



Report No.: RZA2010-1491SAR01R2



OET 65

TEST REPORT

Product Name	HUAWEI IDEOS X5;HSPA+/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth; IDEOS X5
Model	HUAWEI U8800H/U8800H
FCC ID	QISU8800
Client	Huawei Technologies Co., Ltd.

TA Technology (Shanghai) Co., Ltd.



GENERAL SUMMARY

Product Name	HUAWEI IDEOS X5; HSPA+/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth; IDEOS X5	Model	HUAWEI U8800H/U8800H
FCC ID	QISU8800	Report No.	RZA2010-1491SAR01R2
Client	Huawei Technologies Co., Ltd.		
Manufacturer	Huawei Technologies Co., Ltd.		
Reference Standard(s)	<p>IEEE Std C95.1, 1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radiofrequency Electromagnetic Fields, 3 kHz to 300 GHz.</p> <p>IEEE Std 1528™-2003: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.</p> <p>SUPPLEMENT C Edition 01-01 to OET BULLETIN 65 Edition 97-01 June 2001 including DA 02-1438, published June 2002: Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields Additional Information for Evaluation Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions.</p>		
Conclusion	<p>This portable wireless equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 7 of this test report are below limits specified in the relevant standards.</p> <p>General Judgment: Pass</p> <p style="text-align: right;">(Stamp) Date of issue: October 12th, 2010</p>		
Comment	The test result only responds to the measured sample.		

Approved by 杨伟中

Yang Weizhong

Revised by 凌敏宝

Ling Minbao

Performed by 薛超峰

Xue Chaofeng

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1. General Information

1.1. Notes of the Test Report

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

TA Technology (Shanghai) Co., Ltd. is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. This report only refers to the item that has undergone the test.

This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

1.2. Testing Laboratory

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City: Shanghai
Post code: 201201
Country: P. R. China
Contact: Yang Weizhong
Telephone: +86-021-50791141/2/3
Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: yangweizhong@ta-shanghai.com

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1.3. Applicant Information

Company: Huawei Technologies Co., Ltd.
Address: Bantian, Longgang District
City: Shenzhen
Postal Code: 518129
Country: P.R. China
Contact: Wang Wei
Telephone: 0755-28780808
Fax: 0755-28780808

1.4. Manufacturer Information

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

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1.5. Information of EUT

General Information

Device Type:	Portable Device		
Exposure Category:	Uncontrolled Environment / General Population		
Product Name:	HUAWEI IDEOS X5;HSPA+/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth; IDEOS X5		
IMEI:	353043040007315		
Hardware Version:	HD1U880M		
Software Version:	U8800HV100R001C00B128		
Antenna Type:	Internal Antenna		
Device Operating Configurations:			
Supporting Mode(s):	GSM 850/GSM 1900; (tested) GSM 900/GSM 1800; WCDMA Band I/WCDMA Band VIII; Bluetooth; WiFi;		
Test Modulation:	(GSM)GMSK;		
Device Class:	B		
GPRS Multislot Class(10):	Max Number of Timeslots in Uplink	2	
	Max Number of Timeslots in Downlink	4	
	Max Total Timeslot	5	
EGPRS 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):	Mode	Tx (MHz)	Rx (MHz)
	GSM 850	824.2 ~ 848.8	869.2 ~ 893.8
	GSM 1900	1850.2 ~ 1909.8	1930.2 ~ 1989.8
Test Channel: (Low - Middle - High)	128 -192 - 251 (GSM 850) (tested)		
	512 - 661 - 810 (GSM 1900) (tested)		
Power Class:	GSM 850: 4, tested with power level 5		
	GSM 1900: 1, tested with power level 0		

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Auxiliary Equipment Details

AE1:Battery

Model: HB4F1
Manufacturer: Huawei Technologies Co., Ltd.
SN: SCCA605HI2330653

Equipment Under Test (EUT) is a model of HUAWEI IDEOS X5;HSPA+/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth; IDEOS X5. SAR is tested for GSM 850 and GSM 1900. The EUT has a GSM antenna that is used for Tx/Rx, and the other is BT/WiFi antenna that can be used for Tx/Rx.

HUAWEI U8800H/U8800H is a variant model of HUAWEI U8800/U8800.
Data taken from HUAWEI U8800/U8800 for HUAWEI U8800H/U8800H/FCC ID:QISU8800.
HUAWEI U8800H/U8800H is only test in the worst-case position of HUAWEI U8800/U8800 in each tested mode. The detailed differences between the HUAWEI U8800H/U8800H and HUAWEI U8800/U8800 please refer to the ANNEX I.

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

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1.6. The Maximum SAR_{1g} Values and Conducted Power of each tested band

Head Configuration

Band	Channel	Position	SAR _{1g} (W/kg)
GSM 850	251	Left, Cheek	0.264
GSM 1900	810	Right, Cheek	0.340

Body Worn Configuration

Band	Channel	Separation distance	SAR _{1g} (W/kg)
2solts GPRS 850	128	15mm	0.734
2solts GPRS 1900	512	15mm	0.790

Maximum Power

Band		Max Conducted Power (dBm)	Max Average Power (dBm)
GSM 850	GSM	33.05	24.02
	GPRS(GMSK),2 time-slots	31.18	25.16
	EGPRS(GMSK),2 time-slots	31.17	25.15
	EGPRS(8PSK) ,2 time-slots	26.38	20.36
GSM 1900	GSM	30.07	21.04
	GPRS(GMSK),2 time-slots	30.08	24.06
	EGPRS(GMSK),2 time-slots	30.07	24.05
	EGPRS(8PSK) ,2 time-slots	25.37	19.35

Note: The detail Power refer to Table 4 (Power Measurement Results).

1.7. Test Date

The test is performed on October 9, 2010.

2. Operational Conditions during Test

2.1. General Description of Test Procedures

A communication link is set up with a System Simulator (SS) by air link, and a call is established. The Absolute Radiofrequency Channel Number (ARFCN) is allocated to 128, 192 and 251 in the case of GSM 850, to 512, 661 and 810 in the case of GSM 1900. The EUT is commanded to operate at maximum transmitting power.

Connection to the EUT is established via air interface with E5515C, and the EUT is set to maximum output power by E5515C. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. The antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30 dB.

2.2. GSM Test Configuration

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a System Simulator (SS) by air link. Using E5515C the power lever is set to “5” in SAR of GSM 850, set to “0” in SAR of GSM 1900. The test in the band of GSM 850 and GSM 1900 are performed in the mode of speech transfer function and 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 timeslots 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 timeslots 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.

GSM 850

GPRS (GMSK):

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	2

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EGPRS (8PSK):

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	0

EGPRS (GMSK):

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	2

GSM 1900

GPRS (GMSK):

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	0

EGPRS (8PSK):

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	0

EGPRS (GMSK):

Number of timeslots in uplink assignment	reduction of maximum output power, (dB)
1	0
2	0

2.3. Test Positions

2.3.1. Against Phantom Head

Measurements were made in "cheek" and "tilt" positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to IEEE 1528 - 2003 "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate(SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques".

2.3.2. Body Worn Configuration

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. The distance between the device and the phantom was kept 15mm.

3. SAR Measurements System Configuration

3.1. SAR Measurement Set-up

The DASY4 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 DASY4 measurement server.
- The DASY4 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003
- DASY4 software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.

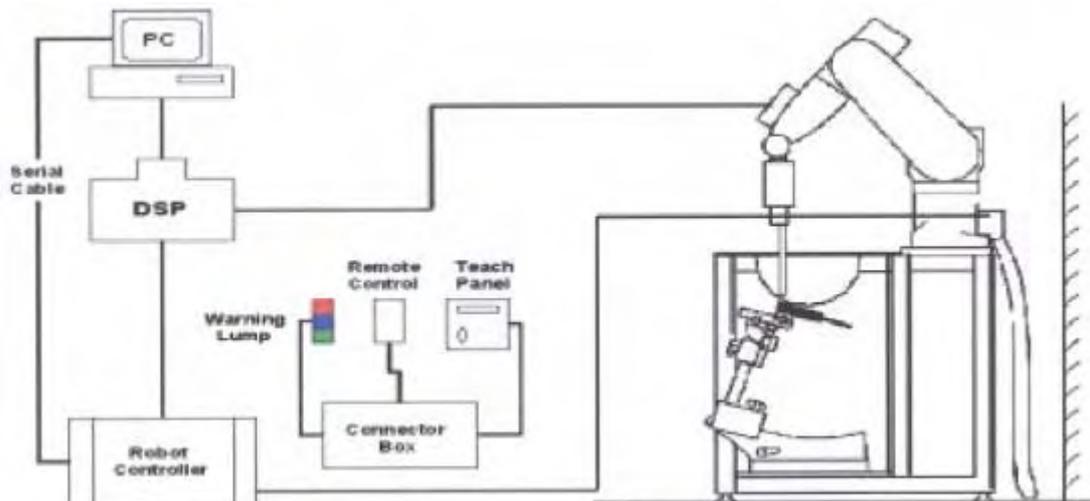


Figure 1 SAR Lab Test Measurement Set-up

3.2. DASY4 E-field Probe System

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

3.2.1. EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	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 μ W/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



Figure 2. EX3DV4 E-field Probe



Figure 3. EX3DV4 E-field probe

3.2.2. E-field Probe Calibration

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

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

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

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

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

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

Where:
 σ = Simulated tissue conductivity,
 ρ = Tissue density (kg/m³).

3.3. Other Test Equipment

3.3.1. Device Holder for Transmitters

The DASY device holder is designed to cope with the die rent positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the inference of the clamp on the test results could thus be lowered.



Figure 4 Device Holder

3.3.2. Phantom

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

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



Figure 5 Generic Twin Phantom

3.4. Scanning Procedure

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

- The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %.
- The “surface check” measurement tests the optical surface detection system of the DASY4 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)
- Area Scan
The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid

spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged.

After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

- Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

- Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY4 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

3.5. Data Storage and Evaluation

3.5.1. Data Storage

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

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

3.5.2. Data Evaluation by SEMCAD

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

Probe parameters:	- Sensitivity	Norm _i , a _{i0} , a _{i1} , a _{i2}
	- Conversion factor	ConvF _i
	- Diode compression point	Dcp _i
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	
	- Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY4 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

$$V_i = U_i + U_i^2 \cdot c f / d c p_i$$

With V_i = compensated signal of channel i (i = x, y, z)

U_i = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcp_i = diode compression point (DASY parameter)

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

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

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

With V_i = compensated signal of channel i (i = x, y, z)

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)²] for E-field Probes

$ConvF$ = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = magnetic field strength of channel i in A/m

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

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

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

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

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

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

σ = conductivity in [mho/m] or [Siemens/m]

ρ = equivalent tissue density in g/cm³

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/cm²

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

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

3.6. System Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulates, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the table 7 and table 8.

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

System check is performed regularly on all frequency bands where tests are performed with the DASY4 system.

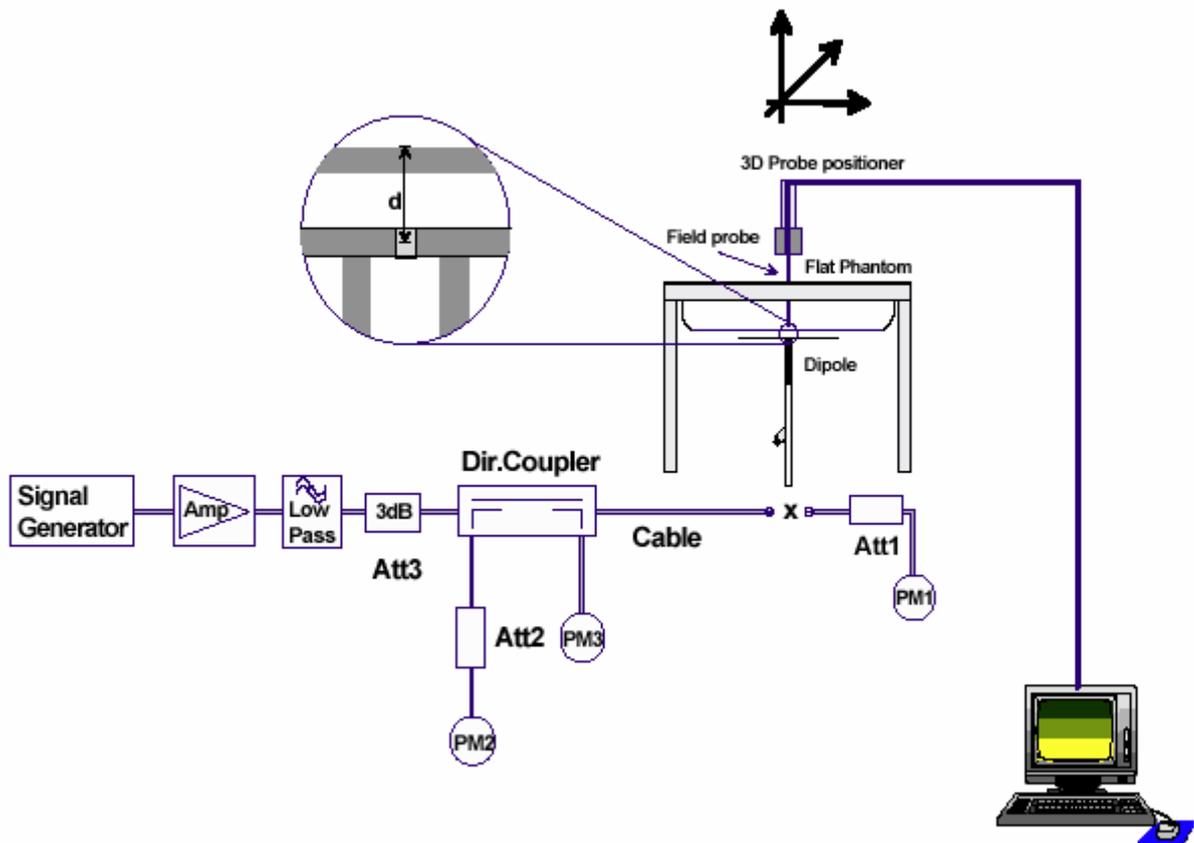


Figure 6 System Check Set-up

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3.7. Equivalent Tissues

The liquid is consisted of water, salt, Glycol, Sugar, Preventol and Cellulose. The liquid has previously been proven to be suited for worst-case. The table 1 and table 2 show the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the OET 65.

Table 1: Composition of the Head Tissue Equivalent Matter

MIXTURE%	FREQUENCY(Brain) 835MHz
Water	41.45
Sugar	56
Salt	1.45
Preventol	0.1
Cellulose	1.0
Dielectric Parameters Target Value	f=835MHz $\epsilon=41.5$ $\sigma=0.9$

MIXTURE%	FREQUENCY(Brain) 1900MHz
Water	55.242
Glycol monobutyl	44.452
Salt	0.306
Dielectric Parameters Target Value	f=1900MHz $\epsilon=40.0$ $\sigma=1.40$

Table 2: Composition of the Body Tissue Equivalent Matter

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

MIXTURE%	FREQUENCY (Body) 1900MHz
Water	69.91
Glycol monobutyl	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1900MHz $\epsilon=53.3$ $\sigma=1.52$

4. Laboratory Environment

Table 3: The Ambient Conditions during Test

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

5. Characteristics of the Test

5.1. Applicable Limit Regulations

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

5.2. Applicable Measurement Standards

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

SUPPLEMENT C Edition 01-01 to OET BULLETIN 65 Edition 97-01 June 2001 including DA 02-1438, published June 2002: Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields Additional Information for Evaluation Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions

6. Conducted Output Power Measurement

6.1. Summary

The DUT is tested using an E5515C communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted power.

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

This result contains conducted output power for the EUT.

6.2. Conducted Power Results

Table 4: Conducted Power Measurement Results(HUAWEI U8800/U8800)

GSM 850		Conducted Power(dBm)				Average power(dBm)			
		Channel 128	Channel 190	Channel 251		Channel 128	Channel 190	Channel 251	
GSM	Before		33.05	33.02	33.03	-9.03dB	24.02	23.99	24
	After		33.04	33.00	33.02	-9.03dB	24.01	23.97	23.99
GPRS (GMSK)	1TXslot	Before	33.02	33.01	33.02	-9.03dB	23.99	23.98	23.99
		After	33.01	33.00	33.01	-9.03dB	23.98	23.97	23.98
	2TXslots	Before	31.09	31.18	31.14	-6.02dB	25.07	25.16	25.12
		After	31.07	31.17	31.13	-6.02dB	25.05	25.15	25.11
EGPRS (GMSK)	1TXslot	Before	33.04	33.02	33.03	-9.03dB	24.01	23.99	24
		After	33.03	33.00	33.02	-9.03dB	24	23.97	23.99
	2TXslots	Before	31.02	31.17	31.12	-6.02dB	25	25.15	25.1
		After	31.00	31.16	31.11	-6.02dB	24.98	25.14	25.09
EGPRS (8PSK)	1TXslot	Before	26.04	26.08	26.43	-9.03dB	17.01	17.05	17.4
		After	26.02	26.07	26.41	-9.03dB	16.99	17.04	17.38
	2TXslots	Before	26.03	26.01	26.38	-6.02dB	20.01	19.99	20.36
		After	26.02	26.00	26.36	-6.02dB	20	19.98	20.34
GSM 1900		Conducted Power(dBm)				Average power(dBm)			
		Channel 512	Channel 661	Channel 810		Channel 512	Channel 661	Channel 810	
GSM	Before		30.07	30.01	30.04	-9.03dB	21.04	20.98	21.01
	After		30.05	30.00	30.03	-9.03dB	21.02	20.97	21
GPRS (GMSK)	1TXslot	Before	30.01	30.03	30.02	-9.03dB	20.98	21	20.99
		After	30.00	30.02	30.01	-9.03dB	20.97	20.99	20.98
	2TXslots	Before	30.06	30.08	30.01	-6.02dB	24.04	24.06	23.99
		After	30.05	30.07	30.00	-6.02dB	24.03	24.05	23.98
EGPRS (GMSK)	1TXslot	Before	30.08	30.02	30.01	-9.03dB	21.05	20.99	20.98
		After	30.06	30.01	30.00	-9.03dB	21.03	20.98	20.97
	2TXslots	Before	30.07	30.05	30.07	-6.02dB	24.05	24.03	24.05

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		After	30.05	30.04	30.06	-6.02dB	24.03	24.02	24.04
EGPRS (8PSK)	1TXslot	Before	25.24	25.43	25.07	-9.03dB	16.21	16.4	16.04
		After	25.22	25.41	25.06	-9.03dB	16.19	16.38	16.03
	2TXslots	Before	25.18	25.37	25.00	-6.02dB	19.16	19.35	18.98
		After	25.17	25.36	24.98	-6.02dB	19.15	19.34	18.96

Table 5: Conducted Power Measurement Results (HUAWEI U8800H/U8800H)

GSM 850		Conducted Power(dBm)				Average power(dBm)			
		Channel 128	Channel 190	Channel 251		Channel 128	Channel 190	Channel 251	
GSM	Before		33.05	33.02	33.03	-9.03dB	24.02	23.99	24
	After		33.03	33.00	33.02	-9.03dB	24.00	23.97	23.99
GPRS (GMSK)	1TXslot	Before	33.02	33.01	33.02	-9.03dB	23.99	23.98	23.99
		After	33.01	33.00	33.01	-9.03dB	23.98	23.97	23.98
	2TXslots	Before	31.09	31.18	31.14	-6.02dB	25.07	25.16	25.12
		After	31.07	31.17	31.13	-6.02dB	25.05	25.15	25.11
EGPRS (GMSK)	1TXslot	Before	33.04	33.02	33.03	-9.03dB	24.01	23.99	24
		After	33.03	33.00	33.02	-9.03dB	24	23.97	23.99
	2TXslots	Before	31.02	31.17	31.12	-6.02dB	25	25.15	25.1
		After	31.00	31.16	31.11	-6.02dB	24.98	25.14	25.09
EGPRS (8PSK)	1TXslot	Before	26.04	26.08	26.43	-9.03dB	17.01	17.05	17.4
		After	26.02	26.07	26.41	-9.03dB	16.99	17.04	17.38
	2TXslots	Before	26.03	26.01	26.38	-6.02dB	20.01	19.99	20.36
		After	26.02	26.00	26.36	-6.02dB	20	19.98	20.34
GSM 1900		Conducted Power(dBm)				Average power(dBm)			
		Channel 512	Channel 661	Channel 810		Channel 512	Channel 661	Channel 810	
GSM	Before		30.07	30.01	30.04	-9.03dB	21.04	20.98	21.01
	After		30.05	30.00	30.03	-9.03dB	21.02	20.97	21
GPRS (GMSK)	1TXslot	Before	30.01	30.03	30.02	-9.03dB	20.98	21	20.99
		After	30.00	30.02	30.01	-9.03dB	20.97	20.99	20.98
	2TXslots	Before	30.06	30.08	30.01	-6.02dB	24.04	24.06	23.99
		After	30.05	30.07	30.00	-6.02dB	24.03	24.05	23.98
EGPRS (GMSK)	1TXslot	Before	30.08	30.02	30.01	-9.03dB	21.05	20.99	20.98
		After	30.06	30.01	30.00	-9.03dB	21.03	20.98	20.97
	2TXslots	Before	30.07	30.05	30.07	-6.02dB	24.05	24.03	24.05
		After	30.05	30.04	30.06	-6.02dB	24.03	24.02	24.04
EGPRS (8PSK)	1TXslot	Before	25.24	25.43	25.07	-9.03dB	16.21	16.4	16.04
		After	25.22	25.41	25.06	-9.03dB	16.19	16.38	16.03
	2TXslots	Before	25.18	25.37	25.00	-6.02dB	19.16	19.35	18.98
		After	25.17	25.36	24.98	-6.02dB	19.15	19.34	18.96

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Note:

1) Division Factors

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

1 TX- slot = 1 transmit time slot out of 8 time slots

=> conducted power divided by (8/1) => -9.03 dB

2 TX- slot = 2 transmit time slots out of 8 time slots

=> conducted power divided by (8/2) => -6.02 dB

2) Average power numbers

The maximum power numbers are marks in bold.

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7. Test Results

7.1. Dielectric Performance

Table 6: Dielectric Performance of Head Tissue Simulating Liquid

Frequency	Description	Dielectric Parameters		Temp ℃
		ϵ_r	σ (s/m)	
835MHz (head)	Target value ± 5% window	41.50 39.43 — 43.58	0.90 0.86 — 0.95	/
	Measurement value 2010-10-9	42.47	0.90	21.5
1900MHz (head)	Target value ±5% window	40.00 38.00 — 42.00	1.40 1.33 — 1.47	/
	Measurement value 2010-10-9	40.39	1.40	21.5

Table 7: Dielectric Performance of Body Tissue Simulating Liquid

Frequency	Description	Dielectric Parameters		Temp ℃
		ϵ_r	σ (s/m)	
835MHz (body)	Target value ±5% window	55.20 52.44 — 57.96	0.97 0.92 — 1.02	/
	Measurement value 2010-10-9	55.38	1.01	21.5
1900MHz (body)	Target value ±5% window	53.30 50.64 — 55.97	1.52 1.44 — 1.60	/
	Measurement value 2010-10-9	51.92	1.53	21.5

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7.2. System Check Results

Table 8: System Check for Head tissue simulation liquid

Frequency	Description	SAR(W/kg)		Dielectric Parameters		Temp
		10g	1g	ϵ_r	σ (s/m)	°C
835MHz	Recommended result ±10% window	1.56 1.40 — 1.72	2.39 2.15 — 2.63	41.2	0.89	/
	Measurement value 2010-10-9	1.61	2.43	42.47	0.90	21.5
1900MHz	Recommended result ±10% window	5.22 4.70 — 5.74	10 9.00 — 11.00	39.5	1.44	/
	Measurement value 2010-10-9	5.35	10.31	40.39	1.40	21.5

Note: 1. the graph results see ANNEX B.

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

Table 9: System Check for Body tissue simulation liquid

Frequency	Description	SAR(W/kg)		Dielectric Parameters		Temp
		10g	1g	ϵ_r	σ (s/m)	°C
835MHz	Recommended result ±10% window	1.63 1.47 — 1.79	2.49 2.24 — 2.74	54.6	0.98	/
	Measurement value 2010-10-9	1.66	2.53	55.38	1.01	21.5
1900 MHz	Recommended result ±10% window	5.52 4.97 — 6.07	10.3 9.27 — 11.33	53.5	1.54	/
	Measurement value 2010-10-9	5.35	10.19	51.92	1.53	21.5

Note: 1. The graph results see ANNEX B.

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

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7.3. Summary of Measurement Results

7.3.1. GSM 850 (GPRS/EGPRS)

Table 10: SAR Values [GSM 850 (GPRS/EGPRS), HUAWEI U8800/U8800]

Limit of SAR		10 g Average	1 g Average	Power Drift	Graph Results
		2.0 W/kg	1.6 W/kg	± 0.21 dB	
Test Case		Measurement Result(W/kg)		Power Drift	
Different Test Position	Channel	10 g Average	1 g Average	(dB)	
Test Position of Head					
Left Hand, Touch Cheek	High	0.234	0.307	0.023	/
	Middle	0.234	0.307	0.042	/
	Low	0.168	0.223	0.155	/
Left Hand, Tilt 15 Degree	Middle	0.153	0.200	-0.053	/
Right Hand, Touch Cheek	Middle	0.202	0.260	0.018	/
Right Hand, Tilt 15 Degree	Middle	0.159	0.207	-0.144	/
Test Position of Body (Distance 15mm)					
Towards Ground	High	0.360	0.483	-0.046	/
	Middle	0.380	0.509	-0.027	/
	Low	0.331	0.440	0.032	/
Towards Phantom	Middle	0.235	0.309	-0.084	/
Worst Case Position of Body with Earphone					
Towards Ground	Middle	0.292	0.390	-0.050	/
Test Position of Body with GPRS (2Up, Distance 15mm)					
Towards Ground	High	0.568(max.cube)	0.764(max.cube)	-0.080	/
	Middle	0.551(max.cube)	0.735(max.cube)	-0.033	/
	Low	0.433(max.cube)	0.580(max.cube)	-0.044	/
Towards Phantom	Middle	0.336	0.447	0.083	/
Worst Case Position of Body with EGPRS (GMSK, 2Up, Distance 15mm)					
Towards Ground	High	0.550	0.735	-0.190	/

Note: 1. Upper and lower frequencies were measured at the worst position.

2. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit (< 0.8W/kg), testing at the high and low channels is optional.
3. The (max.cube) labeling indicates that during the grid scanning an additional peak was found which was within 2.0dB of the highest peak. The value of the highest cube is given in the table above; the value from the second assessed cube is given in the SAR distribution plots (See ANNEX C).
4. 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.

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Table 11: Extrapolated SAR Values of highest measured SAR [GSM 850 (GPRS/EGPRS), HUAWEI U8800/U8800]

Limit of SAR		Conducted Power	1g Average		Tune-up procedures MAX Power(dBm)	1g Average
			1.6 W/kg			1.6
Test Case		Measurement Result (dBm)	Measurement Result (W/kg)	Extrapolated Result (W/kg)		
Test Position	Channel					
GSM						
Towards Ground	Middle	33.02	0.509	33.90	0.623	
GPRS (2Up)						
Towards Ground	High	31.14	0.764	31.90	0.910	
EGPRS (GMSK, 2Up)						
Towards Ground	High	31.12	0.735	31.90	0.880	

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Table 12: SAR Values [GSM 850 (GPRS/EGPRS), HUAWEI U8800H/U8800H]

Limit of SAR		10 g Average	1 g Average	Power Drift	Graph Results
		2.0 W/kg	1.6 W/kg	± 0.21 dB	
Test Case		Measurement Result(W/kg)		Power Drift (dB)	
Test Position	Channel	10 g Average	1 g Average		
Worst case position of Head of HUAWEI U8800/U8800 with HUAWEI U8800H/U8800H					
Left Touch Cheek	High	0.202	0.264	-0.036	Figure 11
Worst case position of Body of HUAWEI U8800/U8800 with HUAWEI U8800H/U8800H					
Towards Ground	High	0.534	0.734	-0.116	Figure 12

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

2.Data taken from HUAWEI U8800/U8800 for HUAWEI U8800H/U8800H/FCC ID:QISU8800.

Table 13: Extrapolated SAR Values of highest measured SAR [GSM 850 (GPRS/EGPRS), HUAWEI U8800H/U8800H]

Limit of SAR		Conducted Power	1g Average	Tune-up procedures MAX Power(dBm)	1g Average
			1.6 W/kg		1.6
Test Case		Measurement Result (dBm)	Measurement Result (W/kg)		Extrapolated Result (W/kg)
Test Position	Channel				
GSM					
Left Touch Cheek	High	33.03	0.264	33.9	0.323
GPRS (2Up)					
Towards Ground	High	31.14	0.734	31.9	0.874

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7.3.2. GSM 1900 (GPRS/EGPRS)

Table 14: SAR Values [GSM 1900 (GPRS/EGPRS), HUAWEI U8800/U8800]

Limit of SAR		10 g Average	1 g Average	Power Drift	Graph Results
		2.0 W/kg	1.6 W/kg	± 0.21 dB	
Test Case		Measurement Result(W/kg)		Power Drift	
Different Test Position	Channel	10 g Average	1 g Average	(dB)	
Test Position of Head					
Left Hand, Touch Cheek	Middle	0.182	0.277	0.084	/
Left Hand, Tilt 15 Degree	Middle	0.066	0.104	-0.007	/
Right Hand, Touch Cheek	High	0.147	0.235	-0.103	/
	Middle	0.175	0.279	-0.114	/
	Low	0.210	0.329	0.164	/
Right Hand, Tilt 15 Degree	Middle	0.083	0.131	-0.064	/
Test Position of Body (Distance 15mm)					
Towards Ground	High	0.180	0.310	0.038	/
	Middle	0.221	0.381	-0.038	/
	Low	0.248	0.424	0.037	/
Towards Phantom	Middle	0.125	0.203	0.045	/
Worst Case Position of Body with Earphone					
Towards Ground	Low	0.246	0.419	-0.006	/
Test Position of Body with GPRS (2Up, Distance 15mm)					
Towards Ground	High	0.327	0.558	-0.151	/
	Middle	0.404	0.686	-0.032	/
	Low	0.455	0.773	-0.154	/
Towards Phantom	Middle	0.229	0.372	0.174	/
Worst Case Position of Body with EGPRS (GMSK, 2Up, Distance 15mm)					
Towards Ground	Low	0.454	0.767	-0.008	/

Note: 1. The value with blue color 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 ($< 0.8W/kg$), testing at the high and low channels is optional.
4. 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.

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Table 15: Extrapolated SAR Values of highest measured SAR [GSM 1900 (GPRS/EGPRS), HUAWEI U8800/U8800]

Limit of SAR		Conducted Power	1g Average	Tune-up procedures MAX Power(dBm)	1g Average
			1.6 W/kg		1.6
Test Case		Measurement Result (dBm)	Measurement Result (W/kg)		Extrapolated Result (W/kg)
Test Position	Channel				
GSM					
Towards Ground	Low	30.07	0.424	31.2	0.550
GPRS (2Up)					
Towards Ground	Low	30.06	0.773	31.2	1.005
EGPRS (GMSK, 2Up)					
Towards Ground	Low	30.07	0.767	31.2	0.995

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Table 16: SAR Values [GSM 1900 (GPRS/EGPRS), HUAWEI U8800H/U8800H]

Limit of SAR		10 g Average	1 g Average	Power Drift	Graph Results
		2.0 W/kg	1.6 W/kg	± 0.21 dB	
Test Case		Measurement Result(W/kg)		Power Drift (dB)	
Test Position	Channel	10 g Average	1 g Average		
Worst case position of Head of HUAWEI U8800/U8800 with HUAWEI U8800H/U8800H					
Right Touch Cheek	Low	0.209	0.340	-0.002	Figure 13
Worst case position of Body of HUAWEI U8800/U8800 with HUAWEI U8800H/U8800H					
Towards Ground	Low	0.474	0.790	0.092	Figure 14

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

2.Data taken from HUAWEI U8800/U8800 for HUAWEI U8800H/U8800H/FCC ID:QISU8800.

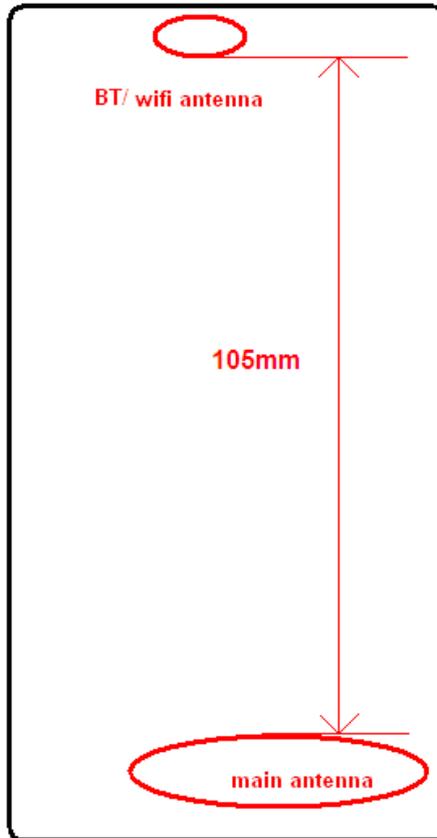
Table 17: Extrapolated SAR Values of highest measured SAR [GSM 1900 (GPRS/EGPRS), HUAWEI U8800H/U8800H]

Limit of SAR		Conducted Power	1g Average	Tune-up procedures MAX Power(dBm)	1g Average
			1.6 W/kg		1.6
Test Case		Measurement Result (dBm)	Measurement Result (W/kg)		Extrapolated Result (W/kg)
Test Position	Channel				
GSM					
Towards Ground	Low	30.07	0.340	31.2	0.441
GPRS (2Up)					
Towards Ground	Low	30.06	0.790	31.2	1.027

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7.3.3. Bluetooth/WiFi functions

The distance between BT/WIFI antenna and main antenna is 10.5cm>5cm. The location of the antennas inside mobile phone is shown (ANNEX H):



The output power of BT antenna is as following:

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz
Test result (dBm)	3.54	1.73	2.45

The output power of WIFI antenna is as following:

Mode	Channel	Data rate (Mbps)	AV Power (dBm)	PK Power (dBm)
11b	1	1	11.92	15.01
		2	11.84	14.87
		5.5	11.94	15.02
		13	11.86	14.89
	6	1	13.53	16.56
		2	13.58	16.62
		5.5	13.58	16.81
		13	13.76	16.85
	11	1	13.15	16.32

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		2	13.19	16.23	
		5.5	13.43	16.58	
		13	13.74	16.73	
11g	1	7	8.39	16.42	
		9	8.54	16.57	
		12	8.62	16.76	
		18	8.67	16.75	
		24	8.83	16.86	
		37	8.16	16.18	
		48	8.58	16.64	
		54	8.28	16.38	
		6	7	11.81	19.86
	9		11.43	19.59	
	12		11.25	19.53	
	18		11.72	19.78	
	24		11.43	19.81	
	37		11.83	19.92	
	48		11.40	19.49	
	54		11.68	19.86	
	11	7	11.49	19.51	
		9	11.16	19.27	
		12	11.56	19.74	
		18	11.43	19.75	
		24	11.37	19.59	
		37	11.74	19.83	
		48	11.71	19.76	
		54	11.54	19.92	
	11n HT20	1	7.5	7.74	15.87
			13	7.78	15.89
			19.5	7.62	15.84
27			7.95	15.98	
39			7.81	15.91	
52			7.46	15.50	
58.5			7.64	15.69	
75			7.73	15.76	
6		7.5	10.25	18.57	
		13	10.56	18.65	
		19.5	10.49	18.54	
		27	10.58	18.59	
		39	10.51	18.64	
		52	10.43	18.54	
		58.5	10.56	18.84	
75	10.56	18.62			

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	11	7.5	9.72	17.85
		13	9.27	17.53
		19.5	9.81	17.83
		27	9.43	17.64
		39	9.67	17.81
		52	9.47	17.57
		58.5	9.43	17.44
		75	9.47	17.59

Stand-alone SAR

According to the output power measurement result and the distance between BT/wifi antenna and main antenna we can draw the conclusion that:

stand-alone SAR are not required for BT, because the output power of BT transmitter is $\leq 2P_{Ref}$ and its antenna is $\geq 5\text{cm}$ from other antenna.

stand-alone SAR are not required for wifi, because the output power of wifi transmitter is $\leq 2P_{Ref}$ and its antenna is $\geq 5\text{cm}$ from other antenna.

Simultaneous SAR

About BT and main antenna, because stand-alone SAR are not required for BT and its antenna is $\geq 5\text{cm}$ from other antenna, so Simultaneous SAR are not required for BT and main antenna.

About wifi and main antenna, because stand-alone SAR are not required for wifi and its antenna is $\geq 5\text{cm}$ from other antenna, so Simultaneous SAR are not required for wifi and main antenna.

About BT and WiFi can't simultaneous transmit.

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8. Measurement Uncertainty

No.	source	Type	Uncertainty Value (%)	Probability Distribution	k	c _i	Standard uncertainty u _i (%)	Degree of freedom V _{eff} or v _i
1	System repetivity	A	0.5	N	1	1	0.5	9
Measurement system								
2	probe calibration	B	5.9	N	1	1	5.9	∞
3	axial isotropy of the probe	B	4.7	R	$\sqrt{3}$	$\sqrt{0.5}$	1.9	∞
4	Hemispherical isotropy of the probe	B	9.4	R	$\sqrt{3}$	$\sqrt{0.5}$	3.9	∞
6	boundary effect	B	1.9	R	$\sqrt{3}$	1	1.1	∞
7	probe linearity	B	4.7	R	$\sqrt{3}$	1	2.7	∞
8	System detection limits	B	1.0	R	$\sqrt{3}$	1	0.6	∞
9	readout Electronics	B	1.0	N	1	1	1.0	∞
10	response time	B	0	R	$\sqrt{3}$	1	0	∞
11	integration time	B	4.32	R	$\sqrt{3}$	1	2.5	∞
12	noise	B	0	R	$\sqrt{3}$	1	0	∞
13	RF Ambient Conditions	B	3	R	$\sqrt{3}$	1	1.73	∞
14	Probe Positioner Mechanical Tolerance	B	0.4	R	$\sqrt{3}$	1	0.2	∞
15	Probe Positioning with respect to Phantom Shell	B	2.9	R	$\sqrt{3}$	1	1.7	∞
16	Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	B	3.9	R	$\sqrt{3}$	1	2.3	∞
Test sample Related								
17	-Test Sample Positioning	A	2.9	N	1	1	2.9	5
18	-Device Holder Uncertainty	A	4.1	N	1	1	4.1	5
19	-Output Power Variation - SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.9	∞
Physical parameter								

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20	-phantom	B	4.0	R	$\sqrt{3}$	1	2.3	∞
21	-liquid conductivity (deviation from target)	B	5.0	R	$\sqrt{3}$	$\frac{0.6}{4}$	1.8	∞
22	-liquid conductivity (measurement uncertainty)	B	5.0	N	1	$\frac{0.6}{4}$	3.2	∞
23	-liquid permittivity (deviation from target)	B	5.0	R	$\sqrt{3}$	0.6	1.7	∞
24	-liquid permittivity (measurement uncertainty)	B	5.0	N	1	0.6	3.0	∞
Combined standard uncertainty		$u_c = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$					12.0	
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$		N	k=2		24.0	

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9. Main Test Instruments

Table 18: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	Agilent 8753E	US37390326	September 13, 2010	One year
02	Dielectric Probe Kit	Agilent 85070E	US44020115	No Calibration Requested	
03	Power meter	Agilent E4417A	GB41291714	March 13, 2010	One year
04	Power sensor	Agilent 8481H	MY41091316	March 26, 2010	One year
05	Signal Generator	HP 8341B	2730A00804	September 13, 2010	One year
06	Amplifier	IXA-020	0401	No Calibration Requested	
07	BTS	E5515C	MY48360988	December 4, 2009	One year
08	E-field Probe	EX3DV4	3661	December 30, 2009	One year
09	DAE	DAE4	871	November 11, 2009	One year
10	Validation Kit 835MHz	D835V2	4d092	January 14, 2010	One year
11	Validation Kit 1900MHz	D1900V2	5d018	June 15, 2010	One year

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

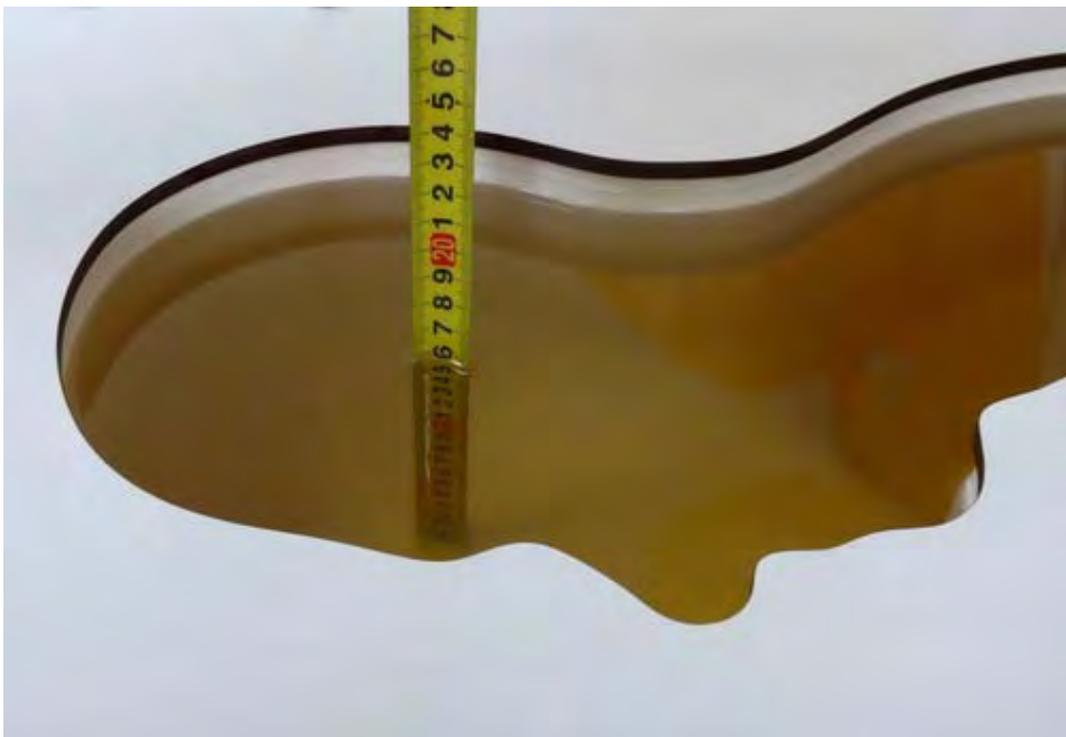
ANNEX A: Test Layout



Picture 1: Specific Absorption Rate Test Layout



Picture 2: Liquid depth in the flat Phantom (835MHz, 15.4cm depth)



Picture 3: Liquid depth in the head Phantom (835MHz, 15.4cm depth)



Picture 4: Liquid depth in the flat Phantom (1900 MHz, 15.2cm depth)



Picture 5: liquid depth in the head Phantom (1900 MHz, 15.2cm depth)

ANNEX B: System Check Results

System Performance Check at 835 MHz Head TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d092

Date/Time: 10/9/2010 8:23:13 AM

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

Medium parameters used: $f = 835$ MHz; $\sigma = 0.90$ mho/m; $\epsilon_r = 42.47$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3661; ConvF(9.34, 9.34, 9.34); Calibrated: 12/30/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.56 mW/g

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

Reference Value = 51.1 V/m; Power Drift = -0.039 dB

Peak SAR (extrapolated) = 3.54 W/kg

SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.61 mW/g

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

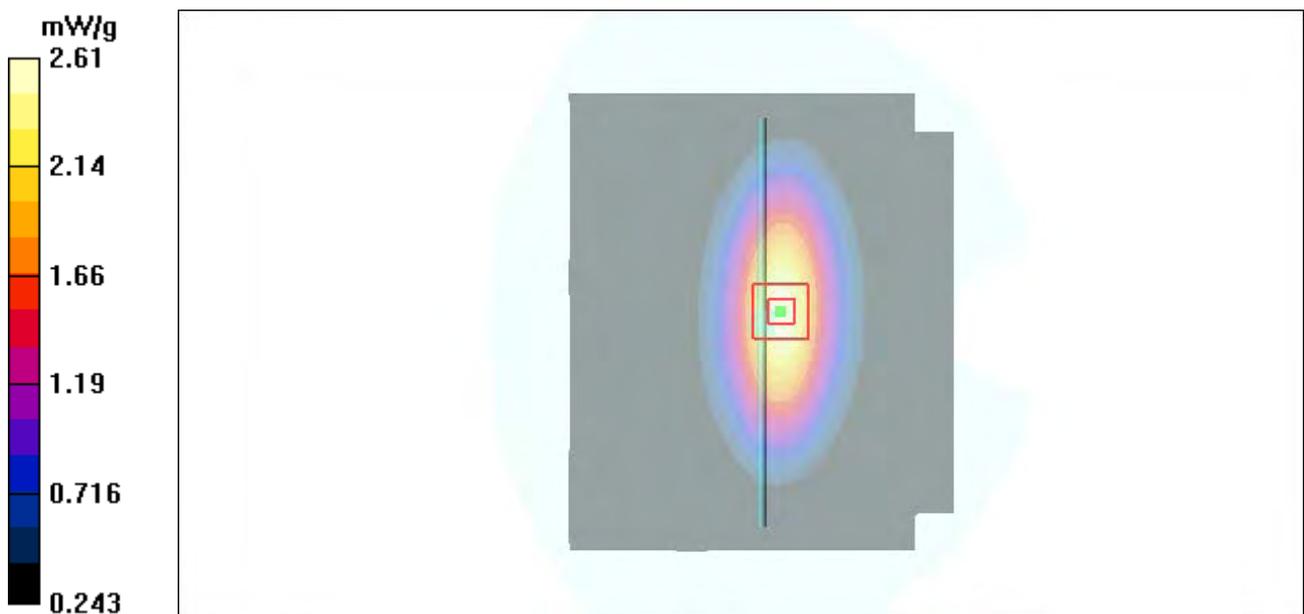


Figure 7 System Performance Check 835MHz 250mW

System Performance Check at 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d092

Date/Time: 10/9/2010 11:21:20 AM

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

Medium parameters used: $f = 835$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 55.38$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3661; ConvF(9.24, 9.24, 9.24); Calibrated: 12/30/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (61x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.72 mW/g

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

Reference Value = 50.9 V/m; Power Drift = 0.014 dB

Peak SAR (extrapolated) = 3.63 W/kg

SAR(1 g) = 2.53 mW/g; SAR(10 g) = 1.66 mW/g

Maximum value of SAR (measured) = 2.73 mW/g

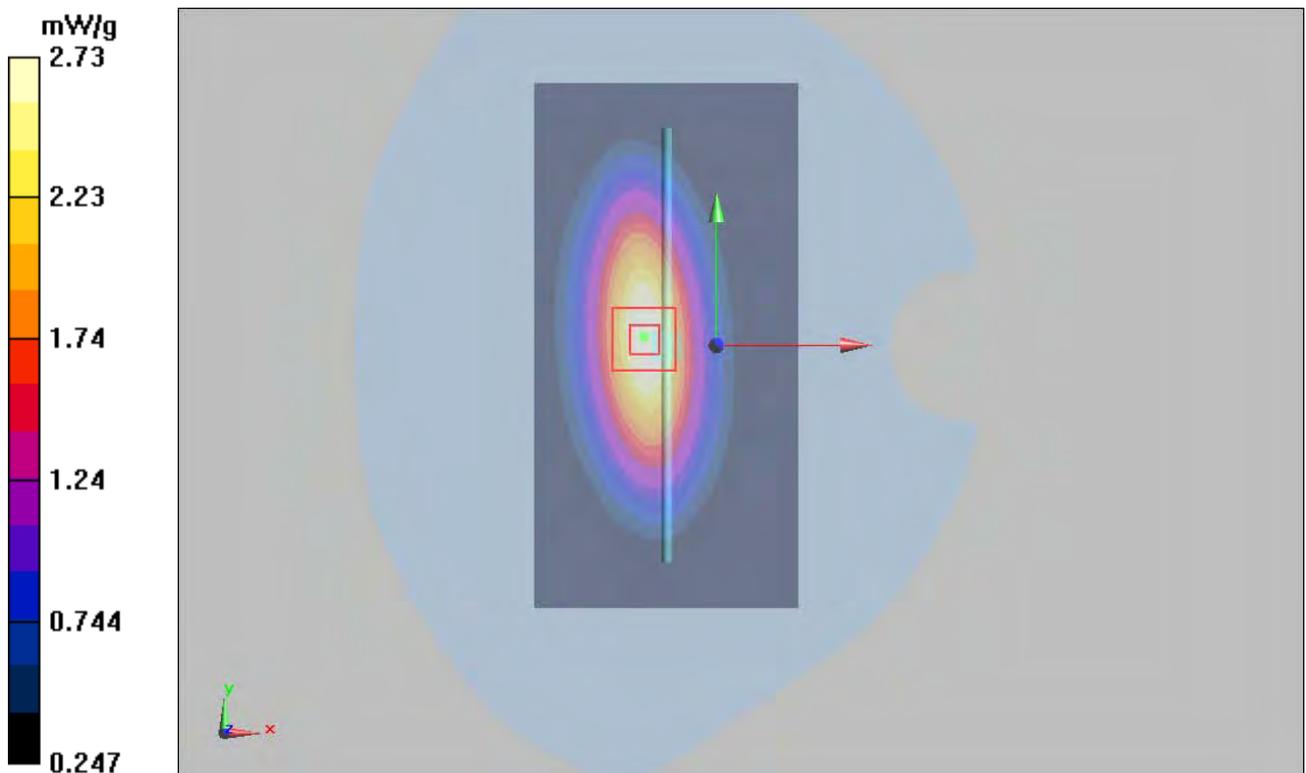


Figure 8 System Performance Check 835MHz 250mW

System Performance Check at 1900 MHz Head TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d018

Date/Time: 10/9/2010 9:01:34 PM

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.40$ mho/m; $\epsilon_r = 40.39$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3661; ConvF(7.77, 7.77, 7.77); Calibrated: 12/30/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 12.7 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.0 V/m; Power Drift = -0.054 dB

Peak SAR (extrapolated) = 18.9 W/kg

SAR(1 g) = 10.31 mW/g; SAR(10 g) = 5.35 mW/g

Maximum value of SAR (measured) = 11.5 mW/g

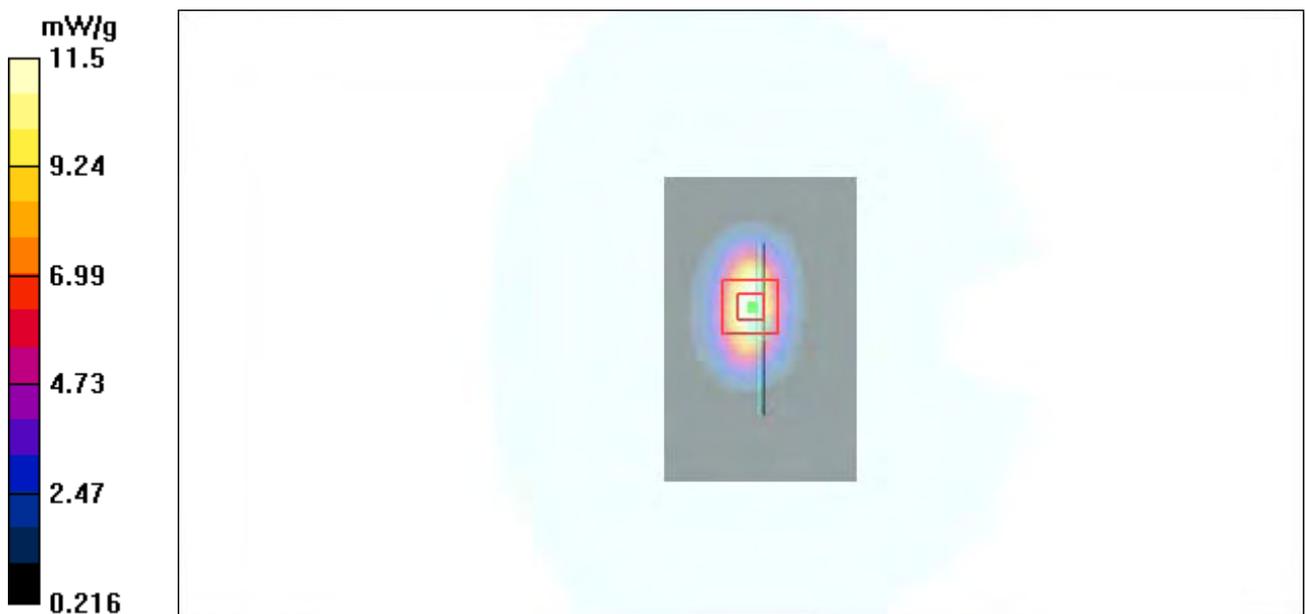


Figure 9 System Performance Check 1900MHz 250mW

System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d018

Date/Time: 10/9/2010 3:34:19 PM

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 51.92$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3661; ConvF(7.60, 7.60, 7.60); Calibrated: 12/30/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

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

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 80.8 V/m; Power Drift = -0.063 dB

Peak SAR (extrapolated) = 17.6 W/kg

SAR(1 g) = 10.19 mW/g; SAR(10 g) = 5.35 mW/g

Maximum value of SAR (measured) = 11 mW/g

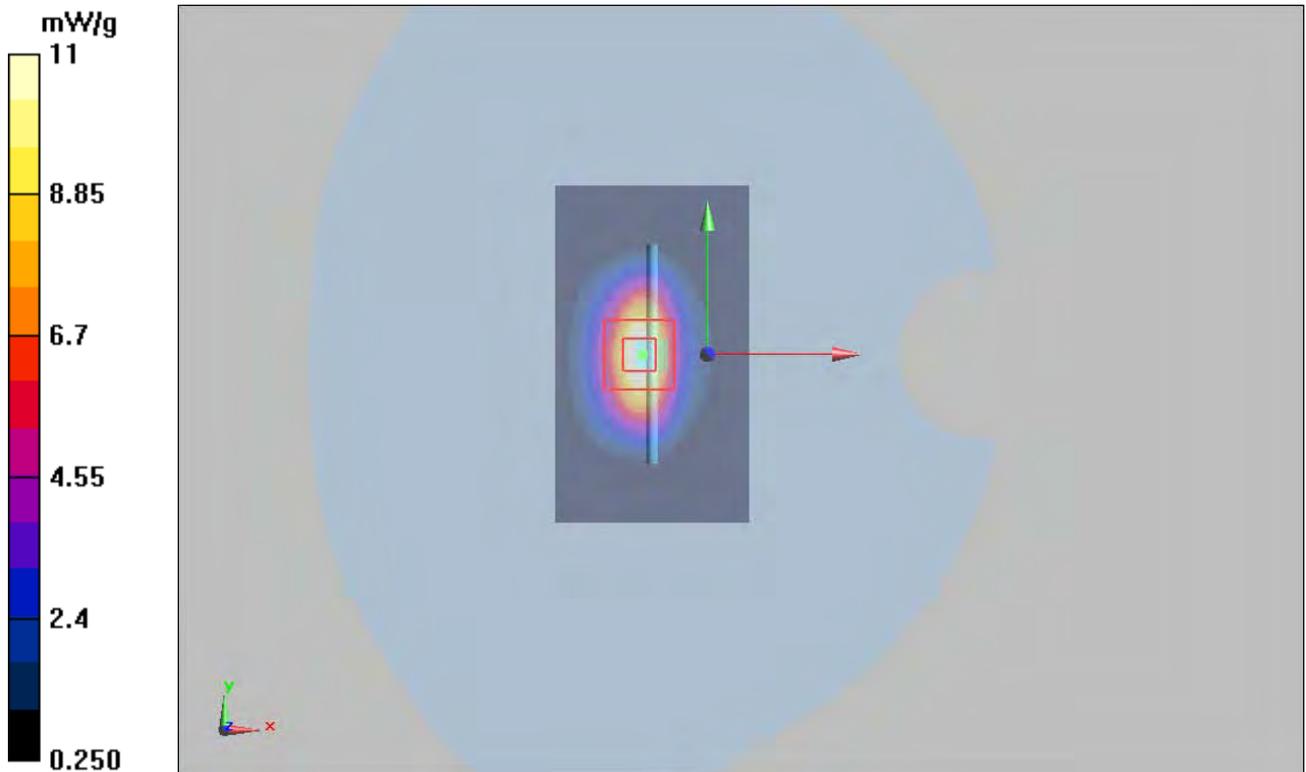


Figure 10 System Performance Check 1900MHz 250mW

ANNEX C: Graph Results

GSM 850 Left Cheek High

Date/Time: 10/9/2010 9:43:03 AM

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

Medium parameters used: $f = 849$ MHz; $\sigma = 0.917$ mho/m; $\epsilon_r = 42.3$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Left Section

DASY4 Configuration:

Probe: EX3DV4 - SN3661; ConvF(9.34, 9.34, 9.34); Calibrated: 12/30/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Cheek High/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.279 mW/g

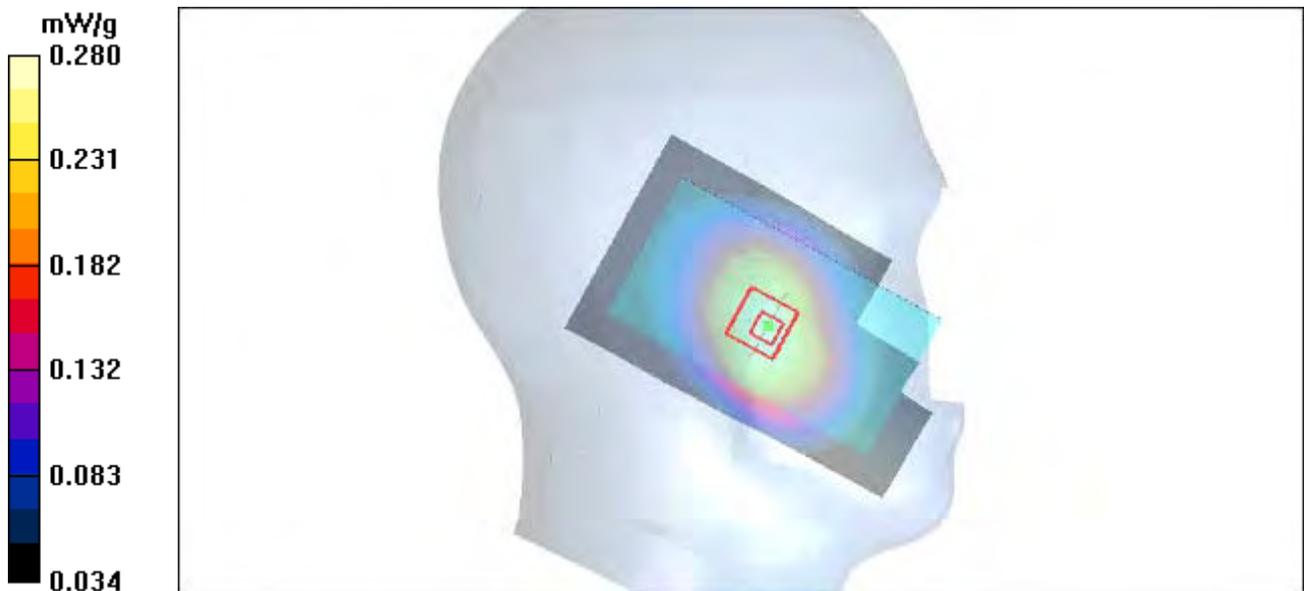
Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.25 V/m; Power Drift = -0.036 dB

Peak SAR (extrapolated) = 0.324 W/kg

SAR(1 g) = 0.264 mW/g; SAR(10 g) = 0.202 mW/g

Maximum value of SAR (measured) = 0.280 mW/g



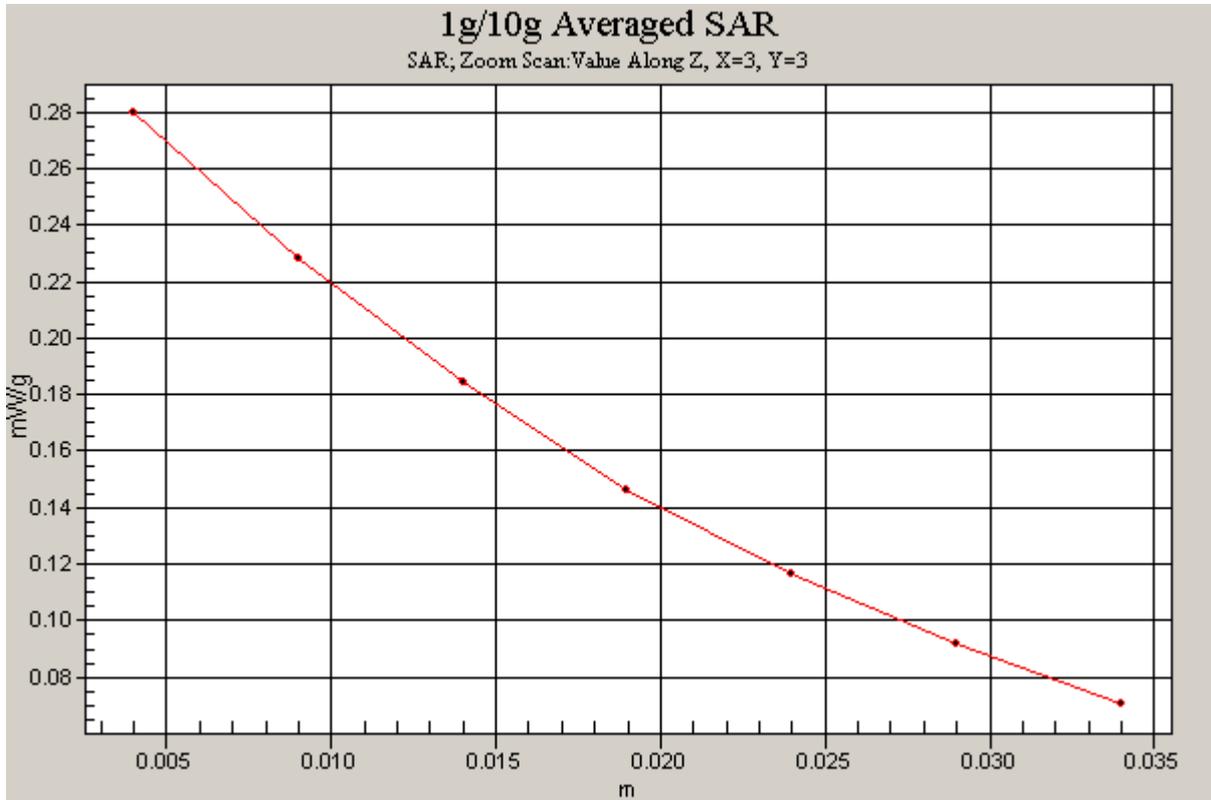


Figure 11 Left Hand Touch Cheek GSM 850 Channel 251

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GSM 850 GPRS (2Up) Towards Ground High

Date/Time: 10/9/2010 12:36:40 PM

Communication System: GSM850 + GPRS(2Up); Frequency: 848.8 MHz;Duty Cycle: 1:4.15

Medium parameters used: $f = 849$ MHz; $\sigma = 1.02$ mho/m; $\epsilon_r = 55.2$; $\rho = 1000$ kg/m³

Ambient Temperature:22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3661; ConvF(9.24, 9.24, 9.24); Calibrated: 12/30/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

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

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Towards Ground High /Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.778 mW/g

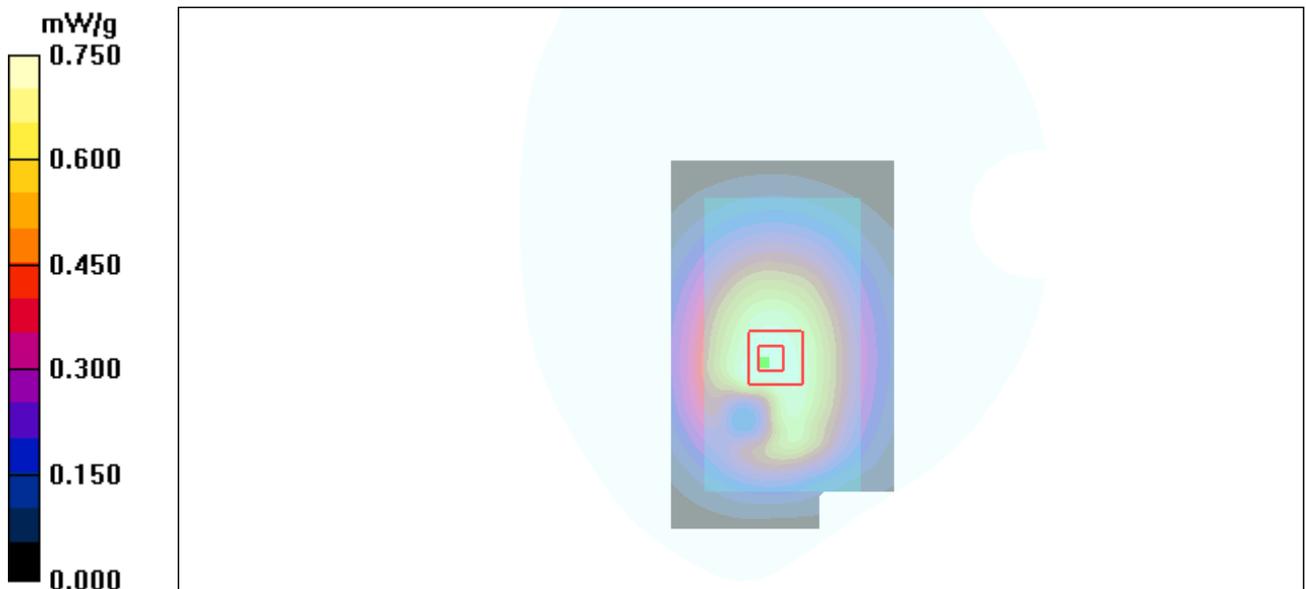
Towards Ground High /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.2 V/m; Power Drift = -0.116 dB

Peak SAR (extrapolated) = 1.72 W/kg

SAR(1 g) = 0.734 mW/g; SAR(10 g) = 0.534 mW/g

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



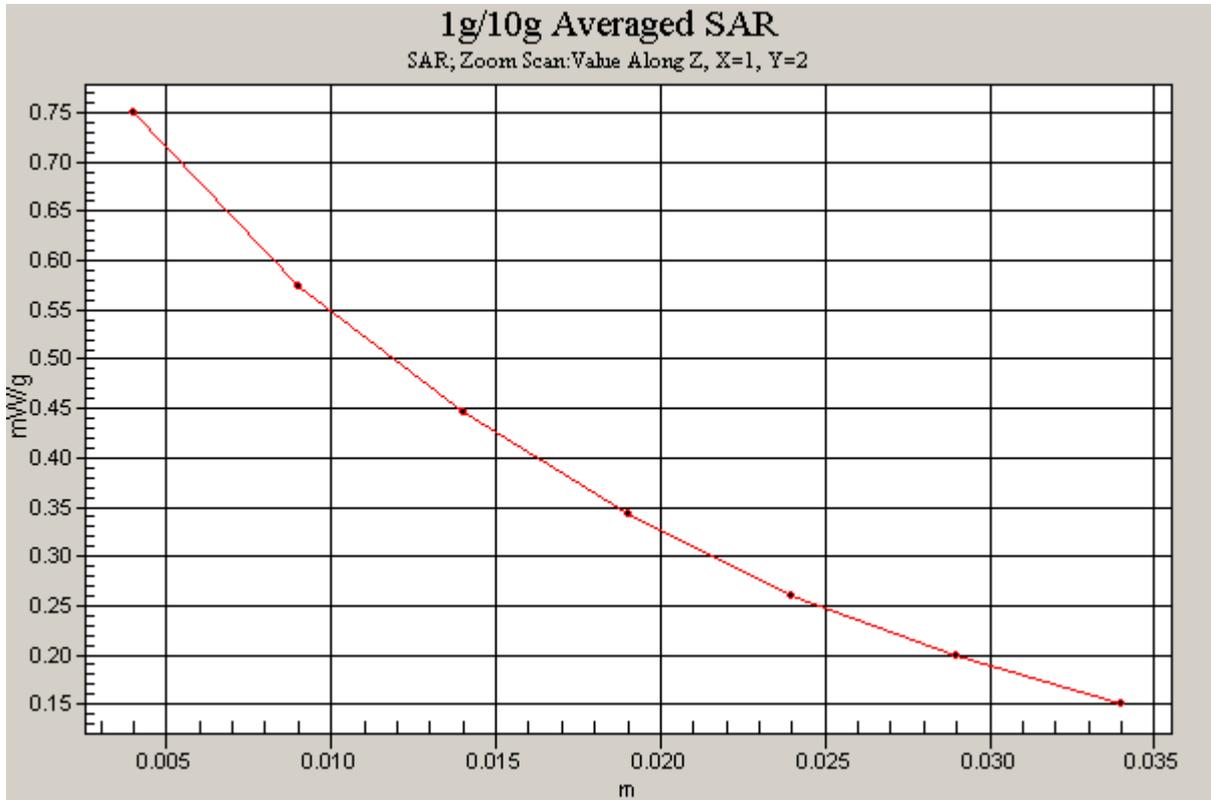


Figure 12 Body, Towards Ground, GSM 850 GPRS (2Up) Channel 251

GSM 1900 Right Cheek Low

Date/Time: 10/9/2010 10:19:21 PM

Communication System: PCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.36$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Right Section

DASY4 Configuration:

Probe: EX3DV4 - SN3661; ConvF(7.77, 7.77, 7.77); Calibrated: 12/30/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Cheek Low/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.369 mW/g

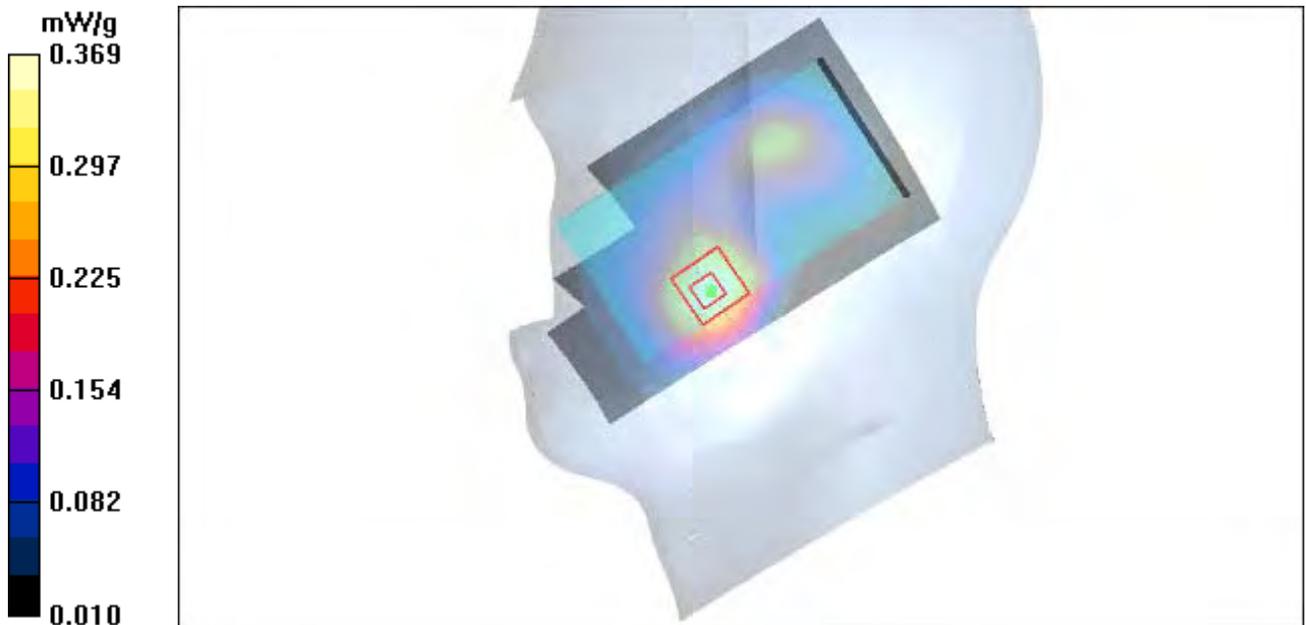
Cheek Low /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.2 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 0.526 W/kg

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

Maximum value of SAR (measured) = 0.369 mW/g



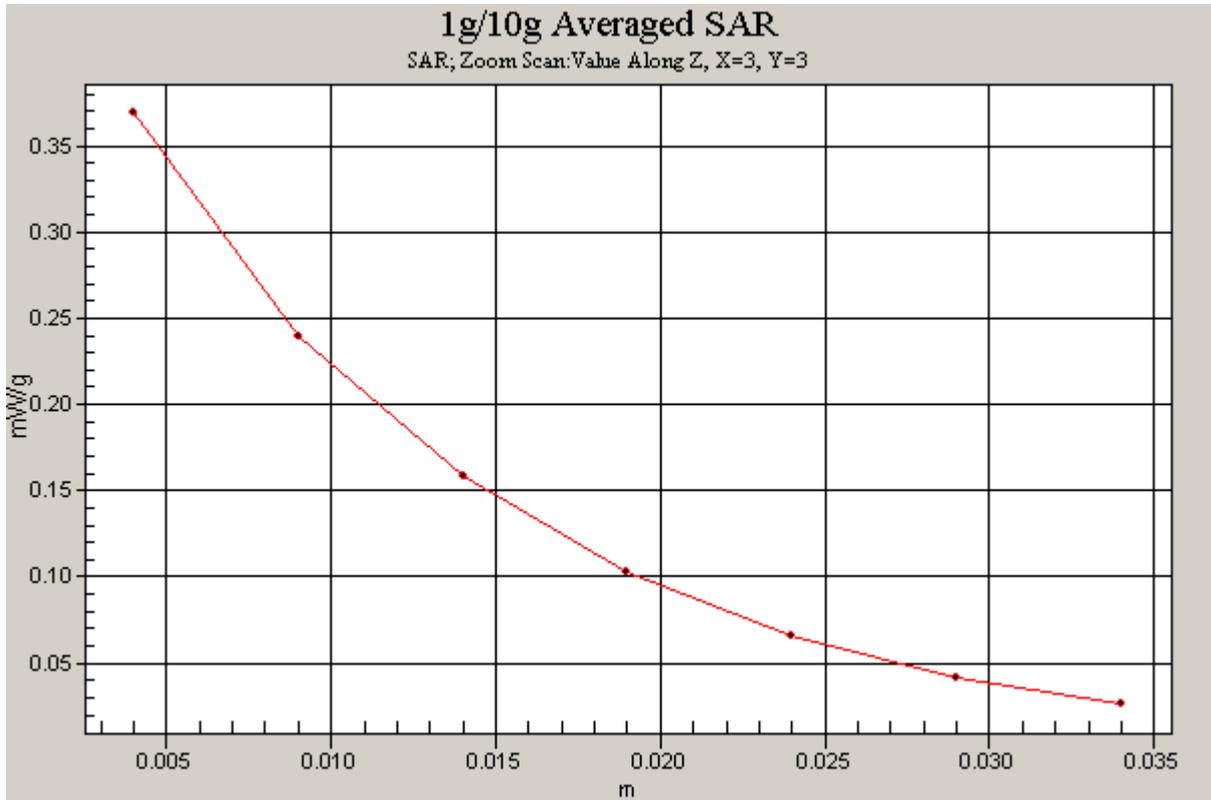


Figure 13 Right Hand Touch Cheek GSM 1900 Channel 512

GSM 1900 GPRS (2Up) Towards Ground Low

Date/Time: 10/9/2010 4:54:42 PM

Communication System: PCS 1900+GPRS(2Up); Frequency: 1850.2 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3661; ConvF(7.60, 7.60, 7.60); Calibrated: 12/30/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM000 T01; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Towards Ground Low/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.785 mW/g

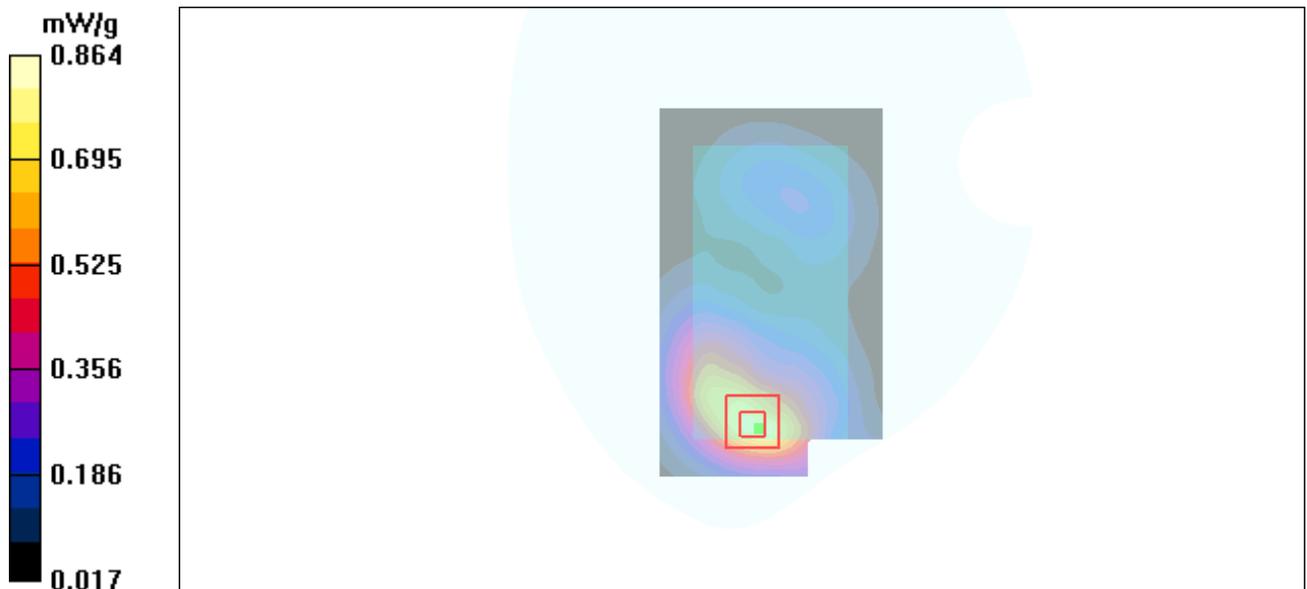
Towards Ground Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.3 V/m; Power Drift = 0.092 dB

Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.790 mW/g; SAR(10 g) = 0.474 mW/g

Maximum value of SAR (measured) = 0.864 mW/g



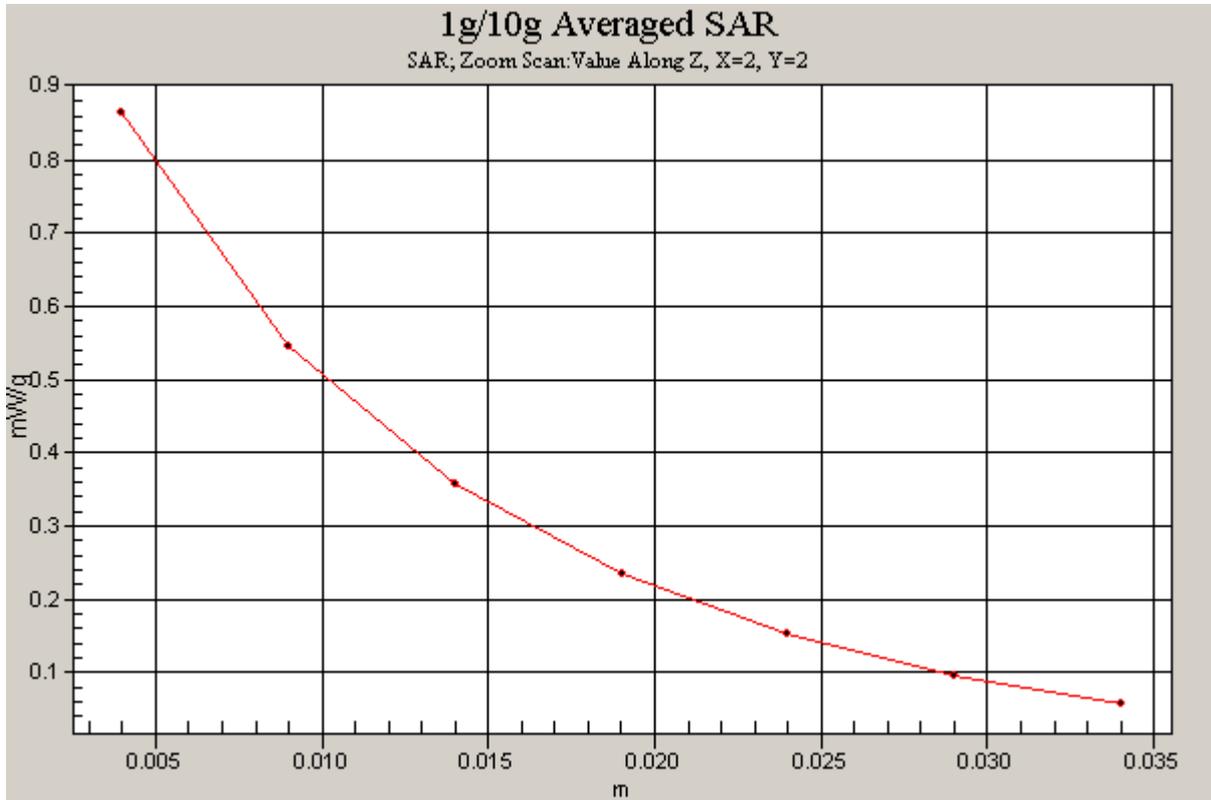


Figure 14 Body, Towards Ground, GSM 1900 GPRS (2Up) Channel 512

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ANNEX D: Probe Calibration Certificate

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



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

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Auden**

Certificate No: **EX3-3661_Dec09**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3661**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2
Calibration procedure for dosimetric E-field probes**

Calibration date: **December 30, 2009**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 880	29-Sep-08 (No. DAE4-880_Sep08)	Sep-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-09 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

Calibrated by:	Name Katja Pokovic	Function Technical Manager	Signature 
Approved by:	Name Niels Kuster	Quality Manager	

Issued: December 30, 2009

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

TA Technology (Shanghai) Co., Ltd.

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



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

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: In a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

EX3DV4 SN:3661

December 30, 2009

Probe EX3DV4

SN:3661

Manufactured:	October 20, 2008
Calibrated:	December 30, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

TA Technology (Shanghai) Co., Ltd.

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DASY - Parameters of Probe: EX3DV4 SN:3661

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.46	0.52	0.48	± 10.1%
DCP (mV) ^B	89.4	91.4	90.5	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	± 1.5%
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter; uncertainty not required.

^E Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value.