



## **MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*

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August 20, 2013

Phoenix Contact, Inc.  
586 Fulling Mill Rd.  
Middletown, PA 17057

Dear Thomas Olsen,

Enclosed is the EMC Wireless Class II Permissive Change test report for compliance testing of the Phoenix Contact, Inc., SHR-900 as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15, Subpart B and ICES-003, Issue 5 August 2012 for a Class A Digital Device, and FCC 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: (\Phoenix Contact, Inc.\EMC37509B-FCC247 Rev. 1)

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## Electromagnetic Compatibility Criteria Class II Permissive Change Test Report

for the

**Phoenix Contact, Inc.  
SHR-900**

**Tested under**  
the FCC Certification Rules  
contained in  
Title 47 of the CFR, Parts 15 Subpart B & ICES-003  
for Class A Digital Devices  
&  
15.247 Subpart C & RSS-210, Issue 8, Dec. 2010  
for Intentional Radiators

**MET Report: EMC37509B-FCC247 Rev. 1**

August 20, 2013

**Prepared For:**

**Phoenix Contact, Inc.  
586 Fulling Mill Rd.  
Middletown, PA 17057**

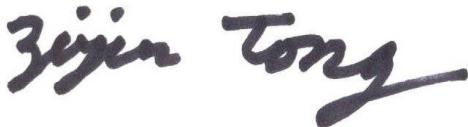
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## Electromagnetic Compatibility Criteria Class II Permissive Change Test Report

for the

**Phoenix Contact, Inc.  
SHR-900**

**Tested under**  
the FCC Certification Rules  
contained in  
Title 47 of the CFR, Parts 15 Subpart B & ICES-003  
for Class A Digital Devices  
&  
15.247 Subpart C & RSS-210, Issue 8, Dec. 2010  
for Intentional Radiators



Zijun Tong, 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 Parts 15B, 15.247 and Industry Canada standards ICES-003, Issue 5 August 2012, RSS-210, Issue 8, Dec. 2010 under normal use and maintenance.



Asad Bajwa,  
Director, Electromagnetic Compatibility Lab

## Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	August 13, 2013	Initial Issue.
1	August 20, 2013	Revised to reflect 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<sub>μ</sub>A</b>	Decibels above one <b>microamp</b>
<b>dB<sub>μ</sub>V</b>	Decibels above one <b>microvolt</b>
<b>dB<sub>μ</sub>A/m</b>	Decibels above one <b>microamp per meter</b>
<b>dB<sub>μ</sub>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>μH</b>	<b>microhenry</b>
<b>μ</b>	<b>microfarad</b>
<b>μs</b>	<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>	Volts <b>per meter</b>
<b>VCP</b>	Vertical Coupling Plane

# I. Executive Summary

## A. Purpose of Test

An EMC Class II Permissive Change evaluation was performed to determine compliance of the Phoenix Contact, Inc. SHR-900, 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 SHR-900. Phoenix Contact, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the SHR-900, 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 Phoenix Contact, Inc., purchase order number 303427. 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 Issues 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	Not Applicable – EUT is DC Powered.
Title 47 of the CFR, Part 15 §15.247(a)(1)	RSS-Gen(4.6)	20 dB Occupied Bandwidth	Compliant
		99% Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(1)	RSS-210(A8.1)	Average Time of Occupancy (Dwell Time)	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(1)	RSS-210(A8.1)	Number of RF Channels	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(1)	RSS-210(A8.1)	RF Channel Separation	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	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	Spurious Conducted Emissions	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 Phoenix Contact, Inc. to perform Class II Permissive Change testing on the SHR-900, under Phoenix Contact, Inc.'s purchase order number 303427.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Phoenix Contact, Inc., SHR-900.

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

<b>Model(s) Tested:</b>	SHR-900
<b>Model(s) Covered:</b>	SHR-900
<b>EUT Specifications:</b>	Primary Power: 3.6 VDC FCC ID: SGV-SHR-900 IC: 4720C-SHR900 Type of Modulations: GMSK Equipment Code: DSS Peak RF Output Power: 29.69 dBm EUT Frequency Ranges: 902 – 928 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>	Zijun Tong
<b>Report Date(s):</b>	August 20, 2013

**Table 2. EUT Summary Table**

## 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>ISO/IEC 17025:2005</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., 914 W. Patapsco Ave., Baltimore, MD 21230. 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 3 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 Phoenix Contact, Inc. SHR-900, Equipment Under Test (EUT), is a frequency hopping spread spectrum data transceiver module intended for use in Phoenix Contact process control and industrial automation equipment.

The SHR-900 operated in the 902-928 MHz band and radiates as much as 1 watt.

Phoenix is seeking Limited Modular approval as in all cases it will be embedded in Phoenix equipment and will be subject to professional installation.

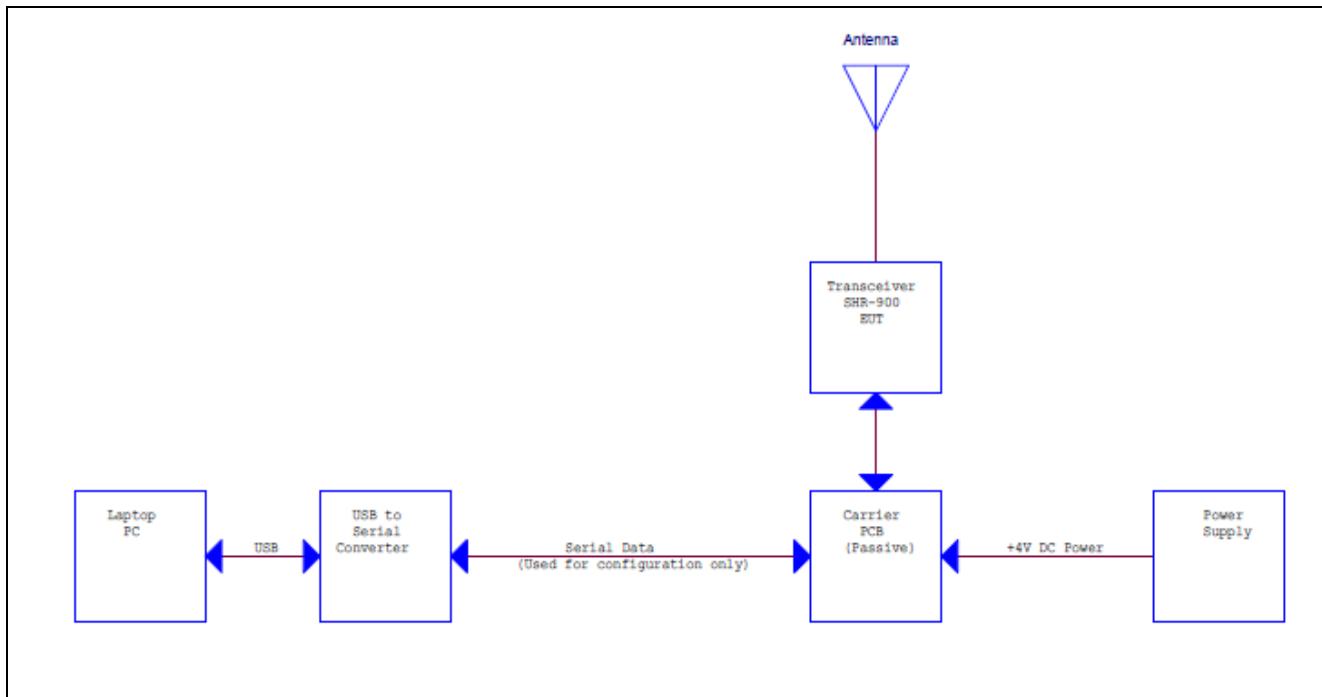


Figure 1. Block Diagram of Test Configuration

## E. Equipment Configuration

The EUT was set up as outlined in Figure 1, 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	Serial Number
1	SHR-900 Transceiver	0138843	13
2	SHR-900 Transceiver	0138843	33
3	SHR-900 Transceiver	0138843	42
4	1/4 Wave Antenna	0600-00030	N/A
5	RAD-ISM-900-YAGI-1	5606614	N/A

**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	Serial Number
1	Laptop PC	Dell	D630C	12635462701
2	Power Supply	Tenma	72-6610	1101465
3	Carrier PCB	Signalcraft	SCT-PC54E3UC	N/A
4	USB to TTL Adapter	N/A	N/A	N/A

**Table 5. Support Equipment**

## G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
1	Antenna	Antenna	1	.2	Y	Antenna
2	Power	DC Power, 3.6V	1	6	N	Pwr. Supply
3	Serial TTL	Used for Configuration only, not test	1	.2	N	Laptop

**Table 6. Ports and Cabling Information**

## H. Mode of Operation

A special test command is used to put the transceiver into simulated link mode whereby the use of a partner transceiver with which to link to is not required.

The unit can also be commanded to park at the low mid, & high frequency and operate in CW mode or with modulation.

## I. Method of Monitoring EUT Operation

A spectrum analyzer can be used to ensure that the EUT is hopping over the entire 902 to 928 MHz band.

## 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 Phoenix Contact, Inc. 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 antenna is professional installed.

**Test Engineer(s):** Zijun Tong

**Test Date(s):** 07/23/13

Gain	Type	Model	Manufacturer
1dBi	1/4 Wave	2885676	Phoenix Contact
12dBi	Yagi	5606614	Phoenix Contact

**Table 7. Antenna List**

## 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  $\Sigma$  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 8. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)**

**Test Results:**

The EUT was not applicable with this requirement. The EUT is DC powered.

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(a)(1) 20 dB Occupied Bandwidth

**Test Requirements:**

§ 15.247(a): 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. For DTS, the minimum 6 dB bandwidth shall be at least 500 kHz. For frequency hopping systems, the EUT shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

**Test Procedure:**

The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth. The 99% band width was measured per FCC tracking number 624197. The 20dB bandwidth was wider than 500 kHz, and as an acceptable alternative, the 99% band width was measured.

**Test Results**

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

**Test Engineer(s):**

Zijun Tong

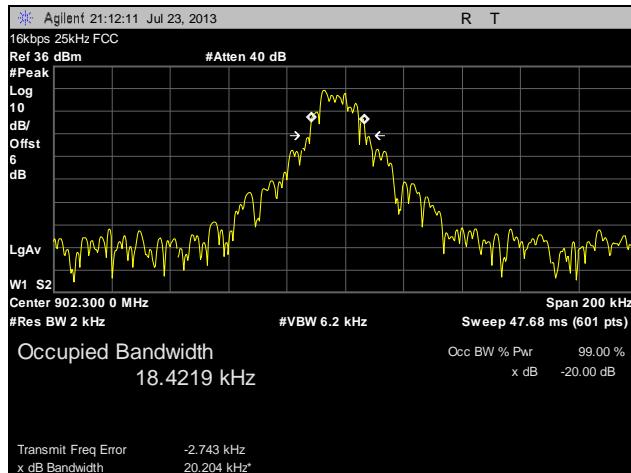
**Test Date(s):**

07/24/13 – 7/26/13

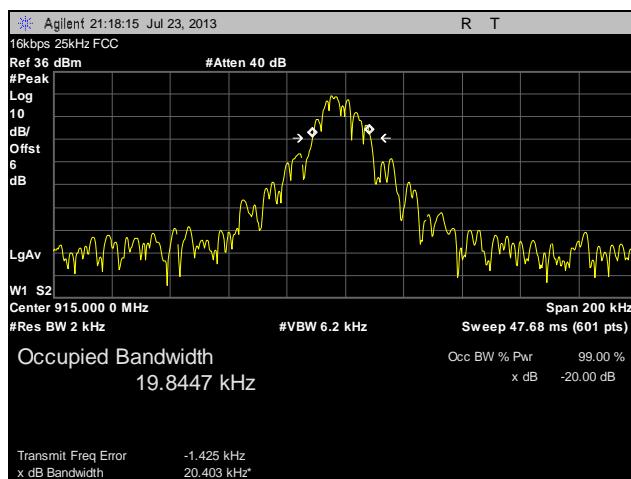


**Figure 2. Block Diagram, Occupied Bandwidth Test Setup**

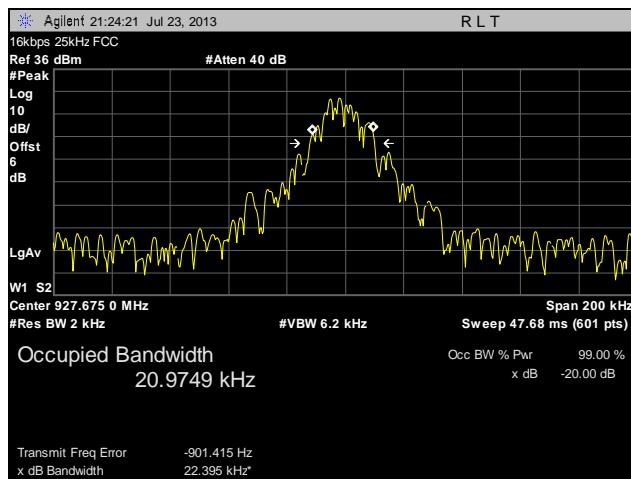
## 99% Occupied Bandwidth Test Results - FCC



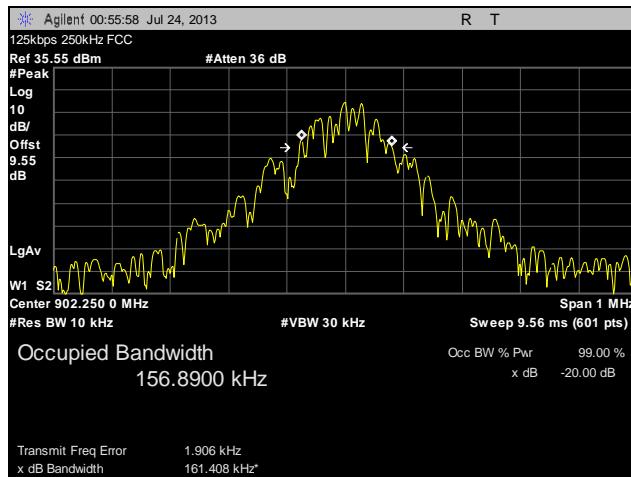
**Plot 1. Occupied Bandwidth, 16 kbps, 25 kHz, Low Channel, FCC Limits**



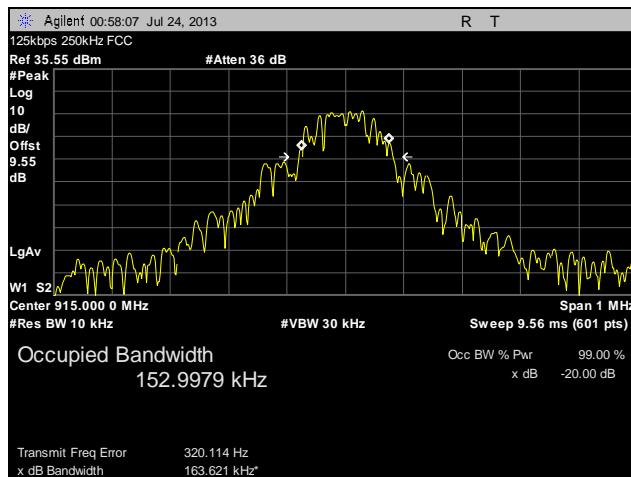
**Plot 2. Occupied Bandwidth, 16 kbps, 25 kHz, Mid Channel, FCC Limits**



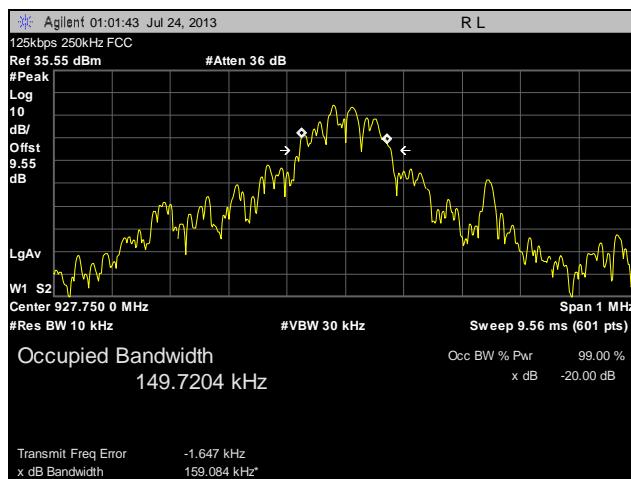
**Plot 3. Occupied Bandwidth, 16 kbps, 25 kHz, High Channel, FCC Limits**



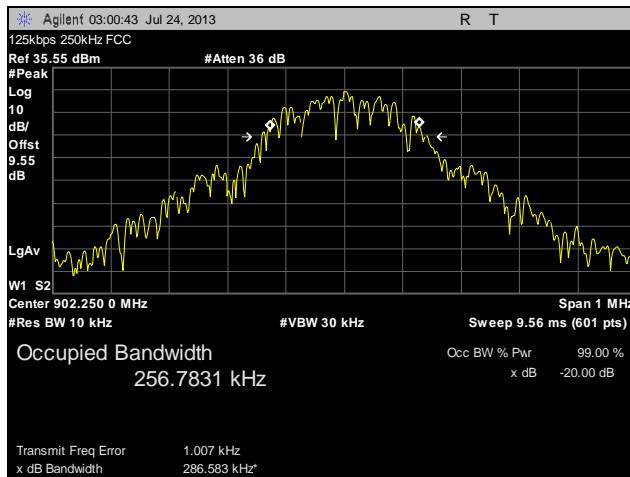
**Plot 4. Occupied Bandwidth, 125 kbps, 250 kHz, Low Channel, FCC Limits**



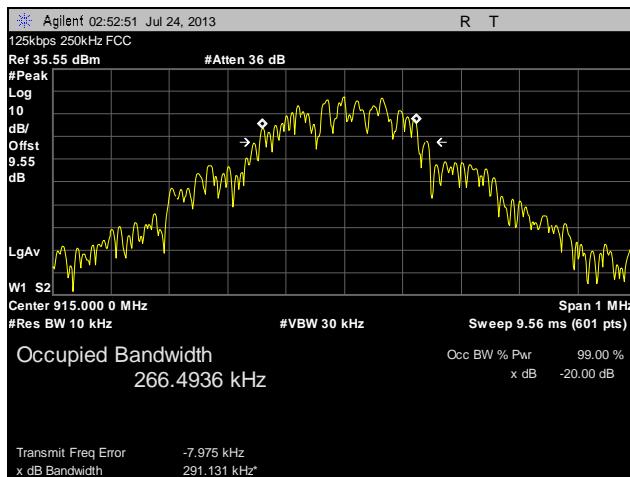
**Plot 5. Occupied Bandwidth, 125 kbps, 250 kHz, Mid Channel, FCC Limits**



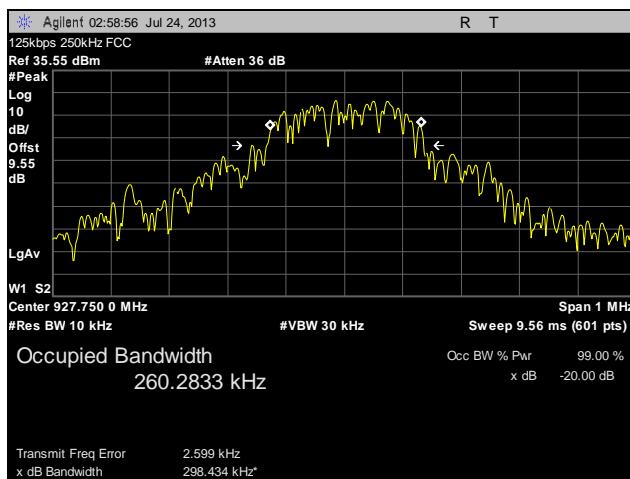
**Plot 6. Occupied Bandwidth, 125 kbps, 250 kHz, High Channel, FCC Limits**



**Plot 7. Occupied Bandwidth, 250 kbps, 250 kHz, Low Channel, FCC Limits**

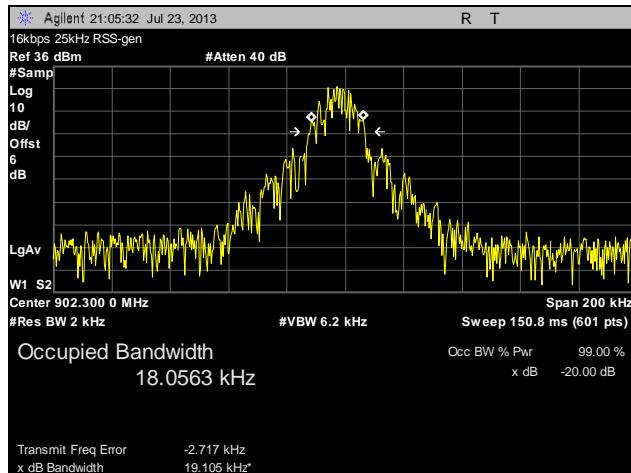


**Plot 8. Occupied Bandwidth, 250 kbps, 250 kHz, Mid Channel, FCC Limits**

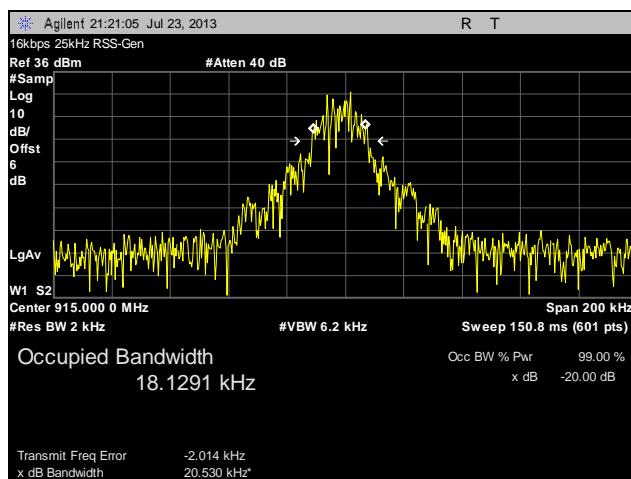


**Plot 9. Occupied Bandwidth, 250 kbps, 250 kHz, High Channel, FCC Limits**

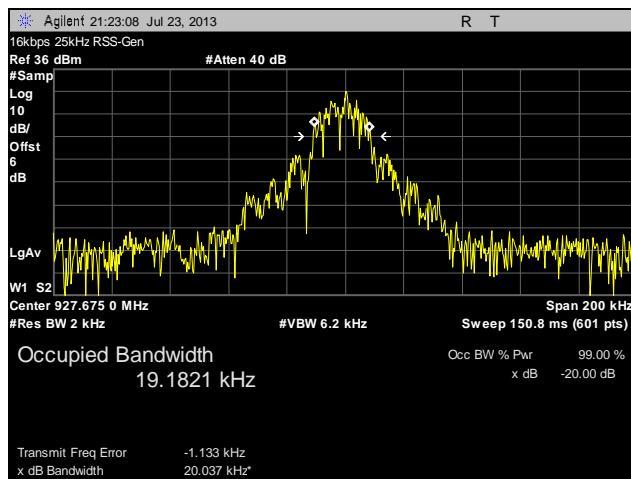
## 99% Occupied Bandwidth Test Results



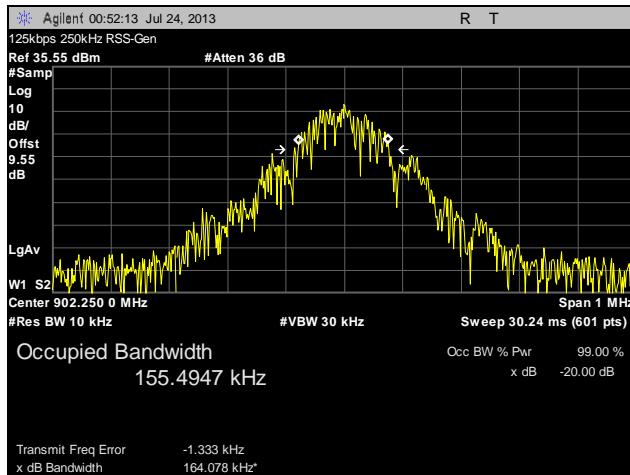
**Plot 10. 99% Occupied Bandwidth, 16 kbps, 25 kHz, Low Channel**



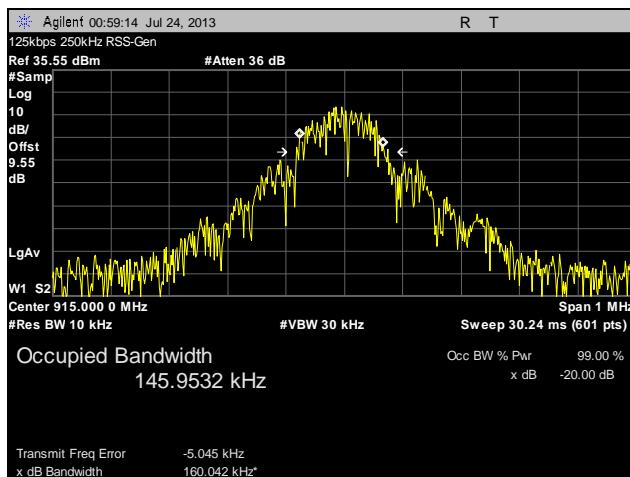
**Plot 11. 99% Occupied Bandwidth, 16 kbps, 25 kHz, Mid Channel**



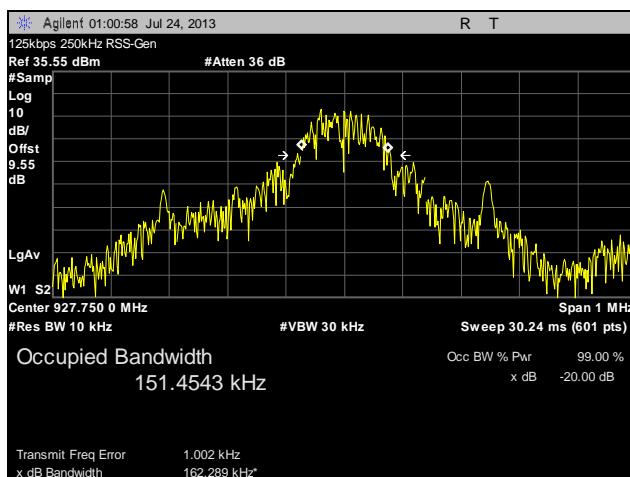
**Plot 12. 99% Occupied Bandwidth, 16 kbps, 25 kHz, High Channel**



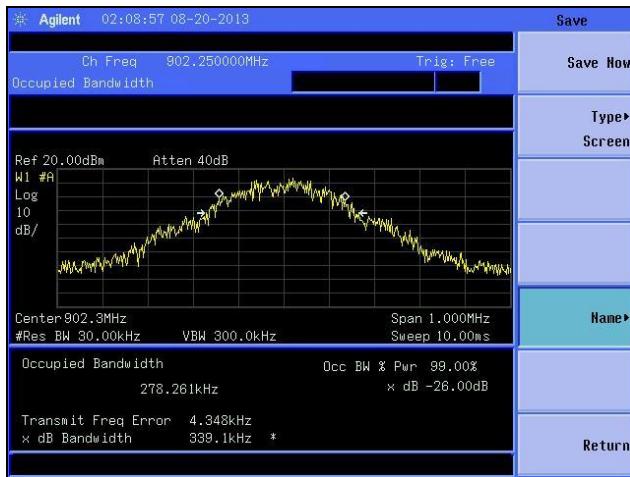
**Plot 13. 99% Occupied Bandwidth, 125 kbps, 250 kHz, Low Channel**



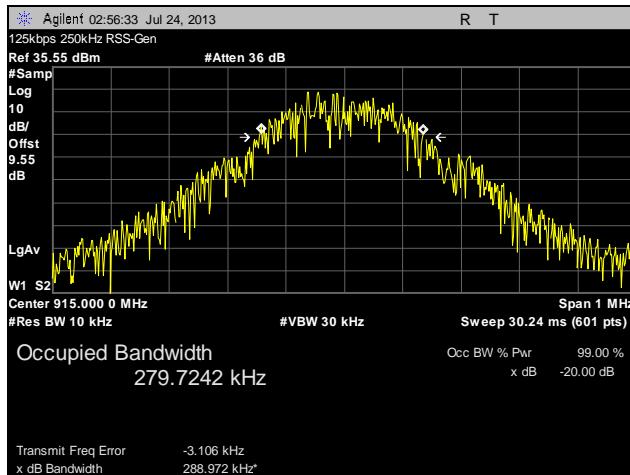
**Plot 14. 99% Occupied Bandwidth, 125 kbps, 250 kHz, Mid Channel**



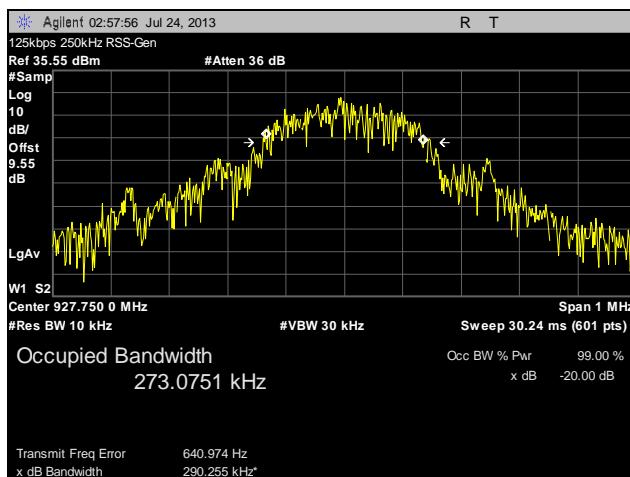
**Plot 15. 99% Occupied Bandwidth, 125 kbps, 250 kHz, High Channel**



Plot 16. 99% Occupied Bandwidth, 250 kbps, 250 kHz, Low Channel



Plot 17. 99% Occupied Bandwidth, 250 kbps, 250 kHz, Mid Channel



Plot 18. 99% Occupied Bandwidth, 250 kbps, 250 kHz, High Channel

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(a)(1)      Average Time of Occupancy (Dwell Time)

**Remarks:** The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

16kbps 25kHz mode total hopping channels is 127.

125kbps 250kHz mode total hopping channels is 103.

250kbps 250kHz mode total hopping channels is 103.

The EUT meets the specifications of Section 15.247(a) (1) (iii) for Number of Hopping Channels.

**Test Results**      The dwell time for each mode is computed as follows:

16kbps 25kHz mode, channel on time is 7.946ms. In 50.8 seconds period, channel peak showed up 5 times. Thus,  $5 \times 7.946\text{ms}$  gives 39.73ms.

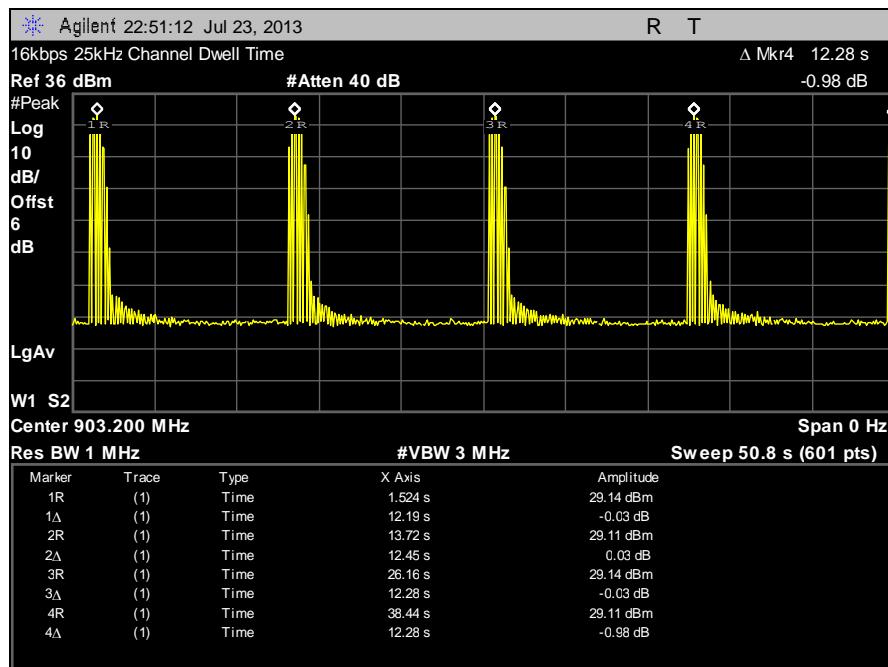
125kbps 250kHz mode, channel on time is 2.285ms. In 41.2 seconds period, channel peak showed up 8 times. Thus,  $8 \times 2.285\text{ms}$  gives 18.28ms.

250kbps 250kHz mode, channel on time is 1.149ms. In 41.2 seconds period, channel peak showed up 9 times. Thus,  $9 \times 1.149\text{ms}$  gives 10.341ms.

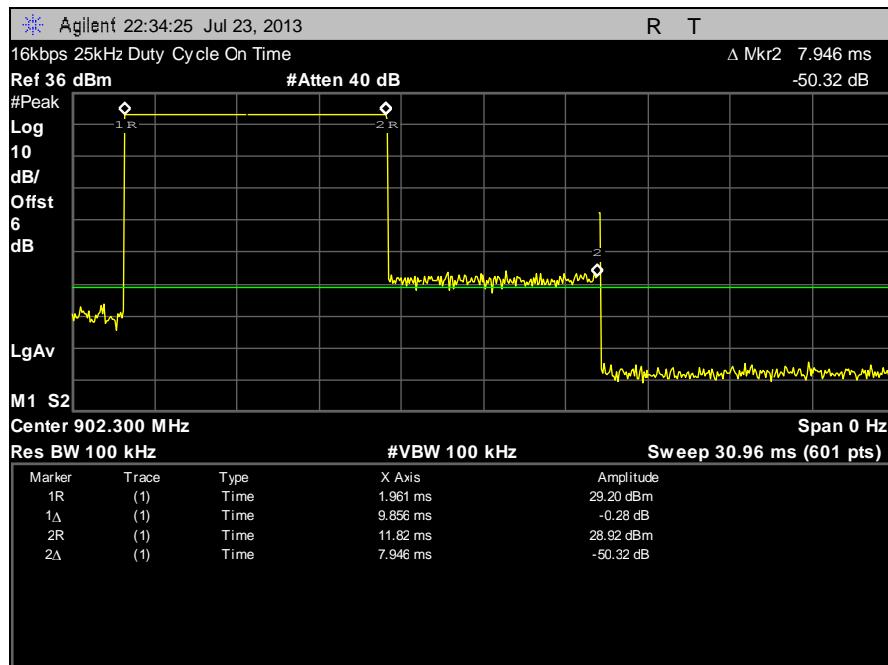
**Test Engineer(s):** Zijun Tong

**Test Date(s):** 07/26/13

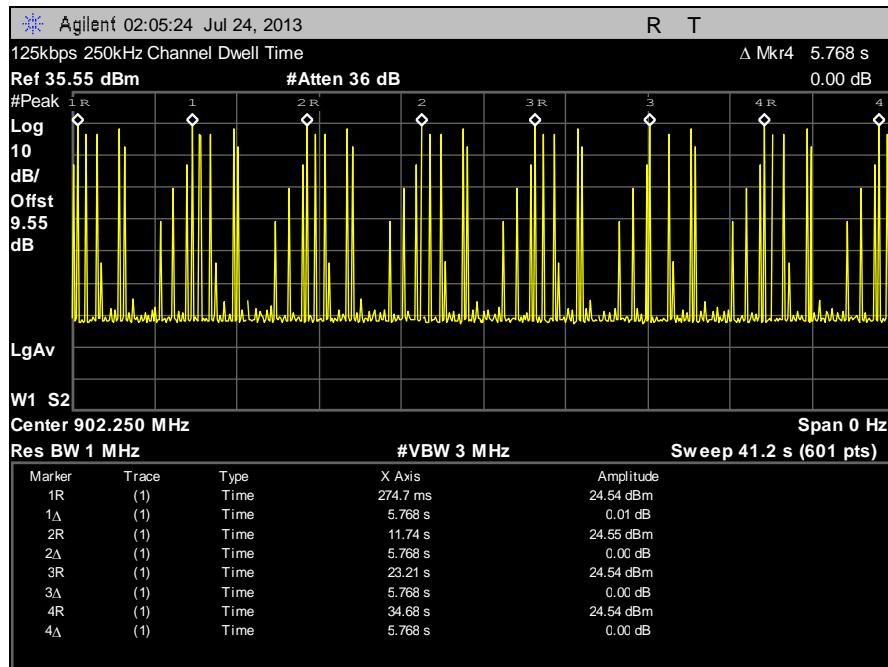
## Dwell Time



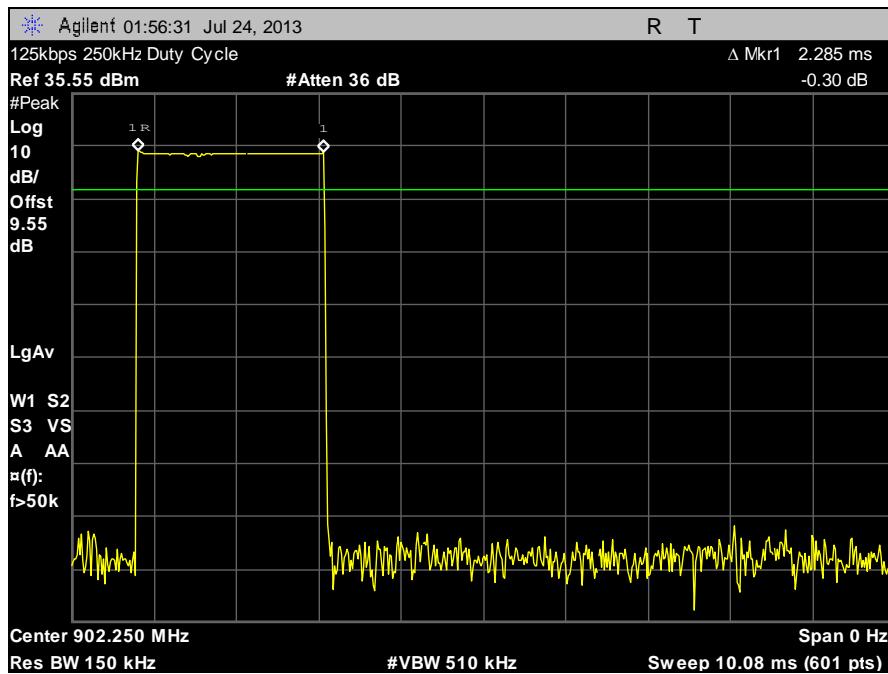
Plot 19. Dwell Time, 16 kbps, 25 kHz, Low Channel



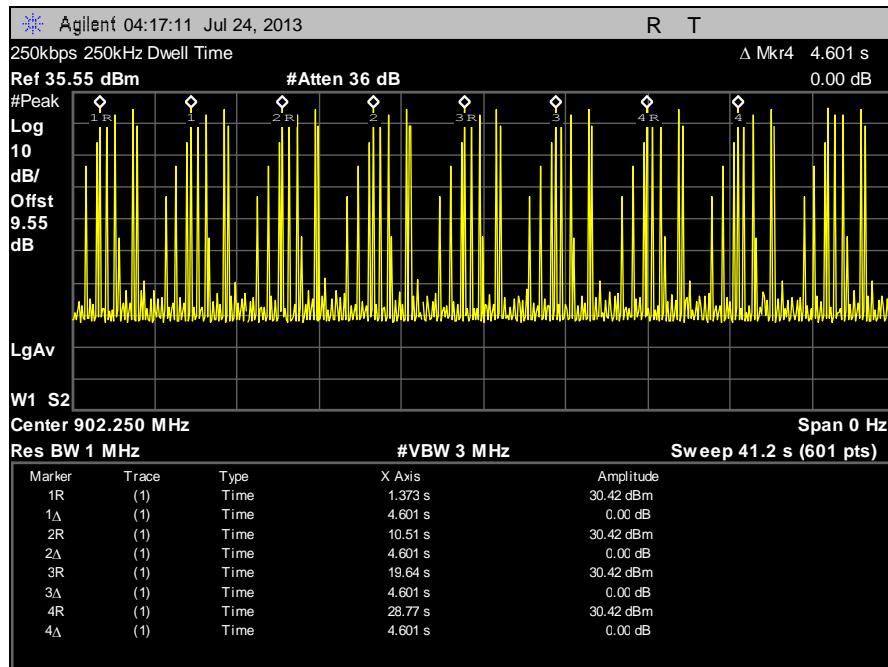
Plot 20. Dwell Time, 16 kbps, 25 kHz, Duty Cycle On Time, Low Channel



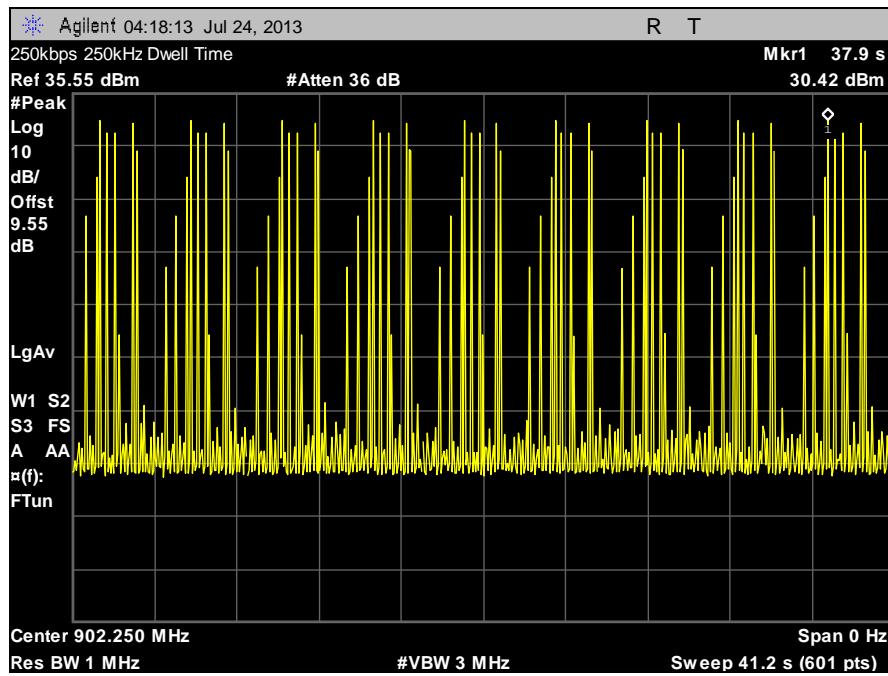
Plot 21. Dwell Time, 125 kbps, 250 kHz



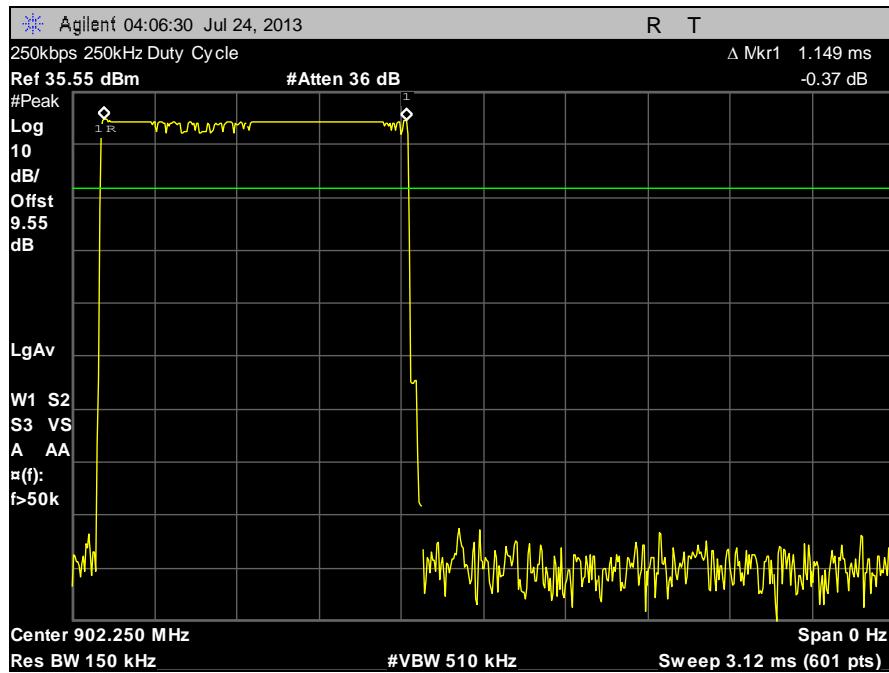
Plot 22. Dwell Time, 125 kbps, 250 kHz, Duty Cycle On Time



Plot 23. Dwell Time, 250 kbps, 250 kHz, Part 1



Plot 24. Dwell Time, 250 kbps, 250 kHz, Part 2



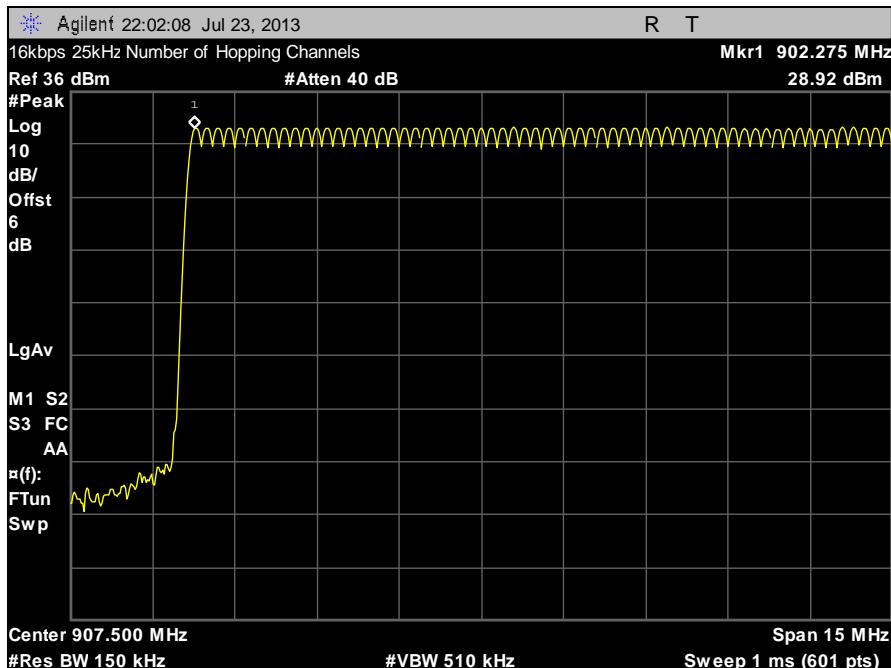
Plot 25. Dwell Time, 250 kbps, 250 kHz, Duty Cycle On Time

## Electromagnetic Compatibility Criteria for Intentional Radiators

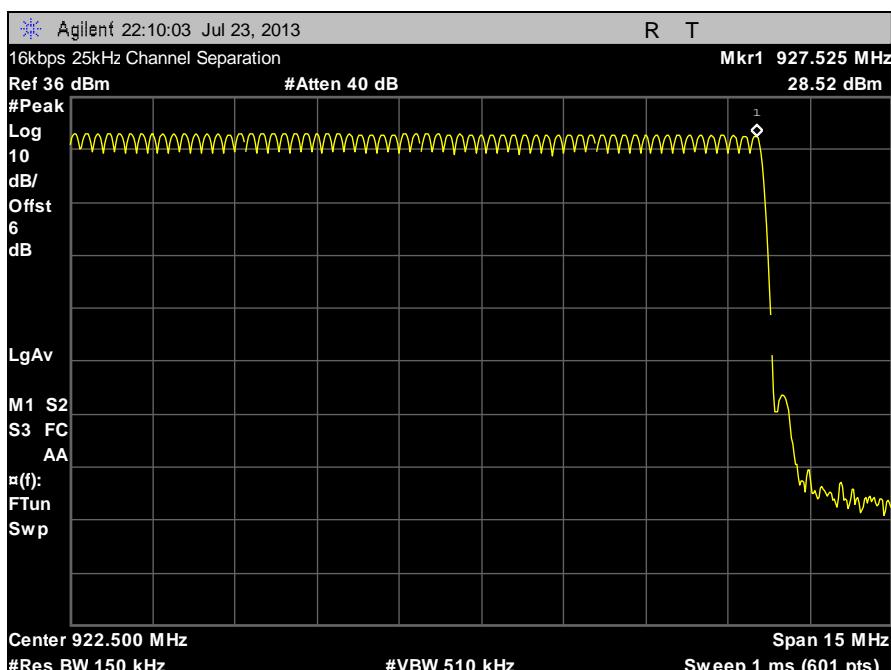
### § 15.247(a)(1) Number of RF Channels

Test Engineer(s): Zijun Tong

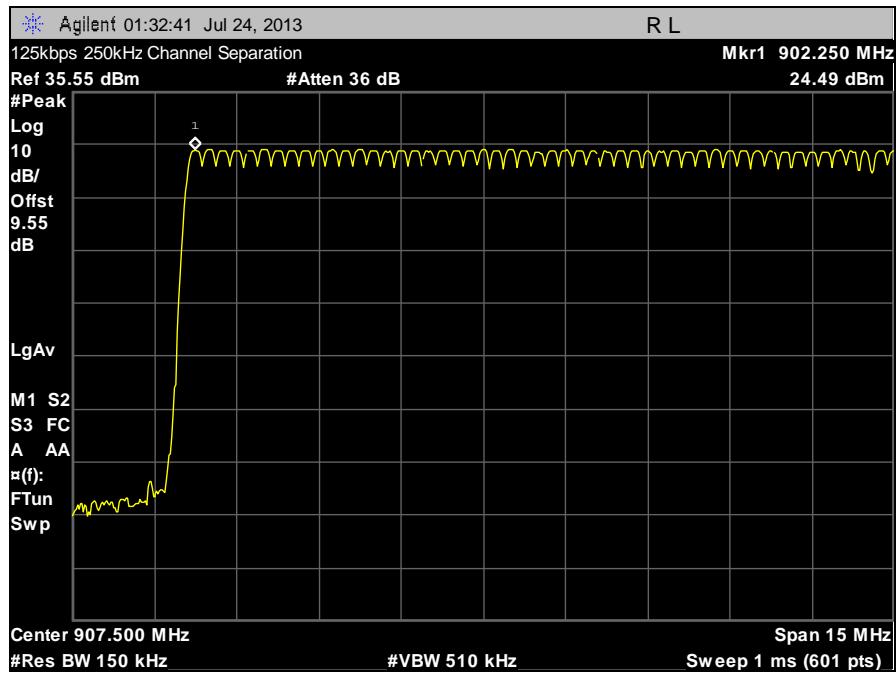
Test Date(s): 07/26/13



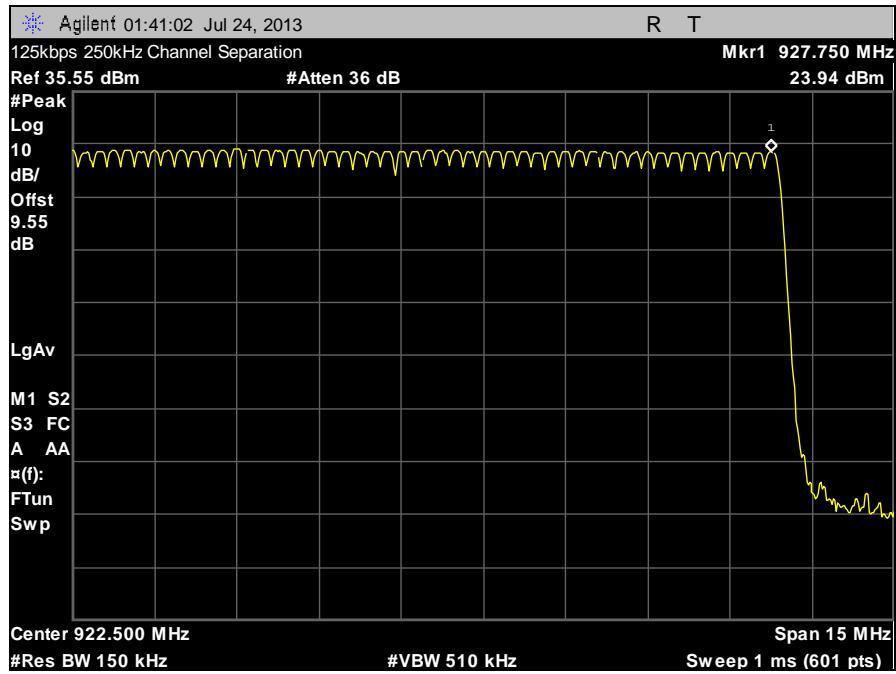
Plot 26. Number of Channels, 16 kbps, 25 kHz, 900 MHz – 915 MHz Range (64)



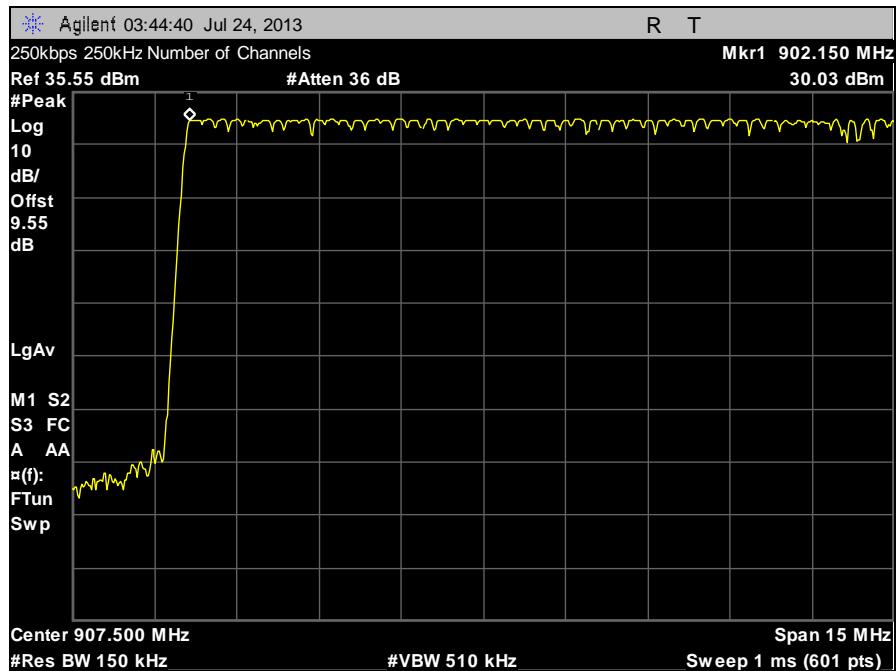
Plot 27. Number of Channels, 16 kbps, 25 kHz, 915 MHz – 930 MHz Range (63)



Plot 28. Number of Channels, 125 kbps, 250 kHz, 900 MHz – 915 MHz Range (51 and a half)



Plot 29. Number of Channels, 125 kbps, 250 kHz, 915 MHz – 930 MHz Range (51 and a half)



Plot 30. Number of Channels, 250 kbps, 250 kHz, 900 MHz – 915 MHz Range (51 and a half)



Plot 31. Number of Channels, 250 kbps, 250 kHz, 915 MHz – 930 MHz Range (51 and a half)

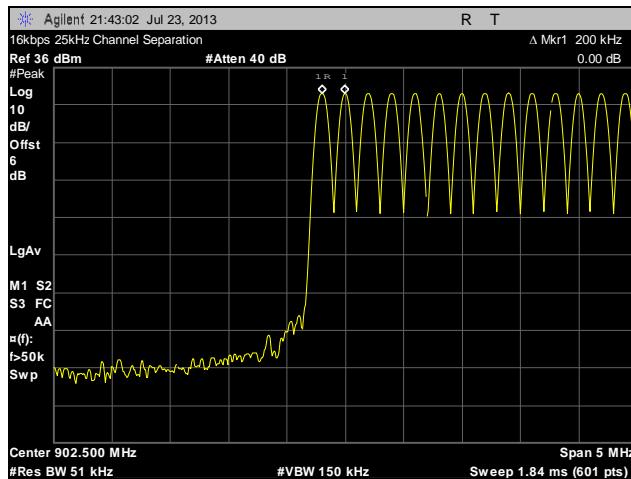
## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(a)(1) RF Channel Separation

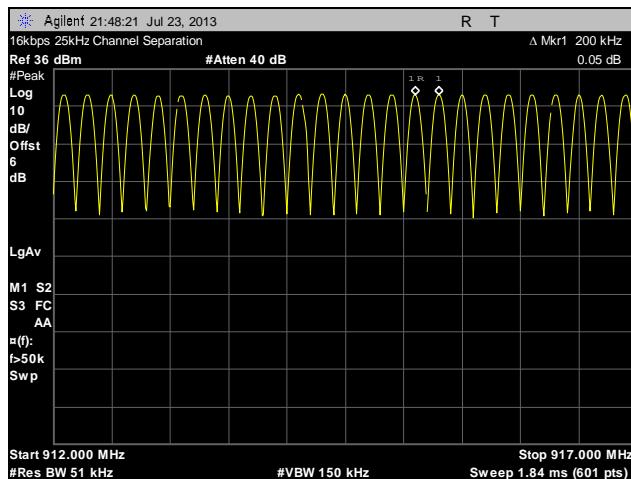
**Requirement:** Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

**Test Engineer(s):** Zijun Tong

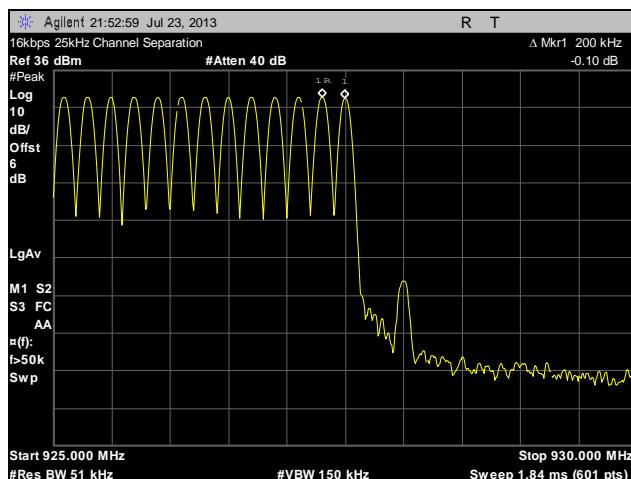
**Test Date(s):** 07/26/13



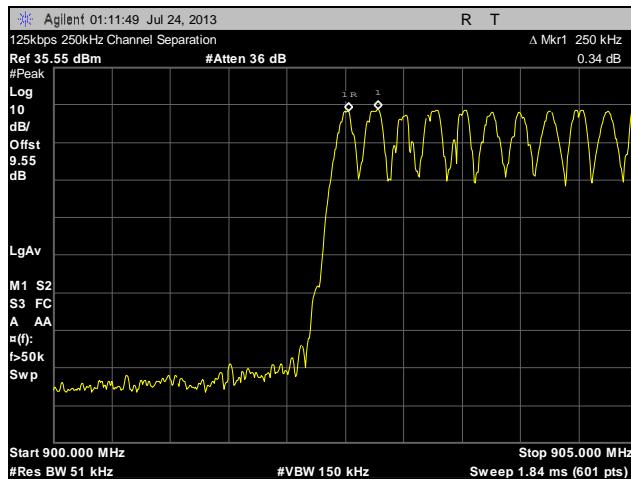
Plot 32. Channel Separation, 16 kbps, 25 kHz, Low Channel



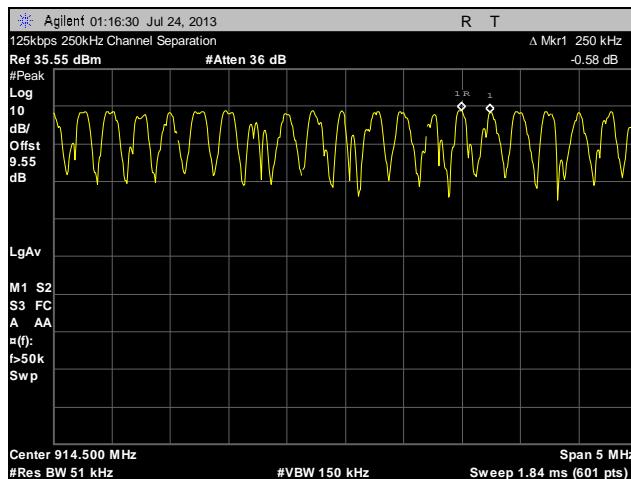
Plot 33. Channel Separation, 16 kbps, 25 kHz, Mid Channel



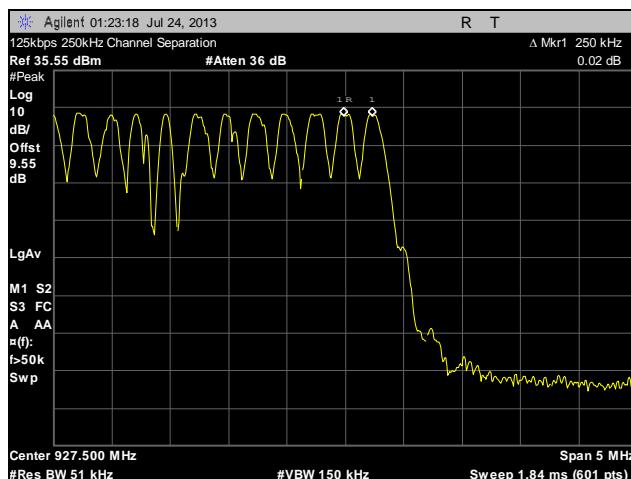
Plot 34. Channel Separation, 16 kbps, 25 kHz, High Channel



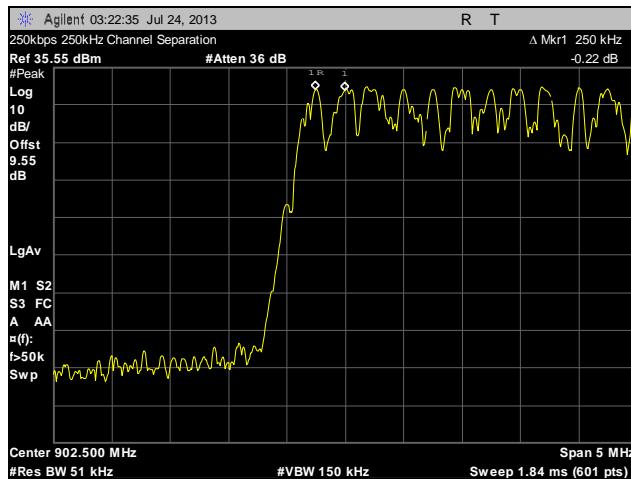
**Plot 35. Channel Separation, 125 kbps, 250 kHz, Low Channel**



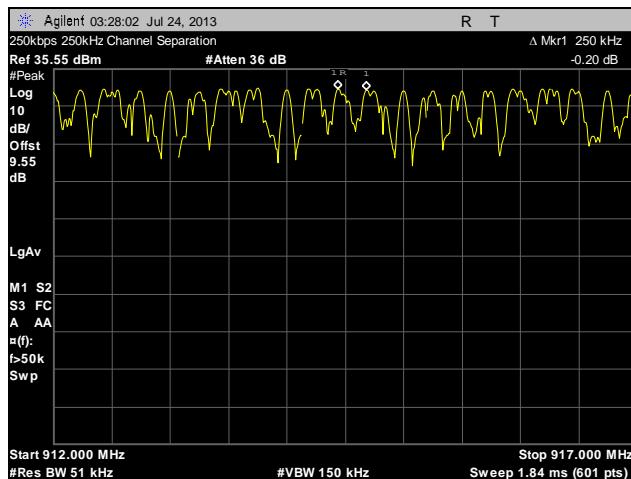
**Plot 36. Channel Separation, 125 kbps, 250 kHz, Mid Channel**



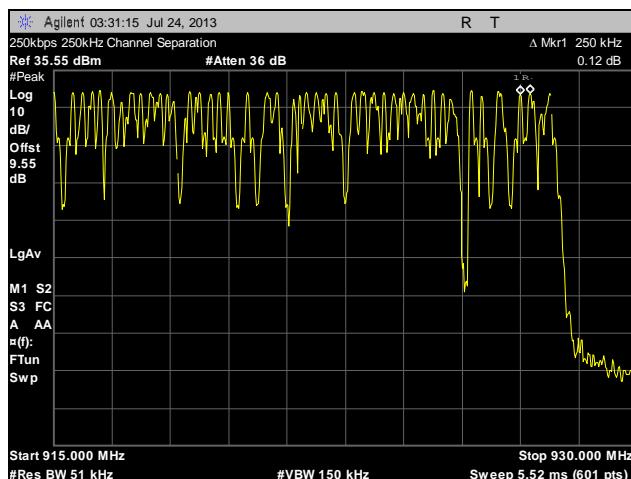
**Plot 37. Channel Separation, 125 kbps, 250 kHz, High Channel**



**Plot 38. Channel Separation, 250 kbps, 250 kHz, Low Channel**



**Plot 39. Channel Separation, 250 kbps, 250 kHz, Mid Channel**



**Plot 40. Channel Separation, 250 kbps, 250 kHz, High Channel**

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(b) Peak Power Output

**Test Requirements:** **§15.247(b)(1):** The maximum peak output power of the intentional radiator shall not exceed 0.125 Watts for frequency hopping systems operating in the 2400-2483.5 MHz band. .

**§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, 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.

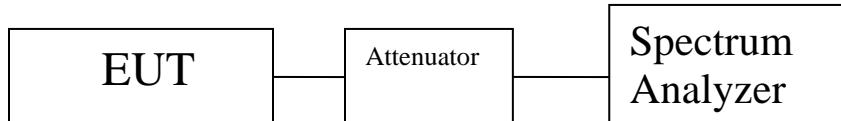
Fixed, point-to-point operation excludes the use of point-to-multipoint systems, omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the 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. The EUT utilizes a 1dBi ¼ wave or a 12dBi Yagi Antenna, so the maximum power allowed is 30dBm and 24dBm respectively.

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

**Test Engineer(s):** Zijun Tong

**Test Date(s):** 07/26/13



**Figure 3. Peak Power Output Test Setup**

## Peak Power Output Test Results

Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
1 dBi Antenna	Low	902.300	29.63
	Mid	914.937	29.35
	High	927.675	29.35
12 dBi Antenna	Low	902.300	23.64
	Mid	915.000	23.68
	High	927.675	23.55

Table 9. Peak Power Output, Test Results, 16 kbps, 25 kHz

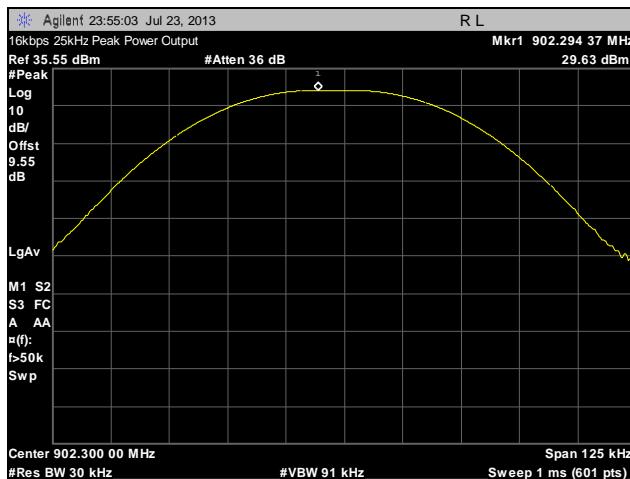
Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
1 dBi Antenna	Low	902.250	29.54
	Mid	915.000	29.57
	High	927.750	29.40
12 dBi Antenna	Low	902.250	23.44
	Mid	915.000	23.67
	High	927.750	23.46

Table 10. Peak Power Output, Test Results, 125 kbps, 250 kHz

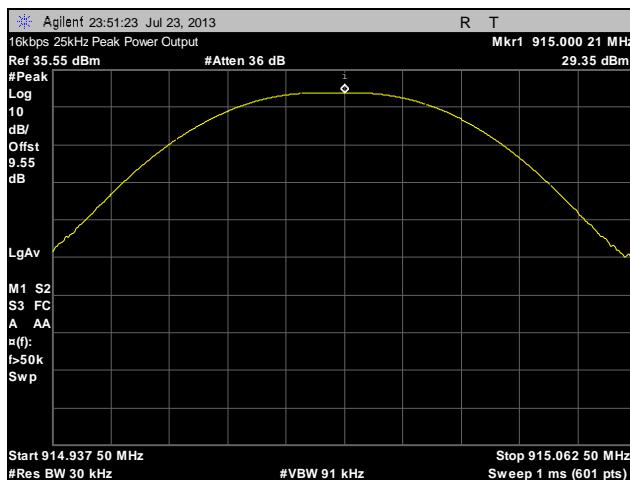
Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
1 dBi Antenna	Low	902.250	29.36
	Mid	915.000	29.71
	High	927.025	29.52
12 dBi Antenna	Low	902.250	23.88
	Mid	915.000	23.68
	High	927.025	23.41

Table 11. Peak Power Output, Test Results, 250 kbps, 250 kHz

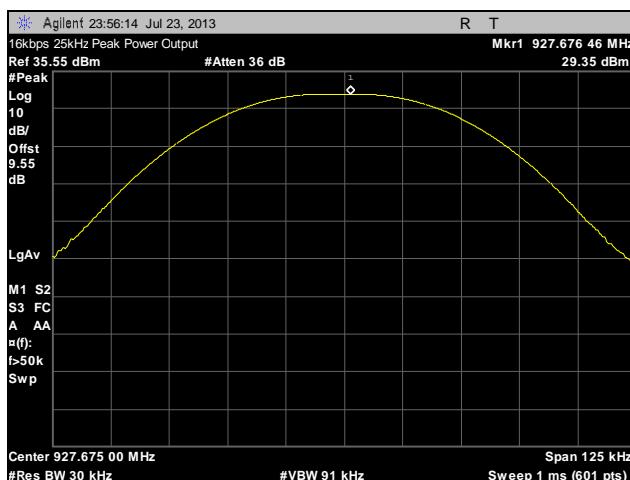
## Peak Power Output, 16 kbps, 25 kHz, Test Results



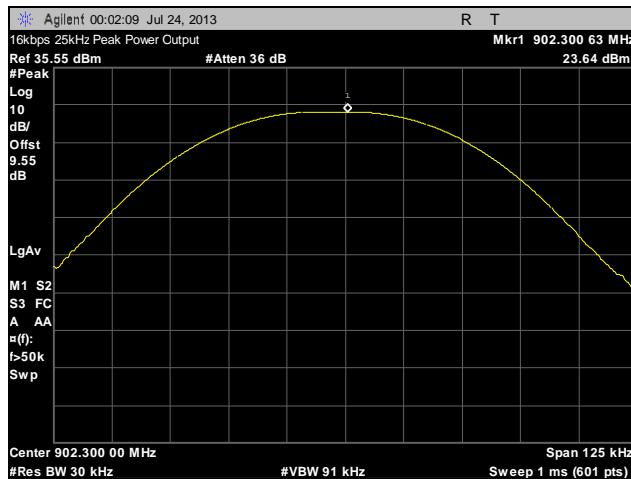
Plot 41. Peak Power Output, 16 kbps, 25 kHz, Low Channel, 1 dBi Antenna



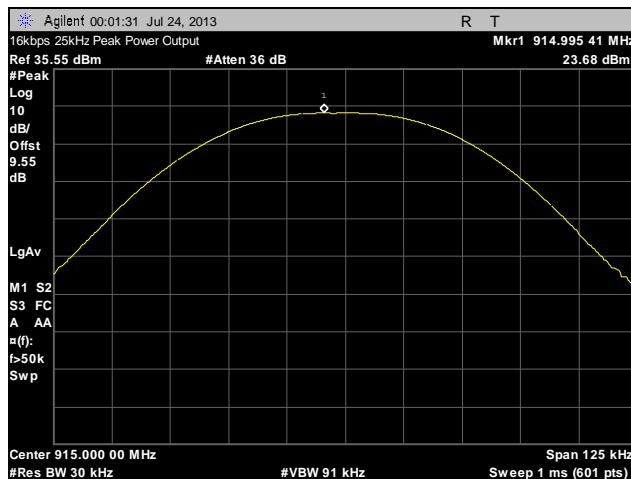
Plot 42. Peak Power Output, 16 kbps, 25 kHz, Mid Channel, 1 dBi Antenna



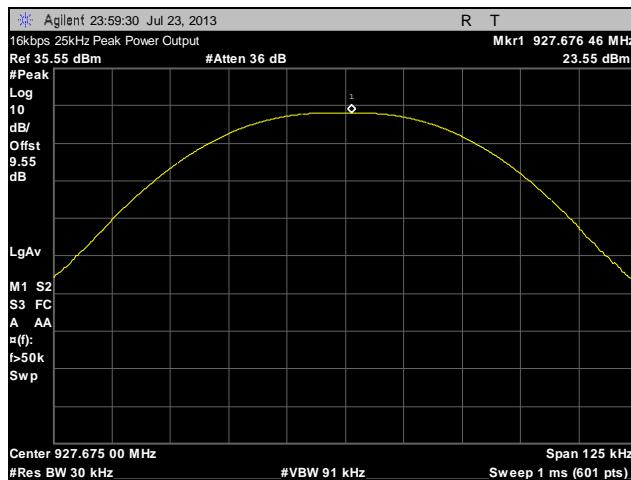
Plot 43. Peak Power Output, 16 kbps, 25 kHz, High Channel, 1 dBi Antenna



**Plot 44. Peak Power Output, 16 kbps, 25 kHz, Low Channel, 12 dBi Antenna**

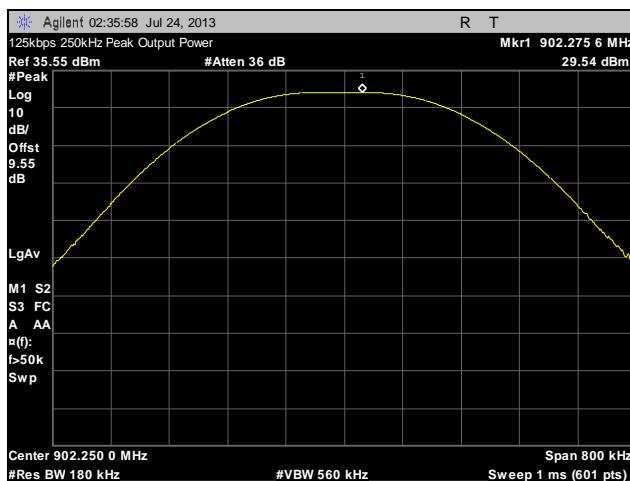


**Plot 45. Peak Power Output, 16 kbps, 25 kHz, Mid Channel, 12 dBi Antenna**

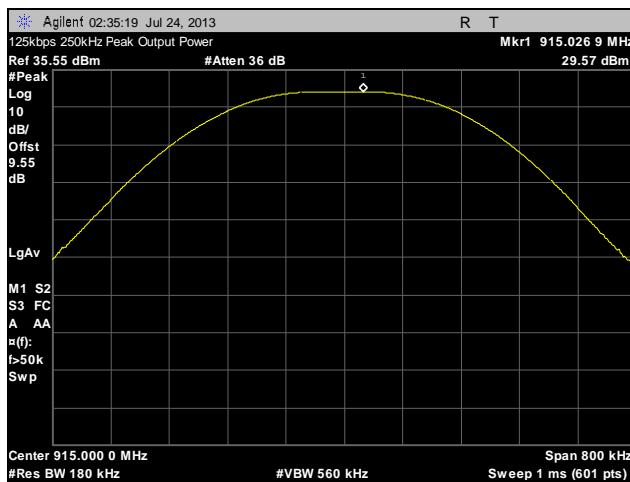


**Plot 46. Peak Power Output, 16 kbps, 25 kHz, High Channel, 12 dBi Antenna**

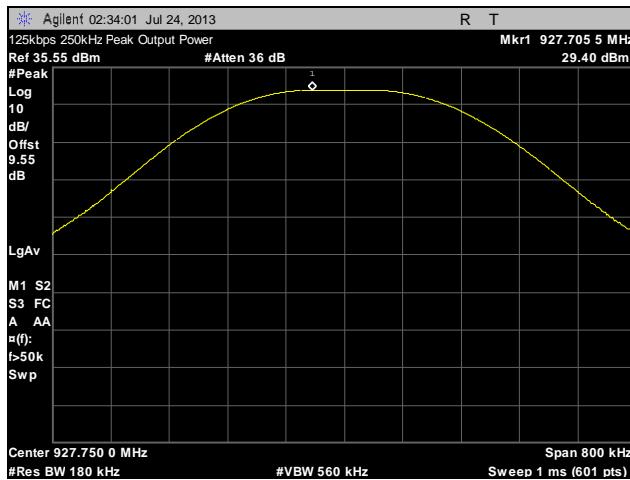
## Peak Power Output, 125 kbps, 250 kHz, Test Results



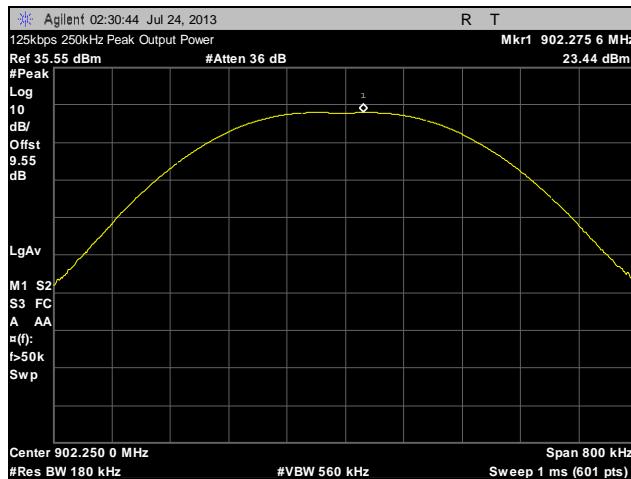
Plot 47. Peak Power Output, 125 kbps, 250 kHz, Low Channel, 1 dBi Antenna



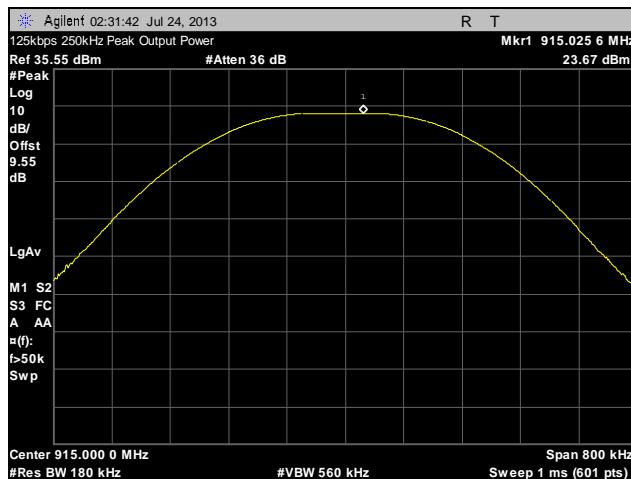
Plot 48. Peak Power Output, 125 kbps, 250 kHz, Mid Channel, 1 dBi Antenna



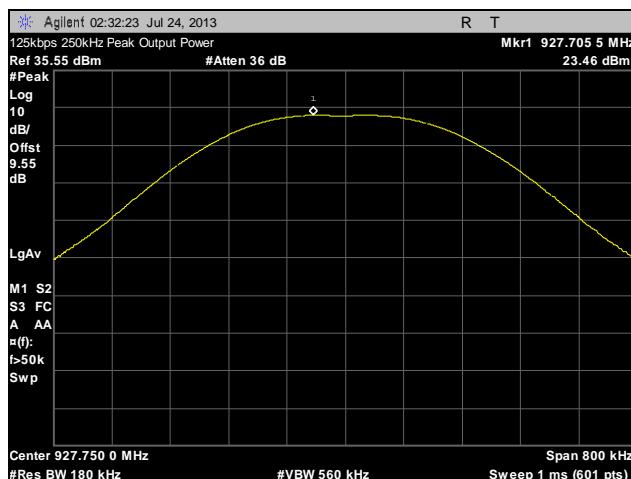
Plot 49. Peak Power Output, 125 kbps, 250 kHz, High Channel, 1 dBi Antenna



**Plot 50. Peak Power Output, 125 kbps, 250 kHz, Low Channel, 12 dBi Antenna**

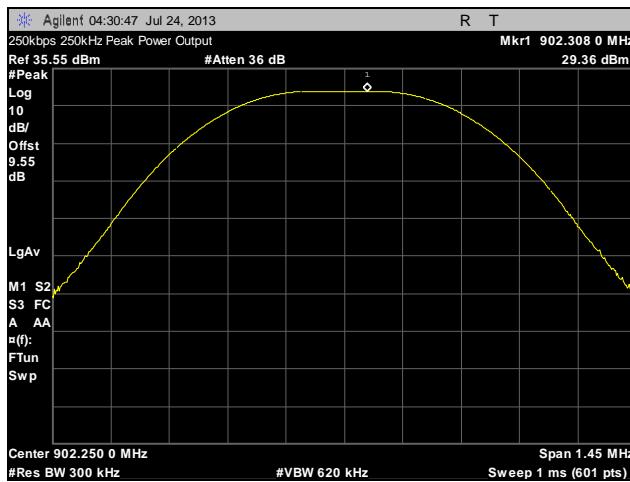


**Plot 51. Peak Power Output, 125 kbps, 250 kHz, Mid Channel, 12 dBi Antenna**

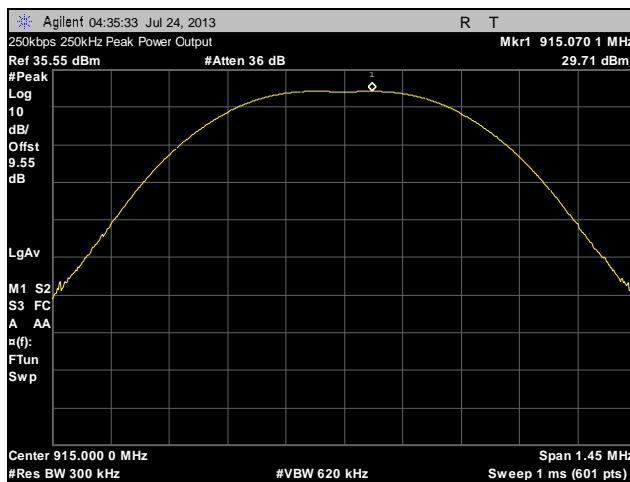


**Plot 52. Peak Power Output, 125 kbps, 250 kHz, High Channel, 12 dBi Antenna**

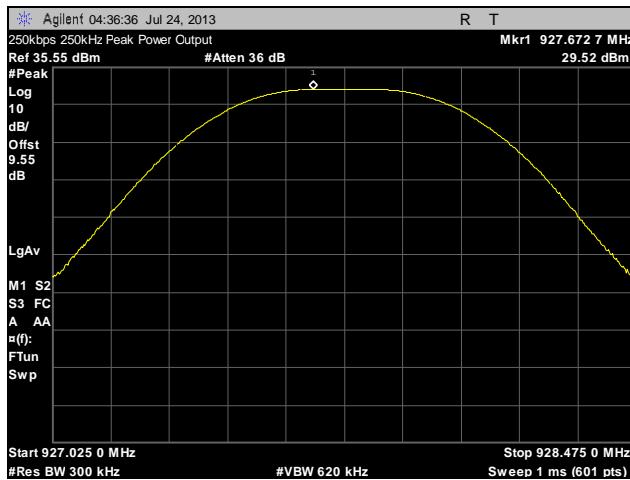
## Peak Power Output, 250 kbps, 250 kHz, Test Results



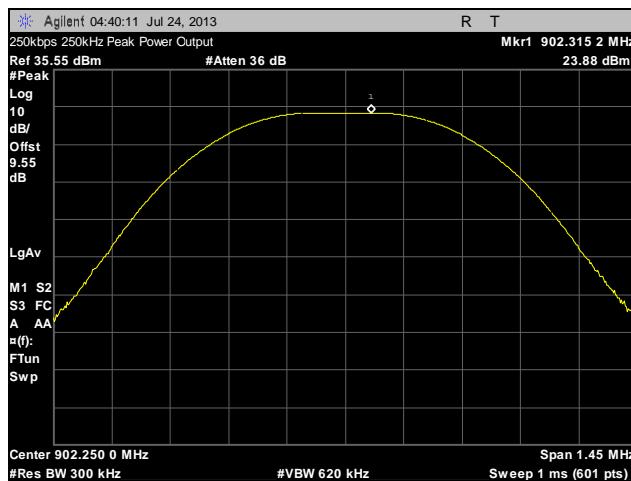
Plot 53. Peak Power Output, 250 kbps, 250 kHz, Low Channel, 1 dBi Antenna



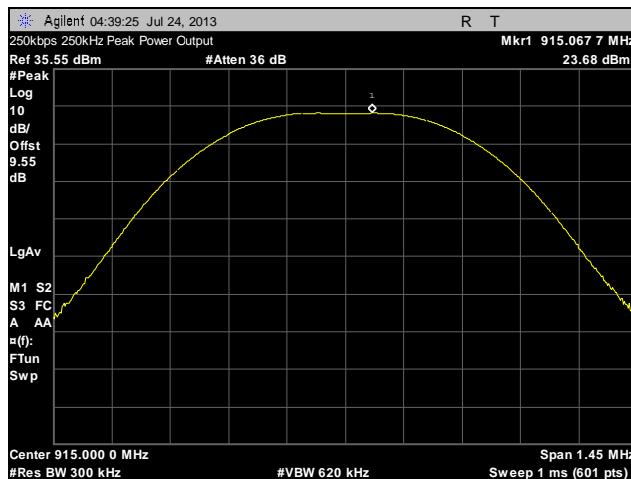
Plot 54. Peak Power Output, 250 kbps, 250 kHz, Mid Channel, 1 dBi Antenna



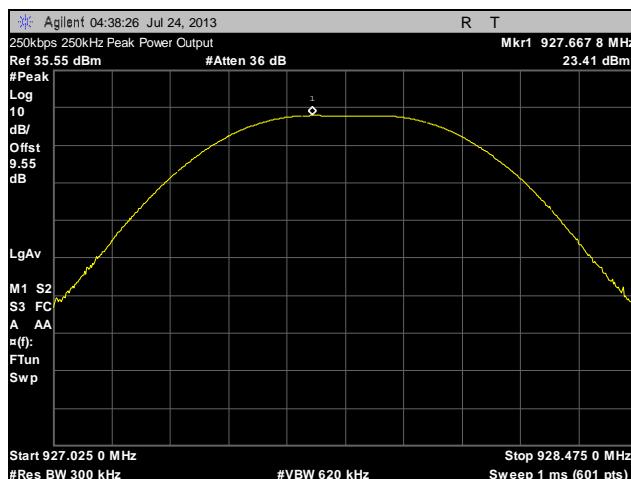
Plot 55. Peak Power Output, 250 kbps, 250 kHz, High Channel, 1 dBi Antenna



**Plot 56. Peak Power Output, 250 kbps, 250 kHz, Low Channel, 12 dBi Antenna**



**Plot 57. Peak Power Output, 250 kbps, 250 kHz, Mid Channel, 12 dBi Antenna**



**Plot 58. Peak Power Output, 250 kbps, 250 kHz, High Channel, 12 dBi Antenna**

## 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 12. 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 13.

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

**Test Procedure:**

The transmitter was set to the mid channel at the highest output power and placed on a 0.8 m high wooden table inside in a semi-anechoic chamber. Measurements were performed with the EUT rotated 360 degrees and varying the adjustable antenna mast with 1 m to 4 m height to determine worst case orientation for maximum emissions. Measurement were repeated the measurement at the low and highest channels.

For frequencies from 30 MHz to 1 GHz, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

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 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

In accordance with §15.35(b) the limit on the radio frequency emissions as measured using instrumentation with a peak detector function shall be 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

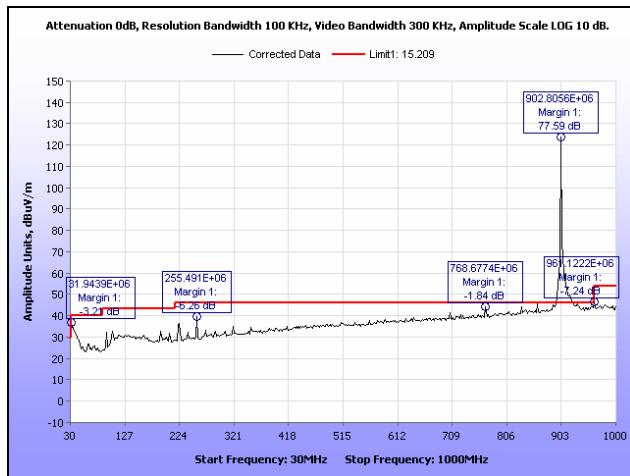
EUT Field Strength Final Amplitude = Raw Amplitude – Preamp gain + Antenna Factor + Cable Loss – Distance Correction Factor

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

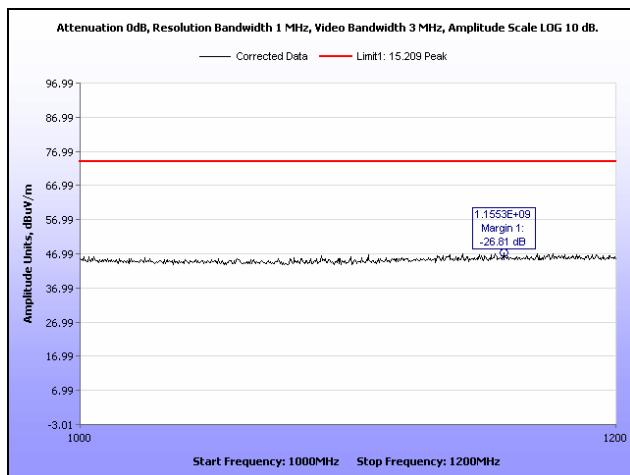
**Test Engineer(s):** Zijun Tong

**Test Date(s):** 07/26/13

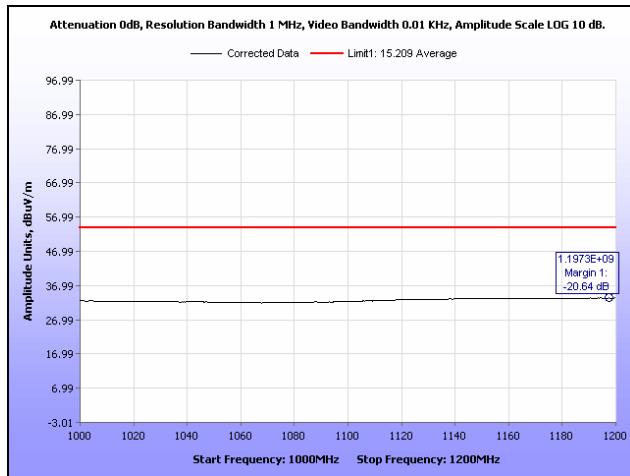
## Radiated Spurious Emissions, 16 kbps, 25 kHz, Test Results



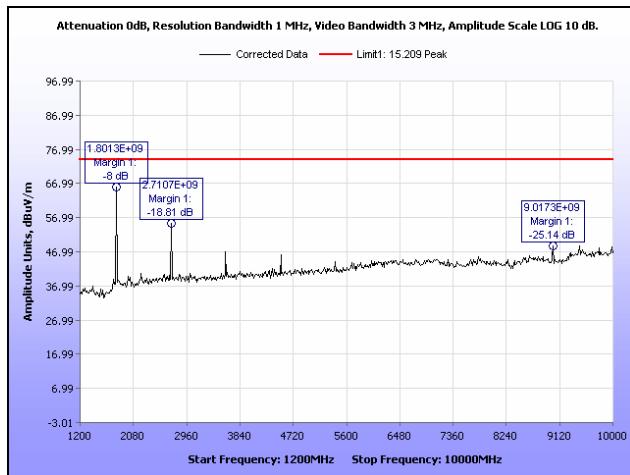
**Plot 59. Radiated Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 30 MHz – 1 GHz, 1 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



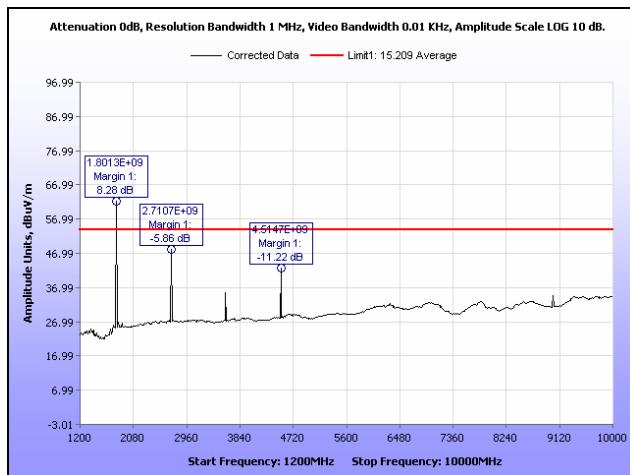
**Plot 60. Radiated Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 1 GHz – 1.2 GHz, Peak, 1 dBi Antenna**



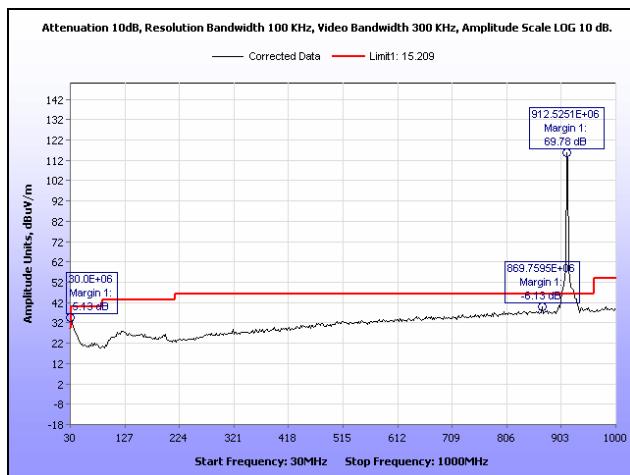
**Plot 61. Radiated Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 1 GHz – 1.2 GHz, Average, 1 dBi Antenna**



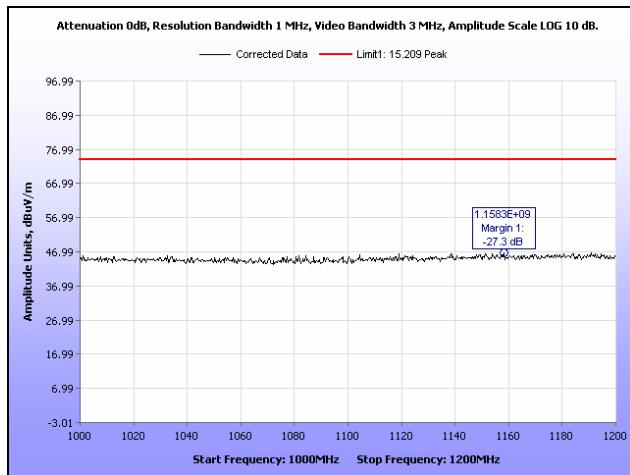
**Plot 62. Radiated Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 1.2 GHz – 10 GHz, Peak, 1 dBi Antenna**



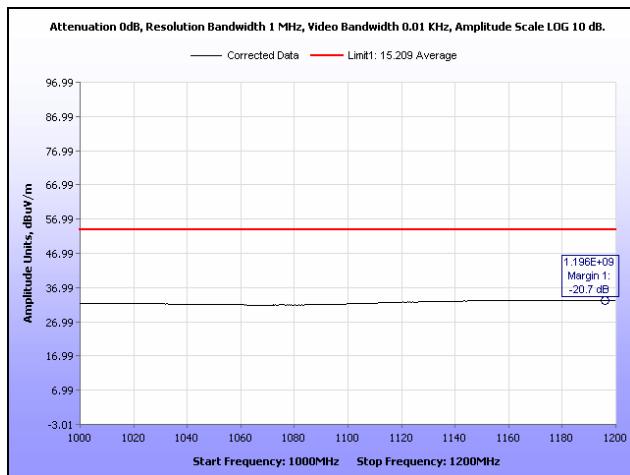
**Plot 63. Radiated Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 1.2 GHz – 10 GHz, Average, 1 dBi Antenna**  
Note: The emission over the limit is not within the restricted band.



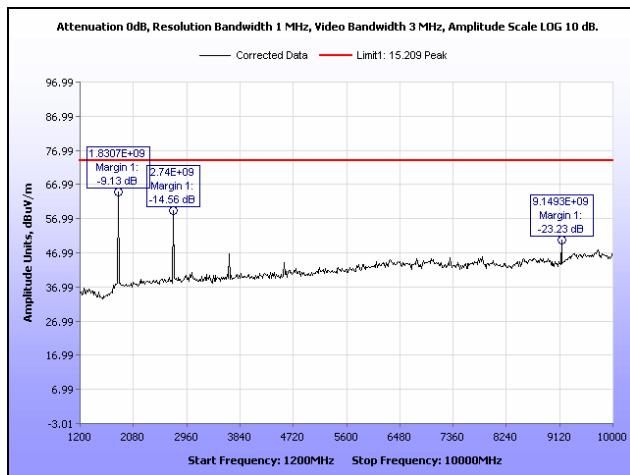
**Plot 64. Radiated Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 30 MHz – 1 GHz, 1 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



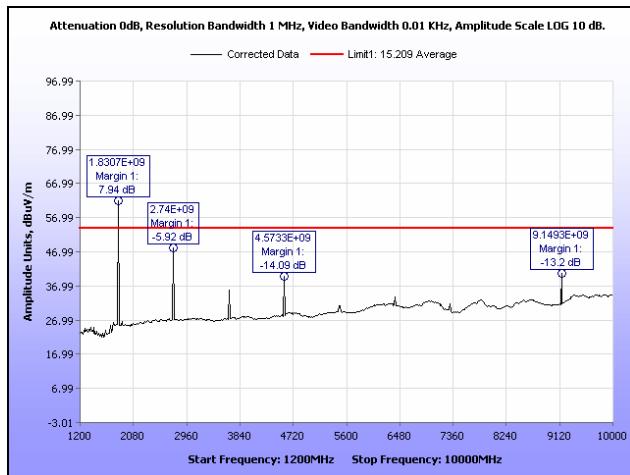
**Plot 65. Radiated Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 1 GHz – 1.2 GHz, Peak, 1 dBi Antenna**



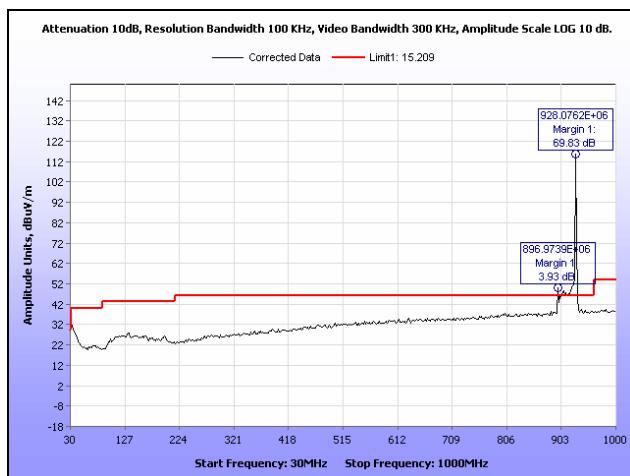
**Plot 66. Radiated Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 1 GHz – 1.2 GHz, Average, 1 dBi Antenna**



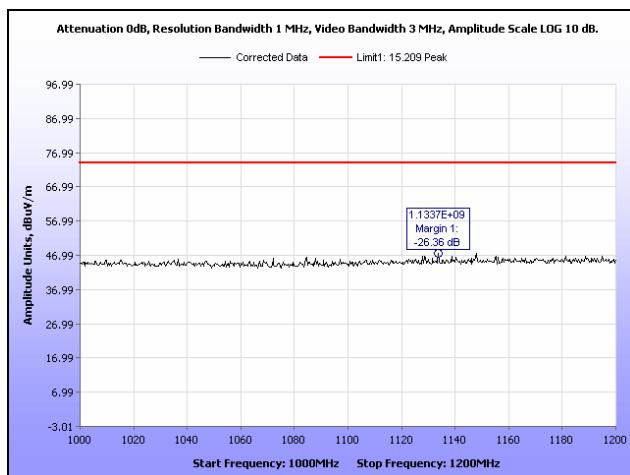
**Plot 67. Radiated Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 1.2 GHz – 10 GHz, Peak, 1 dBi Antenna**



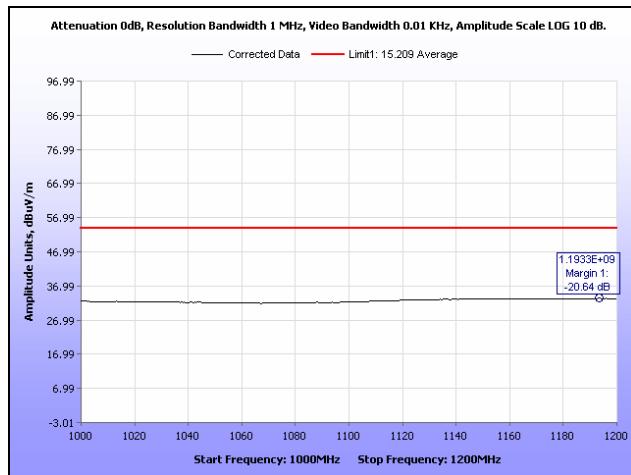
**Plot 68. Radiated Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 1.2 GHz – 10 GHz, Average, 1 dBi Antenna**  
Note: The emission over the limit is not within the restricted band.



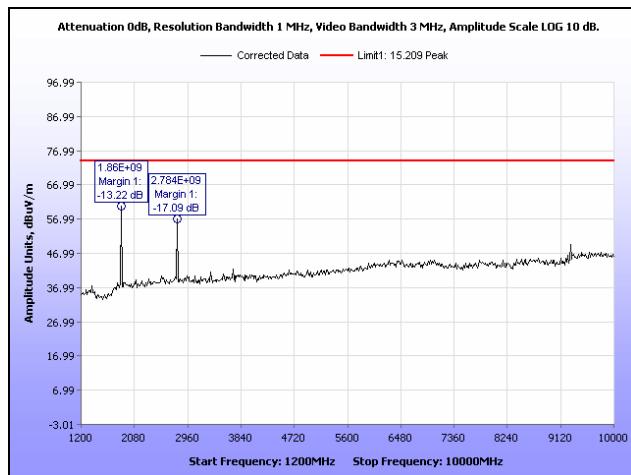
**Plot 69. Radiated Spurious Emissions, 16 kbps, 25 kHz, High Channel, 30 MHz – 1 GHz, 1 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



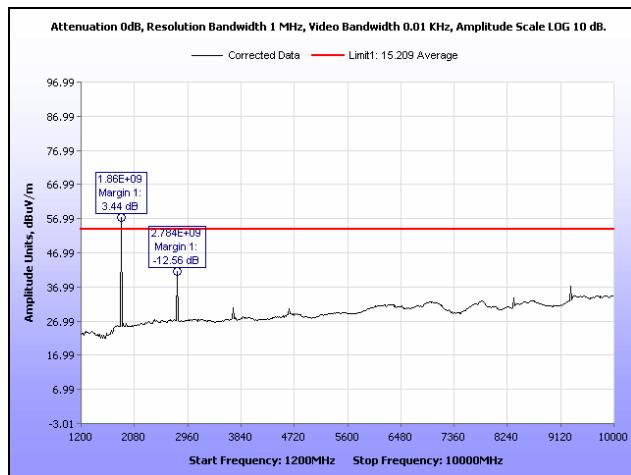
**Plot 70. Radiated Spurious Emissions, 16 kbps, 25 kHz, High Channel, 1 GHz – 1.2 GHz, Peak, 1 dBi Antenna**



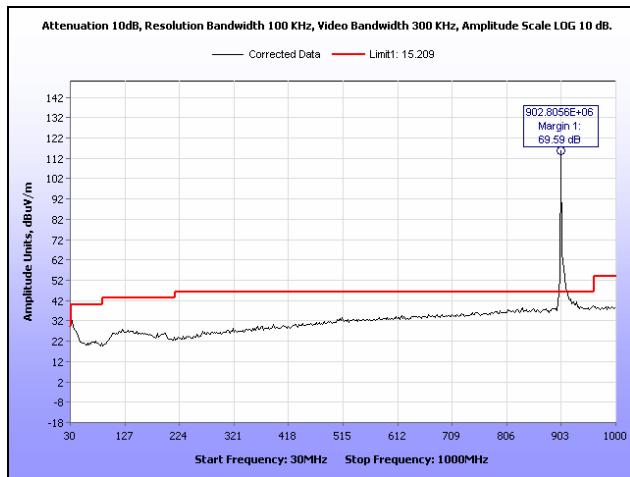
**Plot 71. Radiated Spurious Emissions, 16 kbps, 25 kHz, High Channel, 1 GHz – 1.2 GHz, Average, 1 dBi Antenna**



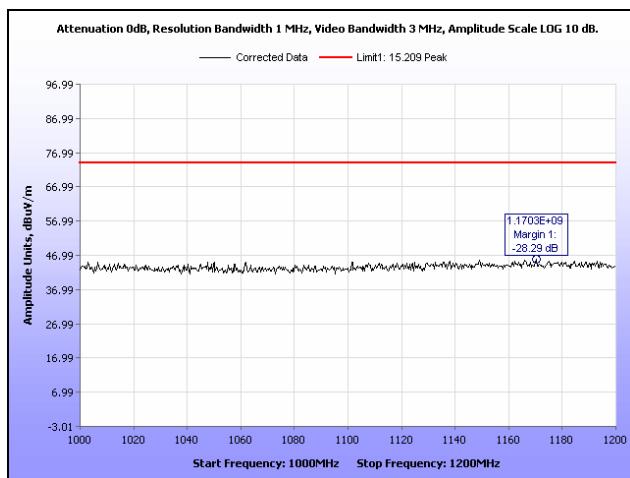
**Plot 72. Radiated Spurious Emissions, 16 kbps, 25 kHz, High Channel, 1.2 GHz – 10 GHz, Peak, 1 dBi Antenna**



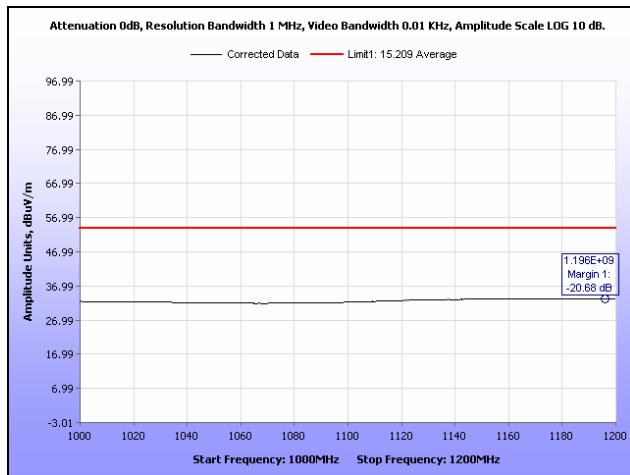
**Plot 73. Radiated Spurious Emissions, 16 kbps, 25 kHz, High Channel, 1.2 GHz – 10 GHz, Average, 1 dBi Antenna**  
Note: The emission over the limit is not within the restricted band.



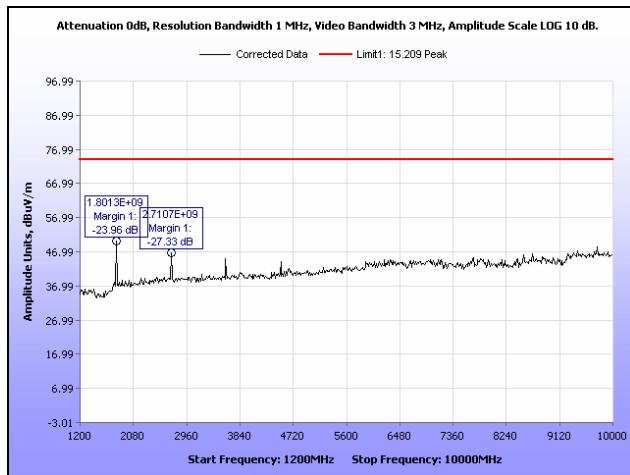
**Plot 74. Radiated Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 30 MHz – 1 GHz, 12 dBi Antenna**  
 Note: The emissions over the limit are either the fundamental or not within the restricted band.



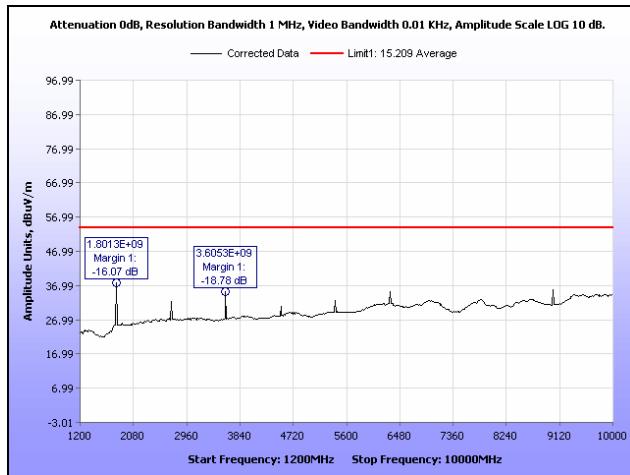
**Plot 75. Radiated Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 1 GHz – 1.2 GHz, Peak, 12 dBi Antenna**



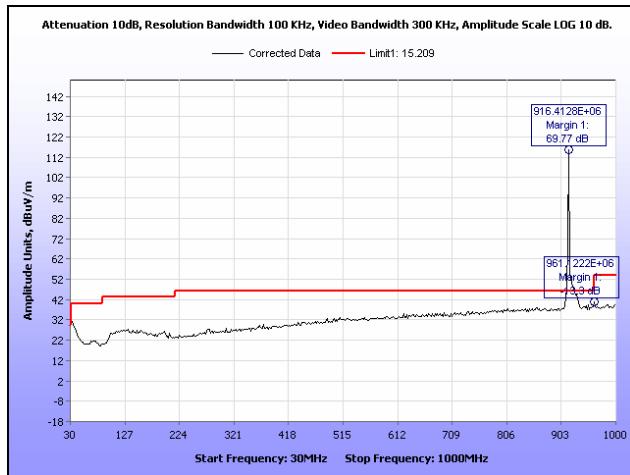
**Plot 76. Radiated Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 1 GHz – 1.2 GHz, Average, 12 dBi Antenna**



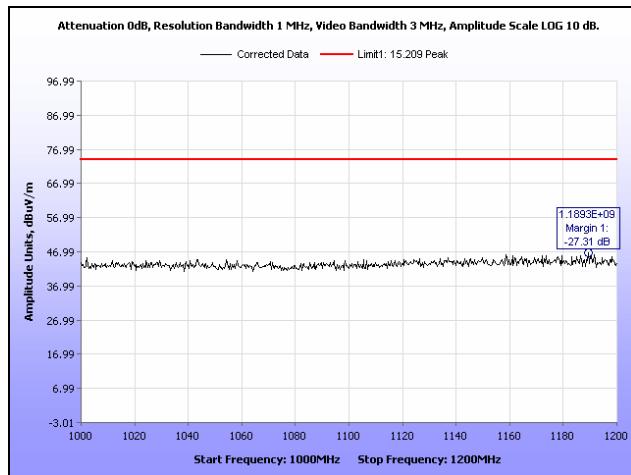
**Plot 77. Radiated Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 1.2 GHz – 10 GHz, Peak, 12 dBi Antenna**



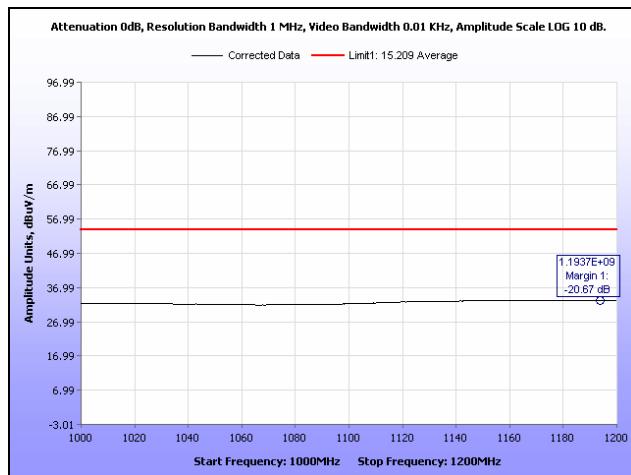
**Plot 78. Radiated Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 1.2 GHz – 10 GHz, Average, 12 dBi Antenna**



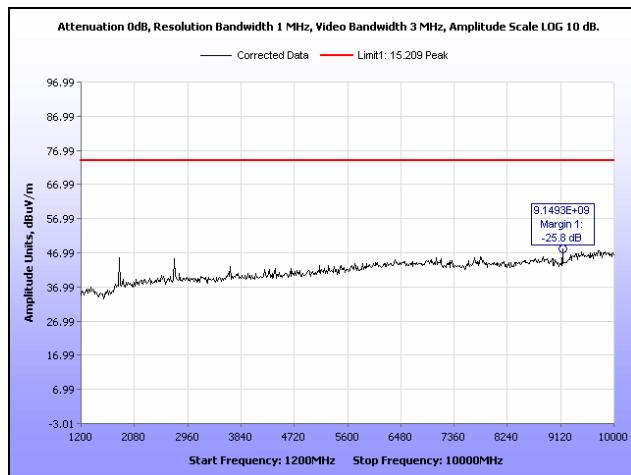
**Plot 79. Radiated Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 30 MHz – 1 GHz, 12 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



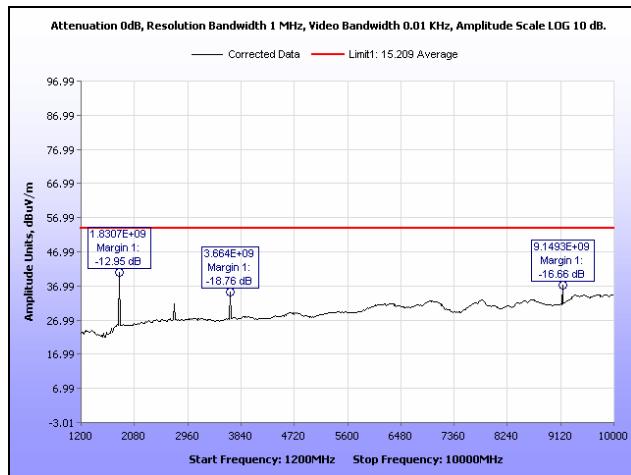
**Plot 80. Radiated Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 1 GHz – 1.2 GHz, Peak, 12 dBi Antenna**



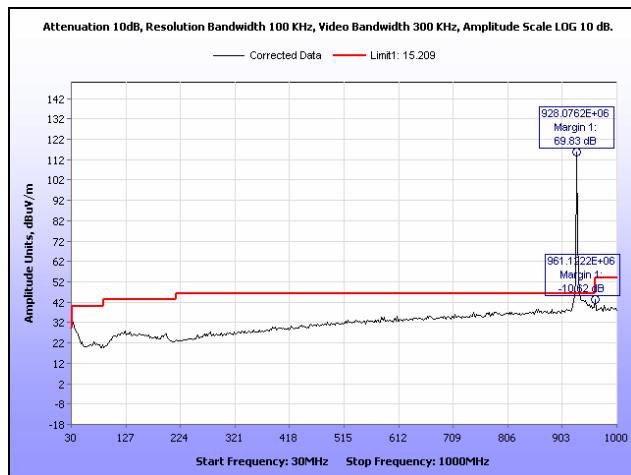
**Plot 81. Radiated Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 1 GHz – 1.2 GHz, Average, 12 dBi Antenna**



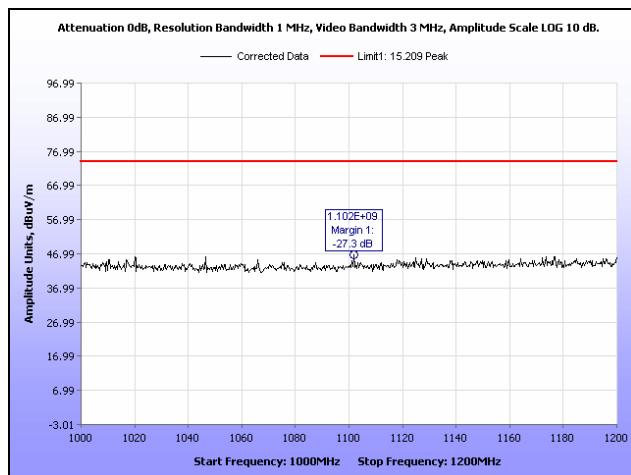
**Plot 82. Radiated Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 1.2 GHz – 10 GHz, Peak, 12 dBi Antenna**



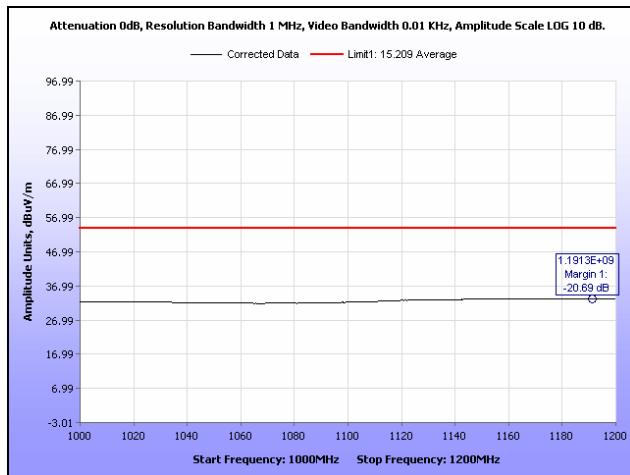
**Plot 83. Radiated Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 1.2 GHz – 10 GHz, Average, 12 dBi Antenna**



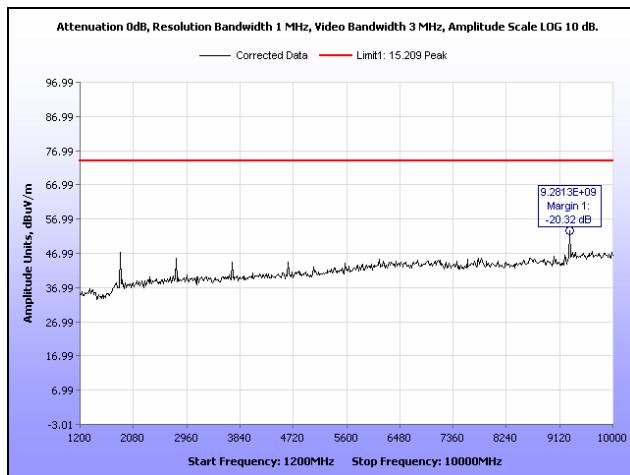
**Plot 84. Radiated Spurious Emissions, 16 kbps, 25 kHz, High Channel, 30 MHz – 1 GHz, 12 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



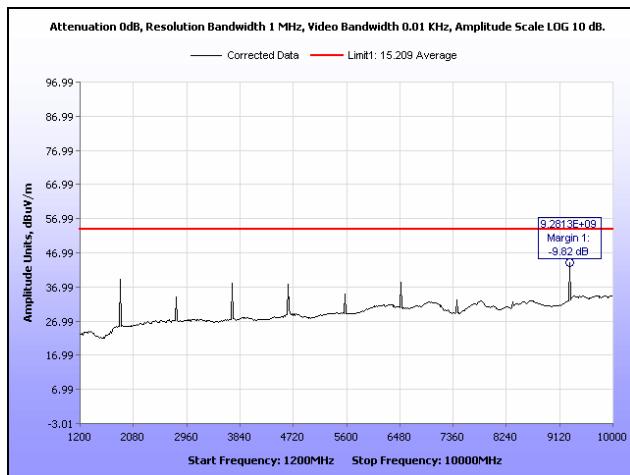
**Plot 85. Radiated Spurious Emissions, 16 kbps, 25 kHz, High Channel, 1 GHz – 1.2 GHz, Peak, 12 dBi Antenna**



**Plot 86. Radiated Spurious Emissions, 16 kbps, 25 kHz, High Channel, 1 GHz – 1.2 GHz, Average, 12 dBi Antenna**

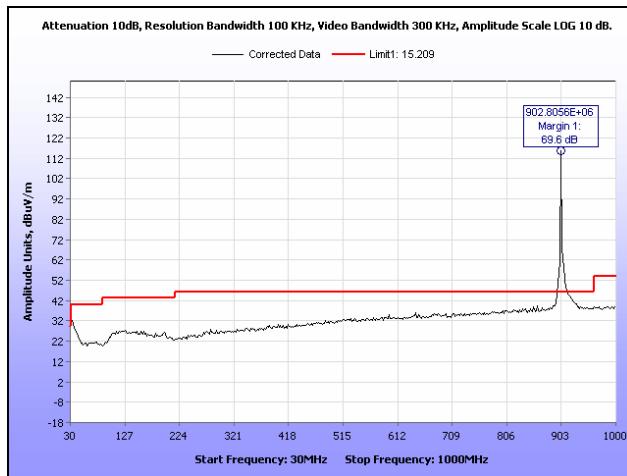


**Plot 87. Radiated Spurious Emissions, 16 kbps, 25 kHz, High Channel, 1.2 GHz – 10 GHz, Peak, 12 dBi Antenna**

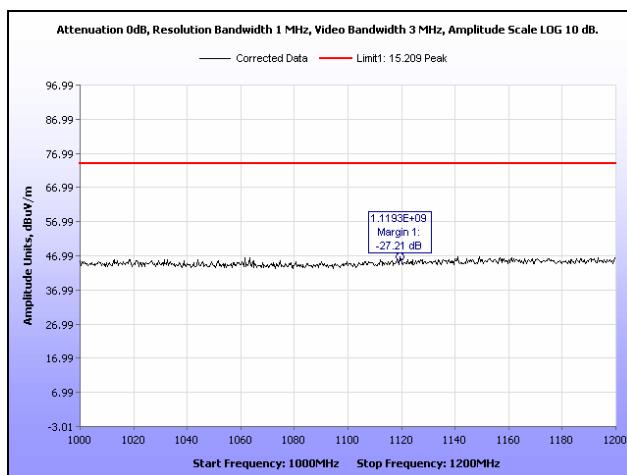


**Plot 88. Radiated Spurious Emissions, 16 kbps, 25 kHz, High Channel, 1.2 GHz – 10 GHz, Average, 12 dBi Antenna**

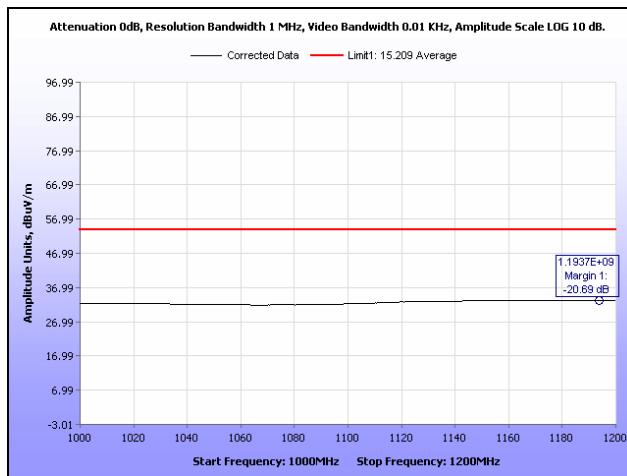
## Radiated Spurious Emissions, 125 kbps, 250 kHz, Test Results



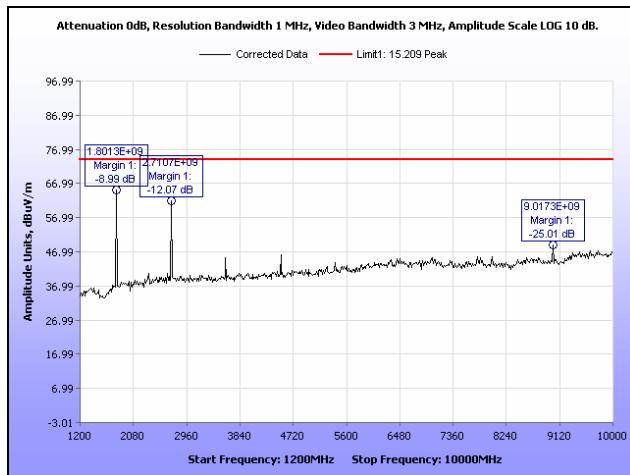
**Plot 89. Radiated Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 30 MHz – 1 GHz, 1 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



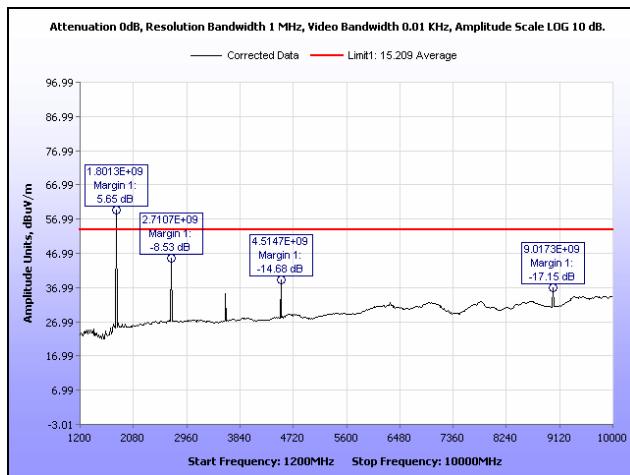
**Plot 90. Radiated Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 1 GHz – 1.2 GHz, Peak, 1 dBi Antenna**



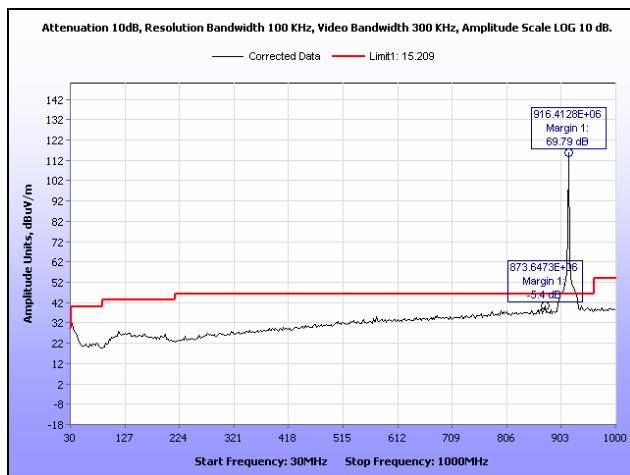
**Plot 91. Radiated Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 1 GHz – 1.2 GHz, Average, 1 dBi Antenna**



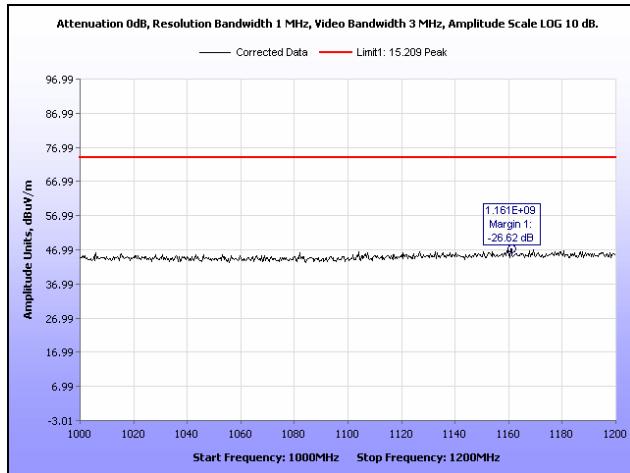
**Plot 92. Radiated Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 1.2 GHz – 10 GHz, Peak, 1 dBi Antenna**



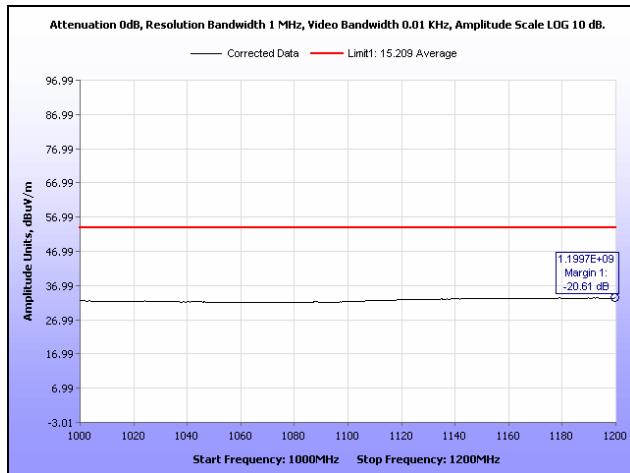
**Plot 93. Radiated Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 1.2 GHz – 10 GHz, Average, 1 dBi Antenna**  
Note: The emission over the limit is not within the restricted band.



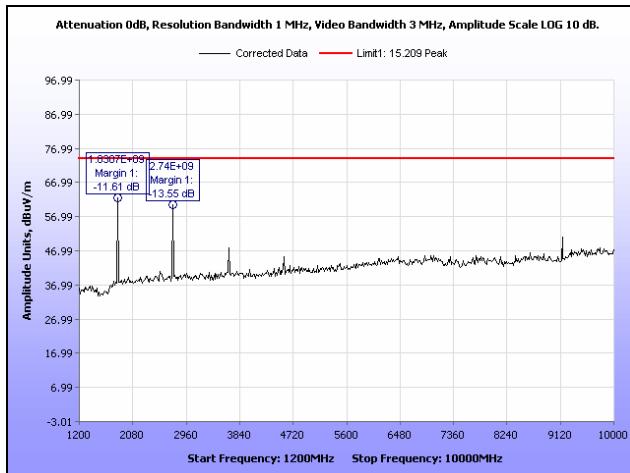
**Plot 94. Radiated Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 30 MHz – 1 GHz, 1 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



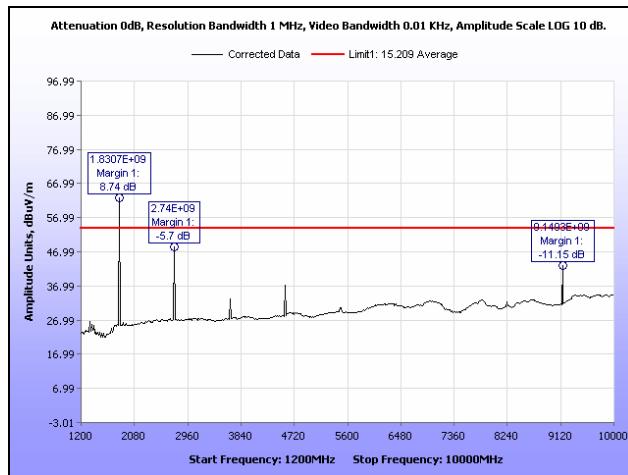
**Plot 95. Radiated Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 1 GHz – 1.2 GHz, Peak, 1 dBi Antenna**



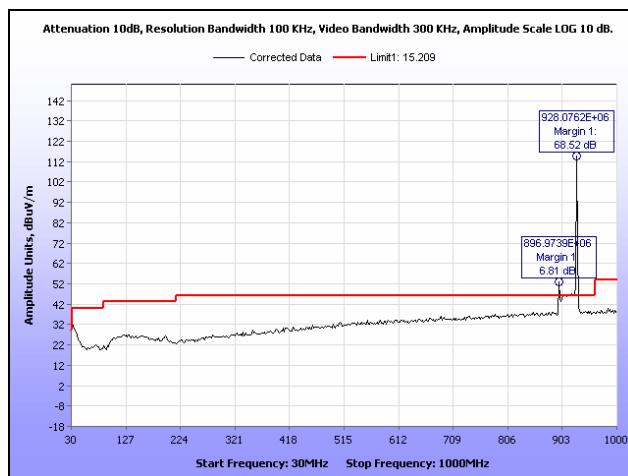
**Plot 96. Radiated Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 1 GHz – 1.2 GHz, Average, 1 dBi Antenna**



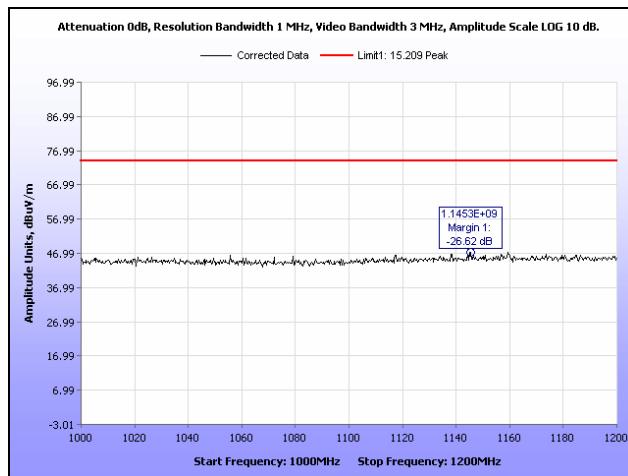
**Plot 97. Radiated Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 1.2 GHz – 10 GHz, Peak, 1 dBi Antenna**



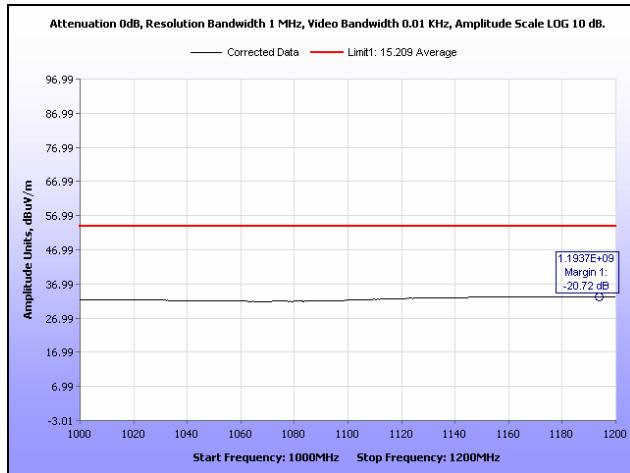
**Plot 98. Radiated Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 1.2 GHz – 10 GHz, Average, 1 dBi Antenna**  
 Note: The emission over the limit is not within the restricted band.



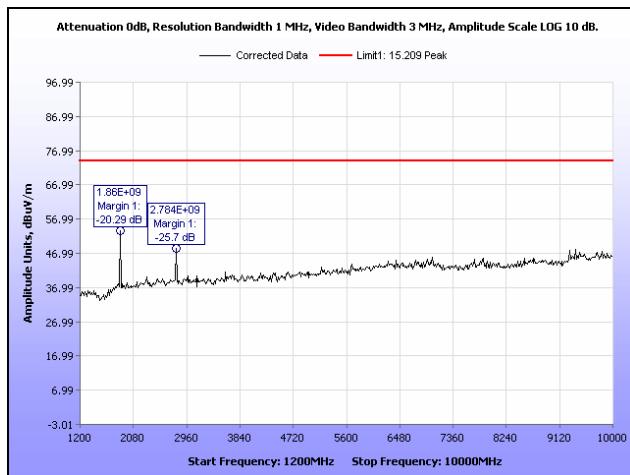
**Plot 99. Radiated Spurious Emissions, 125 kbps, 250 kHz, High Channel, 30 MHz – 1 GHz, 1 dBi Antenna**  
 Note: The emissions over the limit are either the fundamental or not within the restricted band.



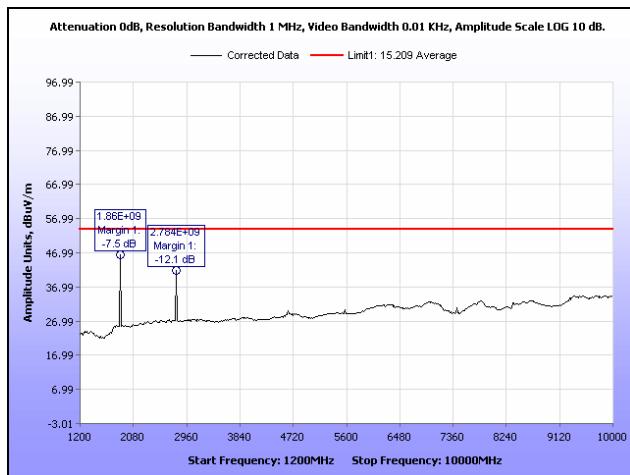
**Plot 100. Radiated Spurious Emissions, 125 kbps, 250 kHz, High Channel, 1 GHz – 1.2 GHz, Peak, 1 dBi Antenna**



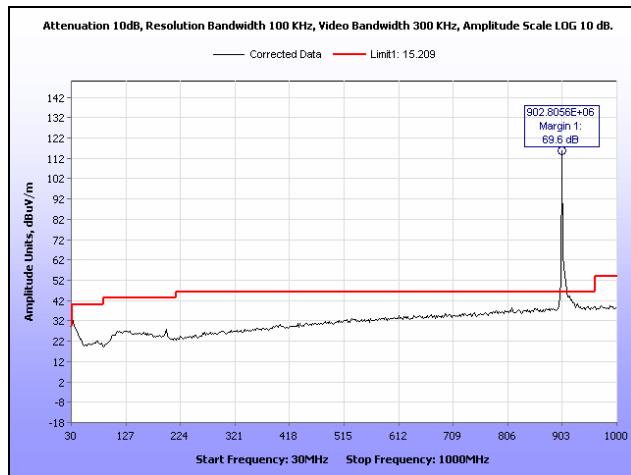
**Plot 101. Radiated Spurious Emissions, 125 kbps, 250 kHz, High Channel, 1 GHz – 1.2 GHz, Average, 1 dBi Antenna**



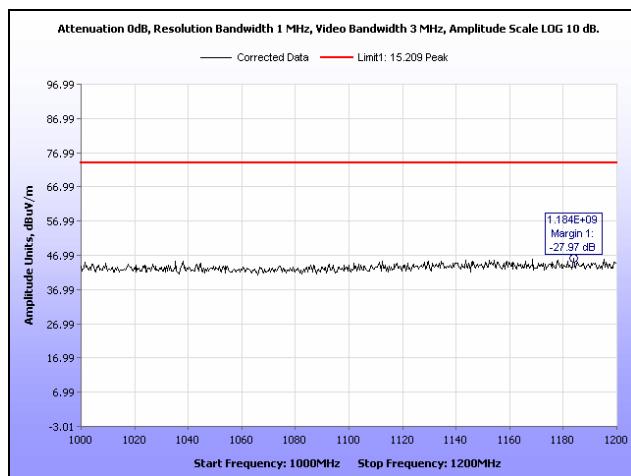
**Plot 102. Radiated Spurious Emissions, 125 kbps, 250 kHz, High Channel, 1.2 GHz – 10 GHz, Peak, 1 dBi Antenna**



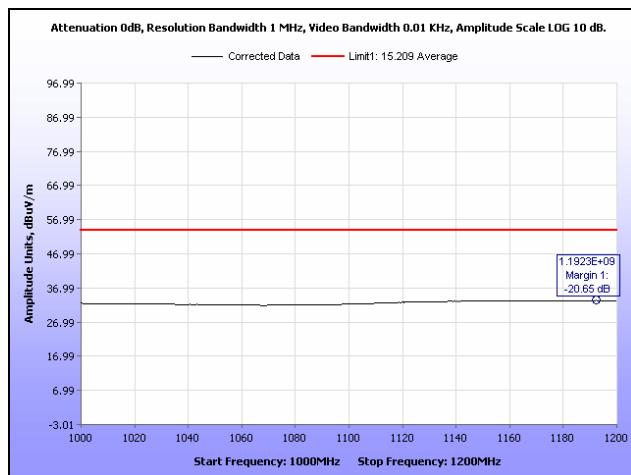
**Plot 103. Radiated Spurious Emissions, 125 kbps, 250 kHz, High Channel, 1.2 GHz – 10 GHz, Average, 1 dBi Antenna**



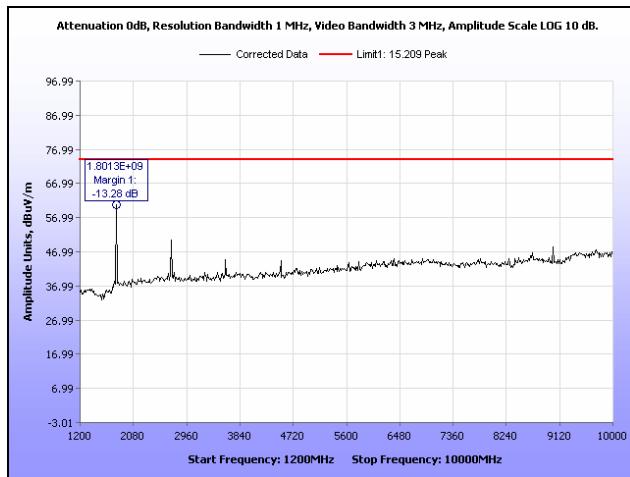
**Plot 104. Radiated Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 30 MHz – 1 GHz, 12 dBi Antenna**  
 Note: The emissions over the limit are either the fundamental or not within the restricted band.



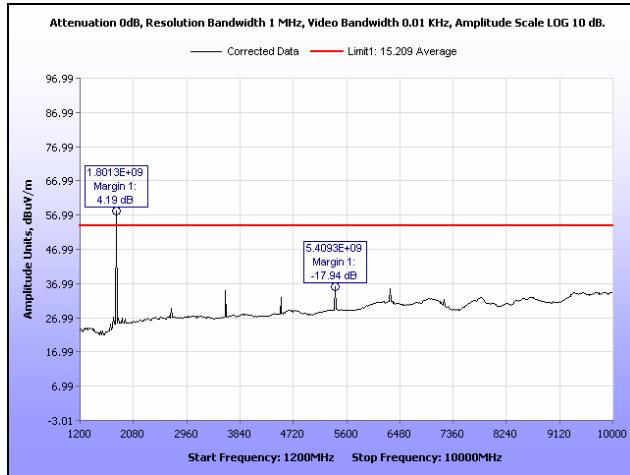
**Plot 105. Radiated Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 1 GHz – 1.2 GHz, Peak, 12 dBi Antenna**



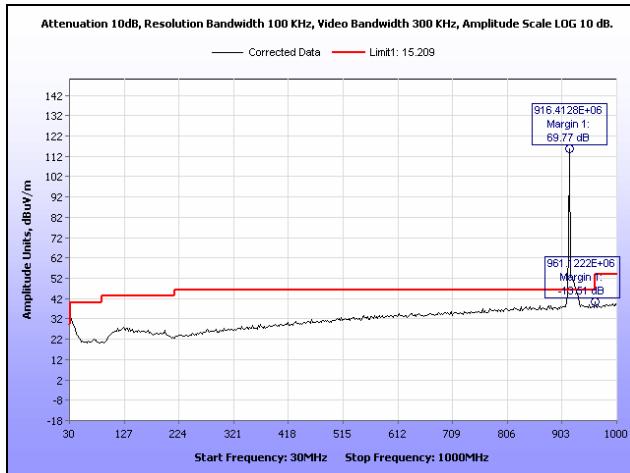
**Plot 106. Radiated Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 1 GHz – 1.2 GHz, Average, 12 dBi Antenna**



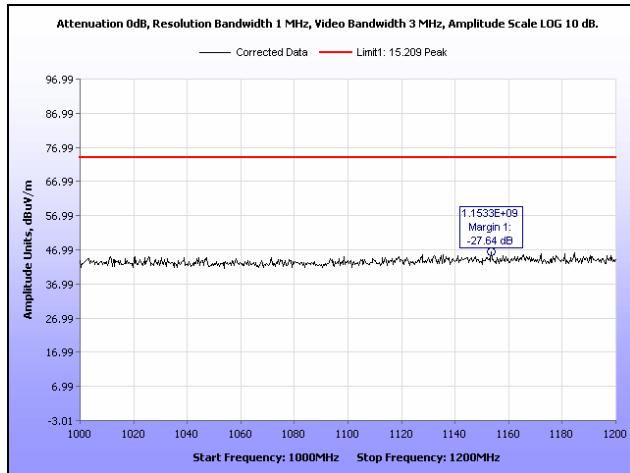
**Plot 107. Radiated Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 1.2 GHz – 10 GHz, Peak, 12 dBi Antenna**



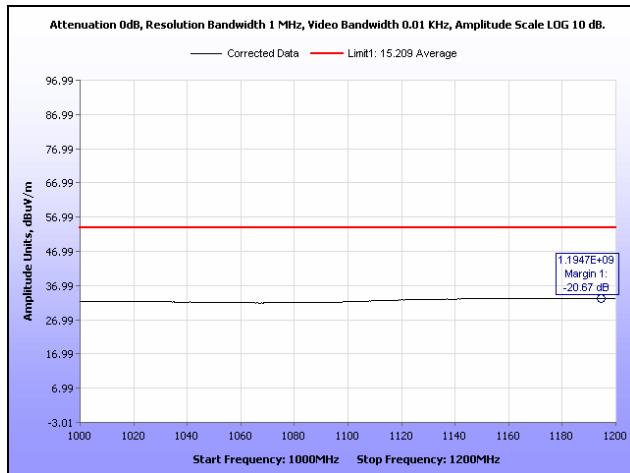
**Plot 108. Radiated Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 1.2 GHz – 10 GHz, Average, 12 dBi Antenna**  
 Note: The emission over the limit is not within the restricted band.



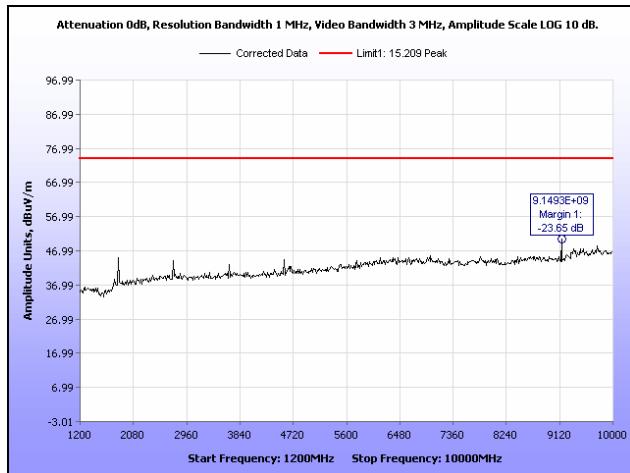
**Plot 109. Radiated Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 30 MHz – 1 GHz, 12 dBi Antenna**  
 Note: The emissions over the limit are either the fundamental or not within the restricted band.



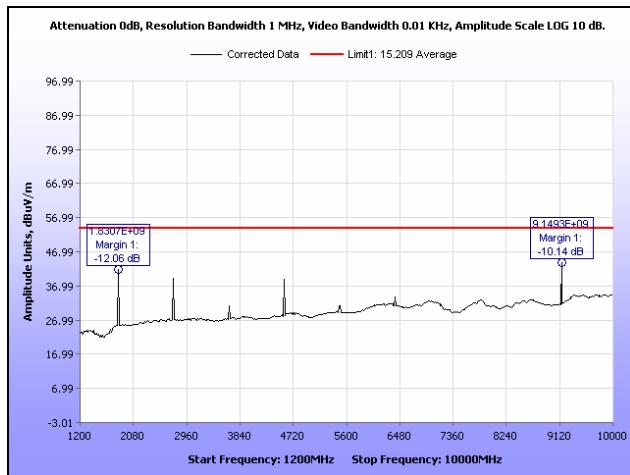
**Plot 110. Radiated Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 1 GHz – 1.2 GHz, Peak, 12 dBi Antenna**



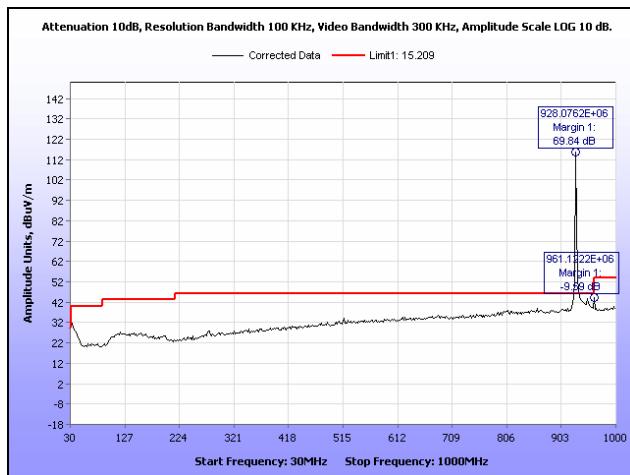
**Plot 111. Radiated Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 1 GHz – 1.2 GHz, Average, 12 dBi Antenna**



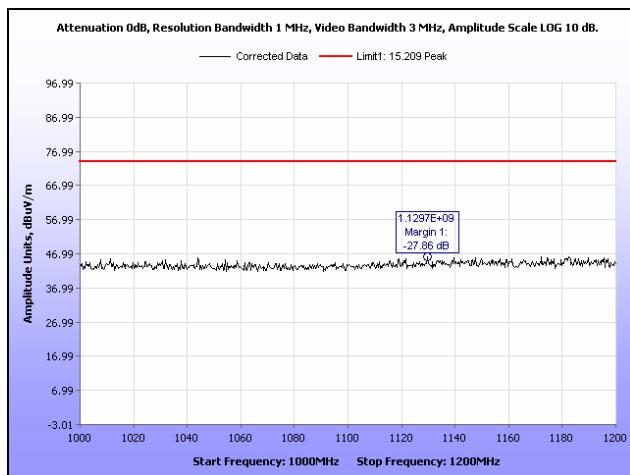
**Plot 112. Radiated Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 1.2 GHz – 10 GHz, Peak, 12 dBi Antenna**



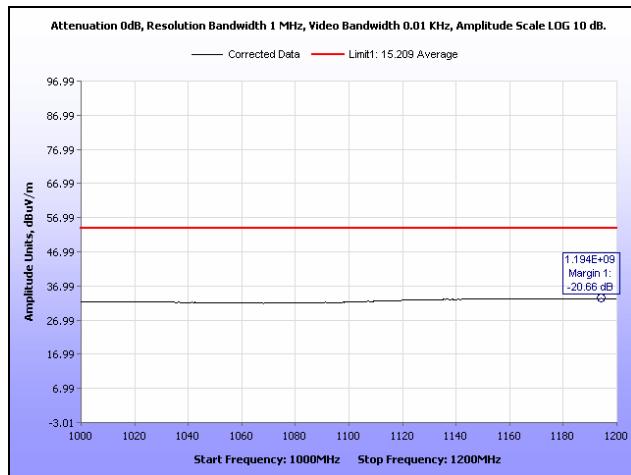
**Plot 113. Radiated Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 1.2 GHz – 10 GHz, Average, 12 dBi Antenna**



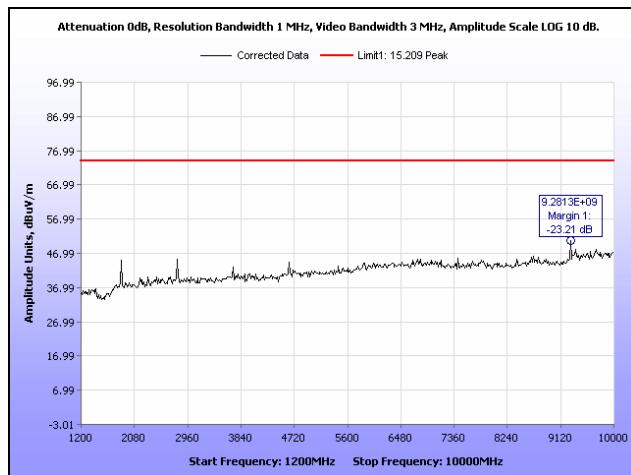
**Plot 114. Radiated Spurious Emissions, 125 kbps, 250 kHz, High Channel, 30 MHz – 1 GHz, 12 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



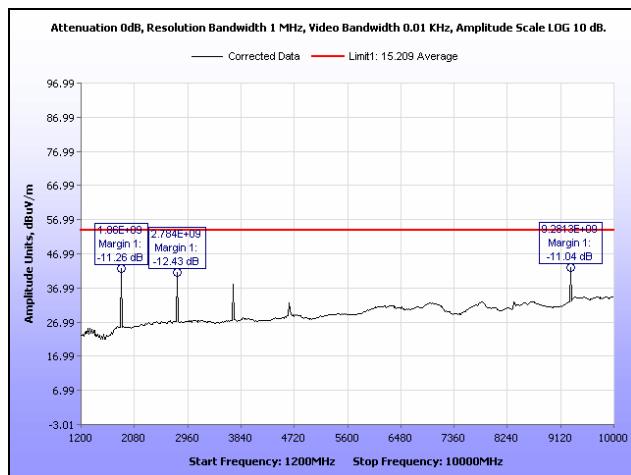
**Plot 115. Radiated Spurious Emissions, 125 kbps, 250 kHz, High Channel, 1 GHz – 1.2 GHz, Peak, 12 dBi Antenna**



**Plot 116. Radiated Spurious Emissions, 125 kbps, 250 kHz, High Channel, 1 GHz – 1.2 GHz, Average, 12 dBi Antenna**

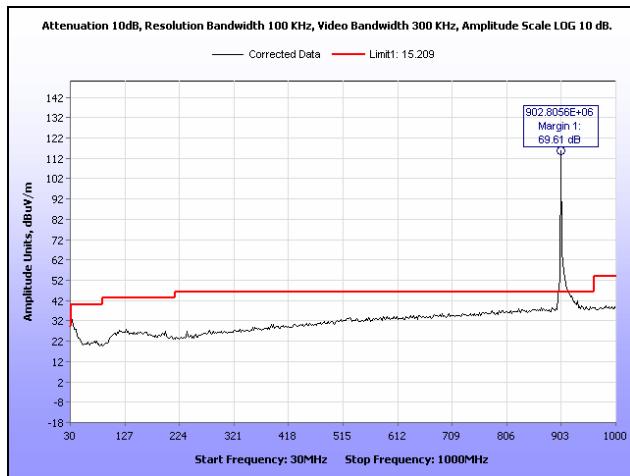


**Plot 117. Radiated Spurious Emissions, 125 kbps, 250 kHz, High Channel, 1.2 GHz – 10 GHz, Peak, 12 dBi Antenna**

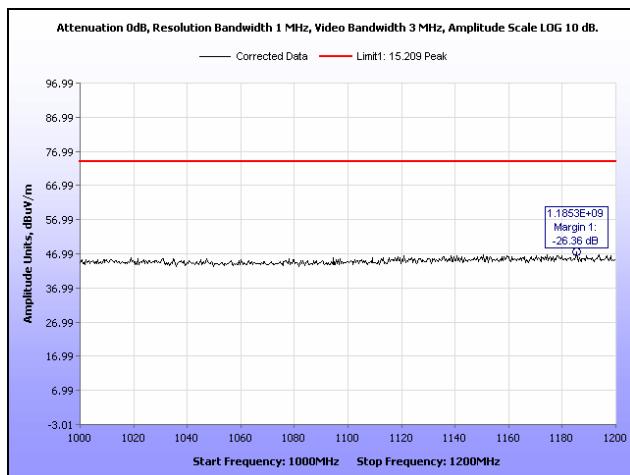


**Plot 118. Radiated Spurious Emissions, 125 kbps, 250 kHz, High Channel, 1.2 GHz – 10 GHz, Average, 12 dBi Antenna**

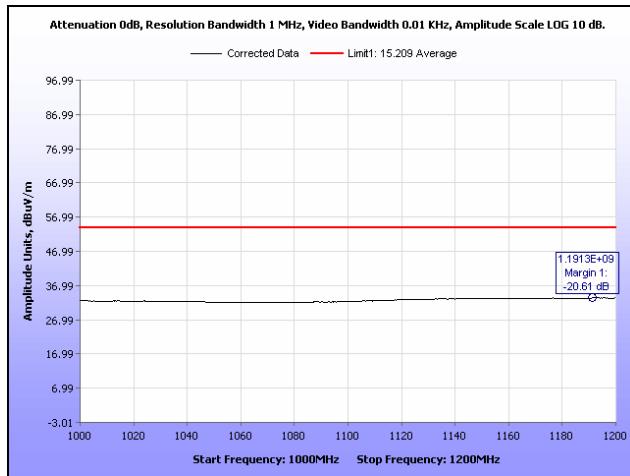
## Radiated Spurious Emissions, 250 kbps, 250 kHz, Test Results



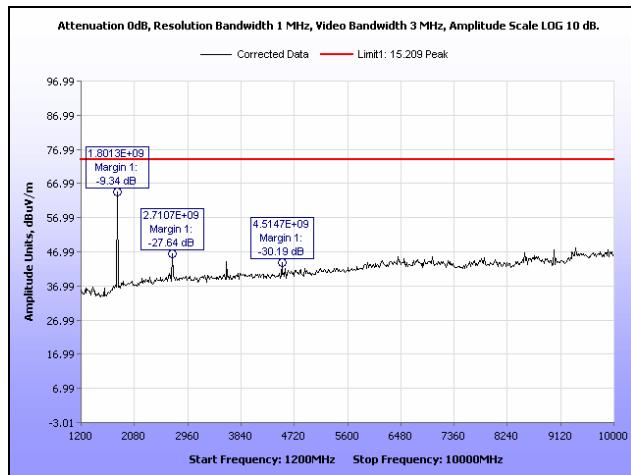
**Plot 119. Radiated Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 30 MHz – 1 GHz, 1 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



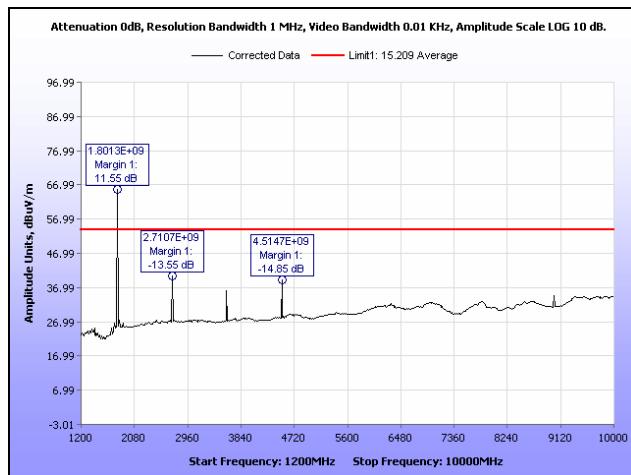
**Plot 120. Radiated Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 1 GHz – 1.2 GHz, Peak, 1 dBi Antenna**



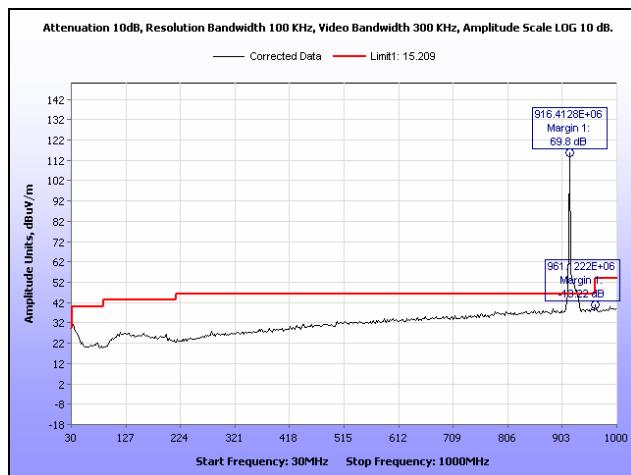
**Plot 121. Radiated Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 1 GHz – 1.2 GHz, Average, 1 dBi Antenna**



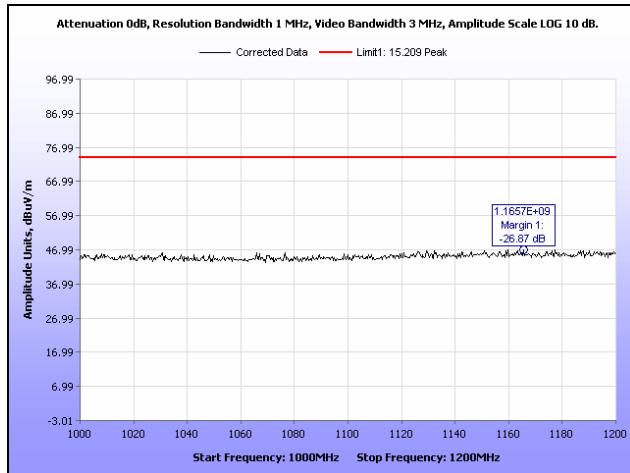
**Plot 122. Radiated Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 1.2 GHz – 10 GHz, Peak, 1 dBi Antenna**



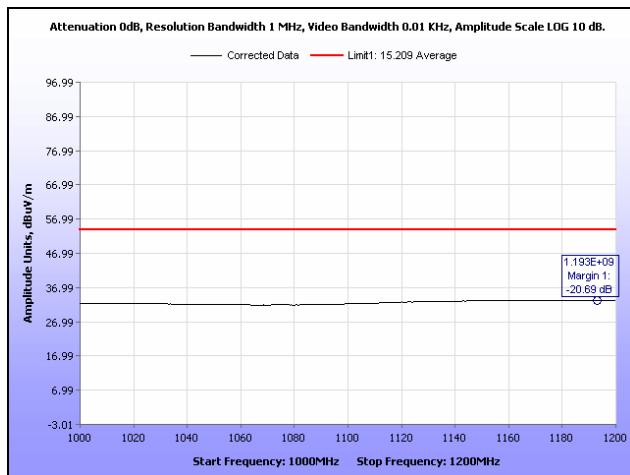
**Plot 123. Radiated Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 1.2 GHz – 10 GHz, Average, 1 dBi Antenna**  
Note: The emission over the limit is not within the restricted band.



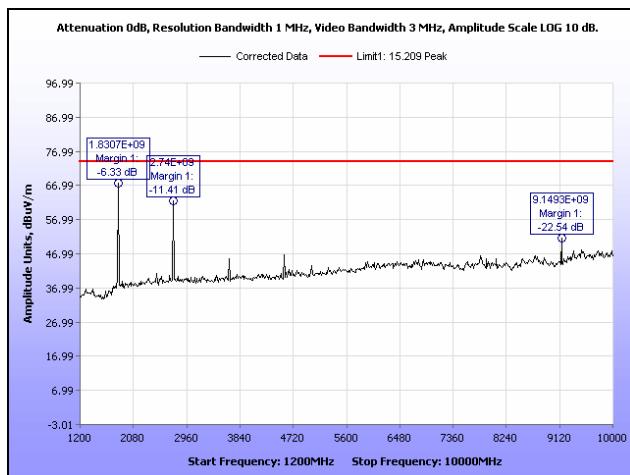
**Plot 124. Radiated Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 30 MHz – 1 GHz, 1 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



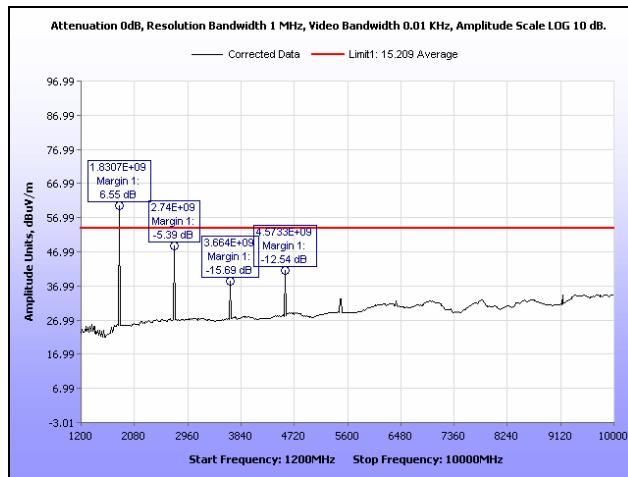
**Plot 125. Radiated Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 1 GHz – 1.2 GHz, Peak, 1 dBi Antenna**



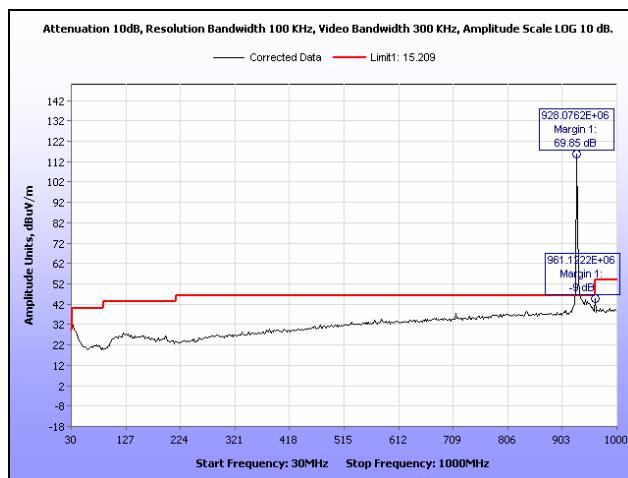
**Plot 126. Radiated Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 1 GHz – 1.2 GHz, Average, 1 dBi Antenna**



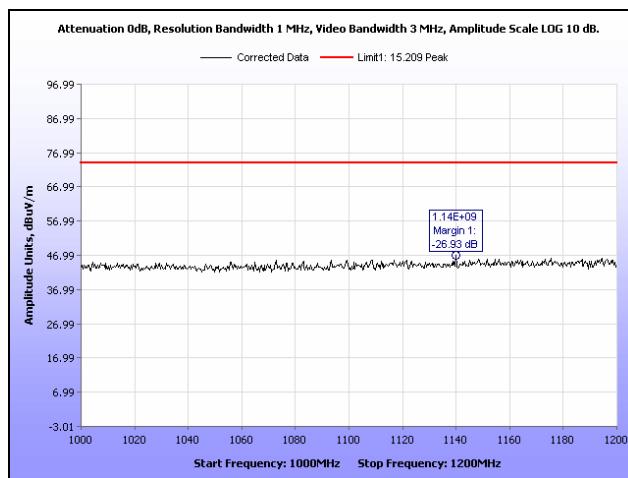
**Plot 127. Radiated Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 1.2 GHz – 10 GHz, Peak, 1 dBi Antenna**



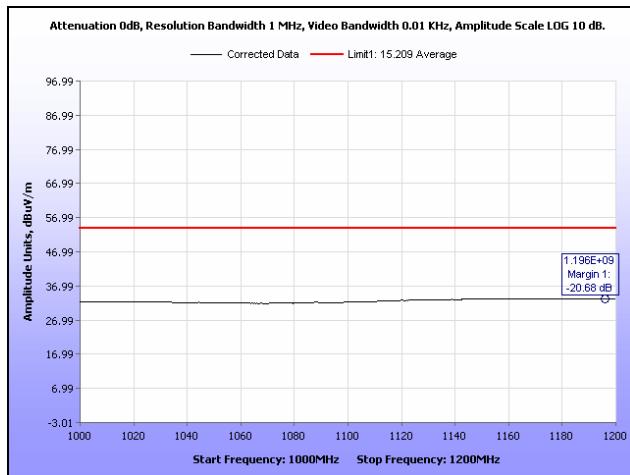
**Plot 128. Radiated Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 1.2 GHz – 10 GHz, Average, 1 dBi Antenna**  
Note: The emission over the limit is not within the restricted band.



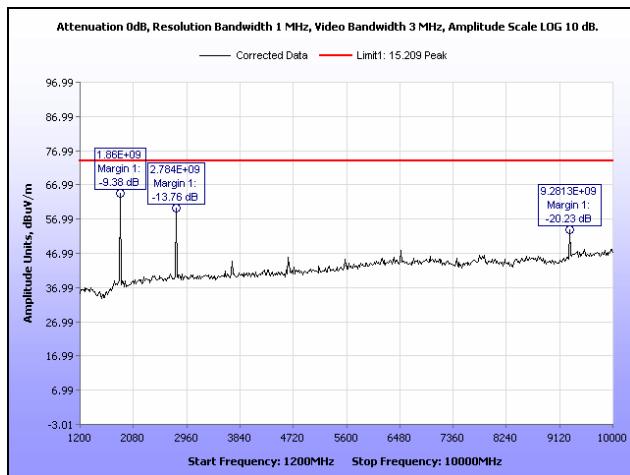
**Plot 129. Radiated Spurious Emissions, 250 kbps, 250 kHz, High Channel, 30 MHz – 1 GHz, 1 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



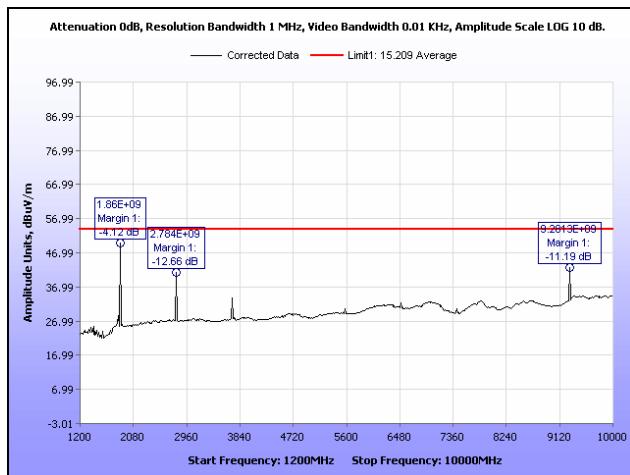
**Plot 130. Radiated Spurious Emissions, 250 kbps, 250 kHz, High Channel, 1 GHz – 1.2 GHz, Peak, 1 dBi Antenna**



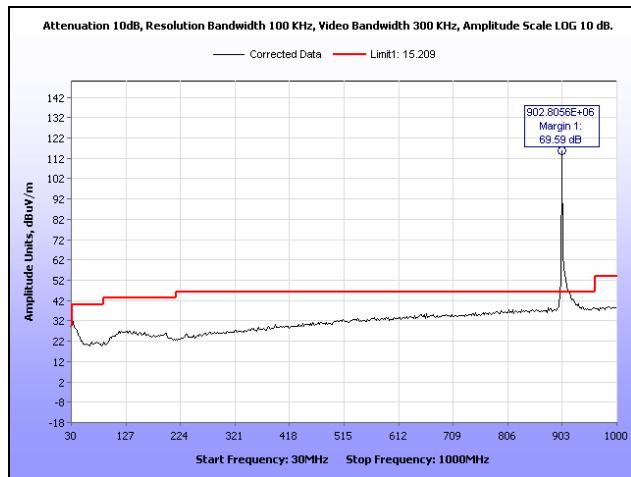
Plot 131. Radiated Spurious Emissions, 250 kbps, 250 kHz, High Channel, 1 GHz – 1.2 GHz, Average, 1 dBi Antenna



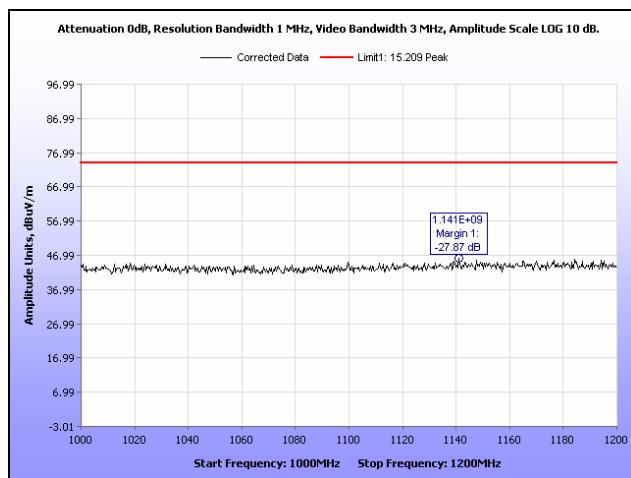
Plot 132. Radiated Spurious Emissions, 250 kbps, 250 kHz, High Channel, 1.2 GHz – 10 GHz, Peak, 1 dBi Antenna



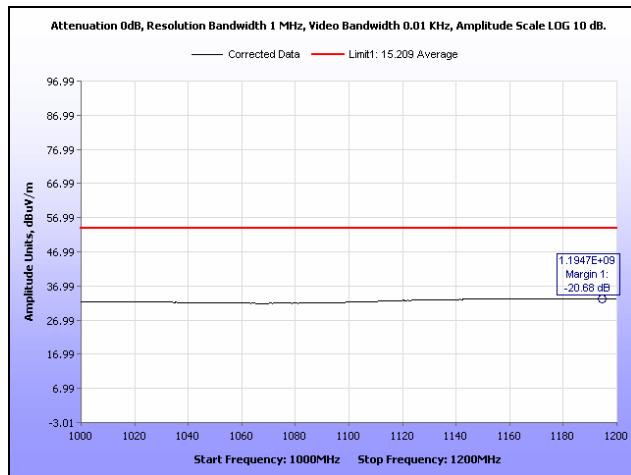
Plot 133. Radiated Spurious Emissions, 250 kbps, 250 kHz, High Channel, 1.2 GHz – 10 GHz, Average, 1 dBi Antenna



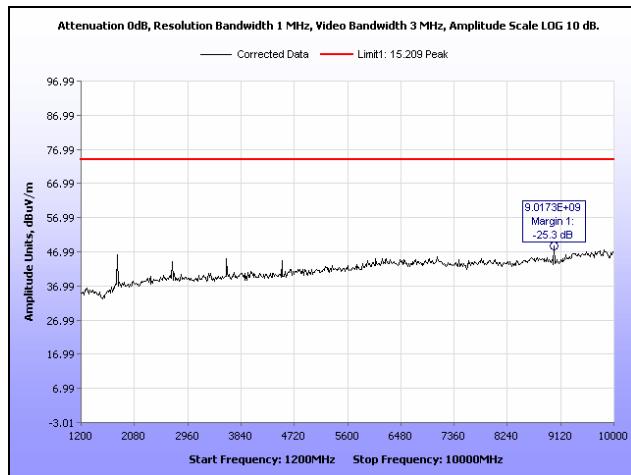
**Plot 134. Radiated Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 30 MHz – 1 GHz, 12 dBi Antenna**  
 Note: The emissions over the limit are either the fundamental or not within the restricted band.



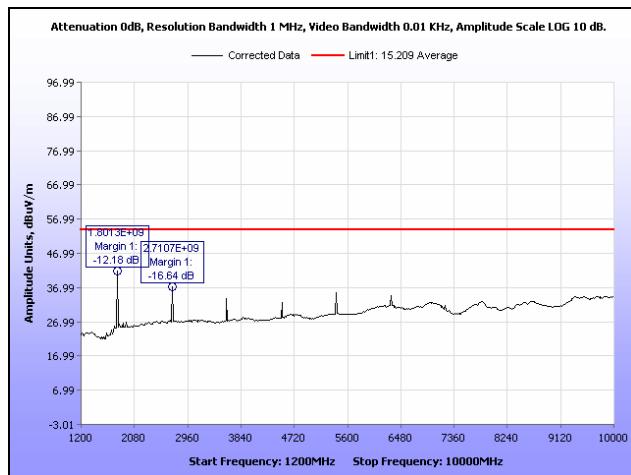
**Plot 135. Radiated Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 1 GHz – 1.2 GHz, Peak, 12 dBi Antenna**



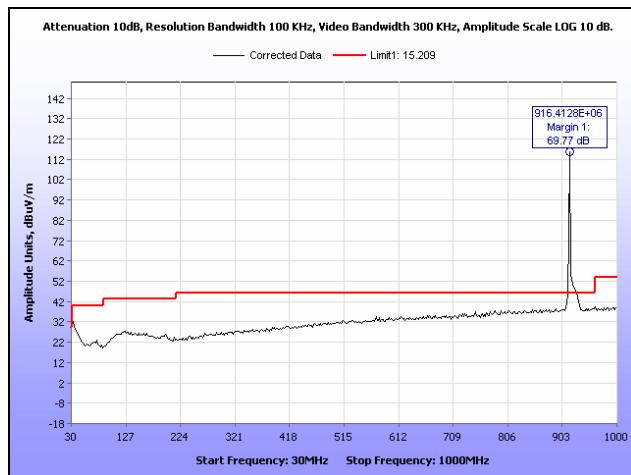
**Plot 136. Radiated Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 1 GHz – 1.2 GHz, Average, 12 dBi Antenna**



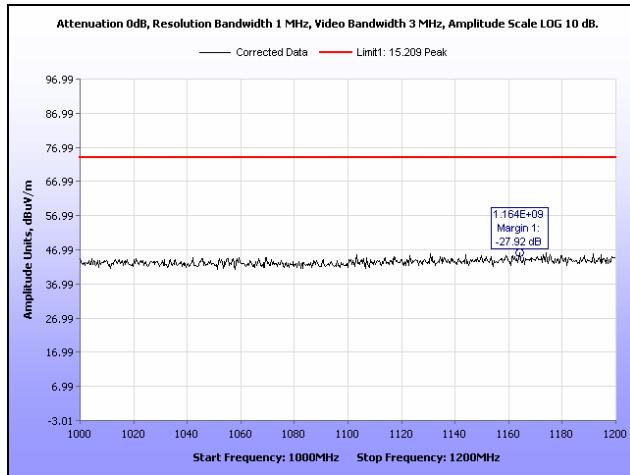
**Plot 137. Radiated Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 1.2 GHz – 10 GHz, Peak, 12 dBi Antenna**



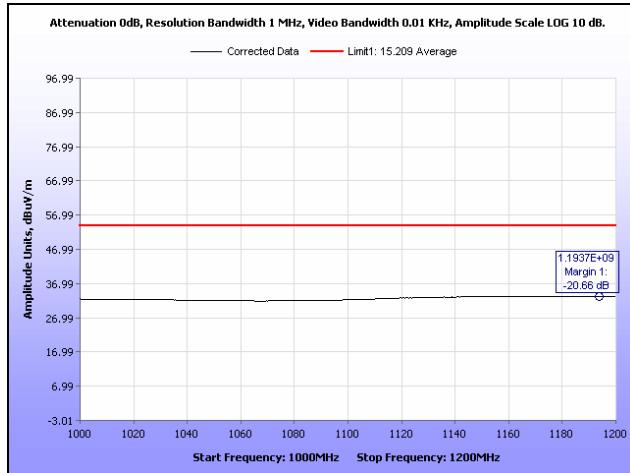
**Plot 138. Radiated Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 1.2 GHz – 10 GHz, Average, 12 dBi Antenna**



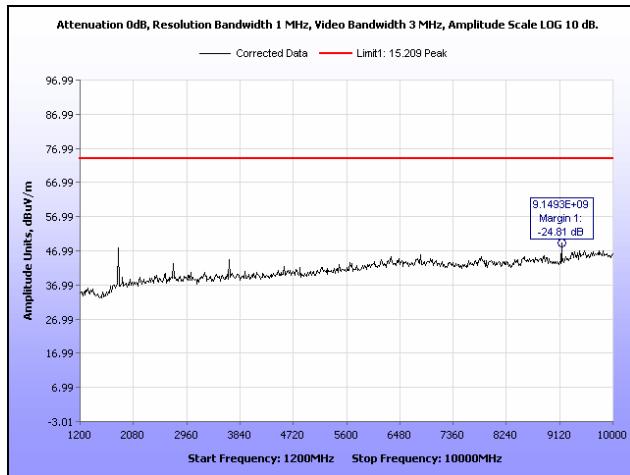
**Plot 139. Radiated Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 30 MHz – 1 GHz, 12 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



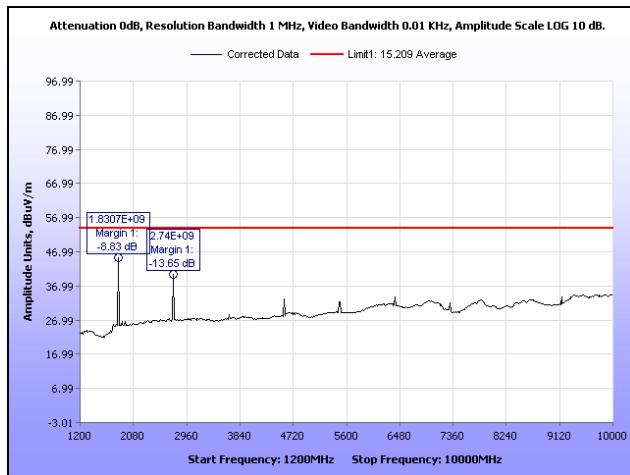
**Plot 140. Radiated Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 1 GHz – 1.2 GHz, Peak, 12 dBi Antenna**



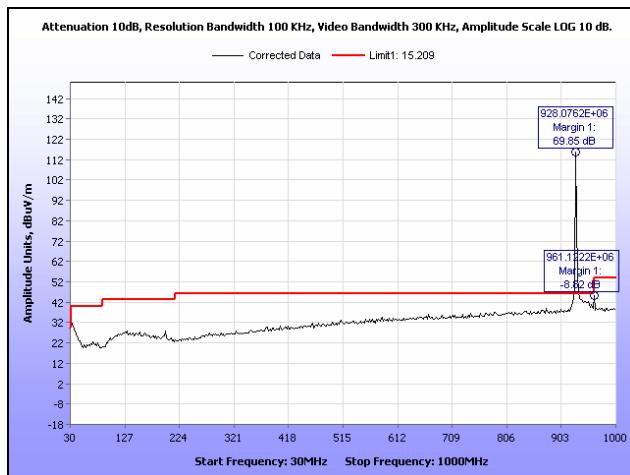
**Plot 141. Radiated Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 1 GHz – 1.2 GHz, Average, 12 dBi Antenna**



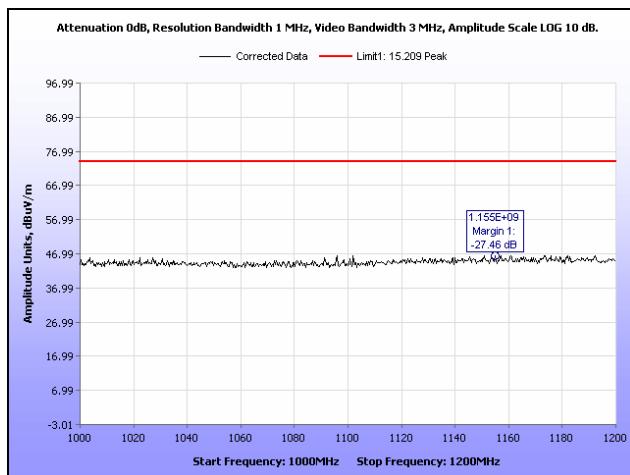
**Plot 142. Radiated Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 1.2 GHz – 10 GHz, Peak, 12 dBi Antenna**



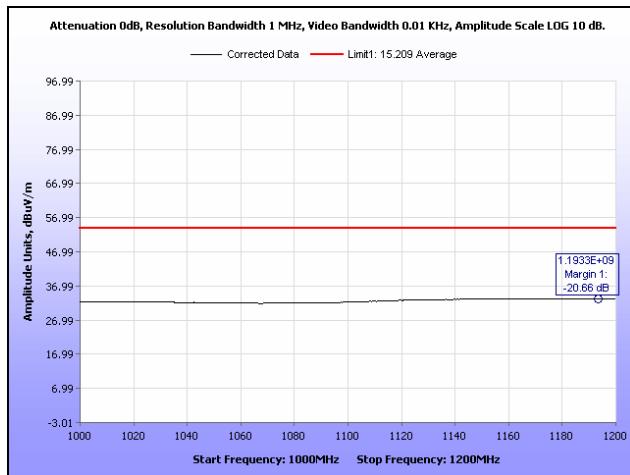
**Plot 143. Radiated Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 1.2 GHz – 10 GHz, Average, 12 dBi Antenna**



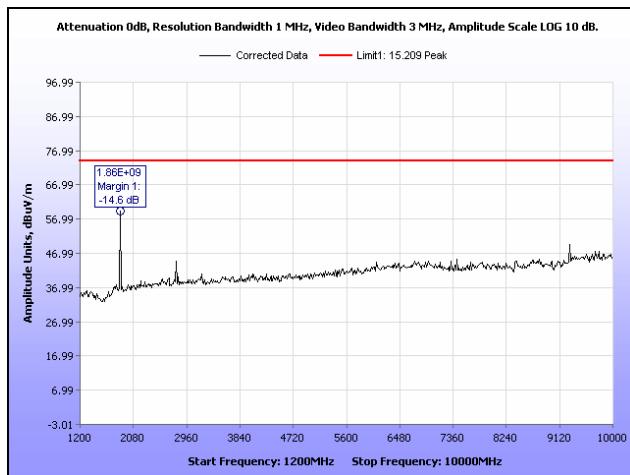
**Plot 144. Radiated Spurious Emissions, 250 kbps, 250 kHz, High Channel, 30 MHz – 1 GHz, 12 dBi Antenna**  
Note: The emissions over the limit are either the fundamental or not within the restricted band.



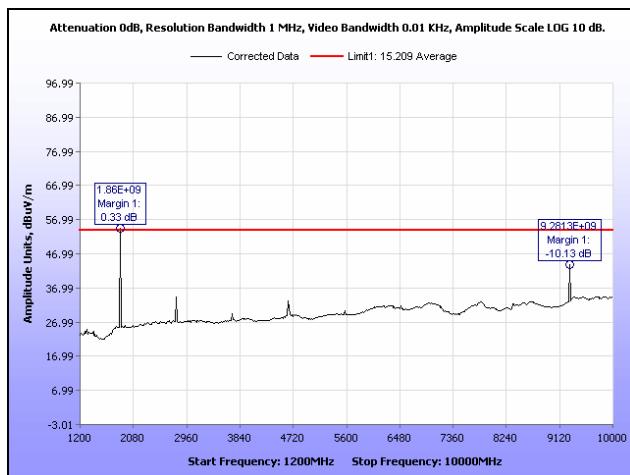
**Plot 145. Radiated Spurious Emissions, 250 kbps, 250 kHz, High Channel, 1 GHz – 1.2 GHz, Peak, 12 dBi Antenna**



**Plot 146. Radiated Spurious Emissions, 250 kbps, 250 kHz, High Channel, 1 GHz – 1.2 GHz, Average, 12 dBi Antenna**



**Plot 147. Radiated Spurious Emissions, 250 kbps, 250 kHz, High Channel, 1.2 GHz – 10 GHz, Peak, 12 dBi Antenna**



**Plot 148. Radiated Spurious Emissions, 250 kbps, 250 kHz, High Channel, 1.2 GHz – 10 GHz, Average, 12 dBi Antenna**  
Note: The emission over the limit is not within the restricted band.

## 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.

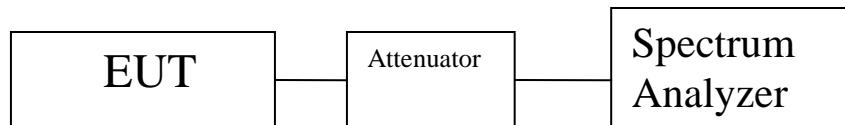
Since the EUT had an integral antenna, conducted measurements could not be performed. Measurements needed to be taken radiated. An antenna was located 3 m away from the EUT and plots were taken. The EUT was rotated through all three orthogonal axes. The plots were corrected for both antenna correction factor and cable loss.

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)**.

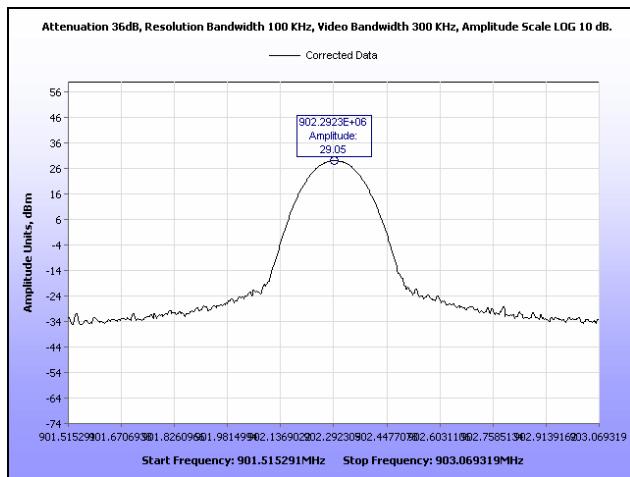
**Test Engineer(s):** Zijun Tong

**Test Date(s):** 07/26/13

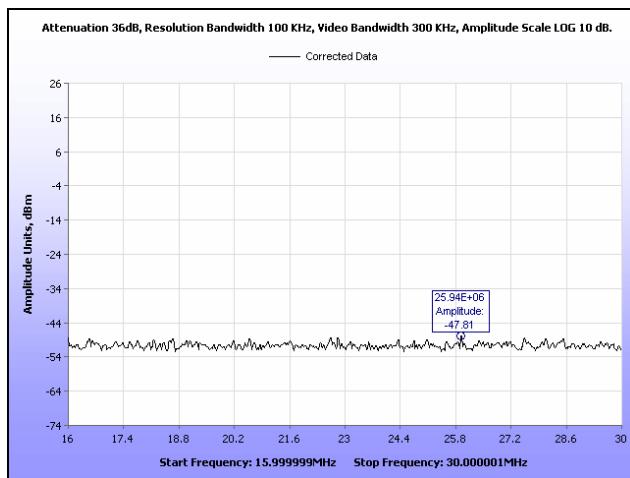


**Figure 4. Block Diagram, Conducted Spurious Emissions Test Setup**

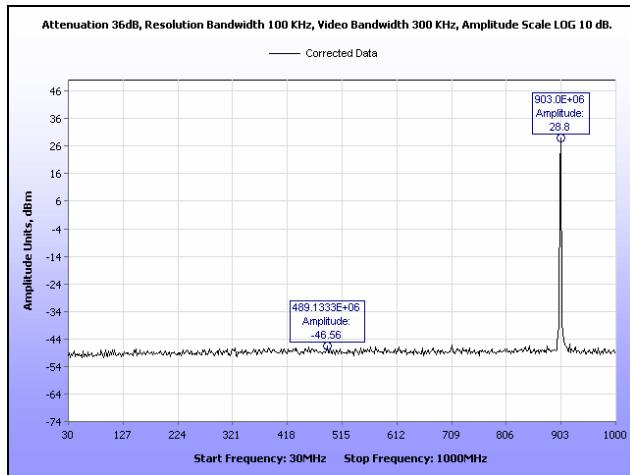
## Conducted Spurious Emissions, 16 kbps, 25 kHz, Test Results



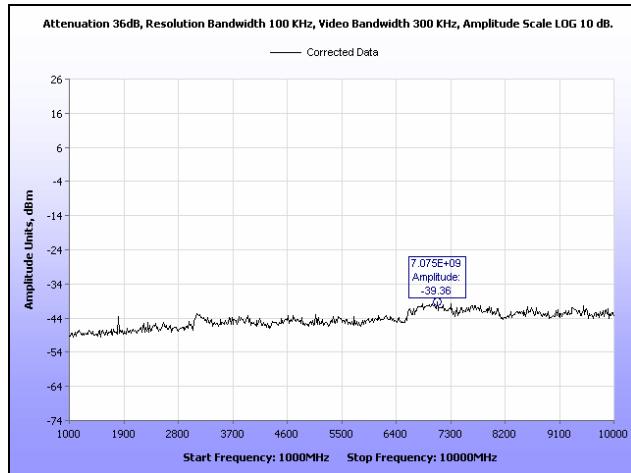
Plot 149. Conducted Spurious Emissions, 16 kbps, 25 kHz, Low Channel, Amplitude, 1 dBi Antenna



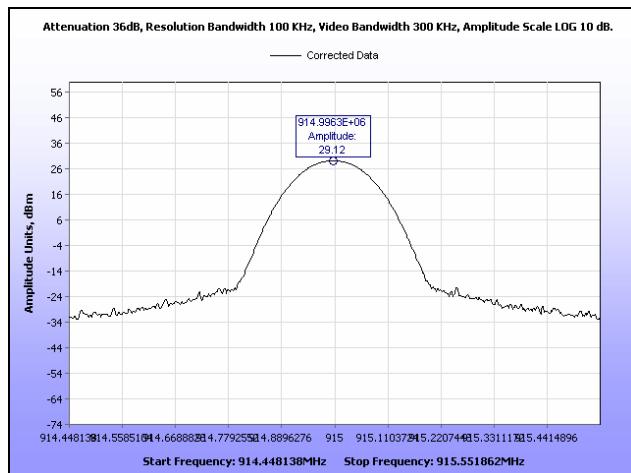
Plot 150. Conducted Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 16 MHz – 30 MHz, 1 dBi Antenna



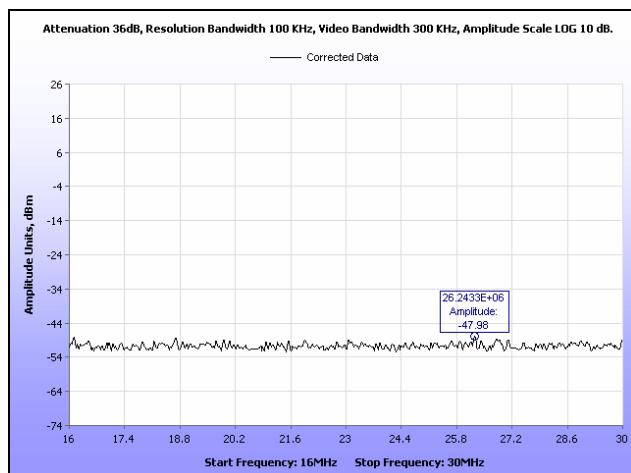
Plot 151. Conducted Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 30 MHz – 1 GHz, 1 dBi Antenna



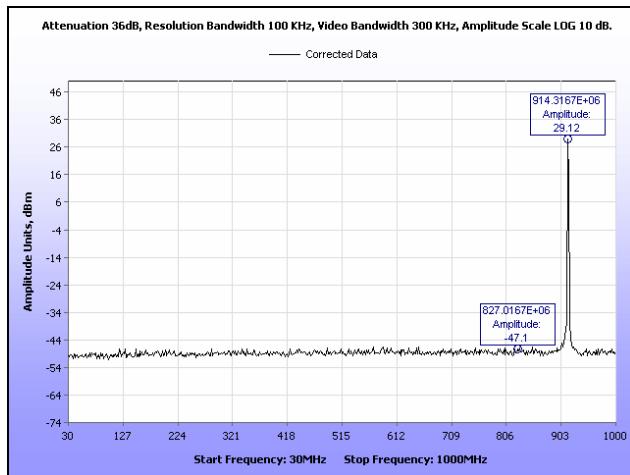
**Plot 152. Conducted Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



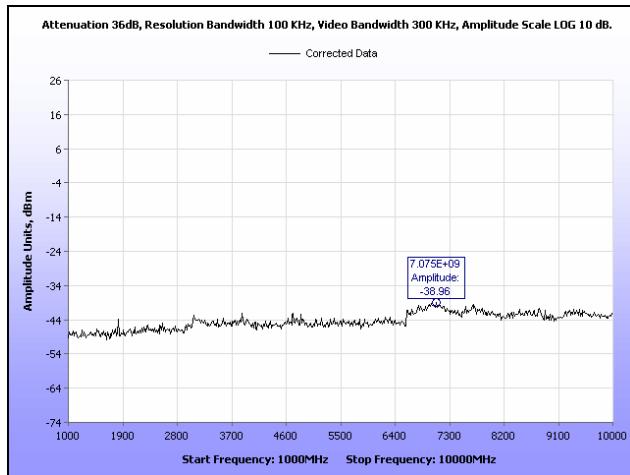
**Plot 153. Conducted Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, Amplitude, 1 dBi Antenna**



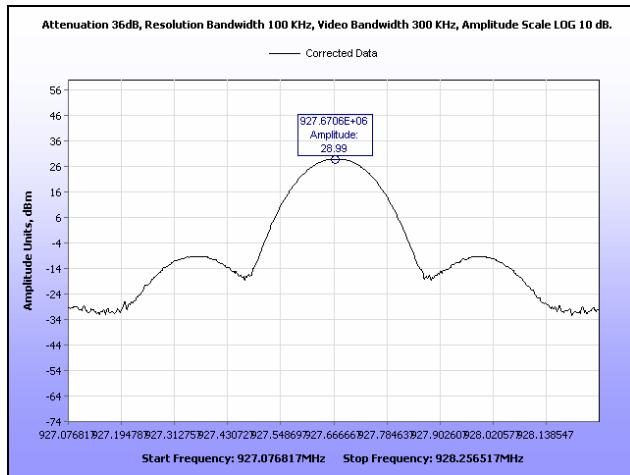
**Plot 154. Conducted Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 16 MHz – 30 MHz, 1 dBi Antenna**



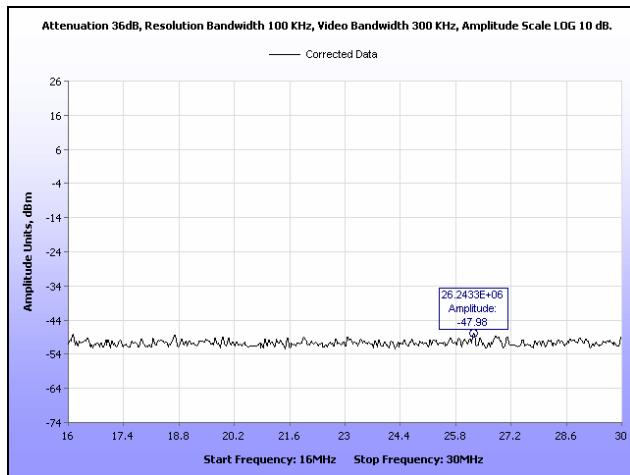
**Plot 155. Conducted Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 30 MHz – 1 GHz, 1 dBi Antenna**



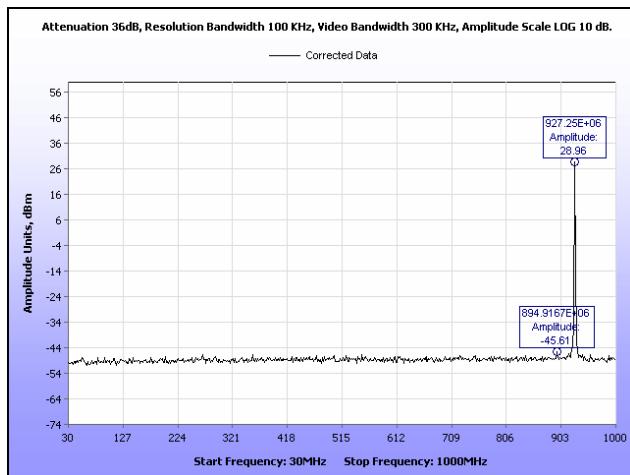
**Plot 156. Conducted Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



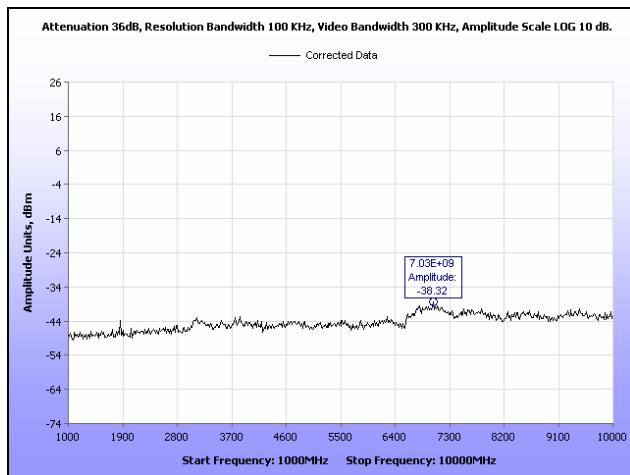
**Plot 157. Conducted Spurious Emissions, 16 kbps, 25 kHz, High Channel, Amplitude, 1 dBi Antenna**



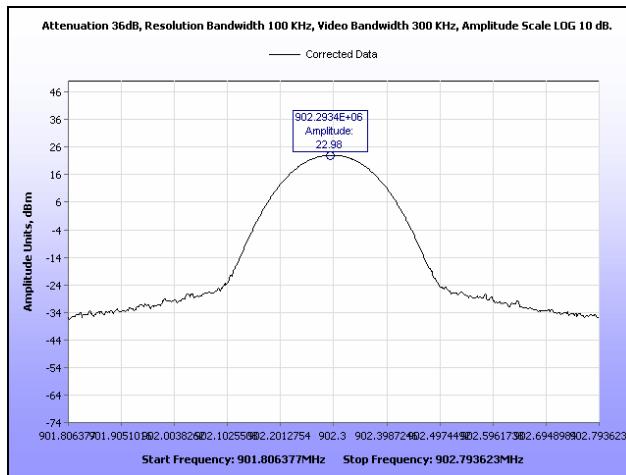
**Plot 158. Conducted Spurious Emissions, 16 kbps, 25 kHz, High Channel, 16 MHz – 30 MHz, 1 dBi Antenna**



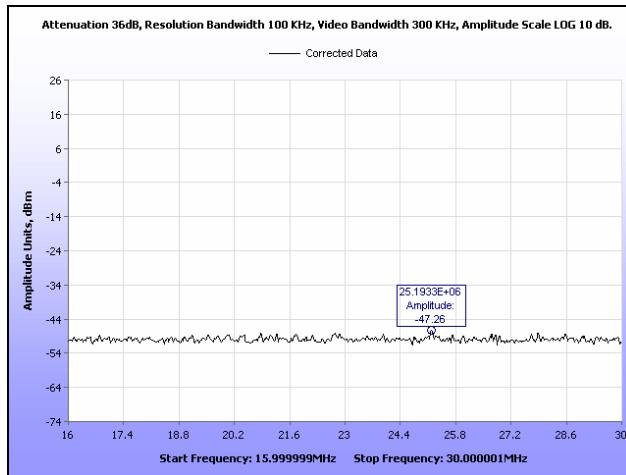
**Plot 159. Conducted Spurious Emissions, 16 kbps, 25 kHz, High Channel, 30 MHz – 1 GHz, 1 dBi Antenna**



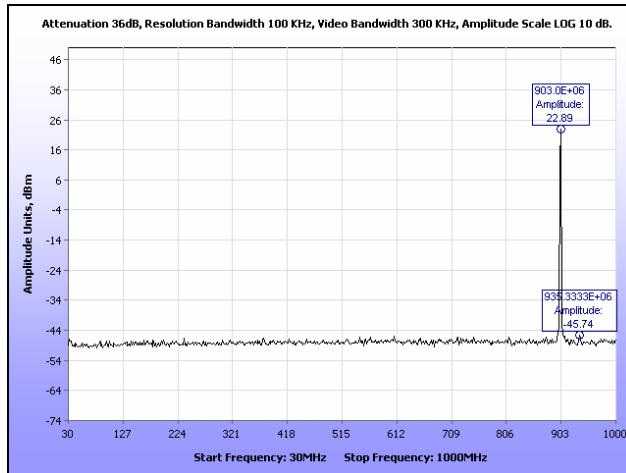
**Plot 160. Conducted Spurious Emissions, 16 kbps, 25 kHz, High Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



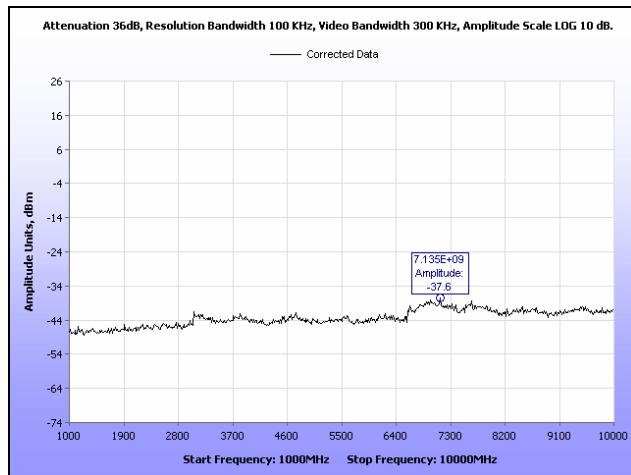
**Plot 161. Conducted Spurious Emissions, 16 kbps, 25 kHz, Low Channel, Amplitude, 12 dBi Antenna**



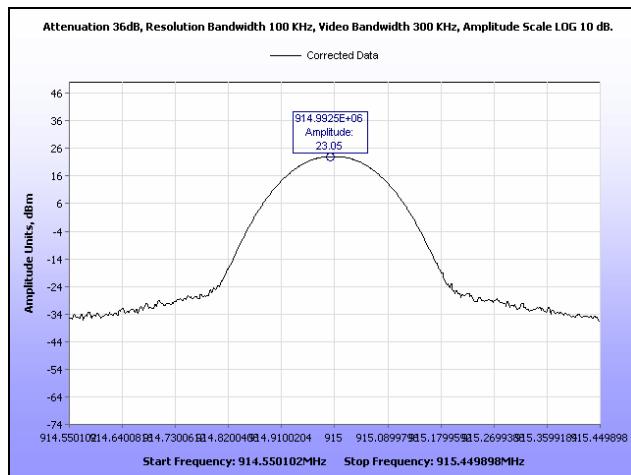
**Plot 162. Conducted Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 16 MHz – 30 MHz, 12 dBi Antenna**



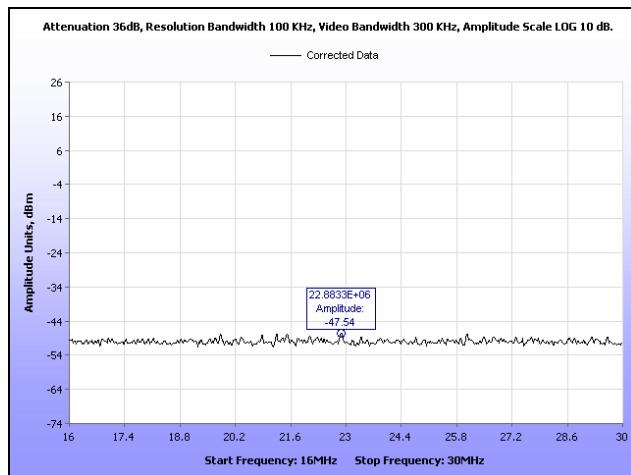
**Plot 163. Conducted Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 30 MHz – 1 GHz, 12 dBi Antenna**



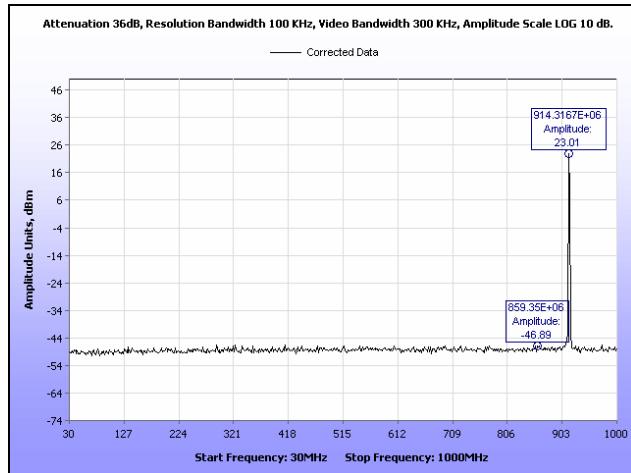
**Plot 164. Conducted Spurious Emissions, 16 kbps, 25 kHz, Low Channel, 1 GHz – 10 GHz, 12 dBi Antenna**



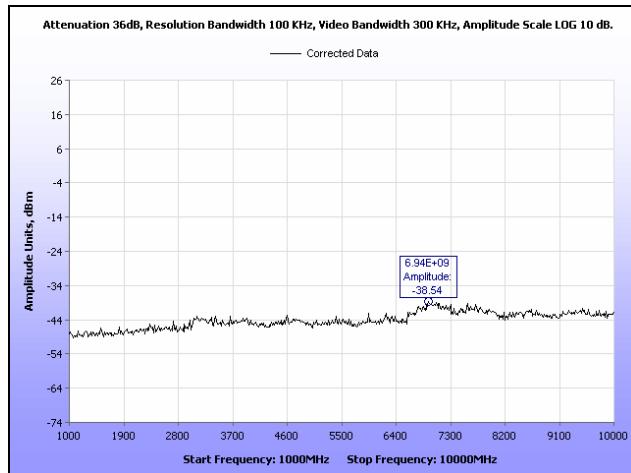
**Plot 165. Conducted Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, Amplitude, 12 dBi Antenna**



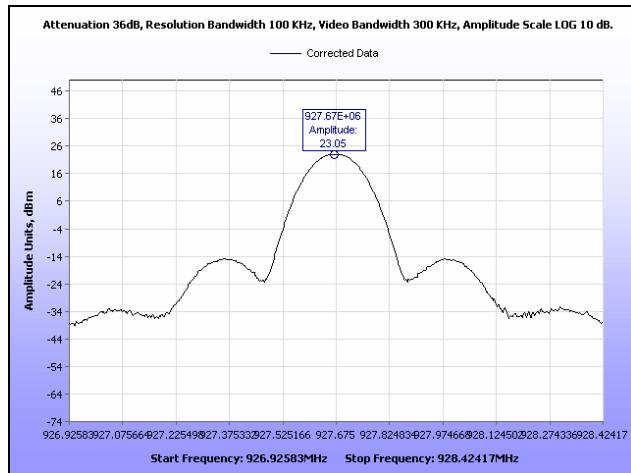
**Plot 166. Conducted Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 16 MHz – 30 MHz, 12 dBi Antenna**



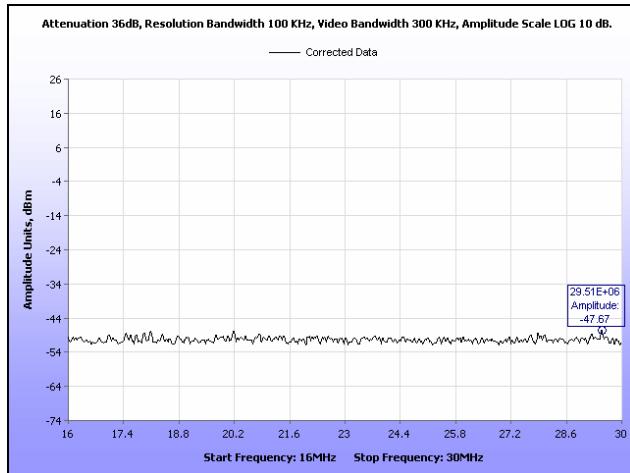
**Plot 167. Conducted Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 30 MHz – 1 GHz, 12 dBi Antenna**



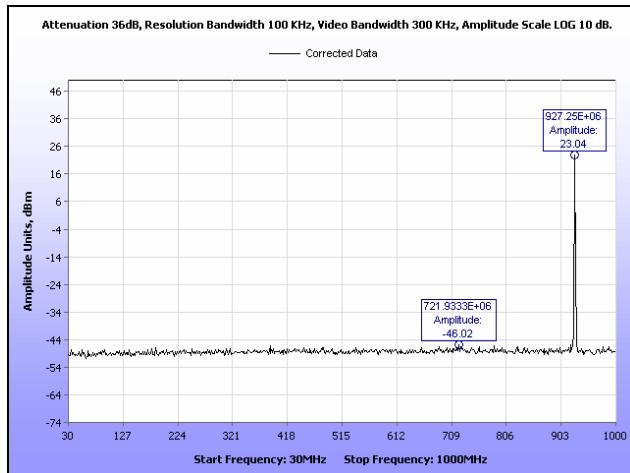
**Plot 168. Conducted Spurious Emissions, 16 kbps, 25 kHz, Mid Channel, 1 GHz – 10 GHz, 12 dBi Antenna**



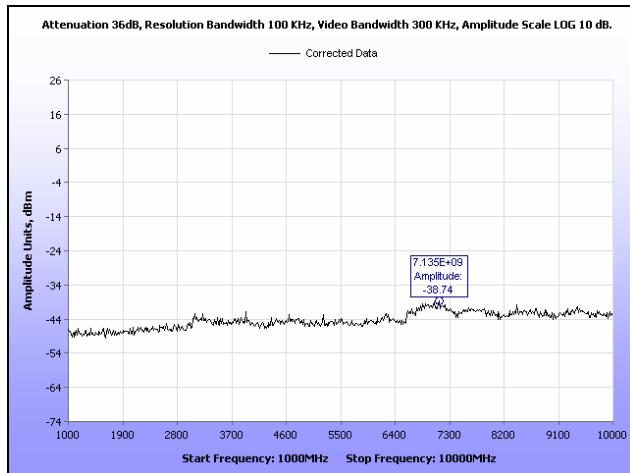
**Plot 169. Conducted Spurious Emissions, 16 kbps, 25 kHz, High Channel, Amplitude, 12 dBi Antenna**



**Plot 170. Conducted Spurious Emissions, 16 kbps, 25 kHz, High Channel, 16 MHz – 30 MHz, 12 dBi Antenna**

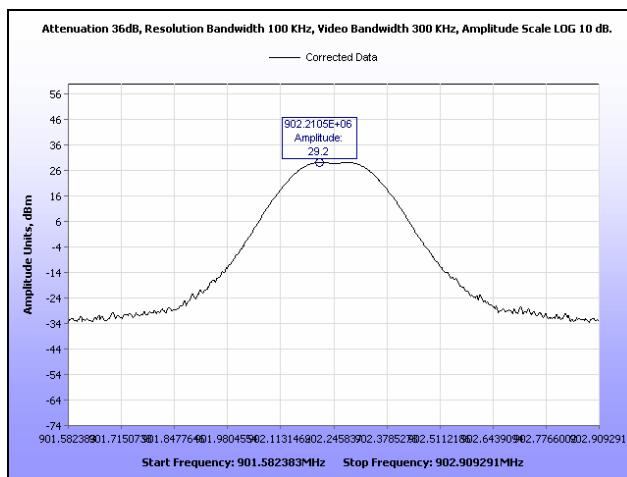


**Plot 171. Conducted Spurious Emissions, 16 kbps, 25 kHz, High Channel, 30 MHz – 1 GHz, 12 dBi Antenna**

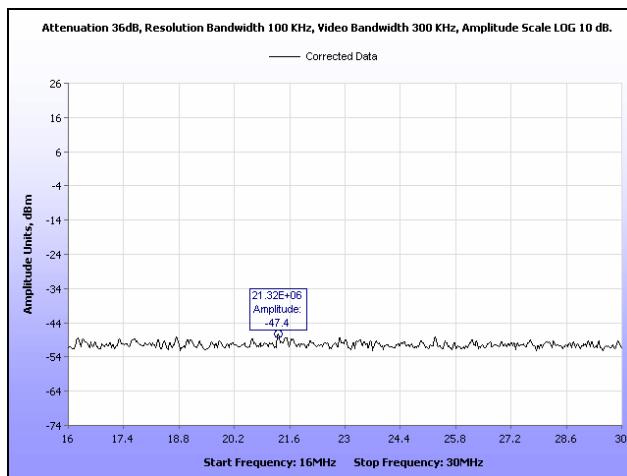


**Plot 172. Conducted Spurious Emissions, 16 kbps, 25 kHz, High Channel, 1 GHz – 10 GHz, 12 dBi Antenna**

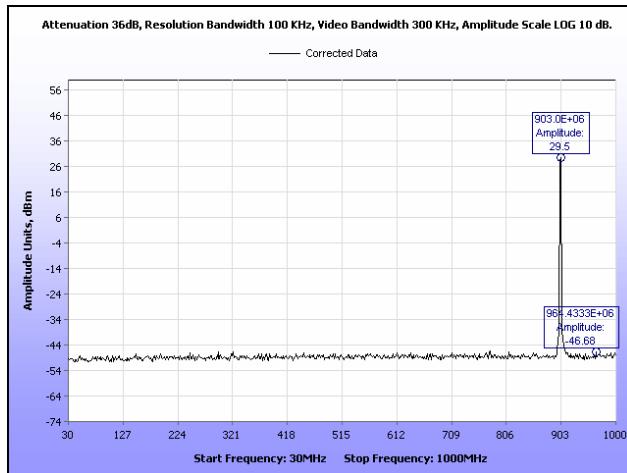
## Conducted Spurious Emissions, 125 kbps, 250 kHz, Test Results



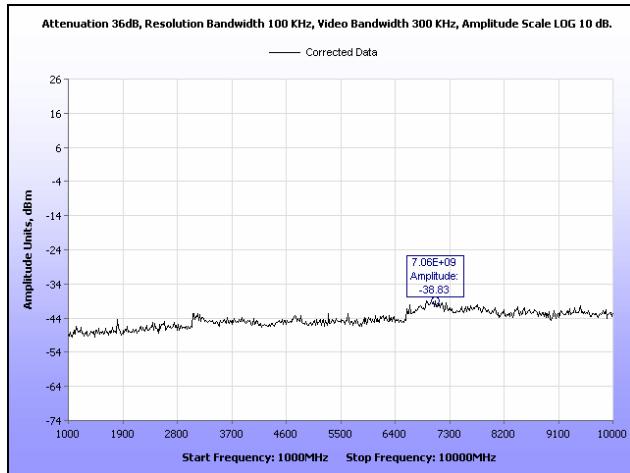
Plot 173. Conducted Spurious Emissions, 125 kbps, 250 kHz, Low Channel, Amplitude, 1 dBi Antenna



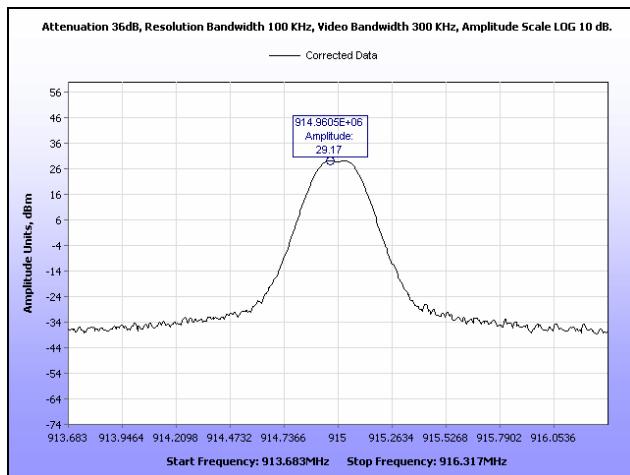
Plot 174. Conducted Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 16 MHz – 30 MHz, 1 dBi Antenna



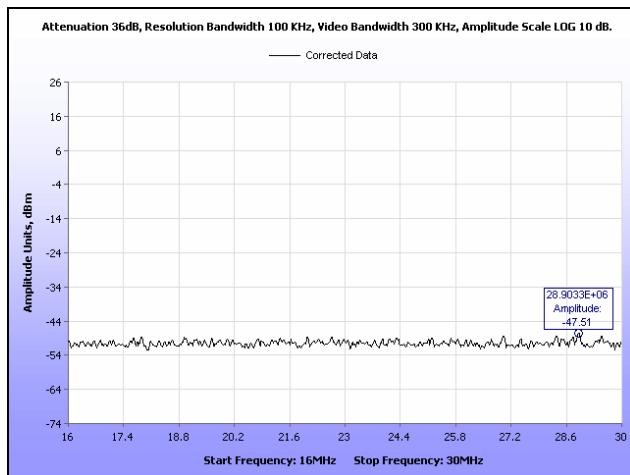
Plot 175. Conducted Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 30 MHz – 1 GHz, 1 dBi Antenna



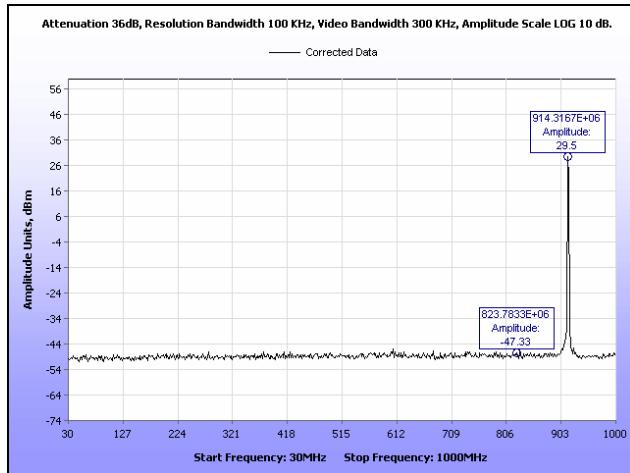
**Plot 176. Conducted Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



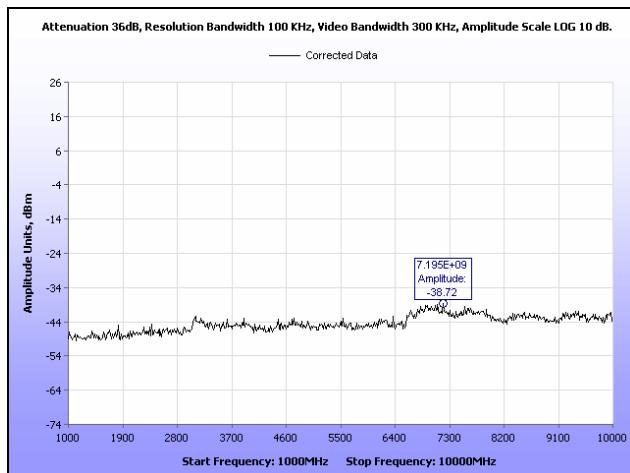
**Plot 177. Conducted Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, Amplitude, 1 dBi Antenna**



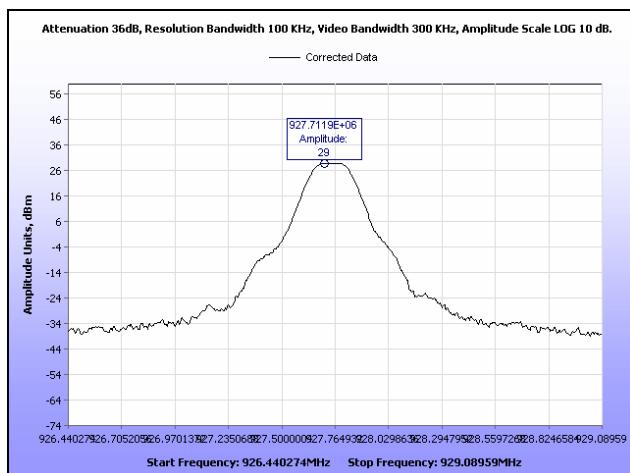
**Plot 178. Conducted Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 16 MHz – 30 MHz, 1 dBi Antenna**



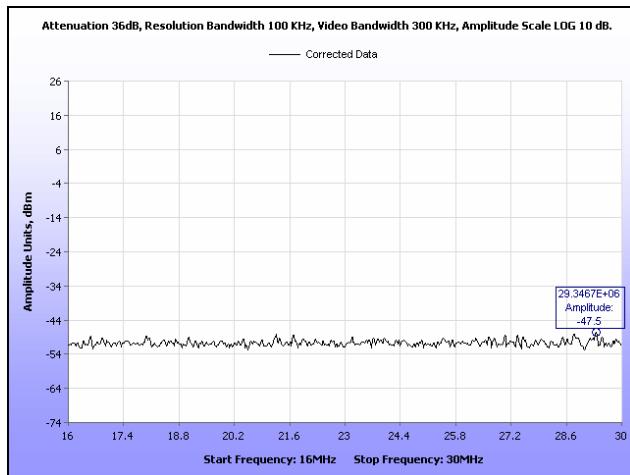
**Plot 179. Conducted Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 30 MHz – 1 GHz, 1 dBi Antenna**



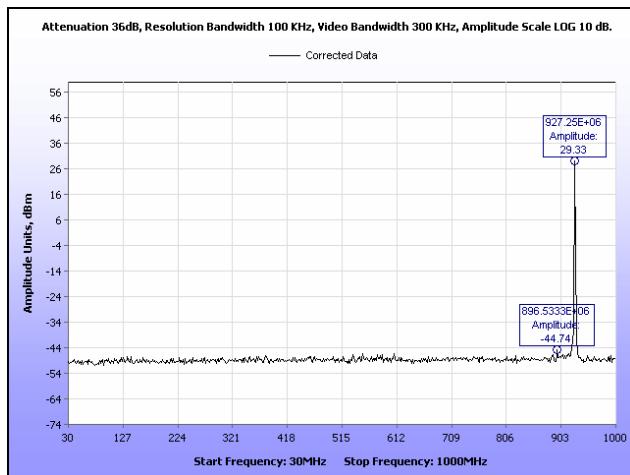
**Plot 180. Conducted Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



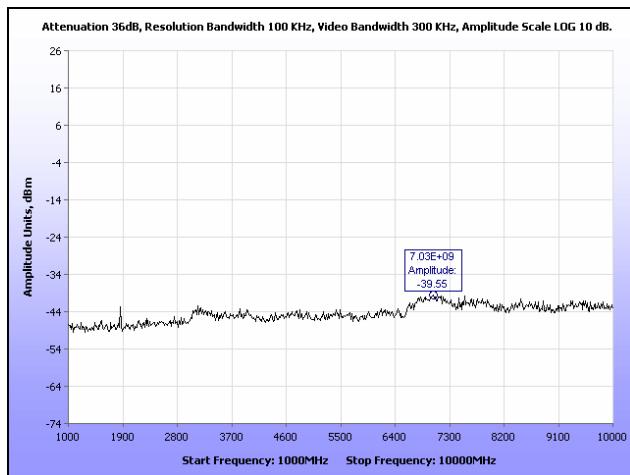
**Plot 181. Conducted Spurious Emissions, 125 kbps, 250 kHz, High Channel, Amplitude, 1 dBi Antenna**



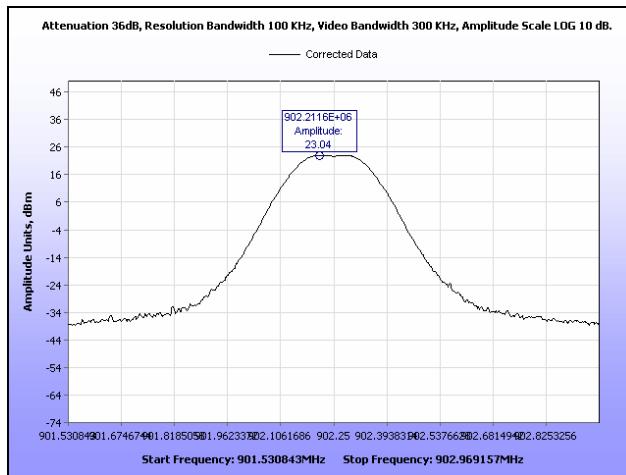
**Plot 182. Conducted Spurious Emissions, 125 kbps, 250 kHz, High Channel, 16 MHz – 30 MHz, 1 dBi Antenna**



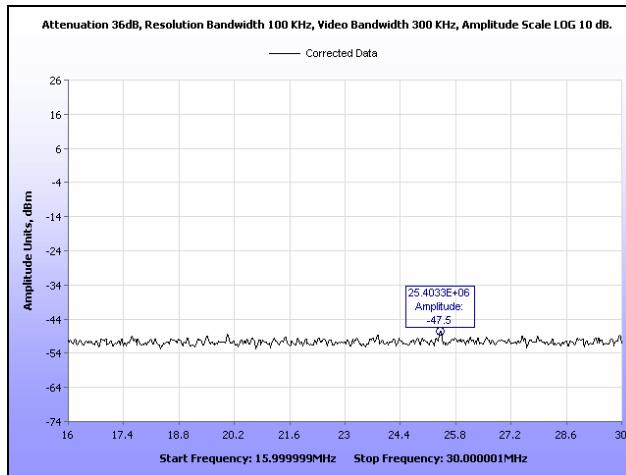
**Plot 183. Conducted Spurious Emissions, 125 kbps, 250 kHz, High Channel, 30 MHz – 1 GHz, 1 dBi Antenna**



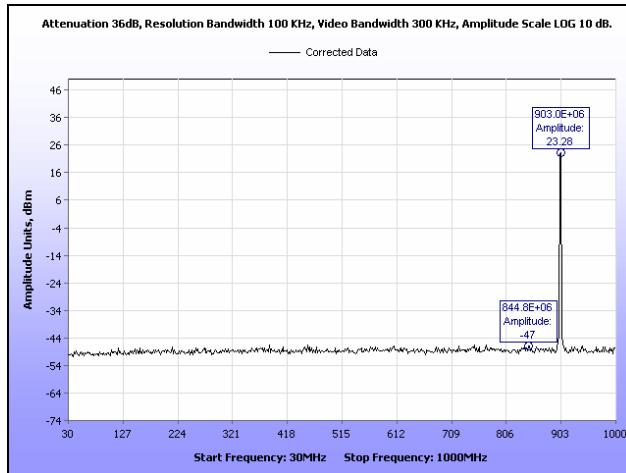
**Plot 184. Conducted Spurious Emissions, 125 kbps, 250 kHz, High Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



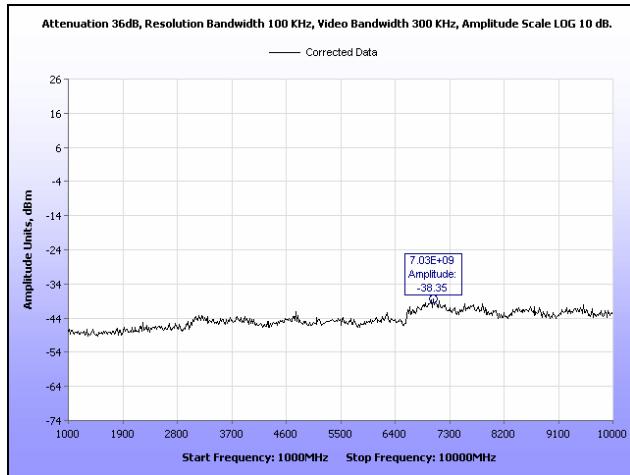
**Plot 185. Conducted Spurious Emissions, 125 kbps, 250 kHz, Low Channel, Amplitude, 12 dBi Antenna**



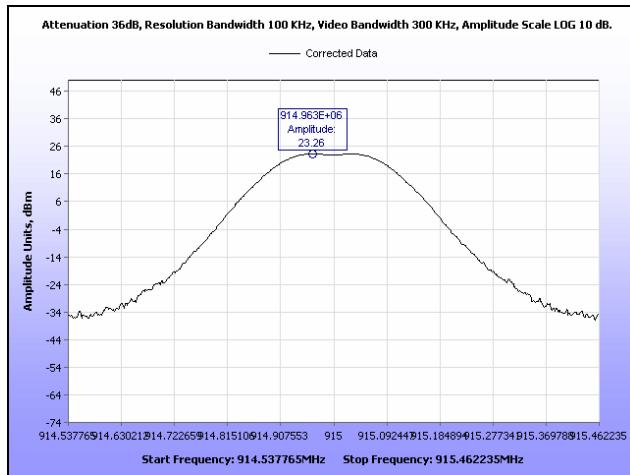
**Plot 186. Conducted Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 16 MHz – 30 MHz, 12 dBi Antenna**



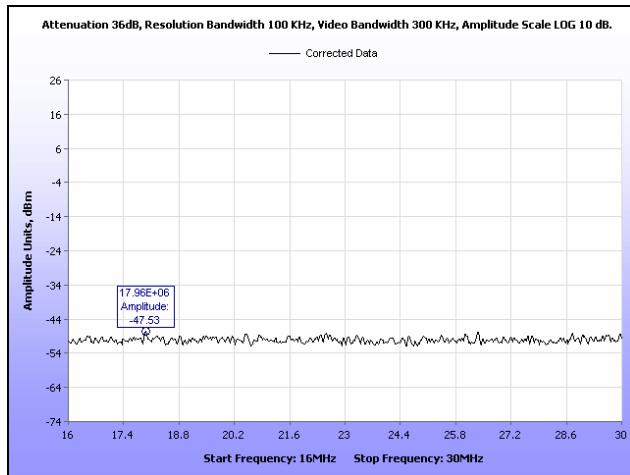
**Plot 187. Conducted Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 30 MHz – 1 GHz, 12 dBi Antenna**



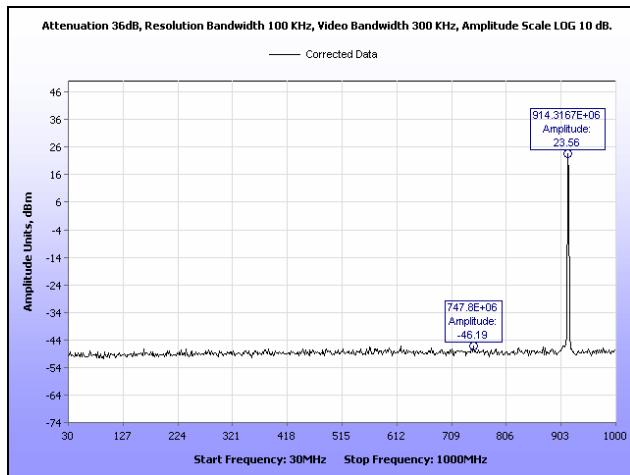
**Plot 188. Conducted Spurious Emissions, 125 kbps, 250 kHz, Low Channel, 1 GHz – 10 GHz, 12 dBi Antenna**



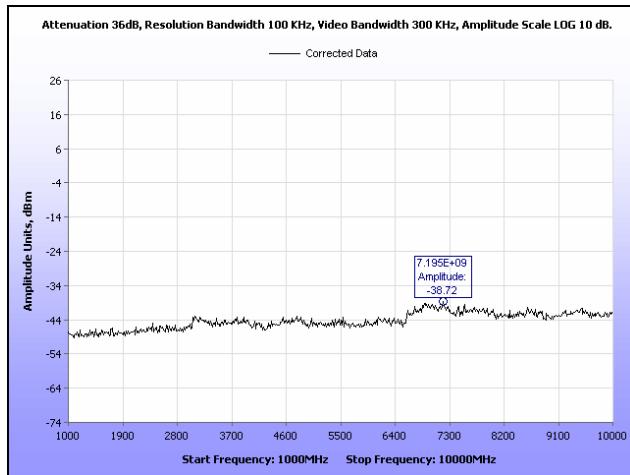
**Plot 189. Conducted Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, Amplitude, 12 dBi Antenna**



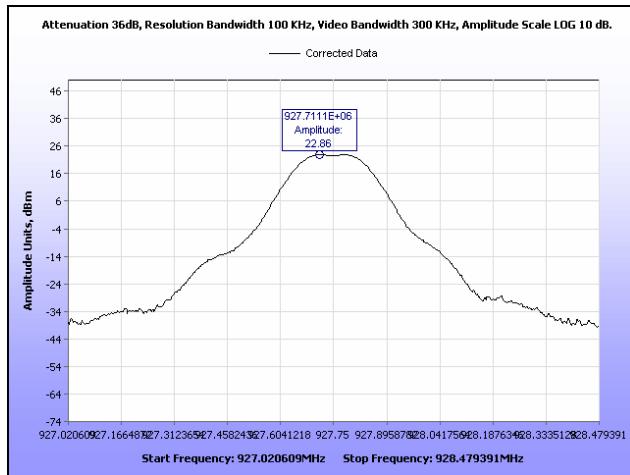
**Plot 190. Conducted Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 16 MHz – 30 MHz, 12 dBi Antenna**



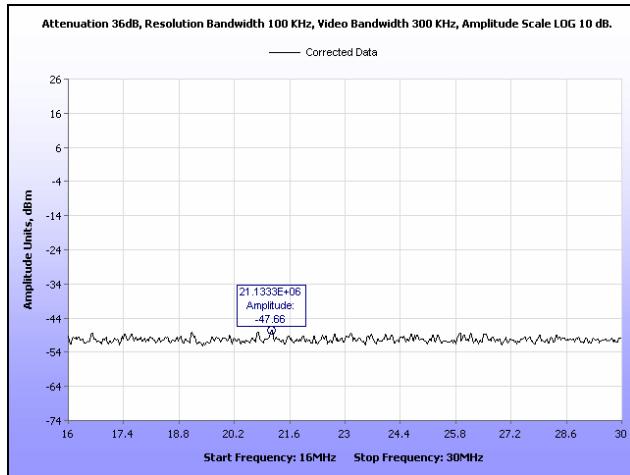
**Plot 191. Conducted Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 30 MHz – 1 GHz, 12 dBi Antenna**



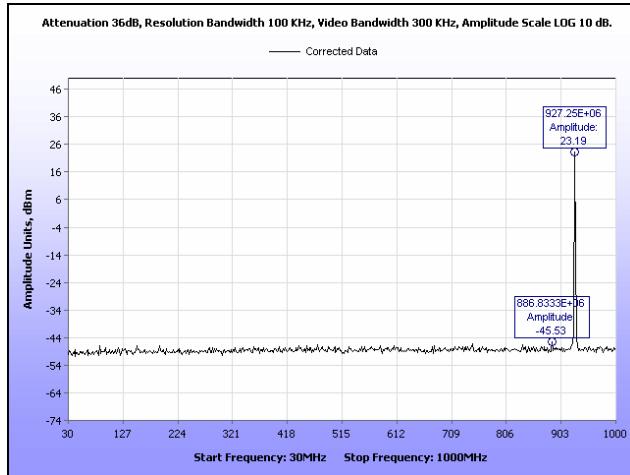
**Plot 192. Conducted Spurious Emissions, 125 kbps, 250 kHz, Mid Channel, 1 GHz – 10 GHz, 12 dBi Antenna**



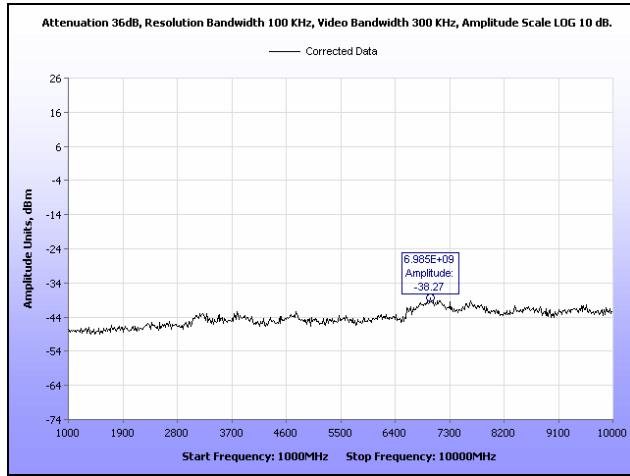
**Plot 193. Conducted Spurious Emissions, 125 kbps, 250 kHz, High Channel, Amplitude, 12 dBi Antenna**



**Plot 194. Conducted Spurious Emissions, 125 kbps, 250 kHz, High Channel, 16 MHz – 30 MHz, 12 dBi Antenna**

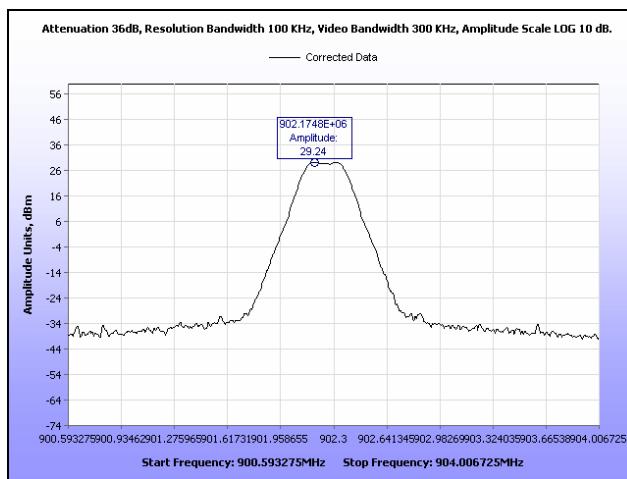


**Plot 195. Conducted Spurious Emissions, 125 kbps, 250 kHz, High Channel, 30 MHz – 1 GHz, 12 dBi Antenna**

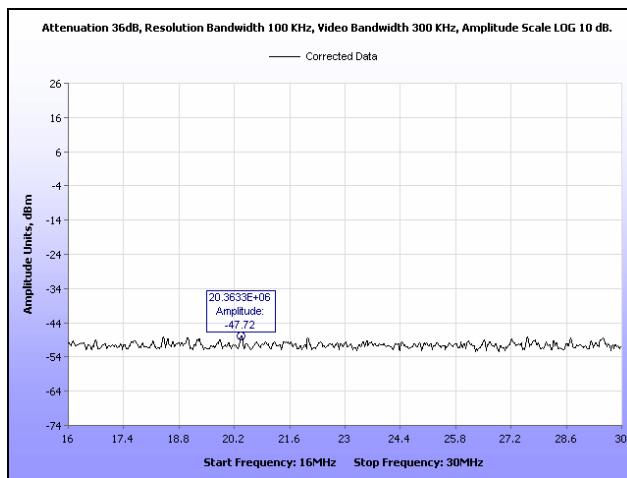


**Plot 196. Conducted Spurious Emissions, 125 kbps, 250 kHz, High Channel, 1 GHz – 10 GHz, 12 dBi Antenna**

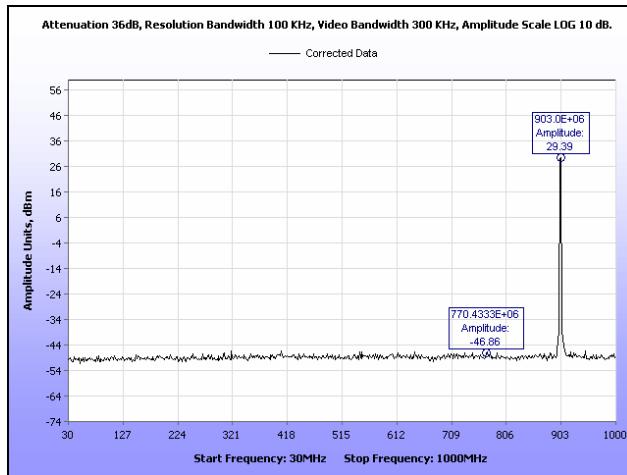
## Conducted Spurious Emissions, 250 kbps, 250 kHz, Test Results



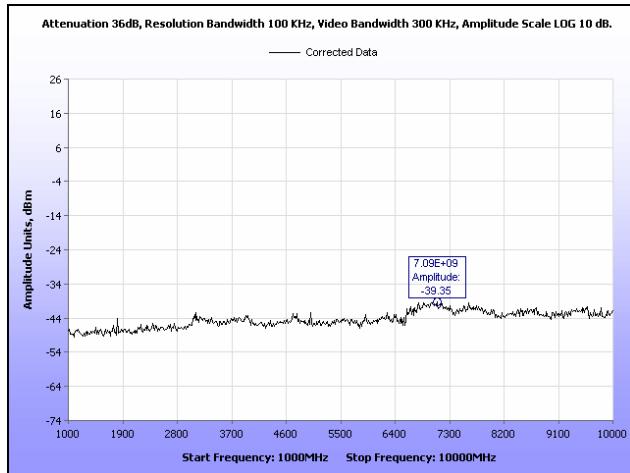
Plot 197. Conducted Spurious Emissions, 250 kbps, 250 kHz, Low Channel, Amplitude, 1 dBi Antenna



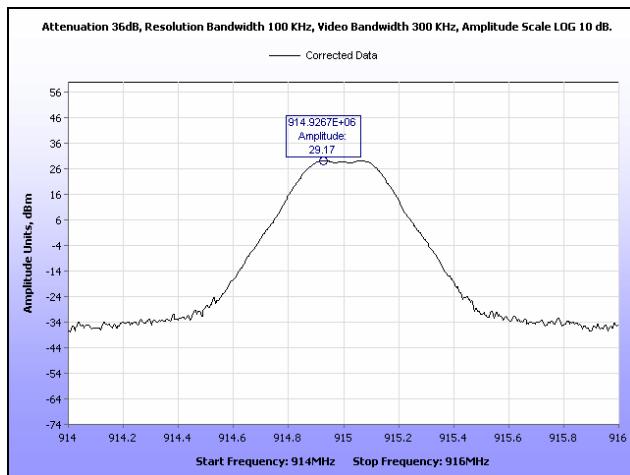
Plot 198. Conducted Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 16 MHz – 30 MHz, 1 dBi Antenna



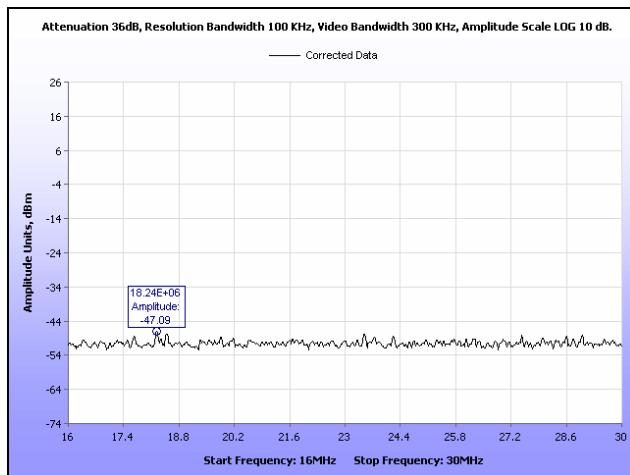
Plot 199. Conducted Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 30 MHz – 1 GHz, 1 dBi Antenna



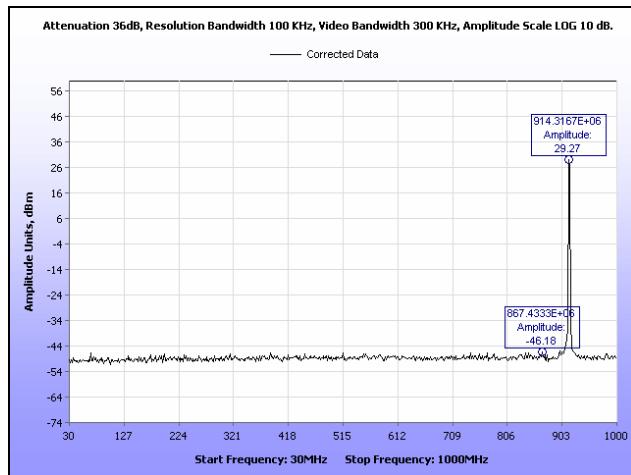
**Plot 200. Conducted Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



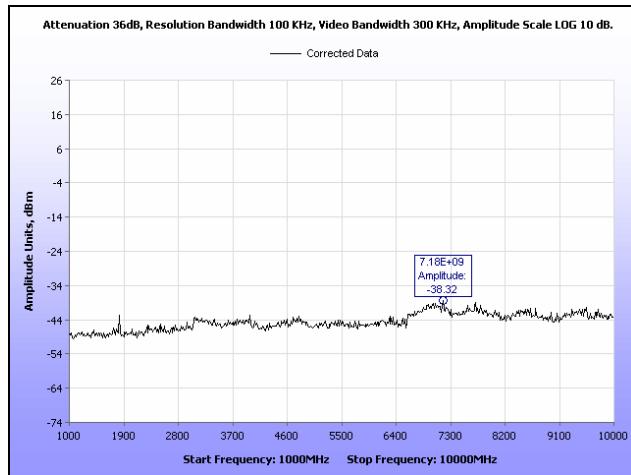
**Plot 201. Conducted Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, Amplitude, 1 dBi Antenna**



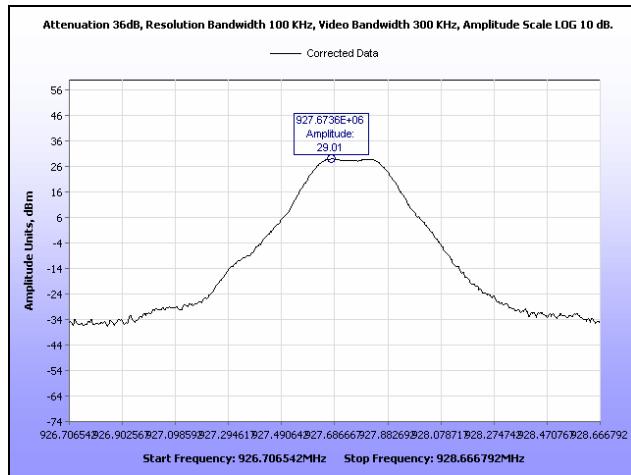
**Plot 202. Conducted Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 16 MHz – 30 MHz, 1 dBi Antenna**



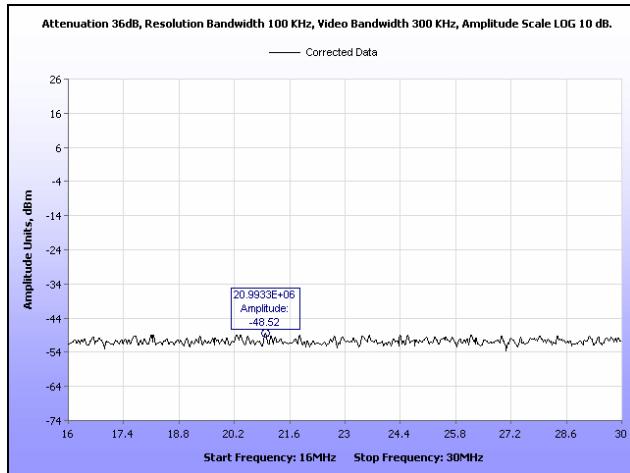
**Plot 203. Conducted Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 30 MHz – 1 GHz, 1 dBi Antenna**



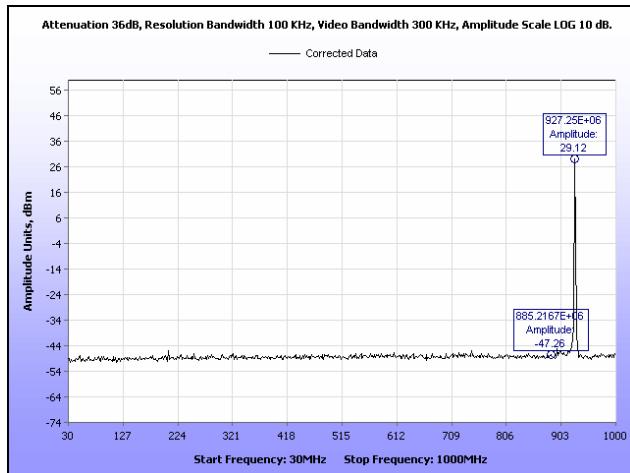
**Plot 204. Conducted Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



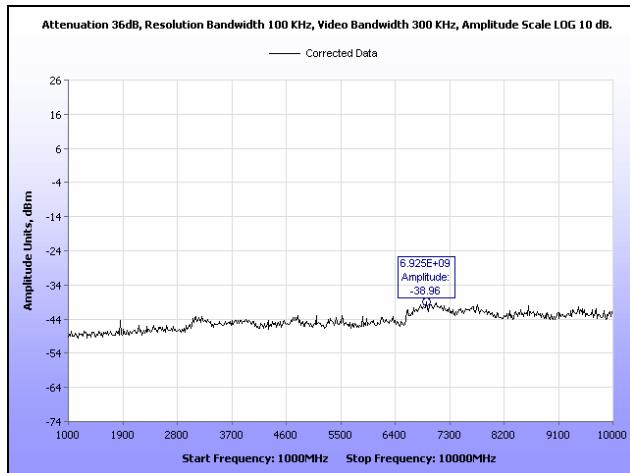
**Plot 205. Conducted Spurious Emissions, 250 kbps, 250 kHz, High Channel, Amplitude, 1 dBi Antenna**



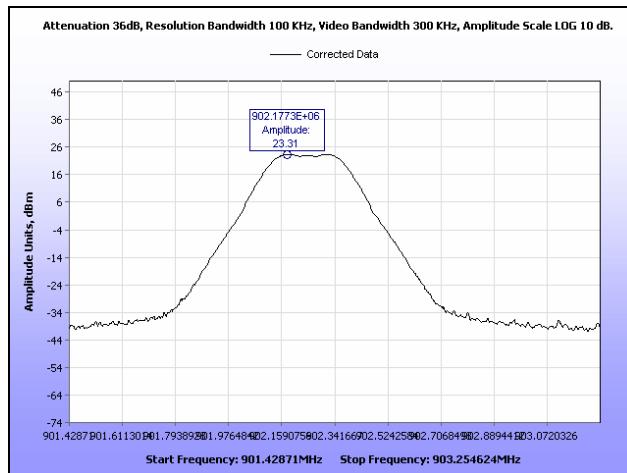
**Plot 206. Conducted Spurious Emissions, 250 kbps, 250 kHz, High Channel, 16 MHz – 30 MHz, 1 dBi Antenna**



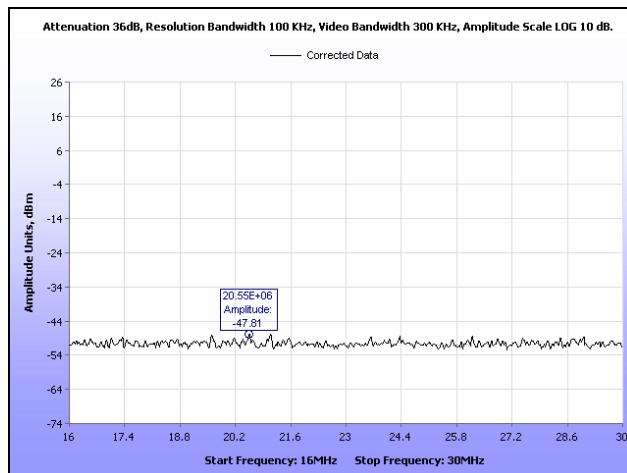
**Plot 207. Conducted Spurious Emissions, 250 kbps, 250 kHz, High Channel, 30 MHz – 1 GHz, 1 dBi Antenna**



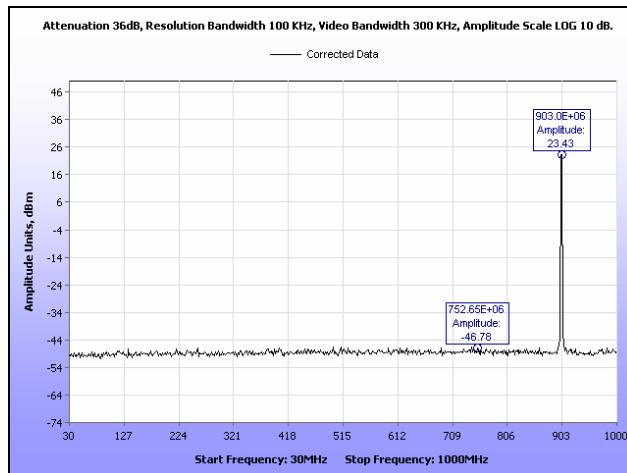
**Plot 208. Conducted Spurious Emissions, 250 kbps, 250 kHz, High Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



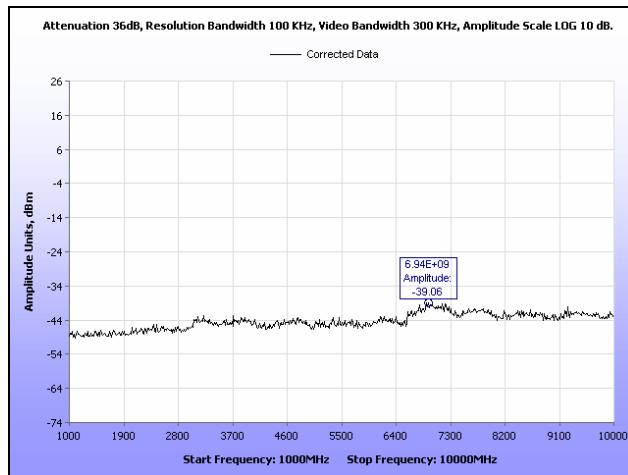
**Plot 209. Conducted Spurious Emissions, 250 kbps, 250 kHz, Low Channel, Amplitude, 12 dBi Antenna**



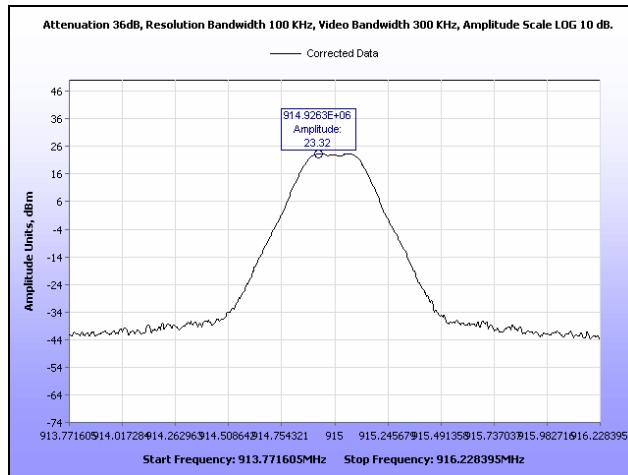
**Plot 210. Conducted Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 16 MHz – 30 MHz, 12 dBi Antenna**



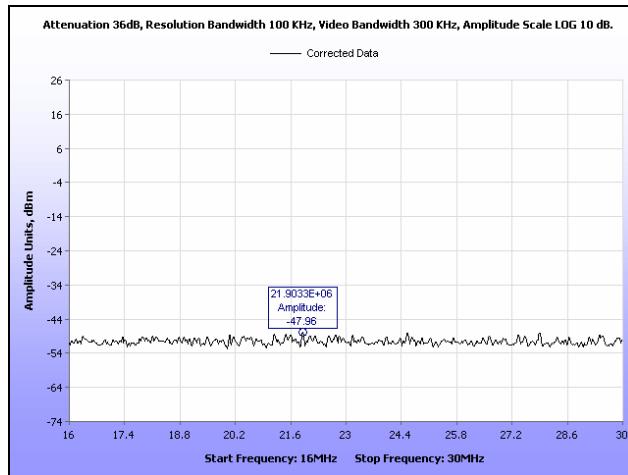
**Plot 211. Conducted Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 30 MHz – 1 GHz, 12 dBi Antenna**



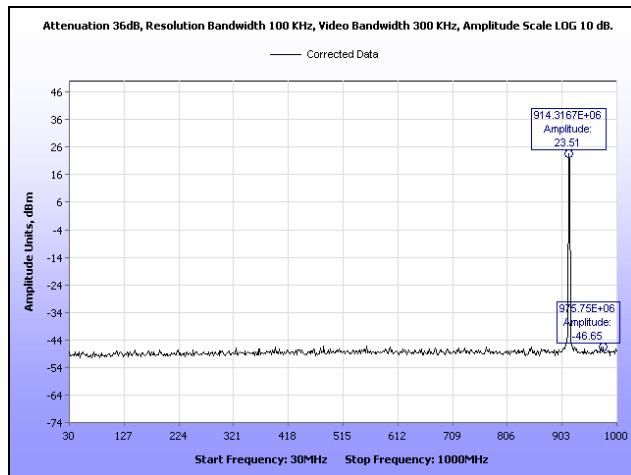
**Plot 212. Conducted Spurious Emissions, 250 kbps, 250 kHz, Low Channel, 1 GHz – 10 GHz, 12 dBi Antenna**



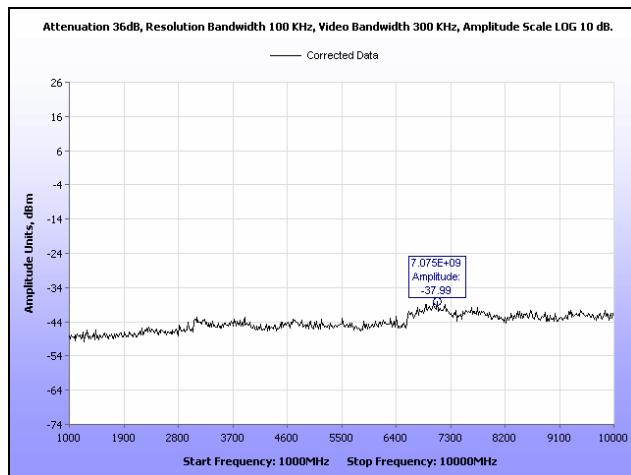
**Plot 213. Conducted Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, Amplitude, 12 dBi Antenna**



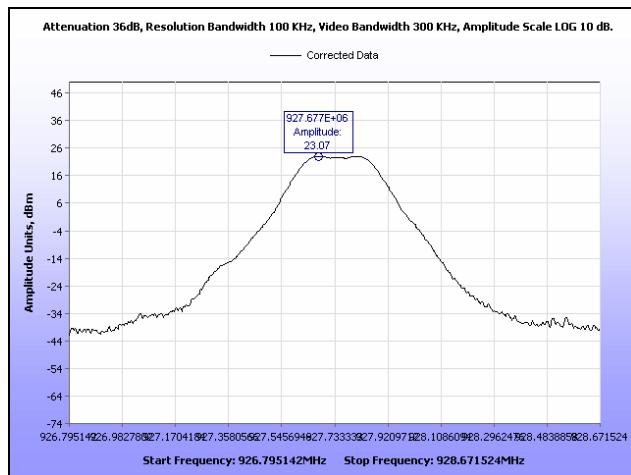
**Plot 214. Conducted Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 16 MHz – 30 MHz, 12 dBi Antenna**



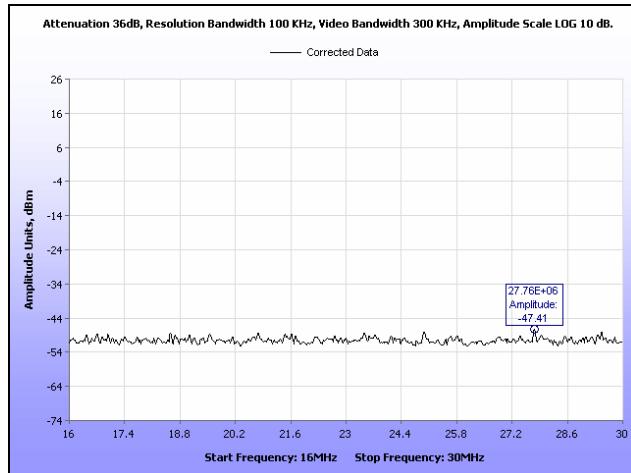
**Plot 215. Conducted Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 30 MHz – 1 GHz, 12 dBi Antenna**



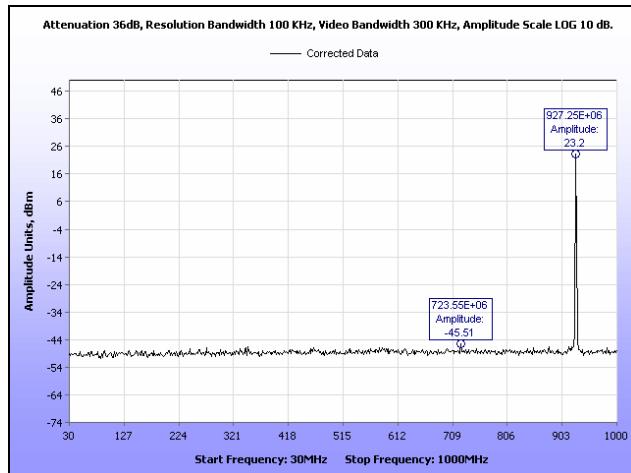
**Plot 216. Conducted Spurious Emissions, 250 kbps, 250 kHz, Mid Channel, 1 GHz – 10 GHz, 12 dBi Antenna**



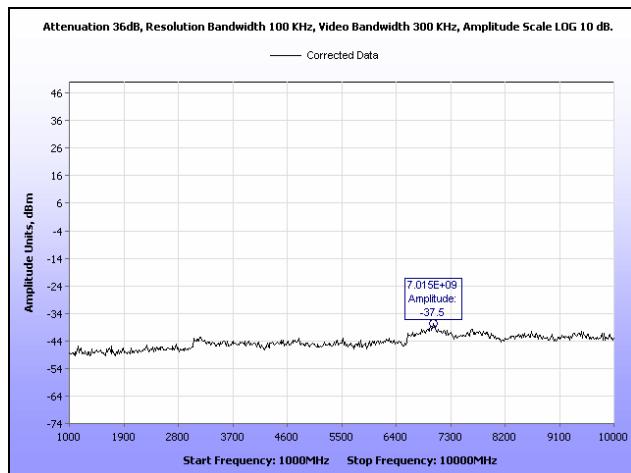
**Plot 217. Conducted Spurious Emissions, 250 kbps, 250 kHz, High Channel, Amplitude, 12 dBi Antenna**



**Plot 218. Conducted Spurious Emissions, 250 kbps, 250 kHz, High Channel, 16 MHz – 30 MHz, 12 dBi Antenna**

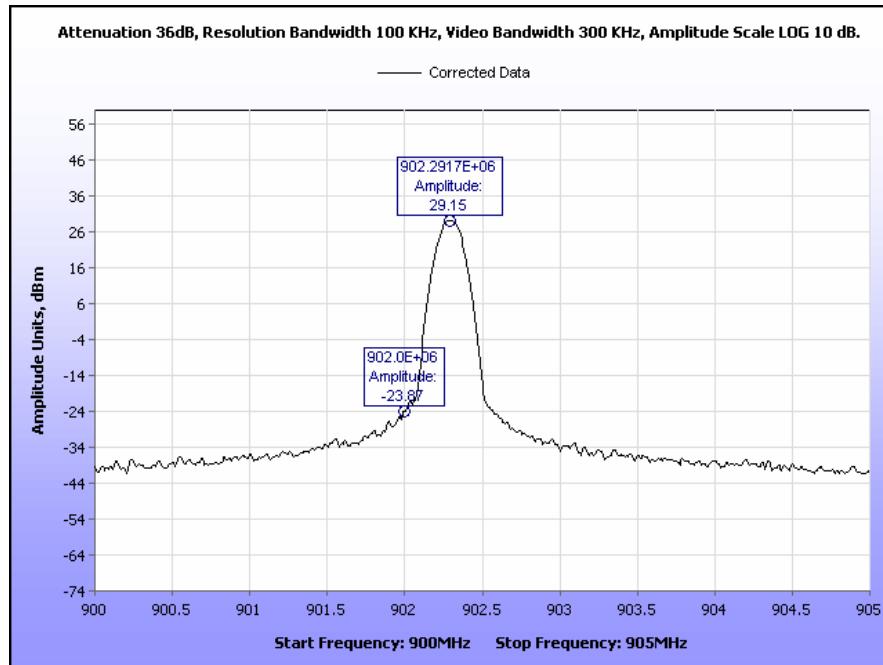


**Plot 219. Conducted Spurious Emissions, 250 kbps, 250 kHz, High Channel, 30 MHz – 1 GHz, 12 dBi Antenna**

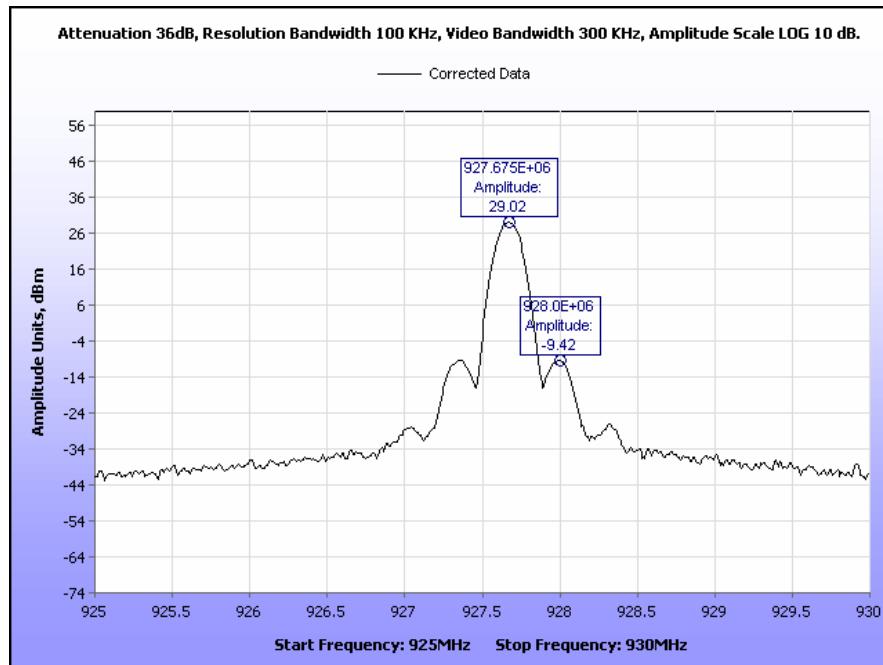


**Plot 220. Conducted Spurious Emissions, 250 kbps, 250 kHz, High Channel, 1 GHz – 10 GHz, 12 dBi Antenna**

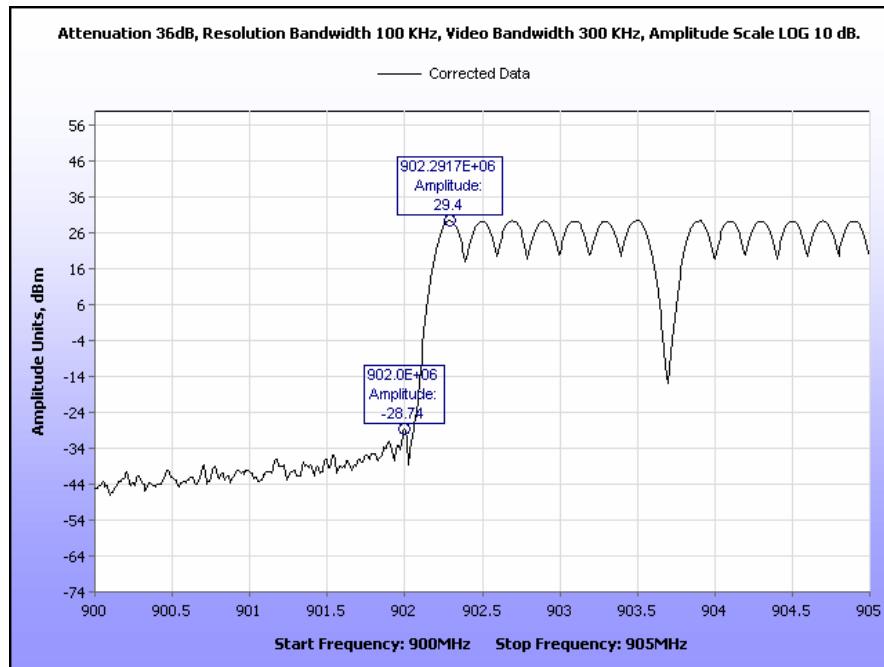
## Conducted Band Edge, 16 kbps, 25 kHz, Test Results



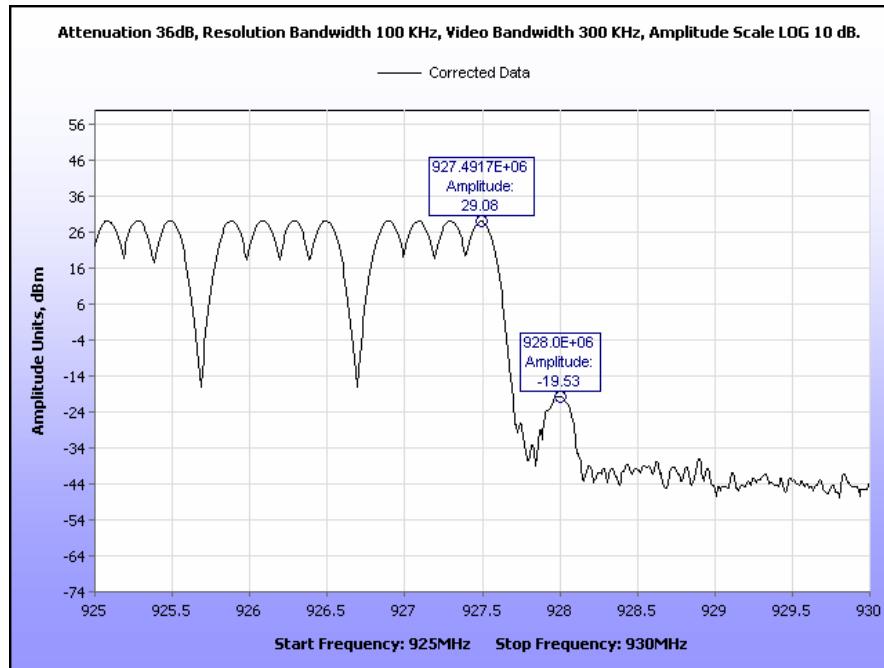
Plot 221. Conducted Band Edge, 16 kbps, 25 kHz, Fixed at Low End, 1 dBi Antenna



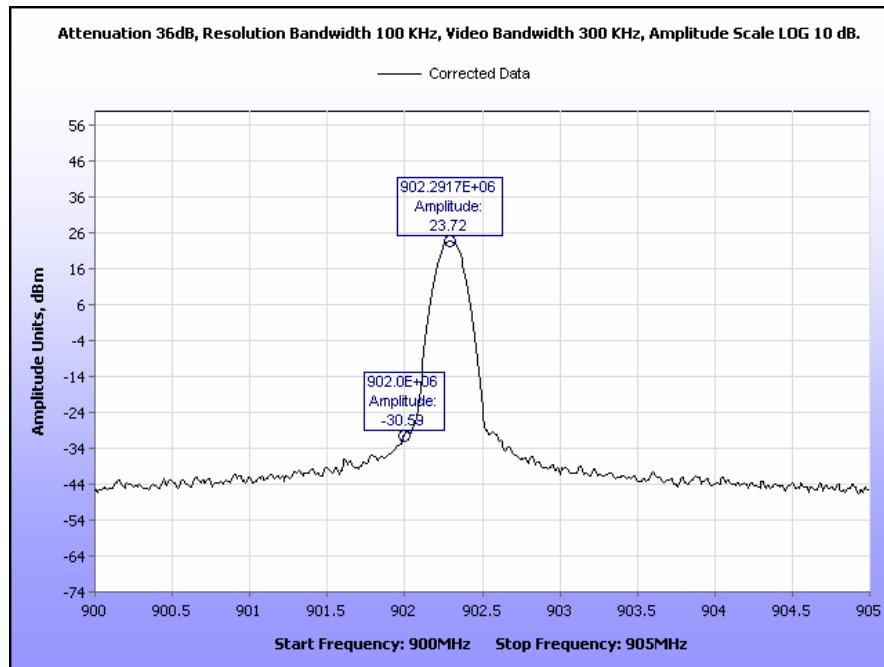
Plot 222. Conducted Band Edge, 16 kbps, 25 kHz, Fixed at High End, 1 dBi Antenna



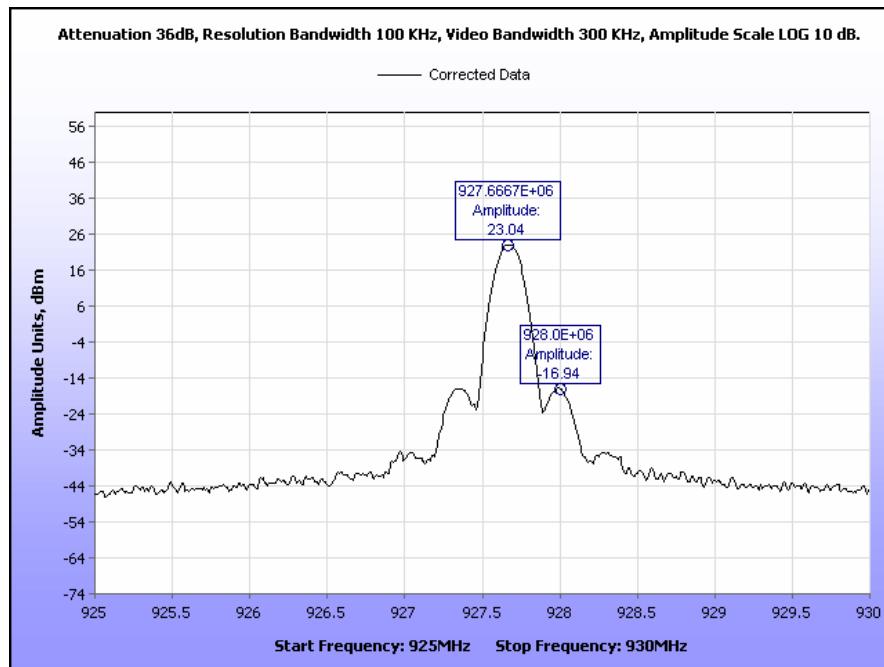
Plot 223. Conducted Band Edge, 16 kbps, 25 kHz, Hopping at Low End, 1 dBi Antenna



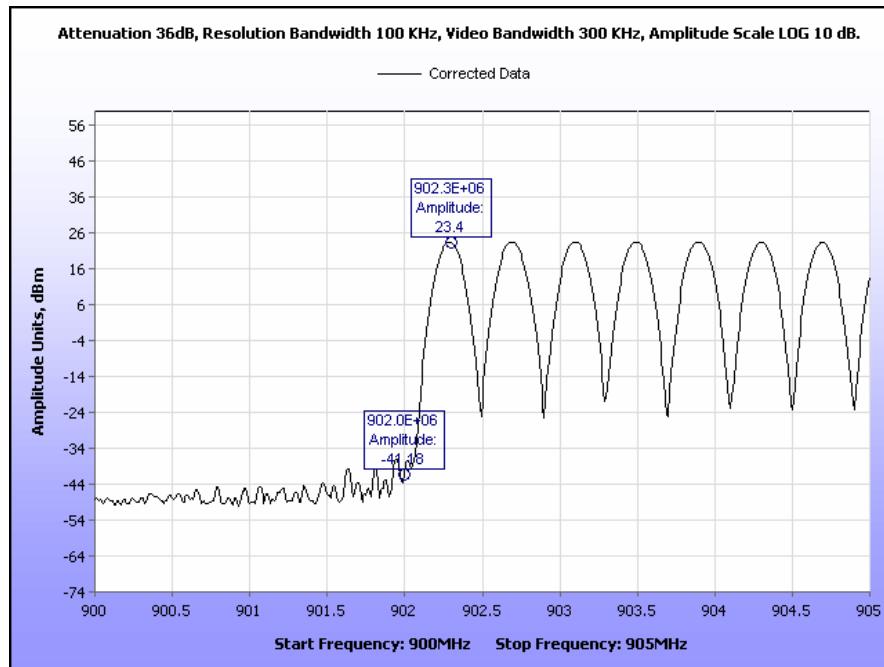
Plot 224. Conducted Band Edge, 16 kbps, 25 kHz, Hopping at High End, 1 dBi Antenna



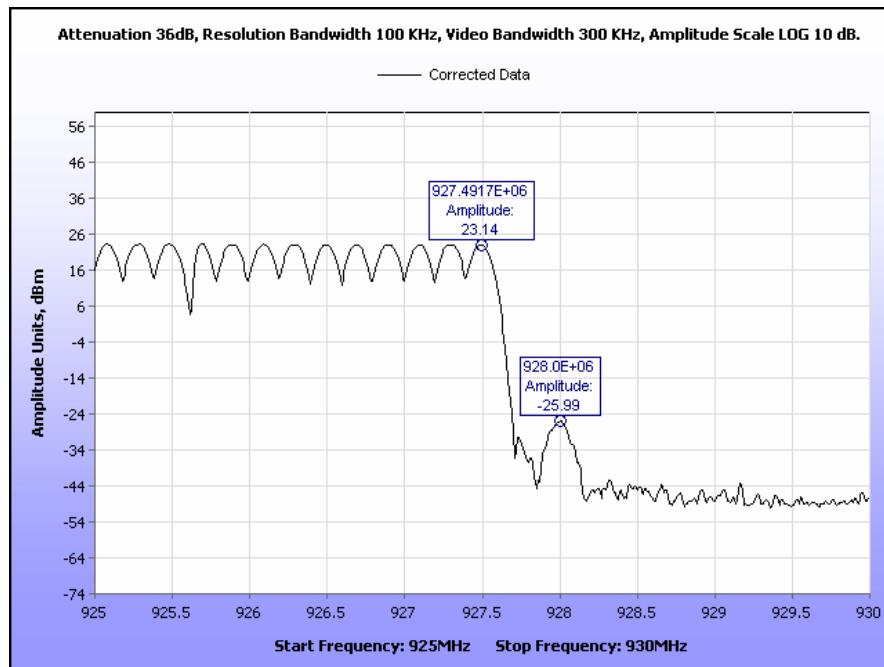
**Plot 225. Conducted Band Edge, 16 kbps, 25 kHz, Fixed at Low End, 12 dBi Antenna**



**Plot 226. Conducted Band Edge, 16 kbps, 25 kHz, Fixed at High End, 12 dBi Antenna**

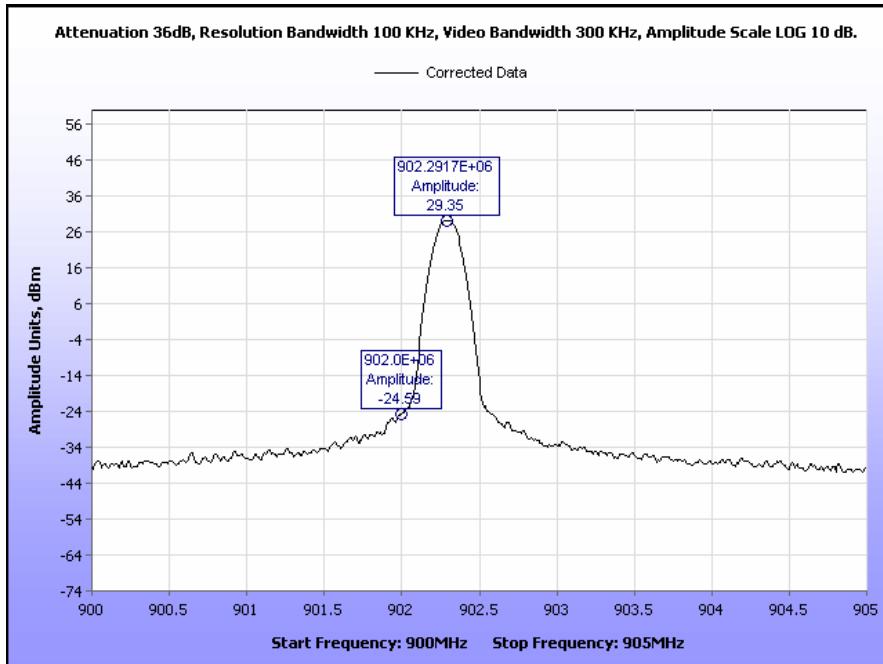


Plot 227. Conducted Band Edge, 16 kbps, 25 kHz, Hopping at Low End, 12 dBi Antenna

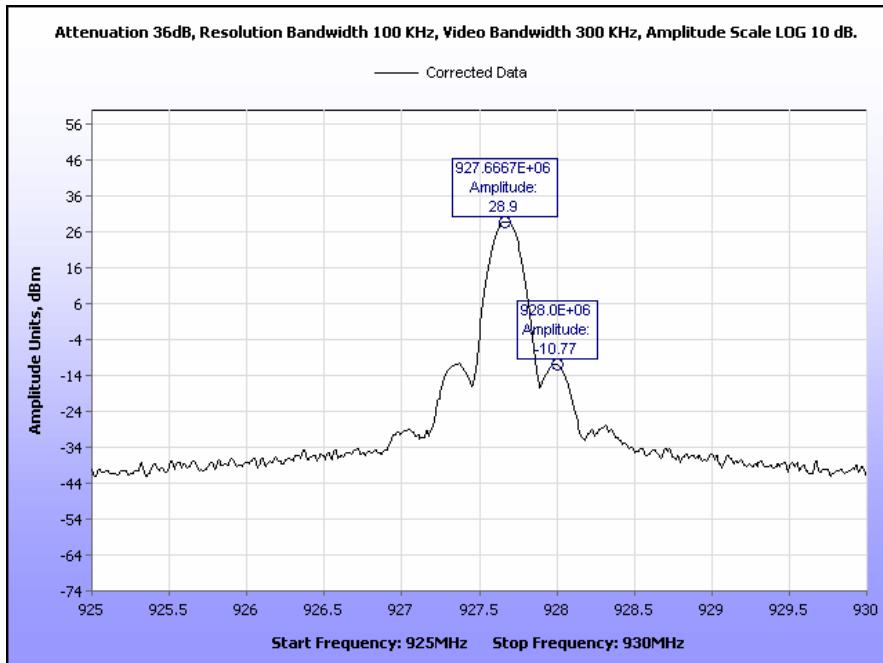


Plot 228. Conducted Band Edge, 16 kbps, 25 kHz, Hopping at High End, 12 dBi Antenna

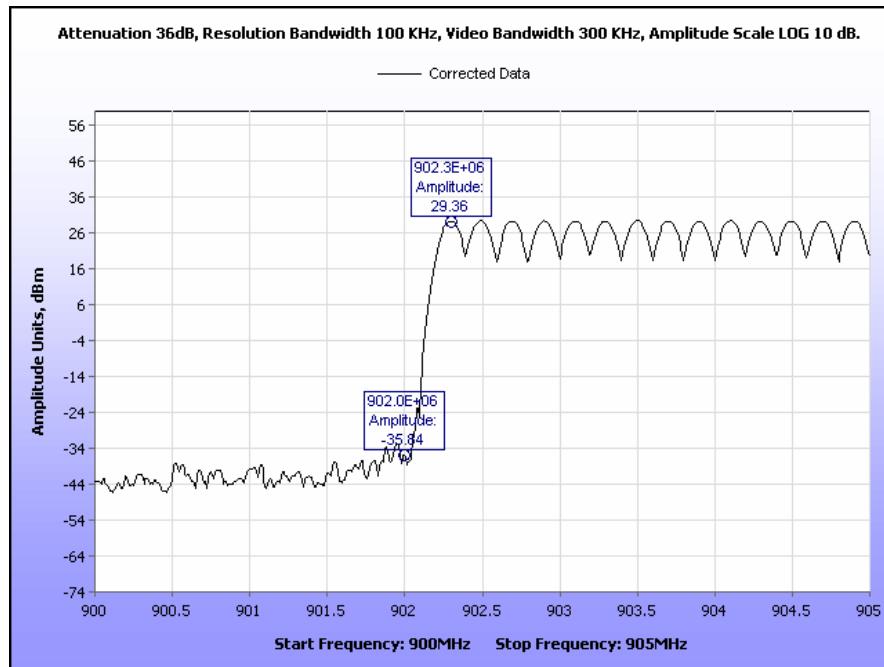
## Conducted Band Edge, 125 kbps, 250 kHz, Test Results



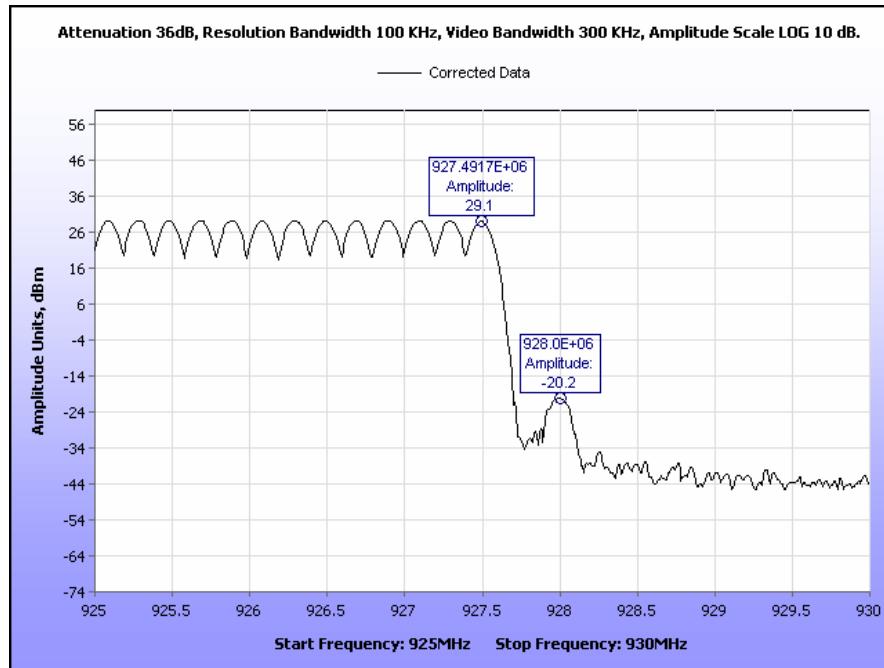
Plot 229. Conducted Band Edge, 125 kbps, 250 kHz, Fixed at Low End, 1 dBi Antenna



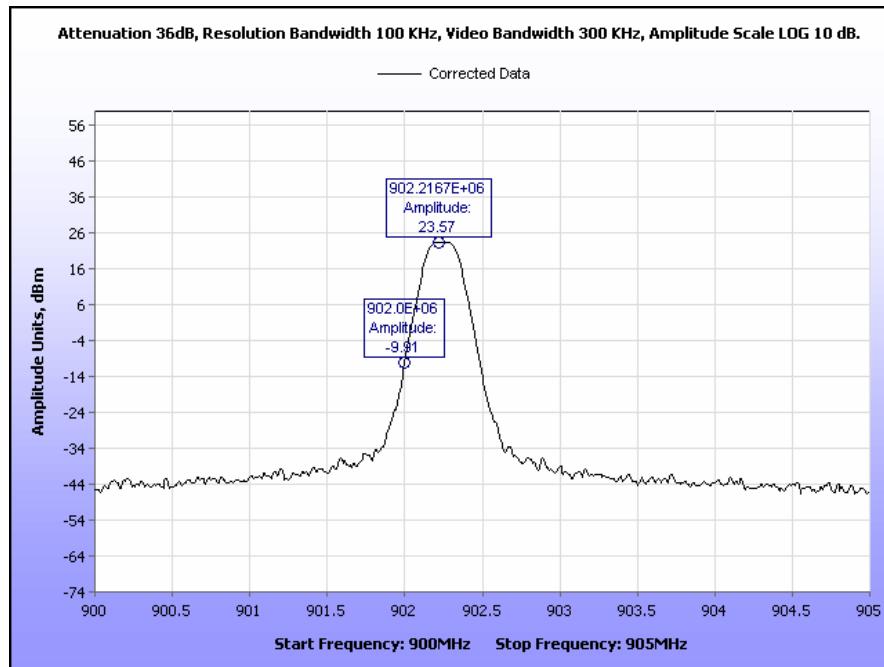
Plot 230. Conducted Band Edge, 125 kbps, 250 kHz, Fixed at High End, 1 dBi Antenna



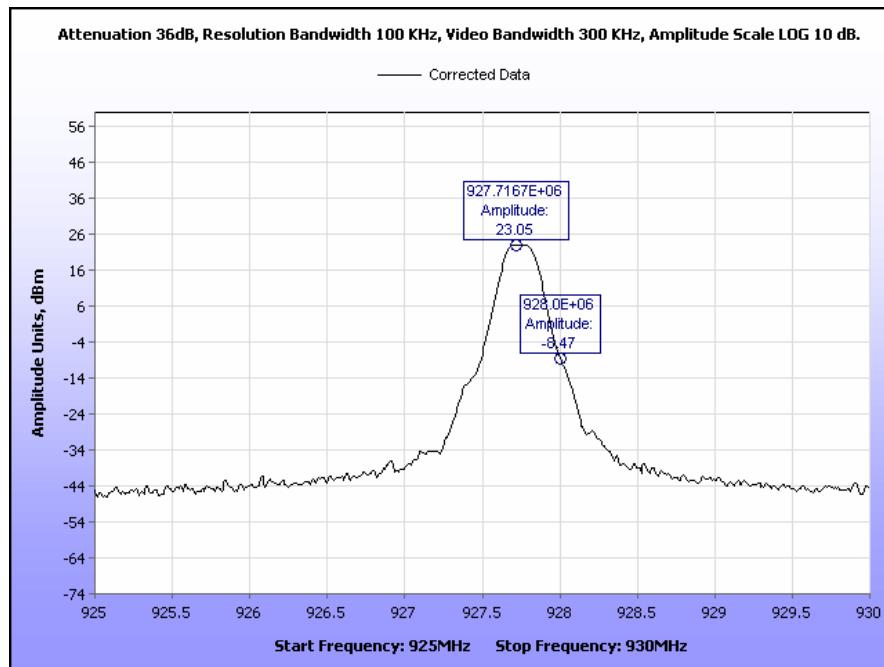
**Plot 231. Conducted Band Edge, 125 kbps, 250 kHz, Hopping at Low End, 1 dBi Antenna**



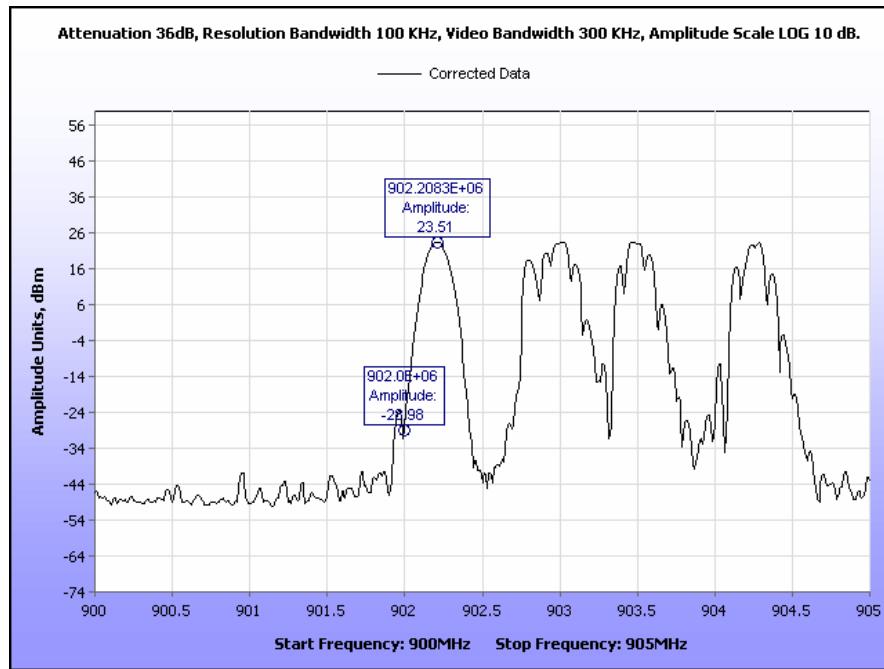
**Plot 232. Conducted Band Edge, 125 kbps, 250 kHz, Hopping at High End, 1 dBi Antenna**



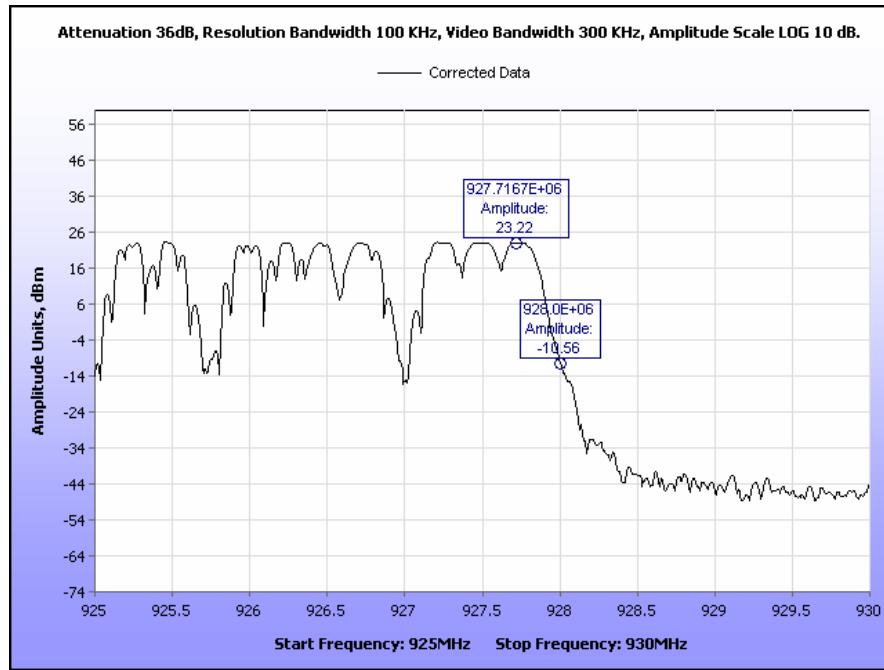
Plot 233. Conducted Band Edge, 125 kbps, 250 kHz, Fixed at Low End, 12 dBi Antenna



Plot 234. Conducted Band Edge, 125 kbps, 250 kHz, Fixed at High End, 12 dBi Antenna

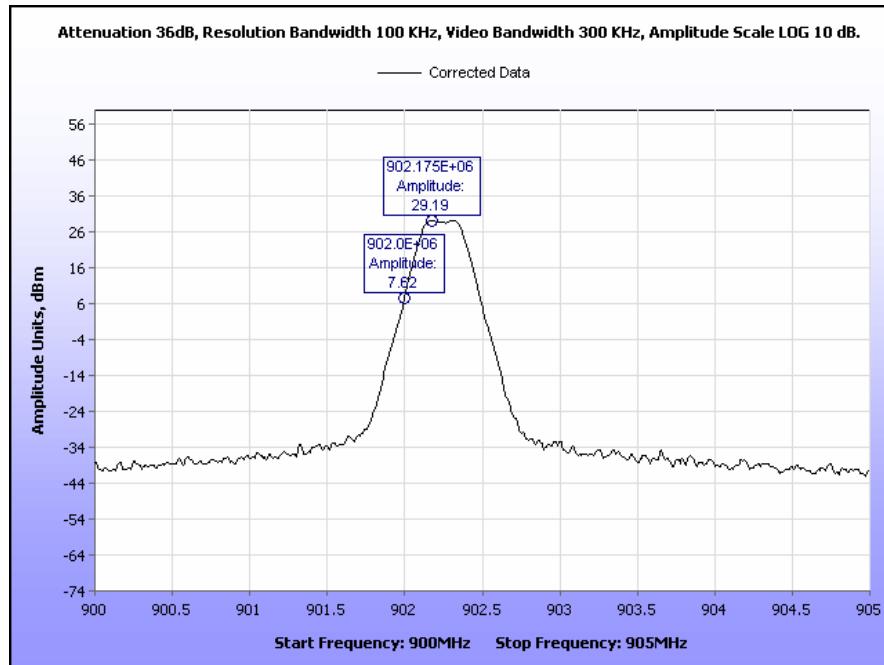


**Plot 235. Conducted Band Edge, 125 kbps, 250 kHz, Hopping at Low End, 12 dBi Antenna**

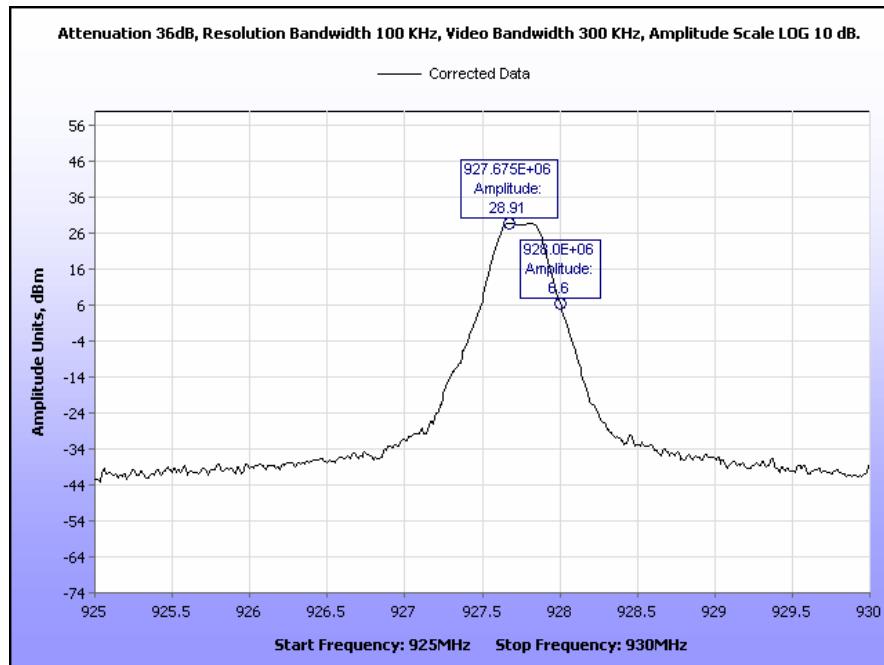


**Plot 236. Conducted Band Edge, 125 kbps, 250 kHz, Hopping at High End, 12 dBi Antenna**

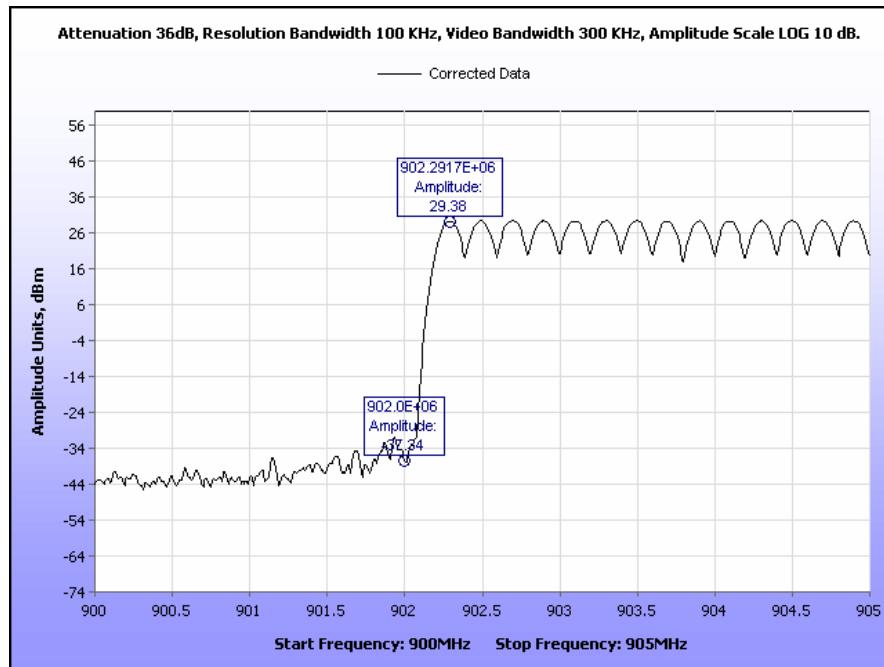
## Conducted Band Edge, 250 kbps, 250 kHz, Test Results



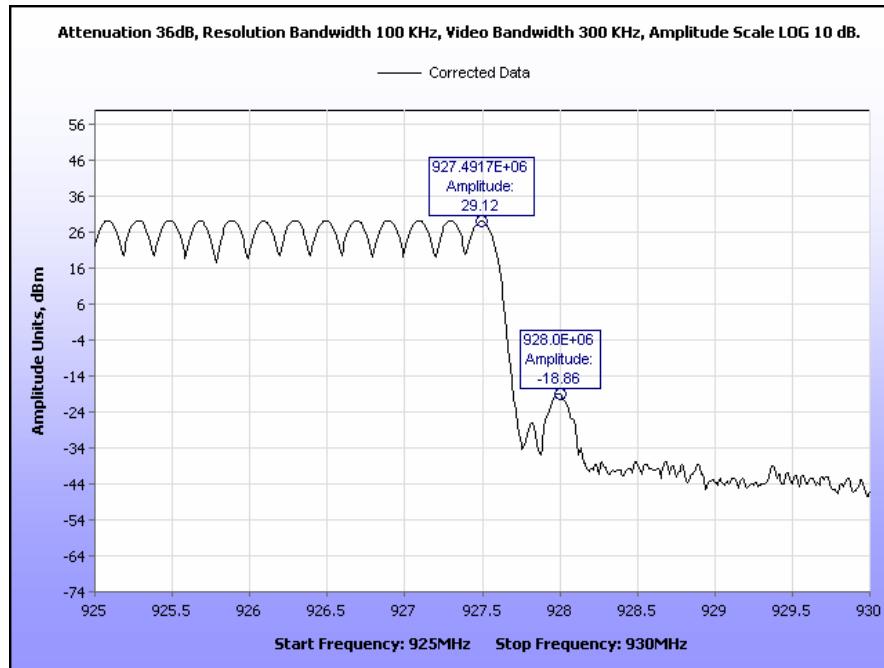
Plot 237. Conducted Band Edge, 250 kbps, 250 kHz, Fixed at Low End, 1 dBi Antenna



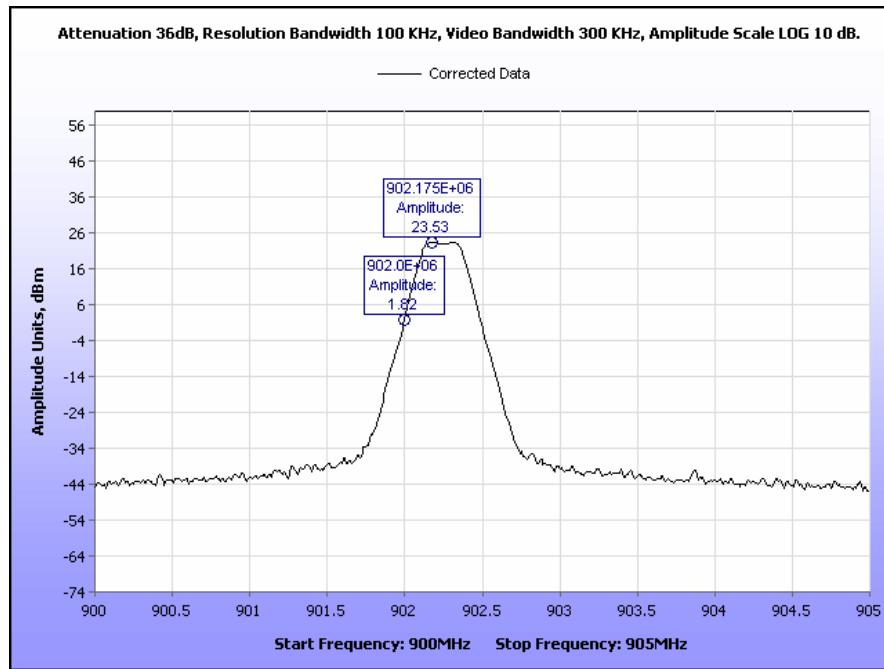
Plot 238. Conducted Band Edge, 250 kbps, 250 kHz, Fixed at High End, 1 dBi Antenna



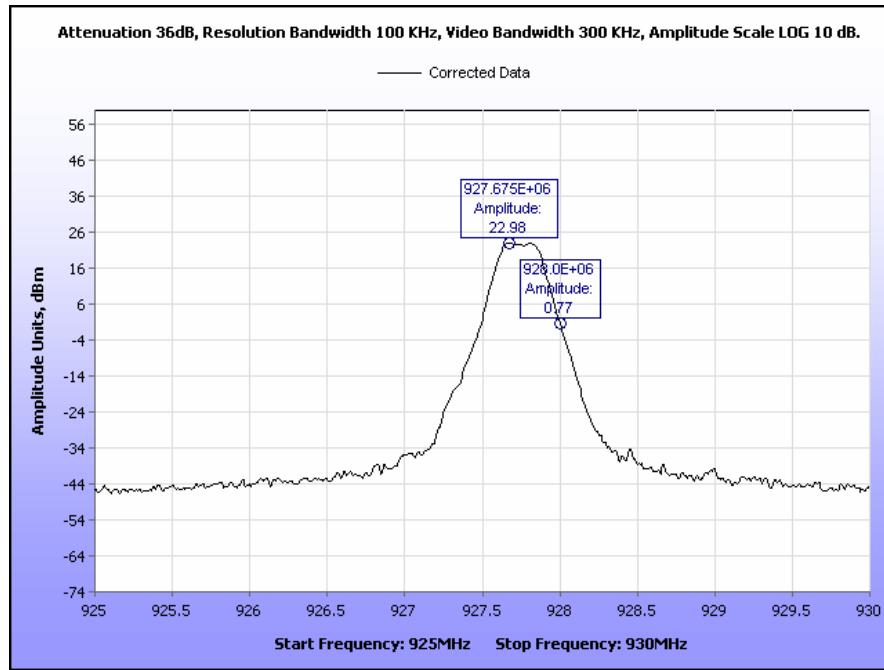
**Plot 239. Conducted Band Edge, 250 kbps, 250 kHz, Hopping at Low End, 1 dBi Antenna**



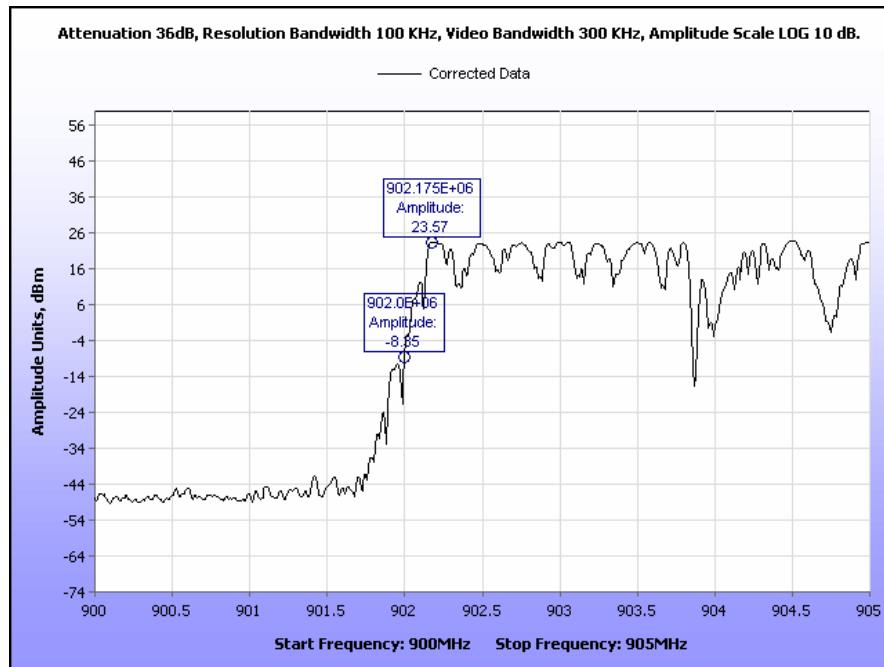
**Plot 240. Conducted Band Edge, 250 kbps, 250 kHz, Hopping at High End, 1 dBi Antenna**



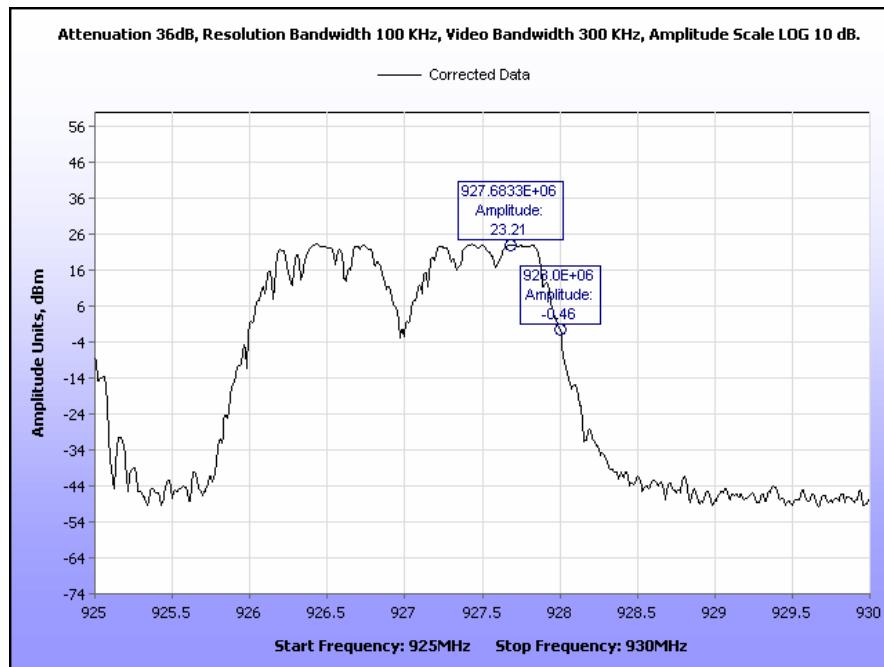
Plot 241. Conducted Band Edge, 250 kbps, 250 kHz, Fixed at Low End, 12 dBi Antenna



Plot 242. Conducted Band Edge, 250 kbps, 250 kHz, Fixed at High End, 12 dBi Antenna



**Plot 243. Conducted Band Edge, 250 kbps, 250 kHz, Hopping at Low End, 12 dBi Antenna**



**Plot 244. Conducted Band Edge, 250 kbps, 250 kHz, Hopping at High End, 12 dBi Antenna**

## 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 14.

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

**Table 14. Spurious Emission Limits for Receivers**

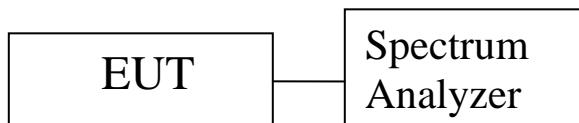
(b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

**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 300 kHz resolution was used 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.

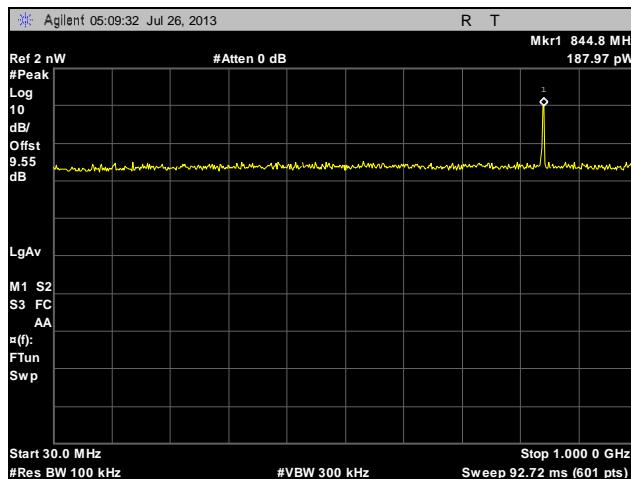
**Test Engineer(s):** Zijun Tong

**Test Date(s):** 07/26/13

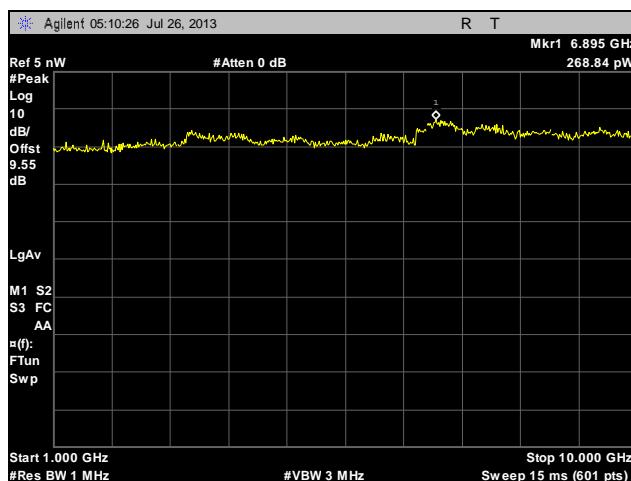


**Figure 5. Block Diagram, Conducted Receiver Spurious Emissions Test Setup**

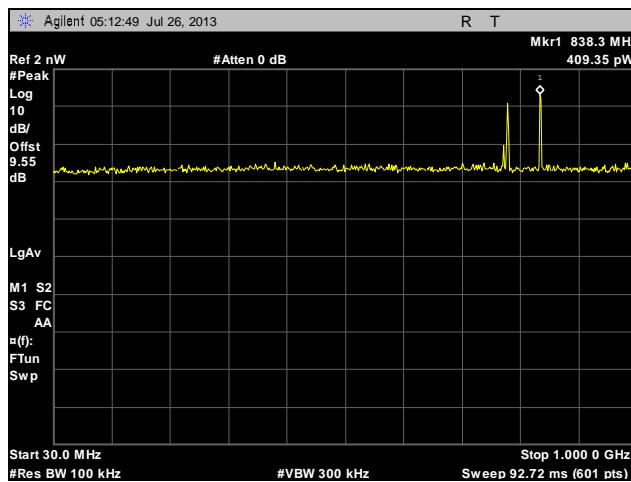
## Conducted Receiver Spurious Emissions, 16 kbps, 25 kHz



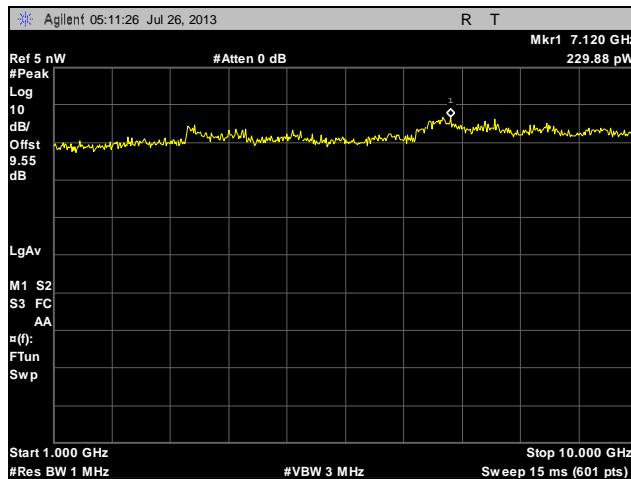
Plot 245. Receiver Spurious Emission, 16 kbps, 25 kHz, Low Channel 30 MHz – 1 GHz, 1 dBi Antenna



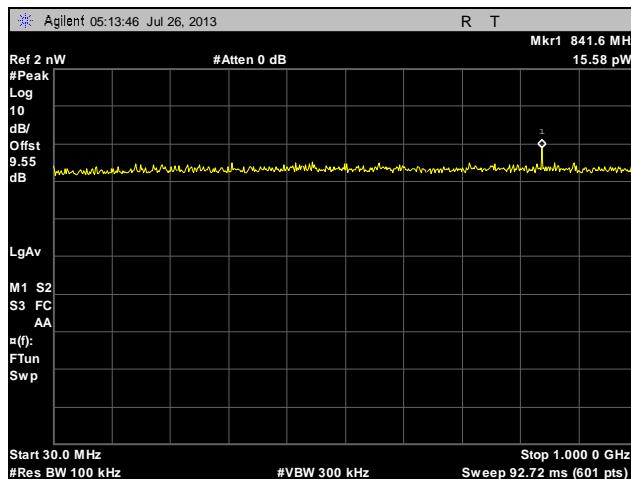
Plot 246. Receiver Spurious Emission, 16 kbps, 25 kHz, Low Channel, 1 GHz – 10 GHz, 1 dBi Antenna



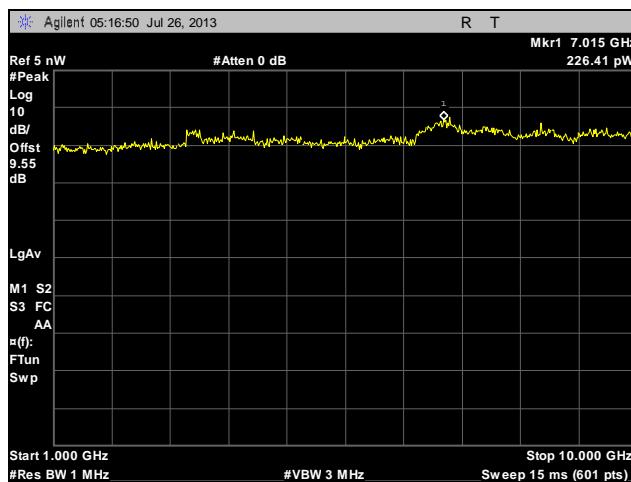
Plot 247. Receiver Spurious Emission, 16 kbps, 25 kHz, Mid Channel 30 MHz – 1 GHz, 1 dBi Antenna



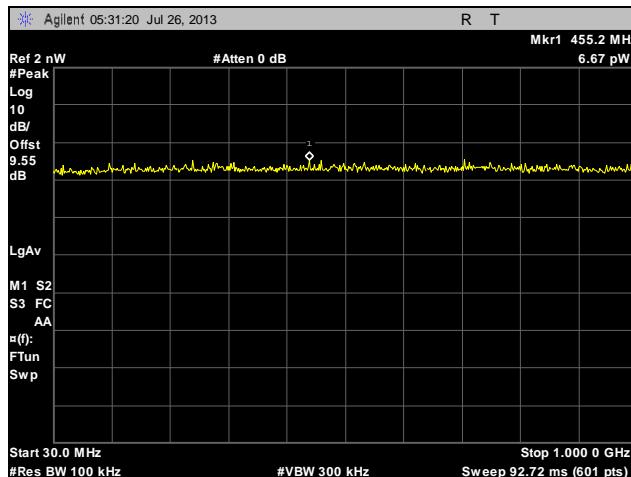
**Plot 248. Receiver Spurious Emission, 16 kbps, 25 kHz, Mid Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



**Plot 249. Receiver Spurious Emission, 16 kbps, 25 kHz, High Channel 30 MHz – 1 GHz, 1 dBi Antenna**



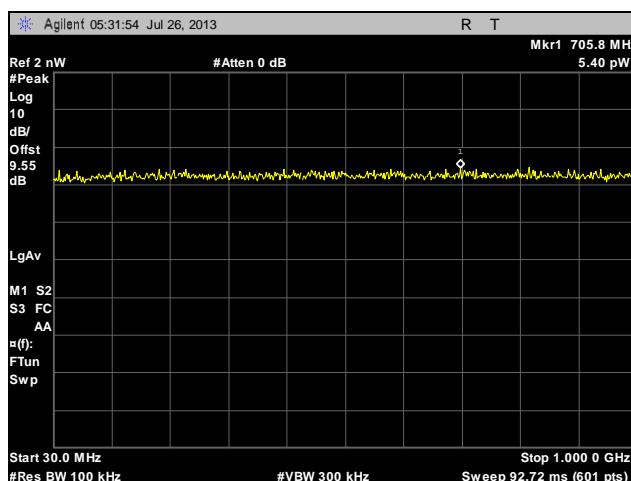
**Plot 250. Receiver Spurious Emission, 16 kbps, 25 kHz, High Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



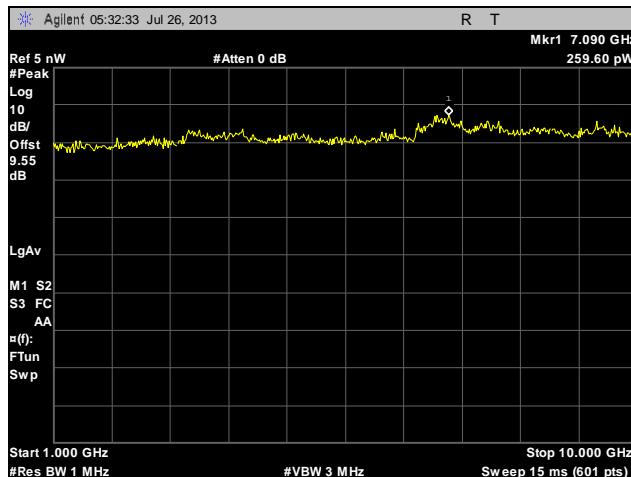
**Plot 251.** Receiver Spurious Emission, 16 kbps, 25 kHz, Low Channel 30 MHz – 1 GHz, 12 dBi Antenna



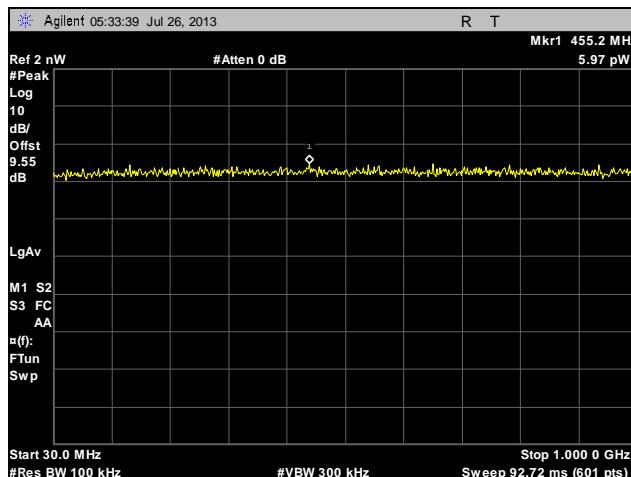
**Plot 252.** Receiver Spurious Emission, 16 kbps, 25 kHz, Low Channel, 1 GHz – 10 GHz, 12 dBi Antenna



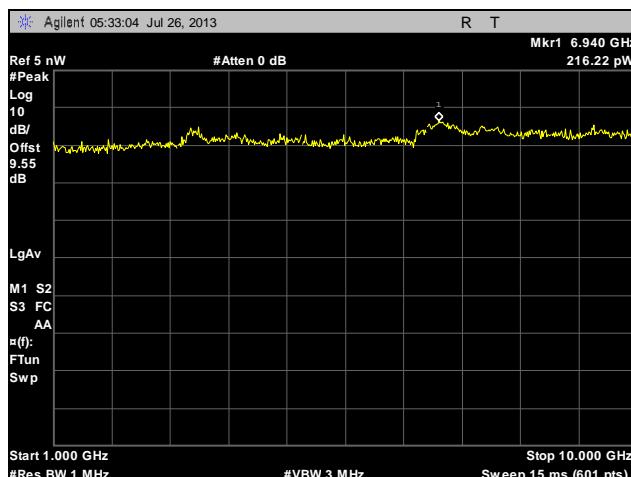
**Plot 253.** Receiver Spurious Emission, 16 kbps, 25 kHz, Mid Channel 30 MHz – 1 GHz, 12 dBi Antenna



**Plot 254. Receiver Spurious Emission, 16 kbps, 25 kHz, Mid Channel, 1 GHz – 10 GHz, 12 dBi Antenna**

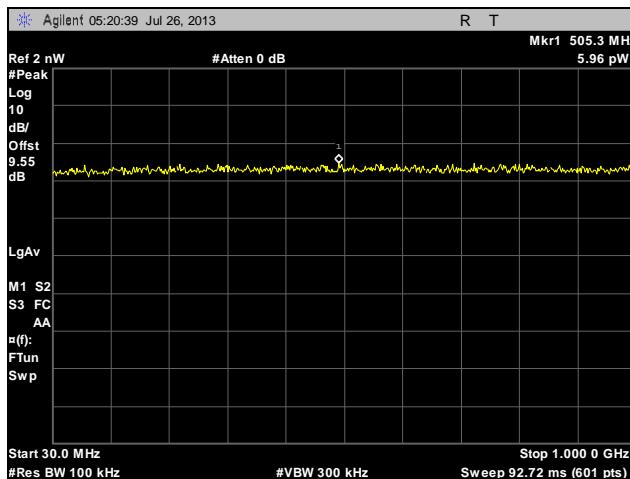


**Plot 255. Receiver Spurious Emission, 16 kbps, 25 kHz, High Channel 30 MHz – 1 GHz, 12 dBi Antenna**

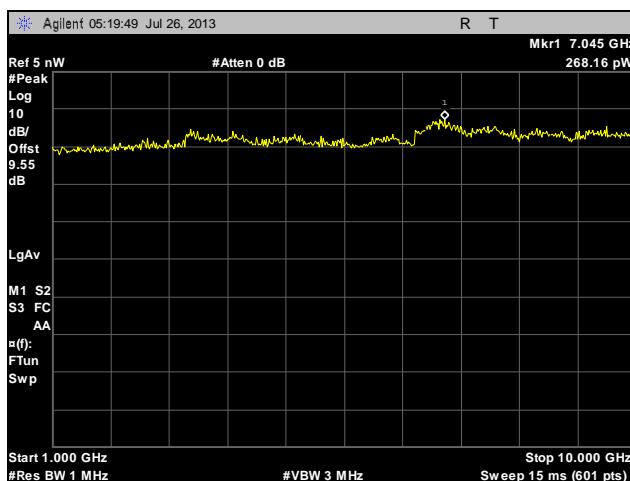


**Plot 256. Receiver Spurious Emission, 16 kbps, 25 kHz, High Channel, 1 GHz – 10 GHz, 12 dBi Antenna**

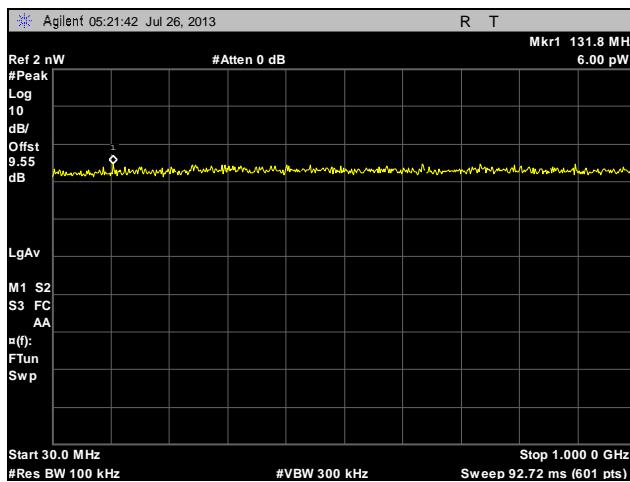
## Conducted Receiver Spurious Emissions, 125 kbps, 250 kHz



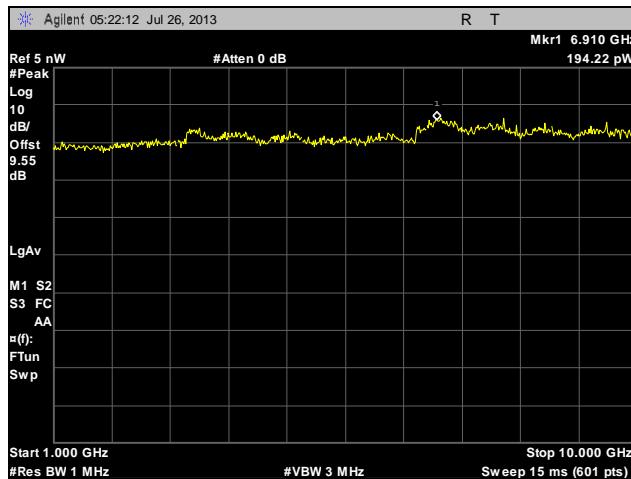
Plot 257. Receiver Spurious Emission, 125 kbps, 250 kHz, Low Channel 30 MHz – 1 GHz, 1 dBi Antenna



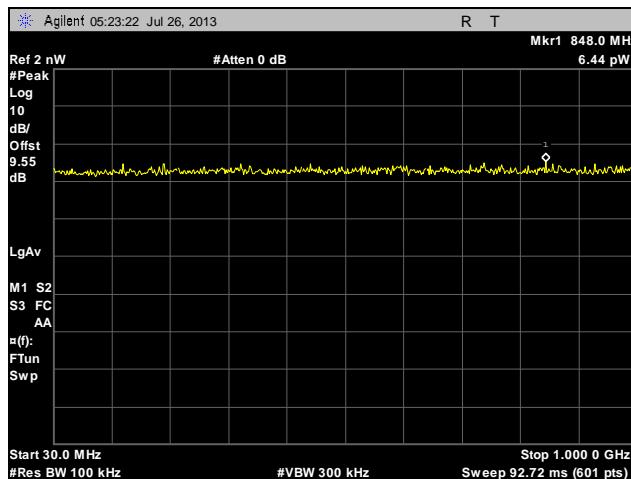
Plot 258. Receiver Spurious Emission, 125 kbps, 250 kHz, Low Channel, 1 GHz – 10 GHz, 1 dBi Antenna



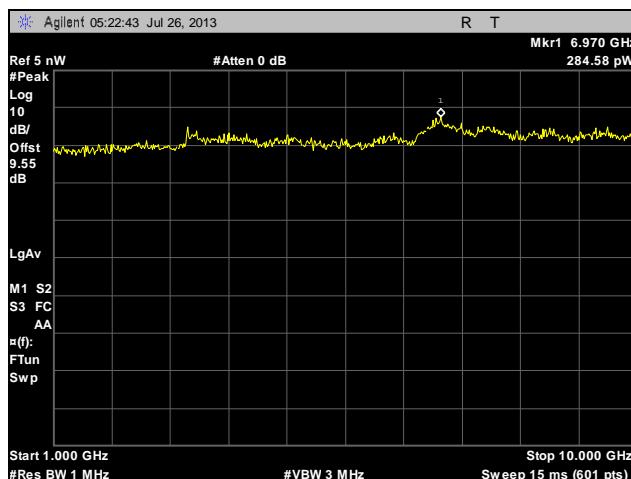
Plot 259. Receiver Spurious Emission, 125 kbps, 250 kHz, Mid Channel 30 MHz – 1 GHz, 1 dBi Antenna



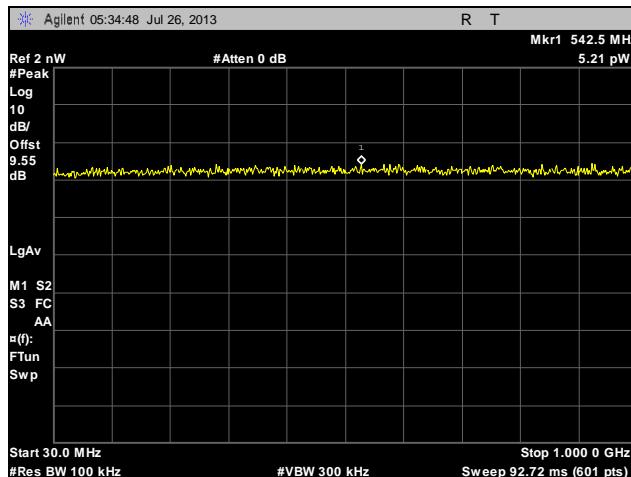
**Plot 260. Receiver Spurious Emission, 125 kbps, 250 kHz, Mid Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



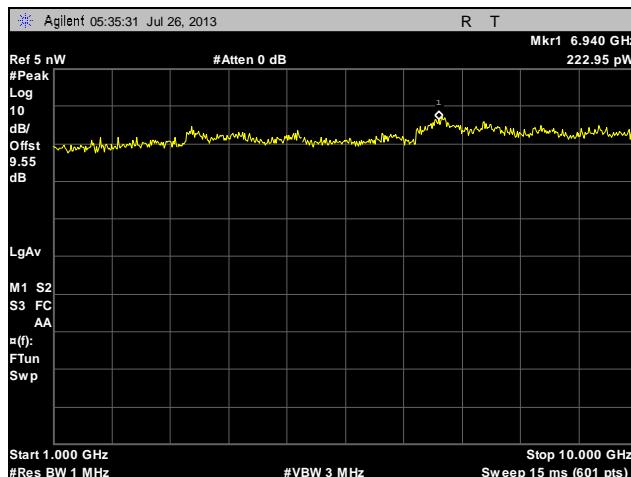
**Plot 261. Receiver Spurious Emission, 125 kbps, 250 kHz, High Channel 30 MHz – 1 GHz, 1 dBi Antenna**



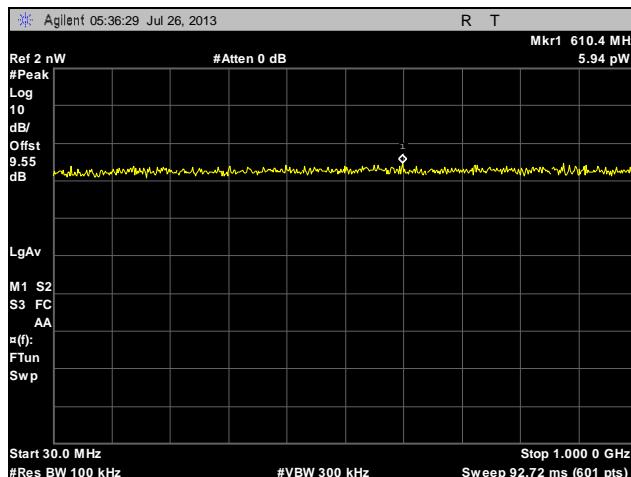
**Plot 262. Receiver Spurious Emission, 125 kbps, 250 kHz, High Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



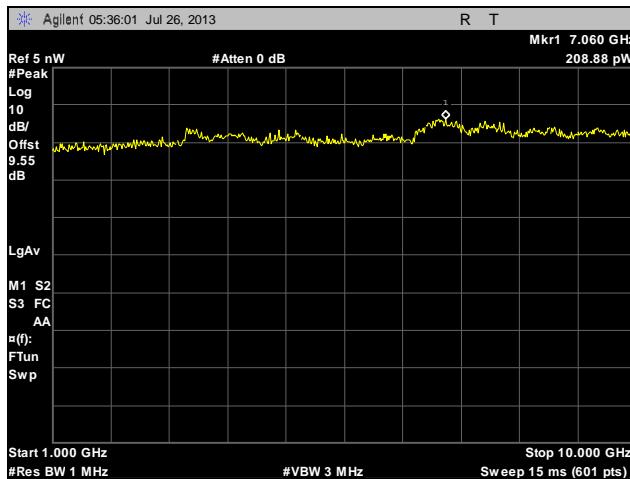
**Plot 263. Receiver Spurious Emission, 125 kbps, 250 kHz, Low Channel 30 MHz – 1 GHz, 12 dBi Antenna**



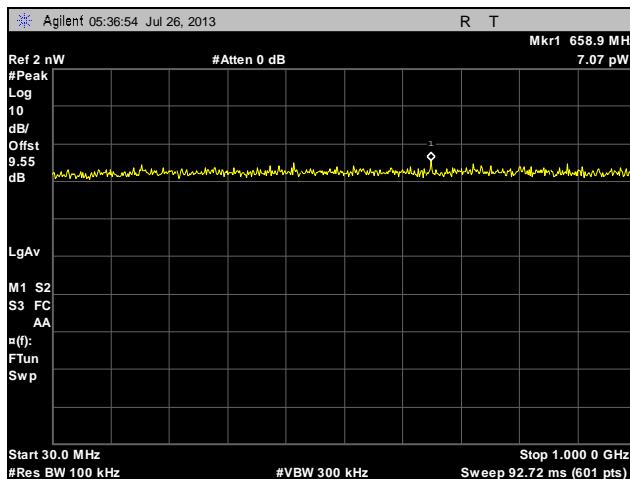
**Plot 264. Receiver Spurious Emission, 125 kbps, 250 kHz, Low Channel, 1 GHz – 10 GHz, 12 dBi Antenna**



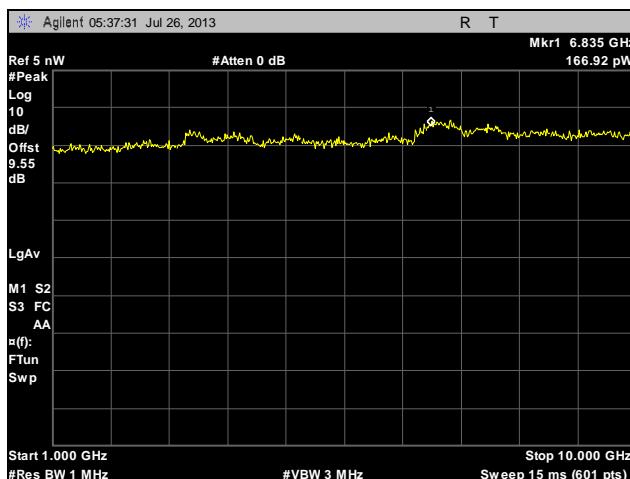
**Plot 265. Receiver Spurious Emission, 125 kbps, 250 kHz, Mid Channel 30 MHz – 1 GHz, 12 dBi Antenna**



**Plot 266.** Receiver Spurious Emission, 125 kbps, 250 kHz, Mid Channel, 1 GHz – 10 GHz, 12 dBi Antenna

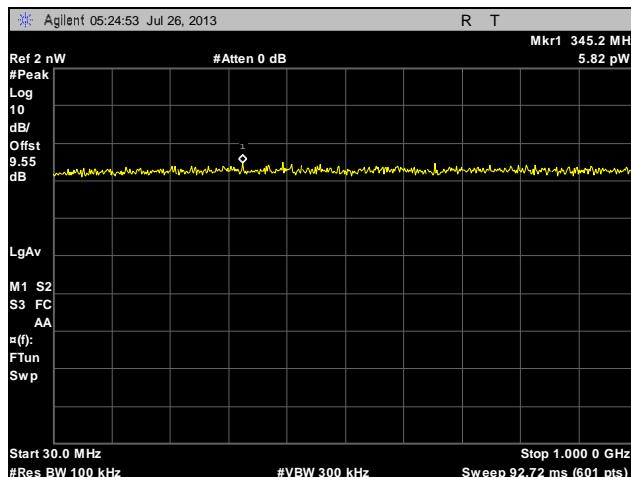


**Plot 267.** Receiver Spurious Emission, 125 kbps, 250 kHz, High Channel 30 MHz – 1 GHz, 12 dBi Antenna

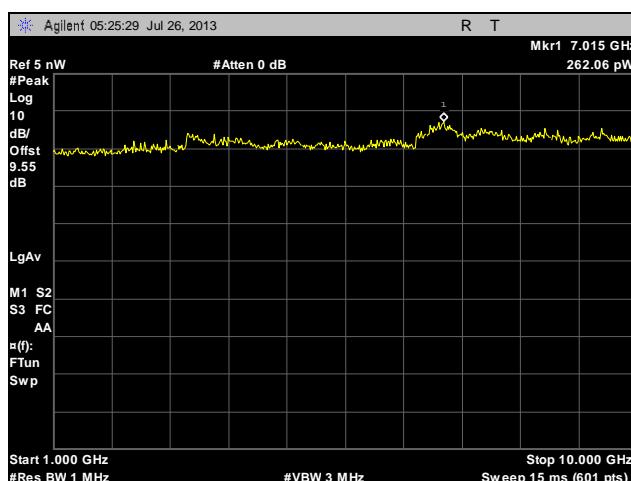


**Plot 268.** Receiver Spurious Emission, 125 kbps, 250 kHz, High Channel, 1 GHz – 10 GHz, 12 dBi Antenna

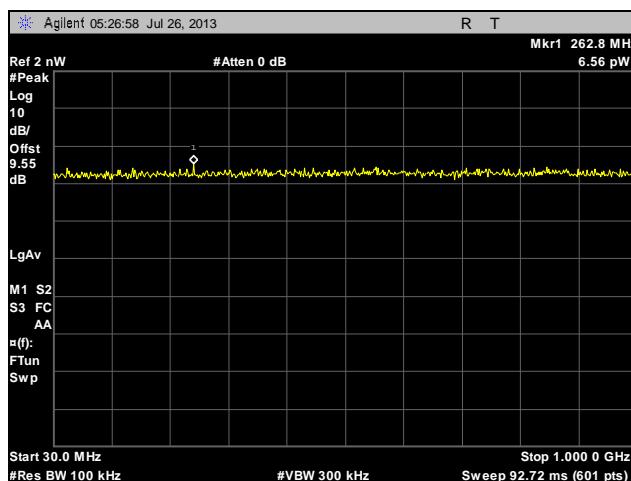
## Conducted Receiver Spurious Emissions, 250 kbps, 250 kHz



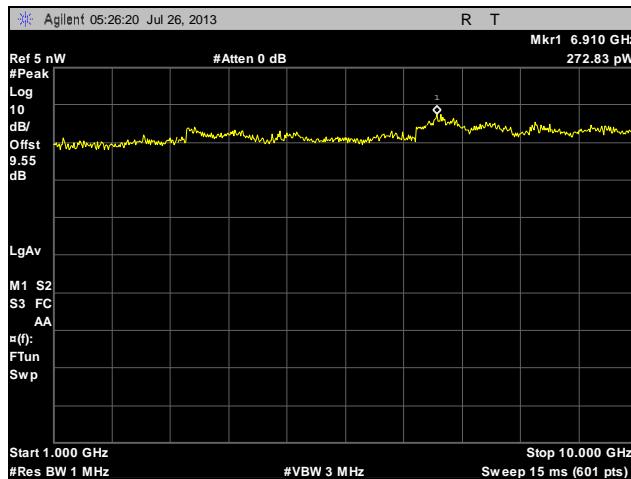
Plot 269. Receiver Spurious Emission, 250 kbps, 250 kHz, Low Channel 30 MHz – 1 GHz, 1 dBi Antenna



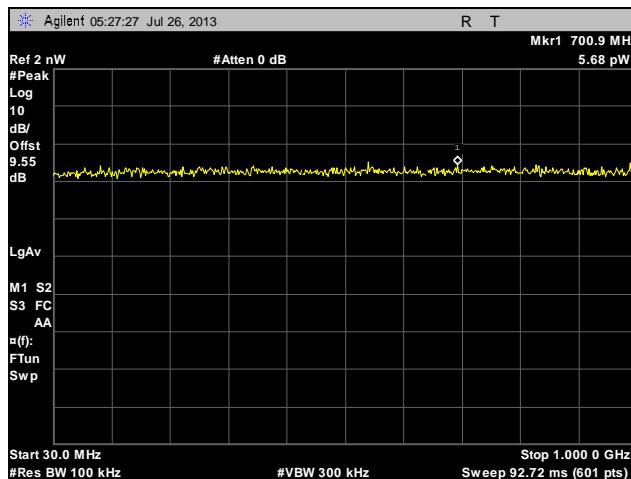
Plot 270. Receiver Spurious Emission, 250 kbps, 250 kHz, Low Channel, 1 GHz – 10 GHz, 1 dBi Antenna



Plot 271. Receiver Spurious Emission, 250 kbps, 250 kHz, Mid Channel 30 MHz – 1 GHz, 1 dBi Antenna



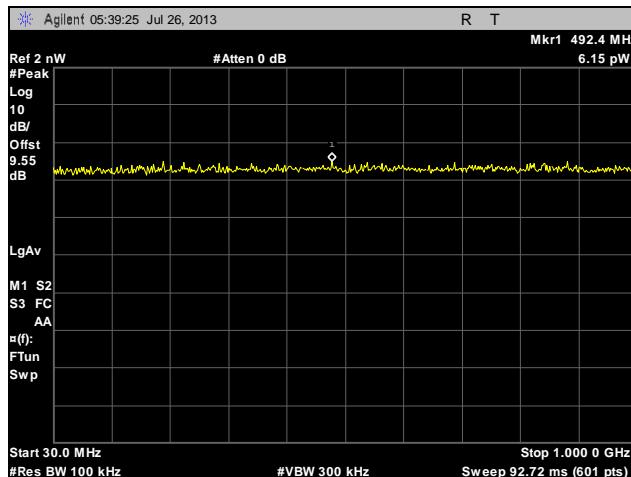
**Plot 272. Receiver Spurious Emission, 250 kbps, 250 kHz, Mid Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



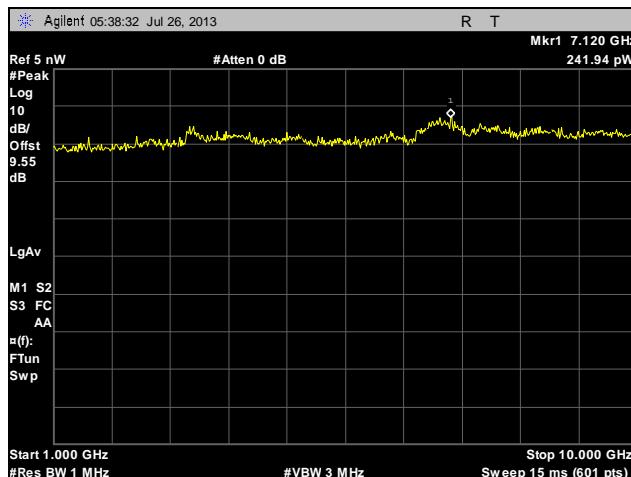
**Plot 273. Receiver Spurious Emission, 250 kbps, 250 kHz, High Channel 30 MHz – 1 GHz, 1 dBi Antenna**



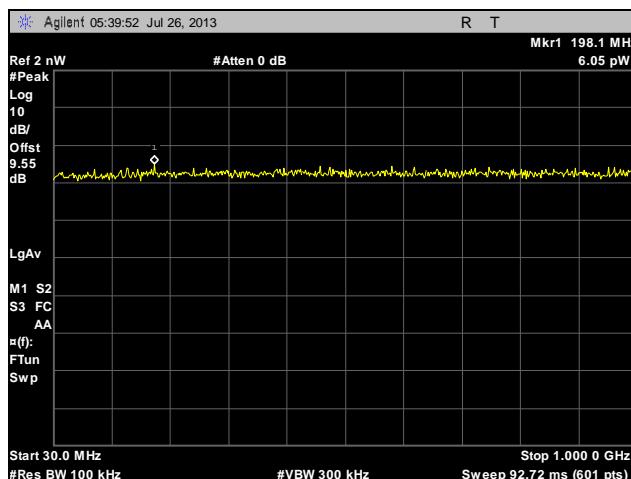
**Plot 274. Receiver Spurious Emission, 250 kbps, 250 kHz, High Channel, 1 GHz – 10 GHz, 1 dBi Antenna**



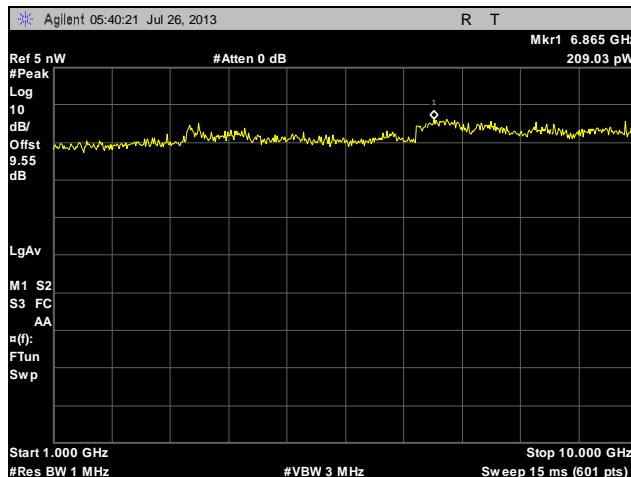
**Plot 275.** Receiver Spurious Emission, 250 kbps, 250 kHz, Low Channel 30 MHz – 1 GHz, 12 dBi Antenna



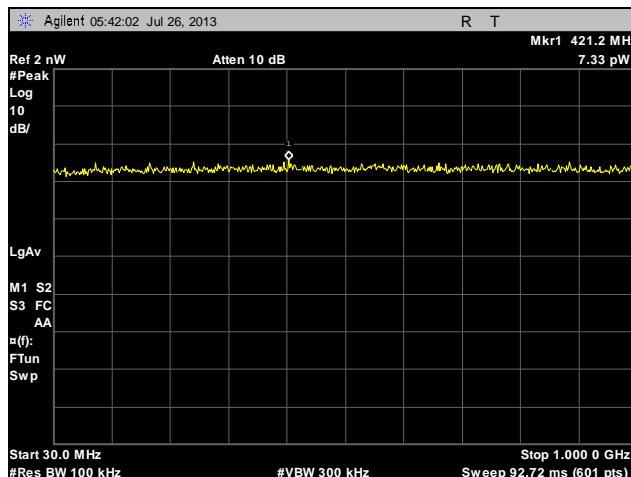
**Plot 276.** Receiver Spurious Emission, 250 kbps, 250 kHz, Low Channel, 1 GHz – 10 GHz, 12 dBi Antenna



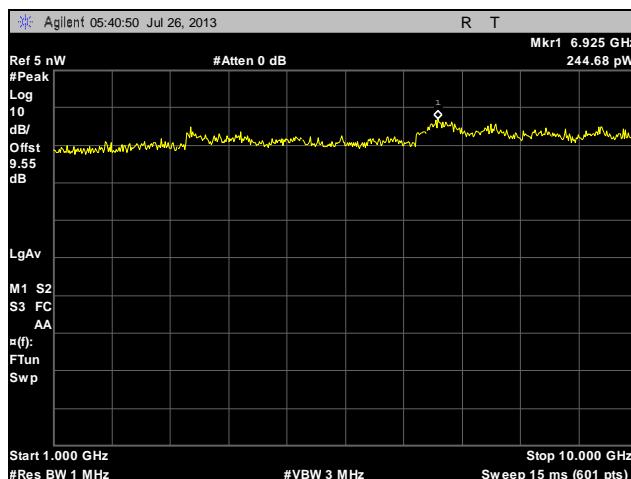
**Plot 277.** Receiver Spurious Emission, 250 kbps, 250 kHz, Mid Channel 30 MHz – 1 GHz, 12 dBi Antenna



**Plot 278. Receiver Spurious Emission, 250 kbps, 250 kHz, Mid Channel, 1 GHz – 10 GHz, 12 dBi Antenna**



**Plot 279. Receiver Spurious Emission, 250 kbps, 250 kHz, High Channel 30 MHz – 1 GHz, 12 dBi Antenna**



**Plot 280. Receiver Spurious Emission, 250 kbps, 250 kHz, High Channel, 1 GHz – 10 GHz, 12 dBi Antenna**

## IV. Test Equipment

## Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	8/6/2012	2/6/2014
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4771	PSA SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4446A	2/15/2013	8/15/2014
1T4791	THERM./CLOCK/HUMIDITY	CONTROL COMPANY	06-662-4	3/8/2012	3/8/2014
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	7/18/2012	1/18/2014
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	7/24/2012	1/24/2014
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	1/8/2013	7/8/2014
1T4509	HIGH PASS FILTER	MICROTRONICS	HPM 14243	SEE NOTE	

**Table 15. 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 stages; 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