FCC OET BULLETIN 65 SUPPLEMENT C
SAR EVALUATION REPORT
(Part 22 & 24)

For

CDMA+ WIMAX + WIFI MOBILE HOT SPOT

MODEL NUMBER: AirCard W802S

FCC ID: N7N-MHS802

REPORT NUMBER: 10U13412-6, Revision A

ISSUE DATE: JANUARY 12, 2011

Prepared for

SIERRA WIRELESS INC.
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Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	October 15, 2010	Initial Issue	--
A	January 12, 2011	Changed model name	A. Zaffar

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1. ATTESTATION OF TEST RESULTS

Applicant name:	Sierra Wireless Inc. 200 Faraday Avenue, Suite 150 Carlsbad, CA 92008
EUT description:	CDMA+ WIMAX + WIFI MOBILE HOT SPOT
Model number:	AirCard W802S
Device category:	Portable
Exposure category:	General Population/Uncontrolled Exposure
Date tested:	September 27, 2010

FCC Rule Parts	Freq. Range [MHz]	The Highest 1g SAR mW/g)	Limit (mW/g)
22H	824 - 849	0.791 (Top position) w/ 10 mm separation distance	1.6
24E	1850 - 1910	1.20 (Top position) w/ 10 mm separation distance	

Applicable Standards	Test Results
FCC OET Bulletin 65 Supplement C 01-01 and the following test procedures: - KDB 648474 D01 SAR Handsets Multi Xmiter and Ant, v01r05 - KDB 941225 D01 SAR test for 3G devices v02	Pass

Compliance Certification Services, Inc. (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released For UL CCS By:

Sunny Shih
Engineering Team Leader
Compliance Certification Services (UL CCS)

Tested By:

Devin Chang
EMC Engineer
Compliance Certification Services (UL CCS)

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C 01-01, and the following specific FCC Test Procedures.

- KDB 648474 D01 SAR Handsets Multi Xmiter and Ant, v01r05
- KDB 941225 D01 SAR test for 3G devices v02

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

Name of Equipment	Manufacturer	Type/Model	Serial No.	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		
Dielectric Probe Kit	HP	85070C	N/A	N/A		
Thermometer	ERTCO	639-1S	1718	7	19	2011
S-Parameter Network Analyzer	Agilent	8753ES-6	MY40001647	11	22	2010
Signal Generator	Agilent	8753ES-6	MY40001647	11	22	2010
E-Field Probe	SPEAG	EX3DV4	3531	2	23	2011
Thermometer	ERTCO	639-1S	1718	7	19	2011
Data Acquisition Electronics	SPEAG	DAE3 V1	427	7	21	2011
System Validation Dipole	SPEAG	D835V2	4d002	4	23	2011
System Validation Dipole	SPEAG	D1900V2	5d043	11	24	2011
Amplifier	Mini-Circuits	ZVE-8G	90606	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
Simulating Liquid	SPEAG	M1900	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	M835	N/A	Within 24 hrs of first test		

Note: Per KDB 450824 D02 requirements for dipole calibration, UL CCS has adopted two years calibration intervals. On annual basis, each measurement dipole has been evaluated and is in compliance with the following criteria:

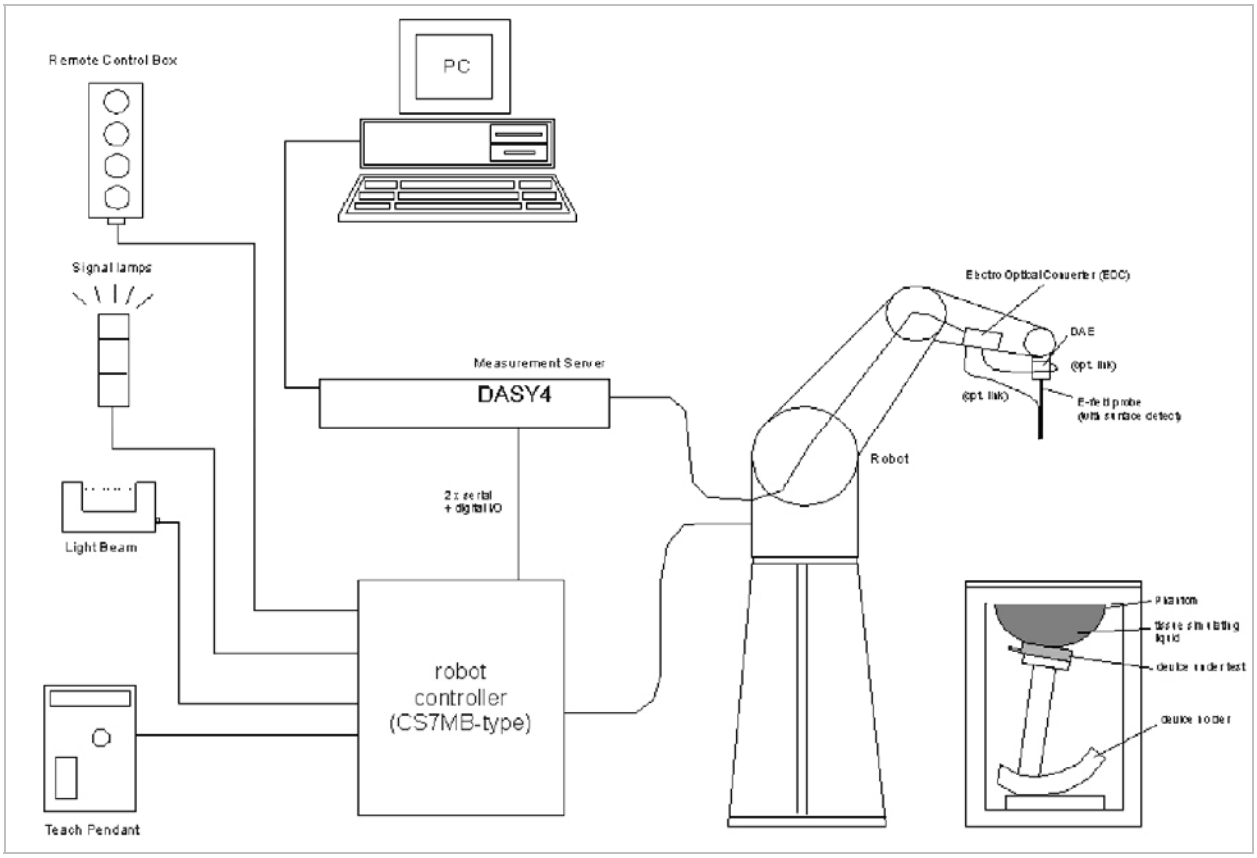
1. There is no physical damage on the dipole
2. System validation with specific dipole is within 10% of calibrated value.
3. Return-loss is within 20% of calibrated measurement (test data on file in UL CCS)
4. Impedance is within 5Ω of calibrated measurement (test data on file in UL CCS)

4.2. MEASUREMENT UNCERTAINTY

Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram

Component	error, %	Probe Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1) @ Body 835 MHz	5.50	Normal	1	1	5.50
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	0.30	Normal	1	1	0.30
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	1.00	Rectangular	1.732	1	0.58
Test Sample Related					
Test Sample Positioning	2.90	Normal	1	1	2.90
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.64	1.85
Liquid Conductivity - measurement	2.09	Normal	1	0.64	1.34
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement	1.54	Normal	1	0.6	0.92
				Combined Standard Uncertainty Uc(y) =	9.58
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 19.16 %	
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 1.52 dB	

5. SYSTEM SPECIFICATIONS



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.

6. 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

7. TISSUE DIELECTRIC 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. For frequencies in 300 MHz to 2 GHz, the measured conductivity and relative permittivity should be within ± 5% of the target values. For frequencies in the range of 2–3 GHz and above the measured conductivity should be within ± 5% of the target values. The measured relative permittivity tolerance can be relaxed to no more than ± 10%.

Reference Values of Tissue Dielectric Parameters

The body tissue parameters that have not been specified in IEEE Std 1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Std 1528.

Target Frequency (MHz)	Body	
	¬	¬ (S/m)
150	61.9	0.8
300	58.2	0.92
450	56.7	0.94
835	55.2	0.97
900	55	1.05
915	55	1.06
1450	54	1.3
1610	53.8	1.4
1800 – 2000	53.3	1.52
2450	52.7	1.95
3000	52	2.73
5800	48.2	6

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

7.1. TISSUE PARAMETERS CHECK RESULTS FOR 835 MHZ

Simulating Liquid Dielectric Parameter Check Result @ Body 835 MHz Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	56.05	Relative Permittivity (ε_r):	56.052	55.2	1.54	± 5
	e"	21.32	Conductivity (σ):	0.990	0.97	2.09	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 39%
September 27, 2010 15:03 PM

Frequency	e'	e"
790000000.	56.3945	21.8003
795000000.	56.3613	21.7732
800000000.	56.3435	21.7197
805000000.	56.2978	21.6906
810000000.	56.2914	21.5857
815000000.	56.2526	21.5309
820000000.	56.2163	21.4706
825000000.	56.1447	21.3937
830000000.	56.0717	21.3457
835000000.	**56.0523**	**21.3189**
840000000.	56.0123	21.2856
845000000.	55.9246	21.2612
850000000.	55.8570	21.2218
855000000.	55.8030	21.2203
860000000.	55.7645	21.2281
865000000.	55.7050	21.2746
870000000.	55.6266	21.2921
875000000.	55.5394	21.3063
880000000.	55.5200	21.3130
885000000.	55.4320	21.3504
890000000.	55.3627	21.3337
895000000.	55.3424	21.2936
900000000.	**55.3241**	**21.2701**
905000000.	55.3250	21.1964
910000000.	55.3343	21.1656
915000000.	55.3401	21.0765
920000000.	55.3163	21.0311
925000000.	55.3279	20.9862
930000000.	55.2992	20.9444
935000000.	55.2732	20.9055
940000000.	55.2477	20.9007
945000000.	55.1822	20.9120
950000000.	55.1228	20.9032
955000000.	55.0377	20.9191

The conductivity (σ) can be given as:

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

where f = target f * 10^6

ε_0 = 8.854 * 10^{-12}

7.2. TISSUE PARAMETERS CHECK RESULTS FOR 1900 MHZ

Simulating Liquid Dielectric Parameter Check Result @ Body 1900 MHz Measured by: Devin Chang

f (MHz)	Muscle Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1900	e'	53.753	Relative Permittivity (ϵ_r):	53.7532	53.3	0.85	± 5
	e"	14.232	Conductivity (σ):	1.50436	1.52	-1.03	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 39%
September 27, 2010 08:03 AM

Frequency	e'	e"
1710000000.	54.4118	13.5844
1720000000.	54.3789	13.6179
1730000000.	54.3659	13.6491
1740000000.	54.3360	13.7090
1750000000.	54.3085	13.7307
1760000000.	54.2601	13.7753
1770000000.	54.2191	13.8029
1780000000.	54.1722	13.8243
1790000000.	54.1300	13.8609
1800000000.	54.0906	13.9031
1810000000.	54.0491	13.9500
1820000000.	54.0146	13.9884
1830000000.	53.9647	14.0225
1840000000.	53.9406	14.0610
1850000000.	53.9062	14.1042
1860000000.	53.8905	14.1249
1870000000.	53.8639	14.1637
1880000000.	53.8241	14.1866
1890000000.	53.7912	14.2174
1900000000.	**53.7532**	**14.2324**
1910000000.	53.7015	14.2664

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

8. SYSTEM VERIFICATION

The system performance check is performed prior to any usage of the system in order to verify SAR system measurement accuracy. The system performance check verifies that the system operates within its specifications of ±10%.

Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Head or 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 7x7x7 fine cube was chosen for cube
- Distance between probe sensors and phantom surface was set to 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW
- The results are normalized to 1 W input power.

Reference SAR Values for HEAD & BODY-tissue from calibration certificate of SPEAG.

System validation dipole	Cal. certificate #	Cal. date	SAR Avg (mW/g)		
			Tissue:	Head	Body
D835V2	D835V2-4d002_Apr09	4/23/09	SAR_{1g}:	9.64	9.96
			SAR_{10g}:	6.28	6.56
D1900V2	D1900V2-5d043_Nov09	11/24/09	SAR_{1g}:	39.8	40.4
			SAR_{10g}:	20.7	21.4

8.1. SYSTEM VERIFICATION RESULTS FOR D835V2

Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Devin Chang

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D835V2	9/27/10	SAR_{1g}:	10.2	9.96	2.41	±10
		SAR_{10g}:	6.75	6.56	2.90	

8.2. SYSTEM VERIFICATION RESULTS FOR D1900V2

Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Devin Chang

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D1900V2	9/27/10	SAR_{1g}:	40.7	40.4	0.74	±10
		SAR_{10g}:	21.6	21.4	0.93	

SYSTEM CHECK PLOT

Date/Time: 9/27/2010 3:35:57 PM

Test Laboratory: Compliance Certification Services

System Performance Check - D835V2

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:xxx

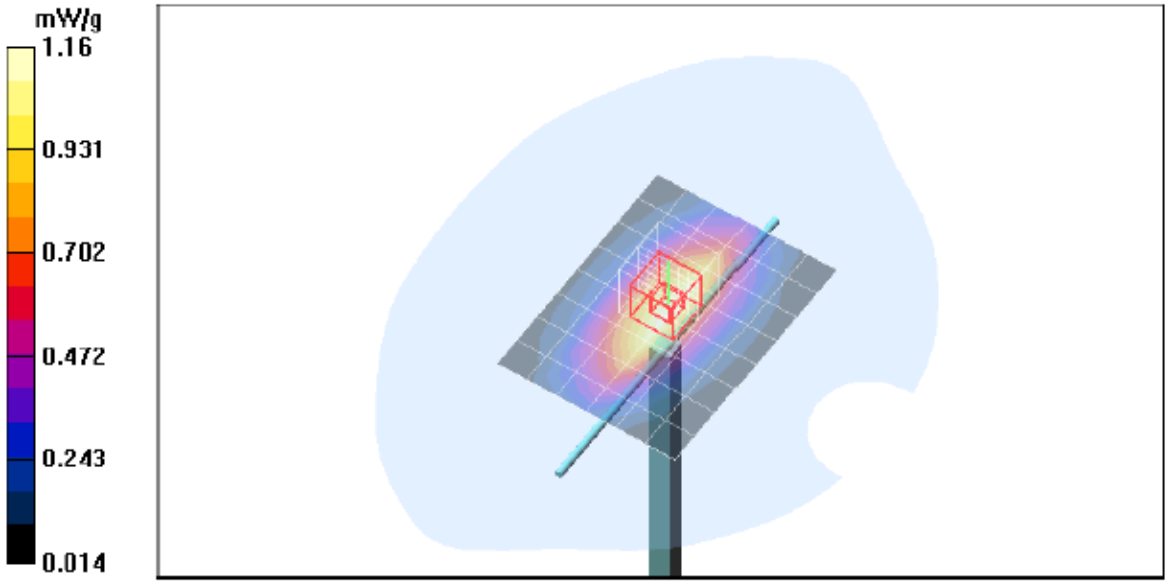
Communication System: CW 835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 56.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(10.18, 10.18, 10.18); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=100 mW/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.16 mW/g

d=15mm, Pin=100 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 34.3 V/m; Power Drift = 0.054 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.675 mW/g
Maximum value of SAR (measured) = 1.20 mW/g



SYSTEM CHECK – Z Plot

Date/Time: 9/27/2010 3:53:36 PM

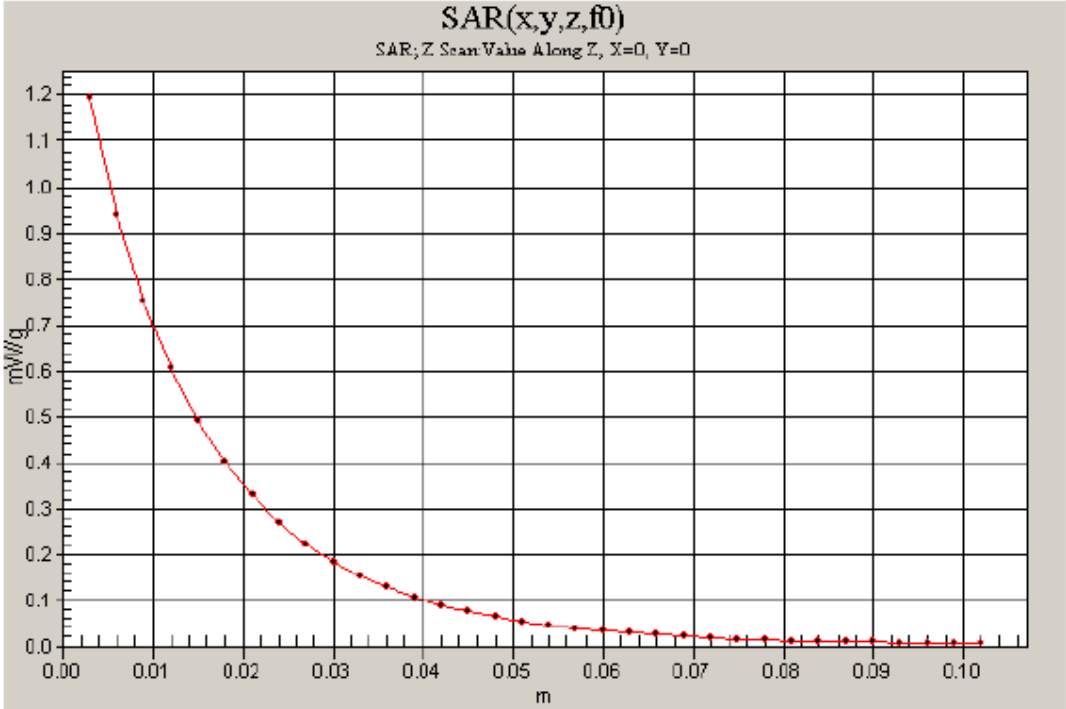
Test Laboratory: Compliance Certification Services

System Performance Check - D835V2

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:xxx

Communication System: CW 835; Frequency: 835 MHz;Duty Cycle: 1:1

d=15mm, Pin=100 mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 1.19 mW/g



SYSTEM CHECK PLOT

Date/Time: 9/27/2010 8:41:17 AM

Test Laboratory: Compliance Certification Services

System Performance Check - D1900V2

DUT: Dipole; Type: D1900V2; Serial: 5d043

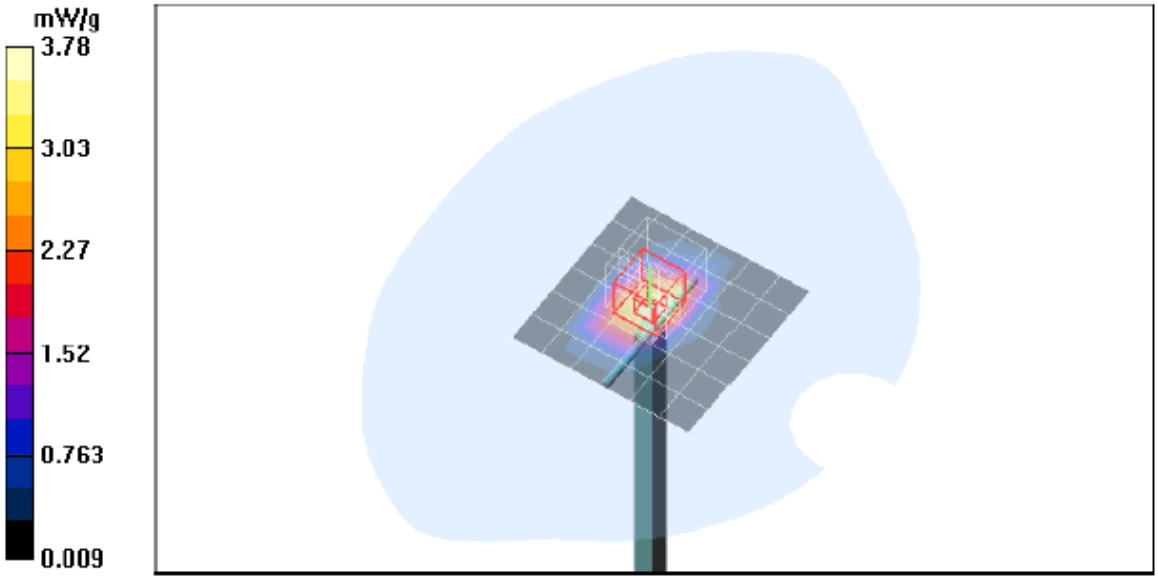
Communication System: System Check Signal - CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.5 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 25.0 deg. C; Liquid Temperature: 24.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(8.04, 8.04, 8.04); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.78 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.1 V/m; Power Drift = 0.038 dB
Peak SAR (extrapolated) = 7.29 W/kg
SAR(1 g) = 4.07 mW/g; SAR(10 g) = 2.16 mW/g
Maximum value of SAR (measured) = 5.14 mW/g



SYSTEM CHECK – Z Plot

Date/Time: 9/27/2010 8:58:05 AM

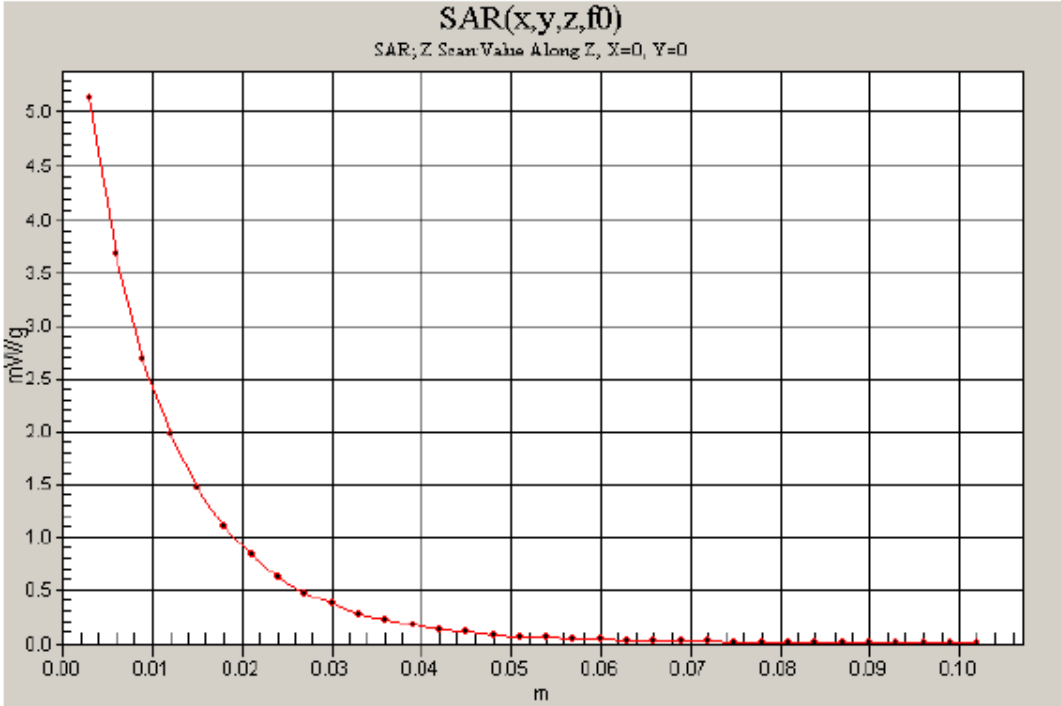
Test Laboratory: Compliance Certification Services

System Performance Check - D1900V2

DUT: Dipole; Type: D1900V2; Serial: 5d043

Communication System: System Check Signal - CW; Frequency: 1900 MHz;Duty Cycle: 1:1

d=10mm, Pin=100mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 5.14 mW/g



9. RF OUTPUT POWER VERIFICATION

Maximum output power is verified on the Low, Middle and High channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E for 1xRTT, section 3.1.2.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rel. 0 and section 4.3.4 of 3GPP2 C.S0033-A for Rev. A

9.1. RF POWER OUTPUT FOR 1xRTT

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

Application	Rev, License
CDMA2000 Mobile Test	B.13.08, L

- Call Setup > Shift & Preset
- Cell Info > Cell Parameters > System ID (SID) > 8
  > Network ID (NID) > 65535
- Protocol Rev > 6 (IS-2000-0)
- Radio Config (RC) > Please see following table or details
- FCH Service Option (SO) Setup > Please see following table or details
- Traffic Data Rate > Full
- TDSO SCH Info > F-SCH Parameters > F-SCH Data Rate > 153.6 kbps
  > R-SCH Parameters > R-SCH Data Rate > 153.6 kbps
- Rvs Power Ctrl > Active bits
  - Rvs Power Ctrl > All Up bits (Maximum TxPout)

RF Output Power for Cellular Band

Radio Configuration (RC)	Service Option (SO)	Conducted Output Power (dBm)		
		Ch. 1013 / 824.7 MHz	Ch. 384 / 836.52 MHz	Ch. 777 / 848.31 MHz
		Average	Average	Average
RC1	2 (Loopback)	23.7	23.8	23.7
	55 (Loopback)	23.8	23.9	23.8
RC2	9 (Loopback)	23.7	23.8	23.7
	55 (Loopback)	23.7	23.8	23.7
RC3	2 (Loopback)	23.8	23.9	23.7
	55 (Loopback)	23.8	23.9	23.7
	32 (+ F-SCH)	23.8	**23.9**	23.7
	32 (+ SCH)	23.8	23.9	23.7
RC4	2 (Loopback)	23.8	23.9	23.7
	55 (Loopback)	23.8	23.9	23.7
	32 (+ F-SCH)	23.8	23.9	23.7
	32 (+ SCH)	23.7	23.9	23.7
RC5	9 (Loopback)	23.8	23.9	23.7
	55 (Loopback)	23.8	23.9	23.7

RF Output Power for PCS Band

Radio Configuration (RC)	Service Option (SO)	Conducted Output Power (dBm)		
		Ch. 25 / 1851.25 MHz	Ch. 600 / 1880 MHz	Ch. 1175 / 1908.75 MHz
		Average	Average	Average
RC1	2 (Loopback)	24.2	24.2	23.8
	55 (Loopback)	24.2	24.2	23.8
RC2	9 (Loopback)	24.2	24.1	23.8
	55 (Loopback)	24.2	24.2	23.9
RC3	2 (Loopback)	24.2	24.2	23.8
	55 (Loopback)	24.2	24.2	23.8
	32 (+ F-SCH)	24.3	24.2	23.9
	32 (+ SCH)	24.3	24.2	23.9
RC4	2 (Loopback)	24.1	24.2	23.8
	55 (Loopback)	24.2	24.1	23.9
	32 (+ F-SCH)	24.2	24.2	23.9
	32 (+ SCH)	24.3	24.2	23.9
RC5	9 (Loopback)	24.2	24.2	23.8
	55 (Loopback)	24.2	24.2	23.7

9.2. RF POWER OUTPUT FOR EVDO REL 0

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

Application	Rev, License
1xEV-DO Terminal Test	A.09.13

EVDO Release 0 - RTAP

- Call Setup > Shift & Preset
- Call Control:
  - Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
  - Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Call Parms:
  - Cell Power > -105.5 dBm/1.23 MHz
  - Cell Band > (Select US Cellular or US PCS)
  - Channel > (Enter channel number)
  - Application Config > Enhanced Test Application Protocol > RTAP
  - RTAP Rate > 153.6 kbps
  - Rvs Power Ctrl > Active bits
  - Protocol Rel > 0 (1xEV-DO)
- Press “Start Data Connection” when “Session Open” appear in “Active Cell”
- Rvs Power Ctrl > All Up bits (Maximum TxPout)

EVDO Release 0 - FTAP

- Call Setup > Shift & Preset
- Call Control:
  - Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
  - Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Call Parms:
  - Cell Power > -105.5 dBm/1.23 MHz
  - Cell Band > (Select US Cellular or US PCS)
  - Channel > (Enter channel number)
  - Application Config > Enhanced Test Application Protocol > FTAP (default)
  - FTAP Rate > 307.2 kbps (2 Slot, QPSK)
  - Rvs Power Ctrl > Active bits
  - Protocol Rel > 0 (1xEV-DO)
- Press “Start Data Connection” when “Session Open” appear in “Active Cell”
- Rvs Power Ctrl > All Up bits (Maximum TxPout)

RF Power Output for EV-DO Rel 0

Cell Band

FTAP Rate	RTAP Rate	Channel	f (MHz)	Conducted pwr (dBm) Average
307.2 kbps (2 slot, QPSK)	153.6 kbps	1013	824.70	23.7
		384	836.52	23.8
		777	848.31	23.7

PCS Band

FTAP Rate	RTAP Rate	Channel	f (MHz)	Conducted pwr (dBm) Average
307.2 kbps (2 slot, QPSK)	153.6 kbps	25	1851.25	24.3
		600	1880.00	24.1
		1175	1908.75	23.8

9.3. RF POWER OUTPUT FOR EVDO REV A

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

Application	Rev, License
1xEV-DO Terminal Test	A.09.13

EVDO Release A – RETAP
- Call Setup > Shift & Preset
- Cell Power > -60 dBm/1.23 MHz
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > RETAP
- R-Data Pkt Size > 4096
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 2
> PL Subtype 2 Access Channel MAC Subtype > Default (Subtype 0)
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration >16 Slots > ACK R-Data After > Subpacket 0 (All ACK)
- Rvs Power Ctrl > All Up bits (to get the maximum power)

EVDO Release A - FETAP
- Call Setup > Shift & Preset
- Cell Power > -60 dBm/1.23 MHz
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > FETAP
- F-Traffic Format > 4 (1024, 2,128) Canonical (307.2k, QPSK)
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 2
> PL Subtype 2 Access Channel MAC Subtype > Default (Subtype 0)
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration >16 Slots > ACK R-Data After > Subpacket 0 (All ACK)
- Rvs Power Ctrl > All Up bits (to get the maximum power)

RF Power Output Results for EV-DO Rev A

Cell Band

FETAP-Traffic Format	RETAP-Data Payload Size	Channel	f (MHz)	Conducted pwr (dBm) Average
307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	1013	824.70	23.8
		384	836.52	23.9
		777	848.31	23.8

PCS Band

FETAP-Traffic Format	RETAP-Data Payload Size	Channel	f (MHz)	Conducted pwr (dBm) Average
307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	25	1851.25	24.2
		600	1880.00	24.1
		1175	1908.75	23.9

10. KDB 941225 TEST REDUCTION CONSIDERATION

CDMA2000 1x handsets Test configurations based on KDB 941225 SAR test for 3G devices v02

Body SAR

1. SAR for RC3
    1) With DUT configured using TDSO/SO32, to transmit at full rate on FCH with all other code channels disabled.
    2) For multiples code channels (FCH + SCH_n)
        (1) Not required when the maximum average output of each RF channel is less than 0.25 dB higher than as measured with FCH only.
        (2) Else SAR is measured on the maximum output channel (FCH + SCH_n) with FCH at full rate and SCH_0 enabled at 9600 bps, for exposure configuration that produced highest SAR for that channel with FCH only.
2. SAR for RC1
    1) Not required when the maximum average output of each channel is less than 0.25 dB higher than as measured in RC3.
    2) Else SAR is measured on the maximum output channel in RC1, with Loopback Service Option SO55, at full rate, for exposure configuration that produced highest SAR for that channel in RC3.
3. Handsets with Ev-Do
    1) SAR for Release 0 (Rel. 0)
        (1) Not required when the maximum average output of each channel is less than 0.25 dB higher than as measured in RC3 (1xRTT)
        (2) Else SAR is measured on the maximum output channel, at 153.6 kbps, for exposure configuration that produced highest SAR for that channel in RC3.
    2) SAR for Revision A (Rev. A)
        (1) Not required when the maximum average output of each channel is less than as measured in Release 0, or is lees than 0.25 dB higher than as measured in RC3 (1xRTT).
        (2) Else SAR is measured on the maximum output channel, using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations (TBD: may be “for exposure configuration that produced highest SAR for that channel in RC3”)

Notes:

Based upon the power measurement in section 9.1, SAR for multiple code channel (FCH+SCH) is not required due to the output power is not ¼ dB higher than RC3/SO32.

Based upon the power measurement in section 9.2 and 9.3, SAR for 1xEVDO Rel. 0 and Rev. A power measurement is not ¼ dB higher than RC3.

Thus, **RC3/SO32** is used for all body SAR measurement.

11. SUMMARY OF TEST RESULTS

1. Top position

Band	Mode	UL Ch No.	f (MHz)	SAR (mW/g)	
				1-g	10-g
Cellular	1xRTT (RC3, SO32)	1013	824.70		
		384	836.52	**0.791**	0.526
		777	848.31		
	1xRTT(RC3, SO55)	384	836.52	0.765	0.513
PCS	1xRTT (RC3, SO32)	25	1851.25	0.899	0.588
		600	1880.00	**1.200**	0.779
		1175	1908.75	0.879	0.559
	1xRTT(RC3, SO55)	600	1880.00	1.160	0.760

2. Bottom position

Band	Mode	UL Ch No.	f (MHz)	SAR (mW/g)	
				1-g	10-g
Cellular	1xRTT (RC3, SO32)	1013	824.70		
		384	836.52	0.776	0.517
		777	848.31		
PCS	1xRTT (RC3, SO32)	25	1851.25	0.857	0.564
		600	1880.00	1.120	0.731
		1175	1908.75	0.797	0.509

3. Edge position

Band	Mode	UL Ch No.	f (MHz)	SAR (mW/g)	
				1-g	10-g
Cellular	1xRTT (RC3, SO32)	1013	824.70		
		384	836.52	0.182	0.112
		777	848.31		
PCS	1xRTT (RC3, SO32)	25	1851.25	0.603	0.351
		600	1880.00	0.915	0.528
		1175	1908.75	0.784	0.446

11.1. WORST-CASE SAR PLOTS

Date/Time: 9/27/2010 4:13:11 PM

Test Laboratory: Compliance Certification Services

Cell 850_Top mode

DUT: Sierra Wireless; Type: NA; Serial: NA

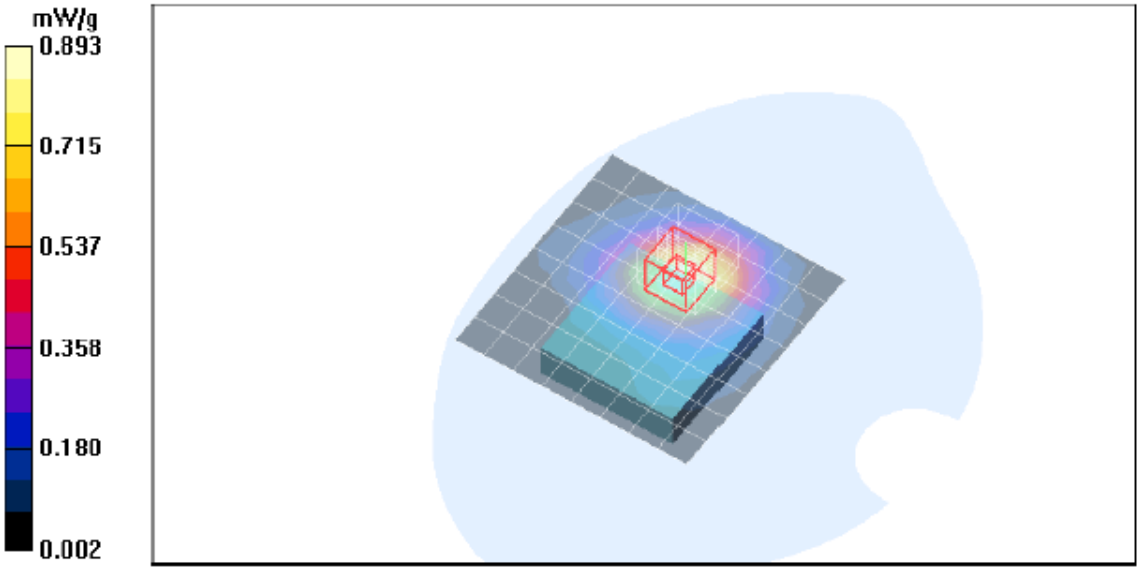
Communication System: CDMA Cell Band; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; σ = 0.992 mho/m; ε_r = 56; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(10.18, 10.18, 10.18); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

1xRTT SO32_M-ch/Area Scan (9x9x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.893 mW/g

1xRTT SO32_M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 30.4 V/m; Power Drift = -0.138 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.791 mW/g; SAR(10 g) = 0.526 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.918 mW/g



Cell Band Worst-case Z-axis Plot

Date/Time: 9/27/2010 7:15:34 PM

Test Laboratory: Compliance Certification Services

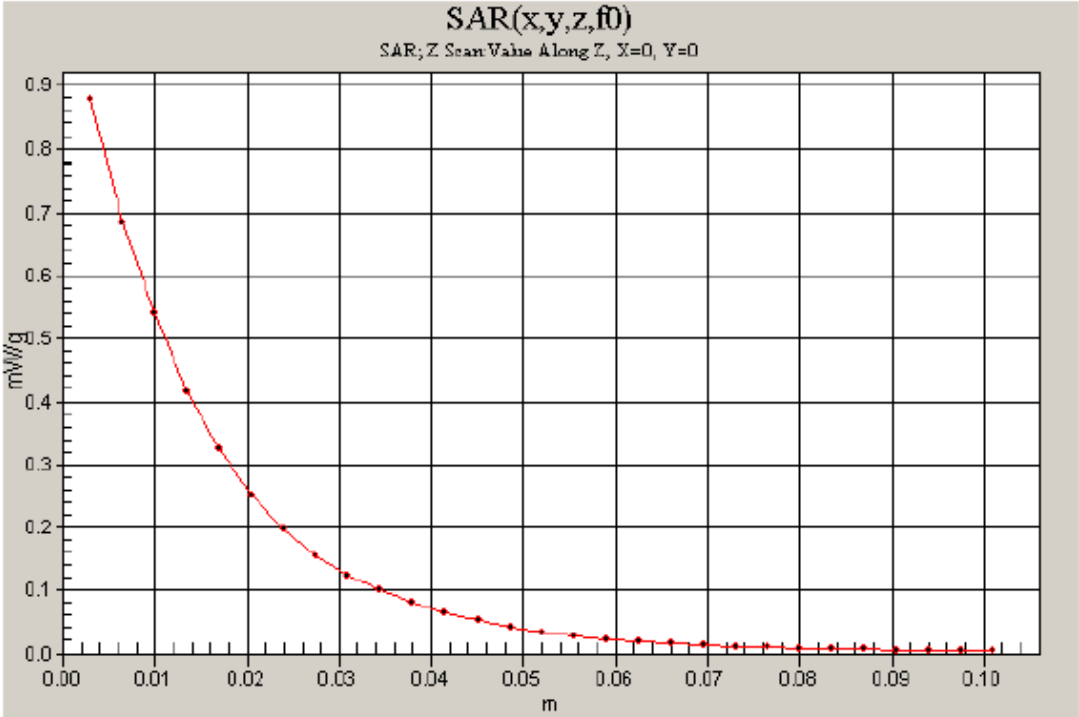
Cell 850_Top mode

DUT: Sierra Wireless; Type: NA; Serial: NA

Communication System: CDMA Cell Band; Frequency: 836.52 MHz;Duty Cycle: 1:1

1xRTT SO32_M-ch/Z Scan (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=3.5mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.879 mW/g



PCS BAND

Date/Time: 9/27/2010 10:18:24 AM

Test Laboratory: Compliance Certification Services

PCS 1900_Top mode

DUT: Sierra Wireless; Type: NA; Serial: NA

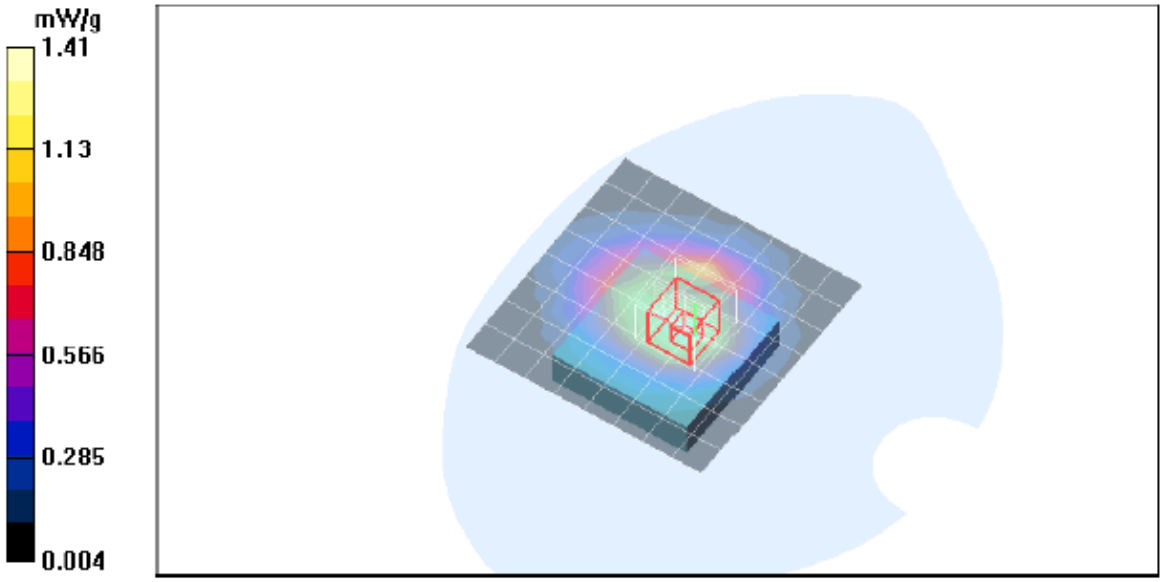
Communication System: CDMA PCS Band; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(8.04, 8.04, 8.04); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

1xRTT SO32_M-ch/Area Scan (9x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.41 mW/g

1xRTT SO32_M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 30.9 V/m; Power Drift = -0.179 dB
Peak SAR (extrapolated) = 1.75 W/kg
SAR(1 g) = 1.2 mW/g; SAR(10 g) = 0.779 mW/g
Maximum value of SAR (measured) = 1.38 mW/g



PCS Band Worst-case Z-axis Plot

Date/Time: 9/27/2010 10:42:18 AM

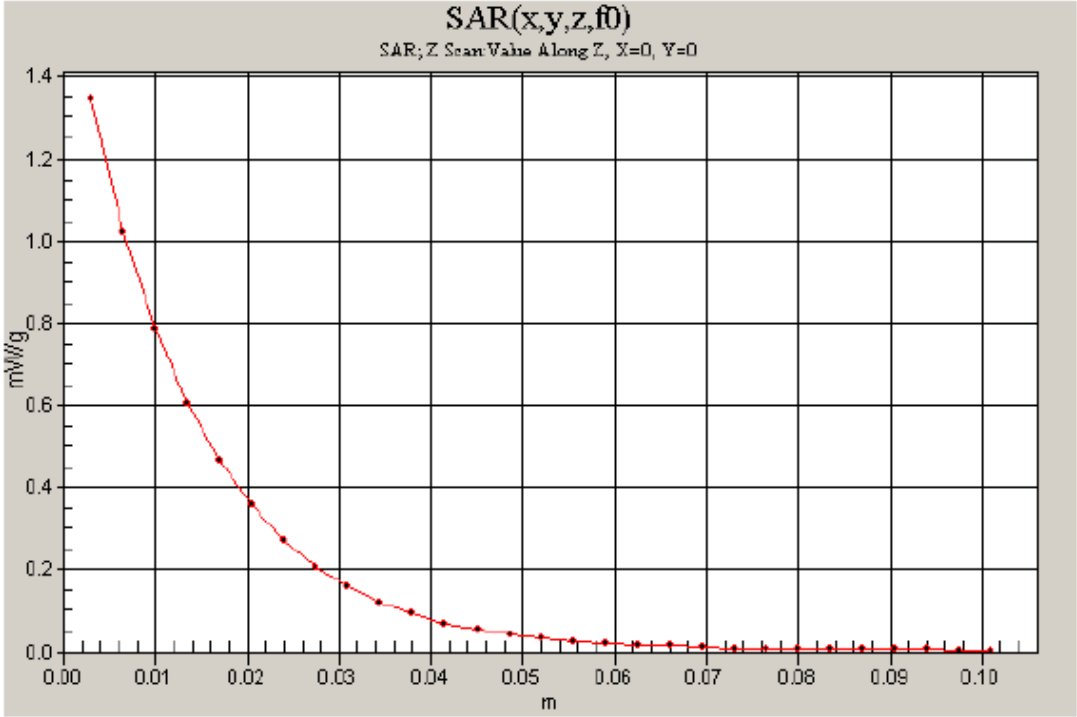
Test Laboratory: Compliance Certification Services

PCS 1900_Top mode

DUT: Sierra Wireless; Type: NA; Serial: NA

Communication System: CDMA PCS Band; Frequency: 1880 MHz;Duty Cycle: 1:1

1xRTT SO32_M-ch/Z Scan (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=3.5mm
Maximum value of SAR (measured) = 1.35 mW/g



12. KDB 648474 SIMULTANEOUS TRANSMISSION CONSIDERATION

SUMMARY OF SAR EVALUATION FOR HANDSET DEVICE WITH MULTIPLE TRANSMITTERS

Individual Transmitter	Stand-alone SAR
WWAN	Yes
WiFi	Yes
WiMAX	Yes

SIMULTANEOUS TRANSMISSION

- WWAN can transmit simultaneously with WiFi
- WWAN can not transmit simultaneously with WiMAX

Highest SAR value and the sum of the 1-g SAR for WWAN & WiFi

Highest 1-g SAR (W/kg)			∑ 1-g SAR (W/kg)
WWAN		WiFi	
Part 22	0.791	0.200	0.991
Part 24	1.12		1.320

CONCLUSION:

Simultaneous transmission	Require for Simultaneous Transmission SAR with volume scans
WWAN & WiFi	No (the sum of the 1-g SAR is < 1.6 W/kg)
WWAN & WiMAX	No (WWAN can not transmit simultaneously with WiMAX)

13. ATTACHMENTS

No.	Contents	No. of page (s)
1-1	SAR Test Plots for Cellular band	5
1-2	SAR Test Plots for PCS band	11
2	Certificate of E-Field Probe - EX3DV3 SN3531	11
3	Certificate of System Validation Dipole D835V2 SN:4d002	9
4	Certificate of System Validation Dipole D1900V2 SN:5d043	9