HCT CO.,LTD

SAR TEST REPORT

HCT CO., LTD

EUT Type:	Cellular/PCS CDMA/GSM Phone with Bluetooth
FCC ID:	JYC78
Model:	C781R3
Date of Issue:	Mar. 03, 2014
Test report No.:	HCT-A-1402-F010
Test Laboratory:	**HCT CO., LTD.** 74, Seoicheon-ro 578 beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea 467-811 TEL: +82 31 645 6300 FAX: +82 31 645 6401
Applicant :	**Pantech Co., Ltd.** DMC I-2, PANTECH R&D Center Sang Am dong, Mapogu, 121-792, Korea
Testing has been carried out in accordance with:	RSS-102 Issue 4; Health Canada Safety Code 6 47CFR §2.1093 ANSI/ IEEE C95.1 – 1992 IEEE 1528-2003
Test result:	The tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.
Signature	Report prepared by : Yun-Jeang, Heo Test Engineer of SAR Part Approved by : Kim Dong-seob Manager of SAR Part

Version

Rev	DATE	DESCRIPTION
HCT-A-1402-F010	Mar. 03, 2014	First Approval Report

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1. INTRODUCTION

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices.

The safety limits used for the environmental evaluation measurements are based on the criteria published bythe American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSIC95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. 1992 by the Institute of Electrical and Electronics Engineers, Inc., Ne York, New York 10017. The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring SAR due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86 NCRP, 1986, Bethesda, MD 20814.SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivativeof the incremental electromagnetic energy (d*W*)absorbed by (dissipated in) an incremental mass (d*m*) contained in a volume element (d*V*) of a given density (*r*). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body.

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

Figure 1. SAR Mathematical Equation

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

$$SAR = \sigma E^2 / \rho$$

Where:
σ = conductivity of the tissue-simulant material (S/m)
ρ = mass density of the tissue-simulant material (kg/m^3)
E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with IEEE Standard 1528-2003 & IEEE 1528-2005 and the following published KDB procedures.

- FCC KDB Publication 941225 D01 SAR test for 3G devices v02
- FCC KDB Publication 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 648474 D04 Handset SAR v01r02
- FCC KDB Publication 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
- FCC KDB Publication 865664 D02 SAR Reporting v01r01
- October 2013 TCB Workshop Notes (GPRS testing criteria)

3. DESCRIPTION OF DEVICE

Environmental evaluation measurements of specific absorption rate (SAR) distributions in emulated human head and body tissues exposed to radio frequency (RF) radiation from wireless portable devices for compliance with the rules and regulations of the U.S. Federal Communications Commission (FCC).

<table>
<tr><td>EUT Type</td><td colspan="6">Cellular/PCS CDMA/GSM Phone with Bluetooth</td></tr>
<tr><td>FCC ID:</td><td colspan="6">JYC78</td></tr>
<tr><td>Model:</td><td colspan="6">C781R3</td></tr>
<tr><td>Trade Name</td><td colspan="6">Pantech Co., Ltd.</td></tr>
<tr><td>Application Type</td><td colspan="6">Certification</td></tr>
<tr><td>Mode(s) of Operation</td><td colspan="6">CDMA835/PCS1900/GSM850/GSM1900</td></tr>
<tr><td>Tx Frequency</td><td colspan="6">824.70 - 848.31 MHz (CDMA) / 1 851.25 – 1 908.75 MHz (PCS CDMA)
824.2 – 848.8 MHz (GSM850) / 1 850.2 – 1 909.8 MHz (GSM1900)</td></tr>
<tr><td>Production Unit or Identical Prototype</td><td colspan="6">Prototype</td></tr>
<tr><td rowspan="8">Max SAR</td><td rowspan="2">Band</td><td rowspan="2">Tx Frequency (MHz)</td><td rowspan="2">Equipment Class</td><td colspan="2">Reported 1 g SAR (W/kg)</td></tr>
<tr><td>Head</td><td>Body-worn</td></tr>
<tr><td>CDMA835</td><td>824.70 - 848.31</td><td>PCE</td><td>1.09</td><td>0.59</td></tr>
<tr><td>PCS1900</td><td>1 851.25 – 1 908.75</td><td>PCE</td><td>1.23</td><td>0.37</td></tr>
<tr><td>GSM850</td><td>824.2 - 848.8</td><td>PCE</td><td>0.73</td><td>0.51</td></tr>
<tr><td>GSM1900</td><td>1 850.2 -1 909.8</td><td>PCE</td><td>0.58</td><td>0.16</td></tr>
<tr><td>Bluetooth</td><td>2 402 - 2 480</td><td>DSS</td><td>-</td><td>0.03</td></tr>
<tr><td colspan="3">Simultaneous SAR per KDB 690783 D01v01r03</td><td>N/A</td><td>0.62</td></tr>
<tr><td>Date(s) of Tests</td><td colspan="6">Feb. 17, 2014 ~ Feb. 18, 2014</td></tr>
<tr><td>Antenna Type</td><td colspan="6">Integral Antenna</td></tr>
<tr><td>GPRS</td><td colspan="6">Multislot Class: 12, Mode Class B</td></tr>
</table>

*Note: BT Body-worn SAR value is estimate SAR value that should not be reported as standalone SAR on grants of equipment approval.

4. DESCRIPTION OF TEST EQUIPMENT

4.1 SAR MEASUREMENT SETUP

These measurements are performed using the DASY4 automated dosimetric assessment system.It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists ofhigh precision robotics system (Staubli), robot controller, Pentium III computer, near-fieldprobe, probe alignment sensor, and the generic twin phantom containing the brain equivalentmaterial. The robot is a six-axis industrial robot performing precise movements to position theprobe to the location (points) of maximum electromagnetic field (EMF) (see Figure.2).

A cell controller system contains the power supply, robot controller, teach pendant (Joystick),and remote control, is used to drive the robot motors. The PC consists of the HP PentiumIV3.0GHz computer with Windows XP system and SAR Measurement Software DASY4, A/Dinterface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cellcontroller to allow software manipulation of the robot. A data acquisition electronic (DAE)circuit performs the signal amplification, signal multiplexing, AD-conversion, offsetmeasurements, mechanical surface detection, collision detection, etc. is connected to theElectro-optical coupler (EOC). The EOC performs the conversion from the optical into digitalelectric signal of the DAE and transfers data to the PC plug-in card.

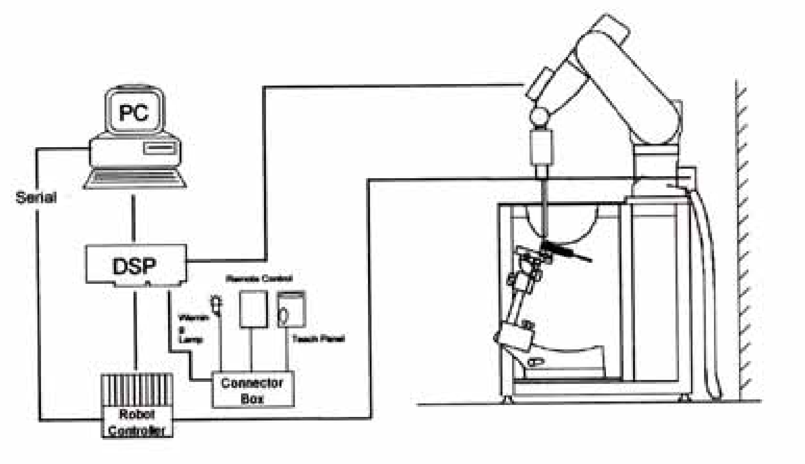


Figure 2. HCT SAR Lab. Test Measurement Set-up

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, achannel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoderand control logic unit. Transmission to the PC-card is accomplished through an opticaldownlink for data and status information and an optical uplink for commands and clock lines.The mechanical probe mounting device includes two different sensor systems for frontal andsidewise probe contacts. They are also used for mechanical surface detection and probecollision detection. The robot uses its own controller with a built in VME-bus computer. Thesystem is described in detail in.

4.2 DASY E-FIELD PROBE SYSTEM

4.2.1 ET3DV6 Probe Specification

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System Built-in shielding against static charges
Calibration	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at Frequencies of 450 MHz, 900 MHz and 1.8 GHz (accuracy: 8%)
Frequency	10 MHz to >3 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in brain tissue (rotation around probe axis) ± 0.4 dB in brain tissue (rotation normal probe axis)
Dynamic	5㎼/g to > 100 mW/g;
Range Linearity:	± 0.2 dB
Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces.
Dimensions	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	General dissymmetry up to 3 GHz Compliance tests of WCDMA/LTE Phones Fast automatic scanning in arbitrary phantoms

Figure 3. Photograph of the probe and the Phantom

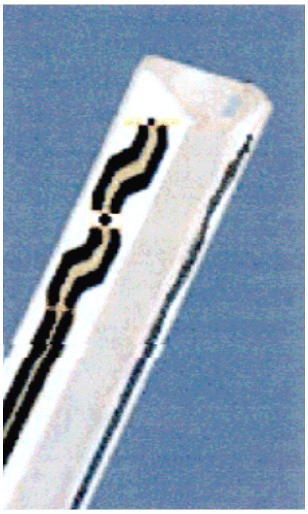


Figure 4. ET3DV6 E-field Probe

The SAR measurements were conducted with the dosimetric probe ET3DV6, designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches a maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2^{nd} order fitting. The approach is stopped at reaching the maximum.

4.2.2EX3DV4 Probe Specification

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

Calibration: Basic Broad Band Calibration in air
Conversion Factors (CF) for HSL 900 and HSL 1810
Additional CF for other liquids and frequencies upon request

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 μW/g to > 100 mW/g; Linearity: ± 0.2 dB

Dimensions: Overall length: 330 mm (Tip: 20 mm)
Tip diameter: 3.9 mm (Body: 12 mm)
Distance from probe tip to dipole centers: 2.0 mm

Application: General dosimetry up to 4 GHz
Dosimetry in strong gradient fields
Compliance tests of Cellular/PCS CDMA/GSM Phone with Bluetooth

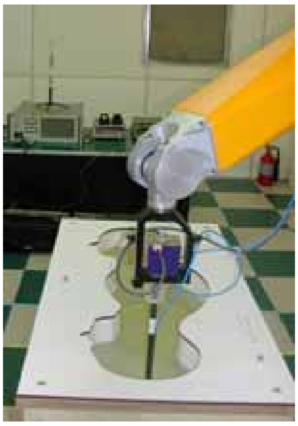


Figure 5. Photograph of the probe and the Phantom

Figure 6. EX3DV4 E-field Probe

The SAR measurements were conducted with the dosimetric probeEX3DV4, designed in the classical triangular configuration andoptimized for dosimetric evaluation. The probe is constructed usingthe thick film technique; with printed resistive lines on ceramicsubstrates. The probe is equipped with an optical multifiber lineending at the front of the probe tip. It is connected to the EOC boxon the robot arm and provides an automatic detection of thephantom surface.
Half of the fibers are connected to a pulsedinfrared transmitter, the other half to a synchronized receiver. Asthe probe approaches the surface,the reflection from the surfaceproduces a coupling from the transmitting to the receiving fibers.
This reflection increases first during the approach, reaches amaximum and then decreases. If the probe is flatly touching thesurface, the coupling is zero. The distance of the couplingmaximum to the surface is independent of the surface reflectivityand largely independent of the surface to probe angle. The DASY4software reads the reflection during a software approach and looksfor the maximum using a 2nd order fitting. The approach is stoppedat reaching the maximum.

HCT CO., LTD.
74, Seoicheon-ro 578 beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea 467-811
TEL: +82 31 645 6300 FAX: +82 31 645 6401

4.3 PROBE CALIBRATION PROCESS

4.3.1 E-Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with anaccuracy better than ± 10%. The spherical isotropy was evaluated with the proper procedure and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diodecompression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.
The free space E-field from amplified probe outputs is determined in a test chamber. This is performed ina TEM cell for frequencies bellow 1 GHz, and in a waveguide above 1 GHz for free space. For the freespace calibration, the probe is placed in the volumetric center of the cavity and at the proper orientationwith the field. The probe is then rotated 360 degrees.
E-field temperature correlation calibration is performed in a flat phantom filled with the appropriatesimulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in adielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperatureprobe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t} \qquad SAR = \frac{|E^2|.\,\sigma}{\rho}$$

where:
Δt = exposure time (30 seconds),
C = heat capacity of tissue (brain or muscle),
ΔT = temperature increase due to RF exposure.
SAR is proportional to $\Delta T/\Delta t$, the initial rate of tissue heating, before thermal diffusion takes place.
Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E-field;

where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm^3 for brain tissue)

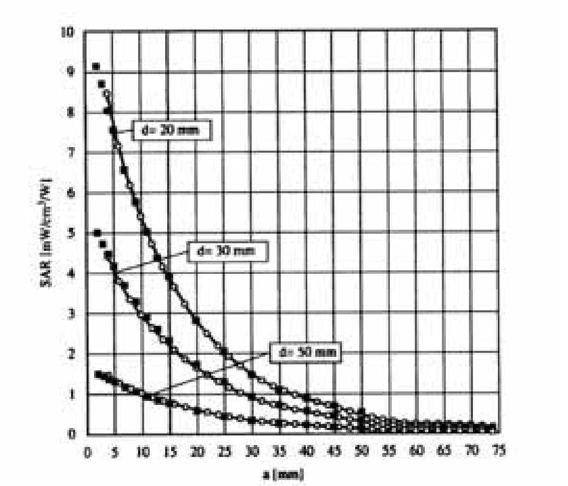


Figure 7. E-Field and Temperature measurements at 900MHz

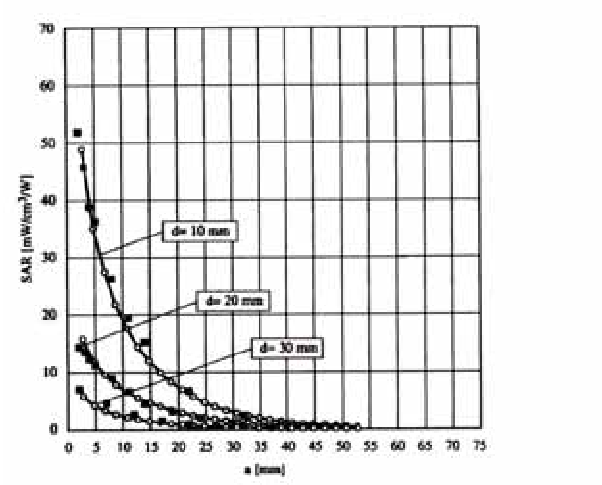


Figure 8. E-Field and temperature measurements at 1.8GHz

4.3.2 Data Extrapolation

The DASY4 software automatically executes the following procedures to calculate the field units fromthe microvolt readings at the probe connector. The first step of the evaluation is a linearization of thefiltered input signal to account for the compression characteristics of the detector diode. Thecompensation depends on the input signal, the diode type and the DC-transmission factor from the diodeto the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be knownto correctly compensate for peak power. The formula for each channel can be given like below;

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$ 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 poing (DASY parameter)

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

E-field probes: with

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

V_i= compensated signal of channel i (i=x,y,z)
$Norm_i$ = sensor sensitivity of channel i (i=x,y,z)
$\mu V/(V/m)^2$ for E-field probes
$ConvF$ = sensitivity of enhancement in solution
E_i = electric field strength of channel i in V/m

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

$$E_{tot} = E_x^2 + E_y^2 + E_z^2$$

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$ with

SAR= local specific absorption rate in W/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770}$$ with

P_{pwe}= equivalent power density of a plane wave in w/cm^2
E_{tot} = total electric field strength in V/m

4.4 SAM Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. 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 evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

igure 9. SAM Phantom

Shell Thickness	2.0 mm ± 0.2 mm (6 ± 0.2 mm at ear point)
Filling Volume	about 25 L
Dimensions	810 mm x 1000 mm x 500 mm (H x L x W)

Triple Modular Phantom consists of tree identical modules which can be installed and removed separately without emptying the liquid. It includes three reference points for phantom installation. Covers prevent evaporation of the liquid. Phantom material is resistant to DGBE based tissue simulating liquids. The MFP V5.1 will be delivered including wooden support only (non-standard SPEAG support).
Applicable for system performance check from 700 MHz to 6 GHz (MFP V5.1C) or 800 MHz - 6 GHz (MFP V5.1A) as well as dosimetric evaluations for body-worn operation.

Shell Thickness	2.0 mm± 0.2 mm
Filling Volume	approx. 9.2L
Dimensions	830 mm x 500 mm (L x W)

Figure 10. MFP V5.1 Triple Modular Phantom

4.5 Device Holder for Transmitters

In combination with the SAM Phantom V4.0, the Mounting Device (POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatable positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations. To produce the Worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Figure11. Device Holder

4.6 Brain & Muscle Simulating Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydrox-ethyl cellulose (HEC) gelling agent and saline solution (see Table 3.1). Preservation with a bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The mixture characterizations used for the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Hartsgrove.

Ingredients (% by weight)	Frequency (MHz)							
	835		1 900		2 450 –2700		5200- 5800	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body
Water	40.45	53.06	54.9	70.17	71.88	73.2	65.52	78.66
Salt (NaCl)	1.45	0.94	0.18	0.39	0.16	0.1	0.0	0.0
Sugar	57.0	44.9	0.0	0	0.0	0.0	0.0	0.0
HEC	1.0	1.0	0.0	0	0.0	0.0	0.0	0.0
Bactericide	0.1	0.1	0.0	0	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	19.97	0.0	17.24	10.67
DGBE	0.0	0.0	44.92	29.44	7.99	26.7	0.0	0.0
Diethyleneglycol hexylether	-	-	-	-	-	-	17.24	10.67

Salt:	99%Pure Sodium Chloride	Sugar:	98%Pure Sucrose
Water:	De-ionized, 16M 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		

Table 3.1 Composition of the Tissue Equivalent Matter

HCT CO., LTD.
74, Seoicheon-ro 578 beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea 467-811
TEL: +82 31 645 6300 FAX: +82 31 645 6401

4.7SAR TEST EQUIPMENT

Manufacturer	Type / Model	S/N	Calib. Date	Calib.Interval	Calib.Due
SPEAG	SAM Phantom	-	N/A	N/A	N/A
SPEAG	Triple Modular Phantom	-	N/A	N/A	N/A
Staubli	Robot RX90L	F11/5K3RA1/A/01	N/A	N/A	N/A
Staubli	Robot ControllerCS7MB	F11/5K3RA1/C/01	N/A	N/A	N/A
HP	Pavilion t000_puffer	CZC1502V6N	N/A	N/A	N/A
SPEAG	Light Alignment Sensor	SE VKS 030 AA	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	D211426.03	N/A	N/A	N/A
SPEAG	DAE4	869	Sep. 30, 2013	Annual	Sep. 30, 2014
SPEAG	E-Field Probe ET3DV6	1609	Sep. 23, 2013	Annual	Sep. 23, 2014
SPEAG	Dipole D835V2	441	Apr.25, 2013	Annual	Apr.25, 2014
SPEAG	Dipole D1900V2	5d032	Jul.29, 2013	Annual	Jul.29, 2014
Agilent	Power Meter(F) E4419B	MY41291386	Nov. 01, 2013	Annual	Nov. 01, 2014
Agilent	Power Sensor(G) 8481	MY41090680	Oct. 30, 2013	Annual	Oct. 30, 2014
HP	Dielectric Probe Kit 85070C	00721521	CBT		
HP	Dual Directional Coupler 778D	16072	Oct. 31, 2013	Annual	Oct. 31, 2014
Agilent	Base Station E5515C	GB44400269	Feb. 10, 2014	Annual	Feb. 10, 2015
HP	Signal Generator 8664A	3744A02069	Nov. 04, 2013	Annual	Nov. 04, 2014
Hewlett Packard	11636B/Power Divider	11377	Nov. 10. 2013	Annual	Nov. 11. 2014
Agilent	N9020A/ SIGNAL ANALYZER	MY51110020	Apr. 25, 2013	Annual	Apr. 25, 2014
TESCOM	TC-3000C / BLUETOOTH	3000C000276	Apr. 24, 2013	Annual	Apr. 24, 2014
HP	Network Analyzer 8753ES	JP39240221	Mar. 26, 2013	Annual	Mar. 26, 2014

NOTE:

1. The E-field probe was calibrated by SPEAG, by the waveguide technique procedure. Dipole Verification measurement is performed by HCT Lab. before each test. The brain/body simulating material is calibratedby HCT using the dielectric probe system and network analyzer to determine the conductivity andpermittivity (dielectric constant) of the brain/body-equivalent material.

2. CBT(Calibrating Before Testing). Prior to testing, the dielectric probe kit was calibrated via the network analyzer, with the specified procedure(calibrated in pure water) and calibration kit(standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Agilent

5. SAR MEASUREMENT PROCEDURE

The evaluation was performed with the following procedure:

1. The SAR value at a fixed location above the ear point was measured and was used as a reference value for assessing the power drop.

2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9mm from the innersurface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was15mm x 15mm. Based on this data, the area of the maximum absorption was determined by splineinterpolation.

3. Around this point, a volume of 32mm x 32mm x 30 mm was assessed by measuring 5 x 5 x 7 points. Onthis basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

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

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

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

4. The SAR value, at the same location as procedure #1, was re-measured. If the value changed by morethan 5%, the evaluation is repeated.

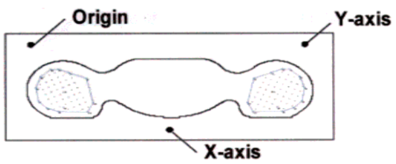


Figure12. SAR Measurement Point in Area Scan

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s).
The measurement grid within an Area Scan is defined by the grid extend, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the hightest E-field value to determine the averaged SASR-distribution over 10g.
Area scan and zoom scan resolution setting follow KDB 865664 D01v01r03 quoted below.

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

6. DESCRIPTION OF TEST POSITION

6.1 HEAD POSITION

The device was placed in a normal operating position with the Point A on the device, as illustrated in following drawing, aligned with the location of the RE(ERP) on the phantom. With the ear-piece pressed against the head, the vertical center line of the body of the handset was aligned with an imaginary plane consisting of the RE, LE and M. While maintaining these alignments, the body of the handset was gradually moved towards the cheek until any point on the mouth-piece or keypad contacted the cheek. This is a cheek/touch position. For ear/tilt position, while maintain the device aligned with the BM and FN lines, the device was pivot against ERP back for 15º or until the device antenna touch the phantom. Please refer to IEEE 1528-2003 illustration below.

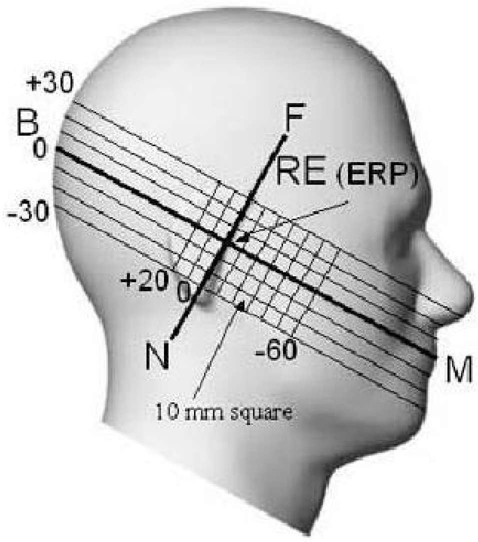


Figure 13. Side view of the phantom

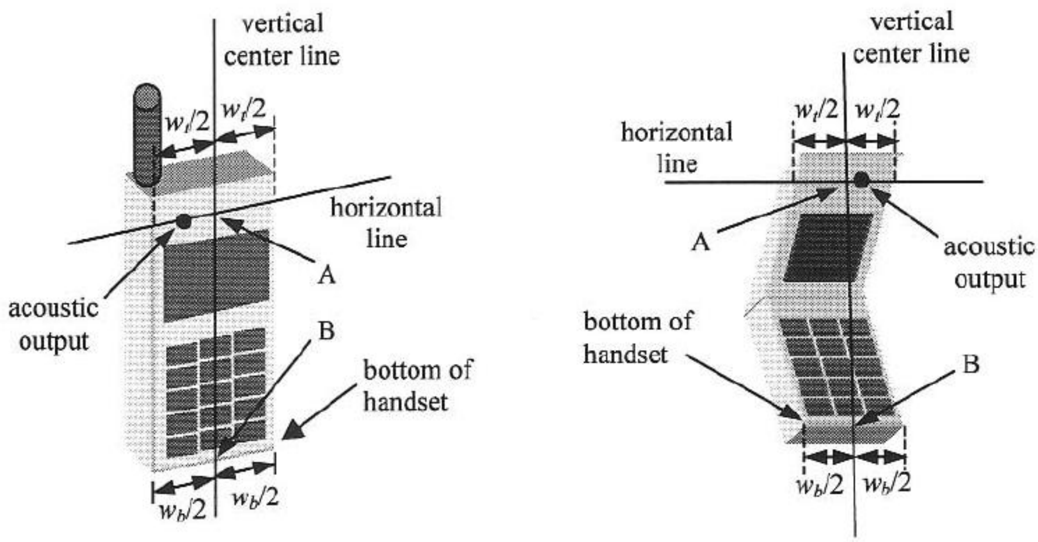


Figure 14. Handset vertical and horizontal reference lines

6.2Body Holster/Belt Clip Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the deviceand positioned against a flat phantom in a normal use configuration. A device witha headset output is tested with a headset connected to the device. Body dielectric parameters areused.

Accessories for Body-worn operation configurations are divided into two categories: those that donot contain metallic components and those that contain metallic components. When multipleaccessories that do not contain metallic components are supplied with the device, the device istested with only the accessory that dictates the closest spacing to the body. Then multipleaccessories that contain metallic components are tested witheach accessory. If multiple accessory share an identicalmetallic component (i.e. the same metallic belt-clip used with different holsters with no other metalliccomponents) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some Devicesintended to be authorized for body-worn use. In this case, a test configuration with a separationdistance between the back of the device and the flat phantom is used.

Since this EUT does not supply anybody worn accessory to the end user a distance of 2.0cm from the EUT back surface to the liquid interface is configured for the generic test.

"See the Test SET-UP Photo"

Transmitters that are designed to operate in front of a person’s face, as in push-to-talkconfigurations, are tested for SAR compliance with the front of the device positioned to face the flatphantom. For devices that are carried next to the body such as a shoulder, waist or chest-worntransmitters, SAR compliance is tested with the accessory(ies), Including headsets andmicrophones, attached to the device and positioned against a flat phantom in a normal useconfiguration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worstcasepositioning is then documented and used to perform Body SAR testing.

7. MEASUREMENT UNCERTAINTY

Error Description	Tol (± %)	Prob. dist.	Div.	c_i	Standard Uncertainty (± %)	v_{eff}
1. Measurement System						
Probe Calibration	6.00	N	1	1	6.00	∞
Axial Isotropy	4.70	R	1.73	0.7	1.90	∞
Hemispherical Isotropy	9.60	R	1.73	0.7	3.88	∞
Boundary Effects	1.00	R	1.73	1	0.58	∞
Linearity	4.70	R	1.73	1	2.71	∞
System Detection Limits	1.00	R	1.73	1	0.58	∞
Readout Electronics	0.30	N	1.00	1	0.30	∞
Response Time	0.8	R	1.73	1	0.46	∞
Integration Time	2.6	R	1.73	1	1.50	∞
RF Ambient Conditions	3.00	R	1.73	1	1.73	∞
Probe Positioner	0.40	R	1.73	1	0.23	∞
Probe Positioning	2.90	R	1.73	1	1.67	∞
Max SAR Eval	1.00	R	1.73	1	0.58	∞
2.Test Sample Related						
Device Positioning	2.90	N	1.00	1	2.90	145
Device Holder	3.60	N	1.00	1	3.60	5
Power Drift	5.00	R	1.73	1	2.89	∞
3.Phantom and Setup						
Phantom Uncertainty	4.00	R	1.73	1	2.31	∞
Liquid Conductivity(target)	5.00	R	1.73	0.64	1.85	∞
Liquid Conductivity(meas.)	2.07	N	1	0.64	1.32	9
Liquid Permitivity(target)	5.00	R	1.73	0.6	1.73	∞
Liquid Permitivity(meas.)	5.02	N	1	0.6	3.01	9
Combind Standard Uncertainty					11.13	
Coverage Factor for 95 %					$k=2$	
Expanded STD Uncertainty					22.25	

Table 7.1 Uncertainty (800 MHz- 2450 MHz)

8. ANSI/ IEEE C95.1 - 1992 RF EXPOSURE LIMITS

HUMAN EXPOSURE	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT Occupational (W/kg) or (mW/g)
SPATIAL PEAK SAR * (Brain)	1.60	8.00
SPATIAL AVERAGE SAR ** (Whole Body)	0.08	0.40
SPATIAL PEAK SAR *** (Hands / Feet / Ankle / Wrist)	4.00	20.00

Table 8.1 Safety Limits for Partial Body Exposure

NOTES:

* The Spatial Peak value of the SAR averaged over any 1 g 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 g 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).

9. SAR SYSTEM VALIDATION

Per FCC KCB 865664 D02v01r01, SAR system validation status should be document to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in IEEE 1528-2003 and FCC KDB 865664 D01v01r03. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

SAR System #	Probe	Probe Type	Probe Calibration Point		Dipole	Date	Dielectric Parameters		CW Validation			Modulation Validation		
							Measured Permittivity	Measured Conductivity	Sensitivity	Probe Linearity	Probe Isotropy	MOD. Type	Duty Factor	PAR
2	1609	ET3DV6	Head	835	441	Oct.08,2013	41.1	0.91	PASS	PASS	PASS	GMSK	PASS	N/A
2	1609	ET3DV6	Head	1900	5d032	Oct.09,2013	39.2	1.42	PASS	PASS	PASS	GMSK	PASS	N/A
2	1609	ET3DV6	Body	835	441	Oct.08,2013	54.8	0.98	PASS	PASS	PASS	GMSK	PASS	N/A
2	1609	ET3DV6	Body	1900	5d032	Oct.09,2013	52.9	1.54	PASS	PASS	PASS	GMSK	PASS	N/A

Table 9.1SAR System Validation Summary

Note;

All measurement were performed using probes calibrated for CW signal only. Modulations in the table bove represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01r03. SAR system were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to KDB 865664D01v01r03.

10. SYSTEM VERIFICATION

10.1 Tissue Verification

Freq. [MHz]	Date	Probe	Dipole	Liquid	Liquid Temp .[°C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
835	Feb. 17, 2014	1609	441	Head	20.4	ε_r	41.5	42.232	+ 1.76	± 5
						σ	0.90	0.878	- 2.44	± 5
835	Feb. 17, 2014			Body	20.4	ε_r	55.2	54.165	- 1.88	± 5
						σ	0.97	0.971	+ 0.10	± 5
1 900	Feb. 18, 2014		5d032	Head	20.3	ε_r	40.0	39.153	- 2.12	± 5
						σ	1.40	1.383	- 1.21	± 5
1 900	Feb. 18, 2014			Body	20.3	ε_r	53.3	52.322	- 1.83	± 5
						σ	1.52	1.505	- 0.99	± 5

The Tissue dielectronic parameters were measured prior to the SAR evaluation using an Agilent 85070C Dielectronic Probe Kit and Agilent Network Analyzer.

10.2 System Verification

Prior to assessment, the system is verified to the ± 10 % of the specifications at 850MHz / 1900MHzby using the system Verification kit. (Graphic Plots Attached)

Freq. [MHz]	Date	Probe (SN)	Dipole (SN)	Liquid	Amb. Temp. [°C]	Liquid Temp. [°C]	1 W Target SAR_{1g} (SPEAG) (mW/g)	Measured SAR_{1g} (mW/g)	1 W Normalized SAR_{1g} (mW/g)	Deviation [%]	Limit [%]
835	Feb. 17, 2014	1609	441	Head	20.6	20.4	9.68	0.999	9.99	+ 3.20	± 10
835	Feb. 17, 2014			Body	20.6	20.4	9.69	0.945	9.45	- 2.48	± 10
1 900	Feb. 18, 2014		5d032	Head	20.5	20.3	40.1	4.05	40.5	+ 1.00	± 10
1 900	Feb. 18, 2014			Body	20.5	20.3	40.5	3.96	39.6	- 2.22	± 10

10.3 System Verification Procedure

SAR measurement was prior to assessment, the system is verified to the ± 10 % of the specifications at each frequencyband by using the system Verification kit. (Graphic Plots Attached)

- Cabling the system, using the Verification kit equipments.
- Generate about 100 mW Input Level from the Signal generator to the Dipole Antenna.
- Dipole Antenna was placed below the Flat phantom.
- The measured one-gram SAR at the surface of the phantom above the dipole feed-point should be within 10 % of the target reference value.
- The results are normalized to 1 W input power.

Note;
SAR Verification was performed according to the FCC KDB 865664D01v01r03.

11. RF CONDUCTED POWER MEASUREMENT

Power measurements were performed using a base station simulator under digital average power.
The handset was placed into a simulated call using a base station simulator in a shielded chamber.
Such test signals offer a consistent means for testing SAR and are recommended for evaluation SAR
SAR measurements were taken with a fully charged battery. In order to verify that the device was tested and maintained at full power, this was configured with the base station simulator. The SAR measurement Software calculates a reference point at the start and end of the test to check for power drifts. If conducted Power deviations of more then 5 % occurred, the tests were repeated.

11.1 Output Power Specifications.

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB publication 447498 D01v05r02.

CDMA

CDMA835
Target Power : 24 dBm
Tune-up Tolerance : -1.5 dB/ +0.5 dB

PCS

PCS1900
Target Power : 24 dBm
Tune-up Tolerance : -1.5 dB/ +0.5 dB

GSM

GSM850	GSM1900
Target Power : 33 dBm	Target Power : 29.7 dBm
GPRS850	GPRS1900
GPRS 1tx : 33 dBm	GPRS 1tx : 29.7 dBm
GPRS 2tx : 32 dBm	GPRS 2tx : 29.5 dBm
GPRS 3tx : 31 dBm	GPRS 3tx : 29 dBm
GPRS 4tx : 30 dBm	GPRS 4tx : 28 dBm
Tune-up Tolerance : -1.5dB/ +0.5 dB	

BT.

Bluetooth(Average Power)	4 dBm

11.2 CDMA

See 3GPP2 C.S0011/TIA-98-E as recommended by "SAR Measurement Procedures for 3G Devices", May 2006. Maximum output power is verified on the High, Middle and Low channels according to procedures defined in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in “All Up” condition.

1. If the mobile station supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9 600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1 (Table 9.1) parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH0 and demodulation of RC 3, 4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9 600 bps Fundamental Channel and 9 600 bps SCH0 data rate Channel and 9 600 bps SCH0 data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2(Table 9.2) was applied.
5. FCHs were configured at full rate for maximum SAR with “All Up” power control bits.

Parameters for Max. Power for RC1

Parameter	Units	Value
I_{or}	dBm/1.23 MHz	-104
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

Table. 9.1

Parameters for Max. Power for RC3

Parameter	Units	Value
I_{or}	dBm/1.23 MHz	-86
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

Table. 9.2

11.2.1 Head SAR Measurement

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 ¼ 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.

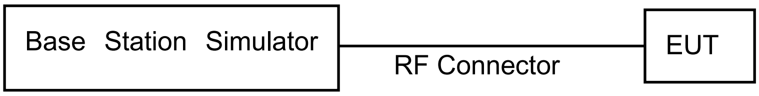
11.2.2 Body SAR Measurement

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCHn) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCHn) with FCH at full rate and SCH0 enabled at 9 600 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 ¼ 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

Band	Channel	SO3	SO3	SO55	SO55	TDSO SO32	1xEvDO Rev.0	1xEvDO Rev.0	1xEvDO Rev.A	1xEvDO Rev.A
		RC1/1	RC3/3	RC1/1	RC3/3	RC3/3	(FTAP)	(RTAP)	(FETAP)	(RETAP)
CDMA	1013	24.20	24.18	24.18	24.10	24.02	24.14	24.15	24.16	24.20
	384	24.10	24.00	23.95	23.90	23.98	24.00	24.02	24.06	24.08
	777	24.25	24.23	24.25	24.16	24.15	24.20	24.20	24.20	24.21
PCS	25	24.15	24.12	24.17	24.11	24.25	24.09	24.13	24.08	24.05
	600	24.10	24.04	24.07	23.98	23.95	24.05	24.00	24.10	24.09
	1175	24.00	23.85	23.80	23.73	23.72	23.84	23.86	23.87	23.90

11.3 GSM

Conducted output power measurements were performed using a base station simulator under digital average power.



SAR Test for WWAN were performed with a base station simulator Agilent E5515C. Communication between the device and the emulator was established by air link. Set base station emulator to allow DUT to radiate maximum output power during all tests. Please refer to the below worst case SAR operation setup.

- GSM voice: Head SAR, Body SAR
- GPRS Multi-slots : Hotspot Body SAR with GPRS Multi-slot Class12 with CS 1 (GMSK)

Note;

CS1 coding scheme was used in GPRS output power measurements and SAR Testing, as a condition where GMSK modulation was ensured. Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels in the GPRS modes.

GSM Conducted output powers (Burst-Average)

Band	Channel	Voice	GPRS(GMSK) Data – CS1			
		GSM (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)
GSM 850	128	32.32	32.42	31.07	30.52	29.13
	190	32.18	32.16	30.94	30.69	29.07
	251	32.14	31.97	30.95	30.04	28.86
GSM 1900	512	28.54	28.36	28.31	28.08	27.55
	661	28.80	28.48	28.27	28.18	27.66
	810	29.19	28.84	28.62	28.34	27.97

GSM Conducted output powers (Frame-Average)

Band	Channel	Voice	GPRS(GMSK) Data – CS1			
		GSM (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)
GSM 850	128	23.29	23.39	25.05	26.26	26.12
	190	23.15	23.13	24.92	26.43	26.06
	251	23.11	22.94	24.93	25.78	25.85
GSM 1900	512	19.51	19.33	22.29	23.82	24.54
	661	19.77	19.45	22.25	23.92	24.65
	810	20.16	19.81	22.60	24.08	24.96

Note:

Time slot average factor is as follows:
1 Tx slot = 9.03 dB, Frame-Average output power = Burst-Average output power – 9.03 dB
2 Tx slot = 6.02 dB, Frame-Average output power = Burst-Average output power – 6.02 dB
3 Tx slot = 4.26 dB, Frame-Average output power = Burst-Average output power – 4.26 dB
4 Tx slot = 3.01 dB, Frame-Average output power = Burst-Average output power – 3.01 dB

11.4 SAR Test Exclusions Applied

11.4.1BT

Per FCC KDB 447498 D01v05r02, The SAR exclusion threshold for distance < 50mm is defined by the following equation:

$$\frac{MaxPowerofChannel(mW)}{TestSeparationDistance(mm)} * \sqrt{Frequency(GHz)} \leq 3.0$$

. Mode	Frequency	Maximum Allowed Power	Separation Distance	≤ 3.0
	[MHz]	[mW]	[mm]	
Bluetooth	2440	3	20	0.23

Based on the maximum conducted power of Bluetooth and antenna to use separation distance, Bluetooth SAR was not required [(3/20)*√2.440] = 0.23< 3.0.

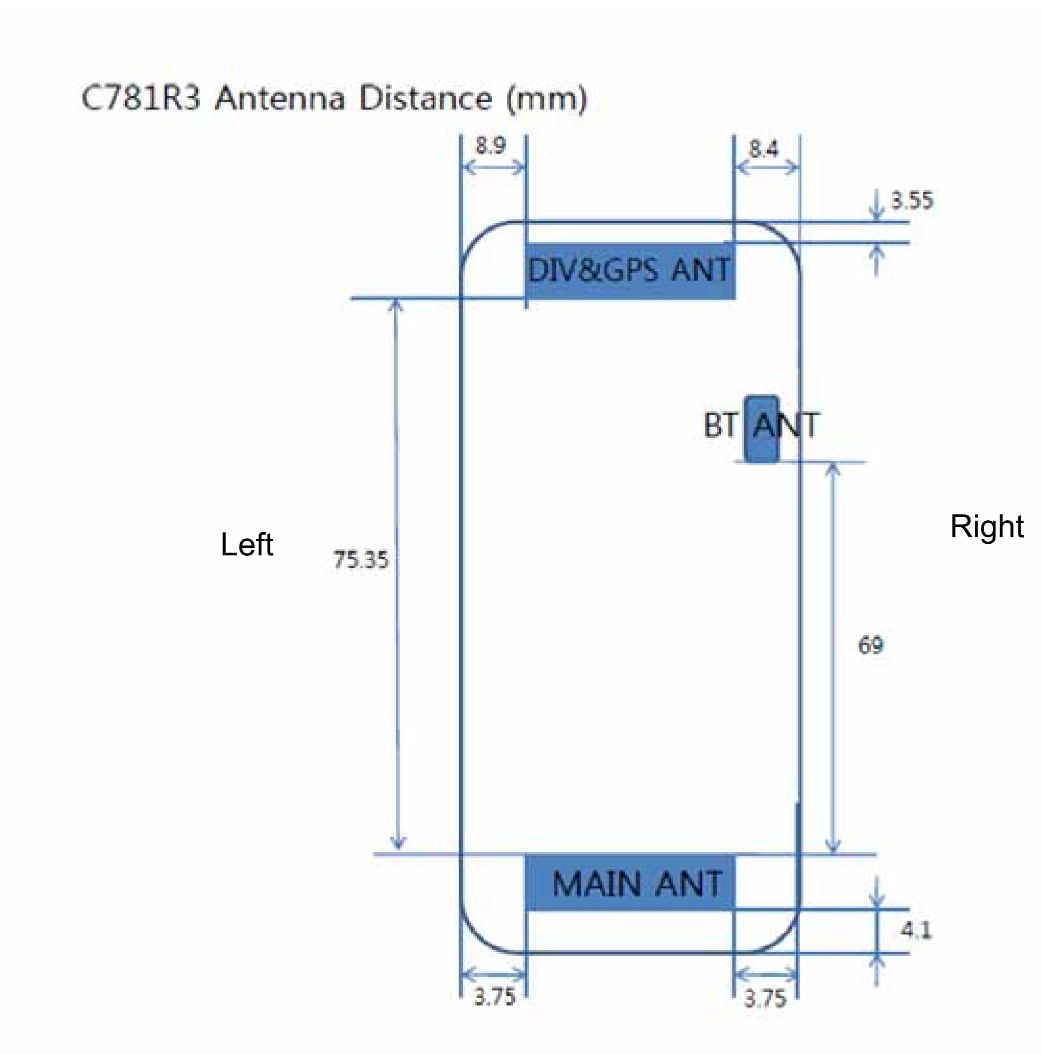
his device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05r02 IV.C.1iii, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤ 1.6W/kg. When standalone SAR is not required to be measured per FCC KDB 447498 D01v05r02 4.3.22, the following equation must be used to estimate the standalone 1-g SAR for simultaneous transmission assessment involving that transmitter

$$Estimated\ SAR = \frac{\sqrt{f(GHZ)}}{7.5} * \frac{(Max\ Power\ of\ channel\ mW)}{Min\ Seperation\ Distance}.$$

. Mode	Frequency	Maximum Allowed Power	separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[mW]	[mm]	[W/kg]
Bluetooth	2440	3	20	0.03

Note : Held-to ear configurations are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission. The Estimated SAR results were determined according to FCC KDB447498 D01v05r02.

12. SAR Test Antenna Information



※Please see C781R3_Ant_distance file for further information.

13. SAR TEST DATA SUMMARY

13.1-1 Measurement Results (CDMA835 Head SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Battery	Phantom Position	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power							
824.7	1013	CDMA 835	24.5	24.10	0.04	Standard	Left Ear	0.689	1.096	0.755	-
836.52	384		24.5	23.90	-0.11	Standard	Left Ear	0.811	1.148	0.931	-
848.31	777		24.5	24.16	-0.02	Standard	Left Ear	0.929	1.081	1.005	-
836.52	384		24.5	23.90	0.00	Standard	Left Tilt 15°	0.223	1.148	0.256	-
824.7	1013		24.5	24.10	-0.09	Standard	Right Ear	0.762	1.096	0.836	-
836.52	384		24.5	23.90	-0.17	Standard	Right Ear	0.838	1.148	0.962	-
848.31	777		24.5	24.16	-0.04	Standard	Right Ear	1.01	1.081	**1.092**	1
836.52	384		24.5	23.90	-0.01	Standard	Right Tilt 15°	0.229	1.148	0.263	-
848.31	777		24.5	24.16	-0.09	Extended	Right Ear	0.920*	1.081	0.995	-
848.31	777		24.5	24.16	-0.09	Standard	Front 2.5 cm without Holster	0.227**	1.081	0.245	-
ANSI/ IEEE C95.1 - 1992– Safety Limit **Spatial Peak** **Uncontrolled Exposure/ General Population**							**Head** **1.6 W/kg (mW/g)** Averaged over 1 gram				

*Highest SAR value measurement in this band repeated with *Extended battery.
** Highest SAR value measurement in this band repeated in **PTT Mode.

13.1-2 Measurement Results (PCS1900 Head SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Battery	Phantom Position	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power							
1 851.25	25	PCS 1900	24.5	24.11	-0.12	Standard	Left Ear	0.807	1.094	0.883	-
1 880.0	600		24.5	23.98	-0.15	Standard	Left Ear	0.786	1.127	0.886	-
1 908.75	1175		24.5	23.73	-0.17	Standard	Left Ear	0.709	1.194	0.847	-
1 880.0	600		24.5	23.98	-0.12	Standard	Left Tilt15°	0.112	1.127	0.126	-
1 851.25	25		24.5	24.11	-0.06	Standard	Right Ear	1.04	1.094	1.138	-
1 880.0	600		24.5	23.98	0.05	Standard	Right Ear	1.09	1.127	**1.229**	2
1 908.75	1175		24.5	23.73	-0.18	Standard	Right Ear	0.868	1.194	1.036	-
1 880.0	600		24.5	23.98	-0.01	Standard	Right Tilt15°	0.154	1.127	0.174	-
1 880.0	600		24.5	23.98	0.00	Extended	Right Ear	0.989*	1.127	1.115	-
1 880.0	600		24.5	23.98	-0.17	Standard	Front 2.5 cm without Holster	0.145**	1.127	0.163	-
ANSI/ IEEE C95.1 - 1992– Safety Limit **Spatial Peak** **Uncontrolled Exposure/ General Population**							**Head** **1.6 W/kg (mW/g)** Averaged over 1 gram				

*Highest SAR value measurement in this band repeated with *Extended battery.
** Highest SAR value measurement in this band repeated in **PTT Mode.

13.1-3 Measurement Results (GSM850 Head SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Battery	Phantom Position	Measured SAR (mW/g)	Scaling factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power							
836.6	190	GSM 850	33.5	32.18	0.14	Standard	Left Ear	0.352	1.355	0.477	-
836.6	190		33.5	32.18	0.06	Standard	Left Tilt15°	0.087	1.355	0.118	-
836.6	190		33.5	32.18	0.11	Standard	Right Ear	0.540	1.355	**0.732**	3
836.6	190		33.5	32.18	-0.01	Standard	Right Tilt15°	0.136	1.355	0.184	-
836.6	190		33.5	32.18	-0.12	Extended	Right Ear	0.464*	1.355	0.629	-
836.6	190		33.5	32.18	0.16	Standard	Front 2.5 cm without Holster	0.226**	1.355	0.306	-
ANSI/ IEEE C95.1 - 1992– Safety Limit **Spatial Peak** **Uncontrolled Exposure/ General Population**							**Head** **1.6 W/kg (mW/g)** Averaged over 1 gram				

*Highest SAR value measurement in this band repeated with *Extended battery.
** Highest SAR value measurement in this band repeated in **PTT Mode.

13.1-4 Measurement Results (GSM1900 Head SAR)

Frequency MHz	Frequency Ch.	Mode	Power (dBm) Tune-Up Limit	Power (dBm) Conducted Power	Power Drift (dB)	Battery	Phantom Position	Measured SAR (mW/g)	Scaling factor	Scaled SAR (mW/g)	Plot No.
1 880.0	661	GSM 1900	30.2	28.80	0.09	Standard	Left Ear	0.357	1.380	0.493	-
1 880.0	661		30.2	28.80	0.07	Standard	Left Tilt15°	0.056	1.380	0.077	-
1 880.0	661		30.2	28.80	-0.12	Standard	Right Ear	0.420	1.380	**0.580**	4
1 880.0	661		30.2	28.80	0.11	Standard	Right Tilt15°	0.045	1.380	0.062	-
1 880.0	661		30.2	28.80	-0.09	Extended	Right Ear	0.373*	1.380	0.515	-
1 880.0	661		30.2	28.80	-0.05	Standard	Front 2.5 cm without Holster	0.051**	1.380	0.070	-
ANSI/ IEEE C95.1 - 1992– Safety Limit **Spatial Peak** **Uncontrolled Exposure/ General Population**							**Head** **1.6 W/kg (mW/g)** Averaged over 1 gram				

*Highest SAR value measurement in this band repeated with *Extended battery.
** Highest SAR value measurement in this band repeated in **PTT Mode.

13.2-1 Measurement Results (CDMA835Body-worn SAR)

Frequency MHz	Frequency Ch.	Mode	Power (dBm) Tune-Up Limit	Power (dBm) Conducted Power	Power Drift (dB)	Configuration	Separation Distance	Measured SAR(mW/g)	Scaling Factor	Scaled SAR(mW/g)	Plot No.
836.52	384	CDMA 835	24.5	23.98	-0.00	Rear	2.0 cm	0.521	1.127	**0.587**	5
836.52	384		24.5	23.98	0.01	Front	2.0 cm	0.414	1.127	0.467	-
836.52	384		24.5	23.98	-0.03	Rear	2.0 cm	0.492*	1.127	0.555	-
ANSI/ IEEE C95.1 - 1992– Safety Limit **Spatial Peak** **Uncontrolled Exposure/ General Population**							**Body** **1.6 W/kg (mW/g)** Averaged over 1 gram				

* Highest SAR value measurement in this band repeated with *Extended battery.

13. 2-2 Measurement Results (PCS1900 Body-worn SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Configuration	Separation Distance	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power							
1 880.0	600	PCS 1900	24.5	23.95	0.03	Rear	2.0 cm	0.327	1.135	**0.371**	6
1 880.0	600		24.5	23.95	0.16	Front	2.0 cm	0.216	1.135	0.245	-
1 880.0	600		24.5	23.95	-0.19	Rear	2.0 cm	0.325*	1.135	0.369	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Body 1.6 W/kg (mW/g)** Averaged over 1 gram				

* Highest SAR value measurement in this band repeated with *Extended battery.

13.2-3 Measurement Results (GSM850 Body-worn SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Configuration	Separation Distance	Measured SAR(mW/g)	Scaling Factor	Scaled SAR(mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power							
836.6	190	GSM 850	33.5	32.18	0.18	Rear	2.0 cm	0.373	1.355	**0.505**	7
836.6	190		33.5	32.18	0.14	Front	2.0 cm	0.303	1.355	0.411	-
836.6	190		33.5	32.18	0.03	Rear	2.0 cm	0.351*	1.355	0.476	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Body 1.6 W/kg (mW/g)** Averaged over 1 gram				

* Highest SAR value measurement in this band repeated with *Extended battery.

13. 2-4 Measurement Results (GSM1900 Body-worn SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Configuration	Separation Distance	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power							
1 880.0	661	GSM 1900	30.2	28.80	-0.14	Rear	2.0 cm	0.111	1.380	0.153	-
1 880.0	661		30.2	28.80	-0.18	Front	2.0 cm	0.070	1.380	0.097	-
1 880.0	661		30.2	28.80	0.13	Rear	2.0 cm	0.112*	1.380	**0.155**	8
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Body 1.6 W/kg (mW/g)** Averaged over 1 gram				

* Highest SAR value measurement in this band repeated with *Extended battery.

13.3SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2003, FCC KDB Procedure.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery was used for all SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB 447498 D01v05r02.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 20 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB 648474 D04v01r02, SAR was evaluated without a headset connected to the device. Since the standalone reported SAR was $\leq$ 1.2 W/kg, no additional SAR evaluation using a headset cable were required..

GSM/GPRS Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. Per FCC KDB 447498 D01v05r02., if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is $\leq$ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is 1/2 dB, instead of the middle channel, the highest output power channel must be used.

CDMA Test Notes:

1. Head SAR was tested under RC3/SO55.
2. Body SAR was tested under RC3/SO32.

HCT CO., LTD.
74, Seoicheon-ro 578 beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea 467-811
TEL: +82 31 645 6300 FAX: +82 31 645 6401

14.SAR Measurement Variability and Uncertainty

In accordance with published RF Exposure KDB procedure 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Frequency		Modulation	Battery	Configuration	Original SAR(mW/g)	Repeated SAR(mW/g)	Largest to Smallest SAR Ratio	Plot No.
MHz	Channel							
848.31	777	CDMA835	Standard	Right	1.01	1.00	1.01	9
1 880	600	PCS1900	Standard	Right	1.09	1.03	1.06	10

Note(s):

1) Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

2) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg.

HCT CO., LTD.
74, Seoicheon-ro 578 beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea 467-811
TEL: +82 31 645 6300 FAX: +82 31 645 6401

15. SAR Summation Scenario

	Position	Applicable Combination	Note
Simultaneous Transmission	Body-worn	CDMA835Voice + 2.4 GHz Bluetooth	
		PCS1900Voice + 2.4 GHz Bluetooth	
		GSM850 Voice + 2.4 GHz Bluetooth	
		GSM1900 Voice + 2.4 GHz Bluetooth	
* BT are not simultaneous transmission.			

15.1 Simultaneous Transmission Summation for Body-Worn

Simultaneous Transmission Summation with Bluetooth (2cm)

Band	configuration	Scaled SAR(W/kg)	BT SAR (W/kg)	∑ 1-g SAR (W/kg)
CDMA835	Rear	0.587	0.03	0.617
CDMA835	Front	0.467	0.03	0.497
PCS1900	Rear	0.371	0.03	0.401
PCS1900	Front	0.245	0.03	0.275
GSM850	Rear	0.505	0.03	0.535
GSM850	Front	0.411	0.03	0.441
GSM1900	Rear	0.155	0.03	0.185
GSM1900	Front	0.097	0.03	0.127

16. CONCLUSION

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the ANSI/ IEEE C95.1 1992.

These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests.

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[19] SAR Evaluation of Handsets with Multiple Transmitters and Antennas #648474.

[20] SAR Measurement Procedure for 802.11 a/b/g Transmitters #KDB 248227.

Attachment 1.– SAR Test Plots

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS CDMA/GSM Phone with Bluetooth
Liquid Temperature:	20.4℃
Ambient Temperature:	20.6℃
Test Date:	Feb.17, 2014
Plot No.:	1

DUT: C781R3; Type: Folder; Serial: #1

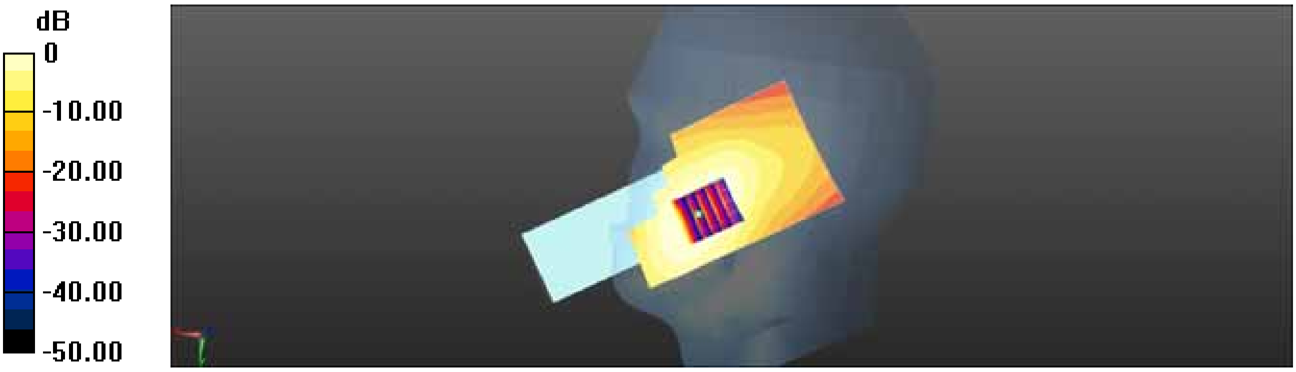
Communication System: UID 0, CDMA 835MHz FCC (0); Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 848.31 MHz; σ = 0.89 S/m; ε_r = 42.09; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.43, 6.43, 6.43); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: SAM with CRP v5.0_Front_20120517; Type: QD000P40CD; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

C781R3/CDMA835 Right touch 777ch/Area Scan (61x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.08 W/kg

C781R3/CDMA835 Right touch 777ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.754 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.36 W/kg
SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.702 W/kg
Maximum value of SAR (measured) = 1.07 W/kg



0 dB = 1.08 W/kg = 0.33 dBW/kg

Test Laboratory: HCT CO., LTD
EUT Type: Cellular/PCS CDMA/GSM Phone with Bluetooth
Liquid Temperature: 20.3℃
Ambient Temperature: 20.5 ℃
Test Date: Feb. 18, 2014
Plot No.: 2

DUT: C781R3; Type: Folder; Serial: #1

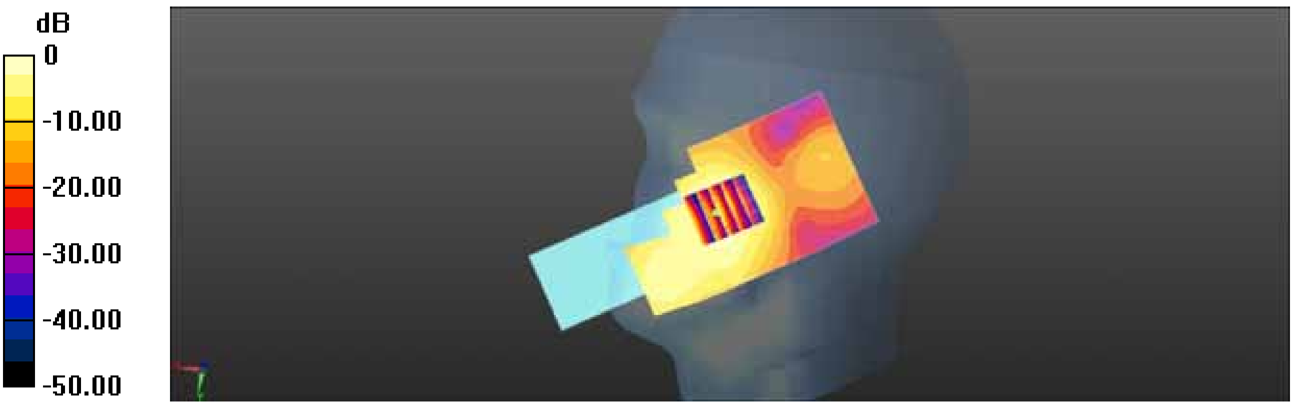
Communication System: UID 0, PCS 1900MHz FCC (0); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.361 S/m; ε_r = 39.243; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.28, 5.28, 5.28); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: SAM with CRP_left20140117; Type: SAM; Serial
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

C781R3/PCS1900 Right touch 600ch/Area Scan (61x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.21 W/kg

C781R3/PCS1900 Right touch 600ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.103 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.61 W/kg
SAR(1 g) = 1.09 W/kg; SAR(10 g) = 0.640 W/kg
Maximum value of SAR (measured) = 1.14 W/kg



0 dB = 1.21 W/kg = 0.84 dBW/kg

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS CDMA/GSM Phone with Bluetooth
Liquid Temperature:	20.4℃
Ambient Temperature:	20.6℃
Test Date:	Feb. 17, 2014
Plot No.:	3

DUT: C781R3; Type: Folder; Serial: #1

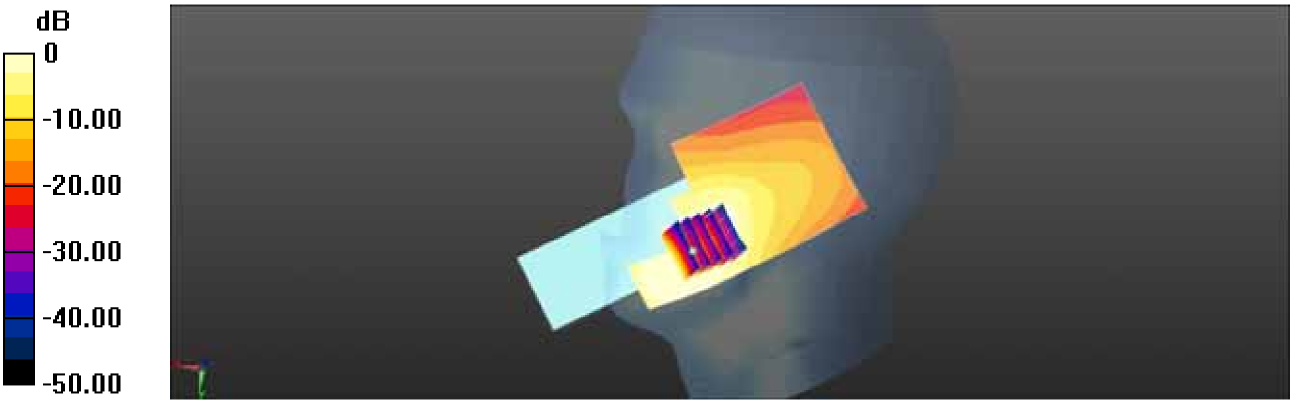
Communication System: UID 0, GSM 850 (0); Frequency: 836.6 MHz;Duty Cycle: 1:8.30042
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.88 S/m; ε_r = 42.218; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.43, 6.43, 6.43); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: SAM with CRP v5.0_2014_01_17; Type: QD000P40CD; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

C781R3/GSM850 Right Touch 190ch/Area Scan (61x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.579 W/kg

C781R3/GSM850 Right Touch 190ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.804 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.694 W/kg
SAR(1 g) = 0.540 W/kg; SAR(10 g) = 0.388 W/kg
Maximum value of SAR (measured) = 0.573 W/kg



0 dB = 0.579 W/kg = -2.37 dBW/kg

Test Laboratory: HCT CO., LTD
EUT Type: Cellular/PCS CDMA/GSM Phone with Bluetooth
Liquid Temperature: 20.3℃
Ambient Temperature: 20.5℃
Test Date: Feb. 18, 2014
Plot No.: 4

DUT: C781R3; Type: Folder; Serial: #1

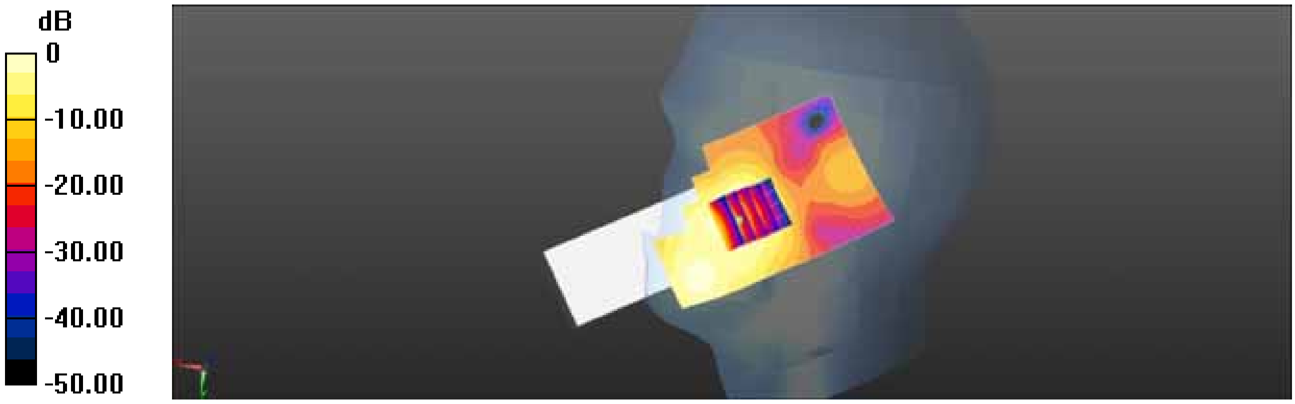
Communication System: UID 0, GSM 1900 (0); Frequency: 1880 MHz;Duty Cycle: 1:8.30042
Medium parameters used: f = 1880 MHz; σ = 1.361 S/m; ε_r = 39.243; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.28, 5.28, 5.28); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: SAM with CRP_left20140117; Type: SAM; Serial
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

C781R3/GSM1900 Right Touch 661ch/Area Scan (61x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.440 W/kg

C781R3/GSM1900 Right Touch 661ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.865 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.657 W/kg
SAR(1 g) = 0.420 W/kg; SAR(10 g) = 0.230 W/kg
Maximum value of SAR (measured) = 0.472 W/kg



0 dB = 0.440 W/kg = -3.57 dBW/kg

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS CDMA/GSM Phone with Bluetooth
Liquid Temperature:	20.4℃
Ambient Temperature:	20.6℃
Test Date:	Feb. 17, 2014
Plot No.:	5

DUT: C781R3; Type: Folder; Serial: #1

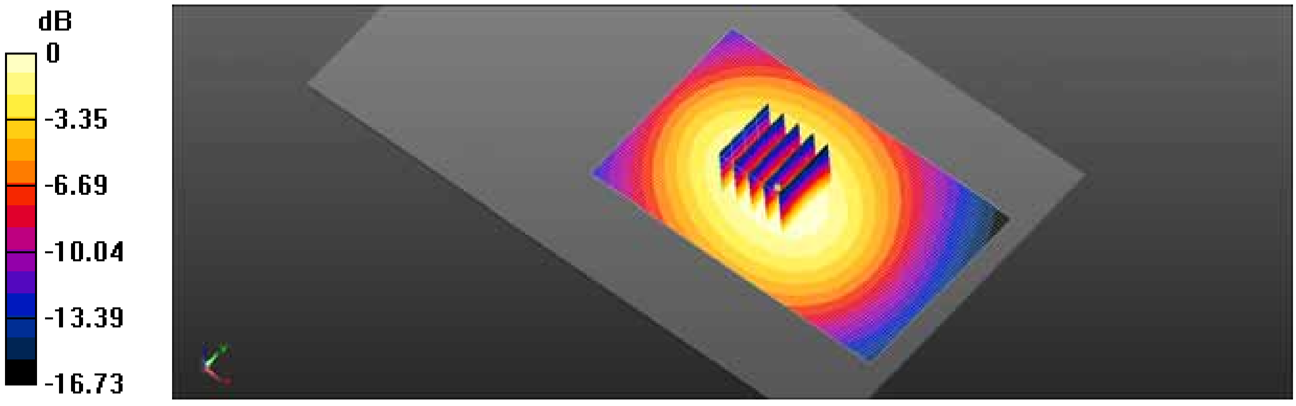
Communication System: UID 0, CDMA 835MHz FCC (0); Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; σ = 0.972 S/m; ε_r = 54.167; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.22, 6.22, 6.22); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: Triple Flat Phantom 5.1C_2014_01_17; Type: QD 000 P51 CA; Serial: xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

C781R3/CDMA835 Body rear 384ch/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.546 W/kg

C781R3/CDMA835 Body rear 384ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.015 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 0.667 W/kg
SAR(1 g) = 0.521 W/kg; SAR(10 g) = 0.379 W/kg
Maximum value of SAR (measured) = 0.553 W/kg



0 dB = 0.546 W/kg = -2.63 dBW/kg

Test Laboratory: HCT CO., LTD
EUT Type: Cellular/PCS CDMA/GSM Phone with Bluetooth
Liquid Temperature: 20.3℃
Ambient Temperature: 20.5℃
Test Date: Feb. 18, 2014
Plot No.: 6

DUT: C781R3; Type: Folder; Serial: #1

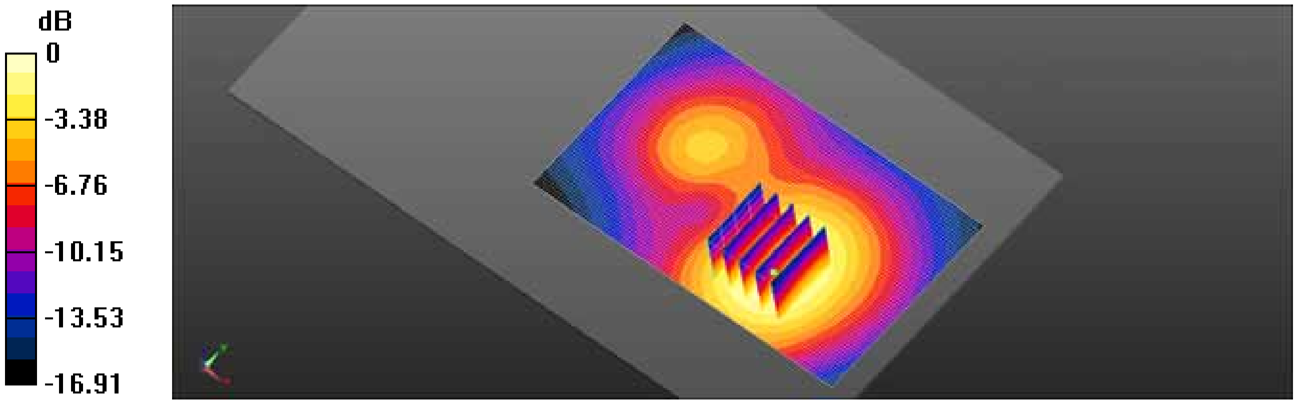
Communication System: UID 0, PCS 1900MHz FCC (0); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.484 S/m; ε_r = 52.401; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.69, 4.69, 4.69); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

C781R3/PCS1900 Body rear 600ch/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.359 W/kg

C781R3/PCS1900 Body rear 600ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.524 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.510 W/kg
SAR(1 g) = 0.327 W/kg; SAR(10 g) = 0.206 W/kg
Maximum value of SAR (measured) = 0.354 W/kg



0 dB = 0.359 W/kg = -4.45 dBW/kg

Test Laboratory: HCT CO., LTD
EUT Type: Cellular/PCS CDMA/GSM Phone with Bluetooth
Liquid Temperature: 20.4℃
Ambient Temperature: 20.6℃
Test Date: Feb. 17, 2014
Plot No.: 7

DUT: C781R3; Type: Folder; Serial: #1

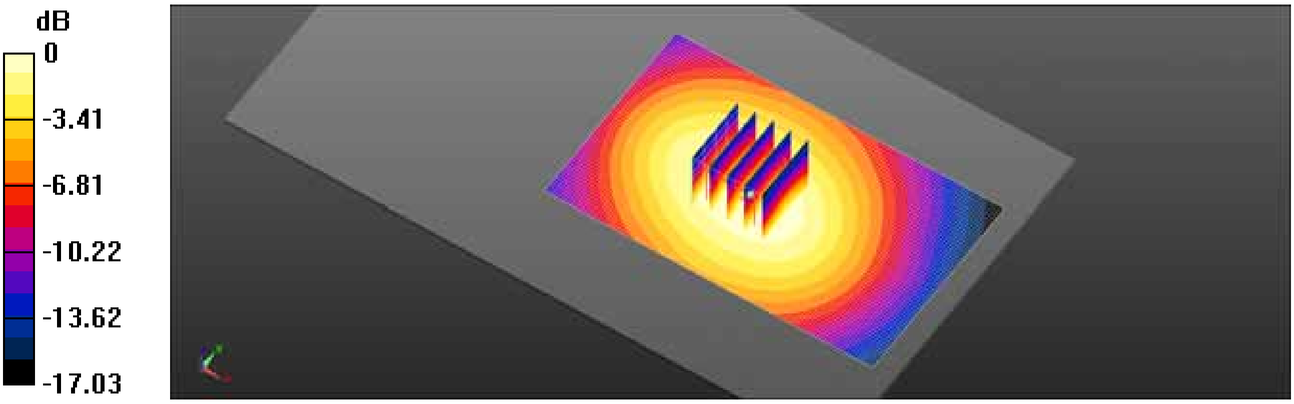
Communication System: UID 0, GSM 850 (0); Frequency: 836.6 MHz;Duty Cycle: 1:8.30042
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.972 S/m; ε_r = 54.167; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.22, 6.22, 6.22); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: Triple Flat Phantom 5.1C_2014_01_17; Type: QD 000 P51 CA; Serial: xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

C781R3/GSM850 Body rear 190ch/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.369 W/kg

C781R3/GSM850 Body rear 190ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.232 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.507 W/kg
SAR(1 g) = 0.373 W/kg; SAR(10 g) = 0.272 W/kg
Maximum value of SAR (measured) = 0.392 W/kg



0 dB = 0.369 W/kg = -4.33 dBW/kg

Test Laboratory: HCT CO., LTD

EUT Type: Cellular/PCS CDMA/GSM Phone with Bluetooth
Liquid Temperature: 20.3℃
Ambient Temperature: 20.5℃
Test Date: Feb. 18, 2014
Plot No.: 8

DUT: C781R3; Type: Folder; Serial: #1

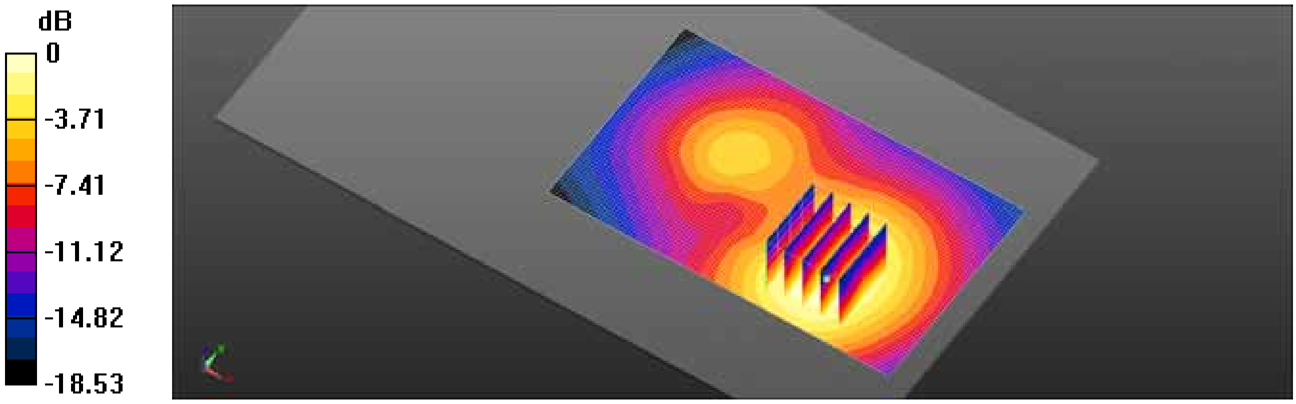
Communication System: UID 0, GSM 1900 (0); Frequency: 1880 MHz;Duty Cycle: 1:8.30042
Medium parameters used: f = 1880 MHz; σ = 1.484 S/m; ε_r = 52.401; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.69, 4.69, 4.69); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

C781R3/GSM1900 Body rear 661ch Extended/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.107 W/kg

C781R3/GSM1900 Body rear 661ch Extended/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.960 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.173 W/kg
SAR(1 g) = 0.112 W/kg; SAR(10 g) = 0.068 W/kg
Maximum value of SAR (measured) = 0.125 W/kg



0 dB = 0.107 W/kg = -9.70 dBW/kg

Test Laboratory: HCT CO., LTD
EUT Type: Cellular/PCS CDMA/GSM Phone with Bluetooth
Liquid Temperature: 20.4℃
Ambient Temperature: 20.6℃
Test Date: Feb. 17, 2014
Plot No.: 9

DUT: C781R3; Type: Folder; Serial: #1

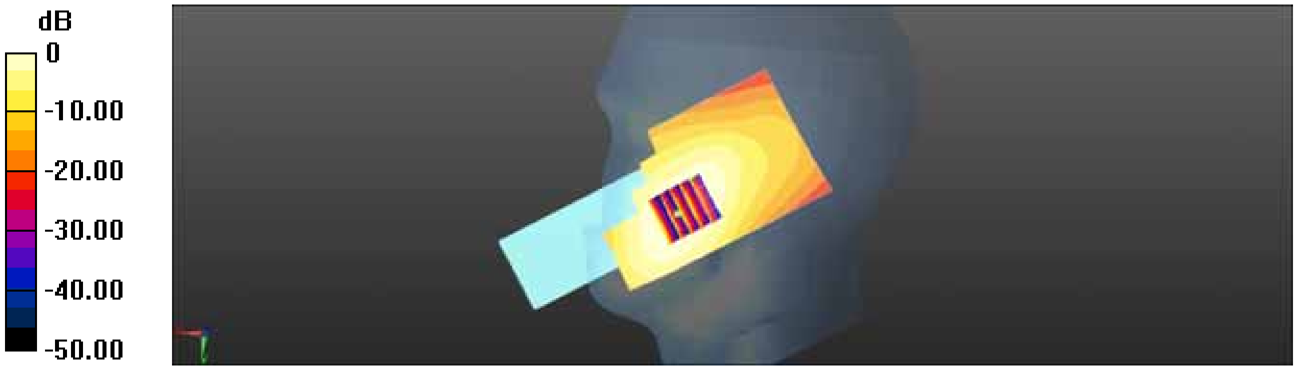
Communication System: UID 0, CDMA 835MHz FCC (0); Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 848.31 MHz; σ = 0.89 S/m; ε_r = 42.09; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.43, 6.43, 6.43); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: SAM with CRP v5.0_Front_20120517; Type: QD000P40CD; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

C781R3/CDMA835 Right touch 777ch/Area Scan (61x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.08 W/kg

C781R3/CDMA835 Right touch 777ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.692 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.42 W/kg
SAR(1 g) = 1.000 W/kg; SAR(10 g) = 0.697 W/kg
Maximum value of SAR (measured) = 1.05 W/kg



0 dB = 1.08 W/kg = 0.34 dBW/kg

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS CDMA/GSM Phone with Bluetooth
Liquid Temperature:	20.3℃
Ambient Temperature:	20.5℃
Test Date:	Feb. 18, 2014
Plot No.:	10

DUT: C781R3; Type: Folder; Serial: #1

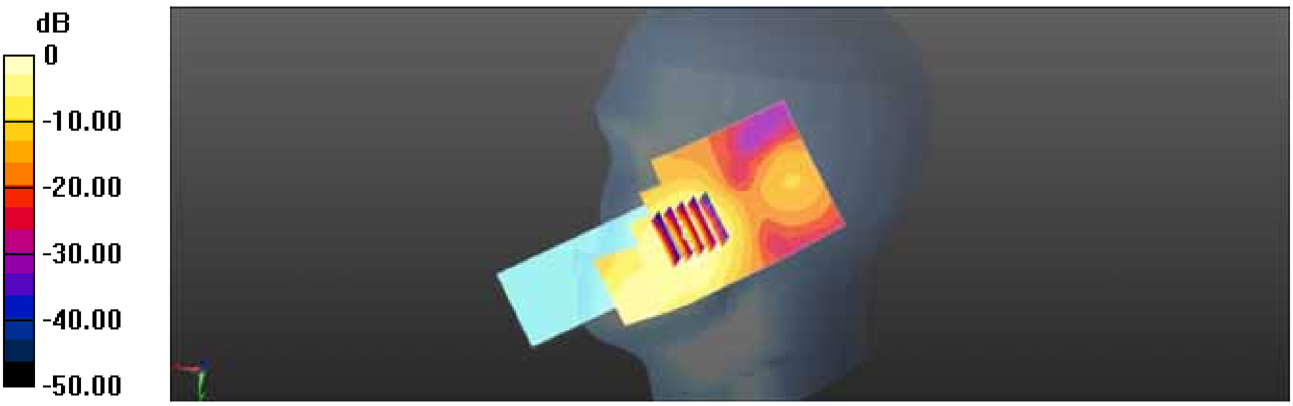
Communication System: UID 0, PCS 1900MHz FCC (0); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.361 S/m; ε_r = 39.243; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.28, 5.28, 5.28); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: SAM with CRP_left20140117; Type: SAM; Serial
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

C781R3/PCS1900 Right touch 600ch repeat/Area Scan (61x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.17 W/kg

C781R3/PCS1900 Right touch 600ch repeat/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.637 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.579 W/kg
Maximum value of SAR (measured) = 1.14 W/kg



0 dB = 1.17 W/kg = 0.70 dBW/kg

Attachment 2. – Dipole Verification Plots

■ Verification Data (835 MHz Head)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.4℃
Test Date:	Feb. 17, 2014

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:441

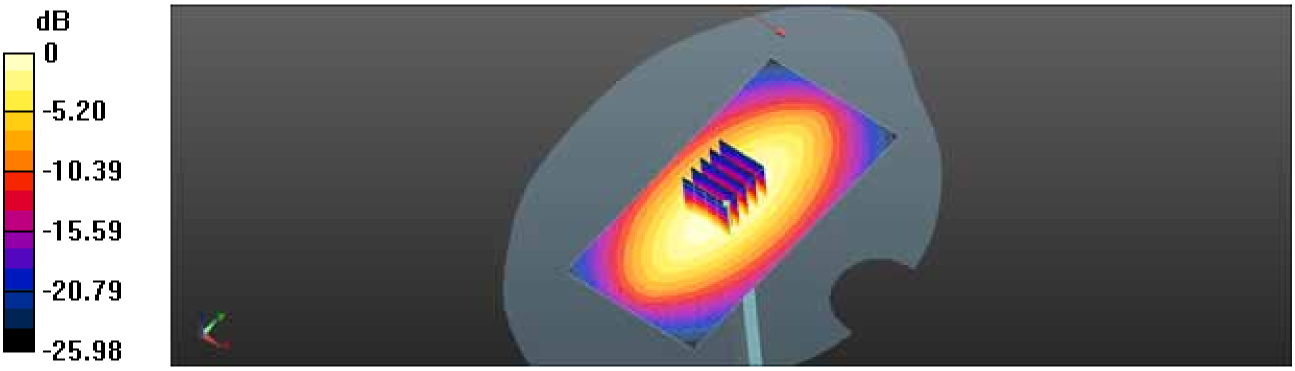
Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.878 S/m; ε_r = 42.232; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.43, 6.43, 6.43); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: SAM with CRP v5.0_Front_20120517; Type: QD000P40CD; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

835MHz SAR Verification/835MHz Verification/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.07 W/kg

835MHz SAR Verification/835MHz Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.923 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.999 W/kg; SAR(10 g) = 0.655 W/kg
Maximum value of SAR (measured) = 1.08 W/kg



0 dB = 1.07 W/kg = 0.30 dBW/kg

■ Verification Data (835 MHzBody)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.4℃
Test Date: Feb. 17, 2014

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:441

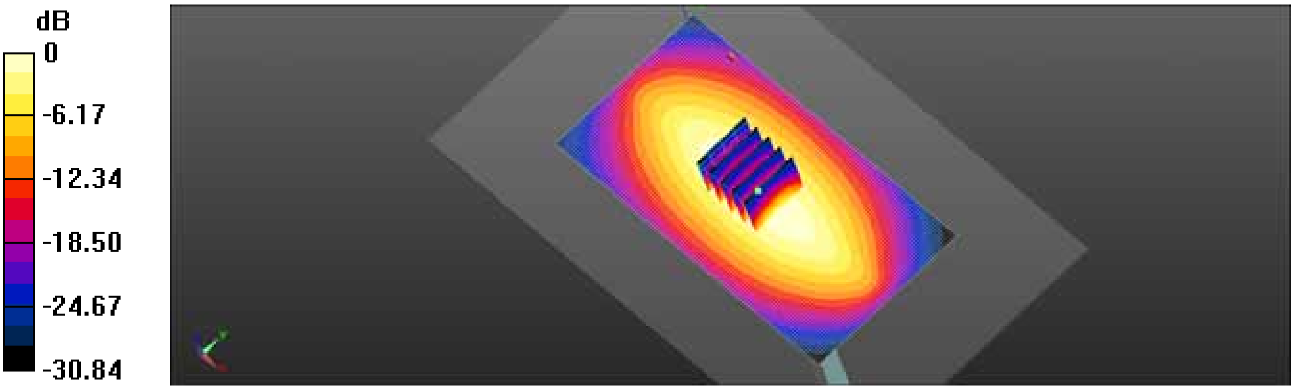
Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.971 S/m; ε_r = 54.165; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.22, 6.22, 6.22); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: Triple Flat Phantom 5.1C-2014-02-21; Type: QD 000 P51 CA; Serial: xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

835MHz SAR verification/835MHz Verification/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.04 W/kg

835MHz SAR verification/835MHz Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.034 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 1.44 W/kg
SAR(1 g) = 0.945 W/kg; SAR(10 g) = 0.595 W/kg
Maximum value of SAR (measured) = 1.04 W/kg



0 dB = 1.04 W/kg = 0.17 dBW/kg

■ Verification Data (1900 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.3℃
Test Date: Feb. 18, 2014

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d032

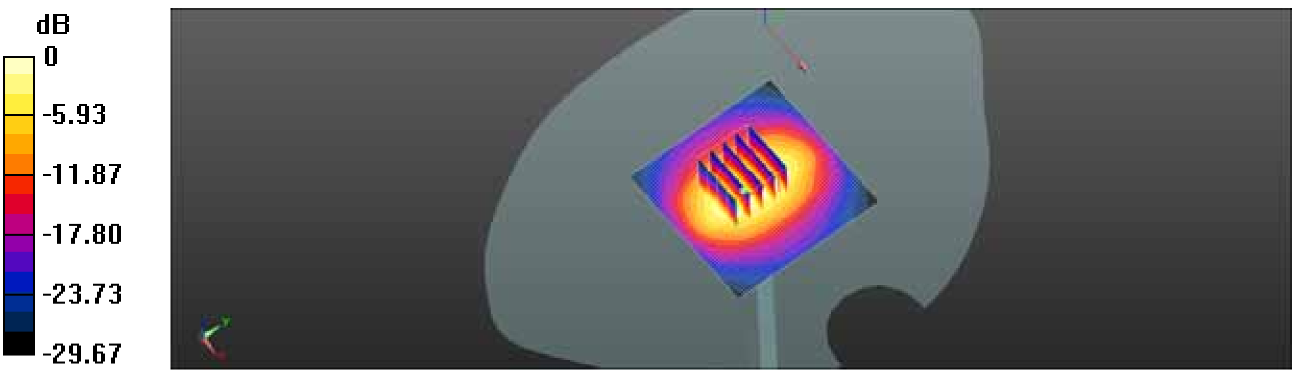
Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.383 S/m; ε_r = 39.153; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.28, 5.28, 5.28); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: SAM with CRP v5.0_Front_20120517; Type: QD000P40CD; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

1900MHz SAR Verification/1900MHz Verification/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 4.69 W/kg

1900MHz SAR Verification/1900MHz Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 60.056 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 7.36 W/kg
SAR(1 g) = 4.05 W/kg; SAR(10 g) = 2.06 W/kg
Maximum value of SAR (measured) = 4.52 W/kg



0 dB = 4.69 W/kg = 6.71 dBW/kg

■ Verification Data (1900 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.3℃
Test Date: Feb. 18, 2014

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d032

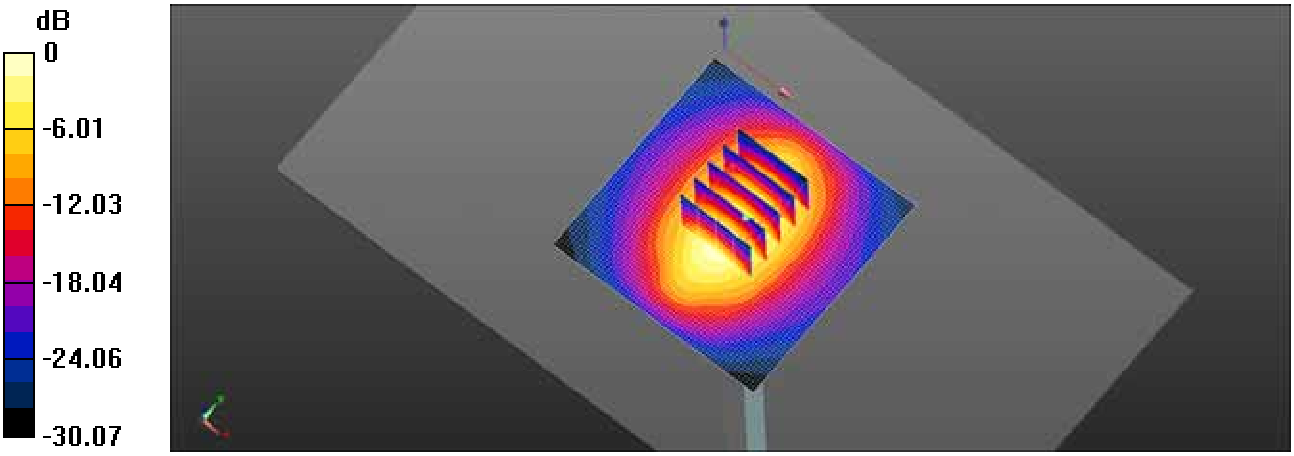
Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.505 S/m; ε_r = 52.322; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY5 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.69, 4.69, 4.69); Calibrated: 2013-09-23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2013-09-30
- Phantom: Triple Flat Phantom 5.1C-2014-02-21; Type: QD 000 P51 CA; Serial: xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

1900MHz SAR verification/1900MHz Verification/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 4.58 W/kg

1900MHz SAR verification/1900MHz Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 58.576 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 6.64 W/kg
SAR(1 g) = 3.96 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 4.39 W/kg



0 dB = 4.58 W/kg = 6.61 dBW/kg

Attachment 3.– Probe Calibration Data

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
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 **HCT (Dymstec)**

Certificate No: **ET3-1609_Sep13**

CALIBRATION CERTIFICATE

Object: ET3DV6 - SN:1609

Calibration procedure(s): QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: September 23, 2013

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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	4-Sep-13 (No. DAE4-660_Sep13)	Apr-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: September 24, 2013

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

Certificate No: ET3-1609_Sep13 Page 1 of 11

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
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
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	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., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,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*.
- *DCPx,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.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* 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 ≤ 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 *NORMx,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.

Probe ET3DV6

SN:1609

Manufactured: July 27, 2001
Calibrated: September 23, 2013

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1609

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.99	1.79	1.80	± 10.1 %
DCP (mV)[B]	98.3	98.3	98.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	146.6	±2.5 %
		Y	0.0	0.0	1.0		151.1	
		Z	0.0	0.0	1.0		144.0	

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 NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

ET3DV6– SN:1609 September 23, 2013

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1609

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.69	6.69	6.69	0.36	2.56	± 12.0 %
835	41.5	0.90	6.43	6.43	6.43	0.26	3.00	± 12.0 %
900	41.5	0.97	6.28	6.28	6.28	0.31	2.78	± 12.0 %
1450	40.5	1.20	5.79	5.79	5.79	0.58	2.37	± 12.0 %
1750	40.1	1.37	5.50	5.50	5.50	0.80	2.02	± 12.0 %
1900	40.0	1.40	5.28	5.28	5.28	0.80	2.07	± 12.0 %
1950	40.0	1.40	5.15	5.15	5.15	0.80	1.99	± 12.0 %
2300	39.5	1.67	4.98	4.98	4.98	0.80	1.84	± 12.0 %
2450	39.2	1.80	4.64	4.64	4.64	0.80	1.70	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

ET3DV6– SN:1609 September 23, 2013

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1609

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.25	6.25	6.25	0.31	2.76	± 12.0 %
835	55.2	0.97	6.22	6.22	6.22	0.42	2.34	± 12.0 %
1750	53.4	1.49	4.90	4.90	4.90	0.80	2.34	± 12.0 %
1900	53.3	1.52	4.69	4.69	4.69	0.80	2.27	± 12.0 %
2450	52.7	1.95	4.20	4.20	4.20	0.68	1.21	± 12.0 %

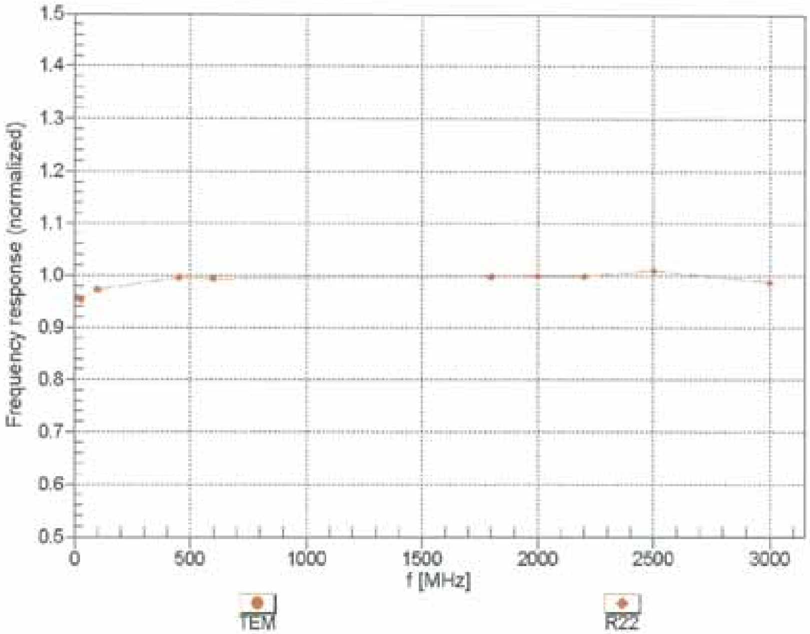
[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Certificate No: ET3-1609_Sep13 Page 6 of 11

ET3DV6– SN:1609 September 23, 2013

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

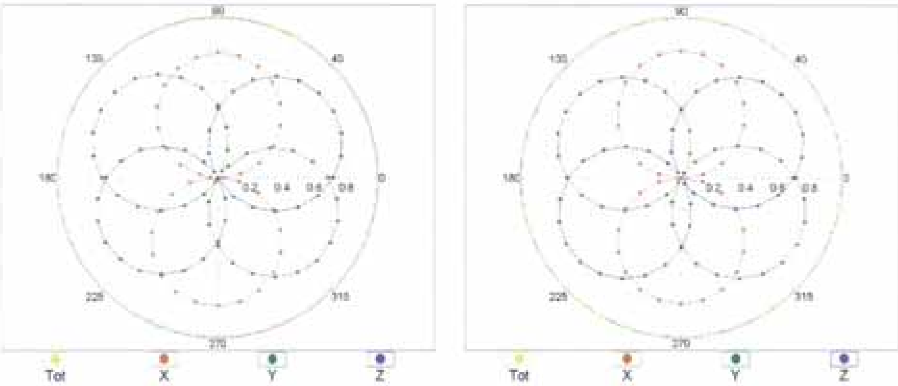


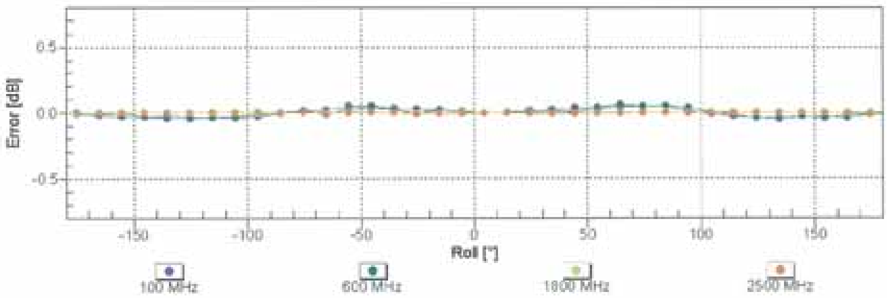
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

ET3DV6– SN:1609 September 23, 2013

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM f=1800 MHz,R22



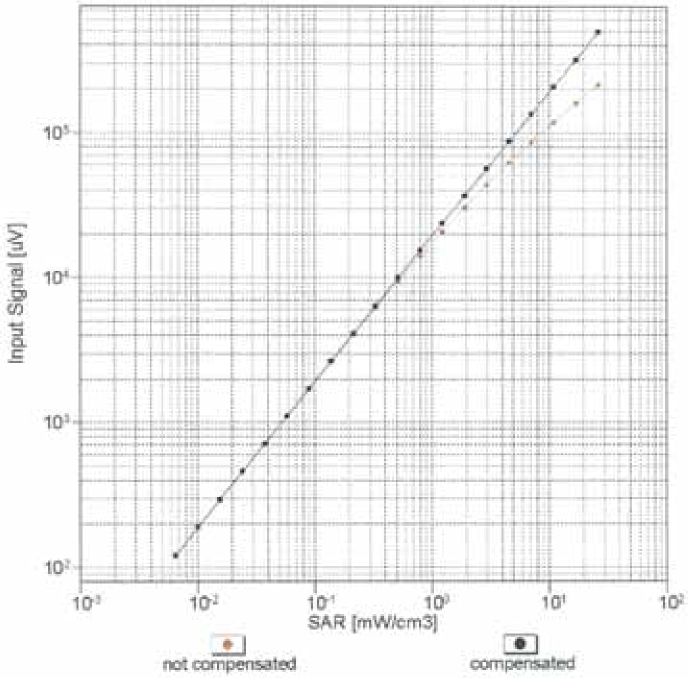


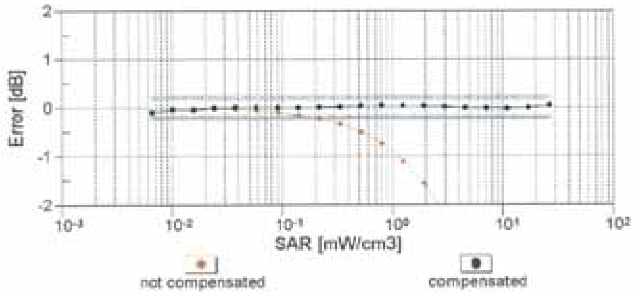
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Certificate No: ET3-1609_Sep13 Page 8 of 11

ET3DV6– SN:1609 September 23, 2013

Dynamic Range f(SAR$_{head}$)
(TEM cell , f = 900 MHz)





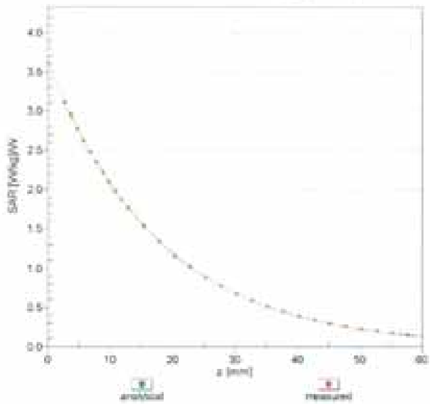
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: ET3-1609_Sep13 Page 9 of 11

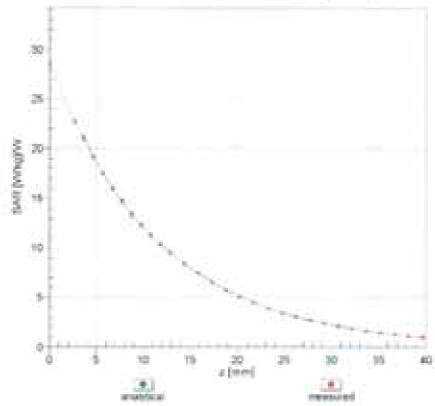
ET3DV6– SN:1609 September 23, 2013

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

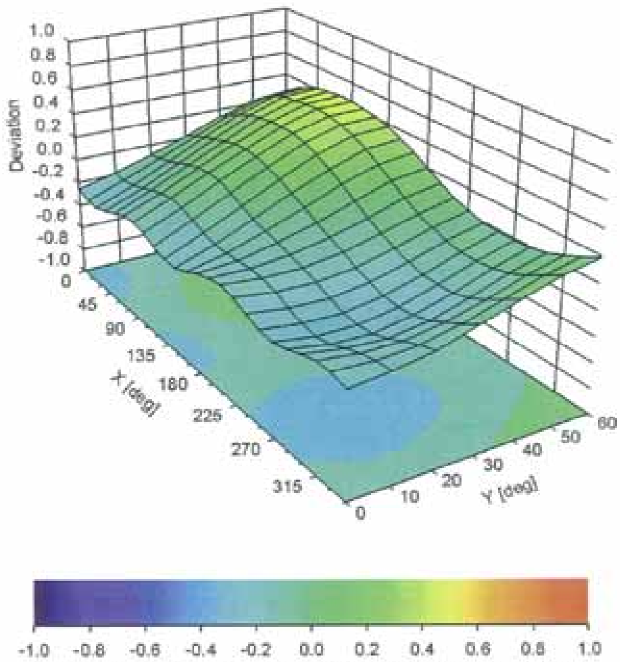


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: ET3-1609_Sep13 Page 10 of 11

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1609

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-105.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

Attachment 4.– Dipole Calibration Data

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

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Accreditation No.: SCS 108

Client **HCT (Dymstec)**

Certificate No: D835V2-441_Apr13

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 441
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	April 25, 2013

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 EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 909	11-Sep-12 (No. DAE4-909_Sep12)	Sep-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 26, 2013

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

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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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.8 ± 6 %	0.94 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.51 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.68 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.30 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.0 ± 6 %	1.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.51 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.69 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.38 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.0 Ω - 1.6 jΩ
Return Loss	- 31.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.0 Ω - 4.6 jΩ
Return Loss	- 24.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.372 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 09, 2001

DASY5 Validation Report for Head TSL

Date: 25.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

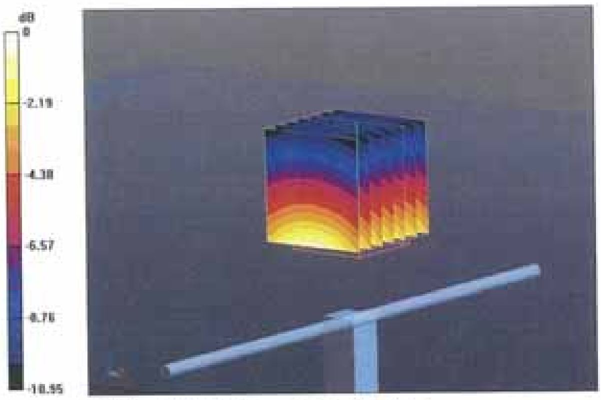
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 441

Communication System: UID 0 - CW - Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

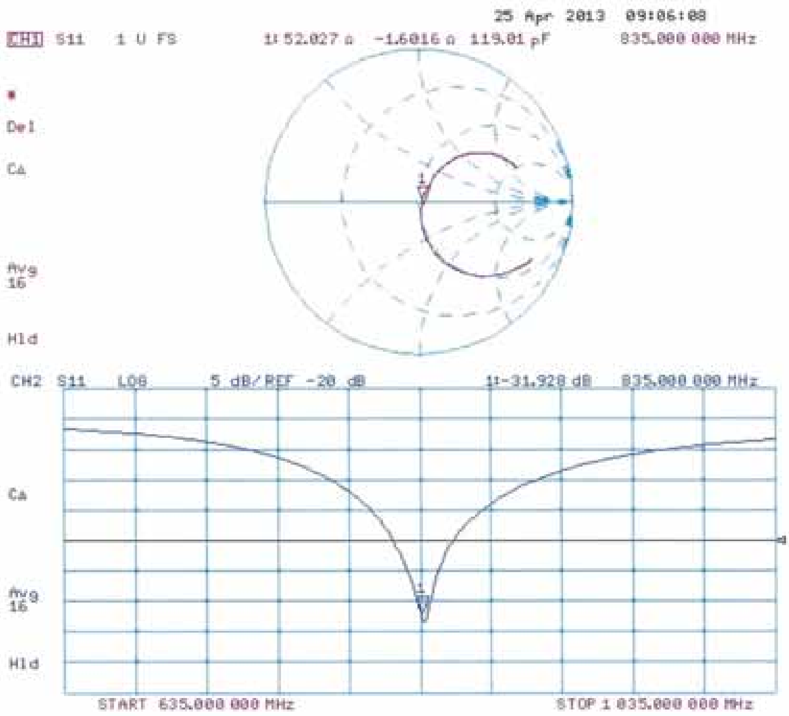
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.617 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.84 W/kg
SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.62 W/kg
Maximum value of SAR (measured) = 2.94 W/kg



0 dB = 2.94 W/kg = 4.68 dBW/kg

Certificate No: D835V2-441_Apr13 Page 5 of 8

Impedance Measurement Plot for Head TSL



Certificate No: D835V2-441_Apr13 Page 6 of 8

DASY5 Validation Report for Body TSL

Date: 24.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

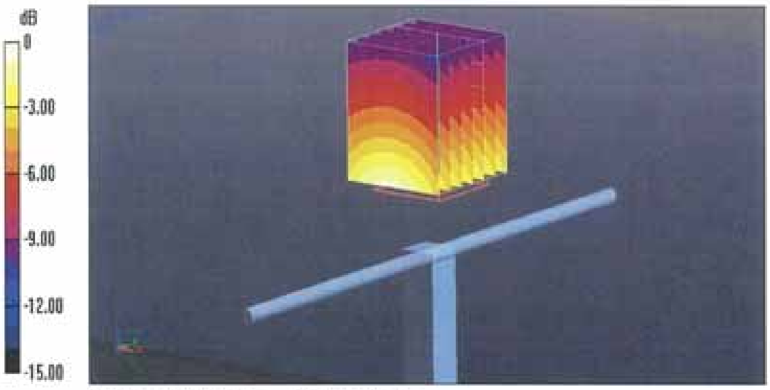
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 441

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 S/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

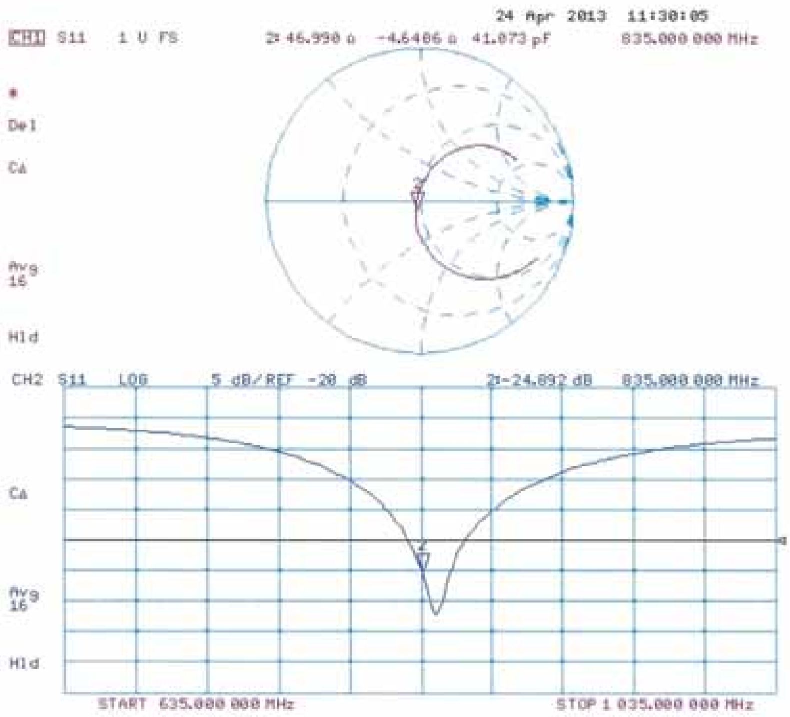
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.722 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.72 W/kg
SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.64 W/kg
Maximum value of SAR (measured) = 2.93 W/kg



0 dB = 2.93 W/kg = 4.67 dBW/kg

Certificate No: D835V2-441_Apr13 Page 7 of 8

Impedance Measurement Plot for Body TSL



Certificate No: D835V2-441_Apr13 Page 8 of 8

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Accreditation No.: SCS 108

Client **HCT (Dymstec)**

Certificate No: **D1900V2-5d032_Jul13**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d032
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 29, 2013

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 EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 30, 2013

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Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.9 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.4 ± 6 %	1.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.34 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1 Ω + 5.3 jΩ
Return Loss	- 25.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω + 5.4 jΩ
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.193 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 17, 2003

HCT CO., LTD.
74, Seoicheon-ro 578 beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea 467-811
TEL: +82 31 645 6300 FAX: +82 31 645 6401

DASY5 Validation Report for Head TSL

Date: 29.07.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d032

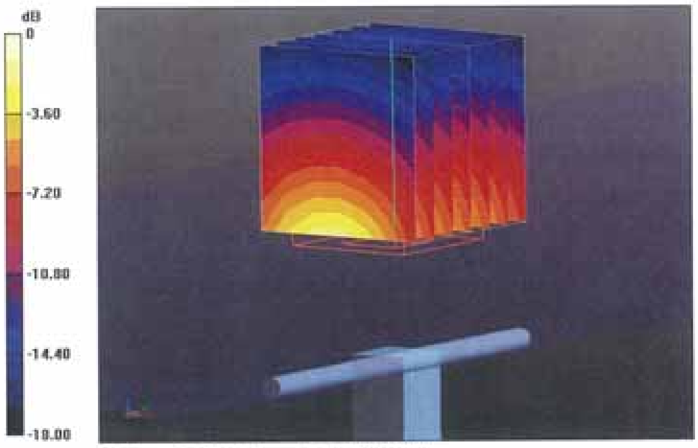
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.36 S/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

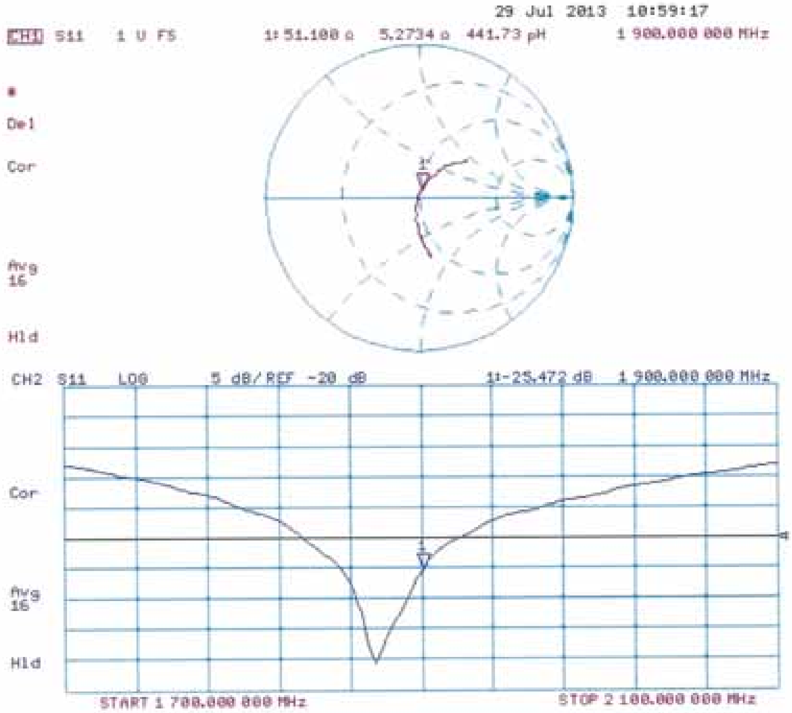
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.191 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.9 W/kg
SAR(1 g) = 9.91 W/kg; SAR(10 g) = 5.21 W/kg
Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg

HCT CO., LTD.
74, Seoicheon-ro 578 beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea 467-811
TEL: +82 31 645 6300 FAX: +82 31 645 6401

Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 29.07.2013

Test Laboratory: SPEAG, Zurich, Switzerland

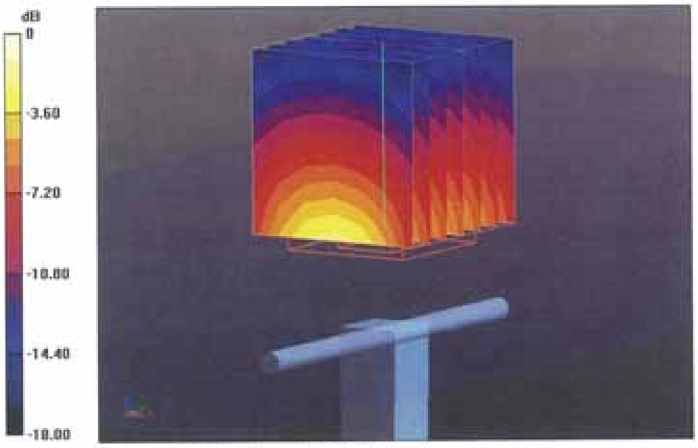
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d032

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.49 S/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.191 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 17.1 W/kg
SAR(1 g) = 10 W/kg; SAR(10 g) = 5.34 W/kg
Maximum value of SAR (measured) = 12.6 W/kg



0 dB = 12.6 W/kg = 11.00 dBW/kg

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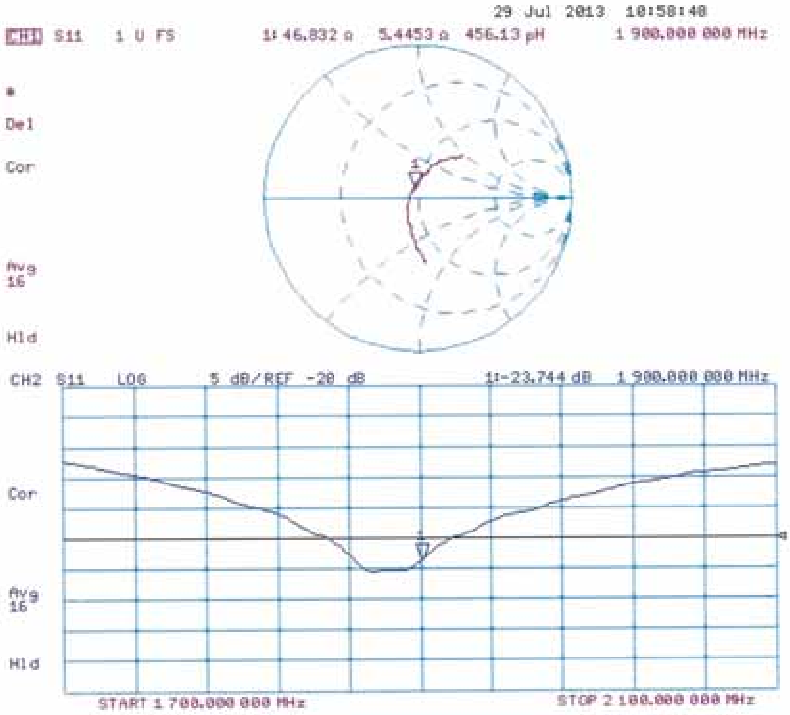
Impedance Measurement Plot for Body TSL



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