SAR TEST REPORT

HCT CO., LTD

EUT Type:	Mobile Phone
FCC ID:	A3LSMN7506V
Model:	SM-N7506V
Date of Issue:	Feb. 20, 2014
Test report No.:	HCTA1402F003-1
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 :	**SAMSUNG Electronics Co., Ltd.** 129, Samsung-ro, Yeongtong-gu, Suwon-City, Gyeonggi-do, 443-742 Republic of 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
HCTA1402F003	Feb. 14, 2014	First Approval Report
HCTA1402F003-1	Feb. 20, 2014	Sec. 15.3 : was revised (Typo)

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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 by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 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 derivative of 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.

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

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 D02 HSPA and 1x Advanced v02r02
- FCC KDB Publication 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- FCC KDB Publication 941225 D04v01 SAR for GSM E GPRS Dual Xfer Mode
- FCC KDB Publication 941225 D05 SAR for LTE Devices v02r03
- FCC KDB Publication 941225 D06 Hot Spot SAR v01r01
- FCC KDB Publication 248227 D01v01r02 (SAR Considerationa for 802.11 Devices)
- 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">Mobile Phone</td></tr>
<tr><td>FCC ID:</td><td colspan="6">A3LSMN7506V</td></tr>
<tr><td>Model:</td><td colspan="6">SM-N7506V</td></tr>
<tr><td>Trade Name</td><td colspan="6">SAMSUNG Electronics 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">GSM850 / GSM1900 / WCDMA850 / WCDMA1900 / LTE41 / 802.11a/b/g/n</td></tr>
<tr><td>Tx Frequency</td><td colspan="6">824.20 - 848.80 MHz (GSM850) / 1 850.20 – 1 909.80 MHz (GSM1900)
826.4 - 846.6 MHz (WCDMA850) / 1 852.4 – 1 907.6 MHz (WCDMA1900) / 2 501.0 – 2 685.0 (LTE 41)
2 412- 2 462 MHz (802.11b/g/n/ac) / 5 180-5 825MHz(802.a/n/ac)</td></tr>
<tr><td>Production Unit or Identical Prototype</td><td colspan="6">Prototype</td></tr>
<tr><td rowspan="20">Max SAR</td><td rowspan="2">Band</td><td rowspan="2">Tx Frequency (MHz)</td><td rowspan="2">Equipment Class</td><td colspan="3">Reported 1g SAR (W/Kg)</td></tr>
<tr><td>Head</td><td>Body-worn</td><td>Hotspot</td></tr>
<tr><td>GSM850</td><td>824.2 - 848.8</td><td>PCE</td><td>0.26</td><td>0.40</td><td>0.40</td></tr>
<tr><td>GSM1900</td><td>1 850.2 -1 909.8</td><td>PCE</td><td>0.23</td><td>0.64</td><td>0.64</td></tr>
<tr><td>WCDMA 850</td><td>826.4 - 846.6</td><td>PCE</td><td>0.16</td><td>0.28</td><td>0.28</td></tr>
<tr><td>WCDMA 1900</td><td>1 852.4 – 1 907.6</td><td>PCE</td><td>0.25</td><td>0.92</td><td>0.92</td></tr>
<tr><td>LTE 41</td><td>2 501.0 – 2 685.0</td><td>PCE</td><td>0.015</td><td>1.07</td><td>1.07</td></tr>
<tr><td>802.11b</td><td>2 412.0 - 2 462.0</td><td>DTS</td><td>0.44</td><td>0.24</td><td>0.24</td></tr>
<tr><td>802.11a</td><td>5 745 - 5 825</td><td>DTS</td><td>0.27</td><td>0.34</td><td>0.34</td></tr>
<tr><td>802.11a</td><td>5 180 - 5 240</td><td>UNII</td><td>0.20</td><td>0.12</td><td></td></tr>
<tr><td>802.11a</td><td>5 260 - 5 320</td><td>UNII</td><td>0.16</td><td>0.14</td><td></td></tr>
<tr><td>802.11a</td><td>5 500 - 5 700</td><td>UNII</td><td>0.18</td><td>0.14</td><td></td></tr>
<tr><td>Bluetooth</td><td>2 402 – 2 480</td><td>DSS/DTS</td><td>-</td><td>0.23</td><td>-</td></tr>
<tr><td colspan="3">Simultaneous SAR per KDB 690783 D01v01r03</td><td>0.70</td><td>1.41</td><td>1.41</td></tr>
<tr><td colspan="6">Hand SAR for Phablet</td></tr>
<tr><td>Band</td><td>Tx Frequency (MHz)</td><td colspan="2">Equipment Class</td><td colspan="2">Reported 10g SAR (W/Kg)</td></tr>
<tr><td>802.11a</td><td>5 180 - 5 240</td><td colspan="2">UNII</td><td colspan="2">0.31</td></tr>
<tr><td>802.11a</td><td>5 260 - 5 320</td><td colspan="2">UNII</td><td colspan="2">0.33</td></tr>
<tr><td>802.11a</td><td>5 500 - 5 700</td><td colspan="2">UNII</td><td colspan="2">0.36</td></tr>
<tr><td>Date(s) of Tests</td><td colspan="6">Feb.06, 2014 ~ Feb.10, 2014</td></tr>
<tr><td>Antenna Type</td><td colspan="6">Integral Antenna</td></tr>
<tr><td>EUT DESCRIPTION</td><td colspan="6">GPRS Class33, GSM850, GSM1900, WCDMA850, WCDMA1900, HSDPA, HSUPA, HSPA Release7 and HSPA+., DC-HSDPA</td></tr>
<tr><td>Key Feature(s)</td><td colspan="6">Hotspot Support</td></tr>
</table>

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

3.1 KDB 941225 LTE information

<table>
<tr><td>Frequency Range:</td><td>Band 41: 2 501.0 MHz – 2 685.0 MHz</td></tr>
<tr><td>Channel Bandwidth:</td><td>Band 41 10 MHz, 15 MHz, 20 MHz</td></tr>
<tr><td>Channel Number & Frequency:</td><td>
<table>
<tr><th colspan="6">Band 41</th></tr>
<tr><th colspan="2">10 MHz</th><th colspan="2">15 MHz</th><th colspan="2">20 MHz</th></tr>
<tr><th>Ch.</th><th>Freq. (MHz)</th><th>Ch.</th><th>Freq. (MHz)</th><th>Ch.</th><th>Freq. (MHz)</th></tr>
<tr><td>39700</td><td>2501</td><td>39725</td><td>2503.5</td><td>39750</td><td>2506</td></tr>
<tr><td>40160</td><td>2547</td><td>40173</td><td>2548.25</td><td>40185</td><td>2549.5</td></tr>
<tr><td>40620</td><td>2593</td><td>40620</td><td>2593</td><td>40620</td><td>2593</td></tr>
<tr><td>41080</td><td>2639</td><td>41068</td><td>2637.75</td><td>41055</td><td>2636.5</td></tr>
<tr><td>41540</td><td>2685</td><td>41515</td><td>2682.5</td><td>41490</td><td>2680</td></tr>
</table>
</td></tr>
<tr><td>UE Category & Uplink Modulation</td><td>UE Category 3 QPSK, 16QAM</td></tr>
<tr><td>Description of the LTE Transmitter & antenna</td><td>This model have two Tx antennas.
-, One is for GSM and WCDMA and LTE. It can not transmit simultaneously.
- The other is for BT & WLAN. It can not transmit simultaneously.
Please find the section 12</td></tr>
<tr><td>LTE voice/data requirements</td><td>Data Only,
LTE voice is available via VoIP. Considering the users may install 3rd party software
to enable VoIP, LTE Head SAR is also evaluated.</td></tr>
<tr><td>Identify if MPR is optional or mendatory
optional or mendatory</td><td>The EUT incorporates MPR as per 3GPP TS36.101.
The MPR is permanently built-in by design as a mandatory.
A-MPR is not implemented.
During SAR testing, A-MPR was disabled by setting NS=01 on the R&S CMW500.</td></tr>
<tr><td rowspan="2">Maximum average conducted output power(dBm)
Identify all other U.S. wireless operating modes, device exposure configurations and frequency bands</td><td>See section 11 RF output power measurements in the SAR report.</td></tr>
<tr><td>-. GSM850/1900, WCDMA850/1900 and LTE Band 41
: Head & Body SAR are required.</td></tr>
<tr><td>Maximum average conducted output power for other wireless mode and frequency</td><td>See section 11.4 RF output power measurements in the SAR report.</td></tr>
<tr><td>Simultaneous Transmission</td><td>This device supports simultaneous transmission. Please find the section</td></tr>
<tr><td>Power reduction explanation</td><td>This device doesn't implements power reduction.</td></tr>
<tr><td>Description of the test equipment,</td><td>LTE SAR Testing was performed using a CMW500.</td></tr>
</table>

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 of high precision robotics system (Staubli), robot controller, Pentium III computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe 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 Pentium IV 3.0 GHz computer with Windows XP system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

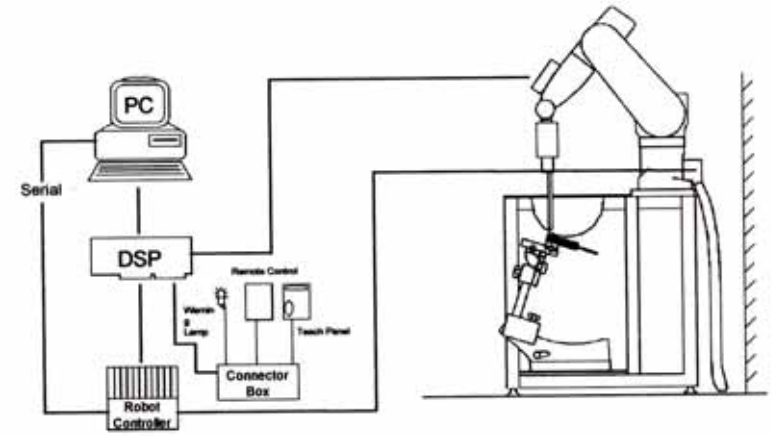


Figure 2. HCT SAR Lab. Test Measurement Set-up

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

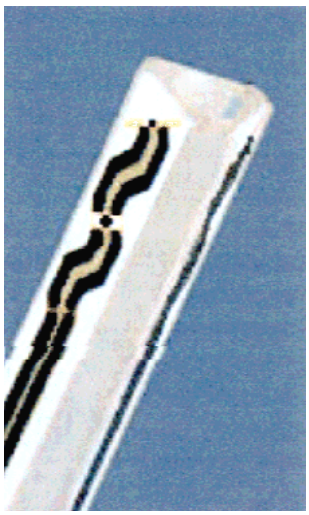


Figure 4. ET3DV6 E-field Probe

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 2nd order fitting. The approach is stopped at reaching the maximum.

4.2.2 EX3DV4 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 mobile phones

Figure 5. Photograph of the probe and the Phantom

Figure 6. EX3DV4 E-field Probe

The SAR measurements were conducted with the dosimetric probe EX3DV4, 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 2nd order fitting. The approach is stopped at reaching the maximum.

4.3 PROBE CALIBRATION PROCESS

4.3.1 E-Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with an accuracy better than ± 10 %. The spherical isotropy was evaluated with the proper procedure and found to be better than ± 0.25 dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression 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 in a TEM cell for frequencies bellow 1 GHz, and in a waveguide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.
E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

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

where:
Δt = exposure time (30 seconds),
C = heat capacity of tissue (brain or muscle),
ΔT = temperature increase due to RF exposure.
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;

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

where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm³ for brain tissue)

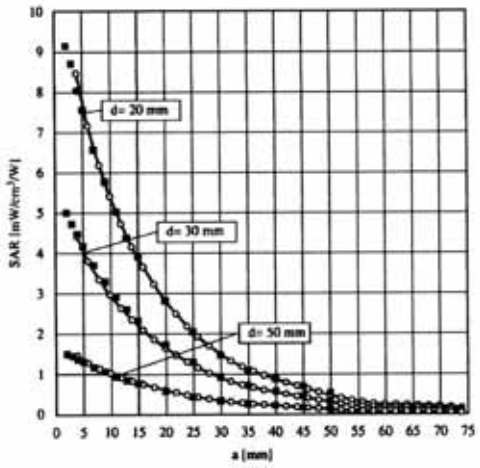


Figure 7. E-Field and Temperature measurements at 900 MHz

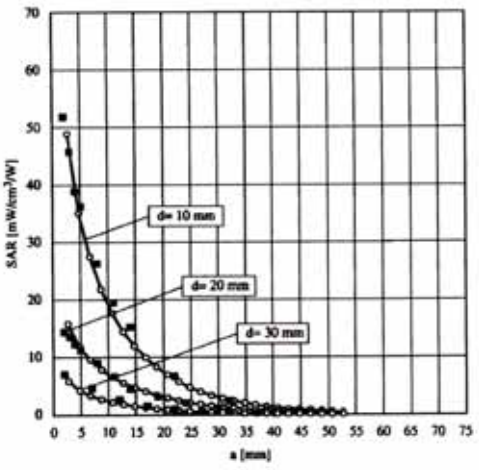


Figure 8. E-Field and temperature measurements at 1.8 GHz

4.3.2 Data Extrapolation

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

$$\boldsymbol{V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}}$$

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:

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

with

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):

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

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

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

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.

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

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.

Figure 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 1 000 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.

Figure 10. MFP V5.1 Triple Modular Phantom

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

4.5 Device Holder for Transmitters

In combination with the SAM Phantom V 4.0, 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.

Figure 11. 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 – 2 700		5 200 - 5 800	
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
Diethylene glycol hexyl ether	-	-	-	-	-	-	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

4.7 SAR 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	F01/5K09A1/A/01	N/A	N/A	N/A
Staubli	Robot ControllerCS7MB	F99/5A82A1/C/01	N/A	N/A	N/A
HP	Pavilion t000_puffer	KRJ51201TV	N/A	N/A	N/A
SPEAG	Light Alignment Sensor	265	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	D221340.01	N/A	N/A	N/A
SPEAG	DAE4	652	Mar. 21, 2013	Annual	Mar. 21, 2014
SPEAG	DAE4	912	Nov. 21, 2013	Annual	Nov. 21, 2014
SPEAG	E-Field Probe EX3DV4	3797	Nov. 29, 2013	Annual	Nov. 29, 2014
SPEAG	E-Field Probe EX3DV4	3903	Mar. 18, 2013	Annual	Mar. 18, 2014
SPEAG	Dipole D835V2	441	Apr. 25, 2013	Annual	Apr. 25, 2014
SPEAG	Dipole D1900V2	5d032	Jul. 29, 2013	Annual	Jul. 29, 2014
SPEAG	Dipole D2450V2	743	Aug. 23, 2013	Annual	Aug. 23, 2014
SPEAG	Dipole D2600V2	1015	May. 02, 2013	Annual	May. 02, 2014
SPEAG	Dipole D5GHzV2	1107	Feb. 21, 2013	Annual	Feb. 21, 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 calibrated by HCT using the dielectric probe system and network analyzer to determine the conductivity and permittivity (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 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15 mm x 15 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

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

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

   b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) 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 more than 5 %, the evaluation is repeated.

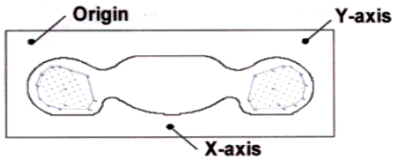


Figure 12. SAR Measurement Point in Area Scan

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.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			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.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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.

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.

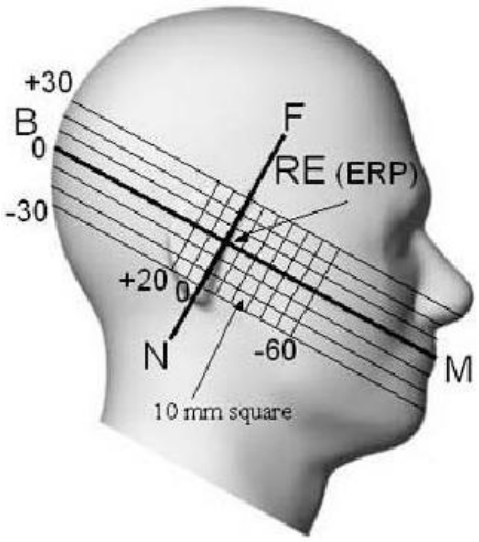


Figure 13. Side view of the phantom

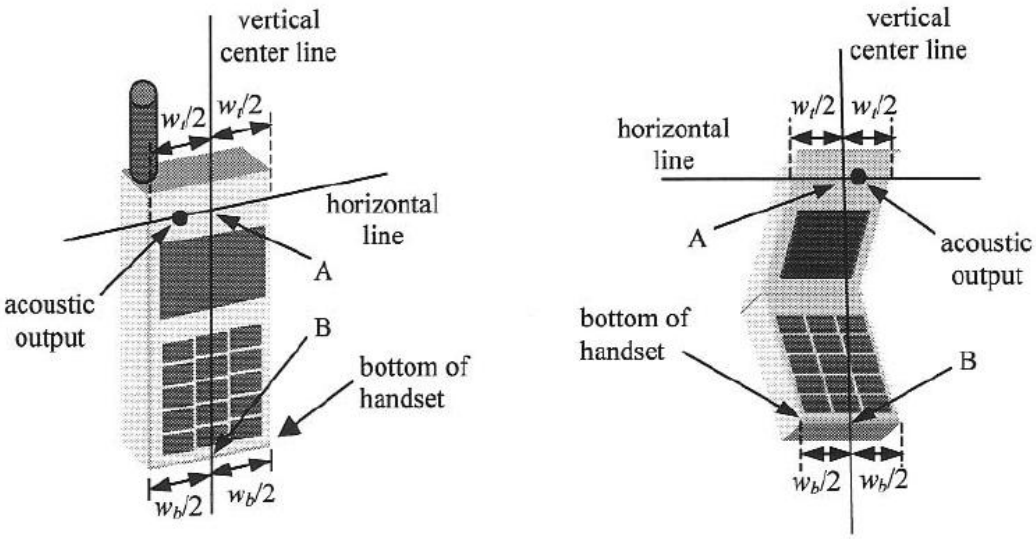


Figure 14. Handset vertical and horizontal reference lines

6.2 Body Holster/Belt Clip Configurations

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

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with each accessory. If multiple accessory share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) 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 Devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used.

Since this EUT does not supply any body worn accessory to the end user a distance of 1.0 cm 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-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessory(ies), Including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worstcase positioning 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- 2 600 MHz)

Error Description	Tol (± %)	Prob. dist.	Div.	c_i	Standard Uncertainty (± %)	v_{eff}
1. Measurement System						
Probe Calibration	6.55	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					11.43	
Coverage Factor for 95 %					*k*=2	
Expanded STD Uncertainty					22.86	

Table 7.2 Uncertainty (5000-5900 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 Isortopy	MOD. Type	Duty Factor	PAR
3	3797	EX3DV4	Head	835	441	May.06,2013	42.01	0.92	PASS	PASS	PASS	GMSK	PASS	N/A
3	3797	EX3DV4	Body	835	441	May.06,2013	55.88	0.99	PASS	PASS	PASS	GMSK	PASS	N/A
3	3797	EX3DV4	Head	1900	5d032	Aug.07,2013	39.8	1.4	PASS	PASS	PASS	GMSK	PASS	N/A
3	3797	EX3DV4	Body	1900	5d032	Aug.08,2013	51.8	1.54	PASS	PASS	PASS	GMSK	PASS	N/A
5	3903	EX3DV4	Head	2450	743	Sep.2,2013	38.91	1.81	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Body	2450	743	Sep.03,2013	52.32	1.96	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Head	2600	1015	Jan.15,2014	38.6	1.98	PASS	PASS	PASS	TDD	PASS	N/A
5	3903	EX3DV4	Body	2600	1015	Jan.16,2014	51.7	2.18	PASS	PASS	PASS	TDD	PASS	N/A
5	3903	EX3DV4	Head	5200	1107	Apr.4,2013	36.68	4.71	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Head	5300	1107	Apr.4,2013	36.41	4.83	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Head	5500	1107	Apr.4,2013	35.81	5.09	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Head	5600	1107	Apr.4,2013	35.63	5.14	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Head	5800	1107	Apr.4,2013	35.17	5.31	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Body	5200	1107	Apr.5,2013	50.14	5.44	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Body	5300	1107	Apr.5,2013	49.52	5.51	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Body	5500	1107	Apr.5,2013	49.15	5.65	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Body	5600	1107	Apr.5,2013	48.84	5.93	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Body	5800	1107	Apr.5,2013	48.26	6.21	PASS	PASS	PASS	OFDM	N/A	PASS

SAR System Validation Summary 1g

SAR System #	Probe	probe Type	Probe Calibration Point		Dipole	Date	Dielectric Parameters		CW Validation			Modulation Validation		
							Measured Permittivity	Measured Conductivity	Sensitivity	Probe Linearity	Probe Isortopy	MOD. Type	Duty Factor	PAR
5	3903	EX3DV4	Body	5200	1107	Oct.01,2013	49.87	5.38	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Body	5300	1107	Oct.01,2013	49.42	5.49	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Body	5500	1107	Oct.01,2013	49.1	5.63	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Body	5600	1107	Oct.01,2013	48.88	5.77	PASS	PASS	PASS	OFDM	N/A	PASS
5	3903	EX3DV4	Body	5800	1107	Oct.01,2013	48.31	6.12	PASS	PASS	PASS	OFDM	N/A	PASS

SAR System Validation Summary – Extremity SAR Considerations

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 865664 D01v01r03.

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. 07, 2014	3797	441	Head	20.1	ε r	41.5	42.2	+ 1.69	± 5
						σ	0.90	0.877	- 2.56	± 5
835	Feb. 07, 2014	3797		Body	20.1	ε r	55.2	54.1	- 1.99	± 5
						σ	0.97	0.964	- 0.62	± 5
1 900	Feb. 06, 2014	3797	5d032	Head	20.0	ε r	40.0	39.1	- 2.25	± 5
						σ	1.40	1.39	- 0.71	± 5
1 900	Feb. 06, 2014	3797		Body	20.0	ε r	53.3	52.3	- 1.88	± 5
						σ	1.52	1.5	- 1.32	± 5
2 450	Feb. 06, 2014	3797	743	Head	20.0	ε r	39.2	39.7	+ 1.28	± 5
						σ	1.80	1.8	+ 0.00	± 5
2 450	Feb. 06, 2014	3797		Body	20.0	ε r	52.7	52.6	- 0.19	± 5
						σ	1.95	1.93	- 1.03	± 5
2 600	Feb. 09, 2014	3903	1015	Head	20.2	ε r	39.0	38.8	- 0.51	± 5
						σ	1.96	2.04	+ 4.08	± 5
2 600	Feb. 10, 2014	3903		Body	20.3	ε r	52.5	54.3	+ 3.43	± 5
						σ	2.16	2.19	+ 1.39	± 5
5 200	Feb. 07, 2014	3903	1107	Head	20.1	ε_r	36	34.8	- 3.33	± 5
						σ	4.66	4.6	- 1.29	± 5
5 300	Feb. 07, 2014	3903		Head	20.1	ε_r	35.9	34.5	- 3.90	± 5
						σ	4.76	4.73	- 0.63	± 5
5 500	Feb. 07, 2014	3903		Head	20.1	ε_r	35.6	34	- 4.49	± 5
						σ	4.96	4.96	+ 0.00	± 5
5 600	Feb. 07, 2014	3903		Head	20.1	ε_r	35.5	33.8	- 4.79	± 5
						σ	5.07	5.1	+ 0.59	± 5
5 800	Feb. 07, 2014	3903		Head	20.1	ε_r	35.3	33.6	- 4.82	± 5
						σ	5.27	5.35	+ 1.52	± 5
5 200	Feb. 06, 2014	3903		Body	20.0	ε_r	49.01	49.3	+ 0.59	± 5
						σ	5.3	5.26	- 0.75	± 5
5 300	Feb. 06, 2014	3903		Body	20.0	ε_r	48.85	49	+ 0.31	± 5
						σ	5.42	5.43	+ 0.18	± 5
5 500	Feb. 06, 2014	3903		Body	20.0	ε_r	48.6	48.4	- 0.41	± 5
						σ	5.65	5.78	+ 2.30	± 5
5 600	Feb. 06, 2014	3903		Body	20.0	ε_r	48.44	48.2	- 0.50	± 5
						σ	5.77	5.93	+ 2.77	± 5
5 800	Feb. 06, 2014	3903		Body	20.0	ε_r	48.2	47.7	- 1.04	± 5
						σ	6.00	6.27	+ 4.50	± 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 835 MHz / 1 900 MHz / 2 450 MHz / 2 600 MHz / 5 200 MHz / 5 300 MHz / 5 500 MHz / 5 600 MHz / 5 800 MHz by using the system Verification kit. (Graphic Plots Attached)

System Verification Results

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. 07, 2014	3797	441	Head	20.3	20.1	9.68	1.01	10.1	+ 4.34	± 10
835	Feb. 07, 2014			Body	20.3	20.1	9.69	0.989	9.89	+ 2.06	± 10
1 900	Feb. 06, 2014		5d032	Head	20.2	20.0	40.1	4.05	40.5	+ 1.00	± 10
1 900	Feb. 06, 2014			Body	20.2	20.0	40.5	3.98	39.8	- 1.73	± 10
2 450	Feb. 06, 2014		743	Head	20.2	20.0	52.8	5.2	52	- 1.52	± 10
2 450	Feb. 06, 2014			Body	20.2	20.0	50.5	4.91	49.1	- 2.77	± 10
2 600	Feb. 09, 2014	3903	1015	Head	20.4	20.2	57.8	5.85	58.5	+ 1.21	± 10
2 600	Feb. 10, 2014			Body	20.5	20.3	57.1	5.52	55.2	- 3.33	± 10
5 200	Feb. 07, 2014		1107	Head	20.3	20.1	80.1	7.77	77.7	- 3.00	± 10
5 300	Feb. 07, 2014			Head	20.3	20.1	81.0	8.24	82.4	+ 1.73	± 10
5 500	Feb. 07, 2014			Head	20.3	20.1	80.0	7.7	77	- 3.75	± 10
5 600	Feb. 07, 2014			Head	20.3	20.1	84.4	8.05	80.5	- 4.62	± 10
5 800	Feb. 07, 2014			Head	20.3	20.1	78.3	7.86	78.6	+ 0.38	± 10
5 200	Feb. 06, 2014			Body	20.2	20.0	74.3	7.42	74.2	- 0.13	± 10
5 300	Feb. 06, 2014			Body	20.2	20.0	76.0	7.64	76.4	+ 0.53	± 10
5 500	Feb. 06, 2014			Body	20.2	20.0	78.4	7.97	79.7	+ 1.66	± 10
5 600	Feb. 06, 2014			Body	20.2	20.0	81.0	8.34	83.4	+ 2.96	± 10
5 800	Feb. 06, 2014			Body	20.2	20.0	74.3	8.05	80.5	+ 8.34	± 10

System Verification Results – Extremity SAR

Freq. [MHz]	Date	Probe (SN)	Dipole (SN)	Liquid	Amb. Temp. [°C]	Liquid Temp. [°C]	1 W Target SAR_{10g} (SPEAG) (mW/g)	Measured SAR_{10g} (mW/g)	1 W Normalized SAR_{10g} (mW/g)	Deviation [%]	Limit [%]
5 200	Feb. 06, 2014	3903	1107	Body	20.2	20.0	20.8	2.1	21	+ 0.96	± 10
5 300	Feb. 06, 2014			Body	20.2	20.0	21.3	2.15	21.5	+ 0.94	± 10
5 500	Feb. 06, 2014			Body	20.2	20.0	21.7	2.24	22.4	+ 3.23	± 10
5 600	Feb. 06, 2014			Body	20.2	20.0	22.3	2.32	23.2	+ 4.04	± 10
5 800	Feb. 06, 2014			Body	20.2	20.0	20.4	2.26	21	+ 0.96	± 10

10.3 System Verification Procedure

SAR measurement was prior to assessment, the system is verified to the ± 10 % of the specifications at each frequency band 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 865664 D01v01r03.

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.

GSM

GSM850	GSM1900
Target Power : 33.0 dBm	Target Power : 31.0 dBm
GPRS850	PCS1900
GPRS 1tx : 33.0 dBm/ EGPRS 1tx : 26.5 dBm	GPRS 1tx : 31.0 dBm/ EGPRS 1tx : 26.5 dBm
GPRS 2tx : 30.5 dBm/ EGPRS 2tx : 26.5 dBm	GPRS 2tx : 29.0 dBm/ EGPRS 2tx : 26.5 dBm
GPRS 3tx : 29.0 dBm/ EGPRS 3tx : 24.0 dBm	GPRS 3tx : 26.0 dBm/ EGPRS 3tx : 24.0 dBm
GPRS 4tx : 27.5 dBm/ EGPRS 4tx : 24.0 dBm	GPRS 4tx : 25.0 dBm/ EGPRS 4tx : 24.0 dBm
Tune-up Tolerance : -1.5 dB/ +0.5 dB	

WCDMA

Mode/Band	Modulated Average (dBm)			
	3GPP RMC Rel 99	HSDPA	HSUPA	DC- HSDPA
		3GPP Rel 5	3GPP Rel 6	3GPP Rel 8
WCDMA 850	22.5	21.5	21.5	21.5
WCDMA 1900	22.5	21.5	21.5	21.5
Tune-up Tolerance : -1.5 dB/ +0.5 dB				

LTE

LTE Band 41
Target Power : 23.0 dBm
Tune-up Tolerance : -1.5 dB/ +0.5 dB

Wifi

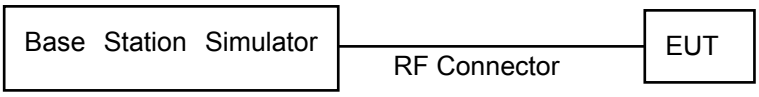
Wifi (Average Power)	Mode / Band					
	2.4 GHz			5 GHz		
	802.11 b	802.11 g	802.11 n	802.11 a	802.11 n (20MHz)	802.11 n (40MHz)
	17.5 dBm	14.5 dBm	13.5 dBm	9.5 dBm	8.5 dBm	8.5 dBm
Tune-up Tolerance : +0.5 dB						

BT.

Bluetooth (Average Power)	Bluetooth	10 dBm
	Bluetooth LE	4.5 dBm
Tune-up Tolerance : +0.5 dB		

11.2 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 Class33 with CS 1 (GMSK)

Note;

CS1/MCS7 coding scheme was used in GPRS output power measurements and SAR Testing, as a condition where GMSK/EDGE modulation was ensured. Investigation has shown that CS1 - CS4/ MCS5 – MCS9 settings do not have any impact on the output levels in the GPRS modes.

GSM Conducted output powers (Burst-Average)

Band	Ch.	Voice	GPRS(GMSK) Data – CS1				EDGE Data			
		GSM (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)	EDGE 1 TX Slot (dBm)	EDGE 2 TX Slot (dBm)	EDGE 3 TX Slot (dBm)	EDGE 4 TX Slot (dBm)
GSM 850	128	33.00	33.00	30.44	29.09	27.34	26.45	26.34	23.76	23.70
	190	33.06	33.05	30.41	29.05	27.25	26.31	26.24	23.64	23.54
	251	33.01	33.00	30.37	29.07	27.25	26.31	26.23	23.72	23.54
GSM 1900	512	30.43	30.41	28.04	26.01	24.89	26.50	26.44	23.81	23.78
	661	31.11	31.10	28.18	26.08	24.87	26.20	26.16	23.61	23.55
	810	31.04	31.01	28.25	26.06	24.92	26.22	26.16	23.50	23.39

GSM Conducted output powers (Frame-Average)

Band	Ch.	Voice	GPRS(GMSK) Data – CS1				EDGE Data			
		GSM (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)	EDGE 1 TX Slot (dBm)	EDGE 2 TX Slot (dBm)	EDGE 3 TX Slot (dBm)	EDGE 4 TX Slot (dBm)
GSM 850	128	23.97	23.97	24.42	24.83	24.33	17.42	20.32	19.50	20.69
	190	24.03	24.02	24.39	24.79	24.24	17.28	20.22	19.38	20.53
	251	23.98	23.97	24.35	24.81	24.24	17.28	20.21	19.46	20.53
GSM 1900	512	21.40	21.38	22.02	21.75	21.88	17.47	20.42	19.55	20.77
	661	22.08	22.07	22.16	21.82	21.86	17.17	20.14	19.35	20.54
	810	22.01	21.98	22.23	21.80	21.91	17.19	20.14	19.24	20.38

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

11.3 WCDMA

Body SAR is not required for handsets with HSDPA/HSUPA capabilities when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Otherwise, SAR is Measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that results in the highest SAR in 12.2 kbps RMC for that RF channel.

11.3.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3 GPP TS 34.121, using the appropriate RMC or AMR with TPC(transmit power control) set to all “1s”.

11.3.2 Head SAR Measurements

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than ¼ dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer using the exposure configuration that results in the highest SAR for that RF channel in 12.2 RMC.

11.3.3 Body SAR Measurement

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all “1s”.

11.3.4 Handsets with Release 5 HSDPA

Body SAR is not required for handsets with HSDPA capabilities when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Otherwise, SAR is Measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that results in the highest SAR in 12.2 kbps RMC for that RF channel.

Sub-Test 1 Setup for Release 5 HSDPA

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM (dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 (3)	15/15 (3)	64	12/15 (3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.
Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

11.3.5 Handsets with Release 6 HSPA (HSDPA/HSUPA)

Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.1 kbps RMC without HSPA. When VOIP is applicable for head exposure, SAR is not required when the maximum output of each RF channel with HSPA is less than ¼ dB higher than that measured using 12.2 kbps RMC; otherwise, the same HSPA configuration used for body measurement should be used to test for head exposure.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}(1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM(2) (dB)	MPR (dB)	AG(4) Index	E-TFCI
1	11/15(3)	15/15(3)	64	11/15(3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}: 47/15 β_{ed2}: 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15(4)	15/15(4)	64	15/15(4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

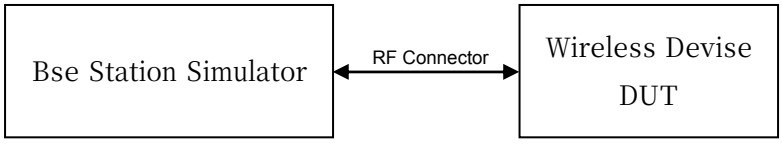
11.3.6 DC-HSDPA

UMTS SAR was tested under RMC 12.2 kbps with HSPA inactive per KDB publication 941225 D01v02.
HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.

DC-HSDPA Considerations:

- 3GPP Specification 34.121-1 Release 8 Ver 8.10.0 was used for DC-HSDPA guidance
- H-Set 12(QPSK) was confirmed to be used during DC-HSDPA measurements
- Measured maximum output powers for DC-HSDPA were not greater than 1/4 dB higher than the WCDMA 12.2 kbps RMC maximum output and as a result, SAR is not required for DC-HSDPA
- The DUT supports UE category 24 for HSDPA

It is expected by the manufacturer that MPR for some HSUPA subtests may be up to 1 dB more than specified by 3GPP, but also as low as 0 dB according to the chipset implementation in this model.



WCDMA850

GPP Release Version	Mode	3GPP 34.121	Cellular Band [dBm]			MPR
		Subtest	UL 4132 DL 4357	UL 4183 DL 4408	UL 4233 DL 4458	
99	WCDMA	12.2 kbps RMC	21.98	22.06	22.19	-
99	WCDMA	12.2 kbps AMR	22.22	22.29	22.31	-
5	HSDPA	Subtest 1	20.88	20.96	21.12	0
5		Subtest 2	21.08	21.16	21.29	0
5		Subtest 3	20.64	20.67	20.81	-0.5
5		Subtest 4	20.71	20.66	20.80	-0.5
6	HSUPA	Subtest 1	20.70	20.88	21.21	0
6		Subtest 2	20.00	19.99	19.88	2
6		Subtest 3	19.85	20.13	19.54	1
6		Subtest 4	20.41	20.66	20.82	2
6		Subtest 5	20.45	20.68	20.92	0
8	DC-HSDPA	Subtest 1	21.12	21.14	21.11	0
8		Subtest 2	21.10	21.08	21.09	0
8		Subtest 3	20.67	20.57	20.61	-0.5
8		Subtest 4	20.65	20.59	20.64	-0.5

WCDMA1900

3GPP Release Version	Mode	3GPP 34.121	PCS Band [dBm]			MPR
		Subtest	UL 9262 DL 9662	UL 9400 DL 9800	UL 9538 DL 9938	
99	WCDMA	12.2 kbps RMC	22.64	22.63	22.82	-
99	WCDMA	12.2 kbps AMR	22.68	22.65	22.84	-
5	HSDPA	Subtest 1	21.74	21.70	21.89	0
5		Subtest 2	21.74	21.67	21.96	0
5		Subtest 3	21.24	21.17	21.50	-0.5
5		Subtest 4	21.24	21.18	21.49	-0.5
6	HSUPA	Subtest 1	21.44	21.41	21.29	0
6		Subtest 2	20.66	20.63	20.65	2
6		Subtest 3	20.42	20.38	20.77	1
6		Subtest 4	20.94	20.92	20.82	2
6		Subtest 5	21.15	21.06	21.61	0
8	DC-HSDPA	Subtest 1	21.44	21.26	21.46	0
8		Subtest 2	21.41	21.24	21.23	0
8		Subtest 3	21.24	21.13	21.15	-0.5
8		Subtest 4	21.13	21.13	21.15	-0.5

WCDMA Average Conducted output powers

11.4 LTE

SAR testing was performed according to the FCC KDB 941225 D05v02r03 publication.
This DUT is developed base on MPR. The MPR is mandatory.
The device will not operate with any other MPR setting than that stated in the table as indicated.
SAR Testing was performed using a CMW500. UE transmits with Maximum output power during SAR testing.
A-MPR has been disabled for all SAR tests by setting NS=01 on the R&S CMW500.

BW	Channel	Freq .(MHz)	Modulation	RB Size	RB Offset	Max.Average Power (dBm)	Target MPR (dB)
10 MHz	39700 low channel	2501MHz	QPSK	1	0	22.98	0
				1	25	22.97	0
				1	49	22.95	0
				25	0	21.68	1
				25	12	21.70	1
				25	25	21.68	1
				50	0	21.58	1
			16QAM	1	0	22.36	1
				1	25	22.32	1
				1	49	22.38	1
				25	0	21.64	2
				25	12	21.60	2
				25	25	21.58	2
				50	0	21.49	2
10 MHz	40160 low-mid channel	2547MHz	QPSK	1	0	23.02	0
				1	25	23.12	0
				1	49	23.00	0
				25	0	22.18	1
				25	12	22.19	1
				25	25	22.10	1
				50	0	22.04	1
			16QAM	1	0	21.78	1
				1	25	21.75	1
				1	49	21.77	1
				25	0	21.58	2
				25	12	21.57	2
				25	25	21.48	2
				50	0	21.34	2
10 MHz	40620 Mid channel	2593MHz	QPSK	1	0	23.27	0
				1	25	23.31	0
				1	49	23.30	0
				25	0	22.28	1
				25	12	22.40	1
				25	25	22.40	1
				50	0	22.38	1
			16QAM	1	0	22.37	1
				1	25	22.33	1
				1	49	22.30	1
				25	0	21.63	2
				25	12	21.67	2
				25	25	21.58	2
				50	0	21.41	2

BW	Channel	Freq .(MHz)	Modulation	RB Size	RB Offset	Max.Average Power (dBm)	Target MPR (dB)
10 MHz	41080 Mid-High channel	2639MHz	QPSK	1	0	23.01	0
				1	25	23.14	0
				1	49	23.15	0
				25	0	22.22	1
				25	12	22.18	1
				25	25	22.15	1
				50	0	22.13	1
			16QAM	1	0	22.20	1
				1	25	22.17	1
				1	49	22.18	1
				25	0	21.52	2
				25	12	21.55	2
				25	25	21.51	2
				50	0	21.39	2
10 MHz	41540 High channel	2685Mhz	QPSK	1	0	23.00	0
				1	25	23.01	0
				1	49	22.98	0
				25	0	22.10	1
				25	12	22.02	1
				25	25	22.05	1
				50	0	22.07	1
			16QAM	1	0	21.94	1
				1	25	21.91	1
				1	49	21.93	1
				25	0	21.54	2
				25	12	21.51	2
				25	25	21.44	2
				50	0	21.38	2

BW	Channel	Freq. (MHz)	Modulation	RB Size	RB Offset	Max.Average Power (dBm)	Target MPR (dB)
15 MHz	39725 low channel	2503.5MHz	QPSK	1	0	23.05	0
				1	36	22.94	0
				1	74	22.93	0
				36	0	21.96	1
				36	18	21.85	1
				36	37	21.95	1
				75	0	22.87	1
			16QAM	1	0	22.41	1
				1	36	22.40	1
				1	74	22.39	1
				36	0	21.68	2
				36	18	21.62	2
				36	37	21.63	2
				75	0	21.58	2
15 MHz	40173 low-mid channel	2548.25MHz	QPSK	1	0	23.04	0
				1	36	23.17	0
				1	74	23.10	0
				36	0	22.21	1
				36	18	22.20	1
				36	37	22.14	1
				75	0	21.98	1
			16QAM	1	0	21.72	1
				1	36	21.54	1
				1	74	21.55	1
				36	0	21.58	2
				36	18	21.49	2
				36	37	21.44	2
				75	0	21.38	2
15 MHz	40620 Mid channel	2593MHz	QPSK	1	0	23.21	0
				1	36	23.25	0
				1	74	23.18	0
				36	0	22.37	1
				36	18	22.40	1
				36	37	22.41	1
				75	0	22.38	1
			16QAM	1	0	22.45	1
				1	36	22.35	1
				1	74	22.37	1
				36	0	21.71	2
				36	18	21.77	2
				36	37	21.69	2
				75	0	21.47	2

BW	Channel	Freq. (MHz)	Modulation	RB Size	RB Offset	Max.Average Power (dBm)	Target MPR (dB)
15 MHz	41068 Mid-High channel	2637.75MHz	QPSK	1	0	22.98	0
				1	36	23.10	0
				1	74	23.15	0
				36	0	22.08	1
				36	18	22.17	1
				36	37	22.12	1
				75	0	22.15	1
			16QAM	1	0	22.18	1
				1	36	22.24	1
				1	74	22.31	1
				36	0	21.89	2
				36	18	21.74	2
				36	37	21.75	2
				75	0	21.46	2
15 MHz	41515 High channel	2682.5Mhz	QPSK	1	0	23.10	0
				1	36	22.97	0
				1	74	22.88	0
				36	0	21.99	1
				36	18	21.84	1
				36	37	21.79	1
				75	0	21.82	1
			16QAM	1	0	21.88	1
				1	36	21.82	1
				1	74	21.87	1
				36	0	21.68	2
				36	18	21.70	2
				36	37	21.66	2
				75	0	21.58	2

BW	Channel	Freq. (MHz)	Modulation	RB Size	RB Offset	Max.Average Power (dBm)	Target MPR (dB)
20 MHz	39750 low channel	2506MHz	QPSK	1	0	23.07	0
				1	49	22.96	0
				1	99	22.92	0
				50	0	21.72	1
				50	25	21.63	1
				50	50	21.68	1
				100	0	21.67	1
			16QAM	1	0	22.49	1
				1	49	22.40	1
				1	99	22.40	1
				50	0	21.71	2
				50	25	21.65	2
				50	50	21.70	2
				100	0	21.61	2
20 MHz	40185 low-mid channel	2549.5MHz	QPSK	1	0	23.09	0
				1	49	23.32	0
				1	99	23.07	0
				50	0	22.25	1
				50	25	22.21	1
				50	50	22.08	1
				100	0	22.07	1
			16QAM	1	0	21.81	1
				1	49	21.84	1
				1	99	21.83	1
				50	0	21.62	2
				50	25	21.64	2
				50	50	21.59	2
				100	0	21.29	2
20 MHz	40620 Mid channel	2593MHz	QPSK	1	0	23.31	0
				1	49	23.42	0
				1	99	23.36	0
				50	0	22.34	1
				50	25	22.45	1
				50	50	22.43	1
				100	0	22.42	1
			16QAM	1	0	22.47	1
				1	49	22.45	1
				1	99	22.42	1
				50	0	21.74	2
				50	25	21.75	2
				50	50	21.72	2
				100	0	21.42	2

BW	Channel	Freq. (MHz)	Modulation	RB Size	RB Offset	Max.Average Power (dBm)	Target MPR (dB)
20 MHz	41055 Mid-High channel	2636.5MHz	QPSK	1	0	22.95	0
				1	49	23.12	0
				1	99	23.26	0
				50	0	22.16	1
				50	25	22.18	1
				50	50	22.15	1
				100	0	22.17	1
			16QAM	1	0	22.23	1
				1	49	22.39	1
				1	99	22.58	1
				50	0	21.84	2
				50	25	21.77	2
				50	50	21.69	2
				100	0	21.33	2
20 MHz	41490 High channel	2680Mhz	QPSK	1	0	22.16	0
				1	49	23.14	0
				1	99	22.92	0
				50	0	21.94	1
				50	25	21.81	1
				50	50	21.87	1
				100	0	21.88	1
			16QAM	1	0	21.94	1
				1	49	21.84	1
				1	99	21.96	1
				50	0	21.38	2
				50	25	21.44	2
				50	50	21.45	2
				100	0	21.32	2

Note;
The EUT enables maximum power reduction in accordance with 3GPP 36.101. The MPR settings are configured during the manufacture process and are not configurable by the network, carrier, or end user.
LTE Band 41 has 5 required test channels per FCC KDB 447498 D01v05r02.

11.5 WiFi

11.4.1 SAR Testing for 802.11b/g/n modes

General Device Setup

Normal Network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

Frequency Channel Configurations

802.11 a/b/g and 4.9 GHz operating modes are tested independently according to the service requirements in each frequency band. 802.11 b/g modes are tested on channels 1, 6 and 11.802.11a is tested for UNII operations on channels 36 and 48 in the 5.15-5.25 GHz band; channels 52 and 64 in the 5.25-5.35 GHz band; Channels 104, 116, 124 and 136 in the 5.470-5.725 GHz band; and channels 149 and 161 in the 5.8 GHz band. When 5.8 GHz § 15.247 is also available, channels 149, 157 and 165 should be tested instead of the UNII channels. 4.9 GHz is tested on channels 1, 10 and 5 or 6, whichever has the higher output power, for 5 MHz channels; channels 11,15 and 19 for 10 MHz channels; and channels 21 and 25 for 20 MHz channels. These are referred to as the “default test channels”. 802.11g mode was evaluated only if the output power was 0.25 dB higher than the 802.11b mode.

Mode		GHz	Channel	Turbo Channel	“Default Test Channels”			
					§15.247		UNII	
					802.11b	802.11g		
802.11b/g		2.412	1#		√	∇		
		2.437	6	6	√	∇		
		2.462	11#		√	∇		
802.11a	UNII	5.18	36				√	
		5.20	40	42 (5.21 GHz)				*
		5.22	44					*
		5.24	48	50 (5.25 GHz)			√	
		5.26	52				√	
		5.28	56	58 (5.29 GHz)				*
		5.30	60					*
		5.32	64				√	
		5.500	100	Unknown				*
		5.520	104				√	
		5.540	108					*
		5.560	112					*
		5.580	116				√	
		5.600	120					*
		5.620	124				√	
		5.640	128					*
		5.660	132					*
		5.680	136				√	
		5.700	140					*
	UNII or §15.247	5.745	149		√		√	
		5.765	153	152 (5.76 GHz)		*		*
		5.785	157		√			*
		5.805	161	160 (5.80 GHz)		*	√	
	§15.247	5.825	165		√			

802.11 Test Channels per FCC Requirements

▣ TEST RESULTS-Average

IEEE 802.11b Average RF Power

Mode	Freq. [MHz]	Channel	802.11b (2.4 GHz) Conducted Power [dBm]			
			Data Rate (Mbps)			
			1	2	5.5	11
802.11b	2412	1	15.67	15.72	15.88	15.82
	2437	6	16.49	16.49	16.65	16.63
	2462	11	15.91	15.98	16.13	16.14

IEEE 802.11g Average RF Power

Mode	Freq. [MHz]	Channel	802.11g (2.4 GHz) Conducted Power [dBm]							
			Data Rate (Mbps)							
			6	9	12	18	24	36	48	54
802.11g	2412	1	12.78	12.87	13.08	13.04	13.07	13.14	12.97	13.21
	2437	6	13.06	13.31	13.33	13.3	13.28	13.27	13.35	13.37
	2462	1	13.2	13.16	13.2	13.21	13.22	13.26	13.33	13.24

IEEE 802.11n Average RF Power

Mode	Freq. [MHz]	Channel	802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate (Mbps)							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	2412	1	11.92	11.95	11.94	12.22	11.95	12.09	12.27	12.26
	2437	6	12.32	12.27	12.54	12.14	12.38	12.56	12.66	12.64
	2462	1	12.16	12.5	12.49	12.56	12.61	12.63	12.64	12.60

IEEE 802.11a Average RF Power– 20 MHz Bandwidth

Mode	Freq. [MHz]	Channel	802.11a (5 GHz) Conducted Power [dBm]							
			Data Rate (Mbps)							
			6	9	12	18	24	36	48	54
802.11a	5180	36	8.00	7.89	8.03	7.97	7.94	8.01	8.03	7.99
	5200	40	7.51	7.51	7.54	7.50	7.49	7.58	7.61	7.60
	5220	44	8.01	8.00	8.06	8.03	8.04	8.02	8.06	8.09
	5240	48	8.10	8.04	8.04	8.10	8.08	8.13	8.12	8.18
	5260	52	8.28	8.28	8.26	8.23	8.27	8.17	8.33	8.38
	5280	56	8.25	8.25	8.22	8.21	8.24	8.19	8.30	8.32
	5300	60	8.30	8.30	8.39	8.33	8.32	8.32	8.33	8.44
	5320	64	7.86	7.85	7.91	7.88	7.87	7.93	7.94	7.94
	5500	100	7.86	7.83	7.88	7.85	7.91	7.89	7.92	7.89
	5520	104	7.84	7.84	7.88	7.86	7.89	7.88	7.90	7.88
	5540	108	7.84	7.80	7.85	7.84	7.88	7.89	7.89	7.88
	5560	112	7.85	7.81	7.86	7.83	7.88	7.89	7.90	7.87
	5580	116	7.88	7.80	7.80	7.87	7.78	7.92	7.96	7.81
	5660	132	7.90	7.91	7.85	7.89	7.84	7.91	7.97	7.85
	5680	136	8.40	8.41	8.39	8.42	8.41	8.45	8.40	8.50
	5700	140	8.58	8.53	8.54	8.61	8.59	8.64	8.58	8.69
	5745	149	7.7	7.7	7.64	7.72	7.74	7.79	7.75	7.78
	5765	153	8.21	8.28	8.27	8.24	8.26	8.32	8.33	8.38
	5785	157	8.52	8.64	8.62	8.58	8.61	8.66	8.69	8.76
	5805	161	8.25	8.29	8.28	8.28	8.30	8.34	8.33	8.40
	5825	165	7.97	7.96	7.99	8.01	8.01	8.03	8.1	8.15

IEEE 802.11n Average RF Power – 20 MHz Bandwidth

Mode	Freq. [MHz]	Channel	20 MHz BW 802.11n (5 GHz) Conducted Power [dBm]							
			Data Rate (Mbps)							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	7.62	7.71	7.68	7.67	7.60	7.66	7.72	7.73
	5200	40	7.12	7.19	7.19	7.22	7.19	7.24	7.23	7.23
	5220	44	7.20	7.24	7.26	7.24	7.27	7.29	7.30	7.28
	5240	48	7.23	7.28	7.30	7.26	7.30	7.31	7.33	7.29
	5260	52	7.41	7.44	7.49	7.46	7.53	7.54	7.57	7.49
	5280	56	7.57	7.59	7.60	7.60	7.65	7.58	7.63	7.62
	5300	60	7.99	8.06	8.05	8.08	8.15	8.05	8.17	8.08
	5320	64	7.56	7.59	7.59	7.59	7.67	7.57	7.64	7.61
	5500	100	6.28	6.40	6.39	6.36	6.43	6.34	6.41	6.36
	5520	104	6.34	6.43	6.42	6.41	6.46	6.39	6.43	6.40
	5540	108	6.52	6.53	6.56	6.55	6.57	6.56	6.61	6.59
	5560	112	6.73	6.72	6.73	6.76	6.73	6.74	6.80	6.78
	5580	116	6.83	6.83	6.87	6.85	6.87	6.88	6.94	6.91
	5660	132	6.92	6.98	7.02	7.01	6.99	7.05	7.04	7.01
	5680	136	7.30	7.38	7.42	7.41	7.40	7.48	7.48	7.45
	5700	140	7.55	7.63	7.68	7.66	7.62	7.71	7.71	7.68
	5745	149	6.85	6.89	6.87	6.81	6.82	6.9	6.93	6.89
	5765	153	7.21	7.25	7.22	7.24	7.28	7.28	7.27	7.25
	5785	157	7.7	7.73	7.7	7.72	7.77	7.76	7.75	7.72
	5805	161	7.03	7.03	7.06	7.03	7.07	7.07	7.09	7.09
	5825	165	7.07	7.07	7.12	7.07	7.12	7.12	7.16	7.13

IEEE 802.11n Average RF Power – 40 MHz Bandwidth

Mode	Freq. [MHz]	Channel	40 MHz BW 802.11n (5 GHz) Conducted Power [dBm]							
			Data Rate (Mbps)							
			13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	7.11	7.19	7.17	7.18	7.19	7.24	7.25	7.24
	5230	46	7.19	7.28	7.23	7.21	7.33	7.28	7.33	7.36
	5270	54	7.39	7.45	7.45	7.44	7.49	7.51	7.53	7.41
	5310	62	7.41	7.51	7.55	7.58	7.53	7.55	7.51	7.50
	5510	102	6.80	6.88	6.95	6.83	6.86	6.89	6.87	6.83
	5550	110	7.36	7.44	7.41	7.43	7.50	7.45	7.52	7.44
	5670	134	7.51	7.58	7.57	7.54	7.61	7.55	7.70	7.63
	5755	151	8.38	8.35	8.4	8.32	8.32	8.21	8.32	8.29
	5795	159	7.99	8.54	8.53	8.48	8.53	8.52	8.51	8.57

11.6 SAR Test Exclusions Applied

11.6.1 BT

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

$$\frac{Max\ Power\ of\ Channel(mW)}{Test\ \ Separation\ Distance\ (mm)} * \sqrt{Frequency(GHz)} \leq 3.0$$

. Mode	Frequency	Maximum Allowed Power	Separatuin Distance	≤ 3.0
	[MHz]	[mW]	[mm]	
Bluetooth	2440	11	10	1.72

Based on the maximum conducted power of Bluetooth and antenna to use separation distance, Bluetooth SAR was not required [(11/10)*√2.440] = 1.72< 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	Separatuin Distance (Body)	Estimated SAR (Body)
	[MHz]	[mW]	[mm]	[W/kg]
Bluetooth	2440	11	10	0.23

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

Note: Bluetooth LE conducted Power is not calculated on the SAR test exclusions table. Because Bluetooth LE conducted power is lower than Bluetooth conducted Power.

11.6.2 Licenced Transmitter(s)

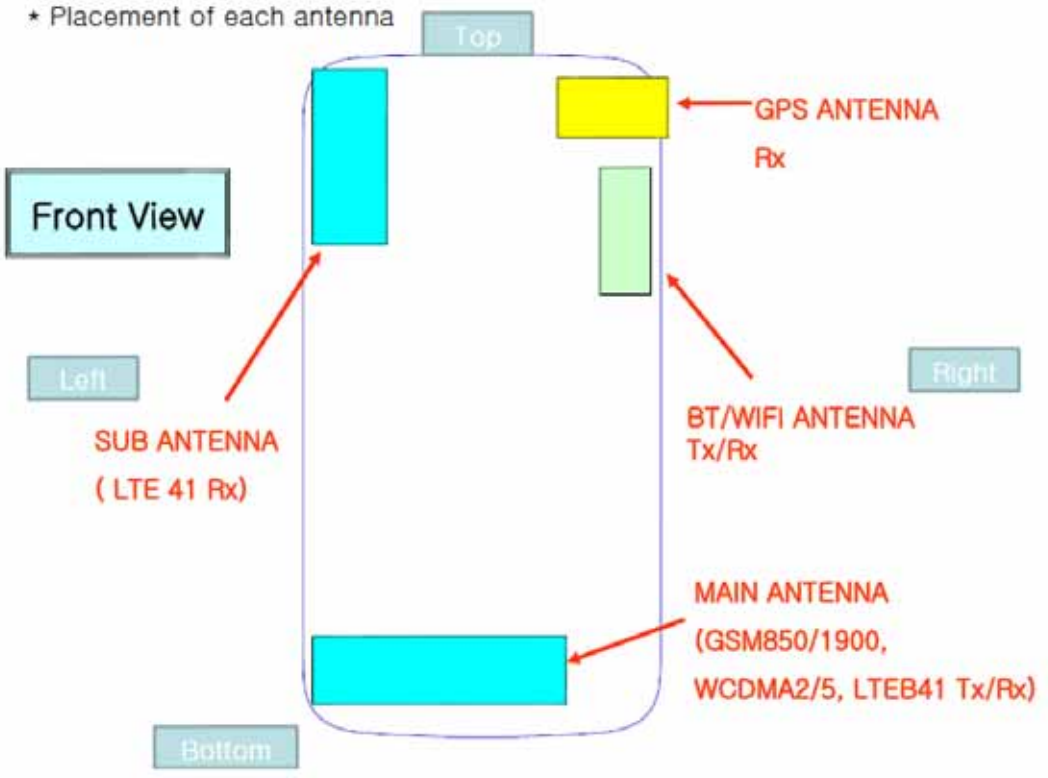
SAR test exclusion for Rel. 7 HSPA+ must also satisfy the SAR test exclusion requirements of Rel. 6 HSPA. SAR test exclusion for HSPA+ devices supporting 16 QAM in the uplink is determined by power measurements according to the configurations in Table C.11.1.4 of 3GPP TS 34.121-1.

12. SAR Test configuration & Antenna Information

12.1 Mobile Hotspot sides for SAR Testing configurations

Mode	Rear	Front	Left	Right	Bottom	Top
GSM 850	Yes	Yes	Yes	Yes	Yes	No
GSM 1 900	Yes	Yes	Yes	Yes	Yes	No
WCDMA 850	Yes	Yes	Yes	Yes	Yes	No
WCDMA 1 900	Yes	Yes	Yes	Yes	Yes	No
LTE band 41	Yes	Yes	Yes	Yes	Yes	No
2.4 GHz WLAN	Yes	Yes	No	Yes	No	Yes
5 GHz WLAN	Yes	Yes	No	Yes	No	Yes

12.2 Antenna and Device Information



※ Please see SM-N7506V_Ant_distance file for further information.

13. SAR TEST DATA SUMMARY

13.1-1 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	33.06	0.193	Standard	Left Ear	0.153	1.107	0.169	-
836.6	190		33.5	33.06	-0.123	Standard	Left Tilt	0.086	1.107	0.095	-
836.6	190		33.5	33.06	-0.124	Standard	Right Ear	0.116	1.107	0.128	-
836.6	190		33.5	33.06	-0.109	Standard	Right Tilt	0.083	1.107	0.092	-
836.6	190	GPRS 3Tx	29.5	29.05	0.069	Standard	Left Ear	0.231	1.109	0.256	1
836.6	190		29.5	29.05	-0.014	Standard	Left Tilt	0.121	1.109	0.134	-
836.6	190		29.5	29.05	-0.187	Standard	Right Ear	0.171	1.109	0.190	-
836.6	190		29.5	29.05	-0.178	Standard	Right Tilt	0.119	1.109	0.132	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Head 1.6 W/kg (mW/g) **Averaged over 1 gram				

13.1-2 Measurement Results (GSM1900 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							
1 880.0	661	GSM 1900	31.5	31.11	-0.136	Standard	Left Ear	0.161	1.094	0.176	-
1 880.0	661		31.5	31.11	0.158	Standard	Left Tilt	0.064	1.094	0.070	-
1 880.0	661		31.5	31.11	0.176	Standard	Right Ear	0.096	1.094	0.105	-
1 880.0	661		31.5	31.11	0.158	Standard	Right Tilt	0.056	1.094	0.061	-
1 880.0	661	GPRS 2Tx	29.5	28.18	0.089	Standard	Left Ear	0.168	1.355	0.228	2
1 880.0	661		29.5	28.18	-0.050	Standard	Left Tilt	0.066	1.355	0.089	-
1 880.0	661		29.5	28.18	0.150	Standard	Right Ear	0.101	1.355	0.137	-
1 880.0	661		29.5	28.18	-0.130	Standard	Right Tilt	0.102	1.355	0.138	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Head 1.6 W/kg (mW/g) **Averaged over 1 gram				

13.1-3 Measurement Results (WCDMA850 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	4183	WCDMA 850	23	22.06	-0.008	Standard	Left Ear	0.128	1.242	0.159	3
836.6	4183		23	22.06	0.147	Standard	Left Tilt	0.071	1.242	0.088	-
836.6	4183		23	22.06	-0.181	Standard	Right Ear	0.097	1.242	0.120	-
836.6	4183		23	22.06	-0.117	Standard	Right Tilt	0.066	1.242	0.082	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Head 1.6 W/kg (mW/g) Averaged over 1 gram**				

13.1-4 Measurement Results (WCDMA1900 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							
1 880.0	9400	WCDMA 1900	23	22.63	-0.139	Standard	Left Ear	0.229	1.089	0.249	4
1 880.0	9400		23	22.63	-0.018	Standard	Left Tilt	0.103	1.089	0.112	-
1 880.0	9400		23	22.63	0.187	Standard	Right Ear	0.153	1.089	0.167	-
1 880.0	9400		23	22.63	-0.029	Standard	Right Tilt	0.153	1.089	0.167	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Head 1.6 W/kg (mW/g) Averaged over 1 gram**				

13.1-5 Measurement Results (LTE Band 41 20MHz Head SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Battery	Phantom Position	RB Size	RB Offset	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No
MHz	Ch.		Tune-Up Limit	Conducted Power									
2 593	40620	QPSK	23.5	23.42	0.152	Standard	Left Ear	1	49	0.015	1.019	0.015	5
2 593	40620		23.5	22.45	0.191	Standard	Left Ear	50	25	0.012	1.012	0.012	-
2 593	40620		23.5	23.42	0.123	Standard	Left Tilt 15°	1	49	0.0061	1.019	0.006	-
2 593	40620		23.5	22.45	0.107	Standard	Left Tilt 15°	50	25	0.00675	1.012	0.007	-
2 593	40620		23.5	23.42	0.174	Standard	Right Ear	1	49	0.012	1.019	0.012	-
2 593	40620		23.5	22.45	0.133	Standard	Right Ear	50	25	0.0053	1.012	0.005	-
2 593	40620		23.5	23.42	0.132	Standard	Right Tilt 15°	1	49	0.00292	1.019	0.003	-
2 593	40620		23.5	22.45	0.108	Standard	Right Tilt 15°	50	25	0.00237	1.012	0.002	-
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Head 1.6 W/kg (mW/g) Averaged over 1 gram**						

13.1-6 Measurement Results (DTS Head SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Battery	Phantom Position	Data Rate	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power								
2 437	6	802.11b	18	16.49	-0.151	Standard	Left Ear	1Mbps	0.310	1.416	0.439	6
			18	16.49	0.116	Standard	Left Tilt	1Mbps	0.175	1.416	0.248	-
			18	16.49	-0.061	Standard	Right Ear	1Mbps	0.160	1.416	0.227	-
			18	16.49	0.113	Standard	Right Tilt	1Mbps	0.098	1.416	0.139	-
5 785	157	802.11a	10	8.52	0.102	Standard	Left Ear	6Mbps	0.189	1.406	0.266	7
			10	8.52	0.174	Standard	Left Tilt	6Mbps	0.117	1.406	0.165	-
			10	8.52	0.120	Standard	Right Ear	6Mbps	0.056	1.406	0.079	-
			10	8.52	0.125	Standard	Right Tilt	6Mbps	0.074	1.406	0.104	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Head 1.6 W/kg (mW/g) Averaged over 1 gram**					

13.1-7 Measurement Results (NII Head SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Battery	Phantom Position	Data Rate	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power								
5 240	48	802.11a	10	8.10	0.178	Standard	Left Ear	6Mbps	0.127	1.549	0.197	8
5 240	48	802.11a	10	8.10	0.146	Standard	Left Tilt	6Mbps	0.073	1.549	0.113	-
5 240	48	802.11a	10	8.10	-0.158	Standard	Right Ear	6Mbps	0.048	1.549	0.074	-
5 240	48	802.11a	10	8.10	0.173	Standard	Right Tilt	6Mbps	0.042	1.549	0.065	-
5 300	60	802.11a	10	8.30	0.145	Standard	Left Ear	6Mbps	0.109	1.479	0.161	-
5 300	60	802.11a	10	8.30	0.126	Standard	Left Tilt	6Mbps	0.078	1.479	0.115	-
5 300	60	802.11a	10	8.30	0.158	Standard	Right Ear	6Mbps	0.061	1.479	0.090	-
5 300	60	802.11a	10	8.30	0.150	Standard	Right Tilt	6Mbps	0.049	1.479	0.072	-
5 700	140	802.11a	10	8.58	0.196	Standard	Left Ear	6Mbps	0.110	1.387	0.153	-
5 700	140	802.11a	10	8.58	0.155	Standard	Left Tilt	6Mbps	0.132	1.387	0.183	-
5 700	140	802.11a	10	8.58	-0.124	Standard	Right Ear	6Mbps	0.093	1.387	0.129	-
5 700	140	802.11a	10	8.58	-0.166	Standard	Right Tilt	6Mbps	0.058	1.387	0.080	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Head 1.6 W/kg (mW/g) Averaged over 1 gram**					

13.2-1 Measurement Results (GSM850 Hotspot 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	GPRS 3Tx	29.5	29.05	-0.030	Rear	1.0 cm	0.364	1.109	0.404	9
836.6	190		29.5	29.05	0.020	Front	1.0 cm	0.249	1.109	0.276	-
836.6	190		29.5	29.05	-0.162	Left	1.0 cm	0.306	1.109	0.339	-
836.6	190		29.5	29.05	-0.053	Right	1.0 cm	0.140	1.109	0.155	-
836.6	190		29.5	29.05	-0.150	Bottom	1.0 cm	0.188	1.109	0.209	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Body 1.6 W/kg (mW/g) **Averaged over 1 gram				

13. 2-2 Measurement Results (GSM1900 Hotspot 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	GPRS 2Tx	29.5	28.18	0.002	Rear	1.0 cm	0.336	1.355	0.455	10
1 880.0	661		29.5	28.18	0.084	Front	1.0 cm	0.470	1.355	0.637	11
1 880.0	661		29.5	28.18	0.007	Left	1.0 cm	0.230	1.355	0.312	-
1 880.0	661		29.5	28.18	-0.104	Right	1.0 cm	0.043	1.355	0.058	-
1 880.0	661		29.5	28.18	-0.144	Bottom	1.0 cm	0.370	1.355	0.501	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Body 1.6 W/kg (mW/g) **Averaged over 1 gram				

13. 2-3 Measurement Results (WCDMA850 Hotspot 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	4183	WCDMA 850	23	22.06	-0.114	Rear	1.0 cm	0.226	1.242	0.281	12
836.6	4183		23	22.06	0.004	Front	1.0 cm	0.146	1.242	0.181	-
836.6	4183		23	22.06	-0.023	Left	1.0 cm	0.178	1.242	0.221	-
836.6	4183		23	22.06	-0.037	Right	1.0 cm	0.078	1.242	0.097	-
836.6	4183		23	22.06	-0.088	Bottom	1.0 cm	0.117	1.242	0.145	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Body 1.6 W/kg (mW/g) **Averaged over 1 gram				

13. 2-4 Measurement Results (WCDMA1900 Hotspot 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	Conducte Power							
1 880.0	9400	WCDMA 1900	23	22.63	-0.138	Rear	1.0 cm	0.452	1.089	0.492	13
1 852.4	9262		23	22.64	-0.013	Front	1.0 cm	0.701	1.086	0.762	-
1 880.0	9400		23	22.63	0.054	Front	1.0 cm	0.770	1.089	0.838	-
1 907.6	9538		23	22.82	0.110	Front	1.0 cm	0.878	1.042	0.915	14
1 880.0	9400		23	22.63	-0.069	Left	1.0 cm	0.191	1.089	0.208	-
1 880.0	9400		23	22.63	-0.008	Right	1.0 cm	0.085	1.089	0.093	-
1 880.0	9400		23	22.63	0.032	Bottom	1.0 cm	0.480	1.089	0.523	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**0.093Body 1.6 W/kg (mW/g) Averaged over 1 gram**				

13.2-5 Measurement Results (LTE Band 41 20MHz Hotspot SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Configuration	RB Size	RB Offset	Separation Distance	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power									
2 506	39750	QPSK	23.5	23.07	-0.19	Rear	1	0	1.0 cm	0.716	1.104	0.791	-
2 549.5	40185	QPSK	23.5	23.32	0.177	Rear	1	49	1.0 cm	1.03	1.042	1.074	15
2 593	40620	QPSK	23.5	23.42	0.193	Rear	1	49	1.0 cm	0.958	1.019	0.976	-
2 636.5	41055	QPSK	23.5	23.26	0.15	Rear	1	99	1.0 cm	0.774	1.057	0.818	-
2 680	41490	QPSK	23.5	23.14	0.159	Rear	1	49	1.0 cm	0.634	1.086	0.689	-
2 506	39750	QPSK	23.5	21.72	-0.15	Rear	50	0	1.0 cm	0.590	1.197	0.706	-
2 549.5	40185	QPSK	23.5	22.25	0.149	Rear	50	0	1.0 cm	0.820	1.059	0.869	
2 593	40620	QPSK	23.5	22.45	0.18	Rear	50	25	1.0 cm	0.769	1.012	0.778	-
2 636.5	41055	QPSK	23.5	22.18	0.18	Rear	50	25	1.0 cm	0.837	1.076	0.901	-
2 680	41490	QPSK	23.5	21.94	0.18	Rear	50	0	1.0 cm	0.548	1.138	0.623	-
2 593	40620	QPSK	23.5	22.42	0.12	Rear	100	0	1.0 cm	0.951	1.019	0.969	-
2 593	40620	QPSK	23.5	23.42	-0.15	Front	1	49	1.0 cm	0.063	1.019	0.064	-
2 593	40620	QPSK	23.5	22.45	0.14	Front	50	25	1.0 cm	0.049	1.012	0.050	-
2 593	40620	QPSK	23.5	23.42	0.10	Left	1	49	1.0 cm	0.063	1.019	0.064	-
2 593	40620	QPSK	23.5	22.45	-0.177	Left	50	25	1.0 cm	0.052	1.012	0.053	-
2 593	40620	QPSK	23.5	23.42	0.11	Right	1	49	1.0 cm	0.010	1.019	0.010	-
2 593	40620	QPSK	23.5	22.45	0.134	Right	50	25	1.0 cm	0.00764	1.012	0.008	-
2 593	40620	QPSK	23.5	23.42	0.171	Bottom	1	49	1.0 cm	0.263	1.019	0.268	-
2 593	40620	QPSK	23.5	22.45	0.148	Bottom	50	25	1.0 cm	0.210	1.012	0.212	-
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population									**Body 1.6 W/kg (mW/g) Averaged over 1 gram**				

13. 2-6 Measurement Results (WLAN Hotspot SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Configuration	Data Rate	Separation Distance	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power								
2 437	6	802.11 b	18	16.49	0.057	Rear	1Mbps	1.0 cm	0.171	1.416	0.242	16
			18	16.49	0.003	Front	1Mbps	1.0 cm	0.055	1.416	0.078	-
			18	16.49	0.160	Right	1Mbps	1.0 cm	0.079	1.416	0.112	-
			18	16.49	0.020	Top	1Mbps	1.0 cm	0.040	1.416	0.057	-
5 785	157	802.11 a	10	8.52	0.144	Rear	6Mbps	1.0 cm	0.242	1.406	0.340	17
			10	8.52	0.088	Front	6Mbps	1.0 cm	0.035	1.406	0.049	-
			10	8.52	0.170	Right	6Mbps	1.0 cm	0.134	1.406	0.188	-
			10	8.52	-0.167	Top	6Mbps	1.0 cm	0.065	1.406	0.091	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Body 1.6 W/kg (mW/g) Averaged over 1 gram**					

13.3-1 Measurement Results (WLAN Body-worn SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Configuration	Data Rate	Separation Distance	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power								
2 437	6	802.11b	18	16.49	0.057	Rear	1Mbps	1.0 cm	0.171	1.416	0.242	16
2 437	6	802.11b	18	16.49	0.003	Front	1Mbps	1.0 cm	0.055	1.416	0.078	-
5 785	157	802.11a	10	8.52	0.144	Rear	6Mbps	1.0 cm	0.242	1.406	0.340	17
5 785	157	802.11a	10	8.52	0.088	Front	6Mbps	1.0 cm	0.035	1.406	0.049	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Body 1.6 W/kg (mW/g) Averaged over 1 gram**					

13.3-2 Measurement Results (NII Body-worn SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Configuration	Data Rate	Separation Distance	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power								
5 240	48	802.11a	10	8.10	-0.14	Rear	6Mbps	1.0 cm	0.078	1.549	0.121	-
5 240	48	802.11a	10	8.10	-0.15	Front	6Mbps	1.0 cm	0.022	1.549	0.034	-
5 300	60	802.11a	10	8.30	-0.166	Rear	6Mbps	1.0 cm	0.094	1.479	0.139	-
5 300	60	802.11a	10	8.30	0.134	Front	6Mbps	1.0 cm	0.000824	1.479	0.001	-
5 700	140	802.11a	10	8.58	0.114	Rear	6Mbps	1.0 cm	0.099	1.387	0.137	18
5 700	140	802.11a	10	8.58	0.125	Front	6Mbps	1.0 cm	0.019	1.387	0.026	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Body 1.6 W/kg (mW/g) Averaged over 1 gram**					

13.3-3 Measurement Results (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	GSM850	33.5	33.06	-0.193	Rear	1.0 cm	0.288	1.107	0.319	19
836.6	190	GSM850	33.5	33.06	0.013	Front	1.0 cm	0.201	1.107	0.222	-
836.6	190	GPRS 3Tx	29.5	29.05	-0.030	Rear	1.0 cm	0.364	1.109	0.404	9
836.6	190	GPRS 3Tx	29.5	29.05	0.020	Front	1.0 cm	0.249	1.109	0.276	-
1 880.0	661	GSM1900	31.5	31.11	0.046	Rear	1.0 cm	0.327	1.094	0.358	-
1 880.0	661	GSM1900	31.5	31.11	0.074	Front	1.0 cm	0.464	1.094	0.508	20
1 880.0	661	GPRS 2Tx	29.5	28.18	0.002	Rear	1.0 cm	0.336	1.355	0.455	10
1 880.0	661	GPRS 2Tx	29.5	28.18	0.084	Front	1.0 cm	0.470	1.355	0.637	11
836.6	4183	WCDMA 850	23.0	22.06	-0.114	Rear	1.0 cm	0.226	1.242	0.281	12
836.6	4183	WCDMA 850	23.0	22.06	0.004	Front	1.0 cm	0.146	1.242	0.181	-
1 880.0	9400	WCDMA 1900	23.0	22.63	-0.138	Rear	1.0 cm	0.452	1.089	0.492	13
1 907.6	9538	WCDMA 1900	23.0	22.82	0.110	Front	1.0 cm	0.878	1.042	0.915	14
2 549.5	40185	LTE 41	23.5	23.32	0.177	Rear	1.0 cm	1.03	1.042	1.074	15
2 593	40620	LTE 41	23.5	23.42	-0.15	Front	1.0 cm	0.063	1.019	0.064	-
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							**Body 1.6 W/kg (mW/g) Averaged over 1 gram**				

13.3-4 Measurement Results (NII Hand SAR)

Frequency		Mode	Power (dBm)		Power Drift (dB)	Configuration	Data Rate	Separation Distance	Measured SAR (mW/g)	Scaling Factor	Scaled SAR (mW/g)	Plot No.
MHz	Ch.		Tune-Up Limit	Conducted Power								
5 240	48	802.11a	10	8.10	0.12	Rear	6Mbps	0 cm	0.201	1.549	0.311	-
5 240	48	802.11a	10	8.10	0.19	Front	6Mbps	0 cm	0.059	1.549	0.091	-
5 240	48	802.11a	10	8.10	-0.15	Right	6Mbps	0 cm	0.089	1.549	0.138	-
5 240	48	802.11a	10	8.10	-0.193	Top	6Mbps	0 cm	0.043	1.549	0.067	-
5 300	60	802.11a	10	8.30	0.158	Rear	6Mbps	0 cm	0.224	1.479	0.331	-
5 300	60	802.11a	10	8.30	0.120	Front	6Mbps	0 cm	0.042	1.479	0.062	-
5 300	60	802.11a	10	8.30	-0.178	Right	6Mbps	0 cm	0.091	1.479	0.135	-
5 300	60	802.11a	10	8.30	0.078	Top	6Mbps	0 cm	0.050	1.479	0.074	-
5 700	140	802.11a	10	8.58	-0.131	Rear	6Mbps	0 cm	0.260	1.387	0.361	21
5 700	140	802.11a	10	8.58	0.131	Front	6Mbps	0 cm	0.048	1.387	0.067	-
5 700	140	802.11a	10	8.58	-0.123	Right	6Mbps	0 cm	0.094	1.387	0.130	-
5 700	140	802.11a	10	8.58	-0.043	Top	6Mbps	0 cm	0.070	1.387	0.097	-
ANSI/ IEEE C95.1 - 1992– Safety Limit **Spatial Peak** **Uncontrolled Exposure/ General Population**							**Body** **2.0 W/kg (mW/g)** Averaged over 10 gram					

13.4 SAR 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 10 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 ≤ 1.2 W/kg, no additional SAR evaluation using a headset cable were required..

GSM/GPRS Test Notes:

1. This device supports GSM VOIP in the head and the body-worn configurations therefore GPRS was additionally evaluated for head and body-worn compliance.
2. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
3. Justification for reduced test configurations per KDB 941225 D03v01: The source-based time-averaged output power was evaluated for all multi-slot operations. The multi-slot configuration with the highest frame averaged output power was evaluated for SAR.
4. 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 ≤ 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.
5. Justification for reduced test configurations per KDB Publication 941225 D03v01 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.

UMTS Notes:

1. UMTS mode in Body SAR was tested under RMC 12.2 kbps with HSPA inactive per KDB 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
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 ≤ 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 channel highest output power channel was used.
3. Measured maximum output powers for DC-HSDPA were not greater than 1/4 dB higher than the WCDMA 12.2 kbps RMC maximum output and as a result, SAR is not required for DC-HSDPA and SAR was less than 1.2 W/kg.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Consideration for LTE Devices in FCC KDB 941125 D05v02r03. The general test procedures used for testing can be found in Section 8.4.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS 36.101 Sec. 6.2.3 - 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames.(Maximum TTI)
4. TDD LTE was tested using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using extended cyclic prefix only and special subframe configuration 6. SAR tests were performed at maximum output power and worst-case transmission duty factor in extended cyclic prefix. Per 3GPP 36.211 Sec. 4, the duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633(cf=1.58).
5. Per FCC KDB Publication 447498 D01v05r02, if the reported (scaled) LTE Band 41 SAR measured at the highest output power channel for each test configuration is ≤ 0.6 W/kg then testing at the other channels is not required for such test configurations.

WLAN Notes:

1. Justification for reduced test configurations for WIFI channels per KDB 248227 D01v01r02 and Oct. 2012 FCC/TCB Meeting Notes for 2.4 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other IEEE 802.11 modes (including 802.11 g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. Justification for reduced test configurations for WIFI channels per KDB 248227 D01v01r02 and Oct. 2012 FCC/TCB Meeting Notes for 5 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE 802.11 modes (including 802.11 n 20MHz and 40 MHz bandwidths) were not investigated since the average output power over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data of IEEE 802.11a mode.
3. When wireless router is enabled, 5.2, 5.3 and 5.5 GHz bands are disabled.
4. This device can operate in the 2.4 GHz and 5.8 GHz bands using WIFI Direct Go capability. Per FCC KDB 941225 D06v01r01, 5.8 GHz WIFI Direct Go is evaluated for SAR using wireless router SAR evaluation procedures.
5. Since the maximum extrapolated peak SAR of the zoom scan for the maximum output channel was ≤ 1.6 W/kg and the reported 1g averaged SAR was < 0.8 W/kg, SAR testing on other default channels was not required.
6. Per FCC KDB Publication 648474 D04v01r02, this device is considered a “phablet” since its diagonal distance, 160.1 mm, is greater than 160 mm. Therefore hand SAR tests are required. Because wireless router operations are not supported for 5 GHz NII WIFI, hand SAR was evaluated for 5 GHz NII WIFI. However, hand SAR was not evaluated for 2.4 GHz WIFI and 5 GHz DTS WIFI since Hotspot SAR for 2.4 GHz WIFI and 5 GHz DTS WIFI were < 1.2 W/kg.”
7. 5GHz Wifi Direct GO is supported in the 5.8 Ghz band only. The manufacturer expects 5.8 GHz Wifi Direct GO may be used similar to wireless router usage. Therefore, 5.8 GHz Wifi Direct GO was evaluated for SAR similar to wireless router SAR procedures in FCC KDB Publication 941225 D06v01r01.

14. SAR Measurement Variability and Uncertainty

In accordance with published RF Exposure KDB procedure 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz v01. 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							
1 907.6	9538	WCDMA1900	Standard	Front	0.878	0.872	1.01	22
2 549.5	40185	LTE Band 41	Standard	Rear	1.03	0.989	1.04	23

15. SAR Summation Scenario

	Position	Applicable Combination	Note
Simultaneous Transmission	Head	GSM 850 Voice/Data + 2.4 GHz WiFi	
		GPRS 850 Voice/Data + 2.4 GHz WiFi	
		GSM 1900 Voice/Data + 2.4 GHz WiFi	
		GPRS 1900 Voice/Data + 2.4 GHz WiFi	
		WCDMA850 Voice/Data + 2.4 GHz WiFi	
		WCDMA1900 Voice/Data + 2.4 GHz WiFi	
		LTE Band 41 Voice/Data + 2.4 GHz WiFi	
		GSM 850 Voice/Data + 5 GHz WiFi	
		GPRS 850 Voice/Data + 5 GHz WiFi	
		GSM 1900 Voice/Data + 5 GHz WiFi	
		GPRS 1900 Voice/Data + 5 GHz WiFi	
		WCDMA850 Voice/Data +5 GHz WiFi	
		WCDMA1900 Voice/Data +5 GHz WiFi	
		LTE Band 41 Voice/Data +5 GHz WiFi	
	Hotspot	GPRS 850 Voice/Data + 2.4 GHz WiFi	
		GPRS 1900 Voice/Data + 2.4 GHz WiFi	
		WCDMA850 Voice/Data + 2.4 GHz WiFi	
		WCDMA1900 Voice/Data + 2.4 GHz WiFi	
		LTE Band 41 Voice/Data + 2.4 GHz WiFi	
		GPRS 850 Voice/Data + 5 GHz WiFi	Wifi Direct GO
		GPRS 1900 Voice/Data + 5 GHz WiFi	
		WCDMA850 Voice/Data + 5 GHz WiFi	
		WCDMA1900 Voice/Data + 5 GHz WiFi	
		LTE Band 41 Voice/Data + 5 GHz WiFi	
	Body-worn	GSM 850 Voice/Data + 2.4 GHz WiFi	
		GPRS 850 Voice/Data + 2.4 GHz WiFi	
		GSM 1900 Voice/Data + 2.4 GHz WiFi	
		GPRS 1900 Voice/Data + 2.4 GHz WiFi	
		WCDMA850 Voice/Data + 2.4 GHz WiFi	
		WCDMA1900 Voice/Data + 2.4 GHz WiFi	
		LTE Band 41 Voice/Data + 2.4 GHz WiFi	
		GSM 850 Voice/Data + 5 GHz WiFi	
		GPRS 850 Voice/Data + 5 GHz WiFi	
		GSM 1900 Voice/Data + 5 GHz WiFi	
		GPRS 1900 Voice/Data + 5 GHz WiFi	
		WCDMA850 Voice/Data + 5 GHz WiFi	
		WCDMA1900 Voice/Data + 5 GHz WiFi	
		LTE Band 41 Voice/Data + 5 GHz WiFi	
		GSM 850 Voice + 2.4 GHz Bluetooth	
		GPRS 850 Voice + 2.4 GHz Bluetooth	
		GSM 1900 Voice + 2.4 GHz Bluetooth	
		GPRS 1900 Voice + 2.4 GHz Bluetooth	
		WCDMA850 Voice/Data + 2.4 GHz Bluetooth	
		WCDMA1900 Voice/Data 2.4 GHz Bluetooth	
		LTE Band 41 Voice/Data 2.4 GHz Bluetooth	
* BT and WLAN are not simultaneous transmission.			

15.1 Simultaneous Transmission Summation for Head

Simultaneous Transmission Summation with 2.4 GHz WIFI

Band	configuration	Scaled SAR (W/kg)	2.4 GHz WIFI Scaled SAR (W/kg)	∑ 1-g SAR (W/kg)
GSM 850	Left Cheek	0.169	0.439	0.608
	Left Tilt	0.095	0.248	0.343
	Right Cheek	0.128	0.227	0.355
	Right Tilt	0.092	0.139	0.231
GPRS 850	Left Cheek	0.256	0.439	0.695
	Left Tilt	0.134	0.248	0.382
	Right Cheek	0.190	0.227	0.417
	Right Tilt	0.132	0.139	0.271
GSM 1900	Left Cheek	0.176	0.439	0.615
	Left Tilt	0.070	0.248	0.318
	Right Cheek	0.105	0.227	0.332
	Right Tilt	0.061	0.139	0.200
GPRS 1900	Left Cheek	0.228	0.439	0.667
	Left Tilt	0.089	0.248	0.337
	Right Cheek	0.137	0.227	0.364
	Right Tilt	0.138	0.139	0.277
WCDMA 850	Left Cheek	0.159	0.439	0.598
	Left Tilt	0.088	0.248	0.336
	Right Cheek	0.120	0.227	0.347
	Right Tilt	0.082	0.139	0.221
WCDMA 1900	Left Cheek	0.249	0.439	0.688
	Left Tilt	0.112	0.248	0.360
	Right Cheek	0.167	0.227	0.394
	Right Tilt	0.167	0.139	0.306
LTE 41	Left Cheek	0.015	0.439	0.454
	Left Tilt	0.007	0.248	0.255
	Right Cheek	0.012	0.227	0.239
	Right Tilt	0.003	0.139	0.142

Simultaneous Transmission Summation with 5 GHz WIFI

Band	configuration	Scaled SAR (W/kg)	5 GHz WIFI Scaled SAR (W/kg)	∑ 1-g SAR (W/kg)
GSM850	Left Cheek	0.169	0.266	0.435
	Left Tilt	0.095	0.183	0.278
	Right Cheek	0.128	0.129	0.257
	Right Tilt	0.092	0.104	0.196
GPRS 850	Left Cheek	0.256	0.266	0.522
	Left Tilt	0.134	0.183	0.317
	Right Cheek	0.190	0.129	0.319
	Right Tilt	0.132	0.104	0.236
GSM 1900	Left Cheek	0.176	0.266	0.442
	Left Tilt	0.070	0.183	0.253
	Right Cheek	0.105	0.129	0.234
	Right Tilt	0.061	0.104	0.165
GPRS 1900	Left Cheek	0.228	0.266	0.494
	Left Tilt	0.089	0.183	0.272
	Right Cheek	0.137	0.129	0.266
	Right Tilt	0.138	0.104	0.242
WCDMA 850	Left Cheek	0.159	0.266	0.425
	Left Tilt	0.088	0.183	0.271
	Right Cheek	0.120	0.129	0.249
	Right Tilt	0.082	0.104	0.186
WCDMA 1900	Left Cheek	0.249	0.266	0.515
	Left Tilt	0.112	0.183	0.295
	Right Cheek	0.167	0.129	0.296
	Right Tilt	0.167	0.104	0.271
LTE 41	Left Cheek	0.015	0.266	0.281
	Left Tilt	0.007	0.183	0.190
	Right Cheek	0.012	0.129	0.141
	Right Tilt	0.003	0.104	0.107

15.2 Simultaneous Transmission Summation for Body-Worn

Simultaneous Transmission Summation with Wifi (1 cm)

Band	configuration	Scaled SAR(W/kg)	2.4 GHz WIFI Scaled SAR (W/kg)	∑ 1-g SAR (W/kg)
GSM 850	Rear	0.319	0.242	0.561
GSM 850	Front	0.222	0.078	0.300
GPRS 850	Rear	0.404	0.242	0.646
GPRS 850	Front	0.276	0.078	0.354
GSM 1900	Rear	0.358	0.242	0.600
GSM 1900	Front	0.508	0.078	0.586
GPRS 1900	Rear	0.455	0.242	0.697
GPRS 1900	Front	0.637	0.078	0.715
WCDMA850	Rear	0.281	0.242	0.523
WCDMA850	Front	0.181	0.078	0.259
WCDMA1900	Rear	0.492	0.242	0.734
WCDMA1900	Front	0.915	0.078	0.993
LTE 41	Rear	1.074	0.242	1.316
LTE 41	Front	0.064	0.078	0.142

Simultaneous Transmission Summation with Wifi (1 cm)

Band	configuration	Scaled SAR(W/kg)	5 GHz WIFI Scaled SAR (W/kg)	∑ 1-g SAR (W/kg)
GSM 850	Rear	0.319	0.340	0.659
GSM 850	Front	0.222	0.049	0.271
GPRS 850	Rear	0.404	0.340	0.744
GPRS 850	Front	0.276	0.049	0.325
GSM 1900	Rear	0.358	0.340	0.698
GSM 1900	Front	0.508	0.049	0.557
GPRS 1900	Rear	0.455	0.340	0.795
GPRS 1900	Front	0.637	0.049	0.686
WCDMA850	Rear	0.281	0.340	0.621
WCDMA850	Front	0.181	0.049	0.230
WCDMA1900	Rear	0.492	0.340	0.832
WCDMA1900	Front	0.915	0.049	0.964
LTE 41	Rear	1.074	0.340	1.414
LTE 41	Front	0.064	0.049	0.113

Simultaneous Transmission Summation with Bluetooth (1 cm)

Band	configuration	Scaled SAR(W/kg)	BT SAR (W/kg)	∑ 1-g SAR (W/kg)
GSM 850	Rear	0.319	0.23	0.549
GSM 850	Front	0.222	0.23	0.452
GPRS 850	Rear	0.404	0.23	0.634
GPRS 850	Front	0.276	0.23	0.506
GSM 1900	Rear	0.358	0.23	0.588
GSM 1900	Front	0.508	0.23	0.738
GPRS 1900	Rear	0.455	0.23	0.685
GPRS 1900	Front	0.637	0.23	0.867
WCDMA850	Rear	0.281	0.23	0.511
WCDMA850	Front	0.181	0.23	0.411
WCDMA1900	Rear	0.492	0.23	0.722
WCDMA1900	Front	0.915	0.23	1.145
LTE 41	Rear	1.074	0.23	1.304
LTE 41	Front	0.064	0.23	0.294

15.3 Simultaneous Transmission Summation for Hotspot

Simultaneous Transmission Summation with 2.4 GHz WIFI (1 cm)

Band	configuration	Scaled SAR (W/kg)	2.4 GHz WIFI Scaled SAR (W/kg)	∑ 1-g SAR (W/kg)
GSM 850	Rear	0.404	0.242	0.646
	Front	0.276	0.078	0.354
	Left	0.339		0.339
	Right	0.155	0.112	0.267
	Bottom	0.209		0.209
	Top		0.057	0.057
GSM 1900	Rear	0.455	0.242	0.697
	Front	0.637	0.078	0.715
	Left	0.312		0.312
	Right	0.058	0.112	0.170
	Bottom	0.501		0.501
	Top		0.057	0.057
WCDMA 850	Rear	0.281	0.242	0.523
	Front	0.181	0.078	0.259
	Left	0.221		0.221
	Right	0.097	0.112	0.209
	Bottom	0.145		0.145
	Top		0.057	0.057
WCDMA 1900	Rear	0.492	0.242	0.734
	Front	0.915	0.078	0.993
	Left	0.208		0.208
	Right	0.093	0.112	0.205
	Bottom	0.523		0.523
	Top		0.057	0.057
LTE 41	Rear	1.074	0.242	1.316
	Front	0.064	0.078	0.142
	Left	0.064		0.064
	Right	0.010	0.112	0.122
	Bottom	0.268		0.268
	Top		0.057	0.057

Simultaneous Transmission Summation with 5.8 GHz DTS Wifi (1 cm)

Band	configuration	Scaled SAR (W/kg)	5 GHz WIFI Scaled SAR (W/kg)	∑ 1-g SAR (W/kg)
GSM 850	Rear	0.404	0.340	0.744
	Front	0.276	0.049	0.325
	Left	0.339		0.339
	Right	0.155	0.188	0.343
	Bottom	0.209		0.209
	Top		0.091	0.091
GSM 1900	Rear	0.455	0.340	0.795
	Front	0.637	0.049	0.686
	Left	0.312		0.312
	Right	0.058	0.188	0.246
	Bottom	0.501		0.501
	Top		0.091	0.091
WCDMA 850	Rear	0.281	0.340	0.621
	Front	0.181	0.049	0.230
	Left	0.221		0.221
	Right	0.097	0.188	0.285
	Bottom	0.145		0.145
	Top		0.091	0.091
WCDMA 1900	Rear	0.492	0.340	0.832
	Front	0.915	0.049	0.964
	Left	0.208		0.208
	Right	0.093	0.188	0.281
	Bottom	0.523		0.523
	Top		0.091	0.091
LTE 41	Rear	1.074	0.340	1.414
	Front	0.064	0.049	0.113
	Left	0.064		0.064
	Right	0.010	0.188	0.198
	Bottom	0.268		0.268
	Top		0.091	0.091

15.4 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit. And therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v05r02

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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Attachment 1. – SAR Test Plots

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.1 ℃
Ambient Temperature:	20.3 ℃
Test Date:	Feb. 07, 2014
Plot No.:	1

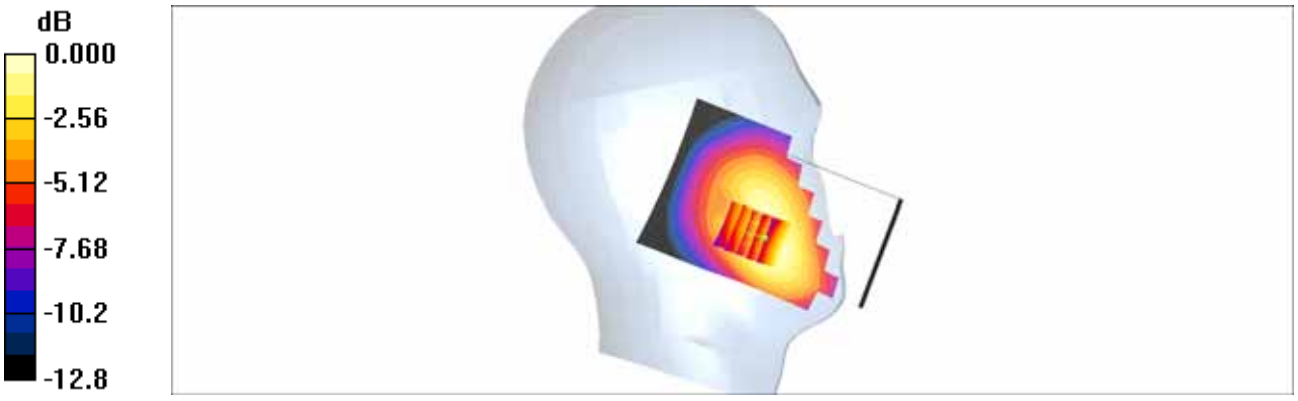
DUT: SM-N7506V; Type: Bar

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:2.77
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.879 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(9.04, 9.04, 9.04); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: 1800/1900 Phantom; Type: SAM

GSM850 Left touch 190 GPRS 3Tx/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.242 mW/g

GSM850 Left touch 190 GPRS 3Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.50 V/m; Power Drift = 0.069 dB
Peak SAR (extrapolated) = 0.494 W/kg
SAR(1 g) = 0.231 mW/g; SAR(10 g) = 0.169 mW/g
Maximum value of SAR (measured) = 0.239 mW/g



0 dB = 0.239mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	2

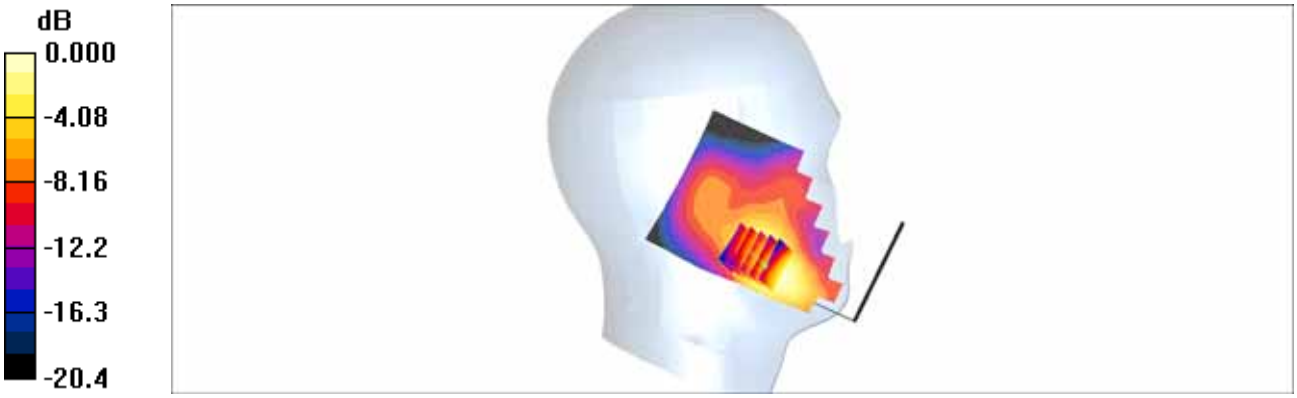
DUT: SM-N7506V; Type: Bar

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; σ = 1.36 mho/m; ε_r = 39.2; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(7.73, 7.73, 7.73); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: 835/900 Phamtom ; Type: SAM

GSM1900 Left touch GPRS 2Tx VOIP 661/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.188 mW/g

GSM1900 Left touch GPRS 2Tx VOIP 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.95 V/m; Power Drift = 0.089 dB
Peak SAR (extrapolated) = 0.255 W/kg
SAR(1 g) = 0.168 mW/g; SAR(10 g) = 0.105 mW/g
Maximum value of SAR (measured) = 0.183 mW/g



0 dB = 0.183mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.1 ℃
Ambient Temperature:	20.3 ℃
Test Date:	Feb. 07, 2014
Plot No.:	3

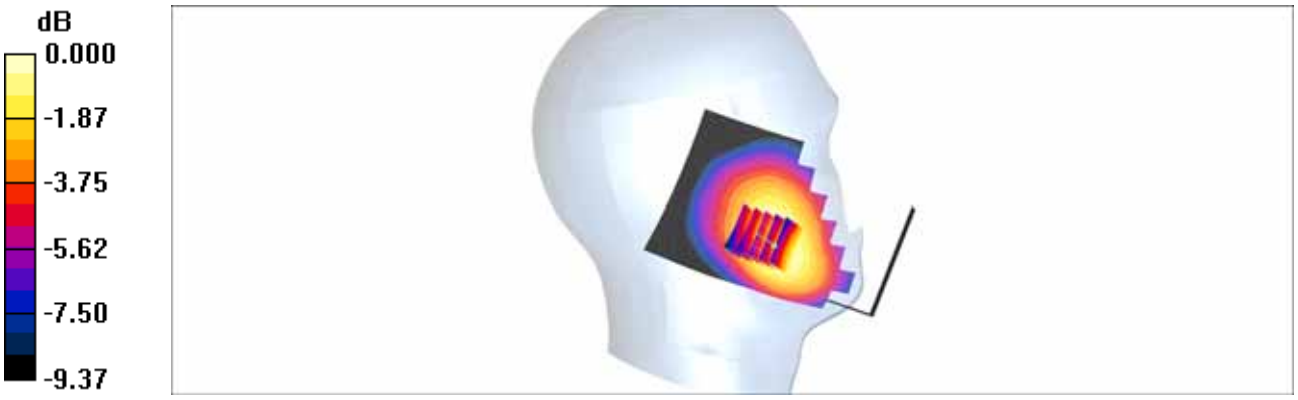
DUT: SM-N7506V; Type: Bar

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.879 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(9.04, 9.04, 9.04); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: 1800/1900 Phantom; Type: SAM

WCDMA850 Left Touch 4183/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.138 mW/g

WCDMA850 Left Touch 4183/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.46 V/m; Power Drift = -0.008 dB
Peak SAR (extrapolated) = 0.162 W/kg
SAR(1 g) = 0.128 mW/g; SAR(10 g) = 0.097 mW/g
Maximum value of SAR (measured) = 0.133 mW/g



0 dB = 0.133mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	4

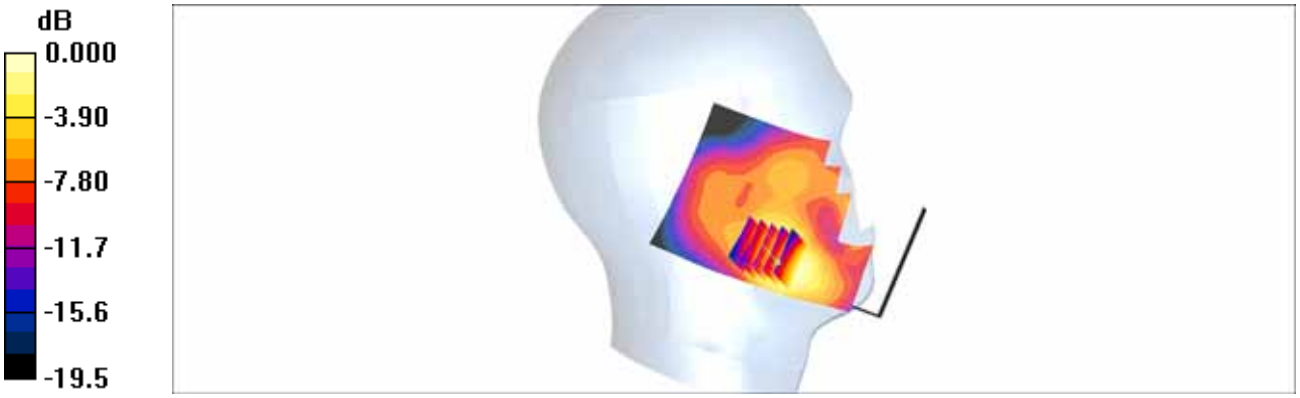
DUT: SM-N7506V; Type: Bar

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.36 mho/m; ε_r = 39.2; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(7.73, 7.73, 7.73); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WCDMA1900 Left touch 9400/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.263 mW/g

WCDMA1900 Left touch 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.28 V/m; Power Drift = -0.139 dB
Peak SAR (extrapolated) = 0.358 W/kg
SAR(1 g) = 0.229 mW/g; SAR(10 g) = 0.141 mW/g
Maximum value of SAR (measured) = 0.246 mW/g



0 dB = 0.246mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.2 ℃
Ambient Temperature:	20.4 ℃
Test Date:	Feb. 09, 2014
Plot No.:	5

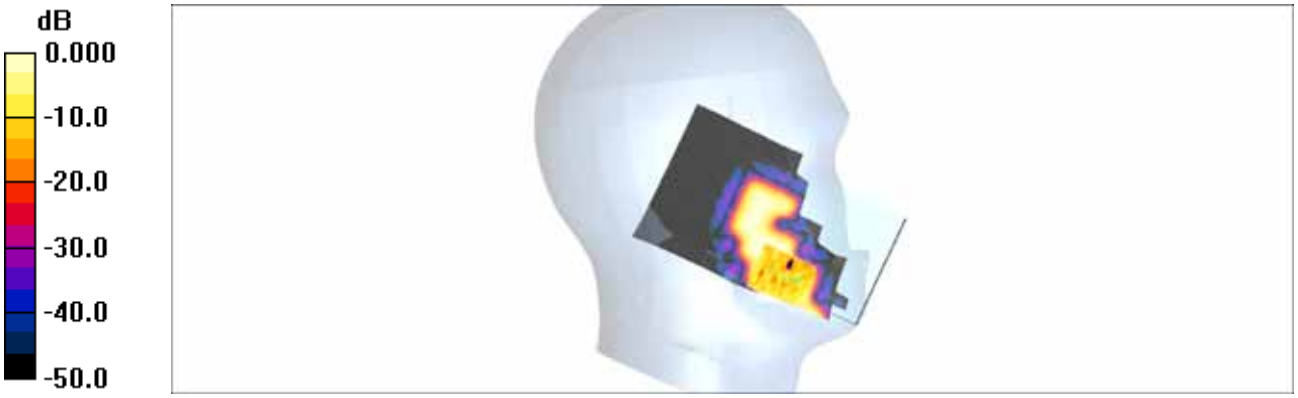
DUT: SM-N7506V; Type: Bar

Communication System: LTE Band 41 (FCC); Frequency: 2593 MHz;Duty Cycle: 1:1.58
Medium parameters used (interpolated): f = 2593 MHz; σ = 2.03 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(7.23, 7.23, 7.23); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 800/900 Phantom; Type: SAM

LTE band 41 Left Touch 20MHz QPSK 1RB 49offset 40620ch/Area Scan (81x141x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.027 mW/g

LTE band 41 Left Touch 20MHz QPSK 1RB 49offset 40620ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.78 V/m; Power Drift = 0.152 dB
Peak SAR (extrapolated) = 0.047 W/kg
SAR(1 g) = 0.015 mW/g; SAR(10 g) = 0.0068 mW/g
Maximum value of SAR (measured) = 0.018 mW/g



0 dB = 0.018mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	6

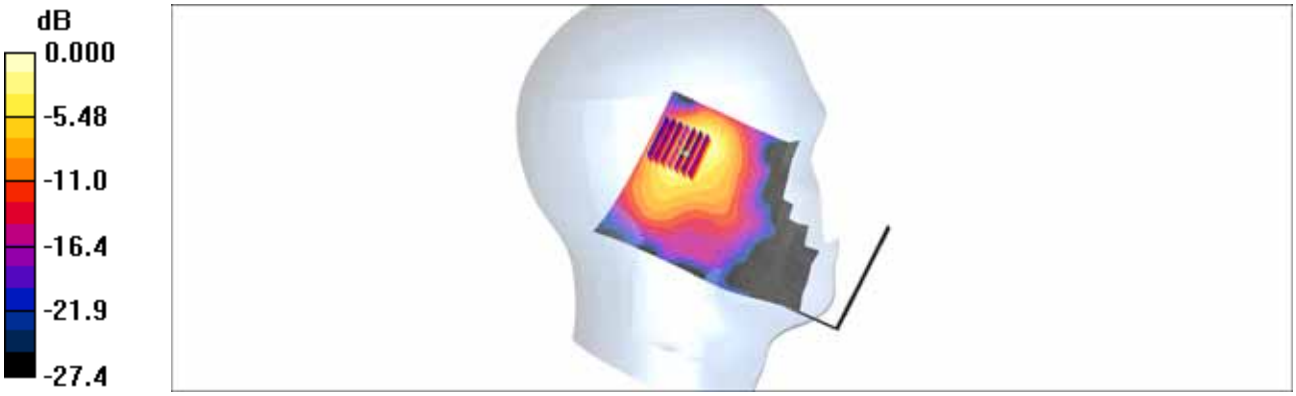
DUT: SM-N7506V; Type: Bar

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.78 mho/m; ε_r = 39.8; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(7.43, 7.43, 7.43); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 800/900 Phantom; Type: SAM

802.11b Left Touch 6ch 1Mbps/Area Scan (91x131x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.343 mW/g

802.11b Left Touch 6ch 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.68 V/m; Power Drift = -0.151 dB
Peak SAR (extrapolated) = 0.780 W/kg
SAR(1 g) = 0.310 mW/g; SAR(10 g) = 0.137 mW/g
Maximum value of SAR (measured) = 0.341 mW/g



0 dB = 0.341mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.1 ℃
Ambient Temperature:	20.3 ℃
Test Date:	Feb. 07, 2014
Plot No.:	7

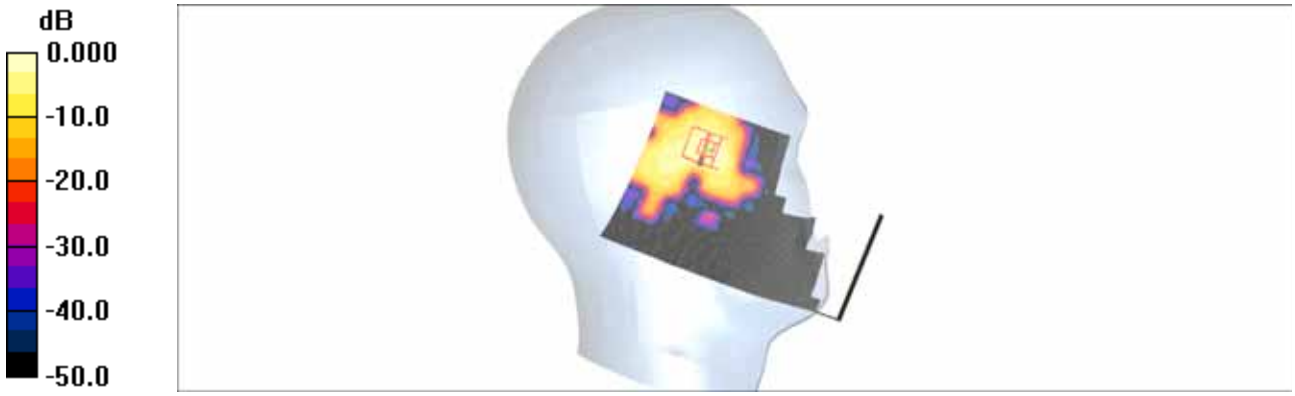
DUT: SM-N7506V; Type: Bar

Communication System: WIFI 5GHz; Frequency: 5785 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5785 MHz; σ = 5.32 mho/m; ε_r = 33.6; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.14, 4.14, 4.14); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 835/900 Phamtom ; Type: SAM

802.11a Left Touch 157ch 6Mbps/Area Scan (111x171x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.345 mW/g

802.11a Left Touch 157ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.53 V/m; Power Drift = 0.102 dB
Peak SAR (extrapolated) = 0.977 W/kg
SAR(1 g) = 0.189 mW/g; SAR(10 g) = 0.050 mW/g
Maximum value of SAR (measured) = 0.439 mW/g



0 dB = 0.439mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.1 ℃
Ambient Temperature:	20.3 ℃
Test Date:	Feb. 07, 2014
Plot No.:	8

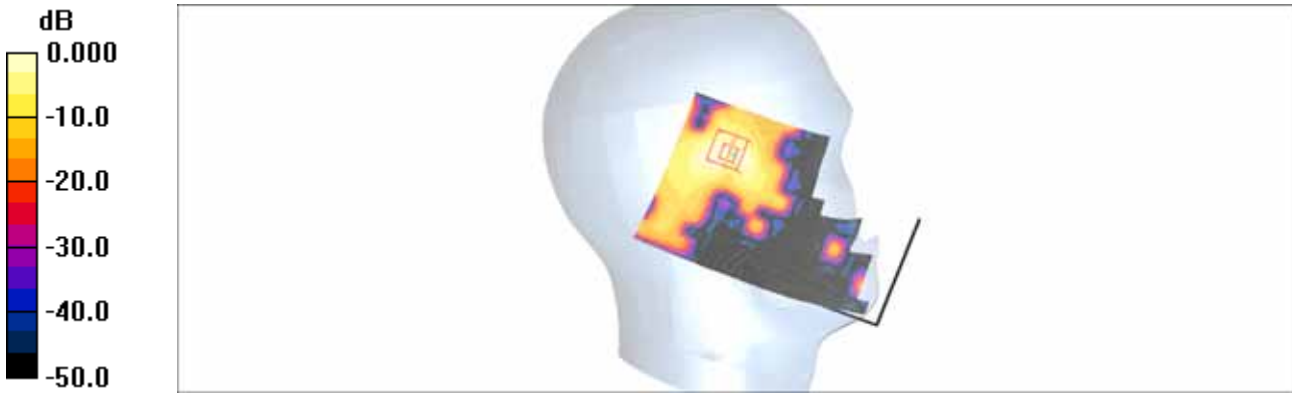
DUT: SM-N7506V; Type: Bar

Communication System: WIFI 5GHz; Frequency: 5240 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5240 MHz; σ = 4.65 mho/m; ε_r = 34.7; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.79, 4.79, 4.79); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 835/900 Phamtom ; Type: SAM

802.11a Left touch 48ch 6Mbps/Area Scan (111x171x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.267 mW/g

802.11a Left touch 48ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.52 V/m; Power Drift = 0.178 dB
Peak SAR (extrapolated) = 0.628 W/kg
SAR(1 g) = 0.127 mW/g; SAR(10 g) = 0.040 mW/g
Maximum value of SAR (measured) = 0.243 mW/g



0 dB = 0.243mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.1 ℃
Ambient Temperature:	20.3 ℃
Test Date:	Feb. 07, 2014
Plot No.:	9

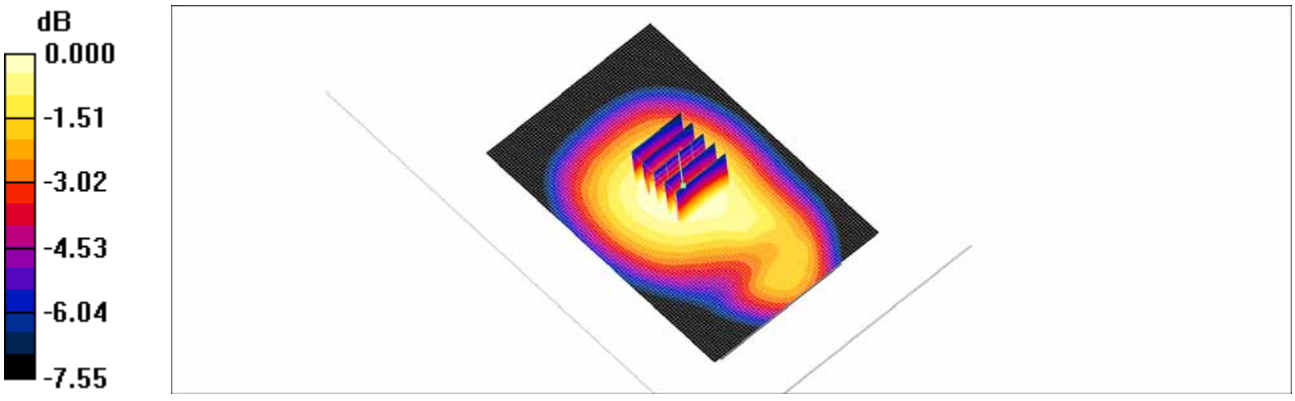
DUT: SM-N7506V; Type: Bar

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:2.77
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.966 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(9.03, 9.03, 9.03); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

GSM850 Body Rear 190ch GPRS 3Tx/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.382 mW/g

GSM850 Body Rear 190ch GPRS 3Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.3 V/m; Power Drift = -0.030 dB
Peak SAR (extrapolated) = 0.451 W/kg
SAR(1 g) = 0.364 mW/g; SAR(10 g) = 0.282 mW/g
Maximum value of SAR (measured) = 0.382 mW/g



0 dB = 0.382mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	10

DUT: SM-N7506V; Type: Bar

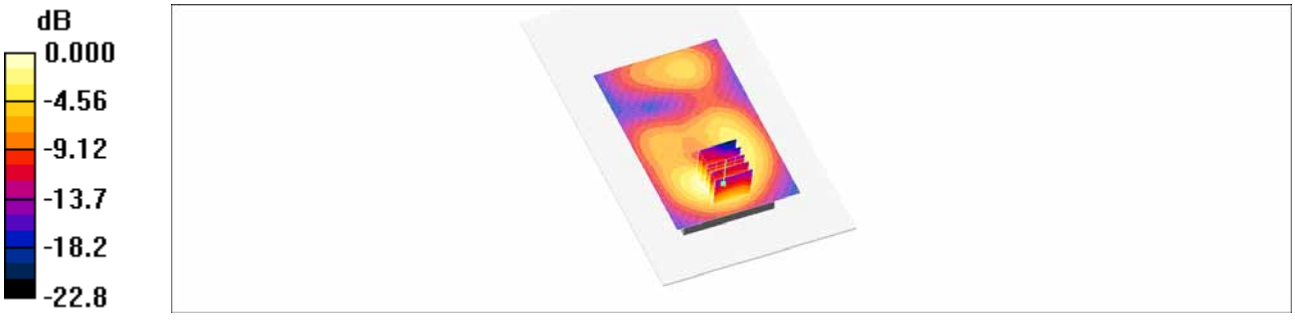
Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(7.14, 7.14, 7.14); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA;
- Measurement SW: DASY4, V4.7 Build 80;

GSM1900 Body Rear 661 GPRS 2Tx/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.359 mW/g

GSM1900 Body Rear 661 GPRS 2Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.76 V/m; Power Drift = 0.002 dB
Peak SAR (extrapolated) = 0.582 W/kg
SAR(1 g) = 0.336 mW/g; SAR(10 g) = 0.182 mW/g
Maximum value of SAR (measured) = 0.363 mW/g



0 dB = 0.363mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	11

DUT: SM-N7506V; Type: Bar

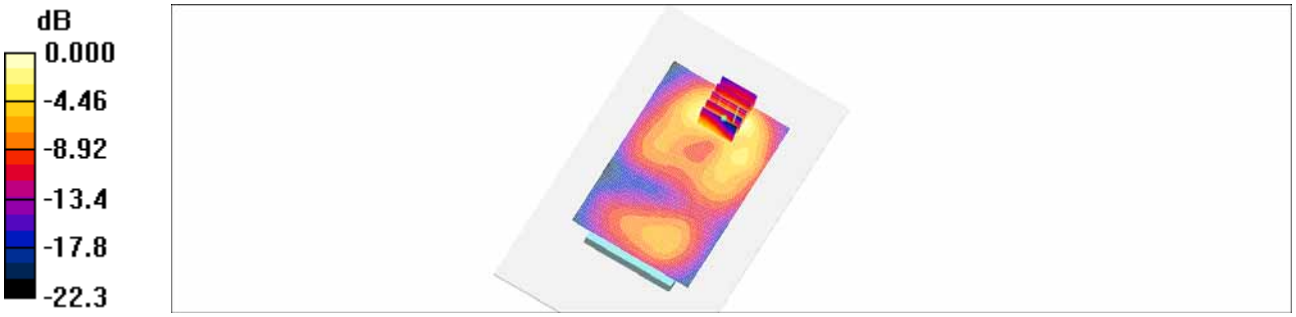
Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(7.14, 7.14, 7.14); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA;
- Measurement SW: DASY4, V4.7 Build 80;

GSM1900 Body GPRS 2Tx Front 661/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.501 mW/g

GSM1900 Body GPRS 2Tx Front 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.07 V/m; Power Drift = 0.084 dB
Peak SAR (extrapolated) = 0.832 W/kg
SAR(1 g) = 0.470 mW/g; SAR(10 g) = 0.249 mW/g
Maximum value of SAR (measured) = 0.513 mW/g



0 dB = 0.513mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.1 ℃
Ambient Temperature:	20.3 ℃
Test Date:	Feb. 07, 2014
Plot No.:	12

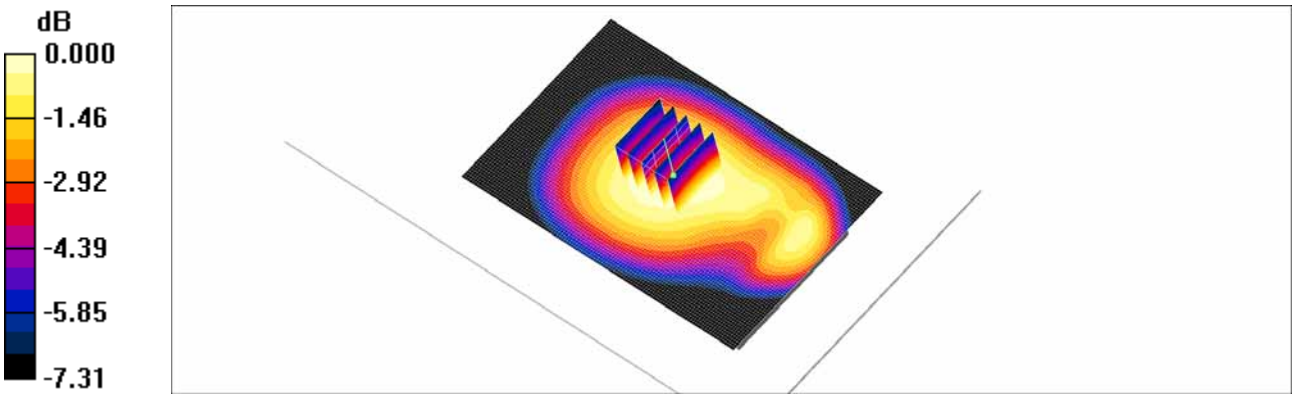
DUT: SM-N7506V; Type: Bar

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.966 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(9.03, 9.03, 9.03); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

WCDMA850 Body rear 4183ch/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.236 mW/g

WCDMA850 Body rear 4183ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.7 V/m; Power Drift = -0.114 dB
Peak SAR (extrapolated) = 0.282 W/kg
SAR(1 g) = 0.226 mW/g; SAR(10 g) = 0.175 mW/g
Maximum value of SAR (measured) = 0.236 mW/g



0 dB = 0.236mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	13

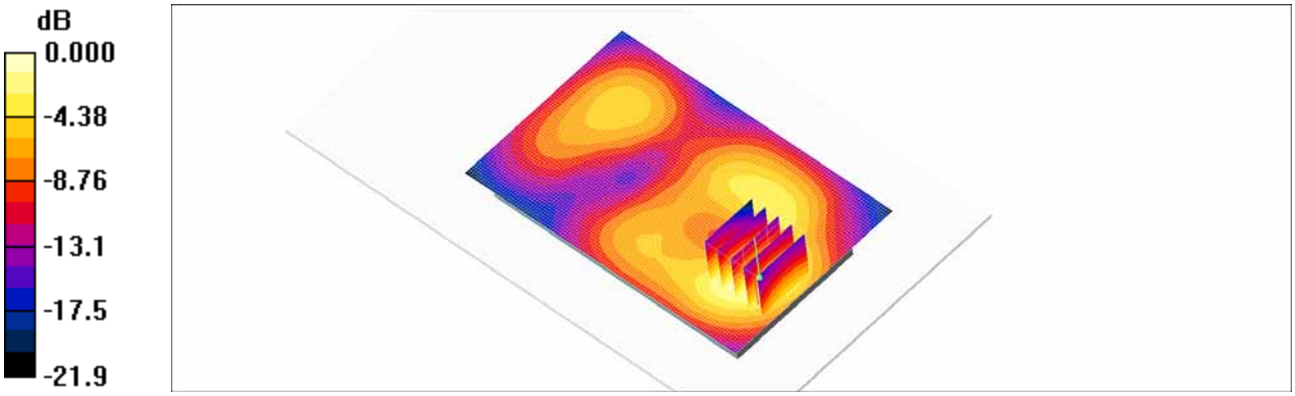
DUT: SM-N7506V; Type: Bar

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(7.14, 7.14, 7.14); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

WCDMA1900 Body rear 9400ch/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.489 mW/g

WCDMA1900 Body rear 9400ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.01 V/m; Power Drift = -0.138 dB
Peak SAR (extrapolated) = 0.786 W/kg
SAR(1 g) = 0.452 mW/g; SAR(10 g) = 0.249 mW/g
Maximum value of SAR (measured) = 0.506 mW/g



0 dB = 0.506mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	14

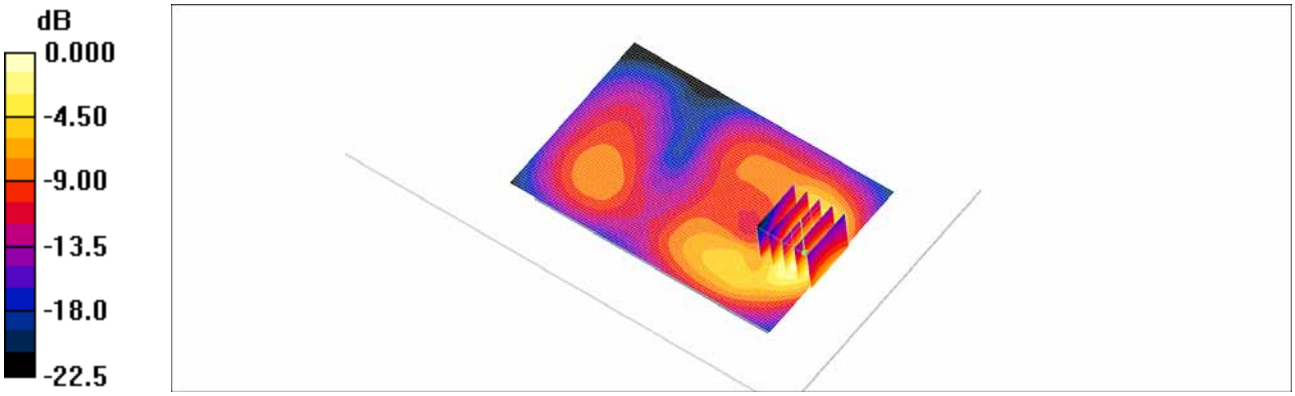
DUT: SM-N7506V; Type: Bar

Communication System: WCDMA1900; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1907.6 MHz; σ = 1.51 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(7.14, 7.14, 7.14); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

WCDMA1900 Body Front 9538ch/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.971 mW/g

WCDMA1900 Body Front 9538ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.32 V/m; Power Drift = 0.110 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 0.878 mW/g; SAR(10 g) = 0.461 mW/g
Maximum value of SAR (measured) = 0.986 mW/g



0 dB = 0.986mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.3 ℃
Ambient Temperature:	20.5 ℃
Test Date:	Feb. 10, 2014
Plot No.:	15

DUT: SM-N7506V; Type: Bar

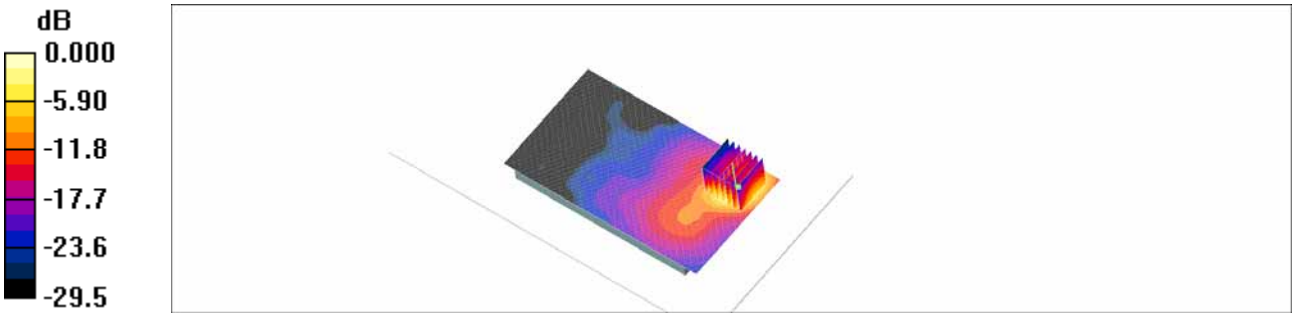
Communication System: LTE Band 41 (FCC); Frequency: 2549.5 MHz;Duty Cycle: 1:1.58
Medium parameters used: f = 2550 MHz; σ = 2.13 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3903; ConvF(6.89, 6.89, 6.89); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA;
- Measurement SW: DASY4, V4.7 Build 80;

LTE band 41 Body Rear 20MHz QPSK 1RB 49offset 40185/Area Scan (81x141x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.31 mW/g

LTE band 41 Body Rear 20MHz QPSK 1RB 49offset 40185/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.53 V/m; Power Drift = 0.177 dB
Peak SAR (extrapolated) = 2.17 W/kg
SAR(1 g) = 1.03 mW/g; SAR(10 g) = 0.426 mW/g
Maximum value of SAR (measured) = 1.23 mW/g



0 dB = 1.23mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	16

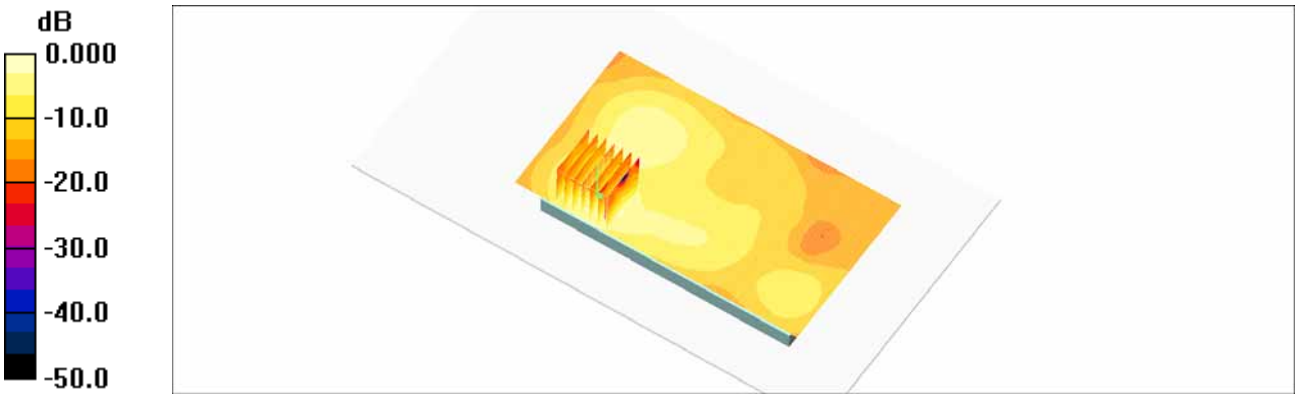
DUT: SM-N7506V; Type: Bar

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(7.14, 7.14, 7.14); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

802.11b Body Rear 6ch 1Mbps/Area Scan (81x141x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.198 mW/g

802.11b Body Rear 6ch 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.00 V/m; Power Drift = 0.057 dB
Peak SAR (extrapolated) = 0.360 W/kg
SAR(1 g) = 0.171 mW/g; SAR(10 g) = 0.078 mW/g
Maximum value of SAR (measured) = 0.192 mW/g



0 dB = 0.192mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	17

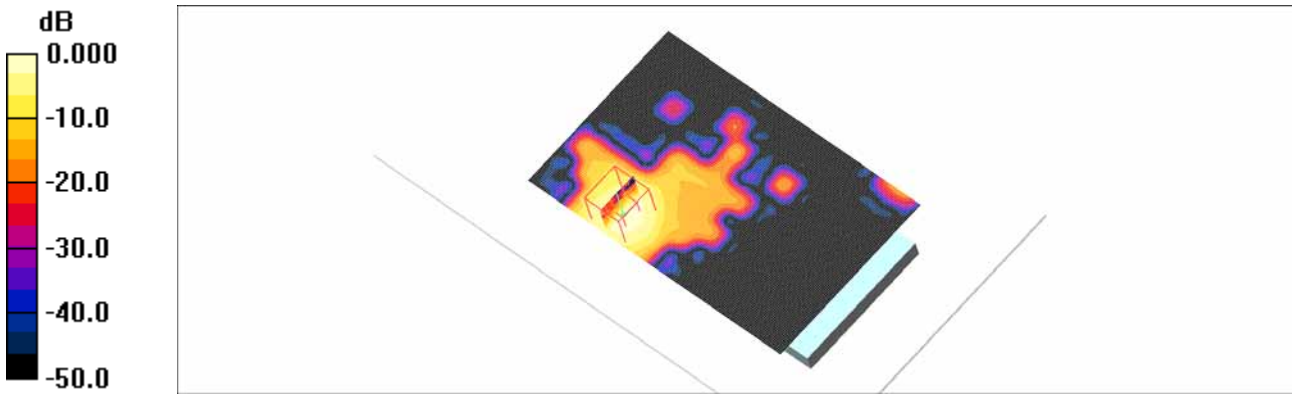
DUT: SM-N7506V; Type: Bar

Communication System: WIFI 5GHz; Frequency: 5785 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5785 MHz; σ = 6.25 mho/m; ε_r = 47.7; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.01, 4.01, 4.01); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

802.11a Body Rear 157ch 6Mbps/Area Scan (101x161x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.434 mW/g

802.11a Body Rear 157ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 1.47 V/m; Power Drift = 0.144 dB
Peak SAR (extrapolated) = 0.985 W/kg
SAR(1 g) = 0.242 mW/g; SAR(10 g) = 0.075 mW/g
Maximum value of SAR (measured) = 0.485 mW/g



0 dB = 0.485mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	18

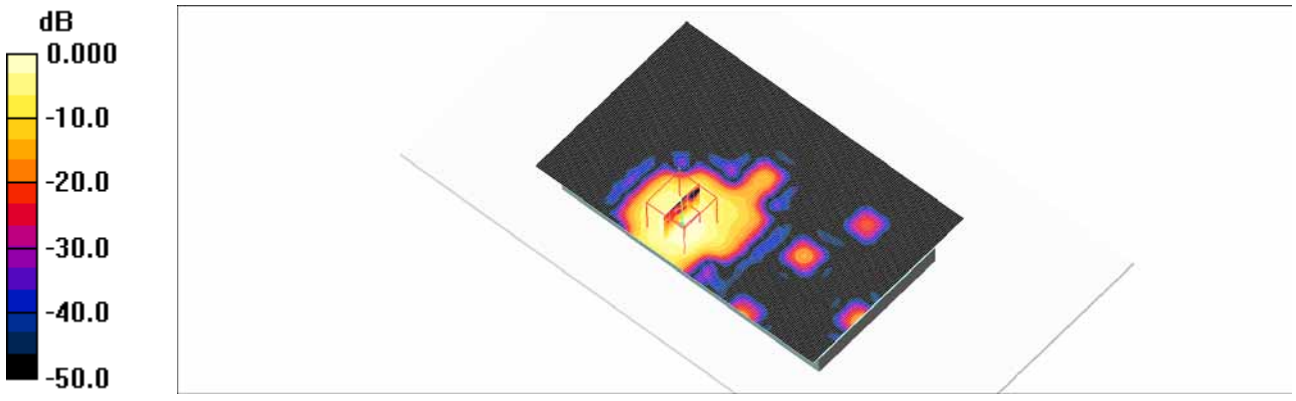
DUT: SM-N7506V; Type: Bar

Communication System: WIFI 5GHz; Frequency: 5700 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5700 MHz; σ = 6.1 mho/m; ε_r = 47.9; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.01, 4.01, 4.01); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

802.11a Body Worn Rear 140ch 6Mbps/Area Scan (101x161x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.210 mW/g

802.11a Body Worn Rear 140ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0.994 V/m; Power Drift = 0.114 dB
Peak SAR (extrapolated) = 0.367 W/kg
SAR(1 g) = 0.099 mW/g; SAR(10 g) = 0.030 mW/g
Maximum value of SAR (measured) = 0.210 mW/g



0 dB = 0.210mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.1 ℃
Ambient Temperature:	20.3 ℃
Test Date:	Feb. 07, 2014
Plot No.:	19

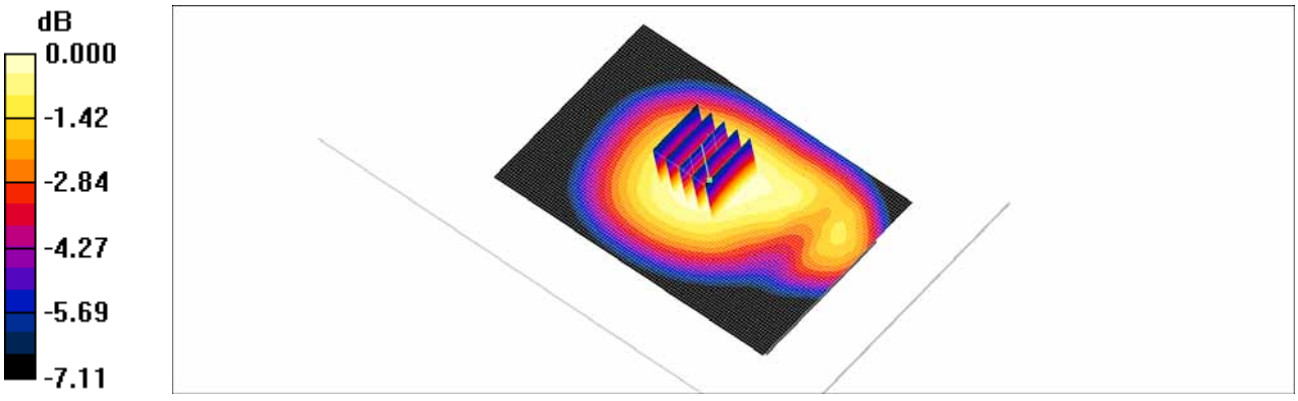
DUT: SM-N7506V; Type: Bar

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.966 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(9.03, 9.03, 9.03); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

GSM850 Body worn Rear 190ch/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.305 mW/g

GSM850 Body worn Rear 190ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.3 V/m; Power Drift = -0.193 dB
Peak SAR (extrapolated) = 0.358 W/kg
SAR(1 g) = 0.288 mW/g; SAR(10 g) = 0.223 mW/g
Maximum value of SAR (measured) = 0.301 mW/g



0 dB = 0.301mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	20

DUT: SM-N7506V; Type: Bar

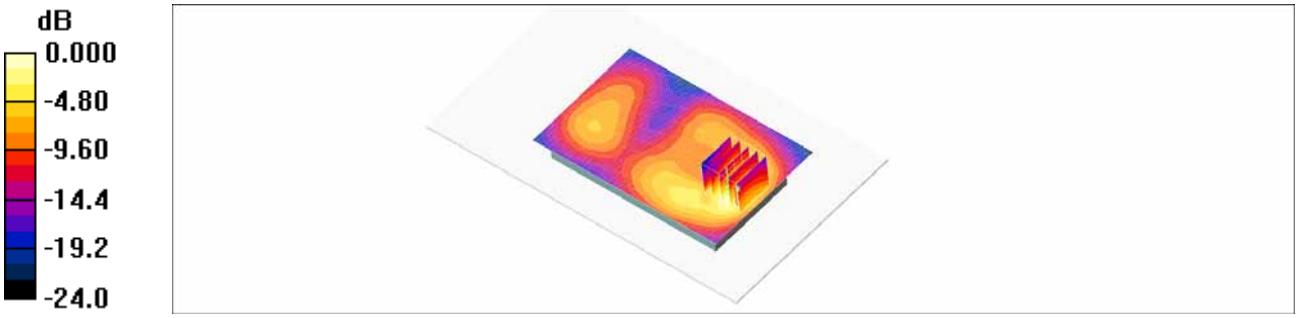
Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(7.14, 7.14, 7.14); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA;
- Measurement SW: DASY4, V4.7 Build 80;

GSM1900 Body Worn Voice Front 661/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.492 mW/g

GSM1900 Body Worn Voice Front 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.04 V/m; Power Drift = 0.074 dB
Peak SAR (extrapolated) = 0.821 W/kg
SAR(1 g) = 0.464 mW/g; SAR(10 g) = 0.246 mW/g
Maximum value of SAR (measured) = 0.506 mW/g



0 dB = 0.506mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	21

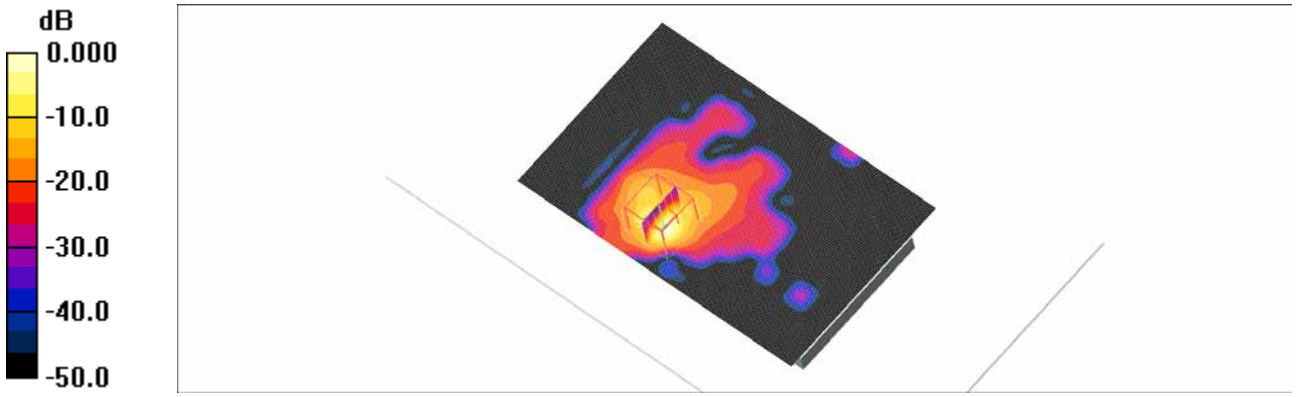
DUT: SM-N7506V; Type: Bar

Communication System: WIFI 5GHz; Frequency: 5700 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5700 MHz; σ = 6.1 mho/m; ε_r = 47.9; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.01, 4.01, 4.01); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

802.11a Hand SAR Body Rear 140ch 6Mbps/Area Scan (101x161x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.85 mW/g

802.11a Hand SAR Body Rear 140ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 1.92 V/m; Power Drift = -0.131 dB
Peak SAR (extrapolated) = 8.40 W/kg
SAR(1 g) = 1.39 mW/g; SAR(10 g) = 0.260 mW/g
Maximum value of SAR (measured) = 3.75 mW/g



0 dB = 3.75mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.0 ℃
Ambient Temperature:	20.2 ℃
Test Date:	Feb. 06, 2014
Plot No.:	22

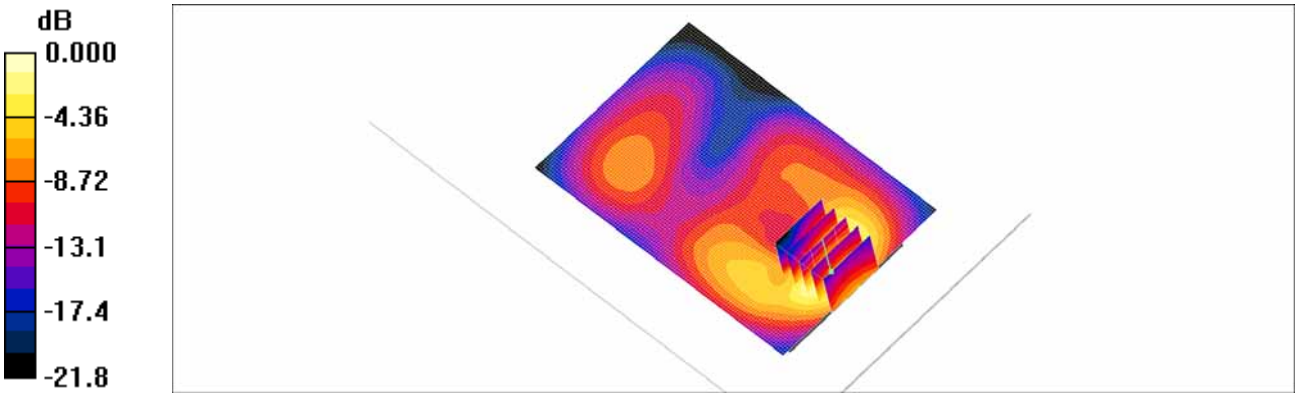
DUT: SM-N7506V; Type: Bar

Communication System: WCDMA1900; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1907.6 MHz; σ = 1.51 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(7.14, 7.14, 7.14); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

WCDMA1900 Body Front 9538ch/Area Scan (71x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.977 mW/g

WCDMA1900 Body Front 9538ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.31 V/m; Power Drift = 0.026 dB
Peak SAR (extrapolated) = 1.59 W/kg
SAR(1 g) = 0.872 mW/g; SAR(10 g) = 0.456 mW/g
Maximum value of SAR (measured) = 0.977 mW/g



0 dB = 0.977mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Liquid Temperature:	20.3 ℃
Ambient Temperature:	20.5 ℃
Test Date:	Feb. 10, 2014
Plot No.:	23

DUT: SM-N7506V; Type: Bar

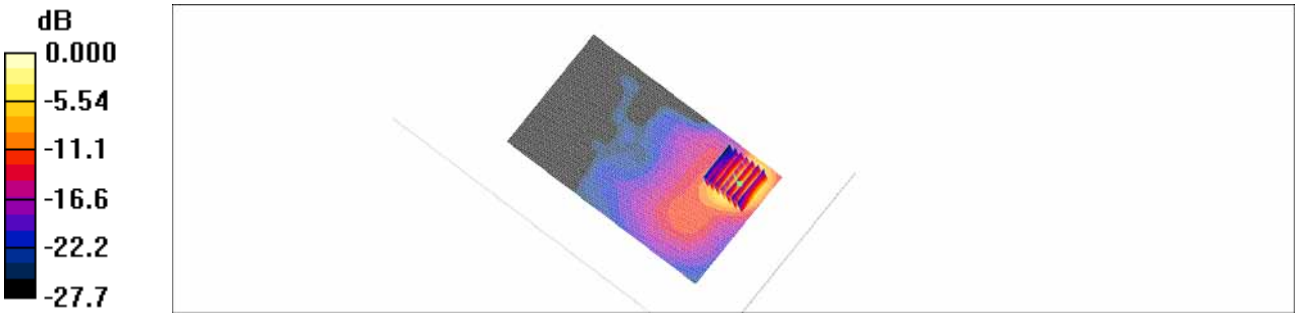
Communication System: LTE Band 41 (FCC); Frequency: 2549.5 MHz;Duty Cycle: 1:1.58
Medium parameters used: f = 2550 MHz; σ = 2.13 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3903; ConvF(6.89, 6.89, 6.89); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA;
- Measurement SW: DASY4, V4.7 Build 80;

LTE band 41 Body Rear 20MHz QPSK 1RB 49 offset 40185ch/Area Scan (81x141x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.25 mW/g

LTE band 41 Body Rear 20MHz QPSK 1RB 49 offset 40185ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.42 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 2.06 W/kg
SAR(1 g) = 0.989 mW/g; SAR(10 g) = 0.410 mW/g
Maximum value of SAR (measured) = 1.17 mW/g



0 dB = 1.17mW/g

Attachment 2. – Dipole Verification Plots

■ Verification Data (835 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.1 ℃
Test Date: Feb. 07, 2014

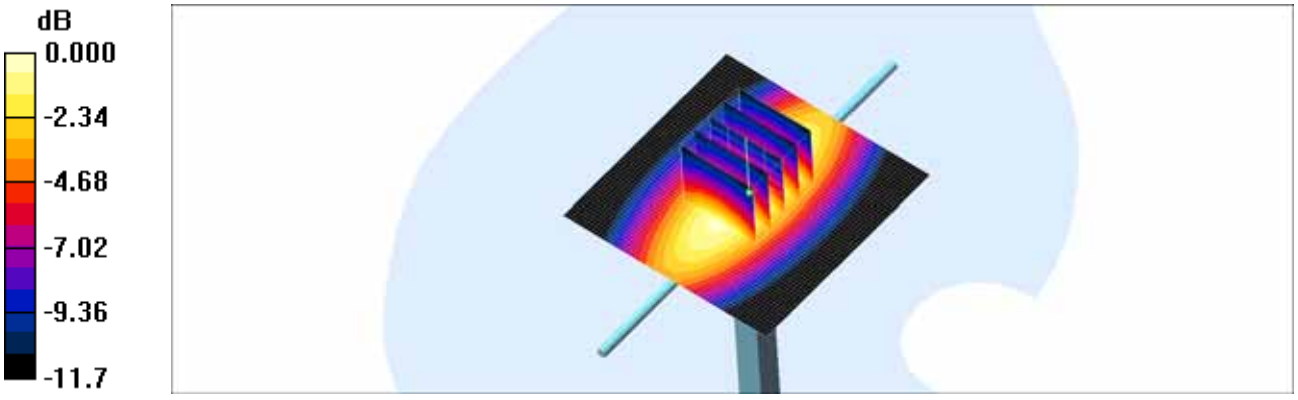
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:441

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.877 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(9.04, 9.04, 9.04); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: 1800/1900 Phantom; Type: SAM

Verification 835MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.11 mW/g

Verification 835MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.7 V/m; Power Drift = -0.002 dB
Peak SAR (extrapolated) = 1.66 W/kg
SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.618 mW/g
Maximum value of SAR (measured) = 1.11 mW/g



0 dB = 1.11mW/g

■ Verification Data (835 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.1 ℃
Test Date: Feb. 07, 2014

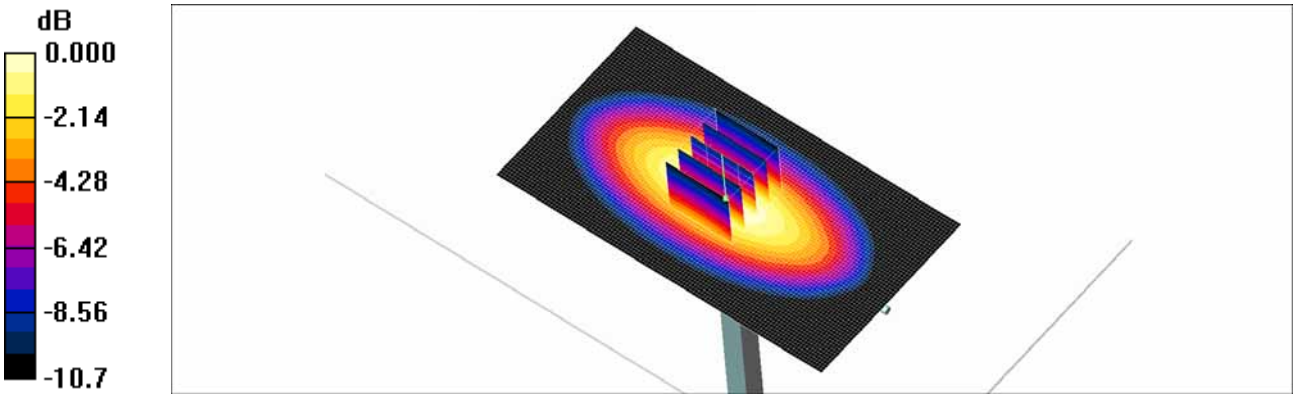
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:xxx

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.964 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(9.03, 9.03, 9.03); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Verification 835 MHz/Area Scan (111x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.07 mW/g

Verification 835 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.2 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 1.49 W/kg
SAR(1 g) = 0.989 mW/g; SAR(10 g) = 0.641 mW/g
Maximum value of SAR (measured) = 1.07 mW/g



0 dB = 1.07mW/g

■ Verification Data (1 900 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.0 ℃
Test Date: Feb. 06, 2014

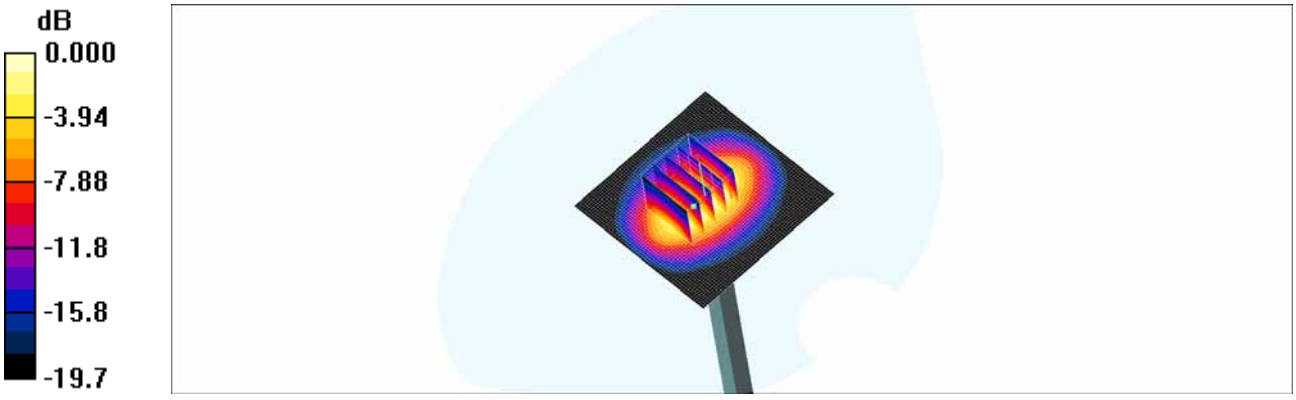
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d032

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.39 mho/m; ε_r = 39.1; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(7.73, 7.73, 7.73); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: 1800/1900 Phantom; Type: SAM

Verification 1900MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.74 mW/g

Verification 1900MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 56.6 V/m; Power Drift = -0.019 dB
Peak SAR (extrapolated) = 7.82 W/kg
SAR(1 g) = 4.05 mW/g; SAR(10 g) = 2.06 mW/g
Maximum value of SAR (measured) = 4.44 mW/g



0 dB = 4.44mW/g

■ Verification Data (1 900 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.0 ℃
Test Date: Feb. 06, 2014

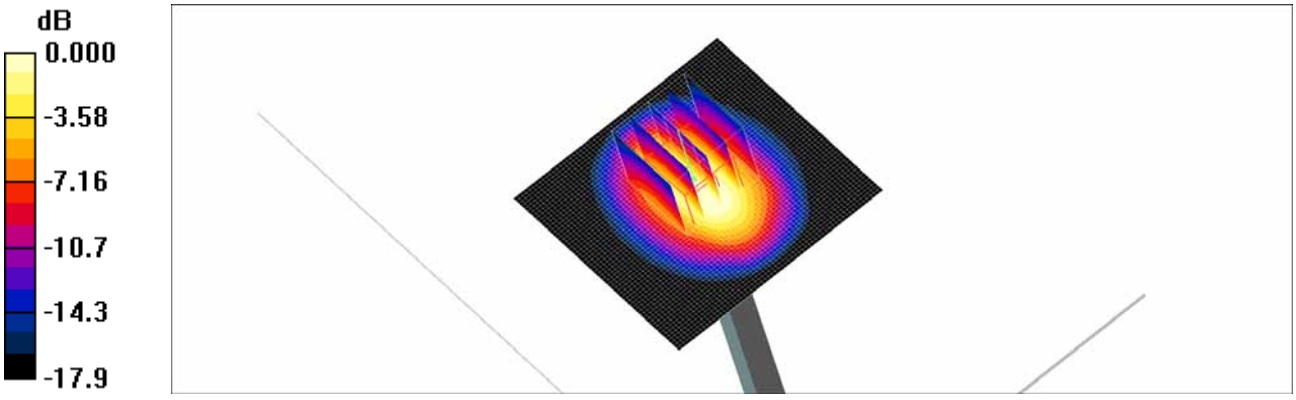
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d032

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.5 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(7.14, 7.14, 7.14); Calibrated: 2013-11-29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn652; Calibrated: 2013-03-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Verification 1900 MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.80 mW/g

Verification 1900 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.8 V/m; Power Drift = 0.009 dB
Peak SAR (extrapolated) = 7.09 W/kg
SAR(1 g) = 3.98 mW/g; SAR(10 g) = 2.1 mW/g
Maximum value of SAR (measured) = 4.38 mW/g



0 dB = 4.38mW/g

■ Verification Data (2 450 MHz Head)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.0 ℃
Test Date:	Feb. 06, 2014

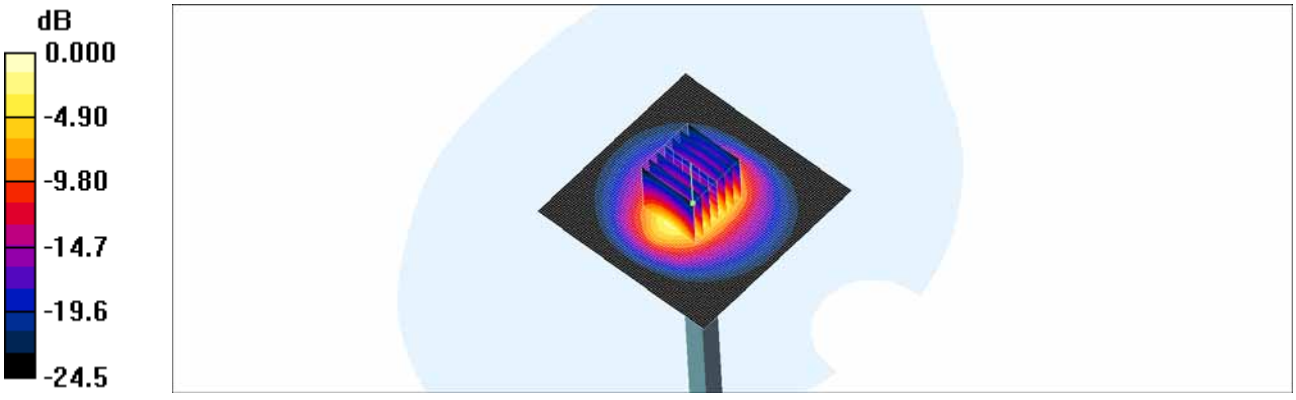
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:743

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.8 mho/m; ε_r = 39.7; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(7.43, 7.43, 7.43); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 835/900 Phamtom ; Type: SAM

Verification 2450MHz/Area Scan (81x81x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 8.25 mW/g

Verification 2450MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.6 V/m; Power Drift = -0.013 dB
Peak SAR (extrapolated) = 11.6 W/kg
SAR(1 g) = 5.2 mW/g; SAR(10 g) = 2.31 mW/g
Maximum value of SAR (measured) = 8.24 mW/g



0 dB = 8.24mW/g

■ Verification Data (2 450 MHz Body)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.0 ℃
Test Date:	Feb. 06, 2014

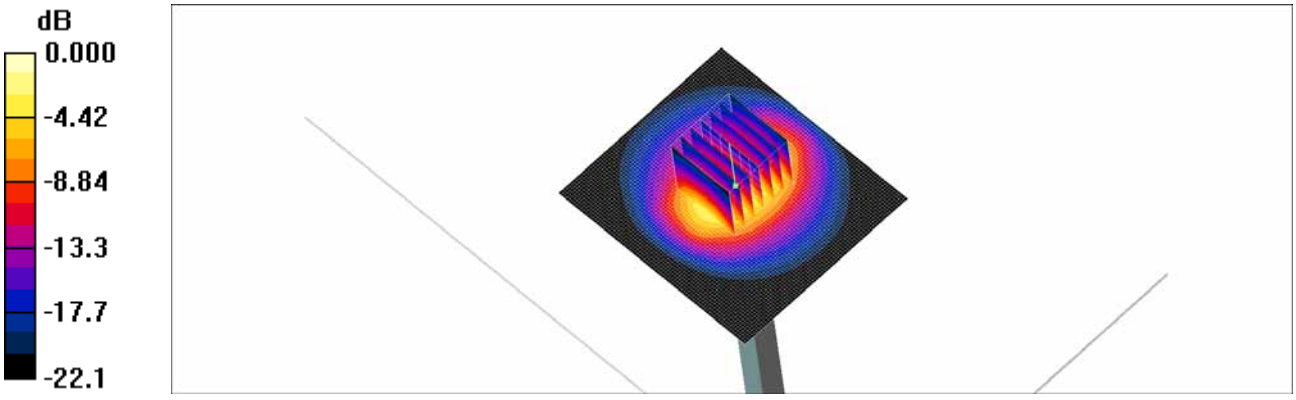
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:743

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.93 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(7.14, 7.14, 7.14); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

Verification 2450MHz/Area Scan (81x71x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 5.64 mW/g

Verification 2450MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.8 V/m; Power Drift = -0.056 dB
Peak SAR (extrapolated) = 10.3 W/kg
SAR(1 g) = 4.91 mW/g; SAR(10 g) = 2.26 mW/g
Maximum value of SAR (measured) = 5.57 mW/g



0 dB = 5.57mW/g

■ Verification Data (2 600 MHz Head)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.2 ℃
Test Date:	Feb. 09, 2014

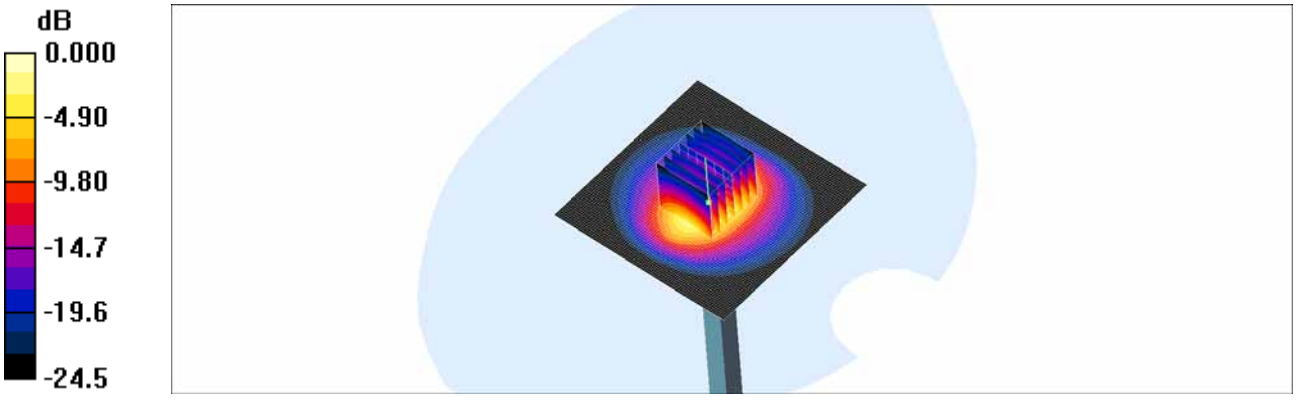
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1015

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 2.04 mho/m; ε_r = 38.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(7.23, 7.23, 7.23); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 835/900 Phamtom ; Type: SAM

Verification 2450MHz/Area Scan (81x81x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 9.26 mW/g

Verification 2450MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.4 V/m; Power Drift = -0.025 dB
Peak SAR (extrapolated) = 13.0 W/kg
SAR(1 g) = 5.85 mW/g; SAR(10 g) = 2.6 mW/g
Maximum value of SAR (measured) = 9.25 mW/g



0 dB = 9.25mW/g

■ Verification Data (2 600 MHz Body)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.3 ℃
Test Date:	Feb. 10, 2014

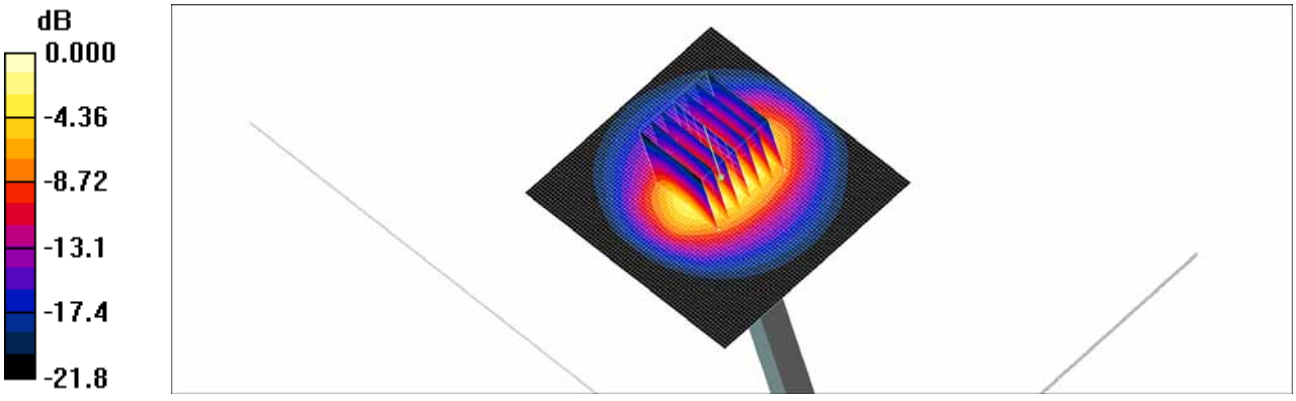
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1015

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 2.19 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(6.89, 6.89, 6.89); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

Verificationn 2600MHz/Area Scan (81x71x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 6.70 mW/g

Verificationn 2600MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.5 V/m; Power Drift = -0.157 dB
Peak SAR (extrapolated) = 11.6 W/kg
SAR(1 g) = 5.52 mW/g; SAR(10 g) = 2.55 mW/g
Maximum value of SAR (measured) = 6.26 mW/g



0 dB = 6.26mW/g

■ Verification Data (5 200 MHz Head)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.1 ℃
Test Date:	Feb. 07, 2014

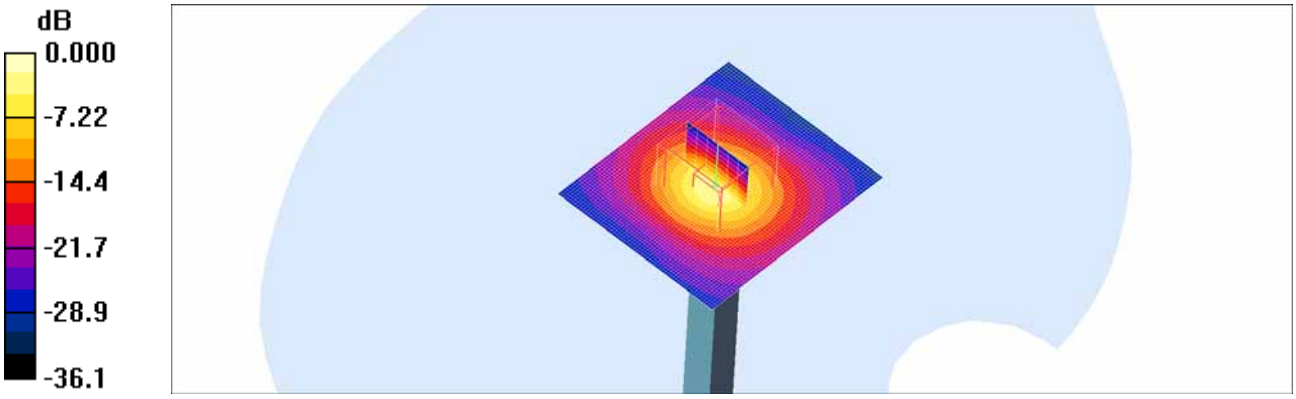
DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 - SN:1107

Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 4.6 mho/m; ε_r = 34.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.79, 4.79, 4.79); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 1800/1900 Phantom; Type: SAM

Verification 5200MHz Head/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 8.98 mW/g

Verification 5200MHz Head/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 43.7 V/m; Power Drift = -0.014 dB
Peak SAR (extrapolated) = 31.5 W/kg
SAR(1 g) = 7.77 mW/g; SAR(10 g) = 2.21 mW/g
Maximum value of SAR (measured) = 15.9 mW/g



0 dB = 15.9mW/g

■ Verification Data (5 200 MHz Body)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.0 ℃
Test Date:	Feb. 06, 2014

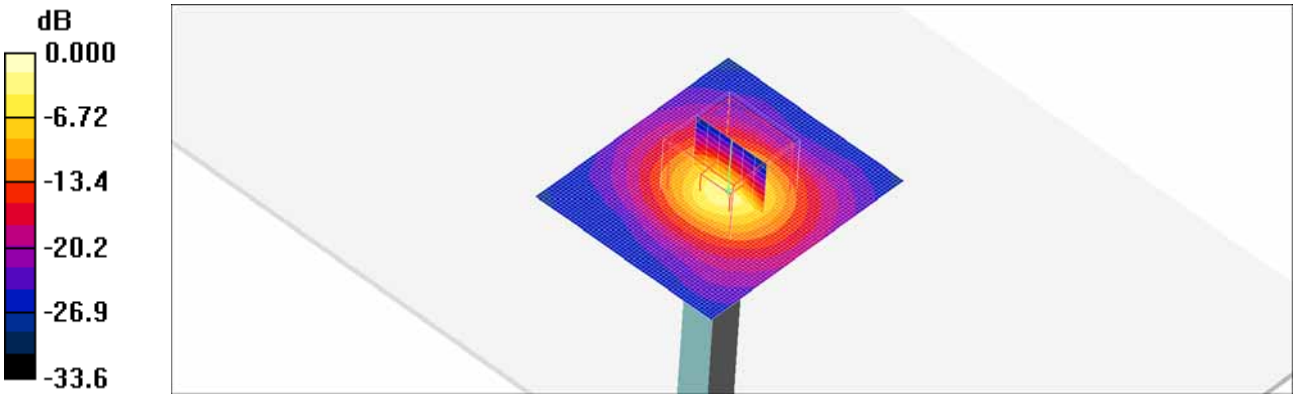
DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 - SN:1107

Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.26 mho/m; ε_r = 49.3; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.32, 4.32, 4.32); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Verification 5200MHz Body/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 8.84 mW/g

Verification 5200MHz Body/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 39.6 V/m; Power Drift = -0.062 dB
Peak SAR (extrapolated) = 30.6 W/kg
SAR(1 g) = 7.42 mW/g; SAR(10 g) = 2.1 mW/g
Maximum value of SAR (measured) = 15.5 mW/g



0 dB = 15.5mW/g

■ Verification Data (5 300 MHz Head)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.1 ℃
Test Date:	Feb. 07, 2014

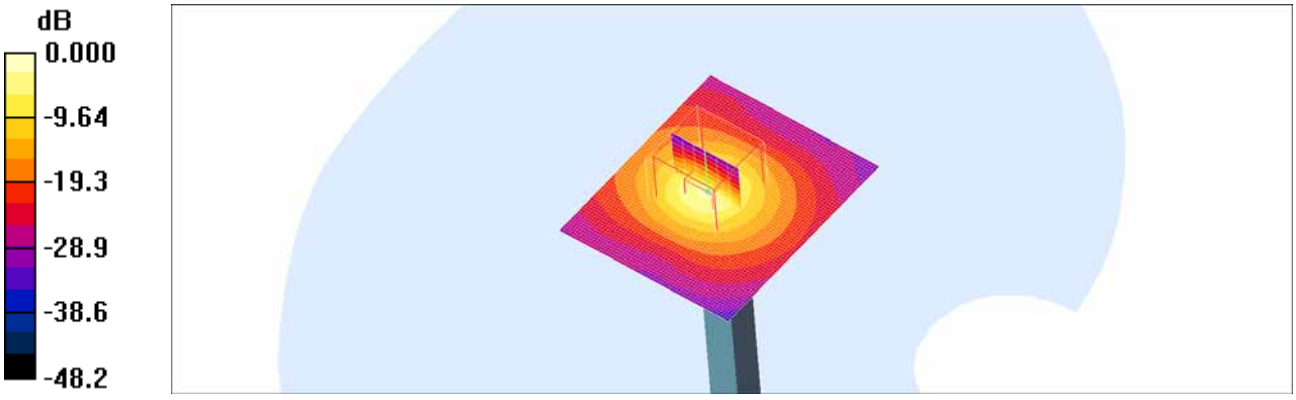
DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 - SN:1107

Communication System: CW; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5300 MHz; σ = 4.73 mho/m; ε_r = 34.5; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.6, 4.6, 4.6); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 800/900 Phantom; Type: SAM

Verification 5300MHz Head/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.73 mW/g

Verification 5300MHz Head/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 39.0 V/m; Power Drift = 0.107 dB
Peak SAR (extrapolated) = 39.3 W/kg
SAR(1 g) = 8.24 mW/g; SAR(10 g) = 2.26 mW/g
Maximum value of SAR (measured) = 17.4 mW/g



0 dB = 17.4mW/g

■ Verification Data (5 300 MHz Body)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.0 ℃
Test Date:	Feb. 06, 2014

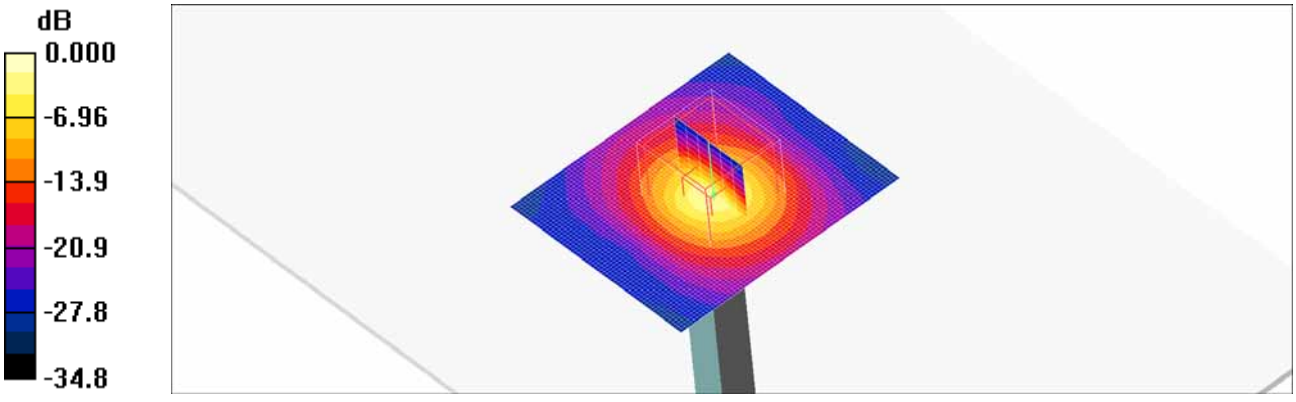
DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 - SN:1107

Communication System: CW; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5300 MHz; σ = 5.43 mho/m; ε_r = 49; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.24, 4.24, 4.24); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Verification 5300MHz Body/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 8.97 mW/g

Verification 5300MHz Body/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 39.4 V/m; Power Drift = -0.063 dB
Peak SAR (extrapolated) = 31.8 W/kg
SAR(1 g) = 7.64 mW/g; SAR(10 g) = 2.15 mW/g
Maximum value of SAR (measured) = 15.9 mW/g



0 dB = 15.9mW/g

■ Verification Data (5 500 MHz Head)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.1 ℃
Test Date:	Feb. 07, 2014

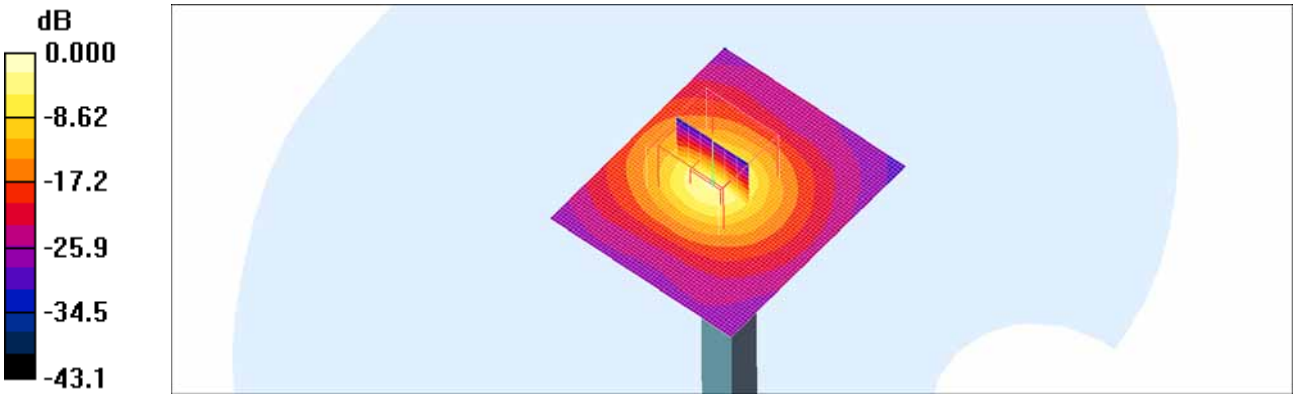
DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 - SN:1107

Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5500 MHz; σ = 4.96 mho/m; ε_r = 34; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.49, 4.49, 4.49); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 800/900 Phantom; Type: SAM

Verification 5500MHz Head/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.70 mW/g

Verification 5500MHz Head/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 37.6 V/m; Power Drift = -0.170 dB
Peak SAR (extrapolated) = 35.2 W/kg
SAR(1 g) = 7.7 mW/g; SAR(10 g) = 2.11 mW/g
Maximum value of SAR (measured) = 16.4 mW/g



0 dB = 16.4mW/g

■ Verification Data (5 500 MHz Body)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.0 ℃
Test Date:	Feb. 06, 2014

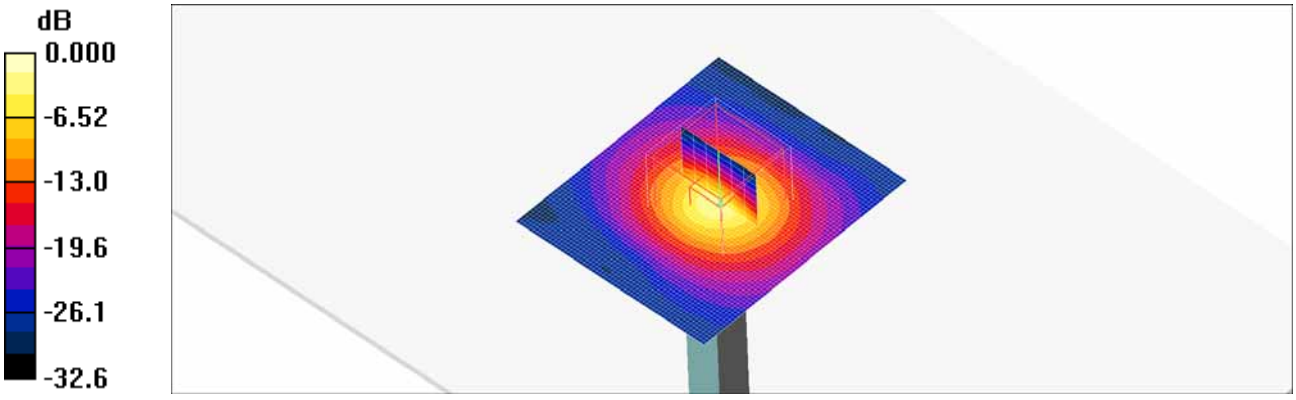
DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 - SN:1107

Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5500 MHz; σ = 5.78 mho/m; ε_r = 48.4; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(3.86, 3.86, 3.86); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Verification 5500MHz Body/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.62 mW/g

Verification 5500MHz Body/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 39.4 V/m; Power Drift = -0.076 dB
Peak SAR (extrapolated) = 34.0 W/kg
SAR(1 g) = 7.97 mW/g; SAR(10 g) = 2.24 mW/g
Maximum value of SAR (measured) = 17.1 mW/g



0 dB = 17.1mW/g

■ Verification Data (5 600 MHz Head)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.1 ℃
Test Date:	Feb. 07, 2014

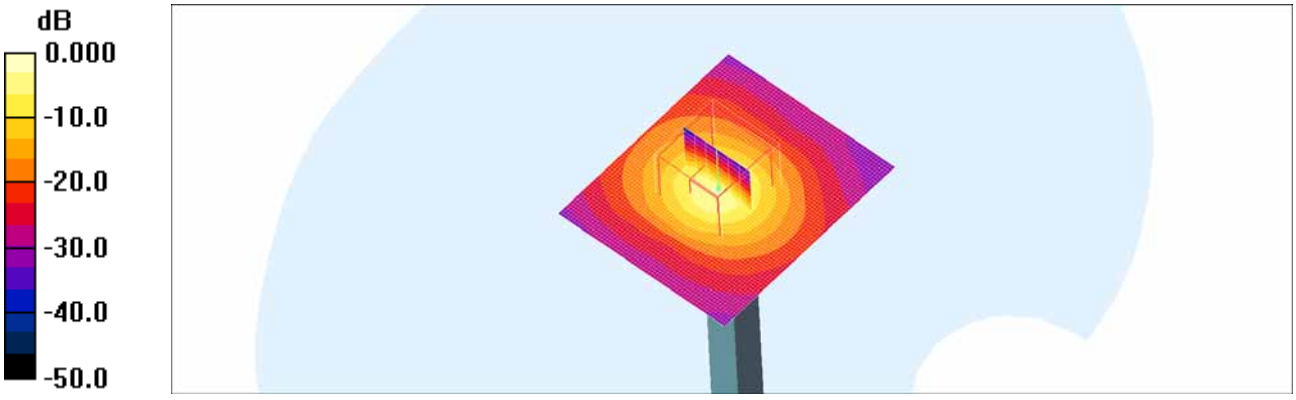
DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 - SN:1107

Communication System: CW; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.1 mho/m; ε_r = 33.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.46, 4.46, 4.46); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 800/900 Phantom; Type: SAM

Verification 5600MHz Head/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 8.73 mW/g

Verification 5600MHz Head/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 40.0 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 41.5 W/kg
SAR(1 g) = 8.05 mW/g; SAR(10 g) = 2.17 mW/g
Maximum value of SAR (measured) = 17.7 mW/g



0 dB = 17.7mW/g

■

■ Verification Data (5 600 MHz Body)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.0 ℃
Test Date:	Feb. 06, 2014

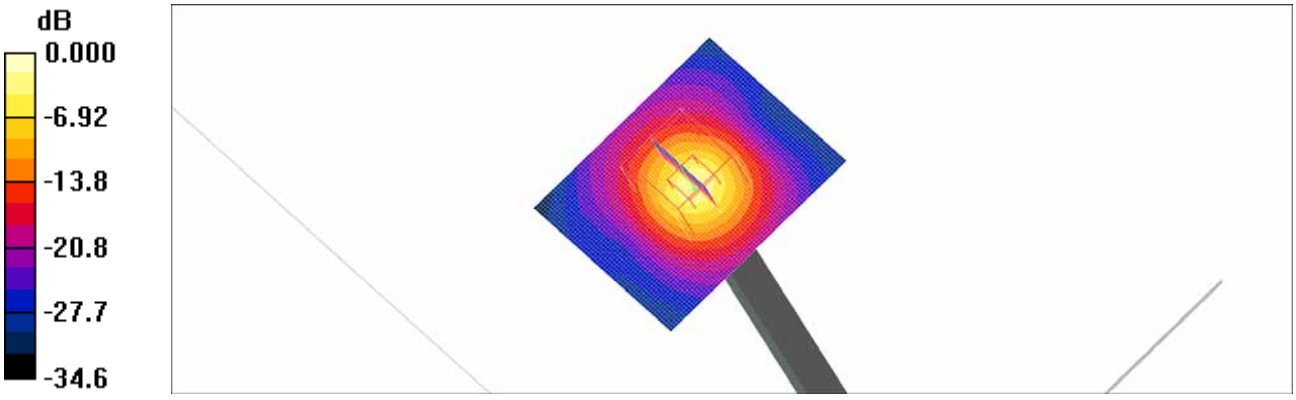
DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 - SN:1107

Communication System: CW; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.93 mho/m; ε_r = 48.2; ρ = 1000 kg/m^3
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(3.73, 3.73, 3.73); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Validation 5600MHz/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.48 mW/g

Validation 5600MHz/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 39.0 V/m; Power Drift = -0.059 dB
Peak SAR (extrapolated) = 37.6 W/kg
SAR(1 g) = 8.34 mW/g; SAR(10 g) = 2.32 mW/g
Maximum value of SAR (measured) = 17.6 mW/g



0 dB = 17.6mW/g

■ Verification Data (5 800 MHz Head)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.1 ℃
Test Date:	Feb. 07, 2014

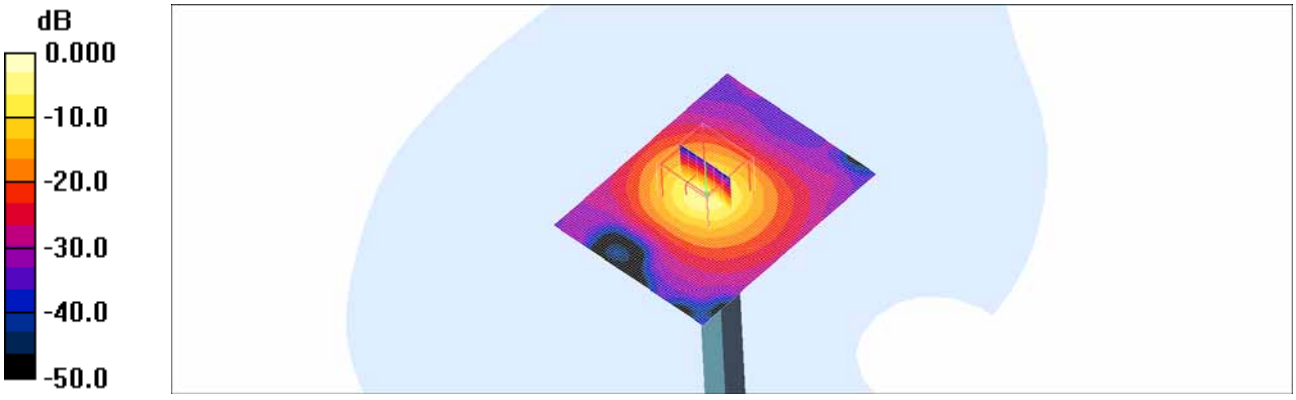
DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 - SN:1107

Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 5.35 mho/m; ε_r = 33.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DASY4 Configuration:
- Probe: EX3DV4 - SN3903; ConvF(4.14, 4.14, 4.14); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: 800/900 Phantom; Type: SAM

Verification 5800MHz Head/Area Scan (71x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 7.89 mW/g

Verification 5800MHz Head/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 35.4 V/m; Power Drift = 0.107 dB
Peak SAR (extrapolated) = 40.6 W/kg
SAR(1 g) = 7.86 mW/g; SAR(10 g) = 2.16 mW/g
Maximum value of SAR (measured) = 17.6 mW/g



0 dB = 17.6mW/g

■ Verification Data (5 800 MHz Body)

Test Laboratory:	HCT CO., LTD
Input Power	100 mW (20 dBm)
Liquid Temp:	20.0 ℃
Test Date:	Feb. 06, 2014

DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 - SN:1107

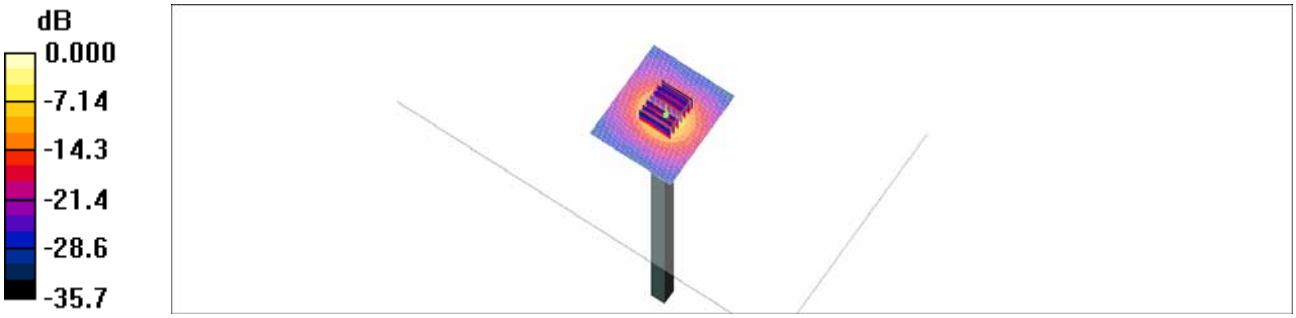
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 6.27 mho/m; ε_r = 47.7; ρ = 1000 kg/m^3
Phantom section: Center Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3903; ConvF(4.01, 4.01, 4.01); Calibrated: 2013-03-18
- Sensor-Surface: 2mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn912; Calibrated: 2013-11-21
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA;
- Measurement SW: DASY4, V4.7 Build 80;

Verification 5800MHz/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 8.90 mW/g

Verification 5800MHz/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 36.6 V/m; Power Drift = 0.135 dB
Peak SAR (extrapolated) = 36.0 W/kg
SAR(1 g) = 8.05 mW/g; SAR(10 g) = 2.26 mW/g
Maximum value of SAR (measured) = 17.5 mW/g



0 dB = 17.5mW/g

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: **EX3-3797_Nov13**

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3797

Calibration procedure(s) QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: November 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 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)	Sep-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-13)	In house check: Oct-14

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

Issued: November 30, 2013

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
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
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.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:3797

Manufactured: April 5, 2011
Calibrated: November 29, 2013

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.63	0.58	0.57	± 10.1 %
DCP (mV)[B]	98.7	97.9	96.5	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	135.5	±2.7 %
		Y	0.0	0.0	1.0		175.4	
		Z	0.0	0.0	1.0		176.6	

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.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

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 [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	9.33	9.33	9.33	0.59	0.73	± 12.0 %
835	41.5	0.90	9.04	9.04	9.04	0.71	0.66	± 12.0 %
900	41.5	0.97	8.89	8.89	8.89	0.35	0.98	± 12.0 %
1450	40.5	1.20	8.27	8.27	8.27	0.80	0.68	± 12.0 %
1750	40.1	1.37	8.02	8.02	8.02	0.69	0.62	± 12.0 %
1900	40.0	1.40	7.73	7.73	7.73	0.64	0.65	± 12.0 %
1950	40.0	1.40	7.48	7.48	7.48	0.60	0.66	± 12.0 %
2300	39.5	1.67	7.27	7.27	7.27	0.31	0.92	± 12.0 %
2450	39.2	1.80	6.94	6.94	6.94	0.51	0.71	± 12.0 %
2600	39.0	1.96	6.76	6.76	6.76	0.34	0.89	± 12.0 %
5200	36.0	4.66	5.00	5.00	5.00	0.33	1.80	± 13.1 %
5300	35.9	4.76	4.77	4.77	4.77	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.70	4.70	4.70	0.37	1.80	± 13.1 %
5600	35.5	5.07	4.43	4.43	4.43	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.64	4.64	4.64	0.35	1.80	± 13.1 %

[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.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

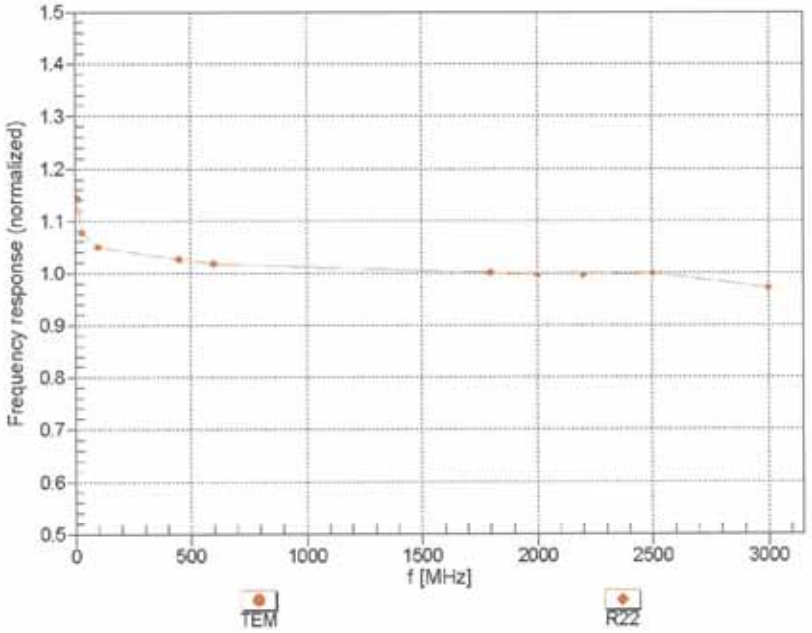
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	9.03	9.03	9.03	0.53	0.76	± 12.0 %
835	55.2	0.97	9.03	9.03	9.03	0.43	0.87	± 12.0 %
900	55.0	1.05	8.73	8.73	8.73	0.33	1.01	± 12.0 %
1750	53.4	1.49	7.61	7.61	7.61	0.31	1.20	± 12.0 %
1900	53.3	1.52	7.14	7.14	7.14	0.28	1.17	± 12.0 %
1950	53.3	1.52	7.33	7.33	7.33	0.27	1.11	± 12.0 %
2450	52.7	1.95	6.75	6.75	6.75	0.80	0.59	± 12.0 %
2600	52.5	2.16	6.45	6.45	6.45	0.80	0.60	± 12.0 %
5200	49.0	5.30	4.42	4.42	4.42	0.42	1.90	± 13.1 %
5300	48.9	5.42	4.17	4.17	4.17	0.45	1.90	± 13.1 %
5500	48.6	5.65	4.01	4.01	4.01	0.45	1.90	± 13.1 %
5600	48.5	5.77	3.67	3.67	3.67	0.55	1.90	± 13.1 %
5800	48.2	6.00	4.23	4.23	4.23	0.45	1.90	± 13.1 %

[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.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

EX3DV4– SN:3797 November 29, 2013

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)

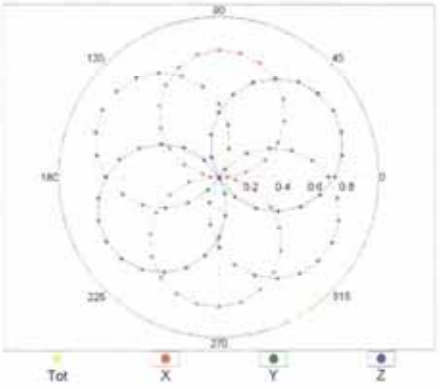


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

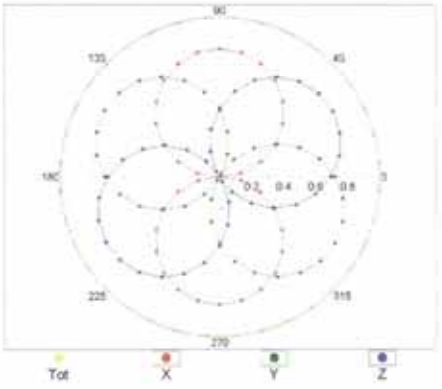
EX3DV4– SN:3797 November 29, 2013

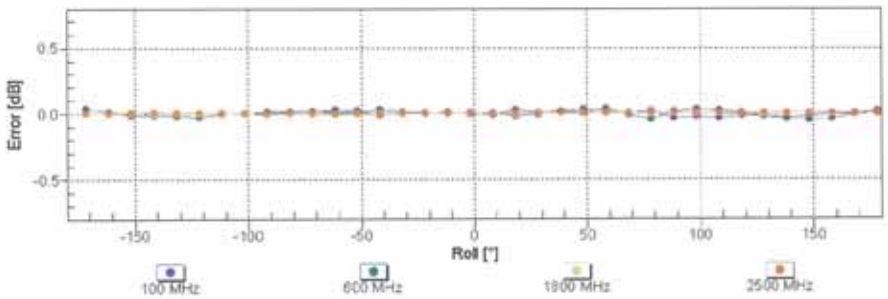
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

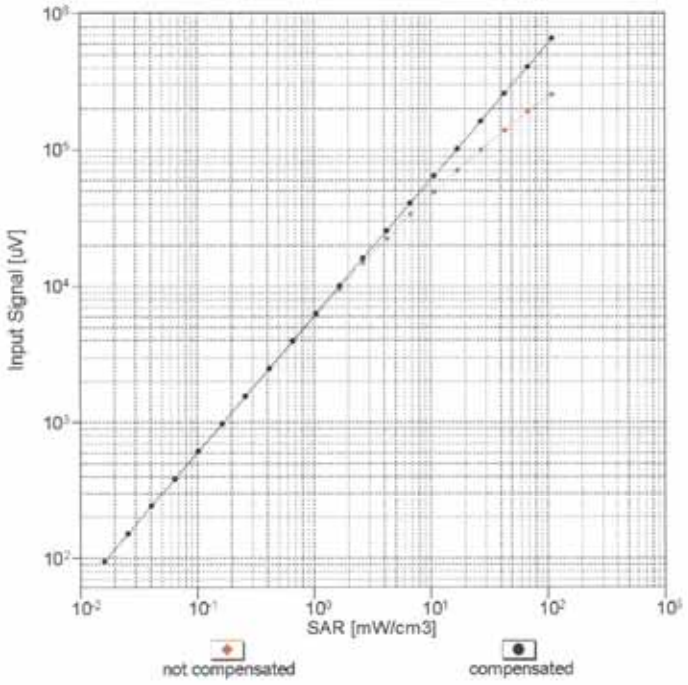


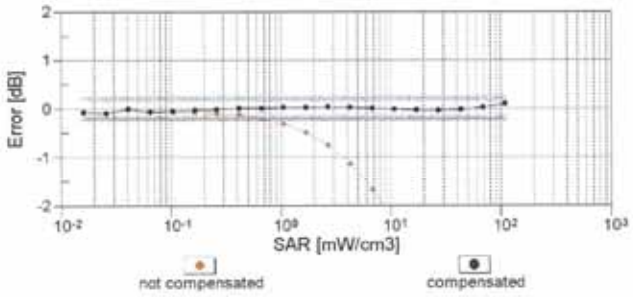


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4– SN:3797 November 29, 2013

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)





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

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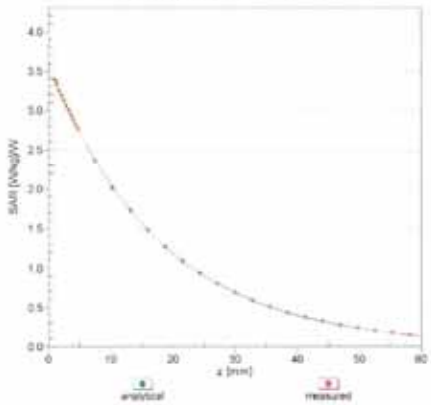
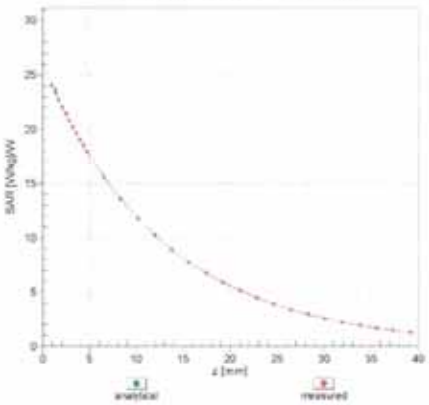
EX3DV4– SN:3797 November 29, 2013

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

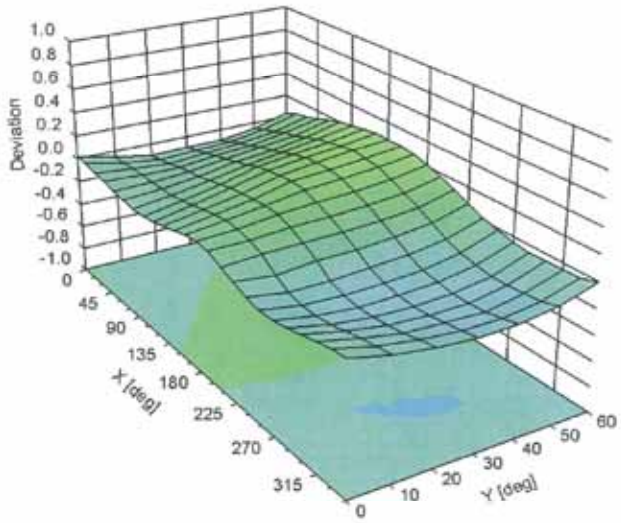


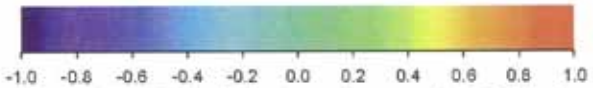
f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-111.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

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: **EX3-3903_Mar13**

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3903

Calibration procedure(s) QA CAL-01.v8, QA CAL-12.v7, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: March 18, 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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
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: March 18, 2013

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 EX3DV4

SN:3903

Manufactured: September 4, 2012
Calibrated: March 18, 2013

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

EX3DV4– SN:3903 March 18, 2013

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3903

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.52	0.48	0.53	± 10.1 %
DCP (mV)[B]	98.8	103.2	100.1	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	129.0	±3.5 %
		Y	0.0	0.0	1.0		122.0	
		Z	0.0	0.0	1.0		124.7	

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.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3903

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)
450	43.5	0.87	10.72	10.72	10.72	0.15	1.68	± 13.4 %
750	41.9	0.89	10.21	10.21	10.21	0.21	1.28	± 12.0 %
835	41.5	0.90	9.87	9.87	9.87	0.28	1.07	± 12.0 %
900	41.5	0.97	9.77	9.77	9.77	0.17	1.66	± 12.0 %
1450	40.5	1.20	8.59	8.59	8.59	0.18	1.76	± 12.0 %
1750	40.1	1.37	8.60	8.60	8.60	0.61	0.67	± 12.0 %
1900	40.0	1.40	8.30	8.30	8.30	0.45	0.76	± 12.0 %
1950	40.0	1.40	8.10	8.10	8.10	0.30	0.90	± 12.0 %
2450	39.2	1.80	7.43	7.43	7.43	0.33	0.85	± 12.0 %
2600	39.0	1.96	7.23	7.23	7.23	0.31	0.95	± 12.0 %
5200	36.0	4.66	4.79	4.79	4.79	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.60	4.60	4.60	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.49	4.49	4.49	0.45	1.80	± 13.1 %
5600	35.5	5.07	4.46	4.46	4.46	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.14	4.14	4.14	0.45	1.80	± 13.1 %

[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.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3903

Calibration Parameter Determined in Body Tissue Simulating Media

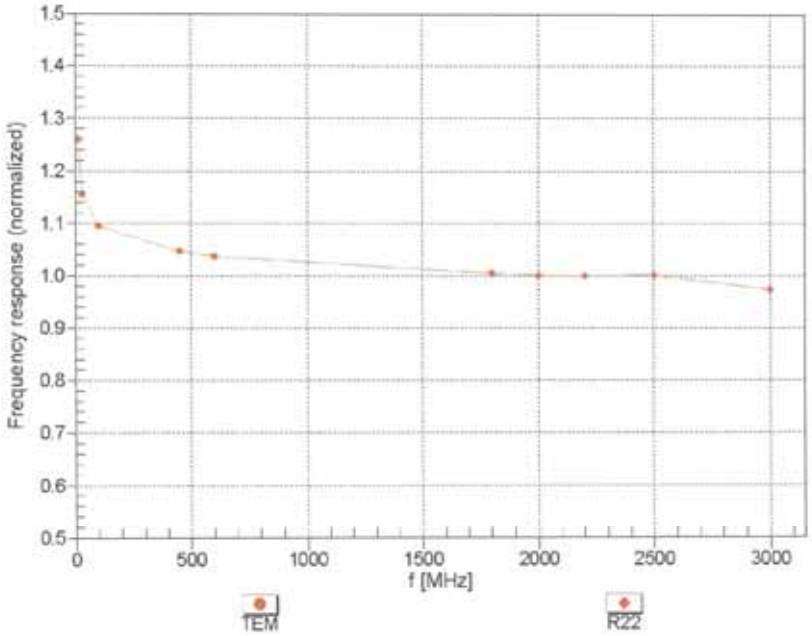
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	11.20	11.20	11.20	0.05	1.10	± 13.4 %
750	55.5	0.96	9.91	9.91	9.91	0.27	1.21	± 12.0 %
835	55.2	0.97	9.75	9.75	9.75	0.33	1.06	± 12.0 %
1750	53.4	1.49	7.82	7.82	7.82	0.35	0.87	± 12.0 %
1900	53.3	1.52	7.53	7.53	7.53	0.28	1.03	± 12.0 %
2450	52.7	1.95	7.14	7.14	7.14	0.80	0.57	± 12.0 %
2600	52.5	2.16	6.89	6.89	6.89	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.32	4.32	4.32	0.40	1.90	± 13.1 %
5300	48.9	5.42	4.24	4.24	4.24	0.40	1.90	± 13.1 %
5500	48.6	5.65	3.86	3.86	3.86	0.45	1.90	± 13.1 %
5600	48.5	5.77	3.73	3.73	3.73	0.40	1.90	± 13.1 %
5800	48.2	6.00	4.01	4.01	4.01	0.50	1.90	± 13.1 %

[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.

EX3DV4– SN:3903 March 18, 2013

Frequency Response of E-Field

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

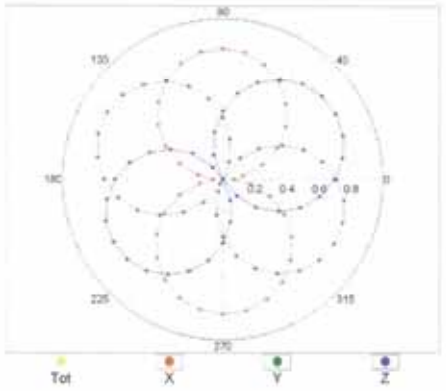


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

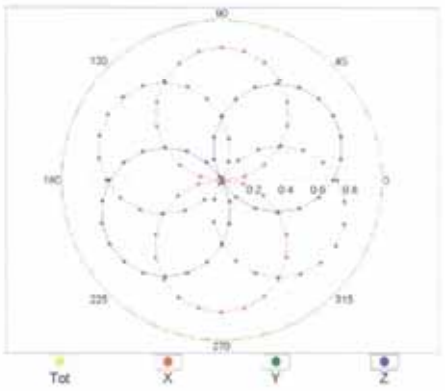
EX3DV4– SN:3903 March 18, 2013

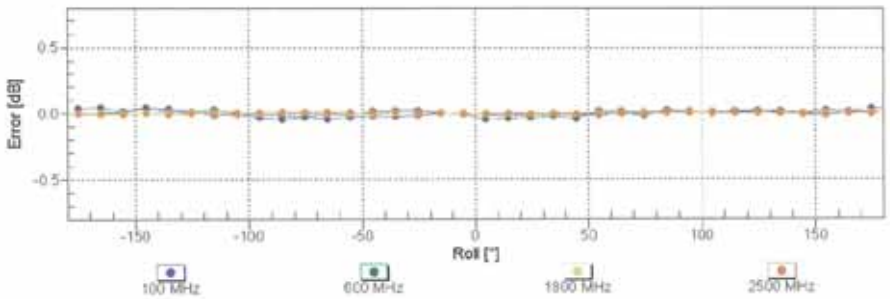
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

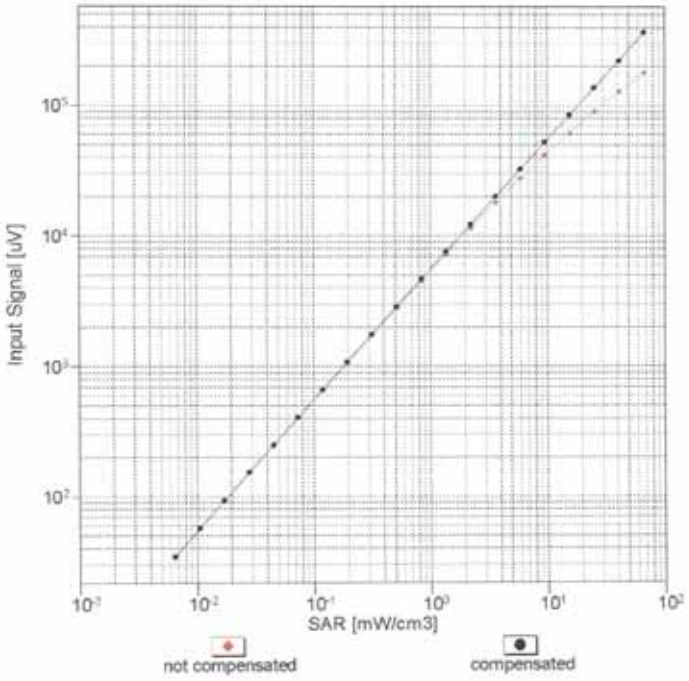


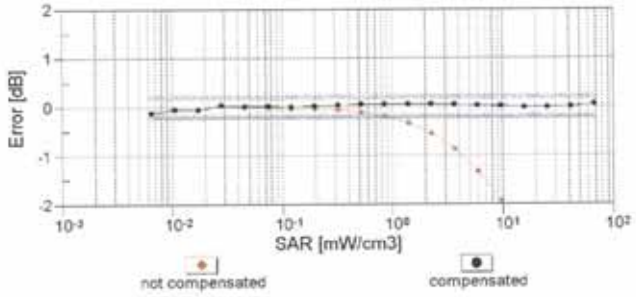


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4– SN:3903 March 18, 2013

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)



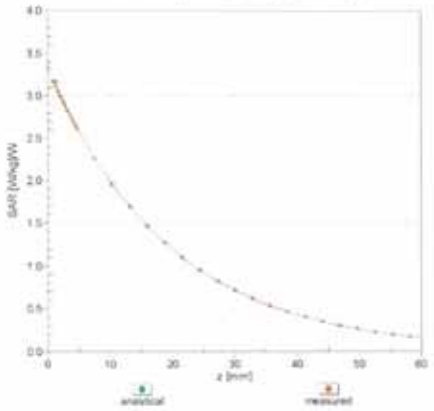


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

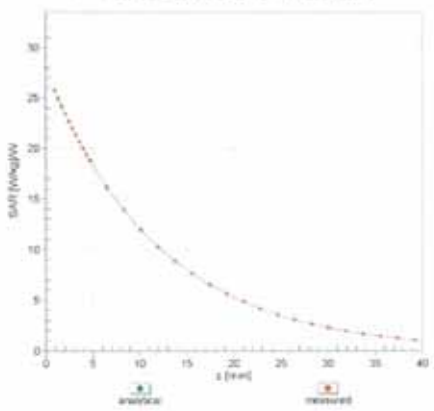
EX3DV4– SN:3903 March 18, 2013

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

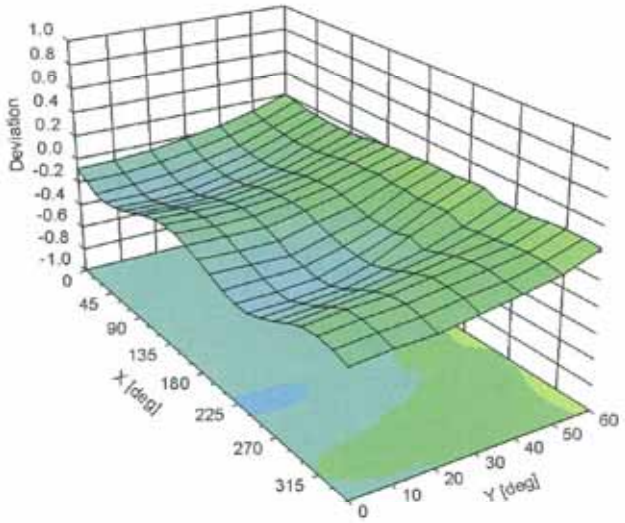


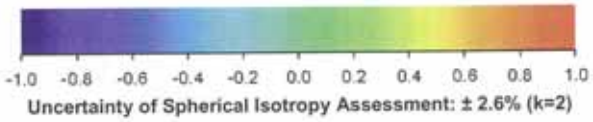
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3903

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-85.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

Attachment 4. – Dipole Calibration Data

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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

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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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	V52.8.6
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 cm³ (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 cm³ (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 cm³ (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 cm³ (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

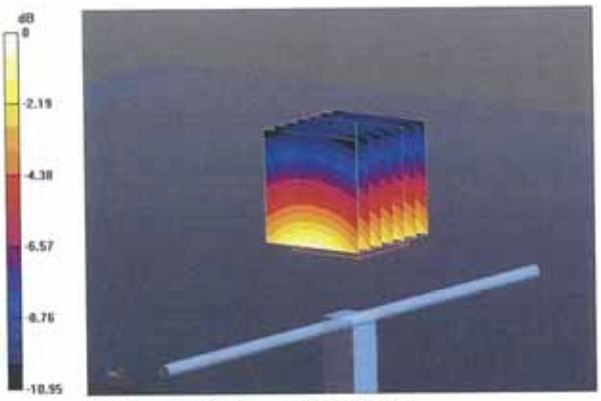
Communication System: UID 0 - CW - Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

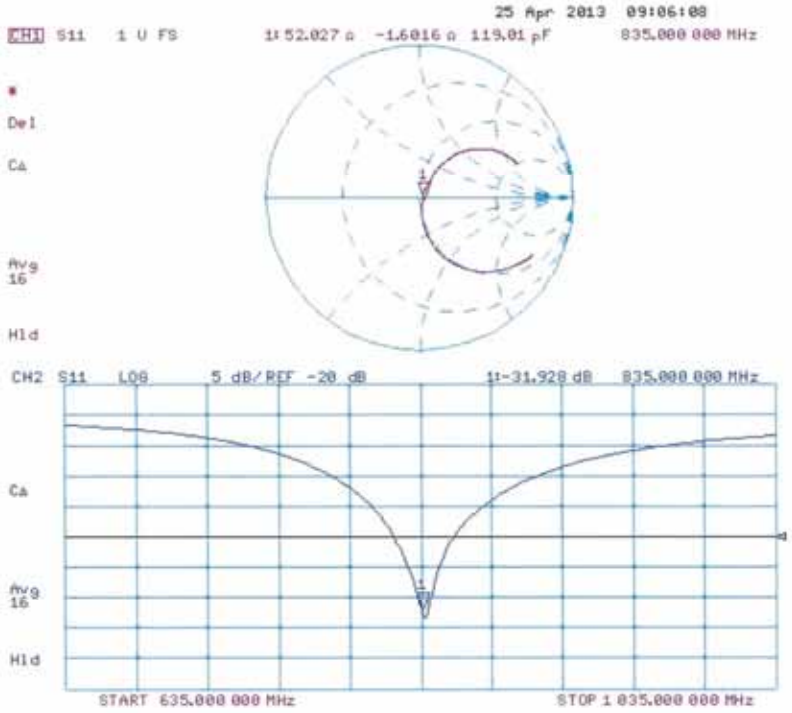
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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

Impedance Measurement Plot for Head TSL



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

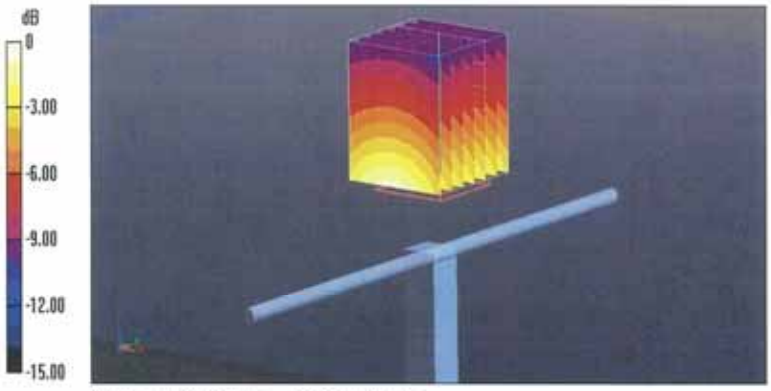
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 S/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

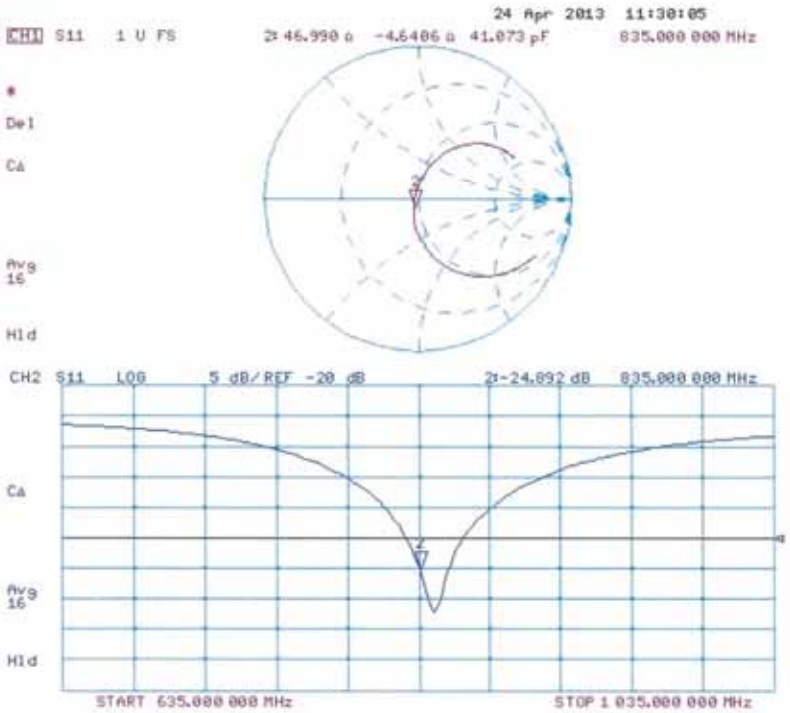
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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

Impedance Measurement Plot for Body TSL



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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	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 30, 2013

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

Certificate No: D1900V2-5d032_Jul13 Page 1 of 8

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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 cm³ (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 cm³ (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 cm³ (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 cm³ (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

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

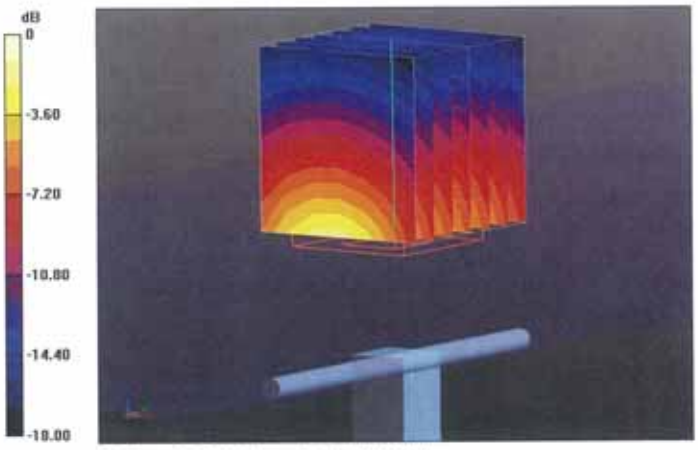
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.36 S/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

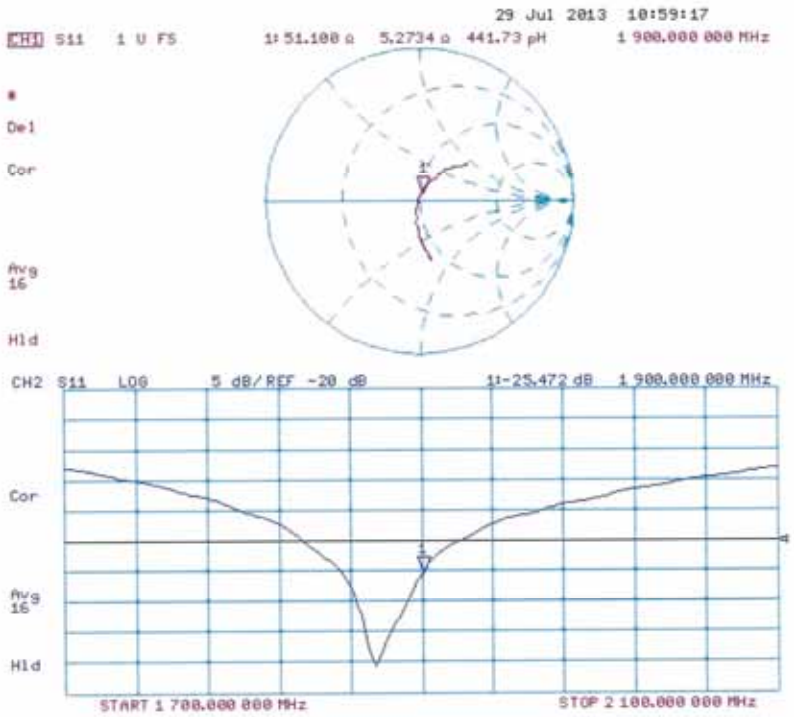
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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

Impedance Measurement Plot for Head TSL



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

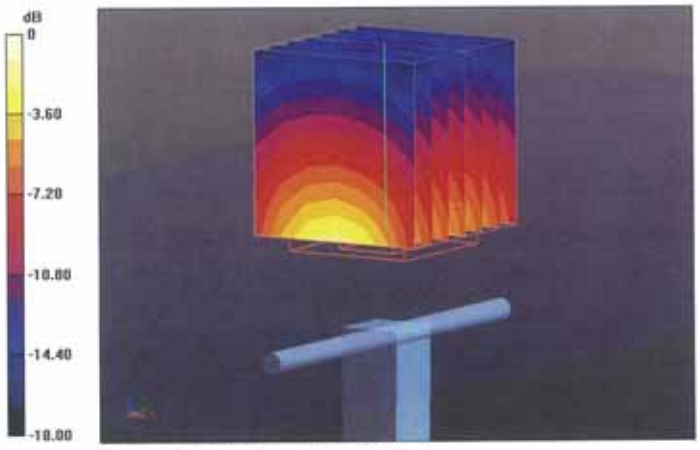
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.49 S/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

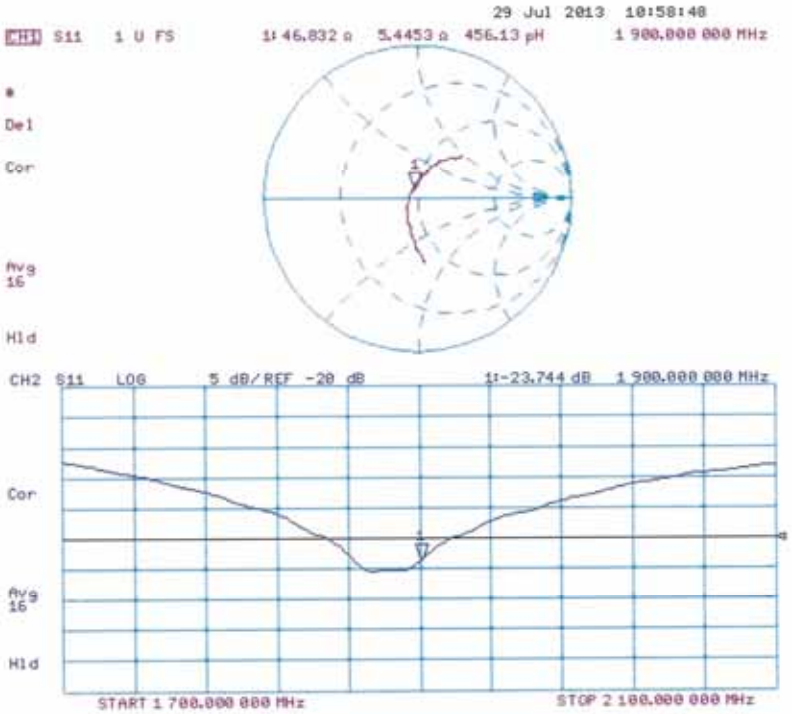
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client HCT (Dymstec)

Certificate No: D2450V2-743_Aug13

CALIBRATION CERTIFICATE

Object D2450V2 - SN: 743

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: August 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 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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 23, 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) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

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	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.80 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.6 ± 6 %	2.03 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.01 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.6 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.9 Ω + 4.2 jΩ
Return Loss	- 25.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.0 Ω + 5.5 jΩ
Return Loss	- 25.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.159 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	December 01, 2003

DASY5 Validation Report for Head TSL

Date: 22.08.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 743

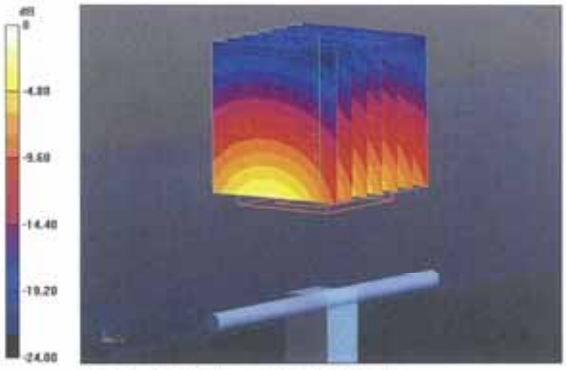
Communication System: UID 0 - CW ; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.8 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); 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)

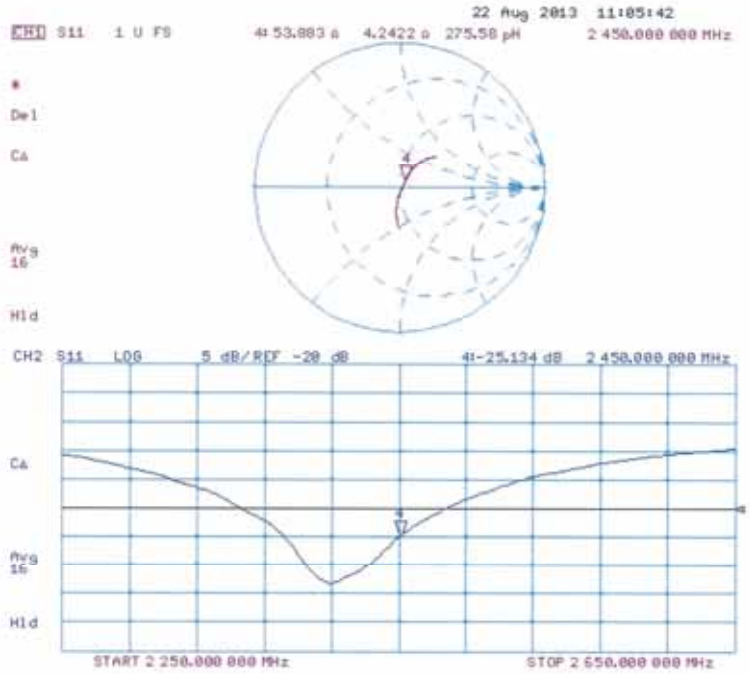
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.4 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 27.8 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.18 W/kg
Maximum value of SAR (measured) = 16.9 W/kg



0 dB = 16.9 W/kg = 12.28 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.08.2013

Test Laboratory: SPEAG, Zurich, Switzerland

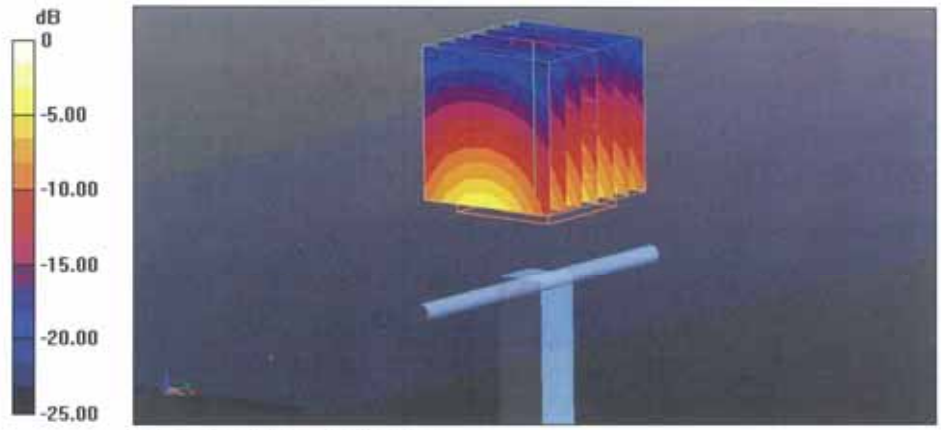
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 743

Communication System: UID 0 - CW ; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.03 S/m; ε_r = 50.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

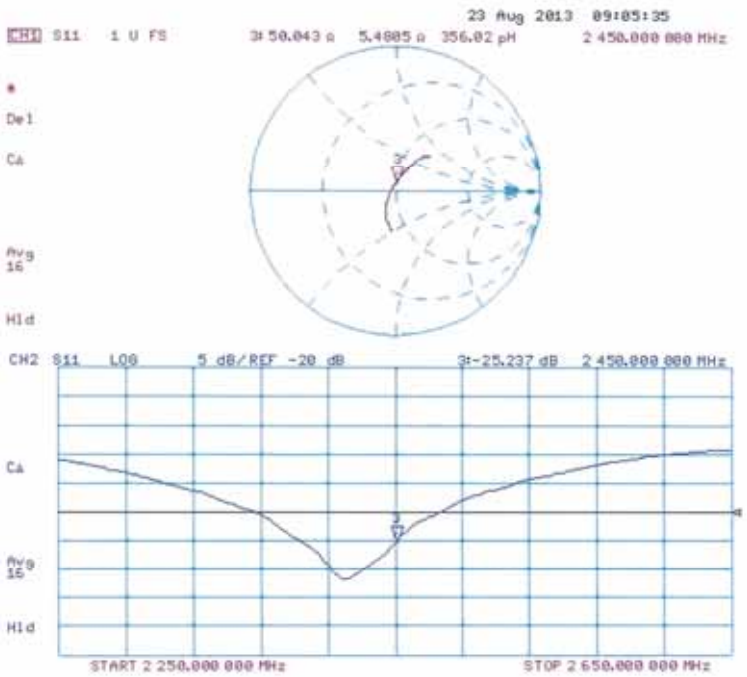
- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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 = 93.835 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 27.3 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 6.01 W/kg
Maximum value of SAR (measured) = 16.8 W/kg



0 dB = 16.8 W/kg = 12.25 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client HCT (Dymstec)

Certificate No: D2600V2-1015_May13

CALIBRATION CERTIFICATE

Object D2600V2 - SN: 1015

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: May 02, 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
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: May 2, 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	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.2 ± 6 %	1.99 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**57.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.9 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	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.8 ± 6 %	2.20 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	14.5 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**57.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**25.4 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8 Ω - 3.0 jΩ
Return Loss	- 30.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.7 Ω - 2.1 jΩ
Return Loss	- 27.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 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	October 30, 2007

DASY5 Validation Report for Head TSL

Date: 02.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1015

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 1.99 S/m; ε_r = 37.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

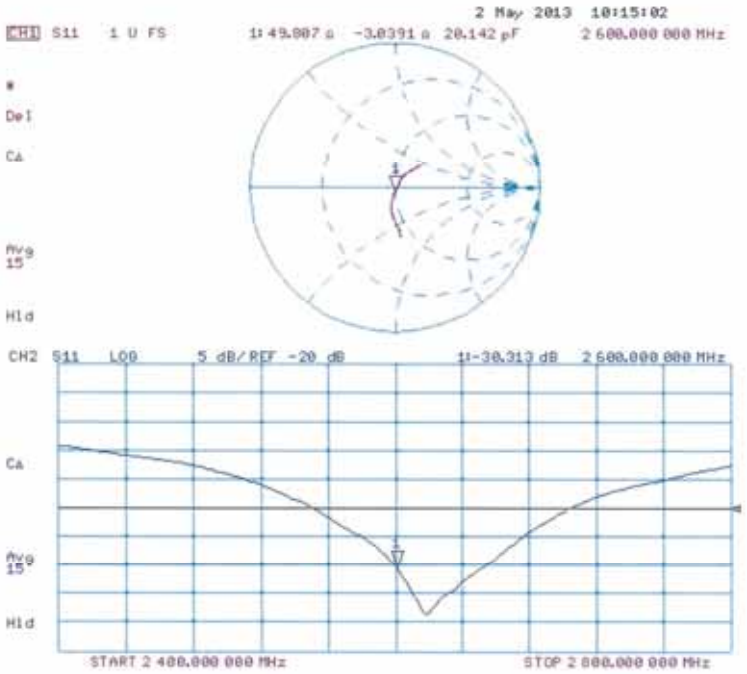
- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

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 = 100.5 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 14.7 W/kg; SAR(10 g) = 6.54 W/kg
Maximum value of SAR (measured) = 18.9 W/kg

0 dB = 18.9 W/kg = 12.76 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 25.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1015

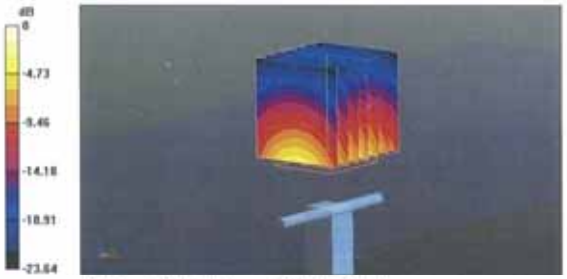
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.2 S/m; ε_r = 50.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.32, 4.32, 4.32); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

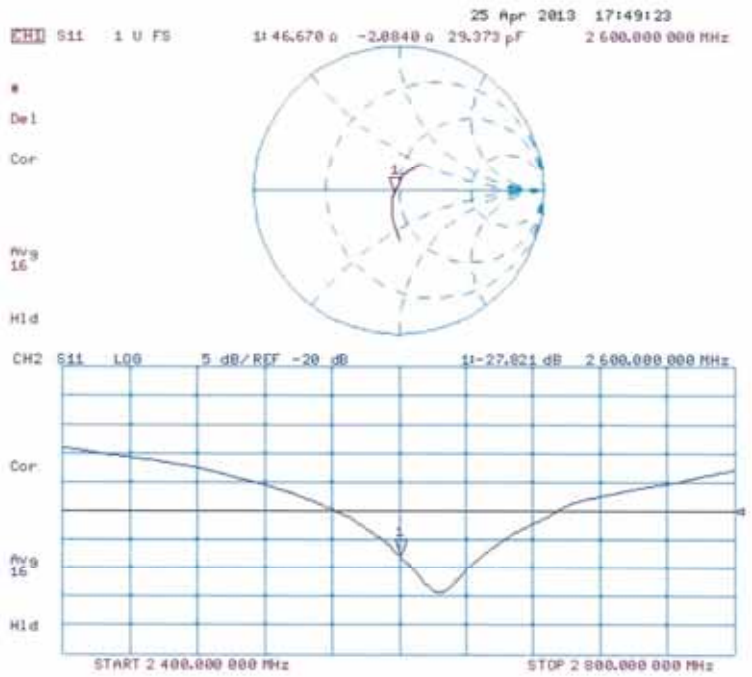
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.154 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.41 W/kg
Maximum value of SAR (measured) = 19.4 W/kg



0 dB = 19.4 W/kg = 12.88 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client HCT (Dymstec)

Certificate No: D5GHzV2-1107_Feb13

CALIBRATION CERTIFICATE

Object D5GHzV2 - SN: 1107

Calibration procedure(s) QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: February 21, 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)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe EX3DV4	SN: 3503	28-Dec-12 (No. EX3-3503_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-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:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 21, 2013

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

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

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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010

b) 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:

c) 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	V52.8.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	4.47 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.8 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.5 ± 6 %	4.57 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.0 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.3 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	4.74 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.6 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.1 ± 6 %	4.83 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.0 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	33.9 ± 6 %	5.05 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.2 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.9 ± 6 %	5.36 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.50 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.8 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.7 ± 6 %	5.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.67 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**76.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.3 ± 6 %	5.71 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.92 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.7 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	5.83 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**81.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.26 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	45.9 ± 6 %	6.12 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.50 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.4 W/kg ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	48.7 Ω - 9.7 jΩ
Return Loss	- 20.1 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	50.1 Ω - 6.7 jΩ
Return Loss	- 23.5 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	51.5 Ω - 5.8 jΩ
Return Loss	- 24.6 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	53.8 Ω - 5.0 jΩ
Return Loss	- 24.4 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	55.8 Ω - 6.1 jΩ
Return Loss	- 22.0 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	48.8 Ω - 9.4 jΩ
Return Loss	- 20.4 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	50.6 Ω - 7.1 jΩ
Return Loss	- 23.0 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	51.8 Ω - 5.9 jΩ
Return Loss	- 24.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	55.4 Ω - 4.7 jΩ
Return Loss	- 23.3 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	56.8 Ω - 5.1 jΩ
Return Loss	- 22.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.195 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 11, 2011

DASY5 Validation Report for Head TSL

Date: 20.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1107

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.47 S/m; ε_r = 34.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.57 S/m; ε_r = 34.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.74 S/m; ε_r = 34.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.83 S/m; ε_r = 34.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.05 S/m; ε_r = 33.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 28.12.2012, ConvF(5.1, 5.1, 5.1); Calibrated: 28.12.2012, ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.76, 4.76, 4.76); Calibrated: 28.12.2012, ConvF(4.81, 4.81, 4.81); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

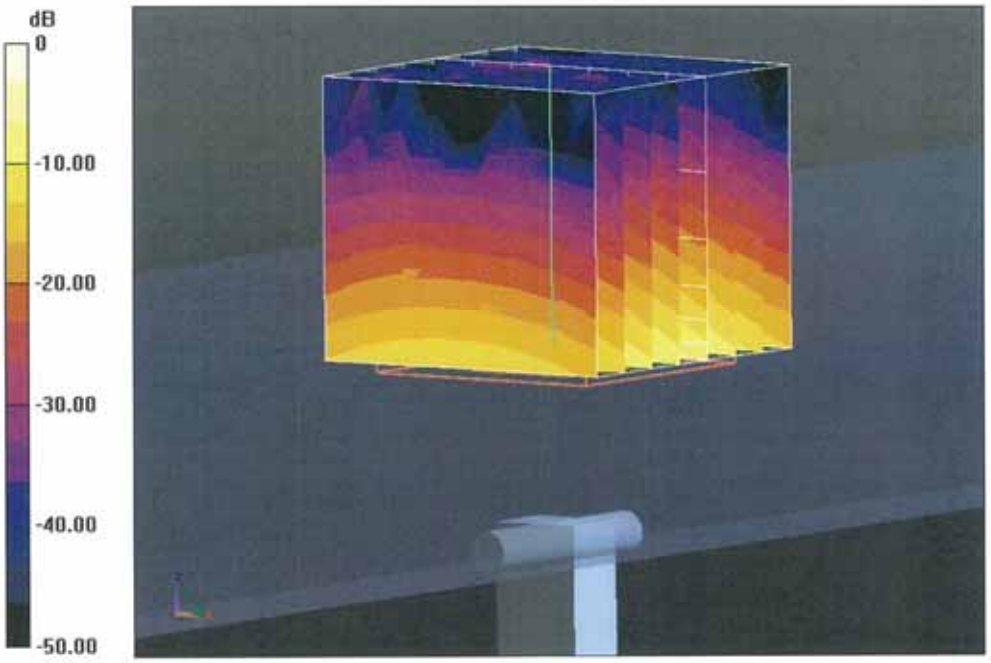
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.648 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 30.0 W/kg
SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 19.1 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.925 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 30.9 W/kg
SAR(1 g) = 8.18 W/kg; SAR(10 g) = 2.36 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.482 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 33.1 W/kg
SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 19.8 W/kg

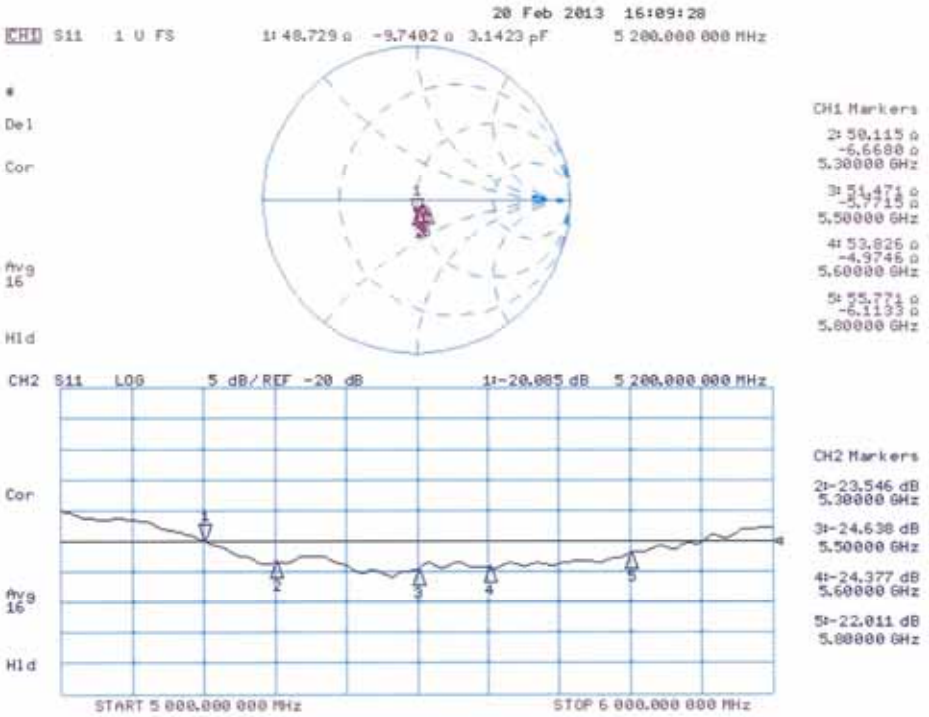
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.269 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 34.0 W/kg
SAR(1 g) = 8.53 W/kg; SAR(10 g) = 2.43 W/kg
Maximum value of SAR (measured) = 20.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.769 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 33.1 W/kg
SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.25 W/kg



0 dB = 19.8 W/kg = 12.97 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 21.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1107

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.36 S/m; ε_r = 46.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.48 S/m; ε_r = 46.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.71 S/m; ε_r = 46.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.83 S/m; ε_r = 46.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.12 S/m; ε_r = 45.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.67, 4.67, 4.67); Calibrated: 28.12.2012, ConvF(4.43, 4.43, 4.43); Calibrated: 28.12.2012, ConvF(4.22, 4.22, 4.22); Calibrated: 28.12.2012, ConvF(4.38, 4.38, 4.38); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

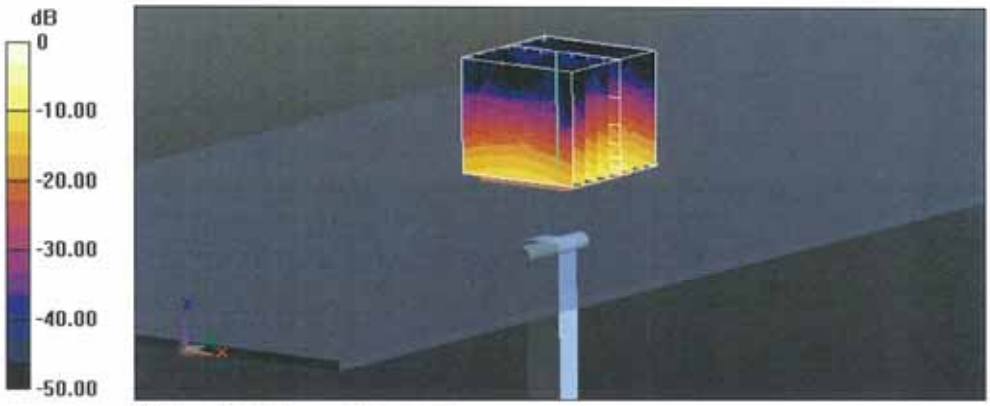
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.005 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 29.7 W/kg
SAR(1 g) = 7.5 W/kg; SAR(10 g) = 2.1 W/kg
Maximum value of SAR (measured) = 17.9 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.257 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 31.3 W/kg
SAR(1 g) = 7.67 W/kg; SAR(10 g) = 2.15 W/kg
Maximum value of SAR (measured) = 18.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.157 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 34.1 W/kg
SAR(1 g) = 7.92 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.204 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 36.5 W/kg
SAR(1 g) = 8.18 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 20.4 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 55.755 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 35.2 W/kg
SAR(1 g) = 7.5 W/kg; SAR(10 g) = 2.07 W/kg
Maximum value of SAR (measured) = 19.1 W/kg



0 dB = 19.1 W/kg = 12.81 dBW/kg

Impedance Measurement Plot for Body TSL