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Accredited testing laboratory

CNAS Registration number: L0310

**Report On SAR Test of
HUAWEI IDEOS SERIES; cdma2000 Digital Mobile Phone; IDEOS
M/N: HUAWEI C8150-1**

Test report no. : SYBH(Z-SAR)034052011-2
Type identification: HUAWEI C8150-1
FCC ID : QISC8150-1
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 item(s) tested , 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 device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits 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, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003 and FCC OET Bulletin 65 Supplement.

Test engineer:

2011-05-05 Gao Weiqiang *Gao Weiqiang*

Date	Name	Signature
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Reviewed by:

2011-05-05 Alvin Way *Alvinway*

Date	Name	Signature
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Approved by:

2011-05-05 Liu Chunlin *Liu Chunlin*

Date	Name	Signature
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1.2 Testing laboratory

Lab Name: Global Compliance & Testing Center (GCTC) of Huawei Technologies Co., Ltd.
Sub-lab Name: SAR Lab of Terminal Reliability Lab
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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

1.4 Application details

Date of receipt of application:	2011-05-03
Date of receipt of test item:	2011-05-03
Start/Date of test:	2011-05-04
End of test:	2011-05-05

1.5 Test item

Device Information:			
DUT Name:	HUAWEI IDEOS SERIES; cdma2000 Digital Mobile Phone; IDEOS		
Type Identification:	HUAWEI C8150-1		
FCC ID :	QISC8150-1		
SN:	1M2AA11060500235		
Device Type :	portable device		
Exposure Category:	uncontrolled environment / general population		
Test device Production Information	production unit		
Device Operating Configurations:			
Operating Mode(s)	CDMA Cellular;(tested) Bluetooth;WiFi;		
Test Modulation	QPSK		
Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	CDMA 800	824.7 ~ 848.31	869.7 ~ 893.31
Power Class :	Tested with power control all up bits (CDMA 800)		
Test Channels (low-mid-high) :	1013-384-777 (CDMA 800)		
Hardware Version :	HC1C815M		
Software Version :	C8150-1V100R001C179B825		
Antenna Type :	Integrated antenna		
Accessories/Body-worn Configurations:	Stereo headset		
Battery Options :	Huawei Technologies Co., Ltd. Rechargeable Li-ion Battery Model: HB4J1H ; Rated capacity: 1200mAh Nominal Voltage: --- +3.7V; Charging Voltage: --- +4.2V S/N: UNHA601XA2200696		

Table 1: Device information and operating configurations

1.6 EUT Description

HUAWEI IDEOS SERIES; cdma2000 Digital Mobile Phone; IDEOS — HUAWEI C8150-1 is subscriber equipment in the CDMA/EVDO system. The frequency band is US Cellular, it can be included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, CDMA2000 1x and 1XEV-DO protocol processing, voice, MMS service, GPS, AGPS and WIFI etc. Externally it provides micro SD card interface, earphone port(to provide voice service) .

1.7 Test specification(s)

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

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

Supplement C, Edition 01-01 to OET Bulletin 65, Edition 97-01 June 2001: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions.

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

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

941225 D06 Hot Spot SAR v01, Published on Apr 4 2011.

648474 D01 SAR Evaluation Considerations for Mobile Phones with Multiple Transmitters and Antennas.

1.7.1 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR* (Brain)	1.60 mW/g	8.00 mW/g
Spatial Average SAR** (Whole Body)	0.08 mW/g	0.40 mW/g
Spatial Peak SAR*** (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

Connection to the EUT is established via air interface with CMU200, and the EUT is set to maximum output power by CMU200. 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.

The test positions please refer to Annex 2.2

1.8.2 Information for the Measurement of CDMA 1x Devices

For SAR test, the maximum power output is very important and essential; it is identical under the measurement uncertainty. It is proper to use typical Test Mode 3(FW RC3, RVS RC3, SO55) as the worst case for SAR test.

Test Parameter setup for maximum RF output power according to section 4.4.5 of 3GPP2;

Parameter	Units	Value
I or	dBm/1.23MHz	-104
PilotE c/I or	dB	-7
TrafficE c /I or	dB	-7.4

SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the maximum average output of each channel is less than $\frac{1}{4}$ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

SAR for body exposure configurations is measured in RC3 with the DUT configured using TDSO / SO32, to transmit at full rate on FCH with all other code channels disabled. SAR for multiple code channels (FCH + SCH_n) is not required when the maximum average output of each RF channel is less than $\frac{1}{4}$ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCH_n) with FCH at full rate and SCH₀ enabled at 9600 bps, using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts.

Body SAR in RC1 is not required when the maximum average output of each channel is less than $\frac{1}{4}$ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

Test communication setup meet as followings:

Communication standard between mobile station and base station simulator	3GPP2 C.S0011-B
Radio configuration	RC3(Supporting CDMA 1X)
Spreading Rate	SR1
Data Rate	9600bps
Service Options	SO55(Loopback service)
Service Options	SO32(Test Data service)
Multiplex Options	The mobile station does not support this service



1.8.3 Information for the Measurement of CDMA Ev-Do Devices

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev.0 is less than $\frac{1}{4}$ dB higher than that measured in RC3 (1x RTT), body SAR for Ev-Do is not required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at 153.6 kbps using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev.A is not required when the maximum average output of each channel is less than that measured in Rev.0 or less than $\frac{1}{4}$ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev.A using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots should be configured in the downlink for both Rev.0 and Rev.A.

2 Technical test

2.1 Summary of test results

Band	SAR _{1g} (W/kg)			Test Result
	Head	Body-worn accessory(10mm)	Mobile hotspot device use(10mm)	
CDMA 800	0.533	1.360	1.360	PASS

Table 3: The Maximum SAR_{1g} Values for Head and Body position

Band		Maximum Conducted Power (dBm)	Maximum Average Power (dBm)
CDMA 800	RC 3	24.95	\
	RC 1	24.82	\
	Rev.0	24.36	\
	Rev.A	24.97	\

Table 4: 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

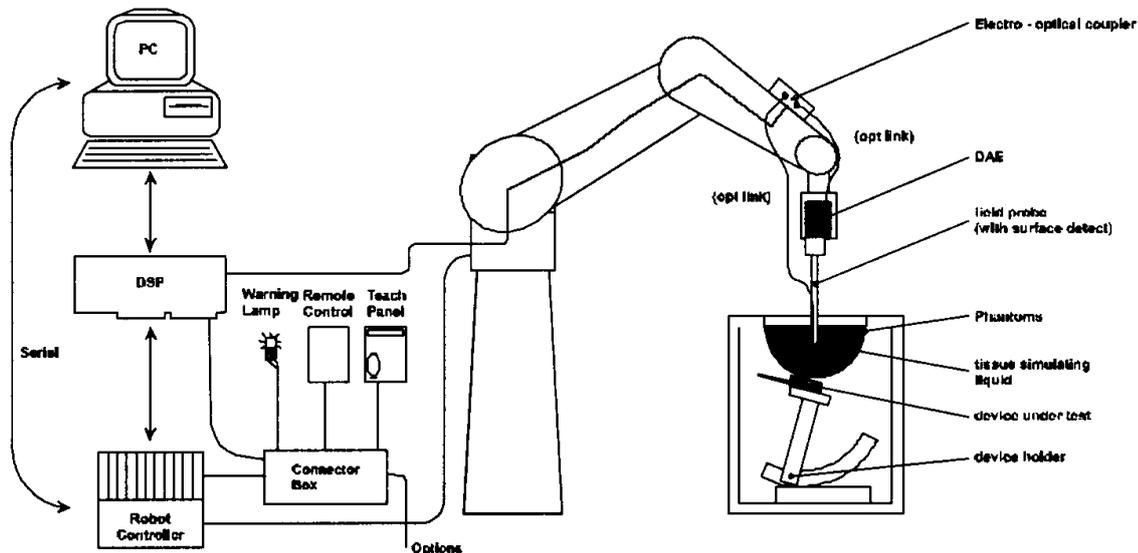
The measurement system is described in chapter 2.4.

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 m³, 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

Technical data according to manufacturer information	
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: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
Optical Surface Detection	± 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)

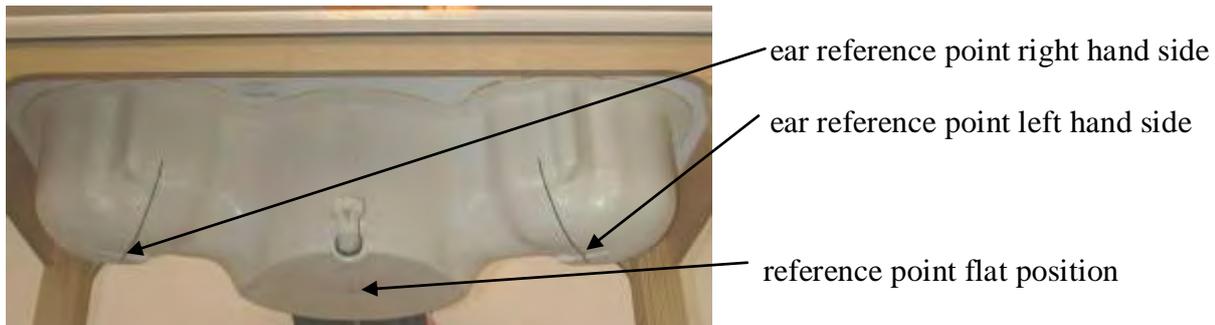
Isotropic E-Field Probe ES3DV3 for Dosimetric Measurements

Technical data according to manufacturer information	
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: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Dynamic range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones

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.



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/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.

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	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the 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)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.

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

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

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 checked="" type="checkbox"/>	Schmid & Partner Engineering AG	835 MHz System Validation Dipole	D835V2	4d095	2011-02-23
<input type="checkbox"/>	Schmid & Partner Engineering AG	900 MHz System Validation Dipole	D900V2	1d063	2011-02-23
<input type="checkbox"/>	Schmid & Partner Engineering AG	1800 MHz System Validation Dipole	D1800V2	2d157	2011-02-23
<input type="checkbox"/>	Schmid & Partner Engineering AG	1900 MHz System Validation Dipole	D1900V2	5d091	2011-02-23
<input type="checkbox"/>	Schmid & Partner Engineering AG	2000 MHz System Validation Dipole	D2000V2	1036	2011-02-23
<input type="checkbox"/>	Schmid & Partner Engineering AG	2300 MHz System Validation Dipole	D2300V2	1016	2010-09-21
<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	2011-02-22
<input checked="" type="checkbox"/>	Agilent	Dielectric Probe Kit	85070E	2484	N/A
<input checked="" type="checkbox"/>	Agilent	Signal Generator	N5181A	MY47420989	2011-02-22
<input checked="" type="checkbox"/>	MINI-CIRCUITS	Amplifier	ZHL-42W	QA0746001	N/A
<input checked="" type="checkbox"/>	Agilent	Power Meter	E4417A	MY45101339	2011-02-22
<input checked="" type="checkbox"/>	Agilent	Power Meter Sensor	E9321A	MY44420359	2011-02-22

Note:

1) Per KDB 450824 D02 requirements for dipole calibration, HUAWEI GCTC SAR lab has adopted three years calibration interval. But each measured dipole is expected to evaluate with the following criteria at least on annual interval.

- a) There is no physical damage on the dipole;
- b) System validation with specific dipole is within 10% of calibrated value;
- c) Return-loss is within 10% of calibrated measurement;
- d) Impedance is within 5Ω from the previous measurement.

2) 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 type="checkbox"/> 835	<input type="checkbox"/> 900	<input type="checkbox"/> 1800	<input type="checkbox"/> 1900	<input type="checkbox"/> 2450
frequency band	<input type="checkbox"/> 450	<input type="checkbox"/> 835	<input type="checkbox"/> 900	<input type="checkbox"/> 1800	<input 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 5: 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 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 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 6: Body tissue dielectric properties

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
 Water: De-ionized, 16MΩ+ 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	Measured Tissue		Measured Tissue		Liquid Temp.	Test Date
	Permittivity (+/-5%)	Conductivity [S/m] (+/-5%)	Permittivity	Conductivity [S/m]		
835MHz Body	55.2 (52.44~57.96)	0.97 (0.92~1.02)	53.40	0.957	21.7°C	2011-05-04

Table 7:Parameter of the body tissue simulating liquid

Note: The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2°C of the conditions expected during the SAR evaluation to satisfy protocol requirements.

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}
Measurement System								
Probe calibration	$\pm 5.9\%$	Normal	1	1	1	$\pm 5.9\%$	$\pm 5.9\%$	∞
Axial isotropy	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 1.9\%$	$\pm 1.9\%$	∞
Hemispherical isotropy	$\pm 9.6\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 3.9\%$	$\pm 3.9\%$	∞
Spatial resolution	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
Boundary effects	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Probe linearity	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
System detection limits	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Readout electronics	$\pm 0.3\%$	Normal	1	1	1	$\pm 0.3\%$	$\pm 0.3\%$	∞
Response time	$\pm 0.8\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.5\%$	$\pm 0.5\%$	∞
Integration time	$\pm 2.6\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.5\%$	$\pm 1.5\%$	∞
RF ambient conditions	$\pm 3.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
Probe positioner	$\pm 0.4\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.2\%$	$\pm 0.2\%$	∞
Probe positioning	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
Max. SAR evaluation	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Test Sample Related								
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	$\pm 2.9\%$	$\pm 2.9\%$	∞
Phantom and Set-up								
Phantom uncertainty	$\pm 4.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.3\%$	$\pm 2.3\%$	∞
Liquid conductivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.64	0.43	$\pm 1.8\%$	$\pm 1.2\%$	∞
Liquid conductivity (meas.)	$\pm 2.5\%$	Normal	1	0.64	0.43	$\pm 1.6\%$	$\pm 1.1\%$	∞
Liquid permittivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.6	0.49	$\pm 1.7\%$	$\pm 1.4\%$	∞
Liquid permittivity (meas.)	$\pm 2.5\%$	Normal	1	0.6	0.49	$\pm 1.5\%$	$\pm 1.2\%$	∞
Combined Uncertainty						$\pm 10.9\%$	$\pm 10.7\%$	387
Expanded Std. Uncertainty						$\pm 21.9\%$	$\pm 21.4\%$	

Table 8: 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}
Measurement System								
Probe calibration	$\pm 5.9\%$	Normal	1	1	1	$\pm 5.9\%$	$\pm 5.9\%$	∞
Axial isotropy	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
Hemispherical isotropy	$\pm 9.6\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 0.0\%$	$\pm 0.0\%$	∞
Boundary effects	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Probe linearity	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
System detection limits	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Readout electronics	$\pm 0.3\%$	Normal	1	1	1	$\pm 0.3\%$	$\pm 0.3\%$	∞
Response time	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
Integration time	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
RF ambient conditions	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Probe positioner	$\pm 0.4\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.2\%$	$\pm 0.2\%$	∞
Probe positioning	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
Max. SAR evaluation	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Dipole								
Deviation of experimental dipole	$\pm 5.5\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 3.2\%$	$\pm 3.2\%$	∞
Dipole axis to liquid distance	$\pm 2.0\%$	Rectangular	1	1	1	$\pm 1.2\%$	$\pm 1.2\%$	∞
Power drift	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
Phantom and Set-up								
Phantom uncertainty	$\pm 4.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.3\%$	$\pm 2.3\%$	∞
Liquid conductivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.64	0.43	$\pm 1.8\%$	$\pm 1.2\%$	∞
Liquid conductivity (meas.)	$\pm 2.5\%$	Normal	1	0.64	0.43	$\pm 1.6\%$	$\pm 1.1\%$	∞
Liquid permittivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.6	0.49	$\pm 1.7\%$	$\pm 1.4\%$	∞
Liquid permittivity (meas.)	$\pm 2.5\%$	Normal	1	0.6	0.49	$\pm 1.5\%$	$\pm 1.2\%$	∞
Combined Uncertainty						$\pm 9.5\%$	$\pm 9.2\%$	
Expanded Std. Uncertainty						$\pm 18.9\%$	$\pm 18.4\%$	

Table 9: 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).

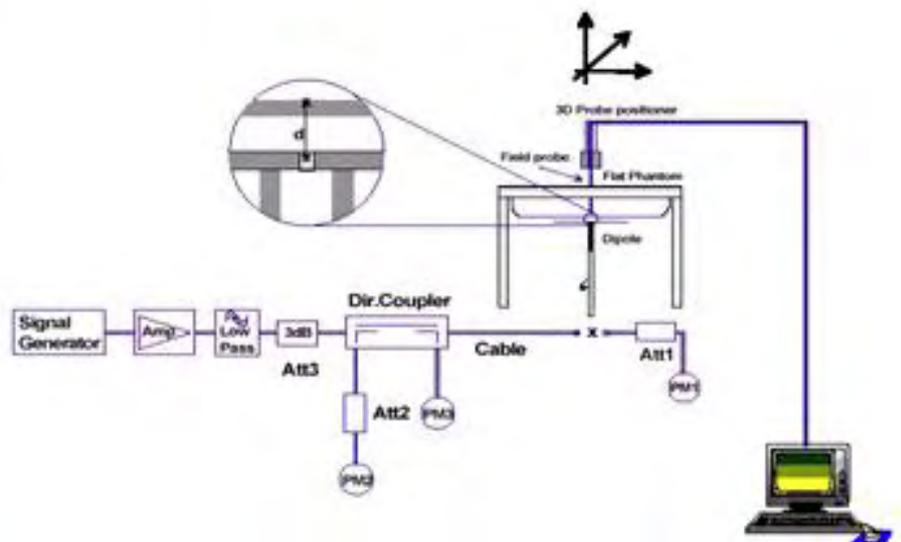
System Check	Target SAR (250 mW) (+/- 10%)		Measured SAR(250mW)		Liquid Temp.	Test Date
	1-g (mW/g)	10-g (mW/g)	1-g (mW/g)	10-g (mW/g)		
D835V2 Body	2.47 (2.22~2.72)	1.61 (1.45~1.77)	2.60	1.71	21.7°C	2011-05-04

Table 10: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.

2.5.2 Conducted power results

CDMA 800MHz

CDMA Cellular (RC3)	Conducted Power		
	Channel 1013	Channel 384	Channel 777
Before test (dBm)	24.95	24.59	24.73
After test (dBm)	24.94	24.57	24.74
CDMA Cellular (RC1)	Conducted Power		
	Channel 1013	Channel 384	Channel 777
Before test (dBm)	24.82	24.46	24.45
After test (dBm)	24.81	24.48	24.46
CDMA Cellular EVDO (Rev.0)	Conducted Power		
	Channel 1013	Channel 384	Channel 777
Before test (dBm)	24.32	24.25	24.36
After test (dBm)	24.31	24.23	24.35
CDMA Cellular EVDO (Rev.A)	Conducted Power		
	Channel 1013	Channel 384	Channel 777
Before test (dBm)	24.97	24.9	24.7
After test (dBm)	24.96	24.91	24.72

Table 11: Test results conducted power measurement CDMA 800MHz

- 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 handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev.0 is less than ¼ dB higher than that measured in RC3(1xRTT), body SAR for Ev-Do is not required. SAR for Rev.A is not required when the maximum average output of each channel is less than that measured in Rev.0 or less than ¼ dB higher than that measured in RC3.

2.5.3 SAR Test results

CDMA800

Test Position of Head	Test channel /Frequency	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Limit (W/kg)	Liquid Temp.
			1-g	10-g			
Data from C8150-1 FCC ID: QISC8150-1 (Report No.RZA2010-1524SAR01R1)							
Left Hand Touched	384/836.52	RC3 SO55	0.503	0.372	-0.141	1.6	21.7°C
Left Hand Tilted 15°	384/836.52	RC3 SO55	0.371	0.264	-0.134	1.6	21.7°C
Right Hand Touched	384/836.52	RC3 SO55	0.507	0.352	-0.113	1.6	21.7°C
Right Hand Tilted 15°	384/836.52	RC3 SO55	0.429	0.287	-0.015	1.6	21.7°C
Right Hand Touched	777/848.31	RC3 SO55	0.417	0.286	-0.004	1.6	21.7°C
Right Hand Touched	1013/824.7	RC3 SO55	0.533	0.369	-0.004	1.6	21.7°C

Table 12:Test results (Head SAR)

Test Position of Body(10mm)	Test channel /Frequency	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Limit (W/kg)	Liquid Temp.
			1-g	10-g			
Towards Phantom	384/836.52	RC3 SO32	0.457	0.336	0.124	1.6	21.7°C
Towards Ground	384/836.52	RC3 SO32	1.080	0.695	-0.022	1.6	21.7°C
Left edge	384/836.52	RC3 SO32	0.587	0.390	0.072	1.6	21.7°C
Right edge	384/836.52	RC3 SO32	0.494	0.341	0.021	1.6	21.7°C
Top edge	384/836.52	RC3 SO32	0.201	0.121	-0.104	1.6	21.7°C
Towards Ground	777/848.31	RC3 SO32	0.931	0.589	-0.118	1.6	21.7°C
Towards Ground	1013/824.7	RC3 SO32	1.360	0.891	0.016	1.6	21.7°C
Towards Ground with Headset	1013/824.7	RC3 SO32	0.898	0.540	-0.015	1.6	21.7°C
Towards Ground	1013/824.7	EVDO Rev.0	1.210	0.804	0.053	1.6	21.7°C
Towards Ground	1013/824.7	EVDO Rev.A	1.210	0.799	-0.098	2.6	21.7°C

Table 13: Test results (Body SAR for Mobile hotspot device use with 10mm separation distance)

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

2) The head and body SAR measured used the same phone.

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

4)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.

5) Per KDB941225 D06 Hot Spot SAR v01,SAR must measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge,for the data modes,wireless technologies and frequency bands supporting hotspot mode.



2.5.4 Extrapolated SAR Values

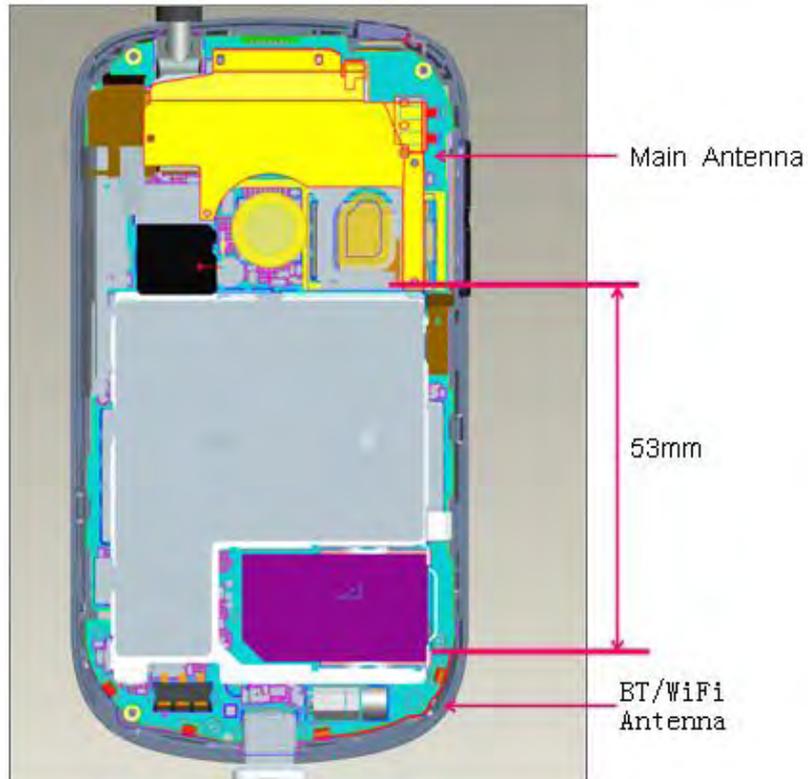
Limit of SAR (W/kg)		Conducted Power	1g Average		Tune-up procedures maximum Power(dBm)	1g Average
Worst Case			1.6			1.6
Test Position	Channel	Measurement Result(dBm)	Measurement Result(W/kg)			Extrapolated Result (W/kg)
Head CDMA 800 (RC3 SO55)						
Right hand touched	Low	0.533	24.95	25.5	0.605	
Body CDMA 800 (RC3 SO32)						
Towards ground 10mm	Low	1.360	24.95	25.5	1.544	
Body CDMA 800 (EVDO Rev.0)						
Towards ground 10mm	Low	1.210	24.32	25.5	1.588	
Body CDMA 800 (EVDO Rev.A)						
Towards ground 10mm	Low	1.210	24.97	25.5	1.367	

Table 14: Extrapolated SAR Values of highest measured SAR

2.5.5 Multiple Transmitter Information

BT Function

The closest distance between BT antenna and main antenna is 5.3cm>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
Average Power(dBm)	7.68	7.59	8.05

Table 15:Conducted power measurement result (BT)

WiFi Function

The output power of WiFi antenna is as following:

Wi-Fi 2450MHz	Channel	Average Power (dBm) for Data Rates							
		1Mbps	2Mbps	5.5Mbps	11Mbps	/	/	/	/
802.11b	1	13.25	13.15	13.44	13.57	/	/	/	/
	6	13.44	13.58	13.75	13.64	/	/	/	/
	11	13.74	13.58	13.26	13.24	/	/	/	/
802.11g	Channel	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
	1	8.56	8.19	8.64	8.75	8.69	8.86	8.37	8.16
	6	8.71	8.84	8.56	8.69	8.86	8.57	8.65	8.34
	11	8.44	8.23	8.76	8.68	8.34	8.46	8.76	8.61
802.11n HT20	Channel	6.5Mbps	13Mbps	19.5Mbps	26Mbps	39Mbps	52Mbps	58.5Mbps	65Mbps
	1	8.18	8.55	8.48	8.43	8.84	8.47	8.91	8.46
	6	8.41	8.85	8.47	8.76	8.76	8.38	8.58	8.54
	11	8.87	8.43	8.38	8.62	8.57	8.61	8.80	8.49

Table 16:Conducted power measurement result (WiFi)

Stand-alone SAR

According to the output power measurement results and the distance between BT antenna and main antenna, we can draw the conclusion that:

Stand-alone SAR evaluation is not required for BT, because the output power of BT is $\leq 2 \cdot P_{Ref}$ (24mW=13.8dBm) and its antenna(s) is ≥ 5.0 cm from other antennas.

Stand-alone SAR evaluation is not required for WiFi, because the output power of WiFi is $\leq 2 \cdot P_{Ref}$ (24mW=13.8dBm) and its antenna(s) is ≥ 5.0 cm from other antennas.

Simultaneous SAR

Simultaneous Transmission SAR evaluation is not required for CDMA & BT, because stand-alone SAR are not required for BT and its antenna(s) is ≥ 5.0 cm from other antennas.

Simultaneous Transmission SAR evaluation is not required for CDMA & WiFi, because the sum of the 1-g SAR is < 1.6 W/kg for all simultaneous transmitting antennas.

Simultaneous Transmission SAR evaluation is not required for BT and WiFi, because BT antenna is < 2.5 cm from WiFi antennas and stand-alone SAR are not required for BT.

Annex 1 SAR Measurement Plots

Annex 1.1 System performance verification

Date/Time: 5/4/2011 14:35:22, Date/Time: 5/4/2011 14:42:11

Test Laboratory: Huawei GCTC Lab

SystemPerformanceCheck-D835-ES-Body

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

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.957$ mho/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASy5 (IEEE/IEC/ANSI C63.19-2007)

DASy5 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: DASy5, 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) = 2.5 mW/g

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

dx=5mm,

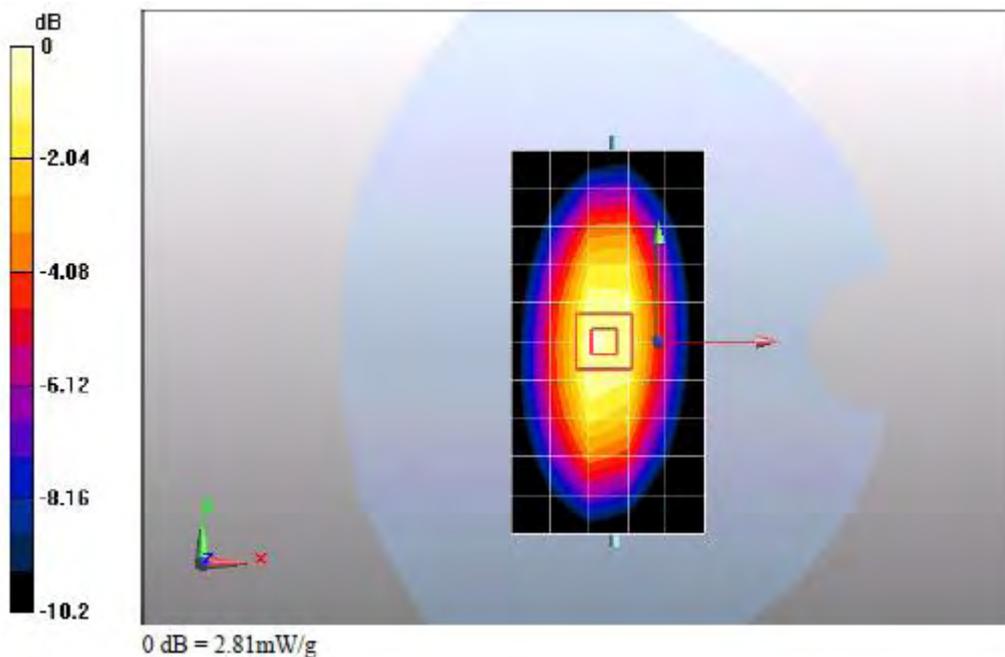
dy=5mm, dz=5mm

Reference Value = 54.4 V/m; Power Drift = 0.014 dB

Peak SAR (extrapolated) = 3.76 W/kg

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

Maximum value of SAR (measured) = 2.81 mW/g



Annex 1.2 CDMA 800 MHz Body

Date/Time: 5/4/2011 16:50:16, Date/Time: 5/4/2011 16:57:08

Test Laboratory: Huawei GCTC Lab

C8150-1 CDMA800 384CH Towards phantom 10mm

DUT: C8150-1; Type: Handset; Serial:1M2AA11060500235

Communication System: HW -CDMA2000; Frequency: 836.52 MHz

Medium parameters used: $f = 837$ MHz; $\sigma = 0.959$ mho/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 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: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.471 mW/g

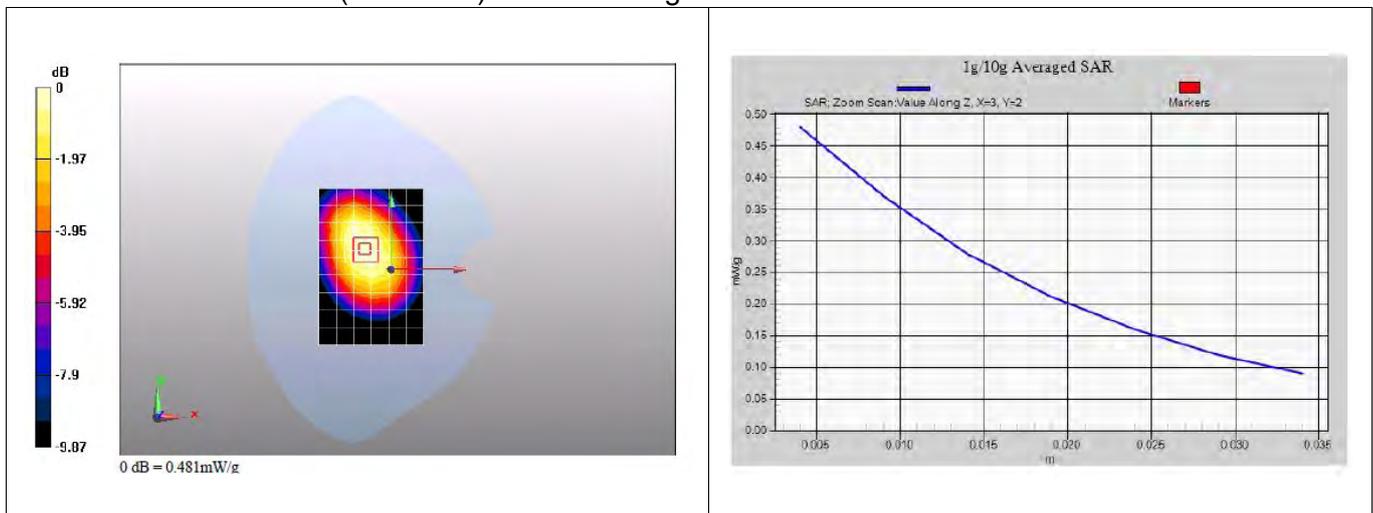
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 21.6 V/m; Power Drift = 0.124 dB

Peak SAR (extrapolated) = 0.583 W/kg

SAR(1 g) = 0.457 mW/g; SAR(10 g) = 0.336 mW/g

Maximum value of SAR (measured) = 0.481 mW/g





Test report no.: SYBH(Z-SAR)034052011-2

Date/Time: 5/4/2011 17:20:27, Date/Time: 5/4/2011 17:27:17

Test Laboratory: Huawei GCTC Lab

C8150-1 CDMA800 384CH Towards ground 10mm

DUT: C8150-1; Type: Handset; Serial:1M2AA11060500235

Communication System: HW -CDMA2000; Frequency: 836.52 MHz

Medium parameters used: $f = 837$ MHz; $\sigma = 0.959$ mho/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 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: DASYS, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

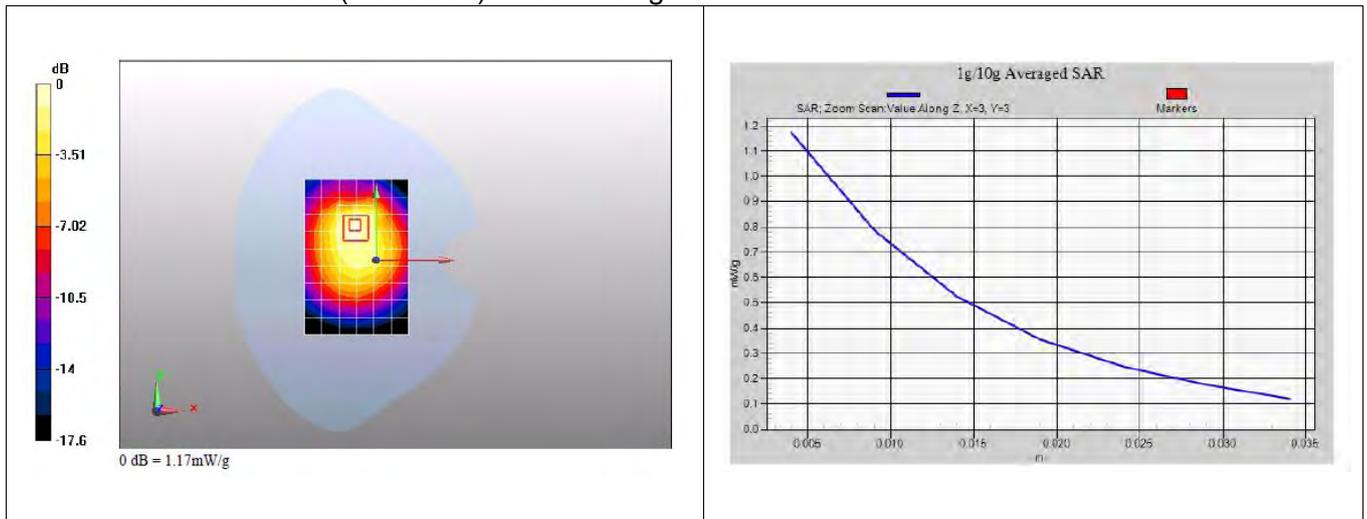
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 30.2 V/m; Power Drift = -0.022 dB

Peak SAR (extrapolated) = 1.65 W/kg

SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.695 mW/g

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



Test report no.: SYBH(Z-SAR)034052011-2

Date/Time: 5/4/2011 17:56:21, Date/Time: 5/4/2011 18:03:13

Test Laboratory: Huawei GCTC Lab

C8150-1 CDMA800 384CH Left edge 10mm

DUT: C8150-1; Type: Handset; Serial:1M2AA11060500235

Communication System: HW -CDMA2000; Frequency: 836.52 MHz

Medium parameters used: $f = 837$ MHz; $\sigma = 0.959$ mho/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 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: DASYS, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.613 mW/g

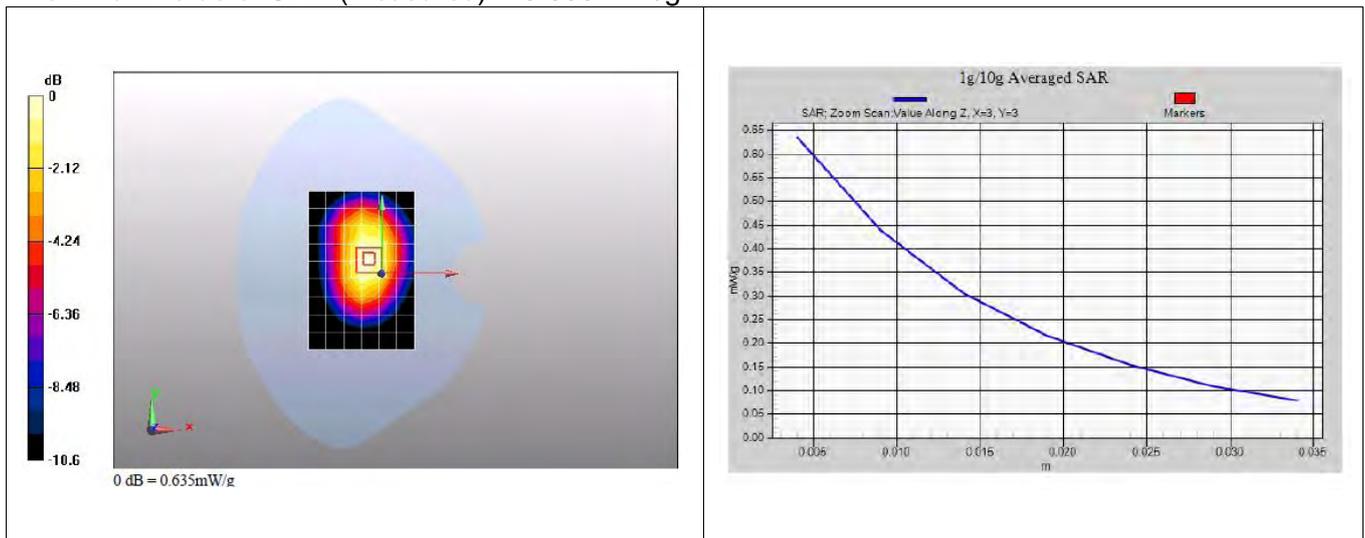
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.9 V/m; Power Drift = 0.072 dB

Peak SAR (extrapolated) = 0.852 W/kg

SAR(1 g) = 0.587 mW/g; SAR(10 g) = 0.390 mW/g

Maximum value of SAR (measured) = 0.635 mW/g



Date/Time: 5/4/2011 18:23:36, Date/Time: 5/4/2011 18:30:26

Test Laboratory: Huawei GCTC Lab

C8150-1 CDMA800 384CH Right edge 10mm

DUT: C8150-1; Type: Handset; Serial:1M2AA11060500235

Communication System: HW -CDMA2000; Frequency: 836.52 MHz

Medium parameters used: $f = 837$ MHz; $\sigma = 0.959$ mho/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 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: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.531 mW/g

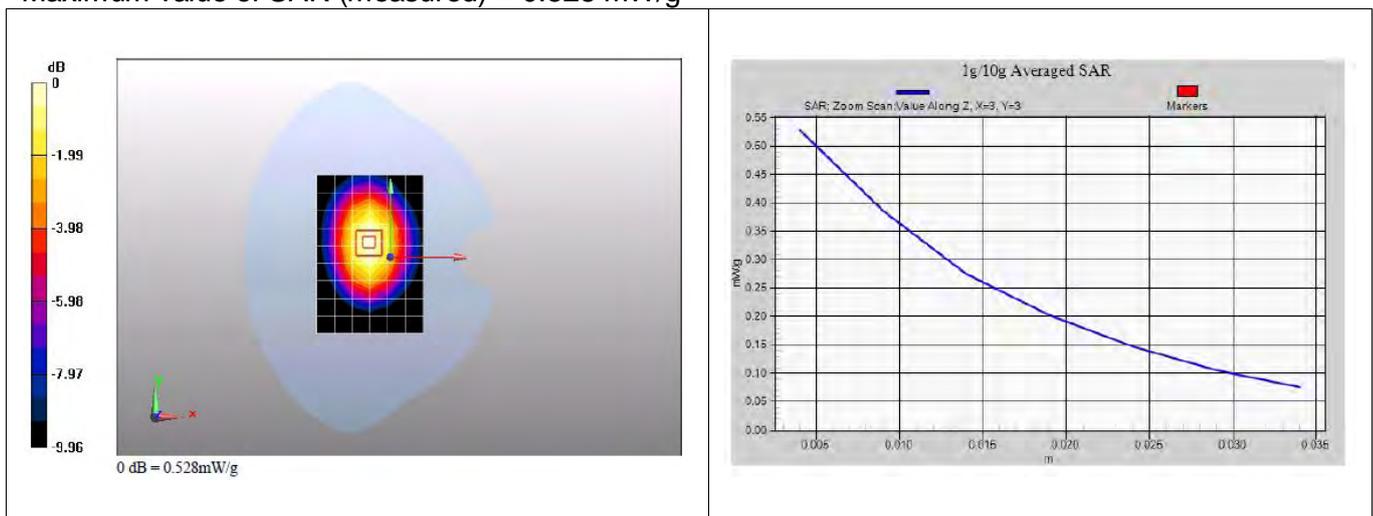
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 22.9 V/m; Power Drift = 0.021 dB

Peak SAR (extrapolated) = 0.669 W/kg

SAR(1 g) = 0.494 mW/g; SAR(10 g) = 0.341 mW/g

Maximum value of SAR (measured) = 0.528 mW/g





Test report no.: SYBH(Z-SAR)034052011-2

Date/Time: 5/4/2011 19:01:27, Date/Time: 5/4/2011 19:08:18

Test Laboratory: Huawei GCTC Lab

C8150-1 CDMA800 384CH Top edge 10mm

DUT: C8150-1; Type: Handset; Serial:1M2AA11060500235

Communication System: HW -CDMA2000; Frequency: 836.52 MHz

Medium parameters used: $f = 837$ MHz; $\sigma = 0.959$ mho/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 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: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.204 mW/g

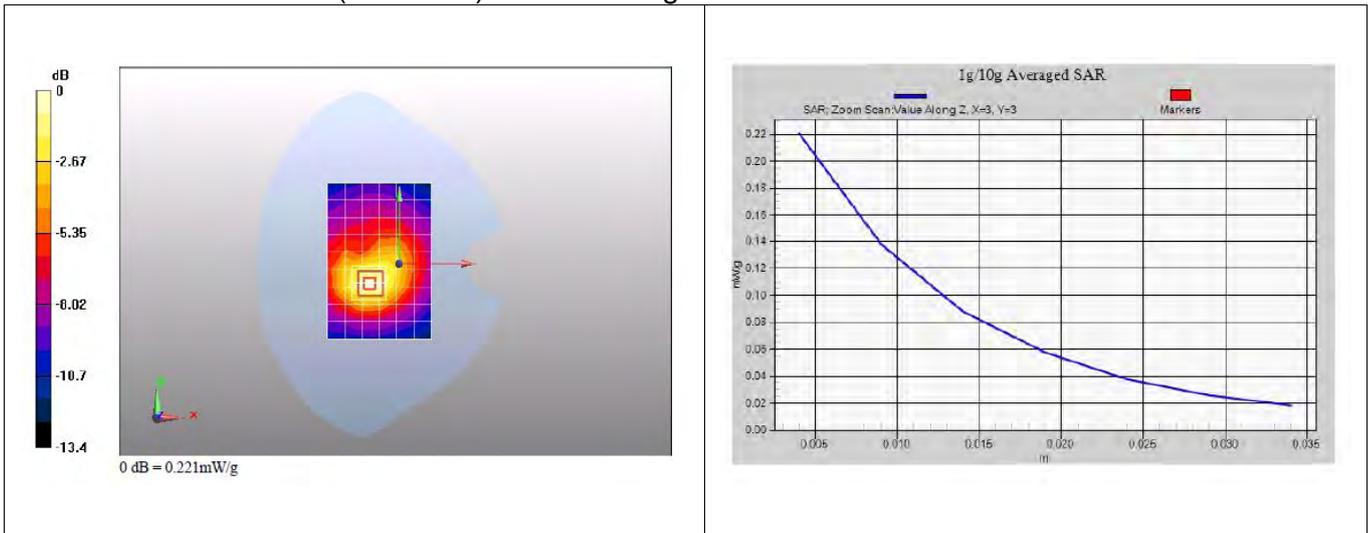
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.6 V/m; Power Drift = -0.104 dB

Peak SAR (extrapolated) = 0.324 W/kg

SAR(1 g) = 0.201 mW/g; SAR(10 g) = 0.121 mW/g

Maximum value of SAR (measured) = 0.221 mW/g



Test report no.: SYBH(Z-SAR)034052011-2

Date/Time: 5/4/2011 19:32:53, Date/Time: 5/4/2011 19:39:45

Test Laboratory: Huawei GCTC Lab

C8150-1 CDMA800 777CH Towards ground 10mm

DUT: C8150-1; Type: Handset; Serial:1M2AA11060500235

Communication System: HW -CDMA2000; Frequency: 848.31 MHz

Medium parameters used (interpolated): $f = 848.31$ MHz; $\sigma = 0.97$ mho/m; $\epsilon_r = 53.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 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: DASYS, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

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

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

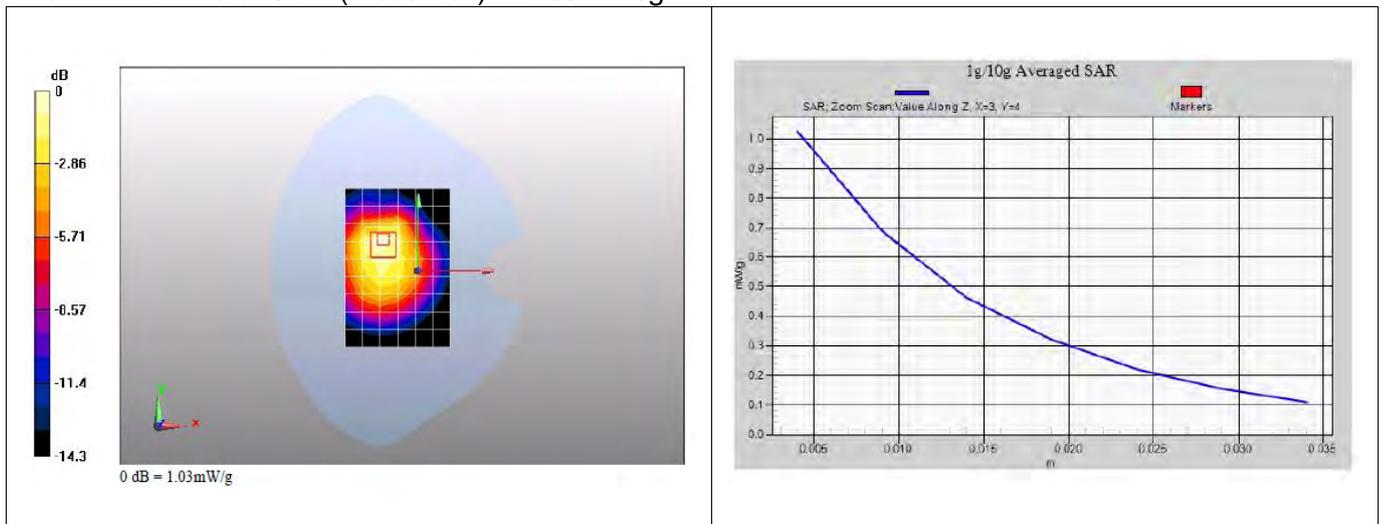
Reference Value = 26.6 V/m; Power Drift = -0.118 dB

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.931 mW/g; SAR(10 g) = 0.589 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

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



Date/Time: 5/4/2011 19:55:05, Date/Time: 5/4/2011 20:01:56

Test Laboratory: Huawei GCTC Lab

C8150-1 CDMA800 1013CH Towards ground 10mm

DUT: C8150-1; Type: Handset; Serial:1M2AA11060500235

Communication System: HW -CDMA2000; Frequency: 824.7 MHz

Medium parameters used: $f = 825$ MHz; $\sigma = 0.948$ mho/m; $\epsilon_r = 53.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 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: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.5 mW/g

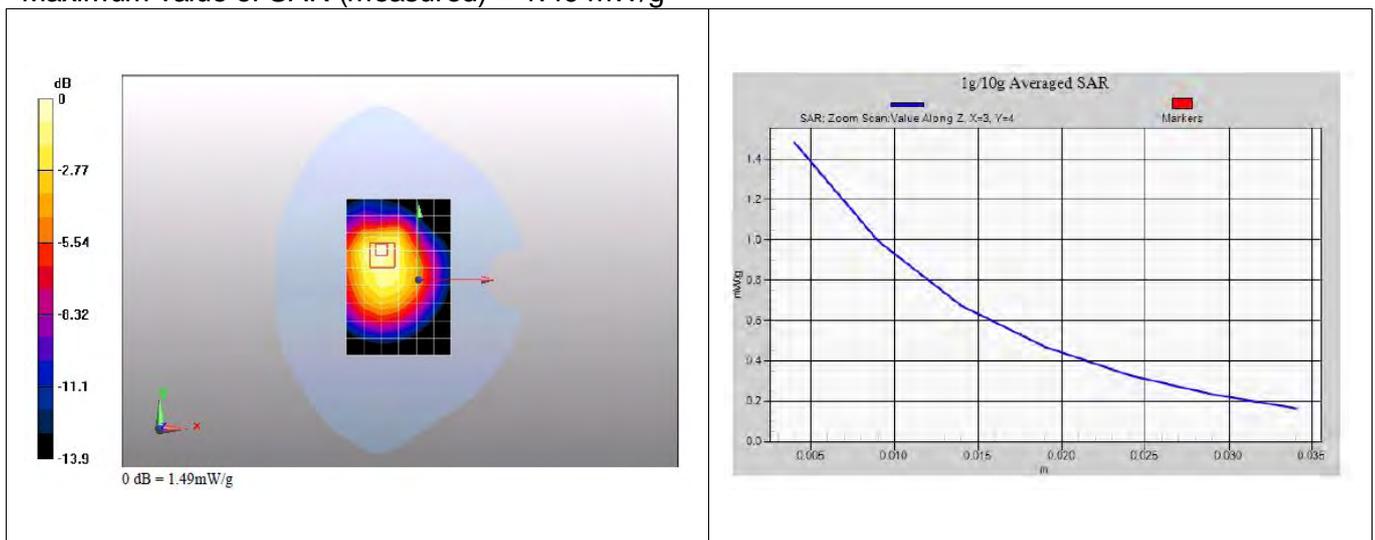
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 33.3 V/m; Power Drift = 0.016 dB

Peak SAR (extrapolated) = 2.07 W/kg

SAR(1 g) = 1.36 mW/g; SAR(10 g) = 0.891 mW/g

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



Date/Time: 5/4/2011 21:10:28, Date/Time: 5/4/2011 21:17:20

Test Laboratory: Huawei GCTC Lab

C8150-1 CDMA800 1013CH Towards ground 10mm with EVDO Rev.0

DUT: C8150-1; Type: Handset; Serial:1M2AA11060500235

Communication System: HW -CDMA2000; Frequency: 824.7 MHz

Medium parameters used: $f = 825$ MHz; $\sigma = 0.941$ mho/m; $\epsilon_r = 53.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 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: DASYS, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.29 mW/g

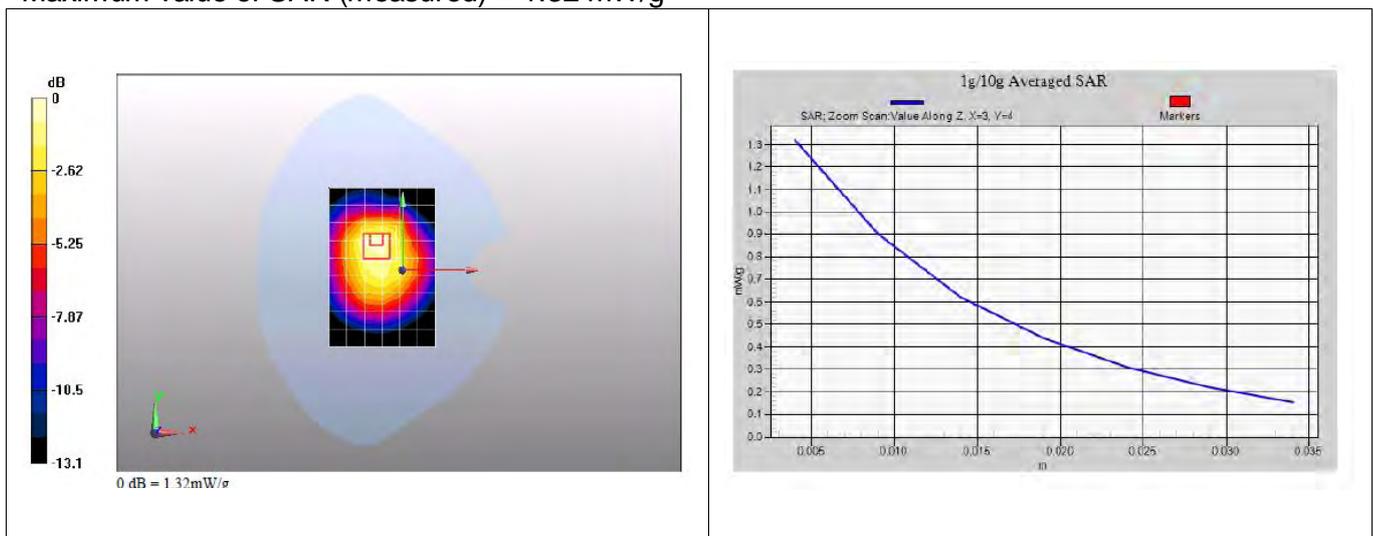
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 33.2 V/m; Power Drift = 0.053 dB

Peak SAR (extrapolated) = 1.85 W/kg

SAR(1 g) = 1.21 mW/g; SAR(10 g) = 0.804 mW/g

Maximum value of SAR (measured) = 1.32 mW/g



Test report no.: SYBH(Z-SAR)034052011-2

Date/Time: 5/4/2011 21:41:26, Date/Time: 5/4/2011 21:48:16

Test Laboratory: Huawei GCTC Lab

C8150-1 CDMA800 1013CH Towards ground 10mm with EVDO Rev.A

DUT: C8150-1; Type: Handset; Serial:1M2AA11060500235

Communication System: HW -CDMA2000; Frequency: 824.7 MHz

Medium parameters used: $f = 825$ MHz; $\sigma = 0.948$ mho/m; $\epsilon_r = 53.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 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: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.28 mW/g

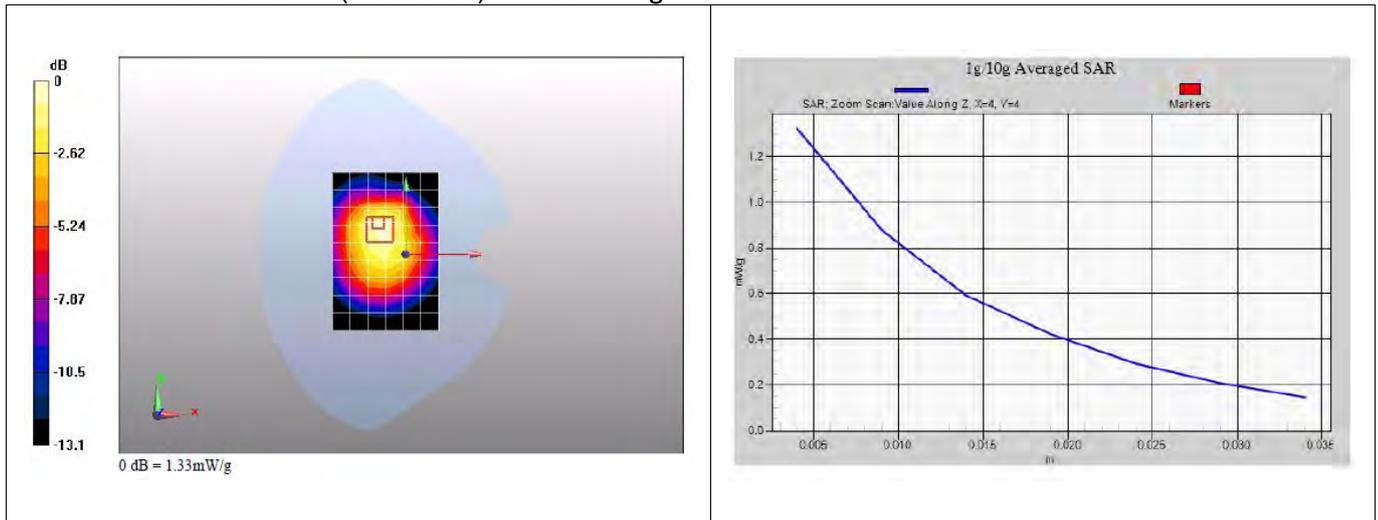
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 33.5 V/m; Power Drift = -0.098 dB

Peak SAR (extrapolated) = 1.9 W/kg

SAR(1 g) = 1.21 mW/g; SAR(10 g) = 0.799 mW/g

Maximum value of SAR (measured) = 1.33 mW/g



Test report no.: SYBH(Z-SAR)034052011-2

Date/Time: 5/4/2011 22:37:06, Date/Time: 5/4/2011 22:43:57

Test Laboratory: Huawei GCTC Lab

C8150-1 CDMA800 1013CH Towards ground 10mm with with Headset

DUT: C8150-1; Type: Handset; Serial:1M2AA11060500235

Communication System: HW -CDMA2000; Frequency: 824.7 MHz

Medium parameters used: $f = 825$ MHz; $\sigma = 0.948$ mho/m; $\epsilon_r = 53.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 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: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.846 mW/g

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

Reference Value = 26.5 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 1.5 W/kg

SAR(1 g) = 0.898 mW/g; SAR(10 g) = 0.540 mW/g

Maximum value of SAR (measured) = 1 mW/g

