



SAR Evaluation Report

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

FOR

**EXPRESS MINI-PCI USB WIRELESS CDMA 1XEV-DO MODULE
INSTALLED INTO FOUR LENOVO LAPTOPS**

FCC ID: N7N-MC5720

REPORT NUMBER: 06U10282-3

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PREPARED FOR

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LAB CODE:200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	May 22, 2006	Initial issue	HS

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)**DATES OF TEST:** May 15, 16, 17 and 18, 2006

APPLICANT:	Sierra Wireless Inc.
ADDRESS:	2290 Cosmos Court, Carlsbad, CA 92009, USA
FCC ID:	N7N-MC5720
MODEL(s):	BV2-C5, BV2-C4, BW2-C7, BW2-C6
DEVICE CATEGORY:	Portable Device
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure

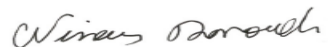
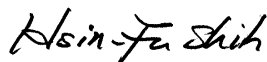
Express Mini-PCI USB Wireless CDMA 1xEV-DO Module MC5720 installed into four Lenovo laptops					
Test Sample is a:	Production unit				
Lenovo Laptops:	1. M2 / Z61t Note - LCD material: Aluminum Frame, Model: BV2-C5 2. M2 / Z61t Note - LCD material: Carbon fiber Frame, Model: BV2-C4 3. W2 / Z61M Note - LCD material: Aluminum Frame, Model: BW2-C7 4. W2 / Z61M Note - LCD material: Carbon fiber Frame, Model: BW2-C6				
FCC Rule Parts	Frequency Range [MHz]	The Highest 1g SAR Values (mW/g)			Collocation 1g SAR Values (mW/g)
		<u>Lenovo laptops</u>	<u>1xRTT</u>	<u>1xEV-DO</u>	<u>1xRTT</u> <u>1xEV-DO</u>
22H	824.7-848.31	1. M2 Note- AI	0.094	0.094	0.090 0.095
		2. M2 Note- CF	0.104	0.107	0.102 0.108
		3. W2 Note- AI	0.055	0.055	0.054 0.057
		4. W2 Note- CF	0.051	0.054	0.052 0.055
24E	1851.25-1908.75	1. M2 Note- AI	0.152	0.158	0.150 0.167
		2. M2 Note- CF	0.111	0.116	0.111 0.116
		3. W2 Note- AI	0.101	0.105	0.099 0.099
		4. W2 Note-CF	0.062	0.062	0.060 0.063

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.

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1 EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Express Mini-PCI USB Wireless CDMA 1xEV-DO Module MC5720 installed into four Lenovo laptops	
Normal operation:	Lap-held position
Duty cycle:	100%
Host Device(s):	1. M2 / Z61t Note - LCD material: Aluminum Frame, Model: BV2-C5 2. M2 / Z61t Note - LCD material: Carbon fiber Frame, Model: BV2-C4 3. W2 / Z61M Note - LCD material: Aluminum Frame, Model: BW2-C7 W2 / Z61M Note - LCD material: Carbon fiber Frame, Model: BW2-C6
Antenna(s):	M2 / Z61t: Foxconn Hon Hai Precision IND. Co. Ltd. (R.O.C.), Dual Planner Inverted F Antenna, Designator: WDAN-LQBV2003-DF W2 / Z61M: Foxconn Hon Hai Precision IND. Co. Ltd. (R.O.C.), Dual Planner Inverted F Antenna, Designator: WDAN-LQBW2003
Power supply:	Power supplied through the laptop computer (host device).

2 FACILITIES AND ACCREDITATION

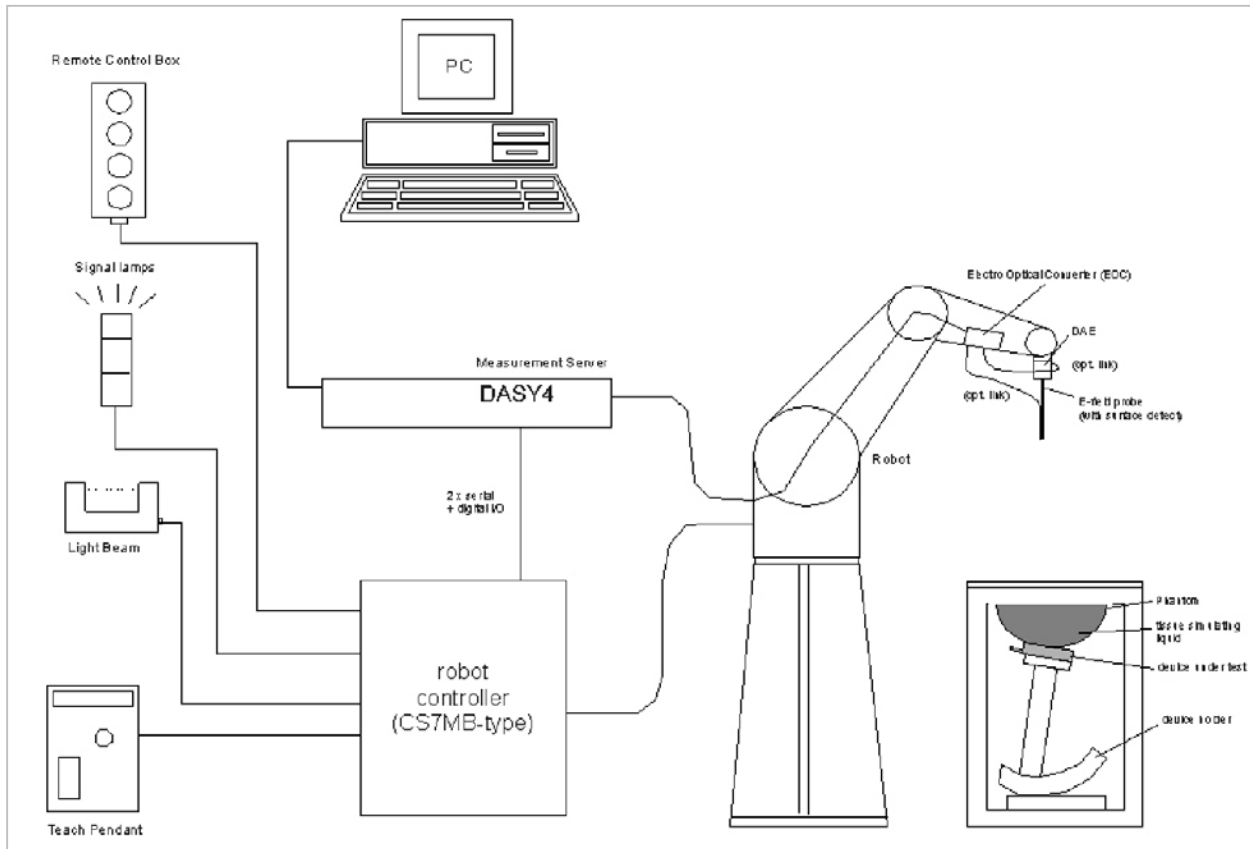
The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1,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



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

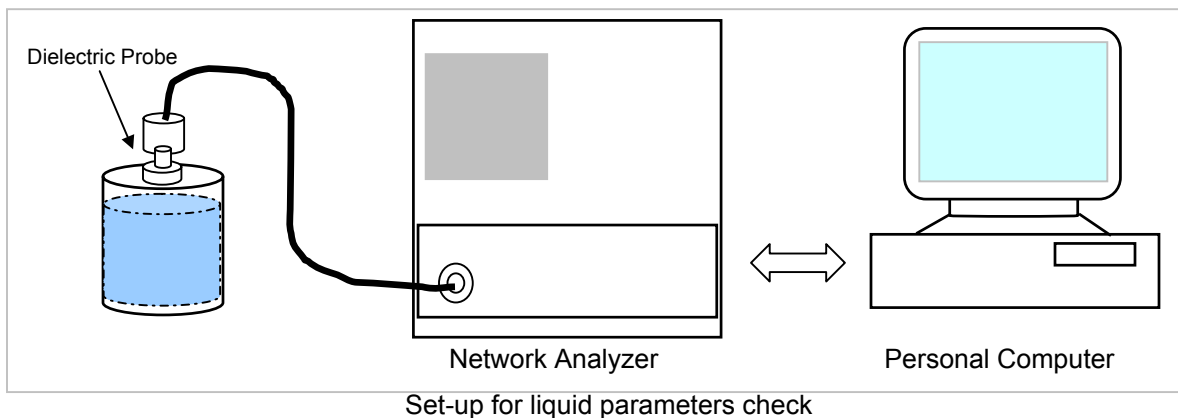
HEC: Hydroxyethyl Cellulose

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 if the dielectric parameters are within the tolerances of the specified target values. The relative permittivity and conductivity of the tissue material should be within $\pm 5\%$ of the values given in the table below.



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 $\rho = 1000 \text{ kg/m}^3$)

4.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameters Check Result @ Muscle 835 MHz

Room Ambient Temperature = 23°C; Relative humidity = 50%

Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	ε'	Relative Permittivity (ε _r):				
835	22	15	ε''		55.2	52.7858	-4.37	± 5
			20.5204	Conductivity (σ):	0.97	0.95322	-1.73	± 5

Liquid Check

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

May 15, 2006 09:51 AM

Frequency	ε'	ε''
800000000.	53.1040	20.6594
805000000.	53.0739	20.6513
810000000.	53.0143	20.6198
815000000.	52.9928	20.6145
820000000.	52.9370	20.5878
825000000.	52.8787	20.5513
830000000.	52.8208	20.5591
835000000.	52.7858	20.5204
840000000.	52.7103	20.5185
845000000.	52.6422	20.5032
850000000.	52.6047	20.5095
855000000.	52.5768	20.4801
860000000.	52.4886	20.4301
865000000.	52.4376	20.4204
870000000.	52.3725	20.4268
875000000.	52.3411	20.3785
880000000.	52.2769	20.3534
885000000.	52.2367	20.3615
890000000.	52.1871	20.3419
895000000.	52.1509	20.3278
900000000.	52.1200	20.3118

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 \epsilon'' = 2 \pi f \epsilon_0 \epsilon''$$

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

$$\epsilon_0 = 8.854 * 10^{-12}$$

Simulating Liquid Dielectric Parameters Check Result @ Muscle 835 MHz

Room Ambient Temperature = 23°C; Relative humidity = 50%

Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	ε"	Relative Permittivity (ε _r):				
835	22	15	20.6124	Conductivity (σ):	55.2	53.0488	-3.90	± 5
					0.97	0.95749	-1.29	± 5

Liquid Check

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

May 18, 2006 09:44 AM

Frequency	ε'	ε"
800000000.	53.3897	20.7984
805000000.	53.3313	20.7759
810000000.	53.2888	20.7314
815000000.	53.2544	20.7235
820000000.	53.1706	20.6831
825000000.	53.1410	20.6517
830000000.	53.0718	20.6457
835000000.	53.0488	20.6124
840000000.	52.9941	20.5798
845000000.	52.8959	20.5742
850000000.	52.8860	20.5694
855000000.	52.8213	20.5306
860000000.	52.7518	20.5048
865000000.	52.6809	20.5014
870000000.	52.6590	20.5118
875000000.	52.6054	20.4916
880000000.	52.5632	20.4990
885000000.	52.5093	20.5003
890000000.	52.4598	20.5105
895000000.	52.4374	20.4791
900000000.	52.3850	20.4491

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 \epsilon'' = 2 \pi f \epsilon_0 \epsilon''$$

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

$$\epsilon_0 = 8.854 * 10^{-12}$$

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1900 MHz

Room Ambient Temperature = 23°C; Relative humidity = 50%

Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	ε"	Relative Permittivity (ε _r):				
1900	22	15	14.1865	Conductivity (σ):	53.3	51.4019	-3.56	± 5
					1.52	1.49950	-1.35	± 5

Liquid Check

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

May 16, 2006 09:37 AM

Frequency	ε'	ε"
1710000000.	52.1050	13.4990
1720000000.	52.0765	13.5230
1730000000.	52.0466	13.5697
1740000000.	52.0019	13.6175
1750000000.	51.9581	13.6505
1760000000.	51.9115	13.6861
1770000000.	51.8922	13.7352
1780000000.	51.8359	13.7756
1790000000.	51.7996	13.8033
1800000000.	51.7790	13.8431
1810000000.	51.7421	13.8610
1820000000.	51.7035	13.9126
1830000000.	51.6529	13.9142
1840000000.	51.6154	13.9583
1850000000.	51.5747	14.0126
1860000000.	51.5442	14.0475
1870000000.	51.4970	14.0937
1880000000.	51.4711	14.1253
1890000000.	51.4162	14.1541
1900000000.	51.4019	14.1865
1910000000.	51.3570	14.2144

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 \epsilon'' = 2 \pi f \epsilon_0 \epsilon''$$

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

$$\epsilon_0 = 8.854 * 10^{-12}$$

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)	ε"	Relative Permittivity (ε _r):				
1900	22	15	14.1339	Conductivity (σ):	53.3	51.7171	-2.97	± 5
					1.52	1.49395	-1.71	± 5

Liquid Check

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

May 17, 2006 09:16 AM

Frequency	e'	e"
1710000000.	52.4500	13.4477
1720000000.	52.4099	13.4718
1730000000.	52.3778	13.5075
1740000000.	52.3274	13.5404
1750000000.	52.3027	13.6063
1760000000.	52.2348	13.6432
1770000000.	52.2034	13.7041
1780000000.	52.1562	13.7390
1790000000.	52.1254	13.7567
1800000000.	52.1004	13.7876
1810000000.	52.0438	13.8168
1820000000.	52.0031	13.8330
1830000000.	51.9868	13.8713
1840000000.	51.9417	13.8988
1850000000.	51.8912	13.9671
1860000000.	51.8303	14.0127
1870000000.	51.7766	14.0275
1880000000.	51.7494	14.0622
1890000000.	51.7335	14.0835
1900000000.	51.7171	14.1339
1910000000.	51.6895	14.1658

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 \epsilon'' = 2 \pi f \epsilon_0 \epsilon''$$

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

$$\epsilon_0 = 8.854 * 10^{-12}$$

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 $\pm 10\%$.

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 $\pm 3\%$.
- 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 15, 2006

Ambient Temperature = 23°C; Relative humidity = 50%

Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target _{1g}	Deviation[%]	Lim it [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
835	22	15	2.41	9.64	9.71	-0.72	± 10
			10g	Normalized to 1 W	Target _{10g}	Deviation[%]	Lim it [%]
			1.59	6.36	6.38	-0.31	± 10

Date: May 18, 2006

Ambient Temperature = 23°C; Relative humidity = 50%

Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target _{1g}	Deviation[%]	Lim it [%]
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[%]	Lim it [%]
			1.6	6.4	6.38	0.31	± 10

System Validation Dipole: D1900V2 SN:5d043

Date: May 16, 2006

Room Ambient Temperature = 23°C; Relative humidity = 50%

Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target _{1g}	Deviation[%]	Lim it [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
1900	22	15	10.00	40	39.8	0.50	± 10
			10g	Normalized to 1 W	Target _{10g}	Deviation[%]	Lim it [%]
			5.33	21.32	20.8	2.50	± 10

Date: May 17, 2006

Room Ambient Temperature = 23°C; Relative humidity = 45%

Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target _{1g}	Deviation[%]	Lim it [%]
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[%]	Lim it [%]
			5.38	21.52	20.8	3.46	± 10

6 SAR MEASUREMENT 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 MEASUREMENT 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 measure the channel power.

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

Call Params

Radio config: FWD3, RVS3

Service option: SO32 (+F-SCH)

Pwr Ctrl Params: Active bits (Select "All Up bits" after linked to get maximum power)

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

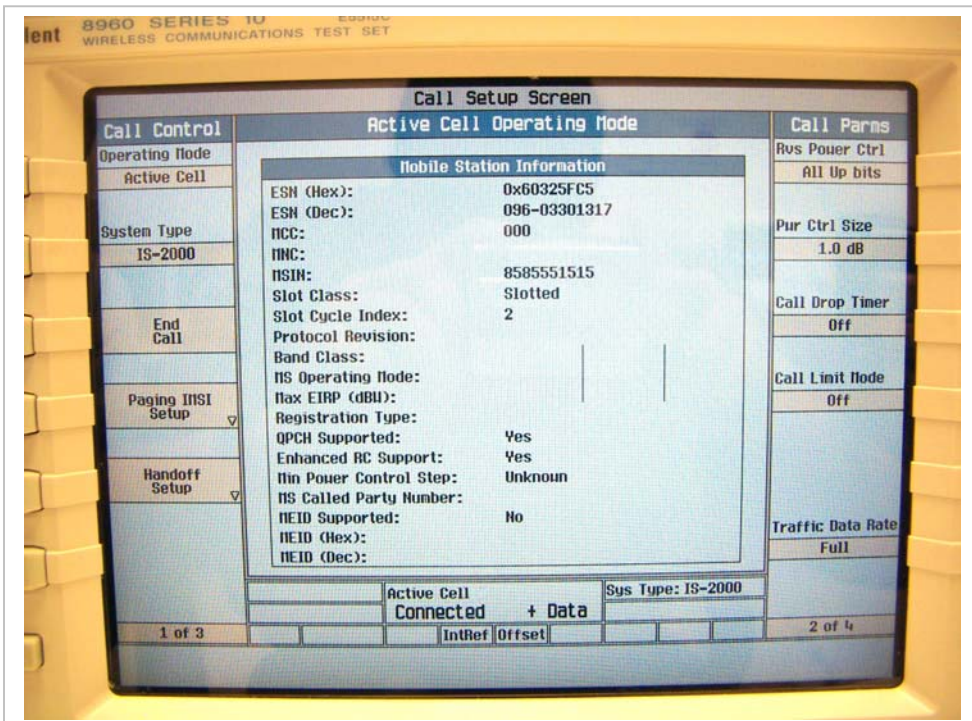
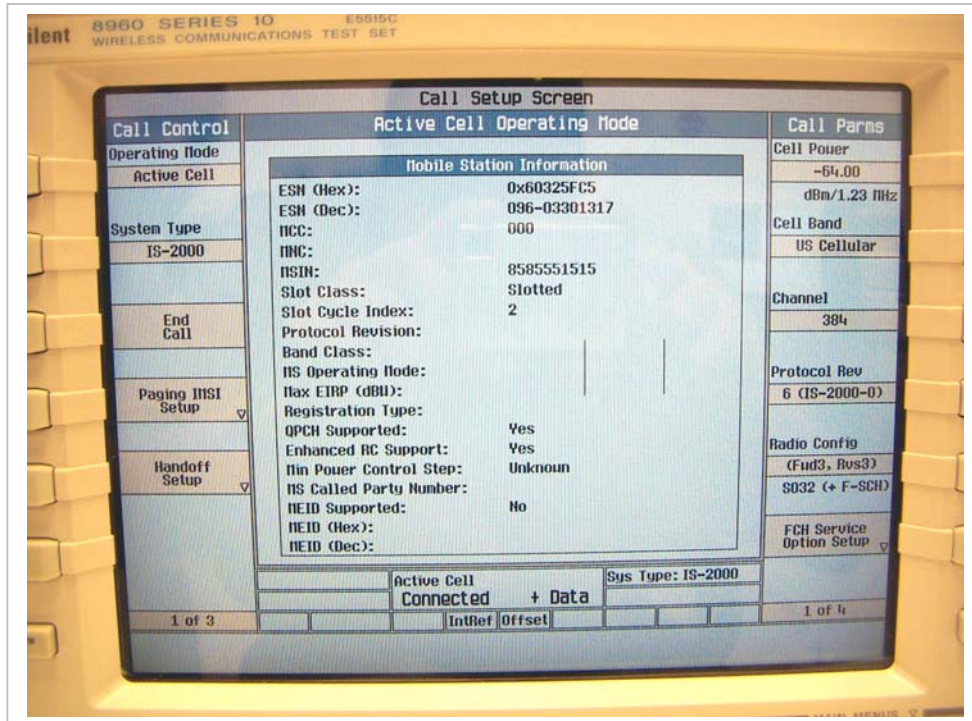
CDMA2000 1xRTT Cell Band

Channel	Frequency (MHz)	Channel Power (dBm)
1013	824.70	24.50
384	836.52	24.30
777	848.31	23.80

CDMA2000 1xRTT PCS Band

Channel	Frequency (MHz)	Channel Power (dBm)
25	1851.25	24.50
600	1880.00	23.90
1175	1908.75	24.10

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



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

Call Params:

Application Config: RTAP

FTAP Rate: 307.2 Kbps

RTAP Rate: 153.6 Kbps

Pwr Ctrl Params: 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

CDMA2000 1xEV-DO Cell Band

Channel	Frequency (MHz)	Channel Power (dBm)
1013	824.70	24.50
384	836.52	24.30
777	848.31	23.80

CDMA2000 1xEV-DO PCS Band

Channel	Frequency (MHz)	Channel Power (dBm)
25	1851.25	24.90
600	1880.00	24.60
1175	1908.75	24.20

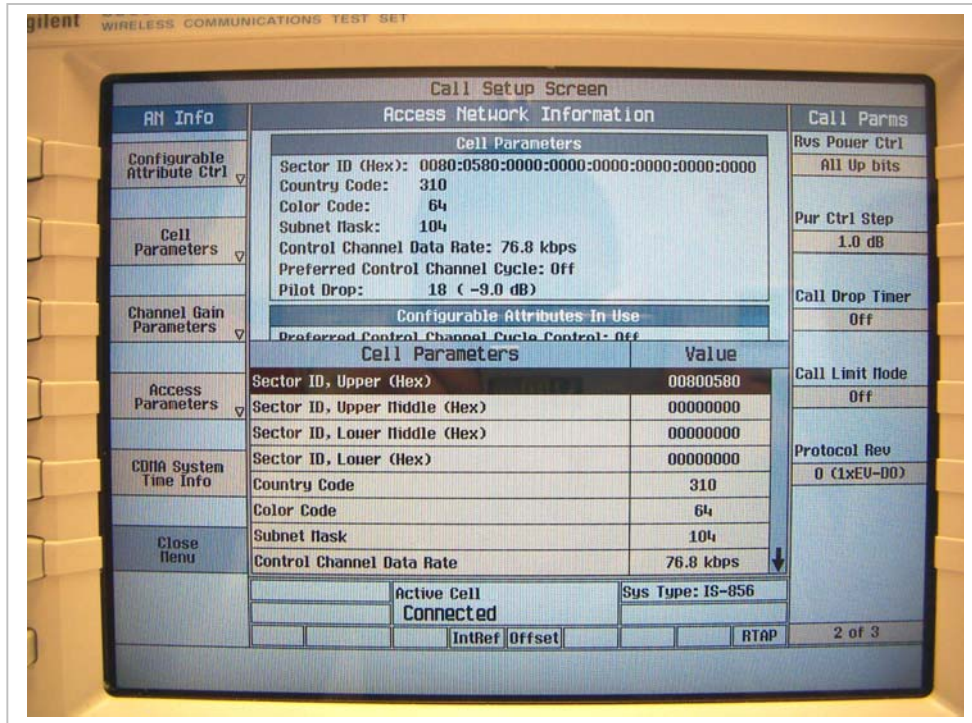
Agilent Settings for 1xEV-DO Rev.0

Call Setup Screen

Call Control	Active Cell Operating Mode	Call Params
Operating Mode	Access Terminal Information (AT Reported)	Cell Power
Active Cell	Session Seed: 0x9A74684C	-55.00
	Hardware ID Type (Hex): 0x010000 ESN	dBm/1.23 MHz
	Hardware ID (Hex): 0x60325FC5	Cell Band
	Hardware ID (Decimal): 096-03301317	US Cellular
	Access Terminal Information (AN Assigned)	Channel
End Data Connection	UATI 024: 3	384
	UATI Color Code: 64	
	NAC Index: 5	
	Access Terminal Information (User Entered)	Application Config
Close Session	AT Max Power: 23 dBm/1.23 MHz	
	Application Configuration	FTAP Rate
Handoff Setup	Session Application Type: Test Application	307.2 kbps
	Test Application Protocol: RTAP	(2 Slot, QPSK)
	Limited TAP: Off	RTAP Rate
AT Max Power	AT Directed Packets: 50 %	153.6 kbps
23 dBm/1.23 MHz	ACK Channel Bit Fixed Mode Attribute: On	
	Active Cell	Sys Type: IS-856
	Connected	
1 of 2	IntRef Offset	RTAP 1 of 3

Call Setup Screen

Call Control	Active Cell Operating Mode	Call Params
Operating Mode	Access Terminal Information (AT Reported)	Avs Power Ctrl
Active Cell	Session Seed: 0x9A74684C	All Up bits
	Hardware ID Type (Hex): 0x010000 ESN	
	Hardware ID (Hex): 0x60325FC5	Pur Ctrl Step
	Hardware ID (Decimal): 096-03301317	1.0 dB
	Access Terminal Information (AN Assigned)	Call Drop Timer
End Data Connection	UATI 024: 3	Off
	UATI Color Code: 64	
	NAC Index: 5	Call Limit Mode
Close Session	Access Terminal Information (User Entered)	Off
	AT Max Power: 23 dBm/1.23 MHz	Protocol Rev
Handoff Setup	Application Configuration	0 (1xEV-DO)
	Session Application Type: Test Application	
	Test Application Protocol: RTAP	
	Limited TAP: Off	
AT Max Power	AT Directed Packets: 50 %	
23 dBm/1.23 MHz	ACK Channel Bit Fixed Mode Attribute: On	
	Active Cell	Sys Type: IS-856
	Connected	
1 of 2	IntRef Offset	RTAP 2 of 3



8 SAR MEASUREMENT RESULTS

8.1 M2 / Z61t Note (LCD material: Aluminum Frame)

8.1.1 CDMA 2000 1xRTT

Photos are confidential, please see a separate file

CDMA 2000 1xRTT Cell Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1013	824.70	0.083	0.000	0.083
384	836.52	0.092	-0.070	0.094
777	848.31	0.079	0.000	0.079
384 ⁴⁾	836.52	0.090	0.000	0.090

CDMA 2000 1xRTT PCS Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
25	1851.25	0.152	0.000	0.152
600	1880.00	0.106	-0.140	0.109
1175	1908.75	0.110	0.000	0.110
25 ⁴⁾	1851.25	0.150	0.000	0.150

Notes:

- 1) The exact method of extrapolation is $\text{Measured SAR} \times 10^{(-\text{drift}/10)}$. 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.
- 4) Collocation with Intel WLAN module FCC ID: PD9LEN3945ABG

8.1.2 CDMA 2000 1xEV-DO

Photos are confidential, please see a separate file

CDMA 2000 1xEV-DO Cell Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1013	824.70	0.089	0.000	0.089
384	836.52	0.094	0.000	0.094
777	848.31	0.082	0.000	0.082
384 ⁴⁾	836.52	0.095	0.000	0.095

CDMA 2000 1xEV-DO PCS Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
25	1851.25	0.154	-0.113	0.158
600	1880.00	0.110	-0.078	0.112
1175	1908.75	0.114	-0.019	0.114
25 ⁴⁾	1851.25	0.160	-0.177	0.167

Notes:

- 1) The exact method of extrapolation is $\text{Measured SAR} \times 10^{(-\text{drift}/10)}$. 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.
- 4) Collocation with Intel WLAN module FCC ID: PD9LEN3945ABG

8.2 M2 / Z61t NOTE (LCD material: CARBON FIBER FRAME)

Spot check is performed based on the worst results from M2 / Z61t Note with Aluminum frame.

8.2.1 CDMA 2000 1xRTT

Photos are confidential, please see a separate file

CDMA 2000 1xRTT 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	0.104	0.000	0.104
777	848.31			
384 ⁴⁾	836.52	0.102	0.000	0.102

CDMA 2000 1xRTT PCS Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
25	1851.25	0.111	0.000	0.111
600	1880.00			
1175	1908.75			
25 ⁴⁾	1851.25	0.111	0.000	0.111

Notes:

- 1) The exact method of extrapolation is $\text{Measured SAR} \times 10^{(-\text{drift}/10)}$. 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.
- 4) Collocation with Intel WLAN module FCC ID: PD9LEN3945ABG

8.2.2 CDMA 2000 1xEV-DO

Photos are confidential, please see a separate file

CDMA 2000 1xEV-DO 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	0.107	0.000	0.107
777	848.31			
384 ⁴⁾	836.52	0.106	-0.081	0.108

CDMA 2000 1xEV-DO PCS Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
25	1851.25	0.116	0.000	0.116
600	1880.00			
1175	1908.75			
25 ⁴⁾	1851.25	0.116	0.000	0.116

Notes:

- 1) The exact method of extrapolation is $\text{Measured SAR} \times 10^{(-\text{drift}/10)}$. 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.
- 4) Collocation with Intel WLAN module FCC ID: PD9LEN3945ABG

8.3 W2 / Z61M NOTE (LCD material: ALUMINUM FRAME)**8.3.1 CDMA 2000 1xRTT**

Photos are confidential, please see a separate file

CDMA2000 1xRTT Cell Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1013	824.70	0.052	0.000	0.052
384	836.52	0.054	-0.083	0.055
777	848.31	0.043	-0.144	0.044
384 ⁴⁾	836.52	0.054	0.000	0.054

CDMA2000 1xRTT PCS Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
25	1851.25	0.051	-0.069	0.052
600	1880.00	0.101	0.000	0.101
1175	1908.75	0.090	-0.092	0.092
600 ⁴⁾	1880.00	0.099	0.000	0.099

Notes:

- 1) The exact method of extrapolation is $\text{Measured SAR} \times 10^{(-\text{drift}/10)}$. 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.
- 4) Collocation with Intel WLAN module FCC ID: PD9LEN3945ABG

8.3.2 CDMA 2000 1XEV-DO

Photos are confidential, please see a separate file

CDMA 2000 1xEV-DO Cell Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
1013	824.70	0.052	-0.001	0.052
384	836.52	0.055	0.000	0.055
777	848.31	0.043	-0.024	0.043
384 ⁴⁾	836.52	0.056	-0.137	0.057

CDMA 2000 1xEV-DO PCS Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
25	1851.25	0.052	-0.119	0.053
600	1880.00	0.104	-0.032	0.105
1175	1908.75	0.086	0.000	0.086
600 ⁴⁾	1880.00	0.096	-0.145	0.099

Notes:

- 1) The exact method of extrapolation is $\text{Measured SAR} \times 10^{(-\text{drift}/10)}$. 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.
- 4) Collocation with Intel WLAN module FCC ID: PD9LEN3945ABG

8.4 W2 / Z61M NOTE (LCD material: CARBON FIBER FRAME)

Spot check is performed based on the worst results from W2 / Z61M Note with Aluminum frame.

8.4.1 CDMA 2000 1xRTT

Photos are confidential, please see a separate file

CDMA 2000 1xRTT 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	0.051	0.000	0.051
777	848.31			
384 ⁴⁾	836.52	0.052	-0.005	0.052

CDMA 2000 1xRTT 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	0.059	-0.170	0.062
1175	1908.75			
600 ⁴⁾	1880.00	0.060	0.000	0.060

Notes:

- 1) The exact method of extrapolation is $\text{Measured SAR} \times 10^{(-\text{drift}/10)}$. 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.
- 4) Collocation with Intel WLAN module FCC ID: PD9LEN3945ABG

8.4.2 CDMA 2000 1xEV-DO

Photos are confidential, please see a seperate file

CDMA 2000 1xEV-DO 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	0.054	0.000	0.054
777	848.31			
384 ⁴⁾	836.52	0.054	-0.062	0.055

CDMA 2000 1xEV-DO 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	0.062	0.000	0.062
1175	1908.75			
600 ⁴⁾	1880.00	0.063	0.000	0.063

Notes:

- 1) The exact method of extrapolation is $\text{Measured SAR} \times 10^{(-\text{drift}/10)}$. 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.
- 4) Collocation with Intel WLAN module FCC ID: PD9LEN3945ABG

9 MEASUREMENT UNCERTAINTY

9.1 MEASUREMENT 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 Mechanical 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 quaity							
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

<u>Name of Equipment</u>	<u>Manufacturer</u>	<u>Type/Model</u>	<u>Serial Number</u>	<u>Cal. Due date</u>
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
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

MC5720 CDMA2000 MODEM MODULE

Photos are confidential, please see a seperate file

M2 / Z61t Note with Carbon fiber frame

Photos are confidential, please see a seperate file

M2-Note with Aluminum frame

Photos are confidential, please see a separate file

Antenna location- M2 Note with Aluminum frame

Photos are confidential, please see a seperate file

MC5720 location- M2-Note Aluminum frame

Photos are confidential, please see a separate file

W2-Note with Carbon fiber frame

Photos are confidential, please see a seperate file

W2-Note with Aluminum frame

Photos are confidential, please see a seperate file

Antenna location- W2 Note with Aluminum frame

Photos are confidential, please see a seperate file

MC5720 location- W2 Note with Aluminum frame

Photos are confidential, please see a seperate file

12 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	8
2-1	SAR Test Plots M2 Note-Aluminum Frame	20
2-2	SAR Test Plots M2 Note-Carbon Fiber Frame	12
2-3	SAR Test Plots W2 Note-Aluminum Frame	20
2-4	SAR Test Plots W2 Note-Carbon Fiber Frame	12
3	Certificate of E-Field Probe - EX3DV3SN3531	10
4	Certificate of System Validation Dipole - D835V2 SN:4d002	9
5	Certificate of System Validation Dipole - D1900V2 SN:5d043	9

END OF REPORT