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SAR COMPLIANCE EVALUATION REPORT

Applicant Name:
Panasonic Corporation of North America
One Panasonic Way, 4B-8
Secaucus, NJ 07094
United States

Date of Testing:
01/14/09 - 11/06/09
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0910051841.ACJ

FCC ID: **ACJ9TGCF-H12**

APPLICANT: **PANASONIC CORPORATION OF NORTH AMERICA**

EUT Type:	850/1900 CDMA/GSM/WCDMA/GPRS/EDGE/HSPA/EVDO Handheld PC with WLAN and Bluetooth
Application Type:	Certification
FCC Rule Part(s):	CFR §2.1093; FCC/OET Bulletin 65 Supplement C [July 2001]
FCC Classification:	PCS Licensed Transmitter (PCB) Digital Transmission System (DTS)
Model(s):	CF-H1mk2 Family
Tx Frequency:	824.20 - 848.80 MHz (Cellular GSM) / 1850.20 - 1909.80 MHz (GSM PCS) 826.40 - 846.60 MHz (Cellular WCDMA) / 1852.4 - 1907.6 MHz (PCS WCDMA) 824.70 - 848.31 MHz (Cellular CDMA) / 1851.25 - 1908.75 MHz (PCS CDMA)
Conducted Power:	32.9 dBm GSM 850 / 30.18 dBm GSM 1900 24.67 dBm UMTS V / 24.38 dBm UMTS II 24.76 dBm Cell. CDMA EVDO / 23.48 dBm PCS CDMA EVDO 13.59 dBm IEEE 802.11b / 14.94 dBm - 802.11g / 14.93 dBm - 802.11n 13.88 dBm IEEE 802.11a 5.2GHz / 13.74 dBm IEEE 802.11n 5.2GHz 13.62 dBm IEEE 802.11a 5.3GHz / 12.73 dBm IEEE 802.11n 5.3GHz 14.04 dBm IEEE 802.11a 5.5GHz / 13.67 dBm IEEE 802.11n 5.5GHz 13.46 dBm IEEE 802.11a 5.8GHz / 12.79 dBm IEEE 802.11n 5.8GHz
Max. SAR Measurement:	0.251 W/kg GSM 850 Body SAR / 0.555 W/kg GSM 1900 Body SAR 0.487 W/kg UMTS V Body SAR / 0.985 W/kg UMTS II Body SAR 0.427 W/kg Cellular CDMA EVDO Body SAR / 0.650 W/kg PCS CDMA EVDO Body SAR 0.136 W/kg IEEE 802.11b / 0.138 W/kg - 802.11g, 0.126 W/kg – 802.11n 2.4GHz 0.293 W/kg IEEE 802.11a 5.2GHz / 0.253 W/kg IEEE 802.11n 5.2GHz 0.286 W/kg IEEE 802.11a 5.3GHz / 0.170 W/kg IEEE 802.11n 5.3GHz 0.331 W/kg IEEE 802.11a 5.5GHz / 0.286 W/kg IEEE 802.11n 5.5GHz 0.152 W/kg IEEE 802.11a 5.8GHz / 0.266 W/kg IEEE 802.11n 5.8GHz
Test Device Serial No.:	*Pre-Production* [S/N: 9HKSA00095]

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 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

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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[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 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]

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).

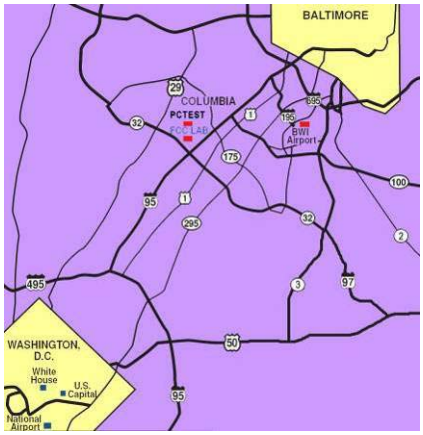

Figure 2-1
Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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

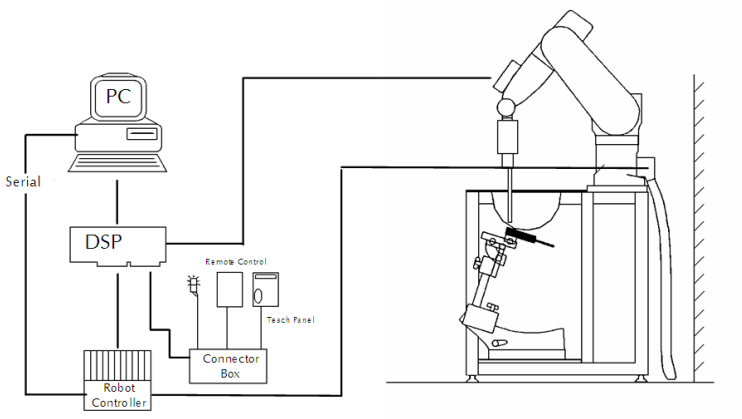

Figure 3-1
SAR Measurement System Setup

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

Positioner

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

Data Acquisition Electronic System (DAE)

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

PC Interface Card

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

Phantom

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 4-3) 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. 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:	ES3DV3, EX3DV4
Frequency Range:	10 MHz – 6.0 GHz (EX3DV4) 10 MHz – 4 GHz (ES3DV3)
Calibration:	In brain and muscle simulating tissue at Frequencies from 835 up to 5800MHz
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

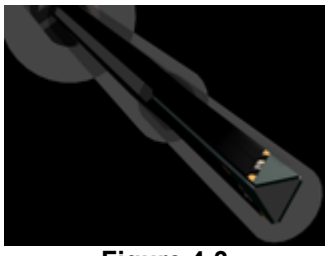

Figure 4-3
Triangular Probe
Configuration

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.

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

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. Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

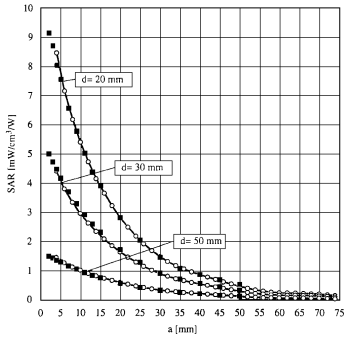

Figure 5-1 E-Field and Temperature measurements at 900MHz [7]

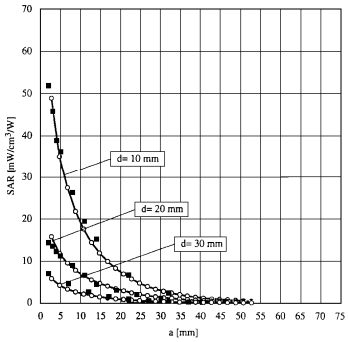

Figure 5-2 E-Field and temperature measurements at 1.9GHz [7]

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. (see Fig. 5.1)

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 (Feyman 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:

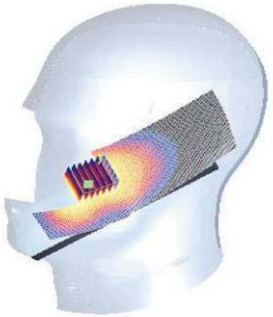

Figure 7-1
Sample SAR Area Scan

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 head was measured at a distance of 3.0mm 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.
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 z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
   b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions) [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. If the value changed by more than 5%, the evaluation is repeated.

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 NOTEBOOK PCS

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 Test Conditions and Positioning for Convertible and Slate Tablet Computers

Figure 8-2
Tablet Computer Form Factors

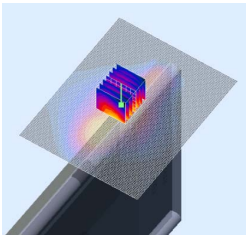

Figure 8-3
Tablet PC Body SAR

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

The WWAN Tx antenna side edge (Left Edge) of the tablet was tested for SAR. Since the Top, Right and Bottom sides of the tablet are greater than 20 cm from the WWAN transmit antenna, WWAN SAR testing was not performed on those sides. See operational description of the laptop for more details on the antennas in the body for the WWAN transmitter.

The WLAN Tx antenna side edge (Tablet Right) of the tablet was tested for SAR. Since the Top, Left and Bottom sides of the tablet are greater than 20 cm from the WLAN transmit antenna, WWAN SAR testing was not performed on those sides. See operational description of the laptop for more details on the antennas in the body for the WLAN transmitter.

Therefore, the only condition applicable to RF Exposure is the Tablet mode on the left side closest to the WWAN transmit antenna, the Tablet mode on the right side closest to the WLAN transmit antenna and the condition where the tablet is placed on the lap.

8.3 Simultaneous Transmission

KDB 616217. The equation n = P/(60/f)-1 is used to calculate minimum antenna separation distance before simultaneous SAR measurements are necessary, where P is the antenna's output power and f is the frequency in GHz of the simultaneous antenna. For the worst-case WLAN(a) 5.8GHz mode where P = 15.96 dBm or 39.45 mW, and f = 5.745, n is calculated to be 2.78. The minimum separation distance is then calculated to be at least (5 + ½ n) cm or 6.39 cm.

The WWAN and WLAN antenna separation distance for the EUT is 11.5 cm, there a simultaneous SAR evaluation is not required.

9 RF EXPOSURE LIMITS

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 *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.

10 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	E2.1	6.6	N	1	1.0	1.0	6.6	6.6	∞
Axial Isotropy	E2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E4.1	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)	E3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E3.3	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

11 SYSTEM VERIFICATION

11.1 Tissue Verification

Table 11-1
Measured Tissue Properties

Calibrated Date:	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
10/05/2009	835M	820	0.964	53.33	0.97	55.20	-0.62%	-3.39%
		835	0.978	53.20	0.97	55.20	0.82%	-3.62%
		850	0.993	53.02	0.97	55.20	2.37%	-3.95%
10/05/2009	1900M	1850	1.496	51.19	1.52	53.30	-1.58%	-3.96%
		1880	1.515	51.37	1.52	53.30	-0.33%	-3.62%
		1910	1.551	51.28	1.52	53.30	2.04%	-3.79%
10/26/2009	835M	820	0.971	53.52	0.97	55.20	0.10%	-3.04%
		835	0.986	53.38	0.97	55.20	1.65%	-3.30%
		850	1.000	53.22	0.97	55.20	3.09%	-3.59%
10/26/2009	1900M	1850	1.506	51.74	1.52	53.30	-0.92%	-2.93%
		1880	1.537	51.67	1.52	53.30	1.12%	-3.06%
		1910	1.572	51.53	1.52	53.30	3.42%	-3.32%
11/02/2009	835M	820	0.957	52.63	0.97	55.20	-1.34%	-4.66%
		835	0.965	52.67	0.97	55.20	-0.52%	-4.58%
		850	0.982	52.53	0.97	55.20	1.24%	-4.84%
11/02/2009	1900M	1850	1.479	51.05	1.52	53.30	-2.70%	-4.22%
		1880	1.505	50.84	1.52	53.30	-0.99%	-4.62%
		1910	1.546	50.66	1.52	53.30	1.71%	-4.95%
01/12/2009	2450M	2450	1.890	51.29	1.95	52.70	-3.08%	-2.68%
01/12/2009	5300M	5300	5.660	47.31	5.42	48.90	4.43%	-3.25%
01/12/2009	5500M	5500	5.680	46.77	5.65	48.60	0.53%	-3.77%
01/12/2009	5800M	5800	6.170	48.49	6.00	48.20	2.83%	0.60%

Note: KDB 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).

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):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{\left[\ln(b/a)\right]^2}\int_a^b\int_a^b\int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r\varepsilon_0)^{1/2}\right]}{r} d\phi' d\rho' d\rho$$

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 $j = \sqrt{-1}$.

11.3 Test System Verification

Prior to assessment, the system is verified to ±10% of the manufacturer SAR result on the reference dipole at the time of calibration, by using the below system validation kit(s).

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**	**Targeted SAR_{1g} (mW)**	**Measured SAR_{1g} (mW)**	**Deviation (%)**
10/07/2009	23.7	22.1	0.060	835	4d047	Muscle	0.59	0.631	7.09%
10/26/2009	23.9	22	0.080	835	4d047	Muscle	0.79	0.847	7.82%
11/06/2009	23.7	22.1	0.060	835	4d047	Muscle	0.59	0.622	5.57%
10/05/2009	23.6	22.6	0.100	1900	5d080	Muscle	4.05	3.98	-1.73%
10/26/2009	23.2	22.8	0.100	1900	502	Muscle	4.15	4.35	4.82%
11/06/2009	23.6	22.2	0.100	1900	502	Muscle	4.15	4.27	2.89%
01/14/2009	22.5	21.3	0.100	2450	797	Brain	5.41	5.27	-2.59%
01/15/2009	22.4	21.2	0.100	5200	1007	Muscle	7.23	7.14	-1.24%
01/15/2009	22.4	21.2	0.100	5500	1007	Muscle	7.68	7.81	1.69%
01/15/2009	224	21.2	0.100	5800	1007	Muscle	6.73	6.98	3.71%

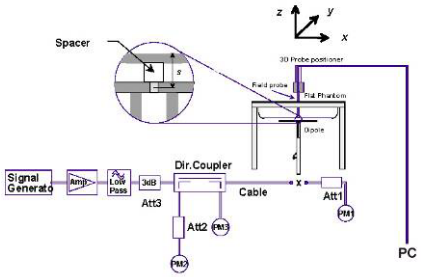

Figure 11-1
System Verification Setup Diagram

Figure 11-2
System Verification Setup Photo

12 FCC 3G MEASUREMENT PROCEDURES

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

12.1 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 [4]. SAR measurements were taken with a fully charged battery. In order to verify that the device was tested and maintained at full power, it was configured with the base station simulator. The SAR measurement software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5% occurred, the tests were repeated.

12.2 SAR Measurement Conditions for CDMA2000

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

12.2.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by "SAR Measurement Procedures for 3G Devices" v02, October 2007. Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in "All Up" condition. .

1. If the mobile station (MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1, Table 13-1 parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH0 and demodulation of RC 3,4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH0 data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2, Table 13-2 was applied.
5. FCHs were configured at full rate for maximum SAR with "All Up" power control bits.

Table 12-1
Parameters for Max. Power for RC1

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

Table 12-2
Parameters for Max. Power for RC3

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

12.2.2 Body SAR Measurements

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCH_n) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCH_n) with FCH at full rate and SCH_0 enabled at 9600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than

0.5 dB and lead to higher SAR drifts and SCH dropouts. Body SAR was measured using TDSO / SO32 with power control bits in the “All Up”

Body SAR in RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

12.2.3 Handsets with EVDO

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev. 0 is less than ¼ dB higher than that measured in RC3 (1x RTT), body SAR for EV-DO is not required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at 153.6 kbps using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev. A is not required when the maximum average output of each channel is less than that measured in Rev. 0 or less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev. A using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots should be configured in the downlink for both Rev. 0 and Rev. A.

12.3 SAR Measurement Conditions for UMTS

12.3.1 Output Power Verification

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

12.3.2 Head SAR Measurements

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

12.3.3 Body SAR Measurements

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

12.3.4 Handsets with HSDPA

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

12.4 RF Conducted Powers:

		RF Conducted Power Table			
		GPRS Data		*EDGE Data*	
Band	**Channel**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**
Cellular	128	32.90	32.84	27.82	27.79
	190	32.58	32.55	27.57	27.54
	251	32.09	32.05	27.19	27.16
PCS	512	29.79	29.74	20.80	20.81
	661	30.18	30.12	21.20	21.16
	810	30.11	30.05	21.21	21.16

Band	Channel	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]	1x EvDO Rev. A [dBm]
	F-RC	RC3	(FTAP)	(RTAP)	(FETAP)	(RETAP)
	Vocoder Rate	N/A	N/A	N/A	N/A	N/A
Cellular	1013	24.68	24.76	24.15	24.97	23.86
	384	24.58	24.38	23.67	24.61	23.72
	777	24.57	24.36	23.67	24.57	23.67
PCS	25	25.04	24.98	24.76	25.17	24.24
	600	25.08	24.90	25.00	25.07	24.28
	1175	25.11	24.87	24.63	24.97	24.01

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			βc	βd	βc/βd	HSDPA FRC	MPR
			4132	4183	4233	9262	9400	9538					
99	WCDMA	12.2 kbps RMC	**24.67**	24.51	24.46	24.32	**24.38**	24.02	-	-	-	-	-
6	HSDPA	Subtest 1	24.65	24.48	24.42	24.27	24.36	24.01	2/15	15/15	2/15	H-SET 1	0
6		Subtest 2	**24.69**	24.50	24.41	24.15	**24.42**	24.00	12/15	15/15	12/15	H-SET 1	0
6		Subtest 3	24.15	23.95	23.84	23.78	23.95	23.48	15/15	8/15	15/8	H-SET 1	0.5
6		Subtest 4	24.17	23.98	23.86	23.82	23.98	23.48	15/15	4/15	15/4	H-SET 1	0.5
6	HSUPA	Subtest 1	**24.63**	24.43	24.42	24.35	**24.45**	23.87	11/15	15/15	11/15	H-SET 1	0
6		Subtest 2	22.62	22.40	22.38	22.32	22.43	21.89	6/15	15/15	6/15	H-SET 1	2
6		Subtest 3	23.65	23.36	23.37	23.31	23.40	22.81	15/15	9/15	15/9	H-SET 1	1
6		Subtest 4	22.57	22.33	22.32	22.24	22.47	21.90	2/15	15/15	2/15	H-SET 1	2
6		Subtest 5	24.59	24.34	24.31	24.27	24.41	23.81	15/15	15/15	15/15	H-SET 1	0

WLAN(b) Output Power

Freq [MHz]	Channel	Data Rate [Mbps]	Average Measured Power [dBm]	Peak Measured Power [dBm]
2412	1	1	13.54	16.84
		2	13.58	16.87
		5.5	13.59	**16.89**
		11	13.58	16.88
2437	6	1	12.32	15.55
		2	12.34	15.58
		5.5	12.33	15.58
		11	12.33	15.58
2462	11	1	12.18	15.41
		2	12.12	15.36
		5.5	12.09	15.27
		11	12.04	15.24

WLAN(g) Output Power

Freq [MHz]	Channel	Data Rate [Mbps]	Average Measured Power [dBm]	Peak Measured Power [dBm]
2412	1	6	12.56	22.19
		9	12.49	22.04
		12	12.73	22.22
		18	12.43	21.75
		24	12.37	22.34
		36	12.69	22.36
		48	12.47	21.51
		54	12.37	22.50
2437	6	6	14.76	23.84
		9	14.77	23.76
		12	14.79	23.89
		18	14.94	23.79
		24	14.88	**24.07**
		36	14.78	23.88
		48	13.49	22.48
		54	11.38	21.37
2462	11	6	11.24	20.69
		9	11.26	20.62
		12	11.66	21.31
		18	11.70	20.81
		24	11.64	21.48
		36	11.59	21.23
		48	11.73	20.66
		54	10.75	20.78

WLAN(n) Output Power

Freq [MHz]	Channel	MCS Index	Data Rate [Mbps]	Average Measured Power [dBm]	Peak Measured Power [dBm]
2422	3	HT0	13.5/15	9.92	19.02
		HT1	27/30	10.01	19.16
		HT2	40/45	9.98	19.34
		HT3	54/60	9.98	19.24
		HT4	81/90	9.92	18.69
		HT5	108/120	9.96	19.39
		HT6	121.5/135	9.99	18.58
		HT7	135/150	10.02	19.03
2437	6	HT0	13.5/15	14.91	23.32
		HT1	27/30	14.90	23.01
		HT2	40/45	14.89	**23.49**
		HT3	54/60	14.85	23.47
		HT4	81/90	14.93	23.39
		HT5	108/120	13.48	22.58
		HT6	121.5/135	11.27	19.74
		HT7	135/150	9.43	18.18
2452	9	HT0	13.5/15	12.75	21.47
		HT1	27/30	12.80	21.32
		HT2	40/45	12.81	21.54
		HT3	54/60	12.78	21.58
		HT4	81/90	12.81	21.57
		HT5	108/120	12.80	22.06
		HT6	121.5/135	10.99	19.46
		HT7	135/150	9.16	17.87

WLAN(a) 5.8GHz Output Power

Freq [MHz]	Channel	Data Rate [Mbps]	Average Measured Power [dBm]	Peak Measured Power [dBm]
5745	149	6	15.78	23.63
		9	15.96	23.78
		12	15.89	23.85
		18	15.86	23.70
		24	15.91	**23.88**
		36	15.87	23.85
		48	14.22	22.52
		54	12.16	21.63
5785	157	6	15.28	23.38
		9	15.33	23.51
		12	15.34	23.61
		18	15.38	23.41
		24	15.33	23.69
		36	15.34	23.61
		48	13.79	22.16
		54	11.85	21.23
5825	165	6	15.04	23.27
		9	14.98	23.26
		12	14.97	23.39
		18	15.00	23.11
		24	14.94	23.51
		36	14.85	23.31
		48	13.29	21.69
		54	10.85	20.24

WLAN(n) 5.8GHz Output Power

Freq [MHz]	Channel	MCS Index	Data Rate [Mbps]	Average Measured Power [dBm]	Peak Measured Power [dBm]
5755	151	HT0	13.5/15	15.35	23.31
		HT1	27/30	15.33	23.26
		HT2	40/45	15.34	23.27
		HT3	54/60	15.35	23.37
		HT4	81/90	15.38	23.37
		HT5	108/120	13.61	22.66
		HT6	121.5/135	11.79	20.57
		HT7	135/150	10.02	18.47
5795	159	HT0	13.5/15	14.74	22.98
		HT1	27/30	14.73	22.89
		HT2	40/45	15.11	23.24
		HT3	54/60	15.12	23.27
		HT4	81/90	15.09	23.21
		HT5	108/120	13.35	22.48
		HT6	121.5/135	11.53	19.63
		HT7	135/150	9.78	18.22

Figure 12-1
Power Measurement Setup

13 SAR DATA SUMMARY

13.1 Body SAR Results

MEASUREMENT RESULTS										
FREQUENCY		Modulation	Conducted Power [dBm]		Test Position	LCD Side	Slots	Spacing (cm)	Protocol	SAR
MHz	Ch.		Start	End						(W/kg)
836.60	384	EVDO Cellular Rev.0	24.38	24.44	Laptop	-		0.0	FTAP, Rev0	0.055
836.60	384	EVDO Cellular Rev.0	24.38	24.81	Edge	Left		0.0	FTAP, Rev0	0.427
1880.00	600	EVDO PCS Rev.0	23.40	23.43	Laptop	-		0.0	FTAP, Rev0	0.029
1880.00	600	EVDO PCS Rev.0	23.40	24.05	Edge	Left		0.0	FTAP, Rev0	0.650
836.6	190	GPRS850	31.55	31.61	Laptop	-	2x	0.0	N/A	0.064
836.6	190	GPRS850	31.55	31.80	Edge	Left	2x	0.0	N/A	0.251
1880.0	661	GPRS1900	28.62	28.66	Laptop	-	2x	0.0	N/A	0.044
1880.0	661	GPRS1900	28.62	29.18	Edge	Left	2x	0.0	N/A	**0.555**
836.60	4183	WCDMA850	24.51	24.56	Laptop	-		0.0	HSPA Inactive	0.048
836.60	4183	WCDMA850	24.51	25.00	Edge	Left		0.0	HSPA Inactive	0.487
1880.00	9400	WCDMA1900	24.38	24.46	Laptop	-		0.0	HSPA Inactive	0.083
1852.4	9262	WCDMA1900	24.32	25.31	Edge	Left		0.0	HSPA Inactive	0.985
1880.00	9400	WCDMA1900	24.38	25.32	Edge	Left		0.0	HSPA Inactive	0.938
1907.6	9538	WCDMA1900	24.02	24.73	Edge	Left		0.0	HSPA Inactive	**0.707**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					**Body 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. Tissue parameters and temperatures are listed on the SAR plots.
4. Batteries are fully charged for all readings.
5. Liquid tissue depth is 15.1 cm. ± 0.1.
6. Device was tested using a fixed spacing.
7. WCDMA mode was tested under RMC 12.2 kbps with HSPA Inactive.
8. Justification for reduced test configurations: This model supports EV-DO. The maximum average output of each channel in RC3 (1x RTT) and Rev. A is less than ¼ dB higher than that measured in Rev. 0. Therefore Body SAR is not required for RC3 (1x RTT) and Rev. A mode.
9. All other time averaged powers for the other multi-slot modes were evaluated to be significantly lower than that of the other GPRS multi-slot time-averaged powers. The worst-case results are reported.
10. The device tested in January was electrically identical in WLAN module, WLAN Tx antennas and external CF-H1 housing as that of the device in November.

13.2 IEEE 802.11b/11g/11n Body SAR Results

MEASUREMENT RESULTS									
FREQUENCY		Modulation	Conducted Power [dBm]		Test Position	Spacing (cm)	Data Rate (Mbps)	SAR	Remarks
MHz	Ch.		Start	End				(W/kg)	
2412	1	DSSS	13.54	13.67	Laptop	0.0	1	0.051	802.11b
2437	6	DSSS	12.32	12.50	Laptop	0.0	1	**0.052**	802.11b
2462	11	DSSS	12.18	12.30	Laptop	0.0	1	0.047	802.11b
2412	1	OFDM	12.56	12.54	Laptop	0.0	6	0.051	802.11g
2437	6	OFDM	14.76	14.84	Laptop	0.0	6	**0.061**	802.11g
2462	11	OFDM	11.24	11.43	Laptop	0.0	6	0.060	802.11g
2422	3	OFDM	9.92	9.99	Laptop	0.0	13.5	0.060	802.11n
2437	6	OFDM	14.91	15.07	Laptop	0.0	13.5	**0.064**	802.11n
2452	9	OFDM	12.75	12.93	Laptop	0.0	13.5	0.061	802.11n
2412	1	DSSS	13.54	13.64	Tablet Right	0.0	1	0.096	802.11b
2437	6	DSSS	12.32	12.21	Tablet Right	0.0	1	**0.136**	802.11b
2462	11	DSSS	12.18	12.33	Tablet Right	0.0	1	0.126	802.11b
2412	1	OFDM	12.56	12.60	Tablet Right	0.0	6	0.121	802.11g
2437	6	OFDM	14.76	14.69	Tablet Right	0.0	6	**0.138**	802.11g
2462	11	OFDM	11.24	11.29	Tablet Right	0.0	6	0.103	802.11g
2422	3	OFDM	9.92	10.12	Tablet Right	0.0	13.5	0.114	802.11n
2437	6	OFDM	14.91	14.83	Tablet Right	0.0	13.5	**0.126**	802.11n
2452	9	OFDM	12.75	12.78	Tablet Right	0.0	13.5	0.116	802.11n
ANSI / IEEE C95.1 2005 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**					**Body** **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.

13.3 IEEE 802.11a/11n 5.2 – 5.3GHz Body SAR Results

MEASUREMENT RESULTS									
FREQUENCY		Modulation	Conducted Power [dBm]		Test Position	Spacing (cm)	Data Rate (Mbps)	SAR	Remarks
MHz	Ch.		Start	End				(W/kg)	
5200	40	OFDM	13.67	13.83	Laptop	0.0	6	0.086	802.11a 5.2GHz
5240	48	OFDM	13.38	13.55	Laptop	0.0	6	**0.106**	802.11a 5.2GHz
5260	52	OFDM	13.46	13.63	Laptop	0.0	6	0.092	802.11a 5.3GHz
5300	60	OFDM	12.66	12.73	Laptop	0.0	6	**0.109**	802.11a 5.3GHz
5190	38	OFDM	12.06	12.17	Laptop	0.0	13.5	0.056	802.11n 5.2GHz
5230	46	OFDM	13.74	13.82	Laptop	0.0	13.5	**0.084**	802.11n 5.2GHz
5270	54	OFDM	12.58	12.74	Laptop	0.0	13.5	**0.087**	802.11n 5.3GHz
5310	62	OFDM	12.00	12.14	Laptop	0.0	13.5	0.062	802.11n 5.3GHz
5200	40	OFDM	13.67	13.86	Tablet Right	0.0	6	**0.293**	802.11a 5.2GHz
5240	48	OFDM	13.38	13.44	Tablet Right	0.0	6	0.198	802.11a 5.2GHz
5260	52	OFDM	13.46	13.62	Tablet Right	0.0	6	0.286	802.11a 5.3GHz
5300	60	OFDM	12.66	12.64	Tablet Right	0.0	6	0.158	802.11a 5.3GHz
5190	38	OFDM	12.06	12.17	Tablet Right	0.0	13.5	**0.253**	802.11n 5.2GHz
5230	46	OFDM	13.74	13.77	Tablet Right	0.0	13.5	0.249	802.11n 5.2GHz
5270	54	OFDM	12.58	12.66	Tablet Right	0.0	13.5	0.170	802.11n 5.3GHz
5310	62	OFDM	12.00	12.09	Tablet Right	0.0	13.5	0.143	802.11n 5.3GHz
ANSI / IEEE C95.1 2005 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**					**Body** **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

13.4 IEEE 802.11a/11n 5.5 – 5.8GHz Body SAR Results

MEASUREMENT RESULTS									
FREQUENCY		Modulation	Conducted Power [dBm]		Test Position	Spacing (cm)	Data Rate (Mbps)	SAR	Remarks
MHz	Ch.		Start	End				(W/kg)	
5540	108	OFDM	13.35	13.48	Laptop	0.0	6	**0.101**	802.11a 5.5GHz
5580	116	OFDM	14.13	14.31	Laptop	0.0	6	0.096	802.11a 5.5GHz
5600	120	OFDM	14.04	14.12	Laptop	0.0	6	0.096	802.11a 5.5GHz
5660	132	OFDM	13.03	13.18	Laptop	0.0	6	0.082	802.11a 5.5GHz
5745	149	OFDM	13.20	13.35	Laptop	0.0	6	0.068	802.11a 5.8GHz
5785	157	OFDM	12.48	12.62	Laptop	0.0	6	**0.092**	802.11a 5.8GHz
5825	165	OFDM	11.99	12.17	Laptop	0.0	13.5	0.090	802.11a 5.8GHz
5510	102	OFDM	12.47	12.61	Laptop	0.0	13.5	0.081	802.11n 5.5GHz
5590	118	OFDM	13.67	13.87	Laptop	0.0	13.5	**0.087**	802.11n 5.5GHz
5670	134	OFDM	12.69	12.87	Laptop	0.0	13.5	0.062	802.11n 5.5GHz
5755	151	OFDM	12.79	13.31	Laptop	0.0	13.5	**0.103**	802.11n 5.8GHz
5795	159	OFDM	12.19	12.38	Laptop	0.0	13.5	0.079	802.11n 5.8GHz
5540	108	OFDM	13.35	13.50	Tablet Right	0.0	6	0.195	802.11a 5.5GHz
5580	116	OFDM	14.13	14.16	Tablet Right	0.0	6	**0.331**	802.11a 5.5GHz
5600	120	OFDM	14.04	13.97	Tablet Right	0.0	6	0.307	802.11a 5.5GHz
5660	132	OFDM	13.03	13.18	Tablet Right	0.0	6	0.132	802.11a 5.5GHz
5745	149	OFDM	13.20	13.30	Tablet Right	0.0	6	**0.152**	802.11a 5.8GHz
5785	157	OFDM	12.48	12.34	Tablet Right	0.0	6	0.112	802.11a 5.8GHz
5825	165	OFDM	11.99	11.98	Tablet Right	0.0	13.5	0.142	802.11a 5.8GHz
5510	102	OFDM	12.47	12.63	Tablet Right	0.0	13.5	0.136	802.11n 5.5GHz
5590	118	OFDM	13.67	13.54	Tablet Right	0.0	13.5	**0.286**	802.11n 5.5GHz
5670	134	OFDM	12.69	12.54	Tablet Right	0.0	13.5	0.103	802.11n 5.5GHz
5755	151	OFDM	12.79	12.97	Tablet Right	0.0	13.5	**0.266**	802.11n 5.8GHz
5795	159	OFDM	12.19	12.38	Tablet Right	0.0	13.5	0.236	802.11n 5.8GHz
ANSI / IEEE C95.1 2005 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**					**Body** **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

14 EQUIPMENT LIST

1/12/09 – 1/15/09 Tests:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8648D	(9kHz-4GHz) Signal Generator	10/11/2007	Biennial	10/11/2009	3613A00315
Agilent	8753E	(30kHz-6GHz) Network Analyzer	3/12/2008	Annual	3/12/2009	JP38020182
Agilent	E5515C	Wireless Communications Test Set	9/10/2008	Biennial	9/10/2010	GB41450275
Agilent	E5515C	Wireless Communications Test Set	6/8/2007	Biennial	6/8/2009	GB46110872
Agilent	E5515C	Wireless Communications Test Set	6/8/2007	Biennial	6/8/2009	GB46310798
Agilent	E6651A	Mobile WiMAX Tester	8/23/2007	Biennial	8/23/2009	MY47310109
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/8/2007	Biennial	3/8/2009	MY45470194
Gigatronics	80701A	(0.05-18GHz) Power Sensor	8/18/2008	Annual	8/18/2009	1833460
Gigatronics	8651A	Universal Power Meter	8/18/2008	Annual	8/18/2009	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	7/23/2008	Annual	7/23/2009	109892
Rohde & Schwarz	CMU200	Base Station Simulator	5/29/2008	Annual	5/29/2009	836371/0079
Rohde & Schwarz	NRVD	Dual Channel Power Meter	8/20/2008	Biennial	8/20/2010	101695
Rohde & Schwarz	NRVS	Single Channel Power Meter	7/3/2007	Biennial	7/3/2009	835360/0079
Rohde & Schwarz	NRV-Z32	Peak Power Sensor (100uW-2W)	12/5/2008	Biennial	12/5/2010	100155
Rohde & Schwarz	NRV-Z33	Peak Power Sensor (1mW-20W)	12/5/2008	Biennial	12/5/2010	100004
Rohde & Schwarz	NRV-Z53	Power Sensor	7/3/2007	Biennial	7/3/2009	846076/0007
SPEAG	D1450V2	1450 MHz SAR Dipole	6/11/2007	Biennial	6/11/2009	1025
SPEAG	D1765V2	1765 MHz SAR Dipole	6/11/2007	Biennial	6/11/2009	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	1/23/2007	Biennial	1/23/2009	502
SPEAG	D1900V2	1900 MHz SAR Dipole	1/23/2007	Biennial	1/23/2009	5d080
SPEAG	D2300V2	2300 MHz SAR Dipole	3/6/2008	Biennial	3/6/2010	1008
SPEAG	D2450V2	2450 MHz SAR Dipole	9/26/2007	Biennial	9/26/2009	719
SPEAG	D2450V2	2450 MHz SAR Dipole	1/17/2007	Biennial	1/17/2009	797
SPEAG	D2600V2	2600 MHz SAR Dipole	1/30/2008	Biennial	1/30/2010	1004
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/25/2007	Biennial	9/25/2009	1007
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/24/2007	Biennial	1/24/2009	1057
SPEAG	D835V2	835 MHz SAR Dipole	8/27/2007	Biennial	8/27/2009	4d026
SPEAG	D835V2	835 MHz SAR Dipole	1/8/2007	Biennial	1/8/2009	4d047
SPEAG	DAE3	Dasy Data Acquisition Electronics	10/17/2008	Annual	10/17/2009	455
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/30/2008	Annual	1/30/2009	649
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/25/2008	Annual	8/25/2009	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/26/2008	Annual	6/26/2009	704
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/30/2008	Annual	7/30/2009	859
SPEAG	EX3DV4	SAR Probe	1/31/2008	Annual	1/31/2009	3550
SPEAG	EX3DV4	SAR Probe	8/26/2008	Annual	8/26/2009	3561
SPEAG	EX3DV4	SAR Probe	6/26/2008	Annual	6/26/2009	3589

10/05/09 - 11/06/09 Tests:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8648D	(9kHz-4GHz) Signal Generator	9/19/2009	Biennial	9/19/2011	3613A00315
Agilent	8753E	(30kHz-6GHz) Network Analyzer	3/25/2009	Annual	3/25/2010	JP38020182
Agilent	E5515C	Wireless Communications Test Set	9/10/2009	Annual	9/10/2010	GB46110872
Agilent	E5515C	Wireless Communications Test Set	9/11/2009	Annual	9/11/2010	GB46310798
Agilent	E5515C	Wireless Communications Test Set	8/25/2009	Annual	8/25/2010	GB41450275
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/25/2009	Biennial	3/25/2011	MY45470194
Gigatronics	80701A	(0.05-18GHz) Power Sensor	9/9/2009	Annual	9/9/2010	1833460
Gigatronics	8651A	Universal Power Meter	9/9/2009	Annual	9/9/2010	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	9/11/2009	Annual	9/11/2010	836371/0079
Rohde & Schwarz	CMU200	Base Station Simulator	4/6/2009	Annual	4/6/2010	833855/0010
Rohde & Schwarz	CMU200	Base Station Simulator	9/4/2009	Annual	9/4/2010	109892
Rohde & Schwarz	NRVD	Dual Channel Power Meter	8/20/2008	Biennial	8/20/2010	101695
Rohde & Schwarz	NRV-Z32	Peak Power Sensor (100uW-2W)	12/5/2008	Biennial	12/5/2010	100155
Rohde & Schwarz	NRV-Z33	Peak Power Sensor (1mW-20W)	12/5/2008	Biennial	12/5/2010	100004
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	D2300V2	2300 MHz SAR Dipole	3/6/2008	Biennial	3/6/2010	1008
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	5/14/2009	Annual	5/14/2010	704
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/25/2009	Annual	5/25/2010	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/21/2009	Annual	1/21/2010	649
SPEAG	ES3DV2	SAR Probe	9/18/2009	Annual	9/18/2010	3022
SPEAG	EX3DV4	SAR Probe	1/21/2009	Annual	1/21/2010	3550
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/21/2009	Annual	7/21/2010	859
SPEAG	D750V3	750 MHz Dipole	2/19/2009	Biennial	2/19/2011	1003
Rohde & Schwarz	CMU200	Base Station Simulator	6/12/2009	Annual	6/12/2010	836536/0005
Speag	ES3DV3	SAR Probe	4/15/2009	Annual	4/15/2010	3213
Speag	ES3DV3	SAR Probe	4/15/2009	Annual	4/15/2010	3209
Rohde & Schwarz	SMIQ03B	Signal Generator	5/21/2009	Annual	5/21/2010	832810/021
Speag	D1640V2	1640 MHz Dipole	8/21/2008	Biennial	8/21/2010	321
Rohde & Schwarz	CMW500	LTE Base Station Simulator	8/25/2009	Annual	8/25/2010	100976

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 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]

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