



**Accredited testing laboratory**

**CNAS Registration number: L0310**

**Report On SAR Test of  
UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth;**

**M/N: HUAWEI U6150/U6150-5**

**Test report no. : SYBH(Z-SAR)006022011-2**  
**Type identification: HUAWEI U6150/U6150-5**  
**FCC ID : QISU6150-5**  
**Test specification : IEEE 1528-2003**  
**: ANSI C95.1-1999**  
**: RSS-102 issue 4 (2010)**  
**: OET Bulletin 65 Supplement C**

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## 1 General Information

### 1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The HUAWEI does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of HUAWEI.

#### 1.1.1 Statement of Compliance

The SAR values found for the HUAWEI U6150-5/U6150-5 are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1 g tissue according to the FCC rule §2.1093, the ANSI/IEEE C 95.1:1999, the NCRP Report Number 86 for uncontrolled environment, according to the Health Canada's Safety Code 6 and the Industry Canada Radio Standards Specification RSS-102 for General Population/Uncontrolled exposure.

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 15 mm 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 2.3 of this test report. A detailed description of the equipment under test can be found in chapter 1.5.

#### Test engineer:

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2011-02-18

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## 1.2 Testing laboratory

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State of accreditation: The Test laboratory (area of testing) is accredited according to  
ISO/IEC 17025.  
CNAS Registration number: L0310

## 1.3 Applicant and Manufacturer

Name: HUAWEI TECHNOLOGIES CO., LTD  
Street: Huawei Base, Bantian, Longgang District  
Town: Shenzhen  
Country: P.R.China  
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## 1.4 Application details

Date of receipt of application:	2011-02-12
Date of receipt of test item:	2011-02-12
Start/Date of test:	2011-02-12
End of test:	2011-02-16

## 1.5 Test item

Device Information:			
DUT Name:	UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth		
Type Identification:	HUAWEI U6150/U6150-5		
FCC ID :	QISU6150-5		
IMEI No:	359893030005206		
Device Type :	portable device		
Exposure Category:	uncontrolled environment / general population		
Test device Production Information	production unit		
Device Operating Configurations:			
Operating Mode(s)	GSM850/1900,WCDMA 850/1900, (Tested) ; Bluetooth,		
Test Modulation	GSM(GMSK), WCDMA(QPSK)		
Device Class	B		
(E)GPRS Multislot Class (10)	Max Number of Timeslots in Uplink	2	
	Max Number of Timeslots in Downlink	4	
	Max Total Timeslot	5	
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM 1900	1850.2 ~1909.8	1930.2 ~1989.8
	GSM850	824.2 ~ 848.8	869.2 ~893.8
	WCDMA Band II	1852.4 ~1907.6	1932.4 ~1987.6
	WCDMA Band V	826.4 ~ 846.6	871.4 ~ 891.6
Power Class :	1, tested with power level 0 (GSM 1900)		
	4, tested with power level 5 (GSM 850)		
	3, tested with power control all up bits(WCDMA Band II)		
	3, tested with power control all up bits(WCDMA Band V)		
Test Channels (low-mid-high) :	512-661-810 (GSM 1900)		
	128-190-251(GSM 850)		
	9262-9400-9538(WCDMA Band II)		
	4132-4182-4233(WCDMA Band V)		
Hardware Version :	Ver.A		
Software Version :	U6150C79B000		
Antenna Type :	Integrated antenna		
Accessories/Body-worn Configurations:	Stereo headset		
Battery Options :	Huawei Technologies Co., Ltd. Rechargeable Li-ion Battery Model: HB511; Rated capacity: 1100mAh Nominal Voltage: $\text{---}$ +3.7V; Charging Voltage: $\text{---}$ +4.2V S/N: SCCA605H12339275		
Charger Options:	Manufacturer: SHENZHEN HUNTKEY POWER TECHNOLOGY CO., LTD AC/DC Adapter Model: HS-050040E5/ HS-050040U5; Rated Voltage: $\sim$ 120V, 60Hz ; Input Voltage: $\sim$ 100-240V 50/60Hz; Output Voltage: $\text{---}$ 5.0 V ; Rated Power: 2W.		

Table 1: Device information and operating configurations

## 1.6 EUT Description

UMTS/GPRS/GSMEDGE Mobile Phone with Bluetooth HUAWEI U6150/U6150-5 is subscriber equipment in the WCDMA/GSM system. The UMTS frequency band is Band I and Band II and Band V, but only Band II and Band V test data included in this report. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only GSM850MHz and PCS1900MHz band test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, UMTS and GSM/GPRS/EDGE protocol processing, voice, video, MMS service etc. Externally it provides micro SD card interface, earphone port(to provide voice service) and USIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to exchange data with other Bluetooth devices.

## 1.7 Test specification(s)

Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01)

IEEE 1528-2003 (April 21, 2003): Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

RSS-102: Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands (Issue 4 of March 2010)

Canada's Safety Code 6: Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz (99-EHD-237)

IEEE Std C95.3 – 1991, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.

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

941225 D01 SAR test for 3G devices v02 ,Published on Nov 13 2009

941225 D03 SAR Test Reduction GSM GPRS EDGE vo1 ,Published on Nov 13 2009

648474 D01 SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas

### 1.7.1 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
<b>Spatial Peak SAR*</b> (Brain)	<b>1.60 mW/g</b>	8.00 mW/g
<b>Spatial Average SAR**</b> (Whole Body)	0.08 mW/g	0.40 mW/g
<b>Spatial Peak SAR***</b> (Hands/Feet/Ankle/Wrist)	4.00 mW/g	20.00 mW/g

Table 2: RF exposure limits

The limit applied in this test report is shown in **bold** letters

**Notes:**

\* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

\*\* The Spatial Average value of the SAR averaged over the whole body.

\*\*\* The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

**Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

**Controlled Environments** are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

## 1.8 Operating conditions during test

### 1.8.1 General description of test procedures

The DUT is tested using a CMU200 communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power.

Test positions as described in the tables above are in accordance with the specified test standard.

Tests in body position are performed with the maximum number of timeslots in uplink.

Tests in head position are performed in voice mode with 1 timeslot unless GPRS function allows parallel voice and data traffic on 2 or more timeslots.

Conducted output power was measured using an integrated RF connector and attached RF cable.

### 1.8.2 GSM/GPRS/EGPRS Test Configurations

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a base station by air link. Using CMU200 the power lever is set to "5" and "0" in SAR of GSM 850 and GSM 1900. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 10 for this EUT, it has at most 2 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 10 for this EUT, it has at most 2 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

GSM1900	Reduction of maximum output power, (dB)		
	Number of timeslots in uplink assignment	GPRS (GMSK)	EGPRS (8PSK)
1	0	0	0
2	3	3	3

Table 3: The allowed power reduction in the multi-slot configuration of GSM1900

GSM850	Reduction of maximum output power, (dB)		
	Number of timeslots in uplink assignment	GPRS (GMSK)	EGPRS (8PSK)
1	0	0	0
2	3	3	3

Table 4: The allowed power reduction in the multi-slot configuration of GSM850

### 1.8.3 WCDMA Test Configurations

As the SAR body tests for WCDMA Band II and WCDMA Band V, we established the radio link through call processing. The maximum output power were verified on high, middle and low channels for each test band according to 3GPP TS 34.121 with the following configuration:

- 1) 12.2kbps RMC, 64,144,384 kbps RMC with TPC set to 'all 1'.
- 2) Test loop Mode 1.

For the output power, the configurations for the DPCCH and DPDCH<sub>1</sub> are as followed (EUT do not support the DPDCH<sub>2-n</sub>)

	Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	Spreading Factor	Spreading Code Number	Bits/Slot
DPCCH	15	15	256	0	10
DPDCH <sub>1</sub>	15	15	256	64	10
	30	30	128	32	20
	60	60	64	16	40
	120	120	32	8	80
	240	240	16	4	160
	480	480	8	2	320
	960	960	4	1	640
DPDCH <sub>n</sub>	960	960	4	1, 2, 3	640

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits configured to all "1s". SAR for other spreading codes and multiple DPDCH<sub>n</sub>, when supported by the EUT, are not required when the maximum average outputs of each RF channel, for each spreading code and DPDCH<sub>n</sub> configuration, are less than ¼ dB higher than those measured in 12.2 kbps RMC.

## 2 Technical test

### 2.1 Summary of test results

Band	SAR <sub>1g</sub> (W/kg)		Test Result
	Head	Body	
GSM 1900	0.574	0.797	PASS
GSM 850	0.492	<b>1.150</b>	
WCDMA Band II	<b>0.804</b>	0.624	
WCDMA Band V	0.385	0.471	

Table 5: The Maximum SAR1g Values for Head and Body position

Band		Maximum Conducted Power (dBm)	Maximum Average Power (dBm)
GSM 1900	GSM	30.23	21.23
	GPRS,2TS	28.35	22.35
	EGPRS (GMSK), 2TS	28.41	22.41
	EGPRS (8PSK), 2TS	25.38	19.38
GSM850	GSM	33.32	24.32
	GPRS,2TS	31.33	25.33
	EGPRS (GMSK) ,2TS	31.35	25.35
	EGPRS (8PSK) ,2TS	26.33	20.33
WCDMA1900	RMC (QPSK)	23.33	/
WCDMA850	RMC (QPSK)	23.36	/

Table 6: The Maximum Conducted Power and Average Power

### 2.2 Test environment

General Environment conditions in the test area are as follows:

Ambient temperature: 20°C – 24°C  
Tissue simulating liquid: 20°C – 24°C  
Humidity: 30% – 70%

Exact temperature values for each test are shown in the table(s) under 2.5. and/or on the measurement plots.

### 2.3 Measurement and test set-up

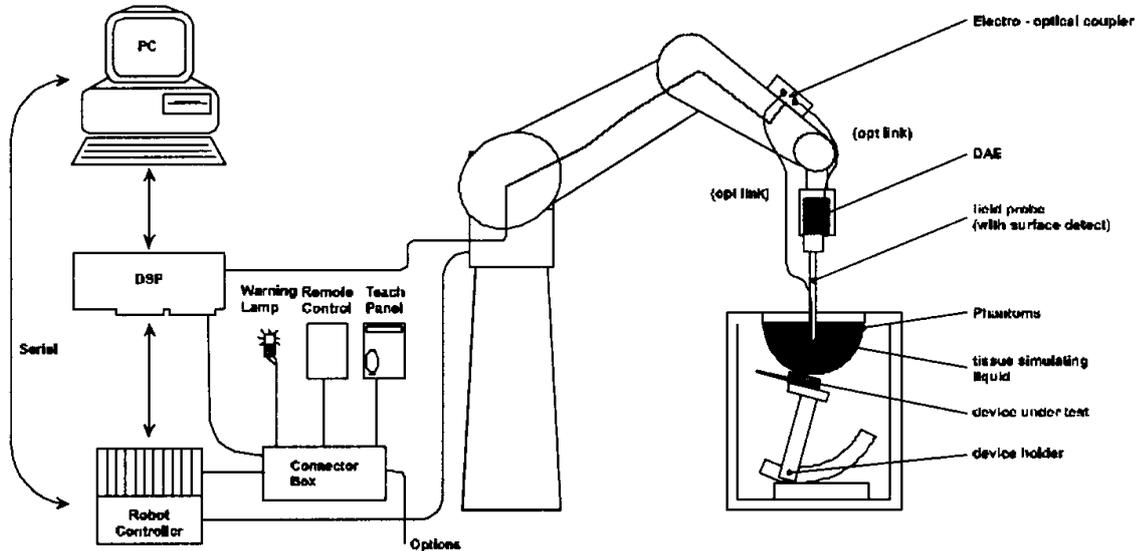
The measurement system is described in chapter 2.4.

The test setup for the system validation can be found in chapter 2.4.14.

A description of positioning and test signal control can be found in chapter 2.5 together with the test results.

## 2.4 Measurement system

### 2.4.1 System Description



The DASYS5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASYS5 measurement server.
- The DASYS5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows XP.
- DASYS5 software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.

### 2.4.2 Test environment

The DASY5 measurement system is placed at the head end of a room with dimensions: 4.5 x 4 x 3 m<sup>3</sup>, the SAM phantom is placed in a distance of 1.3 m from the side walls and 1.1m from the rear wall.

Picture 1 of the photo documentation shows a complete view of the test environment.

The system allows the measurement of SAR values larger than 0.005 mW/g.

### 2.4.3 Probe description

Isotropic E-Field Probe EX3DV4 for Dosimetric Measurements

<b>Technical data according to manufacturer information</b>	
Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycoether)
Calibration	In air from 10 MHz to 2.5 GHz In head tissue simulating liquid (HSL) at 900 (800-1000) MHz and 1.8 GHz (1700-1910 MHz) (accuracy $\pm 11\%$ ; k=2) Calibration for other liquids and frequencies upon request
Frequency	10 MHz to 3 GHz (dosimetry); Linearity: $\pm 0.2$ dB (30 MHz to 3 GHz)
Directivity	$\pm 0.2$ dB in HSL (rotation around probe axis) $\pm 0.4$ dB in HSL (rotation normal to probe axis)
Dynamic range	5 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.2$ dB
Optical Surface Detection	$\pm 0.2$ mm repeatability in air and clear liquids over diffuse reflecting surfaces (EX3DV4 only)
Dimensions	Overall length: 337 mm Tip length: 9 mm Body diameter: 10 mm Tip diameter: 2.5 mm Distance from probe tip to dipole centers: 1.0 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (EX3DV4)

Isotropic E-Field Probe ES3DV3 for Dosimetric Measurements

<b>Technical data according to manufacturer information</b>	
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: $\pm 0.2$ dB (30 MHz to 4 GHz)
Directivity	$\pm 0.2$ dB in HSL (rotation around probe axis) $\pm 0.3$ dB in tissue material (rotation normal to probe axis)
Dynamic range	5 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.2$ 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

#### 2.4.4 Phantom description

The used SAM Phantom meets the requirements specified in Edition 01-01 of Supplement C to OET Bulletin 65 for Specific Absorption Rate (SAR) measurements.

The phantom consists of a fibreglass shell integrated in a wooden table. It allows left-hand and right-hand head as well as body-worn measurements with a maximum liquid depth of 18 cm in head position and 22 cm in planar position (body measurements). The thickness of the Phantom shell is 2 mm +/- 0.1 mm.



ear reference point right hand side

ear reference point left hand side

reference point flat position

#### 2.4.5 Device holder description

The DASY5 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used.



Larger DUT's (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values.

Therefore those devices are normally only tested at the flat part of the SAM.

## 2.4.6 Scanning procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- The „reference“ and „drift“ measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT's output power and should vary max. +/- 5 %.
- The „surface check“ measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above  $\pm 0.1\text{mm}$ ). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within  $\pm 30^\circ$ .)
- The „area scan“ measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid spacing for head measurements is 15 mm in x- and y- dimension. If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation. Results of this coarse scan are shown in annex 2.
- A „7x7x7 zoom scan“ measures the field in a volume around the 2D peak SAR value acquired in the previous „coarse“ scan. This is a fine 7x7 grid where the robot additionally moves the probe in 7 steps along the z-axis away from the bottom of the Phantom. Grid spacing for the cube measurement is 5 mm in x and y-direction and 5 mm in z-direction. DASY5 is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in annex 2. Test results relevant for the specified standard (see chapter 1.6.) are shown in table form in chapter 2.5.
- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2mm steps. This measurement shows the continuity of the liquid and can - depending in the field strength – also show the liquid depth. A z-axis scan of the measurement with maximum SAR value is shown in annex 2.

## 2.4.7 Spatial Peak SAR Evaluation

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of 7 x 7 x 7 points. The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting 'Graph Evaluated'.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

### Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

### Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff ].

### Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

### Advanced Extrapolation

DASY5 uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.



## 2.4.8 Data Storage and Evaluation

### Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

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

### Data Evaluation by SEMCAD

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

Probe parameters:	- Sensitivity	$Norm_i, a_{i0}, a_{i1}, a_{i2}$
	- Conversion factor	$ConvF_i$
	- Diode compression point	$Dcpi$
Device parameters:	- Frequency	$f$
	- Crest factor	$cf$
Media parameters:	- Conductivity	$\sigma$
	- Density	$\rho$

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

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

with  $V_i$  = compensated signal of channel i (i = x, y, z)  
 $U_i$  = input signal of channel i (i = x, y, z)  
 cf = crest factor of exciting field (DASY parameter)  
 $dcp_i$  = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes: 
$$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

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

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

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

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

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

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

with SAR = local specific absorption rate in mW/g  
 $E_{tot}$  = total field strength in V/m  
 $\sigma$  = conductivity in [mho/m] or [Siemens/m]  
 $\rho$  = equivalent tissue density in g/cm<sup>3</sup>

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

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

with  $P_{pwe}$  = equivalent power density of a plane wave in mW/cm<sup>2</sup>  
 $E_{tot}$  = total electric field strength in V/m  
 $H_{tot}$  = total magnetic field strength in A/m

### 2.4.9 Test equipment utilized

This table gives a complete overview of the SAR measurement equipment

Devices used during the test described in chapter 2.5 are marked

	Manufacturer	Device	Type	Serial number	Date of last calibration )*
<input checked="" type="checkbox"/>	Schmid & Partner Engineering AG	Dosimetric E-Field Probe	ES3DV3	3168	2010-12-23
<input type="checkbox"/>	Schmid & Partner Engineering AG	Dosimetric E-Field Probe	EX3DV4	3736	2010-11-16
<input checked="" type="checkbox"/>	Schmid & Partner Engineering AG	835 MHz System Validation Dipole	D835V2	4d095	2009-05-25
<input type="checkbox"/>	Schmid & Partner Engineering AG	900 MHz System Validation Dipole	D900V2	1d063	2009-05-26
<input type="checkbox"/>	Schmid & Partner Engineering AG	1800 MHz System Validation Dipole	D1800V2	2d157	2009-05-27
<input checked="" type="checkbox"/>	Schmid & Partner Engineering AG	1900 MHz System Validation Dipole	D1900V2	5d091	2009-05-28
<input type="checkbox"/>	Schmid & Partner Engineering AG	2000 MHz System Validation Dipole	D2000V2	1036	2009-05-29
<input type="checkbox"/>	Schmid & Partner Engineering AG	Data acquisition electronics	DAE4	851	2010-06-30
<input checked="" type="checkbox"/>	Schmid & Partner Engineering AG	Data acquisition electronics	DAE4	852	2010-12-24
<input checked="" type="checkbox"/>	Schmid & Partner Engineering AG	Software	DASY 5	N/A	N/A
<input checked="" type="checkbox"/>	Schmid & Partner Engineering AG	Twin Phantom	SAM1	TP-1475	N/A
<input checked="" type="checkbox"/>	Schmid & Partner Engineering AG	Twin Phantom	SAM2	TP-1474	N/A
<input checked="" type="checkbox"/>	Rohde & Schwarz	Universal Radio Communication Tester	CMU 200	111379	2010-08-11
<input checked="" type="checkbox"/>	Agilent)*	Network Analyser 300 kHz to 8.5 GHz	E5071B	MY42404956	2010-03-08
<input checked="" type="checkbox"/>	Agilent	Dielectric Probe Kit	85070E	2484	N/A
<input checked="" type="checkbox"/>	Agilent	Signal Generator	N5181A	MY47420989	2010-03-08
<input checked="" type="checkbox"/>	MINI-CIRCUITS	Amplifier	ZHL-42W	QA0746001	N/A
<input checked="" type="checkbox"/>	Agilent	Power Meter	E4417A	MY45101339	2010-05-19
<input checked="" type="checkbox"/>	Agilent	Power Meter Sensor	E9321A	MY44420359	2010-05-19

Note: The calibration interval of validation dipoles is 3 years.

)\*: Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

### 2.4.10 Tissue simulating liquids: dielectric properties

The following materials are used for producing the tissue-equivalent materials.

(liquids used for tests described in chapter 2.5. are marked with ☒) :

Ingredients (% of weight)	Frequency (MHz)					
	<input type="checkbox"/> 450	<input checked="" type="checkbox"/> 835	<input type="checkbox"/> 900	<input type="checkbox"/> 1800	<input checked="" type="checkbox"/> 1900	<input type="checkbox"/> 2450
frequency band	<input type="checkbox"/> 450	<input checked="" type="checkbox"/> 835	<input type="checkbox"/> 900	<input type="checkbox"/> 1800	<input checked="" type="checkbox"/> 1900	<input type="checkbox"/> 2450
Tissue Type	Head	Head	Head	Head	Head	Head
Water	38.56	41.45	40.92	52.64	54.9	62.7
Salt (NaCl)	3.95	1.45	1.48	0.36	0.18	0.5
Sugar	56.32	56.0	56.5	0.0	0.0	0.0
HEC	0.98	1.0	1.0	0.0	0.0	0.0
Bactericide	0.19	0.1	0.1	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	36.8
DGBE	0.0	0.0	0.0	47.0	44.92	0.0

Table 7: Head tissue dielectric properties

Ingredients (% of weight)	Frequency (MHz)					
	<input type="checkbox"/> 450	<input checked="" type="checkbox"/> 835	<input type="checkbox"/> 900	<input type="checkbox"/> 1800	<input checked="" type="checkbox"/> 1900	<input type="checkbox"/> 2450
frequency band	<input type="checkbox"/> 450	<input checked="" type="checkbox"/> 835	<input type="checkbox"/> 900	<input type="checkbox"/> 1800	<input checked="" type="checkbox"/> 1900	<input type="checkbox"/> 2450
Tissue Type	Body	Body	Body	Body	Body	Body
Water	51.16	52.4	56.0	69.91	69.91	73.2
Salt (NaCl)	1.49	1.40	0.76	0.13	0.13	0.04
Sugar	46.78	45.0	41.76	0.0	0.0	0.0
HEC	0.52	1.0	1.21	0.0	0.0	0.0
Bactericide	0.05	0.1	0.27	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	0.0	29.96	29.96	26.7

Table 8: Body tissue dielectric properties

Salt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16M $\Omega$ + resistivity

HEC: Hydroxyethyl Cellulose

DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

Note : Due to their availability body tissue simulating liquids as defined by FCC OET Bulletin 65 Supplement C are generally used for body worn SAR testing according to European standards.

### 2.4.11 Tissue simulating liquids: parameters

Used Target Frequency [MHz]	Target Head Tissue		Measured Head Tissue		Measured Date
	Permittivity (+/-5%)	Conductivity [S/m] (+/-5%)	Permittivity	Conductivity [S/m]	
1900	40.0	1.40	41.1	1.43	2011-02-12
835	41.5	0.90	42.8	0.88	2011-02-16

Table 9: Parameter of the head tissue simulating liquid

Used Target Frequency [MHz]	Target Body Tissue		Measured Body Tissue		Measured Date
	Permittivity (+/-5%)	Conductivity [S/m] (+/-5%)	Permittivity	Conductivity [S/m]	
1900	53.3	1.52	53.8	1.55	2011-02-15
835	55.2	0.97	54.5	0.97	2011-02-14

Table 10:Parameter of the body tissue simulating liquid

Note: The dielectric properties have been measured using the contact probe method at 22°C.

### 2.4.12 Measurement uncertainty evaluation for SAR test

The overall combined measurement uncertainty of the measurement system is  $\pm 10.7\%$  ( $K=1$ ).

The expanded uncertainty ( $k=2$ ) is assessed to be  $\pm 21.4\%$

This measurement uncertainty budget is suggested by IEEE P1528 and determined by Schmid & Partner Engineering AG. The breakdown of the individual uncertainties is as follows:

Error Sources	Uncertainty Value	Probability Distribution	Divisor	$c_i$ 1g	$c_i$ 10g	Standard Uncertainty 1g	Standard Uncertainty 10g	$v_i^2$ or $v_{eff}$
<b>Measurement System</b>								
Probe calibration	$\pm 5.9\%$	Normal	1	1	1	$\pm 5.9\%$	$\pm 5.9\%$	$\infty$
Axial isotropy	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 1.9\%$	$\pm 1.9\%$	$\infty$
Hemispherical isotropy	$\pm 9.6\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 3.9\%$	$\pm 3.9\%$	$\infty$
Spatial resolution	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	$\infty$
Boundary effects	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	$\infty$
Probe linearity	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	$\infty$
System detection limits	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	$\infty$
Readout electronics	$\pm 0.3\%$	Normal	1	1	1	$\pm 0.3\%$	$\pm 0.3\%$	$\infty$
Response time	$\pm 0.8\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.5\%$	$\pm 0.5\%$	$\infty$
Integration time	$\pm 2.6\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.5\%$	$\pm 1.5\%$	$\infty$
RF ambient conditions	$\pm 3.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	$\infty$
Probe positioner	$\pm 0.4\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.2\%$	$\pm 0.2\%$	$\infty$
Probe positioning	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	$\infty$
Max. SAR evaluation	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	$\infty$
<b>Test Sample Related</b>								
Device positioning	$\pm 2.9\%$	Normal	1	1	1	$\pm 2.9\%$	$\pm 2.9\%$	145
Device holder uncertainty	$\pm 3.6\%$	Normal	1	1	1	$\pm 3.6\%$	$\pm 3.6\%$	5
Power drift	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.9\%$	$\pm 2.9\%$	$\infty$
<b>Phantom and Set-up</b>								
Phantom uncertainty	$\pm 4.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.3\%$	$\pm 2.3\%$	$\infty$
Liquid conductivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.64	0.43	$\pm 1.8\%$	$\pm 1.2\%$	$\infty$
Liquid conductivity (meas.)	$\pm 2.5\%$	Normal	1	0.64	0.43	$\pm 1.6\%$	$\pm 1.1\%$	$\infty$
Liquid permittivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.6	0.49	$\pm 1.7\%$	$\pm 1.4\%$	$\infty$
Liquid permittivity (meas.)	$\pm 2.5\%$	Normal	1	0.6	0.49	$\pm 1.5\%$	$\pm 1.2\%$	$\infty$
<b>Combined Uncertainty</b>						$\pm 10.9\%$	$\pm 10.7\%$	387
<b>Expanded Std. Uncertainty</b>						$\pm 21.9\%$	$\pm 21.4\%$	

Table 11: Measurement uncertainties

**2.4.13 Measurement uncertainty evaluation for system validation**

The overall combined measurement uncertainty of the measurement system is  $\pm 9.2\%$  (K=1).  
 The expanded uncertainty (k=2) is assessed to be  $\pm 18.4\%$   
 This measurement uncertainty budget is suggested by IEEE P1528 and determined by Schmid & Partner Engineering AG. The breakdown of the individual uncertainties is as follows:

Error Sources	Uncertainty Value	Probability Distribution	Divisor	$c_i$ 1g	$c_i$ 10g	Standard Uncertainty 1g	Standard Uncertainty 10g	$v_i^2$ or $v_{eff}$
<b>Measurement System</b>								
Probe calibration	$\pm 5.9\%$	Normal	1	1	1	$\pm 5.9\%$	$\pm 5.9\%$	$\infty$
Axial isotropy	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	$\infty$
Hemispherical isotropy	$\pm 9.6\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 0.0\%$	$\pm 0.0\%$	$\infty$
Boundary effects	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	$\infty$
Probe linearity	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	$\infty$
System detection limits	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	$\infty$
Readout electronics	$\pm 0.3\%$	Normal	1	1	1	$\pm 0.3\%$	$\pm 0.3\%$	$\infty$
Response time	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	$\infty$
Integration time	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	$\infty$
RF ambient conditions	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	$\infty$
Probe positioner	$\pm 0.4\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.2\%$	$\pm 0.2\%$	$\infty$
Probe positioning	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	$\infty$
Max. SAR evaluation	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	$\infty$
<b>Dipole</b>								
Deviation of experimental dipole	$\pm 5.5\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 3.2\%$	$\pm 3.2\%$	$\infty$
Dipole axis to liquid distance	$\pm 2.0\%$	Rectangular	1	1	1	$\pm 1.2\%$	$\pm 1.2\%$	$\infty$
Power drift	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	$\infty$
<b>Phantom and Set-up</b>								
Phantom uncertainty	$\pm 4.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.3\%$	$\pm 2.3\%$	$\infty$
Liquid conductivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.64	0.43	$\pm 1.8\%$	$\pm 1.2\%$	$\infty$
Liquid conductivity (meas.)	$\pm 2.5\%$	Normal	1	0.64	0.43	$\pm 1.6\%$	$\pm 1.1\%$	$\infty$
Liquid permittivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.6	0.49	$\pm 1.7\%$	$\pm 1.4\%$	$\infty$
Liquid permittivity (meas.)	$\pm 2.5\%$	Normal	1	0.6	0.49	$\pm 1.5\%$	$\pm 1.2\%$	$\infty$
<b>Combined Uncertainty</b>						<b><math>\pm 9.5\%</math></b>	<b><math>\pm 9.2\%</math></b>	
<b>Expanded Std. Uncertainty</b>						<b><math>\pm 18.9\%</math></b>	<b><math>\pm 18.4\%</math></b>	

Table 12: Measurement uncertainties

#### 2.4.14 System check

The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system validation is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows validation results for all frequency bands and tissue liquids used during the tests of the test item described in chapter 1.5. (graphic plot(s) see annex 1).

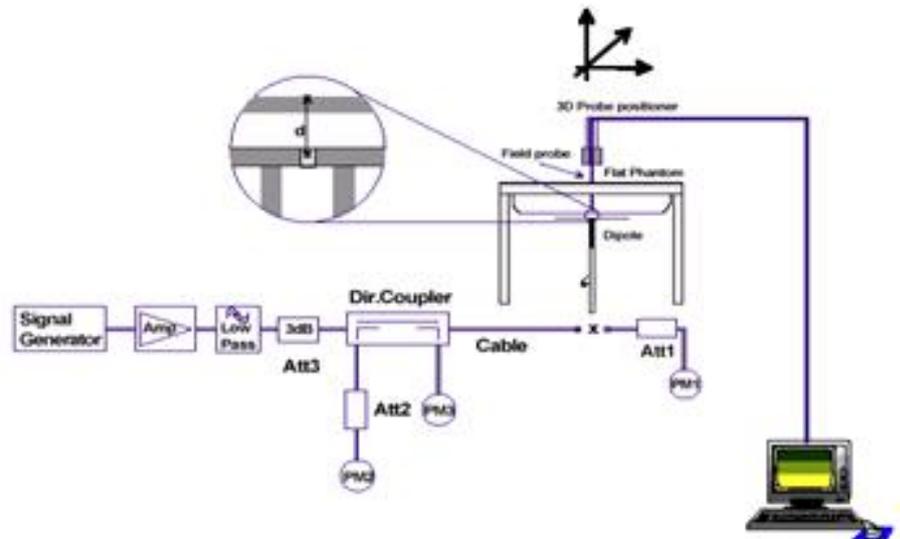
Validation Kit	Frequency	Target SAR <sub>1g</sub> (250 mW) (+/- 10%)	Target SAR <sub>10g</sub> (250 mW) (+/- 10%)	Measured SAR <sub>1g</sub>	Measured SAR <sub>10g</sub>	Measured date
D1900V2 S/N: 5d091	1900 MHz Head	9.60mW/g	5.10mW/g	10.3mW/g	5.29mW/g	2011-02-12
D1900V2 S/N: 5d091	1900 MHz Body	10.1mW/g	5.27mW/g	10.5mW/g	5.45mW/g	2011-02-15
D835V2 S/N: 4d095	835 MHz Head	2.29mW/g	1.50mW/g	2.48mW/g	1.63mW/g	2011-02-16
D835V2 S/N: 4d095	835 MHz Body	2.49mW/g	1.62mW/g	2.60mW/g	1.71mW/g	2011-02-14

Table 13:Results system Check

### 2.4.15 Validation procedure

The validation is performed by using a validation dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 250 mW. To adjust this power a power meter is used. The power sensor is connected to the cable before the validation to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the validation to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).

Validation results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.



## 2.5 Test Results

### 2.5.1 Conducted power measurements

For the measurements a Rohde & Schwarz Radio Communication Tester CMU 200 was used. The output power was measured using an integrated RF connector and attached RF cable. The conducted output power was also checked before and after each SAR measurement. The resulting power values were within a 0.2 dB tolerance of the values shown below.

Note: CMU200 measures GSM peak and average output power for active timeslots.  
For SAR the timebased average power is relevant. The difference in between depends on the duty cycle of the TDMA signal :

No. of timeslots	1	2	3	4
Duty Cycle	1 : 8	1: 4	1 : 2.66	1 : 2
timebased avg. power compared to slotted avg. power	- 9 dB	- 6 dB	- 4.25 dB	- 3 dB

The signalling modes differ as follows:

mode	coding scheme	modulation
GPRS	CS1 to CS4	GMSK
EDGE	MCS1 to MCS4	GMSK
EDGE	MCS5 to MCS9	8PSK

Apart from modulation change (GMSK/8PSK) coding schemes differ in code rate without influence on the RF signal. Therefore one coding scheme per mode was selected for conducted power measurements.

## 2.5.2 Conducted power results

### GSM 1900 MHz

GSM1900		Conducted power (dBm)			Averaged power(dBm)		
		Channel 512	Channel 661	Channel 810	Channel 512	Channel 661	Channel 810
Before test		30.25	30.17	30.31	21.25	21.17	21.31
After test		30.33	30.29	30.21	<b>21.33</b>	<b>21.29</b>	<b>21.21</b>
GSM1900 GPRS (GMSK)		Conducted power (dBm)			Averaged power(dBm)		
		Channel 512	Channel 661	Channel 810	Channel 512	Channel 661	Channel 810
1TX slot	Before test	30.15	30.09	30.11	21.15	21.09	21.11
	After test	30.18	30.06	30.04	21.18	21.06	21.04
2 TX slots	Before test	28.23	28.27	28.19	22.23	22.27	22.19
	After test	28.35	28.12	28.22	<b>22.35</b>	<b>22.12</b>	<b>22.22</b>
GSM1900 EGPRS (GMSK)		Conducted power (dBm)			Averaged power(dBm)		
		Channel 512	Channel 661	Channel 810	Channel 512	Channel 661	Channel 810
1TX slot	Before test	30.39	30.13	30.22	21.39	21.13	21.22
	After test	30.24	30.36	30.17	21.24	21.36	21.17
2 TX slots	Before test	28.41	28.37	28.14	<b>22.41</b>	<b>22.37</b>	<b>22.14</b>
	After test	28.28	28.14	28.27	22.28	22.14	22.27
GSM1900 EGPRS (8PSK)		Conducted power (dBm)			Averaged power(dBm)		
		Channel 512	Channel 661	Channel 810	Channel 512	Channel 661	Channel 810
1TX slot	Before test	26.34	26.21	26.16	17.34	17.21	17.16
	After test	26.33	26.28	26.09	17.33	17.28	17.09
2 TX slots	Before test	25.38	25.18	25.07	<b>19.38</b>	<b>19.18</b>	<b>19.07</b>
	After test	25.24	25.33	25.19	19.24	19.33	19.19

Table 14: Test results conducted power measurement GSM1900MHz

**GSM 850 MHz**

GSM850		Conducted power (dBm)			Averaged power(dBm)		
		Channel 128	Channel 190	Channel 251	Channel 128	Channel 190	Channel 251
Before test		33.32	33.19	33.26	<b>24.32</b>	<b>24.19</b>	<b>24.26</b>
After test		33.17	33.22	33.09	24.17	24.22	24.09
GSM850 GPRS (GMSK)		Conducted power (dBm)			Averaged power(dBm)		
		Channel 128	Channel 190	Channel 251	Channel 128	Channel 190	Channel 251
1TX slot	Before test	33.16	33.24	33.31	24.16	24.24	24.31
	After test	33.28	33.12	33.29	24.28	24.12	24.29
2 TX slots	Before test	31.15	31.33	31.27	<b>25.15</b>	<b>25.33</b>	<b>25.27</b>
	After test	31.21	31.18	31.03	25.21	25.18	25.03
GSM850 EGPRS (GMSK)		Conducted power (dBm)			Averaged power(dBm)		
		Channel 128	Channel 190	Channel 251	Channel 128	Channel 190	Channel 251
1TX slot	Before test	33.17	33.05	33.24	24.17	24.05	24.24
	After test	33.26	33.18	33.09	24.26	24.18	24.09
2 TX slots	Before test	31.35	31.29	31.13	<b>25.35</b>	<b>25.29</b>	<b>25.13</b>
	After test	31.34	31.27	31.12	25.34	25.27	25.12
GSM850 EGPRS (8PSK)		Conducted power (dBm)			Averaged power(dBm)		
		Channel 128	Channel 190	Channel 251	Channel 128	Channel 190	Channel 251
1TX slot	Before test	27.25	27.14	27.32	18.25	18.14	18.32
	After test	27.11	27.34	27.23	18.11	18.34	18.23
2 TX slots	Before test	26.29	26.33	26.16	<b>20.29</b>	<b>20.33</b>	<b>20.16</b>
	After test	26.26	26.18	26.07	20.26	20.18	20.07

Table 15: Test results conducted power measurement GSM850MHz

**WCDMA Band II**

WCDMA Band II		Conducted Power (dBm)		
		Channel 9262	Channel 9400	Channel 9538
12.2kbps RMC	Before test	23.21	23.17	23.09
	After test	23.14	23.11	23.26
64kbps RMC	Before test	23.12	23.08	23.23
	After test	23.31	23.25	23.13
144kbps RMC	Before test	23.07	23.16	23.22
	After test	<b>23.23</b>	<b>23.19</b>	<b>23.33</b>
384kbps RMC	Before test	23.15	23.22	23.05
	After test	23.15	23.24	23.18

Table 16: Conducted power measurement result (WCDMA 1900)

**WCDMA Band V**

WCDMA Band V		Conducted Power (dBm)		
		Channel 4132	Channel 4182	Channel 4233
12.2kbps RMC	Before test	<b>23.22</b>	<b>23.13</b>	<b>23.36</b>
	After test	23.35	23.28	23.21
64kbps RMC	Before test	23.18	23.19	23.26
	After test	23.24	23.07	23.12
144kbps RMC	Before test	23.09	23.15	23.24
	After test	23.12	23.33	23.19
384kbps RMC	Before test	23.26	23.17	23.09
	After test	23.11	23.08	23.16

Table 17: Conducted power measurement result (WCDMA 850)

Note: 1) The maximum average power numbers are marks in bold.

2) To verify if the output changes within the tolerance before and after each SAR test, please see the power drift of each test in chapter 2.5.3.

3) For SAR testing, the EUT was set to multislot class based on the maximum averaged conducted power.

### 2.5.3 Test results (Head and Body SAR)

#### GSM 1900 (GSM/GPRS/EGPRS)

The table contains the measured SAR values averaged over a mass of 1 g						
Channel / frequency	Position	Left hand position	Right hand position	Power Drift (dB)	Limit	Liquid temperature
U6150-5,GSM						
661 /1880.0 MHz	cheek	0.475 W/kg	<b>0.574</b> W/kg	-0.001/0.166	1.6 W/kg	21.6/21.6 °C
661 / 1880.0 MHz	tilted15°	0.244 W/kg	0.214 W/kg	0.073/0.047	1.6 W/kg	21.6/21.6 °C
810 / 1909.8 MHz	cheek	--- W/kg	0.456 W/kg	---/-0.045	1.6 W/kg	---/21.6 °C
512 / 1850.2 MHz	cheek	--- W/kg	0.491 W/kg	---/-0.084	1.6 W/kg	---/21.6 °C

Table 18:Test results (Head SAR GSM1900MHz)

The table contains the measured SAR values averaged over a mass of 1 g					
Channel / frequency	Position	Body worn	Power Drift (dB)	Limit	Liquid temperature
U6150-5,GPRS					
661 / 1880.0 MHz	front 1TS	0.340 W/kg	-0.093	1.6 W/kg	21.8 °C
661 / 1880.0 MHz	rear 1TS	0.428 W/kg	-0.159	1.6 W/kg	21.8 °C
661 / 1880.0 MHz	rear 2TS	<b>0.797</b> W/kg	-0.115	1.6 W/kg	21.8 °C
810 / 1909.8 MHz	rear 2TS	0.754 W/kg	0.002	1.6 W/kg	21.8 °C
512 / 1850.2 MHz	rear 2TS	0.710 W/kg	-0.085	1.6 W/kg	21.8 °C
U6150-5,EGPRS					
661 / 1880.0 MHz	rear 1TS	0.400 W/kg	0.129	1.6 W/kg	21.8 °C
661 / 1880.0 MHz	rear 2TS	0.771 W/kg	0.129	1.6 W/kg	21.8 °C
810 / 1909.8 MHz	rear 2TS	0.724 W/kg	0.129	1.6 W/kg	21.8 °C
512 / 1850.2 MHz	rear 2TS	0.700 W/kg	0.129	1.6 W/kg	21.8 °C
U6150-5, Speech Mode with Headset					
661 / 1880.0 MHz	rear	0.399 W/kg	0.129	1.6 W/kg	21.8 °C
U6150-5, Speech Mode with Bluetooth Headset					
661 / 1880.0 MHz	rear	0.432 W/kg	0.020	1.6 W/kg	21.8 °C

Table 19:Test results (Body SAR GSM1900MHz)

- Note: 1) The value with bold colour is the maximum SAR value of each test band.  
 2) Upper and lower frequencies were measured at the worst position.  
 3) The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit (< 0.8 W/kg), testing at the high and low channels is optional.  
 4) Tests in body position were performed with 15 mm air gap between DUT and SAM to simulate the use of a non-metallic belt-clip or holster.  
 5) The addition body test was performed at worst case.

**GSM 850 (GSM/GPRS/EGPRS)**

The table contains the measured SAR values averaged over a mass of 1 g						
Channel / frequency	Position	Left hand position	Right hand position	Power Drift (dB)	Limit	Liquid temperature
U6150-5,GSM						
190 / 836.6 MHz	cheek	<b>0.492</b> W/kg	0.431 W/kg	0.018/-0.108	1.6 W/kg	21.6/21.6 °C
190 / 836.6 MHz	tilted15°	0.311 W/kg	0.314 W/kg	0.014/0.094	1.6 W/kg	21.6/21.6 °C
251 / 848.8MHz	cheek	0.446 W/kg	--- W/kg	-0.025/---	1.6 W/kg	21.6/21.6 °C
128 / 824.2MHz	cheek	0.450 W/kg	--- W/kg	-0.094/---	1.6 W/kg	21.6/21.6 °C

Table 20:Test results (Head SAR GSM850MHz)

The table contains the measured SAR values averaged over a mass of 1 g					
Channel / frequency	Position	Body worn	Power Drift (dB)	Limit	Liquid temperature
U6150-5,GPRS					
190 / 836.6 MHz	front 1TS	0.439 W/kg	-0.015	1.6 W/kg	21.6 °C
190 / 836.6 MHz	rear 1TS	0.568 W/kg	0.042	1.6 W/kg	21.6 °C
190 / 836.6 MHz	rear 2TS	1.080 W/kg	-0.137	1.6 W/kg	21.6 °C
251 / 848.8MHz	rear 2TS	0.957 W/kg	0.114	1.6 W/kg	21.6 °C
128 / 824.2MHz	rear 2TS	1.110 W/kg	-0.105	1.6 W/kg	21.6 °C
U6150-5,EGPRS					
190 / 836.6 MHz	rear 1TS	0.557 W/kg	-0.049	1.6 W/kg	21.6 °C
190 / 836.6 MHz	rear 2TS	1.060 W/kg	-0.022	1.6 W/kg	21.6 °C
251 / 848.8MHz	rear 2TS	0.993 W/kg	-0.033	1.6 W/kg	21.6 °C
128 / 824.2MHz	rear 2TS	<b>1.150</b> W/kg	-0.171	1.6 W/kg	21.6 °C
U6150-5, Speech Mode with Headset					
128 / 824.2MHz	rear	0.336 W/kg	0.043	1.6 W/kg	21.6 °C
U6150-5, Speech Mode with Bluetooth Headset					
128 / 824.2MHz	rear	0.662 W/kg	-0.077	1.6 W/kg	21.6 °C

Table 21:Test results (Body SAR GSM850MHz)

- Note: 1) The value with bold colour is the maximum SAR value of each test band.  
 2) Upper and lower frequencies were measured at the worst position.  
 3) The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit ( $< 0.8$  W/kg), testing at the high and low channels is optional.  
 4) Tests in body position were performed with 15 mm air gap between DUT and SAM to simulate the use of a non-metallic belt-clip or holster.  
 5) The addition body test was performed at worst case.

**WCDMA 1900**

The table contains the measured SAR values averaged over a mass of 1 g						
Channel / frequency	Position	Left hand position	Right hand position	Power Drift (dB)	Limit	Liquid temperature
U6150-5 with RMC						
9400 /1880 MHz	cheek	0.605 W/kg	0.710 W/kg	-0.069/-0.065	1.6 W/kg	21.7/21.7 °C
9400 /1880 MHz	tilted15°	0.279 W/kg	0.290 W/kg	-0.039/0.031	1.6 W/kg	21.7/21.7 °C
9538 /1907.6 MHz	cheek	--- W/kg	0.700 W/kg	---/0.156	1.6 W/kg	---/21.7 °C
9262 /1852.4 MHz	cheek	--- W/kg	<b>0.804</b> W/kg	---/-0.038	1.6 W/kg	---/21.7 °C

Table 22:Test results (Head SAR WCDMA 1900MHz)

The table contains the measured SAR values averaged over a mass of 1g					
Channel / frequency	Position	Body worn	Power Drift (dB)	Limit	Liquid temperature
U6150-5, with RMC					
9400 /1880 MHz	front	0.454 W/kg	-0.033	1.6 W/kg	21.6 °C
9400 /1880 MHz	rear	0.562 W/kg	0.106	1.6 W/kg	21.6 °C
9538 /1907.6 MHz	rear	0.573 W/kg	0.049	1.6 W/kg	21.6 °C
9262 /1852.4 MHz	rear	0.585 W/kg	-0.172	1.6 W/kg	21.6 °C
U6150-5,Speech Mode with Headset					
9262 /1852.4 MHz	rear	0.531 W/kg	0.055	1.6 W/kg	21.6 °C
U6150-5, Speech Mode with Bluetooth Headset					
9262 /1852.4 MHz	rear	<b>0.624</b> W/kg	0.174	1.6 W/kg	21.6 °C

Table 23:Test results (Body SAR WCDMA1900MHz)

Note: 1) The value with bold colour is the maximum SAR value of each test band.

2) Upper and lower frequencies were measured at the worst position.

3) The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit (< 0.8 W/kg), testing at the high and low channels is optional.

4) Tests in body position were performed with 15 mm air gap between DUT and SAM to simulate the use of a non-metallic belt-clip or holster.

5) The addition body test was performed at worst case.

**WCDMA 850**

The table contains the measured SAR values averaged over a mass of 1 g						
Channel / frequency	Position	Left hand position	Right hand position	Power Drift (dB)	Limit	Liquid temperature
U6150-5 with RMC						
4182 / 836.4 MHz	cheek	0.264 W/kg	0.241 W/kg	-0.14/0.109	1.6 W/kg	21.6/21.6 °C
4182 / 836.4 MHz	tilted15°	0.186 W/kg	0.188 W/kg	0.028/0.124	1.6 W/kg	21.6/21.6 °C
4233 / 846.4 MHz	cheek	<b>0.385</b> W/kg	--- W/kg	0.174/---	1.6 W/kg	21.6/21.6 °C
4132 / 826.4 MHz	cheek	0.332 W/kg	--- W/kg	0.052/---	1.6 W/kg	21.6/21.6 °C

Table 24:Test results (Head SAR WCDMA 850MHz)

The table contains the measured SAR values averaged over a mass of 1g					
Channel / frequency	Position	Body worn	Power Drift (dB)	Limit	Liquid temperature
U6150-5, with RMC					
4182 / 836.4 MHz	front	0.249 W/kg	-0.029	1.6 W/kg	21.6 °C
4182 / 836.4 MHz	rear	0.349 W/kg	0.178	1.6 W/kg	21.6 °C
4233 / 846.4 MHz	rear	0.461 W/kg	0.059	1.6 W/kg	21.6 °C
4132 / 826.4 MHz	rear	0.402 W/kg	-0.094	1.6 W/kg	21.6 °C
U6150-5,Speech Mode with Headset					
4233 / 846.4 MHz	rear	0.351 W/kg	0.117	1.6 W/kg	21.6 °C
U6150-5, Speech Mode with Bluetooth Headset					
4233 / 846.4 MHz	rear	<b>0.471</b> W/kg	0.004	1.6 W/kg	21.6 °C

Table 25:Test results (Body SAR WCDMA 850MHz)

- Note: 1) The value with bold colour is the maximum SAR value of each test band.  
 2) Upper and lower frequencies were measured at the worst position.  
 3) The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit (< 0.8 W/kg), testing at the high and low channels is optional.  
 4) Tests in body position were performed with 15 mm air gap between DUT and SAM to simulate the use of a non-metallic belt-clip or holster.  
 5) The addition body test was performed at worst case.

**2.5.4 Extrapolated SAR Values**

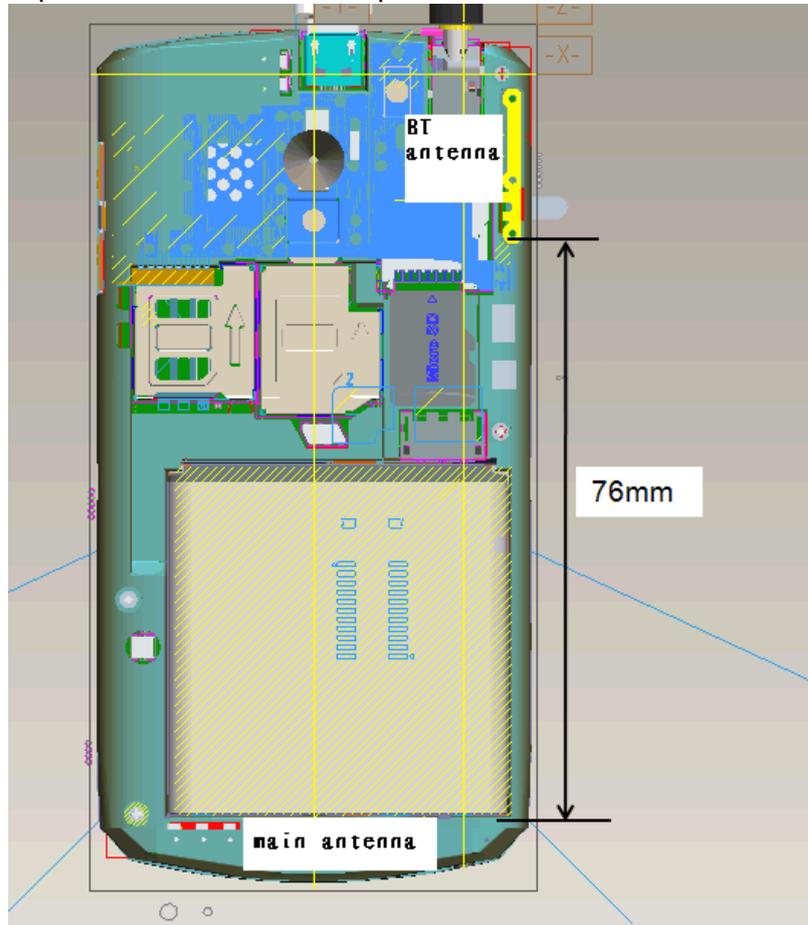
Limit of SAR (W/kg)		Conducted Power	1g Average		Tune-up procedures maximum Power(dBm)	1g Average	
Worst Case			1.6			1.6	
Test Position	Channel	Measurement Result(dBm)	Measurement Result(W/kg)			Extrapolated Result (W/kg)	
Head GSM1900							
Right hand touched	Middle	30.29	0.574	30.8	0.646		
Body GPRS1900 (2 timeslots uplink)							
Rear	Middle	28.27	0.797	28.8	0.900		
Body EGPRS1900 (2 timeslots uplink)							
Rear	Middle	28.37	0.771	28.8	0.851		
Head GSM850							
Left hand touched	Middle	33.22	0.492	33.8	0.562		
Body GPRS850 (2 timeslots uplink)							
Rear	Low	31.21	1.110	31.8	1.272		
Body EGPRS850 (2 timeslots uplink)							
Rear	Low	31.35	1.150	31.8	<b>1.276</b>		
Head WCDMA1900 (RMC)							
Right hand touched	Low	23.31	0.804	23.8	0.900		
Body WCDMA1900 Speech Mode with Bluetooth Headset (RMC)							
Rear	Low	23.31	0.624	23.8	0.699		
Head WCDMA850 (RMC)							
Right hand touched	High	23.36	0.385	23.8	0.426		
Body WCDMA850 Speech Mode with Bluetooth Headset (RMC)							
Rear	High	23.36	0.471	23.8	0.521		

Table 26: Extrapolated SAR Values of highest measured SAR (UMTS/GPRS/GSM)

**2.5.5 Multiple Transmitter Information**

**BT Function**

The closest distance between BT antenna and main antenna is 7.6cm>5cm, and the location of the antennas inside mobile phone is shown as below picture:



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)	5.5	6.2	5.8

**Stand-alone SAR**

According to the output power measurement results and the distance between BT antenna and GSM/WCDMA antenna we can draw the conclusion that:

About BT, because the output power of BT unlicensed transmitter is  $\leq 2 \cdot P_{ref}$  (24mW) and its antenna(s) is  $\geq 5.0$  cm from other antennas, stand-alone SAR evaluation is not required for BT.

**Simultaneous SAR**

About BT, because stand-alone SAR are not required for BT and its antenna(s) is  $\geq 5.0$  cm from other antennas, Simultaneous Transmission SAR evaluation is not required for GSM/WCDMA& BT.

**Annex 1 System performance verification**

Date/Time: 2/12/2011 3:49:19 PM, Date/Time: 2/12/2011 3:53:22 PM

**SystemPerformanceCheck-D1900 Head**

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d091**

Communication System: CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.43$  mho/m;  $\epsilon_r = 41.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.97, 4.97, 4.97); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/d=10mm, Pin=250mW/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 11.6 mW/g

Configuration/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

dx=5mm,

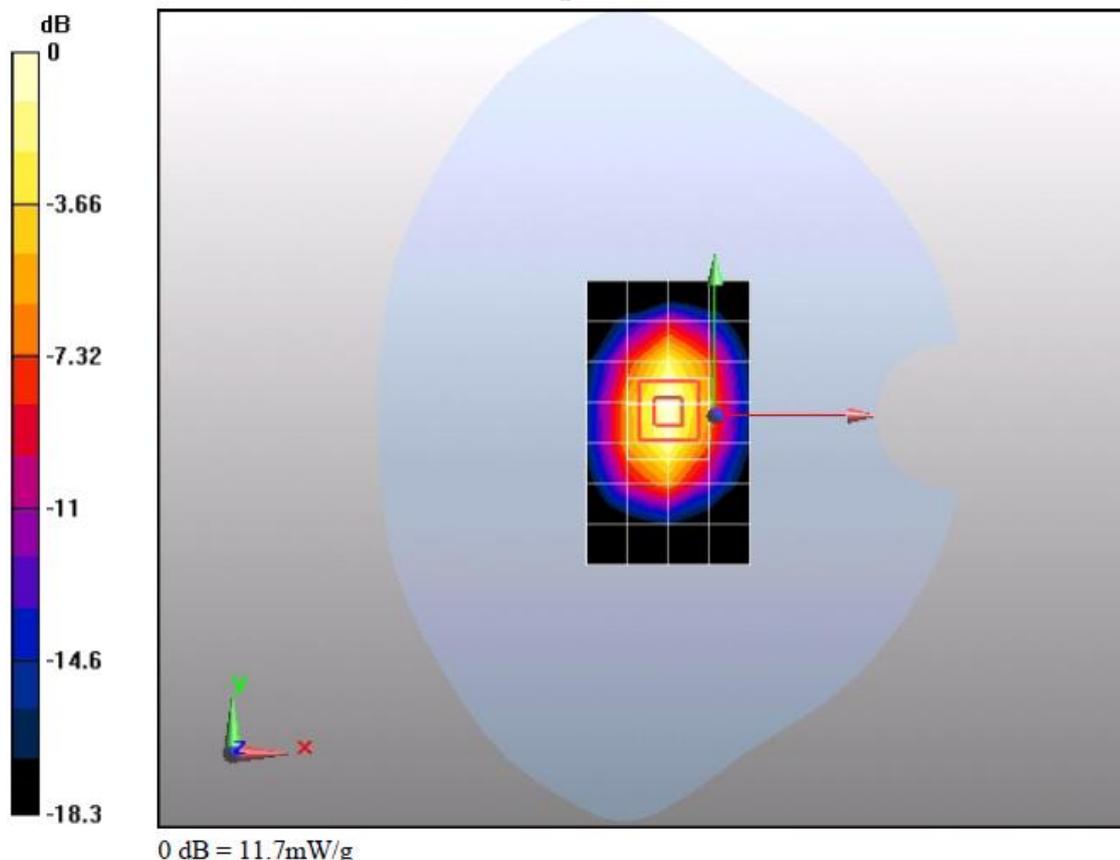
dy=5mm, dz=5mm

Reference Value = 92.3 V/m; Power Drift = -0.024 dB

Peak SAR (extrapolated) = 19.3 W/kg

SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.29 mW/g

Maximum value of SAR (measured) = 11.7 mW/g



**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :

ambient temperature: 22.0°C; liquid temperature: 21.6°C

Date/Time: 2/15/2011 6:59:02 AM, Date/Time: 2/15/2011 7:03:02 AM

**SystemPerformanceCheck-D1900 Body**

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d091**

Communication System: CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 53.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.61, 4.61, 4.61); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/d=10mm, Pin=250mW/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 11.7 mW/g

Configuration/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

dx=5mm,

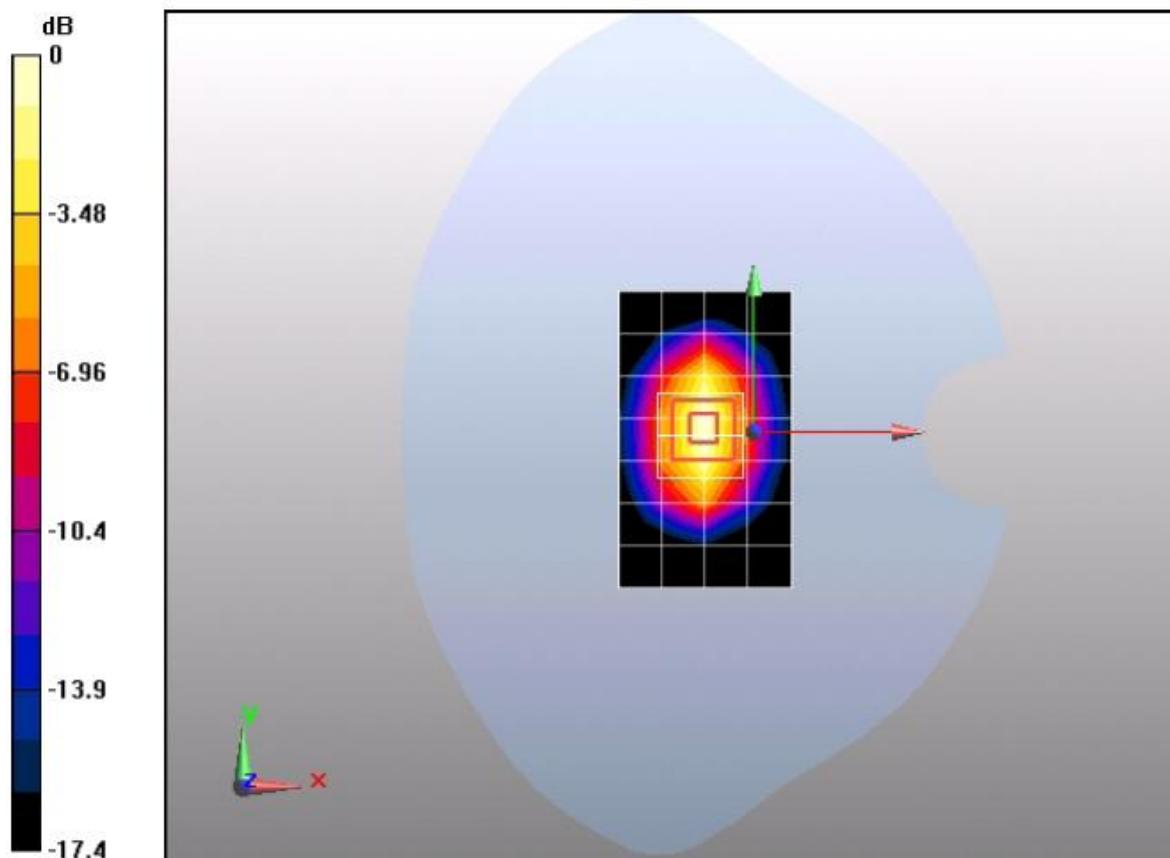
dy=5mm, dz=5mm

Reference Value = 89.9 V/m; Power Drift = 0.038 dB

Peak SAR (extrapolated) = 19.1 W/kg

SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.45 mW/g

Maximum value of SAR (measured) = 11.9 mW/g



0 dB = 11.9mW/g

**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :

ambient temperature: 22.2°C; liquid temperature: 21.8°C

Date/Time: 2/15/2011 11:51:56 PM, Date/Time: 2/15/2011 11:58:36 PM

**SystemPerformanceCheck-D835 Head**

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d059**

Communication System: CW; Frequency: 835 MHz

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.876 \text{ mho/m}$ ;  $\epsilon_r = 42.8$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(5.98, 5.98, 5.98); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM2; Type: SAM; Serial: TP-1474
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/d=15mm, Pin=250mW/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 2.35 mW/g

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

dx=5mm,

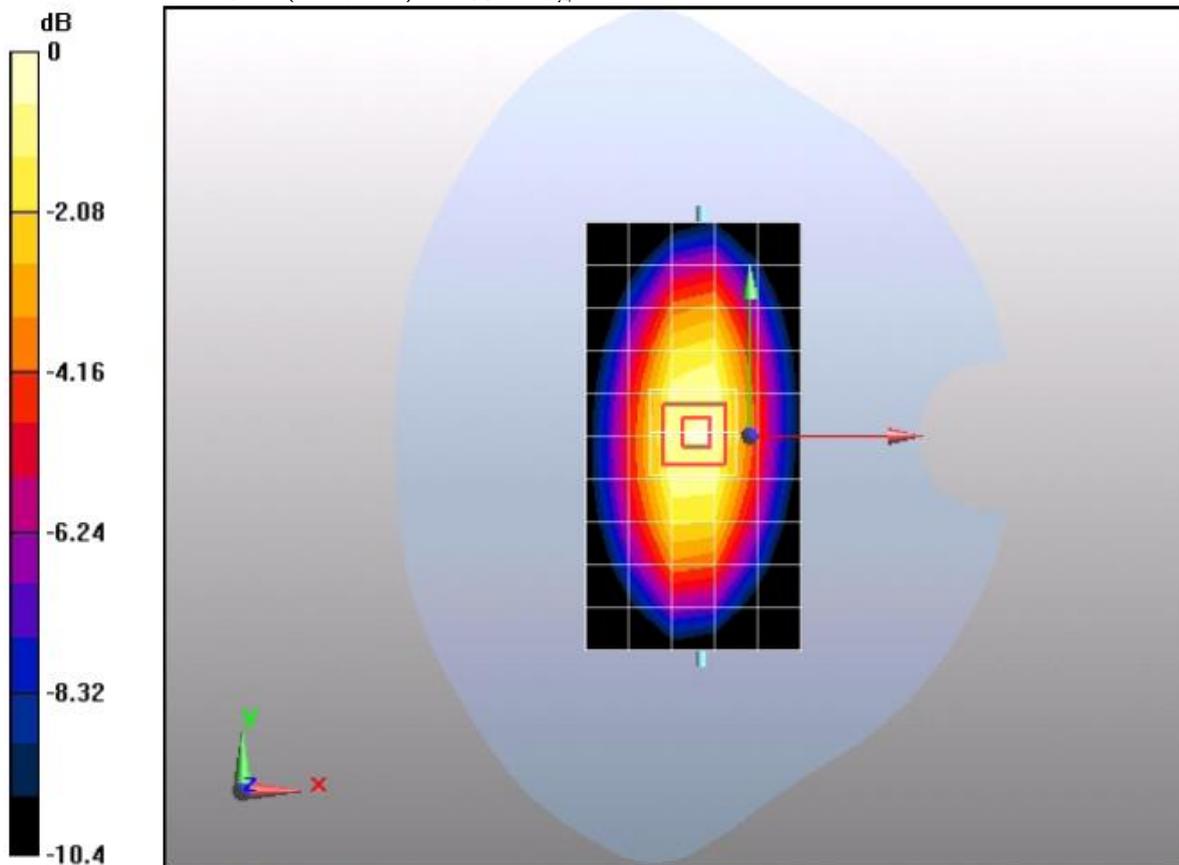
dy=5mm, dz=5mm

Reference Value = 56.3 V/m; Power Drift = -0.045 dB

Peak SAR (extrapolated) = 3.61 W/kg

SAR(1 g) = 2.48 mW/g; SAR(10 g) = 1.63 mW/g

Maximum value of SAR (measured) = 2.68 mW/g



0 dB = 2.68mW/g

**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :

ambient temperature: 22.0°C; liquid temperature: 21.6°C

Date/Time: 2/14/2011 9:40:45 AM, Date/Time: 2/14/2011 9:47:28 AM

**SystemPerformanceCheck-D835 Body****DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d059**

Communication System: CW; Frequency: 835 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.973$  mho/m;  $\epsilon_r = 54.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(5.92, 5.92, 5.92); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM2; Type: SAM; Serial: TP-1474
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/d=15mm, Pin=250mW/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 2.44 mW/g

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

dx=5mm,

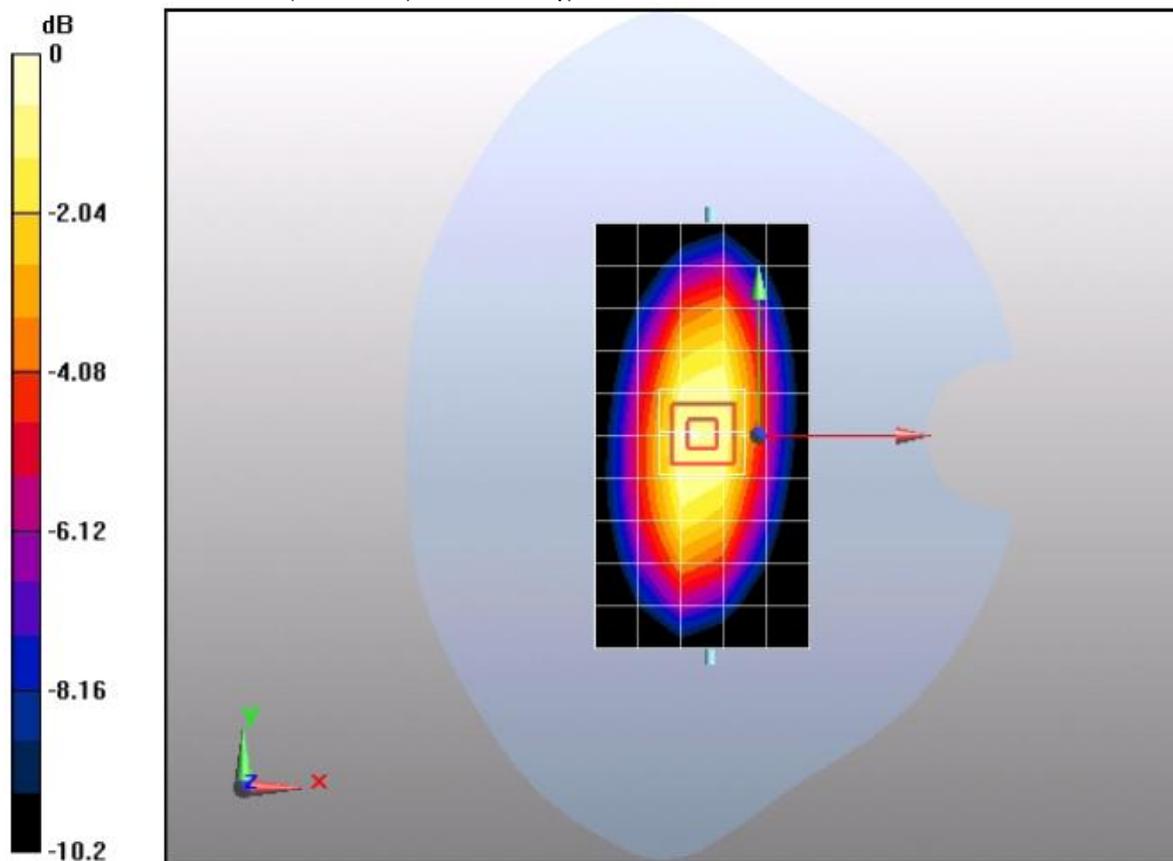
dy=5mm, dz=5mm

Reference Value = 54.2 V/m; Power Drift = 0.024 dB

Peak SAR (extrapolated) = 3.75 W/kg

SAR(1 g) = 2.6 mW/g; SAR(10 g) = 1.71 mW/g

Maximum value of SAR (measured) = 2.82 mW/g



0 dB = 2.82mW/g

**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :

ambient temperature: 22.0°C; liquid temperature: 21.6°C

**Annex 2 Measurement results (printout from DASY TM)****Annex 2.1 PCS 1900 MHz Head**

Date/Time: 2/12/2011 9:18:23 PM, Date/Time: 2/12/2011 9:27:22 PM

**P1528\_OET65\_EN62209- LeftHandSide touched –GSM1900 Middle**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 1TS; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.41$  mho/m;  $\epsilon_r = 41.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.97, 4.97, 4.97); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/head/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

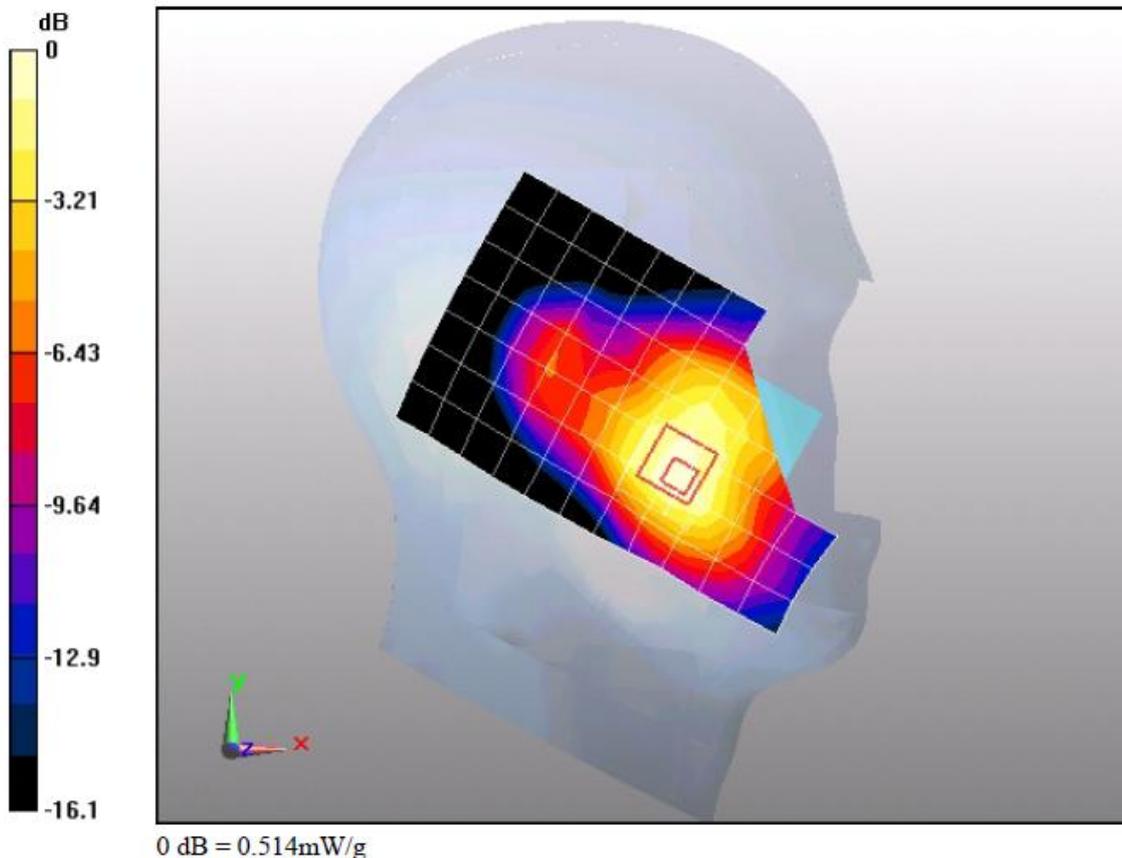
Configuration/head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.33 V/m; Power Drift = -0.00023 dB

Peak SAR (extrapolated) = 0.706 W/kg

SAR(1 g) = 0.475 mW/g; SAR(10 g) = 0.294 mW/g

Maximum value of SAR (measured) = 0.514 mW/g

**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :

ambient temperature: 22.0°C; liquid temperature: 21.6°C

Date/Time: 2/12/2011 9:47:04 PM, Date/Time: 2/12/2011 9:55:59 PM

**P1528\_OET65\_EN62209- LeftHandSide tilted 15° -GSM1900 Middle**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 1TS; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.41$  mho/m;  $\epsilon_r = 41.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.97, 4.97, 4.97); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/head/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.247 mW/g

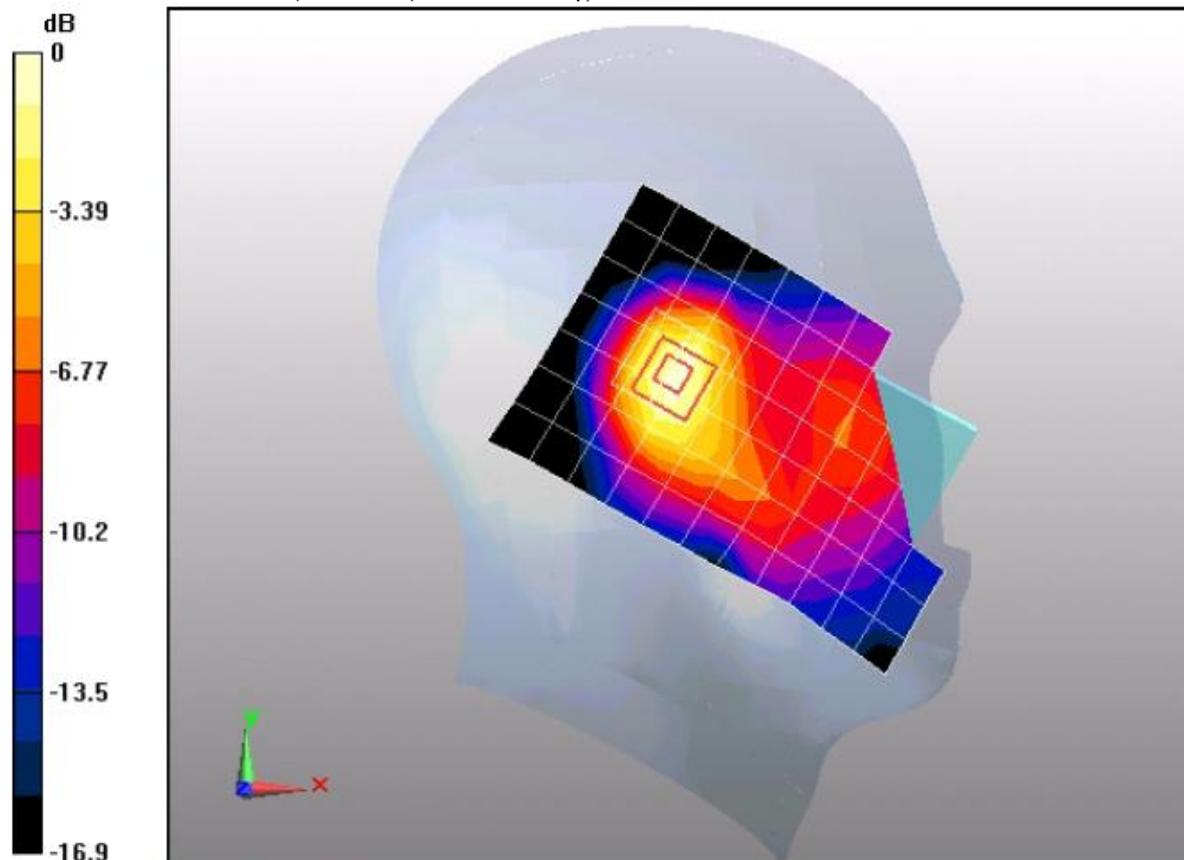
Configuration/head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.8 V/m; Power Drift = 0.073 dB

Peak SAR (extrapolated) = 0.398 W/kg

SAR(1 g) = 0.244 mW/g; SAR(10 g) = 0.139 mW/g

Maximum value of SAR (measured) = 0.267 mW/g



0 dB = 0.267mW/g

**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :

ambient temperature: 22.0°C; liquid temperature: 21.6°C

**P1528\_OET65\_EN62209- RightHandSide touched -GSM1900 Middle**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 1TS; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.41$  mho/m;  $\epsilon_r = 41.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.97, 4.97, 4.97); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/head/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.604 mW/g

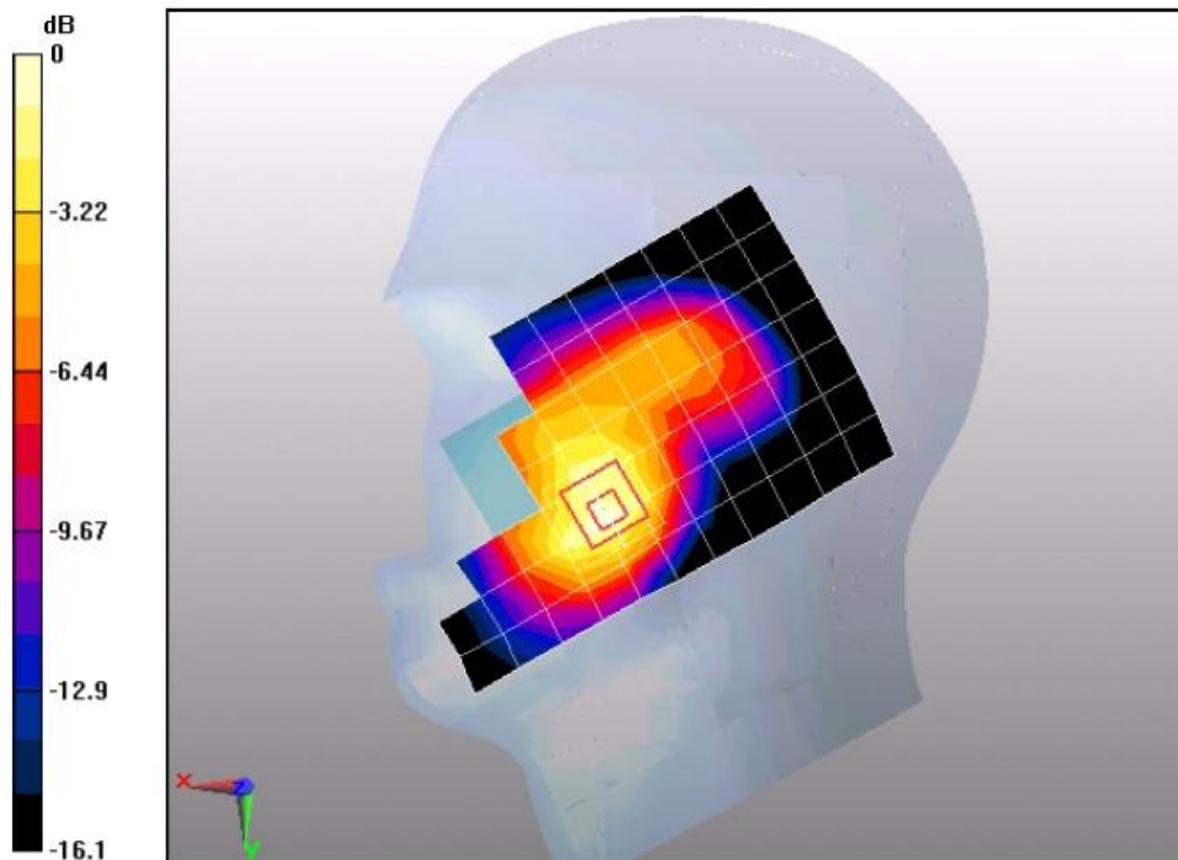
Configuration/head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.85 V/m; Power Drift = 0.166 dB

Peak SAR (extrapolated) = 0.857 W/kg

SAR(1 g) = 0.574 mW/g; SAR(10 g) = 0.345 mW/g

Maximum value of SAR (measured) = 0.631 mW/g



0 dB = 0.631mW/g

**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :

ambient temperature: 22.0°C; liquid temperature: 21.6°C

Date/Time: 2/12/2011 5:09:45 PM, Date/Time: 2/12/2011 5:18:09 PM

**P1528\_OET65\_EN62209- RightHandSide tilted 15° –GSM1900 Middle**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 1TS; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.41$  mho/m;  $\epsilon_r = 41.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.97, 4.97, 4.97); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/head/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.200 mW/g

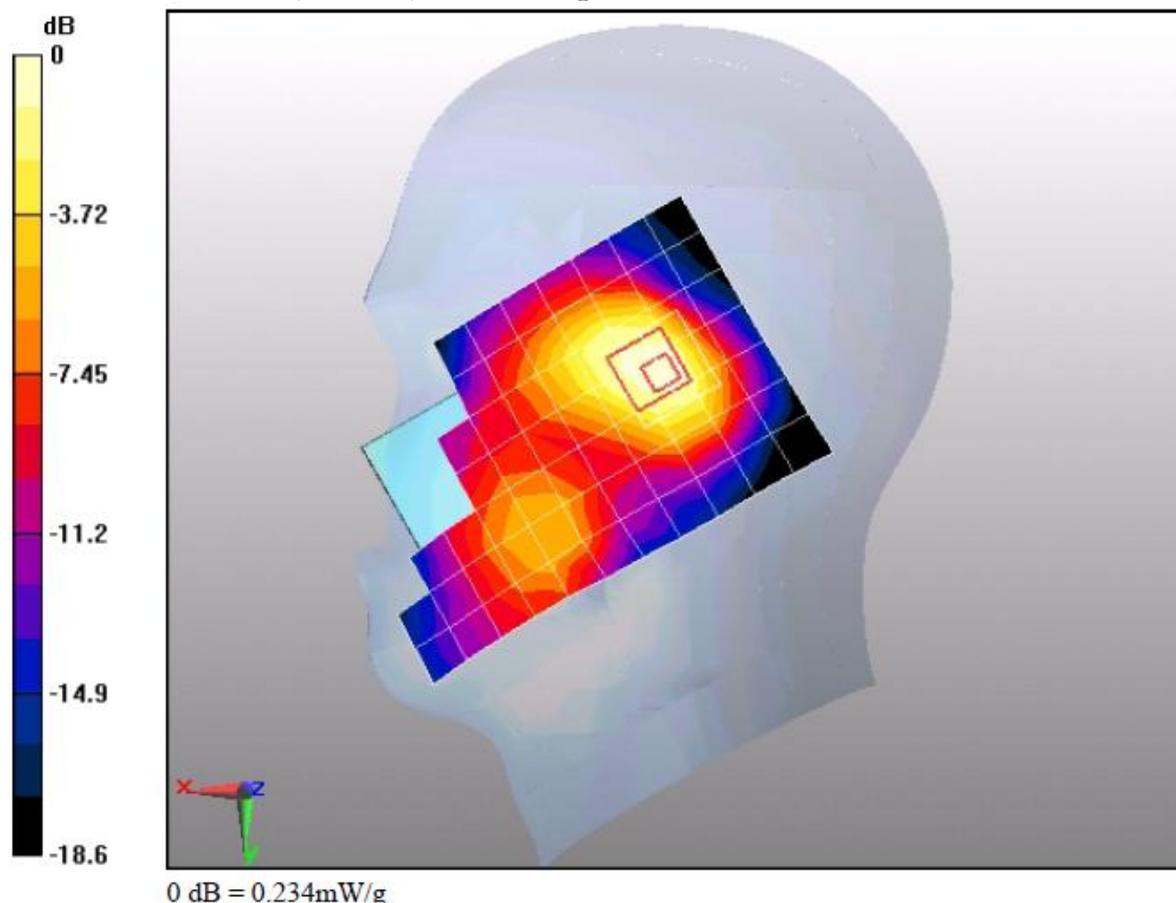
Configuration/head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.2 V/m; Power Drift = 0.047 dB

Peak SAR (extrapolated) = 0.335 W/kg

SAR(1 g) = 0.214 mW/g; SAR(10 g) = 0.129 mW/g

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

**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :

ambient temperature: 22.0°C; liquid temperature: 21.6°C

Date/Time: 2/12/2011 10:15:10 PM, Date/Time: 2/12/2011 10:23:55 PM

**P1528\_OET65\_EN62209- RightHandSide touched -GSM1900 High**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 1TS; Frequency: 1909.8 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.44$  mho/m;  $\epsilon_r = 41.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.97, 4.97, 4.97); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/head/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.459 mW/g

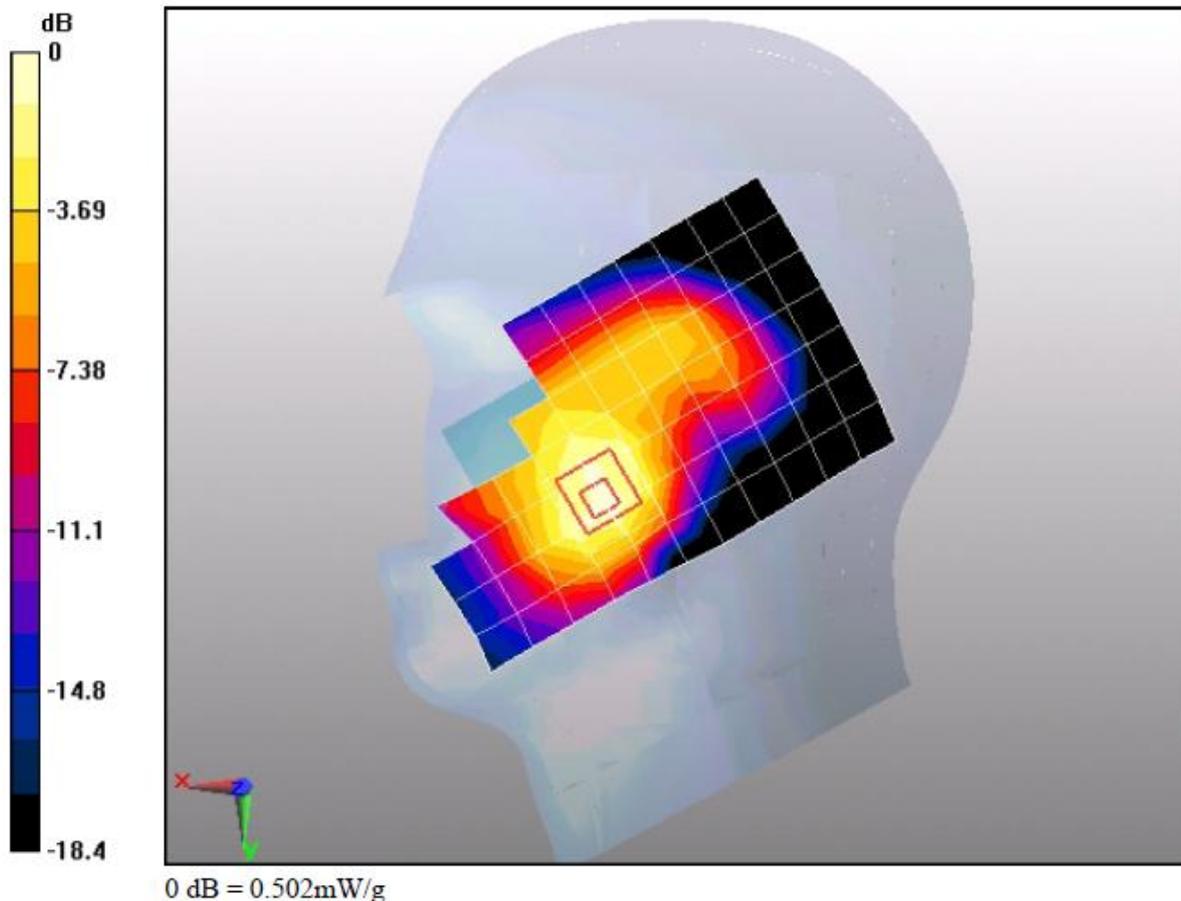
Configuration/head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.34 V/m; Power Drift = -0.045 dB

Peak SAR (extrapolated) = 0.684 W/kg

SAR(1 g) = 0.456 mW/g; SAR(10 g) = 0.274 mW/g

Maximum value of SAR (measured) = 0.502 mW/g



**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :

ambient temperature: 22.0°C; liquid temperature: 21.6°C

**P1528\_OET65\_EN62209-RightHandSide touched –GSM1900 Low**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 1TS; Frequency: 1850.2 MHz

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 41.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.97, 4.97, 4.97); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/head/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.480 mW/g

Configuration/head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

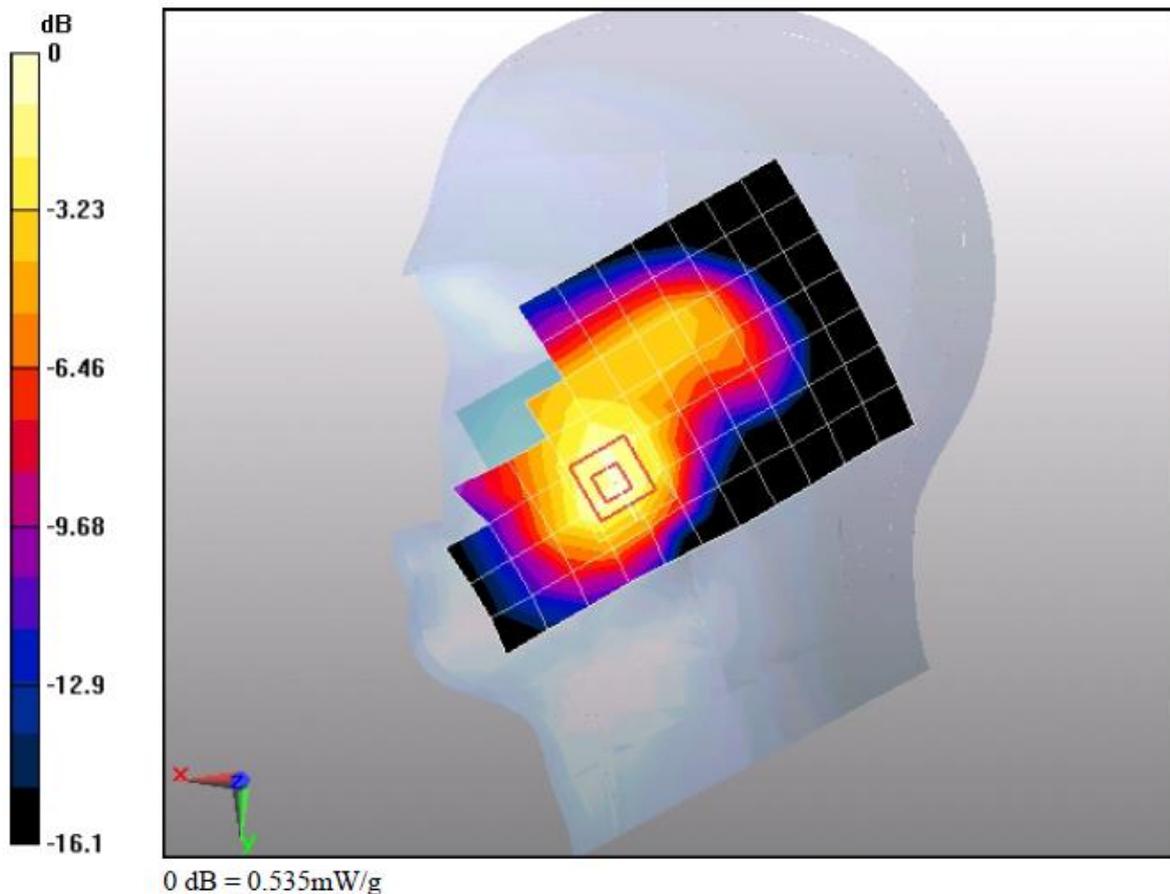
Reference Value = 8.29 V/m; Power Drift = 0.083 dB

Peak SAR (extrapolated) = 0.730 W/kg

SAR(1 g) = 0.491 mW/g; SAR(10 g) = 0.298 mW/g

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.535 mW/g



**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :

ambient temperature: 22.0°C; liquid temperature: 21.6°C

**Annex 2.2 PCS 1900 MHz Body**

Date/Time: 2/15/2011 9:10:51 AM, Date/Time: 2/15/2011 9:19:39 AM

**P1528\_OET65\_EN62209- towards phantom- GSM1900 GPRS 1TS Middle**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 1TS; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 53.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.61, 4.61, 4.61); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/body/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.360 mW/g

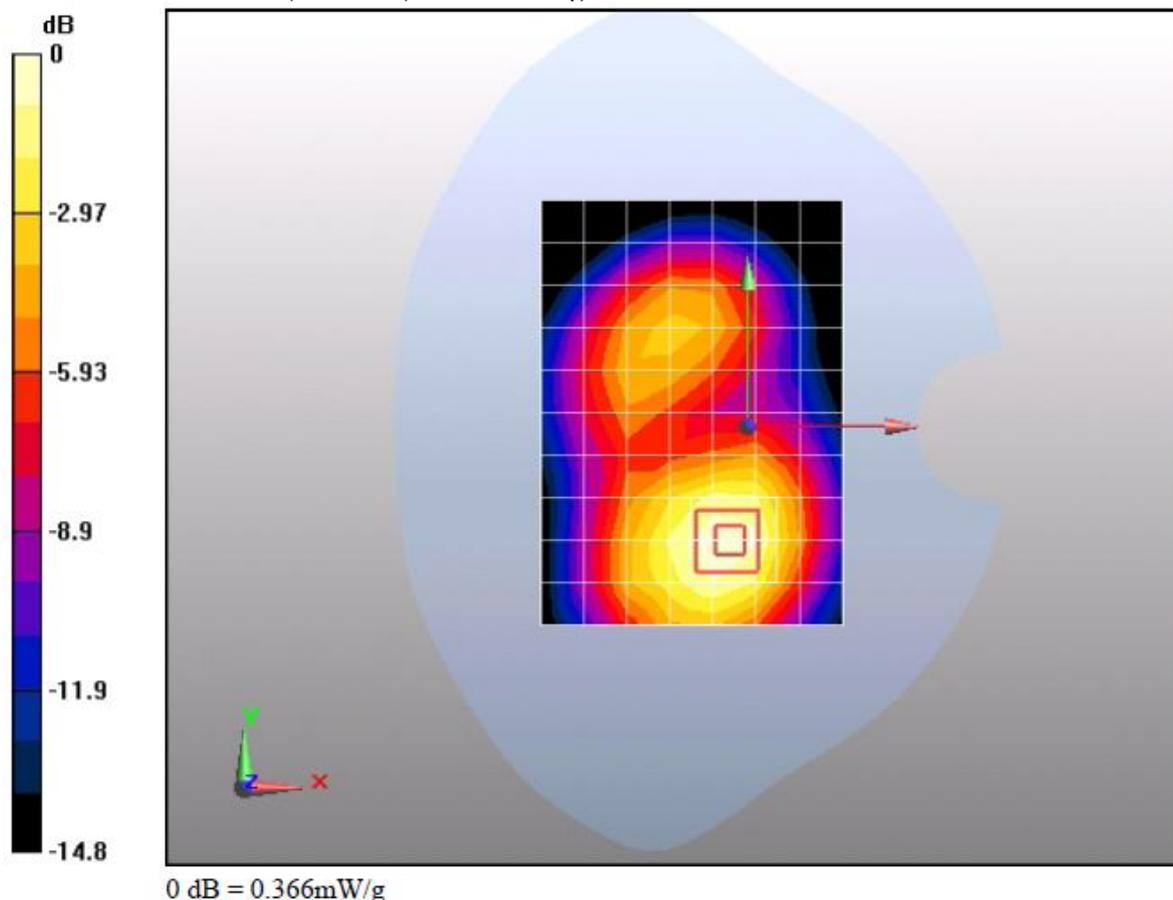
Configuration/body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.51 V/m; Power Drift = -0.093 dB

Peak SAR (extrapolated) = 0.535 W/kg

SAR(1 g) = 0.340 mW/g; SAR(10 g) = 0.209 mW/g

Maximum value of SAR (measured) = 0.366 mW/g



**Additional information:**

position or distance of DUT to SAM (if not standard head positions) : 15 mm

ambient temperature: 22.3°C; liquid temperature: 21.8°C

Date/Time: 2/15/2011 9:38:46 AM, Date/Time: 2/15/2011 9:47:42 AM

**P1528\_OET65\_EN62209- towards ground- GSM1900 GPRS 1TS Middle**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 1TS; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 53.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.61, 4.61, 4.61); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/body/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm

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

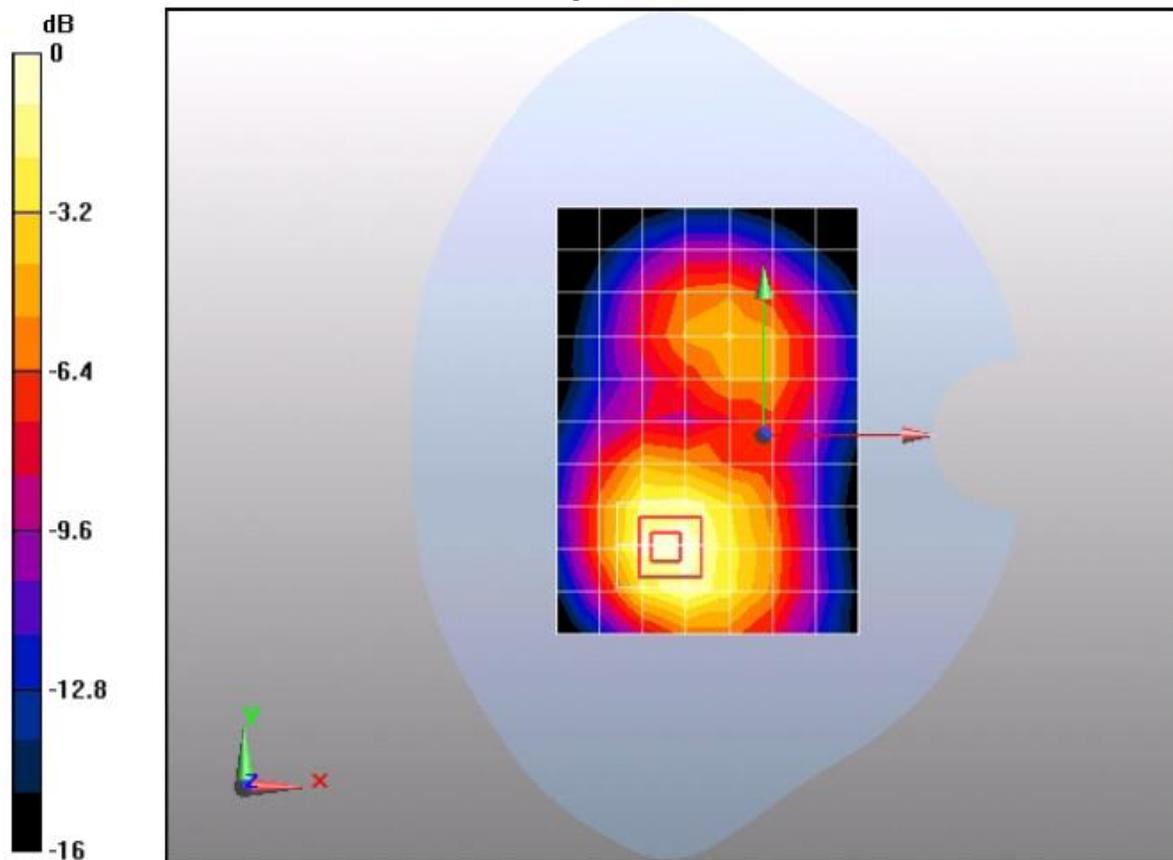
Configuration/body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.73 V/m; Power Drift = -0.159 dB

Peak SAR (extrapolated) = 0.694 W/kg

SAR(1 g) = 0.428 mW/g; SAR(10 g) = 0.258 mW/g

Maximum value of SAR (measured) = 0.462 mW/g



0 dB = 0.462mW/g

**Additional information:**

position or distance of DUT to SAM (if not standard head positions) : 15 mm

ambient temperature: 22.3°C; liquid temperature: 21.8°C

Date/Time: 2/15/2011 10:12:38 AM, Date/Time: 2/15/2011 10:21:28 AM

**P1528\_OET65\_EN62209- towards ground- GSM1900 GPRS 2TS Middle**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 2TS; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 53.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.61, 4.61, 4.61); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/body/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.782 mW/g

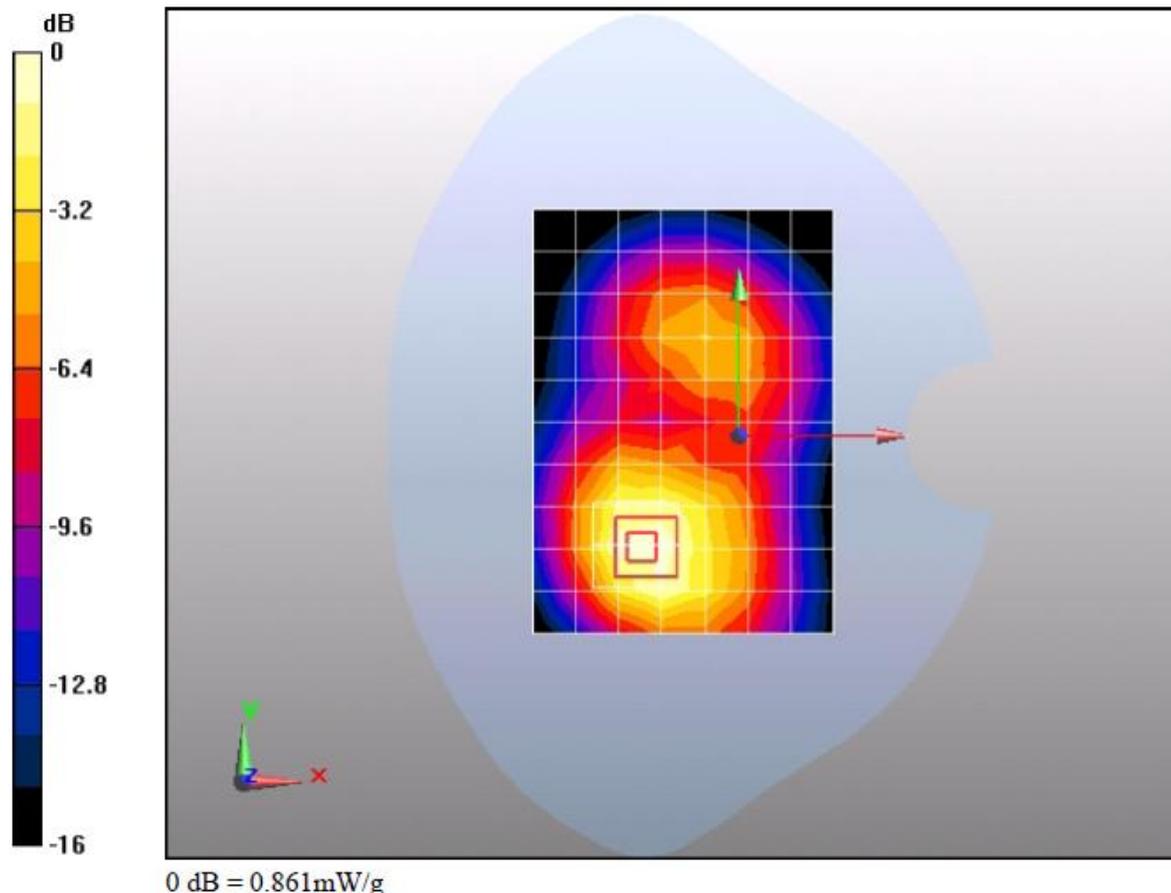
Configuration/body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.21 V/m; Power Drift = -0.115 dB

Peak SAR (extrapolated) = 1.31 W/kg

SAR(1 g) = 0.797 mW/g; SAR(10 g) = 0.481 mW/g

Maximum value of SAR (measured) = 0.861 mW/g



**Additional information:**

position or distance of DUT to SAM (if not standard head positions) : 15 mm

ambient temperature: 22.3°C; liquid temperature: 21.8°C

Date/Time: 2/15/2011 10:38:38 AM, Date/Time: 2/15/2011 10:47:26 AM

**P1528\_OET65\_EN62209- towards ground- GSM1900 GPRS 2TS High**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 2TS; Frequency: 1909.8 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 53.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.61, 4.61, 4.61); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/body/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.750 mW/g

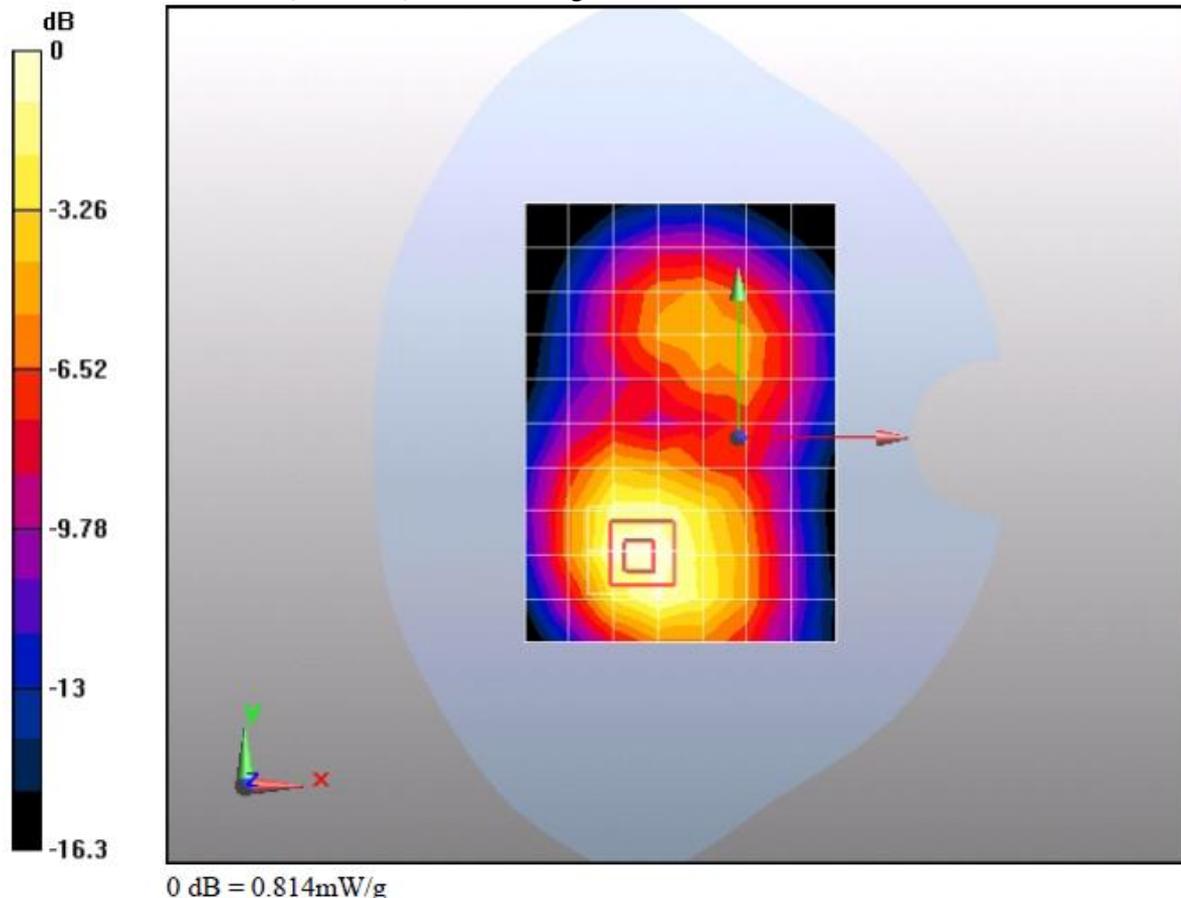
Configuration/body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.52 V/m; Power Drift = 0.00164 dB

Peak SAR (extrapolated) = 1.23 W/kg

SAR(1 g) = 0.754 mW/g; SAR(10 g) = 0.456 mW/g

Maximum value of SAR (measured) = 0.814 mW/g



**Additional information:**

position or distance of DUT to SAM (if not standard head positions) : 15 mm

ambient temperature: 22.3°C; liquid temperature: 21.8°C

Date/Time: 2/15/2011 11:05:37 AM, Date/Time: 2/15/2011 11:14:24 AM

**P1528\_OET65\_EN62209- towards ground- GSM1900 GPRS 2TS Low**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 2TS; Frequency: 1850.2 MHz

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.49$  mho/m;  $\epsilon_r = 53.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.61, 4.61, 4.61); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/body/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.676 mW/g

Configuration/body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

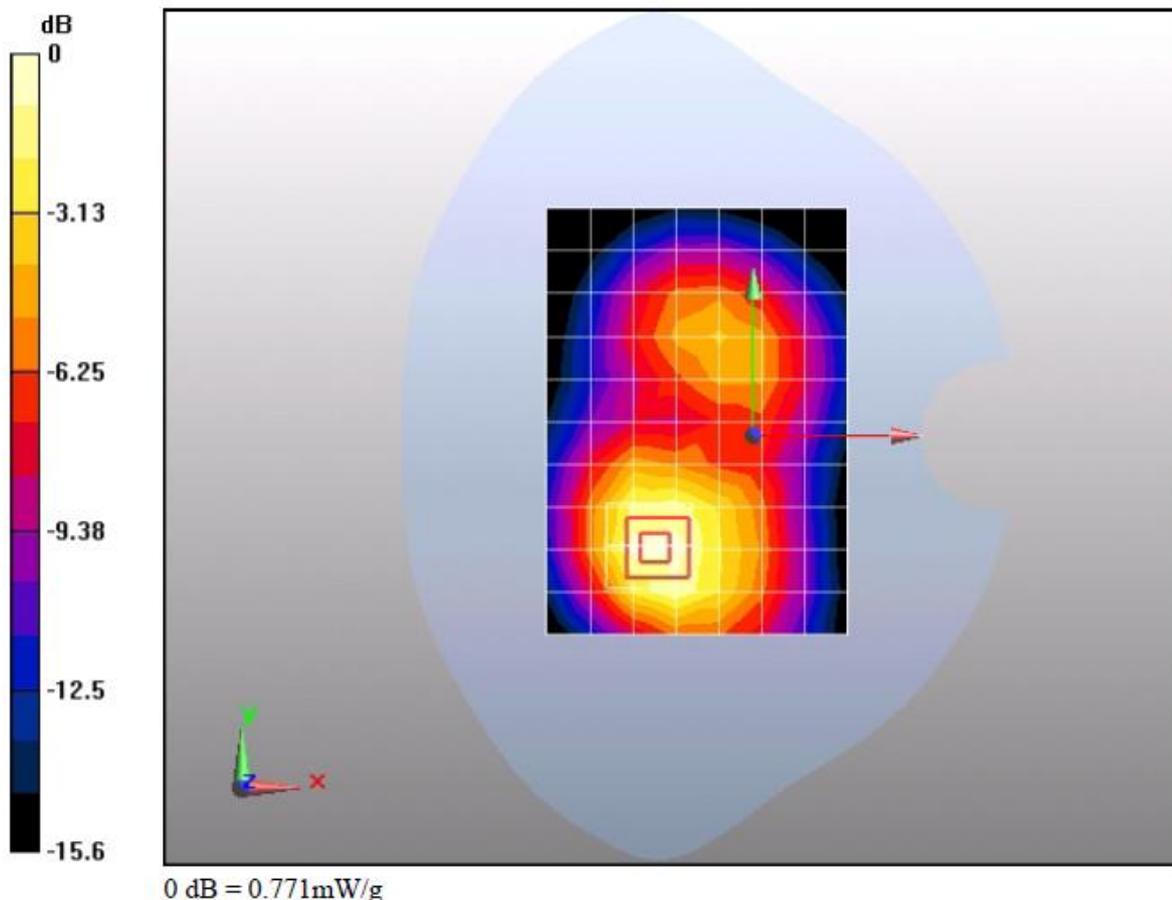
Reference Value = 9.29 V/m; Power Drift = -0.085 dB

Peak SAR (extrapolated) = 1.15 W/kg

SAR(1 g) = 0.710 mW/g; SAR(10 g) = 0.428 mW/g

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.771 mW/g



**Additional information:**

position or distance of DUT to SAM (if not standard head positions) :15 mm

ambient temperature: 22.3°C; liquid temperature: 21.8°C

Date/Time: 2/15/2011 12:21:32 PM, Date/Time: 2/15/2011 12:30:21 PM

**P1528\_OET65\_EN62209- towards ground- GSM1900 EGPRS 1TS Middle**

DUT: U6150-5; Type: Handset; Serial: 9UA4CB10C0800084

Communication System: HW -GSM/GPRS/EDGE 1TS; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 53.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS Y5 (IEEE/IEC/ANSI C63.19-2007)

DAS Y5 Configuration:

- Probe: ES3DV3 - SN3168; ConvF(4.61, 4.61, 4.61); Calibrated: 12/23/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn852; Calibrated: 12/24/2010
- Phantom: SAM1; Type: SAM; Serial: TP-1475
- Measurement SW: DAS Y5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/body/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.397 mW/g

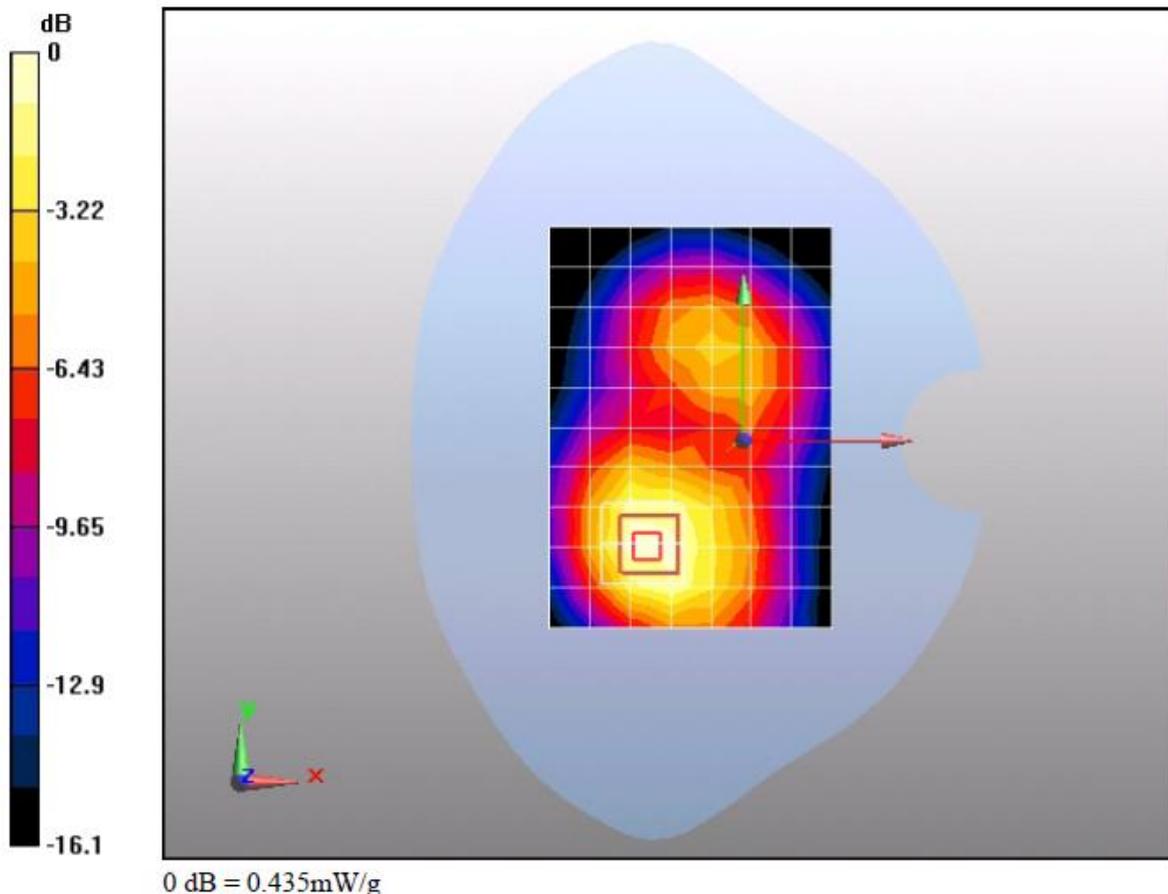
Configuration/body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.59 V/m; Power Drift = 0.078 dB

Peak SAR (extrapolated) = 0.653 W/kg

SAR(1 g) = 0.400 mW/g; SAR(10 g) = 0.241 mW/g

Maximum value of SAR (measured) = 0.435 mW/g



**Additional information:**

position or distance of DUT to SAM (if not standard head positions) : 15 mm

ambient temperature: 22.3°C; liquid temperature: 21.8°C