A Test Lab Techno Corp.

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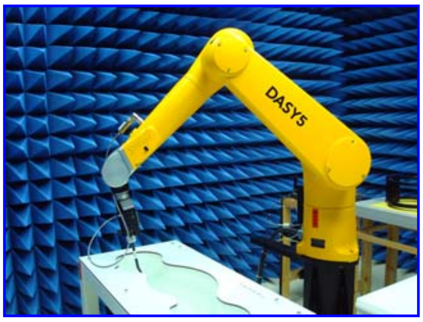
SAR EVALUATION REPORT

Test Report No.	:	1304FS20-01
Applicant	:	QBEX Electronics Corp.
Product Type	:	Smartphone
Trade Name	:	QBEX
Model Number	:	QBA769
Date of Received	:	Mar. 22, 2013
Test Period	:	Apr. 27 ~ Apr. 28, 2013
Date of Issued	:	May 27, 2013
Test Environment	:	Ambient Temperature： 22 ±2 ° C
		Relative Humidity：40 - 70 %
Standard	:	ANSI/IEEE C95.1-1999
		IEEE Std. 1528-2003
		IEEE Std. 1528a-2005
		47 CFR Part §2.1093;
		FCC/OET Bulletin 65 Supplement C [July 2001]
Max. Reported SAR	:	0.20 W/kg Head SAR
		0.64 W/kg Body SAR
Test Lab Location	:	Chang-an Lab



1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
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Approved By : Yung-Tan Tsai (Yung Tan Tsai) Tested By : Bill Hu (Bill Hu)

Contents

1. Description of Equipment under Test (EUT)

Applicant	QBEX Electronics Corp.	
Applicant Address	1606 NW 84th Ave, Miami, FL33126, USA	
Manufacture	TRANSAVA INC. (SZ)	
Manufacture Address	Unit 10c, Block 7, East Pacific Garden 2,Shen Zhen, Guangdong, China 518040	
Product Type	Smartphone	
Trade Name	QBEX	
Model Number	QBA769	
FCC ID	XFM-QBA769	
RF Function	GSM/GPRS/EGPRS 850 GSM/GPRS/EGPRS 1900 WCDMA(RMC 12.2K) / HSDPA / HSUPA Band V IEEE 802.11b / 802.11g / IEEE 802.11n (2.4GHz) 20MHz & 40MHz Bluetooth v3.0 / Bluetooth v4.0 LE	
Tx Frequency	Band	Operate Frequency (MHz)
	GSM/GPRS/EGPRS 850	824.2 - 848.8
	GSM/GPRS/EGPRS 1900	1850.2 - 1909.8
	WCDMA (RMC 12.2K) / HSDPA / HSUPA Band V	826.4 - 846.6
	IEEE 802.11b / 802.11g / IEEE 802.11n 20MHz	2412 - 2462
	IEEE 802.11n 40MHz	2422 - 2452
	Bluetooth v3.0 / Bluetooth v4.0 LE	2402 - 2480
RF Conducted Power (Avg.)	Band	Power (W / dBm)
	GSM/GPRS/EGPRS 850	1.750 / 32.43
	GSM/GPRS/EGPRS 1900	0.822 / 29.15
	WCDMA (RMC 12.2K) / HSDPA / HSUPA Band V	0.177 / 22.49
	IEEE 802.11b	0.029 / 14.60
	IEEE 802.11g	0.016 / 12.09
	IEEE 802.11n (2.4GHz) 20MHz	0.021 / 13.13
	IEEE 802.11n (2.4GHz) 40MHz	0.013 / 11.25
	Bluetooth v3.0	0.0020 / 3.11
	Bluetooth v4.0 LE	0.0003 / -5.34
Max. Reported SAR	0.20 W/kg Head SAR 0.64 W/kg Body SAR	
Device Category	Portable Device	
RF Exposure Environment	General Population / Uncontrolled	
Application Type	Certification	

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment / general population exposure limits specified in Standard C95.1-1999 and had been tested in accordance with the measurement procedures specified in IEEE Std. 1528-2003 and IEEE Std. 1528a-2005.

2. Introduction

The A Test Lab Techno Corp. has performed measurements of the maximum potential exposure to the user of **QBEX Electronics Corp. Trade Name：QBEX Model(s)：QBA769**. The test procedures, as described in American National Standards, Institute C95.1-1999〔1〕, FCC/OET Bulletin 65 Supplement C [July 2001] were employed and they specify the maximum exposure limit of 1.6mW/g as averaged over any 1 gram of tissue for portable devices being used within 20cm between user and EUT in the uncontrolled environment. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the equipment used are included within this test report.

2.1 SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (dw) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Figure 2).

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

Figure 2. **SAR Mathematical Equation**

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

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

Where：

σ = conductivity of the tissue (S/m)

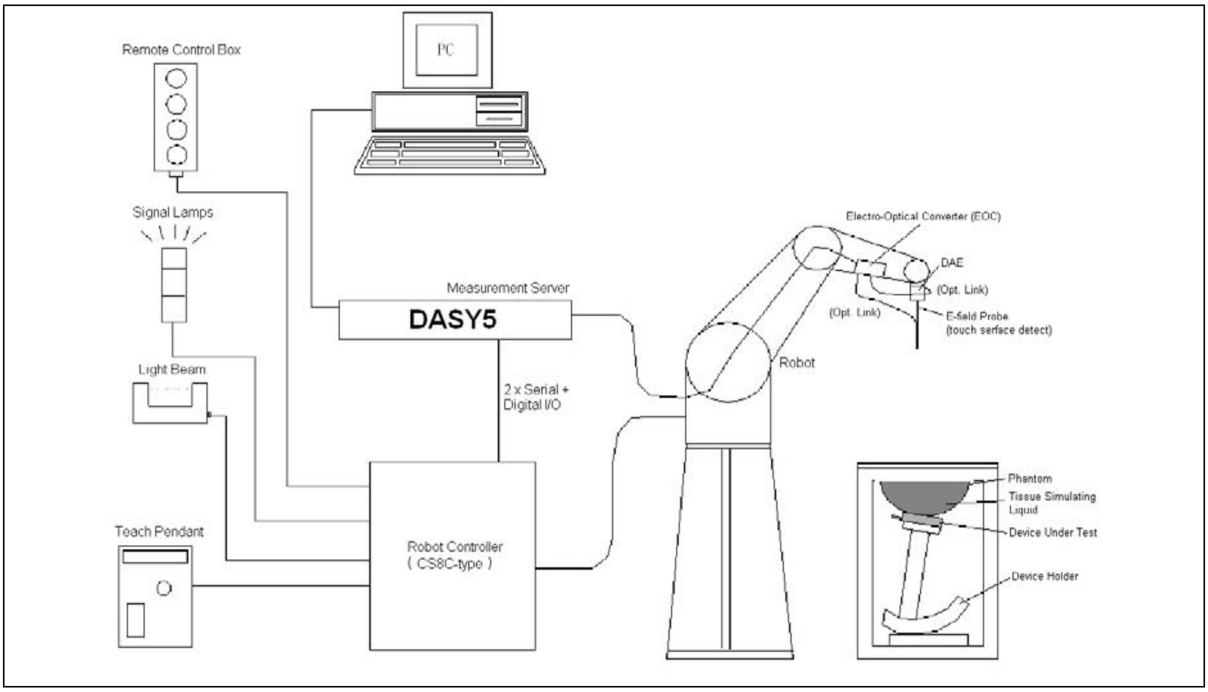
ρ = mass density of the tissue (kg/m3)

E = 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〕

3. SAR Measurement Setup



The DASY5 system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli TX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
4. The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
5. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
6. A computer operating Windows 2000 or Windows XP.
7. DASY5 software.
8. Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
9. The SAM twin phantom enabling testing left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. Validation dipole kits allowing validating the proper functioning of the system.

3.1 DASY E-Field Probe System

The SAR measurements were conducted with the dosimetric probe (manufactured by SPEAG), designed in the classical triangular configuration〔3〕and optimized for dosimetric evaluation. The probes is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber 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 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 DASY software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped when reaching the maximum.

3.1.1 E-Field Probe Specification

Construction	Symmetrical design with triangular core
	Built-in optical fiber for surface detection System
	Built-in shielding against static charges
	PEEK enclosure material (resistant to organic solvents, e.q., glycol)
Calibration	In air from 10 MHz to 6 GHz
	In brain and muscle simulating tissue at frequencies of 835MHz, 1900MHz and 2450MHz (accuracy ±8%)
	Calibration for other liquids and frequencies upon request
Frequency	±0.2 dB (30 MHz to 6 GHz)
Directivity	±0.3 dB in brain tissue (rotation around probe axis)
	±0.5 dB in brain tissue (rotation normal probe axis)
	Dynamic Range 10μW/g to > 100mW/g; Linearity: ±0.2dB
Dimensions	Overall length: 337mm
	Tip length: 9mm
	Body diameter: 10mm
	Tip diameter: 2.5mm
	Distance from probe tip to dipole centers: 1.0mm
Application	General dosimetry up to 6GHz
	Compliance tests of mobile phones
	Fast automatic scanning in arbitrary phantoms

Figure 3. E-field Probe

Figure 4. Probe setup on robot

3.1.2 E-Field Probe Calibration process

Dosimetric Assessment Procedure

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an RF Signal generator, TEM cell, and RF Power Meter.

Free Space Assessment

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies 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 rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm^2.

Temperature Assessment

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated head tissue. The E-field in the medium correlates with the temperature rise in the 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 (head or body),

ΔT = Temperature increase due to RF exposure.

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

Where：

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

3.2 Data Acquisition Electronic (DAE) System

Cell Controller

Processor：	Intel Core(TM)2 CPU
Clock Speed：	@ 1.86GHz
Operating System：	Windows XP Professional

Data Converter

Features：	Signal Amplifier, multiplexer, A/D converter, and control logic
Software：	DASY5 v5.0 (Build 125) & SEMCAD X Version 13.4 Build 125
Connecting Lines：	Optical downlink for data and status info
	Optical uplink for commands and clock

3.3 Robot

Positioner：	Stäubli Unimation Corp. Robot Model: TX90XL
Repeatability：	±0.02 mm
No. of Axis：	6

3.4 Measurement Server

Processor：	PC/104 with a 400MHz intel ULV Celeron
I/O-board：	Link to DAE4 (or DAE3)
	16-bit A/D converter for surface detection system
	Digital I/O interface
	Serial link to robot
	Direct emergency stop output for robot

3.5 Device Holder

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

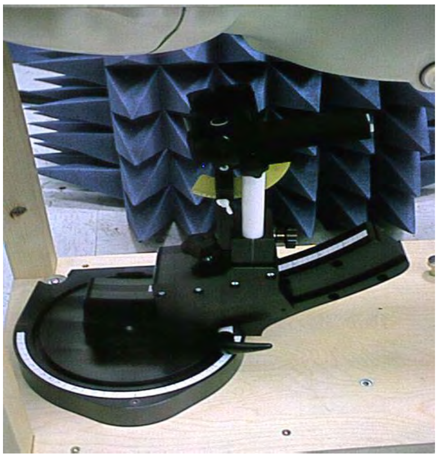


Figure 5. Device Holder

3.6 Phantom - SAM v4.0

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209. 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 manually teaching three points with the robot.

Shell Thickness	2 ±0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	1000×500 mm (L×W)

Table 1. Specification of SAM v4.0

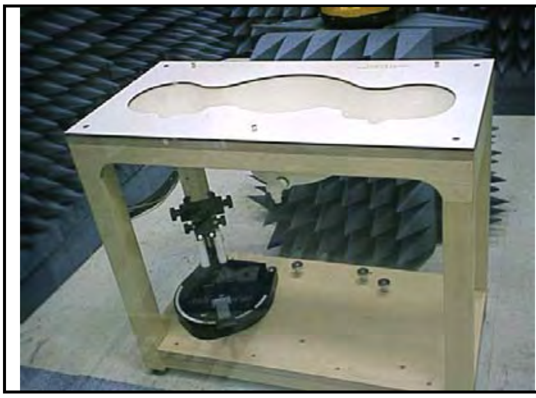


Figure 6. SAM Twin Phantom

3.7 Oval Flat Phantom - ELI 4.0

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (Oval Flat) phantom defined in IEEE 1528-2003, IEEE Std. 1528a-2005, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of wireless portable device 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 manually teaching three points with the robot.

Shell Thickness	2 ±0.2 mm
Filling Volume	Approx. 30 liters
Dimensions	190×600×400 mm (H×L×W)

Table 2. Specification of ELI 4.0

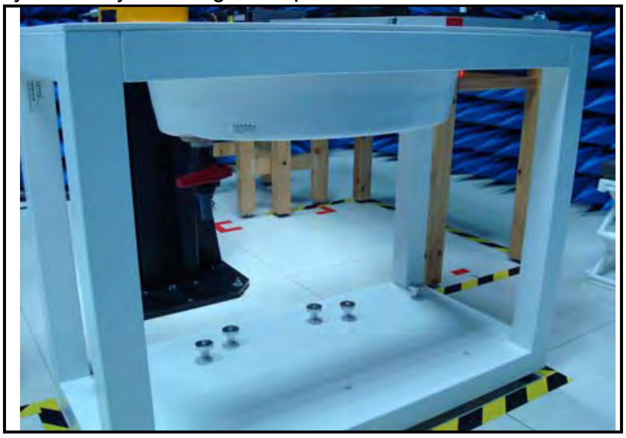


Figure 7. Oval Flat Phantom

3.8 Data Storage and Evaluation

3.8.1 Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension DA4 or DA5. The post processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

3.8.2 Data Evaluation

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

Probe parameters：	- Sensitivity	*Normi, ai0, ai1, ai2*
	- Conversion factor	*ConvFi*
	- Diode compression point	*dcpi*
Device parameters：	- Frequency	*f*
	- Crest factor	*cf*
Media parameters：	- Conductivity	σ
	- Density	ρ

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

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as：

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

With	*Vi*	= compensated signal of channel i (i = x, y, z)
	Ui	= input signal of channel i (i = x, y, z)
	cf	= crest factor of exciting field (DASY parameter)
	dcpi	= diode compression point (DASY parameter)

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

E-field probes：

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

H-field probes：

$$H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

with *Vi* = compensated signal of channel i (i = x, y, z)

Normi= sensor sensitivity of channel i (i = x, y, z)

μV/(V/m)2 for E-field Probes

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

Ei = electric field strength of channel i in V/*m*

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

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

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

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

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

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

Etot = total field strength in V/m

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

ρ = equivalent tissue density in g/cm3

＊Note：That the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

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

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

with *Ppwe* = equivalent power density of a plane wave in mW/cm2

Etot = total electric field strength in V/m

Htot = total magnetic field strength in A/m

4. Tissue Simulating Liquids

The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the tissue.
The dielectric parameters of the liquids were verified prior to the SAR evaluation using an 85070C Dielectric Probe Kit and an E5071B Network Analyzer.

IEEE SCC-34/SC-2 in 1528 recommended Tissue Dielectric Parameters

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in human head. Other head and body tissue parameters that have not been specified in 1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equation and extrapolated according to the head parameter specified in 1528.

Target Frequency	Head		Body	
(MHz)	εr	σ (S/m)	εr	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 - 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00
(εr = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)				

Table 3. Tissue dielectric parameters for head and body phantoms

4.1 Ingredients

The following ingredients are used:

- Water: deionized water (pure H_20), resistivity ≥ 16 M Ω -as basis for the liquid
- Sugar: refied white sugar (typically 99.7 % sucrose, available as crystal sugar in food shops) -to reduce relative permittivity
- Salt: pure NaCl -to increase conductivity
- Cellulose: Hydroxyethyl-cellulose, medium viscosity (75-125 mPa.s, 2% in water, 20°C), CAS # 54290 -to increase viscosity and to keep sugar in solution.
- Preservative: Preventol D-7 Bayer AG, D-51368 Leverkusen, CAS # 55965-84-9 -to prevent the spread of bacteria and molds
- DGBE: Diethylenglycol-monobuthyl ether (DGBE), Fluka Chemie GmbH, CAS # 112-34-5 -to reduce relative permittivity

4.2 Recipes

The following tables give the recipes for tissue simulating liquids to be used in different frequency bands.

Note: The goal dielectric parameters (at 22 ℃) must be achieved within a tolerance of ±5% for ε and ±5% for σ.

Ingredients (% by weight)	Frequency (MHz)											
	750		835		1750		1900		2450		2600	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	39.28	51.30	41.45	52.40	54.50	40.20	54.90	40.40	62.70	73.20	60.30	71.40
Salt (NaCl)	1.47	1.42	1.45	1.50	0.17	0.49	0.18	0.50	0.50	0.10	0.60	0.20
Sugar	58.15	46.18	56.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEC	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bactericide	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Triton X-100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DGBE	0.00	0.00	0.00	0.00	45.33	59.31	44.92	59.10	36.80	26.70	39.10	28.40
Dielectric Constant	41.88	54.60	42.54	56.10	40.10	53.60	39.90	54.00	39.80	52.50	39.80	52.50
Conductivity (S/m)	0.90	0.97	0.91	0.95	1.39	1.49	1.42	1.45	1.88	1.78	1.88	1.78

Salt: 99^{+}% Pure Sodium Chloride Sugar: 98^{+}% Pure Sucrose

Water: De-ionized, 16 $MΩ^{+}$ 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

4.3 Liquid Depth

The liquid level was during measurement 15cm ±0.5cm.
According to KDB865664 ,the depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm ±0.5 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm ±0.5 cm for measurements > 3 GHz.

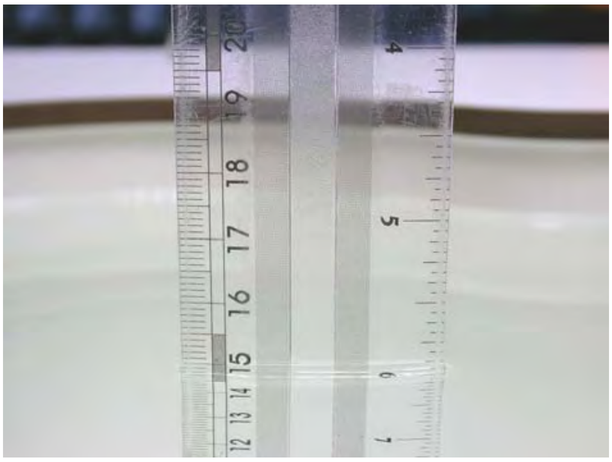


Figure 8. Head-Position

Figure 9. Body-Position

5. *SAR Testing with RF Transmitters*

5.1 SAR Testing with GSM/GPRS/EGPRS Transmitters

Configure the basestation to support GMSK and 8PSK call respectively, and set timeslot transmission for GMSK GSM/GPRS and 8PSK EDGE. Measure and record power outputs for both modulations, that test is applicable.

5.2 SAR Testing with WCDMA Transmitters

Configure the basestation to support all WCDMA tests in respect to the 3GPP 34.121.Measure the power at Ch4132, 4183 and 4233 for US cell; Ch9262, 9400 and 9538 for US PCS Band.

- Step 1: set a Test Mode 1 loop back with a 12.2kbps Reference Measurement Channel (RMC).
- Step 2: set and send continuously up power control commands to the device.
- Step 3: measure the power at the device antenna connector using the power meter with average detector and test SAR

5.3 SAR Testing with HSDPA Transmitters

HSDPA Date Devices setup for SAR Measurement

HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(βc, βd), and HS-DPCCH power offset parameters (ΔACK, ΔNACK, ΔCQI) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Setup for Release 5 HSDPA							
Sub-test	βc	βd	βd (SF)	βc/βd	βhs(1,2)	CM(3) (dB)	MRP(3) (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15(4)	15/15(4)	64	12/15(4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note

1. Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ Ahs = βhs/βc = 30/15 ⇔ βhs= 30/15 *βc
2. For theHS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude(EVM) with HS-DPCCH test in clause 5.13.1A and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with βhs = 30/15 *βc and Δ_{CQI} = 24/15 with βhs = 24/15*βc
3. CM = 1 for βc/βd =12/15, βhs/βc=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.
4. For subtest 2 the βc/βd 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 βc = 11/15 and βd = 15/15.

HSPA Date Devices setup for SAR Measurement.

The following procedures are applicable to HSPA (HSUPA/HSDPA) data devices operating under 3GPP Release 6. Body exposure conditions generally apply to these devices, including handsets and data modems operating in various electronic devices. HSUPA operates in conjunction with WCDMA and HSDPA. SAR is initially measured in WCDMA test configurations without HSPA. The default test configuration is to establish a radio link between the DUT and a communication test set to configure a 12.2 kbps RMC (reference measurement channel) in Test Loop Mode 1. SAR for HSPA is selectively measured with HS-DPCCH, EDPCCH and E-DPDCH, all enabled, along with a 12.2 kbps RMC using the highest SAR configuration in WCDMA with 12.2 kbps RMC only. An FRC is configured according to HSDPCCH Sub-test 1 using H-set 1 and QPSK. HSPA is configured according to E-DCH Subtest 5 requirements. SAR for other HSPA sub-test configurations is also confirmed selectively according to output power, exposure conditions and E-DCH UE Category. Maximum output power is verified according to procedures in applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. The UE Categories for HSDPCCH and HSPA should be clearly identified in the SAR report. The following procedures are applicable only if Maximum Power Reduction (MPR) is implemented according to Cubic Metric (CM) requirements.

When voice transmission and head exposure conditions are applicable to a WCDMA/HSPA data device, head exposure is measured according to the ‘Head SAR Measurements’ procedures in the ‘WCDMA Handsets’ section of this document. SAR for body exposure configurations are measured according to the ‘Body SAR Measurements’ procedures in the ‘WCDMA Handsets’ section of this document. In addition, body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 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 12.2 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 measurements should be used to test for head exposure.

Due to inner loop power control requirements in HSPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA should be configured according to the β values indicated below as well as other applicable procedures described in the ‘WCDMA Handset’ and ‘Release 5 HSDPA Data Devices’ sections of this document.

The highest body SAR measured in Antenna Extended & Retracted configurations on a channel in 12.2 kbps RMC. The possible channels are the High, Middle & Low channel. Contact the FCC Laboratory for test and approval requirements if the maximum output power measured in E-DCH Sub-test 2 - 4 is higher than Sub-test 5.

Setup for Release 6 HSPA / Release 7 HSPA+													
Sub-test	βc	βd	βd (SF)	βc/βd	βhs(1)	βec	βed	Bed (SF)	Bed (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	βed1: 47/15 βed2: 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 Δ_{CQI} = 8 ⇔ Ahs = βhs/βc = 30/15 ⇔ βhs= 30/15 *βc.
2. CM = 1 for βc/βd =12/15, βhs/βc=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.
3. For subtest 1 the βc/βd 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 βc = 10/15 and βd = 15/15.
4. For subtest 5 the βc/βd 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 βc = 14/15 and βd = 15/15.
5. Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
6. βed can not be set directly; it is set by Absolute Grant Value.

5.4 Power reduction

No power reduction issue.

5.5 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 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.

5.6 General Device Setup

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.

IEEE 802.11 Test Channels per FCC Requirement							
Mode	GHz	Channel	Turbo Channel	Default Test “Channels”			
				§15.247		UNII	
				802.11b	802.11g		
IEEE 802.11 b/g	2412	1		✓	▽		
	2437	6	6	✓	▽		
	2462	11		✓	▽		

5.7 Conducted Power

Band	Modulation	Data Rate	CH	Frequency (MHz)	Average Power (dBm)	
					Time Average	Burst Average
GSM 850	GMSK	1Down1Up Duty factor 1/8	Lowest	824.2	23.34	32.37
			Middle	836.6	23.36	32.39
			Highest	848.8	23.38	32.41
GPRS 850 Multi Class :12 Max Up:4 Max Down:4 Sum:5	GMSK	4Down1Up Duty factor 1/8	Lowest	824.2	23.27	32.30
			Middle	836.6	23.31	32.34
			Highest	848.8	23.34	32.37
		3Down2Up Duty factor 2/8	Lowest	824.2	25.69	31.71
			Middle	836.6	25.71	31.73
			Highest	848.8	25.75	31.77
		2Down3Up Duty factor 3/8	Lowest	824.2	26.73	30.99
			Middle	836.6	26.76	31.02
			Highest	848.8	27.71	31.97
		1Down4Up Duty factor 4/8	Lowest	824.2	27.75	30.76
			Middle	836.6	27.78	30.79
			Highest	848.8	27.82	30.83
EGPRS 850 Multi Class :12 Max Up:4 Max Down:4 Sum:5	8PSK	4Down1Up Duty factor 1/8	Lowest	824.2	17.17	26.20
			Middle	836.6	17.32	26.35
			Highest	848.8	17.40	26.43
		3Down2Up Duty factor 2/8	Lowest	824.2	19.34	25.36
			Middle	836.6	19.42	25.44
			Highest	848.8	19.53	25.55
		2Down3Up Duty factor 3/8	Lowest	824.2	21.28	25.54
			Middle	836.6	21.39	25.65
			Highest	848.8	21.45	25.71
		1Down4Up Duty factor 4/8	Lowest	824.2	22.42	25.43
			Middle	836.6	22.54	25.55
			Highest	848.8	22.66	25.67

Note: 1. Time Average power slot duty cycle factor calculate:
1up: Average burst power+10*LOG(1/8)
2up: Average burst power+10*LOG(2/8)
3up: Average burst power+10*LOG(3/8)
4up: Average burst power+10*LOG(4/8)
2. SIM1 & SIM2 can't transmit simultaneously.

Band	Modulation	Data Rate	CH	Frequency (MHz)	Average Power (dBm)	
					Time Average	Burst Average
GSM 1900	GMSK	1Down1Up Duty factor 1/8	Lowest	1850.2	19.79	28.82
			Middle	1880.0	19.97	29.00
			Highest	1909.8	20.09	29.12
GPRS 1900 Multi Class :12 Max Up:4 Max Down:4 Sum:5	GMSK	4Down1Up Duty factor 1/8	Lowest	1850.2	19.76	28.79
			Middle	1880.0	19.92	28.95
			Highest	1909.8	20.05	29.08
		3Down2Up Duty factor 2/8	Lowest	1850.2	21.76	27.78
			Middle	1880.0	21.92	27.94
			Highest	1909.8	22.11	28.13
		2Down3Up Duty factor 3/8	Lowest	1850.2	22.10	26.36
			Middle	1880.0	22.26	26.52
			Highest	1909.8	22.44	26.70
		1Down4Up Duty factor 4/8	Lowest	1850.2	23.11	26.12
			Middle	1880.0	23.29	26.30
			Highest	1909.8	23.47	26.48
EGPRS 1900 Multi Class :12 Max Up:4 Max Down:4 Sum:5	8PSK	4Down1Up Duty factor 1/8	Lowest	1850.2	16.67	25.70
			Middle	1880.0	16.92	25.95
			Highest	1909.8	17.21	26.24
		3Down2Up Duty factor 2/8	Lowest	1850.2	19.30	25.32
			Middle	1880.0	19.49	25.51
			Highest	1909.8	19.71	25.73
		2Down3Up Duty factor 3/8	Lowest	1850.2	20.27	24.53
			Middle	1880.0	20.58	24.84
			Highest	1909.8	20.77	25.03
		1Down4Up Duty factor 4/8	Lowest	1850.2	20.52	23.53
			Middle	1880.0	20.67	23.68
			Highest	1909.8	21.15	24.16

Note: 1. Time Average power slot duty cycle factor calculate:

1up: Average burst power+10*LOG(1/8)

2up: Average burst power+10*LOG(2/8)

3up: Average burst power+10*LOG(3/8)

4up: Average burst power+10*LOG(4/8)

2. SIM1 & SIM2 can't transmit simultaneously.

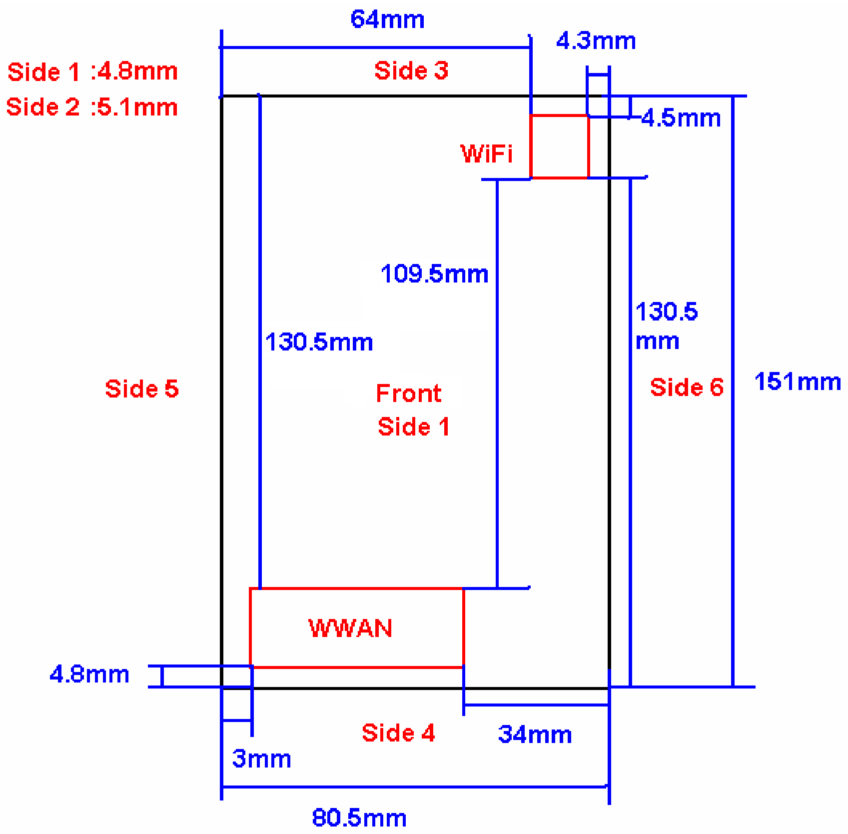
Band	Modulation	Sub-test	CH	Frequency (MHz)	Burst Average Power (dBm)
WCDMA Band V	RMC12.2K	---	Lowest	826.4	22.32
			Middle	836.6	22.37
			Highest	846.6	22.49
HSDPA Band V	QPSK	1	Lowest	826.4	22.21
			Middle	836.6	22.26
			Highest	846.6	22.37
		2	Lowest	826.4	22.18
			Middle	836.6	22.24
			Highest	846.6	22.36
		3	Lowest	826.4	21.70
			Middle	836.6	21.77
			Highest	846.6	21.86
		4	Lowest	826.4	21.69
			Middle	836.6	21.75
			Highest	846.6	21.84
HSUPA Band V	QPSK	1	Lowest	826.4	21.22
			Middle	836.6	21.27
			Highest	846.6	21.39
		2	Lowest	826.4	19.20
			Middle	836.6	19.26
			Highest	846.6	19.37
		3	Lowest	826.4	20.20
			Middle	836.6	20.24
			Highest	846.6	20.34
		4	Lowest	826.4	19.18
			Middle	836.6	19.24
			Highest	846.6	19.35
		5	Lowest	826.4	21.20
			Middle	836.6	21.23
			Highest	846.6	21.36

Band	Data Rate	CH	Frequency (MHz)	Average Power (dBm)
IEEE 802.11b	1 M	1	2412.0	11.37
		6	2437.0	13.31
		11	2462.0	14.60
	2 M	6	2437.0	13.28
	5.5 M	6	2437.0	13.21
	11 M	6	2437.0	13.16
IEEE 802.11g	6 M	1	2412.0	8.69
		6	2437.0	10.61
		11	2462.0	12.09
	9 M	6	2437.0	10.58
	12 M	6	2437.0	10.54
	18 M	6	2437.0	10.50
	24 M	6	2437.0	10.47
	36 M	6	2437.0	10.45
	48 M	6	2437.0	10.43
	54 M	6	2437.0	10.41
IEEE 802.11n (2.4 GHz) 20MHz	6.5 M	1	2412.0	9.97
		6	2437.0	11.79
		11	2462.0	13.13
	13 M	6	2437.0	11.76
	19.5 M	6	2437.0	11.72
	26 M	6	2437.0	11.69
	39 M	6	2437.0	11.65
	52 M	6	2437.0	11.62
	58.5 M	6	2437.0	11.60
	65 M	6	2437.0	11.58
IEEE 802.11n (2.4 GHz) 40MHz	13.5 M	3	2422.0	9.18
		6	2437.0	10.37
		9	2452.0	11.25
	27 M	6	2437.0	10.34
	40.5 M	6	2437.0	10.31
	54 M	6	2437.0	10.26
	81 M	6	2437.0	10.23
	108 M	6	2437.0	10.20
	121.5 M	6	2437.0	10.18
	135 M	6	2437.0	10.14

Band	CH	Frequency (MHz)	Packet Type	Average RF Conducted Output Power (dBm)
Bluetooth v3.0 (GFSK)	0	2402	DH1	-3.48
			DH3	-0.11
			DH5	0.59
	39	2441	DH1	-2.62
			DH3	0.75
			DH5	1.45
	78	2480	DH1	-0.96
			DH3	2.47
			DH5	3.11
Bluetooth v3.0 (π/4-DQPSK)	0	2402	DH1	-5.59
			DH3	-2.78
			DH5	-2.22
	39	2441	DH1	-4.76
			DH3	-1.97
			DH5	-1.36
	78	2480	DH1	-3.08
			DH3	-0.28
			DH5	0.35
Bluetooth v3.0 (8DPSK)	0	2402	DH1	-5.54
			DH3	-2.75
			DH5	-2.15
	39	2441	DH1	-4.71
			DH3	-1.91
			DH5	-1.32
	78	2480	DH1	-3.02
			DH3	-0.25
			DH5	0.38
Bluetooth v4.0 LE	0	2402.0	---	-8.02
	19	2440.0	---	-7.14
	39	2480.0	---	-5.34

5.8 Antenna location

Antenna-User			
Distance of WWAN to edge		Distance of WLAN/Bluetooth to edge	
WWAN to Side 1	4.8mm	WLAN & BT to Side 1	4.8mm
WWAN to Side 2	5.1mm	WLAN & BT to Side 2	5.1mm
WWAN to Side 3	130.5mm	WLAN & BT to Side 3	4.5mm
WWAN to Side 4	4.8mm	WLAN & BT to Side 4	130.5mm
WWAN to Side 5	3mm	WLAN & BT to Side 5	64mm
WWAN to Side 6	34mm	WLAN & BT to Side 6	4.3mm
Antenna-Antenna			
Antenna account		Distance (cm)	
WWAN to WLAN/Bluetooth		10.95	



5.9 Stand-alone SAR Evaluate

Transmitter and antenna implementation as below:

Band	WWAN antenna	WLAN/Bluetooth antenna
WWAN	V	X
WLAN	X	V
Bluetooth	X	V

Stand-alone transmission configurations as below:

Band	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
GPRS/EGPRS 850	V	V		V	V	
GPRS/EGPRS 1900	V	V		V	V	
WCDMA/HSDPA/HSUPA BV	V	V		V	V	
IEEE 802.11b/g/n	V	V	V			V
Bluetooth v3.0 / Bluetooth v4.0 LE	V	V				

Note: Stand-alone SAR is required when SAR must be measured for all sides and surfaces with a transmitting antenna located within 25 mm from that surface or edge, detail refer antenna location.

5.10 Simultaneous Transmitting Evaluate

Simultaneous transmission configurations as below:

Condition	Side	Frequency Band		
		WWAN	WLAN	Bluetooth
1	1	V	V	V
2	2	V	V	V

5.10.1 Sum of 1-g or 10-g SAR of all simultaneously transmitting

When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in and operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration.

Sum of 1-g SAR of summary as below:

Phantom Position		Spacing (mm)	ASSY	Simult Tx 1		Simult Tx 2		∑ SAR^{1g} (mW/g)	Event
				Band	SAR^{1g} (mW/g)	Band	SAR^{1g} (mW/g)		
Head	RC	0	N/A	WLAN	0.071	GPRS 850	0.168	0.239	<1.6
		0	N/A	WLAN	0.071	GPRS 1900	0.113	0.184	<1.6
		0	N/A	WLAN	0.071	WCDMA Band V	0.042	0.113	<1.6
	RT	0	N/A	WLAN	0.085	GPRS 850	0.092	0.177	<1.6
		0	N/A	WLAN	0.085	GPRS 1900	0.089	0.174	<1.6
		0	N/A	WLAN	0.085	WCDMA Band V	0.022	0.107	<1.6
	LC	0	N/A	WLAN	0.199	GPRS 850	0.178	0.377	<1.6
		0	N/A	WLAN	0.199	GPRS 1900	0.199	0.398	<1.6
		0	N/A	WLAN	0.199	WCDMA Band V	0.046	0.245	<1.6
	LT	0	N/A	WLAN	0.133	GPRS 850	0.094	0.227	<1.6
		0	N/A	WLAN	0.133	GPRS 1900	0.100	0.233	<1.6
		0	N/A	WLAN	0.133	WCDMA Band V	0.023	0.156	<1.6

Phantom Position		Spacing (mm)	ASSY	Simult Tx 1		Simult Tx 2		Simult Tx 3		∑ SAR^{1g} (mW/g)	Event
				Band	SAR^{1g} (mW/g)	Band	SAR^{1g} (mW/g)	Band	SAR^{1g} (mW/g)		
Flat	Side 1	10	N/A	WLAN	0.012	Bluetooth v3.0	0.000237	GPRS 850	0.211	0.223237	<1.6
		10	N/A	WLAN	0.012	Bluetooth v3.0	0.000237	GPRS 1900	0.219	0.231237	<1.6
		10	N/A	WLAN	0.012	Bluetooth v3.0	0.000237	WCDMA Band V	0.055	0.067237	<1.6
		10	N/A	WLAN	0.012	Bluetooth V4.0 LE	0.000199	GPRS 850	0.211	0.223199	<1.6
		10	N/A	WLAN	0.012	Bluetooth V4.0 LE	0.000199	GPRS 1900	0.219	0.231199	<1.6
		10	N/A	WLAN	0.012	Bluetooth V4.0 LE	0.000199	WCDMA Band V	0.055	0.067199	<1.6
	Side 2	10	N/A	WLAN	0.081	Bluetooth v3.0	0.002080	GPRS 850	0.642	0.725080	<1.6
		10	N/A	WLAN	0.081	Bluetooth v3.0	0.002080	GPRS 1900	0.402	0.485080	<1.6
		10	N/A	WLAN	0.081	Bluetooth v3.0	0.002080	WCDMA Band V	0.198	0.281080	<1.6
		10	N/A	WLAN	0.081	Bluetooth V4.0 LE	0.001650	GPRS 850	0.642	0.724650	<1.6
		10	N/A	WLAN	0.081	Bluetooth V4.0 LE	0.001650	GPRS 1900	0.402	0.484650	<1.6
		10	N/A	WLAN	0.081	Bluetooth V4.0 LE	0.001650	WCDMA Band V	0.198	0.280650	<1.6

5.10.2 SAR to peak location separation ratio (SPLSR)

When the sum of SAR is larger than the limit, SAR test exclusion is determined by the SAR to peak location separation ratio. The ratio is determined by (SAR1 + SAR2)^1.5/Ri, rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

All of sum of SAR < 1.6 W/Kg, therefore SPLSR is not required.

5.11 SAR test reduction according to KDB

General:

- The test data reported are the worst-case SAR value with the position set in a typical configuration.
  Test procedures used were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and IEEE Std. 1528a-2005.
- All modes of operation were investigated, and worst-case results are reported.
- Tissue parameters and temperatures are listed on the SAR plots.
- Batteries are fully charged for all readings.
- When the Channel's SAR 1g of maximum conducted power is > 0.8 mW/g, low, middle and high channel are supposed to be tested.

KDB 447498:

- The test data reported are the worst-case SAR value with the position set in a typical configuration.
  Test procedures used were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and IEEE Std. 1528a-2005.

KDB 865664:

- Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg.
- When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 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.
- 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.

KDB 941225:

- In order to qualify for the above test reduction, the maximum burst-averaged output power for each mode (GMS/GPRS/EDGE) and the corresponding multi-slot class must be clearly identified in the SAR report for each frequency band.We perform worst case SAR with maximum time-average power on GMS/GPRS/EDGE mode.
- When HSDPA & (HSUPA / HSPA+ uplink with QPSK) power are not more than WCDMA 12.2K RMC 0.25dB and the SAR value of WCDMA BII/BV<1.2 mW/g ,therefore HSDPA & HSUPA / HSPA+ Stand-alone SAR is not required.
- SAR must be measured for all sides and surfaces with a transmitting antenna located within 25 mm from that surface or edge.

KDB 248227:

- If the conducted power of (802.11g and 802.11n) are higher than 802.11b 0.25dB,(802.11g and 802.11n) are supposed to be tested.

6. System Verification and Validation

6.1 Symmetric Dipoles for System Verification

Construction	Symmetrical dipole with l/4 balun enables measurement of feed point impedance with NWA matched for use near flat phantoms filled with head simulating solutions Includes distance holder and tripod adaptor Calibration Calibrated SAR value for specified position and input power at the flat phantom in head simulating solutions.
Frequency	835, 1900 and 2450 MHz
Return Loss	> 20 dB at specified verification position
Power Capability	> 100 W (f < 1GHz); > 40 W (f > 1GHz)
Options	Dipoles for other frequencies or solutions and other calibration conditions are available upon request
Dimensions	D835V2: dipole length 161 mm; overall height 340 mm D1900V2: dipole length 67.7 mm; overall height 300 mm D2450V2: dipole length 51.5 mm; overall height 300 mm

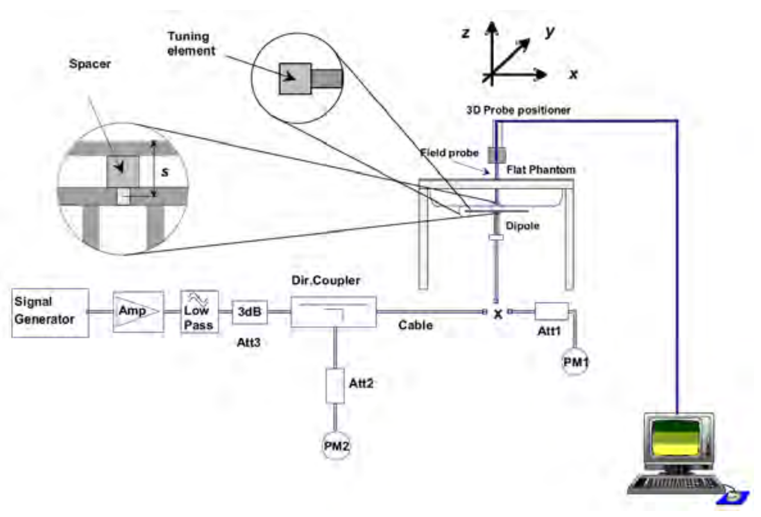


Figure 10. System Verification Setup Diagram

Figure 11. Validation Kit

6.2 Liquid Parameters

Liquid Verify								
Ambient Temperature： 22 ± 2 °C；Relative Humidity：40 -70%								
Liquid Type	Frequency	Temp (°C)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)	Measured Date
835MHz (Head)	820MHz	22.0	εr	41.57	42.35	1.88	± 5	Apr. 27, 2013
			σ	0.898	0.896	-0.22	± 5	
	835MHz	22.0	εr	41.50	42.28	1.88	± 5	
			σ	0.900	0.910	1.11	± 5	
	850MHz	22.0	εr	41.50	42.20	1.69	± 5	
			σ	0.916	0.923	0.76	± 5	
835MHz (Body)	820MHz	22.0	εr	55.26	54.11	-2.08	± 5	Apr. 28, 2013
			σ	0.969	0.955	-1.45	± 5	
	835MHz	22.0	εr	55.20	53.86	-2.43	± 5	
			σ	0.970	0.973	0.31	± 5	
	850MHz	22.0	εr	55.15	53.78	-2.48	± 5	
			σ	0.988	1.003	1.52	± 5	
1900MHz (Head)	1850MHz	22.0	εr	40.00	40.01	0.03	± 5	Apr. 27, 2013
			σ	1.400	1.348	-3.71	± 5	
	1900MHz	22.0	εr	40.00	39.82	-0.45	± 5	
			σ	1.400	1.396	-0.29	± 5	
	1930MHz	22.0	εr	40.00	39.69	-0.78	± 5	
			σ	1.400	1.425	1.79	± 5	
1900MHz (Body)	1850MHz	22.0	εr	53.30	53.60	0.56	± 5	Apr. 27, 2013
			σ	1.520	1.453	-4.41	± 5	
	1900MHz	22.0	εr	53.30	53.42	0.23	± 5	
			σ	1.520	1.507	-0.86	± 5	
	1930MHz	22.0	εr	53.30	53.27	-0.06	± 5	
			σ	1.520	1.539	1.25	± 5	

Table 4. Measured Tissue dielectric parameters for Head/body phantoms -1

Liquid Verify								
Ambient Temperature： 22 ± 2 °C；Relative Humidity：40 -70%								
Liquid Type	Frequency	Temp (°C)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)	Measured Date
2450MHz (Head)	2400MHz	22.0	εr	39.29	39.07	-0.56	± 5	Apr. 28, 2013
			σ	1.756	1.797	2.34	± 5	
	2450MHz	22.0	εr	39.20	38.80	-1.02	± 5	
			σ	1.800	1.827	1.50	± 5	
	2500MHz	22.0	εr	39.13	38.64	-1.25	± 5	
			σ	1.853	1.905	2.81	± 5	
2450MHz (Body)	2400MHz	22.0	εr	52.77	52.13	-1.21	± 5	Apr. 28, 2013
			σ	1.902	1.889	-0.68	± 5	
	2450MHz	22.0	εr	52.70	51.92	-1.48	± 5	
			σ	1.950	1.964	0.72	± 5	
	2500MHz	22.0	εr	52.64	51.77	-1.65	± 5	
			σ	2.021	2.038	0.84	± 5	

Table 5. Measured Tissue dielectric parameters for Head/body phantoms -2

6.3 Verification Summary

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ± 7%. The verification was performed at 835, 1900 and 2450MHz.

Mixture Type	Frequency (MHz)	Power	SAR_{1g} (mW/g)	SAR_{10g} (mW/g)	Drift (dB)	Difference percentage		Probe	Dipole	1W Target		Date
						1g	10g	Model / Serial No.	Model / Serial No.	SAR_{1g} (mW/g)	SAR_{10g} (mW/g)	
Head	835	250 mW	2.38	1.56	0.03	1.8%	2.3%	EX3DV3 SN:3519	D835V2 SN:4d082	9.35	6.10	Apr. 27, 2013
		Normalize to 1 Watt	9.52	6.24								
Body	835	250 mW	2.35	1.56	-0.023	-1.5%	-0.8%	EX3DV3 SN:3519	D835V2 SN:4d082	9.54	6.29	Apr. 28, 2013
		Normalize to 1 Watt	9.40	6.24								
Head	1900	250 mW	9.76	5.06	-0.067	-1.4%	-2.7%	EX3DV3 SN:3519	D1900V2 SN:5d111	39.60	20.80	Apr. 27, 2013
		Normalize to 1 Watt	39.04	20.24								
Body	1900	250 mW	10.4	5.48	0.043	3.2%	2.9%	EX3DV3 SN:3519	D1900V2 SN:5d111	40.3	21.3	Apr. 27, 2013
		Normalize to 1 Watt	41.60	21.92								
Head	2450	250 mW	13.5	6.24	0.178	2.9%	1.9%	EX3DV3 SN:3519	D2450V2 SN:712	52.5	24.5	Apr. 28, 2013
		Normalize to 1 Watt	54.00	24.96								
Body	2450	250 mW	12.5	5.79	0.139	-0.6%	-1.4%	EX3DV3 SN:3519	D2450V2 SN:712	50.30	23.50	Apr. 28, 2013
		Normalize to 1 Watt	50.00	23.16								

6.4 Validation Summary

Per FCC KDB 865664 D02v01, SAR system validation status should be documented 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 D01v01. 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 as below.

Probe Type Model / Serial No.	Prob Cal. Point (MHz)	Head / Body	Cond.	Perm.	CW Validation			Mod. Validation			Date
			εr	σ	Sensitivity	Probe Linearity	Probe Isotropy	Mod. Type	Duty Factor	PAR	
EX3DV3 SN:3519	835	Head	39.82	1.396	Pass	Pass	Pass	GMSK	Pass	N/A	Apr. 27, 2013
EX3DV3 SN:3519	835	Body	42.28	0.910	Pass	Pass	Pass	GMSK	Pass	N/A	Apr. 28, 2013
EX3DV3 SN:3519	1900	Head	53.42	1.507	Pass	Pass	Pass	GMSK	Pass	N/A	Apr. 27, 2013
EX3DV3 SN:3519	1900	Body	53.86	0.973	Pass	Pass	Pass	GMSK	Pass	N/A	Apr. 27, 2013
EX3DV3 SN:3519	2450	Head	38.80	1.827	Pass	Pass	Pass	OFDM	N/A	Pass	Apr. 28, 2013
EX3DV3 SN:3519	2450	Body	51.92	1.964	Pass	Pass	Pass	OFDM	N/A	Pass	Apr. 28, 2013

7. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d082	Jul. 25, 2012	Jul. 25, 2013
SPEAG	1900MHz System Validation Kit	D1900V2	5d111	Jul. 20, 2012	Jul. 20, 2013
SPEAG	2450MHz System Validation Kit	D2450V2	712	Feb. 19, 2013	Feb. 19, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV3	3519	Feb. 20, 2013	Feb. 20, 2014
SPEAG	Data Acquisition Electronics	DAE4	779	Feb. 13, 2013	Feb. 13, 2014
SPEAG	Device Holder	N/A	N/A	NCR	
SPEAG	Measurement Server	SE UMS 011 AA	1025	NCR	
SPEAG	Phantom	SAM V4.0	TP-1150	NCR	
SPEAG	Robot	Staubli TX90XL	F07/564ZA1/C/01	NCR	
SPEAG	Software	DASY5 V5.0 Build 125	N/A	NCR	
SPEAG	Software	SEMCAD V13.4 Build 125	N/A	NCR	
Agilent	Dielectric Probe Kit	85070C	US99360094	NCR	
Agilent	ENA Series Network Analyzer	E5071B	MY42404655	Apr. 05, 2012	Apr. 05, 2014
R&S	Power Sensor	NRP-Z22	100179	May 16, 2012	May 16, 2013
Agilent	MXG Vector Signal Generator	N5182A	MY47420962	May 24, 2012	May 24, 2014
Agilent	Dual Directional Coupler	778D	50334	NCR	
Mini-Circuits	Power Amplifier	ZHL-42W-SMA	D111103#5	NCR	
Mini-Circuits	Power Amplifier	ZVE-8G-SMA	D042005 671800514	NCR	
Aisi	Attenuator	IEAT 3dB	N/A	NCR	

Table 6. Test Equipment List

8. Measurement Uncertainty

Measurement uncertainties in SAR measurements are difficult to quantify due to several variables including biological, physiological, and environmental. However, we estimate the measurement uncertainties in SAR to be less than ±19.62 %〔8〕. The frequency range of the measurement uncertainty is 750 ~ 5800MHz ±10.1 %

According to Std. C95.3〔9〕, the overall uncertainties are difficult to assess and will vary with the type of meter and usage situation. However, accuracy's of ±1 to 3 dB can be expected in practice, with greater uncertainties in near-field situations and at higher frequencies (shorter wavelengths), or areas where large reflecting objects are present. Under optimum measurement conditions, SAR measurement uncertainties of at least ±2dB can be expected.

According to CENELEC〔10〕, typical worst-case uncertainty of field measurements is ±5 dB. For well-defined modulation characteristics the uncertainty can be reduced to ±3 dB.

Item	Uncertainty Component	Uncertainty Value	Prob. Dist	Div.	c_i (1g)	c_i (10g)	Std. Unc. （1-g）	Std. Unc. （10-g）	v_i or V_{eff}
Measurement System									
u1	Probe Calibration (*k*=1)	±5.05%	Normal	1	1	1	±5.05%	±5.05%	∞
u2	Probe Isotropy	±7.6%	Rectangular	$\sqrt{3}$	0.7	0.7	±3.1%	±3.1%	∞
u3	Boundary Effect	±1.0%	Rectangular	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
u4	Linearity	±4.7%	Rectangular	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
u5	System Detection Limit	±1.0%	Rectangular	$\sqrt{3}$	1	1	±0.58%	±0.58%	∞
u6	Readout Electronics	±0.3%	Normal	1	1	1	±0.3%	±0.3%	∞
u7	Response Time	±0.8%	Rectangular	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
u8	Integration Time	±2.6%	Rectangular	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
u9	RF Ambient Conditions	±0%	Rectangular	$\sqrt{3}$	1	1	±0%	±0%	∞
u10	RF Ambient Reflections	±0%	Rectangular	$\sqrt{3}$	1	1	±0%	±0%	∞
u11	Probe Positioner Mechanical Tolerance	±0.4%	Rectangular	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
u12	Probe Positioning with respect to Phantom Shell	±2.9%	Rectangular	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
u13	Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	±1.0%	Rectangular	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Test sample Related									
u14	Test sample Positioning	±3.6%	Normal	1	1	1	±3.6%	±3.6%	89
u15	Device Holder Uncertainty	±3.5%	Normal	1	1	1	±3.5%	±3.5%	5
u16	Output Power Variation - SAR drift measurement	±5.0%	Rectangular	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Tissue Parameters									
u17	Phantom Uncertainty (shape and thickness tolerances)	±4.0%	Rectangular	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
u18	Liquid Conductivity - deviation from target values	±5.0%	Rectangular	$\sqrt{3}$	0.64	0.43	±1.8%	±1.2%	∞
u19	Liquid Conductivity - measurement uncertainty	±1.93%	Normal	1	0.64	0.43	±1.24%	±0.83%	69
u20	Liquid Permittivity - deviation from target values	±5.0%	Rectangular	$\sqrt{3}$	0.6	0.49	±1.7%	±1.4%	∞
u21	Liquid Permittivity - measurement uncertainty	±1.4%	Normal	1	0.6	0.49	±0.84%	±1.69%	69
Combined standard uncertainty			RSS				±9.81%	±9.62%	313
Expanded uncertainty (95% CONFIDENCE LEVEL)			*k*=2				±19.62%	±19.24%	

Table 7. Uncertainty Budget of DASY

9. *Measurement Procedure*

The measurement procedures are as follows:

1. For WLAN function, engineering testing software installed on Notebook can provide continuous transmitting signal.
2. Measure output power through RF cable and power meter
3. Set scan area, grid size and other setting on the DASY software
4. Find out the largest SAR result on these testing positions of each band
5. Measure SAR results for other channels in worst SAR testing position if the SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

1. Power reference measurement
2. Area scan
3. Zoom scan
4. Power drift measurement

9.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages

1. Extraction of the measured data (grid and values) from the Zoom Scan
2. Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. Generation of a high-resolution mesh within the measured volume
4. Interpolation of all measured values form the measurement grid to the high-resolution grid
5. Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. Calculation of the averaged SAR within masses of 1g and 10g

9.2 Area & Zoom Scan Procedures

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 extent, 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 measures points and step size follow as below. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

Grid Type	Frequency		Step size (mm)			X*Y*Z (Point)	Cube size			Step size		
			X	Y	Z		X	Y	Z	X	Y	Z
uniform grid	≦ 3GHz	≦2GHz	≤ 8	≤ 8	≤ 5	5*5*7	32	32	30	8	8	5
		2G - 3G	≤ 5	≤ 5	≤ 5	7*7*7	30	30	30	5	5	5
	3 - 6GHz	3 - 4GHz	≤ 5	≤ 5	≤ 4	7*7*8	30	30	28	5	5	4
		4 - 5GHz	≤ 4	≤ 4	≤ 3	8*8*10	28	28	27	4	4	3
		5 - 6GHz	≤ 4	≤ 4	≤ 2	8*8*12	28	28	22	4	4	2

(Our measure settings are refer KDB Publication 865664 D01v01)

9.3 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the DUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

9.4 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation. Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

9.5 Power Drift Monitoring

All SAR testing is under the DUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of DUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drift more than 5%, the SAR will be retested.

10. SAR Test Results Summary

10.1 Head Measurement SAR

Index.	Position	Band	Ch.	Data Rate or Sub-Test	Side to Phantom	Spacing (mm)	SAR 1g (mW/g)	Power Drift	Burst Avg Power	Source-Time-Avg power (dBm)	Max tune-up	Time-Avg Tune-Up	Reported SAR 1g
#5	RC	GPRS 850	251	1D4U	---	0	0.168	-0.045	30.85	27.84	30.85	27.84	0.17
#6	RT		251	1D4U	---	0	0.092	0.071	30.85	27.84	30.85	27.84	0.09
#7	LC		251	1D4U	---	0	0.178	-0.002	30.85	27.84	30.85	27.84	0.18
#8	LT		251	1D4U	---	0	0.100	0.017	30.85	27.84	30.85	27.84	0.10
#1	RC	GPRS 1900	810	1D4U	---	0	0.113	0.188	26.51	23.50	26.51	23.50	0.11
#2	RT		810	1D4U	---	0	0.089	0.099	26.51	23.50	26.51	23.50	0.09
#3	LC		810	1D4U	---	0	0.199	0.051	26.51	23.50	26.51	23.50	0.20
#4	LT		810	1D4U	---	0	0.094	0.016	26.51	23.50	26.51	23.50	0.09
#9	RC	WCDMA Band V	4233	---	---	0	0.042	0.092	22.49	---	22.49	---	0.04
#10	RT		4233	---	---	0	0.022	0.179	22.49	---	22.49	---	0.02
#11	LC		4233	---	---	0	0.046	-0.039	22.49	---	22.49	---	0.05
#12	LT		4233	---	---	0	0.023	0.155	22.49	---	22.49	---	0.02
#31	RC	IEEE 802.11b	11	1M	---	0	0.071	0.051	14.60	---	14.60	---	0.07
#32	RT		11	1M	---	0	0.085	0.008	14.60	---	14.60	---	0.09
#33	LC		11	1M	---	0	0.199	-0.005	14.60	---	14.60	---	0.20
#34	LT		11	1M	---	0	0.133	0.199	14.60	---	14.60	---	0.13

Note:
1. According KDB 447498 D01 V05 section 4.1.4, the "Reported" explanation as below:
   "When SAR or MPE is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported."
2. If actual power less than tune-up power that Scaling SAR is required.
3. The formula of Reported SAR, that represent as below:
   Reported SAR = Original SAR * 10^[(Tune-up power - Actual power)/10]
4. If the Channel's SAR 1g of maximum conducted power is > 0.8 mW/g, low, middle and high channel are supposed to be tested.
5. If the conducted power of (IEEE 802.11g and IEEE 802.11n) are higher than IEEE 802.11b 0.25dB, (IEEE 802.11g and IEEE 802.11n) are supposed to be tested.
6. HSDPA & HSUPA power are not more than WCDMA 0.25dB and the SAR value of WCDMA <1.2 mW/g, therefore HSDPA & HSUPA Stand-alone SAR is not required.

10.2 Body Measurement SAR

Evaluated body SAR refers to Hot-spot mode measurement results.

10.3 Hot-spot mode Measurement SAR

Index.	Position	Band	Ch.	Data Rate or Sub-Test	Side to Phantom	Spacing (mm)	SAR 1g (mW/g)	Power Drift	Burst Avg Power	Source-Time-Avg power (dBm)	Max tune-up	Time-Avg Tune-Up	Reported SAR 1g\ (mW/g)
#22	Flat	GPRS 850	251	1D4U	1	10	0.211	-0.070	30.85	27.84	30.85	27.84	0.21
#20	Flat		128	1D4U	2	10	0.459	-0.054	30.78	27.77	30.85	27.84	0.47
#21	Flat		190	1D4U	2	10	0.621	0.003	30.81	27.80	30.85	27.84	0.63
#19	Flat		251	1D4U	2	10	0.642	-0.004	30.85	27.84	30.85	27.84	0.64
#23	Flat		251	1D4U	4	10	0.153	-0.040	30.85	27.84	30.85	27.84	0.15
#24	Flat		251	1D4U	5	10	0.204	-0.137	30.85	27.84	30.85	27.84	0.20
#14	Flat	GPRS 1900	810	1D4U	1	10	0.219	-0.041	26.51	23.50	26.51	23.50	0.22
#13	Flat		810	1D4U	2	10	0.402	-0.020	26.51	23.50	26.51	23.50	0.40
#15	Flat		810	1D4U	4	10	0.153	0.056	26.51	23.50	26.51	23.50	0.15
#16	Flat		810	1D4U	5	10	0.266	-0.041	26.51	23.50	26.51	23.50	0.27
#28	Flat	WCDMA Band V	4233	---	1	10	0.055	0.014	22.49	---	22.49	---	0.06
#27	Flat		4233	---	2	10	0.198	0.018	22.49	---	22.49	---	0.20
#29	Flat		4233	---	4	10	0.040	-0.044	22.49	---	22.49	---	0.04
#30	Flat		4233	---	5	10	0.054	-0.013	22.49	---	22.49	---	0.05
#36	Flat	IEEE 802.11b	11	1M	1	10	0.012	-0.074	14.60	---	14.60	---	0.01
#35	Flat		11	1M	2	10	0.081	0.173	14.60	---	14.60	---	0.08
#37	Flat		11	1M	3	10	0.054	0.189	14.60	---	14.60	---	0.05
#38	Flat		11	1M	6	10	0.038	0.089	14.60	---	14.60	---	0.04
#40	Flat	Bluetooth v3.0	78	---	1	10	0.000237	-0.021	3.11	---	3.11	---	0.0002
#39	Flat		78	---	2	10	0.002080	-0.188	3.11	---	3.11	---	0.0021
#42	Flat	Bluetooth v4.0 LE	39	---	1	10	0.001650	0.138	-5.34	---	-5.34	---	0.0017
#41	Flat		39	---	2	10	0.000199	0.110	-5.34	---	-5.34	---	0.0002

Note: 1. According KDB 447498 D01 V05 section 4.1.4, the "Reported" explanation as below:
"When SAR or MPE is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported."
2. If actual power less than tune-up power that Scaling SAR is required.
3. The formula of Reported SAR, that represent as below:
Reported SAR = Original SAR * 10^[(Tune-up power - Actual power)/10]
4. If the Channel's SAR 1g of maximum conducted power is > 0.8 mW/g, low, middle and high channel are supposed to be tested.
4. If the Channel's SAR 1g of maximum conducted power is > 0.8 mW/g, low, middle and high channel are supposed to be tested.
5. If the conducted power of (IEEE 802.11g and IEEE 802.11n) are higher than IEEE 802.11b 0.25dB, (IEEE 802.11g and IEEE 802.11n) are supposed to be tested.
6. For hot-spot mode, the WWAN antenna location to edge >2.5 cm, therefore test Side 3 and Side 6 are not required.
7. For hot-spot mode, the WLAN antenna location to edge >2.5 cm, therefore test Side 4 and Side 5 are not required.

10.4 Extremity Measurement SAR

Evaluated extremity SAR is not available.

10.5 SAR Measurement Variability

Detailed evaluations please refer KDB 865664 on "SAR test reduction according to KDB" section.

Index.	Position	Band	Ch.	Side to Phantom	Spacing (mm)	SAR $_{1g}$ (mW/g)	Power Drift	Burst Avg Power	Source-Time-Avg power (dBm)	Max tune-up	Time-Avg Tune-Up	Reported SAR $_{1g}$ (mW/g)	Repeated measure-ment Ratio
#43	Flat	GPRS 850 (1D4U)	251	2	10	0.736	-0.039	30.85	27.84	31.85	28.84	0.93	1.15

Note:
1. According KDB 447498 D01 V05 section 4.1.4, the “Reported” explanation as below:
   “When SAR or MPE is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported.”
2. If actual power less than tune-up power that Scaling SAR is required.
3. The formula of Reported SAR, that represent as below:
   Reported SAR = Original SAR * 10^[(Tune-up power - Actual power)/10]
4. The original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
5. Perform a second repeated measurement the ratio of largest to smallest SAR for the original and first repeated measurements is < 1.2,the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

10.6 Std. C95.1-1999 RF Exposure Limit

Human Exposure	Population Uncontrolled Exposure (W/kg) or (mW/g)	Occupational Controlled Exposure (W/kg) or (mW/g)
Spatial Peak SAR* (head)	1.60	8.00
Spatial Peak SAR** (Whole Body)	0.08	0.40
Spatial Peak SAR*** (Partial-Body)	1.60	8.00
Spatial Peak SAR**** (Hands / Feet / Ankle / Wrist)	4.00	20.00

Table 8. Safety Limits for Partial Body Exposure

Notes：

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

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

******* The Spatial Average value of the SAR averaged over the partial – body.

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

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

Occupational / 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).

11. Conclusion

The SAR test values found for the portable mobile phone **QBEX Electronics Corp. Trade Name：QBEX Model(s)：QBA769** is below the maximum recommended level of 1.6 W/kg (mW/g).

12. References

[1] Std. C95.1-1999, *"American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300KHz to 100GHz",* New York.

[2] NCRP, National Council on Radiation Protection and Measurements, "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields", NCRP report NO. 86, 1986.

[3] T. Schmid, O. Egger, and N. Kuster, "Automatic E-field scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp, 105-113, Jan. 1996.

[4] K. Pokovi ć, T. Schmid, and N. Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequency", in ICECOM'97, Dubrovnik, October 15-17, 1997, pp.120-124.

[5] K. Pokovi ć, T. Schmid, and N. Kuster, "E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp.172-175.

[6] N. Kuster, and Q. Balzano, "Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz", IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[7] Robert J. Renka, "Multivariate Interpolation Of Large Sets Of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988 , pp. 139-148.

[8] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[9] Std. C95.3-1991, "IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, Aug. 1992.

[10] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10KHz-300GHz, Jan. 1995.

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

[12] IEEE Std 1528a™-2005 (Amendment to IEEE Std 1528™-2003), IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

13. SAR Measurement Guidance

[1] KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01

[2] KDB 447498 D01 General RF Exposure Guidance v05

[3] KDB 248227 D01 SAR meas for 802 11 a b g v01r02.

[4] KDB 648474 D01 SAR Handsets Multi Xmiter and Ant v01r05

[5] KDB 941225 D01 SAR test for 3G devices v02

[6] KDB 941225 D02 Guidance PBA for 3GPP R6 HSPA v02r01

[7] KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE vo1

[8] KDB 941225 D06 Hot Spot SAR v01

Appendix A - System Performance Check

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 6:48:11 PM

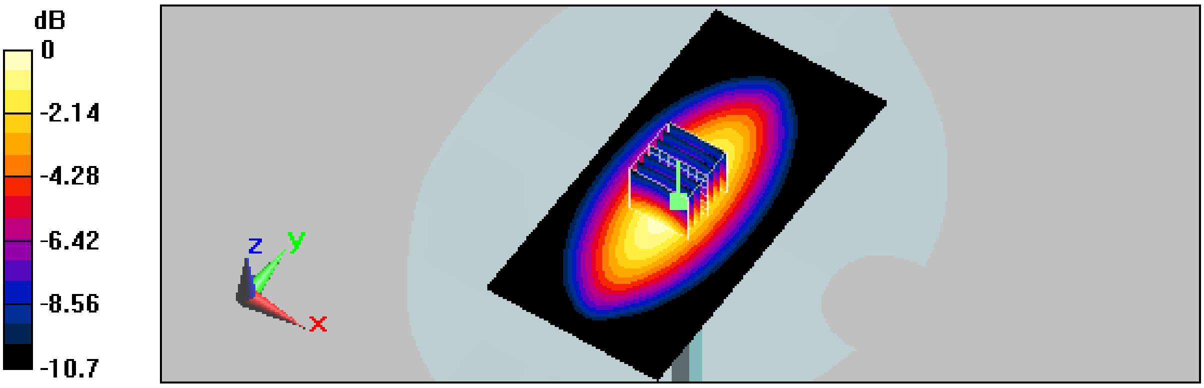
System Performance Check at 835MHz_20130427_Head
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d082

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.91 mho/m; ε_r = 42.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.73, 10.73, 10.73); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

System Performance Check at 835MHz/Area Scan (61x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.02 mW/g

System Performance Check at 835MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.6 V/m; Power Drift = 0.030 dB
Peak SAR (extrapolated) = 3.57 W/kg
SAR(1 g) = 2.38 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 3.03 mW/g



0 dB = 3.03mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 3:04:19 AM

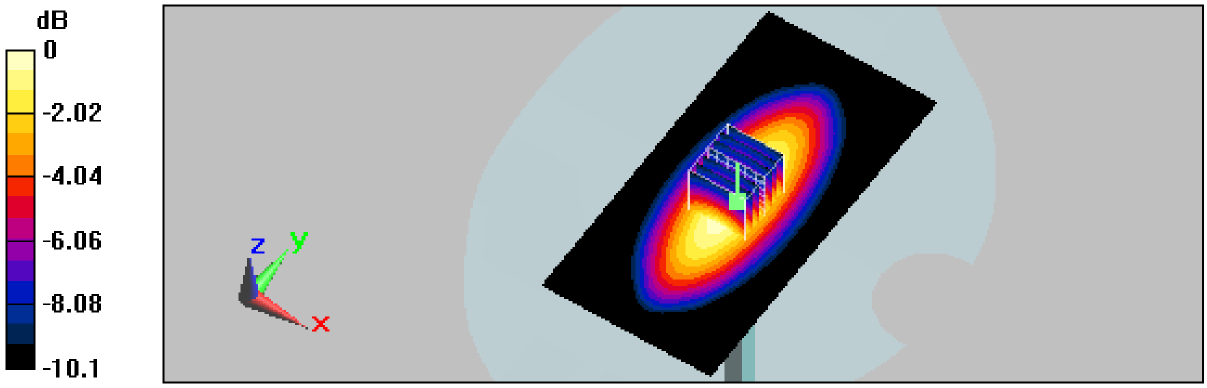
System Performance Check at 835MHz_20130428_Body
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d082

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.973 mho/m; εr = 53.9; ρ = 1000 kg/m3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

System Performance Check at 835MHz/Area Scan (61x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.95 mW/g

System Performance Check at 835MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56 V/m; Power Drift = -0.023 dB
Peak SAR (extrapolated) = 3.41 W/kg
SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.94 mW/g



0 dB = 2.94mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 2:44:47 PM

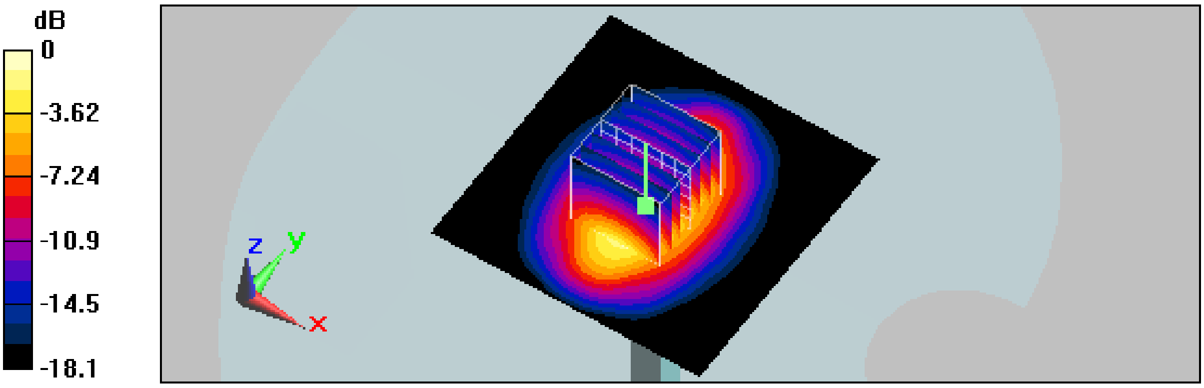
System Performance Check at 1900MHz_20130427_Head
DUT: Dipole D1900V2_SN5d111; Type: D1900V2; Serial: D1900V2 - SN:5d111

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.4 mho/m; ε_r = 39.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(8.79, 8.79, 8.79); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

System Performance Check at 1900MHz/Area Scan (61x61x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.4 mW/g

System Performance Check at 1900MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.1 V/m; Power Drift = -0.067 dB
Peak SAR (extrapolated) = 18.3 W/kg
SAR(1 g) = 9.76 mW/g; SAR(10 g) = 5.06 mW/g
Maximum value of SAR (measured) = 14.1 mW/g



0 dB = 14.1mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 11:23:13 PM

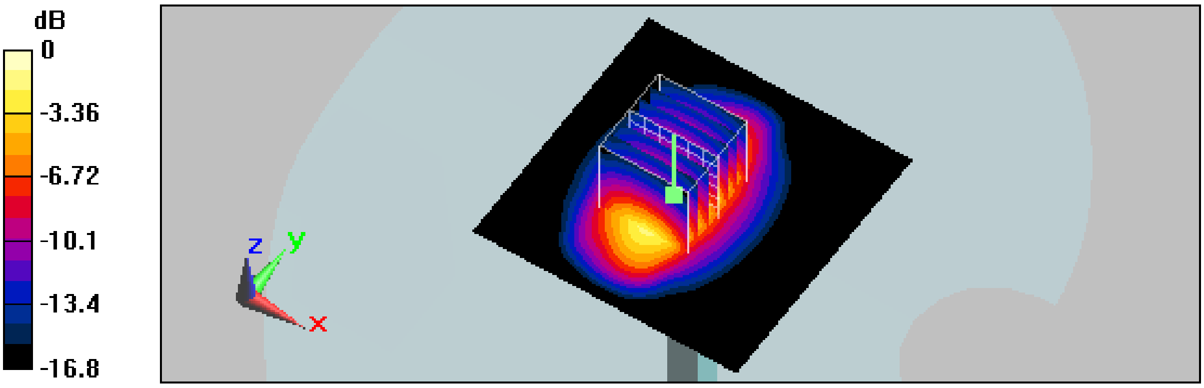
System Performance Check at 1900MHz_20130427_Body
DUT: Dipole D1900V2_SN5d111; Type: D1900V2; Serial: D1900V2 - SN:5d111

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.51 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(8.58, 8.58, 8.58); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

System Performance Check at 1900MHz/Area Scan (61x61x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 15.1 mW/g

System Performance Check at 1900MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.4 V/m; Power Drift = 0.043 dB
Peak SAR (extrapolated) = 18.8 W/kg
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.48 mW/g
Maximum value of SAR (measured) = 14.9 mW/g



0 dB = 14.9mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 11:21:19 AM

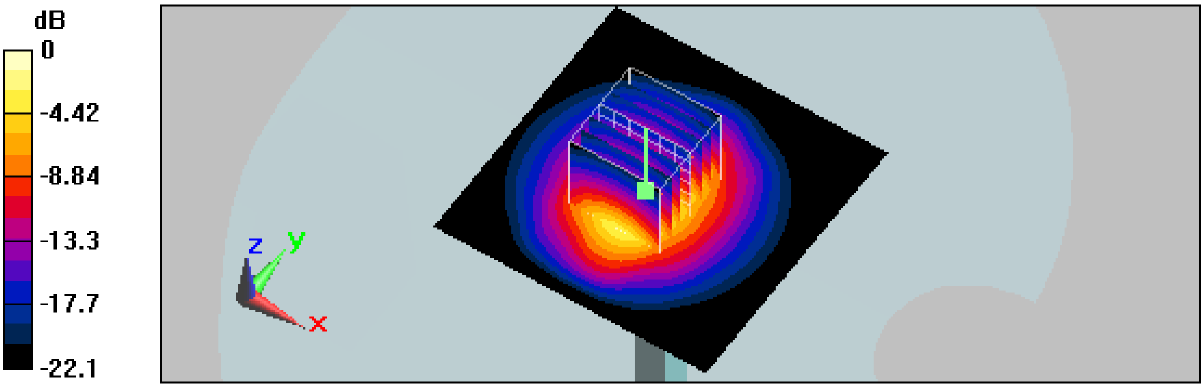
System Performance Check at 2450MHz_20130428_Head
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:712

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.83 mho/m; εr = 38.8; ρ = 1000 kg/m3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.94, 7.94, 7.94); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

System Performance Check at 2450MHz/Area Scan (61x61x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 20.7 mW/g

System Performance Check at 2450MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.7 V/m; Power Drift = 0.178 dB
Peak SAR (extrapolated) = 28 W/kg
SAR(1 g) = 13.5 mW/g; SAR(10 g) = 6.24 mW/g
Maximum value of SAR (measured) = 20.6 mW/g



0 dB = 20.6mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 4:48:57 PM

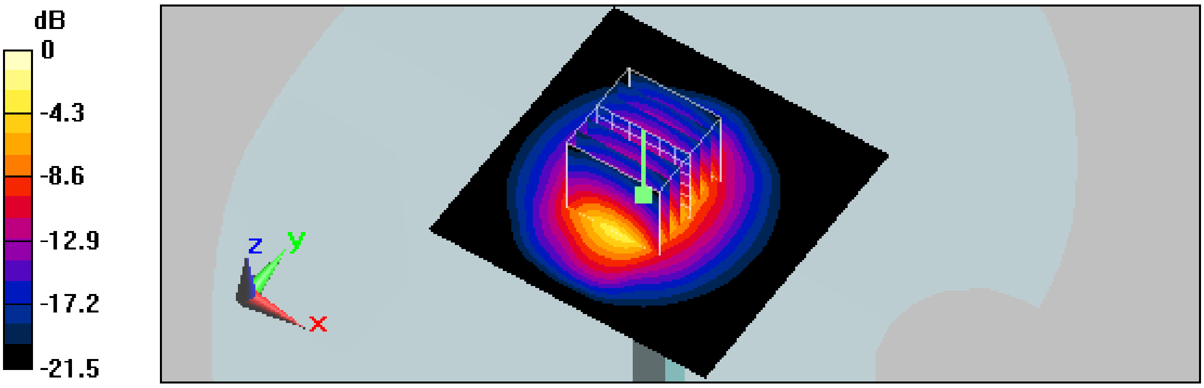
System Performance Check at 2450MHz_20130428_Body
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:712

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.96 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.88, 7.88, 7.88); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

System Performance Check at 2450MHz/Area Scan (61x61x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 19.1 mW/g

System Performance Check at 2450MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.8 V/m; Power Drift = 0.139 dB
Peak SAR (extrapolated) = 25.9 W/kg
SAR(1 g) = 12.5 mW/g; SAR(10 g) = 5.79 mW/g
Maximum value of SAR (measured) = 19.1 mW/g



0 dB = 19.1mW/g

Appendix B - SAR Measurement Data

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 7:17:58 PM

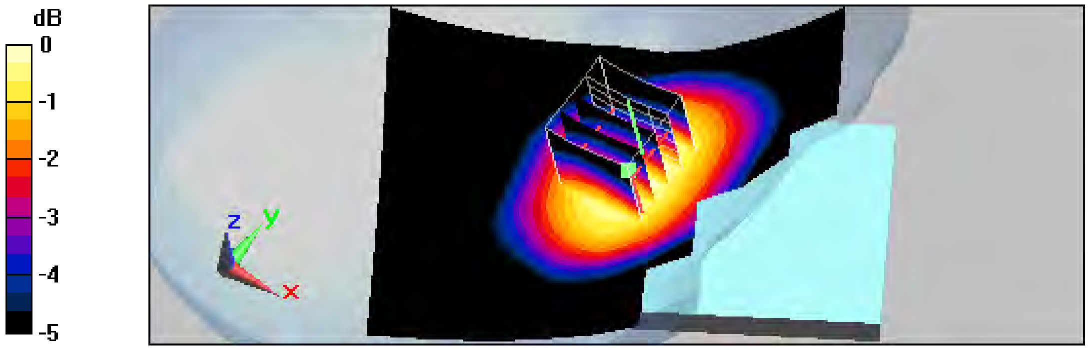
#5_RC_GPRS 850 CH251_1D4U_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS 850 (1Down, 4Up); Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; σ = 0.922 mho/m; εr = 42.2; ρ = 1000 kg/m3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.73, 10.73, 10.73); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Right Cheek/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.192 mW/g

Right Cheek/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.18 V/m; Power Drift = -0.045 dB
Peak SAR (extrapolated) = 0.203 W/kg
SAR(1 g) = 0.168 mW/g; SAR(10 g) = 0.132 mW/g
Maximum value of SAR (measured) = 0.187 mW/g



0 dB = 0.187mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 7:36:08 PM

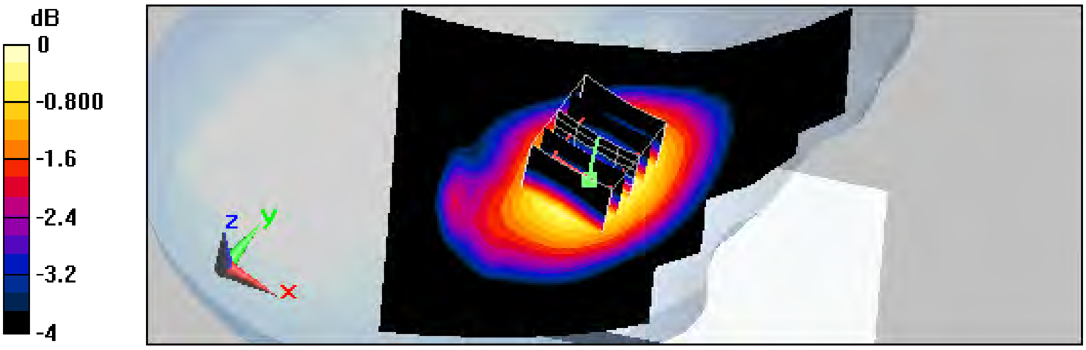
#6_RT_GPRS 850 CH251_1D4U_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS 850 (1Down, 4Up); Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; σ = 0.922 mho/m; εr = 42.2; ρ = 1000 kg/m3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.73, 10.73, 10.73); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Right Tilted/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.104 mW/g

Right Tilted/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.87 V/m; Power Drift = 0.071 dB
Peak SAR (extrapolated) = 0.111 W/kg
SAR(1 g) = 0.092 mW/g; SAR(10 g) = 0.072 mW/g
Maximum value of SAR (measured) = 0.103 mW/g



0 dB = 0.103mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 7:55:37 PM

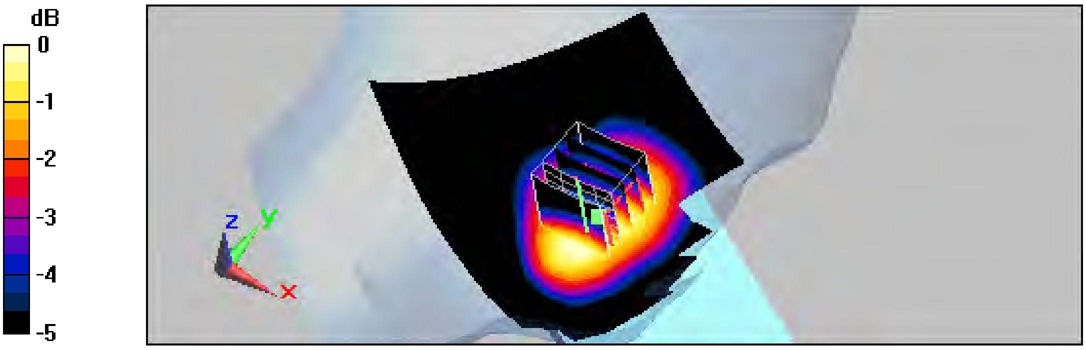
#7_LC_GPRS 850 CH251_1D4U_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS 850 (1Down, 4Up); Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; σ = 0.922 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.73, 10.73, 10.73); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.203 mW/g

Left Cheek/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.97 V/m; Power Drift = -0.0016 dB
Peak SAR (extrapolated) = 0.215 W/kg
SAR(1 g) = 0.178 mW/g; SAR(10 g) = 0.139 mW/g
Maximum value of SAR (measured) = 0.199 mW/g



0 dB = 0.199mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 8:13:06 PM

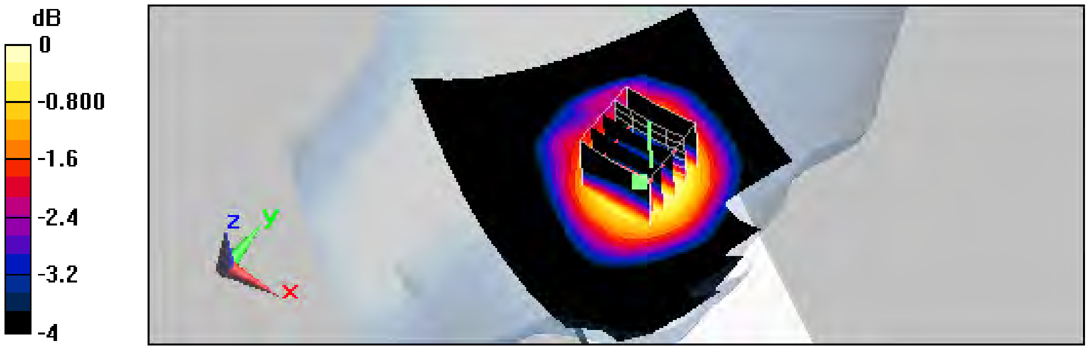
#8_LT_GPRS 850 CH251_1D4U_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS 850 (1Down, 4Up); Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; σ = 0.922 mho/m; εr = 42.2; ρ = 1000 kg/m3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.73, 10.73, 10.73); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Left Tilted/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.114 mW/g

Left Tilted/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.94 V/m; Power Drift = 0.017 dB
Peak SAR (extrapolated) = 0.123 W/kg
SAR(1 g) = 0.100 mW/g; SAR(10 g) = 0.078 mW/g
Maximum value of SAR (measured) = 0.112 mW/g



0 dB = 0.112mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 4:08:08 PM

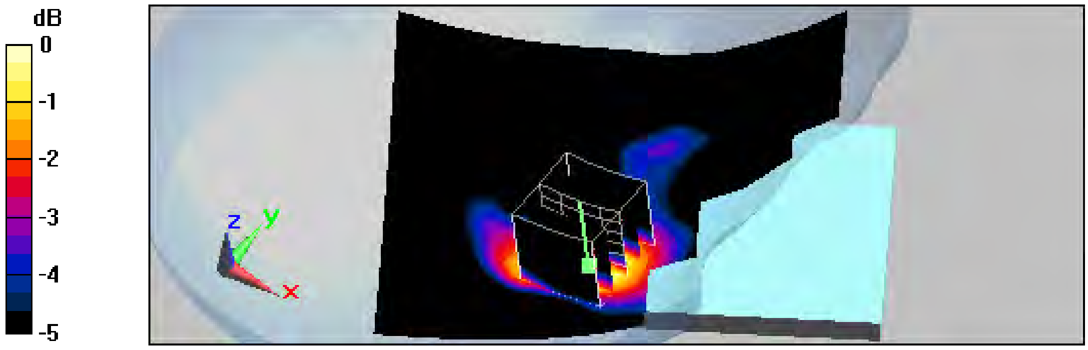
#1_RC_GPRS PCS CH810_1D4U_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS PCS (1Down,4Up); Frequency: 1909.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 1910 MHz; σ = 1.41 mho/m; εr = 39.8; ρ = 1000 kg/m3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(8.79, 8.79, 8.79); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Right Cheek/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.154 mW/g

Right Cheek/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.01 V/m; Power Drift = 0.188 dB
Peak SAR (extrapolated) = 0.181 W/kg
SAR(1 g) = 0.113 mW/g; SAR(10 g) = 0.070 mW/g
Maximum value of SAR (measured) = 0.149 mW/g



0 dB = 0.149mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 4:34:21 PM

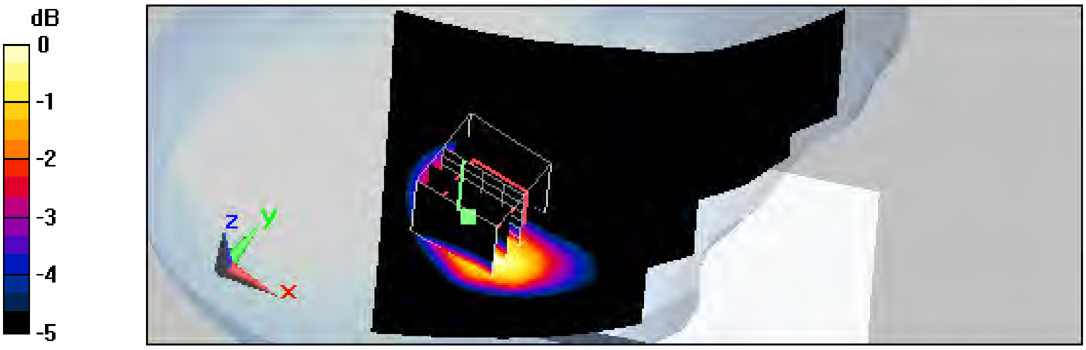
#2_RT_GPRS PCS CH810_1D4U_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS PCS (1Down,4Up); Frequency: 1909.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 1910 MHz; σ = 1.41 mho/m; εr = 39.8; ρ = 1000 kg/m3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(8.79, 8.79, 8.79); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Right Tilted/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.120 mW/g

Right Tilted/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.32 V/m; Power Drift = 0.099 dB
Peak SAR (extrapolated) = 0.142 W/kg
SAR(1 g) = 0.089 mW/g; SAR(10 g) = 0.054 mW/g
Maximum value of SAR (measured) = 0.115 mW/g



0 dB = 0.115mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 5:06:32 PM

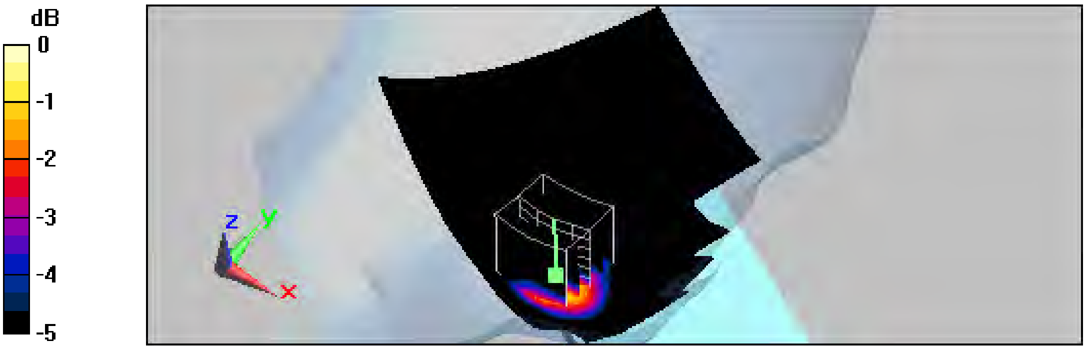
#3_LC_GPRS PCS CH810_1D4U_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS PCS (1Down,4Up); Frequency: 1909.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 1910 MHz; σ = 1.41 mho/m; ε_r = 39.8; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(8.79, 8.79, 8.79); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.246 mW/g

Left Cheek/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.81 V/m; Power Drift = 0.051 dB
Peak SAR (extrapolated) = 0.313 W/kg
SAR(1 g) = 0.199 mW/g; SAR(10 g) = 0.117 mW/g
Maximum value of SAR (measured) = 0.245 mW/g



0 dB = 0.245mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 5:25:36 PM

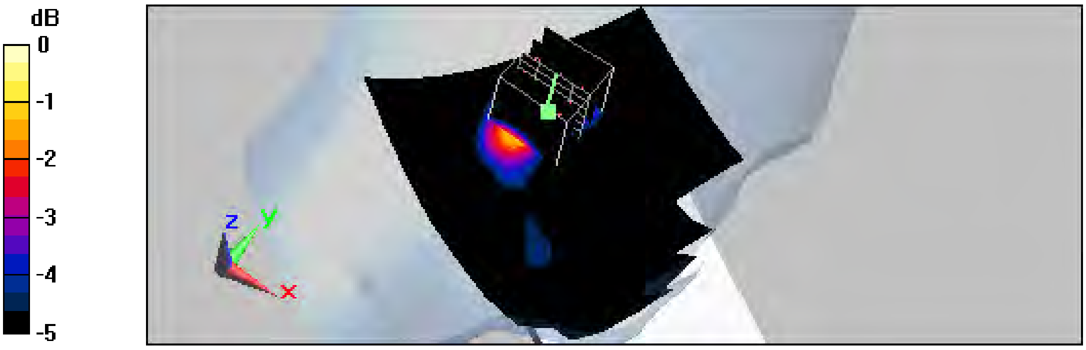
#4_LT_GPRS PCS CH810_1D4U_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS PCS (1Down,4Up); Frequency: 1909.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 1910 MHz; σ = 1.41 mho/m; ε_r = 39.8; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(8.79, 8.79, 8.79); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Left Tilted/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.129 mW/g

Left Tilted/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.65 V/m; Power Drift = 0.016 dB
Peak SAR (extrapolated) = 0.157 W/kg
SAR(1 g) = 0.094 mW/g; SAR(10 g) = 0.053 mW/g
Maximum value of SAR (measured) = 0.126 mW/g



0 dB = 0.126mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 10:19:58 PM

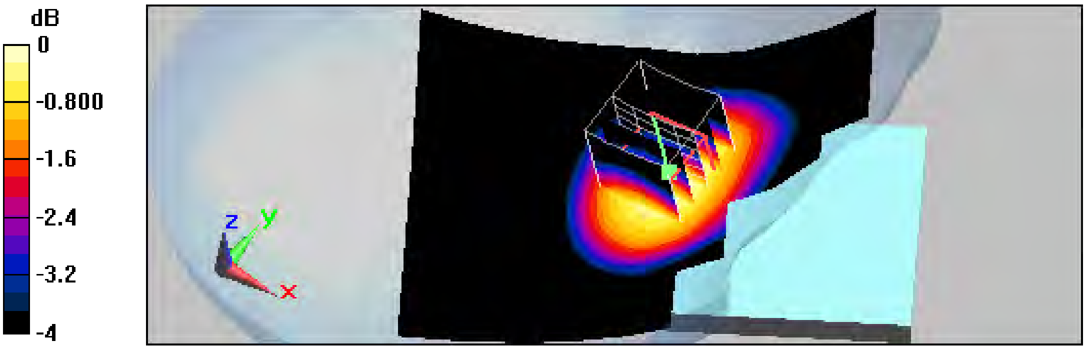
#9_RC_WCDMA Band V CH4233
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: WCDMA Band V; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 847 MHz; σ = 0.92 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.73, 10.73, 10.73); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Right Cheek/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.047 mW/g

Right Cheek/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.76 V/m; Power Drift = 0.092 dB
Peak SAR (extrapolated) = 0.051 W/kg
SAR(1 g) = 0.042 mW/g; SAR(10 g) = 0.033 mW/g
Maximum value of SAR (measured) = 0.047 mW/g



0 dB = 0.047mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 10:40:08 PM

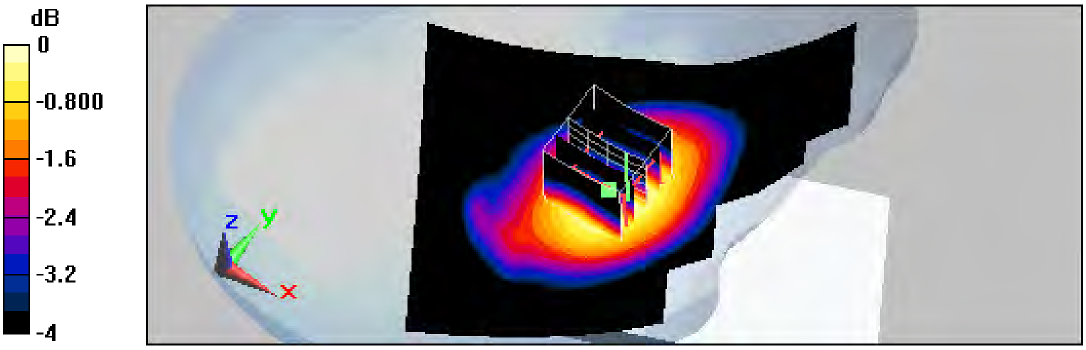
#10_RT_WCDMA Band V CH4233
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: WCDMA Band V; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 847 MHz; σ = 0.92 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.73, 10.73, 10.73); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Right Tilted/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.026 mW/g

Right Tilted/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.71 V/m; Power Drift = 0.179 dB
Peak SAR (extrapolated) = 0.027 W/kg
SAR(1 g) = 0.022 mW/g; SAR(10 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.025 mW/g



0 dB = 0.025mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 9:25:07 PM

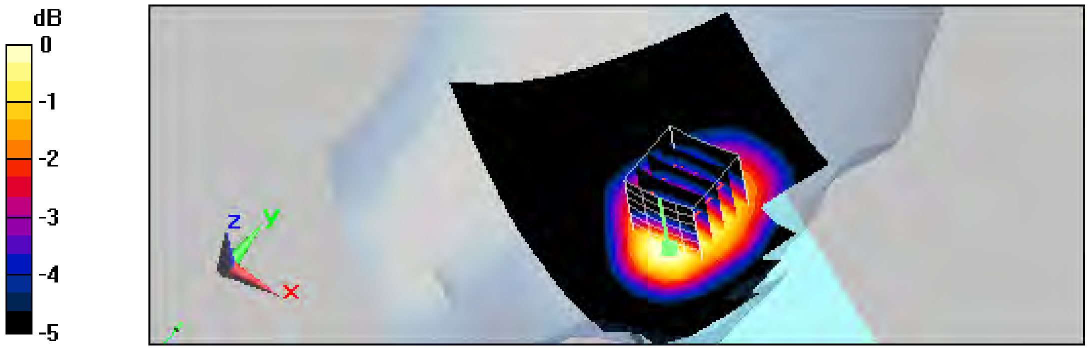
#11_LC_WCDMA Band V CH4233
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: WCDMA Band V; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 847 MHz; σ = 0.92 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.73, 10.73, 10.73); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.053 mW/g

Left Cheek/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.09 V/m; Power Drift = -0.039 dB
Peak SAR (extrapolated) = 0.057 W/kg
SAR(1 g) = 0.046 mW/g; SAR(10 g) = 0.036 mW/g
Maximum value of SAR (measured) = 0.051 mW/g



0 dB = 0.051mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 9:52:27 PM

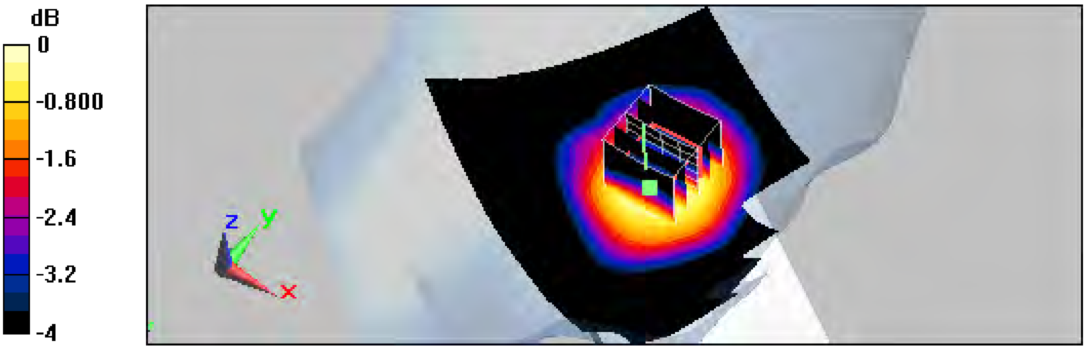
#12_LT_WCDMA Band V CH4233
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: WCDMA Band V; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 847 MHz; σ = 0.92 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.73, 10.73, 10.73); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Left Tilted/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.026 mW/g

Left Tilted/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.93 V/m; Power Drift = 0.155 dB
Peak SAR (extrapolated) = 0.028 W/kg
SAR(1 g) = 0.023 mW/g; SAR(10 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.026 mW/g



0 dB = 0.026mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 12:10:46 PM

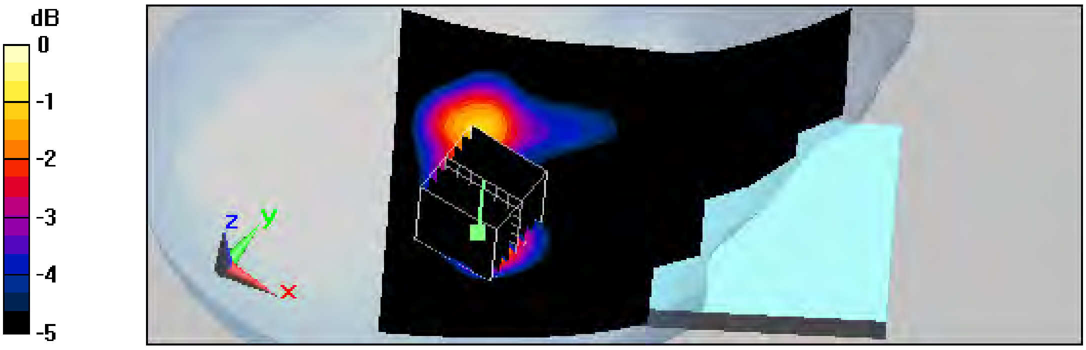
#31_RC_802.11b CH11_1M
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: IEEE 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.84 mho/m; ε_r = 38.7; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.94, 7.94, 7.94); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Right Cheek/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.125 mW/g

Right Cheek/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.39 V/m; Power Drift = 0.051 dB
Peak SAR (extrapolated) = 0.139 W/kg
SAR(1 g) = 0.071 mW/g; SAR(10 g) = 0.037 mW/g
Maximum value of SAR (measured) = 0.105 mW/g



0 dB = 0.105mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 12:36:54 PM

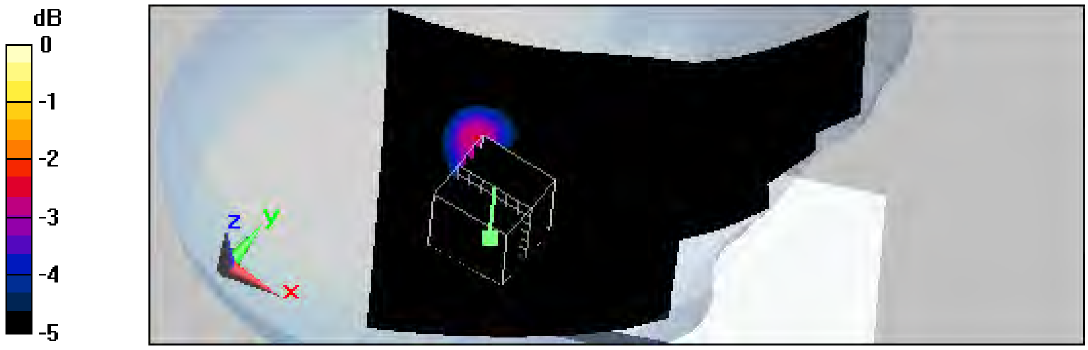
#32_RT_802.11b CH11_1M
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: IEEE 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.84 mho/m; ε_r = 38.7; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.94, 7.94, 7.94); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Right Tilted/Area Scan (81x131x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.101 mW/g

Right Tilted/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.93 V/m; Power Drift = 0.00784 dB
Peak SAR (extrapolated) = 0.172 W/kg
SAR(1 g) = 0.085 mW/g; SAR(10 g) = 0.041 mW/g
Maximum value of SAR (measured) = 0.127 mW/g



0 dB = 0.127mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 1:03:55 PM

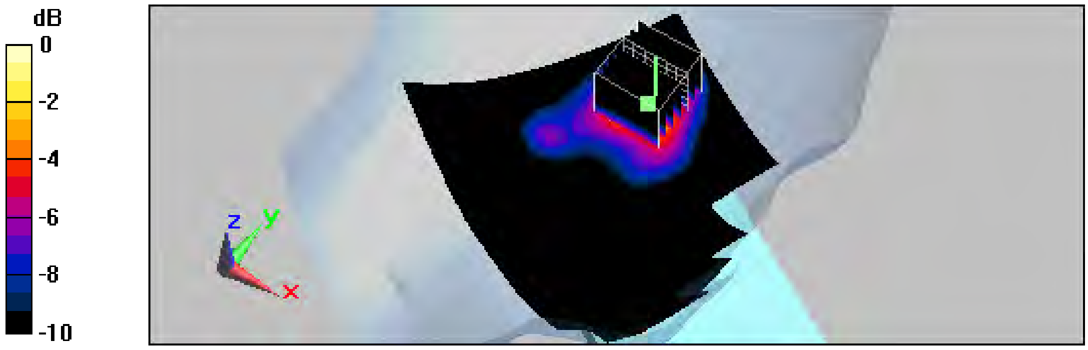
#33_LC_802.11b CH11_1M
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: IEEE 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.84 mho/m; ε_r = 38.7; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.94, 7.94, 7.94); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (81x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.288 mW/g

Left Cheek/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.66 V/m; Power Drift = -0.00469 dB
Peak SAR (extrapolated) = 0.432 W/kg
SAR(1 g) = 0.199 mW/g; SAR(10 g) = 0.091 mW/g
Maximum value of SAR (measured) = 0.313 mW/g



0 dB = 0.313mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 1:29:08 PM

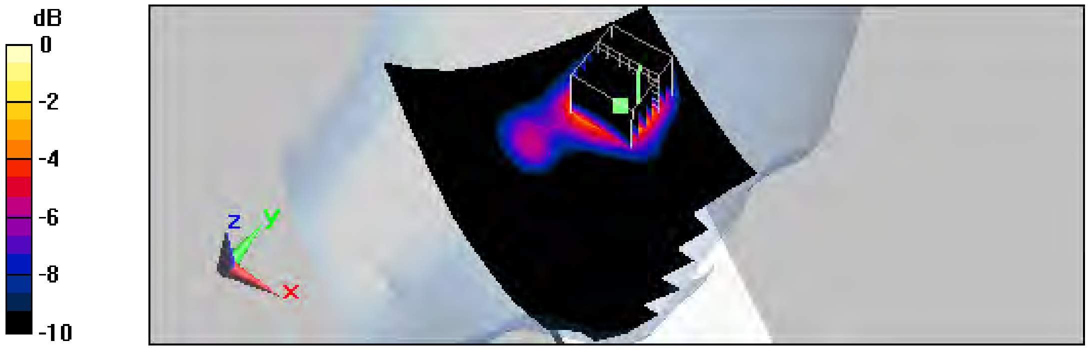
#34_LT_802.11b CH11_1M
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: IEEE 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.84 mho/m; ε_r = 38.7; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.94, 7.94, 7.94); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Left Tilted/Area Scan (81x131x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.190 mW/g

Left Tilted/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.65 V/m; Power Drift = 0.199 dB
Peak SAR (extrapolated) = 0.281 W/kg
SAR(1 g) = 0.133 mW/g; SAR(10 g) = 0.065 mW/g
Maximum value of SAR (measured) = 0.196 mW/g



0 dB = 0.196mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 7:06:29 AM

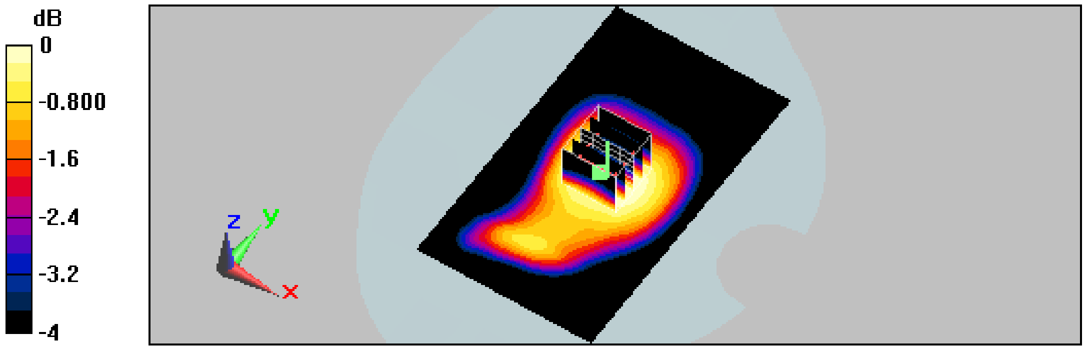
#22_Flat_GPRS 850 CH251_1D4U_Side 1 to Phantom_10mm_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS 850 (1Down, 4Up); Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; σ = 1 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.247 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.1 V/m; Power Drift = -0.070 dB
Peak SAR (extrapolated) = 0.259 W/kg
SAR(1 g) = 0.211 mW/g; SAR(10 g) = 0.166 mW/g
Maximum value of SAR (measured) = 0.239 mW/g



0 dB = 0.239mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 9:25:45 AM

#20_Flat_GPRS 850 CH128_1D4U_Side 2 to Phantom_10mm_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

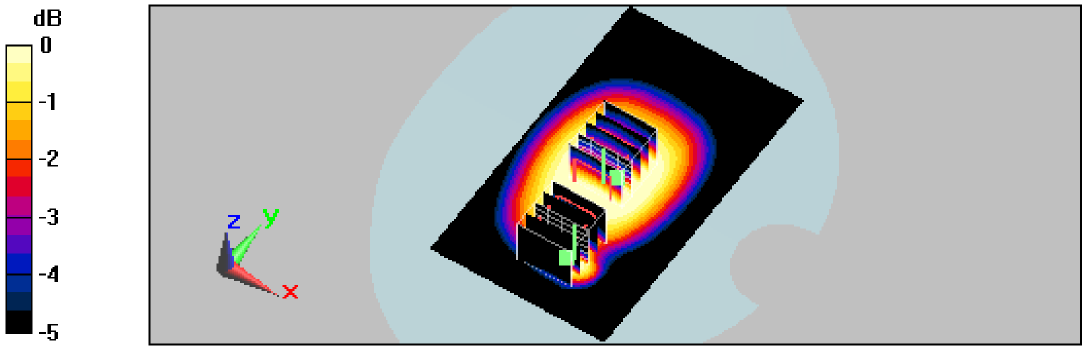
Communication System: GPRS 850 (1Down, 4Up); Frequency: 824.2 MHz;Duty Cycle: 1:2
Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.959 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.526 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24 V/m; Power Drift = -0.054 dB
Peak SAR (extrapolated) = 0.561 W/kg
SAR(1 g) = 0.459 mW/g; SAR(10 g) = 0.362 mW/g
Maximum value of SAR (measured) = 0.519 mW/g

Flat/Zoom Scan (5x5x7)/Cube 1:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24 V/m; Power Drift = -0.054 dB
Peak SAR (extrapolated) = 0.617 W/kg
SAR(1 g) = 0.351 mW/g; SAR(10 g) = 0.226 mW/g
Maximum value of SAR (measured) = 0.446 mW/g



0 dB = 0.446mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 10:23:10 AM

#21_Flat_GPRS 850 CH190_1D4U_Side 2 to Phantom_10mm_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

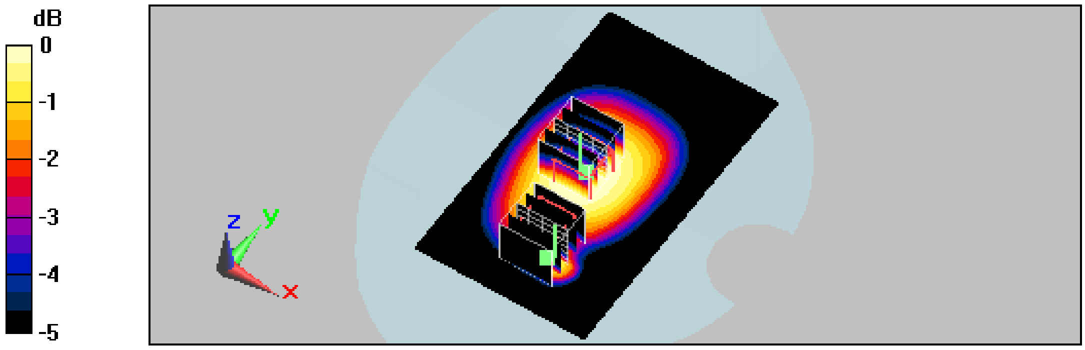
Communication System: GPRS 850 (1Down, 4Up); Frequency: 836.6 MHz;Duty Cycle: 1:2
Medium parameters used: f = 837 MHz; σ = 0.977 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.716 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.3 V/m; Power Drift = 0.00276 dB
Peak SAR (extrapolated) = 0.866 W/kg
SAR(1 g) = 0.490 mW/g; SAR(10 g) = 0.303 mW/g
Maximum value of SAR (measured) = 0.619 mW/g

Flat/Zoom Scan (5x5x7)/Cube 1:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.3 V/m; Power Drift = 0.00276 dB
Peak SAR (extrapolated) = 0.761 W/kg
SAR(1 g) = 0.621 mW/g; SAR(10 g) = 0.489 mW/g
Maximum value of SAR (measured) = 0.700 mW/g



0 dB = 0.700mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 8:01:35 AM

#19_Flat_GPRS 850 CH251_1D4U_Side 2 to Phantom_10mm_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

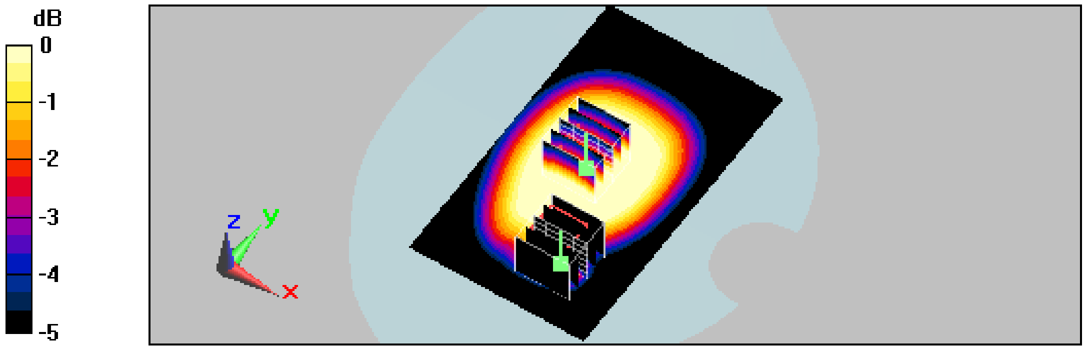
Communication System: GPRS 850 (1Down, 4Up); Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; σ = 1 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.735 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.7 V/m; Power Drift = -0.00424 dB
Peak SAR (extrapolated) = 0.799 W/kg
SAR(1 g) = 0.642 mW/g; SAR(10 g) = 0.497 mW/g
Maximum value of SAR (measured) = 0.733 mW/g

Flat/Zoom Scan (5x5x7)/Cube 1:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.7 V/m; Power Drift = -0.00424 dB
Peak SAR (extrapolated) = 0.658 W/kg
SAR(1 g) = 0.390 mW/g; SAR(10 g) = 0.252 mW/g
Maximum value of SAR (measured) = 0.525 mW/g



0 dB = 0.525mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 4:57:45 AM

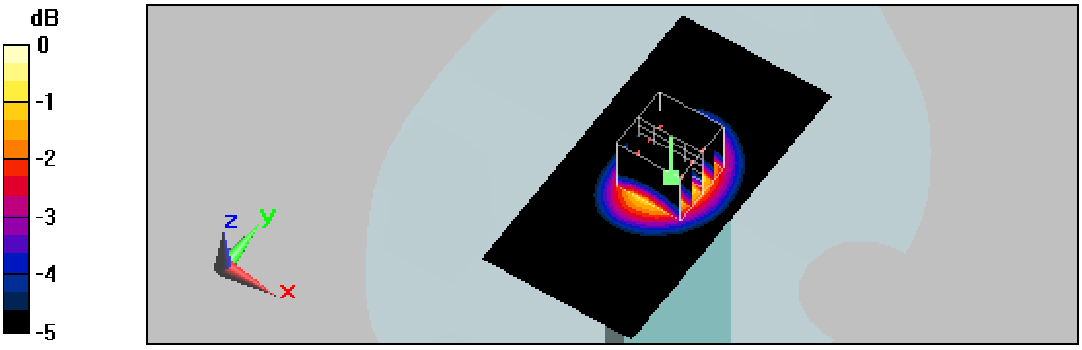
#23_Flat_GPRS 850 CH251_1D4U_Side 4 to phantom 10mm_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS 850 (1Down, 4Up); Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; σ = 1 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (51x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.189 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.9 V/m; Power Drift = -0.040 dB
Peak SAR (extrapolated) = 0.218 W/kg
SAR(1 g) = 0.153 mW/g; SAR(10 g) = 0.102 mW/g
Maximum value of SAR (measured) = 0.189 mW/g



0 dB = 0.189mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 3:29:30 AM

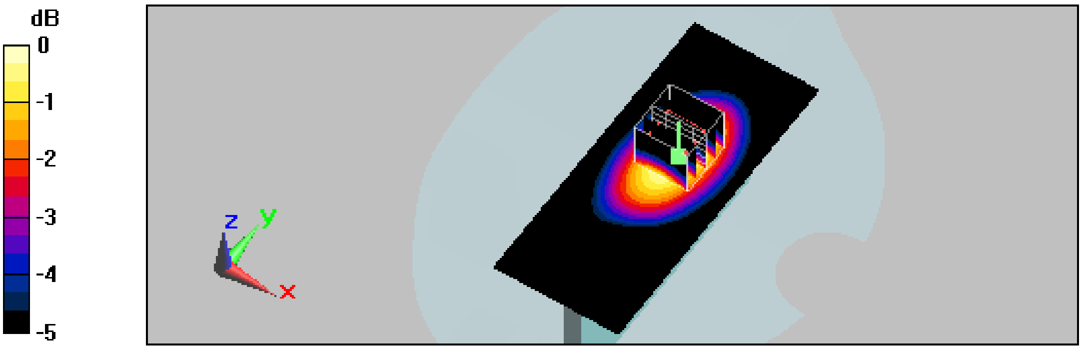
#24_Flat_GPRS 850 CH251_1D4U_Side 5 to phantom 10mm_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS 850 (1Down, 4Up); Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; σ = 1 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (51x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.247 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.5 V/m; Power Drift = -0.137 dB
Peak SAR (extrapolated) = 0.281 W/kg
SAR(1 g) = 0.204 mW/g; SAR(10 g) = 0.144 mW/g
Maximum value of SAR (measured) = 0.248 mW/g



0 dB = 0.248mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 1:12:16 AM

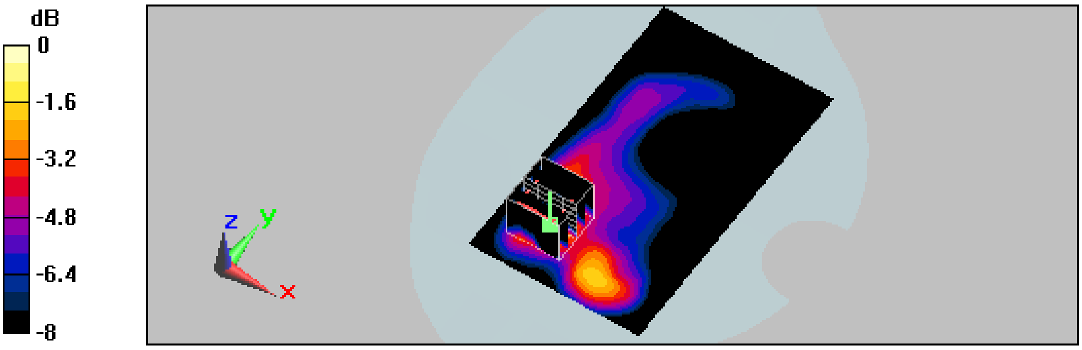
#14_Flat_GPRS PCS CH810_1D4U_Side 1 to Phantom_10mm_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS PCS (1Down,4Up); Frequency: 1909.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 1910 MHz; σ = 1.52 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(8.58, 8.58, 8.58); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.281 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.78 V/m; Power Drift = -0.041 dB
Peak SAR (extrapolated) = 0.379 W/kg
SAR(1 g) = 0.219 mW/g; SAR(10 g) = 0.116 mW/g
Maximum value of SAR (measured) = 0.285 mW/g



0 dB = 0.285mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/27/2013 11:58:03 PM

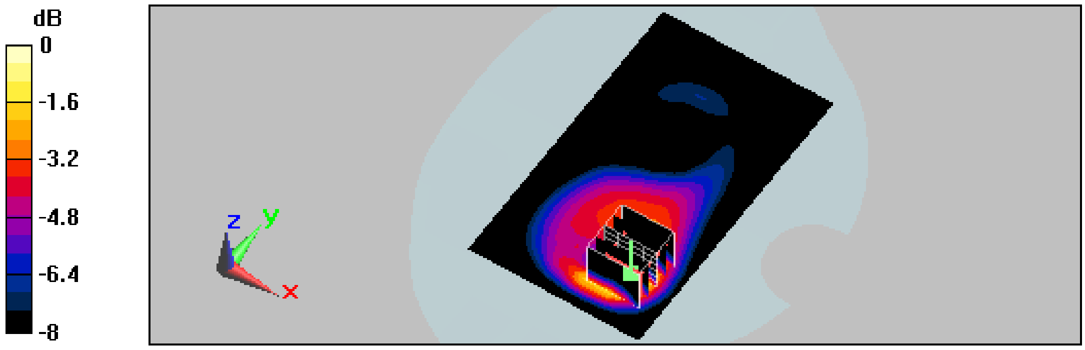
#13_Flat_GPRS PCS CH810_1D4U_Side 2 to Phantom_10mm_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS PCS (1Down,4Up); Frequency: 1909.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 1910 MHz; σ = 1.52 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(8.58, 8.58, 8.58); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.510 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.03 V/m; Power Drift = -0.020 dB
Peak SAR (extrapolated) = 0.686 W/kg
SAR(1 g) = 0.402 mW/g; SAR(10 g) = 0.221 mW/g
Maximum value of SAR (measured) = 0.548 mW/g



0 dB = 0.548mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 1:38:51 AM

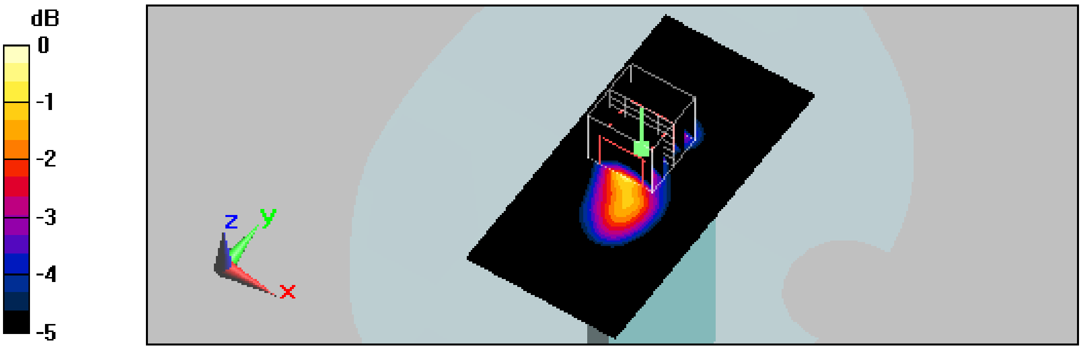
#15_Flat_GPRS PCS CH810_1D4U_Side 4 to phantom 10mm_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS PCS (1Down,4Up); Frequency: 1909.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 1910 MHz; σ = 1.52 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(8.58, 8.58, 8.58); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (51x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.205 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.5 V/m; Power Drift = 0.056 dB
Peak SAR (extrapolated) = 0.255 W/kg
SAR(1 g) = 0.153 mW/g; SAR(10 g) = 0.085 mW/g
Maximum value of SAR (measured) = 0.208 mW/g



0 dB = 0.208mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 2:19:43 AM

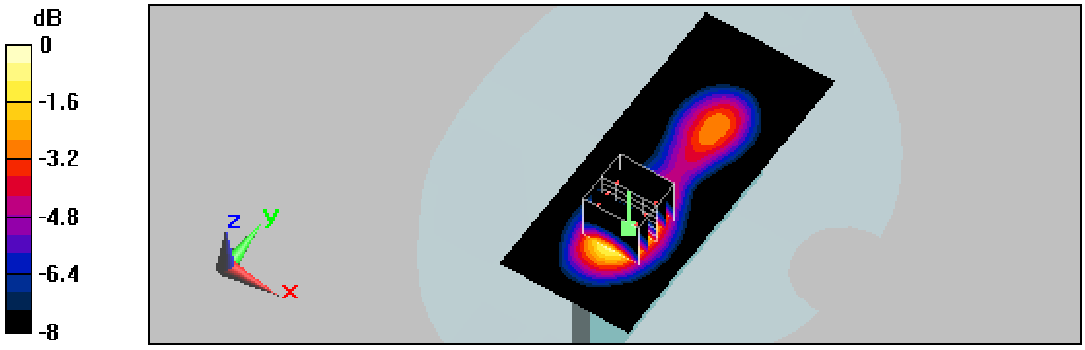
#16_Flat_GPRS PCS CH810_1D4U_Side 5 to phantom 10mm_SIM1
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: GPRS PCS (1Down,4Up); Frequency: 1909.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 1910 MHz; σ = 1.52 mho/m; εr = 53.4; ρ = 1000 kg/m3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(8.58, 8.58, 8.58); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (51x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.360 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.01 V/m; Power Drift = -0.041 dB
Peak SAR (extrapolated) = 0.435 W/kg
SAR(1 g) = 0.266 mW/g; SAR(10 g) = 0.156 mW/g
Maximum value of SAR (measured) = 0.356 mW/g



0 dB = 0.356mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 5:31:02 AM

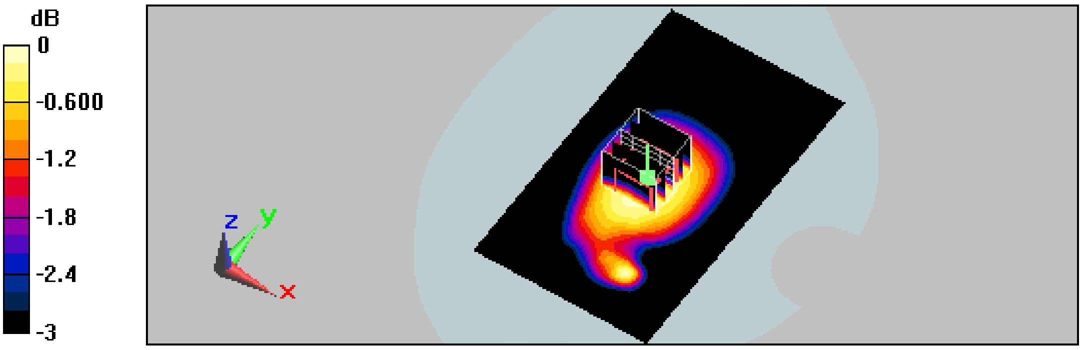
#27_Flat_WCDMA Band V CH4233_Side 2 to Phantom_10mm
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: WCDMA Band V; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 847 MHz; σ = 0.998 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.225 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15 V/m; Power Drift = 0.018 dB
Peak SAR (extrapolated) = 0.246 W/kg
SAR(1 g) = 0.198 mW/g; SAR(10 g) = 0.155 mW/g
Maximum value of SAR (measured) = 0.226 mW/g



0 dB = 0.226mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 7:36:27 AM

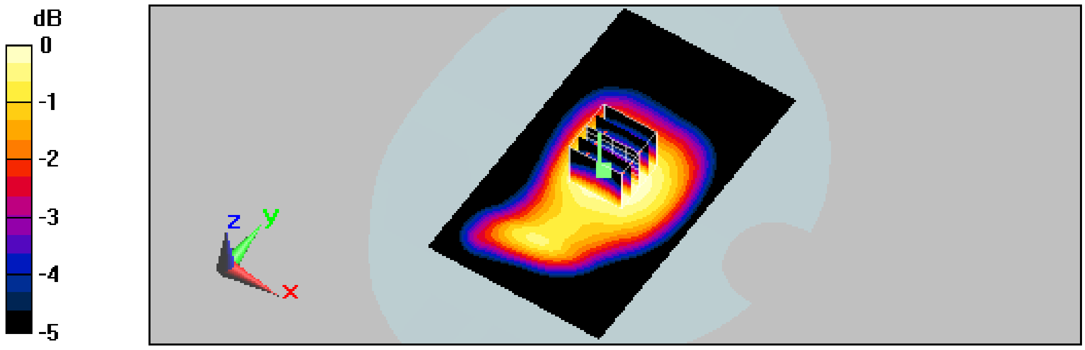
#28_Flat_WCDMA Band V CH4233_Side 1 to Phantom_10mm
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: WCDMA Band V; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 847 MHz; σ = 0.998 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.063 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.13 V/m; Power Drift = 0.014 dB
Peak SAR (extrapolated) = 0.068 W/kg
SAR(1 g) = 0.055 mW/g; SAR(10 g) = 0.043 mW/g
Maximum value of SAR (measured) = 0.062 mW/g



0 dB = 0.062mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 5:12:48 AM

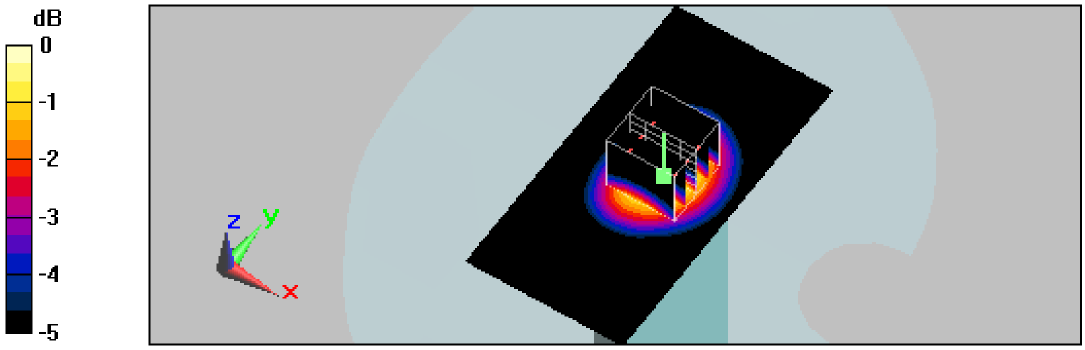
#29_Flat_WCDMA Band V CH4233_Side 4 to phantom 10mm
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: WCDMA Band V; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 847 MHz; σ = 0.998 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (51x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.050 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.15 V/m; Power Drift = -0.044 dB
Peak SAR (extrapolated) = 0.058 W/kg
SAR(1 g) = 0.040 mW/g; SAR(10 g) = 0.027 mW/g
Maximum value of SAR (measured) = 0.050 mW/g



0 dB = 0.050mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 3:46:09 AM

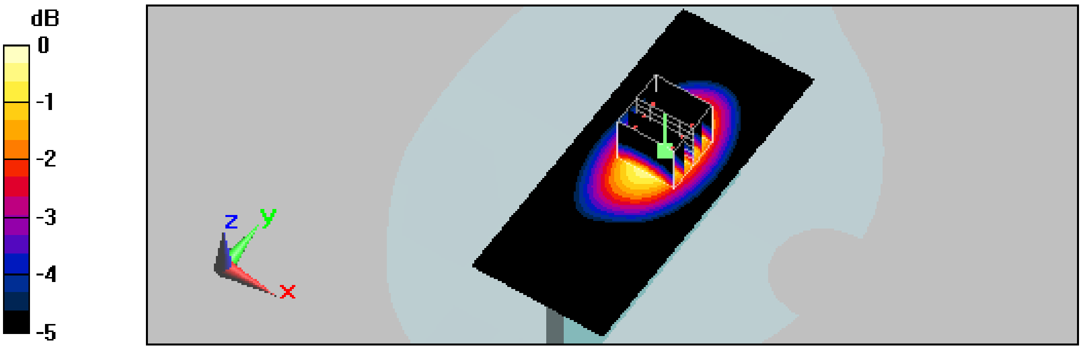
#30_Flat_WCDMA Band V CH4233_Side 5 to phantom 10mm
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: WCDMA Band V; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 847 MHz; σ = 0.998 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (51x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.065 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.86 V/m; Power Drift = -0.013 dB
Peak SAR (extrapolated) = 0.074 W/kg
SAR(1 g) = 0.054 mW/g; SAR(10 g) = 0.038 mW/g
Maximum value of SAR (measured) = 0.065 mW/g



0 dB = 0.065mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 5:50:09 PM

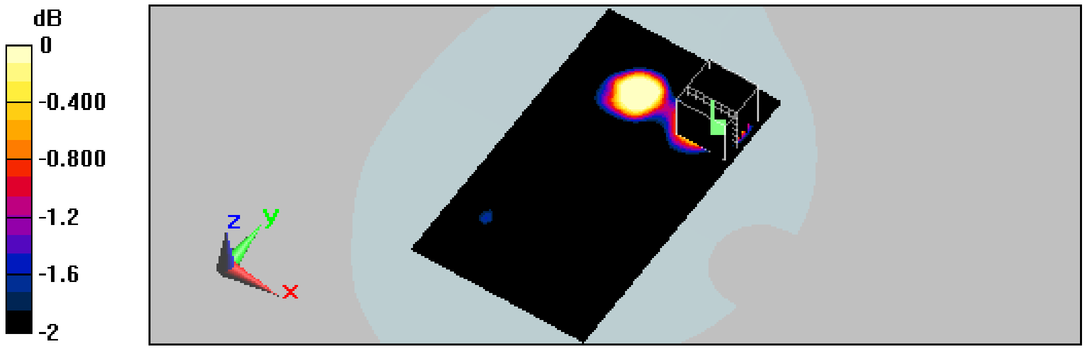
#36_Flat_802.11b CH11_1M_Side 1 to Phantom_10mm_Headset
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: IEEE 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.98 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.88, 7.88, 7.88); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.029 mW/g

Flat/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.56 V/m; Power Drift = -0.074 dB
Peak SAR (extrapolated) = 0.024 W/kg
SAR(1 g) = 0.012 mW/g; SAR(10 g) = 0.00614 mW/g
Maximum value of SAR (measured) = 0.017 mW/g



0 dB = 0.017mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 5:21:39 PM

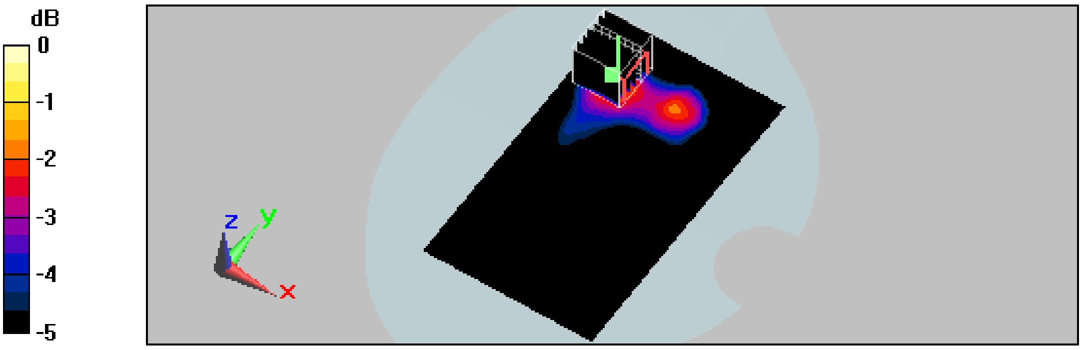
#35_Flat_802.11b CH11_1M_Side 2 to Phantom_10mm_Headset
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: IEEE 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.98 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.88, 7.88, 7.88); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.091 mW/g

Flat/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.66 V/m; Power Drift = 0.173 dB
Peak SAR (extrapolated) = 0.170 W/kg
SAR(1 g) = 0.081 mW/g; SAR(10 g) = 0.038 mW/g
Maximum value of SAR (measured) = 0.125 mW/g



0 dB = 0.125mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 6:40:26 PM

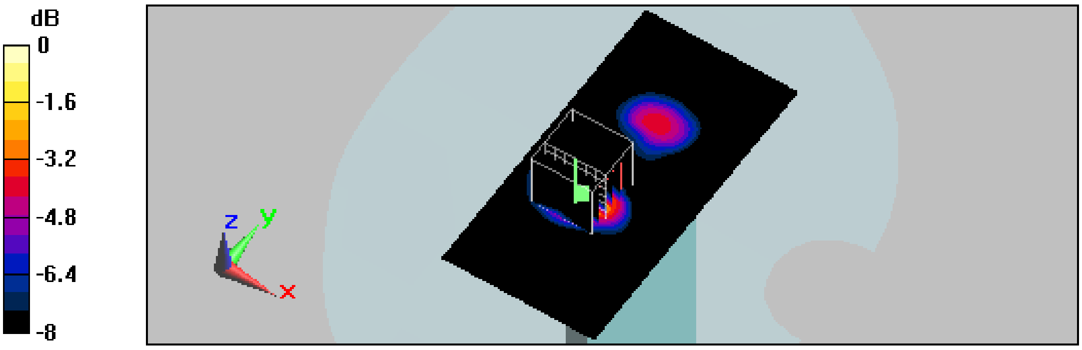
#37_Flat_802.11b CH11_1M_Side 3 to phantom 10mm_Headset
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: IEEE 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.98 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.88, 7.88, 7.88); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (51x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.075 mW/g

Flat/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.37 V/m; Power Drift = 0.189 dB
Peak SAR (extrapolated) = 0.118 W/kg
SAR(1 g) = 0.054 mW/g; SAR(10 g) = 0.025 mW/g
Maximum value of SAR (measured) = 0.080 mW/g



0 dB = 0.080mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 7:09:41 PM

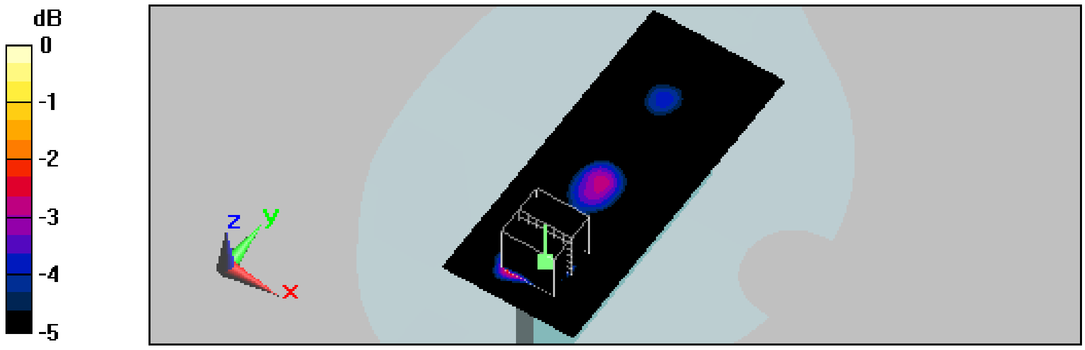
#38_Flat_802.11b CH11_1M_Side 6 to phantom 10mm_Headset
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: IEEE 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.98 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.88, 7.88, 7.88); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (51x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.051 mW/g

Flat/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.66 V/m; Power Drift = 0.089 dB
Peak SAR (extrapolated) = 0.078 W/kg
SAR(1 g) = 0.038 mW/g; SAR(10 g) = 0.019 mW/g
Maximum value of SAR (measured) = 0.056 mW/g



0 dB = 0.056mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 9:10:13 PM

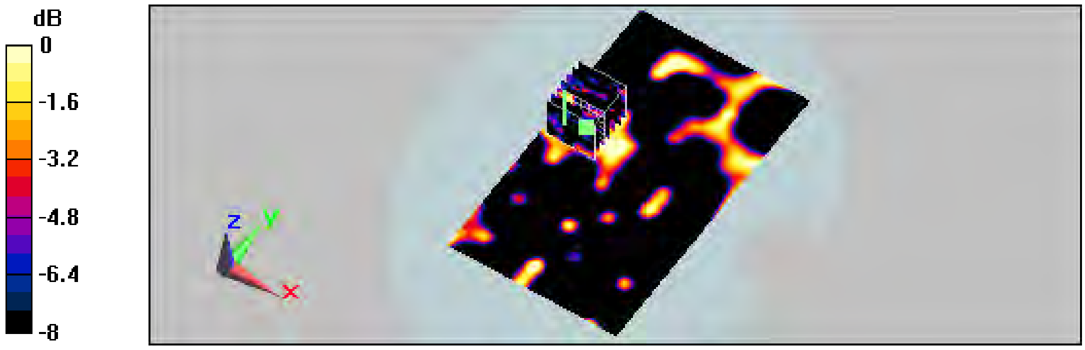
#40_Flat_BT CH78_BT 3.0_Side 1 to Phantom_10mm
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: Bluetooth; Frequency: 2480 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2480 MHz; σ = 2.01 mho/m; εr = 51.9; ρ = 1000 kg/m3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.88, 7.88, 7.88); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.00396 mW/g

Flat/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.481 V/m; Power Drift = -0.021 dB
Peak SAR (extrapolated) = 0.00311 W/kg
SAR(1 g) = 0.000237 mW/g; SAR(10 g) = 0.0000505 mW/g
Maximum value of SAR (measured) = 0.00183 mW/g



0 dB = 0.00183mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 7:52:26 PM

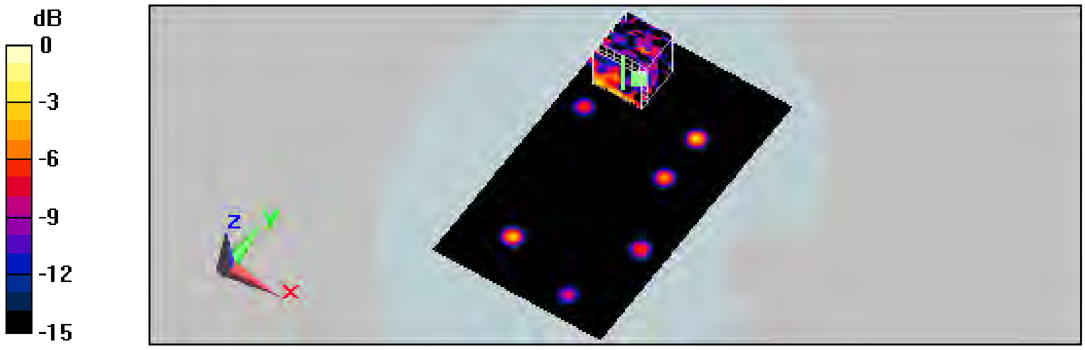
#39_Flat_BT CH78_BT 3.0_Side 2 to Phantom_10mm
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: Bluetooth; Frequency: 2480 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2480 MHz; σ = 2.01 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.88, 7.88, 7.88); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.00233 mW/g

Flat/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.589 V/m; Power Drift = -0.188 dB
Peak SAR (extrapolated) = 0.00684 W/kg
SAR(1 g) = 0.00208 mW/g; SAR(10 g) = 0.000734 mW/g
Maximum value of SAR (measured) = 0.00354 mW/g



0 dB = 0.00354mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 10:39:03 PM

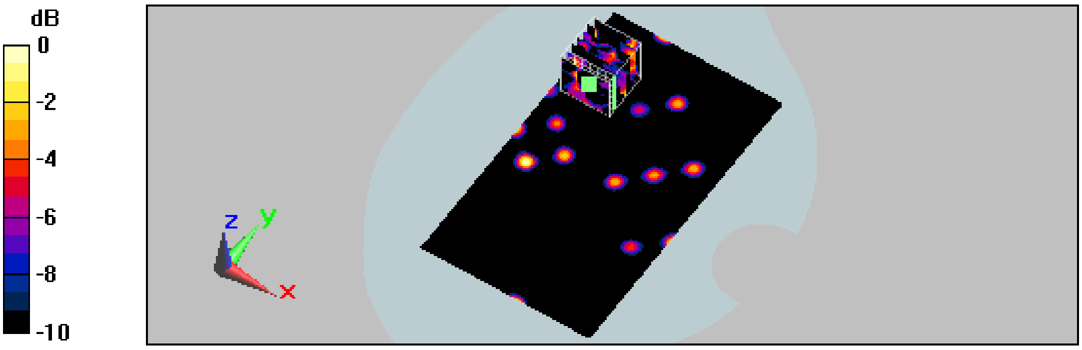
#42_Flat_BT CH39_BT 4.0_Side 1 to Phantom_10mm
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: Bluetooth 4.0; Frequency: 2480 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2480 MHz; σ = 2.01 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.88, 7.88, 7.88); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.00203 mW/g

Flat/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.241 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.00314 W/kg
SAR(1 g) = 0.000199 mW/g; SAR(10 g) = 0.0000351 mW/g
Maximum value of SAR (measured) = 0.00213 mW/g



0 dB = 0.00213mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 8:41:00 PM

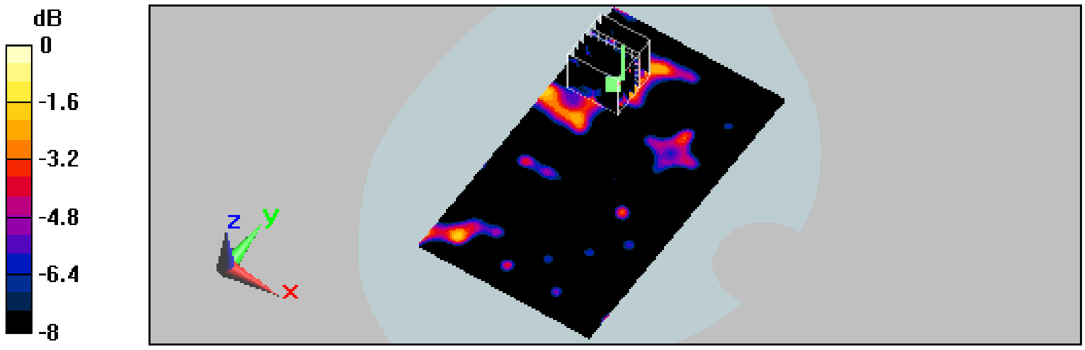
#41_Flat_BT CH39_BT 4.0_Side 2 to Phantom_10mm
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

Communication System: Bluetooth 4.0; Frequency: 2480 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2480 MHz; σ = 2.01 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(7.88, 7.88, 7.88); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.00274 mW/g

Flat/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.443 V/m; Power Drift = 0.138 dB
Peak SAR (extrapolated) = 0.00788 W/kg
SAR(1 g) = 0.00165 mW/g; SAR(10 g) = 0.000457 mW/g
Maximum value of SAR (measured) = 0.00363 mW/g



0 dB = 0.00363mW/g

Test Laboratory: A Test Lab Techno Corp.
Date/Time: 4/28/2013 8:58:11 AM

#43_Flat_GPRS 850 CH251_1D4U_Side 2 to Phantom_10mm_SIM1_repeat #19
DUT: QBA769; Type: Smartphone; Serial: 354515040754300

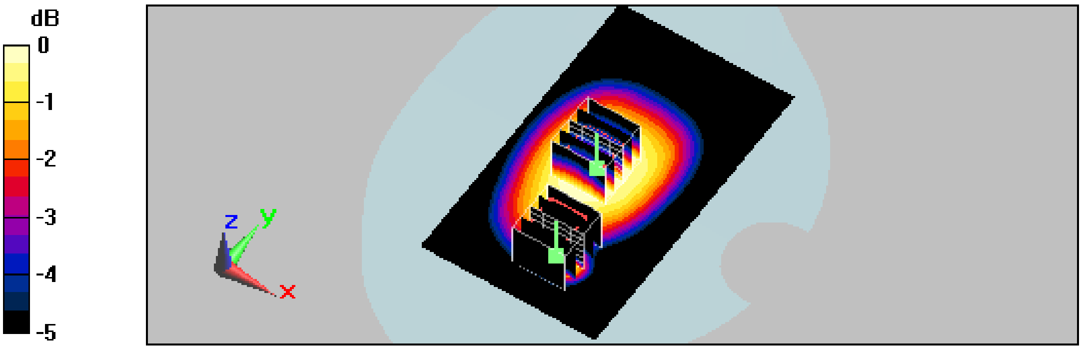
Communication System: GPRS 850 (1Down, 4Up); Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; σ = 1 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV3 - SN3519; ConvF(10.56, 10.56, 10.56); Calibrated: 2/20/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 2/13/2013
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x121x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.889 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30 V/m; Power Drift = -0.039 dB
Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.608 mW/g; SAR(10 g) = 0.357 mW/g
Maximum value of SAR (measured) = 0.832 mW/g

Flat/Zoom Scan (5x5x7)/Cube 1:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30 V/m; Power Drift = -0.039 dB
Peak SAR (extrapolated) = 0.902 W/kg
SAR(1 g) = 0.736 mW/g; SAR(10 g) = 0.573 mW/g
Maximum value of SAR (measured) = 0.837 mW/g



0 dB = 0.837mW/g

Appendix C - Calibration

All of the instruments Calibration information are listed below.

- Dipole _ D835V2 SN:4d082 Calibration No.D835V2-4d082_Jul12
- Dipole _ D1900V2 SN:5d111 Calibration No.D1900V2-5d111_Jul12
- Dipole _ D2450V2 SN:712 Calibration No.D2450V2-712_Feb13
- Probe _ EX3DV3 SN:3519 Calibration No.EX3-3519_Feb13
- DAE _ DAE4 SN:779 Calibration No.DAE4-779_Feb13

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

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

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

Accreditation No.: SCS 108

Client **ATL (Auden)**

Certificate No: **D835V2-4d082_Jul12**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d082
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 25, 2012

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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
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-11)	In house check: Oct-12

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

Issued: July 25, 2012

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

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
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	V52.8.1
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	40.5 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.33 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.35 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.52 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.10 mW /g ± 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	53.3 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.44 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.54 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.29 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.9 Ω - 3.4 jΩ
Return Loss	- 28.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.0 Ω - 5.4 jΩ
Return Loss	- 24.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.389 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 17, 2008

DASY5 Validation Report for Head TSL

Date: 25.07.2012

Test Laboratory: SPEAG, Zurich, Switzerland

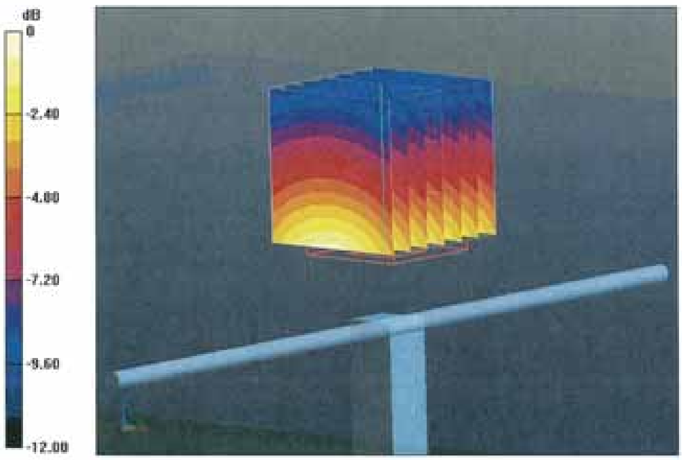
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d082

Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma = 0.89$ mho/m; $\varepsilon_r = 40.5$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

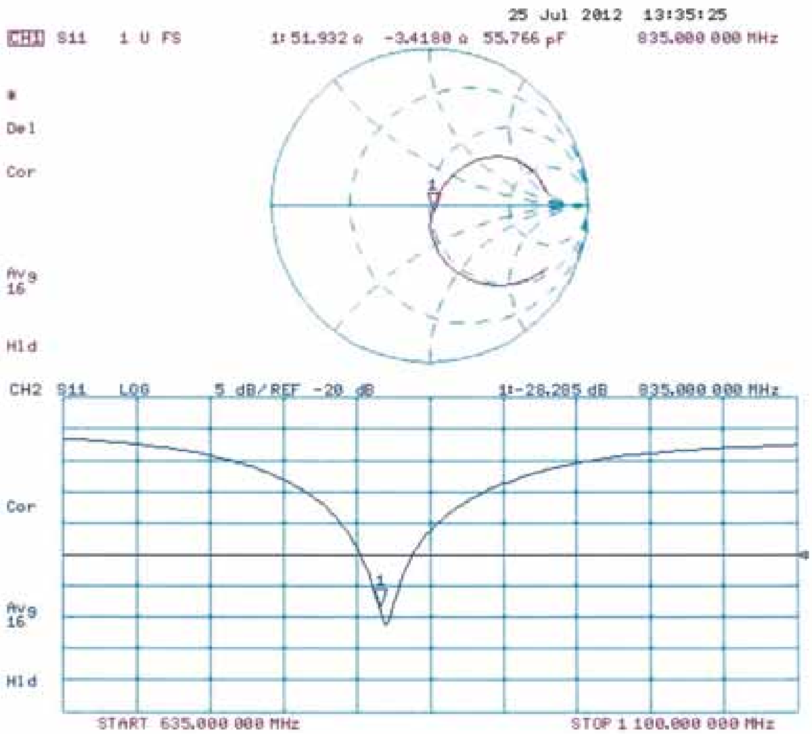
- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm 2/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.079 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.436 mW/g
SAR(1 g) = 2.33 mW/g; SAR(10 g) = 1.52 mW/g
Maximum value of SAR (measured) = 2.71 mW/g



0 dB = 2.71 mW/g = 8.66 dB mW/g

Impedance Measurement Plot for Head TSL



Certificate No: D835V2-4d082_Jul12 Page 6 of 8

DASY5 Validation Report for Body TSL

Date: 25.07.2012

Test Laboratory: SPEAG, Zurich, Switzerland

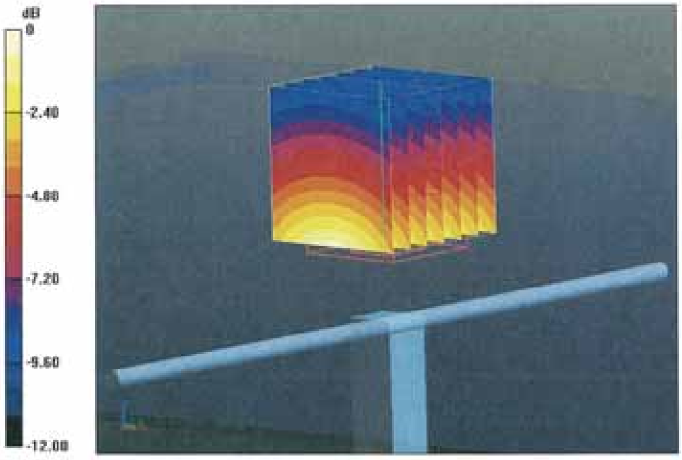
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d082

Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 53.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

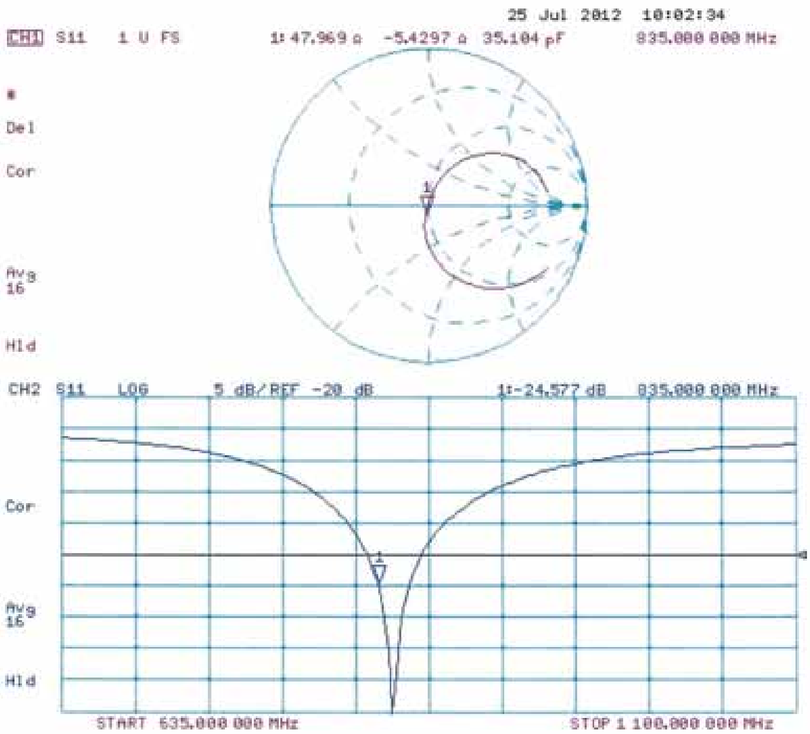
- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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 = 55.616 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.563 mW/g
SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g
Maximum value of SAR (measured) = 2.85 mW/g



0 dB = 2.85 mW/g = 9.10 dB mW/g

Impedance Measurement Plot for Body TSL



Certificate No: D835V2-4d082_Jul12 Page 8 of 8

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Accreditation No.: SCS 108

Client **ATL (Auden)**

Certificate No: D1900V2-5d111_Jul12

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d111
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 20, 2012

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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
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-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 20, 2012

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

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	V52.8.1
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	39.9 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.82 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**39.6 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.18 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.8 mW /g ± 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	52.6 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.1 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**40.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.33 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.9 Ω + 5.6 jΩ
Return Loss	- 25.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.2 Ω + 6.1 jΩ
Return Loss	- 22.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 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 28, 2008

DASY5 Validation Report for Head TSL

Date: 20.07.2012

Test Laboratory: SPEAG, Zurich, Switzerland

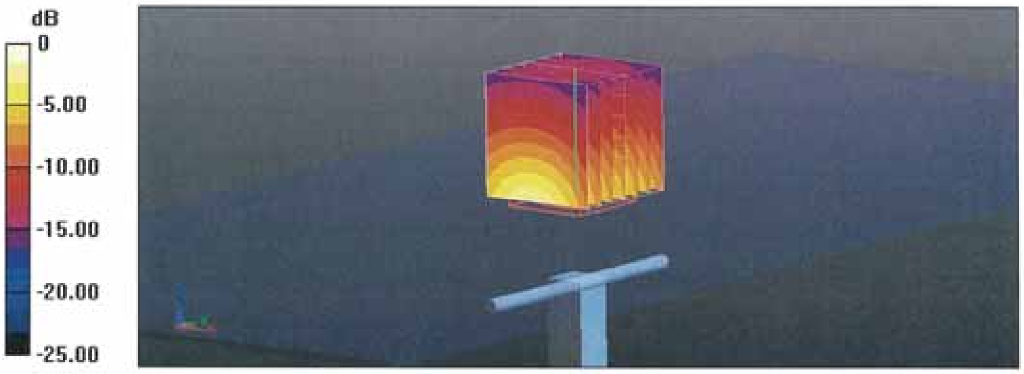
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d111

Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

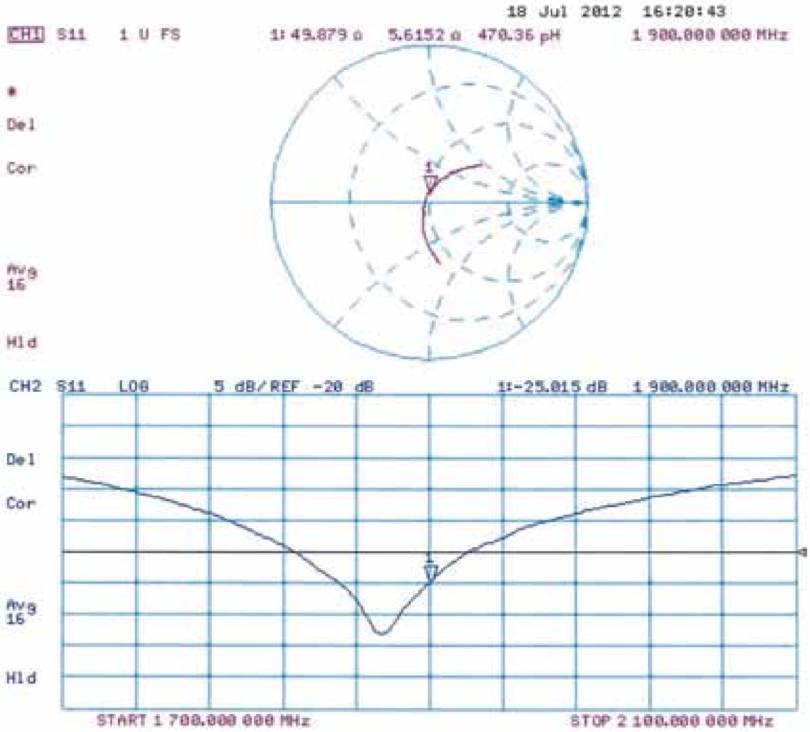
- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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 = 96.871 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 17.499 mW/g
SAR(1 g) = 9.82 mW/g; SAR(10 g) = 5.18 mW/g
Maximum value of SAR (measured) = 12.1 mW/g



0 dB = 12.1 mW/g = 21.66 dB mW/g

Impedance Measurement Plot for Head TSL



Certificate No: D1900V2-5d111_Jul12 Page 6 of 8

DASY5 Validation Report for Body TSL

Date: 20.07.2012

Test Laboratory: SPEAG, Zurich, Switzerland

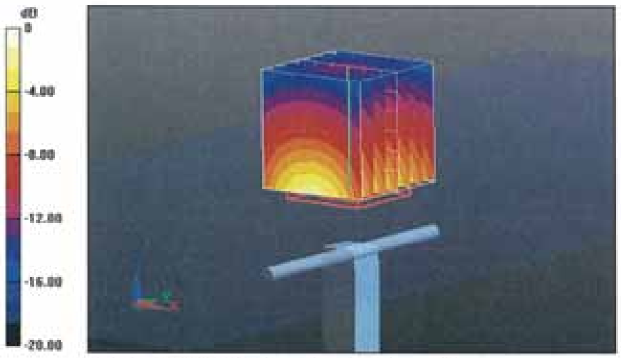
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d111

Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma = 1.52$ mho/m; $\varepsilon_r = 52.6$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

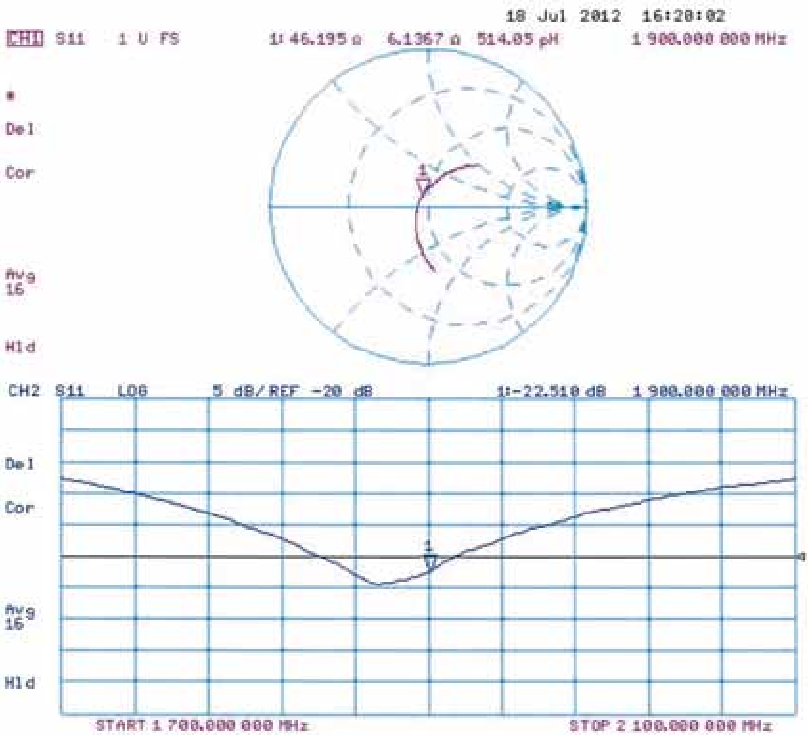
- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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 = 95.399 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 17.454 mW/g
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.33 mW/g
Maximum value of SAR (measured) = 12.7 mW/g



0 dB = 12.7 mW/g = 22.08 dB mW/g

Impedance Measurement Plot for Body TSL



Certificate No: D1900V2-5d111_Jul12 Page 8 of 8

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Accreditation No.: **SCS 108**

Client **ATL (Auden)**

Certificate No: **D2450V2-712_Feb13**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 712
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 19, 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 ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_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	Leif Klysner
Approved by:	Katja Pokovic	Technical Manager	Katja Pokovic

Issued: February 20, 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	V52.8.5
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	37.9 ± 6 %	1.85 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.5 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	50.9 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.95 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.5 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.8 Ω + 1.3 jΩ
Return Loss	- 26.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.4 Ω + 5.0 jΩ
Return Loss	- 25.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.158 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	July 05, 2002

DASY5 Validation Report for Head TSL

Date: 19.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

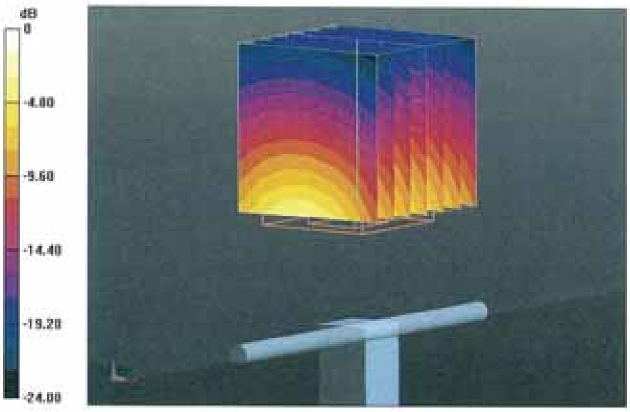
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 712

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.85 S/m; ε_r = 37.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

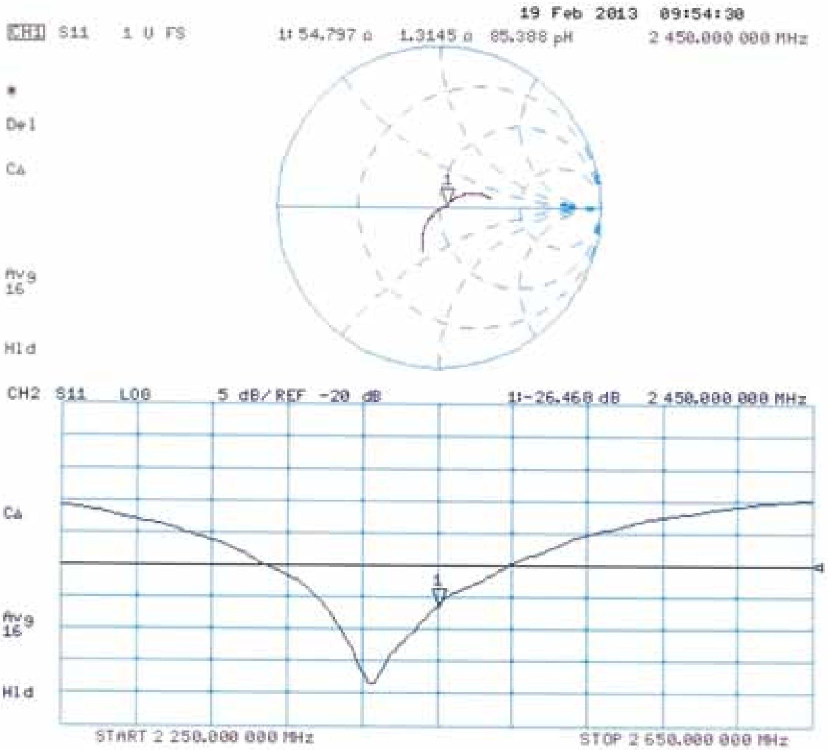
- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.359 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 28.2 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.2 W/kg
Maximum value of SAR (measured) = 17.1 W/kg



0 dB = 17.1 W/kg = 12.33 dBW/kg

Impedance Measurement Plot for Head TSL



Certificate No: D2450V2-712_Feb13 Page 6 of 8

DASY5 Validation Report for Body TSL

Date: 18.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

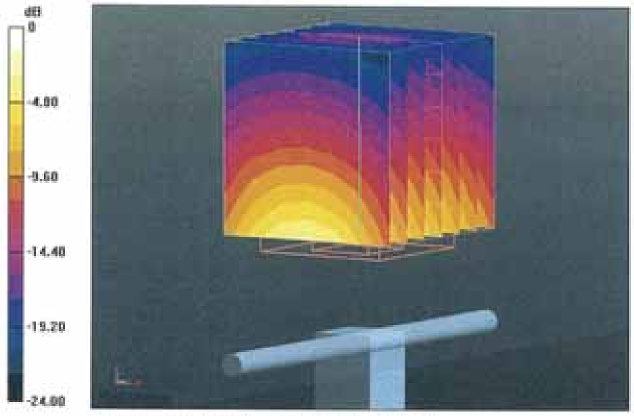
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 712

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 S/m; ε_r = 50.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

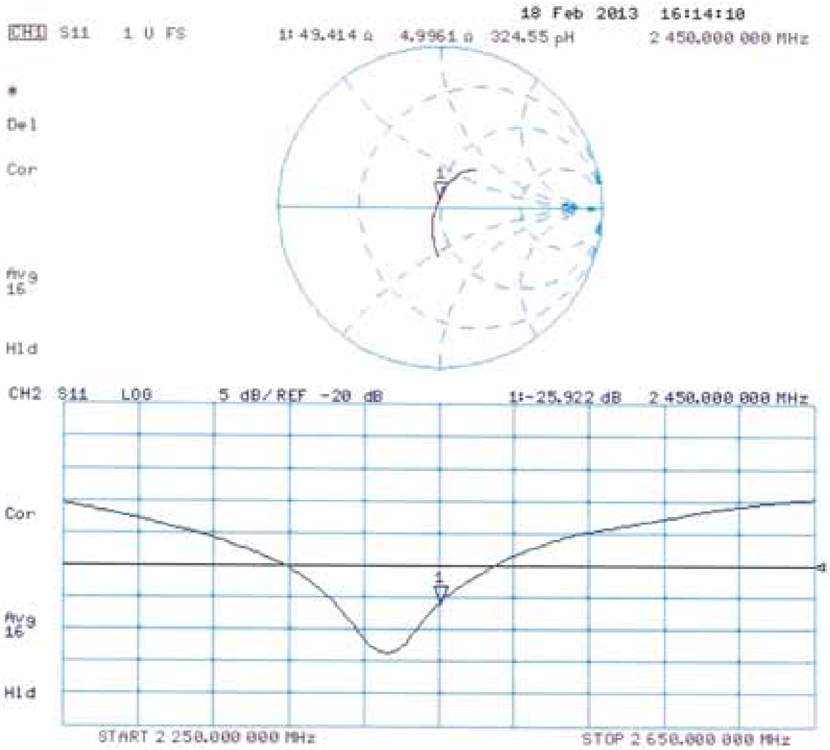
- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.989 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.95 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



Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: **SCS 108**

Client **ATL (Auden)**

Certificate No: **EX3-3519_Feb13**

CALIBRATION CERTIFICATE

Object	EX3DV3 - SN:3519
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:	February 20, 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-13
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: February 22, 2013

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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 EX3DV3

SN:3519

Manufactured: March 8, 2004
Calibrated: February 20, 2013

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

DASY/EASY - Parameters of Probe: EX3DV3 - SN:3519

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.82	0.70	0.72	± 10.1 %
DCP (mV)[B]	100.2	99.1	102.5	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	112.7	±3.0 %
		Y	0.0	0.0	1.0		116.6	
		Z	0.0	0.0	1.0		142.1	

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: EX3DV3 - SN:3519

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	10.80	10.80	10.80	0.13	1.43	± 13.4 %
750	41.9	0.89	11.12	11.12	11.12	0.18	1.41	± 12.0 %
835	41.5	0.90	10.73	10.73	10.73	0.12	1.92	± 12.0 %
900	41.5	0.97	10.72	10.72	10.72	0.31	0.90	± 12.0 %
1750	40.1	1.37	9.03	9.03	9.03	0.30	0.91	± 12.0 %
1810	40.0	1.40	8.85	8.85	8.85	0.46	0.72	± 12.0 %
1900	40.0	1.40	8.79	8.79	8.79	0.34	0.83	± 12.0 %
2000	40.0	1.40	8.76	8.76	8.76	0.38	0.83	± 12.0 %
2100	39.8	1.49	8.93	8.93	8.93	0.76	0.57	± 12.0 %
2300	39.5	1.67	8.40	8.40	8.40	0.39	0.80	± 12.0 %
2450	39.2	1.80	7.94	7.94	7.94	0.31	0.92	± 12.0 %
2600	39.0	1.96	7.69	7.69	7.69	0.36	0.89	± 12.0 %
5200	36.0	4.66	4.99	4.99	4.99	0.41	1.80	± 13.1 %
5300	35.9	4.76	4.86	4.86	4.86	0.42	1.80	± 13.1 %
5500	35.6	4.96	4.51	4.51	4.51	0.45	1.80	± 13.1 %
5600	35.5	5.07	4.31	4.31	4.31	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.28	4.28	4.28	0.48	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: EX3DV3 - SN:3519

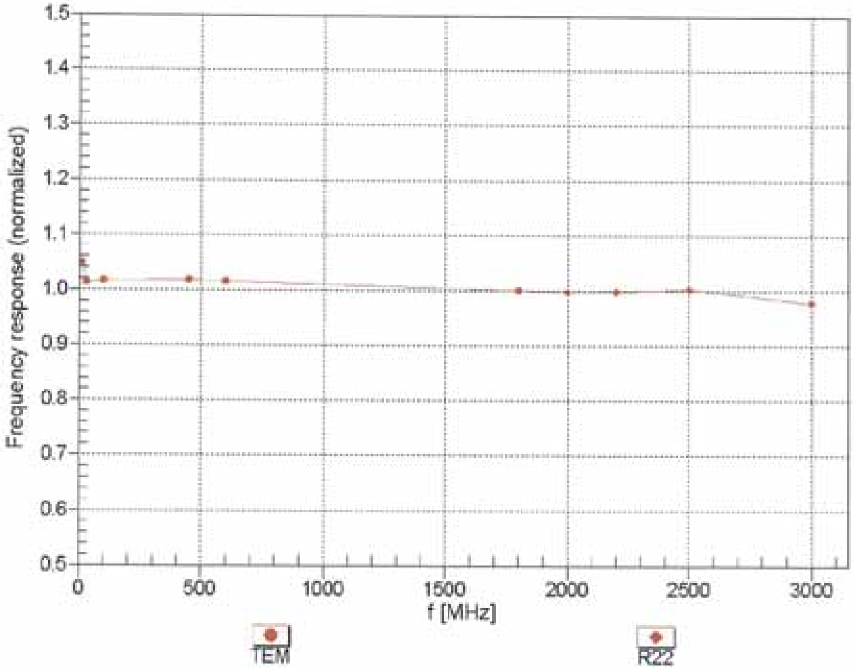
Calibration Parameter Determined in Body Tissue Simulating Media

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	11.79	11.79	11.79	0.05	1.25	± 13.4 %
750	55.5	0.96	10.78	10.78	10.78	0.42	0.86	± 12.0 %
835	55.2	0.97	10.56	10.56	10.56	0.20	1.37	± 12.0 %
900	55.0	1.05	10.46	10.46	10.46	0.36	0.93	± 12.0 %
1750	53.4	1.49	8.99	8.99	8.99	0.49	0.69	± 12.0 %
1810	53.3	1.52	8.79	8.79	8.79	0.54	0.68	± 12.0 %
1900	53.3	1.52	8.58	8.58	8.58	0.26	1.00	± 12.0 %
2000	53.3	1.52	8.61	8.61	8.61	0.38	0.80	± 12.0 %
2100	53.2	1.62	8.72	8.72	8.72	0.24	1.09	± 12.0 %
2300	52.9	1.81	8.13	8.13	8.13	0.57	0.67	± 12.0 %
2450	52.7	1.95	7.88	7.88	7.88	0.80	0.50	± 12.0 %
2600	52.5	2.16	7.61	7.61	7.61	0.62	0.50	± 12.0 %
3500	51.3	3.31	7.14	7.14	7.14	0.33	1.24	± 13.1 %
5200	49.0	5.30	4.49	4.49	4.49	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.27	4.27	4.27	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.96	3.96	3.96	0.55	1.90	± 13.1 %
5600	48.5	5.77	3.63	3.63	3.63	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.88	3.88	3.88	0.59	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.

Frequency Response of E-Field

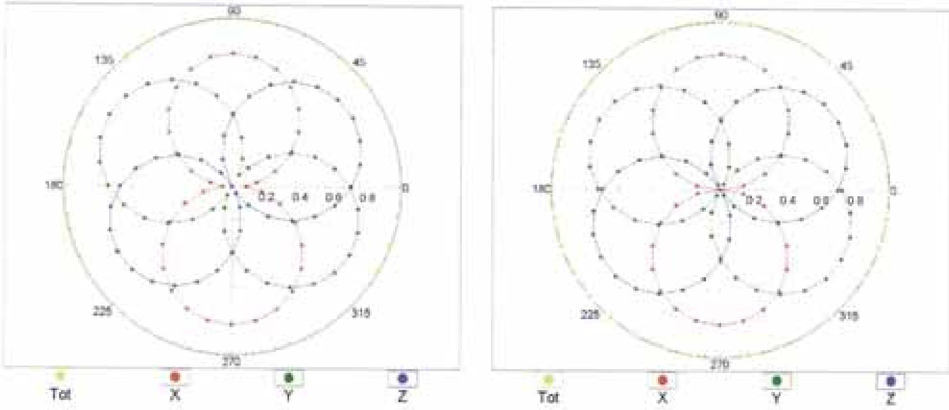
(TEM-Cell:ifi110 EXX, Waveguide: R22)

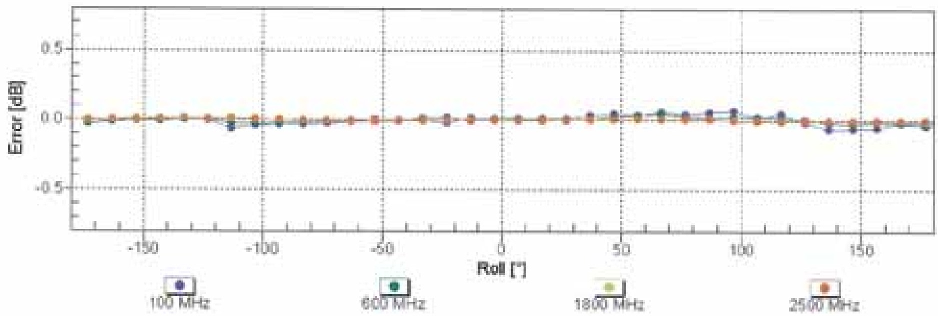


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$

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

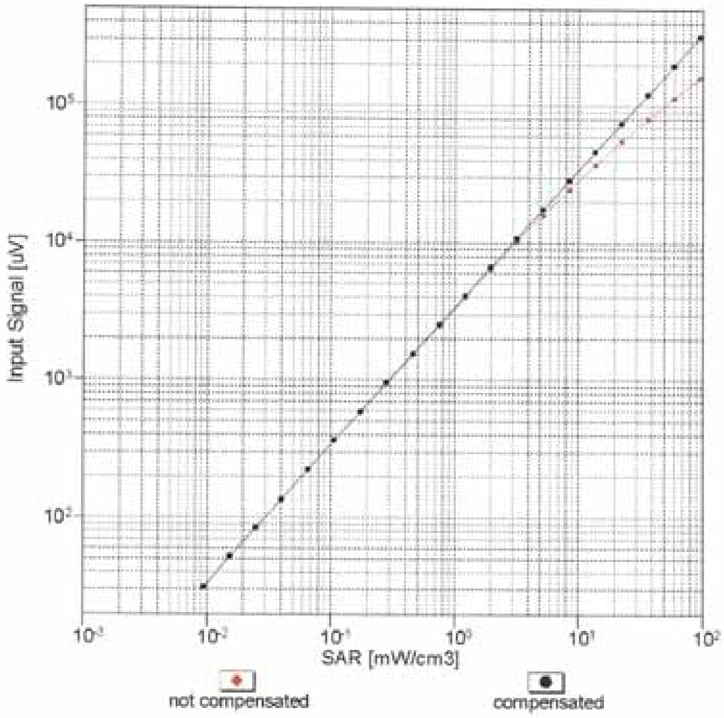


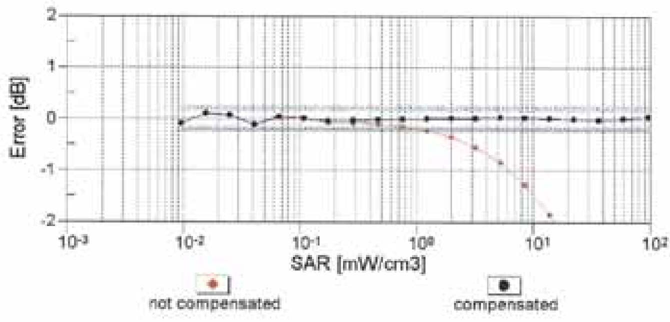


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

(TEM cell , f = 900 MHz)

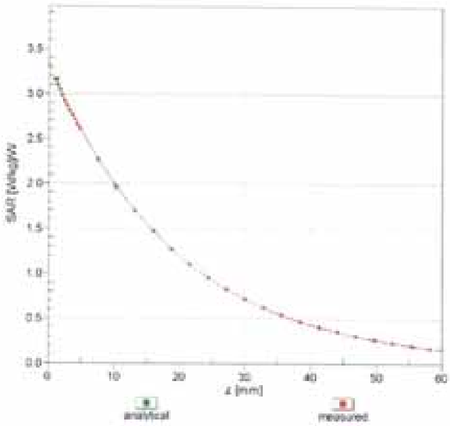




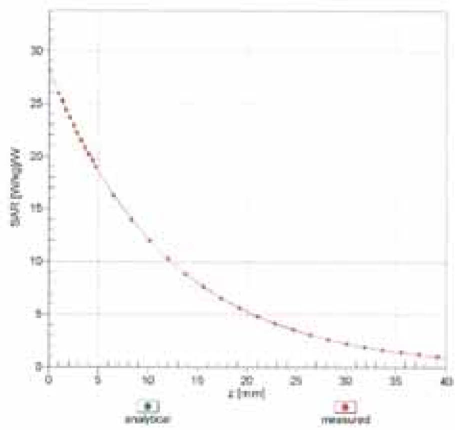
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

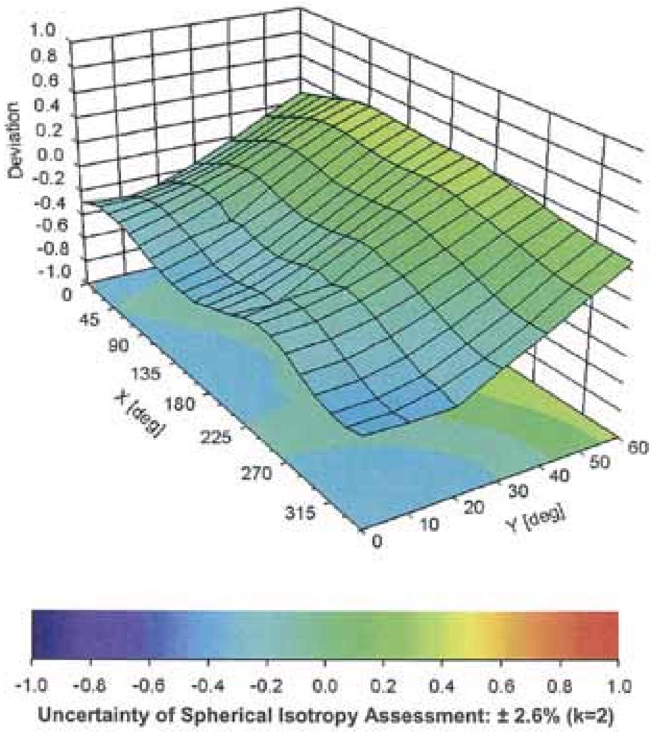


f = 1900 MHz,WGLS R22 (H_convF)



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: EX3DV3 - SN:3519

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-93.4
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

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Accreditation No.: **SCS 108**

Client **ATL (Auden)**

Certificate No: **DAE4-779_Feb13**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 779
Calibration procedure(s)	QA CAL-06.v25 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	February 13, 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
Keithley Multimeter Type 2001	SN: 0810278	02-Oct-12 (No:12728)	Oct-13
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-13 (in house check)	In house check: Jan-14
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-13 (in house check)	In house check: Jan-14

	Name	Function	Signature
Calibrated by:	Eric Hainfeld	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	i.V. B. Bimer

Issued: February 13, 2013

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

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.452 ± 0.02% (k=2)	403.694 ± 0.02% (k=2)	403.914 ± 0.02% (k=2)
Low Range	3.96902 ± 1.55% (k=2)	3.97887 ± 1.55% (k=2)	3.99319 ± 1.55% (k=2)

Connector Angle

Connector Angle to be used in DASY system	156.5 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199996.96	1.92	0.00
Channel X	+ Input	20001.89	1.69	0.01
Channel X	- Input	-19996.92	3.97	-0.02
Channel Y	+ Input	199996.16	1.24	0.00
Channel Y	+ Input	19999.20	-0.93	-0.00
Channel Y	- Input	-20000.26	0.76	-0.00
Channel Z	+ Input	199997.40	2.46	0.00
Channel Z	+ Input	20001.63	1.50	0.01
Channel Z	- Input	-19998.30	2.69	-0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2001.21	0.58	0.03
Channel X	+ Input	201.35	0.31	0.15
Channel X	- Input	-198.61	0.26	-0.13
Channel Y	+ Input	2000.66	0.18	0.01
Channel Y	+ Input	200.39	-0.58	-0.29
Channel Y	- Input	-199.01	0.03	-0.01
Channel Z	+ Input	2000.62	0.22	0.01
Channel Z	+ Input	200.34	-0.52	-0.26
Channel Z	- Input	-199.81	-0.83	0.42

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-2.78	-4.73
	- 200	5.70	4.22
Channel Y	200	14.58	13.79
	- 200	-15.41	-15.51
Channel Z	200	2.91	3.09
	- 200	-4.86	-4.74

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-2.01	-3.72
Channel Y	200	10.67	-	-0.58
Channel Z	200	7.80	8.55	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15602	13837
Channel Y	15845	15843
Channel Z	16202	15651

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.26	-0.87	2.39	0.52
Channel Y	-0.70	-2.45	1.01	0.66
Channel Z	-0.84	-1.90	0.45	0.44

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9