MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372
3162 BELICK STREET ● SANTA CLARA, CALIFORNIA 95054 ● PHONE (408 748-3585 ● FAX (510) 489-6372
13301 MCCALLEN PASS ● AUSTIN, TX 78753 ● PHONE (512) 287-2500 ● FAX (512) 287-2513

March 11, 2013

Amimon
2 Maskit St. Building D, 2nd Floor
Herzelia, 46733

Dear Guy Dar,

Enclosed is the EMC Wireless test report for compliance testing of the Amimon, Falcon TX, Amimon P/N-AMN35254 as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15, Subpart B for Unintentional Radiators and Part 15.407 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: (\Amimon\EMC37062A-FCC407 UNII 1 Rev. 2)

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Electromagnetic Compatibility Criteria
Test Report

for the

Amimon
Model Falcon TX, Amimon P/N-AMN35254

Tested under
the Certification Rules
contained in
Title 47 of the CFR, Part 15, Subpart B
for Unintentional Radiators
and
Title 47 of the CFR, Part 15.407
for Intentional Radiators

MET Report: EMC37062A-FCC407 Rev. 2

March 11, 2013

Prepared For:

Amimon
2 Maskit St. Building D, 2nd Floor
Herzelia, 46733

Prepared By:
MET Laboratories, Inc.
914 W. Patapsco Ave
Baltimore, MD 21230

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for Intentional Radiators

Jeffrey Pratt, 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 Parts 15B, 15.407, of the FCC Rules under normal use and maintenance.

Asad Bajwa, Director
Electromagnetic Compatibility Lab

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Report Status Sheet

Revision	Report Date	Reason for Revision
∅	February 17, 2013	Initial Issue.
1	March 8, 2013	Revised to reflect editorial corrections.
2	March 11, 2013	Revised to reflect customer corrections.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

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I. Executive Summary

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A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Amimon Falcon TX, Amimon P/N-AMN35254, with the requirements of Part 15, §15.407. 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 Falcon TX, Amimon P/N-AMN35254. Amimon should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Falcon TX, Amimon P/N-AMN35254, 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, §15.407, in accordance with Amimon, purchase order number 120291. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference	Description	Results
15.107	Conducted Emissions	Compliant
15.109	Radiated Emissions	Compliant
15.203	Antenna Requirements	Compliant
15.207	AC Conducted Emissions 150KHz – 30MHz	Compliant
15.403 (i)	26dB Occupied Bandwidth	Compliant
15.407 (a)(2)	Conducted Transmitter Output Power	Compliant
15.407 (a)(2)	Power Spectral Density	Compliant
15.407 (a)(6)	Peak Excursion	Compliant
15.407 (b)(2), (3), (5), (6)	Undesirable Emissions (15.205/15.209 - General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Compliant
15.407(f)	RF Exposure	Compliant
15.407(g)	Frequency Stability	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

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II. Equipment Configuration

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A. Overview

MET Laboratories, Inc. was contracted by Amimon to perform testing on the Falcon TX, Amimon P/N-AMN35254, under Amimon's purchase order number 120291.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Amimon Falcon TX, Amimon P/N-AMN35254.

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

Model(s) Tested:	Falcon TX, Amimon P/N-AMN35254	
Model(s) Covered:	Falcon TX, Amimon P/N-AMN35254	
EUT Specifications:	Primary Power: 120VAC, 60Hz	
	Secondary Line: 12 VDC	
	FCC ID: VQSAMN35254	
	Type of Modulations:	OFDM
	Equipment Code:	NII
	Peak RF Output Power:	16.94 dBm
	EUT Frequency Ranges:	5180 – 5240 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Jeffrey Pratt	
Report Date(s):	March 11, 2013	

Table 2. EUT Summary

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B. References

CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
ANSI C63.4:2003	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories

Table 3. References

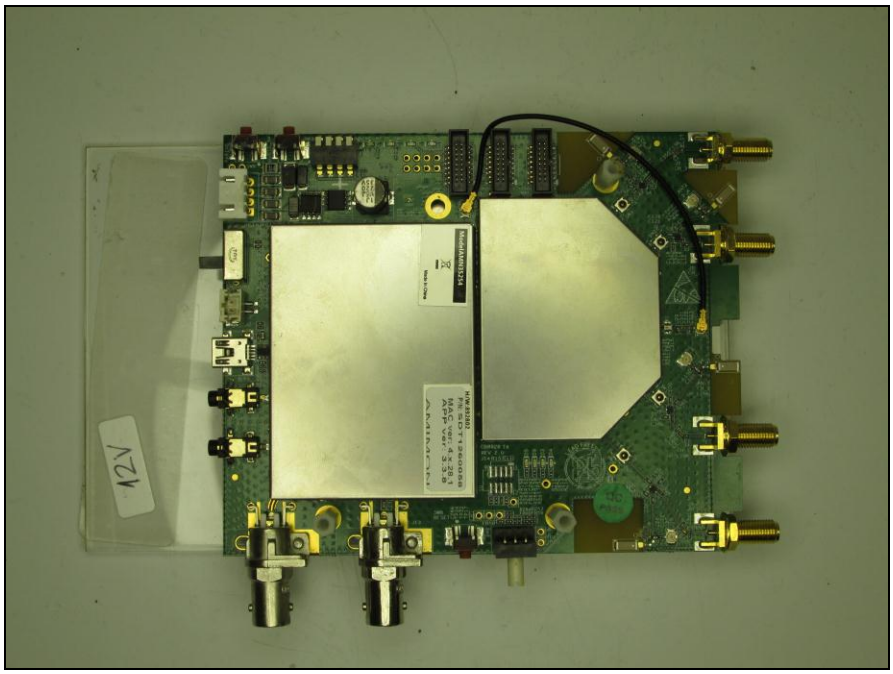
C. Test Site

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 AMN35254/AMN36254 are respectively wireless A/V transmitter/receiver boards, which works at the 5GHz unlicensed band.



Photograph 1. Amimon Falcon TX, Amimon P/N-AMN35254

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E. Equipment Configuration

All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
N/A	HD-SDI Wireless Transmitter module	AMN35254	NA	SDT1260058	2.0

Table 4. Equipment Configuration

F. Support Equipment

Amimon supplied support equipment necessary for the operation and testing of the Falcon TX, Amimon P/N-AMN35254. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number
N/A	PC Laptop	N/A	N/A
N/A	Debug Board (MAC)	Amimon	AMN043PCB
N/A	Debug Board (APP)	Amimon	AMN043PCB
N/A	USB-to-Serial Converter (MAC)	ATEN	UC-232A
N/A	USB-to-Serial Converter (APP)	ATEN	UC-232A
N/A	HDMI to SDI Converter	CYPRESS	CLUX-H2SDI
N/A	HDMI Pattern Generator	CYPRESS	CPHD-1
N/A	12V Power Supply	Switching Power Supply	S075AQ12000600
N/A	HDMI Cable	Standard	standard

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
J1	J1 power supply	XH-4P-with Tin L=200 1007-28#	1	0.2	N	Power Supply
J12	J12 – SDI in	75 ohm SDI cable BNC-P to BNC-P	1	3	Y	HDMI to SDI converter
J18	J18 – MAC	Standard USB able with USB to serial converter	1	2	Y	PC
J17	J17 – APP	Standard USB able with USB to serial converter	1	2	Y	PC

Table 6. Ports and Cabling Information

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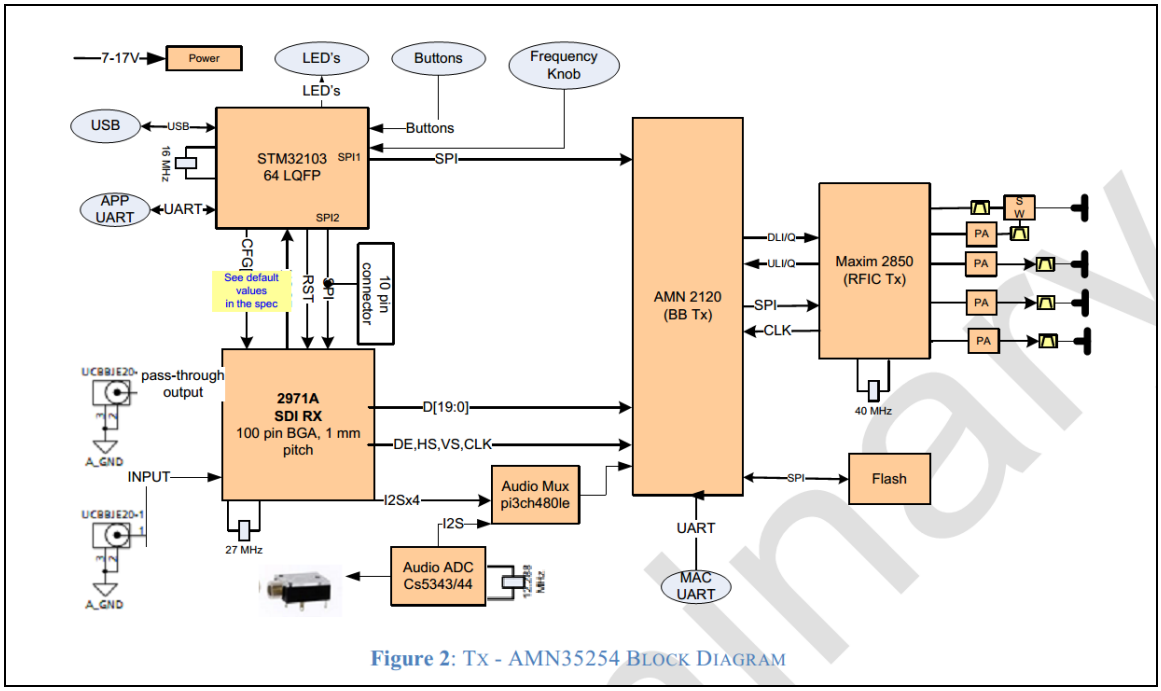

Figure 2: TX - AMN35254 BLOCK DIAGRAM

Figure 1. Block Diagram of Equipment

H. Mode of Operation

The AMN2120 WHDI baseband transmitter chip is the heart of the AMN35254 WHDI transmitter module. The AMN2120 interfaces the SDI receiver A/V source; it also includes an internal microcontroller for controlling the physical level.
The AMN2120 is based on MIMO technology transmitting through up to four output channels. Four digital-to-analog converters and one analog-to-digital converter are embedded within the chip.
The AMN2120 internal PLL accepts an input clock frequency of 40MHz. The input frequency is multiplied and then used as an internal system clock. The AMN2120 also generates a 10MHz reference clock, derived from 40MHz for general use.

I. Method of Monitoring EUT Operation

Using AppCom (Amimon designated SW) for commands and LOG.

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 Amimon upon completion of testing.

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III. Electromagnetic Compatibility Criteria for Unintentional Radiators

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Electromagnetic Compatibility Criteria

§ 15.107 Conducted Emissions Limits

Test Requirement(s):

15.107 (a) Except for Class A digital devices, for equipment 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 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

15.107 (b) For a Class A digital device 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 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

Frequency range (MHz)	Class A Conducted Limits (dBµV)		*Class B Conducted Limits (dBµV)	
	Quasi-Peak	Average	Quasi-Peak	Average
* 0.15- 0.45	79	66	66 - 56	56 - 46
0.45 - 0.5	79	66	56	46
0.5 - 30	73	60	60	50
Note 1 — The lower limit shall apply at the transition frequencies. Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz. * -- Limits per Subsection 15.207(a).				

Table 7. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) and 15.207(a)

Test Results: The EUT was compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

Test Engineer(s): Zijun Tong

Test Date(s): 12/17/12

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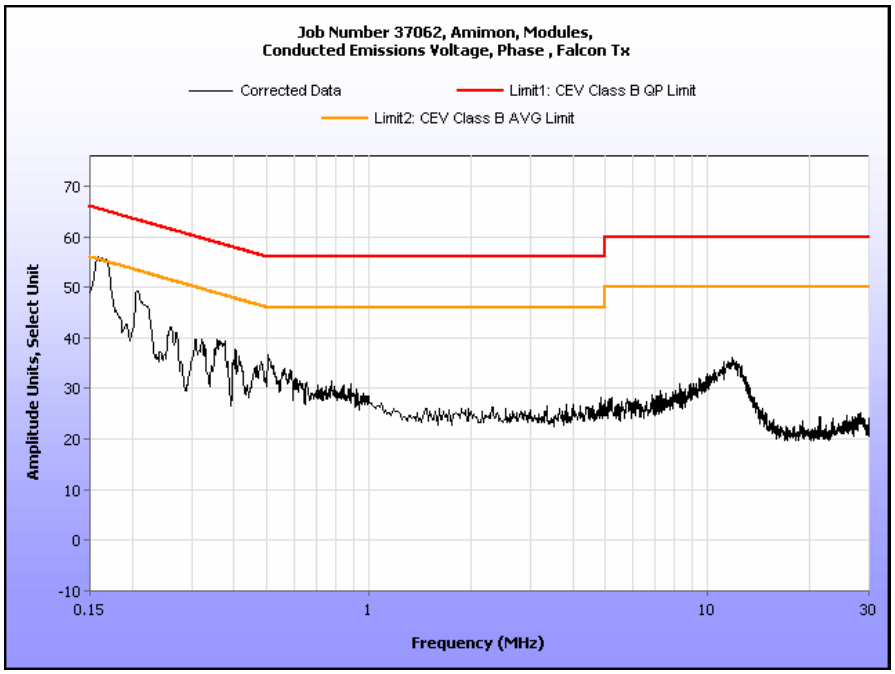
Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) Avg.	Limit (dBuV) Avg.	Margin (dB) Avg.
0.1526	48.82	0	48.82	65.86	-17.04	30.61	0	30.61	55.86	-25.25
0.1999	41.05	0	41.05	63.61	-22.56	28.88	0	28.88	53.61	-24.73
0.2524	34.07	0	34.07	61.68	-27.61	22.91	0	22.91	51.68	-28.77
0.3176	32.01	0	32.01	59.77	-27.76	23.01	0	23.01	49.77	-26.76
0.353	32.47	0	32.47	58.89	-26.42	24.46	0	24.46	48.89	-24.43
0.5149	28.88	0	28.88	56	-27.12	22	0	22	46	-24

Table 8. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)



Plot 1. Conducted Emission, Phase Line Plot

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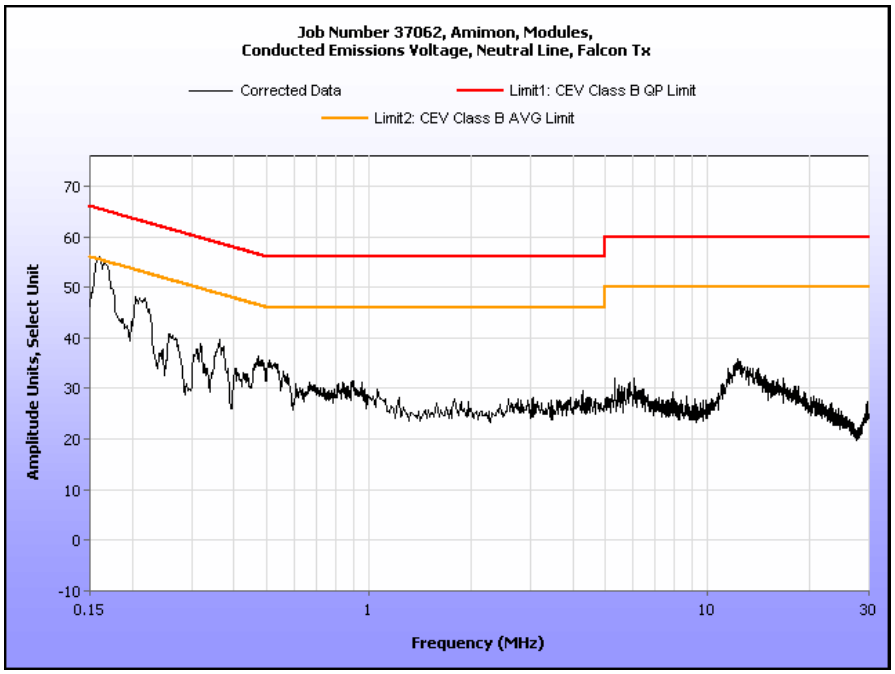
Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) Avg.	Limit (dBuV) Avg.	Margin (dB) Avg.
0.1523	48.85	0	48.85	65.87	-17.02	28.05	0	28.05	55.87	-27.82
0.1587	48.79	0	48.79	65.53	-16.74	32.88	0	32.88	55.53	-22.65
0.2016	41.45	0	41.45	63.54	-22.09	26.5	0	26.5	53.54	-27.04
0.2521	33.91	0	33.91	61.69	-27.78	21	0	21	51.69	-30.69
0.3182	30.98	0	30.98	59.75	-28.77	21.25	0	21.25	49.75	-28.5
0.352	31.35	0	31.35	58.92	-27.57	22.86	0	22.86	48.92	-26.06
0.5067	29.9	0	29.9	56	-26.1	22	0	22	46	-24

Table 9. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)



Plot 2. Conducted Emission, Neutral Line Plot

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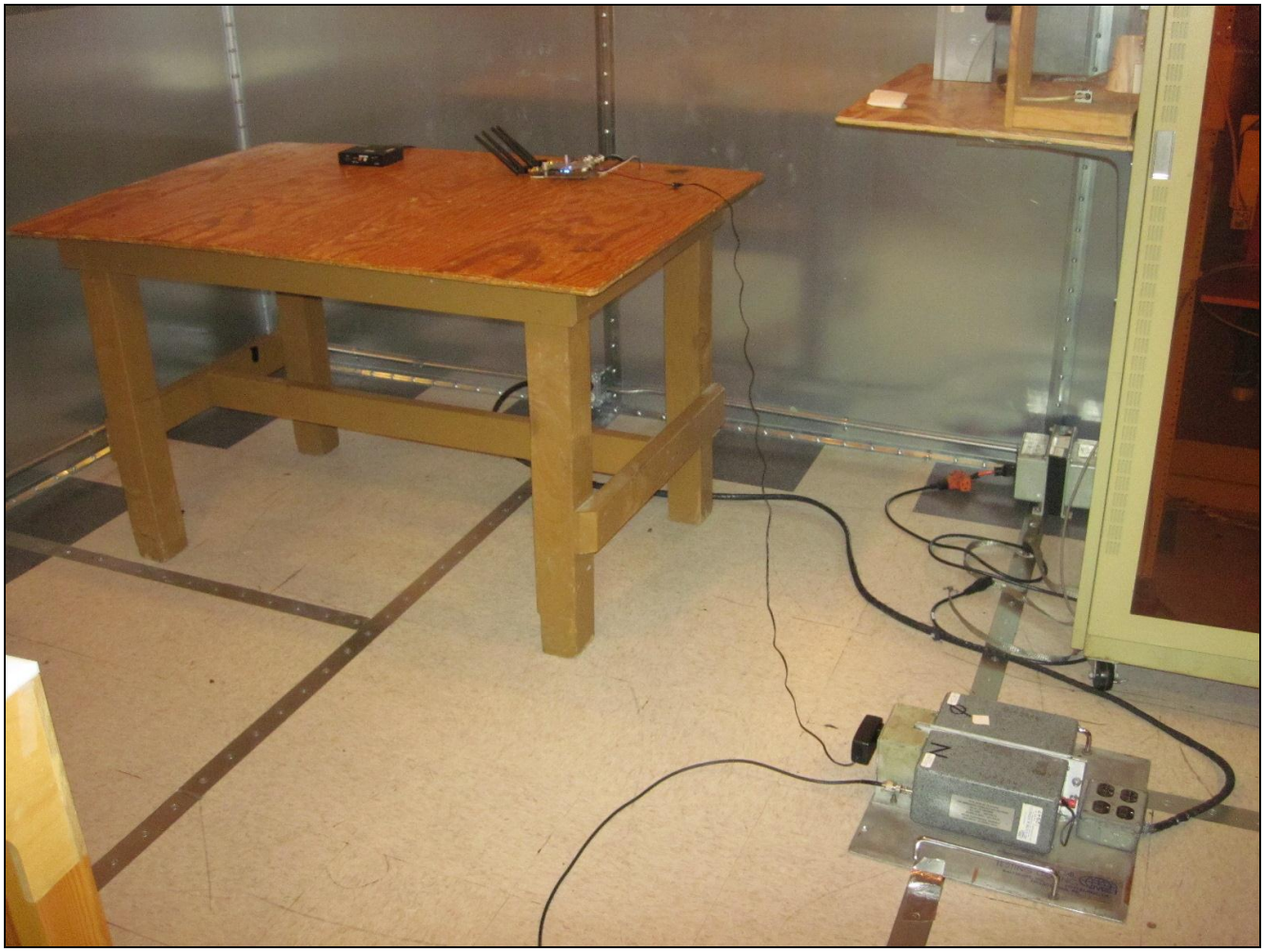
Conducted Emission Limits Test Setup



Photograph 2. Conducted Emissions, Test Setup

 © 2013, MET Laboratories, Inc.

Radiated Emission Limits

§ 15.109 Radiated Emissions Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 10.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 10.

Frequency (MHz)	Field Strength (dBµV/m)	
	§15.109 (b), Class A Limit (dBµV) @ 10m	§15.109 (a),Class B Limit (dBµV) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 10. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 3 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Test Results: The EUT was compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

Test Engineer(s): Zijun Tong

Test Date(s): 12/17/12

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Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBµV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
38.590453	86	H	1.71	5.10	15.53	0.58	0.00	21.21	40.00	-18.79
38.590453	175	V	1.02	13.82	15.53	0.58	0.00	29.93	40.00	-10.07
49.733512	0	H	1.46	7.54	8.81	0.68	0.00	17.03	40.00	-22.97
49.733512	341	V	1.00	26.63	8.81	0.68	0.00	36.12	40.00	-3.88
50.8934	294	H	1.77	5.72	8.52	0.64	0.00	14.88	40.00	-25.12
50.8934	338	V	1.01	26.65	8.52	0.64	0.00	35.81	40.00	-4.19
52.052558	0	H	2.39	6.16	8.09	0.63	0.00	14.88	40.00	-25.12
52.052558	282	V	1.01	25.77	8.09	0.63	0.00	34.49	40.00	-5.51
56.680718	329	H	1.02	6.58	7.50	0.69	0.00	14.77	40.00	-25.23
56.680718	360	V	1.00	21.44	7.50	0.69	0.00	29.63	40.00	-10.37
83.122551	360	H	1.74	5.18	7.79	0.86	0.00	13.83	40.00	-26.17
83.122551	0	V	1.21	14.80	7.79	0.86	0.00	23.45	40.00	-16.55
90.000126	322	H	2.21	9.64	7.90	0.90	0.00	18.44	43.50	-25.06
90.000126	277	V	1.00	18.75	7.90	0.90	0.00	27.55	43.50	-15.95
107.3211	0	H	1.64	6.37	12.16	0.99	0.00	19.52	43.50	-23.98
107.3211	0	V	1.00	12.56	12.16	0.99	0.00	25.71	43.50	-17.79
134.95924	70	H	2.06	12.00	13.80	1.07	0.00	26.87	43.50	-16.63
134.95924	202	V	1.00	20.94	13.80	1.07	0.00	35.81	43.50	-7.69
296.99057	360	H	1.01	8.30	14.04	1.56	0.00	23.90	46.00	-22.10
296.99057	0	V	1.43	4.43	14.04	1.56	0.00	20.03	46.00	-25.97
332.0621	360	H	1.00	6.44	14.84	1.49	0.00	22.77	46.00	-23.23
332.0621	0	V	1.59	4.52	14.84	1.49	0.00	20.85	46.00	-25.15
445.48667	36	H	1.00	10.92	17.20	1.92	0.00	30.04	46.00	-15.96
445.48667	0	V	1.08	9.25	17.20	1.92	0.00	28.37	46.00	-17.63
869.20441	360	H	1.41	5.50	22.70	2.74	0.00	30.94	46.00	-15.06
869.20441	0	V	1.67	5.57	22.70	2.74	0.00	31.01	46.00	-14.99

Table 11. Radiated Emissions Limits, Test Results

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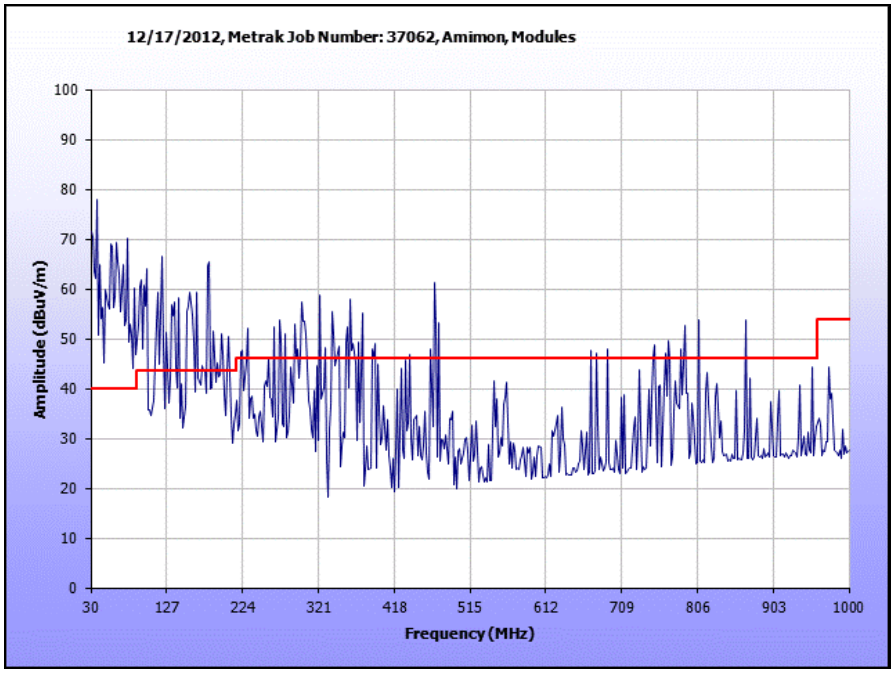

Plot 3. Radiated Emissions, Pre-Scan

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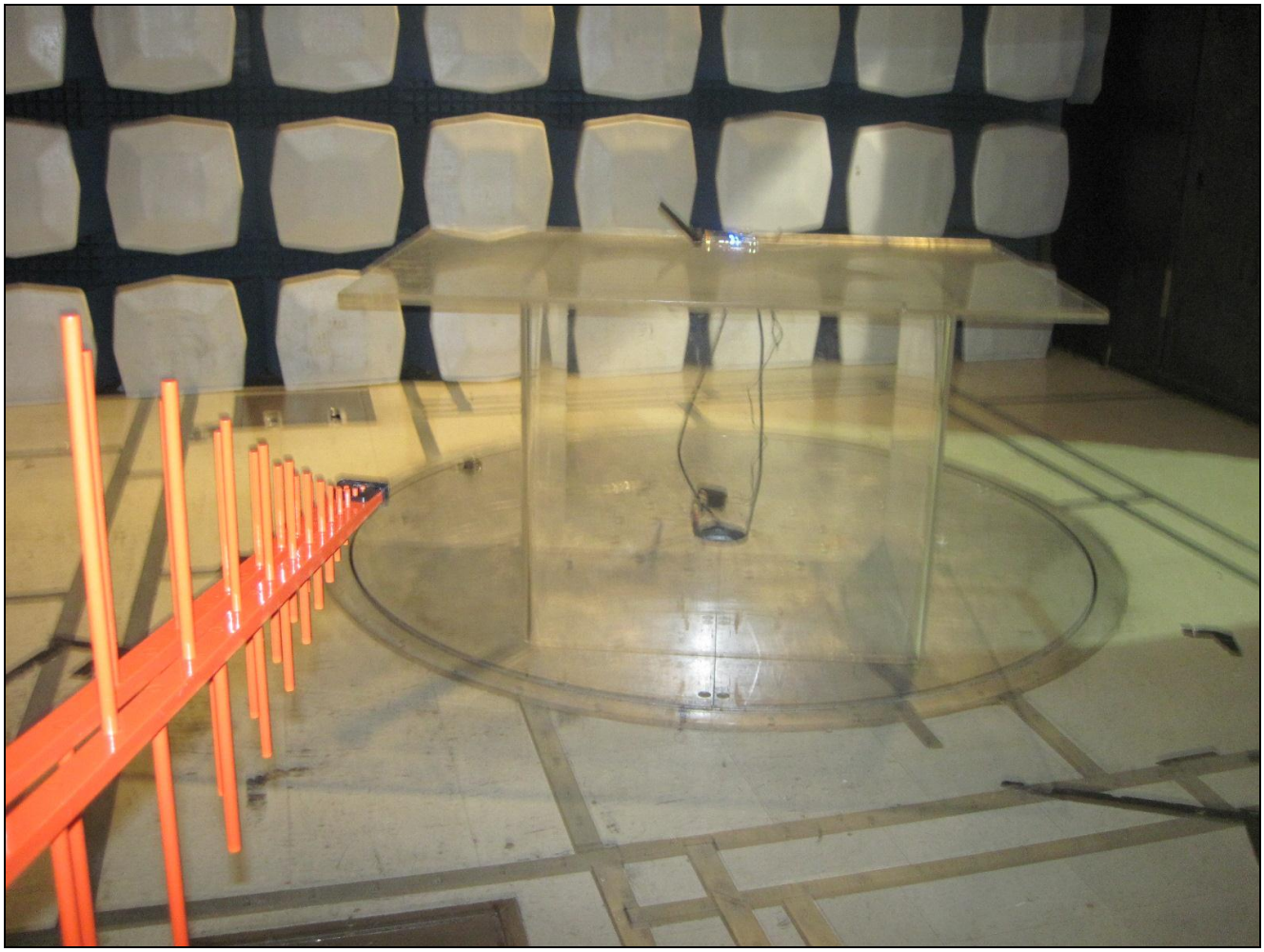
Radiated Emission Limits Test Setup



Photograph 3. Radiated Emission, Test Setup

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IV. Electromagnetic Compatibility Criteria for Intentional Radiators

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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 has a unique antenna connector. Therefore, the EUT as tested is compliant with the criteria of §15.203.

Gain	Type	Manufacturer	Model
5 dBi	Omni	Laird	RD2458-5-RSMA
2 dBi	Omni	Wanshih	WSS 002

Test Engineer(s): Jeff Pratt

Test Date(s): 01/14/2013

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207 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 μH/50 Ω 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 (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 12. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Procedure: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-1992 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to an EMC/field intensity meter.

Test Results: The EUT was compliant with the requirement(s) of this section.

Test Engineer(s): Jeff Pratt

Test Date(s): 01/18/13

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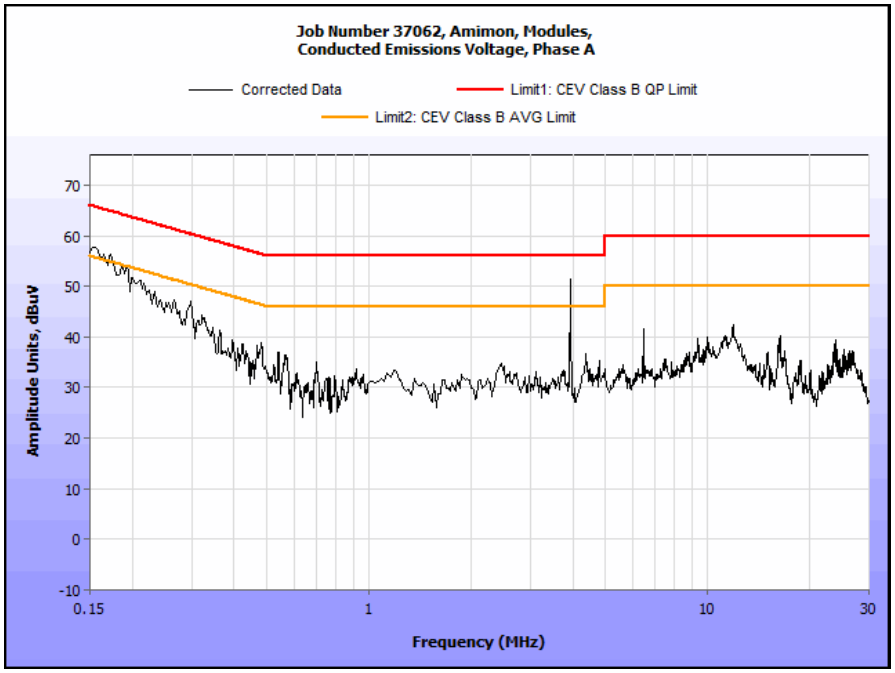
Conducted Emissions - Voltage, AC Power, (120 VAC, 60 Hz)

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) Avg.	Limit (dBuV) Avg.	Margin (dB) Avg.
0.218	36.93	0	36.93	62.9	-25.97	21.58	0	21.58	52.9	-31.32
3.927	24.33	0	24.33	56	-31.67	19.24	0	19.24	46	-26.76
6.457	26.17	0	26.17	60	-33.83	20.43	0	20.43	50	-29.57
11.93	34.16	0	34.16	60	-25.84	29.82	0	29.82	50	-20.18
16.43	31.03	0	31.03	60	-28.97	26.19	0	26.19	50	-23.81
23.9	32.28	0	32.28	60	-27.72	27.38	0	27.38	50	-22.62

Table 13. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)



Plot 4. Conducted Emissions, 15.207, Pre-Scan, Phase Line

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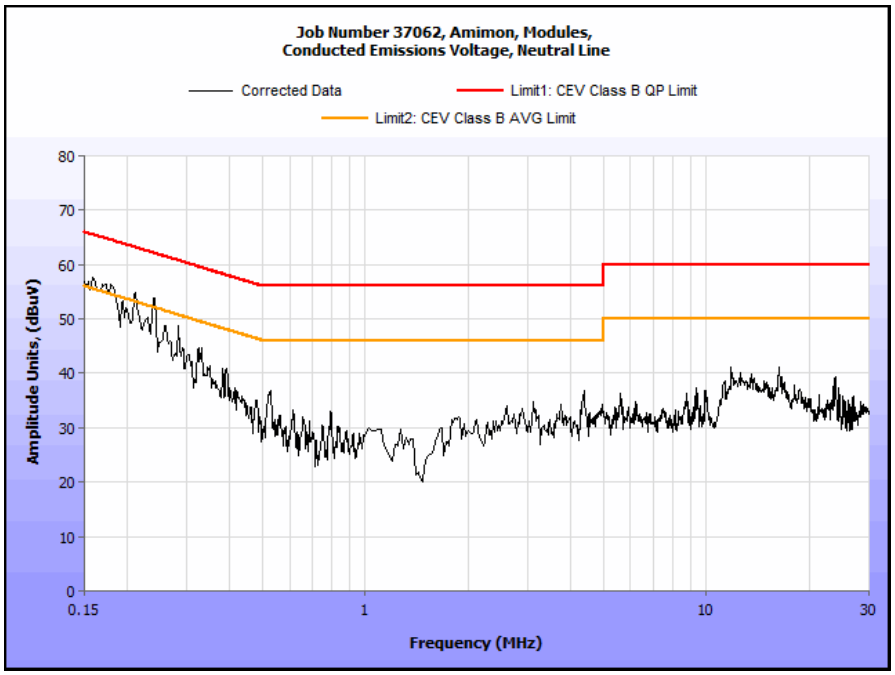
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) Avg.	Limit (dBuV) Avg.	Margin (dB) Avg.
0.299	28.63	0	28.63	60.27	-31.64	18.74	0	18.74	50.27	-31.53
4.36	33.18	0	33.18	56	-22.82	28.49	0	28.49	46	-17.51
5.383	23.62	0	23.62	60	-36.38	17.59	0	17.59	50	-32.41
11.82	33.77	0	33.77	60	-26.23	29.04	0	29.04	50	-20.96
16.32	32.92	0	32.92	60	-27.08	27.37	0	27.37	50	-22.63
23.88	31.66	0	31.66	60	-28.34	27.11	0	27.11	50	-22.89

Table 14. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)



Plot 5. Conducted Emissions, 15.207, Pre-Scan, Neutral Line

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Conducted Emission Limits Test Setup

Photograph 4. Conducted Emissions, Test Setup

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(c) 26dB Bandwidth

Test Requirements: **§ 15.403 (i):** For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

Test Procedure: The transmitter was set to both operating frequencies at the highest output power and connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth, VBW > RBW. The 26 dB Bandwidth was measured and recorded.

Test Results The 26 dB Bandwidth was compliant with the requirements of this section and was determined from the plots on the following pages.

Test Engineer(s): Jeff Pratt

Test Date(s): 01/20/13

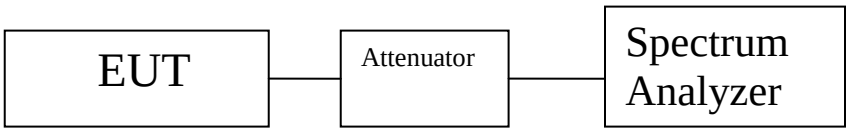

Figure 2. Occupied Bandwidth, Test Setup

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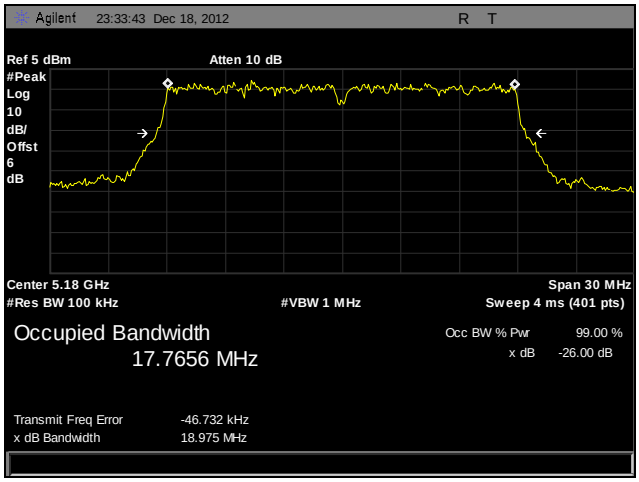
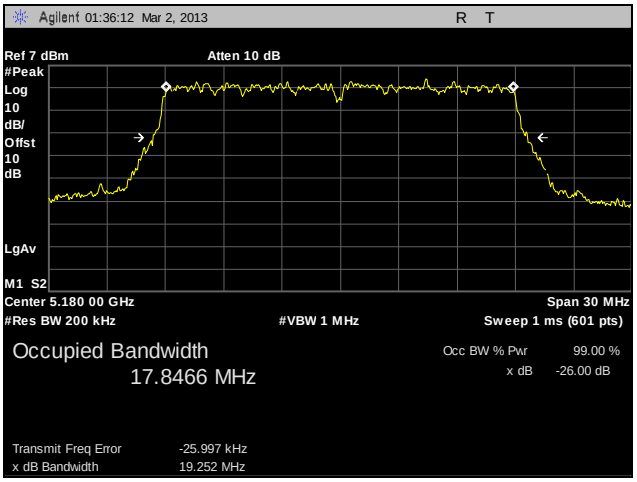
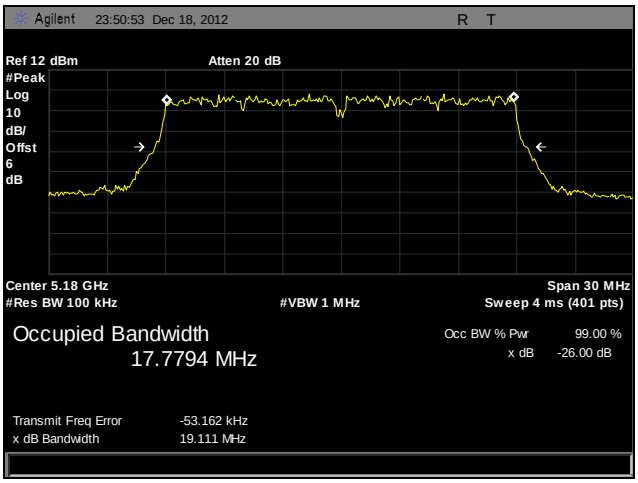
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 6. Occupied Bandwidth, 5180 MHz, 20 MHz, Port 1, 26 dB



Plot 7. Occupied Bandwidth, 5180 MHz, 20 MHz, Port 1, 26 dB



Plot 8. Occupied Bandwidth, 5180 MHz, 20 MHz, Port 3, 26 dB

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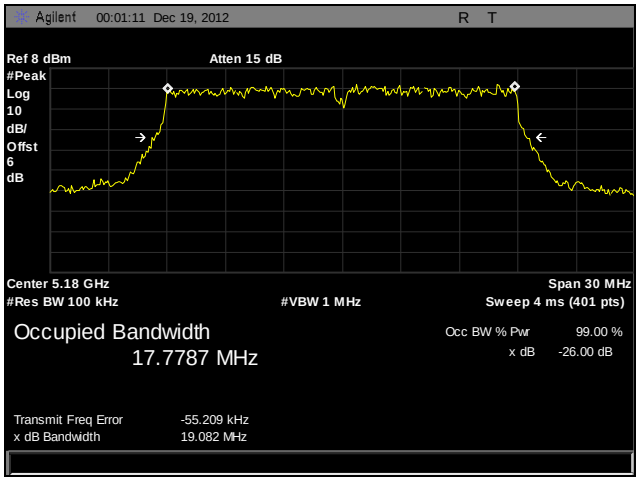
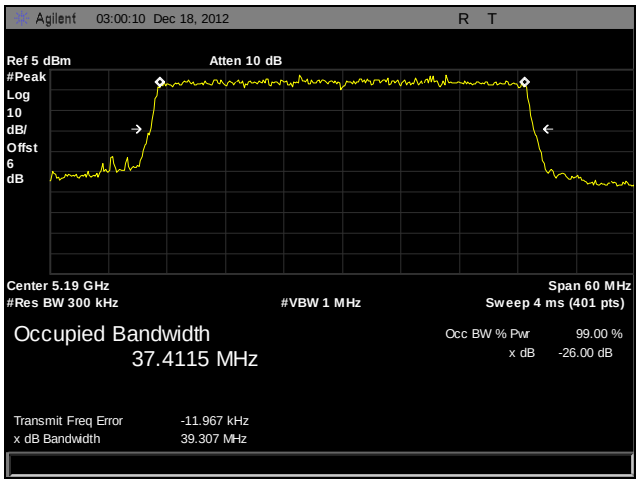
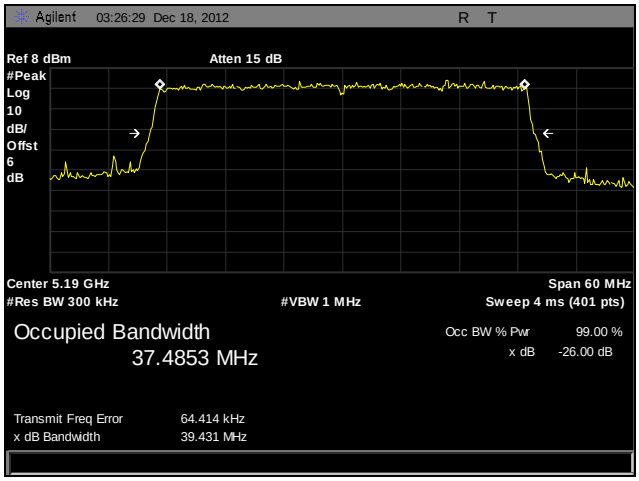


Plot 9. Occupied Bandwidth, 5180 MHz, 20 MHz, Port 4, 26 dB



Plot 10. Occupied Bandwidth, 5190 MHz, 40 MHz, Port 1, 26 dB



Plot 11. Occupied Bandwidth, 5190 MHz, 40 MHz, Port 2, 26 dB

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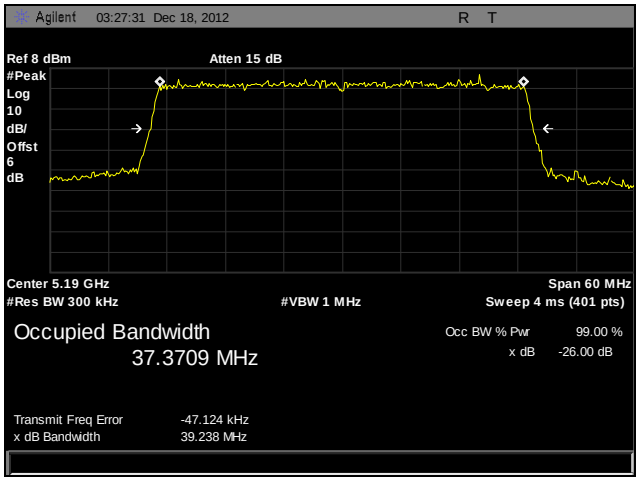
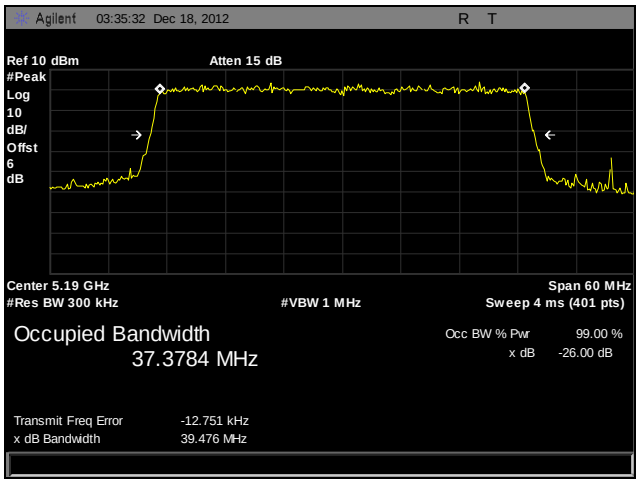
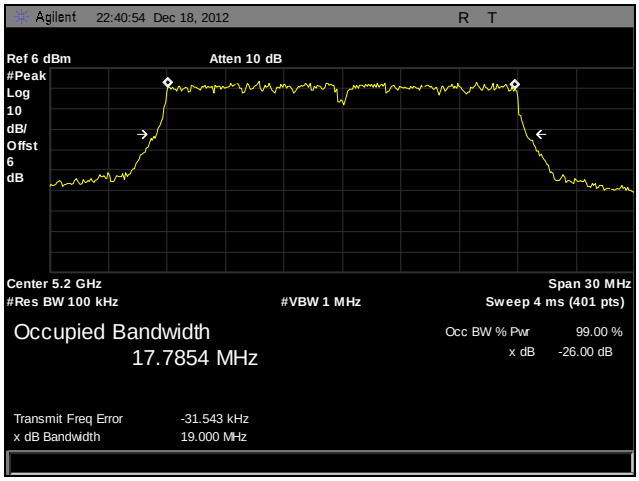


Plot 12. Occupied Bandwidth, 5190 MHz, 40 MHz, Port 3, 26 dB



Plot 13. Occupied Bandwidth, 5190 MHz, 40 MHz, Port 4, 26 dB



Plot 14. Occupied Bandwidth, 5200 MHz, 20 MHz, Port 1, 26 dB

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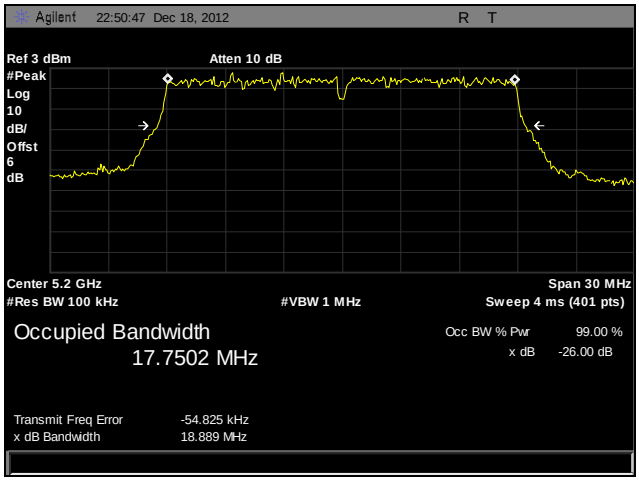
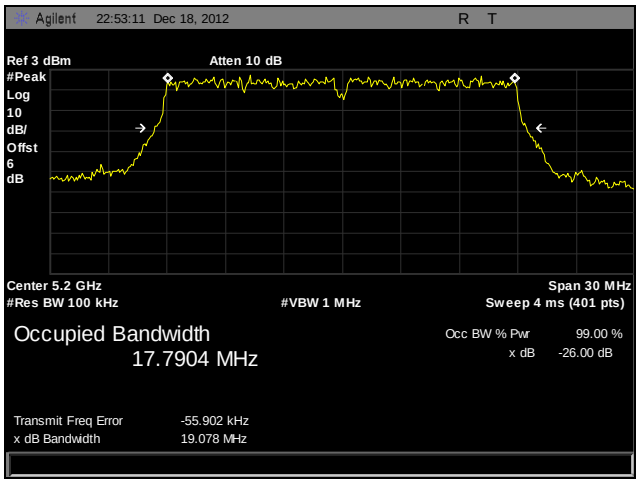
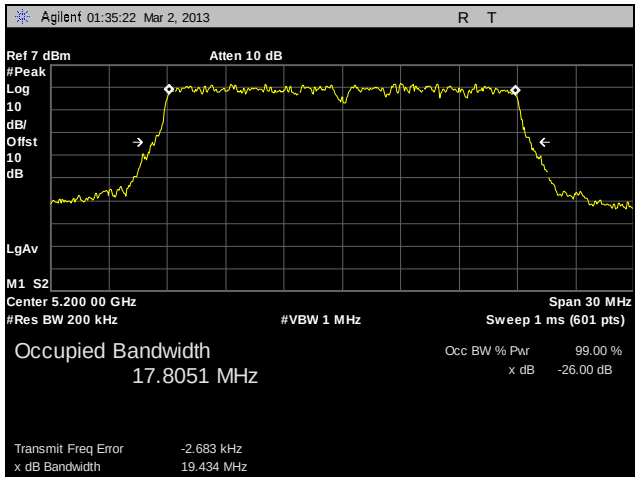


Plot 15. Occupied Bandwidth, 5200 MHz, 20 MHz, Port 2, 26 dB



Plot 16. Occupied Bandwidth, 5200 MHz, 20 MHz, Port 3, 26 dB



Plot 17. Occupied Bandwidth, 5200 MHz, 20 MHz, Port 4, 26 dB

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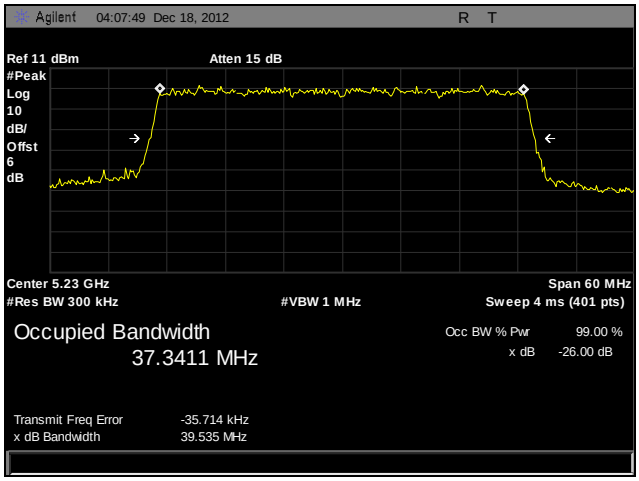
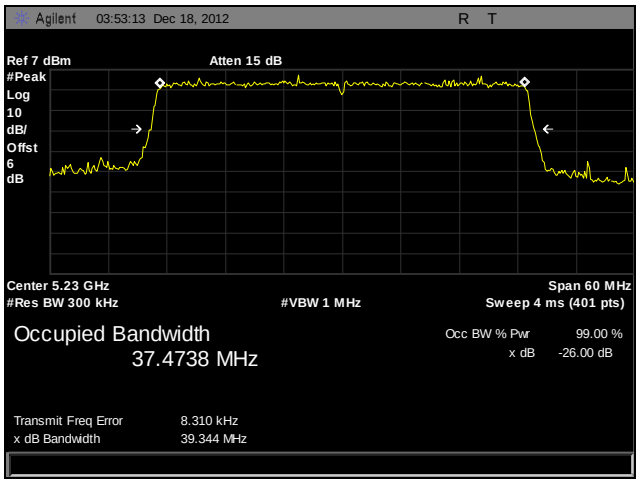
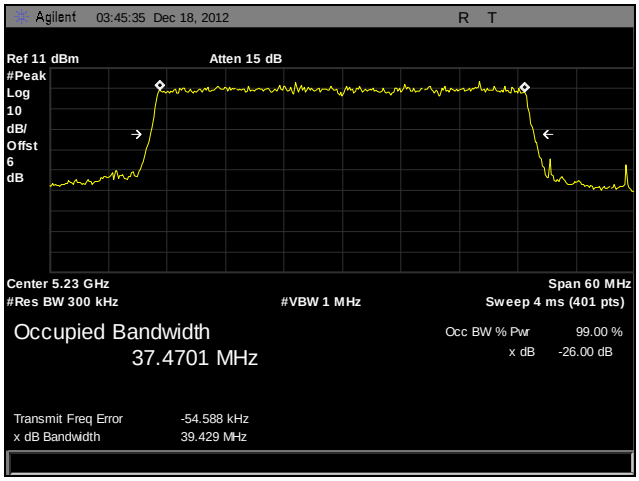


Plot 18. Occupied Bandwidth, 5230 MHz, 40 MHz, Port 1, 26 dB



Plot 19. Occupied Bandwidth, 5230 MHz, 40 MHz, Port 2, 26 dB



Plot 20. Occupied Bandwidth, 5230 MHz, 40 MHz, Port 3, 26 dB

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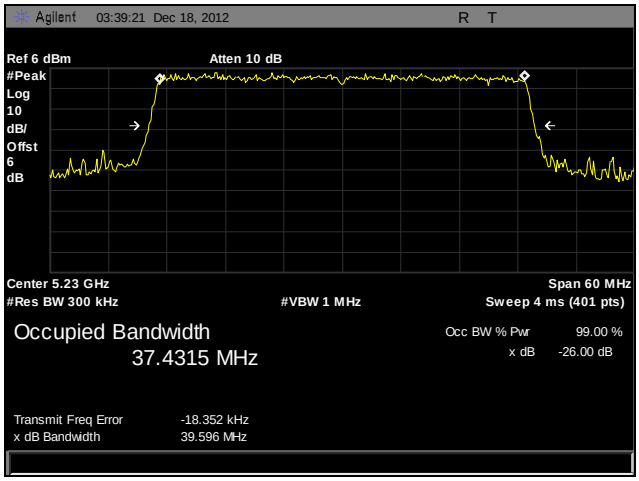
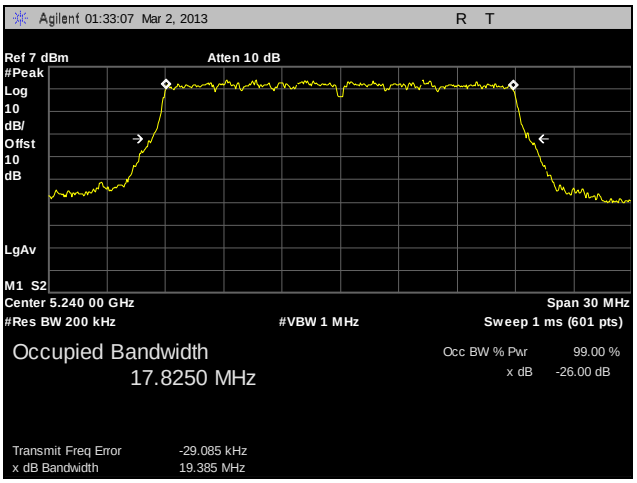
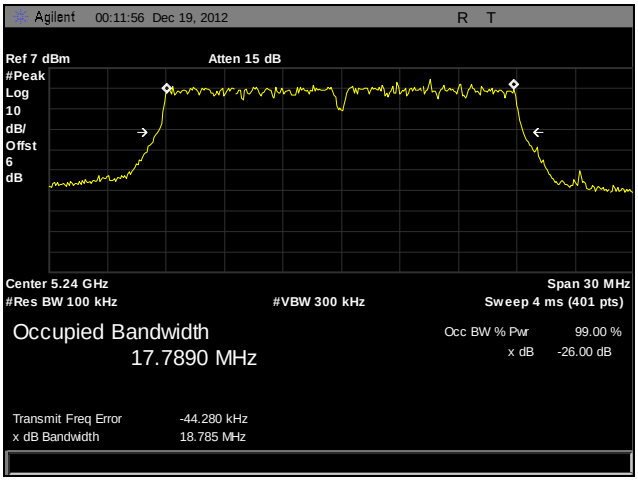


Plot 21. Occupied Bandwidth, 5230 MHz, 40 MHz, Port 4, 26 dB



Plot 22. Occupied Bandwidth, 5240 MHz, 20 MHz, Port 1, 26 dB



Plot 23. Occupied Bandwidth, 5240 MHz, 20 MHz, Port 2, 26 dB

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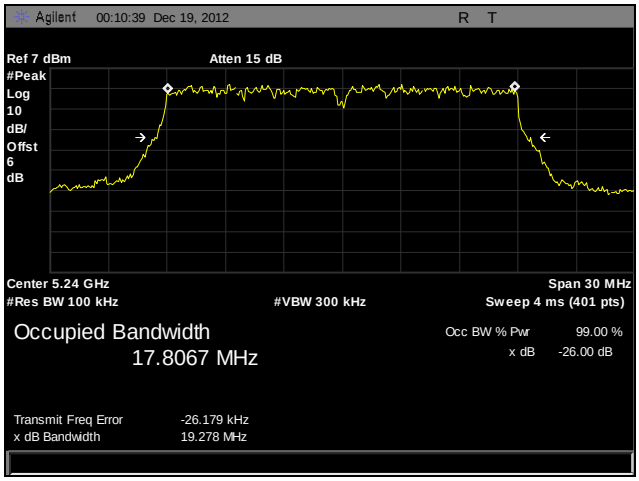
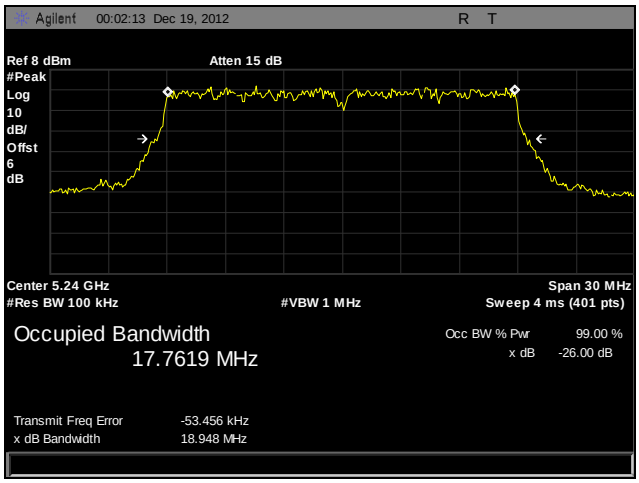
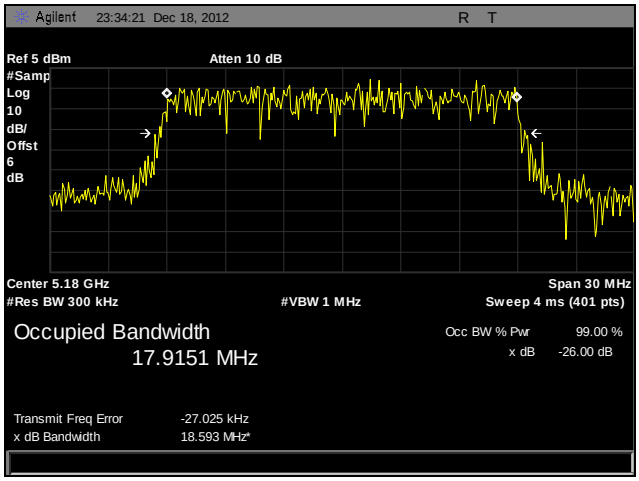


Plot 24. Occupied Bandwidth, 5240 MHz, 20 MHz, Port 3, 26 dB



Plot 25. Occupied Bandwidth, 5240 MHz, 20 MHz, Port 4, 26 dB



Plot 26. Occupied Bandwidth, 5180 MHz, 20 MHz, Port 1, 99%

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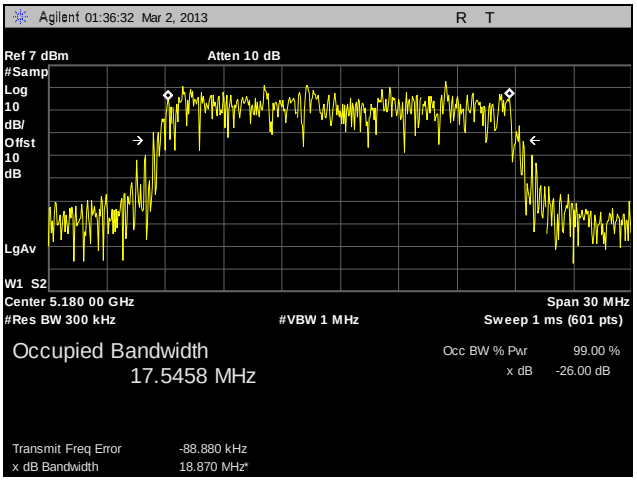
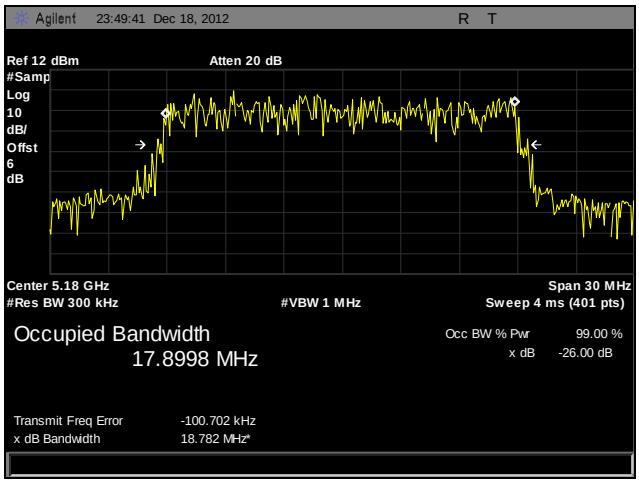
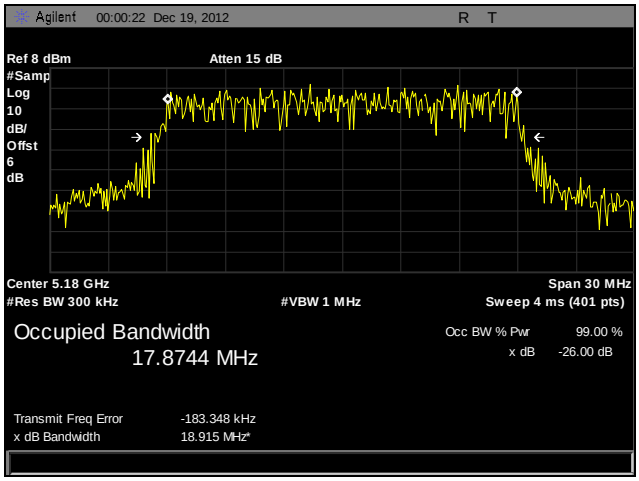


Plot 27. Occupied Bandwidth, 5180 MHz, 20 MHz, Port 2, 99%



Plot 28. Occupied Bandwidth, 5180 MHz, 20 MHz, Port 3, 99%



Plot 29. Occupied Bandwidth, 5180 MHz, 20 MHz, Port 4, 99%

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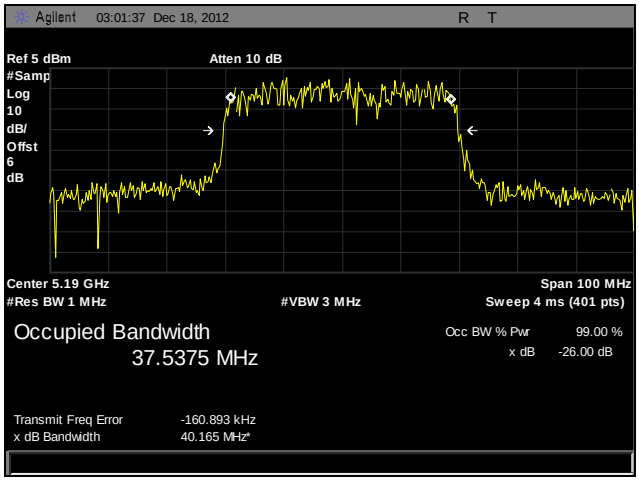
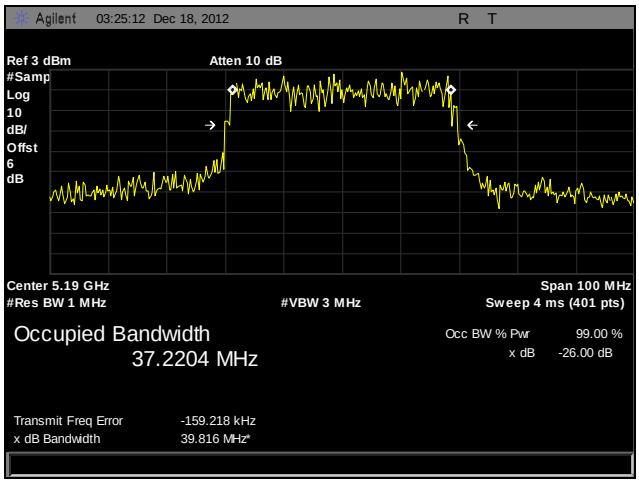
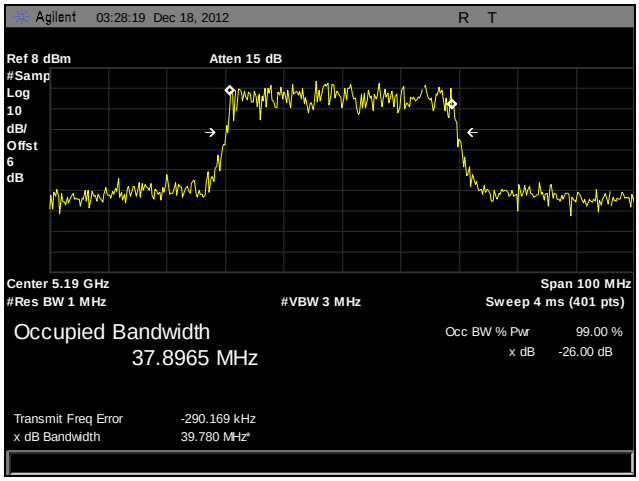


Plot 30. Occupied Bandwidth, 5190 MHz, 40 MHz, Port 1, 99%



Plot 31. Occupied Bandwidth, 5190 MHz, 40 MHz, Port 2, 99%



Plot 32. Occupied Bandwidth, 5190 MHz, 40 MHz, Port 3, 99%

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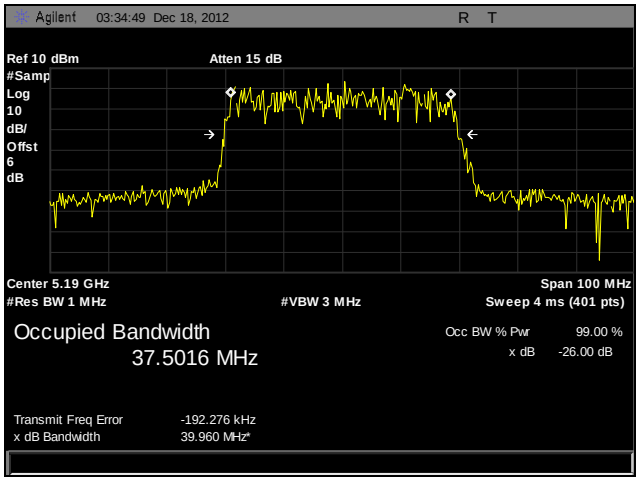
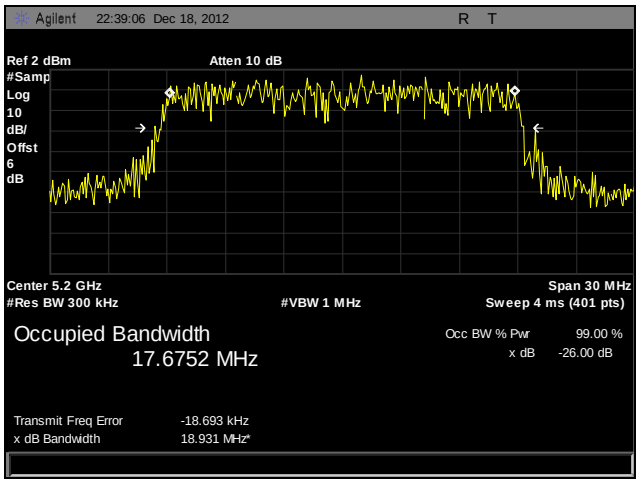
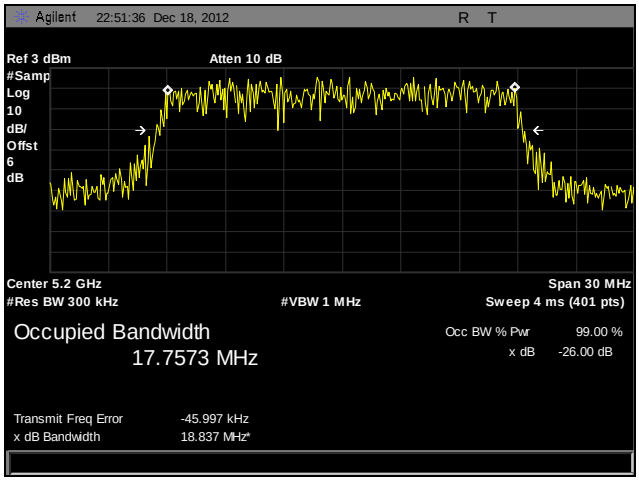


Plot 33. Occupied Bandwidth, 5190 MHz, 40 MHz, Port 4, 99%



Plot 34. Occupied Bandwidth, 5200 MHz, 20 MHz, Port 1, 99%



Plot 35. Occupied Bandwidth, 5200 MHz, 20 MHz, Port 2, 99%

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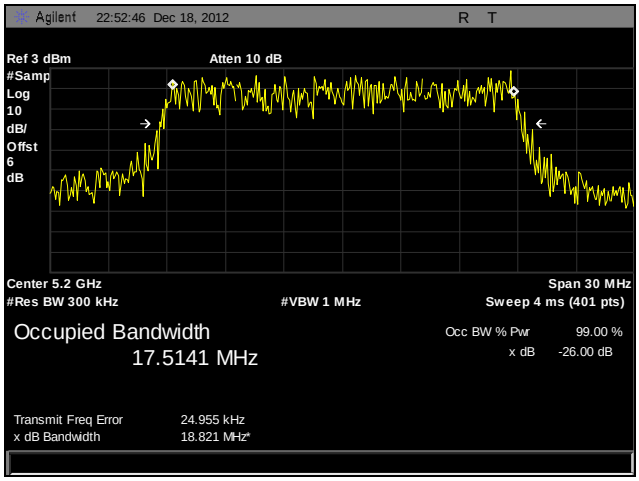
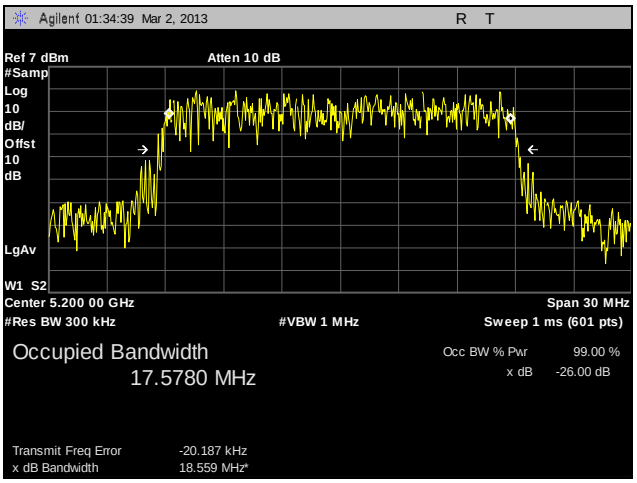
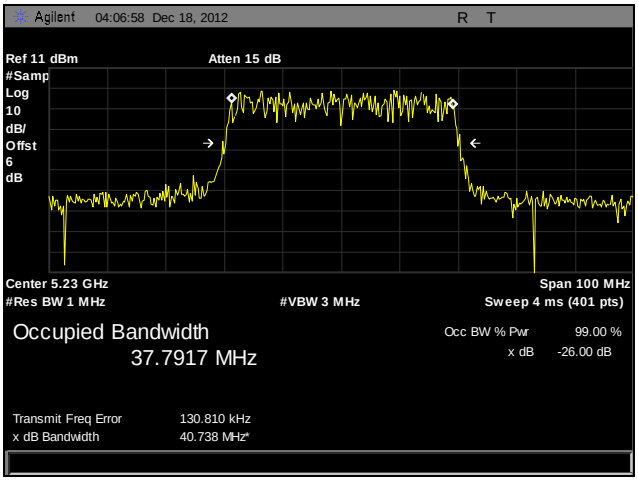


Plot 36. Occupied Bandwidth, 5200 MHz, 20 MHz, Port 3, 99%



Plot 37. Occupied Bandwidth, 5200 MHz, 20 MHz, Port 4, 99%



Plot 38. Occupied Bandwidth, 5230 MHz, 40 MHz, Port 1, 99%

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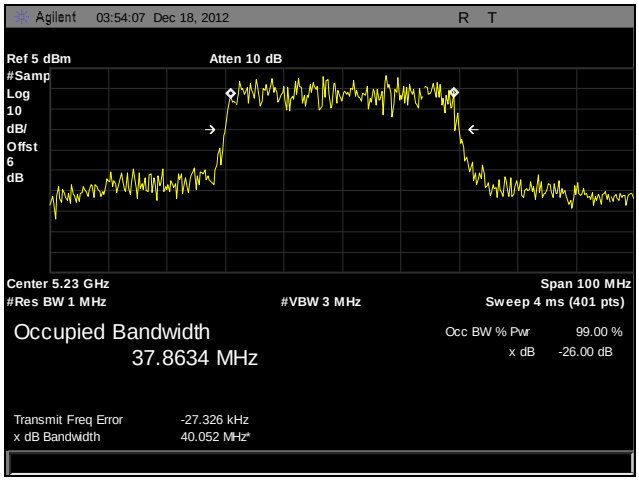
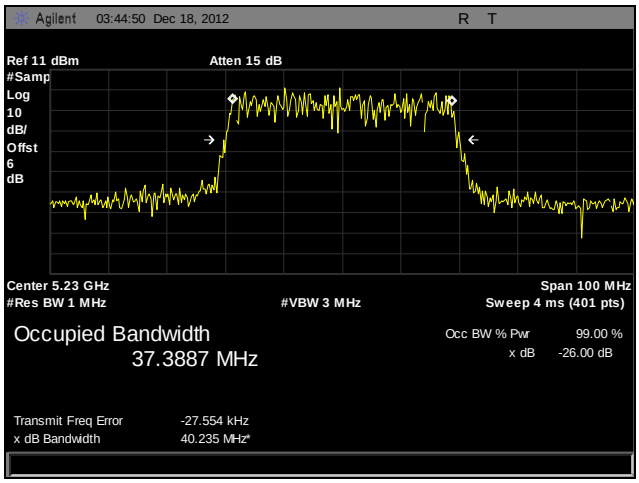
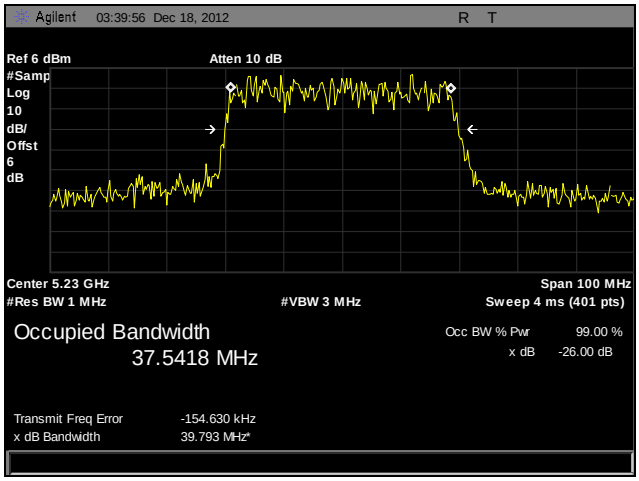


Plot 39. Occupied Bandwidth, 5230 MHz, 40 MHz, Port 2, 99%



Plot 40. Occupied Bandwidth, 5230 MHz, 40 MHz, Port 3, 99%



Plot 41. Occupied Bandwidth, 5230 MHz, 40 MHz, Port 4, 99%

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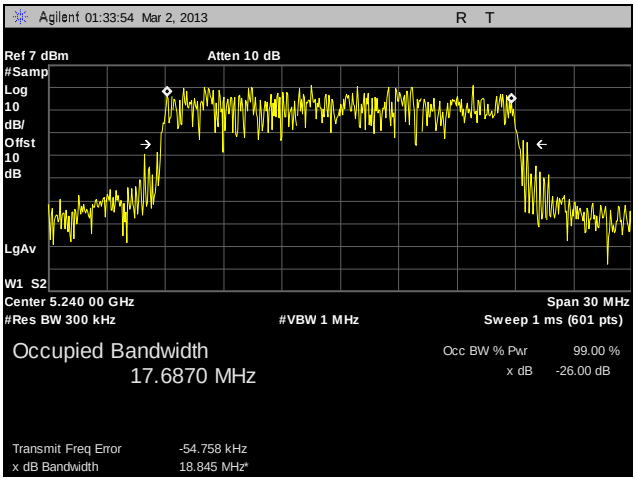
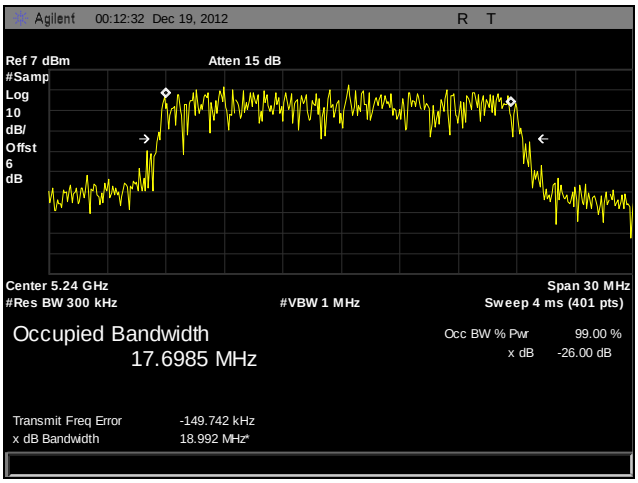
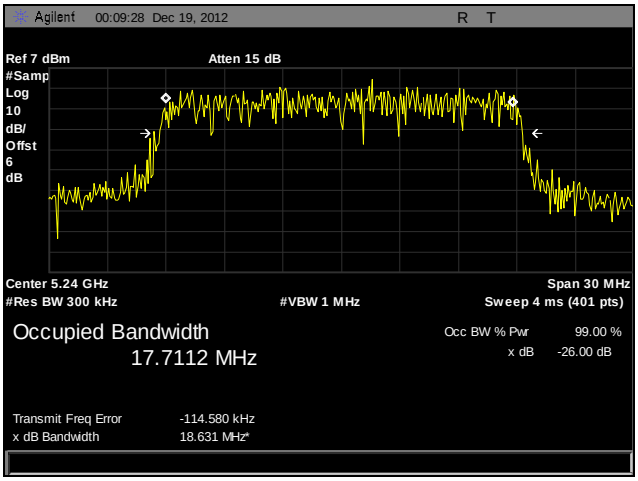


Plot 42. Occupied Bandwidth, 5240 MHz, 20 MHz, Port 1, 99%



Plot 43. Occupied Bandwidth, 5240 MHz, 20 MHz, Port 2, 99%



Plot 44. Occupied Bandwidth, 5240 MHz, 20 MHz, Port 3, 99%

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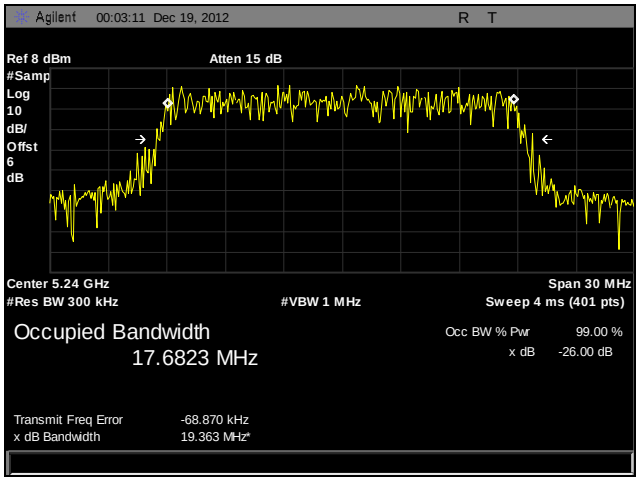

Plot 45. Occupied Bandwidth, 5240 MHz, 20 MHz, Port 4, 99%

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(1) RF Power Output

Test Requirements: **§15.407(a)(1):** The maximum output power of the intentional radiator shall not exceed the following:

§15.407(a)(1): For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz.

Test Procedure: The EUT was connected to a Spectrum Analyzer. The power was measured on both channels.

Test Results: Equipment was compliant with the Peak Power Output limits of **§ 15.401(a)(1)**.

Test Engineer(s): Jeff Pratt

Test Date(s): 01/20/13

Frequency (MHz)	Bandwidth	Port 1 Power (dBm)	Port 2 Power (dBm)	Port 3 Power (dBm)	Port 4 Power (dBm)	Summed Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5180	20 MHz	8.30	8.65	9.57	10.09	15.23	5.00	16.99	-1.76
5200	20 MHz	7.82	8.11	8.84	9.80	14.73	5.00	16.99	-2.26
5240	20 MHz	8.29	8.33	8.96	9.75	14.89	5.00	16.99	-2.10
5190	40 MHz	9.86	9.70	11.26	11.49	16.67	5.00	16.99	-0.32
5230	40 MHz	10.25	10.17	11.24	11.80	16.94	5.00	16.99	-0.05

Table 15. RF Power Output, Test Results

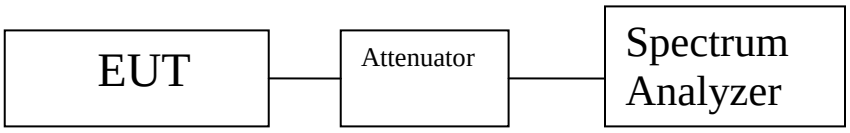

Figure 3. Power Output Test Setup

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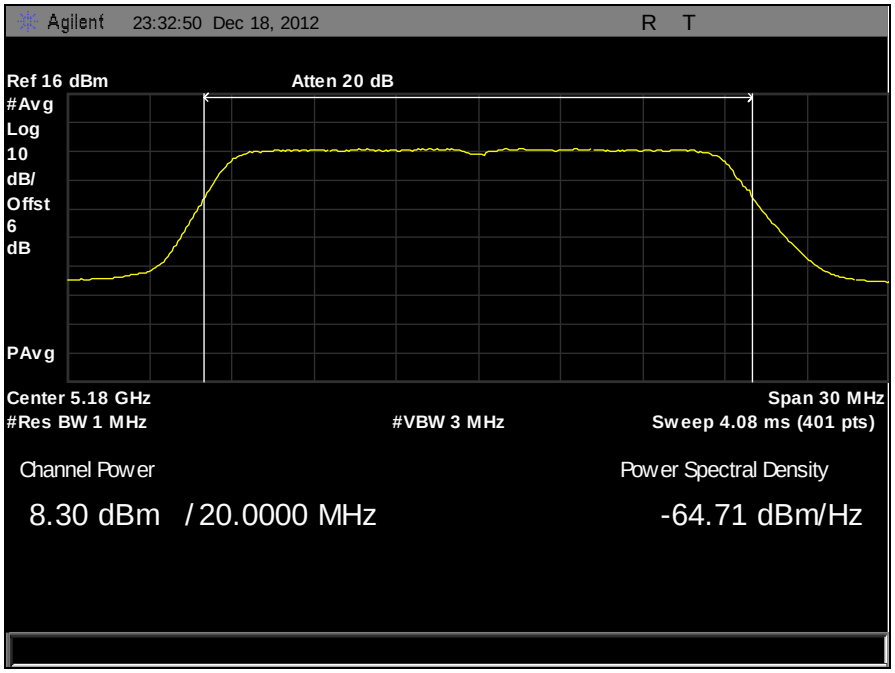
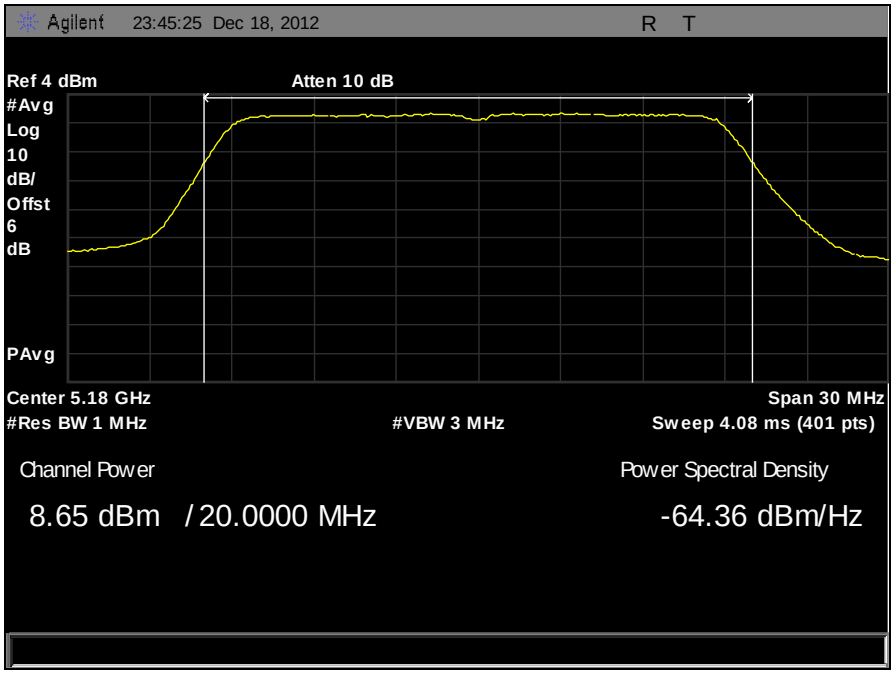


Plot 46. RF Power Output, 5180 MHz, 20 MHz, Port 1



Plot 47. RF Power Output, 5180 MHz, 20 MHz, Port 2

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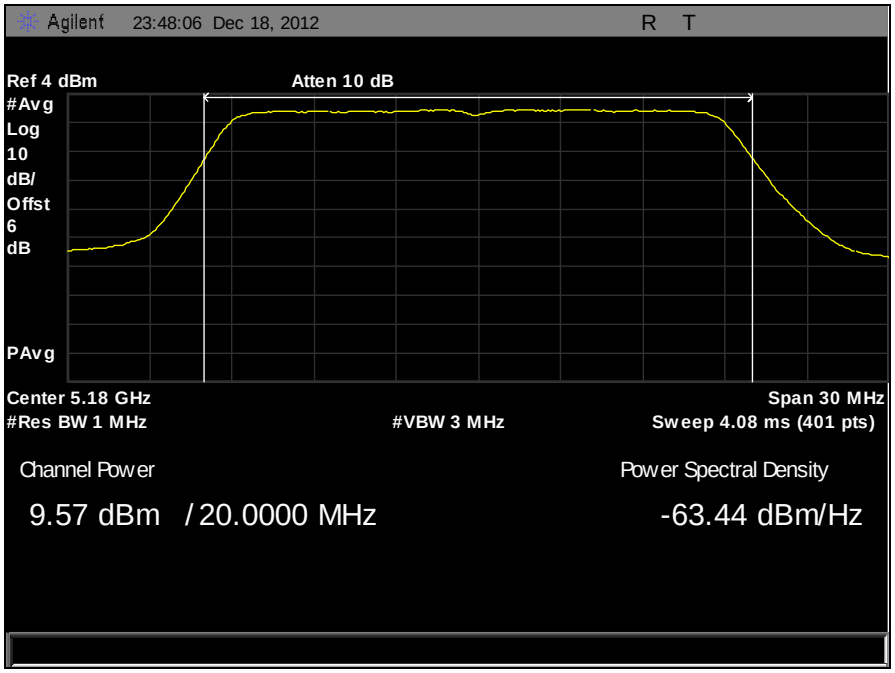
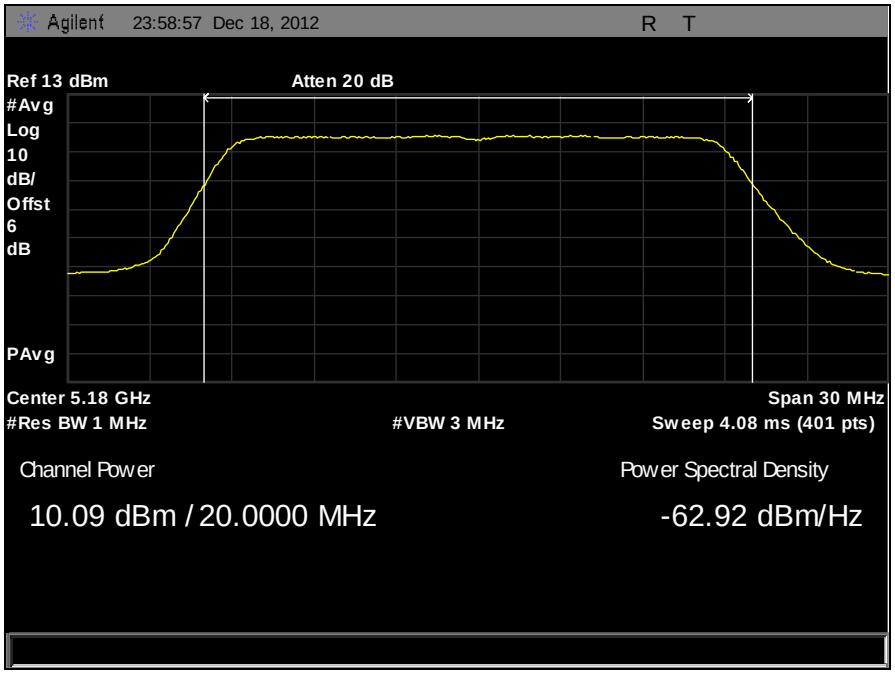
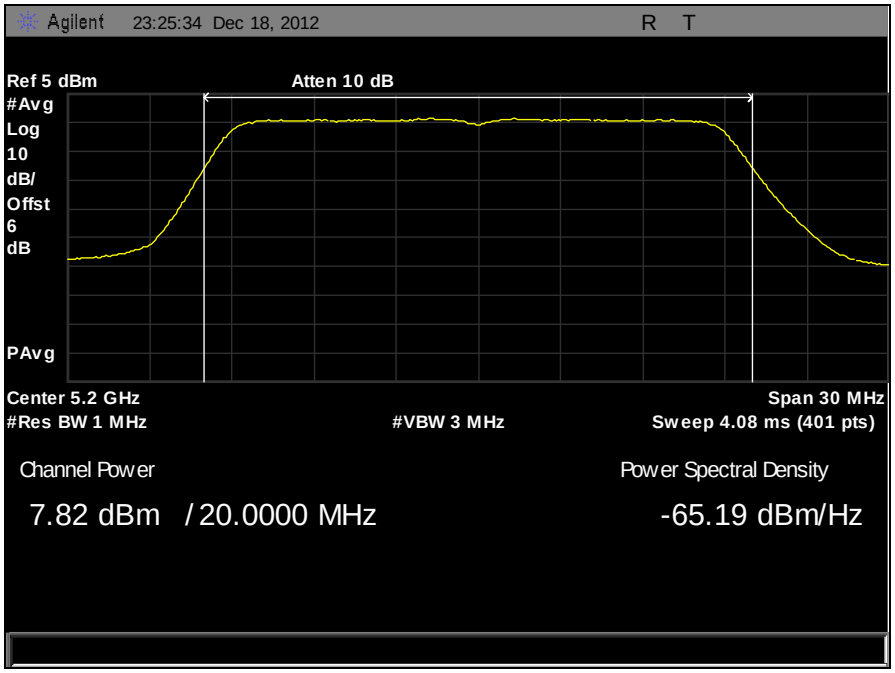


Plot 48. RF Power Output, 5180 MHz, 20 MHz, Port 3

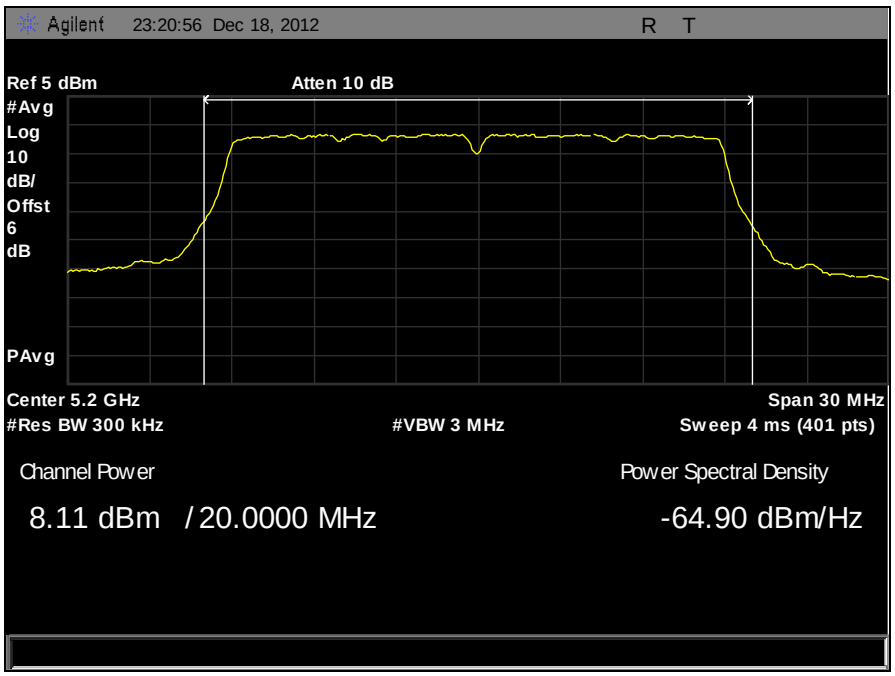


Plot 49. RF Power Output, 5180 MHz, 20 MHz, Port 4

 © 2013, MET Laboratories, Inc.



Plot 50. RF Power Output, 5200 MHz, 20 MHz, Port 1



Plot 51. RF Power Output, 5200 MHz, 20 MHz, Port 2

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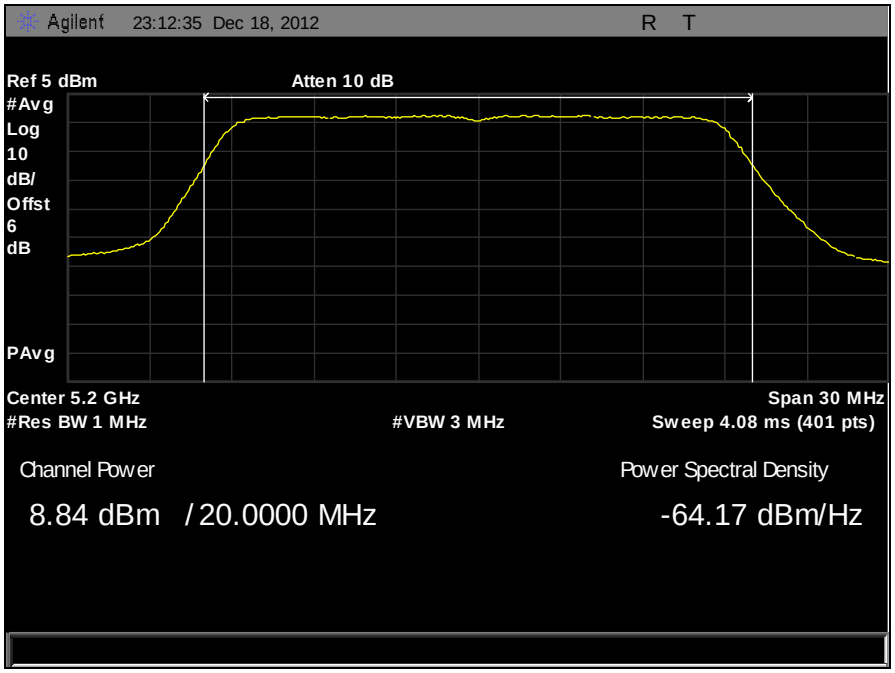
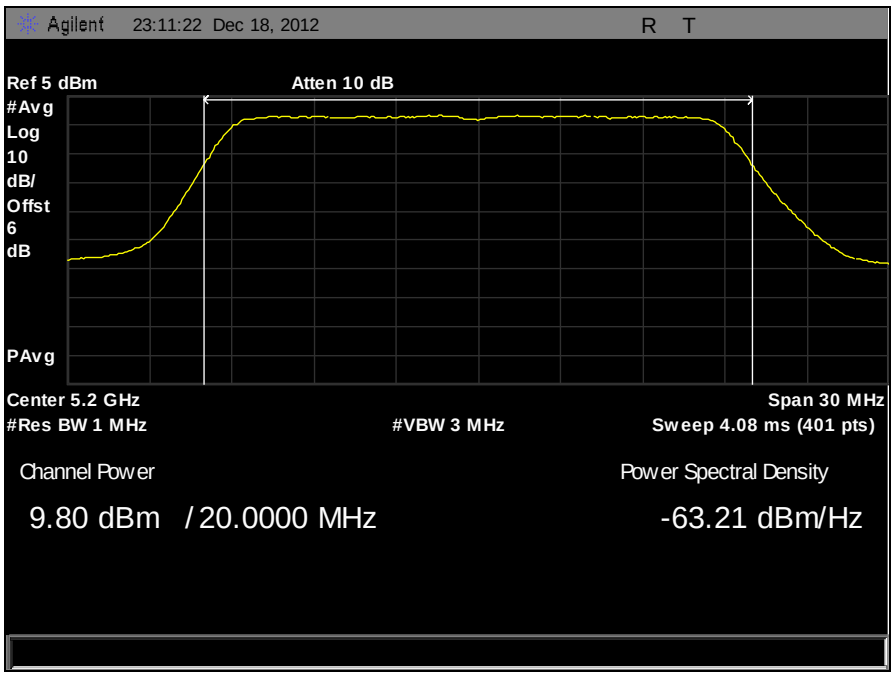


Plot 52. RF Power Output, 5200 MHz, 20 MHz, Port 3



Plot 53. RF Power Output, 5200 MHz, 20 MHz, Port 4

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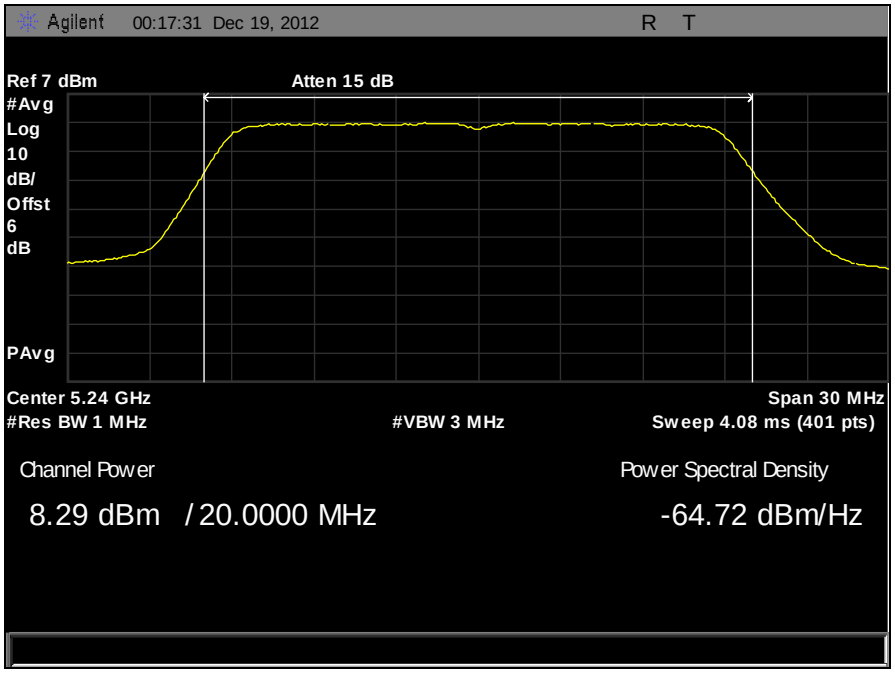
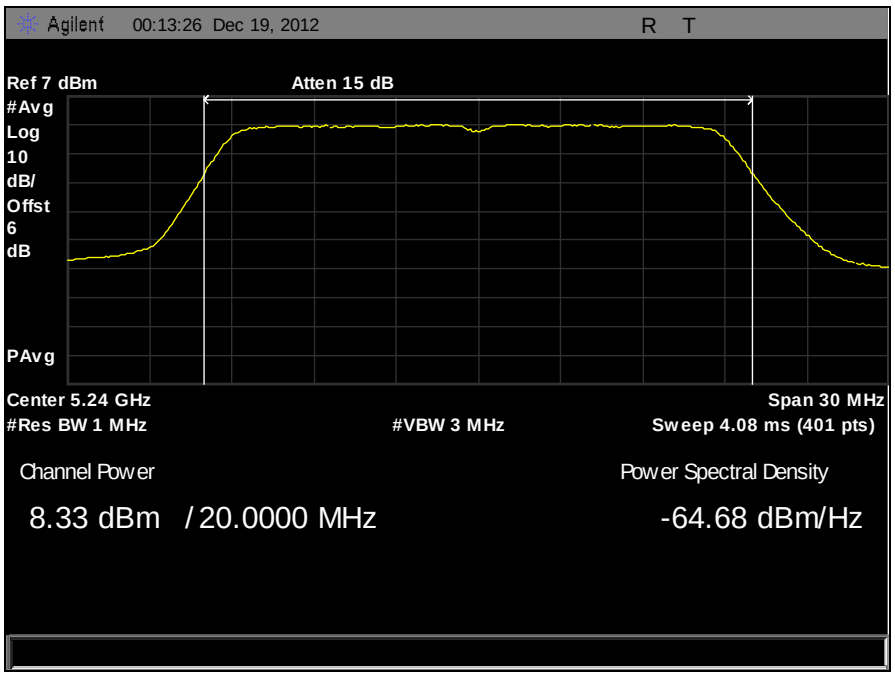


Plot 54. RF Power Output, 5240 MHz, 20 MHz, Port 1



Plot 55. RF Power Output, 5240 MHz, 20 MHz, Port 2

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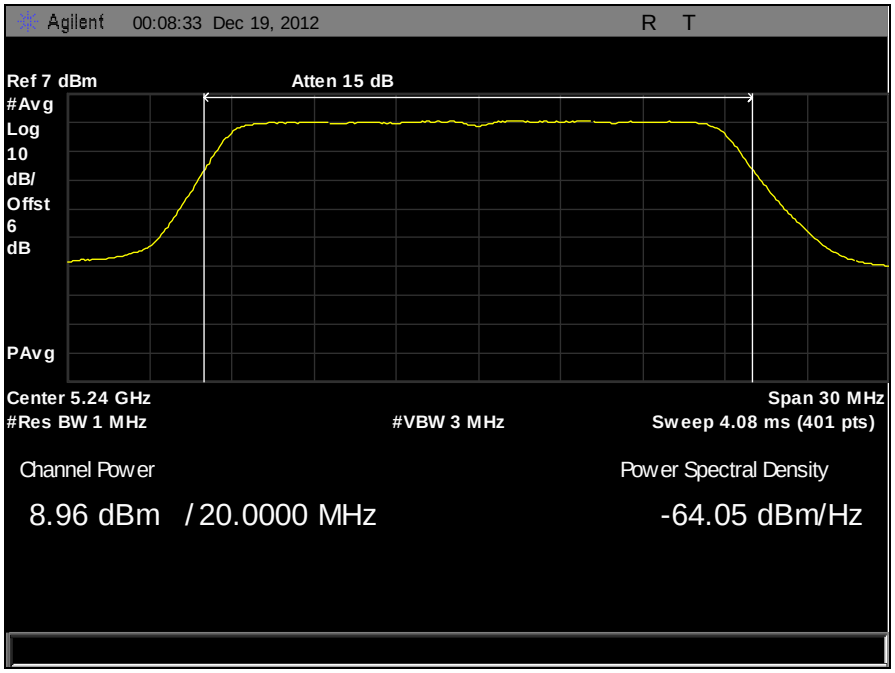
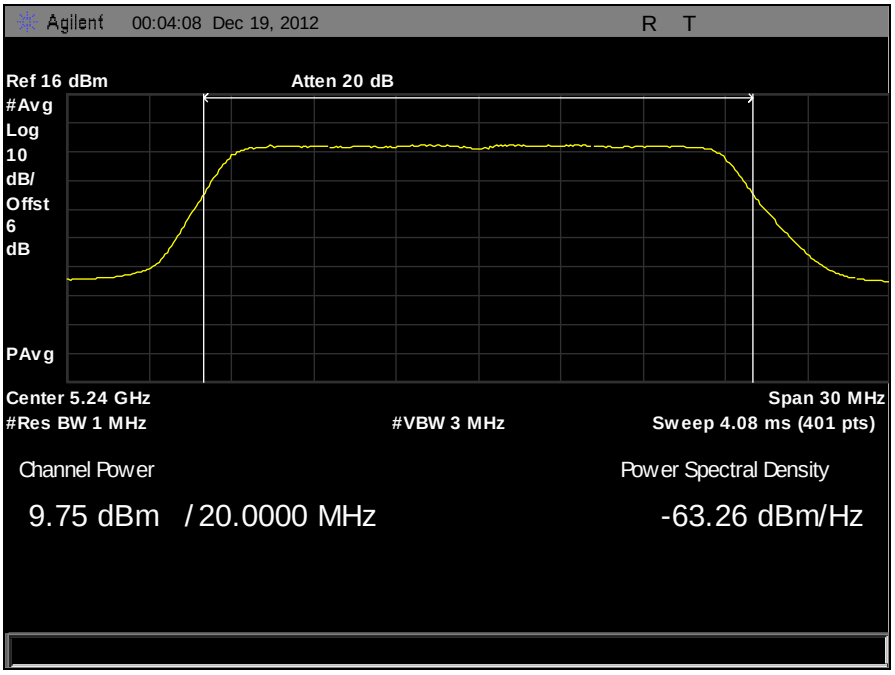


Plot 56. RF Power Output, 5240 MHz, 20 MHz, Port 3



Plot 57. RF Power Output, 5240 MHz, 20 MHz, Port 4

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(1) Peak Power Spectral Density

Test Requirements: **§ 15.407(a)(1):** In addition, the peak power spectral density shall not exceed 4 dBm in any 1 megahertz band.

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level on the EUT. The RBW was set to 1MHz and the VBW was set to 3MHz. The method of measurement SA-1 from FCC Publication 789033 was used.

Test Results: Equipment was compliant with the peak power spectral density limits of **§ 15.407 (a)(1).** The peak power spectral density was determined from plots on the following page(s).

Test Engineer(s): Jeff Pratt

Test Date(s): 01/20/13

Frequency (MHz)	Bandwidth	Port 1 PSD (dBm)	Port 2 PSD (dBm)	Port 3 PSD (dBm)	Port 4 PSD (dBm)	Summed PSD (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5180	20 MHz	-3.44	-2.76	-1.56	-1.56	3.76	5.00	4.00	-0.24
5200	20 MHz	-3.71	-3.45	-2.48	-1.96	3.18	5.00	4.00	-0.82
5240	20 MHz	-3.10	-2.88	-2.36	-1.64	3.57	5.00	4.00	-0.43
5190	802.11n HT40	-4.65	-5.27	-3.75	-3.22	1.87	5.00	4.00	-2.13
5230	802.11n HT40	-4.28	-4.18	-3.29	-2.61	2.49	5.00	4.00	-1.51

Table 16. Power Spectral Density, Test Results

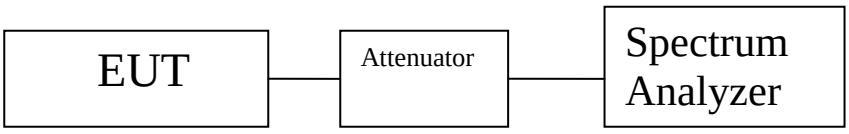

Figure 4. Power Spectral Density Test Setup

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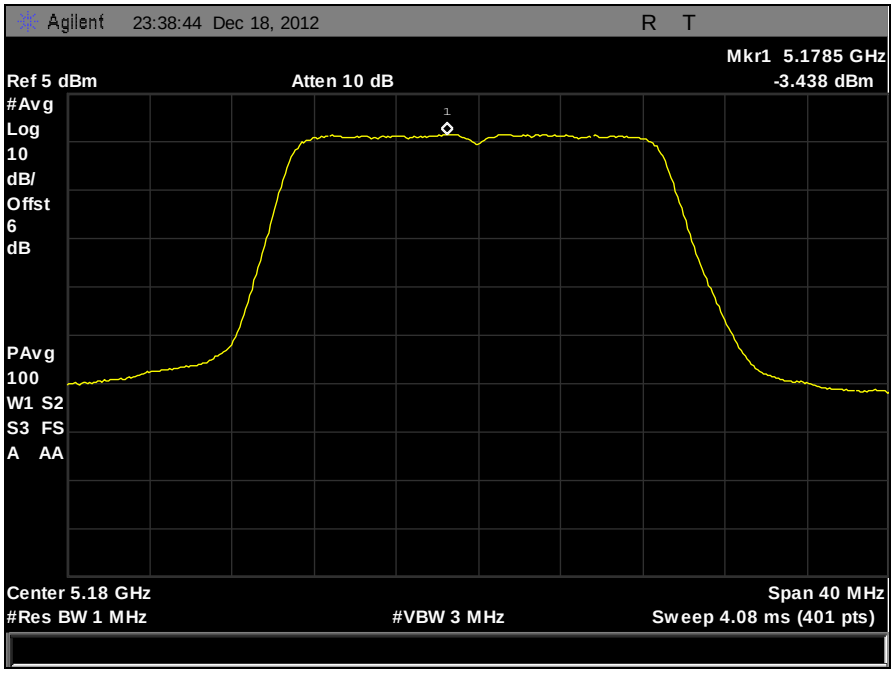
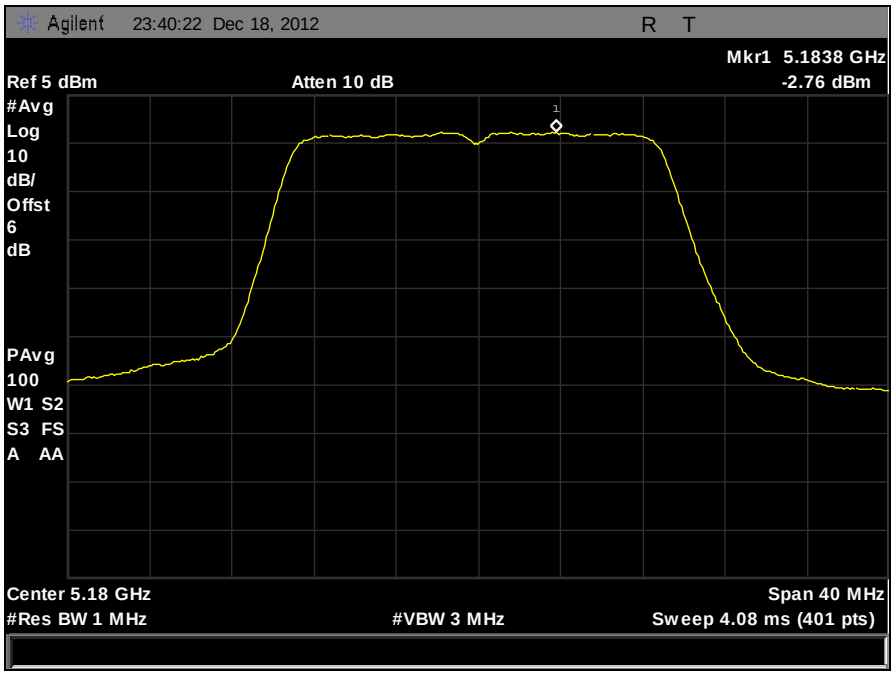
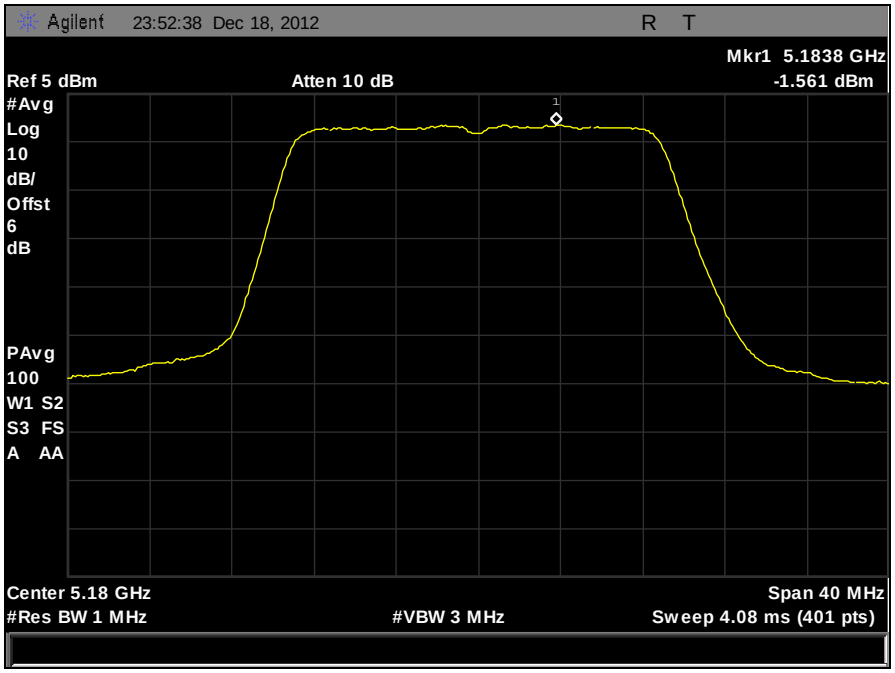


Plot 58. Power Spectral Density, 5180 MHz, 20 MHz, Port 1

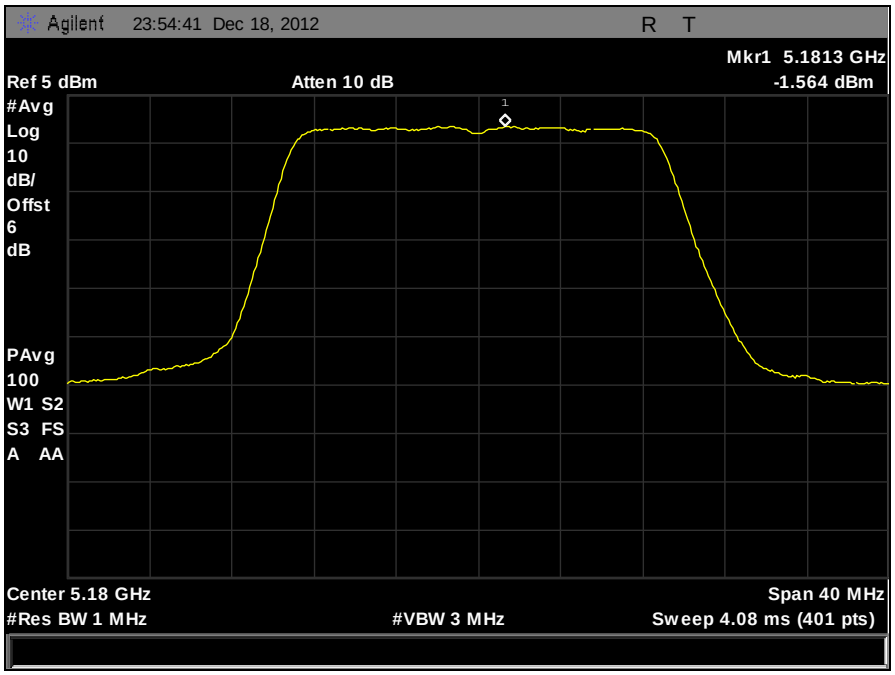


Plot 59. Power Spectral Density, 5180 MHz, 20 MHz, Port 2

 © 2013, MET Laboratories, Inc.



Plot 60. Power Spectral Density, 5180 MHz, 20 MHz, Port 3



Plot 61. Power Spectral Density, 5180 MHz, 20 MHz, Port 4

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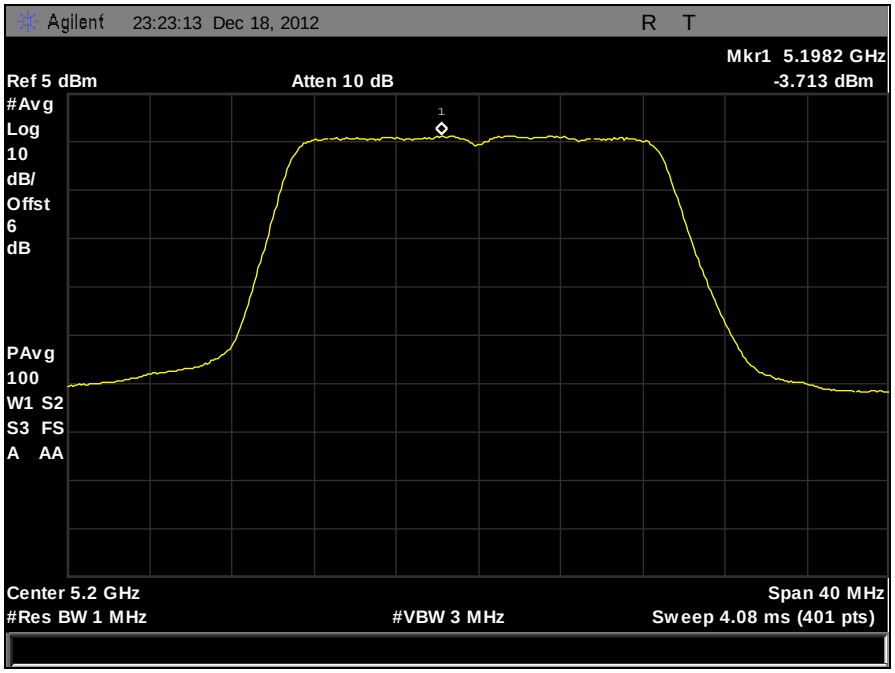
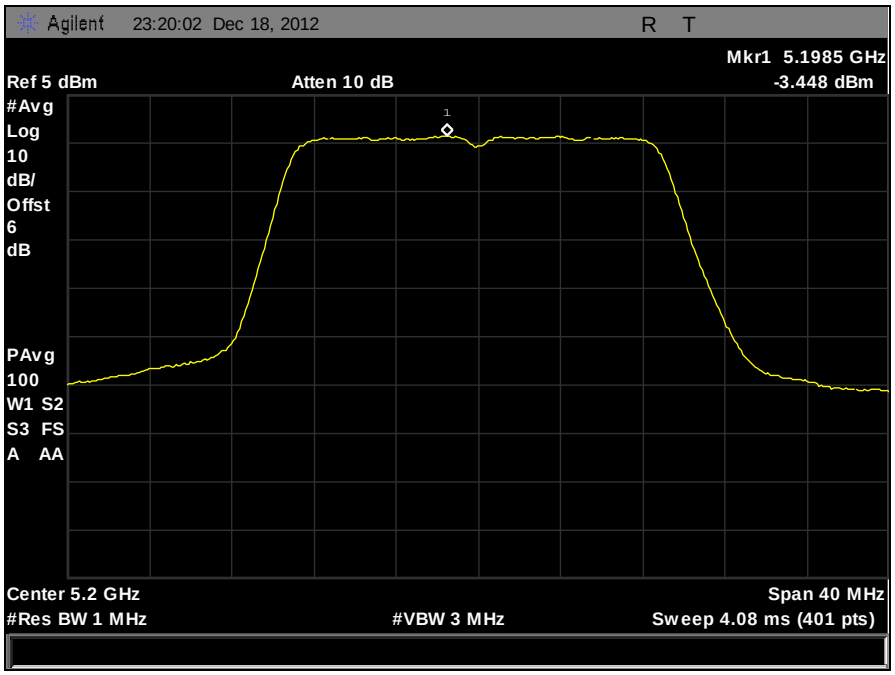


Plot 62. Power Spectral Density, 5200 MHz, 20 MHz, Port 1



Plot 63. Power Spectral Density, 5200 MHz, 20 MHz, Port 2

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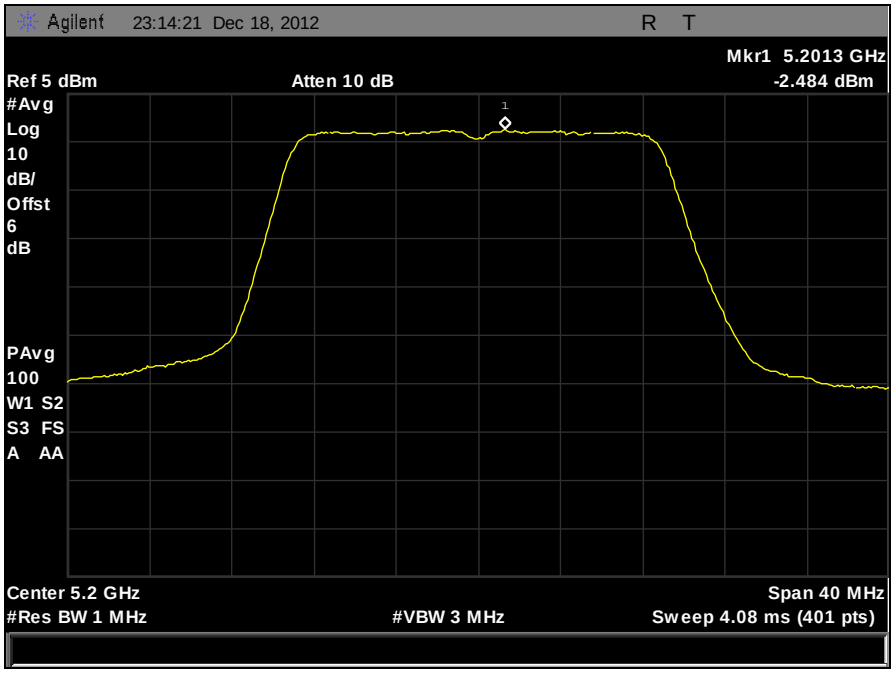
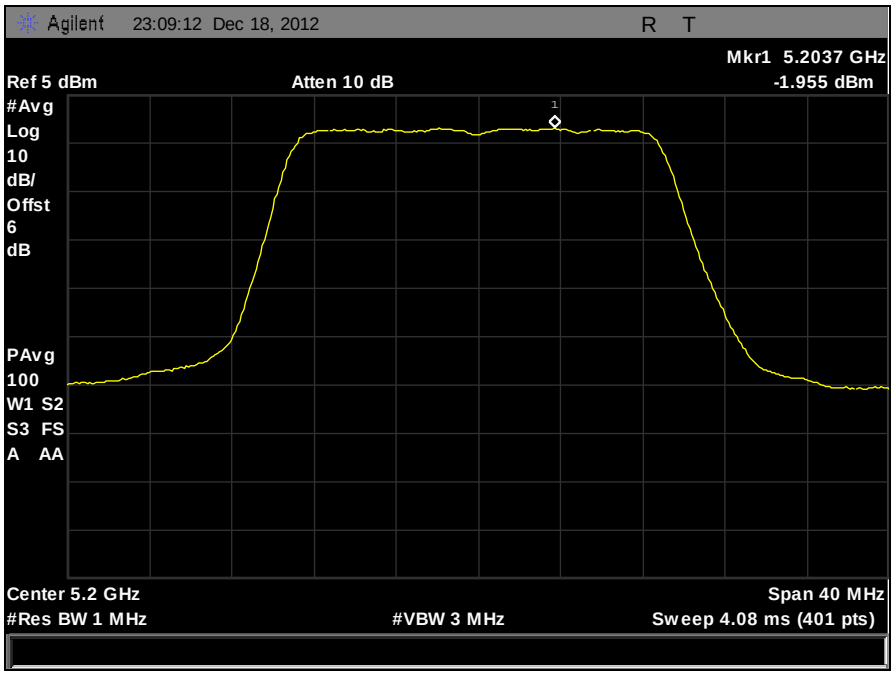


Plot 64. Power Spectral Density, 5200 MHz, 20 MHz, Port 3



Plot 65. Power Spectral Density, 5200 MHz, 20 MHz, Port 4

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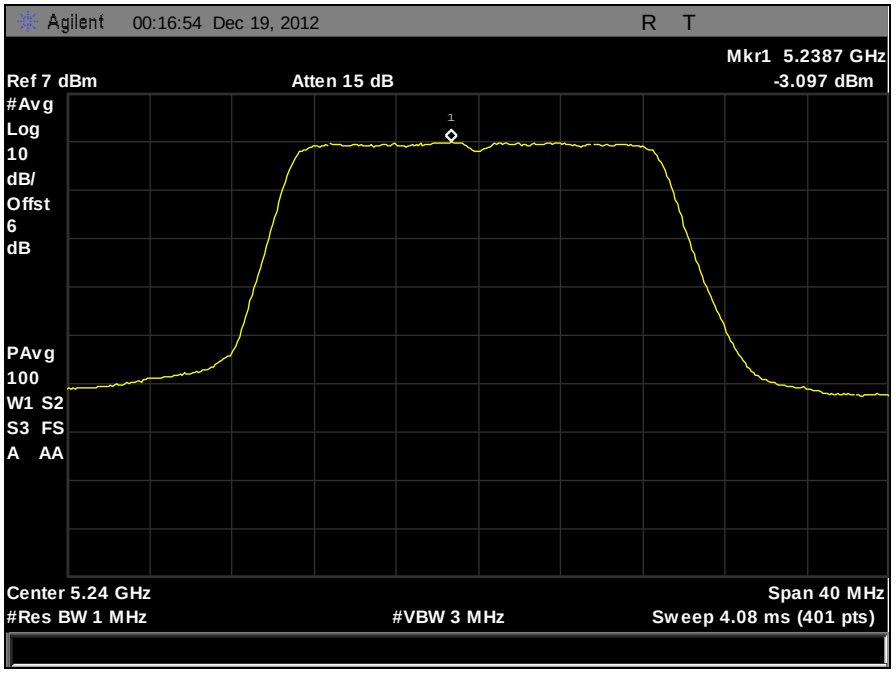
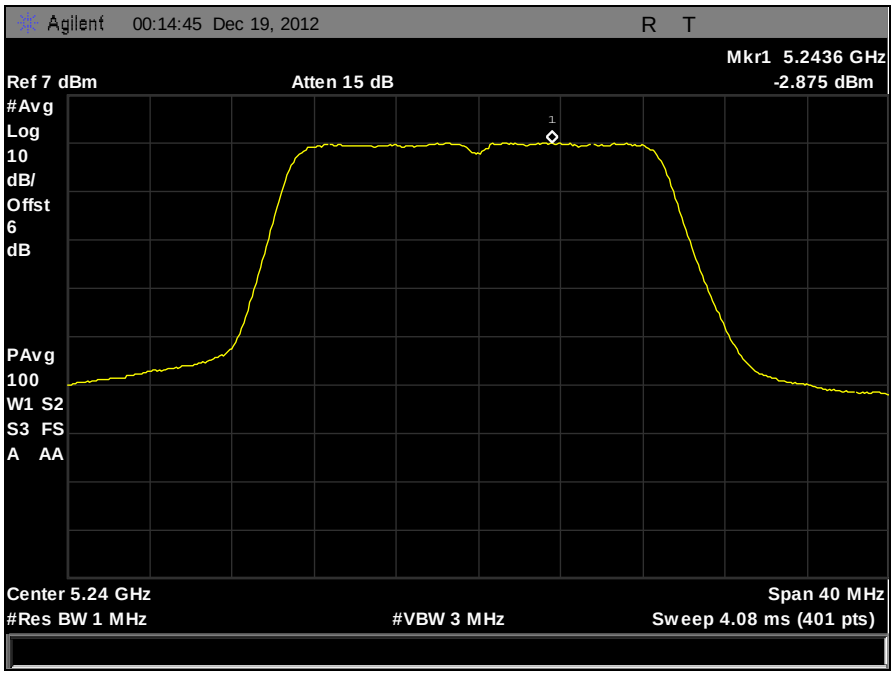


Plot 66. Power Spectral Density, 5240 MHz, 20 MHz, Port 1



Plot 67. Power Spectral Density, 5240 MHz, 20 MHz, Port 2

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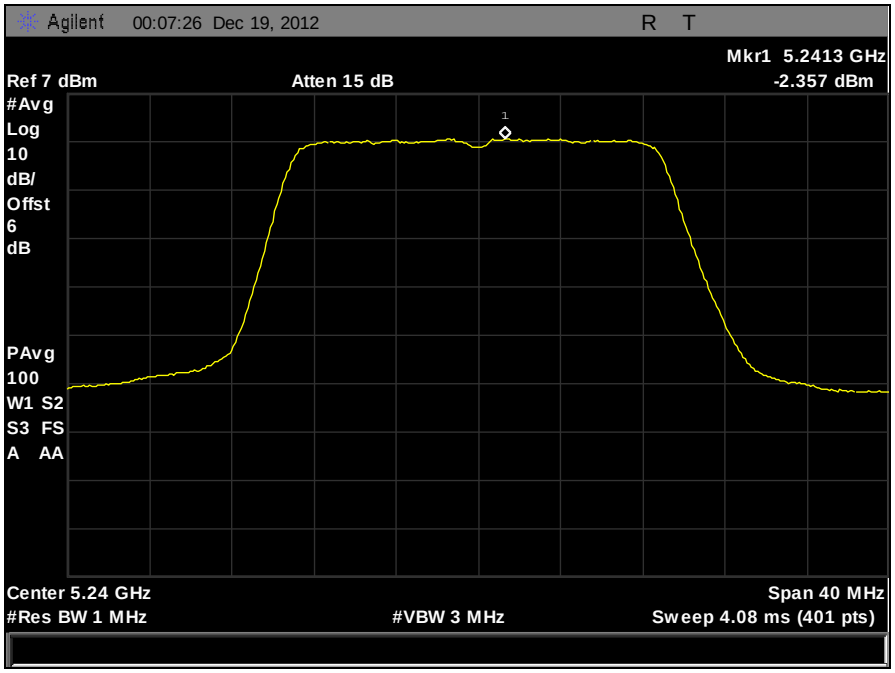
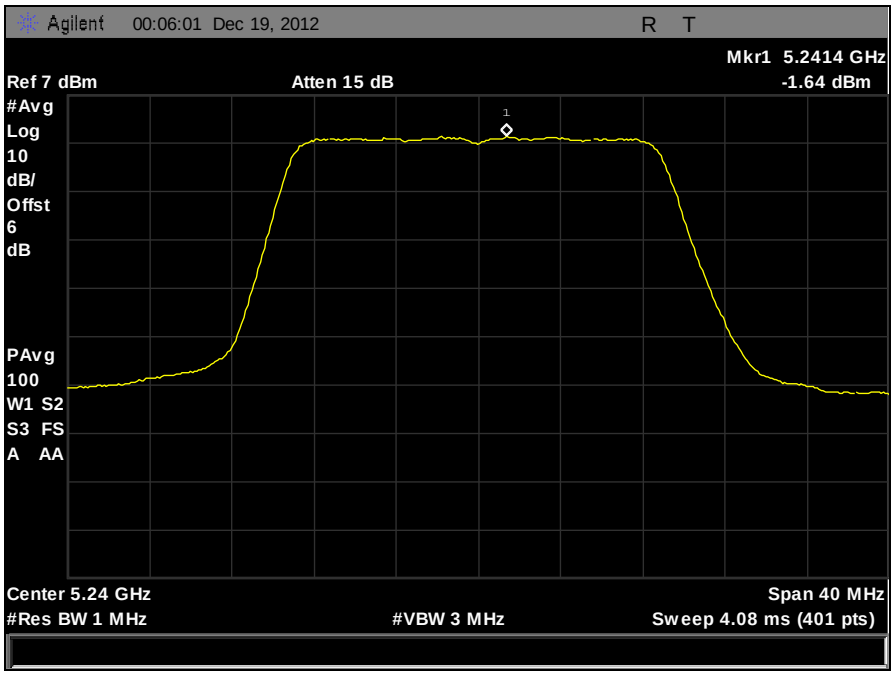


Plot 68. Power Spectral Density, 5240 MHz, 20 MHz, Port 3



Plot 69. Power Spectral Density, 5240 MHz, 20 MHz, Port 4

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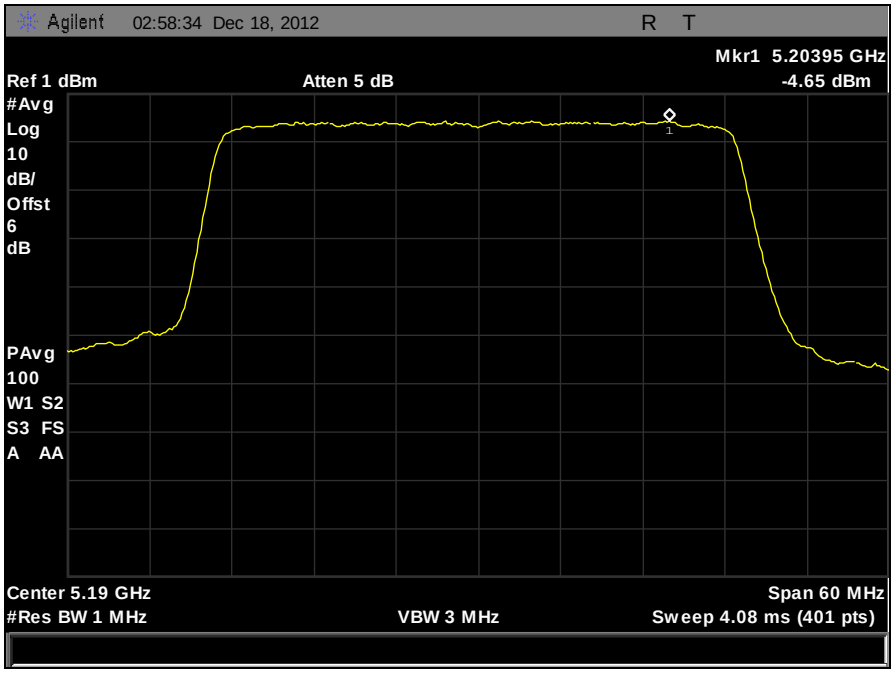
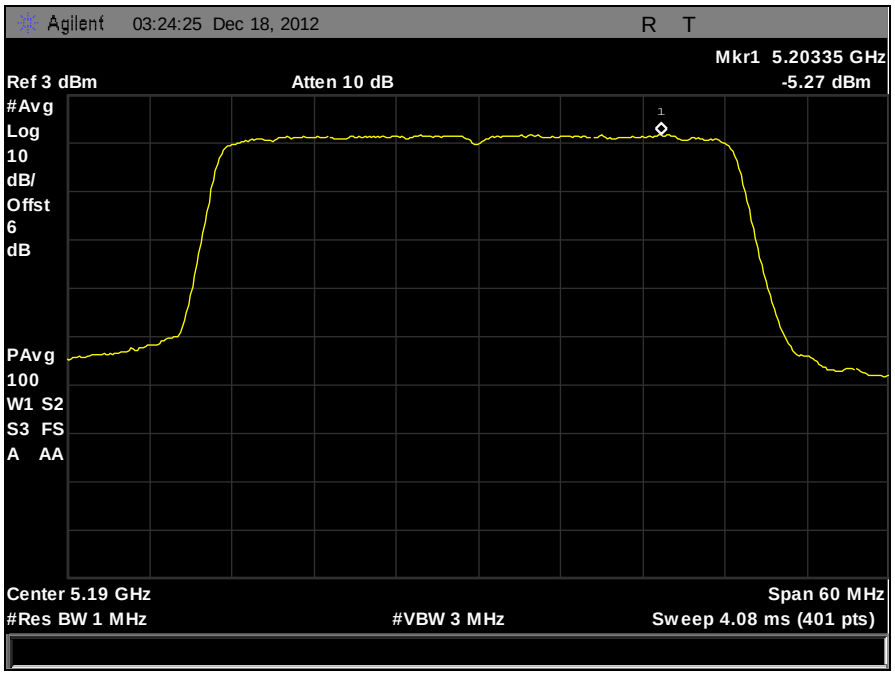


Plot 70. Power Spectral Density, 5190 MHz, 40 MHz, Port 1



Plot 71. Power Spectral Density, 5190 MHz, 40 MHz, Port 2

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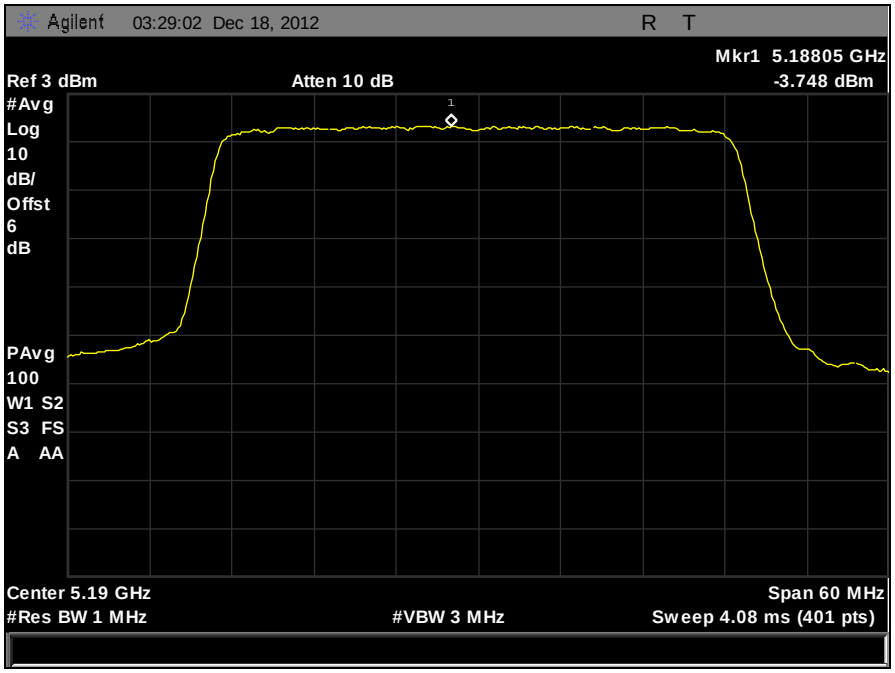
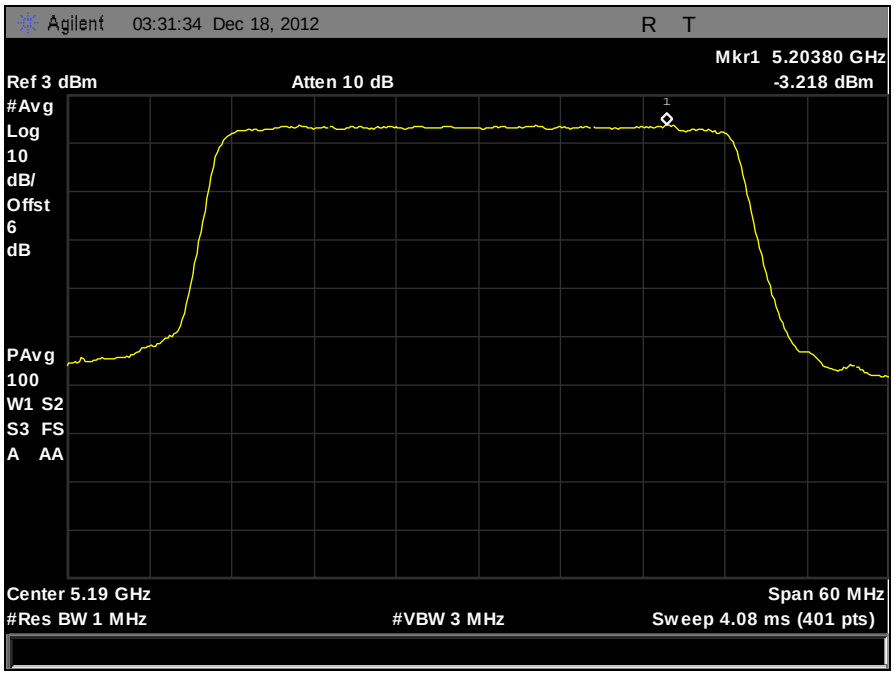


Plot 72. Power Spectral Density, 5190 MHz, 40 MHz, Port 3



Plot 73. Power Spectral Density, 5190 MHz, 40 MHz, Port 4

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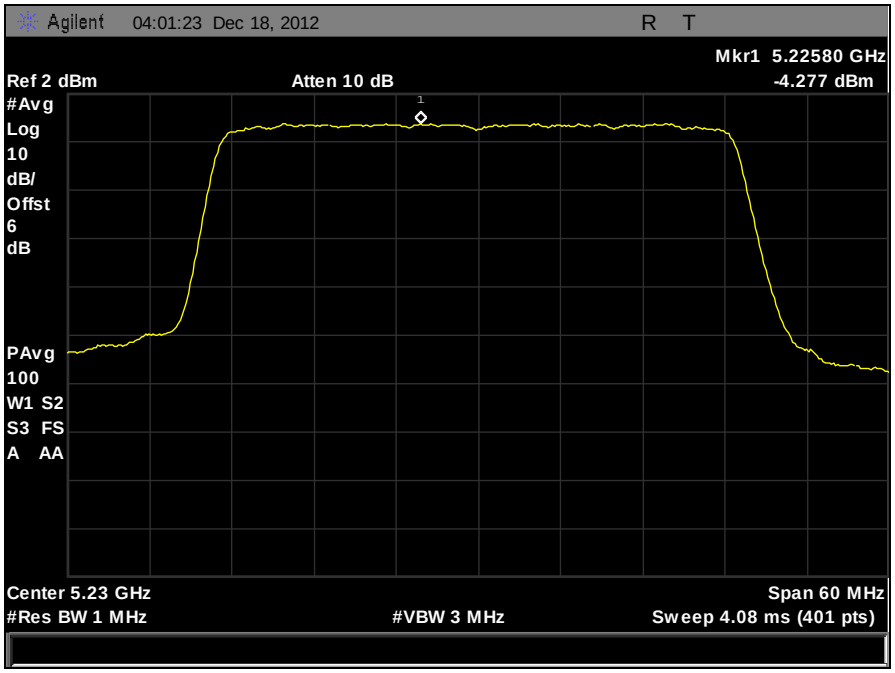
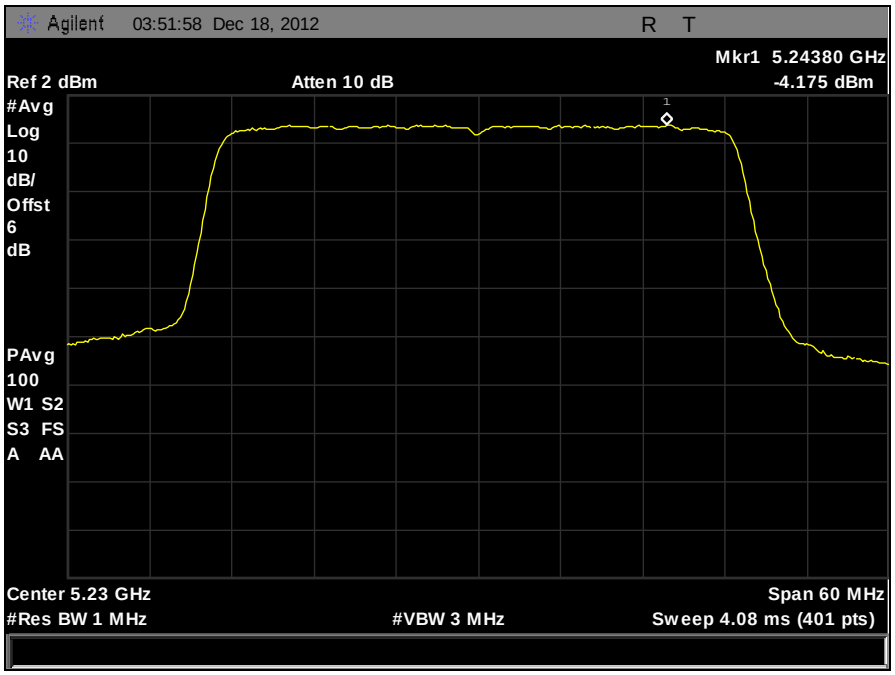


Plot 74. Power Spectral Density, 5230 MHz, 40 MHz, Port 1



Plot 75. Power Spectral Density, 5230 MHz, 40 MHz, Port 2

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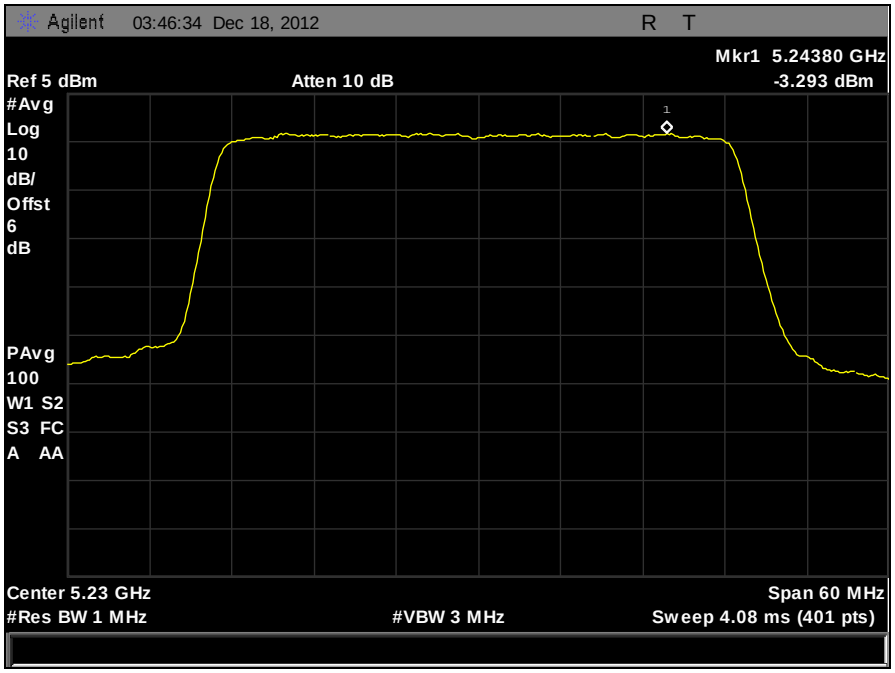
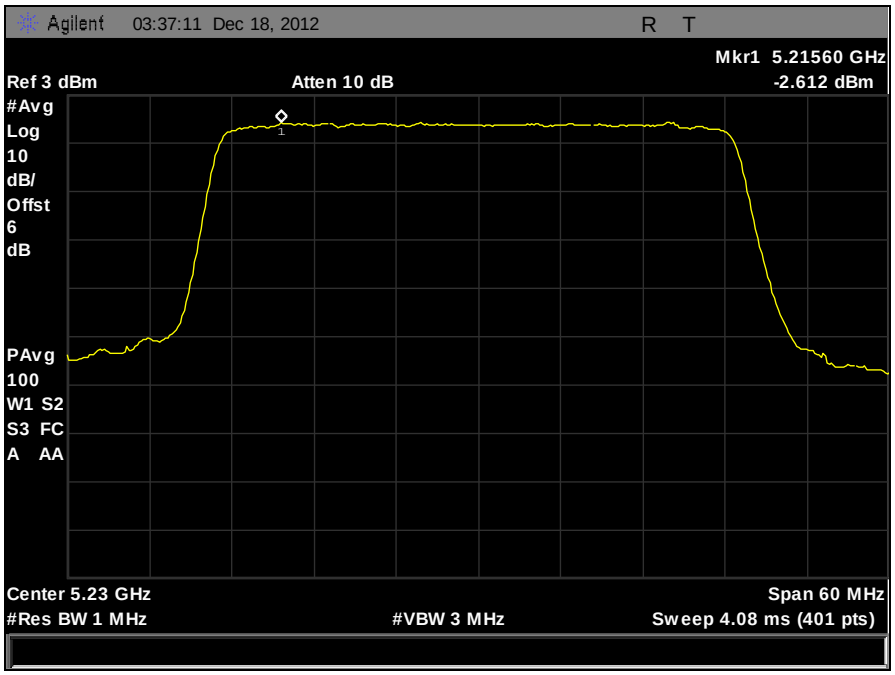


Plot 76. Power Spectral Density, 5230 MHz, 40 MHz, Port 3



Plot 77. Power Spectral Density, 5230 MHz, 40 MHz, Port 4

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(6) Peak Excursion Ratio

Test Requirements: **§ 15.407(a)(6):** The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Test Procedure: The EUT was connected directly to the spectrum analyzer through cabling and attenuation. The 1st trace on the spectrum analyzer was set to RBW=1MHz, VBW=3MHz. The peak detector mode was used and the trace max held. The 2nd trace on the spectrum analyzer was set according to measurement method SA-1 from FCC Publication 789033 for making conducted power measurements.

Test Results: Equipment was compliant with the peak excursion ratio limits of **§ 15.407(a)(6).** The peak excursion ratio was determined from plots on the following page(s).

Test Engineer(s): Jeff Pratt

Test Date(s): 01/20/13

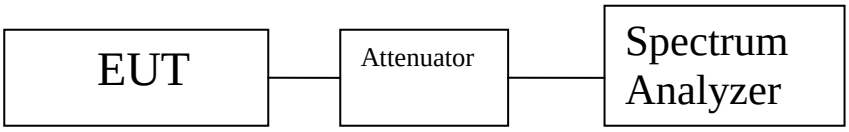

Figure 5. Peak Excursion Ration Test Setup

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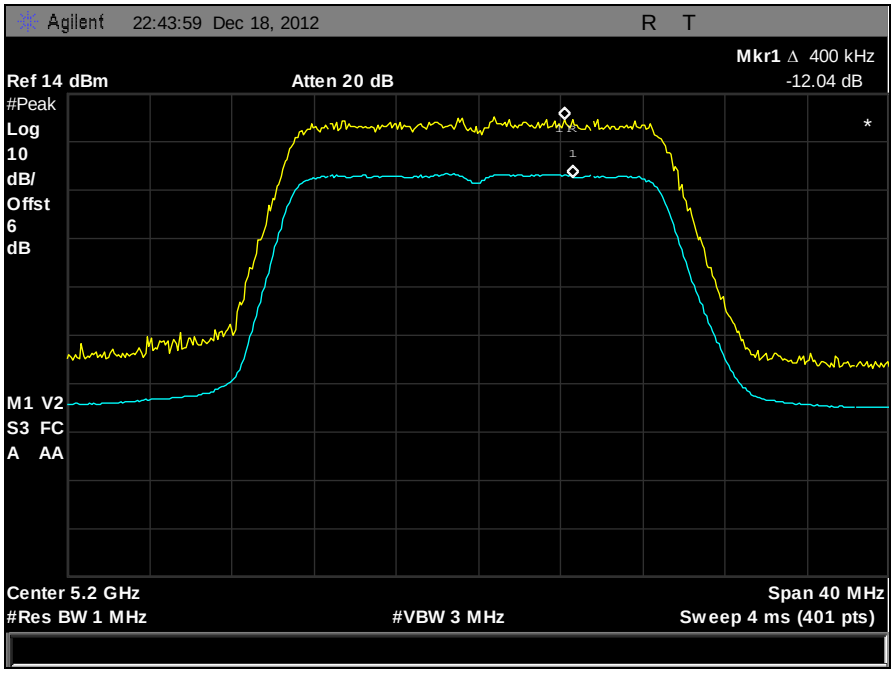
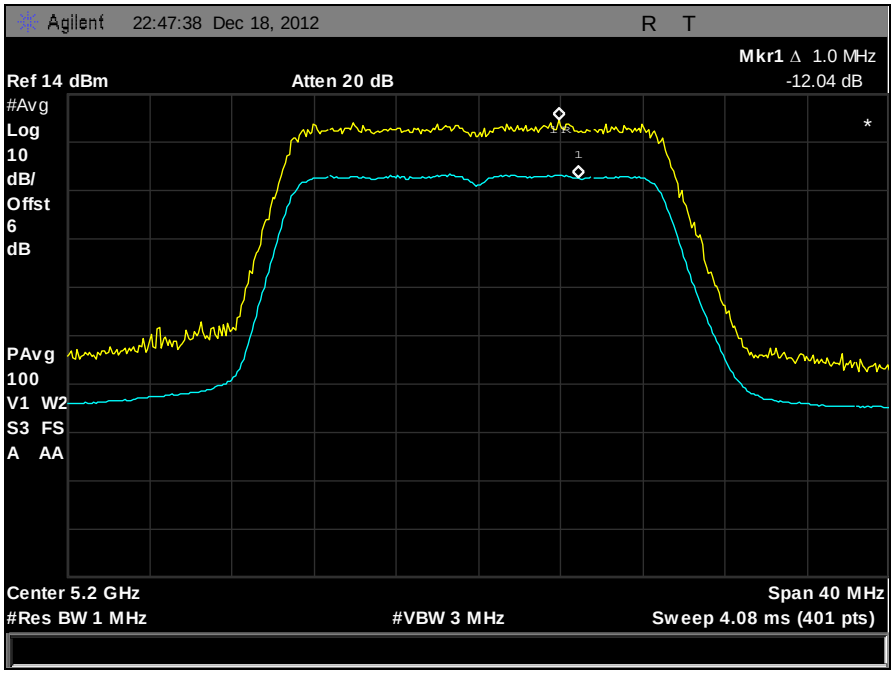


Plot 78. Peak Excursion Ratio, 5200 MHz, 20 MHz, Port 1



Plot 79. Peak Excursion Ratio, 5200 MHz, 20 MHz, Port 2

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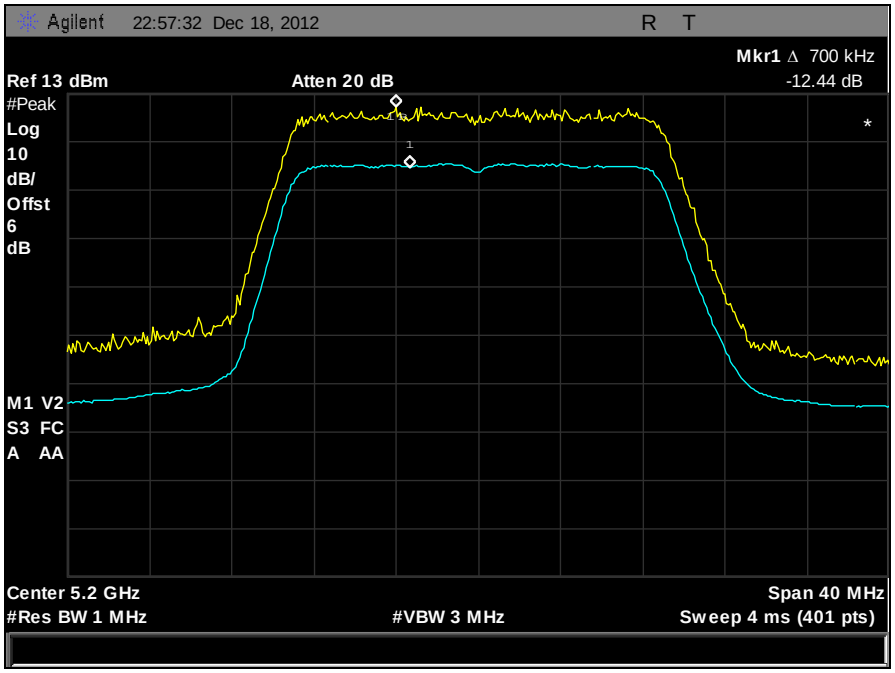
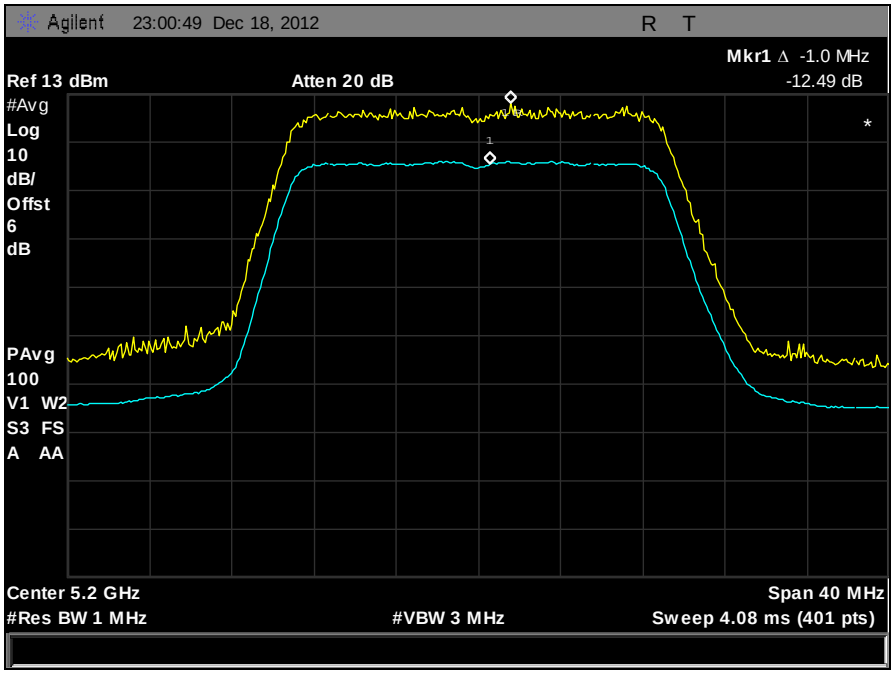


Plot 80. Peak Excursion Ratio, 5200 MHz, 20 MHz, Port 3



Plot 81. Peak Excursion Ratio, 5200 MHz, 20 MHz, Port 4

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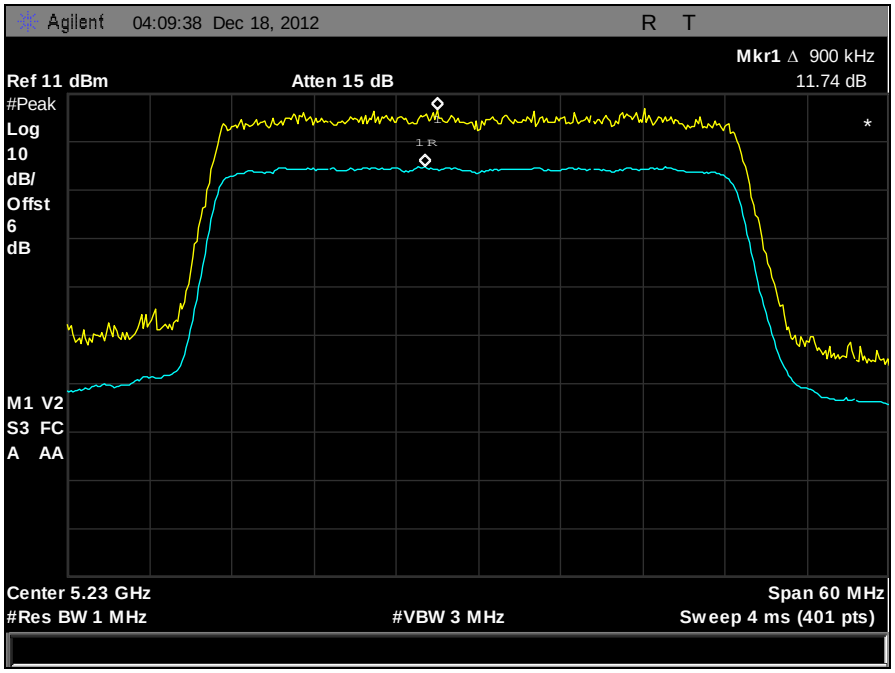
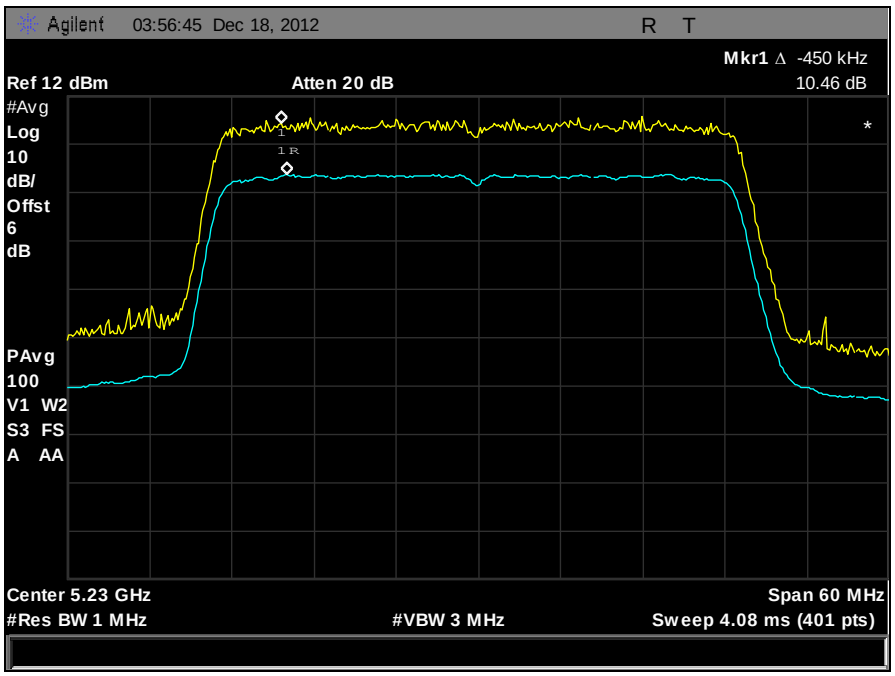


Plot 82. Peak Excursion Ratio, 5230 MHz, 40 MHz, Port 1



Plot 83. Peak Excursion Ratio, 5230 MHz, 40 MHz, Port 2

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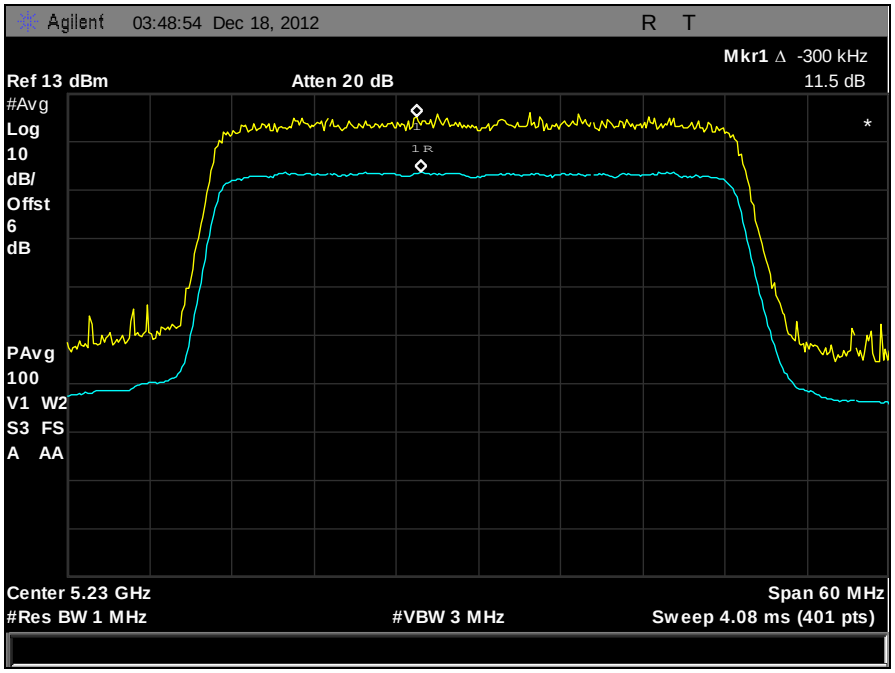
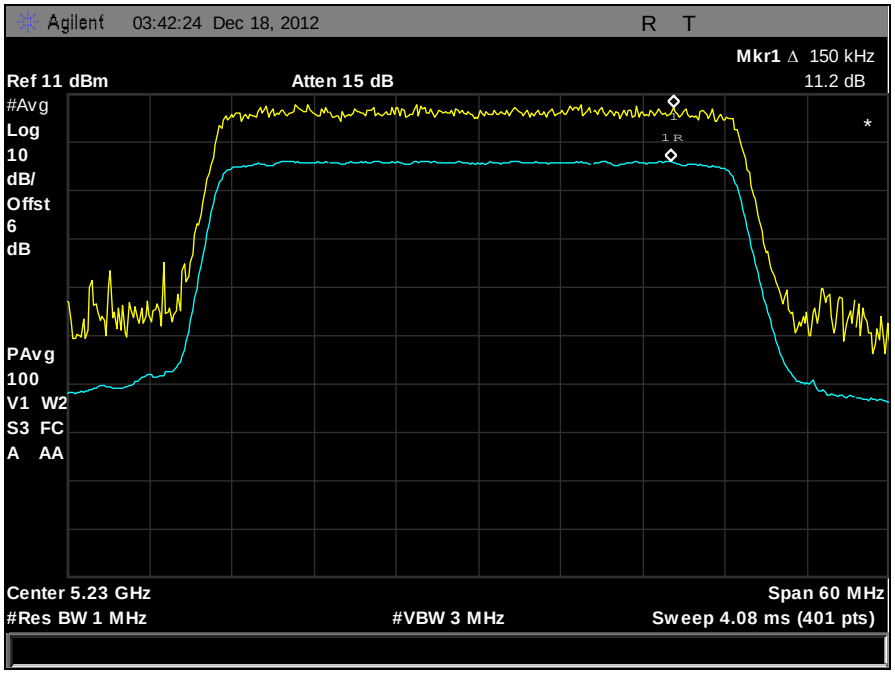


Plot 84. Peak Excursion Ratio, 5230 MHz, 40 MHz, Port 3



Plot 85. Peak Excursion Ratio, 5230 MHz, 40 MHz, Port 4

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(1), (6), (7) Undesirable Emissions

Test Requirements: **§ 15.407(b)(1), (6), (7)**; **§15.205:** Emissions outside the frequency band.

§ 15.407(b)(1): For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz.

§ 15.407(b)(6): Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.

§ 15.407(b)(7): The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

Test Procedure: The transmitter was placed on an acrylic stand inside in a semi-anechoic chamber. Measurements were performed with the EUT rotated 360 degrees and varying the adjustable antenna mast height to determine worst case orientation for maximum emissions.

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

For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with 15.209 limits. Emissions were explored up to 40 GHz.
The equation, **EIRP= E + 20 log D – 104.8** was used to convert an EIRP limit to a field strength limit.
E = field strength (dBuV/m)
D = Reference measurement distance

Test Results: The EUT was compliant with the Radiated Emission limits for Intentional Radiators. See following pages for detailed test results.

Test Engineer(s): Jeff Pratt and Zijun Tong

Test Date(s): 12/18/12 – 01/24/13

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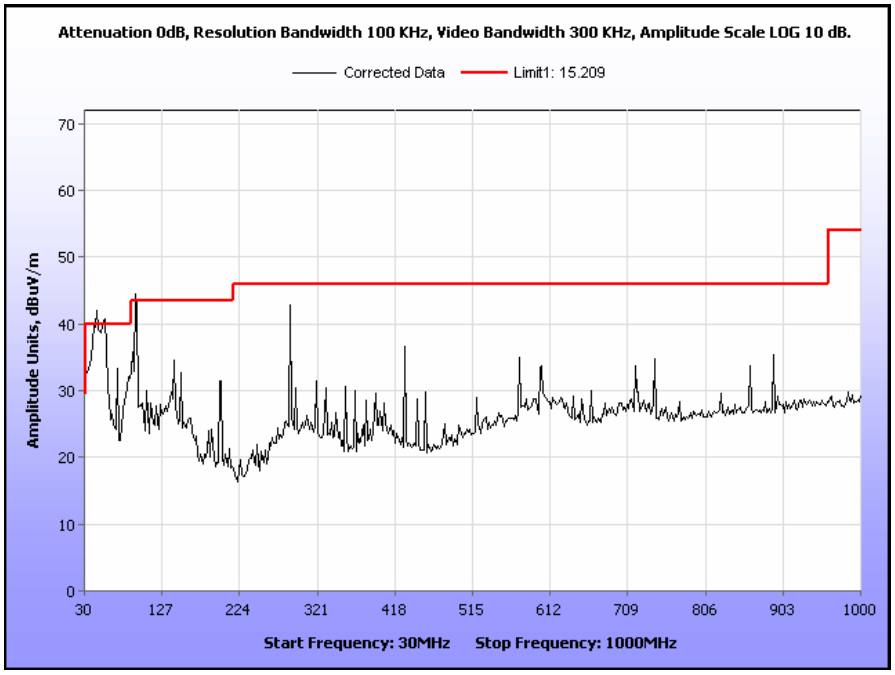
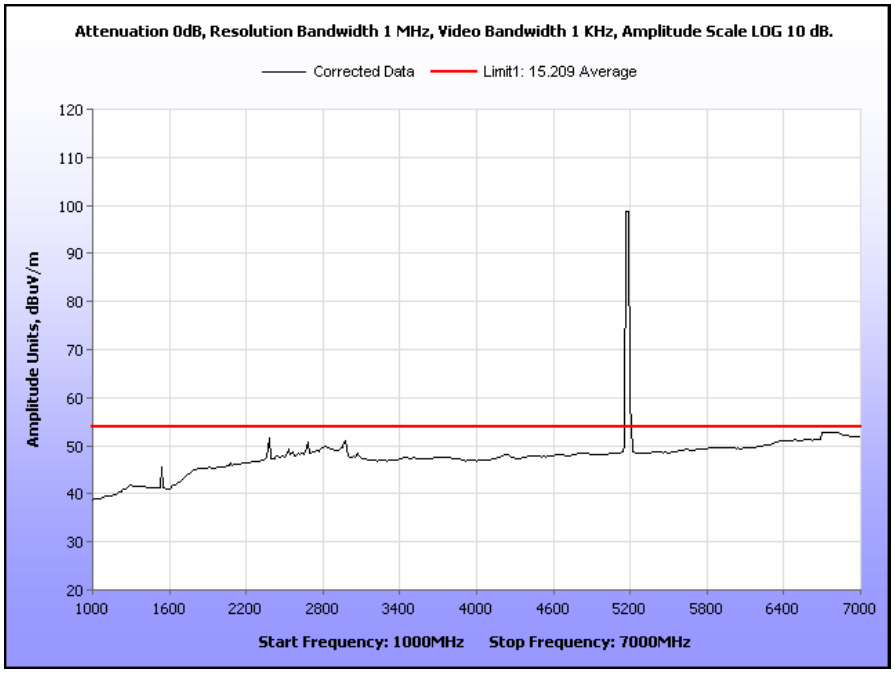
§ 15.209 Radiated Emissions Limits



Plot 86. Radiated Spurious Emissions, 5180 MHz, 20 MHz Channel, Tx Power 8, 30 MHz – 1 GHz

Emissions which exceed the 15.209 limit are digital and meet the Class B limits of 15.109. Refer to Table 11.



Plot 87. Radiated Spurious Emissions, 5180 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Average

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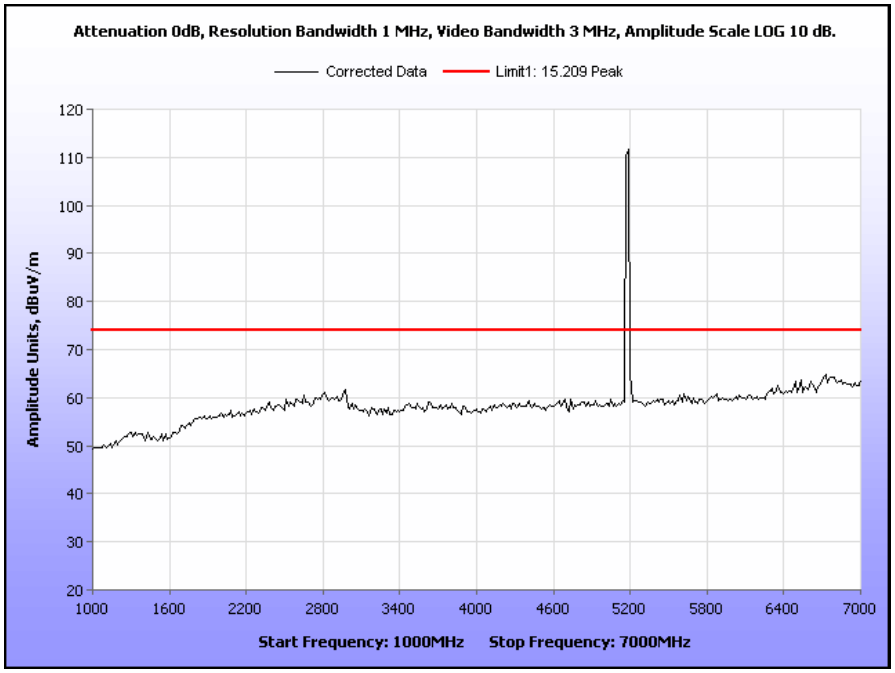
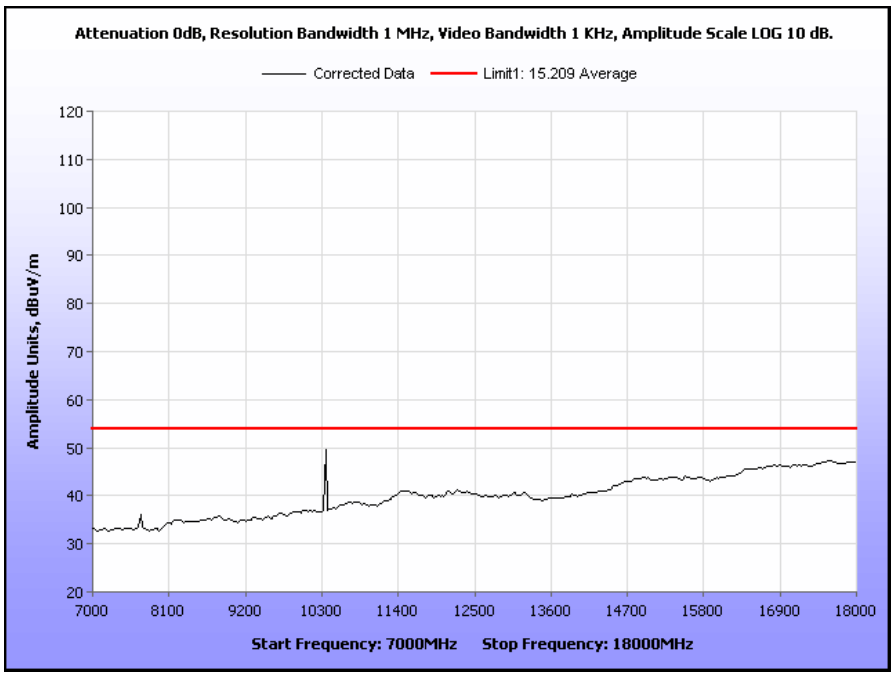


Plot 88. Radiated Spurious Emissions, 5180 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 89. Radiated Spurious Emissions, 5180 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Average

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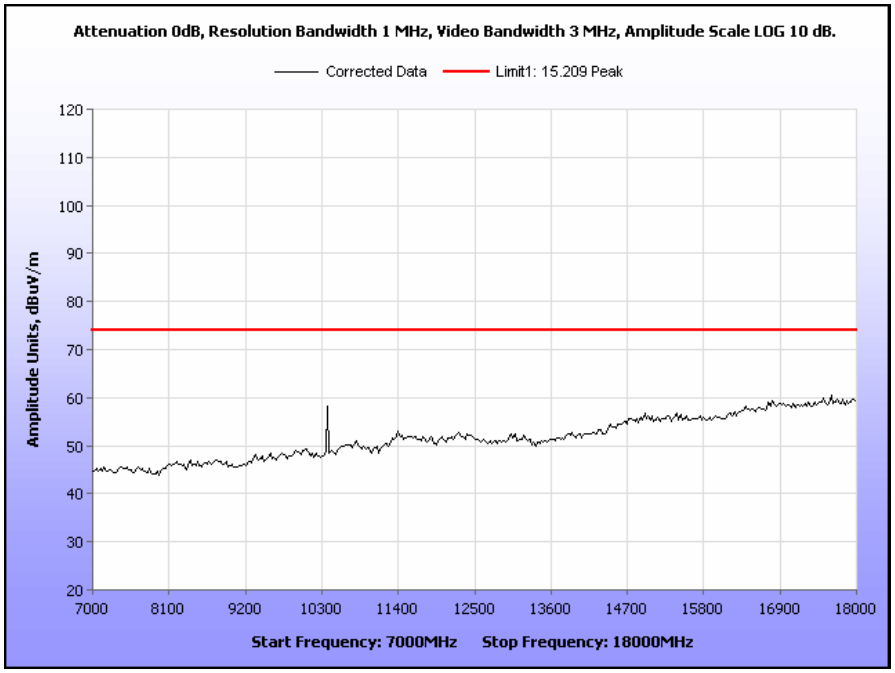
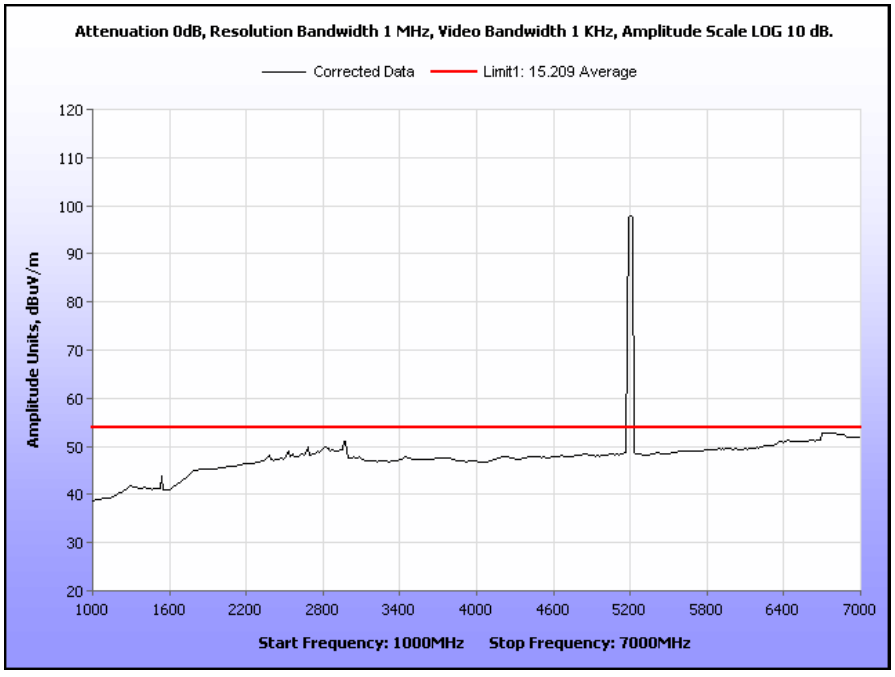
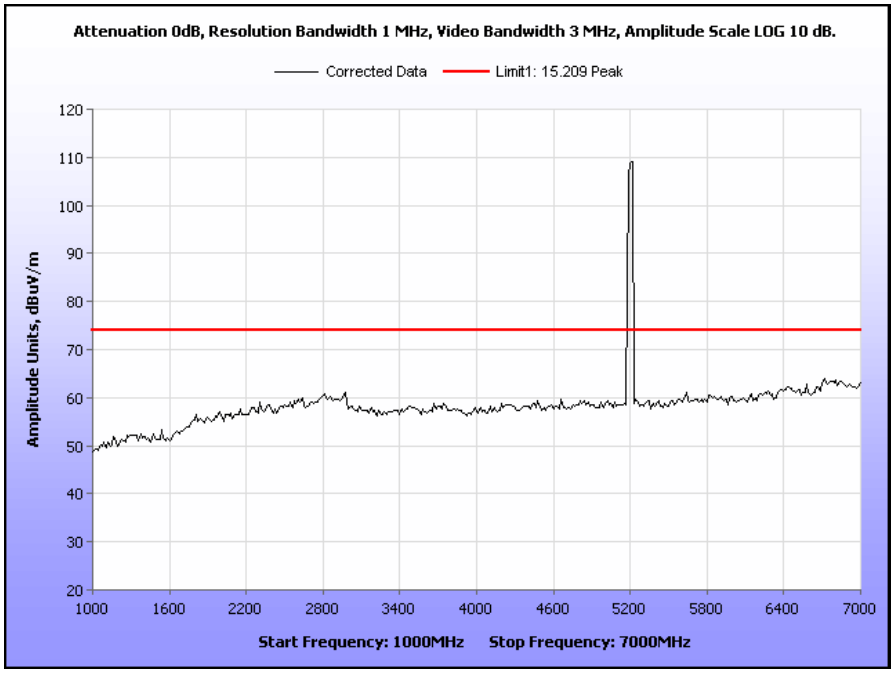


Plot 90. Radiated Spurious Emissions, 5180 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Peak

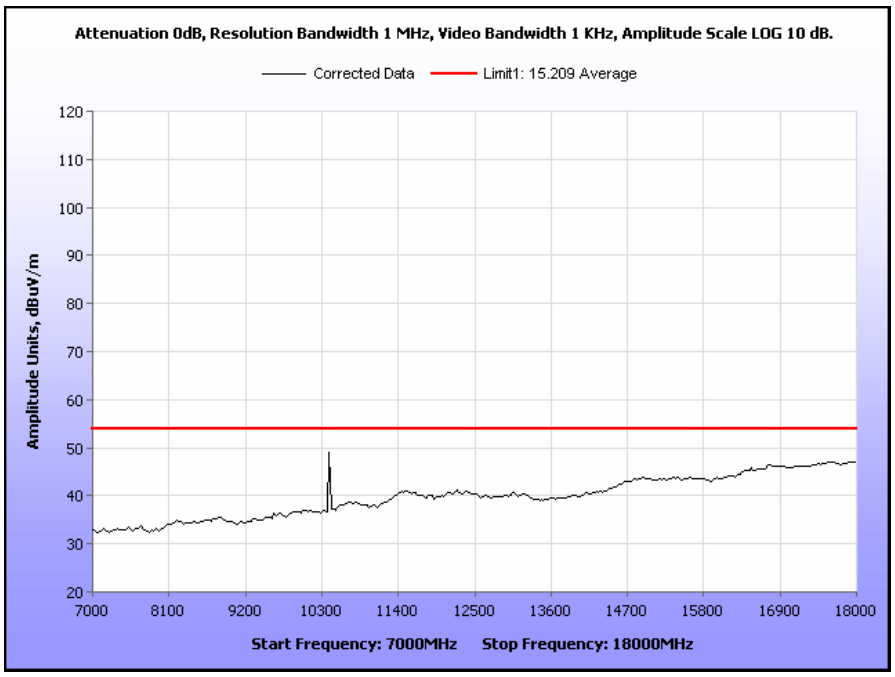


Plot 91. Radiated Spurious Emissions, 5200 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Average

 © 2013, MET Laboratories, Inc.

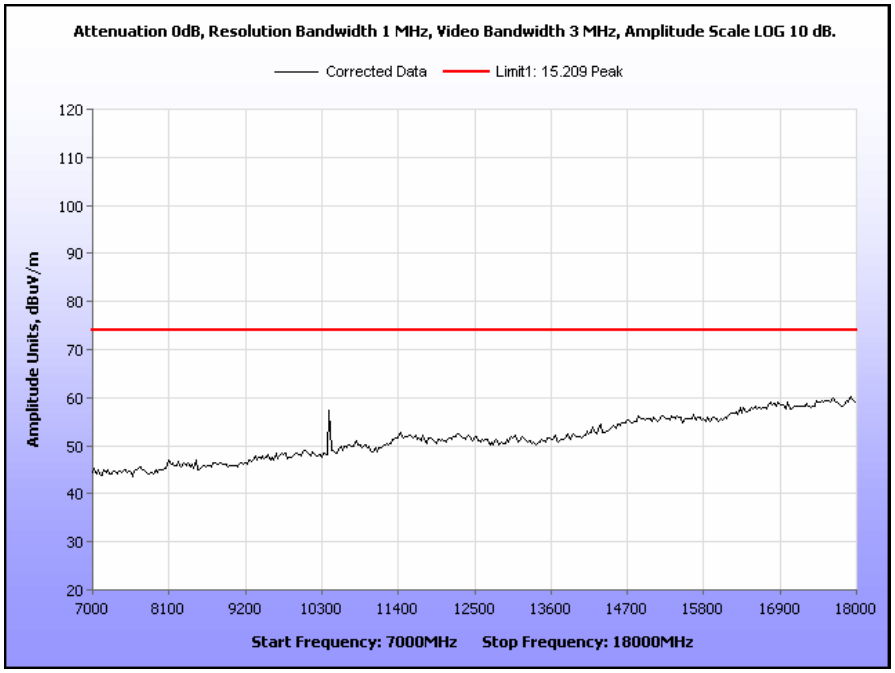


Plot 92. Radiated Spurious Emissions, 5200 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Peak

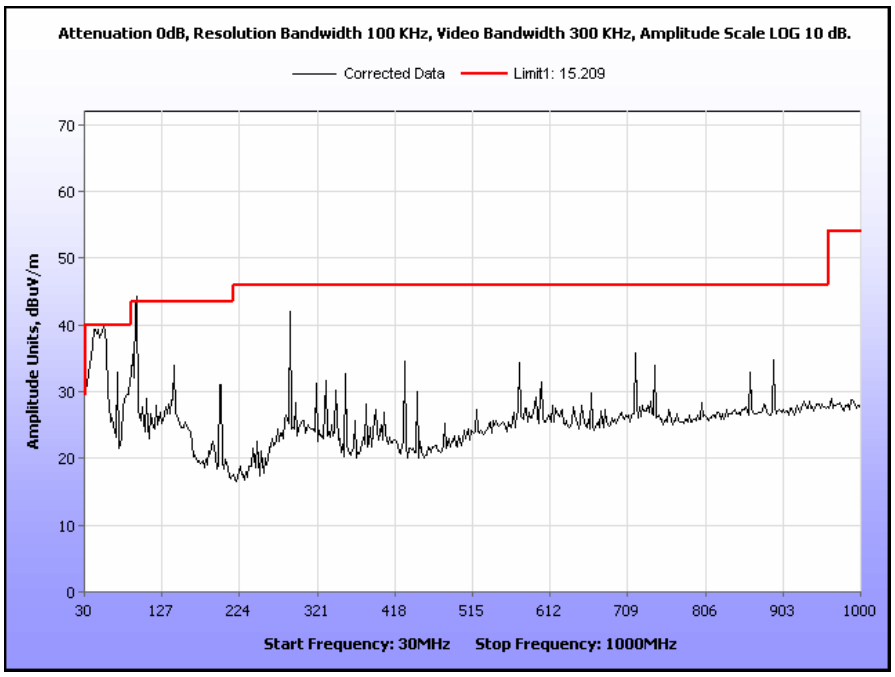


Plot 93. Radiated Spurious Emissions, 5200 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Average

 © 2013, MET Laboratories, Inc.



Plot 94. Radiated Spurious Emissions, 5200 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Peak



Plot 95. Radiated Spurious Emissions, 5240 MHz, 20 MHz Channel, Tx Power 8, 30 MHz – 1 GHz

Emissions which exceed the 15.209 limit are digital and meet the Class B limits of 15.109. Refer to Table 11.

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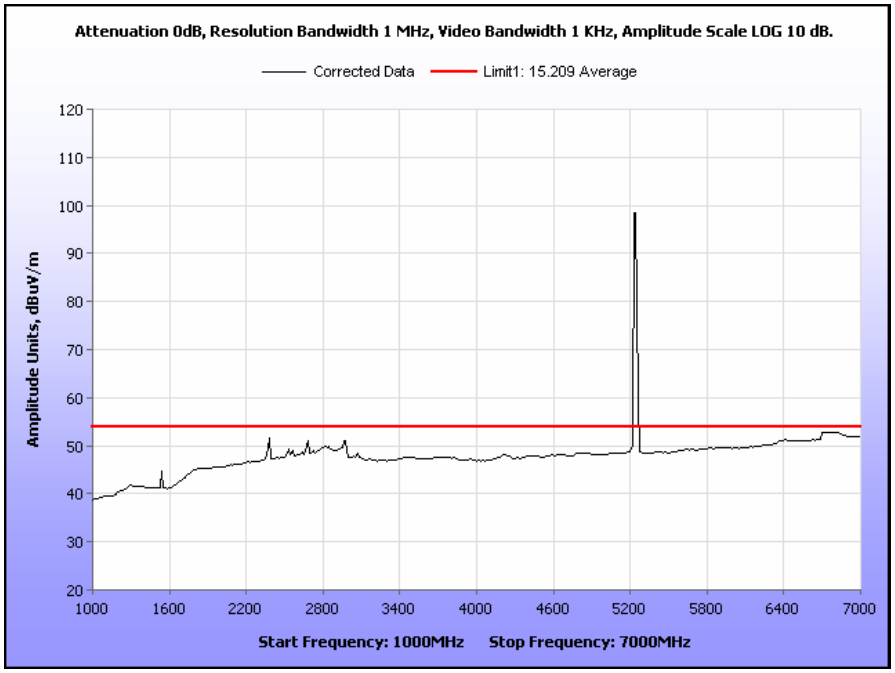
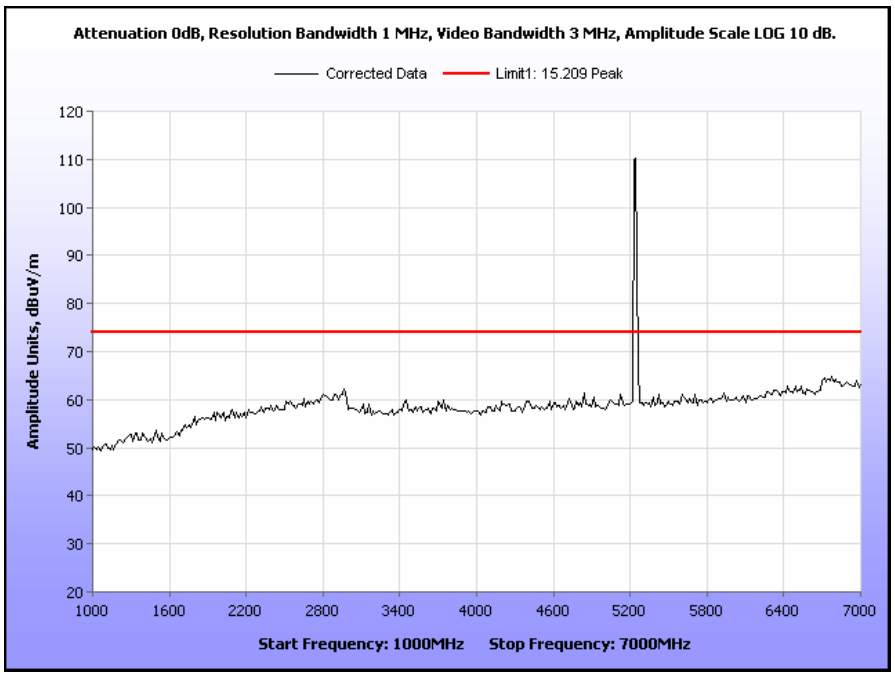


Plot 96. Radiated Spurious Emissions, 5240 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Average



Plot 97. Radiated Spurious Emissions, 5240 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Peak

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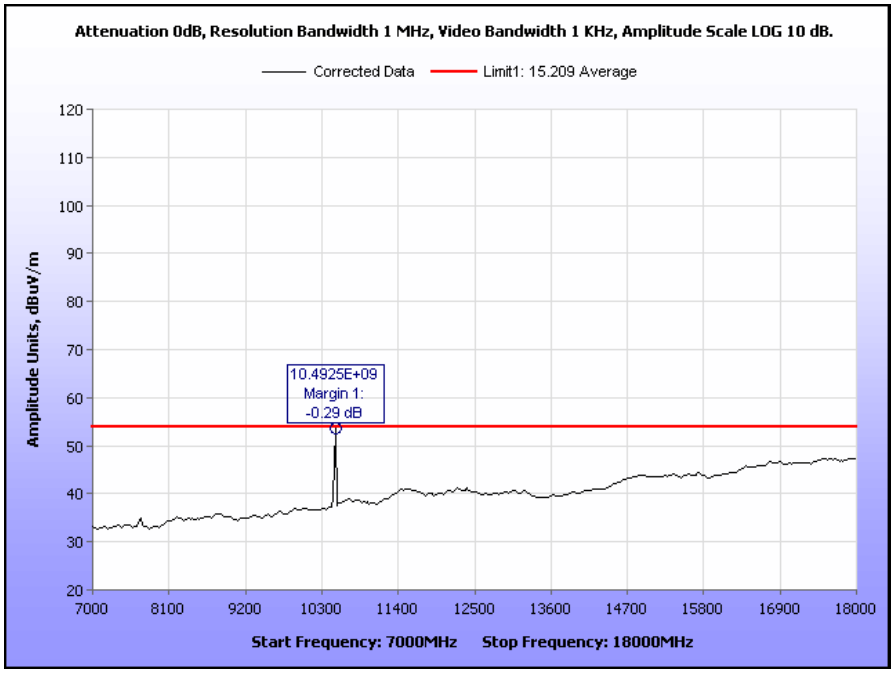
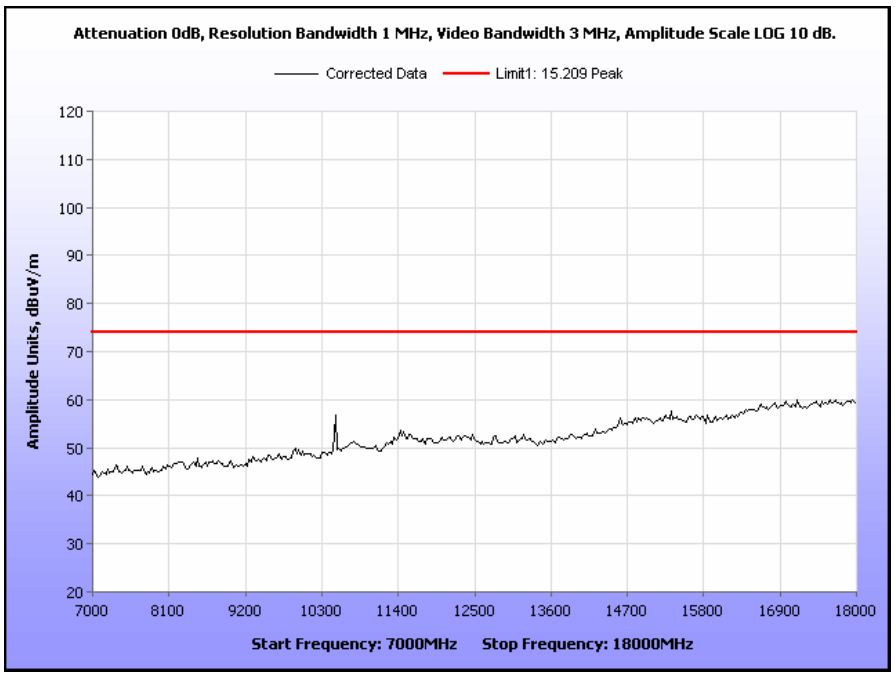


Plot 98. Radiated Spurious Emissions, 5240 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Average



Plot 99. Radiated Spurious Emissions, 5240 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Peak

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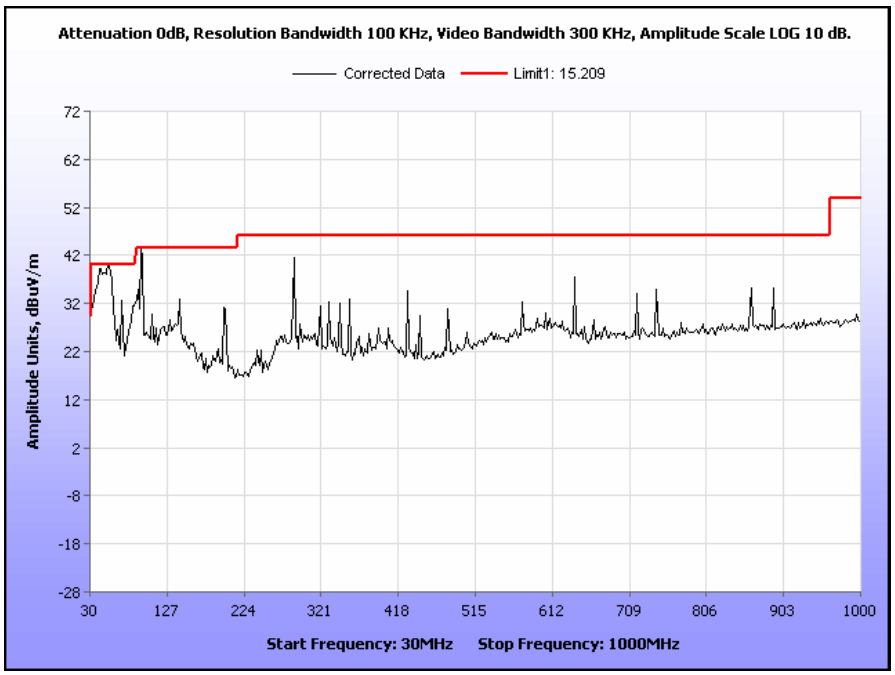
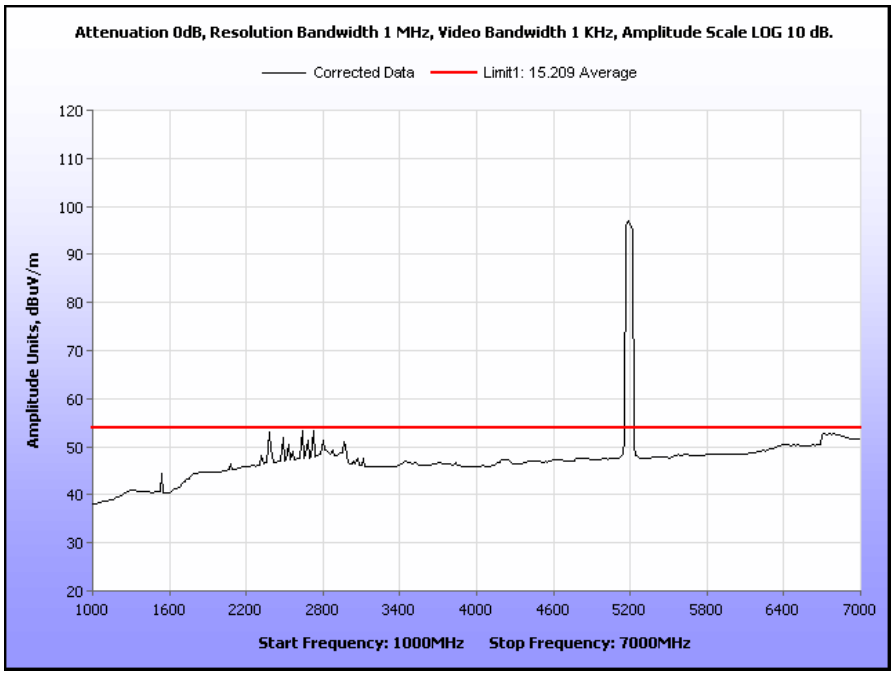


Plot 100. Radiated Spurious Emissions, 5190 MHz, 40 MHz Channel, Tx Power 10, 30 MHz – 1 GHz

Emissions which exceed the 15.209 limit are digital and meet the Class B limits of 15.109. Refer to Table 11.



Plot 101. Radiated Spurious Emissions, 5190 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Average

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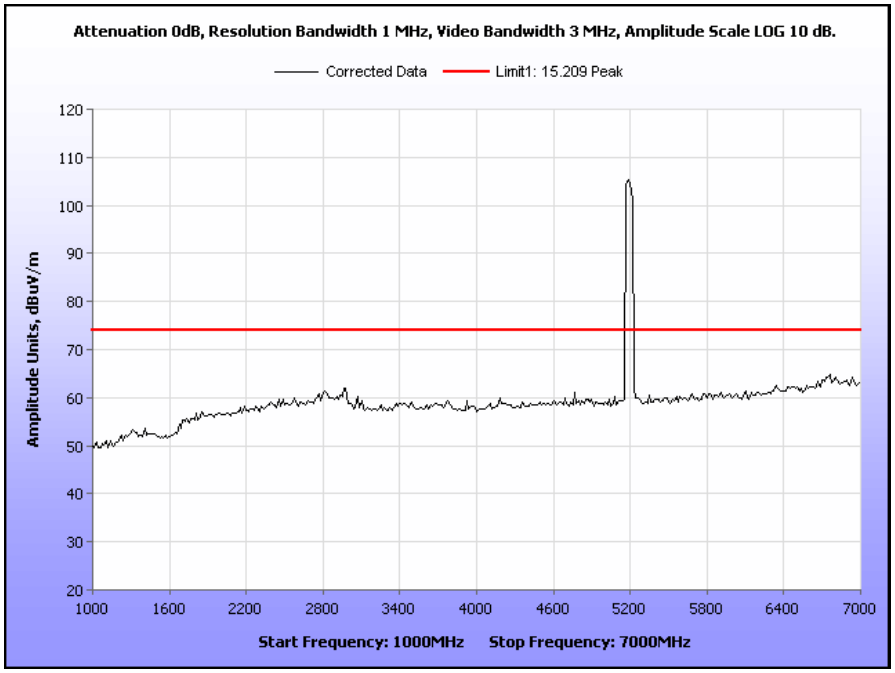
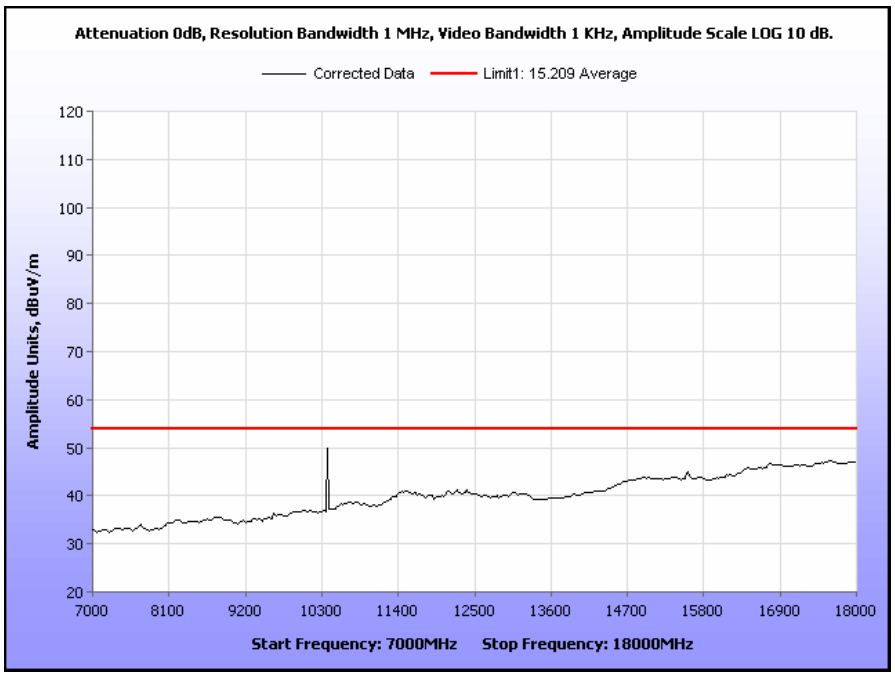


Plot 102. Radiated Spurious Emissions, 5190 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 103. Radiated Spurious Emissions, 5190 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Average

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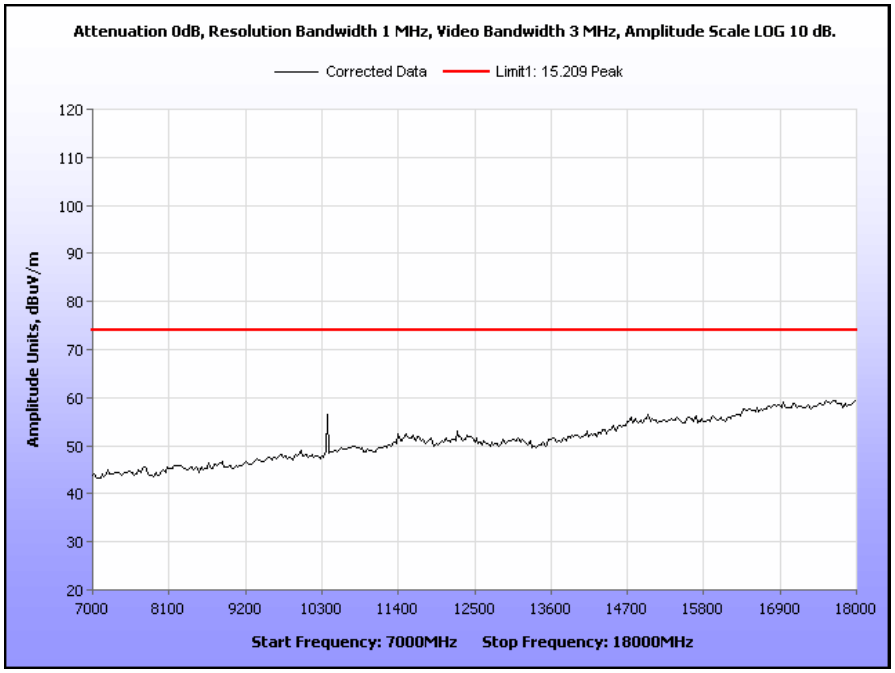
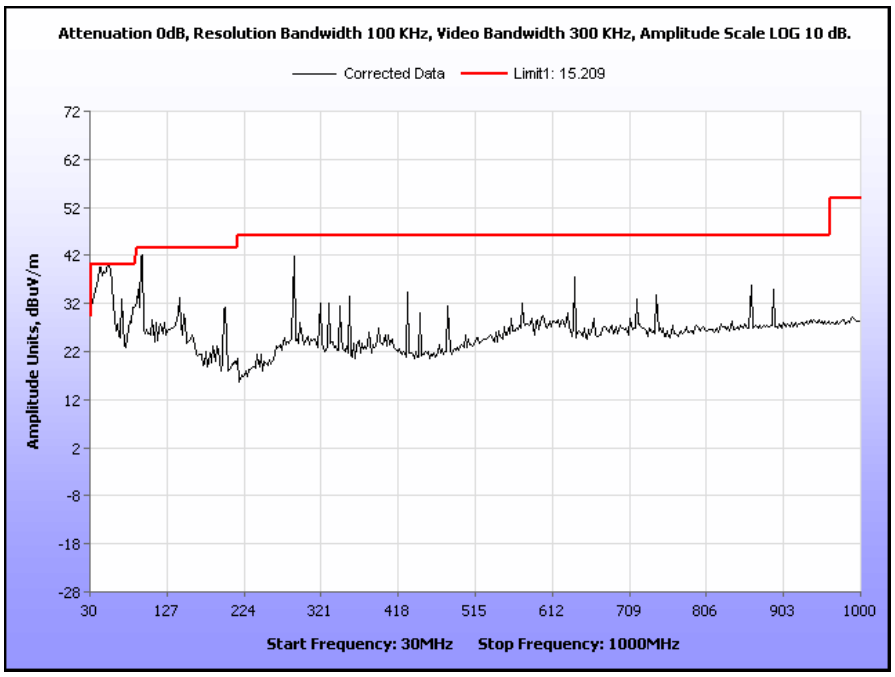


Plot 104. Radiated Spurious Emissions, 5190 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Peak



Plot 105. Radiated Spurious Emissions, 5230 MHz, 40 MHz Channel, Tx Power 11, 30 MHz – 1 GHz

Emissions which exceed the 15.209 limit are digital and meet the Class B limits of 15.109. Refer to Table 11.

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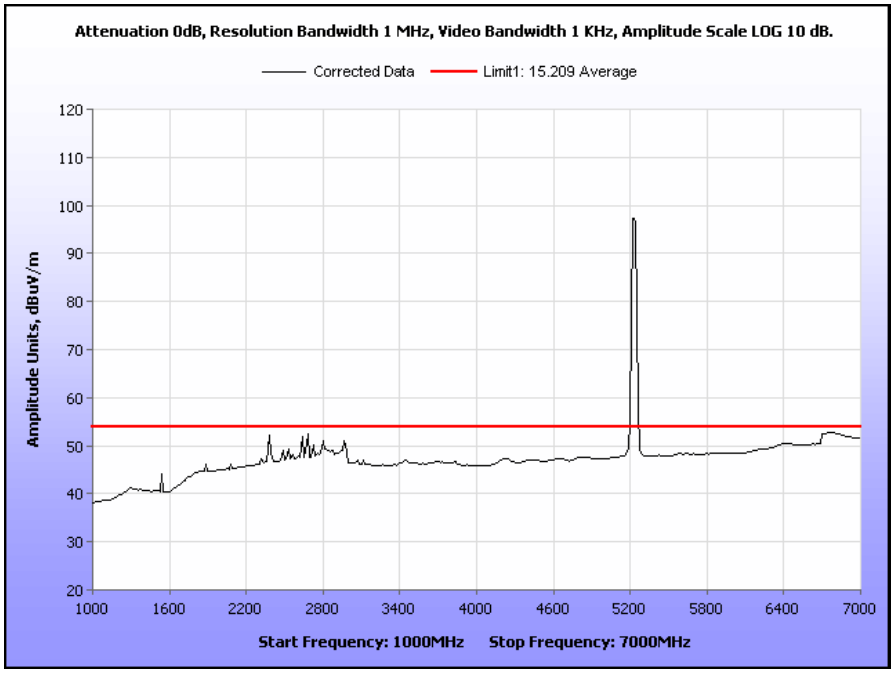
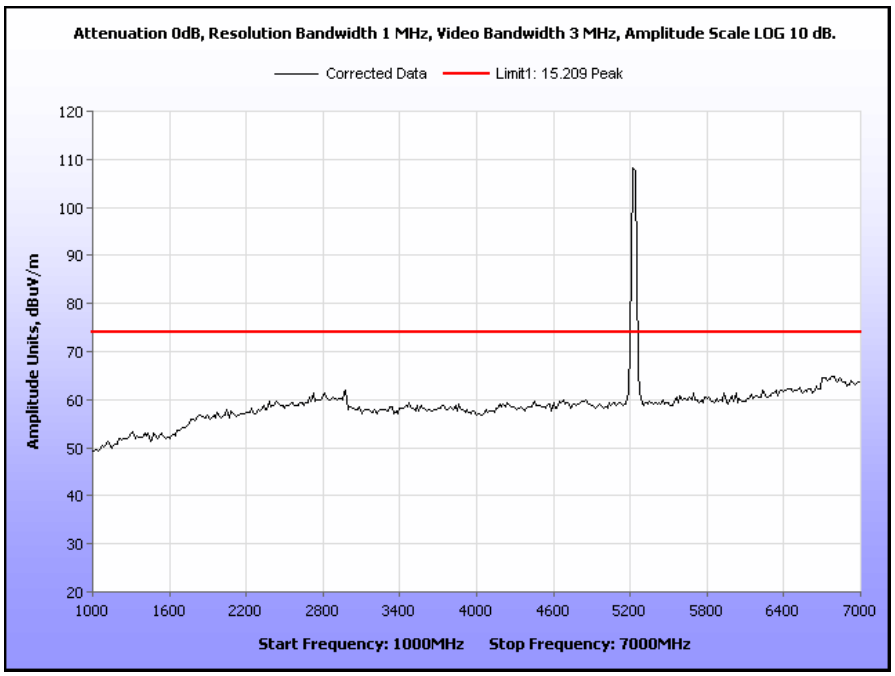


Plot 106. Radiated Spurious Emissions, 5230 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Average



Plot 107. Radiated Spurious Emissions, 5230 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Peak

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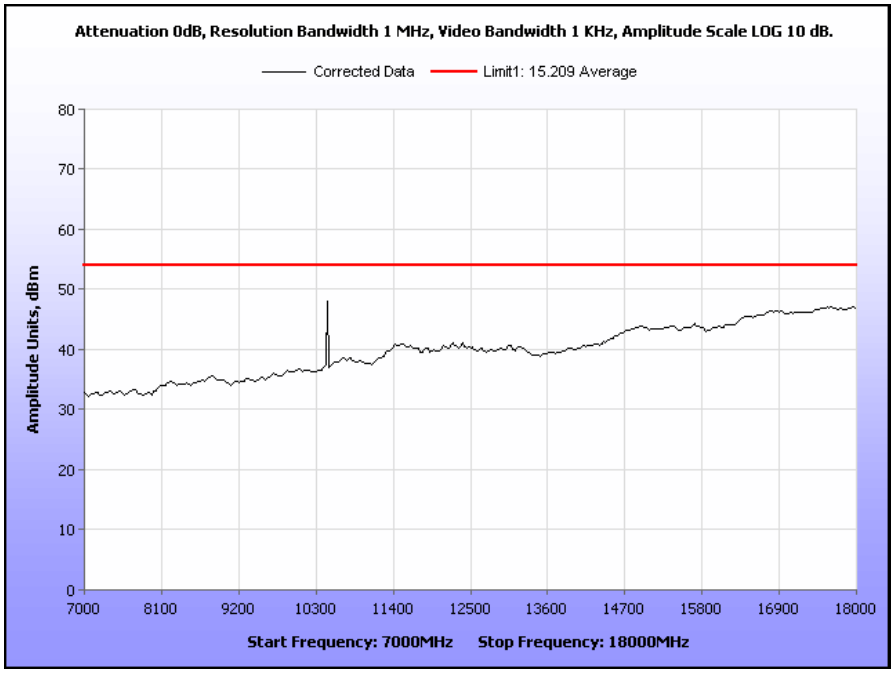
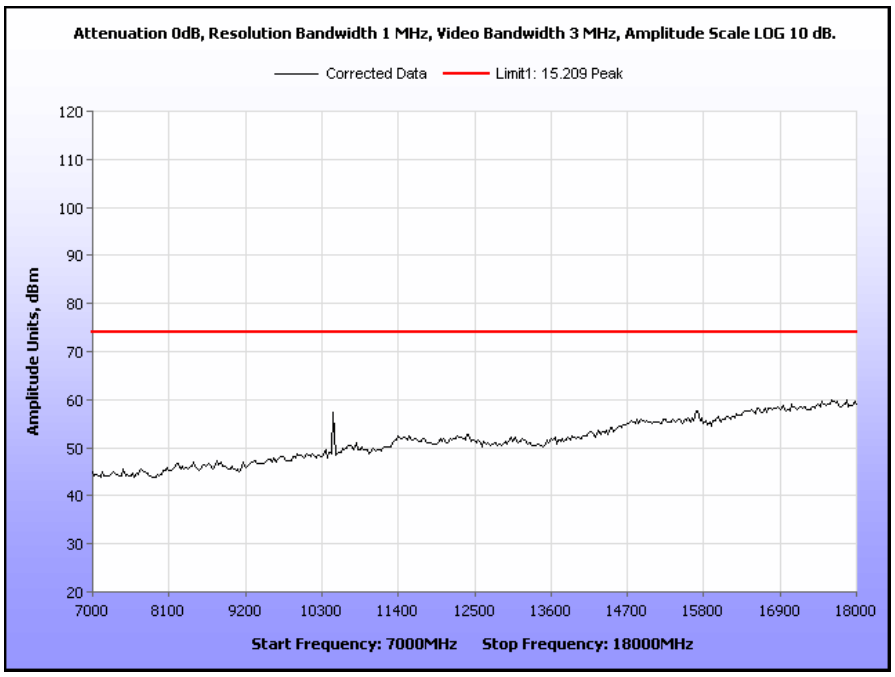


Plot 108. Radiated Spurious Emissions, 5230 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Average



Plot 109. Radiated Spurious Emissions, 5230 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Peak

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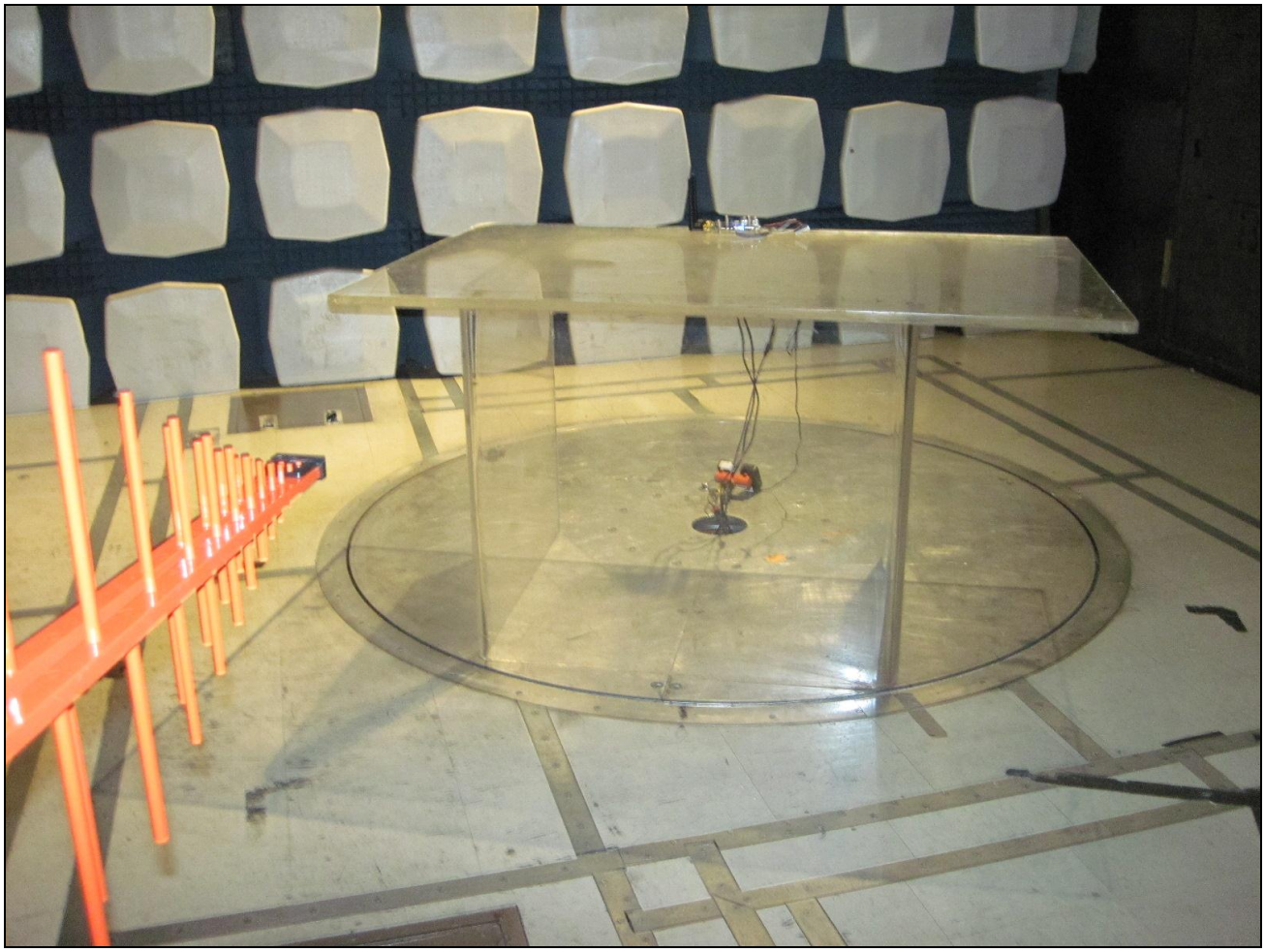

Photograph 5. Radiated Spurious Emissions, Test Setup

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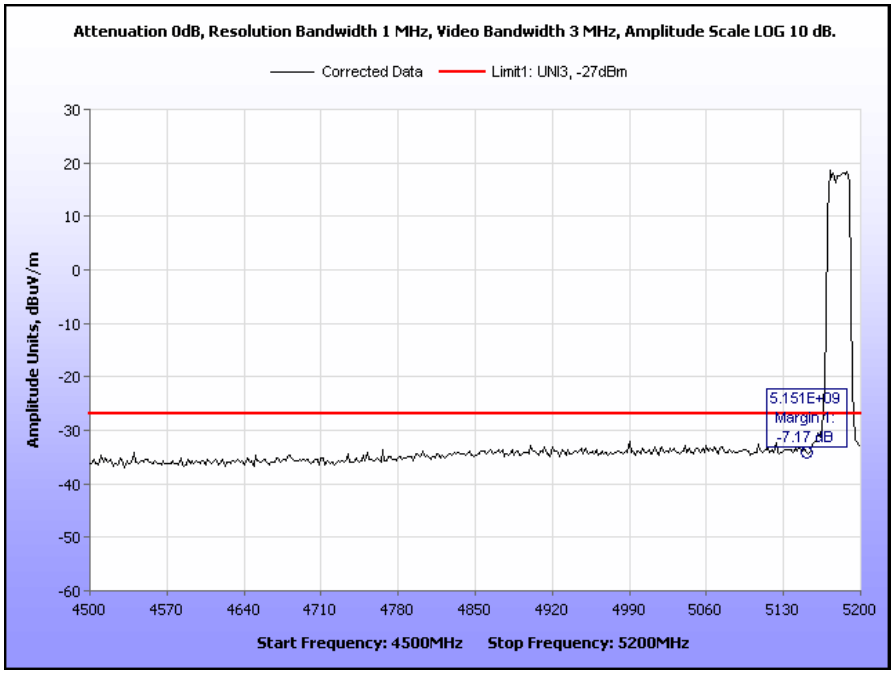
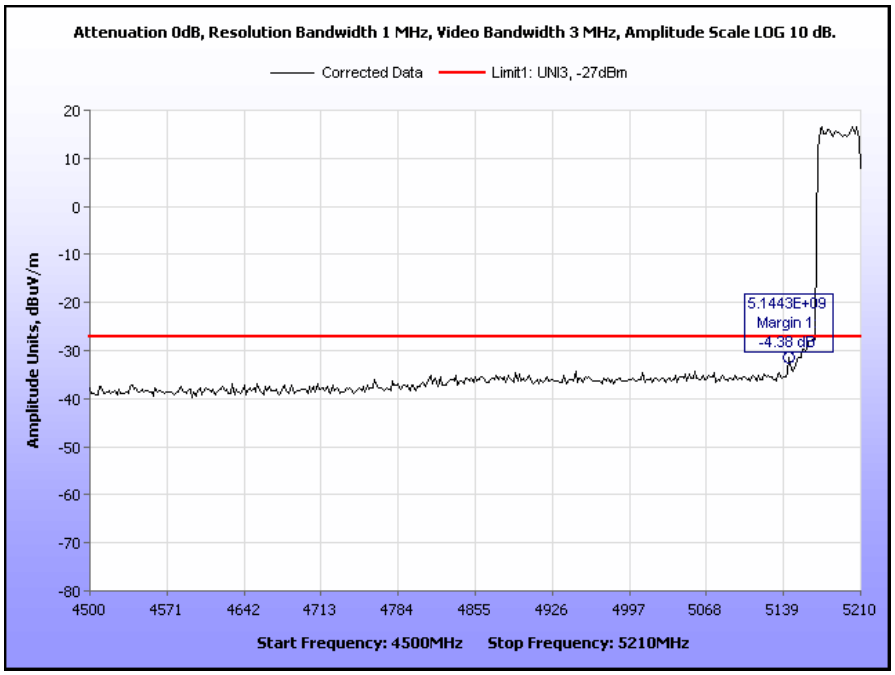
EIRP



Plot 110. E.I.R.P., 5180 MHz, 20 MHz, Band Edge



Plot 111. E.I.R.P., 5190 MHz, 40 MHz, Band Edge

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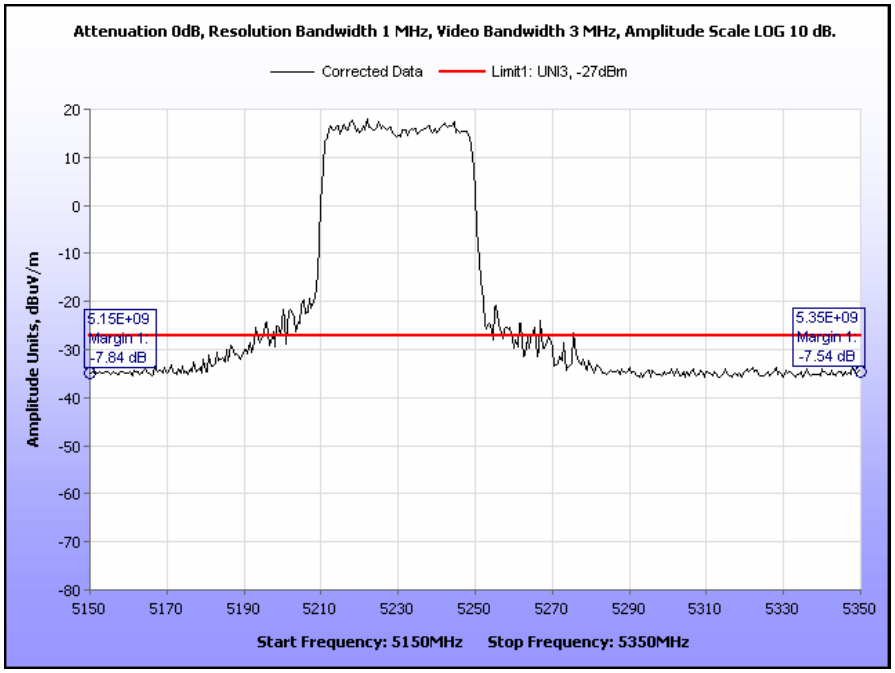
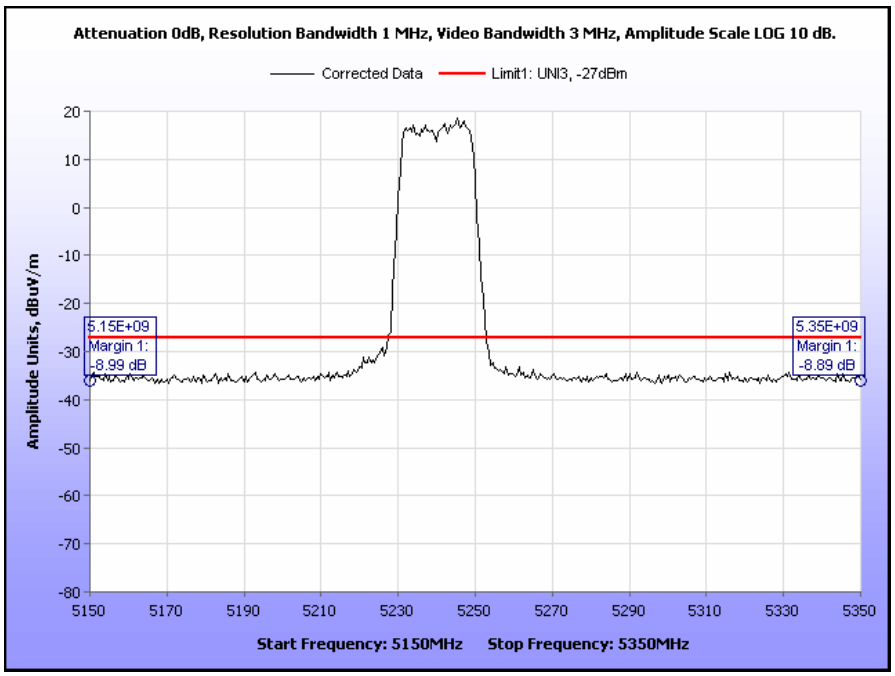


Plot 112. E.I.R.P., 5230 MHz, 40 MHz, Band Edge



Plot 113. E.I.R.P., 5240 MHz, 20 MHz, Band Edge

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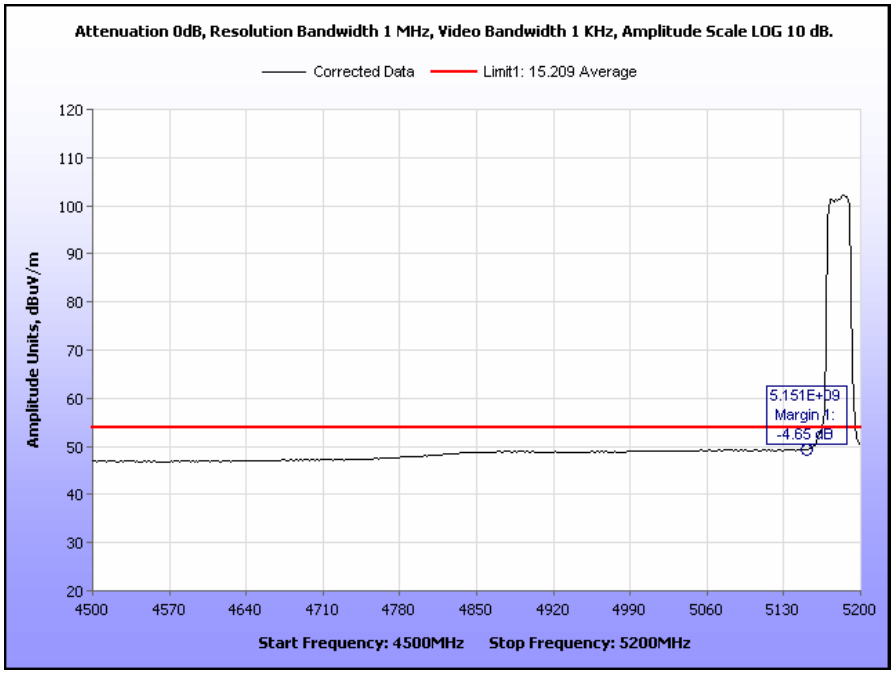
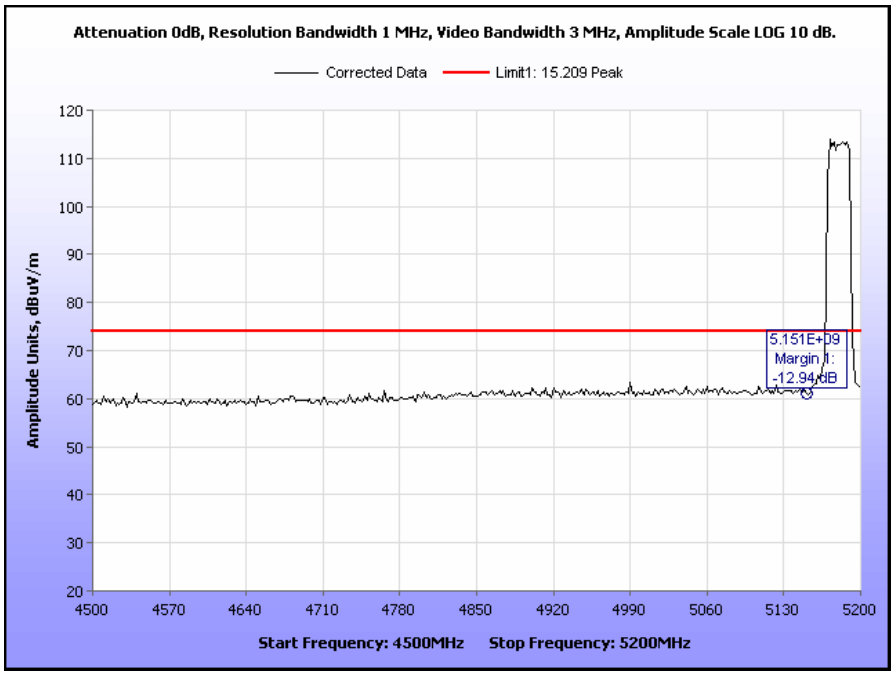
Restricted Band



Plot 114. Restricted Band Emissions, 5180 MHz, 20 MHz, Average



Plot 115. Restricted Band Emissions, 5180 MHz, 20 MHz, Peak

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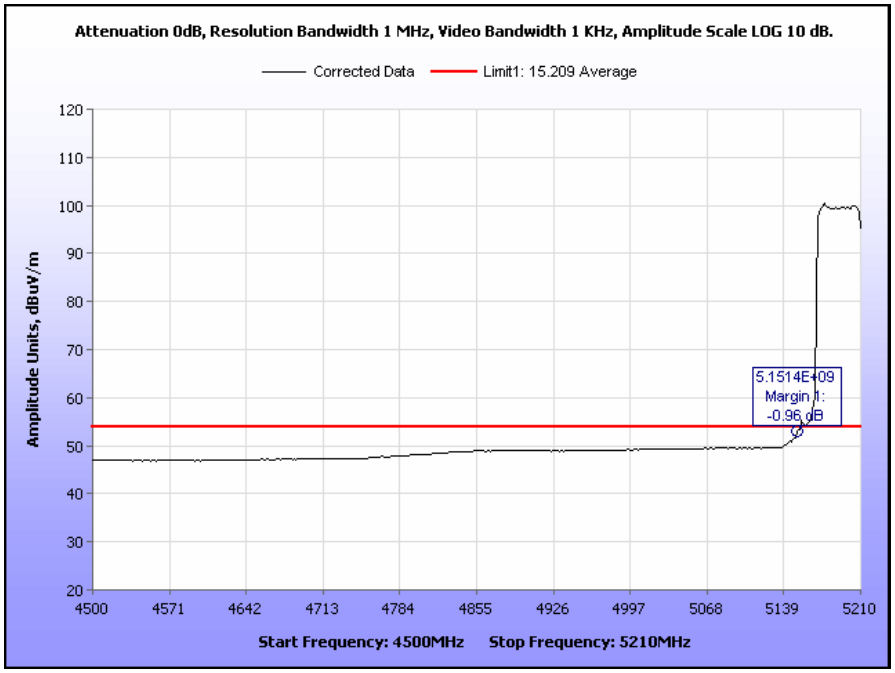
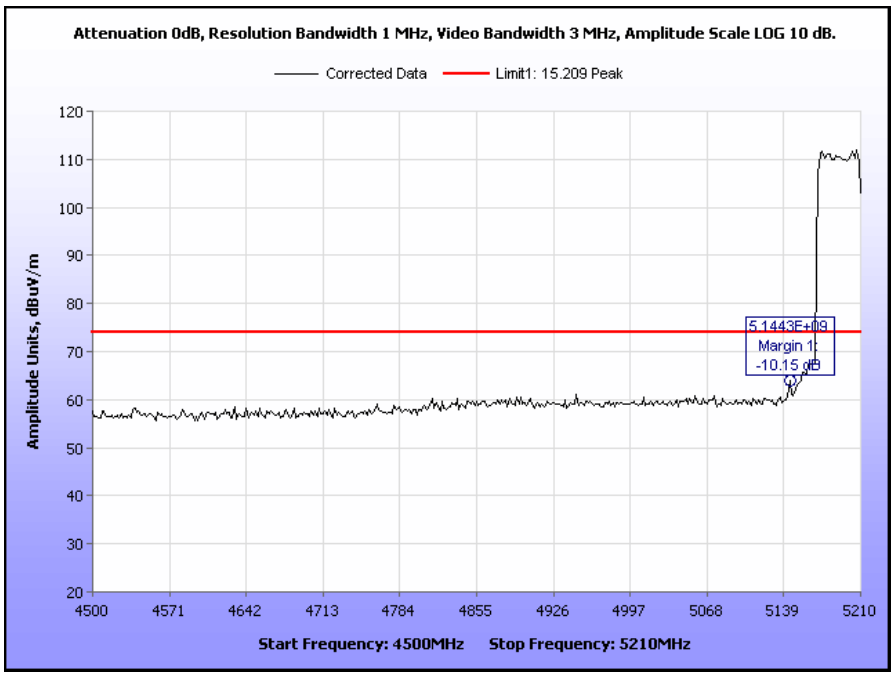


Plot 116. Restricted Band Emissions, 5190 MHz, 40 MHz, Average



Plot 117. Restricted Band Emissions, 5190 MHz, 40 MHz, Peak

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) RF Exposure

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

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

MPE Limit Calculation: EUT's operating frequencies @ 5180-5240MHz; highest conducted power = 16.94 dBm (Avg) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

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

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

where, S = Power Density (<1 mW/cm^2)
P = Power Input to antenna (49.43 mW)
G = Antenna Gain (3.16)
R = Minimum Distance between User and Antenna (20 cm)

$S = (49.43 * 3.16)/(4*3.14*20^2) = 0.031$ mW/cm^2

Since S < 1 mW/cm^2, the minimum distance (R) is 20cm

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(g) Frequency Stability

Test Requirements: **§ 15.407(g):** Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The resolution band width of the spectrum analyzer was set to 1 KHz. A reference frequency was found at 20°C with input voltage of 120VAC. The voltage was varied at ambient temperature and the temperature was changed in steps no greater than 10°C. The carrier frequency was recorded in each case and compared to the reference frequency.

Test Results: The EUT was compliant with the requirements of **§15.407(g)**.

Test Engineer(s): Jeff Pratt

Test Date(s): 01/22/13

Frequency	5200 MHz	UNII1	
Temperature (C)	Voltage (V)	Center Frequency (MHz)	Drift (PPM)
-20	120	5200.016011	4.671815
-10	120	5200.001431	1.868022
0	120	5200.004661	2.489119
10	120	5200.002442	2.062388
20	108	5199.991829	0.021423
20	120	5199.991718	0
20	132	5199.991821	0.019885
30	120	5199.986338	-1.03454
40	120	5199.986297	-1.04242
50	120	5199.95247	-7.54763
55	120	5199.95913	-6.26685614

Table 17. Frequency Stability, Test Results

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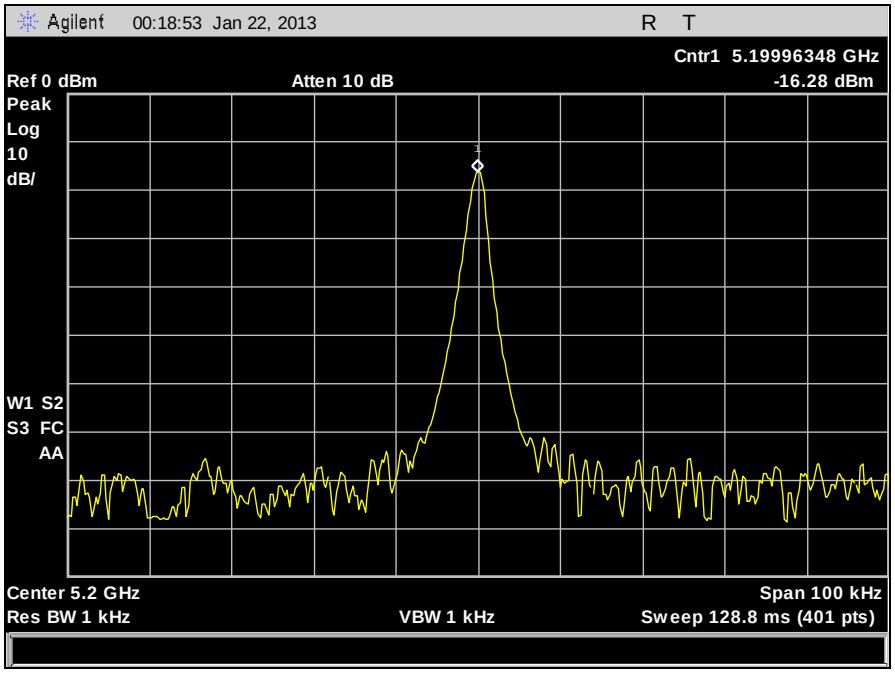
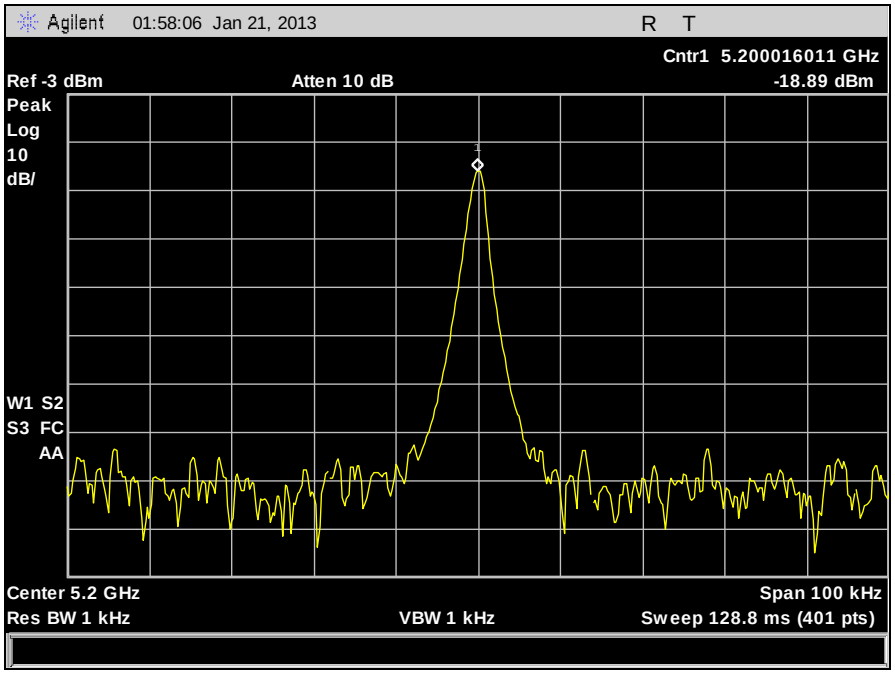


Plot 118. Frequency Stability, 5200 MHz, -30°C, 120 V



Plot 119. Frequency Stability, 5200 MHz, -20°C, 120 V

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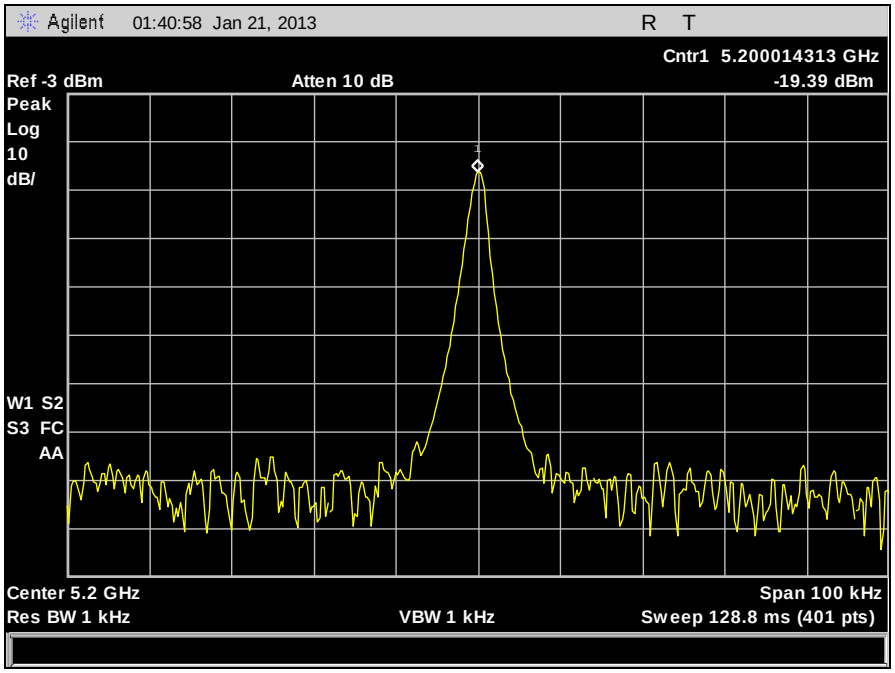
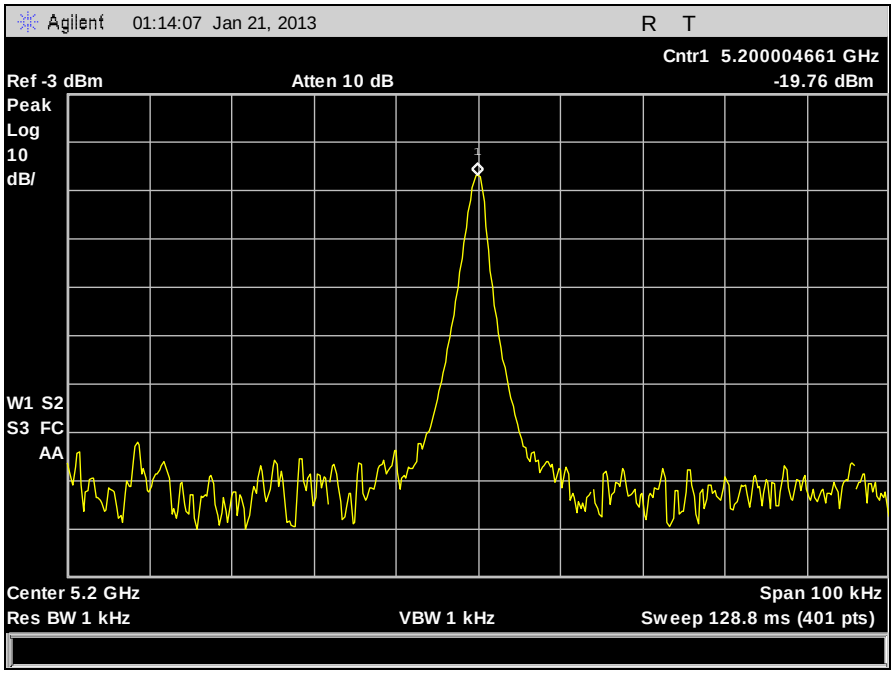


Plot 120. Frequency Stability, 5200 MHz, -10°C, 120 V



Plot 121. Frequency Stability, 5200 MHz, 0°C, 120 V

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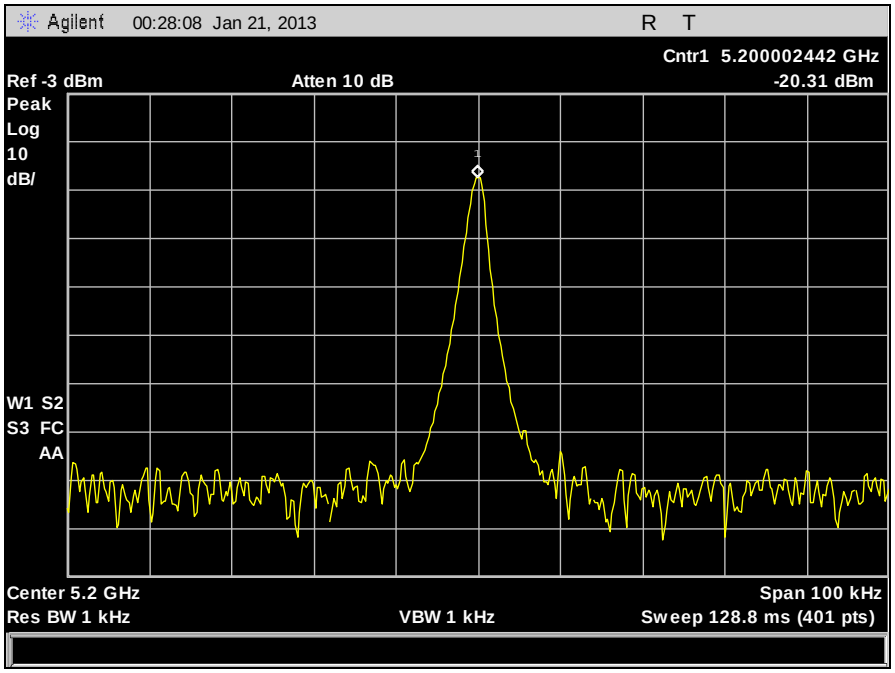
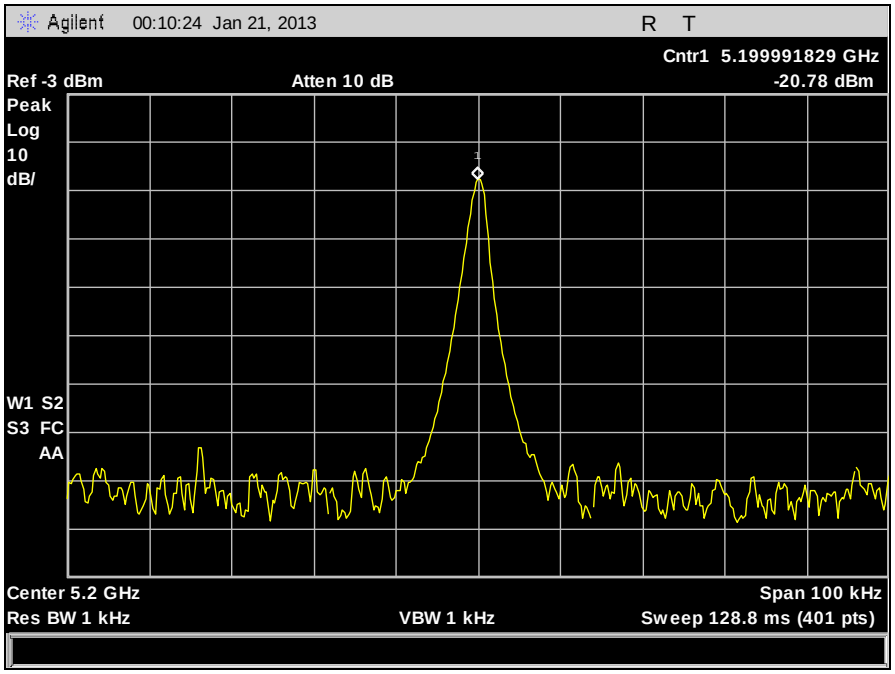


Plot 122. Frequency Stability, 5200 MHz, 10°C, 120 V



Plot 123. Frequency Stability, 5200 MHz, 20°C, 108V

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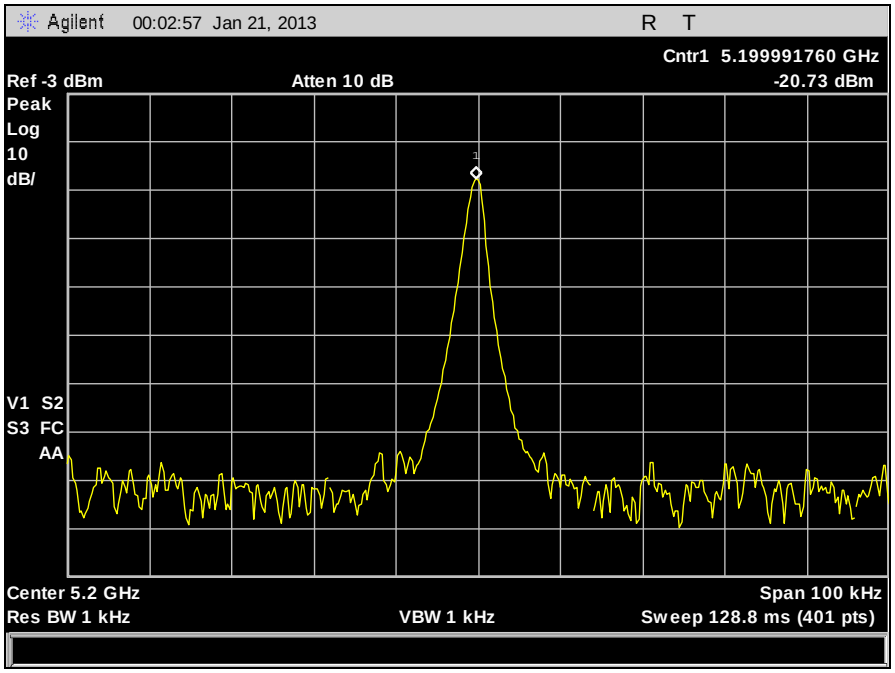
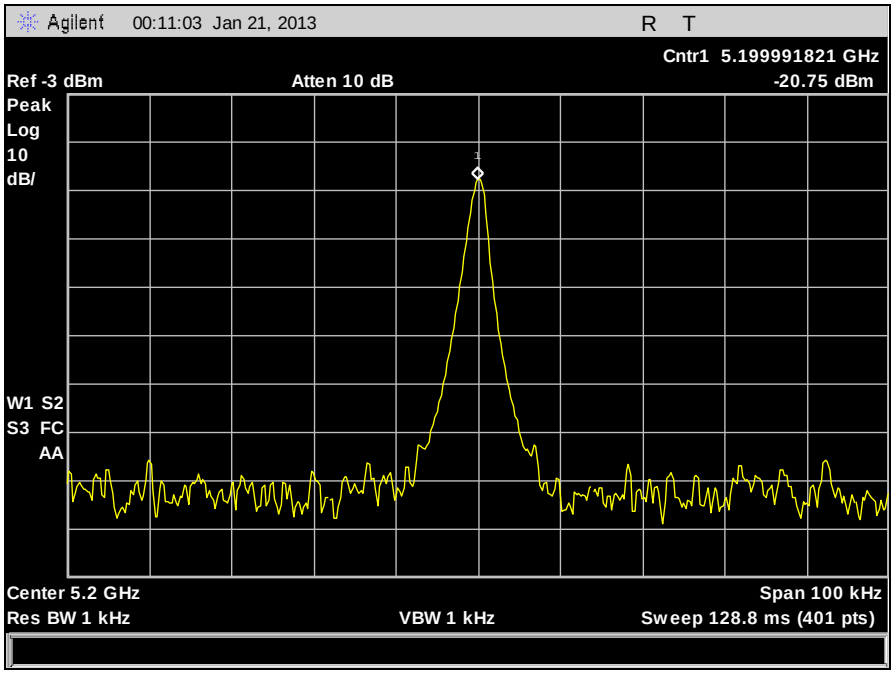


Plot 124. Frequency Stability, 5200 MHz, 20°C, 120 V



Plot 125. Frequency Stability, 5200 MHz, 20°C, 132 V

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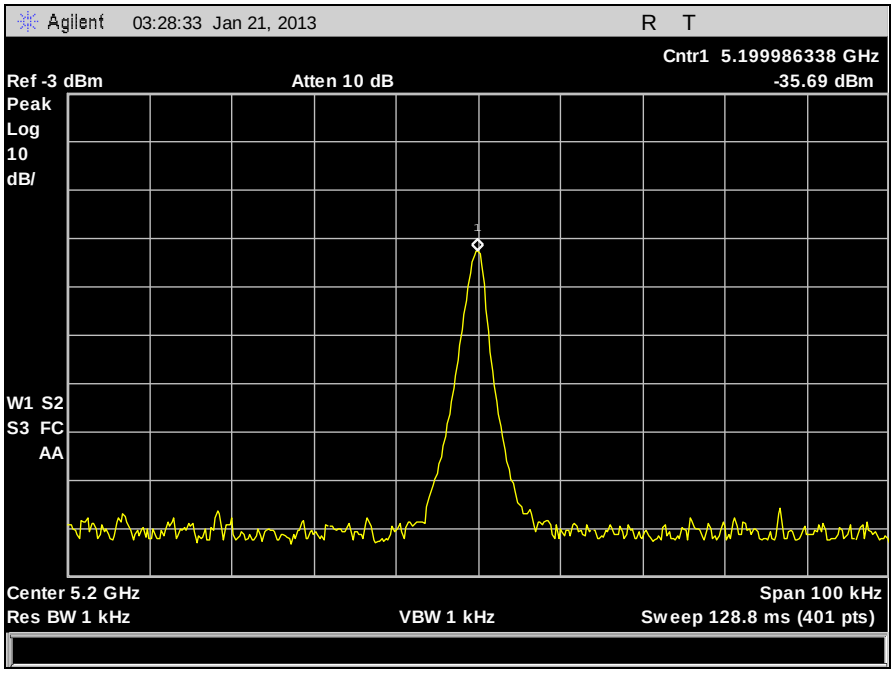
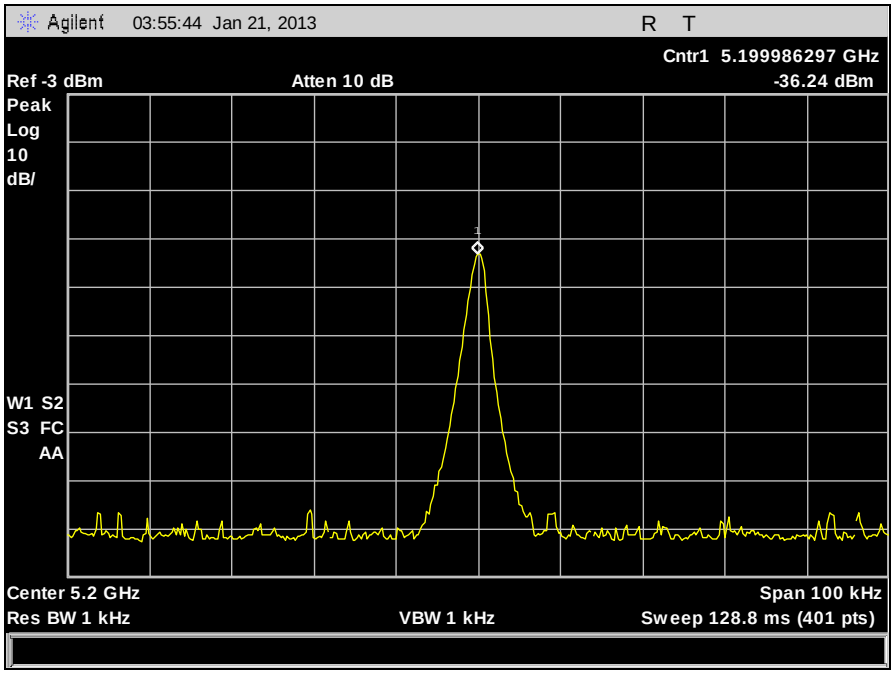


Plot 126. Frequency Stability, 5200 MHz, 30°C, 120 V



Plot 127. Frequency Stability, 5200 MHz, 40°C, 120 V

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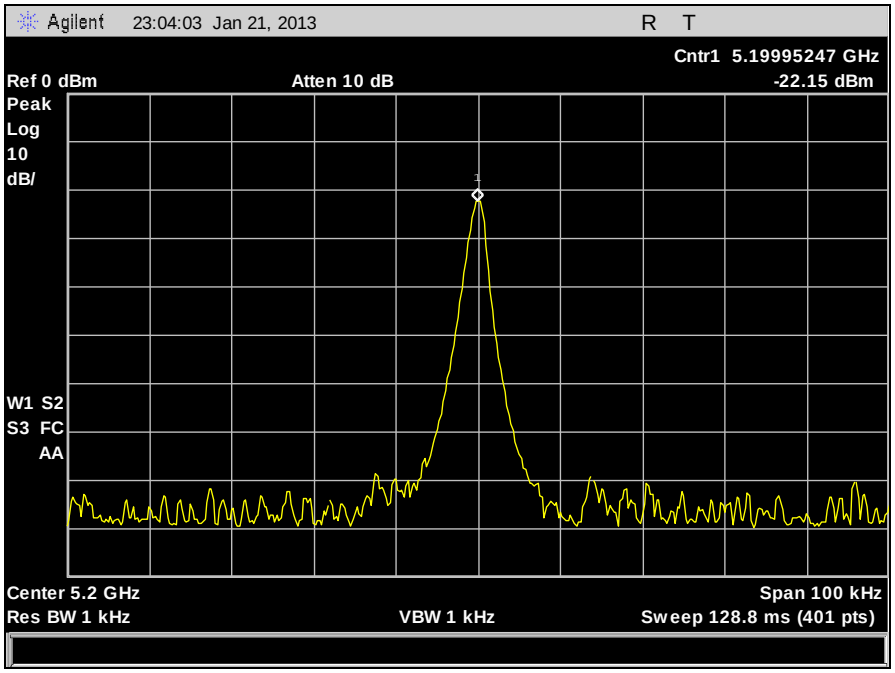
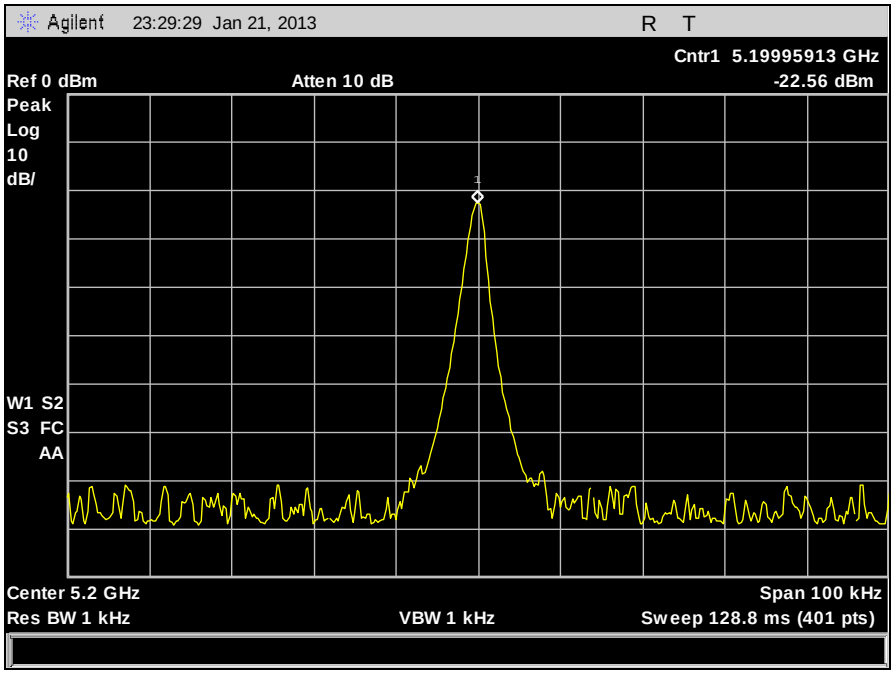


Plot 128. Frequency Stability, 5200 MHz, 50°C, 120 V



Plot 129. Frequency Stability, 5200 MHz, 55°C, 120 V

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IV. Test Equipment

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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
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	81	SEE NOTE	
1T4300	SEMI-ANECHOIC CHAMBER #1 (FCC)	EMC TEST SYSTEMS	NONE	7/24/2012	7/24/2015
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	5/23/2012	11/23/2013
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	7/16/2012	7/16/2013
1T4753	ANTENNA - BILOG	SUNOL SCIENCES	JB6	1/5/2012	7/5/2013
1T4505	TEMPERATURE CHAMBER	TEST EQUITY	115	12/2/2012	12/2/2013
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	8/6/2012	2/6/2014
1T2511	ANTENNA; HORN	EMCO	3115	9/22/2011	3/22/2013
1T4502	COMB GENERATOR	COM-POWER	CGC-255	8/21/2012	2/21/2014
1T4568	RADIATING NOISE SOURCE	MET LABORATORIES	N/A	SEE NOTE	
1T4791	THERM./CLOCK/HUMIDITY	CONTROL COMPANY	06-662-4	3/8/2012	3/8/2014
1T4563	LISN (10 AMP)	SOLAR ELECTRONICS	9322-50-R-10-BNC	11/27/2012	5/27/2014
1T2948	LISN	SOLAR ELECTRONICS	8028-50-TS-24-BNC	1/30/2012	7/30/2013
1T4503	SHIELDED ROOM	UNIVERSAL SHIELDING CORP	N/A	SEE NOTE	
1T4504	SHIELDED ROOM	UNIVERSAL SHIELDING CORP	N/A	SEE NOTE	
1T4814	COMB GENERATOR	COM-POWER	CGO-5100	SEE NOTE	
1T4479	POWER SUPPLY PROGRAMMABLE	CALIFORNIA INSTRUMENTS	1501TC	SEE NOTE	

Table 18. Test Equipment List

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

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V. Certification & User's Manual Information

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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.

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

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

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

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

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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.[1] *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.

[1] 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.

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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.

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Certification & User's Manual Information

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.

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End of Report

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