SAR Evaluation Report

IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC OET BULLETIN 65 SUPPLEMENT C

FOR

PCMCIA CARD

MODEL: AC595

FCC ID: N7NAC595

REPORT NUMBER: 06U10234-10B

ISSUE DATE: MAY 22, 2006

Prepared for

SIERRA WIRELESS
2290 COSMOS COURT,
CARLSBAD, CA 92009, USA

Prepared by

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LAB CODE:200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	May 11, 2006	Initial issue	HS
B	May 22, 2006	Corrected some typo in pages 20 and 22	HS

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: May 4, 5 and 9, 2006

APPLICANT: ADDRESS:	SIERRA WIRELESS 2290 COSMOS COURT, CARLSBAD, CA 92009, USA
FCC ID: MODEL:	N7NAC595 AC595
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

PCMCIA Card installed in three host laptops.			
Test Sample is a:	Production unit		
Host(s)	1- Toshiba Satellite 2- HP Pavilion dv4000 3- Compaq Presario v2000		
FCC Rule Parts	Frequency range[MHz]	The highest SAR values 1xRTT RC3 SO32 (+F-SCH) mode	The highest SAR values 1xEV-DO Rev.0mode
22H	824.7-848.31	Host devices / SAR (mW/g) Toshiba 1.201 HP 1.345 Compaq 1.284	Host devices / SAR (mW/g) Toshiba 1.195 HP 1.321 Compaq 1.323
24E	1851.25-1908.7!	Host devices / SAR (mW/g) Toshiba 0.638 HP 0.785 Compaq 0.853	Host devices / SAR (mW/g) Toshiba 0.628 HP 0.915 Compaq 0.886

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).

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:

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Tested By:

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EMC Engineer
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1 EQUIPMENT UNDER TEST (EUT) DESCRIPTION

PCMCIA Card is installed in three host laptops.	
Normal operation:	Lap-held position
Host Device(s):	1- Toshiba Satellite 2- HP Pavilion dv4000 3- Compaq Presario v2000
Power supply:	Power supplied through the laptop computer (host device).

2 FACILITIES AND ACCREDITATION

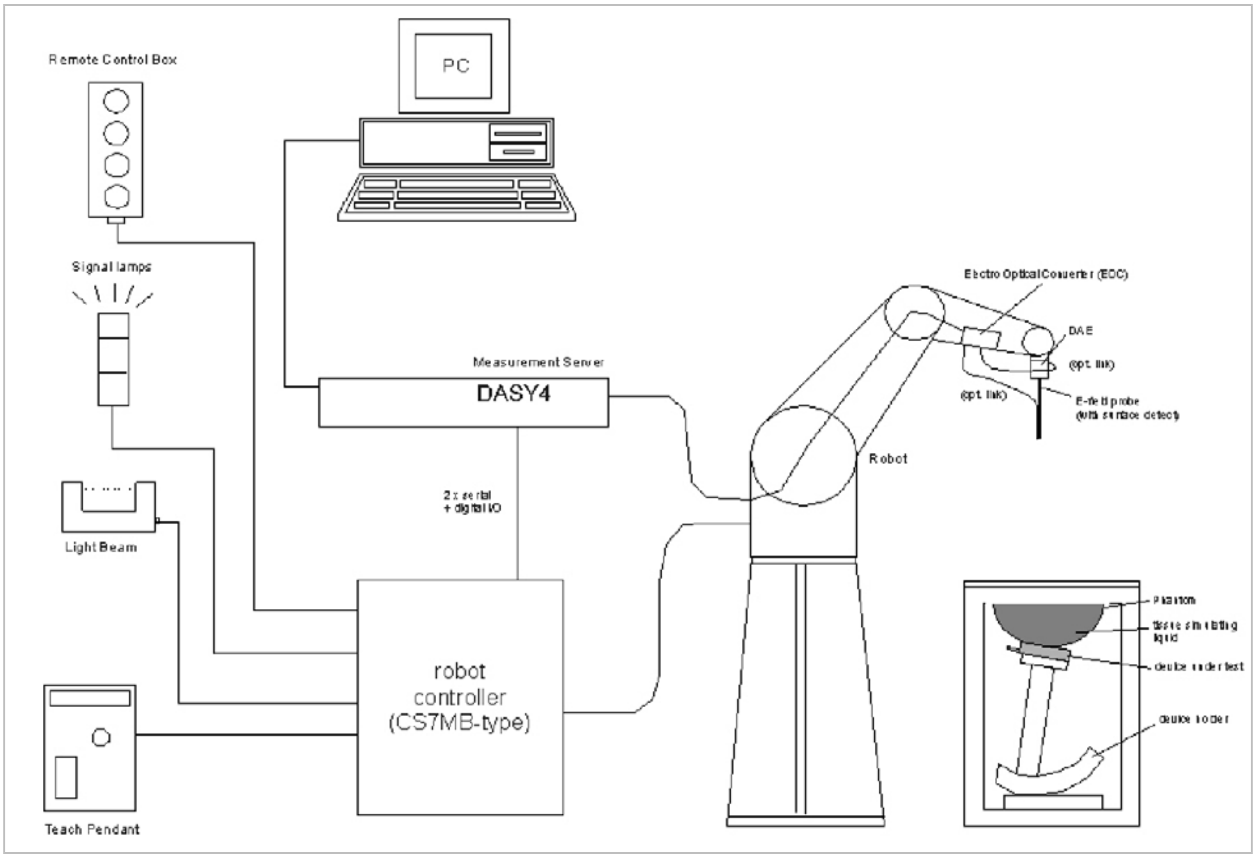
The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1,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

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.

No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

3 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.

3.1 COMPOSITION OF INGREDIENTS FOR TISSUE SIMULATIG LIQUIDS

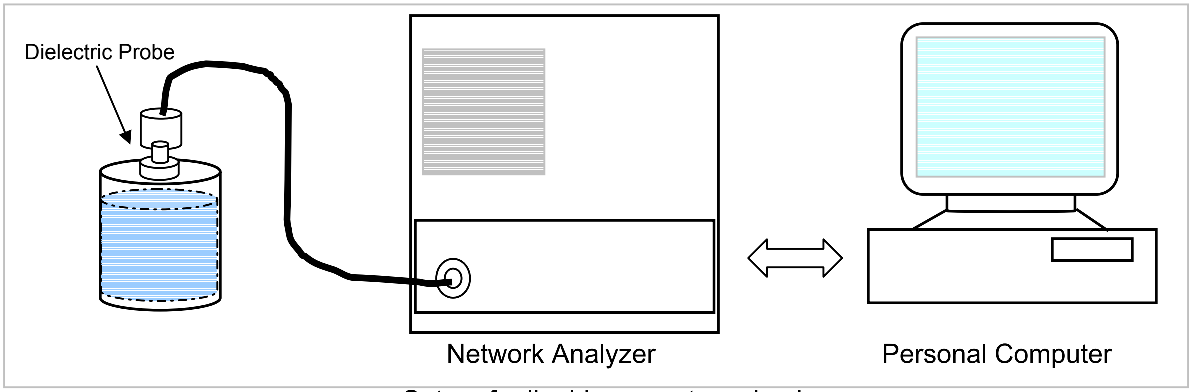
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

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

4 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)

4.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameters Check Result @ Muscle 835 MHz

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	21.7	15	є"	Relative Permittivity (ϵ_r):	55.2	53.0341	-3.92	± 5
			20.5409	Conductivity (σ):	0.97	0.95417	-1.63	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 21.7 deg C
May 04, 2006 08:09 AM

Frequency	e'	e''
800000000.	53.3683	20.7039
805000000.	53.3369	20.6951
810000000.	53.2922	20.6292
815000000.	53.2492	20.6137
820000000.	53.1923	20.6031
825000000.	53.1397	20.5858
830000000.	53.0899	20.5732
835000000.	53.0341	20.5409
840000000.	52.9837	20.5508
845000000.	52.9396	20.5149
850000000.	52.8877	20.5147
855000000.	52.8454	20.4787
860000000.	52.7945	20.4462
865000000.	52.6788	20.4381
870000000.	52.6568	20.4488
875000000.	52.6159	20.4347
880000000.	52.5504	20.4089
885000000.	52.4930	20.4015
890000000.	52.4548	20.3869
895000000.	52.4231	20.3596
900000000.	52.3848	20.3402

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 = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	21.3	15	e"	Relative Permittivity (ϵ_r):	55.2	52.5820	-4.74	± 5
			20.4400	Conductivity (σ):	0.97	0.94948	-2.12	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 21.3 deg C
May 05, 2006 10:03 AM

Frequency	e'	e''
800000000.	52.9646	20.5831
805000000.	52.9116	20.5725
810000000.	52.8727	20.5347
815000000.	52.8119	20.5273
820000000.	52.7783	20.4994
825000000.	52.7361	20.4913
830000000.	52.6356	20.4710
835000000.	52.5820	20.4400
840000000.	52.5329	20.4187
845000000.	52.4943	20.3938
850000000.	52.4280	20.3792
855000000.	52.3981	20.3732
860000000.	52.3339	20.3583
865000000.	52.2707	20.3433
870000000.	52.2249	20.3434
875000000.	52.1511	20.3223
880000000.	52.1131	20.3093
885000000.	52.0552	20.3248
890000000.	52.0076	20.3364
895000000.	51.9710	20.2920
900000000.	51.9313	20.2646

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 = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	22	15	є"	Relative Permittivity (ϵ_r):	55.2	53.0065	-3.97	± 5
			20.6166	Conductivity (σ):	0.97	0.95768	-1.27	± 5

Liquid Check

Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C

May 09, 2006 09:01 AM

Frequency	e'	e''
800000000.	53.3687	20.7377
805000000.	53.3304	20.7086
810000000.	53.2533	20.7102
815000000.	53.2036	20.6744
820000000.	53.1622	20.6749
825000000.	53.1358	20.6369
830000000.	53.0383	20.6136
835000000.	53.0065	20.6166
840000000.	52.9494	20.6069
845000000.	52.9160	20.5995
850000000.	52.8599	20.5572
855000000.	52.8024	20.5375
860000000.	52.7364	20.5212
865000000.	52.6809	20.5014
870000000.	52.6381	20.4558
875000000.	52.5695	20.4521
880000000.	52.5135	20.4228
885000000.	52.4632	20.4337
890000000.	52.4378	20.4247
895000000.	52.3993	20.3791
900000000.	52.3618	20.3750

The conductivity (σ) can be given as:

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

where $f = \text{target } f * 10^6$

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

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1900 MHz

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	21.6	15	є"	Relative Permittivity (ϵ_r):	53.3	50.8912	-4.52	± 5
			14.0783	Conductivity (σ):	1.52	1.48807	-2.10	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 21.6 deg C
May 04, 2006 08:42 AM

Frequency	e'	e"
1710000000.	51.6311	13.4211
1720000000.	51.5966	13.4599
1730000000.	51.5416	13.4793
1740000000.	51.5135	13.5166
1750000000.	51.4695	13.5669
1760000000.	51.4278	13.6084
1770000000.	51.3895	13.6473
1780000000.	51.3363	13.6914
1790000000.	51.3102	13.7314
1800000000.	51.2770	13.7560
1810000000.	51.2381	13.7927
1820000000.	51.1837	13.8001
1830000000.	51.1490	13.8373
1840000000.	51.1223	13.8608
1850000000.	51.0909	13.9097
1860000000.	51.0445	13.9470
1870000000.	50.9922	13.9791
1880000000.	50.9565	14.0323
1890000000.	50.9497	14.0397
1900000000.	50.8912	14.0783
1910000000.	50.8614	14.1236

The conductivity (σ) can be given as:

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

where $f = \text{target } f * 10^6$

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

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1900 MHz

Room Ambient Temperature = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	21.8	15	є"	Relative Permittivity (ϵ_r):	53.3	50.8845	-4.53	± 5
			14.0104	Conductivity (σ):	1.52	1.48089	-2.57	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 21.8 deg C
May 05, 2006 12:17 PM

Frequency	e'	e"
1710000000.	51.6077	13.3502
1720000000.	51.5713	13.3692
1730000000.	51.5353	13.4130
1740000000.	51.4876	13.4307
1750000000.	51.4383	13.4925
1760000000.	51.4015	13.5232
1770000000.	51.3594	13.5796
1780000000.	51.3094	13.6107
1790000000.	51.2793	13.6506
1800000000.	51.2473	13.6815
1810000000.	51.2263	13.6894
1820000000.	51.1826	13.7270
1830000000.	51.1417	13.7448
1840000000.	51.1066	13.7756
1850000000.	51.0715	13.8207
1860000000.	51.0400	13.8594
1870000000.	50.9840	13.8878
1880000000.	50.9504	13.9358
1890000000.	50.9246	13.9703
1900000000.	50.8845	14.0104
1910000000.	50.8489	14.0295

The conductivity (σ) can be given as:

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

where $f = \text{target } f * 10^6$

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

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1900 MHz

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	22	15	є"	Relative Permittivity (ϵ_r):	53.3	51.2893	-3.77	± 5
			14.0069	Conductivity (σ):	1.52	1.48052	-2.60	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
May 09, 2006 09:27 AM

Frequency	e'	e''
1710000000.	51.9908	13.3775
1720000000.	51.9579	13.4058
1730000000.	51.9171	13.4441
1740000000.	51.8742	13.4770
1750000000.	51.8270	13.5066
1760000000.	51.7839	13.5473
1770000000.	51.7569	13.5964
1780000000.	51.7070	13.6324
1790000000.	51.6557	13.6557
1800000000.	51.6320	13.6883
1810000000.	51.5903	13.7183
1820000000.	51.5554	13.7499
1830000000.	51.5198	13.7575
1840000000.	51.4830	13.7948
1850000000.	51.4503	13.8429
1860000000.	51.4092	13.8667
1870000000.	51.3764	13.8977
1880000000.	51.3532	13.9417
1890000000.	51.3220	13.9541
1900000000.	51.2893	14.0069
1910000000.	51.2558	14.0288

The conductivity (σ) can be given as:

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

where $f = \text{target } f * 10^6$

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

5 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 8x8x8 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.

5.1 SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D835V2 SN:4d002

Date: May 4, 2006

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
835	21.7	15	2.42	9.68	9.71	-0.31	± 10
			10g	Normalized to 1 W	Target_10g	Deviation[%]	Limit [%]
			1.59	6.36	6.38	-0.31	± 10

Date: May 5, 2006

Room Ambient Temperature = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
835	21.3	15	2.40	9.6	9.71	-1.13	± 10
			10g	Normalized to 1 W	Target_10g	Deviation[%]	Limit [%]
			1.58	6.32	6.38	-0.94	± 10

Date: May 9, 2006

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
835	22	15	2.42	9.68	9.71	-0.31	± 10
			10g	Normalized to 1 W	Target_10g	Deviation[%]	Limit [%]
			1.6	6.4	6.38	0.31	± 10

System Validation Dipole: D1900V2 SN:5d043

Date: May 4, 2006

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		$Target_{1g}$	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
1900	21.6	15	10.20	40.8	39.8	2.51	± 10
			10g	Normalized to 1 W	$Target_{10g}$	Deviation[%]	Limit [%]
			5.39	21.56	20.8	3.65	± 10

Date: May 5, 2006

Room Ambient Temperature = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		$Target_{1g}$	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
1900	21.8	15	10.20	40.8	39.8	2.51	± 10
			10g	Normalized to 1 W	$Target_{10g}$	Deviation[%]	Limit [%]
			5.36	21.44	20.8	3.08	± 10

Date: May 9, 2006

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		$Target_{1g}$	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
1900	22	15	10.20	40.8	39.8	2.51	± 10
			10g	Normalized to 1 W	$Target_{10g}$	Deviation[%]	Limit [%]
			5.36	21.44	20.8	3.08	± 10

6 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 8 x 8 x 8 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.

6.1 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 8 x 8 x 8 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.

7 PROCEDURE USED TO ESTABLISH TEST SIGNAL

The following procedures had been used to prepare the EUT for the SAR test.

Agilent 8960 Communication Test Set was used to control the channel and measure the conducted power. The cable loss of 0.4 dB (Cell band) and 0.6 dB (PCS band) were entered as an offset in the Agilent 8960 Communication Test Set to mmeasure the channel power.

The following setting was used during test for 1x RTT RC3 SO32 (+F-SCH):

Call Parms

Radio config: FWD3, RVS3

Service option: SO32 (+F-SCH)

Pwr Ctrl Parms: Active bits (Select “All Up bits” after linked to get maximum power)

Protocol Rev.: 6 (IS-2000-0)

CDMA 1x RTT RC3 SO 32 (+F-SCH) Cell Band

Channel	Frequency (MHz)	Channel Power (dBm)
1013	824.70	24.80
384	836.52	24.85
777	848.31	24.81

CDMA 1x RTT RC3 SO 32 (+F-SCH) PCS Band

Channel	Frequency (MHz)	Channel Power (dBm)
25	1851.25	24.70
600	1880.00	24.90
1175	1908.75	24.20

Agilent settings for 1x RTT RC3 SO32 (+F-SCH)

Photos are confidential, please see a seperate file

The following setting was used during test for 1xEV-DO Rev.0

Call Parms:

Application Config: RTAP

FTAP Rate: 307.2 Kbps

RTAP Rate: 153.6 Kbps

Pwr Ctrl Parms: Active bits (Select “All Up bits” after linked to get maximum power)

Protocol Rev.: 0 (1xEV-DO)

Call Control:

Cell Parameters → Sector ID, Upper (Hex): 00800580

Sector ID, Lower (Hex): 00000000

AT Max Power: 23 dBm/1.23 MHz

CDMA 1xEV-DO Rev.0 Cell Band

Channel	Frequency (MHz)	Channel Power (dBm)
1013	824.70	24.70
384	836.52	24.71
777	848.31	24.65

CDMA 1xEV-DO Rev.0 PCS Band

Channel	Frequency (MHz)	Channel Power (dBm)
25	1851.25	24.70
600	1880.00	24.60
1175	1908.75	24.10

Agilent Settings for 1xEV-DO Rev.0

Photos are confidential, please see a seperate file

SAR MEASURMENT RESULTS

7.1 1x RTT RC3 SO32 (+F-SCH) MODE

7.1.1 TOSHIBA SATELLITE

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CDMA 1x RTT RC3 SO 32 (+F-SCH) Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013	824.70	0.992	-0.165	1.030
384	836.52	1.150	-0.190	**1.201**
777	848.31	0.833	-0.160	0.864
CDMA 1x RTT RC3 SO 32 (+F-SCH) 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	0.613	-0.176	**0.638**
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.

7.1.2 HP PAVILION DV4000

Photos are confidential, please see a seperate file

CDMA 1x RTT RC3 SO 32 (+F-SCH) Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013	824.70	1.050	-0.184	1.095
384	836.52	1.310	-0.113	**1.345**
777	848.31	0.992	-0.116	1.019

CDMA 1x RTT RC3 SO 32 (+F-SCH) PCS Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
25	1851.25	0.635	-0.185	0.663
600	1880.00	0.756	-0.163	**0.785**
1175	1908.75	0.536	-0.124	0.552

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.

7.1.3 COMPAQ PRESARIO V2000

Photos are confidential, please see a seperate file

CDMA 1x RTT RC3 SO 32 (+F-SCH) Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013	824.70	1.110	-0.175	1.156
384	836.52	1.250	-0.117	**1.284**
777	848.31	0.991	-0.204	1.039
CDMA 1x RTT RC3 SO 32 (+F-SCH) PCS Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
25	1851.25	0.623	-0.139	0.643
600	1880.00	0.818	-0.182	**0.853**
1175	1908.75	0.622	-0.061	0.631

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.

7.2 1xEV-DO Rev.0 MODE

7.3 TOSHIBA SATELLITE

Photos are confidential, please see a seperate file

CDMA 1xEV-DO Rev.0 Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013	824.70	0.972	-0.136	1.003
384	836.52	1.160	-0.130	**1.195**
777	848.31	0.841	-0.156	0.872
CDMA 1xEV-DO Rev.0 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	0.603	-0.179	**0.628**
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.

7.4 HP PAVILION DV4000

Photos are confidential, please see a seperate file

CDMA 1xEV-DO Rev.0 Cell Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013	824.70	1.040	-0.148	1.076
384	836.52	1.290	-0.104	**1.321**
777	848.31	1.060	-0.136	1.094
CDMA 1xEV-DO Rev.0 PCS Band				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
25	1851.25	0.747	-0.122	0.768
600	1880.00	0.883	-0.156	**0.915**
1175	1908.75	0.656	-0.172	0.683

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 COMPAQ PRESARIO V2000

Photos are confidential, please see a seperate file

CDMA 1xEV-DO Rev.0 Cell Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1013	824.70	1.090	-0.169	1.133
384	836.52	1.280	-0.143	**1.323**
777	848.31	0.919	-0.150	0.951

CDMA 1xEV-DO Rev.0 PCS Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
25	1851.25	0.662	0.000	0.662
600	1880.00	0.856	-0.149	**0.886**
1175	1908.75	0.646	0.000	0.646

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 - Nomal
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	EX3DV3	3531	7/21/06
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
Data Acquisition Electronics	SPEAG	DAE4	558	1/20/07
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	ZHL-42W	D072701-5	N/A
Radio Communication Tester	Rohde & Schwarz	CMU 200	838114/032	3/21/07
Wireless Conmmunication test set	Agilent	E5515C	GB44051094	4/8/07
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 EUT PHOTOS

PCMCIA MODEM CARD CDMA

Photos are confidential, please see a seperate file

Toshiba Satellite

Photos are confidential, please see a seperate file

HP Pavilion dv4000

Photos are confidential, please see a seperate file

Photos are confidential, please see a seperate file

Compaq Presario v2000

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11 ATTACHMENTS

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3	Certificate of E-Field Probe - EX3DV3SN3531	10
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END OF REPORT