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SAR COMPLIANCE EVALUATION REPORT
FCC CFR §2.1093 / INDUSTRY CANADA RSS-102

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

Date of Testing:
04/06/10 - 04/13/10
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1003170428.ACJ

FCC ID: **ACJ9TGCF-C11**

IC CERTIFICATION No.: **216A-CFC11**

APPLICANT: **PANASONIC CORPORATION OF NORTH AMERICA**

EUT Type:	Convertible Tablet PC with WLAN, Bluetooth and WWAN
Application Type:	Certification
FCC Rule Part(s):	CFR §2.1093; FCC/OET Bulletin 65 Supplement C [June 2001]
IC Specification(s):	RSS-102, Issue 4, Health Canada Safety Code 6
FCC Classification:	Unlicensed National Information Infrastructure (UNII)/ PCS Licensed Transmitter (PCB) / Digital Transmission system (DTS)/FCC Part 15 Frequency Hopping Spread Spectrum Transceiver (DSS)
IC Radio Equipment Type:	Cellular communications Apparatus
FCC Model(s):	CF-C1 mk1
IC Model(s):	CF-C11
Tx Frequency:	824.20-848.80 MHz (GSM 850) / 1850.20-1909.80 MHz (GSM 1900) 826.40-846.60 MHz (UMTS V) / 1852.4-1907.6 MHz (UMTS II) 824.70-848.31 MHz (Cellular CDMA) / 1851.25-1908.75 MHz (PCS CDMA) 2412-2462 MHz(WLAN 802.11b/g/n) / 5180-5240 MHz(WLAN 802.11a/n) 5260-5320 MHz(WLAN 802.11a/n) / 5500-5700 MHz(WLAN 802.11a/n) 2402-2480 MHz (Bluetooth)
Conducted Power:	31.49 dBm GSM 850 / 29.2 dBm GSM 1900 31.51 dBm GPRS 850 / 29.24 dBm GPRS 1900 24.66 dBm WCDMA 850 / 24.2 dBm WCDMA 1900 25.07 dBm EvDO 850 / 25.13 dBm EvDO 1900 13.55 dBm 802.11b / 14.22 dBm 802.11g /14.05 dBm 802.11n 2.4GHz 13.86 dBm 802.11a 5.2 GHz / 12.82 dBm 802.11n 5.2 GHz 13.39 dBm 802.11a 5.3 GHz / 12.60 dBm 802.11n 5.3 GHz 14.05 dBm 802.11a 5.5 GHz / 12.59 dBm 802.11n 5.5 GHz 12.92 dBm 802.11a 5.8 GHz / 12.00 dBm 802.11n 5.8 GHz 3.07 dBm Bluetooth
Max. SAR Measurement:	0.45 W/kg GPRS 850 / 0.49 W/kg GPRS 1900 0.32 W/kg WCDMA 850 / 0.53 W/kg WCDMA 1900 0.3 W/kg EvDO 850 / 0.67 W/kg EvDO 1900 0.05 W/kg IEEE 802.11b / 0.14 W/kg IEEE 802.11g / 0.08 W/kg IEEE 802.11n 2.4 GHz 0.09 W/kg IEEE 802.11a 5.2 GHz / 0.07 W/kg IEEE 802.11a 5.3 GHz 0.12 W/kg IEEE 802.11a 5.5 GHz / 0.15 W/kg IEEE 802.11a 5.8 GHz 0.06 W/kg Bluetooth SAR
EUT Serial No.:	Pre-Production [S/N:CF-C1ADABZDM]

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 and Industry Canada have 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).

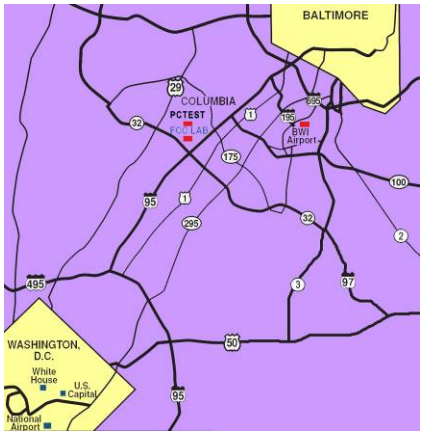

Figure 2-1
Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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. PCTEST facility is an IC registered (2341A-1) test laboratory with the site description filed to Industry Canada in accordance with Raido Standards Specifications (RSS).

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

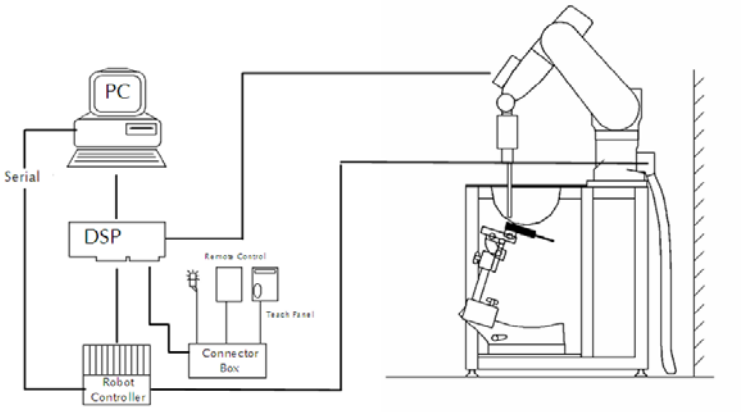

Figure 3-1
SAR Measurement System Setup

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

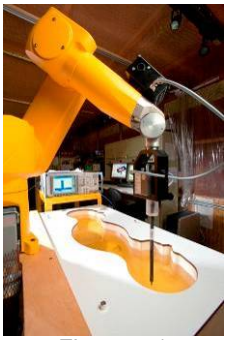

Figure 4-1
SAR System

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

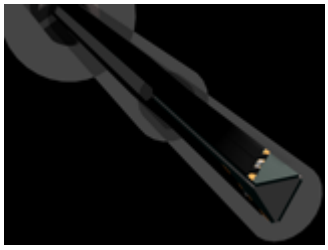

Figure 4-3
Triangular Probe
Configuration

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;

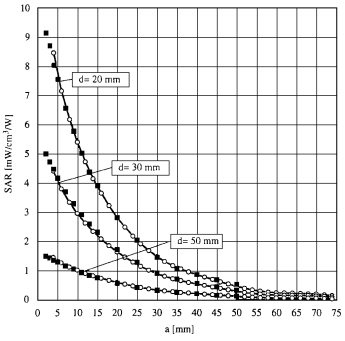

Figure 5-1 E-Field and Temperature measurements at 900MHz [7]

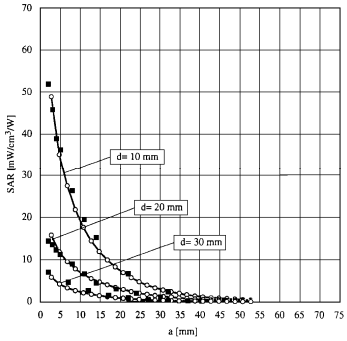

Figure 5-2 E-Field and temperature measurements at 1.9GHz [7]

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

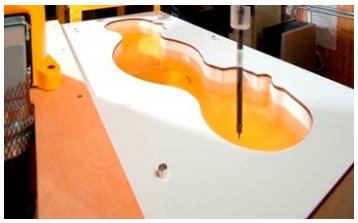

Figure 6-2
Head Simulated

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
Ingredient: (% 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]).

[a]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:

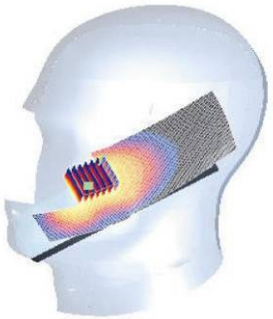

Figure 7-1
Sample SAR Area Scan

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 DEFINITION OF REFERENCE POINTS

8.1 SAR Testing with IEEE 802.11 a/b/g Transmitters (if applicable)

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.

8.1.1 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 devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

8.1.2 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 NOTEBOOK PCS AND USB DONGLES

9.1 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 9-1
Notebook Setup for SAR

9.2 Positioning for Convertible and Slate Tablet Computers

Figure 9-2
Tablet Computer Form Factors

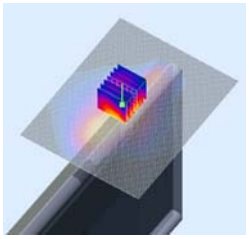

Figure 9-3
Tablet PC Body SAR

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.

10 FCC AND HEALTH CANADA SAFETY CODE 6RF 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 C95.1-1992 and Health Canada Safety Code 6 (2.2.1 & 2.2.6)

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	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

12 SYSTEM VERIFICATION

12.1 Tissue Verification

Table 12-1
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
04/05/2010	835M	820	0.979	54.43	**0.97**	**55.20**	*0.93%*	*-1.39%*
		835	0.990	54.15	**0.97**	**55.20**	*2.06%*	*-1.90%*
		850	0.996	54.01	**0.97**	**55.20**	*2.68%*	*-2.16%*
04/05/2010	1900M	1850	1.492	52.22	**1.52**	**53.30**	*-1.84%*	*-2.03%*
		1880	1.516	52.06	**1.52**	**53.30**	*-0.26%*	*-2.33%*
		1910	1.559	51.84	**1.52**	**53.30**	*2.57%*	*-2.74%*
04/05/2010	2450M	2401	1.886	50.97	**1.95**	**52.70**	*-3.28%*	*-3.28%*
		2450	1.956	50.62	**1.95**	**52.70**	*0.31%*	*-3.95%*
		2499	2.020	50.57	**1.95**	**52.70**	*3.59%*	*-4.04%*
04/12/2010	5200-5800M	5170	5.127	47.38	**5.26**	**49.15**	*-2.60%*	*-3.60%*
		5210	5.157	47.34	**5.31**	**48.95**	*-2.92%*	*-3.29%*
		5250	5.192	47.27	**5.36**	**48.75**	*-3.13%*	*-3.04%*
		5270	5.282	47.19	**5.38**	**48.65**	*-1.89%*	*-3.00%*
		5310	5.291	47.15	**5.43**	**48.45**	*-2.60%*	*-2.68%*
		5350	5.327	47.09	**5.48**	**48.25**	*-2.79%*	*-2.40%*
		5470	5.513	46.82	**5.61**	**48.63**	*-1.80%*	*-3.72%*
		5510	5.549	46.73	**5.66**	**48.59**	*-2.00%*	*-3.83%*
		5550	5.588	46.74	**5.71**	**48.55**	*-2.14%*	*-3.73%*
		5570	5.644	46.66	**5.73**	**48.53**	*-1.57%*	*-3.85%*
		5610	5.578	46.57	**5.78**	**48.49**	*-3.53%*	*-3.96%*
		5650	5.724	46.53	**5.83**	**48.45**	*-1.82%*	*-3.96%*
		5670	5.787	46.46	**5.85**	**48.40**	*-1.14%*	*-4.00%*
		5710	5.820	46.39	**5.90**	**48.34**	*-1.39%*	*-4.02%*
		5750	5.861	46.34	**5.95**	**48.28**	*-1.50%*	*-4.01%*
		5770	5.924	46.28	**5.97**	**48.25**	*-0.84%*	*-4.07%*
		5810	5.958	46.22	**6.01**	**48.20**	*-0.87%*	*-4.11%*
		5850	5.998	46.13	**6.07**	**48.13**	*-1.19%*	*-4.15%*
04/12/2010	2450M	2401	1.857	50.80	**1.95**	**52.70**	*-4.77%*	*-3.61%*
		2450	1.923	50.58	**1.95**	**52.70**	*-1.38%*	*-4.02%*
		2499	1.996	50.40	**1.95**	**52.70**	*2.36%*	*-4.36%*

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).

12.2 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 $j = \sqrt{-1}$.

12.3 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 12-2
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} (W/kg)**	**Measured SAR_{1g} (W/kg)**	**Deviation (%)**
04/06/2010	23.5	22.4	0.1	835	4d047	Muscle	0.98	0.953	-2.95
04/08/2010	23.7	22.8	0.04	1900	5d080	Muscle	1.62	1.68	3.70
04/08/2010	23.8	22.6	0.025	2450	719	Muscle	1.29	1.35	5.06
04/12/2010	23.9	22.7	0.025	5200	1057	Muscle	1.98	1.9	-3.92
04/13/2010	23.7	22.6	0.025	5500	1057	Muscle	2.04	1.88	-7.84
04/13/2010	23.8	22.7	0.025	5800	1057	Muscle	1.79	1.65	-7.82
04/12/2010	23.9	23	0.025	2450	719	Muscle	1.29	1.29	0.39

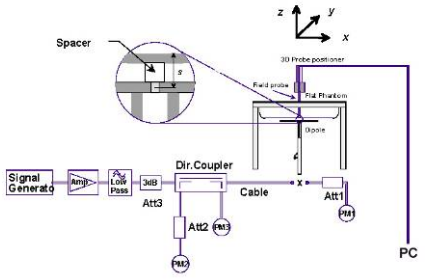

Figure 12-1
System Verification Setup Diagram

Figure 12-2
System Verification Setup Photo

13 FCC 3G MEASUREMENT PROCEDURES

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

13.1 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.

13.2 SAR Measurement Conditions for CDMA2000

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

13.2.1 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 13-1
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 13-2
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

13.2.2 Body SAR Measurements

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

Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0. SAR for Subtype 2 Physical layer configurations is not required for Rev. A when the maximum average output of each RF channels is less than that measured in Subtype 0/1 Physical layer configurations. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for that RF channels in Rev. 0. Head SAR is required for EV-DO devices that support operations next to the ear; for example, with VOIP, using Subtype 2 Physical Layer configurations according to the required handset test configurations.

13.2.1 1x RTT Support

For EV-DO devices that also support 1x RTT voice and/or data operations, SAR is not required for 1x RTT when the maximum average output of each channel is less than ¼ dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0. Otherwise, the 'Body SAR Measurements' procedures in the 'CDMA-2000 1x Handsets' section should be applied.

13.3 Procedures Used to Establish RF Signal for SAR HSPA Devices

The following procedures are applicable to HSDPA data devices operating under 3GPP Release 5. Body exposure conditions are typically applicable to these devices, including handsets and data modems operating in various electronic devices. HSDPA operates in conjunction with WCDMA and requires an active DPCCH. The default test configuration is to measure SAR in WCDMA without HSDPA, with an established radio link between the DUT and a communication test set using a 12.2 kbps RMC configured in Test Loop Mode 1; and test HSDPA within FRC and a 12.2 kbps RMC using the highest SAR configuration in WCDMA. SAR is selectively confirmed for other physical channel configurations according to output power, exposure conditions and device operating capabilities. Maximum output power is verified according to 3GPP TS 23.121 (Release 5) and SAR must be measured according to these maximum output conditions.

The DUT 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, this was configured with the base station simulator. The SAR measurement software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5% occurred, the tests were repeated.

13.4 SAR Measurement Conditions for HSDPA Data Devices

13.4.1 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 (release 5), using the appropriate RMC with TPC (transmit power control) set to all "1s". Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH) is tabulated in the test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations is identified.

13.4.2 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits configured to all "1s". In addition, body SAR is also measured in HSDPA with an FRC, together with a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA.

The H-set used in FRC for HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HSPDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the applicable H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the FRC for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 2 ms to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors of βc=9 and βd=15, and power offset parameters of ΔACK= ΔNACK =5 and ΔCQI=2 is used. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the FRC.

13.5 SAR Measurement Conditions for HSPA Data Devices

13.5.1 Body SAR Measurements

When voice transmission and head exposure conditions are applicable to a WCDMA/HSPA data device, head exposure is measured according to the 'Head SAR Measurements' procedures in the 'WCDMA Handsets' section of the FCC 3G document. SAR for body exposure configurations are measured according to the 'Body SAR Measurements' procedures in the 'WCDMA Handsets' section of the FCC 3G document. In addition, body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP is applicable for head exposure, SAR is not required when the maximum output of each RF channel with HSPA is less than ¼ dB higher than that measured using 12.2 kbps RMC; otherwise, the same HSPA configuration used for body measurements should be used to test for head exposure.

Due to inner loop power control requirements in HSPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and EDCH configurations for HSPA should be configured according to the β values indicated below as well as other applicable procedures described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Devices' sections of the FCC 3G document.

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

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

13.6 RF Conducted Powers

13.6.1 CDMA Conducted Powers

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	24.88	25.07	24.71	24.31	24.32
	384	24.85	25.03	24.55	24.15	24.20
	777	24.84	25.04	24.60	24.11	24.19
PCS	25	25.19	25.06	24.98	24.28	24.36
	600	25.21	25.13	25.01	24.60	24.47
	1175	25.18	24.98	24.97	24.25	24.23

13.6.2 GSM 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	31.51	31.49	27.17	27.13
	190	31.49	31.49	27.15	27.13
	251	31.48	31.41	27.14	27.09
PCS	512	29.08	29.06	25.61	25.61
	661	29.24	29.20	25.77	25.76
	810	29.06	29.02	25.60	25.59

13.6.3 HSPA Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]		
			4132	4183	4233	9262	9400	9538
99	WCDMA	12.2 kbps RMC	24.36	**24.43**	24.39	23.82	**23.84**	23.73
6	HSDPA	Subtest 1	24.32	**24.49**	24.41	23.85	**23.86**	23.70
6		Subtest 2	24.29	24.45	24.35	23.81	23.82	23.72
6		Subtest 3	23.81	23.92	23.86	23.29	23.30	23.17
6		Subtest 4	23.77	23.94	23.92	23.30	23.34	23.19
6	HSUPA	Subtest 1	24.32	**24.46**	**24.43**	**23.83**	23.81	23.70
6		Subtest 2	22.33	22.41	22.38	21.78	21.79	21.66
6		Subtest 3	23.34	23.47	23.39	22.81	22.80	22.68
6		Subtest 4	22.29	22.43	22.32	21.79	21.78	21.63
6		Subtest 5	24.37	24.45	24.34	23.82	23.81	23.66

13.6.1 Bluetooth Conducted Powers

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Conducted Power [DH5 Packet Type]	
			[dBm]	[mW]
2402	1.0	0	2.71	1.868
2441	1.0	39	3.07	2.026
2480	1.0	78	2.63	1.831

13.6.2 IEEE 802.11 2.4GHz Conducted Powers

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps] 1	2	5.5	11
802.11b	2412	1	13.54	13.00	13.50	13.05
802.11b	2437	6	13.54	13.52	13.55	13.25
802.11b	2462	11	12.84	13.25	13.23	13.10

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps] 6	9	12	18	24	36	48	54
802.11g	2412	1	11.91	11.78	11.77	11.78	11.68	11.00	11.54	10.30
802.11g	2437	6	14.22	14.16	14.03	14.01	13.84	13.80	12.50	10.70
802.11g	2462	11	12.56	12.50	12.45	12.44	12.28	12.20	12.22	11.15

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps] 13.5	27	40	54	81	108	122	135
802.11n	2422	3	7.42	7.43	7.77	7.15	7.08	7.00	7.01	6.90
802.11n	2437	6	14.05	14.00	13.93	13.68	13.61	12.20	10.49	8.80
802.11n	2452	9	7.73	7.78	8.14	7.50	7.40	7.84	7.38	7.31

13.6.3 IEEE 802.11 5.2 GHz Conducted Powers

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps] 6	9	12	18	24	36	48	54
802.11a	5180	36	12.28	12.20	12.11	12.12	12.20	11.94	11.96	9.80
802.11a	**5200**	40	12.98	12.92	12.80	12.84	12.72	12.62	11.85	10.03
802.11a	5220	44	13.34	13.34	13.73	13.76	13.86	13.80	12.94	11.15
802.11a	**5240**	48	12.65	13.11	13.04	13.05	12.92	12.83	11.63	10.23

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps] 13.5	27	40	54	81	108	122	135
802.11n	5190	38	9.06	9.01	8.97	8.81	8.67	8.73	8.68	8.63
802.11n	5230	46	12.82	12.41	12.72	12.40	12.08	11.56	9.81	7.97

13.6.4 IEEE 802.11 5.3 GHz Conducted Powers

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps] 6	9	12	18	24	36	48	54
802.11a	5260	52	12.84	13.24	12.80	12.83	12.70	12.66	11.85	10.04
802.11a	**5280**	56	13.11	13.10	13.10	13.14	12.97	12.91	11.71	10.23
802.11a	5300	60	13.18	13.30	13.39	13.19	13.24	13.24	12.33	10.60
802.11a	**5320**	64	13.22	13.18	12.94	12.92	12.73	13.02	11.78	9.95

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps] 13.5	27	40	54	81	108	122	135
802.11n	5270	54	12.22	12.60	12.52	12.32	12.22	11.76	10.01	8.25
802.11n	5310	62	10.03	10.01	9.96	9.78	9.71	9.69	9.73	8.35

13.6.5 IEEE 802.11 5.5 GHz Conducted Powers

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	**5500**	100	13.10	13.32	13.24	13.31	12.81	12.80	12.30	10.64
802.11a	5520	104	13.51	13.42	13.70	13.02	13.12	13.16	12.22	10.68
802.11a	**5540**	108	13.27	13.26	14.05	12.84	12.90	12.97	12.04	10.37
802.11a	5560	112	13.11	13.50	13.89	13.20	12.86	12.89	11.75	10.51
802.11a	**5580**	116	13.45	13.39	13.39	12.71	12.80	13.05	11.81	10.09
802.11a	5600	120	12.74	12.67	12.62	12.72	12.56	12.54	11.74	9.49
802.11a	**5620**	124	12.82	13.07	13.34	13.86	12.28	12.33	11.27	9.16
802.11a	5640	128	13.07	12.91	13.34	12.40	12.22	12.48	11.63	9.31
802.11a	**5660**	132	12.71	12.88	13.06	12.53	12.52	12.54	11.61	9.27
802.11a	5680	136	12.75	12.66	12.93	12.30	12.97	12.41	11.64	9.30
802.11a	**5700**	140	12.47	12.43	12.06	12.12	12.00	11.93	11.10	9.28

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]							
			13.5	27	40	54	81	108	122	135
802.11n	5510	102	11.47	11.43	11.36	11.16	11.10	10.63	10.27	8.48
802.11n	5550	110	11.21	11.09	11.42	11.05	11.40	11.04	9.14	7.68
802.11n	5590	118	**12.59**	12.57	12.45	11.93	11.81	11.43	10.00	8.25
802.11n	5630	126	10.72	10.89	10.80	10.44	10.56	10.47	8.17	6.72
802.11n	5670	134	11.80	11.79	11.69	11.47	11.42	11.24	9.17	5.06

13.6.6 IEEE 802.11 5.8 GHz Conducted Powers

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5745	149	11.82	12.04	12.00	12.03	11.84	11.76	10.85	8.50
802.11a	5785	157	12.31	12.35	12.10	12.20	12.03	11.95	11.10	8.78
802.11a	5825	165	12.92	12.80	12.40	12.62	12.10	12.10	11.25	8.85

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]							
			13.5	27	40	54	81	108	122	135
802.11n	5755	151	11.35	11.66	11.54	11.35	11.30	10.72	8.60	5.60
802.11n	5795	159	12.00	11.90	11.76	11.56	11.40	11.00	8.81	6.01

Figure 13-1
Power Measurement Setup

14 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

14.1 Maximum Conducted Power

Maximum Conducted Power						
Transmitter	Frequency Band	Highest Frequency	Conducted Power		60/f (GHz)	>60/f
	MHz	MHz	dBm	mW	mW	
GSM GPRS850	836.6	848.80	31.51	1,415.79	70.69	yes
GSM GPRS1900	1880	1,908.75	29.24	839.46	31.43	yes
GSM EDGE850	836.6	848.80	27.17	521.19	70.69	yes
GSM EDGE1900	1880	1,908.75	25.77	377.57	31.43	yes
WCDMA850 (UMTS V)	836.6	848.80	24.43	277.33	70.69	yes
WCDMA1900 (UMTS II)	1880	1,908.75	23.84	242.10	31.43	yes
Cell CDMA	836.6	848.80	24.88	307.61	70.69	yes
PCS CDMA	1880	1,908.75	25.21	331.89	31.43	yes
EVDO Rev.0	836.6	848.80	25.07	321.37	70.69	yes
EVDO Rev.0	1880	1,908.75	25.13	325.84	31.43	yes
EVDO Rev.A	836.6	848.80	24.32	270.40	70.69	yes
EVDO Rev.A	1880	1,908.75	24.60	288.40	31.43	yes
Bluetooth	2441	2,480.00	3.07	2.03	24.19	no
802.11b	2437	2,462.00	13.55	22.65	24.37	no
802.11g	2437	2,462.00	14.22	26.42	24.37	yes
802.11a	5200	5,240.00	13.86	24.32	11.45	yes
802.11a	5300	5,320.00	13.39	21.83	11.28	yes
802.11a	5500	5,600.00	14.05	25.41	10.71	yes
802.11a	5785	5,825.00	12.92	19.59	10.30	yes
802.11n	2437	2,462.00	14.05	25.41	24.37	yes
802.11n	5200	5,240.00	12.82	19.14	11.45	yes
802.11n	5300	5,320.00	12.60	18.20	11.28	yes
802.11n	5500	5,600.00	12.59	18.16	10.71	yes
802.11n	5785	5,825.00	12.00	15.85	10.30	yes

14.2 Co-Transmission

Co-Transmission														
TX		GPRS	GPRS	WCDMA	WCDMA	EVDO	EVDO	802.11b	802.11g	802.11n	802.11a	802.11a	802.11a	802.11a
	Freq	835	1880	835	1880	835	1880	2437	2437	2437	5200	5300	5500	5800
GPRS	835	N/A	N/A	N/A	N/A	N/A	N/A	yes	yes	yes	yes	yes	yes	yes
GPRS	1800	N/A	N/A	N/A	N/A	N/A	N/A	yes	yes	yes	yes	yes	yes	yes
EDGE	835	N/A	N/A	N/A	N/A	N/A	N/A	yes	yes	yes	yes	yes	yes	yes
EDGE	1880	N/A	N/A	N/A	N/A	N/A	N/A	yes	yes	yes	yes	yes	yes	yes
WCDMA	836	N/A	N/A	N/A	N/A	N/A	N/A	yes	yes	yes	yes	yes	yes	yes
WCDMA	1880	N/A	N/A	N/A	N/A	N/A	N/A	yes	yes	yes	yes	yes	yes	yes
EVDO	835	N/A	N/A	N/A	N/A	N/A	N/A	yes	yes	yes	yes	yes	yes	yes
EVDO	1880	N/A	N/A	N/A	N/A	N/A	N/A	yes	yes	yes	yes	yes	yes	yes
802.11b	2437	yes	yes	yes	yes	yes	yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11g	2437	yes	yes	yes	yes	yes	yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5200	yes	yes	yes	yes	yes	yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5300	yes	yes	yes	yes	yes	yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5500	yes	yes	yes	yes	yes	yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5800	yes	yes	yes	yes	yes	yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	2437	yes	yes	yes	yes	yes	yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A

14.3 Distance- Antenna to Antenna

Distance - Antenne to Antenna				
Antenna	WWAN	WLAN Main	WLAN Aux	BT
WWAN	N/A	50 mm	298 mm	263 mm
WLAN Main	50 mm	N/A	291 mm	250 mm
WLAN Aux.	298 mm	291 mm	N/A	140 mm
BT	263 mm	250 mm	140 mm	N/A

14.4 Distance- Antenna to Body

Distance - Antenna to Body				
Position	Antenna			
	WWAN	WLAN Main	WLAN Aux	BT
Laptop	30 mm	38 mm	41 mm	11 mm
Tablet Bottom	205 mm	67 mm	60 mm	3 mm
Tablet Top	20 mm	158 mm	165 mm	222 mm
Tablet Right	1 mm	1 mm	299 mm	5 mm
Tablet Left	299 mm	299 mm	1 mm	295 mm

14.5 Summary of ∑ SAR

WWAN Mode	SAR Result [W/kg]													
	GPRS	GPRS	WCDMA	WCDMA	EVDO	EVDO	802.11b	802.11g	802.11n	802.11a	802.11a	802.11a	802.11a	Sigma SAR
	850	1900	850	1900	850	1900	2.4	2.4	2.4	5.2	5.3	5.5	5.8	
GPRS 850	0.447						0.012							0.459
GPRS 850	0.447							0.021						0.468
GPRS 850	0.447								0.016					0.463
GPRS 850	0.447									0.058				0.505
GPRS 850	0.447										0.072			0.519
GPRS 850	0.447											0.119		0.566
GPRS 850	0.447												0.031	0.478
GPRS 1900		0.487					0.012							0.499
GPRS 1900		0.487						0.021						0.508
GPRS 1900		0.487							0.016					0.503
GPRS 1900		0.487								0.058				0.545
GPRS 1900		0.487									0.072			0.559
GPRS 1900		0.487										0.119		0.606
GPRS 1900		0.487											0.031	0.518
WCDMA 850			0.316				0.012							0.328
WCDMA 850			0.316					0.021						0.337
WCDMA 850			0.316						0.016					0.332
WCDMA 850			0.316							0.058				0.374
WCDMA 850			0.316								0.072			0.388
WCDMA 850			0.316									0.119		0.435
WCDMA 850			0.316										0.031	0.347
WCDMA 1900				0.526			0.012							0.538
WCDMA 1900				0.526				0.021						0.547
WCDMA 1900				0.526					0.016					0.542
WCDMA 1900				0.526						0.058				0.584
WCDMA 1900				0.526							0.072			0.598
WCDMA 1900				0.526								0.119		0.645
WCDMA 1900				0.526									0.031	0.557
EVDO 850					0.304		0.012							0.316
EVDO 850					0.304			0.021						0.325
EVDO 850					0.304				0.016					0.320
EVDO 850					0.304					0.058				0.362
EVDO 850					0.304						0.072			0.376
EVDO 850					0.304							0.119		0.423
EVDO 850					0.304								0.031	0.335
EVDO 1900						0.666	0.012							0.678
EVDO 1900						0.666		0.021						0.687
EVDO 1900						0.666			0.016					0.682
EVDO 1900						0.666				0.058				0.724
EVDO 1900						0.666					0.072			0.738
EVDO 1900						0.666						0.119		0.785
EVDO 1900						0.666							0.031	0.697

15 SAR DATA SUMMARY

15.1 GSM SAR Results

MEASUREMENT RESULTS									
FREQUENCY		Modulation	Service	Conducted Power [dBm]		Test Position	Slot	Spacing (cm)	SAR
MHz	Ch.			Start	End				(W/kg)
836.60	190	GPRS 850	GPRS	31.49	31.29	Laptop	2	0.0 cm	0.303
836.60	190	GPRS 850	GPRS	31.49	31.68	Edge Bottom	2	0.0 cm	0.024
836.60	190	GPRS 850	GPRS	31.49	31.68	Edge Top	2	0.0 cm	**0.447**
1880.00	661	GPRS 1900	GPRS	29.20	29.36	Laptop	2	0.0 cm	0.030
1880.00	661	GPRS 1900	GPRS	29.20	29.39	Edge Bottom	2	0.0 cm	0.030
1880.00	661	GPRS 1900	GPRS	29.20	29.08	Edge Top	2	0.0 cm	**0.487**
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 were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and RSS-102.
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 was at least 15.0 cm.
6. Justification for reduced test configurations per KDB 941225: The source-based time-averaged output power was evaluated for all multi-slot operations. In addition to the worst-case reported, all source-based time-averaged powers within 10% of the worst-case were additionally included in the evaluation.
7. The TX WWAN antenna is located on “Edge Right” but is disabled in corresponding display mode so only the “Edge Top” and “Edge Bottom” configurations of the tablet mode were tested.

15.2 UMTS SAR Results

MEASUREMENT RESULTS								
FREQUENCY		Modulation	Service	Conducted Power [dBm]		Test Position	Spacing (cm)	SAR
MHz	Ch.			Start	End			(W/kg)
836.60	4183	UMTS V	RMC	24.43	24.50	Laptop	0.0 cm	0.228
836.60	4183	UMTS V	RMC	24.43	24.57	Edge Bottom	0.0 cm	0.018
836.60	4183	UMTS V	RMC	24.43	24.60	Edge Top	0.0 cm	**0.316**
1880.00	9400	UMTS II	RMC	23.84	23.95	Laptop	0.0 cm	0.025
1880.00	9400	UMTS II	RMC	23.84	23.97	Edge Bottom	0.0 cm	0.049
1880.00	9400	UMTS II	RMC	23.84	23.94	Edge Top	0.0 cm	**0.526**
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 were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and RSS-102.
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 was at least 15.0 cm.
6. WCDMA mode in Body SAR was tested under RMC 12.2 kbps with HSPA Inactive.
7. The TX WWAN antenna is located on “Edge Right” but is disabled in corresponding display mode so only the “Edge Top” and “Edge Bottom” configurations of the tablet mode were tested.

15.3 CDMA SAR Results

MEASUREMENT RESULTS								
FREQUENCY		Modulation	Service	Conducted Power [dBm]		Test Position	Spacing (cm)	SAR
MHz	Ch.			Start	End			(W/kg)
836.52	384	Cell EvDO	Rev 0	25.03	24.89	Laptop	0.0 cm	0.182
836.52	384	Cell EvDO	Rev 0	25.03	25.22	Edge Bottom	0.0 cm	0.019
836.52	384	Cell EvDO	Rev 0	25.03	25.18	Edge Top	0.0 cm	0.304
1880.00	600	PCS EvDO	Rev 0	25.13	25.28	Laptop	0.0 cm	0.031
1880.00	600	PCS EvDO	Rev 0	25.13	25.33	Edge Bottom	0.0 cm	0.043
1880.00	600	PCS EvDO	Rev 0	25.13	25.25	Edge Top	0.0 cm	0.666
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 were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and RSS-102.
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 was at least 15.0 cm.
6. Body SAR was tested under EV-DO Rev. 0, FTAP.
7. Justification for reduced test configurations: This model supports EV-DO. The maximum average output of each channel in RC3 (1x RTT) and EV-DO Rev. A. are less than ¼ dB higher than that measured in Rev. 0. Therefore Body SAR is not required for RC3 (1x RTT) and EV-DO Rev. A. modes.
8. The TX WWAN antenna is located on “Edge Right” but is disabled in corresponding display mode so only the “Edge Top” and “Edge Bottom” configurations of the tablet mode were tested.

15.4 2.4 GHz SAR Results

MEASUREMENT RESULTS										
FREQUENCY		Modulation	Conducted Power [dBm]		Test Position	Antenna	Spacing (cm)	Data Rate (Mbps)	SAR	Remarks
MHz	Ch.		Start	End		A-Main / B-Aux			(W/kg)	
2437	6	DSSS	13.54	13.62	Laptop	A	0.00	1 Mbps	0.00982	802.11b
2437	6	DSSS	13.54	13.71	Laptop	B	0.00	1 Mbps	0.0123	802.11b
2437	6	DSSS	13.54	13.37	Edge Bottom	A	0.00	1 Mbps	0.0429	802.11b
2437	6	DSSS	13.54	13.41	Edge Bottom	B	0.00	1 Mbps	**0.048**	802.11b
2437	6	DSSS	13.54	13.72	Edge Top	A	0.00	1 Mbps	0.0205	802.11b
2437	6	DSSS	13.54	13.60	Edge Top	B	0.00	1 Mbps	0.0173	802.11b
2437	6	OFDM	14.22	14.40	Laptop	A	0.00	6 Mbps	0.0212	802.11g
2437	6	OFDM	14.22	14.39	Laptop	B	0.00	6 Mbps	0.0188	802.11g
2437	6	OFDM	14.22	14.39	Edge Bottom	A	0.00	6 Mbps	0.142	802.11g
2437	6	OFDM	14.22	14.40	Edge Bottom	B	0.00	6 Mbps	**0.0964**	802.11g
2437	6	OFDM	14.22	14.42	Edge Top	A	0.00	6 Mbps	0.081	802.11g
2437	6	OFDM	14.22	14.35	Edge Top	B	0.00	6 Mbps	0.0383	802.11g
2437	6	OFDM	14.05	14.10	Laptop	A	0.00	13.5 Mbps	0.0155	802.11n
2437	6	OFDM	14.05	14.21	Laptop	B	0.00	13.5 Mbps	0.014	802.11n
2437	6	OFDM	14.05	14.14	Edge Bottom	A	0.00	13.5 Mbps	**0.0833**	802.11n
2437	6	OFDM	14.05	13.96	Edge Bottom	B	0.00	13.5 Mbps	0.0663	802.11n
2437	6	OFDM	14.05	14.15	Edge Top	A	0.00	13.5 Mbps	0.0372	802.11n
2437	9	OFDM	14.05	14.22	Edge Top	B	0.00	13.5 Mbps	0.0173	802.11n
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 were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and RSS-102.
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 was at least 15.0 cm.
6. WLAN antennas are located on “Edge Right” and “Edge Left” and each can only transmit when the transmitting antenna is positioned away from body, per display orientation.
7. WLAN transmission was verified using a spectrum analyzer.

15.5 5.2 GHz SAR Results

MEASUREMENT RESULTS										
FREQUENCY		Modulation	Conducted Power [dBm]		Test Position	Antenna	Spacing (cm)	Data Rate (Mbps)	SAR	Remarks
MHz	Ch.		Start	End		A-Main / B-Aux			(W/kg)	
5220	44	OFDM	13.86	13.99	Laptop	A	0.0	24 Mbps	0.0295	**802.11a**
5220	44	OFDM	13.86	14.06	Laptop	B	0.0	24 Mbps	0.0178	**802.11a**
5220	44	OFDM	13.86	14.02	Edge Bottom	A	0.0	24 Mbps	**0.0898**	**802.11a**
5220	44	OFDM	13.86	14.03	Edge Bottom	B	0.0	24 Mbps	0.0234	**802.11a**
5220	44	OFDM	13.86	14.00	Edge Top	A	0.0	24 Mbps	0.058	**802.11a**
5220	44	OFDM	13.86	13.99	Edge Top	B	0.0	24 Mbps	0.0254	**802.11a**
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 were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and RSS-102.
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 was at least 15.0 cm.
6. WLAN antennas are located on “Edge Right” and “Edge Left” and each can only transmit when the transmitting antenna is positioned away from body, per display orientation.
7. WLAN transmission was verified using a spectrum analyzer.

15.6 5.3 GHz SAR Results

MEASUREMENT RESULTS										
FREQUENCY		Modulation	Conducted Power [dBm]		Test Position	Antenna	Spacing (cm)	Data Rate (Mbps)	SAR	Remarks
MHz	Ch.		Start	End		A-Main / B-Aux			(W/kg)	
5300	60	OFDM	13.39	13.54	Laptop	A	0.0	12 Mbps	0.018	**802.11a**
5300	60	OFDM	13.39	13.51	Laptop	B	0.0	12 Mbps	0.0459	**802.11a**
5300	60	OFDM	13.39	13.53	Edge Bottom	A	0.0	12 Mbps	0.0266	**802.11a**
5300	60	OFDM	13.39	13.55	Edge Bottom	B	0.0	12 Mbps	0.041	**802.11a**
5300	60	OFDM	13.39	13.43	Edge Top	A	0.0	12 Mbps	0.0451	**802.11a**
5300	60	OFDM	13.39	13.55	Edge Top	B	0.0	12 Mbps	**0.0717**	**802.11a**
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 were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and RSS-102.
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 was at least 15.0 cm.
6. WLAN antennas are located on “Edge Right” and “Edge Left” and each can only transmit when the transmitting antenna is positioned away from body, per display orientation.
7. WLAN transmission was verified using a spectrum analyzer.

15.7 5.5 GHz SAR Results

MEASUREMENT RESULTS										
FREQUENCY		Modulation	Conducted Power [dBm]		Test Position	Antenna	Spacing (cm)	Data Rate (Mbps)	SAR	Remarks
MHz	Ch.		Start	End		A-Main / B-Aux			(W/kg)	
5540	108	OFDM	14.05	14.25	Laptop	A	0.0	12 Mbps	0.0329	802.11a
5540	108	OFDM	14.05	14.22	Laptop	B	0.0	12 Mbps	0.0364	802.11a
5540	108	OFDM	14.05	14.19	Edge Bottom	A	0.0	12 Mbps	0.119	802.11a
5540	108	OFDM	14.05	14.09	Edge Bottom	B	0.0	12 Mbps	0.0837	802.11a
5540	108	OFDM	14.05	14.17	Edge	A	0.0	12 Mbps	0.0143	802.11a
5540	108	OFDM	14.05	14.21	Edge	B	0.0	12 Mbps	0.0294	802.11a
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General					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 were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and RSS-102.
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 was at least 15.0 cm.
6. WLAN antennas are located on “Edge Right” and “Edge Left” and each can only transmit when the transmitting antenna is positioned away from body, per display orientation.
7. WLAN transmission was verified using a spectrum analyzer.

15.8 5.8 GHz SAR Results

MEASUREMENT RESULTS										
FREQUENCY		Modulation	Conducted Power [dBm]		Test Position	Antenna	Spacing (cm)	Data Rate (Mbps)	SAR	Remarks
MHz	Ch.		Start	End		A-Main / B-Aux			(W/kg)	
5825	165	OFDM	12.92	13.06	Laptop	A	0.0	6 Mbps	0.0252	**802.11a**
5825	165	OFDM	12.92	13.09	Laptop	B	0.0	6 Mbps	0.031	**802.11a**
5825	165	OFDM	12.92	13.06	Edge Bottom	A	0.0	6 Mbps	**0.154**	**802.11a**
5825	165	OFDM	12.92	12.96	Edge Bottom	B	0.0	6 Mbps	0.108	**802.11a**
5825	165	OFDM	12.92	13.04	Edge Top	A	0.0	6 Mbps	0.0189	**802.11a**
5825	165	OFDM	12.92	13.08	Edge Top	B	0.0	6 Mbps	0.0308	**802.11a**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General**					**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 were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and RSS-102.
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 was at least 15.0 cm.
6. WLAN antennas are located on “Edge Right” and “Edge Left” and each can only transmit when the transmitting antenna is positioned away from body, per display orientation.
7. WLAN transmission was verified using a spectrum analyzer.

15.9 Bluetooth SAR Results

MEASUREMENT RESULTS									
FREQUENCY		Modulation	Service	Conducted Power [dBm]		Test Position	LCD Side	Spacing (cm)	SAR
MHz	Ch.			Start	End				(W/kg)
2441.00	39.00	Bluetooth	FHSS	3.07	2.90	Laptop	-	0.0 cm	0.002
2441.00	39.00	Bluetooth	FHSS	3.07	2.92	Edge Right	Right	0.0 cm	0.001
2441.00	39.00	Bluetooth	FHSS	3.07	3.25	Edge Top	Top	0.0 cm	0.056
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 were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE1528-2003 and RSS-102.
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 was at least 15.0 cm.
6. Bluetooth transmission was verified using a spectrum analyzer.

16 EQUIPMENT LIST

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	3/31/2010	Annual	3/31/2011	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	3/30/2010	Biennial	3/30/2012	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	DAE3	Dasy Data Acquisition Electronics	9/17/2009	Annual	9/17/2010	455
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/22/2010	Annual	3/22/2011	704
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/22/2010	Annual	1/22/2011	649
SPEAG	ES3DV2	SAR Probe	9/18/2009	Annual	9/18/2010	3022
SPEAG	EX3DV4	SAR Probe	1/26/2010	Annual	1/26/2011	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
Speag	ES3DV3	SAR Probe	3/16/2010	Annual	3/16/2011	3213
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
Anritsu	MA2481A	Power Sensor	12/2/2009	Annual	12/2/2010	5318
Anritsu	MA2481A	Power Sensor	12/3/2009	Annual	12/3/2010	5442
Anritsu	ML2438A	Power Meter	12/3/2009	Annual	12/3/2010	1190013
Anritsu	ML2438A	Power Meter	12/3/2009	Annual	12/3/2010	98150041
Agilent	8648D	Signal Generator	4/1/2010	Annual	4/1/2011	3629U00687
Anritsu	ML2438A	Power Meter	12/3/2009	Annual	12/3/2010	1070030
Anritsu	MA2481A	Power Sensor	12/2/2009	Annual	12/2/2010	5821
Anritsu	MA2481A	Power Sensor	12/3/2009	Annual	12/3/2010	8013
Anritsu	MA2481A	Power Sensor	12/3/2009	Annual	12/3/2010	2400
Aprel	ALS-PR-DIEL	Dielectric Probe Kit	N/A		N/A	260-00959

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.

17 CONCLUSION

17.1 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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