CNAS
TESTING
No. L2264

OET 65

TEST REPORT

Product Name	EVDO Rev.A Rotatable USB Stick
FCC ID	QISEC167
Model	HUAWEI EC167
Client	HUAWEI Technologies Co., Ltd.

TA Technology (Shanghai) Co., Ltd.

GENERAL SUMMARY

Product Name	EVDO Rev.A Rotatable USB Stick	**Model**	HUAWEI EC167
FCC ID	QISEC167	**Report No.**	RZA2009 -1578
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. **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 62209-2:2008(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. General Judgment: **Pass** (Stamp) **Date of issue: December 2nd, 2009**		
Comment	The test result only responds to the measured sample.		

Approved by _____   **Revised by** _____   **Performed by** _____

Yang Weizhong   Ling Minbao   Li Jinchang

TABLE OF CONTENT

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

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1.4. Manufacturer Information

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City: Shenzhen

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1.5. Information of EUT

General information

Device type :	portable device
Exposure category:	uncontrolled environment / general population
Name of EUT:	EVDO Rev.A Rotatable USB Stick
IMEI or SN:	BH2AA109A1600021
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 (Low –Middle –High)	1013 -384 – 777 (CDMA Cellular) (tested)		
hardware version:	CE1EC167M		
software version:	11.102.11.00.45		
antenna type:	Internal antenna		

Equipment Under Test (EUT) is a model of EVDO Rev.A Rotatable USB Stick. During SAR test of the EUT, it was connected to a portable computer. The tests in the band of CDMA Cellular are performed in the mode of CDMA and EVDO. The measurements were performed in combination with two different host products (IBM T61, BenQ Joybook R55V). IBM T61 laptop has vertical USB slot and horizontal USB slot, BenQ Joybook R55V laptop has horizontal USB slot.

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 December 1, 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. 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 （Test loop back mode 1）
Service Options	SO32 （Test Data service mode）
Multiplex Options	The mobile station does not support this service.

2.3. Information for the measurement of CDMA 1x EV-DO devices

2.3.1. Output Power Verification for EV-DO

Maximum output power is verified on the High, Middle, Low channel according to procedures in section 3.1.1.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rev.0 and section 4.3.4 of 3GPP2 C.S0033-A for Rev. A. For Rev. A, maximum output power for both Subtype 0/1 and Subtype 2 Physical Layer configurations should be measured.

2.3.2. SAR measurement

SAR is measured using FTAP/RTAP and FETAP/RETAP respectively for Rev.0 and Rev. A devices. The AT is tested with a Reverse Data Channel rate of 153.6kbps IN Subtype 0/1 Physical Layer configurations; and a Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots in Subtype 2 Physical Layer configurations. Both FTAP and FETAP are configured with a Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2kbps with the ACK Channel transmitting in all slots. AT power control should be in "All Bits Up" conditions for TAP/ETAP.

Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev.0. SAR for Subtype 2 Physical Layer configurations is not required for Rev. A when the maximum average output of each RF channels is less that measured in Subtype 0/1 Physical Layer configurations. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for that RF channels in Rev.0[14].

For Ev-Do devices that also support 1x RTT voice and/or data operations, SAR is not required for 1x RTT when the maximum average output of each channel is less than ¼ dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0. Otherwise, the 'Body SAR Measurements' procedures in the 'CDMA-2000 1x Handsets' section should be applied.

2.4. Position of module in Portable devices

The measurements were performed in combination with two host products (IBMT61, BenQ Joybook R55V). IBM T61 laptop has horizontal USB slot, BenQ Joybook R55V laptop has vertical USB slot.

A test distance of 5mm or less, according to KDB 447498, should be considered for the orientation that can satisfy such requirements.

For each channel, the EUT is tested at the following 5 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 G Picture 5-a)

● Test Position 2: The EUT is connected to the portable computer through a 19 cm USB cable. The front side of the EUT towards the bottom of the flat phantom. (ANNEX G Picture 5-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 G Picture 5-c)

● Test Position 4: The EUT is connected to the portable computer through a 19 cm USB cable. The left side of the EUT towards the bottom of the flat phantom. (ANNEX G Picture 5-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 G Picture 5-e)

2.5. Picture of host product

During the test, IBM T61 and BenQ Joybook R55V laptop were used as an assistant to help to setup communication. (See Picture 1)

Picture 1-a: IBM T61 Close

Picture 1-b: IBM T61 Open

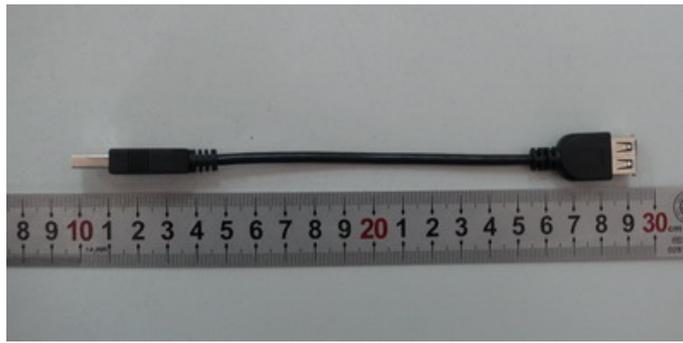Picture 1-c: BenQ Joybook R55V Close

Picture 1-d: BenQ Joybook R55V Open

Picture 1-e: BenQ Joybook R55V with vertical USB slot

Picture 1-f: IBM T61 with horizontal USB slot

Picture 1-g: a 19 cm USB cable
Picture 1: Computer as a test assistant

3. SAR Measurements System Configuration

3.1. SAR Measurement Set-up

The DASY5 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 DASY5 measurement server.
- The DASY5 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
- DASY5 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.
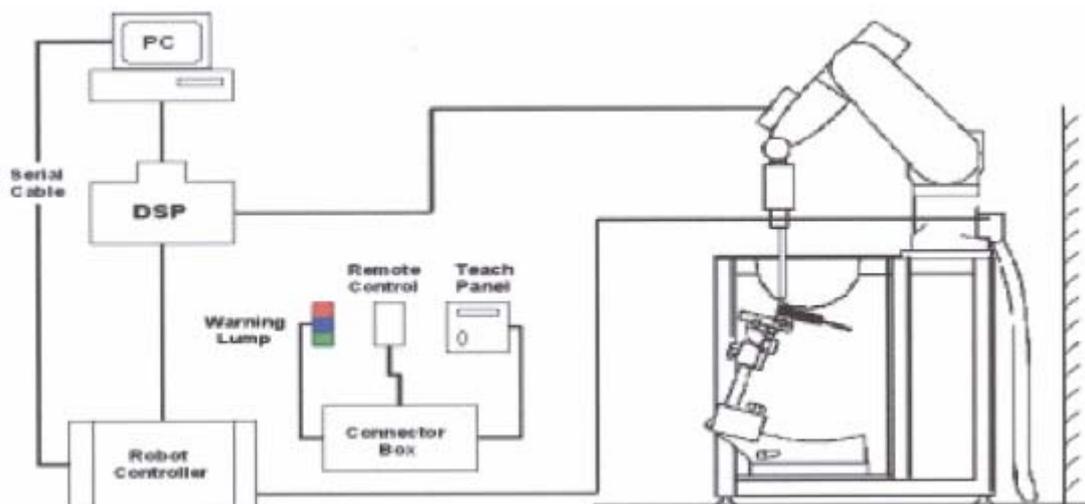- System validation dipoles allowing to validate the proper functioning of the system.

Figure 1. SAR Lab Test Measurement Set-up

3.2. DASY 5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

3.2.1. EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 835 ,HSL 900, HSL 1750 and HSL 1950 Additional CF for other liquids and frequencies upon request

Figure 2.EX3DV4 E-field Probe

Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

Figure 3. EX3DV4 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.

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

Where: Δt = Exposure time (30 seconds),
C = Heat capacity of tissue (brain or muscle),
ΔT = Temperature increase due to RF exposure.
Or

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

Where:
σ = Simulated tissue conductivity,
ρ = Tissue density (kg/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 DASY5 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 DASY5 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 10 mm x 10 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 DASY5 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 DASY5 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 ".DA5". 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 $Normi$, a_{i0}, 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 DASY5 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:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

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

   ▪ = 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.

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

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

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 5.

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 DASY 5 system.
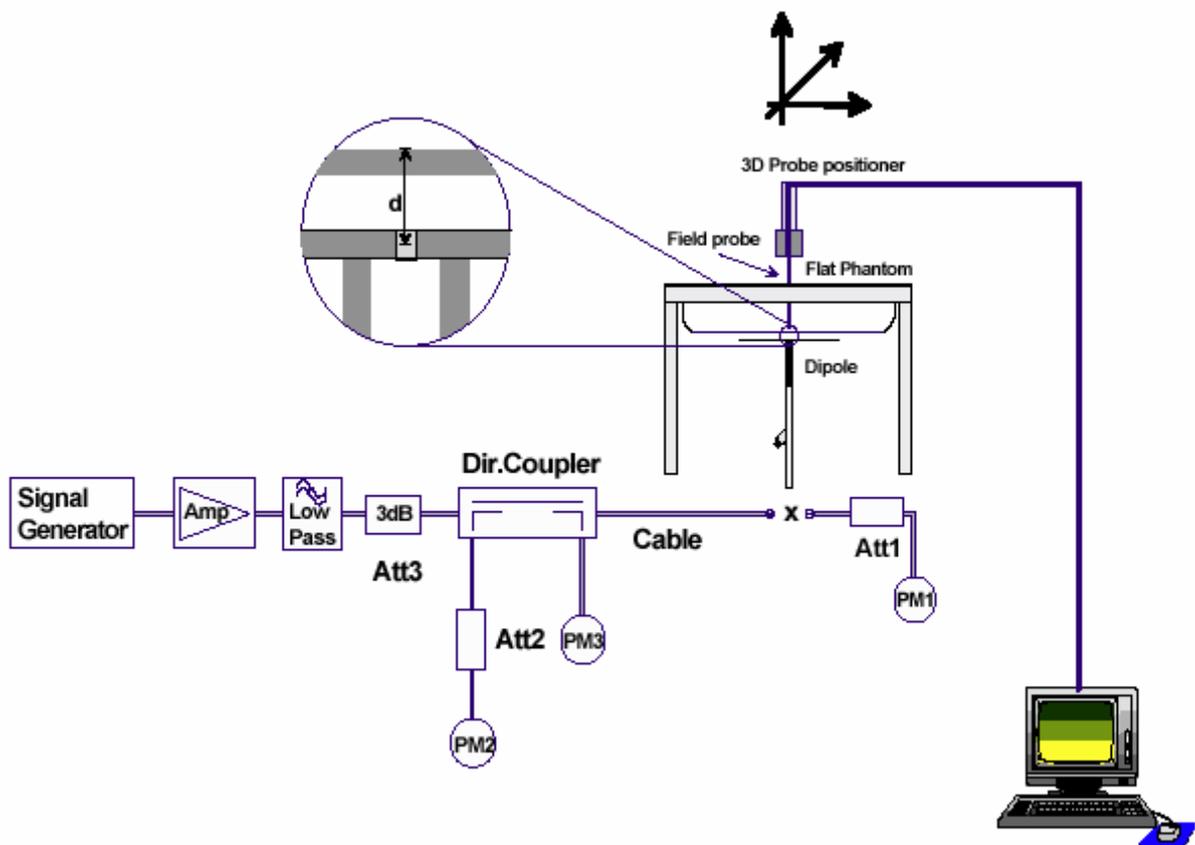
Figure 6. **System check Set-up**

3.7. Equivalent Tissues

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

Table 1: 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 2: 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 Std C95.1-1999:   IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

5.2. Applicable Measurement Standards

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 62209-2:2008(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 3: Conducted Power Measurement Results

CDMA Cellular (RC3)	Conducted Power		
	Channel 1013	**Channel 384**	**Channel 777**
Before test (dBm)	23.62	23.79	23.65
After test (dBm)	23.61	23.78	23.64
CDMA Cellular (RC1)	**Conducted Power**		
	Channel 1013	**Channel 384**	**Channel 777**
Before test (dBm)	23.71	23.76	23.64
After test (dBm)	23.70	23.75	23.63
CDMA Cellular + EV-DO (Subtype0)	**Conducted Power**		
	Channel 1013	**Channel 384**	**Channel 777**
Before Test(dBm)	23.96	24.01	23.83
After Test(dBm)	23.95	24.00	23.82
CDMA Cellular + EV-DO (Subtype2)	**Conducted Power**		
	Channel 1013	**Channel 384**	**Channel 777**
Before Test(dBm)	23.73	23.69	23.65
After Test(dBm)	23.72	23.68	23.64

7. Test Results

7.1. Dielectric Performance

Table 4: **Dielectric Performance of Body Tissue Simulating Liquid**

Frequency	Description	Dielectric Parameters		Temp
		ε_r	σ(s/m)	℃
835MHz **(body)**	Target value ±5% window	55.20 52.44 – 57.96	0.97 0.92 – 1.02	/
	Measurement value 2009-12-1	54.17	0.97	21.5

7.2. System check

Table 5: System Check for Body tissue stimulant

Frequency	Description	SAR(W/kg)		Dielectric Parameters		Temp
		10g	**1g**	ε_r	σ(s/m)	℃
835MHz	Recommended result ±10% window	1.67 1.50 - 1.84	2.54 2.29 - 2.79	53.5	1.00	/
	Measurement value 2009-12-1	1.58	2.41	54.17	0.97	21.9

Note: 1. the graph results see ANNEX B.

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

7.3. Summary of Measurement Results

7.3.1. Summary of Measurement Results (CDMA Cellular)

Table 6: SAR Values (CDMA Cellular)

Limit of SAR (W/kg)		10 g Average	1 g Average	Power Drift (dB)	Graph Results
		2.0	1.6	$\pm$ 0.21	
Test Case Of Body		Measurement Result(W/kg)		Power Drift(dB)	
Different Test Position	Channel	10 g Average	1 g Average		
IBM T61					
Test Position 1	High	0.556	0.902	-0.069	Figure 9
	Middle	0.684	1.120	-0.036	Figure 11
	Low	0.633	1.020	-0.020	Figure 13
Test Position 2	Middle	0.353	0.597	-0.134	Figure 15
Test Position 3	Middle	0.085	0.264	-0.100	Figure 17
Test Position 5	Middle	0.284	0.443	-0.096	Figure 19
BenQ Joybook R55V					
Test Position 4	Middle	0.414	0.638	-0.059	Figure 21

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.

3. Upper and lower frequencies were measured at the worst position.

Table 7: **SAR Values [CDMA Cellular, 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)
Test Position 1	initial position	Middle	1.200	0.600	1.500
	5mm		0.780		
	10mm		0.300		

Note: 1. The probe tip location is fixed at the distance of 2mm from the phantom surface.

2. 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.

3. 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.

7.3.2. Summary of Measurement Results (CDMA Cellular EV-DO)
Table 8: SAR Values (CDMA Cellular EV-DO)

Limit of SAR (W/kg)		10 g Average	1 g 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	Channel	10 g Average	1 g Average		
IBM T61 (Rev.0)					
Test Position 1	High	0.624	1.010	-0.075	Figure 23
	Middle	0.686	1.100	-0.144	Figure 25
	Low	0.694	1.110	0.036	Figure 27
Test Position 2	Middle	0.335	0.574	-0.061	Figure 29
Test Position 3	Middle	0.117	0.365	0.114	Figure 31
Test Position 5	Middle	0.283	0.438	-0.041	Figure 33
BenQ Joybook R55V (Rev.0)					
Test Position 4	Middle	0.409	0.634	-0.089	Figure 35
Worst case of EV-DO Rev.0 with EV-DO Rev.A					
Test Position 1	Low	0.668	1.070	0.008	Figure 37

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.

3. Upper and lower frequencies were measured at the worst position.

Table 9: SAR Values (CDMA Cellular EV-DO, 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)
Test Position 1	initial position	Low	1.204	0.602	1.505
	5mm		0.663		
	10mm		0.441		

Note: 1. The probe tip location is fixed at the distance of 2mm from the phantom surface.

2. 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.

3. 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.

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} is 1.12 W/kg that is 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	Validation Kit 835MHz	D835V2	4d031	January 22, 2009	One year
08	BTS	E5515C	MY48360988	December 16, 2008	BTS
09	E-field Probe	EX3DV4	3677	September 23, 2009	One year
10	DAE	DAE4	905	June 24, 2009	One year

END OF REPORT BODY

ANNEX A: Test Layout

Picture 2 Specific Absorption Rate Test Layout
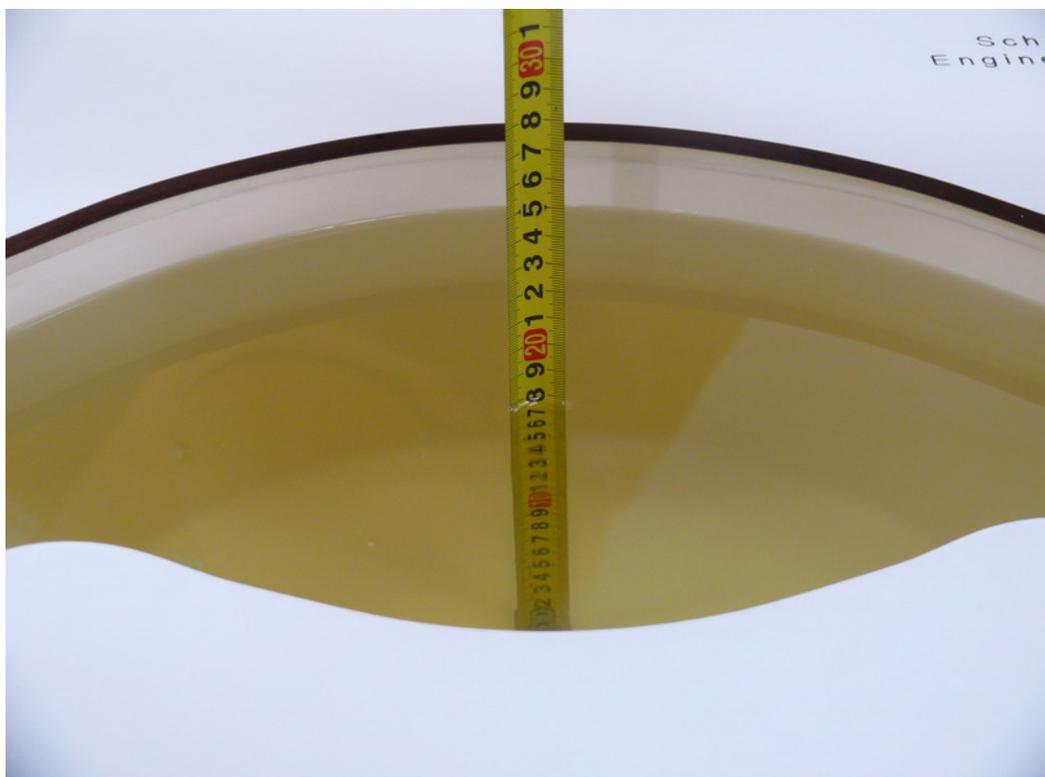
Picture 3 Liquid depth in the Flat Phantom (835 MHz)

ANNEX B: System Check Results

System Performance Check at 835 MHz Body TSL
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d031

Date/Time: 12/1/2009 7:15:49 AM

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

Medium parameters used: f = 835 MHz; σ = 0.97 mho/m; ε_r = 54.17; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

d=15mm, Pin=250mW/Area Scan (101x121x1): Measurement grid: dx=10mm, dy=10mm

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

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

Reference Value = 51.1 V/m; Power Drift = -0.037 dB

Peak SAR (extrapolated) = 3.52 W/kg

SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.58 mW/g

Maximum value of SAR (measured) = 2.59 mW/g
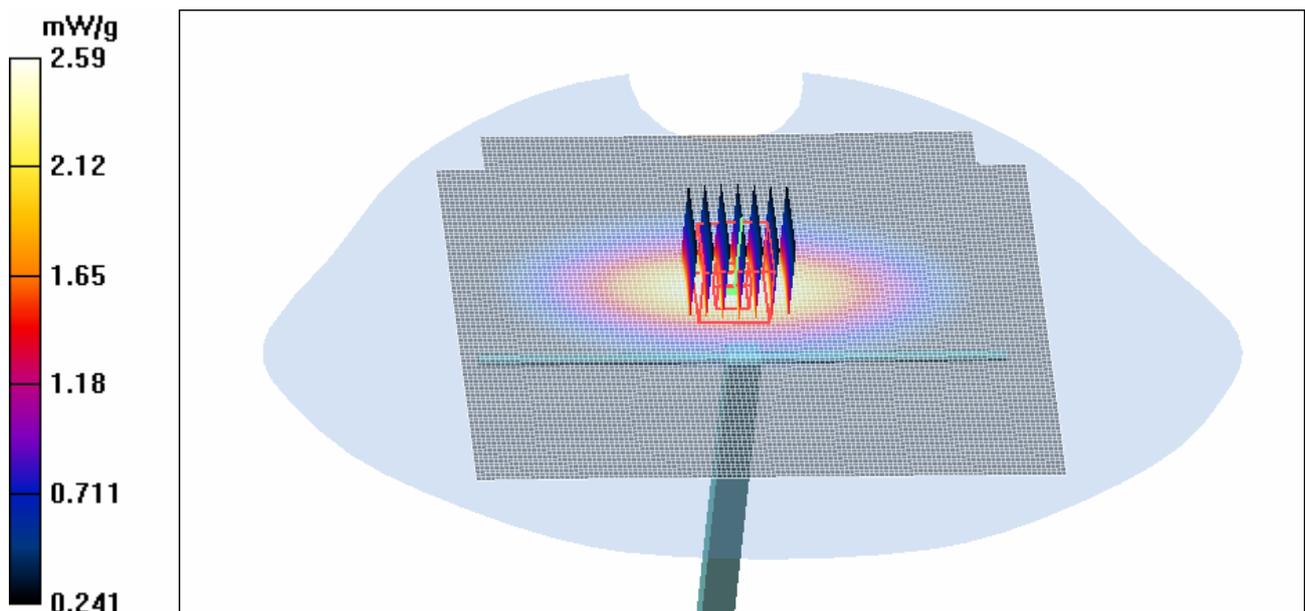

Figure 7 System Performance Check 835MHz 250mW
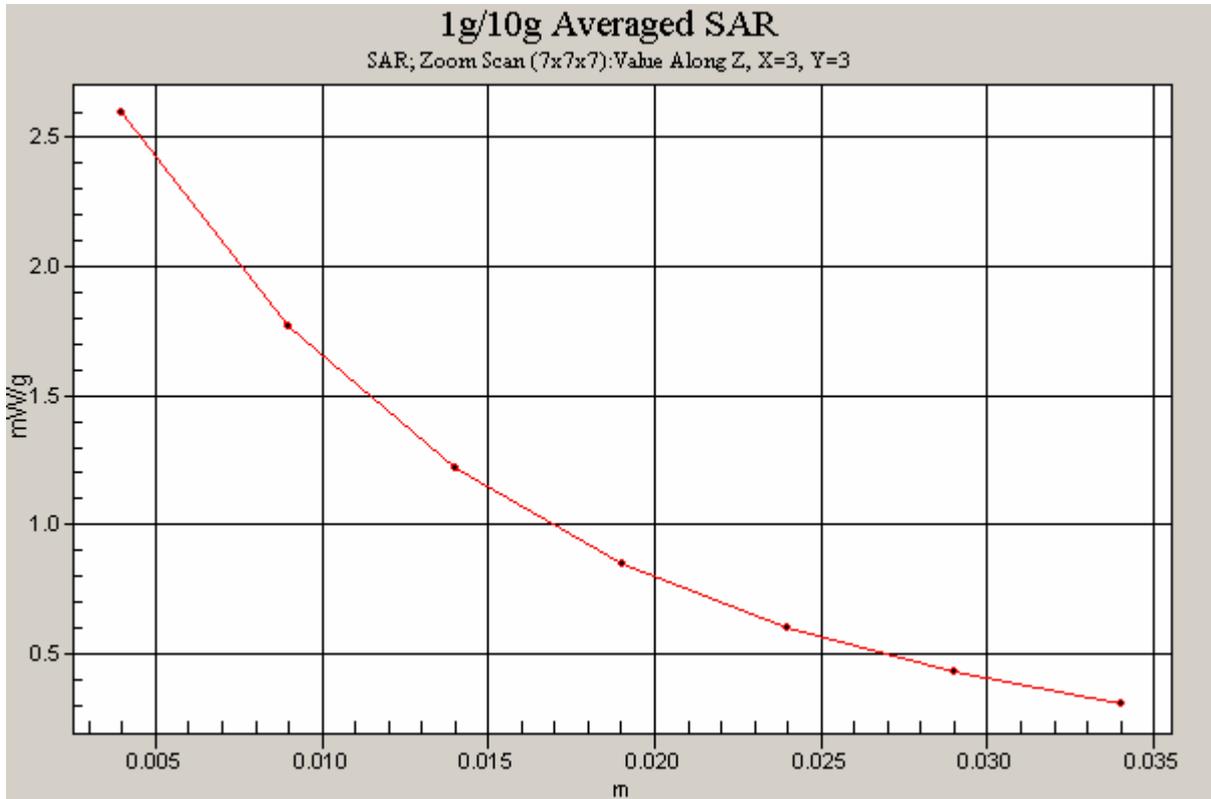
Figure 8 Z-Scan at power reference point (System Check at 835 MHz Dipole)

ANNEX C: Graph Results

CDMA Cellular with IBM T61 Test Position 1 High

Date/Time: 12/1/2009 12:06:19 PM

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

Medium parameters used (interpolated): f = 848.31 MHz; σ = 1 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM1; Type: SAM;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 High/Area Scan (41x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.04 mW/g

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

Reference Value = 20.2 V/m; Power Drift = -0.069 dB

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.902 mW/g; SAR(10 g) = 0.556 mW/g

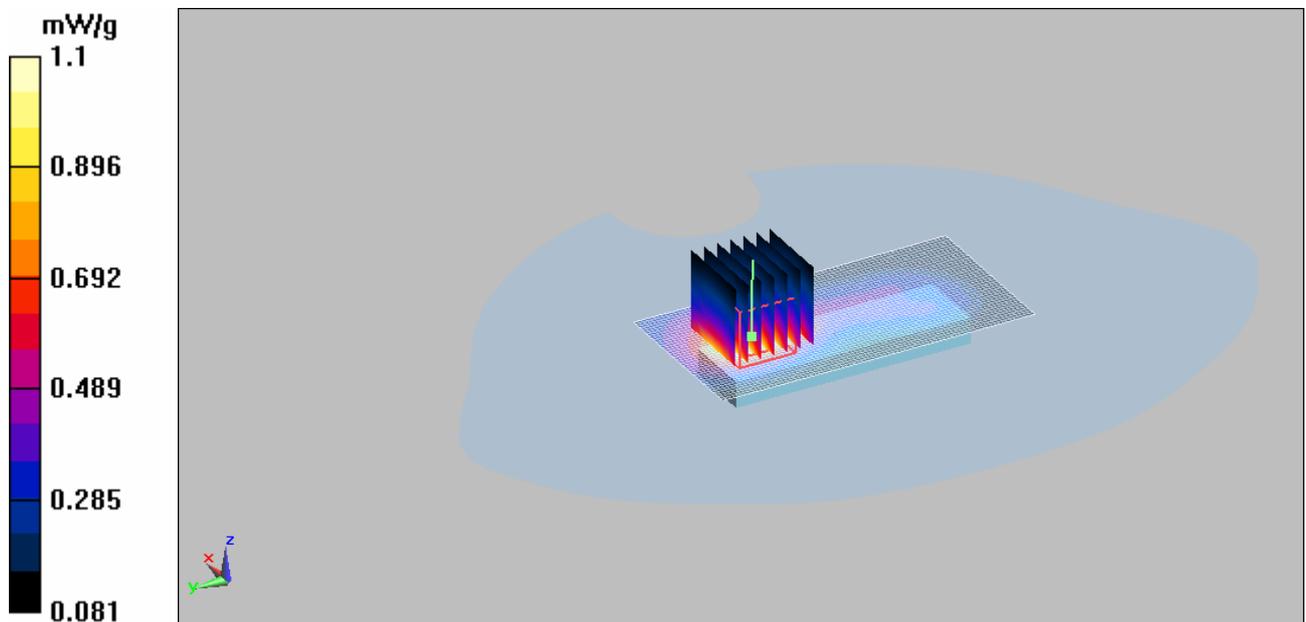Maximum value of SAR (measured) = 0.984 mW/g
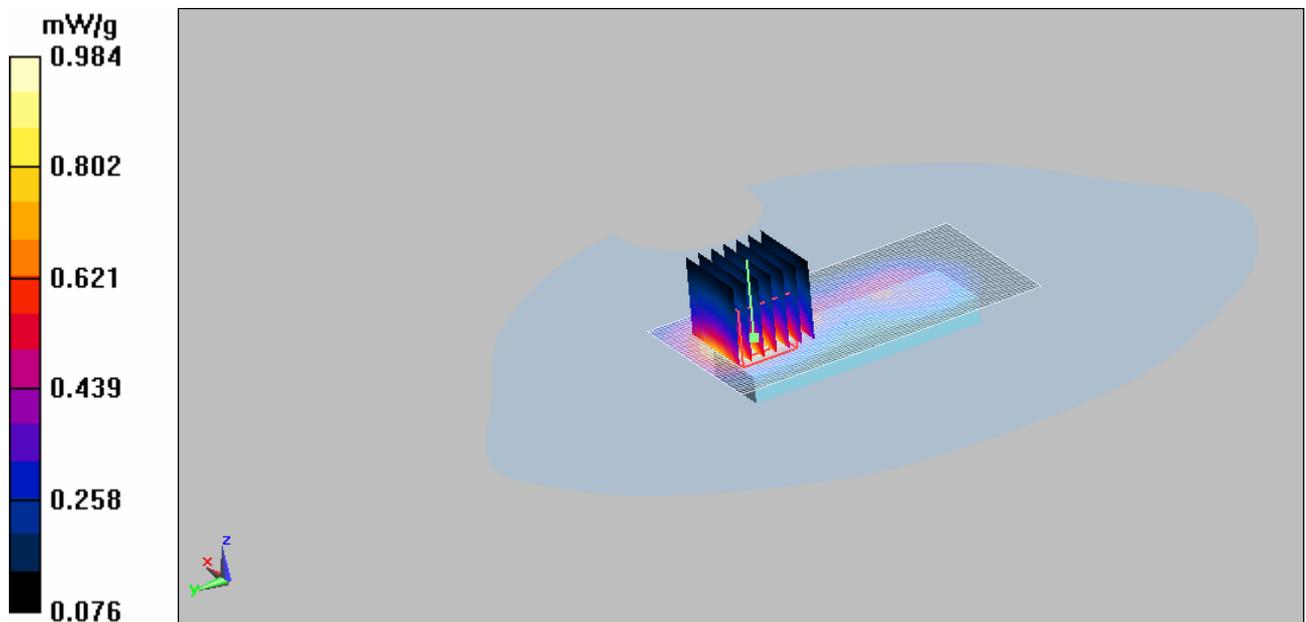
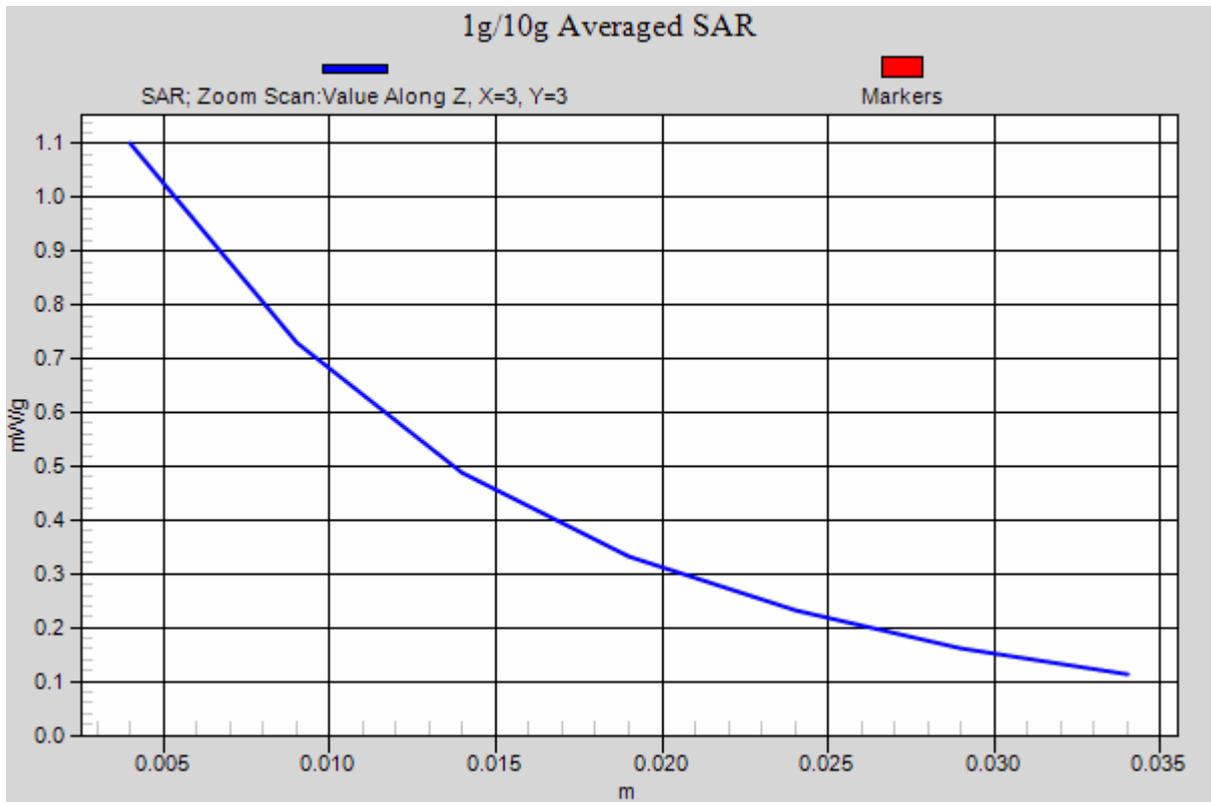**Figure 9 CDMA Cellular with IBM T61 Test Position 1 Channel 777**
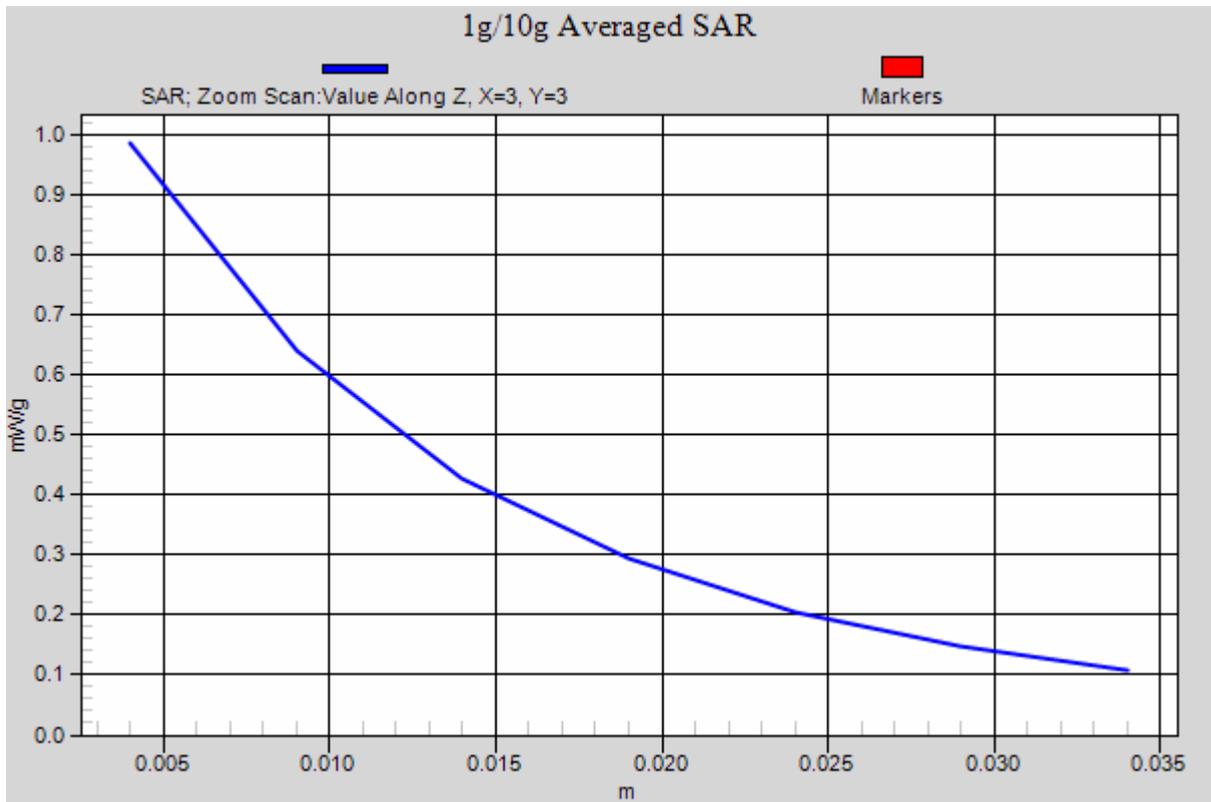
Figure 10 Z-Scan at power reference point (CDMA Cellular with IBM T61 Test Position 1 Channel 777)

CDMA Cellular with IBM T61 Test Position 1 Middle

Date/Time: 12/1/2009 9:28:23 AM

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

Medium parameters used: f = 837 MHz; σ = 0.989 mho/m; $ε_r$ = 53.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM1; Type: SAM;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 Middle/Area Scan (41x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.21 mW/g

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

Reference Value = 23 V/m; Power Drift = -0.036 dB

Peak SAR (extrapolated) = 1.76 W/kg

SAR(1 g) = 1.12 mW/g; SAR(10 g) = 0.684 mW/g

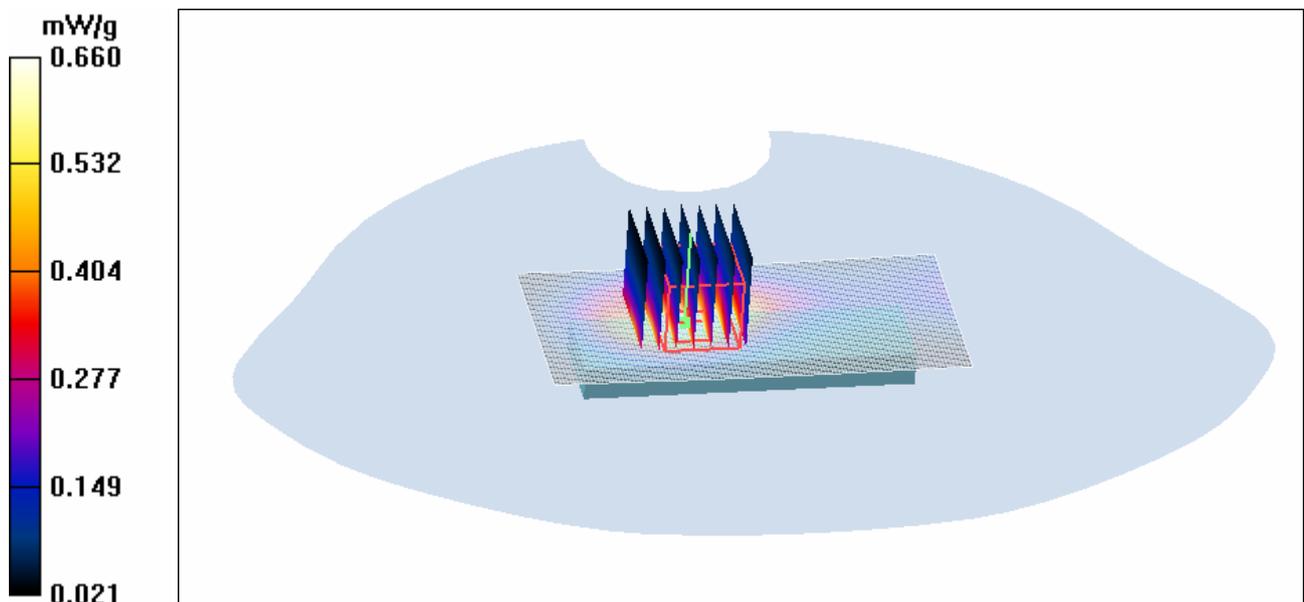Maximum value of SAR (measured) = 1.24 mW/g
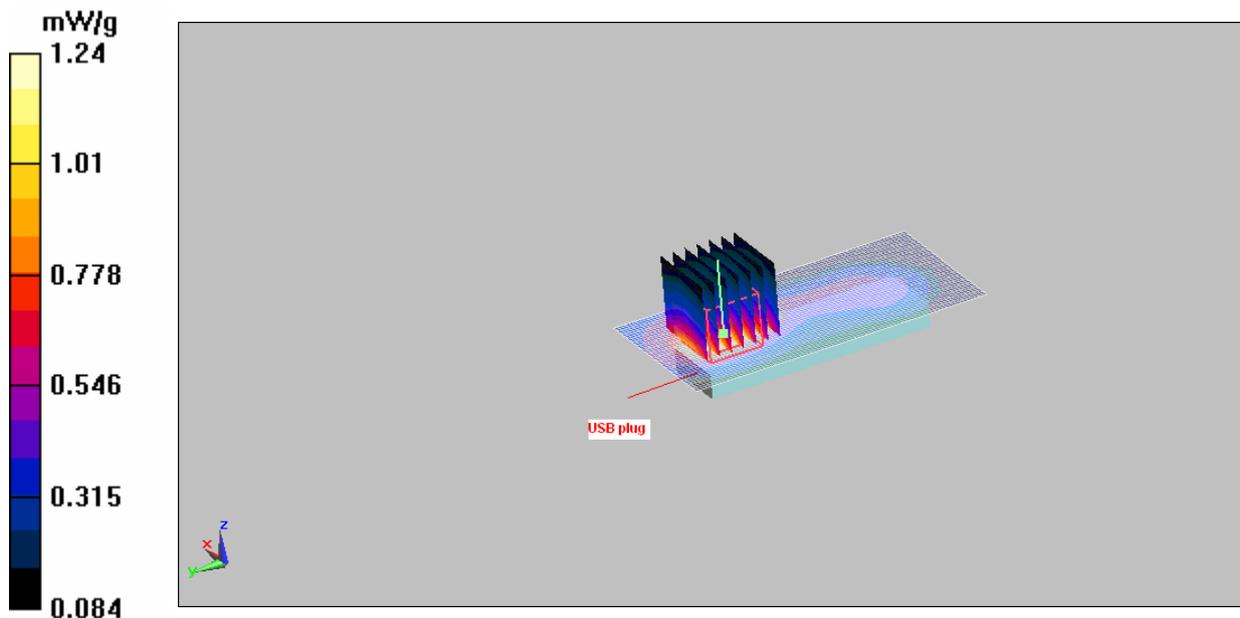
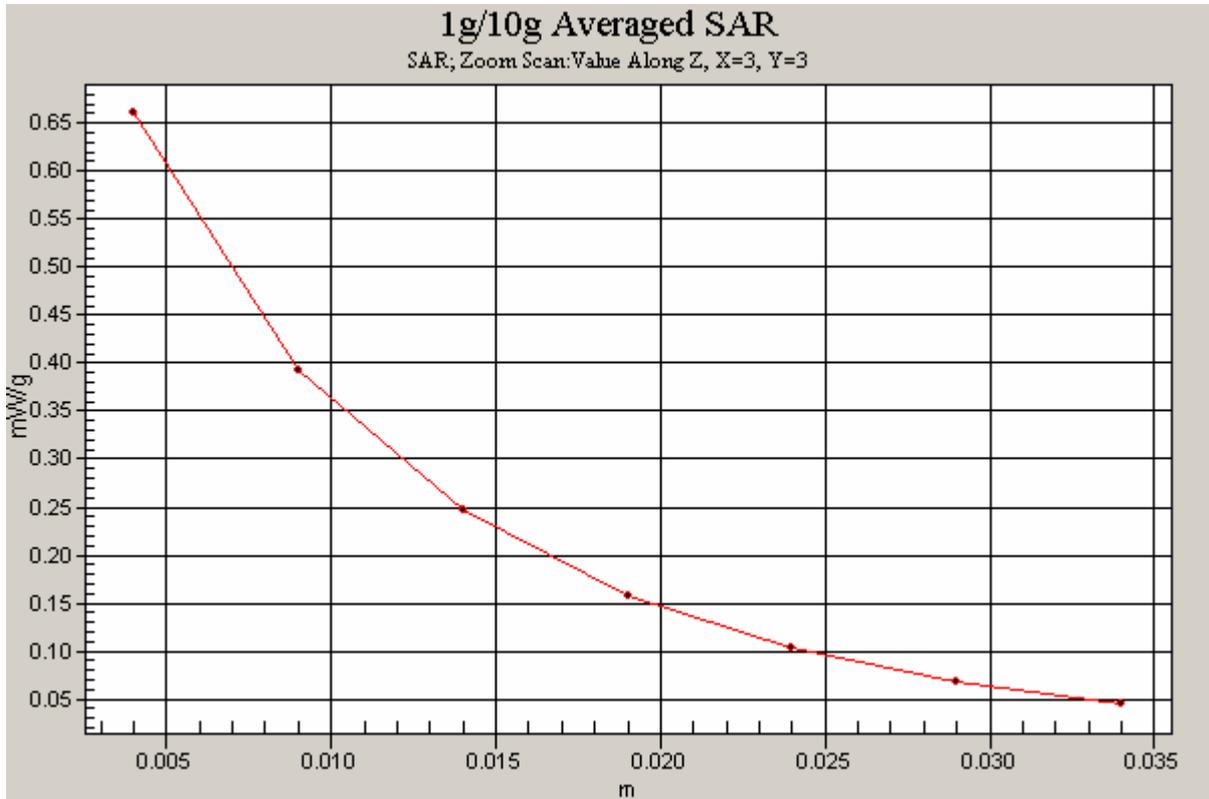**Figure 11 CDMA Cellular with IBM T61 Test Position 1 Channel 384**
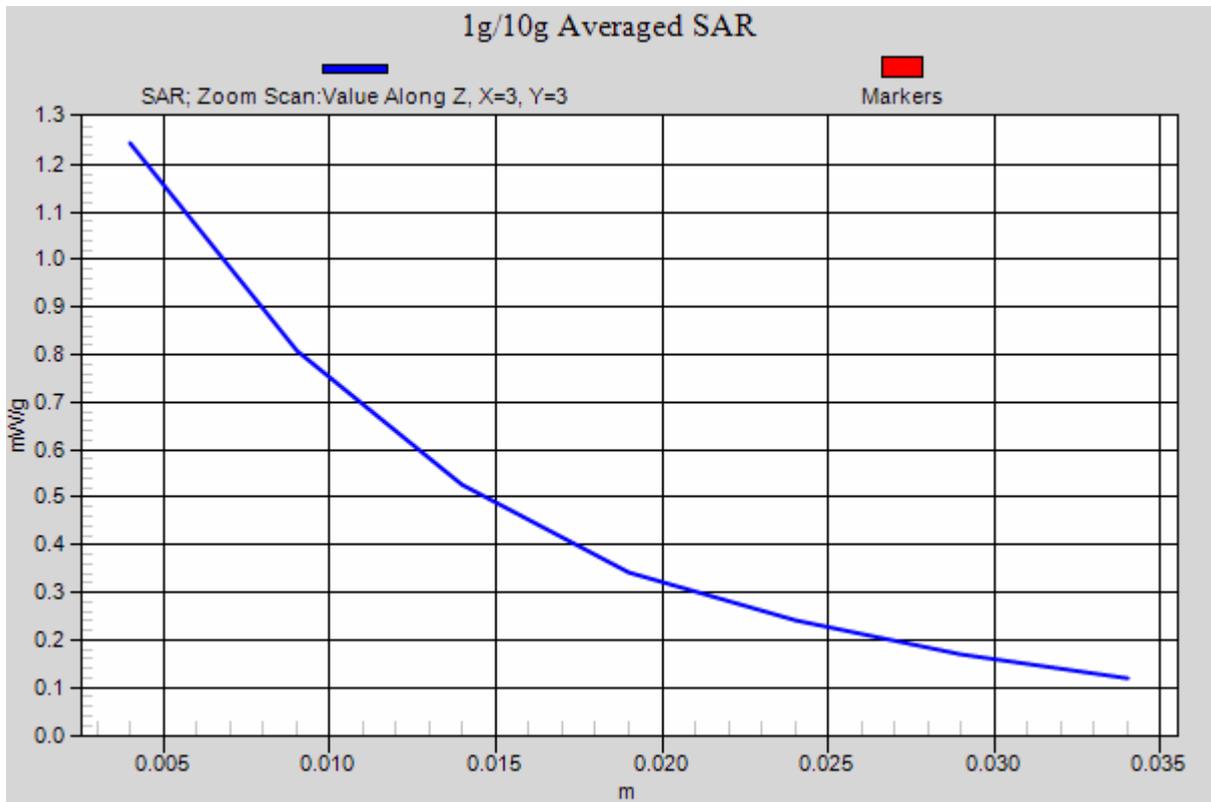
Figure 12 Z-Scan at power reference point (CDMA Cellular with IBM T61 Test Position 1 Channel 384)

CDMA Cellular with IBM T61 Test Position 1 Low

Date/Time: 12/1/2009 10:12:21 AM

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

Medium parameters used: f = 825 MHz; σ = 0.971 mho/m; ε_r = 53.7; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM1; Type: SAM;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 Low/Area Scan (41x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.11 mW/g

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

Reference Value = 22.2 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 1.61 W/kg

SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.633 mW/g

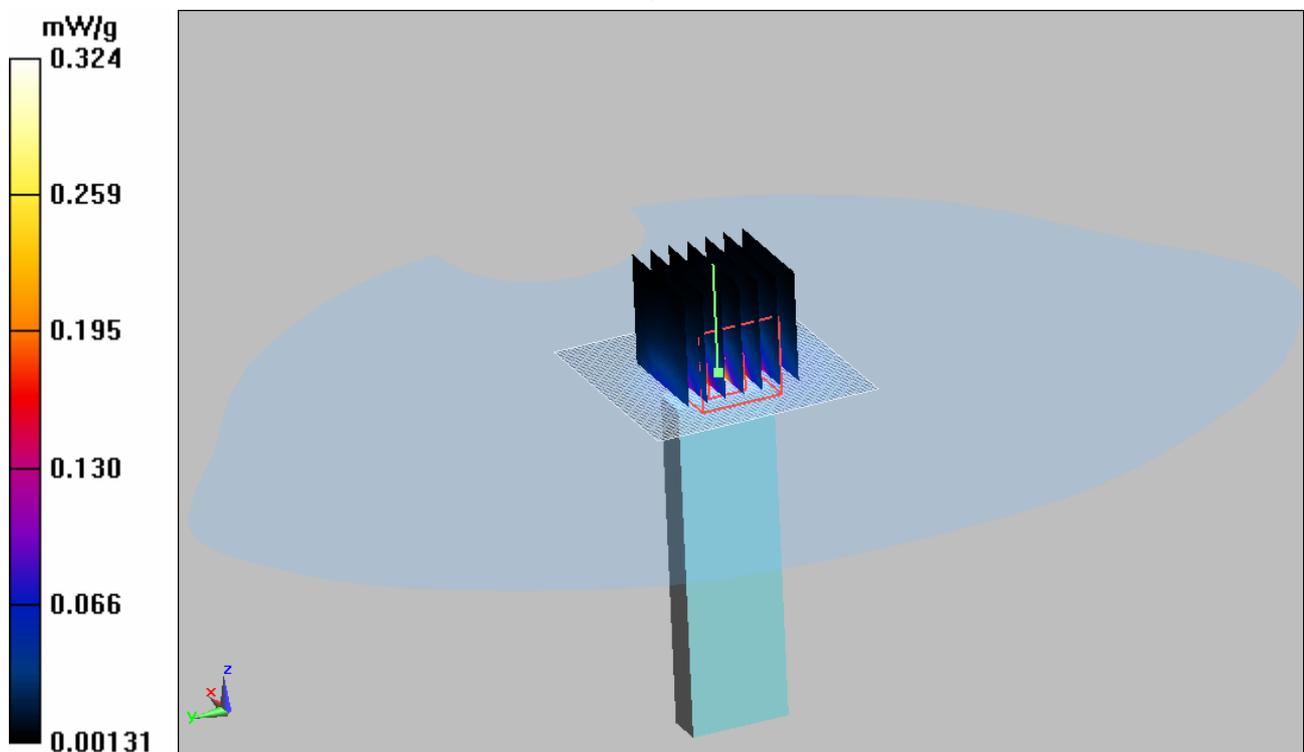Maximum value of SAR (measured) = 1.1 mW/g

Figure 13 CDMA Cellular with IBM T61 Test Position 1 Channel 1013

Figure 14 Z-Scan at power reference point (CDMA Cellular with IBM T61 Test Position 1 Channel 1013)

CDMA Cellular with IBM T61 Test Position 2 Middle

Date/Time: 12/1/2009 5:46:53 PM

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

Medium parameters used: f = 837 MHz; σ = 0.976 mho/m; $ε_r$ = 54.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM1; Type: SAM;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 2 Middle/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.694 mW/g

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

Reference Value = 22.1 V/m; Power Drift = -0.134 dB

Peak SAR (extrapolated) = 1.00 W/kg

SAR(1 g) = 0.597 mW/g; SAR(10 g) = 0.353 mW/g

Maximum value of SAR (measured) = 0.660 mW/g

Figure 15 CDMA Cellular with IBM T61 Test Position 2 Channel 384
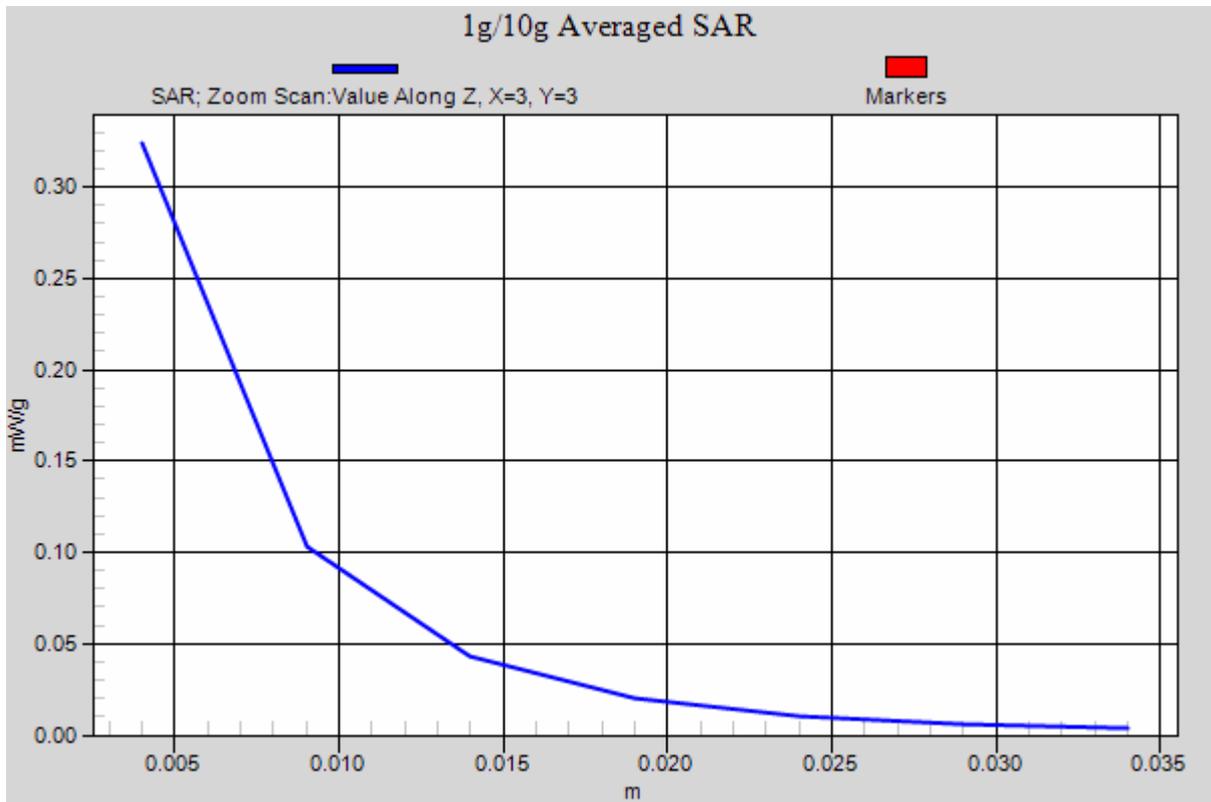
Figure 16 Z-Scan at power reference point (CDMA Cellular with IBM T61 Test Position 2 Channel 384)

CDMA Cellular with IBM T61 Test Position 3 Middle

Date/Time: 12/1/2009 5:07:27 PM

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

Medium parameters used: f = 837 MHz; σ = 0.989 mho/m; ε_r = 53.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM1; Type: SAM;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 3 Middle/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.367 mW/g

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

Reference Value = 20 V/m; Power Drift = -0.100 dB

Peak SAR (extrapolated) = 1.1 W/kg

SAR(1 g) = 0.264 mW/g; SAR(10 g) = 0.085 mW/g

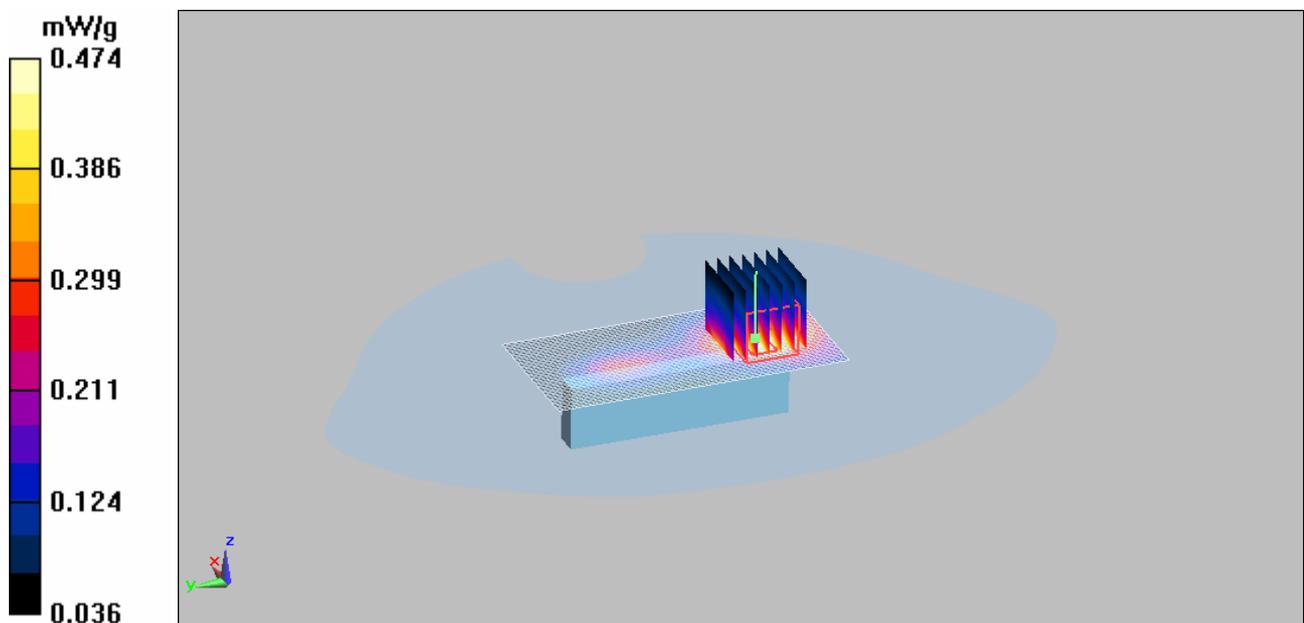Maximum value of SAR (measured) = 0.324 mW/g

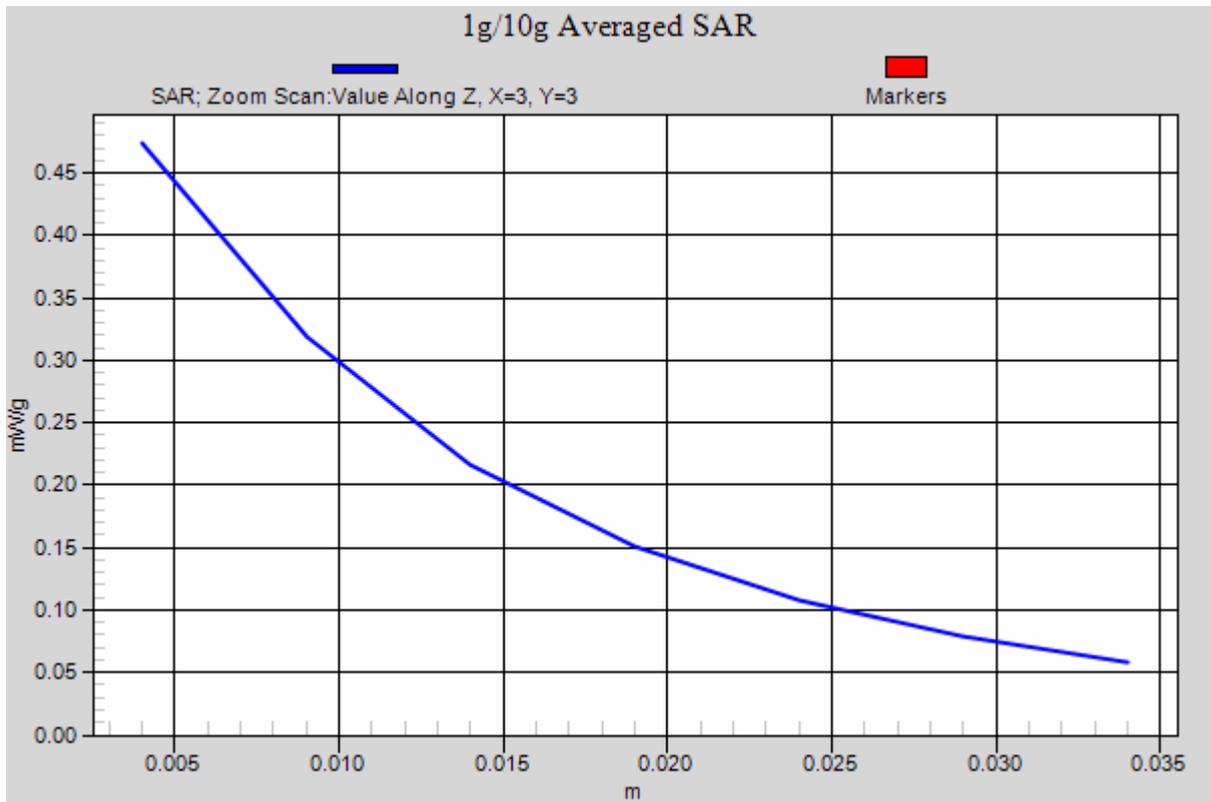**Figure 17 CDMA Cellular with IBM T61 Test Position 3 Channel 384**

Figure 18 Z-Scan at power reference point (CDMA Cellular with IBM T61 Test Position 3 Channel 384)

CDMA Cellular with IBM T61 Test Position 5 Middle

Date/Time: 12/1/2009 4:10:53 PM

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

Medium parameters used: f = 837 MHz; σ = 0.989 mho/m; ε_r = 53.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM1; Type: SAM;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 5 Middle/Area Scan (41x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.515 mW/g

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

Reference Value = 14.3 V/m; Power Drift = -0.096 dB

Peak SAR (extrapolated) = 0.674 W/kg

SAR(1 g) = 0.443 mW/g; SAR(10 g) = 0.284 mW/g
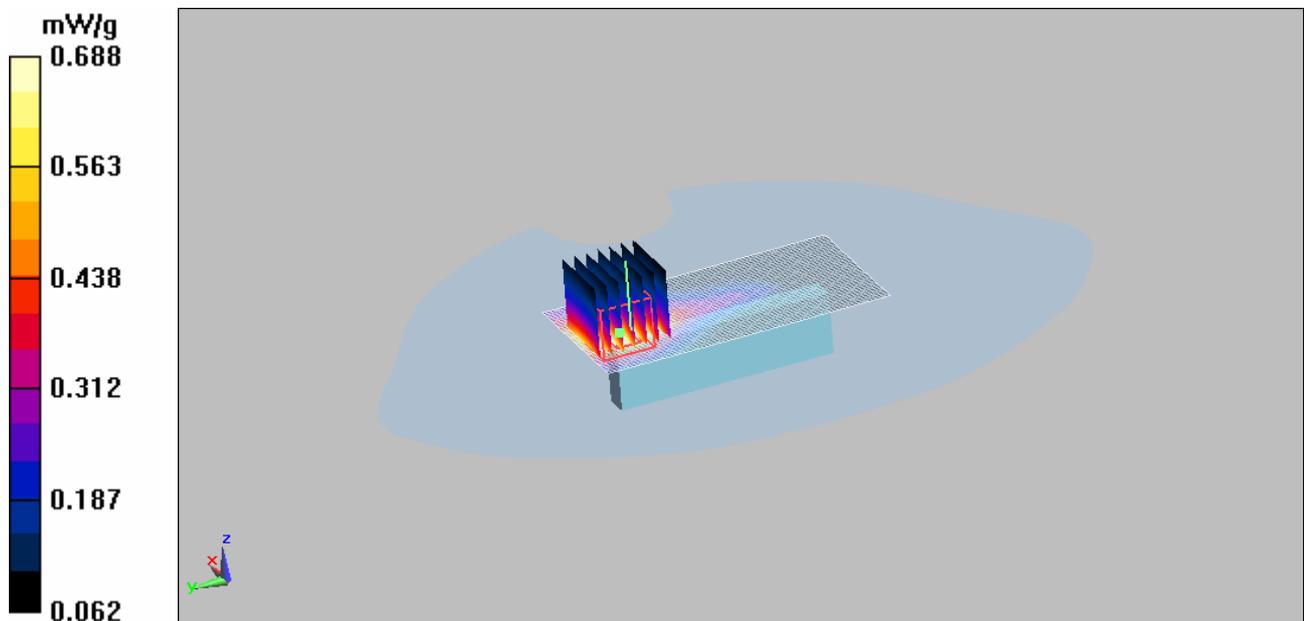
Maximum value of SAR (measured) = 0.474 mW/g

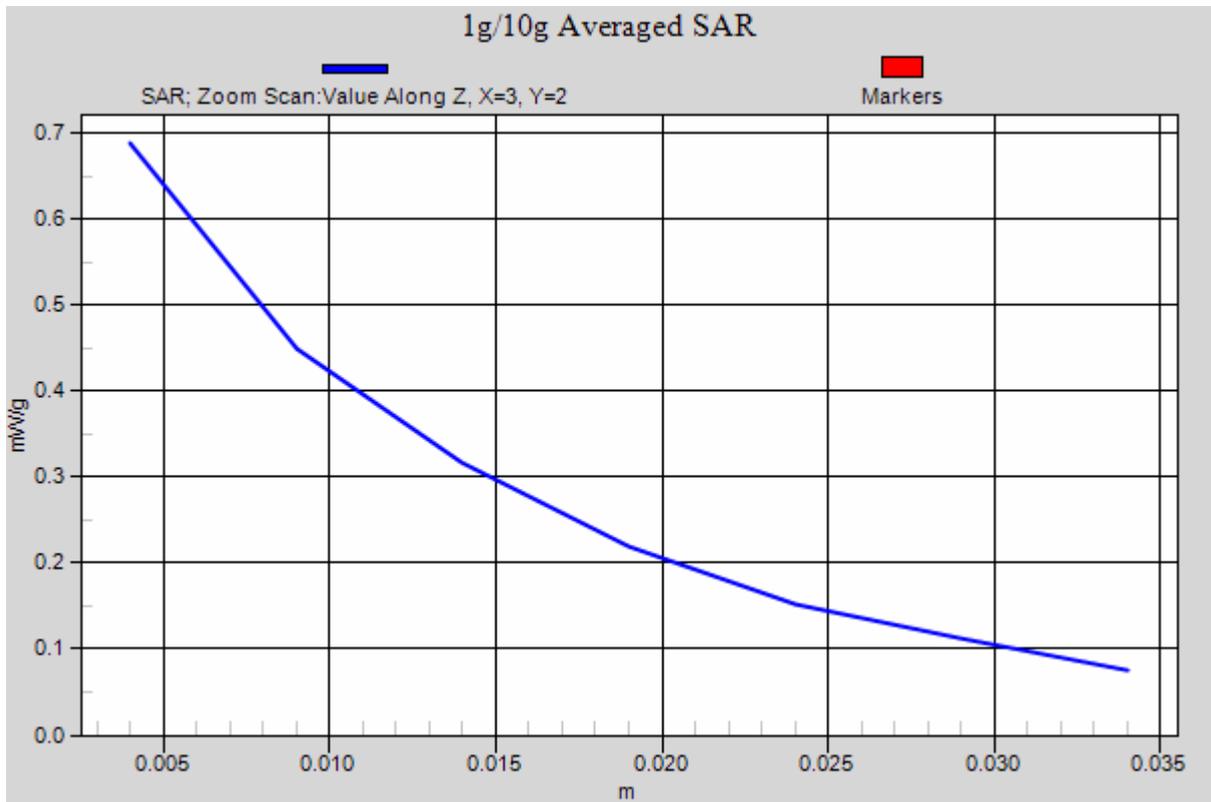**Figure 19 CDMA Cellular with IBM T61 Test Position 5 Channel 384**

Figure 20 Z-Scan at power reference point (CDMA Cellular with IBM T61 Test Position 5 Channel 384)

CDMA Cellular with BenQ Joybook R55V Test Position 4 Middle

Date/Time: 12/1/2009 4:36:36 PM

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

Medium parameters used: f = 837 MHz; σ = 0.989 mho/m; ε_r = 53.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM1; Type: SAM;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 4 Middle/Area Scan (41x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.701 mW/g

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

Reference Value = 17.3 V/m; Power Drift = -0.059 dB

Peak SAR (extrapolated) = 0.993 W/kg

SAR(1 g) = 0.638 mW/g; SAR(10 g) = 0.414 mW/g

Maximum value of SAR (measured) = 0.688 mW/g

Figure 21 CDMA Cellular with BenQ Joybook R55V Test Position 4 Channel 384

Figure 22 Z-Scan at power reference point (CDMA Cellular with BenQ Joybook R55V Test Position 4 Channel 384)

CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 1 High

Date/Time: 12/1/2009 3:48:04 PM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 848.31 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 848.31 MHz; σ = 0.988 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 High/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.09 mW/g

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

Reference Value = 17.9 V/m; Power Drift = -0.075 dB

Peak SAR (extrapolated) = 1.56 W/kg

SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.624 mW/g

Maximum value of SAR (measured) = 1.11 mW/g
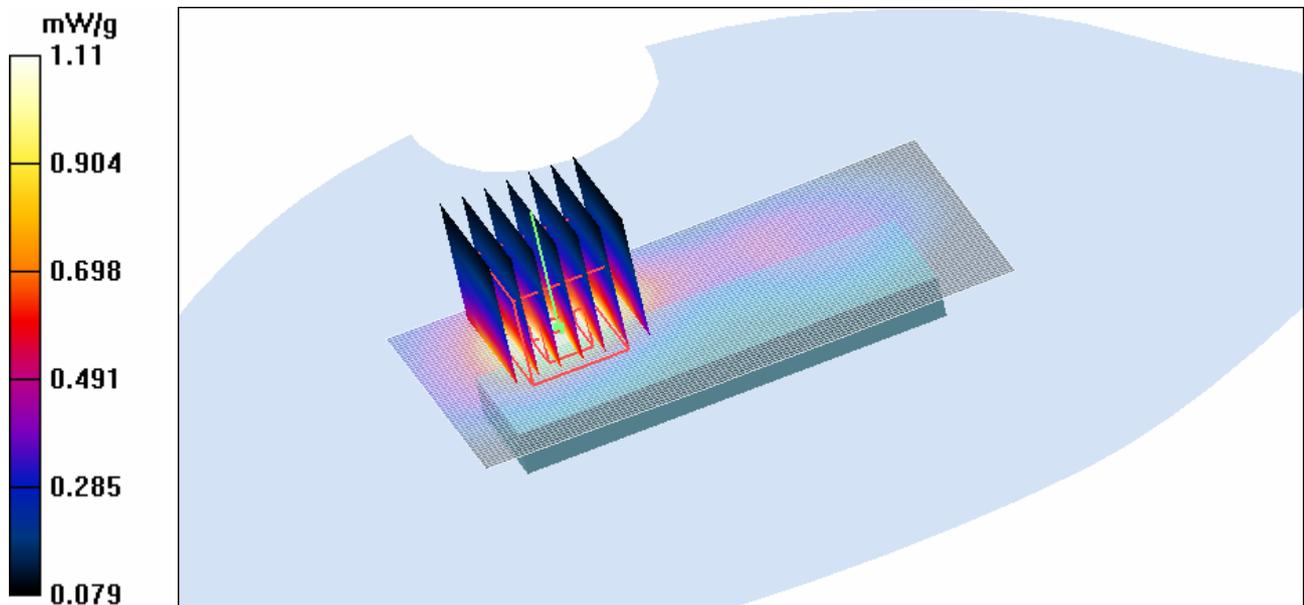
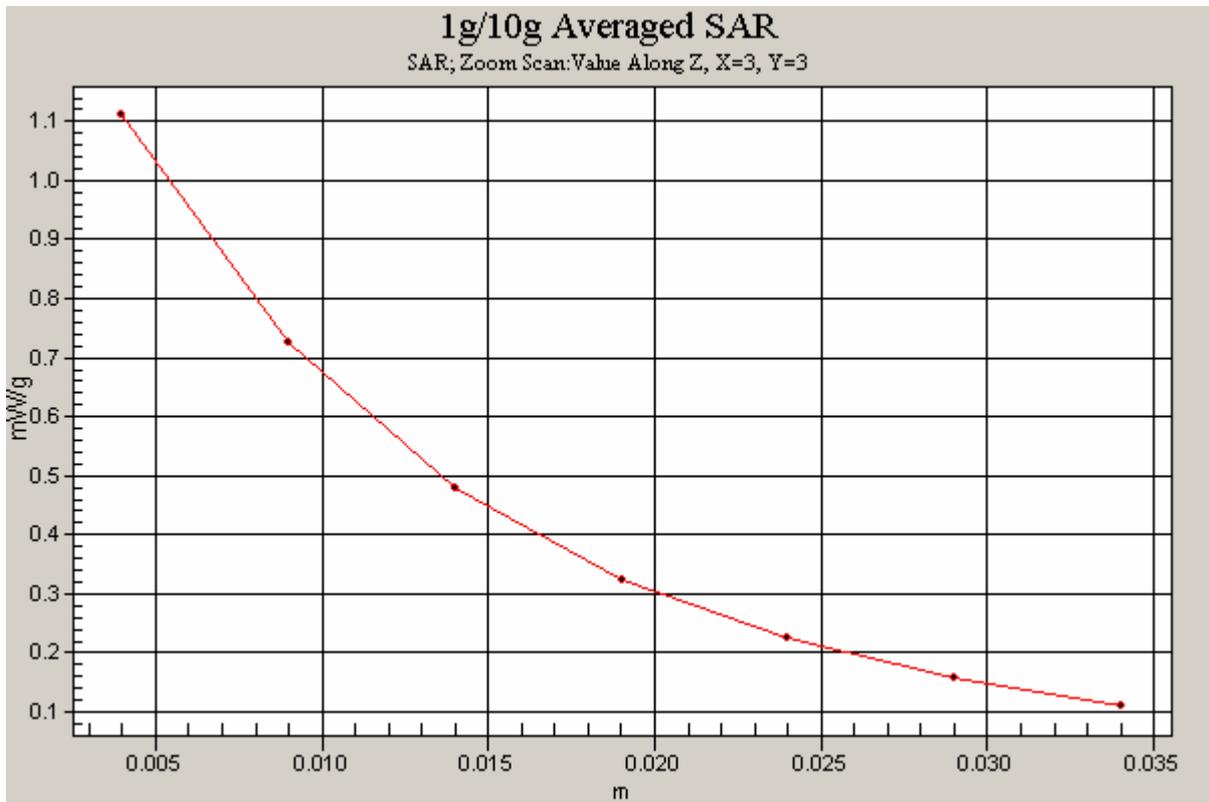**Figure 23 CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 1 Channel 777**

Figure 24 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 1 Channel 777)

CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 1 Middle

Date/Time: 12/1/2009 2:24:35 PM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; σ = 0.976 mho/m; $ε_r$ = 54.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 Middle/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.22 mW/g

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

Reference Value = 19.0 V/m; Power Drift = -0.144 dB

Peak SAR (extrapolated) = 1.70 W/kg

SAR(1 g) = 1.1 mW/g; SAR(10 g) = 0.686 mW/g
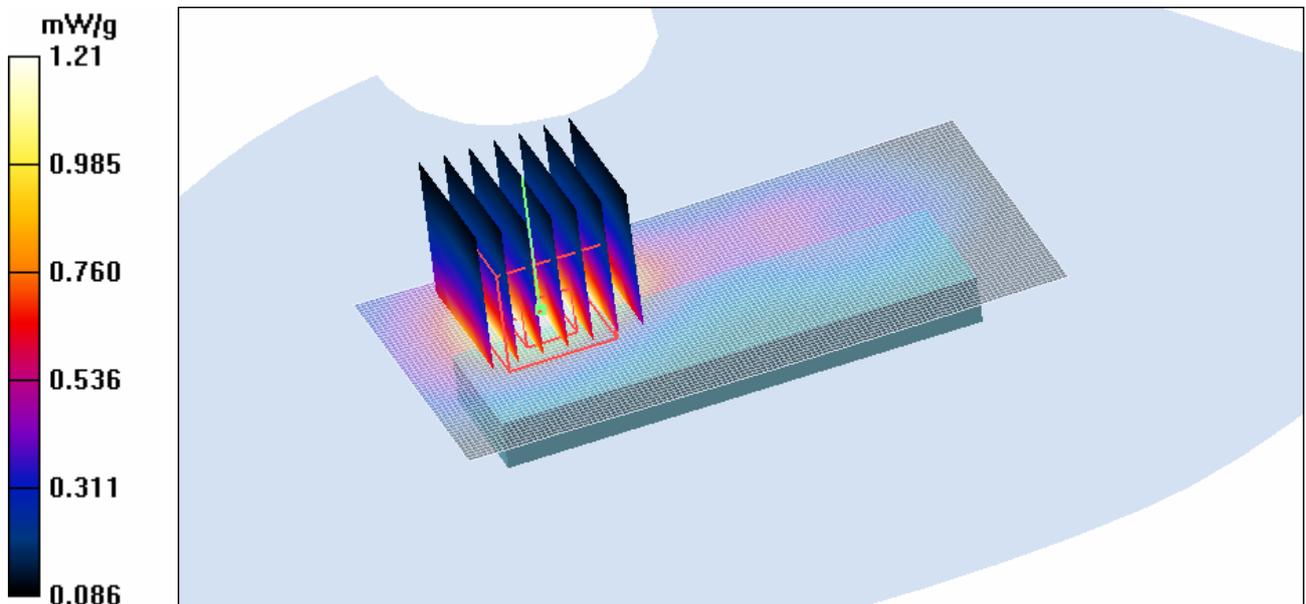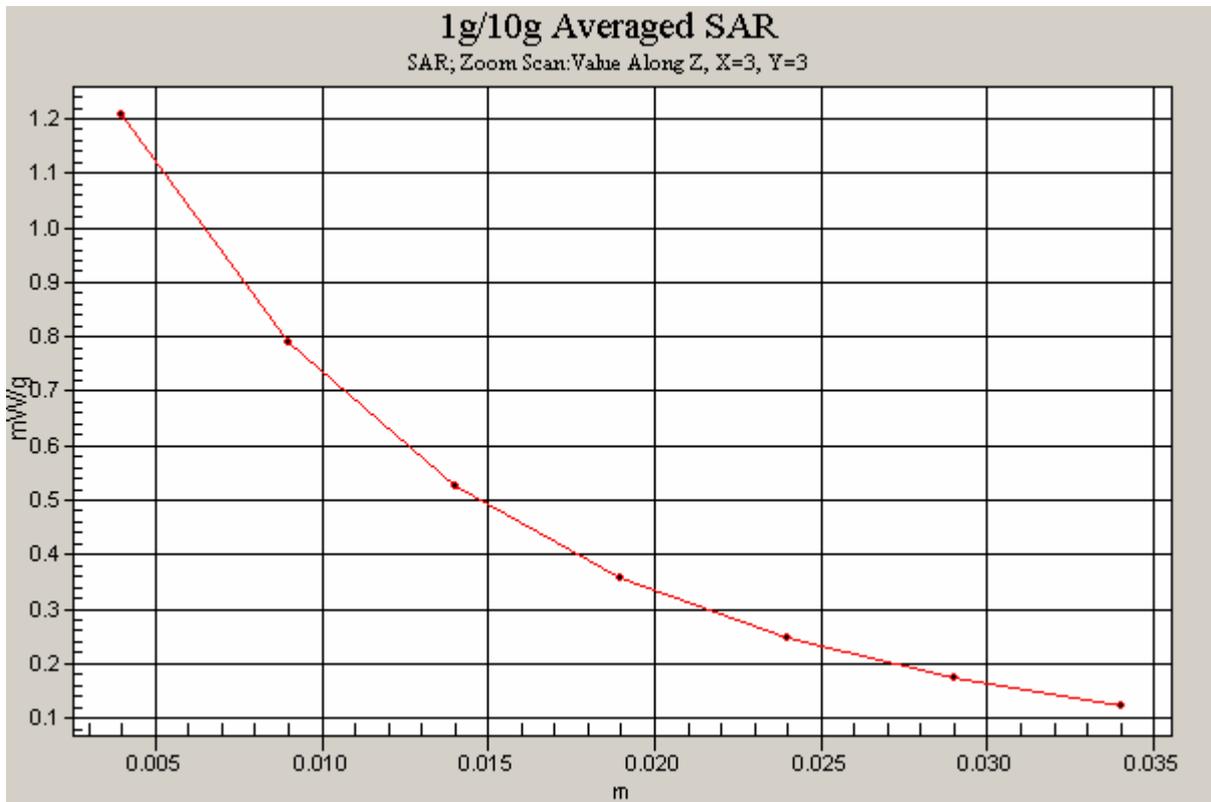
Maximum value of SAR (measured) = 1.21 mW/g

Figure 25 CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 1 Channel 384

Figure 26 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 1 Channel 384)

CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 1 Low

Date/Time: 12/1/2009 3:26:13 PM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 824.7 MHz;Duty Cycle: 1:1

Medium parameters used: f = 825 MHz; σ = 0.961 mho/m; $ε_r$ = 54.3; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 Low/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.19 mW/g

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

Reference Value = 19.7 V/m; Power Drift = 0.036 dB

Peak SAR (extrapolated) = 1.72 W/kg

SAR(1 g) = 1.11 mW/g; SAR(10 g) = 0.694 mW/g
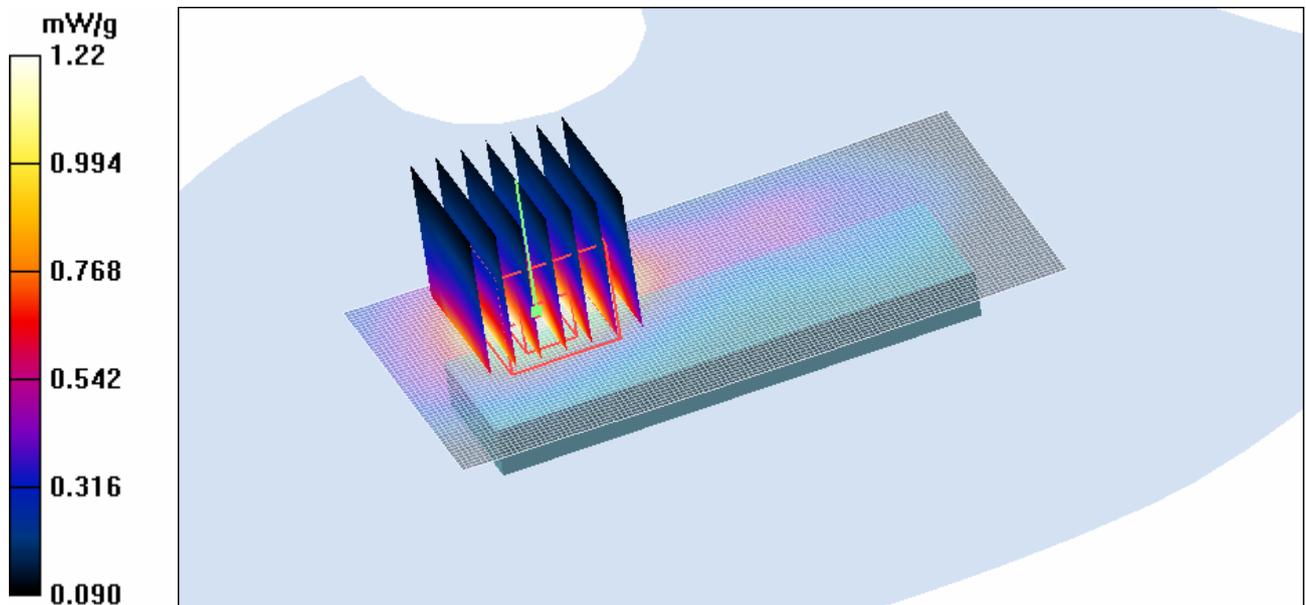
Maximum value of SAR (measured) = 1.22 mW/g

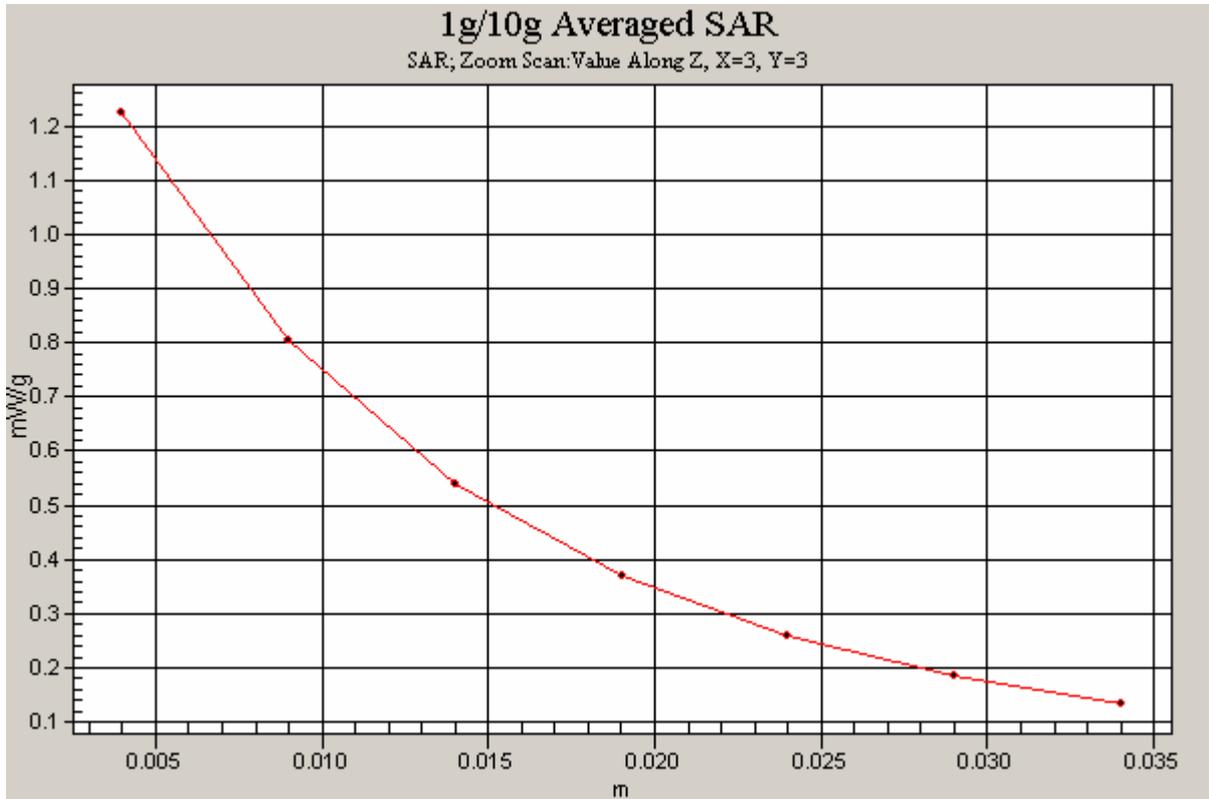**Figure 27 CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 1 Channel 1013**

Figure 28 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 1 Channel 1013)

CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 2 Middle

Date/Time: 12/1/2009 4:50:02 PM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; σ = 0.976 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 2 Middle/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.654 mW/g

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

Reference Value = 20.8 V/m; Power Drift = -0.061 dB

Peak SAR (extrapolated) = 0.998 W/kg

SAR(1 g) = 0.574 mW/g; SAR(10 g) = 0.335 mW/g

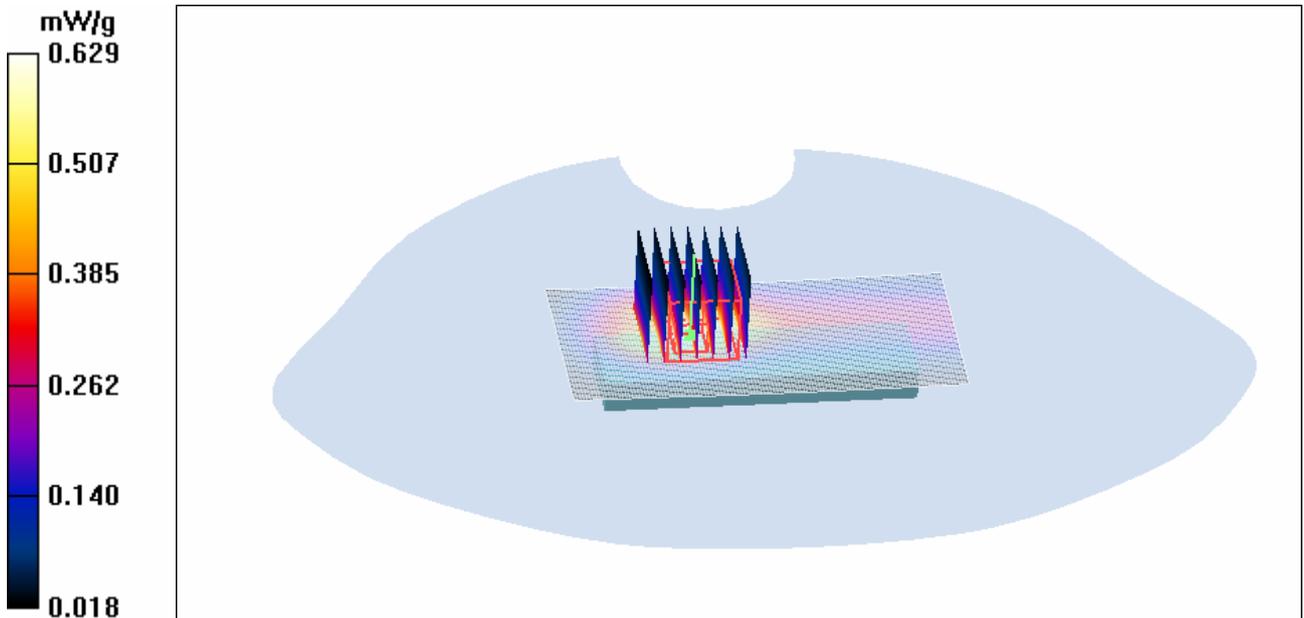Maximum value of SAR (measured) = 0.629 mW/g

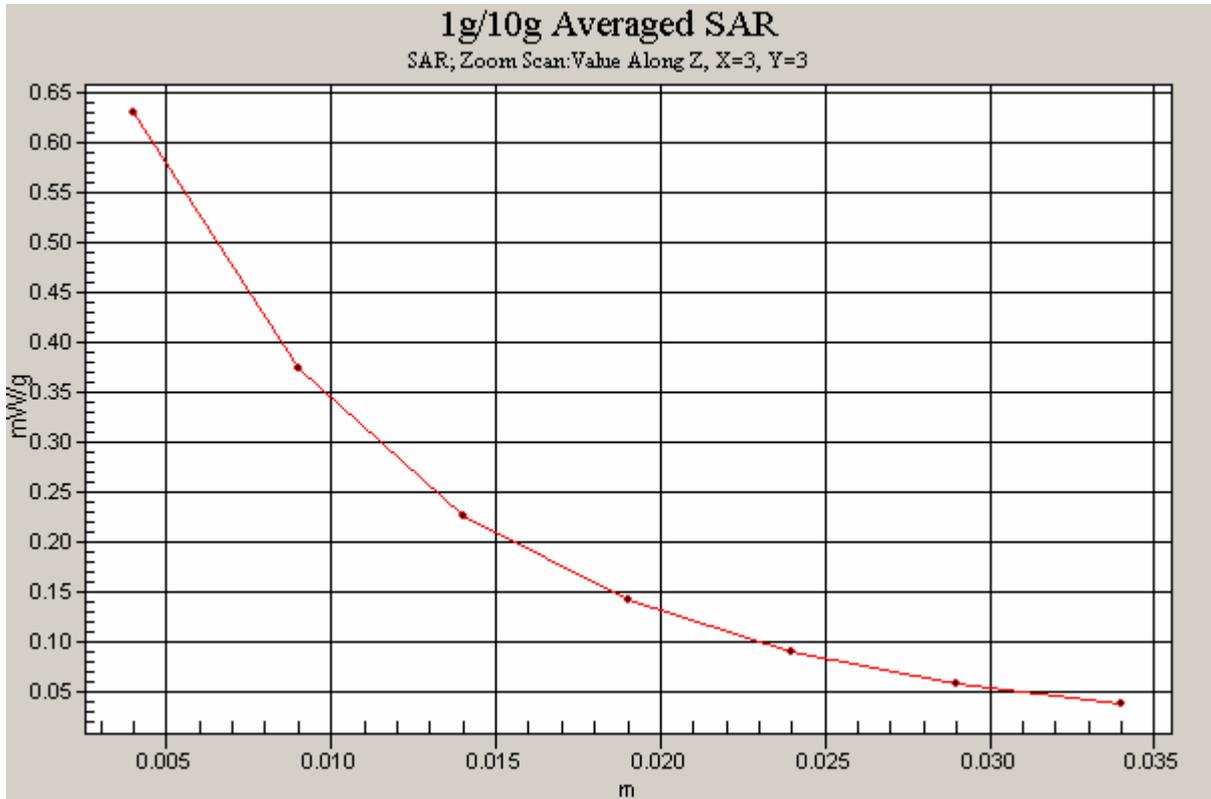**Figure 29 CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 2 Channel 384**

Figure 30 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 2 Channel 384)

CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 3 Middle

Date/Time: 12/1/2009 7:01:00 PM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; σ = 0.976 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 3 Middle/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm

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

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

Reference Value = 9.31 V/m; Power Drift = 0.114 dB

Peak SAR (extrapolated) = 1.65 W/kg

SAR(1 g) = 0.365 mW/g; SAR(10 g) = 0.117 mW/g

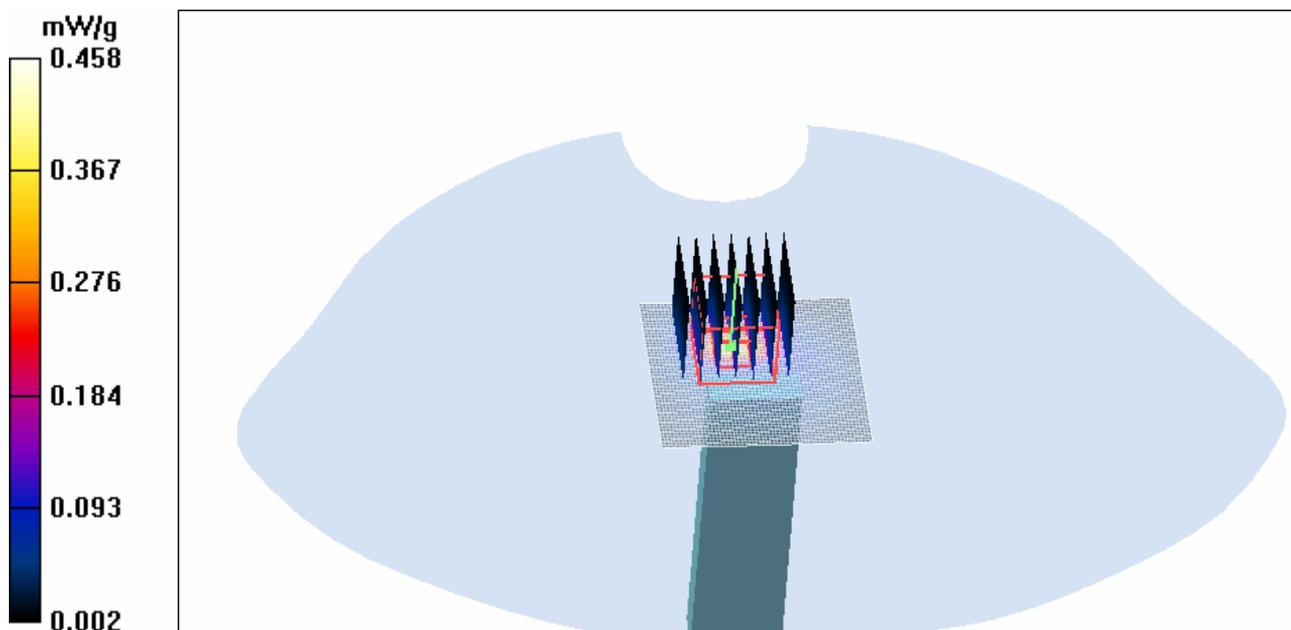Maximum value of SAR (measured) = 0.458 mW/g

Figure 31 CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 3 Channel 384
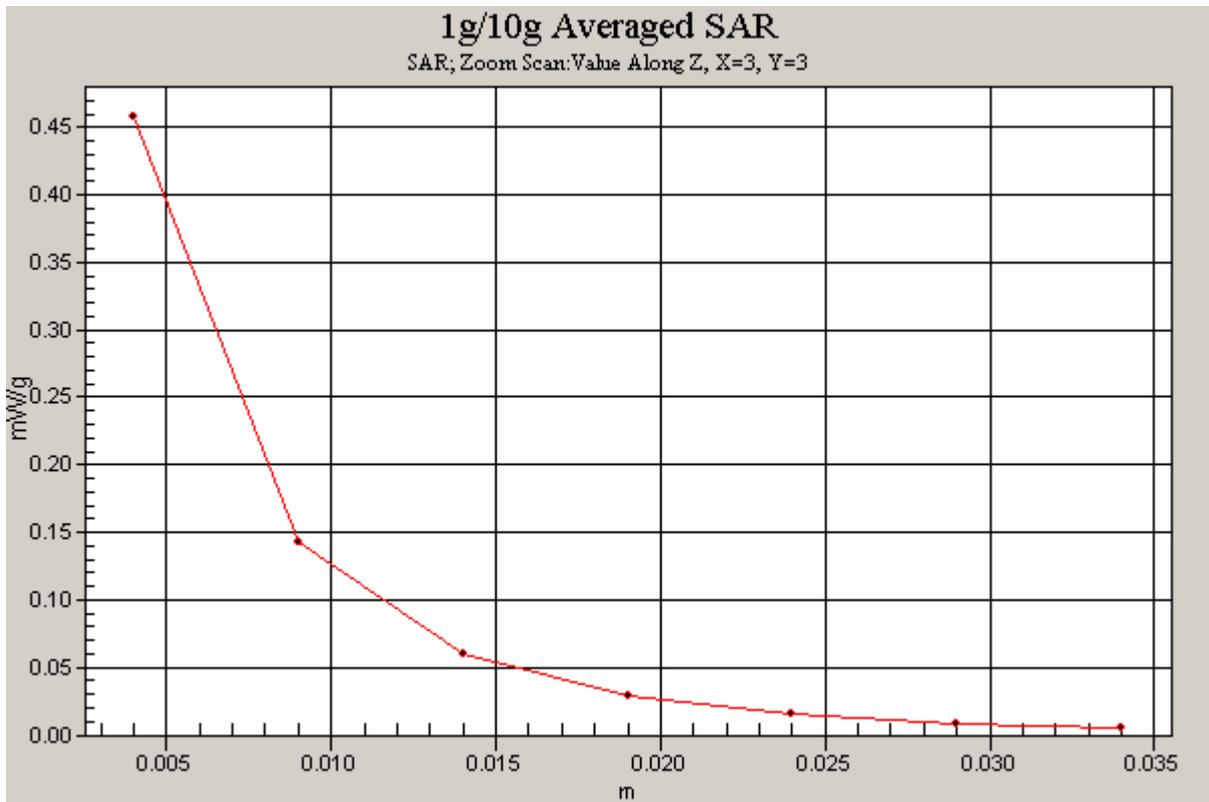
Figure 32 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 3 Channel 384)

CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 5 Middle

Date/Time: 12/1/2009 6:16:07 PM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; σ = 0.976 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 5 Middle/Area Scan (41x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.488 mW/g

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

Reference Value = 14.6 V/m; Power Drift = -0.041 dB

Peak SAR (extrapolated) = 0.665 W/kg

SAR(1 g) = 0.438 mW/g; SAR(10 g) = 0.283 mW/g

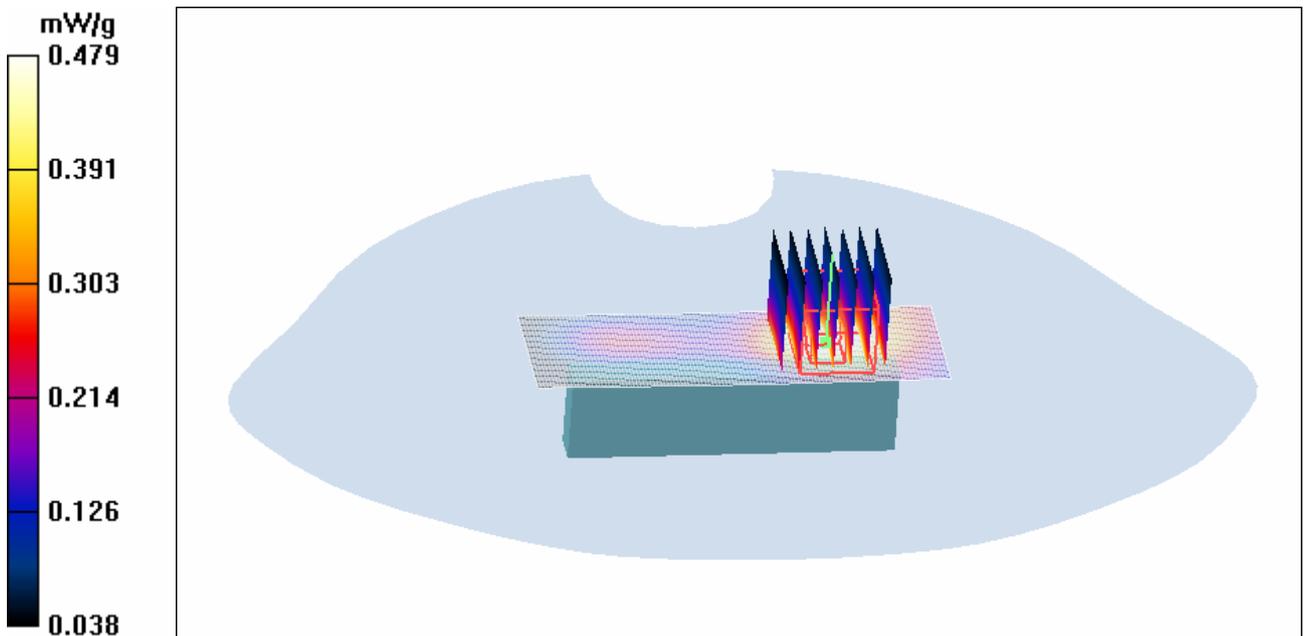Maximum value of SAR (measured) = 0.479 mW/g

Figure 33 CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 5 Channel 384
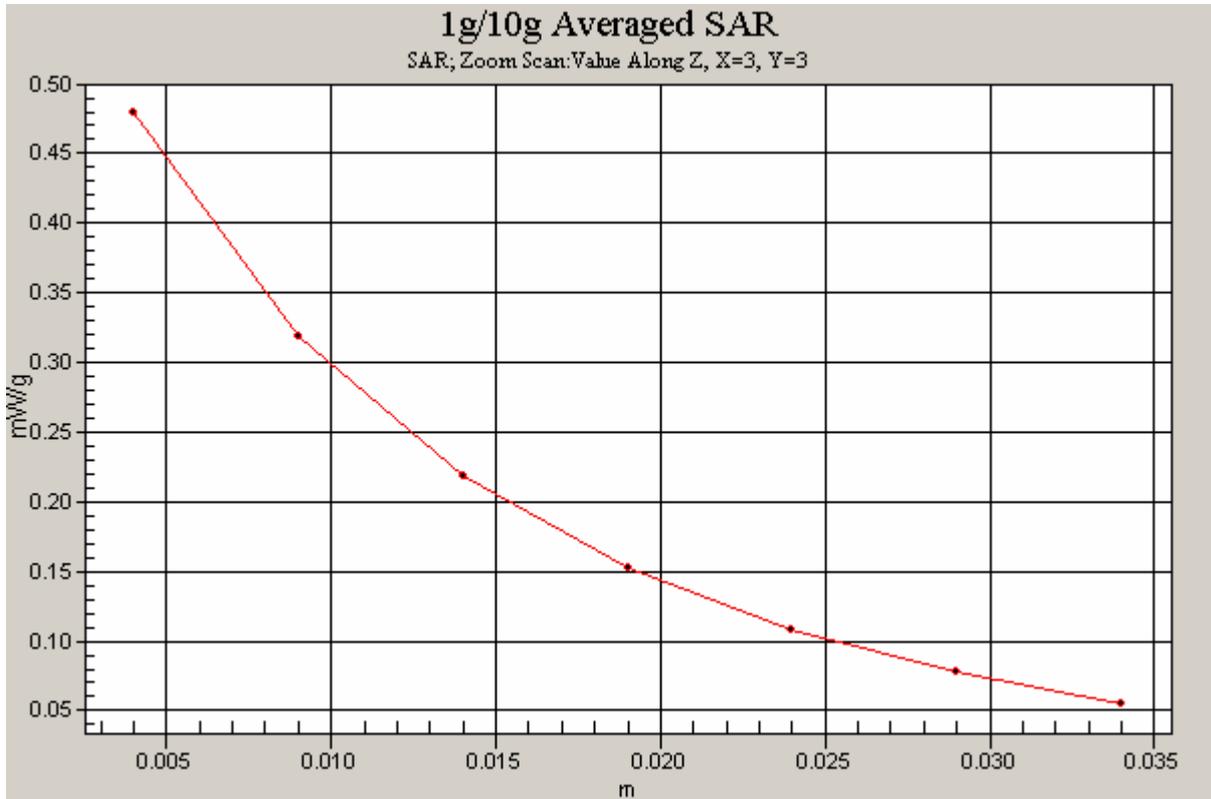
Figure 34 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 with IBM T61 Test Position 5 Channel 384)

CDMA Cellular EV-DO REV.0 with BenQ Joybook R55V Test Position 4 Middle

Date/Time: 12/1/2009 6:40:31 PM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 836.52 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; σ = 0.976 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 4 Middle/Area Scan (41x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.687 mW/g

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

Reference Value = 16.8 V/m; Power Drift = -0.089 dB

Peak SAR (extrapolated) = 0.957 W/kg

SAR(1 g) = 0.634 mW/g; SAR(10 g) = 0.409 mW/g

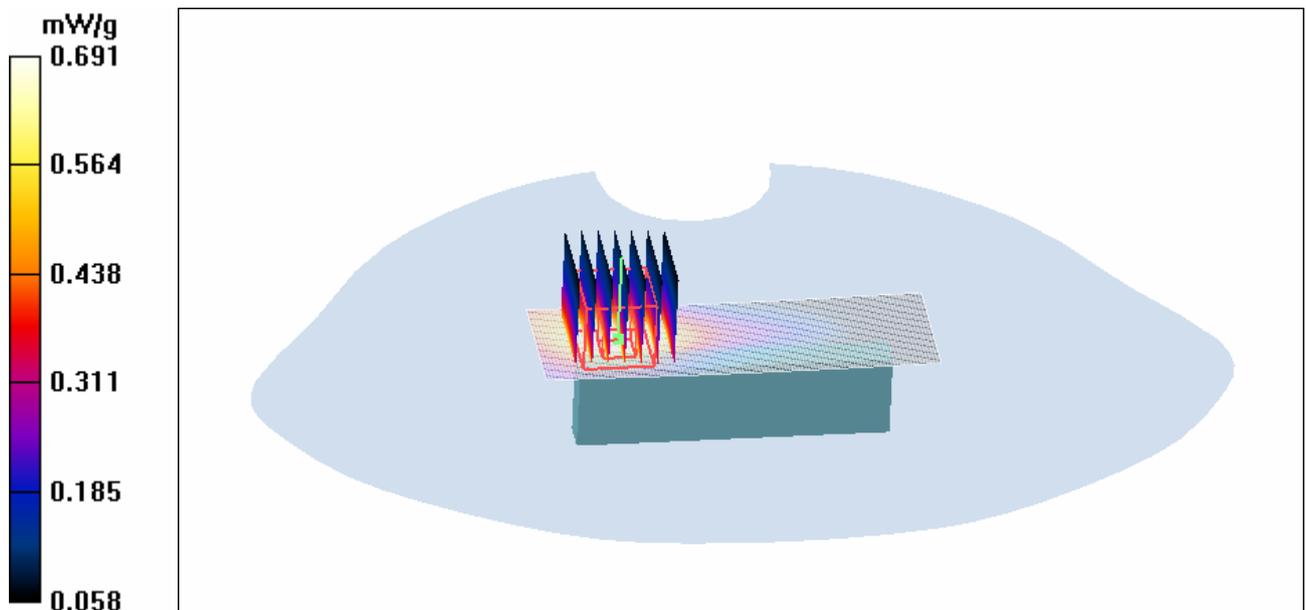Maximum value of SAR (measured) = 0.691 mW/g

Figure 35 CDMA Cellular EV-DO REV.0 with BenQ Joybook R55V Test Position 4 Channel 384
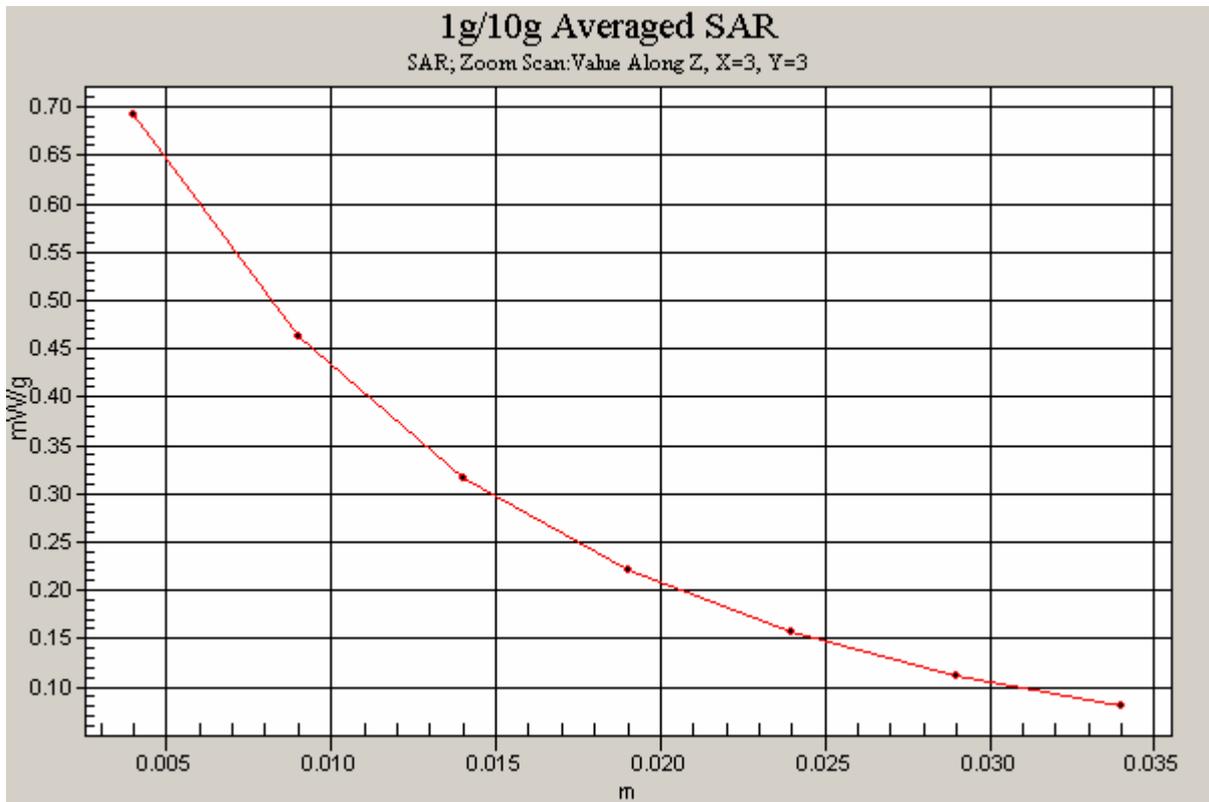
Figure 36 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 with BenQ Joybook R55V Test Position 4 Channel 384)

CDMA Cellular EV-DO REV.A with IBM T61 Test Position 1 Low

Date/Time: 12/1/2009 4:11:36 PM

Communication System: CDMA Cellular EVDO Re.A; Frequency: 824.7 MHz;Duty Cycle: 1:1

Medium parameters used: f = 825 MHz; σ = 0.961 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn905; Calibrated: 6/24/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 Low/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.16 mW/g

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

Reference Value = 19.5 V/m; Power Drift = 0.008 dB

Peak SAR (extrapolated) = 1.67 W/kg

SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.668 mW/g
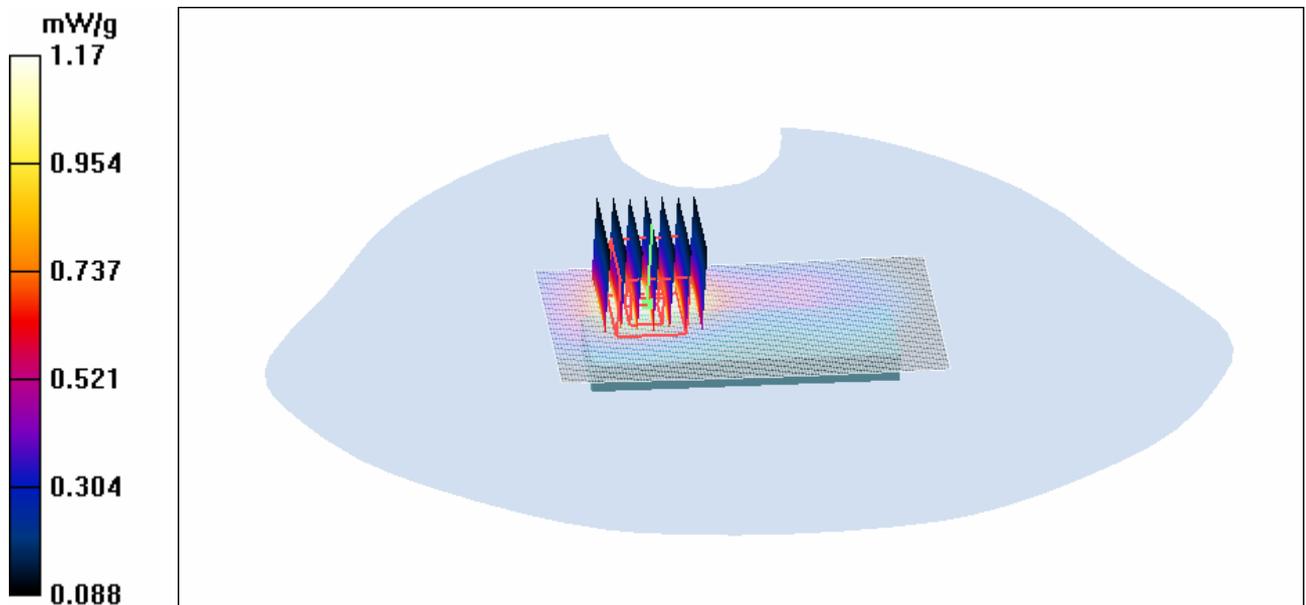
Maximum value of SAR (measured) = 1.17 mW/g

Figure 37 CDMA Cellular EV-DO REV.A with IBM T61 Test Position 1 Channel 1013
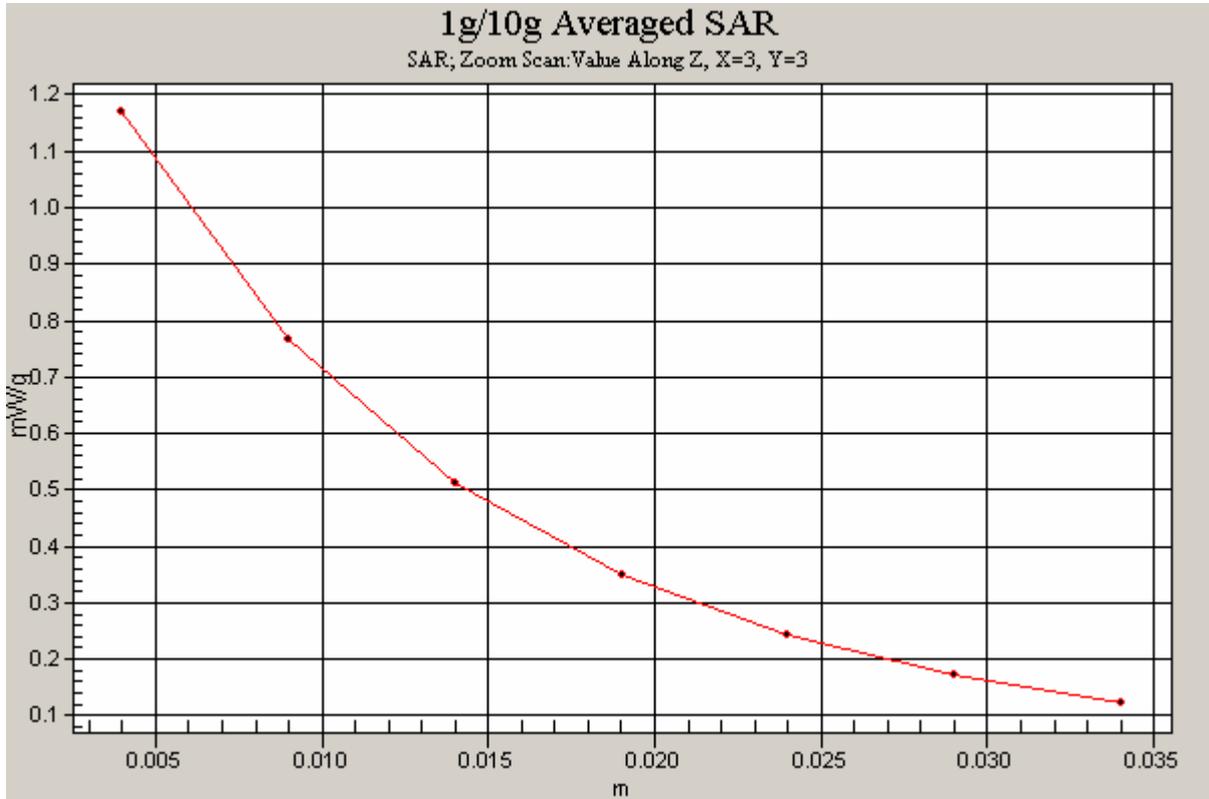
Figure 38 Z-Scan at power reference point (CDMA Cellular EV-DO REV.A with IBM T61 Test Position 1 Channel 1013)

ANNEX D: 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
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 (Auden)**   Certificate No: **EX3-3677_Sep09**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3677
Calibration procedure(s)	QA CAL-01.v6, QA CAL-12.v5, QA CAL-23.v3 and QA CAL-25.v2 - Calibration procedure for dosimetric E-field probes
Calibration date:	September 23, 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)°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-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
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:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 23, 2009

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

Certificate No: EX3-3677_Sep09   Page 1 of 9

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

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

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

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., $\vartheta = 0$ 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 $\vartheta = 0$ ($f \le 900$ 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 $f \le 800$ 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.