



# SAR TEST REPORT

No. 2011SAR00067

For

**Sony Ericsson Mobile Communications(China) Co., Ltd.**

**GSM triple bands and TD-SCDMA dual bands mobile phone**

**AAK-7880002-BV**

**WT18i**

With

**Hardware Version: A**

**Software Version: R1AA023**

**SEMC ID: AAK-7880002-BV**

**Industry Canada ID: 4170B-A7880002**

**FCCID: PY7A7880002**

**Issued Date: 2011-06-15**



**No. DGA-PL-114/01-02**

**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.

**Test Laboratory:**

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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 Ω

Ambient noise is checked and found very low and in compliance with requirement of standards.  
Reflection of surrounding objects is minimized and in compliance with requirement of standards.

### 1.3 Project Data

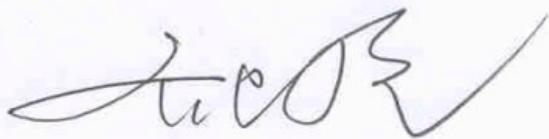
Project Leader: Qi Dianyuan  
Test Engineer: Lin Xiaojun  
Testing Start Date: May 26, 2011  
Testing End Date: May 28, 2011

### 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 General Information

### 2.1 Statement of Compliance

The SAR values found for the AAK-7880002-BV Mobile Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1g tissue according to the FCC rule, 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 and that positions the handset a minimum of 15mm from the body. 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 chapter 5 of this test report. A detailed description of the equipment under test can be found in chapter 3 of this test report.

### 2.2 Applicant Information

Company Name:	Sony Ericsson Mobile Communications(China) Co., Ltd.
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### 2.3 Manufacturer Information

Company Name:	Sony Ericsson Mobile Communications AB
Address /Post:	Nya Vattentornet 22188 Lund Sweden
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Postal Code:	22188
Country:	Sweden
Contact:	Nordlof, Anders
Email:	Anders.Nordlof@sonyericsson.com
Telephone:	+46 46 193919
Fax:	+46 46 193295

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

#### 3.1 About EUT

Description:	GSM triple bands and TD-SCDMA dual bands mobile phone
Model name:	AAK-7880002-BV
Marketing name:	WT18i
Operating mode(s):	GSM, DCS, PCS, Bluetooth, WiFi
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

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

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	004402141999288 / 004402141999304	A	R1AA023

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

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

AE ID*	Description	Model	SN	Manufacturer
AE1	Battery	CBA-0002019	/	Sony Ericsson
AE2	Headset	MH410	/	Sony Ericsson

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

#### 3.4 Antenna description

There are two antennae in the EUT, Main antenna and BT/WiFi antenna.

Antenna dimension:

Max length: 8mm

Max width: 43mm

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

### 4 CHARACTERISTICS OF THE TEST

#### 4.1 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.

#### 4.2 Applicable Measurement Standards

**IC RSS-102 ISSUE4:** Radio Frequency (RF) Exposure Compliance of Radiocommunication

Apparatus (All Frequency Bands)

**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.

**KDB648474 D01 SAR Handsets Multi Xmitter and Ant, v01r05:** SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas.

**KDB248227:** SAR measurement procedures for 802.112abg transmitters.

**KDB941225 :** SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

## 5 OPERATIONAL CONDITIONS DURING TEST

### 5.1 Schematic Test Configuration

During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a System Simulator (SS) by air link, and a call is established. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 512, 661 and 810 respectively in the case of PCS 1900 MHz. The EUT is commanded to operate at maximum transmitting power.

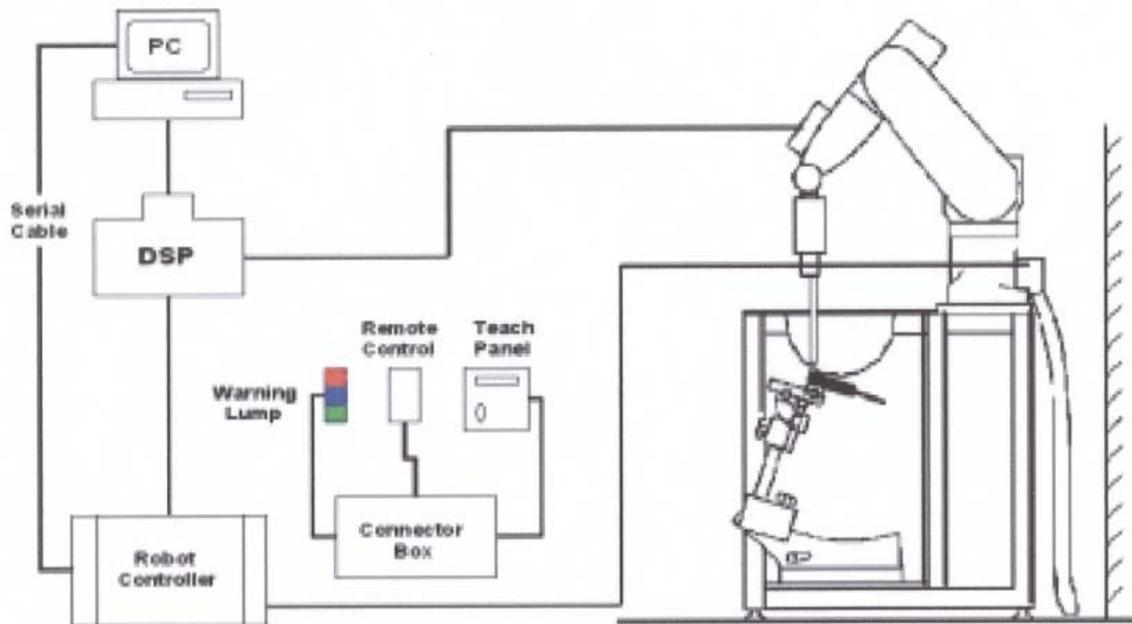
The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the manufacturer. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. If a wireless link is used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the handset. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the handset by at least 30 dB.

### 5.2 SAR Measurement Set-up

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

A cell controller system contains the power supply, robot controller, teaches pendant (Joystick), and remote control, is used to drive the robot motors. The PC consists of the Micron Pentium III 800 MHz computer with Windows 2000 system and SAR Measurement Software DASY4 Professional, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE

and transfers data to the PC plug-in card.



**Picture 1: SAR Lab Test Measurement Set-up**

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

### 5.3 Dasy E-field Probe System

The SAR measurements were conducted with the dosimetric probe ES3DV3 / EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the standard procedure with an accuracy of better than  $\pm 10\%$ . The spherical isotropy was evaluated and found to be better than  $\pm 0.25\text{dB}$ .

#### ES3DV3 Probe Specification

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to 4 GHz; Linearity: $\pm 0.2 \text{ dB}$ (30 MHz to 4GHz)



**Picture 2: EX3DV4 E-field**

Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones



**Picture3:ES3DV3 E-field probe**

### EX3DV4 Probe Specification

Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

**Calibration** ISO/IEC 17025 calibration service available.

**Frequency** 10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)

**Directivity** ± 0.3 dB in HSL (rotation around probe axis)  
± 0.5 dB in tissue material (rotation normal to probe axis)

**Dynamic Range** 10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)

**Dimensions** Overall length: 337 mm (Tip: 20 mm)  
Tip diameter: 2.5 mm (Body: 12 mm)  
Typical distance from probe tip to dipole centers: 1 mm

**Application** High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

### 5.4 E-field Probe Calibration

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

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and

at the proper orientation with the field. The probe is then rotated 360 degrees.

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

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

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

Or

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

Where:

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



**Picture 4: Device Holder**

## 5.5 Other Test Equipment

### 5.5.1 Device Holder for Transmitters

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

### 5.5.2 Phantom

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

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



**Picture 5: Generic Twin Phantom**

## 5.6 Equivalent Tissues

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 1 and 2 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528.

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

MIXTURE %	FREQUENCY 1900MHz
Water	55.242
Glycol monobutyl	44.452
Salt	0.306
Dielectric Parameters Target Value	f=1900MHz $\epsilon=40.0$ $\sigma=1.40$
MIXTURE %	FREQUENCY 2450MHz
Water	58.79
Glycol monobutyl	41.15
Salt	0.06
Dielectric Parameters Target Value	f=2450MHz $\epsilon=39.2$ $\sigma=1.80$

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

MIXTURE %	FREQUENCY 1900MHz
Water	69.91
Glycol monobutyl	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1900MHz $\epsilon=53.3$ $\sigma=1.52$
MIXTURE %	FREQUENCY 2450MHz
Water	72.60
Glycol monobutyl	27.22
Salt	0.18
Dielectric Parameters Target Value	f=2450MHz $\epsilon=52.7$ $\sigma=1.95$

## 5.7 System Specifications

### Specifications

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

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

**No. of Axis:** 6

### Data Acquisition Electronic (DAE) System

#### Cell Controller

**Processor:** Pentium III

**Clock Speed:** 800 MHz

**Operating System:** Windows 2000

#### Data Converter

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

**Software:** DASY4 software

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

## 6 CONDUCTED OUTPUT POWER MEASUREMENT

### 6.1 Summary

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMU-200) to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured output power should be greater and within 5% than EMI measurement.

### 6.2 Conducted Power

#### 6.2.1 Measurement Methods

The EUT was set up for the maximum output power. The channel power was measured with Agilent Spectrum Analyzer E4440A. These measurements were done at low, middle and high channels.

#### 6.2.2 Measurement result

**Table 3: The conducted power for GSM 1900**

GSM 1900MHZ	Conducted Power (dBm)		
	Channel 810(1909.8MHz)	Channel 661(1880MHz)	Channel 512(1850.2MHz)
	29.21	29.40	29.59

**Table 4: The conducted power for GPRS 1900 and EGPRS 1900 (GMSK)**

PCS1900 GPRS	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	810	661	512		810	661	512
1 Txslot	29.22	29.40	29.59	-9.03dB	20.19	20.37	20.56
<b>2 Txslots</b>	29.24	29.42	29.61	<b>-6.02dB</b>	<b>23.22</b>	<b>23.40</b>	<b>23.59</b>
PCS1900 EGPRS	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	810	661	512		810	661	512
1 Txslot	29.21	29.39	29.58	-9.03dB	20.18	20.36	20.55
<b>2 Txslots</b>	29.23	29.42	29.61	<b>-6.02dB</b>	<b>23.21</b>	<b>23.40</b>	<b>23.59</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 2 Txslots for GSM1900.**

#### 6.2.3 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 9 to Table 12 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

## 7 TEST RESULTS

### 7.1 Dielectric Performance

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

Measurement is made at temperature 23.0 °C and relative humidity 37%.			
Liquid temperature during the test: 22.5°C			
Measurement Date : 1900 MHz <u>May 28, 2011</u> 2450 MHz <u>May 26, 2011</u>			
/	Frequency	Permittivity $\epsilon$	Conductivity $\sigma$ (S/m)
<b>Target value</b>	1900 MHz	40.0	1.40
	2450 MHz	39.2	1.80
<b>Measurement value (Average of 10 tests)</b>	1900 MHz	40.7	1.41
	1910 MHz	40.6	1.42
	1880 MHz	40.7	1.40
	1850.2 MHz	40.8	1.37
	2450 MHz	39.6	1.82
	2462 MHz	39.6	1.84
	2437 MHz	39.7	1.82
	2412 MHz	39.8	1.80

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

Measurement is made at temperature 23.0 °C and relative humidity 37%.			
Liquid temperature during the test: 22.5°C			
Measurement Date : 1900 MHz <u>May 28, 2011</u> 2450 MHz <u>May 26, 2011</u>			
/	Frequency	Permittivity $\epsilon$	Conductivity $\sigma$ (S/m)
<b>Target value</b>	1900 MHz	53.3	1.52
	2450 MHz	52.7	1.95
<b>Measurement value (Average of 10 tests)</b>	1900 MHz	53.5	1.53
	1910 MHz	53.5	1.54
	1880 MHz	53.6	1.51
	1850.2 MHz	53.6	1.49
	2450 MHz	52.0	1.96
	2462 MHz	51.9	1.98
	2437 MHz	51.9	1.95
	2412 MHz	52.0	1.92

## 7.2 System Validation

**Table 7: System Validation of Head**

Measurement is made at temperature 23.0 °C and relative humidity 37%.							
Liquid temperature during the test: 22.5°C							
Measurement Date : 1900 MHz <u>May 28, 2011</u> 2450 MHz <u>May 26, 2011</u>							
<b>Liquid parameters</b>	Dipole calibration Target value	<b>Frequency</b>		<b>Permittivity <math>\epsilon</math></b>		<b>Conductivity <math>\sigma</math> (S/m)</b>	
		1900 MHz		39.6		1.40	
		2450 MHz		39.0		1.74	
		1900 MHz		40.7		1.41	
		2450 MHz		39.6		1.82	
<b>Verification results</b>	<b>Frequency</b>	<b>Target value (W/kg)</b>		<b>Measured value (W/kg)</b>		<b>Deviation</b>	
		<b>10 g Average</b>	<b>1 g Average</b>	<b>10 g Average</b>	<b>1 g Average</b>	<b>10 g Average</b>	<b>1 g Average</b>
	1900 MHz	20.1	39.4	19.52	39.12	-2.89%	-0.71%
	2450 MHz	24.6	52.4	23.72	51.2	-3.58%	-2.29%

Note: Target values are the data of the dipole validation results, please check Annex F for the Dipole Calibration Certificate.

**Table 8: System Validation of Body**

Measurement is made at temperature 23.0 °C and relative humidity 37%.								
Liquid temperature during the test: 22.5°C								
Measurement Date : 1900 MHz <u>May 28, 2011</u> 2450 MHz <u>May 26, 2011</u>								
<b>Liquid parameters</b>	Dipole calibration Target value	<b>Frequency</b>		<b>Permittivity <math>\epsilon</math></b>		<b>Conductivity <math>\sigma</math> (S/m)</b>		
		1900 MHz		52.5		1.51		
		2450 MHz		52.5		1.95		
		Actural Measurement value	1900 MHz		53.5		1.53	
			2450 MHz		52.0		1.96	
<b>Verification results</b>	<b>Frequency</b>	<b>Target value (W/kg)</b>		<b>Measured value (W/kg)</b>		<b>Deviation</b>		
		<b>10 g Average</b>	<b>1 g Average</b>	<b>10 g Average</b>	<b>1 g Average</b>	<b>10 g Average</b>	<b>1 g Average</b>	
	1900 MHz	20.9	41.4	21.0	40.8	0.49%	-1.45%	
	2450 MHz	23.9	51.6	23.36	51.2	-2.26%	-0.78%	

Note: Target values are the data of the dipole validation results, please check Annex F for the Dipole Calibration Certificate.

### 7.3 Summary of Measurement Results

	Duty Cycle
Speech	1 : 8.3
GPRS&EGPRS 1900	1 : 4

Table 9: SAR Values (1900MHz-Head)

Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
Left hand, Touch cheek, Middle frequency (See Fig.1)	0.705	1.33	-0.101
Left hand, Tilt 15 Degree, Middle frequency (See Fig.2)	0.189	0.312	-0.068
Left hand, Touch cheek, High frequency (See Fig.3)	0.737	1.4	0.024
Left hand, Touch cheek, Low frequency (See Fig.4)	0.662	1.24	0.044
Right hand, Touch cheek, Middle frequency (See Fig.5)	0.464	0.791	0.061
Right hand, Tilt 15 Degree, Middle frequency (See Fig.6)	0.205	0.350	-0.027
Right hand, Touch cheek, High frequency (See Fig.7)	0.468	0.805	-0.014
Right hand, Touch cheek, Low frequency (See Fig.8)	0.432	0.732	0.022

Table 10: SAR Values (1900MHz-Body)

Limit of SAR (W/kg)	10 g Average	1g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		Power Drift (dB)
	10 g Average	1 g Average	
Body, Towards Ground, High frequency with GPRS (See Fig.9)	0.590	0.993	0.051
Body, Towards Ground, Middle frequency with GPRS (See Fig.10)	0.595	1.02	0.030
Body, Towards Ground, Low frequency with GPRS (See Fig.11)	0.593	1.01	-0.022
Body, Towards Phantom, Low frequency with GPRS (See Fig.12)	0.378	0.644	0.048
Body, Towards Ground, Middle frequency with EGPRS (See Fig.13)	0.576	0.983	0.006
Body, Towards Ground, Middle frequency with Headset (See Fig.14)	0.275	0.466	0.039
Body, Towards Ground, Middle frequency with Bluetooth (See Fig.15)	0.323	0.554	-0.021

### 7.4 Summary of Measurement Results (Bluetooth and WiFi function)

The distance between BT antenna and RF antenna is 8.92cm.

The output power of BT antenna is 7.9mW.

According to the output power measurement result and the distance between the two antennas, we can draw the conclusion that: stand-alone SAR and simultaneous transmission SAR are not required for BT transmitter, because the output power of BT transmitter is  $\leq 2P_{Ref}$  and its antenna is  $> 5\text{cm}$  from other antenna

**Note:** Power thresholds ( $P_{Ref}$ ) is derived from multiples of  $0.5 \times 60/f_{(GHz)}$ , that is 12mW (10.79dBm) for BT frequency.

The average conducted power for WiFi is as following:

802.11b (dBm)

Channel\data rate	1Mbps	2Mbps	5.5Mbps	11Mbps
1	16.9	17.0	17.0	16.9
6	16.9	16.9	16.8	16.8
11	17.0	17.0	16.9	16.9

802.11g (dBm)

Channel\data rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
1	14.3	14.3	14.4	14.4	14.4	14.3	14.4	14.4
6	14.2	14.1	14.3	14.3	14.2	14.2	14.3	14.2
11	13.8	13.8	13.9	13.9	13.9	13.8	13.9	13.9

The peak conducted power for WiFi is as following:

802.11b (dBm)

Channel\data rate	1Mbps	2Mbps	5.5Mbps	11Mbps
1	11.3	11.8	13.2	14.9
6	11.4	11.7	13.4	14.8
11	11.6	11.9	13.2	15.0

802.11g (dBm)

Channel\data rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
1	10.7	10.6	11.5	11.3	11.9	11.5	12.4	11.6
6	10.6	10.9	11.5	11.4	11.9	11.7	11.9	11.5
11	10.3	10.6	11.2	11.0	11.8	11.9	11.3	11.2

According to the conducted power measurement result, we can draw the conclusion that: stand-alone SAR for WiFi should be performed. Then, simultaneous transmission SAR for WiFi is considered with measurement results of GSM and WiFi.

SAR is not required for 802.11g channels if the output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels, and for each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 0.25dB higher than those measured at the lowest data rate. According to the above conducted power, the EUT should be tested for “802.11b, 1Mbps, channel 11”.

**Table 11: SAR Values (WIFI 802.b - Head)**

Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		
	10 g Average	1 g Average	
Left hand, Touch cheek, 1Mbps,channel 11 (See Fig.16)	0.152	0.264	-0.155
Left hand, Tilt 15 Degree, 1Mbps,channel 11 (See Fig.17)	0.117	0.211	-0.090
Right hand, Touch cheek, 1Mbps,channel 11 (See Fig.18)	0.193	0.395	0.138
Right hand, Tilt 15 Degree, 1Mbps,channel 11 (See Fig.19)	0.149	0.295	-0.191

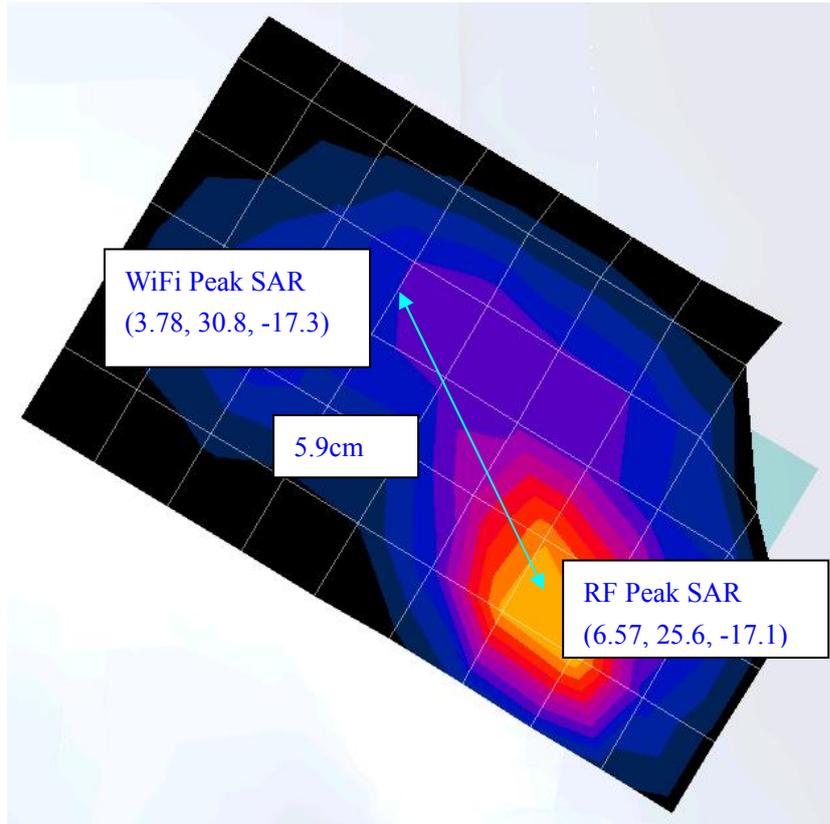
**Table 12: SAR Values (WIFI 802.b - Body)**

Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		
	10 g Average	1 g Average	
Toward Ground, 1Mbps,channel 11 (See Fig.20)	0.048	0.084	0.035
Toward Phantom, 1Mbps,channel 11(See Fig.21)	0.044	0.076	-0.189

**Table 13: The sum of SAR values for GSM and WiFi**

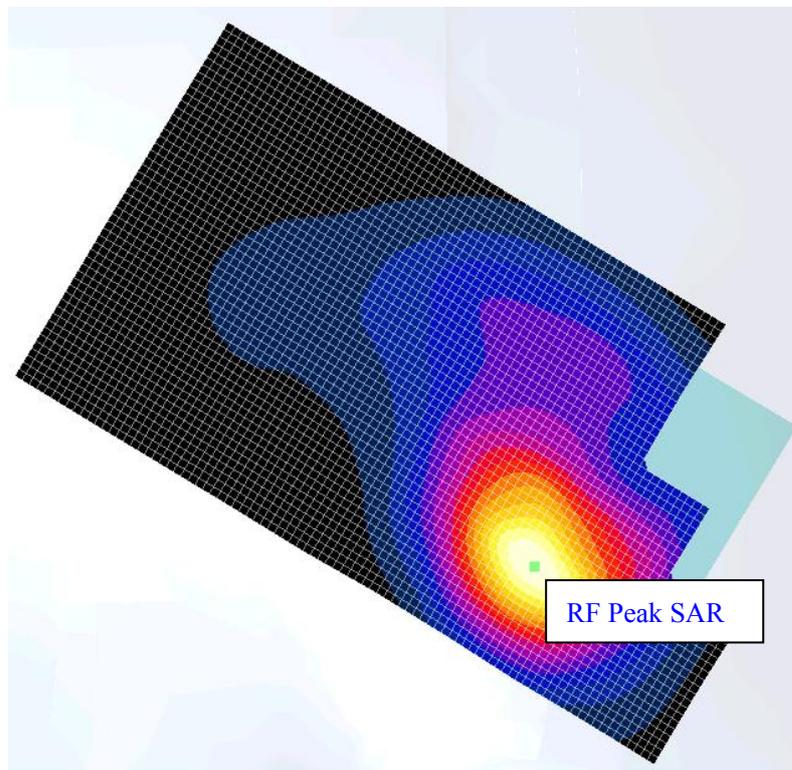
	Position	GSM/WCDMA	WiFi	Sum
<b>Maximum SAR value for Head</b>	Left hand, Touch cheek	1.4	0.264	<b>1.664</b>
	Right hand, Touch cheek	0.805	0.395	<b>1.2</b>
<b>Maximum SAR value for Body</b>	Toward Ground	1.02	0.084	<b>1.104</b>

Since the much difference between the SAR values of GSM and WiFi, it is not clear for WiFi peak SAR point in the combined picture made by SEMCAD software. So the GSM and WiFi plots are presented respectively to show clearly peak SAR point. It is showed by X, Y and Z coordinates (unit: cm) for peak SAR points in the combined picture.

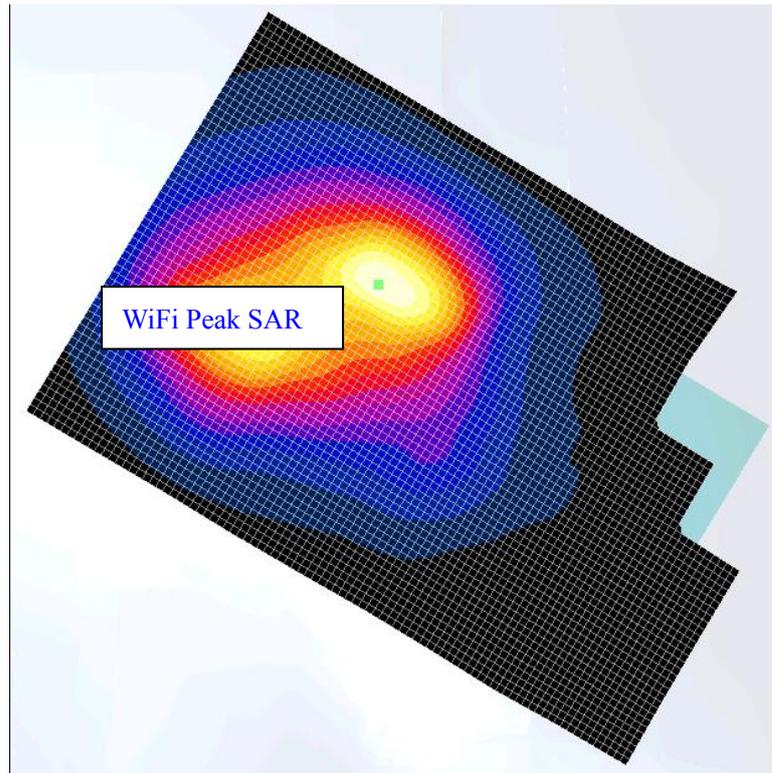


Combined picture for GSM1900 and WiFi

The peak location separation =  $[(3.78-6.57)^2+(30.8-25.6)^2+(-17.3-(-17.1))^2]^{0.5} = 5.9$



GSM 1900MHz, Head, Left hand, Touch cheek, High frequency



**WiFi, Head, Left hand, Touch cheek, 1Mbps,channel 11**

According to the above table and pictures, the sum of SAR values for GSM and WiFi is 1.664W/kg and peak location separation is 5.9cm. So antenna pair SAR to peak SAR location separation ratio is  $1.664/5.9=0.28 < 0.3$ , simultaneous transmission SAR are not required for WiFi transmitter.

## 7.5 Conclusion

Localized Specific Absorption Rate (SAR) of this portable wireless device has been measured in all cases requested by the relevant standards cited in Clause 4.2 of this report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 4.1 of this test report.

The maximum SAR values are obtained at the case of **GSM 1900 MHz Band, Head, Left hand, Touch cheek, High frequency (Table 9)**, and the value are: **1.4(1g)**.

## 8 Measurement Uncertainty

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	
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## 9 MAIN TEST INSTRUMENTS

**Table 14: List of Main Instruments**

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	HP 8753E	US38433212	August 4,2010	One year
02	Power meter	NRVD	102083	September 11, 2010	One year
03	Power sensor	NRV-Z5	100542		
04	Signal Generator	E4433C	MY49070393	November 13, 2010	One Year
05	Amplifier	VTL5400	0505	No Calibration Requested	
06	BTS	8960	MY48365192	November 18, 2010	One year
07	E-field Probe	SPEAG ES3DV3	3149	September 25, 2010	One year
08	E-field Probe	SPEAG EX3DV4	3617	July 9, 2010	One year
09	DAE	SPEAG DAE4	771	November 21, 2010	One year
11	Dipole Validation Kit	SPEAG D1900V2	541	February 26, 2010	Two years
12	Dipole Validation Kit	SPEAG D2450V2	853	September 27, 2010	Two years

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

## ANNEX A MEASUREMENT PROCESS

The evaluation was performed with the following procedure:

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

Step 2: The SAR distribution at the exposed side of the phantom was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the flat phantom and the horizontal grid spacing was 10 mm x 10 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

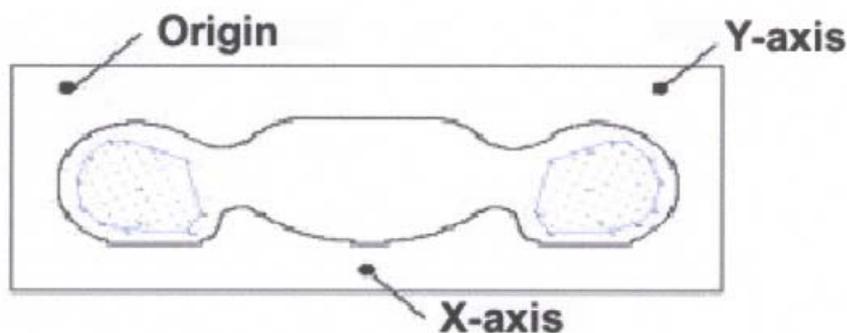
Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7 x 7 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axis. This polynomial was then used to evaluate the points between the surface and the probe tip.

b. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot"-condition (in x ~ y and z-directions). The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

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



Picture A: SAR Measurement Points in Area Scan

**ANNEX B TEST LAYOUT**



**Picture B1: Specific Absorption Rate Test Layout**



**Picture B2 Liquid depth in the Flat Phantom (1900MHz)**



**Picture B3 Liquid depth in the Flat Phantom (2450MHz)**

## ANNEX C GRAPH RESULTS

### 1900 Left Cheek Middle

Date/Time: 2011-5-28 16:51:45

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.40$  mho/m;  $\epsilon_r = 40.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 - SN3149 ConvF(5.03, 5.03, 5.03)

**Cheek Middle/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 1.46 mW/g

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

Reference Value = 9.04 V/m; Power Drift = -0.101 dB

Peak SAR (extrapolated) = 2.3 W/kg

**SAR(1 g) = 1.33 mW/g; SAR(10 g) = 0.705 mW/g**

Maximum value of SAR (measured) = 1.49 mW/g

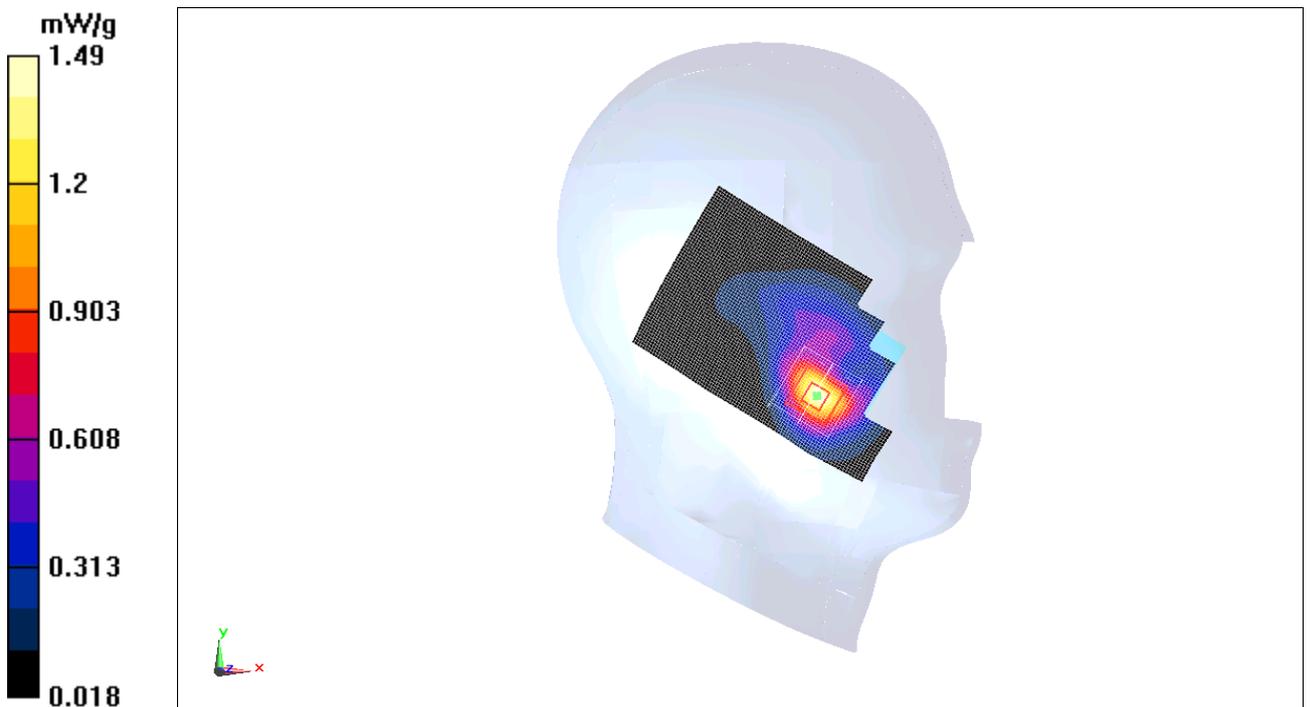


Fig. 1 1900 MHz CH661

**1900 Left Tilt Middle**

Date/Time: 2011-5-28 17:35:39

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.40$  mho/m;  $\epsilon_r = 40.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 - SN3149 ConvF(5.03, 5.03, 5.03)

**Tilt Middle/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.375 mW/g

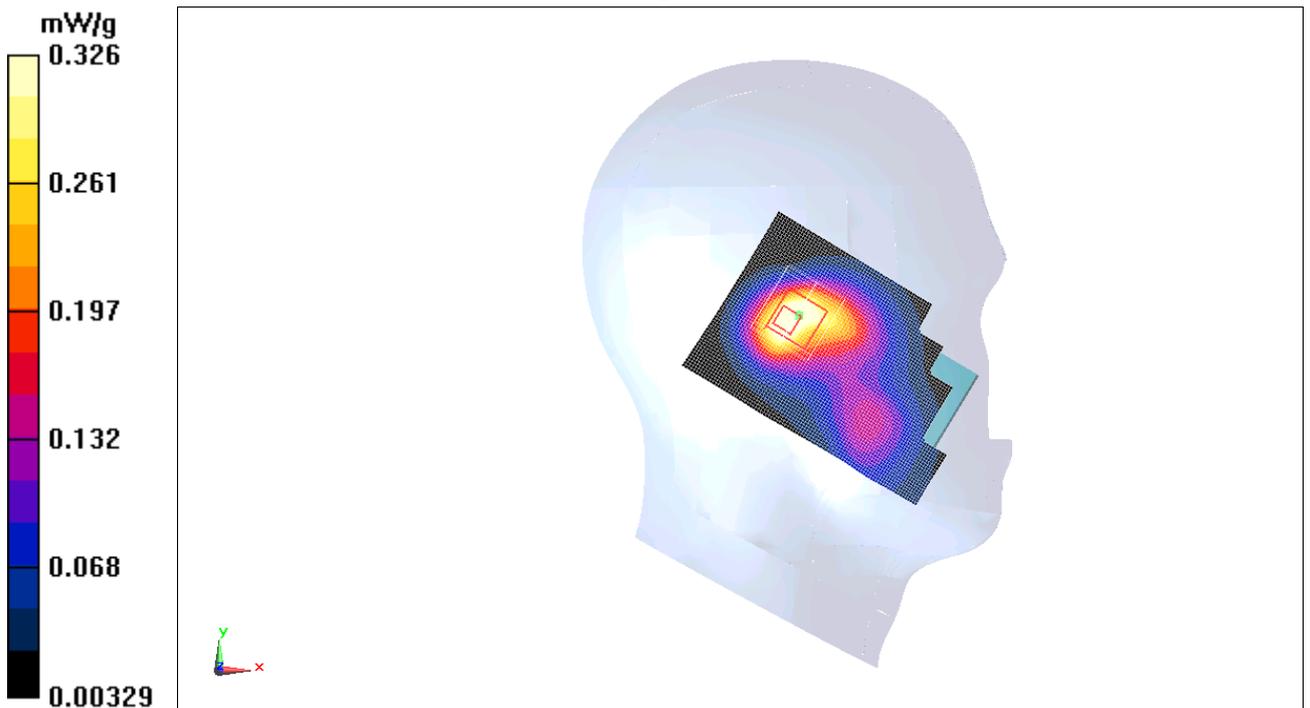
**Tilt Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15 V/m; Power Drift = -0.068 dB

Peak SAR (extrapolated) = 0.499 W/kg

**SAR(1 g) = 0.312 mW/g; SAR(10 g) = 0.189 mW/g**

Maximum value of SAR (measured) = 0.326 mW/g



**Fig. 2 1900 MHz CH661**

**1900 Left Cheek High**

Date/Time: 2011-5-28 17:06:13

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.42$  mho/m;  $\epsilon_r = 40.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

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

Probe: ES3DV3 - SN3149 ConvF(5.03, 5.03, 5.03)

**Cheek High/Area Scan (51x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.47 mW/g

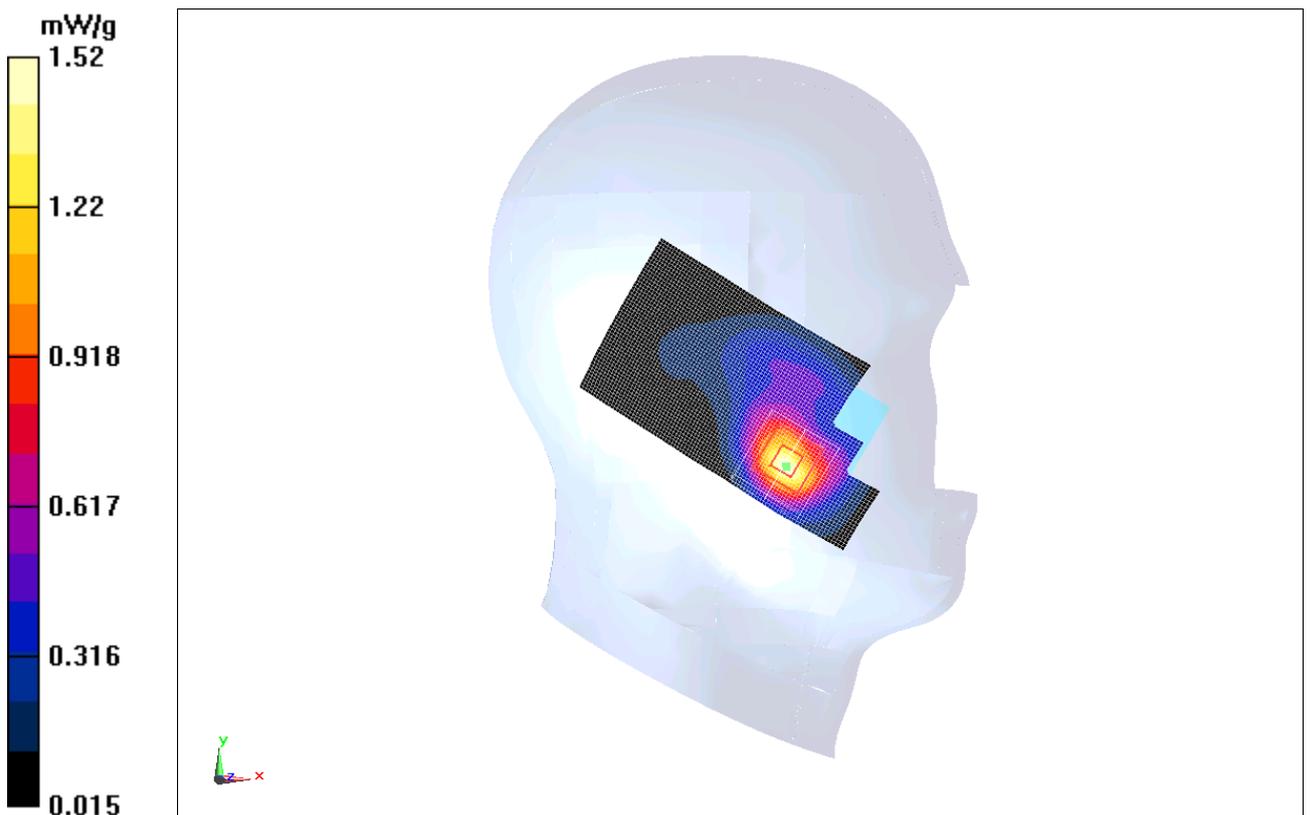
**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10 V/m; Power Drift = 0.024 dB

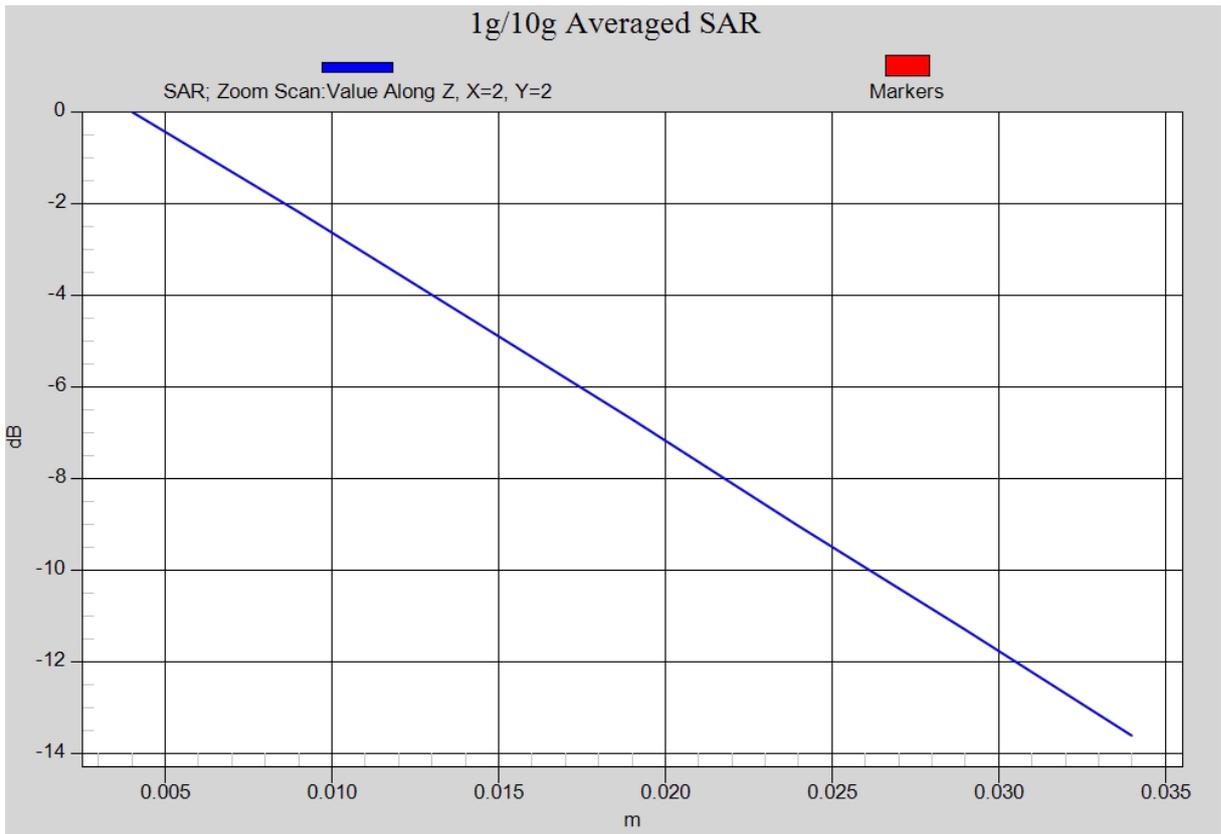
Peak SAR (extrapolated) = 2.45 W/kg

**SAR(1 g) = 1.4 mW/g; SAR(10 g) = 0.737 mW/g**

Maximum value of SAR (measured) = 1.52 mW/g



**Fig. 3 1900 MHz CH810**



**Fig. 3-1 Z-Scan at power reference point (1900 MHz CH810)**

**1900 Left Cheek Low**

Date/Time: 2011-5-28 17:20:46

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 40.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 - SN3149 ConvF(5.03, 5.03, 5.03)

**Cheek Low/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.37 mW/g

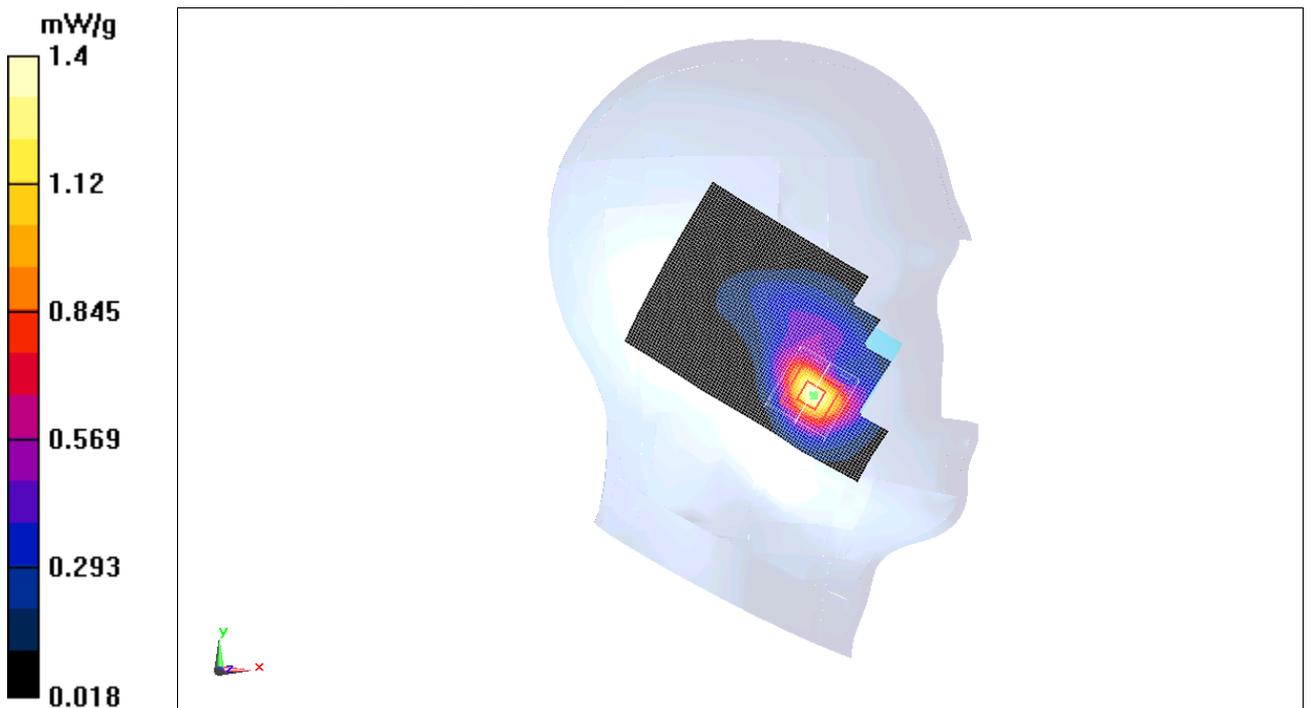
**Cheek Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.9 V/m; Power Drift = 0.044 dB

Peak SAR (extrapolated) = 2.17 W/kg

**SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.662 mW/g**

Maximum value of SAR (measured) = 1.4 mW/g



**Fig. 4 1900 MHz CH512**

**1900 Right Cheek Middle**

Date/Time: 2011-5-28 17:50:41

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.40$  mho/m;  $\epsilon_r = 40.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 - SN3149 ConvF(5.03, 5.03, 5.03)

**Cheek Middle/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.879 mW/g

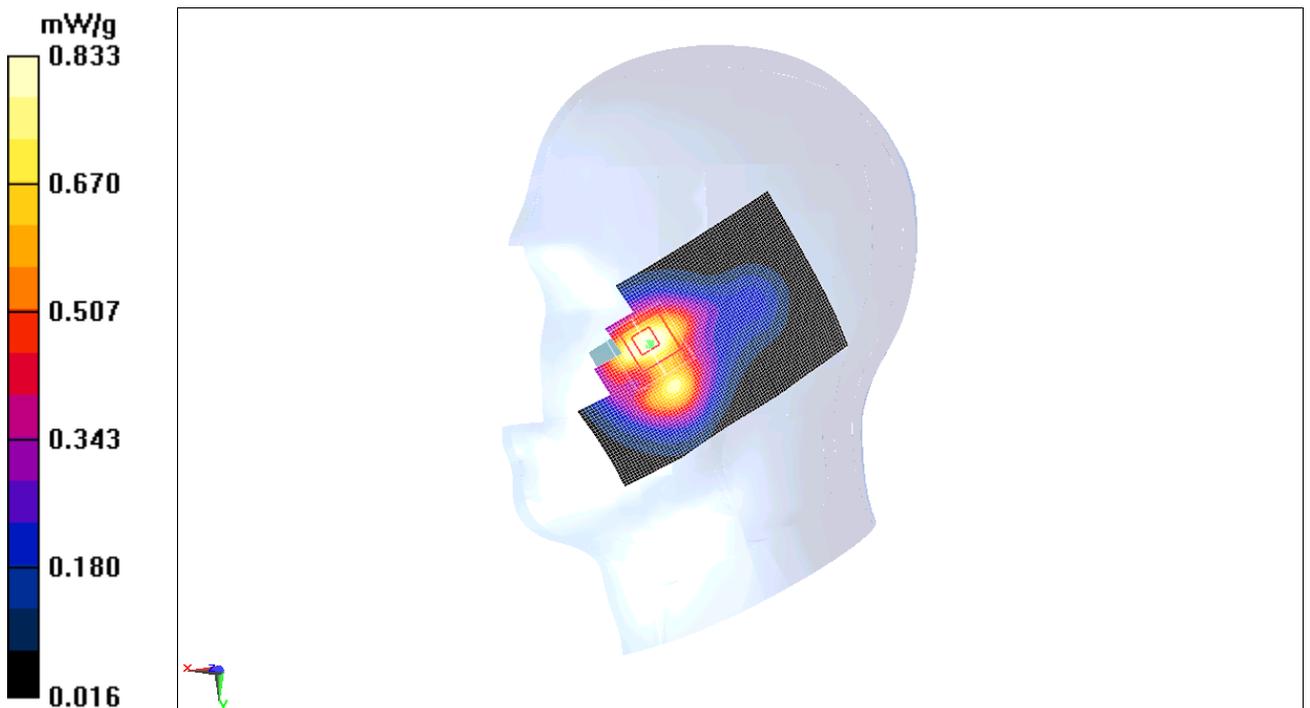
**Cheek Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.5 V/m; Power Drift = 0.061 dB

Peak SAR (extrapolated) = 1.27 W/kg

**SAR(1 g) = 0.791 mW/g; SAR(10 g) = 0.464 mW/g**

Maximum value of SAR (measured) = 0.833 mW/g



**Fig. 5 1900 MHz CH661**

**1900 Right Tilt Middle**

Date/Time: 2011-5-28 18:34:22

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.40$  mho/m;  $\epsilon_r = 40.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 - SN3149 ConvF(5.03, 5.03, 5.03)

**Tilt Middle/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.414 mW/g

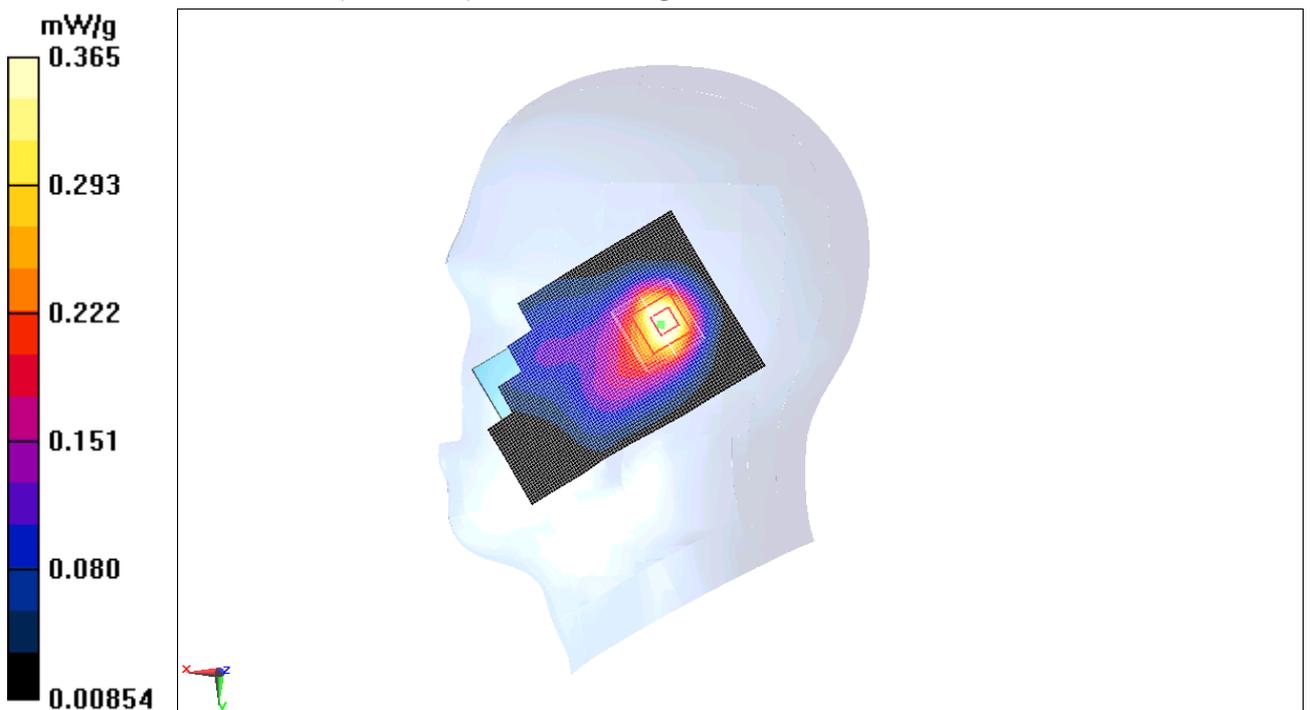
**Tilt Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.8 V/m; Power Drift = -0.027 dB

Peak SAR (extrapolated) = 0.547 W/kg

**SAR(1 g) = 0.350 mW/g; SAR(10 g) = 0.205 mW/g**

Maximum value of SAR (measured) = 0.365 mW/g



**Fig.6 1900 MHz CH661**

**1900 Right Cheek High**

Date/Time: 2011-5-28 18:05:04

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.42$  mho/m;  $\epsilon_r = 40.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

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

Probe: ES3DV3 - SN3149 ConvF(5.03, 5.03, 5.03)

**Cheek High/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.898 mW/g

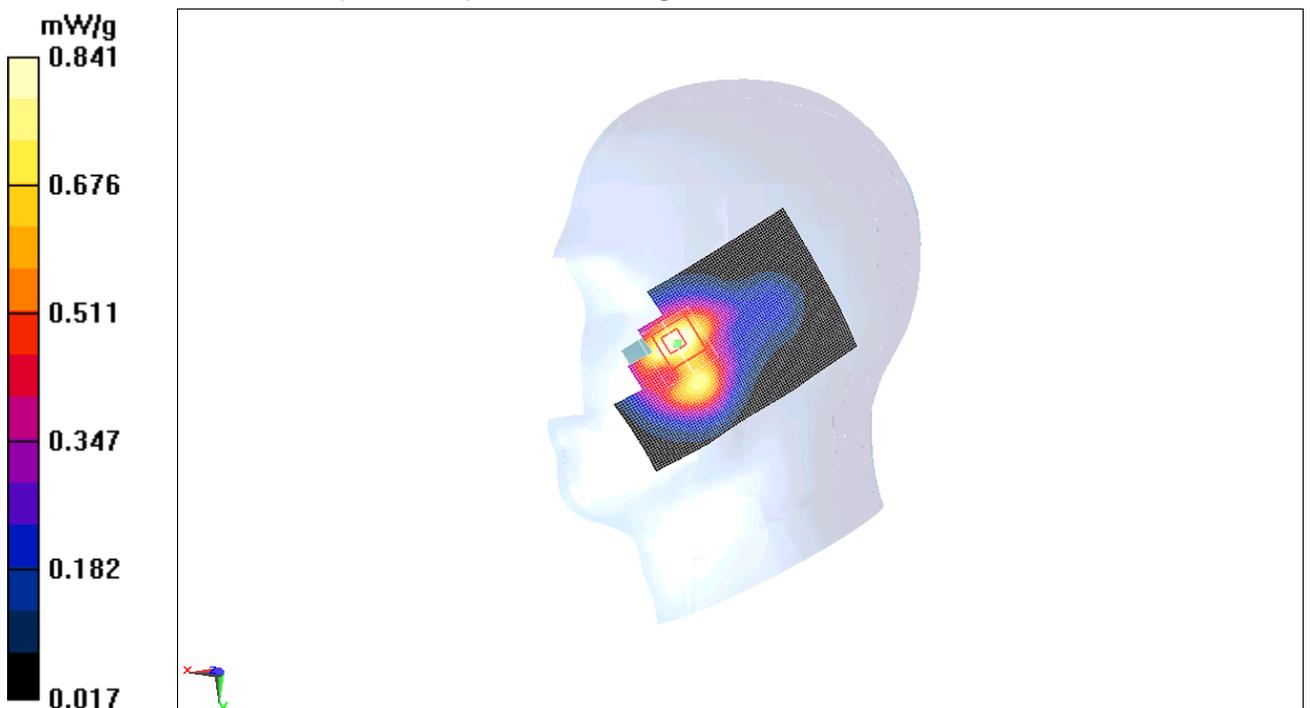
**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.8 V/m; Power Drift = -0.014 dB

Peak SAR (extrapolated) = 1.31 W/kg

**SAR(1 g) = 0.805 mW/g; SAR(10 g) = 0.468 mW/g**

Maximum value of SAR (measured) = 0.841 mW/g



**Fig. 7 1900 MHz CH810**

**1900 Right Cheek Low**

Date/Time: 2011-5-28 18:19:25

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 40.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 - SN3149 ConvF(5.03, 5.03, 5.03)

**Cheek Low/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.828 mW/g

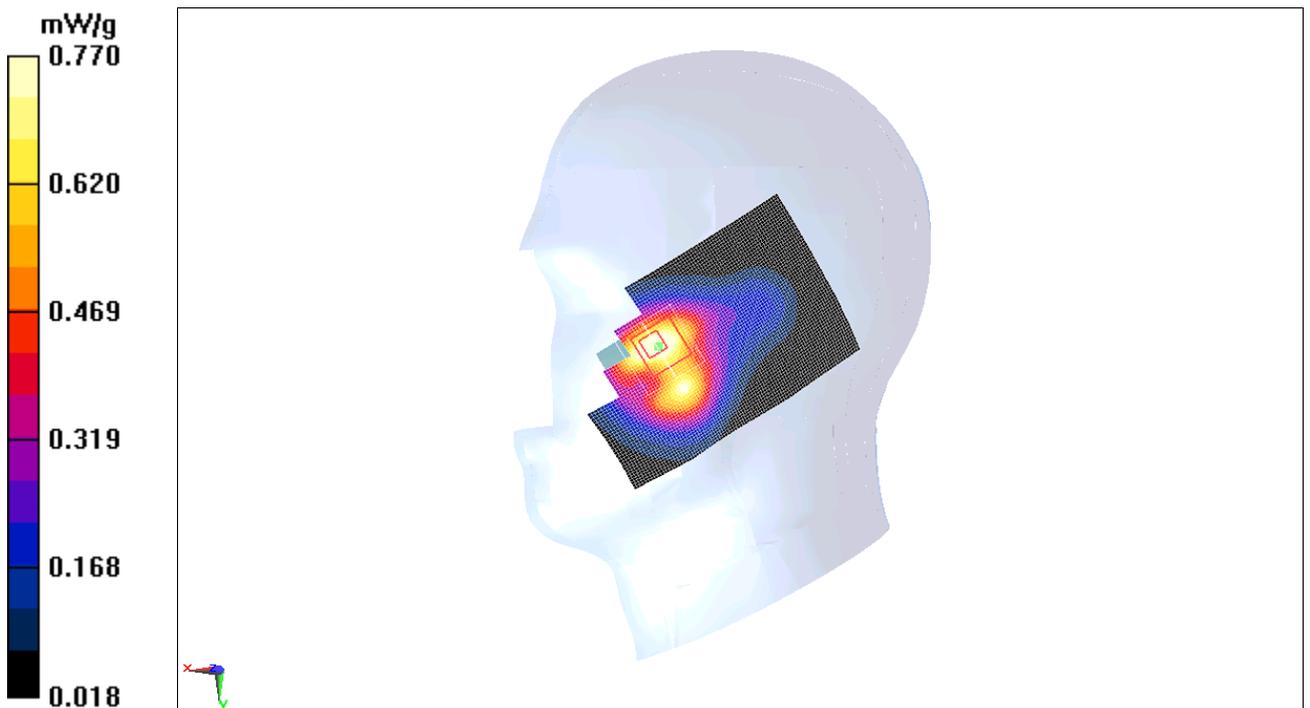
**Cheek Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.72 V/m; Power Drift = 0.022 dB

Peak SAR (extrapolated) = 1.16 W/kg

**SAR(1 g) = 0.732 mW/g; SAR(10 g) = 0.432 mW/g**

Maximum value of SAR (measured) = 0.770 mW/g



**Fig. 8 1900 MHz CH512**

**1900 Body Towards Ground High with GPRS**

Date/Time: 2011-5-28 11:14:09

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 53.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Frequency: 1909.8 MHz Duty Cycle: 1:4

Probe: ES3DV3 - SN3149 ConvF(4.68, 4.68, 4.68)

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

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

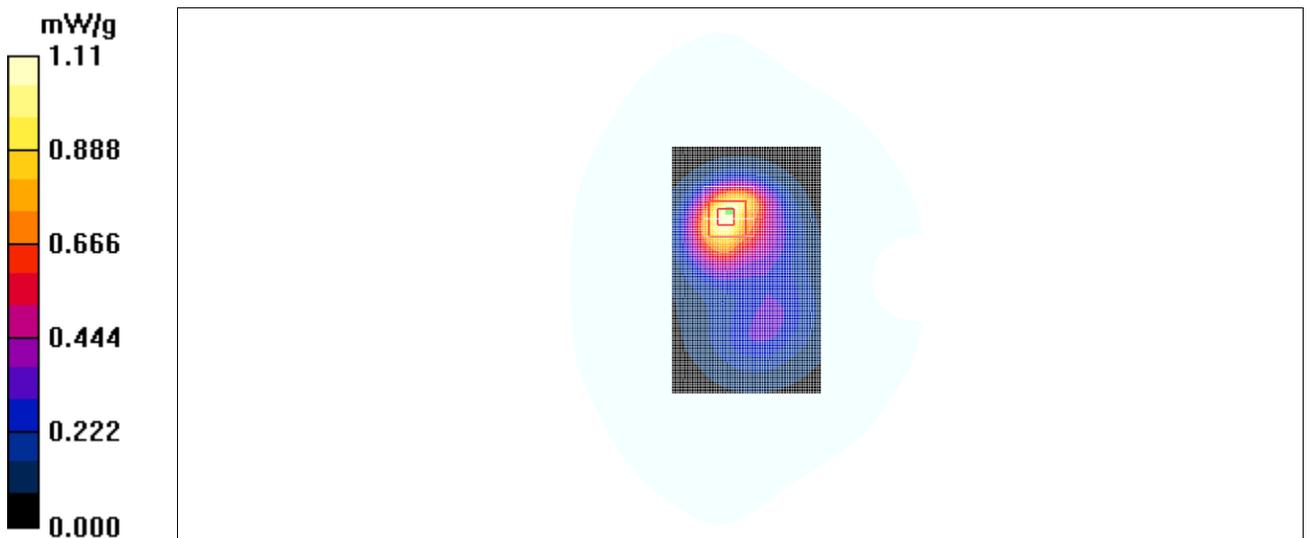
**Toward Ground High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.6 V/m; Power Drift = 0.051 dB

Peak SAR (extrapolated) = 1.65 W/kg

**SAR(1 g) = 0.993 mW/g; SAR(10 g) = 0.590 mW/g**

Maximum value of SAR (measured) = 1.06 mW/g



**Fig. 9 1900 MHz CH810**

**1900 Body Towards Ground Middle with GPRS**

Date/Time: 2011-5-28 11:29:33

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ES3DV3 - SN3149 ConvF(4.68, 4.68, 4.68)

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

Maximum value of SAR (interpolated) = 1.18 mW/g

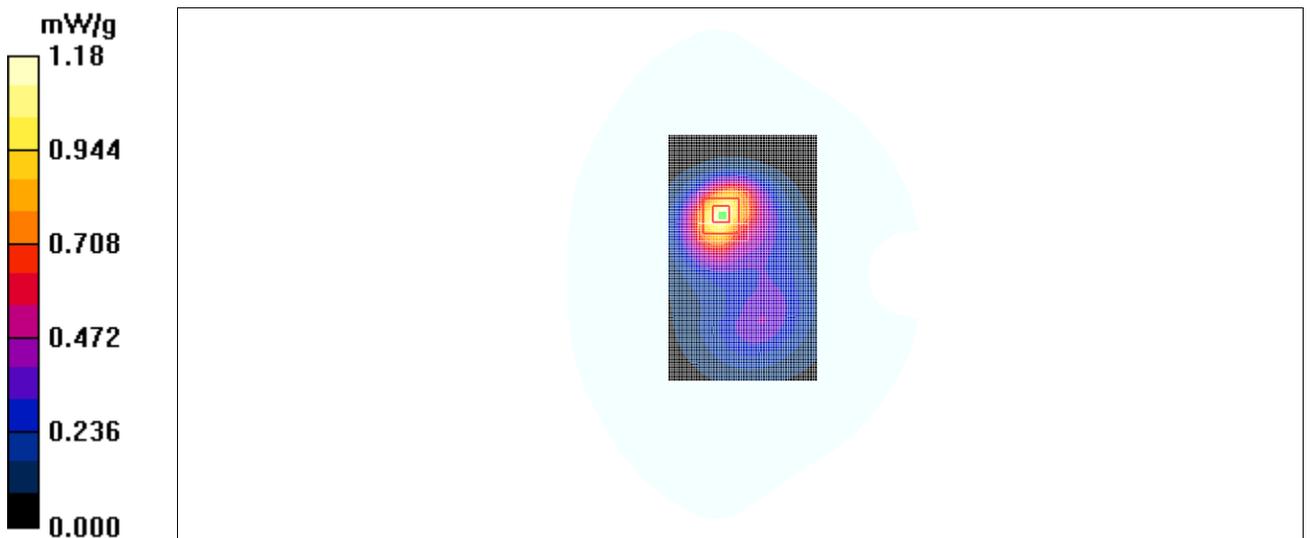
**Toward Ground Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.8 V/m; Power Drift = 0.030 dB

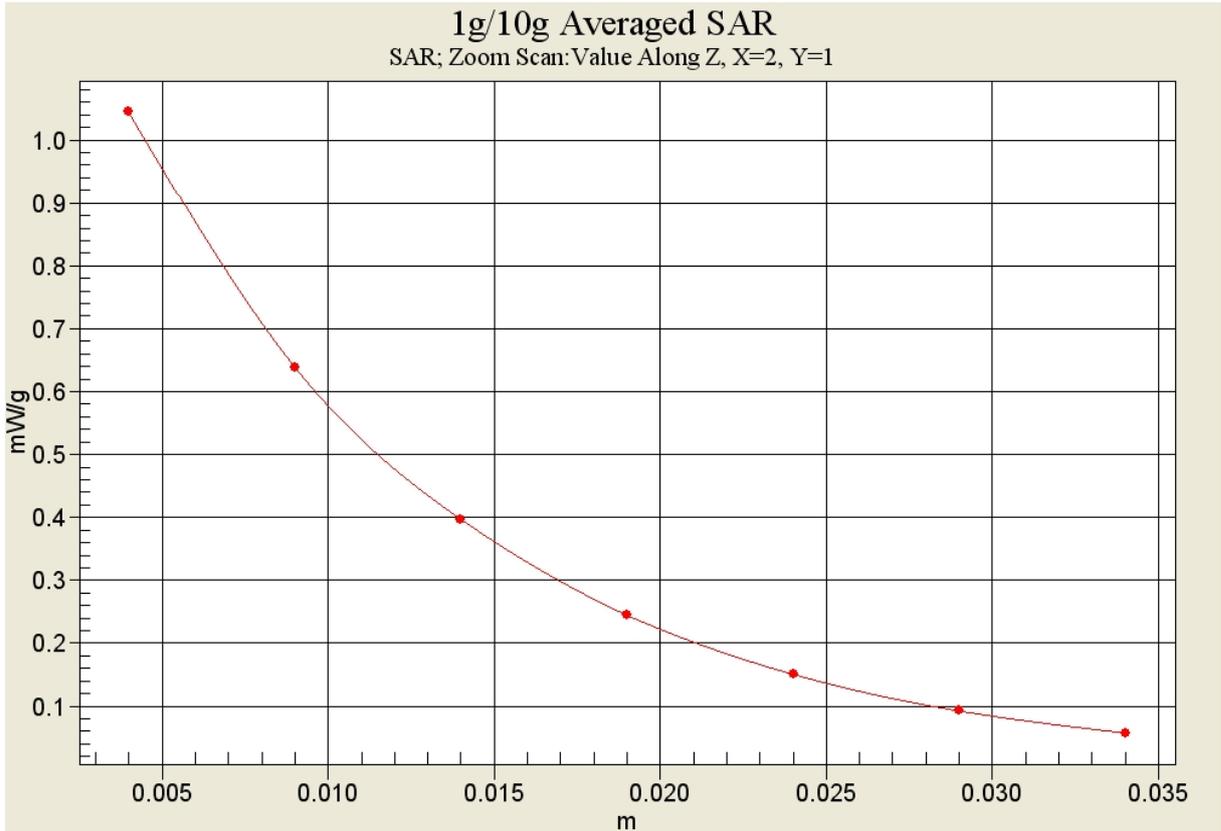
Peak SAR (extrapolated) = 1.70 W/kg

**SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.595 mW/g**

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



**Fig. 10 1900 MHz CH661**



**Fig. 10-1 Z-Scan at power reference point (1900 MHz CH661)**

**1900 Body Towards Ground Low with GPRS**

Date/Time: 2011-5-28 10:58:47

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.49$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

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

Probe: ES3DV3 - SN3149 ConvF(4.68, 4.68, 4.68)

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

Maximum value of SAR (interpolated) = 1.14 mW/g

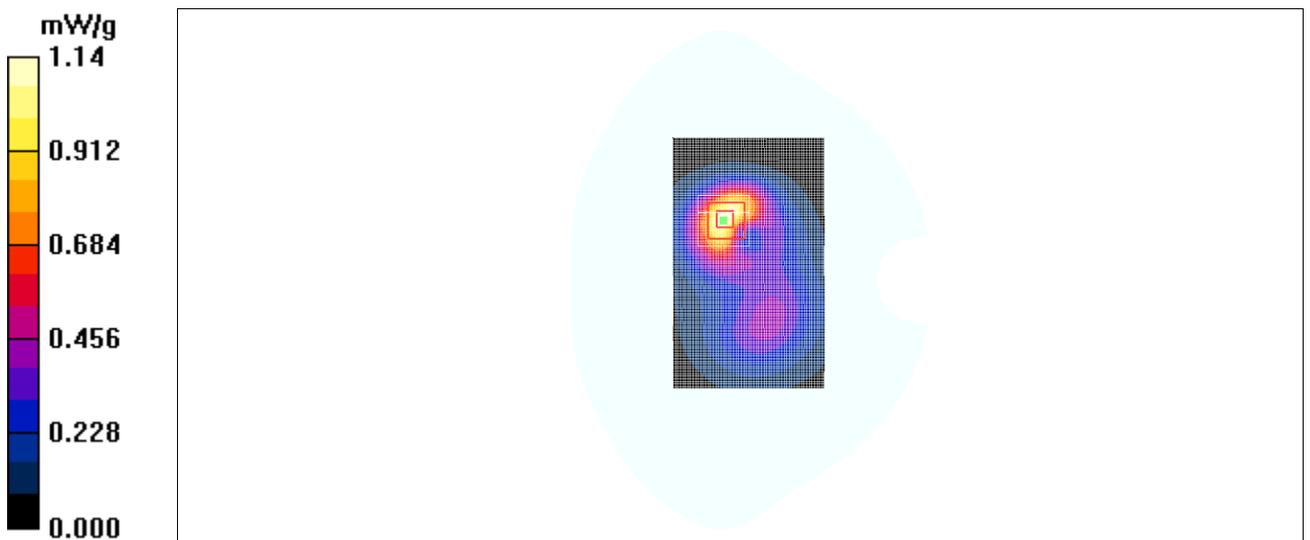
**Toward Ground Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 14.8 V/m; Power Drift = -0.022 dB

Peak SAR (extrapolated) = 1.68 W/kg

**SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.593 mW/g**

Maximum value of SAR (measured) = 1.06 mW/g



**Fig. 11 1900 MHz CH512**

**1900 Body Towards Phantom Low with GPRS**

Date/Time: 2011-5-28 10:43:16

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.49$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

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

Probe: ES3DV3 - SN3149 ConvF(4.68, 4.68, 4.68)

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

Maximum value of SAR (interpolated) = 0.708 mW/g

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

Reference Value = 13.3 V/m; Power Drift = 0.048 dB

Peak SAR (extrapolated) = 1.08 W/kg

**SAR(1 g) = 0.644 mW/g; SAR(10 g) = 0.378 mW/g**

Maximum value of SAR (measured) = 0.662 mW/g

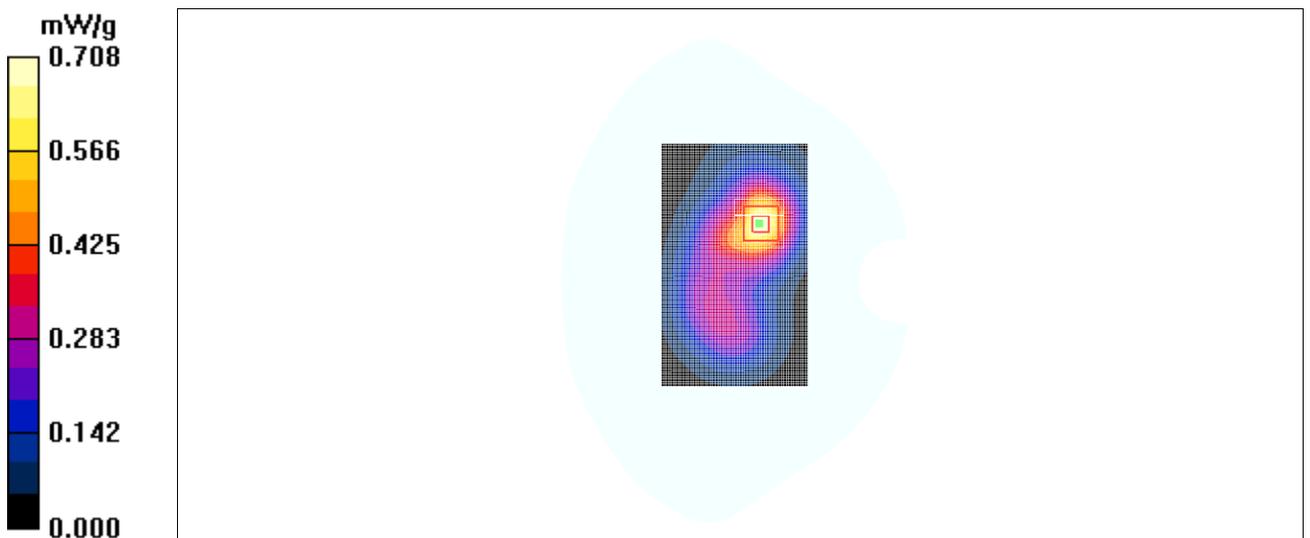


Fig. 12 1900 MHz CH512

**1900 Body Towards Ground Middle with EGPRS**

Date/Time: 2011-5-28 11:46:10

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ES3DV3 - SN3149 ConvF(4.68, 4.68, 4.68)

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

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

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

Reference Value = 14.1 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 1.64 W/kg

**SAR(1 g) = 0.983 mW/g; SAR(10 g) = 0.576 mW/g**

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

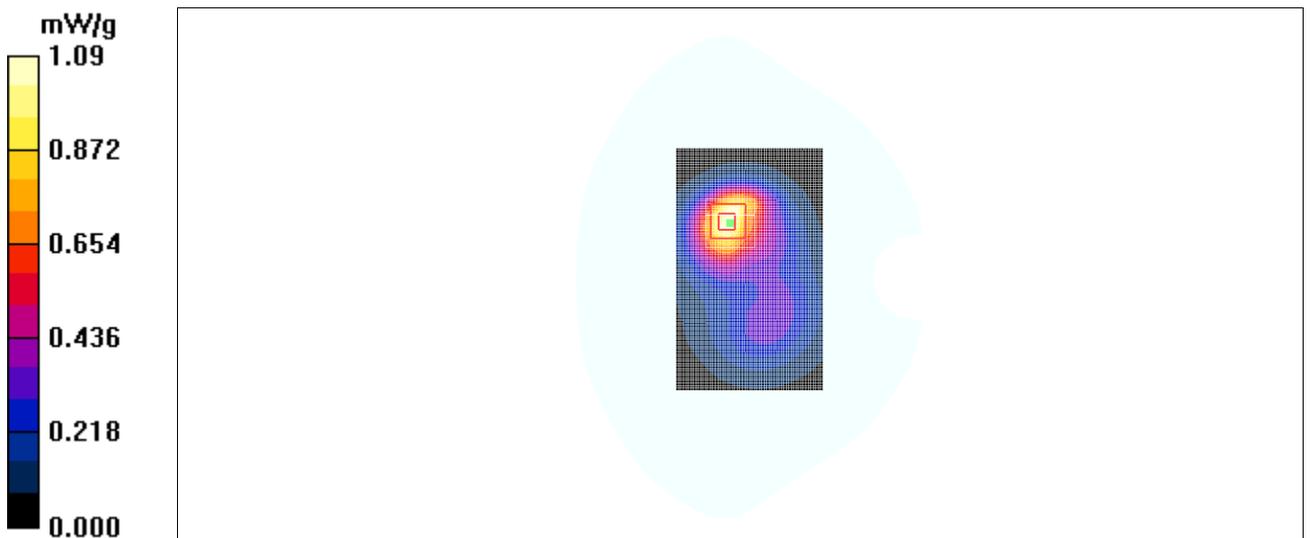


Fig. 13 1900 MHz CH661

**1900 Body Towards Ground Middle with Headset**

Date/Time: 2011-5-28 12:03:18

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 - SN3149 ConvF(4.68, 4.68, 4.68)

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

Maximum value of SAR (interpolated) = 0.543 mW/g

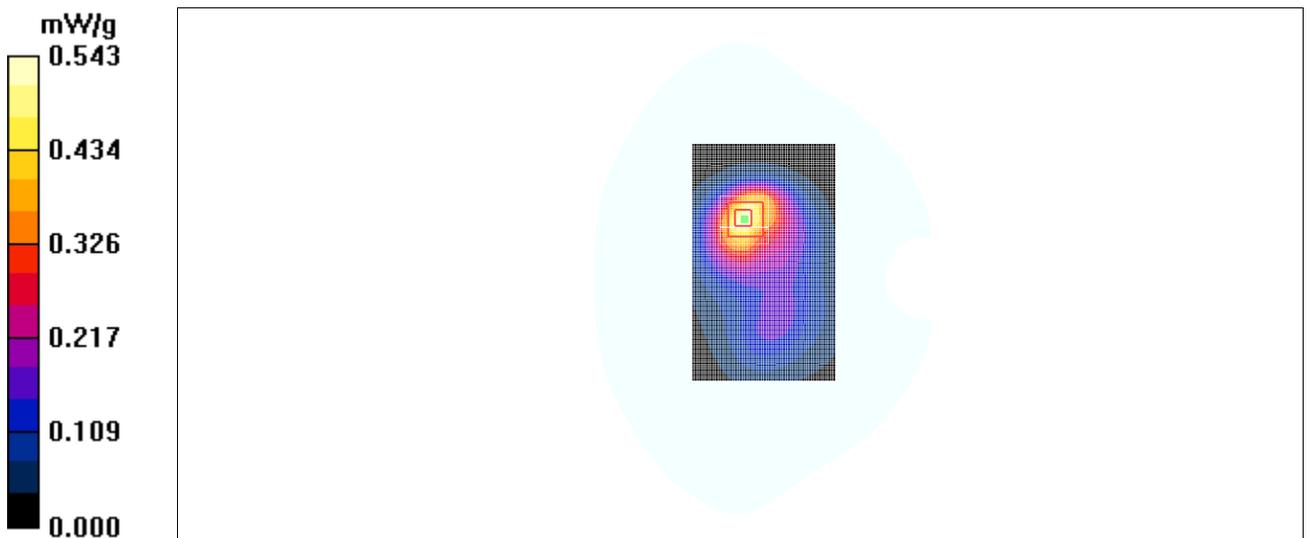
**Toward Ground Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.4 V/m; Power Drift = 0.039 dB

Peak SAR (extrapolated) = 0.775 W/kg

**SAR(1 g) = 0.466 mW/g; SAR(10 g) = 0.275 mW/g**

Maximum value of SAR (measured) = 0.483 mW/g



**Fig. 14 1900 MHz CH661**

**1900 Body Towards Ground Middle with Bluetooth**

Date/Time: 2011-5-28 12:20:32

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 - SN3149 ConvF(4.68, 4.68, 4.68)

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

Maximum value of SAR (interpolated) = 0.630 mW/g

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

Reference Value = 11.4 V/m; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 0.938 W/kg

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

Maximum value of SAR (measured) = 0.569 mW/g

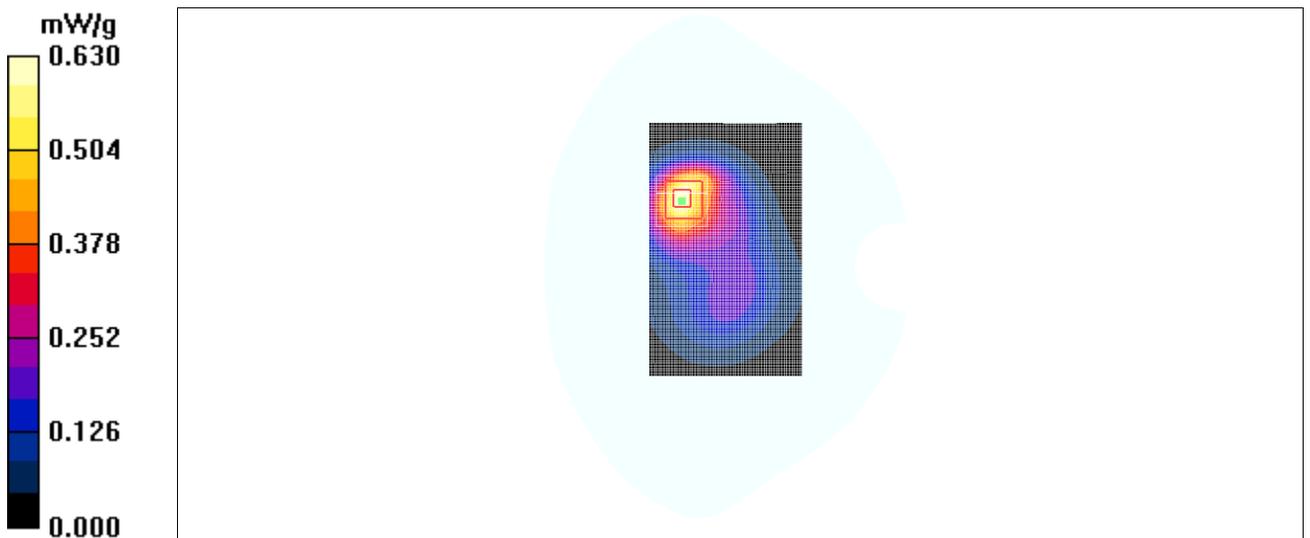


Fig. 15 1900 MHz CH661

**WiFi 802.11b 1Mbps Left Cheek Channel 11**

Date/Time: 2011-5-26 12:31:20

Electronics: DAE4 Sn771

Medium: Head 2450 MHz

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 1.84$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0 °C      Liquid Temperature: 22.5 °C

Communication System: WLAN 2450 Frequency: 2462 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(7.19, 7.19, 7.19)

**Cheek High/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.315 mW/g

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

Reference Value = 10.8 V/m; Power Drift = -0.155 dB

Peak SAR (extrapolated) = 0.445 W/kg

**SAR(1 g) = 0.264 mW/g; SAR(10 g) = 0.152 mW/g**

Maximum value of SAR (measured) = 0.276 mW/g

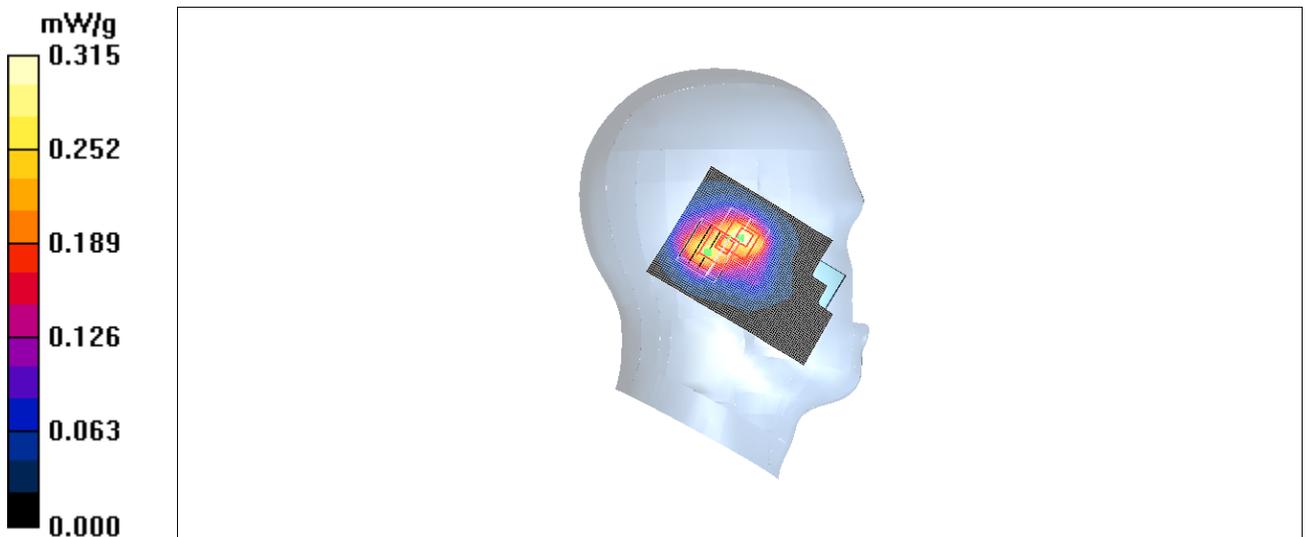
**Cheek High/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.8 V/m; Power Drift = -0.155 dB

Peak SAR (extrapolated) = 0.414 W/kg

**SAR(1 g) = 0.221 mW/g; SAR(10 g) = 0.130 mW/g**

Maximum value of SAR (measured) = 0.257 mW/g



**Fig.16 802.11b 1Mbps CH11**

**WiFi 802.11b 1Mbps Left Tilt Channel 11**

Date/Time: 2011-5-26 12:45:53

Electronics: DAE4 Sn771

Medium: Head 2450 MHz

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 1.84$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0 °C      Liquid Temperature: 22.5 °C

Communication System: WLAN 2450 Frequency: 2462 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(7.19, 7.19, 7.19)

**Tilt High/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.245 mW/g

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

Reference Value = 10.4 V/m; Power Drift = -0.090 dB

Peak SAR (extrapolated) = 0.371 W/kg

**SAR(1 g) = 0.211 mW/g; SAR(10 g) = 0.117 mW/g**

Maximum value of SAR (measured) = 0.234 mW/g

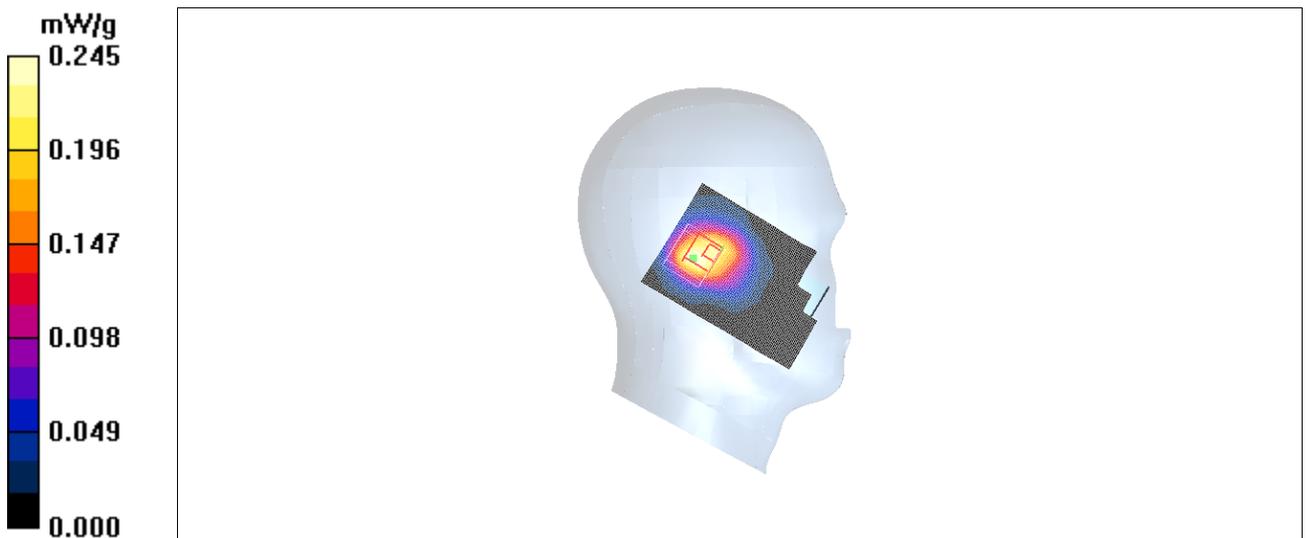


Fig.17 802.11b 1Mbps CH11

**WiFi 802.11b 1Mbps Right Cheek Channel 11**

Date/Time: 2011-5-26 13:00:43

Electronics: DAE4 Sn771

Medium: Head 2450 MHz

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 1.84$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0 °C      Liquid Temperature: 22.5 °C

Communication System: WLAN 2450 Frequency: 2462 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(7.19, 7.19, 7.19)

**Cheek High/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.400 mW/g

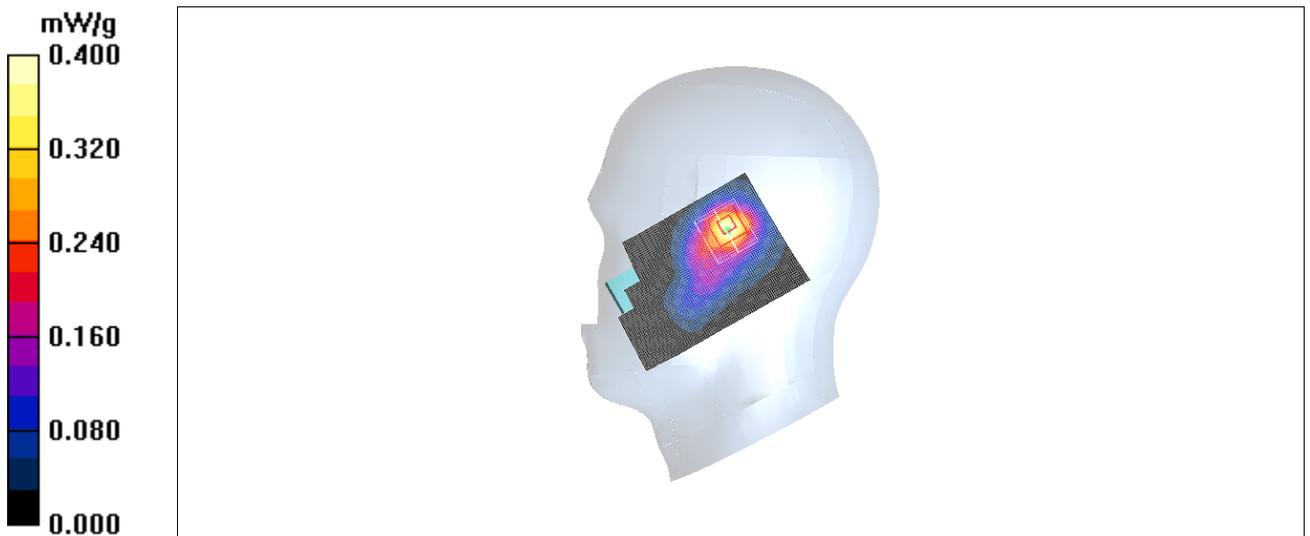
**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.89 V/m; Power Drift = 0.138 dB

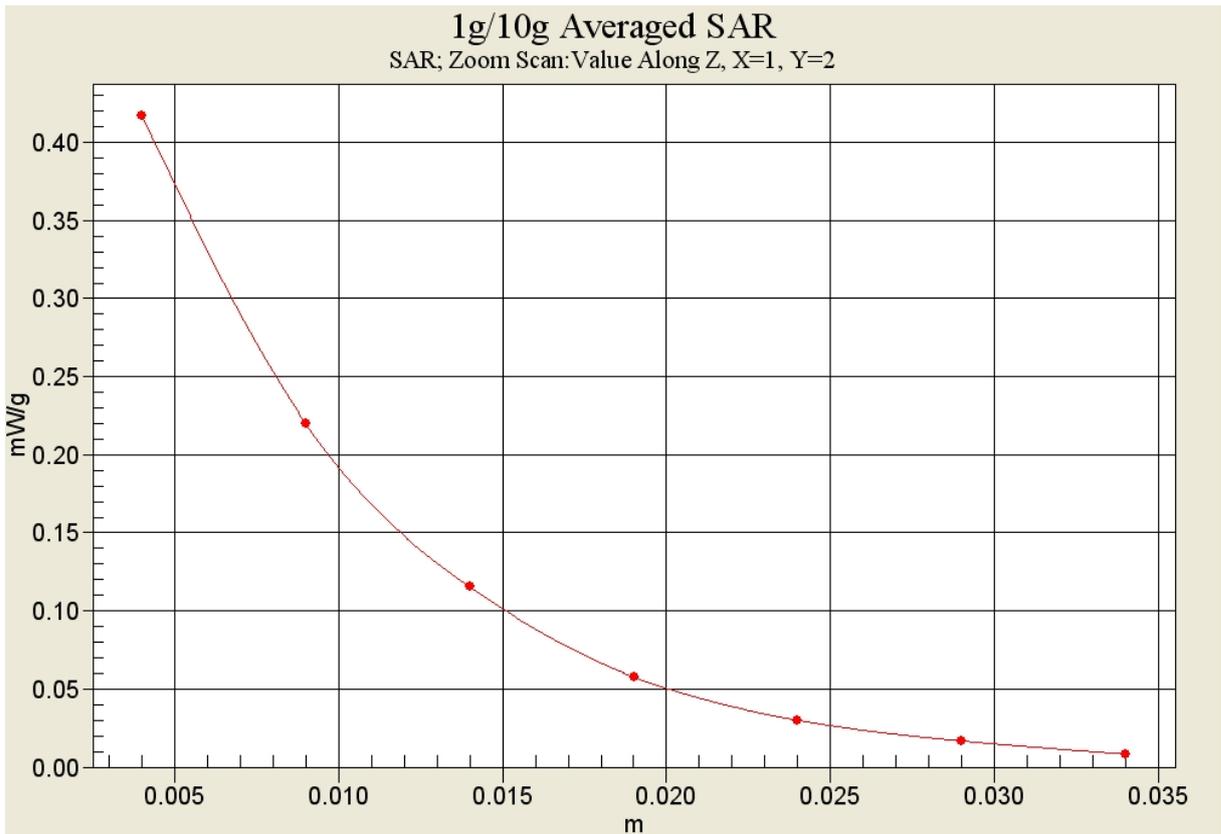
Peak SAR (extrapolated) = 0.782 W/kg

**SAR(1 g) = 0.395 mW/g; SAR(10 g) = 0.193 mW/g**

Maximum value of SAR (measured) = 0.417 mW/g



**Fig.18 802.11b 1Mbps CH11**



**Fig. 18-1 Z-Scan at power reference point (2462 MHz CH11)**

**WiFi 802.11b 1Mbps Right Tilt Channel 11**

Date/Time: 2011-5-26 13:15:27

Electronics: DAE4 Sn771

Medium: Head 2450 MHz

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 1.84$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0 °C      Liquid Temperature: 22.5 °C

Communication System: WLAN 2450 Frequency: 2462 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(7.19, 7.19, 7.19)

**Tilt High/Area Scan (61x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.339 mW/g

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

Reference Value = 10.1 V/m; Power Drift = -0.191 dB

Peak SAR (extrapolated) = 0.589 W/kg

**SAR(1 g) = 0.295 mW/g; SAR(10 g) = 0.149 mW/g**

Maximum value of SAR (measured) = 0.333 mW/g

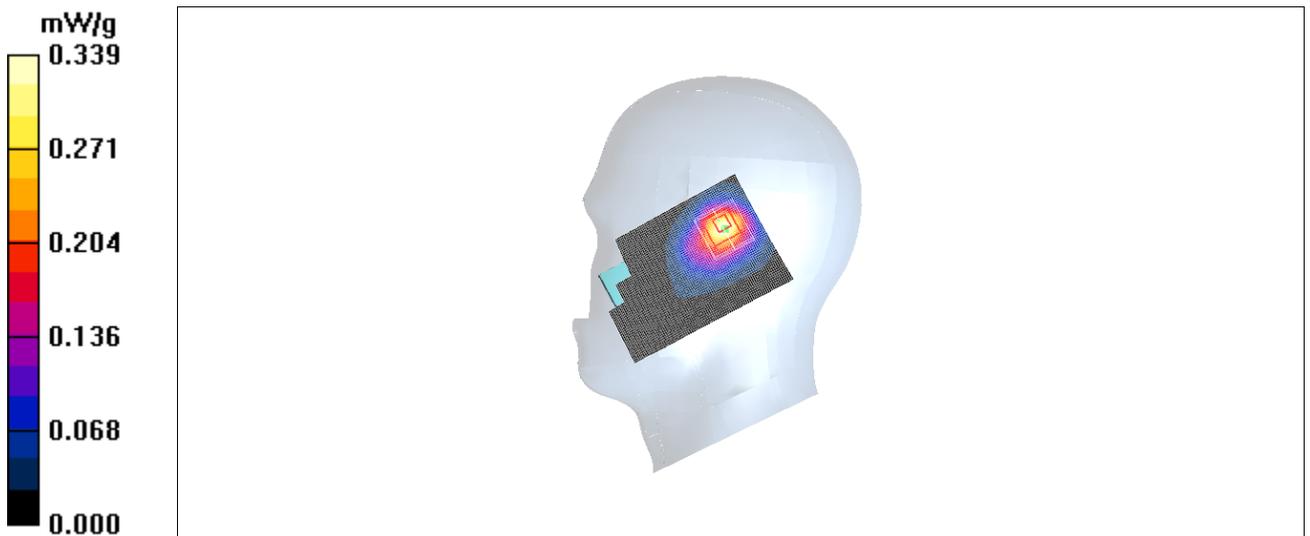


Fig.19 802.11b 1Mbps CH11

**WiFi 802.11b 1Mbps Toward Ground Channel 11**

Date/Time: 2011-5-26 09:03:12

Electronics: DAE4 Sn771

Medium: Body 2450 MHz

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 1.98$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0 °C      Liquid Temperature: 22.5 °C

Communication System: WLAN 2450 Frequency: 2462 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(6.88, 6.88, 6.88)

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

Maximum value of SAR (interpolated) = 0.091 mW/g

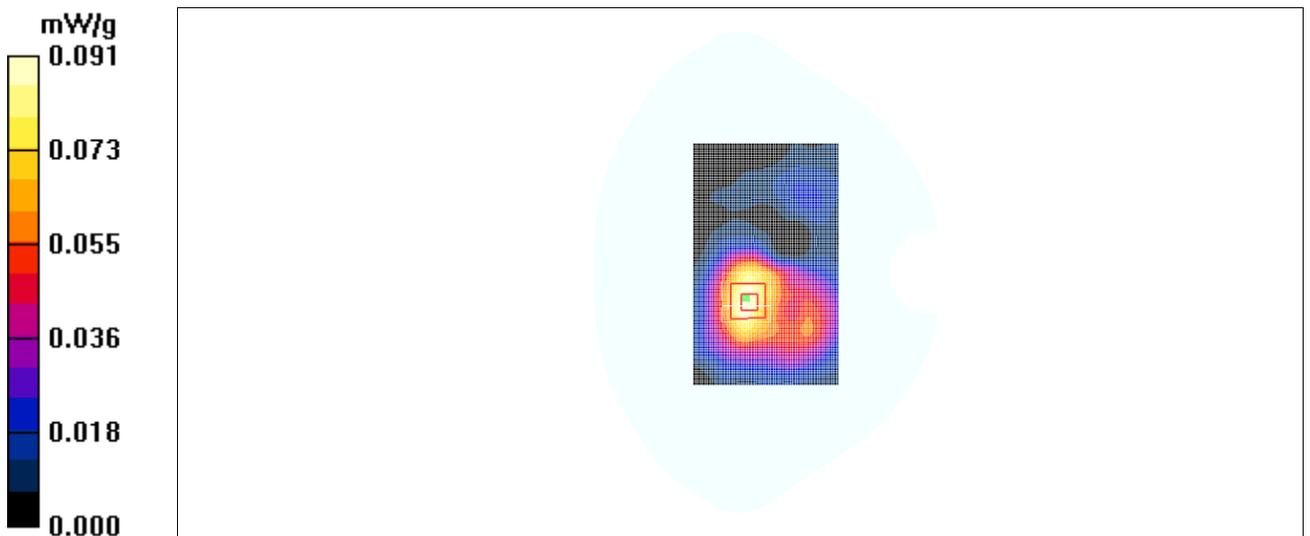
**Toward Ground High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.75 V/m; Power Drift = -0.035 dB

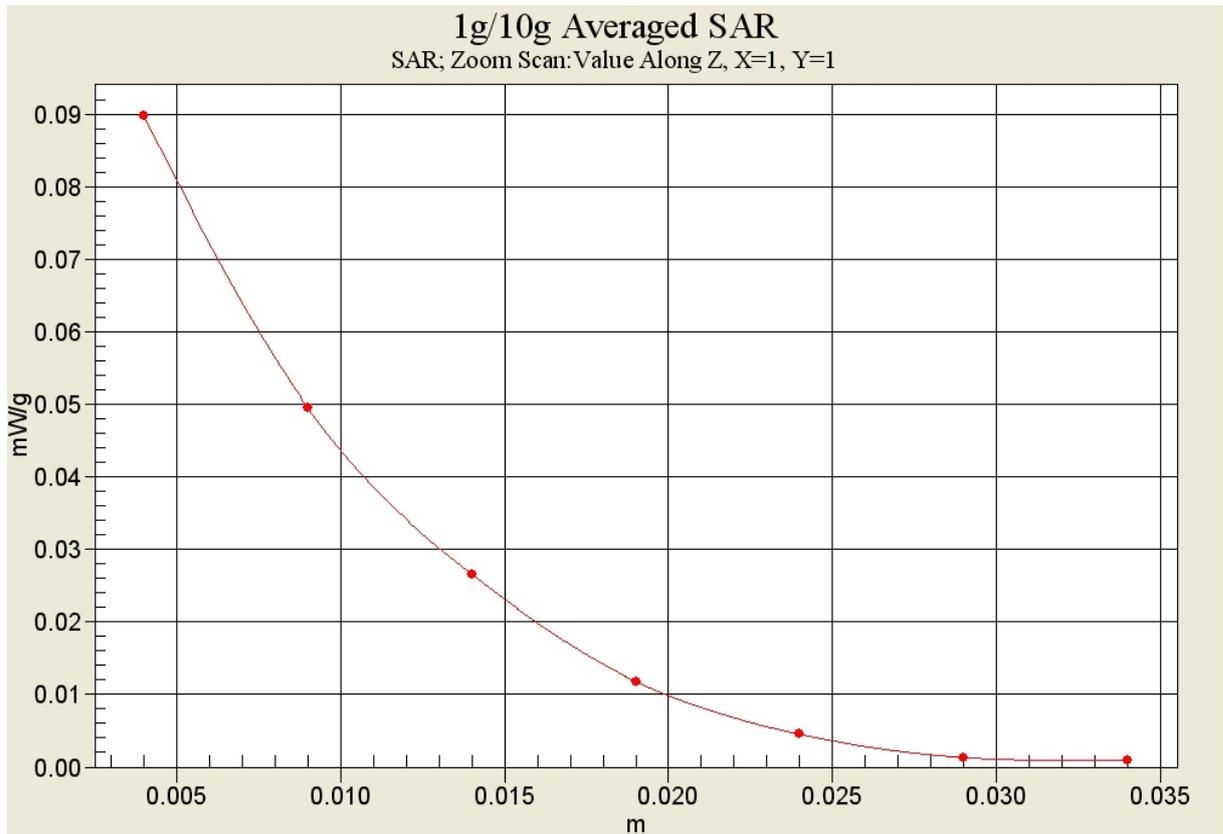
Peak SAR (extrapolated) = 0.140 W/kg

**SAR(1 g) = 0.084 mW/g; SAR(10 g) = 0.048 mW/g**

Maximum value of SAR (measured) = 0.090 mW/g



**Fig.20 802.11b 1Mbps CH11**



**Fig. 20-1 Z-Scan at power reference point (2462 MHz CH11)**

**WiFi 802.11b 1Mbps Toward Phantom Channel 11**

Date/Time: 2011-5-26 09:19:38

Electronics: DAE4 Sn771

Medium: Body 2450 MHz

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 1.98$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0 °C      Liquid Temperature: 22.5 °C

Communication System: WLAN 2450 Frequency: 2462 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(6.88, 6.88, 6.88)

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

Maximum value of SAR (interpolated) = 0.086 mW/g

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

Reference Value = 6.35 V/m; Power Drift = -0.189 dB

Peak SAR (extrapolated) = 0.126 W/kg

**SAR(1 g) = 0.076 mW/g; SAR(10 g) = 0.044 mW/g**

Maximum value of SAR (measured) = 0.079 mW/g

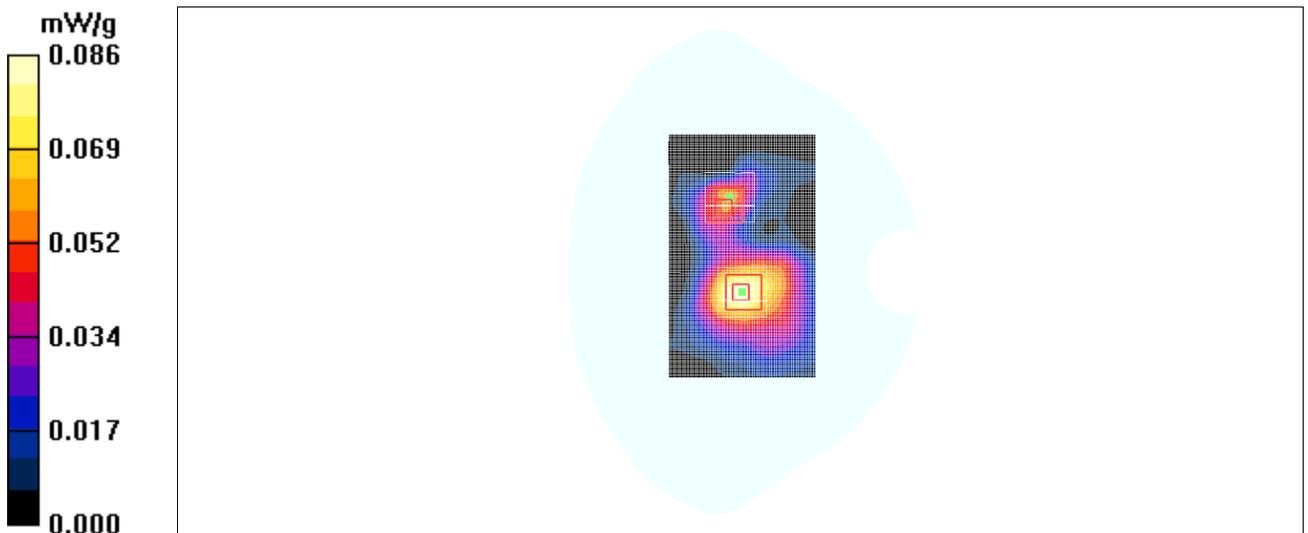
**Toward Phantom High/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.35 V/m; Power Drift = -0.189 dB

Peak SAR (extrapolated) = 0.074 W/kg

**SAR(1 g) = 0.045 mW/g; SAR(10 g) = 0.024 mW/g**

Maximum value of SAR (measured) = 0.051 mW/g



**Fig.21 802.11b 1Mbps CH11**

## ANNEX D SYSTEM VALIDATION RESULTS

### 1900MHz

Date/Time: 2011-5-28 13:21:29

Electronics: DAE4 Sn771

Medium: Head 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.41$  mho/m;  $\epsilon_r = 40.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0°C      Liquid Temperature: 22.5°C

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

Probe: ES3DV3 - SN3149 ConvF(5.03, 5.03, 5.03)

**System Validation/Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 11.4 mW/g

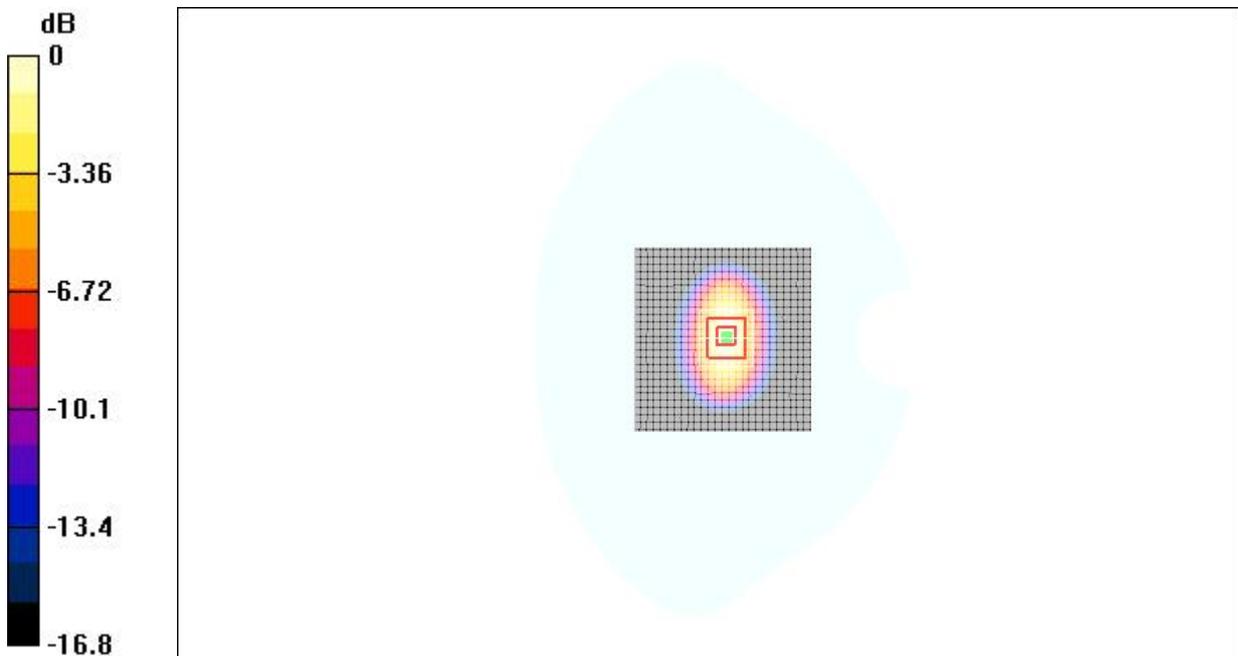
**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.7 V/m; Power Drift = -0.065 dB

Peak SAR (extrapolated) = 14.5 W/kg

**SAR(1 g) = 9.78 mW/g; SAR(10 g) = 4.88 mW/g**

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



0 dB = 10.3mW/g

Fig.22 validation 1900MHz 250mW

## 1900MHz

Date/Time: 2011-5-28 07:28:52

Electronics: DAE4 Sn771

Medium: Body 1900 MHz

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.53 \text{ mho/m}$ ;  $\epsilon_r = 53.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $23.0^\circ\text{C}$       Liquid Temperature:  $22.5^\circ\text{C}$

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

Probe: ES3DV3 - SN3149 ConvF(4.68, 4.68, 4.68)

**System Validation/Area Scan (101x101x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$   
Maximum value of SAR (interpolated) =  $11.3 \text{ mW/g}$

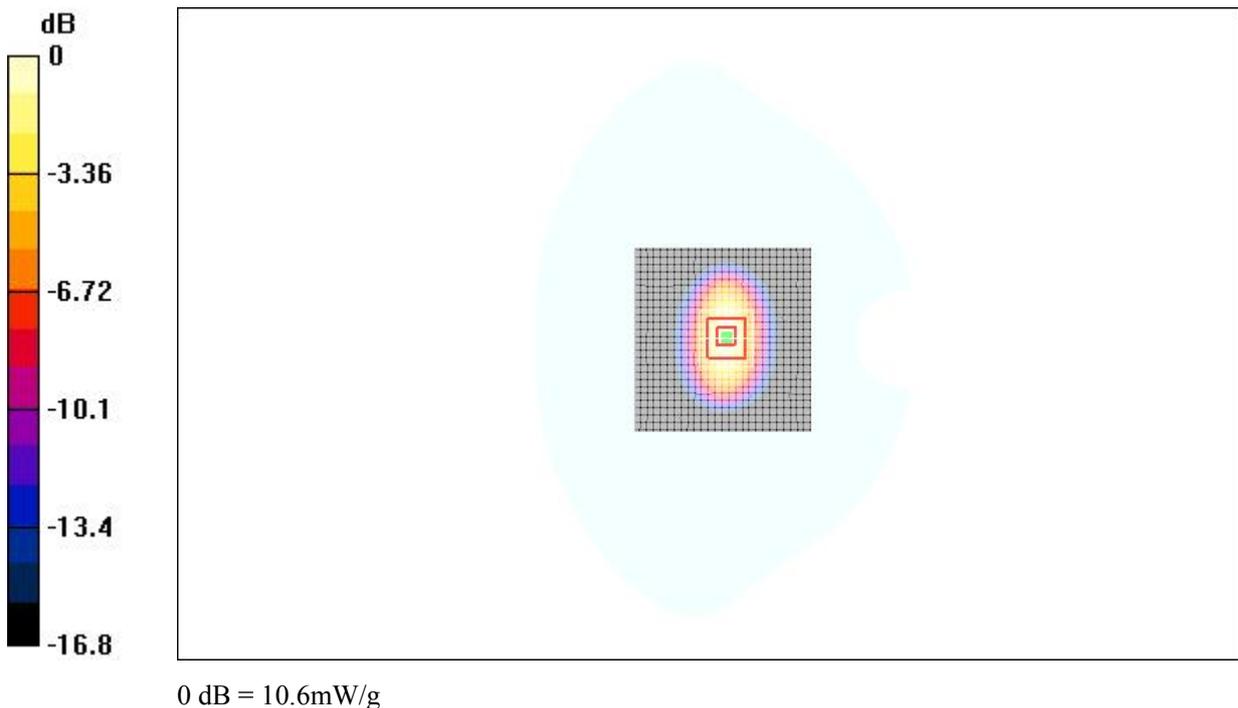
**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value =  $90.8 \text{ V/m}$ ; Power Drift =  $0.053 \text{ dB}$

Peak SAR (extrapolated) =  $15.9 \text{ W/kg}$

**SAR(1 g) =  $10.2 \text{ mW/g}$ ; SAR(10 g) =  $5.25 \text{ mW/g}$**

Maximum value of SAR (measured) =  $10.6 \text{ mW/g}$



**Fig.23 validation 1900MHz 250mW**

## 2450MHz

Date/Time: 2011-5-26 10:42:18

Electronics: DAE4 Sn771

Medium: Head 2450

Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.82 \text{ mho/m}$ ;  $\epsilon_r = 39.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $23.0^\circ\text{C}$       Liquid Temperature:  $22.5^\circ\text{C}$

Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(7.19, 7.19, 7.19)

**System Validation/Area Scan (101x101x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$   
Maximum value of SAR (interpolated) = 13.9 mW/g

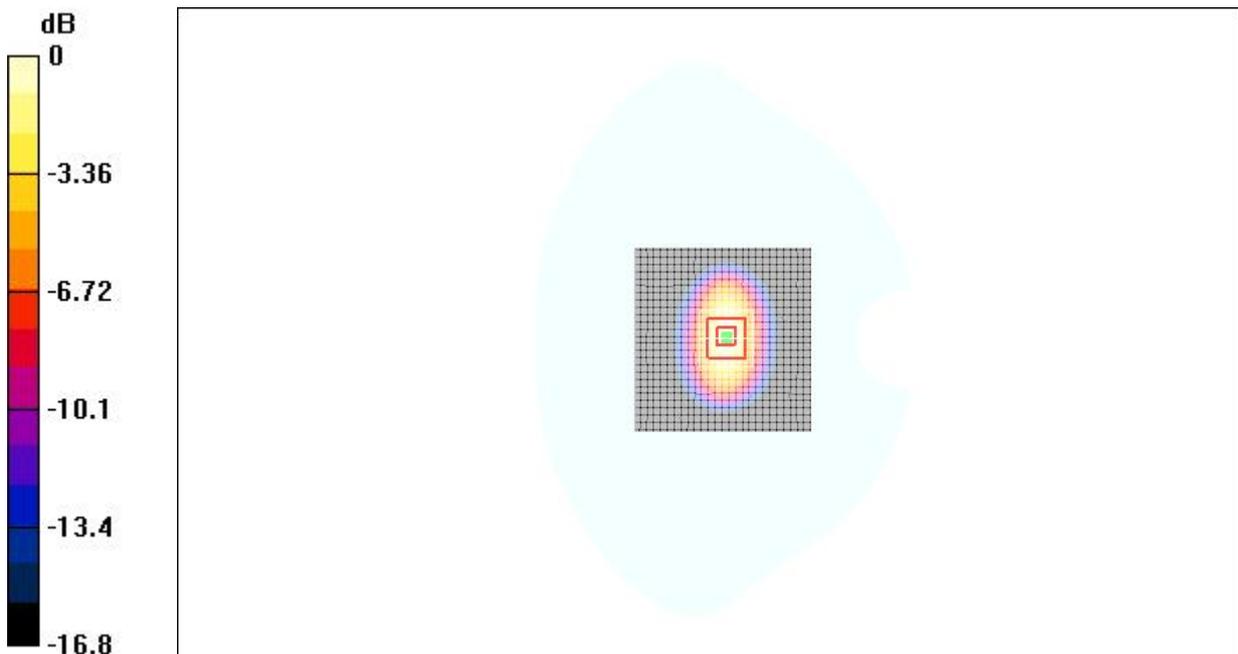
**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  
 $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 86.0 V/m; Power Drift = -0.091 dB

Peak SAR (extrapolated) = 18.4 W/kg

**SAR(1 g) = 12.8 mW/g; SAR(10 g) = 5.93 mW/g**

Maximum value of SAR (measured) = 13.7 mW/g



0 dB = 13.7mW/g

**Fig.24 validation 2450MHz 250mW**

## 2450MHz

Date/Time: 2011-5-26 07:32:46

Electronics: DAE4 Sn771

Medium: Body 2450

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.96$  mho/m;  $\epsilon_r = 52.0$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 23.0oC      Liquid Temperature: 22.5°C

Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(6.88, 6.88, 6.88)

**System Validation/Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 15.6 mW/g

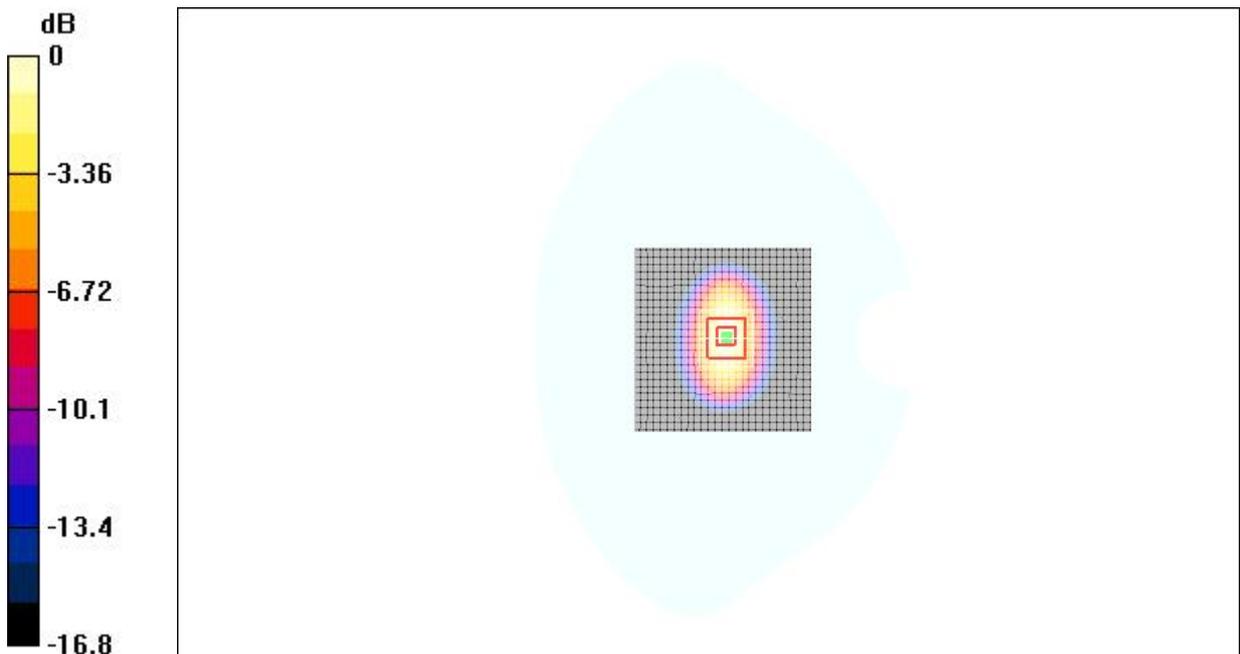
**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.3 V/m; Power Drift = 0.062 dB

Peak SAR (extrapolated) = 24.0 W/kg

**SAR(1 g) = 12.8 mW/g; SAR(10 g) = 5.84 mW/g**

Maximum value of SAR (measured) = 14.4 mW/g



0 dB = 14.4mW/g

**Fig.25 validation 2450MHz 250mW**

**Calibration certificate and Test positions are described in the additional document:**

Appendix to test report no. 2011SAR00067

Calibration certificate and Test positions