SAR Evaluation Report

IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC OET BULLETIN 65 SUPPLEMENT C
IC RSS 102 ISSUE 1 : 1999

FOR

PCMCIA ExpressCard MODEM CDMA

MODEL: AC597E

FCC ID: N7NAC597E

IC: 2417C-AC597E

REPORT NUMBER: 06U10740-6, REVISION B

ISSUE DATE: JANUARY 9, 2007

Prepared for

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Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	January 4, 2007	Initial issue	HS
B	January 9, 2007	Updated EUT description	DZ

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: December 19, 20, and 21, 2006

APPLICANT: ADDRESS:	SIERRA WIRELESS 2290 COSMOS COURT, CARLSBAD, CA 92009, USA
FCC ID: MODEL:	N7NAC597E AC597E
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

PCMCIA ExpressCard Modem CDMA Installed in three Host Laptops.

Test Sample is a:	Production unit
Host Device(s):	1-Toshiba PSAA8U-14N02K 2- HP Pavilion dv8000 3- Sony VGN-C140G

FCC/IC Rule Parts	Frequency Range [MHz]	The Highest SAR Values	
22H / RSS 102	824.7 - 848.31	Host Devices	SAR (mW/g)
		# 1 - Toshiba	**0.966**
		# 2 - HP	0.817
		# 3 - Sony	0.615
24E / RSS102	1851.25 - 1908.75	Host Devices	SAR (mW/g)
		# 1 - Toshiba	0.877
		# 2 - HP	0.768
		# 3 - Sony	**1.000**

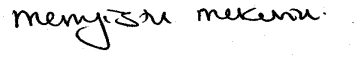
This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in FCC OET 65 Supplement C (Edition 01-01) and IC RSS 102 ISSUE 1 : 1999

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Hsin Fu Shih
EMC Supervisor
Compliance Certification Services

Tested By:



Mengistu Mekuria
EMC Engineer
Compliance Certification Services

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EQUIPMENT UNDER TEST (EUT) DESCRIPTION

PCMCIA ExpressCard Modem CDMA Installed in three Host Laptops.		
Normal operation:	Lap-held position	
Host Device(s):	Host Devices	Distance b/n Phantom and EUT
	# 1 -Toshiba PSAA8U-14N02K	18.0 mm
	# 2 - HP Pavilion dv8000	19.0 mm
	# 3 - Sony VGN-C140G	19.5 mm
Power supply:	Power supplied through the laptop computer (host device).	

1 FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

NVLAP LAB CODE 200065-0

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

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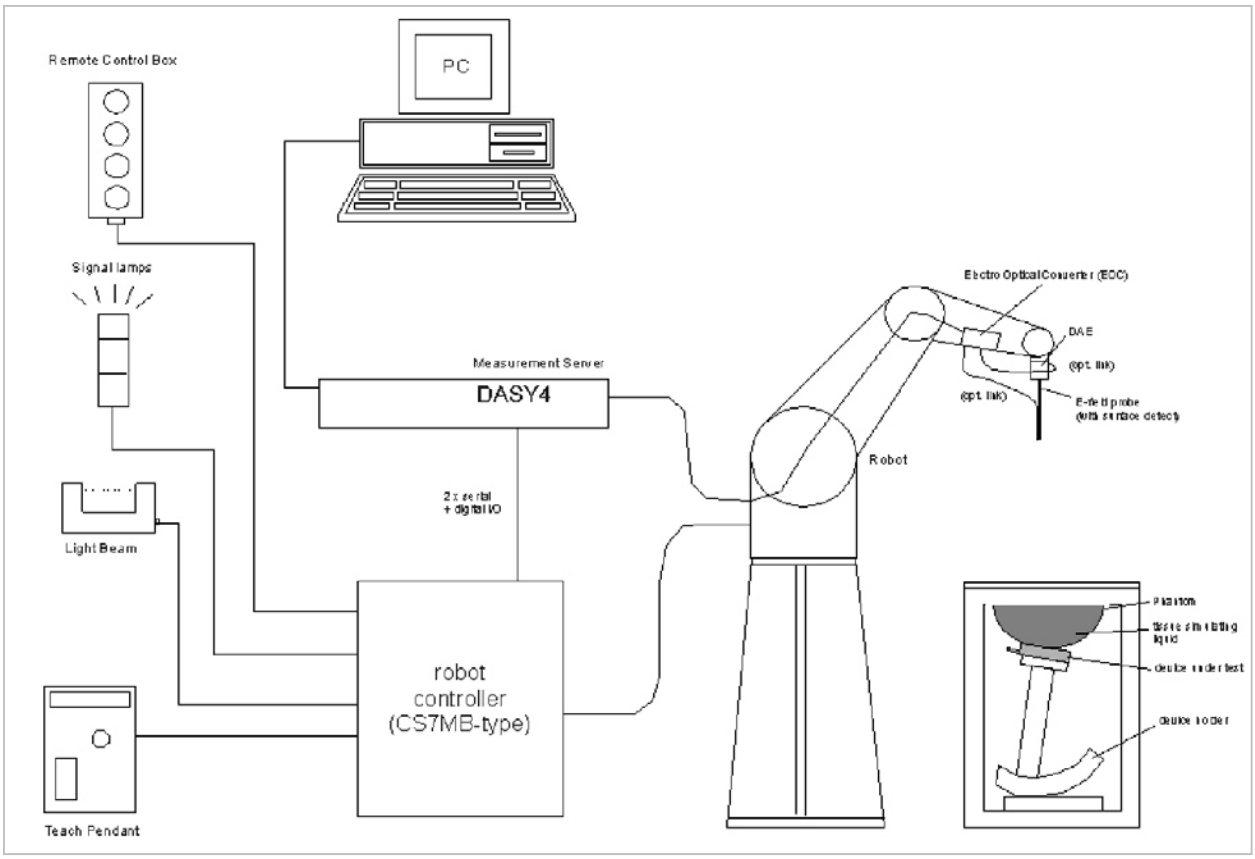
2 SYSTEM DESCRIPTION



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

2.1 COMPOSITION OF INGREDIENTS FOR TISSUE SIMULATING LIQUIDS

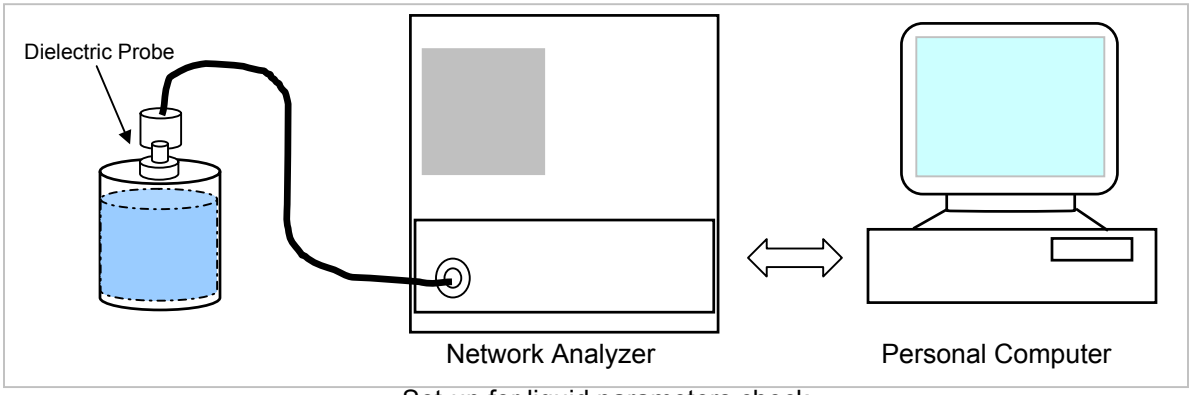
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

3 SIMULATING LIQUID PARAMETERS CHECK

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameters are within the tolerances of the specified target values. The relative permittivity and conductivity of the tissue material should be within ± 5% of the values given in the table below.



Set-up for liquid parameters check

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 150 – 3000 MHz and 5800 MHz)

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE Standard 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Standard 1528.

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

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

3.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameters Check Result @ Muscle 835 MHz

Room Ambient Temperature = 24°C; Relative humidity = 32% Measured by: Mengistu Mekuria

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
835	23	15	e'	52.8448	Relative Permittivity (ε_r):	52.8448	55.2	-4.27	± 5
			e"	20.5322	Conductivity (σ):	0.95376	0.97	-1.67	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
December 19, 2006 07:12 AM

Frequency	e'	e"
750000000.	53.7409	20.8672
755000000.	53.6822	20.8434
760000000.	53.6599	20.8548
765000000.	53.6174	20.8024
770000000.	53.5585	20.8026
775000000.	53.4904	20.8060
780000000.	53.4512	20.7881
785000000.	53.4200	20.7907
790000000.	53.3486	20.7726
795000000.	53.3090	20.7439
800000000.	53.2302	20.7630
805000000.	53.1722	20.7073
810000000.	53.1244	20.7104
815000000.	53.0833	20.6497
820000000.	53.0134	20.5997
825000000.	52.9628	20.5547
830000000.	52.8794	20.5383
835000000.	**52.8448**	**20.5322**
840000000.	52.8145	20.5355
845000000.	52.7704	20.4677
850000000.	52.7132	20.4809
855000000.	52.6761	20.4868
860000000.	52.6142	20.4804
865000000.	52.5686	20.4575
870000000.	52.4901	20.4576
875000000.	52.4290	20.4727
880000000.	52.4095	20.4828
885000000.	52.3471	20.4879
890000000.	52.2949	20.4892
895000000.	52.2516	20.4561
900000000.	52.2034	20.4355

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = target\ f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Dielectric Parameters Check Result @ Muscle 835 MHz

Room Ambient Temperature = 24°C; Relative humidity = 36% Measured by: Mengistu Mekuria

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
835	23	15	e'	52.5736	Relative Permittivity (ε_r):	52.5736	55.2	-4.76	± 5
			e"	20.5086	Conductivity (σ):	0.95267	0.97	-1.79	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
December 20, 2006 07:45 AM

Frequency	e'	e"
750000000.	53.4875	20.8191
755000000.	53.4444	20.7676
760000000.	53.3457	20.7584
765000000.	53.3189	20.7142
770000000.	53.2545	20.6944
775000000.	53.2087	20.6918
780000000.	53.1329	20.6649
785000000.	53.1065	20.6445
790000000.	53.0231	20.6551
795000000.	52.9917	20.6140
800000000.	52.9315	20.6510
805000000.	52.8718	20.6200
810000000.	52.8082	20.5907
815000000.	52.7741	20.5628
820000000.	52.7443	20.5446
825000000.	52.6818	20.4939
830000000.	52.5937	20.5078
835000000.	**52.5736**	**20.5086**
840000000.	52.5474	20.4897
845000000.	52.4663	20.4365
850000000.	52.4105	20.4503
855000000.	52.3964	20.4275
860000000.	52.3417	20.4089
865000000.	52.2949	20.4090
870000000.	52.2107	20.3911
875000000.	52.1718	20.3780
880000000.	52.1095	20.3842
885000000.	52.0529	20.3466
890000000.	51.9813	20.3776
895000000.	51.9393	20.3455
900000000.	51.8925	20.3259
905000000.	51.8516	20.3197
910000000.	51.8182	20.2902

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = target\ f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1900 MHz

Room Ambient Temperature =24 °C; Relative humidity = 36% Measured by: Mengistu Mekuria

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
1900	23	15	e'	52.7885	Relative Permittivity (ε_r):	52.7885	53.3	-0.96	± 5
			e"	14.5252	Conductivity (σ):	1.53531	1.52	1.01	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
December 20, 2006 10:03 AM

Frequency	e'	e"
1710000000.	53.5062	13.7842
1720000000.	53.4657	13.8203
1730000000.	53.4251	13.8272
1740000000.	53.3842	13.8970
1750000000.	53.3485	13.9223
1760000000.	53.3136	13.9545
1770000000.	53.2859	14.0099
1780000000.	53.2488	14.0516
1790000000.	53.2230	14.0911
1800000000.	53.1829	14.1285
1810000000.	53.1548	14.1813
1820000000.	53.1058	14.2161
1830000000.	53.0555	14.2634
1840000000.	53.0143	14.3103
1850000000.	52.9749	14.3486
1860000000.	52.9448	14.3827
1870000000.	52.8926	14.4223
1880000000.	52.8726	14.4550
1890000000.	52.8258	14.4761
1900000000.	**52.7885**	**14.5252**
1910000000.	52.7399	14.5560

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = target\ f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1900 MHz

Room Ambient Temperature =24 °C; Relative humidity = 35% Measured by: Mengistu Mekuria

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
1900	23	15	e'	52.6907	Relative Permittivity (ε_r):	52.6907	53.3	-1.14	± 5
			e"	14.3427	Conductivity (σ):	1.51602	1.52	-0.26	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
December 21, 2006 07:42 AM

Frequency	e'	e"
1710000000.	53.3826	13.6064
1720000000.	53.3533	13.6305
1730000000.	53.3230	13.6774
1740000000.	53.2898	13.7048
1750000000.	53.2326	13.7490
1760000000.	53.2089	13.7871
1770000000.	53.1696	13.8385
1780000000.	53.1174	13.8720
1790000000.	53.0897	13.9104
1800000000.	53.0462	13.9406
1810000000.	53.0161	13.9923
1820000000.	52.9774	14.0190
1830000000.	52.9338	14.0503
1840000000.	52.8965	14.0946
1850000000.	52.8718	14.1424
1860000000.	52.8297	14.1806
1870000000.	52.8003	14.2185
1880000000.	52.7625	14.2608
1890000000.	52.7360	14.2893
1900000000.	**52.6907**	**14.3427**
1910000000.	52.6382	14.3741

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = target\ f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

4 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of ±10%.

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3-SN: 3531 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 5 x 5 x 7 fine cube was chosen for cube integration(dx=dy=7.5mm; dz=5mm).
  For 5 GHz band - Special 7 x 7 x 9 fine cube was chosen for cube integration (dx=dy=4.3mm; dz=3mm)
- Distance between probe sensors and phantom surface was set to 4 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.0mm
- The dipole input power (forward power) was 250 mW±3%.
- The results are normalized to 1 W input power.

Reference SAR Values for body-tissue

In the table below, the numerical reference SAR values of a SPEAG validation dipoles placed below the flat phantom filled with body-tissue simulating liquid are given. The reference SAR values were calculated using the finite-difference time-domain method and the geometry parameters.

Dipole Type	Distance (mm)	Frequency (MHz)	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D450V2	15	450	5.01	3.36	7.22
D835V2	15	835	9.71	6.38	14.1
D900V2	15	900	11.1	7.17	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1800V2	10	1800	38.5	20.3	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	40.9	21.2	71.5
D2450V2	10	2450	51.2	23.7	97.6

Note: All SAR values normalized to 1 W forward power.

4.1 SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D835V2 SN:4d002

Date: December 19, 2006

Ambient Temperature = 24 °C; Relative humidity = 32% Measured by: Mengistu Mekuria

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	23	15	1g	2.38	9.52	9.71	-1.96	± 10
			10g	1.57	6.28	6.38	-1.57	± 10

Date: December 20, 2006

Ambient Temperature = 24 °C; Relative humidity = 36% Measured by: Mengistu Mekuria

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	23	15	1g	2.38	9.52	9.71	-1.96	± 10
			10g	1.57	6.28	6.38	-1.57	± 10

System Validation Dipole: D1900V2 SN:5d043

Date: December 20, 2006

Ambient Temperature = 24°C; Relative humidity = 36% Measured by: Mengistu Mekuria

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	23	15	1g	9.56	38.24	39.8	-3.92	± 10
			10g	5.03	20.12	20.8	-3.27	± 10

Date: December 21, 2006

Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Mengistu Mekuria

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	23	15	1g	9.44	37.76	39.8	-5.13	± 10
			10g	4.95	19.8	20.8	-4.81	± 10

5 SAR MEASURMENT PROCEDURE

A summary of the procedure follows:

a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the EUT. The SAR at this point is measured at the start of the test, and then again at the end of the test.

b) The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 4 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 15 mm x 15 mm. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

For 5 GHz band - The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 2.0 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 10 mm x 10 mm. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

c) Around this point, a volume of X=Y= 30 and Z=21 mm is assessed by measuring 5 x 5 x 7 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

For 5 GHz band - Around this point, a volume of X=Y=Z=30 mm is assessed by measuring 7 x 7 x 9 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

(i) The data at the surface are extrapolated, since the centre of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.

(ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are 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-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.

(iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

(iv) The SAR value at the same location as in Step (a) is again measured to evaluate the actual power drift.

5.1 DASY4 SAR MEASURMENT PROCEDURE

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 1.2 mm for an EX3DV3 probe type).

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures 5 x 5 x 7 points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

For 5 GHz band – Same as above except the Zoom Scan measures 7 x 7 x 9 points.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation, the extrapolated distance should not be larger than the step size in Z-direction.

6 PROCEDURE USED TO ESTABLISH TEST SIGNAL

3G-CDMA2000 1xRTT

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

Application	Rev, License
CDMA2000 Mobil Test	B.10.11, L

1xRTT

- Call Setup > Shift & Preset
- Protocol Rev > 6 (IS-2000-0)
- Radio Config (RC) > RC3 (Fwd3, Rvs3)
- FCH Service Option (SO) Setup > 32 (+ F-SCH)
- Traffic Data Rate > Full
- TDSO SCH Info > F-SCH Parameters > F-SCH Data Rate > 153.6 kbps
  > R-SCH Parameters > R-SCH Data Rate > 153.6 kbps
- Cell Info > Cell Parameters > System ID (SID) > 8
  > Network ID (NID) > 65535

Once "Active Cell" show "Connected " then change "Rvs Power Ctrl" from "Active bits" to "**All Up bits**" to get the maximum power.

Worst-case Measurement Result @ Low, Middle and High Channel

Cellular Band

Radio Configuration (RC)	Service Option (SO)	Channel	Frequency	Output Power (dBm)	
				Average	Peak
RC3 (Fwd3, Rvs3)	SO32 (+F-SCH)	1013	824.70	24.38	27.88
		384	836.52	24.58	28.19
		777	848.31	24.54	28.10

PCS Band

Radio Configuration (RC)	Service Option (SO)	Channel	Frequency	Output Power (dBm)	
				Average	Peak
RC3 (Fwd3, Rvs3)	SO32 (+F-SCH)	25	1851.25	24.31	27.52
		600	1880.00	24.41	27.59
		1175	1908.75	23.90	26.76

3G-CDMA2000 1xRTT

Preliminary Measurement Results @ Middle channel

Radio Configuration (RC)	Service Option (SO)	Output Power (dBm)			
		Cellular Band @ M-ch		PCS Band @ M-ch	
		Average	Peak	Average	Peak
RC1 (Fwd1, Rvs1)	1 (Voice)				
	2 (Loopback)	24.58	28.18	24.41	27.58
	3 (Voice)				
	55 (Loopback)	24.58	28.18	24.41	27.58
RC2 (Fwd2, Rvs2)	9 (Loopback)	24.58	28.18	24.41	27.58
	17 (Voice)				
	55 (Loopback)	24.58	28.18	24.41	27.58
RC3 (Fwd3, Rvs3)	1 (Voice)				
	2 (Loopback)	24.58	28.18	24.41	27.58
	3 (Voice)				
	55 (Loopback)	24.58	28.18	24.41	27.58
	32 (+ F-SCH)	**24.58**	**28.19**	**24.41**	**27.59**
	32 (+ SCH)	23.90	28.00	23.77	27.43
RC43 (Fwd4, Rvs3)	1 (Voice)				
	2 (Loopback)	24.58	28.18	24.40	27.61
	3 (Voice)				
	55 (Loopback)	24.58	28.18	24.40	27.59
	32 (+ F-SCH)	24.58	28.18	24.40	27.59
	32 (+ SCH)	23.90	28.08	23.77	27.43
RC54 (Fwd5, Rvs4)	9 (Loopback)	24.58	28.18	24.40	27.60
	17 (Voice)				
	55 (Loopback)	24.58	28.18	24.40	27.66

3G-CDMA2000 1xEV-DO Release 0 (Rel 0)

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

Application	Rev, License
1xEV-DO Terminal Test	A.06.06, L

FTAP

- Call Setup > Shift & Preset
- Protocol Rev > 0 (1xEV-DO)
- Application Config > Enhanced Test Application Protocol > FTAP
- FTAP Rate > 307.2 kbps (2 Slot, QPSK)
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Rvs Power Ctrl > All Up bits (to get the maximum power)

RTAP

- Call Setup > Shift & Preset
- Protocol Rev > 0 (1xEV-DO)
- Application Config > Enhanced Test Application Protocol > RTAP
- RTAP Rate > 153.6 kbps
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Rvs Power Ctrl > All Up bits (to get the maximum power)

Worst-case Measurement Result @ Low, Middle and High Channel

Cellular Band - RTAP					**Cellular Band - FTAP**				
			Conducted power (dBm)					Conducted power (dBm)	
Channel	f (MHz)	RTAP Rate	Average	Peak	Channel	f (MHz)	FTAP Rate	Average	Peak
1013	824.70	153.6	24.27	28.20	1013	824.70	307.2 kbps (2 slot, QPSK)	24.04	27.80
384	836.52		24.57	28.28	384	836.52		24.33	28.22
777	848.31		24.61	28.30	777	848.31		24.26	27.95

PCS Band - RTAP					**PCS Band - FTAP**				
			Conducted power (dBm)					Conducted power (dBm)	
Channel	f (MHz)	RTAP Rate	Average	Peak	Channel	f (MHz)	FTAP Rate	Average	Peak
25	1851.25	153.6	24.27	27.26	25	1851.25	307.2 kbps (2 slot, QPSK)	24.06	27.42
600	1880.00		24.40	27.80	600	1880.00		24.22	27.49
1175	1908.75		23.18	26.28	1175	1908.75		23.12	26.60

3G-CDMA2000 1xEV-DO Release 0 (Rel 0)

Preliminary Measurement Results @ Middle channel

Cellular Band - RTAP					Cellular Band - FTAP				
Channel	f (MHz)	RTAP Rate	Conducted power (dBm)		Channel	f (MHz)	FTAP Rate	Conducted power (dBm)	
			Average	Peak				Average	Peak
384	836.52	9.6	24.22	28.20	384	836.52	307.2 kbps (2 slot, QPSK)	24.33	28.22
		19.2	24.40	28.23					
		38.4	24.47	28.25					
		76.8	24.56	28.27					
		153.6	**24.57**	**28.28**					

PCS Band - RTAP					PCS Band - FTAP				
Channel	f (MHz)	RTAP Rate	Conducted power (dBm)		Channel	f (MHz)	FTAP Rate	Conducted power (dBm)	
			Average	Peak				Average	Peak
600	1880.00	9.6	24.10	27.42	600	1880.00	307.2 kbps (2 slot, QPSK)	24.22	27.49
		19.2	24.13	27.42					
		38.4	24.20	27.38					
		76.8	24.24	27.30					
		153.6	**24.40**	**27.80**					

3G-CDMA2000 1xEV-DO Revision A (Rev A)

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

Application	Rev, License
1xEV-DO Terminal Test	A.06.06, L

FETAP

- Call Setup > Shift & Preset
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > FETAP
- FTAP Rate > 307.2 kbps (2 Slot, QPSK)
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 0
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration >16 Slots
- Rvs Power Ctrl > All Up bits (to get the maximum power)

RETAP

- Call Setup > Shift & Preset
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > RETAP
- F-Traffic Format > 4 (1024, 2,128) Canonical (307.2k, QPSK)
- R-Data Pkt Size > 4096 (for PCS band),12288 (for Cellular band)
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 2
  > PL Subtype 2 Access Channel MAC Subtype > Default (Subtype 0)
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration >16 Slots
  > ACK R-Data After > Subpacket 0 (All ACK)
- Rvs Power Ctrl > All Up bits (to get the maximum power)

Worst-case Measurement Result @ Low, Middle and High Channel

Cellular Band - RETAP					**Cellular Band - FETAP**				
			Conducted power (dBm)					Conducted power (dBm)	
Channel	f (MHz)	R-Data Pkt Size	Average	Peak	Channel	f (MHz)	FTAP Rate	Average	Peak
1013	824.70	12288	24.47	28.23	1013	824.70	307.2 (2 slot)	23.95	27.90
384	836.52		24.73	28.41	384	836.52		24.43	28.27
777	848.31		24.68	28.30	777	848.31		24.21	28.10

PCS Band - RETAP					**PCS Band - FETAP**				
			Conducted power (dBm)					Conducted power (dBm)	
Channel	f (MHz)	R-Data Pkt Size	Average	Peak	Channel	f (MHz)	FTAP Rate	Average	Peak
25	1851.25	4096	24.34	27.50	25	1851.25	307.2 (2 slot)	24.06	27.38
600	1880.00		24.44	27.53	600	1880.00		24.18	27.42
1175	1908.75		23.22	26.48	1175	1908.75		23.00	26.47

3G-CDMA2000 1xEV-DO Revision A (Rev A)

Preliminary Measurement Results @ Middle channel

Cellular Band - RETAP					Cellular Band - FETAP				
Channel	f (MHz)	R-Data Pkt Size	Conducted power (dBm)		Channel	f (MHz)	FTAP Rate	Conducted power (dBm)	
			Average	Peak				Average	Peak
384	836.52	128	24.00	28.32	384	836.52	307.2 (2 slot)	24.43	28.27
		256	24.09	28.28			307.2 (4 slot)	24.20	28.19
		512	24.17	28.28					
		768	24.27	28.28					
		1024	24.30	28.25					
		1536	24.40	28.32					
		2048	24.45	28.19					
		3072	24.62	28.38					
		4096	24.64	28.32					
		6144	24.65	28.38					
		8192	24.68	28.39					
		12288	**24.73**	**28.41**					

PCS Band - RETAP					PCS Band - FETAP				
Channel	f (MHz)	R-Data Pkt Size	Conducted power (dBm)		Channel	f (MHz)	FTAP Rate	Conducted power (dBm)	
			Average	Peak				Average	Peak
600	1880.00	128	24.00	27.51	600	1880	307.2 (2 slot)	24.18	27.42
		256	24.01	27.51			307.2 (4 slot)	23.92	27.23
		512	24.10	27.42					
		768	24.14	27.42					
		1024	24.18	27.42					
		1536	24.23	27.42					
		2048	24.27	27.38					
		3072	24.43	27.53					
		4096	**24.44**	**27.53**					
		6144	24.40	27.56					
		8192	24.40	27.60					
		12288	24.42	27.56					

7 SAR MEASURMENT RESULTS

7.1 HOST # 1 TOSHIBA – 1xRTT

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1xRTT RC3, SO32 (+F-SCH) , Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013	824.70	0.630	-0.246	0.667
384	836.52	0.725	-0.107	0.743
777	848.31	0.637	0.000	0.637
1xRTT RC3, SO32 (+F-SCH) , PCS Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
25	1851.25	0.507	-0.101	0.519
600	1880.00	0.651	-0.078	0.663
1175	1908.75	0.778	-0.172	0.809

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.2 HOST # 1 TOSHIBA - 1XEV-DO

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1xEv-Do Rev A, Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013	824.70	0.668	-0.147	0.691
384	**836.52**	**0.928**	**-0.175**	**0.966**
777	848.31	0.709	0.000	0.709
1xEv-Do Rev A, PCS Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
25	1851.25	0.537	-0.165	0.558
600	1880.00	0.738	-0.129	0.760
1175	1908.75	0.850	-0.137	0.877

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.3 HOST # 2 HP - 1XRTT

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1xRTT RC3, SO32 (+F-SCH) , Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013 384 777	824.70 836.52 848.31	0.736	-0.169	0.765
1xRTT RC3, SO32 (+F-SCH) , PCS Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
25 600 1175	1851.25 1880.00 1908.75	0.751	-0.097	0.768

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.4 HOST # 2 HP - 1XEV-DO

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1xEv-Do Rev A, Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013	824.70	0.676	0.000	0.676
384	**836.52**	**0.817**	**0.000**	**0.817**
777	848.31	0.798	0.000	0.798
1xEv-Do Rev A, PCS Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
25	1851.25			
600	1880.00	0.689	-0.188	0.719
1175	1908.75			

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.5 HOST # 3 SONY - 1XRTT

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1xRTT RC3, SO32 (+F-SCH) , Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013 384 777	824.70 836.52 848.31	0.583	-0.229	0.615
1xRTT RC3, SO32 (+F-SCH) , PCS Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
25	1851.25	0.636	0.000	0.636
600	1880.00	0.839	-0.016	0.842
1175	1908.75	0.928	-0.135	0.957

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.6 HOST # 3 SONY - 1XEV-DO

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1xEv-Do Rev A, Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013	824.70			
384	**836.52**	**0.579**	**-0.026**	**0.582**
777	848.31			

1xEv-Do Rev A, PCS Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
25	1851.25	0.681	-0.078	0.693
600	1880.00	0.923	-0.121	0.949
1175	1908.75	0.975	-0.109	1.000

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8 MEASURMENT UNCERTAINTY

8.1 MEASURMENT UNCERTAINTY FOR 300 MHz – 3000 MHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	1.59	R	1.732	1	1	0.92	0.92
RF Ambient Conditions - Reflections	0.00	R	1.732	1	1	0.00	0.00
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.44	10.49
Expanded Uncertainty (95% Confidence Interval)	K=2					22.87	20.98

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Normal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

9 EQUIPMENT LIST AND CALIBRATION

Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date
Robot - Six Axes	Stäubli	RX90BL	N/A	N/A
Robot Remote Control	Stäubli	CS7MB	3403-91535	N/A
DASY4 Measurement Server	SPEAG	SEUMS001BA	1041	N/A
Probe Alignment Unit	SPEAG	LB (V2)	261	N/A
S-Parameter Network Analyzer	Agilent	8753ES-6	US39173569	2/9/07
Electronic Probe kit	Hewlett Packard	85070C	N/A	N/A
E-Field Probe	SPEAG	EX3DV4	3552	5/30/07
Thermometer	ERTCO	639-1S	1718	1/11/07
SAM Phantom (SAM1)	SPEAG	TP-1185	QD000P40CA	N/A
SAM Phantom (SAM2)	SPEAG	TP-1015	N/A	N/A
System Validation Dipole	SPEAG	D835V2	4d002	1/23/08
System Validation Dipole	SPEAG	D1900V2	5d043	1/29/08
Power Meter	Giga-tronics	8651A	8651404	12/27/06
Power Sensor	Giga-tronics	80701A	1834588	12/27/07
Amplifier	Mini-Circuits	ZVE-8G	0360	N/A
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A
Radio Communication Tester	Rohde & Schwarz	CMU 200	838114/032	3/21/07
Radio Communication Tester	Agilent	E5515C	GB46160222	6/29/2007
Simulating Liquid	CCS	M835	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	M1900	N/A	Within 24 hrs of first test

10 PHOTOS

EUT

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HOST DEVICE # 1 - TOHSIBA PSAA8U-14N02K WITH EUT

EUT photos on this page have been removed to a separate file.

HOST DEVICE # 2 - HP PAVILION DV4000 WITH EUT

EUT photos on this page have been removed to a separate file.

HOST DEVICE # 3 - SONY VGN-C140G WITH EUT

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11 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	8
2.1	SAR Test Plots-Cell Band	13
2.2	SAR Test Plots-PCS Band	16
3	Certificate of E-Field Probe - EXDV4SN3552	9
4	Certificate of System Validation Dipole - D835V2 SN:4d002	9
5	Certificate of System Validation Dipole - D1900V2 SN:5d043	9

END OF REPORT