FCC OET BULLETIN 65 SUPPLEMENT C 01-01
IEEE STD 1528:2003

SAR EVALUATION REPORT

For
TD-CDMA PCI Express Mini Module Embedded Tablet PC
(Tested inside of Panasonic Tablet PC CF-H2)

MODEL: WW11A
FCC ID: ACJ9TGWW11A

REPORT NUMBER: 11J13998-2C

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Prepared for
PANASONIC CORPORATION OF NORTH AMERICA
ONE PANASONIC WAY, 4B-8, GUNPOSI
SECAUCUS, NEW JERSEY 07094, U.S.A.

Prepared by
COMPLIANCE CERTIFICATION SERVICES (UL CCS)
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	November 11, 2011	Initial Issue	--
A	December 15, 2011	Updated report based on reviewer's comments 1. Sec. 1: Added worst-case simultaneous SAR 2. Sec. 11: Removed Note # 2 3. Sec. 2 & 12: Added reference to KDB 971168	Sunny Shih
A1	December 16, 2011	Updated report based on reviewer's comments 1. Sec. 19: Added BlueTooth Antenna location and distance between WWAN	Bobby Bayani
B	December 21, 2011	Updated report based on reviewer's comments 1. Sec. 13: Revised Table – Calculated Values 2. Updated TD-CDMA SAR Plots for revised Duty Cycle	Bobby Bayani
B1	December 22, 2011	1. Sec. 14: Updated Worst Case Plots 2. Sec. 16: Added RFID Antenna location	Bobby Bayani
C	January 9, 2012	1. Sec. 1: Highest 1g SAR [mW/g] 2. Sec. 13: Additional Testing for Base/Tilt Configuration 3. Sec. 14: Updated Worst Case SAR Plots 4. Sec. 15: Updated Simultaneous Transmission SAR Analysis Table 5. Sec. 18: Updated Summary of Test Configurations Table 6. Sec. 19: Updated Diagram 7. Sec. 20: Added Base/Tilt Setup Photo	Bobby Bayani

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1. Attestation of Test Results

Applicant name:	Panasonic Corporation Of North America		
EUT description:	TD-CDMA PCI Express Mini Module (Tested inside of Panasonic Tablet PC, Model CF-H2)		
Model number:	WW11A		
Device category:	Portable		
Exposure category:	General Population/Uncontrolled Exposure		
Date tested:	October 27-29, 2011		
FCC Rule Parts	Freq. Range [MHz]	Highest 1g SAR [mW/g]	Limit [mW/g]
27	2506 – 2685	0.279 mW/g (Base/Tilt)	1.6
Worst-case Simultaneous SAR:		0.808 mW/g (Sum SAR)	
Applicable Standards			Test Results
OET Bulletin 65 Supplement C 01-01, IEEE STD 1528: 2003			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 CCS By:

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

Tested By:

Bobby Bayani
SAR 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 Edition 01-01, IEEE STD 1528:2003 and the following KDBs Procedures.

- 447498 D01 Mobile Portable RF Exposure v04
- 615223 D01 802.16e WiMax SAR Guidance v01
- 971168 D01 Power Meas License Digital Systems v01

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
Dielectric Probe Kit	HP	85070C	N/A	N/A		
Network Analyzer	Agilent	E5071B	MY42100131	2	2	2012
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
E-Field Probe	SPEAG	EX3DV4	3773	5	3	2012
Thermometer	EXTECH	Thermometer	SCL29766	5	17	2012
Data Acquisition Electronics	SPEAG	DAE4	1239	9	18	2012
System Validation Dipole	SPEAG	D2600V2	1036	4	15	2012
Power Meter	Boonton	4541	12405	4	5	2012
Power Sensor	Boonton	57006	6940	3	31	2012
Directional Coupler	Warlatone	C8060-102	2141	N/A		
Amplifier	Mini-Circuits	ZVE-8G	90606	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
Simulating Liquid	SPEAG	MSL2600	N/A	Within 24 hrs of first test		

4.2. Measurement Uncertainty

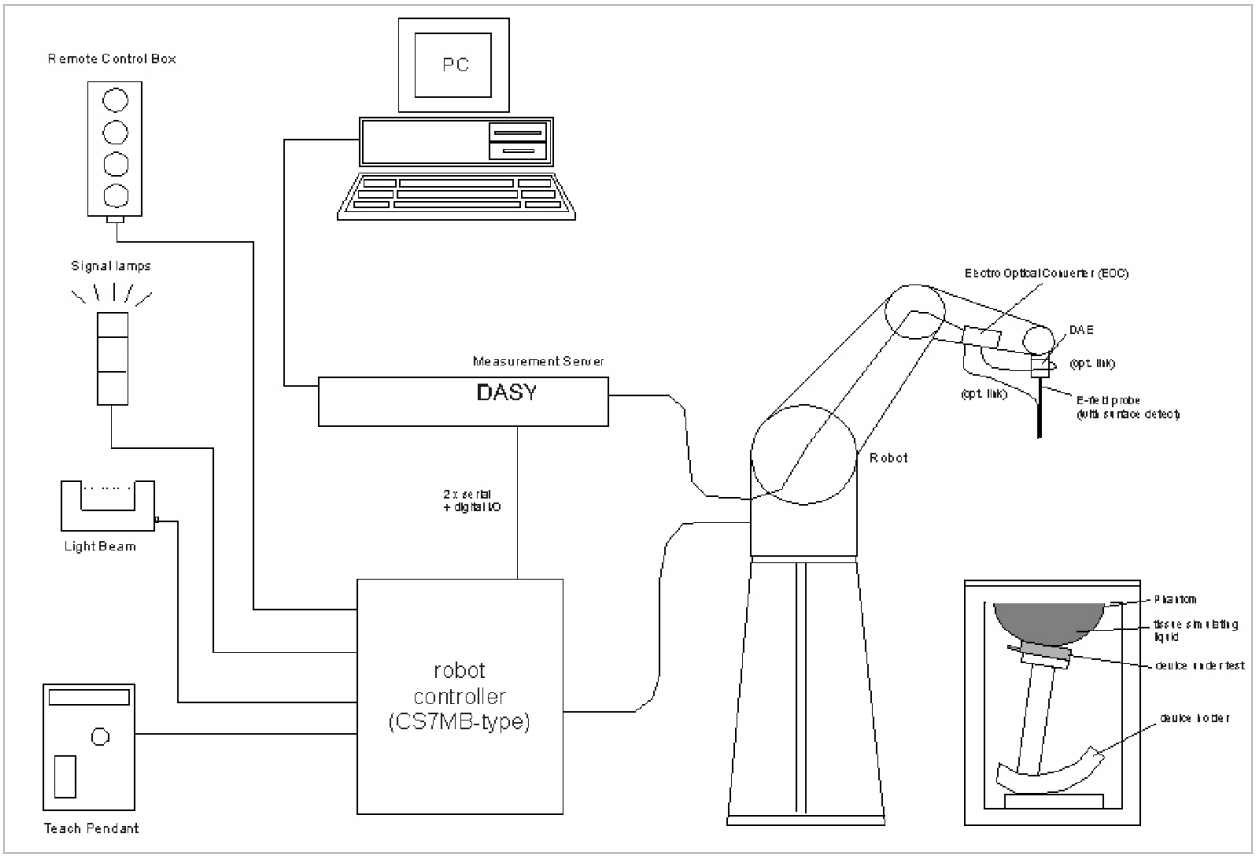
Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram

Component	error, %	Probe Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1)	6.00	Normal	1	1	6.00
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	3.29	Normal	1	0.64	2.11
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement	1.28	Normal	1	0.6	0.77
				Combined Standard Uncertainty Uc(y) =	9.99
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 19.99	%
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 1.58	dB

5. Equipment Under Test

The EUT is the TD-CDMA PCI Express Mini Module. Tested inside Panasonic Tablet PC, CF-H2 Rubber Handle located at the back of the Device is non-removable.	
Normal operation:	Multiple display orientations supporting both portrait and landscape configurations.
Antenna tested:	Manufactured: Panasonic Part Number: Chain A: DFUP2071ZA(1), Chain B: DFUP2071ZA(1)
Antenna-to-antenna/user separation distances:	See Section 18 for details of antenna locations and separation distances.
Simultaneous transmission:	• WWAN can transmit simultaneously with WiFi • WWAN can transmit simultaneously with Bluetooth • WiFi can transmit simultaneously with Bluetooth
Assessment for SAR evaluation for Simultaneous transmission:	**WiFi and BT** Due to Bluetooth's maximum output is < 60/f(GHz) mW and standalone SAR is not required, that WiFi and Bluetooth are not considered as co-located transmitters each other. (Bluetooth – FCC ID: ACJ9TGBT11A, IC: 216ACFBT11A) **WWAN and BT** Same as WiFi and BT **WWAN and WiFi** SAR is not required due to $\sum (SAR_{1g})$ < SAR limit. (Refer to Sec. 14 Simultaneous Transmission SAR Analyses.)

6. System Specification



The DASY 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.
- DASY 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 validating the proper functioning of the system.

7. 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

MSL/HSL750 (Body and Head liquids for 700 – 800 MHz)

Item	Head Tissue Simulation Liquids HSL750 Muscle (body) Tissue Simulation Liquids MSL750
Type No	SL AAH 075
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H^2O	Water, 35 – 58%
Sucrese	Sugar, white, refined, 40-60%
NaCl	Sodium Chloride, 0-6%
Hydroxyethel-cellulsoe	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone, 0.1-0.7%

MSL/HSL1750 (Body and Head liquids for 1700 – 1800 MHz)

Item	Head Tissue Simulation Liquids HSL1750 Muscle (body) Tissue Simulation Liquids MSL1750
Type No	SL AAM 175
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H^2O	Water, 52 – 75%
C8H18O3	Diethylene glycol monobutyl ether (DGBE), 25-48%
NaCl	Sodium Chloride, <1.0%

8. Liquid Parameters

The simulating liquids are 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. For frequencies in 300 MHz to just under 2 GHz, the measured conductivity and relative permittivity were within ± 5% of the target values. For frequencies above 2 GHz the measured conductivity was within ± 5% of the target values. The measured relative permittivity tolerance was within ± 10% of the target value.

Reference Values of Tissue Dielectric Parameters for Head & 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)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.8
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
750	41.96	0.89	55.6	0.96
835	41.5	0.9	55.2	0.97
900	41.5	0.97	55	1.05
915	41.5	0.98	55	1.06
1450	40.5	1.2	54	1.3
1610	40.3	1.29	53.8	1.4
1750	40.08	1.37	53.44	1.49
1800 – 2000	40	1.4	53.3	1.52
2450	39.2	1.8	52.7	1.95
2500	---	---	52.6	2.02
2600	---	---	52.5	2.16
2690	---	---	52.4	2.29
3000	38.5	2.4	52	2.73

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

8.1. Simulating Liquid Check Results

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
10/27/2011	Body 2600	e'	52.9627	Relative Permittivity (ϵ_r):	52.96	52.51	0.86	5
		e"	14.4958	Conductivity (σ):	2.10	2.16	-3.02	5
10/27/2011	Body 2505	e'	53.3026	Relative Permittivity (ϵ_r):	53.30	52.63	1.28	5
		e"	14.1414	Conductivity (σ):	1.97	2.03	-2.84	5
10/27/2011	Body 2595	e'	52.9808	Relative Permittivity (ϵ_r):	52.98	52.52	0.88	5
		e"	14.4771	Conductivity (σ):	2.09	2.15	-3.01	5
10/27/2011	Body 2685	e'	52.6928	Relative Permittivity (ϵ_r):	52.69	52.40	0.55	5
		e"	14.7711	Conductivity (σ):	2.21	2.28	-3.29	5

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
10/28/2011	Body 2600	e'	52.3991	Relative Permittivity (ϵ_r):	52.40	52.51	-0.21	5
		e"	14.9405	Conductivity (σ):	2.16	2.16	-0.04	5
10/28/2011	Body 2505	e'	52.7242	Relative Permittivity (ϵ_r):	52.72	52.63	0.18	5
		e"	14.5279	Conductivity (σ):	2.02	2.03	-0.19	5
10/28/2011	Body 2595	e'	52.4064	Relative Permittivity (ϵ_r):	52.41	52.52	-0.21	5
		e"	14.9083	Conductivity (σ):	2.15	2.15	-0.12	5
10/28/2011	Body 2685	e'	52.0851	Relative Permittivity (ϵ_r):	52.09	52.40	-0.61	5
		e"	15.2674	Conductivity (σ):	2.28	2.28	-0.04	5

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
10/29/2011	Body 2600	e'	52.4688	Relative Permittivity (ϵ_r):	52.47	52.51	-0.08	5
		e"	14.5053	Conductivity (σ):	2.10	2.16	-2.95	5
10/29/2011	Body 2505	e'	52.8244	Relative Permittivity (ϵ_r):	52.82	52.63	0.37	5
		e"	14.1206	Conductivity (σ):	1.97	2.03	-2.98	5
10/29/2011	Body 2595	e'	52.4856	Relative Permittivity (ϵ_r):	52.49	52.52	-0.06	5
		e"	14.4816	Conductivity (σ):	2.09	2.15	-2.98	5
10/29/2011	Body 2685	e'	52.1619	Relative Permittivity (ϵ_r):	52.16	52.40	-0.46	5
		e"	14.8202	Conductivity (σ):	2.21	2.28	-2.97	5

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
10/31/2011	Body 2600	e'	52.7734	Relative Permittivity (ϵ_r):	52.77	52.51	0.50	5
		e"	15.0044	Conductivity (σ):	2.17	2.16	0.39	5
10/31/2011	Body 2505	e'	53.0931	Relative Permittivity (ϵ_r):	53.09	52.63	0.88	5
		e"	14.6209	Conductivity (σ):	2.04	2.03	0.45	5
10/31/2011	Body 2595	e'	52.8069	Relative Permittivity (ϵ_r):	52.81	52.52	0.55	5
		e"	14.9848	Conductivity (σ):	2.16	2.15	0.39	5
10/31/2011	Body 2685	e'	52.5245	Relative Permittivity (ϵ_r):	52.52	52.40	0.23	5
		e"	15.3538	Conductivity (σ):	2.29	2.28	0.52	5

Liquid Check Results (Continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
1/5/2012	Body 2600	e'	52.9662	Relative Permittivity (ϵ_r):	52.97	52.51	0.87	5
		e''	15.0718	Conductivity (σ):	2.18	2.16	0.84	5
	Body 2505	e'	53.2907	Relative Permittivity (ϵ_r):	53.29	52.63	1.25	5
		e''	14.6685	Conductivity (σ):	2.04	2.03	0.78	5
	Body 2595	e'	52.9846	Relative Permittivity (ϵ_r):	52.98	52.52	0.89	5
		e''	15.0476	Conductivity (σ):	2.17	2.15	0.81	5
	Body 2685	e'	52.6678	Relative Permittivity (ϵ_r):	52.67	52.40	0.50	5
		e''	15.4076	Conductivity (σ):	2.30	2.28	0.88	5

9. System Verification

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

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The DASY5 system with an Isotropic E-Field Probe EX3DV4 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 (2.4 GHz) fine cube was chosen for cube integration and Special 8x8x10 (5 GHz) fine cube was chosen for cube integration
- Distance between probe sensors and phantom surface was set to 2.5 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input powers (forward power) were 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:	Freq.	Head	Body
D2600V2 SN: 1036	D2600V2-1036_Apr11	4/15/11	1g SAR:	2.6 GHz	59.60	59.20
			10g SAR:		26.40	26.00

9.1. System Check Results

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D2600V2 SN: 1036	10/27/11	1g SAR:	56.90	59.20	-3.89	±10
		10g SAR:	25.00	26.00	-3.85	
D2600V2 SN: 1036	10/28/11	1g SAR:	58.60	59.20	-1.01	±10
		10g SAR:	25.90	26.00	-0.38	
D2600V2 SN: 1036	10/29/11	1g SAR:	59.10	59.20	-0.17	±10
		10g SAR:	25.60	26.00	-1.54	
D2600V2 SN: 1036	10/31/11	1g SAR:	59.10	59.20	-0.17	±10
		10g SAR:	26.10	26.00	0.38	
D2600V2 SN: 1036	01/05/12	1g SAR:	58.00	59.20	-2.03	±10
		10g SAR:	25.60	26.00	-1.54	

10. SAR Measurement Procedures

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.

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 DASY5 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 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 ≥ 7x7x9 (above 4.5 GHz) or 5x5x7 (below 3 GHz) 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.

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.

11. RF Output Power Verification

BW (MHz)	Mode	Ch.	Freq. (MHz)	Original Average Output Power		Actual Average Output power	
				dBm	mW	dBm	mW
10	QPSK	Low	2506.0	24.360	272.90	24.456	279.00
		Middle	2593.0	24.670	293.09	24.651	291.81
		High	2685.0	24.260	266.69	24.258	266.56
	16QAM	Low	2506.0	24.370	273.53	24.422	276.82
		Middle	2593.0	24.660	292.42	24.649	291.68
		High	2685.0	24.200	263.03	24.262	266.81
	64QAM	Low	2506.0	24.370	273.53	24.244	265.71
		Middle	2593.0	24.610	289.07	24.444	278.23
		High	2685.0	24.170	261.22	24.440	277.97

BW (MHz)	Mode	Ch.	Freq. (MHz)	Original Average Output Power		Actual Average Output power	
				dBm	mW	dBm	mW
5	QPSK	Low	2506.0	24.340	271.6	24.115	257.93
		Middle	2593.0	24.620	289.7	24.474	280.16
		High	2685.0	24.060	254.7	24.133	259.00
	16QAM	Low	2506.0	24.360	272.9	24.274	267.55
		Middle	2593.0	24.640	291.1	24.280	267.92
		High	2685.0	24.070	255.3	23.928	247.06
	64QAM	Low	2506.0	24.310	269.8	24.209	263.57
		Middle	2593.0	24.640	291.1	24.218	264.12
		High	2685.0	24.070	255.3	24.086	256.21

Note(s):

1. Original output power is from EMC report “11J13998-1 FCC CFR47 Part 27 Subpart M Certification Test Report (Issue date: October 31, 2011)”.

12. Peak-to-Average Power Ratio (PAR)

Peak and Average Output power measurements were made in accordance with KDB971168.

BW (MHz)	Mode	Freq. (MHz)	Output power (dBm)		PAR
			Peak	Average	
10	QPSK	2593.0	28.010	24.320	3.69
	16QAM	2593.0	29.570	24.330	5.24
	64QAM	2593.0	29.520	24.360	5.16

BW (MHz)	Mode	Freq. (MHz)	Output power (dBm)		PAR
			Peak	Average	
5	QPSK	2593.0	27.800	24.630	3.17
	16QAM	2593.0	28.610	24.810	3.80
	64QAM	2593.0	28.990	24.800	4.19

13. SAR Test Results

Primary Portrait

BW (MHz)	Mode	Calculated		Ch.	Freq. (MHz)	Average Output power		SAR (mW/g)	
		Duty Cycle (%)	Crest Factor			dBm	mW	1g	10g
10	QPSK	33.00	3.00	Low	2506.0	24.236	265.2		
				Middle	2593.0	24.651	291.8	0.117	0.063
				High	2685.0	24.258	266.6		
	16QAM	33.00	3.00	Low	2506.0	24.422	276.8		
				Middle	2593.0	24.649	291.7	0.127	0.069
				High	2685.0	24.626	290.1		
	64QAM	33.00	3.00	Low	2506.0	24.244	265.7		
				Middle	2593.0	24.444	278.2	0.123	0.067
				High	2685.0	24.440	278.0		

BW (MHz)	Mode	Calculated		Ch.	Freq. (MHz)	Average Output power		SAR (mW/g)	
		Duty Cycle (%)	Crest Factor			dBm	mW	1g	10g
5	QPSK	33.00	3.00	Low	2506.0	24.115	257.9		
				Middle	2593.0	24.474	280.2	0.114	0.060
				High	2685.0	24.133	259.0		
	16QAM	33.00	3.00	Low	2506.0	24.274	267.5		
				Middle	2593.0	24.280	267.9	0.123	0.064
				High	2685.0	23.928	247.1		
	64QAM	33.00	3.00	Low	2506.0	24.209	263.6		
				Middle	2593.0	24.218	264.1	0.125	0.066
				High	2685.0	24.086	256.2		

Note(s):

1. Crest Factor = 100 / Duty Cycle (%)
2. SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit (1.6mW/g).

Secondary Landscape

BW (MHz)	Mode	Calculated		Ch.	Freq. (MHz)	Output power		SAR (mW/g)	
		Duty Cycle (%)	Crest Factor			dBm	mW	1g	10g
10	QPSK	33.00	3.00	Low	2506.0	24.236	265.2		
				Middle	2593.0	24.651	291.8	0.097	0.056
				High	2685.0	24.258	266.6		
	16QAM	33.00	3.00	Low	2506.0	24.422	276.8		
				Middle	2593.0	24.649	291.7	0.097	0.056
				High	2685.0	24.626	290.1		
	64QAM	33.00	3.00	Low	2506.0	24.244	265.7		
				Middle	2593.0	24.444	278.2	0.097	0.056
				High	2685.0	24.440	278.0		

BW (MHz)	Mode	Calculated		Ch.	Freq. (MHz)	Output power		SAR (mW/g)	
		Duty Cycle (%)	Crest Factor			dBm	mW	1g	10g
5	QPSK	33.00	3.00	Low	2506.0	24.115	257.9		
				Middle	2593.0	24.474	280.2	0.101	0.057
				High	2685.0	24.133	259.0		
	16QAM	33.00	3.00	Low	2506.0	24.274	267.5		
				Middle	2593.0	24.280	267.9	0.099	0.057
				High	2685.0	23.928	247.1		
	64QAM	33.00	3.00	Low	2506.0	24.209	263.6		
				Middle	2593.0	24.218	264.1	0.099	0.057
				High	2685.0	24.086	256.2		

Note(s):

1. Crest Factor = 100 / Duty Cycle (%)
2. SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit (1.6mW/g).

Bottom/Base

BW (MHz)	Mode	Calculated		Ch.	Freq. (MHz)	Output power		SAR (mW/g)	
		Duty Cycle (%)	Crest Factor			dBm	mW	1g	10g
10	QPSK	33.00	3.00	Low	2506.0	24.236	265.2		
				Middle	2593.0	24.651	291.8	0.036	0.022
				High	2685.0	24.258	266.6		
	16QAM	33.00	3.00	Low	2506.0	24.422	276.8		
				Middle	2593.0	24.649	291.7	0.034	0.021
				High	2685.0	24.626	290.1		
	64QAM	33.00	3.00	Low	2506.0	24.244	265.7		
				Middle	2593.0	24.444	278.2	0.035	0.021
				High	2685.0	24.440	278.0		

23:24 UL:DL Ratio = [(Max. Rated pwr*5/35*3) + (Max. Rated pwr*21)] / Actual pwr*12)]

BW (MHz)	Mode	Calculated		Ch.	Freq. (MHz)	Output power		SAR (mW/g)	
		Duty Cycle (%)	Crest Factor			dBm	mW	1g	10g
5	QPSK	33.00	3.00	Low	2506.0	24.115	257.9		
				Middle	2593.0	24.474	280.2	0.034	0.021
				High	2685.0	24.133	259.0		
	16QAM	33.00	3.00	Low	2506.0	24.274	267.5		
				Middle	2593.0	24.280	267.9	0.034	0.021
				High	2685.0	23.928	247.1		
	64QAM	33.00	3.00	Low	2506.0	24.209	263.6		
				Middle	2593.0	24.218	264.1	0.034	0.021
				High	2685.0	24.086	256.2		

Note(s):

1. Crest Factor = 100 / Duty Cycle (%)
2. SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit (1.6mW/g).

Base/Tilt

BW (MHz)	Mode	Calculated		Ch.	Freq. (MHz)	Output power		SAR (mW/g)	
		Duty Cycle (%)	Crest Factor			dBm	mW	1g	10g
10	QPSK	33.00	3.00	Low	2506.0	24.236	265.2		
				Middle	2593.0	24.651	291.8	0.273	0.152
				High	2685.0	24.258	266.6		
	16QAM	33.00	3.00	Low	2506.0	24.422	276.8		
				Middle	2593.0	24.649	291.7	0.279	0.156
				High	2685.0	24.626	290.1		
	64QAM	33.00	3.00	Low	2506.0	24.244	265.7		
				Middle	2593.0	24.444	278.2	0.274	0.153
				High	2685.0	24.440	278.0		

BW (MHz)	Mode	Calculated		Ch.	Freq. (MHz)	Output power		SAR (mW/g)	
		Duty Cycle (%)	Crest Factor			dBm	mW	1g	10g
5	QPSK	33.00	3.00	Low	2506.0	24.115	257.9		
				Middle	2593.0	24.474	280.2	0.042	0.023
				High	2685.0	24.133	259.0		
	16QAM	33.00	3.00	Low	2506.0	24.274	267.5		
				Middle	2593.0	24.280	267.9	0.042	0.023
				High	2685.0	23.928	247.1		
	64QAM	33.00	3.00	Low	2506.0	24.209	263.6		
				Middle	2593.0	24.218	264.1	0.042	0.231
				High	2685.0	24.086	256.2		

Note(s):

1. Crest Factor = 100 / Duty Cycle (%)
2. SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit (1.6mW/g).

14. Worst case SAR Plots

Date: 1/5/2012

Test Laboratory: UL CCS SAR Lab C

TD-CDMA 2.6GHz Band_Body_Bottom-Base/Tilt

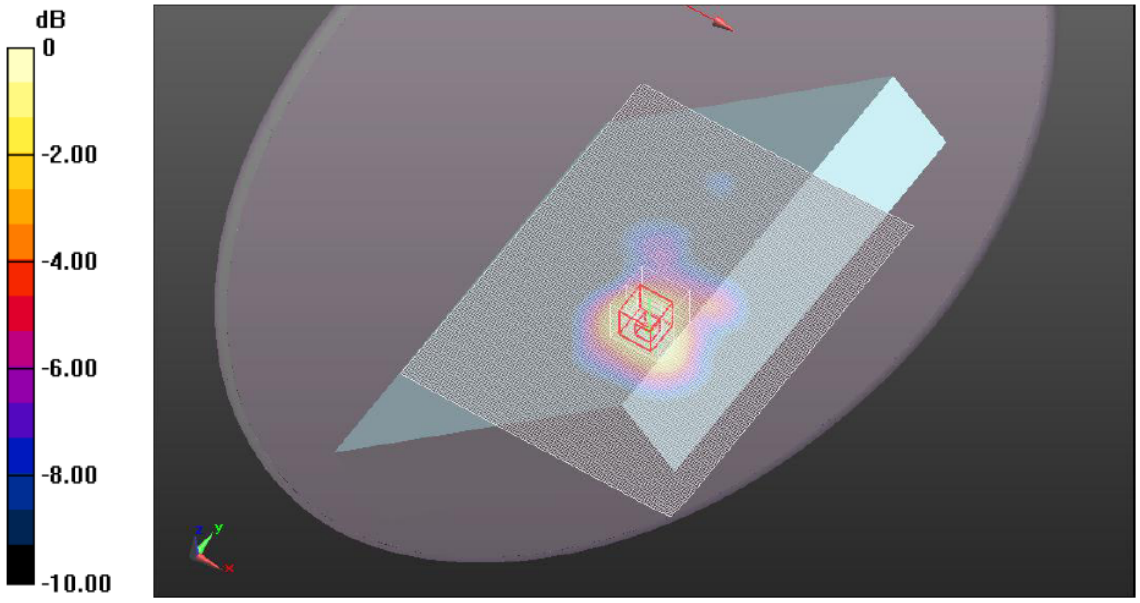
Communication System: TD-CDMA; Frequency: 2593 MHz;Duty Cycle: 1:3.0
Medium parameters used (interpolated): f = 2593 MHz; σ = 2.169 mho/m; ε_r = 52.992; ρ = 1000 kg/m^3
Phantom section: Flat Section

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

DASY5 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3772; ConvF(6.3, 6.3, 6.3); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1117
- Measurement SW: DASY52, Version 52.8 (0);SEMCAD X Version 14.6.4 (4989)

16QAM_BW-10MHz_Mid-Ch/Area Scan (121x161x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.368 mW/g

16QAM_BW-10MHz_Mid-Ch/Zoom Scan(1st) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.823 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.5290
SAR(1 g) = 0.279 mW/g; SAR(10 g) = 0.156 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.368 mW/g



0 dB = 0.370mW/g = -8.64 dB mW/g

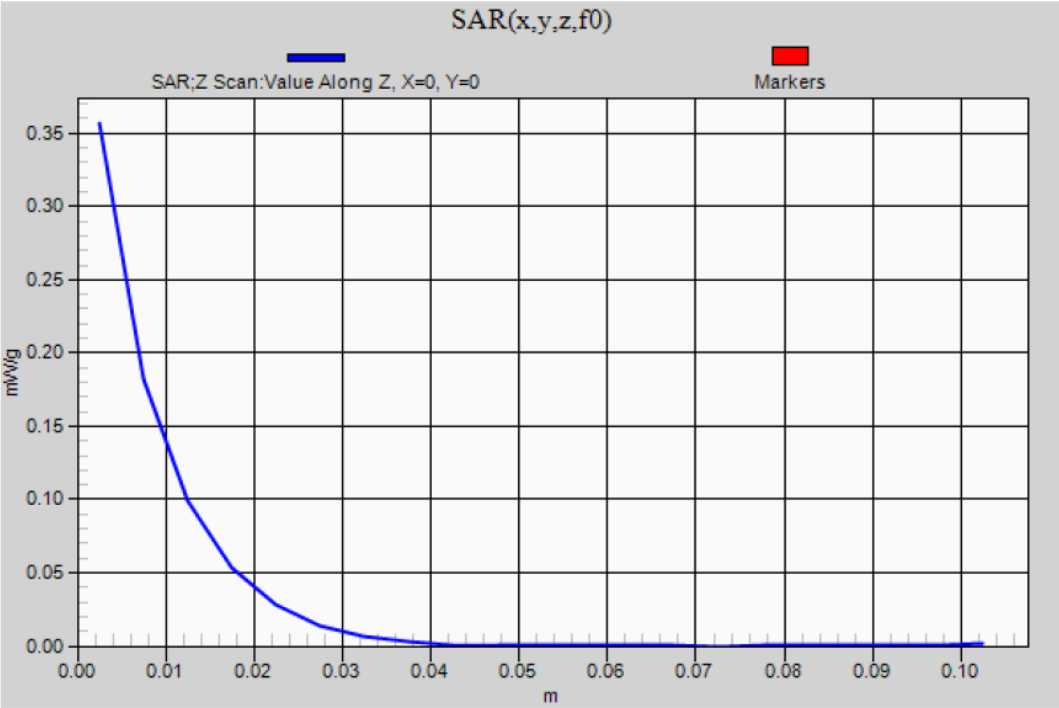
Date: 1/5/2012

Test Laboratory: UL CCS SAR Lab C

TD-CDMA 2.6GHz Band_Body_Bottom-Base/Tilt

Communication System: TD-CDMA; Frequency: 2593 MHz;Duty Cycle: 1:3.0

16QAM_BW-10MHz_Mid-Ch/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.357 mW/g



15. Simultaneous Transmission SAR Analysis

WWAN + WiFi 2.4 GHz

Test configuration	(1) TD-CDMA	(4)* WiFi Main	(5)* WiFi Aux	Sum of 1g SAR (mW/g)
Base	0.036	0.021	0.050	0.107
Base/Tilt	0.279	0.065		0.344
Primary Portrait	0.127		0.173	0.300

WWAN + WiFi 5.2 GHz

Test configuration	(1) TD-CDMA	(4)* WiFi Main	(5)* WiFi Aux	Sum of 1g SAR (mW/g)
Base	0.036	0.022	0.118	0.176
Base/Tilt	0.279	0.253		0.532
Primary Portrait	0.127		0.297	0.424

WWAN + WiFi 5.3 GHz

Test configuration	(1) TD-CDMA	(4)* WiFi Main	(5)* WiFi Aux	Sum of 1g SAR (mW/g)
Base	0.036	0.025	0.180	0.241
Base/Tilt	0.279	0.265		0.544
Primary Portrait	0.127		0.471	0.598

WWAN + WiFi 5.5 GHz

Test configuration	(1) TD-CDMA	(4)* WiFi Main	(5)* WiFi Aux	Sum of 1g SAR (mW/g)
Base	0.036	0.031	0.130	0.197
Base/Tilt	0.279	0.411		0.690
Primary Portrait	0.127		0.557	0.684

WWAN + WiFi 5.8 GHz

Test configuration	(1) TD-CDMA	(4)* WiFi Main	(5)* WiFi Aux	Sum of 1g SAR (mW/g)
Base	0.036	0.024	0.151	0.211
Base/Tilt	0.279	0.295		0.574
Primary Portrait	0.127		0.681	0.808

Note(s)

1. *: WiFi max. 1g SAR from SAR report "11J13820-4 SAR report" submitted under FCC ID: ACJ9TGWL11A (Panasonic Corporation of North America).
   This WiFi module supports MIMO operation in all bands in 802.11n modes and the simultaneous evaluation has included an evaluation with both WLAN antennas operational with the WWAN antenna based on the worst case SAR in each band for each individual WLAN antenna.

2. The RFID transmitter (RFID transmitter, which is approved under FCC ID ACJ9TGRI11A against FCC Part 15C (15.225) with a field strength at the operating frequency of 13.56MHz of 56.94dBuV/m @ 30m. This device is not subject to SAR test requirements based on the low operating power and excluded from simultaneous SAR evaluation for this reason.

Conclusions:

Simultaneous transmission SAR is not required because the 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(Peak to Average Ratio) issues, the configuration with the highest SAR in each channel bandwidth and frequency band is measured at various power levels, from approximately 15.0 mW at approx. 3 dB steps, until the maximum power is reached.

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 10 mW at approx. 3 dB steps, until the maximum power is reached.

Procedure:

1. Position the EUT at flat phantom with the Primary Portrait of the Tablet PC in direct contact against a flat phantom.
2. Perform single point SAR evaluation with EUT power to be tuned at approximately 10 – 15 mW.
3. Record the highest single point SAR value for each power setting as indicated above.
4. Without changing probe and EUT position increase the EUT power by 3 dB steps.

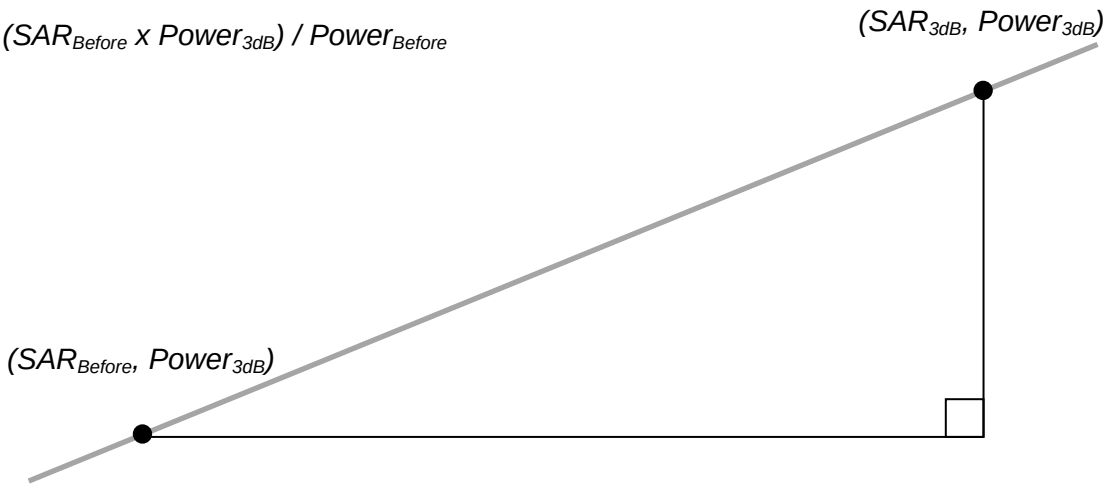
Assumption:

1) First single point SAR at power = 0 mW the SAR = 0 mW/g
2) SAR is linear to power only when the measurement probe sensors are operating within the square-law region.

Linear Line:

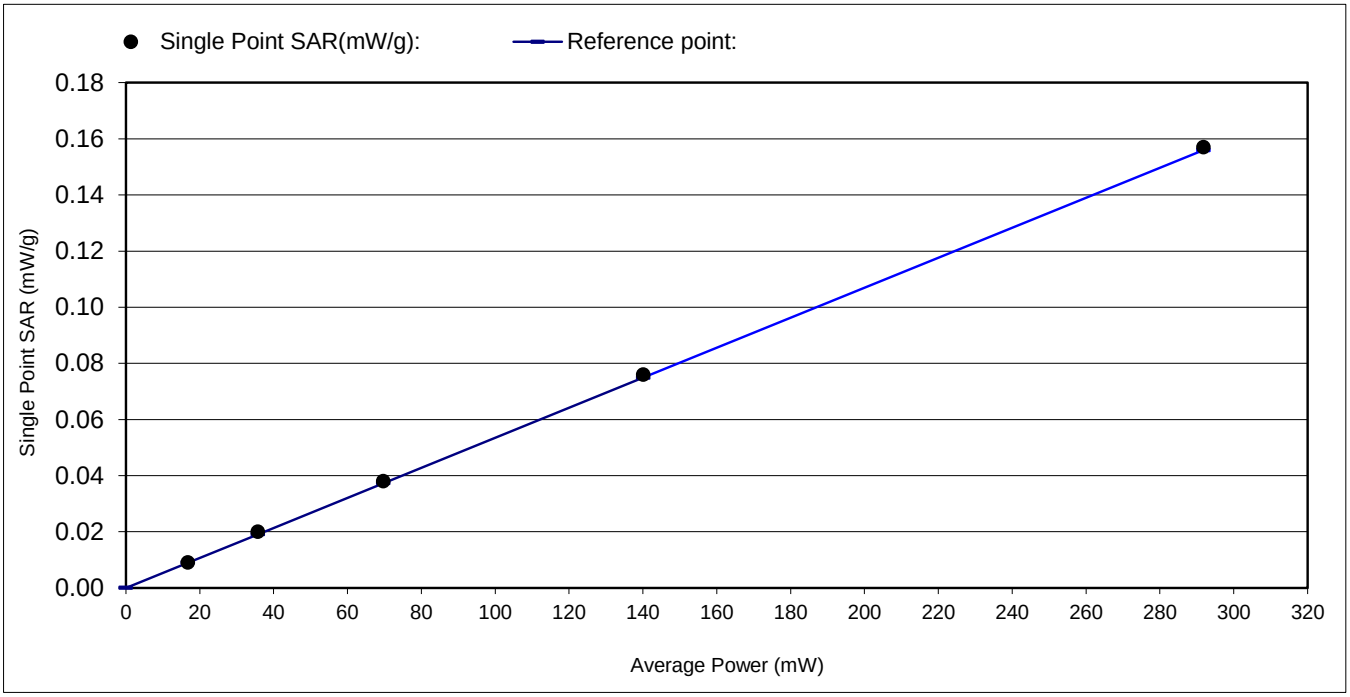
The actual measure output power has an tolerance due to the accuracy of the power sensors, RF cable and attenuator therefore the measure power will exhibited a +/- 0.05 % error. When power is set to 10 mW and SAR value "*x*" is known the next value on the Linear Line at approximately 3 dB up can be calculated as follow:

$SAR_{3dB} = (SAR_{Before} \times Power_{3dB}) / Power_{Before}$



Measurement Result for Band Width 10 MHz, Modulation QPSK

	First	Second	Third	Fourth	Sixth
Average Power (dBm):	12.257	15.533	18.435	21.464	24.651
Average Power (mW):	16.82	35.75	69.74	140.09	291.81
Single Point SAR(mW/g):	**0.0090**	**0.0200**	**0.0380**	**0.0760**	**0.1570**
Reference point:	**0.0090**	**0.0191**	**0.0373**	**0.0749**	**0.1560**
Estimated (%):	0.0000	4.6334	1.9117	1.4738	0.6329



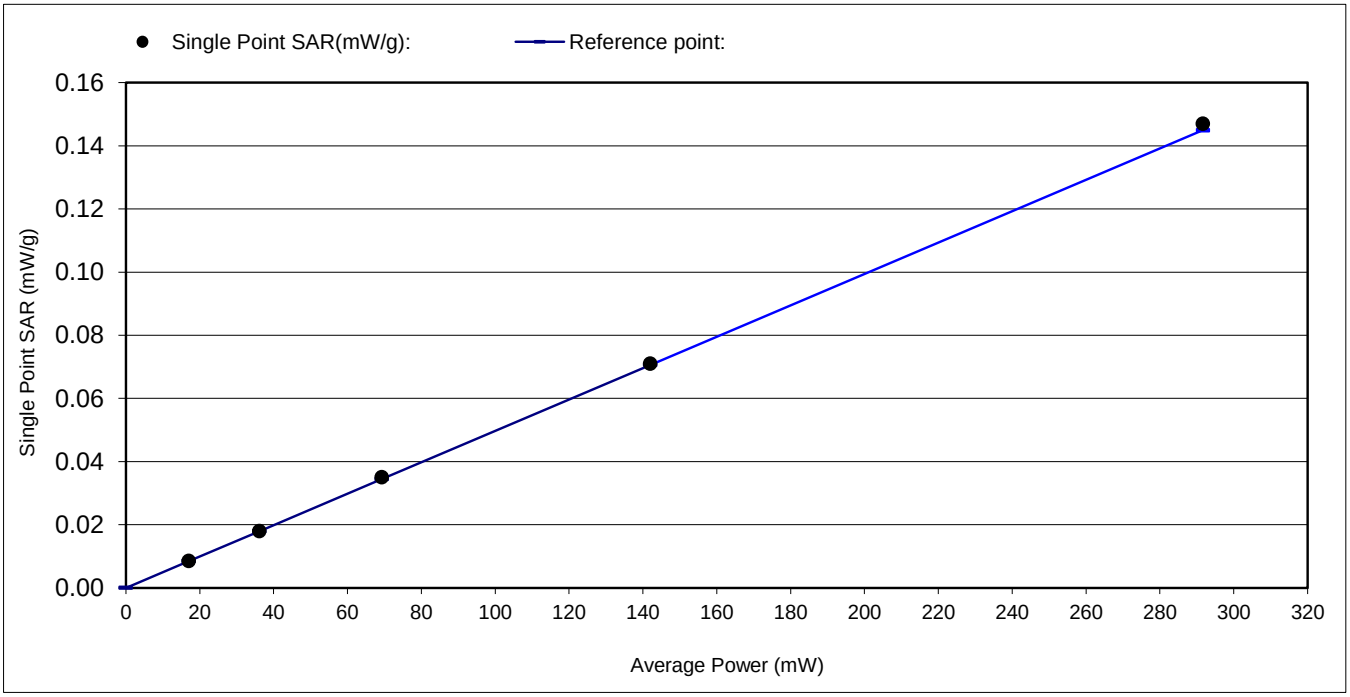
Procedure in establishing linear line (SAR):

First reference point = 0 mW/g when power = 0 mW
Second reference point: 0.0090 mW/g @ 16.82 mW
Third reference point: (0.0090 * 35.75 mW) / 16.82 mW = 0.0191
Fourth reference point: (0.0191 * 69.74 mW) / 35.75 mW = 0.0373
Fifth reference point: (0.0373 * 140.09 mW) / 69.74 mW = 0.0749
Sixth reference point: (0.0749 * 291.81 mW) / 140.09 mW = 0.1560

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

Measurement Result for Band Width 10 MHz, Modulation 16QAM

	First	Second	Third	Fourth	Sixth
Average Power (dBm):	12.310	15.578	18.410	21.522	24.649
Average Power (mW):	17.02	36.12	69.34	141.97	291.68
Single Point SAR(mW/g):	**0.0085**	**0.0180**	**0.0350**	**0.0710**	**0.1470**
Reference point:	**0.0085**	**0.0180**	**0.0345**	**0.0706**	**0.1450**
Estimated (%):	0.0000	0.2541	1.5542	0.6209	1.4021



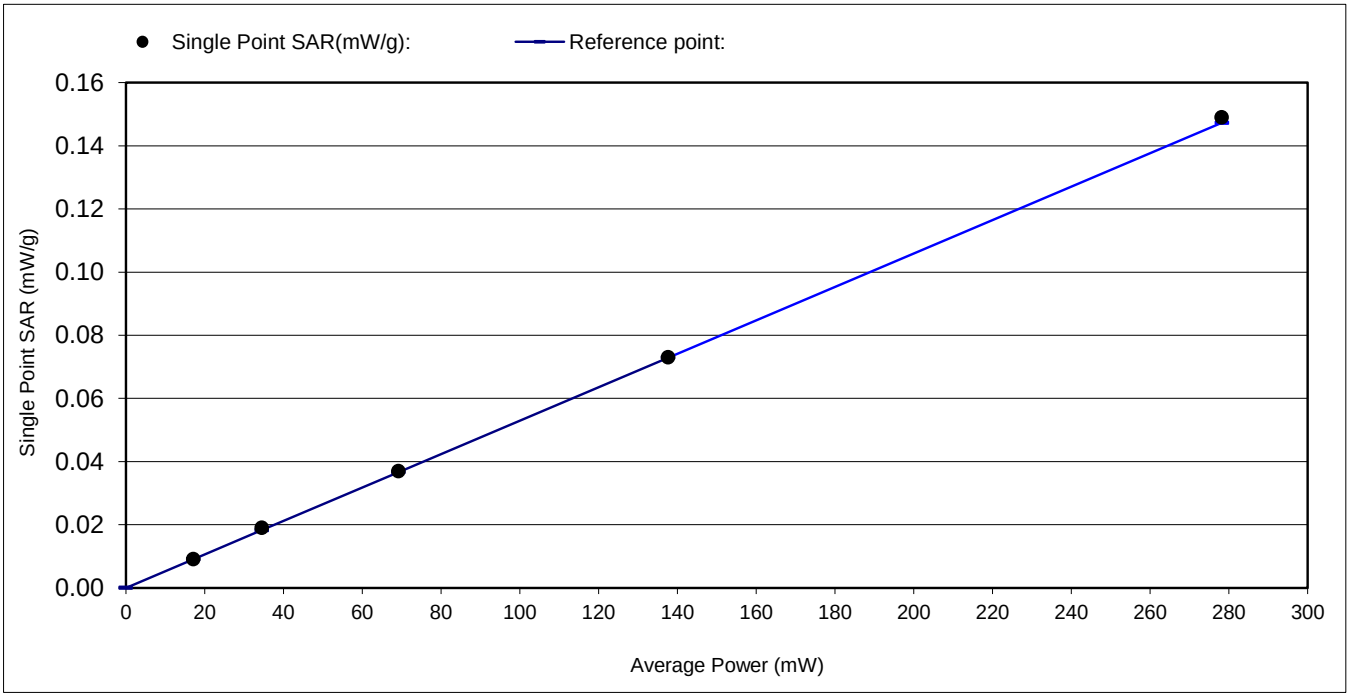
Procedure in establishing linear line (SAR):

First reference point = 0 mW/g when power = 0 mW
Second reference point: 0.0085 mW/g @ 17.02 mW
Third reference point: (0.0085 * 36.12 mW) / 17.02 mW = 0.0180
Fourth reference point: (0.0180 * 69.34 mW) / 36.12 mW = 0.0345
Fifth reference point: (0.0345 * 141.97 mW) / 69.34 mW = 0.0706
Sixth reference point: (0.0706 * 291.68 mW) / 141.97 mW = 0.1450

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

Measurement Result for Band Width 10 MHz, Modulation 64QAM

	First	Second	Third	Fourth	Sixth
Average Power (dBm):	12.333	15.378	18.401	21.388	24.444
Average Power (mW):	17.11	34.50	69.20	137.66	278.23
Single Point SAR(mW/g):	**0.0091**	**0.0190**	**0.0370**	**0.0730**	**0.1490**
Reference point:	**0.0091**	**0.0183**	**0.0366**	**0.0729**	**0.1473**
Estimated (%):	0.0000	4.0220	0.9889	0.1601	1.1482



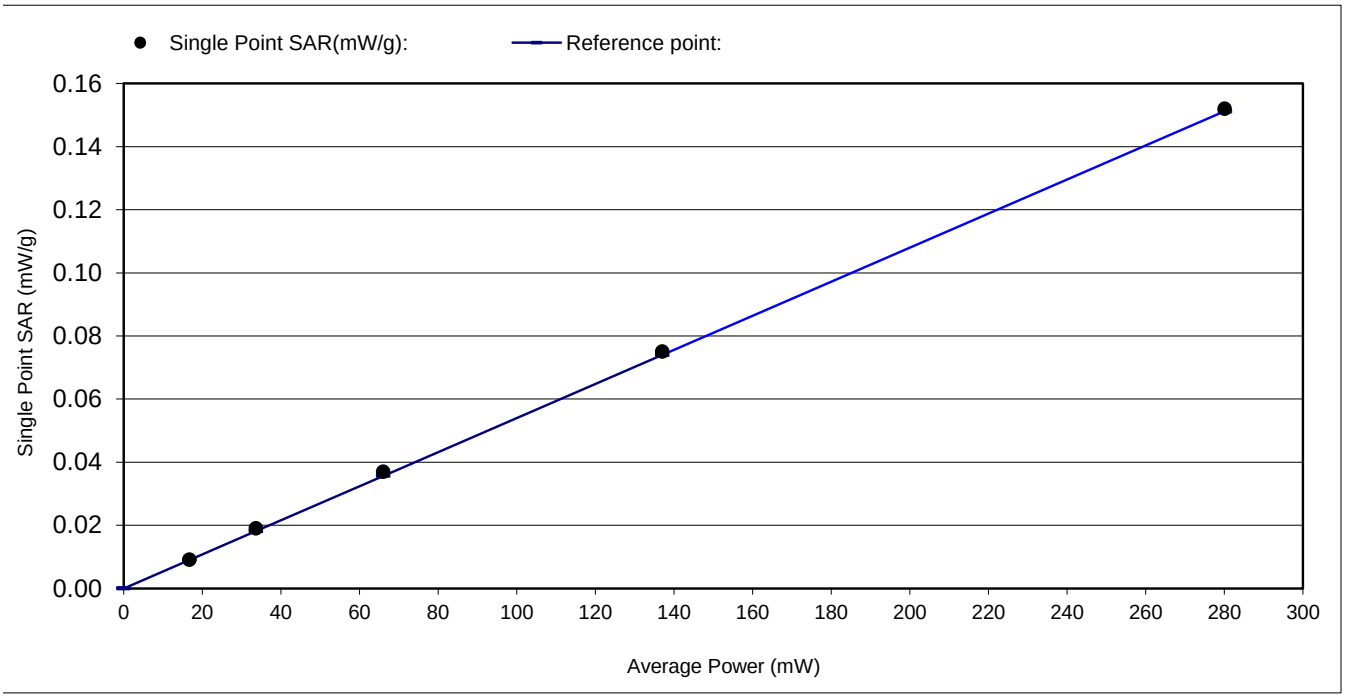
Procedure in establishing linear line (SAR):

First reference point = 0 mW/g when power = 0 mW
Second reference point: 0.0091 mW/g @ 17.11 mW
Third reference point: (0.0091 * 34.50 mW) / 17.11 mW = 0.0183
Fourth reference point: (0.0183 * 69.20 mW) / 34.50 mW = 0.0366
Fifth reference point: (0.0366 * 137.66 mW) / 69.20 mW = 0.0729
Sixth reference point: (0.0729 * 278.23 mW) / 137.66 mW = 0.1473

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

Measurement Result for Band Width 5 MHz, Modulation QPSK

	First	Second	Third	Fourth	Sixth
Average Power (dBm):	12.244	15.276	18.199	21.370	24.474
Average Power (mW):	16.76	33.70	66.05	137.09	280.16
Single Point SAR(mW/g):	**0.0091**	**0.0190**	**0.0370**	**0.0750**	**0.1520**
Reference point:	**0.0091**	**0.0182**	**0.0357**	**0.0740**	**0.1512**
Estimated (%):	0.0000	4.4492	3.7655	1.3474	0.5067



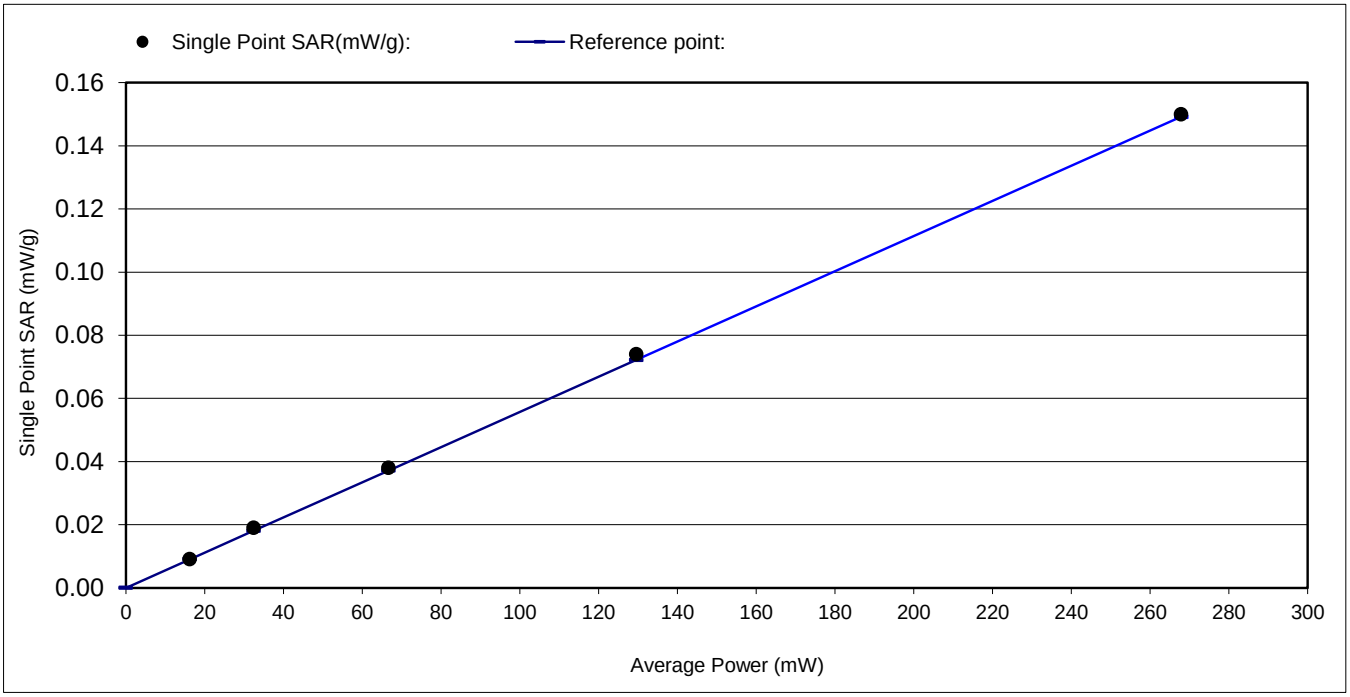
Procedure in establishing linear line (SAR):

First reference point = 0 mW/g when power = 0 mW
Second reference point: 0.0091 mW/g @ 16.76 mW
Third reference point: (0.0091 * 33.70 mW) / 16.76 mW = 0.0182
Fourth reference point: (0.0182 * 66.05 mW) / 33.70 mW = 0.0357
Fifth reference point: (0.0357 * 137.09 mW) / 66.05 mW = 0.0740
Sixth reference point: (0.0740 * 280.16 mW) / 137.09 mW = 0.1512

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

Measurement Result for Band Width 5 MHz, Modulation 16QAM

	First	Second	Third	Fourth	Sixth
Average Power (dBm):	12.104	15.109	18.238	21.125	24.280
Average Power (mW):	16.23	32.43	66.65	129.57	267.92
Single Point SAR(mW/g):	**0.0090**	**0.0190**	**0.0380**	**0.0740**	**0.1500**
Reference point:	**0.0090**	**0.0181**	**0.0371**	**0.0722**	**0.1492**
Estimated (%):	0.0000	5.2168	2.3800	2.5565	0.5363



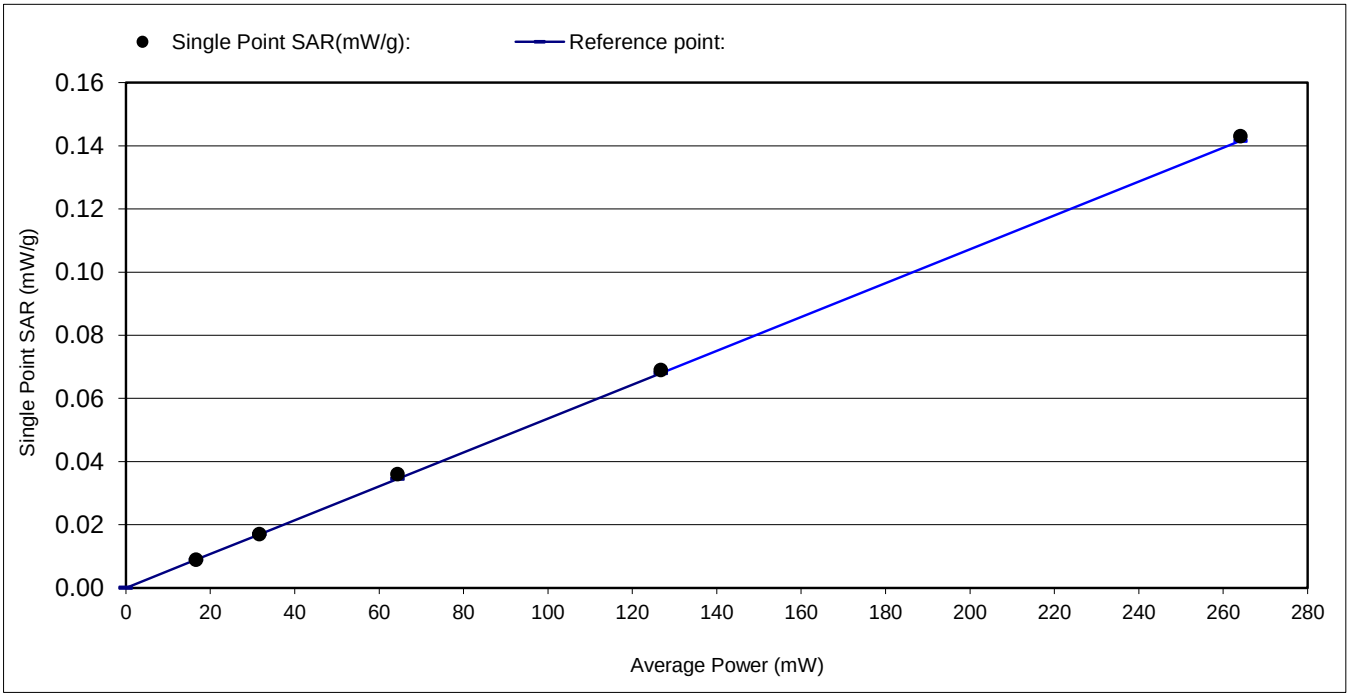
Procedure in establishing linear line (SAR):

First reference point = 0 mW/g when power = 0 mW
Second reference point: 0.0090 mW/g @ 16.23 mW
Third reference point: (0.0090 * 32.43 mW) / 16.23 mW = 0.0181
Fourth reference point: (0.0181 * 66.65 mW) / 32.43 mW = 0.0371
Fifth reference point: (0.0371 * 129.57 mW) / 66.65 mW = 0.0722
Sixth reference point: (0.0722 * 267.92 mW) / 129.57 mW = 0.1492

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

Measurement Result for Band Width 5 MHz, Modulation 64QAM

	First	Second	Third	Fourth	Sixth
Average Power (dBm):	12.200	15.004	18.087	21.030	24.218
Average Power (mW):	16.60	31.65	64.37	126.77	264.12
Single Point SAR(mW/g):	**0.0089**	**0.0170**	**0.0360**	**0.0690**	**0.1430**
Reference point:	**0.0089**	**0.0170**	**0.0345**	**0.0680**	**0.1416**
Estimated (%):	0.0000	0.1518	4.2828	1.4984	0.9592



Procedure in establishing linear line (SAR):

First reference point = 0 mW/g when power = 0 mW
Second reference point: 0.0089 mW/g @ 16.60 mW
Third reference point: (0.0089 * 31.65 mW) / 16.60 mW = 0.0170
Fourth reference point: (0.0170 * 64.37 mW) / 31.65 mW = 0.0345
Fifth reference point: (0.0345 * 126.77 mW) / 64.37 mW = 0.0680
Sixth reference point: (0.0680 * 264.12 mW) / 126.77 mW = 0.1416

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

17. Appendixes

Refer to separated files for the following appendixes

17.1. Appendix A: System Check Plots

17.2. Appendix B: SAR Test Plots

17.3. Appendix C: Calibration Certificate for EX3DV4 SN 3772

17.4. Appendix D: Calibration Certificate for D2600V2 SN 1036

18. Summary of Test configurations

Configuration	Antenna-to-User distance	SAR Require	Comments
(1) Bottom/Base	78.8 mm From WWAN antenna to user.	Yes	
(2) Bottom/Base/Tilt	8 mm From WWAN antenna to user.	Yes	The handle is not-removable and that is why the tilt position was used rather than a touch position during testing.
Primary Landscape	215 mm From WWAN antenna to user.	No	This is not the most conservative antenna to user distance.
(3) Secondary Landscape	11 mm From WWAN antenna to user.	Yes	
Secondary Portrait	220 mm From WWAN antenna to user.	No	This is not the most conservative antenna to user distance.
(4) Primary Portrait	13 mm From WWAN antenna to user.	Yes	