



PCTEST ENGINEERING LABORATORY, INC.

6660-B Dobbin Road, Columbia, MD 21045 USA
Tel. +1.410.290.6652 / Fax +1.410.290.6554
<http://www.pctestlab.com>



SAR COMPLIANCE EVALUATION REPORT

Applicant Name:
LG Electronics USA
1000 Sylvan Avenue
Englewood Cliffs, NJ 07632
United States

Date of Testing:
10/25/10 - 11/05/10
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1010221751.BEJ

FCC ID: BEJVL600

APPLICANT: LG ELECTRONICS USA

EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Application Type: Class II Permissive Change
FCC Rule Part(s): CFR §2.1093; FCC/OET Bulletin 65 Supplement C [June 2001]
FCC Classification: PCS Licensed Transmitter (PCB)
Model(s): VL600
Tx Frequency: 824.70 - 848.31 MHz (Cellular CDMA)
1851.25 - 1908.75 MHz (PCS CDMA)
782MHz (LTE)
Conducted Power: 23.96 dBm Cell. CDMA
24.13 dBm PCS CDMA
25.89 dBm LTE
Max. SAR Measurement: 0.78 W/kg Cell. CDMA Body SAR
1.05 W/kg PCS CDMA Body SAR
1.18 W/kg LTE-750 Body SAR
Test Device Serial No.: Pre-Production [S/N: SAR#1, FCC#9]
Class II Permissive Changes: See FCC Change Document
Date of Original Grant: 07/16/2010

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 ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in FCC/OET Bulletin 65 Supplement C (2001), IEEE 1528-2003 and in applicable Industry Canada Radio Standards Specifications (RSS); for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

PCTEST certifies that no party to this application has been subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.


Randy Ortanez
President



FCC ID: BEJVL600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 1 of 35

T A B L E O F C O N T E N T S

1	INTRODUCTION	3
2	TEST SITE LOCATION	4
3	SAR MEASUREMENT SETUP	5
4	DASY E-FIELD PROBE SYSTEM	7
5	PROBE CALIBRATION PROCESS	8
6	PHANTOM AND EQUIVALENT TISSUES.....	9
7	DOSIMETRIC ASSESSMENT & PHANTOM SPECS.....	11
8	SAR TEST POSITIONING	12
9	RF EXPOSURE LIMITS	13
10	FCC 3G MEASUREMENT PROCEDURES.....	14
11	SYSTEM VERIFICATION.....	16
12	4G LTE TEST CONFIGURATION.....	18
13	SAR DATA SUMMARY	22
14	EQUIPMENT LIST.....	25
15	MEASUREMENT UNCERTAINTIES	26
16	CONCLUSION.....	27
17	REFERENCES	28
18	SAR TEST SETUP PHOTOGRAPHS.....	30

FCC ID: BEJVL600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 2 of 35

1 INTRODUCTION

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [24]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [3] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

1.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) 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 Fig. 1-1).

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

Figure 1-1
SAR Mathematical Equation

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

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

where:

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

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation 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.[6]

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 3 of 35

2 TEST SITE LOCATION

2.1 INTRODUCTION

The map at the right shows the location of the PCTEST LABORATORY in Columbia, Maryland. It is in proximity to the FCC Laboratory, the Baltimore-Washington International (BWI) airport, the city of Baltimore and Washington, DC.

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49' 38" W longitude. The facility is 1.5 miles north of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on January 27, 2006 and Industry Canada.

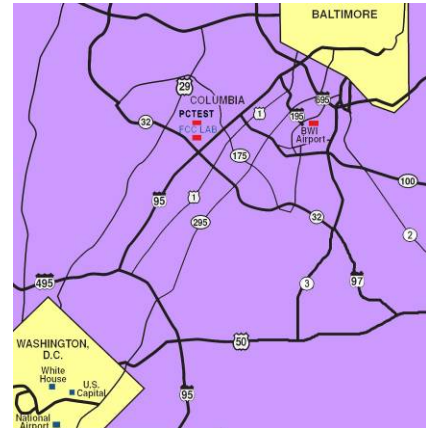
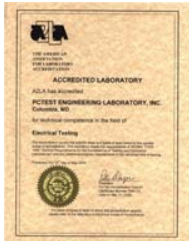


Figure 2-1

Map of the Greater Baltimore and Metropolitan Washington, D.C. area

2.2 Test Facility / Accreditations:

Measurements were performed at an independent accredited PCTEST Engineering Lab located in Columbia, MD 21045, U.S.A.



- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing-Aid Compatibility (HAC), Battery Safety, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (IC-2451).
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and all Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (IC-2451) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS and CDMA, and EvDO mobile phones.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO Data, CDMA 1xRTT Data

FCC ID: BEJVL600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 4 of 35

3 SAR MEASUREMENT SETUP

3.1 Robotic System

Measurements are performed using the DASY4 automated dosimetric assessment system. The DASY4 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of a high precision robotics system (Staubli), robot controller, desktop computer, near-field probe, probe alignment sensor, and the SAM phantom containing the head or body equivalent material. The robot is a six-axis industrial robot, performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Figure 3-1).

3.2 System Hardware

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and a remote control used to drive the robot motors. The PC consists of the SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, A/D conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal from the DAE and transfers data to the PC card.

3.3 System Electronics

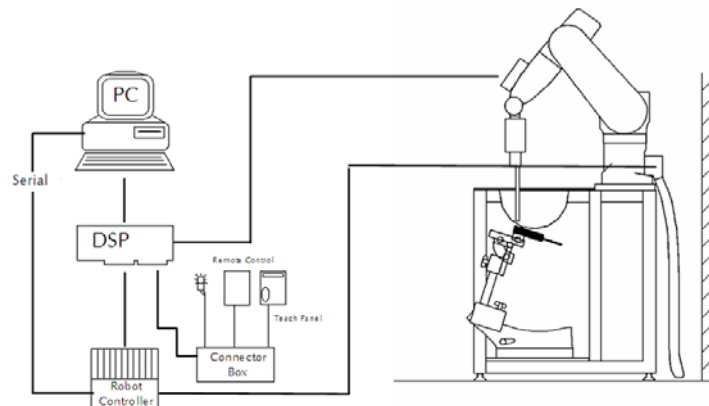


Figure 3-1
SAR Measurement System Setup

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

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 5 of 35

3.4 Automated Test System Specifications

Test Software: SPEAG DASY4 version 4.7 Measurement Software
Robot: Stäubli Unimation Corp. Robot RX60L
Repeatability: 0.02 mm
No. of Axes: 6

Data Acquisition Electronic System (DAE)

Data Converter

Features: Signal Amplifier, multiplexer, A/D converter & control logic
Software: SEMCAD software
Connecting Lines: Optical Downlink for data and status info
Optical upload for commands and clock

PC Interface Card

Function: Link to DAE
16-bit A/D converter for surface detection system
Two Serial & Ethernet link to robotics
Direct emergency stop output for robot

Phantom

Type: SAM Twin Phantom (V4.0)
Shell Material: Composite
Thickness: 2.0 ± 0.2 mm



Figure 3-2
SAR Measurement System

FCC ID: BEJVL600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 6 of 35

4 DASY E-FIELD PROBE SYSTEM

4.1 Probe Measurement System



Figure 4-1
SAR System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration (see Figure 4-3) and optimized for dosimetric evaluation [9]. The probe 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 DASY4 software reads the reflection during a software approach and looks for the

maximum using a 2nd order curve fitting (see Figure 5-1). The approach is stopped at reaching the maximum.

4.2 Probe Specifications

Model(s):	ES3DV2, ES3DV3, EX3DV4
Frequency Range:	10 MHz – 6.0 GHz (EX3DV4) 10 MHz – 4 GHz (ES3DV3)
Calibration:	In head and body simulating tissue at Frequencies from 300 up to 6000MHz
Linearity:	± 0.2 dB (30 MHz to 6 GHz) for EX3DV4 ± 0.2 dB (30 MHz to 4 GHz) for ES3DV3
Dynamic Range:	10 mW/kg – 100 W/kg
Probe Length:	330 mm
Probe Tip Length:	20 mm
Body Diameter:	12 mm
Tip Diameter:	2.5 mm (3.9mm for ES3DV3)
Tip-Center:	1 mm (2.0 mm for ES3DV3)
Application:	SAR Dosimetry Testing Compliance tests of mobile phones Dosimetry in strong gradient fields



Figure 4-2
Near-Field Probe



Figure 4-3
Triangular Probe Configuration

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 7 of 35

5 PROBE CALIBRATION PROCESS

5.1 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/cm²) using an RF Signal generator, TEM cell, and RF Power Meter.

5.2 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/cm².

5.3 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 (brain or muscle),
 ΔT = temperature increase due to RF exposure.

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

where:

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

SAR is proportional to $\Delta T/\Delta t$, the initial rate of tissue heating, before thermal diffusion takes place. The electric field in the simulated tissue can be used to estimate SAR by equating the thermally derived SAR to that with the E- field component.

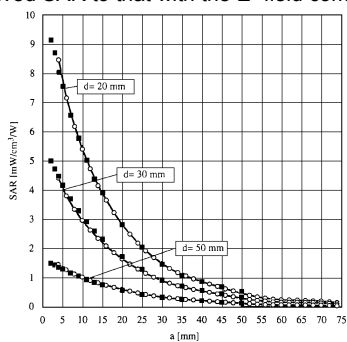


Figure 5-1 E-Field and Temperature measurements at 900MHz [9]

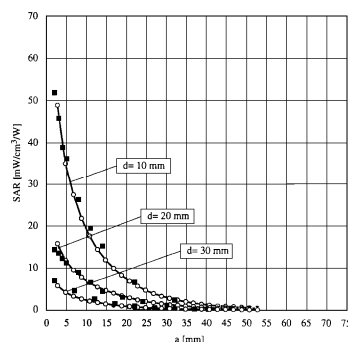


Figure 5-2 E-Field and temperature measurements at 1.9GHz [9]

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 8 of 35

6 PHANTOM AND EQUIVALENT TISSUES

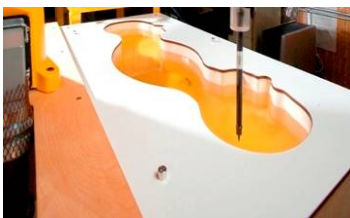
6.1 SAM Phantoms



**Figure 6-1
SAM Phantoms**

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to represent the 90th percentile of the population [12][13]. The phantom enables the dosimetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

6.2 Tissue Simulating Mixture Characterization



**Figure 6-2
SAM Phantom with
Simulating Tissue**

The mixture is characterized to obtain proper dielectric constant (permittivity) and conductivity of the tissue of interest. The tissue dielectric parameters recommended in IEEE 1528 and IEC 62209 have been used as targets for the compositions, and are to match within 5%, per the FCC recommendations.

Table 6-1
Composition of the Tissue Equivalent Matter

Frequency (MHz)	835	1900
Tissue	Body	Body
Ingredients (% by weight)		
Bactericide	0.1	
DGBE		29.44
HEC	1	
NaCl	0.94	0.39
Sucrose	44.9	
Triton X-100		
Water	53.06	70.16

Note: See next page for 750 MHz information

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 9 of 35

Table 6-2
Composition of the 750MHz Body Tissue Equivalent Matter

2 Composition / Information on ingredients

The Item is composed of the following ingredients:

H ₂ O	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40 – 60%
NaCl	Sodium Chloride, 0 – 8%
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-82-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone, 0.1 – 0.7%
	Relevant for safety; Refer to the respective Safety Data Sheet [®] .

Note: 750MHz Body liquid recipe is proprietary SPEAG. The composition is approximate to the actual liquids utilized. Thus the manufacturer production sheet is provided below.

Figure 6-1
750MHz Body Tissue Equivalent Matter

f [MHz]	HP-e'	HP-e''	sigma	P/N:	SL AAM 075	TARGET PARAMETERS		
300	61.02	35.43	0.59	Charge:	090224-1	f [MHz]	eps	sigma
350	60.21	32.13	0.63	Mea Date:	05-Mrz-09	700	55.7	0.96
400	59.50	29.71	0.66	Temp [°C]	22	750	55.5	0.96
450	58.79	28.00	0.70			800	55.3	0.97
500	58.16	26.60	0.74					
550	57.57	25.54	0.78					
600	56.99	24.68	0.82					
650	56.43	23.97	0.87					
700	55.88	23.46	0.91					
750	55.35	22.91	0.96					
800	55.02	22.56	1.00					
850	54.50	22.31	1.06					
900	54.02	22.08	1.11					
950	53.55	21.89	1.16					
1000	53.05	21.70	1.21					

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 10 of 35

7.1 Measurement Procedure

The evaluation was performed using the following procedure:

1. The SAR distribution at the exposed side of the head was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm x 15mm.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during testing the 1 gram cube. This fixed point was measured and used as a reference value.
3. Based on the area scan data, the area of the maximum absorption was determined by spline interpolation. Around this point, a volume of 30mm x 30mm x 30mm (fine resolution volume scan, zoom scan) was assessed by measuring 7 x 7 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual for more details):
 - a. The data was extrapolated to the surface of the outer-shell of the phantom. The combined distance extrapolated was the combined distance from the center of the dipoles 2.7mm away from the tip of the probe housing plus the 1.2 mm distance between the surface and the lowest measuring point. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
 - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
 - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete. If the value deviated by more than 5%, the evaluation was repeated.
5. For 5 GHz testing finer resolution zoom scans were preformed as specified by FCC SAR Measurement Requirements for 3 – 6 GHz, KDB pub 865664. The 5 GHz zoom scan requires a minimum volume of 24mm x 24mm x 20mm and 7 x 7 x 11 points.

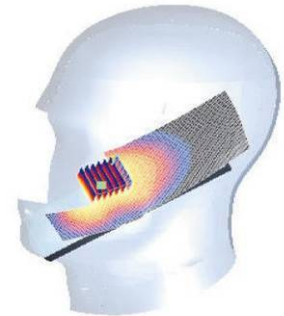


Figure 7-1
Sample SAR Area Scan

7.2 Specific Anthropomorphic Mannequin (SAM) Specifications

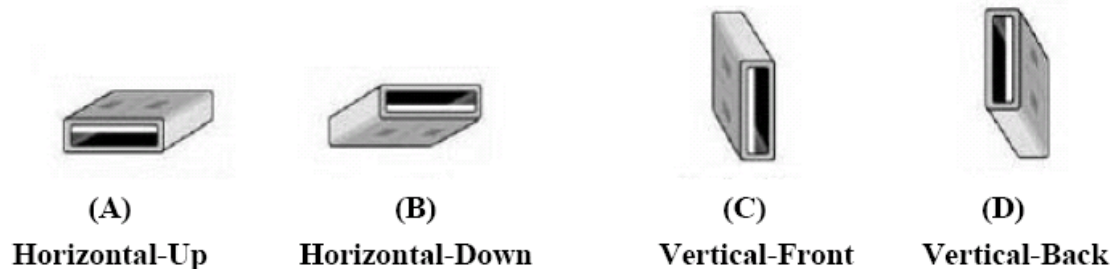
The phantom for handset SAR assessment testing is a low-loss dielectric shell, with shape and dimensions derived from the anthropometric data of the 90th percentile adult male head dimensions as tabulated by the US Army. The SAM Twin Phantom shell is bisected along the mid-sagittal plane into right and left halves (see Figure 7-2). The perimeter sidewalls of each phantom halves are extended to allow filling with liquid to a depth that is sufficient to minimize reflections from the upper surface. The liquid depth is maintained at a minimum depth of 15 cm.



Figure 7-2
SAM Twin Phantom Shell

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem	Page 11 of 35	

8.1 SAR test procedure for USB Dongles



Note: these are USB connector orientations on laptop computers; USB dongles have the reverse configuration for plugging into the corresponding laptop computers.

Figure 8-1
USB Dongle Test Configurations

FCC KDB Publication 447498. USB orientations (see Figure 8-1) with a device to phantom separation distance of 5 mm or less, according to FCC KDB Publication 447498 requirements. Current generation laptop computers should be used to ensure proper measurement distances. The same test separation distance should be used for all frequency bands and modes in each USB orientation. The typical Horizontal-Up USB connection (A), found in the majority of laptop computers, must be tested using an appropriate laptop computer. A laptop with either Vertical-Front (C) or Vertical-Back (D) USB connection should be used to test one of the vertical USB orientations. If laptop computers are not available for testing the Horizontal-Down (B) or the remaining Vertical USB orientation, a short and high quality USB cable (12 inches or less) may be used for testing these other orientations. It should be ensured that the USB cable does not affect device radiating characteristics and output power of the dongle.

For the Horizontal-Down (or Horizontal 2) position, the USB dongle was positioned in accordance with FCC KDB Inquiry 567894, as shown below. Since there were no changes to the mechanical operation of the EUT affecting its usable configurations, guidance from FCC Inquiry KDB 567894 was implemented for the configurations tested in terms of configuring dongle sides to be tested.

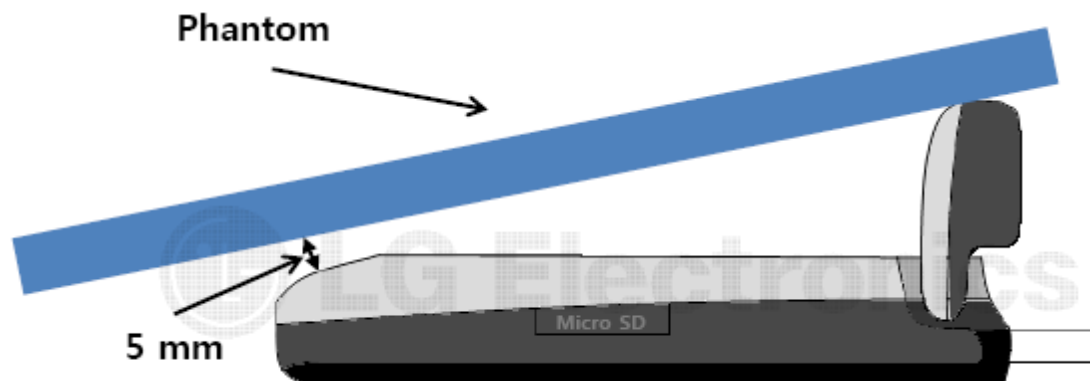


Figure 8-2
Horizontal-Down Configuration

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 12 of 35

9.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

9.2 Controlled Environment

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). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 9-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT <i>General Population</i> (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT <i>Occupational</i> (W/kg) or (mW/g)
SPATIAL PEAK SAR Brain	1.6	8.0
SPATIAL AVERAGE SAR Whole Body	0.08	0.4
SPATIAL PEAK SAR Hands, Feet, Ankles, Wrists	4.0	20

1. 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.
2. The Spatial Average value of the SAR averaged over the whole body.
3. 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.

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 13 of 35

10 FCC 3G MEASUREMENT PROCEDURES

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

10.1 Procedures Used to Establish RF Signal for SAR

The device was placed into a simulated call using a base station simulator in a shielded chamber. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR. The SAR measurement software calculates a reference point at the start and end of the test to check for power drifts. If SAR deviations of more than 5% occurred, the tests were repeated.

10.2 SAR Measurement Conditions for EvDO Data Devices

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

10.3 SAR Measurement Conditions for CDMA2000

The following procedures were followed according to FCC "SAR Measurement Procedures for 3G Devices" v02, October 2007.

10.3.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to procedures in section 3.1.2.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rev. 0 and section 4.3.4 of 3GPP2 C.S0033-A for Rev. A. For Rev. A, maximum output power for both Subtype 0/1 and Subtype 2 Physical Layer configurations was measured.

10.3.2 Body SAR Measurements for EVDO Data devices

Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0. SAR for Subtype 2 Physical layer configurations is not required for Rev. A when the maximum average output of each RF channels is less than that measured in Subtype 0/1 Physical layer configurations. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for the RF channels in Rev. 0.

The AT is tested with a Reverse Data Channel rate of 153.6 kbps in Subtype 0/1 Physical Layer configurations; and a Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots in Subtype 2 Physical Layer configurations. Both FTAP and FETAP are configured with a Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots. AT power control should be in "All Bits Up" conditions for TAP/ETAP.

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 14 of 35

10.4 RF Conducted Powers

10.4.1 CDMA Conducted Powers (Data Device)

Band	Channel	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
	F-RC	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	1013	24.08	24.04	24.11	24.13
	384	23.95	23.94	23.96	23.98
	777	23.84	23.85	23.89	23.91
PCS	25	24.16	24.22	24.13	24.12
	600	23.99	24.02	23.86	23.76
	1175	23.94	24.22	24.10	23.75

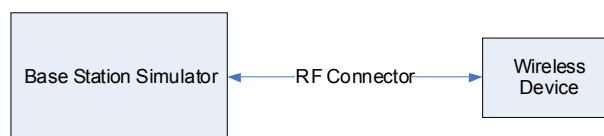


Figure 10-1
Power Measurement Setup

FCC ID: BEJVL600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 15 of 35

11 SYSTEM VERIFICATION

11.1 Tissue Verification

Table 11-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
11/05/2010	750B	750	0.950	55.65	0.96	55.68	-1.25%	-0.05%
		775	0.975	55.31	0.96	55.20	1.14%	0.20%
		790	0.991	55.17	0.97	55.15	2.59%	0.03%
11/04/2010	835B	820	0.930	53.42	0.97	55.28	-4.02%	-3.37%
		835	0.930	53.50	0.97	55.20	-4.12%	-3.08%
		850	0.960	53.59	0.99	55.15	-2.83%	-2.84%
10/25/2010	1900B	1850	1.460	52.40	1.52	53.30	-3.95%	-1.69%
		1880	1.480	52.14	1.52	53.30	-2.63%	-2.18%
		1910	1.530	51.95	1.52	53.30	0.66%	-2.53%

Note: KDB Publication 450824 was ensured to be applied for probe calibration frequencies greater than or equal to 50 MHz of the DUT frequencies.

The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies (per IEEE 1528 6.6.1.2). The SAR test plots may slightly differ from the table above since the DASY software rounds to three significant digits.

11.2 Measurement Procedure for Tissue verification

- 1) The network analyzer and probe system was configured and calibrated.
- 2) The probe was immersed in the sample which was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
- 3) The complex admittance with respect to the probe aperture was measured
- 4) The complex relative permittivity , for example from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\epsilon_r\epsilon_0}{[\ln(b/a)]^2} \int_a^b \int_a^b \int_0^\pi \cos\phi' \frac{\exp[-j\omega r(\mu_0\epsilon_r'\epsilon_0)^{1/2}]}{r} d\phi' d\rho' d\rho$$

where Y is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 16 of 35

11.3 Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 2 years ago but more than 1 year ago were confirmed in maintaining return loss (< -20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 450824:

D835V2 SN: 4d047					D1900V2 SN:5d080				
Date of Measurement	Return Loss (dB)	Δ %	Impedance (Ω)	$\Delta\Omega$	Date of Measurement	Return Loss (dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
1/19/2009	-28.4		50.9		8/18/2009	-24.3		50	
8/19/2010	-25.6	-10%	48.9	-2	8/19/2010	-22.4	-7.8%	51	1.0

D750V2 SN: 1003				
Date of Measurement	Return Loss (dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2/19/2009	-26		48.9	
8/29/2010	-24.5	-6%	49.9	1.0

11.4 Test System Verification

Prior to assessment, the system is verified to $\pm 10\%$ of the manufacturer SAR measurement on the reference dipole at the time of calibration.

Table 11-2
System Verification Results

System Verification TARGET & MEASURED										
Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Tissue Frequency (MHz)	Dipole SN	Tissue Type	Measured SAR _{1g} (W/kg)	1 W Target SAR _{1g} (W/kg)	1 W Normalized SAR _{1g} (W/kg)	Deviation (%)
10/25/2010	23.4	22.1	0.100	1900	5d080	Body	4.03	40.500	40.30	-0.49%
11/04/2010	23.9	22.2	0.100	835	4d047	Body	0.994	9.820	9.94	1.22%
11/05/2010	23.8	22.1	0.250	750	1003	Body	2.15	8.880	8.60	-3.15%

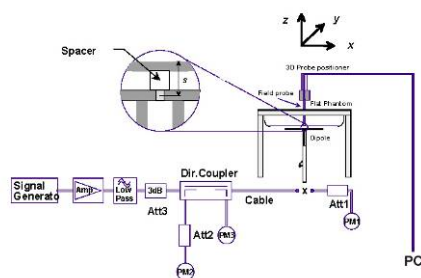


Figure 11-1
System Verification Setup Diagram



Figure 11-2
System Verification Setup Photo

FCC ID: BEJVL600	PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 17 of 35

12 4G LTE TEST CONFIGURATION

12.1 Frequency of Operation per 27.5

Per FCC Rule 27.5(b)(3): “(3) Two paired channels of 11 megahertz each are available for assignment in Block C in the 746-757 MHz and 776-787 MHz bands.”

12.2 Test Conditions

Testing was performed using a SMU200 and programmed UL synchronization signal from the device necessary to establish a live connection. Test software was used to set the device into test configurations.

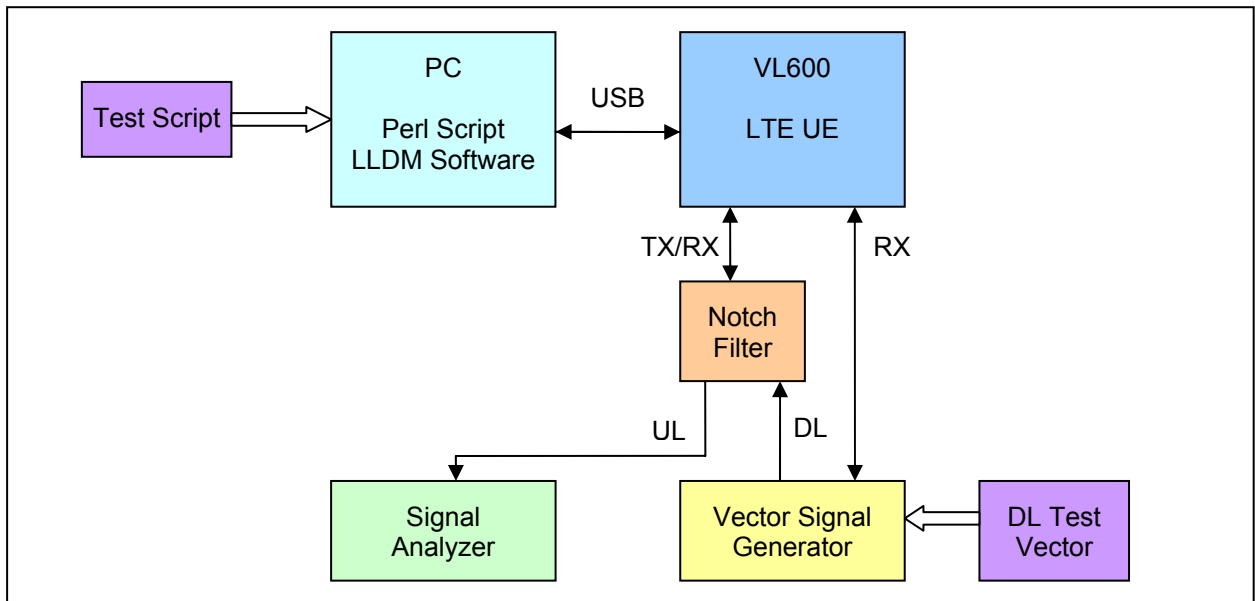


Figure 12-1
LTE Set-up Diagram

Note: MPR, A-MPR was disabled for all tests.

FCC ID: BEJVL600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 18 of 35

12.3 LTE Measured Maximum RF Output Conducted Powers

Table 12-1
Measured LTE RF Output Powers

	Frequency (MHz)	Mod.	Resource Block Offset	Maximum Average Power [dBm]
Resource Block Size 1	782	QPSK	0	25.89
	782	16QAM	0	25.13
	782	QPSK	49	24.65
	782	16QAM	49	24.37
Resource Block Size 25	782	QPSK	13	23.17
	782	16QAM	13	23.05
	782	QPSK	0	23.31
	782	16QAM	0	23.14

12.4 RB Implementation Spectrum Analyzer Plots

The following plots show bandwidth plots varying RB sizes. There is only 10 MHz Bandwidth available in this device. Please note, that the plots were not representative of maximum output.



Figure 12-2
RB 1, Offset 0, QPSK Plot



Figure 12-3
RB 1, Offset 0, 16QAM Plot

FCC ID: BEJVL600	PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 19 of 35

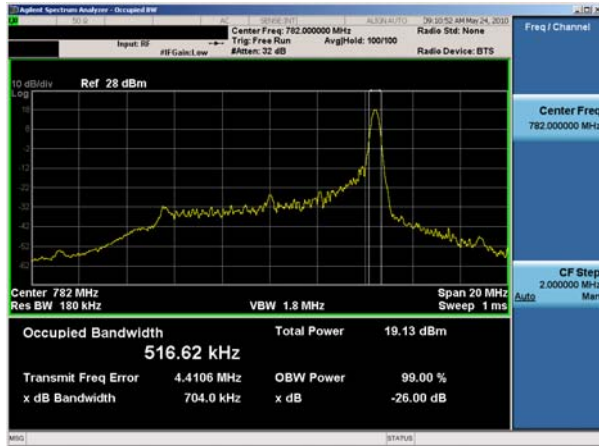


Figure 12-4
RB 1, Offset 49, QPSK Plot



Figure 12-5
RB 1, Offset 49, 16QAM Plot



Figure 12-6
RB 25, Offset 12, QPSK Plot



Figure 12-7
RB 25, Offset 12, 16QAM Plot

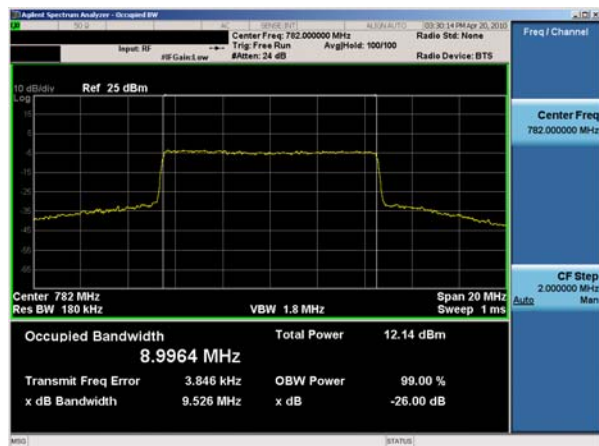


Figure 12-8
RB 50, Offset 0, QPSK Plot

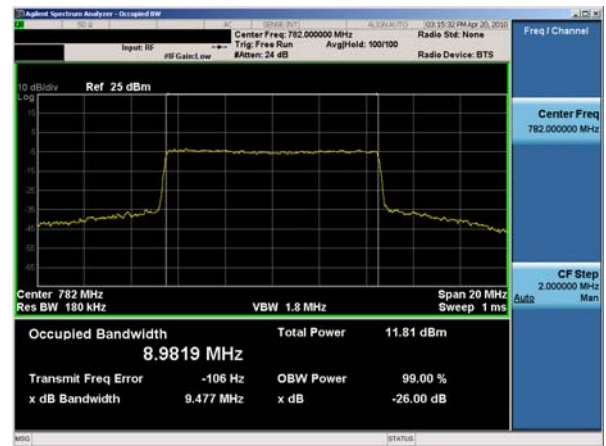
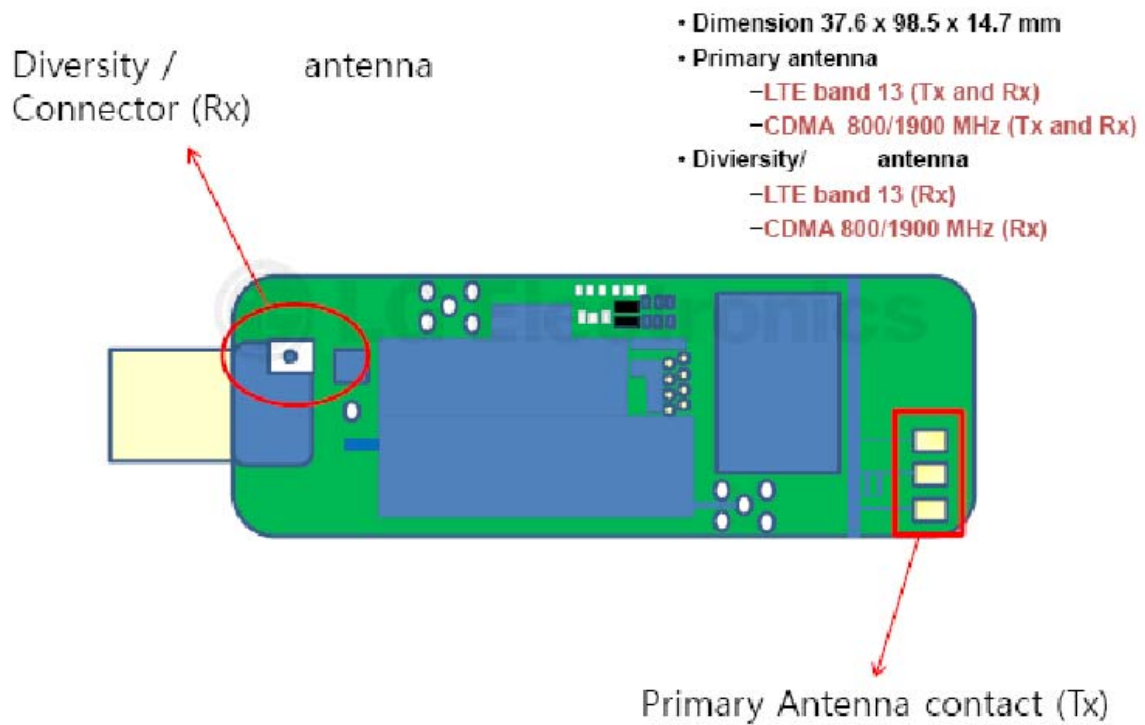


Figure 12-9
RB 50, Offset 0, 16QAM Plot

FCC ID: BEJVL600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: OY1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 20 of 35

12.5 BEJVL600 Antenna Location



12.6 BEJVL600 Simultaneous Transmission

CDMA radio cannot transmit simultaneously with the LTE radio. Thus, simultaneous transmission considerations are not required.

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 21 of 35

13 SAR DATA SUMMARY

Table 13-1
CDMA Body SAR Results

MEASUREMENT RESULTS									
FREQUENCY		Mode	Service	C_Power[dBm]		Spacing	Configuration	Side	SAR (1g)
MHz	Ch.			Start	End				(W/kg)
836.52	384	Cell. CDMA	EVDO	23.96	24.06	0.5 cm	Laptop	Horizontal Up	0.776
836.52	384	Cell. CDMA	EVDO	23.96	24.02	0.5 cm	USB Cable	Horizontal Down	0.361
836.52	384	Cell. CDMA	EVDO	23.96	23.95	0.5 cm	Laptop	Vertical Front	0.353
836.52	384	Cell. CDMA	EVDO	23.96	23.90	0.5 cm	Laptop	Vertical Back	0.203
836.52	384	Cell. CDMA	EVDO	23.96	24.00	0.5 cm	Laptop	Tip	0.071
1851.25	25	PCS CDMA	EVDO	24.13	24.07	0.5 cm	Laptop	Horizontal Up	0.967
1880.00	600	PCS CDMA	EVDO	23.86	23.87	0.5 cm	Laptop	Horizontal Up	1.050
1908.75	1175	PCS CDMA	EVDO	24.10	24.27	0.5 cm	Laptop	Horizontal Up	1.020
1880.00	600	PCS CDMA	EVDO	23.86	23.84	0.5 cm	USB Cable	Horizontal Down	0.721
1880.00	600	PCS CDMA	EVDO	23.86	23.82	0.5 cm	Laptop	Vertical Front	0.676
1880.00	600	PCS CDMA	EVDO	23.86	23.78	0.5 cm	Laptop	Vertical Back	0.548
1880.00	600	PCS CDMA	EVDO	23.86	23.92	0.5 cm	Laptop	Tip	0.433
ANSI / IEEE C95.1 1992 - SAFETY LIMIT						Body			
Spatial Peak						1.6 W/kg (mW/g)			
Uncontrolled Exposure/General Population						averaged over 1 gram			

Notes:

1. 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].
2. All modes of operation were investigated, and the worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plots.
4. Liquid tissue depth was at least 15.0 cm.
5. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June 2001) and Public Notice DA-02-1438, if the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
6. Body SAR was tested under EVDO Rev. 0 per FCC 3G Guidance (See Section 10.3.2)
7. Lenovo ThinkPad T400 Type 7417-TPU notebooks were used as hosts for testing the modem configurations
8. A spacing of 0.5 cm was used for all sides of the modem per FCC Publication KDB 447498.
9. Since, in this c2pc application, there were no changes to the mechanical operation of the EUT affecting its usable configurations, guidance from FCC Inquiry KDB 567894 was implemented for the Horizontal Down position with USB cable

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem	Page 22 of 35	

Table 13-2
LTE Body SAR Results

MEASUREMENT RESULTS											
FREQUENCY		Mode	C_Power[dBm]		Spacing	RB Size	RB Offset	Modulation	Configuration	Side	SAR (1g)
MHz	Ch.		Start	End							(W/kg)
782.00	23230	LTE	23.17	23.25	0.5 cm	25	13	QPSK	Laptop	Horizontal Up	0.710
782.00	23230	LTE	25.89	25.86	0.5 cm	1	0	QPSK	Laptop	Horizontal Up	0.698
782.00	23230	LTE	24.65	24.75	0.5 cm	1	49	QPSK	Laptop	Horizontal Up	1.010
782.00	23230	LTE	23.05	23.06	0.5 cm	25	13	16QAM	Laptop	Horizontal Up	0.759
782.00	23230	LTE	25.13	25.09	0.5 cm	1	0	16QAM	Laptop	Horizontal Up	0.716
782.00	23230	LTE	24.37	24.27	0.5 cm	1	49	16QAM	Laptop	Horizontal Up	0.871
782.00	23230	LTE	23.17	23.10	0.5 cm	25	13	QPSK	USB Cable	Horizontal Down	0.458
782.00	23230	LTE	25.89	25.82	0.5 cm	1	0	QPSK	USB Cable	Horizontal Down	0.597
782.00	23230	LTE	24.65	24.51	0.5 cm	1	49	QPSK	USB Cable	Horizontal Down	0.499
782.00	23230	LTE	23.05	23.04	0.5 cm	25	13	16QAM	USB Cable	Horizontal Down	0.441
782.00	23230	LTE	25.13	25.03	0.5 cm	1	0	16QAM	USB Cable	Horizontal Down	0.545
782.00	23230	LTE	24.37	24.29	0.5 cm	1	49	16QAM	USB Cable	Horizontal Down	0.525
ANSI / IEEE C95.1 1992 - SAFETY LIMIT					Body						
Spatial Peak					1.6 W/kg (mW/g)						
Uncontrolled Exposure/General Population					averaged over 1 gram						

Notes:

- 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].
- All modes of operation were investigated, and worst-case results are reported.
- Tissue parameters and temperatures are listed on the SAR plots.
- Liquid tissue depth was at least 15.0 cm.
- Lenovo ThinkPad T400 Type 7417-TPU notebooks were used as hosts for testing the modem configurations
- A spacing of 0.5 cm was used for all sides of the modem per FCC Publication KDB 447498.
- Since, in this c2pc application, there were no changes to the mechanical operation of the EUT affecting its usable configurations, guidance from FCC Inquiry KDB 567894 was implemented for the Horizontal Down position with USB cable
- LTE Considerations
 - KDB inquiry 178562 and KDB Pub 941225 Interim SAR guidance was used since the LTE conducted power, BW's, modulations, bands, UE category did not change from the original application
 - LTE test configurations are determined according to KDB 178562. 1RB and 50% RB allocations were tested in both QPSK and 16 QAM for all configurations. There is only 10 MHz bandwidth available for this device in the LTE mode.
 - The dongle does not support VOIP.
 - There is only one channel available for LTE.
- Tests were performed per KDB Pub 941225 Interim LTE SAR guidance.

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 23 of 35

Table 13-3
LTE Body SAR Results (Continued)

MEASUREMENT RESULTS											
FREQUENCY		Mode	C_Power[dBm]		Spacing	RB Size	RB Offset	Modulation	Configuration	Side	SAR (1g)
MHz	Ch.		Start	End							(W/kg)
782.00	23230	LTE	23.17	23.10	0.5 cm	25	13	QPSK	Laptop	Vertical Front	0.942
782.00	23230	LTE	25.89	25.93	0.5 cm	1	0	QPSK	Laptop	Vertical Front	1.180
782.00	23230	LTE	24.65	24.65	0.5 cm	1	49	QPSK	Laptop	Vertical Front	1.060
782.00	23230	LTE	23.05	23.03	0.5 cm	25	13	16QAM	Laptop	Vertical Front	1.020
782.00	23230	LTE	25.13	25.04	0.5 cm	1	0	16QAM	Laptop	Vertical Front	1.160
782.00	23230	LTE	24.37	24.39	0.5 cm	1	49	16QAM	Laptop	Vertical Front	1.080
782.00	23230	LTE	23.17	23.20	0.5 cm	25	13	QPSK	Laptop	Vertical Back	0.319
782.00	23230	LTE	25.89	25.91	0.5 cm	1	0	QPSK	Laptop	Vertical Back	0.286
782.00	23230	LTE	24.65	24.62	0.5 cm	1	49	QPSK	Laptop	Vertical Back	0.207
782.00	23230	LTE	23.05	23.02	0.5 cm	25	13	16QAM	Laptop	Vertical Back	0.245
782.00	23230	LTE	25.13	25.12	0.5 cm	1	0	16QAM	Laptop	Vertical Back	0.286
782.00	23230	LTE	24.37	24.32	0.5 cm	1	49	16QAM	Laptop	Vertical Back	0.321
782.00	23230	LTE	23.17	23.17	0.5 cm	25	13	QPSK	Laptop	Tip	0.051
782.00	23230	LTE	25.89	25.94	0.5 cm	1	0	QPSK	Laptop	Tip	0.068
782.00	23230	LTE	24.65	24.65	0.5 cm	1	49	QPSK	Laptop	Tip	0.075
782.00	23230	LTE	23.05	23.11	0.5 cm	25	13	16QAM	Laptop	Tip	0.062
782.00	23230	LTE	25.13	25.23	0.5 cm	1	0	16QAM	Laptop	Tip	0.067
782.00	23230	LTE	24.37	24.48	0.5 cm	1	49	16QAM	Laptop	Tip	0.076
ANSI / IEEE C95.1 1992 - SAFETY LIMIT					Body						
Spatial Peak					1.6 W/kg (mW/g)						
Uncontrolled Exposure/General Population					averaged over 1 gram						

Notes:

- 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].
- All modes of operation were investigated, and worst-case results are reported.
- Tissue parameters and temperatures are listed on the SAR plots.
- Liquid tissue depth was at least 15.0 cm.
- Lenovo ThinkPad T400 Type 7417-TPU notebooks were used as hosts for testing the modem configurations
- A spacing of 0.5 cm was used for all sides of the modem per FCC Publication KDB 447498.
- Since, in this c2pc application, there were no changes to the mechanical operation of the EUT affecting its usable configurations, guidance from FCC Inquiry KDB 567894 was implemented for the Horizontal Down position with USB cable
- LTE Considerations
 - KDB inquiry 178562 and KDB Pub 941225 Interim SAR guidance was used since the LTE conducted power, BW's, modulations, bands, UE category did not change from the original application
 - LTE test configurations are determined according to KDB 178562. 1RB and 50% RB allocations were tested in both QPSK and 16 QAM for all configurations. There is only 10 MHz bandwidth available for this device in the LTE mode.
 - The dongle does not support VOIP.
 - There is only one channel available for LTE.
- Tests were performed per KDB Pub 941225 Interim LTE SAR guidance.

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 24 of 35

14

EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	85070B	Dielectric Probe Kit	8/22/2010	Annual	8/22/2011	US33020316
Agilent	8648D	(9kHz-4GHz) Signal Generator	10/11/2010	Annual	10/11/2011	3613A00315
Agilent	8753E	(30kHz-6GHz) Network Analyzer	3/31/2010	Annual	3/31/2011	JP38020182
Agilent	E5515C	Wireless Communications Test Set	10/11/2010	Annual	10/11/2011	GB46110872
Agilent	E5515C	Wireless Communications Test Set	10/11/2010	Annual	10/11/2011	GB46310798
Agilent	E5515C	Wireless Communications Test Set	8/12/2010	Annual	8/12/2011	GB41450275
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/30/2010	Annual	3/30/2011	MY45470194
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/11/2010	Annual	10/11/2011	1833460
Gigatronics	8651A	Universal Power Meter	10/11/2010	Annual	10/11/2011	8650319
Index SAR	IXTL-010	Dielectric Measurement Kit	N/A		N/A	N/A
Index SAR	IXTL-030	30MM TEM line for 6 GHz	N/A		N/A	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	6/21/2010	Annual	6/21/2011	833855/0010
SPEAG	D1450V2	1450 MHz SAR Dipole	5/20/2009	Biennial	5/20/2011	1025
SPEAG	D1765V2	1765 MHz SAR Dipole	5/19/2009	Biennial	5/19/2011	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	1/20/2009	Biennial	1/20/2011	502
SPEAG	D1900V2	1900 MHz SAR Dipole	8/18/2009	Biennial	8/18/2011	5d080
SPEAG	D2450V2	2450 MHz SAR Dipole	8/27/2009	Biennial	8/27/2011	719
SPEAG	D2450V2	2450 MHz SAR Dipole	1/8/2009	Biennial	1/8/2011	797
SPEAG	D2600V2	2600 MHz SAR Dipole	8/12/2009	Biennial	8/12/2011	1004
SPEAG	D5GHzV2	5 GHz SAR Dipole	8/19/2009	Biennial	8/19/2011	1007
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/15/2009	Biennial	1/15/2011	1057
SPEAG	D835V2	835 MHz SAR Dipole	1/19/2009	Biennial	1/19/2011	4d047
SPEAG	D835V2	835 MHz SAR Dipole	8/24/2009	Biennial	8/24/2011	4d026
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/22/2010	Annual	3/22/2011	704
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/21/2010	Annual	4/21/2011	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/22/2010	Annual	1/22/2011	649
SPEAG	ES3DV2	SAR Probe	9/21/2010	Annual	9/21/2011	3022
SPEAG	EX3DV4	SAR Probe	8/19/2010	Annual	8/19/2011	3561
SPEAG	EX3DV4	SAR Probe	1/26/2010	Annual	1/26/2011	3550
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/8/2010	Annual	7/8/2011	859
SPEAG	D750V3	750 MHz Dipole	8/19/2010	Biennial	8/19/2012	1003
SPEAG	ES3DV3	SAR Probe	3/16/2010	Annual	3/16/2011	3213
SPEAG	ES3DV3	SAR Probe	4/20/2010	Annual	4/20/2011	3209
Rohde & Schwarz	SMIQ03B	Signal Generator	4/1/2010	Annual	4/1/2011	DE27259
SPEAG	D1640V2	1640 MHz Dipole	8/17/2010	Biennial	8/17/2012	321
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	8/30/2010	Annual	8/30/2011	100976
Agilent	8648D	Signal Generator	4/1/2010	Annual	4/1/2011	3629U00687
Apriel	ALS-PR-DIEL	Dielectric Probe Kit	N/A		N/A	260-00959
Agilent	E5515C	Wireless Communications Tester	4/14/2010	Annual	4/14/2011	US41140256
SPEAG	ES3DV3	SAR Probe	2/10/2010	Annual	2/10/2011	3173
Amplifier Research	5S1G4	5W, 800MHz-4.2GHz	N/A			17042

Justification for 2-year calibration cycle for SAR dipoles is found in Section 11.3.

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 25 of 35

15 MEASUREMENT UNCERTAINTIES

Applicable for 700 – 3000 MHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c _i 1gm	c _i 10 gms	1gm u _i (± %)	10gms u _i (± %)	v _i
Measurement System									
Probe Calibration	E.2.1	5.5	N	1	1.0	1.0	5.5	5.5	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)							RSS	11.8	11.5
Expanded Uncertainty (95% CONFIDENCE LEVEL)							k=2	23.7	23.0
									299

The above measurement uncertainties are according to IEEE Std. 1528-2003

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 26 of 35

16 CONCLUSION

16.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Industry Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

FCC ID: BEJVL600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 27 of 35

17 REFERENCES

- [1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.
- [2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300kHz to 100GHz, New York: IEEE, 2006.
- [3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300kHz to 100GHz, New York: IEEE, Sept. 1992.
- [4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.
- [5] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, June 2001.
- [6] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2003, Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices.
- [7] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.
- [8] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.
- [9] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 120-124.
- [10] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.
- [11] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.
- [12] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Head Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.
- [13] 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.
- [14] G. Hartsgrrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.
- [15] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

FCC ID: BEJVL600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 LG	Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 28 of 35

- [16] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
- [17] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.
- [18] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C, Dec. 1997.
- [19] 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.
- [20] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.
- [21] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hochschule Zürich, Dosimetric Evaluation of the Cellular Phone.
- [22] IEC 62209-1, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz), Feb. 2005.
- [23] Industry Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 4, March 2010.
- [24] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2009
- [25] FCC Public Notice DA-02-1438. Office of Engineering and Technology Announces a Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65, June 19, 2002
- [26] FCC SAR Measurement Procedures for 3G Devices KDB Publication 941225
- [27] SAR Measurement procedures for IEEE 802.11a/b/g KDB Publication 248227
- [28] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publication 648474
- [29] FCC Application Note for SAR Probe Calibration and System Verification Consideration for Measurements at 150 MHz – 3 GHz, KDB Publication 450824
- [30] FCC SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens, KDB Publication 616217
- [31] FCC SAR Measurement Requirements for 3 – 6 GHz, KDB Publication 865664
- [32] FCC Mobile Portable RF Exposure Procedure, KDB Publication 447498
- [33] FCC SAR Procedures for Dongle Transmitters, KDB Publication 447498
- [34] Anexo à Resolução No. 533, de 10 de Setembro de 2009.

FCC ID: BEJVL600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1010221751.BEJ	Test Dates: 10/25/10 - 11/05/10	EUT Type: Cell/PCS CDMA/EVDO and LTE 700 MHz USB Modem		Page 29 of 35

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Muscle Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.933 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-04-2010; Ambient Temp: 23.9 °C; Tissue Temp: 22.2 °C

Probe: ES3DV3 - SN3213; ConvF(5.91, 5.91, 5.91); Calibrated: 3/16/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 3/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

Mode: Cellular CDMA, EvDO Rev. 0, Body SAR, Horizontal Up, Mid.ch

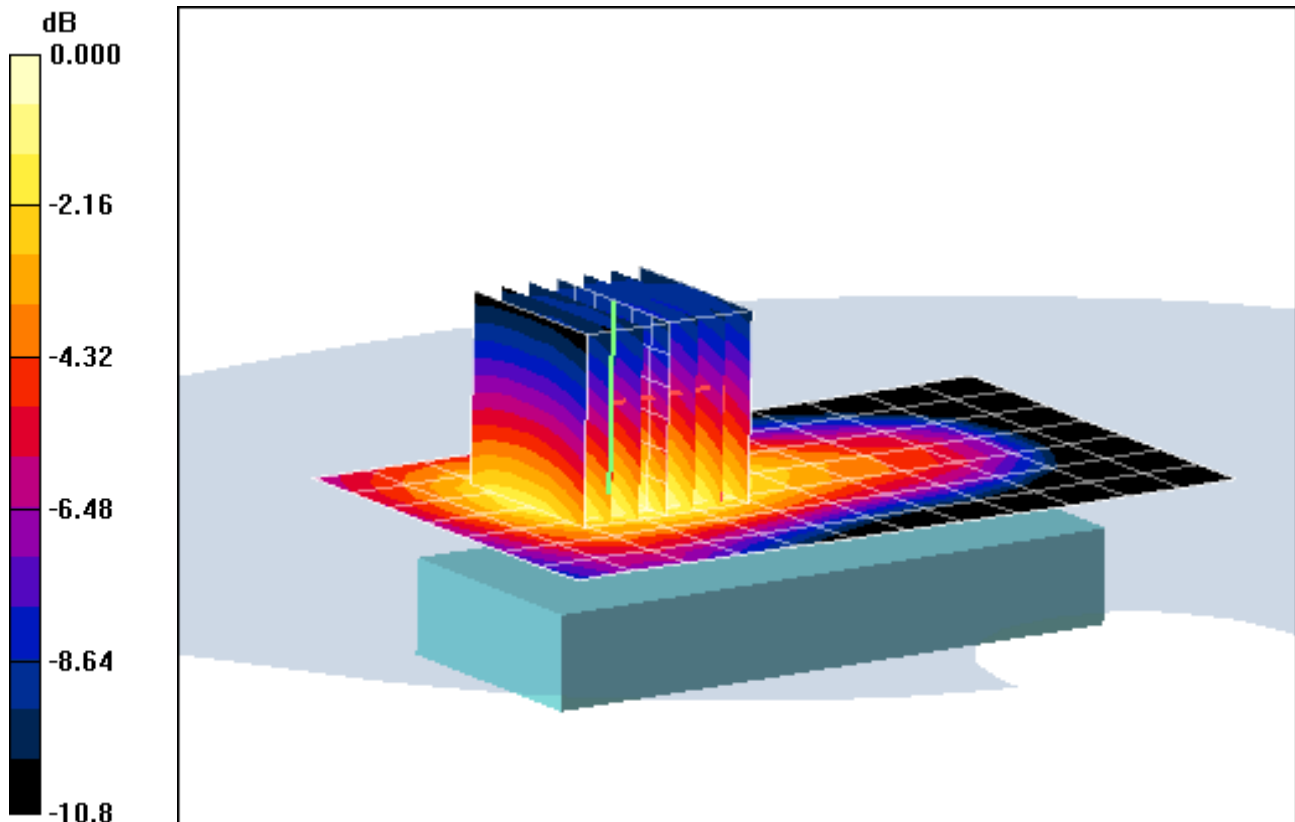
Area Scan (8x13x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 31.9 V/m

Peak SAR (extrapolated) = 1.14 W/kg

SAR(1 g) = 0.776 mW/g; SAR(10 g) = 0.507 mW/g



0 dB = 0.843mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Muscle Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.933 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-04-2010; Ambient Temp: 23.9 °C; Tissue Temp: 22.2 °C

Probe: ES3DV3 - SN3213; ConvF(5.91, 5.91, 5.91); Calibrated: 3/16/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 3/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

Mode: Cellular CDMA, EvDO Rev. 0, Body SAR, Horizontal Up, Mid.ch

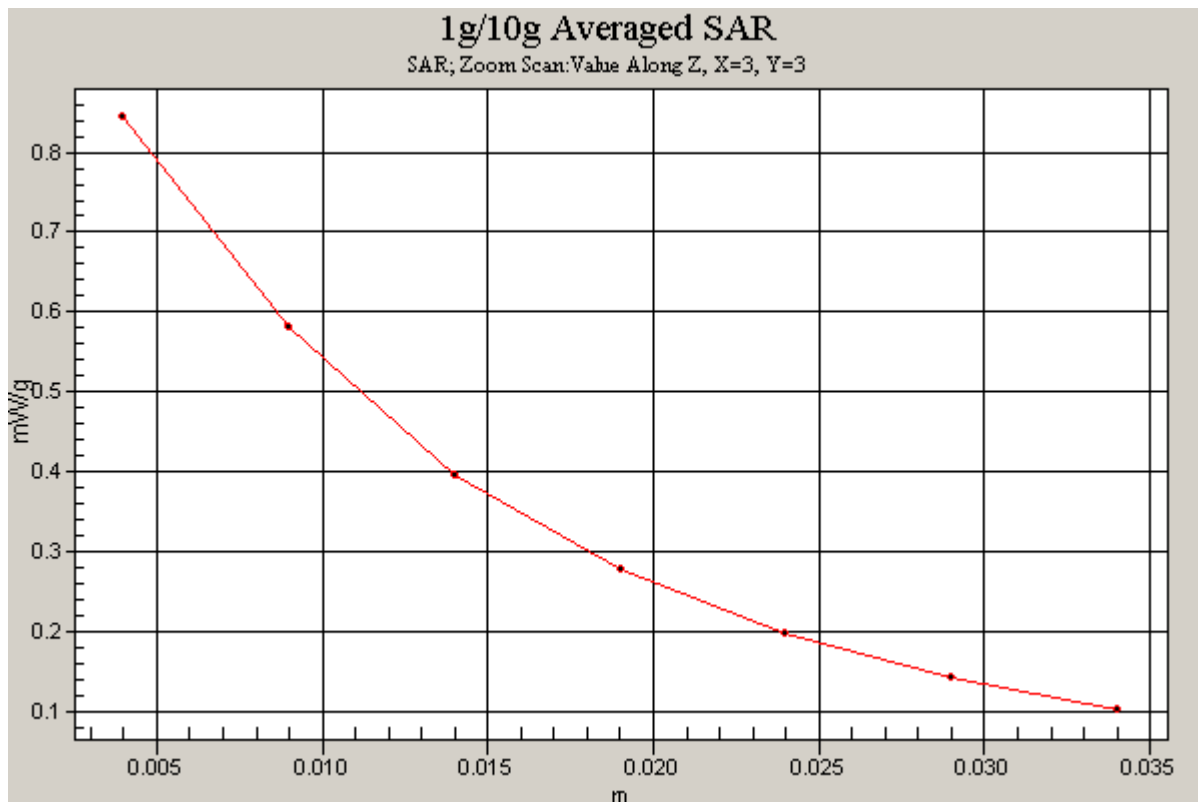
Area Scan (8x13x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 31.9 V/m

Peak SAR (extrapolated) = 1.14 W/kg

SAR(1 g) = 0.776 mW/g; SAR(10 g) = 0.507 mW/g



PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Muscle Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.933 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-04-2010; Ambient Temp: 23.9 °C; Tissue Temp: 22.2 °C

Probe: ES3DV3 - SN3213; ConvF(5.91, 5.91, 5.91); Calibrated: 3/16/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 3/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

Mode: Cellular CDMA, EvDO Rev.0, Body SAR, Horizontal Down, Mid.ch

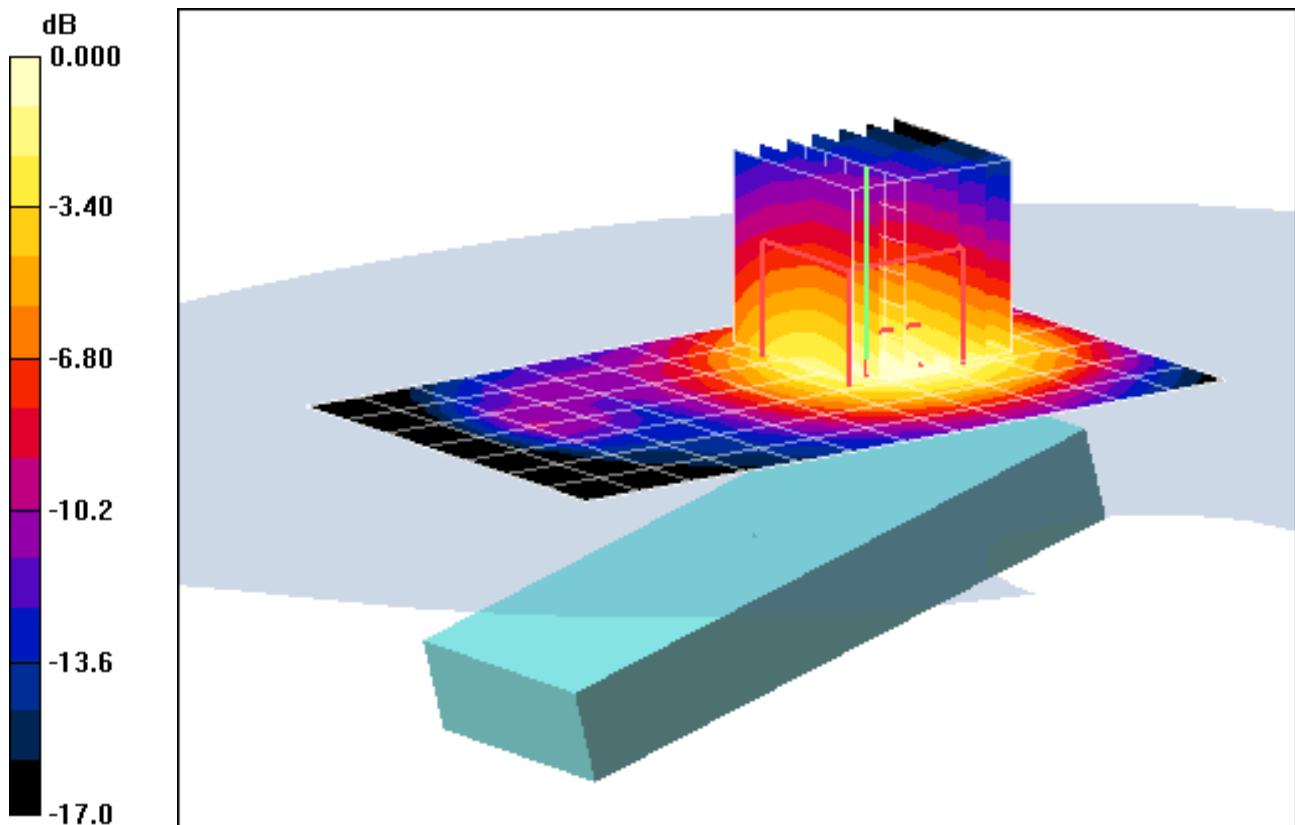
Area Scan (8x13x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 10.6 V/m

Peak SAR (extrapolated) = 0.636 W/kg

SAR(1 g) = 0.361 mW/g; SAR(10 g) = 0.203 mW/g



0 dB = 0.407mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Muscle Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.933 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-04-2010; Ambient Temp: 23.9 °C; Tissue Temp: 22.2 °C

Probe: ES3DV3 - SN3213; ConvF(5.91, 5.91, 5.91); Calibrated: 3/16/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 3/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

Mode: Cellular CDMA, EvDO Rev.0, Body SAR, Vertical Front, Mid.ch

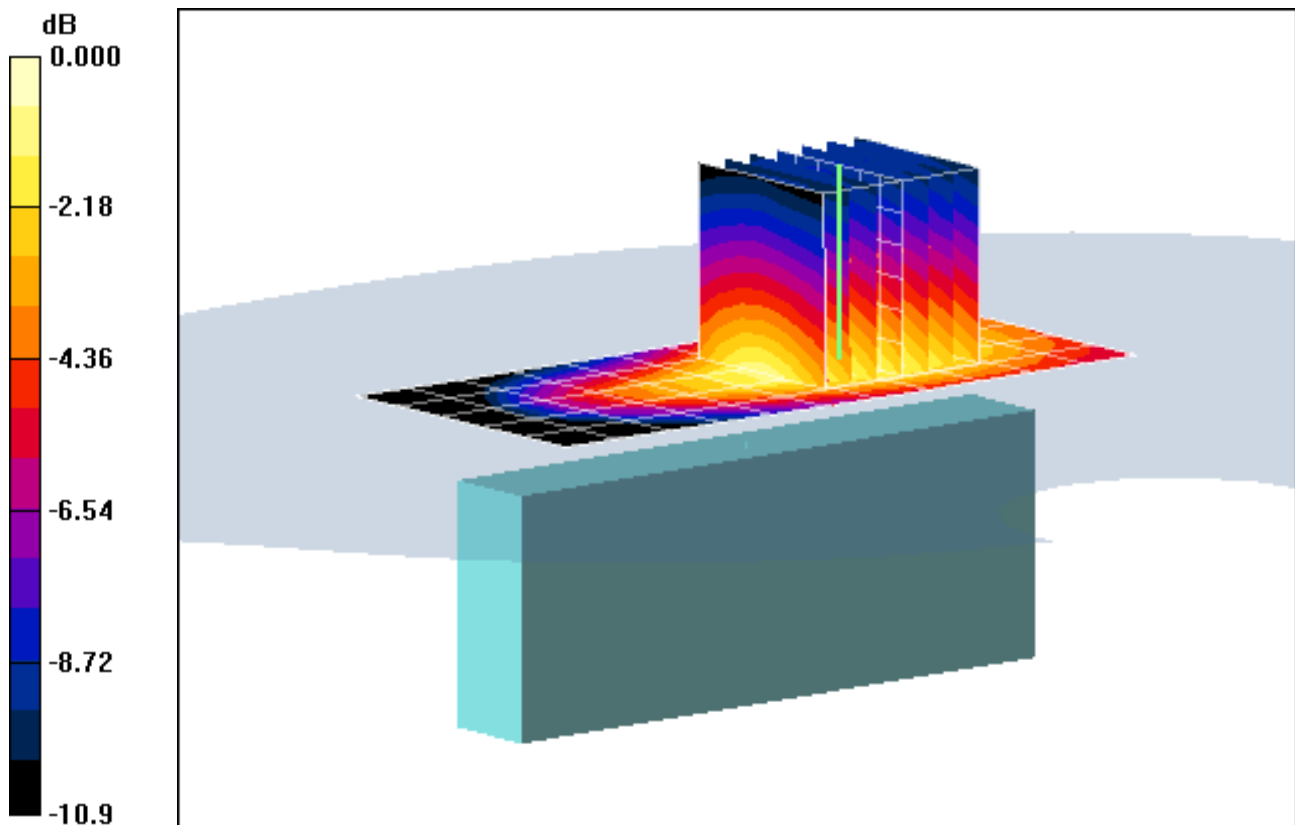
Area Scan (6x12x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 21.5 V/m

Peak SAR (extrapolated) = 0.543 W/kg

SAR(1 g) = 0.353 mW/g; SAR(10 g) = 0.230 mW/g



0 dB = 0.386mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Muscle Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.933 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-04-2010; Ambient Temp: 23.9 °C; Tissue Temp: 22.2 °C

Probe: ES3DV3 - SN3213; ConvF(5.91, 5.91, 5.91); Calibrated: 3/16/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 3/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

Mode: Cellular CDMA, EvDO Rev. 0, Body SAR, Vertical Back, Mid.ch

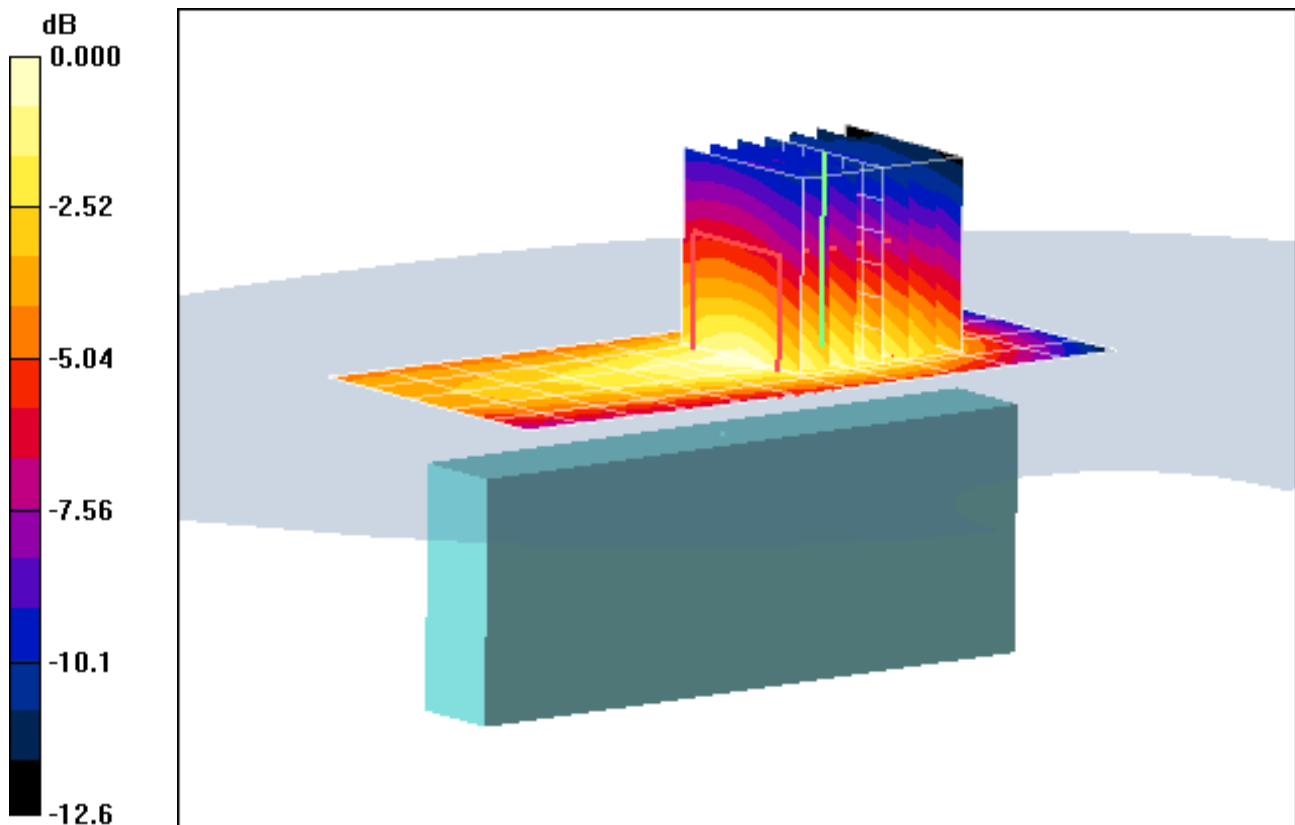
Area Scan (6x12x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 16.4 V/m

Peak SAR (extrapolated) = 0.316 W/kg

SAR(1 g) = 0.203 mW/g; SAR(10 g) = 0.130 mW/g



0 dB = 0.220mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Muscle Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.933 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-04-2010; Ambient Temp: 23.9 °C; Tissue Temp: 22.2 °C

Probe: ES3DV3 - SN3213; ConvF(5.91, 5.91, 5.91); Calibrated: 3/16/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 3/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

Mode: Cellular CDMA, EvDO Rev. 0, Body SAR, Tip, Mid.ch

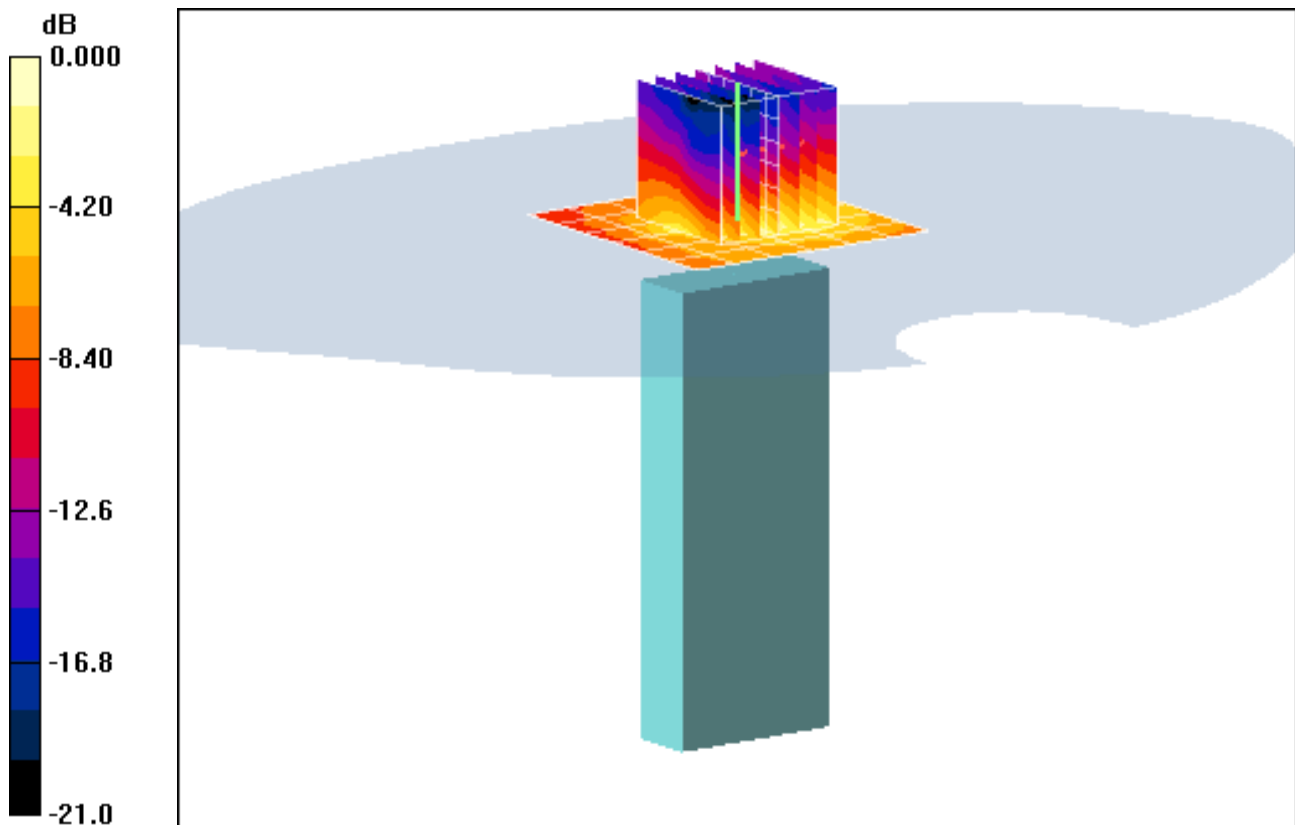
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 10.6 V/m

Peak SAR (extrapolated) = 0.194 W/kg

SAR(1 g) = 0.071 mW/g; SAR(10 g) = 0.032 mW/g



0 dB = 0.079mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR #1**

Communication System: PCS CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Muscle Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.48 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 10-25-2010; Ambient Temp: 23.4 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(4.34, 4.34, 4.34); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

Mode: PCS CDMA, EvDO Rev.0, Body SAR, Horizontal Up, Mid.ch

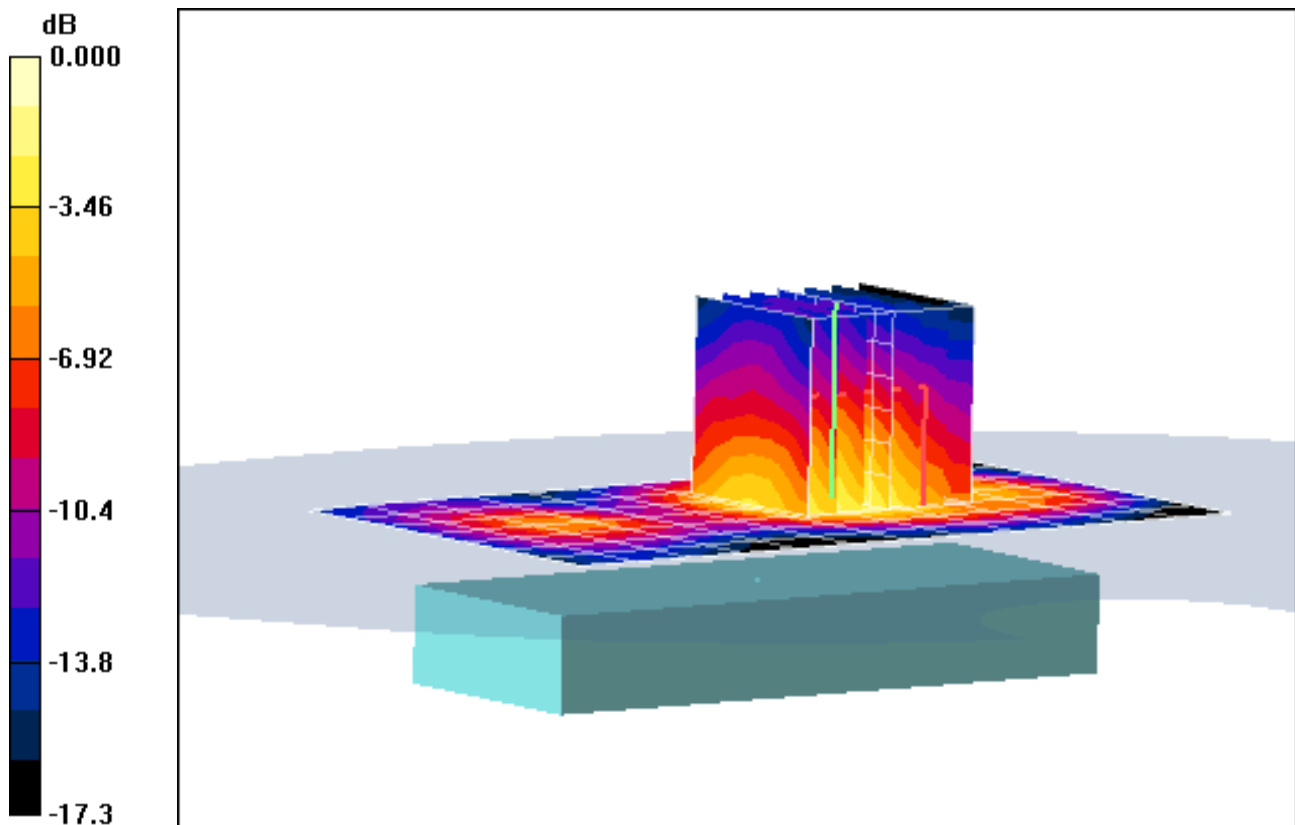
Area Scan (8x13x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 28.9 V/m

Peak SAR (extrapolated) = 1.80 W/kg

SAR(1 g) = 1.05 mW/g; SAR(10 g) = 0.569 mW/g



0 dB = 1.21mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR #1**

Communication System: PCS CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Muscle Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.48 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 10-25-2010; Ambient Temp: 23.4 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(4.34, 4.34, 4.34); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

Mode: PCS CDMA, EvDO Rev.0, Body SAR, Horizontal Up, Mid.ch

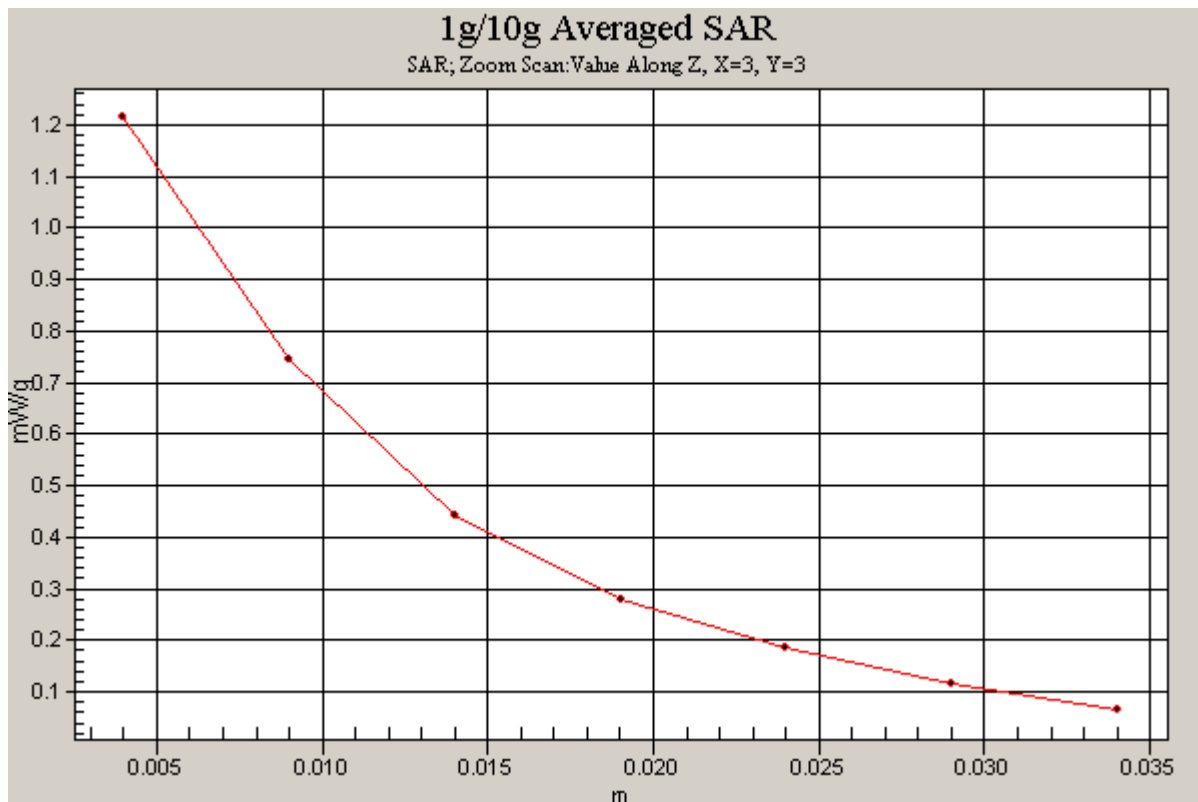
Area Scan (8x13x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 28.9 V/m

Peak SAR (extrapolated) = 1.80 W/kg

SAR(1 g) = 1.05 mW/g; SAR(10 g) = 0.569 mW/g



PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR #1**

Communication System: PCS CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Muscle Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.48 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 10-25-2010; Ambient Temp: 23.4 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(4.34, 4.34, 4.34); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

Mode: PCS CDMA, EvDO Rev.0, Body SAR, Horizontal Down, Mid.ch

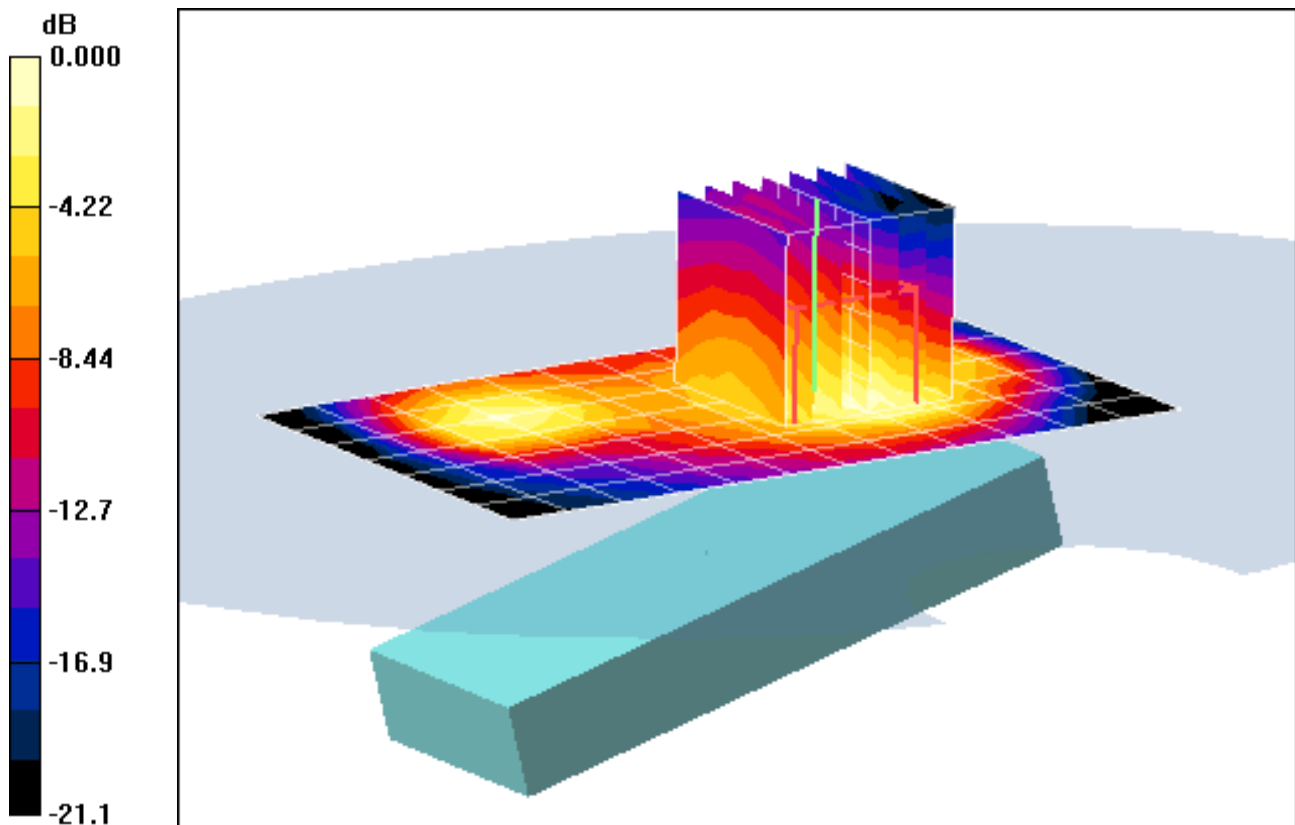
Area Scan (8x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 25.7 V/m

Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.721 mW/g; SAR(10 g) = 0.376 mW/g



0 dB = 0.832mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR #1**

Communication System: PCS CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Muscle Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.48 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 10-25-2010; Ambient Temp: 23.4 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(4.34, 4.34, 4.34); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

Mode: PCS CDMA, EvDO Rev.0, Body SAR, Vertical Front, Mid.ch

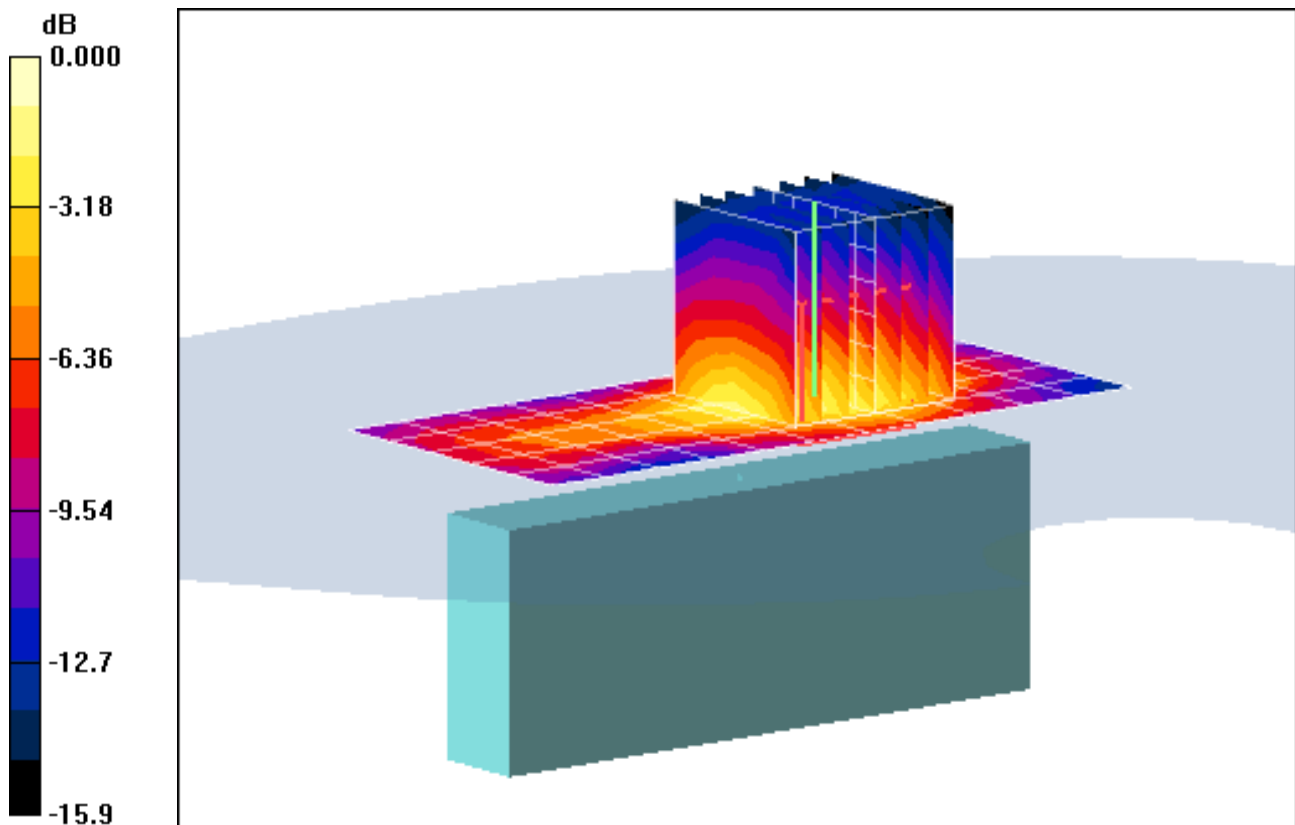
Area Scan (6x12x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 24.6 V/m

Peak SAR (extrapolated) = 1.20 W/kg

SAR(1 g) = 0.676 mW/g; SAR(10 g) = 0.379 mW/g



0 dB = 0.769mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR #1**

Communication System: PCS CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Muscle Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.48 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 10-25-2010; Ambient Temp: 23.4 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(4.34, 4.34, 4.34); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

Mode: PCS CDMA, EvDO Rev.0, Body SAR, Vertical Back, Mid.ch

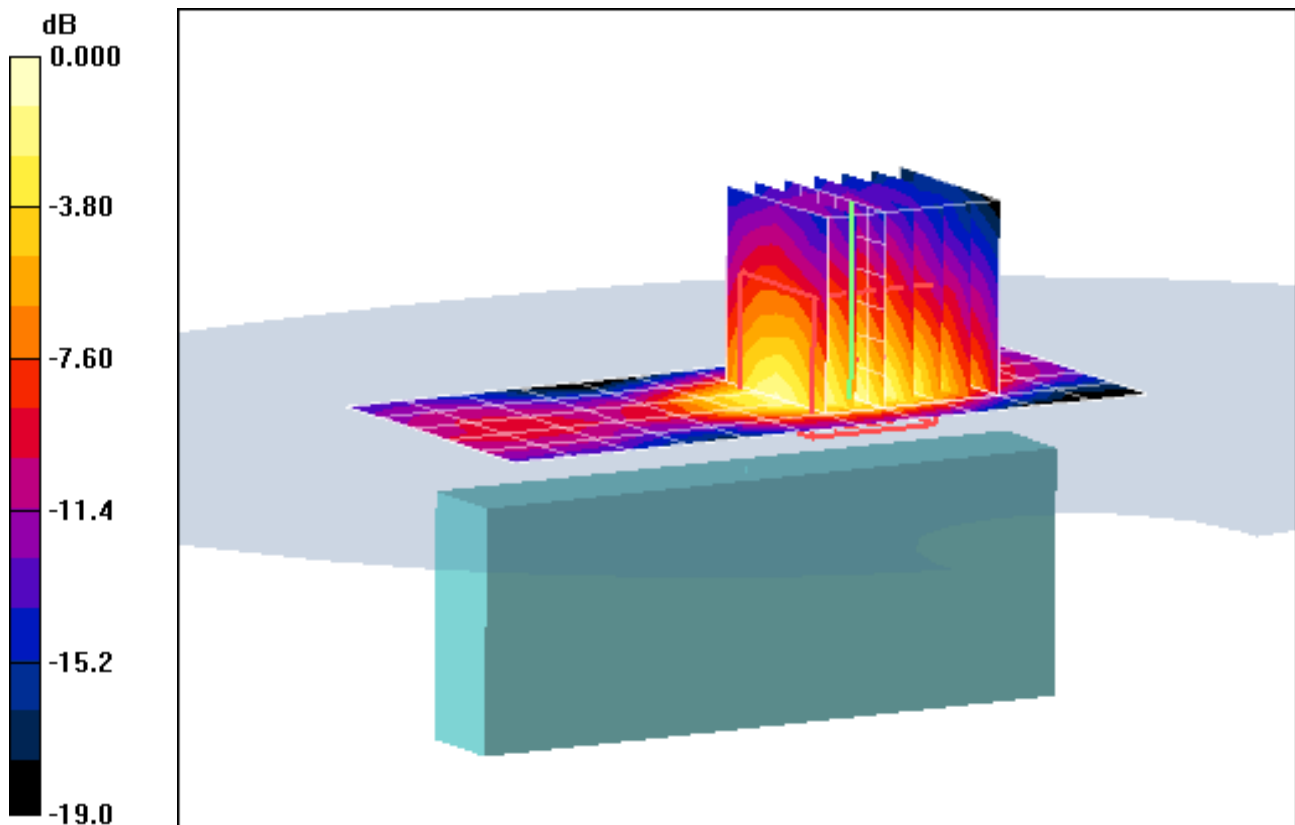
Area Scan (6x12x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 22.2 V/m

Peak SAR (extrapolated) = 0.929 W/kg

SAR(1 g) = 0.548 mW/g; SAR(10 g) = 0.292 mW/g



0 dB = 0.602mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR #1**

Communication System: PCS CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Muscle Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.48 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 10-25-2010; Ambient Temp: 23.4 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(4.34, 4.34, 4.34); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

Mode: PCS CDMA, EvDO Rev.0, Body SAR, Tip, Mid.ch

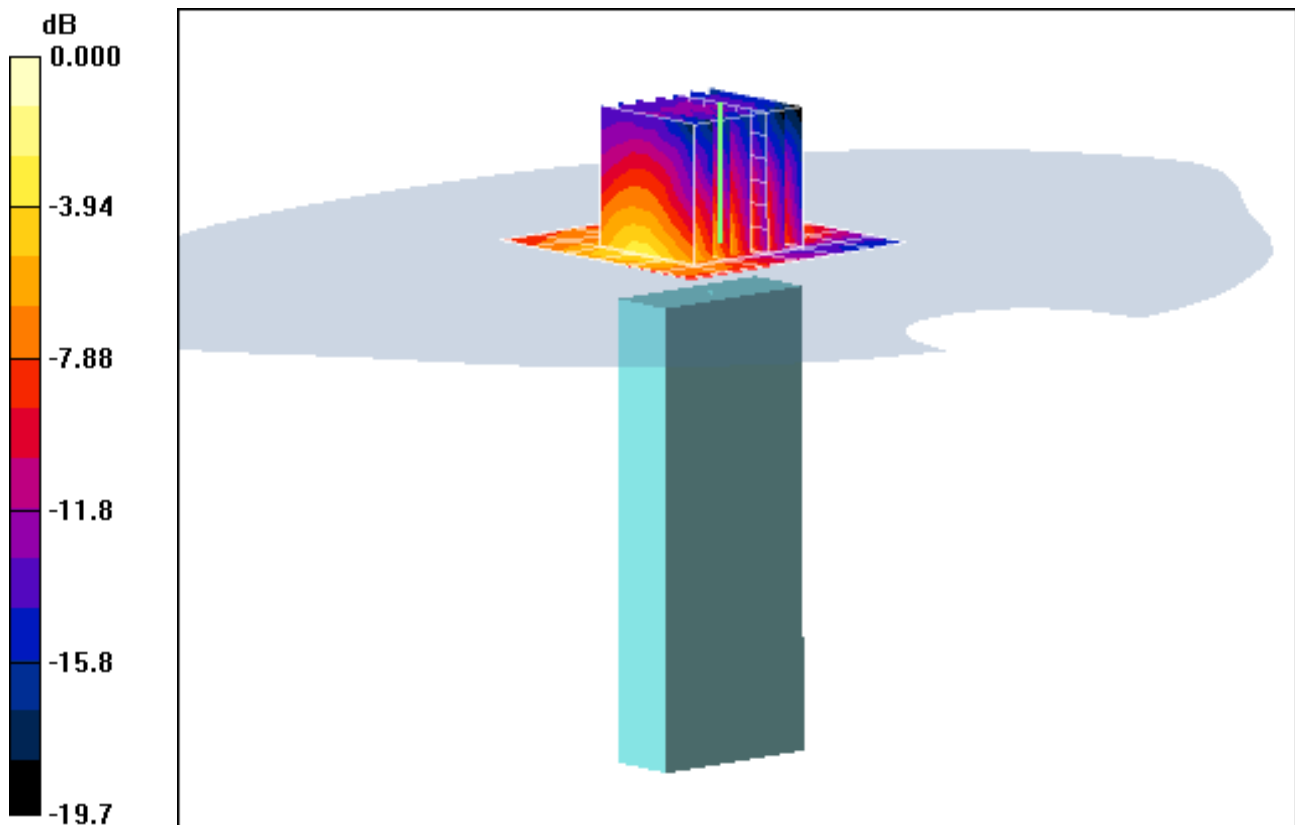
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 19.8 V/m

Peak SAR (extrapolated) = 0.781 W/kg

SAR(1 g) = 0.433 mW/g; SAR(10 g) = 0.204 mW/g



0 dB = 0.476mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: LTE RF; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Muscle Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.982 \text{ mho/m}$; $\epsilon_r = 55.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-05-2010; Ambient Temp: 23.8 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: 700MHz LTE, Body SAR, Mid Ch., RB1, Offset 49,
MCS 0, QPSK, 10MHz BW, Horizontal Up**

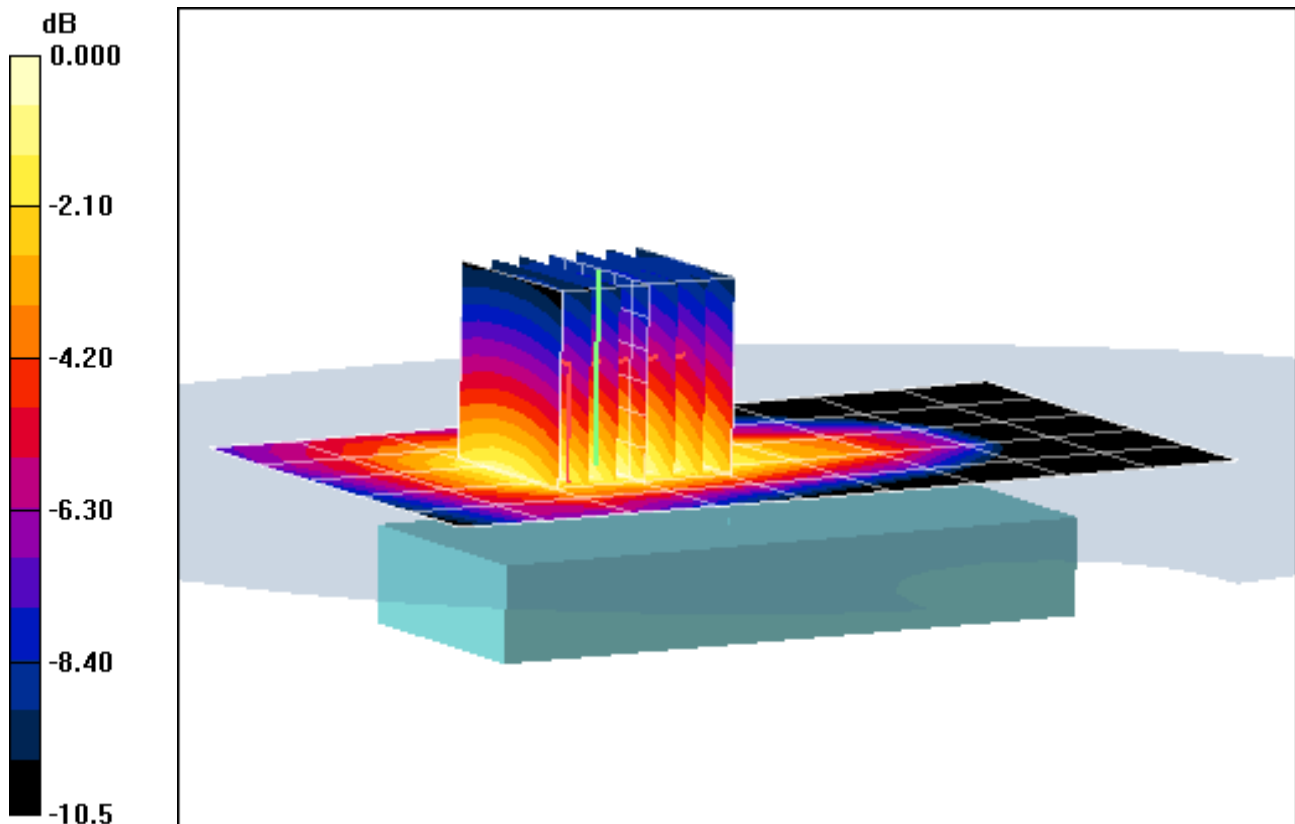
Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 29.9 V/m

Peak SAR (extrapolated) = 1.43 W/kg

SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.677 mW/g



0 dB = 1.08mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: LTE RF; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Muscle Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.982 \text{ mho/m}$; $\epsilon_r = 55.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-05-2010; Ambient Temp: 23.8 ° C; Tissue Temp: 22.1 ° C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: 700MHz LTE, Body SAR, Mid Ch., RB1, Offset 0,
MCS 0, QPSK, 10MHz BW, Horizontal Down**

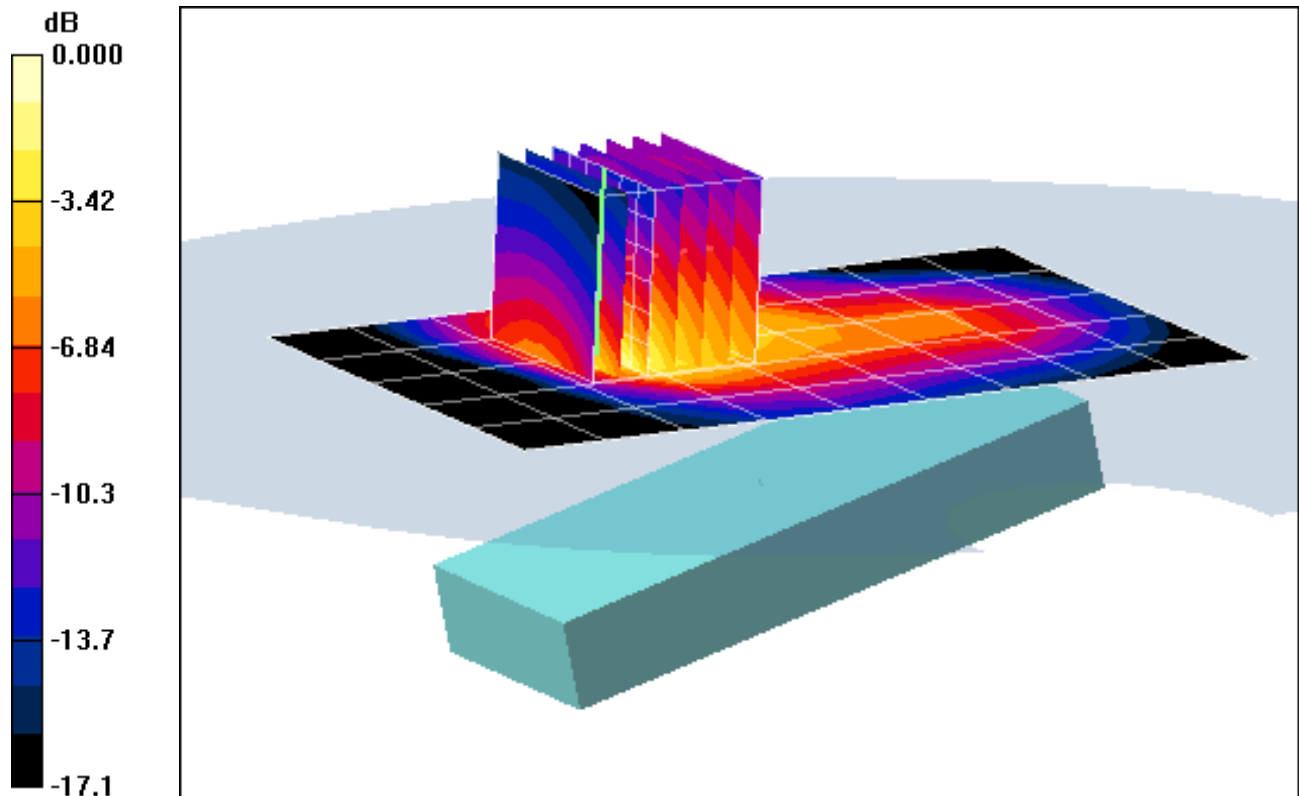
Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 26.0 V/m

Peak SAR (extrapolated) = 1.68 W/kg

SAR(1 g) = 0.597 mW/g; SAR(10 g) = 0.302 mW/g



0 dB = 0.697mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: LTE RF; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Muscle Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.982 \text{ mho/m}$; $\epsilon_r = 55.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-05-2010; Ambient Temp: 23.8 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: 700MHz LTE, Body SAR, Mid Ch., RB1, Offset 0,
MCS 0, QPSK , 10MHz BW, Vertical Front**

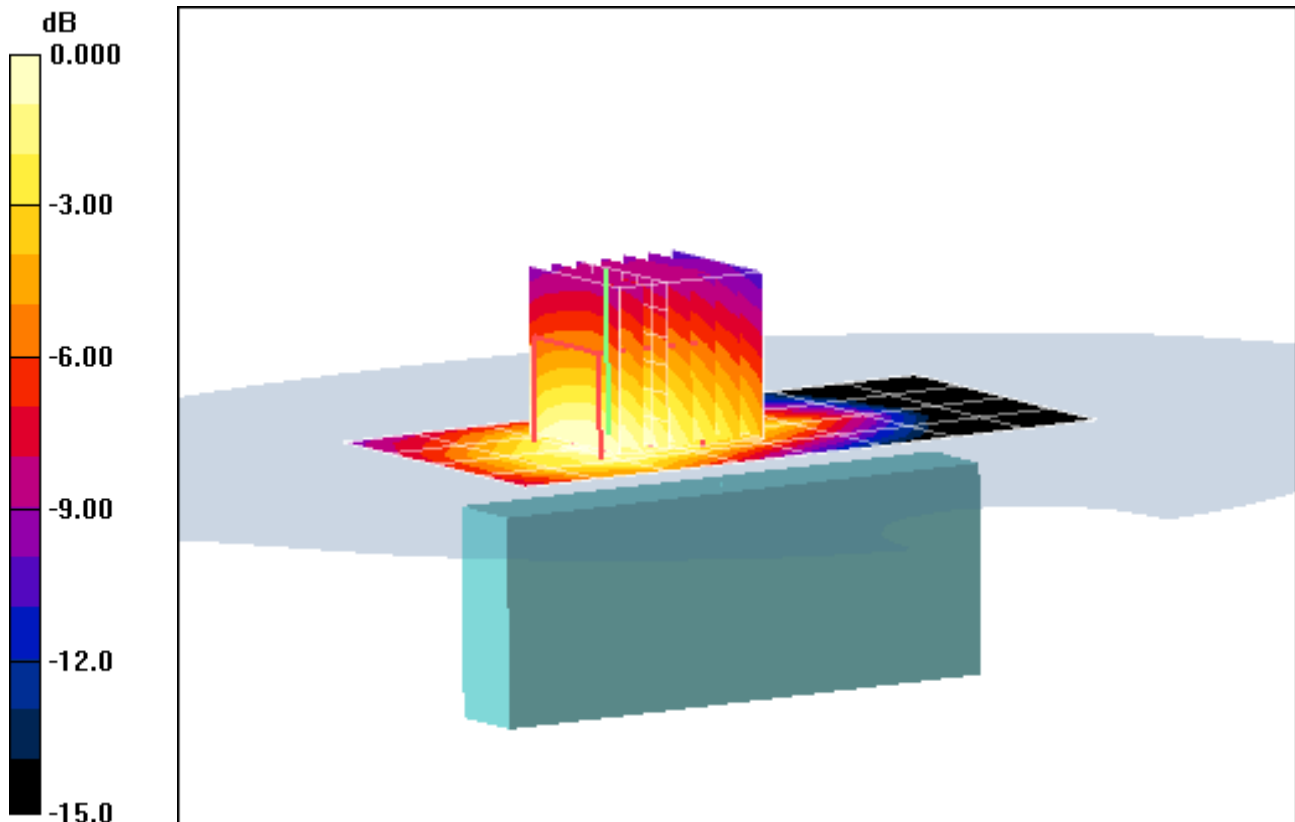
Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 35.4 V/m

Peak SAR (extrapolated) = 1.76 W/kg

SAR(1 g) = 1.18 mW/g; SAR(10 g) = 0.775 mW/g



0 dB = 1.06mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: LTE RF; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Muscle Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.982 \text{ mho/m}$; $\epsilon_r = 55.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-05-2010; Ambient Temp: 23.8 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: 700MHz LTE, Body SAR, Mid Ch., RB1, Offset 0,
MCS 0, QPSK , 10MHz BW, Vertical Front**

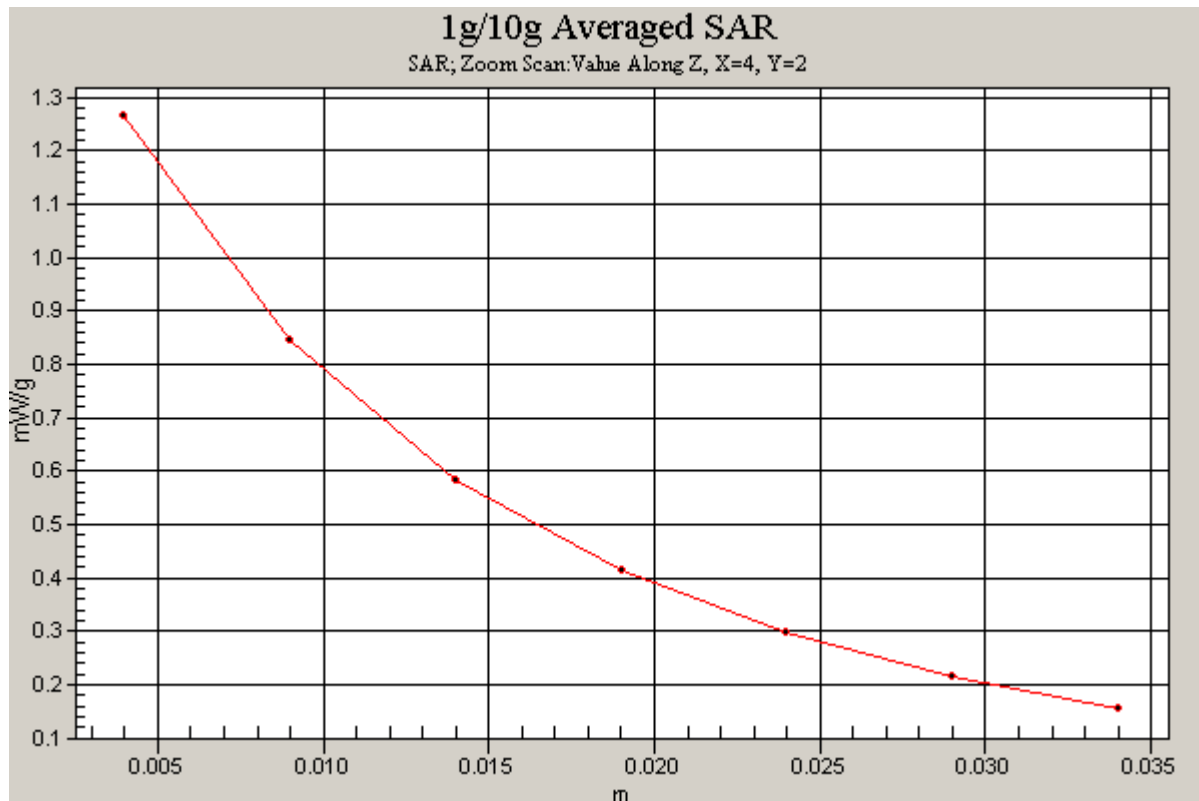
Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 35.4 V/m

Peak SAR (extrapolated) = 1.76 W/kg

SAR(1 g) = 1.18 mW/g; SAR(10 g) = 0.775 mW/g



PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: LTE RF; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Muscle Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.982 \text{ mho/m}$; $\epsilon_r = 55.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-05-2010; Ambient Temp: 23.8 ° C; Tissue Temp: 22.1 ° C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: 700MHz LTE, Body SAR, Mid Ch., RB1, Offset 49,
MCS 20, 16QAM , 10MHz BW, Vertical Back**

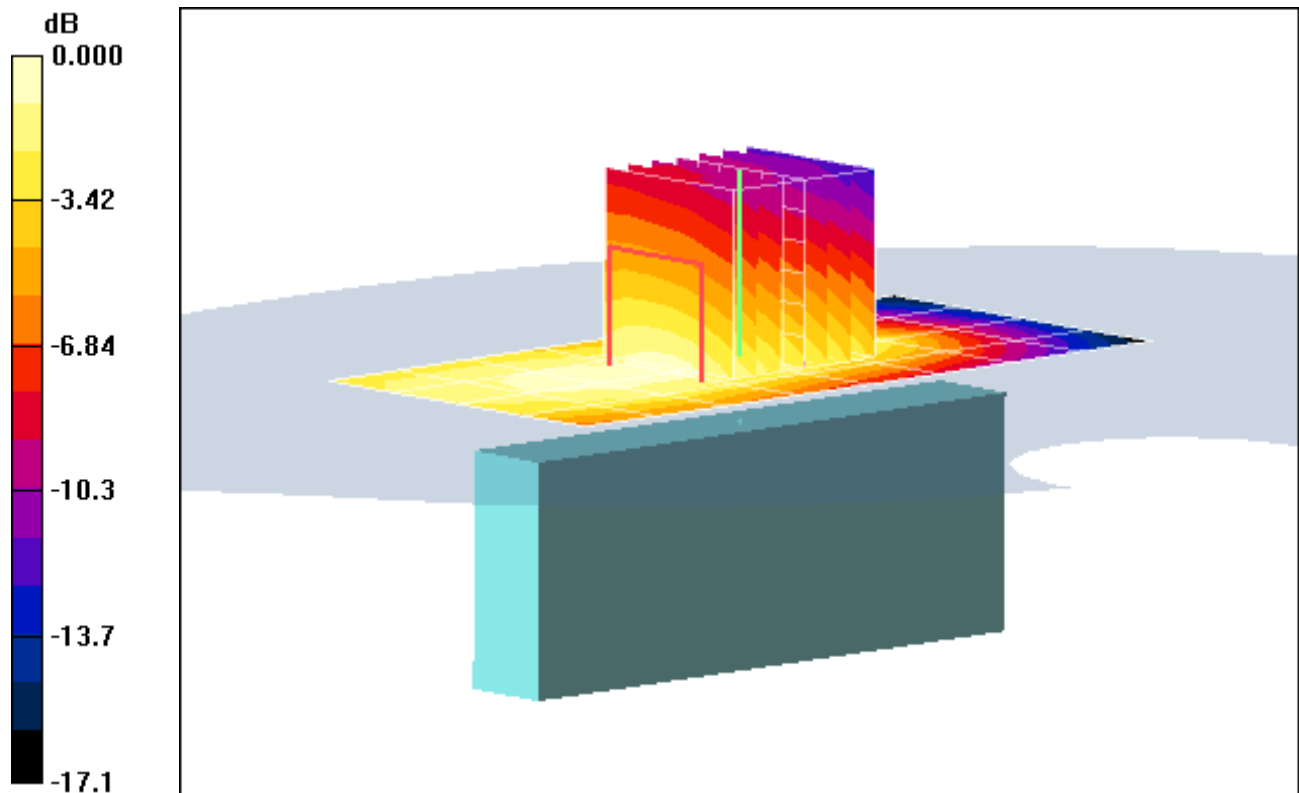
Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 19.1 V/m

Peak SAR (extrapolated) = 0.498 W/kg

SAR(1 g) = 0.321 mW/g; SAR(10 g) = 0.216 mW/g



0 dB = 0.371mW/g

PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJVL600; Type: Cellular/PCS CDMA/EVDO and LTE 700 MHz USB Modem
Serial: SAR#1**

Communication System: LTE RF; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Muscle Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.982 \text{ mho/m}$; $\epsilon_r = 55.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.5 cm

Test Date: 11-05-2010; Ambient Temp: 23.8 ° C; Tissue Temp: 22.1 ° C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: 700MHz LTE, Body SAR, Mid Ch., RB1, Offset 49,
MCS 20, 16QAM, 10MHz BW, Tip**

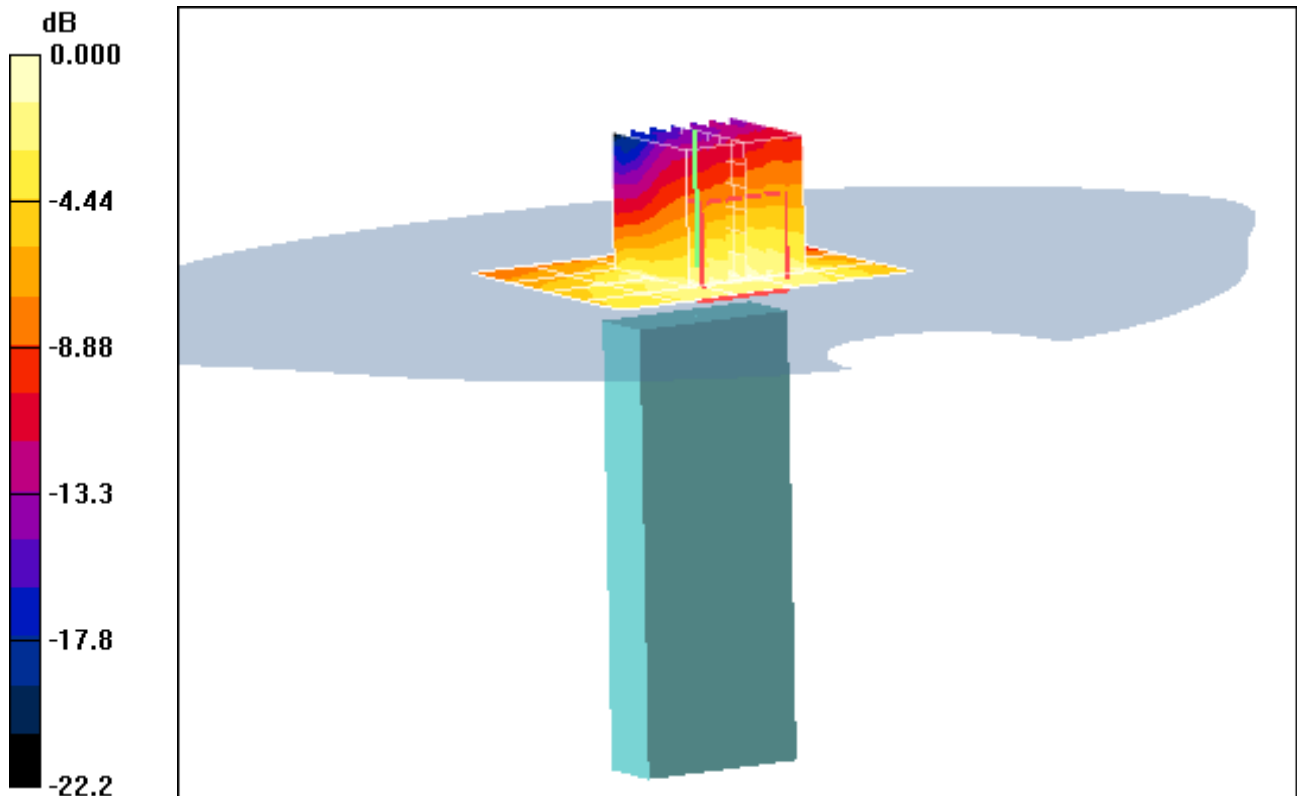
Area Scan (5x6x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 8.83 V/m

Peak SAR (extrapolated) = 0.187 W/kg

SAR(1 g) = 0.076 mW/g; SAR(10 g) = 0.041 mW/g



0 dB = 0.083mW/g

APPENDIX B: DIPOLE VALIDATION

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1003

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: 750 Muscle Medium parameters used:

$f = 750 \text{ MHz}$; $\sigma = 0.955 \text{ mho/m}$; $\epsilon_r = 55.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-05-2010; Ambient Temp: 23.8 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(6.09, 6.09, 6.09); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

750MHz System Verification

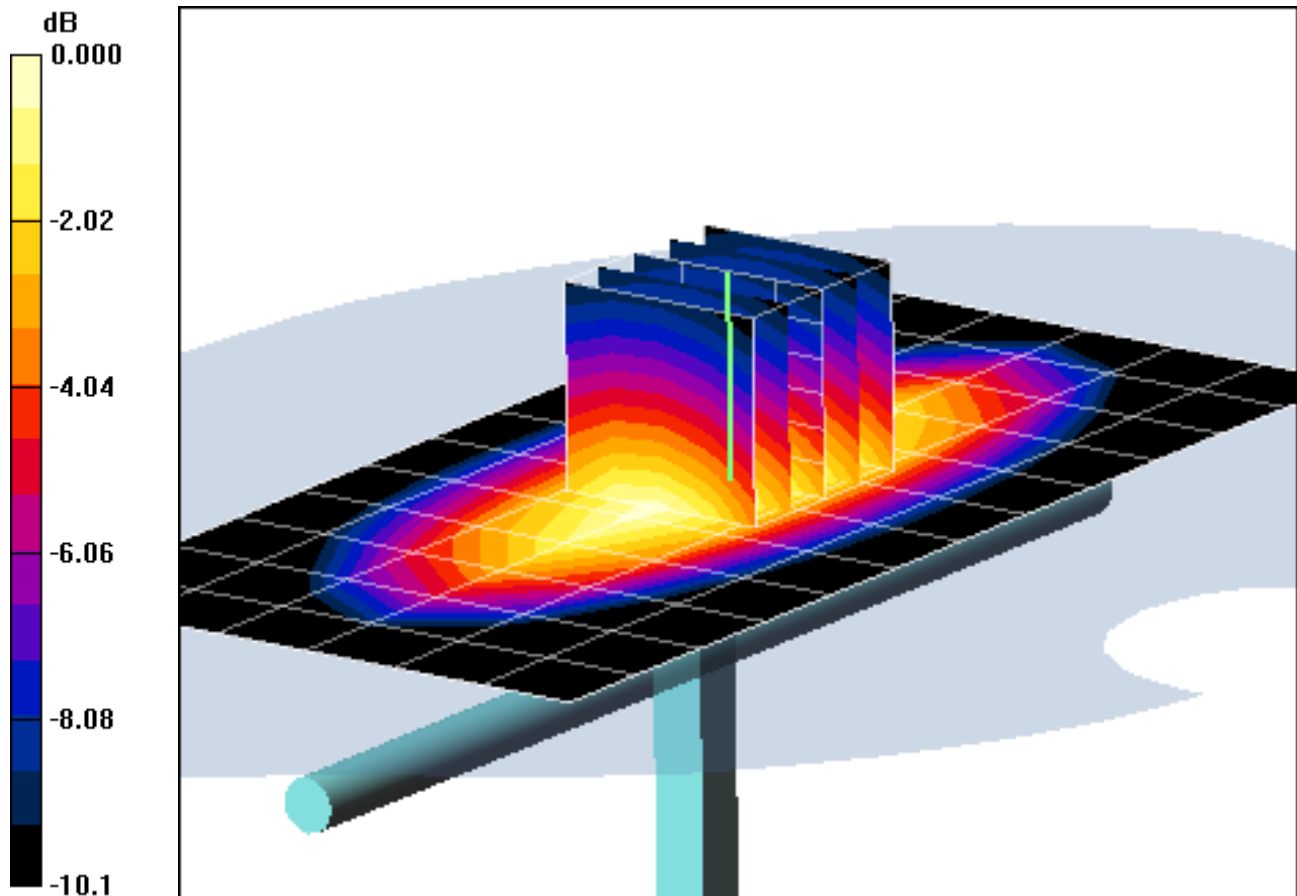
Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 24.0 dBm (250 mW)

SAR(1 g) = 2.15 mW/g; SAR(10 g) = 1.42 mW/g

Deviation = -3.15 %



0 dB = 2.30mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d047

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

Medium: 835 Muscle Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.93 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-04-2010; Ambient Temp: 23.9 °C; Tissue Temp: 22.2 °C

Probe: ES3DV3 - SN3213; ConvF(5.91, 5.91, 5.91); Calibrated: 3/16/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 3/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

835MHz System Verification

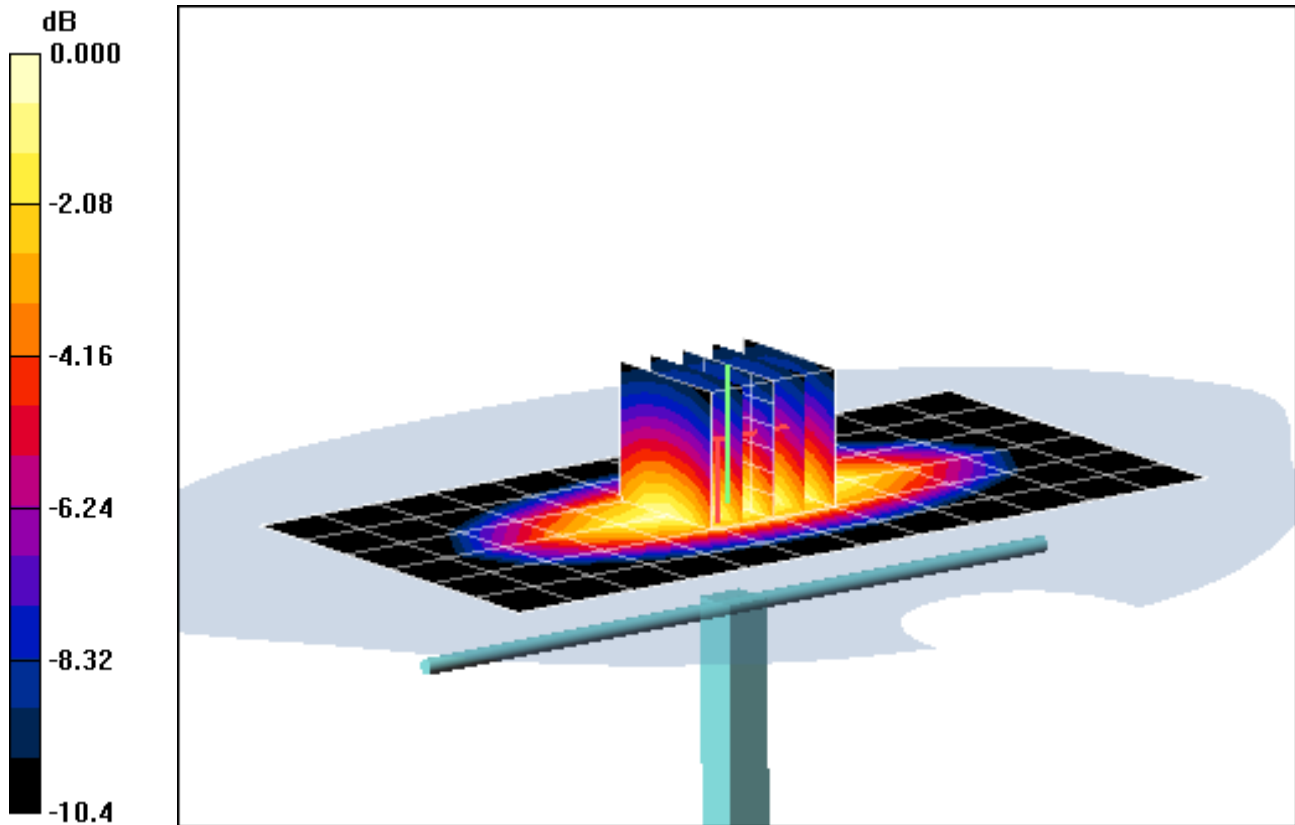
Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

SAR(1 g) = 0.994 mW/g; SAR(10 g) = 0.650 mW/g

Deviation = 1.22 %



0 dB = 1.08mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 5d080

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

Medium: 1900 Muscle Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.51 \text{ mho/m}$; $\epsilon_r = 52$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-25-2010; Ambient Temp: 23.4 °C; Tissue Temp: 22.1 °C

Probe: ES3DV2 - SN3022; ConvF(4.34, 4.34, 4.34); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

1900MHz System Verification

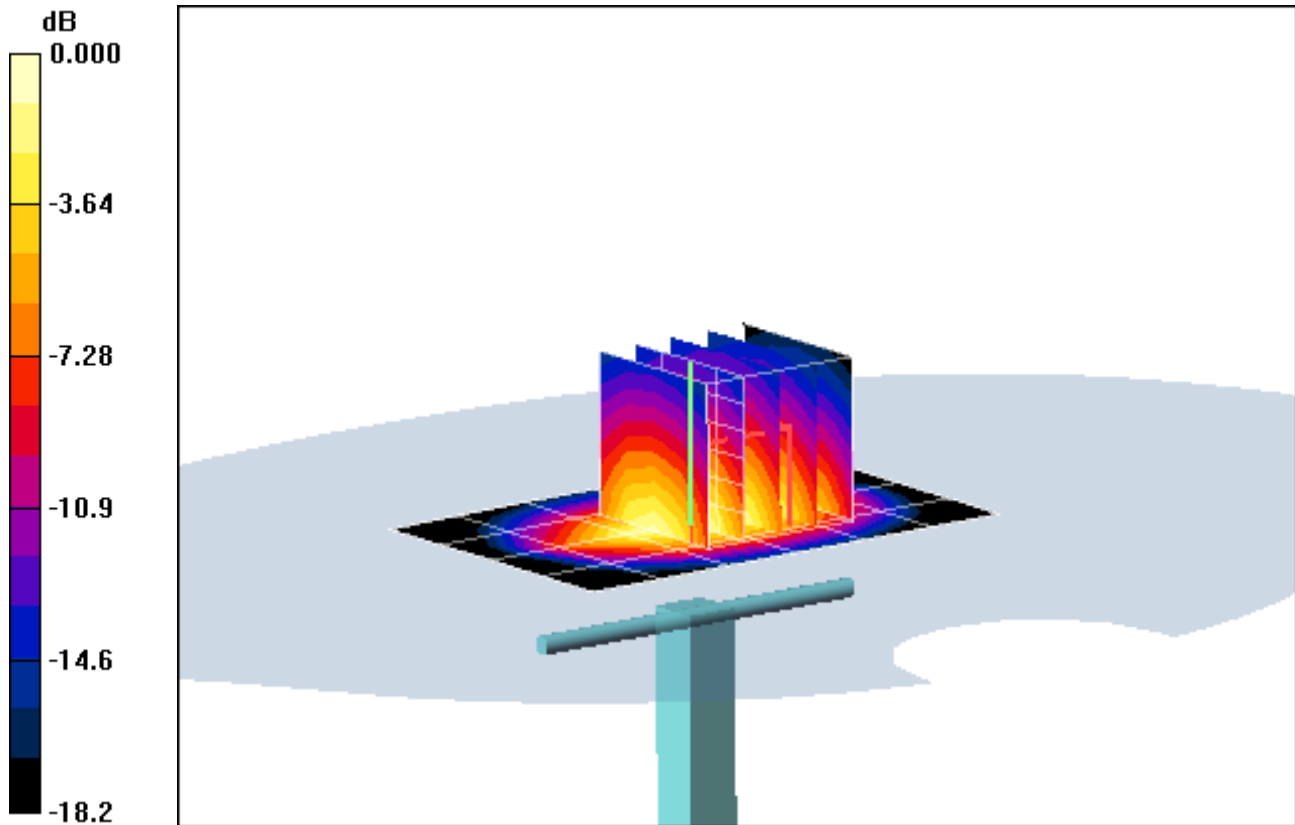
Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

SAR(1 g) = 4.03 mW/g; SAR(10 g) = 2.13 mW/g

Deviation = -0.49 %



0 dB = 4.49mW/g

APPENDIX C: PROBE CALIBRATION



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 **PC Test**

Certificate No: **ES3-3213_Mar10**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3213**

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

Calibration date: **March 16, 2010**

*Volc
 3/29/10*

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 $(22 \pm 3)^{\circ}\text{C}$ and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013 Dec09)	Dec-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

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

Issued: March 19, 2010

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



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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe ES3DV3

SN:3213

Manufactured:	October 14, 2008
Last calibrated:	April 15, 2009
Recalibrated:	March 16, 2010

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV3 SN:3213**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.24	1.40	1.36	± 10.1%
DCP (mV) ^B	93.8	93.1	91.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300.0	± 1.5%
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

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

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

^B Numerical linearization parameter: uncertainty not required.

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

DASY - Parameters of Probe: ES3DV3 SN:3213

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
750	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	6.30	6.30	6.30	0.99	1.04 ± 13.3%
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	5.98	5.98	5.98	0.96	1.07 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	5.11	5.11	5.11	0.50	1.38 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	4.92	4.92	4.92	0.53	1.39 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	4.36	4.36	4.36	0.46	1.62 ± 11.0%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

DASY - Parameters of Probe: ES3DV3 SN:3213

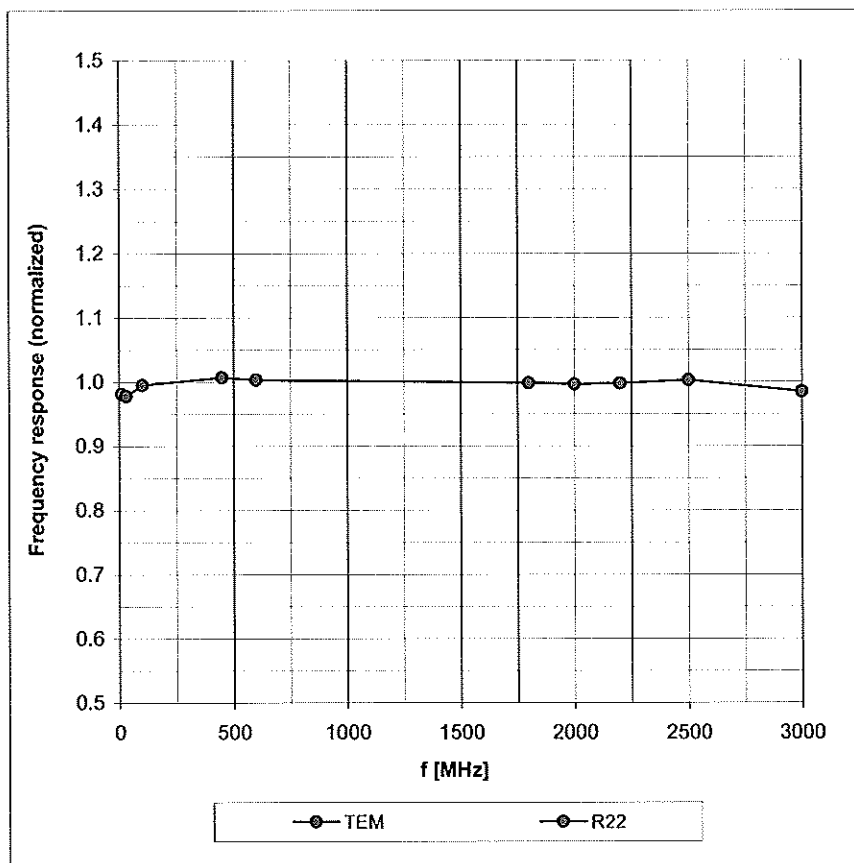
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
750	± 50 / ± 100	55.5 ± 5%	0.96 ± 5%	5.97	5.97	5.97	0.77	1.16 ± 13.3%
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	5.91	5.91	5.91	0.85	1.17 ± 11.0%
1640	± 50 / ± 100	53.8 ± 5%	1.40 ± 5%	5.04	5.04	5.04	0.35	1.97 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	4.80	4.80	4.80	0.42	1.82 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.61	4.61	4.61	0.41	1.97 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	4.27	4.27	4.27	0.70	1.36 ± 11.0%
2600	± 50 / ± 100	52.5 ± 5%	2.16 ± 5%	4.16	4.16	4.16	0.92	1.17 ± 11.0%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

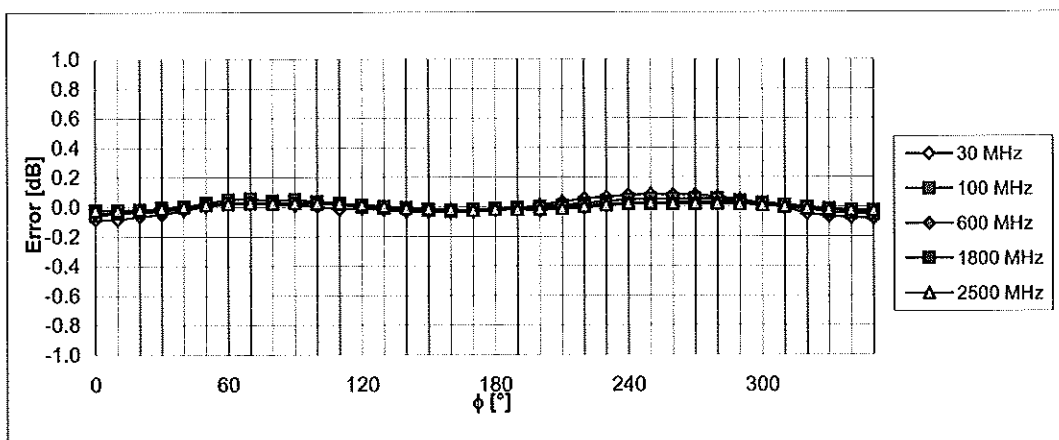
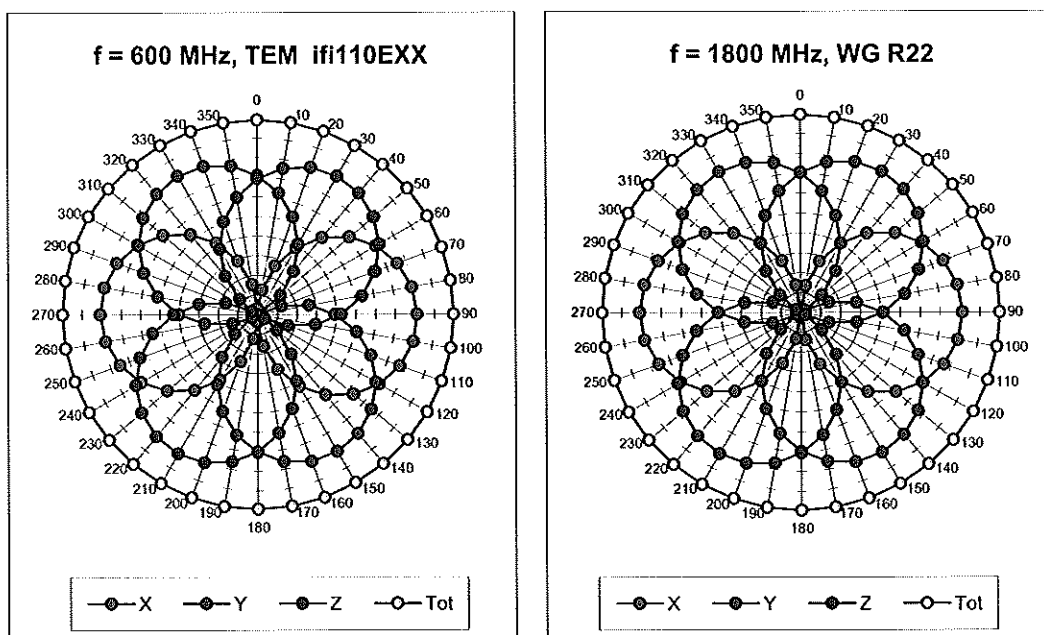
Frequency Response of E-Field

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



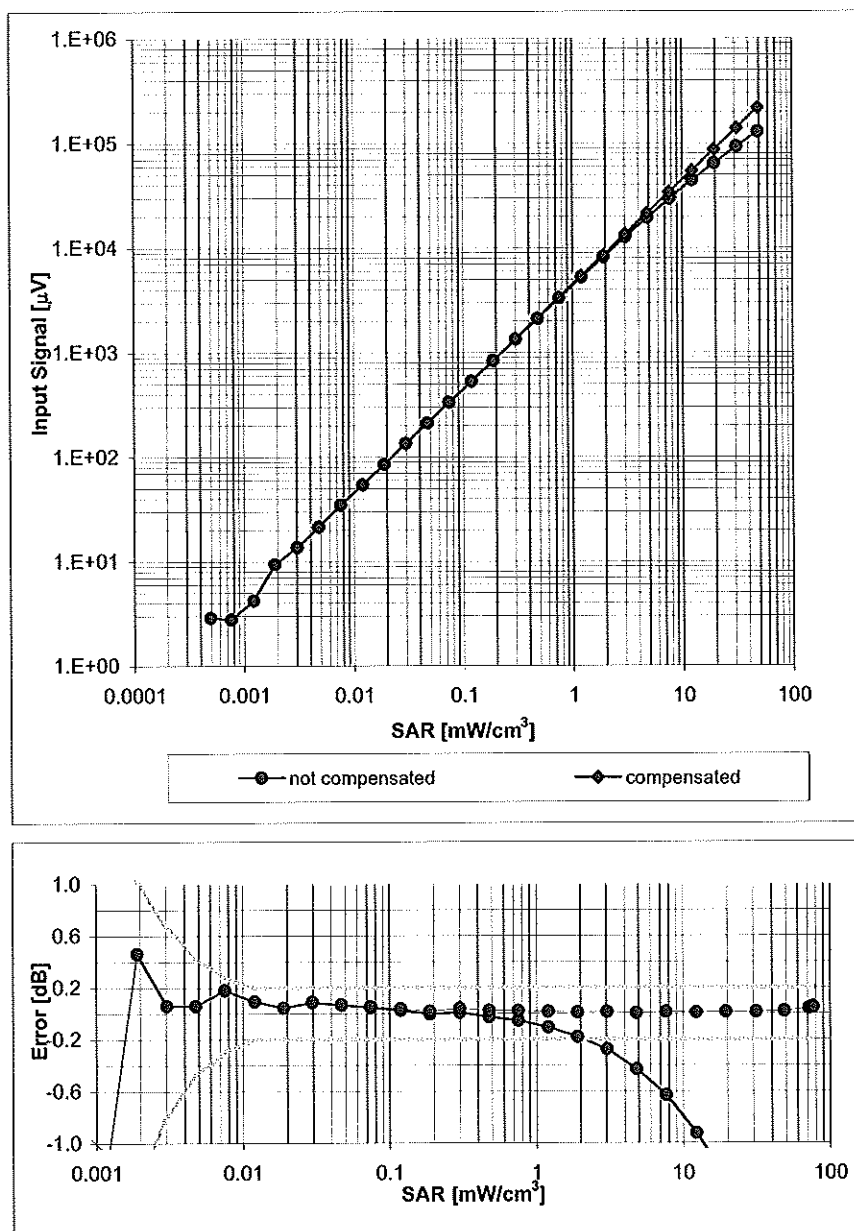
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$



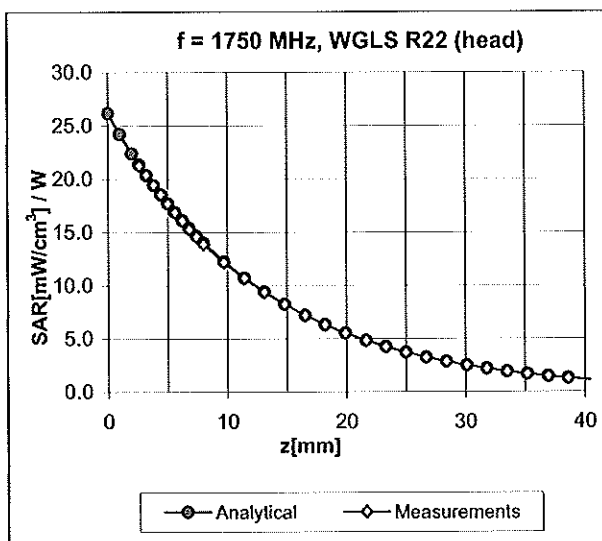
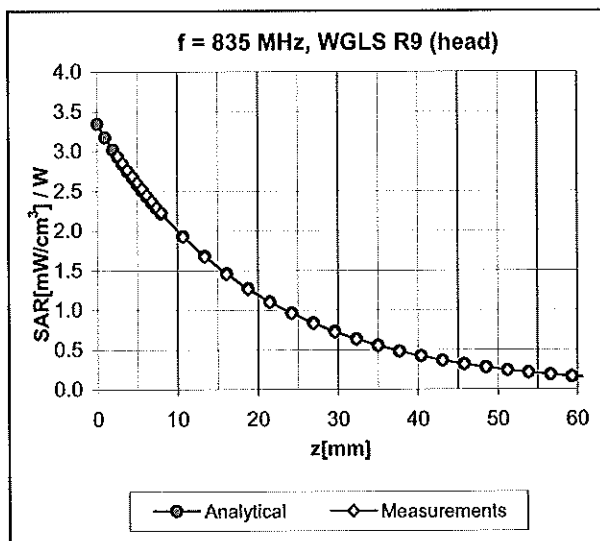
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$)



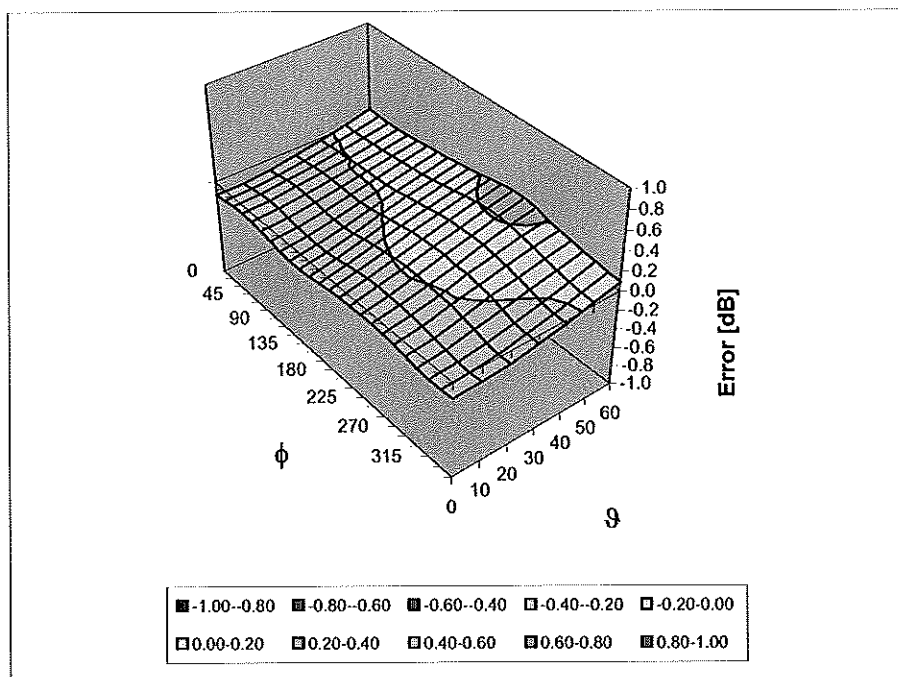
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ , θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ (k=2)

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4.0 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ES3DV3

Serial Number:

3213

Place of Assessment:

Zurich

Date of Assessment:

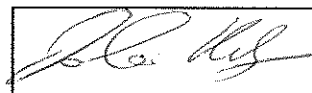
April 13, 2010

Probe Calibration Date:

March 16, 2010

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. The evaluation is coupled with measured conversion factors (probe calibration date indicated above). The uncertainty of the numerical assessment is based on the extrapolation from measured value at 835 MHz or at 1750 MHz.

Assessed by:



Dosimetric E-Field Probe ES3DV3 SN:3213

Conversion factor ($\pm$ standard deviation)

1640 $\pm$ 50 MHz

ConvF

5.27 $\pm$ 7%

$\epsilon_r = 40.2 \pm 5\%$
 $\sigma = 1.31 \pm 5\%$ mho/m
(head tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also DASY4 Manual.



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 **PC Test**

Certificate No: **ES3-3022_Sep10**

CALIBRATION CERTIFICATE

Object **ES3DV2 - SN:3022**

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

Calibration date: **September 21, 2010**

✓
 KOK
 9/29/10

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

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

Issued: September 22, 2010

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



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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV2

SN:3022

Manufactured:	April 15, 2003
Last calibrated:	September 18, 2009
Recalibrated:	September 21, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV2 SN:3022

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.01	1.05	1.01	± 10.1%
DCP (mV) ^B	92.8	92.5	89.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300.0	± 1.5%
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

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

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

^B Numerical linearization parameter: uncertainty not required.

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

DASY/EASY - Parameters of Probe: ES3DV2 SN:3022

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
750	± 50 / ± 100	41.9 ± 5%	0.89 ± 5%	6.32	6.32	6.32	0.87	1.01 ± 11.0%
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	6.02	6.02	6.02	0.62	1.20 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	5.01	5.01	5.01	0.27	2.23 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	4.83	4.83	4.83	0.25	2.29 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	4.21	4.21	4.21	0.25	2.62 ± 11.0%
2600	± 50 / ± 100	39.0 ± 5%	1.96 ± 5%	4.14	4.14	4.14	0.25	2.64 ± 11.0%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

DASY/EASY - Parameters of Probe: ES3DV2 SN:3022

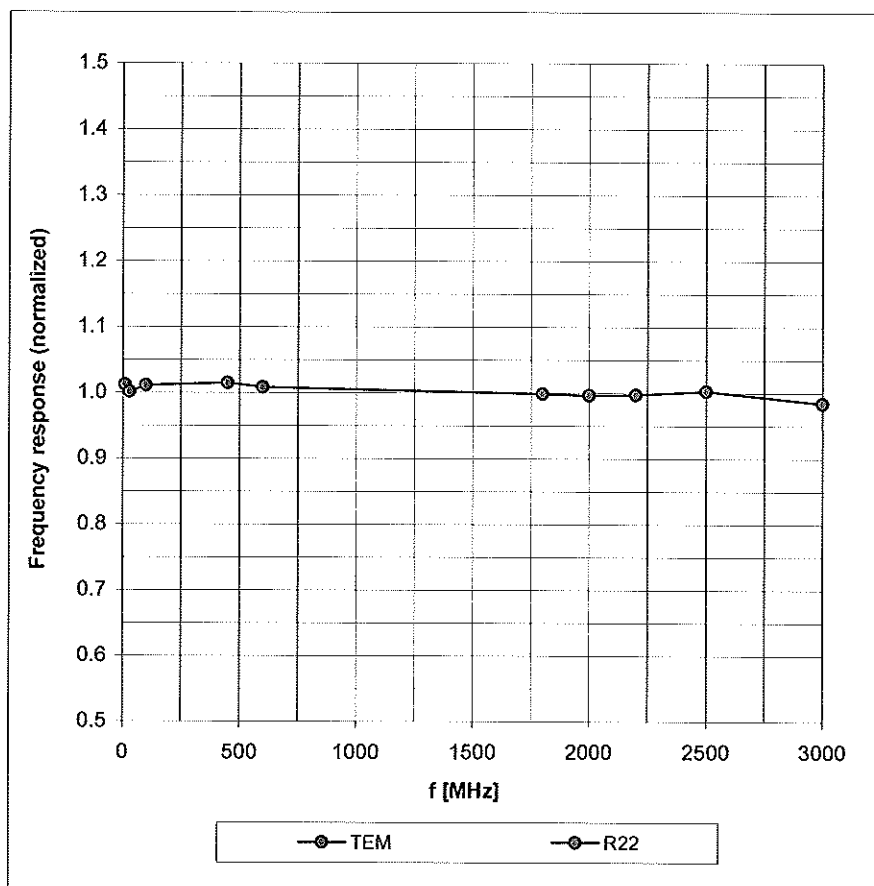
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
750	± 50 / ± 100	55.5 ± 5%	0.96 ± 5%	6.09	6.09	6.09	0.68	1.20 ± 11.0%
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	5.89	5.89	5.89	0.65	1.20 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	4.59	4.59	4.59	0.23	2.83 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.34	4.34	4.34	0.22	3.71 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	4.06	4.06	4.06	0.41	1.42 ± 11.0%
2600	± 50 / ± 100	52.5 ± 5%	2.16 ± 5%	4.06	4.06	4.06	0.53	1.23 ± 11.0%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

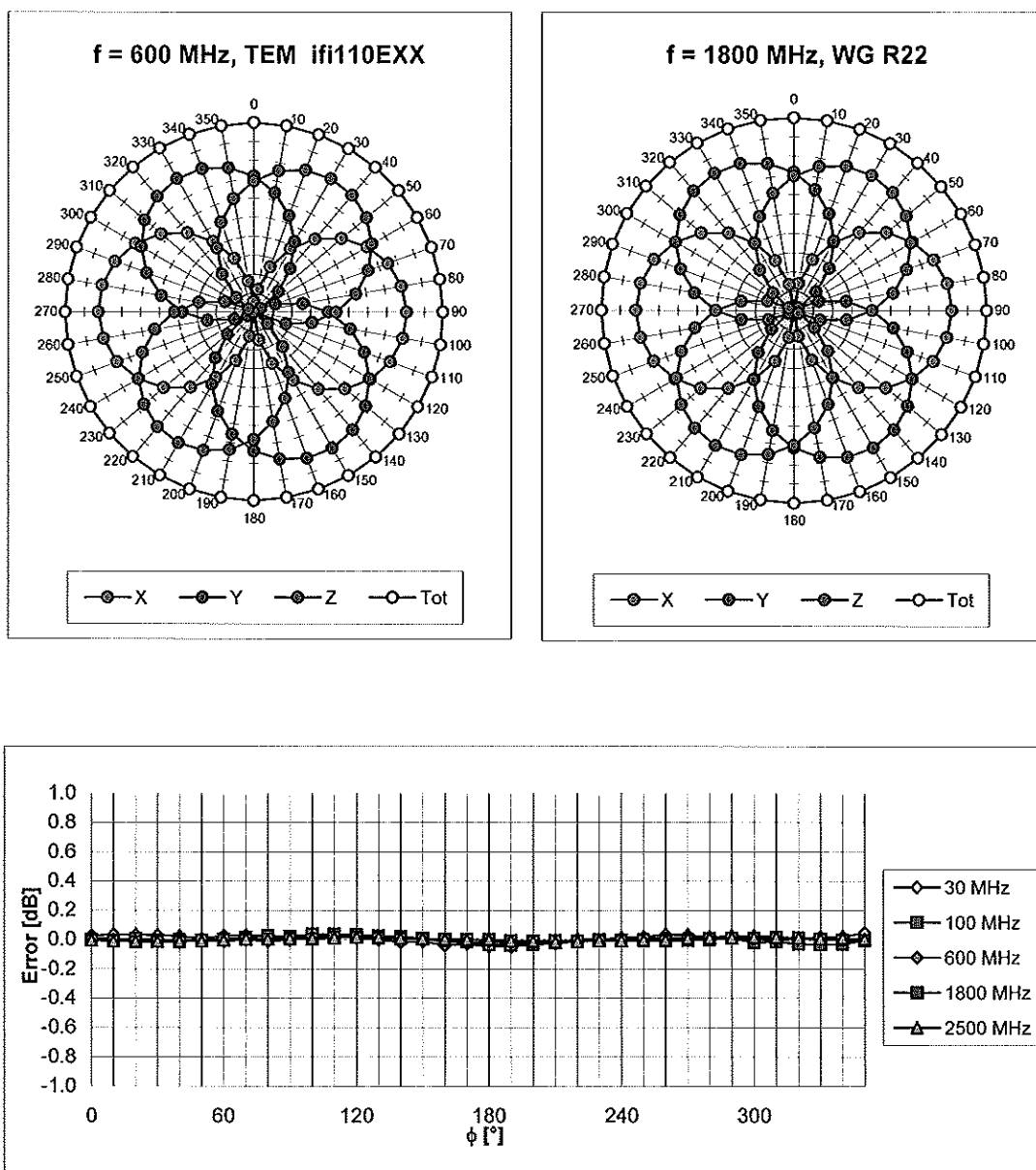
Frequency Response of E-Field

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



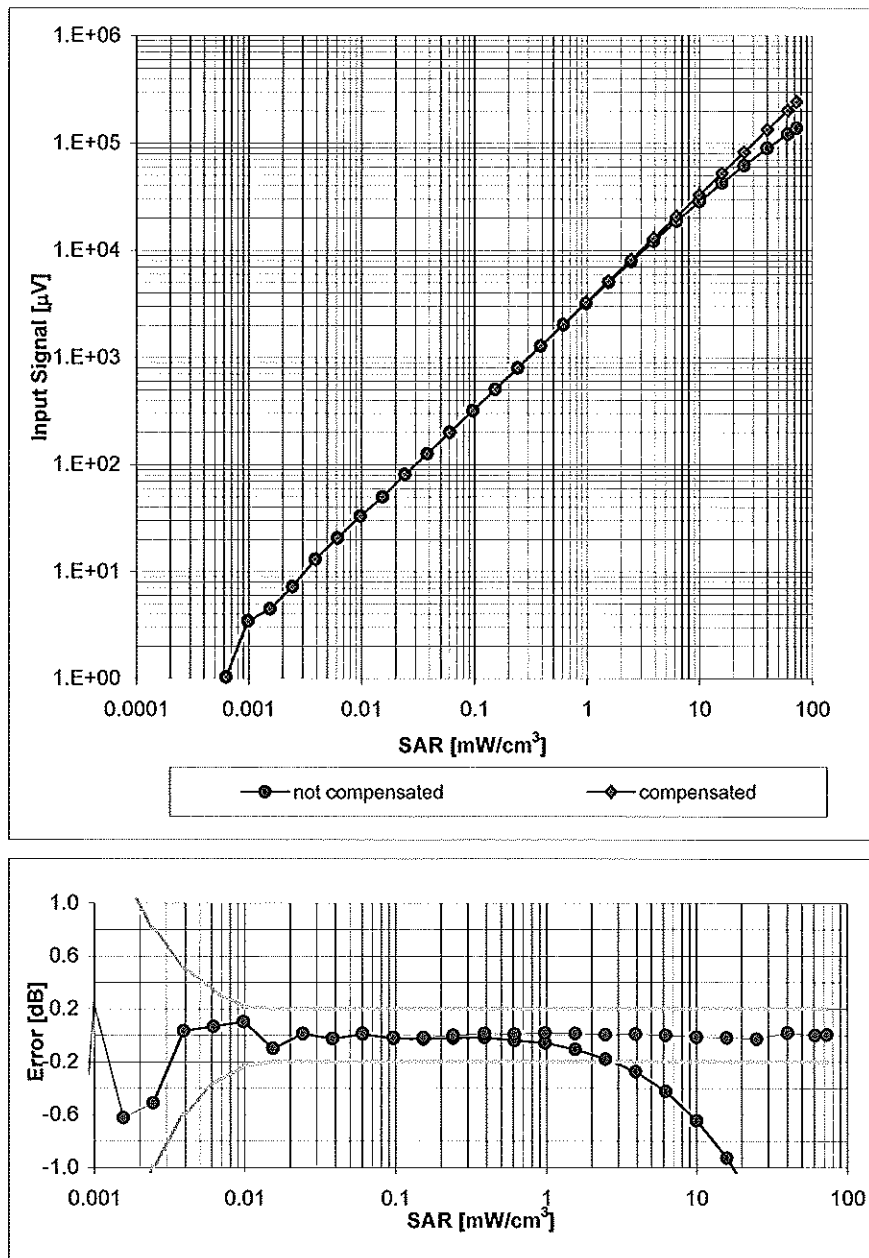
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$



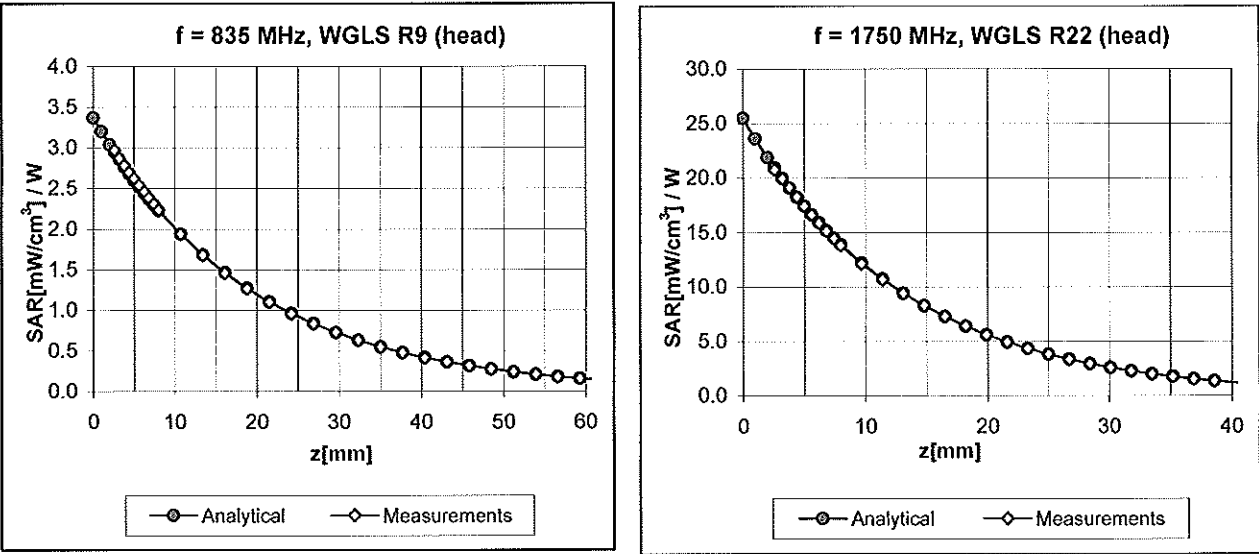
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$)



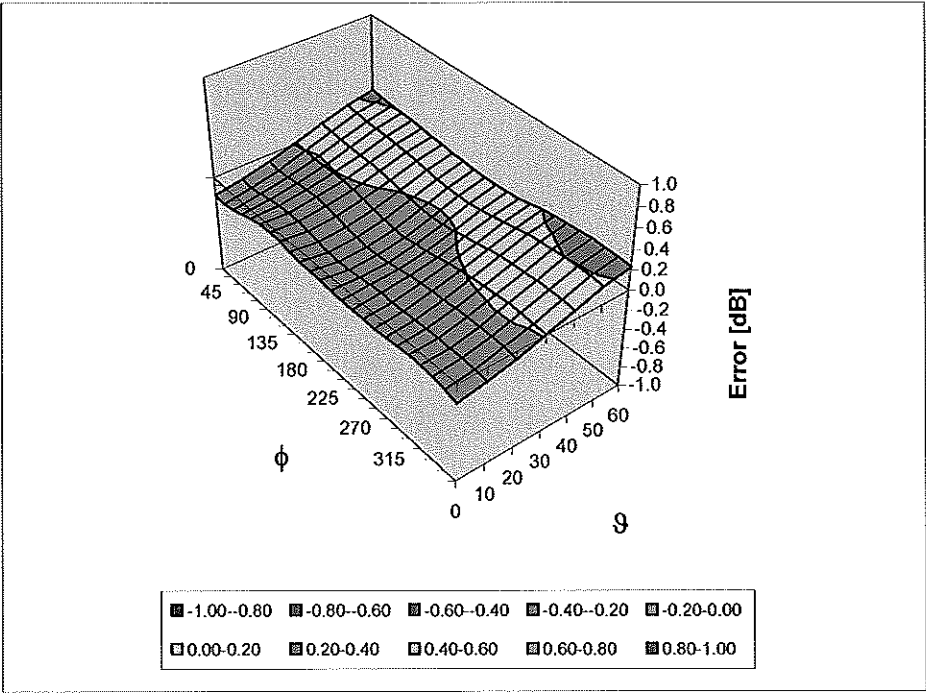
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ , θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ (k=2)

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4.0 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm



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 **PC Test**

Certificate No: **D750V3-1003_Aug10**

CALIBRATION CERTIFICATE

Object **D750V3 - SN: 1003**

Calibration procedure(s) **QA CAL-05.v7**
Calibration procedure for dipole validation kits

Calibration date: **August 19, 2010**

KOK
8130110

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	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

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

Issued: August 23, 2010

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



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:

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

- 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.

Measurement Conditions

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

DASY Version	DASY5	V52.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 1 MHz	

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	55.2 $\pm$ 6 %	0.97 mho/m $\pm$ 6 %
Body TSL temperature during test	(22.0 $\pm$ 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.24 mW / g
SAR normalized	normalized to 1W	8.96 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	8.88 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.50 mW / g
SAR normalized	normalized to 1W	6.00 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	5.96 mW / g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.7 Ω - 3.3 j Ω
Return Loss	- 29.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.045 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.

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	January 21, 2009

DASY5 Validation Report for Body TSL

Date/Time: 19.08.2010 14:22:09

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1003

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: MSL U11 BB

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.97 \text{ mho/m}$; $\epsilon_r = 55.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.08, 6.08, 6.08); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

Pin=250mW; dip=15mm; dist=3.0mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

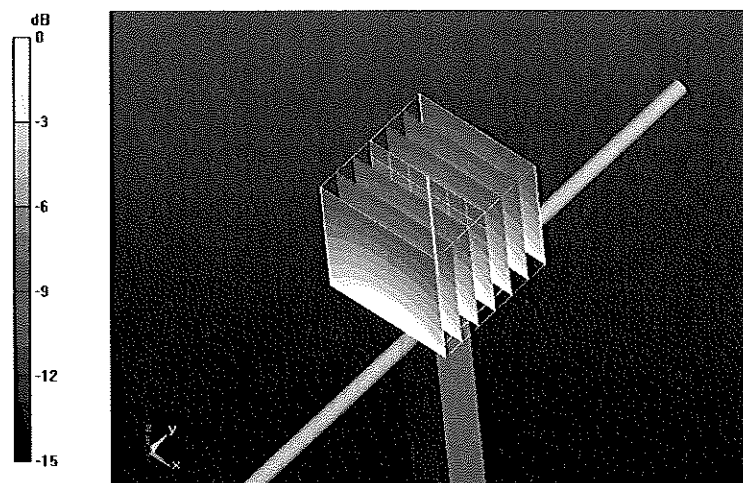
$dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53.2 V/m; Power Drift = 0.013 dB

Peak SAR (extrapolated) = 3.23 W/kg

SAR(1 g) = 2.24 mW/g; SAR(10 g) = 1.5 mW/g

Maximum value of SAR (measured) = 2.59 mW/g

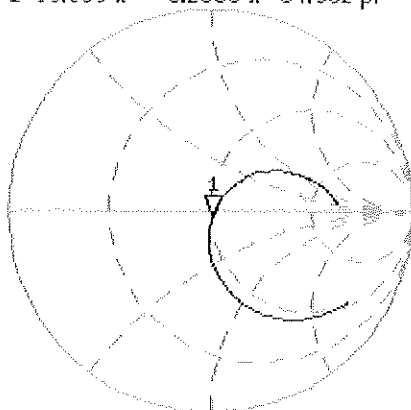


0 dB = 2.59mW/g

Impedance Measurement Plot for Body TSL

19 Aug 2010 13:17:12
[CH1] S11 1 U FS 1: 50.689 Ω -3.2656 Ω 64.982 pF 750.000 000 MHz

*
De1
Cor



Avg
16

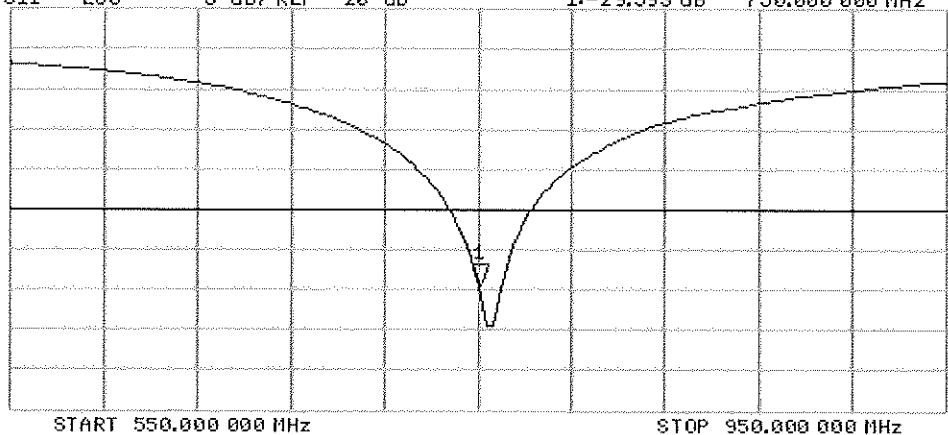
↑

CH2 S11 LOG 5 dB/REF -20 dB 1:-29.593 dB 750.000 000 MHz

Cor

Avg
16

↑





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 **PC Test**

Certificate No: **D1900V2-5d080-Aug09**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d080**

Calibration procedure(s) **QA CAL-05.v7
Calibration procedure for dipole validation kits**

Calibration date: **August 18, 2009**

Condition of the calibrated item **In Tolerance**

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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

Calibrated by: **Claudio Leubler** **Laboratory Technician** **Signature**

Approved by: **Katja Pokovic** **Technical Manager**

Issued: August 19, 2009

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



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:

- 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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- 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:

- 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.

Measurement Conditions

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

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 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 $\pm$ 0.2) °C	40.8 $\pm$ 6 %	1.45 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.0 $\pm$ 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	10.2 mW / g
SAR normalized	normalized to 1W	40.8 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	40.1 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.30 mW / g
SAR normalized	normalized to 1W	21.2 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	21.0 mW / g $\pm$ 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.9 ± 6 %	1.57 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR normalized	normalized to 1W	41.2 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	40.5 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.41 mW / g
SAR normalized	normalized to 1W	21.6 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	21.5 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.0 Ω + 6.1 j Ω
Return Loss	- 24.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.1 Ω + 5.7 j Ω
Return Loss	- 23.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.193 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

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	June 28, 2006

DASY5 Validation Report for Head TSL

Date/Time: 05.08.2009 14:25:51

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d080

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

Medium: HSL U11 BB

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; dip = 10 mm, scan at 3.0 mm/Zoom Scan (dist=3.0 mm, probe 0deg)

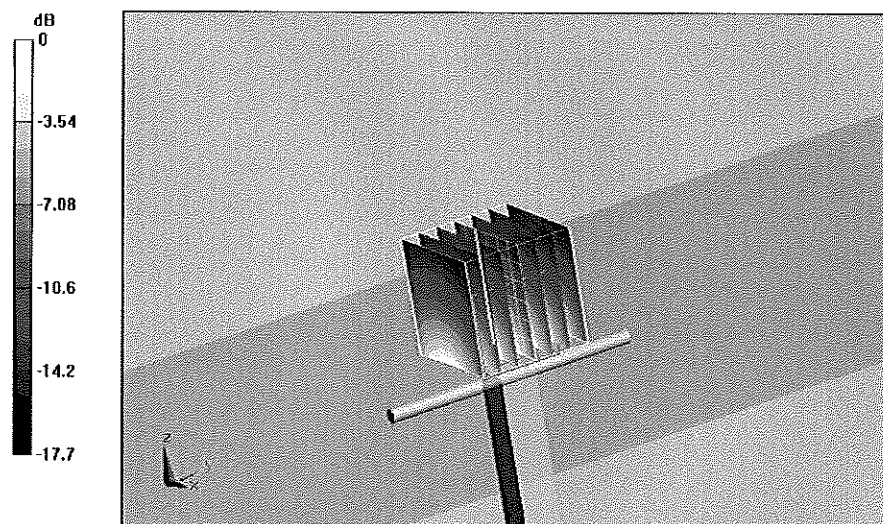
(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.9 V/m; Power Drift = 0.040 dB

Peak SAR (extrapolated) = 18.7 W/kg

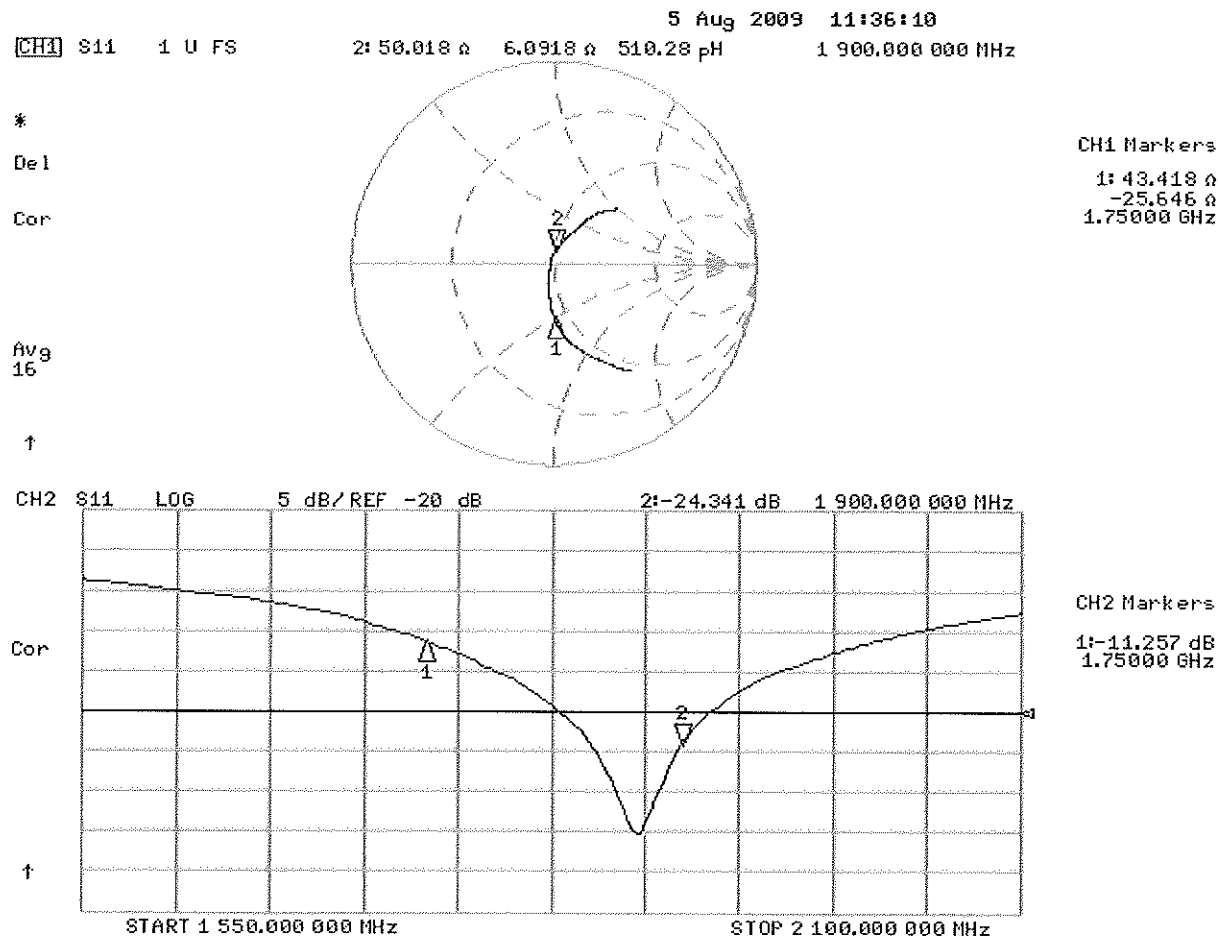
SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.3 mW/g

Maximum value of SAR (measured) = 12.6 mW/g



0 dB = 12.6mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 18.08.2009 14:14:25

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d080

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

Medium: MSL U10 BB

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.57$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; dip = 10 mm, scan at 3.0mm/Zoom Scan (dist=3.0mm, probe 0deg)

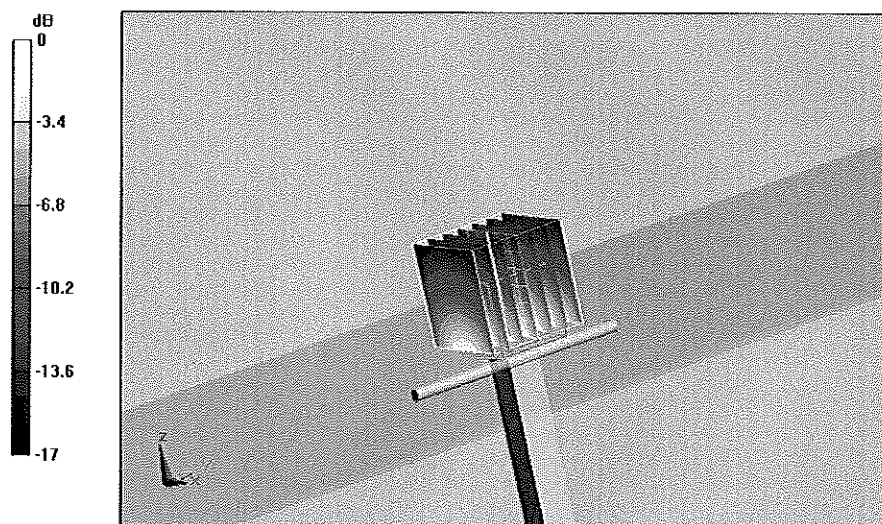
(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.7 V/m; Power Drift = -0.00545 dB

Peak SAR (extrapolated) = 17.7 W/kg

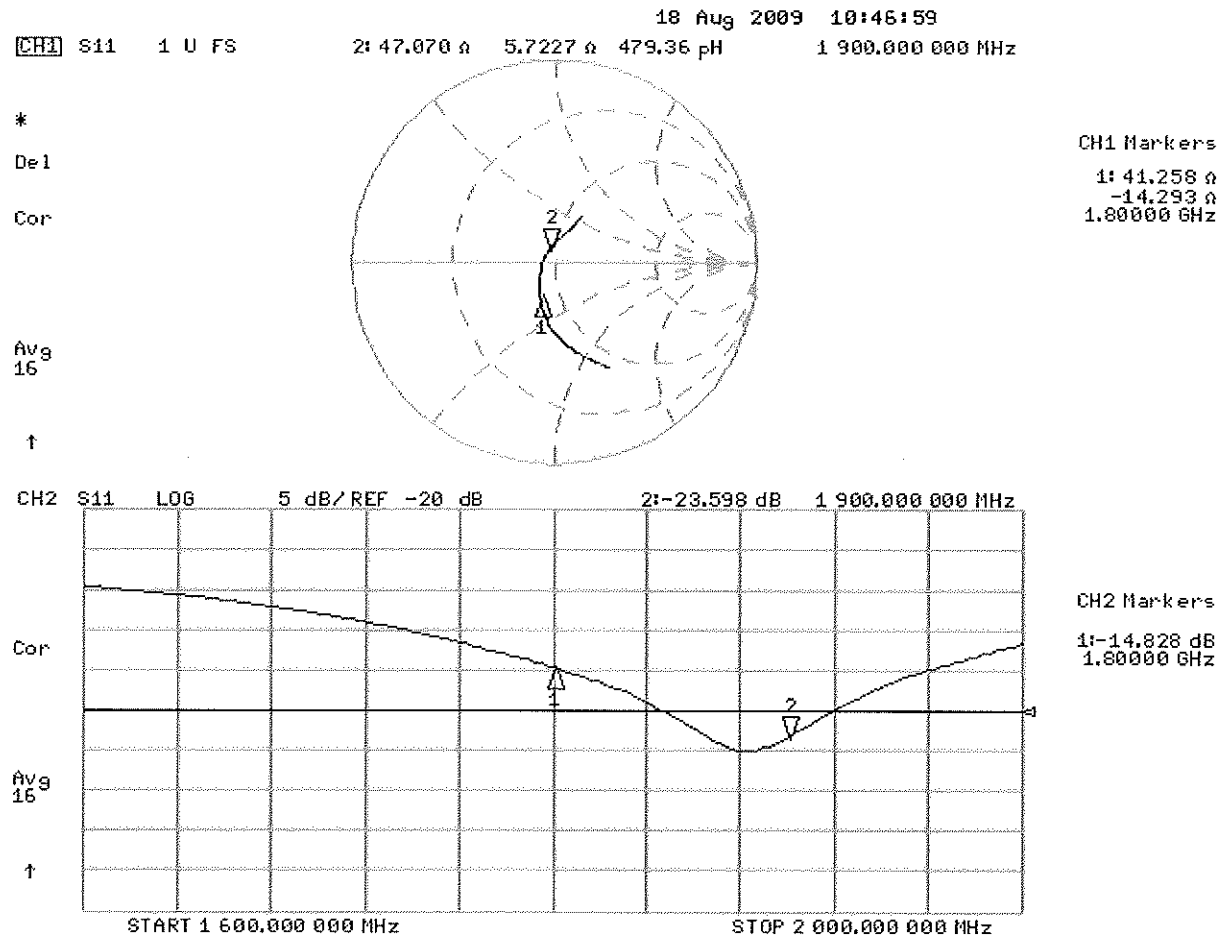
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.41 mW/g

Maximum value of SAR (measured) = 13.1 mW/g



0 dB = 13.1mW/g

Impedance Measurement Plot for Body TSL





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 **PC Test**

Certificate No: **D835V2-4d047_Jan09**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d047**

Calibration procedure(s) **QA CAL-05.v7**
Calibration procedure for dipole validation kits

Calibration date: **January 19, 2009**

Condition of the calibrated item **In Tolerance**

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 $(22 \pm 3)^\circ\text{C}$ 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	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	01-Jul-08 (No. 217-00864)	Jul-09
Type-N mismatch combination	SN: 5047.2 / 06327	01-Jul-08 (No. 217-00867)	Jul-09
Reference Probe ES3DV2	SN: 3025	28-Apr-08 (No. ES3-3025_Apr08)	Apr-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

Calibrated by: **Jeton Kastrati** **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Issued: January 20, 2009

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



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:

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

- 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.

Measurement Conditions

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

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 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 $\pm$ 0.2) °C	41.3 $\pm$ 6 %	0.91 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.5 $\pm$ 0.2) °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.45 mW / g
SAR normalized	normalized to 1W	9.80 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	9.70 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.61 mW / g
SAR normalized	normalized to 1W	6.44 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	6.39 mW / g $\pm$ 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9 Ω -3.7 j Ω
Return Loss	- 28.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω -5.5 j Ω
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 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.

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	August 16, 2006

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	53.5 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.53 mW / g
SAR normalized	normalized to 1W	10.1 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	9.82 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.67 mW / g
SAR normalized	normalized to 1W	6.68 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	6.54 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

DASY5 Validation Report for Head TSL

Date/Time: 19.01.2009 11:45:19

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d047

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

Medium: HSL 900 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.91 \text{ mho/m}$; $\epsilon_r = 41.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.97, 5.97, 5.97); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

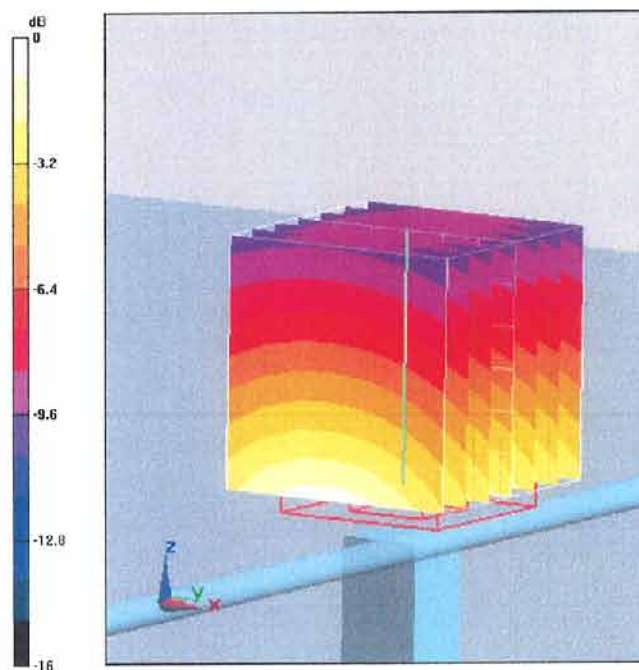
Pin=250mW; dip=15mm; dist=3.4mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.4 V/m; Power Drift = -0.00691 dB

Peak SAR (extrapolated) = 3.61 W/kg

SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.61 mW/g

Maximum value of SAR (measured) = 2.77 mW/g

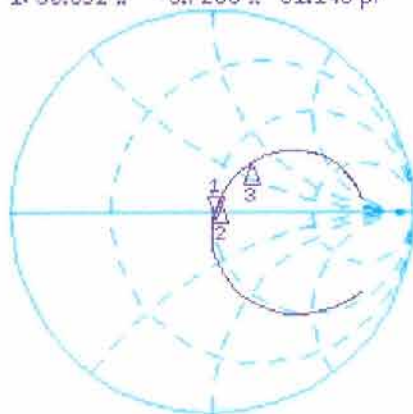


0 dB = 2.77mW/g

Impedance Measurement Plot for Head TSL

19 Jan 2009 10:48:17
 CH1 S11 1 U FS 1: 50.052 Ω -3.7266 Ω 51.148 pF 835.000 000 MHz

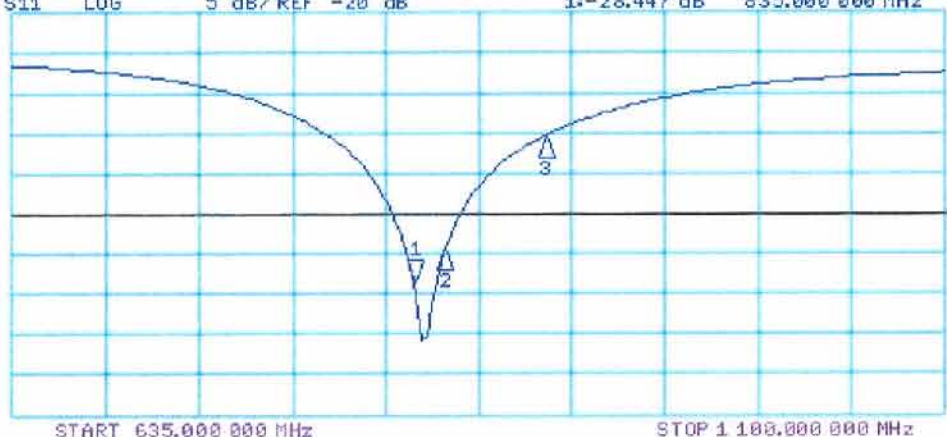
*
 Del
 Cor
 Avg
 15
 ↑



CH1 Markers
 2: 53.711 Ω
 4.9805 Ω
 850.000 MHz
 3: 63.910 Ω
 32.400 Ω
 900.000 MHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -28.447 dB 835.000 000 MHz

Cor
 Avg
 15
 ↑



CH2 Markers
 2: -24.508 dB
 850.000 MHz
 3: -10.504 dB
 900.000 MHz

DASY5 Validation Report for Body TSL

Date/Time: 12.01.2009 12:18:12

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d047

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

Medium: MSL900

Medium parameters used: $f = 835$ MHz; $\sigma = 1$ mho/m; $\epsilon_r = 53.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.9, 5.9, 5.9); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

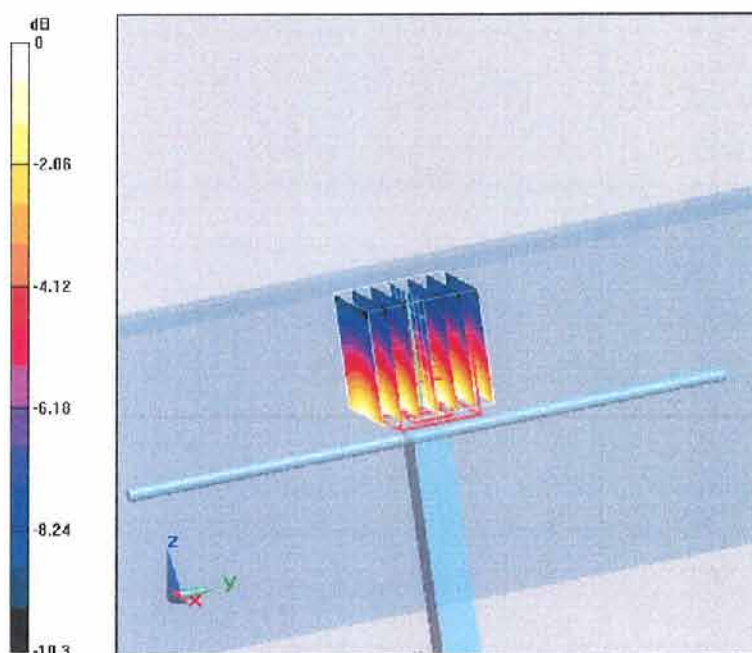
Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.5 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 3.65 W/kg

SAR(1 g) = 2.53 mW/g; SAR(10 g) = 1.67 mW/g

Maximum value of SAR (measured) = 2.82 mW/g



0 dB = 2.82mW/g

Impedance Measurement Plot for Body TSL

