Report No.: RZA2009-1167

TESTING
No. L2264

# OET 65

# TEST REPORT

| | |
|---|---|
| **Product Name** | CDMA 1X Digital Mobile Telephone |
| **FCC ID** | QISC6100 |
| **Model** | HUAWEI C6100 |
| **Client** | Huawei Technologies Co., Ltd. |

上海同耀通信技术有限公司
报告专用章

## TA Technology (Shanghai) Co., Ltd.

# GENERAL SUMMARY

| | | | |
|---|---|---|---|
| **Product Name** | CDMA 1X Digital Mobile Telephone | **Model** | HUAWEI C6100 |
| **FCC ID** | QISC6100 | **Report No.** | RZA2009 -1167 |
| **Client** | Huawei Technologies Co., Ltd. | | |
| **Manufacturer** | Huawei Technologies Co., Ltd. | | |
| **Standard(s)** | **ANSI/IEEE C95.1–1999:** 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 62209-1:** 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).<br>**IEC 62209-2:2008(106/162/CDV):** Human exposure to radio frequency fields from handheld and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 2: Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body. ( frequency rang of 30MHz to 6GHz ) | | |
| **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 5.2 of this test report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 5.1 of this test report.<br>General Judgment: **Pass**<br>(Stamp)<br>**Date of issue: October 13th, 2009** | | |
| **Comment** | The test result only responds to the measured sample. | | |

**Approved by**____________ **Revised by**____________ **Performed by**____________

Yang Weizhong　　　Ling Minbao　　　Li Jinchang

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# 1. General Information

## 1.1. Notes of the 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.

**TA Technology (Shanghai) Co., Ltd.** is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. This report only refers to the item that has undergone the test.

This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

## 1.2. Testing laboratory

| | |
|---|---|
| Company: | TA Technology (Shanghai) Co., Ltd. |
| Address: | No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai,China |
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Postal Code: 518129

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Contact: Wang Yue

Telephone: 0755-28780808

Fax: 0755-28780808

## 1.4. Manufacturer Information

Company: Huawei Technologies Co., Ltd.

Address: Bantian, Longgang District

City: Shenzhen

Postal Code: 518129

Country: P.R. China

Telephone: 0755-28780808

Fax: 0755-28780808

## 1.5. Information of EUT

**General information**

| | | | |
|---|---|---|---|
| Device type : | portable device | | |
| Exposure category: | uncontrolled environment / general population | | |
| Name of EUT: | CDMA 1X Digital Mobile Telephone | | |
| IMEI or SN: | DI2SB10992700037 | | |
| Device operating configurations : | | | |
| Operating mode(s): | CDMA Cellular | | |
| Test Modulation: | QPSK | | |
| Operating frequency range(s): | Band | Tx (MHz) | Rx (MHz) |
| | CDMA Cellular | 824.7 ~ 848.31 | 869.7 ~ 893.31 |
| Test channel<br>(Low –Middle –High) | 1013 – 384 – 777 | (CDMA Cellular) | (tested) |
| hardware version: | Ver.B | | |
| software version: | C6100C03B101 | | |
| antenna type: | internal antenna | | |

**Auxiliary equipment details**

**AE1:Battery**

| | |
|---|---|
| Model: | HB6A2L |
| Manufacture: | Huawei Technologies Co., Ltd. |
| IMEI or SN: | GAG9807XC3213991 |

**AE2:Travel Adaptor**

| | |
|---|---|
| Model: | HS-050040U2 |
| Manufacture: | Huawei Technologies Co., Ltd. |
| IMEI or SN: | HKA842051050 |

Equipment Under Test (EUT) is a model of CDMA 1X Digital Mobile Telephone with internal antenna. The detail about Mobile phone, Lithium Battery and AC/DC Adapter is in in chapter 1.5. in this report. SAR is tested for CDMA Cellular only.

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

## 1.6. Test Date

The test is performed on October 9, 2009.

# 2. Operational Conditions during Test

## 2.1. General description of test procedures

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 1013, 384 and 777 respectively in the case of CDMA Cellular. The EUT is commanded to operate at maximum transmitting power.

Connection to the EUT is established via air interface with E5515C, and the EUT is set to maximum output power by E5515C. 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.

## 2.2. Information for the measurement of CDMA 1x devices

### 2.2.1. Output Power Verification

Test Parameter setup for maximum RF output power according to section 4.4.5 of 3GPP2

| Parameter | Units | Value |
|---|---|---|
| I or | dBm/1.23MHz | -104 |
| PilotE c /I or | dB | -7 |
| TrafficE c /I or | dB | -7.4 |

For SAR test, the maximum power output is very important and essential; it is identical under the measurement uncertainty. It is proper to use typical Test Mode 3 (FW RC3, RVS RC3, SO55) as the worst case for SAR test.

### 2.2.2. Head SAR measurement

SAR is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55.SAR for RC1 is not required because the maximum average output of each channel is less than 0.25 dB higher than that measured in RC3.Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

### 2.2.3. Body SAR measurement

SAR is measured in RC3 with the EUT configured to transmit at full rate using TDSO/SO32, transmit at full rate on FCH with all other code channels disabled. SAR for multiple code channels (FCH+SCHn) is not required when the maximum average output of each RF channel is less than 0.25dB higher than measured with FCH only.

Body SAR in RC1 is not required because the maximum average output of each channel is less than 0.25 dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate using the body exposure configuration that results in the highest SAR for that channel in RC3.

Test communication setup meet as followings:

| | |
|---|---|
| Communication standard between mobile station and base station simulator | 3GPP2 C.S0011-B |
| Radio configuration | RC3（Supporting CDMA 1X） |
| Spreading Rate | SR1 |
| Data Rate | 9600bps |
| Service Options | SO55 （loop back mode） |
| Service Options | SO32 （test data service mode） |
| Multiplex Options | The mobile station does not support this service. |

# 3. SAR Measurements System Configuration

## 3.1. SAR Measurement Set-up

The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY4 measurement server.
- The DASY4 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003
- DASY4 software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.

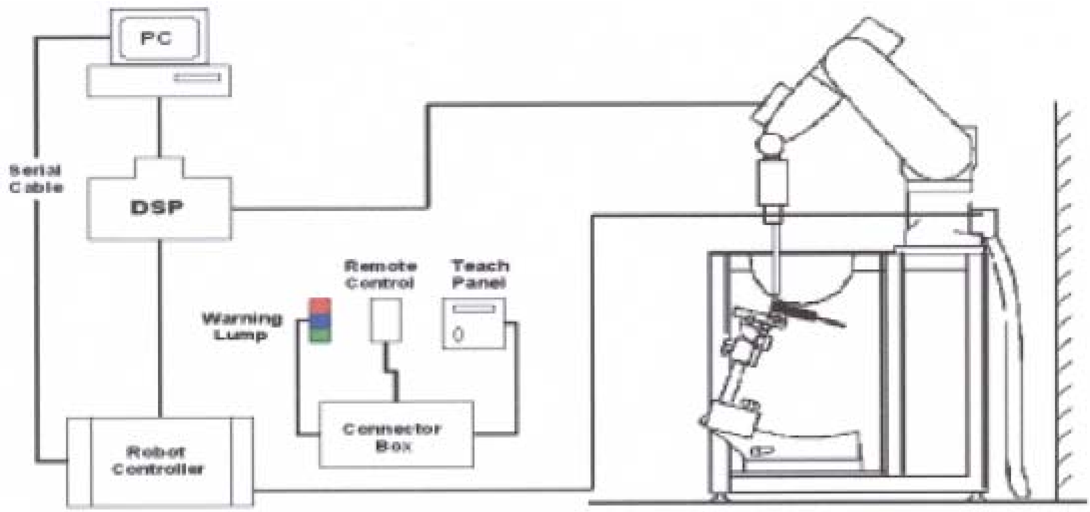


**Figure 1. SAR Lab Test Measurement Set-up**

## 3.2. 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.

### 3.2.1. 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<br>In brain and muscle simulating tissue at frequencies of 450MHz, 900MHz, 1750 MHz, 1950MHz and 2450 MHz. (accuracy±8%)<br>Calibration for other liquids and frequencies upon request |
| Frequency | 10 MHz to 2.5 GHz; Linearity: ±0.2 dB (30 MHz to 2.5 GHz) |
| Directivity | ±0.2 dB in brain tissue (rotation around probe axis)<br>±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<br>Tip length: 16mm<br>Body diameter: 12mm<br>Tip diarneter: 6.8mm<br>Distance from probe tip to dipole centers: 2.7mm |
| Application | General dosimetry up to 2.5GHz<br>Compliance tests of mobile phones<br>Fast automatic scanning in arbitrary Phantoms |

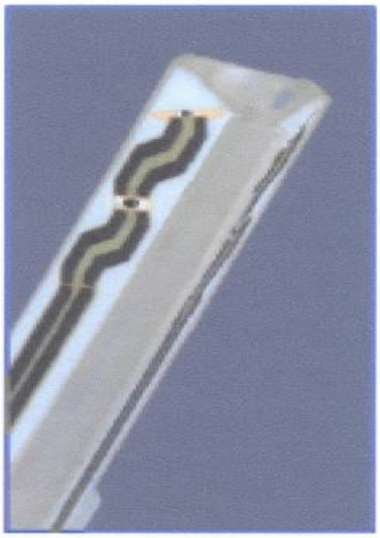

**Figure 2 ET3DV6 E-field Probe**

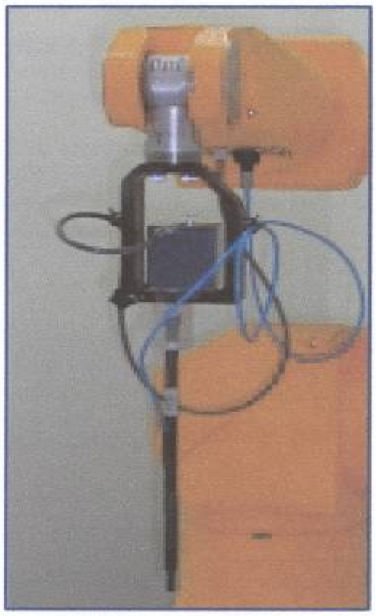

**Figure 3 ET3DV6 E-field probe**

### 3.2.2. 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.

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

Where: $\Delta t$ = Exposure time (30 seconds),
C = Heat capacity of tissue (brain or muscle),
$\Delta T$ = Temperature increase due to RF exposure.
Or

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

Where:
$\sigma$ = Simulated tissue conductivity,
$\rho$ = Tissue density (kg/m3).

## 3.3. Other Test Equipment

### 3.3.1. Device Holder for Transmitters

The DASY device holder is designed to cope with the die rent positions given in the standard.
It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.
The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the inference of the clamp on the test results could thus be lowered.

**Figure 4.Device Holder**

### 3.3.2. Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden Figure. 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**

## 3.4. 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°.)

- Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot.Before starting the area scan a grid

spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged.
After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

- Zoom Scan
  Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

- Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses.The DASY4 system allows evaluations that combine measured data and robot positions, such as:
• maximum search
• extrapolation
• boundary correction
• peak search for averaged SAR
During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.
Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

- 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 5mm steps.

## 3.5. Data Storage and Evaluation

### 3.5.1. 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.

### 3.5.2. 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 | |
| | - Density | |

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.

$$SAR = ( E_{tot}^2 \cdot \quad ) \,/\, ( \quad \cdot 1000)$$

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

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

. = conductivity in [mho/m] or [Siemens/m]

. = 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.

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

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

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

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

### 3.6. System check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyser. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the table 7 and table 8.

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

System check is performed regularly on all frequency bands where tests are performed with the DASY4 system.

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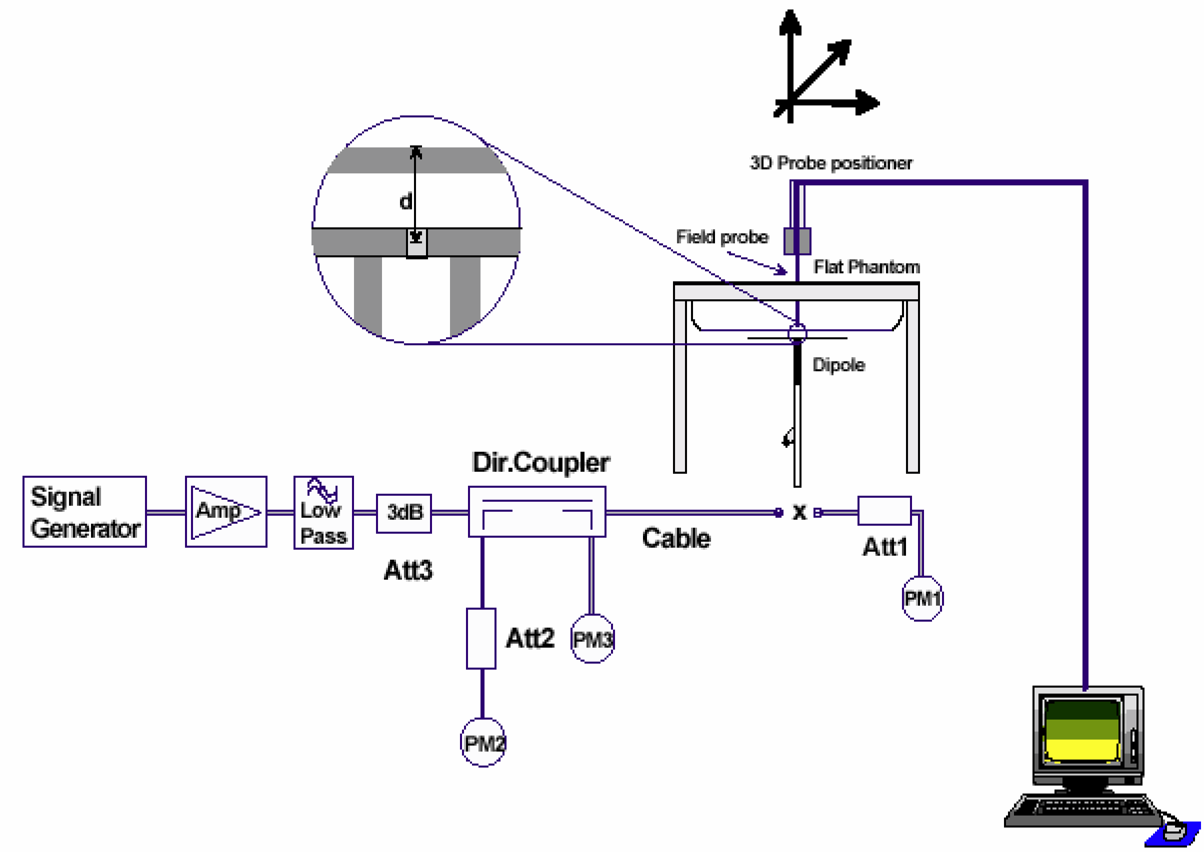



**Figure 6. System Check Set-up**

### 3.7. Equivalent Tissues

The liquid is consisted of water, sugar, salt, Preventol,Glycol and Cellulose. The liquid has previously been proven to be suited for worst-case. The Table 1 and Table 2 show the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the OET 65.

**Table 1: Composition of the Head Tissue Equivalent Matter**

| MIXTURE% | FREQUENCY(Brain) 835MHz |
|---|---|
| Water | 41.45 |
| Sugar | 56 |
| Salt | 1.45 |
| Preventol | 0.1 |
| Cellulose | 1.0 |
| Dielectric Parameters Target Value | f=835MHz ε=41.5 σ=0.9 |

**Table 2: Composition of the Body Tissue Equivalent Matter**

| MIXTURE% | FREQUENCY(Body)835MHz |
|---|---|
| Water | 52.5 |
| Sugar | 45 |
| Salt | 1.4 |
| Preventol | 0.1 |
| Cellulose | 1.0 |
| Dielectric Parameters Target Value | f=835MHz ε=55.2 σ=0.97 |

## 4. Laboratory Environment

**Table 3: The Ambient Conditions during Test**

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

# 5. Characteristics of the Test

## 5.1. Applicable Limit Regulations

**ANSI/IEEE 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.

## 5.2. Applicable Measurement Standards

**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 62209-1:** 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 62209-2:2008(106/162/CDV):** Human exposure to radio frequency fields from handheld and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 2: Procedure to determine the Specific Absorption Rate (SAR)for wireless communication devices used in close proximity to the human body .( frequency rang of 30MHz to 6GHz )

# 6. Conducted Output Power Measurement

## 6.1. Summary

The DUT is tested using an 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. Conducted output power was measured using an integrated RF connector and attached RF cable. This result contains conducted output power for the EUT.

## 6.2. Conducted Power Results

**Table 4: Conducted Power Measurement Results**

| **CDMA Cellular (RC3)** | **Conducted Power** | | |
|---|---|---|---|
| | **Channel 1013** | **Channel 384** | **Channel 777** |
| Before test (dBm) | 24.2 | 24.2 | 24.3 |
| After test (dBm) | 24.2 | 24.3 | 24.2 |
| **CDMA Cellular (RC1)** | **Conducted Power** | | |
| | **Channel 1013** | **Channel 384** | **Channel 777** |
| Before test (dBm) | 24.3 | 24.3 | 24.2 |
| After test (dBm) | 24.1 | 24.3 | 24.3 |

# 7. Test Results

## 7.1. Dielectric Performance

**Table 5: Dielectric Performance of Head Tissue Simulating Liquid**

| Frequency | Description | Dielectric Parameters | | Temp |
|---|---|---|---|---|
| | | $\varepsilon_r$ | σ(s/m) | ℃ |
| **835MHz (head)** | Target value<br>±5% window | 41.5<br>39.43 - 43.58 | 0.90<br>0.86 - 0.95 | / |
| | Measurement value<br>2009-10-9 | 41.86 | 0.92 | 22.5 |

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

| Frequency | Description | Dielectric Parameters | | Temp |
|---|---|---|---|---|
| | | $\varepsilon_r$ | σ(s/m) | ℃ |
| **835MHz (body)** | Target value<br>±5% window | 55.20<br>52.44 - 57.96 | 0.97<br>0.92 - 1.02 | / |
| | Measurement value<br>2009-10-9 | 55.07 | 1.02 | 22.5 |

## 7.2. System Checking Results

**Table 7: System Checking for Head tissue simulant**

| Frequency | Description | SAR(W/kg) | | Dielectric Parameters | | Temp |
|---|---|---|---|---|---|---|
| | | 10g | 1g | $\varepsilon_r$ | σ(s/m) | ℃ |
| **835MHz** | Recommended value<br>±10% window | 1.55<br>1.40 - 1.71 | 2.40<br>2.16 - 2.64 | 41.2 | 0.91 | / |
| | Measurement value<br>2009-10-9 | 1.50 | 2.30 | 41.86 | 0.92 | 22.5 |

Note：1. The graph results see ANNEX B.

2. Recommended Values used derive from the calibration certificate and 250 mW is used as feeding power to the calibrated dipole.

**Table 8: System Check for body tissue stimulant**

| Frequency | Description | SAR(W/kg) | | Dielectric Parameters | | Temp |
|---|---|---|---|---|---|---|
| | | 10g | 1g | $\varepsilon_r$ | σ(s/m) | ℃ |
| **835MHz** | Recommended value<br>±10% window | 1.58<br>1.42 - 1.74 | 2.41<br>2.17 - 2.65 | 54.60 | 0.99 | / |
| | Measurement value<br>2009-10-9 | 1.58 | 2.40 | 55.07 | 1.02 | 21.9 |

Note：1. The graph results see ANNEX B.

2. Recommended Values used derive from the calibration certificate and 250 mW is used as feeding power to the calibrated dipole.

## 7.3. Test Results

### 7.3.1. Summary of Measurement Results (CDMA Cellular)

**Table 9: SAR Values (CDMA Cellular)**

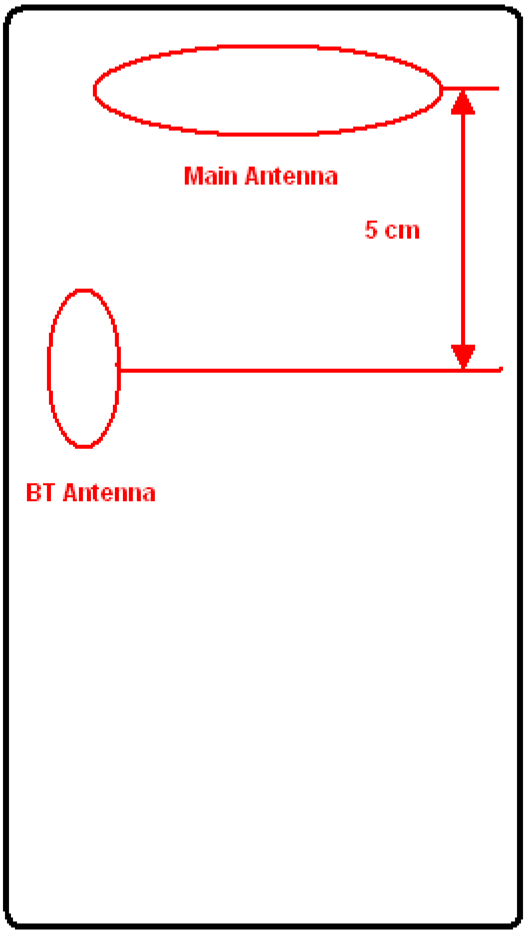
| Limit of SAR (W/kg) | | 10 g Average | 1 g Average | Power Drift (dB) | Graph Results |
|---|---|---|---|---|---|
| | | 2.0 | 1.6 | ± 0.21 | |
| Different Test Position | Channel | Measurement Result(W/kg) | | Power Drift(dB) | |
| | | 10 g Average | 1 g Average | | |
| Test position of Head | | | | | |
| Left hand, Touch cheek | High | 0.164 | 0.228 | 0.019 | Figure 11 |
| | Middle | 0.162 | 0.224 | -0.096 | Figure 13 |
| | Low | 0.129 | 0.179 | -0.059 | Figure 15 |
| Left hand, Tilt 15 Degree | Middle | 0.111 | 0.156 | 0.005 | Figure 17 |
| Right hand, Touch cheek | Middle | 0.145 | 0.206 | -0.086 | Figure 19 |
| Right hand, Tilt 15 Degree | Middle | 0.110 | 0.160 | -0.033 | Figure 25 |
| Test position of Body (Distance 15mm) | | | | | |
| Towards Ground | High | 0.388 | 0.537 | -0.037 | Figure 27 |
| | Middle | 0.357 | 0.495 | -0.016 | Figure 29 |
| | Low | 0.304 | 0.413 | 0.009 | Figure 31 |
| Towards Phantom | Middle | 0.102 | 0.142 | -0.123 | Figure 33 |
| Worst case position of Body with Earphone (Distance 15mm) | | | | | |
| Towards Ground | High | 0.375 | 0.519 | 0.040 | Figure 35 |

Note: 1.The value with blue color is the maximum SAR Value of test case of head and body in each test band.

2. Upper and lower frequencies were measured at the worst position.
3. 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 $SAR_{1g}$ limit (< 0.8W/kg), testing at the high and low channels is optional.
4. Tests in body position were performed with 15 mm air gap between DUT and Phantom to simulate the use of a non-metallic belt-clip or holster.

### 7.3.2. Summary of Measurement Results (Bluetooth function)

The distance between BT antenna and CDMA antenna is ≤ 5 cm. 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) | 6.38 | 6.29 | 6.00 |

According to the output power measurement result and the distance between the two antennas, we can draw the conclusion that: stand-alone SAR and simultaneous transmission SAR are not required for BT transmitter, because the output power of BT transmitter is ≤$P_{Ref}$ and its antenna is ≤5cm from other antenna.

## 7.4. 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 5.2 of this report. Maximum localized $SAR_{1g}$ are 0.228 W/kg (head) and 0.537 W/kg (body) that are below exposure limits specified in the relevant standards cited in Clause 5.1 of this test report.

## 8. Measurement Uncertainty

| No. | source | Type | Uncertainty Value (%) | Probability Distribution | k | $c_i$ | Standard ncertainty $u_i^{'}$ (%) | Degree of freedom $V_{eff}$ or $v_i$ |
|---|---|---|---|---|---|---|---|---|
| 1 | System repetivity | A | 0.5 | N | 1 | 1 | 0.5 | 9 |
| Measurement system | | | | | | | | |
| 2 | probe calibration | B | 5.9 | N | 1 | 1 | 5.9 | ∞ |
| 3 | axial isotropy of the probe | B | 4.7 | R | $\sqrt{3}$ | $\sqrt{0.5}$ | 1.9 | ∞ |
| 4 | Hemispherical isotropy of the probe | B | 9.4 | R | $\sqrt{3}$ | $\sqrt{0.5}$ | 3.9 | ∞ |
| 6 | boundary effect | B | 1.9 | R | $\sqrt{3}$ | 1 | 1.1 | ∞ |
| 7 | probe linearity | B | 4.7 | R | $\sqrt{3}$ | 1 | 2.7 | ∞ |
| 8 | System detection limits | B | 1.0 | R | $\sqrt{3}$ | 1 | 0.6 | ∞ |
| 9 | readout Electronics | B | 1.0 | N | 1 | 1 | 1.0 | ∞ |
| 10 | response time | B | 0 | R | $\sqrt{3}$ | 1 | 0 | ∞ |
| 11 | integration time | B | 4.32 | R | $\sqrt{3}$ | 1 | 2.5 | ∞ |
| 12 | noise | B | 0 | R | $\sqrt{3}$ | 1 | 0 | ∞ |
| 13 | RF Ambient Conditions | B | 3 | R | $\sqrt{3}$ | 1 | 1.73 | ∞ |
| 14 | Probe Positioner Mechanical Tolerance | B | 0.4 | R | $\sqrt{3}$ | 1 | 0.2 | ∞ |
| 15 | Probe Positioning with respect to Phantom Shell | B | 2.9 | R | $\sqrt{3}$ | 1 | 1.7 | ∞ |
| 16 | Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation | B | 3.9 | R | $\sqrt{3}$ | 1 | 2.3 | ∞ |
| Test sample Related | | | | | | | | |
| 17 | -Test Sample Positioning | A | 2.9 | N | 1 | 1 | 2.9 | 5 |
| 18 | -Device Holder Uncertainty | A | 4.1 | N | 1 | 1 | 4.1 | 5 |
| 19 | -Output Power Variation - SAR drift measurement | B | 5.0 | R | $\sqrt{3}$ | 1 | 2.9 | ∞ |
| Physical parameter | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 20 | -phantom | B | 4.0 | R | $\sqrt{3}$ | 1 | 2.3 | ∞ |
| 21 | -liquid conductivity (deviation from target) | B | 5.0 | R | $\sqrt{3}$ | 0.64 | 1.8 | ∞ |
| 22 | -liquid conductivity (measurement uncertainty) | B | 5.0 | N | 1 | 0.64 | 3.2 | ∞ |
| 23 | -liquid permittivity (deviation from target) | B | 5.0 | R | $\sqrt{3}$ | 0.6 | 1.7 | ∞ |
| 24 | -liquid permittivity (measurement uncertainty ) | B | 5.0 | N | 1 | 0.6 | 3.0 | ∞ |
| Combined standard uncertainty | | $u_c^{'} = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$ | | | | | 12.0 | |
| Expanded uncertainty (confidence interval of 95 %) | | $u_e = 2u_c$ | | N | k=2 | | 24.0 | |

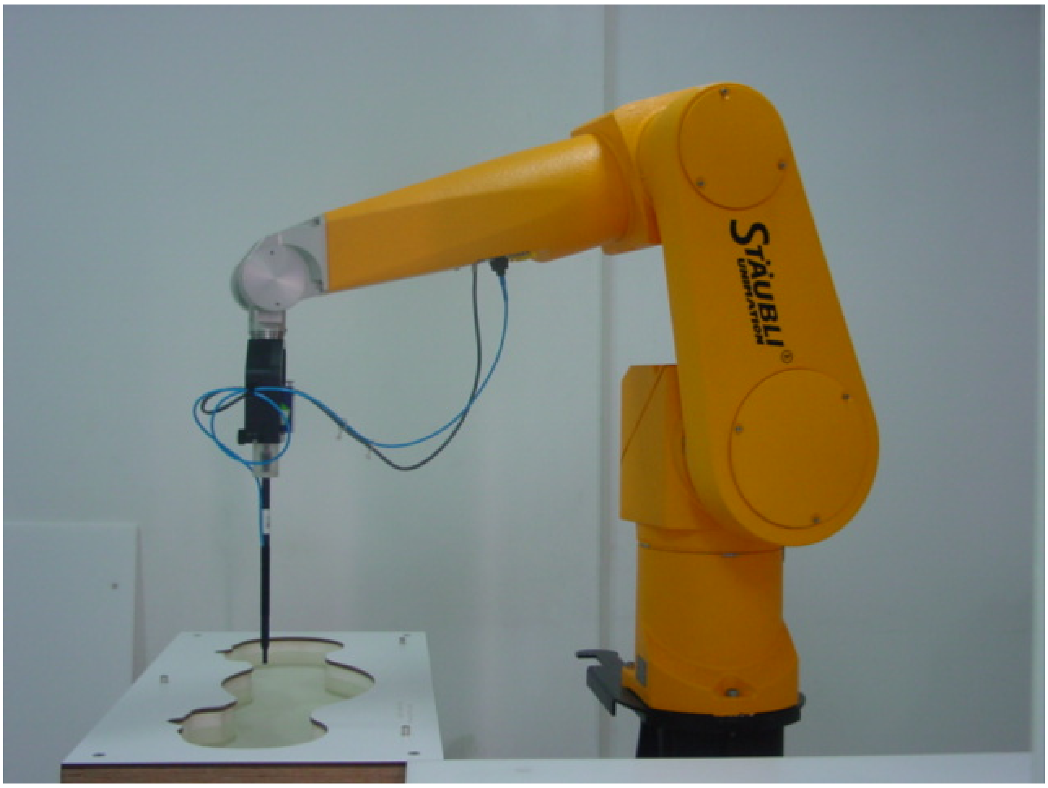
## 9. Main Test Instruments

**Table 10: List of Main Instruments**

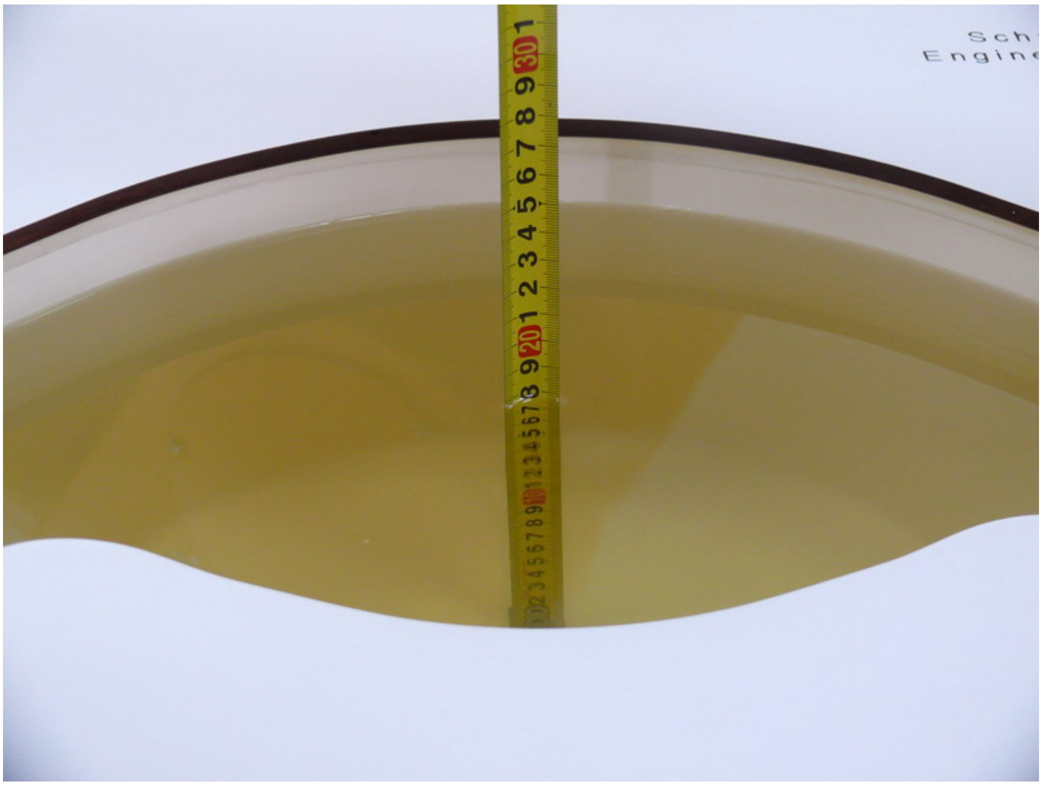
| No. | Name | Type | Serial Number | Calibration Date | Valid Period |
|---|---|---|---|---|---|
| 01 | Network analyzer | Agilent 8753E | US37390326 | September 13, 2009 | One year |
| 02 | Dielectric Probe Kit | Agilent 85070E | US44020115 | No Calibration Requested | |
| 03 | Power meter | Agilent E4417A | GB41291714 | March 14, 2009 | One year |
| 04 | Power sensor | Agilent 8481H | MY41091316 | March 14, 2009 | One year |
| 05 | Signal Generator | HP 8341B | 2730A00804 | September 13, 2009 | One year |
| 06 | Amplifier | IXA-020 | 0401 | No Calibration Requested | |
| 07 | BTS | E5515C | MY48360988 | December 16, 2008 | One year |
| 08 | E-field Probe | ET3DV6 | 1737 | November 25, 2008 | One year |
| 09 | DAE | DAE4 | 452 | November 18, 2008 | One year |
| 10 | Validation Kit 835MHz | D835V2 | 4d020 | July 15, 2009 | One year |

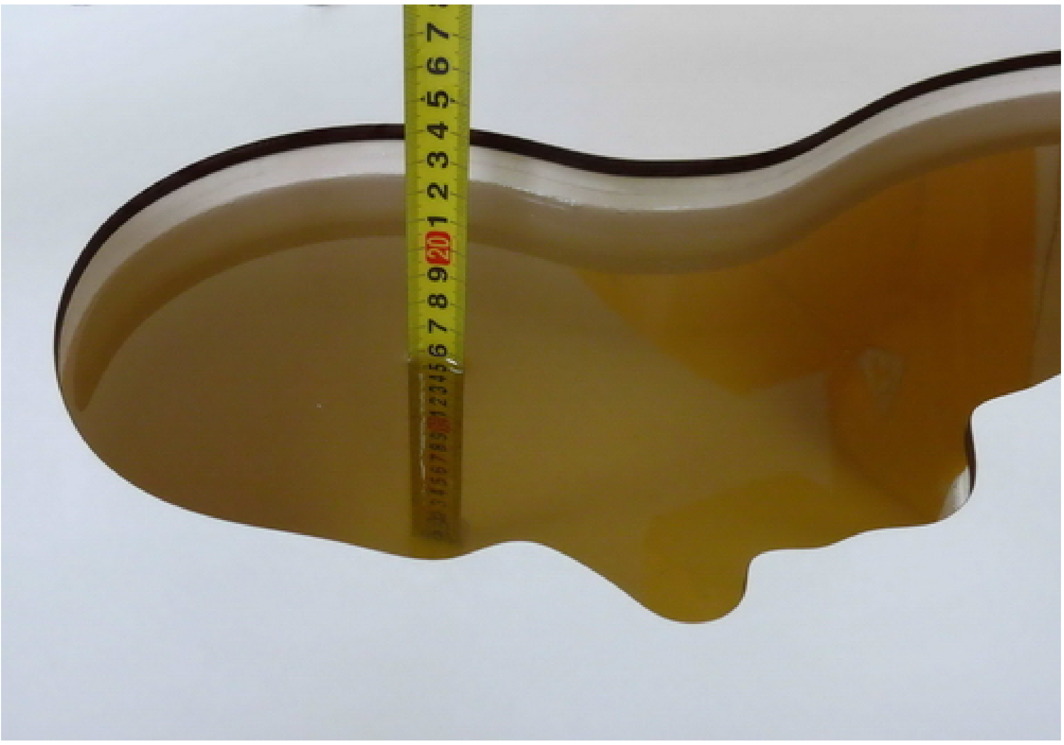
*******END OF REPORT BODY*******

## ANNEX A: Test Layout



Picture 1: Specific Absorption Rate Test Layout


Picture 2: Liquid depth in the Flat Phantom (835 MHz)



Picture 3: Liquid depth in the head Phantom (835 MHz)

# ANNEX B: System Check Results

### System Performance Check at 835 MHz Head TSL

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d020**

Date/Time: 10/9/2009 10:15:58 AM

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

Medium parameters used: f = 835 MHz; $\sigma$ = 0.92 mho/m; $\varepsilon_r$ = 41.86; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:23.3℃ Liqiud Temperature: 22.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.33, 6.33, 6.33); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM 12; Type: SAM V4.0;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**d=15mm, Pin=250mW/Area Scan (101x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.81 mW/g

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

Reference Value = 55.8 V/m; Power Drift = -0.060 dB

Peak SAR (extrapolated) = 3.50 W/kg

**SAR(1 g) = 2.3 mW/g; SAR(10 g) = 1.5 mW/g**

Maximum value of SAR (measured) = 2.83 mW/g

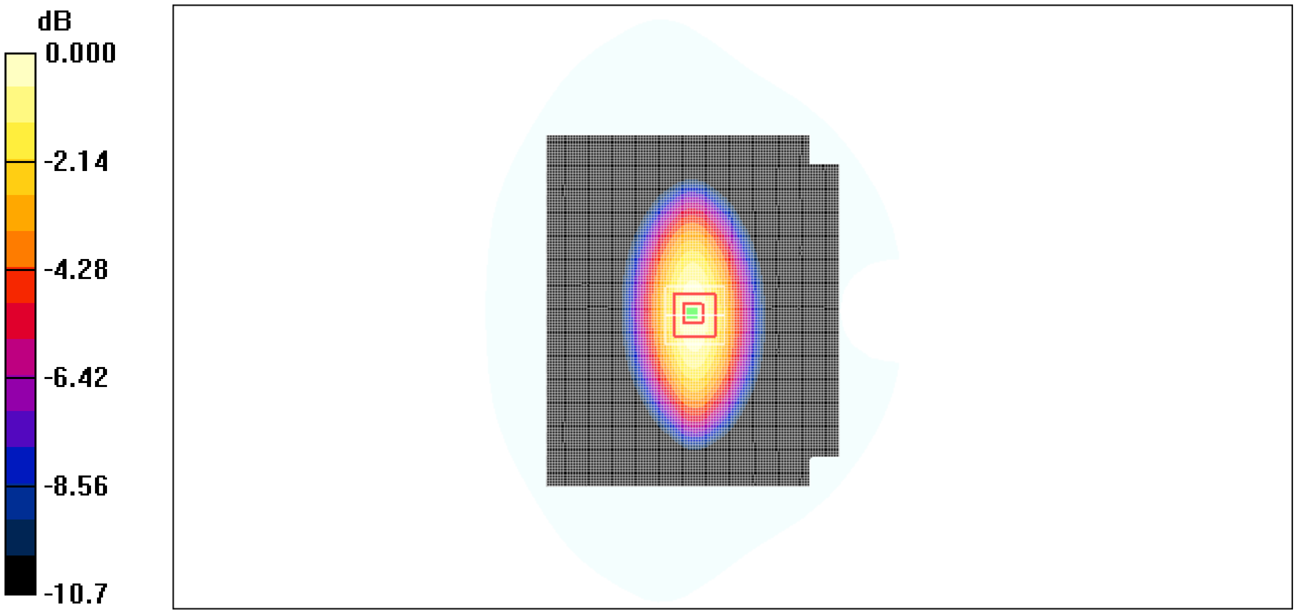



**Figure 7 System Performance Check 835MHz 250mW**

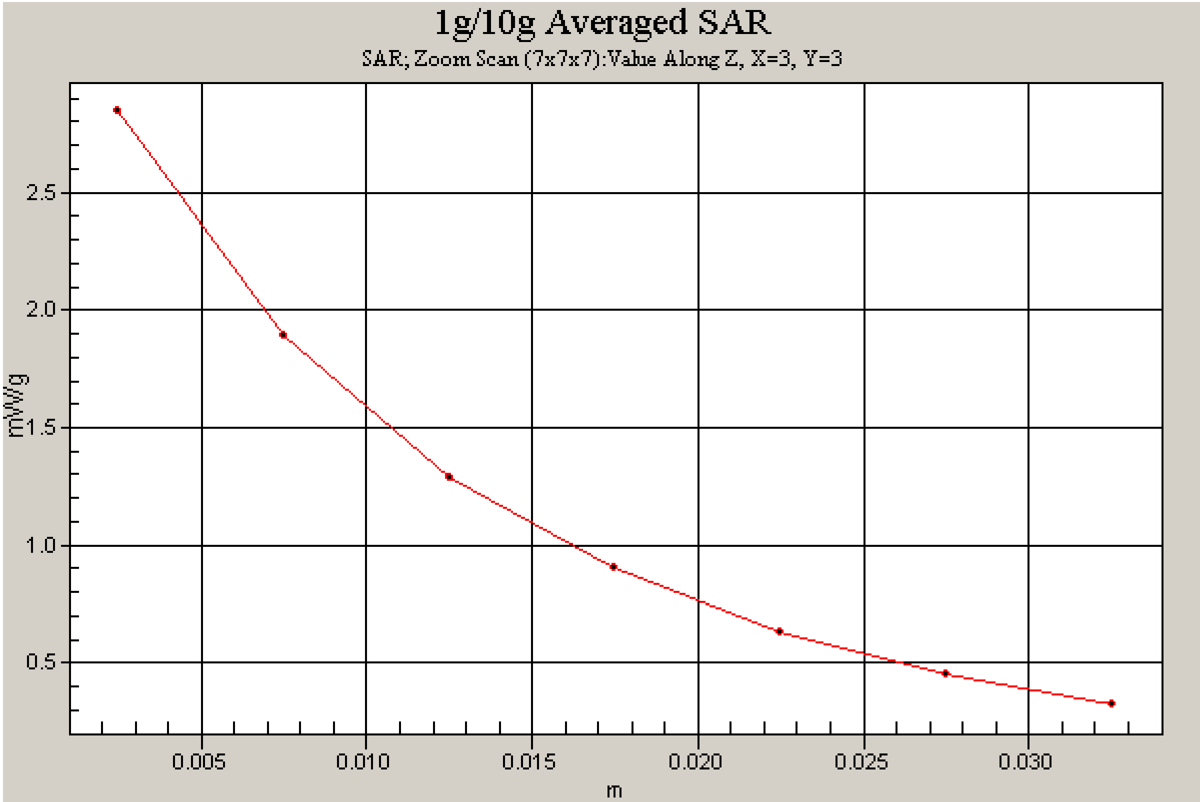



**Figure 8 Z-Scan at power reference point (system check at 835 MHz dipole)**

## System Performance Check at 835 MHz Body TSL

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d020**

Date/Time: 10/9/2009 4:05:49 PM

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

Medium parameters used: f = 835 MHz; $\sigma$ = 1.02 mho/m; $\varepsilon_r$ = 55.07; $\rho$ = 1000 kg/m$^3$

Phantom section: Flat Section

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.14, 6.14, 6.14); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM1; Type: SAM;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**d=15mm, Pin=250mW/Area Scan (101x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.93 mW/g

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

Reference Value = 55.7 V/m; Power Drift = -0.017 dB

Peak SAR (extrapolated) = 3.59 W/kg

**SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.58 mW/g**

Maximum value of SAR (measured) = 2.92 mW/g

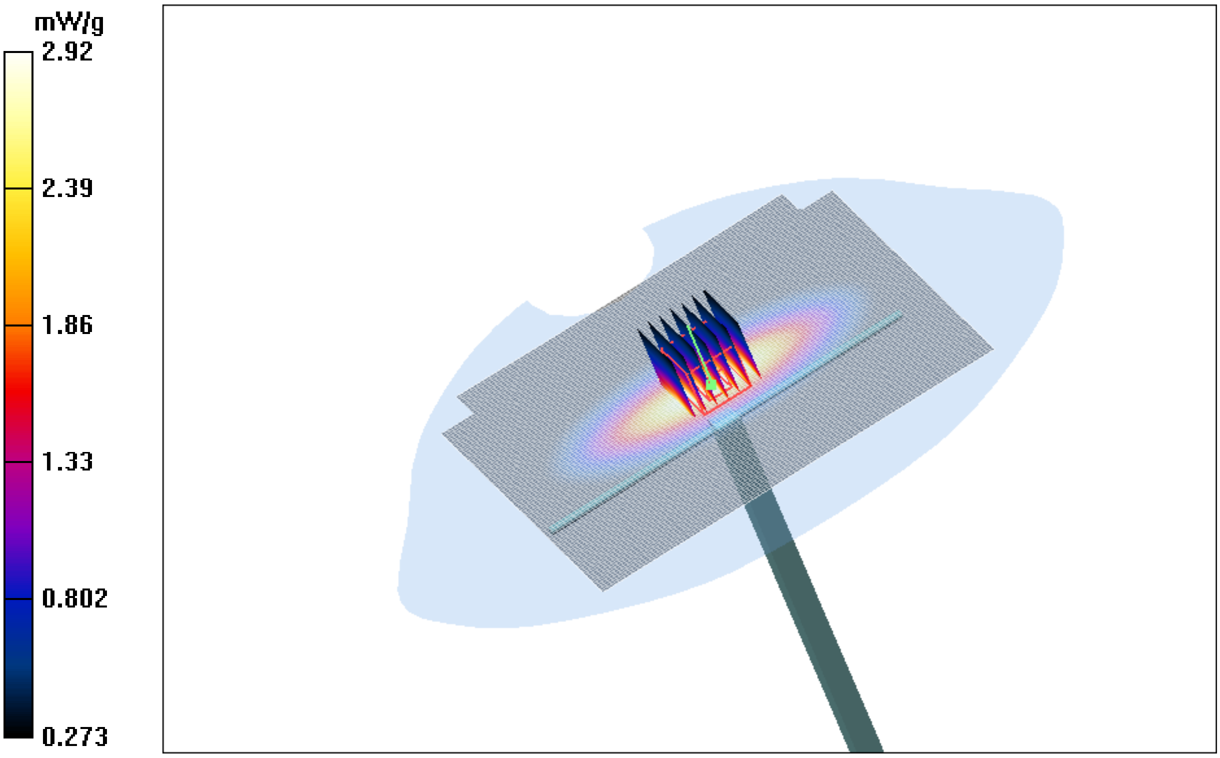



**Figure 9 System Performance Check 835MHz 250mW**

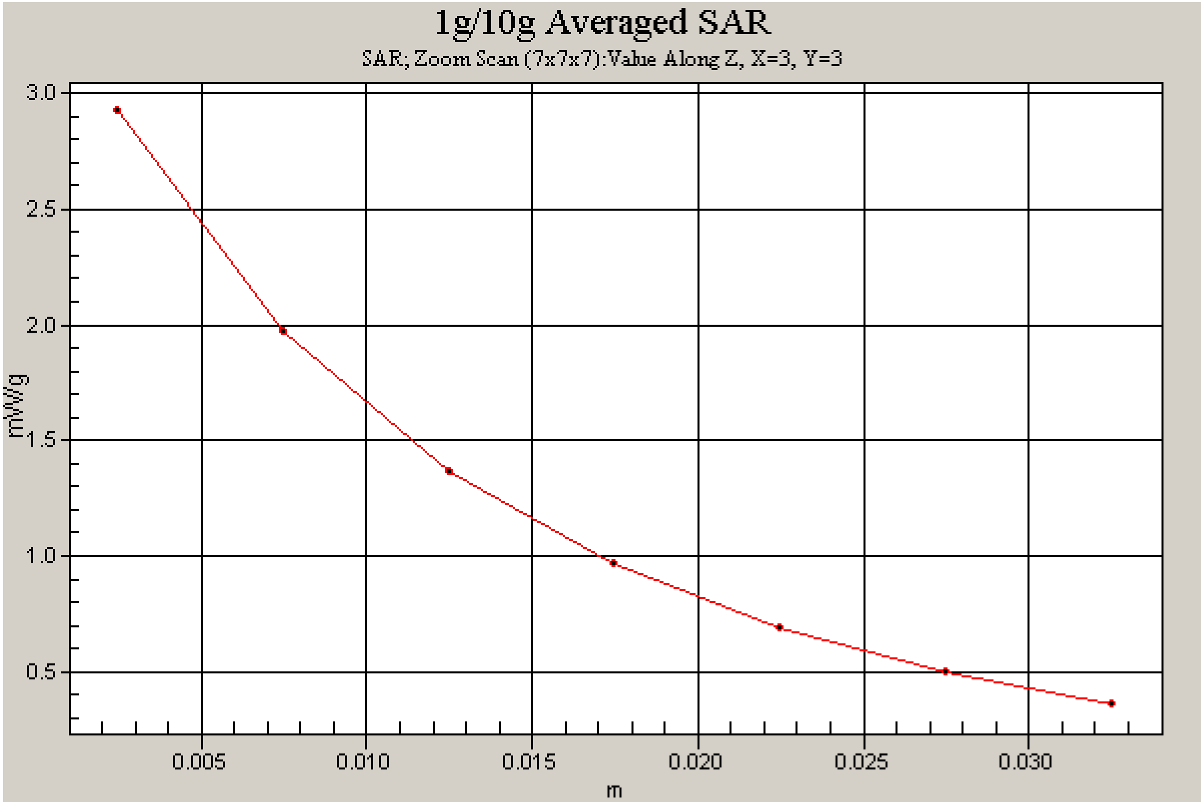



**Figure 10 Z-Scan at power reference point (System Check at 835 MHz Dipole)**

# ANNEX C: Graph Results

## CDMA Cellular Left Cheek High

Date/Time: 10/9/2009 1:35:55 PM

Communication System: CDMA Cellular; Frequency: 848.31 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 848.31 MHz; $\sigma$ = 0.936 mho/m; $\varepsilon_r$ = 41.8; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.33, 6.33, 6.33); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM 12; Type: SAM V4.0;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Cheek High/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.241 mW/g

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

Reference Value = 13.4 V/m; Power Drift = 0.019 dB

Peak SAR (extrapolated) = 0.292 W/kg

**SAR(1 g) = 0.228 mW/g; SAR(10 g) = 0.164 mW/g**

Maximum value of SAR (measured) = 0.242 mW/g

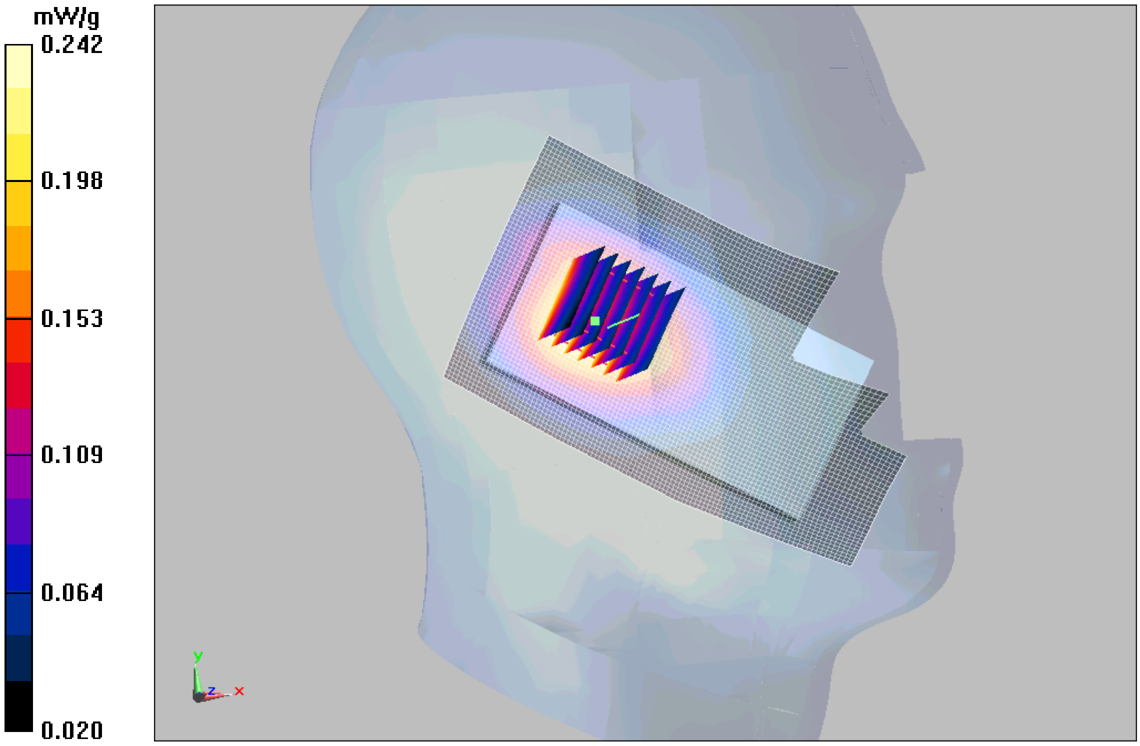



**Figure 11 Left Hand Touch Cheek CDMA Cellular Channel 777**

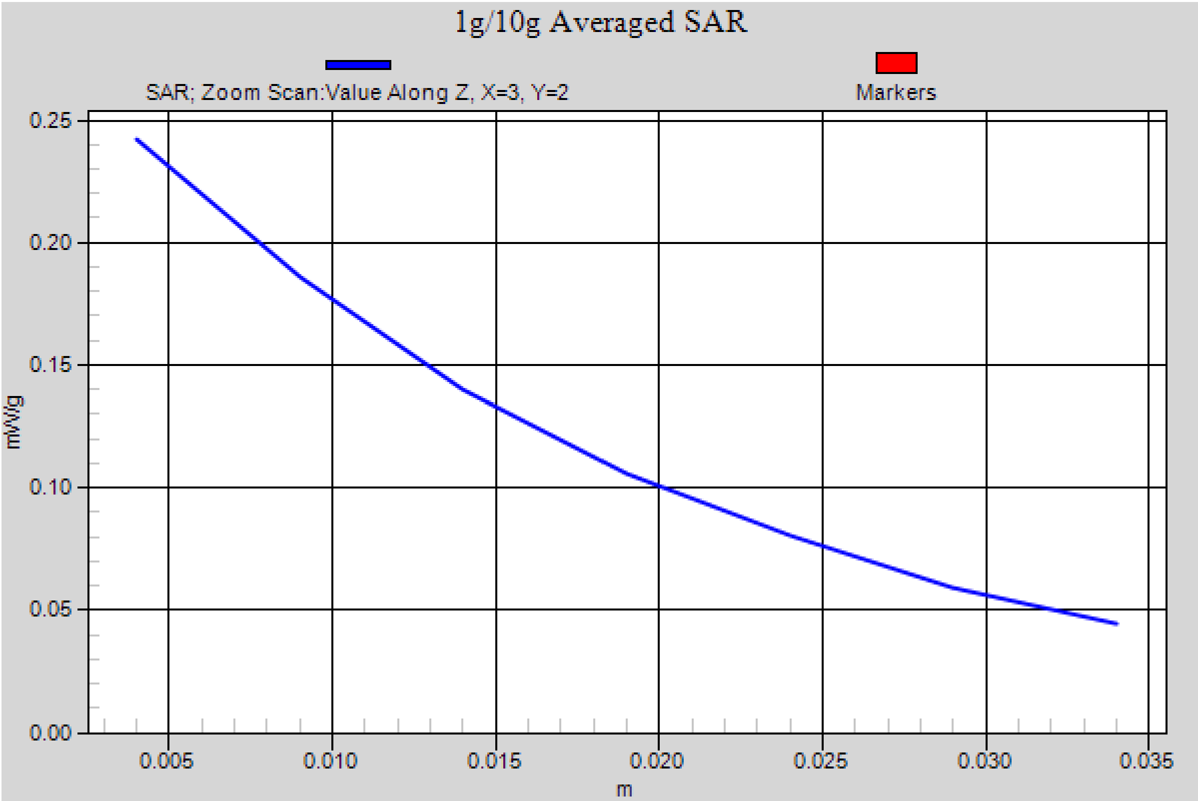



**Figure 12 Z-Scan at power reference point (Left Hand Touch Cheek CDMA Cellular Channel 777)**

**CDMA Cellular Left Cheek Middle**

Date/Time: 10/9/2009 12:45:45 PM

Communication System: CDMA Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; $\sigma$ = 0.924 mho/m; $\varepsilon_r$ = 41.8; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.33, 6.33, 6.33); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM 12; Type: SAM V4.0;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Cheek Middle/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

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

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

Reference Value = 13.4 V/m; Power Drift = -0.096 dB

Peak SAR (extrapolated) = 0.278 W/kg

**SAR(1 g) = 0.224 mW/g; SAR(10 g) = 0.162 mW/g**

Maximum value of SAR (measured) = 0.238 mW/g

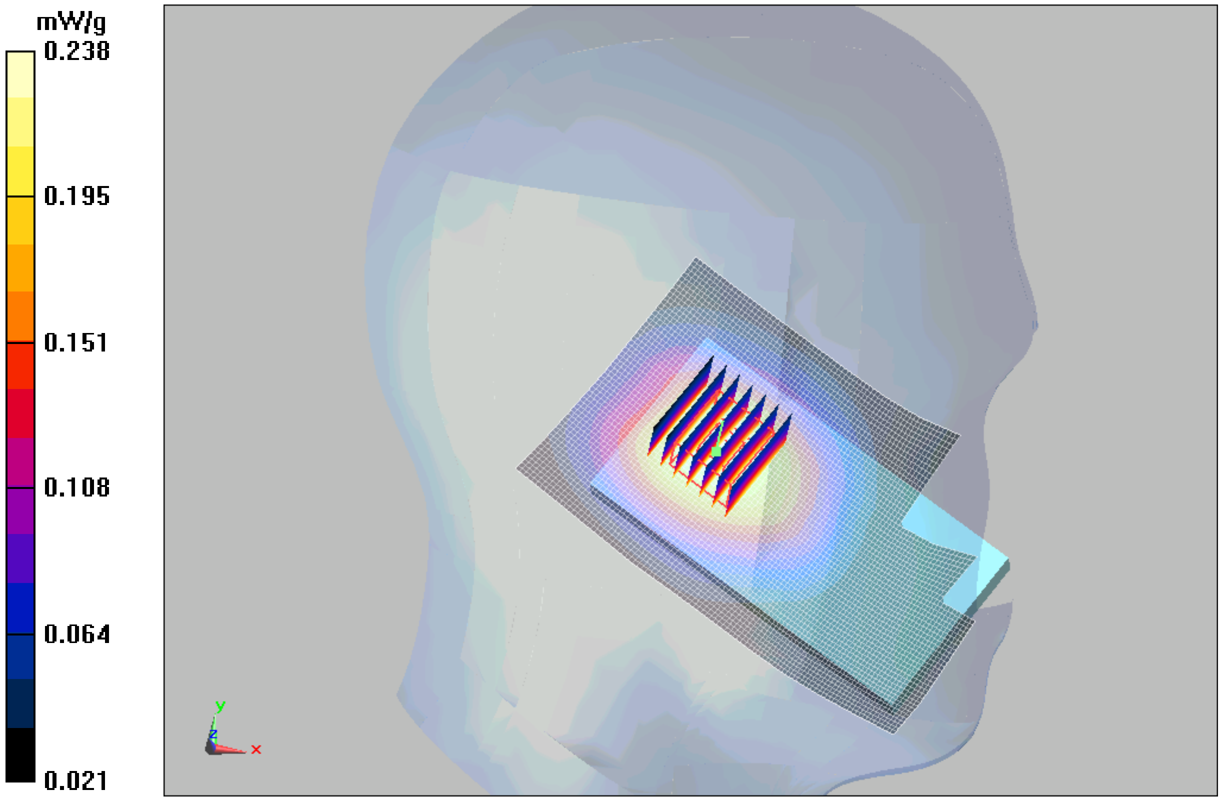



**Figure 13 Left Hand Touch Cheek CDMA Cellular Channel 384**

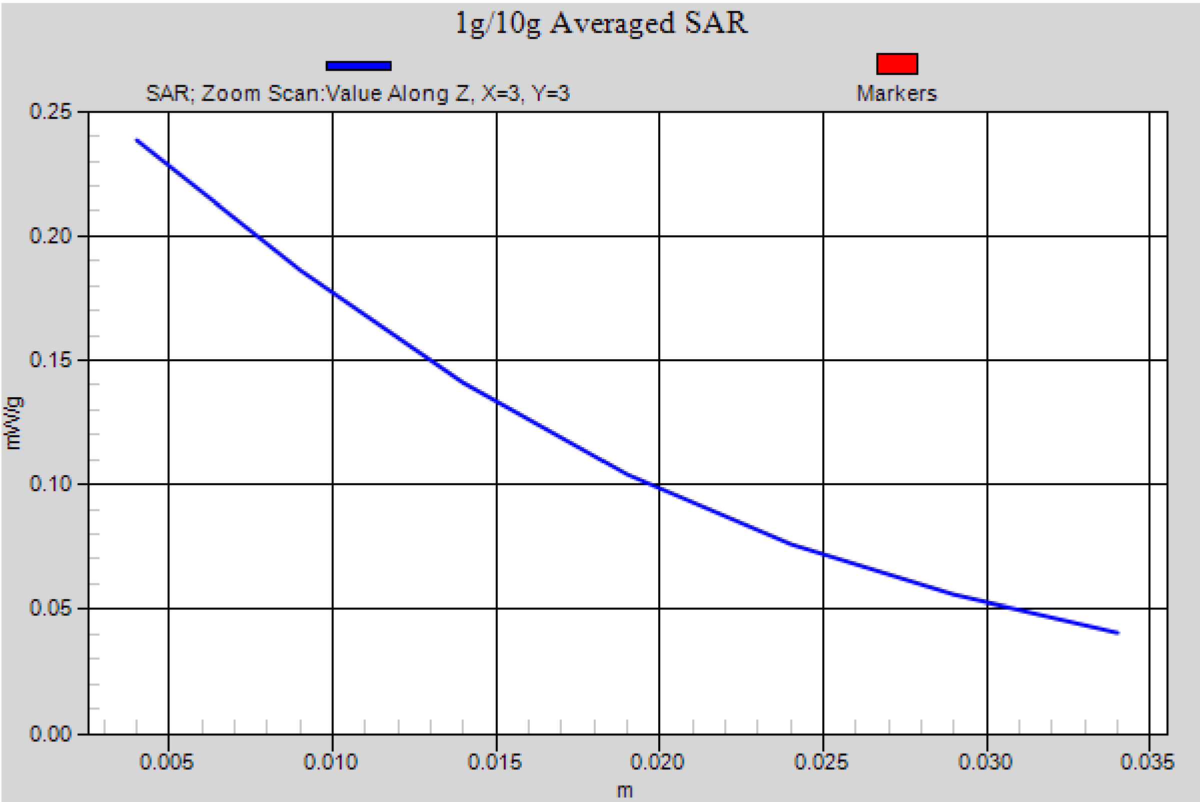



**Figure 14 Z-Scan at power reference point (Left Hand Touch Cheek CDMA Cellular Channel 384)**

**CDMA Cellular Left Cheek Low**

Date/Time: 10/9/2009 1:10:24 PM

Communication System: CDMA Cellular; Frequency: 824.7 MHz;Duty Cycle: 1:1

Medium parameters used: f = 825 MHz; $\sigma$ = 0.906 mho/m; $\varepsilon_r$ = 41.9; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.33, 6.33, 6.33); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM 12; Type: SAM V4.0;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Cheek Low/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.192 mW/g

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

Reference Value = 12.3 V/m; Power Drift = -0.059 dB

Peak SAR (extrapolated) = 0.233 W/kg

**SAR(1 g) = 0.179 mW/g; SAR(10 g) = 0.129 mW/g**

Maximum value of SAR (measured) = 0.190 mW/g

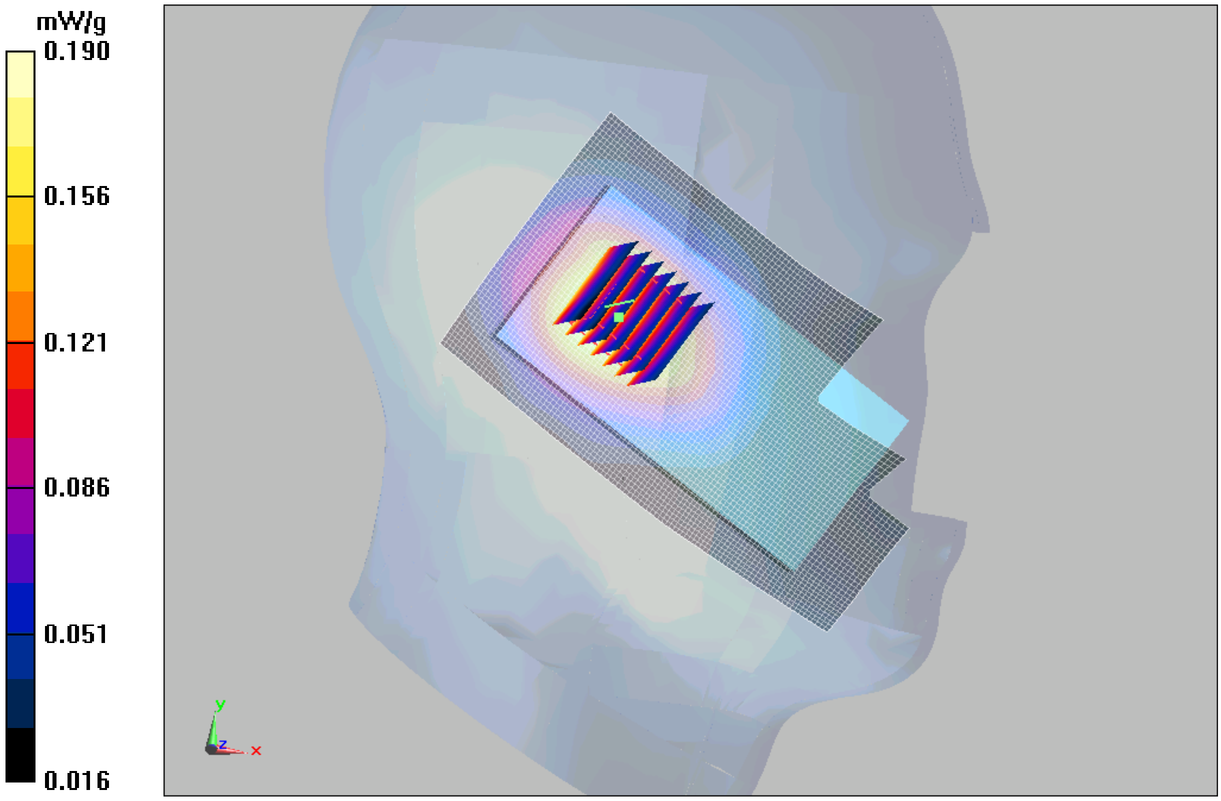



**Figure 15 Left Hand Touch Cheek CDMA Cellular Channel 1013**

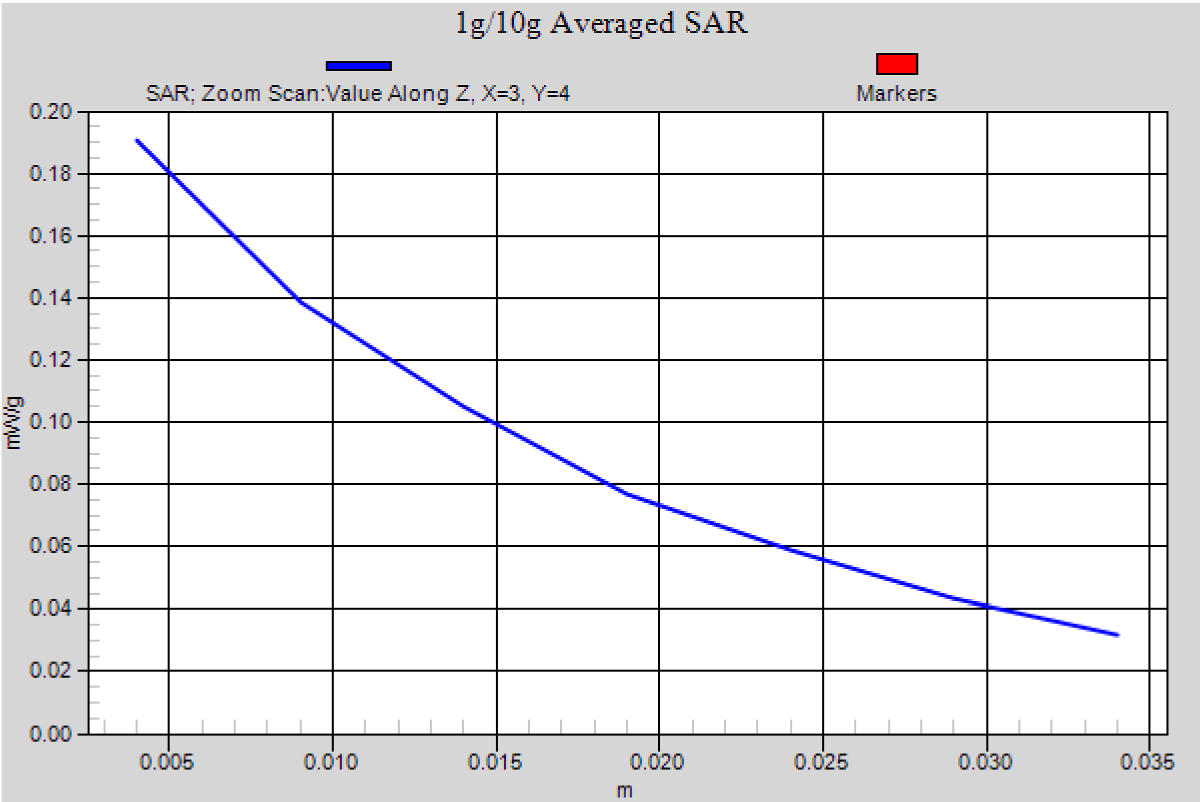



**Figure 16 Z-Scan at power reference point (Left Hand Touch Cheek CDMA Cellular Channel 1013)**

## CDMA Cellular Left Tilt Middle

Date/Time: 10/9/2009 2:01:04 PM

Communication System: CDMA Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; $\sigma$ = 0.924 mho/m; $\varepsilon_r$ = 41.8; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.33, 6.33, 6.33); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM 12; Type: SAM V4.0;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Tilt Middle/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.169 mW/g

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

Reference Value = 12.2 V/m; Power Drift = 0.005 dB

Peak SAR (extrapolated) = 0.209 W/kg

**SAR(1 g) = 0.156 mW/g; SAR(10 g) = 0.111 mW/g**

Maximum value of SAR (measured) = 0.167 mW/g

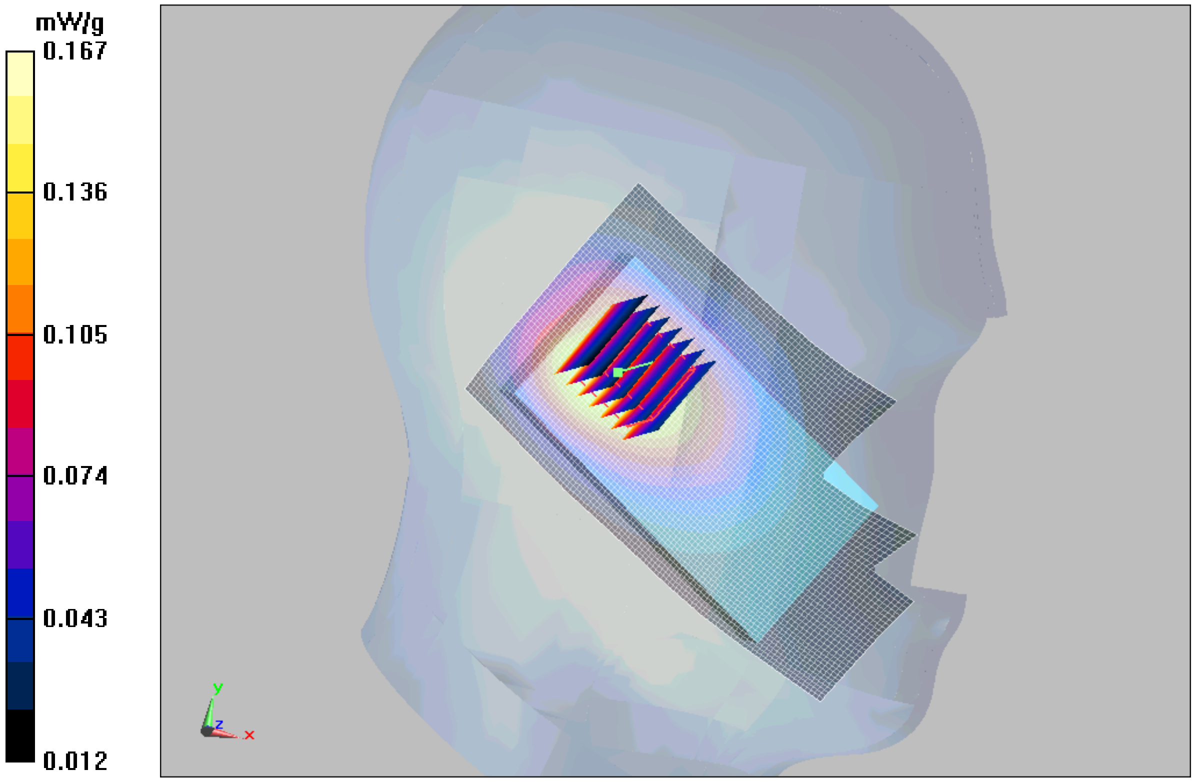



**Figure 17 Left Hand Tilt 15° CDMA Cellular Channel 384**

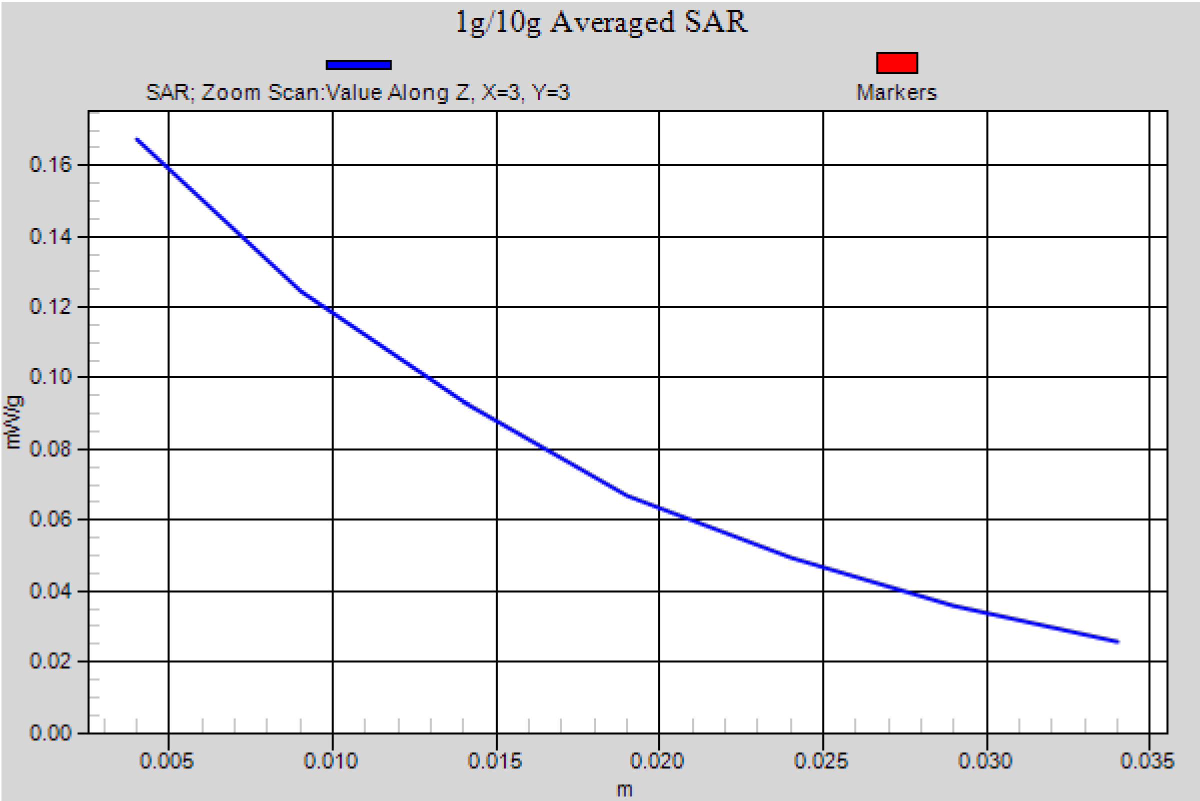



**Figure 18 Z-Scan at power reference point (Left Hand Tilt 15° CDMA Cellular Channel 384)**

**CDMA Cellular Right Cheek Middle**

Date/Time: 10/9/2009 2:25:24 PM

Communication System: CDMA Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; $\sigma$ = 0.924 mho/m; $\varepsilon_r$ = 41.8; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.33, 6.33, 6.33); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM 12; Type: SAM V4.0;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Cheek Middle/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.220 mW/g

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

Reference Value = 13.3 V/m; Power Drift = -0.086 dB

Peak SAR (extrapolated) = 0.283 W/kg

**SAR(1 g) = 0.206 mW/g; SAR(10 g) = 0.145 mW/g**

Maximum value of SAR (measured) = 0.218 mW/g

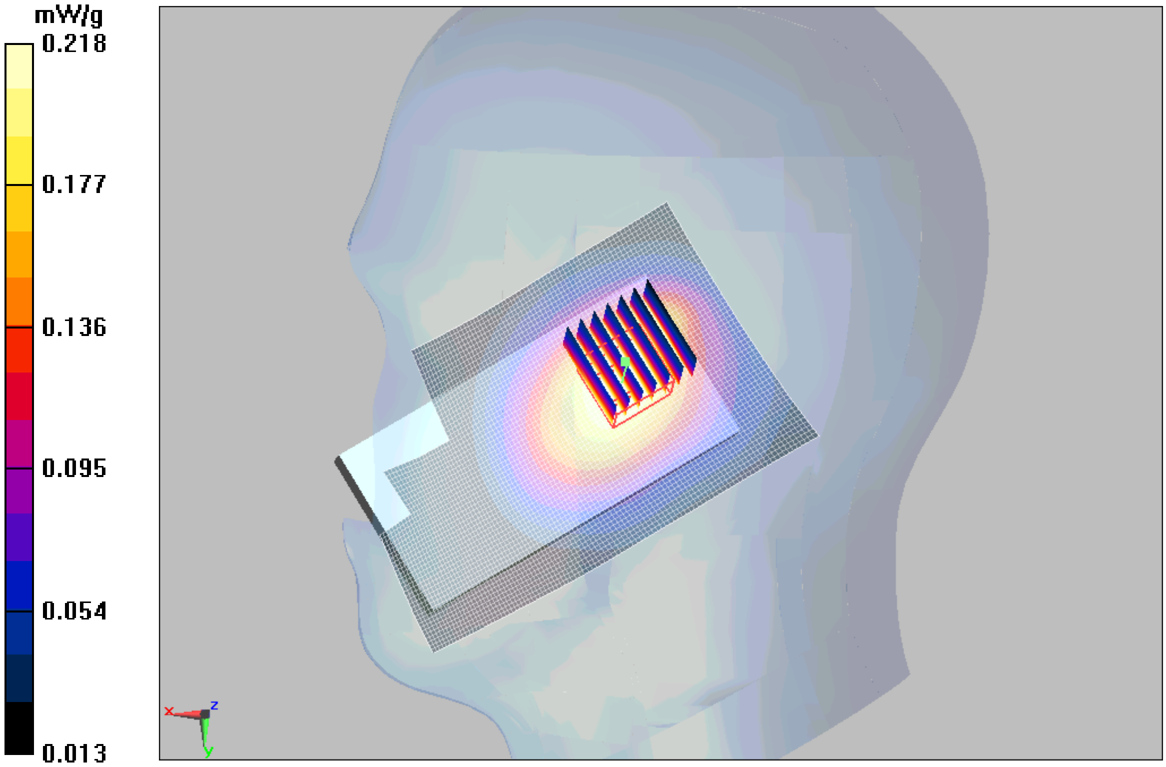



**Figure 19 Right Hand Touch Cheek CDMA Cellular Channel 384**

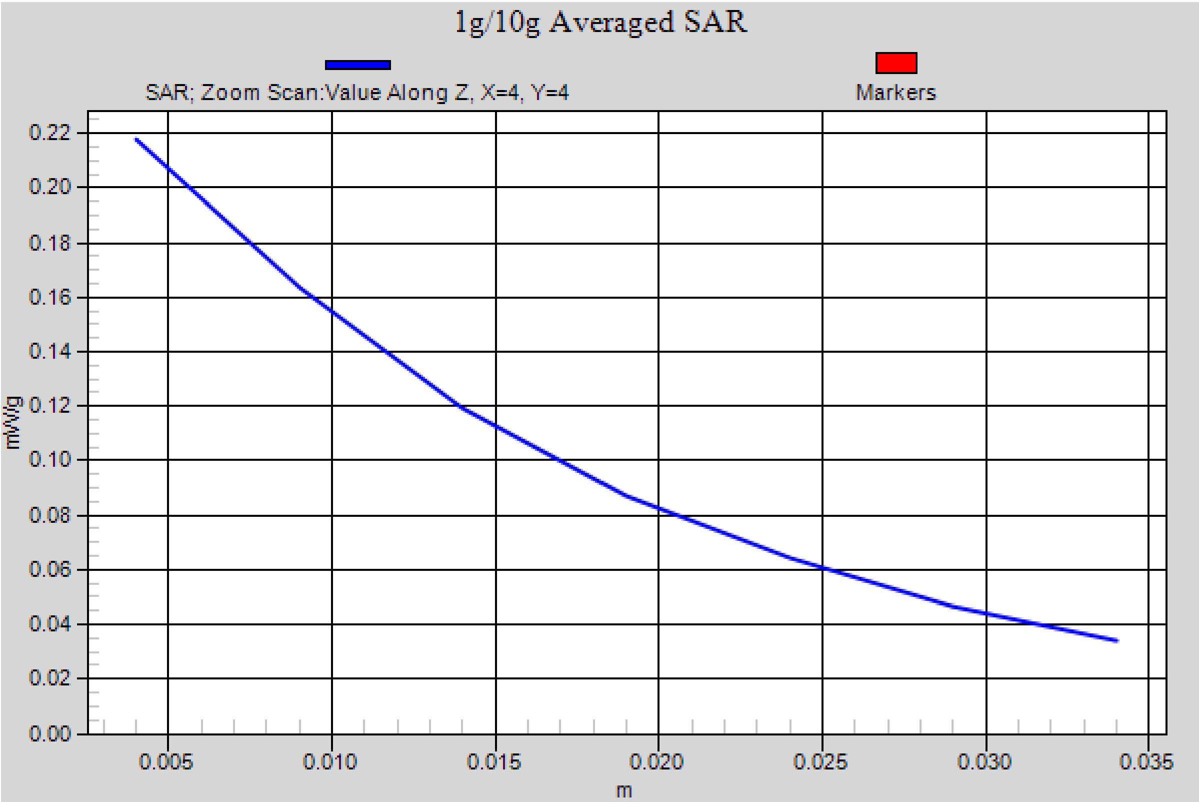



**Figure 20 Z-Scan at power reference point (Right Hand Touch Cheek CDMA Cellular Channel 384)**

**CDMA Cellular Right Tilt Middle**

Date/Time: 10/9/2009 3:14:31 PM

Communication System: CDMA Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; σ = 0.924 mho/m; $\varepsilon_r$ = 41.8; ρ = 1000 kg/m$^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.33, 6.33, 6.33); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM 12; Type: SAM V4.0;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Tilt Middle/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.178 mW/g

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

Reference Value = 12.7 V/m; Power Drift = -0.033 dB

Peak SAR (extrapolated) = 0.265 W/kg

**SAR(1 g) = 0.160 mW/g; SAR(10 g) = 0.110 mW/g**

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

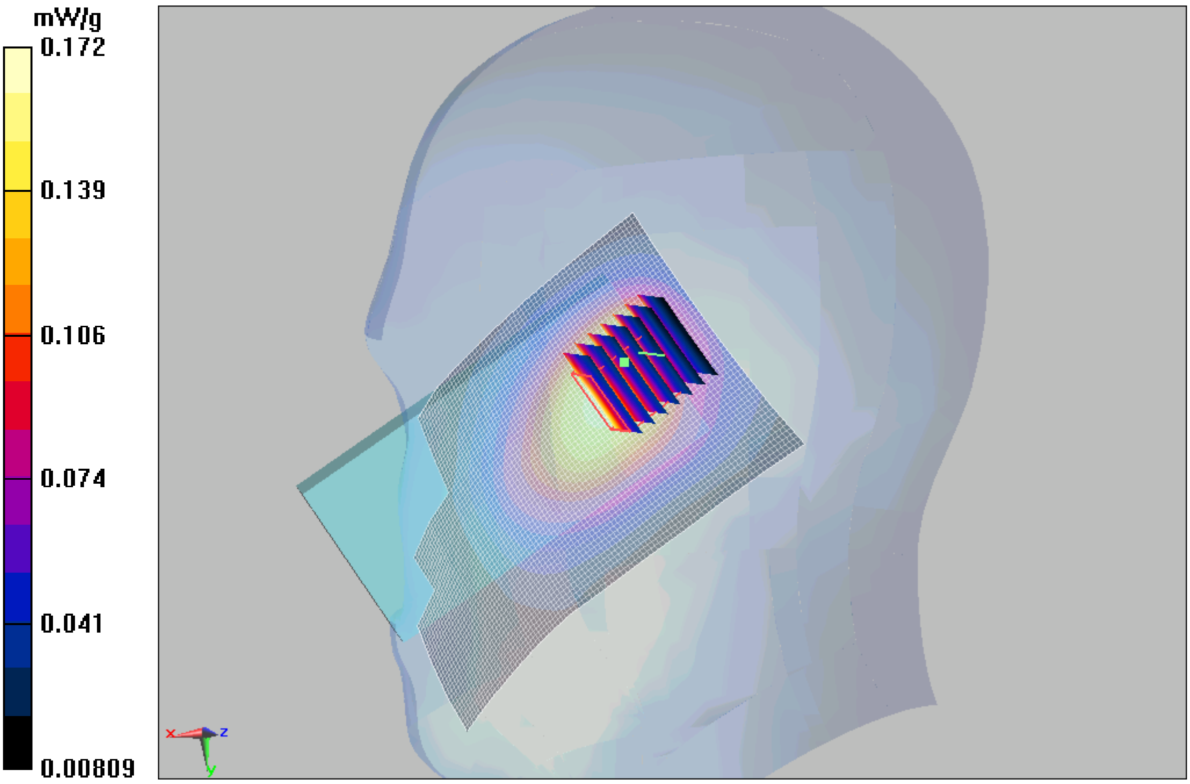



**Figure 21 Right Hand Tilt 15° CDMA Cellular Channel 384**

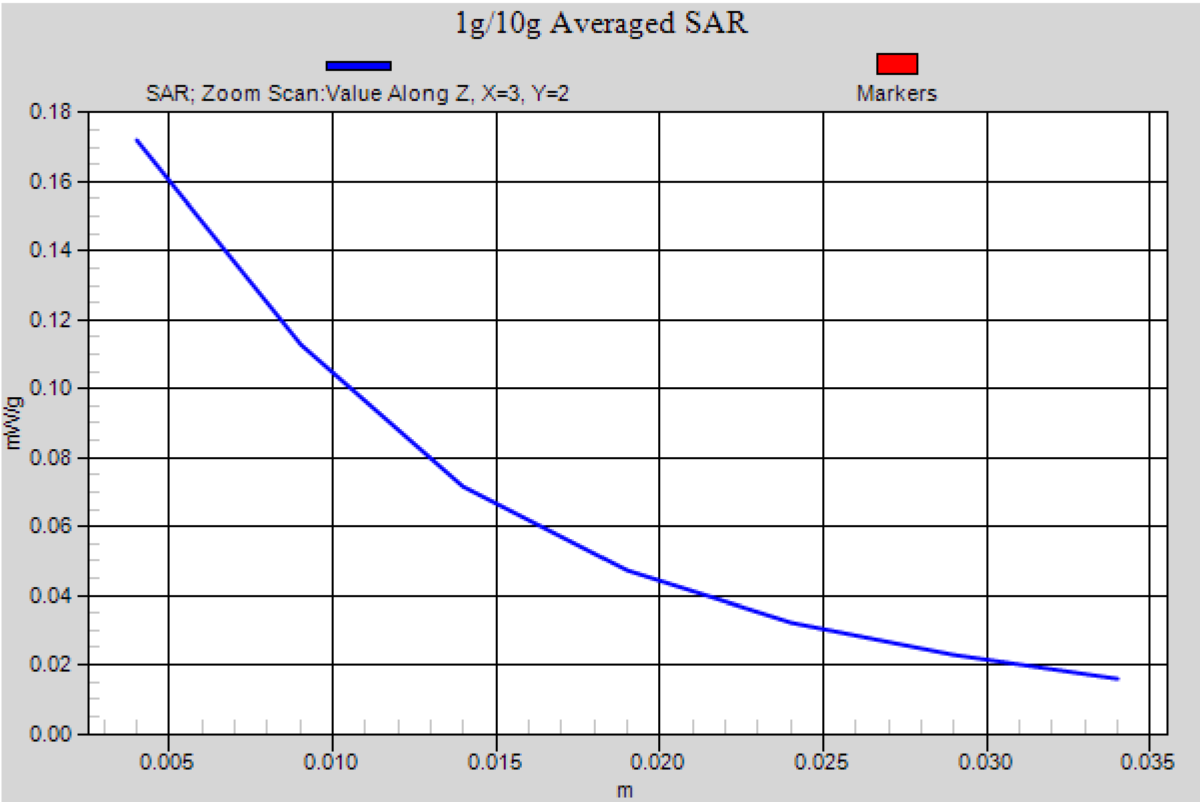



**Figure 22 Z-Scan at power reference point (Right Hand Tilt 15° CDMA Cellular Channel 384)**

**CDMA Cellular Towards Ground High**

Date/Time: 10/9/2009 7:04:00 PM

Communication System: CDMA Cellular; Frequency: 848.31 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 848.31 MHz; σ = 1.03 mho/m; $\varepsilon_r$ = 54.9; ρ = 1000 kg/$m^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.14, 6.14, 6.14); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM1; Type: SAM;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Towards Ground High/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.570 mW/g

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

Reference Value = 15.1 V/m; Power Drift = -0.037 dB

Peak SAR (extrapolated) = 0.693 W/kg

**SAR(1 g) = 0.537 mW/g; SAR(10 g) = 0.388 mW/g**

Maximum value of SAR (measured) = 0.572 mW/g

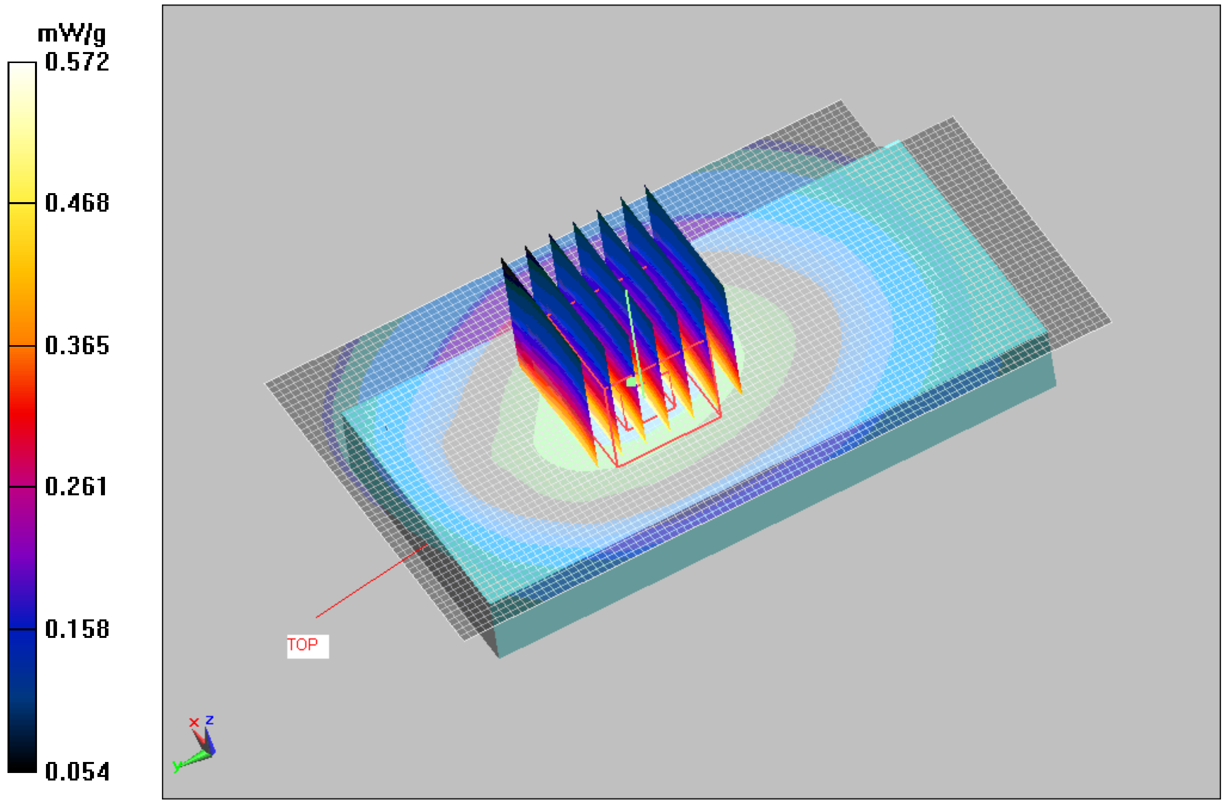



**Figure 23 Body, Towards Ground, CDMA Cellular Channel 777**

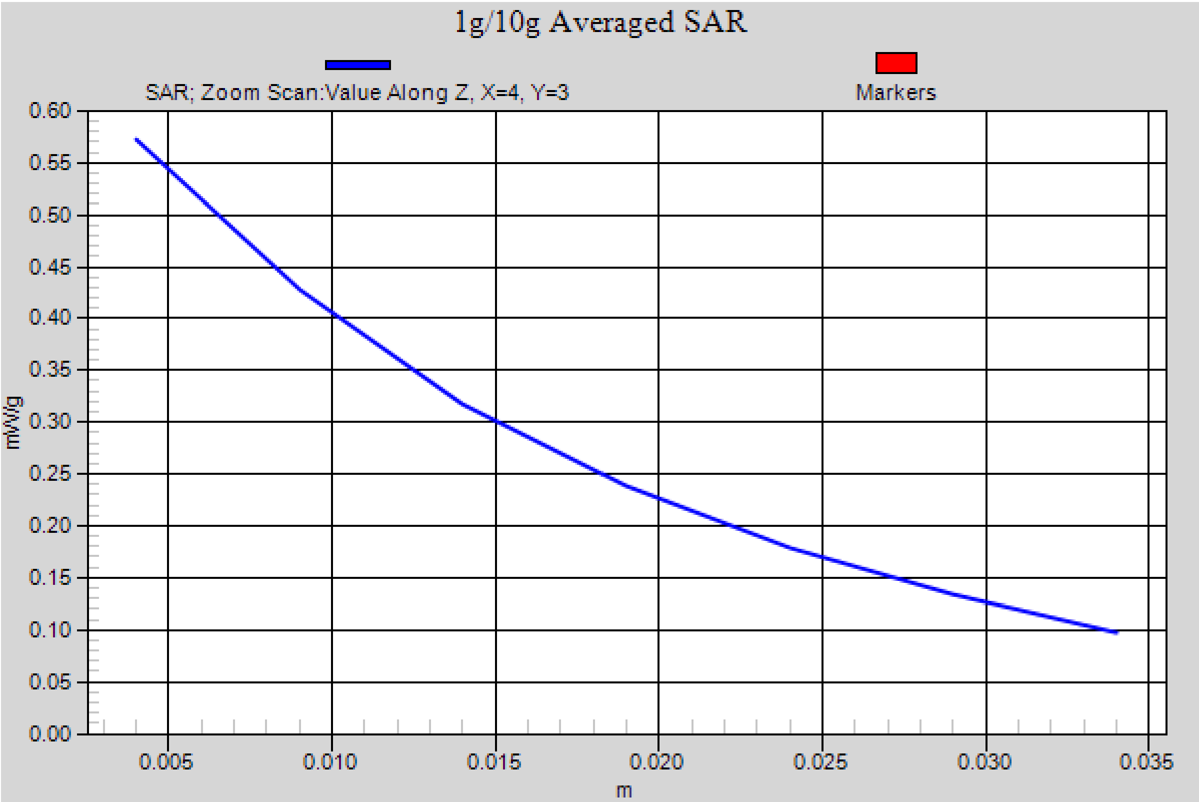



**Figure 24 Z-Scan at power reference point (Body, Towards Ground, CDMA Cellular Channel 777)**

**CDMA Cellular Towards Ground Middle**

Date/Time: 10/9/2009 6:15:17 PM

Communication System: CDMA Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; $\sigma$ = 1.02 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.14, 6.14, 6.14); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM1; Type: SAM;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Towards Ground Middle/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

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

Reference Value = 14.4 V/m; Power Drift = -0.016 dB

Peak SAR (extrapolated) = 0.645 W/kg

**SAR(1 g) = 0.495 mW/g; SAR(10 g) = 0.357 mW/g**

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

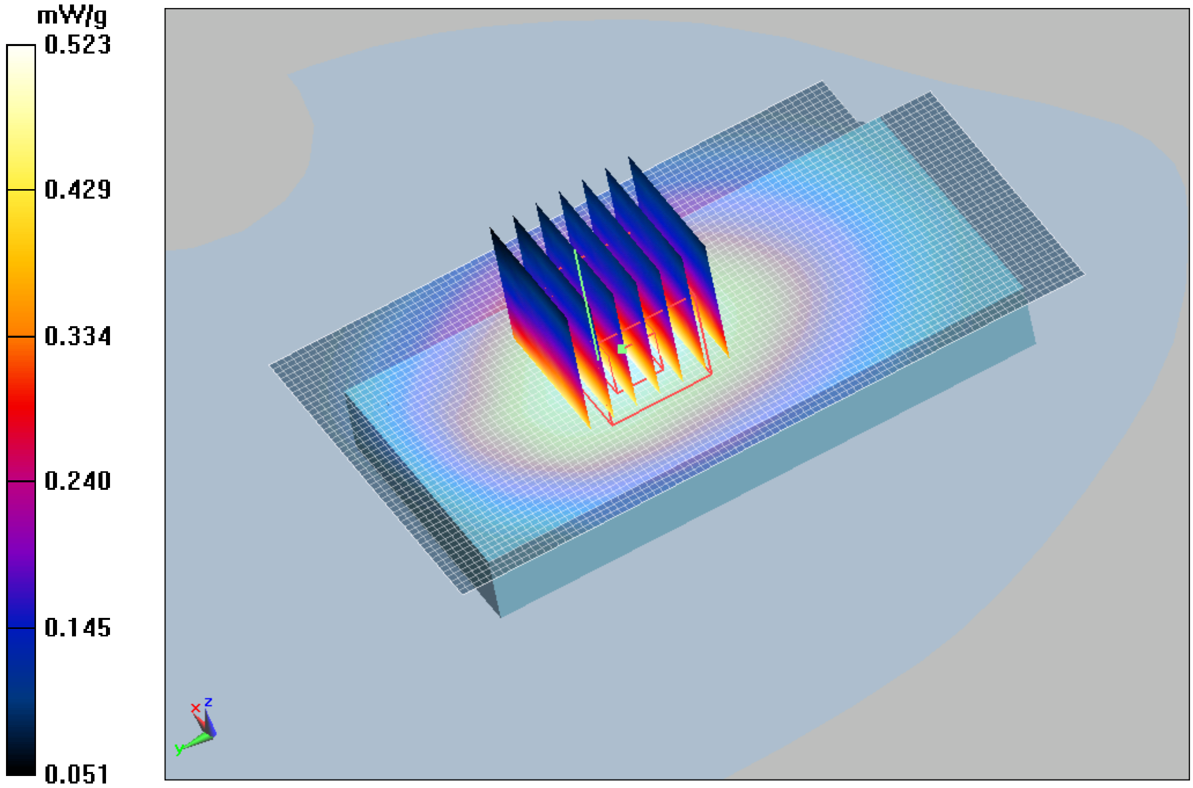



**Figure 25 Body, Towards Ground, CDMA Cellular Channel 384**

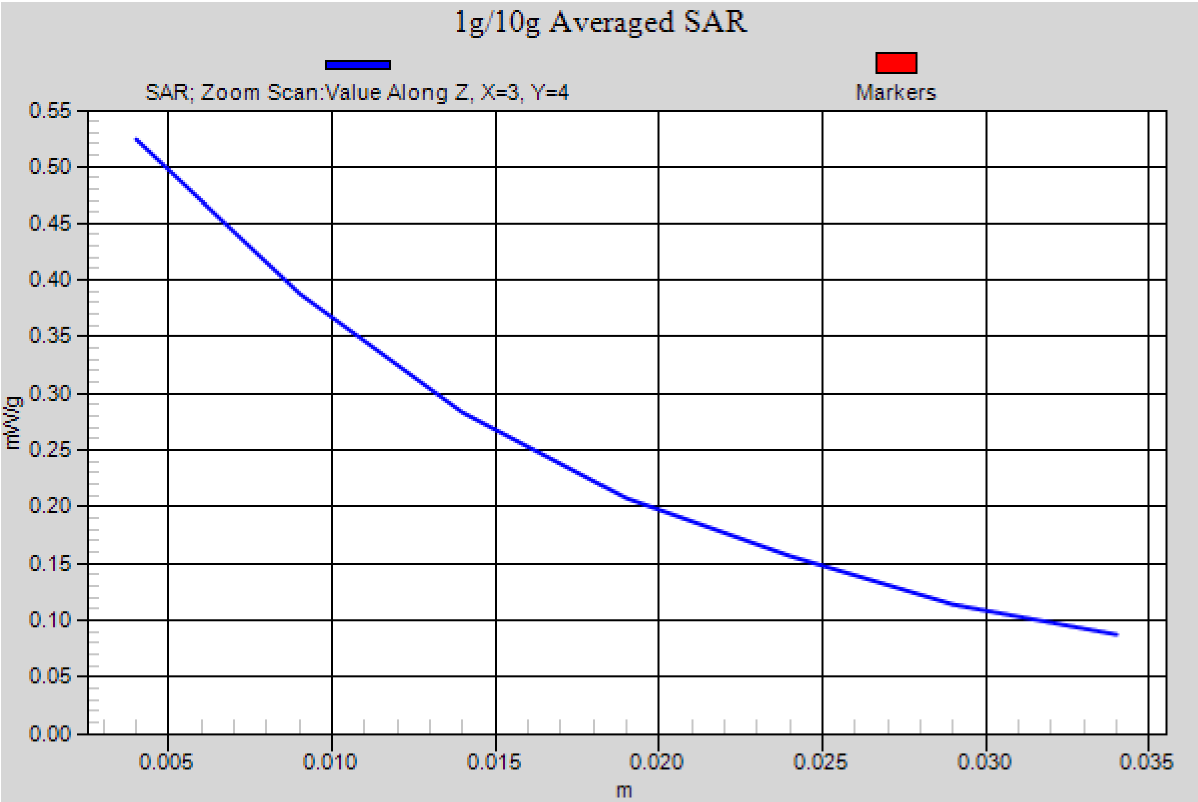



**Figure 26 Z-Scan at power reference point (Body, Towards Ground, CDMA Cellular Channel 384)**

**CDMA Cellular Towards Ground Low**

Date/Time: 10/9/2009 7:29:12 PM

Communication System: CDMA Cellular; Frequency: 824.7 MHz;Duty Cycle: 1:1

Medium parameters used: f = 825 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55.2; $\rho$ = 1000 kg/$m^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.14, 6.14, 6.14); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM1; Type: SAM;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Towards Ground Low/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.446 mW/g

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

Reference Value = 13.5 V/m; Power Drift = 0.009 dB

Peak SAR (extrapolated) = 0.531 W/kg

**SAR(1 g) = 0.413 mW/g; SAR(10 g) = 0.304 mW/g**

Maximum value of SAR (measured) = 0.441 mW/g

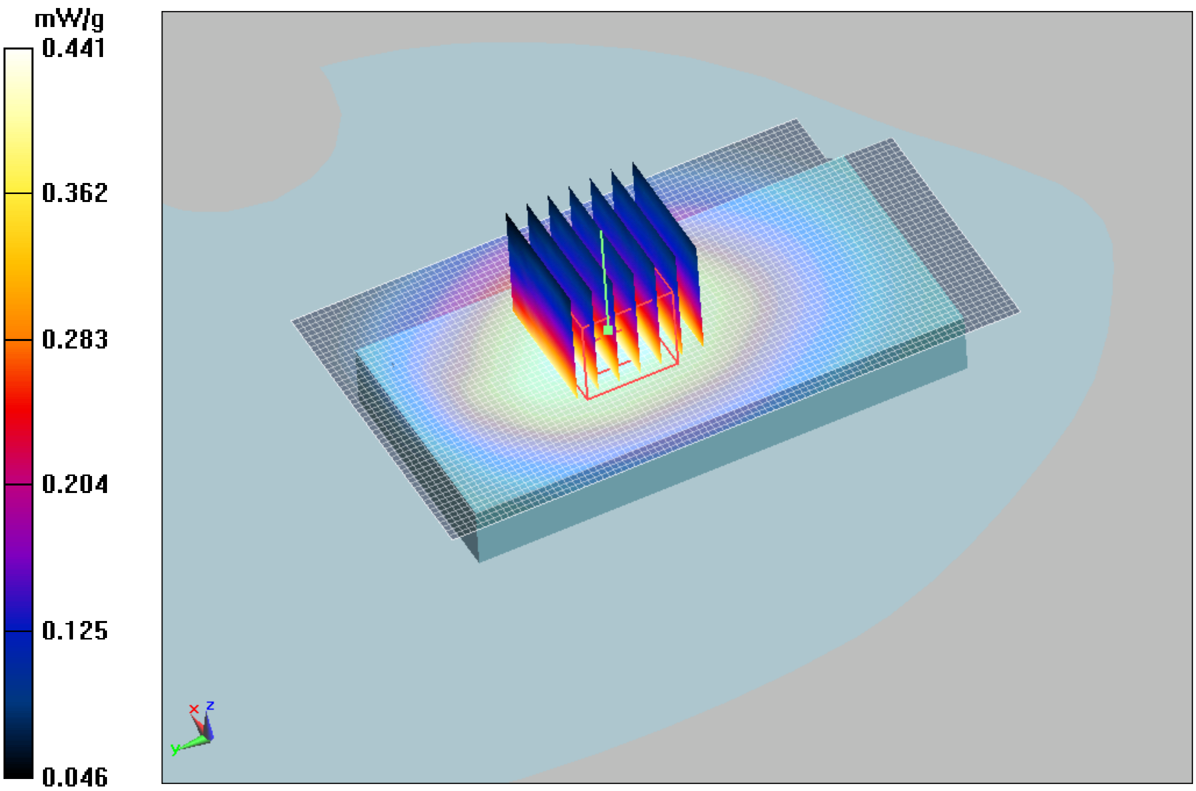



**Figure 27 Body, Towards Ground, CDMA Cellular Channel 1013**

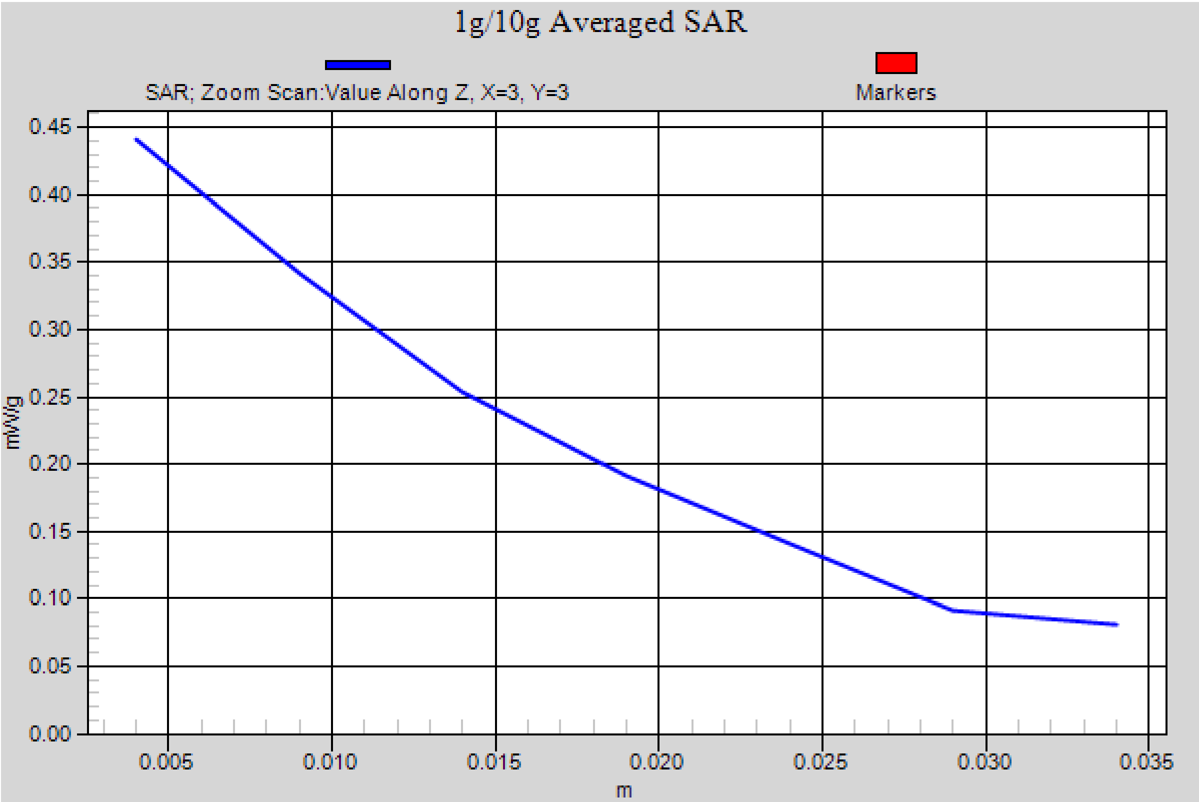



**Figure 28 Z-Scan at power reference point (Body, Towards Ground, CDMA Cellular Channel 1013)**

**CDMA Cellular Towards Phantom Middle**

Date/Time: 10/9/2009 6:40:51 PM

Communication System: CDMA Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; $\sigma$ = 1.02 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.14, 6.14, 6.14); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM1; Type: SAM;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Towards Phantom Middle/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.151 mW/g

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

Reference Value = 9.21 V/m; Power Drift = -0.123 dB

Peak SAR (extrapolated) = 0.191 W/kg

**SAR(1 g) = 0.142 mW/g; SAR(10 g) = 0.102 mW/g**

Maximum value of SAR (measured) = 0.152 mW/g

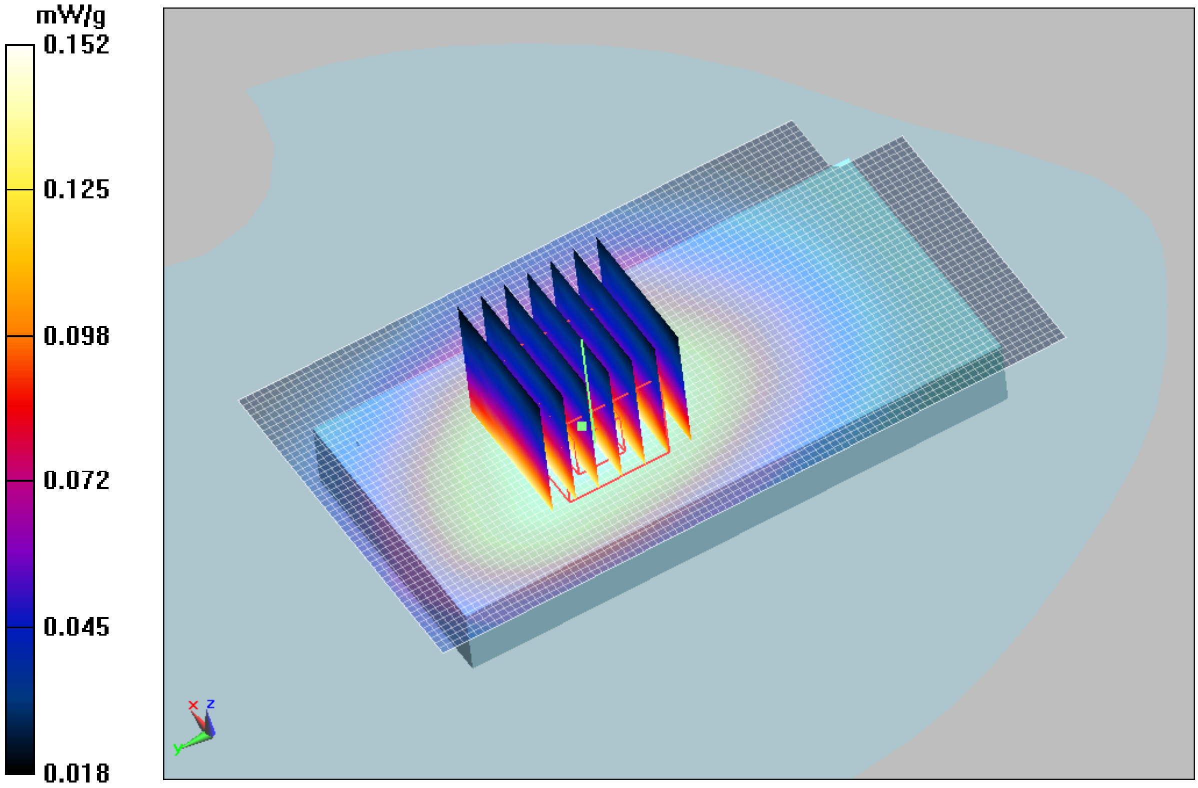



**Figure 29 Body, Towards Phantom, CDMA Cellular Channel 384**

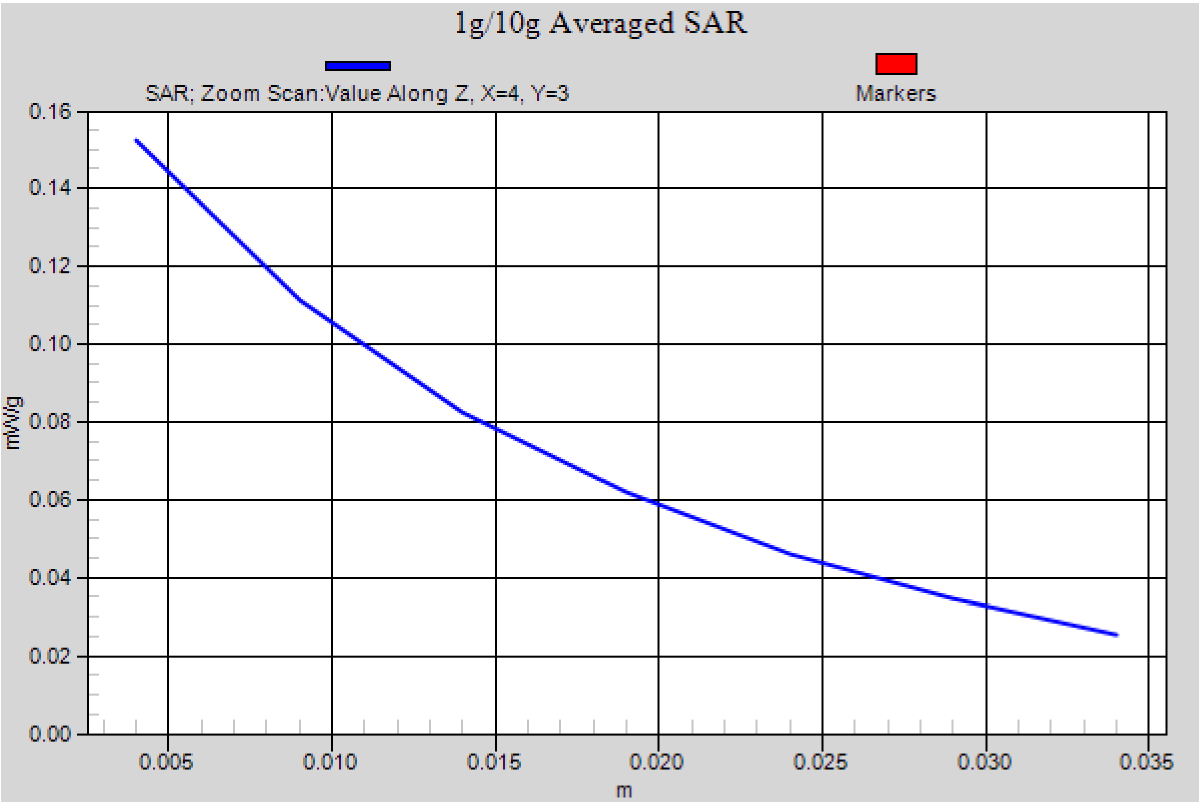



**Figure 30 Z-Scan at power reference point (Body, Towards Phantom, CDMA Cellular Channel 384)**

## CDMA Cellular Towards Ground with Earphone High

Date/Time: 10/9/2009 7:50:38 PM

Communication System: CDMA Cellular; Frequency: 848.31 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 848.31 MHz; σ = 1.03 mho/m; $\varepsilon_r$ = 54.9; ρ = 1000 kg/$m^3$

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(6.14, 6.14, 6.14); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM1; Type: SAM;

Measurement SW: DASY4, V4.7 Build 80; SEMCAD X Version 13.4 Build 45

**Towards Ground High/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.546 mW/g

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

Reference Value = 14.3 V/m; Power Drift = 0.040 dB

Peak SAR (extrapolated) = 0.678 W/kg

**SAR(1 g) = 0.519 mW/g; SAR(10 g) = 0.375 mW/g**

Maximum value of SAR (measured) = 0.556 mW/g

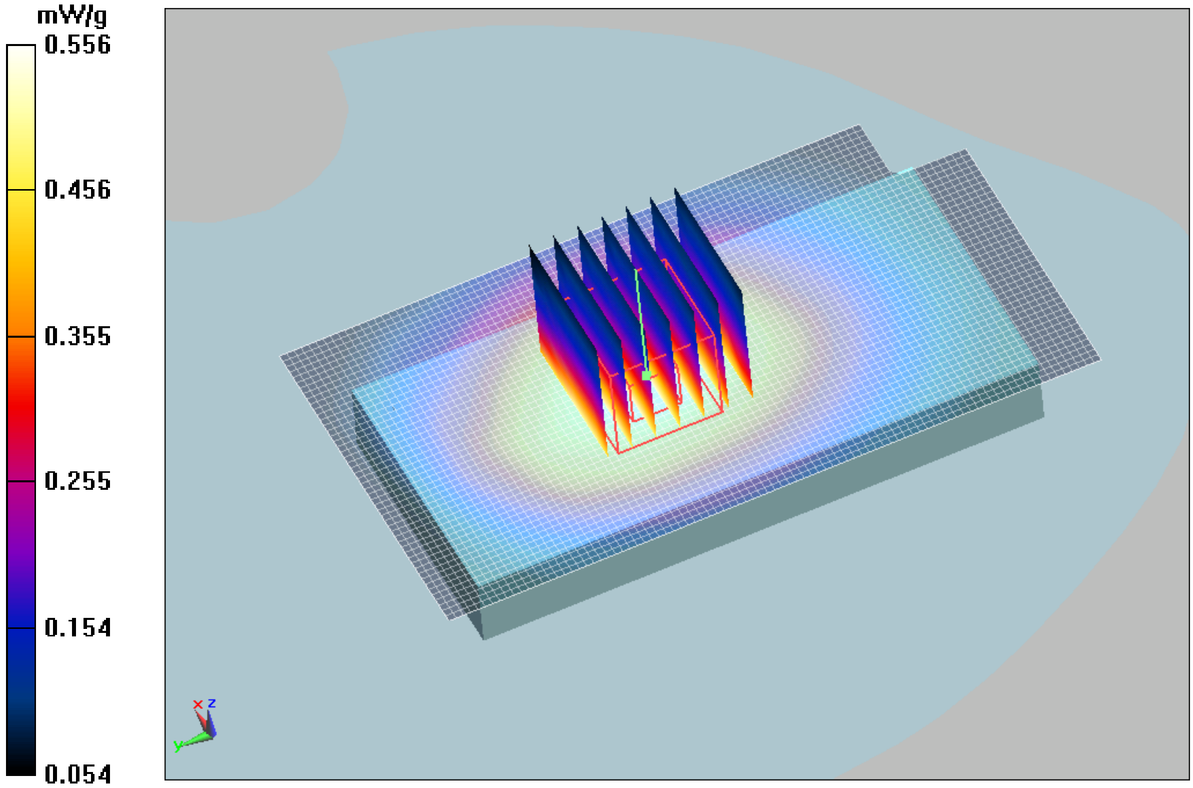



**Figure 31 Body with Earphone, Towards Ground, CDMA Cellular Channel 777**

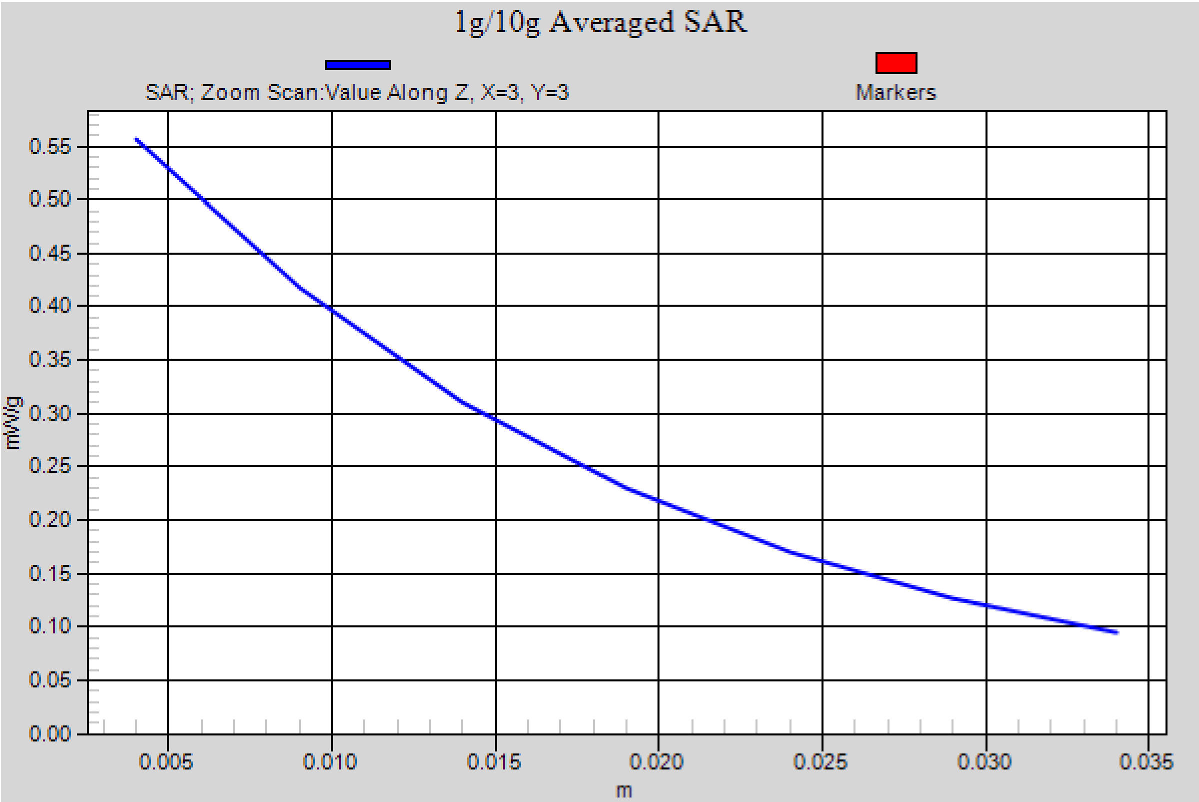



**Figure 32 Z-Scan at power reference point (Body with Earphone, Towards Ground, CDMA Cellular Channel 777)**

## ANNEX D: 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
**S** 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 **TA Shanghai (Auden)**

**Certificate No: ET3-1737_Nov08**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | ET3DV6 - SN:1737 |
| Calibration procedure(s) | QA CAL-01.v6, QA CAL-12.v5 and QA CAL-23.v3<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | November 25, 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 (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 1-Apr-08 (No. 217-00788) | Apr-09 |
| Power sensor E4412A | MY41495277 | 1-Apr-08 (No. 217-00788) | Apr-09 |
| Power sensor E4412A | MY41498087 | 1-Apr-08 (No. 217-00788) | Apr-09 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 1-Jul-08 (No. 217-00865) | Jul-09 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 31-Mar-08 (No. 217-00787) | Apr-09 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 1-Jul-08 (No. 217-00866) | Jul-09 |
| Reference Probe ES3DV2 | SN: 3013 | 2-Jan-08 (No. ES3-3013_Jan08) | Jan-09 |
| DAE4 | SN: 660 | 9-Sep-08 (No. DAE4-660_Sep08) | Sep-09 |

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

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

Issued: November 25, 2008

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

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

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| NORMx,y,z | sensitivity in free space |
| ConvF | 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 ET3DV6

## SN:1737

| | |
|---|---|
| Manufactured: | September 27, 2002 |
| Last calibrated: | February 19, 2007 |
| Repaired: | November 18, 2008 |
| Recalibrated: | November 25, 2008 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1737 November 25, 2008

# DASY - Parameters of Probe: ET3DV6 SN:1737

## Sensitivity in Free Space[A]

| | | |
|---|---|---|
| NormX | **1.42** ± 10.1% | $\mu V/(V/m)^2$ |
| NormY | **1.68** ± 10.1% | $\mu V/(V/m)^2$ |
| NormZ | **1.63** ± 10.1% | $\mu V/(V/m)^2$ |

## Diode Compression[B]

| | |
|---|---|
| DCP X | **93** mV |
| DCP Y | **94** mV |
| DCP Z | **85** 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 | | **3.7 mm** | **4.7 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 10.7 | 6.9 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.3 | 0.4 |

**TSL** **1750 MHz** **Typical SAR gradient: 10 % per mm**

| Sensor Center to Phantom Surface Distance | | **3.7 mm** | **4.7 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 12.5 | 8.4 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.8 | 0.5 |

## 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%.**

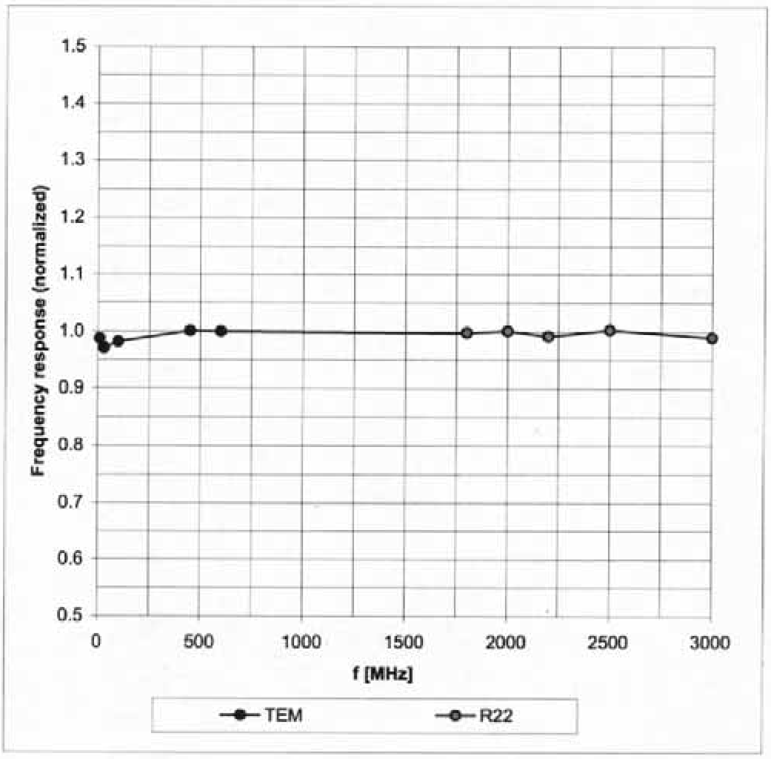
[A] The uncertainties of NormX,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1737 November 25, 2008

## Frequency Response of E-Field

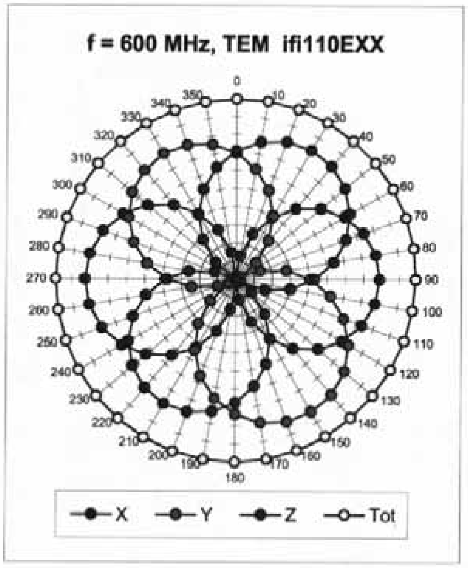
(TEM-Cell:ifi110 EXX, Waveguide: R22)

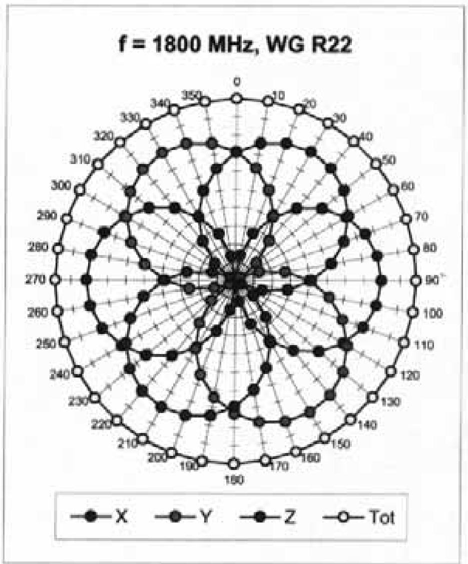


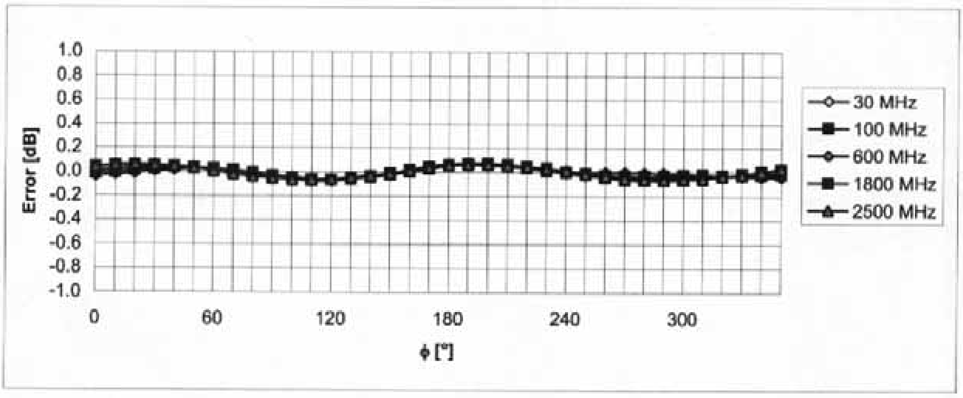

Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

ET3DV6 SN:1737 November 25, 2008

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



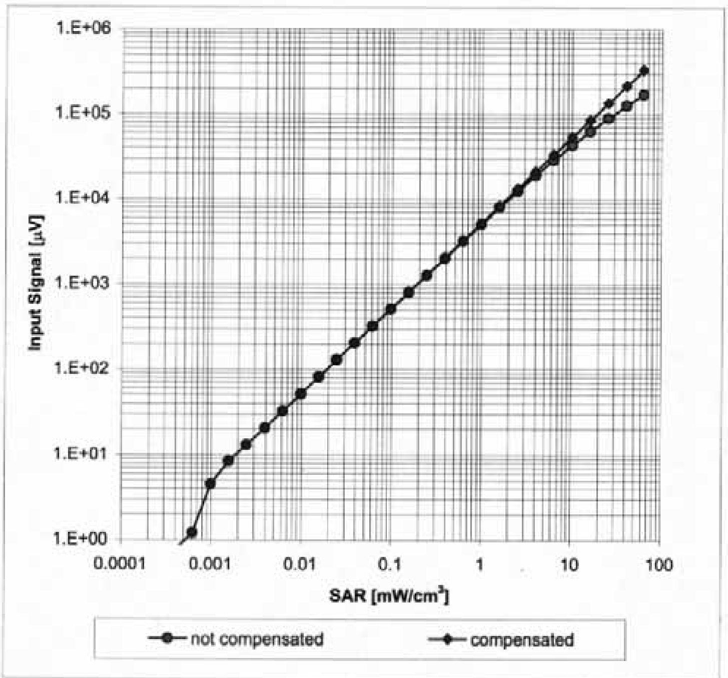



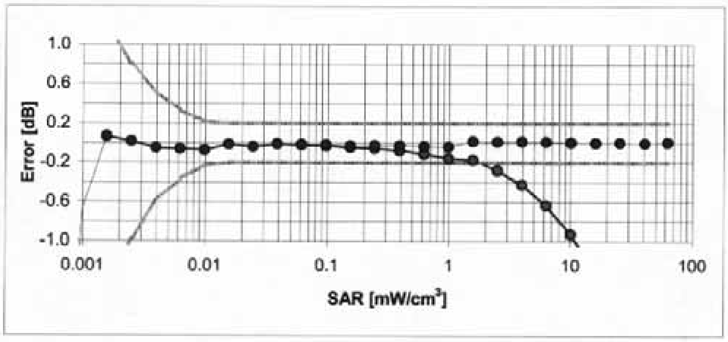

**Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)**

ET3DV6 SN:1737 November 25, 2008

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

**(Waveguide R22, f = 1800 MHz)**

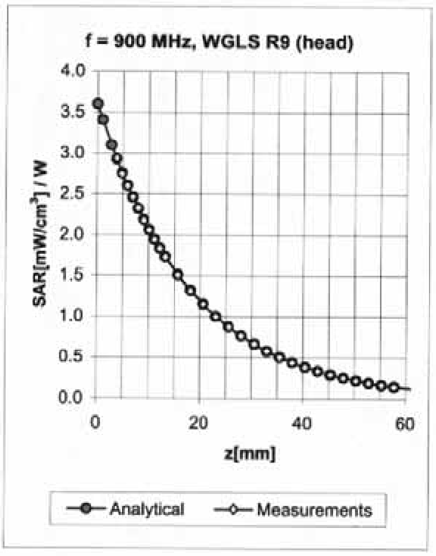


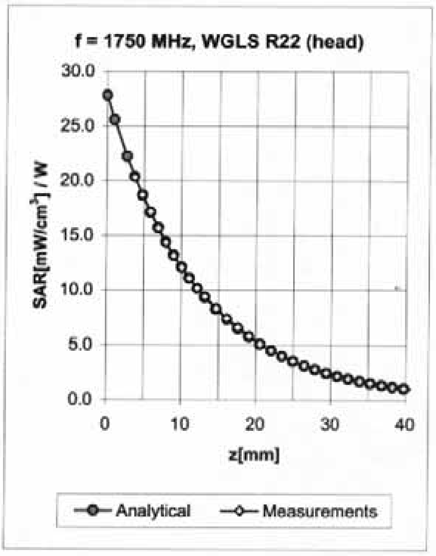




**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

ET3DV6 SN:1737 November 25, 2008

## Conversion Factor Assessment



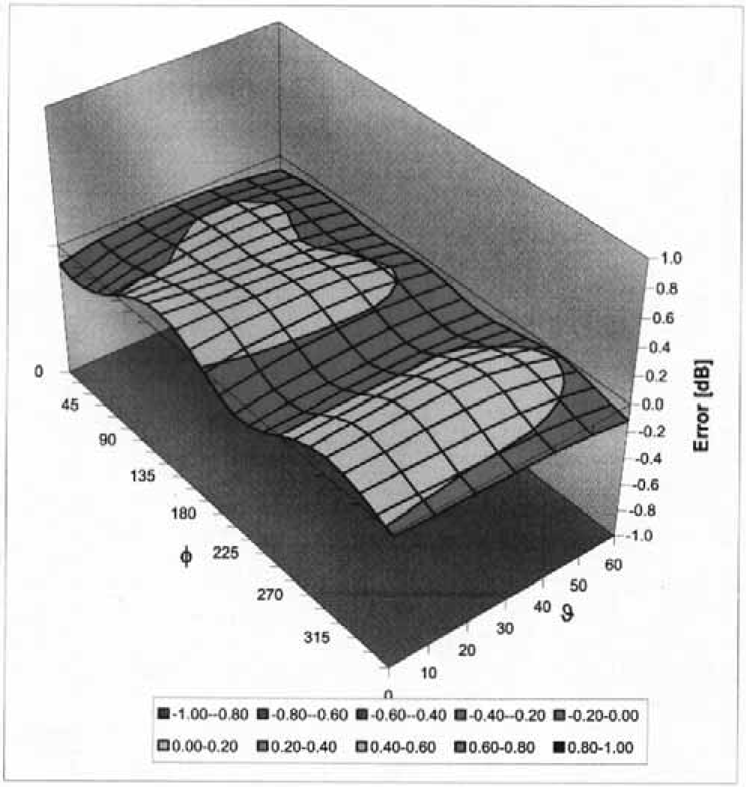




| f [MHz] | Validity [MHz][c] | TSL | Permittivity | Conductivity | Alpha | Depth | ConvF | Uncertainty |
|---|---|---|---|---|---|---|---|---|
| 450 | ± 50 / ± 100 | Head | 43.5 ± 5% | 0.87 ± 5% | 0.36 | 1.84 | 7.20 | ± 13.3% (k=2) |
| 835 | ± 50 / ± 100 | Head | 41.5 ± 5% | 0.90 ± 5% | 0.25 | 3.53 | 6.33 | ± 11.0% (k=2) |
| 900 | ± 50 / ± 100 | Head | 41.5 ± 5% | 0.97 ± 5% | 0.27 | 3.53 | 6.14 | ± 11.0% (k=2) |
| 1750 | ± 50 / ± 100 | Head | 40.1 ± 5% | 1.37 ± 5% | 0.56 | 2.77 | 5.35 | ± 11.0% (k=2) |
| 1950 | ± 50 / ± 100 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.57 | 2.72 | 4.89 | ± 11.0% (k=2) |
| 2450 | ± 50 / ± 100 | Head | 39.2 ± 5% | 1.80 ± 5% | 0.51 | 1.60 | 4.39 | ± 11.0% (k=2) |
| | | | | | | | | |
| 450 | ± 50 / ± 100 | Body | 56.7 ± 5% | 0.94 ± 5% | 0.27 | 1.80 | 7.52 | ± 13.3% (k=2) |
| 835 | ± 50 / ± 100 | Body | 55.2 ± 5% | 0.97 ± 5% | 0.36 | 2.75 | 6.14 | ± 11.0% (k=2) |
| 900 | ± 50 / ± 100 | Body | 55.0 ± 5% | 1.05 ± 5% | 0.43 | 2.51 | 5.98 | ± 11.0% (k=2) |
| 1750 | ± 50 / ± 100 | Body | 53.4 ± 5% | 1.49 ± 5% | 0.99 | 1.74 | 4.84 | ± 11.0% (k=2) |
| 1950 | ± 50 / ± 100 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.99 | 1.50 | 4.60 | ± 11.0% (k=2) |
| 2450 | ± 50 / ± 100 | Body | 52.7 ± 5% | 1.95 ± 5% | 0.98 | 1.42 | 3.91 | ± 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 E: D835V2 Dipole Calibration Certificate

信息产业部通信计量中心
Telecommunication Metrology Center of MII

TMC ilac-MRA CNAS 检测 CNAS L0442

Client TA Certificate No: D835V2-4d020_Jul09

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D835V2 - SN: 4d020 |
| Calibration Procedure(s) | TMC-XZ-01-027<br>Calibration procedure for dipole validation kits |
| Calibration date: | July 15, 2009 |
| 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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power Meter NRVD | 101253 | 19-Jun-09 (TMC, No.JZ09-248) | Jun-10 |
| Power sensor NRV-Z5 | 100333 | 19-Jun-09 (TMC, No. JZ09-248) | Jun-10 |
| Reference Probe ES3DV3 | SN 3149 | 08-Dec-08(SPEAG, No.ES3-3149_Dec08) | Dec-09 |
| DAE4 | SN 771 | 21-Nov-08(SPEAG, No.DAE4-771_Nov08) | Nov-09 |
| RF generator E4438C | MY45092879 | 18-Jun-09(TMC, No.JZ09-302) | Jun-10 |
| Network Analyzer 8753E | US38433212 | 03-Aug-08(TMC, No.JZ08-056) | Aug-09 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Lin Hao | SAR Test Engineer | 林浩 |
| Reviewed by: | Qi Dianyuan | SAR Project Leader | |
| Approved by: | Lu Bingsong | Deputy Director of the laboratory | |

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**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORMx,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) 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 300MHz to 3GHz)", February 2005

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) DASY 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** | DASY5 | V5.0 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | 2mm Oval Phantom ELI4 | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 835 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 41.5 | 0.90 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 41.2 ± 6 % | 0.91mho/m ± 6 % |
| **Head TSL temperature during test** | (21.7 ± 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 | 2.40 mW / g |
| SAR normalized | normalized to 1W | 9.60 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **9.2 mW /g ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.55 mW / g |
| SAR normalized | normalized to 1W | 6.20 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **6.07 mW /g ± 16.5 % (k=2)** |

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