PCTEST ENGINEERING LABORATORY, INC.

6660-B Dobbin Road, Columbia, MD 21045 USA
Tel. 410.290.6652 / Fax 410.290.6554
http://www.pctestlab.com

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

Applicant Name:
Samsung Electronics, Co. Ltd.
18600 Broadwick St.
Rancho Dominguez, CA 90220
United States

Date of Testing:
4/7/2008 - 4/8/2008
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0803270374.A3L

FCC ID: A3LSWCE100

APPLICANT: SAMSUNG ELECTRONICS, CO. LTD.

EUT Type:	BRS/ EBS Band PC Card
Application Type:	Class II Permissive Change
FCC Rule Part(s):	§2.1093; FCC/OET Bulletin 65 Supplement C [July 2001]
FCC Classification:	Non-Broadcast Transmitter (TNB)
Model(s):	SWC-E100
Tx Frequency:	2501.0 – 2685.0 MHz for 10MHz 2498.5 – 2687.5 MHz for 5MHz
Conducted Power:	23.51dBm for 10MHz 23.38dBm for 5MHz
Max. SAR Measurement:	0.401 W/kg (Body SAR) for 10MHz 0.395 W/kg (Body SAR) for 5MHz
Test Device Serial No.:	*Pre-Production* [S/N: FF-052-A]
Date of Original Grant:	OCT 29, 2007

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 Std. C95.1-2005 and has been tested in accordance with the measurement procedures specified in FCC/OET Bulletin 65 Supplement C (2001) and IEEE Std. 1528-2003.

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.

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

Randy Ortanez
President

ACCREDITED
TESTING LABORATORY
CERTIFICATE #2041.01

TABLE OF CONTENTS

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 C95.1-2005 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz[2] and Health Canada RF Exposure Guidelines Safety Code 6 [26]. 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 Equation 1-1).

Equation 1-1
SAR Mathematical Equation

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

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]

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 (See Figure 2-1).

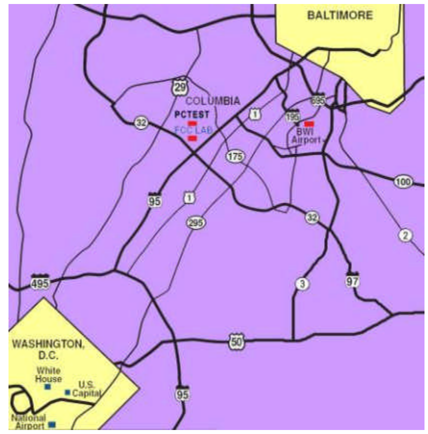
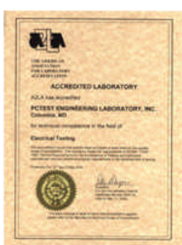


Figure 2-1
Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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.

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), 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.

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 high precision robotics system (Staubli), robot controller, Pentium 4 computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Figure 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 Gateway Pentium 4 2.53 GHz computer with Windows XP system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

3.3 System Electronics

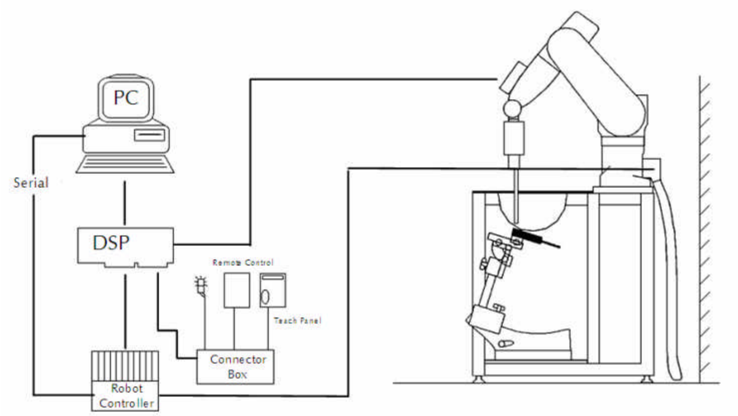


Figure 3-1
SAR Measurement System Setup

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in [7].

3.4 Automated Test System Specifications

<u>Positioner</u>

Robot:	Stäubli Unimation Corp. Robot RX60L
Repeatability:	0.02 mm
No. of Axes:	6

<u>Data Acquisition Electronic System (DAE)</u>

Cell Controller

Processor:	Pentium 4
Clock Speed:	2.53 GHz
Operating System:	Windows XP Professional

Data Converter

Features:	Signal Amplifier, multiplexer, A/D converter & control logic
Software:	DASY4, SEMCAD software
Connecting Lines:	Optical Downlink for data and status info Optical upload for commands and clock

<u>PC Interface Card</u>

Function:	166MHz low power Pentium MMX 32MB chipdisk Link to DAE 16-bit A/D converter for surface detection system Two Serial & Ethernet link to robotics Direct emergency stop output for robot

<u>Phantom</u>

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

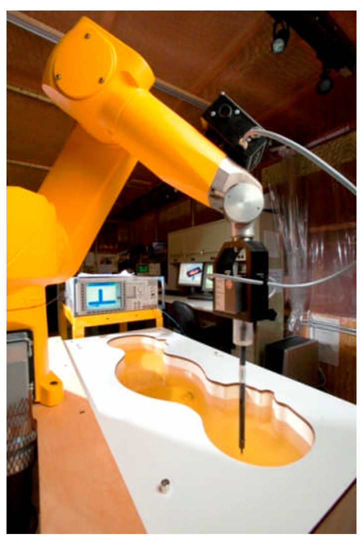


Figure 3-2
DASY4 SAR Measurement System

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 EX3DV4, designed in the classical triangular configuration [7] (see Figure 4-1) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip (see Figure 4-2). 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 fitting (see Figure 5-1). The approach is stopped at reaching the maximum.

4.2 Probe Specifications

Model:	EX3DV4
Frequency Range:	10 MHz – 6.0 GHz
Calibration:	In brain and muscle simulating tissue at Frequencies from 835 up to 5800MHz
Linearity:	± 0.2 dB (30 MHz to 6 GHz)
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
Tip-Center:	1 mm
Application:	SAR Dosimetry Testing
	Compliance tests of mobile phones

Figure 4-2
Near-Field Probe

Figure 4-3
Triangular Probe Configuration

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/cm^2) 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/cm^2.

5.3 Temperature Assessment

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain 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.

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

where:

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

$$\text{SAR} = \frac{|E|^2 \cdot s}{r}$$

where:

σ = simulated tissue conductivity,
ρ = Tissue density

SAR is proportional to $\Delta T/\Delta t$, the initial rate of tissue heating, before thermal diffusion takes place. Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

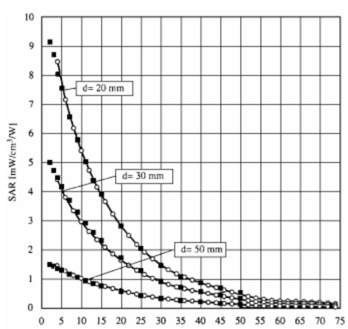


Figure 5-1 E-Field and Temperature measurements at 900MHz [7]

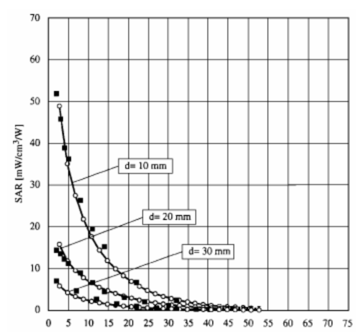


Figure 5-2 E-Field and temperature measurements at 1.9GHz [7]

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 wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users [11][12]. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

6.2 Brain & Muscle Simulating Mixture Characterization

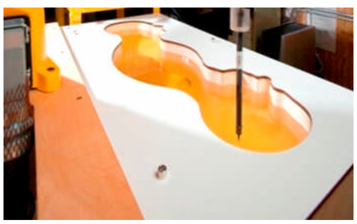


Figure 6-2
Head Simulated

The brain and muscle mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution (see Table 6-1). Preservation with a bactericide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 have been incorporated in the following table. Other head and body tissue parameters that have not been specified in IEEE-1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations The mixture characterizations used for the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Hartsgrove [13].(See Table 6-1)

Table 6-1
Composition of the Brain & Muscle Tissue Equivalent Matter

Frequency (MHz)	300	450		835	900			1450	1800				1900		1950	2000	2100		2450		3000
Recipe #	1	1	3	1	1	2	3	1	1	2	2	3	1	2	4	1	1	2	2	3	2
Ingredients (% by weight)																					
1,2-Propanediol						64.81															
Bactericide	0.19	0.19	0.50	0.10	0.10		0.50					0.50								0.50	
Diacetin			48.90				49.20					49.43								49.75	
DGBE								45.41	47.00	13.84	44.92		44.94	13.84	45.00	50.00	50.00	7.99	7.99		7.99
HEC	0.98	0.98		1.00	1.00																
NaCl	5.95	3.95	1.70	1.45	1.48	0.79	1.10	0.67	0.36	0.35	0.18	0.64	0.18	0.35				0.16	0.16		0.16
Sucrose	55.32	56.32		57.00	56.50																
Triton X-100										30.45				30.45				19.97	19.97		19.97
Water	37.56	38.56	48.90	40.45	40.92	34.40	49.20	53.80	52.64	55.36	54.90	49.43	54.90	55.36	55.00	50.00	50.00	71.88	71.88	49.75	71.88
Measured dielectric parameters																					
ε_r'	46.00	43.4	44.3	41.6	41.2	41.8	42.7	40.9	39.3	41	40.4	39.2	39.9	41	40.1	37	36.8	41.1	40.3	39.2	37.9
σ(S/m)	0.86	0.85	0.9	0.9	0.98	0.97	0.99	1.21	1.39	1.38	1.4	1.4	1.42	1.38	1.41	1.4	1.51	1.55	1.88	1.82	2.46
Temp. (°C)	22	22	20	22	22	22	20	22	22	21	22	20	21	21	20	22	22	20	20	20	20
Target dielectric parameters (Table 2)																					
ε_r'	45.30	43.50		41.5	41.50			40.5	40.0								39.80		39.2		38.5
σ(S/m)	0.87	0.87		0.9	0.97			1.2	1.4								1.49		1.8		2.4

NOTE—Multiple columns for any single frequency are optional recipes. Recipe #, reference: 1 (Kanda et al. [B85]), 2 (Vigneras [B143]), 3 (Peyman and Gabriel [B119]), 4 (Fukunaga et al. [B50]).

*The formulas containing Triton X-100 and corresponding measured parameters are under review and verification.

7 DOSIMETRIC ASSESSMENT & PHANTOM SPECS

7.1 Measurement Procedure

The evaluation was performed using the following procedure:

1. The SAR measurement was taken at a selected spatial reference point to monitor power variations during testing. This fixed point was measured and used as a reference value.
2. The SAR distribution at the exposed side of the phantom was measured at a distance of 3.0mm from the inner surface of the shell. The horizontal grid spacing was 15mm x 15mm.
3. Based on the area scan data, the area of the maximum absorption was determined by spline interpolation. Around this point, a volume of 32mm x 32mm x 30mm (fine resolution volume scan, zoom scan) was assessed by measuring 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see Figure 7-1):
   a. The data at the surface was extrapolated since the center of the dipoles is 2.7mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. The extrapolation was based on a least square algorithm [15]. A polynomial of the fourth order was calculated through the points in the z-axis. This polynomial was then used to evaluate the points between the surface and the probe tip.
   b. The maximum interpolated value was found with a software algorithm. Around this maximum, the SAR values averaged over the spatial volumes (1g or 10g) were computed using 3D-Spline interpolation. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions) [15][16]. The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 1, was re-measured to measure drift. If the value drifted by more than 5%, the evaluation was repeated.

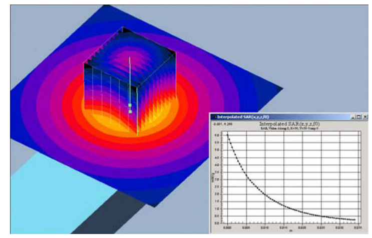


Figure 7-1
Sample SAR Area Scan

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 minimized reflections from the upper surface. The liquid depth is maintained at a minimum depth of 15cm to minimize reflections from the upper surface.

Figure 7-2
SAM Twin Phantom Shell

8 TEST CONFIGURATION POSITIONS

8.1 SAR for Notebooks and Lap-touching Devices

Lap-touching devices that have transmitting antennas located less than 20 cm from the lap of the user require routine SAR evaluation. Such devices are considered portable and are capable of being held to the body. Devices are to be setup touching the phantom and are configured with maximum output power during SAR assessment for a worst-case SAR evaluation.

Figure 8-1
Notebook Setup for SAR

8.2 Integral Antenna PCMCIA and CompactFlash Cards

KDB 497522. Integral-antenna PCMCIA and CompactFlash radio cards are common module-like devices meant to be purchased and installed without tools or special skills by consumers. The common host configurations (platforms, categories) are notebook (laptop) computers with PCMCIA slot(s) in the keyboard section, and PDAs (personal digital assistants or palmtop computers). Integral-antenna radio cards installed in PDAs with body-worn and/or held-to-ear configurations, and in all notebook computers, must be evaluated under portable RF exposure conditions per 47 C.F.R. 2.1093(b). To better represent the range of near field topography and environment of various notebook and PDA hosts, SAR evaluation using a minimum of <u>three</u> hosts within each platform type (three PDAs, three notebooks, etc.) is recommended by FCC. Hosts shall be modern, current-market, and expected final installations for the PC Cards.

Figure 8-2
CompactFlash radio card in PDA host configuration

Figure 8-3
PCMCIA Radio Card in a notebook host configuration

For notebook computers with multiple card slots (e.g., two stacked), RF exposure should be evaluated with the transmitter installed in the slot(s) producing the highest SAR (See Figure 8-3). The minimum number of positions that should be evaluated for notebook computers and body-worn PDAs are bottom-face in parallel and in contact (0 cm) with flat phantom, and device perpendicular to phantom with recommended spacing of 1.5 cm.

8.3 Positioning for Convertible and Slate Tablet Computers

Figure 8-4
Tablet Computer Form Factors

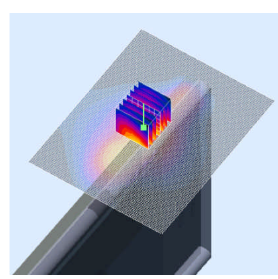


Figure 8-5
Tablet PC Body SAR

KDB 447498. Tablet (notepad) computers are tested in a lap-held position with the bottom of the computer in direct contact against a flat phantom for all user-enabled portrait and landscape positions.

8.4 SAR Testing with IEEE 802.11 a/b/g Transmitters

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

8.4.1 General Device Setup

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

8.4.2 Frequency Channel Configurations [22]

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

Table 8-1
802.11 Test Channels per FCC Requirements

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

9 BRS/EBS TEST CONFIGURATION

Power measurements were performed using a factory test code under digital average power .

9.1 Devices with WIMAX

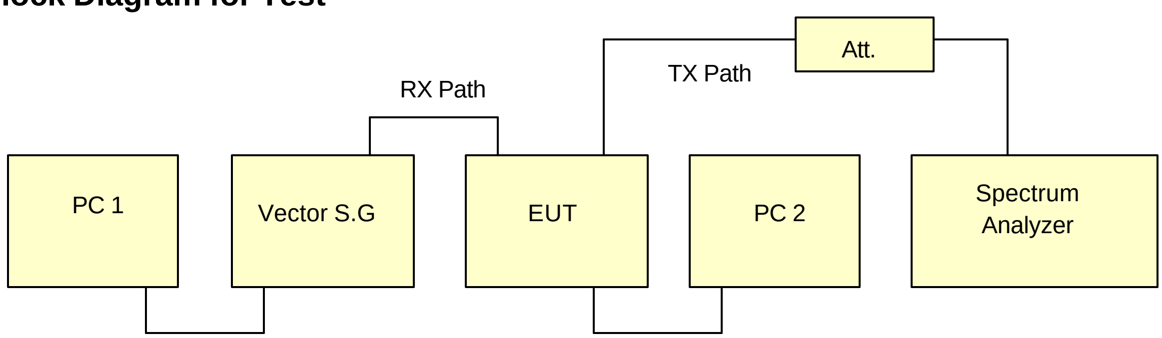
Profile	Range (GHz)	BW (MHz)	CF Start (MHz)	CF Stop (MHz)
3A-5	2.496 – 2.69	5	2498.5	2687.5
3A-10	2.496 – 2.69	10	2501	2685
4A	3.3 – 3.4	5	3302.5	3397.5
4B	3.3 – 3.4	7	3303.5	3396.5
4C	3.3 – 3.4	10	3305	3395

Parameters	Values			
System Channel Bandwidth (MHz)	1.25	5	10	20
Sampling Frequency (F_p in MHz)	1.4	5.6	11.2	22.4
FFT Size (N_{FFT})	128	512	1024	2048
Number of Sub-Channels	2	8	16	32
Sub-Carrier Frequency Spacing	10.94 kHz			
Useful Symbol Time ($T_b = 1/f$)	91.4 microseconds			
Guard Time ($T_g = T_b/8$)	11.4 microseconds			
OFDMA Symbol Duration ($T_s = T_b + T_g$)	102.9 microseconds			
Number of OFDMA Symbols (5 ms Frame)	48			

9.2 Device Conducted Powers:

		5MHZ				10MHz			
		QPSK		16QAM		QPSK		16QAM	
		BAMC	PUSC	BAMC	PUSC	BAMC	PUSC	BAMC	PUSC
2501	512	23.18	22.65	23.38	22.54	-	-	-	-
	1024	-	-	-	-	23.1	22.75	23.51	22.51
2600	512	23.26	22.77	23.32	22.71	-	-	-	-
	1024	-	-	-	-	23.28	22.9	23.35	22.87
2685	512	22.72	22.23	23.21	22.21	-	-	-	-
	1024	-	-	-	-	22.78	22.4	23.42	22.21

9.3 Block Diagram for Test



Uploads test waveforms to vector signal generator

9.5 Mobile WIMAX PHY Data Rate with Sub Channel.

Mod.	Code Rate	5 MHz Channel		10 MHz Channel	
		Downlink Rate, Mbps	Uplink Rate, Mbps	Downlink Rate, Mbps	Uplink Rate, Mbps
QPSK	1/2 CTC, 6x	0.53	0.38	1.06	0.78
	1/2 CTC, 4x	0.79	0.57	1.58	1.18
	1/2 CTC, 2x	1.58	1.14	3.17	2.35
	1/2 CTC, 1x	3.17	2.28	6.34	4.70
	3/4 CTC	4.75	3.43	9.50	7.06
16QAM	1/2 CTC	6.34	4.57	12.07	9.41
	3/4 CTC	9.50	6.85	19.01	14.11
64QAM	1/2 CTC	9.50	*6.85*	19.01	*14.11*
	2/3 CTC	12.67	*9.14*	26.34	*18.82*
	3/4 CTC	14.26	*10.28*	28.51	*21.17*
	5/6 CTC	15.84	*11.42*	31.68	*23.52*

10 ANSI/IEEE C95.1-2005 RF EXPOSURE LIMITS

10.1 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.

10.2 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 10-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-2005 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (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.

11 MEASUREMENT UNCERTAINTIES

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	6.6	N	1	1.0	1.0	6.6	6.6	8
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	8
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	8
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	8
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	8
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	8
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	8
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	8
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	8
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	8
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	8
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	8
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	8
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	8
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	8
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	8
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	8
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	8
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				12.4	12.0	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.7	24.0	

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

12 SYSTEM VERIFICATION

12.1 Tissue Verification

Table 12-1
Measured Tissue Properties

Calibrated Date:	04/04/08					
	2.6 GHz Muscle					
	2500 MHz		2600 MHz		2700 MHz	
	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant	52.64	51.92	52.51	52.54	52.38	53.04
Conductivity	2.02	2.09	2.16	2.17	2.30	2.21

12.2 Test System Verification

Prior to assessment, the system is verified to ±10% of the specifications at 2600MHz by using the system validation kit(s). (Graphic Plots Attached)

Table 12-2
System Verification Results

System Verification TARGET & MEASURED							
Date:	Amb. Temp (°C)	Liquid Temp(°C)	Input Power (W)	Tissue Frequency (Mhz)	Targeted SAR_{1g} (mW)	Measured SAR_{1g} (mW)	Deviation (%)
04/07/08	23.2	21.8	0.025	2600 MHz	1.45	1.5	3.45%
04/08/08	22.5	21.2	0.025	2600 MHz	1.45	1.52	4.83%

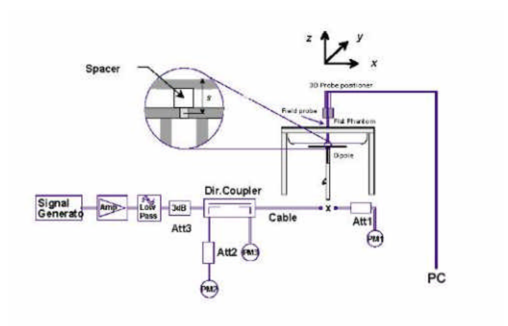


Figure 12-1
System Verification Setup Diagram

Figure 12-2
System Verification Setup Photo

REV 4.3B
09/18/07

13 SAR DATA SUMMARY

13.1 Host#1(HP) Laptop SAR Results

MEASUREMENT RESULTS								
FREQUENCY	Mode	Begin/ End Power [dBm]		Device Test Position	BW	Spacing	Antenna Position	SAR (W/kg)
MHz		Start	End					
2501	BAMCQPSK	23.10	23.48	Laptop	10MHZ	Touch (1.2 cm)	Closed	**0.383**
2600	BAMCQPSK	23.28	23.55	Laptop	10MHZ	Touch (1.2 cm)	Closed	0.266
2685	BAMCQPSK	22.68	22.97	Laptop	10MHZ	Touch (1.2 cm)	Closed	0.291
2501	BAMCQPSK	23.10	23.33	Laptop	10MHZ	Touch (1.2 cm)	Open	0.231
2600	BAMCQPSK	23.28	23.48	Laptop	10MHZ	Touch (1.2 cm)	Open	0.201
2685	BAMCQPSK	22.68	22.83	Laptop	10MHZ	Touch (1.2 cm)	Open	0.151
2501	PUSC16QAM	22.51	22.84	Laptop	10MHZ	Touch (1.2 cm)	Closed	0.332
2501	PUSCQPSK	22.75	23.08	Laptop	10MHZ	Touch (1.2 cm)	Closed	0.333
2501	BAMC16QAM	22.97	23.34	Laptop	10MHZ	Touch (1.2 cm)	Closed	0.366
2498.5	BAMCQPSK	23.02	23.40	Laptop	5MHZ	Touch (1.2 cm)	Closed	**0.376**
2498.5	BAMC16QAM	22.93	23.30	Laptop	5MHZ	Touch (1.2 cm)	Closed	0.372
2498.5	PUSCQPSK	22.45	22.79	Laptop	5MHZ	Touch (1.2 cm)	Closed	0.335
2498.5	PUSC16QAM	22.34	22.67	Laptop	5MHZ	Touch (1.2 cm)	Closed	0.329
ANSI / IEEE C95.1 2005 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Muscle 1.6 W/kg (mW/g) 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 are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Batteries are fully charged for all readings. Standard batteries were investigated
4. Tissue parameters and temperatures are listed on the SAR plots.
5. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (July, 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. Liquid tissue depth is 15.1 cm. ± 0.1.

13.2 Host#2(Toshiba) Laptop SAR Results

MEASUREMENT RESULTS								
FREQUENCY	Mode	Begin/ End Power [dBm]		Device Test Position	BW	Spacing	Antenna Position	SAR (W/kg)
MHz		Start	End					
2501	BAMCQPSK	23.10	23.12	Laptop	10MHz	Touch (1.0 cm)	Closed	**0.401**
2600	BAMCQPSK	23.28	23.29	Laptop	10MHz	Touch (1.0 cm)	Closed	0.272
2685	BAMCQPSK	22.68	22.70	Laptop	10MHz	Touch (1.0 cm)	Closed	0.290
2501	BAMCQPSK	23.10	23.18	Laptop	10MHz	Touch (1.0 cm)	Open	0.284
2600	BAMCQPSK	23.28	23.36	Laptop	10MHz	Touch (1.0 cm)	Open	0.282
2685	BAMCQPSK	22.68	22.83	Laptop	10MHz	Touch (1.0 cm)	Open	0.264
2501	PUSC16QAM	22.51	22.52	Laptop	10MHz	Touch (1.0 cm)	Closed	0.397
2501	PUSCQPSK	22.75	22.75	Laptop	10MHz	Touch (1.0 cm)	Closed	0.363
2501	BAMC16QAM	22.97	22.97	Laptop	10MHz	Touch (1.0 cm)	Closed	0.400
2498.5	BAMCQPSK	23.02	23.07	Laptop	5MHz	Touch (1.0 cm)	Closed	**0.395**
2498.5	BAMC16QAM	22.93	22.94	Laptop	5MHz	Touch (1.0 cm)	Closed	0.390
2498.5	PUSCQPSK	22.45	22.48	Laptop	5MHz	Touch (1.0 cm)	Closed	0.393
2498.5	PUSC16QAM	22.34	22.35	Laptop	5MHz	Touch (1.0 cm)	Closed	0.391
ANSI / IEEE C95.1 2005 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						**Muscle 1.6 W/kg (mW/g)** 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 are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Batteries are fully charged for all readings. Standard batteries were investigated
4. Tissue parameters and temperatures are listed on the SAR plots.
5. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (July, 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. Liquid tissue depth is 15.1 cm. ± 0.1.

13.3 Host#3(Panasonic) Laptop SAR Results

MEASUREMENT RESULTS								
FREQUENCY	Mode	Begin/ End Power [dBm]		Device Test Position	BW	Spacing	Antenna Position	SAR (W/kg)
MHz		Start	End					
2501	BAMCQPSK	23.10	23.21	Laptop	10MHz	Touch (2.0 cm)	Closed	**0.206**
2600	BAMCQPSK	23.28	23.31	Laptop	10MHz	Touch (2.0 cm)	Closed	0.189
2685	BAMCQPSK	22.68	22.71	Laptop	10MHz	Touch (2.0 cm)	Closed	0.199
2501	BAMCQPSK	23.10	23.21	Laptop	10MHz	Touch (2.0 cm)	Open	0.118
2600	BAMCQPSK	23.28	23.32	Laptop	10MHz	Touch (2.0 cm)	Open	0.126
2685	BAMCQPSK	22.68	22.74	Laptop	10MHz	Touch (2.0 cm)	Open	0.132
2501	PUSC16QAM	22.51	22.51	Laptop	10MHz	Touch (2.0 cm)	Closed	0.176
2501	PUSCQPSK	22.75	22.79	Laptop	10MHz	Touch (2.0 cm)	Closed	0.177
2501	BAMC16QAM	22.97	23.00	Laptop	10MHz	Touch (2.0 cm)	Closed	0.194
2498.5	BAMCQPSK	23.02	23.04	Laptop	5MHz	Touch (2.0 cm)	Closed	0.14
2498.5	BAMC16QAM	22.93	22.95	Laptop	5MHz	Touch (2.0 cm)	Closed	0.142
2498.5	PUSCQPSK	22.45	22.52	Laptop	5MHz	Touch (2.0 cm)	Closed	0.142
2498.5	PUSC16QAM	22.34	22.37	Laptop	5MHz	Touch (2.0 cm)	Closed	0.141
ANSI / IEEE C95.1 2005 - SAFETY LIMIT Spatial Peak						Muscle 1.6 W/kg (mW/g)		

Notes:
1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Batteries are fully charged for all readings. Standard batteries were investigated
4. Tissue parameters and temperatures are listed on the SAR plots.
5. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (July, 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. Liquid tissue depth is 15.1 cm. ± 0.1.

13.4 Host 3(Panasonic) Tablet SAR Results

MEASUREMENT RESULTS								
FREQUENCY	Mode	Begin/ End Power [dBm]		Device Test Position	BW	Spacing	Antenna Position	SAR (W/kg)
MHz		Start	End					
2501	BAMCQPSK	23.10	23.22	Tablet	10MHz	Touch (3.5 cm)	Closed	0.043
2600	BAMCQPSK	23.28	23.39	Tablet	10MHz	Touch (3.5 cm)	Closed	0.0447
2685	BAMCQPSK	22.68	22.81	Tablet	10MHz	Touch (3.5 cm)	Closed	**0.048**
2501	BAMCQPSK	23.10	23.27	Tablet	10MHz	Touch (3.5 cm)	Open	0.0185
2600	BAMCQPSK	23.28	23.40	Tablet	10MHz	Touch (3.5 cm)	Open	0.0187
2685	BAMCQPSK	22.68	22.80	Tablet	10MHz	Touch (3.5 cm)	Open	0.02
2685	PUSC16QAM	22.21	22.38	Tablet	10MHz	Touch (3.5 cm)	Closed	0.0327
2685	PUSCQPSK	22.10	22.23	Tablet	10MHz	Touch (3.5 cm)	Closed	0.048
2685	BAMC16QAM	22.50	22.65	Tablet	10MHz	Touch (3.5 cm)	Closed	0.0478
2687.5	BAMC16QAM	22.50	22.63	Tablet	5MHz	Touch (3.5 cm)	Closed	0.0331
2687.5	BAMCQPSK	22.68	22.81	Tablet	5MHz	Touch (3.5 cm)	Closed	0.0323
2687.5	PUSC16QAM	22.21	22.32	Tablet	5MHz	Touch (3.5 cm)	Closed	0.0349
2687.5	PUSCQPSK	22.10	22.23	Tablet	5MHz	Touch (3.5 cm)	Closed	0.032
ANSI / IEEE C95.1 2005 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Muscle 1.6 W/kg (mW/g) 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 are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Batteries are fully charged for all readings. Standard batteries were investigated.
4. Tissue parameters and temperatures are listed on the SAR plots.
5. Liquid tissue depth is 15.1 cm. ± 0.1.
6. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (July, 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).

14 EQUIPMENT LIST

Model	Description	Calibration Date	Cal Inerval	Calibration Due	Serial No.
85070B	Dielectric Probe Kit	7/12/07	Annual	7/11/08	US33020316
8648D	(9kHz-4GHz) Signal Generator	10/11/07	Biennial	10/10/09	3613A00315
8753E	(30kHz-6GHz) Network Analyzer	3/12/08	Annual	3/12/09	JP38020182
E5515C	Wireless Communications Test Set	10/6/06	Biennial	10/5/08	GB43193872
E5515C	Wireless Communications Test Set	6/8/07	Biennial	6/8/09	GB46310798
E5515C	Wireless Communications Test Set	8/31/07	Biennial	8/31/09	GB41450275
E6651A	Mobile WiMAX Tester	8/23/07	Biennial	8/22/09	MY47310109
E8257D	(250kHz-20GHz) Signal Generator	3/8/07	Biennial	3/8/09	MY45470194
N4010A	Wireless Connectivity Test Set	6/11/07	Annual	6/11/08	GB46170464
80701A	(0.05-18GHz) Power Sensor	6/20/07	Annual	6/19/08	1833460
8651A	Universal Power Meter	6/19/07	Annual	6/18/08	8650319
IXTL-010	Dielectric Measurement Kit	N/A		N/A	
IXTL-030	30MM TEM line for 6 GHz	N/A		N/A	
CMU200	Base Station Simulator	5/24/07	Annual	5/23/08	836371/0079
CMU200	Base Station Simulator	9/7/07	Annual	9/6/08	833855/0010
CMU200	Base Station Simulator	12/6/07	Annual	12/5/08	107826
CMU200	Base Station Simulator	12/13/07	Annual	12/13/08	109892
NRVD	Dual Channel Power Meter	12/12/06	Biennial	12/11/08	101695
NRVS	Single Channel Power Meter	7/3/07	Biennial	7/2/09	835360/0079
NRV-Z32	Peak Power Sensor (100uW-2W)	12/21/06	Biennial	12/20/08	100155
NRV-Z33	Peak Power Sensor (1mW-20W)	11/28/06	Biennial	11/27/08	100004
NRV-Z53	Power Sensor	7/3/07	Biennial	7/2/09	846076/0007
D1450V2	1450 MHz SAR Dipole	6/11/07	Biennial	6/10/09	1025
D1765V2	1765 MHz SAR Dipole	6/11/07	Biennial	6/10/09	1008
D1900V2	1900 MHz SAR Dipole	1/23/07	Biennial	1/22/09	502
D1900V2	1900 MHz SAR Dipole	1/23/07	Biennial	1/22/09	5d080
D2300V2	2300 MHz SAR Dipole	3/6/08	Biennial	3/6/10	1008
D2450V2	2450 MHz SAR Dipole	9/26/07	Biennial	9/25/09	719
D2450V2	2450 MHz SAR Dipole	1/17/07	Biennial	1/16/09	797
D2600V2	2600 MHz SAR Dipole	1/30/08	Biennial	1/29/10	1004
D5GHzV2	5 GHz SAR Dipole	9/25/07	Biennial	9/24/09	1007
D5GHzV2	5 GHz SAR Dipole	1/24/07	Biennial	1/23/09	1057
D835V2	835 MHz SAR Dipole	1/8/07	Biennial	1/7/09	4d047
D835V2	835 MHz SAR Dipole	8/27/07	Biennial	8/26/09	4d026
DAE3	Dasy Data Acquisition Electronics	11/13/07	Annual	11/12/08	455
DAE4	Dasy Data Acquisition Electronics	5/25/07	Annual	5/24/08	704
DAE4	Dasy Data Acquisition Electronics	8/29/07	Annual	8/28/08	665
DAE4	Dasy Data Acquisition Electronics	1/30/08	Annual	1/29/09	649
ES3DV2	SAR Probe	10/23/07	Annual	10/22/08	3022
EX3DV4	SAR Probe	5/28/07	Annual	5/27/08	3589
EX3DV4	SAR Probe	8/30/07	Annual	8/29/08	3561
EX3DV4	SAR Probe	1/31/08	Annual	1/30/09	3550

Notes:

The E-field probe was calibrated by SPEAG, by the waveguide technique procedure. Dipole Validation measurement is performed by PCTEST prior to SAR evaluation. The brain simulating material is calibrated by PCTEST using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain-equivalent material.

15 CONCLUSION

15.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC, 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]

16 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, April 2006.

[3] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[4] 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, July 2001.

[5] 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.

[6] 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.

[7] 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.

[8] K. Pokovi c, 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.

[9]K. Pokovi c, 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.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] 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.

[12] 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.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[14] 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.

[15] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[17] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C, Dec. 1997.

[18] 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.

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

[20] Prof. Dr. Niels Kuster, ETH, Eidgen?ssische Technische Hoschschule Z?rich, Dosimetric Evaluation of the Cellular Phone.

[21] FCC SAR Measurement Procedures for 3G Devices, June 2006

[22] SAR Measurement procedures for IEEE 802.11a/b/g rev 1.1, Oct 2006

[23] 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.

[24] 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

[25] Industry Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 2, November 2005

[26] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 1999

[27] Interim SAR Procedures for Release 6 HSPA Devices, FCC OET, June 2007

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: SWC-E100; Type: WIMAX PC DATA CARD; SN: FF-052-A

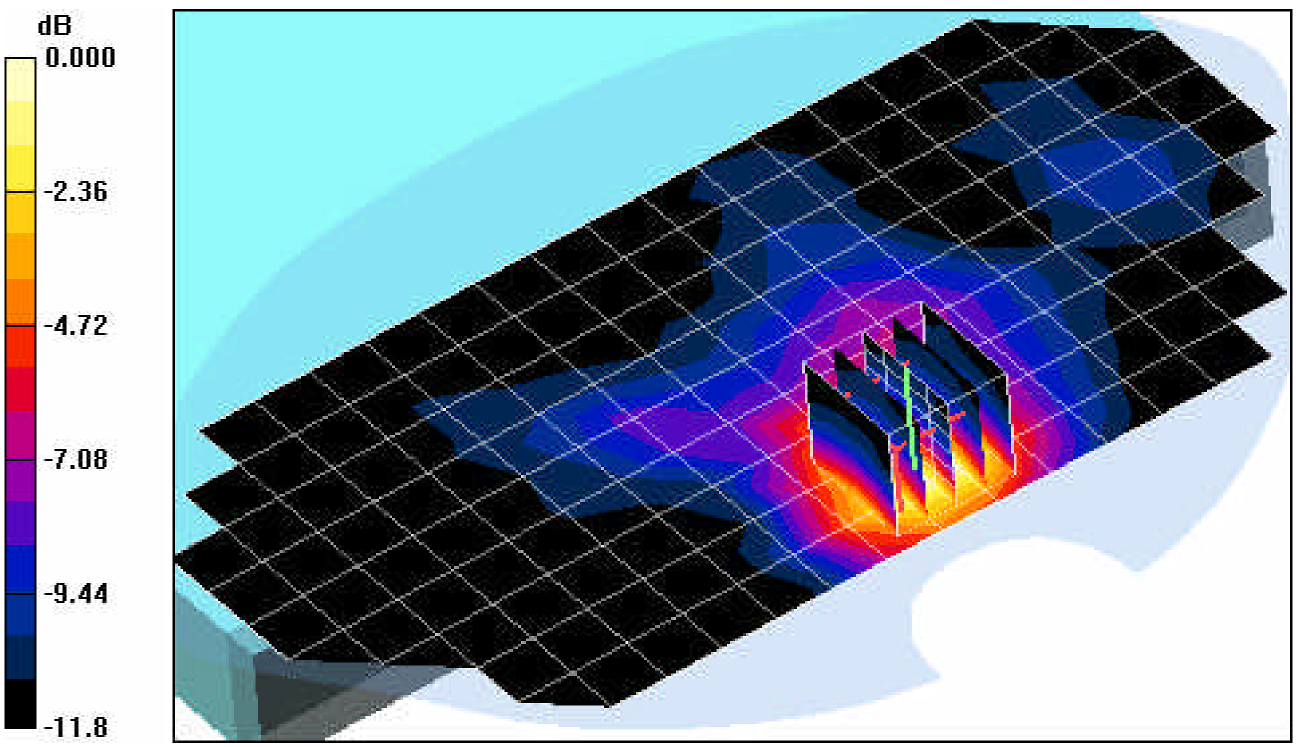
Communication System: WiMAX RF; Frequency: 2600 MHzFrequency: 2501 MHz;Duty Cycle: 1:2.7
Medium: 2500 Muscle (σ = 2.09 mho/m, ε_r = 51.92, ρ = 1000 kg/m^3)
Phantom section: Flat Section Touch (1.0cm)

Test Date: 4-7-2008; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3589; ConvF(6.06, 6.06, 6.06); Calibrated: 5/28/2007
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 8/29/2007, Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Laptop position, Low ch, Antenna Closed, BAMC QPSK, 512P, 5MHz

Area Scan (10x19x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.6 V/m
Peak SAR (extrapolated) = 0.746 W/kg
SAR(1 g) = 0.395 mW/g; SAR(10 g) = 0.212 mW/g



0 dB = 0.493mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: SWC-E100; Type: WIMAX PC DATA CARD; SN: FF-052-A

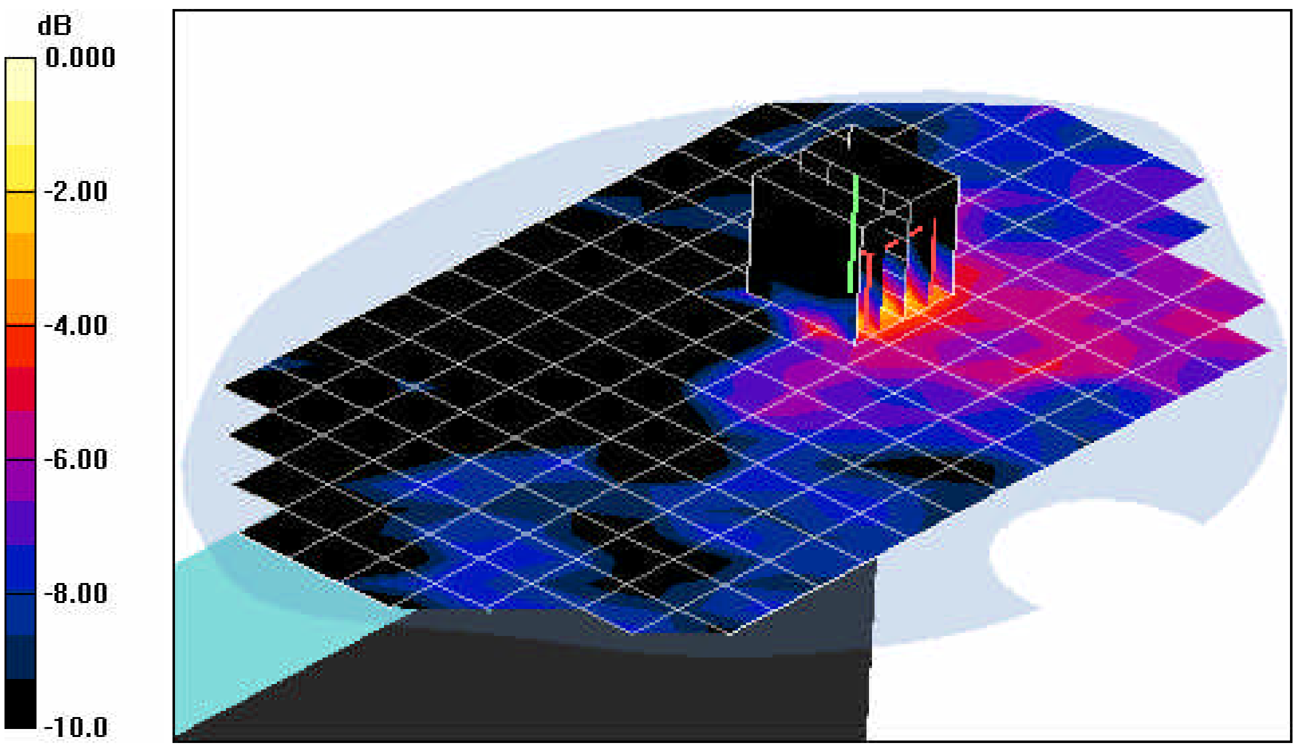
Communication System: WiMAX RF; Frequency: 2600 MHzFrequency: 2685 MHz;Duty Cycle: 1:2.7
Medium: 2700 Muscle (σ = 2.21 mho/m, ε_r = 53.04, ρ = 1000 kg/m^3)
Phantom section: Flat Section Tablet

Test Date: 4-8-2008; Ambient Temp: 22.8°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN3589; ConvF(6.06, 6.06, 6.06); Calibrated: 5/28/2007
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 8/29/2007, Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Tablet position, High.ch, BAMC QPSK, 10MHz, 1024P, Antenna Close,

Area Scan (11x19x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.37 V/m
Peak SAR (extrapolated) = 0.111 W/kg
SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.022 mW/g



0 dB = 0.063mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: SWC-E100; Type: WIMAX PC DATA CARD; SN: FF-052-A

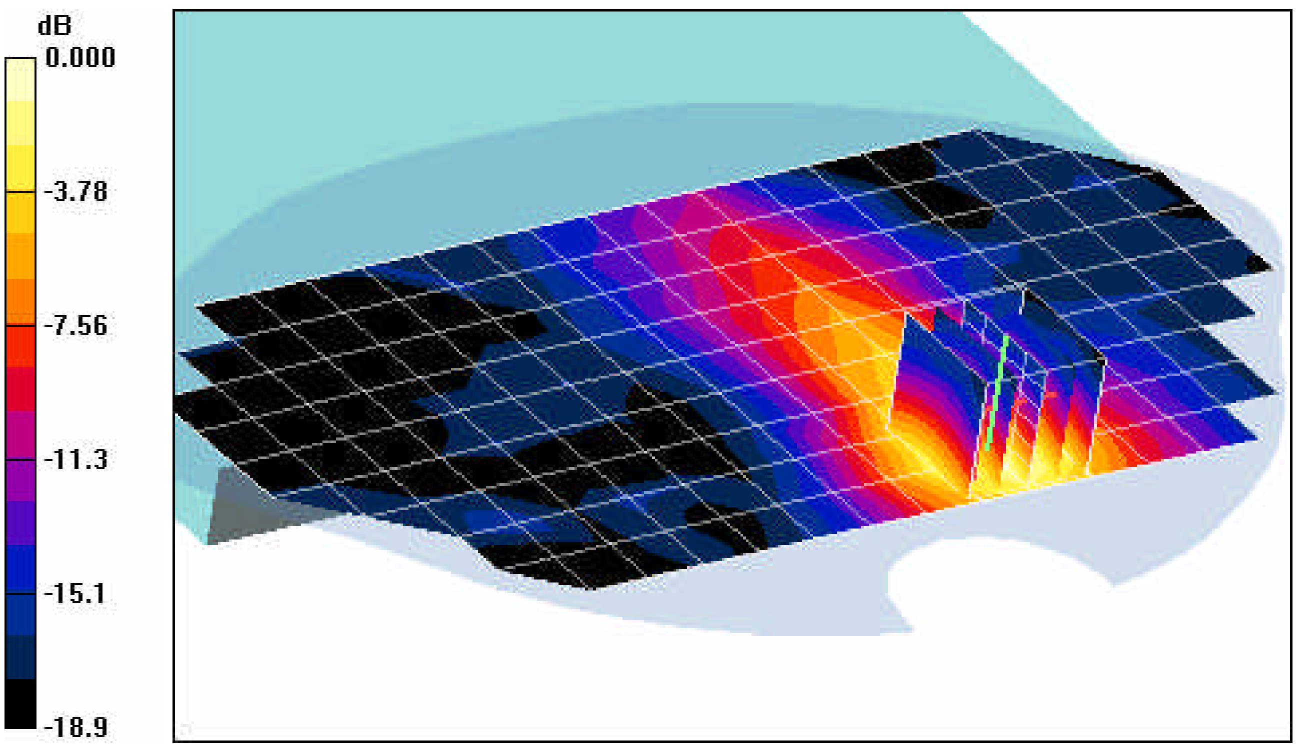
Communication System: WiMAX RF; Frequency: 2600 MHzFrequency: 2501 MHz;Duty Cycle: 1:2.7
Medium: 2500 Muscle (σ = 2.09 mho/m, ε_r = 51.92, ρ = 1000 kg/m^3)
Phantom section: Flat Section Touch (1.2cm)

Test Date: 4-7-2008; Ambient Temp: 23.3°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN3589; ConvF(6.06, 6.06, 6.06); Calibrated: 5/28/2007
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 8/29/2007, Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Laptop position, Low.ch, Antenna Closed, BAMC QPSK, 1024P, 10MHz,

Area Scan (10x19x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.5 V/m
Peak SAR (extrapolated) = 0.722 W/kg
SAR(1 g) = 0.383 mW/g; SAR(10 g) = 0.198 mW/g



0 dB = 0.483mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: SWC-E100; Type: WIMAX PC DATA CARD; SN: FF-052-A

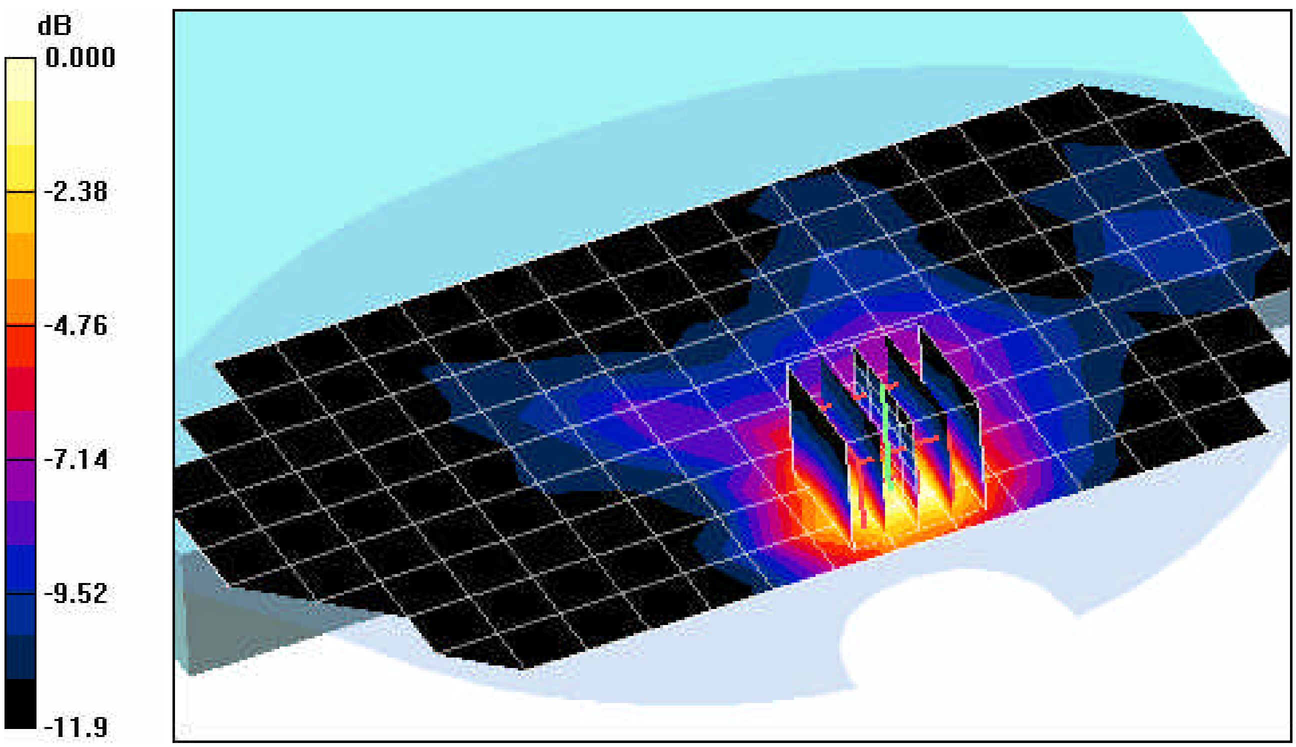
Communication System: WiMAX RF; Frequency: 2600 MHzFrequency: 2501 MHz;Duty Cycle: 1:2.7
Medium: 2500 Muscle (σ = 2.09 mho/m, ε_r = 51.92, ρ = 1000 kg/m^3)
Phantom section: Flat Section Touch (1.0cm)

Test Date: 4-7-2008; Ambient Temp: 23.1°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN3589; ConvF(6.06, 6.06, 6.06); Calibrated: 5/28/2007
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Phantom: Calibrated: 8/29/2007, SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Laptop position, Low.ch, Antenna Closed, BAMC QPSK, 1024P, 10MHz

Area Scan (10x19x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.8 V/m
Peak SAR (extrapolated) = 0.759 W/kg
SAR(1 g) = 0.401 mW/g; SAR(10 g) = 0.215 mW/g



0 dB = 0.500mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: SWC-E100; Type: WIMAX PC DATA CARD; SN: FF-052-A

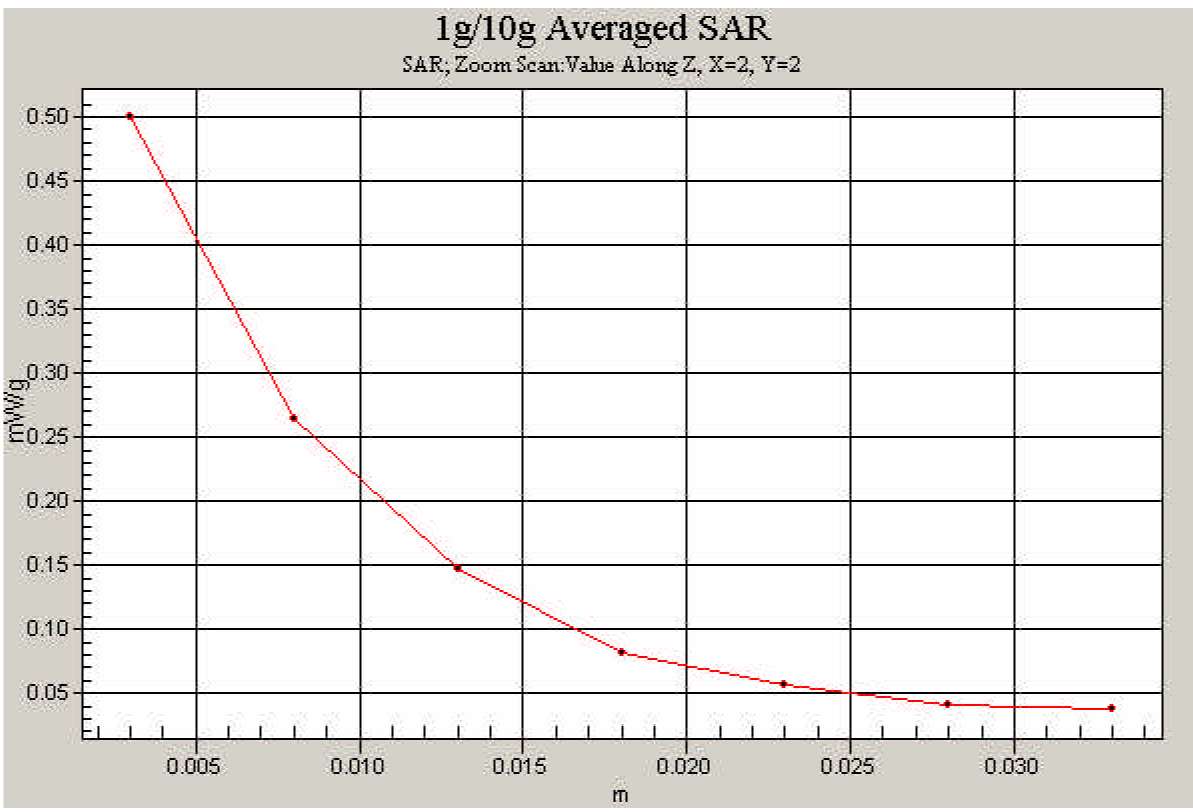
Communication System: WiMAX RF; Frequency: 2600 MHzFrequency: 2501 MHz;Duty Cycle: 1:2.7
Medium: 2500 Muscle (σ = 2.09 mho/m, ε_r = 51.92, ρ = 1000 kg/m^3)
Phantom section: Flat Section Touch (1.0cm)

Test Date: 4-7-2008; Ambient Temp: 23.1°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN3589; ConvF(6.06, 6.06, 6.06); Calibrated: 5/28/2007
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 8/29/2007, Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Laptop position, Low.ch, Antenna Closed, BAMC QPSK, 1024P, 10MHz

Area Scan (10x19x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.8 V/m
Peak SAR (extrapolated) = 0.759 W/kg
SAR(1 g) = 0.401 mW/g; SAR(10 g) = 0.215 mW/g



APPENDIX B: SAR TEST SETUP PHOTOGRAPHS

APPENDIX C: DIPOLE VALIDATION

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1004

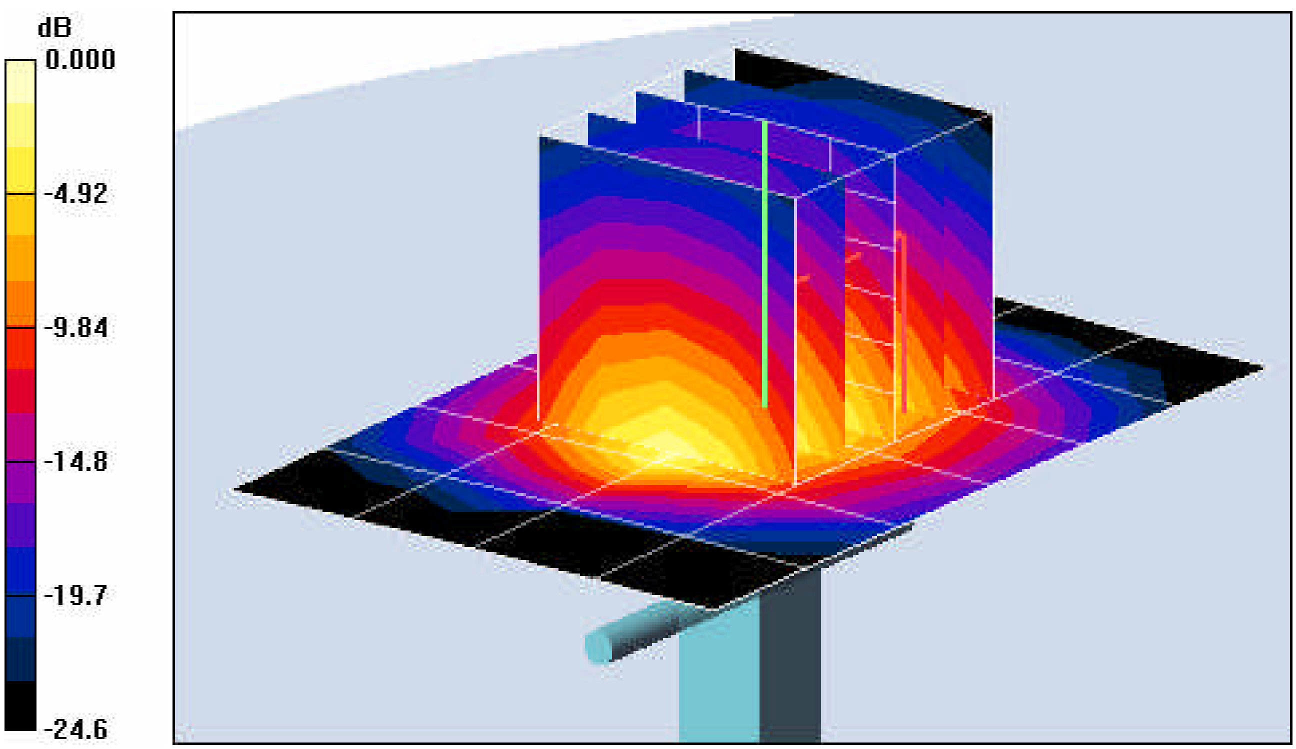
Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: 2600 Muscle (σ = 2.17 mho/m, ε_r = 52.54, ρ = 1000 kg/m^3)
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 4-7-2008; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3589; ConvF(6.06, 6.06, 6.06); Calibrated: 5/28/2007
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Phantom: Calibrated: 8/29/2007, SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

2600MHz Dipole Validation

Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 14.0 dBm (25 mW)
SAR(1 g) = 1.5 mW/g; SAR(10 g) = 0.666 mW/g
Target SAR(1g) = 1.45 mW/g; Deviation = 3.45%



0 dB = 1.93mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1004

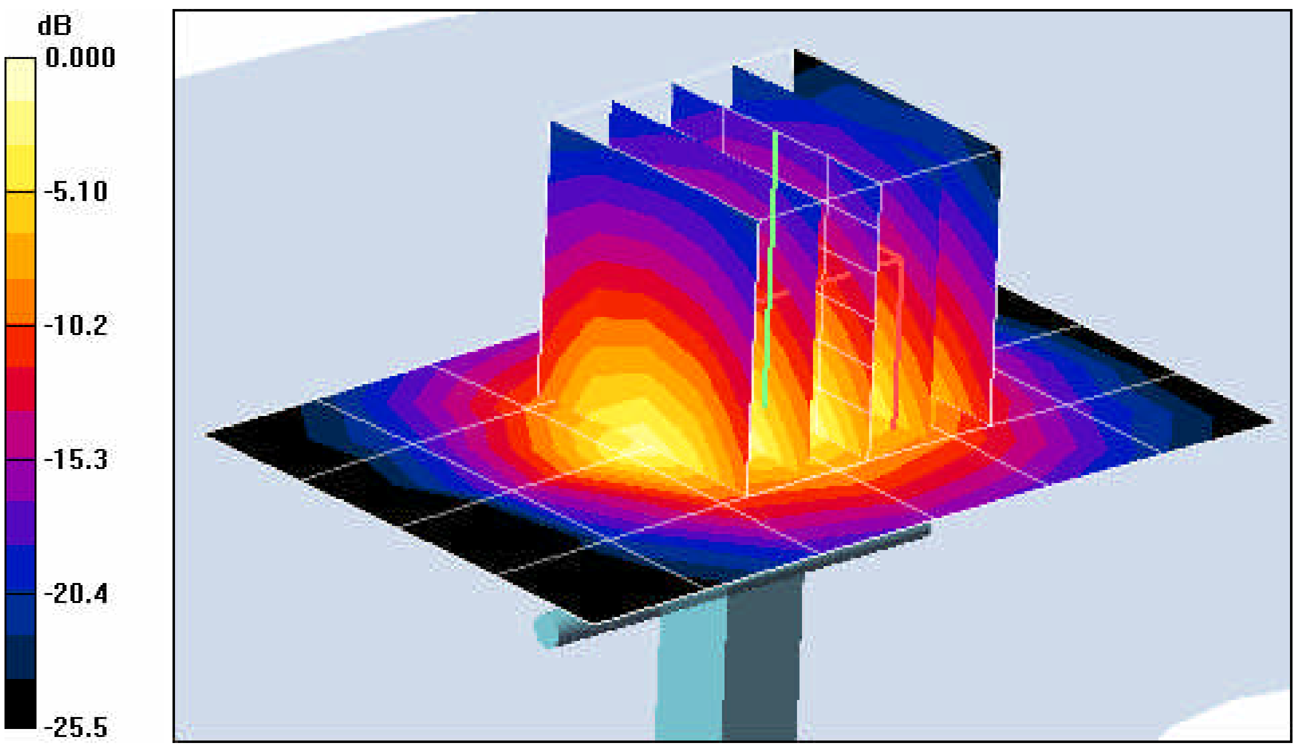
Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: 2600 Muscle (σ = 2.17 mho/m, ε_r = 52.54, ρ = 1000 kg/m^3)
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 4-8-2008; Ambient Temp: 22.5°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(6.06, 6.06, 6.06); Calibrated: 5/28/2007
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 8/29/2007, Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

2600MHz Dipole Validation

Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 14.0 dBm (25 mW)
SAR(1 g) = 1.52 mW/g; SAR(10 g) = 0.677 mW/g
Target SAR(1g) = 1.45 mW/g; Deviation = 4.83%



0 dB = 1.97mW/g

APPENDIX D: PROBE CALIBRATION

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

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

Accredited by the Swiss Federal Office of Metrology and Accreditation
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: EX3-3589_May07

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3589
Calibration procedure(s)	QA CAL-01.v5 and QA CAL-14.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	May 28, 2007
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 ± 3)°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 E4419B	GB41293874	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bomholt	R&D Director	F. Bomholt

Issued: May 29, 2007

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3589

Manufactured:	March 30, 2006
Last calibrated:	July 14, 2006
Recalibrated:	May 28, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: EX3DV4 SN:3589

Sensitivity in Free Space[A]

NormX	**0.460** ± 10.1%	$\mu V/(V/m)^2$
NormY	**0.400** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**0.370** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	**90** mV
DCP Y	**91** mV
DCP Z	**92** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 835 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	3.8	1.3
SAR_{be} [%]	With Correction Algorithm	0.0	0.1

TSL 1900 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	4.5	1.6
SAR_{be} [%]	With Correction Algorithm	0.3	0.5

Sensor Offset

Probe Tip to Sensor Center **1.0** mm

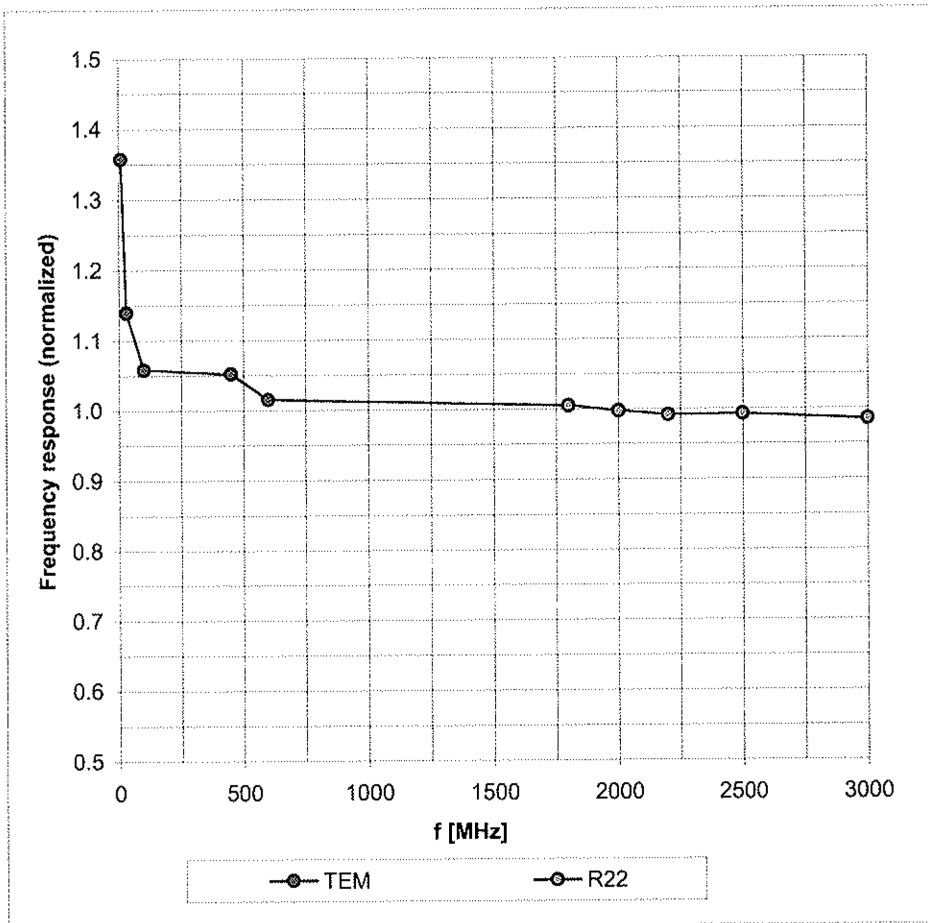
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

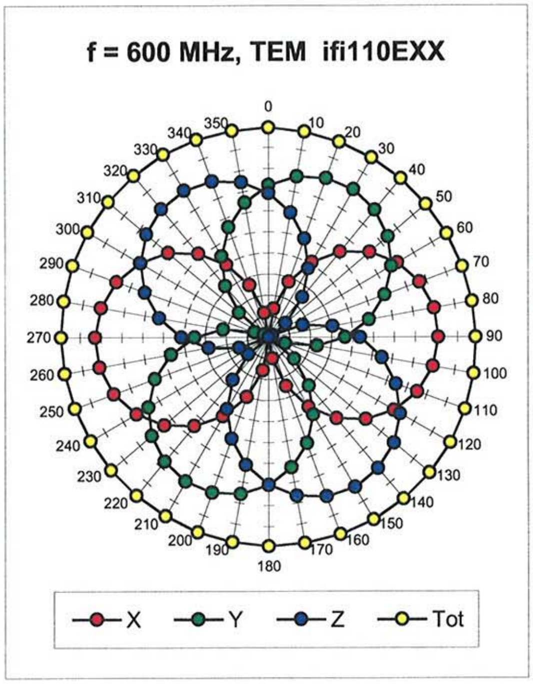
Frequency Response of E-Field

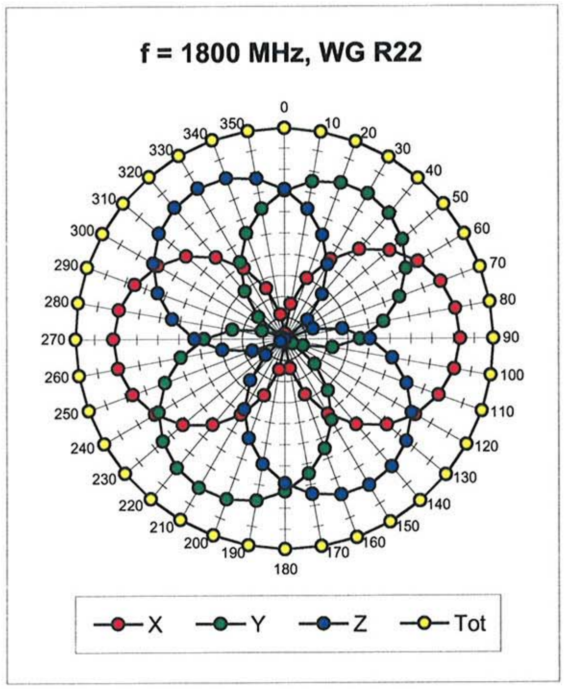
(TEM-Cell:ifi110 EXX, Waveguide: R22)

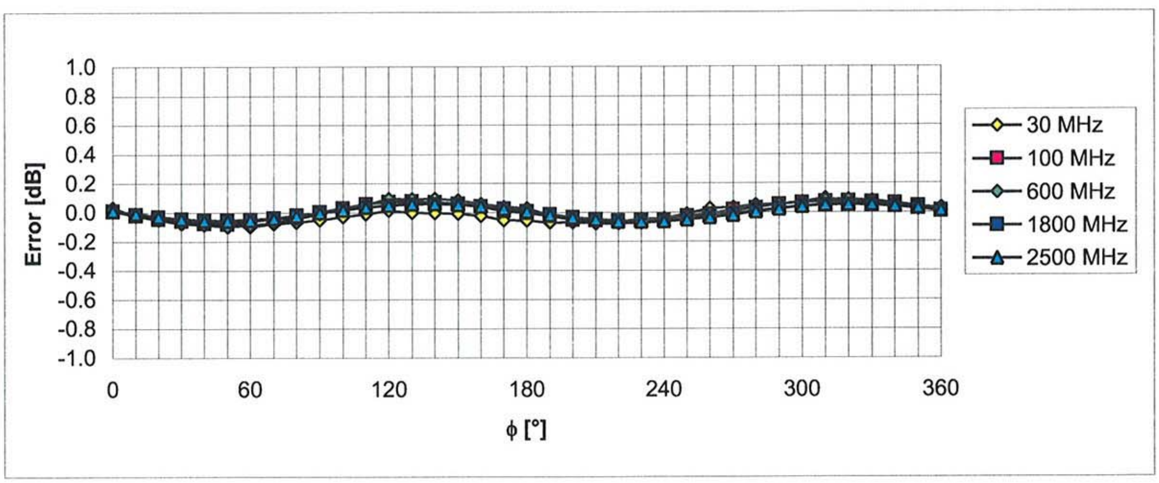


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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



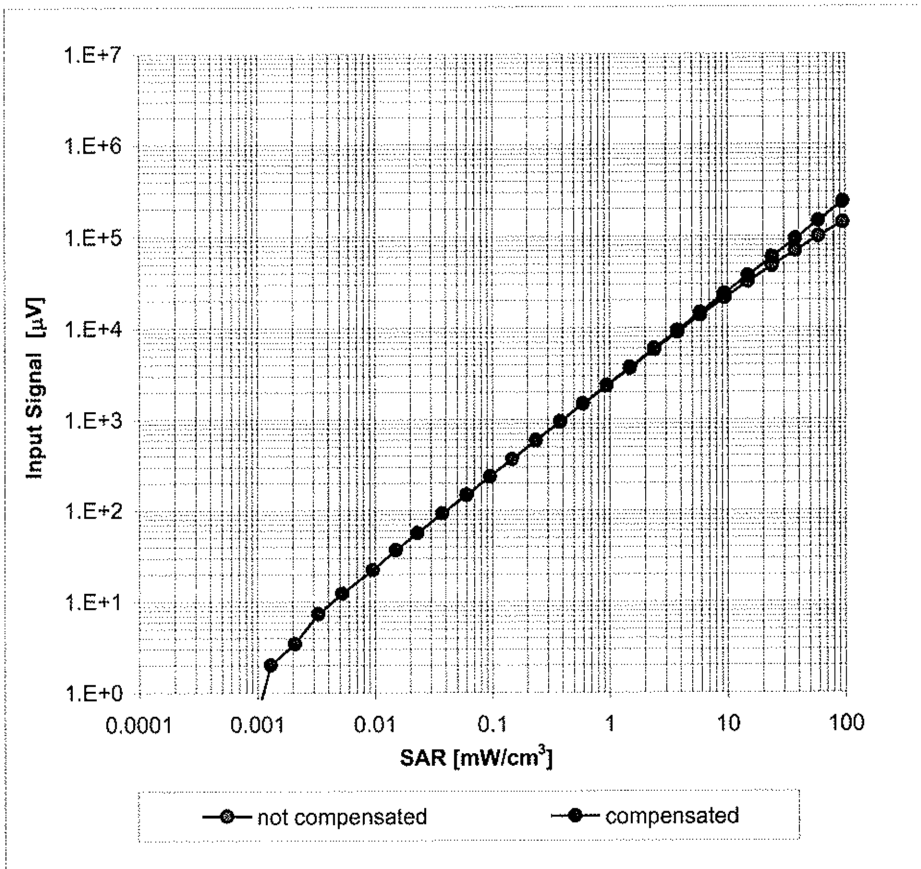


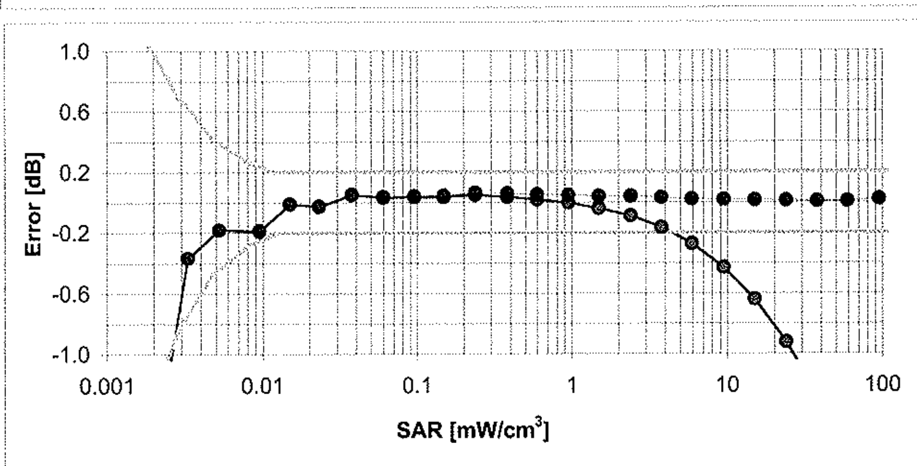


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

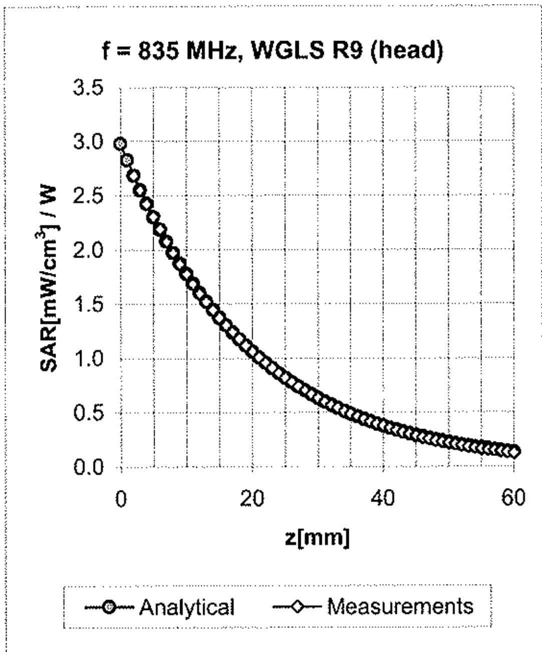
(Waveguide R22, f = 1800 MHz)

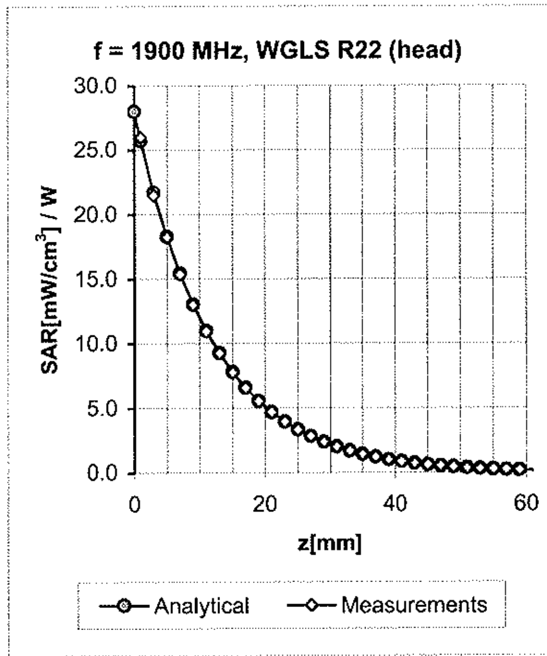




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



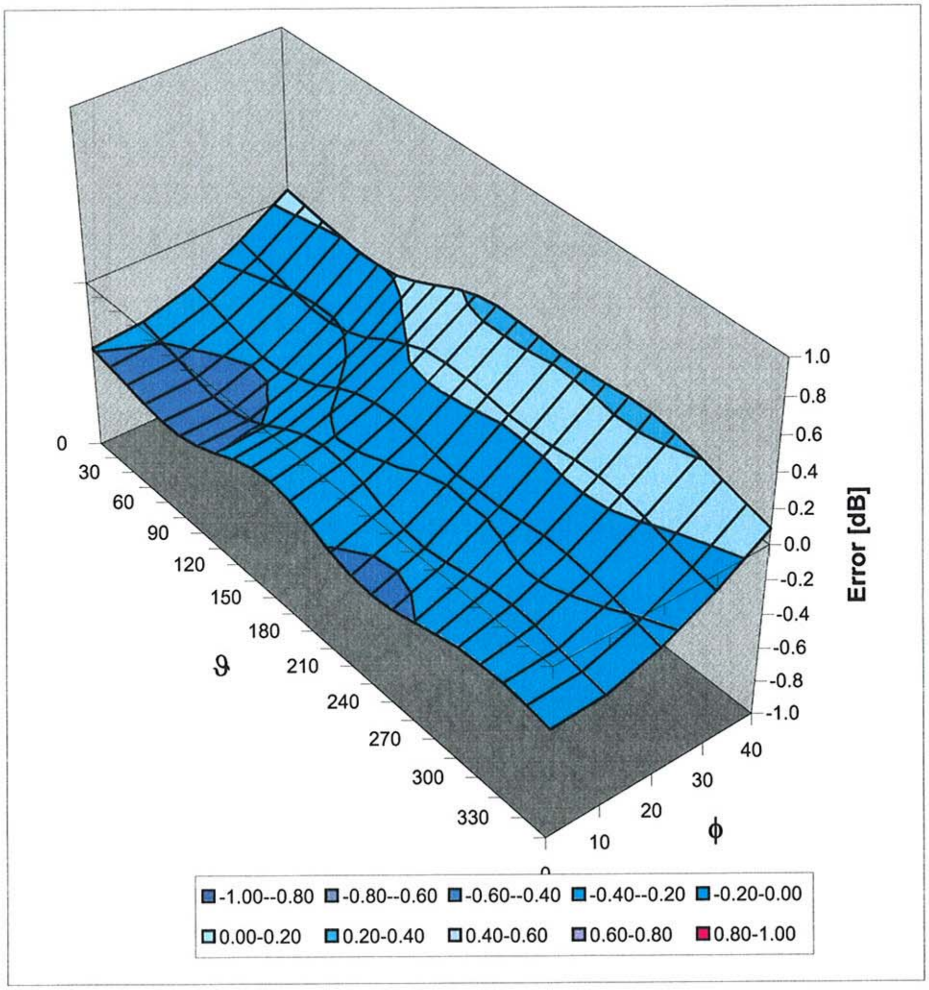


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.27	0.99	8.28	± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.22	1.08	6.71	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.44	1.00	6.29	± 11.8% (k=2)
2600	± 50 / ± 100	Head	39.0 ± 5%	1.96 ± 5%	0.50	1.08	6.10	± 11.8% (k=2)
5200	± 50 / ± 100	Head	36.0 ± 5%	4.66 ± 5%	0.36	1.75	4.60	± 13.1% (k=2)
5300	± 50 / ± 100	Head	35.9 ± 5%	4.76 ± 5%	0.38	1.75	4.31	± 13.1% (k=2)
5800	± 50 / ± 100	Head	35.3 ± 5%	5.27 ± 5%	0.35	1.75	4.16	± 13.1% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.33	0.91	8.30	± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.26	1.00	6.79	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.47	1.00	6.37	± 11.8% (k=2)
2600	± 50 / ± 100	Body	52.5 ± 5%	2.16 ± 5%	0.52	1.08	6.06	± 11.8% (k=2)
5200	± 50 / ± 100	Body	49.0 ± 5%	5.30 ± 5%	0.42	1.70	4.12	± 13.1% (k=2)
5300	± 50 / ± 100	Body	48.5 ± 5%	5.42 ± 5%	0.38	1.70	3.91	± 13.1% (k=2)
5800	± 50 / ± 100	Body	48.2 ± 5%	6.00 ± 5%	0.35	1.70	3.97	± 13.1% (k=2)

[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.

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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