



# SAR TEST REPORT

No. 2013SAR00002

For

**TCT Mobile Limited**

**UMTS Triband / GSM Quadband mobile phone**

**Model name: MiniQ 3G AWS1**

**Marketing name: ONE TOUCH 875T**

With

**Hardware Version: PIO02**

**Software Version: G15**

**FCC ID: RAD296**

**Issued Date: 2013-01-21**



**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of TMC Beijing.

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### Revision Version

<b>Report Number</b>	<b>Revision</b>	<b>Date</b>	<b>Memo</b>
2013SAR00002	00	2013-01-21	Initial creation of test report

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## 1 Test Laboratory

### 1.1 Testing Location

Company Name: TMC Beijing, Telecommunication Metrology Center of MIIT  
Address: No 52, Huayuan beilu, Haidian District, Beijing, P.R.China  
Postal Code: 100191  
Telephone: +86-10-62304633  
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### 1.2 Testing Environment

Temperature: 18°C~25 °C,  
Relative humidity: 30%~ 70%  
Ground system resistance: < 0.5  $\Omega$   
Ambient noise & Reflection: < 0.012 W/kg

### 1.3 Project Data

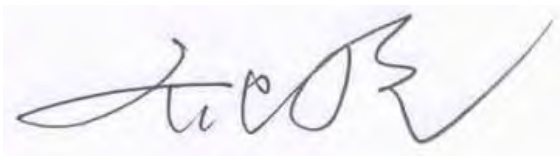
Project Leader: Qi Dianyuan  
Test Engineer: Lin Xiaojun  
Testing Start Date: January 10, 2013  
Testing End Date: January 12, 2013

### 1.4 Signature



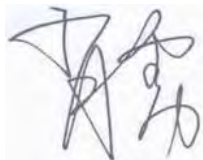
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Lin Xiaojun  
(Prepared this test report)



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Qi Dianyuan  
(Reviewed this test report)



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Xiao Li  
Deputy Director of the laboratory  
(Approved this test report)

## 2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for TCT Mobile Limited UMTS Triband / GSM Quadband mobile phone MiniQ 3G AWS1 / ONE TOUCH 875T are as follows:

**Table 2.1: Max. Reported SAR (1g)**

Band	Position	Reported SAR 1g (W/Kg)
GSM 850	Head (Slide down)	0.02
	Head (Slide up)	0.02
	Body (Slide down)	0.09
	Body (Slide up)	0.10
GSM 1900	Head (Slide down)	0.50
	Head (Slide up)	0.37
	Body (Slide down)	0.48
	Body (Slide up)	0.51
WCDMA 850	Head (Slide down)	0.03
	Head (Slide up)	0.03
	Body (Slide down)	0.10
	Body (Slide up)	0.11
WCDMA 1700	Head (Slide down)	1.27
	Head (Slide up)	0.89
	Body (Slide down)	1.39
	Body (Slide up)	0.83
WCDMA 1900	Head (Slide down)	1.05
	Head (Slide up)	0.67
	Body (Slide down)	0.96
	Body (Slide up)	0.74

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1g tissue according to the ANSI C95.1-1999.

For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

The measurement together with the test system set-up is described in annex C of this test report. A detailed description of the equipment under test can be found in chapter 4 of this test report.

The maximum reported SAR value is obtained at the case of **(Table 2.1)**, and the values are: **1.39 W/kg (1g)**.

### 3 Client Information

#### 3.1 Applicant Information

Company Name: TCT Mobile Limited  
Address /Post: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,  
Pudong Area Shanghai, P.R. China. 201203  
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#### 3.2 Manufacturer Information

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City: ShangHai  
Postal Code: 201203  
Country: P.R.China  
Contact: Gong Zhizhou  
Email: zhizhou.gong@jrdcom.com  
Telephone: 0086-21-61460890  
Fax: 0086-21-61460602

## 4 Equipment Under Test (EUT) and Ancillary Equipment (AE)

### 4.1 About EUT

Description:	UMTS Triband / GSM Quadband mobile phone
Model name:	MiniQ 3G AWS1
Marketing name:	ONE TOUCH 875T
Operating mode(s):	GSM 850/900/1800/1900, WCDMA 850/1700/1900, BT
Tested Tx Frequency:	825 – 848.8 MHz (GSM 850)
	1850.2 – 1910 MHz (GSM 1900)
	826.4–846.6 MHz (WCDMA850 Band V)
	1712.4 – 1752.6 MHz (WCDMA 1700 Band IV)
	1852.4–1907.6 MHz (WCDMA1900 Band II)
GPRS Multislot Class:	10
GPRS capability Class:	B
EGPRS Multislot Class:	10
Test device Production information:	Production unit
Device type:	Portable device
Antenna type:	Integrated antenna
Accessories/Body-worn configurations:	Headset

### 4.2 Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	013337000009796 / 013337000009440	PIO02	G15

\*EUT ID: is used to identify the test sample in the lab internally.

**Note:** It is performed to test SAR with the EUT (013337000009796) and conducted power with the EUT (013337000009440).

### 4.3 Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
AE1	Battery	CAB3120000C1	/	BYD
AE2	Battery	CAB3120000C3	/	BAK
AE3	Headset	CCB3160A15C1	/	Juwei
AE4	Headset	CCB3160A15C4	/	Meihao

\*AE ID: is used to identify the test sample in the lab internally.



## 5 TEST METHODOLOGY

### 5.1 Applicable Limit Regulations

**ANSI C95.1–1999:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

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

### 5.2 Applicable Measurement Standards

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

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

**KDB447498 D01: General RF Exposure Guidance v05:** Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

**KDB648474 D04 SAR Handsets Multi Xmitter and Ant v01:** SAR Evaluation Considerations for Wireless Handsets.

**865664 D01 SAR measurement 100 MHz to 6 GHz v01:** SAR Measurement Requirements for 100 MHz to 6 GHz

**865664 D02 SAR Reporting v01:** RF Exposure Compliance Reporting and Documentation Considerations

## 6 Specific Absorption Rate (SAR)

### 6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

### 6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy ( $dW$ ) absorbed by (dissipated in) an incremental mass ( $dm$ ) contained in a volume element ( $dv$ ) of a given density ( $\rho$ ). The equation description is as below:

$$SAR = \frac{d}{dt} \left( \frac{dW}{dm} \right) = \frac{d}{dt} \left( \frac{dW}{\rho dv} \right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = c \left( \frac{\delta T}{\delta t} \right)$$

Where:  $C$  is the specific heat capacity,  $\delta T$  is the temperature rise and  $\delta t$  is the exposure duration, or related to the electrical field in the tissue by

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

Where:  $\sigma$  is the conductivity of the tissue,  $\rho$  is the mass density of tissue and  $E$  is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

## 7 Tissue Simulating Liquids

### 7.1 Targets for tissue simulating liquid

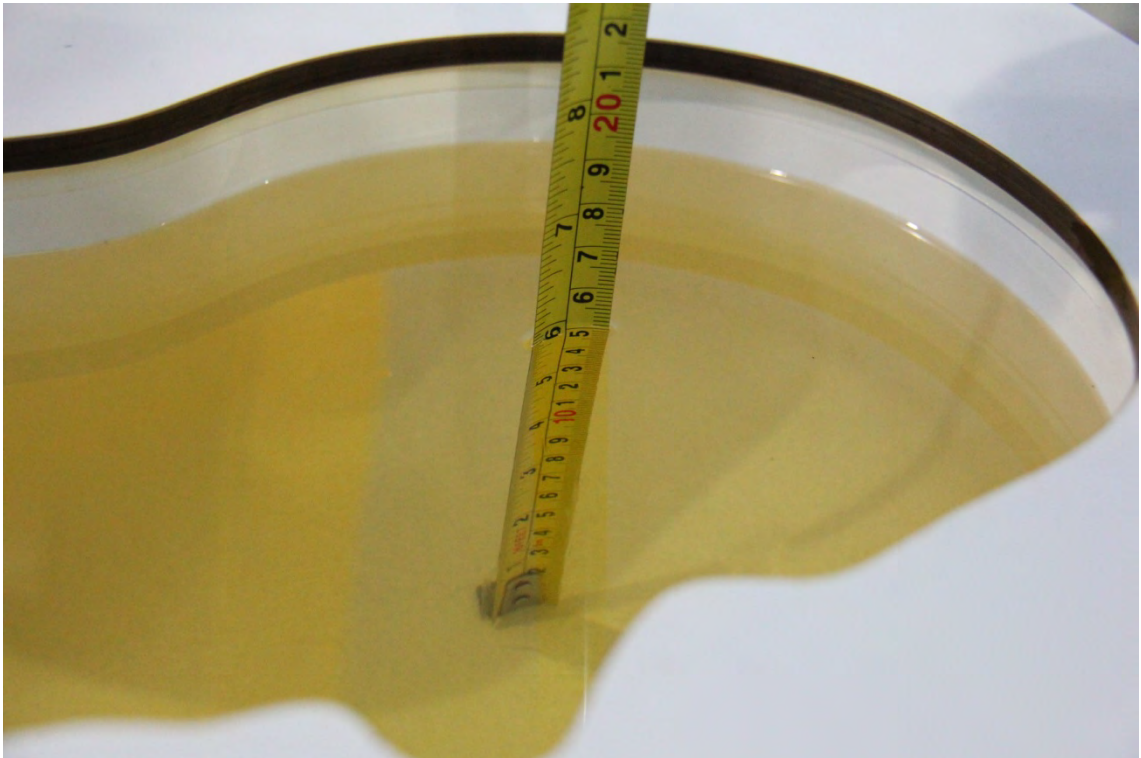
**Table 7.1: Targets for tissue simulating liquid**

Frequency (MHz)	Liquid Type	Conductivity ( $\sigma$ )	$\pm 5\%$ Range	Permittivity ( $\epsilon$ )	$\pm 5\%$ Range
835	Head	0.90	0.86~0.95	41.5	39.4~43.6
835	Body	0.97	0.92~1.02	55.2	52.4~58.0
1750	Head	1.37	1.30~1.44	40.08	38.1~42.1
1750	Body	1.49	1.42~1.56	53.4	50.7~56.1
1900	Head	1.40	1.33~1.47	40.0	38.0~42.0
1900	Body	1.52	1.44~1.60	53.3	50.6~56.0

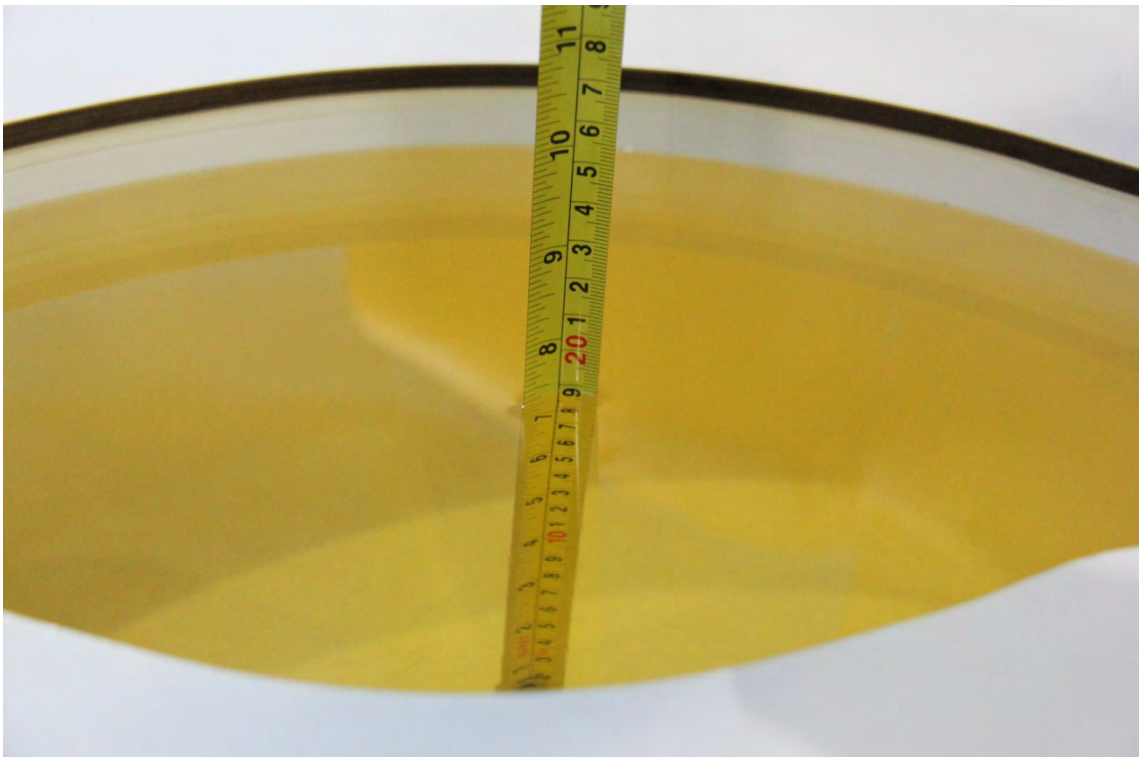
### 7.2 Dielectric Performance

**Table 7.2: Dielectric Performance of Tissue Simulating Liquid**

Measurement Date (yyyy-mm-dd)	Type	Frequency	Permittivity $\epsilon$	Drift (%)	Conductivity $\sigma$ (S/m)	Drift (%)
2013-01-10	Head	835 MHz	40.61	-2.14	0.88	-2.22
	Body	835 MHz	55.71	0.92	0.988	1.86
2013-01-11	Head	1750 MHz	40.06	-0.05	1.362	-0.58
	Body	1750 MHz	53.97	1.07	1.525	2.35
2013-01-12	Head	1900 MHz	39.25	-1.88	1.413	0.93
	Body	1900 MHz	51.92	-2.59	1.492	-1.84

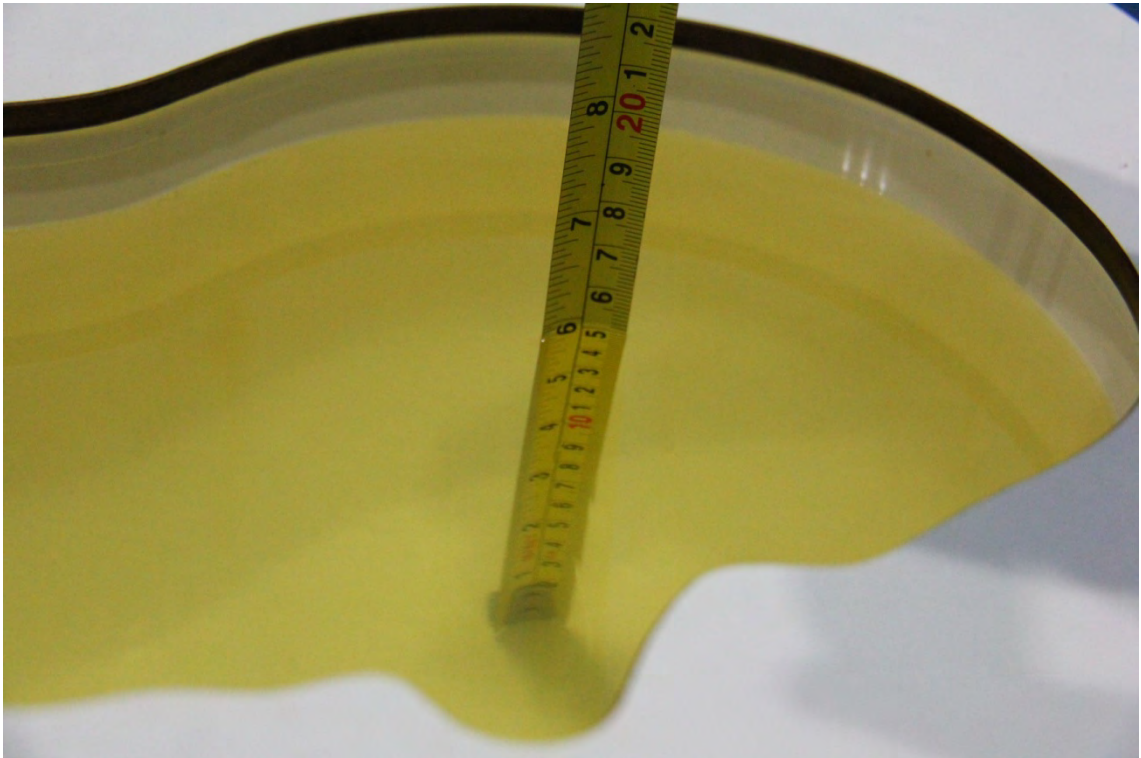


**Picture 7-1: Liquid depth in the Head Phantom (835 MHz)**

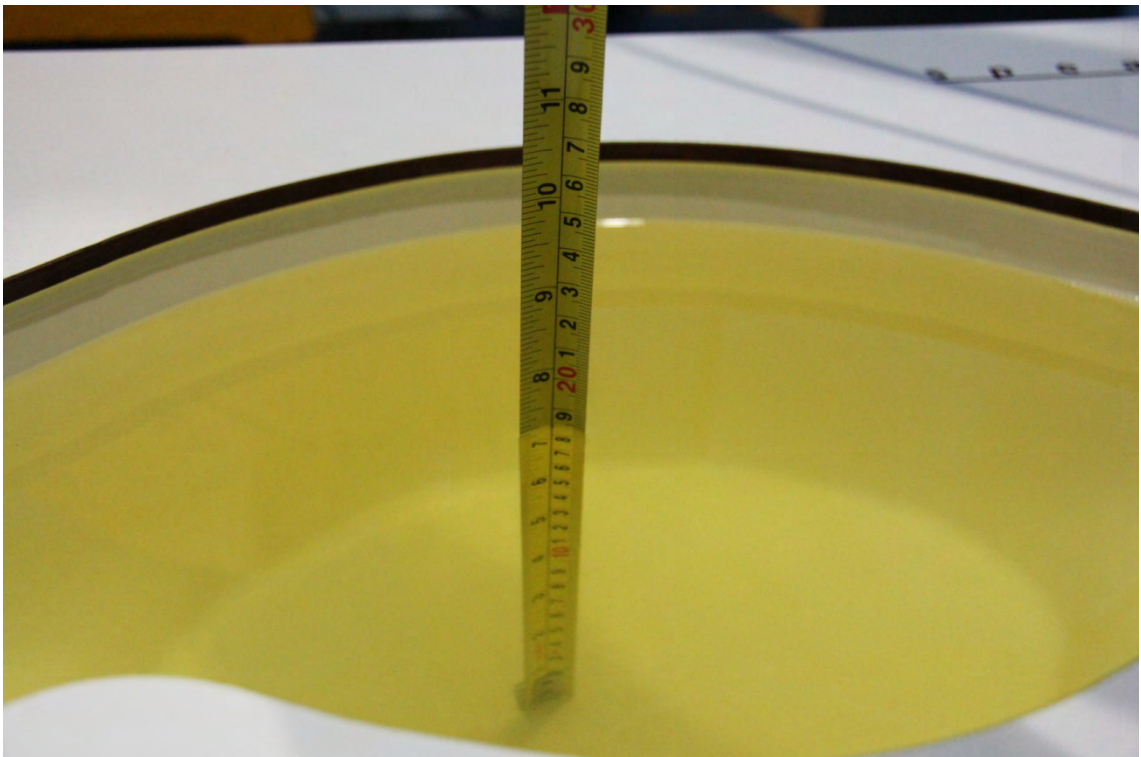


**Picture 7-2: Liquid depth in the Flat Phantom (835 MHz)**

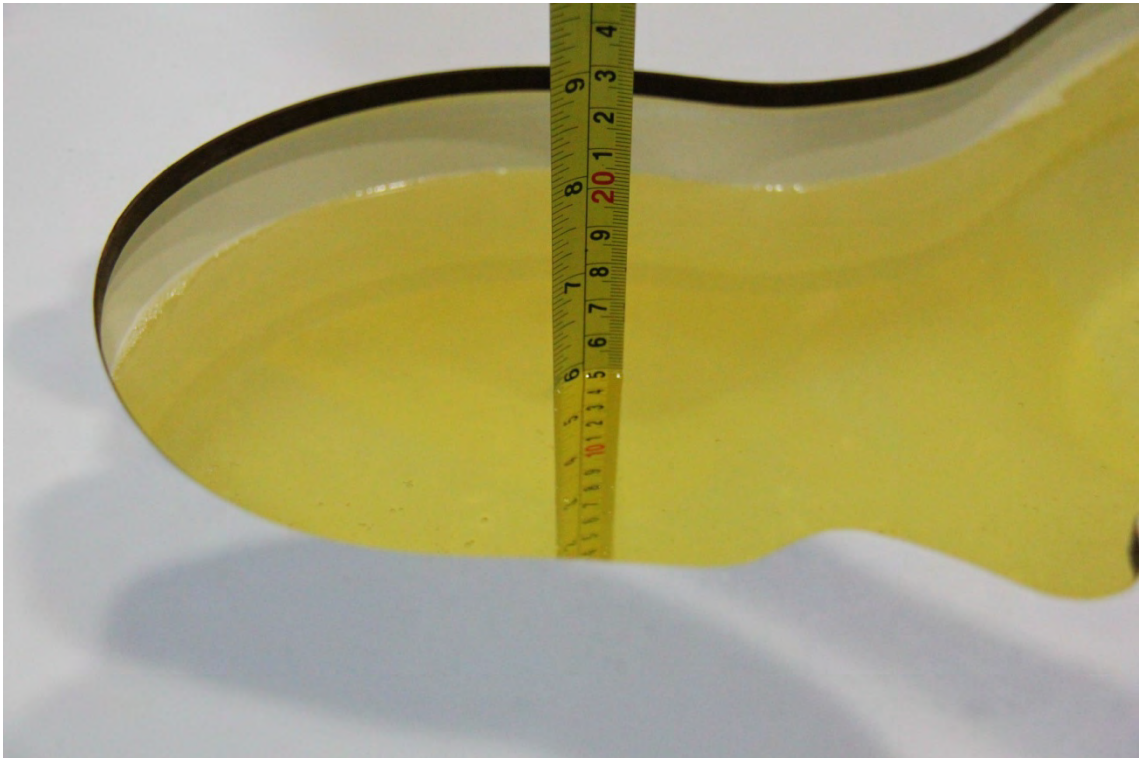




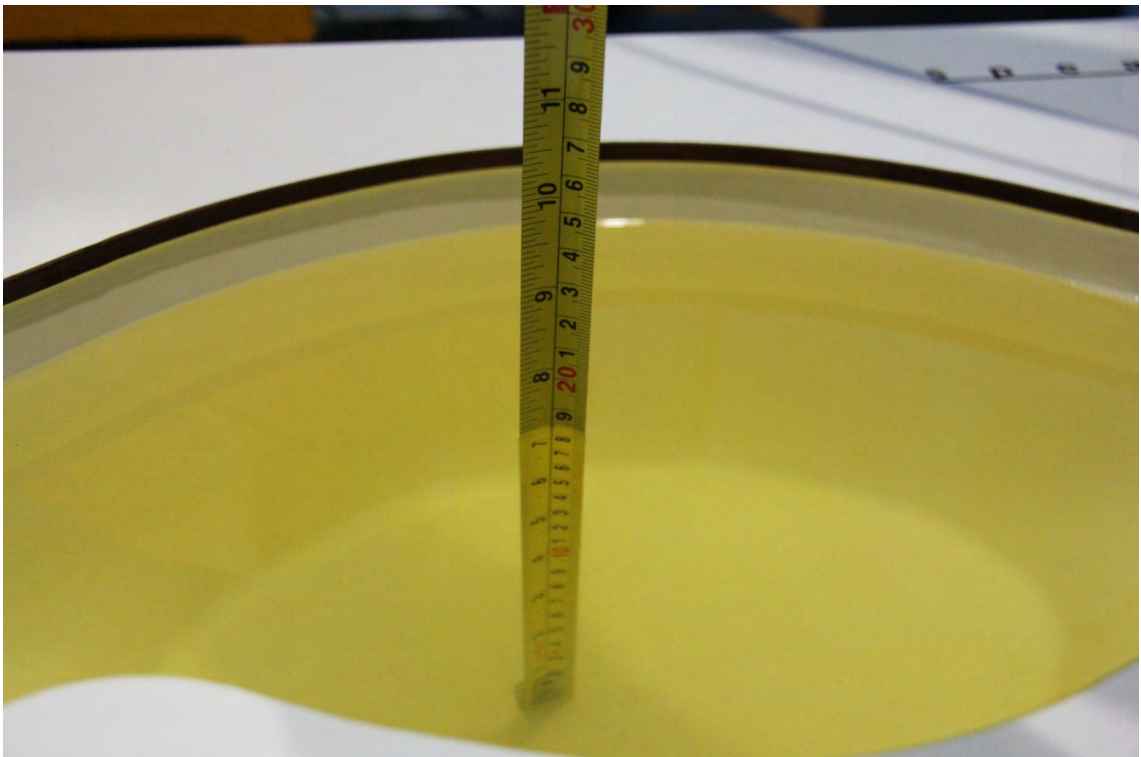
**Picture 7-3: Liquid depth in the Head Phantom (1750 MHz)**



**Picture 7-4 Liquid depth in the Flat Phantom (1750MHz)**



**Picture 7-5 Liquid depth in the Head Phantom (1900MHz)**

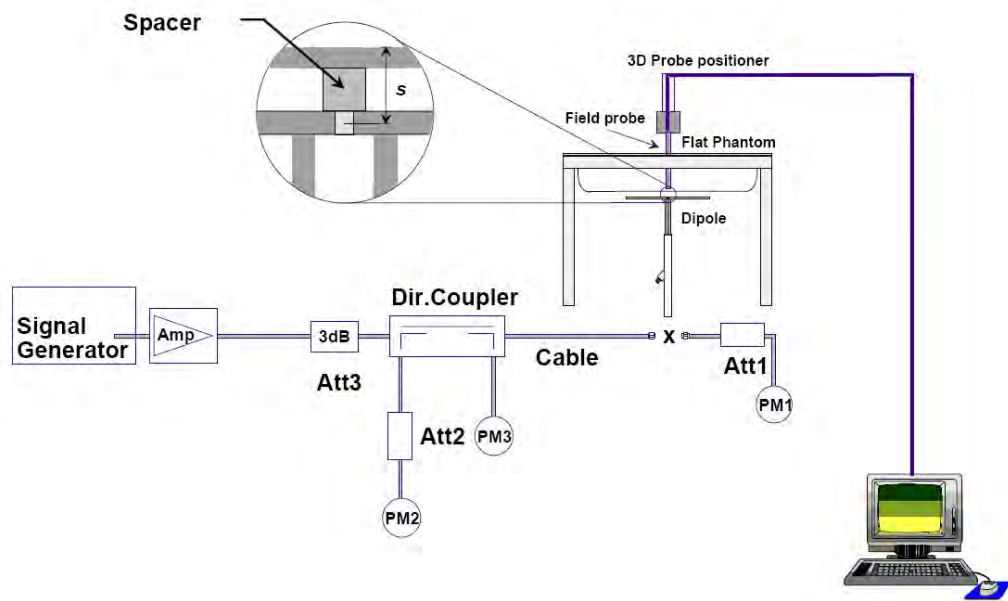


**Picture 7-6 Liquid depth in the Flat Phantom (1900MHz)**

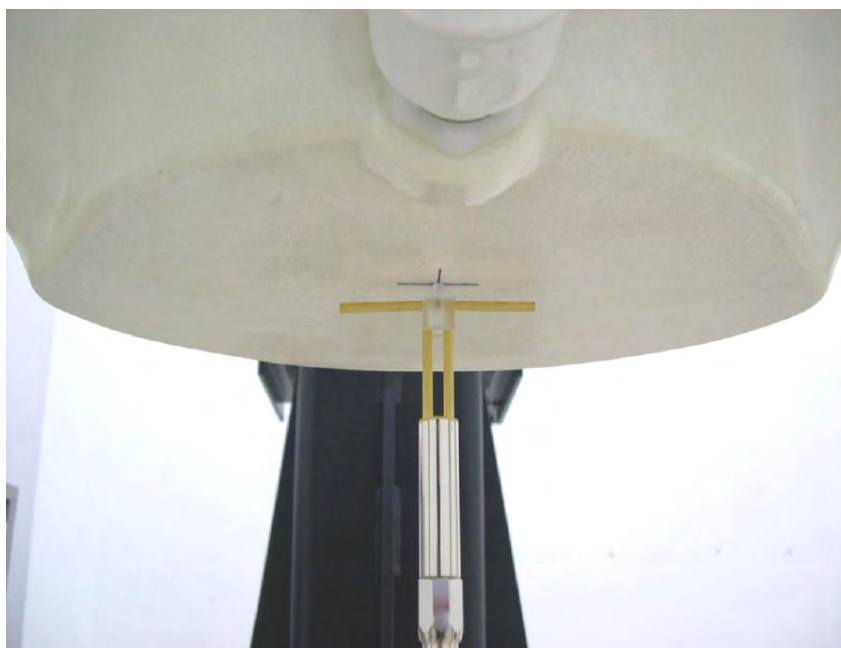
## 8 System verification

### 8.1 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



Picture 8.1 System Setup for System Evaluation



Picture 8.2 Photo of Dipole Setup



## 8.2 System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

The system verification results are required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR. The details are presented in annex B.

**Table 8.1: System Verification of Head**

Measurement Date (yyyy-mm-dd)	Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2013-01-10	835 MHz	6.07	9.30	6.08	9.48	0.16%	1.94%
2013-01-11	1750 MHz	19.3	36.2	19.72	36.72	2.18%	1.44%
2013-01-12	1900 MHz	20.6	39.1	20.24	38.60	-1.75%	-1.28%

**Table 8.2: System Verification of Body**

Measurement Date : 835 MHz <u>January 10, 2013</u> 1750 MHz <u>January 11, 2013</u> 1900 MHz <u>January 12, 2013</u>							
Measurement Date (yyyy-mm-dd)	Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2013-01-10	835 MHz	6.20	9.36	6.32	9.60	1.94%	2.56%
2013-01-11	1750 MHz	20.1	37.4	19.60	35.84	-2.49%	-4.17%
2013-01-12	1900 MHz	21.3	39.9	21.72	40.80	1.97%	2.26%



## 9 Measurement Procedures

### 9.1 Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in Picture 11.1.

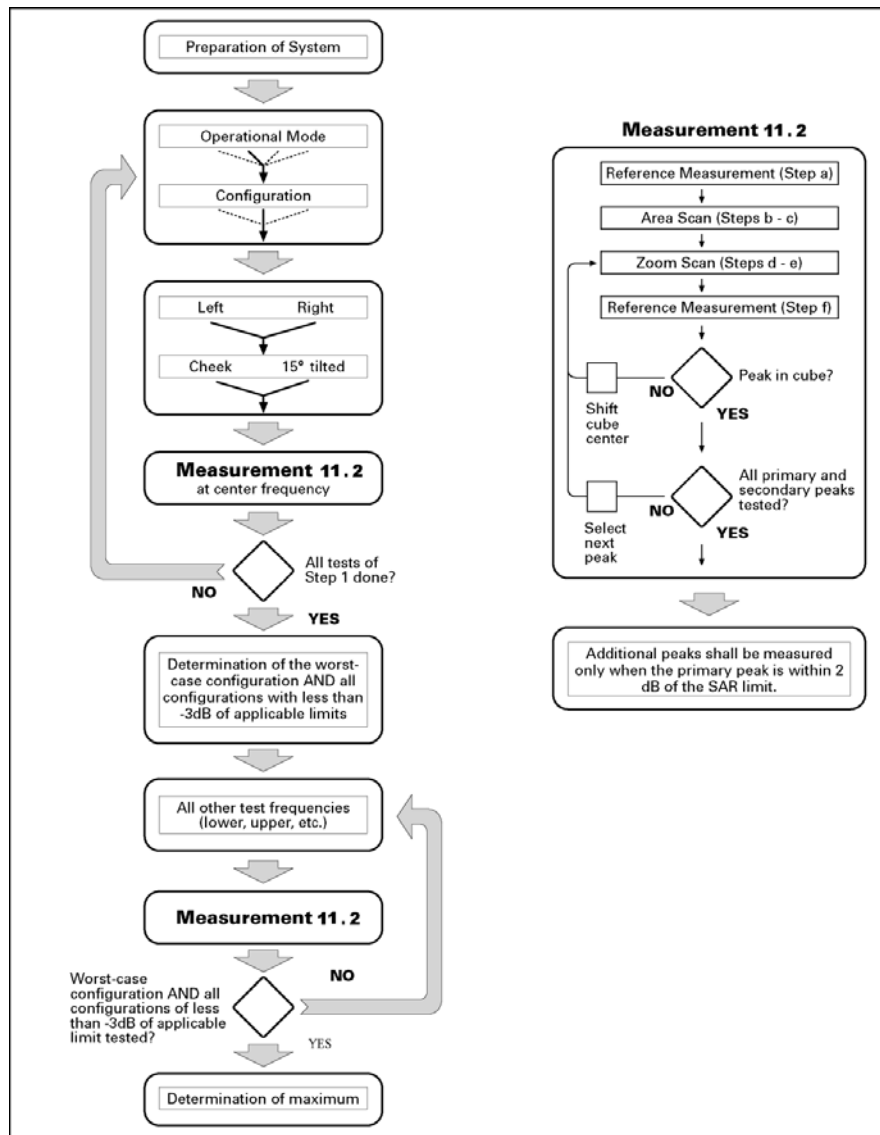
**Step 1:** The tests described in 11.2 shall be performed at the channel that is closest to the centre of the transmit frequency band ( $f_c$ ) for:

- a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in Chapter 8),
- b) all configurations for each device position in a), e.g., antenna extended and retracted, and
- c) all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

If more than three frequencies need to be tested according to 11.1 (i.e.,  $N_c > 3$ ), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

**Step 2:** For the condition providing highest peak spatial-average SAR determined in Step 1, perform all tests described in 11.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

**Step 3:** Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.



Picture 9.1 Block diagram of the tests to be performed

## 9.2 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2003. The results should be documented as part of the system validation records and may be requested to support test results when all the measurement parameters in the following table are not satisfied.

		$\leq 3$ GHz	$> 3$ GHz	
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		$5 \pm 1$ mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm	
Maximum probe angle from probe axis to phantom surface normal at the measurement location		$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$	
Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$		$\leq 2$ GHz: $\leq 15$ mm 2 – 3 GHz: $\leq 12$ mm	3 – 4 GHz: $\leq 12$ mm 4 – 6 GHz: $\leq 10$ mm	
		When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.		
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$ , $\Delta y_{Zoom}$		$\leq 2$ GHz: $\leq 8$ mm 2 – 3 GHz: $\leq 5$ mm*	3 – 4 GHz: $\leq 5$ mm* 4 – 6 GHz: $\leq 4$ mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm	
	graded grid	$\Delta z_{Zoom}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	$\leq 4$ mm	3 – 4 GHz: $\leq 3$ mm 4 – 5 GHz: $\leq 2.5$ mm 5 – 6 GHz: $\leq 2$ mm
		$\Delta z_{Zoom}(n>1)$ : between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z	$\geq 30$ mm	3 – 4 GHz: $\geq 28$ mm 4 – 5 GHz: $\geq 25$ mm 5 – 6 GHz: $\geq 22$ mm	
Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <i>reported</i> SAR from the area scan based <i>I-g SAR estimation</i> procedures of KDB 447498 is $\leq 1.4$ W/kg, $\leq 8$ mm, $\leq 7$ mm and $\leq 5$ mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

### 9.3 WCDMA Measurement Procedures for SAR

The following procedures are applicable to WCDMA handsets operating under 3GPP Release99, Release 5 and Release 6. The default test configuration is to measure SAR with an established radio link between the DUT and a communication test set using a 12.2kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH & DPDCH<sub>n</sub>), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Both uplink and downlink should be configured with the same RMC or AMR, when required. SAR for Release 5 HSDPA and Release 6 HSPA are measured using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified according to applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. When Maximum Power Reduction (MPR) is not implemented according to Cubic Metric (CM) requirements for Release 6 HSPA, the following procedures do not apply.

**For Release 5 HSDPA Data Devices:**

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c / \beta_d$	$\beta_{hs}$	CM/dB
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15	15/15	64	12/15	24/25	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

**For Release 6 HSDPA Data Devices**

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c / \beta_d$	$\beta_{hs}$	$\beta_{ec}$	$\beta_{ed}$	$\beta_{ed}$ (SF)	$\beta_{ed}$ (codes)	CM (dB)	MPR (dB)	AG Index	E-TFCI
1	11/15	15/15	64	11/15	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}:47/15$ $\beta_{ed2}:47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	4/15	56/75	4	1	3.0	2.0	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	1.0	0.0	21	81

## 9.4 Bluetooth & Wi-Fi Measurement Procedures for SAR

Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

## 9.5 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 14.4 to Table 14.25 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

## 10 Area Scan Based 1-g SAR

### 10.1 Requirement of KDB

According to the KDB447498 D01 v05, when the implementation is based the specific polynomial fit algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-g SAR is  $\leq 1.2$  W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. The SAR system verification must also demonstrate that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR (See Annex B). When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

### 10.2 Fast SAR Algorithms

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz) and for both 1- and 10-g averaged SAR using a sample of 264 SAR measurements from 55 wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm are 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

In the second step, the same research group optimized the fitting algorithm to an Polynomial fit whereby the frequency validity was extended to cover the range 30-6000MHz. Details of this study can be found in the BEMS 2007 Proceedings.

Both algorithms are implemented in DASY software.

## 11 Conducted Output Power

### 11.1 Manufacturing tolerance

**Table 11.1: GSM Speech**

GSM 850			
Channel	Channel 251	Channel 190	Channel 128
Target (dBm)	31.8	31.8	31.8
Tolerance $\pm$ (dB)	1	1	1
GSM 1900			
Channel	Channel 810	Channel 661	Channel 512
Target (dBm)	29.3	29.3	29.3
Tolerance $\pm$ (dB)	1	1	1

**Table 11.2: GPRS and EGPRS (GMSK Modulation)**

GSM 850 GPRS				
Channel		<b>251</b>	<b>190</b>	<b>128</b>
1 Txslot	Target (dBm)	31.8	31.8	31.8
	Tolerance $\pm$ (dB)	1	1	1
2 Txslots	Target (dBm)	30	30	30
	Tolerance $\pm$ (dB)	1	1	1
GSM 850 EGPRS				
Channel		<b>251</b>	<b>190</b>	<b>128</b>
1 Txslot	Target (dBm)	31.8	31.8	31.8
	Tolerance $\pm$ (dB)	1	1	1
2 Txslots	Target (dBm)	30	30	30
	Tolerance $\pm$ (dB)	1	1	1
GSM 1900 GPRS				
Channel		<b>810</b>	<b>661</b>	<b>512</b>
1 Txslot	Target (dBm)	29.3	29.3	29.3
	Tolerance $\pm$ (dB)	1	1	1
2 Txslots	Target (dBm)	27.5	27.5	27.5
	Tolerance $\pm$ (dB)	1	1	1
GSM 1900 EGPRS				
Channel		<b>810</b>	<b>661</b>	<b>512</b>
1 Txslot	Target (dBm)	29.3	29.3	29.3
	Tolerance $\pm$ (dB)	1	1	1
2 Txslots	Target (dBm)	27.5	27.5	27.5
	Tolerance $\pm$ (dB)	1	1	1

**Table 11.3: WCDMA**

WCDMA 850 CS			
Channel	Channel 4233	Channel 4182	Channel 4132
Target (dBm)	23	23	23
Tolerance $\pm$ (dB)	1	1	1



WCDMA 1750 CS			
Channel	Channel 1312	Channel 1412	Channel 1513
Target (dBm)	23	23	23
Tolerance $\pm$ (dB)	1	1	1
WCDMA 1900 CS			
Channel	Channel 9538	Channel 9400	Channel 9262
Target (dBm)	23	23	23
Tolerance $\pm$ (dB)	1	1	1

## 11.2 GSM Measurement result

During the process of testing, the EUT was controlled via Agilent Digital Radio Communication tester (E5515C) to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

**Table 11.4: The conducted power measurement results for GSM850/1900**

GSM 850MHZ	Conducted Power (dBm)		
	Channel 251(848.8MHz)	Channel 190(836.6MHz)	Channel 128(824.2MHz)
	31.90	31.87	31.81
GSM 1900MHZ	Conducted Power (dBm)		
	Channel 810(1909.8MHz)	Channel 661(1880MHz)	Channel 512(1850.2MHz)
	29.80	29.83	29.89

**Table 11.5: The conducted power measurement results for GPRS and EGPRS**

GSM 850 GPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	251	190	128		251	190	128
1 Txslot	31.90	31.87	31.81	-9.03dB	22.87	22.84	22.78
<b>2 Txslots</b>	30.94	30.90	30.84	-6.02dB	<b>24.92</b>	<b>24.88</b>	<b>24.82</b>
GSM 850 EGPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	251	190	128		251	190	128
1 Txslot	31.90	31.86	31.81	-9.03dB	22.87	22.83	22.78
<b>2 Txslots</b>	30.94	30.90	30.84	-6.02dB	<b>24.92</b>	<b>24.88</b>	<b>24.82</b>
PCS1900 GPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	810	661	512		810	661	512
1 Txslot	29.80	29.83	29.88	-9.03dB	20.77	20.80	20.85
<b>2 Txslots</b>	28.42	28.44	28.50	-6.02dB	<b>22.40</b>	<b>22.42</b>	<b>22.48</b>
PCS1900 EGPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	810	661	512		810	661	512
1 Txslot	29.80	29.83	29.88	-9.03dB	20.77	20.80	20.85
<b>2 Txslots</b>	28.41	28.44	28.50	-6.02dB	<b>22.39</b>	<b>22.42</b>	<b>22.48</b>

NOTES:

1) Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

According to the conducted power as above, the body measurements are performed with 2Txslots for GSM850 and GSM1900.

Note: According to the KDB941225 D03, “when SAR tests for EDGE or EGPRS mode is necessary, GMSK modulation should be used”.

### 11.3 WCDMA Measurement result

Table 11.6: The conducted Power for WCDMA850/1700/1900

Item	band	FDDV result		
	ARFCN	4233 (846.6MHz)	4182 (836.4MHz)	4132 (826.4MHz)
WCDMA	\	23.13	23.10	23.25
HSUPA	1	19.36	19.52	19.57
	2	18.35	18.49	18.58
	3	18.84	18.98	19.07
	4	19.37	19.52	19.60
	5	21.31	21.48	21.53
Item	band	FDDIV result		
	ARFCN	1513 (1752.6MHz)	1412 (1732.4MHz)	1312 (1712.4MHz)
WCDMA	\	23.46	23.31	23.49
HSUPA	1	19.62	19.64	19.59
	2	18.63	18.63	18.60
	3	19.13	19.12	19.07
	4	19.62	19.65	19.62
	5	21.58	21.60	21.56
Item	band	FDDII result		
	ARFCN	9538 (1907.6MHz)	9400 (1880MHz)	9262 (1852.4MHz)
WCDMA	\	23.96	23.42	23.39
HSUPA	1	19.44	19.62	19.64
	2	18.43	18.62	18.64
	3	18.94	19.12	19.13
	4	19.46	19.63	19.67
	5	21.38	21.57	21.66

**Note:** HSUPA body SAR for WCDMA850/1900 are not required, because maximum average output power of each RF channel with HSUPA active is not 1/4 dB higher than that measured without HSUPA and the maximum SAR for WCDMA850/1900 are not above 75% of the SAR limit.

HSUPA body SAR for WCDMA1700 should be measured with the body exposure configuration that results in the highest SAR, because the maximum SAR for WCDMA1700 is above 75% of the SAR limit.

### 11.4 BT Measurement result

The output power of BT antenna is as following:

Channel	Ch 0 (2402 MHz)	Ch 39 (2441 MHz)	Ch 78 (2480 MHz)
Peak Conducted Output Power(dBm)	5.15	6.60	7.75

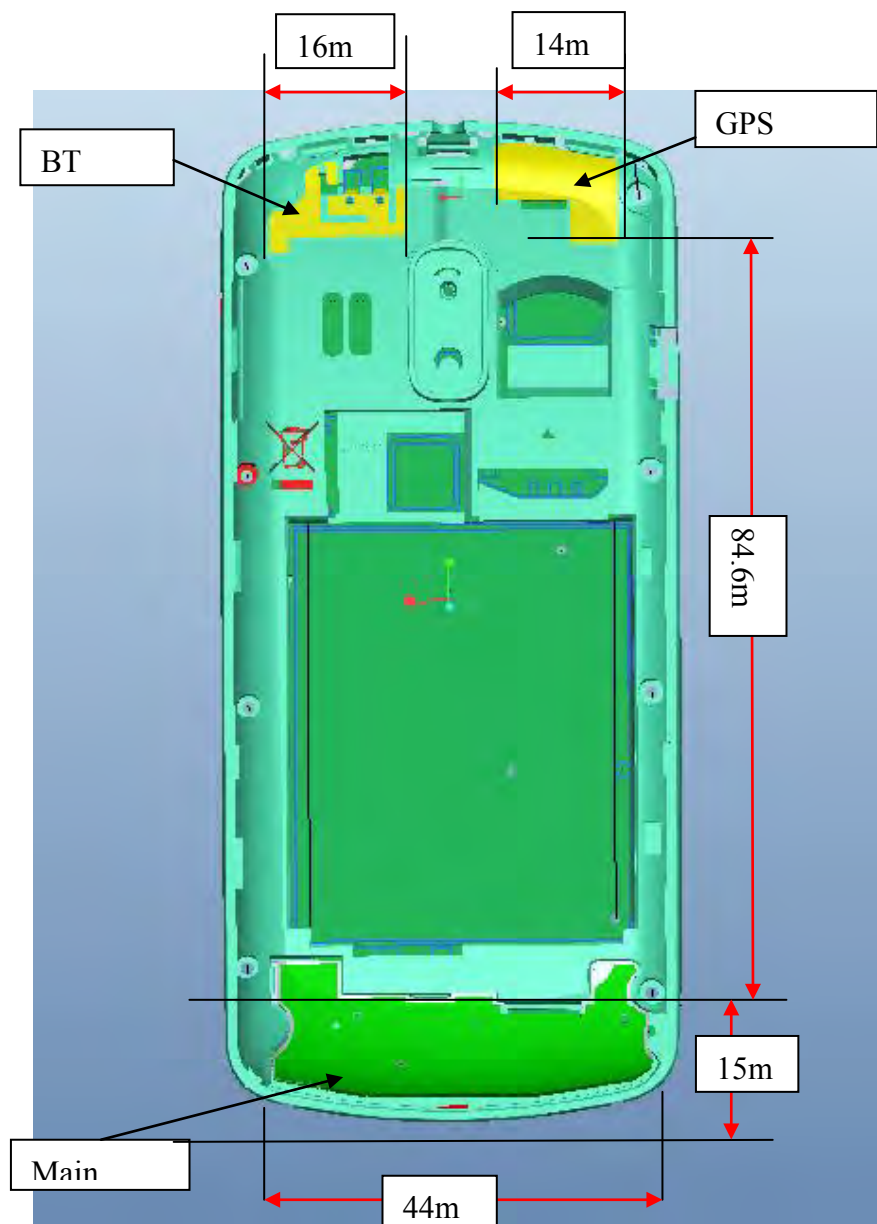


## 12 Simultaneous TX SAR Considerations

### 12.1 Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g and Bluetooth devices which may simultaneously transmit with the licensed transmitter. For this device, the BT and Wi-Fi can transmit simultaneous with other transmitters.

### 12.2 Transmit Antenna Separation Distances



Picture 12.1 Antenna Locations

### 12.3 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied. The 1-g SAR test exclusion threshold for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR, where

- $f(\text{GHz})$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

According to the KDB447498 appendix A, the SAR test exclusion threshold for 2450MHz at 15mm test separation distances is 29mW.

#### Appendix A

##### SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and $\leq 50$ mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

Picture 12.2 Power Thresholds

### 13 Evaluation of Simultaneous

Table 13.1: Summary of Transmitters

Band/Mode	F(GHz)	SAR test exclusion threshold (mW)	RF output power (mW)
Bluetooth	2.441	29	5.96

According to the conducted power measurement result, we can draw the conclusion that: Stand-alone SAR and simultaneous transmission SAR for Bluetooth should not be performed.

## 14 SAR Test Result

It is determined by user manual for the distance between the EUT and the phantom bottom.

The distance is 15mm and just applied to the condition of body worn accessory.

According to the client request, it is still tested in GSM850 and WCDMA850 even though the phone is abnormal for those bands.

It is performed for all SAR measurements with area scan based 1-g SAR estimation. A zoom scan measurement is added when the estimated 1-g SAR is the highest measured SAR in each exposure configuration, wireless mode and frequency band combination or more than 1.2W/kg.

### 14.1 The evaluation of multi-batteries

We'll perform the head measurement in all bands with the primary battery depending on the evaluation of multi-batteries and retest on highest value point with other batteries. Then, repeat the measurement in the Body test.

**Table 14.1: The evaluation of multi-batteries for Head Test (Slide down)**

Frequency		Mode/Band	Side	Test Position	Battery Type	SAR(1g)	Power Drift(dB)
MHz	Ch.					(W/kg)	
1752.6	1513	WCDMA1700	Left	Touch	CAB3120000C1	1.12	0.11
1752.6	1513	WCDMA1700	Left	Touch	CAB3120000C3	1.03	0.05

Note: According to the values in the above table, the battery, CAB3120000C1, is the primary battery. We'll perform the head measurement with this battery and retest on highest value point with others.

**Table 14.2: The evaluation of multi-batteries for Body Test (Slide down)**

Frequency		Headset	Test Position	Spacing (mm)	Battery Type	SAR(1g)	Power Drift(dB)
MHz	Ch.					(W/kg)	
1752.6	1513	\	Ground	15	CAB3120000C1	1.23	0.00
1752.6	1513	\	Ground	15	CAB3120000C3	1.22	-0.05

Note: According to the values in the above table, the battery, CAB3120000C1, is the primary battery. We'll perform the Body measurement with this battery and retest on highest value point with others.

### 14.2 SAR Test Result

**Table 14.3: Duty Cycle**

	Duty Cycle
Speech for GSM850/1900	1:8.3
GPRS&EGPRS for GSM850/1900	1:4
WCDMA850/1700/1900	1:1

**Table 14.4: SAR Values (GSM 850 MHz Band - Head) with battery CAB3120000C1 – Slide down**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
848.8	251	Left	Touch	31.90	0.012 (Fig.1)	0.01	0.016 (Fig.1)	0.02	0.17
836.6	190	Left	Touch	31.87	0.00879	0.01	0.0132	0.02	0.16
824.2	128	Left	Touch	31.81	0.0101	0.01	0.0149	0.02	0.17
848.8	251	Left	Tilt	31.90	0.0101	0.01	0.0146	0.02	-0.16
836.6	190	Left	Tilt	31.87	0.00891	0.01	0.0131	0.02	0.15
824.2	128	Left	Tilt	31.81	0.00839	0.01	0.0123	0.02	0.12
848.8	251	Right	Touch	31.90	0.0109	0.01	0.0148	0.02	0.16
836.6	190	Right	Touch	31.87	0.00931	0.01	0.0138	0.02	0.18
824.2	128	Right	Touch	31.81	0.00788	0.01	0.0116	0.01	0.16
848.8	251	Right	Tilt	31.90	0.00618	0.01	0.00906	0.01	0.16
836.6	190	Right	Tilt	31.87	0.00645	0.01	0.00979	0.01	0.14
824.2	128	Right	Tilt	31.81	0.00517	0.01	0.00764	0.01	0.18

**Table 14.5: SAR Values (GSM 850 MHz Band - Head) with battery CAB3120000C1 – Slide up**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
848.8	251	Left	Touch	31.90	0.011 (Fig.2)	0.01	0.015 (Fig.2)	0.02	0.18
836.6	190	Left	Touch	31.87	0.00969	0.01	0.0143	0.02	0.17
824.2	128	Left	Touch	31.81	0.00882	0.01	0.0129	0.02	0.06
848.8	251	Left	Tilt	31.90	0.00583	0.01	0.00827	0.01	0.18
836.6	190	Left	Tilt	31.87	0.00535	0.01	0.00759	0.01	0.12
824.2	128	Left	Tilt	31.81	0.00525	0.01	0.00750	0.01	0.15
848.8	251	Right	Touch	31.90	0.00771	0.01	0.0108	0.01	0.03
836.6	190	Right	Touch	31.87	0.00716	0.01	0.0105	0.01	0.14
824.2	128	Right	Touch	31.81	0.00640	0.01	0.00937	0.01	0.14
848.8	251	Right	Tilt	31.90	0.00549	0.01	0.00785	0.01	0.18
836.6	190	Right	Tilt	31.87	0.00560	0.01	0.00800	0.01	0.19
824.2	128	Right	Tilt	31.81	0.00458	0.01	0.00657	0.01	0.17

**Table 14.6: SAR Values (GSM 850 MHz Band - Body) with battery CAB3120000C1 – Slide down**

Frequency		Mode (number of timeslots)	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
848.8	251	GPRS (2)	Phantom	30.94	0.0228	0.02	0.0304	0.03	-0.13
836.6	190	GPRS (2)	Phantom	30.90	0.0197	0.02	0.0274	0.03	0.14
824.2	128	GPRS (2)	Phantom	30.84	0.0188	0.02	0.0267	0.03	0.10

848.8	251	GPRS (2)	Ground	30.94	0.064 (Fig.3)	0.06	0.088 (Fig.3)	0.09	-0.03
836.6	190	GPRS (2)	Ground	30.90	0.059	0.06	0.0844	0.09	0.11
824.2	128	GPRS (2)	Ground	30.84	0.0511	0.05	0.0729	0.08	0.13
848.8	251	EGPRS (2)	Ground	30.94	0.0641	0.06	0.0876	0.09	-0.04
848.8	251	Speech	Ground (Headset1)	31.90	0.0292	0.04	0.0417	0.05	0.07
848.8	251	Speech	Ground (Headset2)	31.90	0.0252	0.03	0.0369	0.05	0.17

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The type of Headset1 is CCB3160A15C1, the type of Headset2 is CCB3160A15C4.

**Table 14.7: SAR Values (GSM 850 MHz Band - Body) with battery CAB312000C1 – Slide UP**

Frequency		Mode (number of timeslots)	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
848.8	251	GPRS (2)	Phantom	30.94	0.023	0.02	0.0321	0.03	0.08
836.6	190	GPRS (2)	Phantom	30.90	0.0217	0.02	0.0307	0.03	0.12
824.2	128	GPRS (2)	Phantom	30.84	0.0214	0.02	0.0303	0.03	-0.10
848.8	251	GPRS (2)	Ground	30.94	0.059 (Fig.4)	0.06	0.094 (Fig.4)	0.10	-0.14
836.6	190	GPRS (2)	Ground	30.90	0.0611	0.06	0.0878	0.09	0.00
824.2	128	GPRS (2)	Ground	30.84	0.0631	0.07	0.09	0.09	0.04
848.8	251	EGPRS (2)	Ground	30.94	0.0611	0.06	0.0878	0.09	0.00
848.8	251	Speech	Ground (Headset1)	31.90	0.0411	0.05	0.0598	0.07	0.04
848.8	251	Speech	Ground (Headset2)	31.90	0.0418	0.05	0.0638	0.08	0.05

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The type of Headset1 is CCB3160A15C1, the type of Headset2 is CCB3160A15C4.

**Table 14.8: SAR Values (GSM 1900 MHz Band - Head) with battery CAB312000C1 – Slide down**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
1909.8	810	Left	Touch	29.80	0.264 (Fig.5)	0.30	0.450 (Fig.5)	0.50	0.02
1880	661	Left	Touch	29.83	0.238	0.27	0.421	0.47	0.06
1850.2	512	Left	Touch	29.89	0.237	0.26	0.417	0.46	0.04
1909.8	810	Left	Tilt	29.80	0.133	0.15	0.242	0.27	0.06
1880	661	Left	Tilt	29.83	0.144	0.16	0.261	0.29	0.02
1850.2	512	Left	Tilt	29.89	0.151	0.17	0.272	0.30	0.01
1909.8	810	Right	Touch	29.80	0.189	0.21	0.321	0.36	-0.04



1880	661	Right	Touch	29.83	0.2	<b>0.22</b>	0.344	<b>0.38</b>	0.09
1850.2	512	Right	Touch	29.89	0.233	<b>0.26</b>	0.374	<b>0.41</b>	-0.01
1909.8	810	Right	Tilt	29.80	0.114	<b>0.13</b>	0.206	<b>0.23</b>	0.04
1880	661	Right	Tilt	29.83	0.125	<b>0.14</b>	0.224	<b>0.25</b>	-0.14
1850.2	512	Right	Tilt	29.89	0.132	<b>0.15</b>	0.231	<b>0.25</b>	0.12

**Table 14.9: SAR Values (GSM 1900 MHz Band - Head) with battery CAB312000C1 – Slide up**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
1909.8	810	Left	Touch	29.80	0.185	<b>0.21</b>	0.289	<b>0.32</b>	-0.04
1880	661	Left	Touch	29.83	0.172	<b>0.19</b>	0.288	<b>0.32</b>	0.04
1850.2	512	Left	Touch	29.89	0.169	<b>0.19</b>	0.281	<b>0.31</b>	0.11
1909.8	810	Left	Tilt	29.80	0.0714	<b>0.08</b>	0.127	<b>0.14</b>	0.01
1880	661	Left	Tilt	29.83	0.0711	<b>0.08</b>	0.121	<b>0.13</b>	0.08
1850.2	512	Left	Tilt	29.89	0.071	<b>0.08</b>	0.12	<b>0.13</b>	-0.06
1909.8	810	Right	Touch	29.80	0.206 (Fig.6)	<b>0.23</b>	0.326 (Fig.6)	<b>0.37</b>	-0.14
1880	661	Right	Touch	29.83	0.19	<b>0.21</b>	0.322	<b>0.36</b>	-0.06
1850.2	512	Right	Touch	29.89	0.183	<b>0.20</b>	0.306	<b>0.34</b>	-0.06
1909.8	810	Right	Tilt	29.80	0.0689	<b>0.08</b>	0.124	<b>0.14</b>	-0.05
1880	661	Right	Tilt	29.83	0.064	<b>0.07</b>	0.115	<b>0.13</b>	-0.08
1850.2	512	Right	Tilt	29.89	0.0728	<b>0.08</b>	0.133	<b>0.15</b>	-0.01

**Table 14.10: SAR Values (GSM 1900 MHz Band - Body) with battery CAB312000C1 – Slide down**

Frequency		Mode (number of timeslots)	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
1909.8	810	GPRS (2)	Phantom	28.42	0.137	<b>0.14</b>	0.226	<b>0.23</b>	0.05
1880	661	GPRS (2)	Phantom	28.44	0.158	<b>0.16</b>	0.261	<b>0.26</b>	0.07
1850.2	512	GPRS (2)	Phantom	28.50	0.160	<b>0.16</b>	0.265	<b>0.27</b>	-0.04
1909.8	810	GPRS (2)	Ground	28.42	0.267	<b>0.27</b>	0.454	<b>0.46</b>	-0.01
1880	661	GPRS (2)	Ground	28.44	0.275	<b>0.28</b>	0.466	<b>0.47</b>	0.00
1850.2	512	GPRS (2)	Ground	28.50	0.298 (Fig.7)	<b>0.30</b>	0.482 (Fig.7)	<b>0.48</b>	0.05
1850.2	512	EGPRS (2)	Ground	28.50	0.273	<b>0.27</b>	0.464	<b>0.46</b>	-0.07
1850.2	512	Speech	Ground (Headset1)	29.89	0.173	<b>0.19</b>	0.291	<b>0.32</b>	-0.09
1850.2	512	Speech	Ground (Headset2)	29.89	0.204	<b>0.22</b>	0.347	<b>0.38</b>	0.01

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The type of Headset1 is CCB3160A15C1, the type of Headset2 is CCB3160A15C4.

**Table 14.11: SAR Values (GSM 1900 MHz Band - Body) with battery CAB3120000C1 – Slide up**

Frequency		Mode (number of timeslots)	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
1909.8	810	GPRS (2)	Phantom	28.42	0.151	<b>0.15</b>	0.240	<b>0.24</b>	-0.10
1880	661	GPRS (2)	Phantom	28.44	0.148	<b>0.15</b>	0.235	<b>0.24</b>	0.03
1850.2	512	GPRS (2)	Phantom	28.50	0.156	<b>0.16</b>	0.246	<b>0.25</b>	0.09
1909.8	810	GPRS (2)	Ground	28.42	0.274	<b>0.28</b>	0.470	<b>0.48</b>	0.17
1880	661	GPRS (2)	Ground	28.44	0.266	<b>0.27</b>	0.454	<b>0.46</b>	0.04
1850.2	512	GPRS (2)	Ground	28.50	0.306 (Fig.8)	<b>0.31</b>	0.511 (Fig.8)	<b>0.51</b>	-0.05
1850.2	512	EGPRS (2)	Ground	28.50	0.266	<b>0.27</b>	0.462	<b>0.46</b>	-0.02
1850.2	512	Speech	Ground (Headset1)	29.89	0.175	<b>0.19</b>	0.288	<b>0.32</b>	-0.11
1850.2	512	Speech	Ground (Headset2)	29.89	0.203	<b>0.22</b>	0.341	<b>0.37</b>	0.18

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The type of Headset1 is CCB3160A15C1, the type of Headset2 is CCB3160A15C4.

**Table 14.12: SAR Values (WCDMA 850 MHz Band - Head) with battery CAB3120000C1 – Slide down**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
846.6	4233	Left	Touch	23.13	0.015 (Fig.9)	<b>0.02</b>	0.022 (Fig.9)	<b>0.03</b>	-0.16
836.4	4182	Left	Touch	23.10	0.0111	<b>0.01</b>	0.0164	<b>0.02</b>	0.19
826.4	4132	Left	Touch	23.25	0.0130	<b>0.02</b>	0.0192	<b>0.02</b>	0.18
846.6	4233	Left	Tilt	23.13	0.00956	<b>0.01</b>	0.0139	<b>0.02</b>	0.15
836.4	4182	Left	Tilt	23.10	0.00611	<b>0.01</b>	0.00905	<b>0.01</b>	0.15
826.4	4132	Left	Tilt	23.25	0.00694	<b>0.01</b>	0.0103	<b>0.01</b>	0.18
846.6	4233	Right	Touch	23.13	0.0107	<b>0.01</b>	0.0158	<b>0.02</b>	0.13
836.4	4182	Right	Touch	23.10	0.0126	<b>0.02</b>	0.0183	<b>0.02</b>	0.14
826.4	4132	Right	Touch	23.25	0.0143	<b>0.02</b>	0.0192	<b>0.02</b>	0.16
846.6	4233	Right	Tilt	23.13	0.0116	<b>0.01</b>	0.0171	<b>0.02</b>	0.18
836.4	4182	Right	Tilt	23.10	0.0103	<b>0.01</b>	0.0151	<b>0.02</b>	0.15
826.4	4132	Right	Tilt	23.25	0.0104	<b>0.01</b>	0.0153	<b>0.02</b>	0.17

**Table 14.13: SAR Values (WCDMA 850 MHz Band - Head) with battery CAB3120000C1 – Slide up**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
846.6	4233	Left	Touch	23.13	0.014 (Fig.10)	<b>0.02</b>	0.021 (Fig.10)	<b>0.03</b>	0.19
836.4	4182	Left	Touch	23.10	0.0111	<b>0.01</b>	0.0167	<b>0.02</b>	0.13
826.4	4132	Left	Touch	23.25	0.0134	<b>0.02</b>	0.0197	<b>0.02</b>	0.18

846.6	4233	Left	Tilt	23.13	0.00639	<b>0.01</b>	0.00932	<b>0.01</b>	0.17
836.4	4182	Left	Tilt	23.10	0.0122	<b>0.02</b>	0.0181	<b>0.02</b>	0.16
826.4	4132	Left	Tilt	23.25	0.0137	<b>0.02</b>	0.0209	<b>0.02</b>	0.15
846.6	4233	Right	Touch	23.13	0.00976	<b>0.01</b>	0.0142	<b>0.02</b>	0.13
836.4	4182	Right	Touch	23.10	0.0114	<b>0.01</b>	0.0166	<b>0.02</b>	0.16
826.4	4132	Right	Touch	23.25	0.0108	<b>0.01</b>	0.0155	<b>0.02</b>	0.15
846.6	4233	Right	Tilt	23.13	0.00773	<b>0.01</b>	0.0112	<b>0.01</b>	0.14
836.4	4182	Right	Tilt	23.10	0.00629	<b>0.01</b>	0.00906	<b>0.01</b>	0.18
826.4	4132	Right	Tilt	23.25	0.00764	<b>0.01</b>	0.0113	<b>0.01</b>	0.17

**Table 14.14: SAR Values (WCDMA 850 MHz Band - Body) with battery CAB3120000C1 – Slide down**

Frequency		Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.							
846.6	4233	Phantom	23.13	0.0246	<b>0.03</b>	0.0348	<b>0.04</b>	-0.11
836.4	4182	Phantom	23.10	0.0205	<b>0.03</b>	0.0288	<b>0.04</b>	0.13
826.4	4132	Phantom	23.25	0.0231	<b>0.03</b>	0.0324	<b>0.04</b>	0.10
846.6	4233	Ground	23.13	0.059 (Fig.11)	<b>0.07</b>	0.082 (Fig.11)	<b>0.10</b>	0.08
836.4	4182	Ground	23.10	0.0486	<b>0.06</b>	0.0692	<b>0.09</b>	0.04
826.4	4132	Ground	23.25	0.0563	<b>0.07</b>	0.0798	<b>0.09</b>	0.02
846.6	4233	Ground (Headset1)	23.13	0.0425	<b>0.05</b>	0.0606	<b>0.07</b>	0.05
846.6	4233	Ground (Headset2)	23.13	0.0364	<b>0.04</b>	0.0515	<b>0.06</b>	0.12

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The type of Headset1 is CCB3160A15C1, the type of Headset2 is CCB3160A15C4.

**Table 14.15: SAR Values (WCDMA 850 MHz Band - Body) with battery CAB3120000C1 – Slide up**

Frequency		Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.							
846.6	4233	Phantom	23.13	0.0217	<b>0.03</b>	0.0306	<b>0.04</b>	0.03
836.4	4182	Phantom	23.10	0.0201	<b>0.02</b>	0.0289	<b>0.04</b>	-0.03
826.4	4132	Phantom	23.25	0.0235	<b>0.03</b>	0.0336	<b>0.04</b>	0.04
846.6	4233	Ground	23.13	0.061 (Fig.12)	<b>0.07</b>	0.087 (Fig.12)	<b>0.11</b>	0.09
836.4	4182	Ground	23.10	0.0531	<b>0.07</b>	0.0776	<b>0.10</b>	0.09
826.4	4132	Ground	23.25	0.0609	<b>0.07</b>	0.0863	<b>0.10</b>	0.15
846.6	4233	Ground (Headset1)	23.13	0.0402	<b>0.05</b>	0.0573	<b>0.07</b>	0.14
846.6	4233	Ground (Headset2)	23.13	0.0386	<b>0.05</b>	0.0545	<b>0.07</b>	0.04

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The type of Headset1 is CCB3160A15C1, the type of Headset2 is CCB3160A15C4.



**Table 14.16: SAR Values (WCDMA 1700 MHz Band - Head) with battery CAB3120000C1 – Slide down**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
1752.6	1513	Left	Touch	23.46	0.668 (Fig.13)	<b>0.76</b>	1.12 (Fig.13)	<b>1.27</b>	0.11
1732.4	1412	Left	Touch	23.31	0.614	<b>0.72</b>	1.03	<b>1.21</b>	0.12
1712.4	1312	Left	Touch	23.49	0.576	<b>0.65</b>	0.964	<b>1.08</b>	0.01
1752.6	1513	Left	Tilt	23.46	0.382	<b>0.43</b>	0.654	<b>0.74</b>	0.01
1732.4	1412	Left	Tilt	23.31	0.423	<b>0.50</b>	0.718	<b>0.84</b>	0.09
1712.4	1312	Left	Tilt	23.49	0.367	<b>0.41</b>	0.622	<b>0.70</b>	-0.01
1752.6	1513	Right	Touch	23.46	0.495	<b>0.56</b>	0.798	<b>0.90</b>	-0.05
1732.4	1412	Right	Touch	23.31	0.568	<b>0.67</b>	0.892	<b>1.05</b>	0.04
1712.4	1312	Right	Touch	23.49	0.469	<b>0.53</b>	0.751	<b>0.84</b>	0.01
1752.6	1513	Right	Tilt	23.46	0.294	<b>0.33</b>	0.494	<b>0.56</b>	0.01
1732.4	1412	Right	Tilt	23.31	0.339	<b>0.40</b>	0.566	<b>0.66</b>	-0.02
1712.4	1312	Right	Tilt	23.49	0.302	<b>0.34</b>	0.503	<b>0.57</b>	0.02

**Table 14.17: SAR Values (WCDMA 1700 MHz Band - Head) with battery CAB3120000C1 – Slide up**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
1752.6	1513	Left	Touch	23.46	0.498 (Fig.14)	<b>0.56</b>	0.782 (Fig.14)	<b>0.89</b>	-0.09
1732.4	1412	Left	Touch	23.31	0.443	<b>0.52</b>	0.725	<b>0.85</b>	-0.11
1712.4	1312	Left	Touch	23.49	0.415	<b>0.47</b>	0.677	<b>0.76</b>	-0.01
1752.6	1513	Left	Tilt	23.46	0.219	<b>0.25</b>	0.381	<b>0.43</b>	0.12
1732.4	1412	Left	Tilt	23.31	0.254	<b>0.30</b>	0.44	<b>0.52</b>	0.15
1712.4	1312	Left	Tilt	23.49	0.239	<b>0.27</b>	0.41	<b>0.46</b>	0.12
1752.6	1513	Right	Touch	23.46	0.362	<b>0.41</b>	0.579	<b>0.66</b>	0.18
1732.4	1412	Right	Touch	23.31	0.379	<b>0.44</b>	0.605	<b>0.71</b>	-0.10
1712.4	1312	Right	Touch	23.49	0.332	<b>0.37</b>	0.516	<b>0.58</b>	0.17
1752.6	1513	Right	Tilt	23.46	0.179	<b>0.20</b>	0.301	<b>0.34</b>	-0.04
1732.4	1412	Right	Tilt	23.31	0.205	<b>0.24</b>	0.343	<b>0.40</b>	-0.13
1712.4	1312	Right	Tilt	23.49	0.209	<b>0.24</b>	0.347	<b>0.39</b>	-0.11

**Table 14.18: SAR Values (WCDMA 1700 MHz Band - Body) with battery CAB3120000C1 – Slide down**

Frequency		Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.							
1752.6	1513	Phantom	23.46	0.317	<b>0.36</b>	0.519	<b>0.59</b>	0.00
1732.4	1412	Phantom	23.31	0.357	<b>0.42</b>	0.585	<b>0.69</b>	-0.15
1712.4	1312	Phantom	23.49	0.31	<b>0.35</b>	0.507	<b>0.57</b>	0.01
1752.6	1513	Ground	23.46	0.746 (Fig.15)	<b>0.84</b>	1.23 (Fig.15)	<b>1.39</b>	0.00

1732.4	1412	Ground	23.31	0.72	<b>0.84</b>	1.19	<b>1.39</b>	-0.00
1712.4	1312	Ground	23.49	0.612	<b>0.69</b>	1.05	<b>1.18</b>	0.06
1752.6	1513	Ground (HSUPA)	23.46	0.574	<b>0.65</b>	0.947	<b>1.07</b>	0.01
1752.6	1513	Ground (Headset1)	23.46	0.693	<b>0.78</b>	1.18	<b>1.34</b>	-0.02
1732.4	1412	Ground (Headset1)	23.31	0.627	<b>0.73</b>	1.05	<b>1.23</b>	-0.02
1712.4	1312	Ground (Headset1)	23.49	0.531	<b>0.60</b>	0.89	<b>1.00</b>	0.01
1752.6	1513	Ground (Headset2)	23.46	0.674	<b>0.76</b>	1.17	<b>1.32</b>	0.01
1732.4	1412	Ground (Headset2)	23.31	0.638	<b>0.75</b>	1.07	<b>1.25</b>	0.01
1712.4	1312	Ground (Headset2)	23.49	0.537	<b>0.60</b>	0.901	<b>1.01</b>	0.04

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The type of Headset1 is CCB3160A15C1, the type of Headset2 is CCB3160A15C4.

**Table 14.19: SAR Values (WCDMA 1700 MHz Band - Body) with battery CAB3120000C1 – Slide up**

Frequency		Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.							
1752.6	1513	Phantom	23.46	0.224	<b>0.25</b>	0.353	<b>0.40</b>	0.04
1732.4	1412	Phantom	23.31	0.272	<b>0.32</b>	0.424	<b>0.50</b>	0.02
1712.4	1312	Phantom	23.49	0.237	<b>0.27</b>	0.371	<b>0.42</b>	-0.04
1752.6	1513	Ground	23.46	0.391	<b>0.44</b>	0.627	<b>0.71</b>	0.07
1732.4	1412	Ground	23.31	0.439 (Fig.16)	<b>0.51</b>	0.704 (Fig.16)	<b>0.83</b>	0.01
1712.4	1312	Ground	23.49	0.421	<b>0.47</b>	0.694	<b>0.78</b>	0.04
1732.4	1412	Ground (Headset1)	23.31	0.418	<b>0.49</b>	0.692	<b>0.81</b>	0.03
1732.4	1412	Ground (Headset2)	23.31	0.419	<b>0.49</b>	0.693	<b>0.81</b>	0.01

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The type of Headset1 is CCB3160A15C1, the type of Headset2 is CCB3160A15C4.

**Table 14.20: SAR Values (WCDMA 1900 MHz Band - Head) with battery CAB3120000C1 – Slide down**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
1907.6	9538	Left	Touch	23.96	0.448	<b>0.45</b>	0.8	<b>0.81</b>	-0.18
1880	9400	Left	Touch	23.42	0.541 (Fig.17)	<b>0.62</b>	0.919 (Fig.17)	<b>1.05</b>	0.11
1852.4	9262	Left	Touch	23.39	0.477	<b>0.55</b>	0.839	<b>0.97</b>	-0.00
1907.6	9538	Left	Tilt	23.96	0.262	<b>0.26</b>	0.465	<b>0.47</b>	0.10

1880	9400	Left	Tilt	23.42	0.304	<b>0.35</b>	0.538	<b>0.61</b>	0.08
1852.4	9262	Left	Tilt	23.39	0.286	<b>0.33</b>	0.496	<b>0.57</b>	0.13
1907.6	9538	Right	Touch	23.96	0.43	<b>0.43</b>	0.722	<b>0.73</b>	-0.04
1880	9400	Right	Touch	23.42	0.529	<b>0.60</b>	0.85	<b>0.97</b>	-0.03
1852.4	9262	Right	Touch	23.39	0.531	<b>0.61</b>	0.859	<b>0.99</b>	0.13
1907.6	9538	Right	Tilt	23.96	0.225	<b>0.23</b>	0.405	<b>0.41</b>	0.00
1880	9400	Right	Tilt	23.42	0.246	<b>0.28</b>	0.443	<b>0.51</b>	-0.07
1852.4	9262	Right	Tilt	23.39	0.25	<b>0.29</b>	0.446	<b>0.51</b>	0.16

**Table 14.21: SAR Values (WCDMA 1900 MHz Band - Head) with battery CAB3120000C1 – Slide up**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
1907.6	9538	Left	Touch	23.96	0.374 (Fig.18)	<b>0.38</b>	0.581 (Fig.18)	<b>0.59</b>	-0.08
1880	9400	Left	Touch	23.42	0.349	<b>0.40</b>	0.587	<b>0.67</b>	-0.04
1852.4	9262	Left	Touch	23.39	0.308	<b>0.35</b>	0.515	<b>0.59</b>	0.08
1907.6	9538	Left	Tilt	23.96	0.113	<b>0.11</b>	0.206	<b>0.21</b>	0.09
1880	9400	Left	Tilt	23.42	0.12	<b>0.14</b>	0.204	<b>0.23</b>	0.13
1852.4	9262	Left	Tilt	23.39	0.116	<b>0.13</b>	0.197	<b>0.23</b>	0.04
1907.6	9538	Right	Touch	23.96	0.286	<b>0.29</b>	0.447	<b>0.45</b>	-0.17
1880	9400	Right	Touch	23.42	0.297	<b>0.34</b>	0.46	<b>0.53</b>	-0.02
1852.4	9262	Right	Touch	23.39	0.249	<b>0.29</b>	0.415	<b>0.48</b>	0.03
1907.6	9538	Right	Tilt	23.96	0.12	<b>0.12</b>	0.222	<b>0.22</b>	0.04
1880	9400	Right	Tilt	23.42	0.121	<b>0.14</b>	0.226	<b>0.26</b>	0.03
1852.4	9262	Right	Tilt	23.39	0.116	<b>0.13</b>	0.211	<b>0.24</b>	0.06

**Table 14.22: SAR Values (WCDMA 1900 MHz Band - Body) with battery CAB3120000C1 – Slide down**

Frequency		Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.							
1907.6	9538	Phantom	23.96	0.184	<b>0.19</b>	0.307	<b>0.31</b>	-0.01
1880	9400	Phantom	23.42	0.222	<b>0.25</b>	0.371	<b>0.42</b>	0.14
1852.4	9262	Phantom	23.39	0.222	<b>0.26</b>	0.374	<b>0.43</b>	0.02
1907.6	9538	Ground	23.96	0.413	<b>0.42</b>	0.685	<b>0.69</b>	-0.02
1880	9400	Ground	23.42	0.484	<b>0.55</b>	0.804	<b>0.92</b>	-0.02
1852.4	9262	Ground	23.39	0.504 (Fig.19)	<b>0.58</b>	0.831 (Fig.19)	<b>0.96</b>	-0.00
1852.4	9262	Ground (Headset1)	23.39	0.441	<b>0.51</b>	0.746	<b>0.86</b>	-0.05
1852.4	9262	Ground (Headset2)	23.39	0.407	<b>0.47</b>	0.690	<b>0.79</b>	-0.01

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The type of Headset1 is CCB3160A15C1, the type of Headset2 is CCB3160A15C4.

**Table 14.23: SAR Values (WCDMA 1900 MHz Band - Body) with battery CAB3120000C1 – Slide up**

Frequency		Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.							
1907.6	9538	Phantom	23.96	0.178	<b>0.18</b>	0.286	<b>0.29</b>	-0.03
1880	9400	Phantom	23.42	0.196	<b>0.22</b>	0.313	<b>0.36</b>	0.06
1852.4	9262	Phantom	23.39	0.185	<b>0.21</b>	0.294	<b>0.34</b>	0.04
1907.6	9538	Ground	23.96	0.361	<b>0.36</b>	0.628	<b>0.63</b>	-0.01
1880	9400	Ground	23.42	0.391 (Fig.20)	<b>0.45</b>	0.651 (Fig.20)	<b>0.74</b>	-0.01
1852.4	9262	Ground	23.39	0.313	<b>0.36</b>	0.542	<b>0.62</b>	-0.01
1880	9400	Ground (Headset1)	23.42	0.319	<b>0.37</b>	0.534	<b>0.61</b>	-0.00
1880	9400	Ground (Headset2)	23.42	0.307	<b>0.35</b>	0.513	<b>0.59</b>	0.17

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The type of Headset1 is CCB3160A15C1, the type of Headset2 is CCB3160A15C4.

**Table 14.24: SAR Values (WCDMA 1700 MHz Band - Head) with battery CAB3120000C3 – Slide down**

Frequency		Side	Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.								
1752.6	1513	Left	Touch	23.46	0.619	<b>0.70</b>	1.03	<b>1.17</b>	0.05

**Table 14.25: SAR Values (WCDMA 1700 MHz Band - Body) with battery CAB3120000C3 – Slide down**

Frequency		Test Position	Conducted Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.							
1752.6	1513	Ground	23.46	0.736	<b>0.83</b>	1.22	<b>1.38</b>	-0.05

Note: The distance between the EUT and the phantom bottom is 15mm.

## 15 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is  $\geq 0.80$  W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is  $\geq 1.45$  W/kg (~ 10% from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

**Table 15.1: SAR Measurement Variability for Head WCDMA1700 (1g) – Slide down**

Frequency		Side	Test Position	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
1752.6	1513	Left	Touch	1.12	1.13	1.01	/

**Table 15.2: SAR Measurement Variability for Body WCDMA1700 (1g) – Slide down**

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
1752.6	1513	Ground	15	1.23	1.22	1.01	/

**Table 15.3: SAR Measurement Variability for Head WCDMA1900 (1g) – Slide down**

Frequency		Side	Test Position	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
1880	9400	Left	Touch	0.919	0.88	1.04	/

**Table 15.4: SAR Measurement Variability for Body WCDMA1900 (1g) – Slide down**

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
1852.4	9262	Ground	15	0.831	0.831	1.00	/

## 16 Measurement Uncertainty

### 16.1 Measurement Uncertainty for Normal SAR Tests

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
<b>Measurement system</b>										
1	Probe calibration	B	5.5	N	1	1	1	5.5	5.5	$\infty$
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	$\infty$
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	$\infty$
5	Detection limit	B	1.0	N	1	1	1	0.6	0.6	$\infty$
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	$\infty$
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	$\infty$
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	$\infty$
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
11	Probe positioned mech. restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	$\infty$
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	$\infty$
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
<b>Test sample related</b>										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	$\infty$
<b>Phantom and set-up</b>										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	$\infty$
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	$\infty$
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	$\infty$
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521

Combined standard uncertainty	$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$					9.25	9.12	257
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$					18.5	18.2	

### 16.2 Measurement Uncertainty for Fast SAR Tests

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
<b>Measurement system</b>										
1	Probe calibration	B	5.5	N	1	1	1	5.5	5.5	$\infty$
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	$\infty$
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	$\infty$
5	Detection limit	B	1.0	N	1	1	1	0.6	0.6	$\infty$
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	$\infty$
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	$\infty$
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	$\infty$
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
11	Probe positioned mech. Restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	$\infty$
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	$\infty$
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
14	Fast SAR z-Approximation	B	7.0	R	$\sqrt{3}$	1	1	4.0	4.0	$\infty$
<b>Test sample related</b>										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	$\infty$
<b>Phantom and set-up</b>										
18	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	$\infty$
19	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	$\infty$

20	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
21	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	$\infty$
22	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						10.1	9.95	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						20.2	19.9	

## 17 MAIN TEST INSTRUMENTS

Table 17.1: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	E5071C	MY46110673	February 14, 2012	One year
02	Power meter	NRVD	102083	September 11, 2012	One year
03	Power sensor	NRV-Z5	100542		
04	Signal Generator	E4438C	MY49070393	November 13, 2012	One Year
05	Amplifier	VTL5400	0505	No Calibration Requested	
06	BTS	E5515C	MY50263375	January 30, 2012	One year
07	E-field Probe	SPEAG ES3DV3	3149	April 24, 2012	One year
08	DAE	SPEAG DAE4	771	November 20, 2012	One year
09	Dipole Validation Kit	SPEAG D835V2	443	May 03, 2012	One year
10	Dipole Validation Kit	SPEAG D1750V2	1003	May 08, 2012	One year
11	Dipole Validation Kit	SPEAG D1900V2	541	May 09, 2012	One year

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



## ANNEX A Graph Results

### 850 Left Cheek High – Slide down

Date: 2013-1-10

Electronics: DAE4 Sn771

Medium: Head 850 MHz

Medium parameters used (interpolated):  $f = 848.8$  MHz;  $\sigma = 0.892$  mho/m;  $\epsilon_r = 40.448$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.7°C      Liquid Temperature: 22.2°C

Communication System: GSM 850 Frequency: 848.8 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 - SN3149 ConvF(6.26, 6.26, 6.26)

**Cheek High/Area Scan (61x101x1):** Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0184 W/kg

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

Reference Value = 1.851 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.0210 W/kg

**SAR(1 g) = 0.016 W/kg; SAR(10 g) = 0.012 W/kg**

Maximum value of SAR (measured) = 0.0169 W/kg

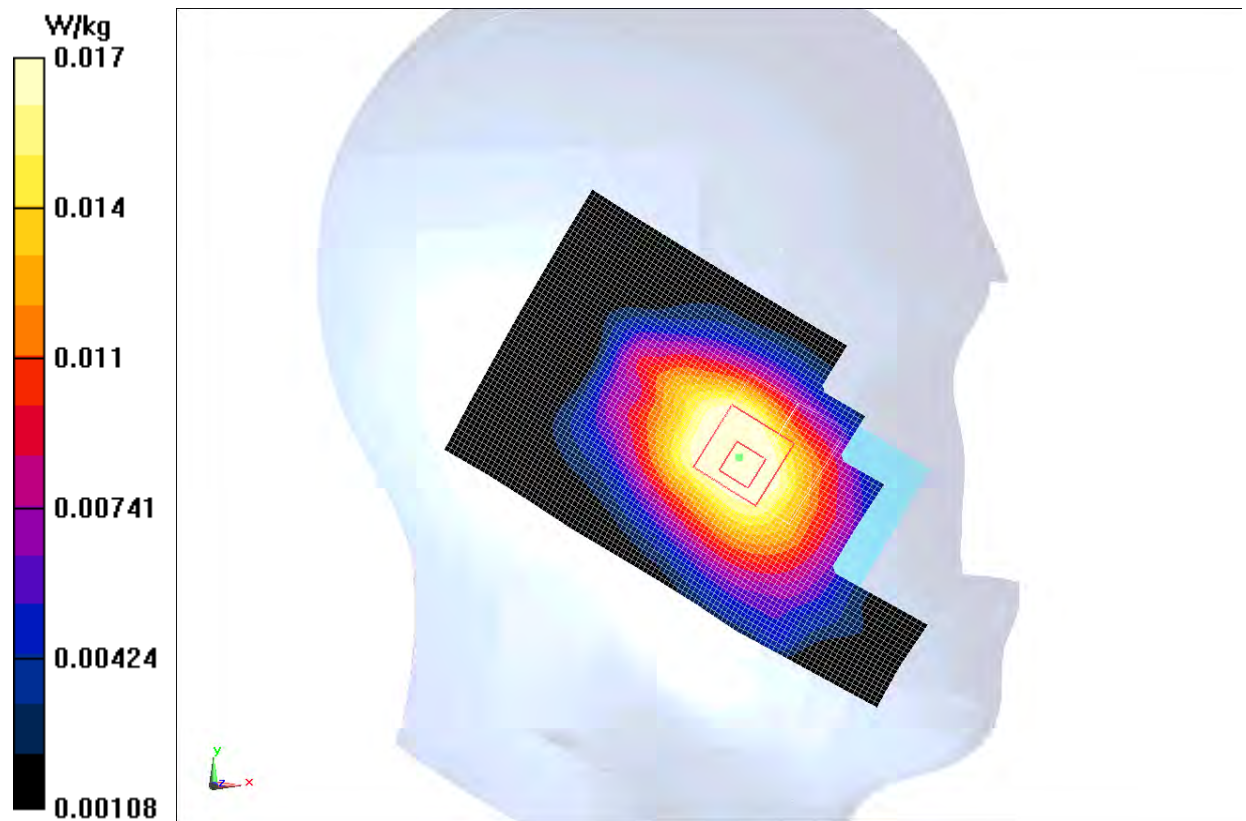


Fig. 1 850MHz CH251

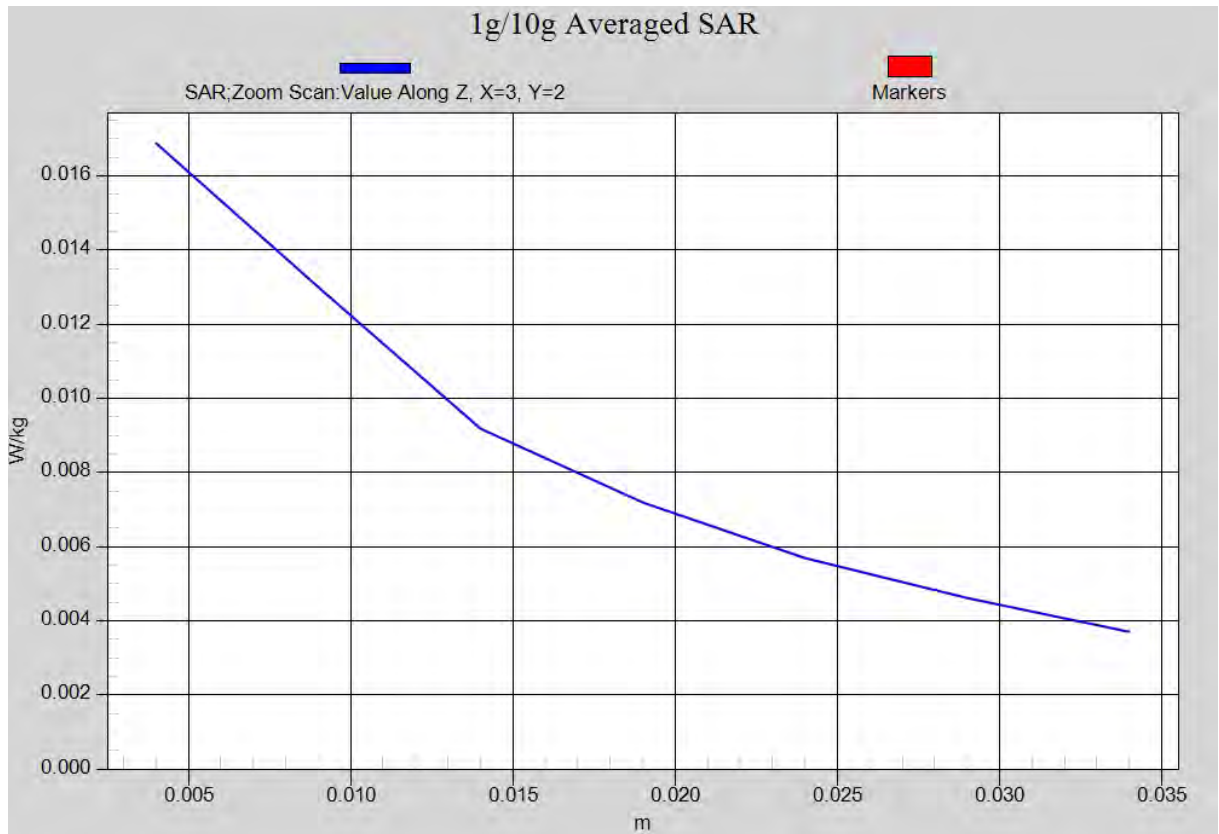


Fig. 1-1 Z-Scan at power reference point (850 MHz CH251)

### 850 Left Cheek High – Slide up

Date: 2013-1-10

Electronics: DAE4 Sn771

Medium: Head 850 MHz

Medium parameters used (interpolated):  $f = 848.8$  MHz;  $\sigma = 0.892$  mho/m;  $\epsilon_r = 40.448$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.7°C      Liquid Temperature: 22.2°C

Communication System: GSM 850 Frequency: 848.8 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 - SN3149 ConvF(6.26, 6.26, 6.26)

**Cheek High/Area Scan (71x101x1):** Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0168 W/kg

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

Reference Value = 1.552 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.0200 W/kg

**SAR(1 g) = 0.015 W/kg; SAR(10 g) = 0.011 W/kg**

Maximum value of SAR (measured) = 0.0165 W/kg

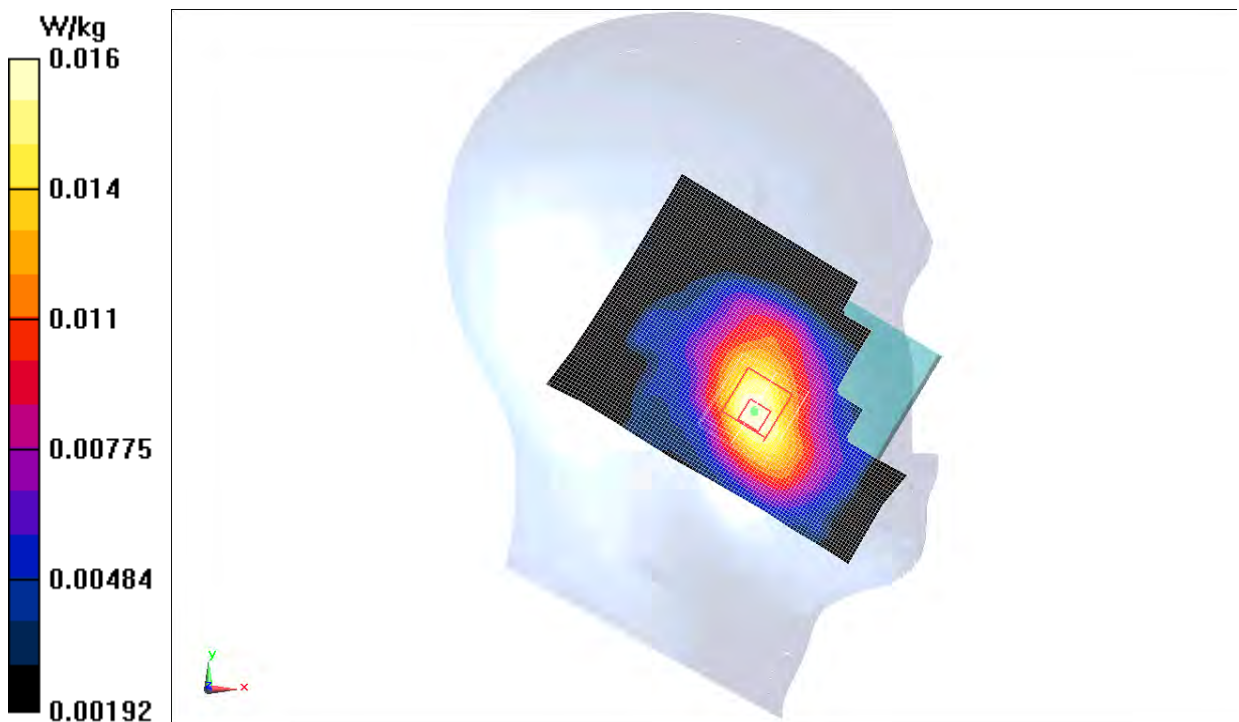
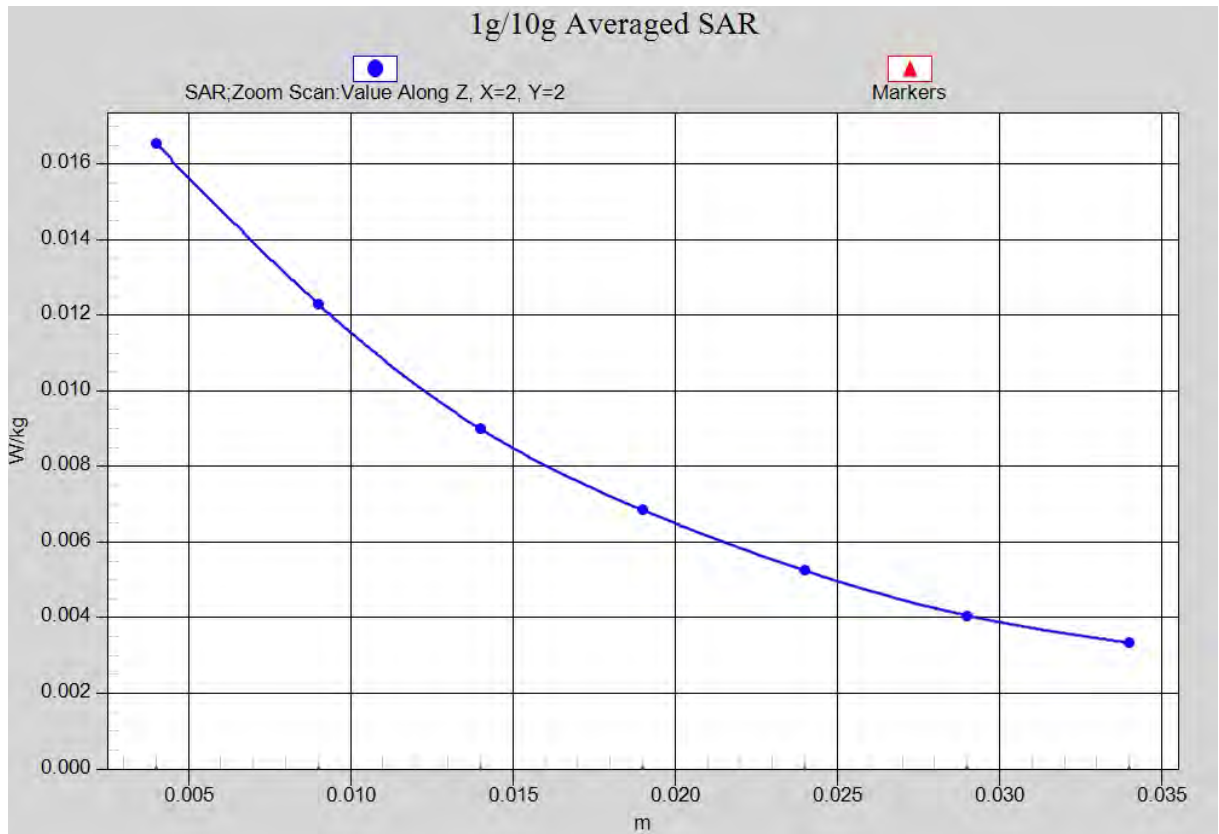


Fig. 2 850MHz CH251



**Fig. 2-1 Z-Scan at power reference point (850 MHz CH251)**

### 850 Body Towards Ground High – Slide down

Date: 2013-1-10

Electronics: DAE4 Sn771

Medium: Body 850 MHz

Medium parameters used (interpolated):  $f = 848.8$  MHz;  $\sigma = 1.003$  mho/m;  $\epsilon_r = 55.543$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.7°C      Liquid Temperature: 22.2°C

Communication System: GSM 850 GPRS Frequency: 848.8 MHz Duty Cycle: 1:4

Probe: ES3DV3 - SN3149 ConvF(6.14, 6.14, 6.14)

**Toward Ground High/Area Scan (61x111x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.0940 mW/g

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

Reference Value = 6.807 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.115 mW/g

**SAR(1 g) = 0.088 mW/g; SAR(10 g) = 0.064 mW/g**

Maximum value of SAR (measured) = 0.0923 mW/g

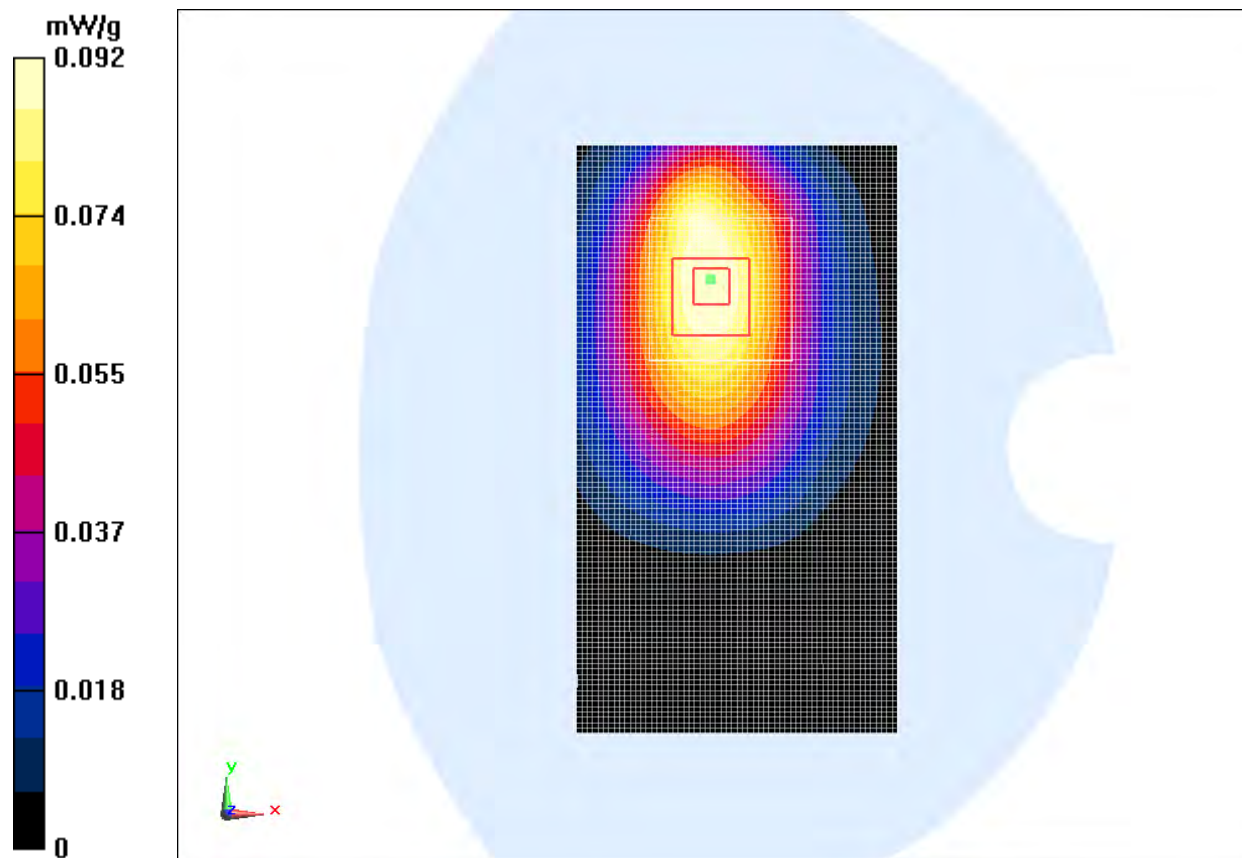
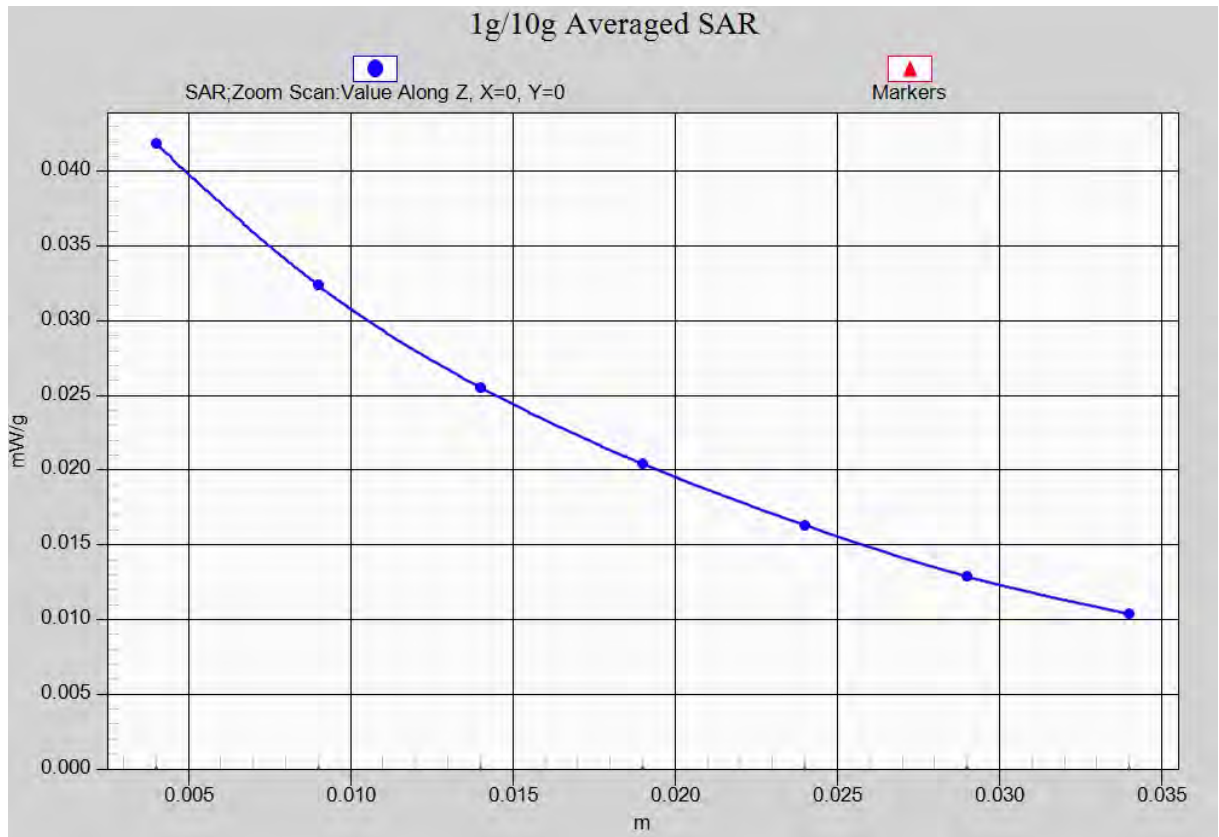


Fig. 3 850 MHz CH251



**Fig. 3-1 Z-Scan at power reference point (850 MHz CH251)**



### 850 Body Towards Ground High – Slide up

Date: 2013-1-10

Electronics: DAE4 Sn771

Medium: Body 850 MHz

Medium parameters used (interpolated):  $f = 848.8$  MHz;  $\sigma = 1.003$  mho/m;  $\epsilon_r = 55.543$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.7°C      Liquid Temperature: 22.2°C

Communication System: GSM 850 GPRS Frequency: 848.8 MHz Duty Cycle: 1:4

Probe: ES3DV3 - SN3149 ConvF(6.14, 6.14, 6.14)

**Toward Ground High/Area Scan (71x111x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.105 mW/g

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

Reference Value = 6.955 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.172 mW/g

**SAR(1 g) = 0.094 mW/g; SAR(10 g) = 0.059 mW/g**

Maximum value of SAR (measured) = 0.100 mW/g

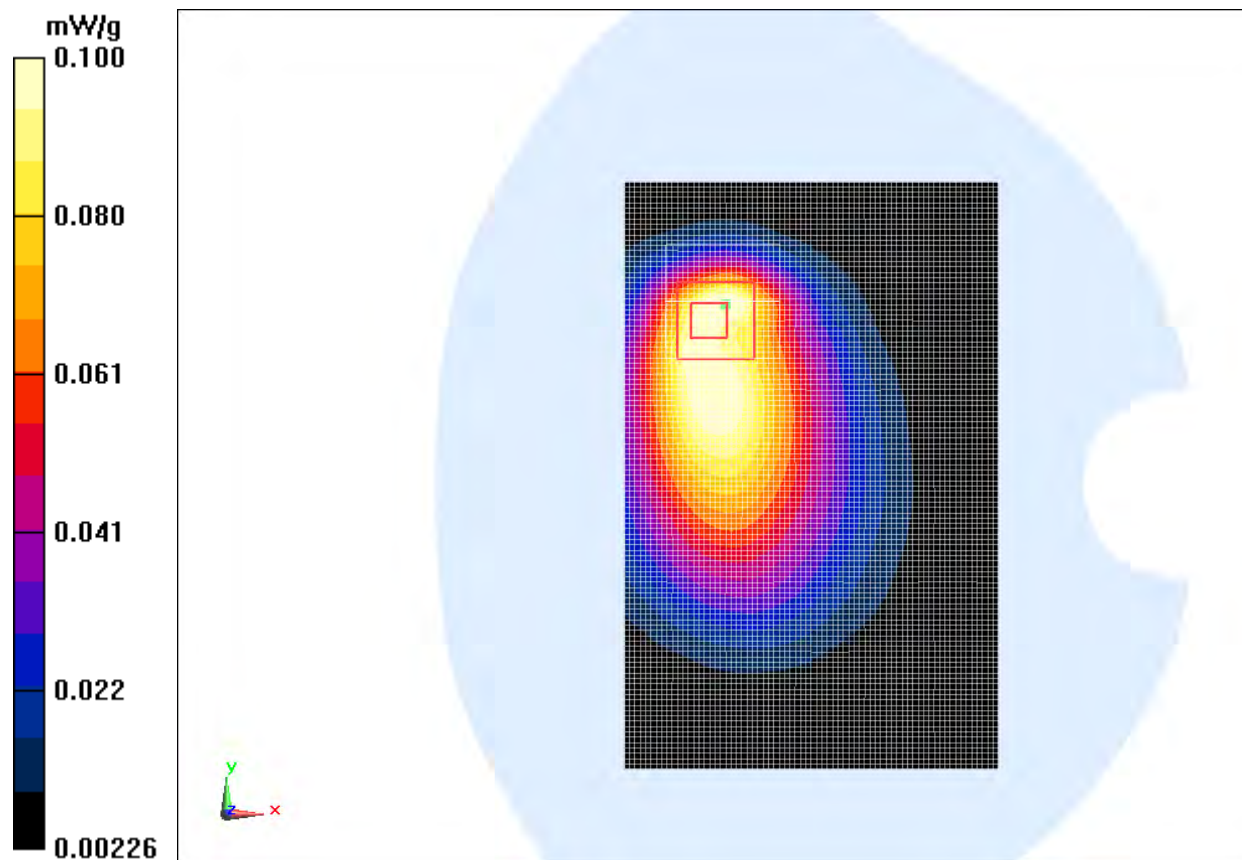


Fig. 4 850 MHz CH251

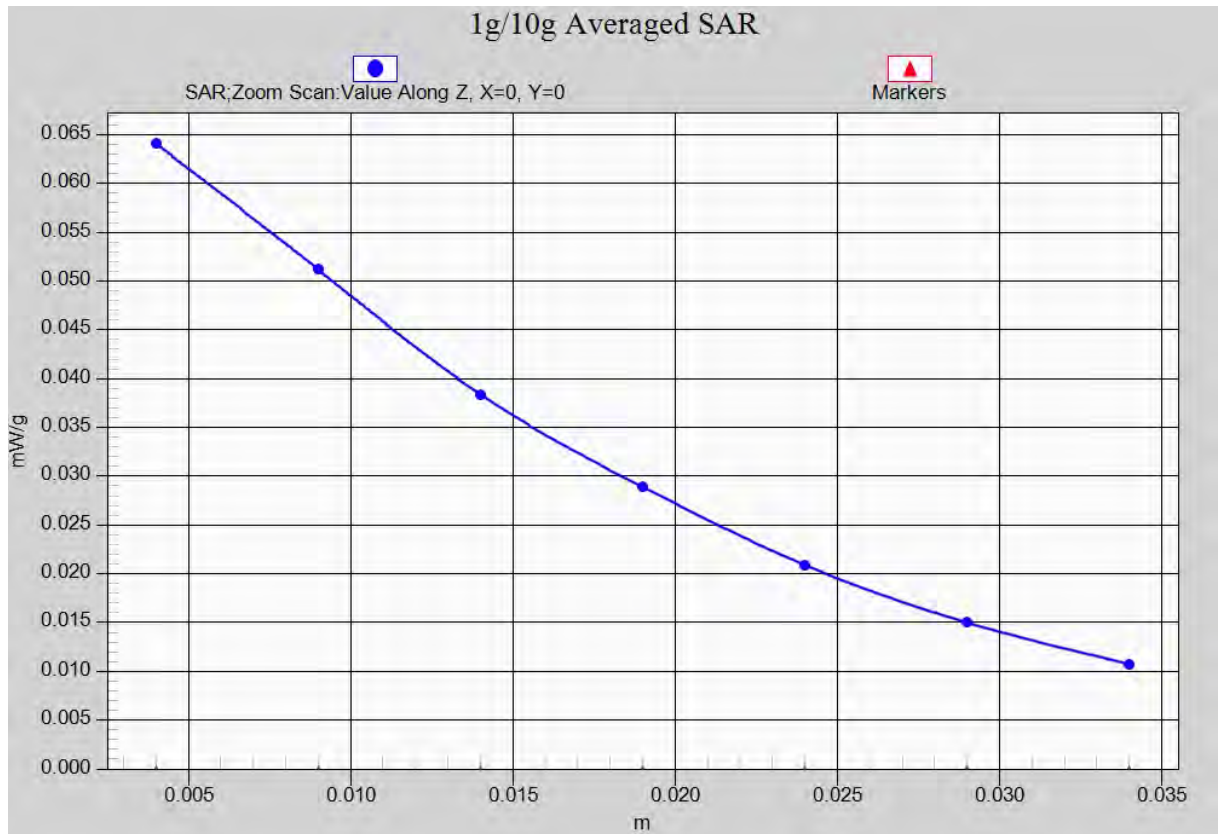


Fig. 4-1 Z-Scan at power reference point (850 MHz CH251)



**1900 Left Cheek High – Slide down**

Date: 2013-1-12

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.423$  mho/m;  $\epsilon_r = 39.202$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.5°C      Liquid Temperature: 22.1°C

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

Probe: ES3DV3 - SN3149 ConvF(5.19, 5.19, 5.19)

**Cheek High/Area Scan (61x101x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.475 mW/g

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

Reference Value = 8.874 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.699 mW/g

**SAR(1 g) = 0.450 mW/g; SAR(10 g) = 0.264 mW/g**

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

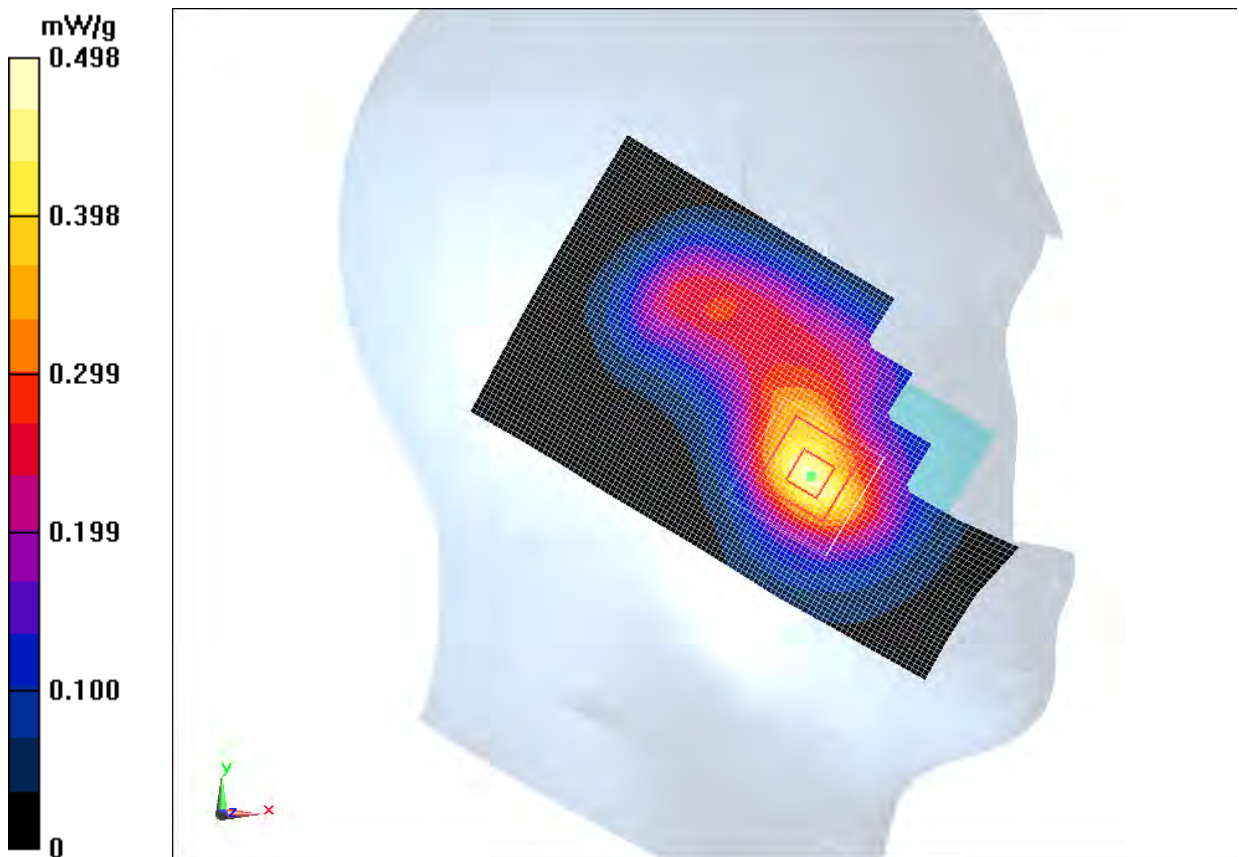


Fig. 5 1900 MHz CH810

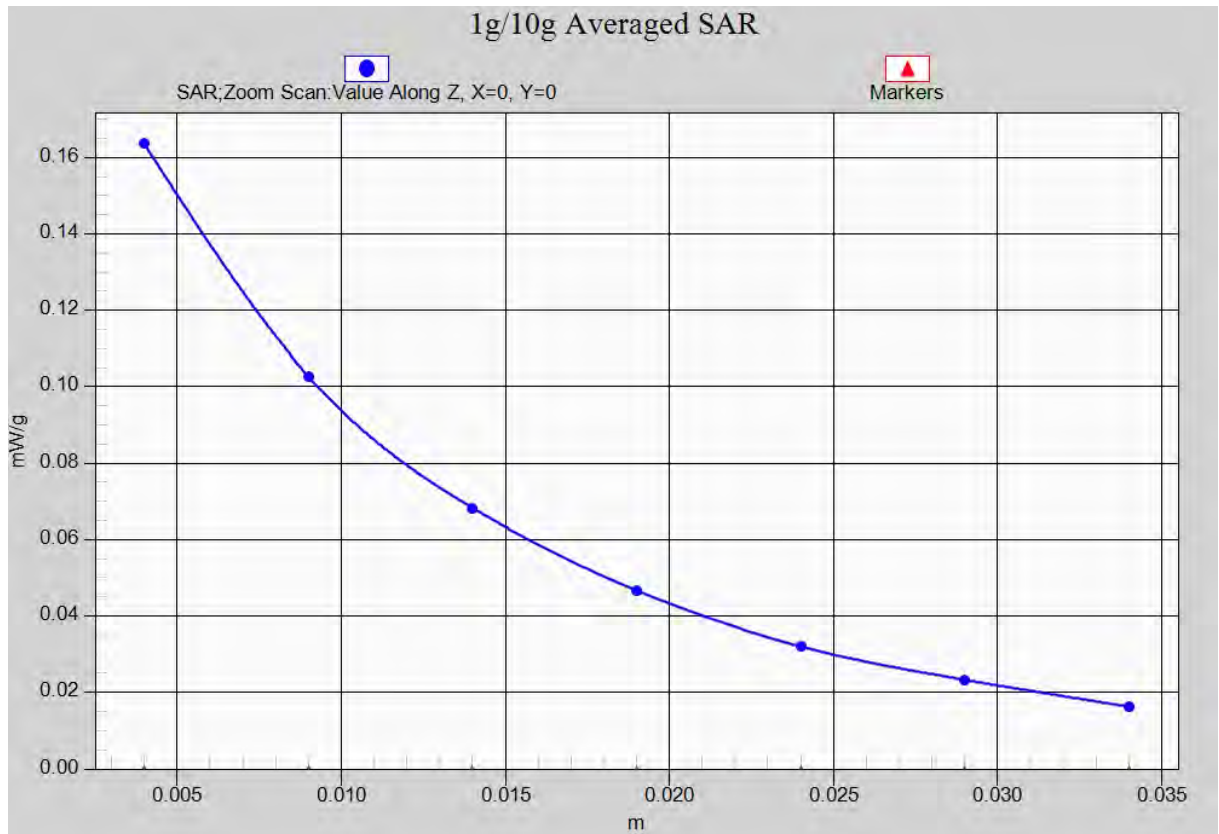


Fig. 5-1 Z-Scan at power reference point (1900 MHz CH810)

**1900 Right Cheek High – Slide up**

Date: 2013-1-12

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.423$  mho/m;  $\epsilon_r = 39.202$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.5°C      Liquid Temperature: 22.1°C

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

Probe: ES3DV3 - SN3149 ConvF(5.19, 5.19, 5.19)

**Cheek High/Area Scan (71x101x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.380 mW/g

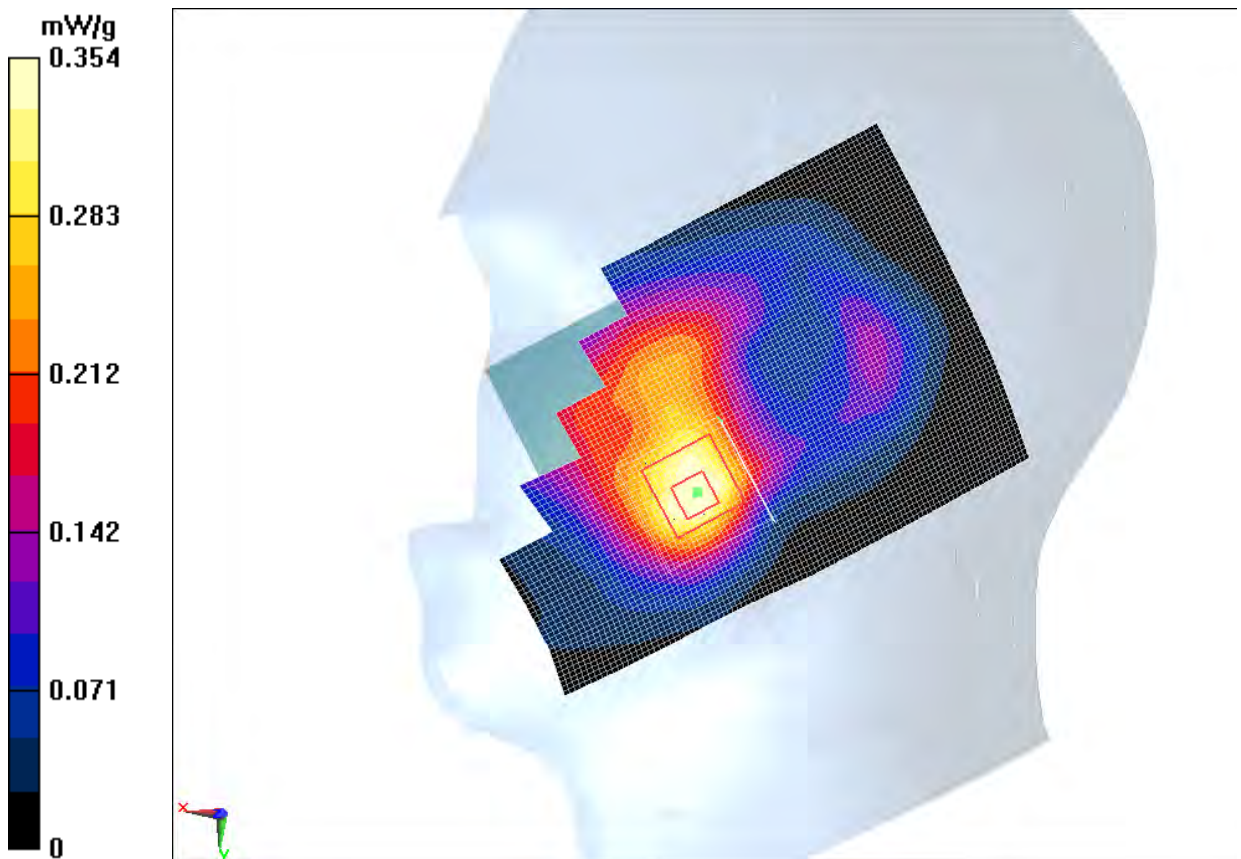
**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.307 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.463 mW/g

**SAR(1 g) = 0.326 mW/g; SAR(10 g) = 0.206 mW/g**

Maximum value of SAR (measured) = 0.354 mW/g



**Fig. 6 1900 MHz CH810**

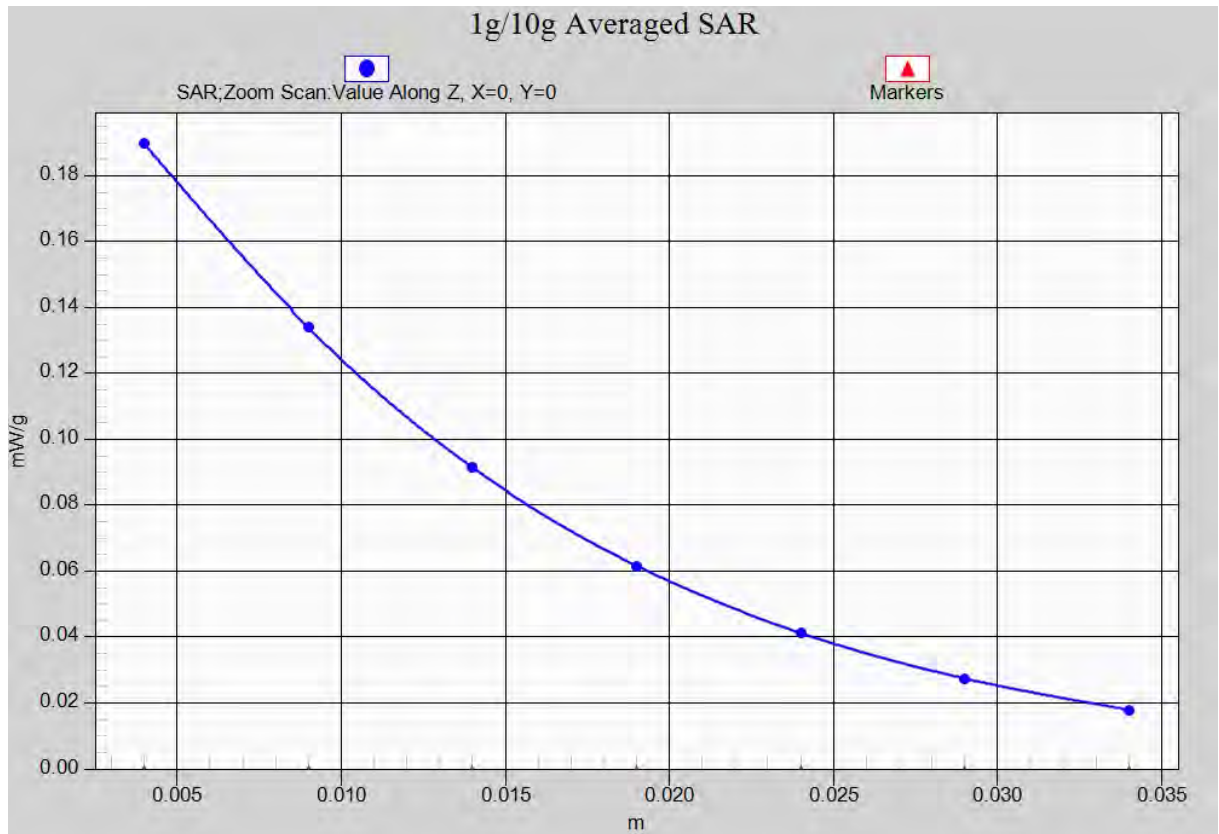


Fig. 6-1 Z-Scan at power reference point (1900 MHz CH810)

### 1900 Body Towards Ground Low – Slide down

Date: 2013-1-12

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.444$  mho/m;  $\epsilon_r = 52.131$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.5°C      Liquid Temperature: 22.1°C

Communication System: GSM 1900MHz GPRS Frequency: 1850.2 MHz Duty Cycle: 1:4

Probe: ES3DV3 - SN3149 ConvF(4.64, 4.64, 4.64)

**Toward Ground Low/Area Scan (61x101x1):** Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.532 W/kg

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

Reference Value = 13.310 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.760 W/kg

**SAR(1 g) = 0.482 W/kg; SAR(10 g) = 0.298 W/kg**

Maximum value of SAR (measured) = 0.517 W/kg

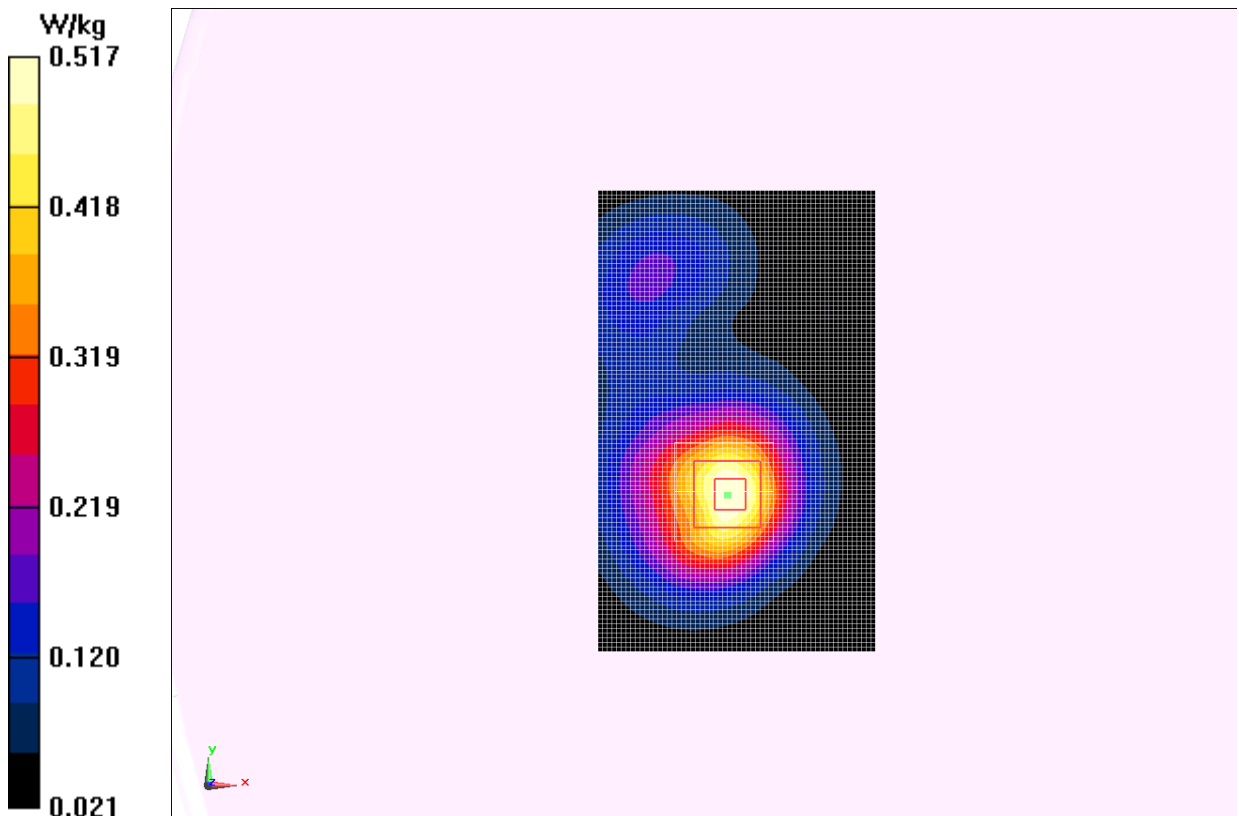


Fig. 7 1900 MHz CH512

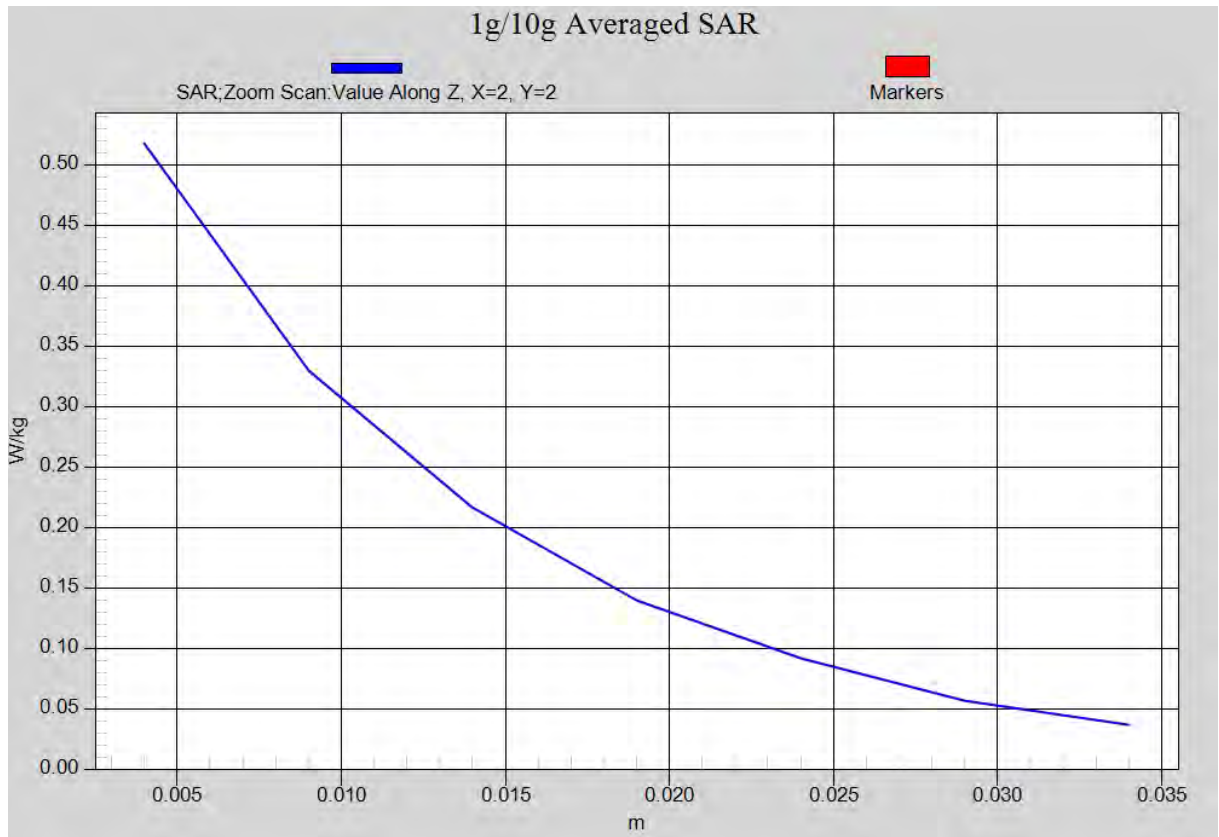


Fig. 7-1 Z-Scan at power reference point (1900 MHz CH512)



### 1900 Body Towards Ground Low – Slide up

Date: 2013-1-12

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.444$  mho/m;  $\epsilon_r = 52.131$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.5°C      Liquid Temperature: 22.1°C

Communication System: GSM 1900MHz GPRS Frequency: 1850.2 MHz Duty Cycle: 1:4

Probe: ES3DV3 - SN3149 ConvF(4.64, 4.64, 4.64)

**Toward Ground Low/Area Scan (81x101x1):** Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.575 W/kg

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

Reference Value = 13.019 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.817 W/kg

**SAR(1 g) = 0.511 W/kg; SAR(10 g) = 0.306 W/kg**

Maximum value of SAR (measured) = 0.538 W/kg

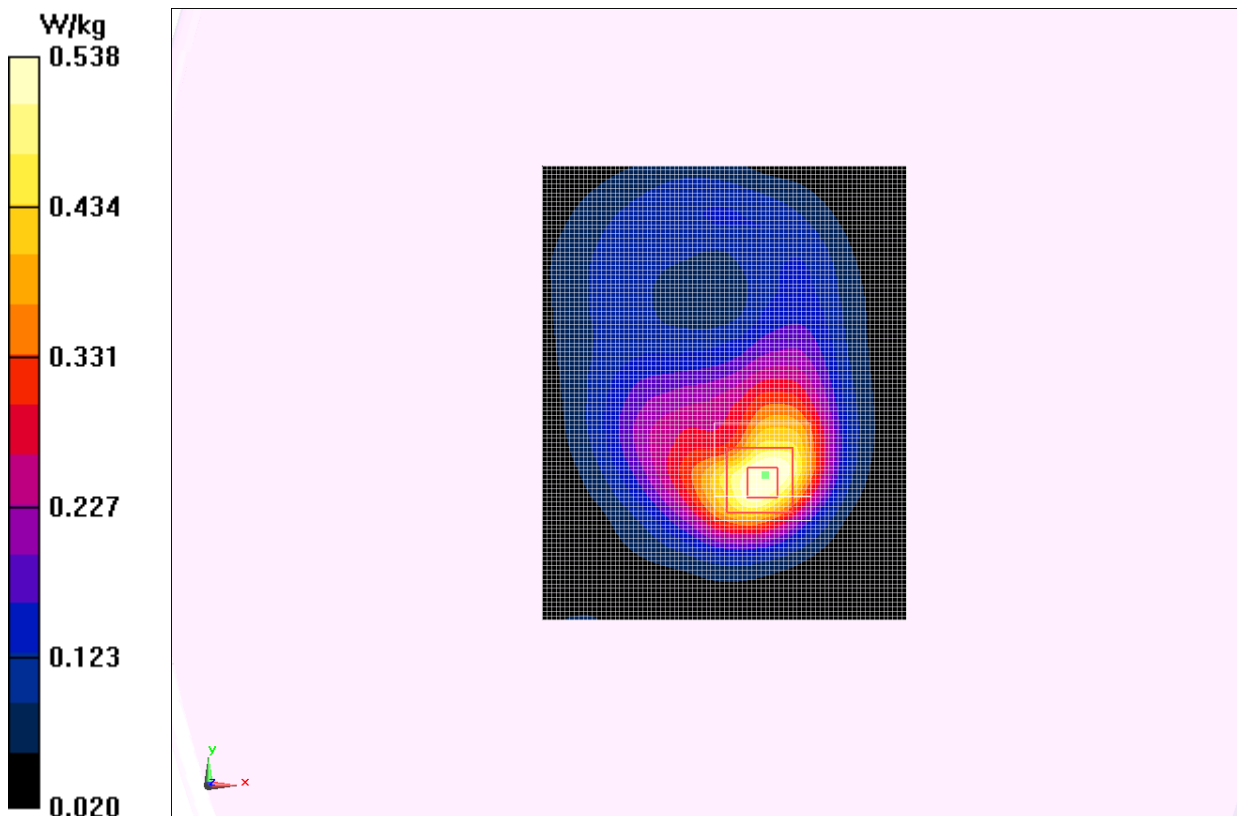
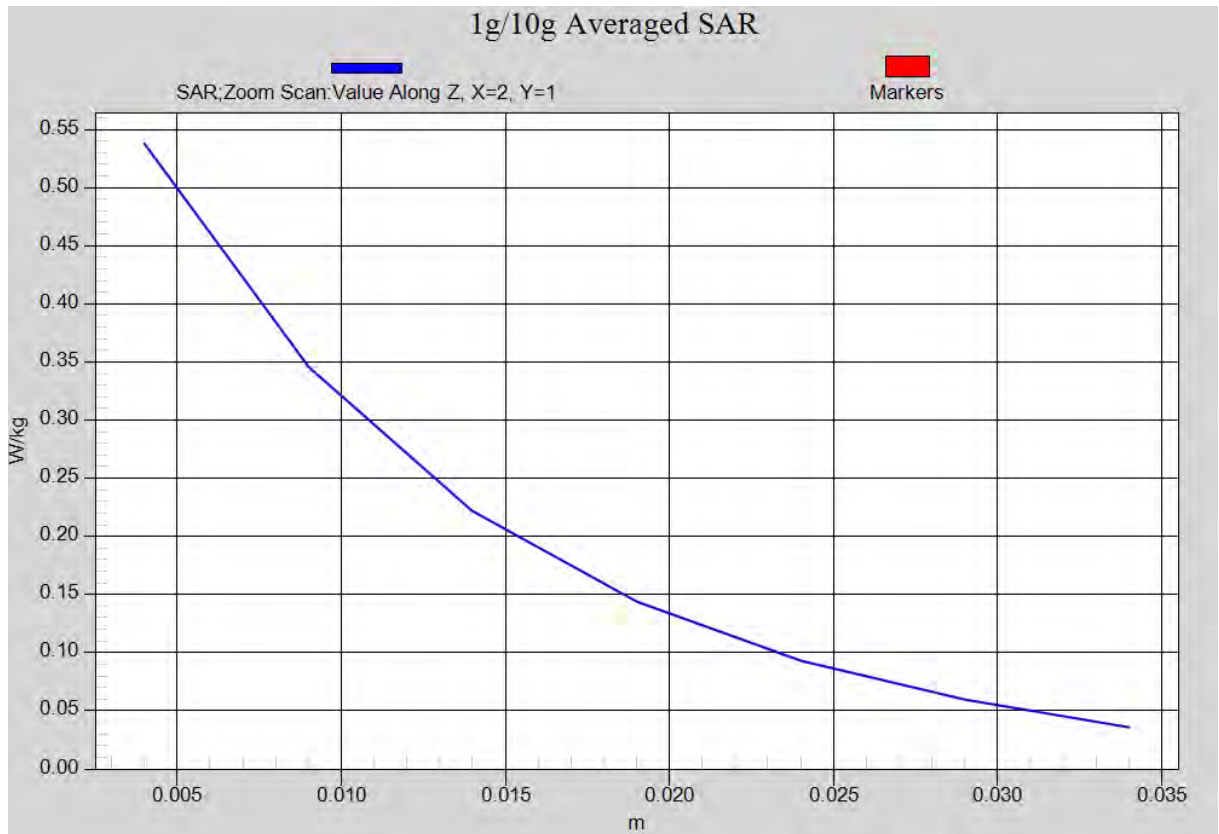


Fig. 8 1900 MHz CH512





**Fig. 8-1 Z-Scan at power reference point (1900 MHz CH512)**

**WCDMA 850 Left Cheek High – Slide down**

Date: 2013-1-10

Electronics: DAE4 Sn771

Medium: Head 850 MHz

Medium parameters used (interpolated):  $f = 846.6$  MHz;  $\sigma = 0.89$  mho/m;  $\epsilon_r = 40.473$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.7°C      Liquid Temperature: 22.2°C

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.26, 6.26, 6.26)

**Cheek High/Area Scan (61x101x1):** Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0210 W/kg

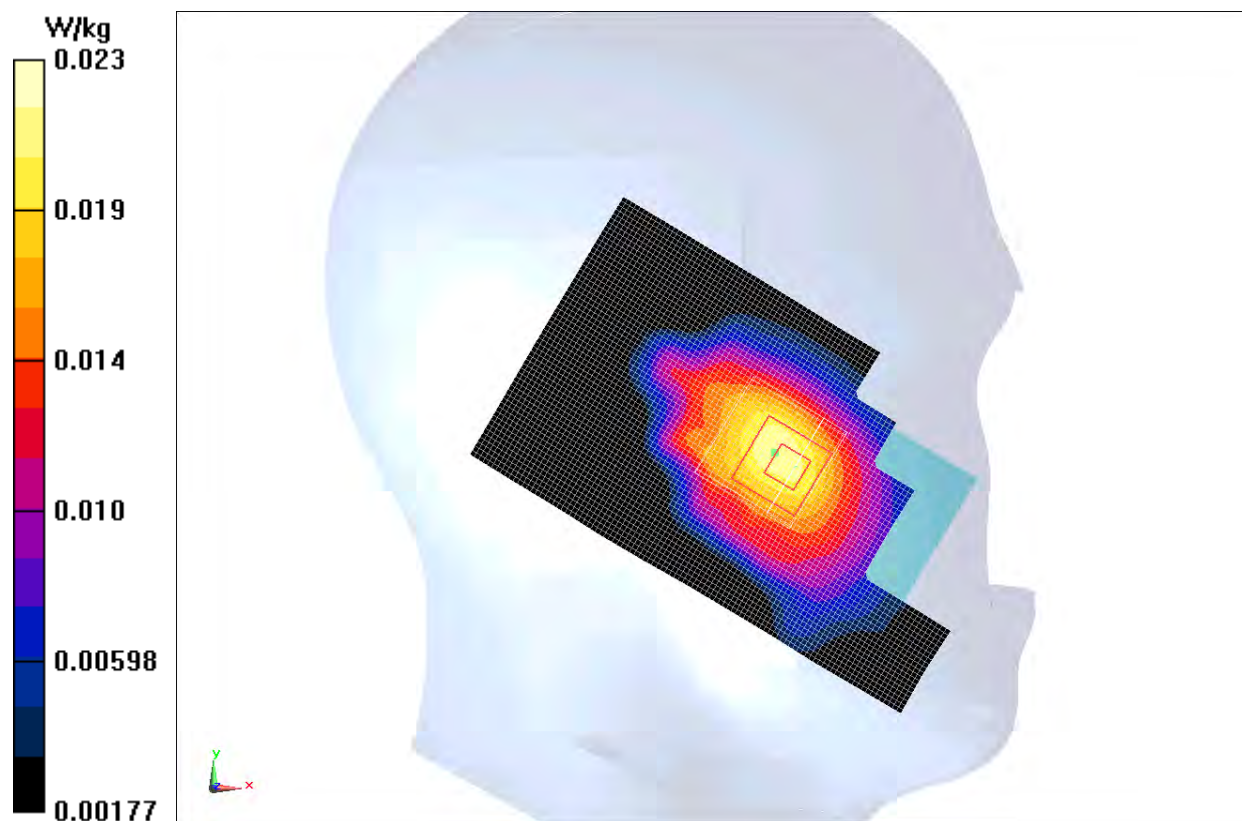
**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.842 V/m; Power Drift = -0.16 dB

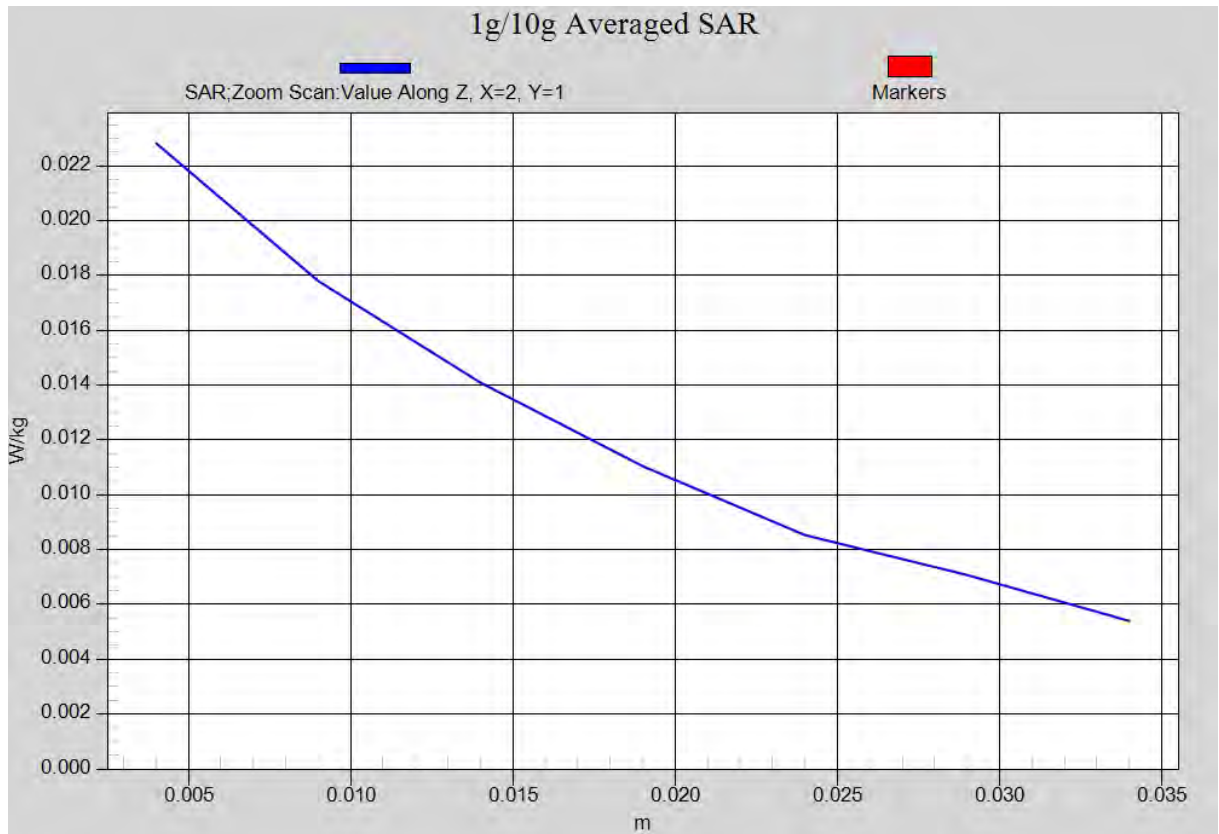
Peak SAR (extrapolated) = 0.0290 W/kg

**SAR(1 g) = 0.022 W/kg; SAR(10 g) = 0.015 W/kg**

Maximum value of SAR (measured) = 0.0228 W/kg



**Fig. 9 WCDMA 850 CH4233**



**Fig. 9-1 Z-Scan at power reference point (WCDMA 850 CH4233)**

### WCDMA 850 Left Cheek High – Slide up

Date: 2013-1-10

Electronics: DAE4 Sn771

Medium: Head 850 MHz

Medium parameters used (interpolated):  $f = 846.6$  MHz;  $\sigma = 0.89$  mho/m;  $\epsilon_r = 40.473$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.7°C      Liquid Temperature: 22.2°C

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.26, 6.26, 6.26)

**Cheek High/Area Scan (61x101x1):** Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0226 W/kg

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

Reference Value = 1.727 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.0300 W/kg

**SAR(1 g) = 0.021 W/kg; SAR(10 g) = 0.014 W/kg**

Maximum value of SAR (measured) = 0.0224 W/kg

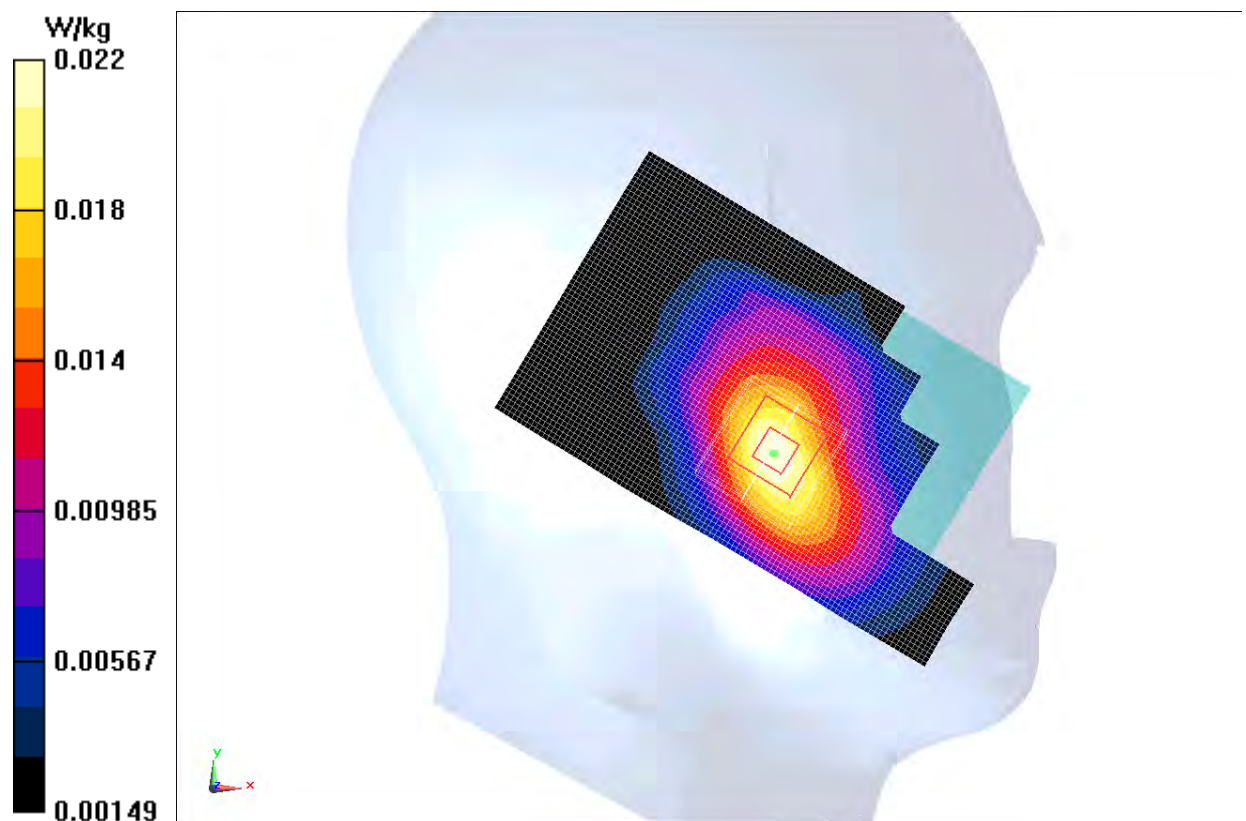
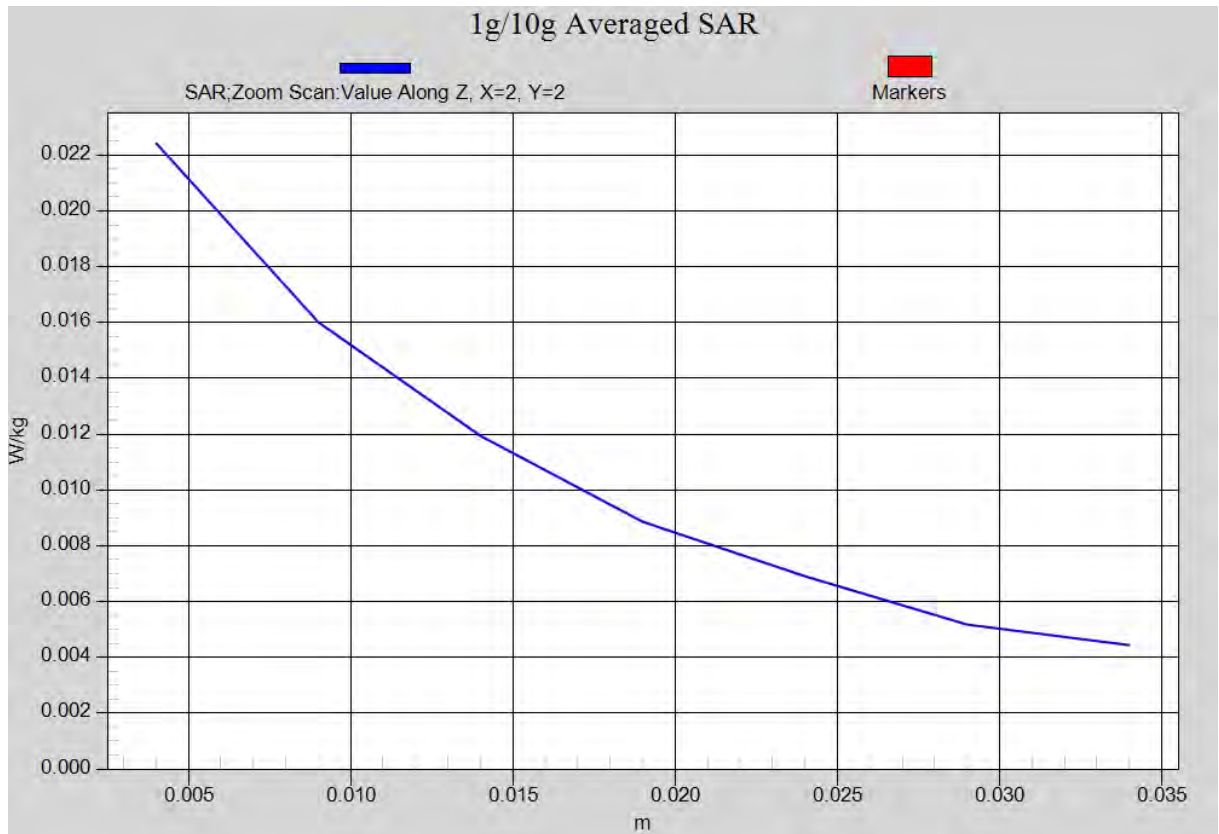


Fig. 10 WCDMA 850 CH4233



**Fig. 10-1 Z-Scan at power reference point (WCDMA 850 CH4233)**

### WCDMA 850 Body Towards Ground High – Slide down

Date: 2013-1-10

Electronics: DAE4 Sn771

Medium: Body 850 MHz

Medium parameters used (interpolated):  $f = 846.6$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.567$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.7°C      Liquid Temperature: 22.2°C

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.14, 6.14, 6.14)

**Toward Ground High/Area Scan (61x111x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.0866 mW/g

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

Reference Value = 7.013 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.107 mW/g

**SAR(1 g) = 0.082 mW/g; SAR(10 g) = 0.059 mW/g**

Maximum value of SAR (measured) = 0.0866 mW/g

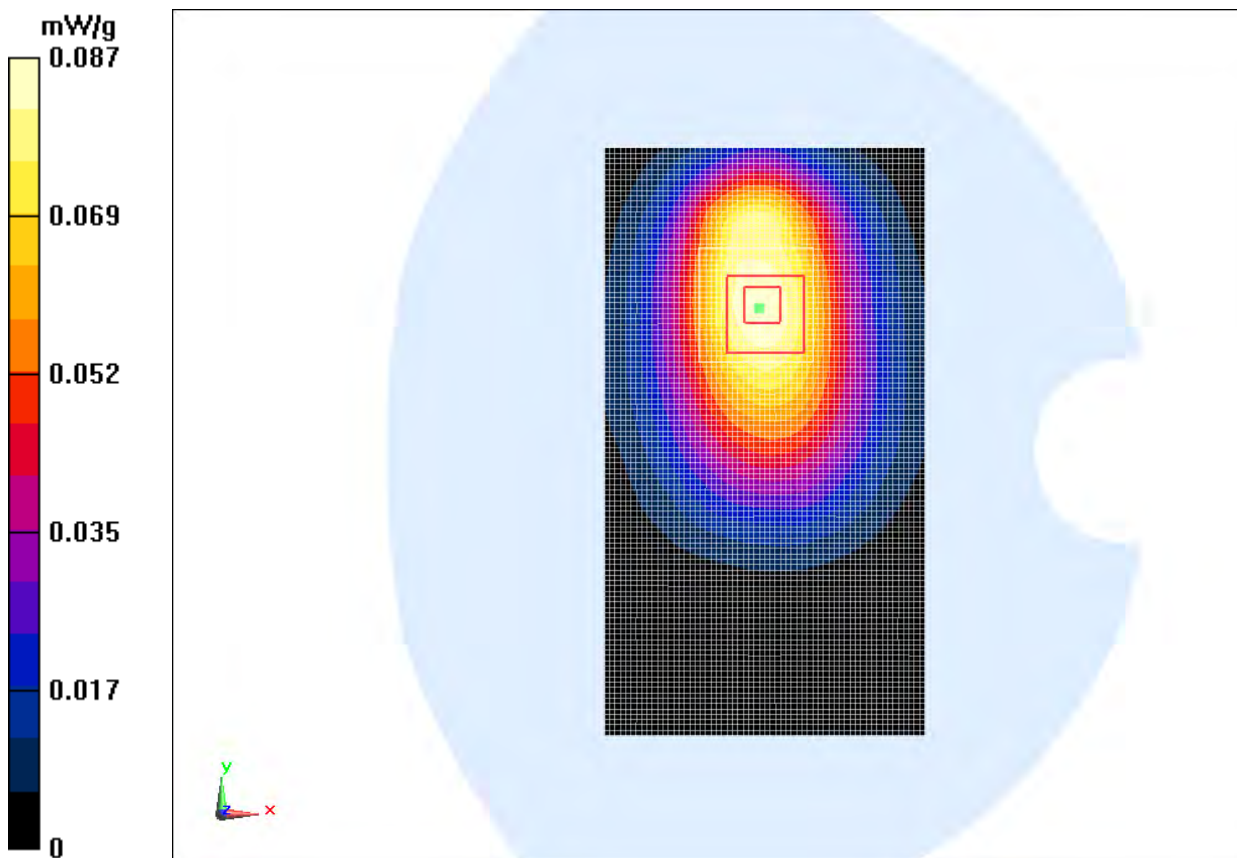


Fig. 11 WCDMA 850 CH4233



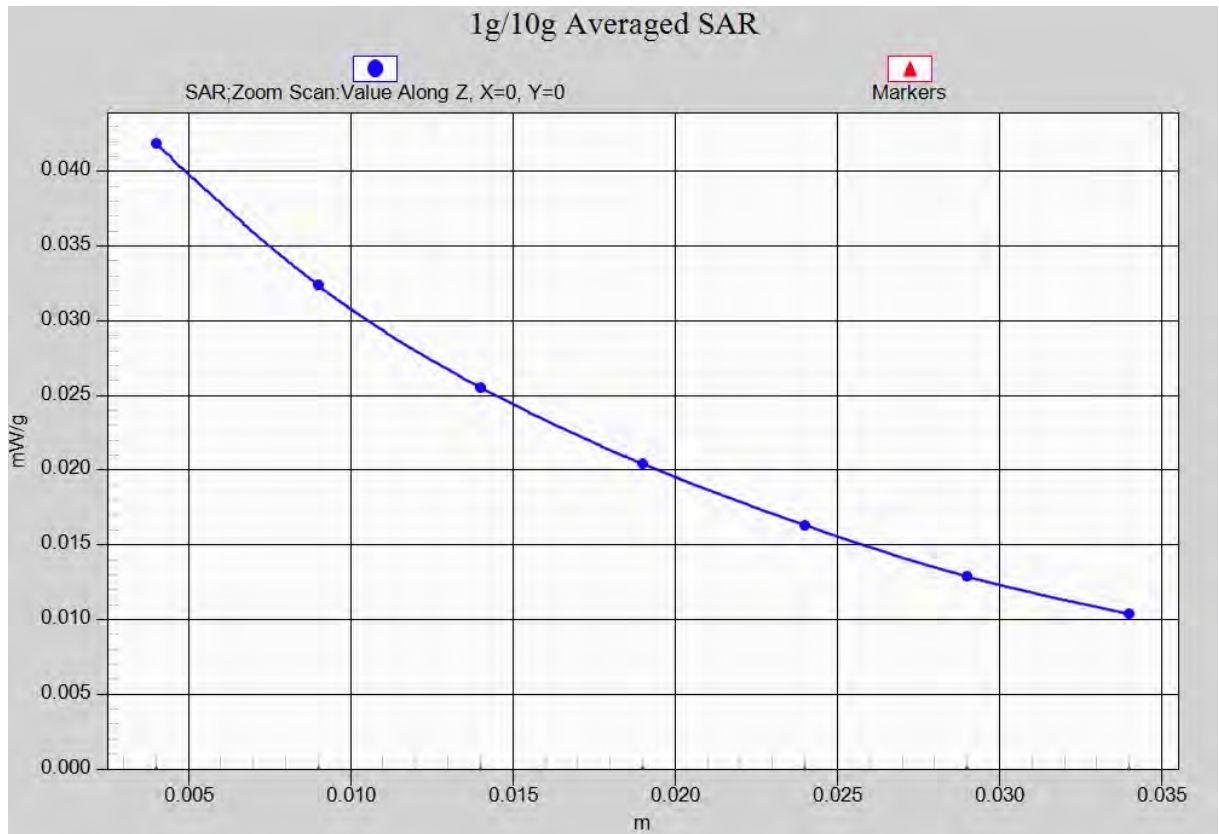


Fig. 11-1 Z-Scan at power reference point (WCDMA850 CH4233)



### WCDMA 850 Body Towards Ground High – Slide up

Date: 2013-1-10

Electronics: DAE4 Sn771

Medium: Body 850 MHz

Medium parameters used (interpolated):  $f = 846.6$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.567$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.7°C      Liquid Temperature: 22.2°C

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(6.14, 6.14, 6.14)

**Toward Ground High/Area Scan (71x111x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.0974 mW/g

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

Reference Value = 6.909 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.148 mW/g

**SAR(1 g) = 0.087 mW/g; SAR(10 g) = 0.061 mW/g**

Maximum value of SAR (measured) = 0.0915 mW/g

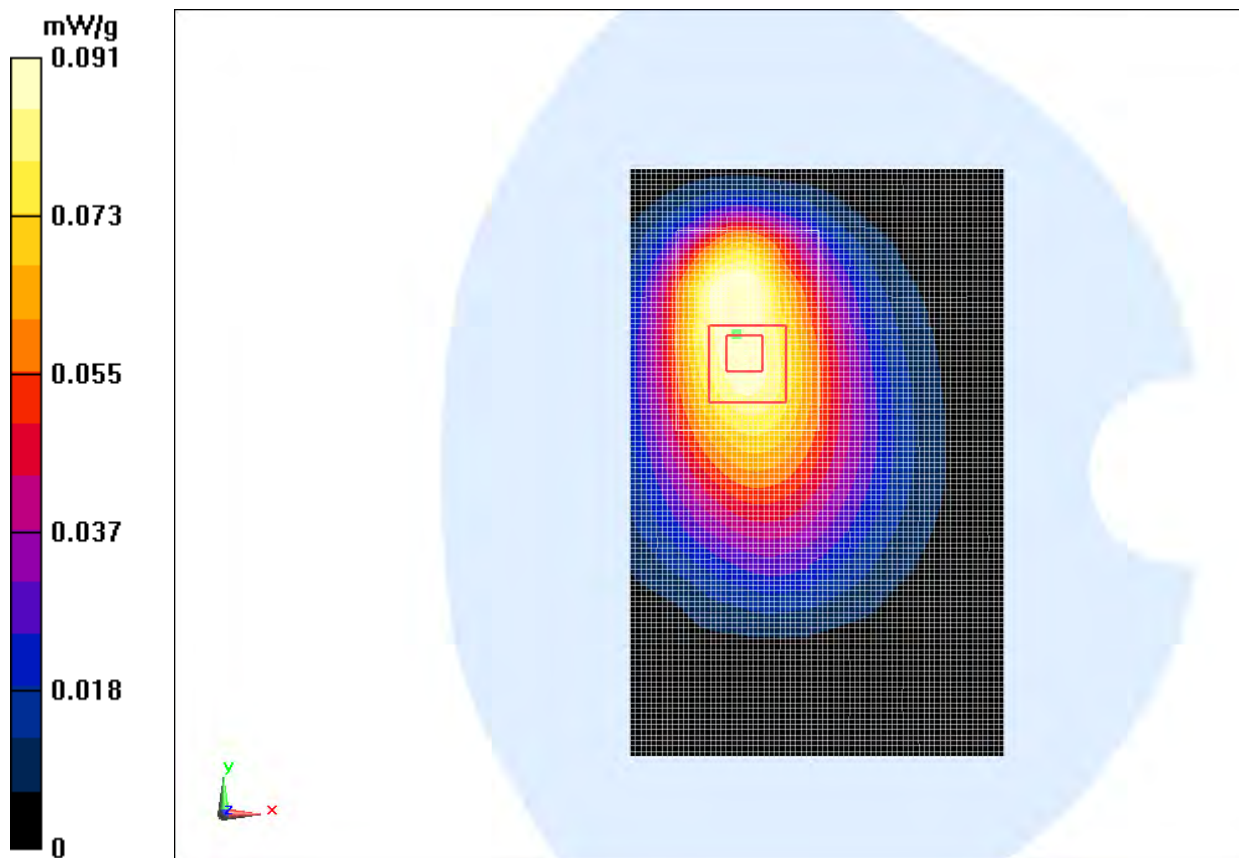
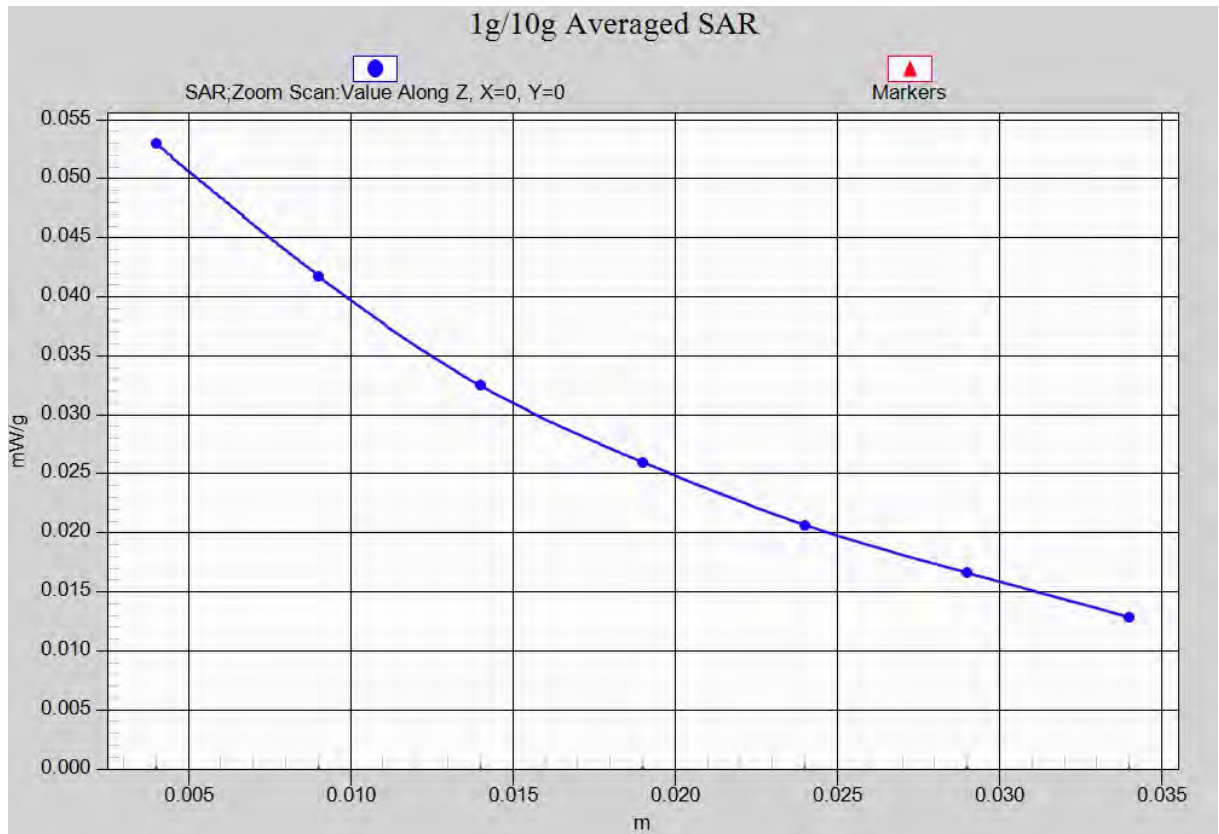


Fig. 12 WCDMA 850 CH4233



**Fig. 12-1 Z-Scan at power reference point (WCDMA850 CH4233)**

**WCDMA 1700 Left Cheek High – Slide down**

Date: 2013-1-11

Electronics: DAE4 Sn771

Medium: Head 1750 MHz

Medium parameters used (interpolated):  $f = 1752.6$  MHz;  $\sigma = 1.365$  mho/m;  $\epsilon_r = 40.044$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.4°C      Liquid Temperature: 21.9°C

Communication System: WCDMA 1700 Frequency: 1752.6 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(5.23, 5.23, 5.23)

**Cheek High/Area Scan (61x101x1):** Measurement grid: dx=10mm, dy=10mm

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

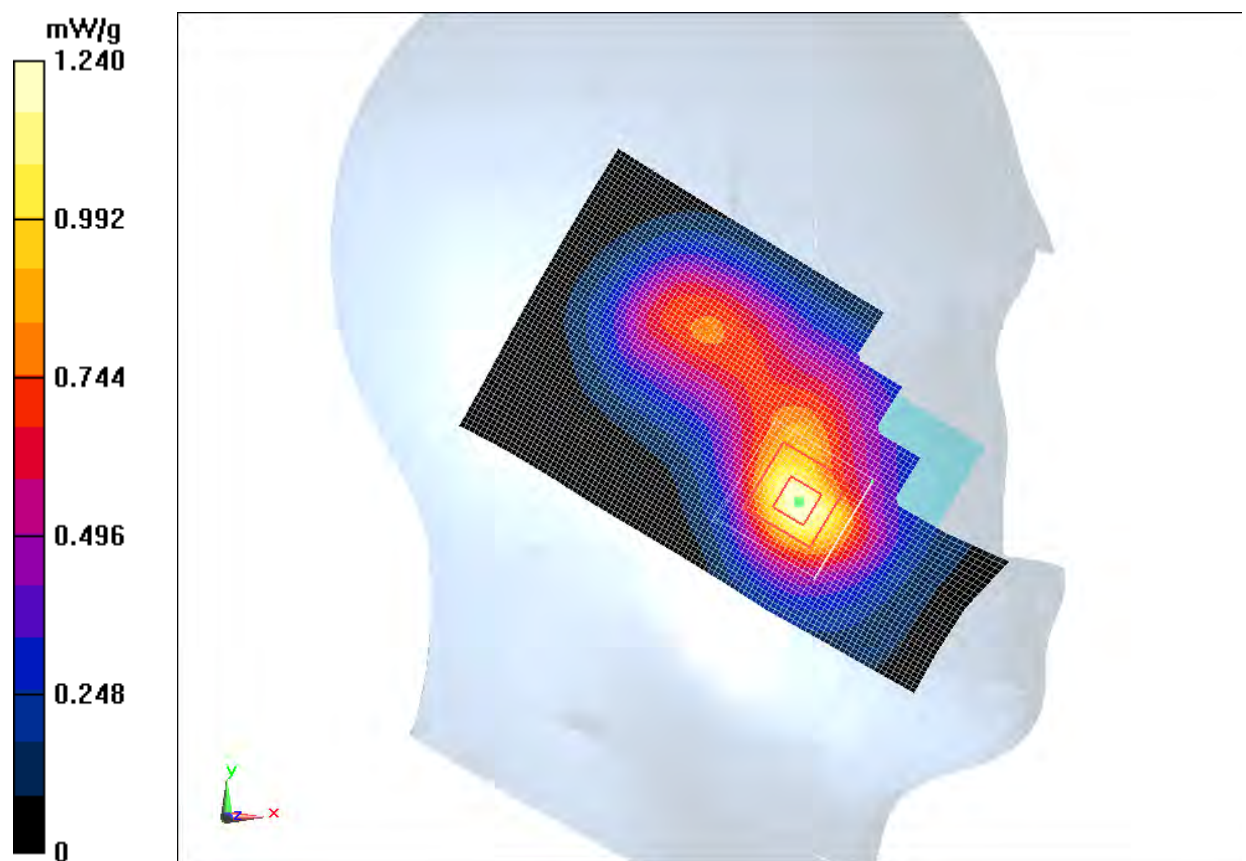
**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.880 V/m; Power Drift = 0.11 dB

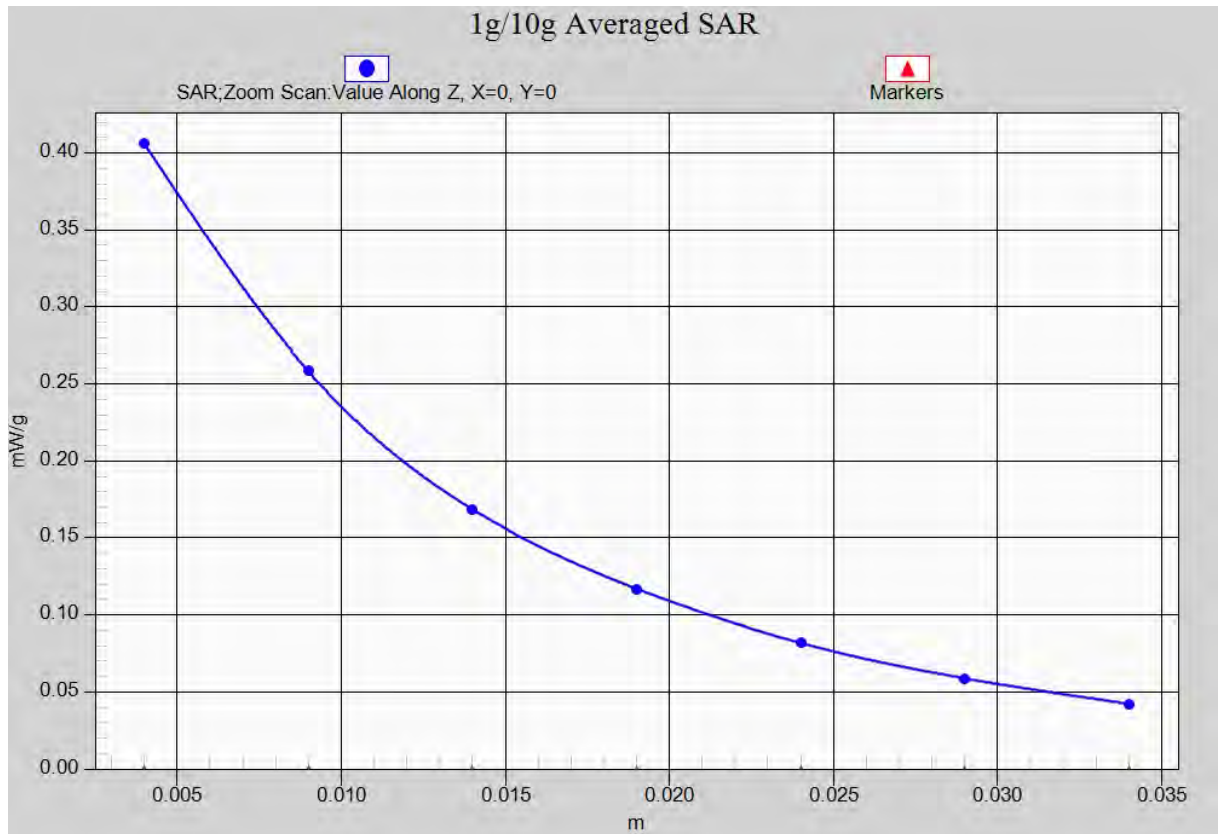
Peak SAR (extrapolated) = 1.729 mW/g

**SAR(1 g) = 1.12 mW/g; SAR(10 g) = 0.668 mW/g**

Maximum value of SAR (measured) = 1.24 mW/g



**Fig. 13 1700MHz CH1513**



**Fig. 13-1 Z-Scan at power reference point (1700 MHz CH1513)**

**WCDMA 1700 Left Cheek High – Slide up**

Date: 2013-1-11

Electronics: DAE4 Sn771

Medium: Head 1750 MHz

Medium parameters used (interpolated):  $f = 1752.6$  MHz;  $\sigma = 1.365$  mho/m;  $\epsilon_r = 40.044$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.4°C      Liquid Temperature: 21.9°C

Communication System: WCDMA 1700 Frequency: 1752.6 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(5.23, 5.23, 5.23)

**Cheek High/Area Scan (71x101x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.913 mW/g

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

Reference Value = 8.931 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 1.126 mW/g

**SAR(1 g) = 0.782 mW/g; SAR(10 g) = 0.498 mW/g**

Maximum value of SAR (measured) = 0.850 mW/g

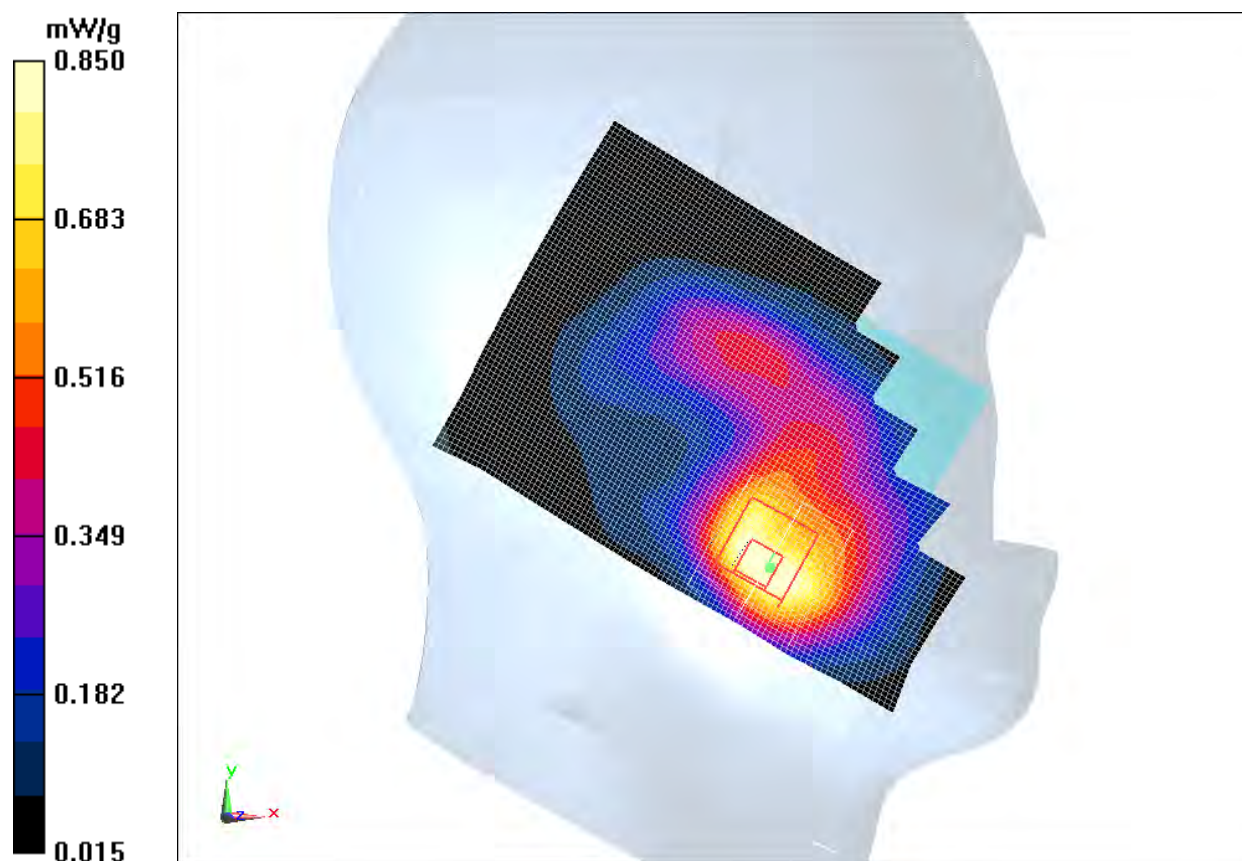
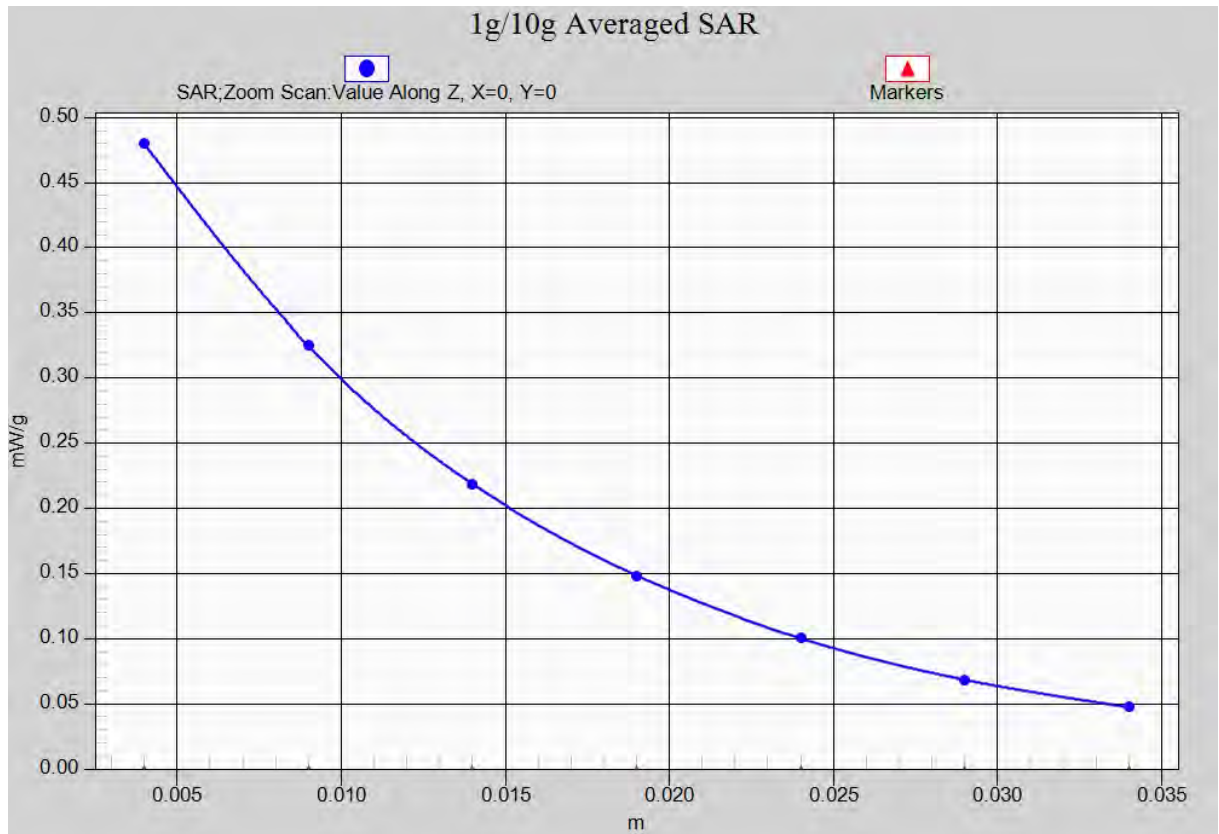


Fig. 14 1700MHz CH1513





**Fig. 14-1 Z-Scan at power reference point (1700 MHz CH1513)**



**WCDMA 1700 Body Toward Ground High – Slide down**

Date: 2013-1-11

Electronics: DAE4 Sn771

Medium: Body 1800 MHz

Medium parameters used (interpolated):  $f = 1752.6$  MHz;  $\sigma = 1.527$  mho/m;  $\epsilon_r = 53.964$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.4°C      Liquid Temperature: 21.9°C

Communication System: WCDMA 1700 Frequency: 1752.6 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(4.84, 4.84, 4.84)

**Toward Ground High/Area Scan (61x111x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.42 mW/g

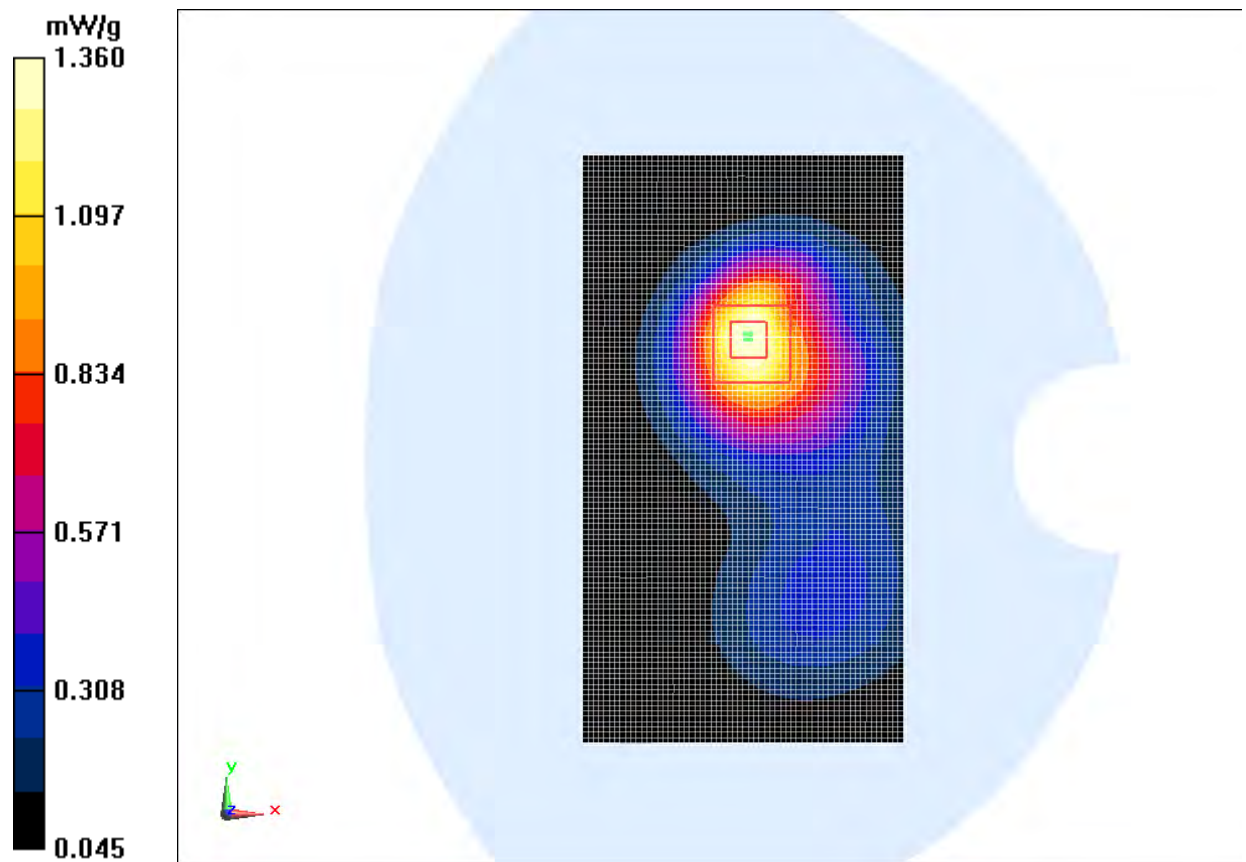
**Toward Ground High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.748 V/m; Power Drift = 0.00 dB

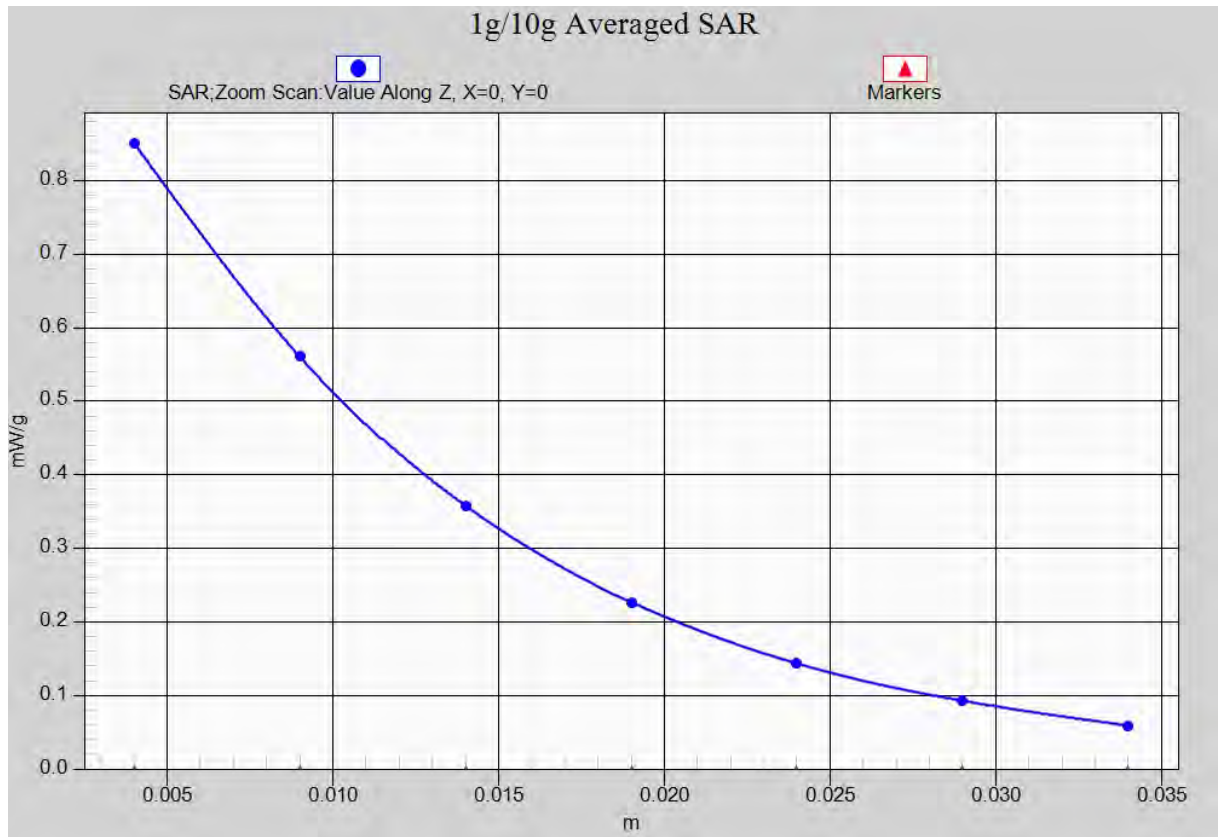
Peak SAR (extrapolated) = 1.843 mW/g

**SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.746 mW/g**

Maximum value of SAR (measured) = 1.36 mW/g



**Fig. 15 1700 MHz CH1513**



**Fig. 15-1 Z-Scan at power reference point (1700 MHz CH1513)**

**WCDMA 1700 Body Toward Ground Middle – Slide up**

Date: 2013-1-11

Electronics: DAE4 Sn771

Medium: Body 1800 MHz

Medium parameters used (interpolated):  $f = 1732.4$  MHz;  $\sigma = 1.509$  mho/m;  $\epsilon_r = 54.038$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.4°C      Liquid Temperature: 21.9°C

Communication System: WCDMA 1700 Frequency: 1732.4 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(4.84, 4.84, 4.84)

**Toward Ground Middle/Area Scan (61x111x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.792 mW/g

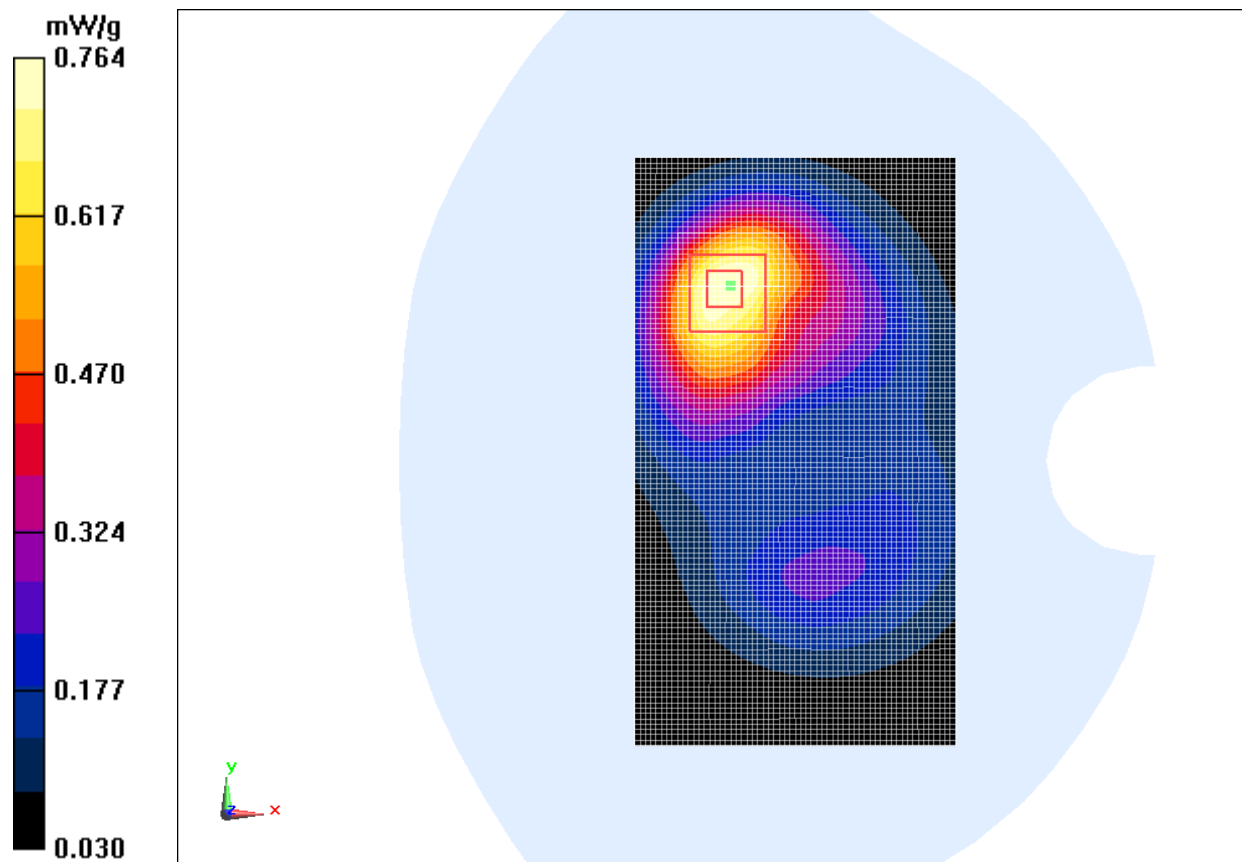
**Toward Ground Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.838 V/m; Power Drift = 0.01 dB

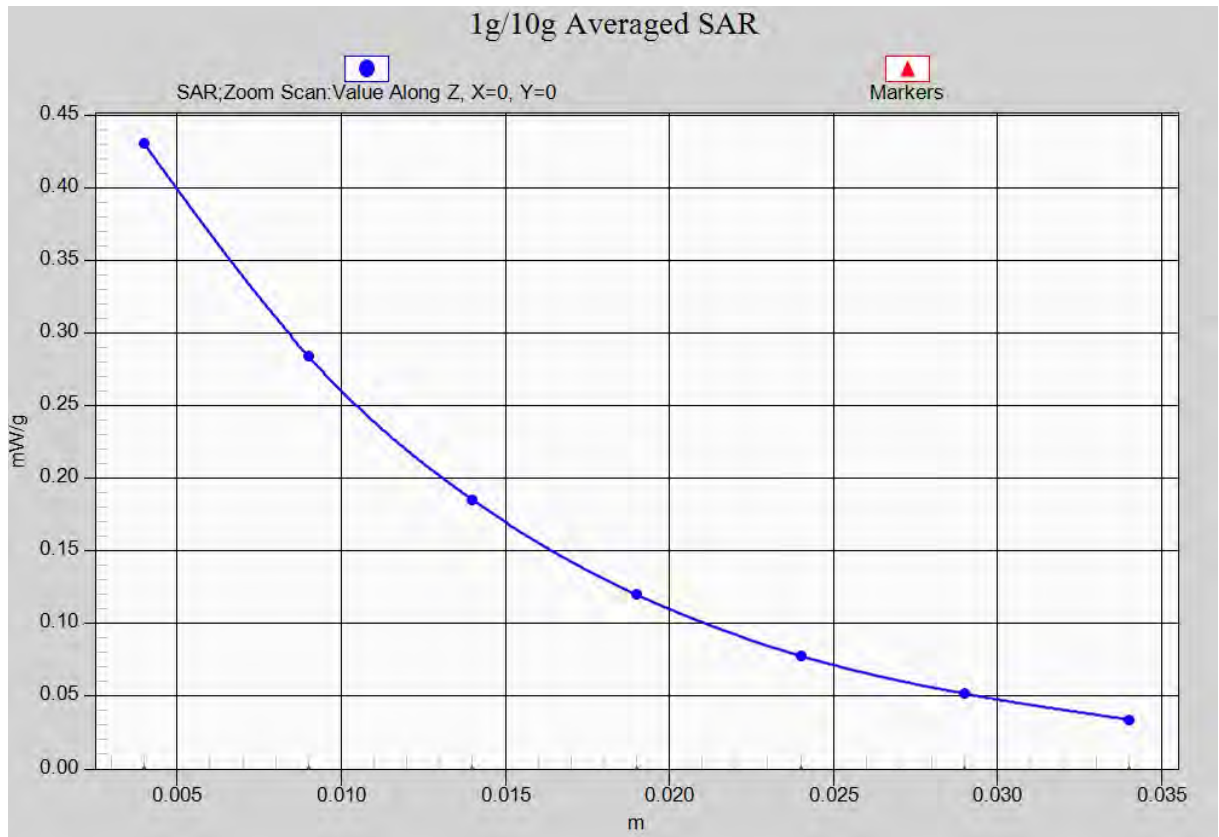
Peak SAR (extrapolated) = 1.039 mW/g

**SAR(1 g) = 0.704 mW/g; SAR(10 g) = 0.439 mW/g**

Maximum value of SAR (measured) = 0.764 mW/g



**Fig. 16 1700 MHz CH1412**



**Fig. 16-1 Z-Scan at power reference point (1700 MHz CH1412)**

**WCDMA 1900 Left Cheek Middle – Slide down**

Date: 2013-1-12

Electronics: DAE4 Sn771

Medium: Head GSM1900

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.395$  mho/m;  $\epsilon_r = 39.357$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.5°C      Liquid Temperature: 22.1°C

Communication System: WCDMA 1900 Frequency: 1880 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(5.19, 5.19, 5.19)

**Cheek Middle/Area Scan (61x101x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.984 mW/g

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

Reference Value = 12.036 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 1.422 mW/g

**SAR(1 g) = 0.919 mW/g; SAR(10 g) = 0.541 mW/g**

Maximum value of SAR (measured) = 1.01 mW/g

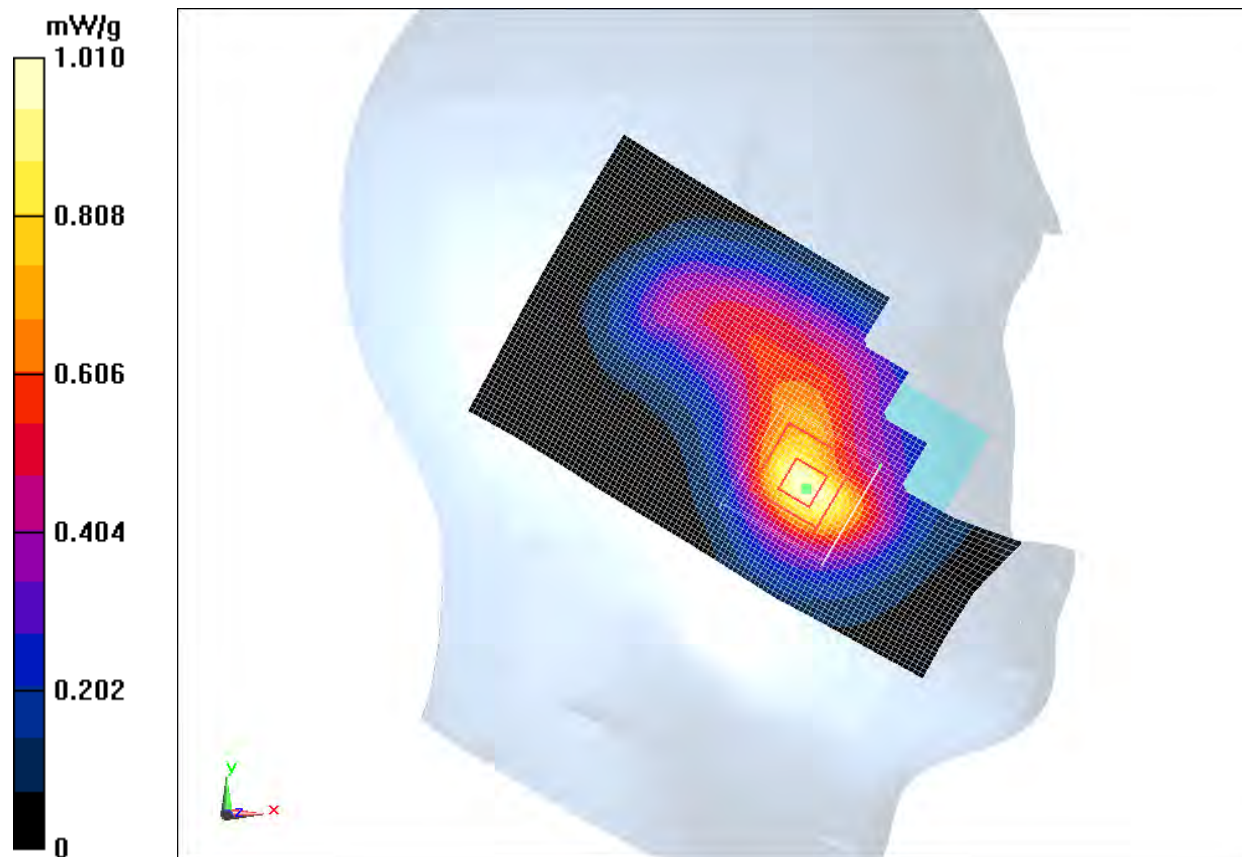


Fig. 17 WCDMA1900 CH9400

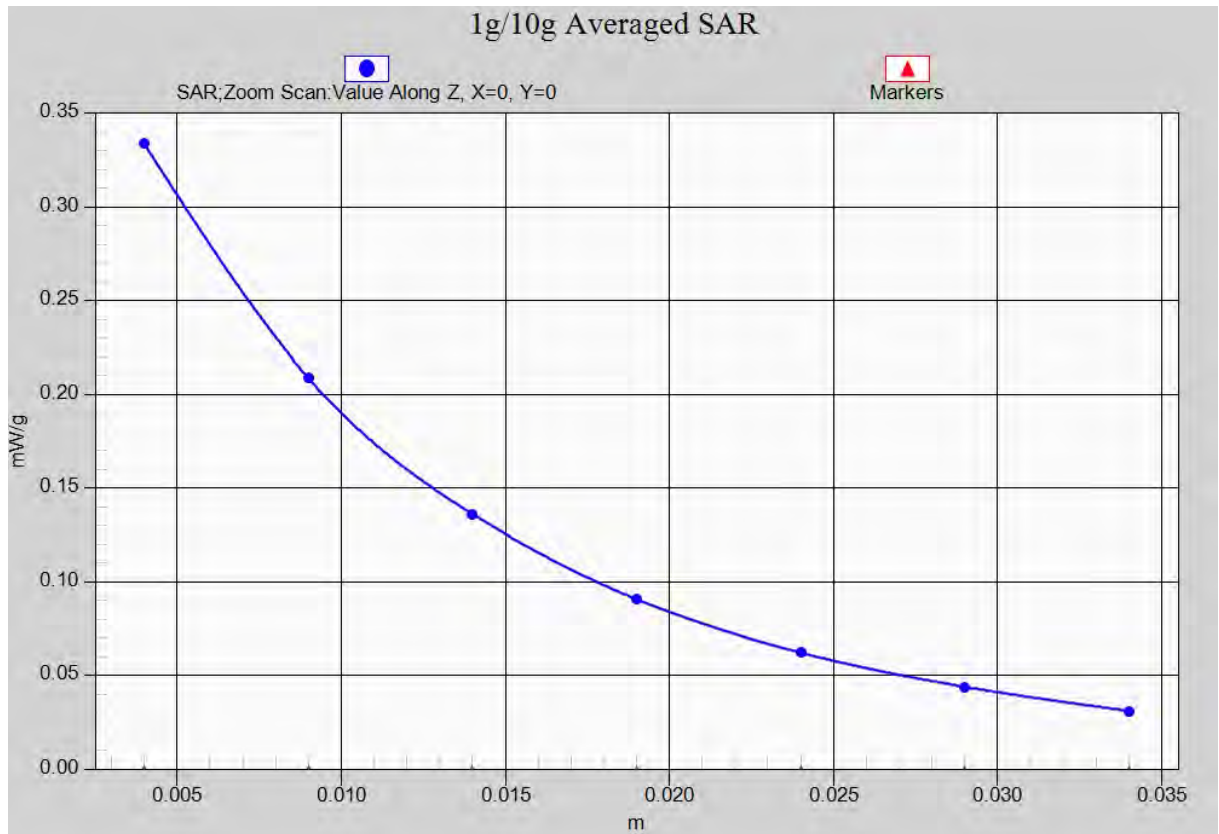


Fig. 17-1 Z-Scan at power reference point (WCDMA1900 CH9400)



**WCDMA 1900 Left Cheek High – Slide up**

Date: 2013-1-12

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1907.6$  MHz;  $\sigma = 1.421$  mho/m;  $\epsilon_r = 39.212$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.5°C      Liquid Temperature: 22.1°C

Communication System: WCDMA 1900 Frequency: 1907.6 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(5.19, 5.19, 5.19)

**Cheek High/Area Scan (71x101x1):** Measurement grid: dx=10mm, dy=10mm

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

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

Reference Value = 11.609 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.864 mW/g

**SAR(1 g) = 0.581 mW/g; SAR(10 g) = 0.374 mW/g**

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

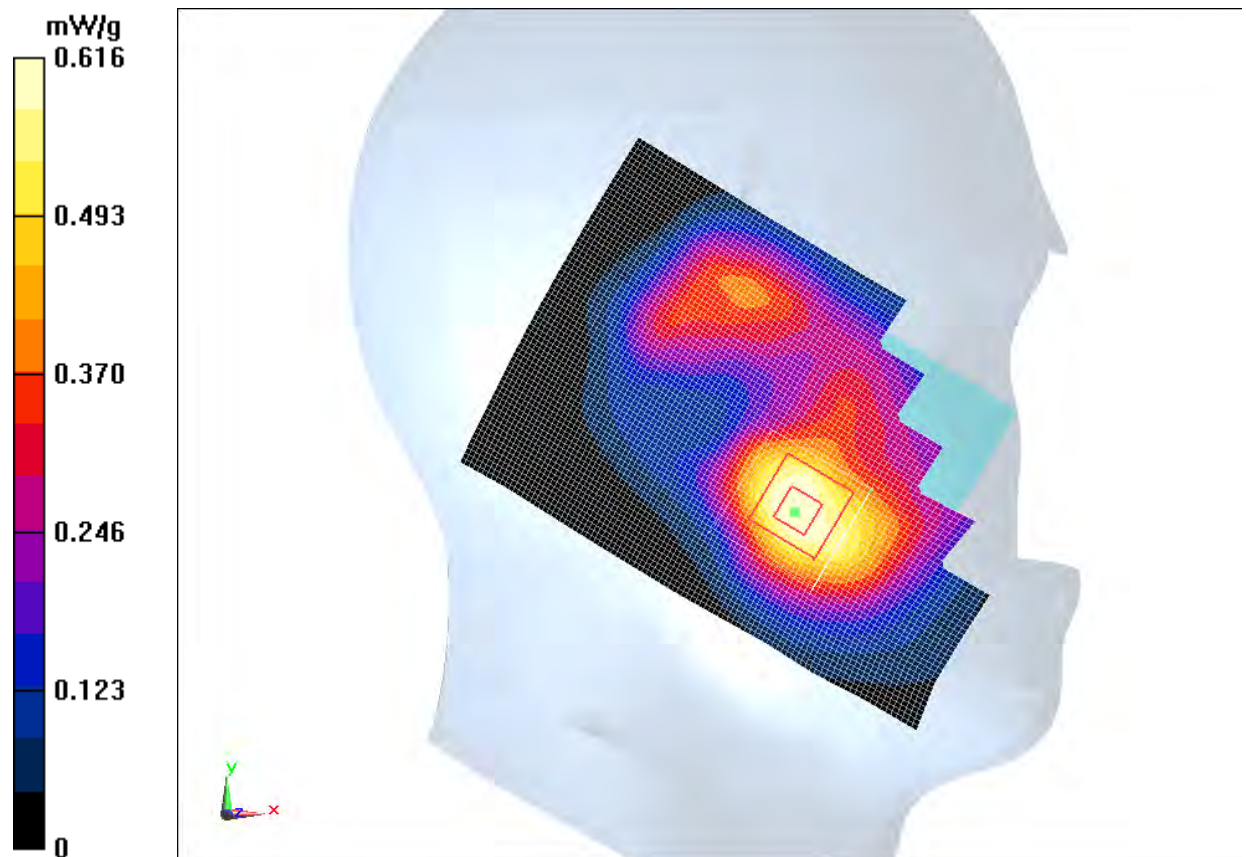
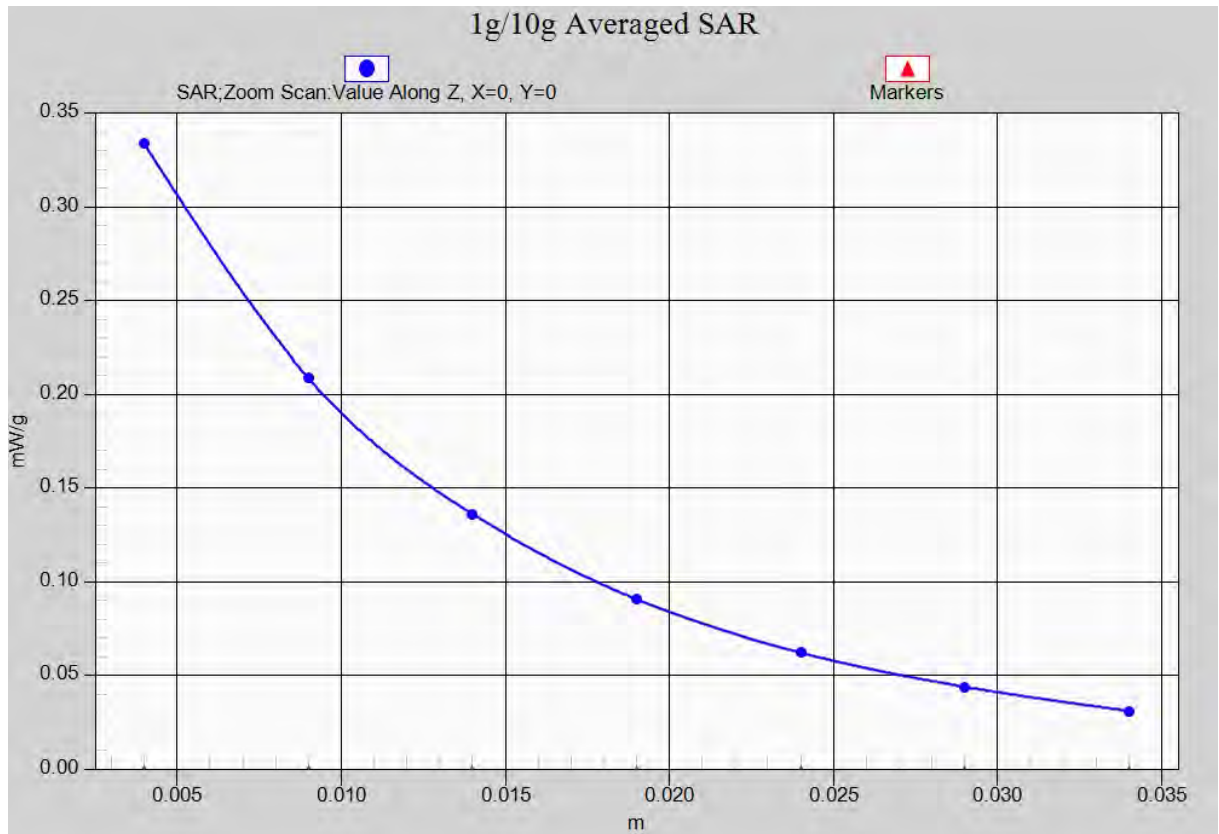


Fig. 18 WCDMA1900 CH9538



**Fig. 18-1 Z-Scan at power reference point (WCDMA1900 CH9538)**

### WCDMA 1900 Body Towards Ground Low – Slide down

Date: 2013-1-12

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.445$  mho/m;  $\epsilon_r = 52.126$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.5°C      Liquid Temperature: 22.1°C

Communication System: WCDMA 1900 Frequency: 1852.4 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(4.64, 4.64, 4.64)

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

Maximum value of SAR (interpolated) = 0.901 W/kg

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

Reference Value = 20.375 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 1.33 W/kg

**SAR(1 g) = 0.831 W/kg; SAR(10 g) = 0.504 W/kg**

Maximum value of SAR (measured) = 0.903 W/kg

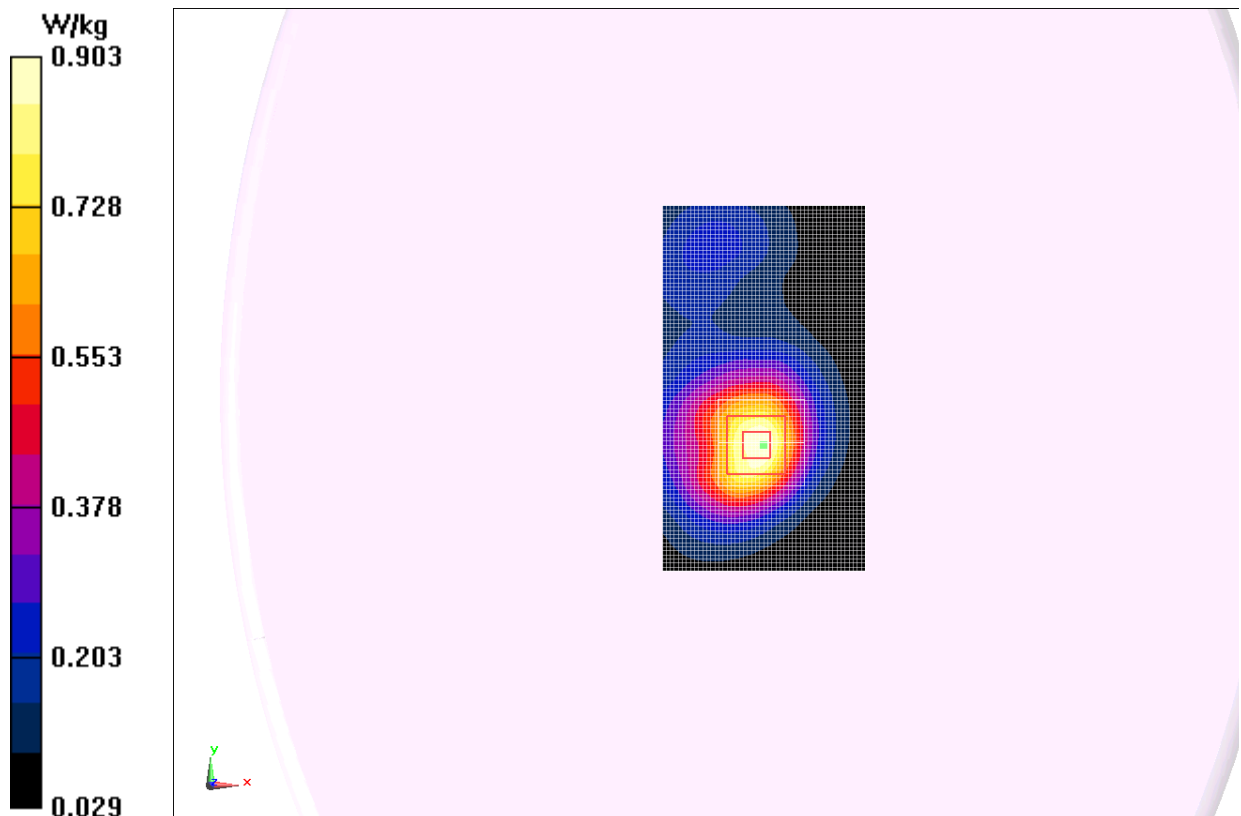


Fig. 19 WCDMA1900 CH9262

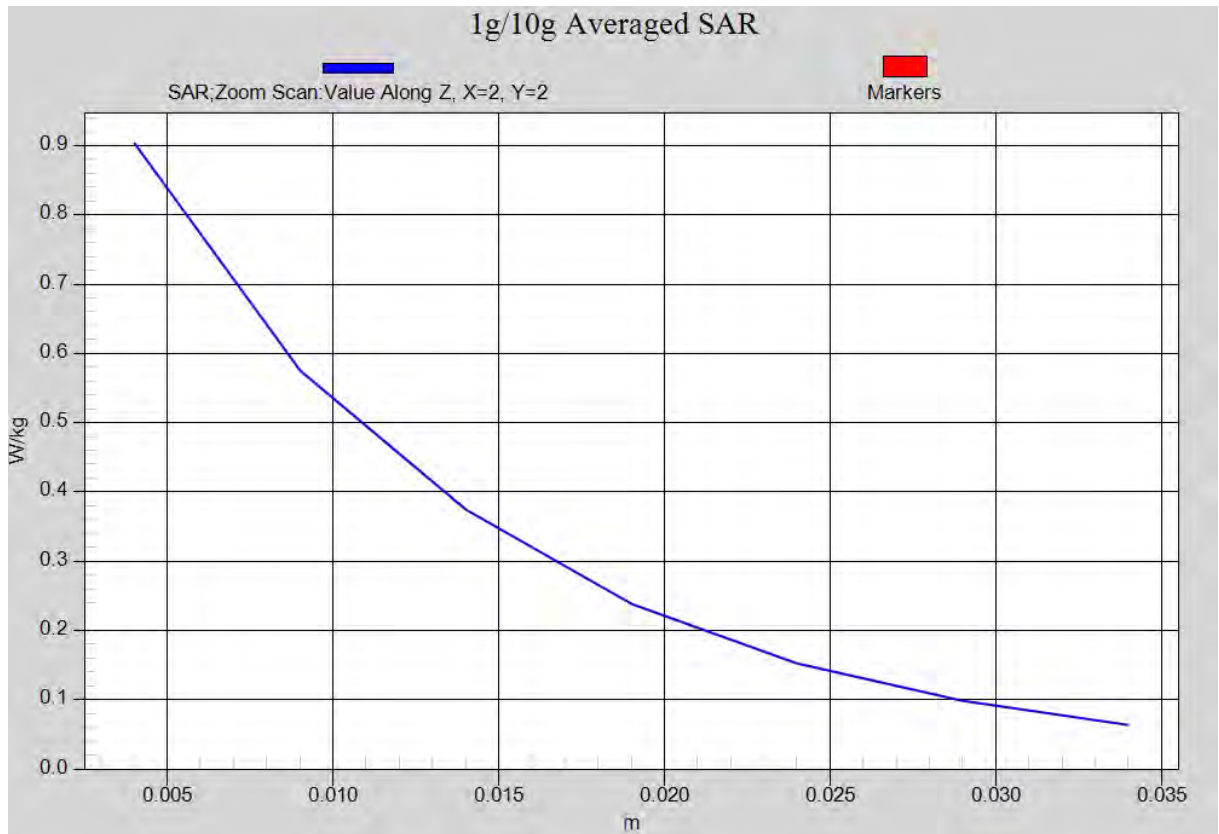


Fig. 19-1 Z-Scan at power reference point (WCDMA1900 CH9262)

**WCDMA 1900 Body Towards Ground Middle – Slide up**

Date: 2013-1-12

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.469$  mho/m;  $\epsilon_r = 51.968$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.5°C      Liquid Temperature: 22.1°C

Communication System: WCDMA 1900 Frequency: 1880 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(4.64, 4.64, 4.64)

**Toward Ground Middle/Area Scan (81x101x1):** Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.728 W/kg

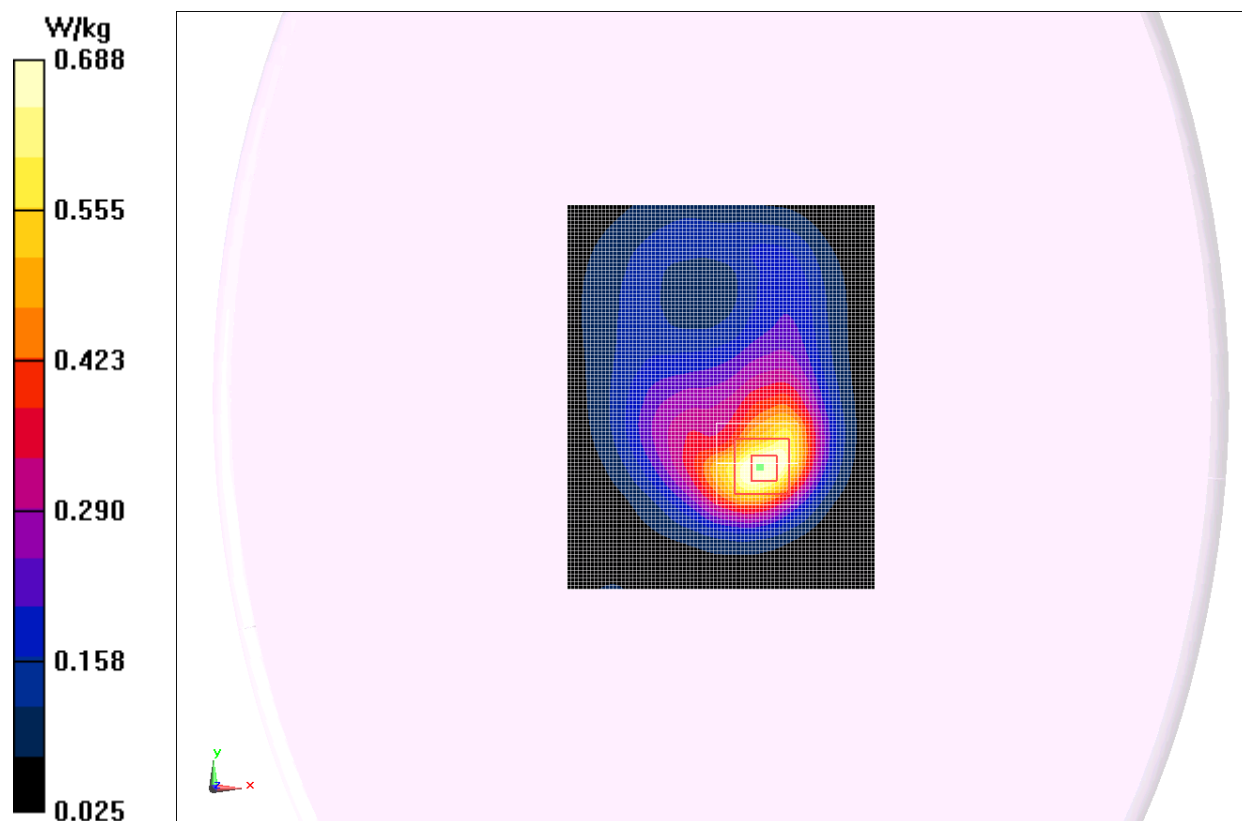
**Toward Ground Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 14.134 V/m; Power Drift = -0.01 dB

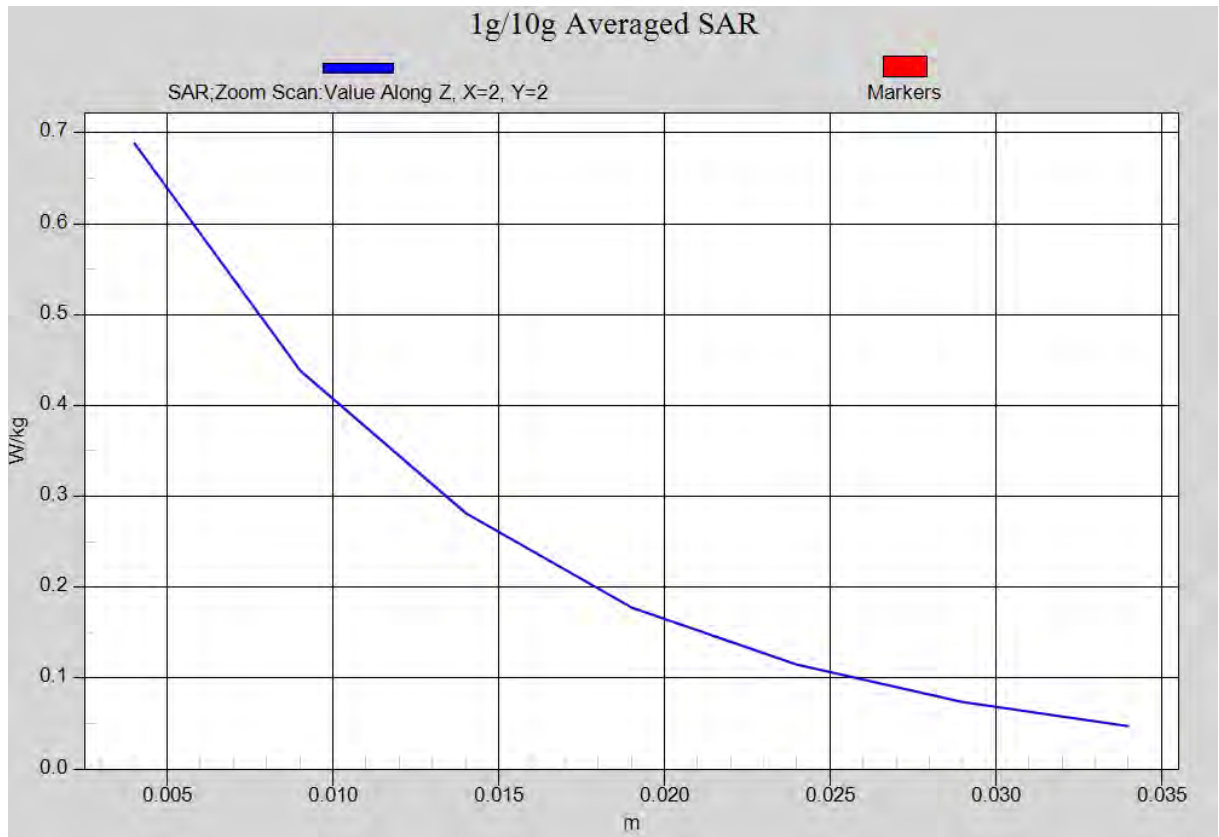
Peak SAR (extrapolated) = 1.04 W/kg

**SAR(1 g) = 0.651 W/kg; SAR(10 g) = 0.391 W/kg**

Maximum value of SAR (measured) = 0.688 W/kg



**Fig. 20 WCDMA1900 CH9400**



**Fig. 20-1 Z-Scan at power reference point (WCDMA1900 CH9400)**



## ANNEX B System Verification Results

### 835MHz

Date: 2013-1-10

Electronics: DAE4 Sn771

Medium: Head 850 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.88$  mho/m;  $\epsilon_r = 40.61$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.7°C      Liquid Temperature: 22.2°C

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

Probe: ES3DV3 - SN3149 ConvF(6.26, 6.26, 6.26)

**System Validation /Area Scan (81x161x1):** Measurement grid: dx=10mm, dy=10mm

Reference Value = 52.967 V/m; Power Drift = -0.084 dB

**Fast SAR: SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.51 mW/g**

Maximum value of SAR (interpolated) = 2.55 mW/g

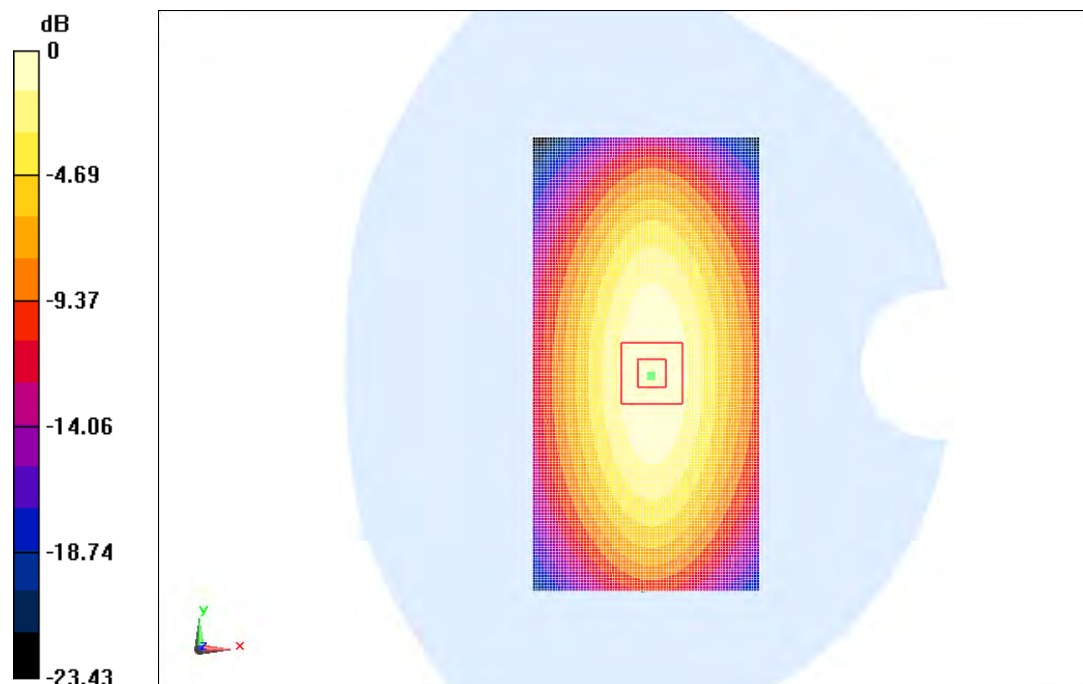
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 52.967 V/m; Power Drift = -0.084 dB

Peak SAR (extrapolated) = 3.514 W/kg

**SAR(1 g) = 2.37 mW/g; SAR(10 g) = 1.52 mW/g**

Maximum value of SAR (measured) = 2.56 mW/g



0 dB = 2.55 mW/g = 8.13 dB mW/g

**Fig.B.1 validation 835MHz 250mW**

## 835MHz

Date: 2013-1-10

Electronics: DAE4 Sn771

Medium: Body 850 MHz

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.988 \text{ mho/m}$ ;  $\epsilon_r = 55.71$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $22.7^\circ\text{C}$       Liquid Temperature:  $22.2^\circ\text{C}$

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

Probe: ES3DV3 - SN3149 ConvF(6.14, 6.14, 6.14)

**System Validation /Area Scan (81x171x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

Reference Value = 47.913 V/m; Power Drift = 0.069 dB

**Fast SAR: SAR(1 g) = 2.39 mW/g; SAR(10 g) = 1.57 mW/g**

Maximum value of SAR (interpolated) = 2.61 mW/g

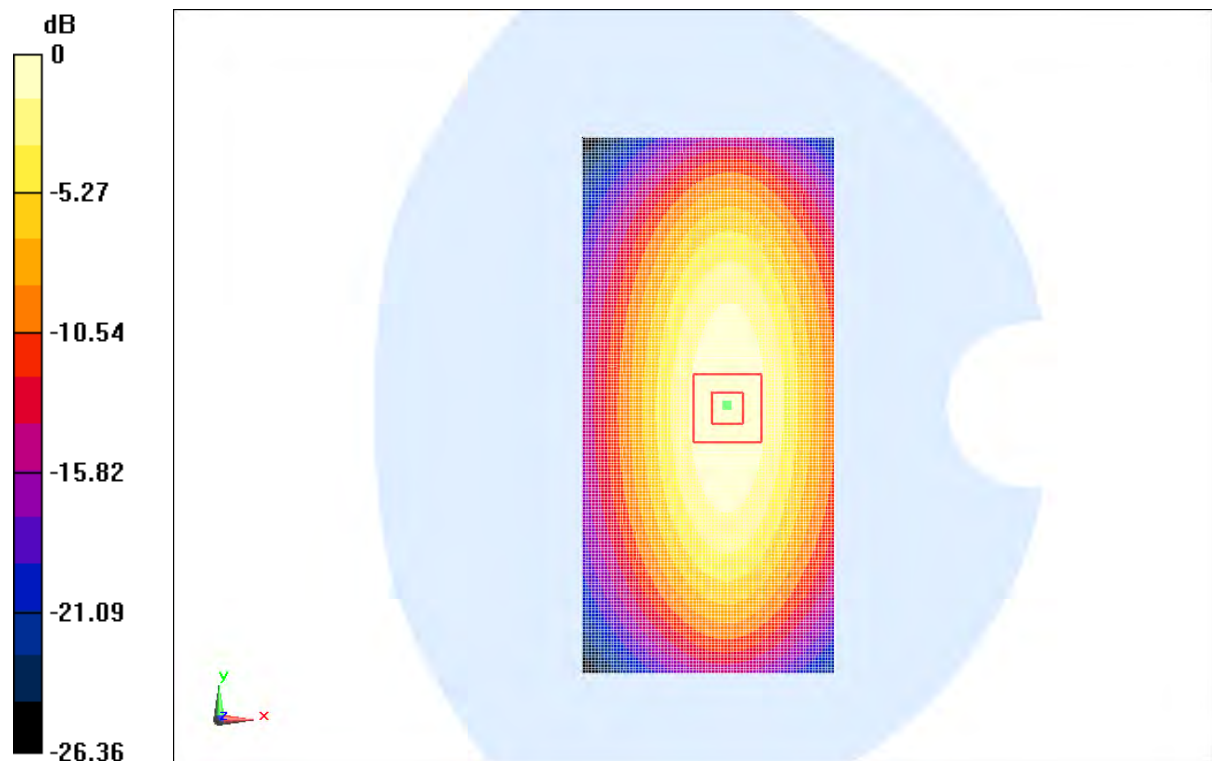
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 47.913 V/m; Power Drift = 0.069 dB

Peak SAR (extrapolated) = 3.603 W/kg

**SAR(1 g) = 2.40 mW/g; SAR(10 g) = 1.58 mW/g**

Maximum value of SAR (measured) = 2.61 mW/g



0 dB = 2.61 mW/g = 8.33 dB mW/g

**Fig.B.2 validation 835MHz 250mW**

## 1750MHz

Date: 2013-1-11

Electronics: DAE4 Sn771

Medium: Head 1750 MHz

Medium parameters used:  $f=1750$  MHz;  $\sigma = 1.362$  mho/m;  $\epsilon_r = 40.06$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.4°C      Liquid Temperature: 21.9°C

Communication System: CW Frequency: 1750 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(5.23, 5.23, 5.23)

**System Validation/Area Scan (81x121x1):** Measurement grid: dx=10mm, dy=10mm

Reference Value = 90.125 V/m; Power Drift = -0.06 dB

**Fast SAR: SAR(1 g) = 9.12 mW/g; SAR(10 g) = 4.89 mW/g**

Maximum value of SAR (interpolated) = 10.4 mW/g

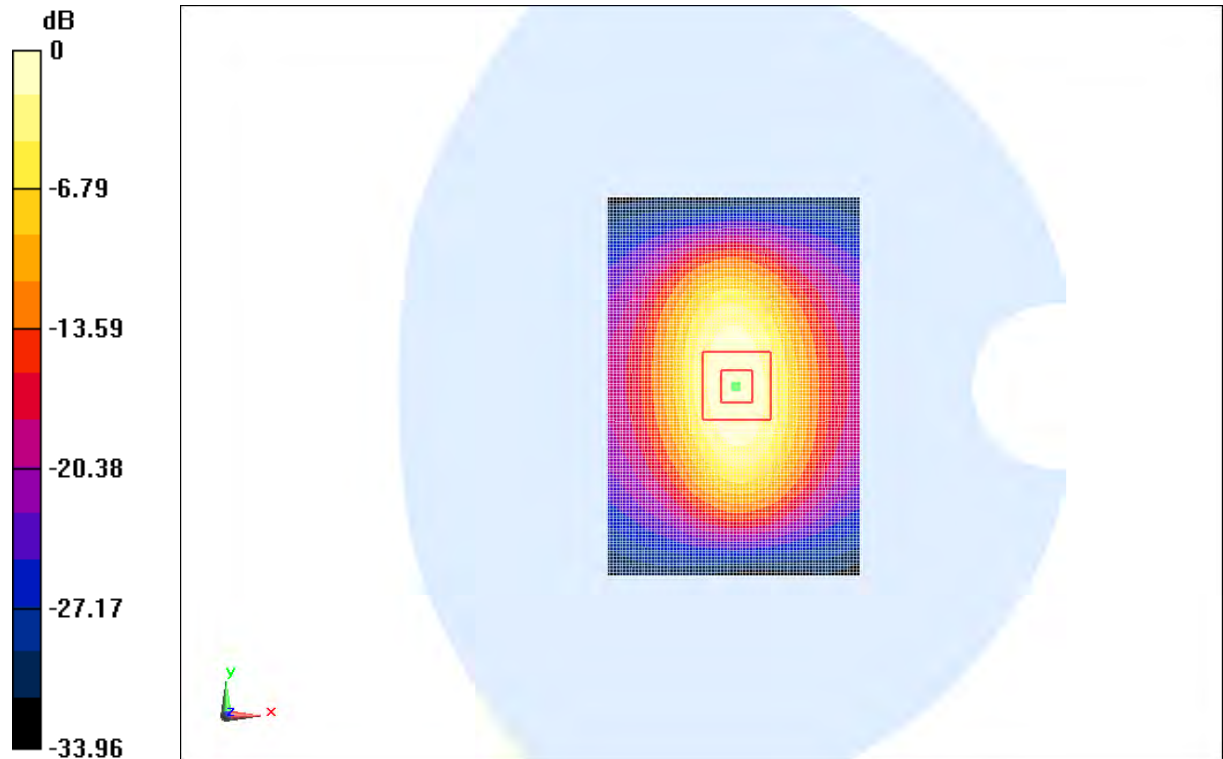
**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.125 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 16.266 W/kg

**SAR(1 g) = 9.18 mW/g; SAR(10 g) = 4.93 mW/g**

Maximum value of SAR (measured) = 10.4 mW/g



0 dB = 10.4 mW/g = 20.34 dB mW/g

**Fig.B.3 validation 1750MHz 250mW**

## 1750MHz

Date: 2013-1-11

Electronics: DAE4 Sn771

Medium: Body 1750 MHz

Medium parameters used:  $f=1750$  MHz;  $\sigma = 1.525$  mho/m;  $\epsilon_r = 53.97$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.4°C      Liquid Temperature: 21.9°C

Communication System: CW Frequency: 1750 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3149 ConvF(4.84, 4.84, 4.84)

**System Validation/Area Scan (81x121x1):** Measurement grid: dx=10mm, dy=10mm

Reference Value = 86.991 V/m; Power Drift = 0.05 dB

**Fast SAR: SAR(1 g) = 8.92 mW/g; SAR(10 g) = 4.88 mW/g**

Maximum value of SAR (interpolated) = 10.3 mW/g

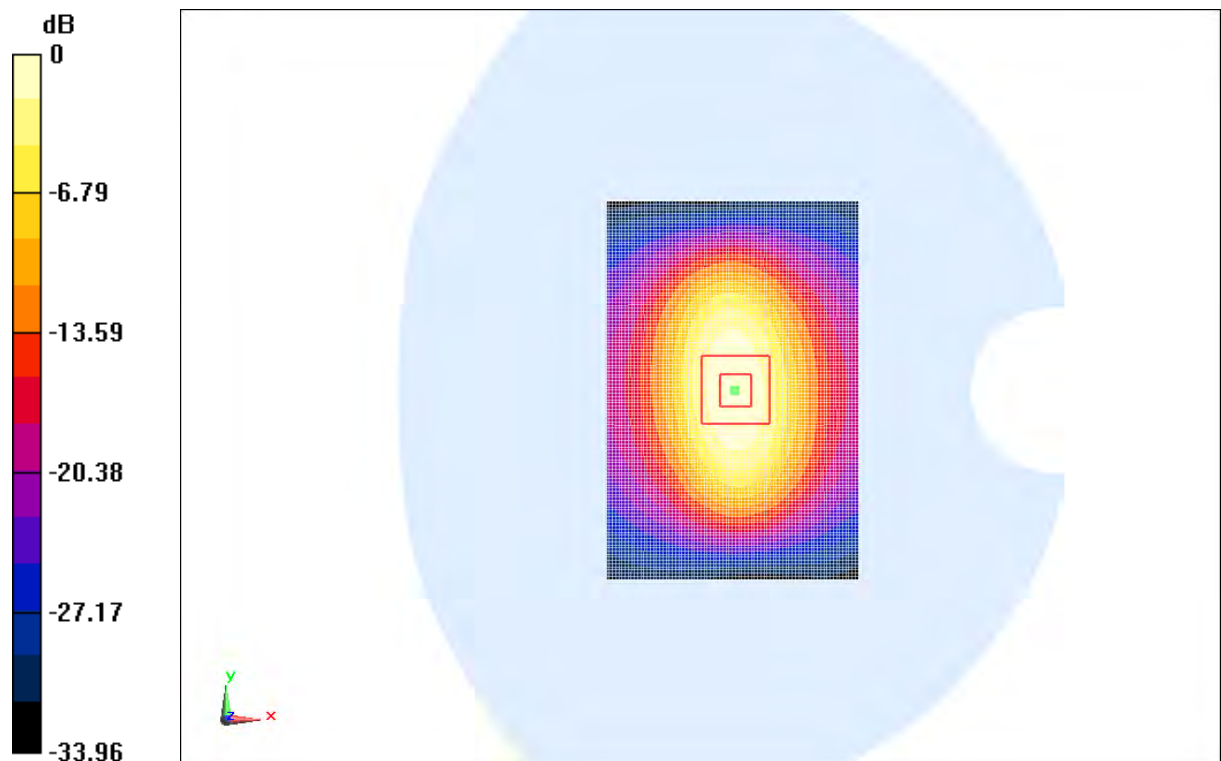
**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 86.991 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 14.637 W/kg

**SAR(1 g) = 8.96 mW/g; SAR(10 g) = 4.90 mW/g**

Maximum value of SAR (measured) = 10.3 mW/g



0 dB = 10.3 mW/g = 20.26 dB mW/g

**Fig.B.4 validation 1750MHz 250mW**

## 1900MHz

Date: 2013-1-12

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.413$  mho/m;  $\epsilon_r = 39.25$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.5°C      Liquid Temperature: 22.1°C

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

Probe: ES3DV3 - SN3149 ConvF(5.19, 5.19, 5.19)

**System Validation/Area Scan (81x121x1):** Measurement grid: dx=10mm, dy=10mm

Reference Value = 92.869 V/m; Power Drift = -0.047 dB

**Fast SAR: SAR(1 g) = 9.71 mW/g; SAR(10 g) = 5.09 mW/g**

Maximum value of SAR (interpolated) = 11.0 mW/g

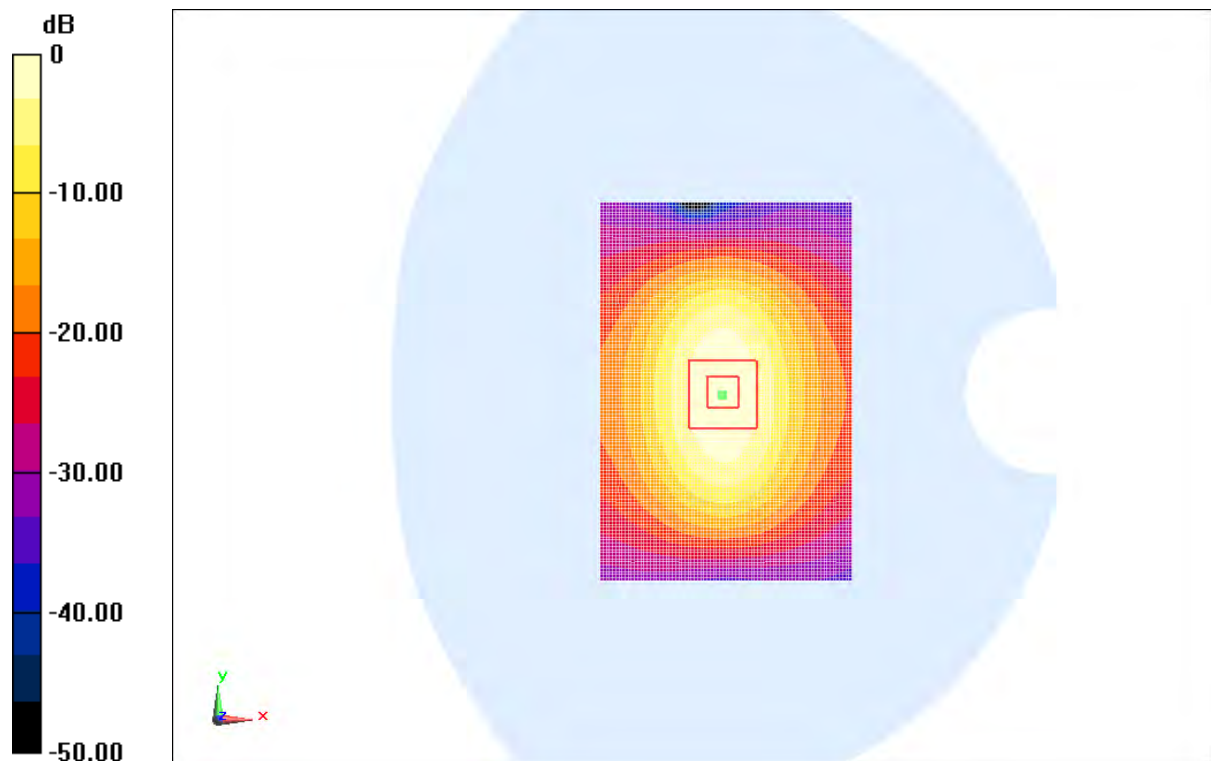
**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.869 V/m; Power Drift = -0.047 dB

Peak SAR (extrapolated) = 17.975 W/kg

**SAR(1 g) = 9.65 mW/g; SAR(10 g) = 5.06 mW/g**

Maximum value of SAR (measured) = 10.9 mW/g



0 dB = 11.0 mW/g = 20.83 dB mW/g

**Fig.B.5 validation 1900MHz 250mW**

## 1900MHz

Date: 2013-1-12

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.492 \text{ mho/m}$ ;  $\epsilon_r = 51.92$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $22.5^\circ\text{C}$       Liquid Temperature:  $22.1^\circ\text{C}$

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

Probe: ES3DV3 - SN3149 ConvF(4.64, 4.64, 4.64)

**System Validation/Area Scan (81x121x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

Reference Value =  $87.795 \text{ V/m}$ ; Power Drift =  $-0.052 \text{ dB}$

**Fast SAR: SAR(1 g) =  $10.2 \text{ mW/g}$ ; SAR(10 g) =  $5.40 \text{ mW/g}$**

Maximum value of SAR (interpolated) =  $11.6 \text{ mW/g}$

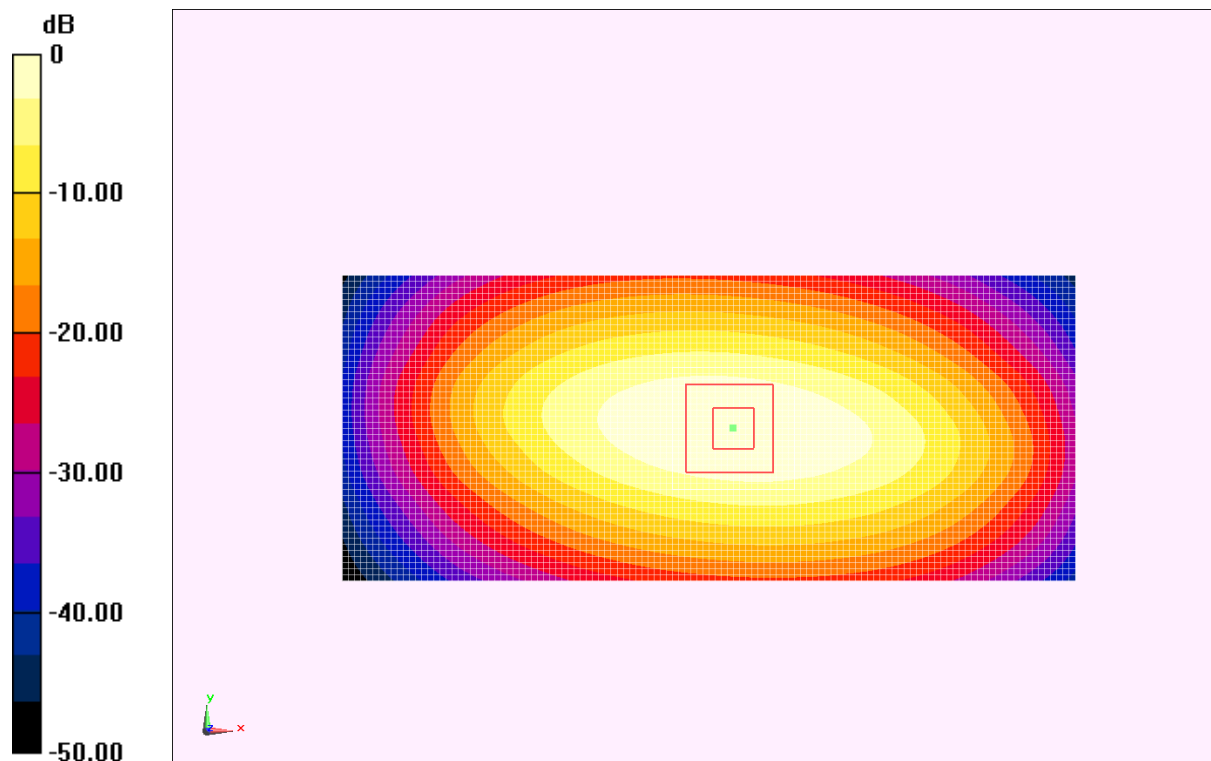
**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value =  $87.795 \text{ V/m}$ ; Power Drift =  $-0.052 \text{ dB}$

Peak SAR (extrapolated) =  $16.807 \text{ W/kg}$

**SAR(1 g) =  $10.2 \text{ mW/g}$ ; SAR(10 g) =  $5.43 \text{ mW/g}$**

Maximum value of SAR (measured) =  $11.7 \text{ mW/g}$



0 dB =  $11.6 \text{ mW/g} = 21.29 \text{ dB mW/g}$

**Fig.B.6 validation 1900MHz 250mW**



The SAR system verification must be required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR.

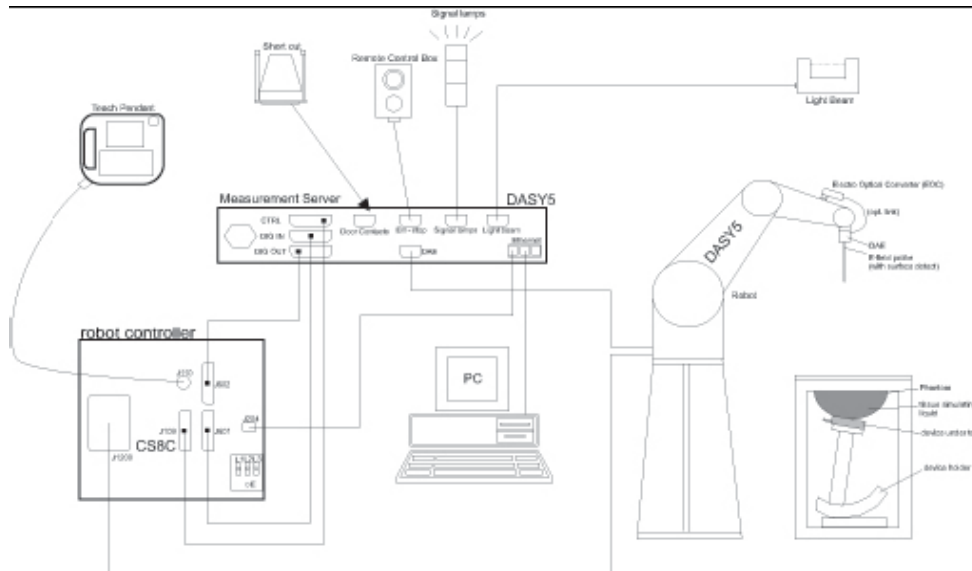
**Table B.1 Comparison between area scan and zoom scan for system verification**

<b>Band</b>	<b>Position</b>	<b>Area scan (1g)</b>	<b>Zoom scan (1g)</b>	<b>Drift (%)</b>
835	Head	2.35	2.37	-0.84
835	Body	2.39	2.40	-0.42
1750	Head	9.12	9.18	-0.65
1750	Body	8.92	8.96	-0.45
1900	Head	9.71	9.65	0.62
1900	Body	10.2	10.2	0.00

## ANNEX C SAR Measurement Setup

### C.1 Measurement Set-up

The Dasy4 or DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Picture C.1 SAR Lab Test Measurement Set-up

- A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY4 or DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as
- warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

## C.2 Dasy4 or DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 or DASY5 software reads the reflection during a software approach and looks for the maximum using 2<sup>nd</sup> order curve fitting. The approach is stopped at reaching the maximum.

### Probe Specifications:

<b>Model:</b>	<b>ES3DV3, EX3DV4</b>
<b>Frequency</b>	<b>10MHz — 6.0GHz(EX3DV4)</b>
<b>Range:</b>	<b>10MHz — 4GHz(ES3DV3)</b>
<b>Calibration:</b>	<b>In head and body simulating tissue at Frequencies from 835 up to 5800MHz</b>
<b>Linearity:</b>	<b>± 0.2 dB(30 MHz to 6 GHz) for EX3DV4 ± 0.2 dB(30 MHz to 4 GHz) for ES3DV3</b>
<b>Dynamic Range:</b>	<b>10 mW/kg — 100W/kg</b>
<b>Probe Length:</b>	<b>330 mm</b>
<b>Probe Tip</b>	
<b>Length:</b>	<b>20 mm</b>
<b>Body Diameter:</b>	<b>12 mm</b>
<b>Tip Diameter:</b>	<b>2.5 mm (3.9 mm for ES3DV3)</b>
<b>Tip-Center:</b>	<b>1 mm (2.0mm for ES3DV3)</b>
<b>Application:</b>	<b>SAR Dosimetry Testing Compliance tests of mobile phones Dosimetry in strong gradient fields</b>



Picture C.2 Near-field Probe



Picture C.3 E-field Probe

## C.3 E-field Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density ( $1 \text{ mW/cm}^2$ ) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies 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 until the three channels show the maximum reading. The power density readings equates to 1 mW/ cm<sup>2</sup>:

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

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

Where:

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

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

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

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

Where:

$\sigma$  = Simulated tissue conductivity,

$\rho$  = Tissue density (kg/m<sup>3</sup>).

## C.4 Other Test Equipment

### C.4.1 Data Acquisition Electronics(DAE)

The data acquisition electronics consist 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 with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



PictureC.4: DAE

### C.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90XL; DASY5: RX160L) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchron motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)



Picture C.5 DASY 4



Picture C.6 DASY 5

### C.4.3 Measurement Server

The Measurement server is based on a PC/104 CPU board with CPU (dasy4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chipdisk (DASY4: 32 MB; DASY5: 128MB), RAM (DASY4: 64 MB, DASY5: 128MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.



Picture C.7 Server for DASY 4



Picture C.8 Server for DASY 5

#### C.4.4 Device Holder for Phantom

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of  $\pm 0.5\text{mm}$  would produce a SAR uncertainty of  $\pm 20\%$ . Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with the different 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 DASY device holder is constructed of low-loss POM material having the following dielectric

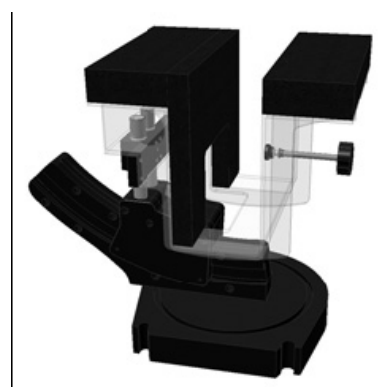
parameters: relative permittivity  $\epsilon = 3$  and loss tangent  $\delta = 0.02$ . The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM and ELI phantoms.



Picture C.9-1: Device Holder



Picture C.9-2: Laptop Extension Kit

#### C.4.5 Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to represent the 90<sup>th</sup> percentile of the population. The phantom enables the dissymmetric evaluation



of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. 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. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

Shell Thickness:  $2 \pm 0.2$  mm

Filling Volume: Approx. 25 liters

Dimensions: 810 x 1000 x 500 mm (H x L x W)

Available: Special

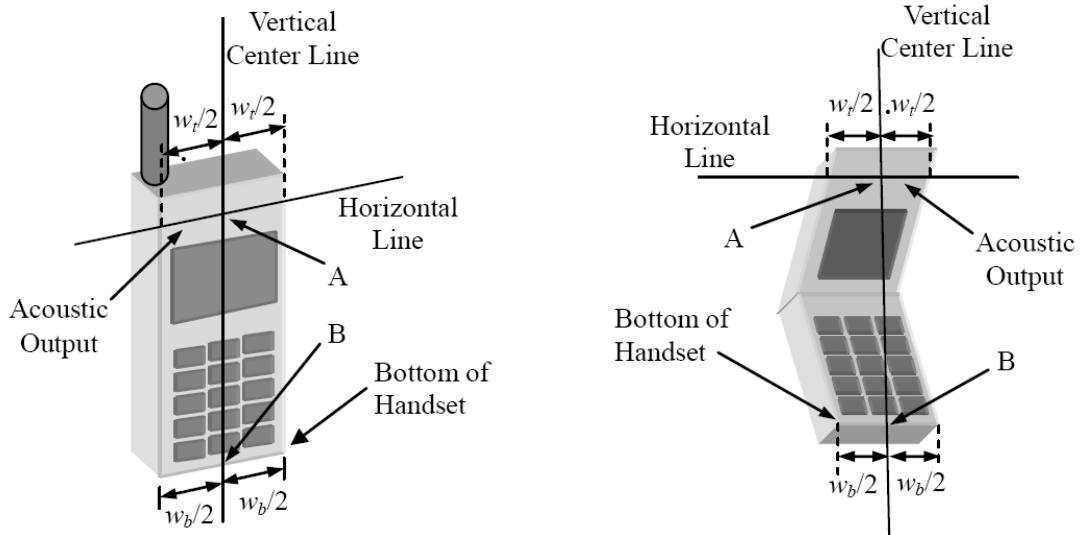


**Picture C.10: SAM Twin Phantom**

## ANNEX D Position of the wireless device in relation to the phantom

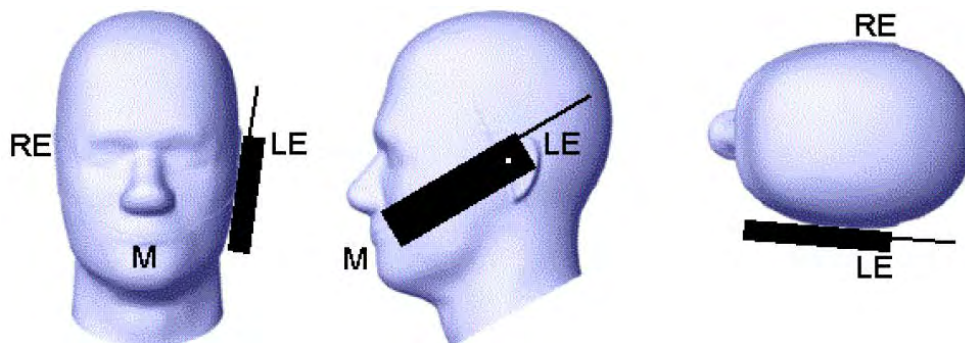
### D.1 General considerations

This standard specifies two handset test positions against the head phantom – the “cheek” position and the “tilt” position.

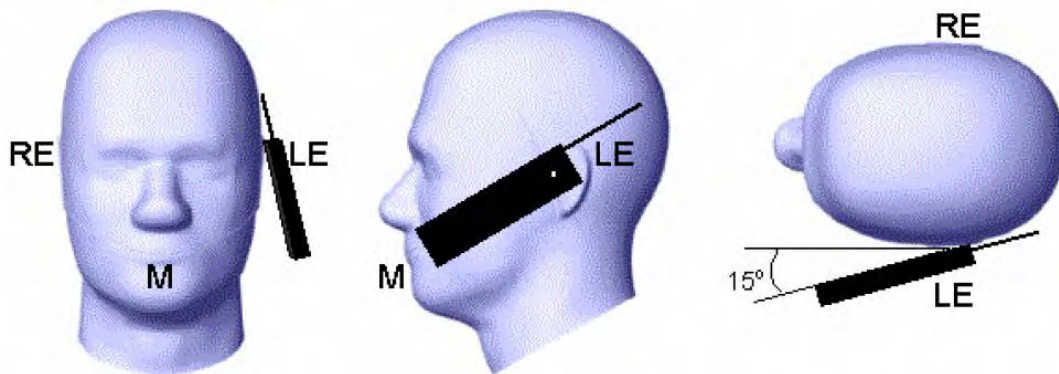


- $w_t$  Width of the handset at the level of the acoustic
- $w_b$  Width of the bottom of the handset
- A Midpoint of the width  $w_t$  of the handset at the level of the acoustic output
- B Midpoint of the width  $w_b$  of the bottom of the handset

Picture D.1-a Typical “fixed” case handset      Picture D.1-b Typical “clam-shell” case handset



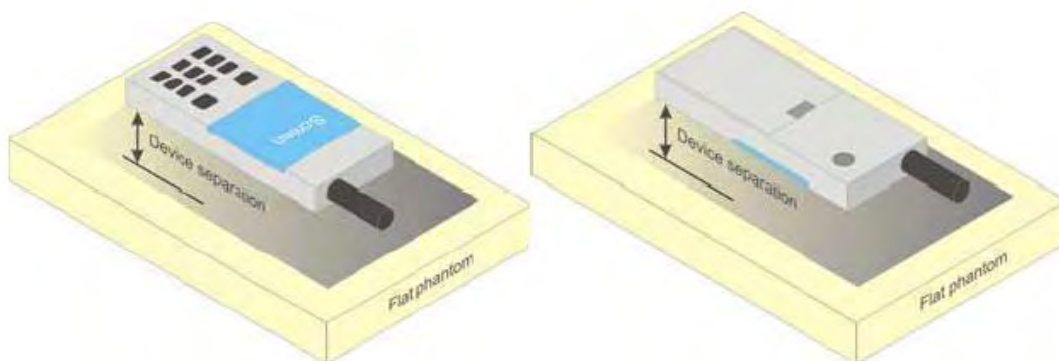
Picture D.2 Cheek position of the wireless device on the left side of SAM



Picture D.3 Tilt position of the wireless device on the left side of SAM

## D.2 Body-worn device

A typical example of a body-worn device is a mobile phone, wireless enabled PDA or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer.

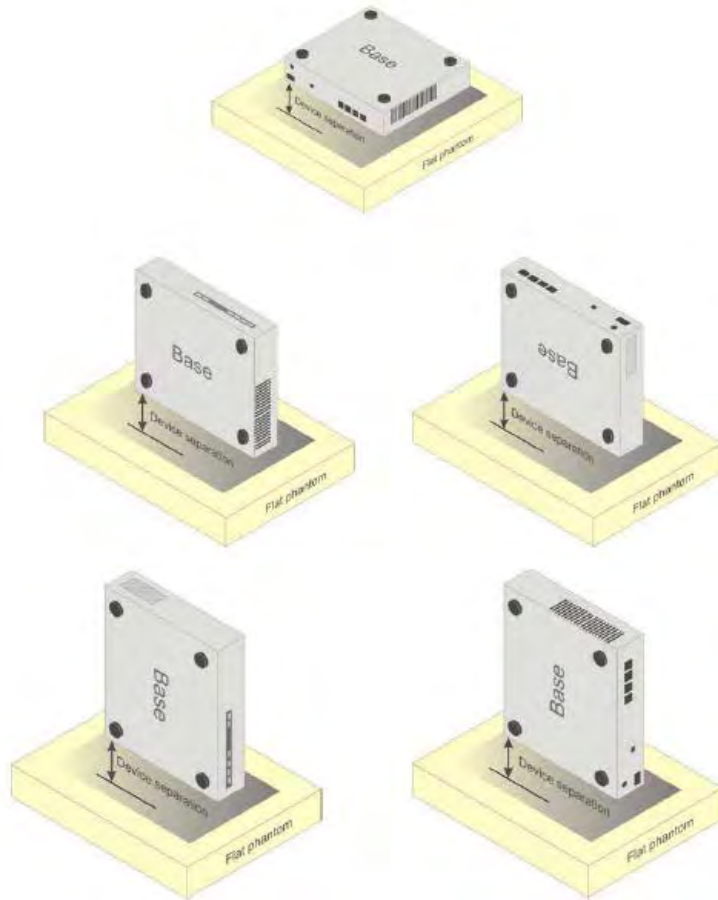


Picture D.4 Test positions for body-worn devices

## D.3 Desktop device

A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.

The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions, tests shall be performed for all antenna positions specified. Picture 8.5 show positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.



Picture D.5 Test positions for desktop devices

#### D.4 DUT Setup Photos



Picture D.6

## ANNEX E Equivalent Media Recipes

The liquid used for the frequency range of 800-3000 MHz consisted of water, sugar, salt, preventol, glycol monobutyl and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table E.1 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and IEC 62209.

**Table E.1: Composition of the Tissue Equivalent Matter**

Frequency (MHz)	835 Head	835 Body	1900 Head	1900 Body	2450 Head	2450 Body
Ingredients (% by weight)						
Water	41.45	52.5	55.242	69.91	58.79	72.60
Sugar	56.0	45.0	\	\	\	\
Salt	1.45	1.4	0.306	0.13	0.06	0.18
Preventol	0.1	0.1	\	\	\	\
Cellulose	1.0	1.0	\	\	\	\
Glycol Monobutyl	\	\	44.452	29.96	41.15	27.22
Dielectric Parameters Target Value	$\epsilon=41.5$ $\sigma=0.90$	$\epsilon=55.2$ $\sigma=0.97$	$\epsilon=40.0$ $\sigma=1.40$	$\epsilon=53.3$ $\sigma=1.52$	$\epsilon=39.2$ $\sigma=1.80$	$\epsilon=52.7$ $\sigma=1.95$

## ANNEX F System Validation

The SAR system must be validated against its performance specifications before it is deployed. When SAR probes, system components or software are changed, upgraded or recalibrated, these must be validated with the SAR system(s) that operates with such components.

**Table F.1: System Validation**

System No.	Probe SN.	Liquid name	Validation date	Frequency point	Status (OK or Not)
	3149	Head 750MHz	Sep. 17, 2012	750 MHz	OK
	3149	Head 850MHz	Sep. 17, 2012	850 MHz	OK
	3149	Head 900MHz	Sep. 17, 2012	900 MHz	OK
	3149	Head 1800MHz	Sep. 18, 2012	1800 MHz	OK
	3149	Head 1900MHz	Sep. 18, 2012	1900 MHz	OK
	3149	Head 2000MHz	Sep. 18, 2012	2000 MHz	OK
	3149	Head 2100MHz	Sep. 18, 2012	2100 MHz	OK
	3149	Head 2450MHz	Sep. 19, 2012	2450 MHz	OK
	3149	Head 2550MHz	Sep. 19, 2012	2550 MHz	OK
	3149	Head 2600MHz	Sep. 19, 2012	2600 MHz	OK
	3149	Body 750MHz	Sep. 20, 2012	750 MHz	OK
	3149	Body 850MHz	Sep. 20, 2012	850 MHz	OK
	3149	Body 900MHz	Sep. 20, 2012	900 MHz	OK
	3149	Body 1800MHz	Sep. 21, 2012	1800 MHz	OK
	3149	Body 1900MHz	Sep. 21, 2012	1900 MHz	OK
	3149	Body 2000MHz	Sep. 21, 2012	2000 MHz	OK
	3149	Body 2100MHz	Sep. 21, 2012	2100 MHz	OK
	3149	Body 2450MHz	Sep. 22, 2012	2450 MHz	OK
	3149	Body 2550MHz	Sep. 22, 2012	2550 MHz	OK
	3149	Body 2600MHz	Sep. 22, 2012	2600 MHz	OK



## ANNEX G Probe Calibration Certificate

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



S Schweizerischer Kalibrierdienst  
S 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 TMC Beijing

Certificate No: ES3-3149\_Apr12

### CALIBRATION CERTIFICATE

Object ES3DV3 - SN:3149

Calibration procedure(s) QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4  
Calibration procedure for dosimetric E-field probes

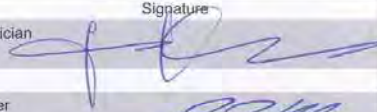

Calibration date: April 24, 2012

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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	10-Jan-12 (No. DAE4-660_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 24, 2012

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

**Calibration Laboratory of  
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**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**

**Glossary:**

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

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

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

**Methods Applied and Interpretation of Parameters:**

- *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 affect the  $E^2$ -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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR*: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *A<sub>x,y,z</sub>*; *B<sub>x,y,z</sub>*; *C<sub>x,y,z</sub>*; *VR<sub>x,y,z</sub>*; *A*, *B*, *C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *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.