# SAR TEST REPORT

## No. 2008SAR00067

**For**

**Shenzhen Sang Fei Consumer Communications Co., Ltd.**

**GSM/GPRS/EDGE Tri-band digital mobile phone with Bluetooth**

**Philips X710**

**With**

**Hardware Version: PCB-P051-MAIN-P1.0**

**Software Version: X710_M6229L_0832A00_V02CN**

**FCCID: VQRCTX710**

**Issued Date: 2008-10-28**

***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

No. 52, Huayuan Bei Road, Haidian District, Beijing, P. R. China 100083.

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# TABLE OF CONTENT

# 1 Test Laboratory

## 1.1 Testing Location

| | |
|---|---|
| Company Name: | TMC Beijing, Telecommunication Metrology Center of MII |
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| Postal Code: | 100083 |
| Telephone: | +86-10-62303288 |
| Fax: | +86-10-62304793 |

## 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: | Sun Qian |
| Test Engineer: | Lin Xiaojun |
| Testing Start Date: | October 16, 2008 |
| Testing End Date: | October 16, 2008 |

## 1.4 Signature

**Lin Xiaojun**

**(Prepared this test report)**

**Sun Qian**

**(Reviewed this test report)**

**Lu Bingsong**

**Deputy Director of the laboratory**

**(Approved this test report)**

# 2 Client Information

## 2.1 Applicant Information

| | |
|---|---|
| Company Name: | Shenzhen Sang Fei Consumer Communications Co.,Ltd. |
| Address /Post: | 11 Science & Technology Rd., Shenzhen Hi-tech Industrial Park, Nanshan District, Shenzhen 518057 |
| City: | Shenzhen |
| Postal Code: | 518057 |
| Country: | P. R. China |
| Telephone: | +86-755-26633217 |
| Fax: | +86-755-26635272 |

## 2.2 Manufacturer Information

| | |
|---|---|
| Company Name: | Shenzhen Sang Fei Consumer Communications Co.,Ltd. |
| Address /Post: | 11 Science & Technology Rd., Shenzhen Hi-tech Industrial Park, Nanshan District, Shenzhen 518057 |
| City: | Shenzhen |
| Postal Code: | 518057 |
| Country: | P. R. China |
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# 3 Equipment Under Test (EUT) and Ancillary Equipment (AE)

## 3.1 About EUT

| | |
|---|---|
| EUT Description: | GSM/GPRS/EDGE Tri-band digital mobile phone with bluetooth |
| Model name: | Philips X710 |
| GSM Frequency Band: | SIM1:EGSM 900/ DCS 1800/PCS 1900 |
| | SIM2:EGSM 900/ DCS 1800 |
| GRPS Class: | 12 |


**Picture 1: Constituents of the sample**

## 3.2 Internal Identification of EUT used during the test

| EUT ID* | SN or IMEI | HW Version | SW Version |
|---|---|---|---|
| EUT1 | 356049030003619(SIM1)<br>356049020003627(SIM2) | PCB-P051-MAIN-P1.0 | X710_M6229L_0832A00_V02CN |

*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 | Travel Adapter | DSA-5W-05 FEU 050065 | \ | DeeVan Electronics(Shenzhen) Co., Ltd |
| AE2 | Battery | AB1900AWM | \ | SHENZHEN XWODA GROUP 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 50361–2001:** Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.

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

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

**IEC 62209-1:** 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

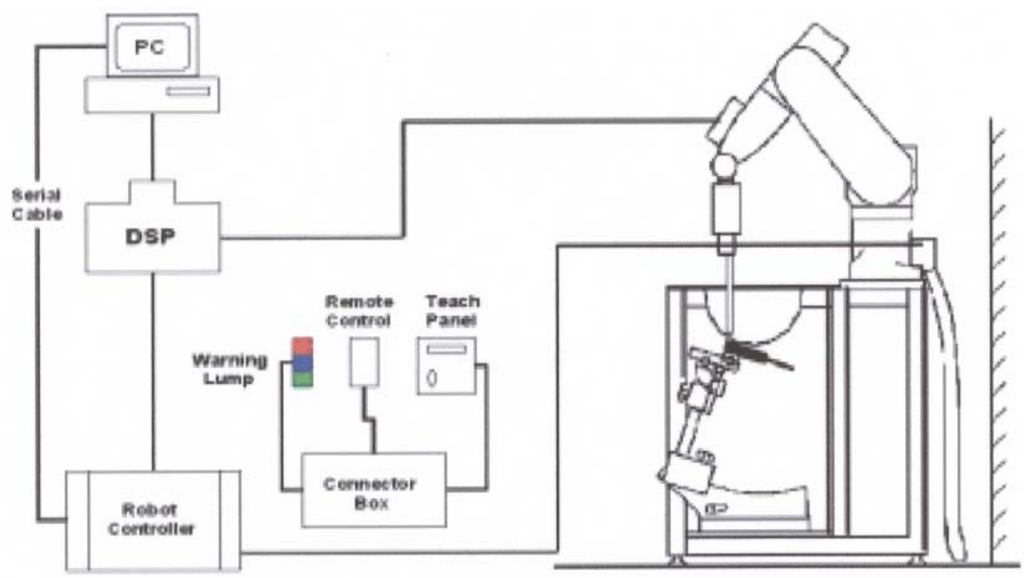
During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a System Simulator (SS) by air link, and a call is established. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 512, 661 and 810 respectively in the case of PCS 1900 MHz only for SIM1. 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.

## 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 ± 0.02mm. 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 Professional, 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.

## 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 ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB.

### ES3DV3 Probe Specification

**Picture 3: ES3DV3 E-field Probe**

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

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

**Picture4:ES3DV3 E-field probe**

## 5.4 E-field Probe Calibration

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

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

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

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

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

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

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

Or

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

Where:

$\sigma$ = Simulated tissue conductivity,

$\rho$ = Tissue density (kg/m$^3$).

**Picture 5: 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. l mm
Filling Volume Approx. 20 liters
Dimensions 810 x l000 x 500 mm (H x L x W)
Available Special

**Picture 6: Generic Twin Phantom**

## 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 4 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528.

**Table 1. 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 ε=40.0 σ=1.40 |

**Table 2. 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 ε=53.3 σ=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 LABORATORY ENVIRONMENT

**Table 3: 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 surroundi 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 low, middle and high channels.

#### 7.2.2 Measurement result

**Table 4: Conducted Power Measurement Results**

| 1900MHZ | Conducted Power (dBm) | | |
|---|---|---|---|
| | Channel 810(1909.8MHz) | Channel 661(1880MHz) | Channel 512(1850.2MHz) |
| | 27.17 | 27.51 | 27.37 |

**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 8 to Table 9 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 5: Dielectric Performance of Head Tissue Simulating Liquid**

| Measurement is made at temperature 23.3 °C and relative humidity 49%.<br>Liquid temperature during the test: 22.5°C | | | |
|---|---|---|---|
| / | **Frequency** | **Permittivity ε** | **Conductivity σ (S/m)** |
| **Target value** | 1900 MHz | 40.0 | 1.40 |
| **Measurement value (Average of 10 tests)** | 1900 MHz | 40.9 | 1.38 |

**Table 6: Dielectric Performance of Body Tissue Simulating Liquid**

| Measurement is made at temperature 23.3 °C and relative humidity 49%.<br>Liquid temperature during the test: 22.5°C | | | |
|---|---|---|---|
| / | **Frequency** | **Permittivity ε** | **Conductivity σ (S/m)** |
| **Target value** | 1900 MHz | 53.3 | 1.52 |
| **Measurement value (Average of 10 tests)** | 1900 MHz | 51.7 | 1.58 |

## 8.2 System Validation

**Table 7: System Validation**

<table>
<tr><td colspan="8">Measurement is made at temperature 23.3 °C, relative humidity 49%, input power 250 mW.<br>Liquid temperature during the test: 22.5°C</td></tr>
<tr><td colspan="2" rowspan="2">Liquid parameters</td><td colspan="2">Frequency</td><td colspan="2">Permittivity ε</td><td colspan="2">Conductivity σ (S/m)</td></tr>
<tr><td colspan="2">1900 MHz</td><td colspan="2">40.9</td><td colspan="2">1.38</td></tr>
<tr><td rowspan="3">Verification results</td><td rowspan="2">Frequency</td><td colspan="2">Target value (W/kg)</td><td colspan="2">Measured value (W/kg)</td><td colspan="2">Deviation</td></tr>
<tr><td>10 g Average</td><td>1 g Average</td><td>10 g Average</td><td>1 g Average</td><td>10 g Average</td><td>1 g Average</td></tr>
<tr><td>1900 MHz</td><td>5.09</td><td>9.73</td><td>5.27</td><td>9.91</td><td>3.3%</td><td>1.9%</td></tr>
</table>

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

## 8.3 Summary of Measurement Results

**Table 8: SAR Values (1900MHz-Head)**

| 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) | 0.211 | 0.435 | 0.018 |
| Left hand, Touch cheek, Mid frequency(See Fig.3) | 0.260 | 0.542 | -0.024 |
| Left hand, Touch cheek, Bottom frequency(See Fig.5) | 0.353 | 0.748 | -0.014 |
| Left hand, Tilt 15 Degree, Top frequency(See Fig.7) | 0.279 | 0.575 | 0.030 |
| Left hand, Tilt 15 Degree, Mid frequency(See Fig.9) | 0.349 | 0.724 | -0.031 |
| Left hand, Tilt 15 Degree, Bottom frequency(See Fig.11) | 0.470 | 0.978 | -0.004 |
| Right hand, Touch cheek, Top frequency(See Fig.13) | 0.187 | 0.346 | -0.200 |
| Right hand, Touch cheek, Mid frequency(See Fig.15) | 0.232 | 0.432 | 0.200 |
| Right hand, Touch cheek, Bottom frequency(See Fig.17) | 0.428 | 0.785 | 0.159 |
| Right hand, Tilt 15 Degree, Top frequency(See Fig.19) | 0.293 | 0.546 | -0.012 |
| Right hand, Tilt 15 Degree, Mid frequency(See Fig.21) | 0.424 | 0.783 | 0.028 |
| Right hand, Tilt 15 Degree, Bottom frequency(See Fig.23) | 0.599 | 1.09 | -0.015 |

**Table 9: SAR Values (1900MHz-Body)**

| Limit of SAR (W/kg) | 10 g Average | 1g 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.25) | 0.343 | 0.582 | 0.079 |
| Body, Towards Ground, Mid frequency with GPRS (See Fig.27) | 0.394 | 0.672 | 0.053 |
| Body, Towards Ground, Bottom frequency with GPRS (See Fig.29) | 0.461 | 0.784 | -0.134 |
| Body, Towards Phantom, Top frequency with GPRS(See Fig.31) | 0.171 | 0.279 | 0.185 |
| Body, Towards Phantom, Mid frequency with GPRS (See Fig.33) | 0.194 | 0.320 | -0.141 |
| Body, Towards Phantom, Bottom frequency with GPRS (See Fig.35) | 0.233 | 0.385 | 0.124 |
| Body, Towards Ground, Bottom frequency with EGPRS(See Fig.37) | 0.260 | 0.449 | 0.009 |
| Body, Towards Ground, Bottom frequency with Headset (See Fig.39) | 0.190 | 0.327 | 0.081 |

## 8.4 Summary of Measurement Results (Bluetooth function)

The distance between BT antenna and GSM antenna is >5cm. The location of the antennas inside mobile phone is shown below:


The output power of BT antenna is as following:

| Channel | Ch 0<br>2402 MHz | Ch 39<br>2441 Mhz | Ch 78<br>2480 MHz |
|---|---|---|---|
| Peak Conducted<br>Output Power(dBm) | -1.85 | -1.26 | -1.18 |

According to the output power measurement result and the distance between the two antennas, we can draw the conclusion that: stand-alone SAR and the simultaneous Tx SAR are both not required for BT transmitter, because the output power of BT transmitter is $\leqslant 2P_{Ref}$ .

## 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 4.2 of this report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 4.1 of this test report.

# 9 Measurement Uncertainty

| SN | a | Type | c | d | e =<br>f(d,k) | f | h =<br>c x f / | k |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | e | |
|---|---|---|---|---|---|---|---|---|
| | 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 | $\sqrt{c_p}$ | | ∞ |
| 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

**Table 10: 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 | December 14, 2007 | One year |
| 09 | DAE | SPEAG DAE4 | 771 | November 22, 2007 | One year |
| 10 | Dipole Validation Kit | SPEAG D1900V2 | 541 | February 20, 2007 | 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.

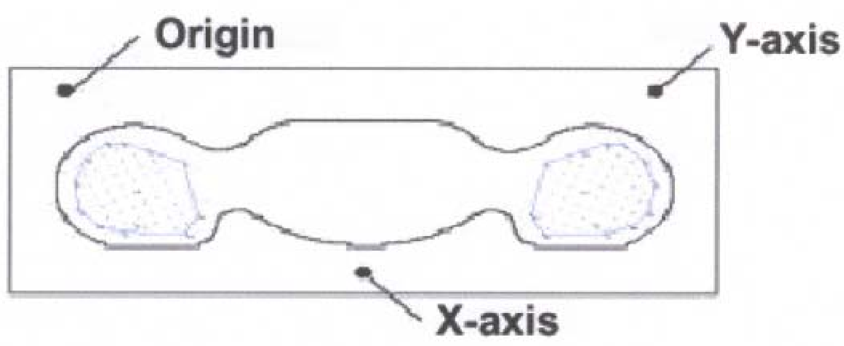
Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7 x 7x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

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.

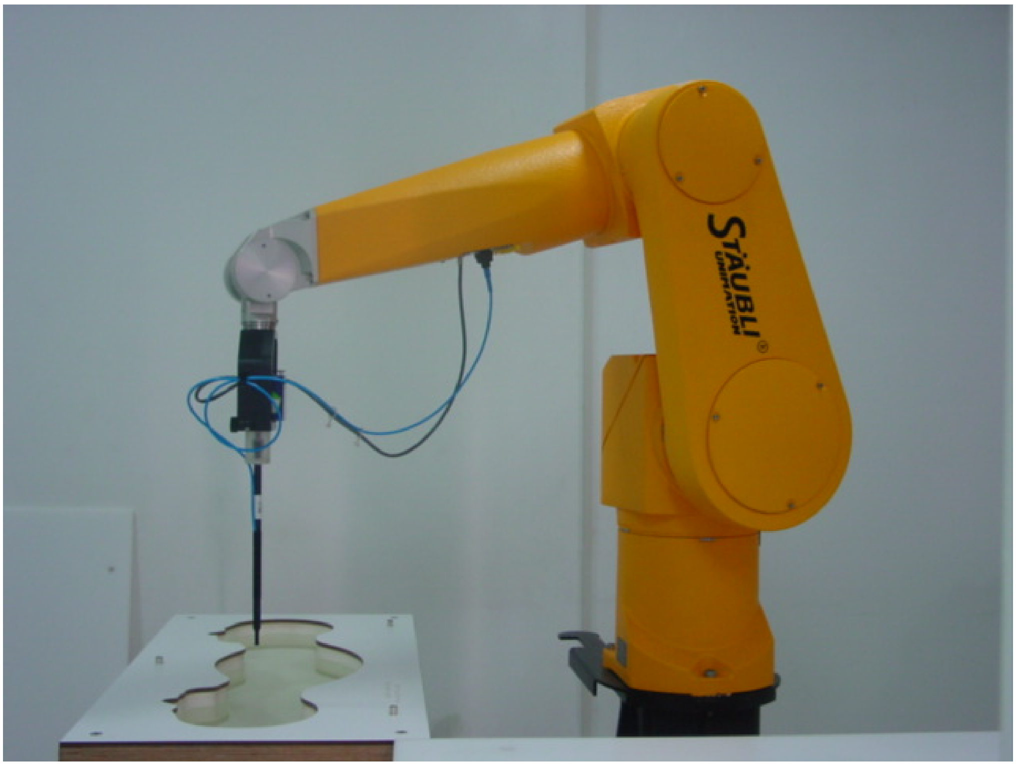
c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

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.



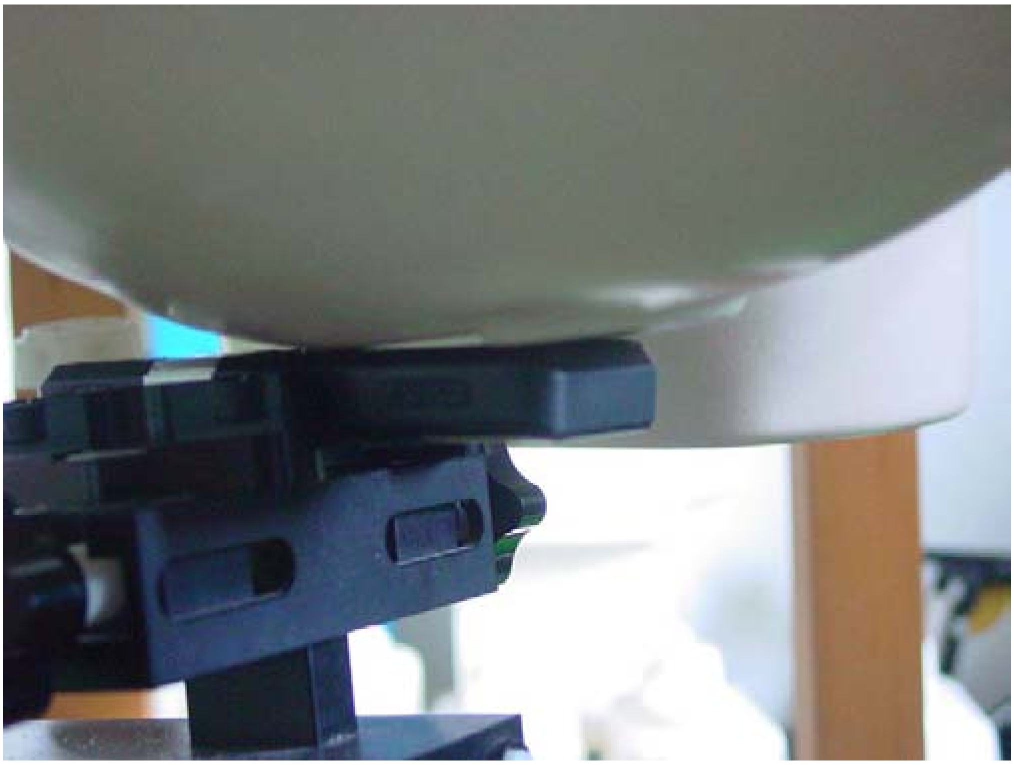

**Picture A: SAR Measurement Points in Area Scan**

## ANNEX B  TEST LAYOUT

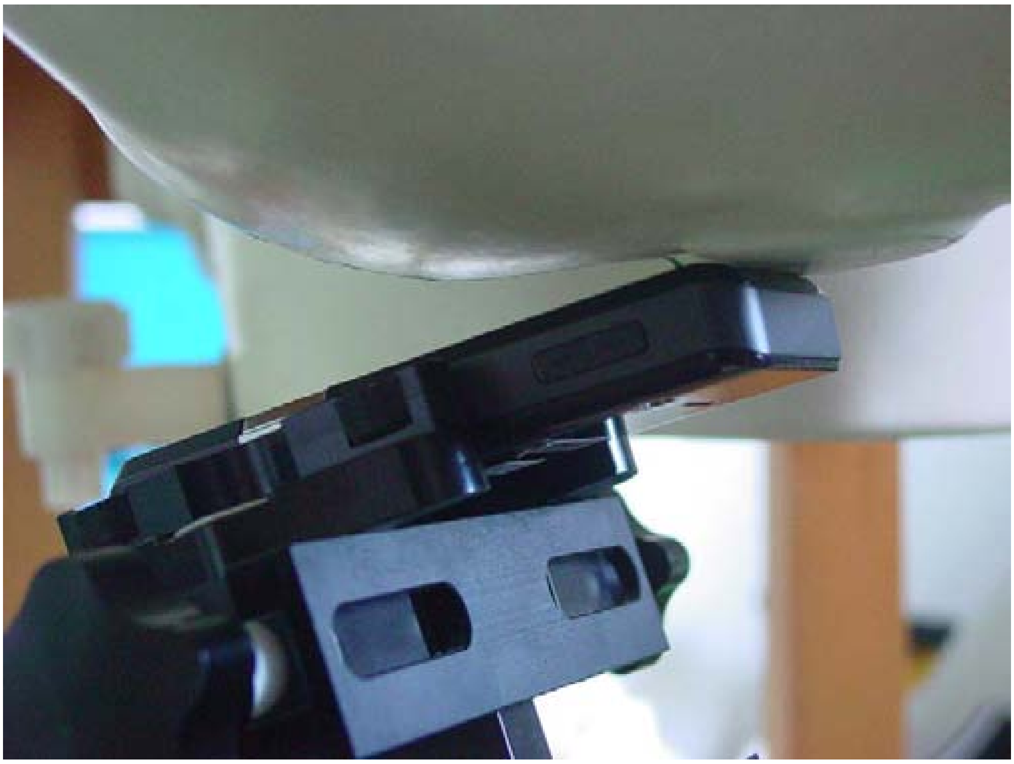



**Picture B1: Specific Absorption Rate Test Layout**

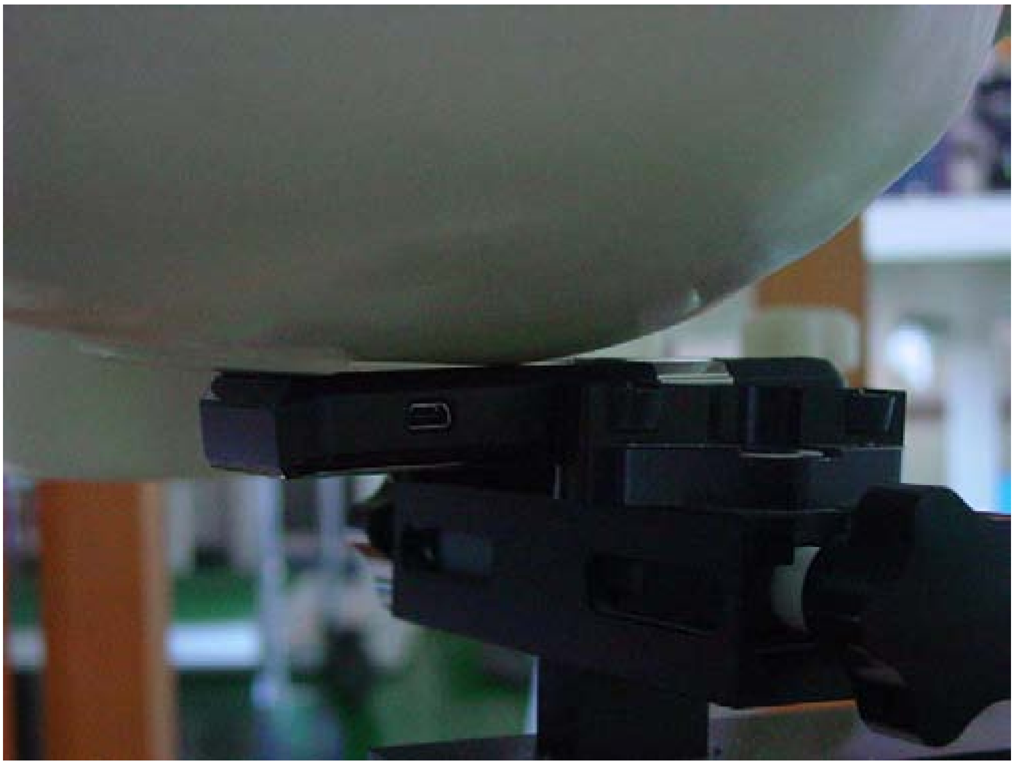
**Picture B2 Liquid depth in the Flat Phantom (1900MHz)**



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

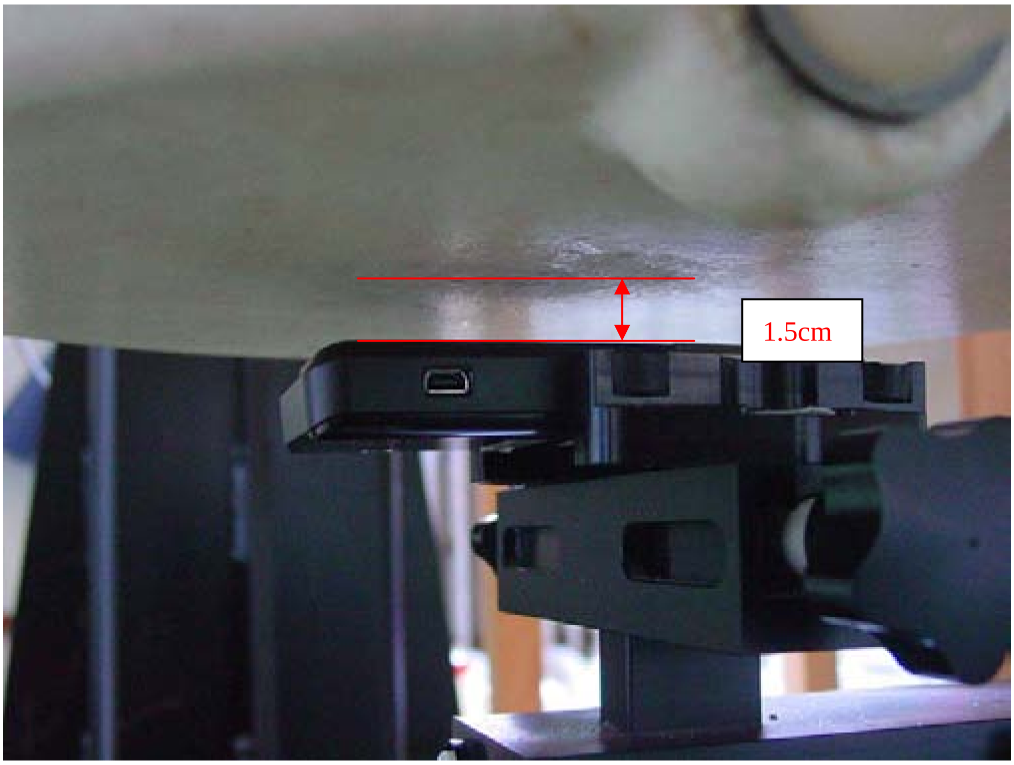


**Picture B4: Left Hand Tilt 15° Position**

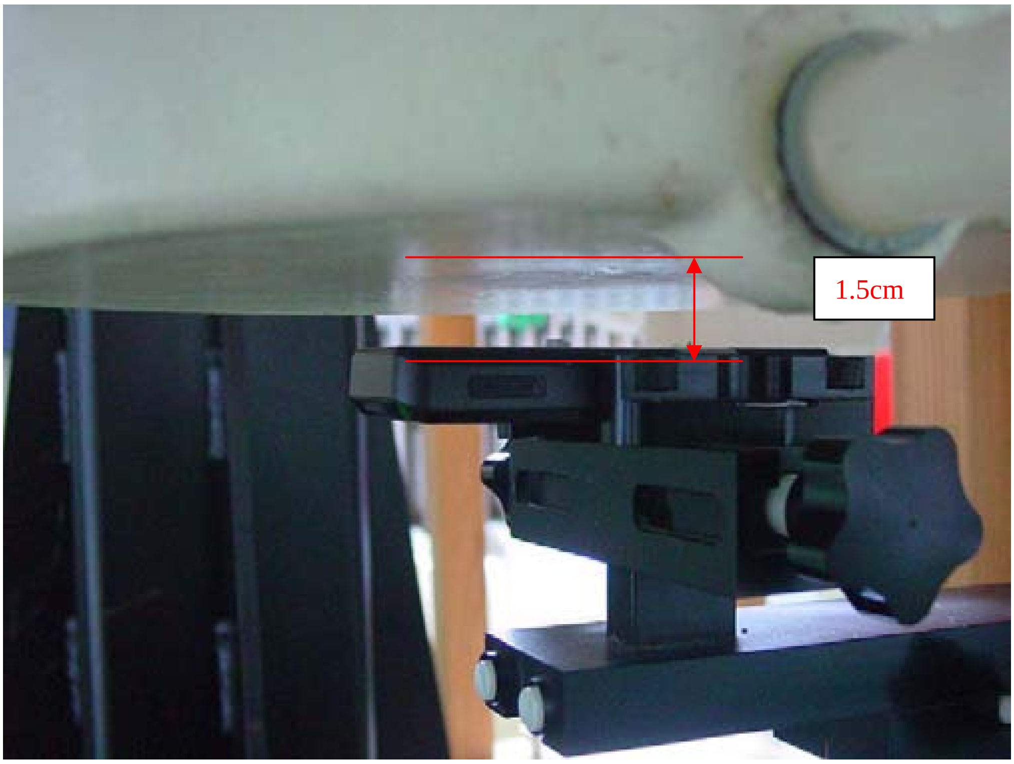


Picture B5: Right Hand Touch Cheek Position

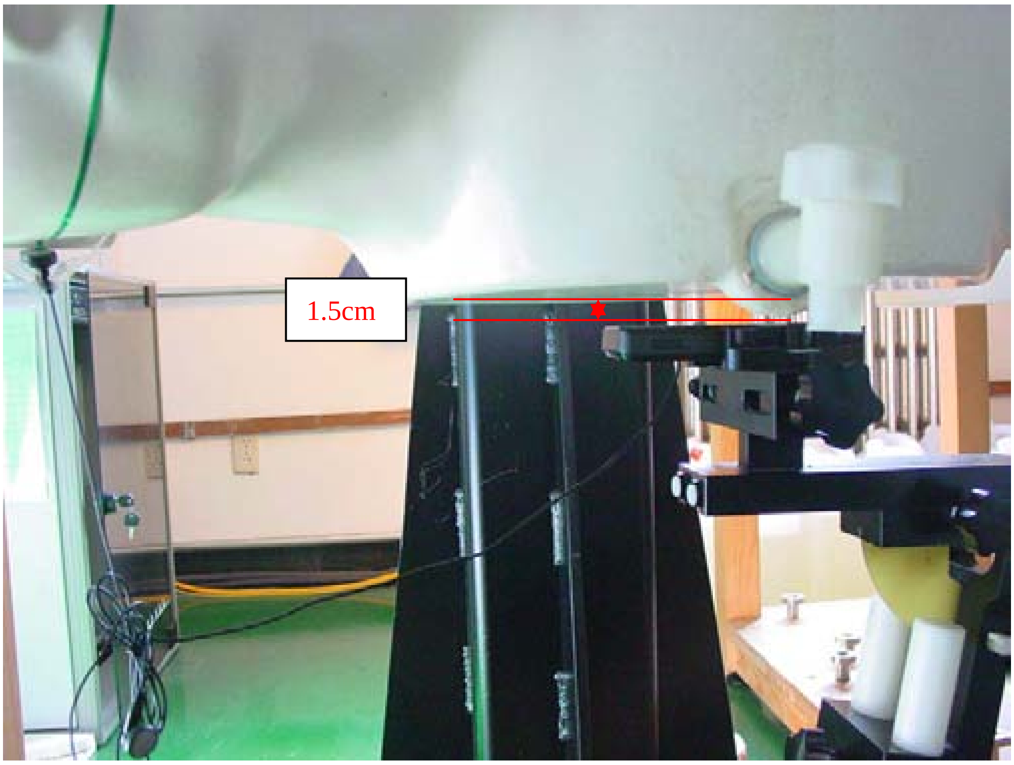
Picture B6: Right Hand Tilt 15° Position




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




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




**Picture B9: Body-worn Position with headset (towards ground, the distance from handset to the bottom of the Phantom is 1.5cm)**

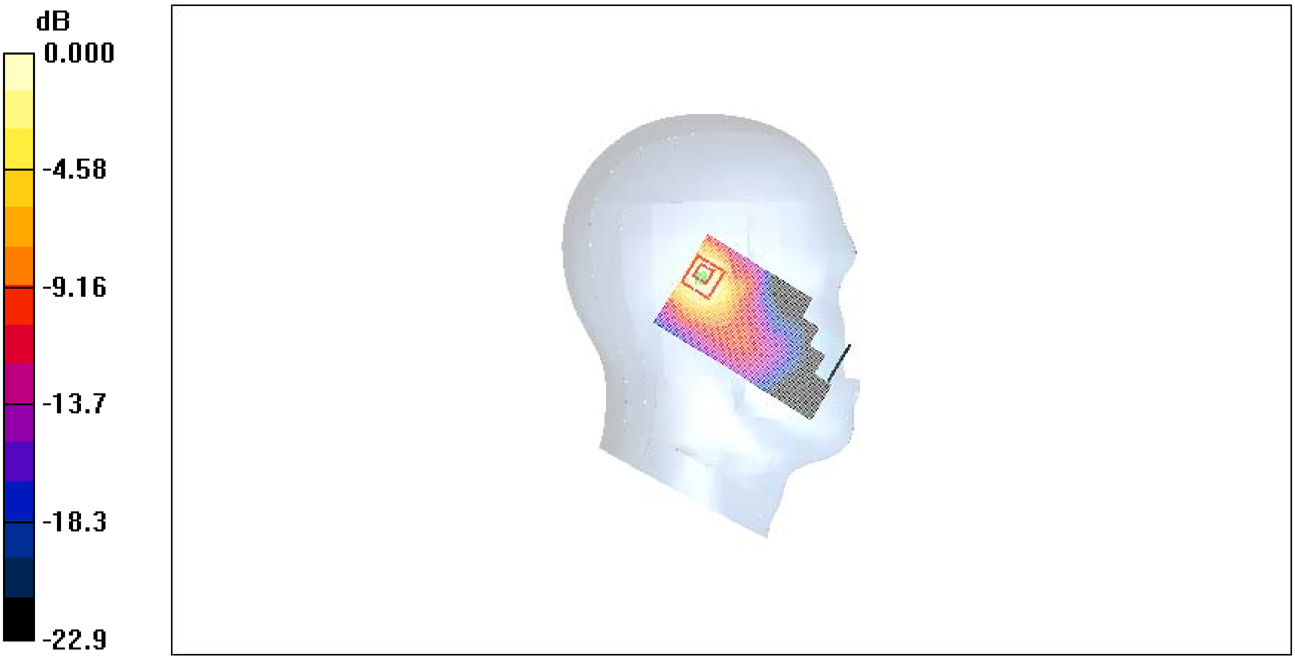
## ANNEX C GRAPH RESULTS

### 1900 Left Cheek High

Date/Time: 2008-10-16 13:46:42
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used: f = 1910 MHz; $\sigma$ = 1.39 mho/m; $\varepsilon_r$ = 40.8; $\rho$ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: GSM 1900MHz new Frequency: 1909.8 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Cheek High/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.454 mW/g

**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.9 V/m; Power Drift = 0.018 dB
Peak SAR (extrapolated) = 0.910 W/kg
**SAR(1 g) = 0.435 mW/g; SAR(10 g) = 0.211 mW/g**
Maximum value of SAR (measured) = 0.500 mW/g




0 dB = 0.500mW/g

**Fig. 1 1900 MHz CH810**

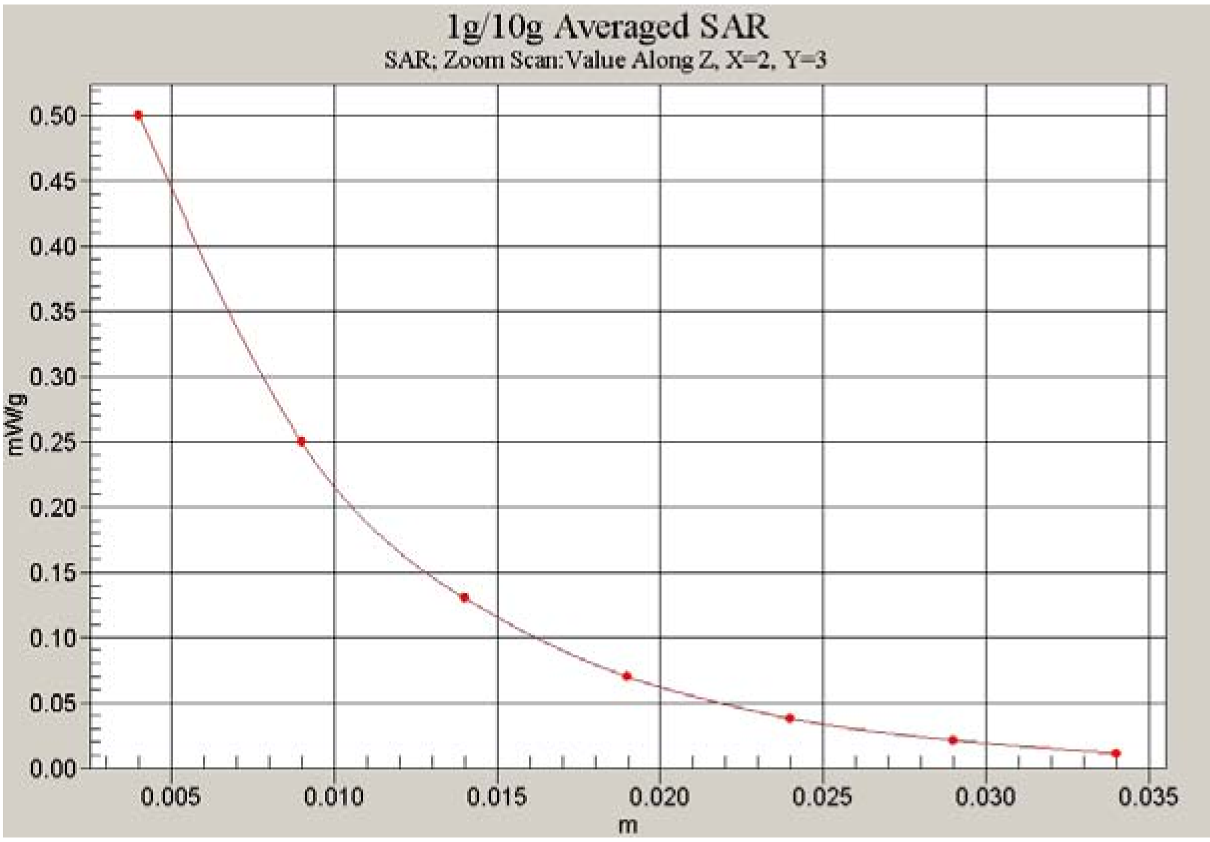


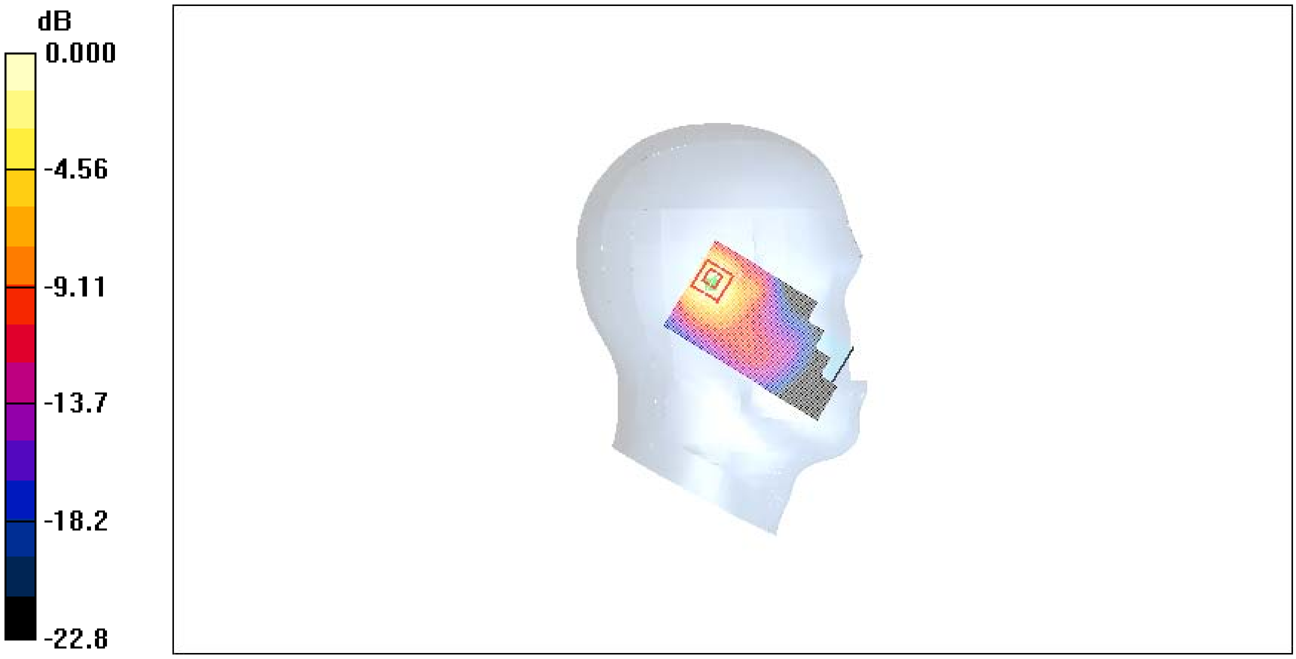

**Fig. 2 Z-Scan at power reference point (1900 MHz CH810)**

**1900 Left Cheek Middle**

Date/Time: 2008-10-16 14:05:49
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.37 mho/m; $\varepsilon_r$ = 41; $\rho$ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: GSM 1900MHz new Frequency: 1880 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Cheek Middle/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.554 mW/g

**Cheek Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.6 V/m; Power Drift = -0.024 dB
Peak SAR (extrapolated) = 1.15 W/kg
**SAR(1 g) = 0.542 mW/g; SAR(10 g) = 0.260 mW/g**
Maximum value of SAR (measured) = 0.625 mW/g




0 dB = 0.625mW/g

**Fig. 3 1900 MHz CH661**

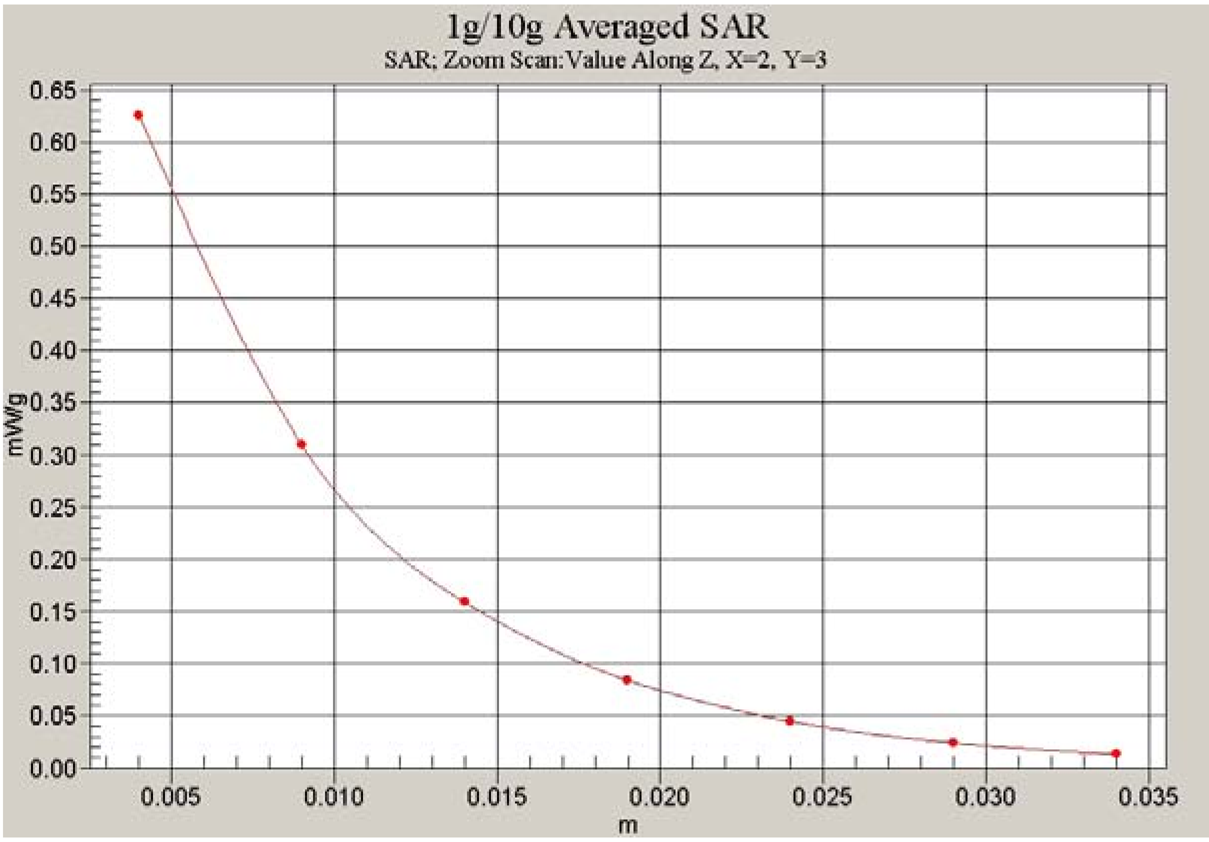


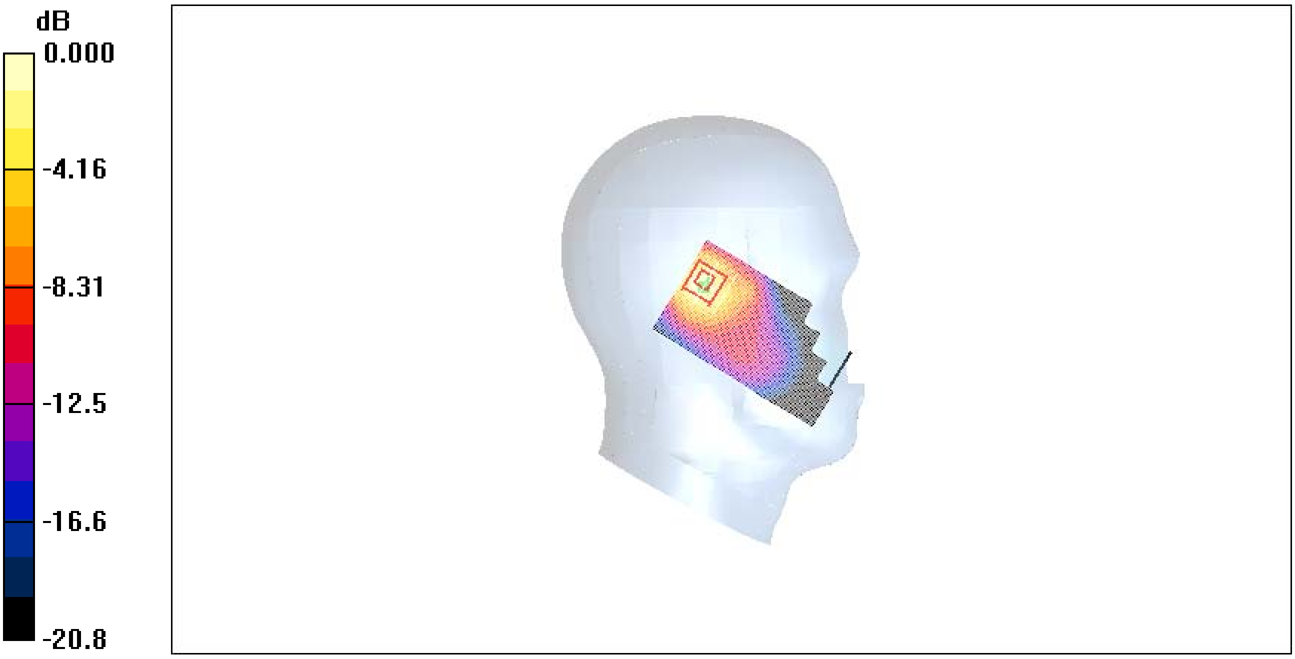

**Fig. 4 Z-Scan at power reference point (1900 MHz CH661)**

**1900 Left Cheek Low**

Date/Time: 2008-10-16 14:25:16
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.36 mho/m; $\varepsilon_r$ = 40.9; ρ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: GSM 1900MHz new Frequency: 1850.2 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Cheek Low/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.760 mW/g

**Cheek Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.9 V/m; Power Drift = -0.014 dB
Peak SAR (extrapolated) = 1.58 W/kg
**SAR(1 g) = 0.748 mW/g; SAR(10 g) = 0.353 mW/g**
Maximum value of SAR (measured) = 0.844 mW/g




0 dB = 0.844mW/g

**Fig. 5 1900 MHz CH512**

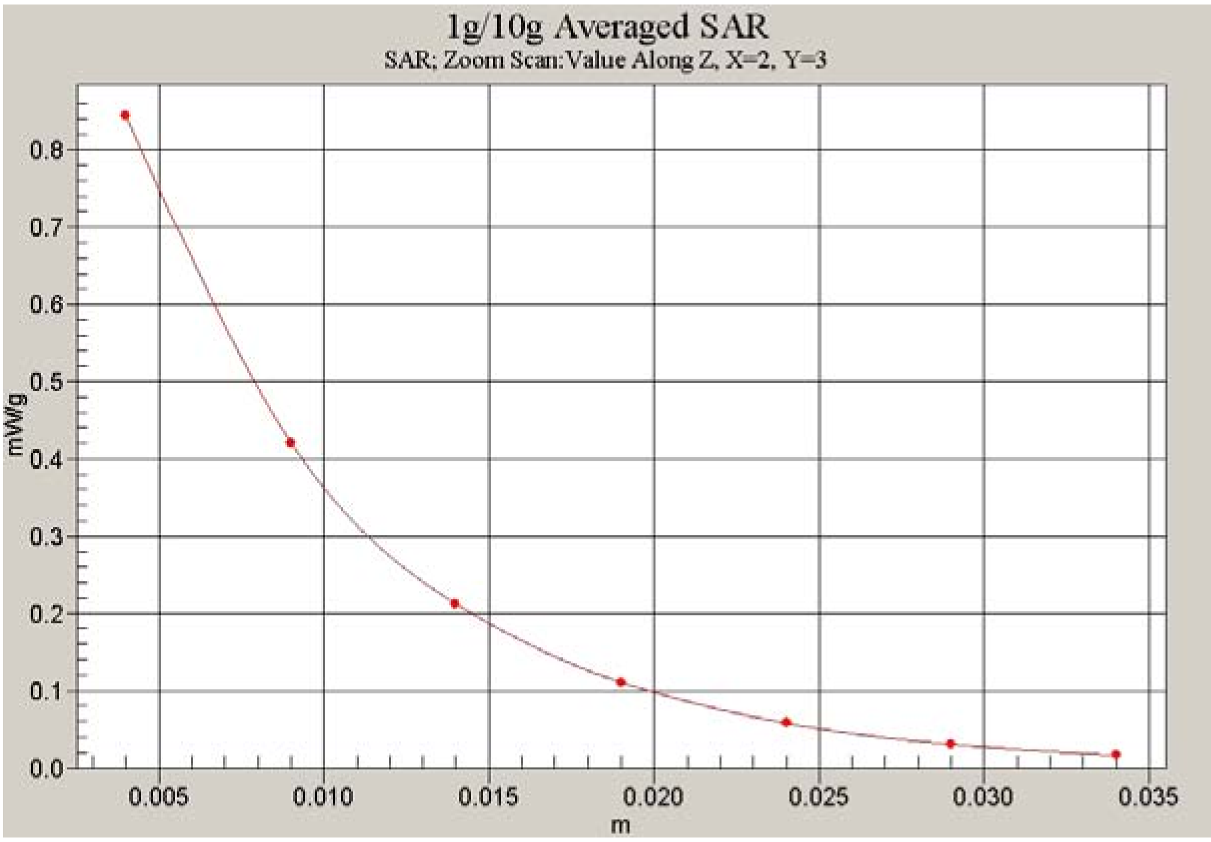



**Fig. 6 Z-Scan at power reference point (1900 MHz CH512)**

**1900 Left Tilt High**

Date/Time: 2008-10-16 16:29:48

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used: f = 1910 MHz; $\sigma$ = 1.39 mho/m; $\varepsilon_r$ = 40.8; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:23.3$^o$C    Liqiud Temperature: 22.5$^o$C

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

Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Tilt High/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.668 mW/g

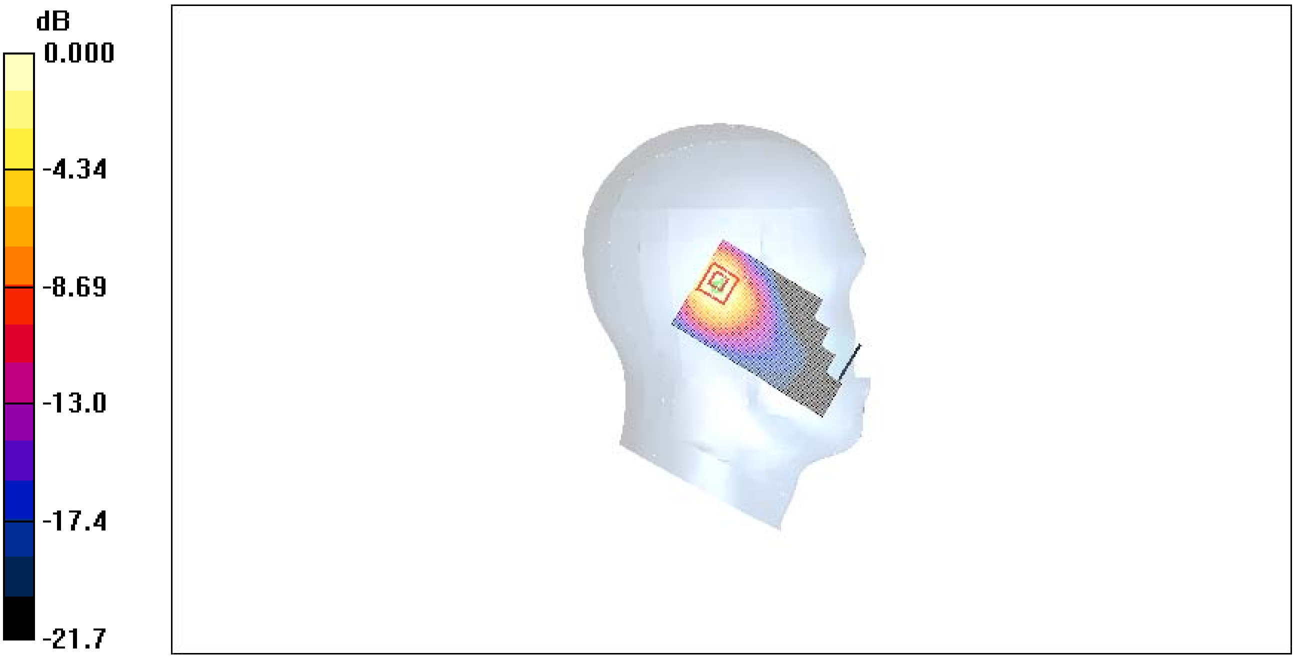
**Tilt High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.7 V/m; Power Drift = 0.030 dB

Peak SAR (extrapolated) = 1.21 W/kg

**SAR(1 g) = 0.575 mW/g; SAR(10 g) = 0.279 mW/g**

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




0 dB = 0.649mW/g

**Fig.7 1900 MHz CH810**

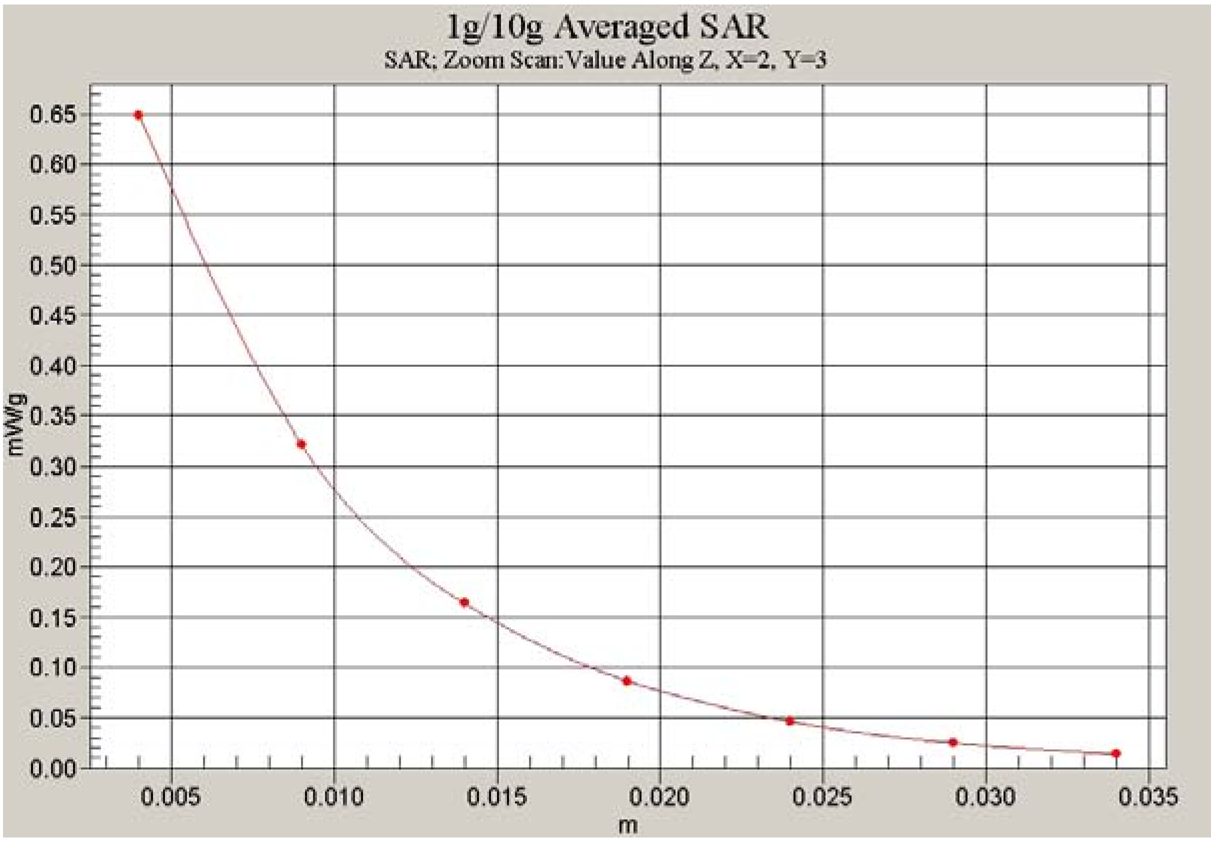
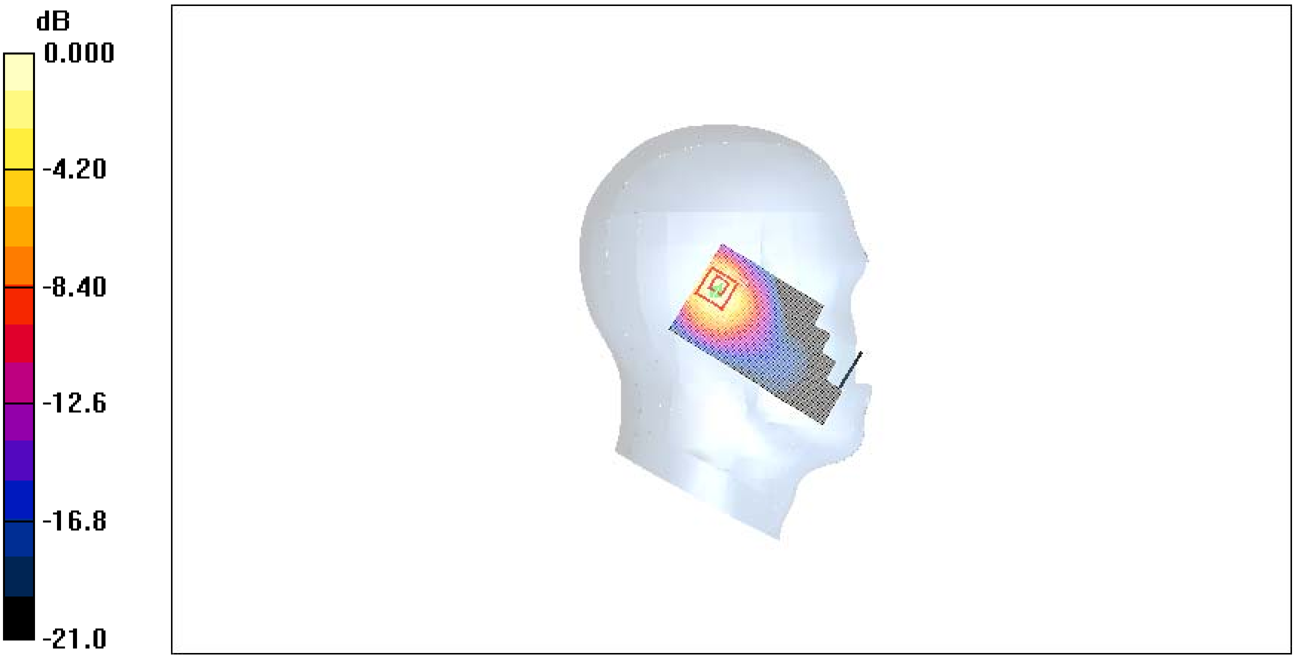



**Fig. 8 Z-Scan at power reference point (1900 MHz CH810)**

**1900 Left Tilt Middle**
Date/Time: 2008-10-16 16:09:01
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.37 mho/m; $\varepsilon_r$ = 41; $\rho$ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: GSM 1900MHz new Frequency: 1880 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Tilt Middle/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.846 mW/g

**Tilt Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.8 V/m; Power Drift = -0.031 dB
Peak SAR (extrapolated) = 1.56 W/kg
**SAR(1 g) = 0.724 mW/g; SAR(10 g) = 0.349 mW/g**
Maximum value of SAR (measured) = 0.831 mW/g




0 dB = 0.831mW/g

**Fig. 9 1900 MHz CH661**

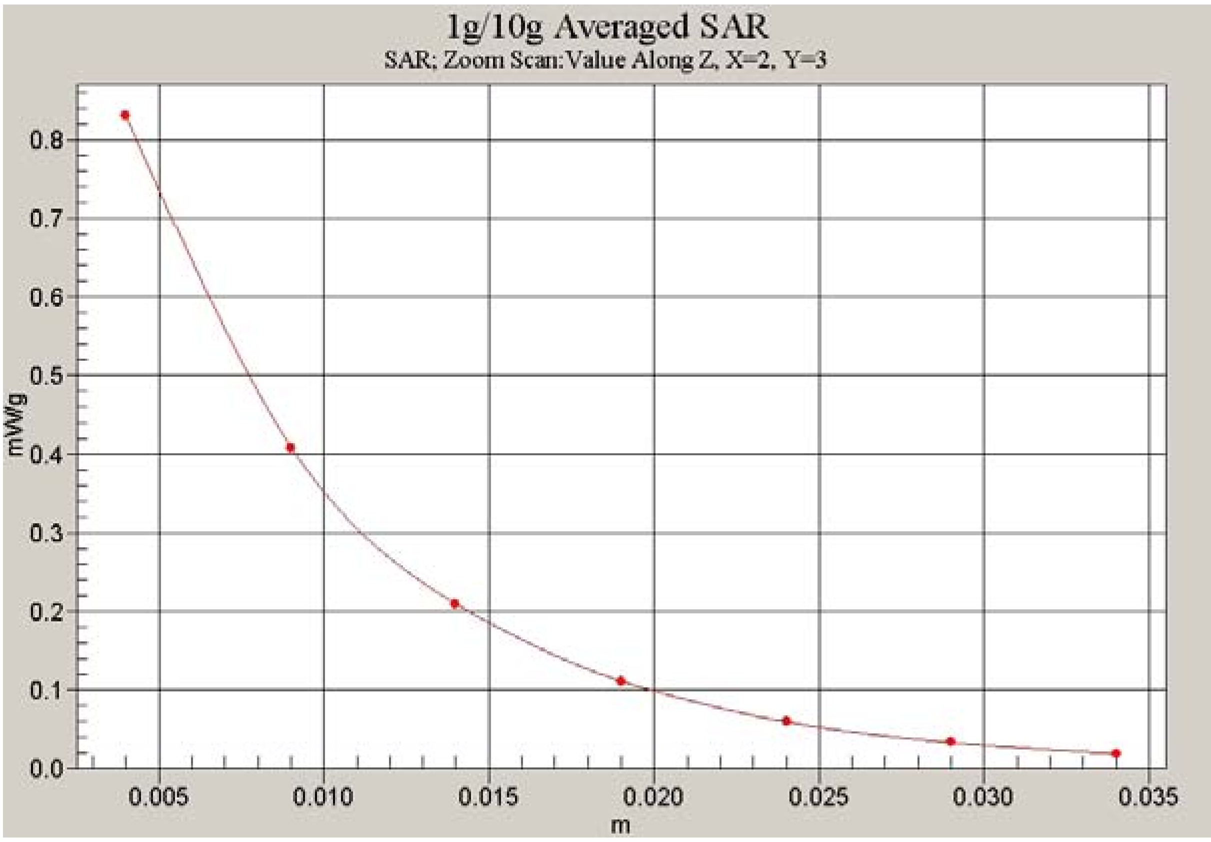


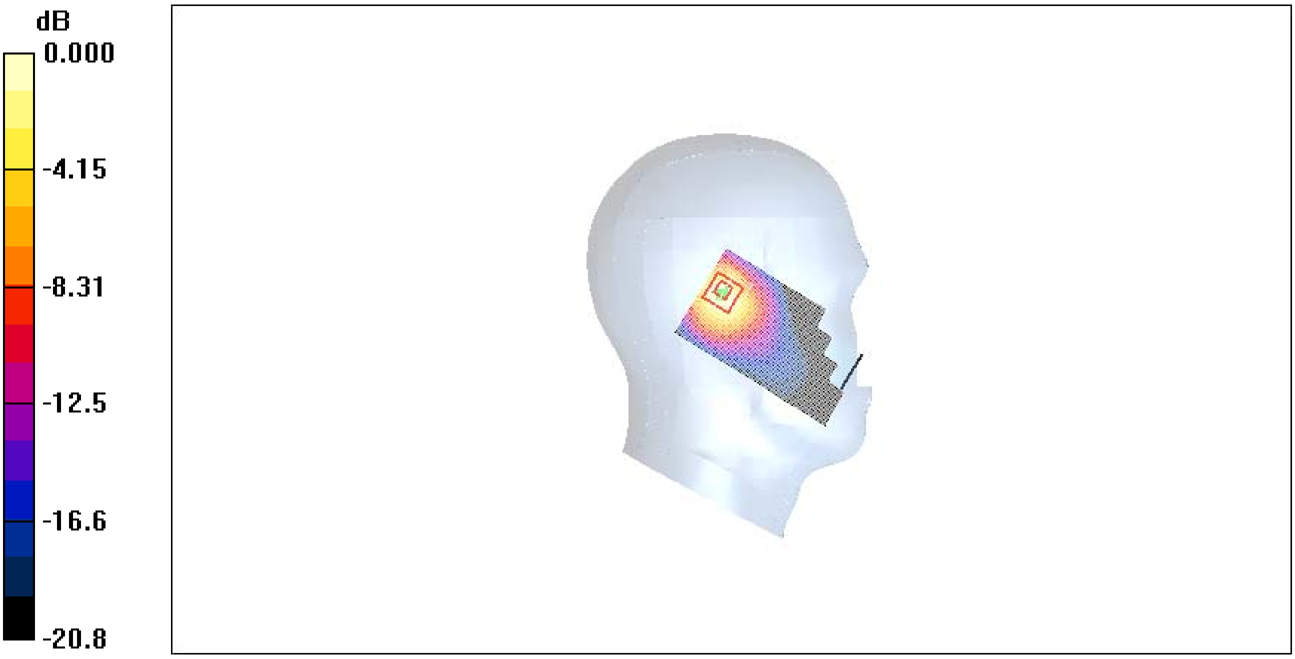

**Fig. 10 Z-Scan at power reference point (1900 MHz CH661)**

**1900 Left Tilt Low**

Date/Time: 2008-10-16 15:44:01
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used (interpolated): f = 1850.2 MHz; $\sigma$ = 1.36 mho/m; $\varepsilon_r$ = 40.9; $\rho$ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: GSM 1900MHz new Frequency: 1850.2 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Tilt Low/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.14 mW/g

**Tilt Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 23.0 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 2.09 W/kg
**SAR(1 g) = 0.978 mW/g; SAR(10 g) = 0.470 mW/g**
Maximum value of SAR (measured) = 1.10 mW/g




0 dB = 1.10mW/g

**Fig. 11 1900 MHz CH512**

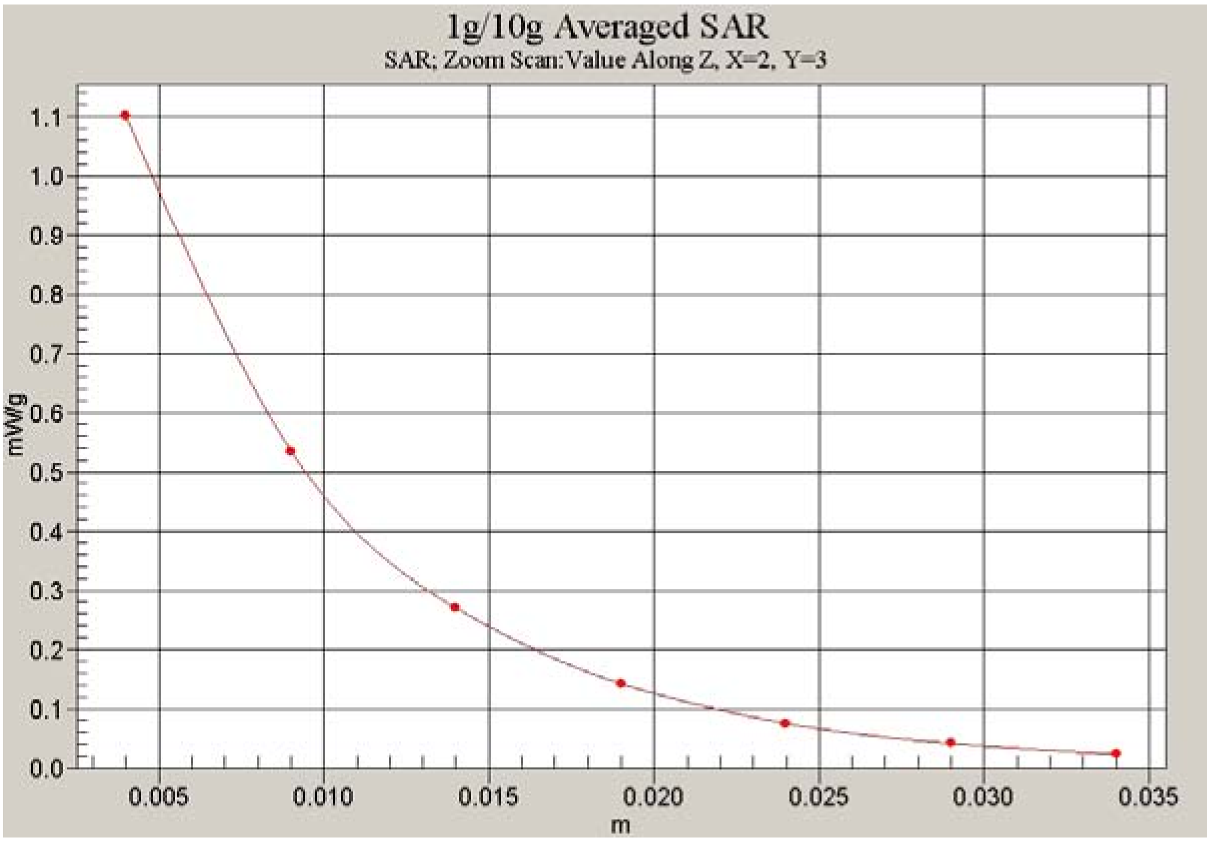
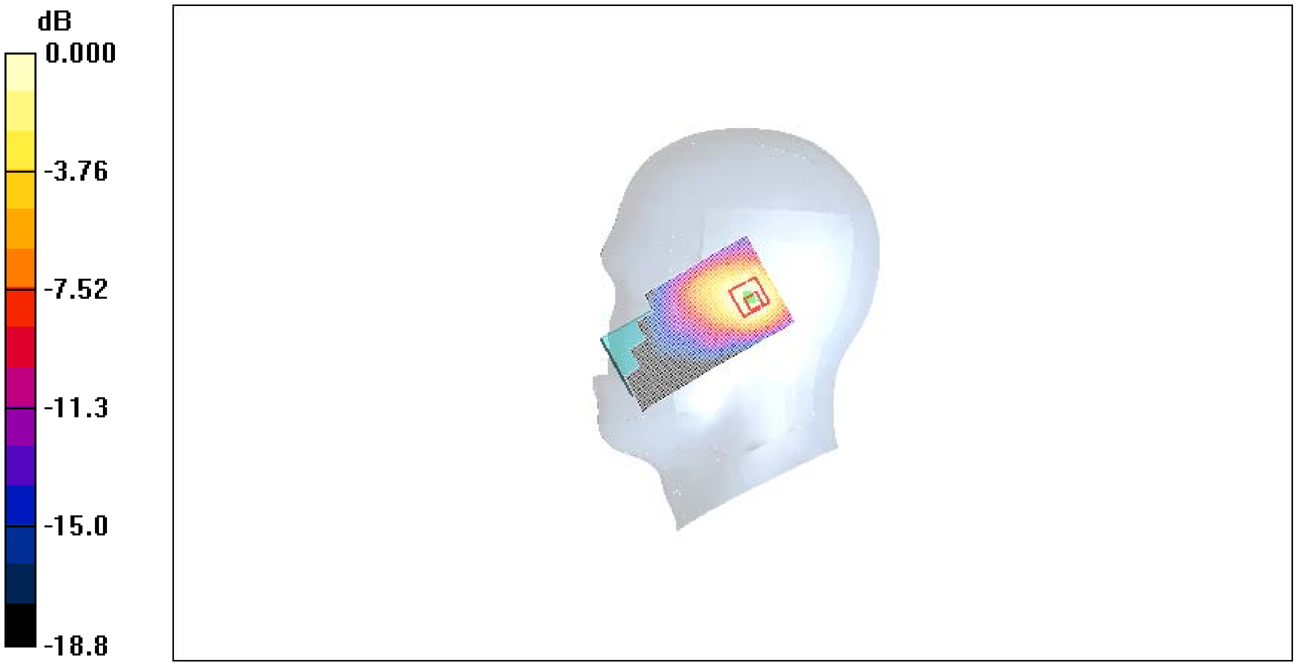



**Fig. 12 Z-Scan at power reference point (1900 MHz CH512)**

**1900 Right Cheek High**
Date/Time: 2008-10-16 9:56:15
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used: f = 1910 MHz; σ = 1.39 mho/m; $\varepsilon_r$ = 40.8; ρ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: GSM 1900MHz new Frequency: 1909.8 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Cheek High/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.423 mW/g

**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.2 V/m; Power Drift = -0.200 dB
Peak SAR (extrapolated) = 0.658 W/kg
**SAR(1 g) = 0.346 mW/g; SAR(10 g) = 0.187 mW/g**
Maximum value of SAR (measured) = 0.383 mW/g




0 dB = 0.383mW/g

**Fig. 13 1900 MHz CH810**

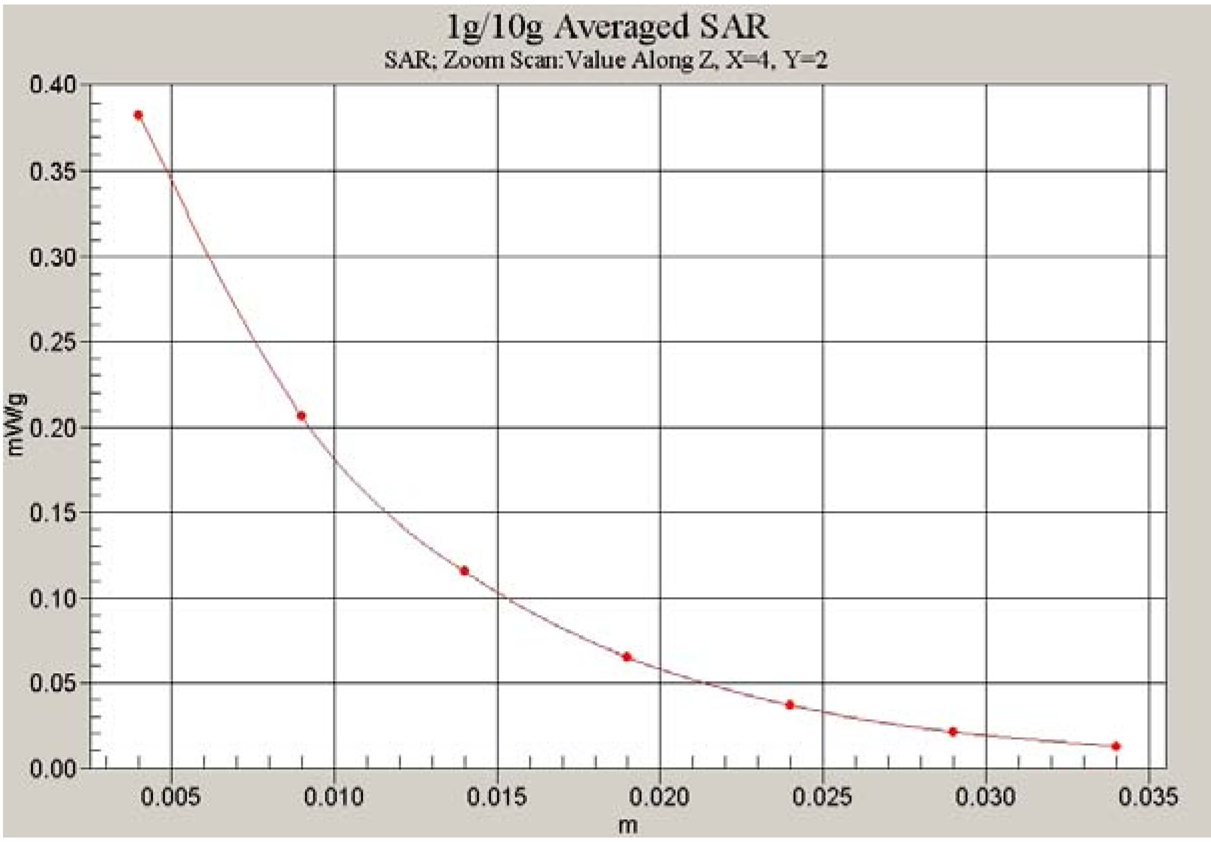


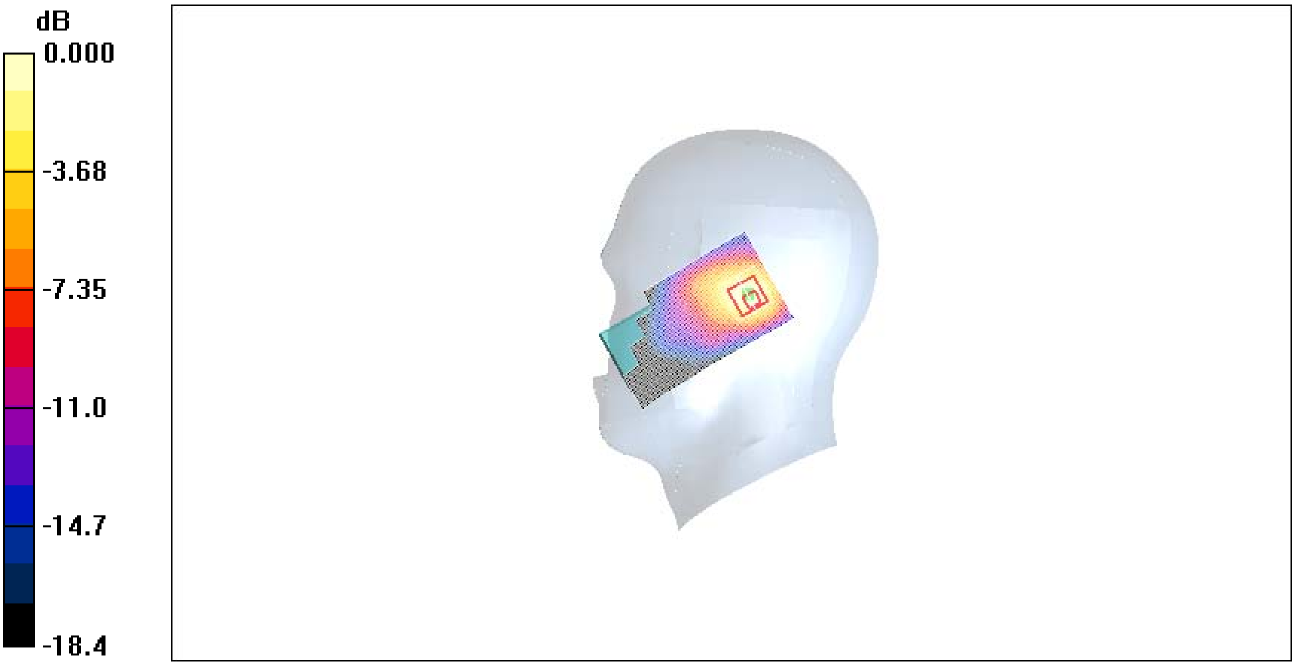

**Fig. 14 Z-Scan at power reference point (1900 MHz CH810)**

## 1900 Right Cheek Middle

Date/Time: 2008-10-16 10:14:42
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.37 mho/m; $\varepsilon_r$ = 41; $\rho$ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: GSM 1900MHz new Frequency: 1880 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Cheek Middle/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.495 mW/g

**Cheek Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.4 V/m; Power Drift = 0.200 dB
Peak SAR (extrapolated) = 0.823 W/kg
**SAR(1 g) = 0.432 mW/g; SAR(10 g) = 0.232 mW/g**
Maximum value of SAR (measured) = 0.489 mW/g




0 dB = 0.489mW/g

**Fig. 15 1900 MHz CH661**

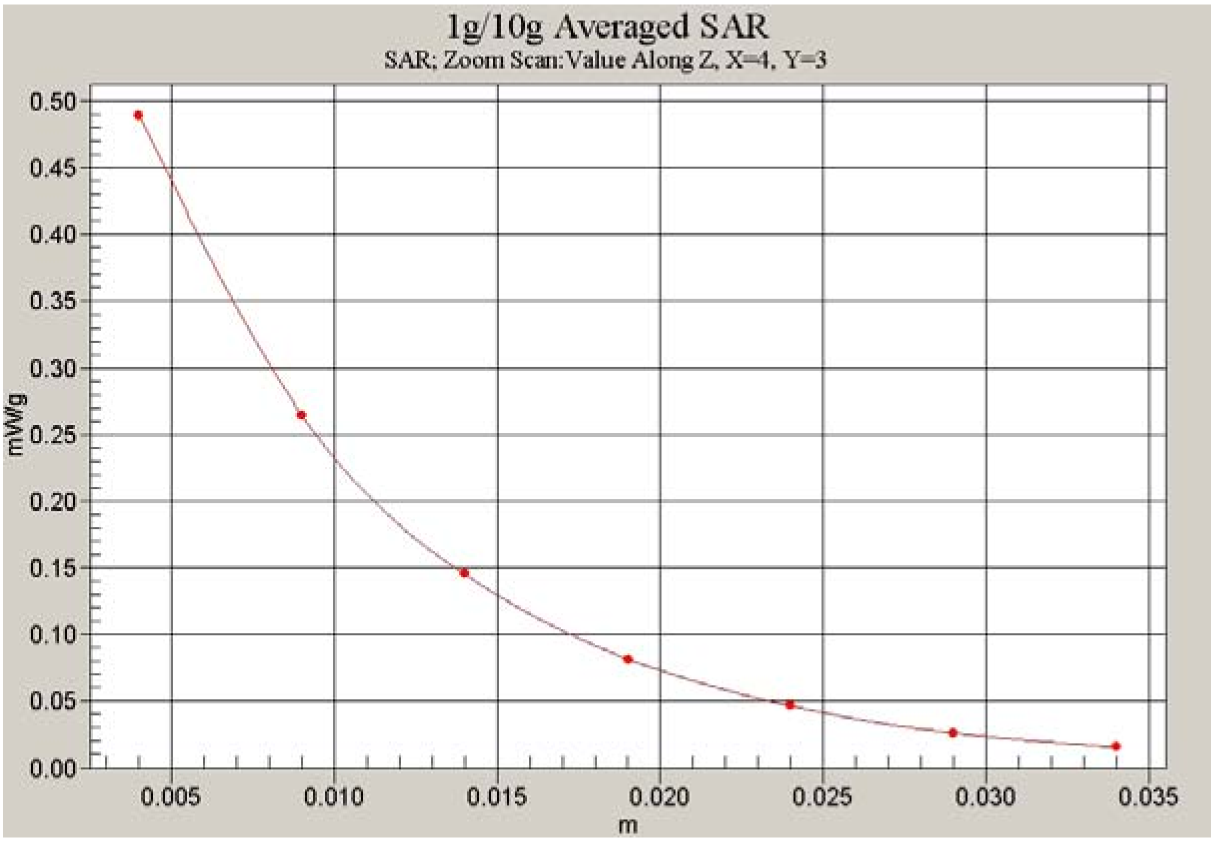
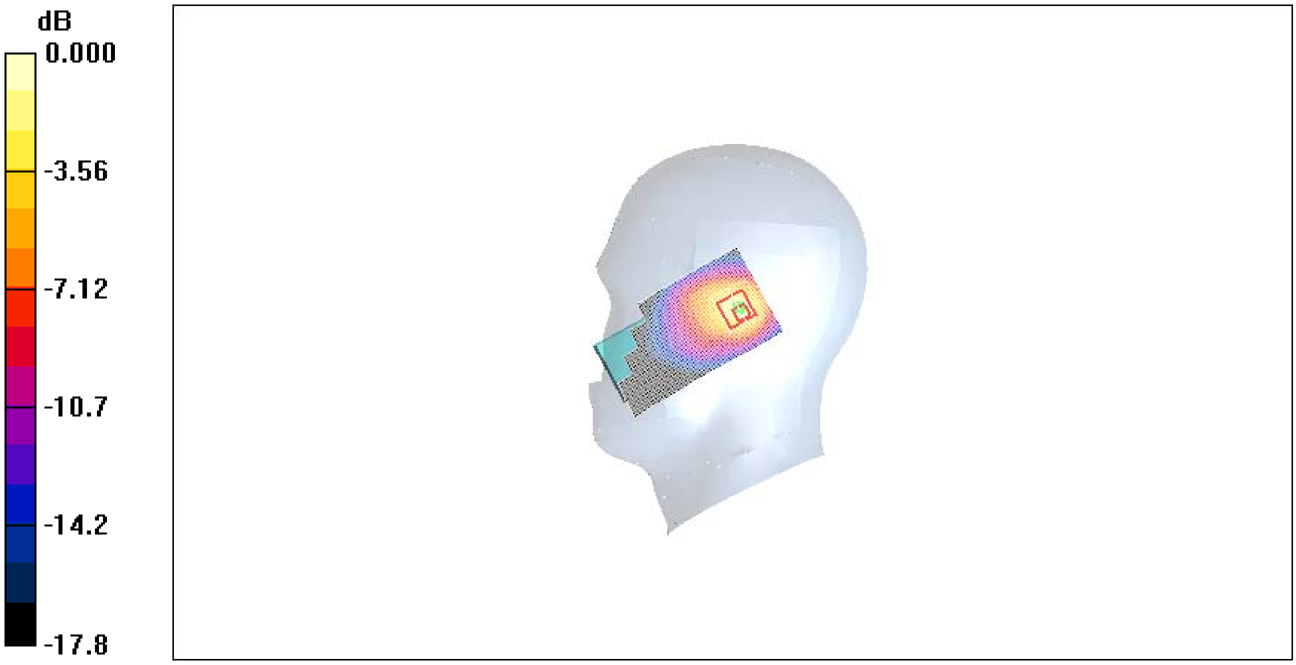



**Fig. 16 Z-Scan at power reference point (1900 MHz CH661)**

**1900 Right Cheek Low**
Date/Time: 2008-10-16 10:33:17
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.36 mho/m; $\varepsilon_r$ = 40.9; ρ = 1000 kg/$m^3$
Ambient Temperature:23.3°C Liqiud Temperature: 22.5°C
Communication System: GSM 1900MHz new Frequency: 1850.2 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Cheek Low/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.710 mW/g

**Cheek Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.9 V/m; Power Drift = 0.159 dB
Peak SAR (extrapolated) = 1.51 W/kg
**SAR(1 g) = 0.785 mW/g; SAR(10 g) = 0.428 mW/g**
Maximum value of SAR (measured) = 0.882 mW/g




0 dB = 0.882mW/g

**Fig. 17 1900 MHz CH512**

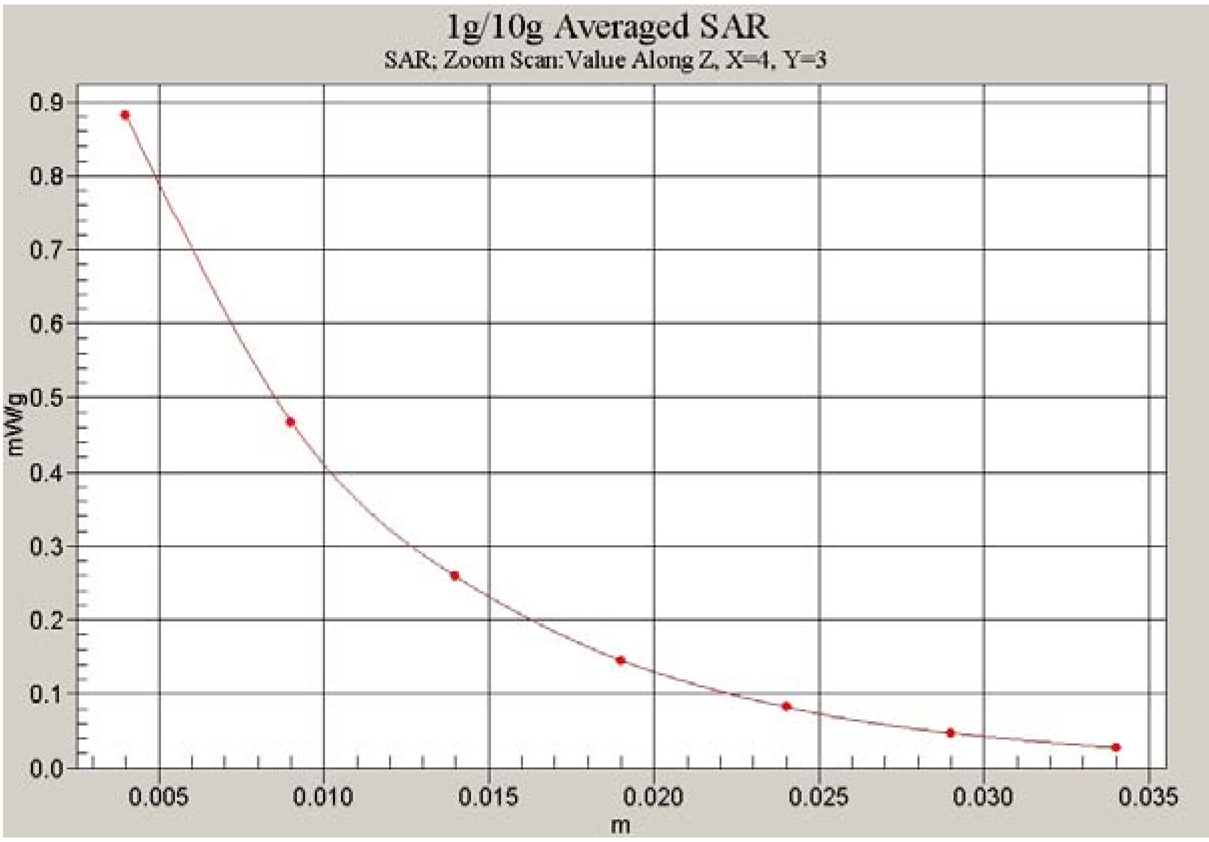


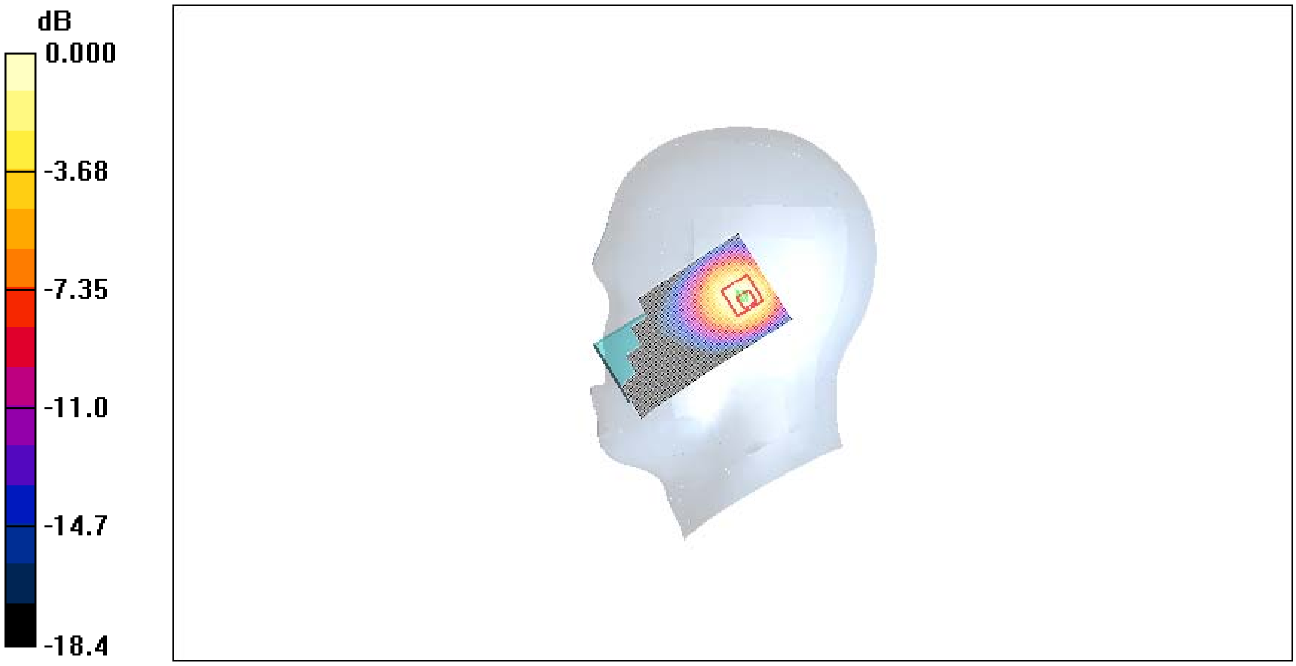

**Fig. 18 Z-Scan at power reference point (1900 MHz CH512)**

**1900 Right Tilt High**

Date/Time: 2008-10-16 11:49:56
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used: f = 1910 MHz; $\sigma$ = 1.39 mho/m; $\varepsilon_r$ = 40.8; $\rho$ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: GSM 1900MHz new Frequency: 1909.8 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Tilt High/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.680 mW/g

**Tilt High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.5 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 1.03 W/kg
**SAR(1 g) = 0.546 mW/g; SAR(10 g) = 0.293 mW/g**
Maximum value of SAR (measured) = 0.608 mW/g




0 dB = 0.608mW/g

**Fig. 19 1900 MHz CH810**

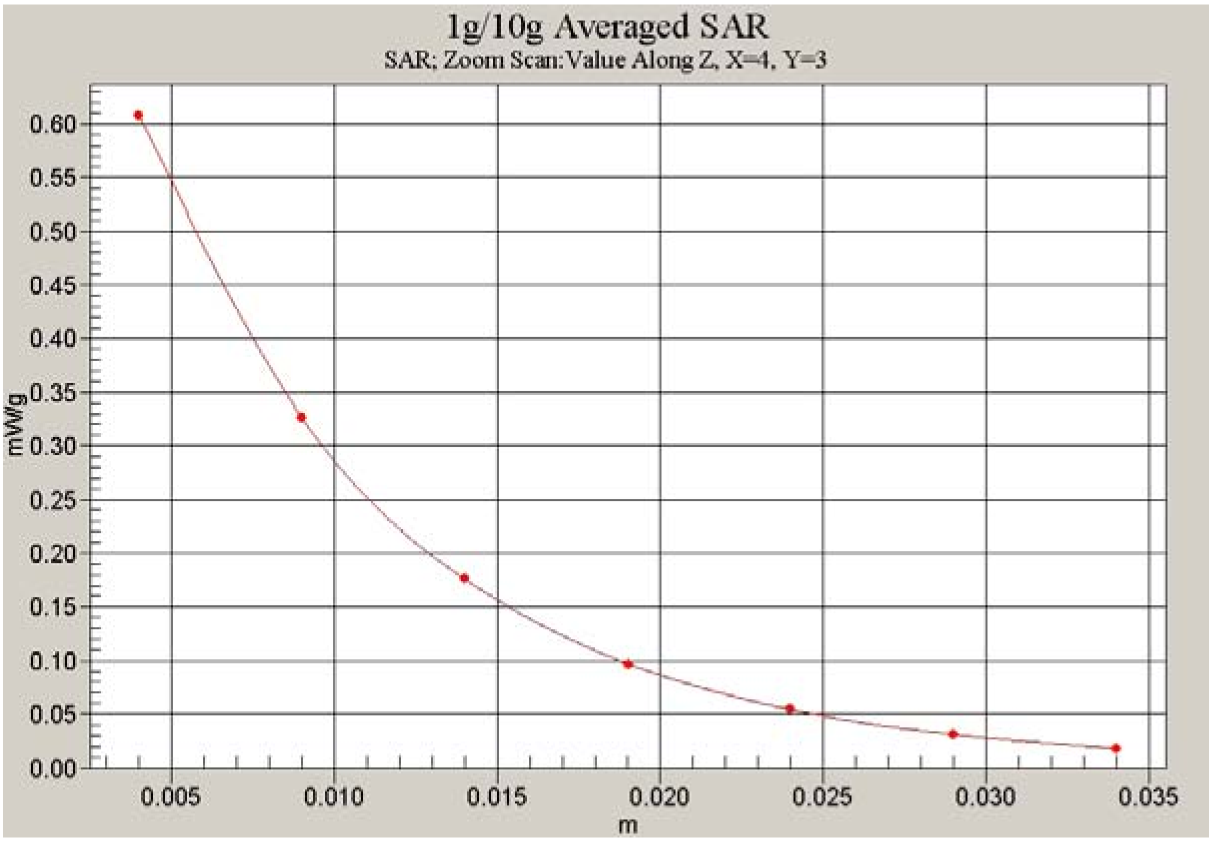
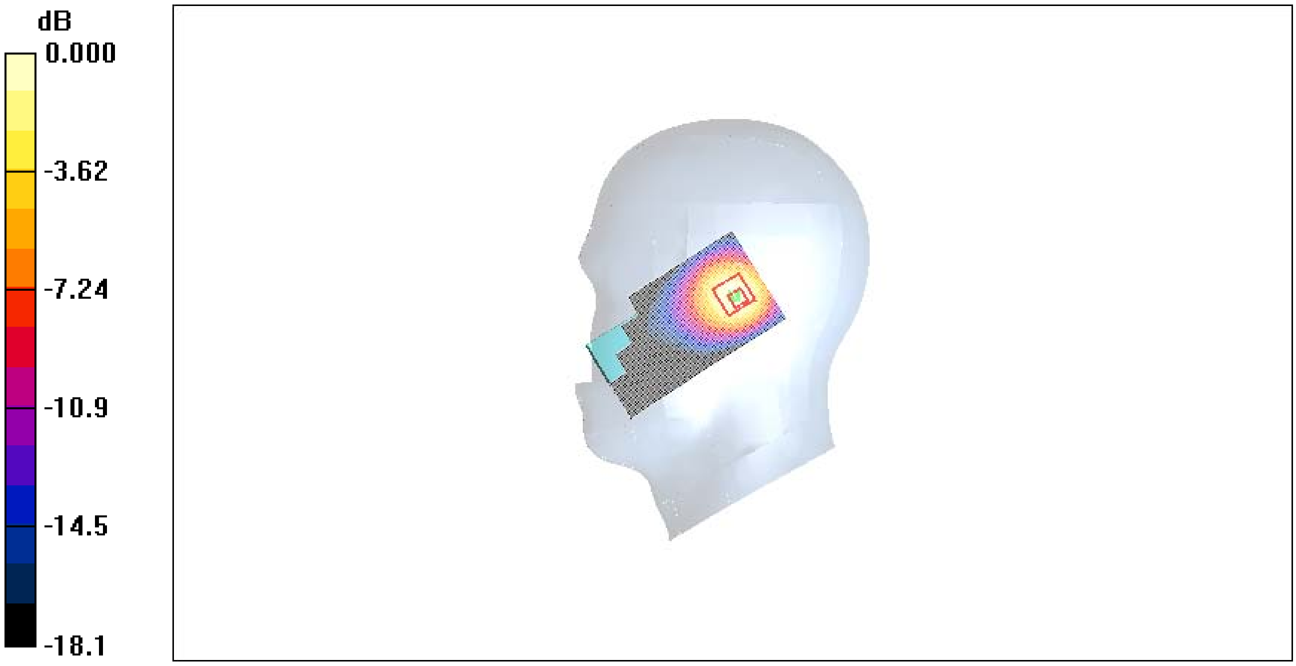



**Fig. 20 Z-Scan at power reference point (1900 MHz CH810)**

**1900 Right Tilt Middle**
Date/Time: 2008-10-16 11:22:10
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.37 mho/m; $\varepsilon_r$ = 41; $\rho$ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: GSM 1900MHz new Frequency: 1880 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Tilt Middle/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.990 mW/g

**Tilt Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.6 V/m; Power Drift = 0.028 dB
Peak SAR (extrapolated) = 1.49 W/kg
**SAR(1 g) = 0.783 mW/g; SAR(10 g) = 0.424 mW/g**
Maximum value of SAR (measured) = 0.866 mW/g




0 dB = 0.866mW/g

**Fig.21 1900 MHz CH661**

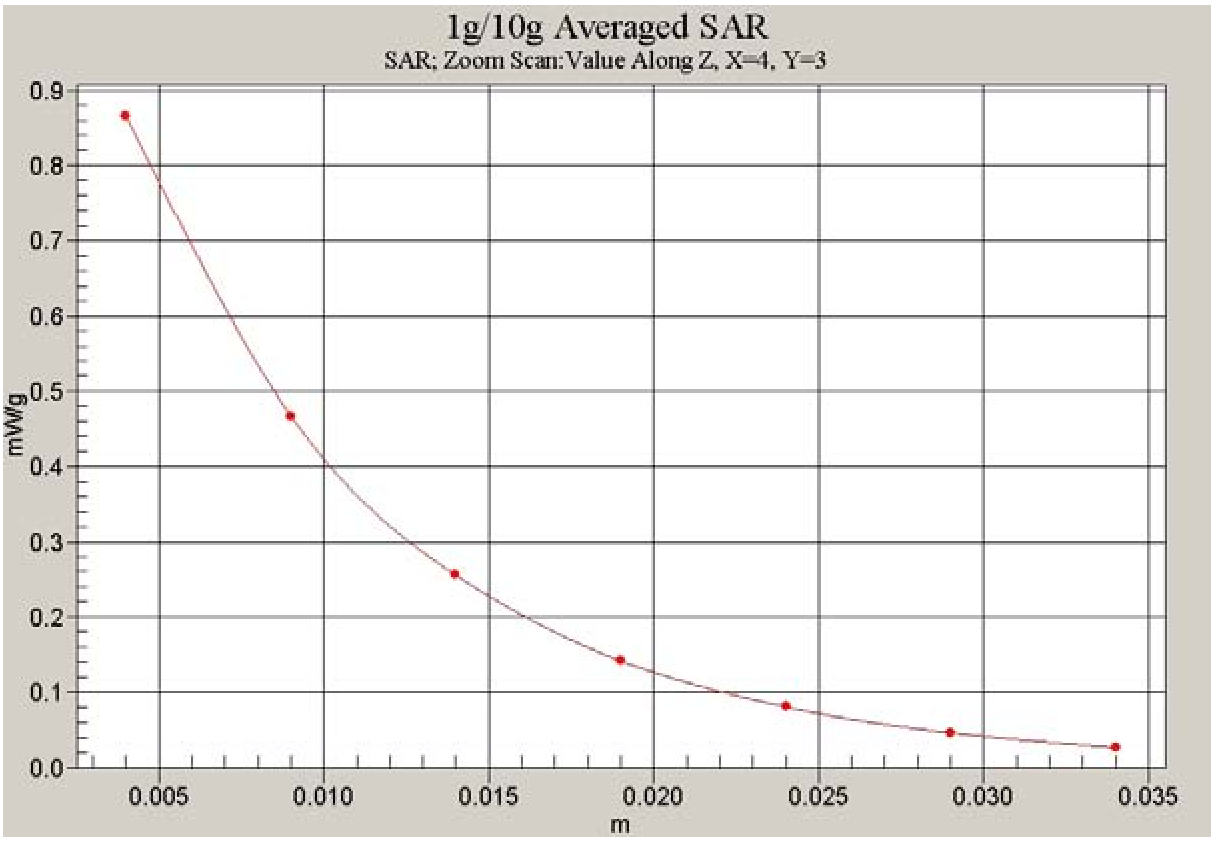


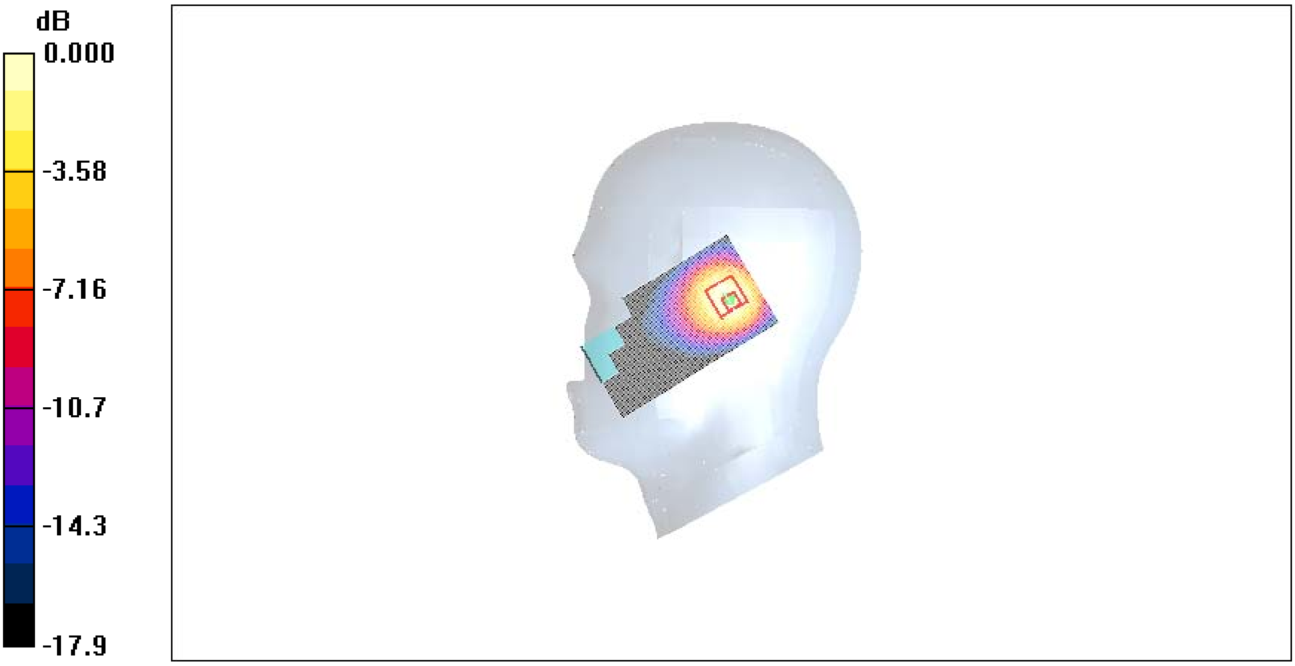

**Fig. 22 Z-Scan at power reference point (1900 MHz CH661)**

**1900 Right Tilt Low**

Date/Time: 2008-10-16 10:52:08
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used (interpolated): f = 1850.2 MHz; $\sigma$ = 1.36 mho/m; $\varepsilon_r$ = 40.9; $\rho$ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: GSM 1900MHz new Frequency: 1850.2 MHz Duty Cycle: 1:8.3
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

**Tilt Low/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.37 mW/g

**Tilt Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.3 V/m; Power Drift = -0.015 dB
Peak SAR (extrapolated) = 2.04 W/kg
**SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.599 mW/g**
Maximum value of SAR (measured) = 1.20 mW/g




0 dB = 1.20mW/g

**Fig.23 1900 MHz CH512**

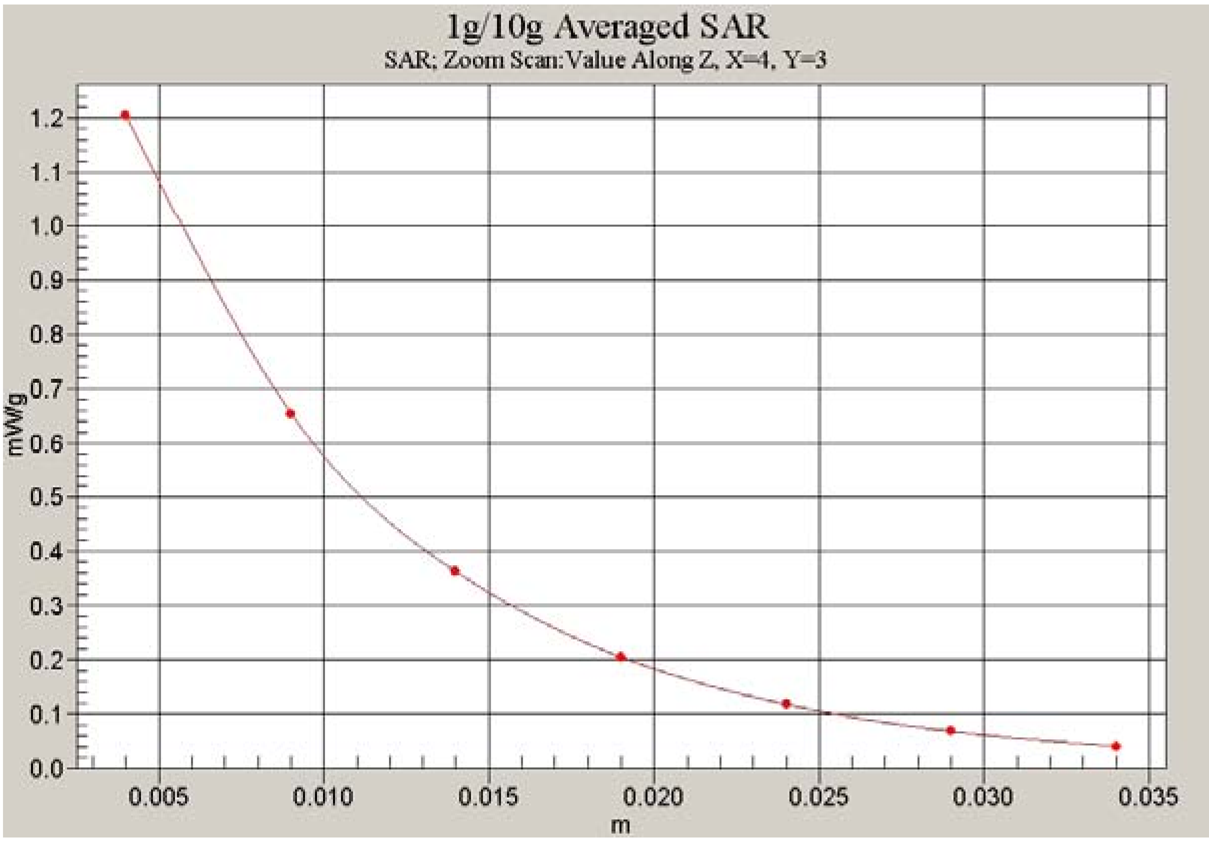



**Fig. 24 Z-Scan at power reference point (1900 MHz CH512)**

**1900 Body Towards Ground High with GPRS**

Date/Time: 2008-10-16 17:03:19

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used: f = 1910 MHz; $\sigma$ = 1.59 mho/m; $\varepsilon_r$ = 51.6; $\rho$ = 1000 kg/$m^3$

Ambient Temperature:23.3°C    Liqiud Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Class 12 Frequency: 1909.8 MHz Duty Cycle: 1:2

Probe: ES3DV3 - SN3149 ConvF(4.85, 4.85, 4.85)

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

Maximum value of SAR (interpolated) = 0.641 mW/g

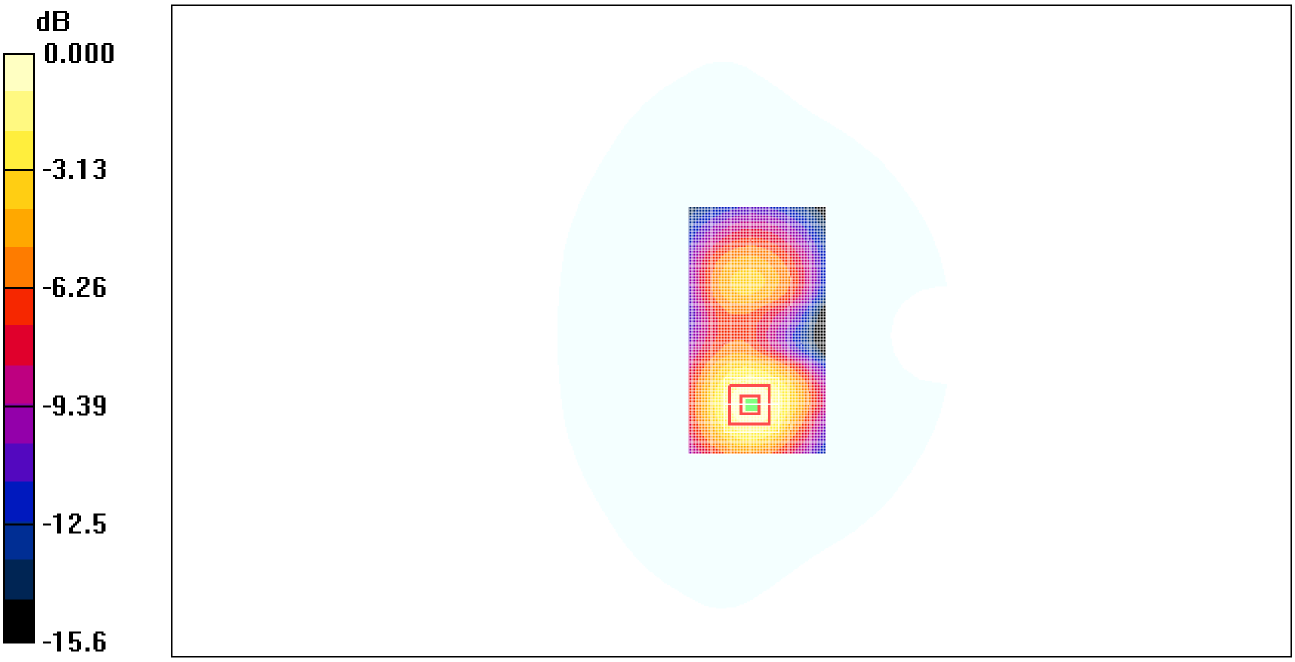
**Toward Ground High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.79 V/m; Power Drift = 0.079 dB

Peak SAR (extrapolated) = 0.969 W/kg

**SAR(1 g) = 0.582 mW/g; SAR(10 g) = 0.343 mW/g**

Maximum value of SAR (measured) = 0.639 mW/g




0 dB = 0.639mW/g

**Fig. 25 1900 MHz CH810**

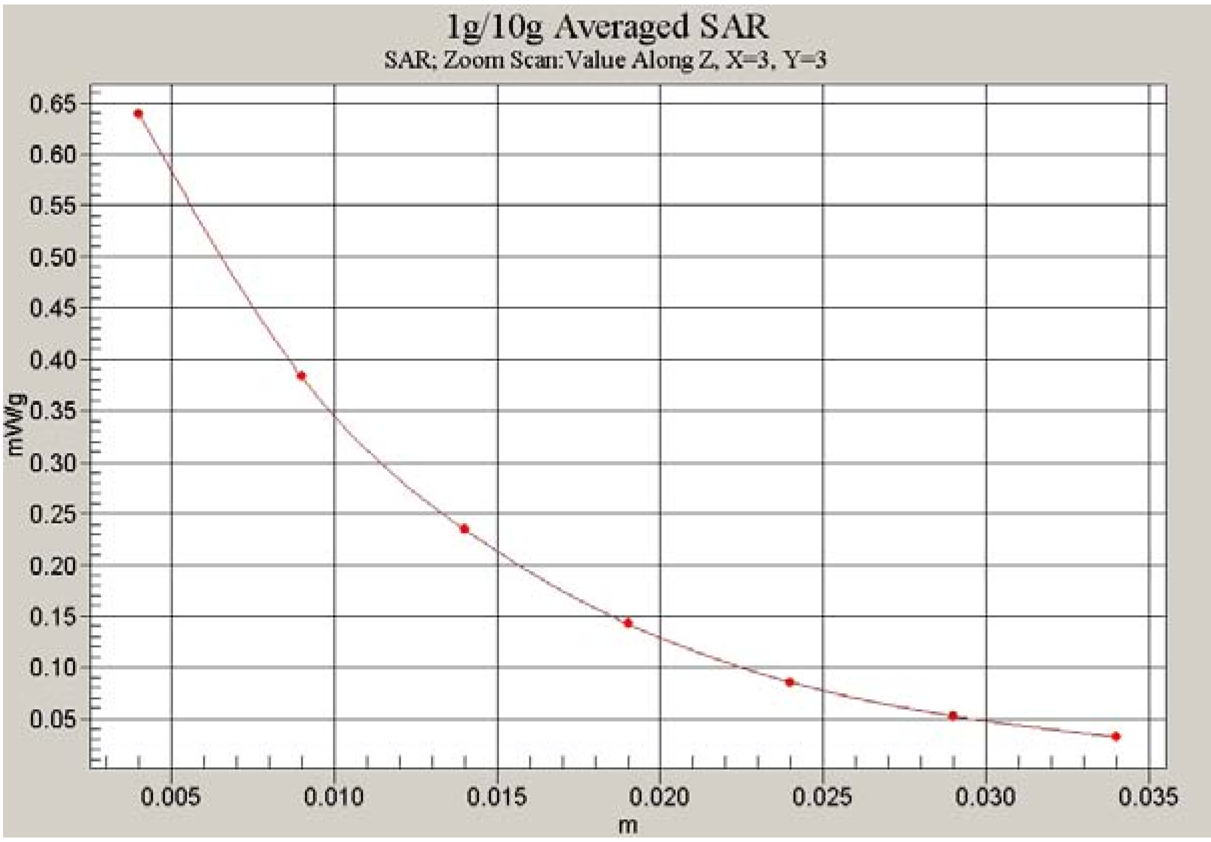



**Fig. 26 Z-Scan at power reference point (1900 MHz CH810)**

**1900 Body Towards Ground Middle with GPRS**

Date/Time: 2008-10-16 17:17:26

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used: f = 1880 MHz; $\sigma$ = 1.56 mho/m; $\varepsilon_r$ = 51.8; $\rho$ = 1000 kg/$m^3$

Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C

Communication System: GSM 1900MHz GPRS Class 12 Frequency: 1880 MHz Duty Cycle: 1:2

Probe: ES3DV3 - SN3149 ConvF(4.85, 4.85, 4.85)

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

Maximum value of SAR (interpolated) = 0.744 mW/g

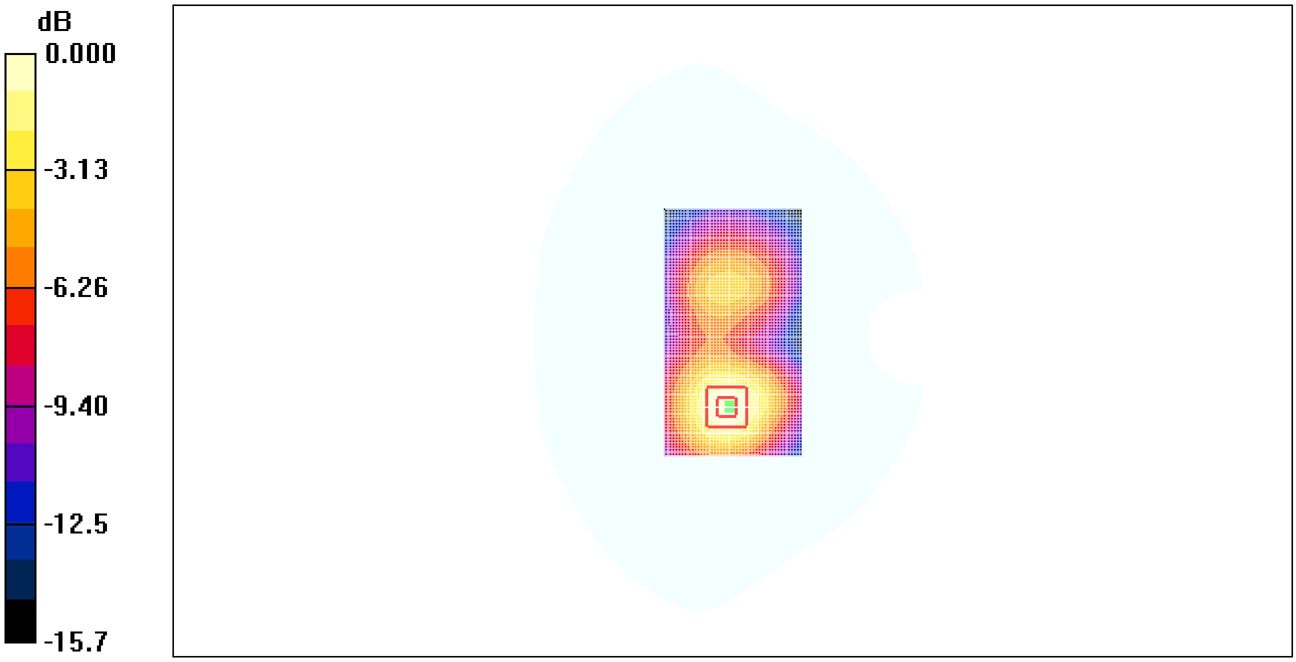
**Toward Ground Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.2 V/m; Power Drift = 0.053 dB

Peak SAR (extrapolated) = 1.12 W/kg

**SAR(1 g) = 0.672 mW/g; SAR(10 g) = 0.394 mW/g**

Maximum value of SAR (measured) = 0.736 mW/g




0 dB = 0.736mW/g

**Fig. 27 1900 MHz CH661**

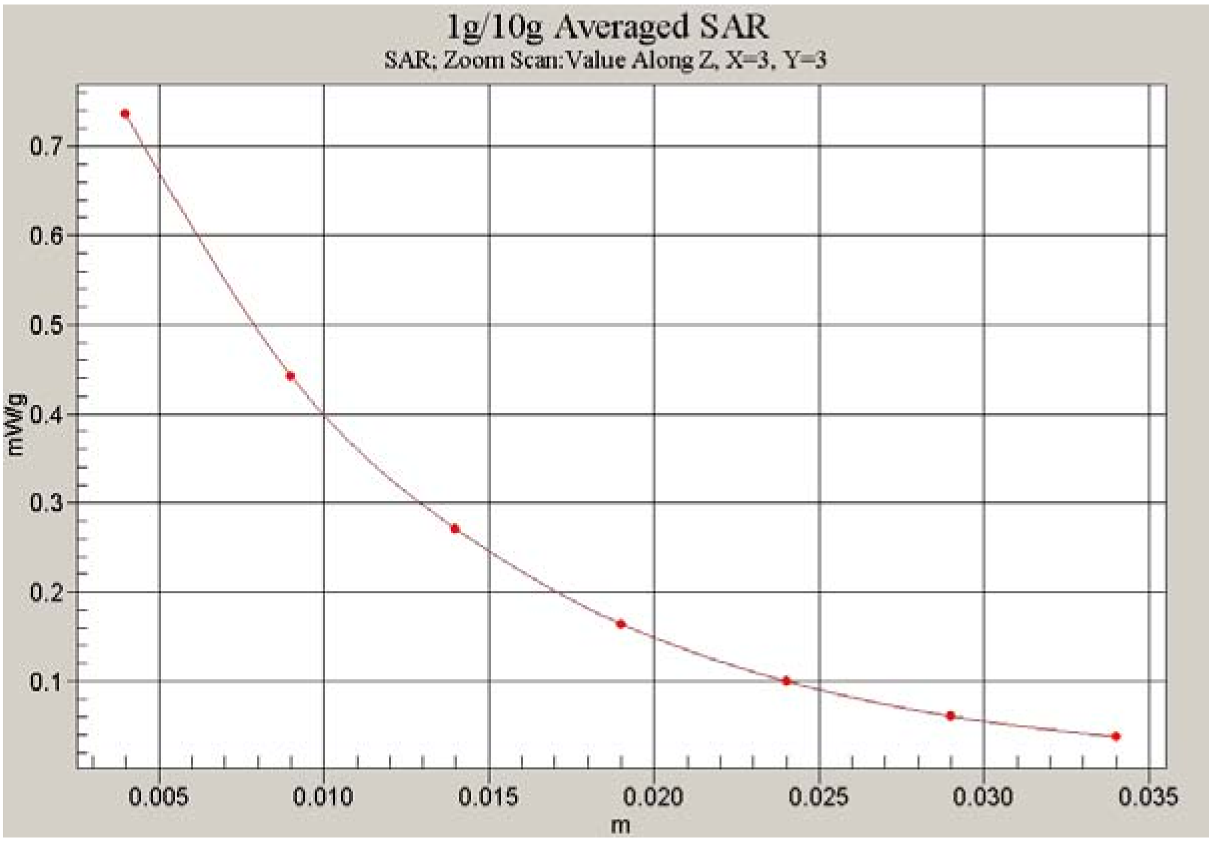



**Fig. 28 Z-Scan at power reference point (1900 MHz CH661)**

**1900 Body Towards Ground Low with GPRS**

Date/Time: 2008-10-16 17:33:02

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used (interpolated): f = 1850.2 MHz; $\sigma$ = 1.54 mho/m; $\varepsilon_r$ = 51.9; $\rho$ = 1000 kg/$m^3$

Ambient Temperature:23.3°C Liqiud Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Class 12 Frequency: 1850.2 MHz Duty Cycle: 1:2

Probe: ES3DV3 - SN3149 ConvF(4.85, 4.85, 4.85)

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

Maximum value of SAR (interpolated) = 0.911 mW/g

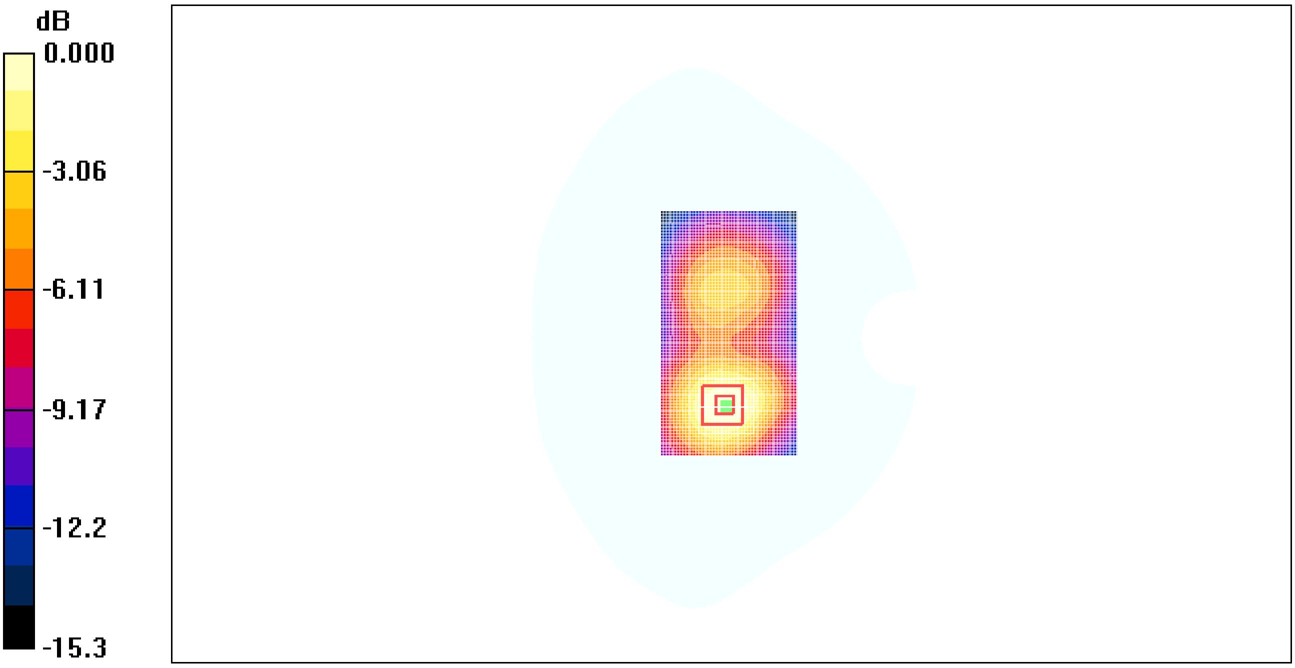
**Toward Ground Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.3 V/m; Power Drift = -0.134 dB

Peak SAR (extrapolated) = 1.30 W/kg

**SAR(1 g) = 0.784 mW/g; SAR(10 g) = 0.461 mW/g**

Maximum value of SAR (measured) = 0.854 mW/g




0 dB = 0.854mW/g

**Fig. 29 1900 MHz CH512**

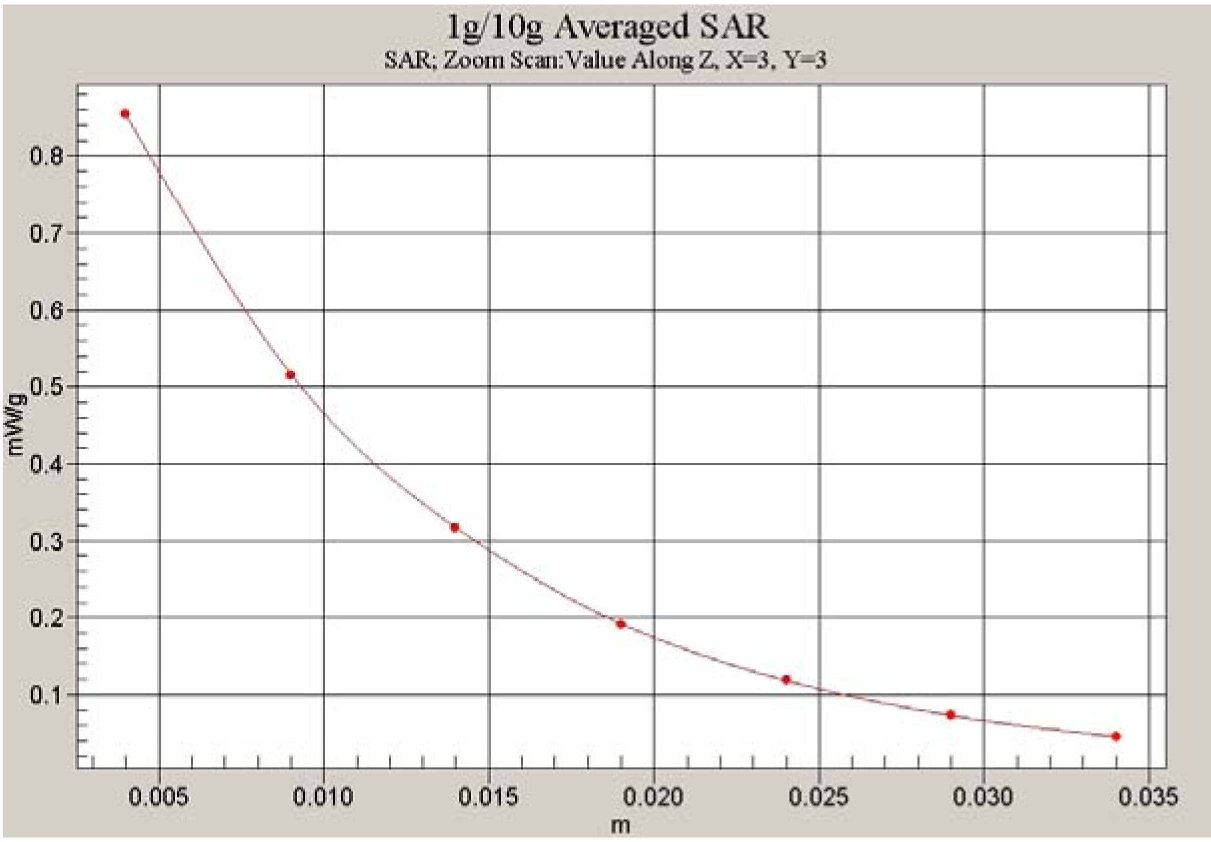



**Fig. 30 Z-Scan at power reference point (1900 MHz CH512)**

**1900 Body Towards Phantom High with GPRS**

Date/Time: 2008-10-16 18:33:17

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used: f = 1910 MHz; $\sigma$ = 1.59 mho/m; $\varepsilon_r$ = 51.6; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:23.3$^o$C      Liqiud Temperature: 22.5$^o$C

Communication System: GSM 1900MHz GPRS Class 12 Frequency: 1909.8 MHz Duty Cycle: 1:2

Probe: ES3DV3 - SN3149 ConvF(4.85, 4.85, 4.85)

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

Maximum value of SAR (interpolated) = 0.320 mW/g

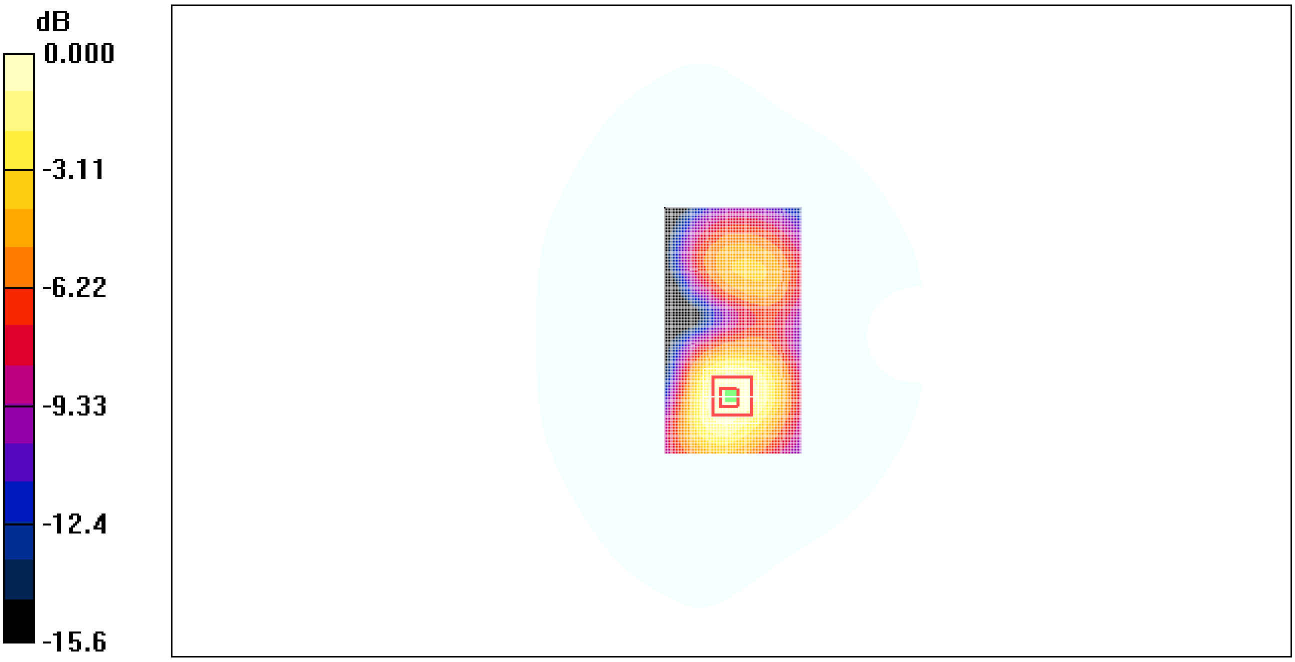
**Toward Phantom High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.67 V/m; Power Drift = 0.185 dB

Peak SAR (extrapolated) = 0.445 W/kg

**SAR(1 g) = 0.279 mW/g; SAR(10 g) = 0.171 mW/g**

Maximum value of SAR (measured) = 0.301 mW/g




0 dB = 0.301mW/g

**Fig. 31 1900 MHz CH810**

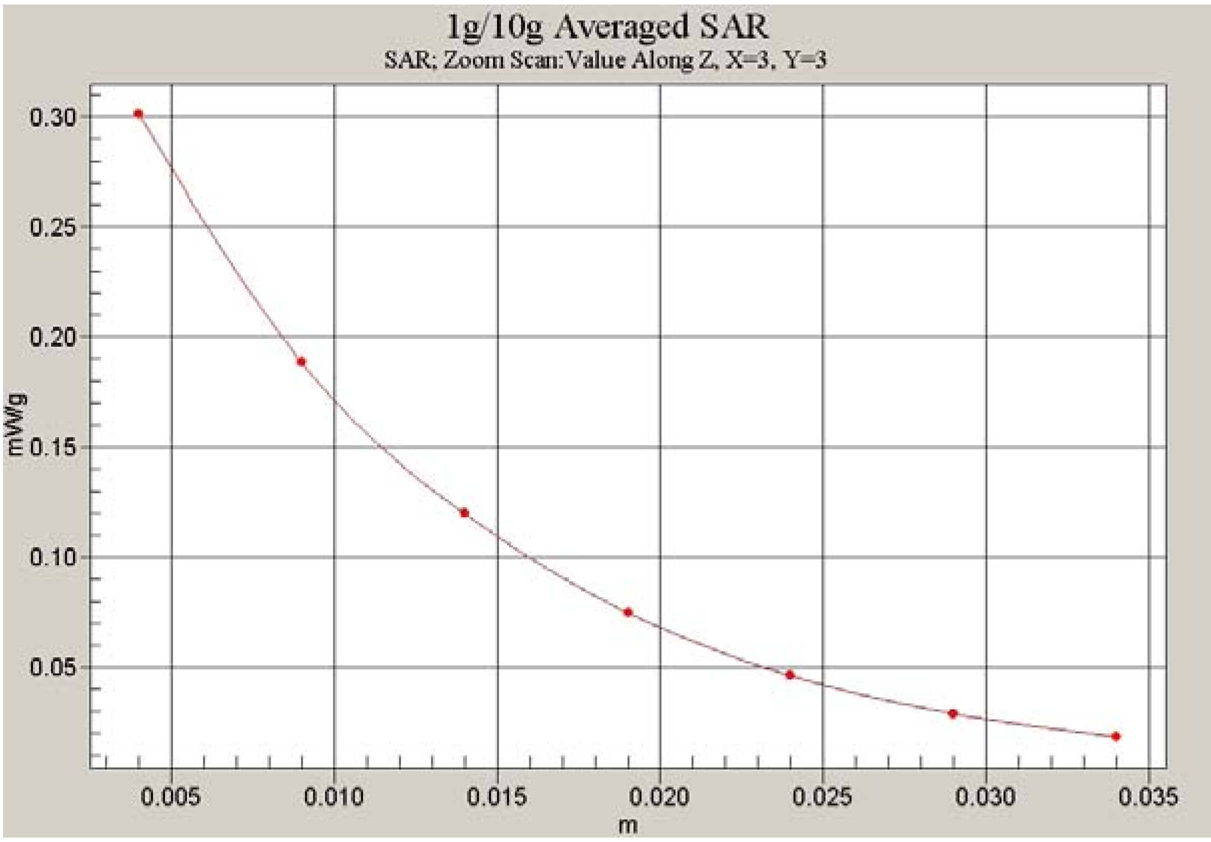


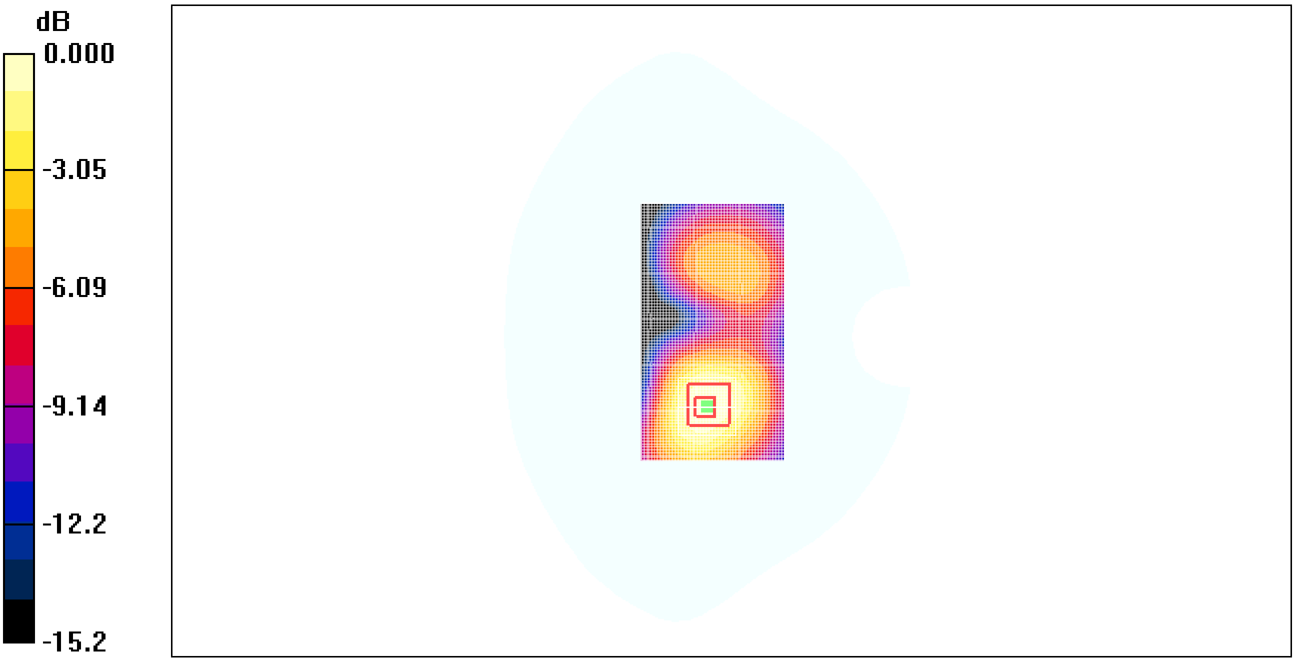

**Fig.32 Z-Scan at power reference point (1900 MHz CH810)**

**1900 Body Towards Phantom Middle with GPRS**

Date/Time: 2008-10-16 18:14:27
Electronics: DAE4 Sn771
Medium: Body 1900 MHz
Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; $\varepsilon_r$ = 51.8; ρ = 1000 kg/m$^3$
Ambient Temperature:23.3°C Liqiud Temperature: 22.5°C
Communication System: GSM 1900MHz GPRS Class 12 Frequency: 1880 MHz Duty Cycle: 1:2
Probe: ES3DV3 - SN3149 ConvF(4.85, 4.85, 4.85)

**Toward Phantom Middle/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.366 mW/g

**Toward Phantom Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.74 V/m; Power Drift = -0.141 dB
Peak SAR (extrapolated) = 0.515 W/kg
**SAR(1 g) = 0.320 mW/g; SAR(10 g) = 0.194 mW/g**
Maximum value of SAR (measured) = 0.346 mW/g




0 dB = 0.346mW/g

**Fig. 33 1900 MHz CH661**

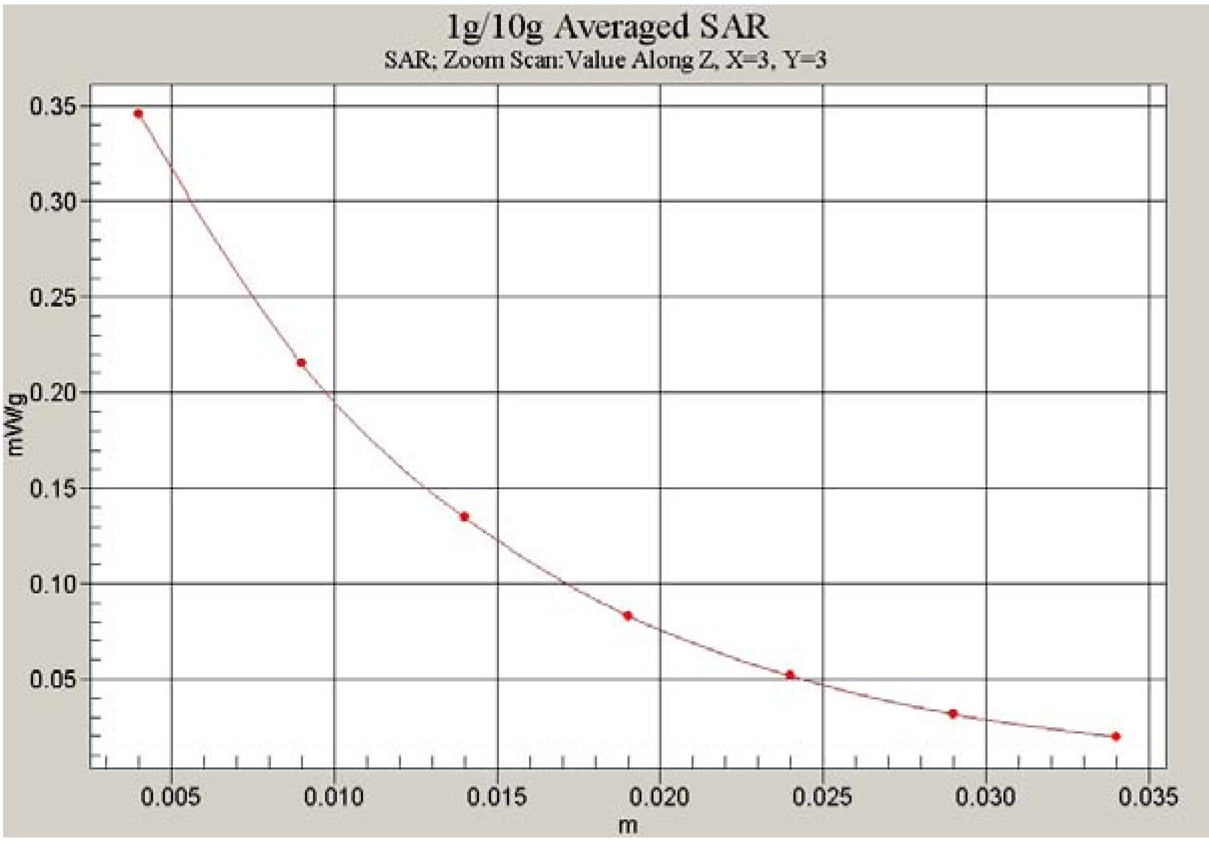



**Fig. 34 Z-Scan at power reference point (1900 MHz CH661)**

**1900 Body Towards Phantom Low with GPRS**

Date/Time: 2008-10-16 17:55:33

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; $\varepsilon_r$ = 51.8; ρ = 1000 kg/m$^3$

Ambient Temperature:23.3°C Liqiud Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Class 12 Frequency: 1880 MHz Duty Cycle: 1:2

Probe: ES3DV3 - SN3149 ConvF(4.85, 4.85, 4.85)

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

Maximum value of SAR (interpolated) = 0.433 mW/g

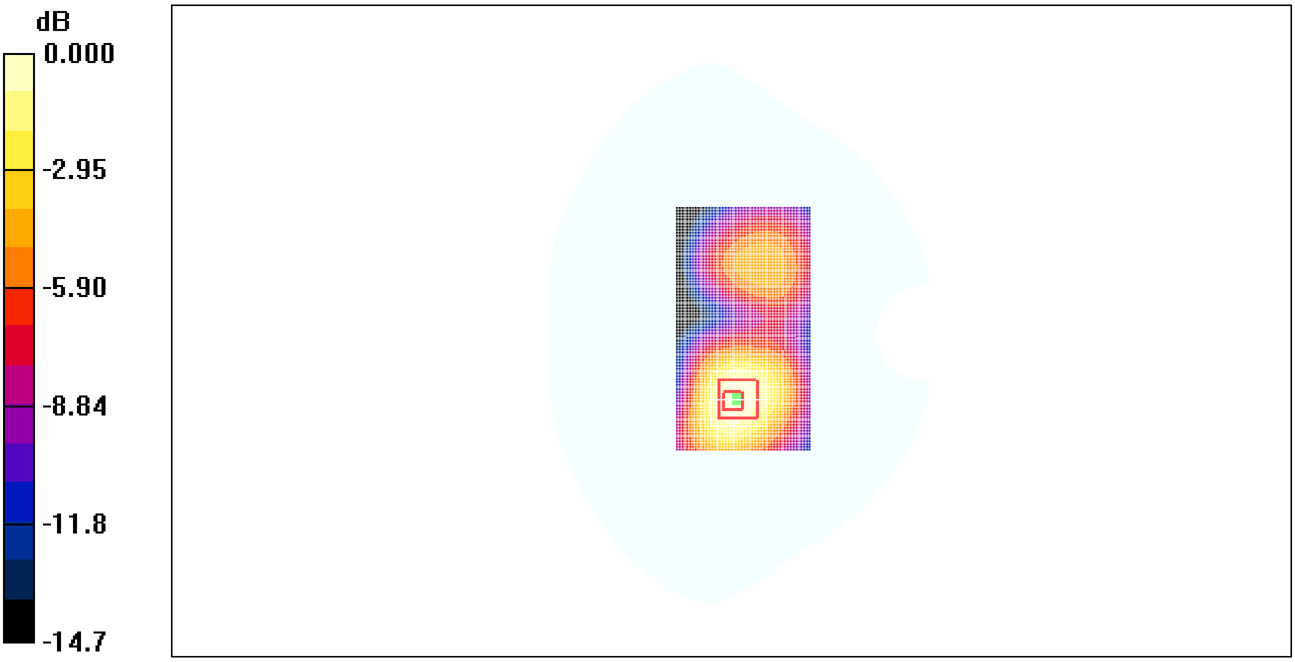
**Toward Phantom Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.44 V/m; Power Drift = 0.124 dB

Peak SAR (extrapolated) = 0.626 W/kg

**SAR(1 g) = 0.385 mW/g; SAR(10 g) = 0.233 mW/g**

Maximum value of SAR (measured) = 0.414 mW/g




0 dB = 0.414mW/g

**Fig. 35 1900 MHz CH512**

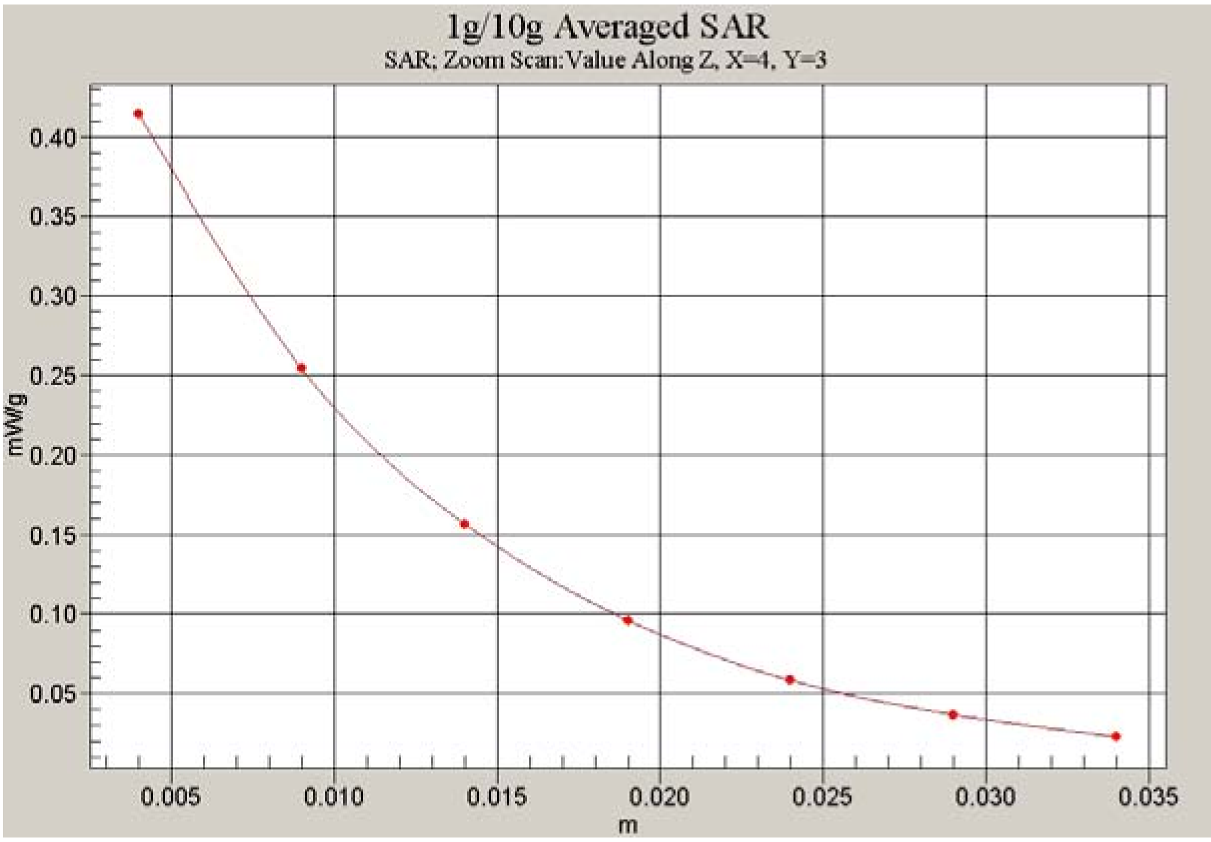



**Fig. 36 Z-Scan at power reference point (1900 MHz CH512)**

**1900 Body Towards Ground Low with EGPRS**

Date/Time: 2008-10-16 18:58:51

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used (interpolated): f = 1850.2 MHz; $\sigma$ = 1.54 mho/m; $\varepsilon_r$ = 51.9; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C

Communication System: GSM 1900MHz GPRS Class 12 Frequency: 1850.2 MHz Duty Cycle: 1:2

Probe: ES3DV3 - SN3149 ConvF(4.85, 4.85, 4.85)

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

Maximum value of SAR (interpolated) = 0.512 mW/g

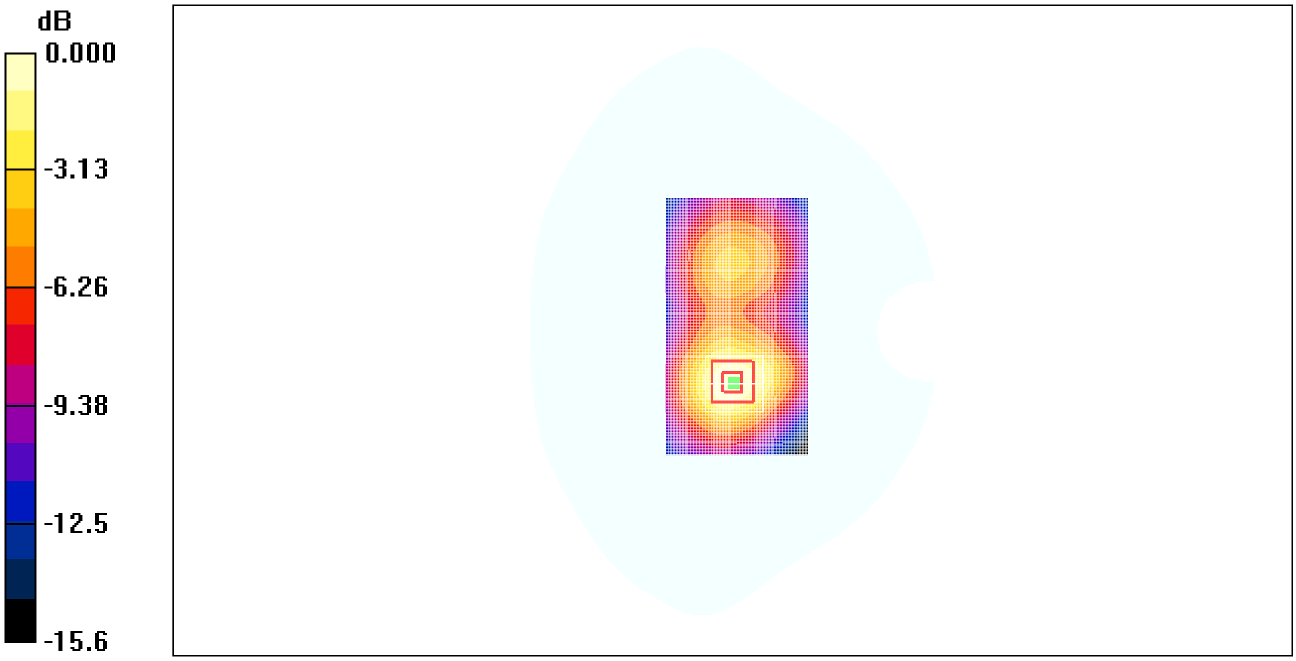
**Toward Ground Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.2 V/m; Power Drift = 0.009 dB

Peak SAR (extrapolated) = 0.752 W/kg

**SAR(1 g) = 0.449 mW/g; SAR(10 g) = 0.260 mW/g**

Maximum value of SAR (measured) = 0.486 mW/g




0 dB = 0.486mW/g

**Fig. 37 1900 MHz CH512**

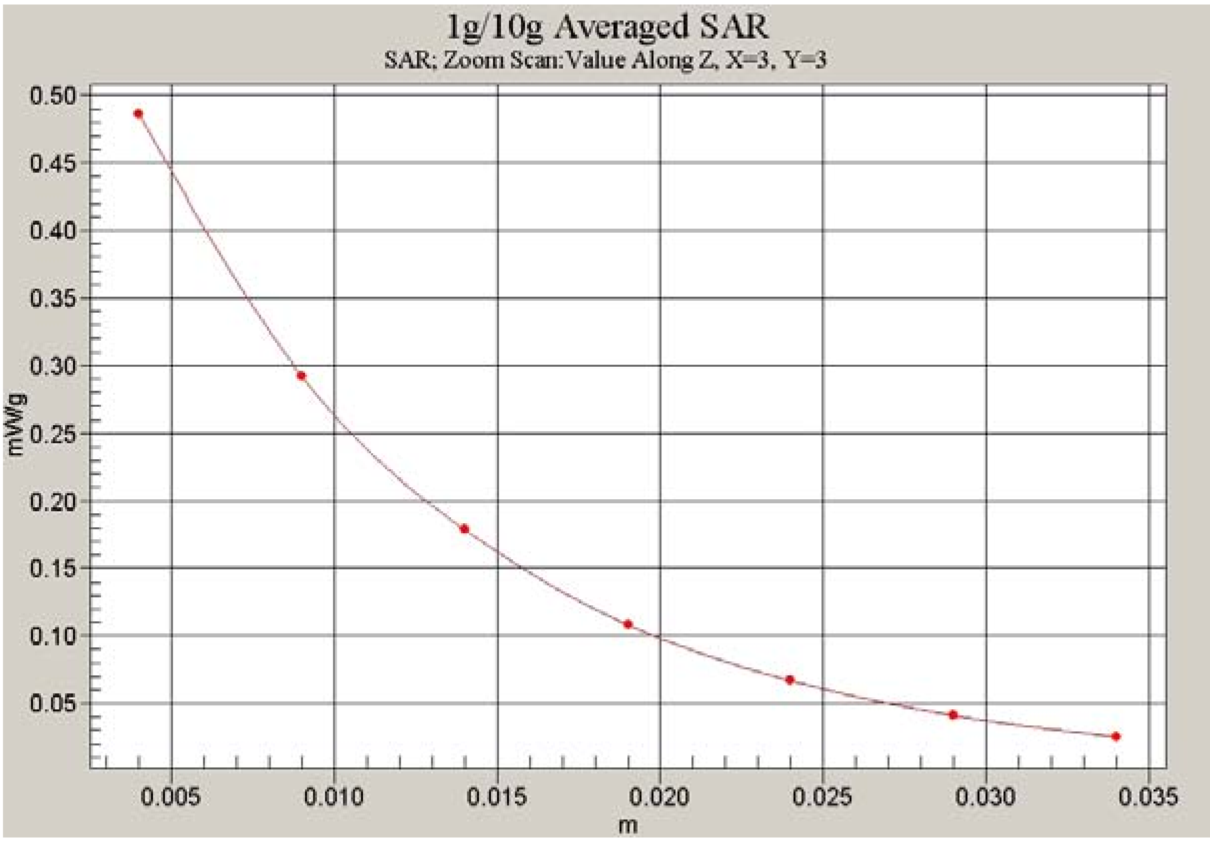



**Fig. 38 Z-Scan at power reference point (1900 MHz CH512)**

**1900 Body Towards Ground Low with Headset**

Date/Time: 2008-10-16 19:30:02

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.54 mho/m; $\varepsilon_r$ = 51.9; ρ = 1000 kg/$m^3$

Ambient Temperature:23.3°C    Liqiud Temperature: 22.5°C

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

Probe: ES3DV3 - SN3149 ConvF(4.85, 4.85, 4.85)

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

Maximum value of SAR (interpolated) = 0.366 mW/g

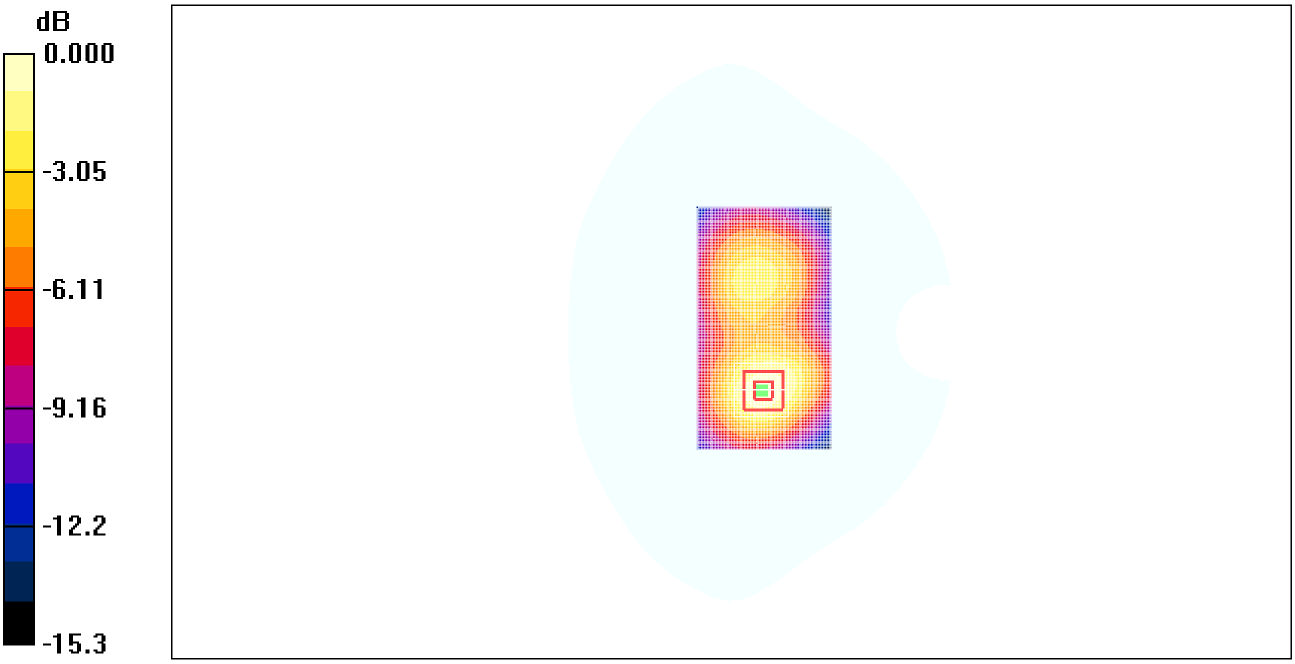
**Toward Ground Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.20 V/m; Power Drift = 0.081 dB

Peak SAR (extrapolated) = 0.556 W/kg

**SAR(1 g) = 0.327 mW/g; SAR(10 g) = 0.190 mW/g**

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




0 dB = 0.357mW/g

**Fig. 39 1900 MHz CH512**

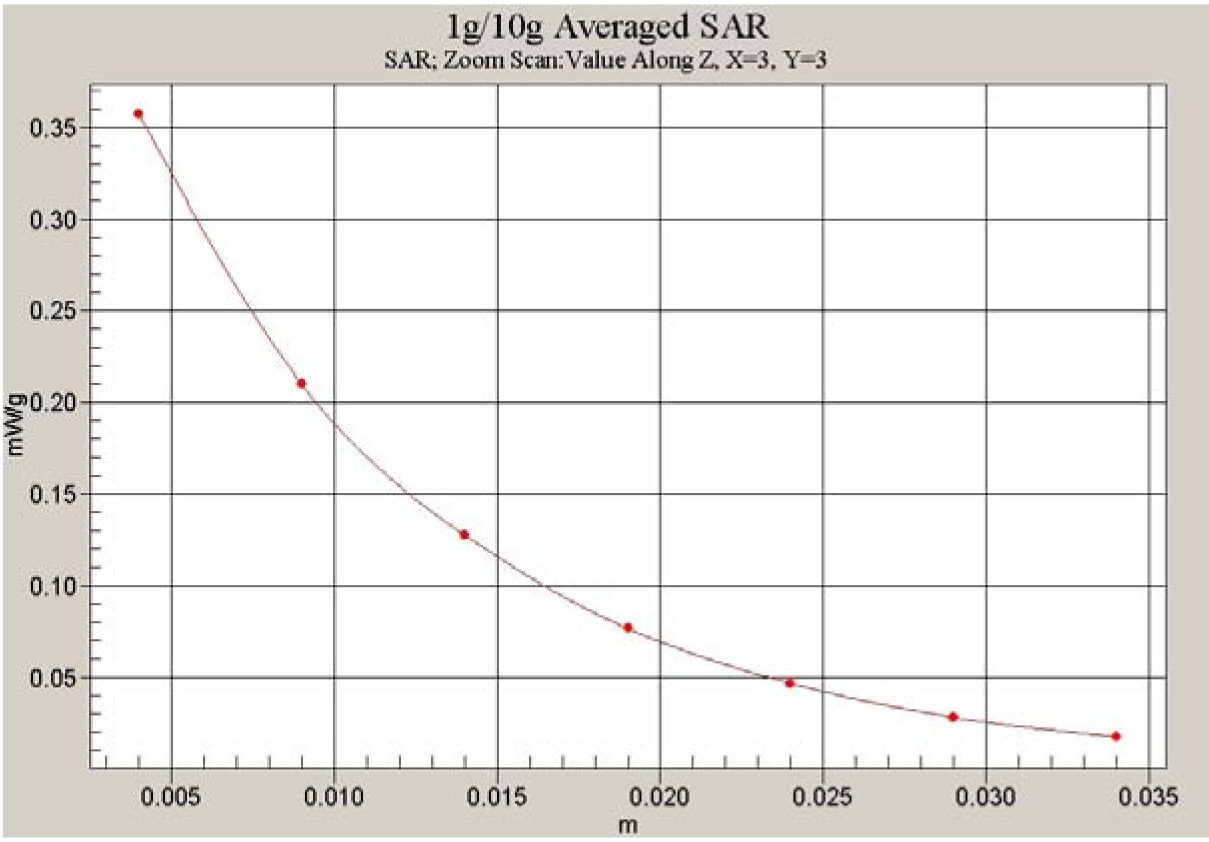



**Fig. 40 Z-Scan at power reference point (1900 MHz CH512)**

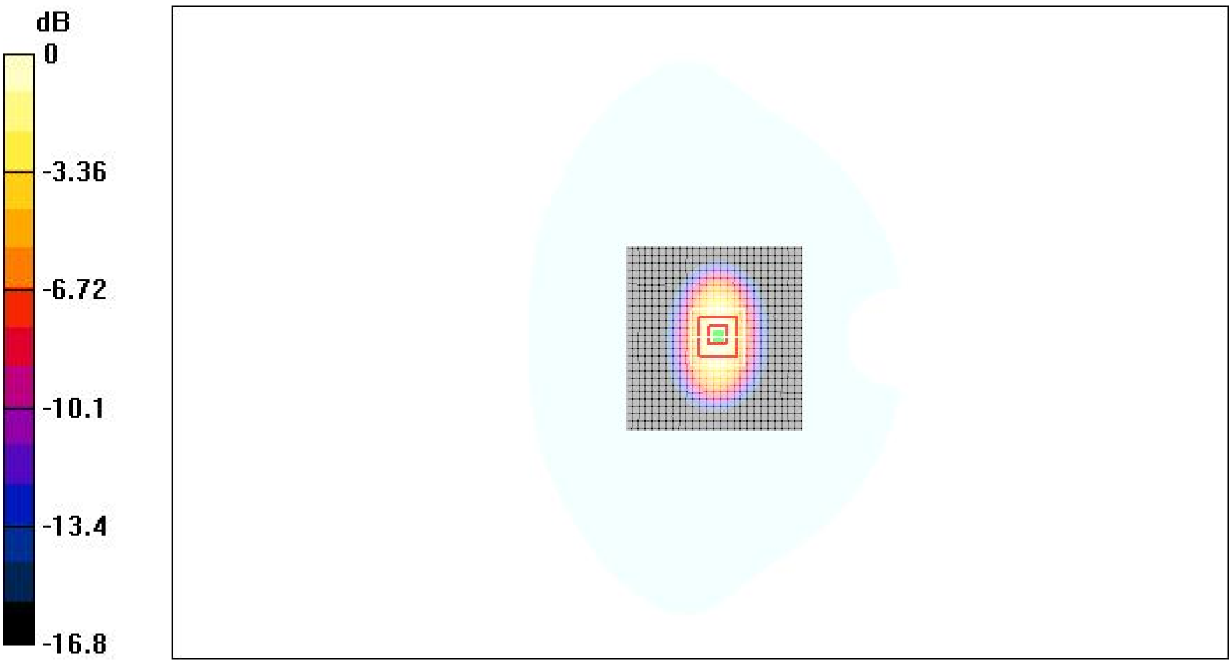
## ANNEX D SYSTEM VALIDATION RESULTS

### 1900MHz

Date/Time: 2008-10-16 7:48:53
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.38 mho/m; $\varepsilon_r$ = 40.9; $\rho$ = 1000 kg/m$^3$
Ambient Temperature:23.3$^o$C Liqiud Temperature: 22.5$^o$C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3149 ConvF(5.08, 5.08, 5.08)

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

**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.1 V/m; Power Drift = 0.1 dB
Peak SAR (extrapolated) = 16.9 W/kg
**SAR(1 g) = 9.91 mW/g; SAR(10 g) = 5.27 mW/g**
Maximum value of SAR (measured) = 11.3 mW/g




0 dB = 11.3mW/g

**Fig.41 validation 1900MHz 250mW**

# ANNEX E PROBE CALIBRATION CERTIFICATE

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

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

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client: TMC

Certificate No: ES3-3149_Dec07

## CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | ES3DV3 - SN:3149 |
| Calibration procedure(s) | QA CAL-01.v6<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | December 14, 2007 |
| Condition of the calibrated item | In Tolerance |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 29-Mar-07 (METAS, No. 217-00670) | Mar-08 |
| Power sensor E4412A | MY41495277 | 29-Mar-07 (METAS, No. 217-00670) | Mar-08 |
| Power sensor E4412A | MY41498087 | 29-Mar-07 (METAS, No. 217-00670) | Mar-08 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 8-Aug-07 (METAS, No. 217-00719) | Aug-08 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 29-Mar-07 (METAS, No. 217-00671) | Mar-08 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 8-Aug-07 (METAS, No. 217-00720) | Aug-08 |
| Reference Probe ES3DV2 | SN: 3013 | 4-Jan-07 (SPEAG, No. ES3-3013_Jan07) | Jan-08 |
| DAE4 | SN: 654 | 20-Apr-07 (SPEAG, No. DAE4-654_Apr07) | Apr-08 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (SPEAG, in house check Oct-07) | In house check: Oct-09 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (SPEAG, in house check Oct-07) | In house check: Oct-08 |

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

Issued: December 14, 2007

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: ES3-3149_Dec07 Page 1 of 9

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

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C Service suisse d'étalonnage
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Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| NORMx,y,z | sensitivity in free space |
| ConF | sensitivity in TSL / NORMx,y,z |
| DCP | diode compression point |
| Polarization φ | φ rotation around probe axis |
| Polarization ϑ | ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis |

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

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

**Methods Applied and Interpretation of Parameters:**

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

# Probe ES3DV3

## SN:3149

Manufactured: June 12, 2007
Calibrated: December 14, 2007

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

ES3DV3 SN:3149 December 14, 2007

# DASY - Parameters of Probe: ES3DV3 SN:3149

## Sensitivity in Free Space[A]

| | | |
|---|---|---|
| NormX | 1.14 ± 10.1% | $\mu V/(V/m)^2$ |
| NormY | 1.23 ± 10.1% | $\mu V/(V/m)^2$ |
| NormZ | 1.29 ± 10.1% | $\mu V/(V/m)^2$ |

## Diode Compression[B]

| | |
|---|---|
| DCP X | 94 mV |
| DCP Y | 95 mV |
| DCP Z | 91 mV |

## Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

## Boundary Effect

**TSL 900 MHz Typical SAR gradient: 5 % per mm**

| Sensor Center to Phantom Surface Distance | | 3.0 mm | 4.0 mm |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 3.7 | 1.7 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.9 | 0.7 |

**TSL 1810 MHz Typical SAR gradient: 10 % per mm**

| Sensor Center to Phantom Surface Distance | | 3.0 mm | 4.0 mm |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 6.9 | 3.4 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.4 | 0.2 |

## Sensor Offset

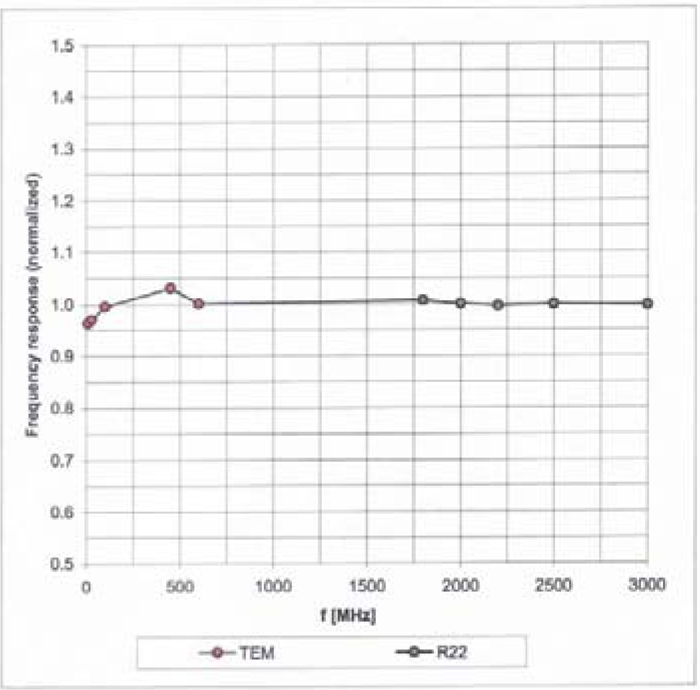
Probe Tip to Sensor Center 2.0 mm

**The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.**

[A] The uncertainties of NormX,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Page 8).
[B] Numerical linearization parameter: uncertainty not required.

## Frequency Response of E-Field

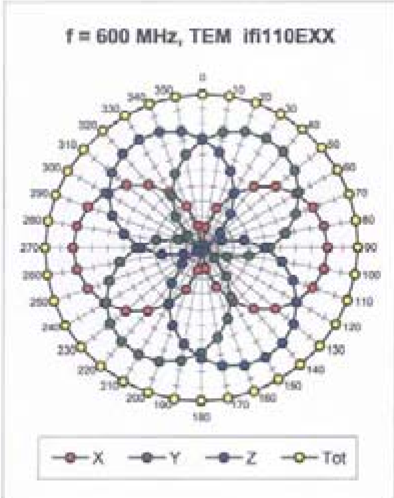
(TEM-Cell:ifi110 EXX, Waveguide: R22)

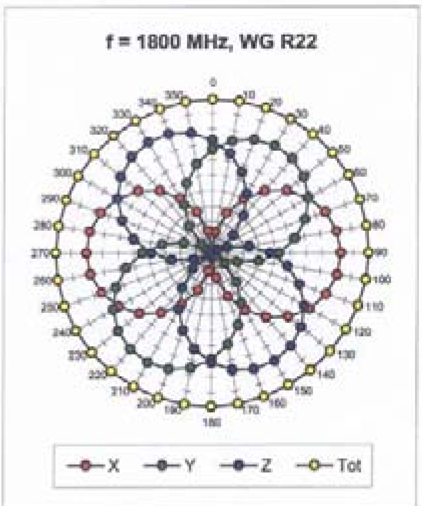


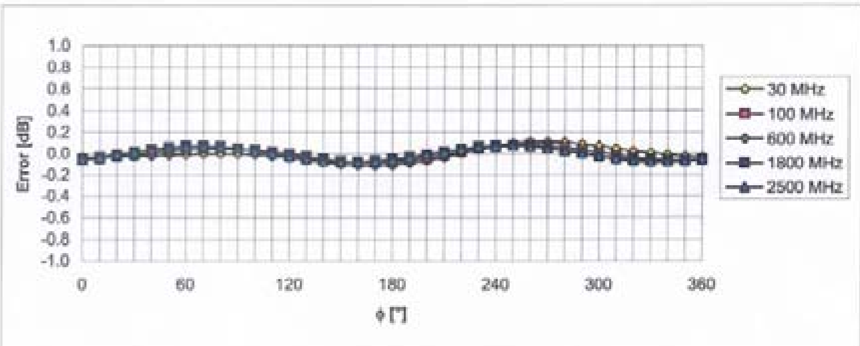

Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

ES3DV3 SN:3149 December 14, 2007

## Receiving Pattern ($\phi$), $\vartheta$ = 0°



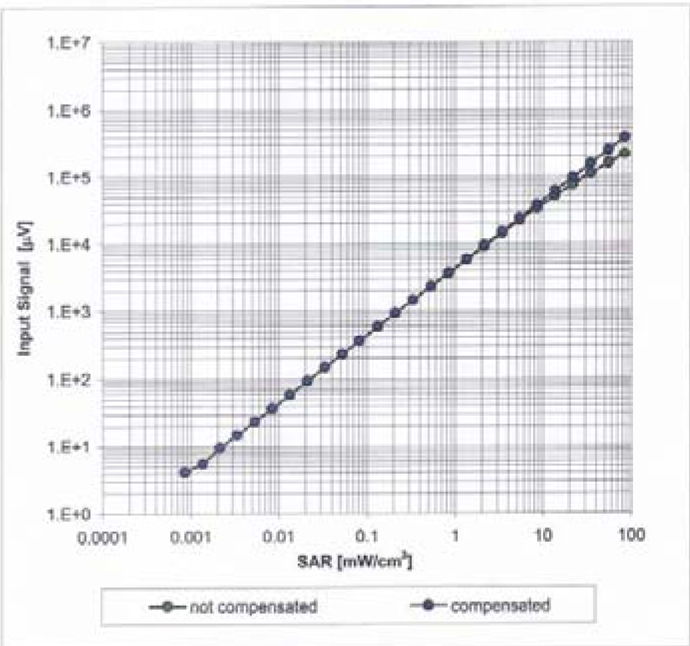



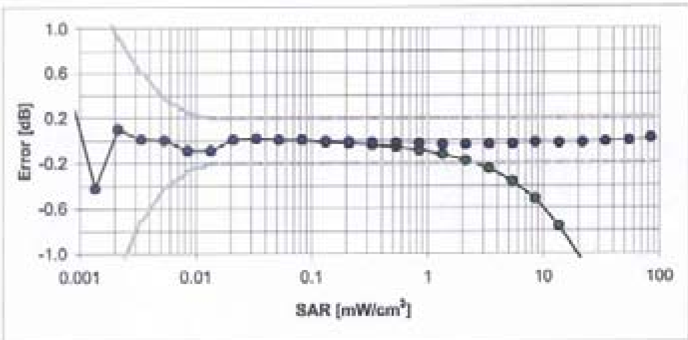

Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

ES3DV3 SN:3149 December 14, 2007

## Dynamic Range f($SAR_{head}$)

(Waveguide R22, f = 1800 MHz)

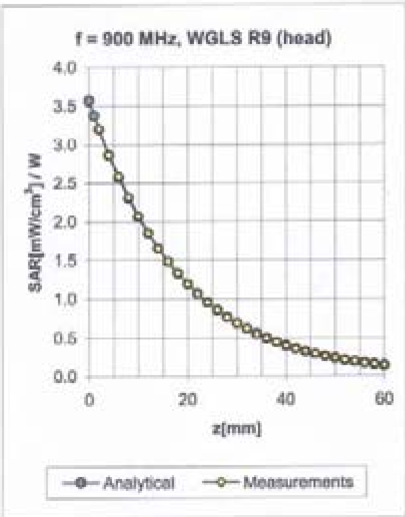


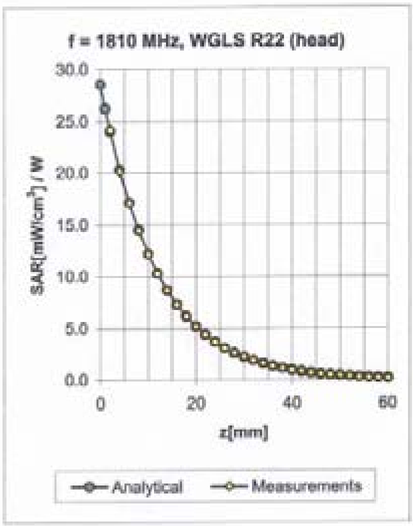




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ES3DV3 SN:3149 December 14, 2007

# Conversion Factor Assessment



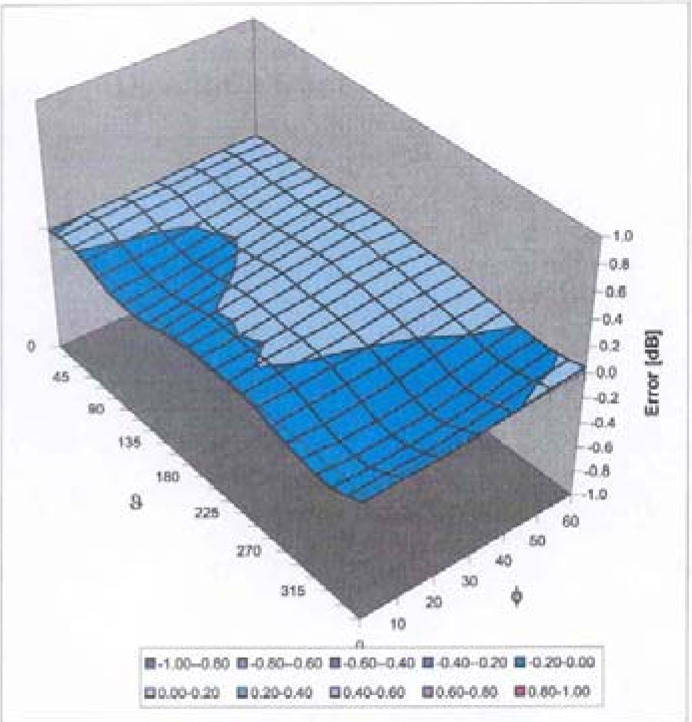




| f [MHz] | Validity [MHz][C] | TSL | Permittivity | Conductivity | Alpha | Depth | ConvF | Uncertainty |
|---|---|---|---|---|---|---|---|---|
| 900 | ± 50 / ± 100 | Head | 41.5 ± 5% | 0.97 ± 5% | 0.89 | 1.24 | 6.28 | ± 11.0% (k=2) |
| 1810 | ± 50 / ± 100 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.66 | 1.44 | 5.08 | ± 11.0% (k=2) |
| 900 | ± 50 / ± 100 | Body | 55.0 ± 5% | 1.05 ± 5% | 0.94 | 1.16 | 5.97 | ± 11.0% (k=2) |
| 1810 | ± 50 / ± 100 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.73 | 1.33 | 4.85 | ± 11.0% (k=2) |

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

## Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz




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

# ANNEX F DIPOLE CALIBRATION CERTIFICATE

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

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

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

Accreditation No.: **SCS 108**

Client TMC China

Certificate No: D1900V2-541_Feb07

## CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | **D1900V2-SN: 541** |
| Calibration procedure(s) | **QA CAL-05.v6**<br>**Calibration procedure for dipole validation kits** |
| Calibration date: | **February 20, 2007** |
| Condition of the calibrated item | **In Tolerance** |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements(SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted at an environment temperature (22±3)°C and humidity<70%

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID# | Cal Data (Calibrated by, Certification NO.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 03-Oct-06 (METAS, NO. 217-00608) | Oct-07 |
| Power sensor 8481A | US37292783 | 03-Oct-06 (METAS, NO. 217-00608) | Oct-07 |
| Reference 20 dB Attenuator | SN:5086 (20g ) | 10-Aug-06 (METAS, NO. 217-00591) | Aug-07 |
| Reference 10 dB Attenuator | SN:5047_2 (10r) | 10-Aug-06 (METAS, NO. 217-00591) | Aug-07 |
| DAE4 | SN:601 | 30-Jan-07 (SPEAG, NO.DAE4-601_Jan07) | Jan-08 |
| Reference Probe ET3DV6 (HF) | SN: 1507 | 19-Oct-06 (SPEAG, NO. ET3-1507_Oct06) | Oct-07 |
| Secondary Standards | ID# | Check Data (in house) | Scheduled Calibration |
| Power sensor HP 8481A | MY41092317 | 18-Oct-02(SPEAG, in house check Oct-05) | In house check: Oct-07 |
| RF generator Agilent E4421B | MY41000676 | 11-May-05(SPEAG, in house check Nov-05) | In house check: Nov -07 |
| Network Analyzer HP 8753E | US37390585S4206 | 18-Oct-01(SPEAG, in house check Oct-06) | In house check: Oct -07 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Marcel Fehr | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Director | |

Issued: February 21, 2007

This calibration certificate shall not be reported except in full without written approval of the laboratory.

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

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Accreditation No.: **SCS 108**

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

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

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

d) DASY4 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| | | |
|---|---|---|
| **DASY Version** | DASY4 | V4.7 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom V5.0 | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1900 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.0 | 1.40 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 38.9 ± 6 % | 1.38 mho/m ± 6 % |
| **Head TSL temperature during test** | (22.1 ± 0.2) °C | — | — |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.73 mW /g |
| SAR normalized | normalized to 1W | 38.9 mW /g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **38.6 mW / g ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.09 mW /g |
| SAR normalized | normalized to 1W | 20.4 mW /g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **20.2 mW / g ± 16.5 % (k=2)** |

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 48.4 Ω - 8.9 jΩ |
| Return Loss | - 26.4 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.214 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | October 4 , 2001 |

**DASY4 Validation Report for Head TSL**

Date/Time: 20.02.2007 09:25:37

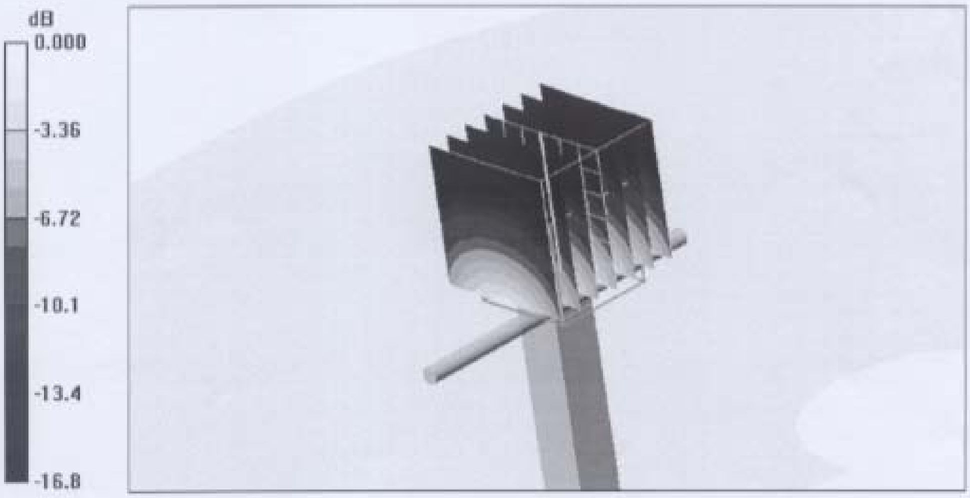
Test laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; serial: D1900V2-SN: 541**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL 1900 MHz;
Medium parameters used: f=1900 MHz; $\sigma$=1.38 mho/m; $\varepsilon_r$=38.9; $\rho$= 1000kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)
DASY4 Configuration:

- Probe: ET3DV6-SN1507(HF); ConvF(5.03, 5.03, 5.03); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.1_2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA;
- Measurement SW: DASY, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

**Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.1 V/m; Power Drift = 0.059 dB
Peak SAR (extrapolated) = 16.9 W/kg
**SAR(1 g) = 9.73 mW/g; SAR(10 g) = 5.09 mW/g**
Maximum value of SAR (measured) = 11.3 mW/g




0 dB = 11.3mW/g

**Impedance measurement Plot for Head TSL**