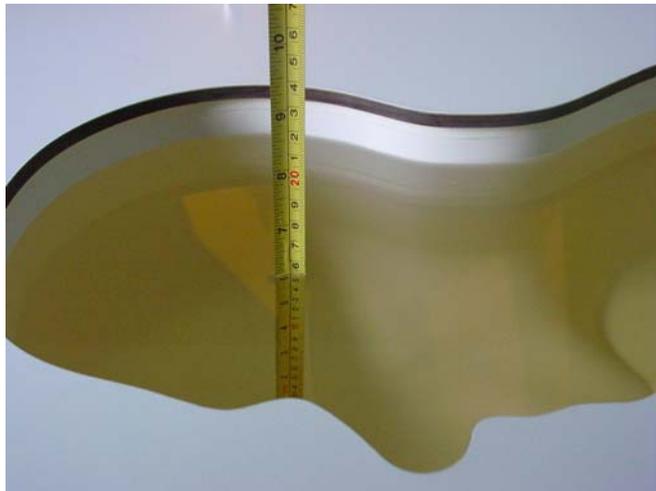


Picture A: SAR Measurement Points in Area Scan

ANNEX B TEST LAYOUT



Picture B1: Specific Absorption Rate Test Layout



Picture B2: Liquid depth in the Flat Phantom (850 MHz Head)



Picture B3: Liquid depth in the Flat Phantom (1900MHz Head)



Picture B4: Liquid depth in the Flat Phantom (850 MHz Body)



Picture B5: Liquid depth in the Flat Phantom (1900MHz Body)

ANNEX C GRAPH RESULTS

WCDMA 850 Left Cheek High

Date/Time: 2009-3-2 8:04:13

Electronics: DAE4 Sn771

Medium: 850 HEAD

Medium parameters used (interpolated): $f = 846.6$ MHz; $\sigma = 0.917$ mho/m; $\epsilon_r = 40.3$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA 850 Frequency: 846.6 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.56, 6.56, 6.56)

Cheek High/Area Scan (61x91x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.838 mW/g

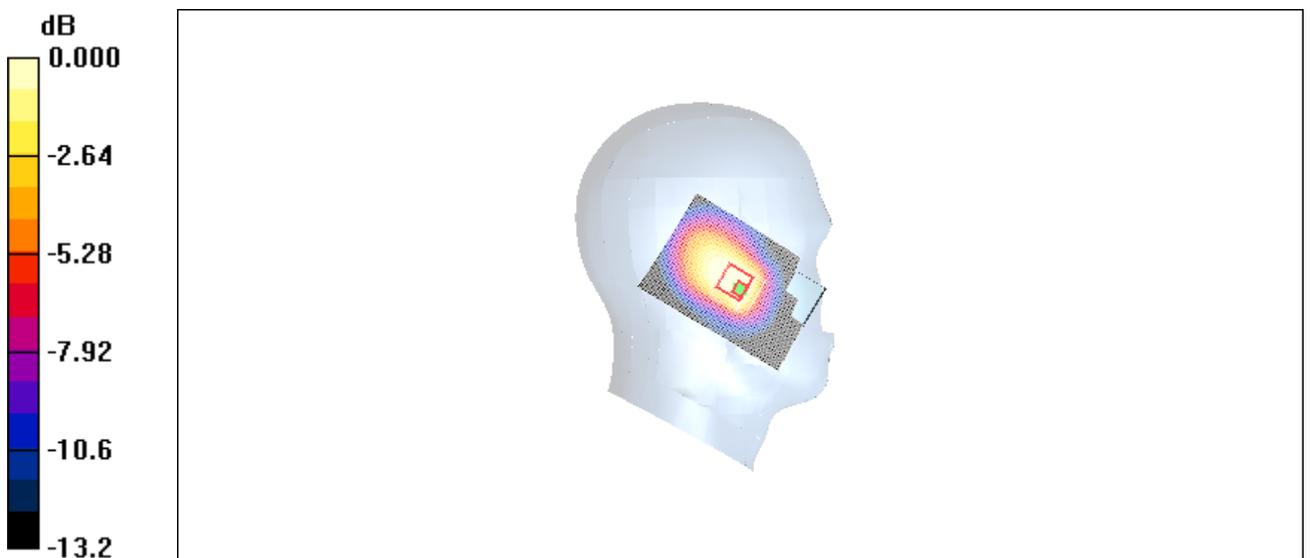
Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 19.2 V/m; Power Drift = 0.080 dB

Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.679 mW/g; SAR(10 g) = 0.448 mW/g

Maximum value of SAR (measured) = 0.676 mW/g



0 dB = 0.676mW/g

Fig. 1 Left Hand Touch Cheek WCDMA 850MHz CH4233

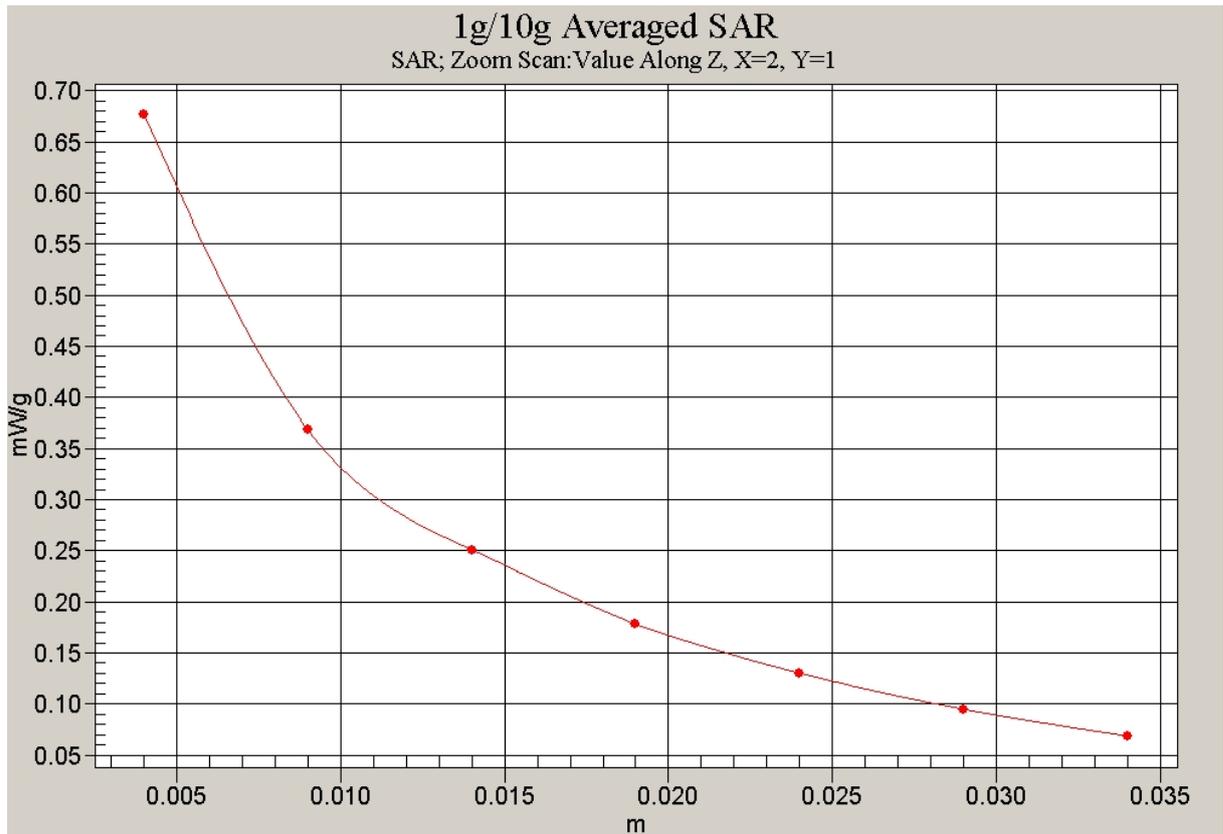


Fig. 2 Z-Scan at power reference point (WCDMA 850MHz CH4233)

WCDMA 850 Left Cheek Middle

Date/Time: 2009-3-2 8:18:32

Electronics: DAE4 Sn771

Medium: 850 HEAD

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 0.907$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA 850 Frequency: 836.4 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.56, 6.56, 6.56)

Cheek Middle/Area Scan (61x91x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.610 mW/g

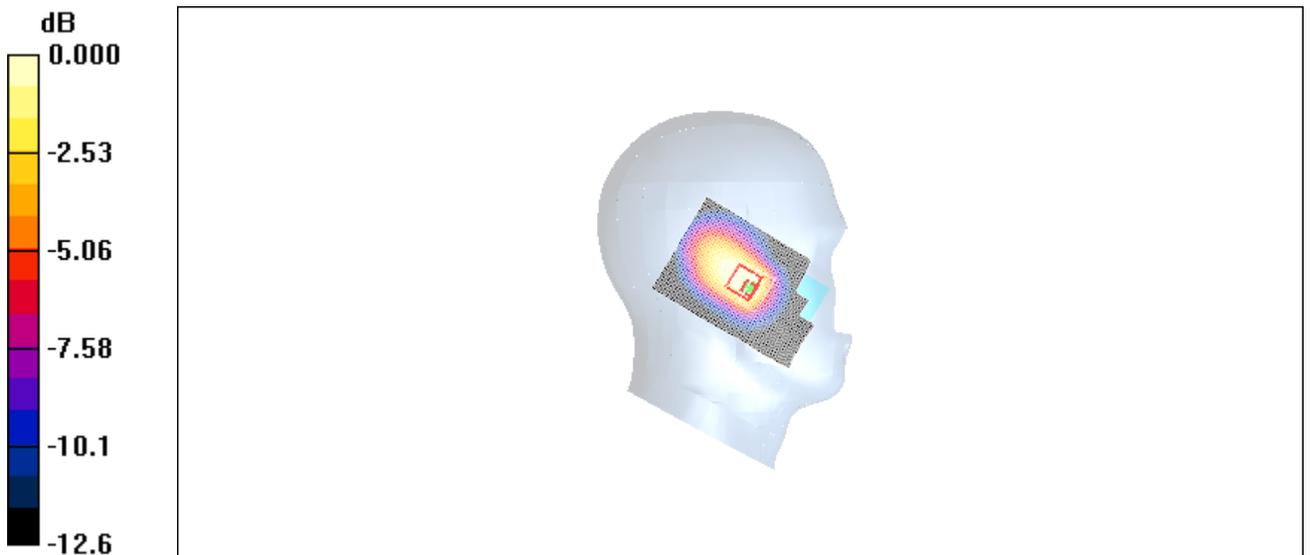
Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.2 V/m; Power Drift = -0.109 dB

Peak SAR (extrapolated) = 0.962 W/kg

SAR(1 g) = 0.521 mW/g; SAR(10 g) = 0.339 mW/g

Maximum value of SAR (measured) = 0.523 mW/g



0 dB = 0.523mW/g

Fig. 3 Left Hand Touch Cheek WCDMA 850MHz CH4182



Fig. 4 Z-Scan at power reference point (WCDMA 850MHz CH4182)

WCDMA 850 Left Cheek Low

Date/Time: 2009-3-2 8:32:15

Electronics: DAE4 Sn771

Medium: 850 HEAD

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 0.897$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA 850 Frequency: 826.4 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.56, 6.56, 6.56)

Cheek Low/Area Scan (61x91x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.817 mW/g

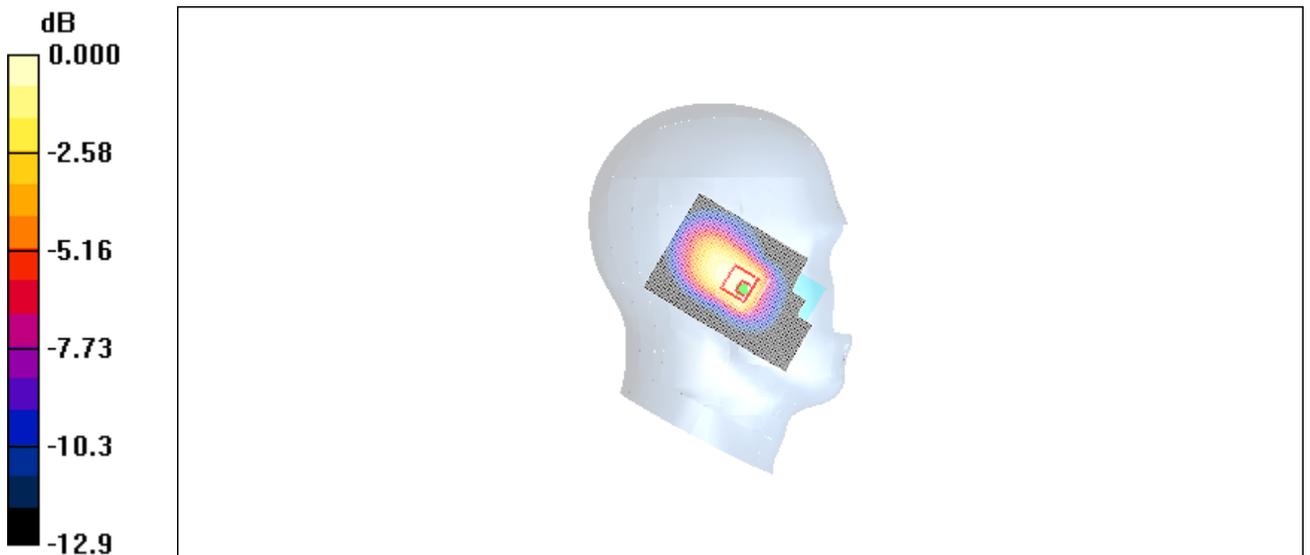
Cheek Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 18.6 V/m; Power Drift = -0.094 dB

Peak SAR (extrapolated) = 1.32 W/kg

SAR(1 g) = 0.637 mW/g; SAR(10 g) = 0.411 mW/g

Maximum value of SAR (measured) = 0.706 mW/g



0 dB = 0.706mW/g

Fig. 5 Left Hand Touch Cheek WCDMA 850MHz CH4132

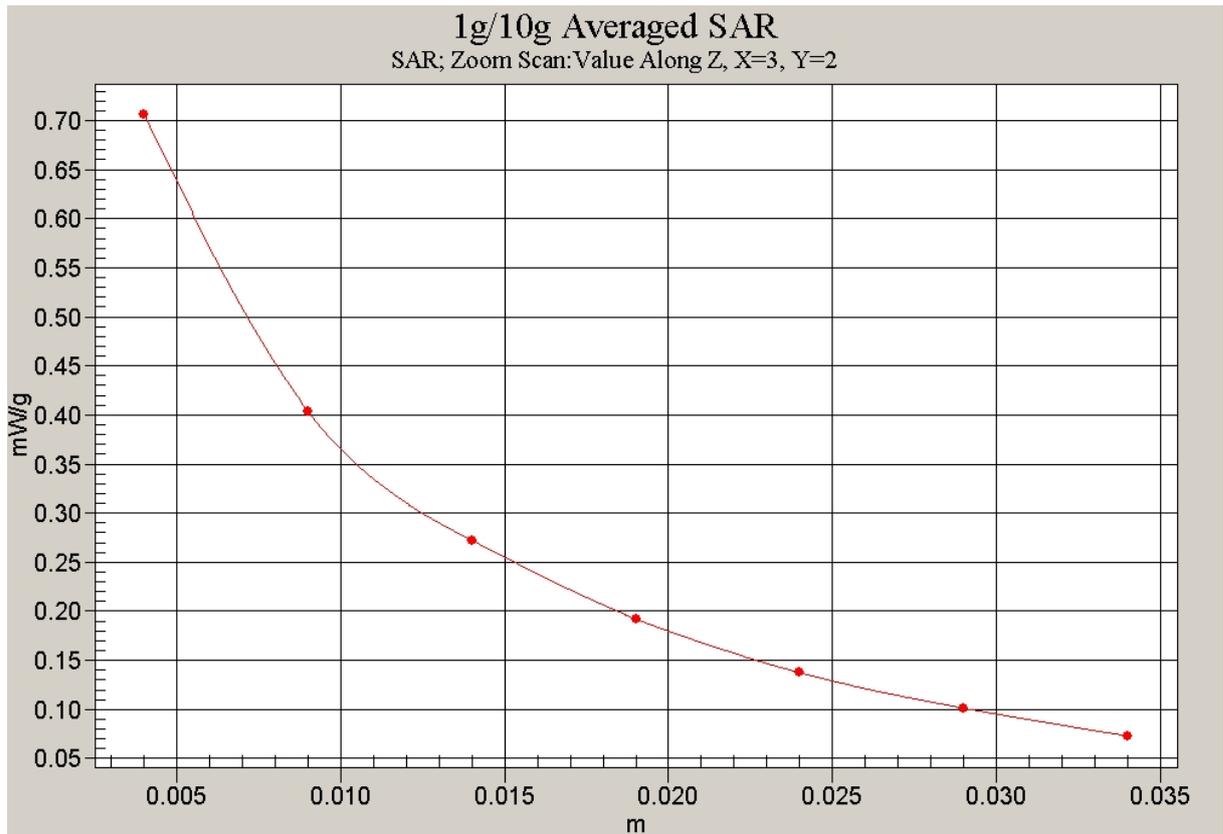


Fig. 6 Z-Scan at power reference point (WCDMA 850MHz CH4132)

WCDMA 850 Left Tilt Middle

Date/Time: 2009-3-2 8:46:41

Electronics: DAE4 Sn771

Medium: 850 HEAD

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 0.907$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA 850 Frequency: 836.4 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.56, 6.56, 6.56)

Tilt Middle/Area Scan (61x101x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.397 mW/g

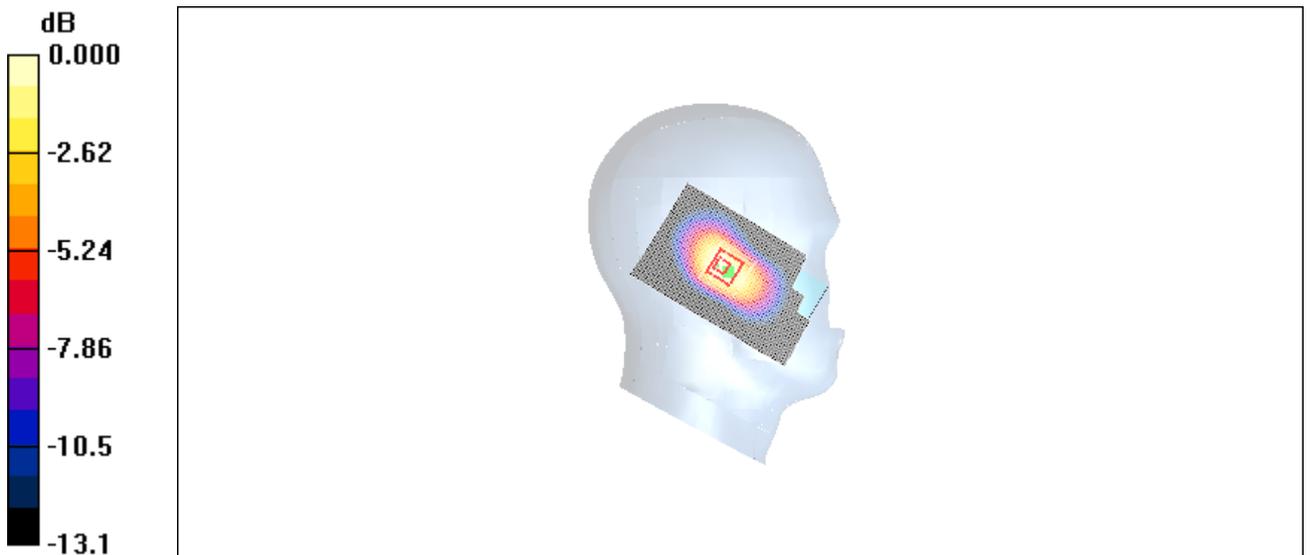
Tilt Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 14.8 V/m; Power Drift = 0.058 dB

Peak SAR (extrapolated) = 0.526 W/kg

SAR(1 g) = 0.363 mW/g; SAR(10 g) = 0.225 mW/g

Maximum value of SAR (measured) = 0.387 mW/g



0 dB = 0.387mW/g

Fig. 7 Left Hand Tilt 15°WCDMA 850MHz CH4182

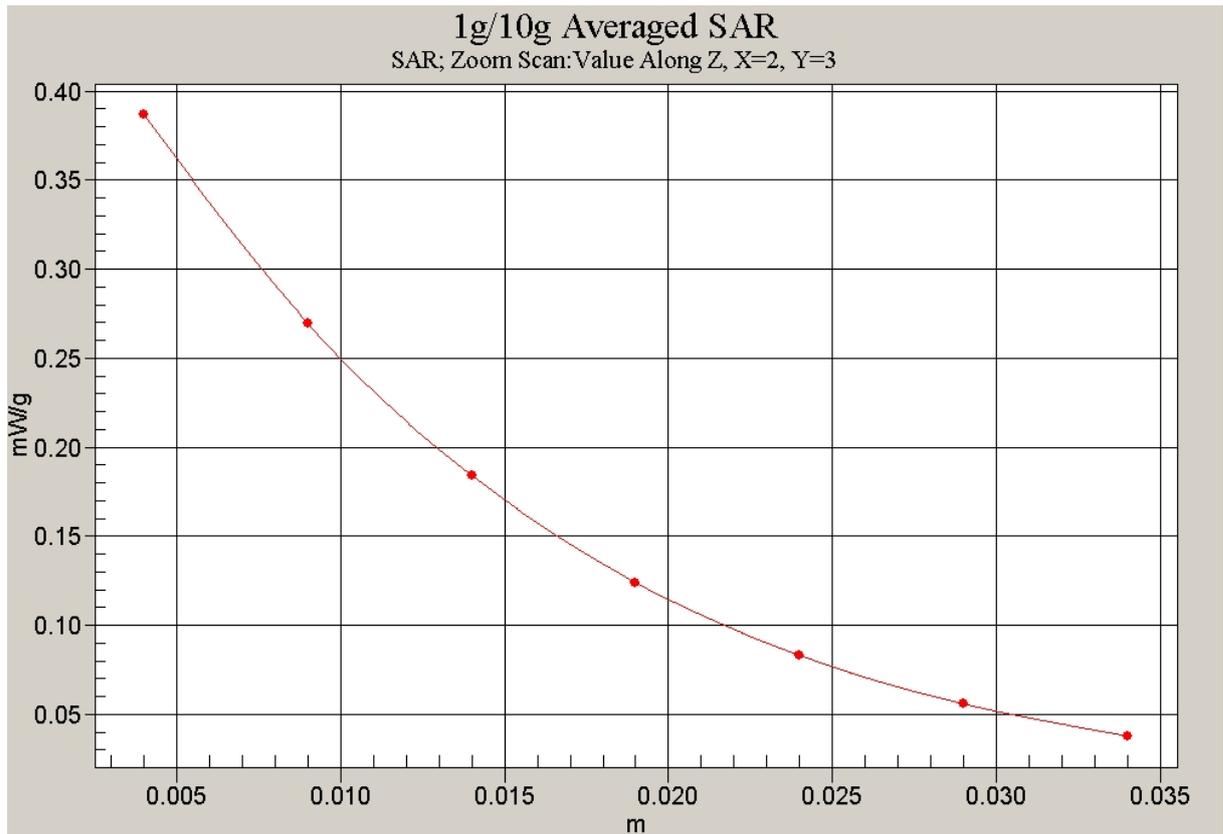


Fig. 8 Z-Scan at power reference point (WCDMA 850MHz CH4182)

WCDMA 850 Right Cheek Middle

Date/Time: 2009-3-2 9:00:54

Electronics: DAE4 Sn771

Medium: 850 HEAD

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 0.907$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA 850 Frequency: 836.4 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.56, 6.56, 6.56)

Cheek Middle/Area Scan (101x141x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.589 mW/g

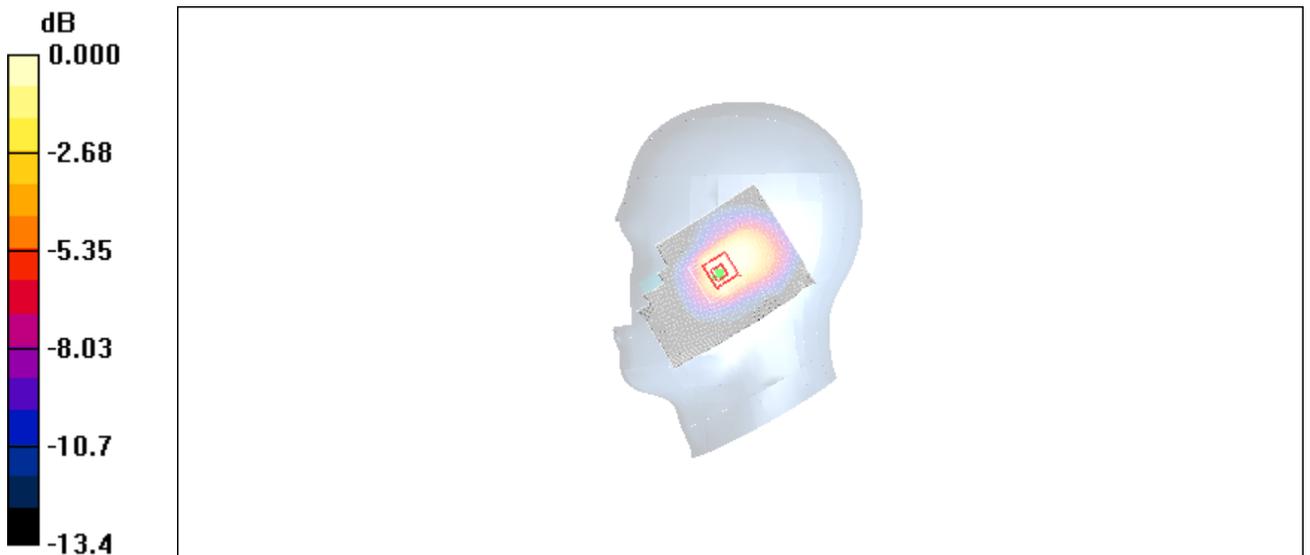
Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 18.1 V/m; Power Drift = 0.041 dB

Peak SAR (extrapolated) = 0.819 W/kg

SAR(1 g) = 0.504 mW/g; SAR(10 g) = 0.335 mW/g

Maximum value of SAR (measured) = 0.534 mW/g



0 dB = 0.534mW/g

Fig.9 Right Hand Touch Cheek WCDMA 850MHz CH4182

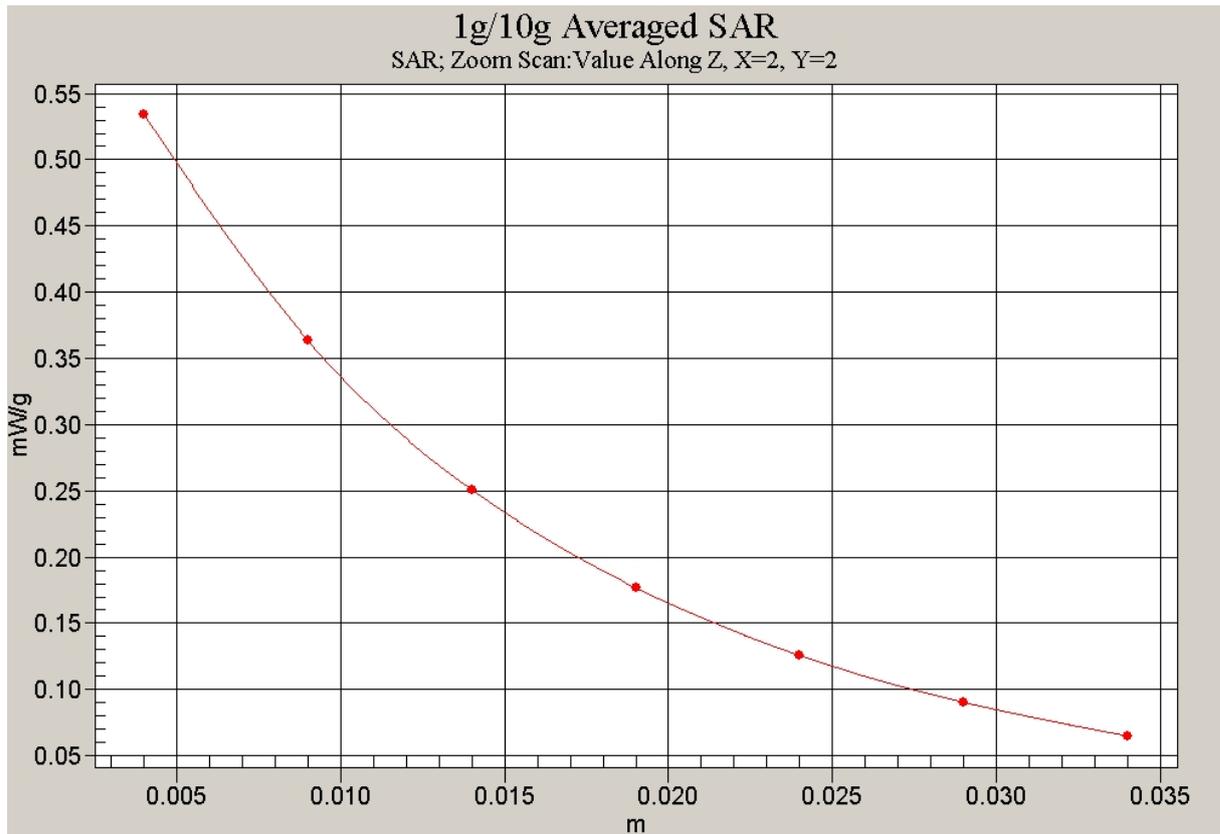


Fig. 10 Z-Scan at power reference point (WCDMA 850MHz CH4182)

WCDMA 850 Right Tilt Middle

Date/Time: 2009-3-2 9:14:25

Electronics: DAE4 Sn771

Medium: 850 HEAD

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 0.907$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA 850 Frequency: 836.4 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.56, 6.56, 6.56)

Tilt Middle/Area Scan (71x91x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.463 mW/g

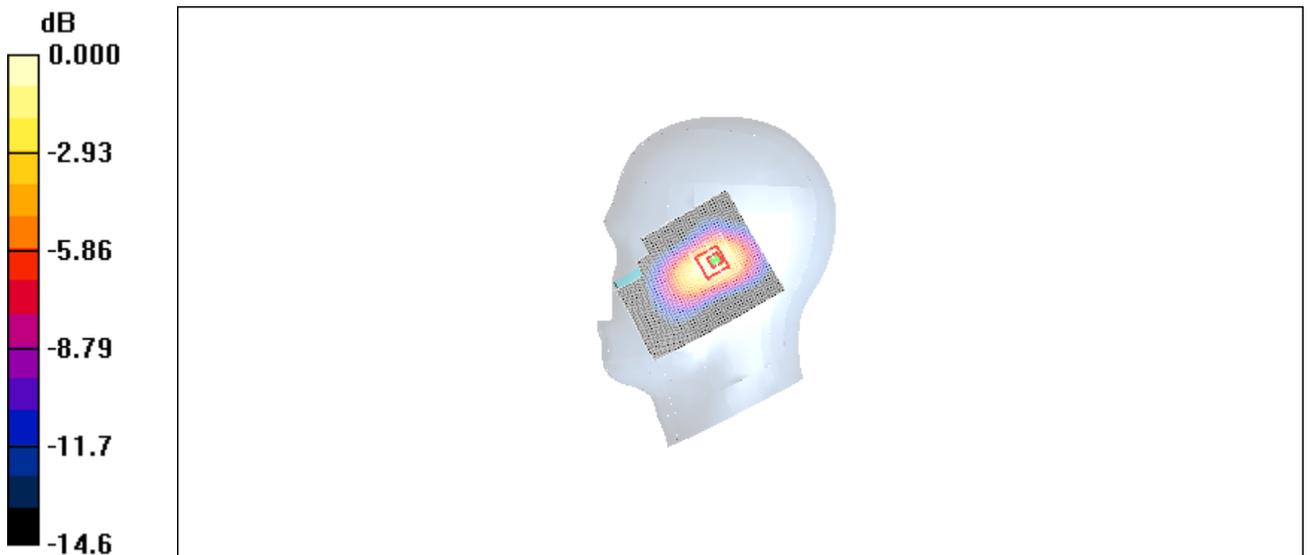
Tilt Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.2 V/m; Power Drift = 0.052 dB

Peak SAR (extrapolated) = 0.559 W/kg

SAR(1 g) = 0.385 mW/g; SAR(10 g) = 0.243 mW/g

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



0 dB = 0.418mW/g

Fig. 11 Right Hand Tilt 15°WCDMA 850MHz CH4182

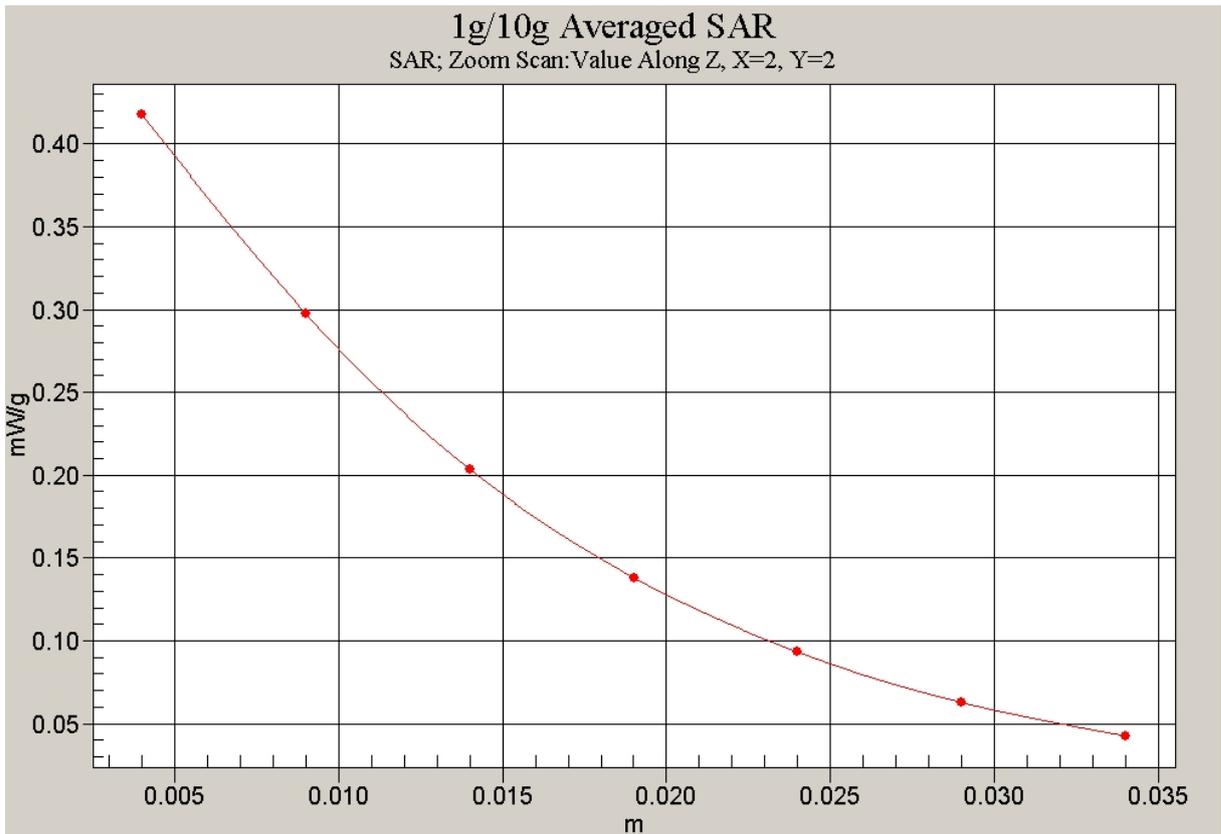


Fig. 12 Z-Scan at power reference point (WCDMA 850MHz CH4182)

WCDMA 850 Body Toward Ground High

Date/Time: 2009-3-2 9:30:46

Electronics: DAE4 Sn771

Medium: 850 Body

Medium parameters used (interpolated): $f = 846.6$ MHz; $\sigma = 1.00$ mho/m; $\epsilon_r = 53.7$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA 850 Frequency: 846.6 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.22, 6.22, 6.22)

Towards Ground High 3/Area Scan (81x141x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.664 mW/g

Towards Ground High 3/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 26.1 V/m; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 0.838 W/kg

SAR(1 g) = 0.628 mW/g; SAR(10 g) = 0.450 mW/g

Maximum value of SAR (measured) = 0.666 mW/g



0 dB = 0.666mW/g

Fig. 13 WCDMA850 MHz, Body, Towards Ground, CH4233

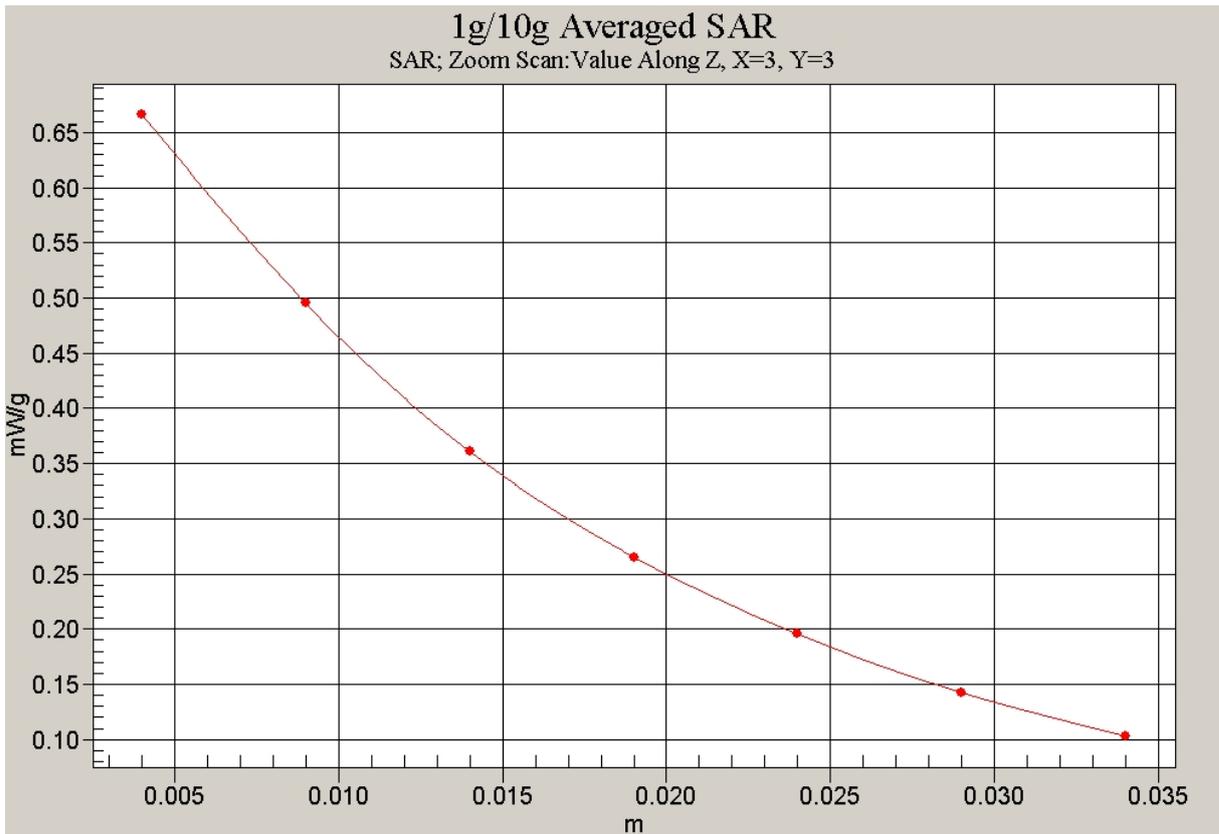


Fig. 14 Z-Scan at power reference point (WCDMA850 MHz, Body, Towards Ground, CH4233)

WCDMA 850 Body Toward Ground Middle

Date/Time: 2009-3-2 9:44:28

Electronics: DAE4 Sn771

Medium: 850 Body

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 0.99$ mho/m; $\epsilon_r = 53.8$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA 850 Frequency: 836.4 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.22, 6.22, 6.22)

Towards Ground Middle/Area Scan (51x91x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.584 mW/g

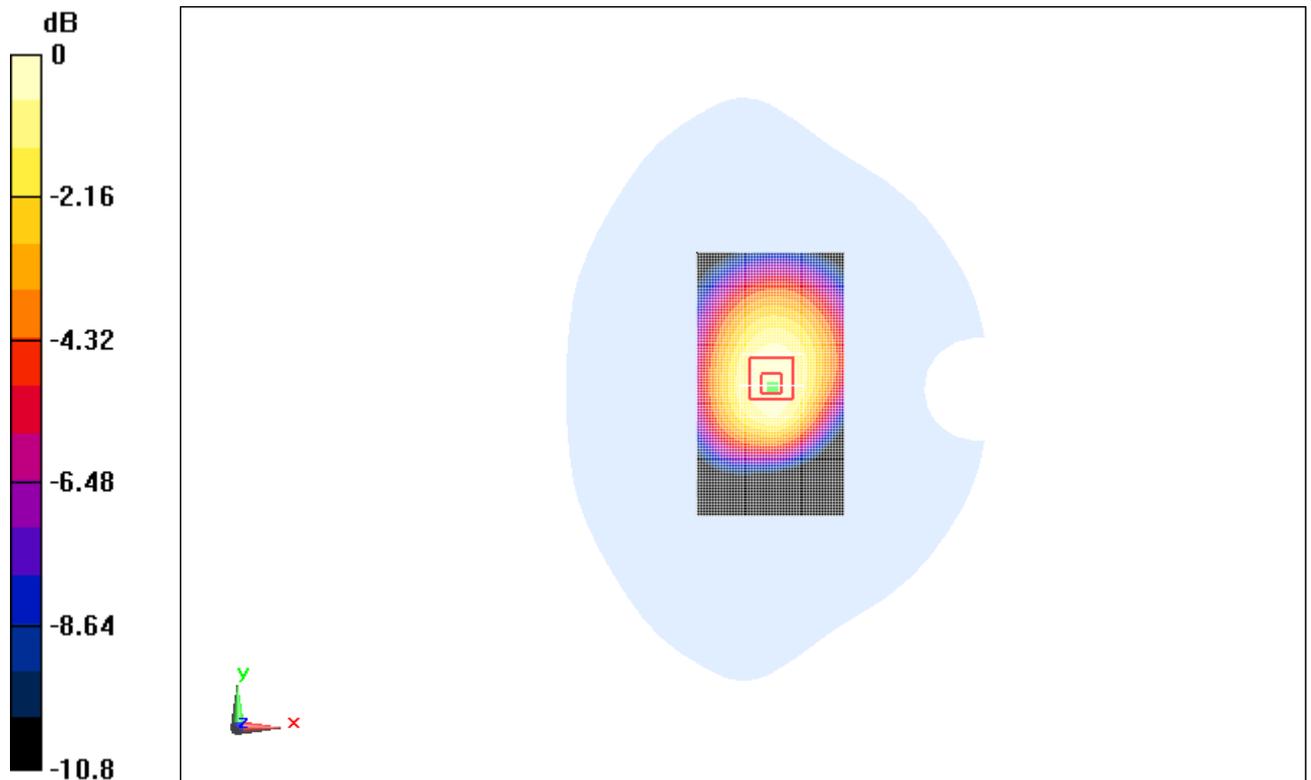
Towards Ground Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.2 V/m; Power Drift = 0.093 dB

Peak SAR (extrapolated) = 0.714 W/kg

SAR(1 g) = 0.543 mW/g; SAR(10 g) = 0.391 mW/g

Maximum value of SAR (measured) = 0.575 mW/g



0 dB = 0.575mW/g

Fig. 15 WCDMA850 MHz, Body, Towards Ground, CH4182

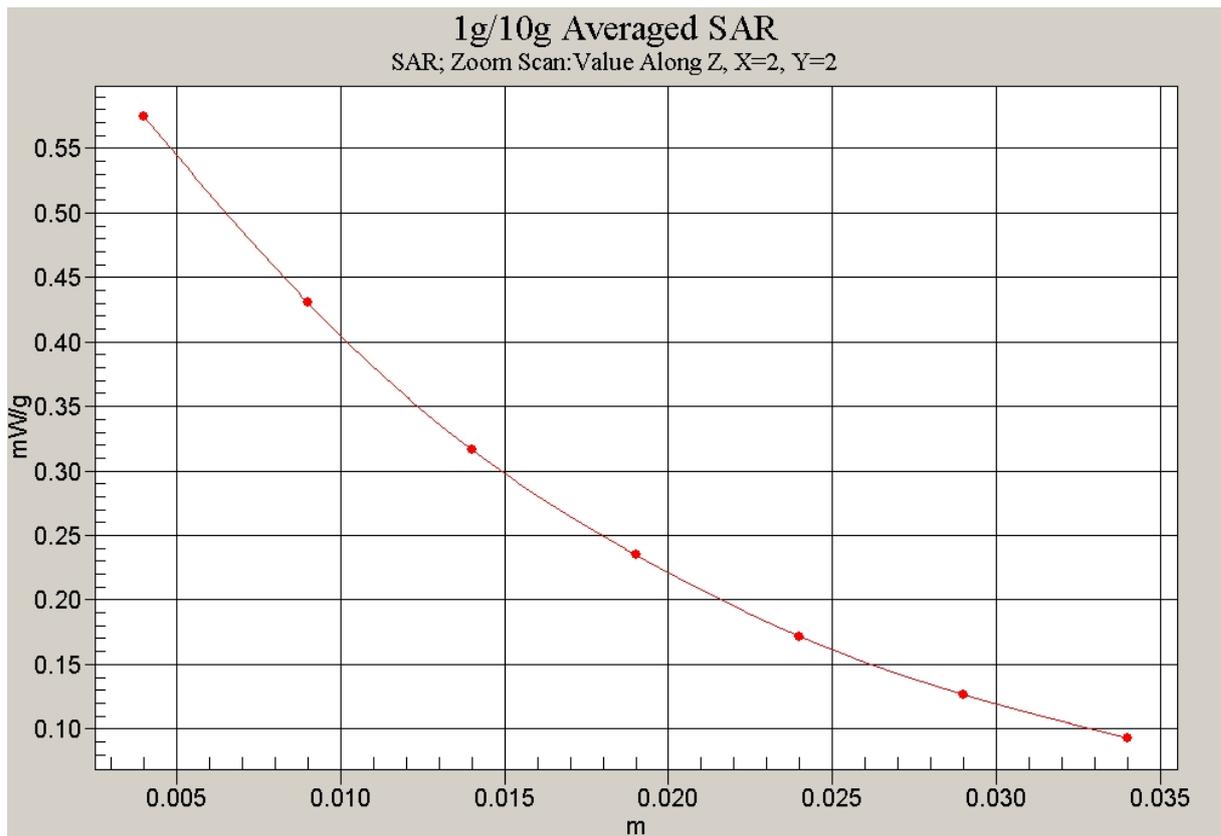


Fig. 16 Z-Scan at power reference point (WCDMA850 MHz, Body, Towards Ground, CH4182)

WCDMA 850 Body Toward Ground Low

Date/Time: 2009-3-2 9:58:10

Electronics: DAE4 Sn771

Medium: 850 Body

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 0.975$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA 850 Frequency: 826.4 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.22, 6.22, 6.22)

Towards Ground Low/Area Scan (51x91x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.649 mW/g

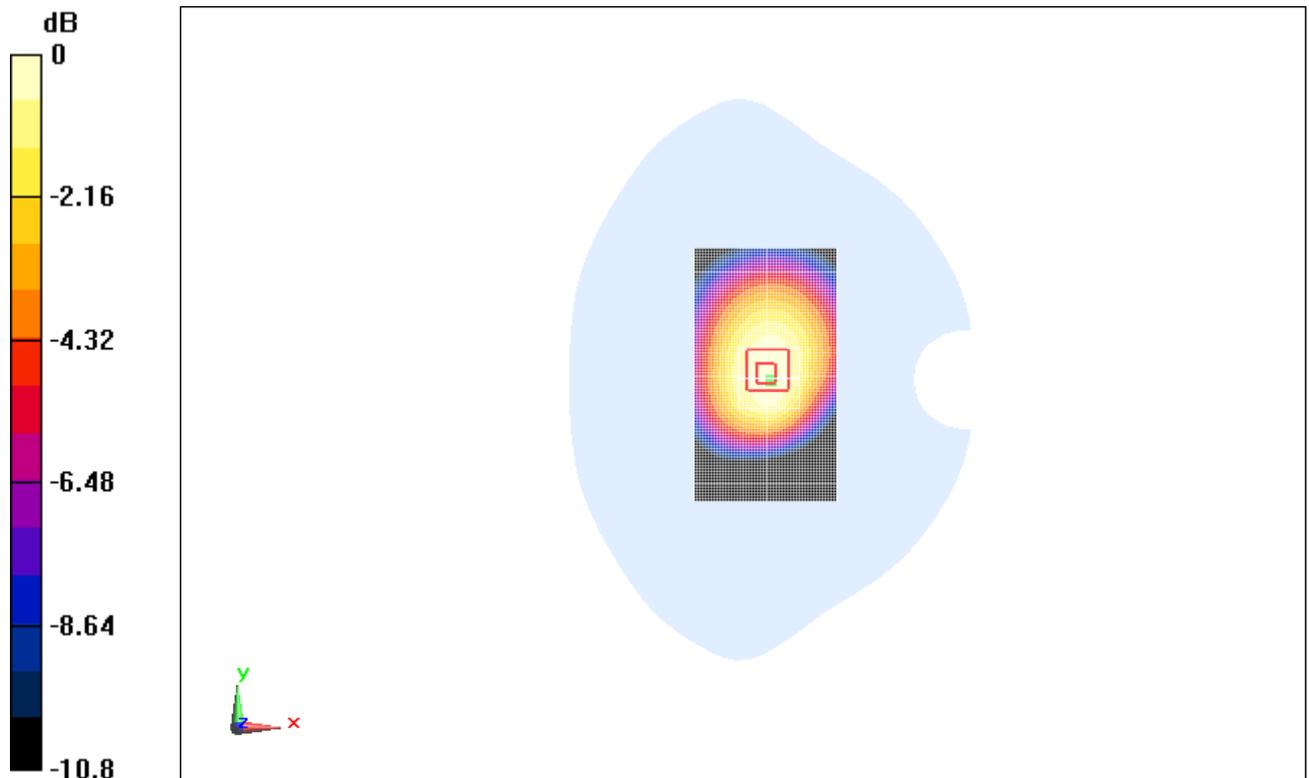
Towards Ground Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 25.7 V/m; Power Drift = -0.023 dB

Peak SAR (extrapolated) = 0.788 W/kg

SAR(1 g) = 0.597 mW/g; SAR(10 g) = 0.429 mW/g

Maximum value of SAR (measured) = 0.627 mW/g



0 dB = 0.627mW/g

Fig. 17 WCDMA850 MHz, Body, Towards Ground, CH4132

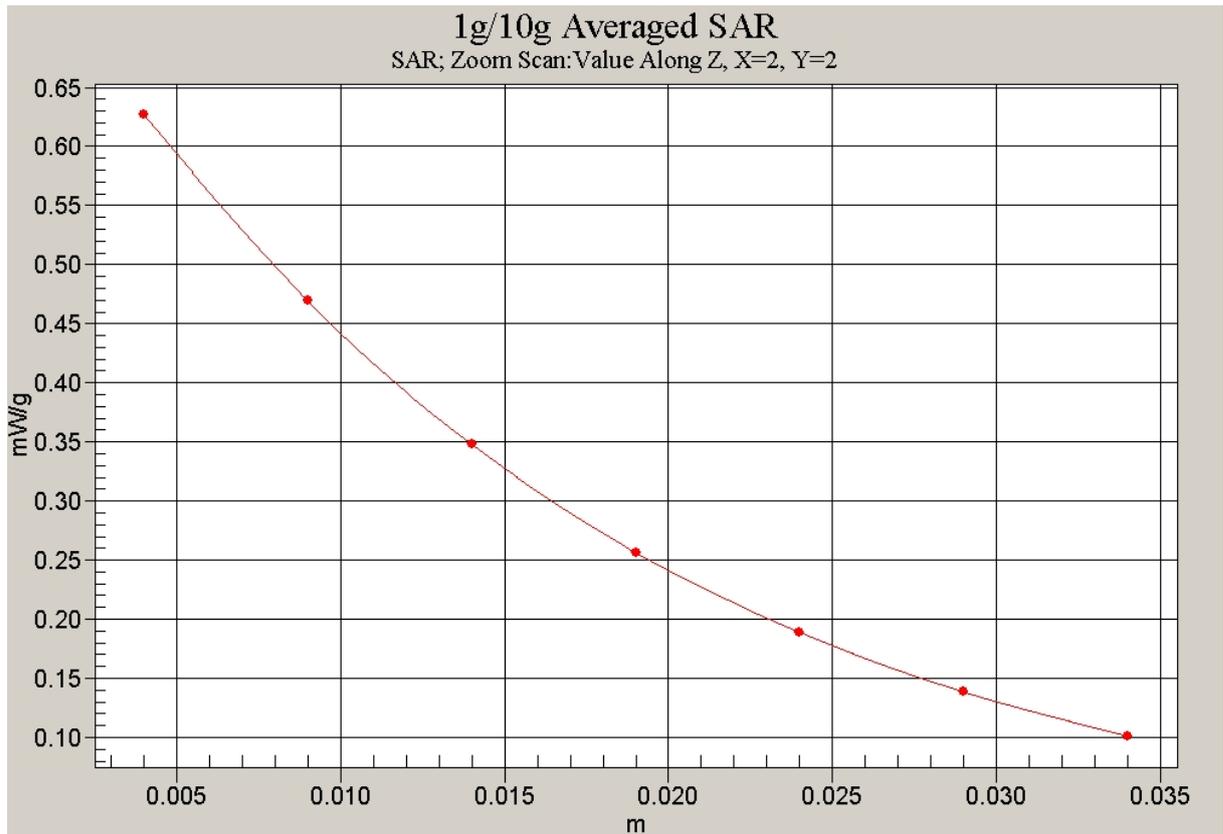


Fig. 18 Z-Scan at power reference point (WCDMA850 MHz, Body, Towards Ground, CH4132)

WCDMA 850 Body Toward Phantom High

Date/Time: 2009-3-2 10:12:34

Electronics: DAE4 Sn771

Medium: 850 Body

Medium parameters used (interpolated): $f = 846.6$ MHz; $\sigma = 1.00$ mho/m; $\epsilon_r = 53.7$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA 850 Frequency: 846.6 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.22, 6.22, 6.22)

Towards Phantom High/Area Scan (81x141x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.270 mW/g

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

Reference Value = 17.1 V/m; Power Drift = -0.161 dB

Peak SAR (extrapolated) = 0.290 W/kg

SAR(1 g) = 0.234 mW/g; SAR(10 g) = 0.164 mW/g

Maximum value of SAR (measured) = 0.249 mW/g



0 dB = 0.249mW/g

Fig. 19 WCDMA850 MHz, Body, Towards Phantom, CH4233

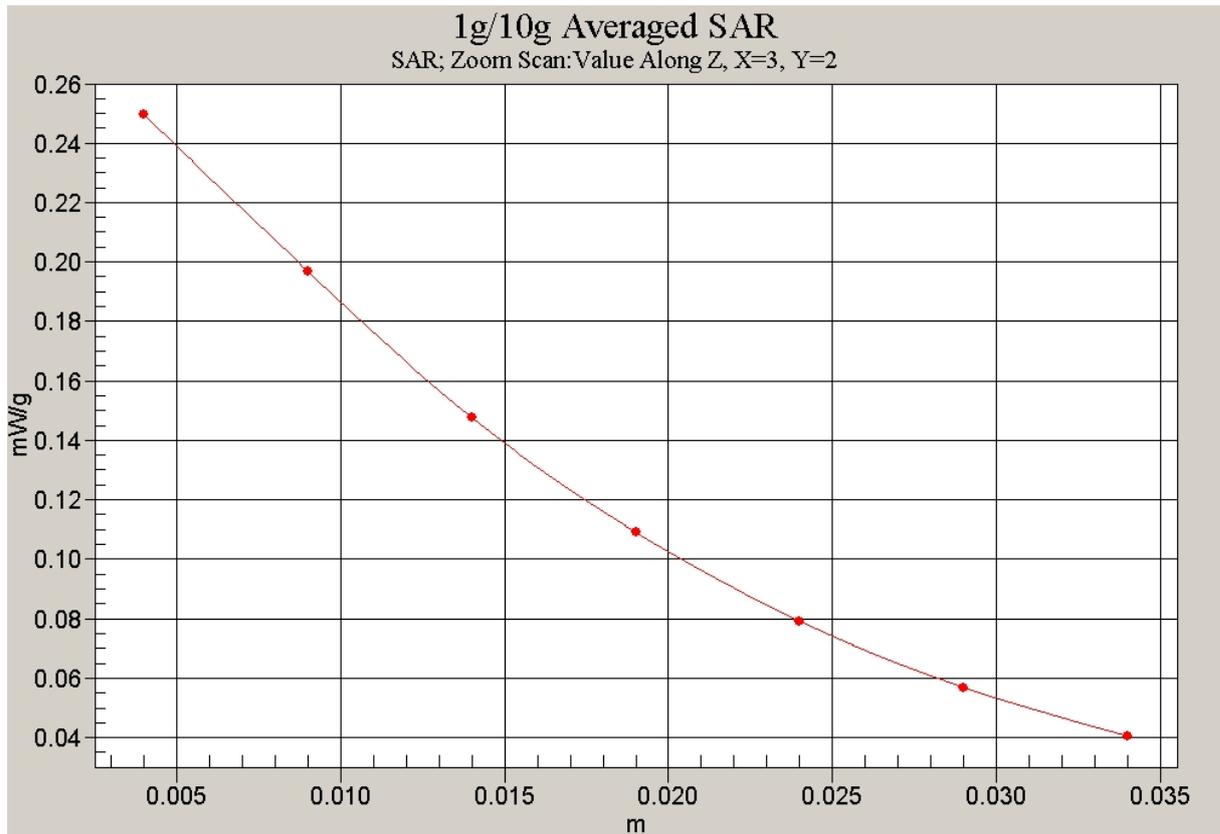


Fig. 20 Z-Scan at power reference point(WCDMA850 MHz, Body, Towards Phantom,CH4233)