FCC OET BULLETIN 65 SUPPLEMENT C

SAR EVALUATION REPORT
(WiMAX Portion)

For

CDMA+ WIMAX + WIFI MOBILE HOT SPOT

MODEL NUMBER: AirCard W802S

FCC ID: N7N-MHS802

REPORT NUMBER: 10U13412-5A

ISSUE DATE: JANUARY 12, 2011

Prepared for

SIERRA WIRELESS INC.
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CARLSBAD, CA 92008

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	Updated report based on reviewer’s comments, includes: 1. Antenna-to-antenna distance for WiMAX antenna. 2. 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 23 – October 5, 2010

FCC rule parts	Freq. range (MHz)	Highest 1-g SAR (W/kg)	Limit (W/kg)
27	2498.5 – 2687.5	0.442 (5MHz/16QAM) Edge position (TX2) (w/ 10 mm separation distance)	1.6
	2501 – 2685	0.394 (10MHz/16QAM) Edge position (TX2) (w/ 10 mm separation distance)	

Applicable Standards	Test Results
FCC OET Bulletin 65 Supplement C 01-01 and the following SAR test procedures: - KDB 648474 D01 SAR Handsets Multi Xmiter and Ant, v01r05 - KDB 615223 - 802 16e WiMax SAR Guidance	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 SAR test procedures:

- KDB 648474 D01 SAR Handsets Multi Xmiter and Ant, v01r05
- KDB 615223 - 802 16e WiMax SAR Guidance

3. FACILITIES AND ACCREDITATION

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

UL 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		
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	22	2011
Thermometer	ERTCO	639-1S	1718	7	19	2011
Data Acquisition Electronics	SPEAG	DAE3 V1	500	9	15	2010
Data Acquisition Electronics	SPEAG	DAE3 V1	427	7	21	2011
System Validation Dipole	SPEAG	D2600V2*	1006	4	22	2012
ESG Vector Signal Generator	Agilent	E4438C	US44271971	9	28	2011
Power Meter	Giga-tronics	8651A	8651404	3	13	2012
Power Sensor	Giga-tronics	80701A	1834588	3	13	2012
Amplifier	Mini-Circuits	ZVE-8G	90606	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
Simulating Liquid	SPEAG	M2600	N/A	Within 24 hrs of first test		

***Note:** Per KDB 450824 D02 requirements for dipole calibration, UL CCS has adopted three 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

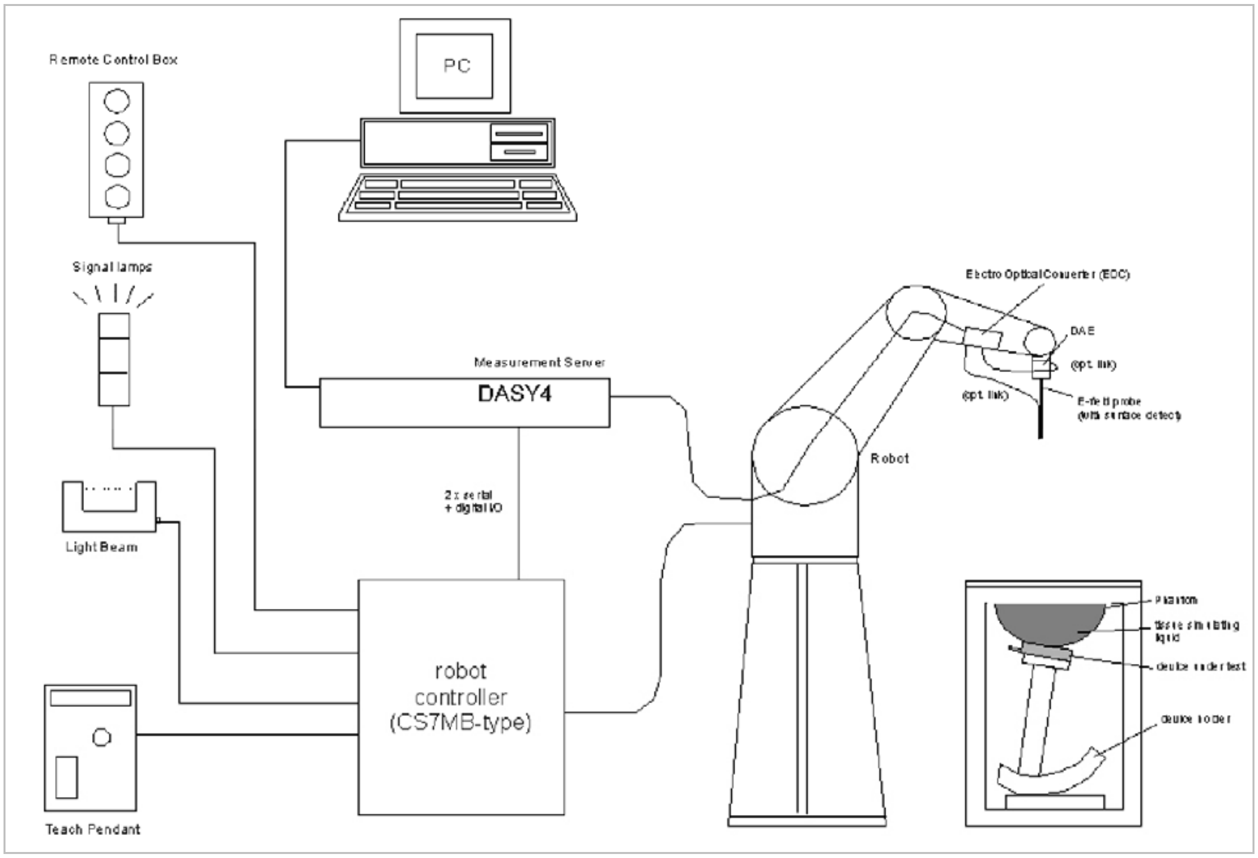
Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram

Component	error, %	Probe Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1) @ Body 2600 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	4.17	Normal	1	0.64	2.67
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement	-2.45	Normal	1	0.6	-1.47
Combined Standard Uncertainty Uc(y) =					9.92
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				19.84	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.57	dB

Measurement uncertainty for 300 MHz to 3 GHz averaged over 10 gram

Component	error, %	Probe Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1) @ 2600 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	0.43	1.24
Liquid Conductivity - measurement	4.17	Normal	1	0.43	1.79
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.49	1.41
Liquid Permittivity - measurement uncertainty	-2.45	Normal	1	0.49	-1.20
Combined Standard Uncertainty Uc(y), % =					9.53
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				19.07	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.52	dB

5. 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.

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		2600
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04	0.05
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	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	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	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	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7	27.2
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5	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	2.16

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. SIMULATING LIQUID 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 for Body Phantom

The 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)	Body	
	ε_r	σ (S/m)
2450	52.7	1.95
2500	52.6	2.02
2590	52.5	2.15
2600	52.5	2.16
2690	52.4	2.29

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

7.1. SIMULATING LIQUID CHECK RESULTS

Simulating Liquid Dielectric Parameter Check Result @ Body 2600 MHz Measured by: Devin Chang

Simulating Liquid		Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Depth (cm)							
2500	15	e'	51.8034	Relative Permittivity (ϵ_r):	51.8034	52.6	-1.51	± 5
		e''	15.0222	Conductivity (σ):	2.08926	2.02	3.43	± 5
2590	15	e'	51.4825	Relative Permittivity (ϵ_r):	51.4825	52.5	-1.94	± 5
		e''	15.4010	Conductivity (σ):	2.21905	2.15	3.21	± 5
2600	15	e'	51.4463	Relative Permittivity (ϵ_r):	51.4463	52.5	-2.03	± 5
		e''	14.4427	Conductivity (σ):	2.08901	2.16	-3.32	± 5
2690	15	e'	51.1156	Relative Permittivity (ϵ_r):	51.1156	52.4	-2.45	± 5
		e''	15.8014	Conductivity (σ):	2.36465	2.29	3.26	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 39%
September 23, 2010 11:53 AM

Frequency	e'	e''
2470000000.	51.9057	14.8940
2480000000.	51.8706	14.9381
2490000000.	51.8369	14.9805
2500000000.	**51.8034**	**15.0222**
2510000000.	51.7644	15.0680
2520000000.	51.7279	15.1078
2530000000.	51.6946	15.1510
2540000000.	51.6601	15.1954
2550000000.	51.6228	15.2352
2560000000.	51.5889	15.2778
2570000000.	51.5514	15.3201
2580000000.	51.5167	15.3599
2590000000.	**51.4825**	**15.4010**
2600000000.	**51.4463**	**15.4427**
2610000000.	51.4090	15.4836
2620000000.	51.3712	15.5234
2630000000.	51.3330	15.5637
2640000000.	51.2981	15.6048
2650000000.	51.2627	15.6456
2660000000.	51.2252	15.6842
2670000000.	51.1896	15.7247
2680000000.	51.1525	15.7637
2690000000.	**51.1156**	**15.8014**
2700000000.	51.0770	15.8403
2710000000.	51.0352	15.8792

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 Parameter Check Result @ Body 2600 MHz Measured by: Devin Chang

Simulating Liquid		Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Depth (cm)							
2500	15	e'	52.0356	Relative Permittivity (ϵ_r):	52.0356	52.6	-1.07	± 5
		e"	15.1303	Conductivity (σ):	2.10429	2.02	4.17	± 5
2590	15	e'	51.7156	Relative Permittivity (ϵ_r):	51.7156	52.5	-1.49	± 5
		e"	15.4396	Conductivity (σ):	2.22461	2.15	3.47	± 5
2600	15	e'	51.6551	Relative Permittivity (ϵ_r):	51.6551	52.5	-1.63	± 5
		e"	15.5251	Conductivity (σ):	2.24557	2.16	3.92	± 5
2690	15	e'	51.3414	Relative Permittivity (ϵ_r):	51.3414	52.4	-2.02	± 5
		e"	15.8542	Conductivity (σ):	2.37255	2.29	3.60	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 39%
October 05, 2010 08:08 AM

Frequency	e'	e"
2480000000.	52.1497	14.9828
2490000000.	52.0842	15.0505
2500000000.	**52.0356**	**15.1303**
2510000000.	52.0031	15.2074
2520000000.	51.9964	15.2606
2530000000.	51.9988	15.2936
2540000000.	51.9999	15.3035
2550000000.	51.9831	15.3010
2560000000.	51.9384	15.3031
2570000000.	51.8753	15.3198
2580000000.	51.7929	15.3661
2590000000.	**51.7156**	**15.4396**
2600000000.	**51.6551**	**15.5251**
2610000000.	51.6190	15.6069
2620000000.	51.6021	15.6635
2630000000.	51.5981	15.6928
2640000000.	51.5856	15.7022
2650000000.	51.5658	15.7077
2660000000.	51.5340	15.7172
2670000000.	51.4850	15.7395
2680000000.	51.4173	15.7871
2690000000.	**51.3414**	**15.8542**
2700000000.	51.2797	15.9331
2710000000.	51.2382	16.0049
2720000000.	51.2204	16.0545

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 EX3DV4 SN3686 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
D2600V2	D2600V2-1006_Apr09	4/22/09	SAR_{1g}:		57.6
			SAR_{10g}:		25.8

8.1. SYSTEM PERFORMANCE CHECK RESULTS

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			
D2600V2	9/23/10	SAR_{1g}:	58.1	57.6	0.87	±10
		SAR_{10g}:	26.0	25.8	0.78	
D2600V2	10/5/10	SAR_{1g}:	56.3	57.6	-2.26	±10
		SAR_{10g}:	25.1	25.8	-2.71	

8.2. SYSTEM CHECK PLOTS

SYSTEM CHECK PLOT

Date/Time: 9/23/2010 12:07:16 PM

Test Laboratory: Compliance Certification Services

System Performance Check - D2600V2

DUT: D2600V2; Type: D2600V2; Serial: 1006

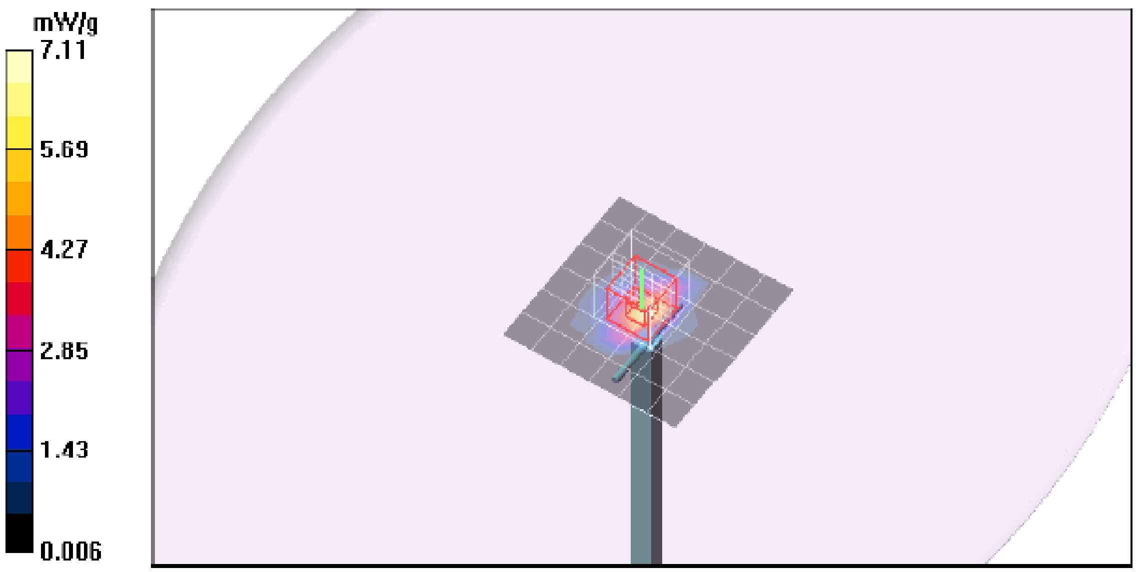
Communication System: CW 2600MHz; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 2.23 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

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(7.4, 7.4, 7.4); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- 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) = 7.11 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.0 V/m; Power Drift = 0.212 dB
Peak SAR (extrapolated) = 12.2 W/kg
SAR(1 g) = 5.81 mW/g; SAR(10 g) = 2.6 mW/g
Maximum value of SAR (measured) = 7.80 mW/g



SYSTEM CHECK – Z Plot

Date/Time: 9/23/2010 12:24:13 PM

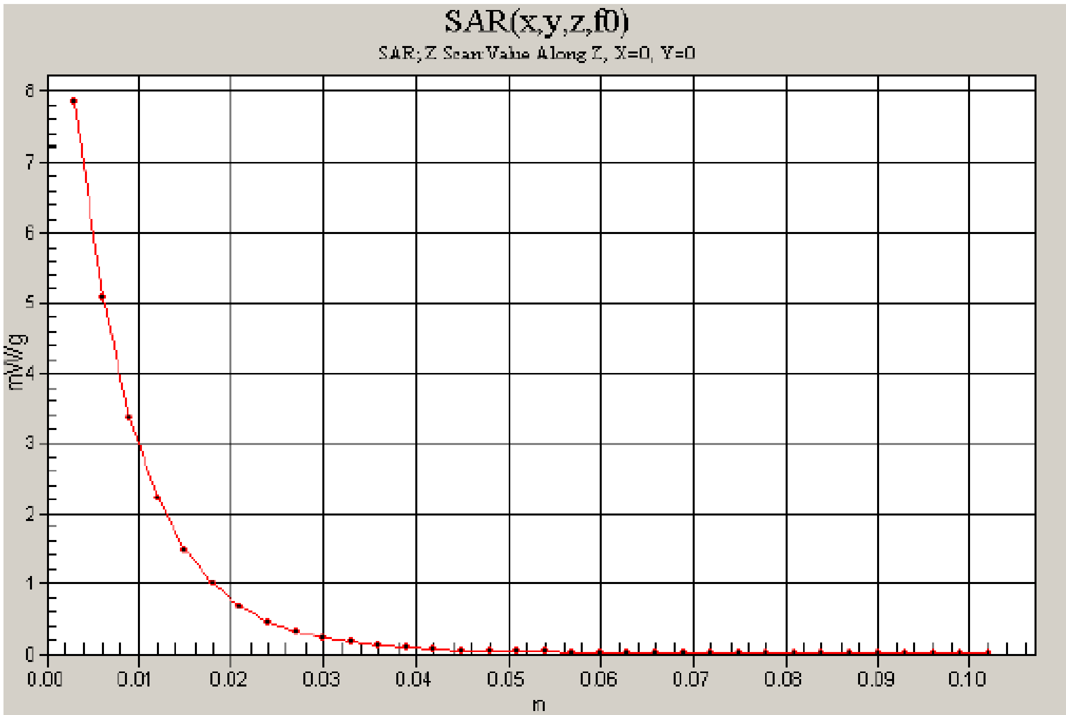
Test Laboratory: Compliance Certification Services

System Performance Check - D2600V2

DUT: D2600V2; Type: D2600V2; Serial: 1006

Communication System: CW 2600MHz; Frequency: 2600 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) = 7.85 mW/g



SYSTEM CHECK PLOT

Date/Time: 10/5/2010 8:52:56 AM

Test Laboratory: Compliance Certification Services

System Performance Check - D2600V2

DUT: D2600V2; Type: D2600V2; Serial: 1006

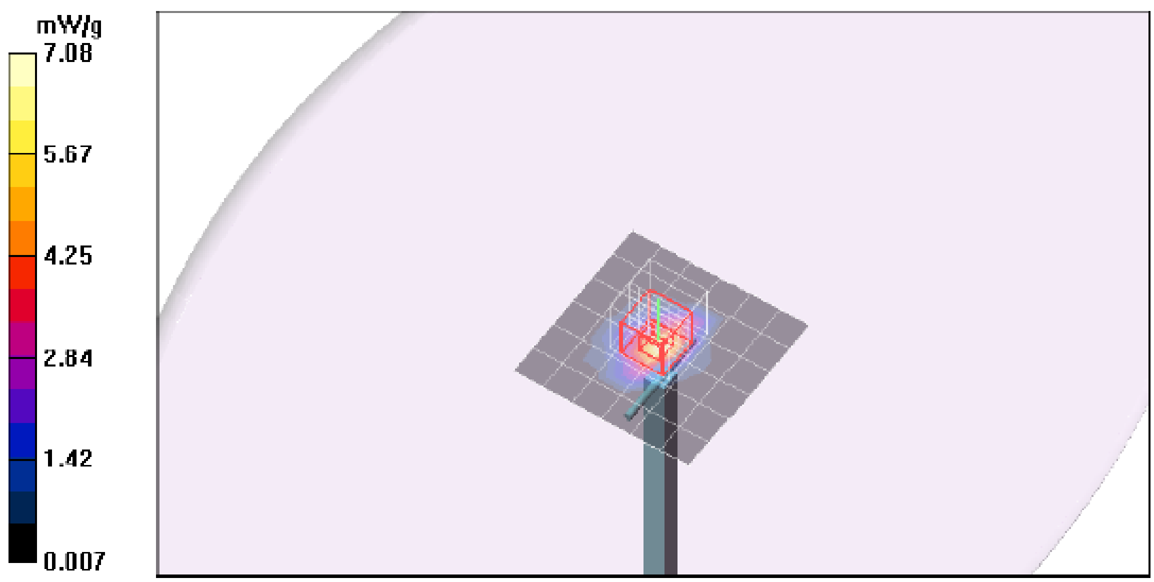
Communication System: CW 2600MHz; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 2.25 mho/m; ε_r = 51.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

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(7.4, 7.4, 7.4); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- 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) = 7.08 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.6 V/m; Power Drift = 0.246 dB
Peak SAR (extrapolated) = 11.9 W/kg
SAR(1 g) = 5.63 mW/g; SAR(10 g) = 2.51 mW/g
Maximum value of SAR (measured) = 7.42 mW/g



SYSTEM CHECK – Z Plot

Date/Time: 10/5/2010 9:09:47 AM

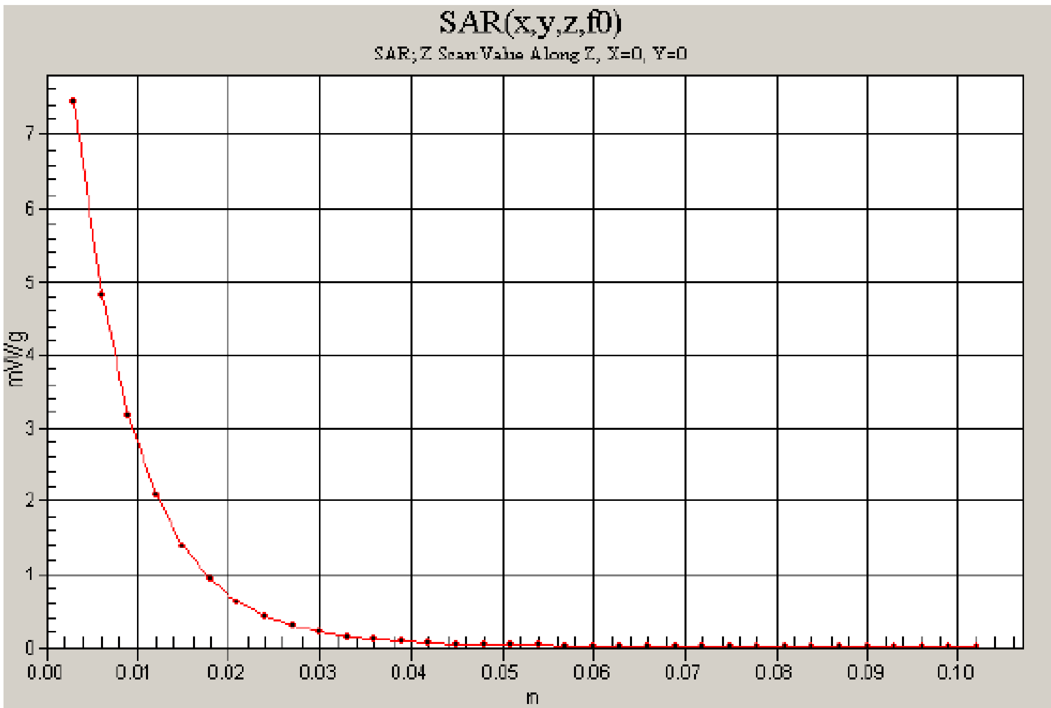
Test Laboratory: Compliance Certification Services

System Performance Check - D2600V2

DUT: D2600V2; Type: D2600V2; Serial: 1006

Communication System: CW 2600MHz; Frequency: 2600 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) = 7.44 mW/g



9. WiMax DEVICE & SYSTEM OPERATING PARAMETERS

Description	Parameter	Comment
FCC ID	N7N-MHS802	CDMA+WIMAX+WIFI MOBILE HOT SPOT
Radio Service	FCC Part 27	Rule parts
Transmit Frequency Range (MHz)	5 MHz BW: 2498.5 – 2687.5 10MHz BW:2501 - 2685	System parameter
System/Channel Bandwidth (MHz)	5MHz / 10MHz	System parameter
System Profile	Release 1.0 (Revision 1.7.1 2008)Band Class 3 Radio Profile 3A	Defined by WiMAX Forum
Modulation Schemes	QPSK, 16QAM	Identify all applicable UL modulations
Sampling Factor	28/25	System parameter
Sampling Frequency (MHz)	5 MHZ BW:5.6MHz 10MHz BW:11.2MHz	(Fs)
Sample Time (ns)	5MHz BW:178usec 10MHz BW:89.3usec	(1/Fs)
FFT Size (NFFT)	5MHz BW:512 10MHz BW:1024	(NFFT)
Sub-Carrier Spacing (kHz)	5MHz BW:10.9KHz 10MHz BW:10.9KHz	(If)
Useful Symbol time (as)	Symbol timing (NOT including guard time): 91.43us	(Tb=1/Δf)
Guard Time (as)	1/8 symbol:11.43us	(Tag=Tb/cp); cp = cyclic prefix
OFDMA Symbol Time (as)	102.86usec	(Ts=Tibet)
Frame Size (ms)	5	System parameter
TTG + RTG (as or number of symbols)	165.7usec	Idle time, system parameter
Number of DL OFDMA Symbols per Frame	29	Identify the allowed & maximum symbols, including both traffic & control symbols
Number of UL OFDMA Symbols per Frame	18	
DL:UL Symbol Ratio	29/18	For determining UL duty factor
Power Class (dBm)	Power Class 2 16QAM: 21 <= PTx,max < 25 QPSK: 23 <= PTx,max < 27	
Wave1 / Wave2	Wave 2: two antennas. Antenna1 (main) is TX/RX diversity antenna, Antenna 2(aux) is TX/RX diversity antenna. Antenna 1 and Antenna 2 cannot transmit simultaneously.	
UL Zone Types (FUSC, PUSC, OFUSC, OPUSC, AMC, TUSC1, TUSC2)	PUSC only	

<table>
<tr><td rowspan="2">Maximum Number of UL Sub-Carriers</td><th colspan="2">10 MHz BW</th><th colspan="2">5 MHz BW</th></tr>
<tr><td colspan="2">Null Sub-Carriers=184
Pilot Sub-Carriers=280
Data Sub-Carriers=560</td><td colspan="2">Null Sub-Carriers=104
Pilot Sub-Carriers=136
Data Sub-Carrier=272</td></tr>
<tr><td rowspan="5">UL Burst Maximum Average Power</td><th>Mode</th><th colspan="2">TX1</th><th>TX2</th></tr>
<tr><td>5 MHz / QPSK</td><td colspan="2">25.62 dBm</td><td>25.61 dBm</td></tr>
<tr><td>5 MHz / 16QAM</td><td colspan="2">25.62 dBm</td><td>25.52 dBm</td></tr>
<tr><td>10MHz / QPSK</td><td colspan="2">25.55 dBm</td><td>25.17 dBm</td></tr>
<tr><td>10MHz / 16QAM</td><td colspan="2">25.42 dBm</td><td>25.12 dBm</td></tr>
<tr><td>Number and type of UL Control Symbols</td><td colspan="4">3 (Ranging, CQICH, HARQ ACK/NACK)
HARQ ACKCH is used for transmission of ACK/NACK for downlink HARQ burst. HARQ allows BS to employ aggressive link adaptation to improve system throughput. CQICH is used for transmission of CQI information from MS to BS. BS may utilize this information for link adaptation and handover decision. MS is configured by BS to transmit CQI every Nth frame, which implies that CQI feedback delay is determined by BS configuration. BS determines CQI period N as a result of trade-off between CQI overhead and CQI accuracy.</td></tr>
<tr><td rowspan="5">UL Control Symbol Maximum Average Power</td><th>Mode</th><th colspan="2">TX1</th><th>TX2</th></tr>
<tr><td>5 MHz / QPSK</td><td colspan="2">364.75 mW x 5/17</td><td>363.92 mW x 5/17</td></tr>
<tr><td>5 MHz / 16QAM</td><td colspan="2">364.75 mW x 5/17</td><td>356.45 mW x 5/17</td></tr>
<tr><td>10MHz / QPSK</td><td colspan="2">358.92 mW x 5/35</td><td>328.85 mW x 5/35</td></tr>
<tr><td>10MHz / 16QAM</td><td colspan="2">348.34 mW x 5/35</td><td>325.09 mW x 5/35</td></tr>
</table>

10. EUT DESCRIPTION

a. The Sierra Wireless WiMAX Router + WiFi Router, model no: OWL is equipped with WiFi and 2.6 GHz WiMAX radio capabilities.
b. OWL transmits on 5 ms frames using 5 MHz and 10 MHz channels. The 10 MHz channel bandwidth uses 1024 sub-carriers and 35 sub-channels, with 184 null sub-carriers and 840 available for transmission, consisting of 560 data sub-carriers and 280 pilot sub-carriers. The 5 MHz channel bandwidth uses 512 sub-carriers and 17 sub-channels, with 104 null sub-carriers and 408 available for transmission, consisting 272 data sub-carriers and 136 pilot sub-carriers.
c. The 802.16e WiMAX and WiFi radio can transmit simultaneously.

10.1. WiMAX Zone Types

The device and its system are both transmitting using only PUSC zone type. This enables multiple users to transmit simultaneously within the system. FUSC, AMC and other zone types are not used by OWL for uplink transmission. The maximum DL:UL symbol ratio can be determined according to the PUSC requirements. The system transmit an odd number of symbols using DL-PUSL consisting of even multiples of traffics and control symbols plus one symbol for the preamble. Multiples of three symbols are transmitted by the device using UL-PUSC. The OFDMA symbol time allows up to 48 downlink and uplink symbols in each 5 ms frame. TTG and RTG are also included in each frame as DL/UL transmission gaps; therefore, the system can only allow 47 or less symbols per frame. The maximum DL:UL symbol ratio is determined according to these PUSC parameters for evaluating SAR compliance.

WiMAX chipset is capable of supporting the following Downlink / Uplink based upon 802.16e.

Description	Down Link	Up Link
Number of OFDM Symbols in Down Link and Up Link for 5 MHz and 10 MHz Bandwidth	35	12
	34	13
	32	15
	31	16
	30	17
	29	18
	28	19
	27	20
	26	21

10.2. Duty Factor and Crest Factor Considerations

Vector Waveform File	Channel BW	Modulation	DL:UL Ratio	Calculated Duty Factor	Calculated Crest Factor
T5D29U184Q34S85	5 MHz	QPSK	29:18:00	30.86%	3.24
T5D29U1816Q34S85	5 MHz	16QAM	29:18:00	30.86%	3.24
T10D29U184Q34S175	10 MHz	QPSK	29:18:00	30.86%	3.24
T10D29U1816Q12S175	10 MHz	16QAM	29:18:00	30.86%	3.24

Crest Factor: The SAR of this device is measured using a DL: UL symbol ratio of 29:18, consisting of 15 traffic symbols and 3 control symbols are not activated. A duty factor of (15 x 102.857µs)/5000µs = 30.86% is applied by the SAR system to calculate the measured SAR. The cf factor, a conversion factor related to 1/(duty factor), used by SAR measurement systems for periodic pulse signal compensation is set to 1/0.3086 = 3.24.

Note: On the spectrum analyzer plots, very small power level corresponding to the noise floor of the TX in these first three control symbols. The remaining 15 symbols are fully occupied with a TX burst which uses all slots and therefore all sub channels.

10.3. SAR Scaling Consideration

a. All Test Vectors are performing with all UL symbols at maximum power

b. Although the chipset can supply higher downlink-to-uplink (DL/UL) symbol ratios, W801 SAR values are scaled up or down based upon BRS/EBS WiMAX operators with agreements to transmit at a maximum DL/UL symbol ratio of 29:18 Vs actual UL traffic symbols were used during SAR measurement. Therefore, the maximum transmission duty factor supported by the chipset is not applicable for this device. The system can transmit up to 48 OFDMA symbols in each 5 ms frame, including 1.6 symbols for TTG and RTG.

c. UL Burst Max. Average Power: was measured using spectrum analyzer gated to measure the power only during TX "ON" stage.

Mode	TX1		TX2	
	dBm	mW	dBm	mW
5 MHz / QPSK	25.62	364.75	25.61	363.92
5 MHz / 16QAM	25.62	364.75	25.52	356.45
10 MHz / QPSK	25.55	358.92	25.17	328.85
10 MHz / 16QAM	25.42	348.34	25.12	325.09

d. The control channels may occupy up to 5 slots during normal operation. A slot is a sub-channel with the duration of 3 symbols. There are a total of 35 slots in the 10 MHz channel configuration.

e. The control channels may occupy up to 5 slots during normal operation. A slot is a sub-channel with the duration of 3 symbols. There are a total of 17 slots in the 5 MHz channel configuration.

f. When the device is transmitting at max rated power, the output power for the control symbol and the target output power for UL:DL ratio of 29:18 is calculated as the following:

Ch. BW	Mode	Max Rated Pwr (mW)	Max pwr control symbol (max. rated pwr x 5 / 17)	29:18 DL:UL ration Pwr (mW) ((ctrl_symb_pwr x 3) + (max_rated pwr x 15))
5 MHz	QPSK	364.75	107.28	5793.09
	16QAM	364.75	107.28	5793.09
Modulation	Ch. BW	Max Rated Pwr (mW)	Max pwr control symbol (max. rated pwr x 5 / 35)	29:18 DL:UL ration Pwr (mW) ((ctrl_symb_pwr x 3) + (max_rated pwr x 15))
10 MHz	QPSK	358.92	51.27	5537.62
	16QAM	348.34	49.76	5374.39

g. Test Vector waveform power

TX1 Antenna

5 MHz BW / QPSK: T5D29U184Q34S85 (29:18 DL:UL Ratio)

Ch. #	Freq. (MHz)	Measured Pwr (dBm)	Measured Pwr (mW)	Number of Traffic Symbols	Traffic Symbols Pwr (mW)
Low	2498.5	25.58	361.41	15	5421.15
Middle	2593	25.62	364.75	15	**5471.31**
High	2687.5	25.57	360.58	15	5408.68

5 MHz BW / 16QAM: T5D29U1816Q12S85 (29:18 DL:UL Ratio)

Ch. #	Freq. (MHz)	Measured Pwr (dBm)	Measured Pwr (mW)	Number of Traffic Symbols	Traffic Symbols Pwr (mW)
Low	2498.5	25.55	358.92	15	5383.83
Middle	2593	25.62	364.75	15	**5471.31**
High	2687.5	25.62	364.75	15	5471.31

10 MHz BW / QPSK: T10D29U184Q34S175 (29:18 DL:UL Ratio)

Ch. #	Freq. (MHz)	Measured Pwr (dBm)	Measured Pwr (mW)	Number of Traffic Symbols	Traffic Symbols Pwr (mW)
Low	2501	25.45	350.75	15	5261.28
Middle	2593	25.55	358.92	15	**5383.83**
High	2685	25.32	340.41	15	5106.12

10 MHz BW / 16QAM: T10D29U1816Q12S175 (29:18 DL:UL Ratio)

Ch. #	Freq. (MHz)	Measured Pwr (dBm)	Measured Pwr (mW)	Number of Traffic Symbols	Traffic Symbols Pwr (mW)
Low	2501	25.17	328.85	15	4932.77
Middle	2593	25.42	348.34	15	**5225.06**
High	2685	25.26	335.74	15	5036.06

Calculation example:
Traffic Symbols Pwr = Measured power * No. of Traffic Symbol

5M QPSK = 364.75 * 15
= 547.31

TX2 Antenna

5 MHz BW / QPSK: T5D29U184Q34S85 (29:18 DL:UL Ratio)

Ch. #	Freq. (MHz)	Measured Pwr (dBm)	Measured Pwr (mW)	Number of Traffic Symbols	Traffic Symbols Pwr (mW)
Low	2498.5	25.57	360.58	15	5408.68
Middle	2593	25.61	363.92	15	**5458.73**
High	2687.5	25.49	354.00	15	5309.96

5 MHz BW / 16QAM: T5D29U1816Q12S85 (29:18 DL:UL Ratio)

Ch. #	Freq. (MHz)	Measured Pwr (dBm)	Measured Pwr (mW)	Number of Traffic Symbols	Traffic Symbols Pwr (mW)
Low	2498.5	25.52	356.45	15	5346.77
Middle	2593	25.52	356.45	15	**5346.77**
High	2687.5	25.43	349.14	15	5237.10

10 MHz BW / QPSK: T10D29U184Q34S175 (29:18 DL:UL Ratio)

Ch. #	Freq. (MHz)	Measured Pwr (dBm)	Measured Pwr (mW)	Number of Traffic Symbols	Traffic Symbols Pwr (mW)
Low	2501	25.04	319.15	15	4787.31
Middle	2593	25.17	328.85	15	**4932.77**
High	2685	25.10	323.59	15	4853.90

10 MHz BW / 16QAM: T10D29U1816Q12S175 (29:18 DL:UL Ratio)

Ch. #	Freq. (MHz)	Measured Pwr (dBm)	Measured Pwr (mW)	Number of Traffic Symbols	Traffic Symbols Pwr (mW)
Low	2501	25.06	320.63	15	4809.40
Middle	2593	25.12	325.09	15	**4876.31**
High	2685	25.11	324.34	15	4865.09

Calculation example:
Traffic Symbols Pwr = Measured power * No. of Traffic Symbol

5M QPSK = 363.92 * 15
= 5458.73

10.4. Duty-Factor Scaling to DL:UL Ratio of 29:18

TX1 Antenna

5 MHz BW / QPSK: **T5D29U184Q34S85 (29:18 DL:UL Ratio)**

Ch. #	Freq. (MHz)	29:18 Rated Pwr	Traffic Symbol Pwr	Scaling Factor (Rated Pwr/Traffic Pwr)
Low	2498.5	5793.09	5421.15	1.07
Middle	2593	5793.09	5471.31	**1.06**
High	2687.5	5793.09	5408.68	1.07

5 MHz BW / 16QAM: **T5D29U1816Q12S85 (29:18 DL:UL Ratio)**

Ch. #	Freq. (MHz)	29:18 Rated Pwr	Traffic Symbol Pwr	Scaling Factor (Rated Pwr/Traffic Pwr)
Low	2498.5	5793.09	5383.83	1.08
Middle	2593	5793.09	5471.31	**1.06**
High	2687.5	5793.09	5471.31	1.06

10 MHz BW / QPSK: **T10D29U184Q34S175 (29:18 DL:UL Ratio)**

Ch. #	Freq. (MHz)	29:18 Rated Pwr	Traffic Symbol Pwr	Scaling Factor (Rated Pwr/Traffic Pwr)
Low	2501	5537.62	5261.28	1.05
Middle	2593	5537.62	5383.83	**1.03**
High	2685	5537.62	5106.12	1.08

10 MHz BW / 16QAM: **T10D29U1816Q12S175 (29:18 DL:UL Ratio)**

Ch. #	Freq. (MHz)	29:18 Rated Pwr	Traffic Symbol Pwr	Scaling Factor (Rated Pwr/Traffic Pwr)
Low	2501	5537.39	4932.77	1.12
Middle	2593	5537.39	5225.06	**1.06**
High	2685	5537.39	5036.06	1.10

TX2 Antenna

5 MHz BW / QPSK: **T5D29U184Q34S85 (29:18 DL:UL Ratio)**

Ch. #	Freq. (MHz)	29:18 Rated Pwr	Traffic Symbol Pwr	Scaling Factor (Rated Pwr/Traffic Pwr)
Low	2498.5	5793.09	5408.68	1.07
Middle	2593	5793.09	5458.73	**1.06**
High	2687.5	5793.09	5309.96	1.09

5 MHz BW / 16QAM: **T5D29U1816Q12S85 (29:18 DL:UL Ratio)**

Ch. #	Freq. (MHz)	29:18 Rated Pwr	Traffic Symbol Pwr	Scaling Factor (Rated Pwr/Traffic Pwr)
Low	2498.5	5793.09	5346.77	1.08
Middle	2593	5793.09	5346.77	**1.08**
High	2687.5	5793.09	5237.10	1.11

10 MHz BW / QPSK: **T10D29U184Q34S175 (29:18 DL:UL Ratio)**

Ch. #	Freq. (MHz)	29:18 Rated Pwr	Traffic Symbol Pwr	Scaling Factor (Rated Pwr/Traffic Pwr)
Low	2501	5537.62	4787.31	1.16
Middle	2593	5537.62	4932.77	**1.12**
High	2685	5537.62	4853.90	1.14

10 MHz BW / 16QAM: **T10D29U1816Q12S175 (29:18 DL:UL Ratio)**

Ch. #	Freq. (MHz)	29:18 Rated Pwr	Traffic Symbol Pwr	Scaling Factor (Rated Pwr/Traffic Pwr)
Low	2501	5537.39	4809.40	1.15
Middle	2593	5537.39	4876.31	**1.14**
High	2685	5537.39	4865.09	1.14

11. RF OUTPUT POWER VERIFICATION

The max. conducted output power is measured for the uplink burst in the difference modulation and channel bandwidth. The output power is measured for the uplink bursts through triggering and gating.

TX 1 Antenna

Mode	Test Vector file name	Freq.	Output Pwr	
		(MHz)	(dBm)	(mW)
5MHz QPSK	T5D29U184Q34S85	2498.5	25.58	361.41
		2593.0	**25.62**	**364.75**
		2687.5	25.57	360.58
5MHz 16QAM	T5D29U1816Q12S85	2498.5	25.55	358.92
		2593.0	**25.62**	**364.75**
		2687.5	25.62	364.75
10MHz QPSK	T10D29U184Q34S175	2501.0	25.45	350.75
		2593.0	**25.55**	**358.92**
		2685.0	25.32	340.41
10MHz 16QAM	T10D29U1816Q12S175	2501.0	25.17	328.85
		2593.0	**25.42**	**348.34**
		2685.0	25.26	335.74

TX2 Antenna

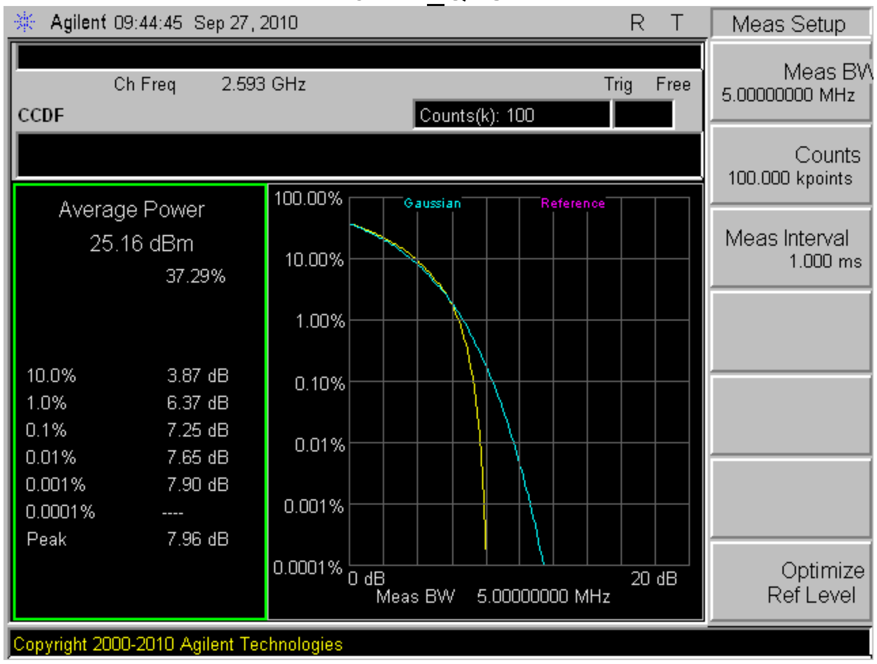
Mode	Test Vector file name	Freq.	Output Pwr	
		(MHz)	(dBm)	(mW)
5MHz QPSK	T5D29U184Q34S85	2498.5	25.57	360.58
		2593.0	**25.61**	**363.92**
		2687.5	25.49	354.00
5MHz 16QAM	T5D29U1816Q12S85	2498.5	25.52	356.45
		2593.0	**25.52**	**356.45**
		2687.5	25.43	349.14
10MHz QPSK	T10D29U184Q34S175	2501.0	25.04	319.15
		2593.0	**25.17**	**328.85**
		2685.0	25.10	323.59
10MHz 16QAM	T10D29U1816Q12S175	2501.0	25.06	320.63
		2593.0	**25.12**	**325.09**
		2685.0	25.11	324.34

12. PEAK TO AVERAGE RATIO

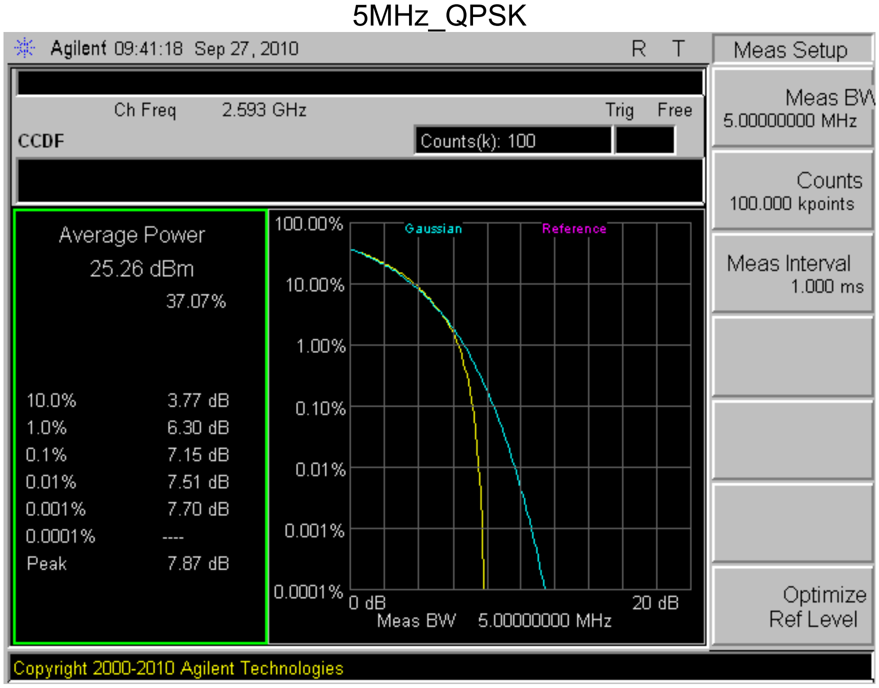
Peak and Average Output power measurements were made with Power Meter.

Mode	Test Vector file name	f (MHz)	Conducted Power (dBm)		Peak-to-average ratio (PAR)
			Peak	Average	
5MHz QPSK	T5D29U184Q34S85	2593	33.12	25.16	7.96
5MHz 16QAM	T5D29U1816Q12S85	2593	33.13	25.26	7.87
10MHz QPSK	T10D29U184Q34S175	2593	33.35	24.33	9.02
10MHz 16QAM	T10D29U1816Q12S175	2593	33.70	24.26	9.44

5MHz_QPSK

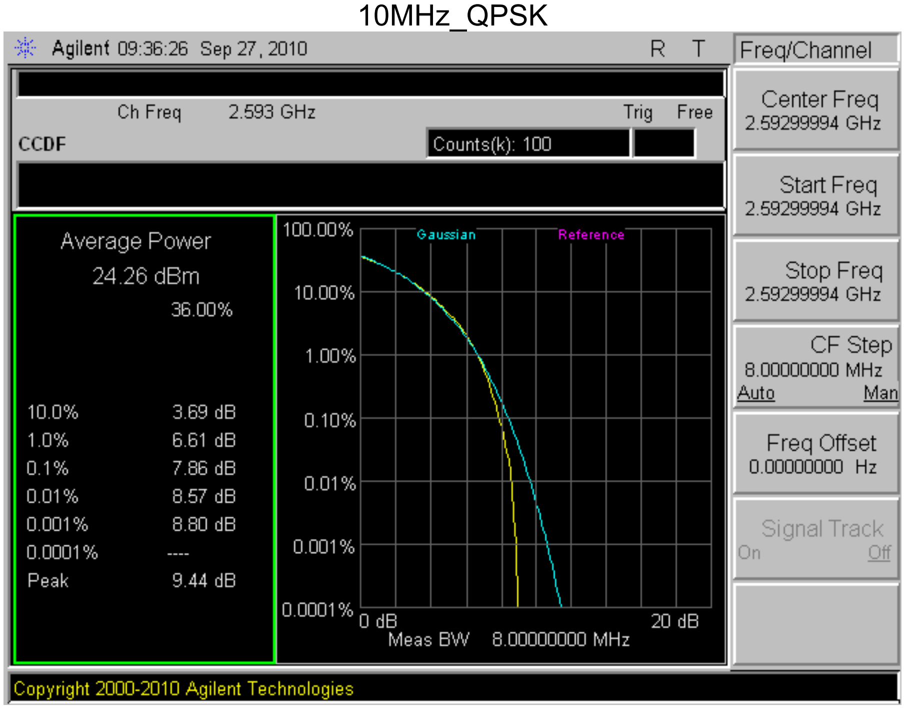


5MHz_QPSK



10MHz_QPSK

10MHz_QPSK



13. SUMMARY OF SAR TEST RESULTS

1. Top Position

BW (MHz)	Mode	Test vector file name	Antenna	f (MHz)	SAR (mW/g)		
					1-g	Scaling Factor	Adjusted 1-g SAR
5	QPSK	T5D29U184Q34S85	TX1	2498.5			
				2593.0	0.096	1.06	0.10
				2687.5			
	16QAM	T5D29U1816Q12S85	TX1	2498.5			
				2593.0	0.093	1.06	0.10
				2687.5			
10	QPSK	T10D29U184Q34S175	TX1	2501.0			
				2593.0	0.092	1.03	0.09
				2685.0			
	16QAM	T10D29U1816Q12S175	TX1	2501.0			
				2593.0	0.091	1.06	0.10
				2685.0			
5	QPSK	T5D29U184Q34S85	TX2	2498.5			
				2593.0	0.323	1.06	0.342
				2687.5			
	16QAM	T5D29U1816Q12S85	TX2	2498.5			
				2593.0	0.306	1.08	0.330
				2687.5			
10	QPSK	T10D29U184Q34S175	TX2	2501.0			
				2593.0	0.272	1.12	0.305
				2685.0			
	16QAM	T10D29U1816Q12S175	TX2	2501.0			
				2593.0	0.264	1.14	0.301
				2685.0			

2. Bottom Position

BW (MHz)	Mode	Test vector file name	Antenna	f (MHz)	SAR (mW/g)		
					1-g	Scaling Factor	Adjusted 1-g SAR
5	QPSK	T5D29U184Q34S85	TX1	2498.5			
				2593.0	0.075	1.06	0.08
				2687.5			
	16QAM	T5D29U1816Q12S85	TX1	2498.5			
				2593.0	0.075	1.06	0.08
				2687.5			
10	QPSK	T10D29U184Q34S175	TX1	2501.0			
				2593.0	0.064	1.03	0.07
				2685.0			
	16QAM	T10D29U1816Q12S175	TX1	2501.0			
				2593.0	0.059	1.06	0.06
				2685.0			
5	QPSK	T5D29U184Q34S85	TX2	2498.5			
				2593.0	0.181	1.06	0.192
				2687.5			
	16QAM	T5D29U1816Q12S85	TX2	2498.5			
				2593.0	0.149	1.08	0.161
				2687.5			
10	QPSK	T10D29U184Q34S175	TX2	2501.0			
				2593.0	0.141	1.12	0.158
				2685.0			
	16QAM	T10D29U1816Q12S175	TX2	2501.0			
				2593.0	0.139	1.14	0.158
				2685.0			

3. Edge Position

BW (MHz)	Mode	Test vector file name	Antenna	f (MHz)	SAR (mW/g)		
					1-g	Scaling Factor	Adjusted 1-g SAR
5	QPSK	T5D29U184Q34S85	TX1	2498.5			
				2593.0	0.082	1.06	0.087
				2687.5			
	16QAM	T5D29U1816Q12S85	TX1	2498.5			
				2593.0	0.168	1.06	0.178
				2687.5			
10	QPSK	T10D29U184Q34S175	TX1	2501.0			
				2593.0	0.177	1.03	0.182
				2685.0			
	16QAM	T10D29U1816Q12S175	TX1	2501.0			
				2593.0	0.177	1.06	0.188
				2685.0			
5	QPSK	T5D29U184Q34S85	TX2	2498.5			
				2593.0	0.408	1.06	0.432
				2687.5			
	16QAM	T5D29U1816Q12S85	TX2	2498.5			
				2593.0	**0.409**	1.08	**0.442**
				2687.5			
10	QPSK	T10D29U184Q34S175	TX2	2501.0			
				2593.0	0.347	1.12	0.389
				2685.0			
	16QAM	T10D29U1816Q12S175	TX 2	2501.0			
				2593.0	**0.346**	1.14	**0.394**
				2685.0			

14. WORST CASE SAR PLOTS

SAR Test Plot (Edge position)

Date/Time: 9/23/2010 6:04:51 PM

Test Laboratory: Compliance Certification Services

WiMAX_Edge mode (5MHz)

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

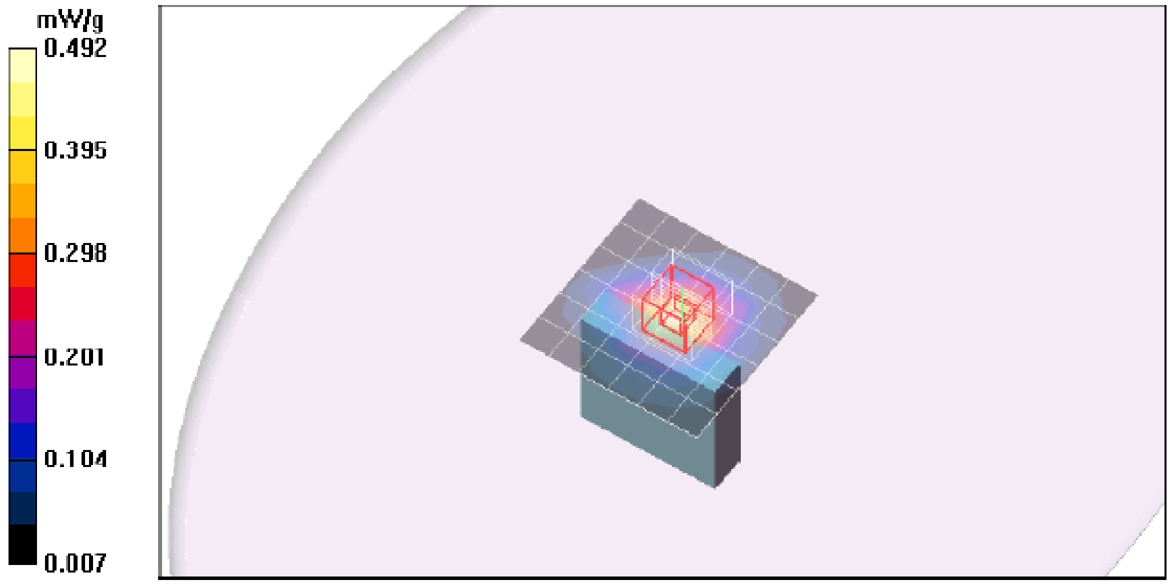
Communication System: WiMAX 2.6GHz; Frequency: 2593 MHz;Duty Cycle: 1:3.24
Medium parameters used (interpolated): f = 2593 MHz; σ = 2.23 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

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(7.4, 7.4, 7.4); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5MHz_16QAM_M-ch_TX2/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.492 mW/g

5MHz_16QAM_M-ch_TX2/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 15.0 V/m; Power Drift = -0.063 dB
Peak SAR (extrapolated) = 0.781 W/kg
SAR(1 g) = 0.409 mW/g; SAR(10 g) = 0.217 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.504 mW/g



SAR Test Plot (Edge position) – z plot

Date/Time: 9/23/2010 6:25:20 PM

Test Laboratory: Compliance Certification Services

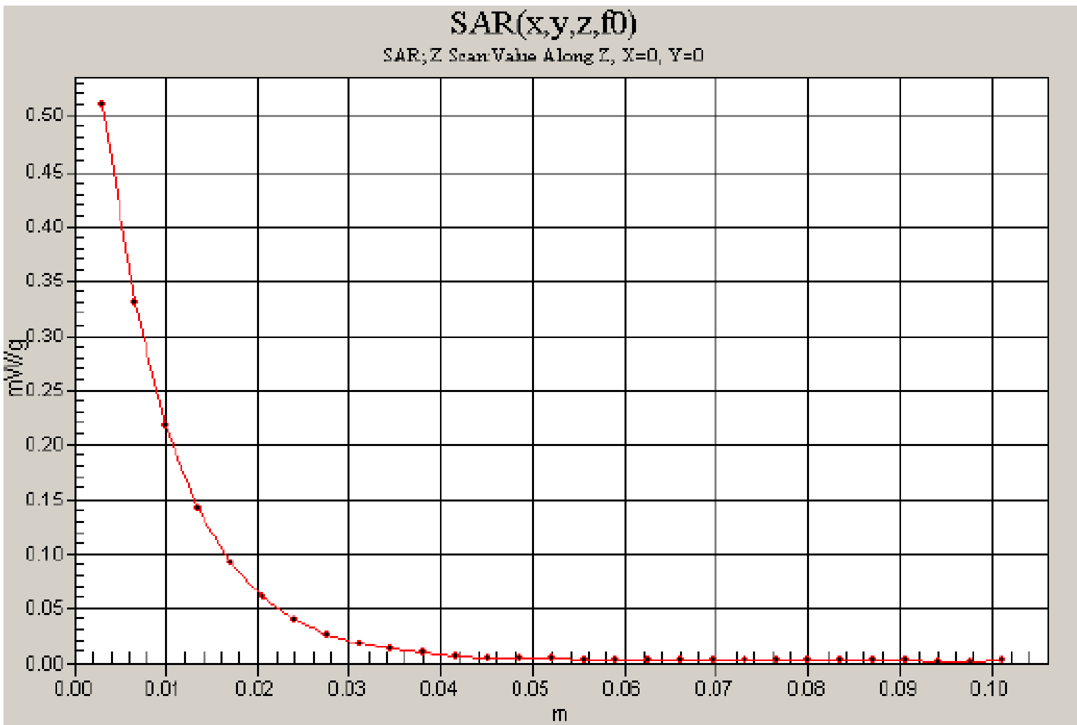
WiMAX_Edge mode (5MHz)

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

Communication System: WiMAX 2.6GHz; Frequency: 2593 MHz;Duty Cycle: 1:3.24

5MHz_16QAM_M-ch_TX2/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) = 0.510 mW/g



SAR Test Plot (Edge position)

Date/Time: 9/23/2010 6:29:05 PM

Test Laboratory: Compliance Certification Services

WiMAX_Edge mode (10MHz)

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

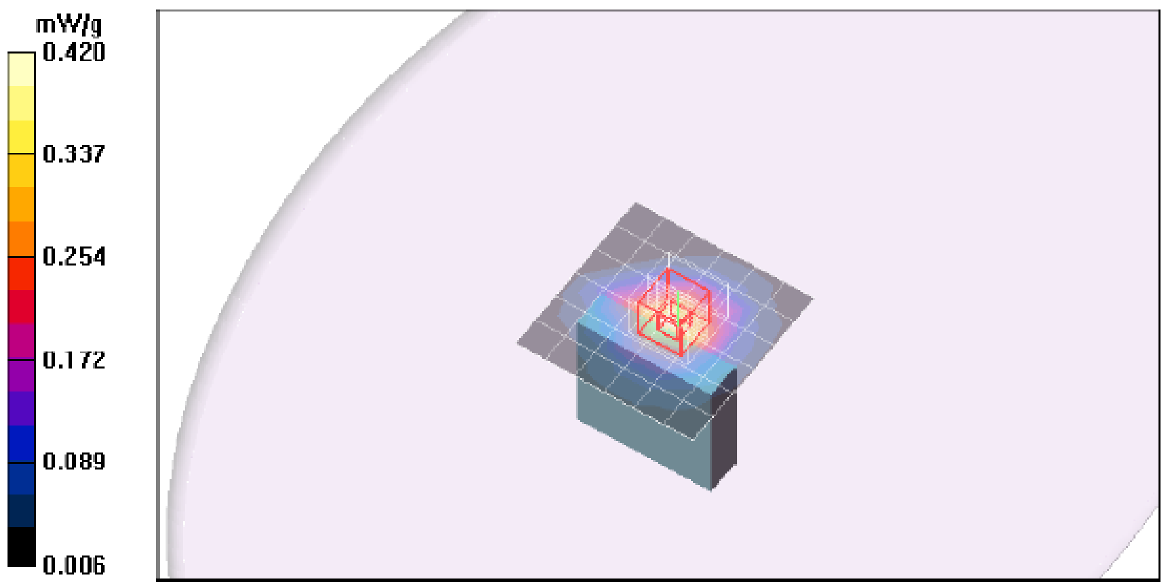
Communication System: WiMAX 2.6GHz; Frequency: 2593 MHz;Duty Cycle: 1:3.24
Medium parameters used (interpolated): f = 2593 MHz; σ = 2.23 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

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(7.4, 7.4, 7.4); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

10MHz_16QAM_M-ch_TX2/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.420 mW/g

10MHz_16QAM_M-ch_TX2/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 13.8 V/m; Power Drift = -0.161 dB
Peak SAR (extrapolated) = 0.639 W/kg
SAR(1 g) = 0.346 mW/g; SAR(10 g) = 0.184 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.431 mW/g



SAR Test Plot (Edge position) – Z- plot

Date/Time: 9/23/2010 6:59:12 PM

Test Laboratory: Compliance Certification Services

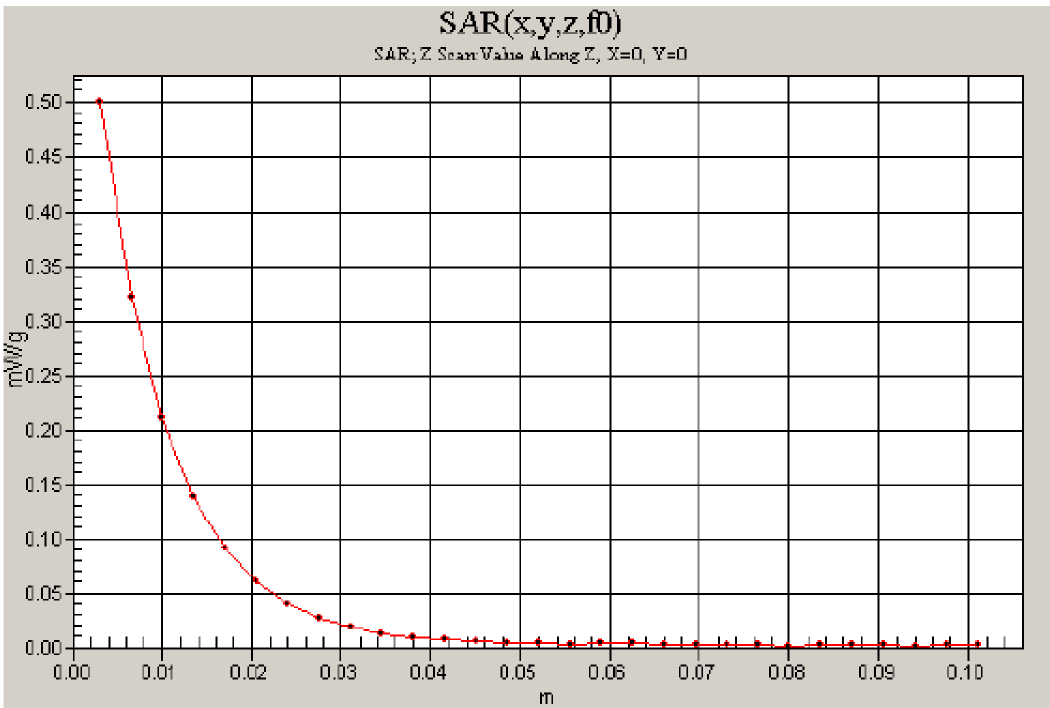
WiMAX_Edge mode (10MHz)

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

Communication System: WiMAX 2.6GHz; Frequency: 2593 MHz;Duty Cycle: 1:3.24

10MHz_16QAM_M-ch_TX2/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) = 0.499 mW/g



15. KDB 648474 SIMULTANEOUS TRANSMISSION CONSIDERATION

SUMMARY OF SAR EVALUATION FOR HANDSET DEVICE WITH MULTIPLE TRANSMITTERS:

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

SIMULTANEOUS TRANSMISSION:

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

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

Highest 1-g SAR (W/kg)		∑ 1-g SAR (W/kg)
WiMAX	WiFi	
0.442	0.200	0.642

CONCLUSION:

Simultaneous transmission	Require for Simultaneous Transmission SAR with Volume Scans
WiMAX & WiFi	No (Sum of the 1-g SAR is < 1.6 W/kg)

16. PAR AND SAR ERROR CONSIDERATION

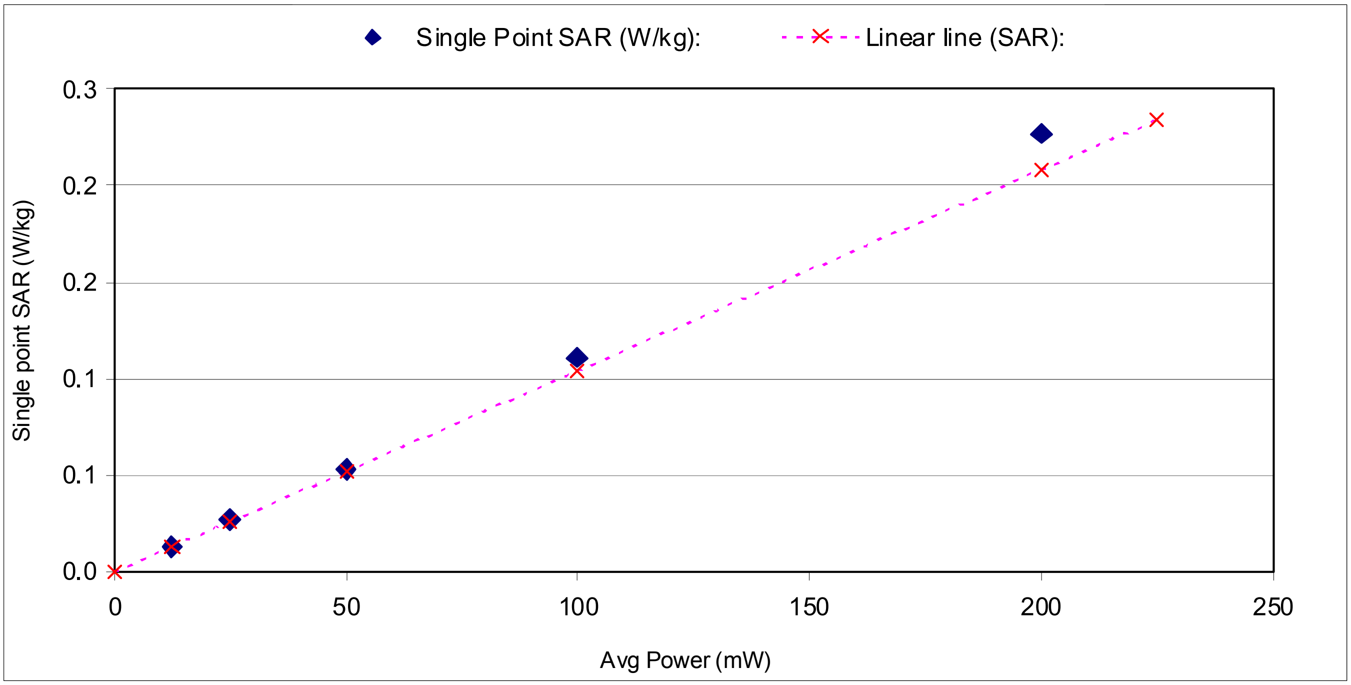
In order to estimate the measurement error due to PAR issues, the configuration with the highest SAR in each channel bandwidth and frequency band is measured at various power levels, from approximately 12.5 mW at approx. 3 dB steps, until the maximum power is reached.

Note:
Refer to Section 19 for SAR and SAR Linearity Test setup photo with separation distance from antenna-to-phantom.

Result

5MHz_QPSK

Average Power (mW):	**12.5**	**25.0**	**50.0**	**100.0**	**200.0**
Single Point SAR (W/kg):	0.013	0.027	0.053	0.111	0.227
Linear line (SAR):	0.013	0.026	0.052	0.104	0.208
Estimation (%):	0.000	3.846	1.923	6.731	9.135



Procedure:
1. Position the EUT at flat phantom with 0 cm separation distance
2. Perform single point SAR evaluation with EUT power to be tuned at 12.5 mW
3. Record the highest single point SAR value 0.013 W/kg @ 12.5 mW.
4. Without changing probe position but tune the EUT power to 25 mW (3dB step).
5. Record the highest single point SAR value 0.027 W/kg @ 25 mW - second single peak SAR
6. Repeat the step 4 and 5 to measure single peak SAR for third, fourth and fifth single peak SAR

Procedure in establishing linear line (SAR):

1) First reference Point = 0 when power = 0
2) Second reference Point: 0.013 W/kg @ 12.5 mW
3) Third reference point: (0.013/12.5) * 25 = 0.26 W/kg
4) Fourth reference point: (0.013/12.5) * 50 = 0.052 W/kg
5) Fifth h reference point: (0.013/12.5) * 100 = 0.104 W/kg
6) Sixth reference point: (0.013/12.5) * 200 = 0.208 W/kg

Draw a reference line from first reference point to sixth reference point.

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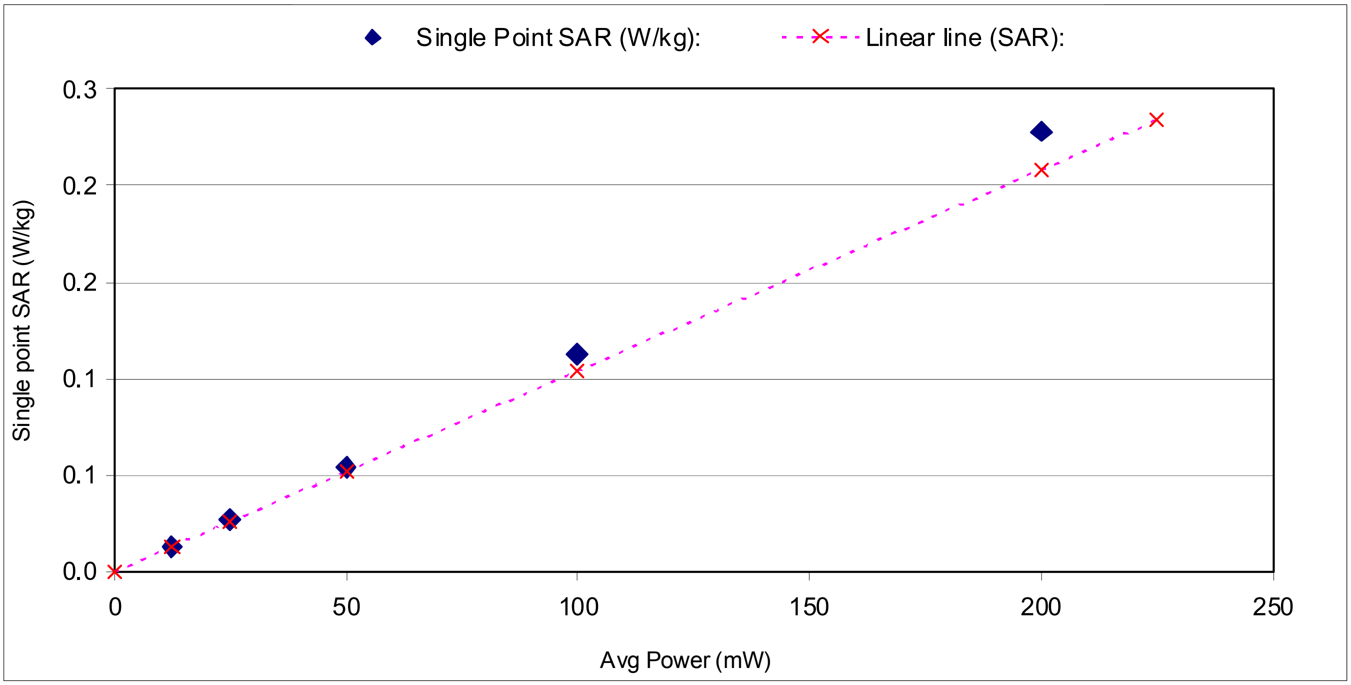
Result

5MHz_16QAM

Average Power (mW):	12.5	25.0	50.0	100.0	200.0
Single Point SAR (W/kg):	0.013	0.027	0.054	0.113	0.228
Linear line (SAR):	0.013	0.026	0.052	0.104	0.208
Estimation (%):	0.000	3.846	3.846	8.654	9.615



Procedure:

1. Position the EUT at flat phantom with 0 cm separation distance
2. Perform single point SAR evaluation with EUT power to be tuned at 12.5 mW
3. Record the highest single point SAR value 0.013 W/kg @ 12.5 mW.
4. Without changing probe position but tune the EUT power to 25 mW (3dB step).
5. Record the highest single point SAR value 0.027 W/kg @ 25 mW - second single peak SAR
6. Repeat the step 4 and 5 to measure single peak SAR for third, fourth and fifth single peak SAR

Procedure in establishing linear line (SAR):

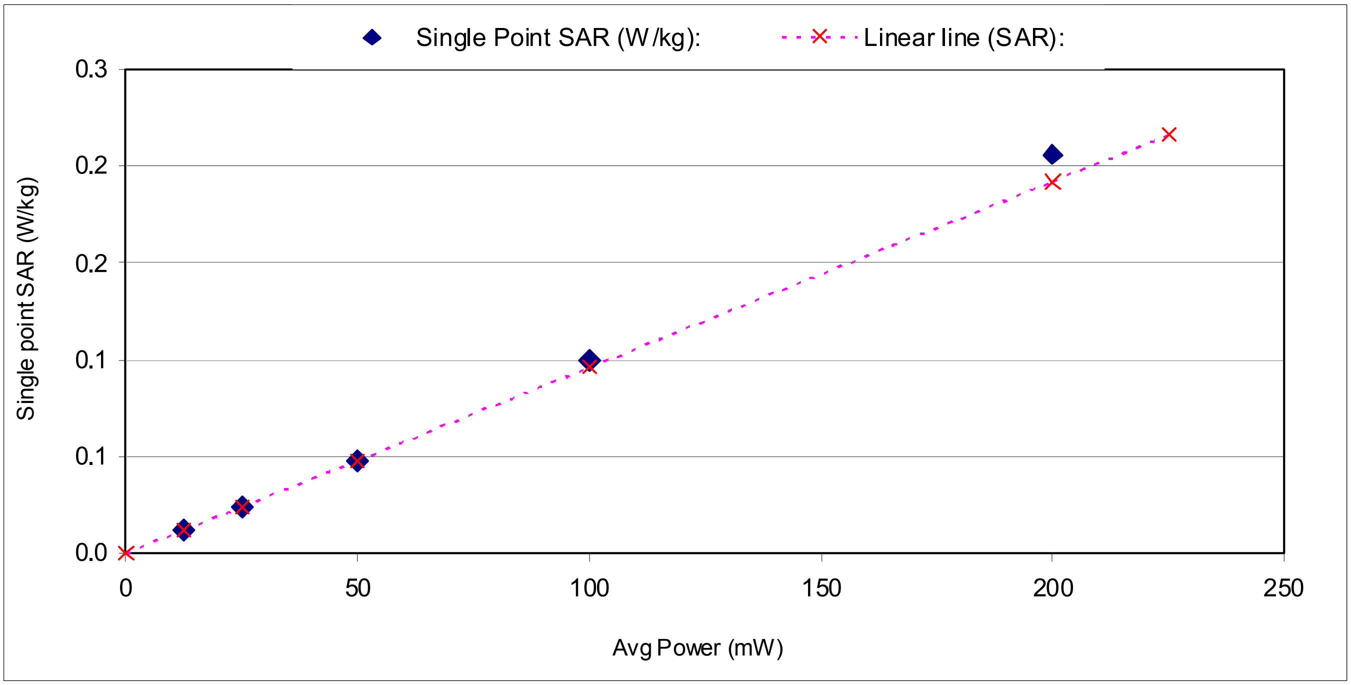
1) First reference Point = 0 when power = 0
2) Second reference Point: 0.013 W/kg @ 12.5 mW
3) Third reference point: (0.013/12.5) * 25 = 0.026 W/kg
4) Fourth reference point: (0.013/12.5) * 50 = 0.052 W/kg
5) Fifth h reference point: (0.013/12.5) * 100 = 0.104 W/kg
6) Sixth reference point: (0.013/12.5) * 200 = 0.208 W/kg

Draw a reference line from first reference point to sixth reference point.

Result

10MHz_QPSK

Average Power (mW):	12.5	25.0	50.0	100.0	200.0
Single Point SAR (W/kg):	0.012	0.024	0.048	0.100	0.206
Linear line (SAR):	0.012	0.024	0.048	0.096	0.192
Estimation (%):	0.000	0.000	0.000	4.167	7.292



Procedure:

1. Position the EUT at flat phantom with 0 cm separation distance
2. Perform single point SAR evaluation with EUT power to be tuned at 12.5 mW
3. Record the highest single point SAR value 0.013 W/kg @ 12.5 mW.
4. Without changing probe position but tune the EUT power to 25 mW (3dB step).
5. Record the highest single point SAR value 0.024 W/kg @ 25 mW - second single peak SAR
6. Repeat the step 4 and 5 to measure single peak SAR for third, fourth and fifth single peak SAR

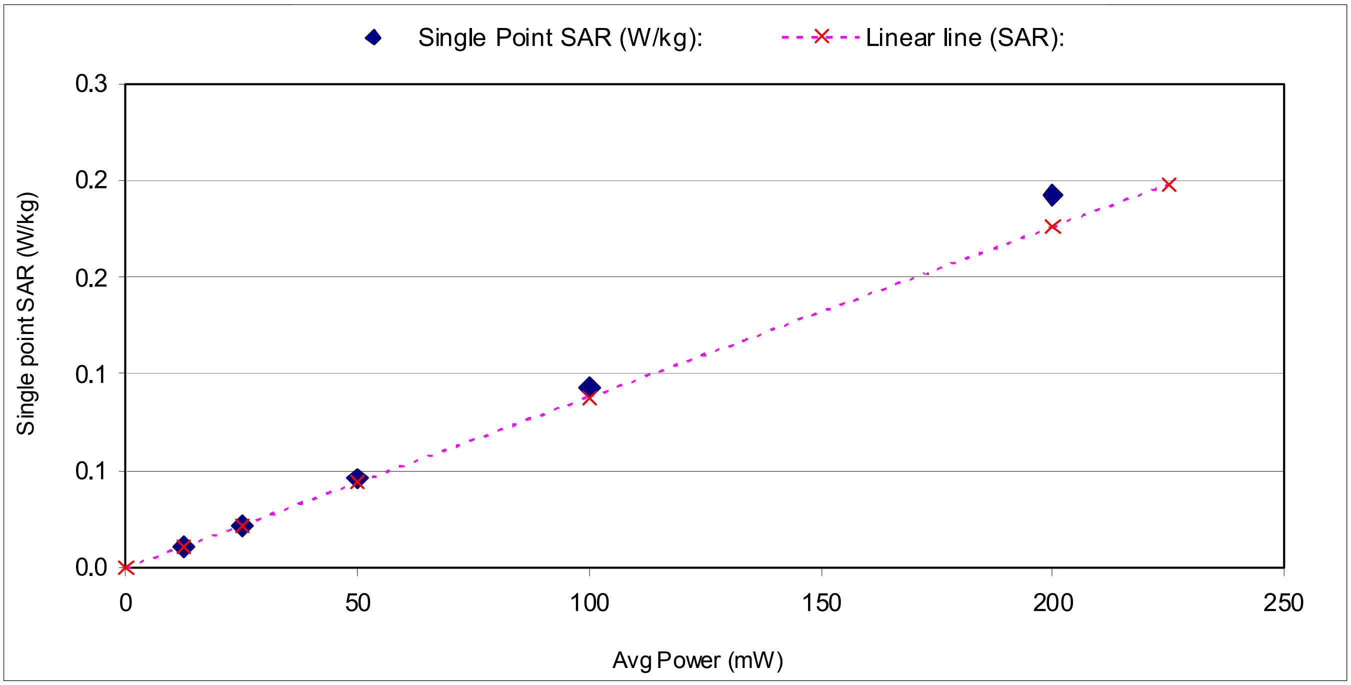
   Procedure in establishing linear line (SAR):
   1) First reference Point = 0 when power = 0
   2) Second reference Point: 0.012 W/kg @ 12.5 mW
   3) Third reference point: (0.012/12.5) * 25 = 0.024 W/kg
   4) Fourth reference point: (0.012/12.5) * 50 = 0.048 W/kg
   5) Fifth h reference point: (0.012/12.5) * 100 = 0.096 W/kg
   6) Sixth reference point: (0.012/12.5) * 200 = 0.192 W/kg

Draw a reference line from first reference point to sixth reference point.

Result

10MHz_16QAM

Average Power (mW):	12.5	25.0	50.0	100.0	200.0
Single Point SAR (W/kg):	0.011	0.022	0.046	0.093	0.192
Linear line (SAR):	0.011	0.022	0.044	0.088	0.176
Estimation (%):	0.000	0.000	4.545	5.682	9.091



Procedure:

7. Position the EUT at flat phantom with 0 cm separation distance
1. Perform single point SAR evaluation with EUT power to be tuned at 12.5 mW
2. Record the highest single point SAR value 0.011 W/kg @ 12.5 mW.
3. Without changing probe position but tune the EUT power to 25 mW (3dB step).
4. Record the highest single point SAR value 0.022 W/kg @ 25 mW - second single peak SAR
5. Repeat the step 4 and 5 to measure single peak SAR for third, fourth and fifth single peak SAR

Procedure in establishing linear line (SAR):

1) First reference Point = 0 when power = 0
2) Second reference Point: 0.011 W/kg @ 12.5 mW
3) Third reference point: (0.011/12.5) * 25 = 0.022 W/kg
4) Fourth reference point: (0.011/12.5) * 50 = 0.044 W/kg
5) Fifth h reference point: (0.011/12.5) * 100 = 0.088 W/kg
6) Sixth reference point: (0.011/12.5) * 200 = 0.176 W/kg

Draw a reference line from first reference point to sixth reference point.

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17. ATTACHMENTS

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2	Certificate of E-Field Probe - EX3DV3 SN3531	11
3	Certificate of System Validation Dipole - D2600V2 - SN:1006	6