



NO.: RZA2008-1054FCC



# OET 65

# TEST REPORT

<b>Test name</b>	Electromagnetic Field (Specific Absorption Rate)
<b>Product</b>	EV-DO Rev.A Rotatable USB Stick
<b>Model</b>	EC168C
<b>FCC ID</b>	QISEC168C
<b>Client</b>	HUAWEI Technologies Co., Ltd.

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



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**GENERAL SUMMARY**

<b>Product</b>	EV-DO Rev.A Rotatable USB Stick	<b>Model</b>	EC168C
<b>Client</b>	HUAWEI Technologies Co., Ltd.	<b>Type of test</b>	Entrusted
<b>Manufacturer</b>	HUAWEI Technologies Co., Ltd.	<b>Arrival Date of sample</b>	August 7 <sup>th</sup> , 2007
<b>Place of sampling</b>	(Blank)	<b>Carrier of the samples</b>	Ting Zhang
<b>Quantity of the samples</b>	One	<b>Date of product</b>	(Blank)
<b>Base of the samples</b>	(Blank)	<b>Items of test</b>	SAR
<b>S/N</b>	KW2AC10871400212		
<b>Standard(s)</b>	<p><b>EN 50360-2001:</b> Product standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.</p> <p><b>BS EN 62209-1:2006:</b> Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)</p> <p><b>ANSI C95.1-2005:</b> IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.</p> <p><b>IEEE 1528-2003:</b> Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Experimental Techniques.</p> <p><b>OET Bulletin 65 supplement C, published June 2001 including DA 02-1438, published June 2002:</b> 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.</p> <p><b>IEC 62209-2 :</b> Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 2: Procedure to determine the Specific Absorption Rate (SAR)in the head and body for 30MHz to 6GHz Handheld and Body-Mounted Devices used in close proximity to the body.</p>		
<b>Conclusion</b>	<p>Localized Specific Absorption Rate (SAR) of this portable wireless equipment has been measured in all cases requested by the relevant standards cited in Clause 7.2 of this test report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 7.1 of this test report.</p> <p>General Judgment: <b>Pass</b></p> <p style="text-align: right;">(Stamp) Date of issue: August 22<sup>th</sup>, 2008</p>		
<b>Comment</b>	The test result only responds to the measured sample.		

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## **1. COMPETENCE AND WARRANTIES**

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

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

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### 3. DESCRIPTION OF EUT

#### 3.1. Addressing Information Related to EUT

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

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

**Table 2: Manufacturer**

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

### 3.2. Constituents of EUT

**Table 3: Constituents of Samples**

Description	Model	Serial Number	Manufacturer
EV-DO Rev.A Rotatable USB Stick	EC168C	KW2AC10871400212	Huawei Technologies Co.,Ltd.

Note:

The EUT appearances see ANNEX H.

### 3.3. General Description

Equipment Under Test (EUT) is a EV-DO Rev.A Rotatable USB Stick. SAR is tested for the EUT CDMA Cellular .

Since the EUT only has the data transfer function, but does not have the speech transfer function, the tests in the band of CDMA Cellular are only performed in the mode of data transfer function.

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

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

### 3.4. Test item

**Table 4: Test item of EUT**

Device type :	portable device	
Exposure category:	uncontrolled environment / general population	
Device operating configurations :		
Operating mode(s):	CDMA Cellular ( tested )	
Standard output power	(24dBm,0.25 W) CDMA Cellular (tested);	
Operating frequency range(s)	transmitter frequency range	receiver frequency range
CDMA Cellular:	824.7 MHz ~ 848.31 MHz	869.7 MHz ~ 893.31MHz
Power class	CDMA Cellular:, tested with maximum output power	
Test channel (Low –Middle –High)	1013 -384 – 777 (CDMA Cellular) (tested)	
Antenna type:	integrated antenna	

## **4. OPERATIONAL CONDITIONS DURING TEST**

### **4.1. General description of test procedures**

The DUT is tested using a E5515C communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power. Test positions as described in ANNEX H are in accordance with the specified test standard. Conducted output power was measured using an integrated RF connector and attached RF cable.

The measurements were performed in combination with three host products (BENQ Joy book S72, BENQ Joy book R55V ,IBM T61). BenQ Joy book S72 and BenQ Joy book R55V laptop have horizontal USB slots, BenQ Joy book R55V and IBM T61 laptop have vertical USB slot .The used notebooks offered the following distances between DUT and SAM phantom when positioned indirect contact to the flat part of the phantom:

1st Laptop –BenQ Joy book R55V: 5 mm

2nd Laptop –IBM T61: 5mm

If a wireless link is used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the handset by at least 30 dB.

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

## 4.2. Information for the measurement of CDMA 1xRTT devices

### 4.2.1. Output Power Verification for 1xRTT

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.

Under the loop back mode between mobile station and E5515C, the transmitter continuously emits with maximum power more strong than voice mode, so the SAR test was done with loop back mode. To make the mobile emits maximum power; the output power of E5515C would be adjusted to minimum power with the sensitivity of the mobile station to build steady connection with mobile station. The power level control parameter “all up” and it means that requires mobile station to emit with maximum power.

### 4.2.2. 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.

### **4.3. Information for the measurement of CDMA 1x EV-DO devices**

#### **4.3.1. 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. The equivalent test configurations should be established under FTM when air link and/or call processing is not supported by the communication test set. For Rev. A, maximum output power for both Subtype 0/1 and Subtype 2 Physical Layer configurations should be measured.

#### **4.3.2. 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.

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 than 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<sup>14</sup>.

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.

#### **4.4. Position of module in Portable devices**

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

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

Test Position 1: The EUT is connected to the portable computer with horizontal USB slot. The back side of the EUT towards the bottom of the flat phantom. (ANNEX H Picture 5-a )

Test Position 2: 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 H Picture 5-b )

Test Position 3: The EUT is connected to the portable computer with vertical USB slot. The front side of the EUT towards the bottom of the flat phantom. (ANNEX H Picture 5-c )

Test Position 4: 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 H Picture 5-d )

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

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

#### 4.5. Picture of host product

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



Picture 1-a: BenQ Joybook S72 Close



Picture 1-b: BenQ Joybook S72 Open



Picture 1-c: IBM T61 Close



Picture 1-d: IBM T61 Open



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



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



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



Picture 1-h: IBM T61 with horizontal USB slot



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



Picture 1-j: BenQ Joybook R55V(118) with horizontal USB slot

Picture 1: Computer as a test assistant

## 5. SAR MEASUREMENTS SYSTEM CONFIGURATION

### 5.1. SAR Measurement Set-up

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than  $\pm 0.02\text{mm}$ . Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length =300mm) to the data acquisition unit.

A cell controller system contains the power supply, robot controller, teaches pendant (Joystick) and remote control, is used to drive the robot motors. The PC consists of the Micron Pentium III 800 MHz computer with Windows 2003 system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

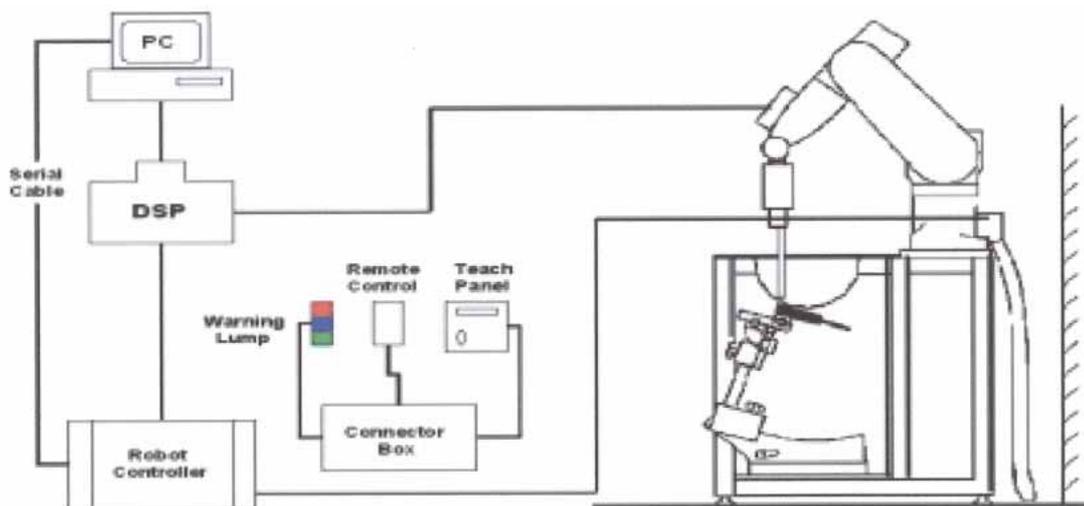


Figure 1 SAR Lab Test Measurement Set-up

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

## 5.2. Dasy4 E-field Probe System

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

### 5.2.1. ET3DV6 Probe Specification

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System (ET3DV6 only) Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.q., glycol)
Calibration	In air from 10 MHz to 3 GHz In brain and muscle simulating tissue at frequencies of 900MHz, 1750 MHz, 1950MHz and 2450 MHz. (accuracy $\pm 8\%$ ) Calibration for other liquids and frequencies upon request
Frequency	10 MHz to 2.5 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 2.5 GHz)
Directivity	$\pm 0.2$ dB in brain tissue (rotation around probe axis) $\pm 0.4$ dB in brain tissue (rotation around probe axis)
Dynamic Range	5u W/g to > 100mW/g; Linearity: $\pm 0.2\text{dB}$
Surface Detection	$\pm 0.2$ mm repeatability in air and clear liquids over diffuse reflecting surface (ET3DV6 only)
Dimensions	Overall length: 330mm Tip length: 16mm Body diameter: 12mm Tip diameter: 6.8mm Distance from probe tip to dipole centers: 2.7mm
Application	General dosimetry up to 2.5GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

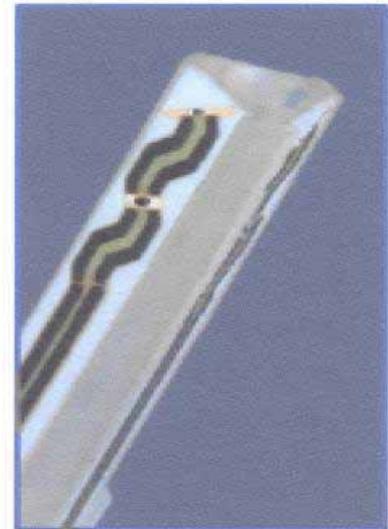


Figure 2 ET3DV6 E-field Probe

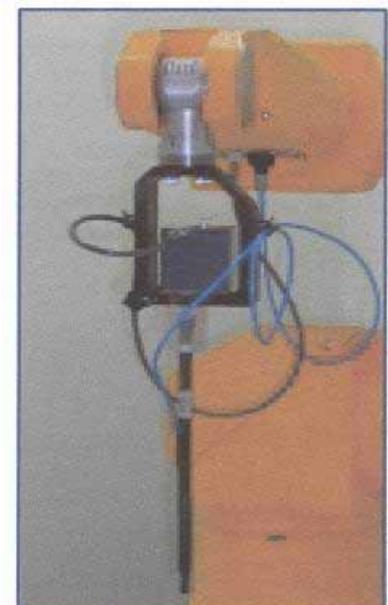


Figure 3 ET3DV6 E-field probe

### 5.2.2. E-field Probe Calibration

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

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

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

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

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

Or

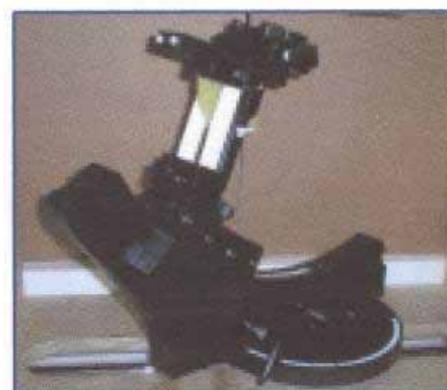
$$\text{SAR} = \frac{|E|^2 \sigma}{\rho}$$

Where:  
 $\sigma$  = Simulated tissue conductivity,  
 $\rho$  = Tissue density ( $\text{kg}/\text{m}^3$ ).

### 5.3. Other Test Equipment

#### 5.3.1. Device Holder for Transmitters

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



**Figure 4 Device Holder**

### 5.3.2. Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

Shell Thickness	2±0.1 mm
Filling Volume	Approx. 20 liters
Dimensions	810 x 1000 x 500 mm (H x L x W)
Available	Special



**Figure 5 Generic Twin Phantom**

### 5.4. Scanning procedure

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

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

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

- The "surface check" measurement tests the optical surface detection system of the DASY4 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)
- The "area scan" measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline

interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid

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

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

## **5.5. Data Storage and Evaluation**

### **5.5.1. Data Storage**

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

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm<sup>2</sup>], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

### 5.5.2. Data Evaluation by SEMCAD

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

Probe parameters:	- Sensitivity	Norm <sub>i</sub> , a <sub>i0</sub> , a <sub>i1</sub> , a <sub>i2</sub>
	- Conversion factor	ConvF <sub>i</sub>
	- Diode compression point	Dcp <sub>i</sub>
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

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

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With	$V_i$	= compensated signal of channel i	(i = x, y, z)
	$Norm_i$	= sensor sensitivity of channel i [mV/(V/m) <sup>2</sup> ] for E-field Probes	(i = x, y, z)
	$ConvF$	= sensitivity enhancement in solution	
	$a_{ij}$	= sensor sensitivity factors for H-field probes	
	$f$	= carrier frequency [GHz]	
	$E_i$	= electric field strength of channel i in V/m	
	$H_i$	= magnetic field strength of channel i in A/m	

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

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

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

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

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

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

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

$\rho$  = equivalent tissue density in g/cm<sup>3</sup>

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<sup>2</sup>

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

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

## **5.6. System Specifications**

### **5.6.1. Robotic System Specifications**

#### **Specifications**

**Positioner:** Stäubli Unimation Corp. Robot Model: RX90L

**Repeatability:**  $\pm 0.02$  mm

**No. of Axis:** 6

#### **Data Acquisition Electronic (DAE) System**

##### **Cell Controller**

**Processor:** Pentium III

**Clock Speed:** 800 MHz

**Operating System:** Windows 2003

##### **Data Converter**

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

**Software:** DASY4 software

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

### 5.7. System validation

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

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

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

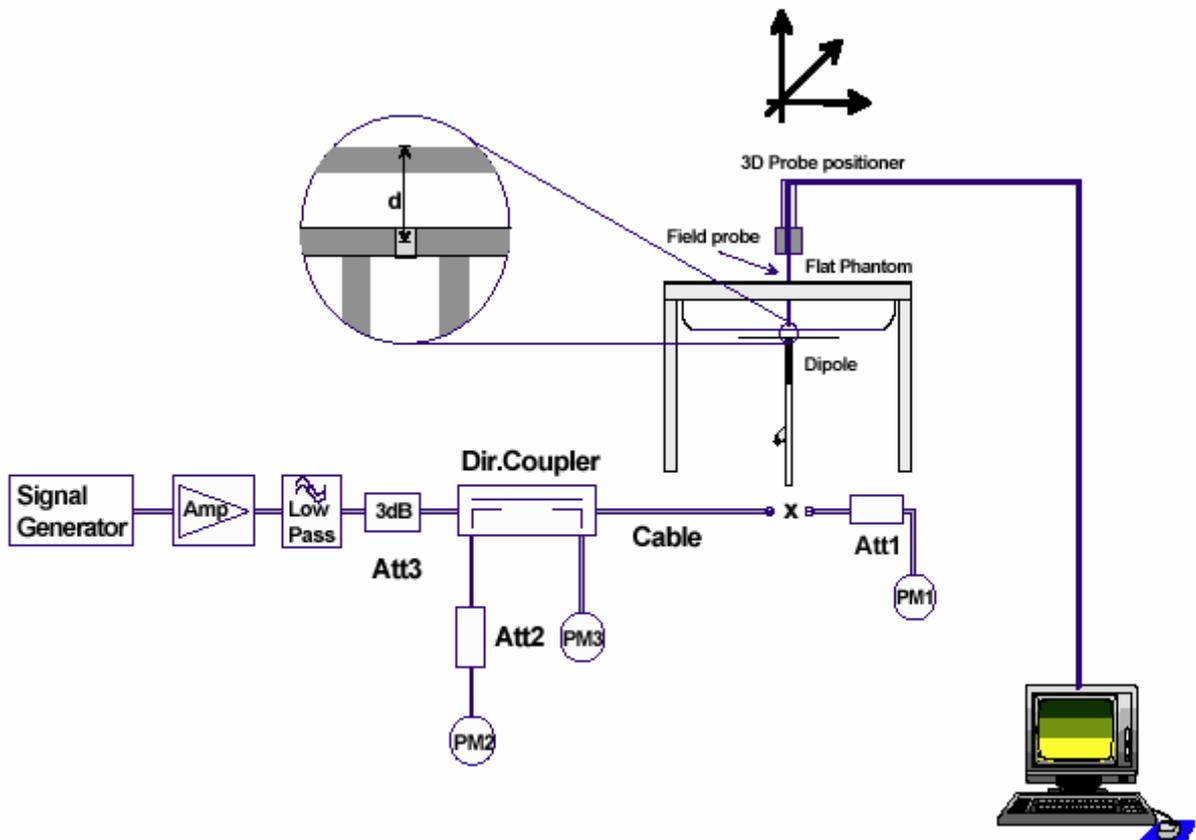


Figure 6 System validation Set-up

### 5.8. Equivalent Tissues

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

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

MIXTURE%	FREQUENCY (Body)835MHz
<b>Water</b>	<b>52.5</b>
<b>Sugar</b>	<b>45</b>
<b>Salt</b>	<b>1.4</b>
<b>Preventol</b>	<b>0.1</b>
<b>Cellulose</b>	<b>1.0</b>
<b>Dielectric Parameters Target Value</b>	<b>f=835MHz    <math>\epsilon=55.2</math>    <math>\sigma=0.97</math></b>

## 6. LABORATORY ENVIRONMENT

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

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

## **7. CHARACTERISTICS OF THE TEST**

### **7.1. Applicable Limit Regulations**

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

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

**ANSI C95.1–2005:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

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

### **7.2. Applicable Measurement Standards**

**BS EN 62209-1:2006:** Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)

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

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

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

## 8. CONDUCTED OUTPUT POWER MEASUREMENT

### 8.1. Summary

During the process of testing, the EUT was controlled via Digital Radio Communication tester to ensure the maximum power transmission and proper modulation. This result contains conducted output power and ERP for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

### 8.2. Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Table 10 to Table 12 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 0.21dB.

### 8.3. Conducted Power

#### 8.3.1. Measurement Methods

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

#### 8.3.2. Measurement result

**Table 7: Conducted Power Measurement Results**

CDMA Cellular(TM1)	Conducted Power(dBm)		
	Channel 1013	Channel 384	Channel 777
Before Test	24.12	24.26	24.01
After Test	24.03	24.18	24.13
CDMA Cellular(TM3)	Conducted Power(dBm)		
	Channel 1013	Channel 384	Channel 777
Before Test	24.41	24.14	24.24
After Test	24.35	24.02	24.13
CDMA Cellular + EV-DO (Subtype0)	Conducted Power(dBm)		
	Channel 1013	Channel384	Channel 777
Before Test	24.31	24.18	24.11
After Test	24.41	24.15	24.22
CDMA Cellular + EV-DO (Subtype2)	Conducted Power(dBm)		
	Channel 1013	Channel 384	Channel 777
Before Test	24.12	24.04	24.21
After Test	24.26	24.13	24.12

## 9. TEST RESULTS

### 9.1. Dielectric Performance

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

Measurement is made at temperature 22.5 °C and relative humidity 51%.					
Liquid temperature during the test: 22.3°C					
Frequency (MHz)		Target value	Measurement value	Difference percentage	
<b>835 (Body)</b>	Permittivity $\epsilon_r$	55.20	55.70	0.90	%
	Conductivity $\sigma$	0.97	1.01	4.12	%

### 9.2. System Validation

**Table 9: System Validation**

Measurement is made at temperature 23.2 °C, relative humidity 50%, and input power 250 mW.							
Liquid temperature during the test: 22.3°C							
Liquid parameters	Frequency	Permittivity $\epsilon$		Conductivity $\sigma$ (S/m)			
	835MHz	42.95		0.93			
Verification results	Frequency	Target value (W/kg)		Measurement value (W/kg)		Difference percentage	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
	835MHz	1.56	2.43	1.53	2.34	-1.92%	-3.70%

Note :

1. Target Values used derive from the SPEAG calibration certificate and 250 mW is used as feeding power to the validation dipole (SPEAG using).
2. The graph results see ANNEX D.

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### 9.3. Summary of Measurement Results

**Table 10: SAR Values (CDMA Cellular at different position, distance 5mm)**

Liquid Temperature: 22.4 ,relative humidity 50%					
Limit of SAR (W/kg)		10 g Average	1g Average	Power Drift(dB)	Graph Results
		2.0	1.6	± 0.21	
Test Case Of Body		Measurement Result (W/kg)		Power Drift(dB)	
Different Test Position	Channel	10 g Average	1 g Average		
BenQ Joy book S72					
Test Position 1	High	0.571	1.080	0.068	Figure 8
	Middle	0.523	1.030	-0.046	Figure 10
	Low	0.449	0.787	0.011	Figure 12
Test Position 2	Middle	0.128	0.366	-0.046	Figure 14
BenQ Joy book R55V					
Test Position 3	Middle	0.418	0.748	-0.082	Figure 16
Test Position 4	Middle	0.266	0.383	0.032	Figure 18
Test Position 5	Middle	0.156	0.455	-0.023	Figure 20
IBM T61					
Test Position 6	Middle	0.387	0.596	-0.190	Figure 22

Note: 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.

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**Table 11: SAR Values [CDMA Cellular EV-DO at different position, distance 5mm]**

Liquid Temperature: 22.4 ,relative humidity 50%					
Limit of SAR (W/kg)		10 g Average	1g Average	Power Drift(dB)	Graph Results
		2.0	1.6	± 0.21	
Test Case Of Body		Measurement Result (W/kg)		Power Drift(dB)	
Different Test Position	Channel	10 g Average	1 g Average		
BenQ Joy book S72(Rev.0)					
Test Position 1	High	0.614	1.160	0.066	Figure 24
	Middle	0.499	0.934	-0.040	Figure 26
	Low	0.514	0.955	-0.097	Figure 28
Test Position 2	Middle	0.128	0.358	-0.034	Figure 30
BenQ Joy book R55V(Rev.0)					
Test Position 3	High	<b>0.625</b>	<b>1.140</b>	0.138	Figure 32
	Middle	0.472	0.855	-0.045	Figure 34
	Low	0.535	0.937	-0.152	Figure 36
Test Position 4	Middle	0.208	0.358	0.060	Figure 38
Test Position 5	Middle	0.152	0.457	-0.029	Figure 40
IBM T61(Rev.0)					
Test Position 6	Middle	0.443	0.687	-0.040	Figure 42
Worse case of Rev.0 with Rev.A					
Test Position 3	High	<b>0.647</b>	<b>1.180</b>	-0.133	Figure 44

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

- 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.

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**Table 12: SAR Values (enhanced energy coupling at increased separation distances)**

Different Test Position	Distance of EUT to Phantom	Channel	Measurement Result (W/kg)	50% of initial position SAR (W/kg)	125% of initial position SAR (W/kg)
BenQ Joybook S72(Rev.0)					
Test Position 1	initial position	Middle	0.805	0.403	1.006
	5mm	Middle	0.311		
IBM T61(Rev.0)					
Test Position 6	initial position	Middle	0.745	0.373	0.931
	5mm	Middle	0.415		
	10mm	Middle	0.279		
BenQ Joybook R55V(Rev.0)					
Test Position 3	initial position	High	1.240	0.620	1.550
	5mm	High	0.263		
BenQ Joybook R55V (Rev.A)					
Test Position 3	initial position	High	1.320	0.660	1.650
	5mm	High	0.367		

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

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

**9.4. Conclusion**

Localized Specific Absorption Rate (SAR) of this portable wireless device has been measured in all cases requested by the relevant standards cited in Clause 7.2 of this report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 7.1 of this test report.

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**10. MEASUREMENT UNCERTAINTY**

No.	a	Type	c	d	e=f(d, k)	f	h=cxf / e	k
	Uncertainty Component		Tol. (±%)	Prob. Dist	Div.	c <sub>1</sub> (1g)	1g u (± %)	v <sub>1</sub>
1	System repetivity	A	0.5	N	1	1	0.5	9
Measurement system								
2	Probe Calibration	B	5	N	2	1	2.5	∞
3	Axial isotropy	B	4.7	R	$\sqrt{3}$	$(1-c_p)^{1/2}$	4.3	∞
4	Hemisphere Isotropy	B	9.4	R	$\sqrt{3}$	$\sqrt{C_P}$		∞
5	Boundary Effect	B	0.4	R	$\sqrt{3}$	1	0.23	∞
6	Linearity	B	4.7	R	$\sqrt{3}$	1	2.7	∞
7	System Detection Limits	B	1.0	R	$\sqrt{3}$	1	0.6	∞
8	Readout Electronics	B	1.0	N	1	1	1.0	∞
9	RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1.73	∞
10	Probe Positioner Mechanical Tolerance	B	0.4	R	$\sqrt{3}$	1	0.2	∞
11	Probe Positioning with respect to Phantom Shell	B	2.9	R	$\sqrt{3}$	1	1.7	∞
12	Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	B	3.9	R	$\sqrt{3}$	1	2.3	∞
Test Sample Related								
13	Test Sample Positioning	A	4.9	N	1	1	4.9	N-1
14	Device Holder Uncertainty	A	6.1	N	1	1	6.1	N-1
15	Output Power Variation-SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.9	∞
Phantom and Tissue Parameters								
16	Phantom Uncertainty(shape and thickness tolerances)	B	1.0	R	$\sqrt{3}$	1	0.6	∞
17	Liquid Conductivity-deviation from target values	B	5.0	R	$\sqrt{3}$	0.64	1.7	∞
18	Liquid Conductivity-measurement uncertainty	B	5.0	N	1	0.64	1.7	M
19	Liquid Permittivity-deviation from target values	B	5.0	R	$\sqrt{3}$	0.6	1.7	∞
20	Liquid Permittivity- measurement uncertainty	B	5.0	N	1	0.6	1.7	M
Combined Standard Uncertainty							11.25	
Expanded Uncertainty (95 % CONFIDENCE INTERVAL)							22.5	

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## 11. MAIN TEST INSTRUMENTS

**Table 13: List of Main Instruments**

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

## 12. TEST PERIOD

The test is performed from August 21<sup>st</sup>, 2008 to August 22<sup>nd</sup>, 2008.

## 13. TEST LOCATION

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

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

## ANNEX A : MEASUREMENT PROCESS

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point was measured and was used as a reference value for assessing the power drop.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15 mm x 15 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Around this point, a volume of 32 mm x 32 mm x 34 mm was assessed by measuring 7 x 7 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

- a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axis. This polynomial was then used to evaluate the points between the surface and the probe tip.
- b. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot"-condition (in x ~ y and z-directions). The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.
- c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation is repeated.

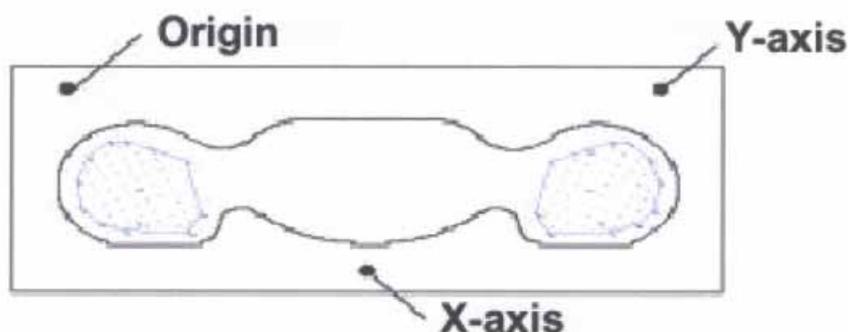
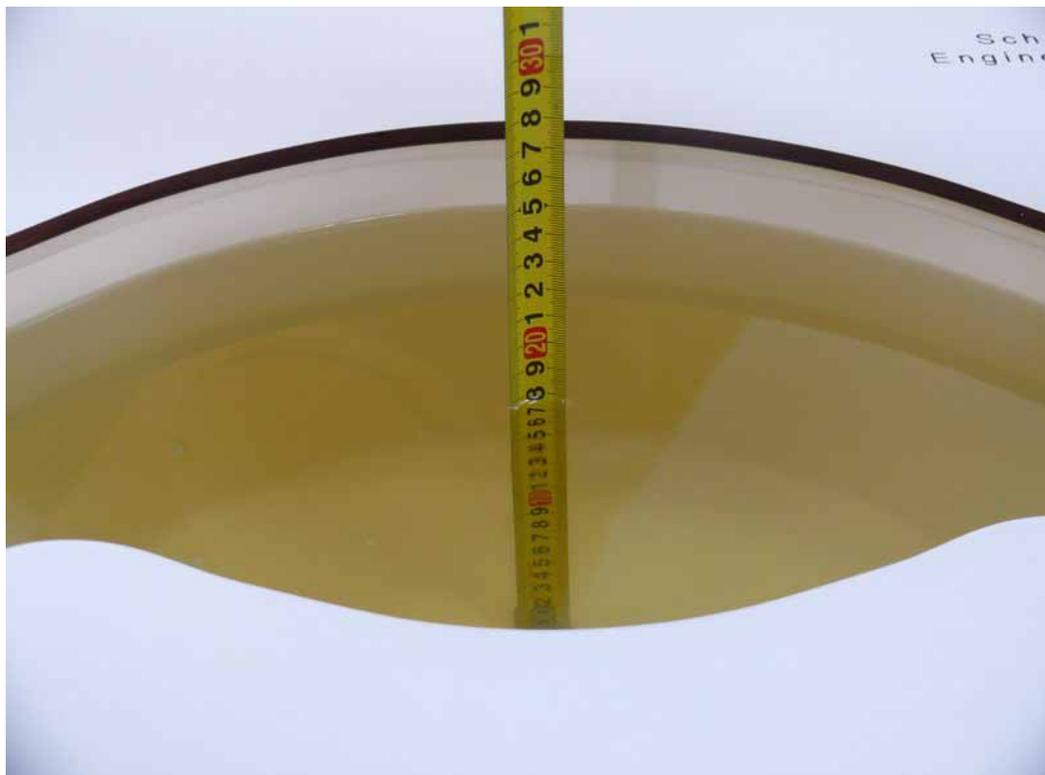


Figure 7 SAR Measurement Points in Area Scan

## ANNEX B : TEST LAYOUT



Picture 2 Specific Absorption Rate Test Layout



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

## ANNEX C : GRAPH RESULTS

### CDMA Cellular Test Position 1 High frequency

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

Medium parameters used (interpolated):  $f = 848.31$  MHz;  $\sigma = 1.02$  mho/m;  $\epsilon_r = 55.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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

Electronics: DAE4 Sn452;

**Test Position 1 High/Area Scan (41x91x1):** Measurement grid: dx=15mm, dy=15mm

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

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

Reference Value = 21.3 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 2.89 W/kg

**SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.571 mW/g**

Maximum value of SAR (measured) = 1.20 mW/g

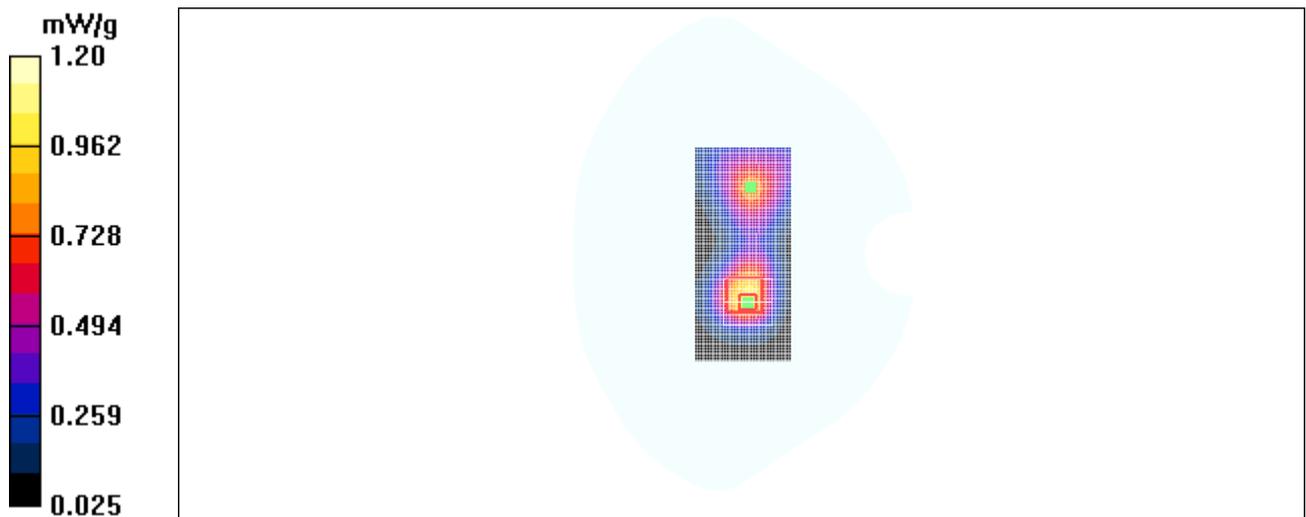


Figure Figure 8 CDMA Cellular Test Position 1 Channel 777

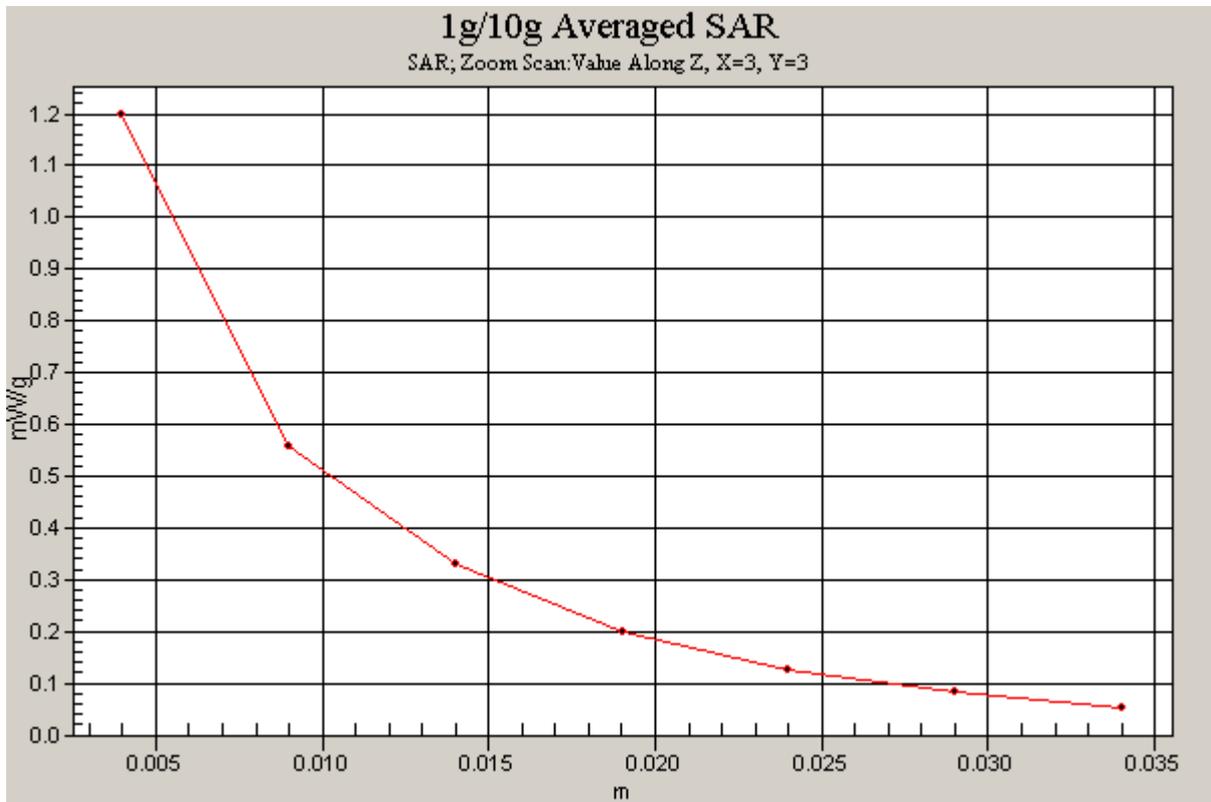


Figure 9 Z-Scan at power reference point (CDMA Cellular Test Position 1 Channel 777)

**CDMA Cellular Test Position 1 Middle frequency**

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 55.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);  
Electronics: DAE4 Sn452;

**Test Position 1 Middle/Area Scan (41x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.01 mW/g

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

Reference Value = 21.9 V/m; Power Drift = -0.046 dB

Peak SAR (extrapolated) = 3.04 W/kg

**SAR(1 g) = 1.03 mW/g; SAR(10 g) = 0.523 mW/g**

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

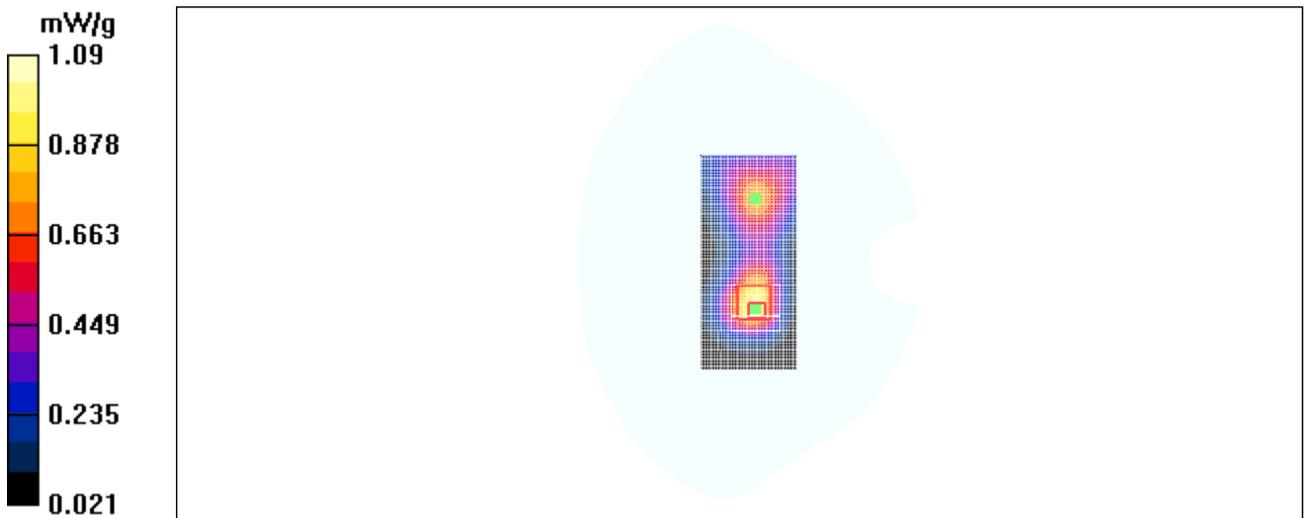


Figure 10 CDMA Cellular Test Position 1 Channel 384

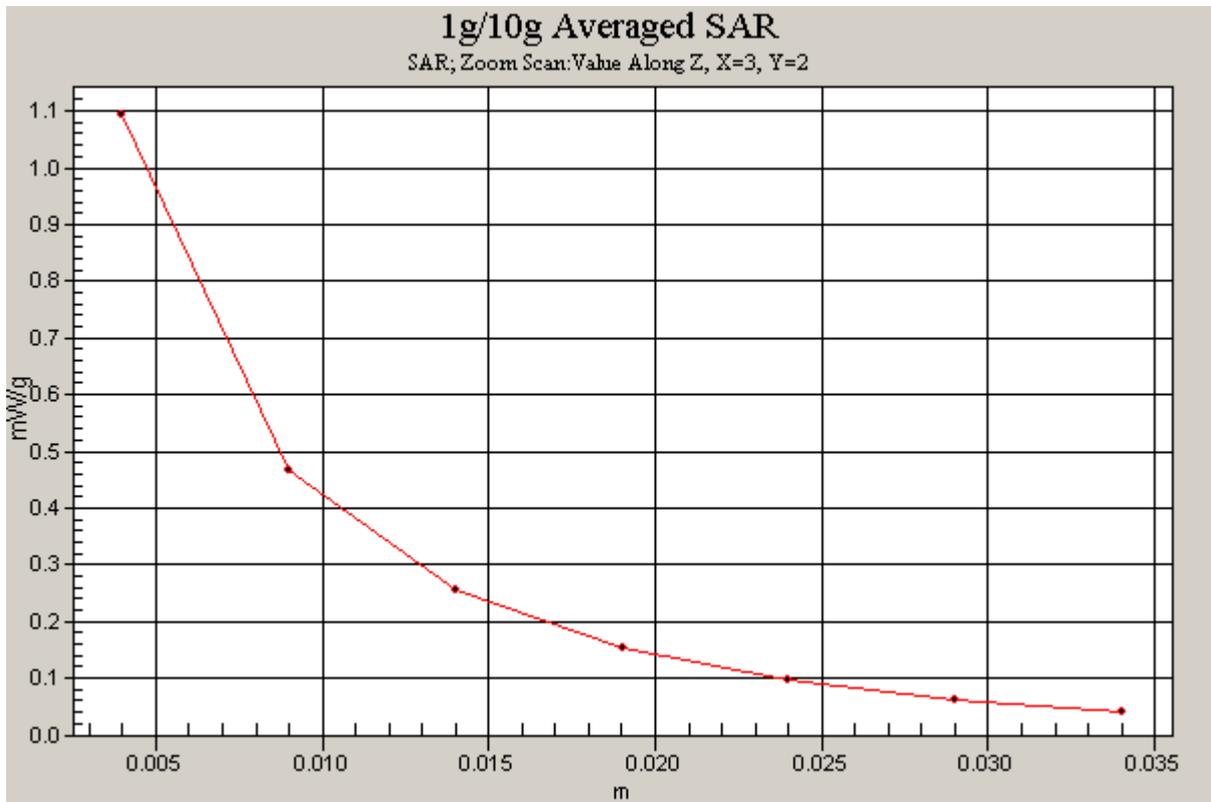


Figure 11 Z-Scan at power reference point (CDMA Cellular Test Position 1 Channel 384)

**CDMA Cellular Test Position 1 Low frequency**

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

Medium parameters used:  $f = 825$  MHz;  $\sigma = 0.998$  mho/m;  $\epsilon_r = 55.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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

Electronics: DAE4 Sn452;

**Test Position 1 Low/Area Scan (41x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.936 mW/g

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

Reference Value = 23.3 V/m; Power Drift = 0.011 dB

Peak SAR (extrapolated) = 1.91 W/kg

**SAR(1 g) = 0.787 mW/g; SAR(10 g) = 0.449 mW/g**

Maximum value of SAR (measured) = 0.849 mW/g

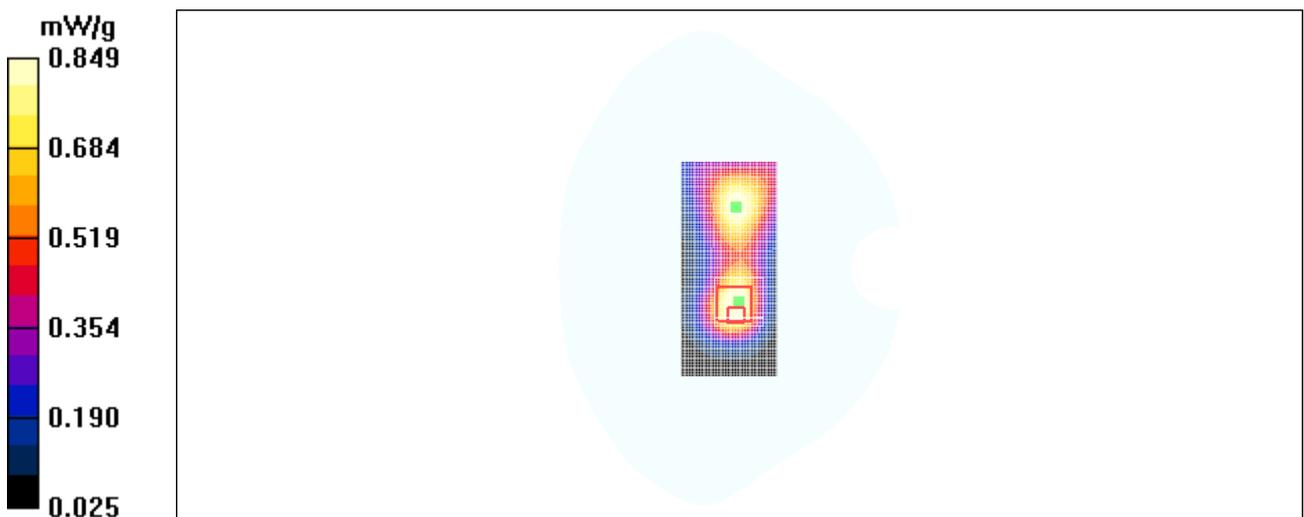


Figure 12 CDMA Cellular Test Position 1 Channel 1013

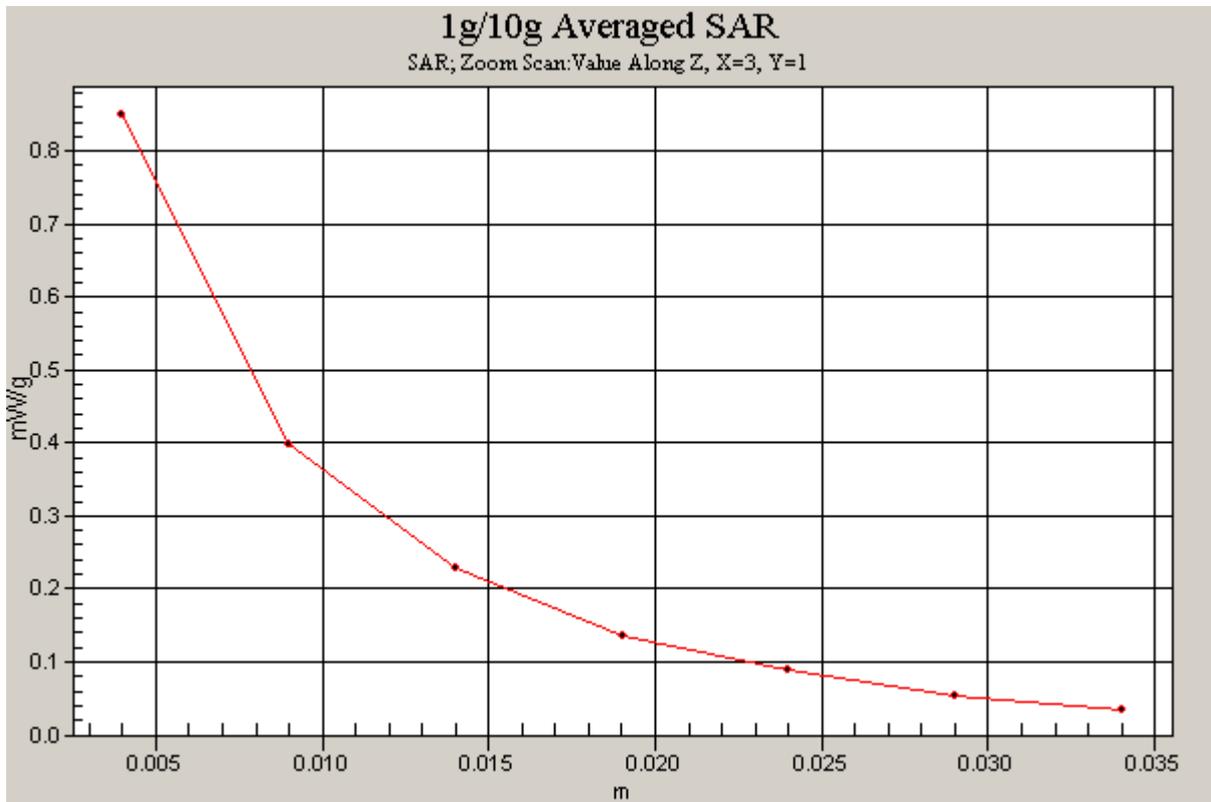


Figure 13 Z-Scan at power reference point (CDMA Cellular Test Position 1 Channel 1013)

**CDMA Cellular Test Position 2 Middle frequency**

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 55.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);  
Electronics: DAE4 Sn452;

**Test Position 2 Middle/Area Scan (51x51x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.292 mW/g

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

Reference Value = 21.8 V/m; Power Drift = -0.046 dB

Peak SAR (extrapolated) = 1.45 W/kg

**SAR(1 g) = 0.366 mW/g; SAR(10 g) = 0.128 mW/g**

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

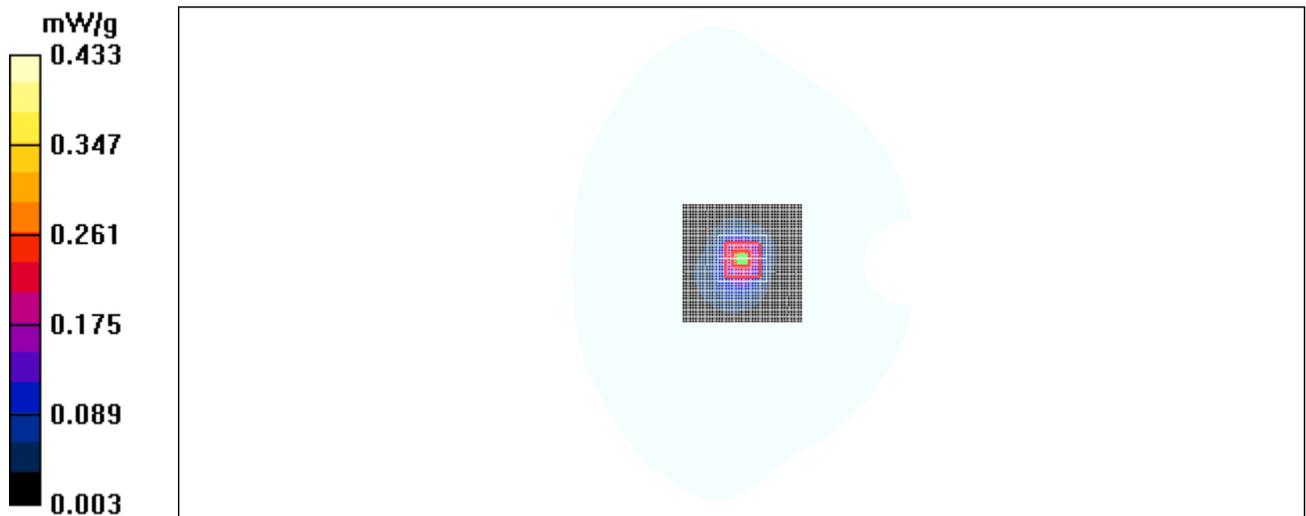


Figure 14 CDMA Cellular Test Position 2 Channel 384

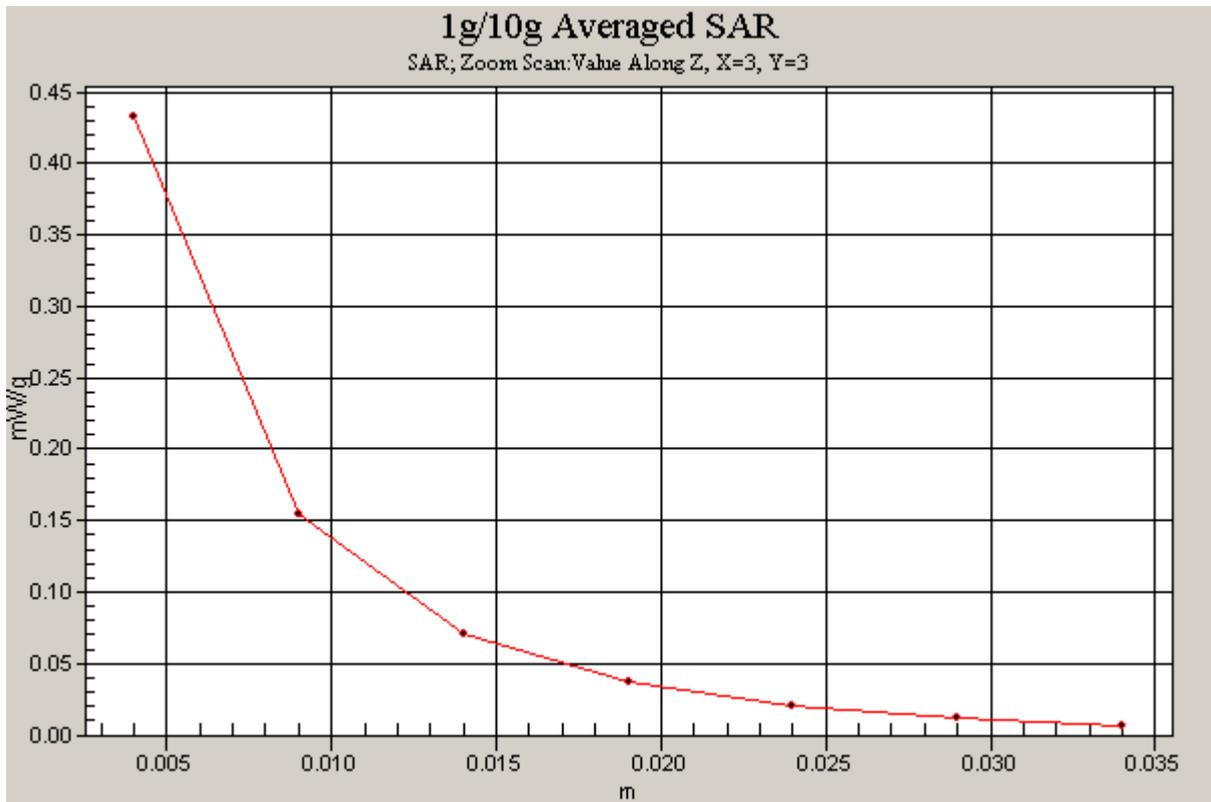


Figure 15 Z-Scan at power reference point (CDMA Cellular Test Position 2 Channel 384)

**CDMA Cellular Test Position 3 Middle frequency**

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 55.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);  
Electronics: DAE4 Sn452;

**Test Position 3 Middle/Area Scan (41x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.894 mW/g

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

Reference Value = 25.0 V/m; Power Drift = -0.082 dB

Peak SAR (extrapolated) = 1.68 W/kg

**SAR(1 g) = 0.748 mW/g; SAR(10 g) = 0.418 mW/g**

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

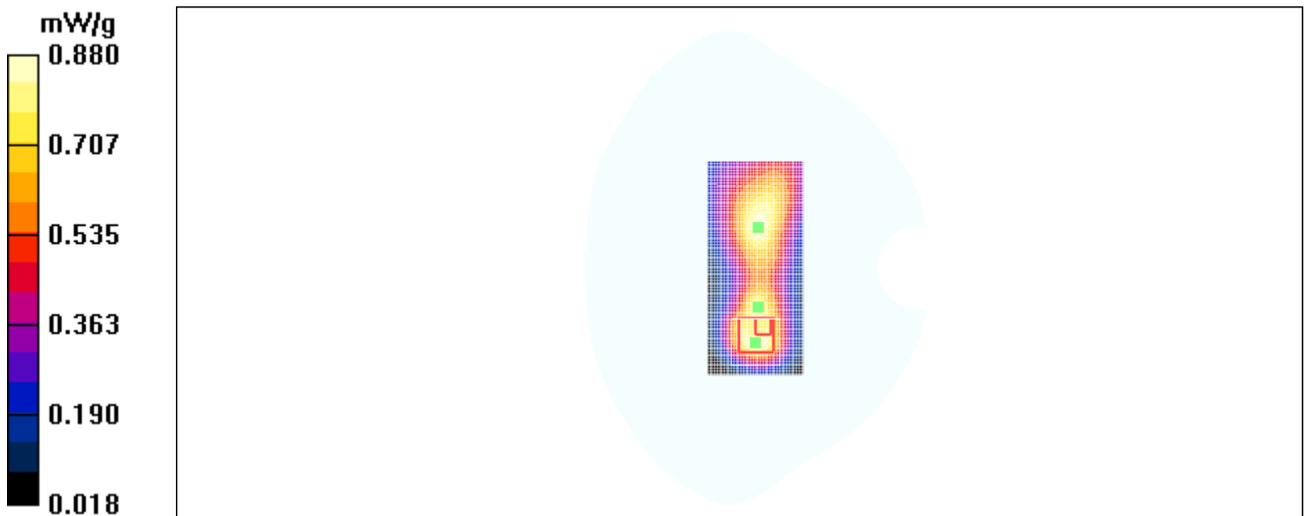


Figure 16 CDMA Cellular Test Position 3 Channel 384

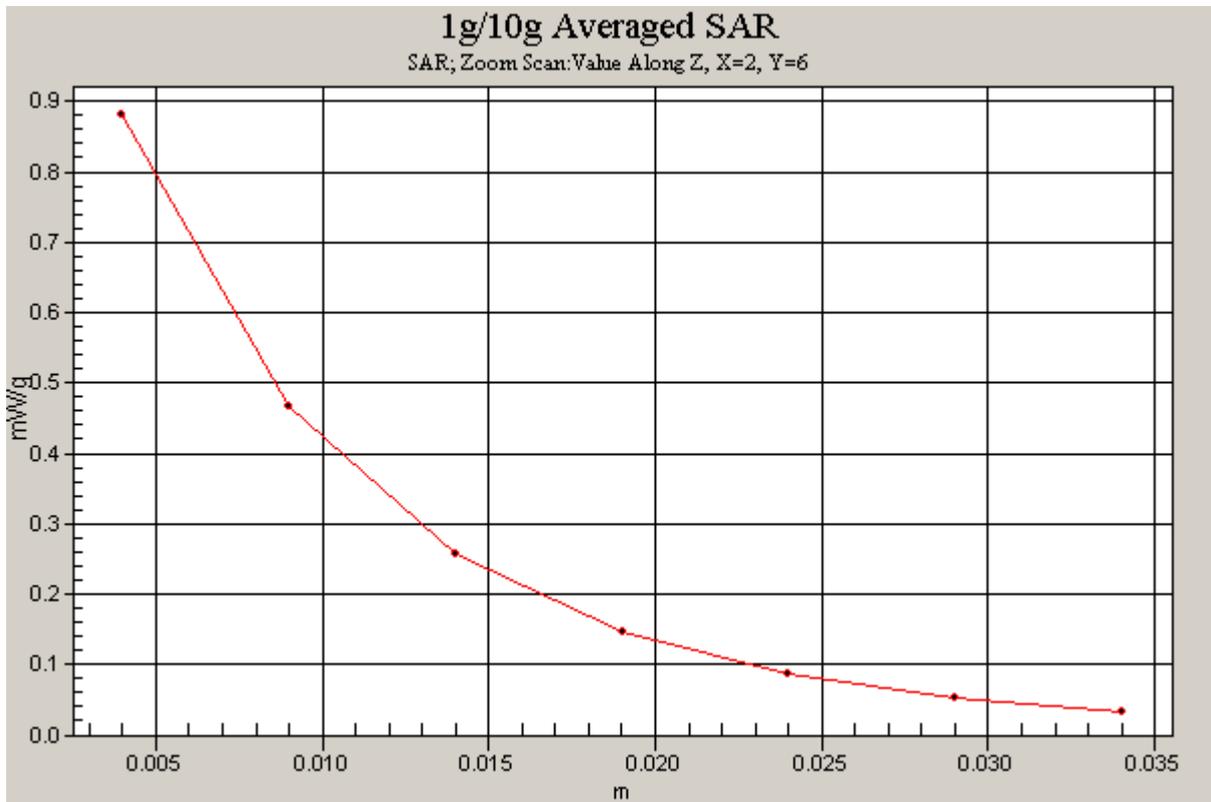


Figure 17 Z-Scan at power reference point (CDMA Cellular Test Position 3 Channel 384)

**CDMA Cellular Test Position 4 Middle frequency**

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 55.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);  
Electronics: DAE4 Sn452;

**Test Position 4 Middle/Area Scan (41x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.419 mW/g

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

Reference Value = 18.0 V/m; Power Drift = 0.032 dB

Peak SAR (extrapolated) = 0.520 W/kg

**SAR(1 g) = 0.383 mW/g; SAR(10 g) = 0.266 mW/g**

Maximum value of SAR (measured) = 0.410 mW/g

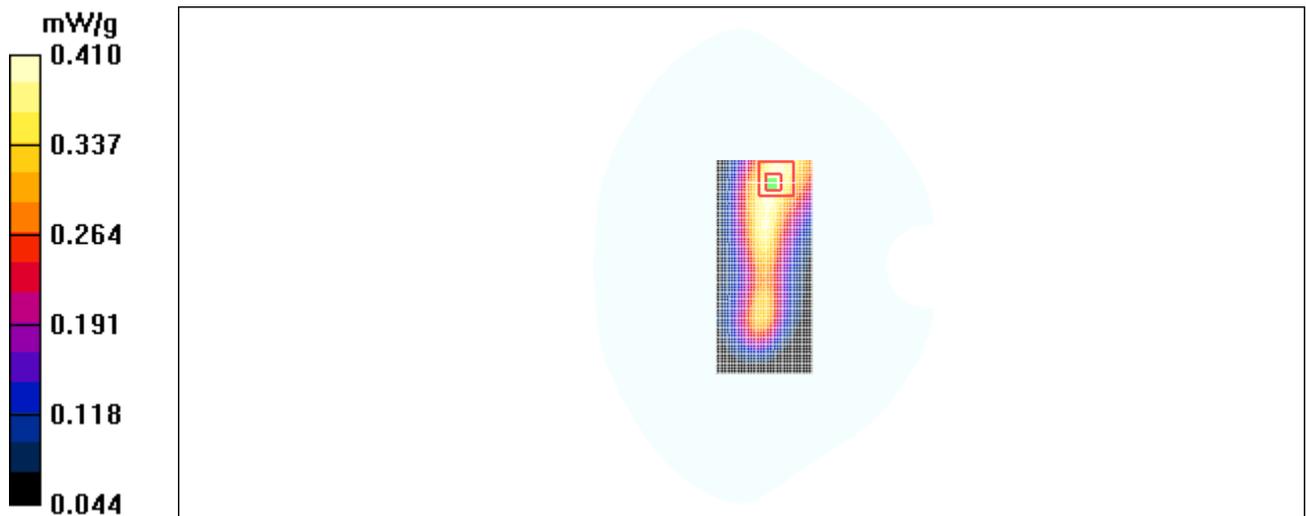


Figure 18 CDMA Cellular Test Position 4 Channel 384

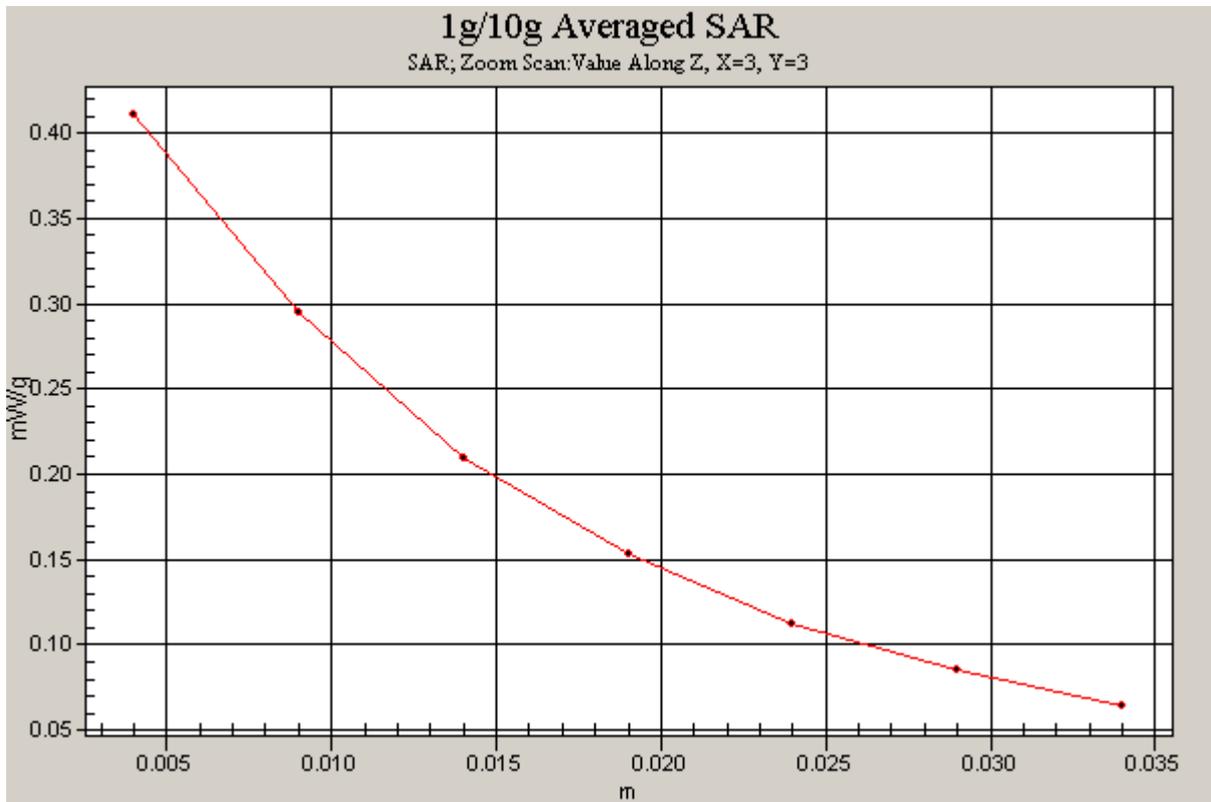


Figure 19 Z-Scan at power reference point (CDMA Cellular Test Position 4 Channel 384)

**CDMA Cellular Test Position 5 Middle frequency**

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 55.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);  
Electronics: DAE4 Sn452;

**Test Position 5 Middle/Area Scan (51x51x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.336 mW/g

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

Reference Value = 23.8 V/m; Power Drift = -0.023 dB

Peak SAR (extrapolated) = 1.99 W/kg

**SAR(1 g) = 0.455 mW/g; SAR(10 g) = 0.156 mW/g**

Maximum value of SAR (measured) = 0.521 mW/g

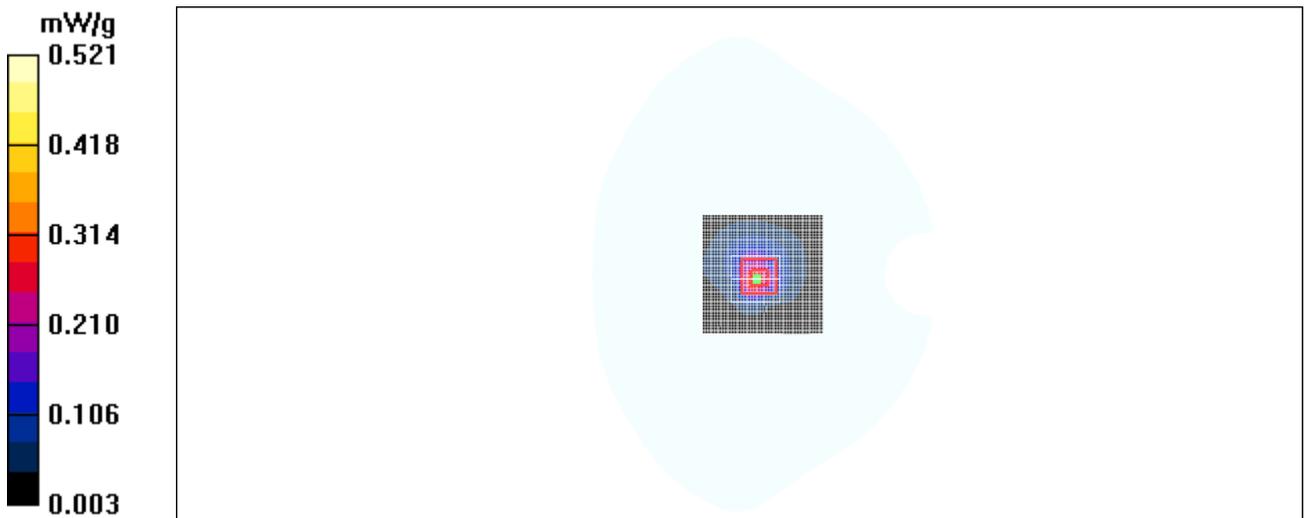


Figure 20 CDMA Cellular Test Position 5 Channel 384

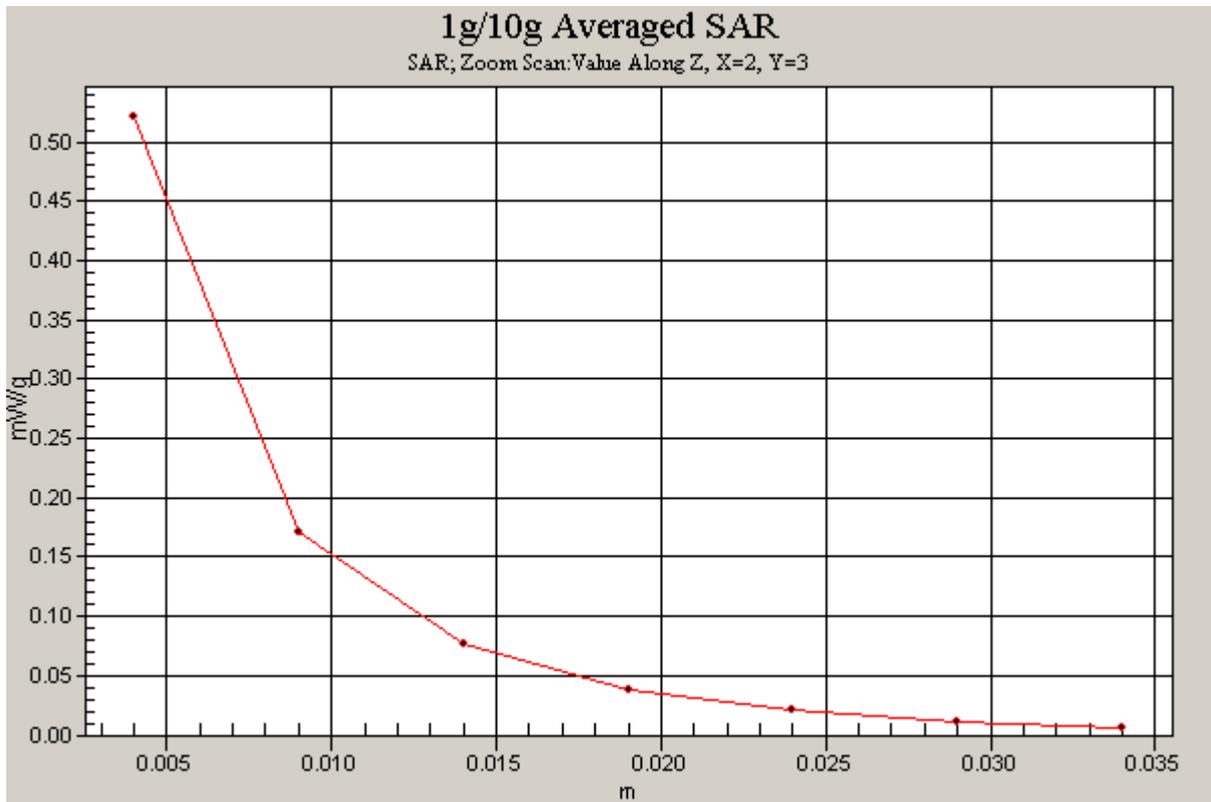


Figure 21 Z-Scan at power reference point (CDMA Cellular Test Position 5 Channel 384)

**CDMA Cellular Test Position 6 Middle frequency**

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 55.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);  
Electronics: DAE4 Sn452;

**Test Position 6 Middle/Area Scan (41x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.663 mW/g

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

Reference Value = 21.3 V/m; Power Drift = -0.190 dB

Peak SAR (extrapolated) = 0.893 W/kg

**SAR(1 g) = 0.596 mW/g; SAR(10 g) = 0.387 mW/g**

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

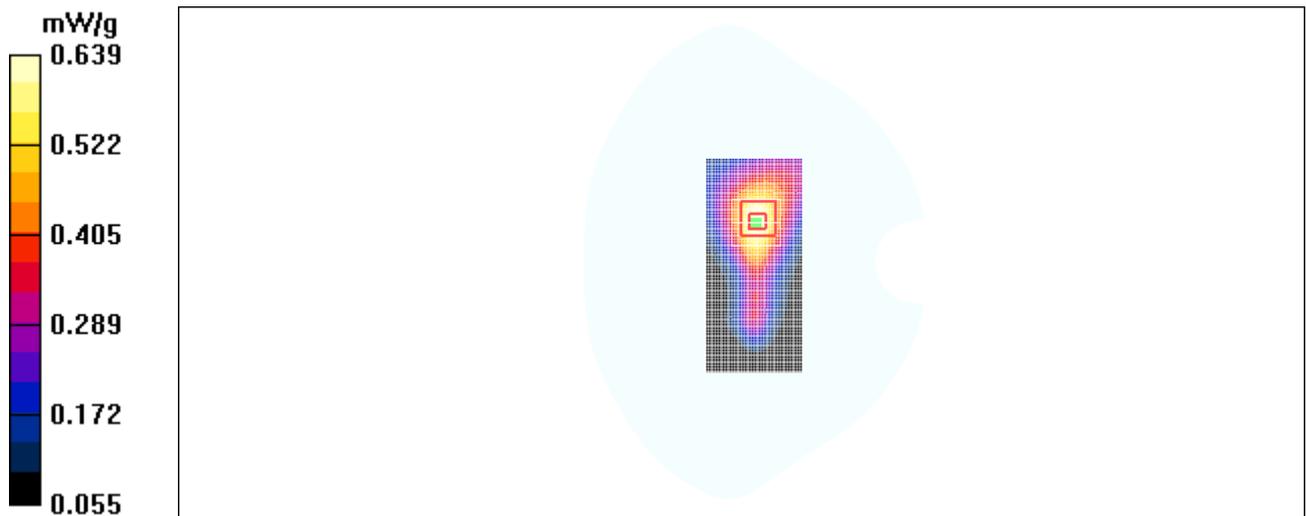


Figure 22 CDMA Cellular Test Position 6 Channel 384

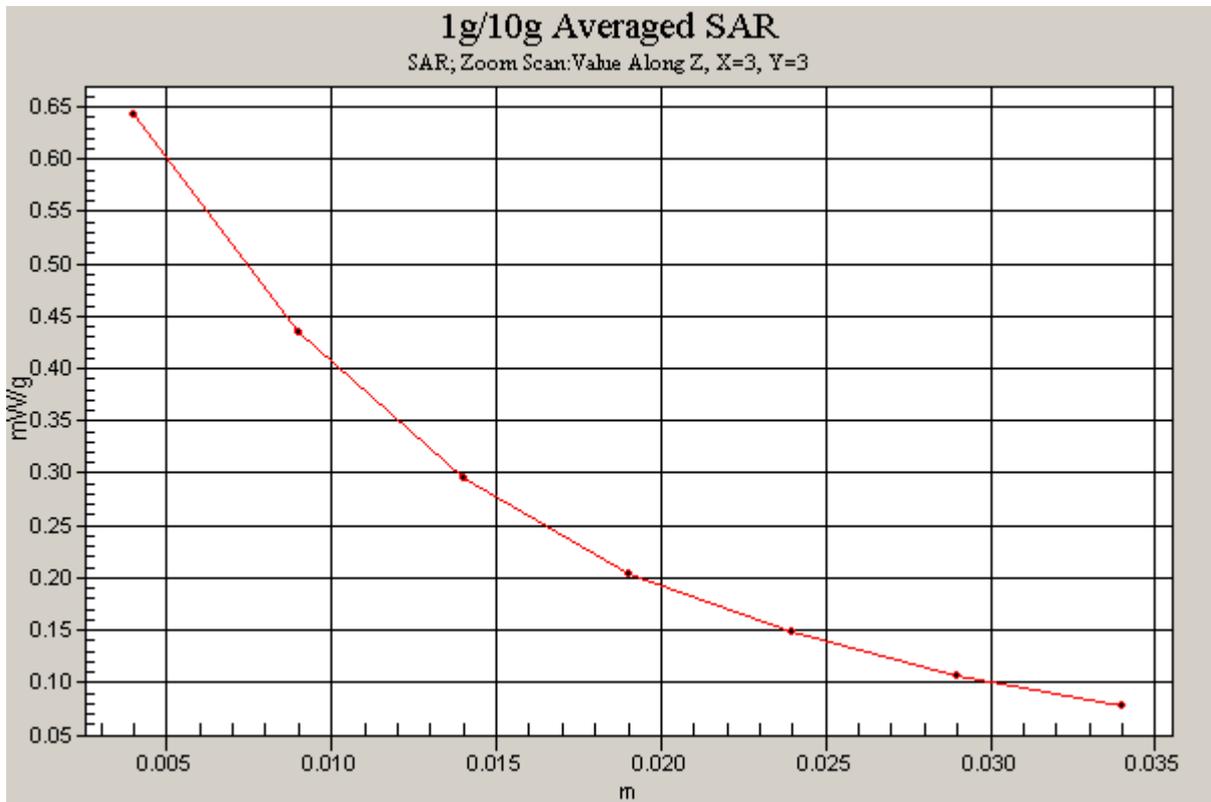


Figure 23 Z-Scan at power reference point (CDMA Cellular Test Position 6 Channel 384)

**CDMA Cellular EV-DO REV.0 Test Position 1 High frequency**

Communication System: CDMA Cellular EVDO(Rev.0); Frequency: 848.31 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 848.31$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 55.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);  
Electronics: DAE4 Sn452;

**Test Position 1 High/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.35 mW/g

**Test Position 1 High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 19.1 V/m; Power Drift = 0.066 dB  
Peak SAR (extrapolated) = 3.00 W/kg

**SAR(1 g) = 1.16 mW/g; SAR(10 g) = 0.614 mW/g**  
Maximum value of SAR (measured) = 1.27 mW/g

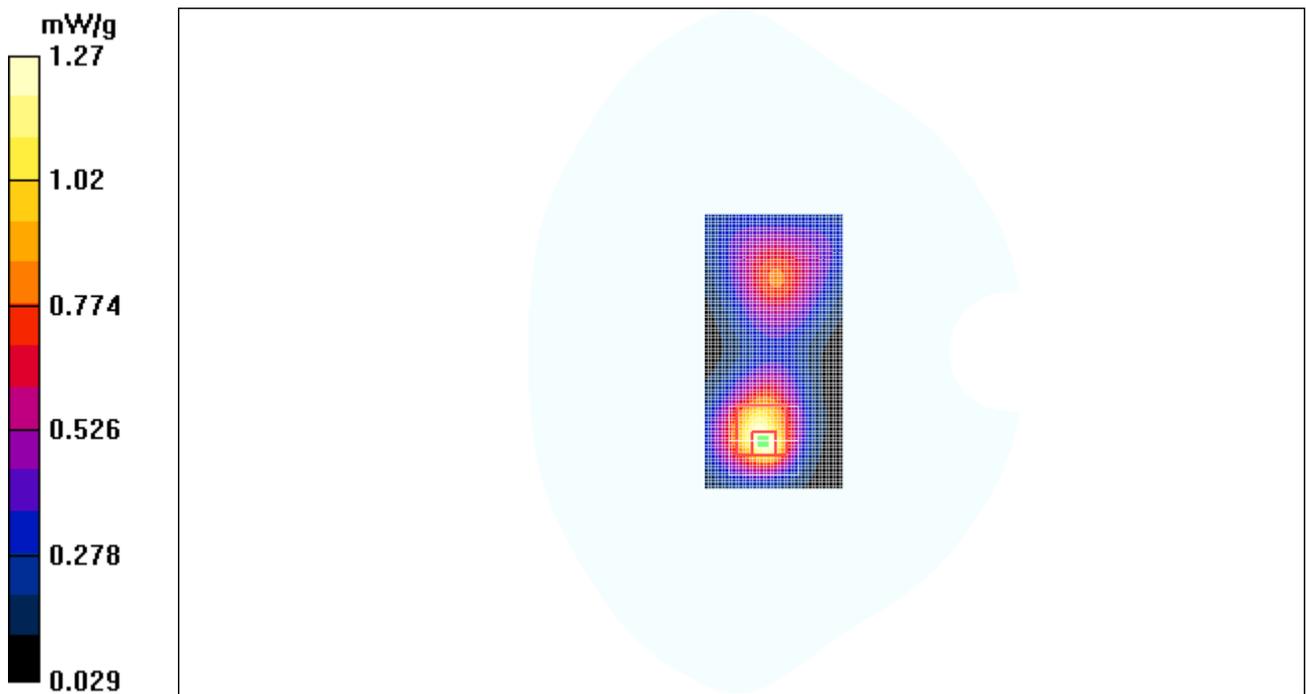


Figure 24 CDMA Cellular EV-DO REV.0 Test Position 1 Channel 777

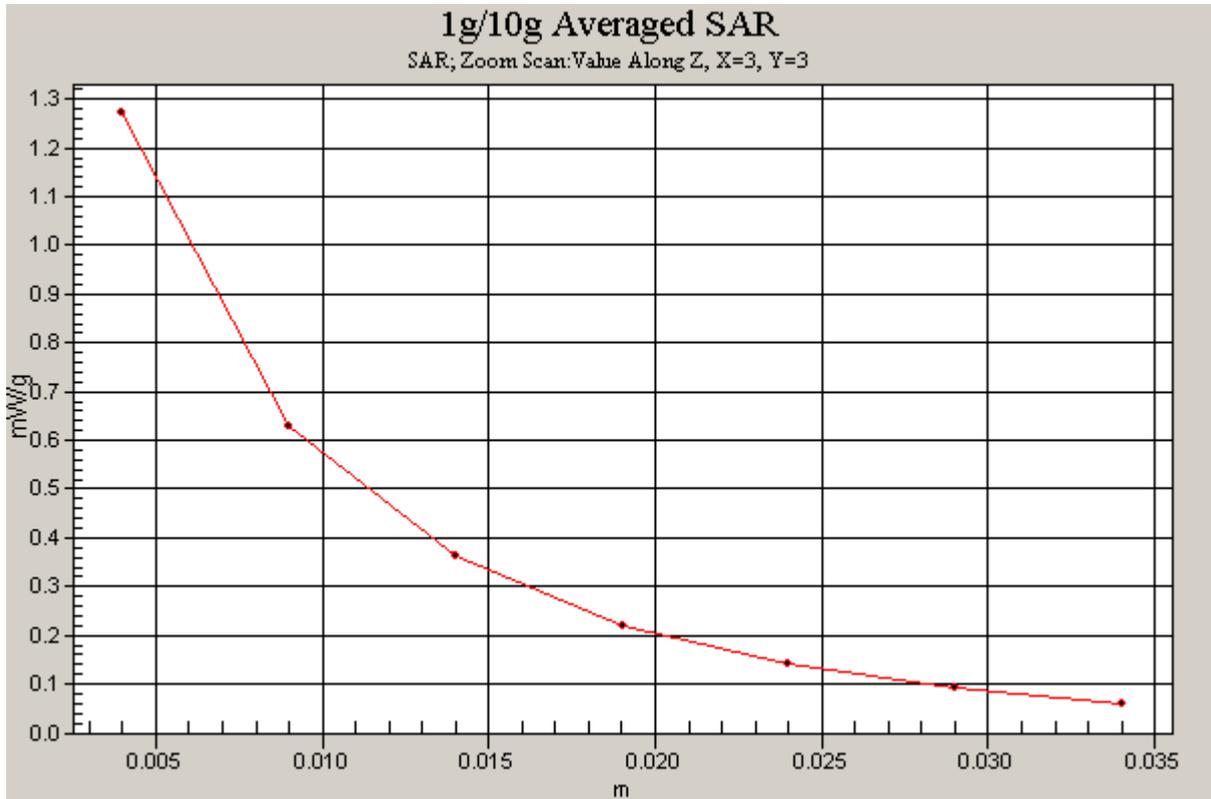


Figure 25 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 Test Position 1 Channel 777)

**CDMA Cellular EV-DO REV.0 Test Position 1 Middle frequency**

Communication System: CDMA Cellular EVDO(Rev.0); Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.999$  mho/m;  $\epsilon_r = 55.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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

Electronics: DAE4 Sn452;

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

Maximum value of SAR (interpolated) = 1.17 mW/g

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

Reference Value = 20.2 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 2.44 W/kg

**SAR(1 g) = 0.934 mW/g; SAR(10 g) = 0.499 mW/g**

Maximum value of SAR (measured) = 1.02 mW/g

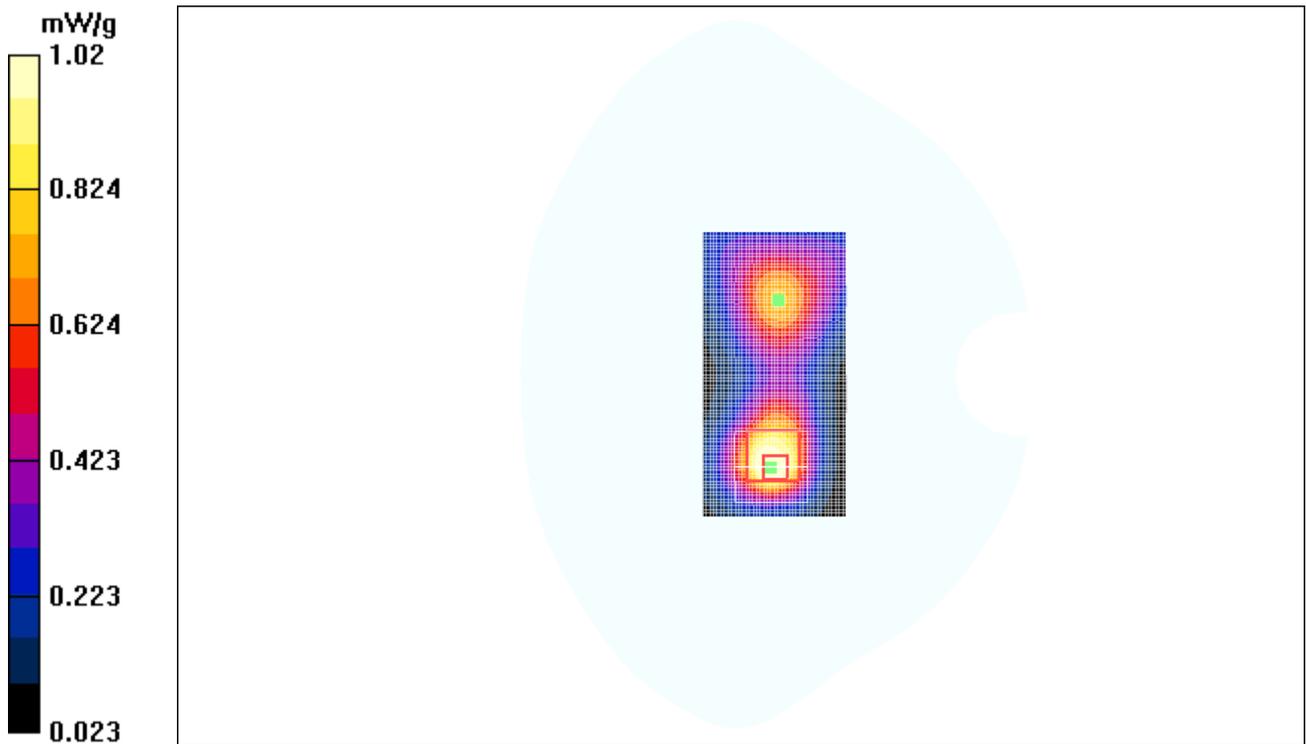


Figure 26 CDMA Cellular EV-DO REV.0 Test Position 1 Channel 384

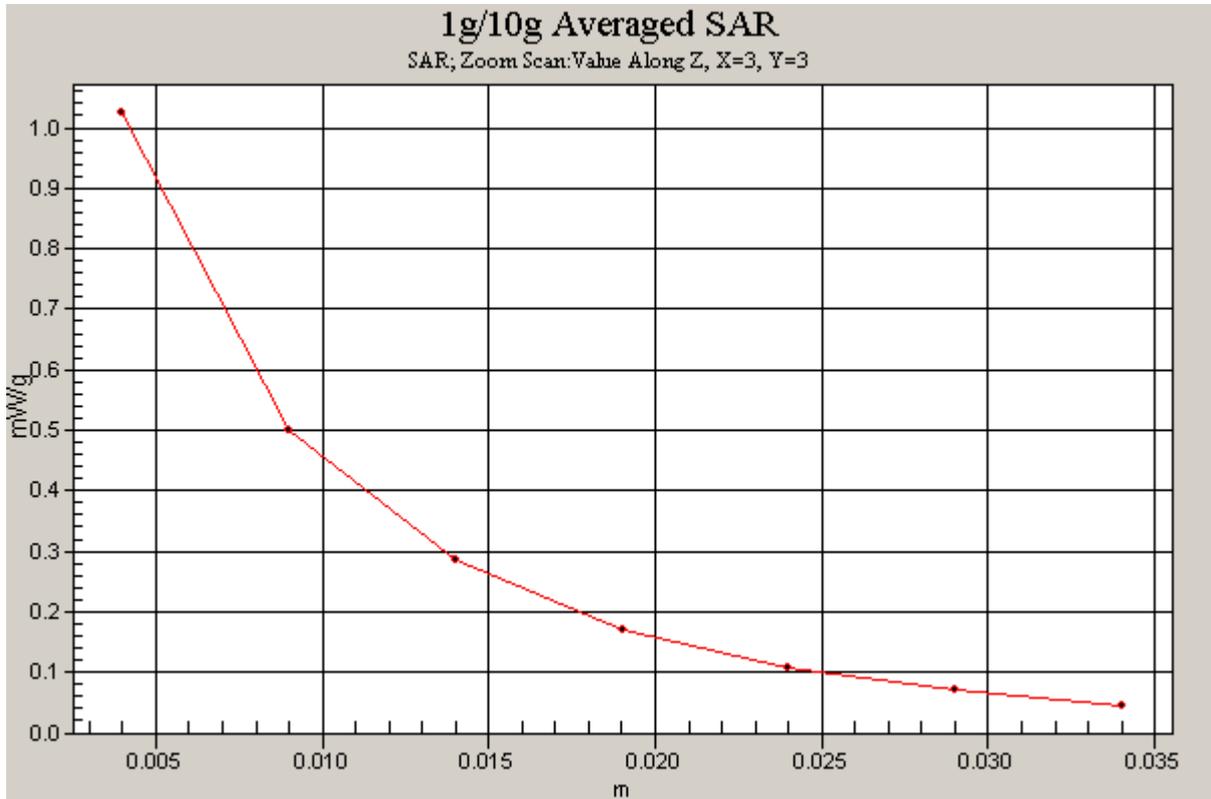


Figure 27 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 Test Position 1 Channel 384)

**CDMA Cellular EV-DO REV.0 Test Position 1 Low frequency**

Communication System: CDMA Cellular EVDO(Rev.0); Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 825 \text{ MHz}$ ;  $\sigma = 0.985 \text{ mho/m}$ ;  $\epsilon_r = 55.7$ ;  $\rho = 1000 \text{ kg/m}^3$

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

Electronics: DAE4 Sn452;

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

Maximum value of SAR (interpolated) = 1.08 mW/g

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

Reference Value = 23.8 V/m; Power Drift = -0.097 dB

Peak SAR (extrapolated) = 2.46 W/kg

**SAR(1 g) = 0.955 mW/g; SAR(10 g) = 0.514 mW/g**

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

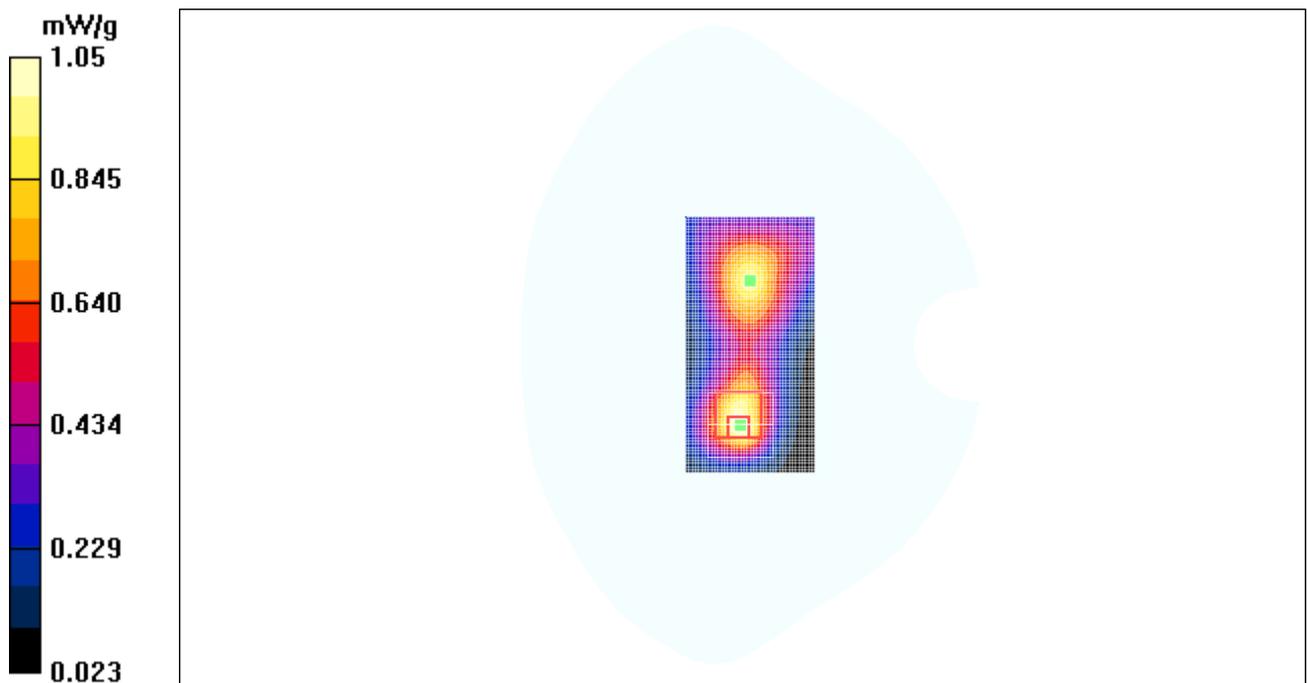


Figure 28 CDMA Cellular EV-DO REV.0 Test Position 1 Channel 1013

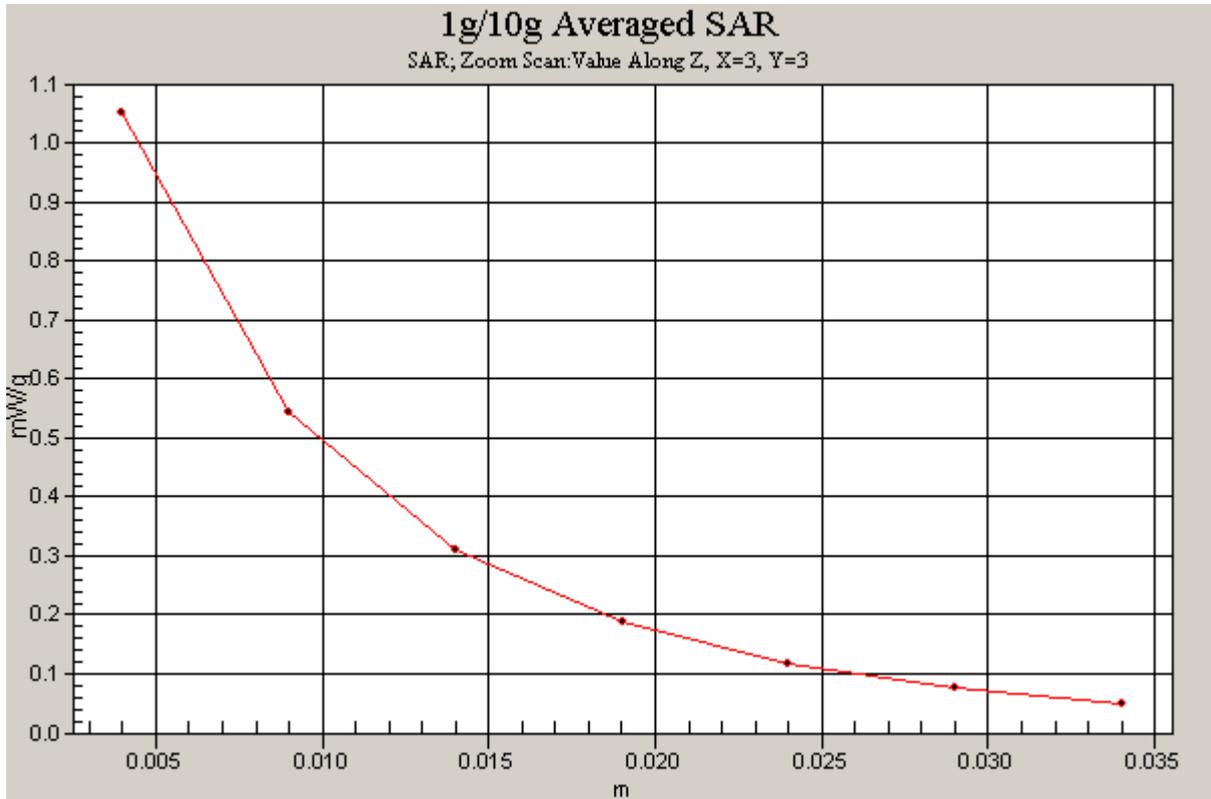


Figure 29 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 Test Position 1 Channel 1013)

**CDMA Cellular EV-DO REV.0 Test Position 2 Middle frequency**

Communication System: CDMA Cellular EVDO(Rev.0); Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.02$  mho/m;  $\epsilon_r = 55.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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

Electronics: DAE4 Sn452;

**Test Position 1 Middle/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.328 mW/g

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

Reference Value = 20.4 V/m; Power Drift = -0.034 dB

Peak SAR (extrapolated) = 1.37 W/kg

**SAR(1 g) = 0.358 mW/g; SAR(10 g) = 0.128 mW/g**

Maximum value of SAR (measured) = 0.384 mW/g

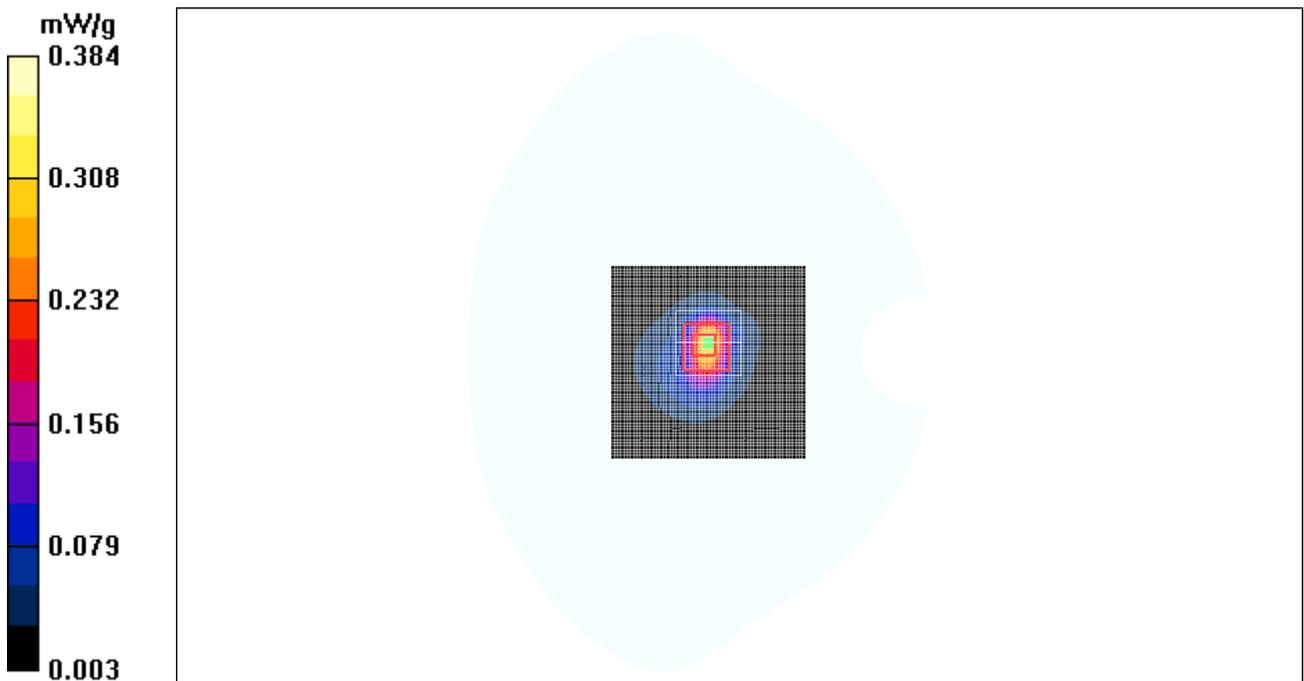


Figure 30 CDMA Cellular EV-DO REV.0 Test Position 2 Channel 384

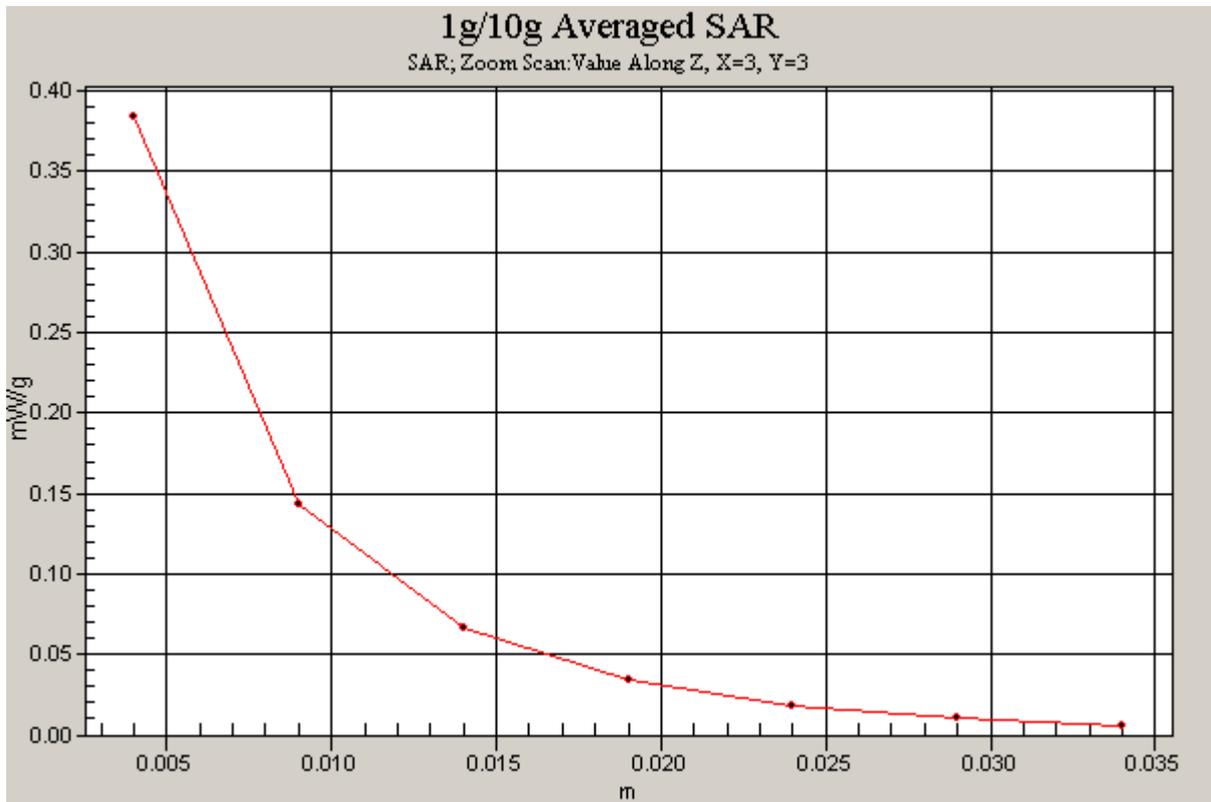


Figure 31 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 Test Position 2 Channel 384)

**CDMA Cellular EV-DO REV.0 Test Position 3 High frequency**

Communication System: CDMA Cellular EVDO(Rev.0); Frequency: 848.31 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 848.31$  MHz;  $\sigma = 1.03$  mho/m;  $\epsilon_r = 55.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);  
Electronics: DAE4 Sn452;

**Test Position 3 High/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.26 mW/g

**Test Position 3 High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 24.8 V/m; Power Drift = 0.138 dB  
Peak SAR (extrapolated) = 2.61 W/kg

**SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.625 mW/g**  
Maximum value of SAR (measured) = 1.24 mW/g

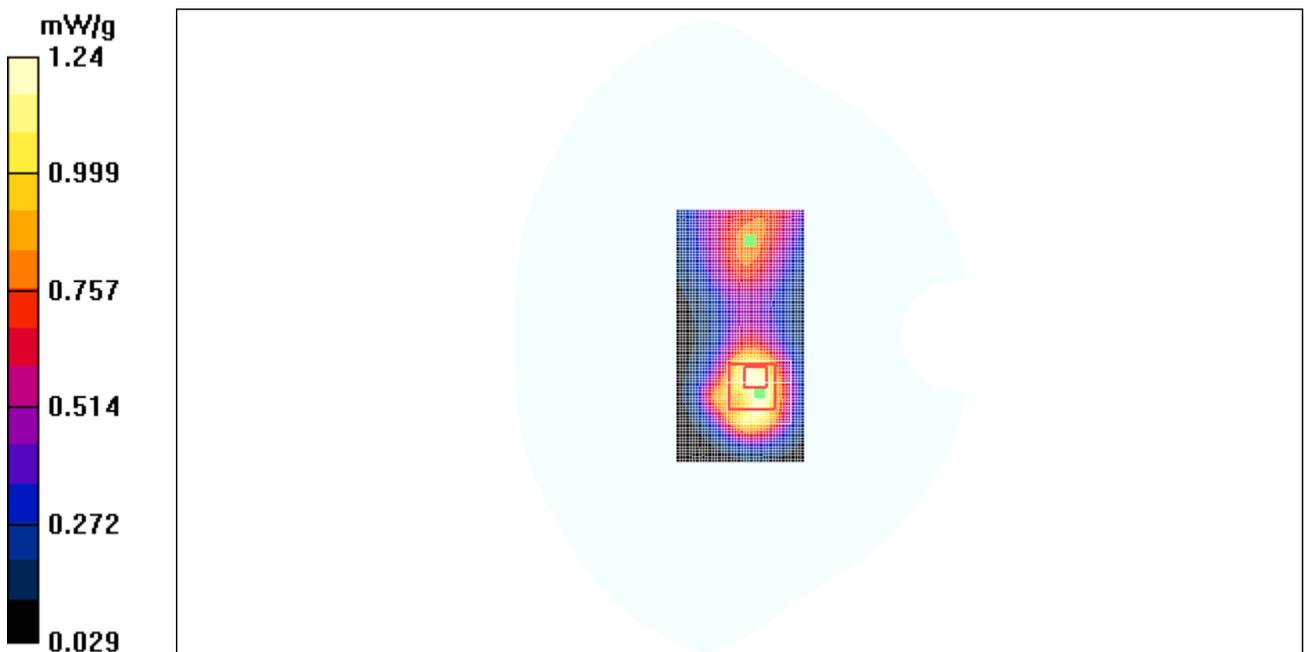


Figure 32 CDMA Cellular EV-DO REV.0 Test Position 3 Channel 777

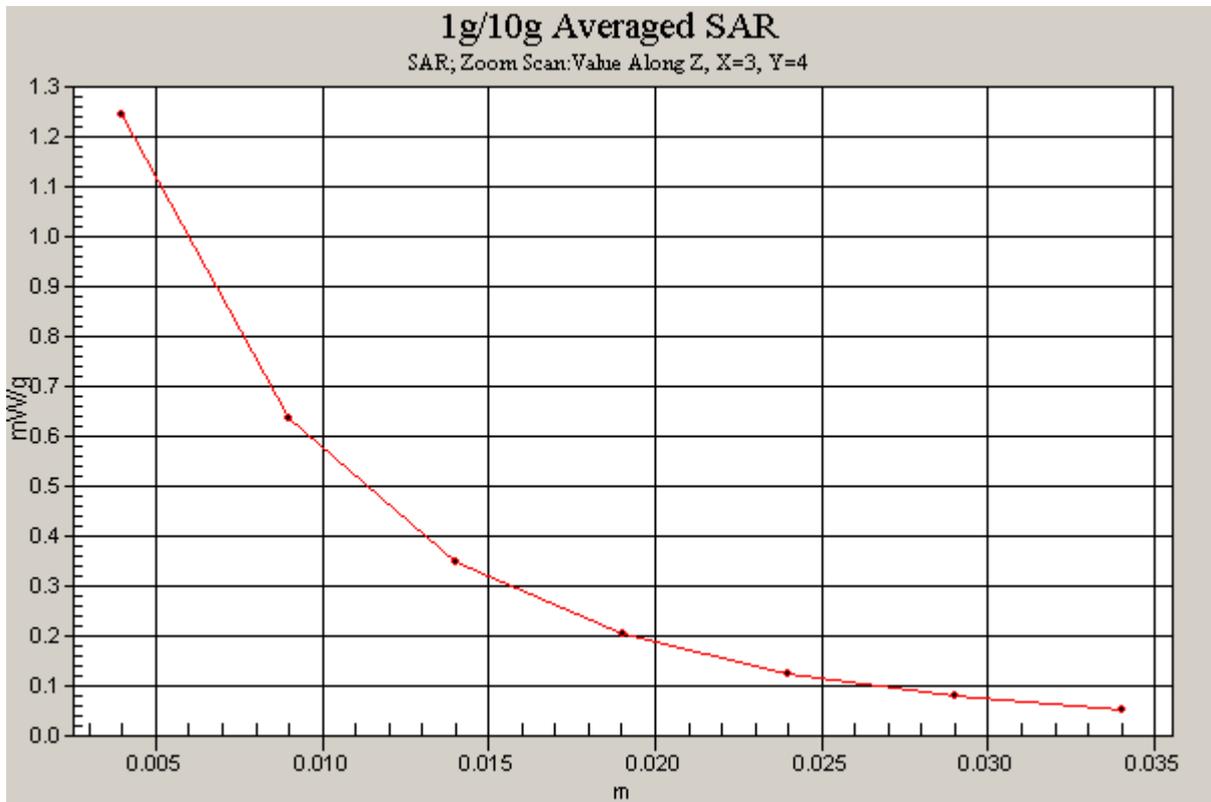


Figure 33 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 Test Position 3 Channel 777)

**CDMA Cellular EV-DO REV.0 Test Position 3 Middlefrequency**

Communication System: CDMA Cellular EVDO(Rev.0); Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.02$  mho/m;  $\epsilon_r = 55.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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

Electronics: DAE4 Sn452;

**Test Position 3 Middle/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.909 mW/g

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

Reference Value = 25.2 V/m; Power Drift = -0.045 dB

Peak SAR (extrapolated) = 1.72 W/kg

**SAR(1 g) = 0.855 mW/g; SAR(10 g) = 0.472 mW/g**

Maximum value of SAR (measured) = 0.953 mW/g

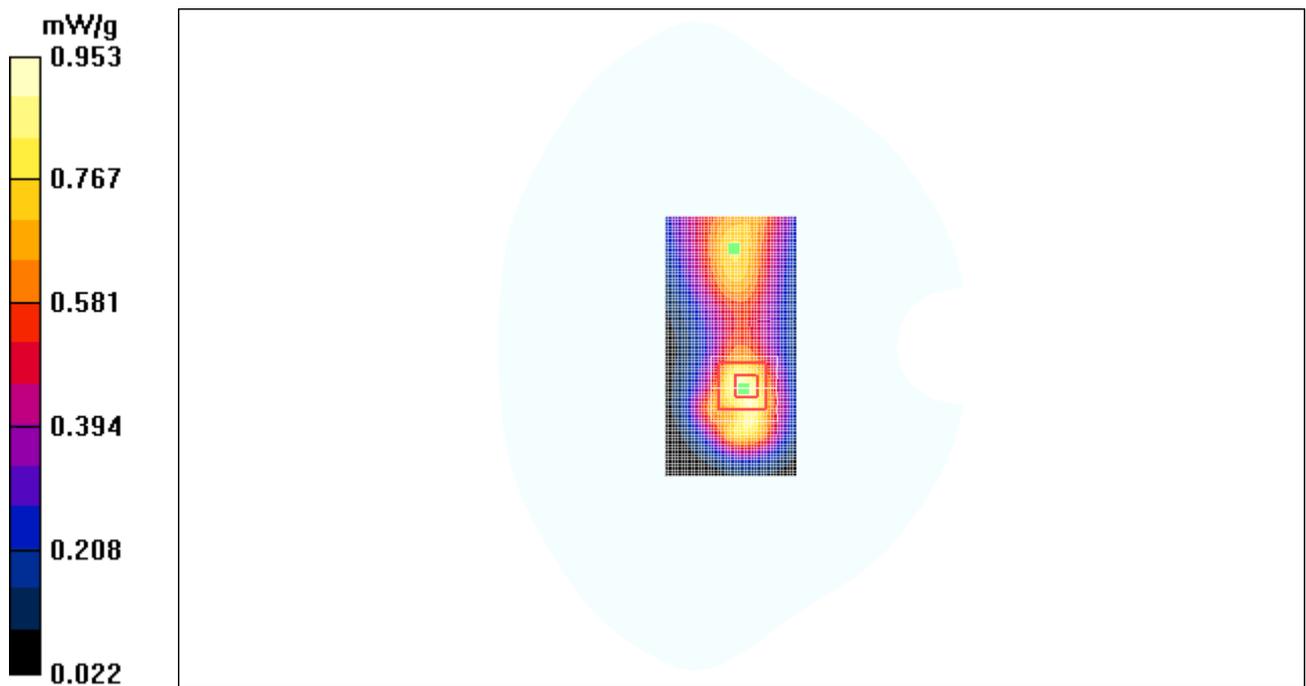


Figure 34 CDMA Cellular EV-DO REV.0 Test Position 3 Channel 384

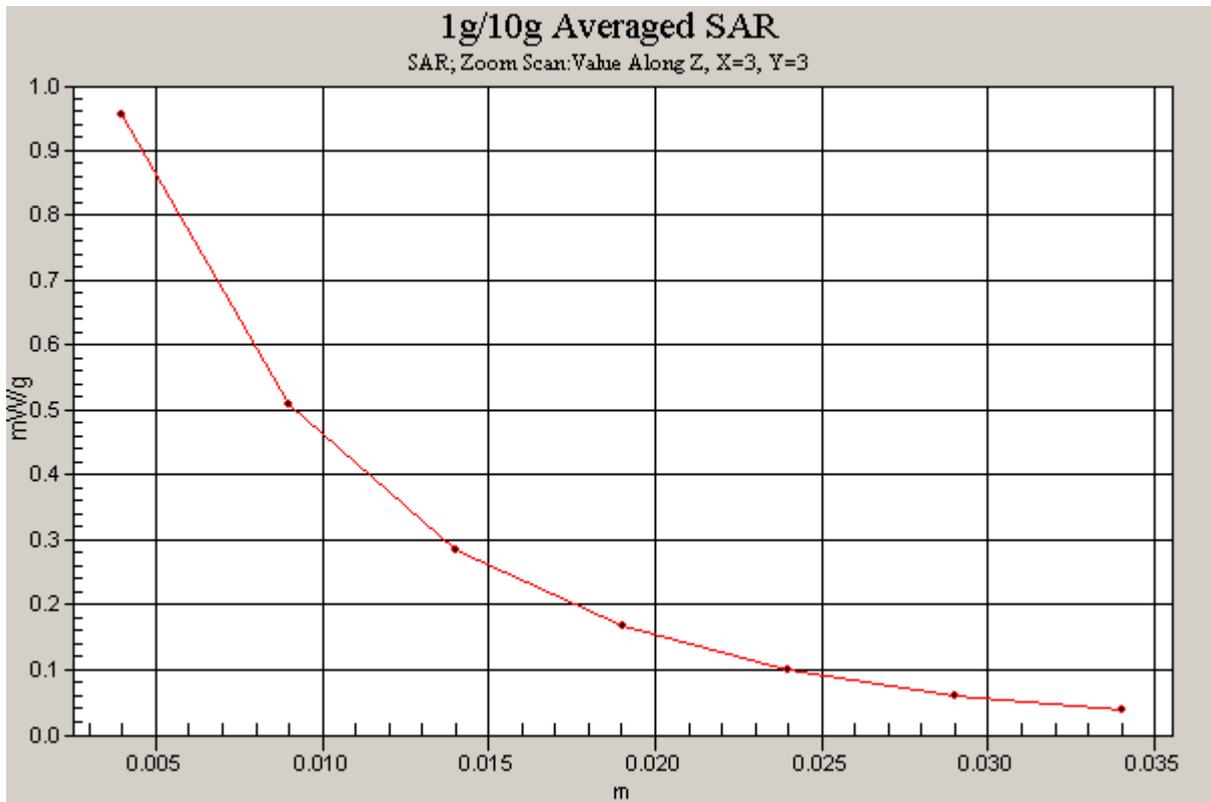


Figure 35 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 Test Position 3 Channel 384)

**CDMA Cellular EV-DO REV.0 Test Position 3 Low frequency**

Communication System: CDMA Cellular EVDO(Rev.0); Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 825$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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

Electronics: DAE4 Sn452;

**Test Position 3 Low/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.999 mW/g

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

Reference Value = 28.6 V/m; Power Drift = -0.152 dB

Peak SAR (extrapolated) = 1.75 W/kg

**SAR(1 g) = 0.937 mW/g; SAR(10 g) = 0.535 mW/g**

Maximum value of SAR (measured) = 1.03 mW/g

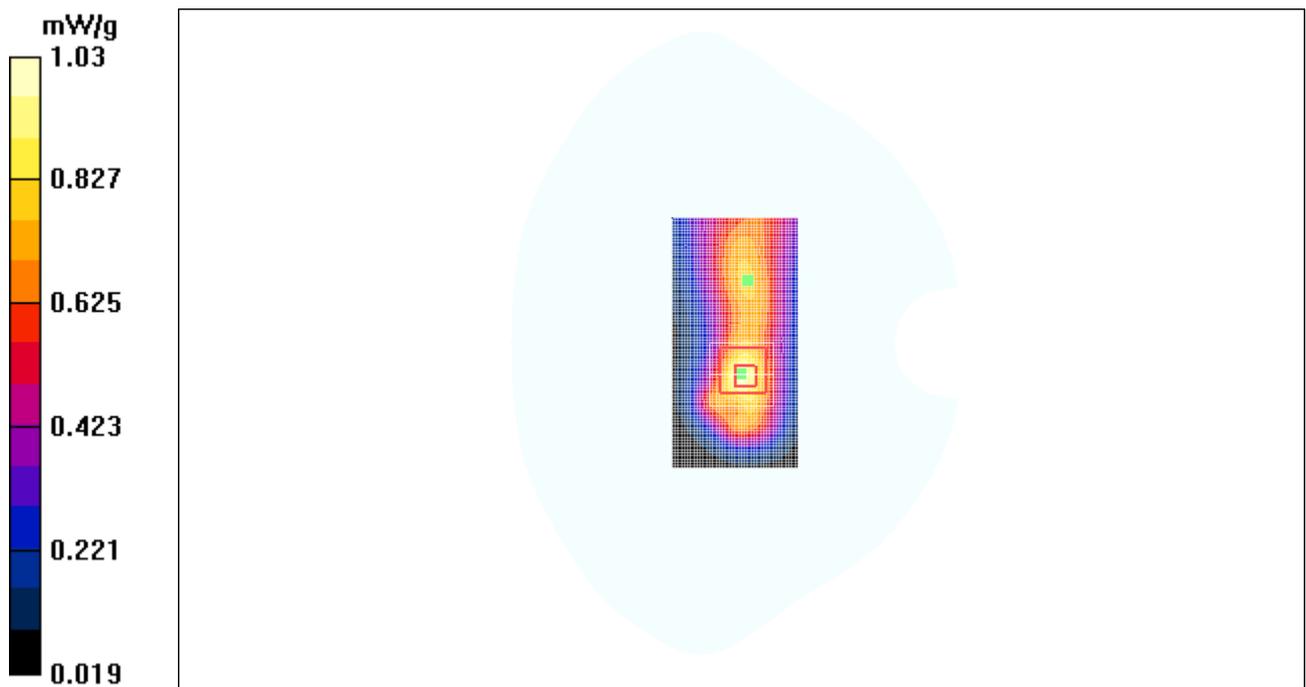


Figure 36 CDMA Cellular EV-DO REV.0 Test Position 3 Channel 1013

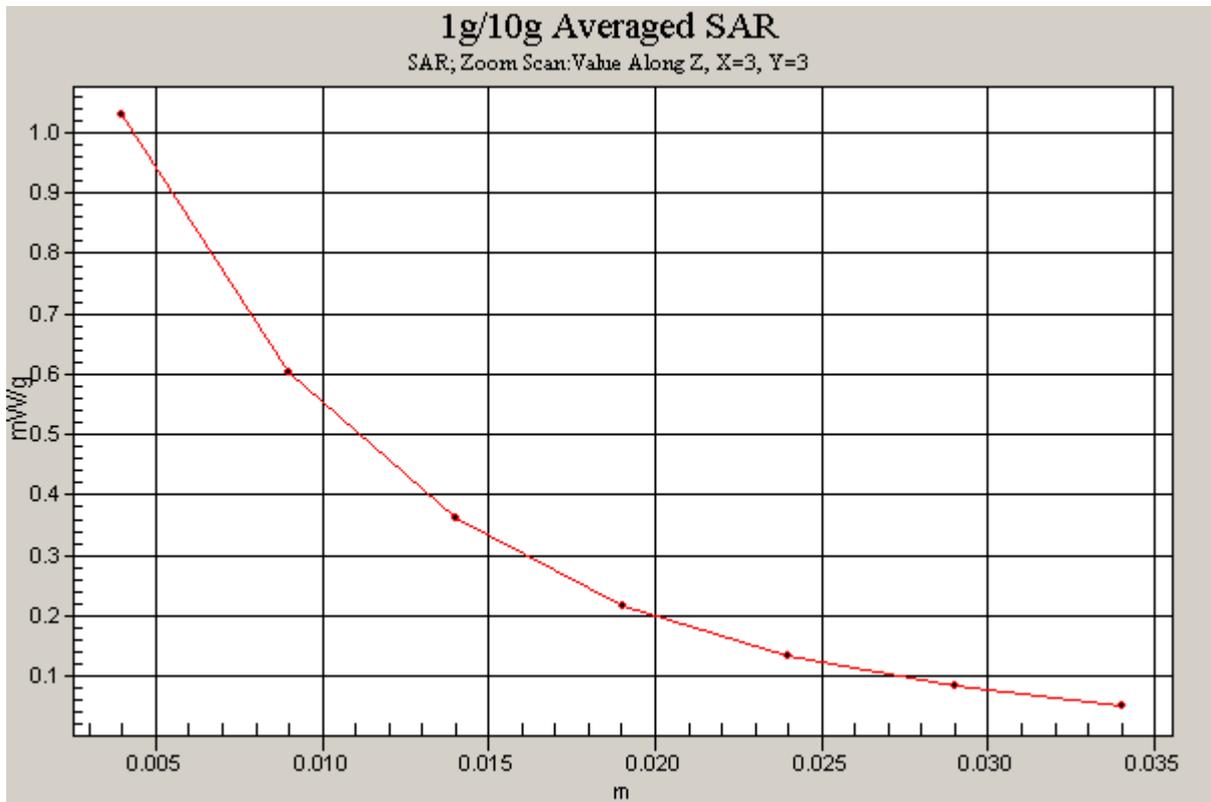


Figure 37 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 Test Position 3 Channel 1013)

**CDMA Cellular EV-DO REV.0 Test Position 4 Middlefrequency**

Communication System: CDMA Cellular EVDO(Rev.0); Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837 \text{ MHz}$ ;  $\sigma = 1.02 \text{ mho/m}$ ;  $\epsilon_r = 55.7$ ;  $\rho = 1000 \text{ kg/m}^3$

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

Electronics: DAE4 Sn452;

**Test Position 4 Middle/Area Scan (41x111x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.404 mW/g

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

Reference Value = 17.5 V/m; Power Drift = 0.060 dB

Peak SAR (extrapolated) = 0.629 W/kg

**SAR(1 g) = 0.358 mW/g; SAR(10 g) = 0.208 mW/g**

Maximum value of SAR (measured) = 0.395 mW/g

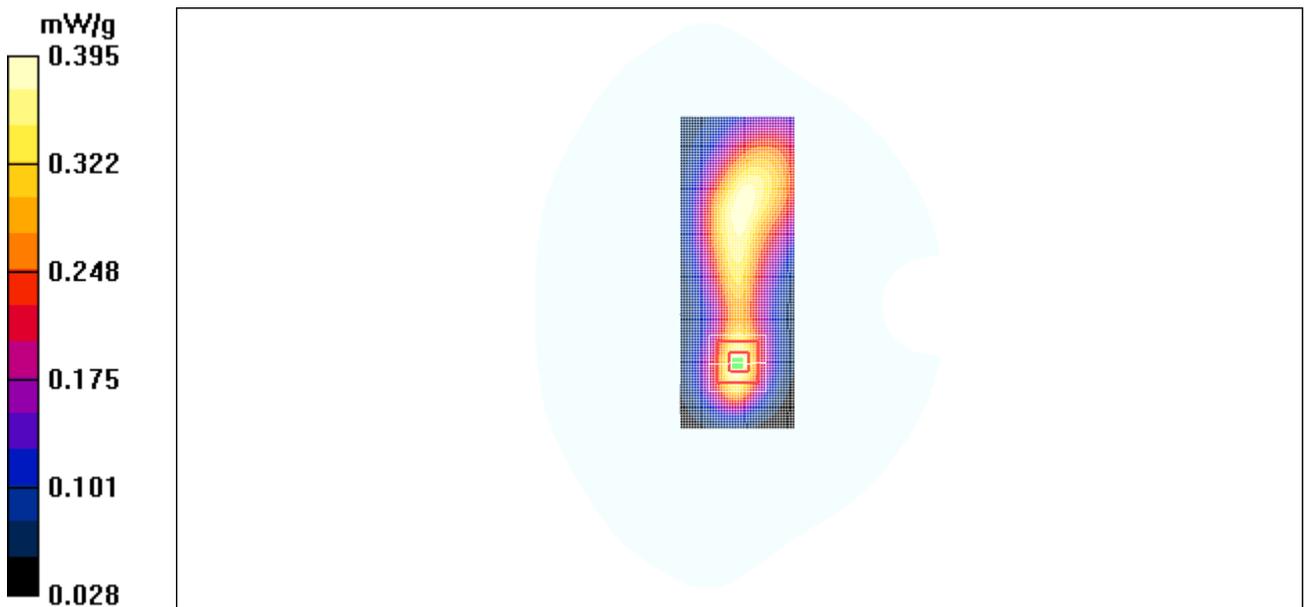


Figure 38 CDMA Cellular EV-DO REV.0 Test Position 4 Channel 384

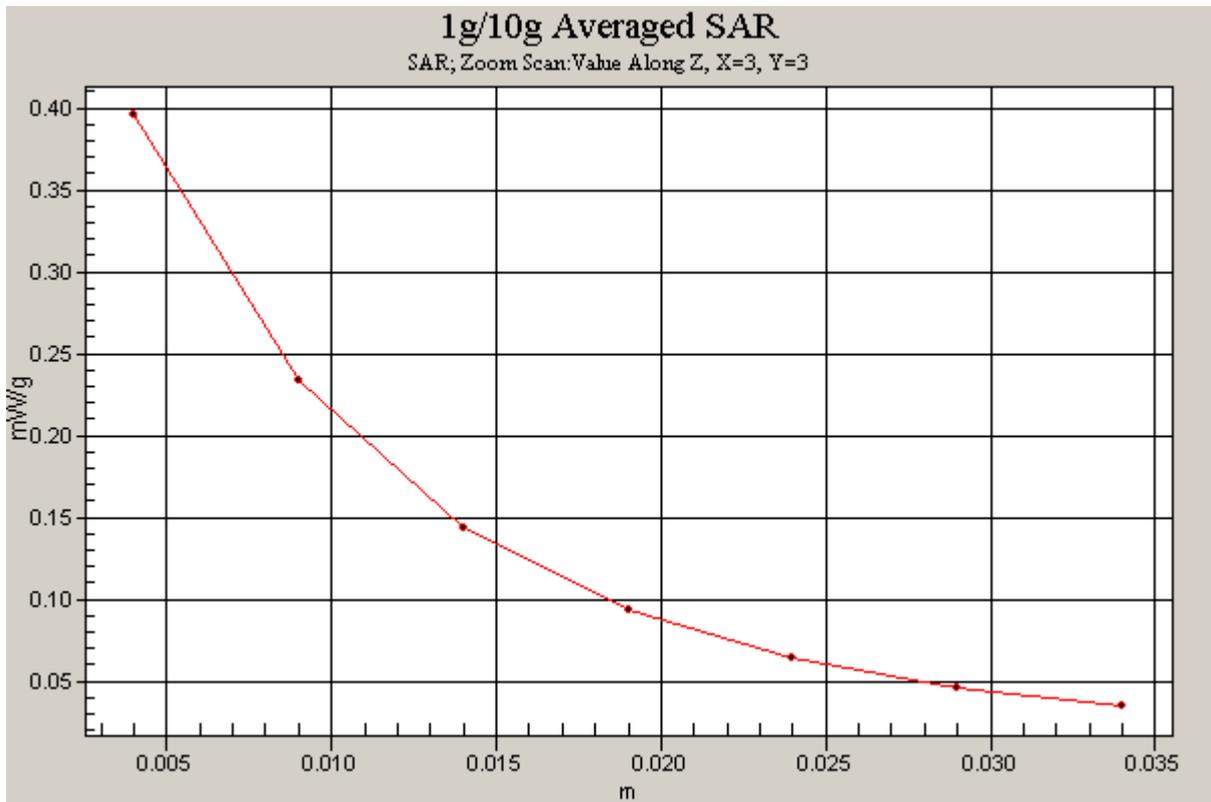


Figure 39 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 Test Position 4 Channel 384)

**CDMA Cellular EV-DO REV.0 Test Position 5 Middle frequency**

Communication System: CDMA Cellular EVDO(Rev.0); Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.02$  mho/m;  $\epsilon_r = 55.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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

Electronics: DAE4 Sn452;

**Test Position 5 Middle/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.476 mW/g

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

Reference Value = 22.8 V/m; Power Drift = -0.029 dB

Peak SAR (extrapolated) = 2.08 W/kg

**SAR(1 g) = 0.457 mW/g; SAR(10 g) = 0.152 mW/g**

Maximum value of SAR (measured) = 0.504 mW/g

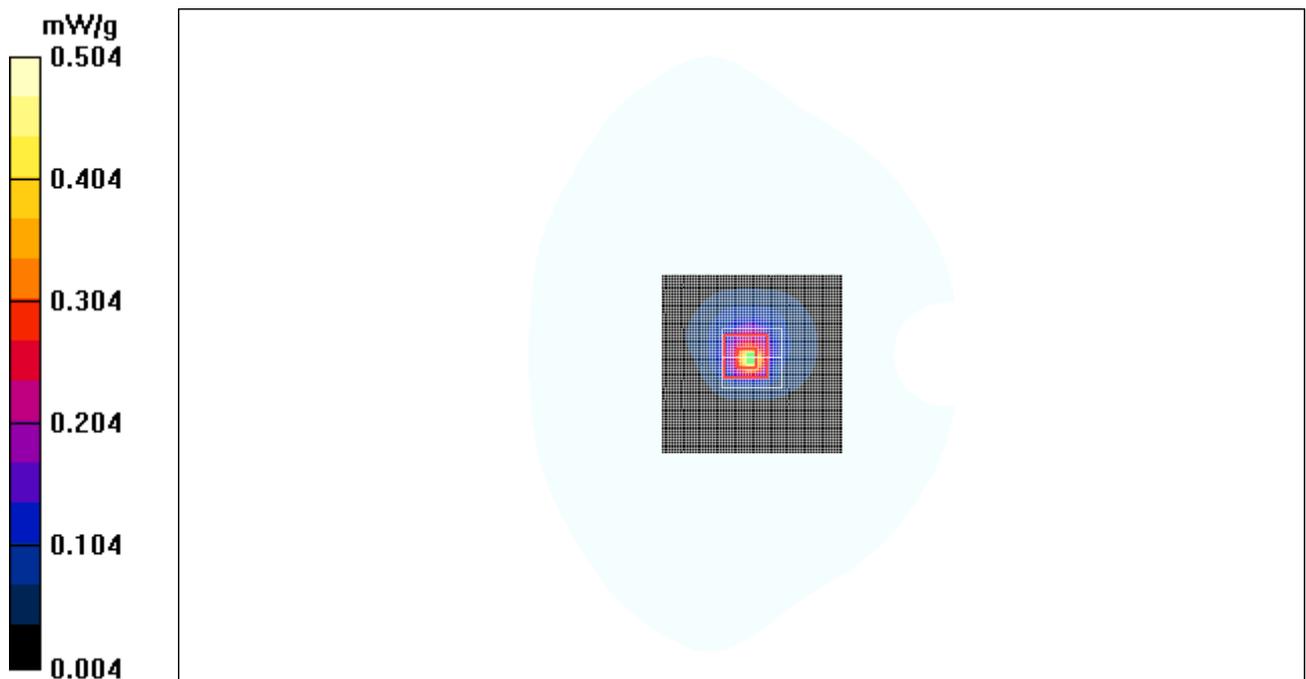


Figure 40 CDMA Cellular EV-DO REV.0 Test Position 5 Channel 384

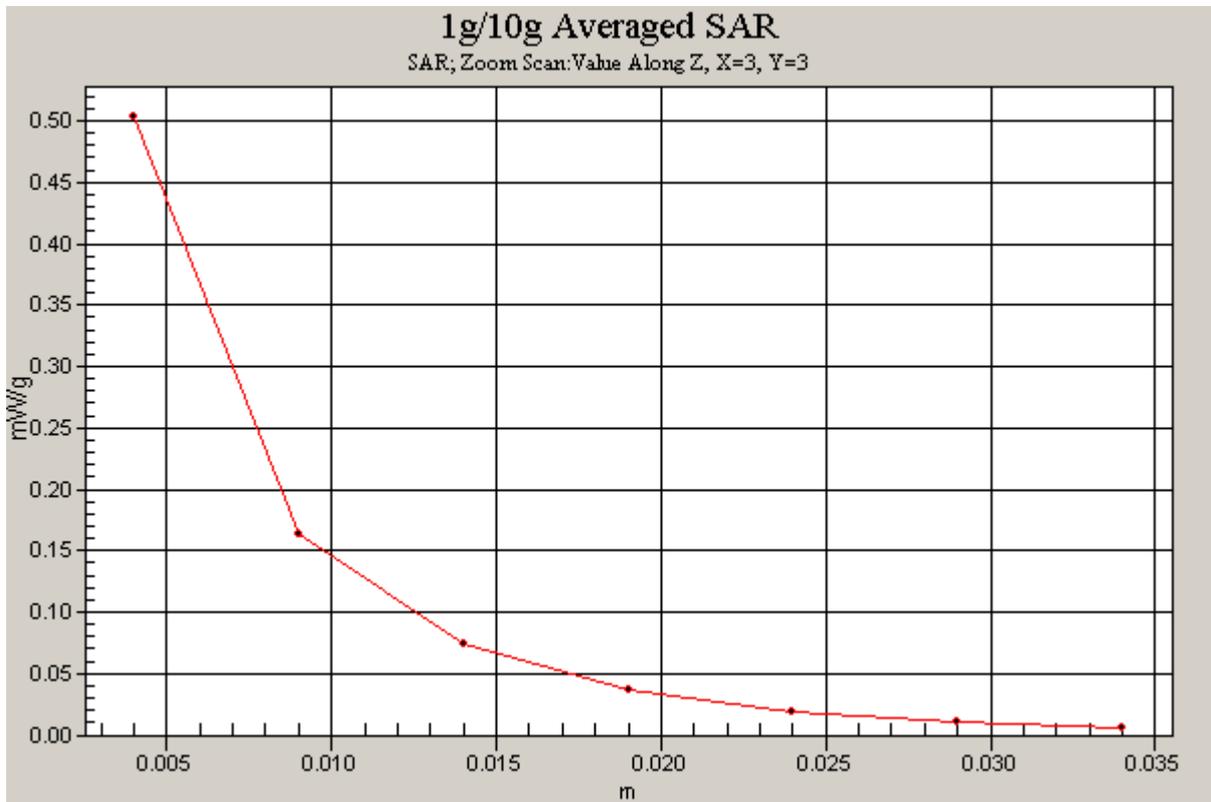


Figure 41 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 Test Position 5 Channel 384)

**CDMA Cellular EV-DO REV.0 Test Position 6 Middle frequency**

Communication System: CDMA Cellular EVDO(Rev.0); Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.02$  mho/m;  $\epsilon_r = 55.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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

Electronics: DAE4 Sn452;

**Test Position 6 Middle/Area Scan (41x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.760 mW/g

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

Reference Value = 19.4 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 1.05 W/kg

**SAR(1 g) = 0.687 mW/g; SAR(10 g) = 0.443 mW/g**

Maximum value of SAR (measured) = 0.745 mW/g

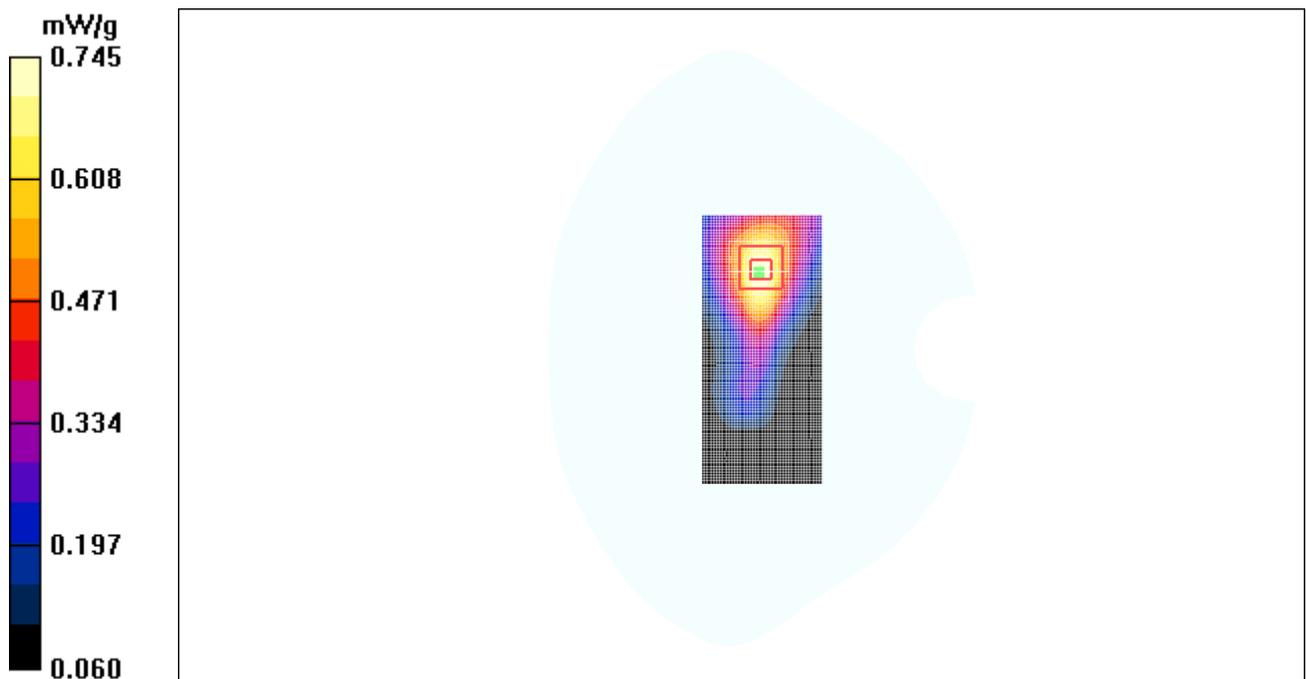


Figure 42 CDMA Cellular EV-DO REV.0 Test Position 6 Channel 384

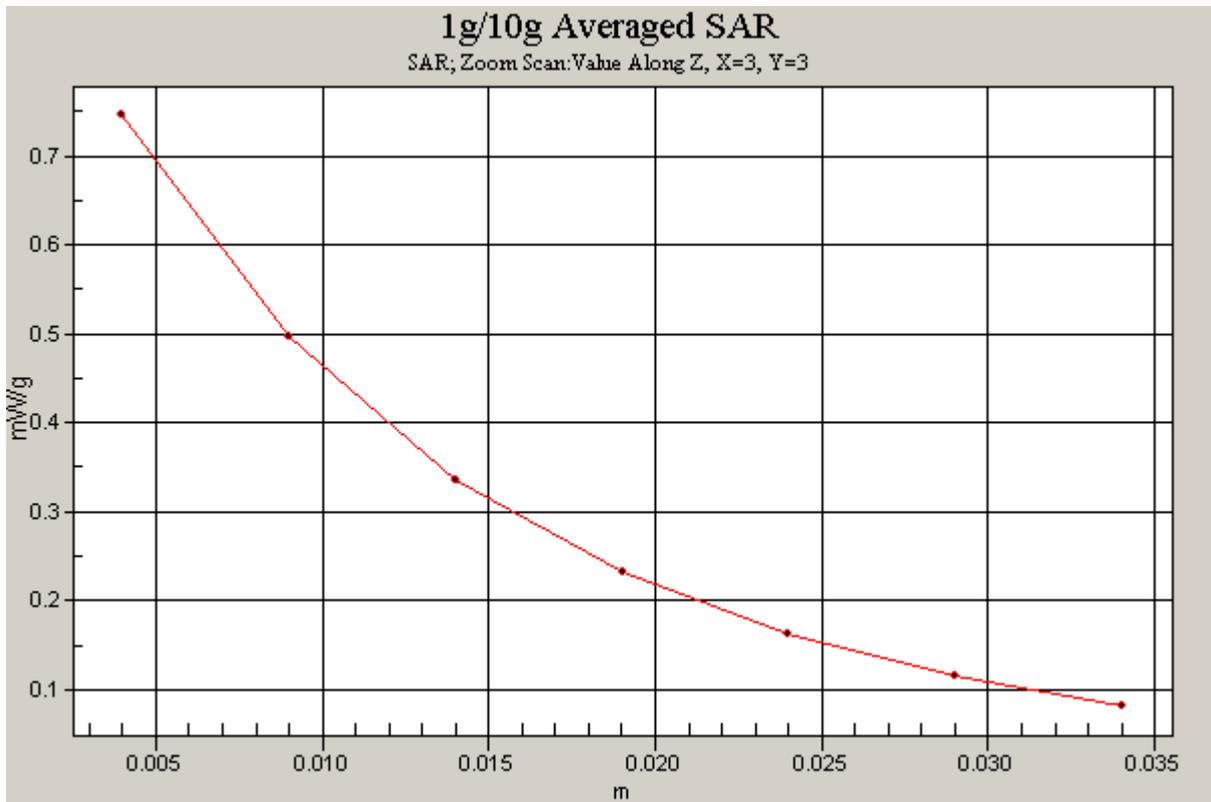


Figure 43 Z-Scan at power reference point (CDMA Cellular EV-DO REV.0 Test Position 6 Channel 384)

**CDMA Cellular EV-DO REV.A Test Position 3 High frequency**

Communication System: CDMA Cellular EVDO(Rev.A); Frequency: 848.31 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 848.31$  MHz;  $\sigma = 1.03$  mho/m;  $\epsilon_r = 55.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);  
Electronics: DAE4 Sn452;

**Test Position 3 High/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.26 mW/g

**Test Position 3 High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 25.8 V/m; Power Drift = -0.133 dB  
Peak SAR (extrapolated) = 2.62 W/kg  
**SAR(1 g) = 1.18 mW/g; SAR(10 g) = 0.647 mW/g**  
Maximum value of SAR (measured) = 1.32 mW/g

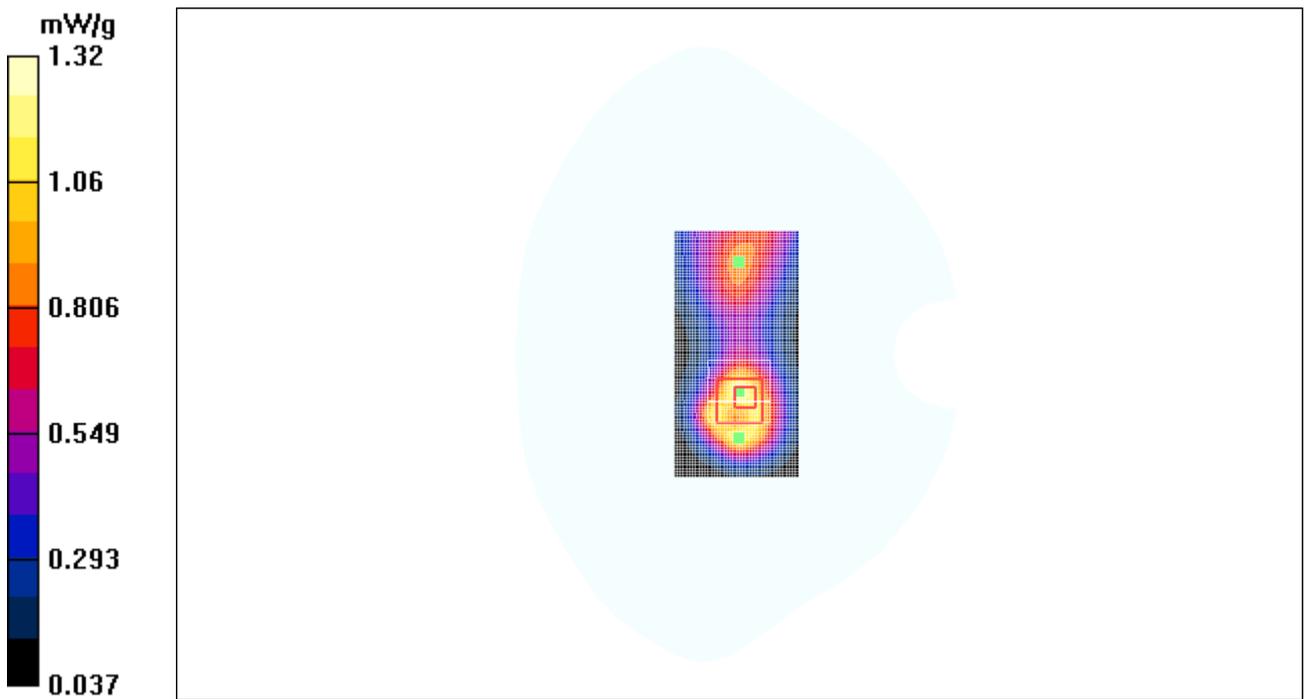


Figure 44 CDMA Cellular EV-DO REV.A Test Position 3 Channel 777

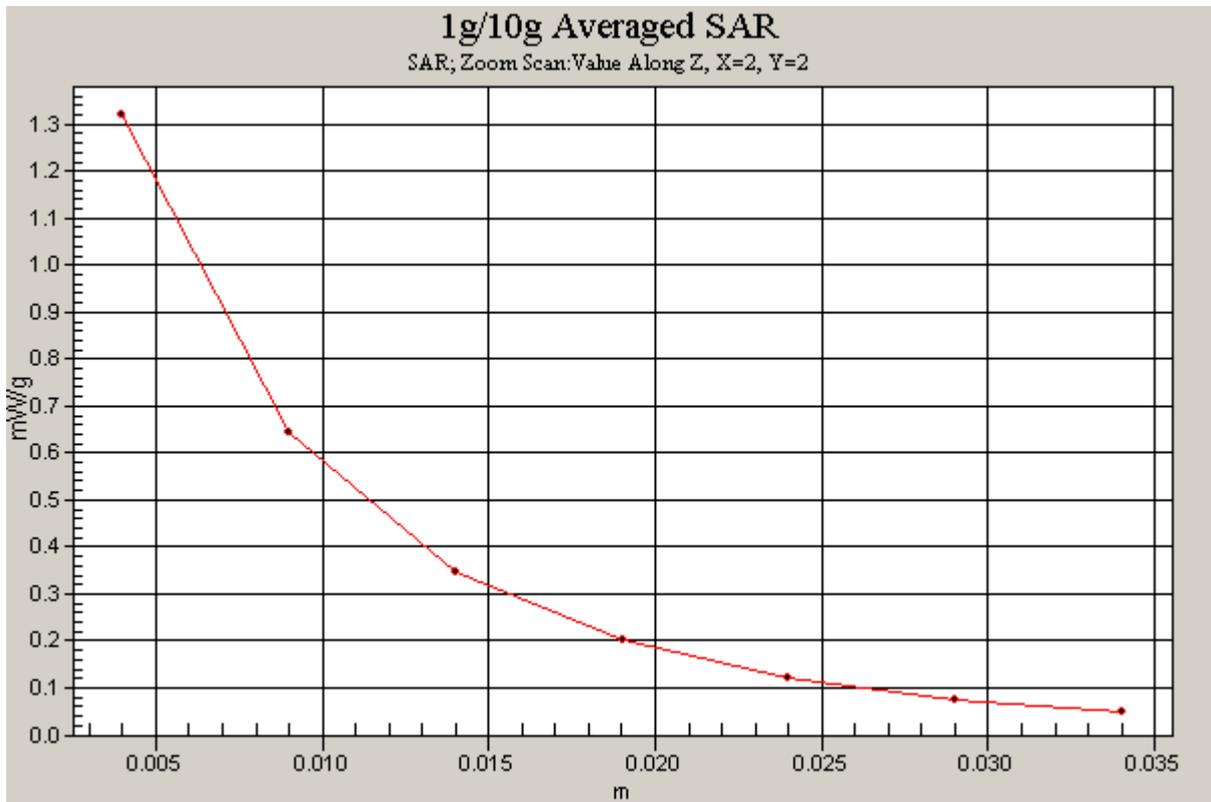


Figure 45 Z-Scan at power reference point (CDMA Cellular EV-DO REV.A Test Position 3 Channel 777)

## ANNEX D : SYSTEM VALIDATION RESULTS

### System Performance Check at 835 MHz

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:443

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

Medium: Head 835MHz

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.93 \text{ mho/m}$ ;  $\epsilon_r = 42.95$ ;  $\rho = 1000 \text{ kg/m}^3$

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

- Electronics: DAE4 Sn452;

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

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

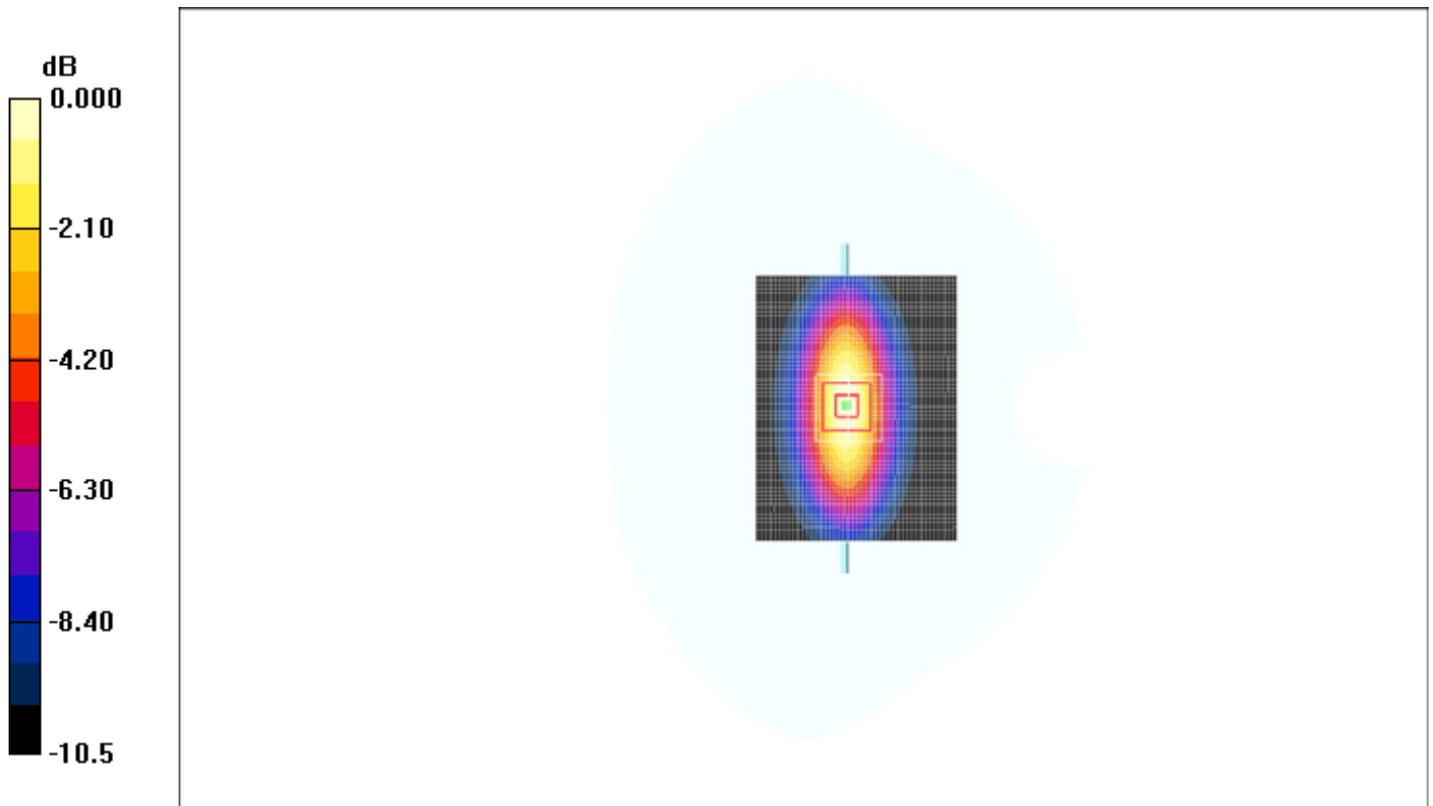
**d=15mm, Pin=250mW/Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 3.44 W/kg

**SAR(1 g) = 2.34 mW/g; SAR(10 g) = 1.53 mW/g**

Maximum value of SAR (measured) = 2.52 mW/g



0 dB = 2.52mW/g

Figure 46 System Performance Check 835MHz 250mW

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

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## ANNEX E : PROBE CALIBRATION CERTIFICATE

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



**S** Schweizerischer Kalibrierdienst  
**S** 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

Client **ATL (Auden)**

Certificate No: **ET3-1531\_Jan08**

### CALIBRATION CERTIFICATE

Object: **ET3DV6 - SN:1531**

Calibration procedure(s): **QA CAL-01 v8 and QA CAL-12 v5  
Calibration procedure for dosimetric E-field probes**

Calibration date: **January 29, 2008**

Condition of the calibrated item: **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41485277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498067	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (SPEAG, No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390565	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Katja Petrovic	Technical Manager	
Approved by:	Nils Kuster	Quality Manager	

Issued: January 29, 2008

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

Certificate No: ET3-1531\_Jan08

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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  
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Accredited by the Swiss Accreditation Service (SAS)  
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Accreditation No.: SCS 108

**Glossary:**

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

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

- 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
- 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:**

- NORM<sub>x,y,z</sub>:** Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* 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*.
- DCP<sub>x,y,z</sub>:** 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  $f \leq 800$  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 NORM<sub>x,y,z</sub> \* *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  $\pm 50$  MHz to  $\pm 100$  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.