



## MET Laboratories, Inc.

*Safety Certification - EMI - Telecom Environmental Simulation*

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September 28, 2012

TenX Precision, LLC  
11824 Jollyville Road, Suite 102  
Austin, Texas 78759

Dear Daraius Hathiram,

Enclosed is the EMC Wireless test report for compliance testing of the TenX Precision, LLC, Echometer Wireless Base as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15 Subpart C and RSS-210, Issue 8, Dec. 2010 for Intentional Radiators.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,  
MET LABORATORIES, INC.

Jennifer Warnell  
Documentation Department

Reference: (\TenX Precision, LLC\EMCA33149A-FCC247 Rev. 3)

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## Electromagnetic Compatibility Criteria Test Report

for the

**TenX Precision, LLC  
Echometer Wireless Base**

**Tested under**  
the FCC Certification Rules  
contained in  
Title 47 of the CFR, Part 15.247 Subpart C & RSS-210, Issue 8, Dec. 2010  
for Intentional Radiators

**MET Report: EMCA33149A-FCC247 Rev. 3**

September 28, 2012

**Prepared For:**

**TenX Precision, LLC  
11824 Jollyville Road, Suite 102  
Austin, Texas 78759**

**Prepared By:**  
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Baltimore, MD 21230

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### TenX Precision, LLC Echometer Wireless Base

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contained in  
Title 47 of the CFR, Part 15.247 Subpart C & RSS-210, Issue 8, Dec. 2010  
for Intentional Radiators



Dusmantha Tennakoon  
Project Engineer, Electromagnetic Compatibility Lab



Jennifer Warnell  
Documentation Department

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Part 15.247 and Industry Canada standard RSS-210, Issue 8, Dec. 2010 under normal use and maintenance.



Shawn McMillen,  
Wireless Manager, Electromagnetic Compatibility Lab

## Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	December 19, 2011	Initial Issue.
1	September 12, 2012	Revised to reflect engineer corrections.
2	September 26, 2012	Revised to reflect engineer corrections.
3	September 28, 2012	Revised MPE per engineer corrections.

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## List of Terms and Abbreviations

<b>AC</b>	Alternating Current
<b>ACF</b>	Antenna Correction Factor
<b>Cal</b>	Calibration
<i>d</i>	Measurement Distance
<b>dB</b>	Decibels
<b>dB<math>\mu</math>A</b>	Decibels above one <b>microamp</b>
<b>dB<math>\mu</math>V</b>	Decibels above one <b>microvolt</b>
<b>dB<math>\mu</math>A/m</b>	Decibels above one <b>microamp per meter</b>
<b>dB<math>\mu</math>V/m</b>	Decibels above one <b>microvolt per meter</b>
<b>DC</b>	Direct Current
<b>E</b>	Electric Field
<b>DSL</b>	Digital Subscriber Line
<b>ESD</b>	Electrostatic Discharge
<b>EUT</b>	Equipment Under Test
<i>f</i>	Frequency
<b>FCC</b>	Federal Communications Commission
<b>GRP</b>	Ground Reference Plane
<b>H</b>	Magnetic Field
<b>HCP</b>	Horizontal Coupling Plane
<b>Hz</b>	Hertz
<b>IEC</b>	International Electrotechnical Commission
<b>kHz</b>	kilohertz
<b>kPa</b>	kilopascal
<b>kV</b>	kilovolt
<b>LISN</b>	Line Impedance Stabilization Network
<b>MHz</b>	Megahertz
<b><math>\mu</math>H</b>	<b>microhenry</b>
$\mu$	<b>microfarad</b>
$\mu$ s	<b>microseconds</b>
<b>NEBS</b>	Network Equipment-Building System
<b>PRF</b>	Pulse Repetition Frequency
<b>RF</b>	Radio Frequency
<b>RMS</b>	Root-Mean-Square
<b>TWT</b>	Traveling Wave Tube
<b>V/m</b>	<b>Volts per meter</b>
<b>VCP</b>	Vertical Coupling Plane

## I. Executive Summary

## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the TenX Precision, LLC Echometer Wireless Base, with the requirements of Part 15, §15.247. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the Echometer Wireless Base. TenX Precision, LLC should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Echometer Wireless Base, has been **permanently** discontinued.

## B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.247, in accordance with TenX Precision, LLC, purchase order number 1053. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference 47 CFR Part 15.247:2005	IC Reference RSS-210 Issue 8: 2010; RSS-GEN Issue 3: 2010	Description	Compliance
Title 47 of the CFR, Part 15 §15.203	N/A	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	RSS-GEN (7.2.4)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(2)	RSS-Gen(4.6)	6dB Occupied Bandwidth	Compliant
		99% Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	RSS-210(A8.4)	Peak Power Output	Compliant
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	RSS-210(A8.5)	Radiated Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	RF Conducted Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	RF Conducted Band Edge	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	RSS-210(A8.2)	Peak Power Spectral Density	Compliant
Title 47 of the CFR, Part 15 §15.247(i)	RSS-Gen(5.6)	Maximum Permissible Exposure (MPE)	Compliant
N/A	RSS-Gen(4.10)	Receiver Spurious Emissions	Compliant

**Table 1. Executive Summary of EMC Part 15.247 Compliance Testing**

## II. Equipment Configuration

## A. Overview

MET Laboratories, Inc. was contracted by TenX Precision, LLC to perform testing on the Echometer Wireless Base, under TenX Precision, LLC's purchase order number 1053.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the TenX Precision, LLC, Echometer Wireless Base.

The results obtained relate only to the item(s) tested.

<b>Model(s) Tested:</b>	Echometer Wireless Base	
<b>Model(s) Covered:</b>	Echometer Wireless Base	
<b>EUT Specifications:</b>	Primary Power: 120 VAC, 60 Hz	
	FCC ID: Q5Q-WB100 IC: 10048A-WB100	
	Type of Modulations:	FSK
	Equipment Code:	DTS
	Peak RF Output Power:	4.68 dBm
	EUT Frequency Ranges:	2405 – 2480 MHz
<b>Analysis:</b>	The results obtained relate only to the item(s) tested.	
<b>Environmental Test Conditions:</b>	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
<b>Evaluated by:</b>	Dusmantha Tennakoon	
<b>Report Date(s):</b>	September 28, 2012	

**Table 2. EUT Summary Table**

**Note:** This device has 2 identical Zigbee modules that are co-located and can transmit simultaneously. However, they will never transmit on the same Zigbee channels at the same time. The modules were both turned on and verified that no inter-modulation products were generated.

## B. References

<b>CFR 47, Part 15, Subpart C</b>	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
<b>RSS-210, Issue 8, Dec. 2010</b>	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
<b>RSS-GEN, Issue 3, Dec. 2010</b>	General Requirements and Information for the Certification of Radio Apparatus
<b>ANSI C63.4:2003</b>	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>ANSI/NCSL Z540-1-1994</b>	Calibration Laboratories and Measuring and Test Equipment - General Requirements
<b>ANSI/ISO/IEC 17025:2000</b>	General Requirements for the Competence of Testing and Calibration Laboratories
<b>ANSI C63.10-2009</b>	American National Standard for Testing Unlicensed Wireless Devices

**Table 3. References**

## C. Test Site

All testing was performed at MET Laboratories, Inc., 13301 McCallen Pass, Austin, TX 78753. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

## D. Description of Test Sample

The Echometer Wireless Base (Model WB100), Equipment Under Test (EUT), is used as a Base station to discover, configure, and control Echometer wireless sensors. It is attached to a computer via USB and transfers control information and data to/from the computer to/from the sensors.

## E. Equipment Configuration

The EUT was set up as outlined in **Error! Reference source not found.**, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
N/A	Echometer Wireless Base	WB100	40-1202	1001	2

**Table 4. Equipment Configuration**

## F. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
	Laptop	Dell	WB100	NA

**Table 5. Support Equipment**

\* All ‘customer supplied’ support equipment will include the equipments calibration data. This column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

## G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
1	Antenna1	Direct mount SMA Antenna	1	N/A	No	N/A
2	Antenna2	Direct mount SMA Antenna	1	N/A	No	N/A
3	USB	Standard USB 2.0 Cable	1	2	Y	N/A
4	Ext Bat	Hookup Wire	1	1	No	N/A

**Table 6. Ports and Cabling Information**

## H. Mode of Operation

The EUT will remain attached to a laptop computer during testing since it derives power via the USb port. It supports diagnostic commands that can set it up in the testing modes:

Continuous Transmit, selectable 802.15.4 channel

Continuous Receive, selectable 802.15.4 channel

During Normal Operation, the EUT remains in Receive mode and reports beacons from other wireless sensors.

## I. Method of Monitoring EUT Operation

Continuous Transmit operation can be monitored on a Spectrum Analyzer at the selected channel.

In Continuous Receive Mode, the local oscillator on the radio may be detectable on a Spectrum Analyzer. However, Continuous Receive Mode can also be illustrated in Normal Operation where wireless sensor beacons can be recognized.

## J. Modifications

### a) Modifications to EUT

No modifications were made to the EUT.

### b) Modifications to Test Standard

No modifications were made to the test standard.

## K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to TenX Precision, LLC upon completion of testing.

### III. Electromagnetic Compatibility Criteria for Intentional Radiators

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.203 Antenna Requirement

**Test Requirement:**

**§ 15.203:** An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

- a.) Antenna must be permanently attached to the unit.
- b.) Antenna must use a unique type of connector to attach to the EUT.
- c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

**Results:** The EUT as tested is compliant the criteria of §15.203. The EUT uses an unique connector.

**Test Engineer(s):** Dusmantha Tennakoon

**Test Date(s):** 11/02/11

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.207(a) Conducted Emissions Limits

**Test Requirement(s):** **§ 15.207 (a):** For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50  $\Omega$  line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dB $\mu$ V)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

**Table 7. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)**

**Test Procedure:**

The EUT was placed on a 0.8 m-high wooden table inside a screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50  $\Omega$ /50  $\mu$ H Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-2003 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50  $\Omega$ /50  $\mu$ H LISN as the input transducer to an EMC/field intensity meter. For the purpose of this testing, the transmitter was turned on. Scans were performed with the transmitter on. Testing was also performed with both radios operating simultaneously to verify that it still met the limits.

**Test Results:**

The EUT was compliant with this requirement.

**Test Engineer(s):**

Ram Shrestha and Dusmantha Tennakoon

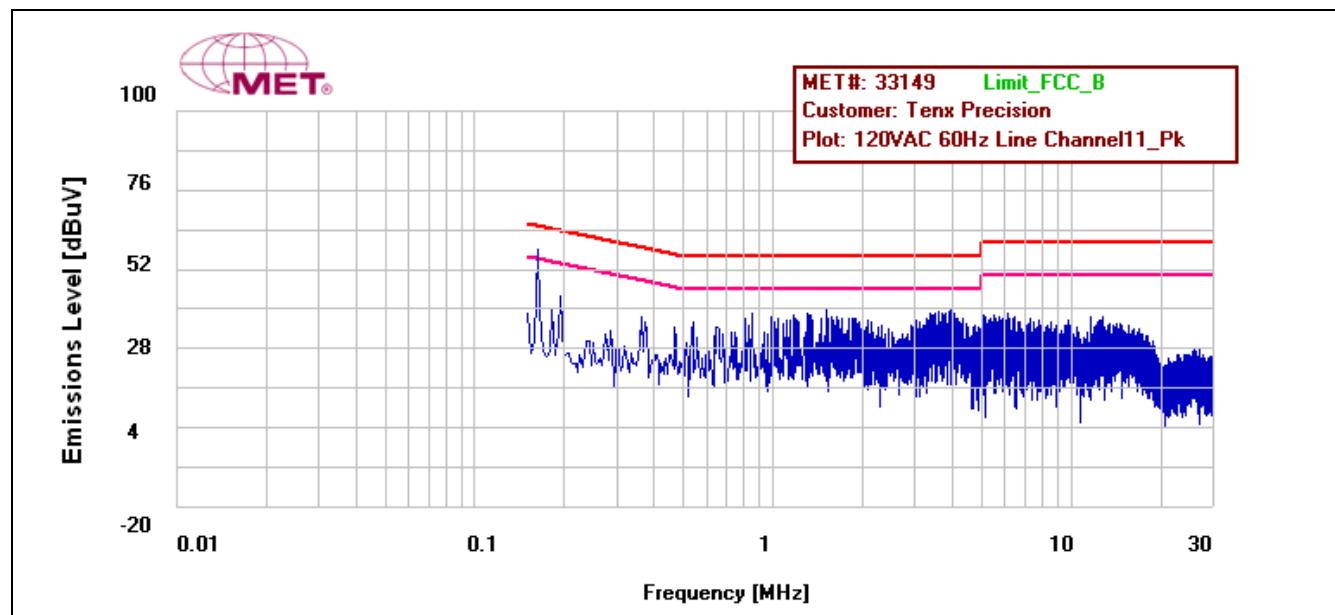
**Test Date(s):**

10/26/11

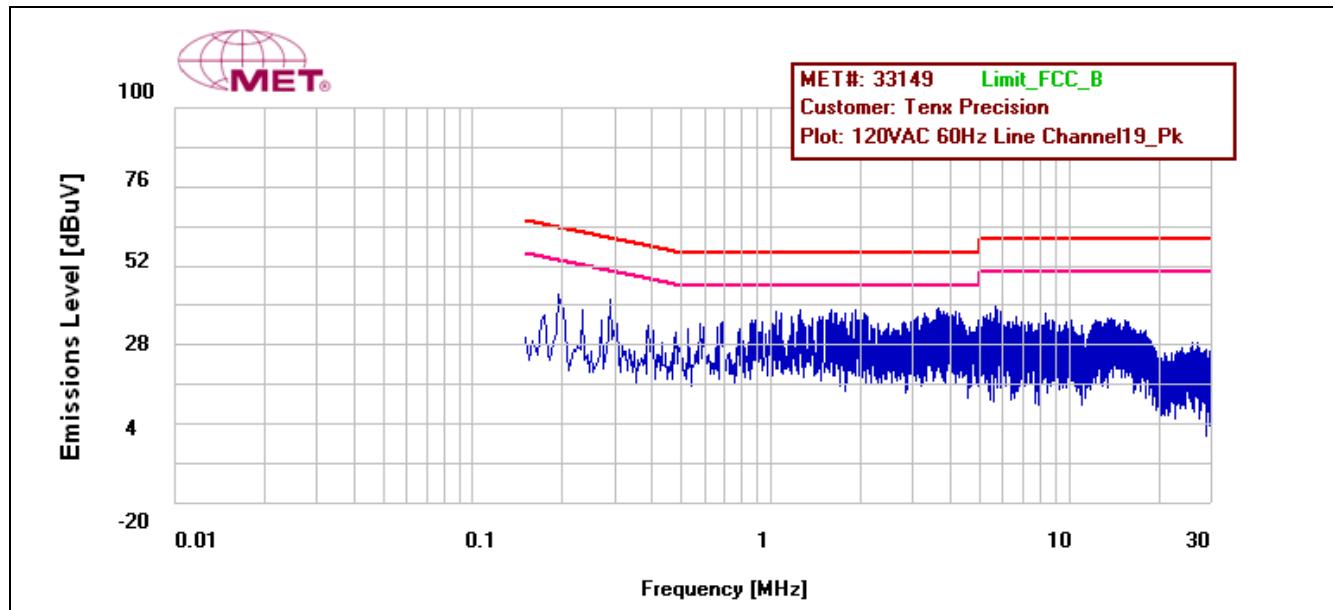
## 15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120VAC 60Hz Line Channel11	0.171	48.7	64.915	-16.215	Pass	35.32	54.915	-19.595	Pass
120VAC 60Hz Line Channel11	1.01	29.87	56	-26.13	Pass	20.38	46	-25.62	Pass
120VAC 60Hz Line Channel11	4	34.52	56	-21.48	Pass	25.54	46	-20.46	Pass

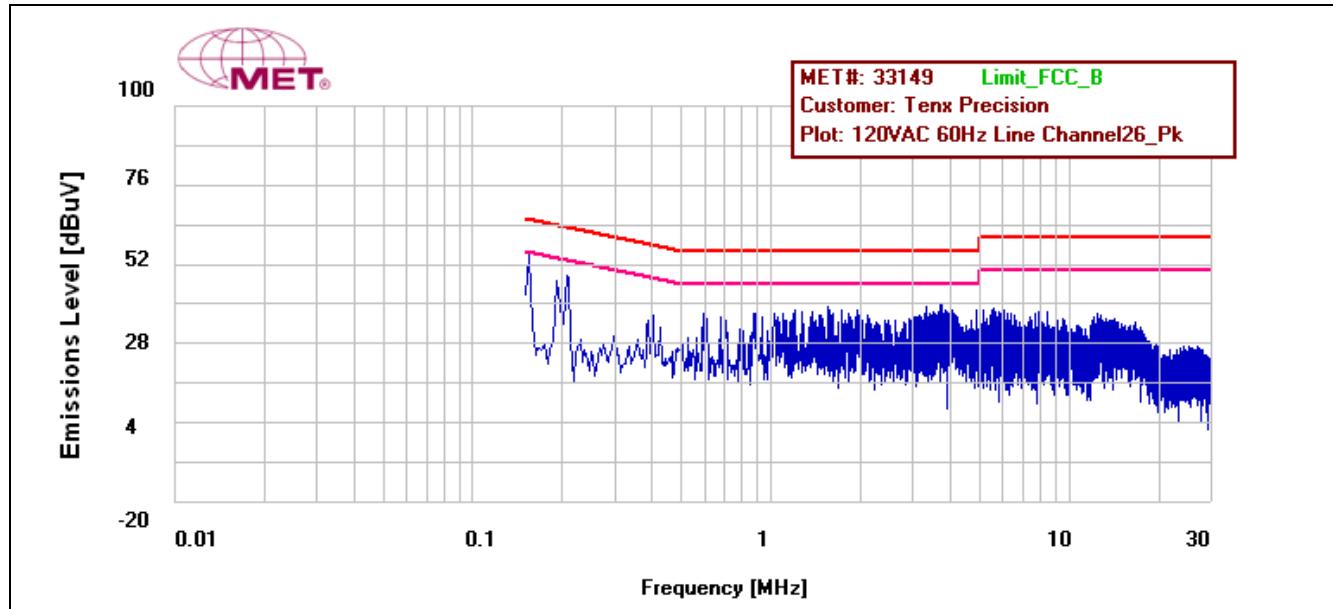
Table 8. Conducted Emissions, 15.207(a), Phase Line, Test Results



Plot 1. Conducted Emissions, 15.207(a), Phase Line, Channel 11



Plot 2. Conducted Emissions, 15.207(a), Phase Line, Channel 19

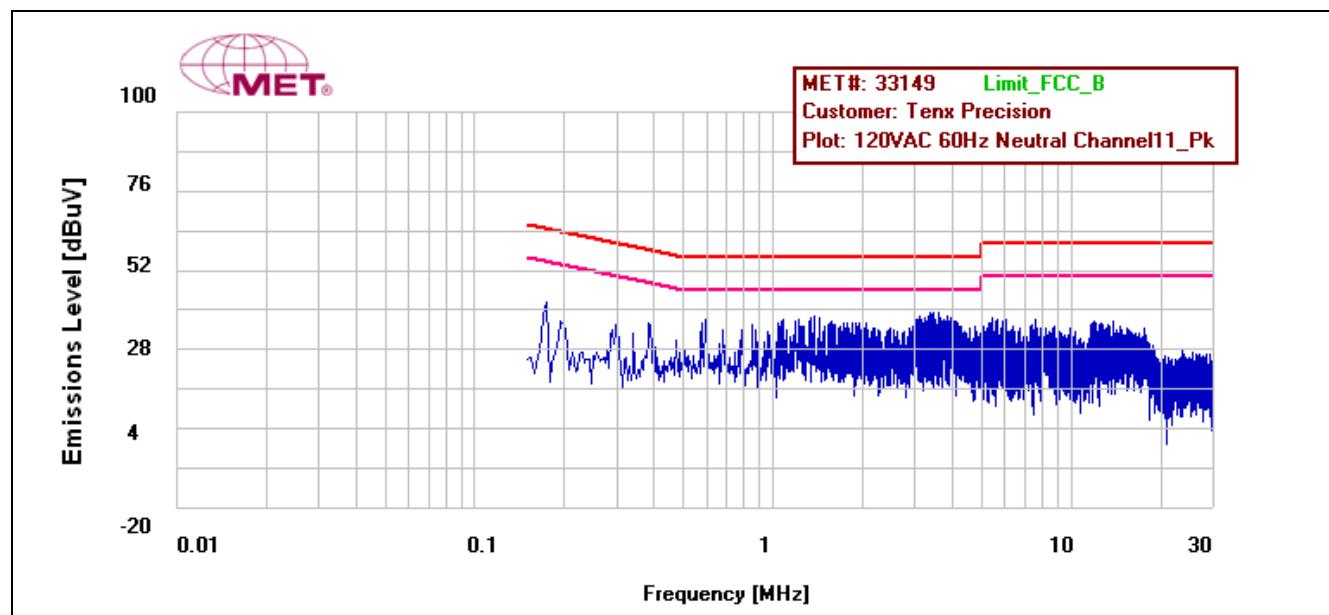


Plot 3. Conducted Emissions, 15.207(a), Phase Line, Channel 26

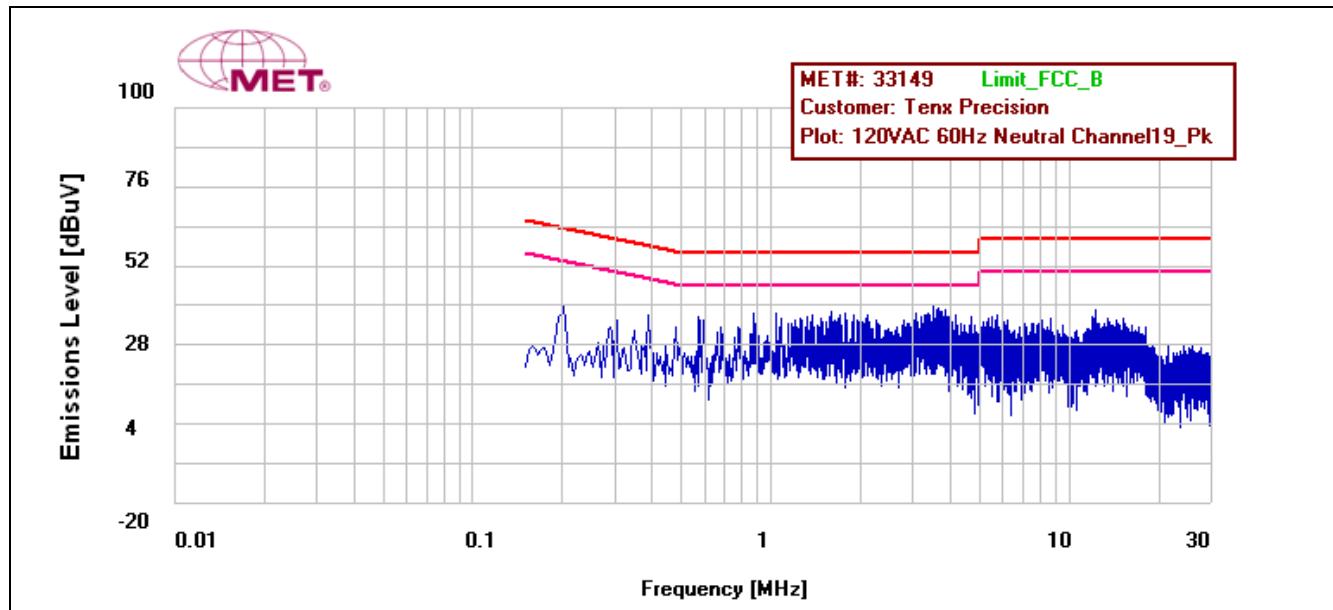
## 15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120VAC 60Hz Neutral Channel11	0.171	47.71	64.915	-17.205	Pass	30.54	54.915	-24.375	Pass
120VAC 60Hz Neutral Channel11	1.10	30.97	56	-25.03	Pass	21.57	46	-24.43	Pass
120VAC 60Hz Neutral Channel11	4	32.39	56	-23.61	Pass	23.54	46	-22.46	Pass

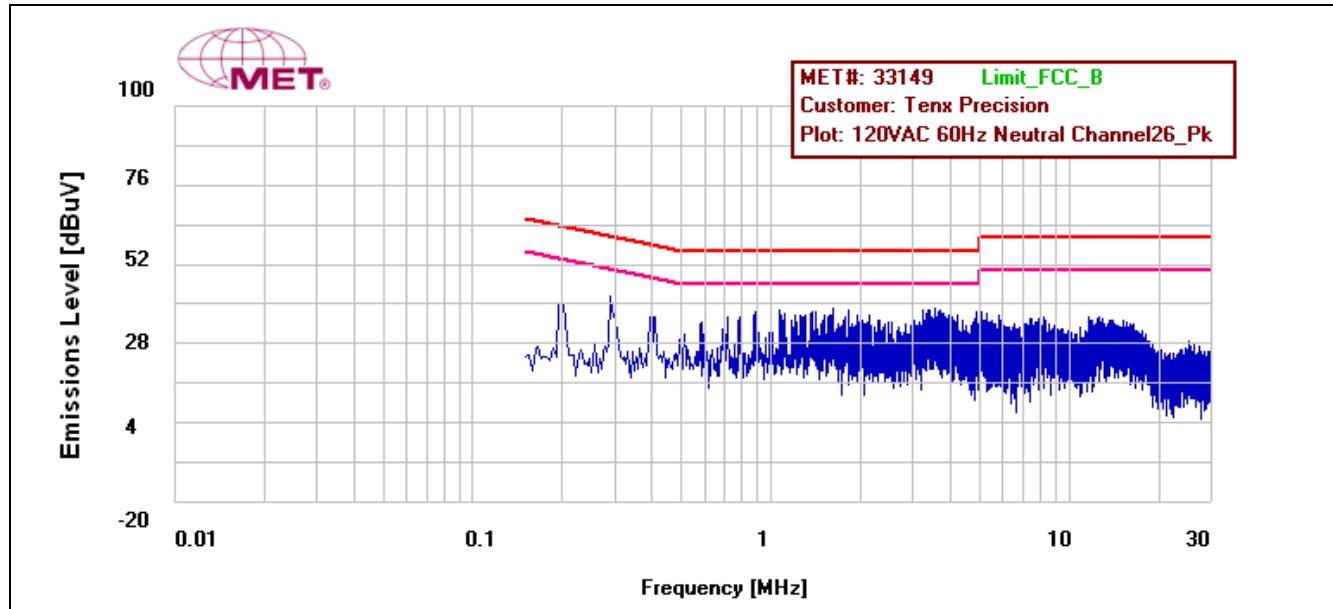
Table 9. Conducted Emissions, 15.207(a), Neutral Line, Test Results



Plot 4. Conducted Emissions, 15.207(a), Neutral Line, Channel 11



Plot 5. Conducted Emissions, 15.207(a), Neutral Line, Channel 19



Plot 6. Conducted Emissions, 15.207(a), Neutral Line, Channel 26

**15.207(a) Conducted Emissions Test Setup Photo**



**Photograph 1. Conducted Emissions, 15.207(a), Test Setup**

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(a)(2) 6 dB and 99% Bandwidth

**Test Requirements:** § 15.247(a)(2): Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

**Test Procedure:** The transmitter was on and transmitting at the highest output power. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately 1% of the total emission bandwidth,  $VBW > RBW$ . The 6 dB Bandwidth was measured and recorded. The measurements were performed on the low, mid and high channels.

**Test Results** The EUT was compliant with § 15.247 (a)(2).

The 6 dB and 99% Bandwidth was determined from the plots on the following pages.

**Test Engineer(s):** Dusmantha Tennakoon

**Test Date(s):** 10/28/11



**Figure 1. Block Diagram, Occupied Bandwidth Test Setup**

## Occupied Bandwidth Test Results

Occupied Bandwidth		
Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)
Channel 11	2405	1.583
Channel 19	2445	1.566
Channel 26	2480	1.477

Table 10. 6 dB Occupied Bandwidth, Test Results

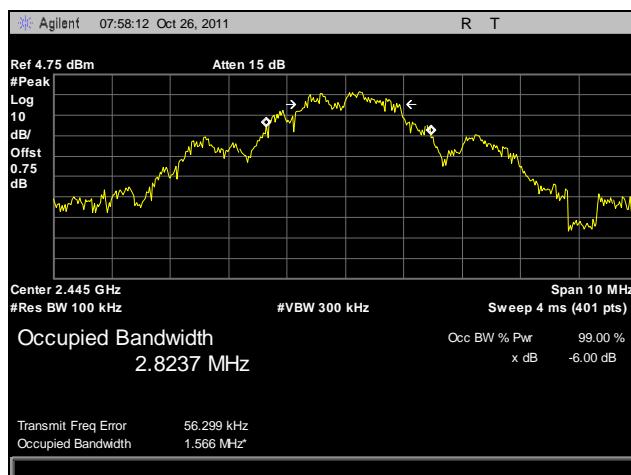
Occupied Bandwidth		
Carrier Channel	Frequency (MHz)	Measured 99% Bandwidth (MHz)
Channel 11	2405	2.8931
Channel 19	2445	2.8272
Channel 26	2480	2.7729

Table 11. 99% Occupied Bandwidth, Test Results

## Occupied Bandwidth Test Results



Plot 7. 6 dB Occupied Bandwidth, Channel 11



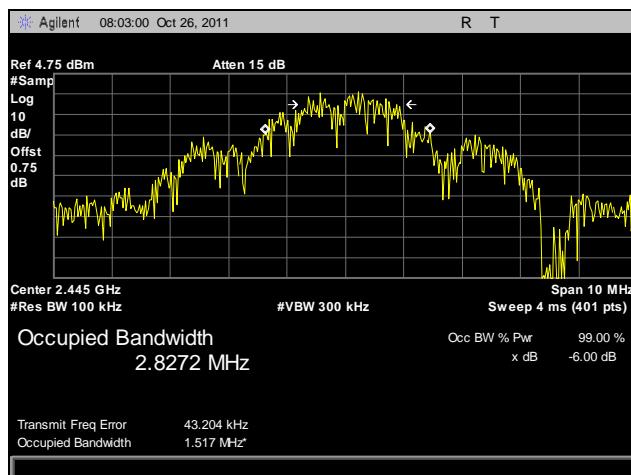
Plot 8. 6 dB Occupied Bandwidth, Channel 19



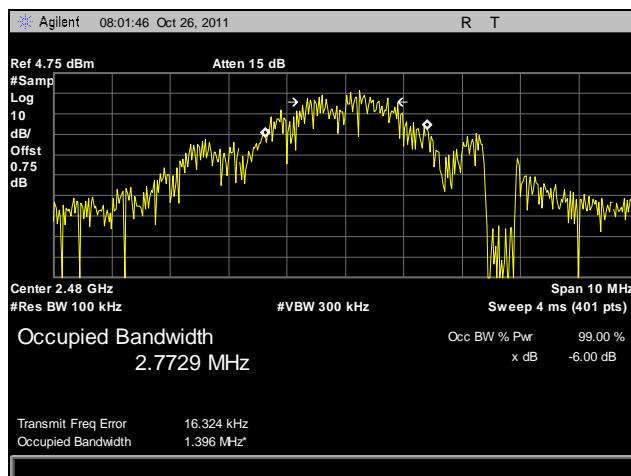
Plot 9. 6 dB Occupied Bandwidth, Channel 26



Plot 10. 99% Occupied Bandwidth, Channel 11



Plot 11. 99% Occupied Bandwidth, Channel 19



Plot 12. 99% Occupied Bandwidth, Channel 26

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(b) Peak Power Output

**Test Requirements:** **§15.247(b):** The maximum peak output power of the intentional radiator shall not exceed the following:

Digital Transmission Systems (MHz)	Output Limit (Watts)
902-928	1.000
2400-2483.5	1.000
5725-5850	1.000

**Table 12. Output Power Requirements from §15.247(b)**

**§15.247(c):** if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the Table 12, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400 – 2483.5 MHz band and using a point to point application may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

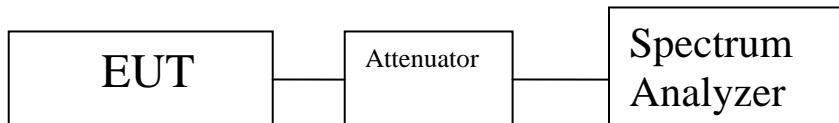
Fixed, point-to-point operation excludes the use of point-to-multipoint systems, Omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

**Test Procedure:** The transmitter was connected to a calibrated spectrum analyzer. The EUT was measured at the low, mid and high channels of each band at the maximum power level.

**Test Results:** The EUT was compliant with the Peak Power Output limits of **§15.247(b)**.

**Test Engineer(s):** Dusmantha Tennakoon

**Test Date(s):** 10/28/11



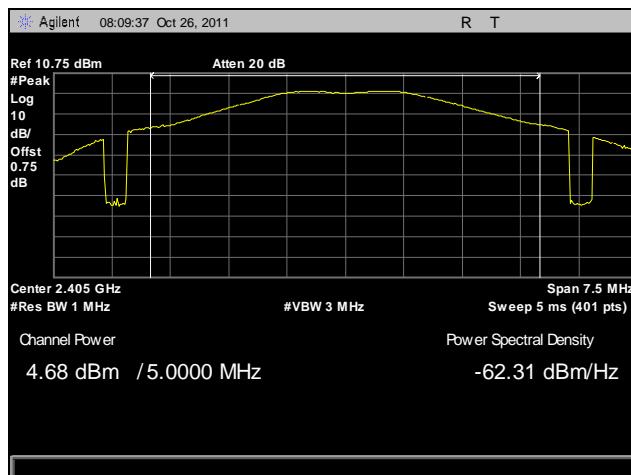
**Figure 2. Peak Power Output Test Setup**

## Peak Power Output Test Results

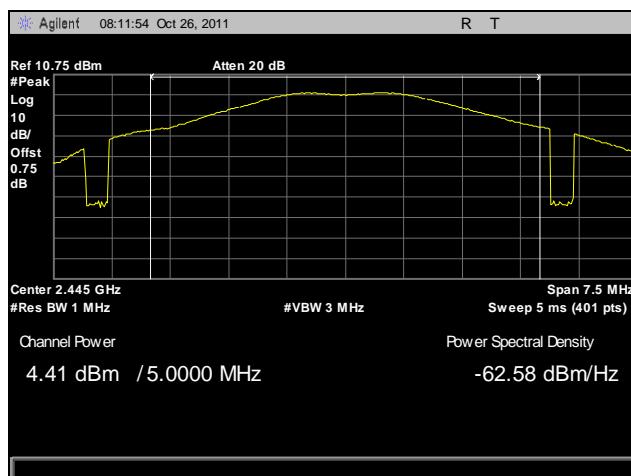
Peak Conducted Output Power		
Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
Channel 11	2405	4.68
Channel 19	2445	4.41
Channel 26	2480	4.46

**Table 13. Peak Power Output, Test Results**

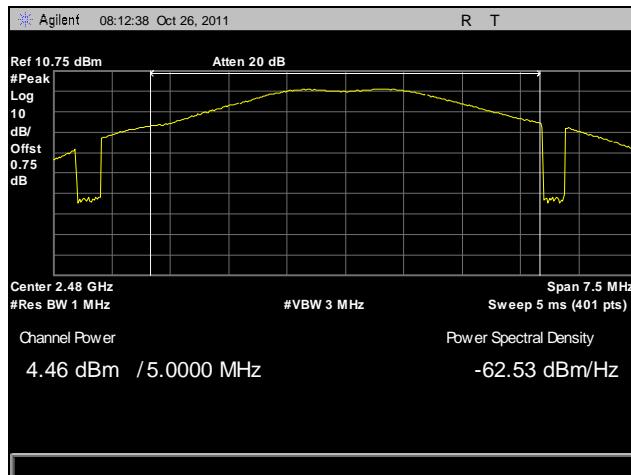
## Peak Power Output Test Results



Plot 13. Peak Power Output, Channel 11



Plot 14. Peak Power Output, Channel 19



Plot 15. Peak Power Output, Channel 26

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(d) Radiated Spurious Emissions Requirements and Band Edge

**Test Requirements:** **§15.247(d); §15.205:** Emissions outside the frequency band.

**§15.247(d):** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

**§15.205(a):** Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110-----	16.42–16.423	399.9–410	4.5–5.15
<sup>1</sup> 0.495–0.505-----	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905-----	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128-----	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775-----	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775-----	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218-----	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825-----	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225-----	123–138	2200–2300	14.47–14.5
8.291–8.294-----	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366-----	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675-----	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475-----	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293-----	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025-----	240–285	3345.8–3358.36.	43–36.5
12.57675–12.57725-----	322–335.4	3600–4400	( <sup>2</sup> )

**Table 14. Restricted Bands of Operation**

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.

<sup>2</sup> Above 38.6

**Test Requirement(s):** **§ 15.209 (a):** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 15.

Frequency (MHz)	§ 15.209(a), Radiated Emission Limits (dB $\mu$ V) @ 3m
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

**Table 15. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)**

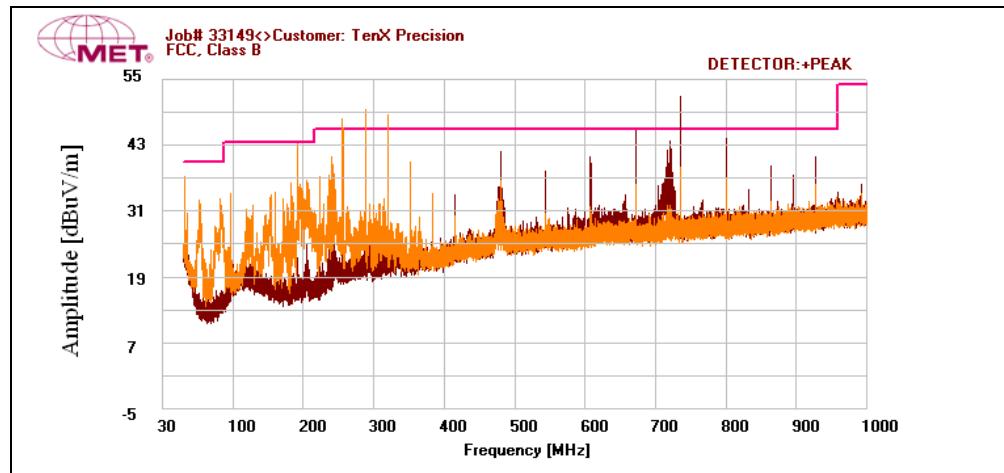
**Test Procedures:** The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was measured above 18 GHz. To verify that no intermodulation products were generated testing was also performed when both radios were operating simultaneously.

**Test Results:** The EUT was compliant with the Radiated Spurious Emission limits of **§ 15.247(d)**.

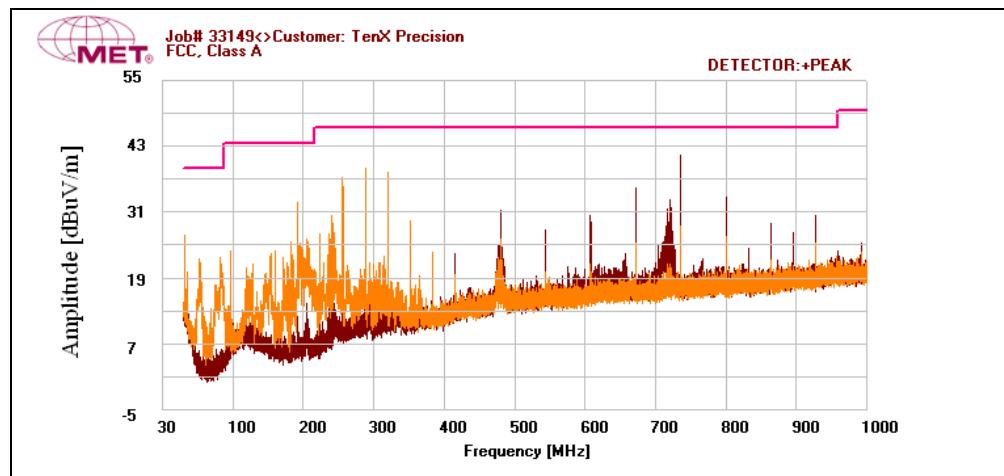
**Test Engineer(s):** Dusmantha Tennakoon

**Test Date(s):** 10/27/11 – 10/28/11

## Radiated Spurious Emissions Test Results

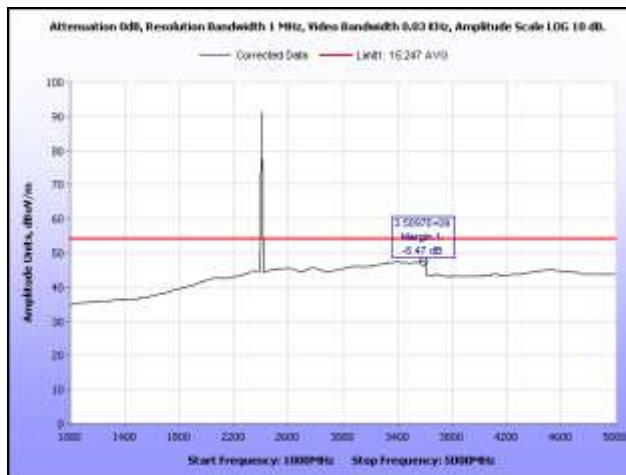


Plot 16. Radiated Spurious Emissions, Channel 11

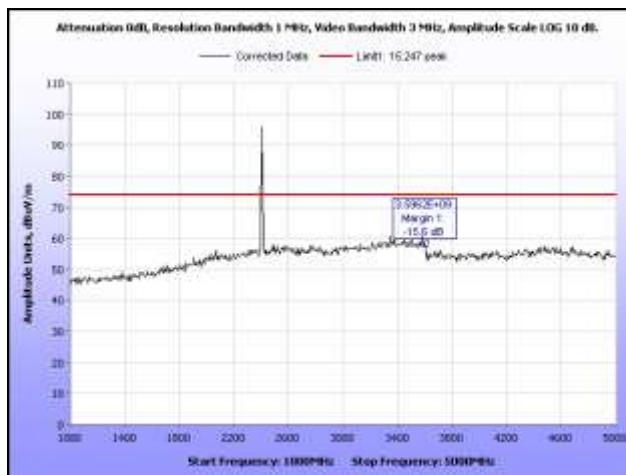


Plot 17. Radiated Spurious Emissions, Radio turned off

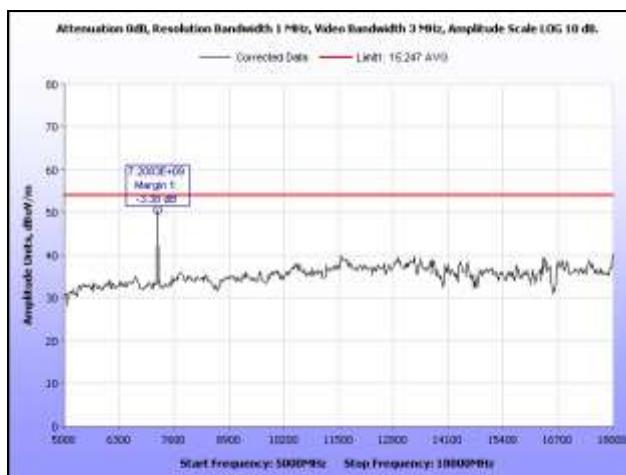
The emissions that appear to fail are from the digital portion as shown above in the plots.



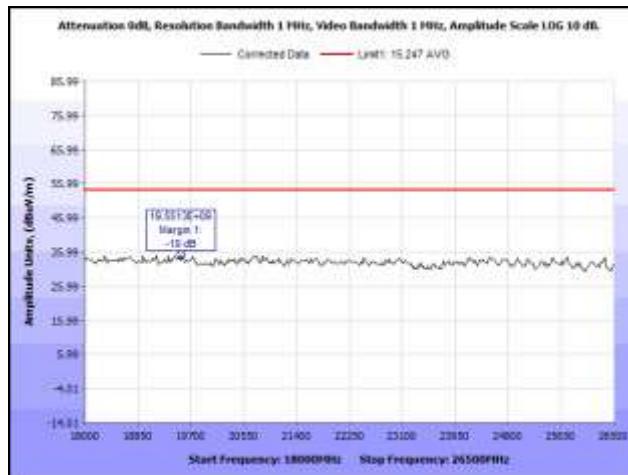
**Plot 18. Radiated Spurious Emissions, Channel 11, 1 GHz – 5 GHz, Average**



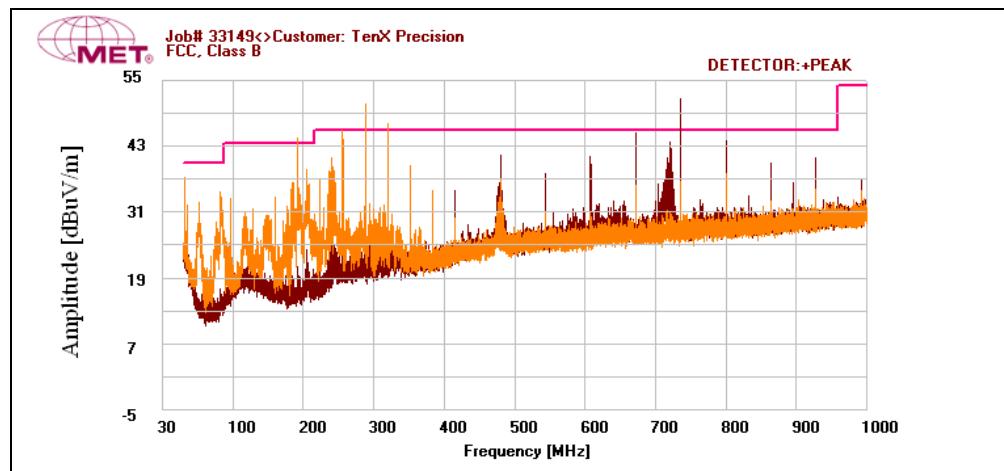
**Plot 19. Radiated Spurious Emissions, Channel 11, 1 GHz – 5 GHz, Peak**



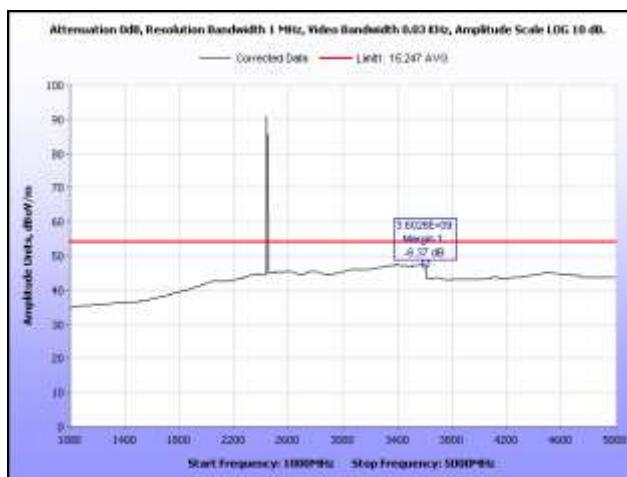
**Plot 20. Radiated Spurious Emissions, Channel 11, 5 GHz – 18 GHz, Peak**



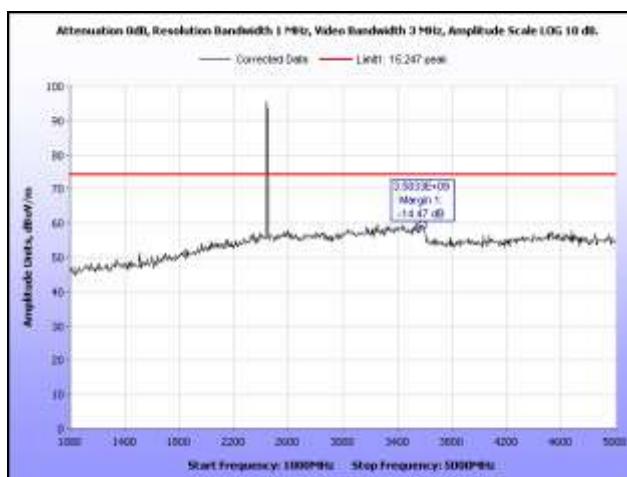
**Plot 21. Radiated Spurious Emissions, Channel 11, 18 GHz – 26.5 GHz, Peak**



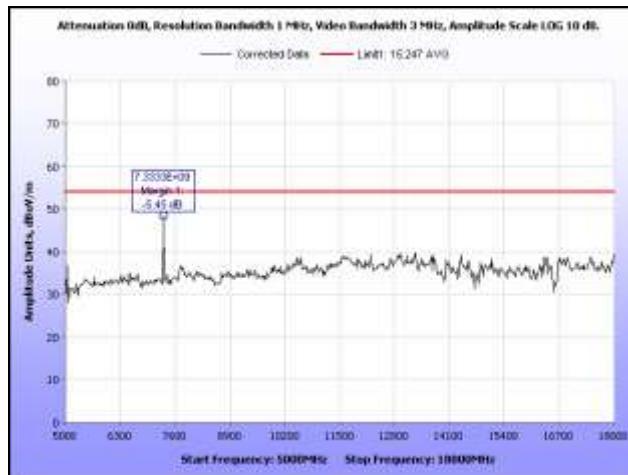
Plot 22. Radiated Spurious Emissions, Transmitter, Channel 19



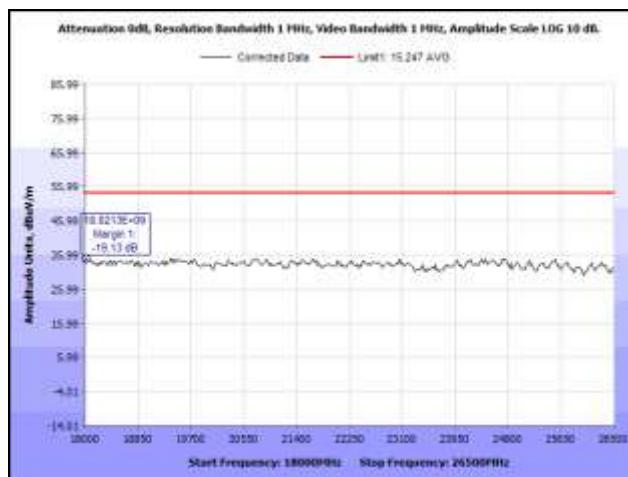
Plot 23. Radiated Spurious Emissions, Channel 19, 1 GHz – 5 GHz, Average



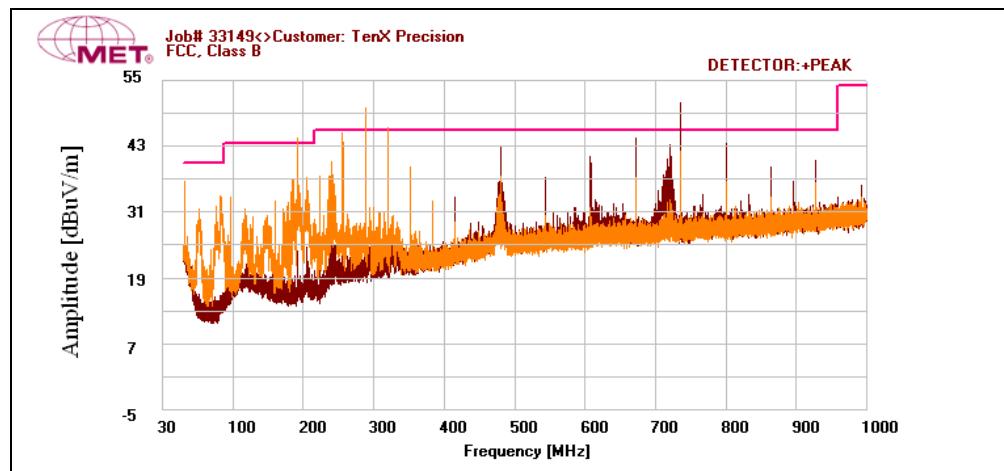
Plot 24. Radiated Spurious Emissions, Channel 19, 1 GHz – 5 GHz, Peak



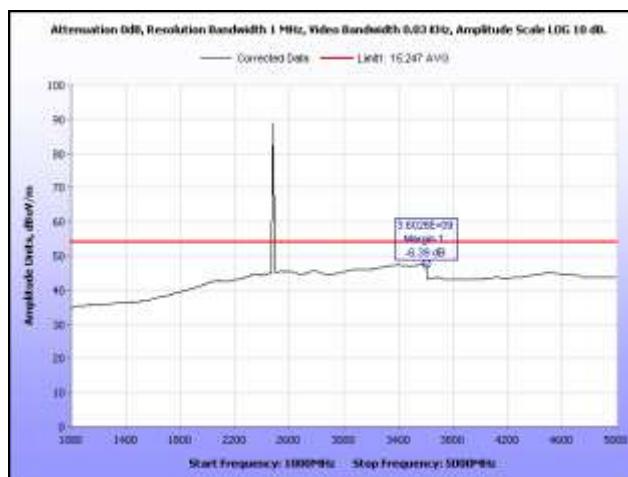
Plot 25. Radiated Spurious Emissions, Channel 19, 5 GHz – 18 GHz, Peak



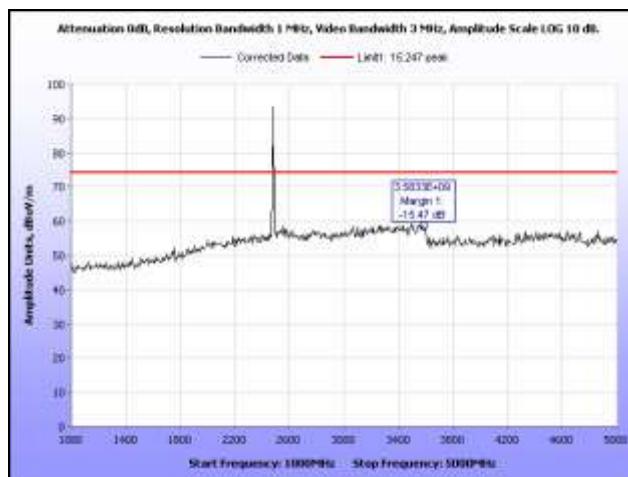
Plot 26. Radiated Spurious Emissions, Channel 19, 18 GHz – 26.5 GHz, Peak



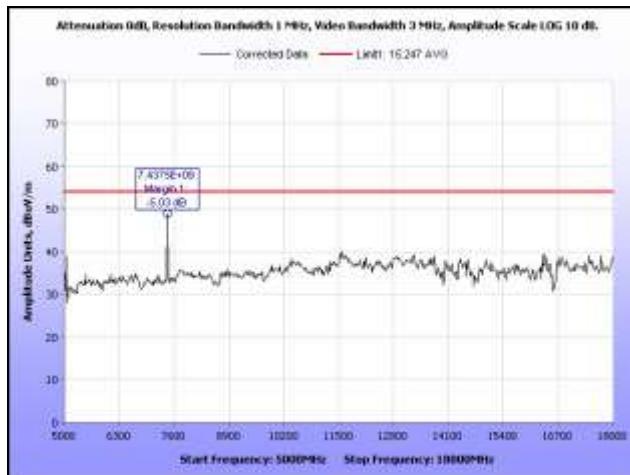
Plot 27. Radiated Spurious Emissions, Transmitter, Channel 29



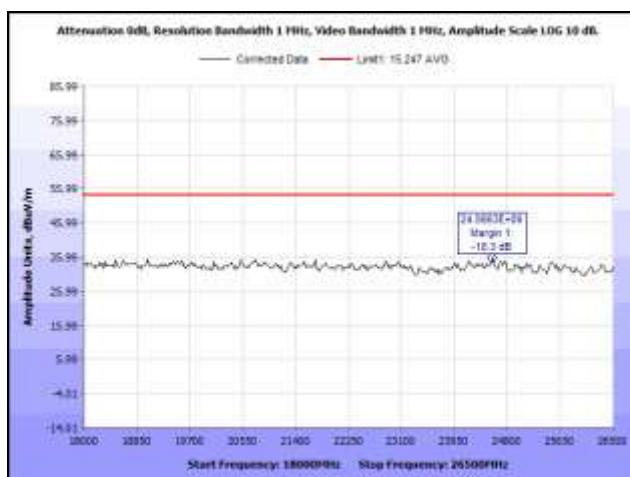
Plot 28. Radiated Spurious Emissions, Channel 29, 1 GHz – 5 GHz, Average



Plot 29. Radiated Spurious Emissions, Channel 29, 1 GHz – 5 GHz, Peak



Plot 30. Radiated Spurious Emissions, Channel 26, 5 GHz – 18 GHz, Peak

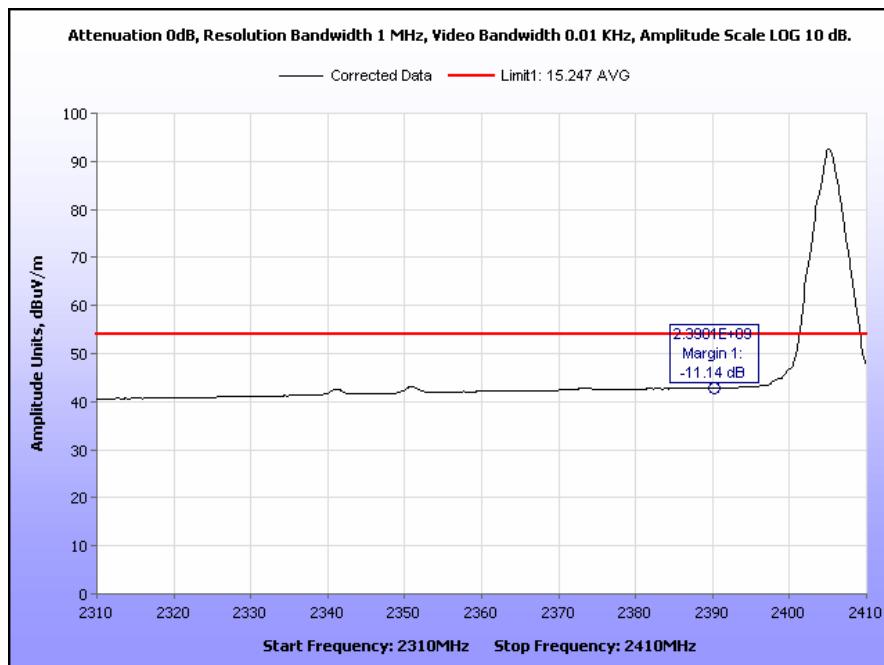


Plot 31. Radiated Spurious Emissions, Channel 29, 18 GHz – 26.5 GHz, Peak

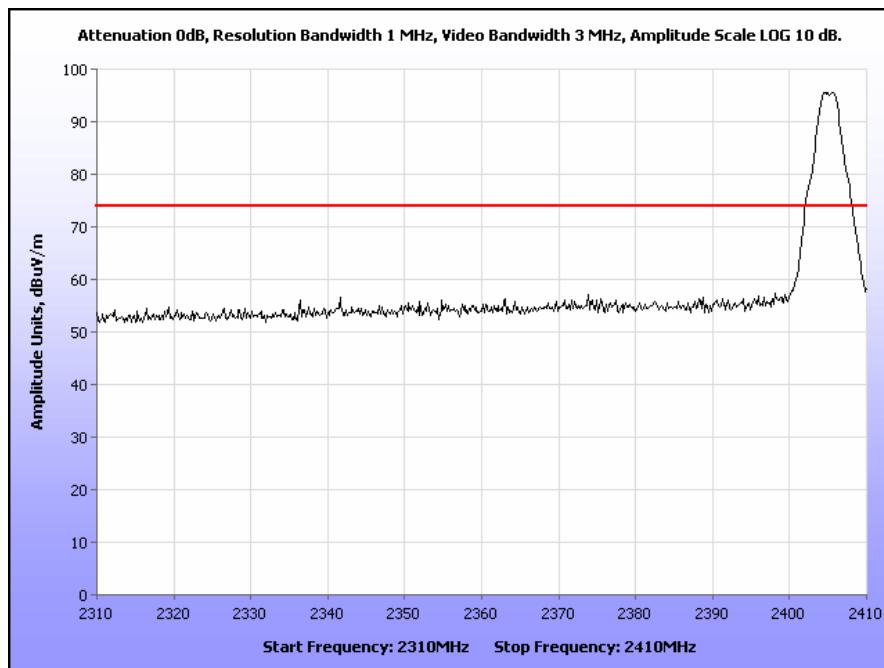
## Radiated Band Edge Measurements

### Test Procedures:

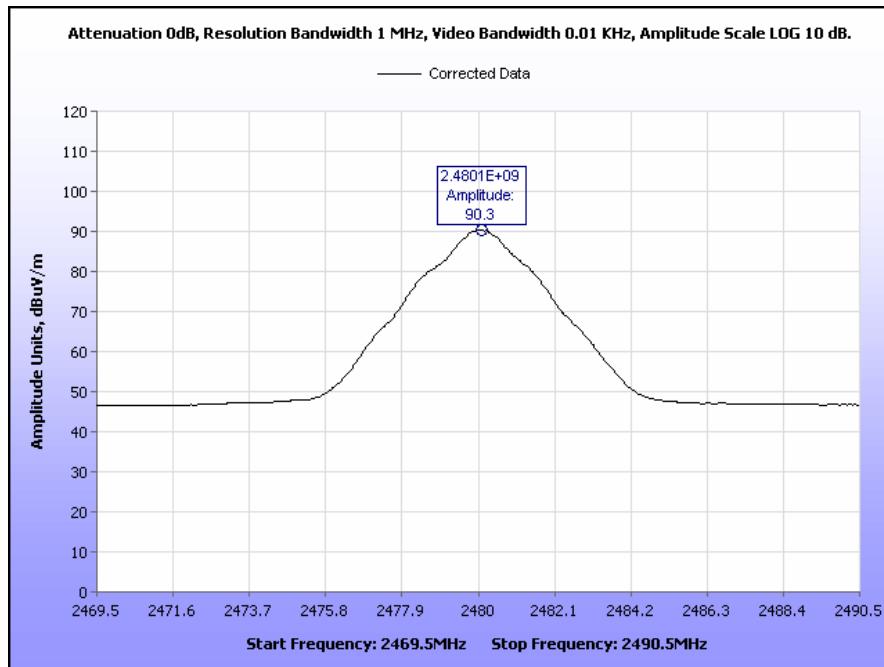
The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Delta marker method was used for high channel.



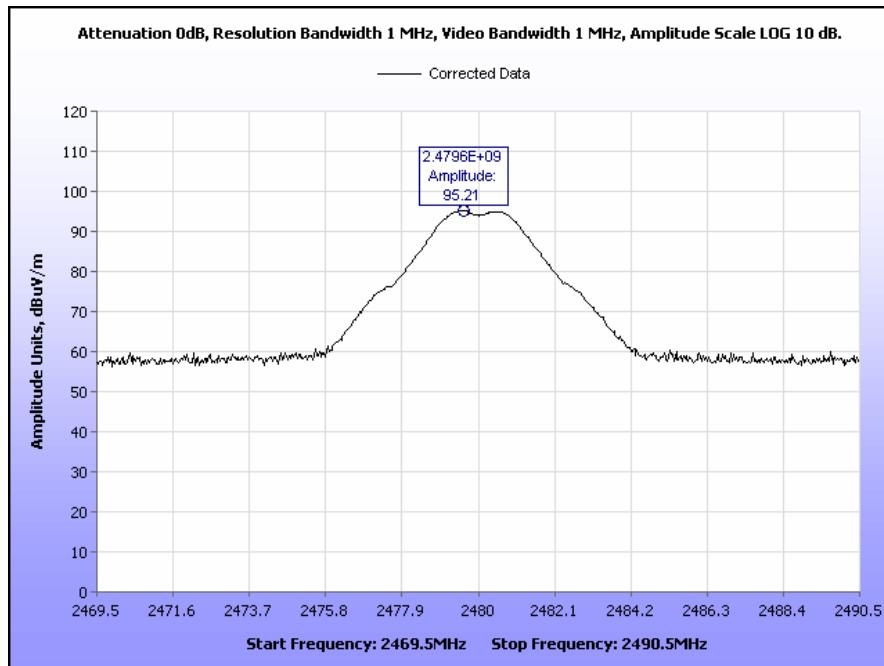
Plot 32. Radiated Restricted Band Edge, Channel 11, Average



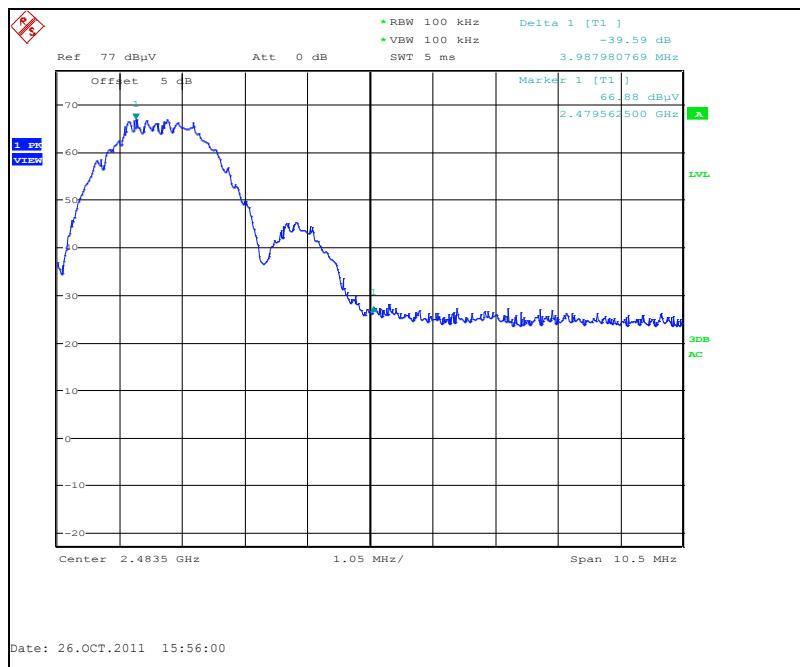
Plot 33. Radiated Restricted Band Edge, Channel 11, Peak



**Plot 34. Average Fundamental**



**Plot 35. Peak Fundamental**



**Plot 36. Band Edge, Delta**

Channel	Fundamental Field Strength (dBuV/m) @ 3m - Peak		Delta (dB)	Corrected Band Edge Field strength (dBuV/m) @ 3m	
	Peak	Avg		Peak	Avg
26	95.21	90.3	-39.59	55.62	50.71

**Table 16. Delta Method, Test Results**

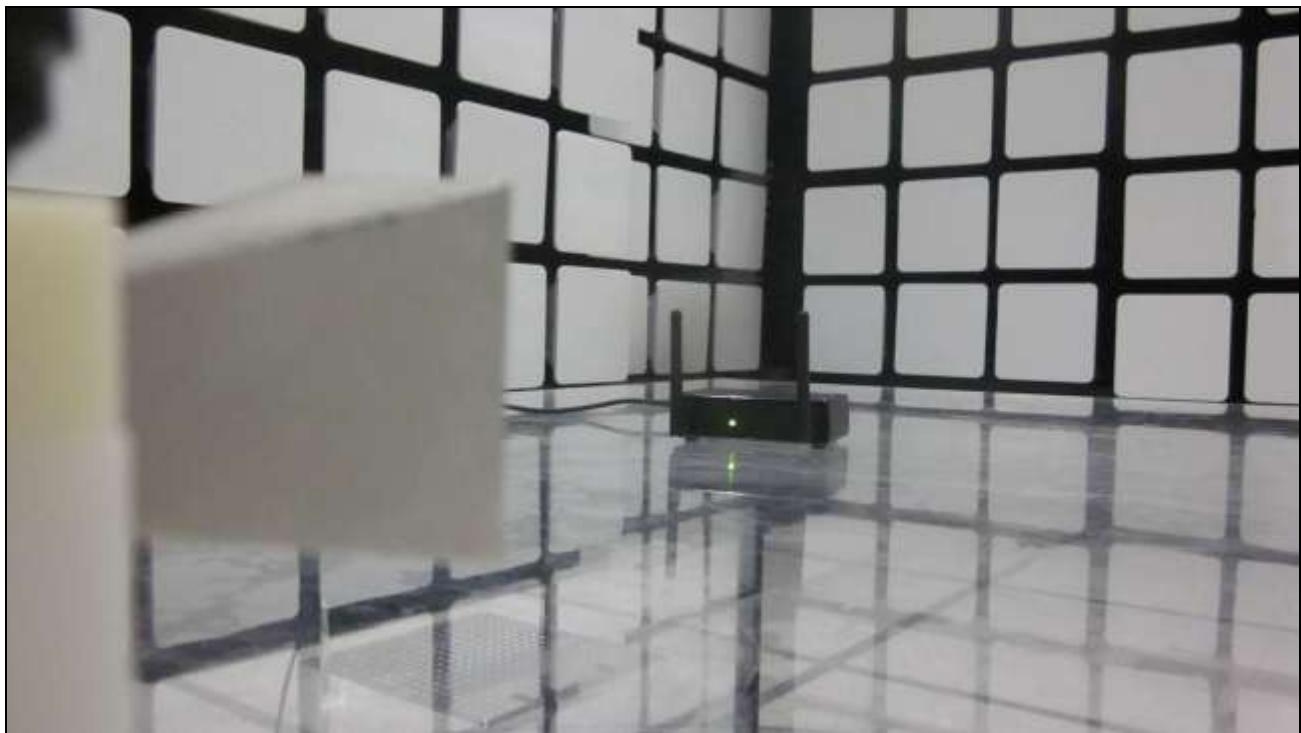
## Radiated Spurious Emissions Test Setup



Photograph 2. Radiated Spurious Emissions, Test Setup, Below 1 GHz



Photograph 3. Radiated Spurious Emissions, Test Setup, 1 GHz – 18 GHz



**Photograph 4. Radiated Spurious Emissions, Test Setup, 18 GHz – 26 GHz**

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(d) RF Conducted Spurious Emissions Requirements and Band Edge

**Test Requirement:** **15.247(d)** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

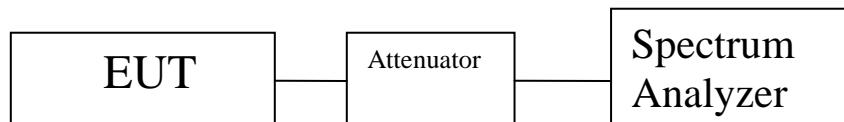
**Test Procedure:** For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10<sup>th</sup> harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

See following pages for detailed test results with RF Conducted Spurious Emissions.

**Test Results:** The EUT was compliant with the Conducted Spurious Emission limits of **§15.247(d)**.

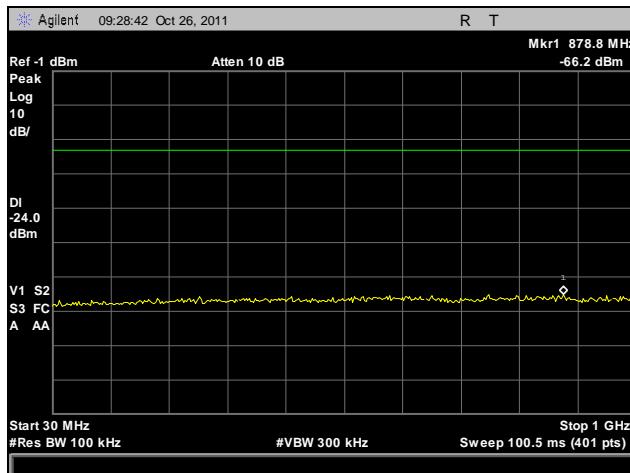
**Test Engineer(s):** Dusmantha Tennakoon

**Test Date(s):** 10/28/11

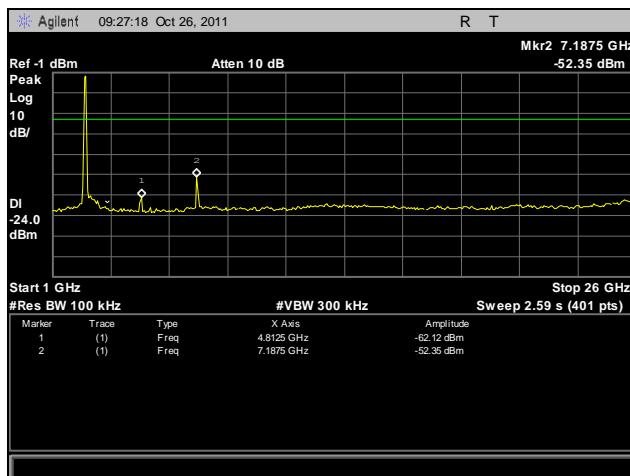


**Figure 3. Block Diagram, Conducted Spurious Emissions Test Setup**

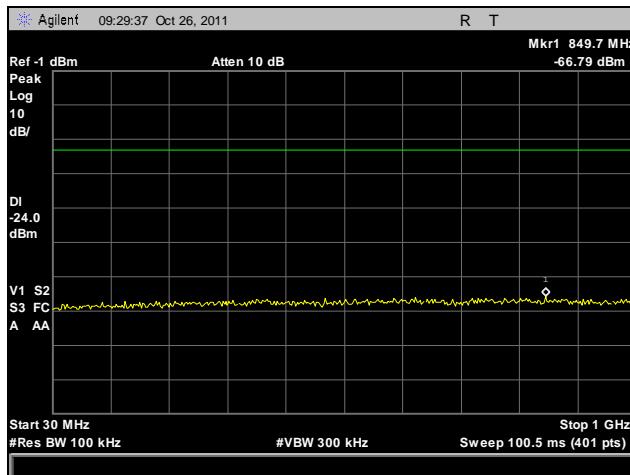
## Conducted Spurious Emissions Test Results



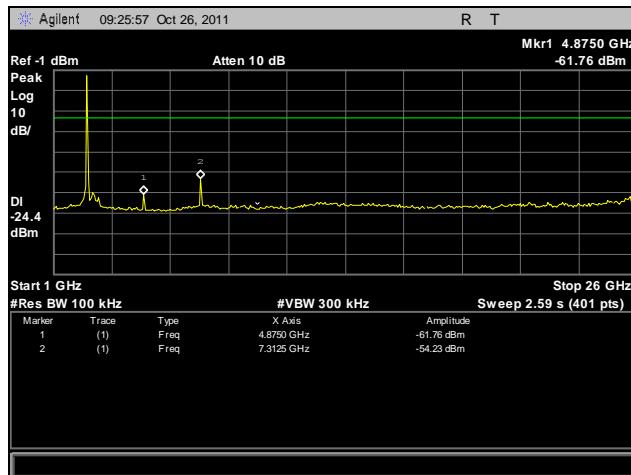
Plot 37. Conducted Spurious Emissions, Channel 11, 30 MHz – 1 GHz



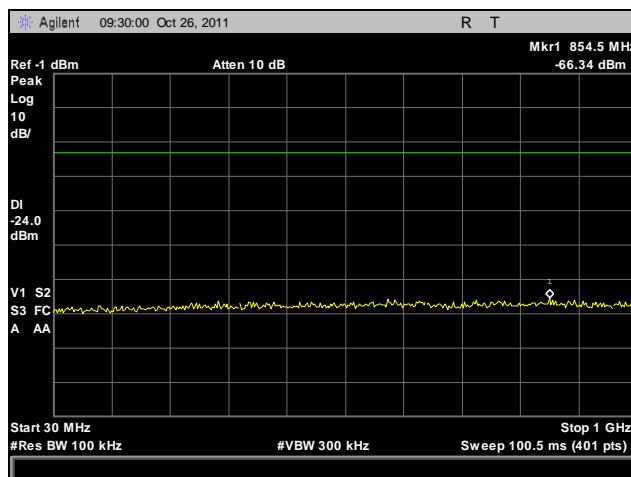
Plot 38. Conducted Spurious Emissions, Channel 11, 1 GHz – 26 GHz



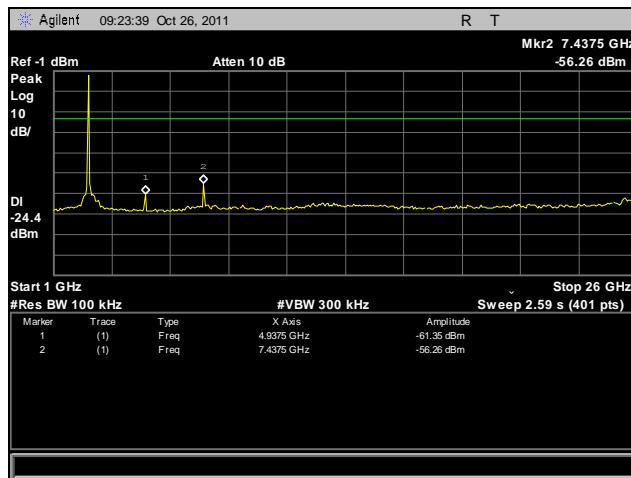
Plot 39. Conducted Spurious Emissions, Channel 19, 30 MHz – 1 GHz



**Plot 40. Conducted Spurious Emissions, Channel 19, 1 GHz – 26 GHz**

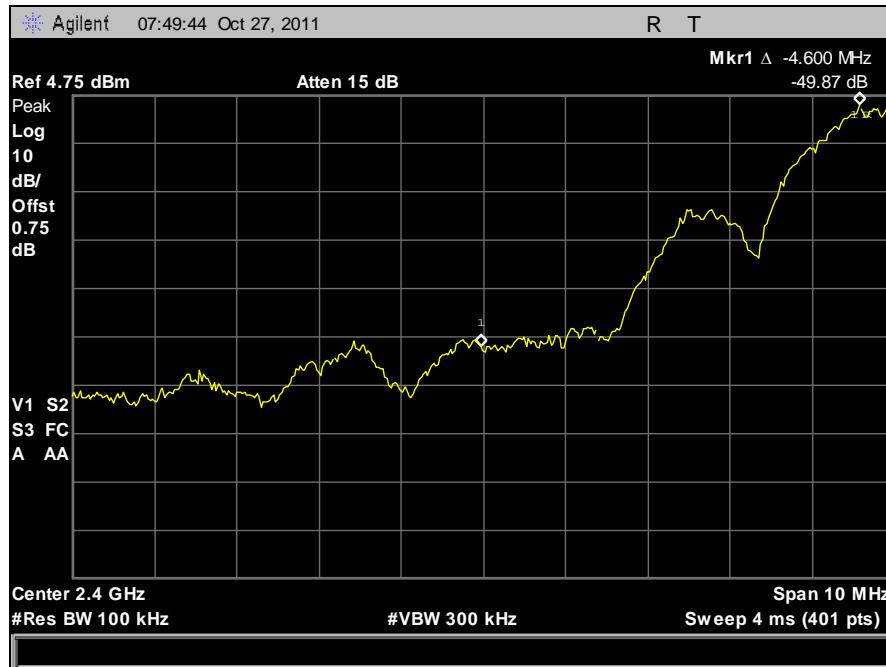


**Plot 41. Conducted Spurious Emissions, Channel 26, 30 MHz – 1 GHz**



**Plot 42. Conducted Spurious Emissions, Channel 26, 1 GHz – 26 GHz**

## Conducted Band Edge Test Results



Plot 43. Conducted Band Edge, Low Channel, 20 dB



Plot 44. Conducted Band Edge, High Channel, 20 dB

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(e) Peak Power Spectral Density

**Test Requirements:** **§15.247(e):** For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

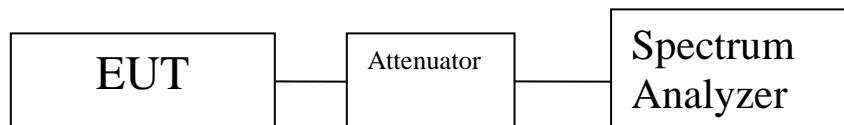
**Test Procedure:** The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level throughout each of the 100 sweeps of power averaging. The RBW was set to 3 kHz and a VBW set to 9 kHz or greater. The spectrum analyzer was set to an auto sweep time and a peak detector was used. Measurements were carried out at the low, mid and high channels.

**Test Results:** The EUT was compliant with the peak power spectral density limits of **§ 15.247 (e)**.

The peak power spectral density was determined from plots on the following page(s).

**Test Engineer:** Dusmantha Tennakoon

**Test Date:** 10/28/11



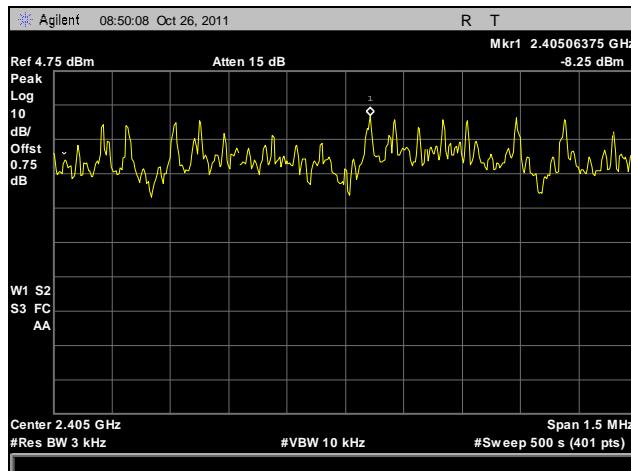
**Figure 4. Block Diagram, Peak Power Spectral Density Test Setup**

## Peak Power Spectral Density Test Results

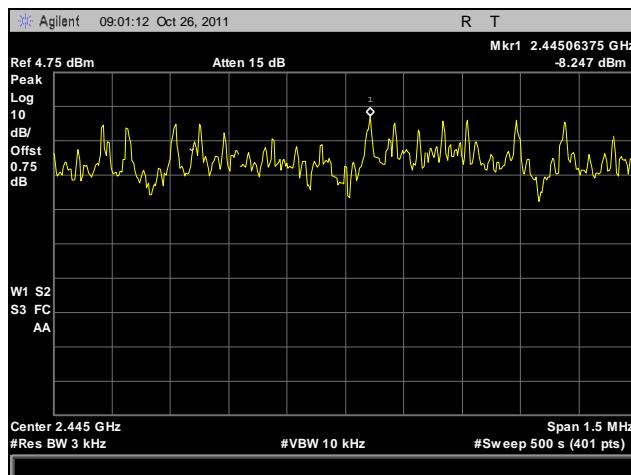
Peak Power Spectral Density				
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm)	Limit (dBm)	Margin (dB)
Channel 11	2405	-8.25	8	-16.25
Channel 19	2445	-8.247	8	-16.247
Channel 26	2480	-8.023	8	-26.023

**Table 17. Peak Power Spectral Density, Test Results**

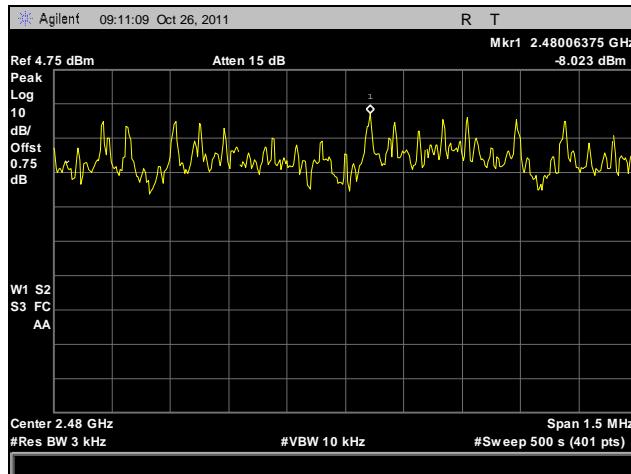
## Peak Power Spectral Density



Plot 45. Peak Power Spectral Density, Channel 11



Plot 46. Peak Power Spectral Density, Channel 19



Plot 47. Peak Power Spectral Density, Channel 26

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(i) Maximum Permissible Exposure

**RF Exposure Requirements:** **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

**RF Radiation Exposure Limit:** **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit Calculation: EUT's operating frequencies @ 2405-2480 MHz; highest conducted power =  $4.68 \text{ dBm}$  (peak) therefore, **Limit for Uncontrolled exposure:  $1 \text{ mW/cm}^2$  or  $10 \text{ W/m}^2$**

EUT maximum antenna gain =  $2 \text{ dBi}$ .

Worst case configuration is being evaluated: the power is doubled to account for two radios simultaneously on same channel (this device will never transmit simultaneously on same channels)

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{PG / 4\pi S}$$

where,  $S$  = Power Density ( $1 \text{ mW/cm}^2$ )  
 $P$  = Combined Power Input to antenna ( $5.88 \text{ mW}$ )  
 $G$  = Antenna Gain ( $1.58$  numeric)

$$S = (5.88 * 1.58 / 4 * 3.14 * 20^2) = 0.002 \text{ mW/cm}^2$$

So the exposure limit is met at 20 cm.

## Electromagnetic Compatibility Criteria for Intentional Radiators

### RSS-GEN      Receiver Spurious Emissions Requirements

**Test Requirements:** The following receiver spurious emission limits shall be complied with:

- (a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 18.

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

**Table 18. Spurious Emission Limits for Receivers**

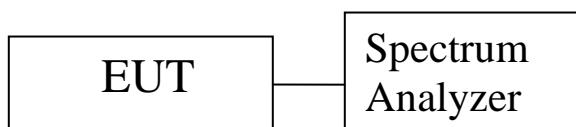
- (b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

**Test Procedures:** The EUT was programmed for receive mode only. Conducted measurements were taken at the antenna port of the EUT. 100 kHz resolution bandwidth was used from 30 MHz - 1 GHz and for measurements done above 1 GHz. All plots are corrected for cable loss.

**Test Results:** Equipment is compliant with the Receiver Spurious Emissions Requirements of RSS-GEN.

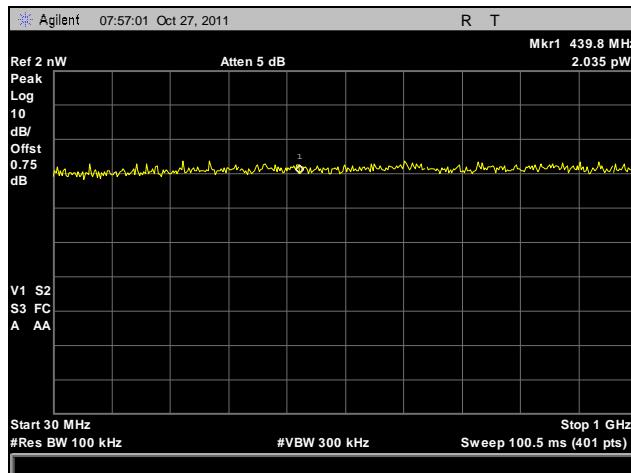
**Test Engineer(s):** Dusmantha Tennakoon

**Test Date(s):** 11/02/11

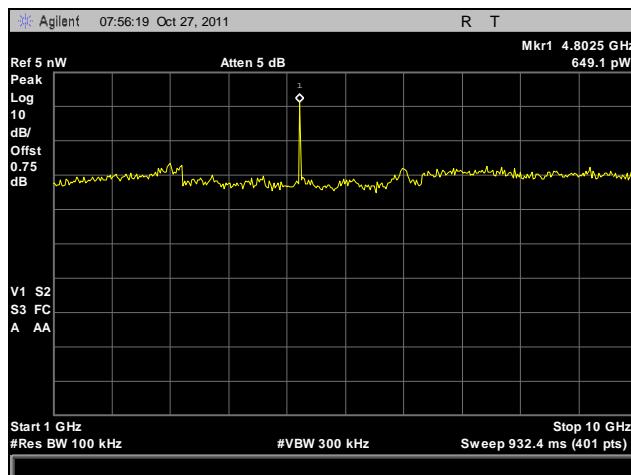


**Figure 5. Block Diagram, Conducted Receiver Spurious Emissions Test Setup**

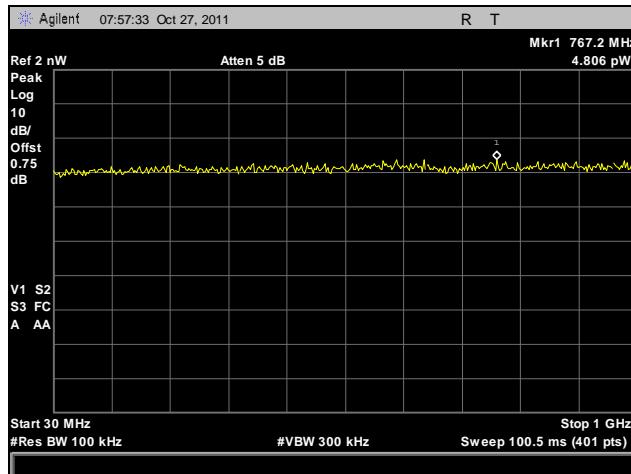
## Conducted Receiver Spurious Emissions



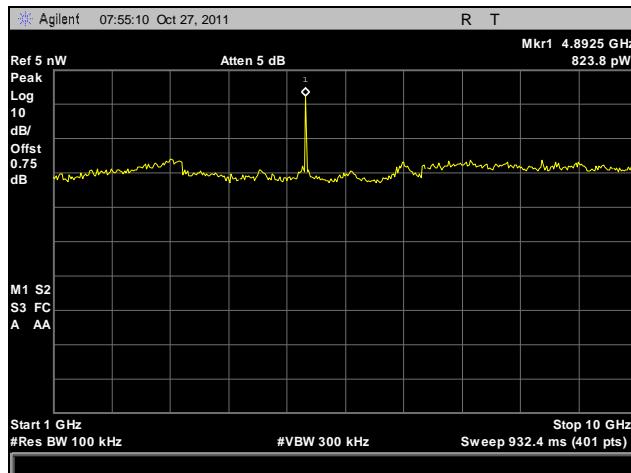
Plot 48. Receiver Spurious Emission, Channel 11, 30 MHz – 1 GHz



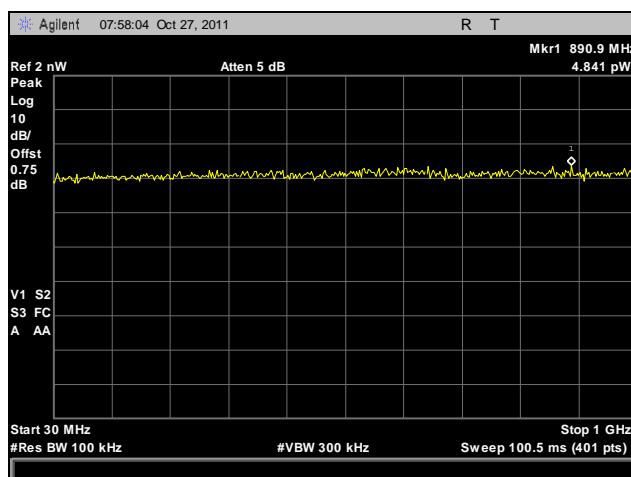
Plot 49. Receiver Spurious Emission, Channel 11, 1 GHz – 10 GHz



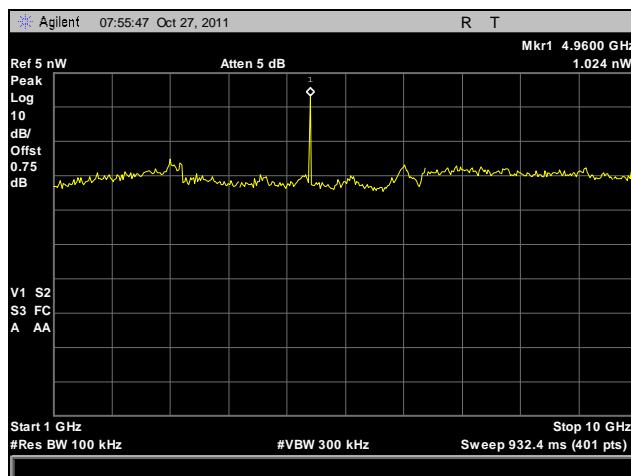
Plot 50. Receiver Spurious Emission, Channel 19, 30 MHz – 1 GHz



Plot 51. Receiver Spurious Emission, Channel 19, 1 GHz – 10 GHz



Plot 52. Receiver Spurious Emission, Channel 26, 30 MHz – 1 GHz



Plot 53. Receiver Spurious Emission, Channel 26, 1 GHz – 10 GHz

## IV. Test Equipment

## Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1A1065	EMI RECEIVER	ROHDE & SCHWARZ	ESCI	12/15/2010	12/15/2011
1A1087	ATTENUATOR	ROHDE & SCHWARZ	ESH3Z2	3/11/2011	3/11/2012
1A1021	VOLTAGE DISPLAY	NEWPORT	Q9000-FUR6	9/15/2011	3/15/2012
1A1076	POWER TRANSFORMER	SUPERIOR ELECTRIC	POWERSTAT	SEE NOTE	
1A1019	ESH3-25 LISN (AE)	ROHDE & SCHWARZ	831-5518.2	SEE NOTE	
1A1119	TEST AREA	CUSTOM MADE	N/A	3/28/2011	3/28/2012
1A1122	LISN	TESEQ	NNB 51	3/31/2011	3/31/2012
1A1083	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU40	2/22/2011	2/22/2012
1A1088	PRE-AMP	RHODE & SCHWARZ	TS-PR1	5/2/2011	5/2/2012
1A1113	PRE-AMP	MINI-CIRCUIT	ZVA-183+	4/4/2011	4/4/2012
1A1072	PRE-AMP	MITEQ	AFS5-01001800-25-8P-6-PS	4/4/2011	4/4/2012
1A1090	PRE-AMP	MITEQ	AFS44-00102650-42-10P-44	4/4/2011	4/4/2012
1A1047	HORN ANTENNA (1-18GHZ)	ETS	3117	7/28/2010	1/28/2012
1A1026	18-26.5GHZ ANTENNA	ETS	011777-002	4/23/2010	4/23/2012
1A1050	BI-CONILOG ANTENNA (30MHZ TO 1GHZ)	SCHAFFNER	CBL6112D	4/22/2011	4/22/2012
1A1106	10M CHAMBER	ETS	SEMI-ANECHOIC	9/12/2011	9/12/2012

**Table 19. Test Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## V. Certification & User's Manual Information

## Certification & User's Manual Information

### A. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

#### **§ 2.801 Radio-frequency device defined.**

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

- (a) The various types of radio communication transmitting devices described throughout this chapter.
- (b) *The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.*
- (c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.
- (d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

#### **§ 2.803 Marketing of radio frequency devices prior to equipment authorization.**

- (a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:
  - (1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or
  - (2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.
- (d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

- (i) *Compliance testing;*
- (ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;
- (iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;
- (iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or
- (v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

## Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

### § 2.901 Basis and Purpose

- (a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.<sup>1</sup> *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer,* be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.
- (b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

### § 2.907 Certification.

- (a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.
- (b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

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<sup>1</sup> In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

## Certification & User's Manual Information

### § 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) *If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.*

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

## Certification & User's Manual Information

### 1. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

#### § 15.19 Labeling requirements.

(a) *In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:*

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

*This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

#### § 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

### § 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## ICES-003 Procedural & Labeling Requirements

From the Industry Canada Electromagnetic Compatibility Advisory Bulletin entitled, "Implementation and Interpretation of the Interference-Causing Equipment Standard for Digital Apparatus, ICES-003" (EMCAB-3, Issue 2, July 1995):

"At present, CISPR 22: 2002 and ICES technical requirements are essentially equivalent. Therefore, if you have CISPR 22: 2002 approval by meeting CISPR Publication 22, the only additional requirements are: to attach a note to the report of the test results for compliance, indicating that these results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations; to maintain these records on file for the requisite five year period; and to provide the device with a notice of compliance in accordance with ICES-003."

### Procedural Requirements:

According to Industry Canada's Interference Causing Equipment Standard for Digital Apparatus ICES-003 Issue 4, February 2004:

Section 6.1: A record of the measurements and results, showing the date that the measurements were completed, shall be retained by the manufacturer or importer for a period of at least five years from the date shown in the record and made available for examination on the request of the Minister.

Section 6.2: A written notice indicating compliance must accompany each unit of digital apparatus to the end user. The notice shall be in the form of a label that is affixed to the apparatus. Where because of insufficient space or other constraints it is not feasible to affix a label to the apparatus, the notice may be in the form of a statement in the user's manual.

### Labeling Requirements:

The suggested text for the notice, in English and in French, is provided below, from the Annex of ICES-003:

This Class <sup>[2]</sup> digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe <sup>[1]</sup> est conforme à la norme NMB-003 du Canada.

<sup>2</sup> Insert either A or B but not both as appropriate for the equipment requirements.

## End of Report