SAR Evaluation Report

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

FOR

WIRELESS MODEM

MODEL: AIRCARD 880U

FCC ID: N7NMC8780U

REPORT NUMBER: 07U11062-4, REVISION B

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Prepared for

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	July 9, 2007	Initial issue	Sunny Shih
B	July 17, 2007	Corrected EUT name and model name	Tiffany Hong

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: July 6, 2007

APPLICANT: ADDRESS:	SIERRA WIRELESS, INC. 13811 WIRELESS WAY, RICHMOND, BC V6V 3A4 CANADA
FCC ID: MODEL:	N7NMC8780U AIRCARD 880U
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

Wireless Modem is installed in three host laptops for SAR testing in 850 and 1900 US bands.
Note: This device contains 900/1800/2100 MHz functions that are not operational in U.S. territories.

Test Sample is a:	Production unit	
Host Laptops:	- Panasonic CF-29 - Toshiba Satellite - Compaq Presario R3000	
Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]
FCC 22H	824.2 - 848.8	Host Device / SAR Value Panasonic CF-29: 0.554 Toshiba Satellite: 0.562 Compaq Presario R3000: 0.248
FCC 24E	1850.20 - 1909.8	Host Device / SAR Value Panasonic CF-29: 0.738 Toshiba Satellite: 0.470 Compaq Presario R3000: 0.375

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 RSS 102.

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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1 DEVICE UNDER TEST (DUT) DESCRIPTION

Wireless Modem is installed in three host laptops for SAR testing in 850 and 1900 MHz US bands. Note: This device contains 900/1800/2100 MHz functions that are not operational in U.S. territories.	
Normal operation:	Lap-held position.
Duty cycle:	GPRS/EGPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
Host Device(s):	Panasonic CF-29 Toshiba Satellite Compaq Presario R3000
Power supply:	Power supply from USB port, assisted by Li – Polymer Battery, Model AirCard ® USB Modem, 3.7 Vdc, 380 mAh.

2 FACILITIES AND ACCREDITATION

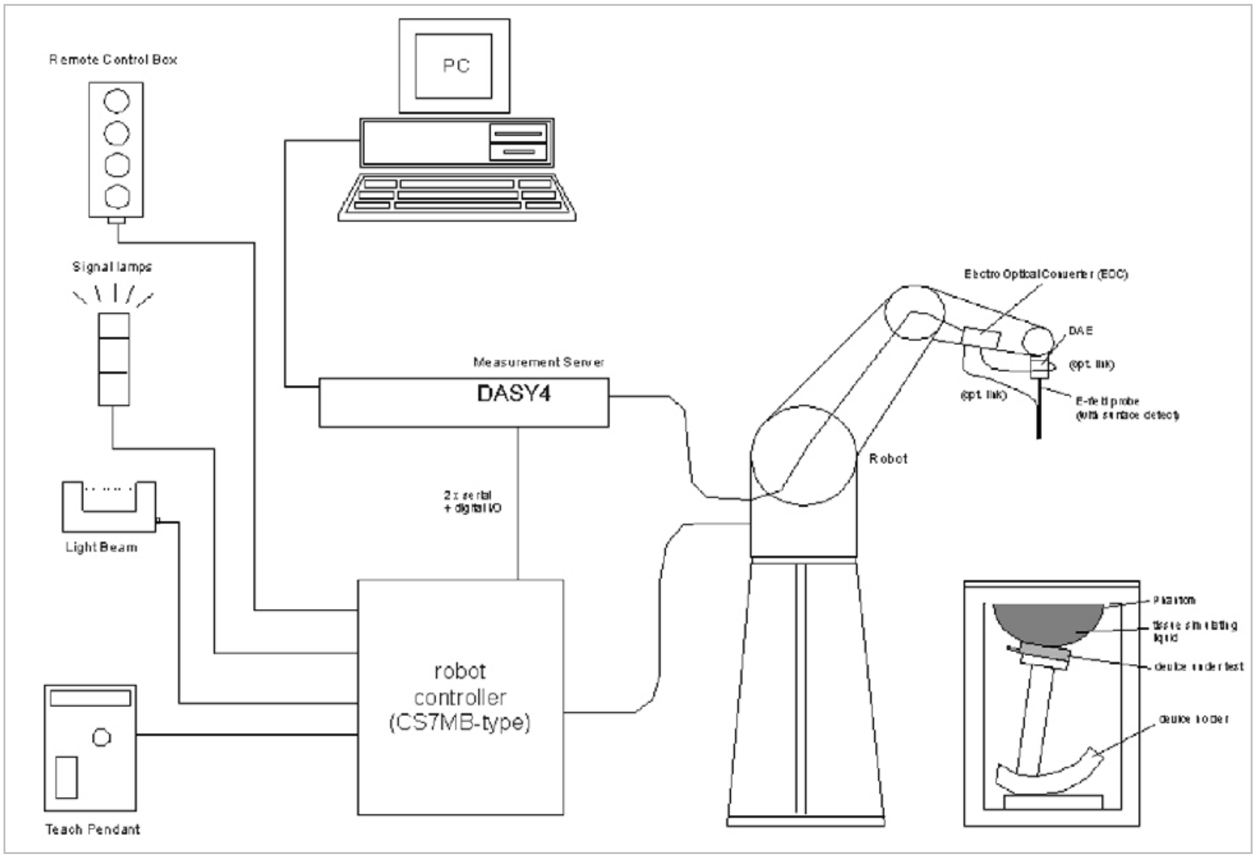
The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, CA 94538 USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, “Radio 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.

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 SIMULATING LIQUIDS

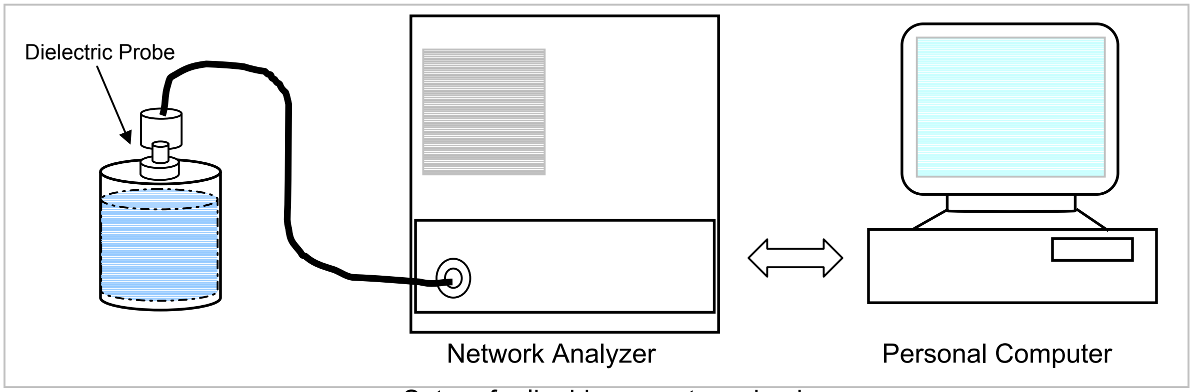
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

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

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 = 55% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
835	22	15	e'	53.764	Relative Permittivity (ϵ_r):	53.7640	55.2	-2.60	± 5
			e''	20.6169	Conductivity (σ):	0.95770	0.97	-1.27	± 5

Liquid Check
Ambient temperature: 23 deg. C; Liquid temperature: 22 deg C
July 06, 2007 09:56 AM

Frequency	e'	e''
805000000.	54.0444	20.7176
810000000.	54.0079	20.6687
815000000.	53.9612	20.6517
820000000.	53.9159	20.6511
825000000.	53.8912	20.6431
830000000.	53.8386	20.6010
835000000.	**53.7640**	**20.6169**
840000000.	53.7188	20.5892
845000000.	53.6912	20.5771
850000000.	53.6311	20.5337
855000000.	53.5851	20.4964
860000000.	53.5152	20.4791
865000000.	53.4652	20.4547
870000000.	53.4197	20.4396
875000000.	53.3623	20.4185
880000000.	53.3024	20.3882
885000000.	53.2689	20.3691
890000000.	53.2214	20.3661
895000000.	53.2097	20.3180
900000000.	53.1853	20.3426
905000000.	53.1325	20.3056
910000000.	53.0731	20.3283
915000000.	53.0194	20.3231
920000000.	52.9596	20.3256
925000000.	52.9026	20.3322
930000000.	52.8676	20.3149
935000000.	52.8299	20.2887
940000000.	52.7807	20.2573
945000000.	52.7030	20.2278
950000000.	52.6661	20.2222

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 = 23°C; Relative humidity = 55% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
1900	22	15	e'	51.7708	Relative Permittivity (ε_r):	51.7708	53.3	-2.87	± 5
			e''	13.8124	Conductivity (σ):	1.45996	1.52	-3.95	± 5

Liquid Check
Ambient temperature: 23 deg. C; Liquid temperature: 22 deg C
July 06, 2007 10:50 AM

Frequency	e'	e''
1710000000.	52.3593	13.2532
1720000000.	52.3388	13.2983
1730000000.	52.3024	13.3167
1740000000.	52.2587	13.3590
1750000000.	52.2169	13.3964
1760000000.	52.1892	13.4224
1770000000.	52.1550	13.4468
1780000000.	52.1199	13.4720
1790000000.	52.0958	13.4953
1800000000.	52.0447	13.5308
1810000000.	52.0177	13.5461
1820000000.	51.9795	13.5962
1830000000.	51.9338	13.6102
1840000000.	51.8993	13.6433
1850000000.	51.8731	13.6837
1860000000.	51.8403	13.6979
1870000000.	51.8230	13.7237
1880000000.	51.8094	13.7356
1890000000.	51.7817	13.7815
1900000000.	**51.7708**	**13.8124**
1910000000.	51.7484	13.8361

The conductivity (σ) can be given as:

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

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

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

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: July 6, 2007

Ambient Temperature = 23°C; Relative humidity = 55% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	22	15	1g	2.40	9.6	9.71	-1.13	± 10
			10g	1.59	6.36	6.38	-0.31	± 10

System Validation Dipole: D1900V2 SN:5d043

Date: July 6, 2007

Ambient Temperature = 23°C; Relative humidity = 55% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	22	15	1g	10.10	40.4	39.8	1.51	± 10
			10g	5.3	21.2	20.8	1.92	± 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=24 and Z=20 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.

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 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.

7 PROCEDURE USED TO ESTABLISH TEST SIGNAL

The following setting is used to configure the CMU200 to establish the link for SAR testing.

Service selection ➔ Test Mode A – Auto Slot Config. ➔ off
Main Service ➔ Packet Data
Network Support ➔ GSM+GPRS
Slot Config ➔ 33 dBm for GSM+GPRS850; 30 dBm for GSM+GPRS1900
27 dBm for GSM+EGPRS850: 26 dBm for GSM+EGPRS1900

Conducted power:

GSM850

Channel	Frequency (MHz)	GPRS			
		1 slot Power (dBm)	2 slots Power (dBm)	3 slots Power (dBm)	4 slots Power (dBm)
128	824.2	32.1	32.1	29.2	26.3
192	837.0	32.1	32.1	29.1	26.2
251	848.8	32.1	32.0	29.1	26.2

GSM850

Channel	Frequency (MHz)	EGPRS			
		1 slot Power (dBm)	2 slots Power (dBm)	3 slots Power (dBm)	4 slots Power (dBm)
128	824.2	27.3	27.3	27.3	27.3
192	837.0	27.3	27.3	27.2	27.3
251	848.8	27.2	27.2	27.2	27.2

GSM1900

Channel	Frequency (MHz)	GPRS			
		1 slot Power (dBm)	2 slots Power (dBm)	3 slots Power (dBm)	4 slots Power (dBm)
512	1850.2	29.4	29.4	29.4	29.3
661	1880.0	29.7	29.9	29.7	29.6
810	1909.8	29.8	29.8	29.7	29.7

GSM1900

Channel	Frequency (MHz)	EGPRS			
		1 slot Power (dBm)	2 slots Power (dBm)	3 slots Power (dBm)	4 slots Power (dBm)
512	1850.2	26.5	26.5	26.4	26.4
661	1880.0	26.8	26.8	26.7	26.7
810	1909.8	26.8	26.8	26.8	26.8

WCDMA + HSDPA Procedure
The following settings were used to configure the Radio Communication Tester, CMU200.

- Connection
  - Dedicated Chan (CS): RMC
  - Band Select:
    - Band VI for US Cell Band
    - Band II for US PCS Band
    - Band I for 2100MHz band
- Network
  - Requested UE Data
    - Authentication: Off
    - Security: Off
    - IMEI: ON
    - RLC Reestablish: Off
- BS Signal
  - Node –B Setting
    - RF Channel Downlink
      - Band VI: 4357 / 4407 / 4458
      - Band II: 9662 / 9800 / 9938
      - Band I: 10562 / 10700 / 10838
  - Circuit Switched
    - RMC Setting
      - Reference Channel Type: 12.2Kbps
      - Test Mode: Loop Mode 2
      - Channel Data Source DTCH: All One
    - Signaling RAB Setting
      - SRB Cell DCH: 13.6 Kbps
- UE Signal
  - Analyzer Setting
    - RF Channel Uplink:
      - Band VI: 4132 / 4182 / 4233
      - Band II: 9262 / 9400 / 9538
      - Band I; 9612 / 9750 / 9888
    - UE power Control
      - Max Allowed UE Power: 25
  - UE Gain Factor
    - HSDPA (for WCDMA + HSDPA mode only)
      - βc: 9
      - βd: 15
      - ΔACK: 5
      - ΔNACK: 5
      - ΔCQI: 2

RF Output Power Measurement Results – for RMC Channel Type

Channel Type: 12.2K RMC

Cell Band

Channel	Frequency (MHz)	Ch Power (dBm)
4132	826.4	22.5
4182	836.4	22.6
4233	846.6	22.7

PCS Band

Channel	Frequency (MHz)	Ch Power (dBm)
9262	1852.4	22.4
9400	1880.0	22.4
9538	1907.6	22.4

RF Output Power Measurement Results - for 12.2k RMC HSDPA Channel Type

12.2k RMC + HSDPA

Cell Band

Channel	Frequency (MHz)	Ch Power (dBm)
4132	826.4	22.6
4182	836.4	22.5
4233	846.6	22.6

PCS Band

Channel	Frequency (MHz)	Ch Power (dBm)
9262	1852.4	22.7
9400	1880.0	22.6
9538	1907.6	22.6

8 SAR MEASURMENT RESULTS

8.1 CELL BAND

The following modes were chosen based on conducted output power measurement results and previous CCS project # 07U11027.

8.1.1 PANASONIC CF-29

8.1.1.1 POSITION 1

GPRS 2 Slots

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
128 192 251	824.20 837.00 848.80	0.502	0.000	0.502

WCDMA

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
4132 4182 4233	826.40 836.40 846.60	0.262	-0.087	0.267

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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.1.2 POSITION 2

GPRS 2 Slots

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
128	824.20			
192	**837.00**	**0.554**	**0.000**	**0.554**
251	848.80			

WCDMA

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
4132	826.40			
4182	836.40	0.425	0.000	0.425
4233	846.60			

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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.2 TOSHIBA SATELLITE

8.1.2.1 VERTICAL

The WCDMA mode was skipped due to low SAR values.

GPRS 2 Slots

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
128	824.20			
192	837.00	0.111	0.000	0.111
251	848.80			

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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.2.2 HORIZONTAL

GPRS 2 Slots				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
128 **192** 251	824.20 **837.00** 848.80	**0.562**	**0.000**	**0.562**
WCDMA				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
4132 4182 4233	826.40 836.40 846.60	0.198	-0.042	0.200

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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.3 COMPAQ PRESARIO

8.1.3.1 VERTICAL

WCDMA mode was skipped due to significantly lower output power

GPRS 2 Slots

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
128	824.20			
192	837.00	0.015	0.000	0.015
251	848.80			

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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.3.2 HORIZONTAL

GPRS 2 Slots				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
128 **192** 251	824.20 **837.00** 848.80	**0.243**	**-0.091**	**0.248**
WCDMA				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
4132 4182 4233	826.40 836.40 846.60	0.150	-0.074	0.153

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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2 PCS BAND

The following modes were chosen based on conducted output power measurement results and previous CCS project # 07U11027.

8.2.1 PANASONIC CF-29

8.2.1.1 POSITION 1

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
GPRS 4 Slots				
512	1850.20			
661	**1880.00**	**0.738**	**0.000**	**0.738**
810	1909.80			
WCDMA				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
9262	1852.40			
9400	1880.00	0.437	0.000	0.437
9538	1907.60			

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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.1.2 POSITION 2

GPRS 4 Slots

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
512	1850.20			
661	1880.00	0.652	0.000	0.652
810	1909.80			

WCDMA

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
9262	1852.40			
9400	1880.00	0.371	0.000	0.371
9538	1907.60			

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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.2 TOSHIBA SATELLITE

8.2.2.1 VERTICAL

GPRS 4 Slots				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
512	1850.20			
661	1880.00	0.159	0.000	0.159
810	1909.80			

WCDMA				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
9262	1852.40			
9400	1880.00	0.107	0.000	0.107
9538	1907.60			

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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.2.2 HORIZONTAL

GPRS 4 Slots

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
512 **661** 810	1850.20 **1880.00** 1909.80	**0.470**	**0.000**	**0.470**

WCDMA

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
9262 9400 9538	1852.40 1880.00 1907.60	0.288	0.000	0.288

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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.3 COMPAQ PRESARIO

8.2.3.1 VERTICAL

WCDMA mode in the following position was skipped due to low SAR values.

GPRS 4 Slots

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
512	1850.20			
661	1880.00	0.052	0.000	0.052
810	1909.80			

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) The battery was fully charged in accordance with manufacture’s instructions prior to SAR measurements.
4) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.3.2 HORIZONTAL

GPRS 4 Slots				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
512	1850.20			
661	**1880.00**	**0.375**	**0.000**	**0.375**
810	1909.80			
WCDMA				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
9262	1852.40			
9400	1880.00	0.233	0.000	0.233
9538	1907.60			

Notes:

5) 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.
6) 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.
7) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
8) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

9 MEASURMENT UNCERTAINTY

9.1 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

10 EQUIPMENT LIST AND CALIBRATION

Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date		
				MM	DD	Year
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		
SAM Phantom (SAM1)	SPEAG	QD000P40CA	1185	N/A		
SAM Phantom (SAM2)	SPEAG	QD000P40CA	1050	N/A		
Oval Flat Phantom (ELI 4.0)	SPEAG	QD OVA001 B	1003	N/A		
Electronic Probe kit	HP	85070C	N/A	N/A		
S-Parameter Network Analyzer	Agilent	8753ES-6	US39173569	2	14	2008
E-Field Probe	SPEAG	EX3DV4	3554	4	24	2008
Thermometer	ERTCO	639-1S	1718	11	7	2007
Data Acquisition Electronics	SPEAG	DAE3 V1	427	11	16	2007
System Validation Dipole	SPEAG	D835V2	4d002	1	19	2008
System Validation Dipole	SPEAG	D1900V2	5d043	1	23	2008
Signal Generator	R&S	SMP 04	DE34210	10	9	2007
Power Meter	Giga-tronics	8651A	8651404	4	3	2008
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
Radio Communication Tester	R &S	CMU 200	838114/032	12	26	2008
Simulating Liquid	CCS	M835	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M1900	N/A	Within 24 hrs of first test		

11 PHOTOS

EUT

Host Device - Compaq

Host Device – Panasonic

Host Device - Toshiba

12 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	4
2-1	SAR Test Plots – Cell Band	11
2-2	SAR Test Plots – PCS Band	12
3	Certificate of E-Field Probe - EX3DV4SN3554	10
4	Certificate of System Validation Dipole - D835V2 SN:4d002	9
5	Certificate of System Validation Dipole - D1900V2 SN:5d043	9

END OF REPORT