# OET 65

# TEST   REPORT

| | |
|---|---|
| **Test name** | Electromagnetic Field (Specific Absorption Rate) |
| **Product** | HSDPA USB Stick |
| **Model** | K3565 |
| **FCC ID** | QISK3565 |
| **Client** | HUAWEI Technologies Co., Ltd. |

# TA Technology (Shanghai) Co., Ltd.

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# GENERAL SUMMARY

| | | | |
|---|---|---|---|
| **Product** | HSDPA USB Stick | **Model** | K3565 |
| **Client** | HUAWEI Technologies Co., Ltd. | **Type of test** | Entrusted |
| **Manufacturer** | HUAWEI Technologies Co., Ltd. | **Arrival Date of sample** | August 26th, 2008 |
| **Place of sampling** | (Blank) | **Carrier of the samples** | Sheng Zheng |
| **Quantity of the samples** | One | **Date of product** | (Blank) |
| **Base of the samples** | (Blank) | **Items of test** | SAR |
| **Series number** | 353871020000268 | | |
| **Standard(s)** | **EN 50360–2001:** Product standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.<br>**BS EN 62209-1:2006:** Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - 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)<br>**ANSI C95.1–2005:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz<br>**IEEE 1528–2003:** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Experimental Techniques.<br>**OET Bulletin 65 supplement C, published June 2001 including DA 02-1438, published June 2002:** Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits. Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65.<br>**IEC 62209-2:** 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. | | |
| **Conclusion** | Localized Specific Absorption Rate (SAR) of this portable wireless equipment has been measured in all cases requested by the relevant standards cited in Clause 7.2 of this test report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 7.1 of this test report.<br>General Judgment:         **Pass**<br>(Stamp)<br>**Date of issue: August 28th,2008** | | |
| **Comment** | The test result only responds to the measured sample. | | |

Approved by _Weizhong Yang_          Revised by _Minbao Ling_          Performed by _Feng Shi_

# TABLE OF CONTENT

# 1.  COMPETENCE AND WARRANTIES

**TA Technology (Shanghai) Co., Ltd.** is a test laboratory competent to carry out the tests described in this test report.

**TA Technology (Shanghai) Co., Ltd.** guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

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# 2.  GENERAL CONDITIONS

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## 3.  DESCRIPTION OF EUT

### 3.1.  Addressing Information Related to EUT

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

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

**Table 2: Manufacturer**

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

### 3.2.  Constituents of EUT

**Table 3: Constituents of Samples**

| Description | Model | Serial Number | Manufacturer |
|---|---|---|---|
| HSDPA USB Stick | K3565 | 353871020000268 | HUAWEI Technologies Co., Ltd. |

Note:

The EUT appearances see ANNEX I.

## 3.3.  General Description

Equipment Under Test (EUT) is a HSDPA USB Stick. SAR is tested for the EUT respectively for GSM 850 and GSM 1900.

Since the EUT only has the data transfer function, but does not have the speech transfer function, the tests in the band of GSM 850 and GSM 1900 are only performed in the mode of data transfer function.

The measurements were performed in combination with three different host products (BenQ Joy book S72, IBM T61 and BenQ Joy book R55V). BenQ Joy book S72 laptop has horizontal USB slot, BenQ Joy book R55V and IBM T61 laptop have vertical USB slots.

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

## 3.4.  Test item

**Table 4: Test item**

| device type : | portable device | |
|---|---|---|
| exposure category: | uncontrolled environment / general population | |
| device operating configurations : | | |
| operating mode(s): | GSM850; (tested） <br> GSM1900; (tested） | |
| Modulation: | GMSK, 8-PSK; | |
| GPRS mobile station class : | B | |
| GPRS multislot class : | 10 | |
| EGPRS multislot class: | 10 | |
| Maximum no. of timeslots in uplink: | 2 | |
| standard output power | (33dBm,2W)GSM850; (tested) <br> (30dBm,1W)GSM1900; (tested); | |
| operating frequency range(s) | transmitter frequency range | receiver frequency range |
| GSM850: (tested) | 824.2 MHz ~ 848.8 MHz | 869.2 MHz ~ 893.8 MHz |
| GSM1900(tested): | 1850.2 MHz ~ 1909.8 MHz | 1930.2 MHz ~ 1989.8 MHz |
| Power class | GSM 850:   4, tested with power level 5 | |
| | GSM 1900: 1, tested with power level 0 | |
| Test channel <br> (Low –Middle –High) | 128 -192– 251   (GSM850); (tested) <br> 512 - 661 – 810    (GSM1900) (tested); | |
| hardware version: | CD25TCPU | |
| software version: | 11.602.03.00.00 | |
| antenna type: | integrated antenna | |
| Used host products: | BenQ Joy book R55V, IBM T61, BenQ Joy book S72 | |

# 4.  OPERATIONAL CONDITIONS DURING TEST

## 4.1.  General description of test procedures

The DUT is tested using a E5515C communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power. Test positions as described in the tables above are in accordance with the specified test standard. Conducted output power was measured using an integrated RF connector and attached RF cable. The measurements was performed in combination with three host products (BENQ Joy book S72, BENQ Joy book R55V, IBM T61). BenQ Joy book S72 laptop have horizontal USB slot, BenQ Joy book R55V and IBM T61 laptop have vertical USB slots .

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 EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30 dB.

And according to the "3 dB rule" OET Bulletin 65 supplement C, published June 2001 including DA 02-1438, published June 2002: **" If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tile/Ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s)"**.

## 4.2.  GSM Test Configuration

For the SAR body tests for 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. Since the EUT only has the data transfer function, but does not have the speech transfer function.

The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS. And since the GPRS class is 10 for this EUT, it has at most 2 timeslots in uplink. According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

| Number of timeslots in uplink assignment | Permissible nominal reduction of maximum output power,(dB) |
|---|---|
| 1 | 0 |
| 2 | 0 to 3,0 |

For this EUT, the tests for GSM 850 GPRS and GSM 1900 GPRS band will be performed under the following 2 setups at one same test position:

1) Using 1 timeslot in uplink with the power of 33 dBm for GSM850 and 30dBm for GSM1900
2) Using 2 timeslots in uplink with the power reduced 2dB

## 4.3.  Position of module in Portable devices

The measurements were performed in combination with three different host products (BenQ Joy book S72, BenQ Joy book R55V, IBM T61).

For each channel, the EUT is tested at the following 6 test positions:

● Test Position 1: The EUT is connected to the portable computer with horizontal USB slot. The back side of the EUT towards the bottom of the flat phantom. (ANNEX I Picture 6-a）

● Test Position 2: The EUT is connected to the portable computer with horizontal USB slot. The front side of the EUT towards the bottom of the flat phantom. (ANNEX I Picture 6-b）

● Test Position 3: The EUT is connected to the portable computer with horizontal USB slot. The top side of the EUT towards the bottom of the flat phantom. （ANNEX I Picture 6-c）

● Test Position 4: The EUT is connected to the portable computer with vertical USB slot. The left side of the EUT towards the bottom of the flat phantom. （ANNEX I Picture 6-d）

● Test Position 5: The EUT is connected to the portable computer with vertical USB slot. The right side of the EUT towards the bottom of the flat phantom. （ANNEX I Picture 6-e）

● Test Position 6: The EUT is connected to the portable computer with vertical USB slot. The top side of the EUT towards the bottom of the flat phantom. （ANNEX I Picture 6-f）

## 4.4.  Picture of host product

During the test, The BENQ Joy book S72, Benq Joy book R55V, IBM T61 laptop were used as an assistant to help to setup communication. (See Picture 1)


Picture 1-a: BenQ Joybook S72 Close


Picture 1-b: BenQ Joybook S72 Open


Picture 1-c: IBM T61 Close


Picture 1-d: IBM T61 Open


Picture 1-e: BenQ Joybook R55V(118) Close


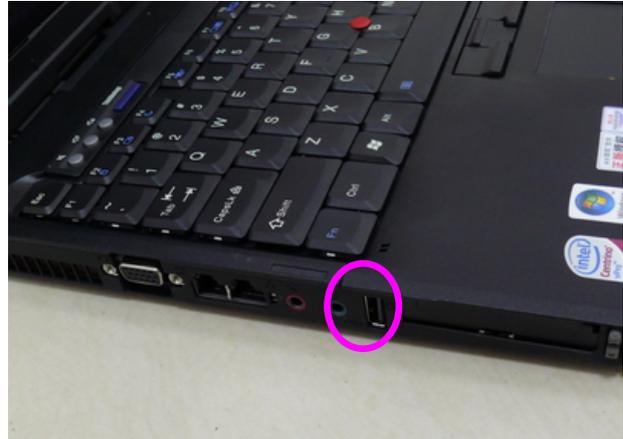Picture 1-f: BenQ Joybook R55V(118) Open

Picture 1-g: BenQ Joy book S72 with horizontal USB slot



Picture 1-h: BenQ Joy book S72 with horizontal USB slot



Picture 1-i: BenQ Joybook R55V(118) with Vertical USB slot



Picture 1-j: IBM T61 with Vertical USB slot

**Picture 1: Computer as a test assistant**

# 5. SAR MEASUREMENTS SYSTEM CONFIGURATION

## 5.1. SAR Measurement Set-up

These measurements were performed with the automated near-field scanning system DASY4 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 2003 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.
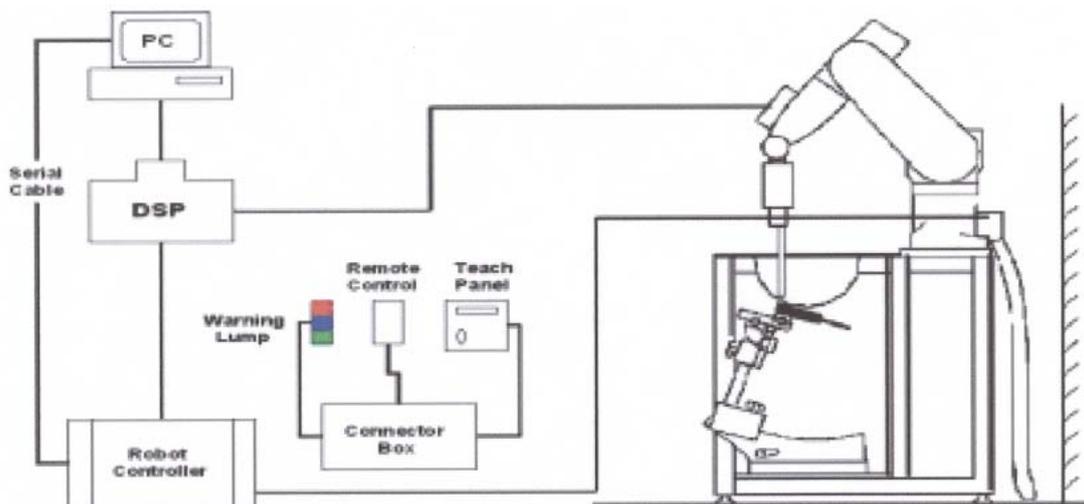


**Figure 1**. **SAR Lab Test Measurement Set-up**

The DAE4 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.

## 5.2.  Dasy4 E-field Probe System

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

### 5.2.1.  ET3DV6 Probe Specification

| | |
|---|---|
| Construction | Symmetrical design with triangular core Built-in optical fiber for surface detection System (ET3DV6 only) Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.q., glycol) |
| Calibration | In air from 10 MHz to 3 GHz In brain and muscle simulating tissue at frequencies of 900MHz, 1750 MHz, 1950MHz and 2450 MHz. (accuracy±8%) Calibration for other liquids and frequencies upon request |
| Frequency | I 0 MHz to 2.5 GHz; Linearity: ±0.2 dB (30 MHz to 2.5 GHz) |



**Figure 2.ET3DV6 E-field Probe**

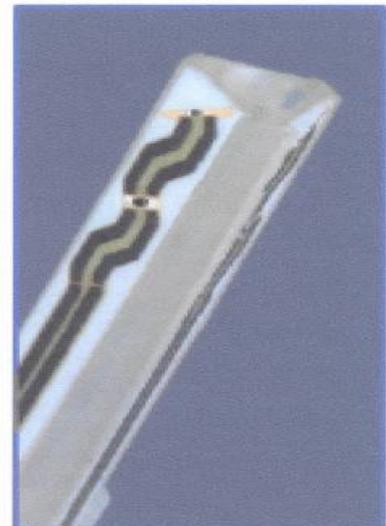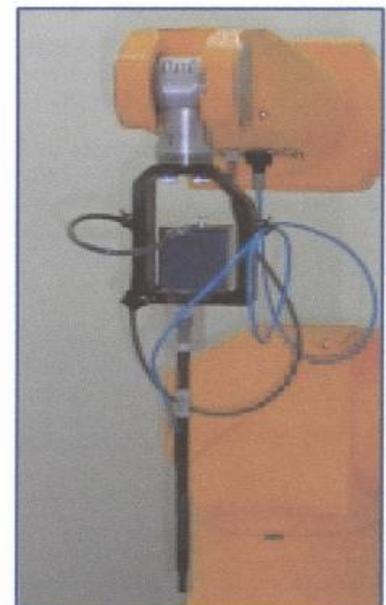| | |
|---|---|
| Directivity | ±0.2 dB in brain tissue (rotation around probe axis) ±0.4 dB in brain tissue (rotation around probe axis) |
| Dynamic Range | 5u W/g to > 100mW/g; Linearity: ±0.2dB |
| Surface Detection | ±0.2 mm repeatability in air and clear liquids over diffuse reflecting surface (ET3DV6 only) |
| Dimensions | Overall length: 330mm Tip length: 16mm Body diameter: 12mm Tip diarneter: 6.8mm Distance from probe tip to dipole centers: 2.7mm |
| Application | General dosimetry up to 2.5GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms |



**Figure 3.ET3DV6 E-field probe**

### 5.2.2. 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/m3).

## 5.3. Other Test Equipment

### 5.3.1. Device Holder for Transmitters

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



**Figure 4.Device Holder**

### 5.3.2.  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 l000 x 500 mm (H x L x W)
Aailable              Special



**Figure 5.Generic Twin Phantom**

## 5.4.  Scanning procedure

The DASY4 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- The ”reference“ and ”drift“ measurements are located at the beginning and end of the batch process.

They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT's output power and should vary max. ± 5 %.

- The ”surface check“ measurement tests the optical surface detection system of the DASY4 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

- The "area scan" measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local

electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid

spacing for head measurements is 15 mm in x- and y- dimension. If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation.

- A" 7x7x7 zoom scan" measures the field in a volume around the 2D peak SAR value acquired in the previous "coarse" scan. This is a fine 7x7 grid where the robot additionally moves the probe in 7 steps along the z-axis away from the bottom of the Phantom. Grid spacing for the cube measurement is 5mm in x and y-direction and 5 mm in z-direction. DASY4 is also able to perform repeated zoom scans if more than 1 peak is found during area scan.

- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2mm steps.

## 5.5. Data Storage and Evaluation

### 5.5.1. Data Storage

The DASY4 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

### 5.5.2. Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:  - Sensitivity                              $Normi$, $ai_0$, $a_{i1}$, $a_{i2}$
                         - Conversion factor                       $ConvF_i$
                         - Diode compression point           $Dcp_i$

Device parameters:  - Frequency                                  $f$
                         - Crest factor                                 $cf$

Media parameters:  - Conductivity                               $\sigma$
                         - Density                                        $\rho$

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY4 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot c\,f\,/\,d\,c\,p_i$$

With    $V_i$ = compensated signal of channel i    ( i = x, y, z )

       $U_i$ = input signal of channel i        ( i = x, y, z )

       $cf$ = crest factor of exciting field      (DASY parameter)

       $dcp_i$ = diode compression point    (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes:        $$E_i = (\, V_i\,/\,Norm_i \cdot ConvF\,)^{1/2}$$

H-field probes:        $$H_i = (\, V_i\,)^{1/2} \cdot (\, a_{i0} + a_{i1}\,f + a_{i2}\,f^2\,)\,/\,f$$

With     $V_i$               = compensated signal of channel i                    (i = x, y, z)

         $Norm_i$            = sensor sensitivity of channel i                    (i = x, y, z)

                             $[mV/(V/m)^2]$ for E-field Probes

         $ConvF$             = sensitivity enhancement in solution

         $a_{ij}$            = sensor sensitivity factors for H-field probes

         $f$                 = carrier frequency [GHz]

         $E_i$               = electric field strength of channel i in V/m

         $H_i$               = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = ( E_{tot}^2 \cdot \sigma ) / ( \rho \cdot 1000)$$

with   $SAR$                = local specific absorption rate in mW/g

       $E_{tot}$            = total field strength in V/m

       $\sigma$             = conductivity in [mho/m] or [Siemens/m]

       $\rho$               = equivalent tissue density in g/cm$^3$

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with   $P_{pwe}$ = equivalent power density of a plane wave in mW/cm$^2$

       $E_{tot}$ = total electric field strength in V/m

       $H_{tot}$ = total magnetic field strength in A/m

## 5.6. System Specifications

### 5.6.1. 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 2003

**Data Converter**

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

**Software:** DASY4 software

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

## 5.7. System validation

System validation is performed by using a validation dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 1000 mW. To adjust this power a power meter is used. The power sensor is connected to the cable before the validation to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the validation to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test.

Validation results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System validation is performed regularly on all frequency bands where tests are performed with the DASY 4 system. Results are stored to have a long time overview of system performance and are shown in test reports at request.
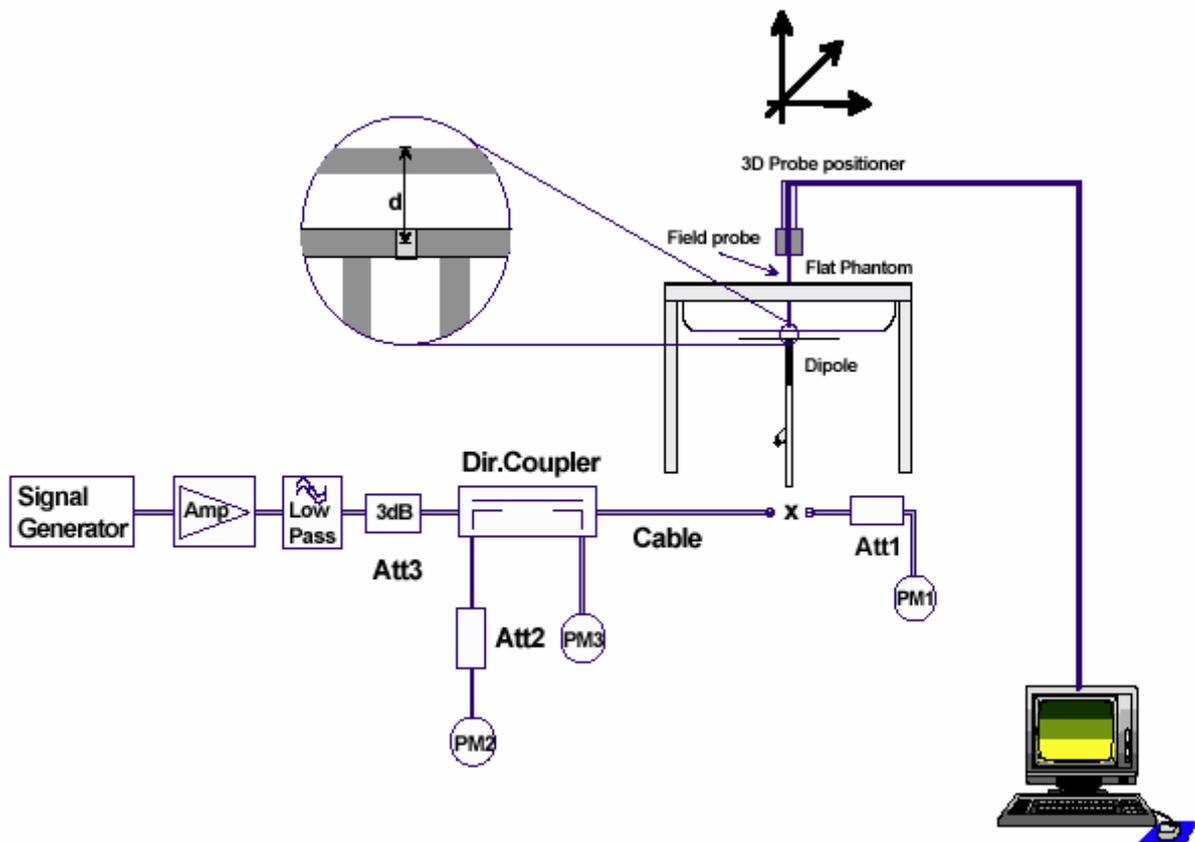


**Figure 6**. **System validation Set-up**

## 5.8. Equivalent Tissues

The liquid used for the frequency range of 800-2000 MHz consisted of water, sugar, salt, Glycol and Cellulose. The liquid has previously been proven to be suited for worst-case. The Table 5 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528.

**Table 5: Composition of the Body Tissue Equivalent Matter**

| MIXTURE% | FREQUENCY 835MHz |
|---|---|
| Water | 52.5 |
| Sugar | 45 |
| Salt | 1.4 |
| Preventol | 0.1 |
| Cellulose | 1.0 |
| Dielectric Parameters Target Value | f=835MHz    $\varepsilon$=55.2    $\sigma$=0.97 |

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

# 6. LABORATORY ENVIRONMENT

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

| | |
|---|---|
| Temperature | Min. = 20°C, Max. = 25 °C |
| Relative humidity | Min. = 30%, Max. = 70% |
| Ground system resistance | < 0.5  $\Omega$ |
| Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards. | |

## 7. CHARACTERISTICS OF THE TEST

### 7.1. 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 C95.1–2005:** 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.

### 7.2. Applicable Measurement Standards

**BS EN 62209-1:2006:** Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - 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 Head Due to Wireless Communications Devices: Experimental Techniques.

**OET Bulletin 65 supplement C, published June 2001 including DA 02-1438, published June 2002:** Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits. Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65.

**IEC 62209-2:** 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.

## 8.  CONDUCTED OUTPUT POWER MEASUREMENT

### 8.1.  Summary

During the process of testing, the EUT was controlled via Digital Radio Communication tester 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.

### 8.2.  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 10 to Table 13 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 0.21dB.

### 8.3.  Conducted Power

#### 8.3.1.  Measurement Methods

The EUT was set up for the maximum output power. The channel power was measured .The measurements were done at 3 channels both before and after SAR tests for each test band.

#### 8.3.2.  Measurement result

**Table 7: Conducted Power Measurement Results**

| GSM 850 | Conducted Power | | |
|---|---|---|---|
| | **Channel 128** | **Channel 192** | **Channel 251** |
| Before Test (dBm) | 31.47 | 31.44 | 31.25 |
| After Test (dBm) | 31.40 | 31.52 | 31.31 |
| **GSM 850+GPRS** | **Conducted Power** | | |
| | **Channel 128** | **Channel 192** | **Channel 251** |
| Before Test (dBm) | 31.48 | 31.51 | 31.38 |
| After Test (dBm) | 31.41 | 31.56 | 31.41 |
| **GSM 1900** | **Conducted Power** | | |
| | **Channel 512** | **Channel 661** | **Channel 810** |
| Before Test (dBm) | 27.15 | 27.20 | 27.19 |
| After Test (dBm) | 27.21 | 27.22 | 27.12 |
| **GSM 1900+GPRS** | **Conducted Power** | | |
| | **Channel 512** | **Channel 661** | **Channel 810** |
| Before Test (dBm) | 27.17 | 27.14 | 27.17 |
| After Test (dBm) | 27.19 | 27.21 | 27.11 |

## 9.  TEST RESULTS

### 9.1.  Dielectric Performance

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

| Frequency | | Target value | Measurement | Difference | |
|---|---|---|---|---|---|
| **835** **(Body)** | Permittivity $\varepsilon_r$ | 55.20 | 55.70 | 0.90 | % |
| | Conductivity $\sigma$ | 0.97 | 1.00 | 3.09 | % |
| **1900** **(Body)** | Permittivity $\varepsilon_r$ | 53.30 | 52.09 | -2.27 | % |
| | Conductivity $\sigma$ | 1.52 | 1.52 | 0.00 | % |

*Measurement is made at temperature 22.5 °C and relative humidity 51%.*

### 9.2.  System Validation

**Table 9: System Validation**

Measurement is made at temperature 23.2 °C, relative humidity 50%, and input power 250 mW.
Liquid temperature during the test: 22.3°C

| **Liquid parameters** | Frequency | Permittivity $\varepsilon$ | | Conductivity $\sigma$ (S/m) | |
|---|---|---|---|---|---|
| | 835MHz | 42.95 | | 0.93 | |
| | 1900MHz | 40.18 | | 1.43 | |

| **Verification results** | Frequency | Target value (W/kg) | | Measurement value (W/kg) | | Difference percentage | |
|---|---|---|---|---|---|---|---|
| | | **10 g Average** | **1 g Average** | **10 g Average** | **1 g Average** | **10 g Average** | **1g Average** |
| | 835MHz | 1.56 | 2.43 | 1.53 | 2.34 | -1.92% | -3.70% |
| | 1900MHz | 4.98 | 9.45 | 4.93 | 9.36 | -1.00% | -0.90% |

Note：

a.  Target Values used derive from the SPEAG calibration certificate and 250 mW is used as feeding power to the validation dipole (SPEAG using).

b.  The graph results see ANNEX D.

## 9.3. Summary of Measurement Results

### 9.3.1. GSM850 (GPRS)

**Table 10: SAR Values [GSM850 (GPRS)]**

| Liquid Temperature: 22.4℃ | | | | | | |
|---|---|---|---|---|---|---|
| **Limit of SAR (W/kg)** | | | **10g Average** | **1g Average** | **Power Drift (dB)** | **Graph Results** |
| | | | **2.0** | **1.6** | **± 0.21** | |
| **Test Case Of Body** | | | **Measurement Result (W/kg)** | | **Power Drift(dB)** | |
| **Different Test Position** | **Different Timeslots** | **Channel** | **10g Average** | **1g Average** | | |
| BenQ Joybook S72 | | | | | | |
| Test Position 1 | 2 timeslots | High | 0.555 | 0.880 | -0.095 | Figure 8 |
| | | Middle | 0.556 | 0.881 | -0.046 | Figure 10 |
| | | Low | 0.508 | 0.800 | 0.017 | Figure 12 |
| | 1 timeslot | Middle | 0.475 | 0.752 | 0.092 | Figure 14 |
| Test Position 2 | 2 timeslots | High | 0.603 | 0.984 | 0.008 | Figure 16 |
| | | Middle | 0.576 | 0.904 | -0.067 | Figure 18 |
| | | Low | 0.538 | 0.838 | -0.049 | Figure 20 |
| Test Position 3 | 2 timeslots | Middle | 0.037 | 0.105 | -0.140 | Figure 22 |
| IBM T61 | | | | | | |
| Test Position 4 | 2 timeslots | Middle | 0.409 | 0.652 | -0.030 | Figure 24 |
| BenQ Joybook R55V | | | | | | |
| Test Position 5 | 2 timeslots | Middle | 0.332 | 0.484 | -0.141 | Figure 26 |
| Test Position 6 | 2 timeslots | Middle | 0.078 | 0.232 | -0.048 | Figure 28 |
| Worst case position of Test Position with EGPRS | | | | | | |
| Test Position 2 | 2 timeslots | High | 0.205 | 0.317 | -0.048 | Figure 30 |

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit (< 0.8 W/kg), testing at the high and low channels is optional.

**Table 11: SAR Values (enhanced energy coupling at increased separation distances)**

| Different Test Position | Distance of EUT to Phantom | Channel | Measurement Result (W/kg) | 50% of initial position SAR (W/kg) | 125% of initial position SAR (W/kg) |
|---|---|---|---|---|---|
| BenQ Joybook S72 | | | | | |
| Test Position 2 | initial position | High | 1.050 | 0.525 | 1.312 |
| | 5mm | High | 0.534 | | |
| | 10mm | High | 0.341 | | |
| IBM T61 | | | | | |
| Test Position 4 | initial position | Middle | 0.698 | 0.349 | 0.872 |
| | 5mm | Middle | 0.373 | | |
| | 10mm | Middle | 0.234 | | |
| BenQ Joybook R55V | | | | | |
| Test Position 5 | initial position | Middle | 0.514 | 0.257 | 0.642 |
| | 5mm | Middle | 0.298 | | |
| | 10mm | Middle | 0.204 | | |

Note: 1. when the device position with the highest point SAR is > 25% of that measured at the initial position, a complete 1-g SAR evaluation is required for this configuration.

2. A single point SAR is measured for each of these device positions until the SAR is less than 50% of that measured at the initial position.

**Table 12:SAR Values [GSM1900 (GPRS)]**

| Liquid Temperature: 22.4℃ | | | | | | |
|---|---|---|---|---|---|---|
| **Limit of SAR (W/kg)** | | | **10g Average** | **1g Average** | **Power Drift (dB)** | **Graph Results** |
| | | | **2.0** | **1.6** | **± 0.21** | |
| **Test Case Of Body** | | | **Measurement Result (W/kg)** | | **Power Drift(dB)** | |
| **Different Test Position** | **Different Timeslots** | **Channel** | **10g Average** | **1g Average** | | |
| BenQ Joybook S72 | | | | | | |
| Test Position 1 | 2 timeslots | Middle | 0.323 | 0.554 | -0.108 | Figure 32 |
| | 1 timeslot | Middle | 0.261 | 0.449 | -0.140 | Figure 34 |
| Test Position 2 | 2 timeslots | Middle | 0.403 | 0.778 | -0.040 | Figure 36 |
| Test Position 3 | 2 timeslots | Middle | 0.131 | 0.305 | -0.124 | Figure 38 |
| IBM T61 | | | | | | |
| Test Position 4 | 2 timeslots | Middle | 0.295 | 0.536 | -0.051 | Figure 40 |
| BenQ Joybook R55V | | | | | | |
| Test Position 5 | 2 timeslots | Middle | 0.366 | 0.671 | 0.001 | Figure 42 |
| Test Position 6 | 2 timeslots | Middle | 0.139 | 0.318 | -0.170 | Figure 44 |
| Worst case position of Test Position with EGPRS | | | | | | |
| Test Position 2 | 2 timeslots | Middle | 0.271 | 0.524 | 0.067 | Figure 46 |

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit (< 0.8 W/kg), testing at the high and low channels is optional.

**Table 13: SAR Values (enhanced energy coupling at increased separation distances)**

| Different Test Position | Distance of EUT to Phantom | Channel | Measurement Result (W/kg) | 50% of initial position SAR (W/kg) | 125% of initial position SAR (W/kg) |
|---|---|---|---|---|---|
| BenQ Joybook S72 | | | | | |
| Test Position 2 | initial position | Middle | 0.880 | 0.440 | 1.100 |
| | 5mm | Middle | 0.291 | | |
| IBM T61 | | | | | |
| Test Position 4 | initial position | Middle | 0.748 | 0.374 | 0.935 |
| | 5mm | Middle | 0.336 | | |
| BenQ Joybook R55V | | | | | |
| Test Position 5 | initial position | Middle | 0.592 | 0.296 | 0.740 |
| | 5mm | Middle | 0.248 | | |

Note: 1. when the device position with the highest point SAR is > 25% of that measured at the initial position, a complete 1-g SAR evaluation is required for this configuration.

    2. A single point SAR is measured for each of these device positions until the SAR is less than 50% of that measured at the initial position.

### 9.4. 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 7.2 of this report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 7.1 of this test report.

## 10. MEASUREMENT UNCERTAINTY

| No. | a | Type | c | d | $e=f(d、k)$ | f | $h=c×f / e$ | k |
|-----|---|------|---|---|-----------|---|-----------|---|
| | Uncertainty Component | | Tol. (±%) | Prob. Dist | Div. | $c_1$(1g) | 1g u (± %) | $v_1$ |
| 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 | $\sqrt{3}$ | $(1-cp)^{1/2}$ | 4.3 | ∞ |
| 4 | Hemisphere 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 | |

## 11. MAIN TEST INSTRUMENTS

**Table 14: List of Main Instruments**

| No. | Name | Type | Serial Number | Calibration Date | Valid Period |
|-----|------|------|---------------|------------------|--------------|
| 01 | Network analyzer | Agilent 8753E | US37390326 | September 15, 2007 | One year |
| 02 | Dielectric Probe Kit | Agilent 85070E | US44020115 | No Calibration Requested | |
| 03 | Power meter | Agilent E4417A | GB41291714 | March 14, 2008 | One year |
| 04 | Power sensor | Agilent 8481H | MY41091316 | March 14, 2008 | One year |
| 05 | Signal Generator | HP 8341B | 2730A00804 | September 15, 2007 | One year |
| 06 | Amplifier | IXA-020 | 0401 | No Calibration Requested | |
| 07 | Validation Kit 835MHz | SPEAG D835V2 | 443 | December 9, 2007 | One year |
| 08 | Validation Kit 1900MHz | SPEAG D1900V2 | 5d018 | March 21, 2008 | One year |
| 09 | BTS | E5515C | GB46490218 | September 15, 2007 | One year |
| 10 | E-field Probe | ET3DV6 | 1531 | January 29, 2008 | One year |
| 11 | DAE | DAE4 | 452 | July 21, 2008 | One year |

## 12. TEST PERIOD

The test is performed in August 27th, 2008 to August 28th, 2008.

## 13. TEST LOCATION

The test is performed at TA Technology (Shanghai) Co., Ltd.

**\*\*\*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 ear 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 head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15 mm x 15 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Around this point, a volume of 32 mm x 32 mm x 34 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.
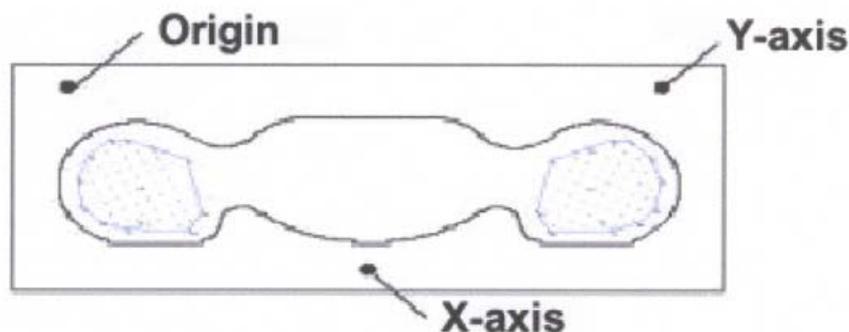


**Figure 7 SAR Measurement Points in Area Scan**

## ANNEX B： TEST LAYOUT



**Picture 2 Specific Absorption Rate Test Layout**
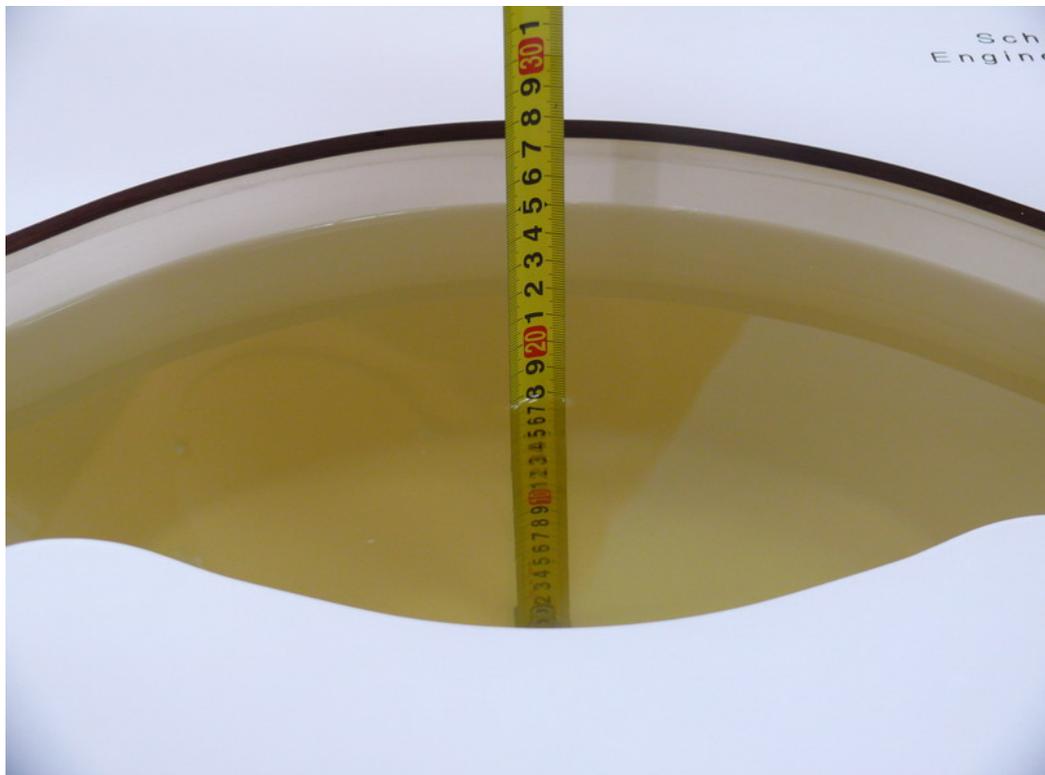


**Picture 3 Liquid depth in the Flat Phantom (835 MHz)**

**Picture 4 Liquid depth in the Flat Phantom (1900 MHz)**

## ANNEX C：  GRAPH RESULTS

### GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 1 High Frequency

Communication System: GSM850 + GPRS(2Up); Frequency: 848.8 MHz;Duty Cycle: 1:4

Medium parameters used: f = 849 MHz; σ = 1.03 mho/m; $\varepsilon_r$ = 55.6; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 1 High/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.949 mW/g

**Test Position 1 High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.3 V/m; Power Drift = -0.095 dB

Peak SAR (extrapolated) = 1.33 W/kg

**SAR(1 g) = 0.880 mW/g; SAR(10 g) = 0.555 mW/g**

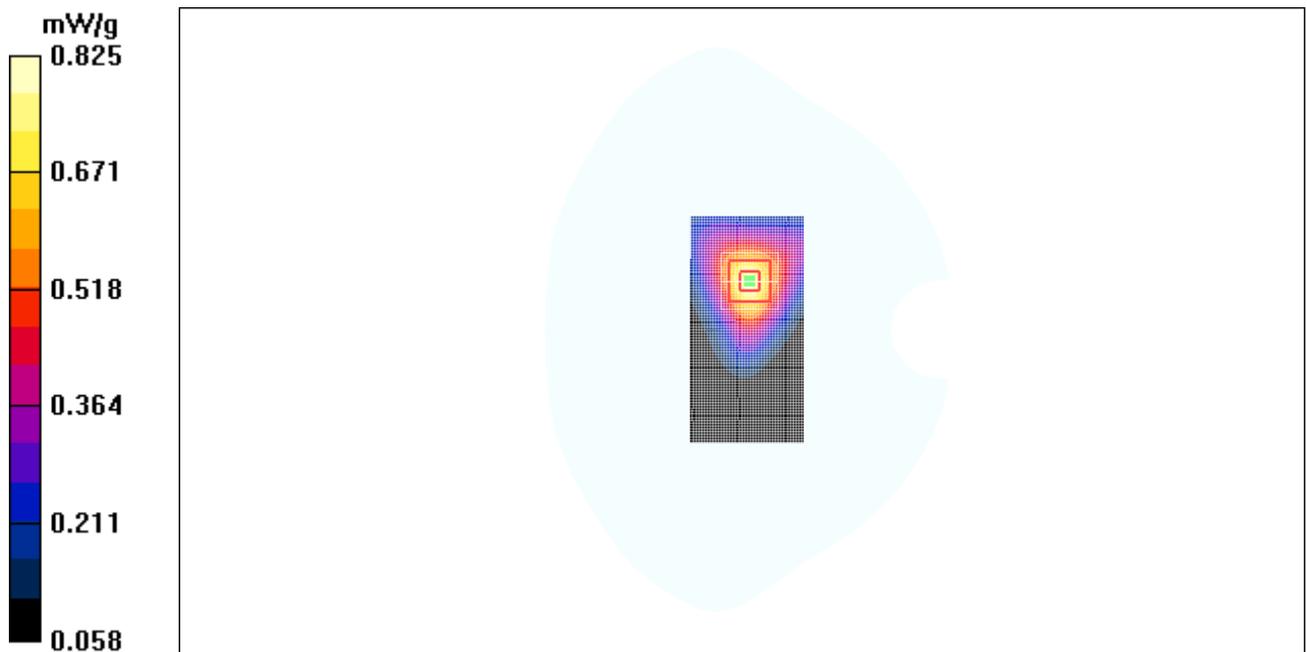Maximum value of SAR (measured) = 0.952 mW/g
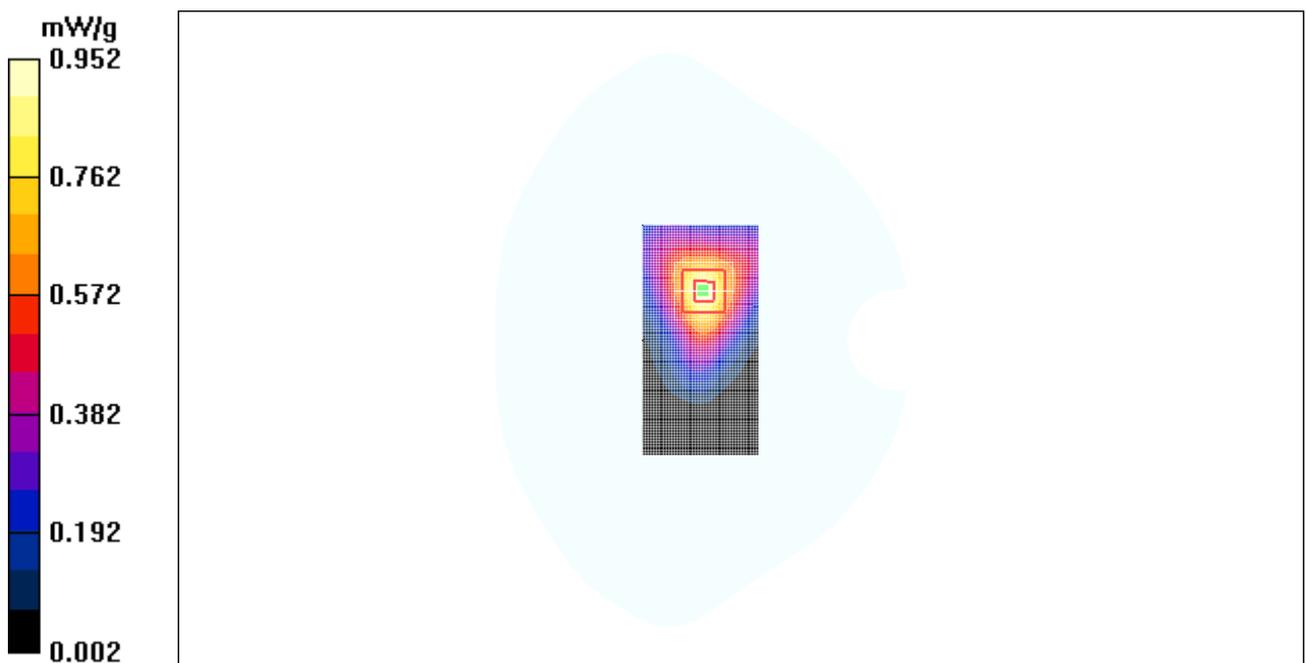


**Figure 8 GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 1 Channel 251**
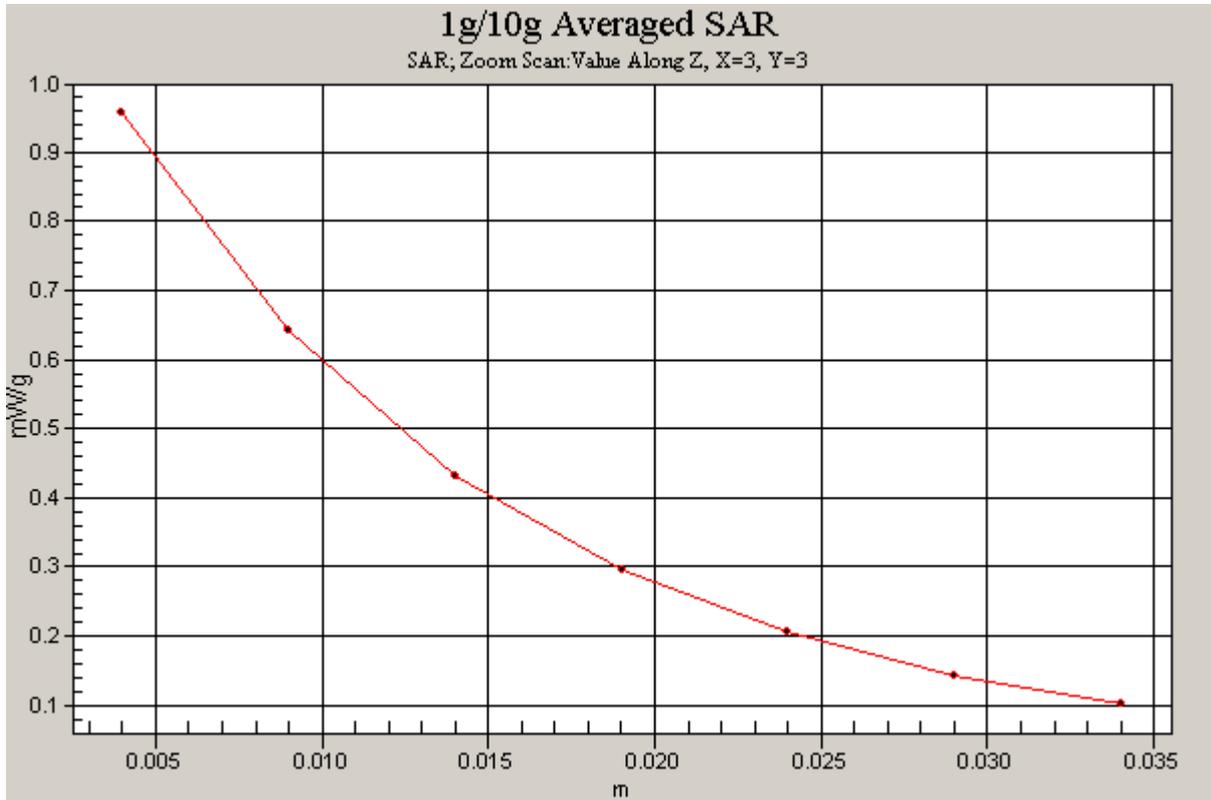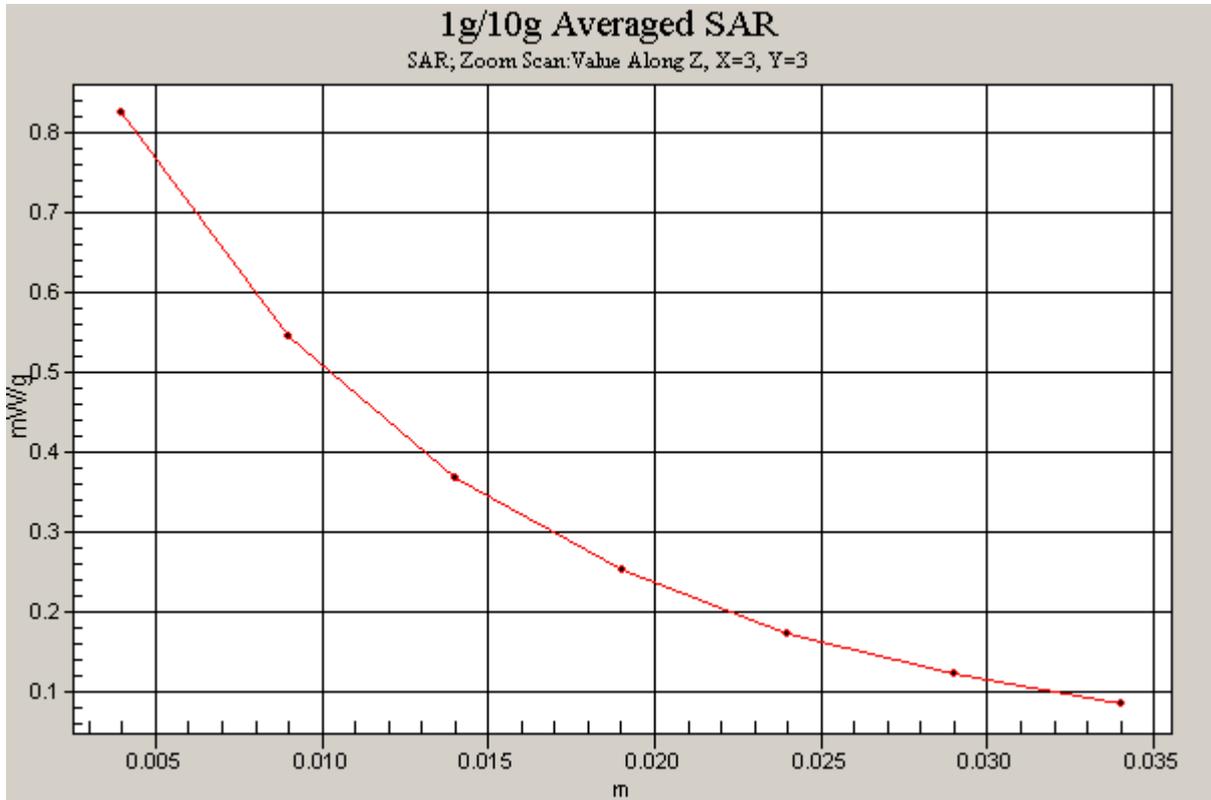
**Figure 9 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 1 Channel 251]**

**GSM 850 GPRS (2 timeslot in uplink) with BenQ Joybook S72 Test Position 1 Middle Frequency**

Communication System: GSM850 + GPRS(2Up); Frequency: 837 MHz;Duty Cycle: 1:4

Medium parameters used: f = 837 MHz; σ = 1.02 mho/m; $ε_r$ = 55.7; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 1 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.985 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.1 V/m; Power Drift = -0.046 dB

Peak SAR (extrapolated) = 1.34 W/kg

**SAR(1 g) = 0.881 mW/g; SAR(10 g) = 0.556 mW/g**

Maximum value of SAR (measured) = 0.960 mW/g
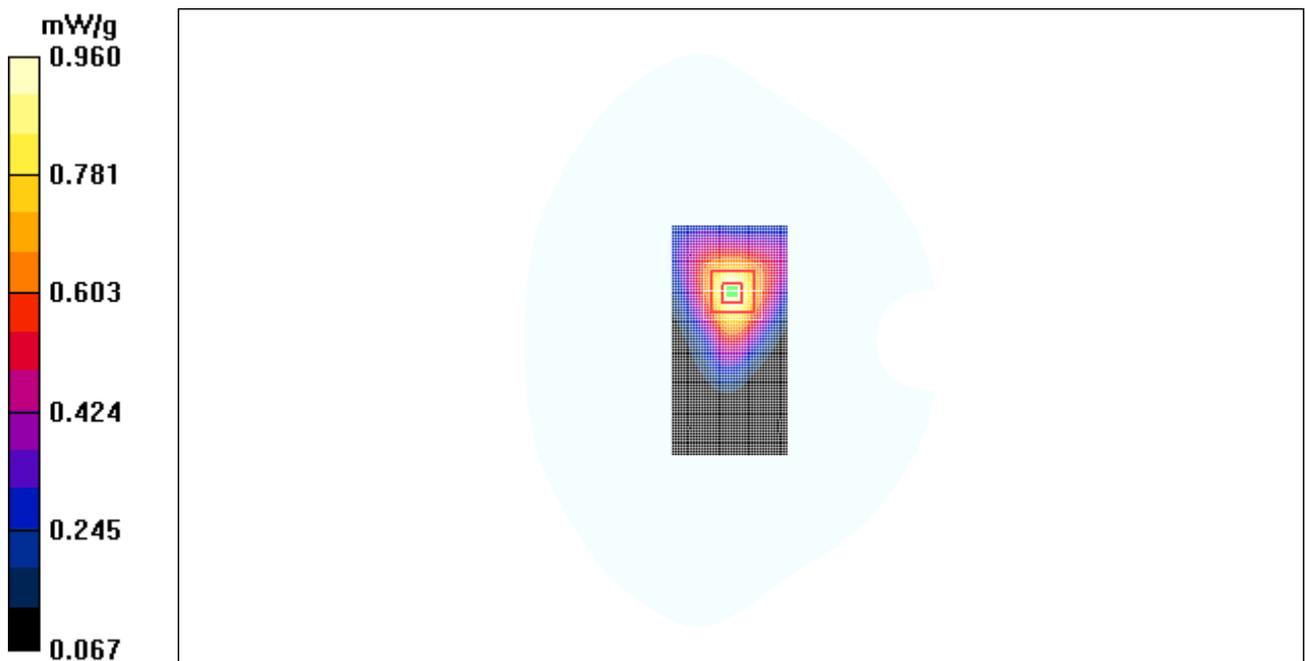


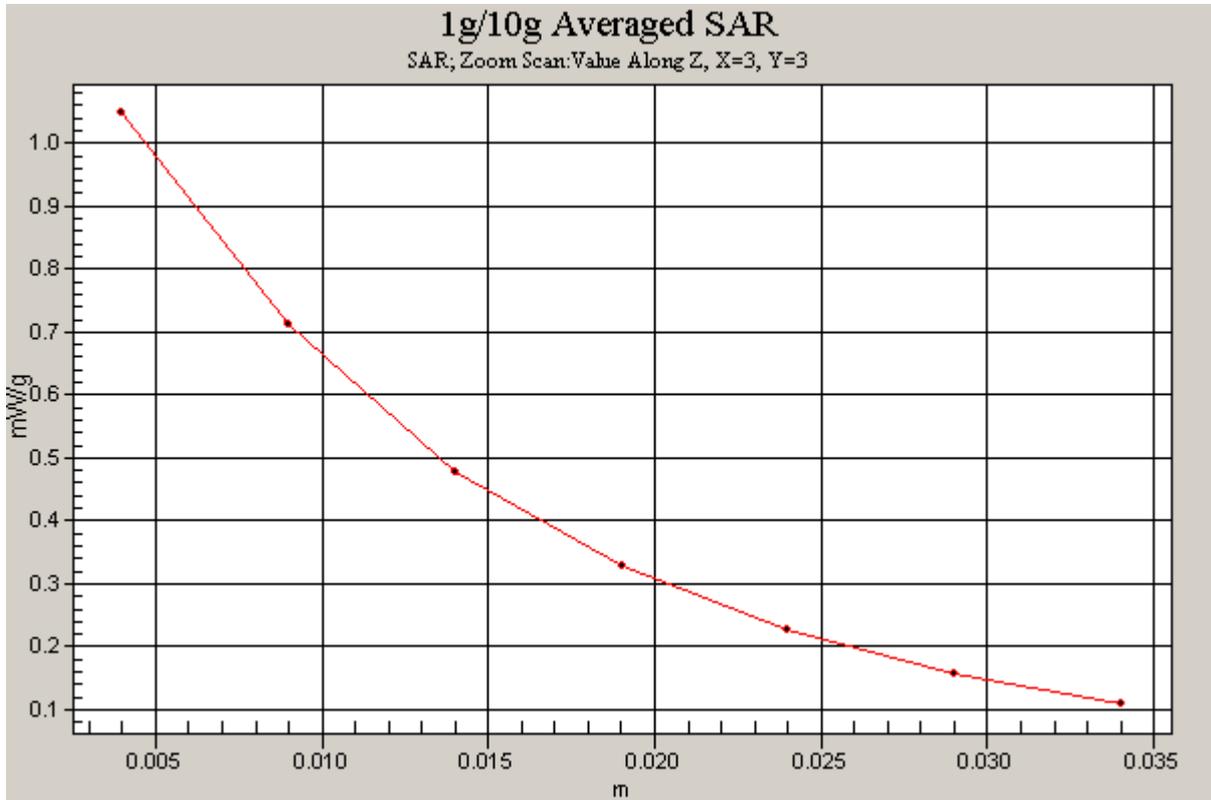**Figure 10 GSM 850 GPRS (2 timeslot in uplink) with BenQ Joybook S72 Test Position 1 Channel 192**
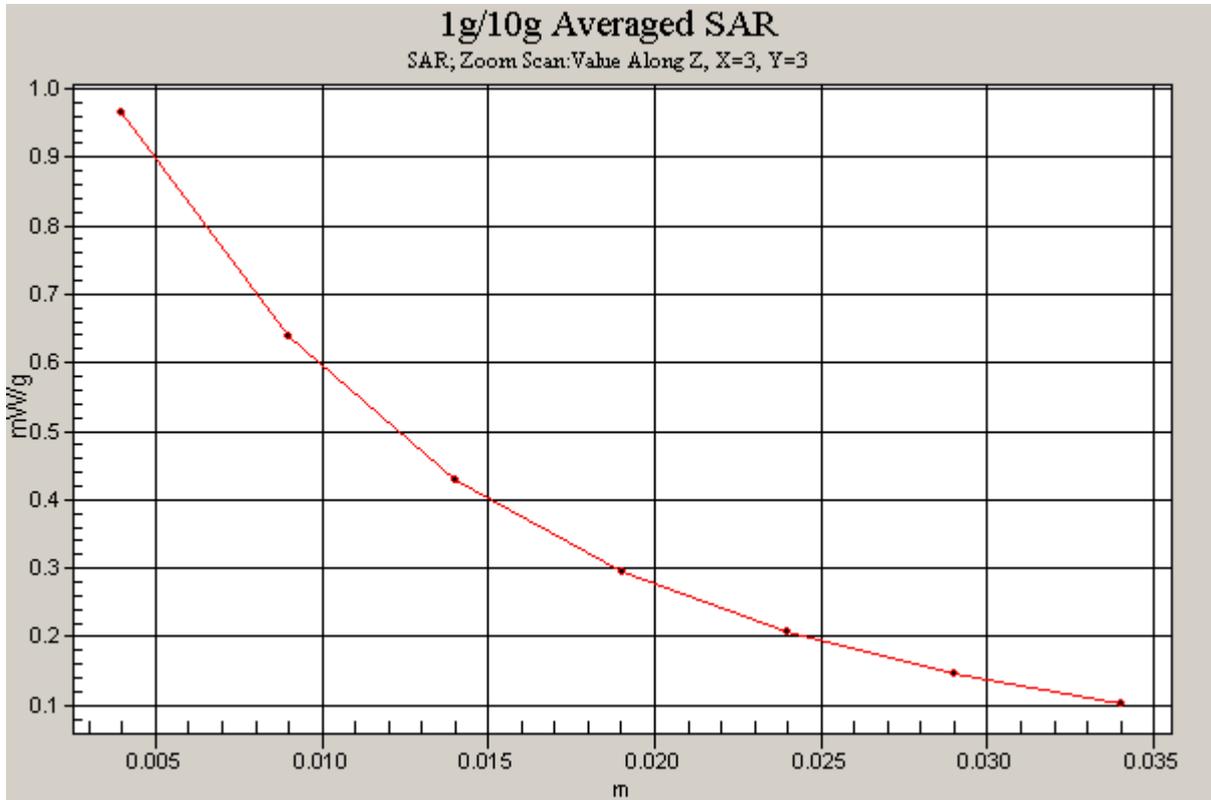
**Figure 11 Z-Scan at power reference point [GSM 850 GPRS (2 timeslot in uplink) with BenQ Joybook S72 Test Position 1 Channel 192]**

**GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 1 Low Frequency**

Communication System: GSM850 + GPRS(2Up); Frequency: 824.2 MHz;Duty Cycle: 1:4

Medium parameters used (interpolated): f = 824.2 MHz; σ = 1 mho/m; $ε_r$ = 55.8; ρ = 1000 kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 1 Low/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.857 mW/g


**Test Position 1 Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 22.6 V/m; Power Drift = 0.017 dB

Peak SAR (extrapolated) = 1.21 W/kg

**SAR(1 g) = 0.800 mW/g; SAR(10 g) = 0.508 mW/g**

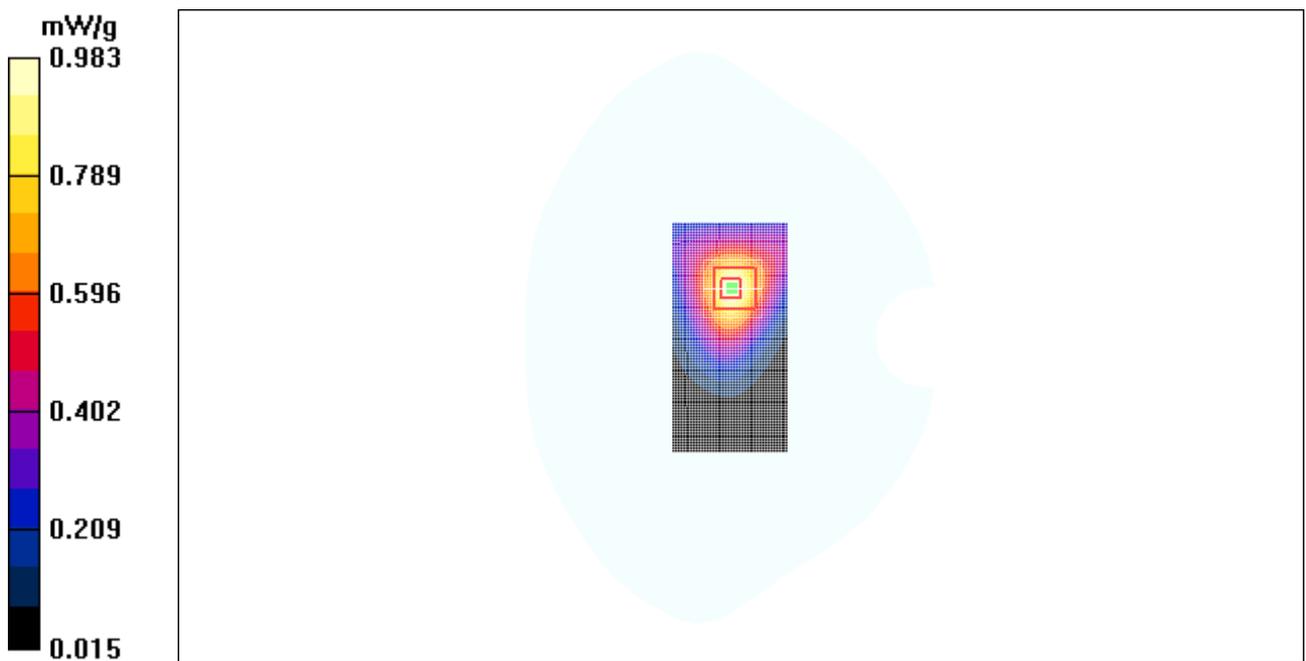Maximum value of SAR (measured) = 0.869 mW/g
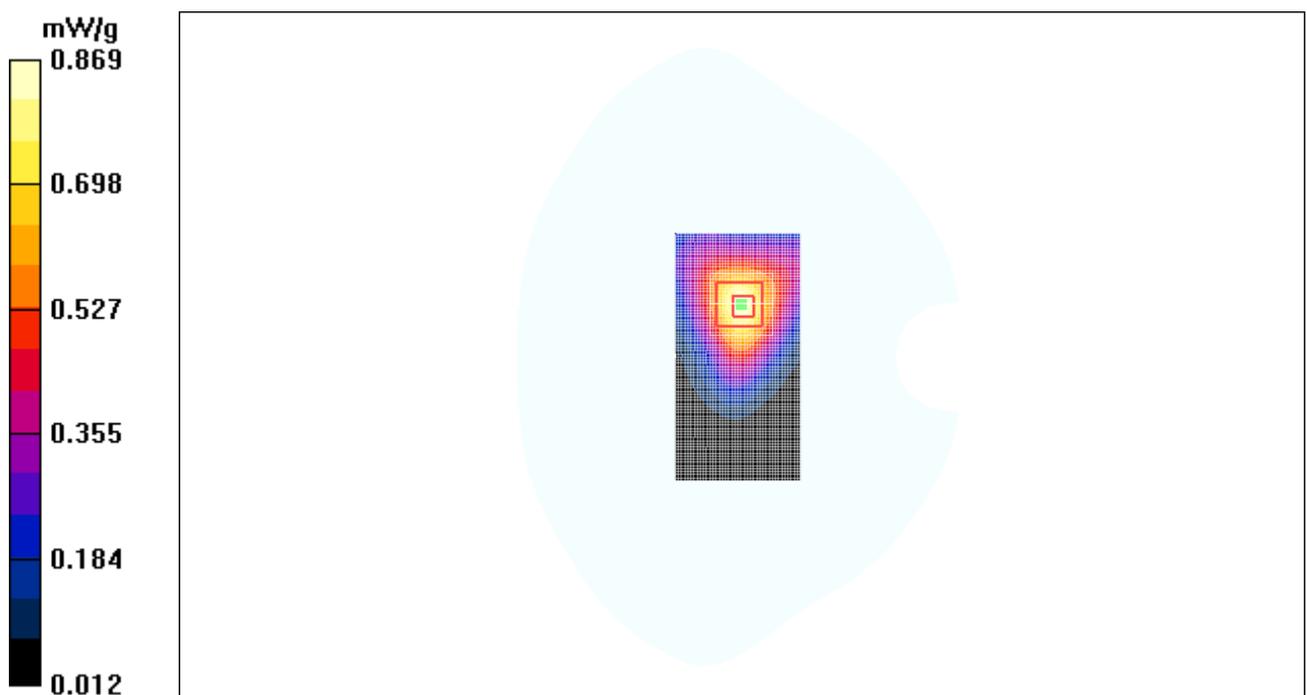


**Figure 12 GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 1 Channel 128**
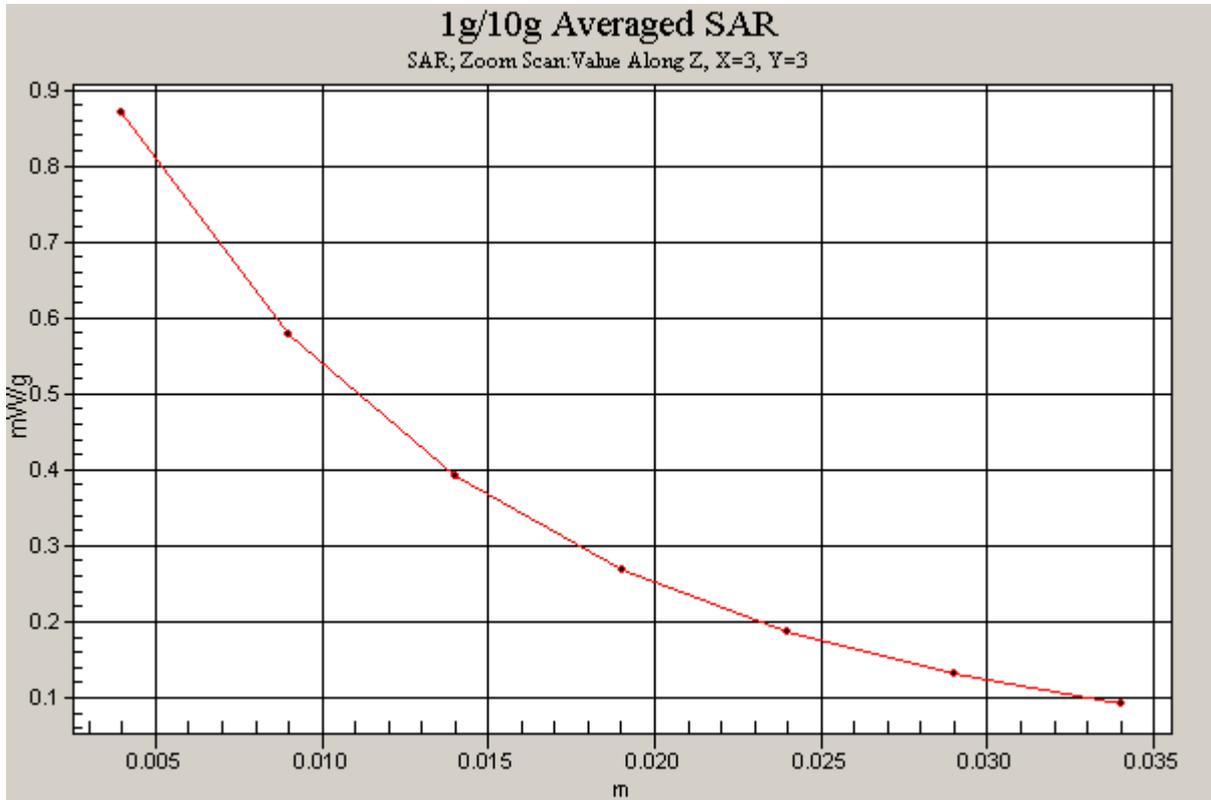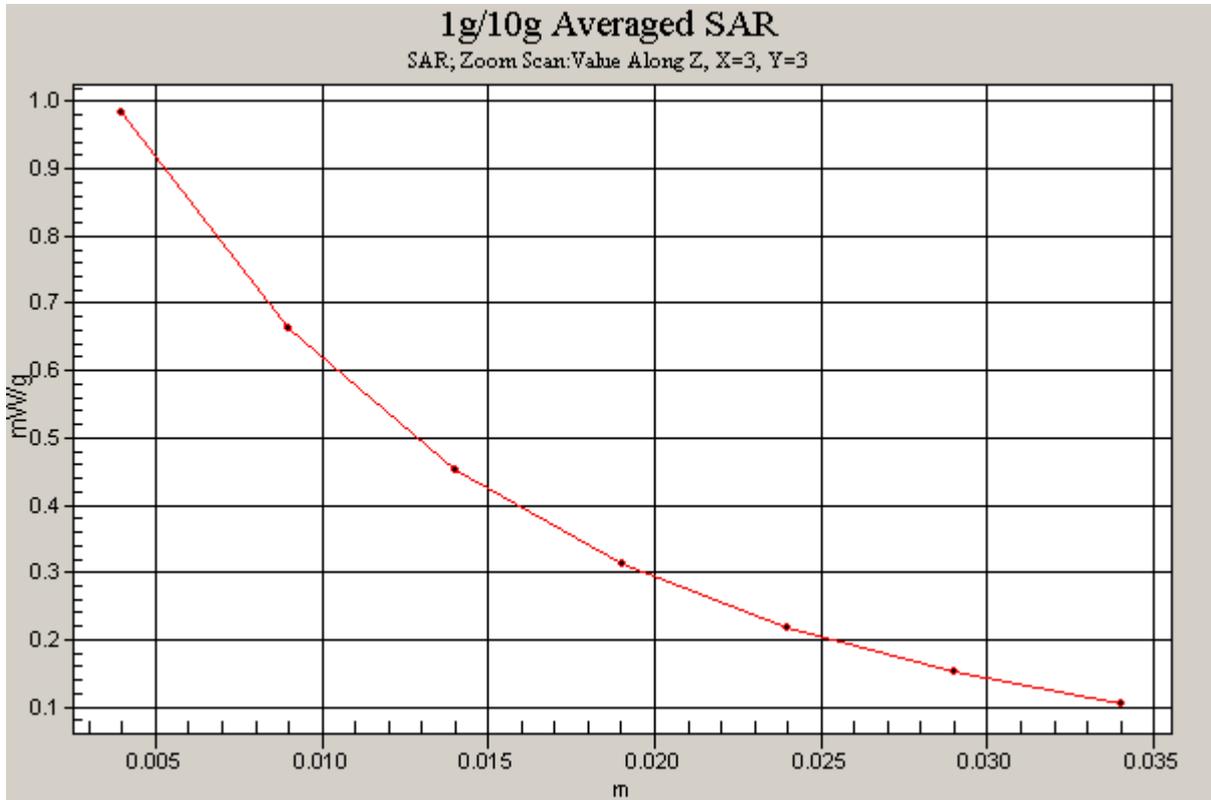
**Figure 13 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 128**

## GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 1 Middle Frequency

Communication System: GSM850 + GPRS(1Up); Frequency: 837 MHz;Duty Cycle: 1:8

Medium parameters used: f = 837 MHz; σ = 1.02 mho/m; $\varepsilon_r$ = 55.7; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 1 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

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

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 21.3 V/m; Power Drift = 0.092 dB

Peak SAR (extrapolated) = 1.14 W/kg

**SAR(1 g) = 0.752 mW/g; SAR(10 g) = 0.475 mW/g**

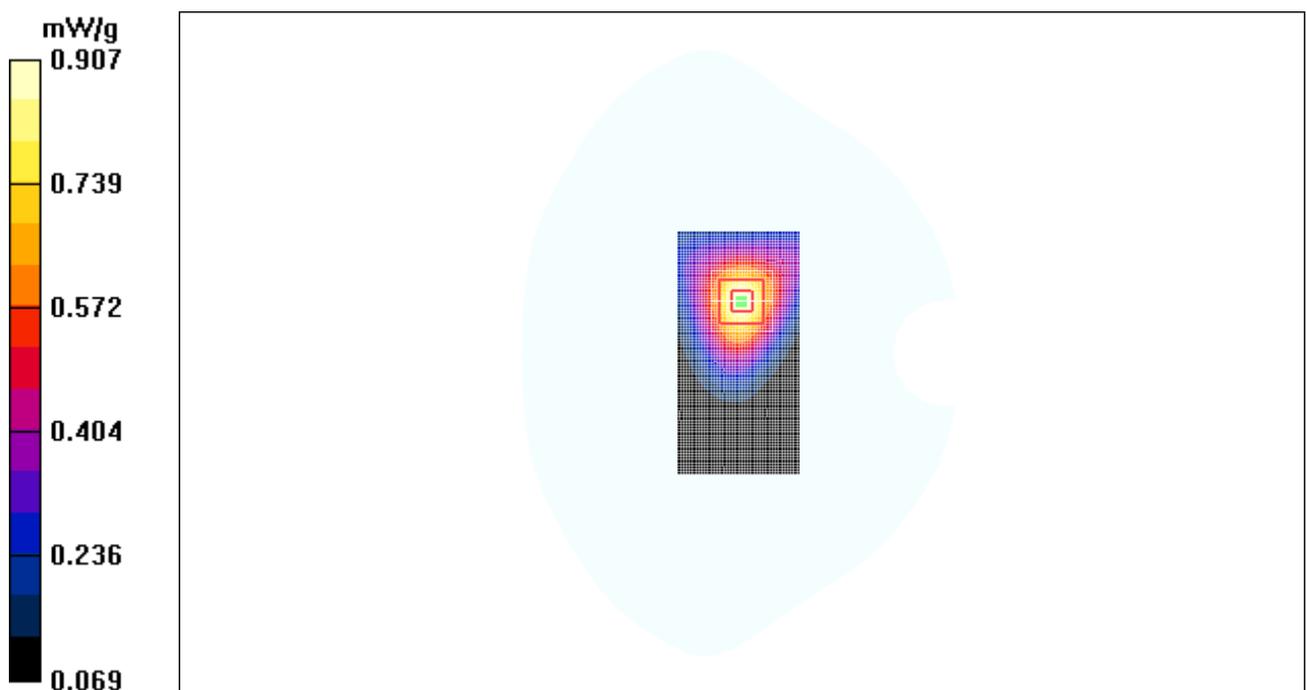Maximum value of SAR (measured) = 0.825 mW/g



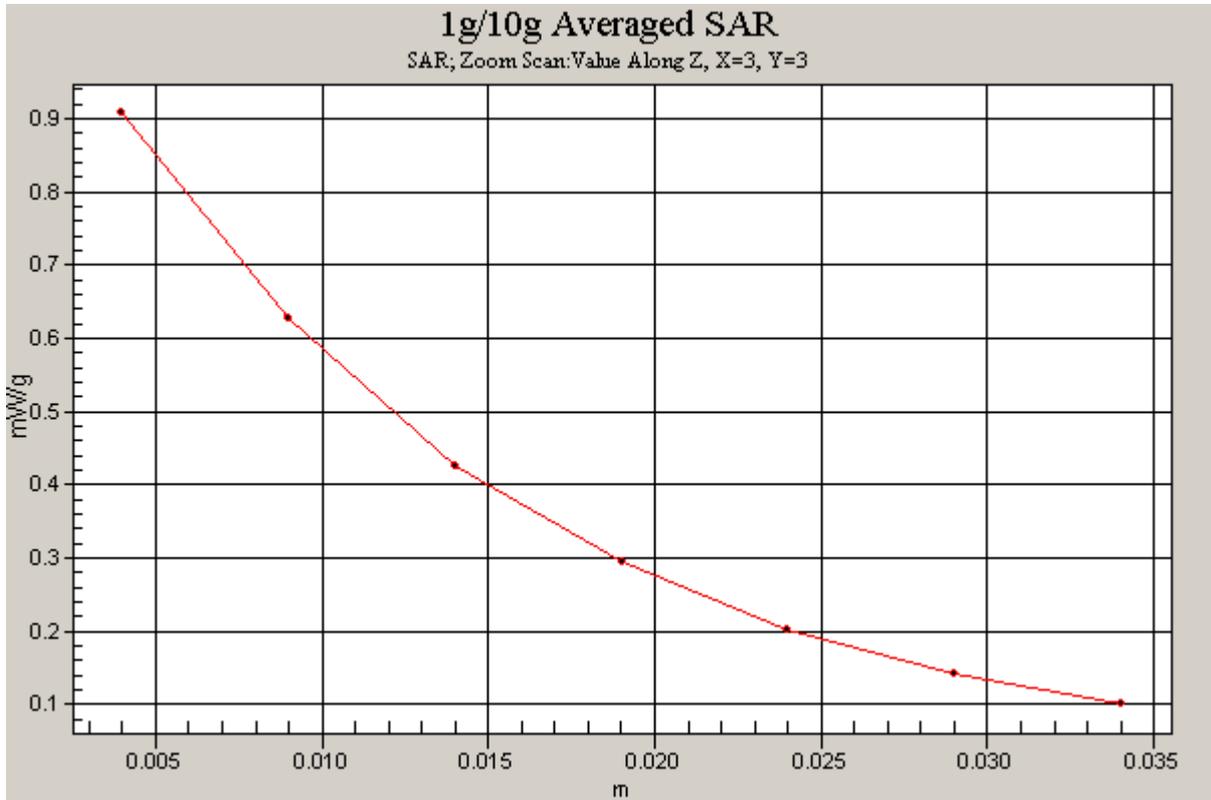**Figure 14 GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 3 Channel 192**

**Figure 15 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 1 Channel 192]**

**GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Middle Frequency**

Communication System: GSM850 + GPRS(2Up); Frequency: 848.8 MHz;Duty Cycle: 1:4

Medium parameters used: f = 849 MHz; σ = 1.03 mho/m; $\varepsilon_r$ = 55.6; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 2 High/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.05 mW/g

**Test Position 2 High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.1 V/m; Power Drift = 0.008 dB

Peak SAR (extrapolated) = 1.53 W/kg

**SAR(1 g) = 0.984 mW/g; SAR(10 g) = 0.603 mW/g**

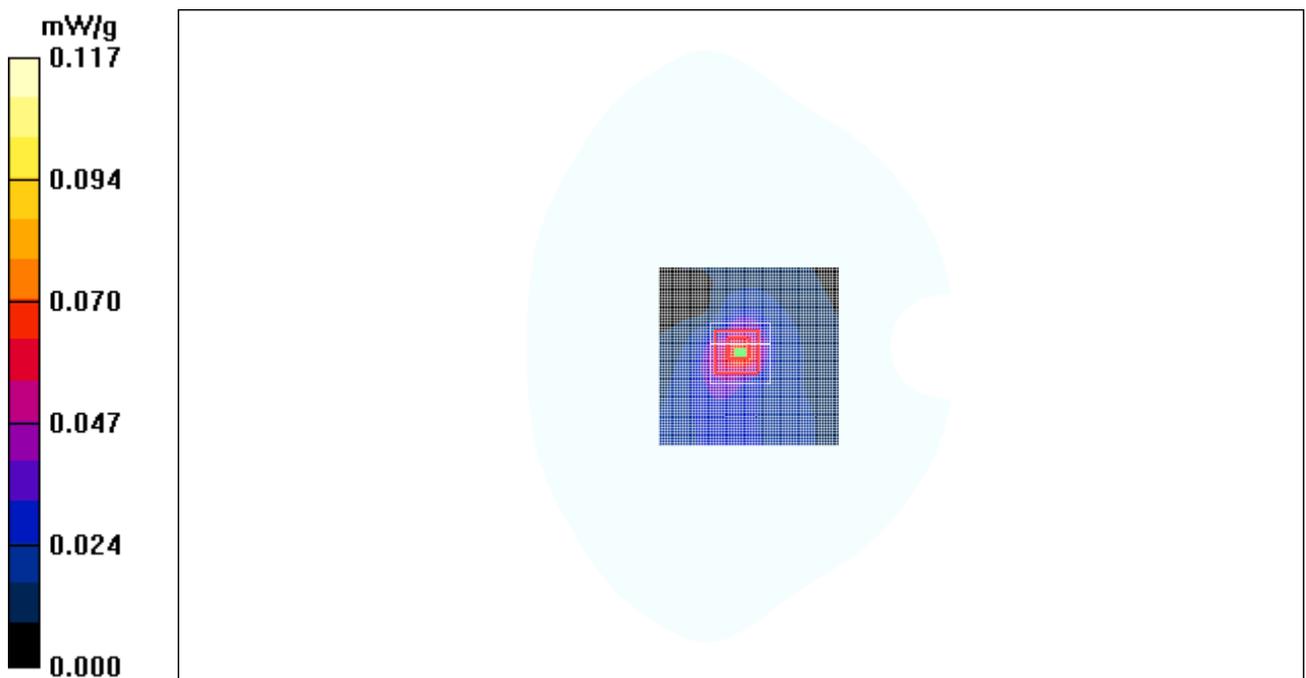Maximum value of SAR (measured) = 1.05 mW/g
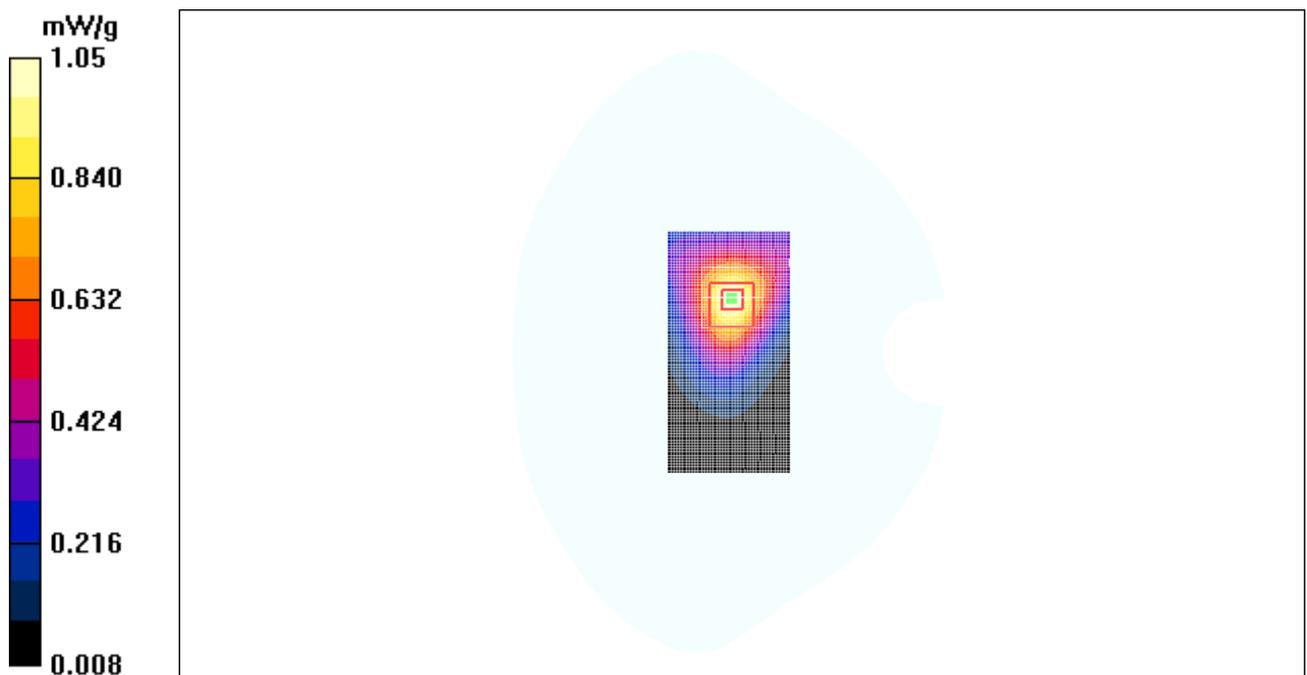


**Figure 16 GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 251**

**Figure 17 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 251]**

## GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Middle Frequency

Communication System: GSM850 + GPRS(2Up); Frequency: 837 MHz;Duty Cycle: 1:4

Medium parameters used: f = 837 MHz; σ = 1.02 mho/m; $\varepsilon_r$ = 55.7; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 2 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.00 mW/g


**Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.2 V/m; Power Drift = -0.067 dB

Peak SAR (extrapolated) = 1.34 W/kg

**SAR(1 g) = 0.904 mW/g; SAR(10 g) = 0.576 mW/g**

Maximum value of SAR (measured) = 0.983 mW/g



**Figure 18 GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 192**
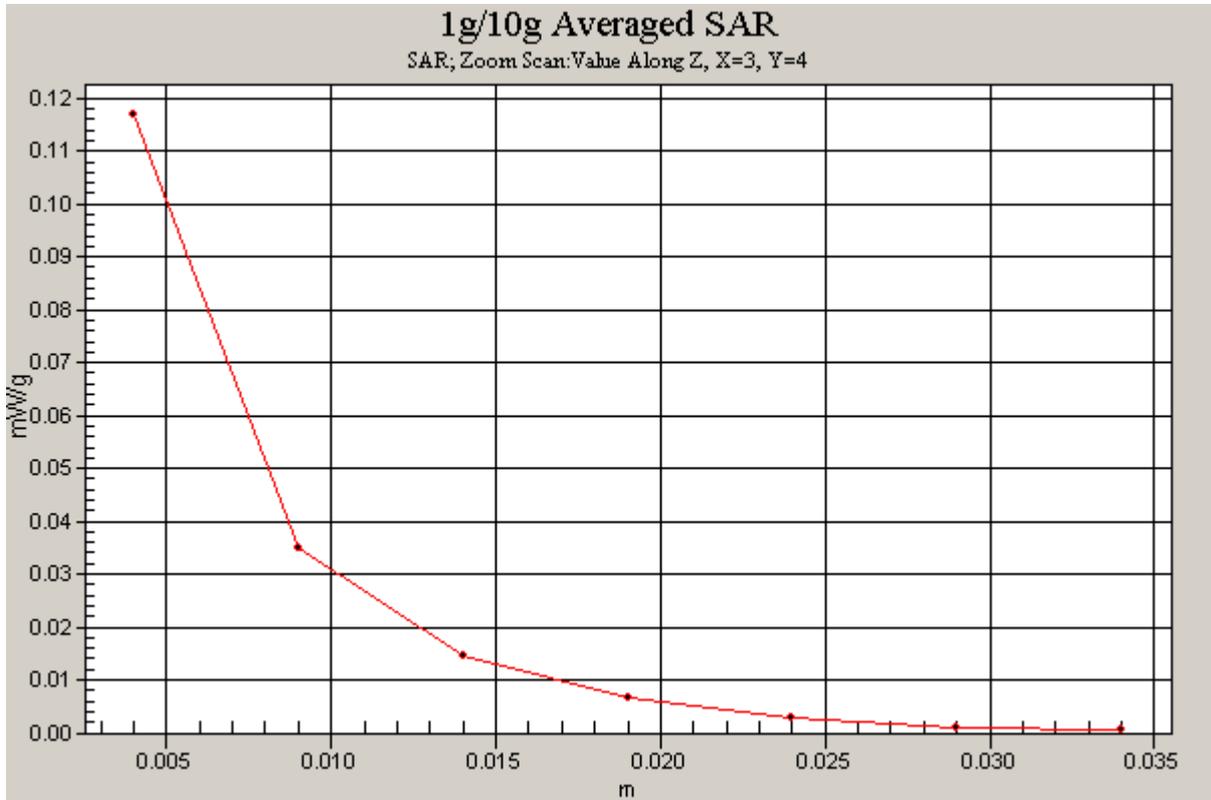
**Figure 19 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 192]**

**GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Middle Frequency**

Communication System: GSM850 + GPRS(2Up); Frequency: 824.2 MHz;Duty Cycle: 1:4

Medium parameters used (interpolated): f = 824.2 MHz; σ = 1 mho/m; $ε_r$ = 55.8; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 2 Low/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.926 mW/g


**Test Position 2 Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 22.6 V/m; Power Drift = -0.049 dB

Peak SAR (extrapolated) = 1.20 W/kg

**SAR(1 g) = 0.838 mW/g; SAR(10 g) = 0.538 mW/g**
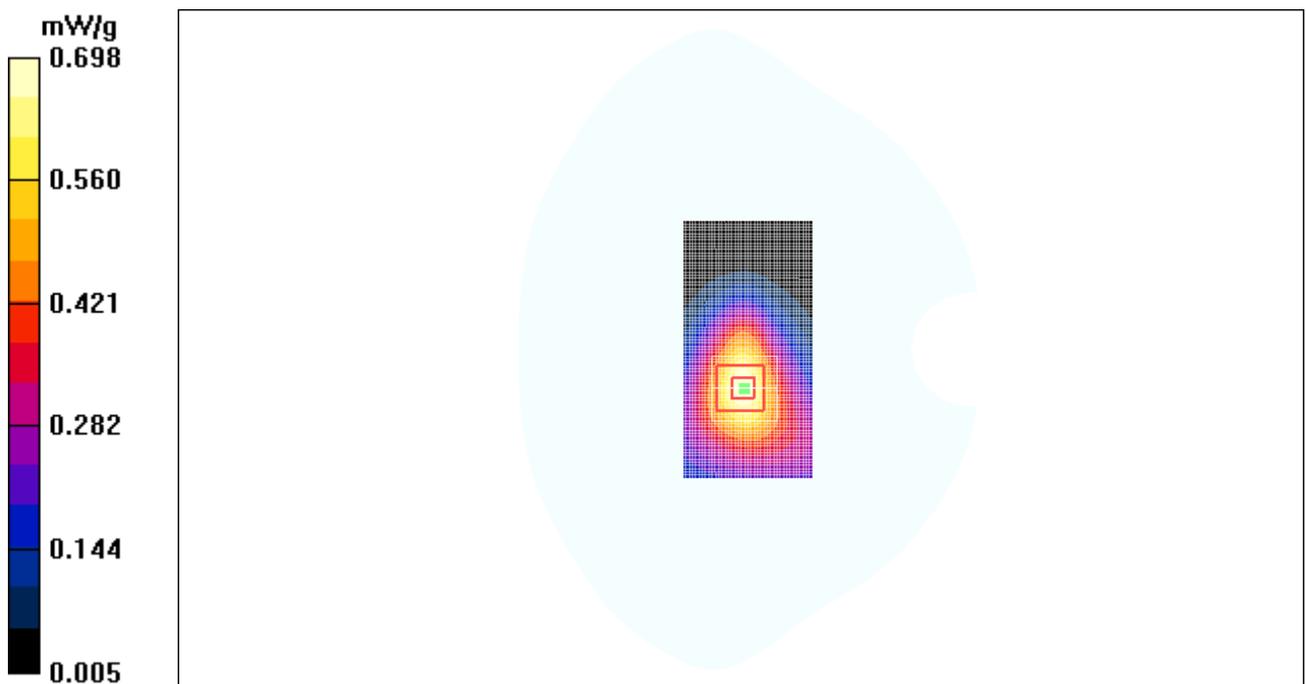
Maximum value of SAR (measured) = 0.907 mW/g



**Figure 20 GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 128**
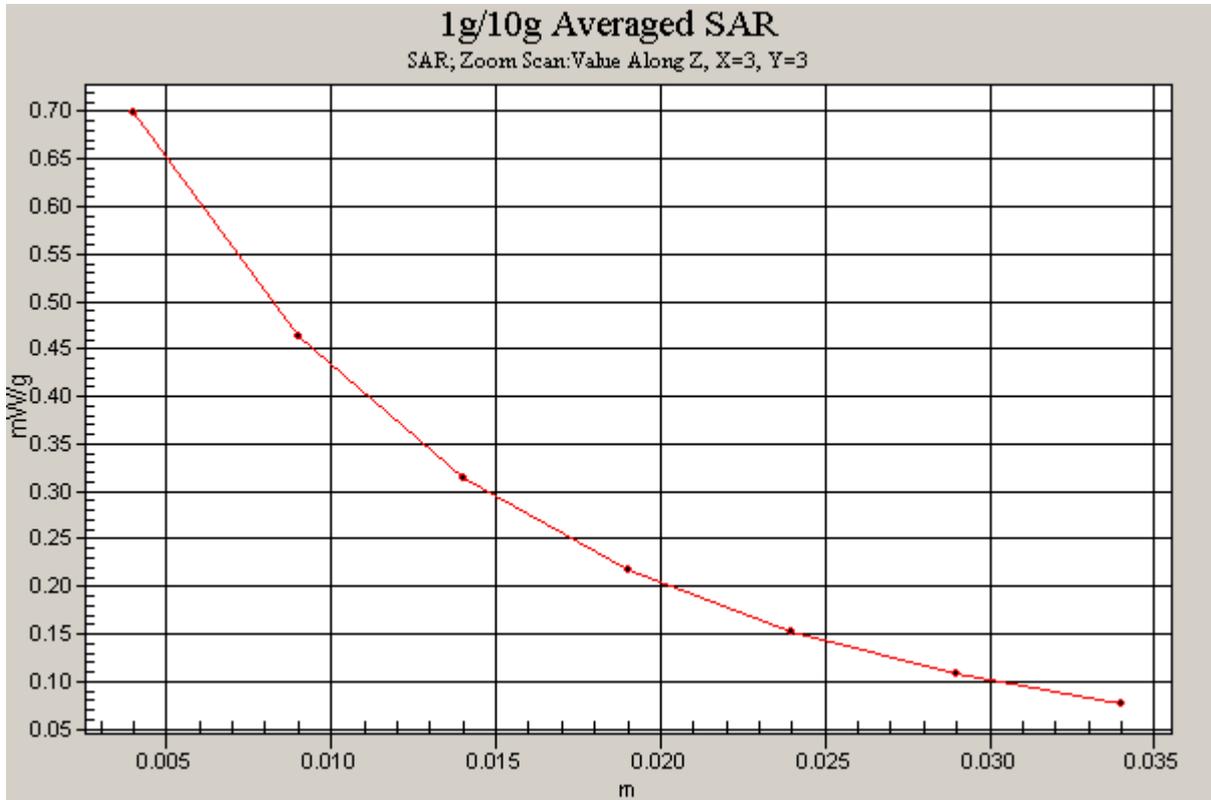
**Figure 21 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 128]**

**GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 3 Middle Frequency**

Communication System: GSM850 + GPRS(2Up); Frequency: 837 MHz;Duty Cycle: 1:4

Medium parameters used: f = 837 MHz; σ = 1.02 mho/m; $\varepsilon_r$ = 55.7; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 3    Middle/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.072 mW/g

**Test Position 3    Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.4 V/m; Power Drift = -0.140 dB

Peak SAR (extrapolated) = 0.485 W/kg

**SAR(1 g) = 0.105 mW/g; SAR(10 g) = 0.037 mW/g**

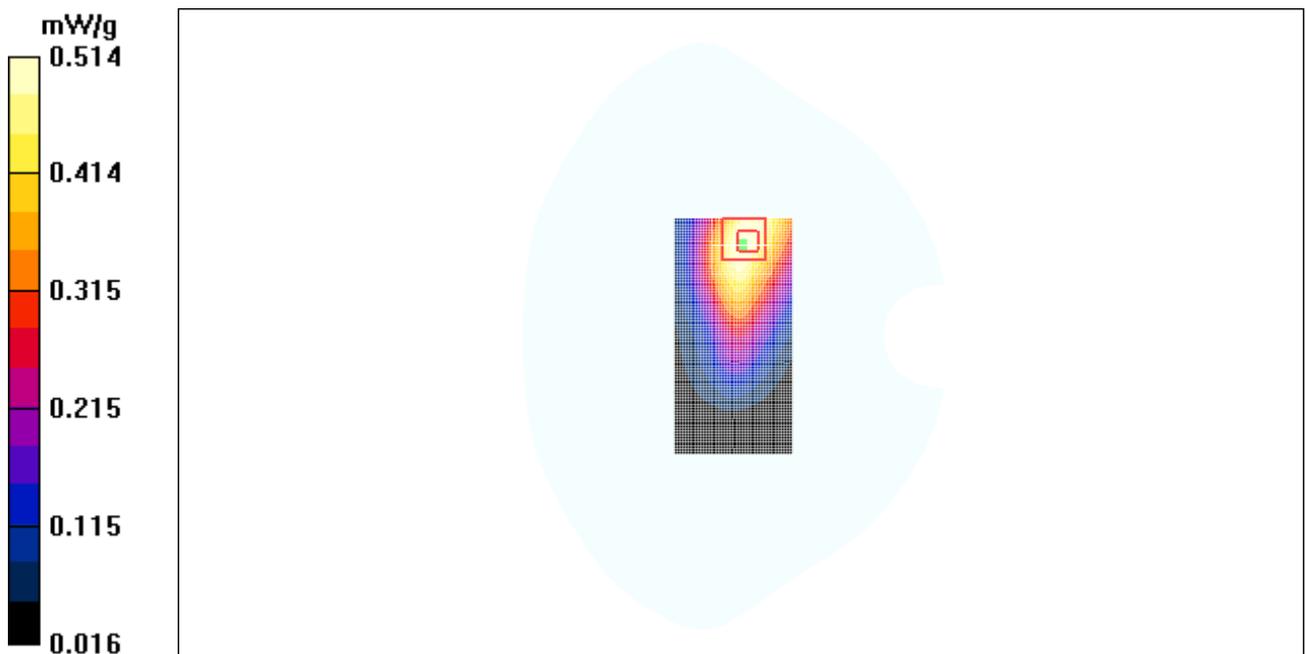Maximum value of SAR (measured) = 0.117 mW/g



**Figure 22 GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 3 Channel 192**
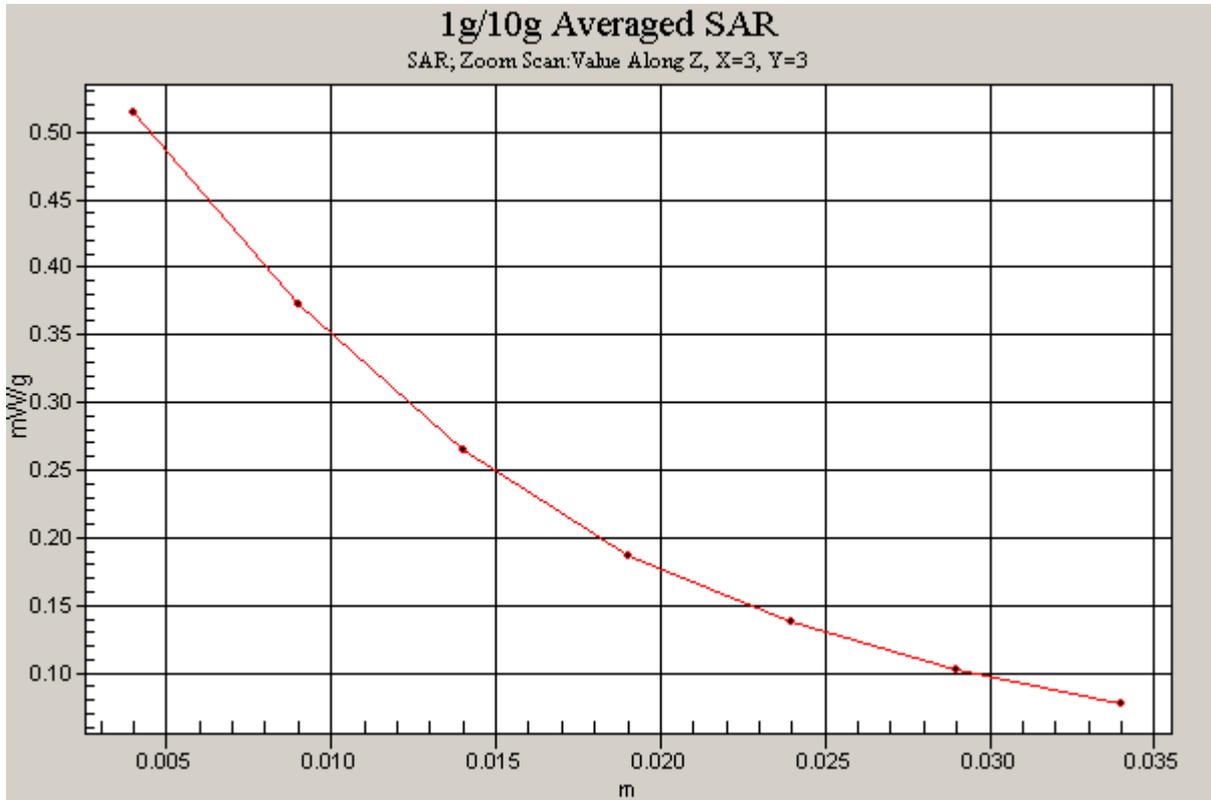
**Figure 23 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 3 Channel 192]**

## GSM 850 GPRS (2 timeslots in uplink) with IBM T61 Test Position 4 Middle Frequency

Communication System: GSM850 + GPRS(2Up); Frequency: 837 MHz;Duty Cycle: 1:4

Medium parameters used: f = 837 MHz; σ = 1.02 mho/m; $\varepsilon_r$ = 55.7; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 4 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

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

**Test Position 4 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.3 V/m; Power Drift = -0.030 dB

Peak SAR (extrapolated) = 1.01 W/kg

**SAR(1 g) = 0.652 mW/g; SAR(10 g) = 0.409 mW/g**
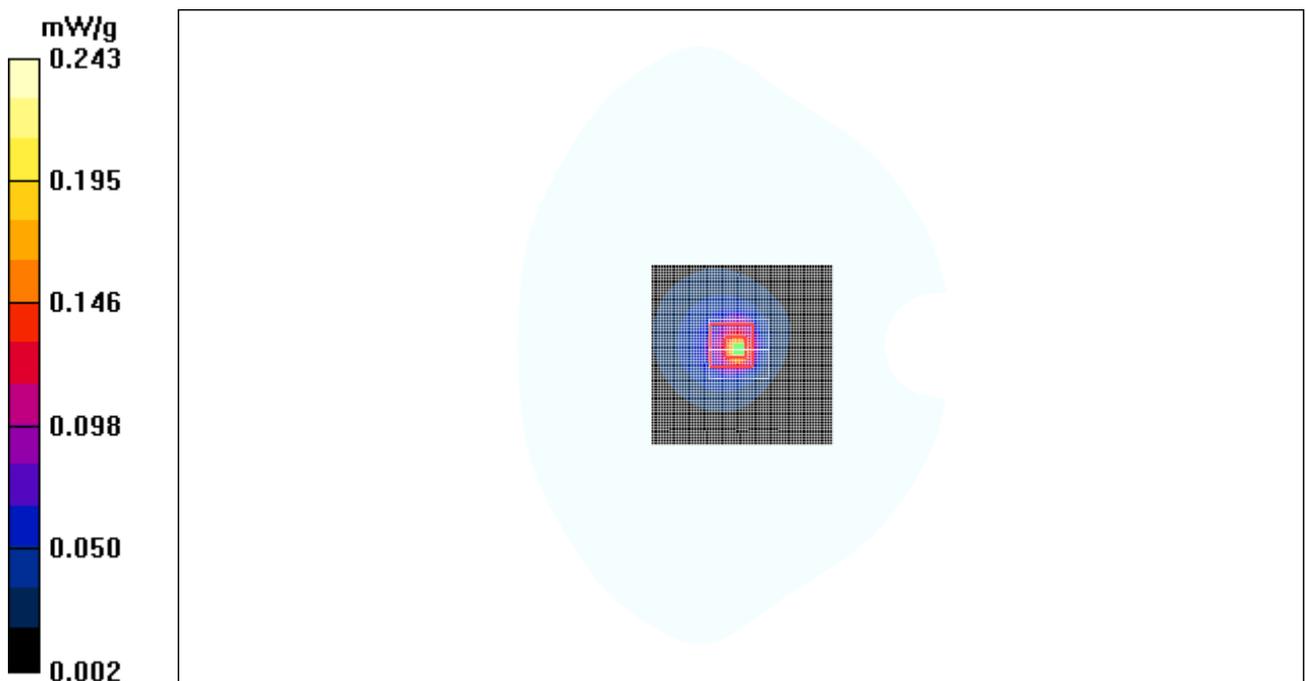
Maximum value of SAR (measured) = 0.698 mW/g



**Figure 24 GSM 850 GPRS (2 timeslots in uplink) with IBM T61 Test Position 4 Channel 192**

**Figure 25 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) with IBM T61 Test Position 4 Channel 192]**

**GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook R55V Test Position 5 Middle Frequency**

Communication System: GSM850 + GPRS(2Up); Frequency: 837 MHz;Duty Cycle: 1:4

Medium parameters used: f = 837 MHz; σ = 1.02 mho/m; $ε_r$ = 55.7; ρ = 1000 kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 5 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.524 mW/g

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

Reference Value = 16.5 V/m; Power Drift = -0.141 dB

Peak SAR (extrapolated) = 0.657 W/kg

**SAR(1 g) = 0.484 mW/g; SAR(10 g) = 0.332 mW/g**

Maximum value of SAR (measured) = 0.514 mW/g



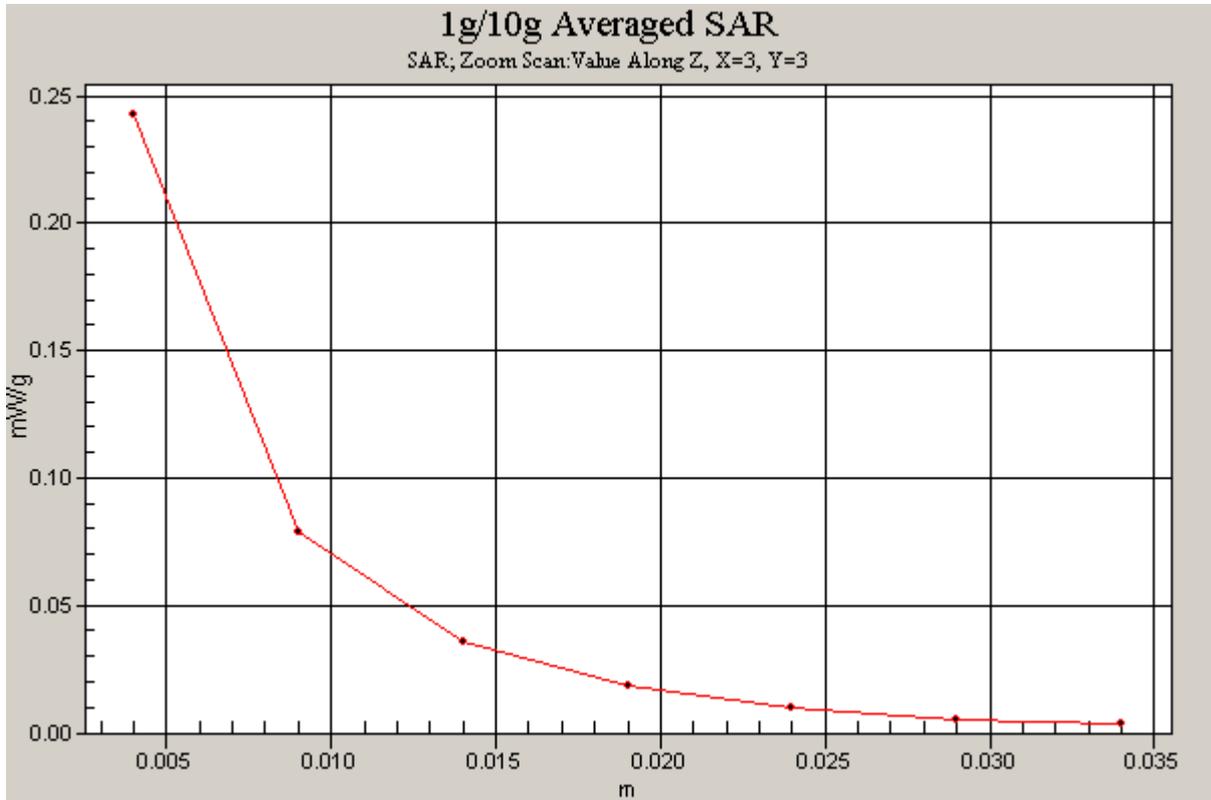**Figure 26 GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook R55V Test Position 5 Channel 192**

**Figure 27 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook R55V Test Position 5 Channel 192]**

**GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook R55V Test Position 6 Middle Frequency**

Communication System: GSM850 + GPRS(2Up); Frequency: 837 MHz;Duty Cycle: 1:4

Medium parameters used: f = 837 MHz; σ = 1.02 mho/m; $ε_r$ = 55.7; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 6 Middle/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.197 mW/g


**Test Position 6 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.1 V/m; Power Drift = -0.048 dB

Peak SAR (extrapolated) = 1.14 W/kg

**SAR(1 g) = 0.232 mW/g; SAR(10 g) = 0.078 mW/g**

Maximum value of SAR (measured) = 0.243 mW/g



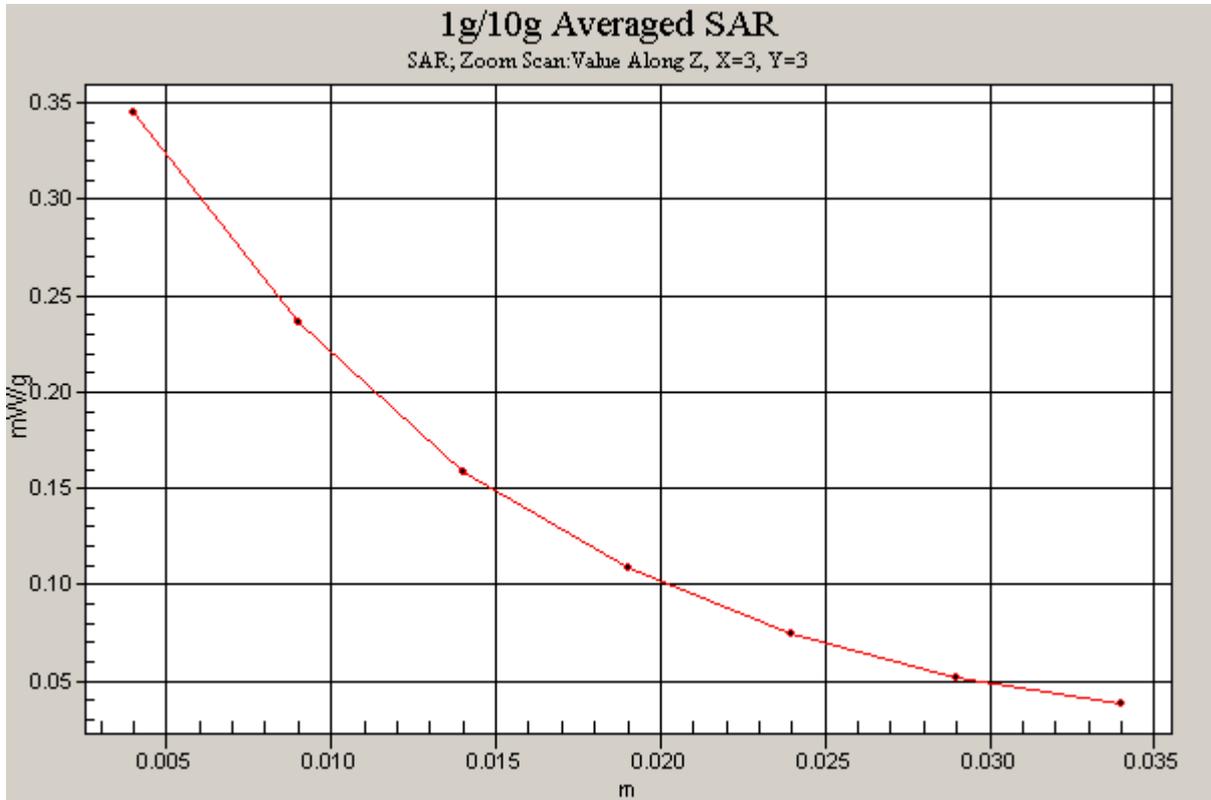**Figure 28 GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook R55V Test Position 6 Channel 192**

**Figure 29 Z-Scan at power reference point [GSM 850 GPRS (2 timeslots in uplink) with BenQ Joybook R55V Test Position 6 Channel 192]**

**GSM 850 EGPRS (2 timeslots in uplink) with BenQJoybookS72 Test Position 2 Middle Frequency**

Communication System: GSM850 +EGPRS(2Up); Frequency: 837 MHz;Duty Cycle: 1:4

Medium parameters used: f = 837 MHz; σ = 1.02 mho/m; $ε_r$ = 55.7; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

**Test Position 2 Middle Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.355 mW/g

**Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 14.2 V/m; Power Drift = -0.048 dB

Peak SAR (extrapolated) = 0.457 W/kg

**SAR(1 g) = 0.317 mW/g; SAR(10 g) = 0.205 mW/g**

Maximum value of SAR (measured) = 0.345 mW/g
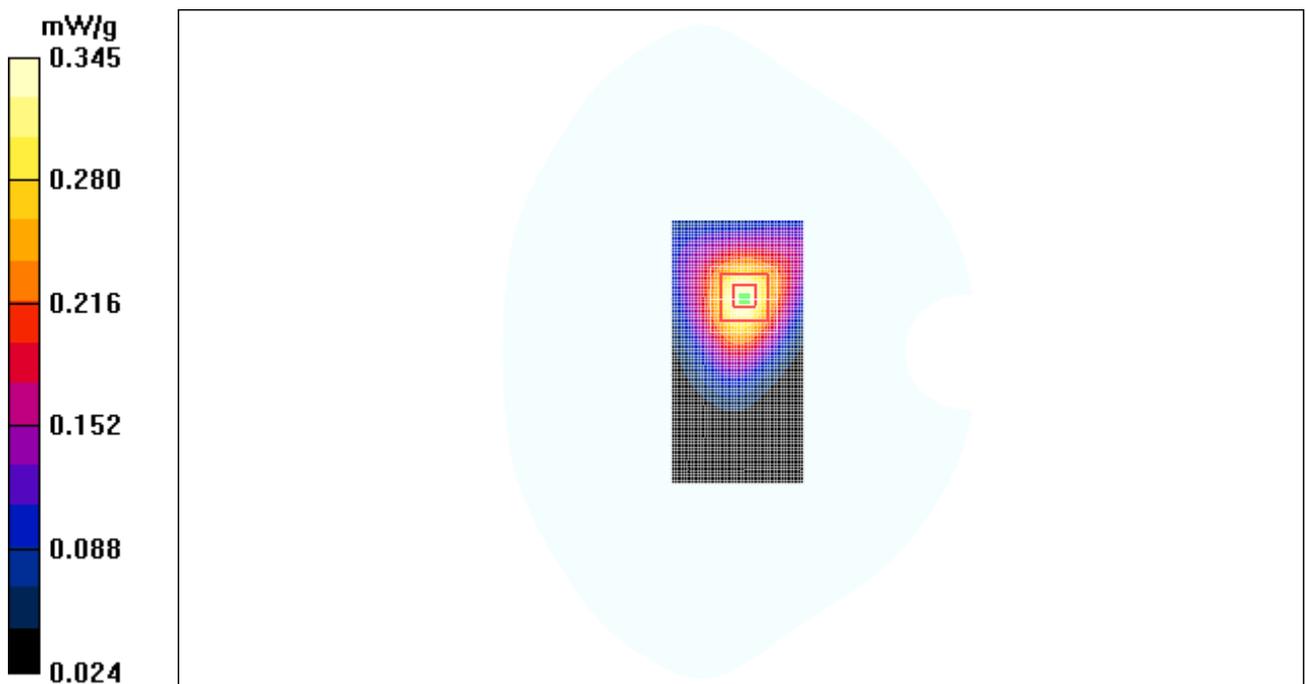


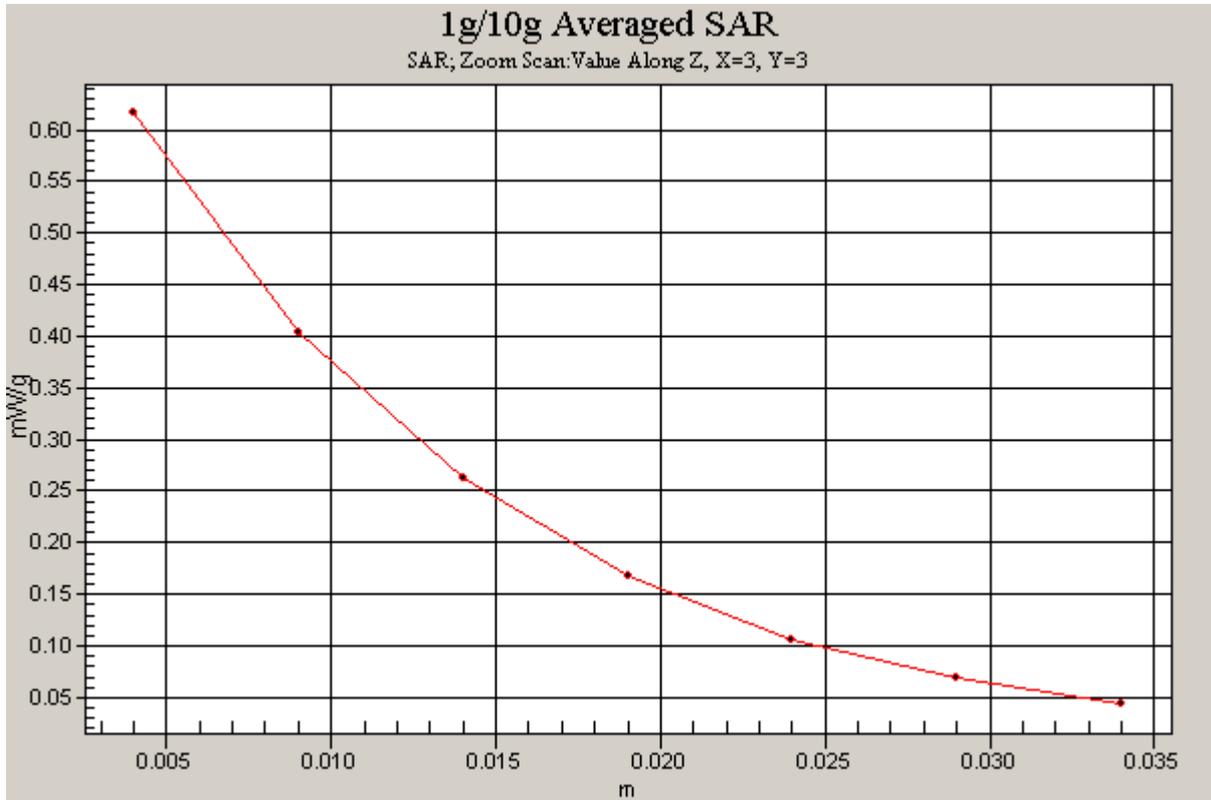**Figure 30 GSM 850 EGPRS (2 timeslots in uplink) with BenQ Joybook S72Test Position 2 Channel 192**

**Figure 31 Z-Scan at power refence point [GSM 850 EGPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 192]**

**GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 1 Middle Frequency**

Communication System: GSM 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4

Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; $\varepsilon_r$ = 52.1; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(4.64, 4.64, 4.64);

Electronics: DAE4 Sn452;

**Test Position 1 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

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


**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 18.4 V/m; Power Drift = -0.108 dB

Peak SAR (extrapolated) = 0.858 W/kg

**SAR(1 g) = 0.554 mW/g; SAR(10 g) = 0.323 mW/g**

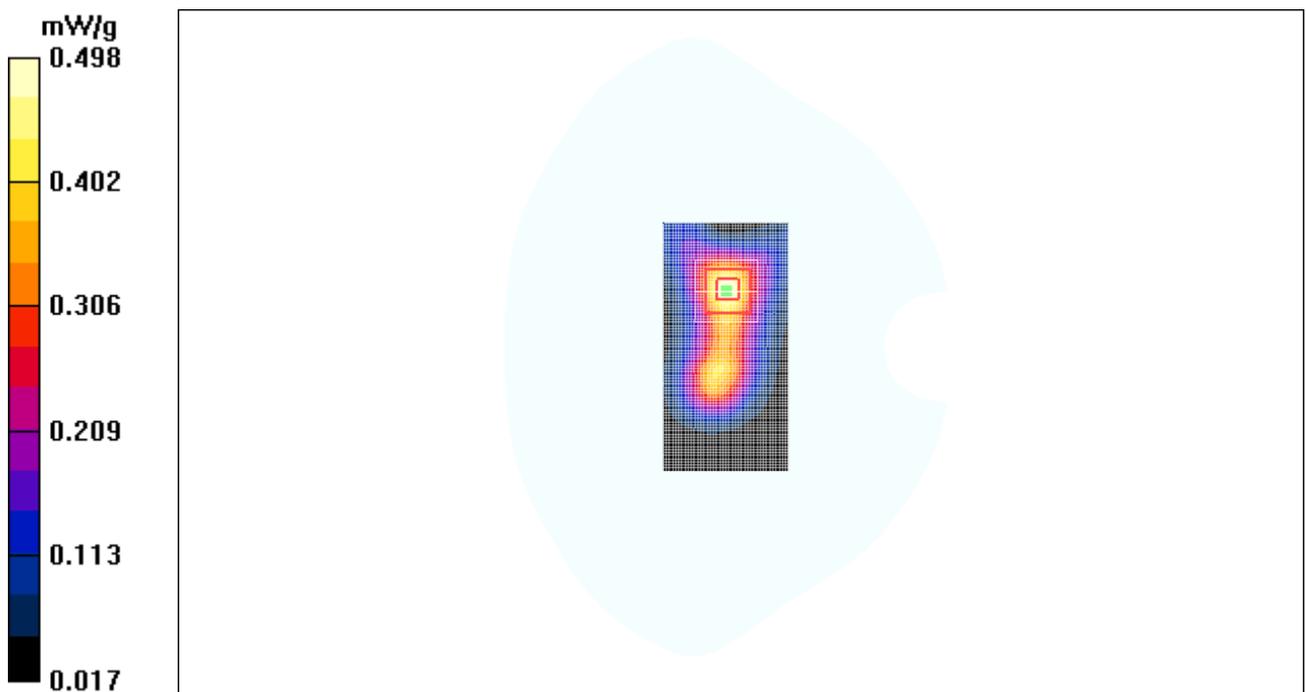Maximum value of SAR (measured) = 0.616 mW/g
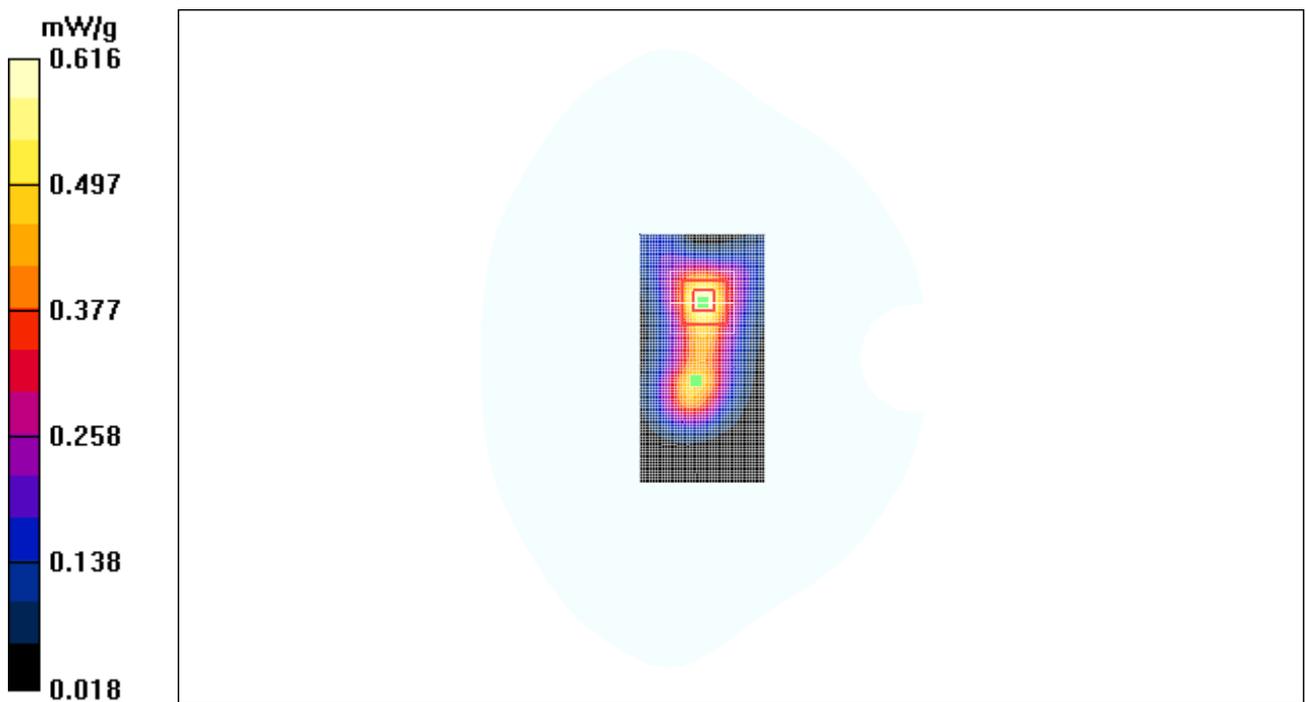


**Figure 32 GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 1 Channel 661**
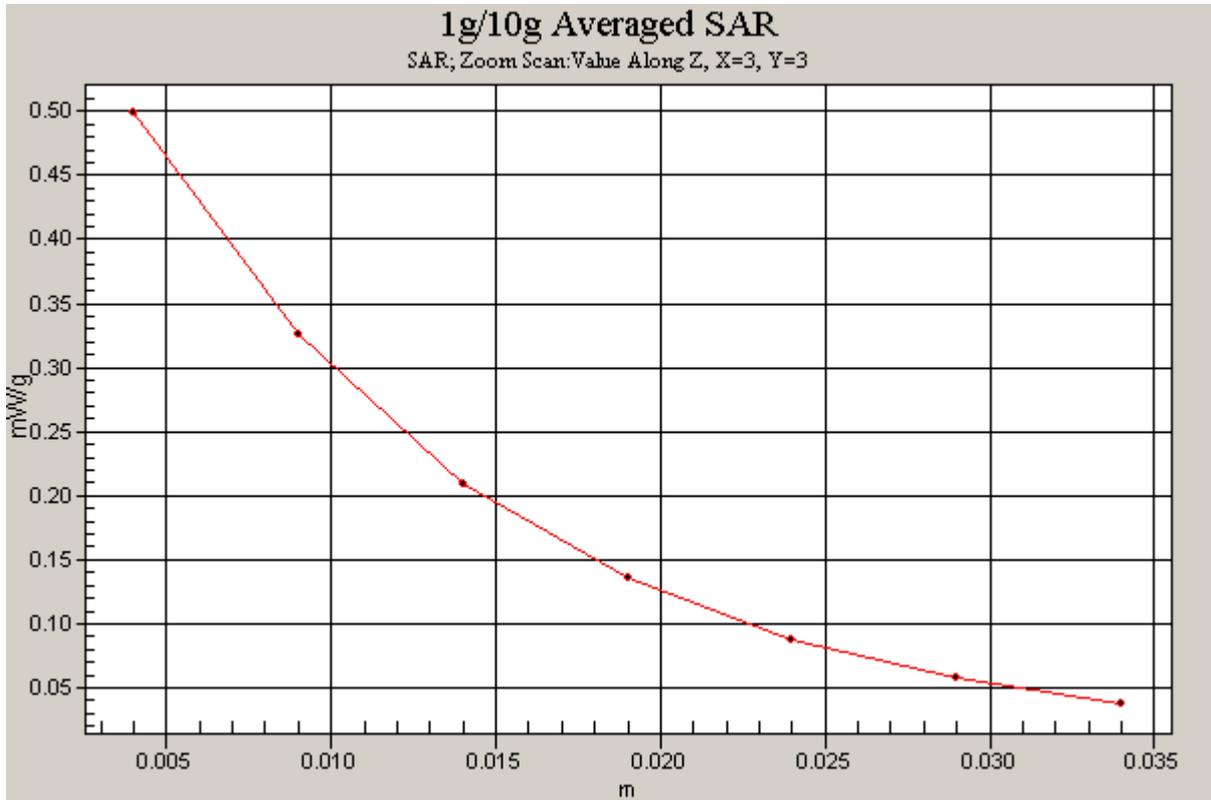
**Figure 33 Z-Scan at power reference point [GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 1 Channel 661]**

**GSM 1900 GPRS (1 timeslot in uplink) with BenQ Joybook S72 Test Position 1 Middle Frequency**

Communication System: GSM 1900+GPRS(1Up); Frequency: 1880 MHz;Duty Cycle: 1:8

Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; $\varepsilon_r$ = 52.1; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(4.64, 4.64, 4.64);

Electronics: DAE4 Sn452;

**Test Position 1 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.516 mW/g

**Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.5 V/m; Power Drift = -0.140 dB

Peak SAR (extrapolated) = 0.700 W/kg

**SAR(1 g) = 0.449 mW/g; SAR(10 g) = 0.261 mW/g**

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



**Figure 34 GSM 1900 GPRS (1 timeslot in uplink) with BenQ Joybook S72 Test Position 1 Channel 661**

**Figure 35 Z-Scan at power reference point [GSM 1900 GPRS (1 timeslot in uplink) with BenQ Joybook S72 Test Position 1 Channel 661]**

### GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Middle Frequency

Communication System: GSM 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4

Medium parameters used: f = 1880 MHz; $\sigma$ = 1.48 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(4.64, 4.64, 4.64);

Electronics: DAE4 Sn452;

**Test Position 2 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.901 mW/g

**Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.4 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 1.47 W/kg

**SAR(1 g) = 0.778 mW/g; SAR(10 g) = 0.403 mW/g**

Maximum value of SAR (measured) = 0.880 mW/g
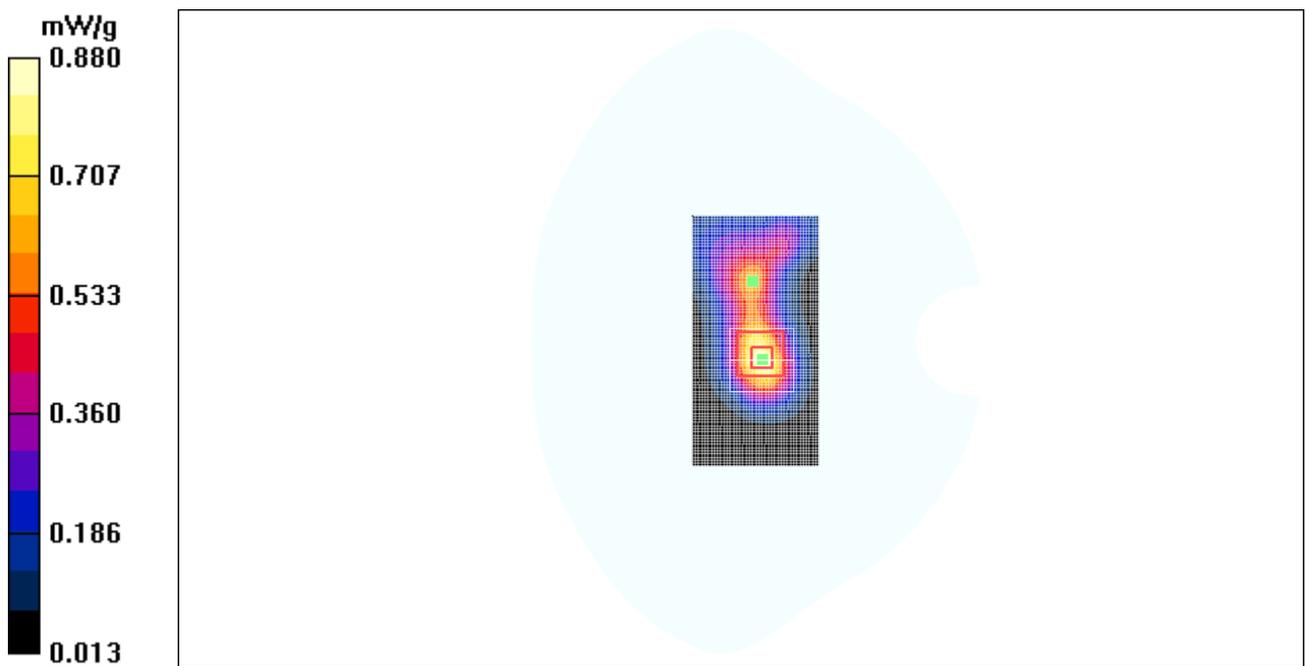


**Figure 36 GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 661**
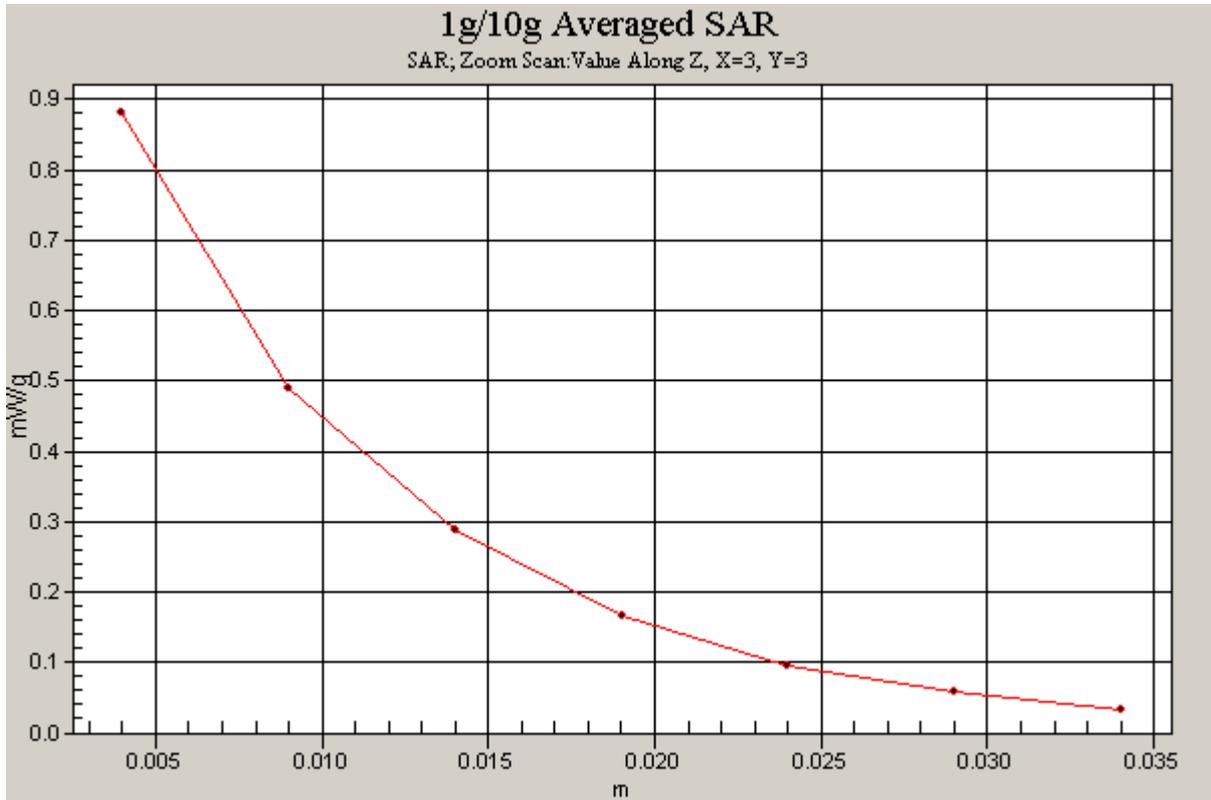
**Figure 37 Z-Scan at power reference point [GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 661]**

## GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 3 Middle Frequency

Communication System: GSM 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4

Medium parameters used: f = 1880 MHz; $\sigma$ = 1.48 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$ Probe: ET3DV6 - SN1531; ConvF(4.64, 4.64, 4.64);

Electronics: DAE4 Sn452;

**Test Position 3 Middle/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.253 mW/g

**Test Position 3 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.8 V/m; Power Drift = -0.124 dB

Peak SAR (extrapolated) = 0.879 W/kg

**SAR(1 g) = 0.305 mW/g; SAR(10 g) = 0.131 mW/g**

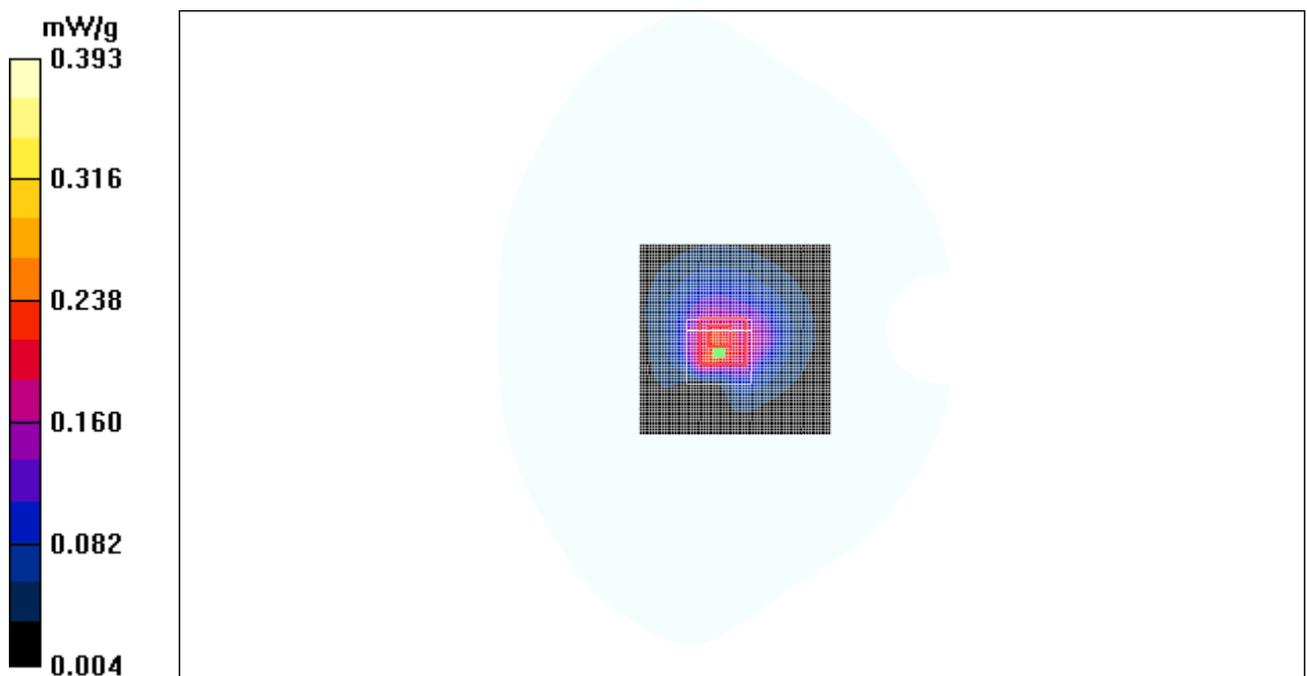Maximum value of SAR (measured) = 0.393 mW/g



**Figure 38 GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 3 Channel 661**
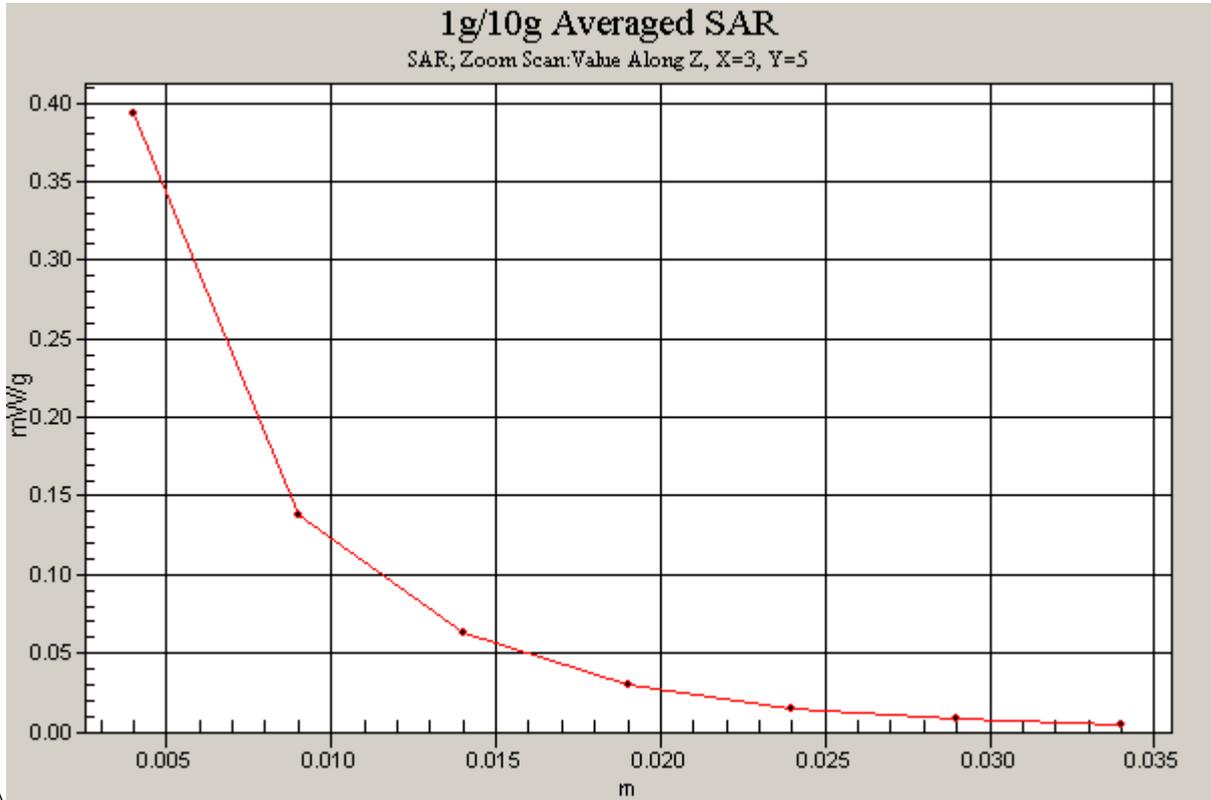
**Figure 39 Z-Scan at power reference point [GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 3 Channel 661]**

**GSM 1900 GPRS (2 timeslots in uplink) with IBM T61 Test Position 4 Middle Frequency**

Communication System: GSM 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4

Medium parameters used: f = 1880 MHz; $\sigma$ = 1.48 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(4.64, 4.64, 4.64);

Electronics: DAE4 Sn452;

**Test Position 4 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.606 mW/g


**Test Position 4 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.0 V/m; Power Drift = -0.051 dB

Peak SAR (extrapolated) = 0.906 W/kg

**SAR(1 g) = 0.536 mW/g; SAR(10 g) = 0.295 mW/g**

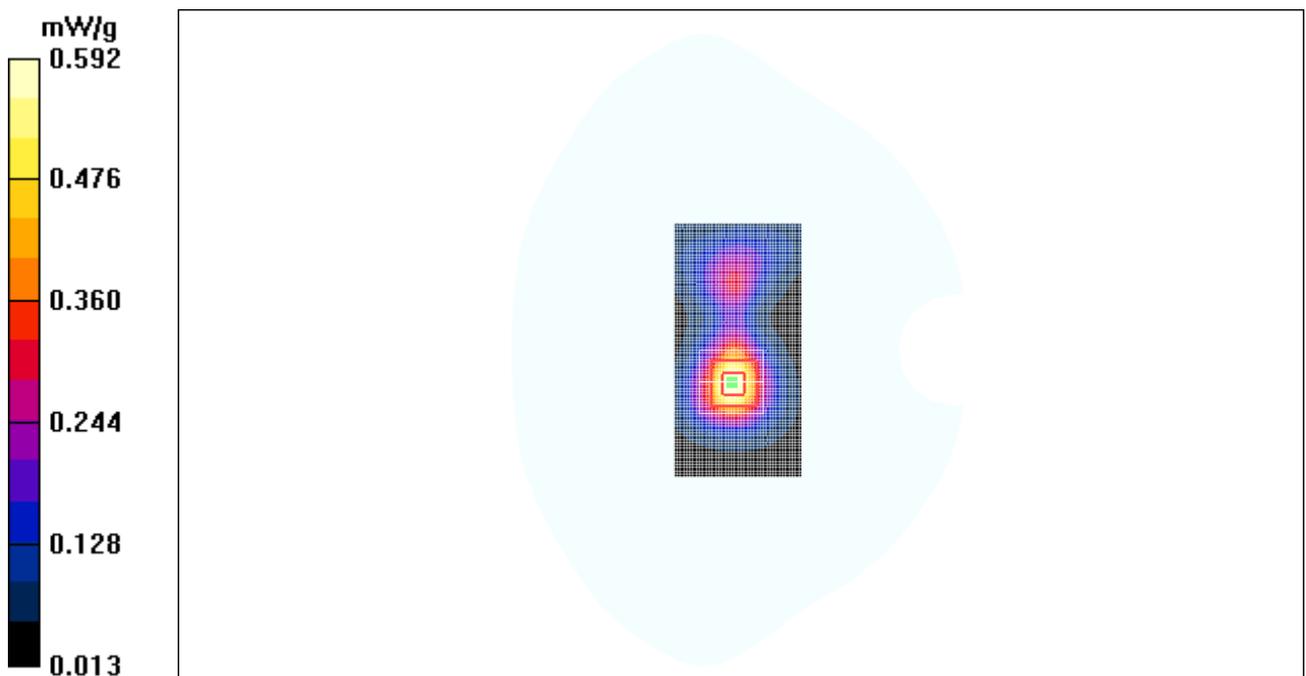Maximum value of SAR (measured) = 0.592 mW/g



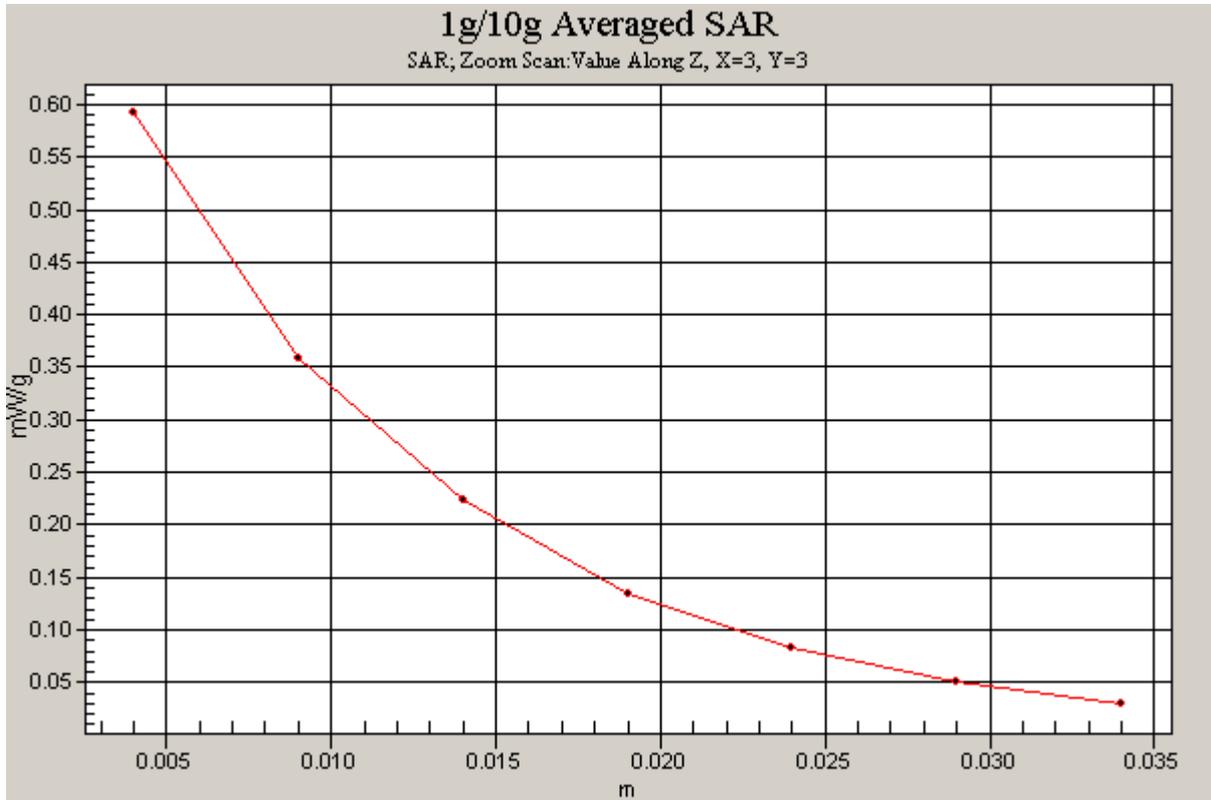**Figure 40 GSM 1900 GPRS (2 timeslots in uplink) with IBM T61 Test Position 4 Channel 661**

**Figure 41 Z-Scan at power reference point [GSM 1900 GPRS (2 timeslots in uplink) with IBM T61 Test Position 4 Channel 661]**

## GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook R55V Test Position 5 Middle Frequency

Communication System: GSM 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4

Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; $ε_r$ = 52.1; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(4.64, 4.64, 4.64);

Electronics: DAE4 Sn452;

**Test Position 5 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.810 mW/g

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

Reference Value = 19.4 V/m; Power Drift = 0.001 dB

Peak SAR (extrapolated) = 1.14 W/kg

**SAR(1 g) = 0.671 mW/g; SAR(10 g) = 0.366 mW/g**

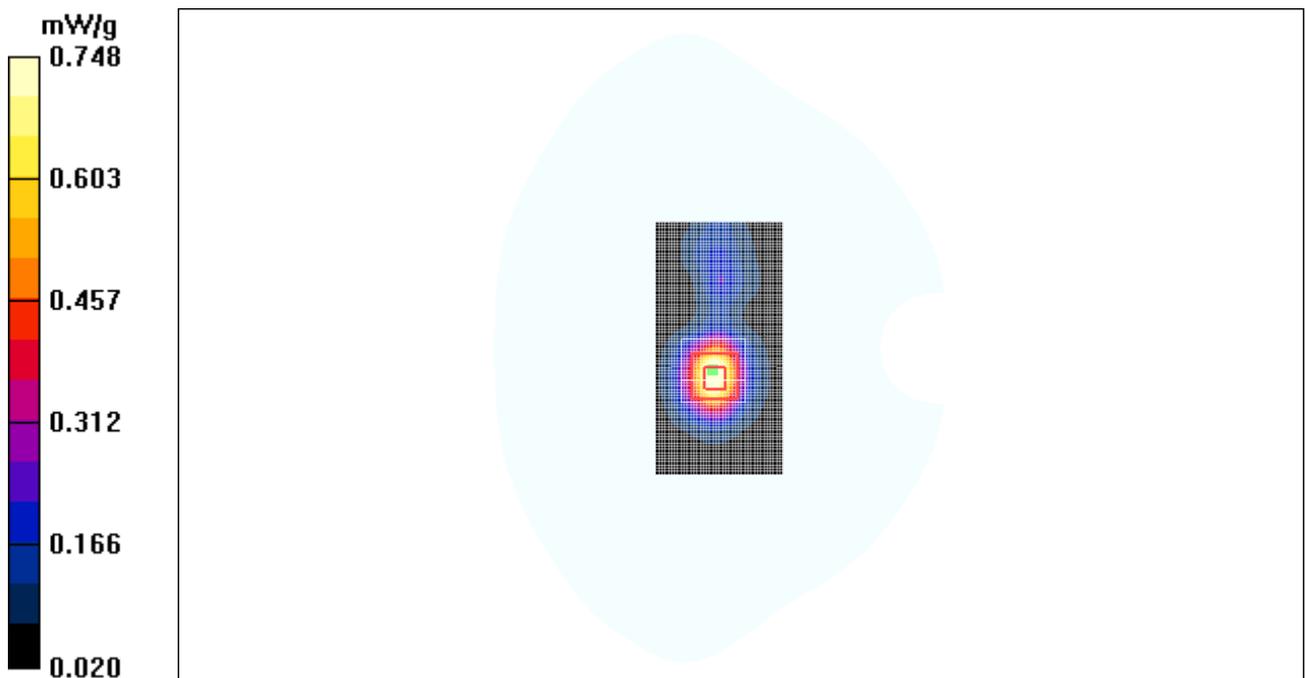Maximum value of SAR (measured) = 0.748 mW/g



**Figure 42 GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 5 Channel 661**
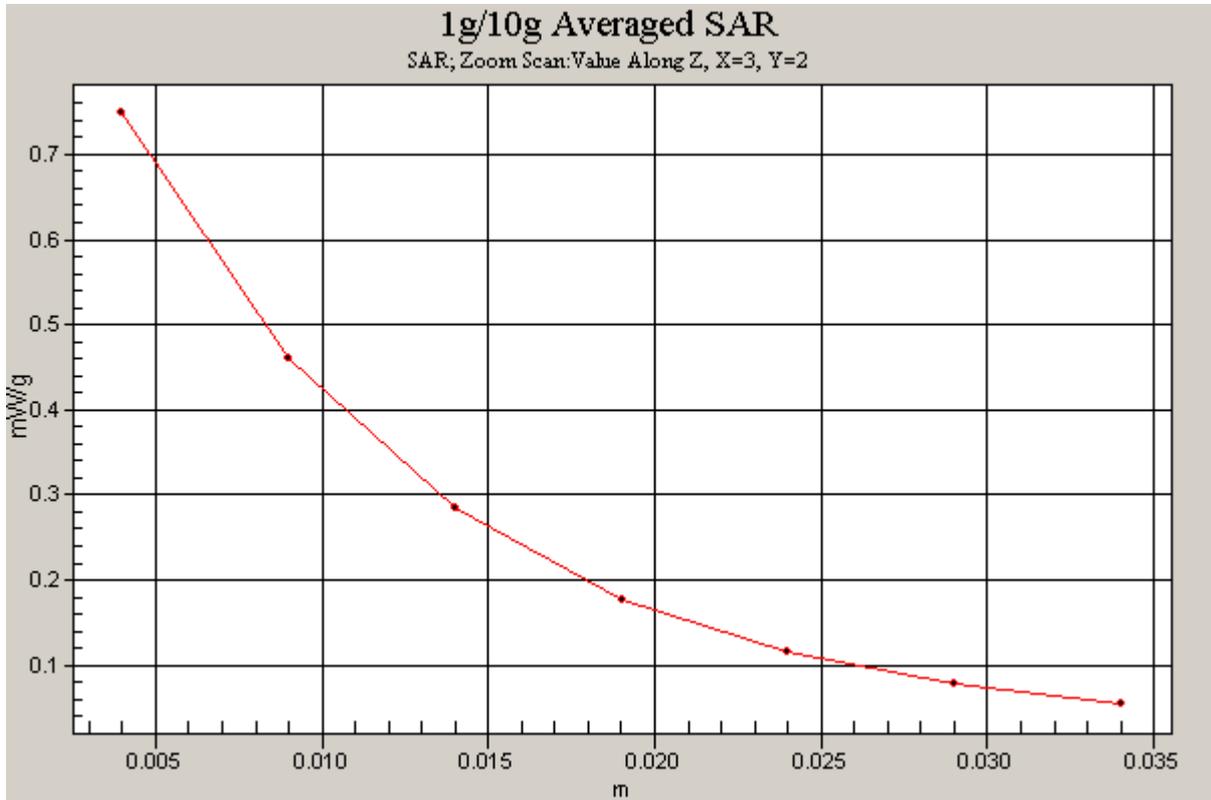
**Figure 43 Z-Scan at power reference point [GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 5 Channel 661]**

**GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook R55V Test Position 6 Middle Frequency**

Communication System: GSM 1900+GPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4

Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; $ε_r$ = 52.1; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(4.64, 4.64, 4.64);

Electronics: DAE4 Sn452;

**Test Position 6 Middle/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm

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

**Test Position 6 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.8 V/m; Power Drift = -0.170 dB

Peak SAR (extrapolated) = 1.01 W/kg

**SAR(1 g) = 0.318 mW/g; SAR(10 g) = 0.139 mW/g**
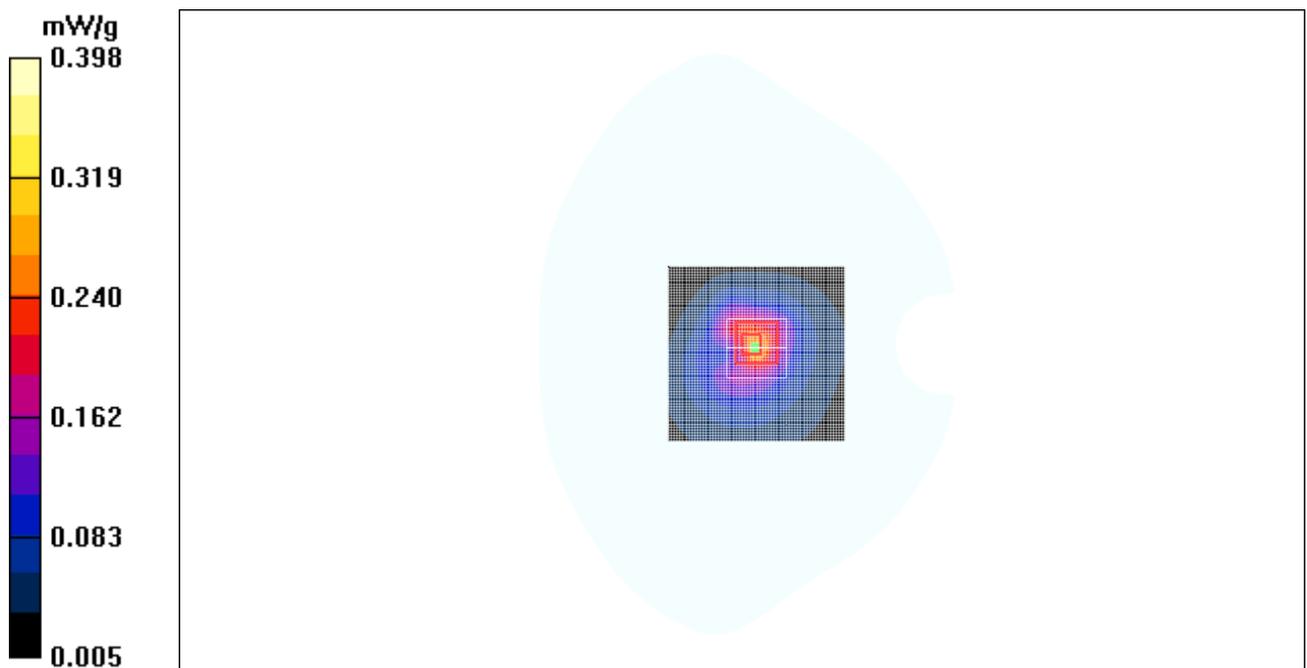
Maximum value of SAR (measured) = 0.398 mW/g



**Figure 44 GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook R55V Test Position 6 Channel 661**
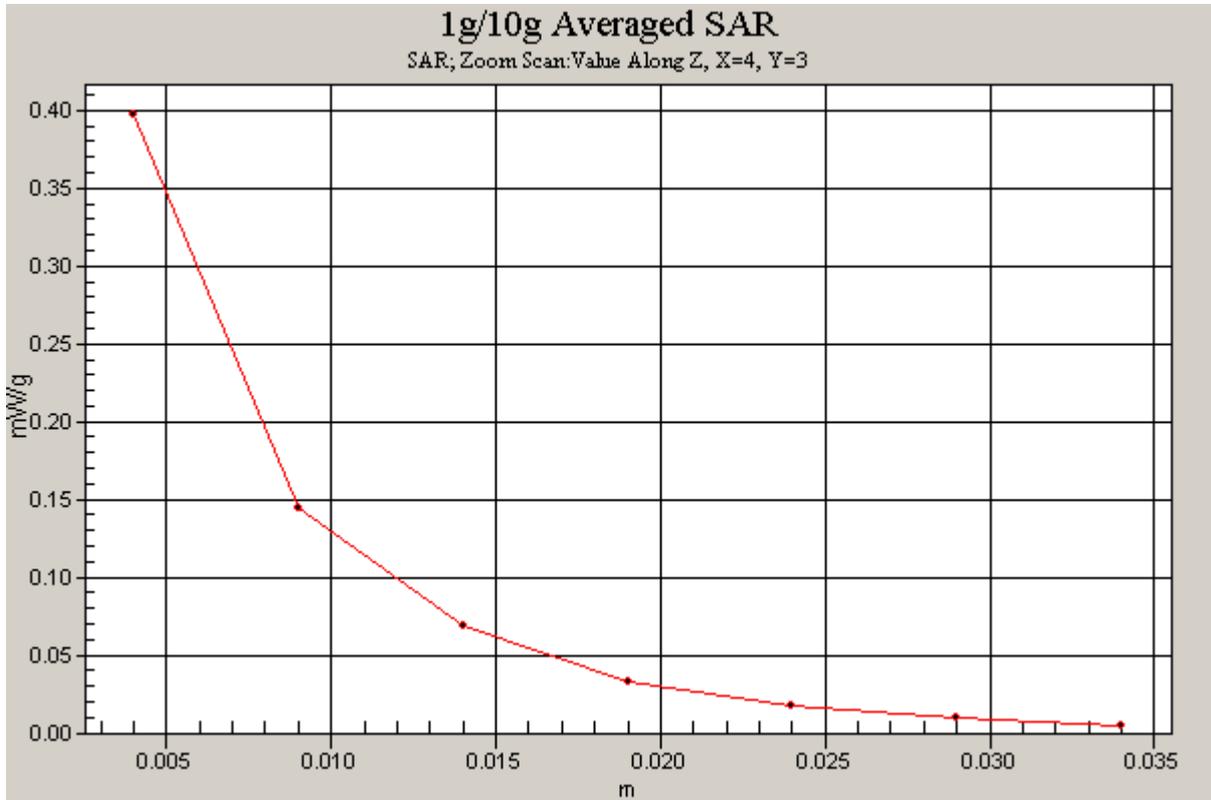
**Figure 45 Z-Scan at power reference point [GSM 1900 GPRS (2 timeslots in uplink) with BenQ Joybook R55V Test Position 6 Channel 661]**

## GSM 1900 EGPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Middle Frequency

Communication System: GSM 1900+EGPRS(2Up); Frequency: 1880 MHz;Duty Cycle: 1:4

Medium parameters used: f = 1880 MHz; $\sigma$ = 1.48 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(4.64, 4.64, 4.64);

Electronics: DAE4 Sn452;

**Test Position 2 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.607 mW/g


**Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.4 V/m; Power Drift = 0.067 dB

Peak SAR (extrapolated) = 0.977 W/kg

**SAR(1 g) = 0.524 mW/g; SAR(10 g) = 0.271 mW/g**

Maximum value of SAR (measured) = 0.591 mW/g
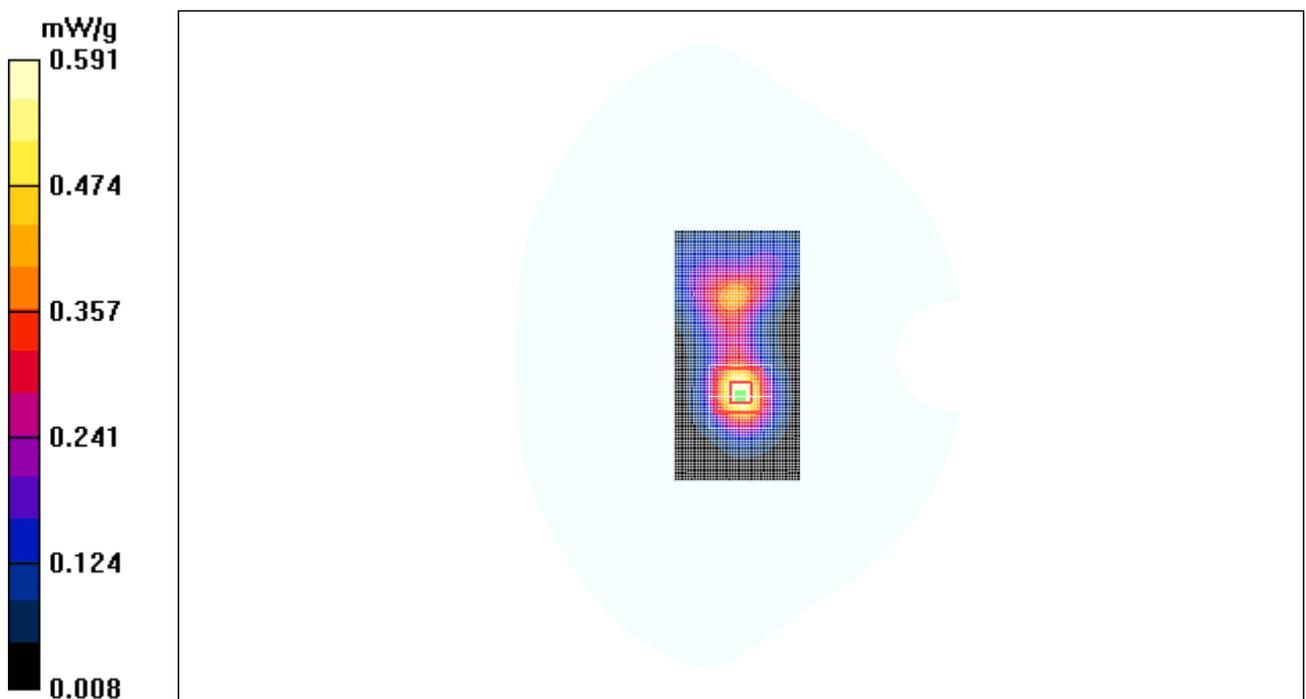


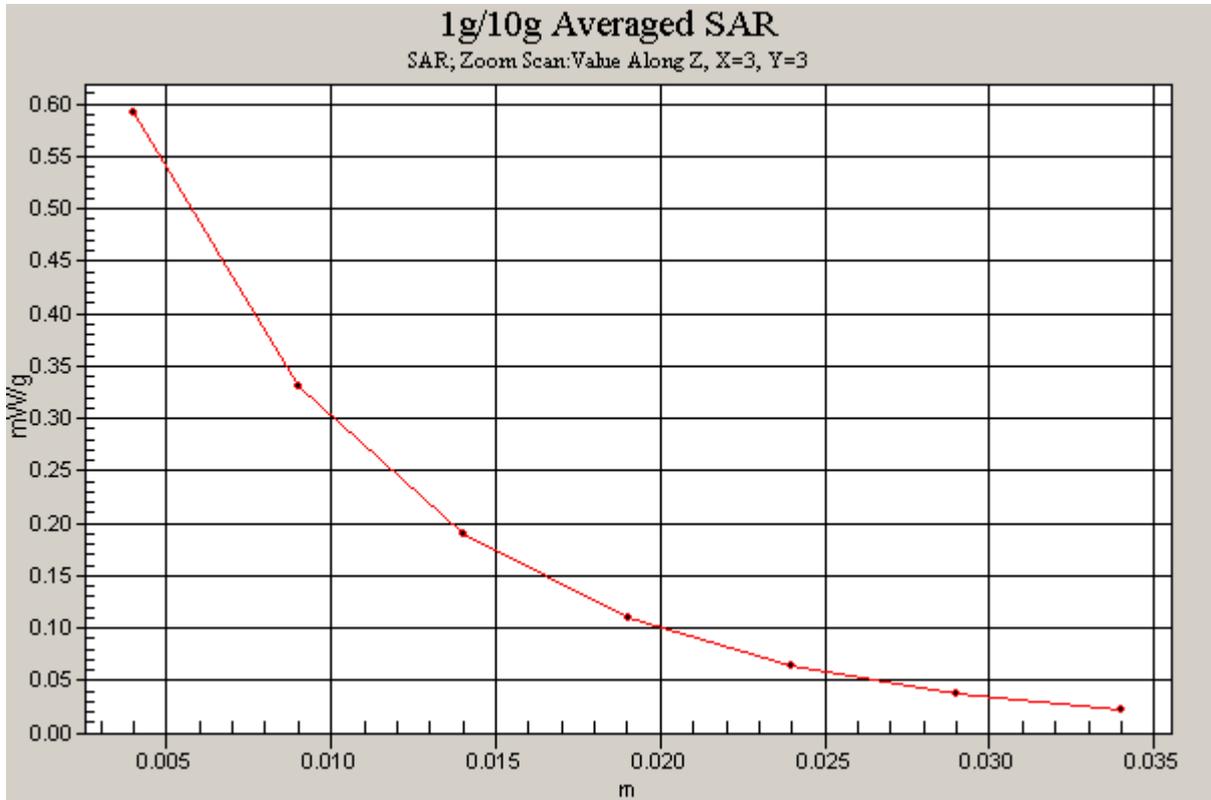Figure 46 GSM 1900 EGPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 661

**Figure 47 Z-Scan at power reference point [GSM 1900 EGPRS (2 timeslots in uplink) with BenQ Joybook S72 Test Position 2 Channel 661]**

## ANNEX D： SYSTEM VALIDATION RESULTS

### System Performance Check at 835 MHz
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 443**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Head 835MHz

Medium parameters used: f = 835 MHz; $\sigma$ = 0. 93 mho/m; $\varepsilon_r$ = 42.95; $\rho$ = 1000 kg/m$^3$

- Probe: ET3DV6 - SN1531; ConvF(6.85, 6.85, 6.85);

- Electronics: DAE4 Sn452;


**d=15mm, Pin=250mW/Area Scan (61x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.54 mW/g

**d=15mm, Pin=250mW/Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.0 V/m; Power Drift = -0.061 dB

Peak SAR (extrapolated) = 3.44 W/kg

**SAR(1 g) = 2.34 mW/g; SAR(10 g) = 1.53 mW/g**
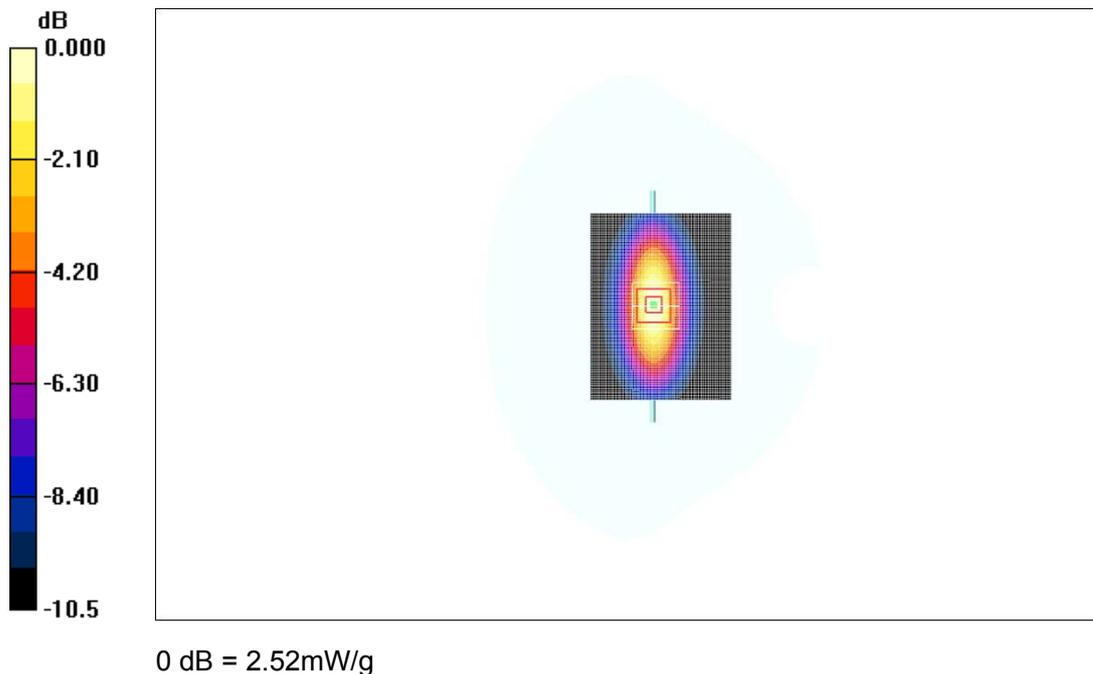
Maximum value of SAR (measured) = 2.52 mW/g



0 dB = 2.52mW/g

**Figure 48 System Performance Check 835MHz 250mW**

**System Performance Check at 1900 MHz**

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d018**

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

Medium parameters used: f = 1900 MHz; σ = 1.43 mho/m; $ε_r$ =40.18; ρ = 1000 kg/m$^3$

Probe: ET3DV6 - SN1531; ConvF(5.15, 5.15, 5.15);

Electronics: DAE4 Sn452;

**d=10mm, Pin=250mW /Area Scan (101x121x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 10.8 mW/g


**d=10mm, Pin=250mW /Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.8 V/m; Power Drift = -0.018 dB

Peak SAR (extrapolated) = 16.0 W/kg

**SAR(1 g) = 9.36 mW/g; SAR(10 g) = 4.93 mW/g**
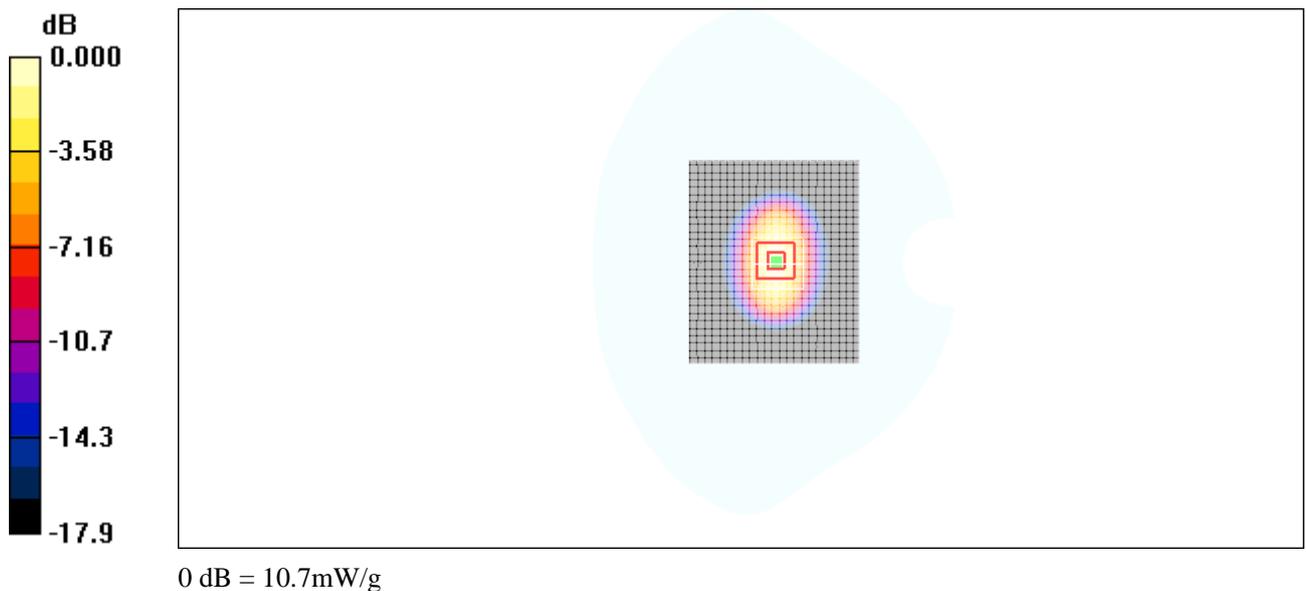
Maximum value of SAR (measured) = 10.7 mW/g



0 dB = 10.7mW/g

**Figure 49 System Performance Check 1900MHz 250mW**

## ANNEX E： PROBE CALIBRATION CERTIFICATE

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

ilac-MRA    SWISS CALIBRATION

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   ATL (Auden)                                      Certificate No: ET3-1531_Jan08

### CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | ET3DV6 - SN:1531 |
| Calibration procedure(s) | QA CAL-01.v6 and QA CAL-12.v5<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | January 29, 2008 |
| 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: 85129 (30b) | 8-Aug-07 (METAS, No. 217-00720) | Aug-08 |
| Reference Probe ES3DV2 | SN: 3013 | 2-Jan-08 (SPEAG, No. ES3-3013_Jan08) | Jan-09 |
| 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 | US37390565 | 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: January 29, 2008

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

Certificate No: ET3-1531_Jan08                        Page 1 of 9

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

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

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

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 $\varphi$ | $\varphi$ rotation around probe axis |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis |

## Calibration is Performed According to the Following Standards:
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 $\vartheta = 0$ (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.

ET3DV6 SN:1531                                                         January 29, 2008

# Probe  ET3DV6

## SN:1531

Manufactured:          July 15, 2000
Last calibrated:       January 22, 2007
Recalibrated:          January 29, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: ET3-1531_Jan08                    Page 3 of 9

ET3DV6 SN:1531

January 29,2008

# DASY - Parameters of Probe: ET3DV6 SN:1531

## Sensitivity in Free Space[A]

| | | | |
|---|---|---|---|
| NormX | 1.52 ± 10.1% | $\mu V/(V/m)^2$ |
| NormY | 1.66 ± 10.1% | $\mu V/(V/m)^2$ |
| NormZ | 1.71 ± 10.1% | $\mu V/(V/m)^2$ |

## Diode Compression[B]

| | |
|---|---|
| DCP X | 95 mV |
| DCP Y | 94 mV |
| DCP Z | 93 mV |

## Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

## Boundary Effect

TSL          900 MHz      Typical SAR gradient: 5 % per mm

| | | 3.7 mm | 4.7 mm |
|---|---|---|---|
| Sensor Center to Phantom Surface Distance | | | |
| $SAR_{\delta e}$ [%] | Without Correction Algorithm | 8.3 | 4.5 |
| $SAR_{\delta e}$ [%] | With Correction Algorithm | 0.7 | 0.0 |

TSL          1750 MHz     Typical SAR gradient: 10 % per mm

| | | 3.7 mm | 4.7 mm |
|---|---|---|---|
| Sensor Center to Phantom Surface Distance | | | |
| $SAR_{\delta e}$ [%] | Without Correction Algorithm | 11.9 | 8.0 |
| $SAR_{\delta e}$ [%] | With Correction Algorithm | 0.5 | 0.1 |

## Sensor Offset

Probe Tip to Sensor Center          2.7 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%.

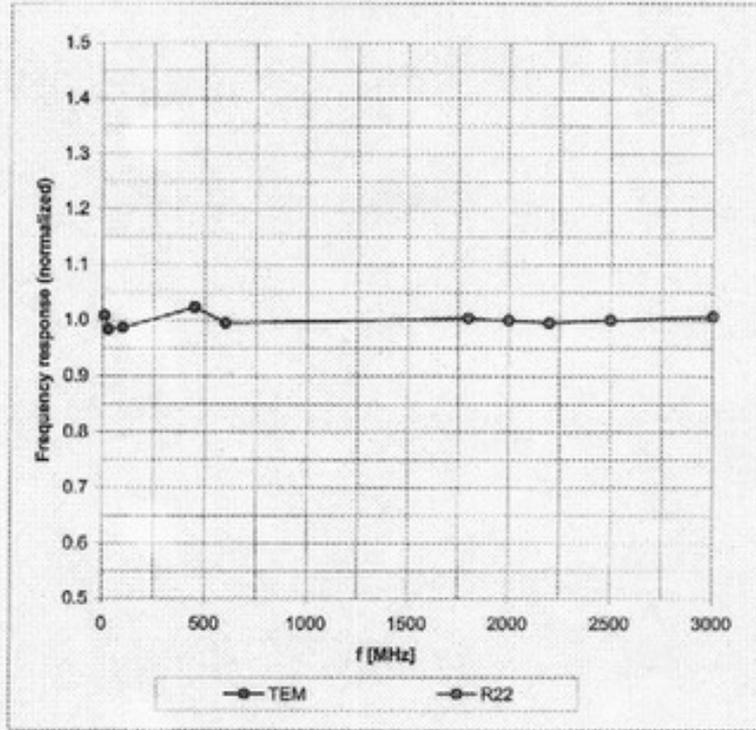[A] The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter. uncertainty not required.

ET3DV6 SN:1531                                                    January 29, 2008

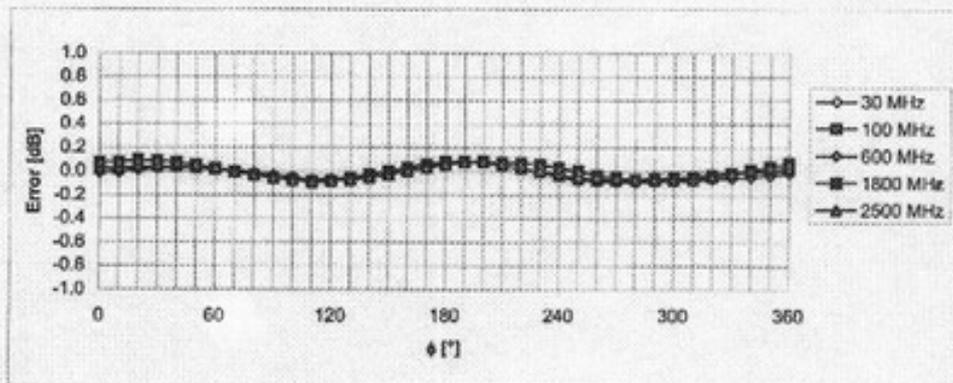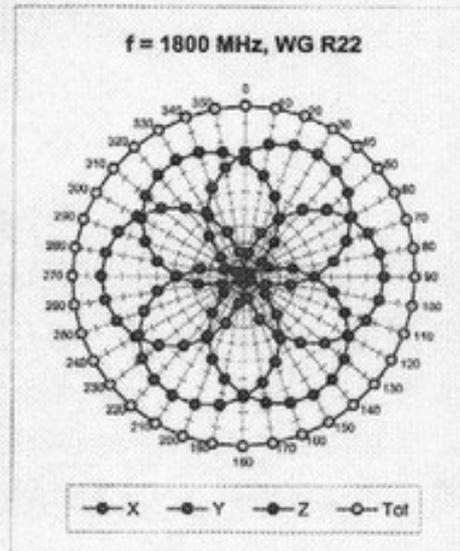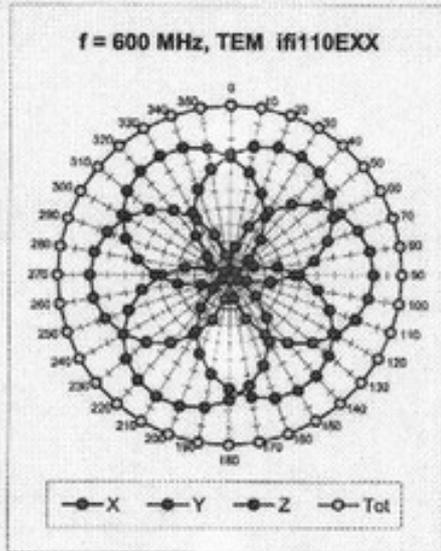## Frequency Response of E-Field

(TEM-Cell:Ifi110 EXX, Waveguide: R22)



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

ET3DV6 SN:1531

January 29, 2008

## Receiving Pattern (φ), ϑ = 0°



**f = 600 MHz, TEM ifi110EXX**

**f = 1800 MHz, WG R22**



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