# FCC OET BULLETIN 65 SUPPLEMENT C 01-01
# SAR EVALUATION REPORT
# (WiMAX PORTION)

*FOR*

**Intel® Centrino® Advanced-N + WiMAX 6250**
**(Tested inside of Dell Tablet, model: K08T-K08T001)**

**MODEL: 622ANXHMW**

**FCC ID: E2K625ANXH**

**REPORT NUMBER: 10U13466-2A**

**ISSUE DATE: December 16, 2010**

*Prepared for*

**DELL INC.**
**ONE DELL WAY**
**ROUND ROCK, TX 78682**

*Prepared by*


**COMPLIANCE CERTIFICATION SERVICES (UL CCS)**
**47173 BENICIA STREET**
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NVLAP LAB CODE 200065-0

Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| -- | 11/23/2010 | Initial Issue | -- |
| A | 12/16/2010 | Updated report, include the following:<br>1. Added KDB 447498 to sec. 1 Attestation test results and sec. 2 Test Methodology.<br>2. Updated scale factors of 64QAM in sec. 12.3 and sec. 16.<br>3. Replace worst-case plots in sec. 17 with correct one.<br>4. P54, updated Secondary Landscape setup photo description to include Linearity SAR tests. | Sunny Shih |

# TABLE OF CONTENTS

# 1. ATTESTATION OF TEST RESULTS

| | |
|---|---|
| Company name: | DELL INC.<br>ONE DELL WAY<br>ROUND ROCK, TX 78682 |
| EUT Description: | Intel® Centrino® Advanced-N + WiMAX 6250<br>(Tested inside of Dell Tablet, model: K08T-K08T001) |
| Model number: | 622ANXHMW |
| Device Category: | Portable |
| Exposure category: | General Population/Uncontrolled Exposure |
| Date of tested: | October 22 – November 3 & 20, 2010 |

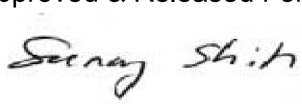
| FCC rule part | Freq. range (MHz) | Highest 1-g SAR (W/kg) | Limit (W/kg) |
|---|---|---|---|
| 27 | 2498.5 – 2687.5 | 1.08 (5MHz_QPSK)<br>Edge - Secondary Landscape | 1.6 |

| Applicable Standards | Test Results |
|---|---|
| FCC OET Bulletin 65 Supplement C 01-01 and the following test procedures:<br>- KDB 615223 802.16e WiMax SAR Guidance<br>- KDB 616217 Laptop with Screen Ant<br>- 447498 D01 Mobile Portable RF Exposure v04 | Pass |

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

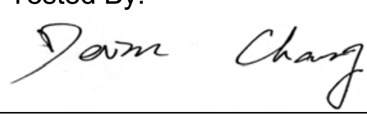
**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released For UL CCS By:



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

Tested By:



Devin Chang
EMC Engineer
Compliance Certification Services (UL CCS)

# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C 01-01 and the following specific FCC test procedures:

- KDB 615223 D01 802.16e WiMax SAR Guidance v01
- KDB 616217 D01 Laptop with Screen Ant v01r01
- KDB 616217 D02 SAR Polcy with Screen Ant v01r01
- KDB 616217 D03 SAR Supp Note and Netbook Laptop v01
- 447498 D01 Mobile Portable RF Exposure v04

## 2a. Control Signal Description

During normal operation of the Intel 6250 as a mobile WiMAX system the control channels may occupy up to 5 slots. A slot is a sub-channel with the duration of 3 symbols A maximum of two simultaneous Fast Channel Feedback (CQICH) reports used to feedback channel state information are possible, which can occupy up to two slots. A maximum of three slots can be used for Hybrid Automatic Repeat Request (HARQ) ACK/NAK by the five possible DL HARQ bursts in the previous DL frame. The 5 ACK/NAK bits each occupy ½ slot.

# 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 |
| ESG Vector Signal Generator | Agilent | E4438C | US44271971 | 9 | 28 | 2011 |
| E-Field Probe | SPEAG | EX3DV3 | 3531 | 2 | 23 | 2011 |
| Thermometer | ERTCO | 639-1S | 1718 | 7 | 19 | 2011 |
| Data Acquisition Electronics | SPEAG | DAE3 V1 | 427 | 7 | 21 | 2011 |
| System Validation Dipole | SPEAG | D2600V2* | 1006 | 4 | 22 | 2012 |
| Amplifier | Mini-Circuits | ZVE-8G | 90606 | N/A | | |
| Amplifier | Mini-Circuits | ZHL-42W | D072701-5 | N/A | | |
| Simulating Liquid | CCS | 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 | 3.36 | Normal | 1 | 0.64 | 2.15 |
| Liquid Permittivity - deviation from target | 5.00 | Rectangular | 1.732 | 0.6 | 1.73 |
| Liquid Permittivity - measurement | 2.63 | Normal | 1 | 0.6 | 1.58 |
| Combined Standard Uncertainty Uc(y) = | | | | | 9.81 |
| Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = | | | | 19.62 | % |
| Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = | | | | 1.56 | 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 | 3.36 | Normal | 1 | 0.43 | 1.44 |
| Liquid Permittivity - deviation from target | 5.00 | Rectangular | 1.732 | 0.49 | 1.41 |
| Liquid Permittivity - measurement uncertainty | 2.63 | Normal | 1 | 0.49 | 1.29 |
| Combined Standard Uncertainty Uc(y), % = | | | | | 9.49 |
| Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = | | | | 18.97 | % |
| Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = | | | | 1.51 | dB |

# 5. EQUIPMENT UNDER TEST

Intel® Centrino® Advanced-N + WiMAX 6250.

Model number: 622ANXHMW (Tested inside of Dell Tablet, model: K08T-K08T001)

Intel® Centrino® Advanced-N + WiMAX 6250 is an embedded IEEE 802.16e and 802.11a/b/g/n wireless network adapter that operates in the 2.4 GHz and 5 GHz spectra for WiFi and 2.6 GHz for WiMAX. The adapter is installed inside the Dell tablet Sparta. This adapter is capable of delivering up to 300 Mbps Tx/Rx over WiFi and up to 4 Mbps UL/10 Mbps DL over WiMAX.

WiMAX and 802.11 a/b/g/n co-location conditions:

The 802.16e WiMAX and 802.11 a/b/g/n WiFi radio will not transmit simultaneously. When the 622ANXHMW is installed in the typical laptop computer, once the network is chosen by the end user during WiMAX/WiFi network, only the WiMAX radio or WiFi radio will transmit.

| | |
|---|---|
| Normal operation: | ○ Laptop mode (with display open at 90° to the keyboard)<br>○ Tablet bottom face, and<br>○ Tablet edges:<br>- Multiple display orientations supporting both portrait and landscape configurations |
| Antenna tested: | <u>Manufactured</u> / <u>Part number</u><br>Smart Approach Co., Ltd: TX1 (A) Antenna: SE-ECIM0-003<br>TX2 (B) Antenna: SE-ECIM0-001<br>Acon: TX1 (A) Antenna: APP8P-700222<br>TX2 (B) Antenna: APP8P-700221 |
| Antenna-to-user separation distances: | Refer to Sec. 18 for details |
| Antenna-to-antenna separation distances: | Refer to Sec. 18 for details |
| Assessment for SAR evaluation for Simultaneous transmission: | **WiMAX – WLAN:**<br>The 802.16e WiMAX and 802.11a/b/g/n WiFi radio will not transmit simultaneously. |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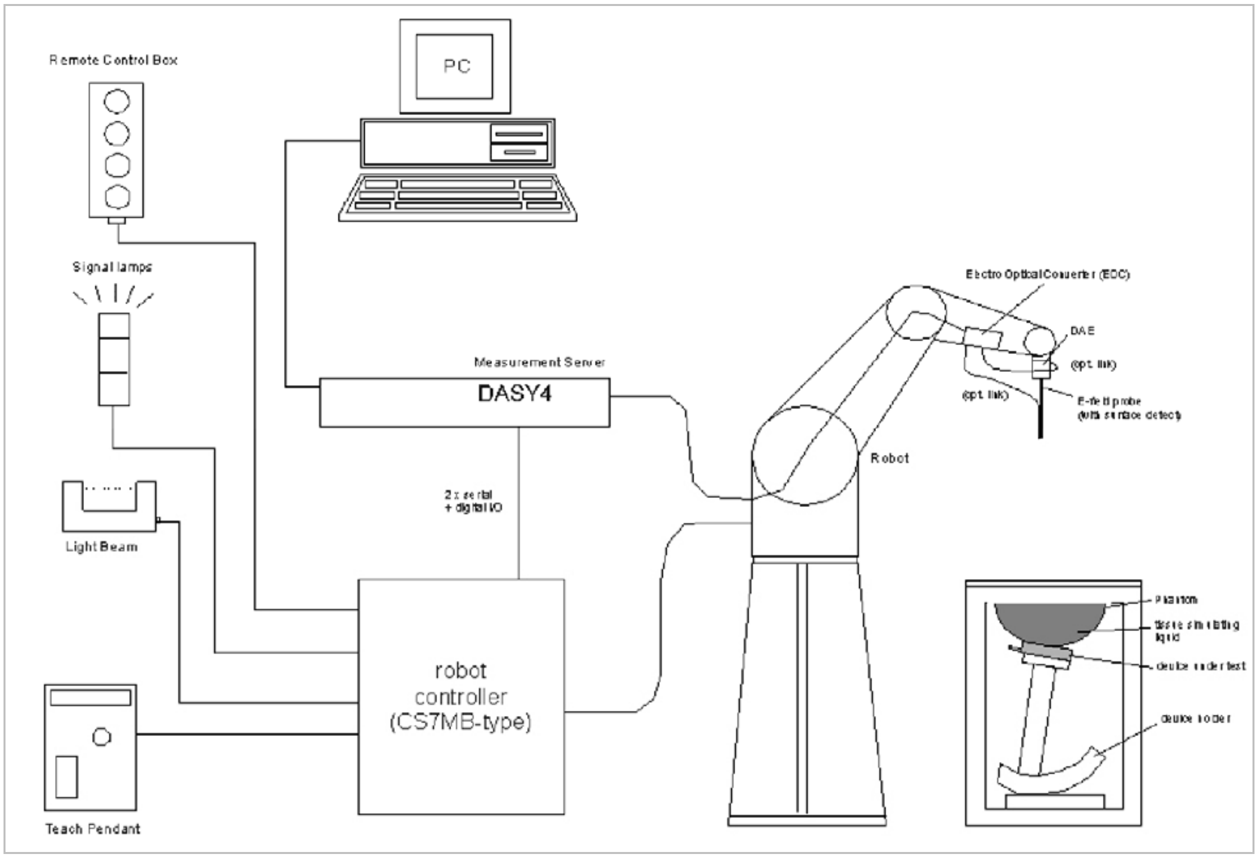
# 6. SYSTEM DESCRIPTION




**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 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

# 8. TISSUE DIELECTRIC PARAMETERS CHECK

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameters are within the tolerances of the specified target values. For frequencies in 300 MHz to 2 GHz, the measured conductivity and relative permittivity should be within ± 5% of the target values. For frequencies in the range of 2–3 GHz and above the measured conductivity should be within ± 5% of the target values. The measured relative permittivity tolerance can be relaxed to no more than ± 10%.

**Reference Values of Tissue Dielectric Parameters 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 | |
|---|---|---|
| | $\varepsilon_r$ | $\sigma$ (S/m) |
| 2450 | 52.7 | 1.95 |
| 2500 | 52.6 | 2.02 |
| 2600 | 52.5 | 2.16 |
| 2690 | 52.4 | 2.29 |

($\varepsilon_r$ = relative permittivity, $\sigma$ = conductivity and $\rho$ = 1000 kg/m$^3$)

## 8.1. 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' | 53.9834 | Relative Permittivity ($\epsilon_r$): | 53.9834 | 52.6 | 2.63 | ± 5 |
| | | e" | 15.0013 | Conductivity (σ): | 2.08635 | 2.02 | 3.28 | ± 5 |
| 2590 | 15 | e' | 53.6467 | Relative Permittivity ($\epsilon_r$): | 53.6467 | 52.5 | 2.18 | ± 5 |
| | | e" | 15.4042 | Conductivity (σ): | 2.21951 | 2.15 | 3.23 | ± 5 |
| 2600 | 15 | e' | 53.6104 | Relative Permittivity ($\epsilon_r$): | 53.6104 | 52.5 | 2.09 | ± 5 |
| | | e" | 15.4404 | Conductivity (σ): | 2.23332 | 2.16 | 3.36 | ± 5 |
| 2690 | 15 | e' | 53.2738 | Relative Permittivity ($\epsilon_r$): | 53.2738 | 52.4 | 1.67 | ± 5 |
| | | e" | 15.8023 | Conductivity (σ): | 2.36478 | 2.29 | 3.27 | ± 5 |

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 24 deg. C; Relative humidity = 41%
October 22, 2010 10:47 AM

| Frequency | e' | e" |
|---|---|---|
| 2480000000. | 54.0588 | 14.9055 |
| 2490000000. | 54.0218 | 14.9545 |
| **2500000000.** | **53.9834** | **15.0013** |
| 2510000000. | 53.9488 | 15.0505 |
| 2520000000. | 53.9144 | 15.0980 |
| 2530000000. | 53.8818 | 15.1456 |
| 2540000000. | 53.8458 | 15.1928 |
| 2550000000. | 53.8059 | 15.2350 |
| 2560000000. | 53.7687 | 15.2791 |
| 2570000000. | 53.7262 | 15.3207 |
| 2580000000. | 53.6848 | 15.3625 |
| **2590000000.** | **53.6467** | **15.4042** |
| **2600000000.** | **53.6104** | **15.4404** |
| 2610000000. | 53.5766 | 15.4820 |
| 2620000000. | 53.5415 | 15.5232 |
| 2630000000. | 53.5081 | 15.5623 |
| 2640000000. | 53.4719 | 15.6018 |
| 2650000000. | 53.4310 | 15.6388 |
| 2660000000. | 53.3890 | 15.6808 |
| 2670000000. | 53.3488 | 15.7211 |
| 2680000000. | 53.3100 | 15.7601 |
| **2690000000.** | **53.2738** | **15.8023** |
| 2700000000. | 53.2436 | 15.8472 |
| 2710000000. | 53.2122 | 15.8883 |
| 2720000000. | 53.1824 | 15.9312 |

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' | 53.1299 | Relative Permittivity ($\epsilon_r$): | 53.1299 | 52.6 | 1.01 | ± 5 |
| | | e" | 14.7666 | Conductivity (σ): | 2.05371 | 2.02 | 1.67 | ± 5 |
| 2590 | 15 | e' | 52.7941 | Relative Permittivity ($\epsilon_r$): | 52.7941 | 52.5 | 0.56 | ± 5 |
| | | e" | 15.1353 | Conductivity (σ): | 2.18077 | 2.15 | 1.43 | ± 5 |
| 2600 | 15 | e' | 52.7756 | Relative Permittivity ($\epsilon_r$): | 52.7756 | 52.5 | 0.50 | ± 5 |
| | | e" | 15.1815 | Conductivity (σ): | 2.19587 | 2.16 | 1.62 | ± 5 |
| 2690 | 15 | e' | 52.4361 | Relative Permittivity ($\epsilon_r$): | 52.4361 | 52.4 | 0.07 | ± 5 |
| | | e" | 15.5180 | Conductivity (σ): | 2.32224 | 2.29 | 1.41 | ± 5 |

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 24 deg. C; Relative humidity = 41%
October 24, 2010 1:47 PM

| Frequency | e' | e" |
|---|---|---|
| 2480000000. | 53.2039 | 14.6703 |
| 2490000000. | 53.1677 | 14.7329 |
| **2500000000.** | **53.1299** | **14.7666** |
| 2510000000. | 53.0881 | 14.7957 |
| 2520000000. | 53.0681 | 14.8481 |
| 2530000000. | 53.0207 | 14.8917 |
| 2540000000. | 52.9973 | 14.9343 |
| 2550000000. | 52.9603 | 14.9801 |
| 2560000000. | 52.9239 | 14.9959 |
| 2570000000. | 52.8972 | 15.0438 |
| 2580000000. | 52.8554 | 15.0923 |
| **2590000000.** | **52.7941** | **15.1353** |
| **2600000000.** | **52.7756** | **15.1815** |
| 2610000000. | 52.7441 | 15.2224 |
| 2620000000. | 52.7165 | 15.2617 |
| 2630000000. | 52.6726 | 15.2990 |
| 2640000000. | 52.6459 | 15.3416 |
| 2650000000. | 52.6055 | 15.3810 |
| 2660000000. | 52.5636 | 15.4080 |
| 2670000000. | 52.5213 | 15.4588 |
| 2680000000. | 52.4795 | 15.4912 |
| **2690000000.** | **52.4361** | **15.5180** |
| 2700000000. | 52.4092 | 15.5519 |
| 2710000000. | 52.3793 | 15.5976 |
| 2720000000. | 52.3531 | 15.6350 |

The conductivity (σ) can be given as:

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

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

$\varepsilon_0 = 8.854 * 10^{-12}$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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' | 52.0849 | Relative Permittivity ($\epsilon_r$): | | 52.0849 | 52.6 | -0.98 | ± 5 |
| | | e" | 14.8132 | Conductivity (σ): | | 2.06019 | 2.02 | 1.99 | ± 5 |
| 2590 | 15 | e' | 51.7795 | Relative Permittivity ($\epsilon_r$): | | 51.7795 | 52.5 | -1.37 | ± 5 |
| | | e" | 15.1828 | Conductivity (σ): | | 2.18761 | 2.15 | 1.75 | ± 5 |
| 2600 | 15 | e' | 51.7454 | Relative Permittivity ($\epsilon_r$): | | 51.7454 | 52.5 | -1.46 | ± 5 |
| | | e" | 15.2241 | Conductivity (σ): | | 2.20203 | 2.16 | 1.91 | ± 5 |
| 2690 | 15 | e' | 51.4012 | Relative Permittivity ($\epsilon_r$): | | 51.4012 | 52.4 | -1.91 | ± 5 |
| | | e" | 15.5838 | Conductivity (σ): | | 2.33209 | 2.29 | 1.84 | ± 5 |

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 38%
October 25, 2010 02:12 PM

| Frequency | e' | e" |
|---|---|---|
| 2480000000. | 52.1535 | 14.7343 |
| 2490000000. | 52.1185 | 14.7726 |
| **2500000000.** | **52.0849** | **14.8132** |
| 2510000000. | 52.0524 | 14.8554 |
| 2520000000. | 52.0190 | 14.8955 |
| 2530000000. | 51.9877 | 14.9347 |
| 2540000000. | 51.9530 | 14.9725 |
| 2550000000. | 51.9207 | 15.0122 |
| 2560000000. | 51.8854 | 15.0518 |
| 2570000000. | 51.8522 | 15.0948 |
| 2580000000. | 51.8164 | 15.1381 |
| **2590000000.** | **51.7795** | **15.1828** |
| **2600000000.** | **51.7454** | **15.2241** |
| 2610000000. | 51.7136 | 15.2689 |
| 2620000000. | 51.6752 | 15.3122 |
| 2630000000. | 51.6407 | 15.3518 |
| 2640000000. | 51.6056 | 15.3933 |
| 2650000000. | 51.5667 | 15.4317 |
| 2660000000. | 51.5276 | 15.4701 |
| 2670000000. | 51.4861 | 15.5052 |
| 2680000000. | 51.4384 | 15.5508 |
| **2690000000.** | **51.4012** | **15.5838** |
| 2700000000. | 51.3624 | 15.6205 |
| 2710000000. | 51.3226 | 15.6651 |
| 2720000000. | 51.2861 | 15.7030 |

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' | 53.7938 | Relative Permittivity ($\epsilon_r$): | 53.7938 | 52.6 | 2.27 | ± 5 |
| | | e" | 14.7819 | Conductivity (σ): | 2.05584 | 2.02 | 1.77 | ± 5 |
| 2590 | 15 | e' | 53.5022 | Relative Permittivity ($\epsilon_r$): | 53.5022 | 52.5 | 1.91 | ± 5 |
| | | e" | 15.1294 | Conductivity (σ): | 2.17992 | 2.15 | 1.39 | ± 5 |
| 2600 | 15 | e' | 53.4665 | Relative Permittivity ($\epsilon_r$): | 53.4665 | 52.5 | 1.82 | ± 5 |
| | | e" | 15.1714 | Conductivity (σ): | 2.19441 | 2.16 | 1.56 | ± 5 |
| 2690 | 15 | e' | 53.1819 | Relative Permittivity ($\epsilon_r$): | 53.1819 | 52.4 | 1.49 | ± 5 |
| | | e" | 15.5237 | Conductivity (σ): | 2.32309 | 2.29 | 1.45 | ± 5 |

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 25 deg. C; Relative humidity = 44%
November 03, 2010 10:56 AM

| Frequency | e' | e" |
|---|---|---|
| 2480000000. | 53.8622 | 14.6927 |
| 2490000000. | 53.8265 | 14.7366 |
| **2500000000.** | **53.7938** | **14.7819** |
| 2510000000. | 53.7615 | 14.8249 |
| 2520000000. | 53.7368 | 14.8685 |
| 2530000000. | 53.7091 | 14.9101 |
| 2540000000. | 53.6800 | 14.9479 |
| 2550000000. | 53.6480 | 14.9809 |
| 2560000000. | 53.6167 | 15.0168 |
| 2570000000. | 53.5767 | 15.0496 |
| 2580000000. | 53.5416 | 15.0877 |
| **2590000000.** | **53.5022** | **15.1294** |
| **2600000000.** | **53.4665** | **15.1714** |
| 2610000000. | 53.4293 | 15.2146 |
| 2620000000. | 53.3950 | 15.2554 |
| 2630000000. | 53.3659 | 15.2990 |
| 2640000000. | 53.3399 | 15.3367 |
| 2650000000. | 53.3089 | 15.3788 |
| 2660000000. | 53.2814 | 15.4120 |
| 2670000000. | 53.2518 | 15.4492 |
| 2680000000. | 53.2196 | 15.4859 |
| **2690000000.** | **53.1819** | **15.5237** |
| 2700000000. | 53.1444 | 15.5634 |
| 2710000000. | 53.1052 | 15.6035 |
| 2720000000. | 53.0685 | 15.6448 |

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' | 52.2683 | Relative Permittivity ($\epsilon_r$): | 52.2683 | 52.6 | -0.63 | ± 5 |
| | | e" | 14.5071 | Conductivity (σ): | 2.01762 | 2.02 | -0.12 | ± 5 |
| 2590 | 15 | e' | 51.9305 | Relative Permittivity ($\epsilon_r$): | 51.9305 | 52.5 | -1.08 | ± 5 |
| | | e" | 14.9312 | Conductivity (σ): | 2.15136 | 2.15 | 0.06 | ± 5 |
| 2600 | 15 | e' | 51.9037 | Relative Permittivity ($\epsilon_r$): | 51.9037 | 52.5 | -1.16 | ± 5 |
| | | e" | 14.9699 | Conductivity (σ): | 2.16527 | 2.16 | 0.21 | ± 5 |
| 2690 | 15 | e' | 51.5538 | Relative Permittivity ($\epsilon_r$): | 51.5538 | 52.4 | -1.61 | ± 5 |
| | | e" | 15.3264 | Conductivity (σ): | 2.29357 | 2.29 | 0.16 | ± 5 |

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 25 deg. C; Relative humidity = 44%
November 20, 2010 10:52 AM

| Frequency | e' | e" |
|---|---|---|
| 2470000000. | 52.3654 | 14.4150 |
| 2480000000. | 52.3422 | 14.4654 |
| 2490000000. | 52.2985 | 14.5133 |
| **2500000000.** | **52.2683** | **14.5071** |
| 2510000000. | 52.2445 | 14.5612 |
| 2520000000. | 52.2154 | 14.5853 |
| 2530000000. | 52.1654 | 14.6252 |
| 2540000000. | 52.1265 | 14.6505 |
| 2550000000. | 52.0860 | 14.7060 |
| 2560000000. | 52.0540 | 14.7415 |
| 2570000000. | 52.0239 | 14.8104 |
| 2580000000. | 51.9794 | 14.8843 |
| **2590000000.** | **51.9305** | **14.9312** |
| **2600000000.** | **51.9037** | **14.9699** |
| 2610000000. | 51.8696 | 15.0007 |
| 2620000000. | 51.8434 | 15.0248 |
| 2630000000. | 51.8265 | 15.0382 |
| 2640000000. | 51.7760 | 15.0609 |
| 2650000000. | 51.7511 | 15.1010 |
| 2660000000. | 51.7041 | 15.1437 |
| 2670000000. | 51.6479 | 15.2023 |
| 2680000000. | 51.6074 | 15.2569 |
| **2690000000.** | **51.5538** | **15.3264** |
| 2700000000. | 51.5185 | 15.3594 |
| 2710000000. | 51.4975 | 15.3924 |
| 2720000000. | 51.4789 | 15.4211 |

The conductivity (σ) can be given as:

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

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

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

# 9. SYSTEM VERIFICATION

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

**Measurement Conditions**

- The measurements were performed in the flat section of the SAM twin phantom filled with Head or Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3 SN3531 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 |

## 9.1. SYSTEM PERFORMANCE CHECK RESULTS

Ambient Temperature = 24°C; Relative humidity = 39% Measured by: Devin Chang

| System validation dipole | Date Tested | Measured (Normalized to 1 W) | | Target | Delta (%) | Tolerance (%) |
|---|---|---|---|---|---|---|
| | | Tissue: | Body | | | |
| D2600V2 | 10/22/10 | $SAR_{1g}$: | 56.5 | 57.6 | -1.91 | ±10 |
| | | $SAR_{10g}$: | 25.3 | 25.8 | -1.94 | |
| D2600V2 | 10/24/10 | $SAR_{1g}$: | 55.5 | 57.6 | -3.65 | ±10 |
| | | $SAR_{10g}$: | 24.8 | 25.8 | -3.88 | |
| D2600V2 | 10/25/10 | $SAR_{1g}$: | 57.3 | 57.6 | -0.52 | ±10 |
| | | $SAR_{10g}$: | 25.7 | 25.8 | -0.39 | |
| D2600V2 | 11/03/10 | $SAR_{1g}$: | 55.5 | 57.6 | -3.65 | ±10 |
| | | $SAR_{10g}$: | 24.9 | 25.8 | -3.49 | |
| D2600V2 | 11/20/10 | $SAR_{1g}$: | 56.9 | 57.6 | -1.22 | ±10 |
| | | $SAR_{10g}$: | 25.3 | 25.8 | -1.94 | |

## SYSTEM CHECK PLOT

Date/Time: 10/22/2010 11:05:12 AM

Test Laboratory: Compliance Certification Services

### System Performance Check - D2600V2

DUT: D2600V2; Type: D2600V2; Serial: 1006

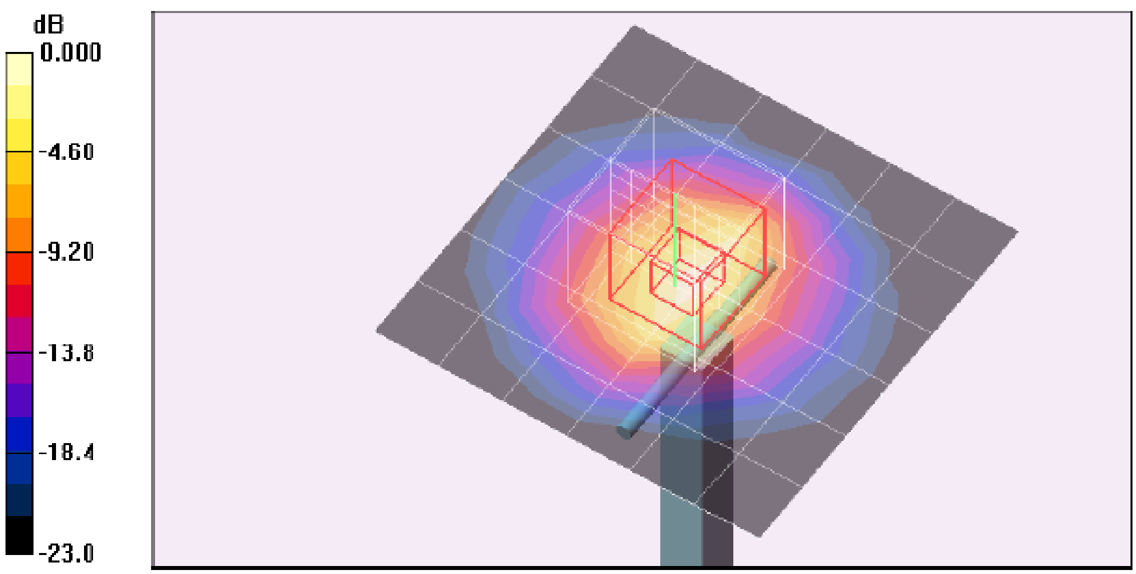
Communication System: CW 2600MHz; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; $\sigma$ = 2.23 mho/m; $\varepsilon_r$ = 53.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

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

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(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) = 7.28 mW/g

**d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.7 V/m; Power Drift = 0.117 dB
Peak SAR (extrapolated) = 11.8 W/kg
**SAR(1 g) = 5.65 mW/g; SAR(10 g) = 2.53 mW/g**
Maximum value of SAR (measured) = 7.35 mW/g



0 dB = 7.35mW/g

**SYSTEM CHECK – Z Plot**

Date/Time: 10/15/2010 9:46:29 AM

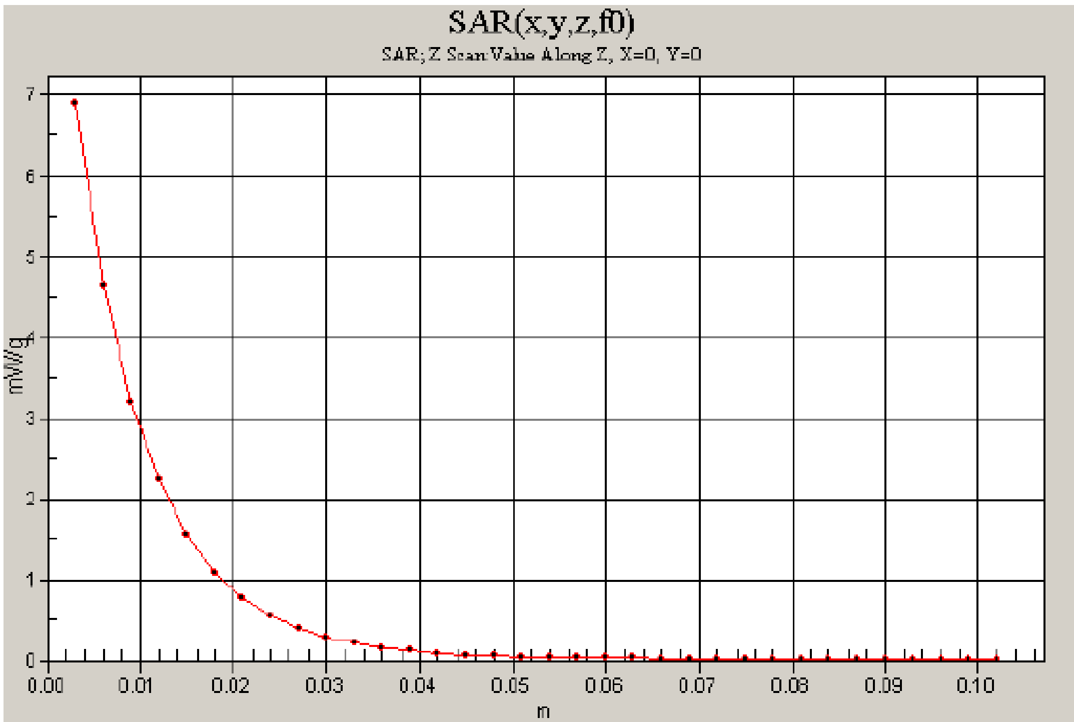
Test Laboratory: Compliance Certification Services

## System Performance Check - D2450V2

DUT: D2450V2; Type: D2450V2; Serial: 706

Communication System: CW 2450MHz; Frequency: 2450 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) = 6.89 mW/g





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**SYSTEM CHECK PLOT**

Date/Time: 10/24/2010 2:05:12 PM

Test Laboratory: Compliance Certification Services

## System Performance Check - D2600V2

DUT: D2600V2; Type: D2600V2; Serial: 1006

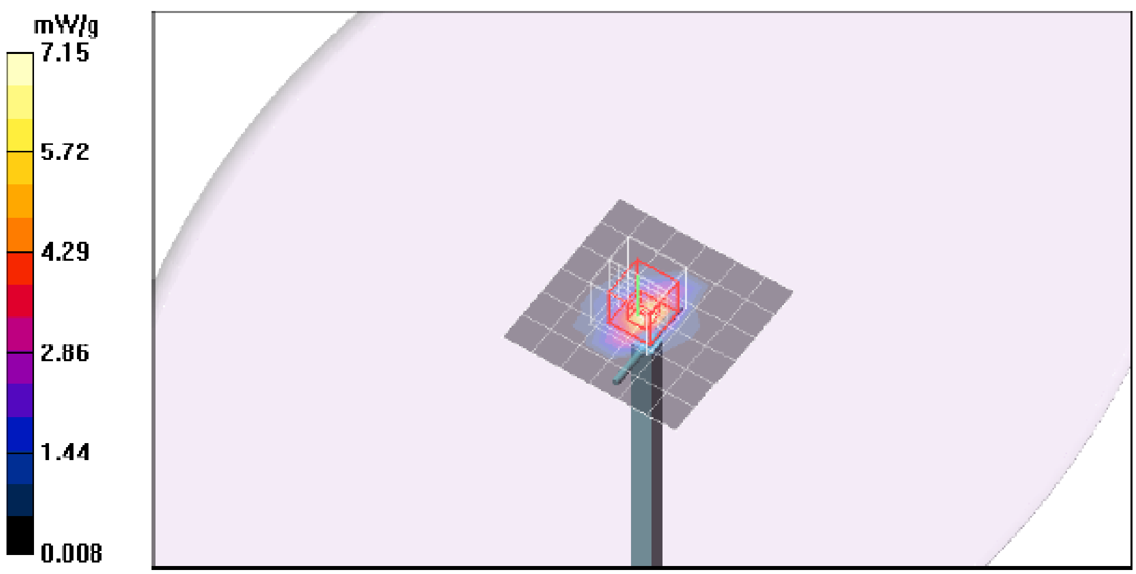
Communication System: CW 2600MHz; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; $\sigma$ = 2.2 mho/m; $\varepsilon_r$ = 52.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

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) = 7.15 mW/g

**d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.7 V/m; Power Drift = 0.117 dB
Peak SAR (extrapolated) = 11.6 W/kg
**SAR(1 g) = 5.55 mW/g; SAR(10 g) = 2.48 mW/g**
Maximum value of SAR (measured) = 7.23 mW/g



**SYSTEM CHECK – Z Plot**

Date/Time: 10/24/2010 2:22:45 PM

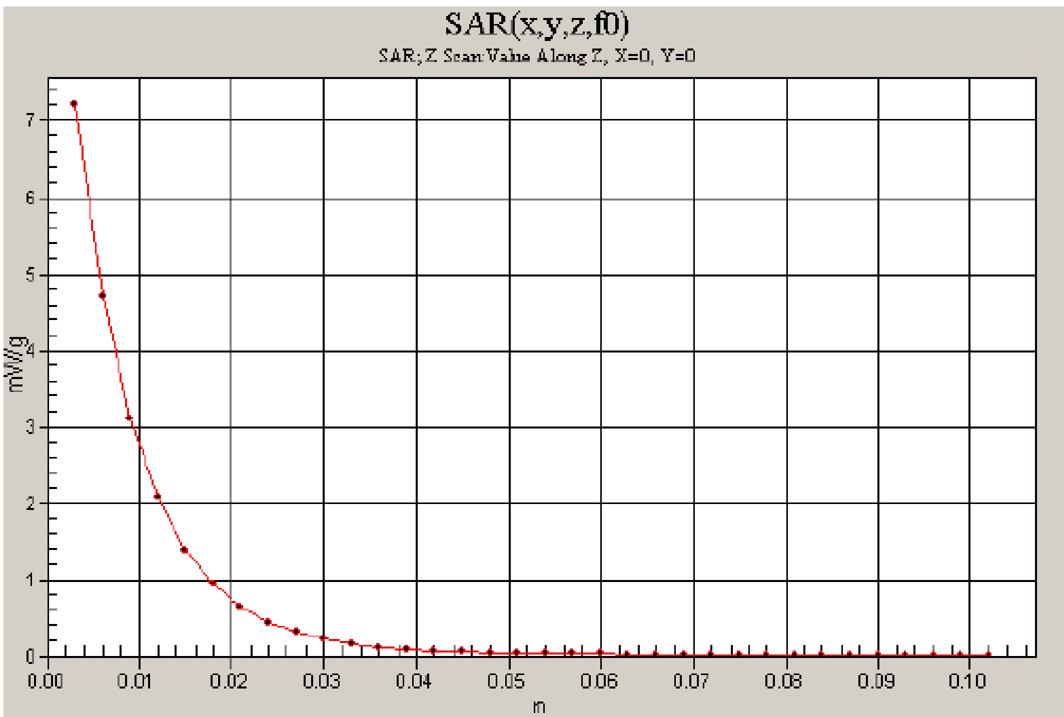
Test Laboratory: Compliance Certification Services

## 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) = 7.20 mW/g



## SYSTEM CHECK PLOT

Date/Time: 10/25/2010 2:49:36 PM

Test Laboratory: Compliance Certification Services

### System Performance Check - D2600V2

DUT: D2600V2; Type: D2600V2; Serial: 1006

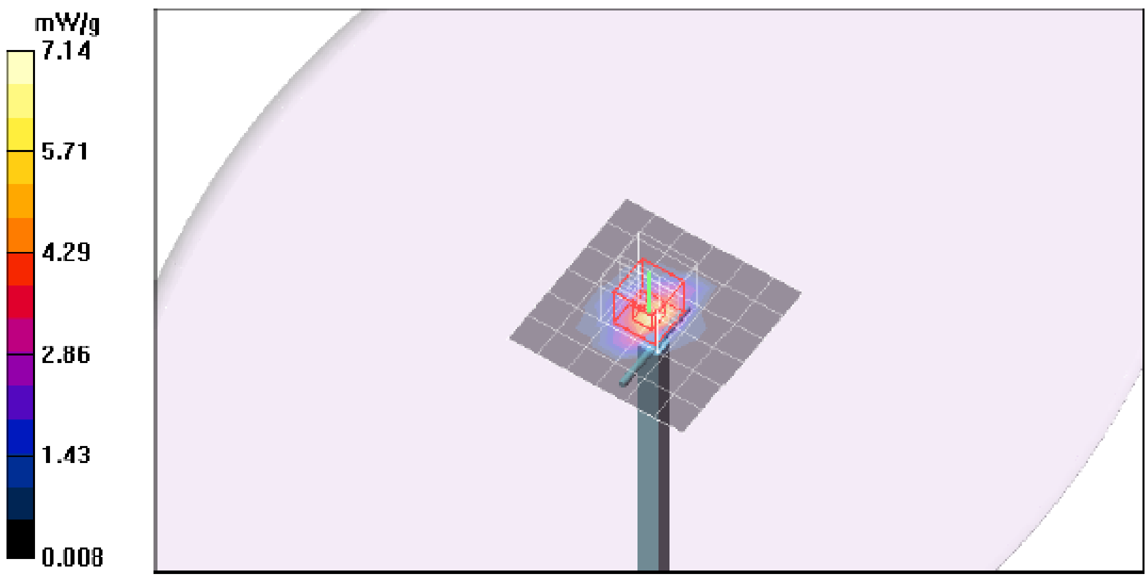
Communication System: CW 2600MHz; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; $\sigma$ = 2.2 mho/m; $\varepsilon_r$ = 51.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

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) = 7.14 mW/g

**d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.7 V/m; Power Drift = 0.217 dB
Peak SAR (extrapolated) = 11.9 W/kg
**SAR(1 g) = 5.73 mW/g; SAR(10 g) = 2.57 mW/g**
Maximum value of SAR (measured) = 7.68 mW/g





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## SYSTEM CHECK – Z Plot

Date/Time: 10/25/2010 3:06:32 PM

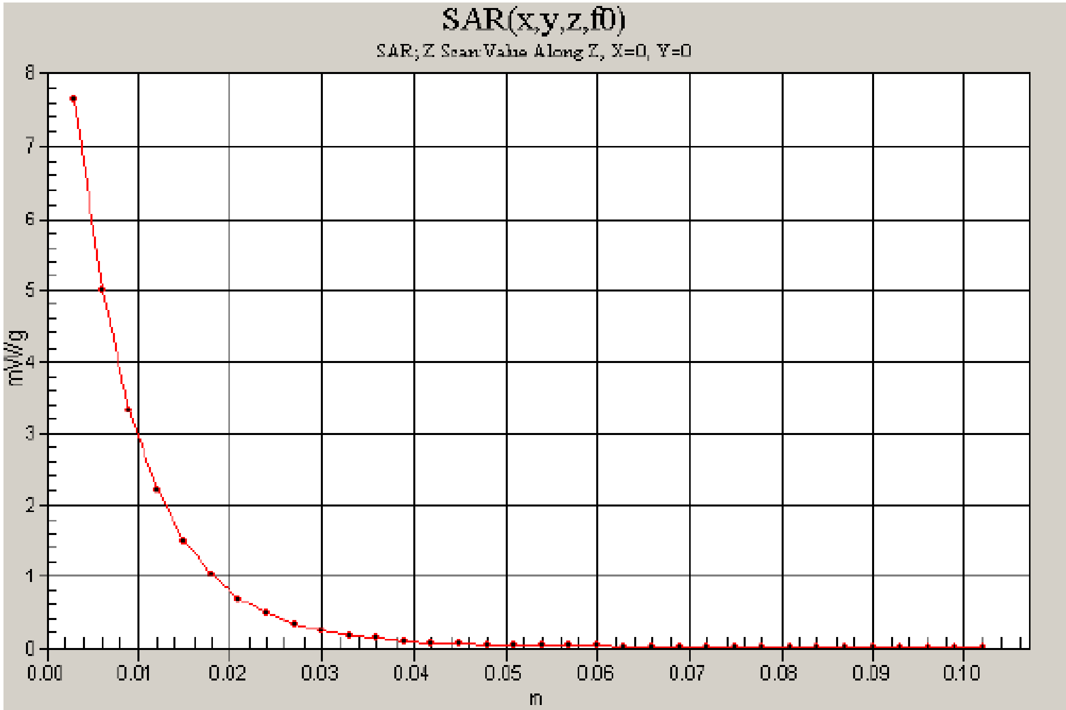
Test Laboratory: Compliance Certification Services

### 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) = 7.65 mW/g





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**SYSTEM CHECK PLOT**

Date/Time: 11/3/2010 1:51:41 PM

Test Laboratory: Compliance Certification Services

## System Performance Check - D2600V2

DUT: D2600V2; Type: D2600V2; Serial: 1006

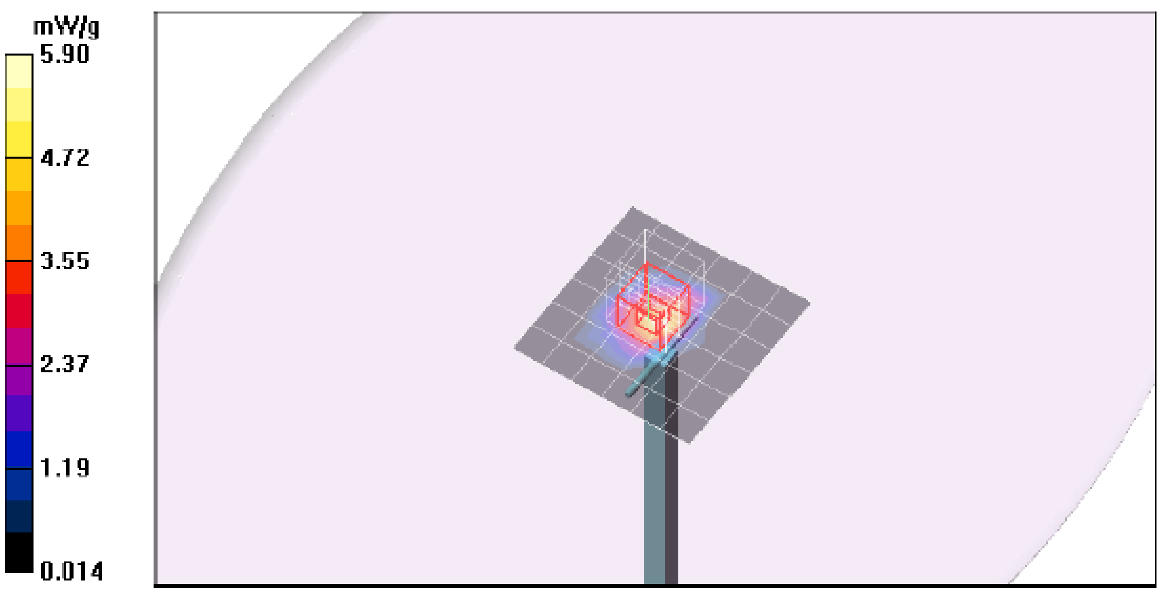
Communication System: CW 2600MHz; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; $\sigma$ = 2.19 mho/m; $\varepsilon_r$ = 53.5; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

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) = 5.90 mW/g

### d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.4 V/m; Power Drift = 0.171 dB
Peak SAR (extrapolated) = 11.7 W/kg
**SAR(1 g) = 5.55 mW/g; SAR(10 g) = 2.49 mW/g**
Maximum value of SAR (measured) = 7.24 mW/g



**SYSTEM CHECK – Z Plot**

Date/Time: 11/3/2010 2:08:40 PM

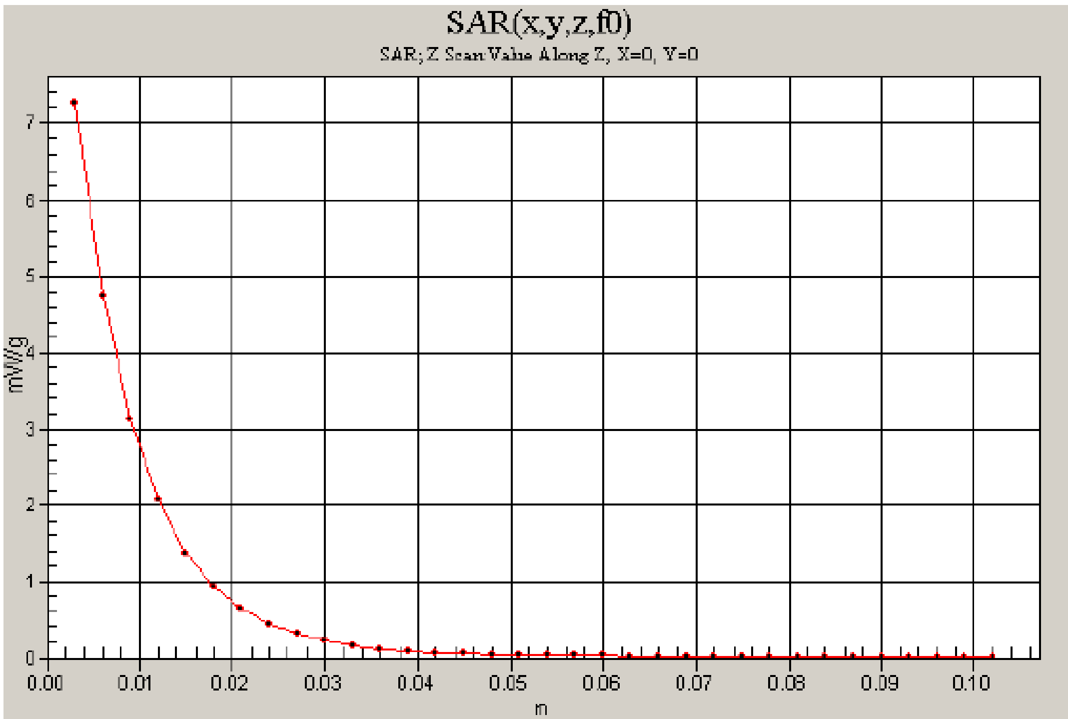
Test Laboratory: Compliance Certification Services

## 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) = 7.26 mW/g



## SYSTEM CHECK PLOT

Date/Time: 11/20/2010 12:46:14 PM

Test Laboratory: Compliance Certification Services

### System Performance Check - D2600V2

DUT: D2600V2; Type: D2600V2; Serial: 1006

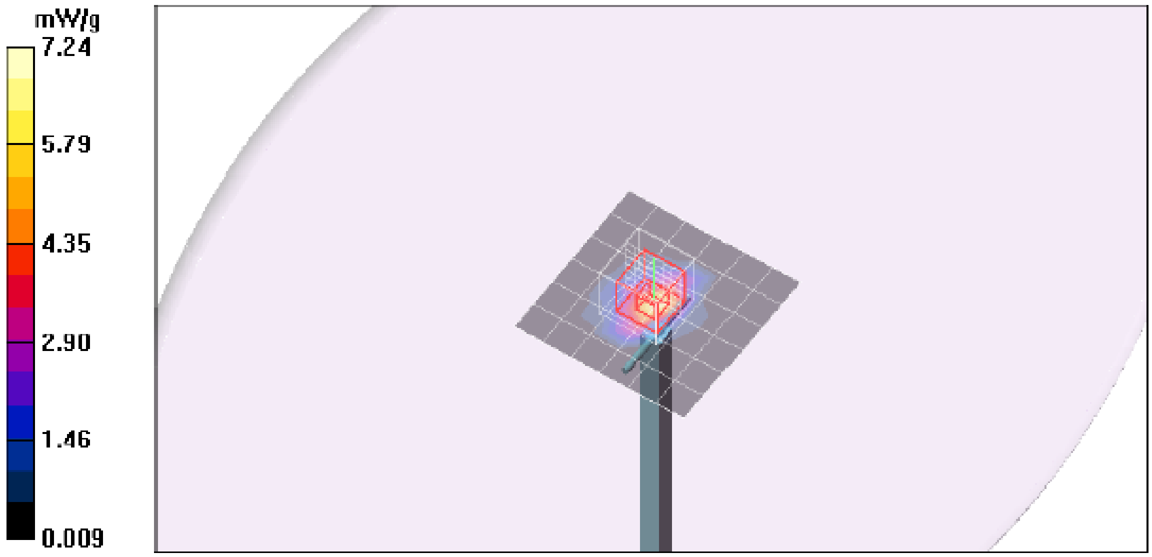
Communication System: CW 2600MHz; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; $\sigma$ = 2.17 mho/m; $\varepsilon_r$ = 51.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section

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) = 7.24 mW/g

**d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.4 V/m; Power Drift = 0.193 dB
Peak SAR (extrapolated) = 12.1 W/kg
**SAR(1 g) = 5.69 mW/g; SAR(10 g) = 2.53 mW/g**
Maximum value of SAR (measured) = 7.49 mW/g



**SYSTEM CHECK – Z Plot**

Date/Time: 11/20/2010 1:03:10 PM

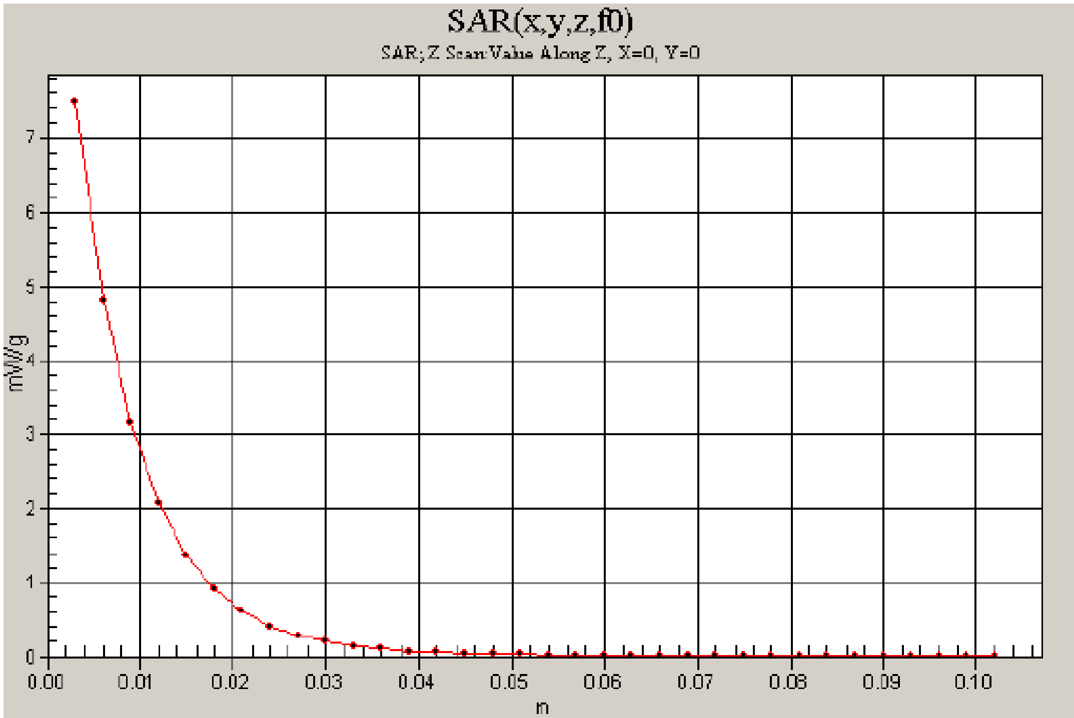
Test Laboratory: Compliance Certification Services

## 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) = 7.48 mW/g





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# 10. 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.

| Mode | | Test Vector file name | Freq. | Conducted output power | |
|---|---|---|---|---|---|
| | | | (MHz) | (dBm) | (mW) |
| 5MHz | QPSK | DQ64_56_UQ4_12_5M | 2498.5 | 24.30 | 269.15 |
| | | | **2593.0** | **24.30** | **269.15** |
| | | | 2687.5 | 24.20 | 263.03 |
| 5MHz | 16QAM | DQ4_12_UQ16_34_5M | 2498.5 | 24.40 | 275.42 |
| | | | **2593.0** | **24.50** | **281.84** |
| | | | 2687.5 | 24.40 | 275.42 |
| 5MHz | 64QAM | DQ4_12_UQ64_56_5M | 2498.5 | 20.10 | 102.33 |
| | | | **2593.0** | **20.10** | **102.33** |
| | | | 2687.5 | 20.00 | 100.00 |
| 10MHz | QPSK | DQ64_UQ4_12_21S_10M | 2501.0 | 23.60 | 229.09 |
| | | | **2593.0** | **23.70** | **234.42** |
| | | | 2685.0 | 23.70 | 234.42 |
| 10MHz | 16QAM | DQ4_12_UQ16_12_10M | 2501.0 | 23.60 | 229.09 |
| | | | **2593.0** | **23.70** | **234.42** |
| | | | 2685.0 | 23.70 | 234.42 |
| 10MHz | 64QAM | DQ4_12_UQ64_56_10M | 2501.0 | 19.20 | 83.18 |
| | | | **2593.0** | **19.30** | **85.11** |
| | | | 2685.0 | 19.30 | 85.11 |

# 11. PEAK TO AVERAGE RATIO

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

| Mode | Test Vector file name | Ch. No | f (MHz) | Conducted Power (dBm) | | Peak-to-average ratio (PAR) |
|---|---|---|---|---|---|---|
| | | | | Peak | Average | |
| QPSK | DQ64_56_UQ4_12_5M | 378 | 2593 | 32.10 | 24.30 | 7.80 |
| 16QAM | DQ4_12_UQ16_34_5M | 378 | 2593 | 33.09 | 24.40 | 8.69 |
| 64QAM | DQ4_12_UQ64_56_5M | 378 | 2593 | 27.26 | 20.10 | 7.16 |
| QPSK | DQ64_UQ4_12_21S_10M | 368 | 2593 | 32.76 | 23.76 | 9.00 |
| 16QAM | DQ4_12_UQ16_12_10M | 368 | 2593 | 32.48 | 23.60 | 8.88 |
| 64QAM | DQ4_12_UQ64_56_10M | 368 | 2593 | 27.95 | 19.30 | 8.65 |

# 12. WIMAX / 802.16e DEVICE SPECIFICATION

## 12.1. 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 WiMAX 6250 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** |

## 12.2. DUTY FACTOR CONSIDERATIONS

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

b. Although the chipset can supply higher downlink-to-uplink (DL/UL) symbol ratios, 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 | | Test Vector file name | Freq. | Conducted output power | |
|---|---|---|---|---|---|
| | | | (MHz) | (dBm) | (mW) |
| 5 MHz | QPSK | DQ64_56_UQ4_12_5M | 2593.0 | 24.30 | 269.15 |
| | 16QAM | DQ4_12_UQ16_34_5M | 2593.0 | 24.50 | 281.84 |
| | 64QAM | DQ4_12_UQ64_56_5M | 2593.0 | 20.10 | 102.33 |
| 10 MHz | QPSK | DQ64_UQ4_12_21S_10M | 2593.0 | 23.70 | 234.42 |
| | 16QAM | DQ4_12_UQ16_12_10M | 2593.0 | 23.70 | 234.42 |
| | 64QAM | DQ4_12_UQ64_56_10M | 2593.0 | 19.30 | 85.11 |

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 | 269.00 | 79.12 | 4272.35 |
| | 16QAM | 269.00 | 79.12 | 4272.35 |
| | 64QAM | 107.15 | 31.51 | 1701.79 |
| 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 | 229.00 | 32.71 | 3533.14 |
| | 16QAM | 229.00 | 32.71 | 3533.14 |
| | 64QAM | 91.20 | 13.03 | 1407.09 |


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g. Test Vector waveform power

**5 MHz BW / QPSK: DQ64_56_UQ4_12_5M (26:21 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | Measured Pwr (dBm) | Measured Pwr (mW) | Number of Traffic Symbols | Traffic Symbols Pwr (mW) |
|---|---|---|---|---|---|
| 0 | 2498.5 | 24.30 | 269.15 | 18 | 4844.76 |
| 378 | 2593 | 24.30 | 269.15 | 18 | 4844.76 |
| 756 | 2687.5 | 24.20 | 263.03 | 18 | 4734.48 |

**5 MHz BW / 16QAM: DQ4_12_UQ16_34_5M (26:21 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | Measured Pwr (dBm) | Measured Pwr (mW) | Number of Traffic Symbols | Traffic Symbols Pwr (mW) |
|---|---|---|---|---|---|
| 0 | 2498.5 | 24.40 | 275.42 | 18 | 4957.61 |
| 378 | 2593 | 24.50 | 281.84 | 18 | 5073.09 |
| 756 | 2687.5 | 24.40 | 275.42 | 18 | 4957.61 |

**5 MHz BW / 64QAM: DQ4_12_UQ64_56_5M (23:24 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | Measured Pwr (dBm) | Measured Pwr (mW) | Number of Traffic Symbols | Traffic Symbols Pwr (mW) |
|---|---|---|---|---|---|
| 0 | 2498.5 | 20.10 | 102.33 | 21 | 2148.92 |
| 378 | 2593 | 20.10 | 102.33 | 21 | 2148.92 |
| 756 | 2687.5 | 20.00 | 100.00 | 21 | 2100.00 |

**10 MHz BW / QPSK: DQ64_UQ4_12_21S_10M (23:24 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | Measured Pwr (dBm) | Measured Pwr (mW) | Number of Traffic Symbols | Traffic Symbols Pwr (mW) |
|---|---|---|---|---|---|
| 0 | 2501 | 23.60 | 229.09 | 21 | 4810.82 |
| 368 | 2593 | 23.70 | 234.42 | 21 | 4922.88 |
| 736 | 2685 | 23.70 | 234.42 | 21 | 4922.88 |

**10 MHz BW / 16QAM: DQ4_12_UQ16_12_10M (32:15 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | Measured Pwr (dBm) | Measured Pwr (mW) | Number of Traffic Symbols | Traffic Symbols Pwr (mW) |
|---|---|---|---|---|---|
| 0 | 2501 | 23.60 | 229.09 | 12 | 2749.04 |
| 368 | 2593 | 23.70 | 234.42 | 12 | 2813.07 |
| 736 | 2685 | 23.70 | 234.42 | 12 | 2813.07 |

**10 MHz BW / 64QAM: DQ4_12_UQ64_56_10M (32:15 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | Measured Pwr (dBm) | Measured Pwr (mW) | Number of Traffic Symbols | Traffic Symbols Pwr (mW) |
|---|---|---|---|---|---|
| 0 | 2501 | 19.20 | 83.18 | 12 | 998.12 |
| 368 | 2593 | 19.30 | 85.11 | 12 | 1021.37 |
| 736 | 2685 | 19.30 | 85.11 | 12 | 1021.37 |

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

5M QPSK = 269.15 * 18
= 4844.76

10M QPSK = 234.42 * 21
= 4922.88

## 12.3. DUTY FACTOR SCALING TO DL:UL RATIO OF 29:18

**5 MHz BW / QPSK:** **DQ64_UQ4_12_5M (26:21 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | 29:18 Rated Pwr | Traffic Symbol Pwr | Scaling Factor (Rated Pwr/Traffic Pwr) |
|---|---|---|---|---|
| 0 | 2498.5 | 4272.35 | 4844.76 | 0.88 |
| 378 | 2593 | 4272.35 | 4844.76 | 0.88 |
| 756 | 2687.5 | 4272.35 | 4734.48 | 0.90 |

**5 MHz BW / 16QAM:** **DQ4_12_UQ16_34_5M (26:21 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | 29:18 Rated Pwr | Traffic Symbol Pwr | Scaling Factor (Rated Pwr/Traffic Pwr) |
|---|---|---|---|---|
| 0 | 2498.5 | 4272.35 | 4957.61 | 0.86 |
| 378 | 2593 | 4272.35 | 5073.09 | 0.84 |
| 756 | 2687.5 | 4272.35 | 4957.61 | 0.86 |

**5 MHz BW / 64QAM:** **DQ4_12_UQ64_56_5M (23:24 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | 29:18 Rated Pwr | Traffic Symbol Pwr | Scaling Factor (Rated Pwr/Traffic Pwr) |
|---|---|---|---|---|
| 0 | 2498.5 | 1701.79 | 2148.92 | 0.79 |
| 378 | 2593 | 1701.79 | 2148.92 | 0.79 |
| 756 | 2687.5 | 1701.79 | 2100.00 | 0.81 |

**10 MHz BW / QPSK:** **DQ64_UQ4_12_21S_10M (23:24 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | 29:18 Rated Pwr | Traffic Symbol Pwr | Scaling Factor (Rated Pwr/Traffic Pwr) |
|---|---|---|---|---|
| 0 | 2501 | 3533.14 | 4810.82 | 0.73 |
| 368 | 2593 | 3533.14 | 4922.88 | 0.72 |
| 736 | 2685 | 3533.14 | 4922.88 | 0.72 |

**10 MHz BW / 16QAM:** **DQ4_12_UQ16_12_10M (32:15 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | 29:18 Rated Pwr | Traffic Symbol Pwr | Scaling Factor (Rated Pwr/Traffic Pwr) |
|---|---|---|---|---|
| 0 | 2501 | 3533.14 | 2749.04 | 1.29 |
| 368 | 2593 | 3533.14 | 2813.07 | 1.26 |
| 736 | 2685 | 3533.14 | 2813.07 | 1.26 |

**10 MHz BW / 64QAM:** **DQ4_12_UQ16_56_10M (32:15 DL:UL Ratio)**

| Ch. # | Freq. (MHz) | 29:18 Rated Pwr | Traffic Symbol Pwr | Scaling Factor (Rated Pwr/Traffic Pwr) |
|---|---|---|---|---|
| 0 | 2501 | 1407.09 | 998.12 | 1.41 |
| 368 | 2593 | 1407.09 | 1021.37 | 1.38 |
| 736 | 2685 | 1407.09 | 1021.37 | 1.38 |

## 12.4. CONVERSION FACTOR & SAR SCALE FACTOR

| Vector Waveform File | Ch. BW | Modulation | DL:UL Ratio | Calculated | |
|---|---|---|---|---|---|
| | | | | Duty Cycle | Crest Factor |
| DQ64_56_UQ4_12_5M | 5 MHz | QPSK | 26 : 21 | 37.0% | 2.70 |
| DQ4_12_UQ16_34_5M | 5 MHz | 16QAM | 26 : 21 | 37.0% | 2.70 |
| DQ4_12_UQ64_56_5M | 5 MHz | 64QAM | 23 : 24 | 43.2% | 2.31 |
| DQ64_UQ4_12_21S_10M | 10 MHz | QPSK | 23 : 24 | 43.2% | 2.31 |
| DQ4_12_UQ16_12_10M | 10 MHz | 16QAM | 32 : 15 | 24.7% | 4.05 |
| DQ4_12_UQ64_56_10M | 10 MHz | 64QAM | 32 : 15 | 24.7% | 4.05 |

Note: The duty factor can be given as: (number of traffic symbols*102.857*us*)/5000*us*



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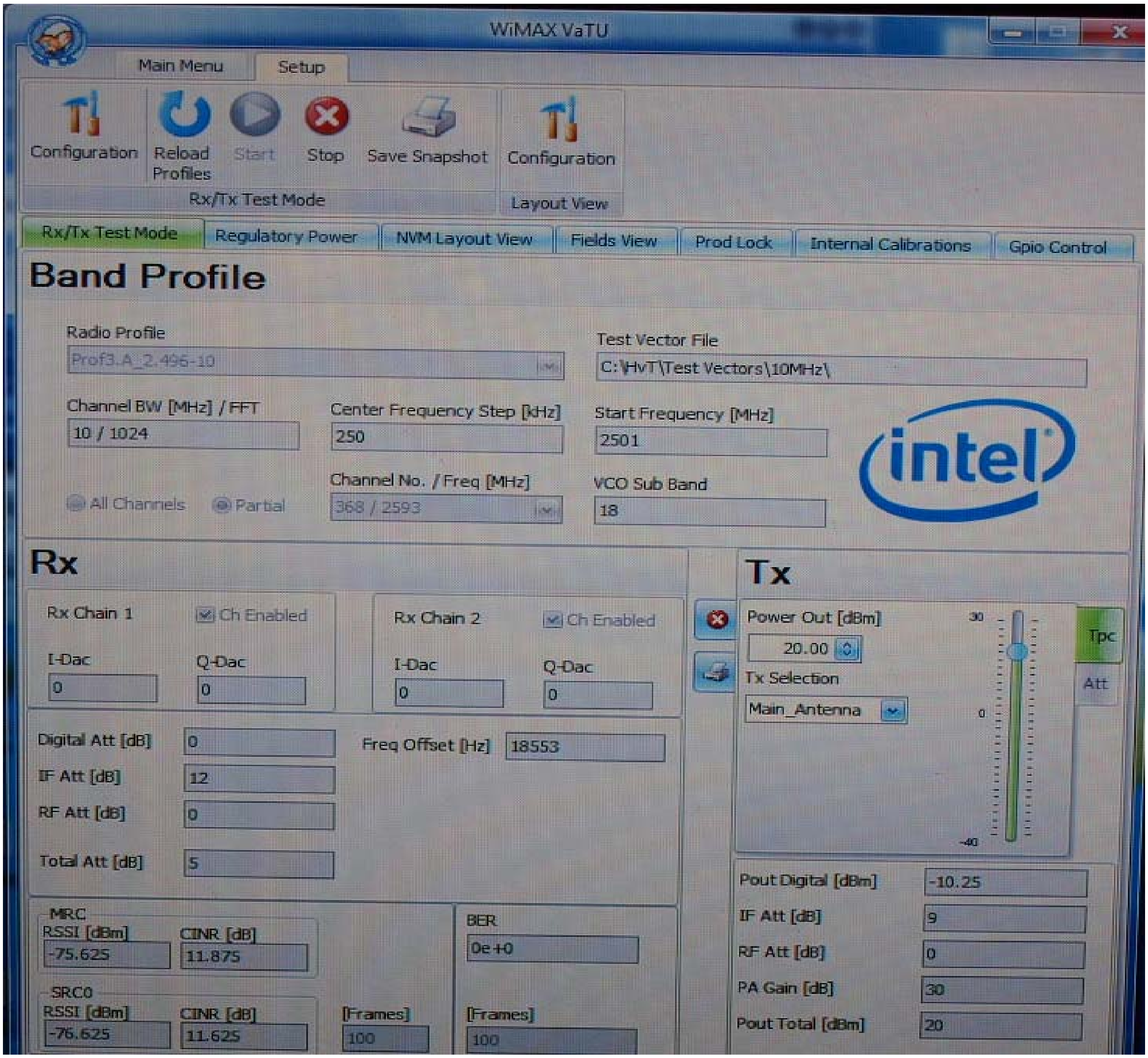
# 13. TEST SOFTWARE

The test software tool (WiMAX VaTU SW application) is installed on the host device, WiMAX , to transmit at max. output power. During normal operation, the output power of WiMAX client module is controlled by a WiMAX basestation, which also determines the characteristics of the transmission. For testing purposes, the device output power is kept at this max. using WiMAX VATU SW application loaded in the host device. The uplink transmission is maintained at a stable condition by the radio profile loaded in Vector signal generator. This enables the WiMAX module to transmit at max. power with a constant duty factor according to the specific radio profile. The test software serves only one purpose, to configure the WiMAX module to transmit at the max. power during SAR measurement.

The EUT driver software installed in the host support equipment during testing was WiMAX VaTU, version: 5.0.0.1

VaTU SW Application

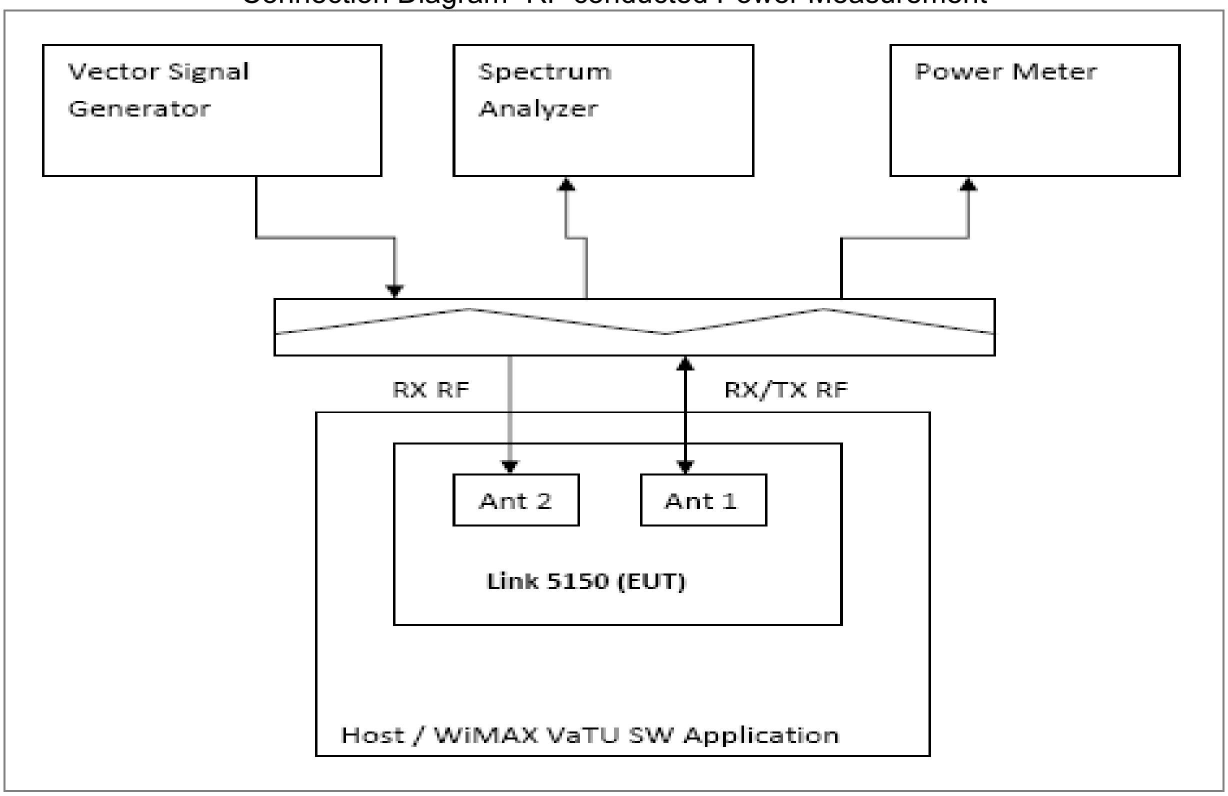


# 14. SIGNAL GENERATEOR DETAILS

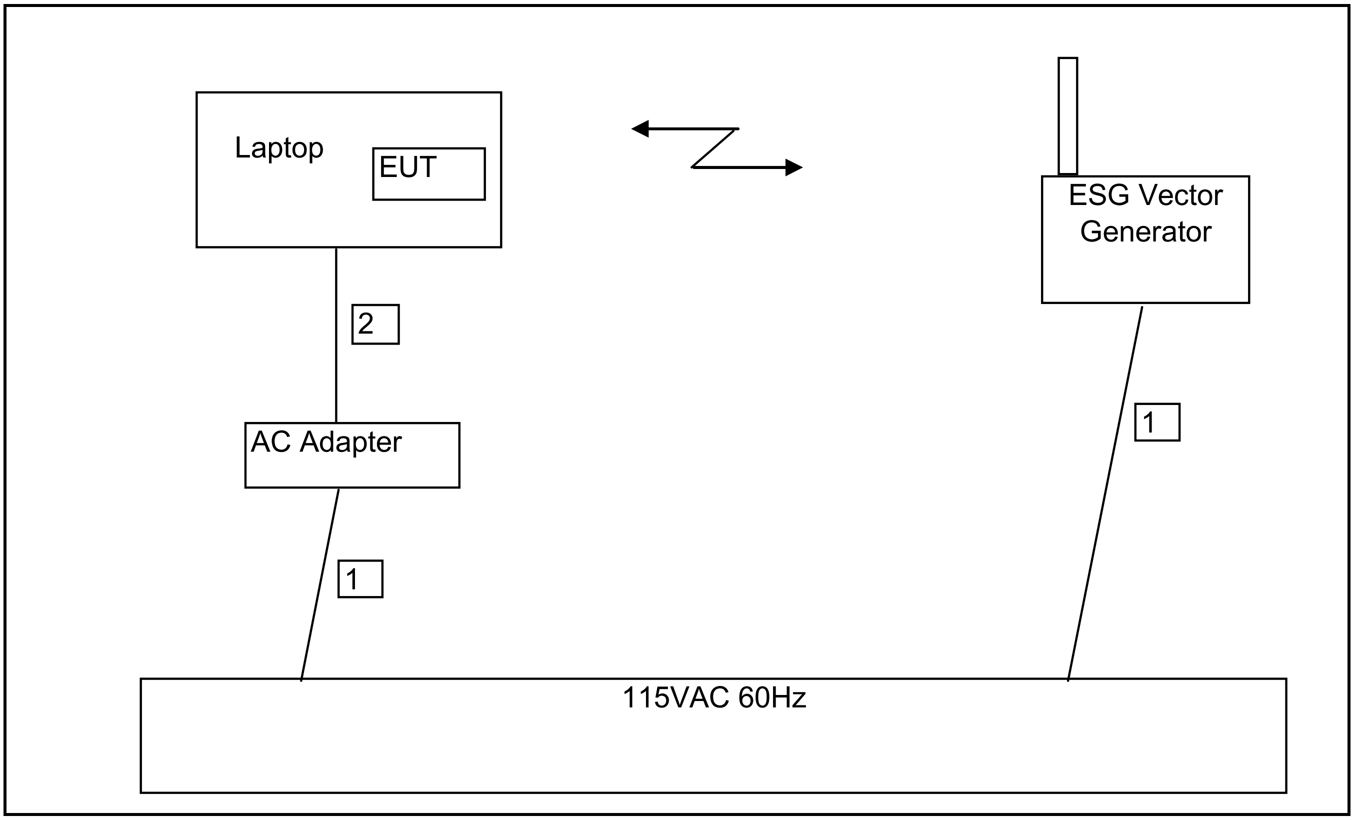
Frame Profile loaded in Vector Signal Generator:

| Test Vector File Name | BW | DL:UL Symbols | UL duty Cycle (%) (Calculated) | DL Modulation | UL Modulation |
|---|---|---|---|---|---|
| DQ4_12_UQ16_12_10M | 10 MHz | 32:15 | 24.7 | QPSK R1/2 | QAM16 R3/4 |
| DQ64_UQ4_12_21S_10M | 10 MHz | 23:24 | 43.2 | QAM64 R5/6 | QPSK R1/2 |
| DQ4_12_UQ16_34_5M | 5 MHz | 26:21 | 37.0 | QPSK R1/2 | QAM16 R3/4 |
| DQ64_56_UQ4_12_5M | 5 MHz | 26:21 | 37.0 | QAM64 R5/6 | QPSK R1/2 |

Connection Diagram- RF conducted Power Measurement



SAR Measurement




Agilent ESG Vector Signal Generator / Model:E4438C is used in conjunction with Intel supplied radio profile to configure the WiMAX module for the SAR evaluation. ESG Vector Signal Generator is loaded with the downlink signal, containing the respective FCH, DL-MAP and UL-MAP required by the test device to configure the uplink transmission. The waveform is configured for a DL:UL symbol ratio of 32:15 for 10 MHz/16WAM; 23:24 for 10MHz/QPSK and 26:21 for 5 MHz/16WAM/QPSK using Intel Signal Waveform Software for 802.16 WiMAX, on the PC and downloaded to the VSG. The test device can synchronize itself to the signal received from VSG, both in frequency and time. It then modulates the DL-MAP and UL-MAP transmitted in the downlink sub-frame and determine the DL:UL symbol ratio. The downlink burst is repeated in each frame, every 5 ms, to simulate the normal transmission from a WiMAX base station. The UL-MAP received by the device is used to configure the uplink burst with all data symbols and sub-channels active. Since this is a one-way communication configuration, control channel transmission is neither requested nor transmitted.

For TDD systems, both uplink and downlink transmissions are at the same frequency. The output power of the VSG is kept at least 80 dB lower than the test device to avoid interfering with the SAR measurements. In addition, a horn antenna is used for the VSG and it is kept more than 1 meter away from the test device to further minimize unnecessary pickup by the SAR probe.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# 15. VECTOR SIGNAL GENERATOR TEST SET DETAILS

Modulation and channel bandwidth selection is loaded to Vector Signal Generator. For example, when evaluating 16QAM with 10 MHz channel Bandwidth, radio profile name “DQ4_12_UQ16_12_10M “ is active on the Vector Signal Generator.

| Parameter /Value | Frame definition for 10 MHz RCT | | |
|---|---|---|---|
| | Test vector name | | Remark |
| | DQ4_12_UQ16_12_10M | DQ64_UQ4_12_21S_10M | |
| Band Width | 10MHz | 10MHz | |
| FFT size | 1024 | 1024 | |
| UL Traffic Symbols | 12 | 21 | |
| ***Down link*** | | | |
| Zone profiles | Zone 1 – PUSC | Zone 1 – PUSC | single zone |
| Burst profile / MCS | MCS : QPSK R1/2 | MCS : QAM64 R5/6 | Single DIUC |
| ***Up link*** | | | |
| Zone profiles | Zone 1 – PUSC | Zone 1 – PUSC | single zone |
| Burst profile / MCS | MCS : QAM16 R3/4 | MCS : QPSK R1/2 | Single DIUC |

| Parameter /Value | Frame definition for 5MHz RCT | | |
|---|---|---|---|
| | Test vector name | | Remarks |
| | DQ4_12_UQ16_34_5M | DQ64_56_UQ4_12_5M | |
| Band Width | 5MHz | 5MHz | |
| FFT size | 512 | 512 | |
| UL traffic symbols | 18 | 18 | |
| ***Down link*** | | | |
| Zone profiles | Zone 1 – PUSC | Zone 1 – PUSC | single zone |
| Burst profile / MCS | MCS: QPSK R1/2 | MCS : QAM64 R5/6 | Single DIUC |
| ***Up link*** | | | |
| Zone profiles | Zone 1 – PUSC | Zone 1 – PUSC | single zone |
| Burst profile / MCS | MCS: QAM16 R3/4 | MCS : QPSK R1/2 | Single DIUC |


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# 16. SUMMARY OF SAR TEST RESULTS

## 16.1. Laptop - Lap-held w/ SA Antenna

Separation distance: 18.4 cm from Main antenna-to-phantom

| Bandwidth | Mode | Test vector file name | f (MHz) | 1g_SAR (mW/g) | Scale Up Factor to DL:UL Symbol ratio of 29:18 | Corrected 1g_SAR (mW/g) |
|---|---|---|---|---|---|---|
| 5MHz | QPSK | DQ64_56_UQ4_12_5M | 2593.0 | 0.00613 | 0.88 | 0.0054 |
| | 16QAM | DQ4_12_UQ16_34_5M | 2593.0 | 0.00701 | 0.84 | 0.0059 |
| | 64QAM | DQ4_12_UQ64_56_5M | 2593.0 | 0.00721 | 0.79 | 0.0057 |
| 10MHz | QPSK | DQ64_UQ4_12_21S_10M | 2593.0 | 0.00620 | 0.72 | 0.0045 |
| | 16QAM | DQ4_12_UQ16_12_10M | 2593.0 | 0.00407 | 1.26 | 0.0051 |
| | 64QAM | DQ4_12_UQ64_56_10M | 2593.0 | 0.00573 | 1.38 | 0.0079 |

## 16.2. Tablet – Bottom face w/ SA Antenna

Separation distance: 1.935 cm from Main antenna-to-phantom

**SKU Antenna**

| Bandwidth | Mode | Test vector file name | f (MHz) | 1g_SAR (mW/g) | Scale Up Factor to DL:UL Symbol ratio of 29:18 | Corrected 1g_SAR (mW/g) |
|---|---|---|---|---|---|---|
| 5MHz | QPSK | DQ64_56_UQ4_12_5M | 2593.0 | 0.171 | 0.88 | 0.1505 |
| | 16QAM | DQ4_12_UQ16_34_5M | 2593.0 | 0.199 | 0.84 | 0.1672 |
| | 64QAM | DQ4_12_UQ64_56_5M | 2593.0 | 0.192 | 0.79 | 0.1517 |
| 10MHz | QPSK | DQ64_UQ4_12_21S_10M | 2593.0 | 0.153 | 0.72 | 0.1102 |
| | 16QAM | DQ4_12_UQ16_12_10M | 2593.0 | 0.0953 | 1.26 | 0.1201 |
| | 64QAM | DQ4_12_UQ64_56_10M | 2593.0 | 0.154 | 1.28 | 0.1971 |

**Additional Test w/ Acon Antenna**

| Bandwidth | Mode | Test vector file name | f (MHz) | 1g_SAR (mW/g) | Scale Up Factor to DL:UL Symbol ratio of 29:18 | Corrected 1g_SAR (mW/g) |
|---|---|---|---|---|---|---|
| 5MHz | 16QAM | DQ4_12_UQ16_34_5M | 2593.0 | 0.080 | 0.84 | 0.0672 |
| 10MHz | 64QAM | DQ4_12_UQ64_56_10M | 2593.0 | 0.085 | 1.20 | 0.1020 |

## 16.3. Edge - Primary Landscape (No SAR)

Separation distance: 18.4 cm from Main antenna-to-phantom

This is not the most conservative antenna-to-user distance at edge mode. According to KDB 447498 4) b) ii) (2), SAR is required only for the edge with the most conservative exposure conditions.

## 16.4. Edge - Secondary Landscape w/ SA Antenna (Worst-case)

Separation distance: 7 mm from Main antenna-to-phantom

| Bandwidth | Mode | Test vector file name | f (MHz) | 1g_SAR (mW/g) | Scale Up Factor to DL:UL Symbol ratio of 29:18 | Corrected 1g_SAR (mW/g) |
|---|---|---|---|---|---|---|
| 5MHz | QPSK | DQ64_56_UQ4_12_5M | 2498.5 | 0.737 | 0.88 | 0.6486 |
| | | | 2593.0 | 0.910 | 0.88 | 0.8008 |
| | | | 2687.5 | 0.956 | 0.90 | 0.8604 |
| | 16QAM | DQ4_12_UQ16_34_5M | 2498.5 | 0.752 | 0.86 | 0.6467 |
| | | | 2593.0 | 0.933 | 0.84 | 0.7837 |
| | | | 2687.5 | 0.945 | 0.86 | 0.8127 |
| | 64QAM | DQ4_12_UQ64_56_5M | 2498.5 | | | |
| | | | 2593.0 | 0.239 | 0.79 | 0.1888 |
| | | | 2687.5 | | | |
| 10MHz | QPSK | DQ64_UQ4_12_21S_10M | 2501.0 | 0.749 | 0.73 | 0.5468 |
| | | | 2593.0 | 0.834 | 0.72 | 0.6005 |
| | | | 2685.0 | 0.983 | 0.72 | 0.7078 |
| | 16QAM | DQ4_12_UQ16_12_10M | 2501.0 | | | |
| | | | 2593.0 | 0.522 | 1.26 | 0.6577 |
| | | | 2685.0 | | | |
| | 64QAM | DQ4_12_UQ64_56_10M | 2501.0 | | | |
| | | | 2593.0 | 0.247 | 1.38 | 0.3409 |
| | | | 2685.0 | | | |


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**Additional Test w/ Acon Antenna**

| Bandwidth | Mode | Test vector file name | f (MHz) | 1g_SAR (mW/g) | Scale Up Factor to DL:UL Symbol ratio of 29:18 | Corrected 1g_SAR (mW/g) |
|---|---|---|---|---|---|---|
| 5MHz | QPSK | DQ64_56_UQ4_12_5M | 2498.5 | 1.190 | 0.88 | 1.0472 |
| | | | 2593.0 | 1.140 | 0.88 | 1.0032 |
| | | | 2687.5 | 1.200 | 0.90 | **1.0800** |
| | 16QAM | DQ4_12_UQ16_34_5M | 2498.5 | 1.240 | 0.86 | 1.0664 |
| | | | 2593.0 | 1.200 | 0.84 | 1.0080 |
| | | | 2687.5 | 1.170 | 0.86 | 1.0062 |
| | 64QAM | DQ4_12_UQ64_56_5M | 2498.5 | | | |
| | | | 2593.0 | 0.356 | 0.79 | 0.2812 |
| | | | 2687.5 | | | |
| 10MHz | QPSK | DQ64_UQ4_12_21S_10M | 2501.0 | 1.150 | 0.73 | 0.8395 |
| | | | 2593.0 | 1.130 | 0.72 | 0.8136 |
| | | | 2685.0 | 1.270 | 0.72 | 0.9144 |
| | 16QAM | DQ4_12_UQ16_12_10M | 2501.0 | | | |
| | | | 2593.0 | 0.707 | 1.26 | 0.8908 |
| | | | 2685.0 | | | |
| | 64QAM | DQ4_12_UQ64_56_10M | 2501.0 | | | |
| | | | 2593.0 | 0.377 | 1.38 | 0.5203 |
| | | | 2685.0 | | | |



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## 16.5. Edge - Primary Portrait w/ SA Antenna

Separation distance: 2.75 cm from Main antenna-to-phantom

| Bandwidth | Mode | Test vector file name | f (MHz) | 1g_SAR (mW/g) | Scale Up Factor to DL:UL Symbol ratio of 29:18 | Corrected 1g_SAR (mW/g) |
|---|---|---|---|---|---|---|
| 5MHz | QPSK | DQ64_56_UQ4_12_5M | 2593.0 | 0.713 | 0.88 | 0.6274 |
| | 16QAM | DQ4_12_UQ16_34_5M | 2593.0 | 0.734 | 0.84 | 0.6166 |
| | 64QAM | DQ4_12_UQ64_56_5M | 2593.0 | 0.711 | 0.59 | 0.4195 |
| 10MHz | QPSK | DQ64_UQ4_12_21S_10M | 2593.0 | 0.650 | 0.72 | 0.4680 |
| | 16QAM | DQ4_12_UQ16_12_10M | 2593.0 | 0.407 | 1.26 | 0.5128 |
| | 64QAM | DQ4_12_UQ64_56_10M | 2593.0 | 0.664 | 1.38 | 0.9163 |

## 16.6. Edge - Secondary Portrait (No SAR)

Separation distance: 17.25 cm from Main antenna-to-phantom
This is not the most conservative antenna-to-user distance at edge mode. According to KDB 447498 4) b) ii) (2), SAR is required only for the edge with the most conservative exposure conditions.

# 17. WORST-CASE SAR PLOTS

**SAR Test Plot for 5 M QPSK w/ Acon Antenna (Secondary landscape)**

Date/Time: 10/25/2010 5:38:17 PM

Test Laboratory: Compliance Certification Services

## Secondary Landscape_5MHz

DUT: Intel; Type: E2K625ANXH; Serial: NA

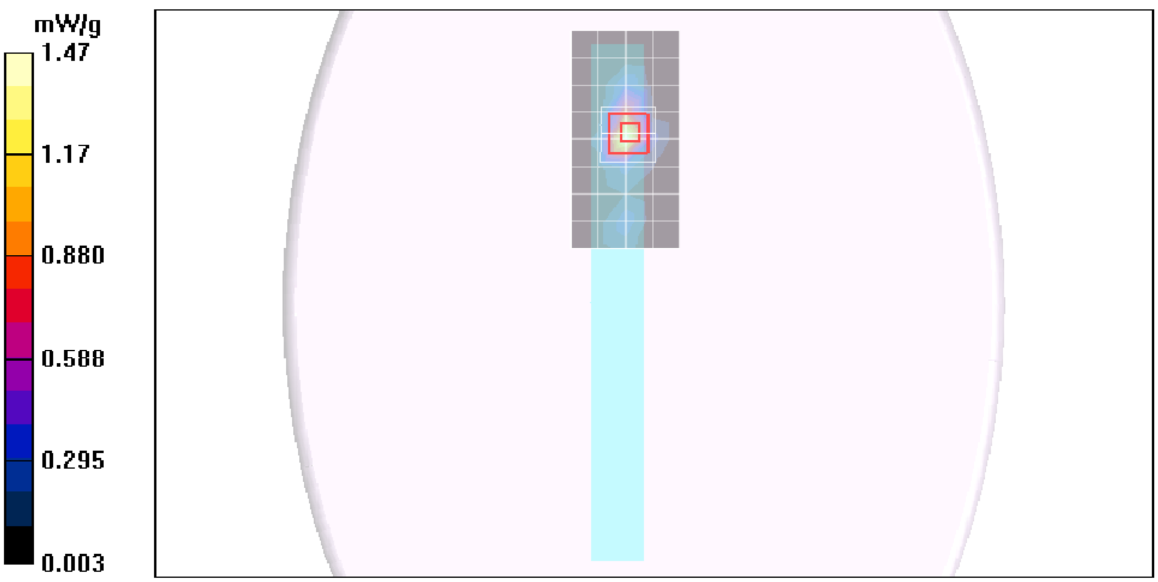
Communication System: WiMAX 2.6GHz; Frequency: 2687.5 MHz;Duty Cycle: 1:2.7
Medium parameters used (interpolated): f = 2687.5 MHz; $\sigma$ = 2.33 mho/m; $\varepsilon_r$ = 51.4; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

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:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**DQ64_56_UQ4_12_5M_H-ch/Area Scan (5x9x1):** Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.47 mW/g

**DQ64_56_UQ4_12_5M_H-ch/Zoom Scan (7x7x9)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 5.17 V/m; Power Drift = 0.151 dB
Peak SAR (extrapolated) = 3.02 W/kg
**SAR(1 g) = 1.2 mW/g; SAR(10 g) = 0.452 mW/g**
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.71 mW/g



**Z-axis Plot**

Date/Time: 10/25/2010 5:58:21 PM

Test Laboratory: Compliance Certification Services

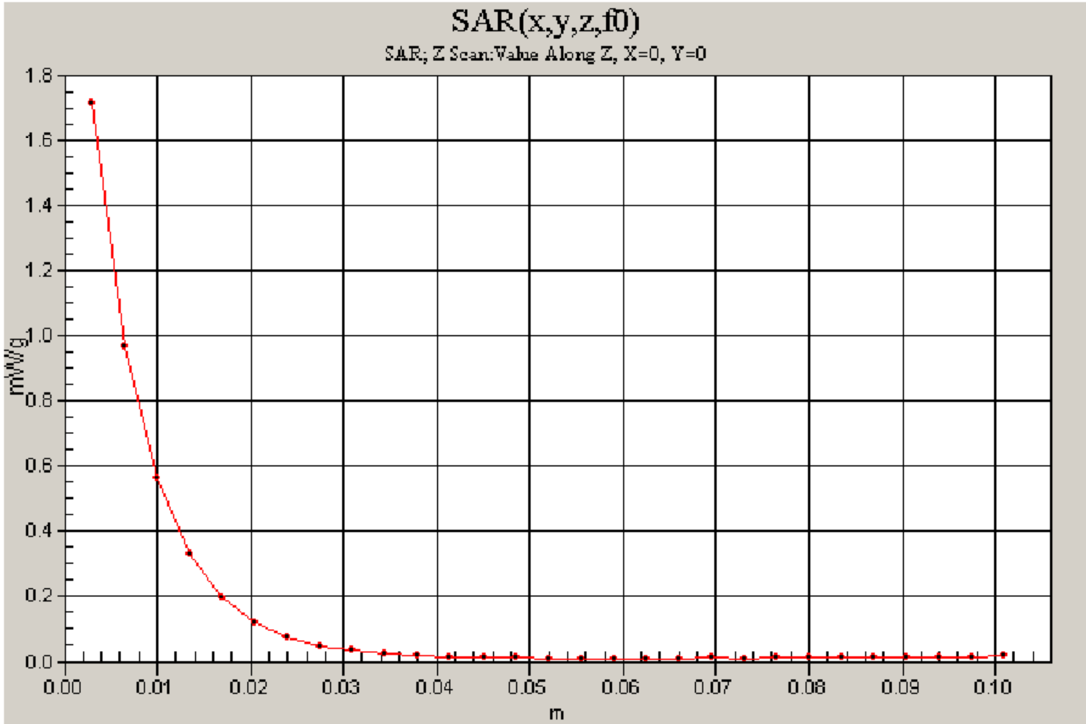
## Secondary Landscape_5MHz

DUT: Intel; Type: E2K625ANXH; Serial: NA

Communication System: WiMAX 2.6GHz; Frequency: 2687.5 MHz;Duty Cycle: 1:2.7

**DQ64_56_UQ4_12_5M_H-ch/Z Scan (1x1x29):** Measurement grid: dx=20mm, dy=20mm, dz=3.5mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.72 mW/g



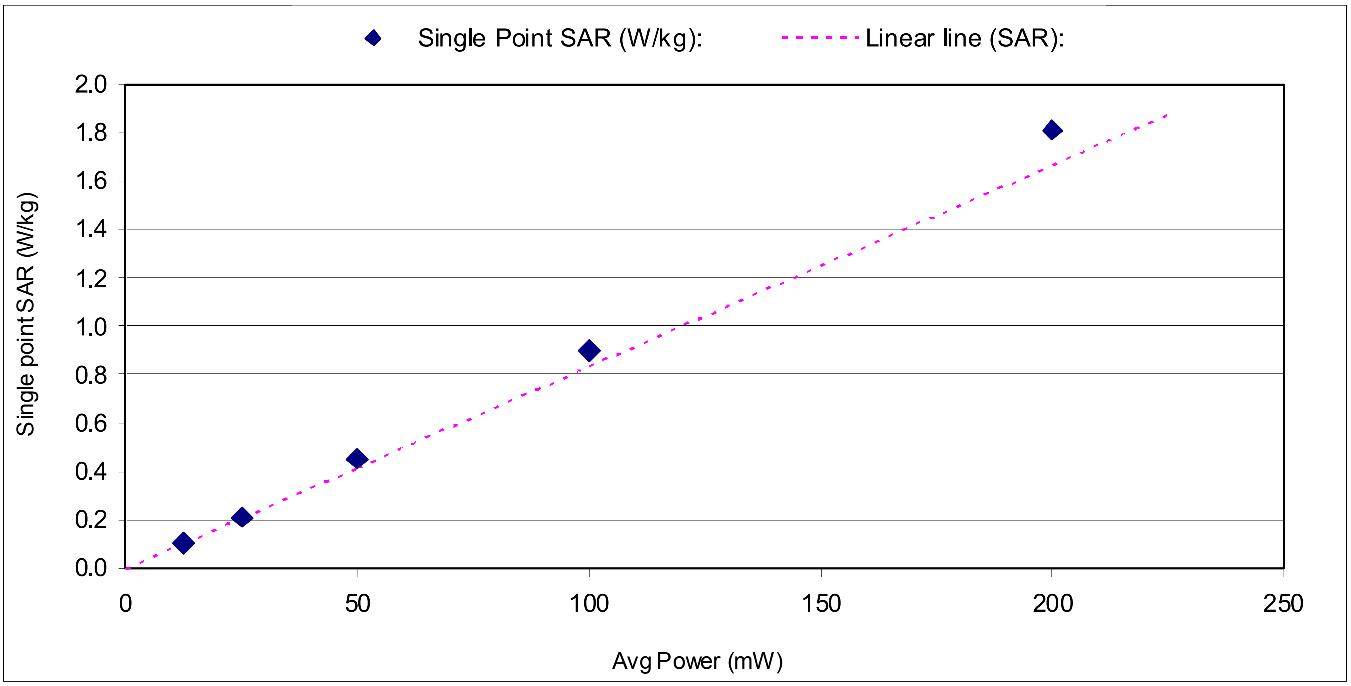
# 18. PAR AND SAR ERROR CONSIDERATION

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.

**Result**

5M_QPSK

| Average Power (mW): | 12.5 | 25.0 | 50.0 | 100.0 | 200.0 |
|---|---|---|---|---|---|
| Single Point SAR (W/kg): | 0.104 | 0.212 | 0.453 | 0.898 | 1.810 |
| Linear line (SAR): | 0.104 | 0.208 | 0.416 | 0.832 | 1.664 |
| Estimation (%): | 0.000 | 1.923 | 8.894 | 7.933 | 8.774 |




**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 0.104 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 0.212 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: 0.104 W/kg @ 12.5 mW
3. Third reference point: (0.104/12.5) * 25 = 0.208 W/kg
4. Fourth reference point: (0.104/12.5) * 50 = 0.416 W/kg
5. Fifth h reference point: (0.104/12.5) * 100 = 0.832 W/kg
6. Sixth reference point: (0.104/12.5) * 200 = 1.664 W/kg

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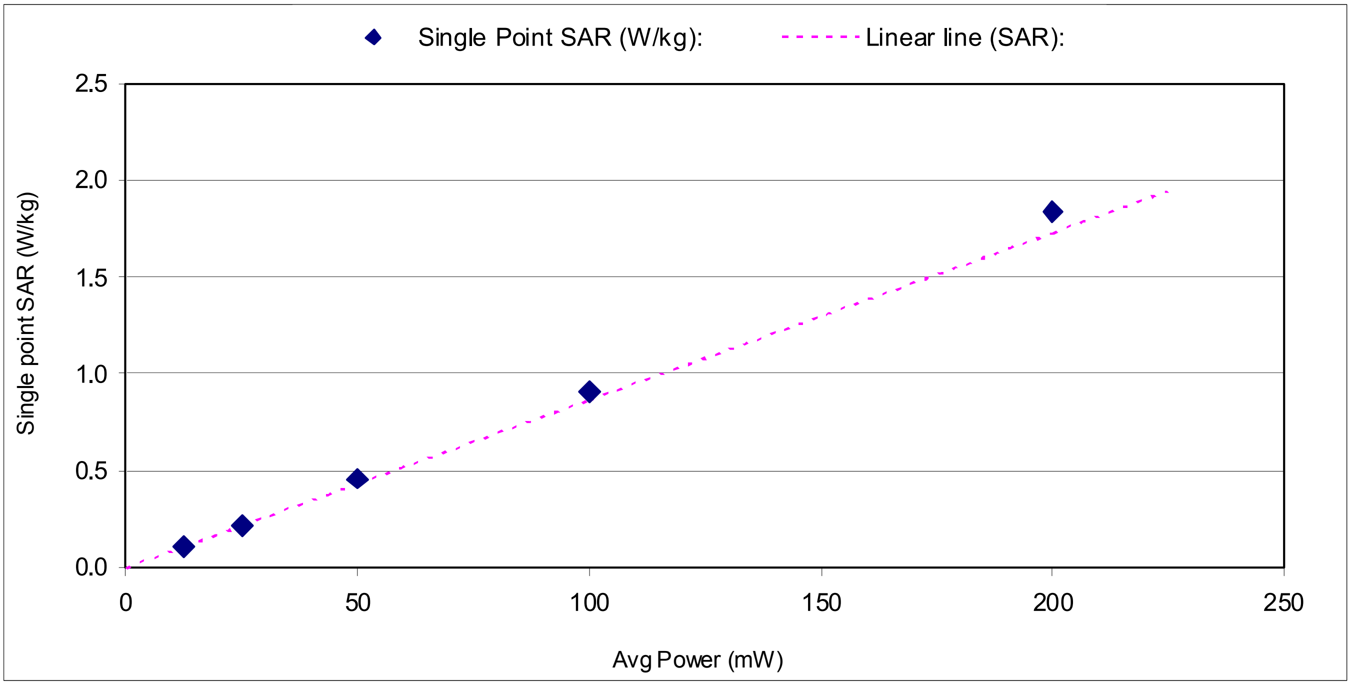
**Result**

5M_16QAM

| Average Power (mW): | 12.5 | 25.0 | 50.0 | 100.0 | 200.0 |
|---|---|---|---|---|---|
| Single Point SAR (W/kg): | 0.108 | 0.214 | 0.459 | 0.911 | 1.840 |
| Linear line (SAR): | 0.108 | 0.216 | 0.432 | 0.864 | 1.728 |
| Estimation (%): | 0.000 | -0.926 | 6.250 | 5.440 | 6.481 |




**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 0.108 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 0.214 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):**

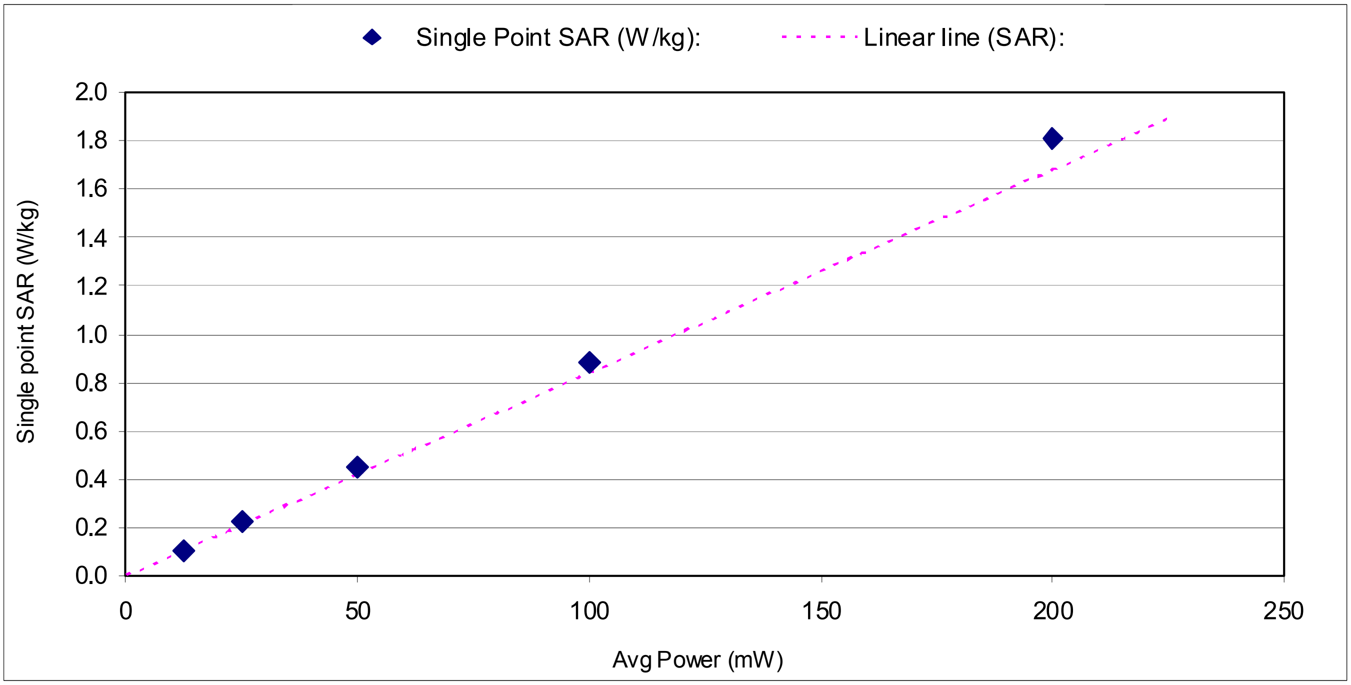
1. First reference point = 0 when power = 0
2. Second reference point 0.108 W/kg @ 12.5 mW
3. Third reference point (0.108/12.5) * 25 = 0.216 W/kg
4. Fourth reference point: (0.108/12.5) * 50 = 0.432 W/kg
5. Fifth reference point (0.108/12.5) * 100 = 0.864 W/kg
6. Sixth reference point (0.108/12.5) * 200 = 1.728 W/kg

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

**Result**

5M_64QAM

| Average Power (mW): | 12.5 | 25.0 | 50.0 | 100.0 | 200.0 |
|---|---|---|---|---|---|
| Single Point SAR (W/kg): | 0.105 | 0.222 | 0.450 | 0.883 | 1.810 |
| Linear line (SAR): | 0.105 | 0.210 | 0.420 | 0.840 | 1.680 |
| Estimation (%): | 0.000 | 5.714 | 7.143 | 5.119 | 7.738 |




**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 0.105 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 0.222 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 0.105 W/kg @ 12.5 mW
3. Third reference point (0.105/12.5) * 25 = 0.21 W/kg
4. Fourth reference point: (0.105/12.5) * 50 = 0.42 W/kg
5. Fifth reference point (0.105/12.5) * 100 = 0.84 W/kg
6. Six reference point (0.105/12.5) * 200 = 1.68 W/kg

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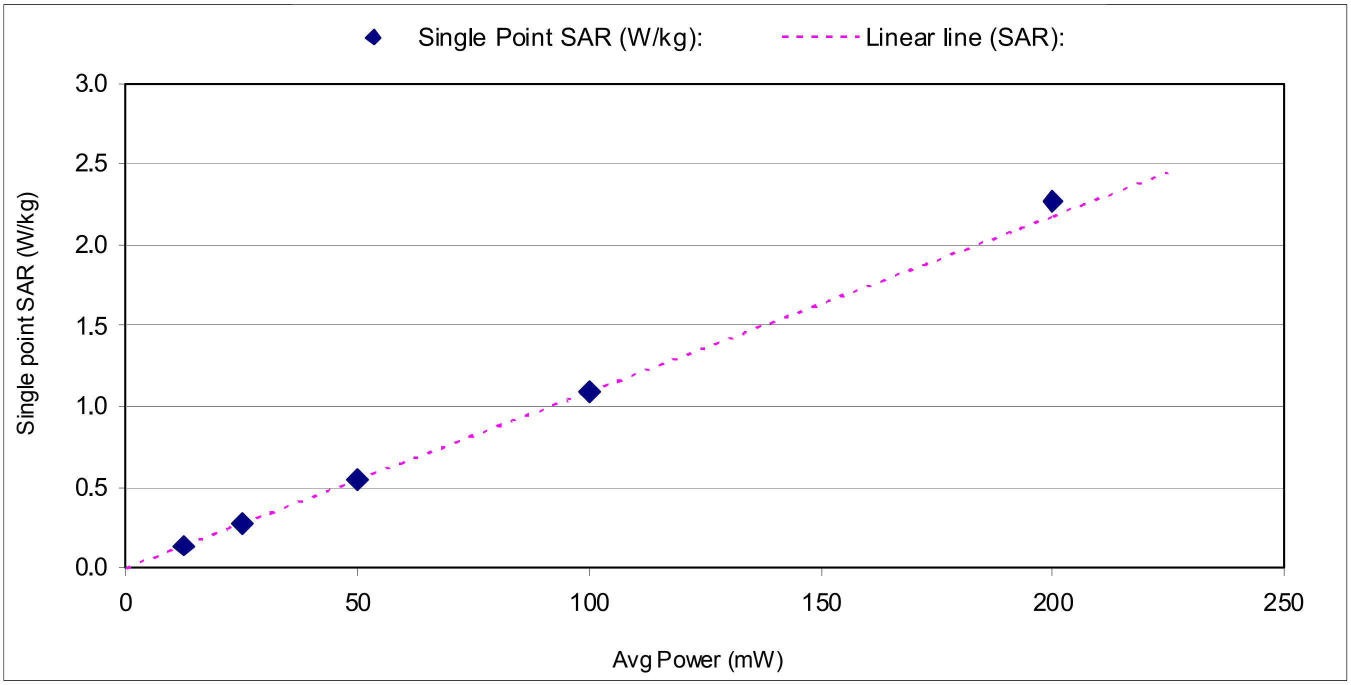
**Result**

10M_QPSK

| Average Power (mW): | 12.5 | 25.0 | 50.0 | 100.0 | 200.0 |
|---|---|---|---|---|---|
| Single Point SAR (W/kg): | 0.136 | 0.273 | 0.550 | 1.090 | 2.270 |
| Linear line (SAR): | 0.136 | 0.272 | 0.544 | 1.088 | 2.176 |
| Estimation (%): | 0.000 | 0.368 | 1.103 | 0.184 | 4.320 |




**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 0.136 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 0.273 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):**

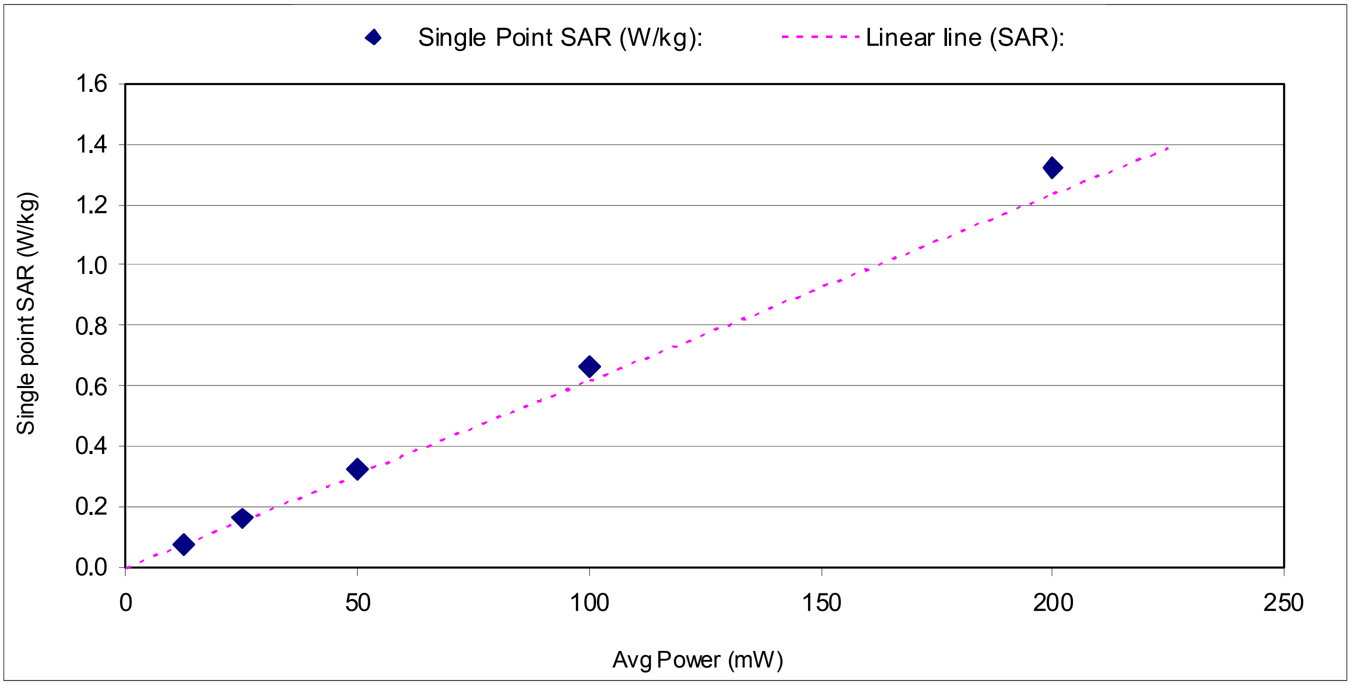
1. First reference point = 0 when power = 0
2. Second reference point 0.136 W/kg @ 12.5 mW
3. Third reference point (0.136/12.5) * 25 = 0.272 W/kg
4. Fourth reference point: (0.136/12.5) * 50 = 0.544 W/kg
5. Fifth reference point (0.136/12.5) * 100 = 1.088 W/kg
6. Six reference point (0.136/12.5) * 200 = 2.176 W/kg

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

**Result**

10M_16QAM

| Average Power (mW): | 12.5 | 25.0 | 50.0 | 100.0 | 200.0 |
|---|---|---|---|---|---|
| Single Point SAR (W/kg): | 0.077 | 0.163 | 0.327 | 0.665 | 1.320 |
| Linear line (SAR): | 0.077 | 0.154 | 0.308 | 0.616 | 1.232 |
| Estimation (%): | 0.000 | 5.844 | 6.169 | 7.955 | 7.143 |




**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 0.077 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 0.163 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):**

7. First reference point = 0 when power = 0
8. Second reference point 0.077 W/kg @ 12.5 mW
9. Third reference point (0.077/12.5) * 25 = 0.154 W/kg
10. Fourth reference point: (0.077/12.5) * 50 = 0.308 W/kg
11. Fifth reference point (0.077/12.5) * 100 = 0.616 W/kg
12. Six reference point (0.077/12.5) * 200 = 1.232 W/kg

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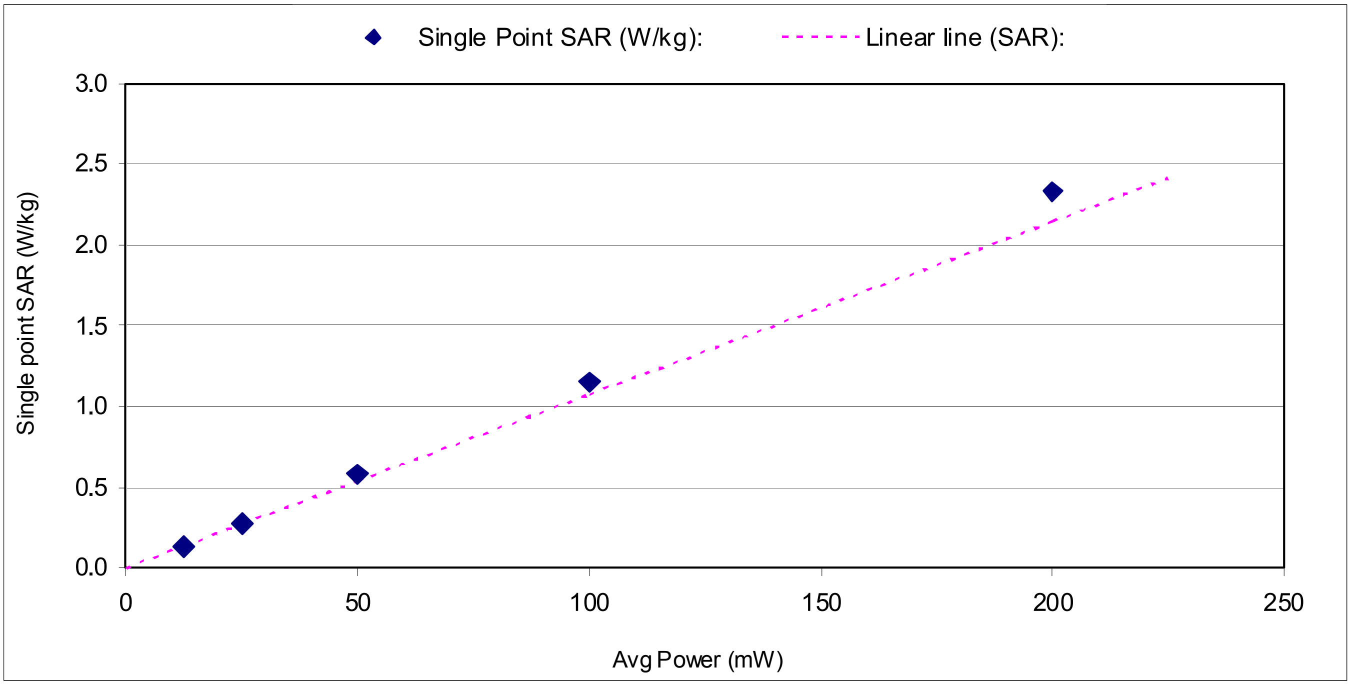
**Result**

10M_64QAM

| | | | | | |
|---|---|---|---|---|---|
| **Average Power (mW):** | **12.5** | **25.0** | **50.0** | **100.0** | **200.0** |
| **Single Point SAR (W/kg):** | 0.134 | 0.271 | 0.580 | 1.150 | 2.330 |
| **Linear line (SAR):** | 0.134 | 0.268 | 0.536 | 1.072 | 2.144 |
| **Estimation (%):** | 0.000 | 1.119 | 8.209 | 7.276 | 8.675 |




**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 0.134 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 0.271 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 0.134 W/kg @ 12.5 mW
3. Third reference point (0.134/12.5) * 25 = 0.268 W/kg
4. Fourth reference point: (0.134/12.5) * 50 = 0.536 W/kg
5. Fifth reference point (0.134/12.5) * 100 = 1.072 W/kg
6. Six reference point (0.134/12.5) * 200 = 2.144 W/kg

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

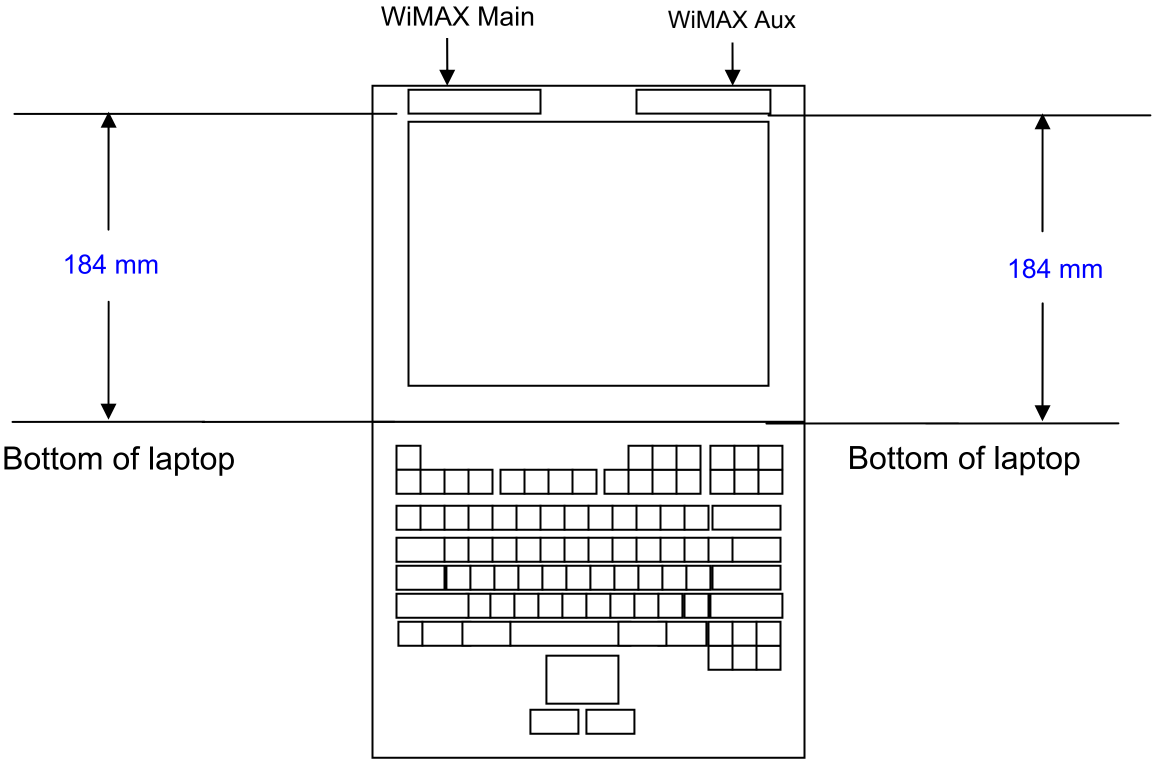
# 19. ATTACHMENTS

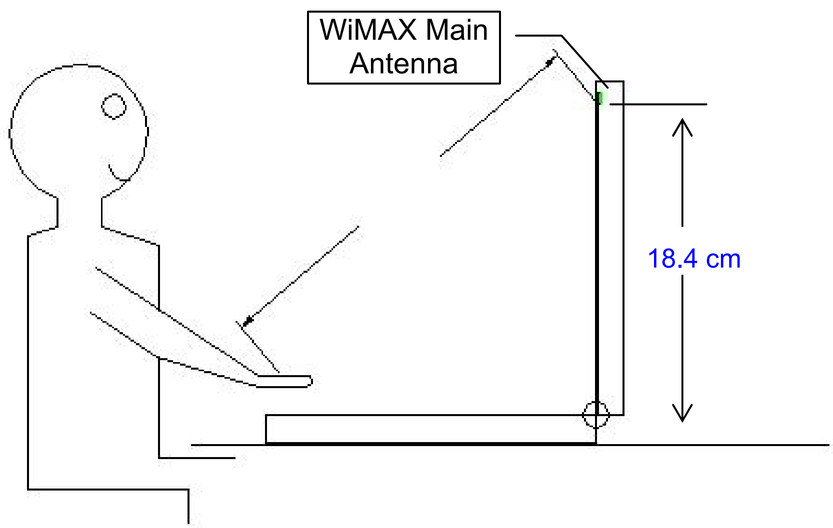
| No. | Contents | No. of page (s) |
|---|---|---|
| 1 | SAR Test Plots | 46 |
| 2 | Certificate of E-Field Probe - EX3DV3 SN3531 | 11 |
| 3 | Certificate of System Validation Dipole - D2600V2 - SN:1006 | 6 |

# 20. ANTENNA LOCATIONS AND SEPARATION DISTANCES

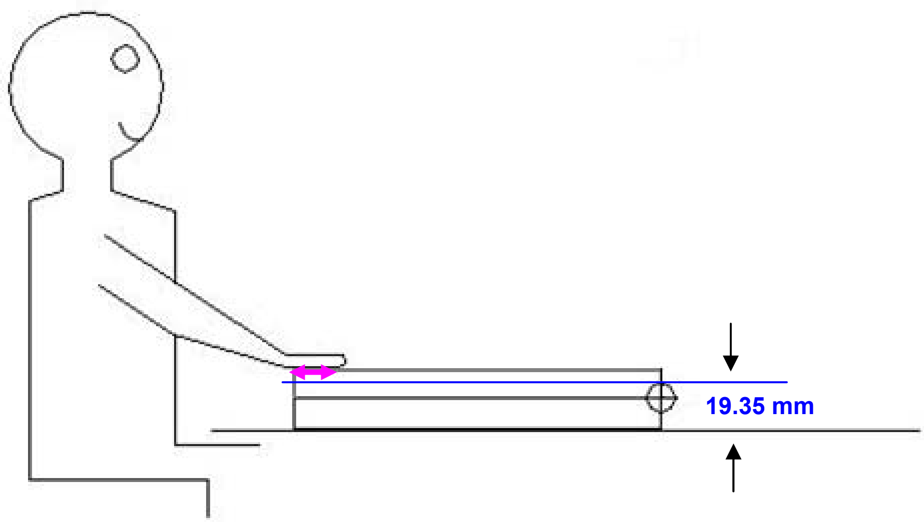
**Laptop Mode**

**(with display open at 90° to the keyboard)**



**Tablet – Bottom Face**




**Tablet – Edges (Landscape & Portrait)**