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

July 17, 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 2 Rev. 4)

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

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. 4

July 17, 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

Electromagnetic Compatibility Criteria
Test Report

for the

Amimon
Model Falcon TX, Amimon P/N-AMN35254

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

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

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	February 17, 2013	Initial Issue.
1	March 8, 2013	Revised to reflect engineer corrections.
2	March 11, 2013	Revised to reflect customer corrections.
3	June 12, 2013	Revised to reflect engineer corrections.
4	July 17, 2013	Revised to reflect engineer corrections.

Table of Contents

List of Tables

List of Figures

List of Photographs

List of Plots

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
μ**H**	**microh**enry
μ	**microf**arad
μ**s**	**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

I. Executive Summary

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
15.407 (h)(2)(ii)	Initial Channel Availability Check Time	Not Applicable
15.407 (h)	DFS Bandwidth	Not Applicable
15.407 (h)(2)(ii)	Radar Burst at the Beginning of Channel Availability Check Time	Not Applicable
15.407 (h)(2)(ii)	Radar Burst at the End of Channel Availability Check Time	Not Applicable
15.407 (h)(2)(iii)	Channel Move Time and Channel Closing Time	Compliant
15.407 (h)(2)(iv)	Non-Occupancy Period	Not Applicable
15.407 (h)(2)	Statistical Performance Check	Not Applicable

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

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.

<table>
<tr><th>Model(s) Tested:</th><td colspan="2">Falcon TX, Amimon P/N-AMN35254</td></tr>
<tr><th>Model(s) Covered:</th><td colspan="2">Falcon TX, Amimon P/N-AMN35254</td></tr>
<tr><th rowspan="8">EUT Specifications:</th><td colspan="2">Primary Power: 120 VAC, 60 Hz</td></tr>
<tr><td colspan="2">FCC ID: VQSAMN35254</td></tr>
<tr><td>Type of Modulations:</td><td>OFDM</td></tr>
<tr><td>Emission Designators:</td><td>D7F</td></tr>
<tr><td>Equipment Code:</td><td>NII</td></tr>
<tr><td>Peak RF Output Power:</td><td>22.49 dBm</td></tr>
<tr><td>EUT Frequency Ranges:</td><td>5260 MHz – 5320 MHz
5500 MHz – 5580 MHz
5660 MHz – 5700 MHz</td></tr>
<tr><th>Analysis:</th><td colspan="2">The results obtained relate only to the item(s) tested.</td></tr>
<tr><th rowspan="3">Environmental Test Conditions:</th><td colspan="2">Temperature: 15-35º C</td></tr>
<tr><td colspan="2">Relative Humidity: 30-60%</td></tr>
<tr><td colspan="2">Barometric Pressure: 860-1060 mbar</td></tr>
<tr><th>Evaluated by:</th><td colspan="2">Jeffrey Pratt</td></tr>
<tr><th>Report Date(s):</th><td colspan="2">July 17, 2013</td></tr>
</table>

Table 2. EUT Summary

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
ANSI C63.10 2009	American National Standard for Testing Unlicensed Wireless Devices.

Table 3. References

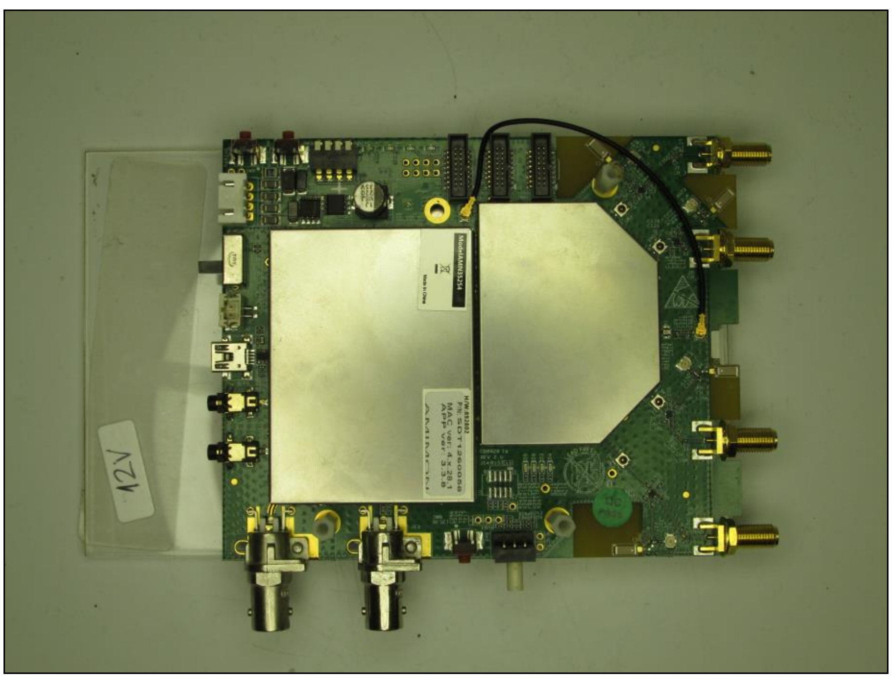
C. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave., Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

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

D. Description of Test Sample

The 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

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

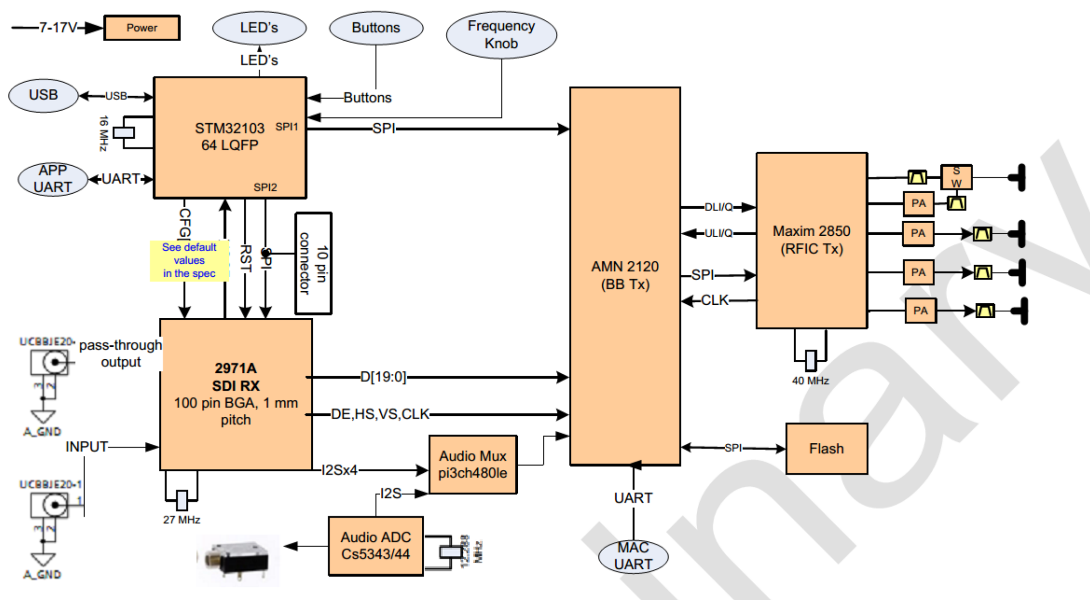


Figure 2: Tx - AMN35254 Block Diagram

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.

III. Electromagnetic Compatibility Criteria for Unintentional Radiators

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.

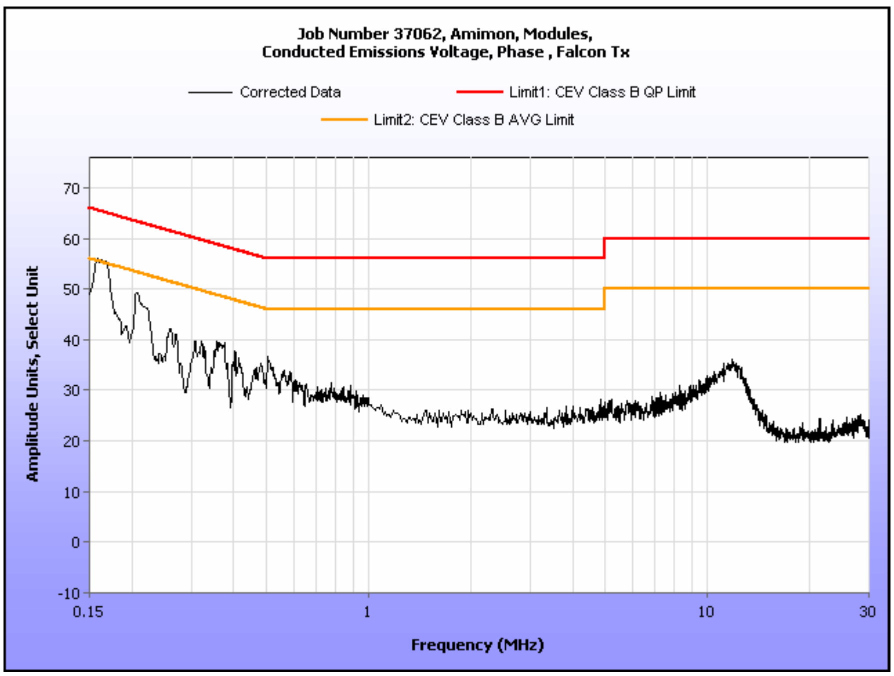
Test Engineer(s): Zijun Tong

Test Date(s): 12/17/12

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)

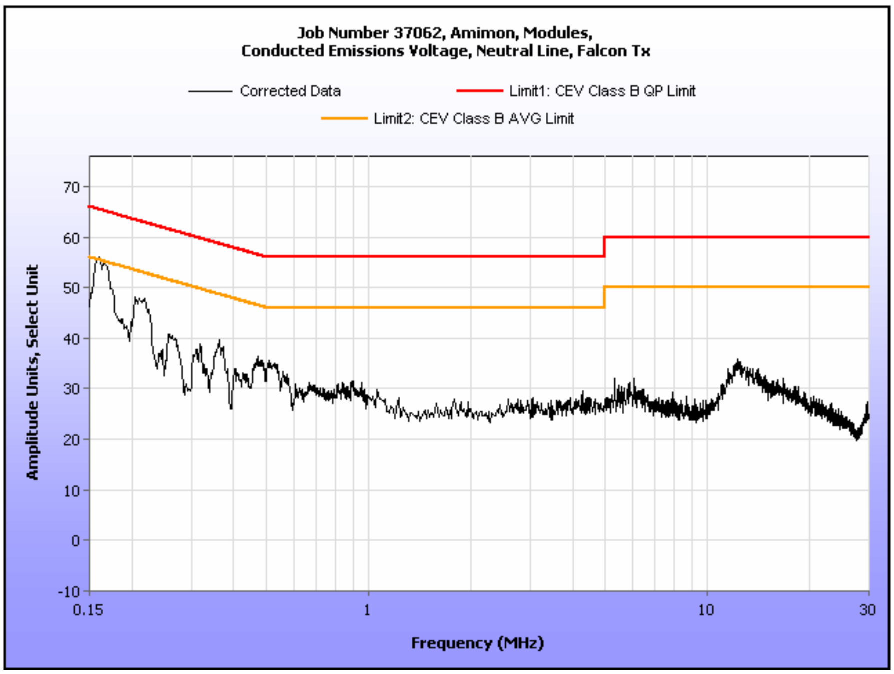


Plot 1. Conducted Emission, Phase Line Plot

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

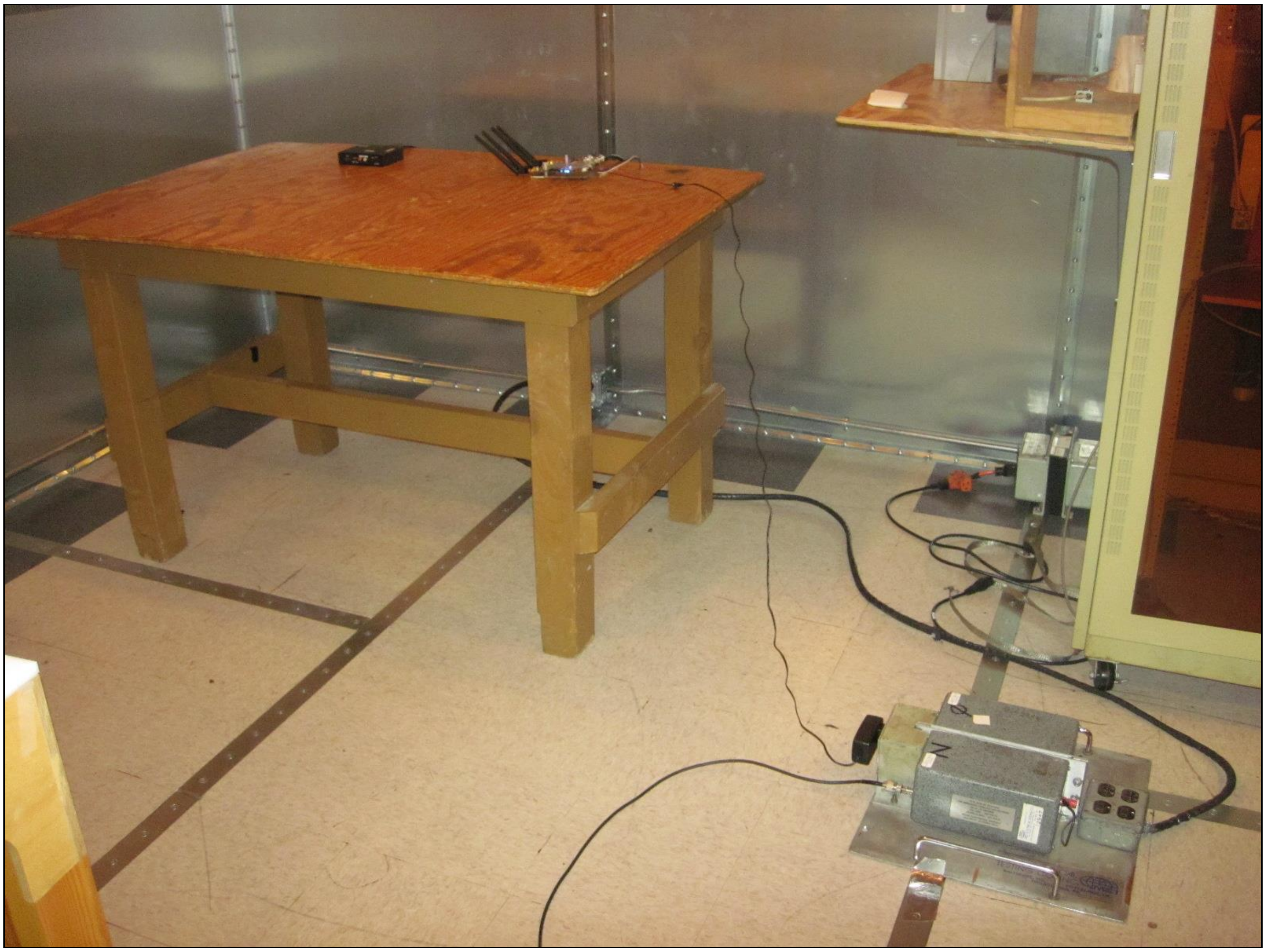
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) Avg.	Limit (dBuV) Avg.	Margin (dB) Avg.
0.1523	48.85	0	48.85	65.87	-17.02	28.05	0	28.05	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

Conducted Emission Limits Test Setup



Photograph 2. Conducted Emissions, Test Setup

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.

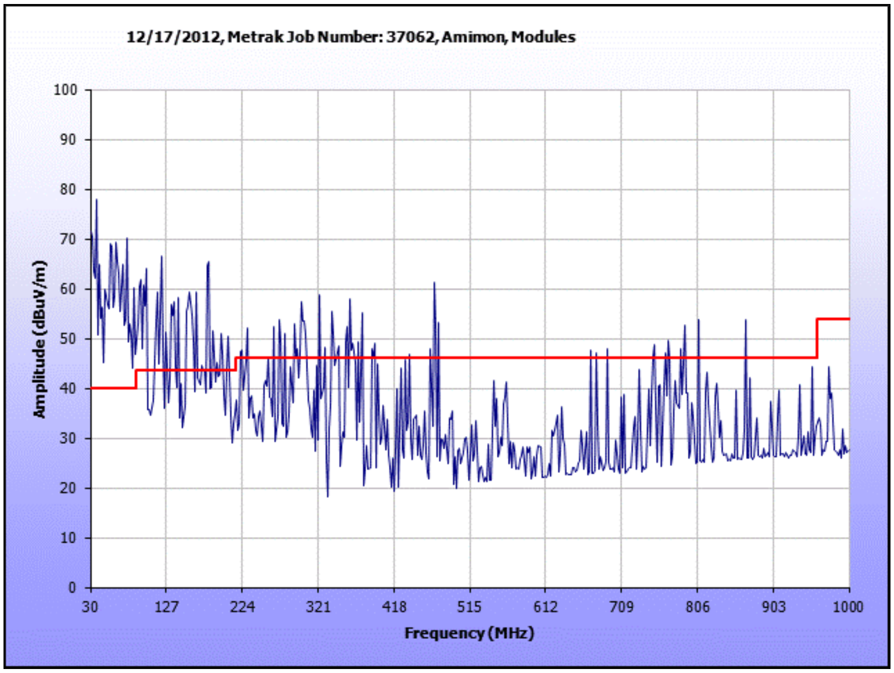
Test Engineer(s): Zijun Tong

Test Date(s): 12/17/12

Radiated Emissions Limits Test Results, Class B

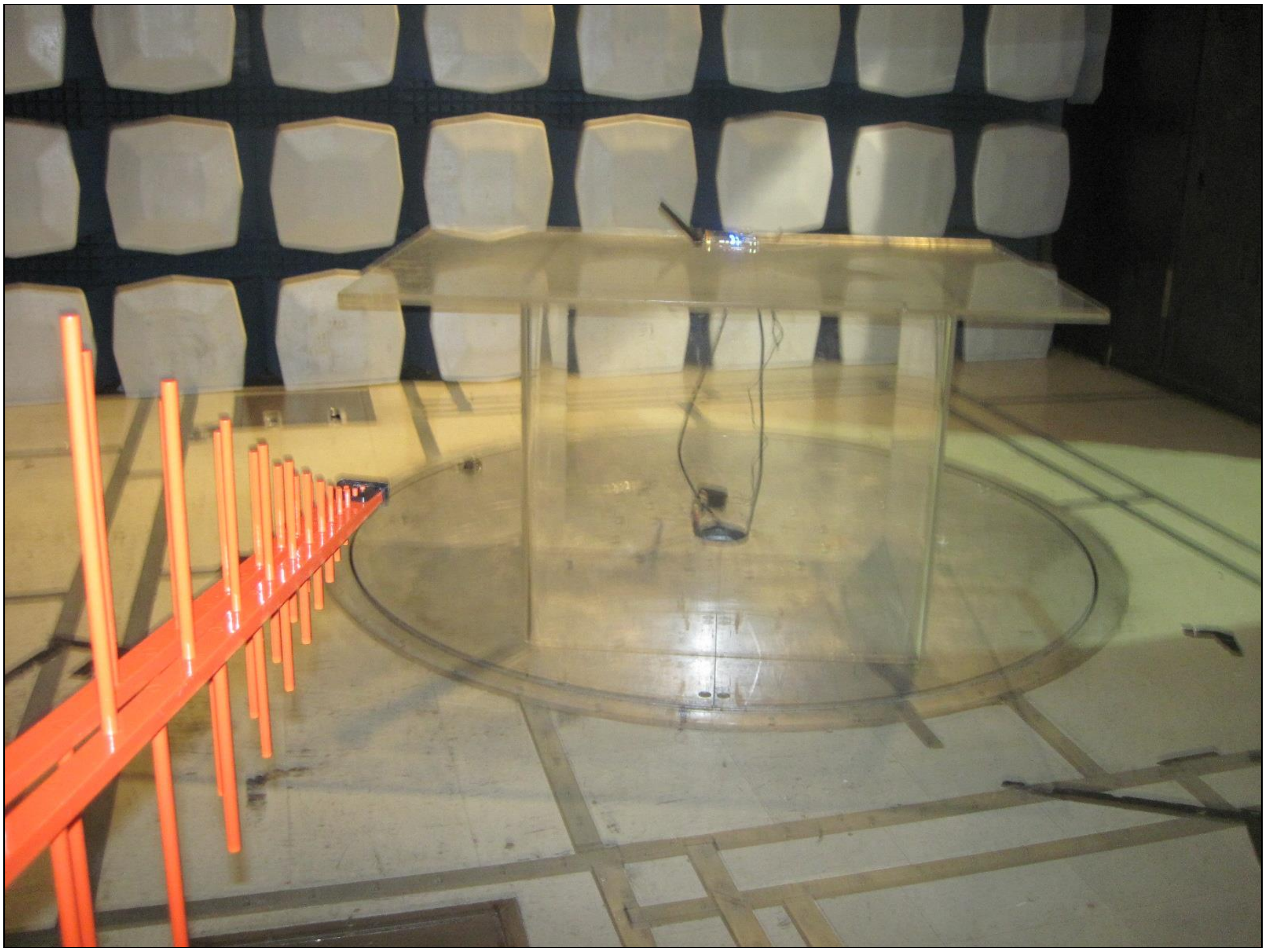
Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBµV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
38.590453	86	H	1.71	5.10	15.53	0.58	0.00	21.21	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



Plot 3. Radiated Emissions, Pre-Scan

Radiated Emission Limits Test Setup



Photograph 3. Radiated Emission, Test Setup

IV. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

a.) Antenna must be permanently attached to the unit.

b.) Antenna must use a unique type of connector to attach to the EUT.

c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT 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

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 Σ 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 Class B requirement(s) of this section.

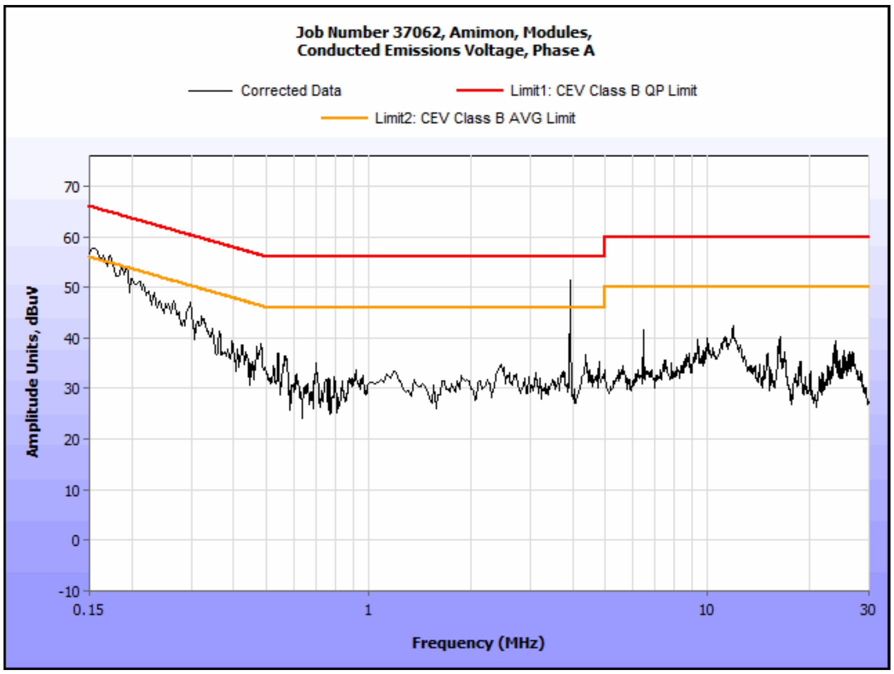
Test Engineer(s): Jeff Pratt

Test Date(s): 01/18/13

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

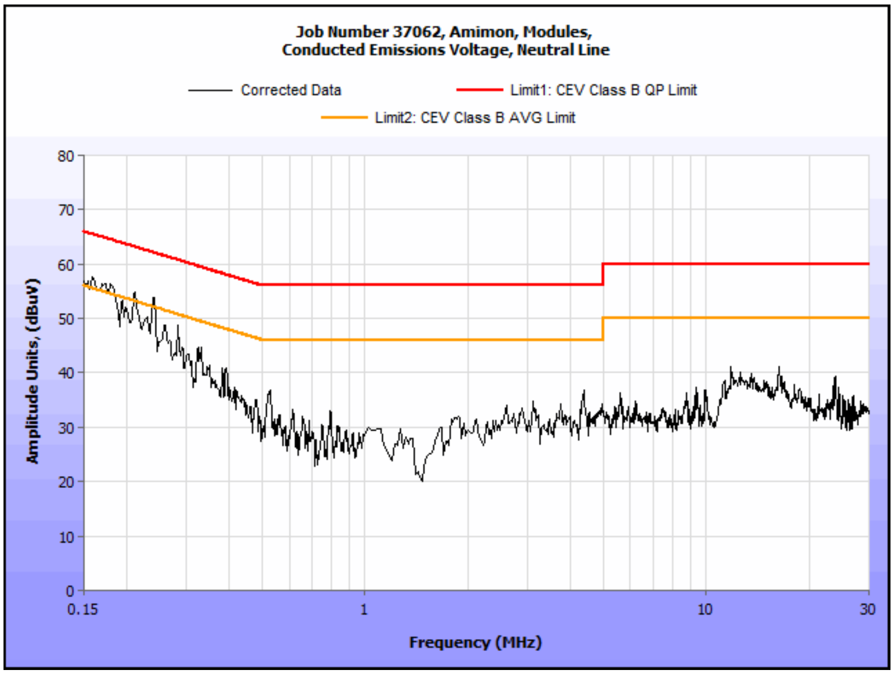
Table 13. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)



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

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

Conducted Emission Limits Test Setup

Photograph 4. Conducted Emissions, Test Setup

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

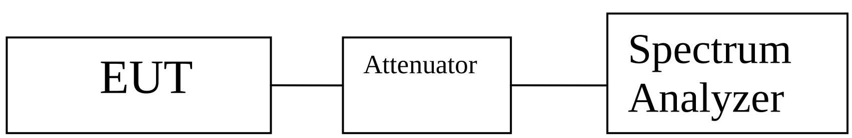
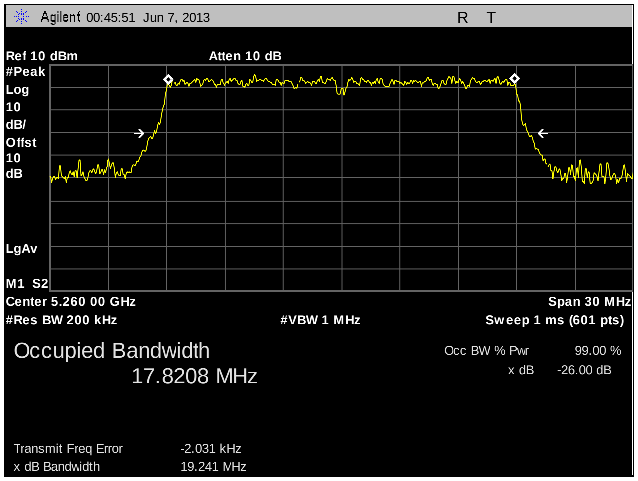
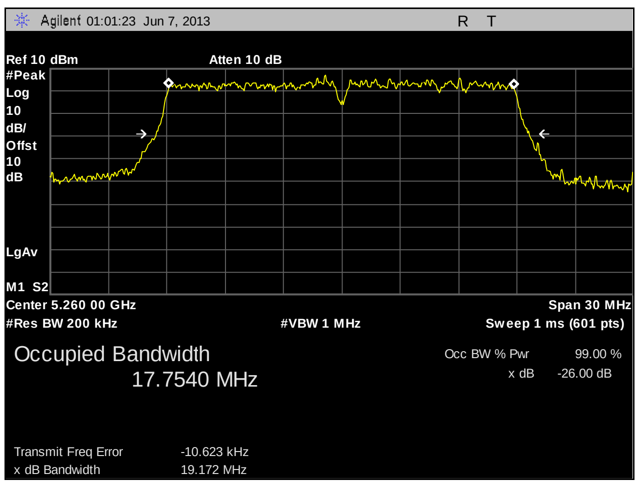


Figure 2. Occupied Bandwidth, Test Setup

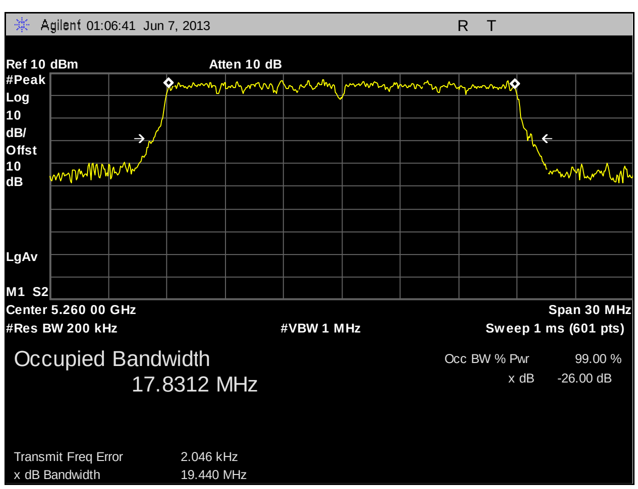
Electromagnetic Compatibility Criteria for Intentional Radiators



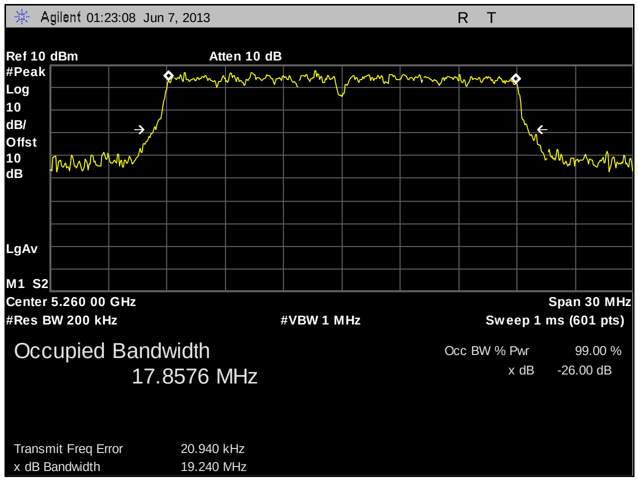
Plot 6. 26 dB Occupied Bandwidth, 5260 MHz, Port 1



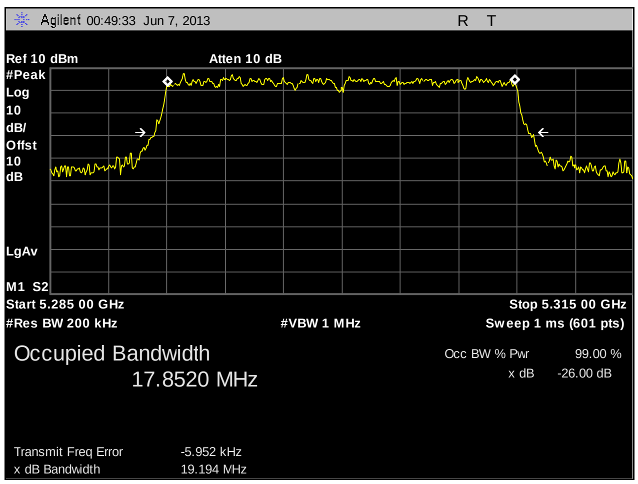
Plot 7. 26 dB Occupied Bandwidth, 5260 MHz, Port 2



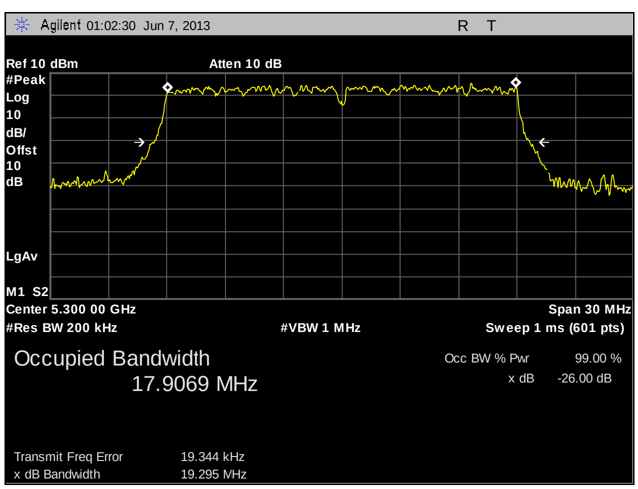
Plot 8. 26 dB Occupied Bandwidth, 5260 MHz, Port 3



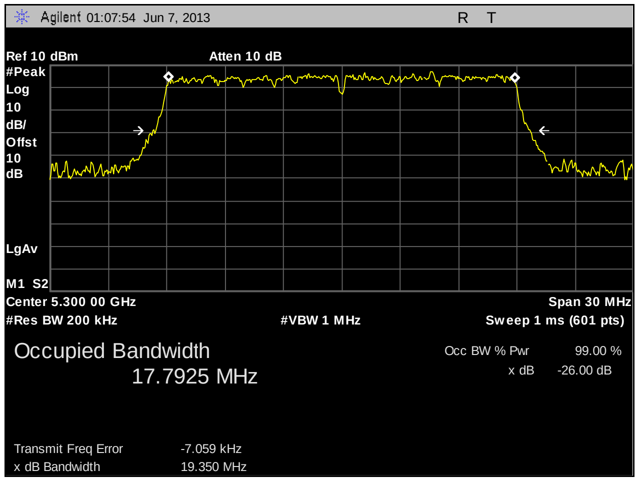
Plot 9. 26 dB Occupied Bandwidth, 5260 MHz, Port 4



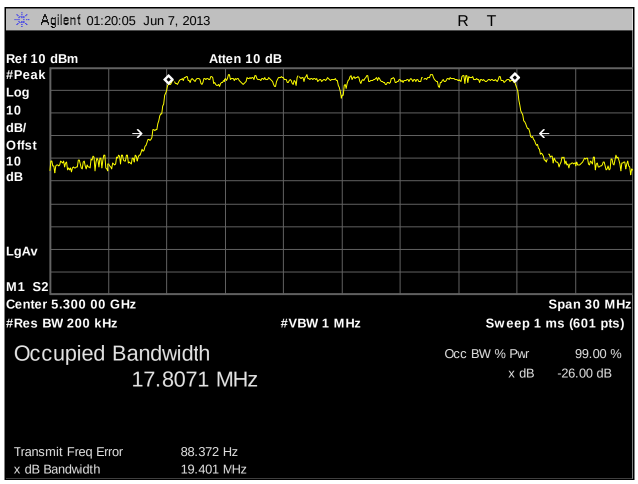
Plot 10. 26 dB Occupied Bandwidth, 5300 MHz, Port 1



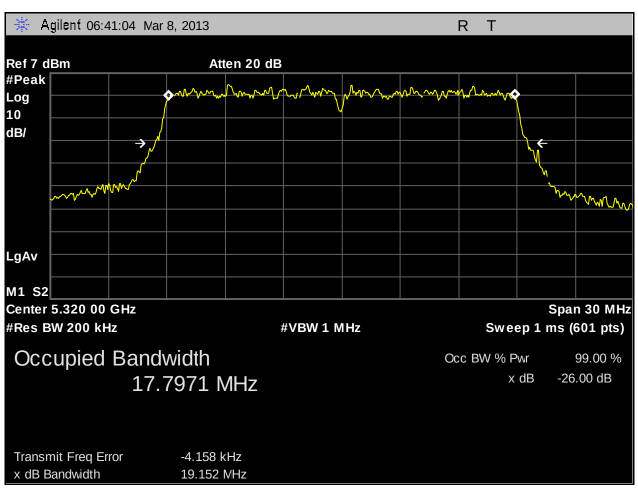
Plot 11. 26 dB Occupied Bandwidth, 5300 MHz, Port 2



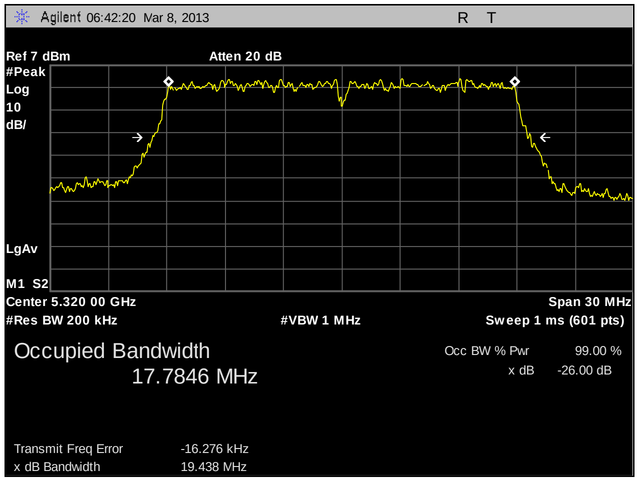
Plot 12. 26 dB Occupied Bandwidth, 5300 MHz, Port 3



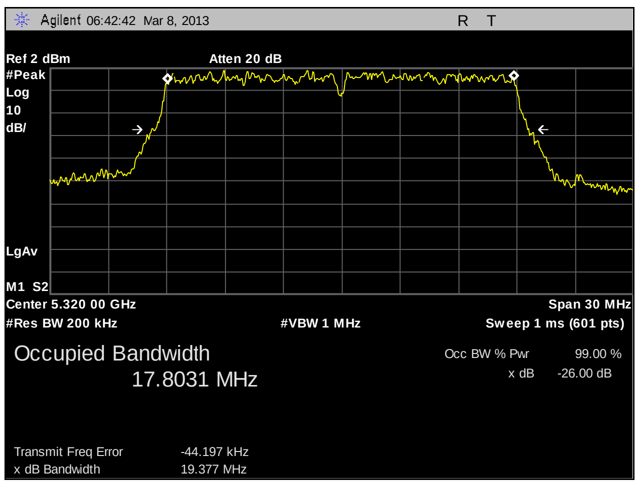
Plot 13. 26 dB Occupied Bandwidth, 5300 MHz, Port 4



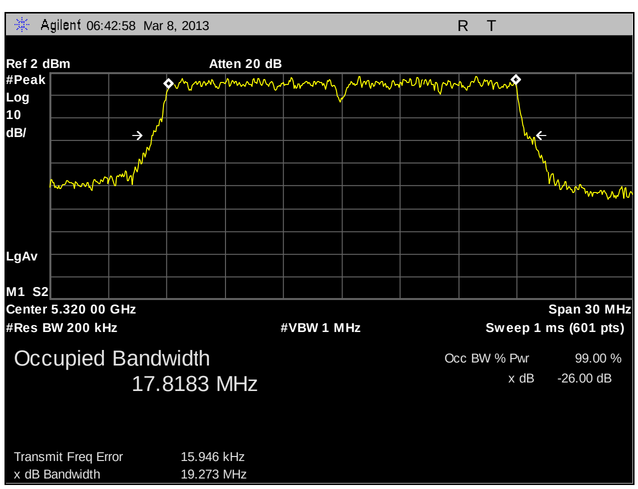
Plot 14. 26 dB Occupied Bandwidth, 5320 MHz, 20 MHz, Port 1



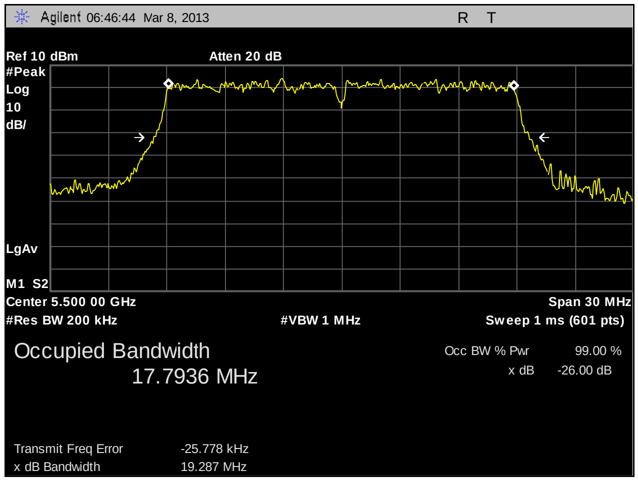
Plot 15. 26 dB Occupied Bandwidth, 5320 MHz, 20 MHz, Port 2



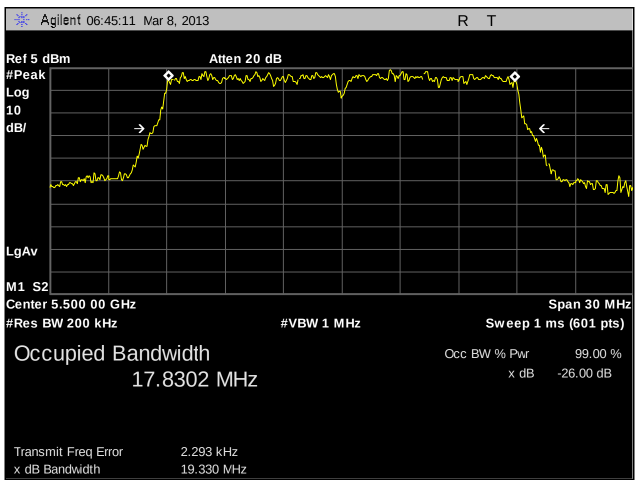
Plot 16. 26 dB Occupied Bandwidth, 5320 MHz, 20 MHz, Port 3



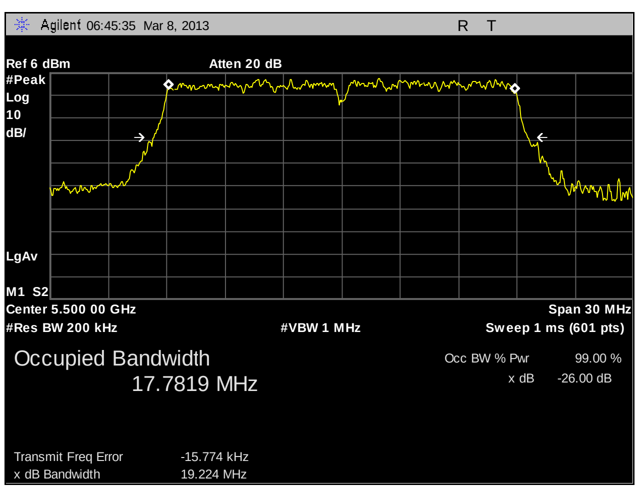
Plot 17. 26 dB Occupied Bandwidth, 5320 MHz, 20 MHz, Port 4



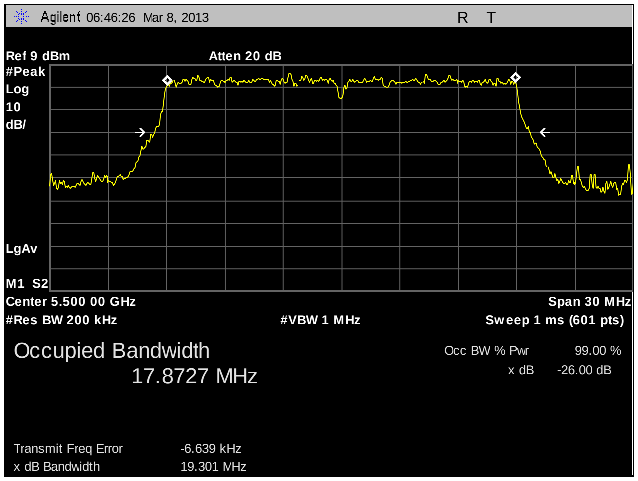
Plot 18. 26 dB Occupied Bandwidth, 5500 MHz, 20 MHz, Port 1



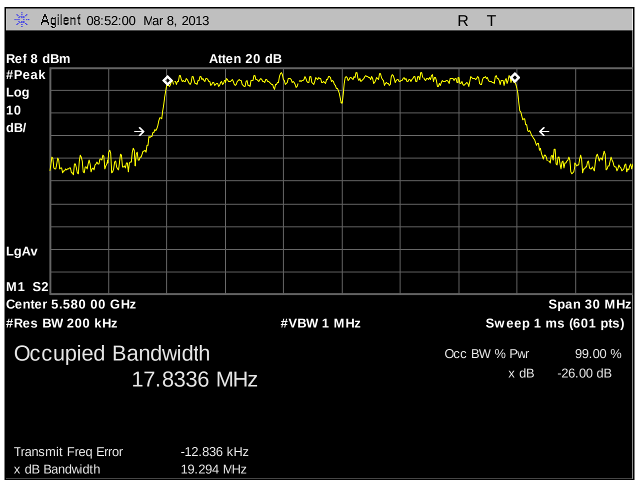
Plot 19. 26 dB Occupied Bandwidth, 5500 MHz, 20 MHz, Port 2



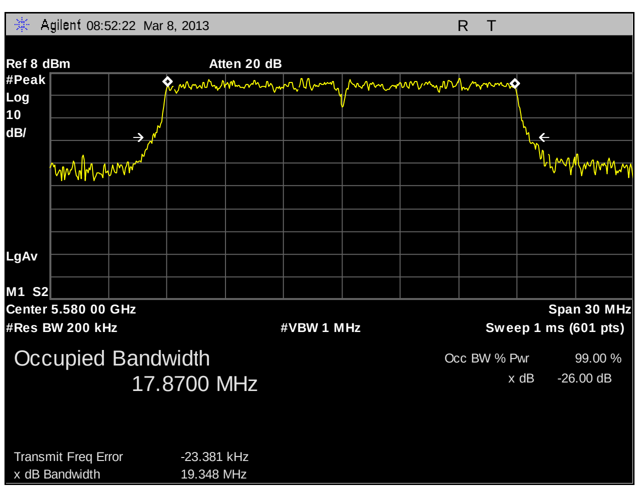
Plot 20. 26 dB Occupied Bandwidth, 5500 MHz, 20 MHz, Port 3



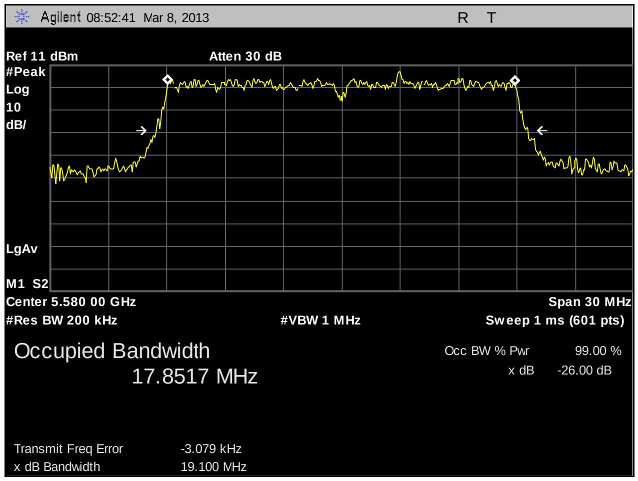
Plot 21. 26 dB Occupied Bandwidth, 5500 MHz, 20 MHz, Port 4



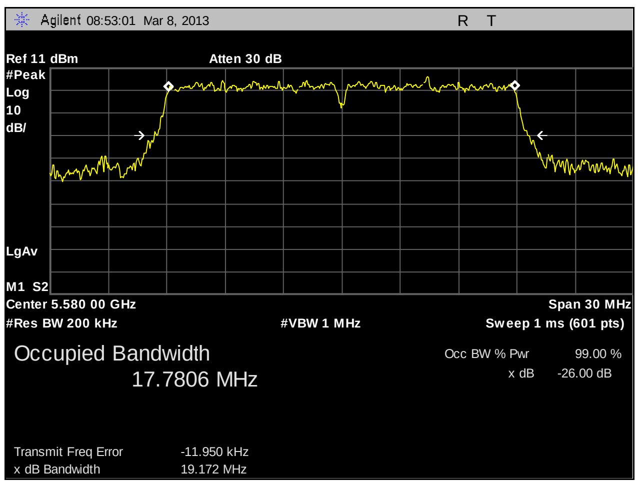
Plot 22. 26 dB Occupied Bandwidth, 5580 MHz, 20 MHz, Port 1



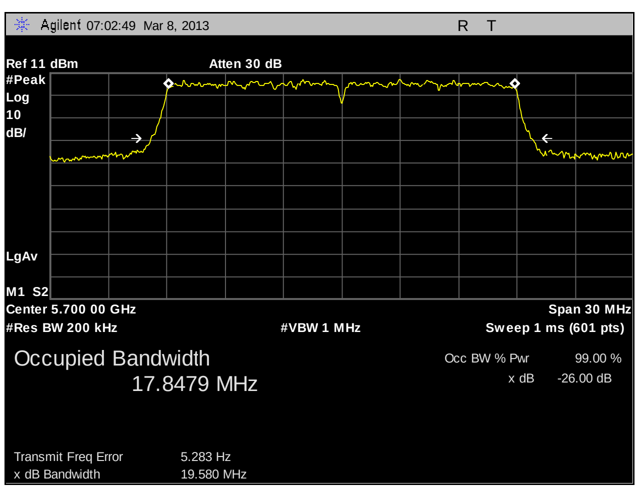
Plot 23. 26 dB Occupied Bandwidth, 5580 MHz, 20 MHz, Port 2



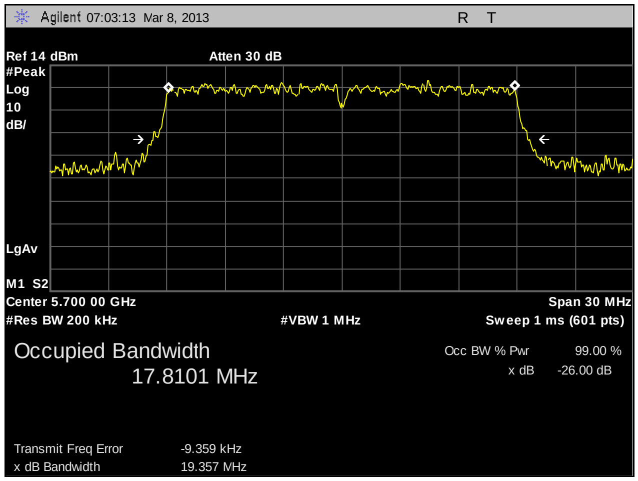
Plot 24. 26 dB Occupied Bandwidth, 5580 MHz, 20 MHz, Port 3



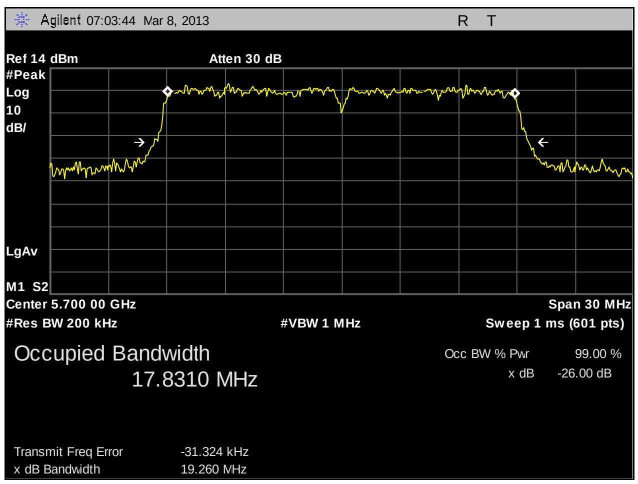
Plot 25. 26 dB Occupied Bandwidth, 5580 MHz, 20 MHz, Port 4



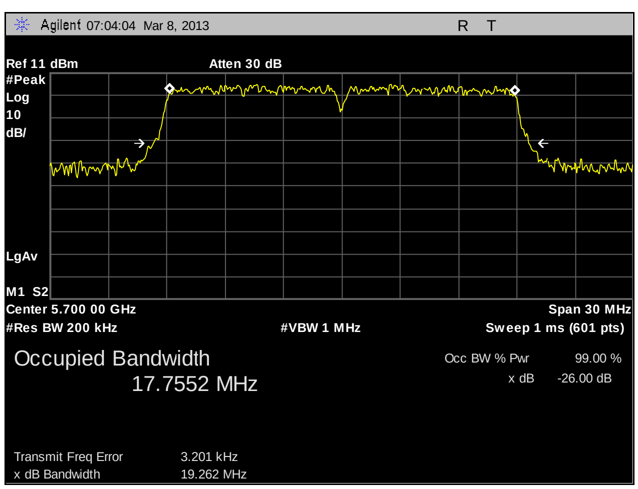
Plot 26. 26 dB Occupied Bandwidth, 5700 MHz, 20 MHz, Port 1



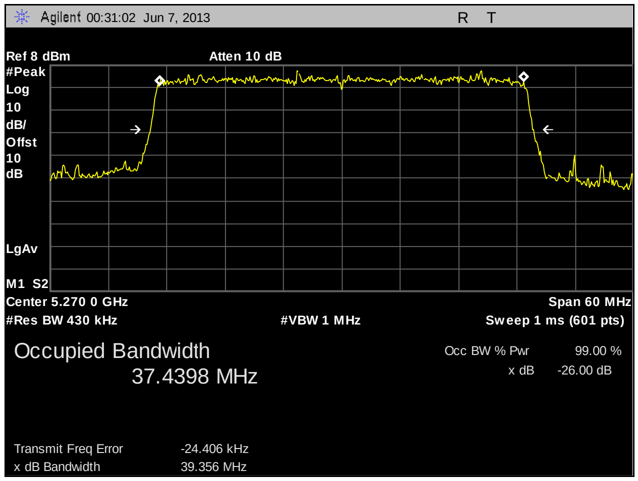
Plot 27. 26 dB Occupied Bandwidth, 5700 MHz, 20 MHz, Port 2



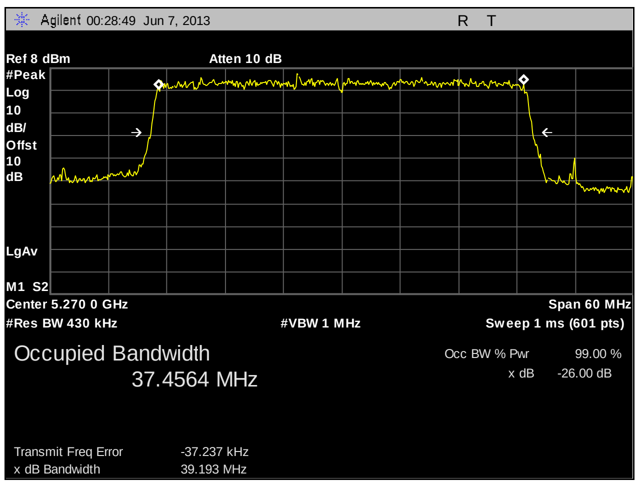
Plot 28. 26 dB Occupied Bandwidth, 5700 MHz, 20 MHz, Port 3



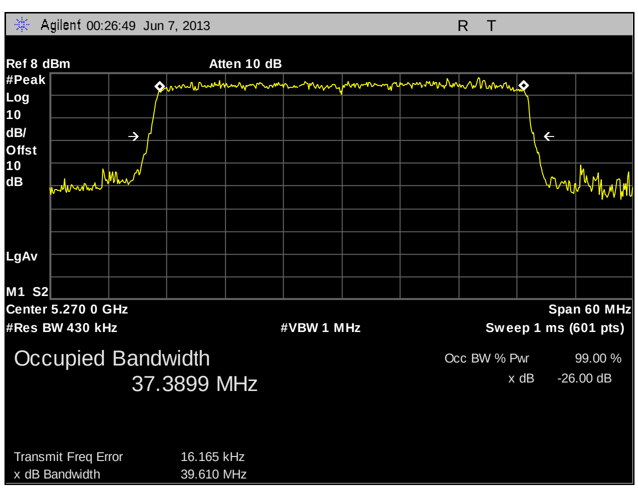
Plot 29. 26 dB Occupied Bandwidth, 5700 MHz, 20 MHz, Port 4



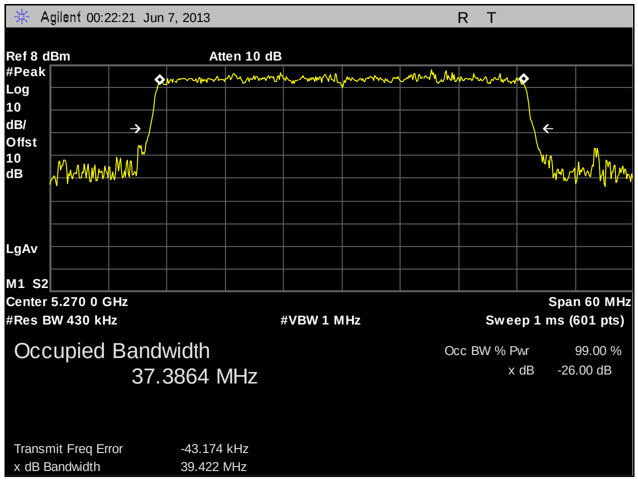
Plot 30. 26 dB Occupied Bandwidth, 5270 MHz, Port 1



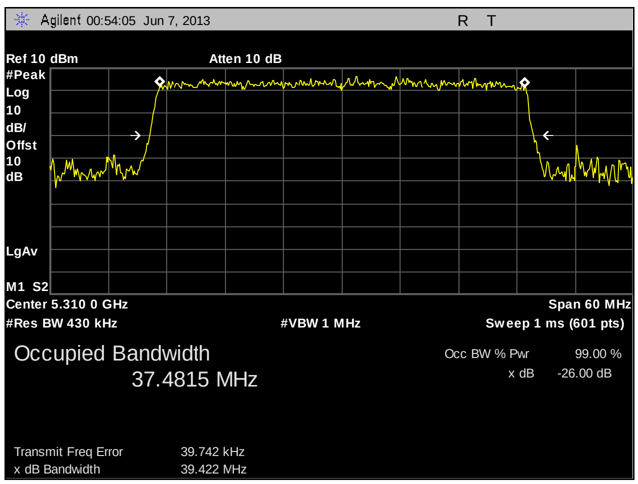
Plot 31. 26 dB Occupied Bandwidth, 5270 MHz, Port 2



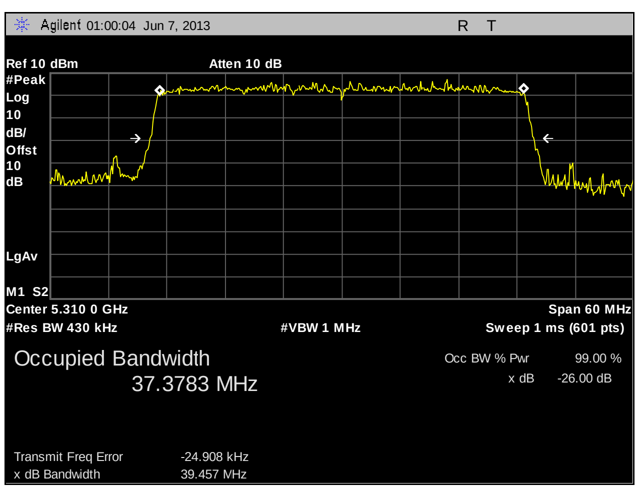
Plot 32. 26 dB Occupied Bandwidth, 5270 MHz, Port 3



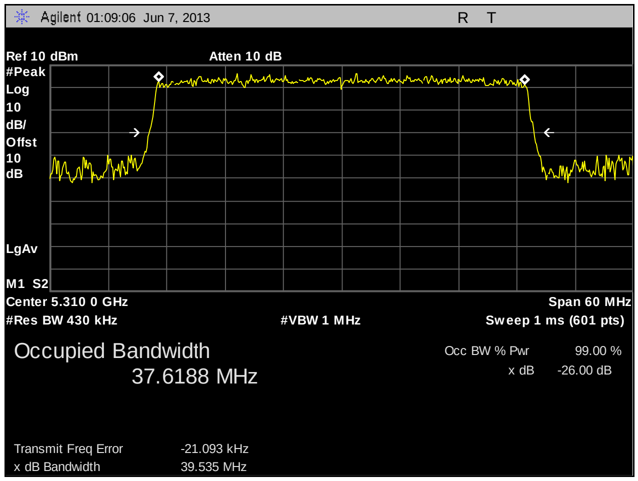
Plot 33. 26 dB Occupied Bandwidth, 5270 MHz, Port 4



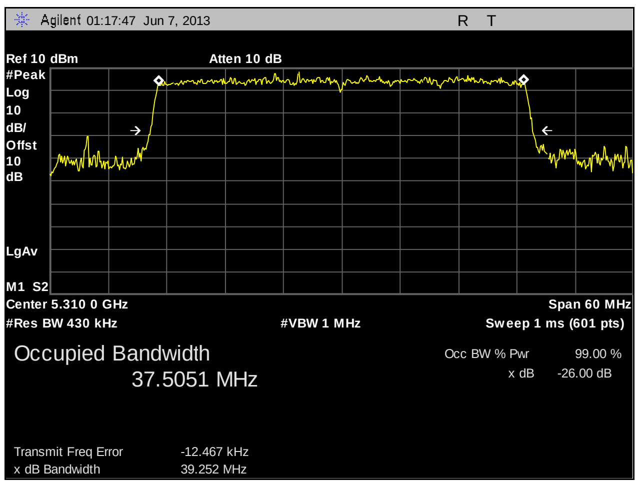
Plot 34. 26 dB Occupied Bandwidth, 5310 MHz, Port 1



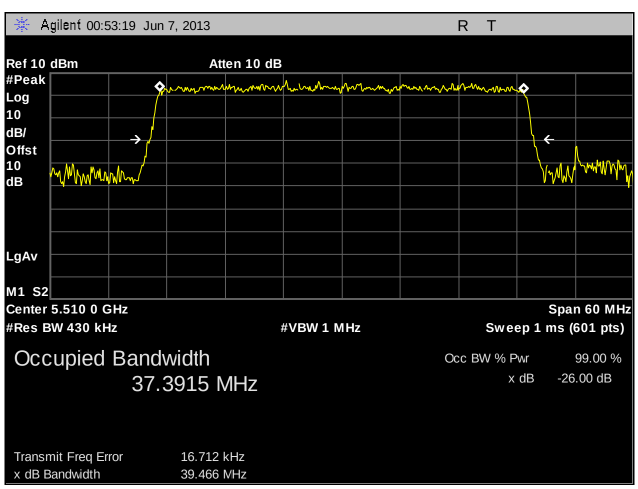
Plot 35. 26 dB Occupied Bandwidth, 5310 MHz, Port 2



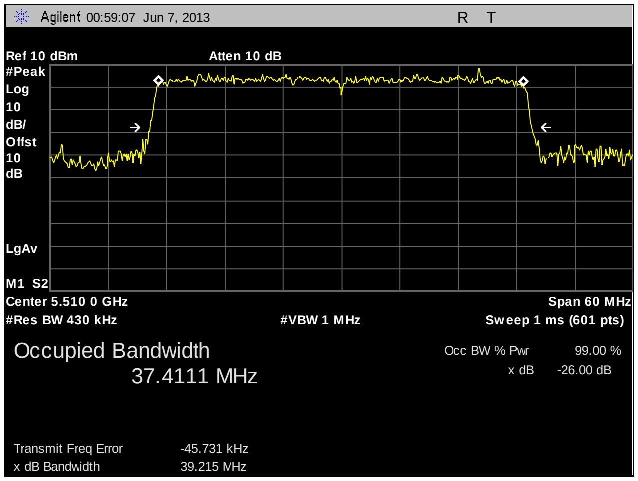
Plot 36. 26 dB Occupied Bandwidth, 5310 MHz, Port 3



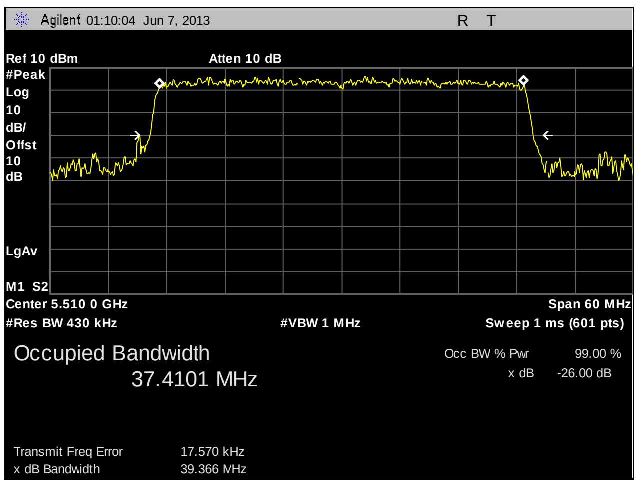
Plot 37. 26 dB Occupied Bandwidth, 5310 MHz, Port 4



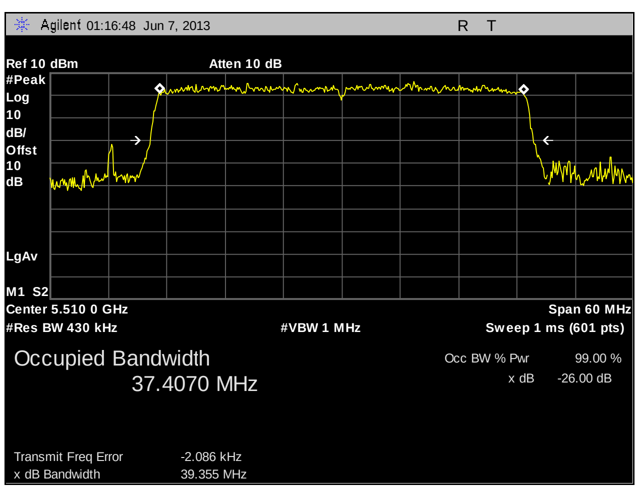
Plot 38. 26 dB Occupied Bandwidth, 5510 MHz, Port 1



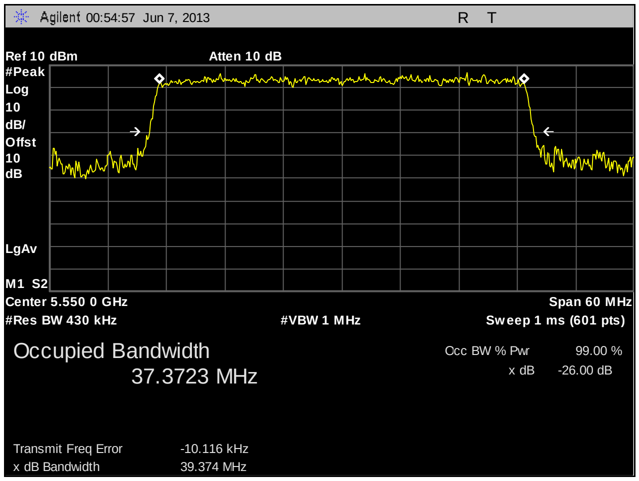
Plot 39. 26 dB Occupied Bandwidth, 5510 MHz, Port 2



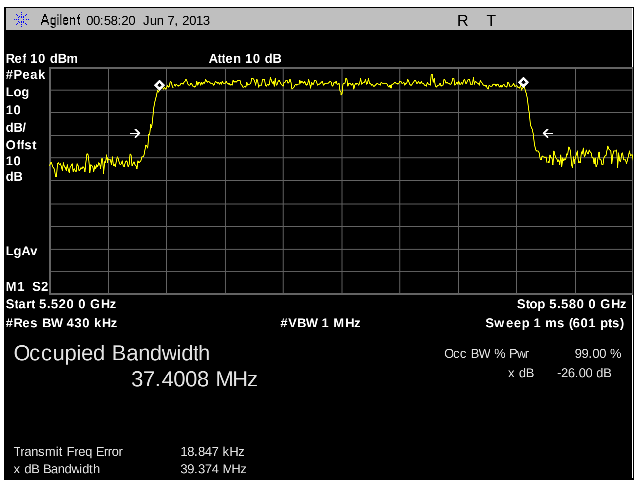
Plot 40. 26 dB Occupied Bandwidth, 5510 MHz, Port 3



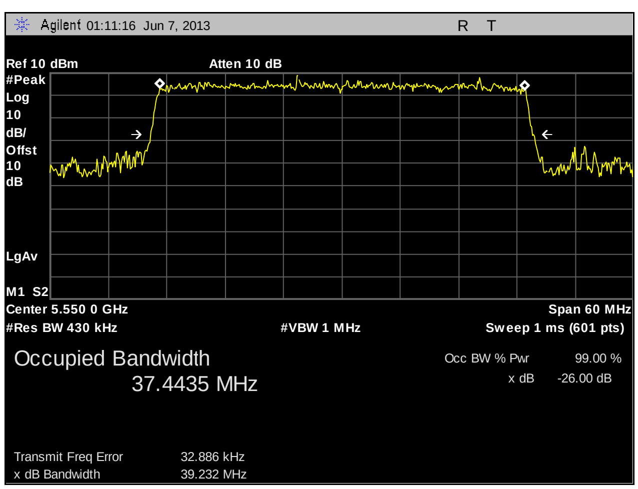
Plot 41. 26 dB Occupied Bandwidth, 5510 MHz, Port 4



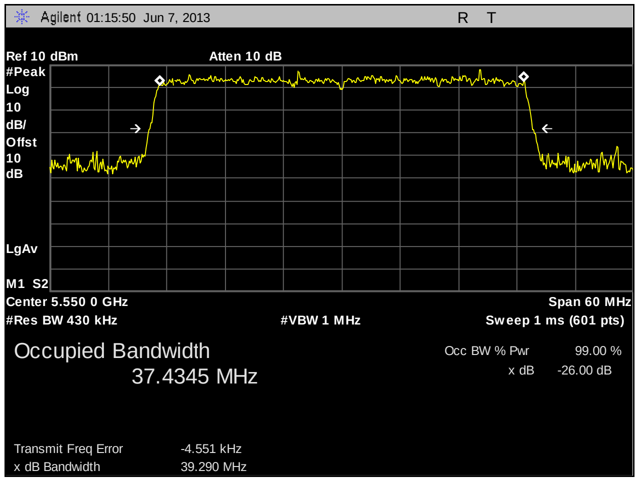
Plot 42. 26 dB Occupied Bandwidth, 5550 MHz, Port 1



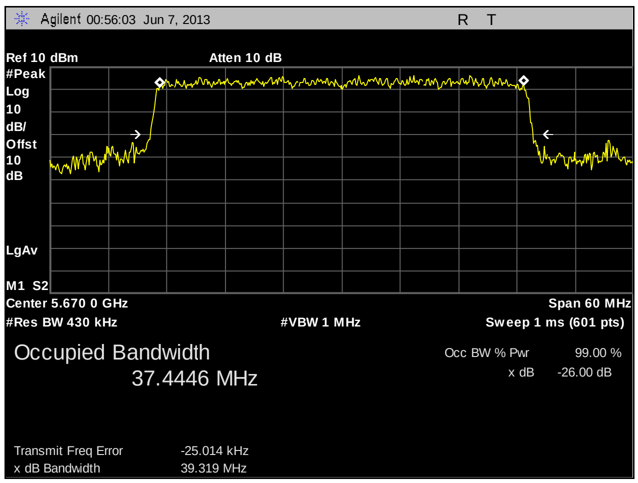
Plot 43. 26 dB Occupied Bandwidth, 5550 MHz, Port 2



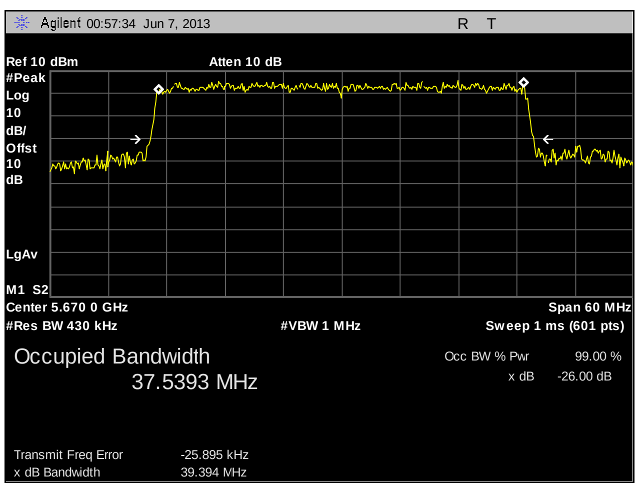
Plot 44. 26 dB Occupied Bandwidth, 5550 MHz, Port 3



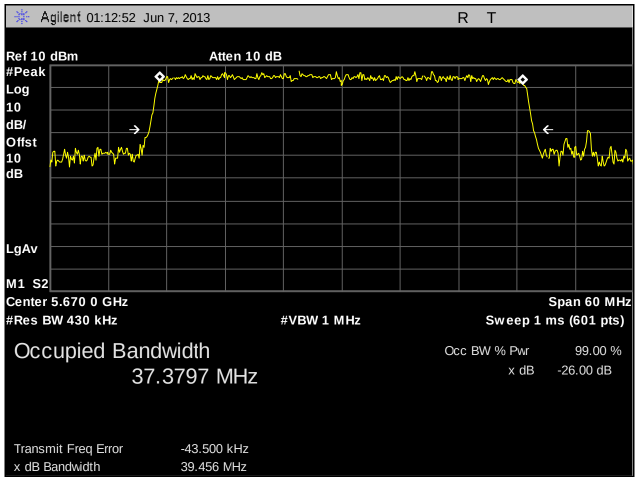
Plot 45. 26 dB Occupied Bandwidth, 5550 MHz, Port 4



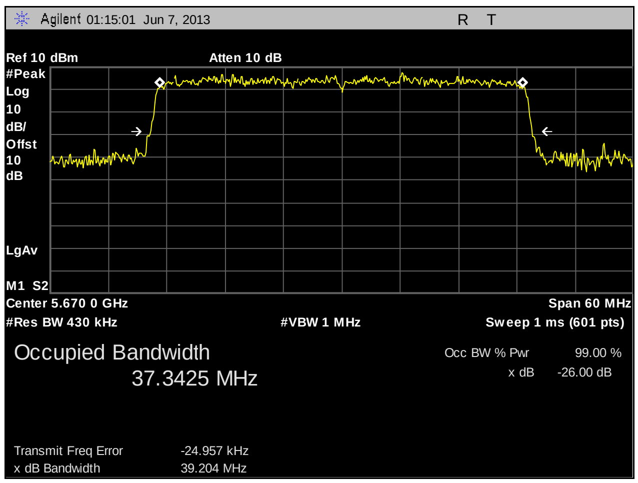
Plot 46. 26 dB Occupied Bandwidth, 5670 MHz, Port 1



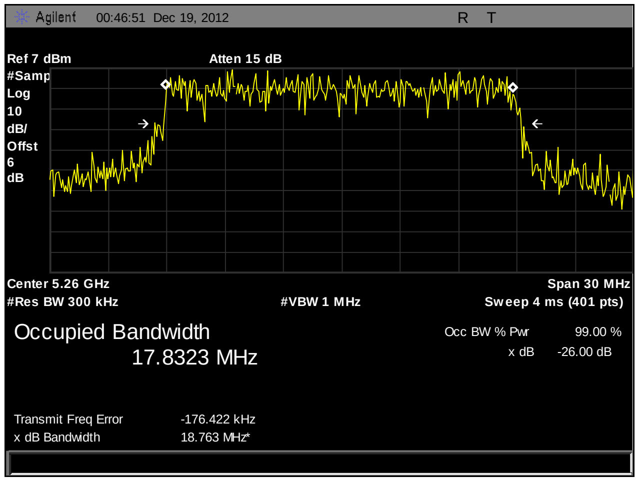
Plot 47. 26 dB Occupied Bandwidth, 5670 MHz, Port 2



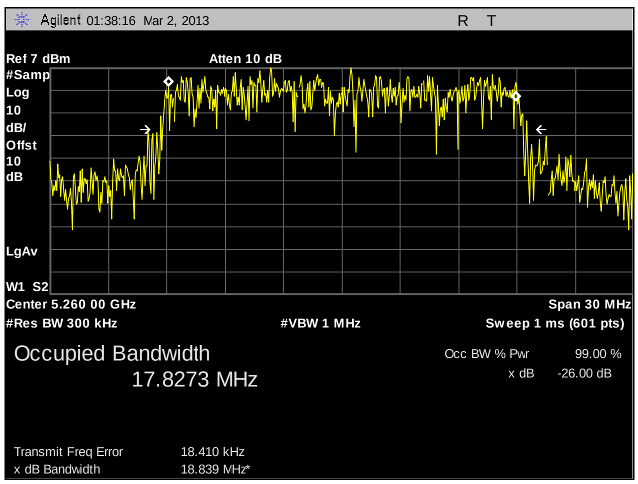
Plot 48. 26 dB Occupied Bandwidth, 5670 MHz, Port 3



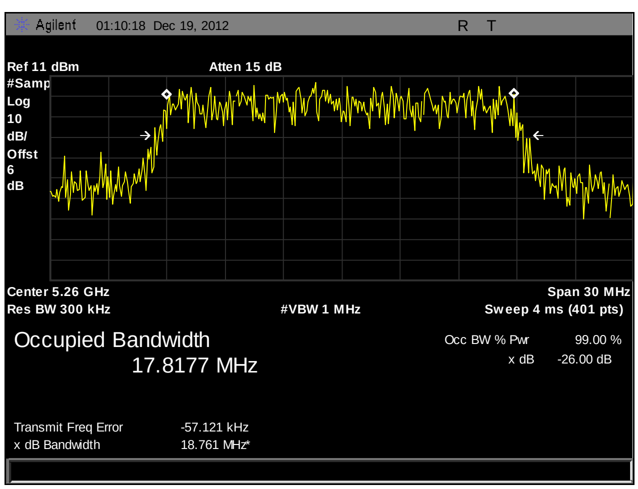
Plot 49. 26 dB Occupied Bandwidth, 5670 MHz, Port 4



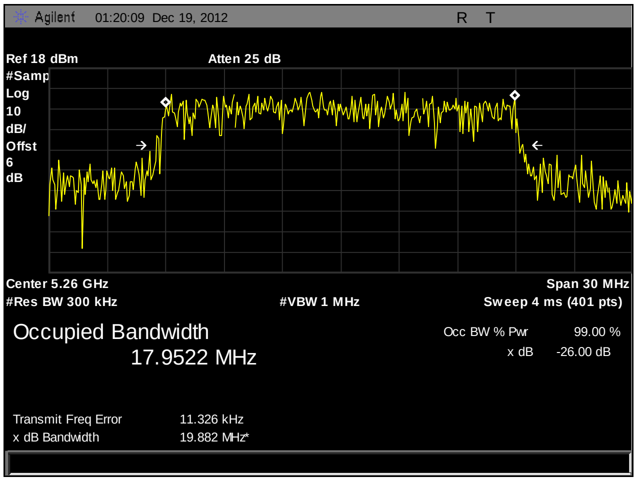
Plot 50. Occupied Bandwidth, 5260 MHz, 20 MHz, Port 1, 99%



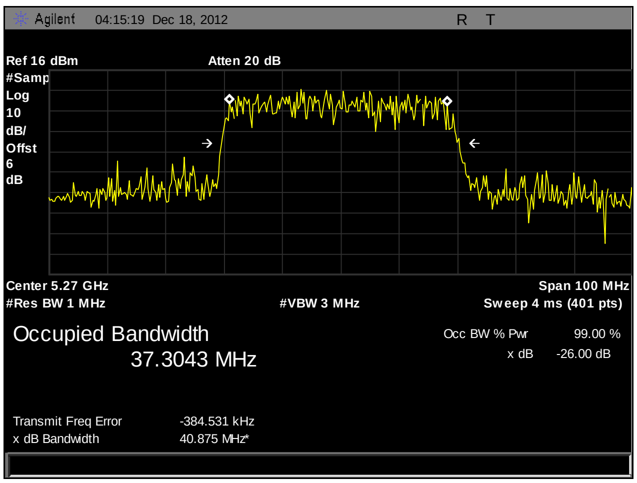
Plot 51. Occupied Bandwidth, 5260 MHz, 20 MHz, Port 2, 99%



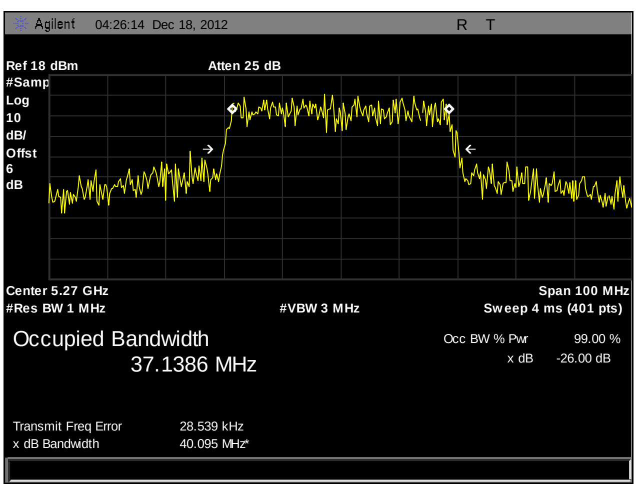
Plot 52. Occupied Bandwidth, 5260 MHz, 20 MHz, Port 3, 99%



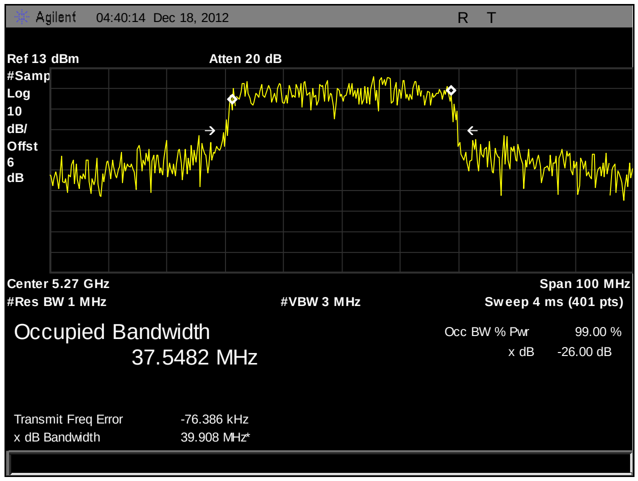
Plot 53. Occupied Bandwidth, 5260 MHz, 20 MHz, Port 4, 99%



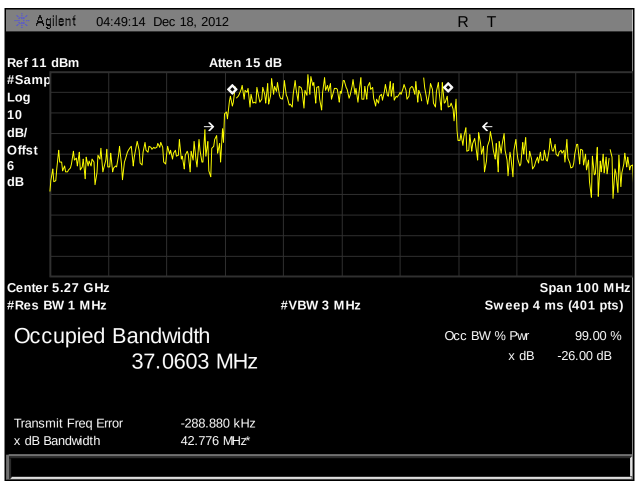
Plot 54. Occupied Bandwidth, 5270 MHz, 40 MHz, Port 1, 99%



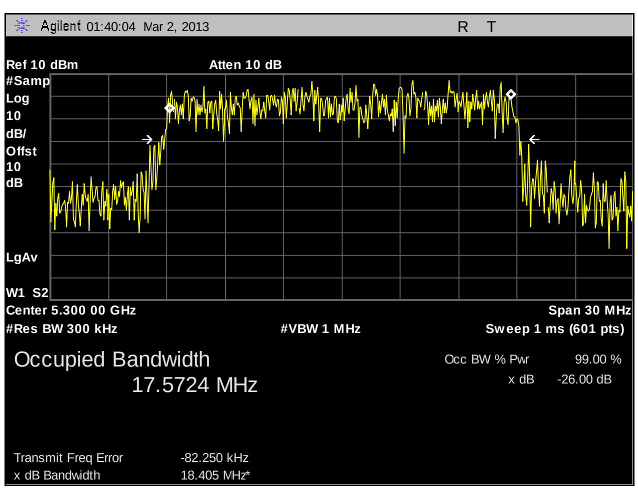
Plot 55. Occupied Bandwidth, 5270 MHz, 40 MHz, Port 2, 99%



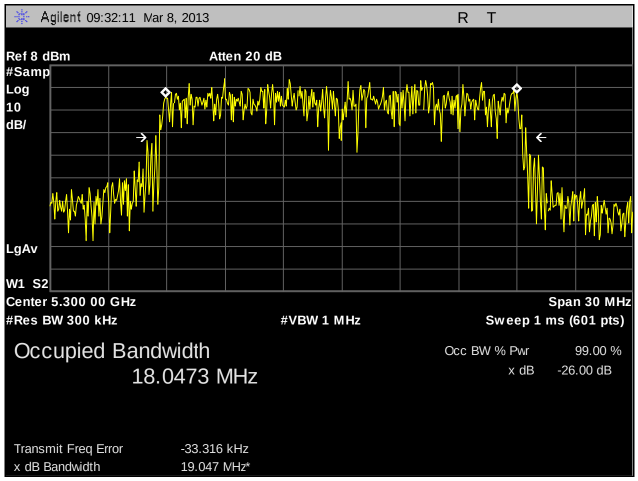
Plot 56. Occupied Bandwidth, 5270 MHz, 40 MHz, Port 3, 99%



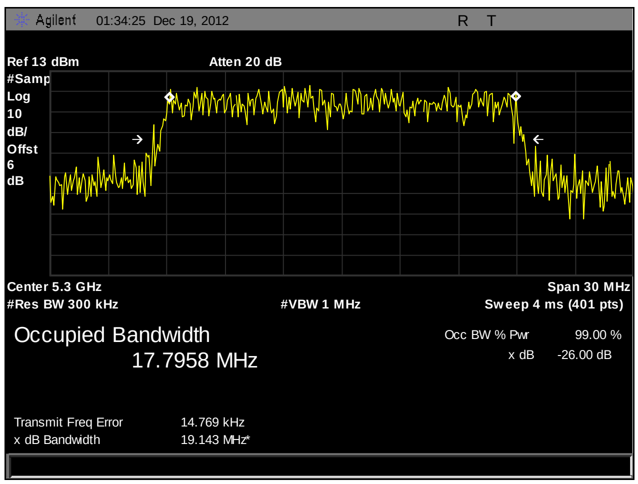
Plot 57. Occupied Bandwidth, 5270 MHz, 40 MHz, Port 4, 99%



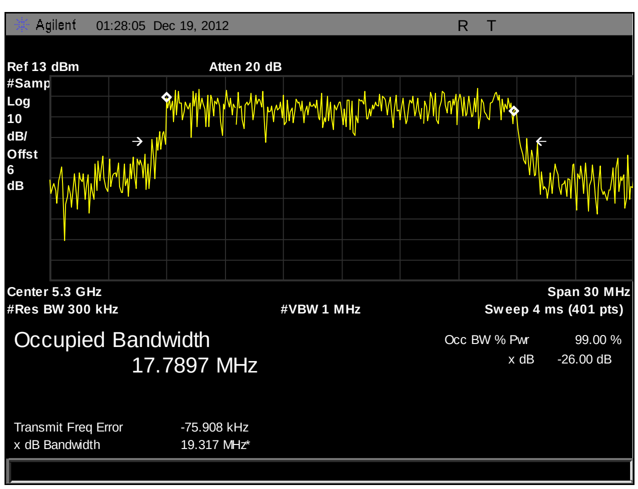
Plot 58. Occupied Bandwidth, 5300 MHz, 20 MHz, Port 1, 99%



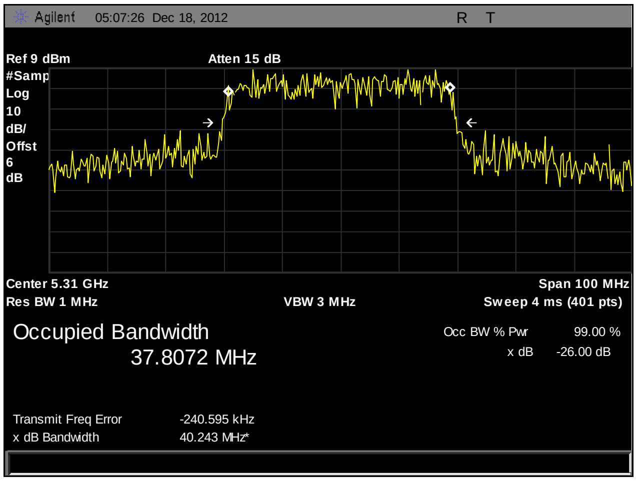
Plot 59. Occupied Bandwidth, 5300 MHz, 20 MHz, Port 2, 99%



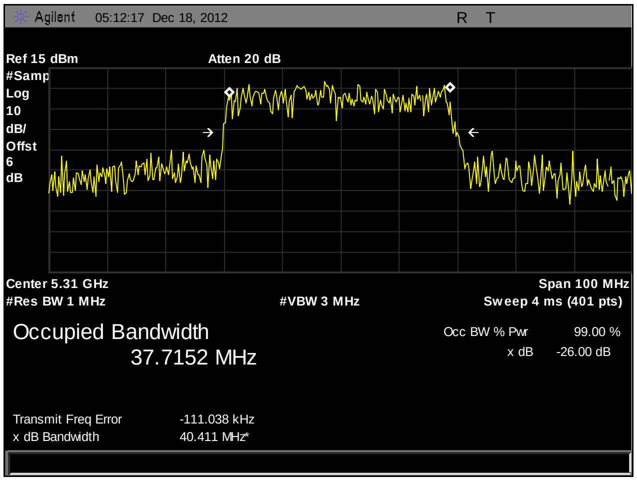
Plot 60. Occupied Bandwidth, 5300 MHz, 20 MHz, Port 3, 99%



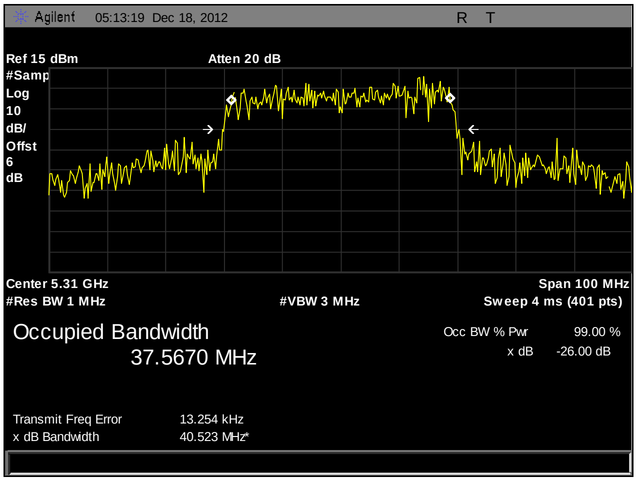
Plot 61. Occupied Bandwidth, 5300 MHz, 20 MHz, Port 4, 99%



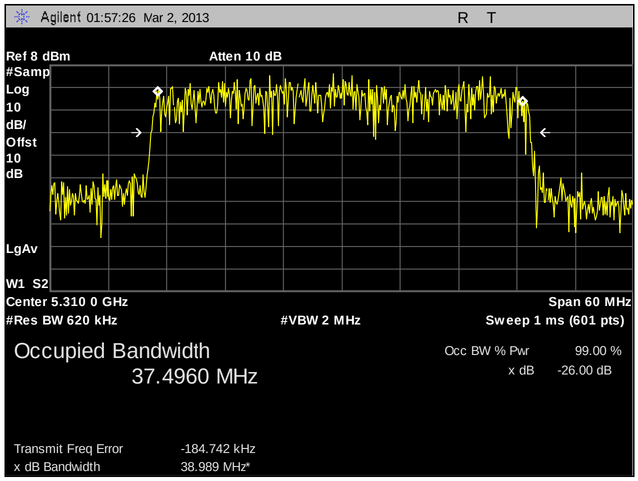
Plot 62. Occupied Bandwidth, 5310 MHz, 40 MHz, Port 1, 99%



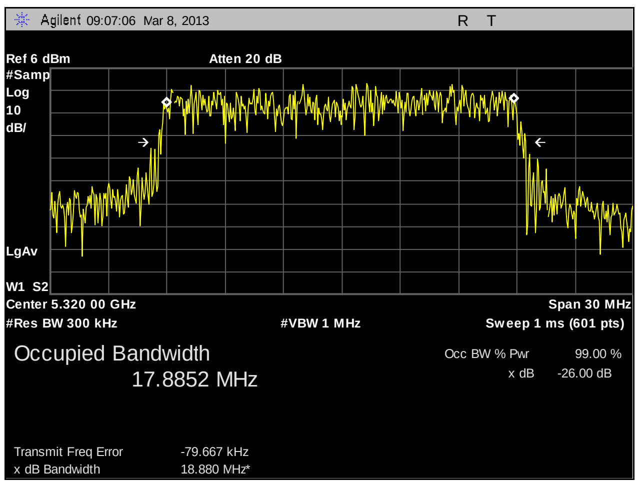
Plot 63. Occupied Bandwidth, 5310 MHz, 40 MHz, Port 2, 99%



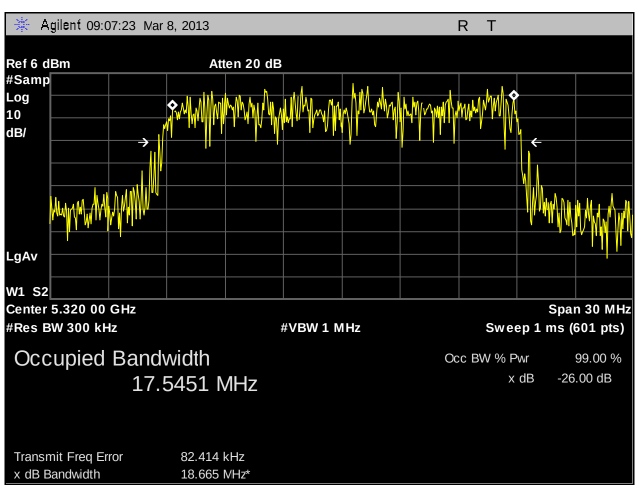
Plot 64. Occupied Bandwidth, 5310 MHz, 40 MHz, Port 3, 99%



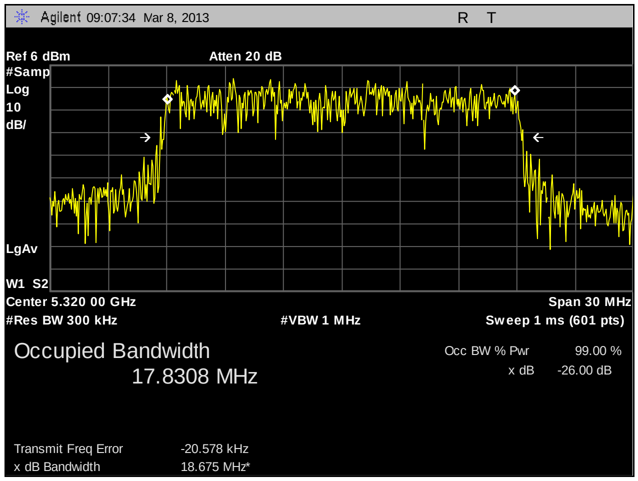
Plot 65. Occupied Bandwidth, 5310 MHz, 40 MHz, Port 4, 99%



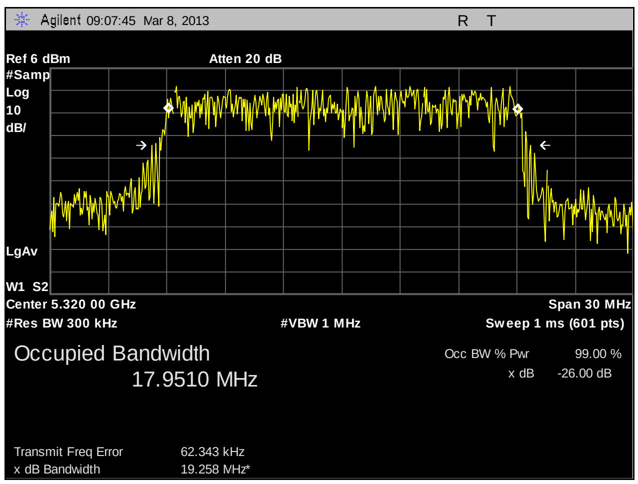
Plot 66. Occupied Bandwidth, 5320 MHz, 20 MHz, Port 1, 99%



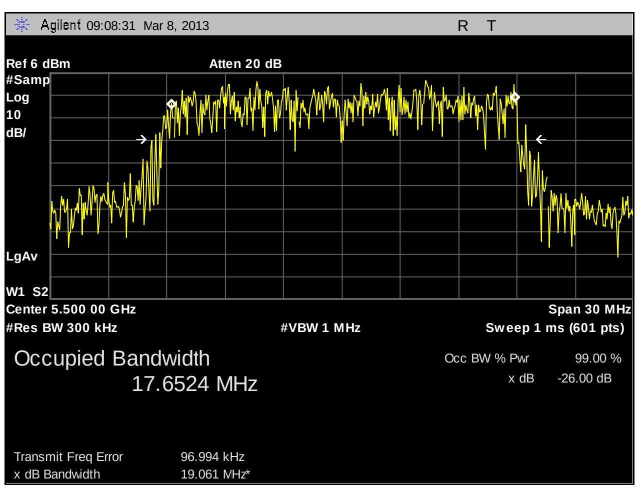
Plot 67. Occupied Bandwidth, 5320 MHz, 20 MHz, Port 2, 99%



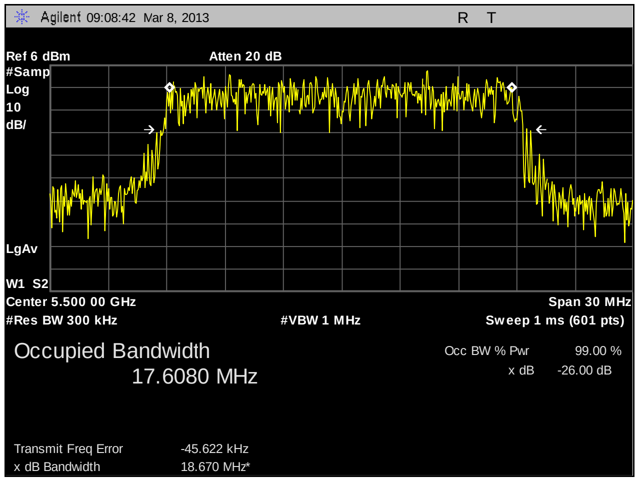
Plot 68. Occupied Bandwidth, 5320 MHz, 20 MHz, Port 3, 99%



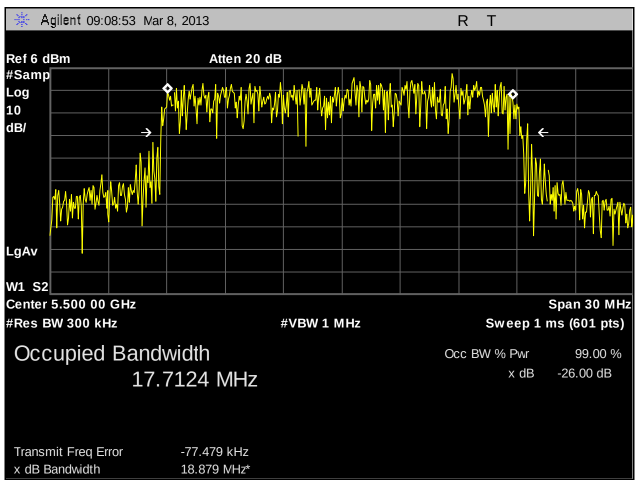
Plot 69. Occupied Bandwidth, 5320 MHz, 20 MHz, Port 4, 99%



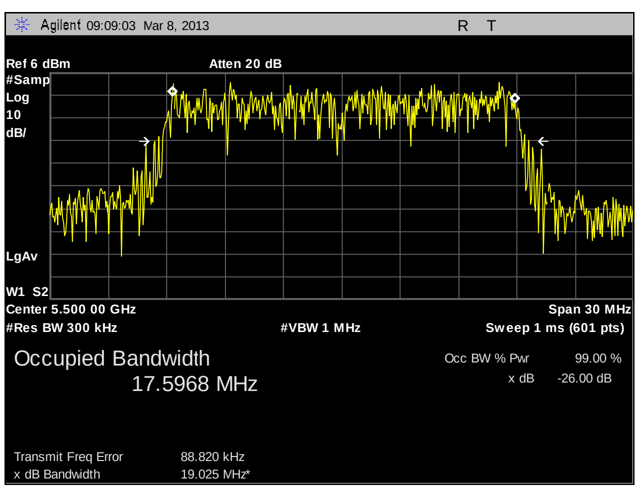
Plot 70. Occupied Bandwidth, 5500 MHz, 20 MHz, Port 1, 99%



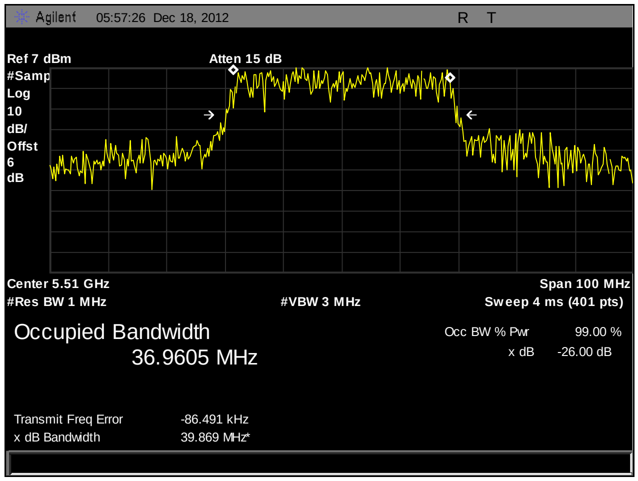
Plot 71. Occupied Bandwidth, 5500 MHz, 20 MHz, Port 2, 99%



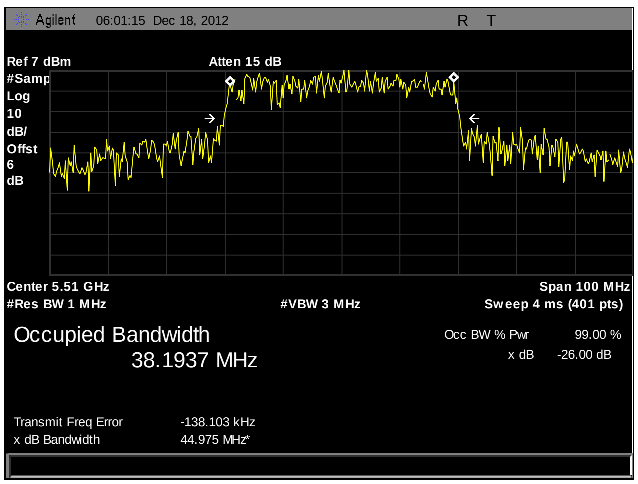
Plot 72. Occupied Bandwidth, 5500 MHz, 20 MHz, Port 3, 99%



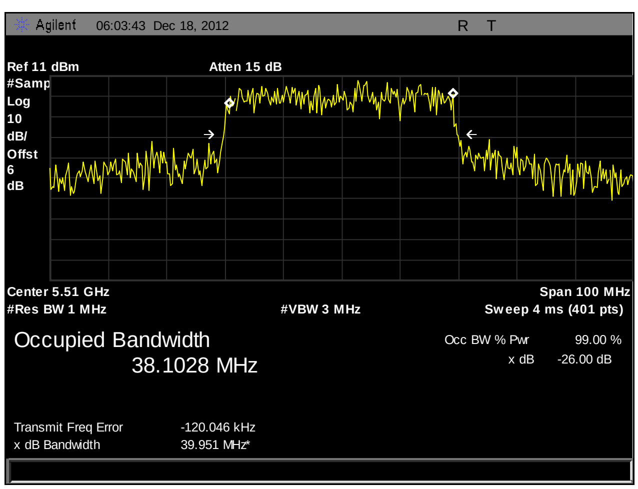
Plot 73. Occupied Bandwidth, 5500 MHz, 20 MHz, Port 4, 99%



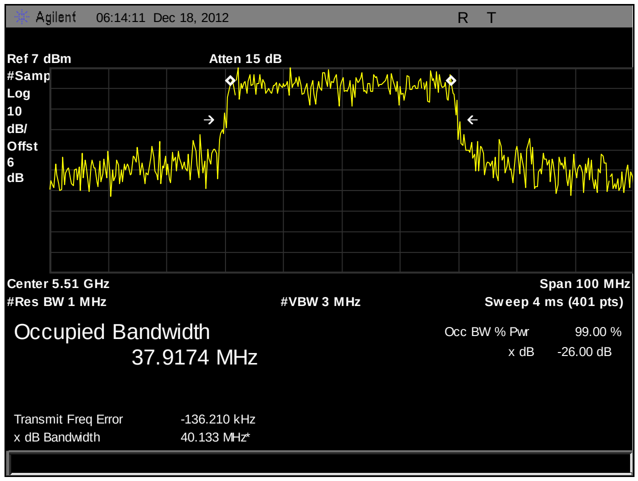
Plot 74. Occupied Bandwidth, 5510 MHz, 40 MHz, Port 1, 99%



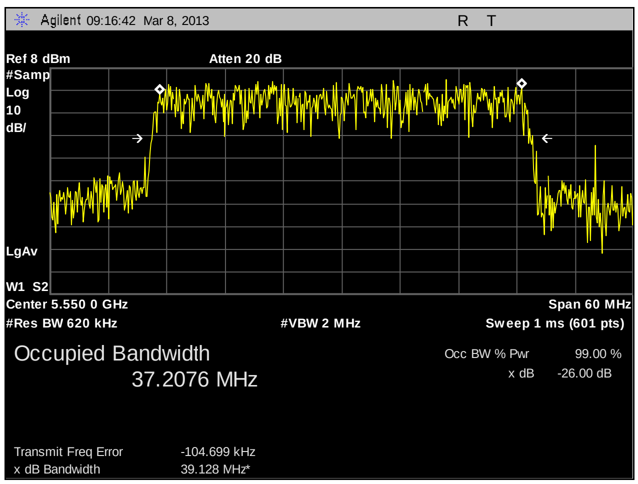
Plot 75. Occupied Bandwidth, 5510 MHz, 40 MHz, Port 2, 99%



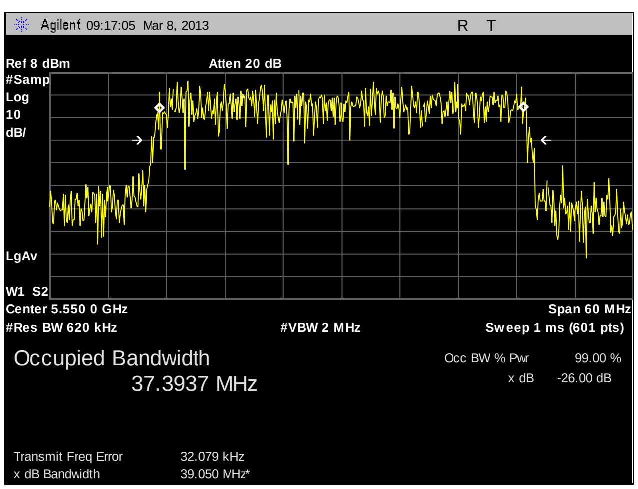
Plot 76. Occupied Bandwidth, 5510 MHz, 40 MHz, Port 3, 99%



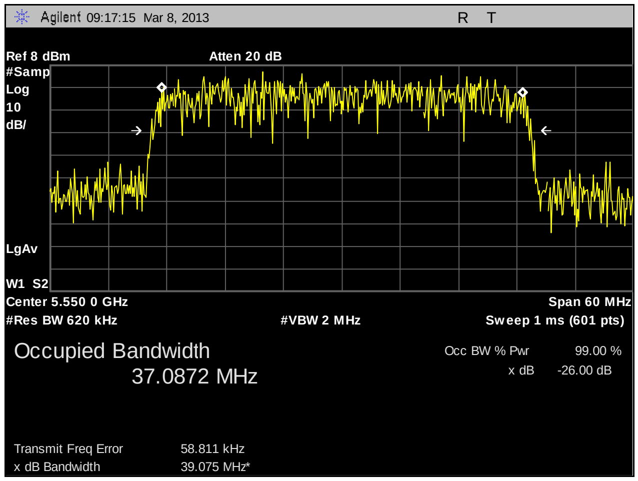
Plot 77. Occupied Bandwidth, 5510 MHz, 40 MHz, Port 4, 99%



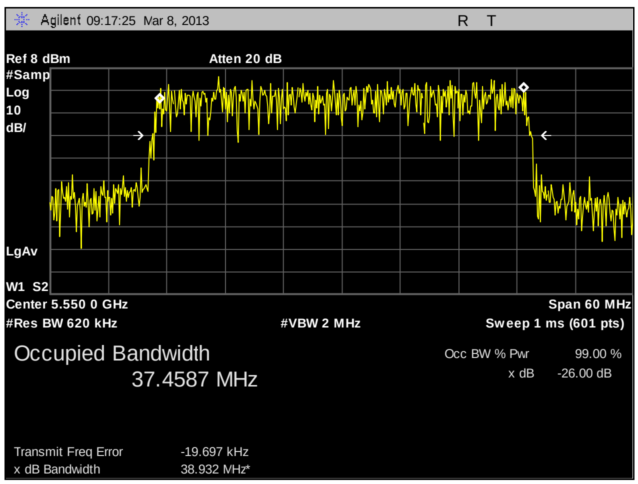
Plot 78. Occupied Bandwidth, 5550 MHz, 40 MHz, Port 1, 99%



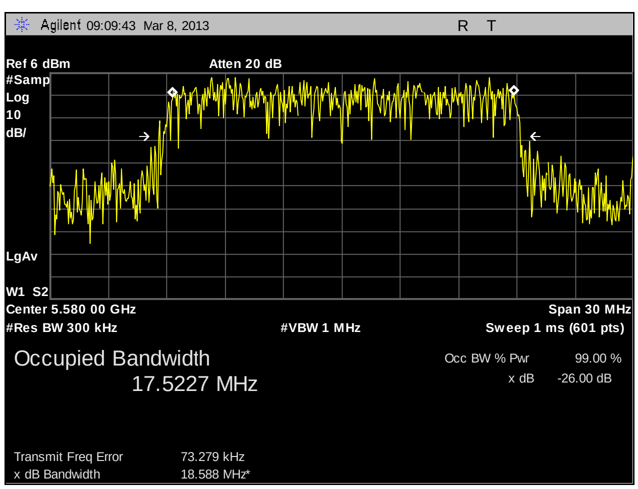
Plot 79. Occupied Bandwidth, 5550 MHz, 40 MHz, Port 2, 99%



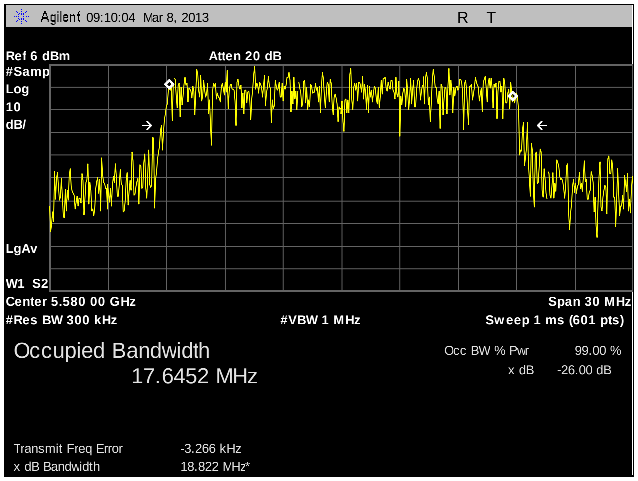
Plot 80. Occupied Bandwidth, 5550 MHz, 40 MHz, Port 3, 99%



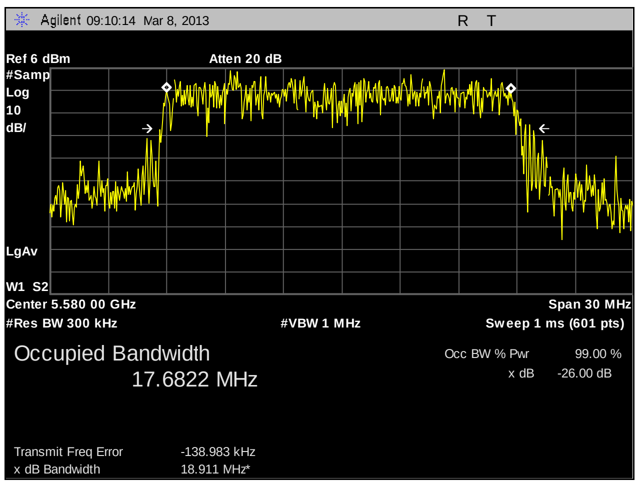
Plot 81. Occupied Bandwidth, 5550 MHz, 40 MHz, Port 4, 99%



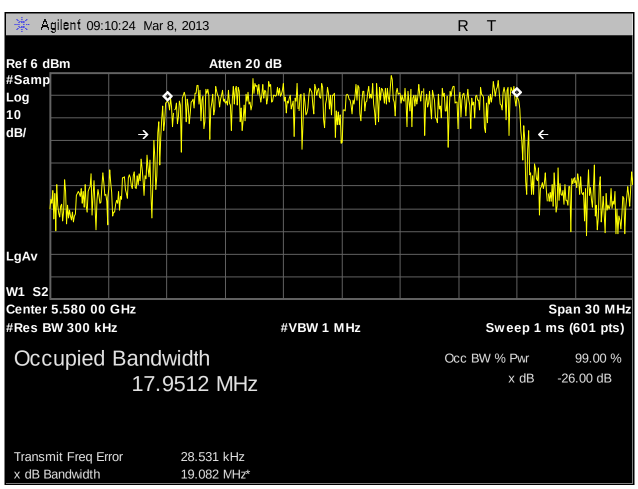
Plot 82. Occupied Bandwidth, 5580 MHz, 20 MHz, Port 1, 99%



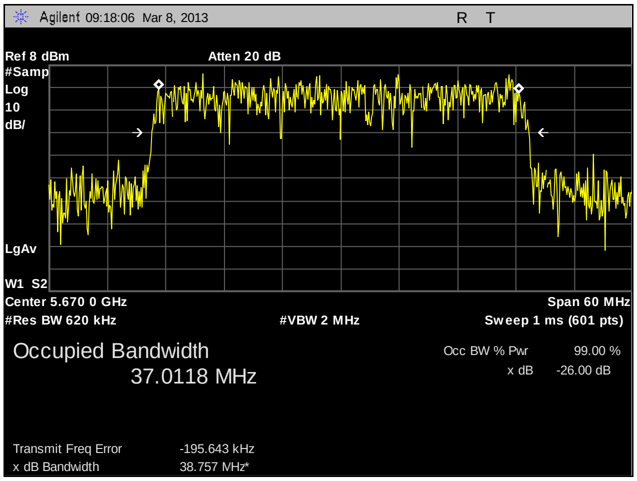
Plot 83. Occupied Bandwidth, 5580 MHz, 20 MHz, Port 2, 99%



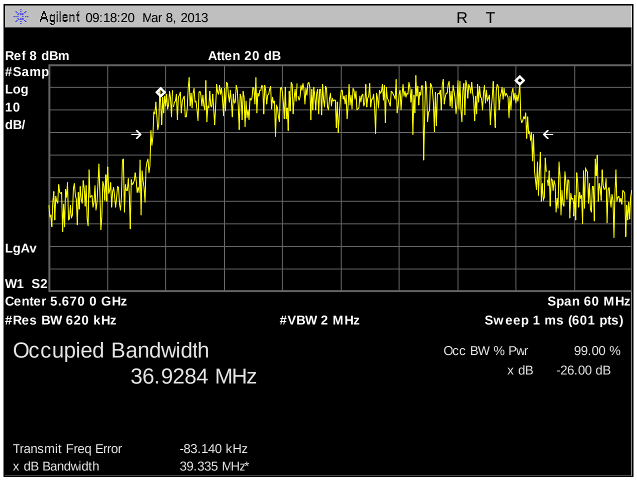
Plot 84. Occupied Bandwidth, 5580 MHz, 20 MHz, Port 3, 99%



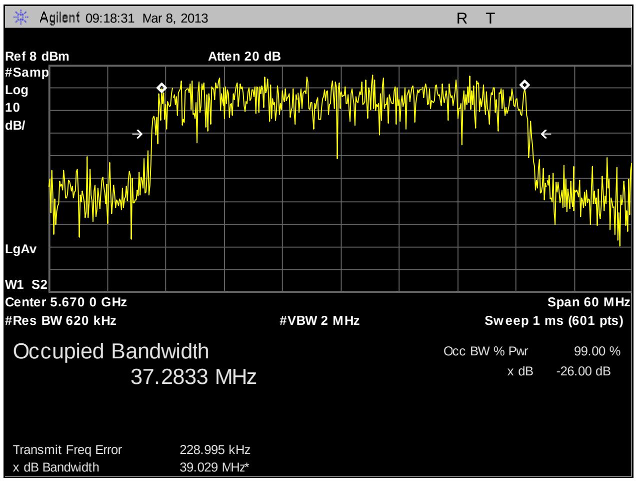
Plot 85. Occupied Bandwidth, 5580 MHz, 20 MHz, Port 4, 99%



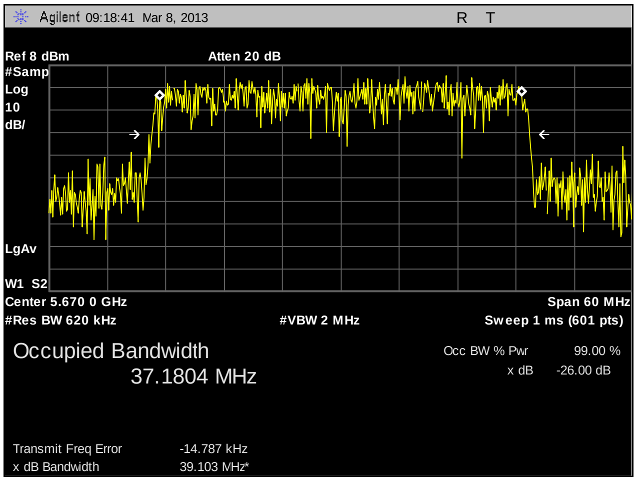
Plot 86. Occupied Bandwidth, 5670 MHz, 40 MHz, Port 1, 99%



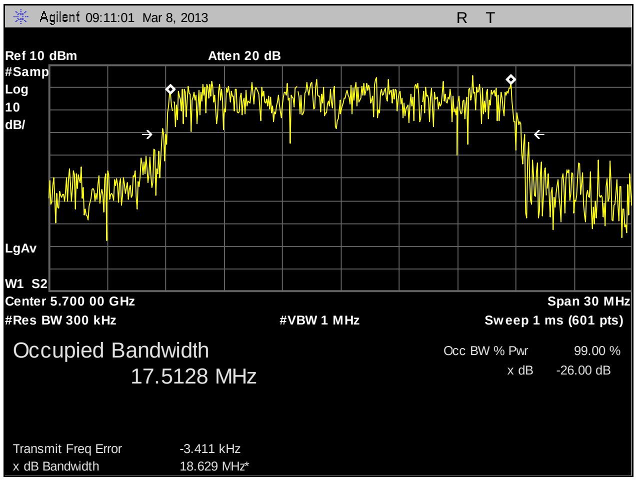
Plot 87. Occupied Bandwidth, 5670 MHz, 40 MHz, Port 2, 99%



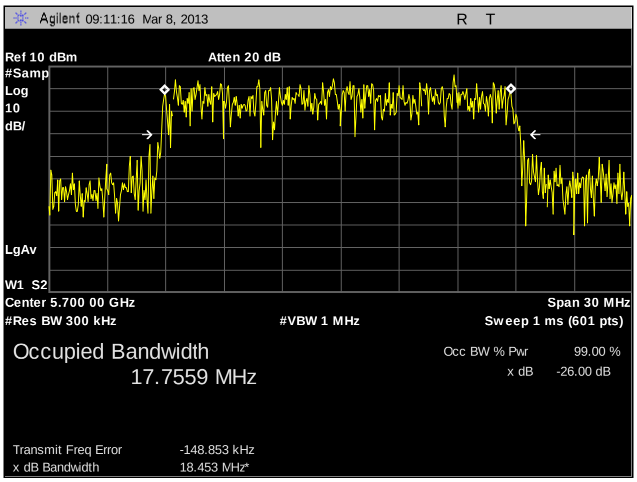
Plot 88. Occupied Bandwidth, 5670 MHz, 40 MHz, Port 3, 99%



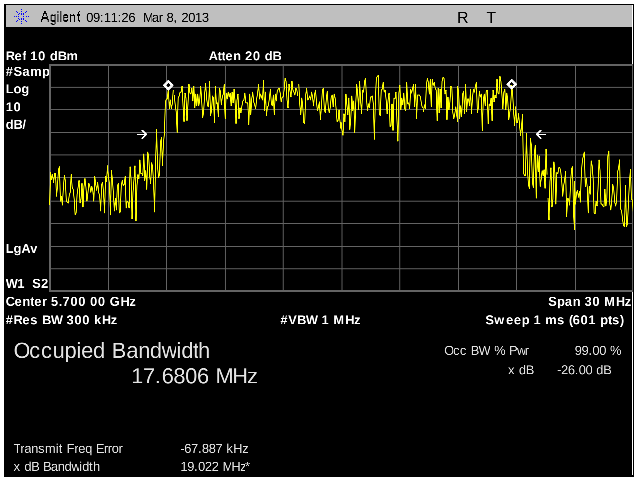
Plot 89. Occupied Bandwidth, 5670 MHz, 40 MHz, Port 4, 99%



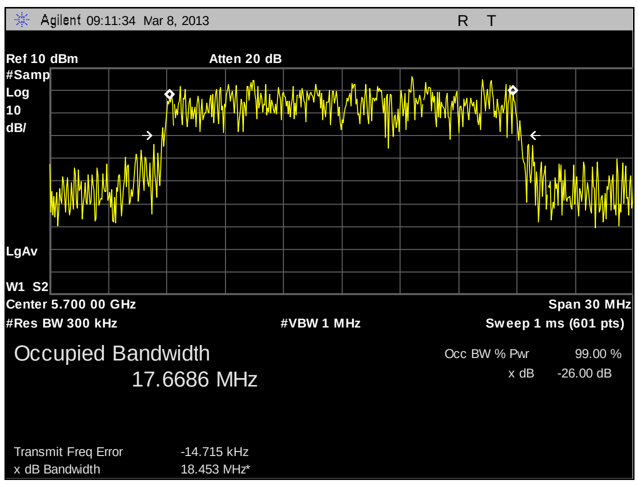
Plot 90. Occupied Bandwidth, 5700 MHz, 20 MHz, Port 1, 99%



Plot 91. Occupied Bandwidth, 5700 MHz, 20 MHz, Port 2, 99%



Plot 92. Occupied Bandwidth, 5700 MHz, 20 MHz, Port 3, 99%



Plot 93. Occupied Bandwidth, 5700 MHz, 20 MHz, Port 4, 99%

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(2) RF Power Output

Test Requirements: **§15.407(a)(2):** The maximum output power of the intentional radiator shall not exceed the following:

§15.407(a) (2): For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26 dB emission bandwidth in megahertz.

Test Procedure: The EUT was connected to a Spectrum Analyzer. The power was measured on low, mid (where applicable), and high channels.

Test Results: Equipment was compliant with the Peak Power Output limits of **§ 15.401(a)(2)**.

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)
5260	20 MHz	15.13	15.02	16.55	17.30	22.13	5.00	23.98	-1.85
5300	20 MHz	15.22	14.30	14.59	15.63	20.99	5.00	23.98	-2.99
5320	20 MHz	14.47	14.38	14.08	14.70	20.43	5.00	23.98	-3.55
5500	20 MHz	14.53	14.7	15.02	14.17	20.64	5.00	23.98	-3.34
5580	20 MHz	15.7	16.13	17.29	15.86	22.31	5.00	23.98	-1.67
5700	20 MHz	15.19	14.91	14.69	14.93	20.95	5.00	23.98	-3.03
5270	40 MHz	14.81	14.66	15.15	16.44	21.34	5.00	23.98	-2.63
5310	40 MHz	13.67	13.2	13.83	14.6	19.88	5.00	23.98	-4.10
5510	40 MHz	13.51	14.17	13.79	12.54	19.56	5.00	23.98	-4.42
5550	40MHz	16.49	16.43	16.82	16.12	22.49	5.00	23.98	-1.49
5670	40 MHz	15.55	14.81	15.61	15.72	21.46	5.00	23.98	-2.52

Table 15. RF Power Output, Test Results

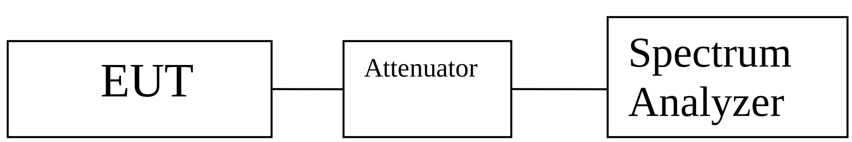
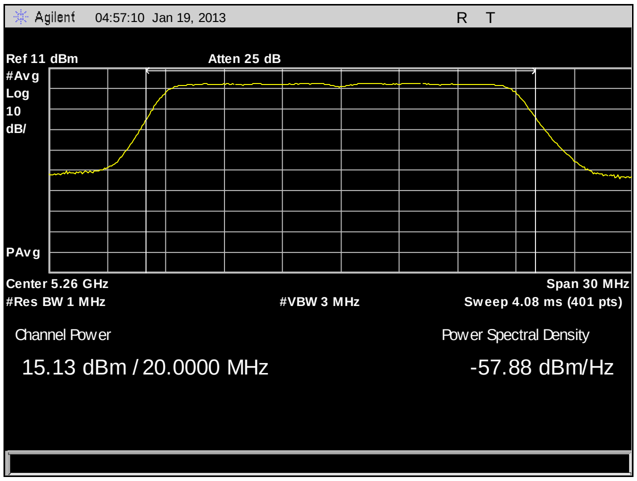
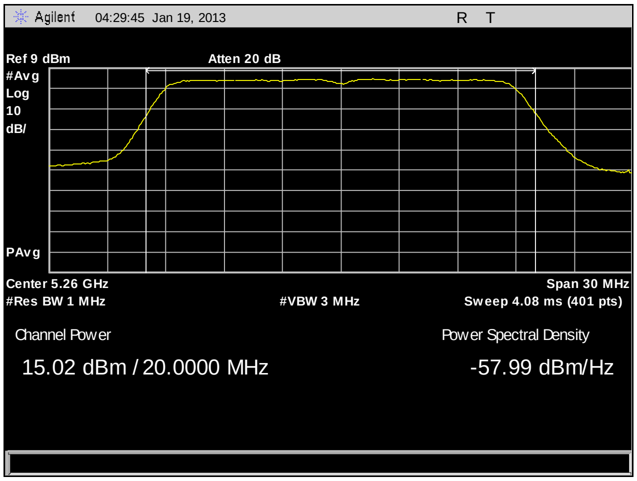


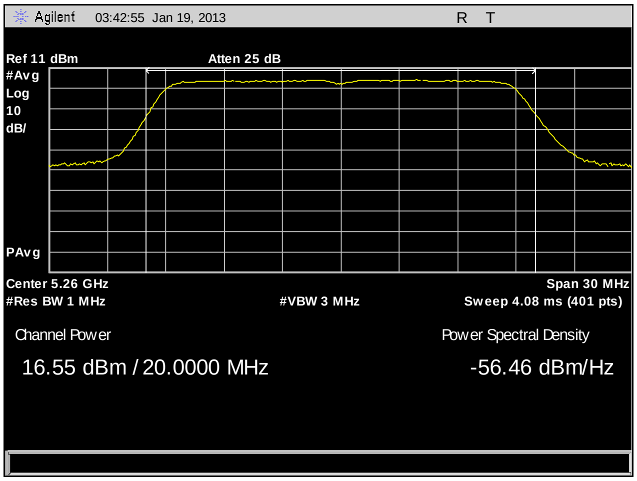
Figure 3. Power Output Test Setup



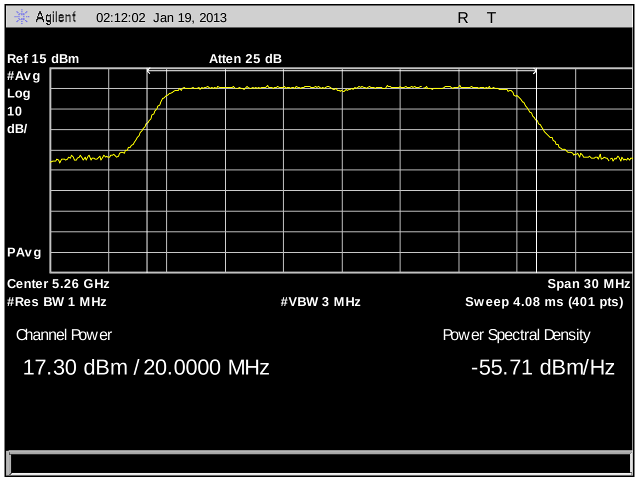
Plot 94. RF Power Output, 5260 MHz, Port 1



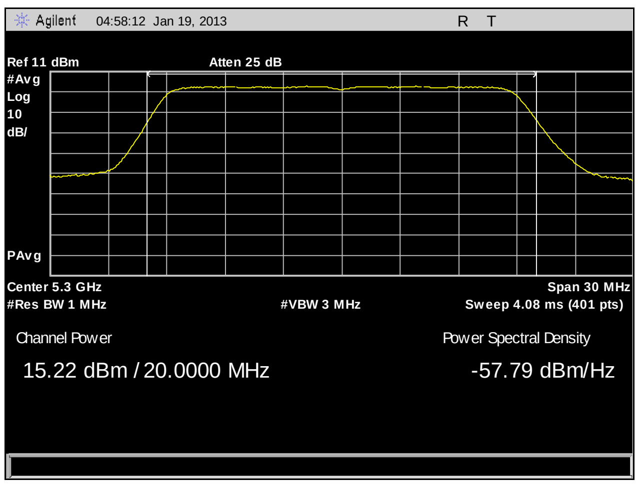
Plot 95. RF Power Output, 5260 MHz, Port 2



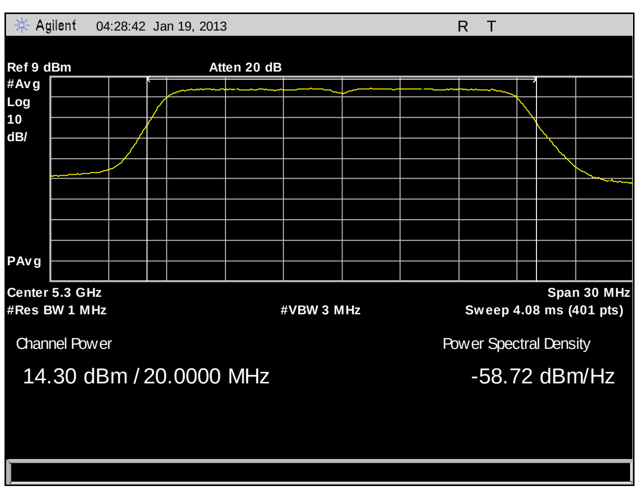
Plot 96. RF Power Output, 5260 MHz, Port 3



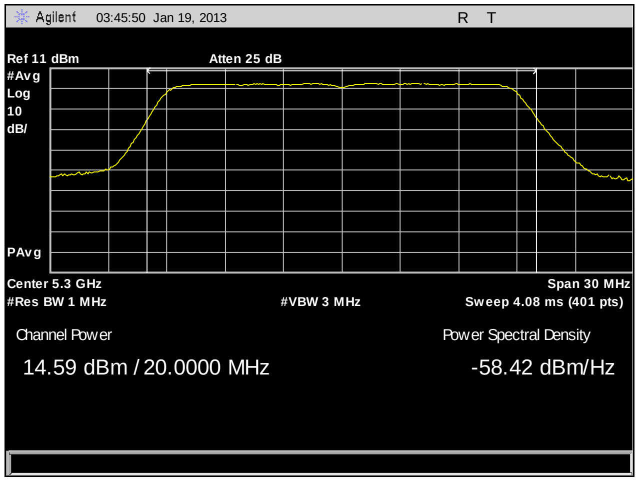
Plot 97. RF Power Output, 5260 MHz, Port 4



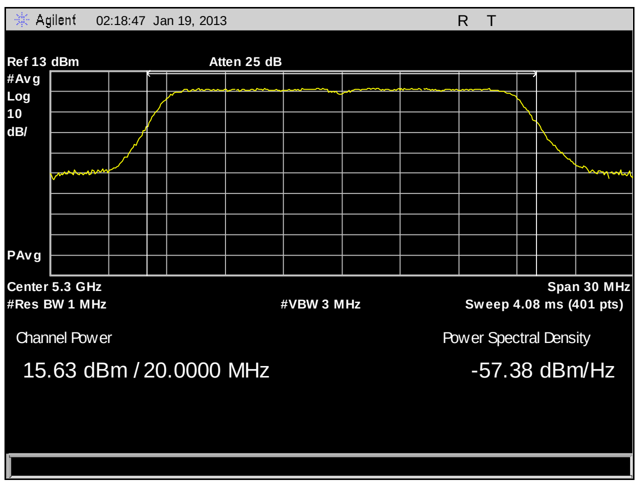
Plot 98. RF Power Output, 5300 MHz, Port 1



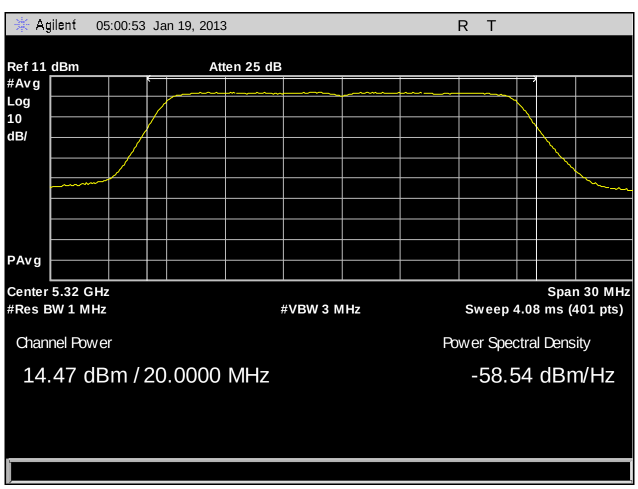
Plot 99. RF Power Output, 5300 MHz, Port 2



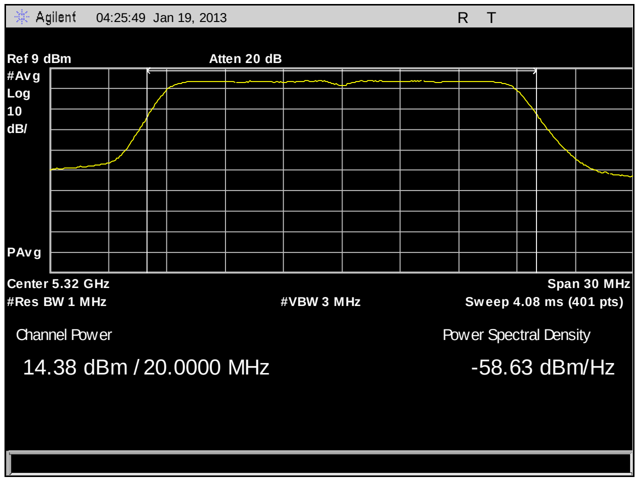
Plot 100. RF Power Output, 5300 MHz, Port 3



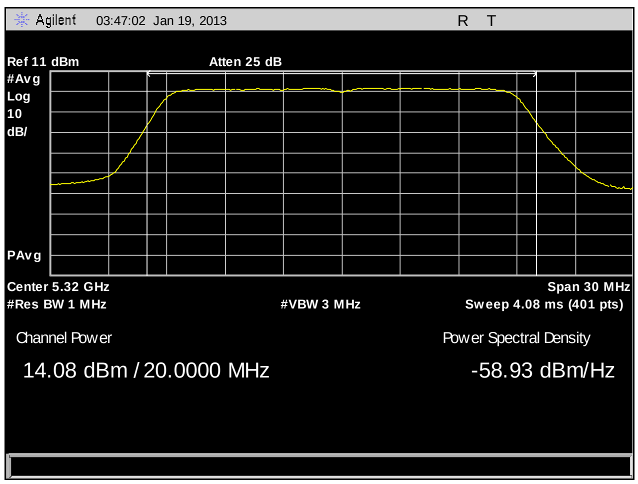
Plot 101. RF Power Output, 5300 MHz, Port 4



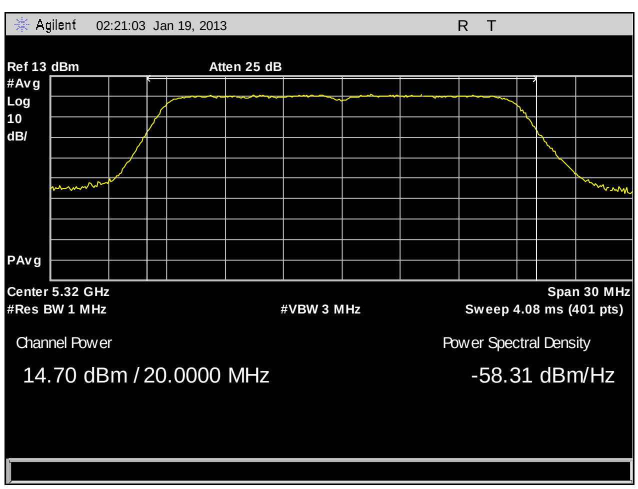
Plot 102. RF Power Output, 5320 MHz, Port 1



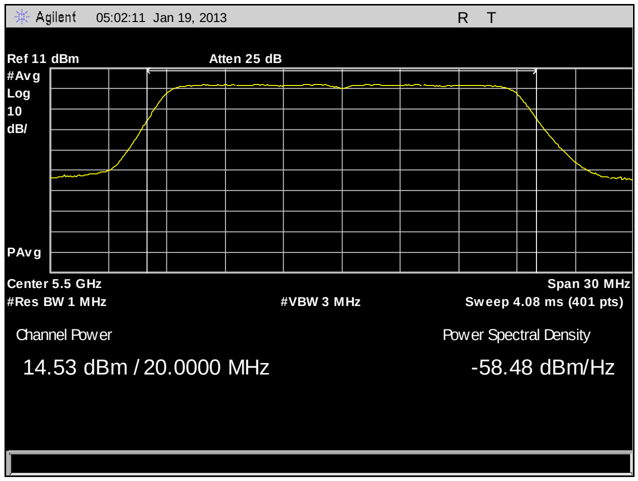
Plot 103. RF Power Output, 5320 MHz, Port 2



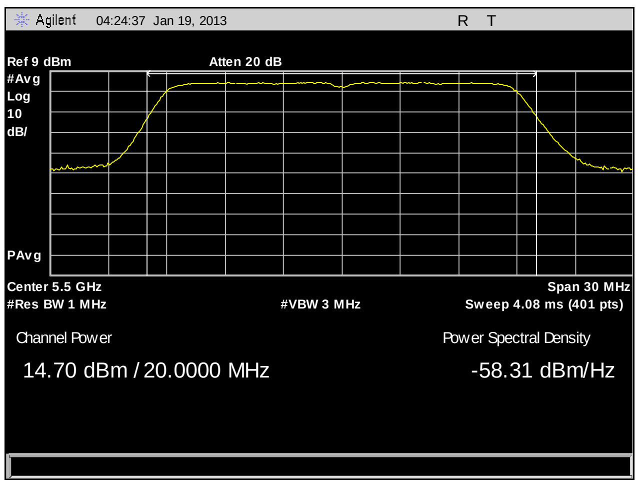
Plot 104. RF Power Output, 5320 MHz, Port 3



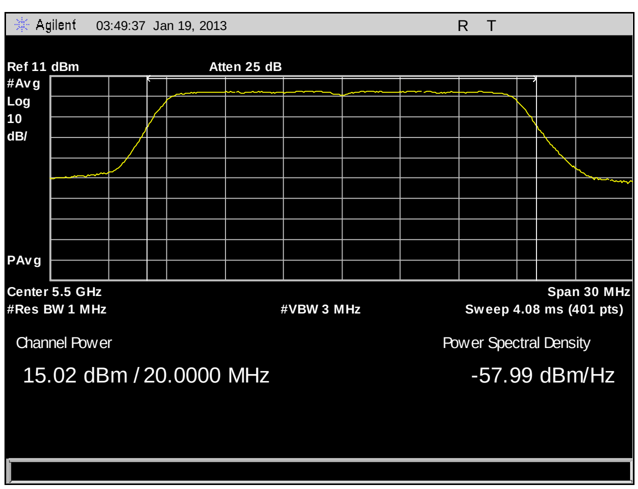
Plot 105. RF Power Output, 5320 MHz, Port 4



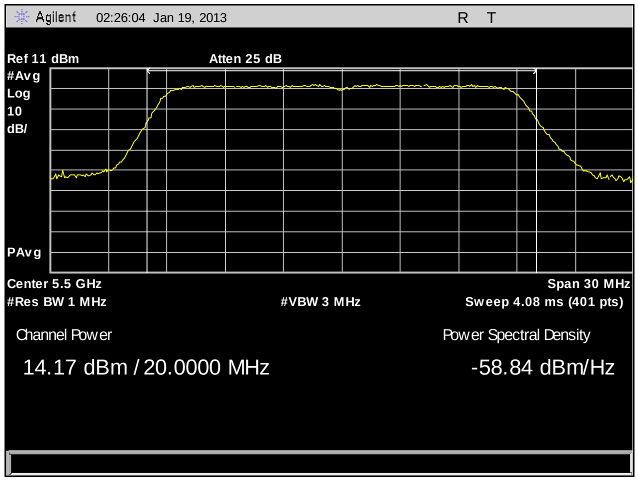
Plot 106. RF Power Output, 5500 MHz, Port 1



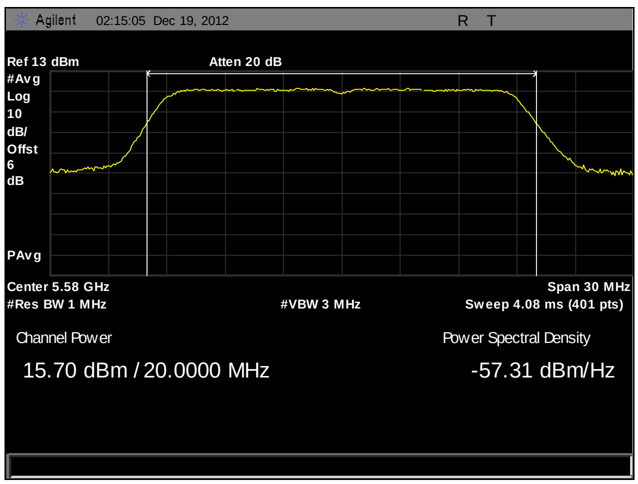
Plot 107. RF Power Output, 5500 MHz, Port 2



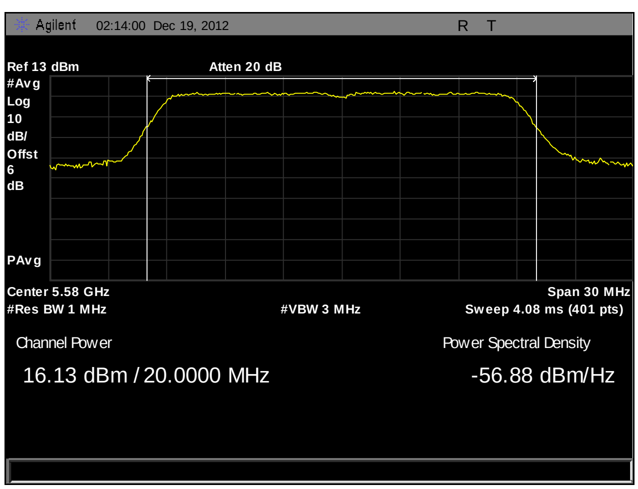
Plot 108. RF Power Output, 5500 MHz, Port 3



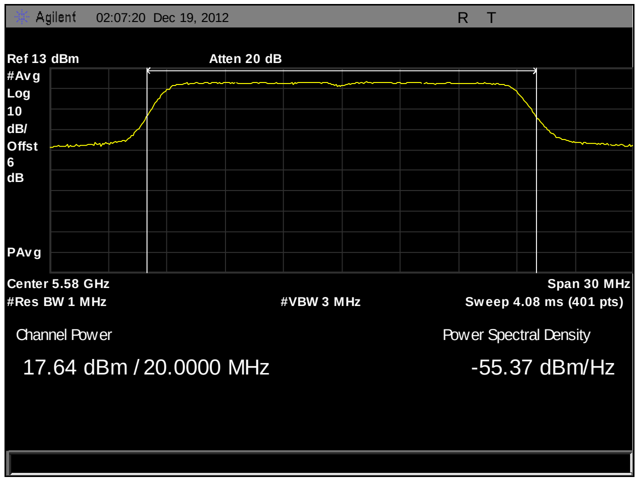
Plot 109. RF Power Output, 5500 MHz, Port 4



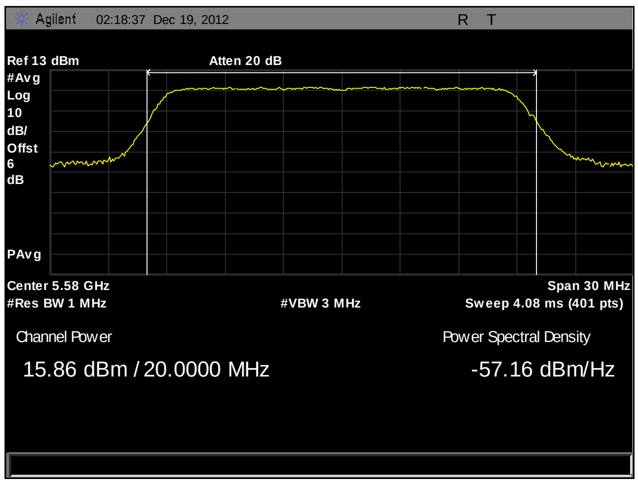
Plot 110. RF Power Output, 5580 MHz, 20 MHz, Port 1



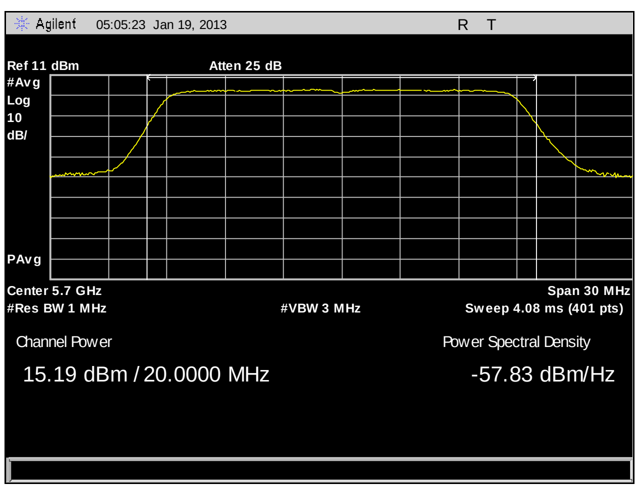
Plot 111. RF Power Output, 5580 MHz, 20 MHz, Port 2



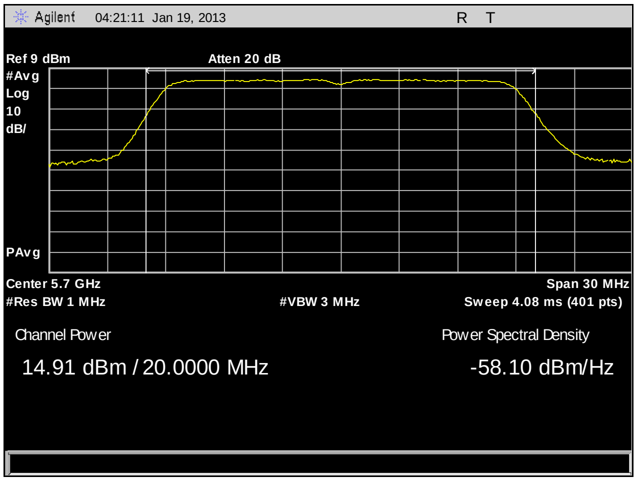
Plot 112. RF Power Output, 5580 MHz, 20 MHz, Port 3



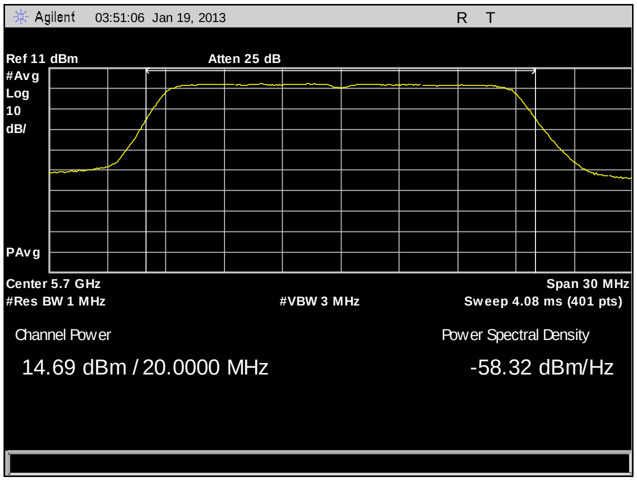
Plot 113. RF Power Output, 5580 MHz, 20 MHz, Port 4



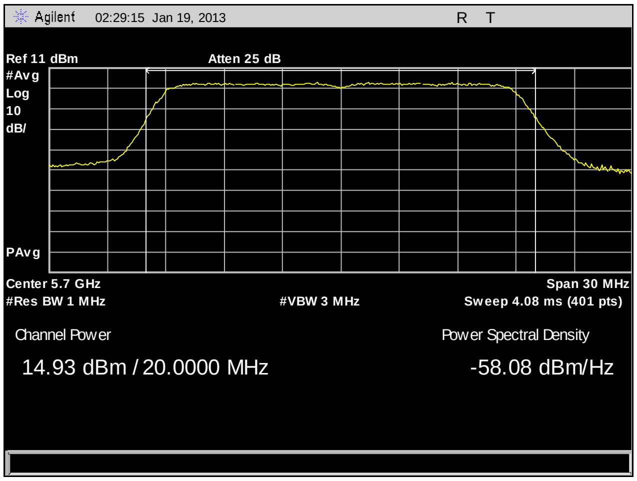
Plot 114. RF Power Output, 5700 MHz, Port 1



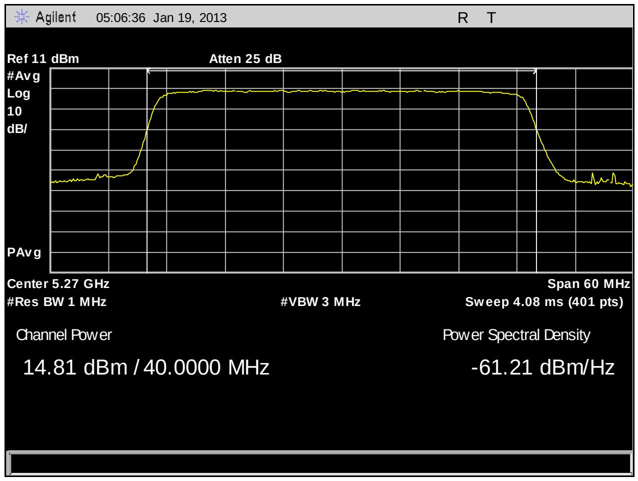
Plot 115. RF Power Output, 5700 MHz, Port 2



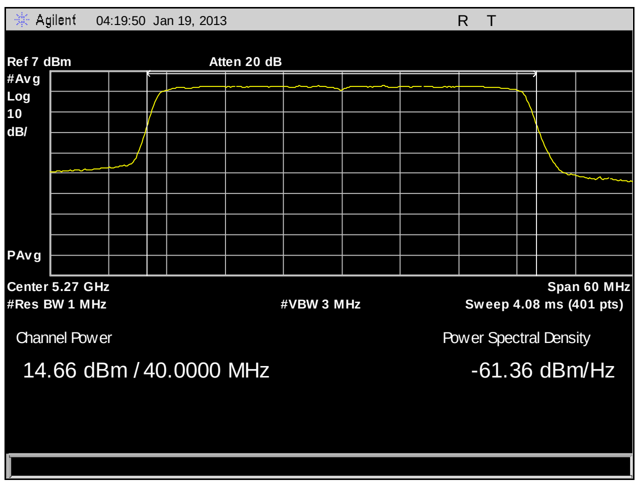
Plot 116. RF Power Output, 5700 MHz, Port 3



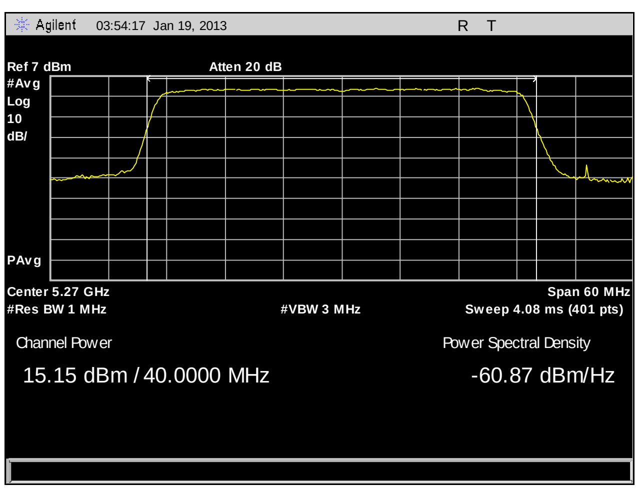
Plot 117. RF Power Output, 5700 MHz, Port 4



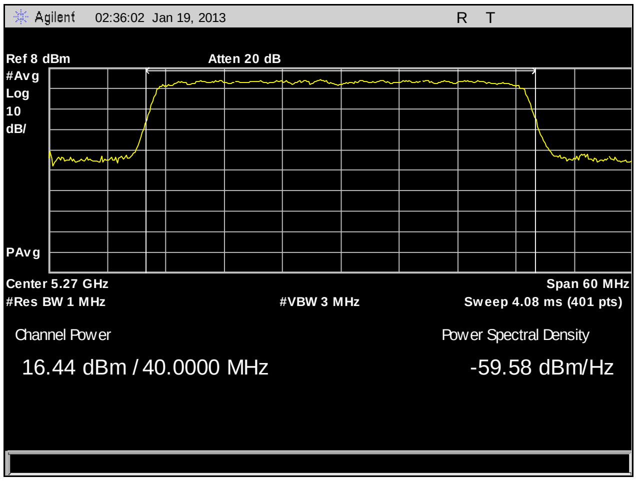
Plot 118. RF Power Output, 5270 MHz, Port 1



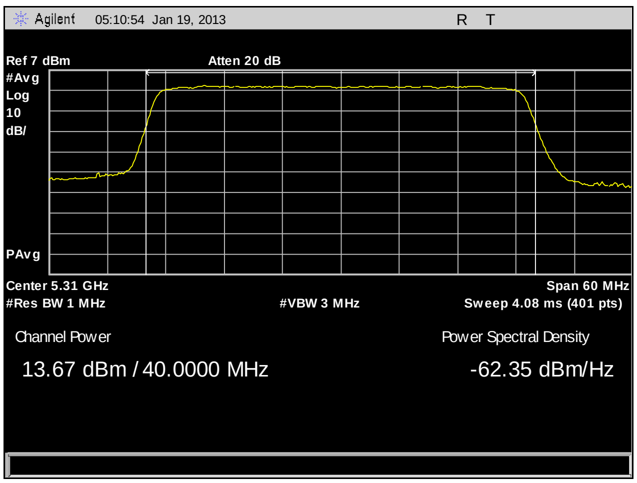
Plot 119. RF Power Output, 5270 MHz, Port 2



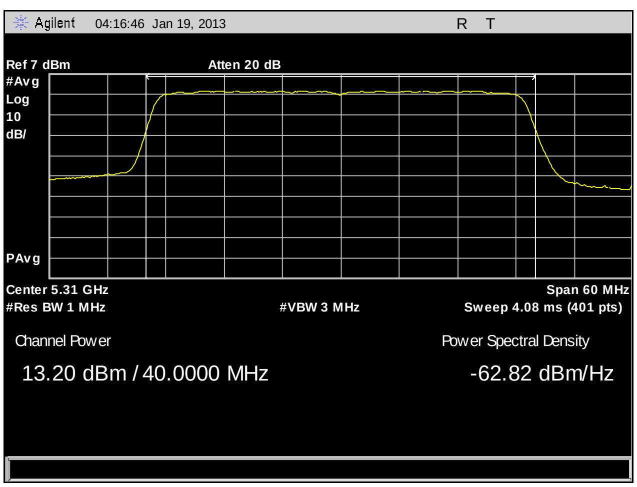
Plot 120. RF Power Output, 5270 MHz, Port 3



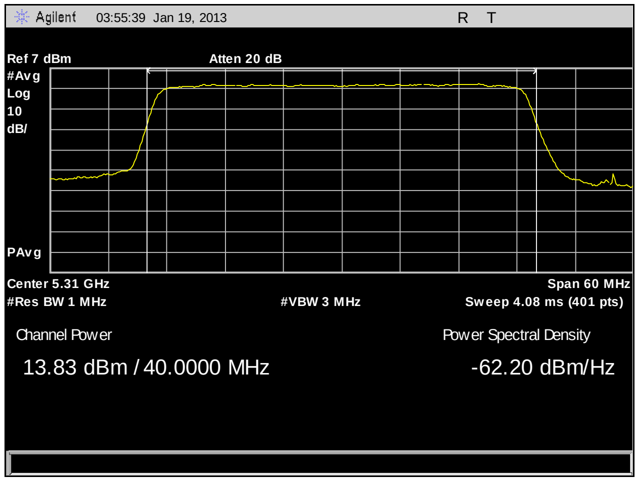
Plot 121. RF Power Output, 5270 MHz, Port 4



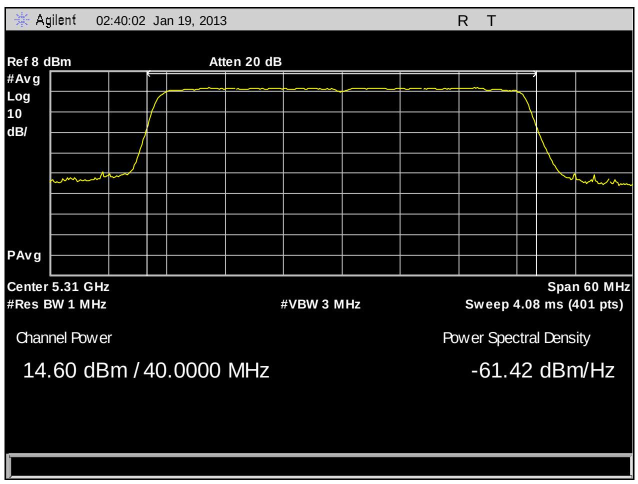
Plot 122. RF Power Output, 5310 MHz, Port 1



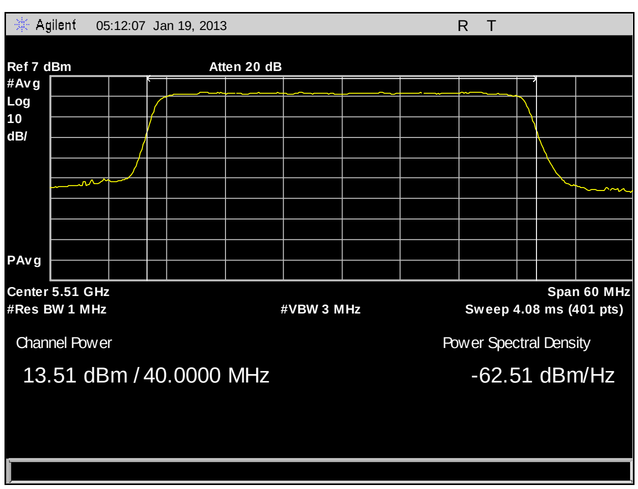
Plot 123. RF Power Output, 5310 MHz, Port 2



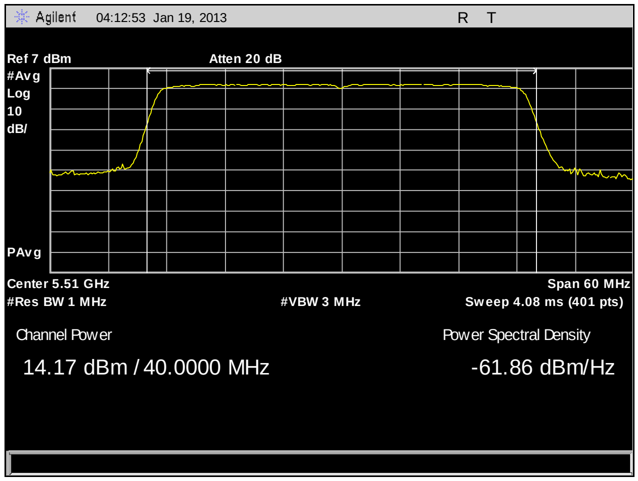
Plot 124. RF Power Output, 5310 MHz, Port 3



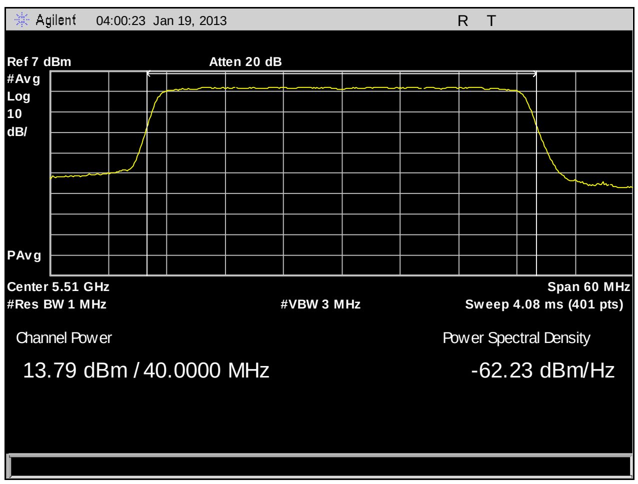
Plot 125. RF Power Output, 5310 MHz, Port 4



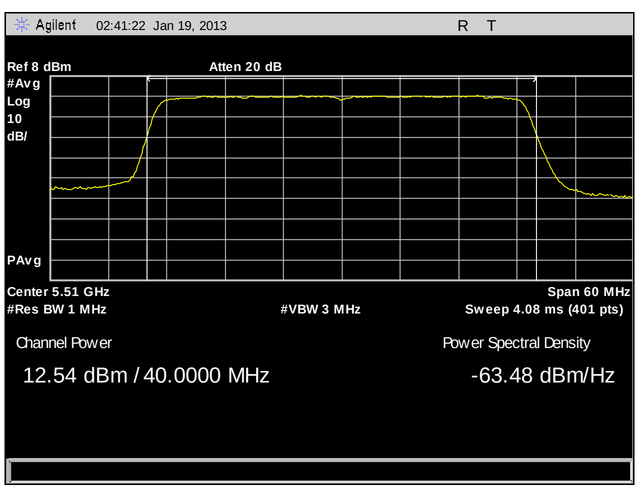
Plot 126. RF Power Output, 5510 MHz, Port 1



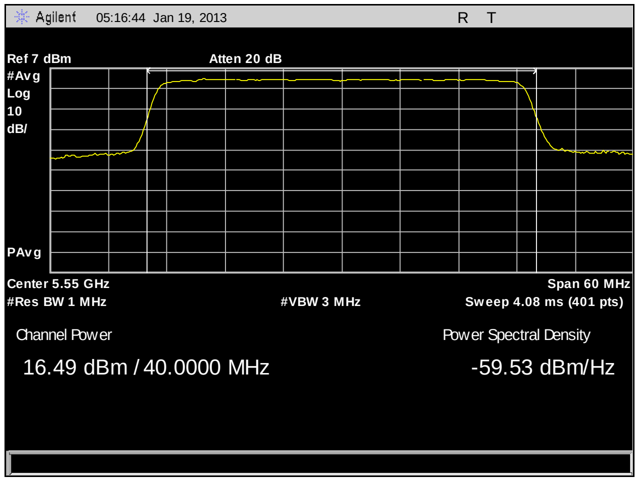
Plot 127. RF Power Output, 5510 MHz, Port 2



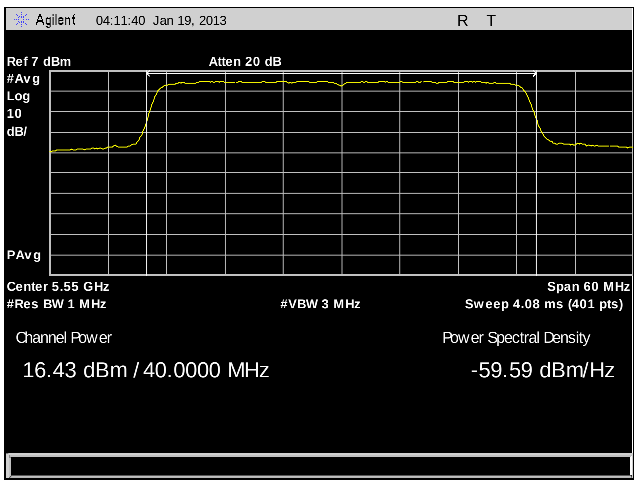
Plot 128. RF Power Output, 5510 MHz, Port 3



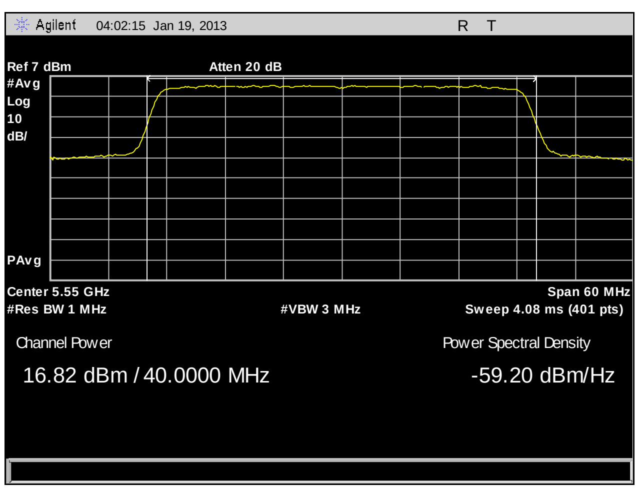
Plot 129. RF Power Output, 5510 MHz, Port 4



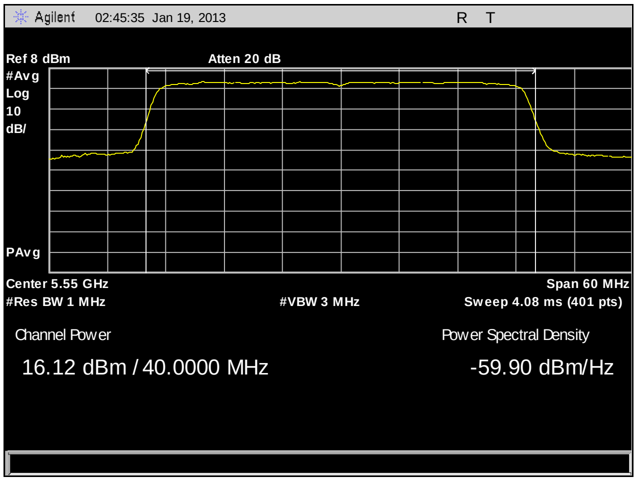
Plot 130. RF Power Output, 5550 MHz, Port 1



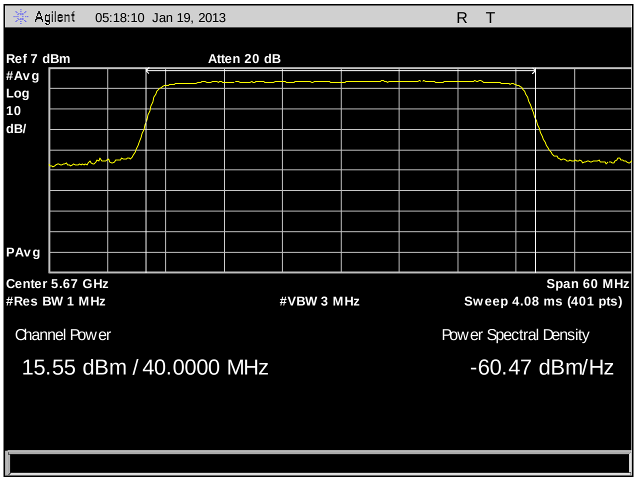
Plot 131. RF Power Output, 5550 MHz, Port 2



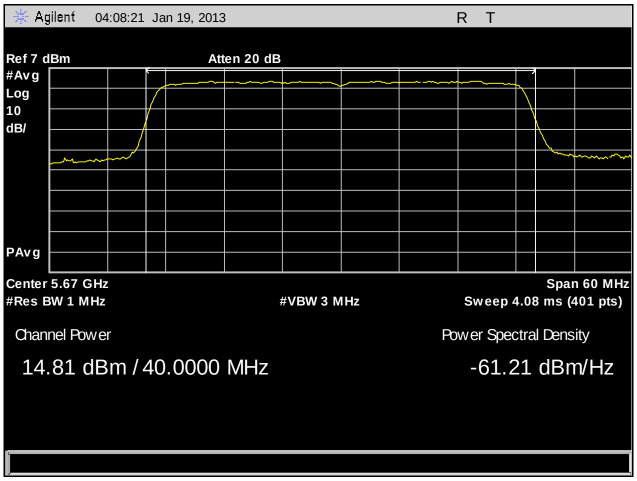
Plot 132. RF Power Output, 5550 MHz, Port 3



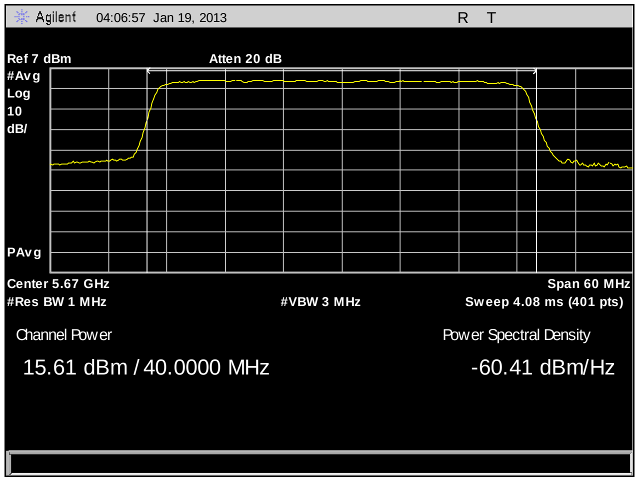
Plot 133. RF Power Output, 5550 MHz, Port 4



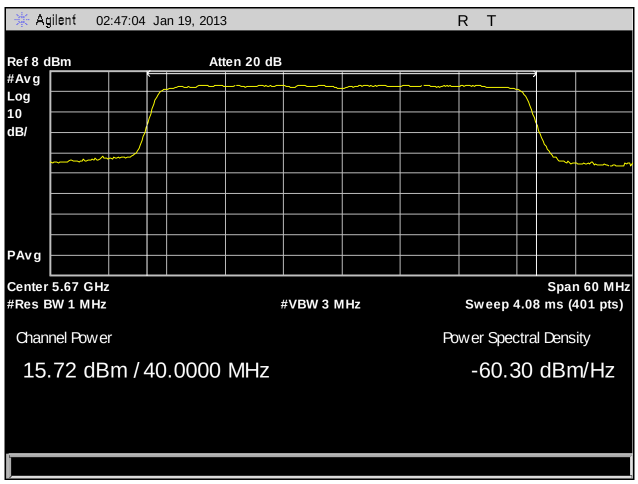
Plot 134. RF Power Output, 5670 MHz, Port 1



Plot 135. RF Power Output, 5670 MHz, Port 2



Plot 136. RF Power Output, 5670 MHz, Port 3



Plot 137. RF Power Output, 5670 MHz, Port 4

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(2) Peak Power Spectral Density

Test Requirements: **§ 15.407(a)(2):** In addition, the peak power spectral density shall not exceed 11 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)(2).** 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)	Tx Power Setting
5260	20 MHz	3.52	3.32	4.98	5.37	10.41	5.00	11.00	-0.59	16.5
5300	20 MHz	3.65	3.14	3.53	4.45	9.74	5.00	11.00	-1.26	16
5320	20 MHz	2.94	2.76	2.69	3.41	8.98	5.00	11.00	-2.02	15
5500	20 MHz	2.94	3.37	3.54	2.59	9.15	5.00	11.00	-1.85	16
5580	20 MHz	4.29	4.69	5.78	4.28	10.82	5.00	11.00	-0.18	17
5700	20 MHz	4.02	3.27	3.23	3.41	9.51	5.00	11.00	-1.49	14.5
5270	40 MHz	-0.08	-0.21	0.73	1.55	6.57	5.00	11.00	-4.43	16.5
5310	40 MHz	-1.88	-1.46	-0.81	-0.25	4.97	5.00	11.00	-6.03	15
5510	40 MHz	-0.866	-0.899	-0.831	-1.764	4.95	5.00	11.00	-6.05	15
5550	40 MHz	1.805	1.899	2.086	1.197	7.78	5.00	12.00	-4.22	18
5670	40 MHz	0.649	0.514	1.056	0.754	6.77	5.00	11.00	-4.23	16

Table 16. Power Spectral Density, Test Results

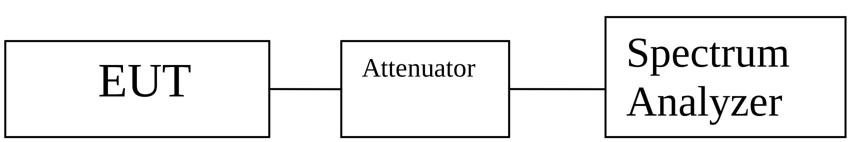
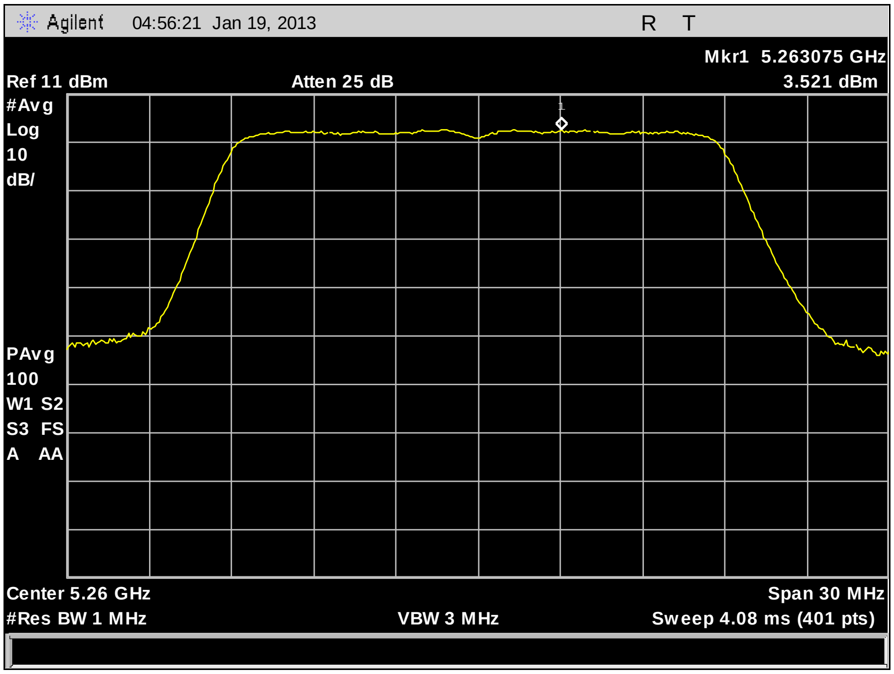
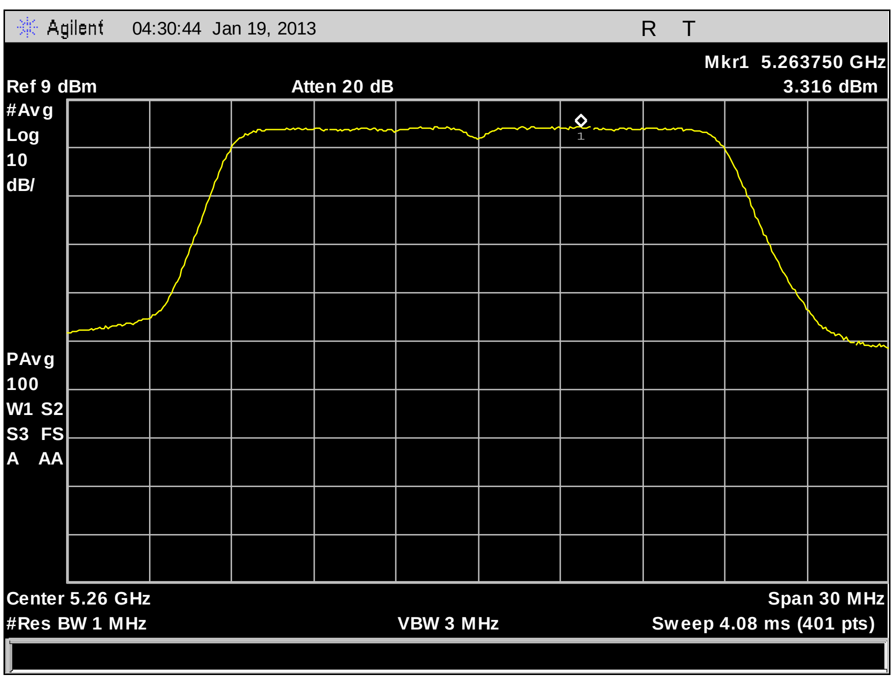


Figure 4. Power Spectral Density Test Setup

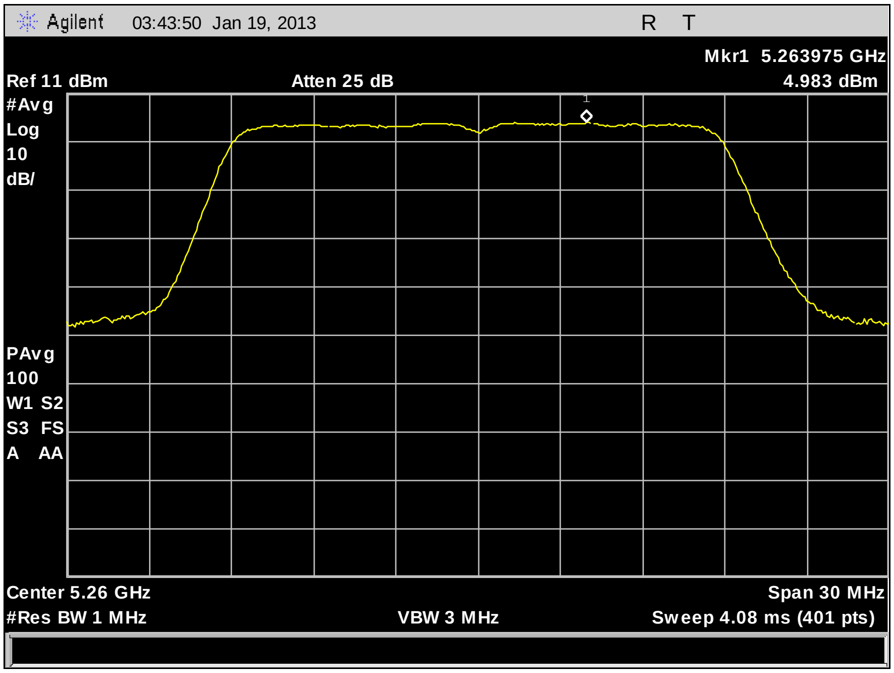
Electromagnetic Compatibility Criteria for Intentional Radiators



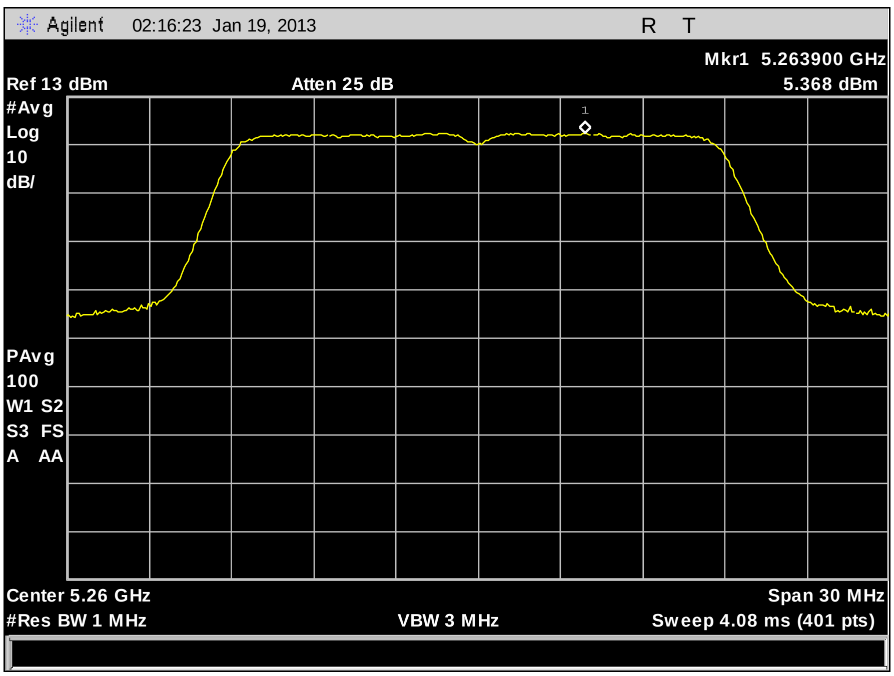
Plot 138. Power Spectral Density, 5260 MHz, Port 1



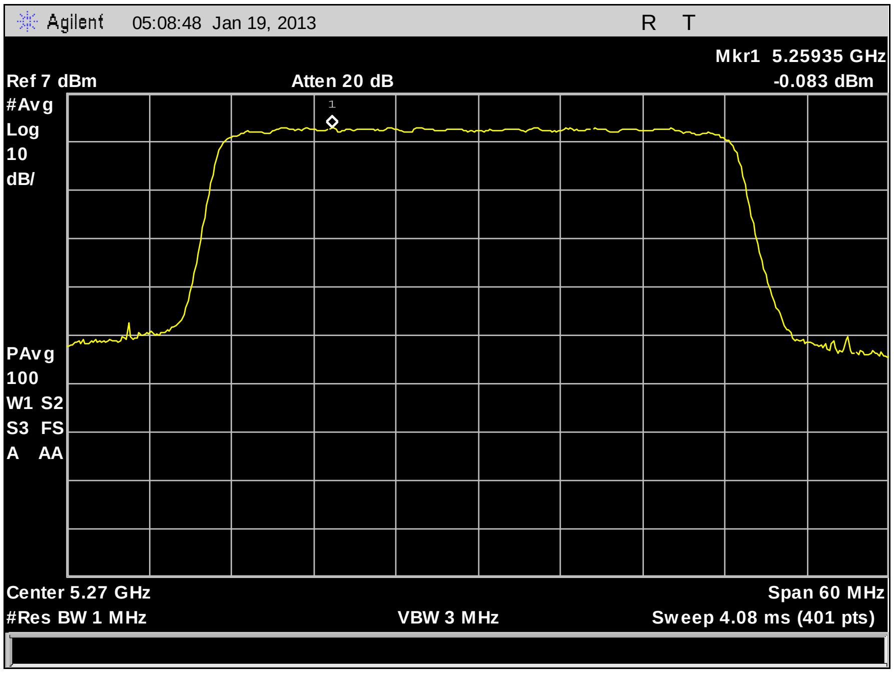
Plot 139. Power Spectral Density, 5260 MHz, Port 2



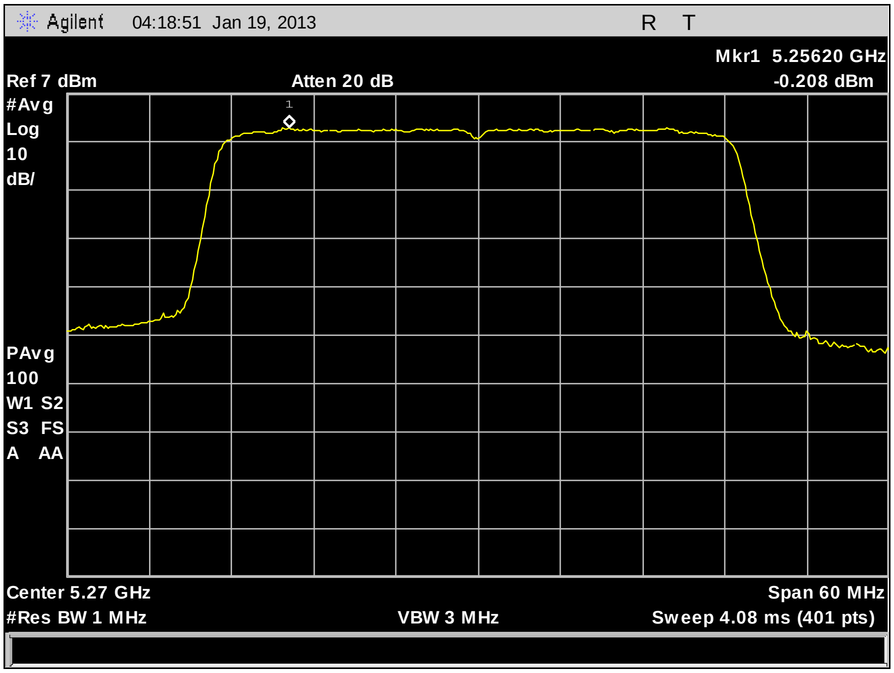
Plot 140. Power Spectral Density, 5260 MHz, Port 3



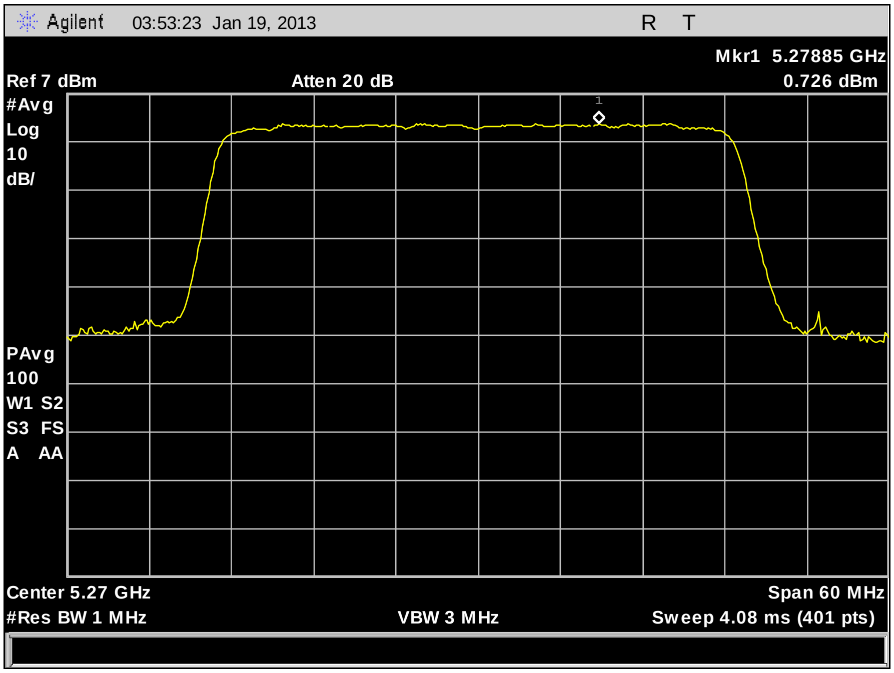
Plot 141. Power Spectral Density, 5260 MHz, Port 4



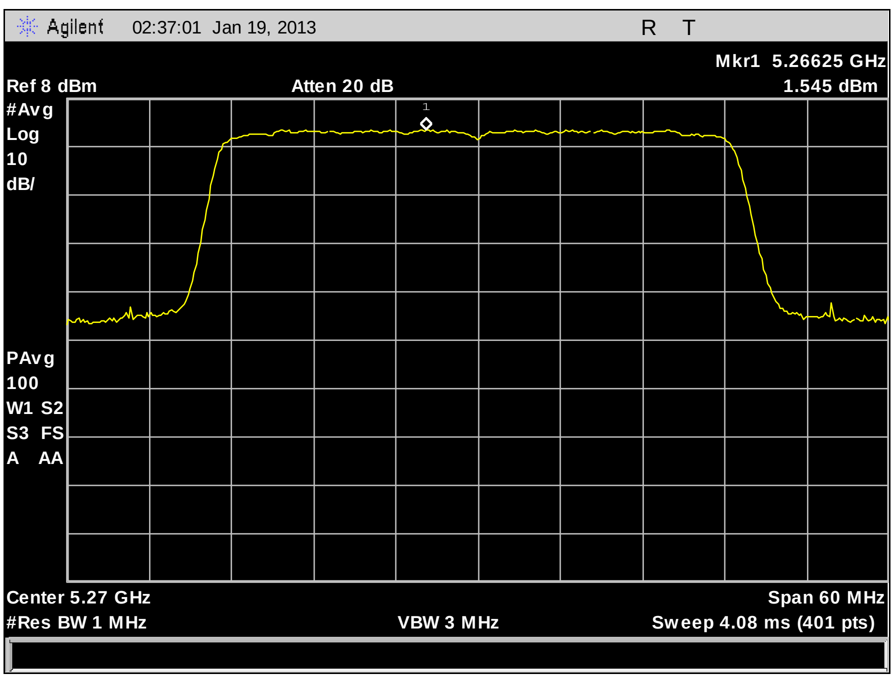
Plot 142. Power Spectral Density, 5270 MHz, Port 1



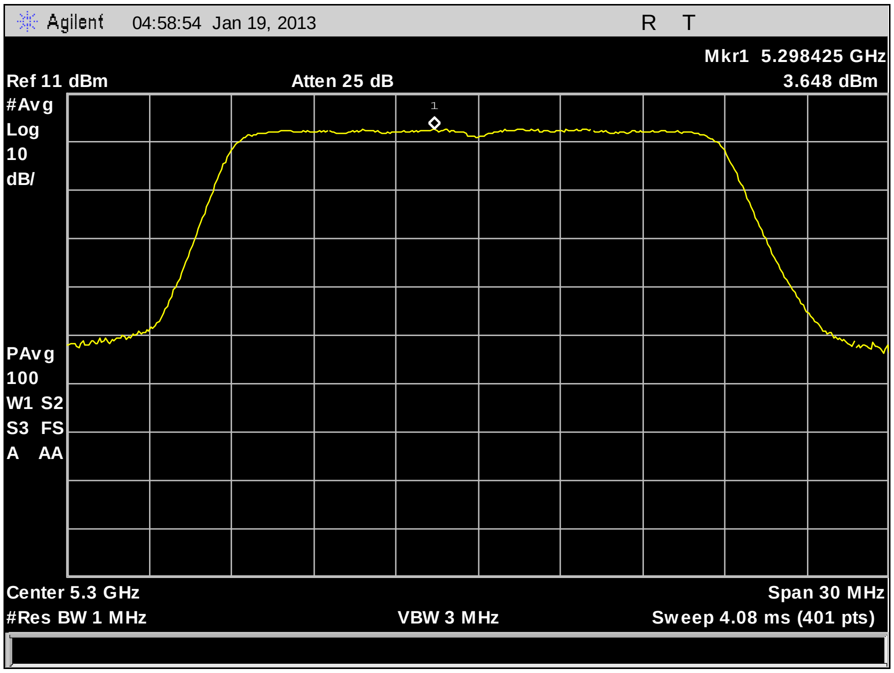
Plot 143. Power Spectral Density, 5270 MHz, Port 2



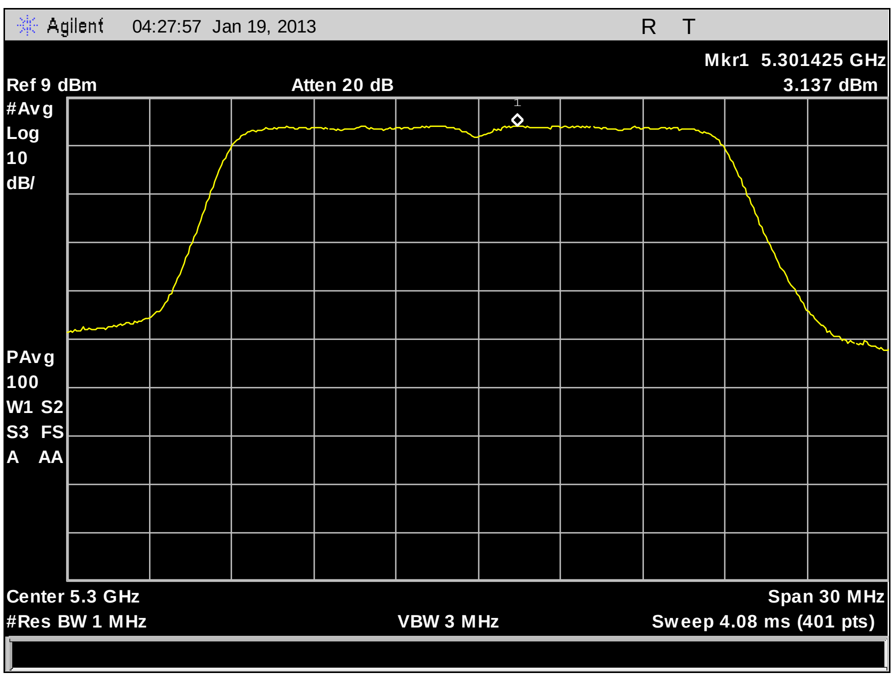
Plot 144. Power Spectral Density, 5270 MHz, Port 3



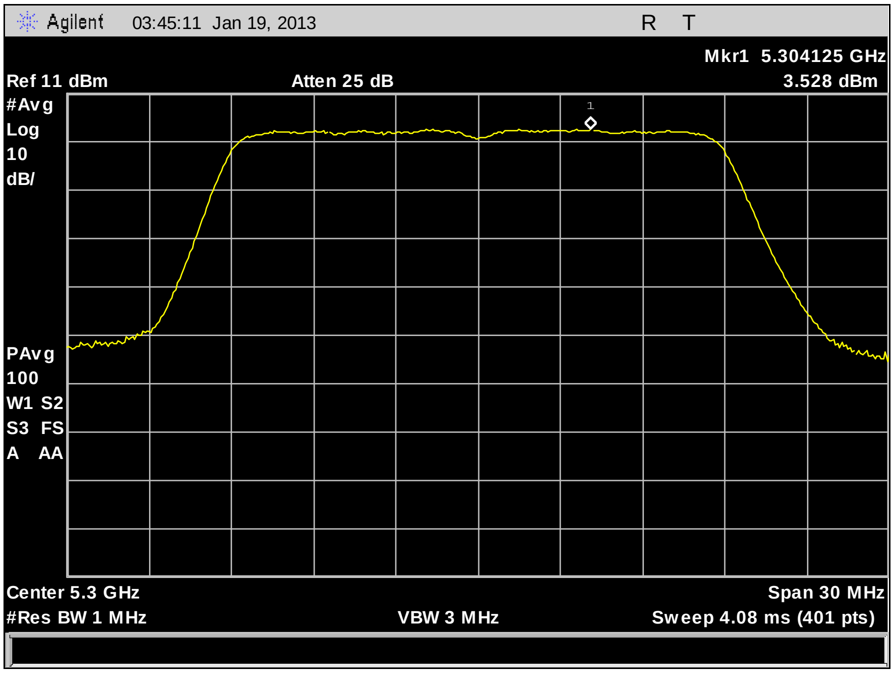
Plot 145. Power Spectral Density, 5270 MHz, Port 4



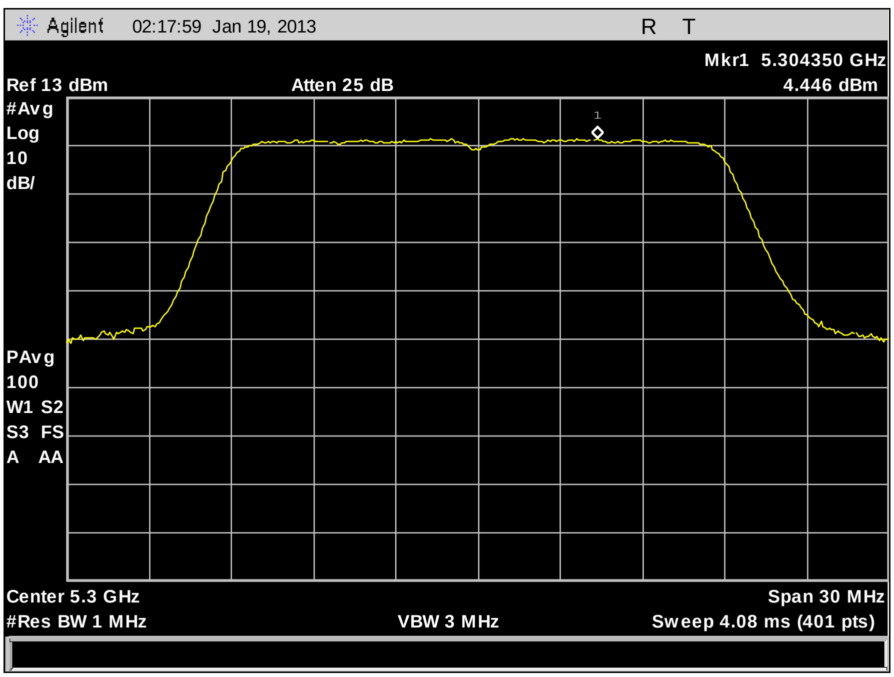
Plot 146. Power Spectral Density, 5300 MHz, Port 1



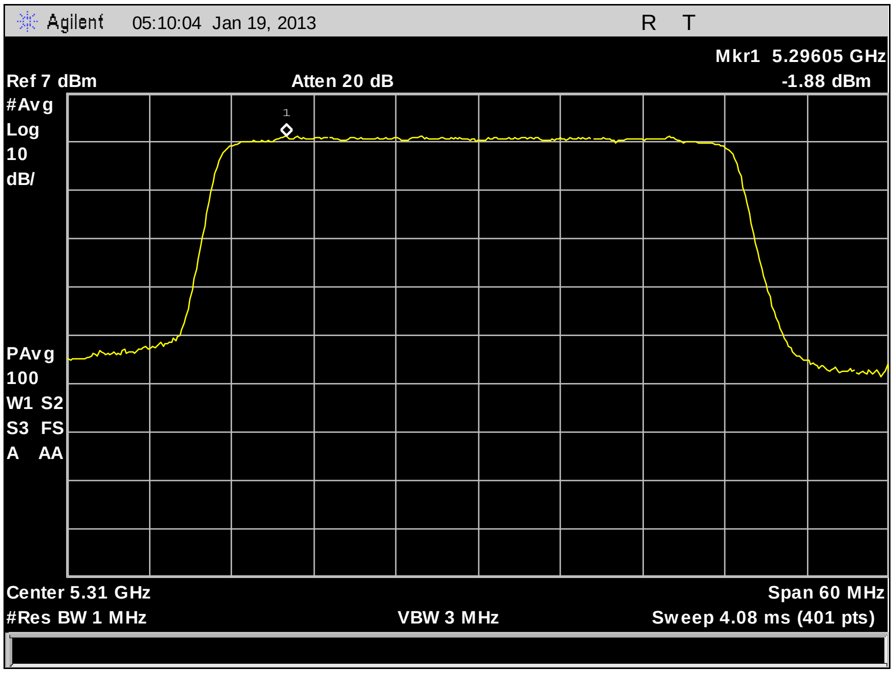
Plot 147. Power Spectral Density, 5300 MHz, Port 2



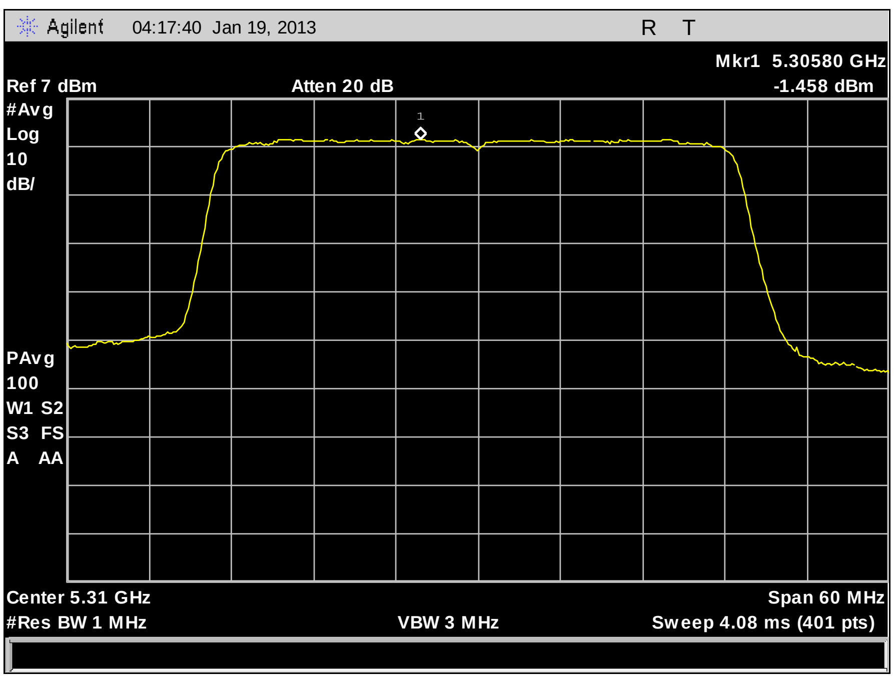
Plot 148. Power Spectral Density, 5300 MHz, Port 3



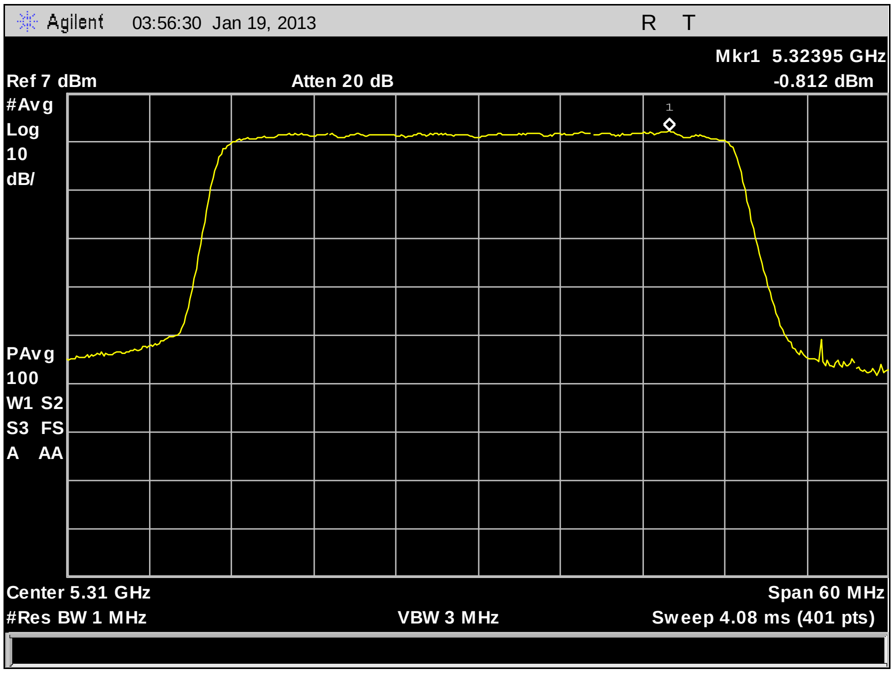
Plot 149. Power Spectral Density, 5300 MHz, Port 4



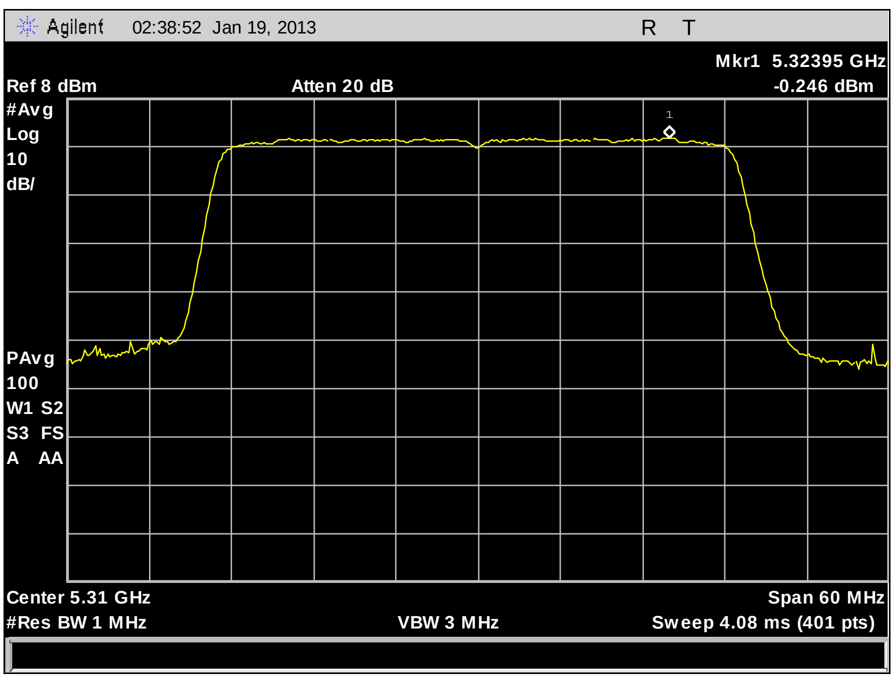
Plot 150. Power Spectral Density, 5310 MHz, Port 1



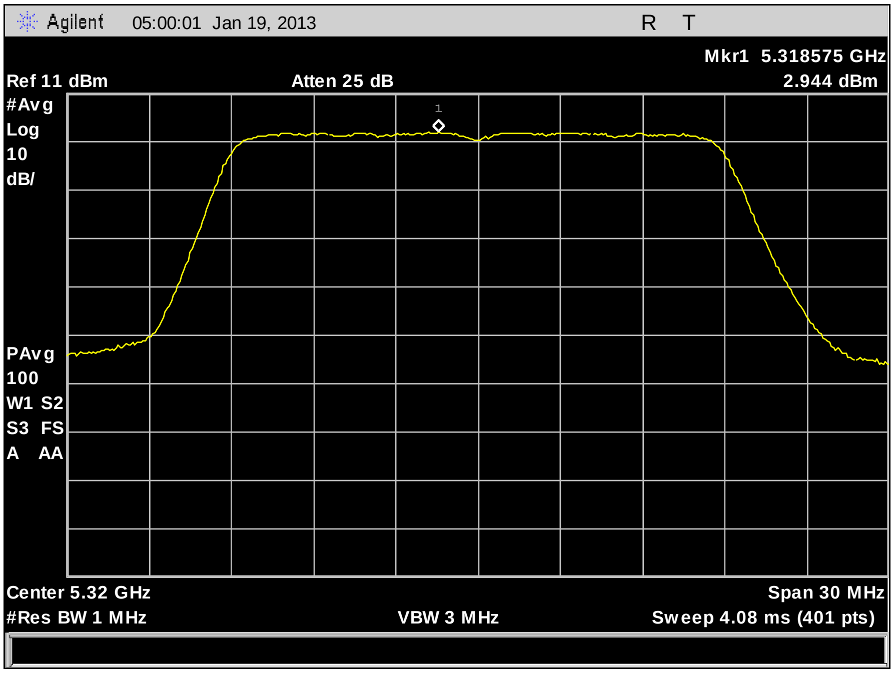
Plot 151. Power Spectral Density, 5310 MHz, Port 2



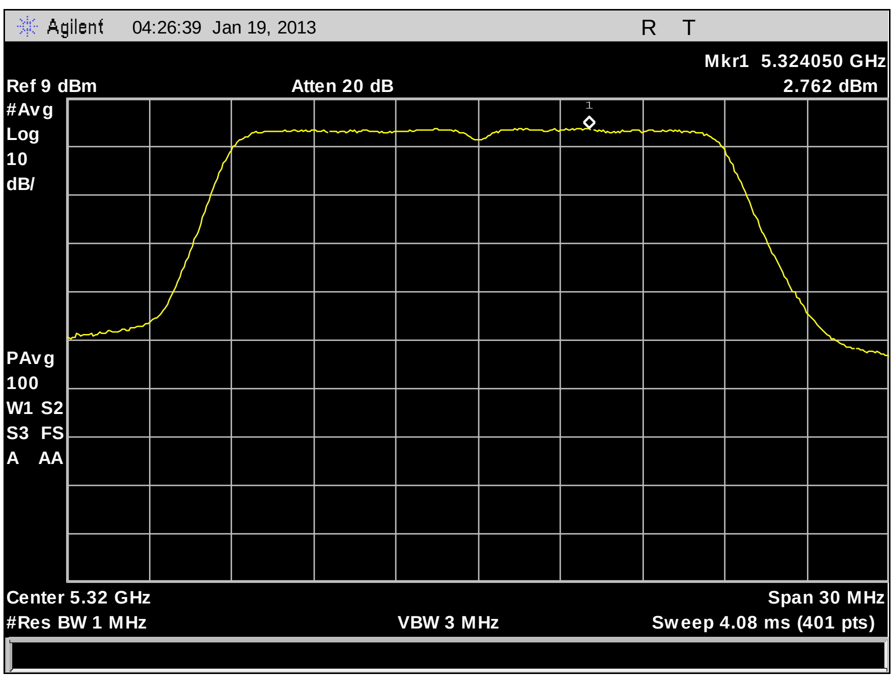
Plot 152. Power Spectral Density, 5310 MHz, Port 3



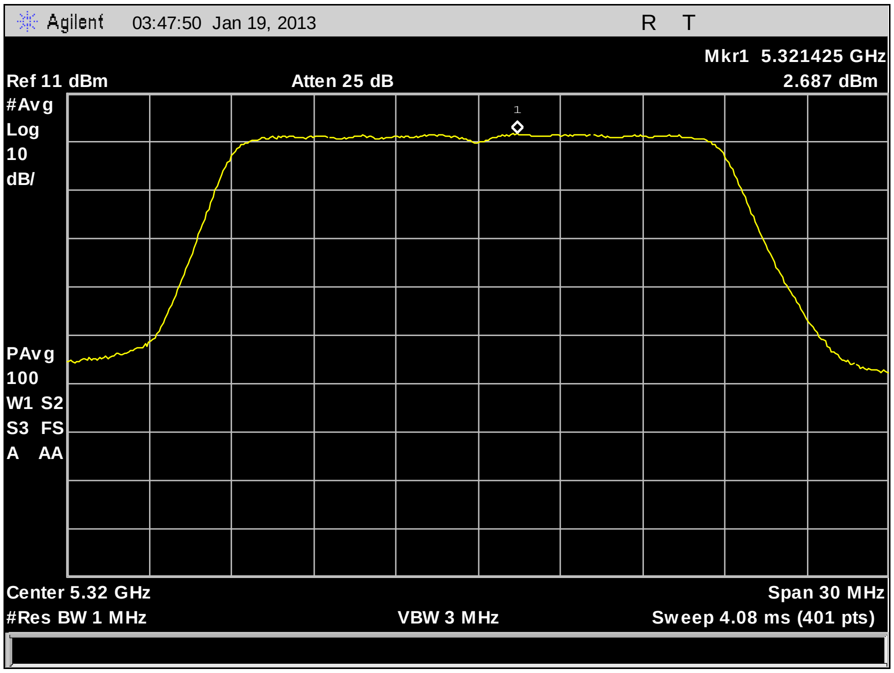
Plot 153. Power Spectral Density, 5310 MHz, Port 4



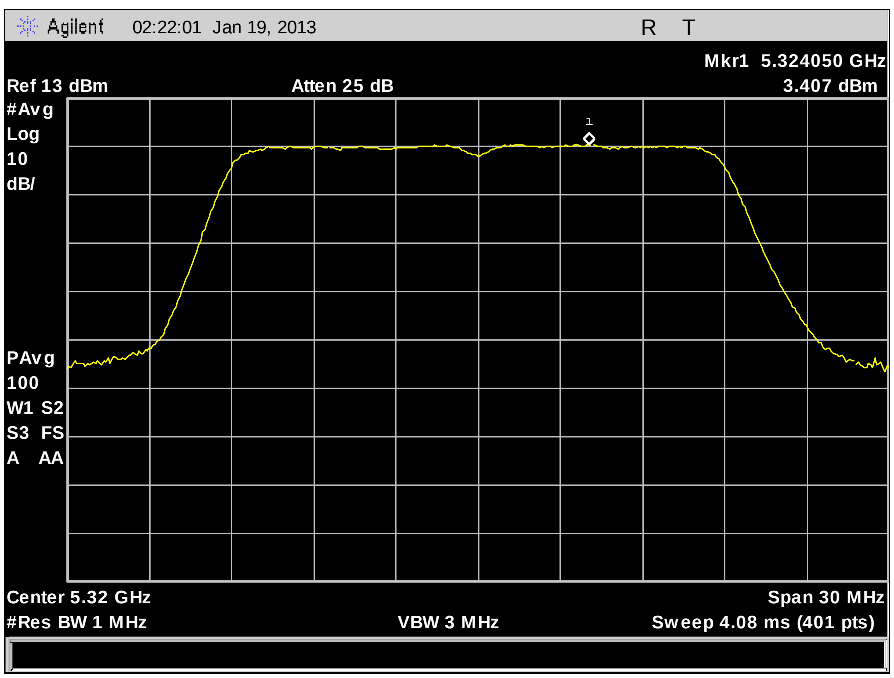
Plot 154. Power Spectral Density, 5320 MHz, Port 1



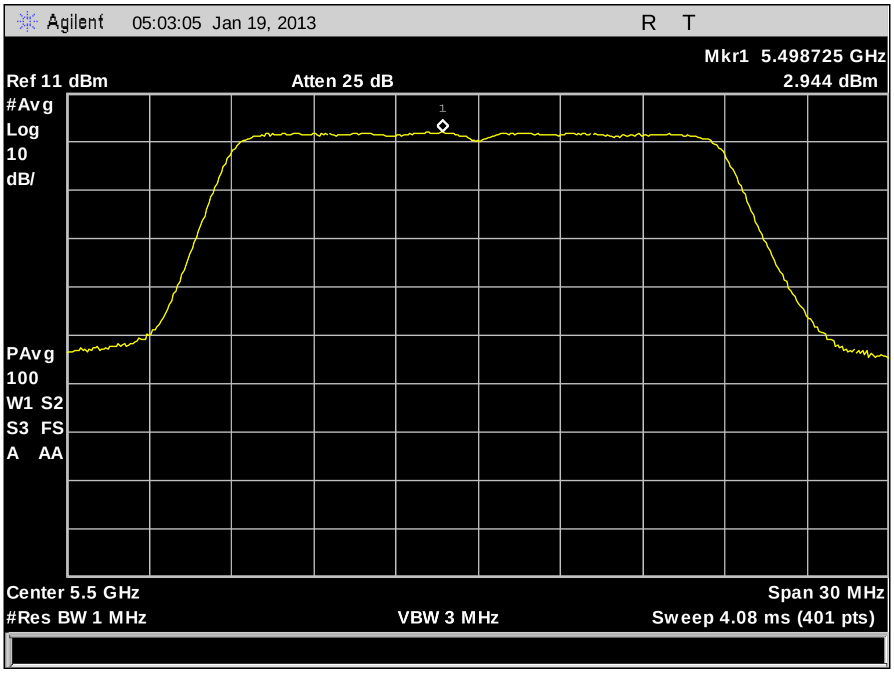
Plot 155. Power Spectral Density, 5320 MHz, Port 2



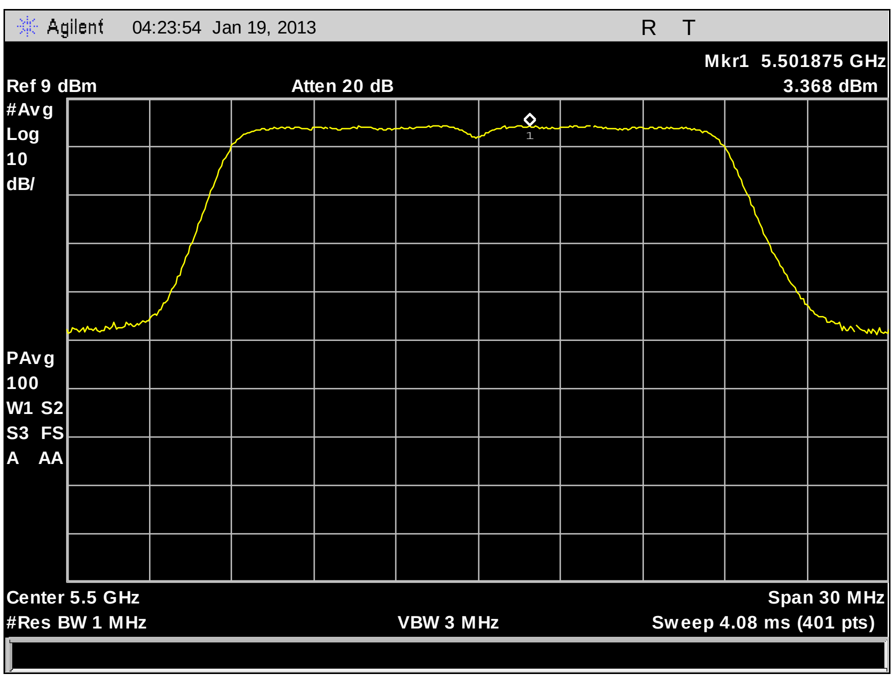
Plot 156. Power Spectral Density, 5320 MHz, Port 3



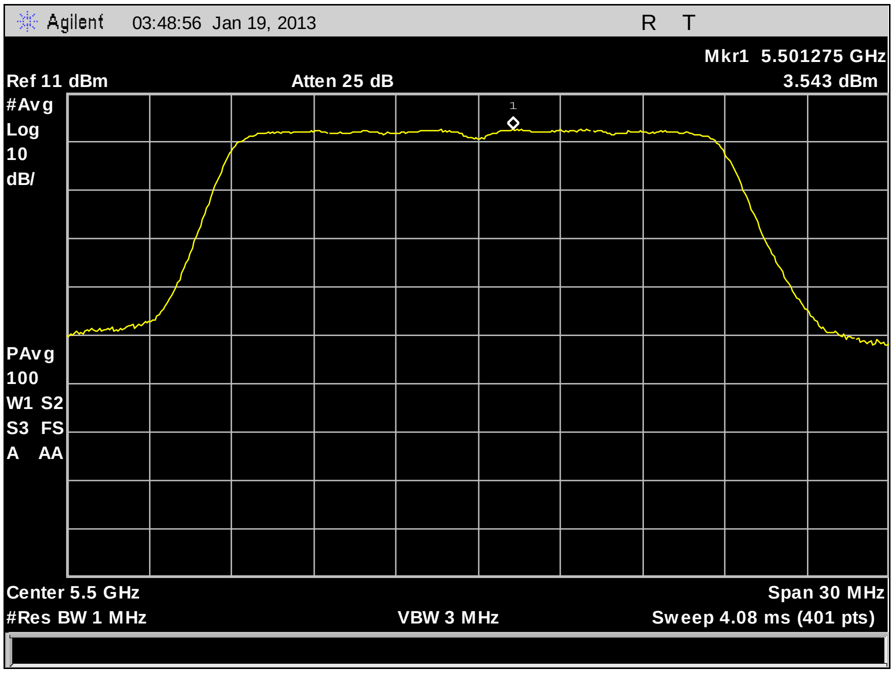
Plot 157. Power Spectral Density, 5320 MHz, Port 4



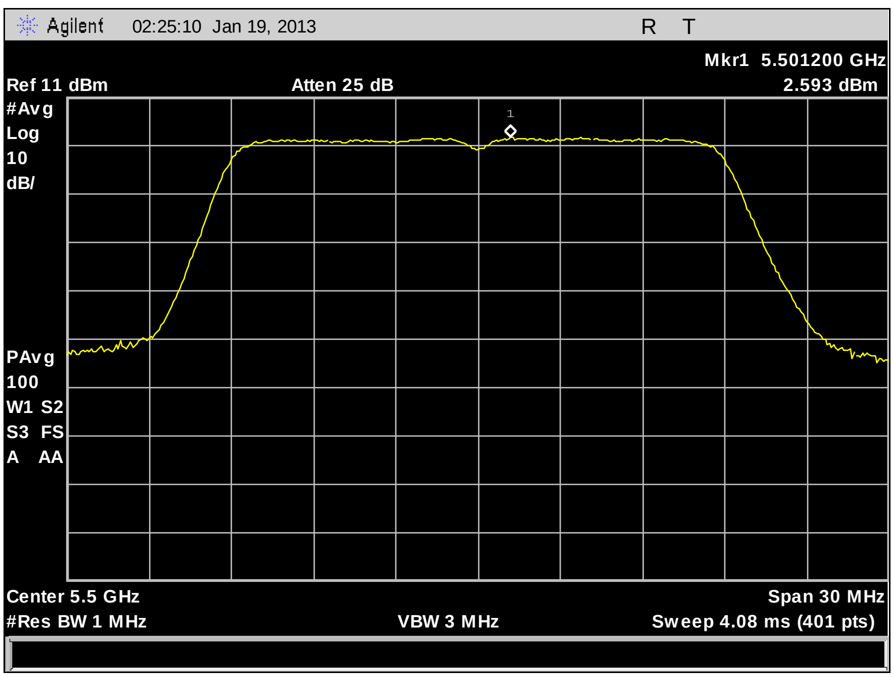
Plot 158. Power Spectral Density, 5500 MHz, Port 1



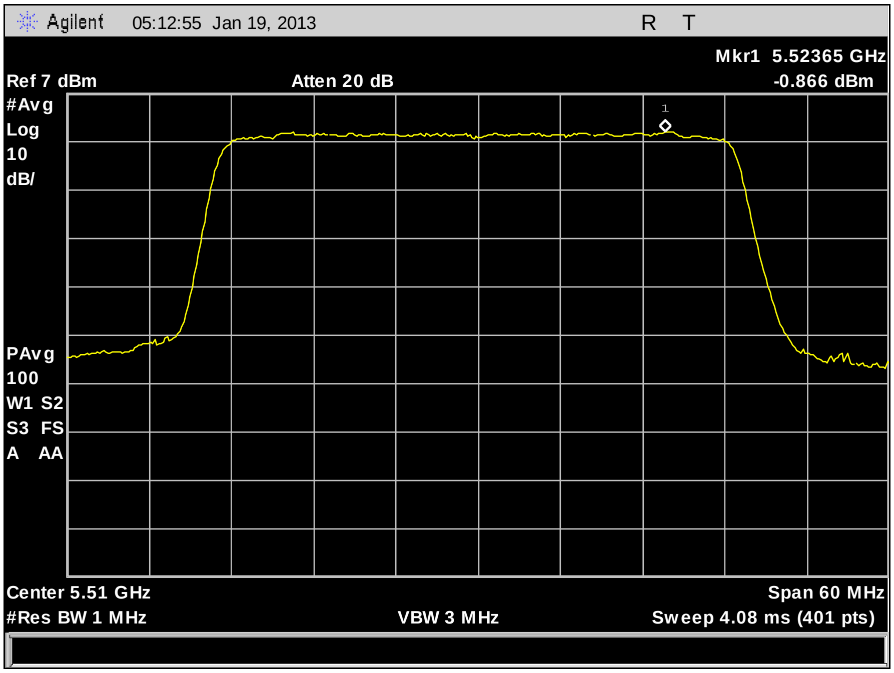
Plot 159. Power Spectral Density, 5500 MHz, Port 2



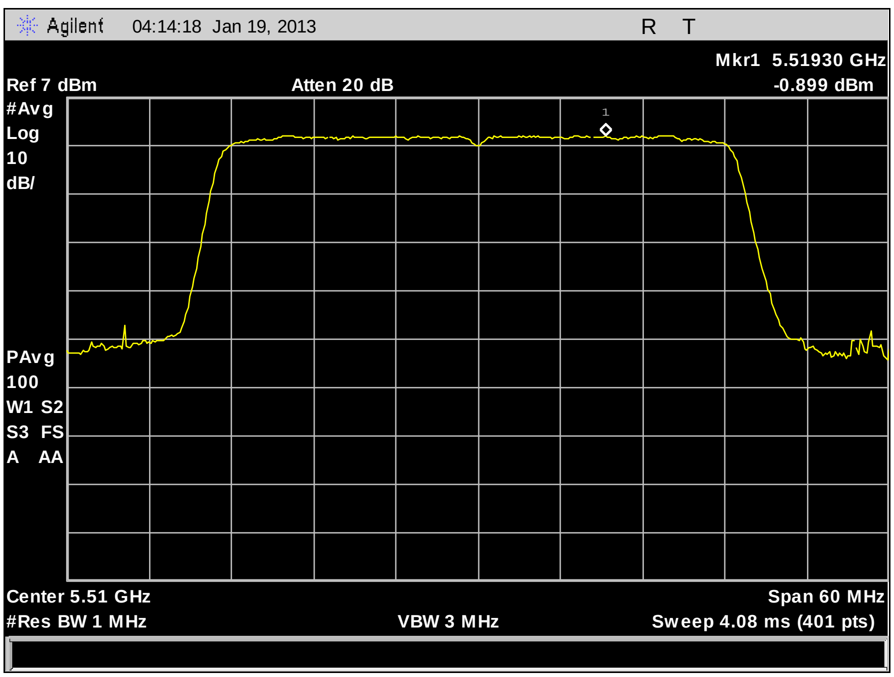
Plot 160. Power Spectral Density, 5500 MHz, Port 3



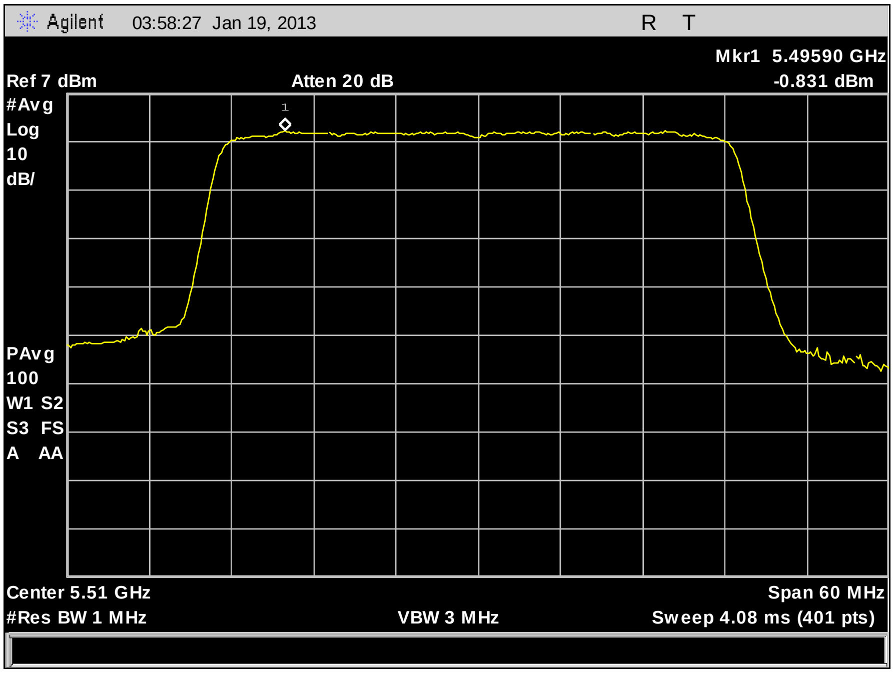
Plot 161. Power Spectral Density, 5500 MHz, Port 4



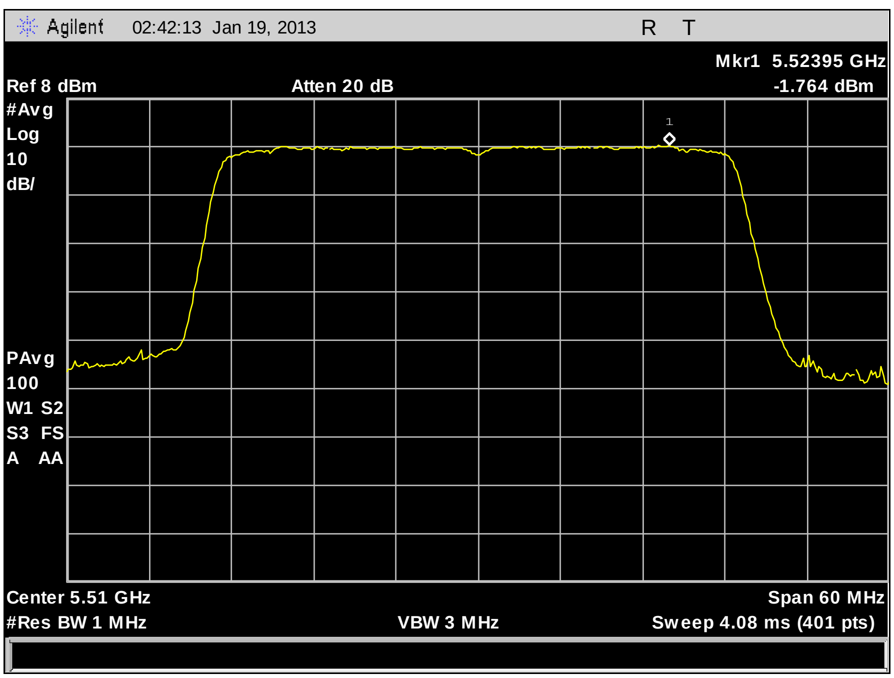
Plot 162. Power Spectral Density, 5510 MHz, Port 1



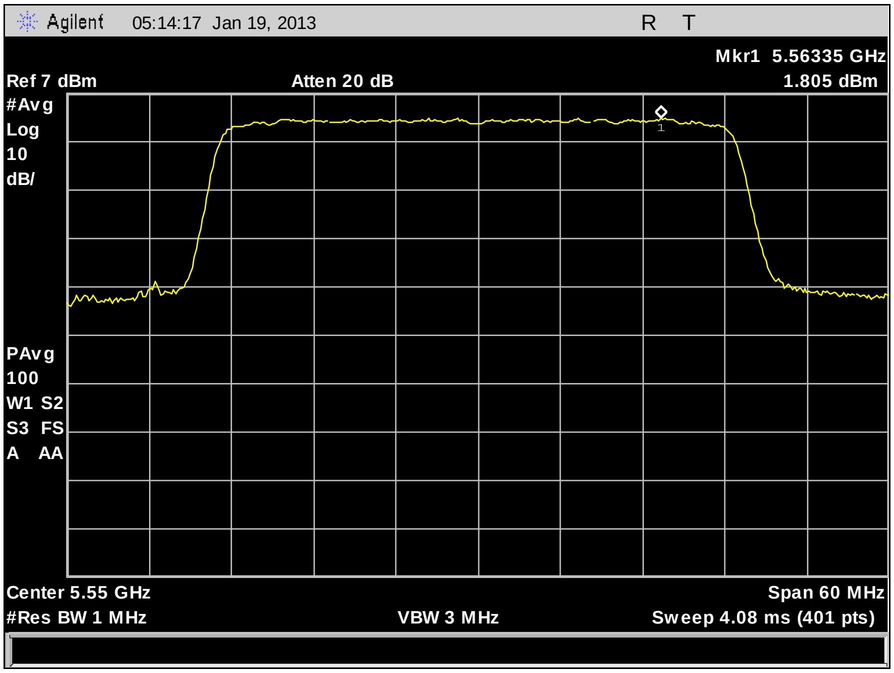
Plot 163. Power Spectral Density, 5510 MHz, Port 2



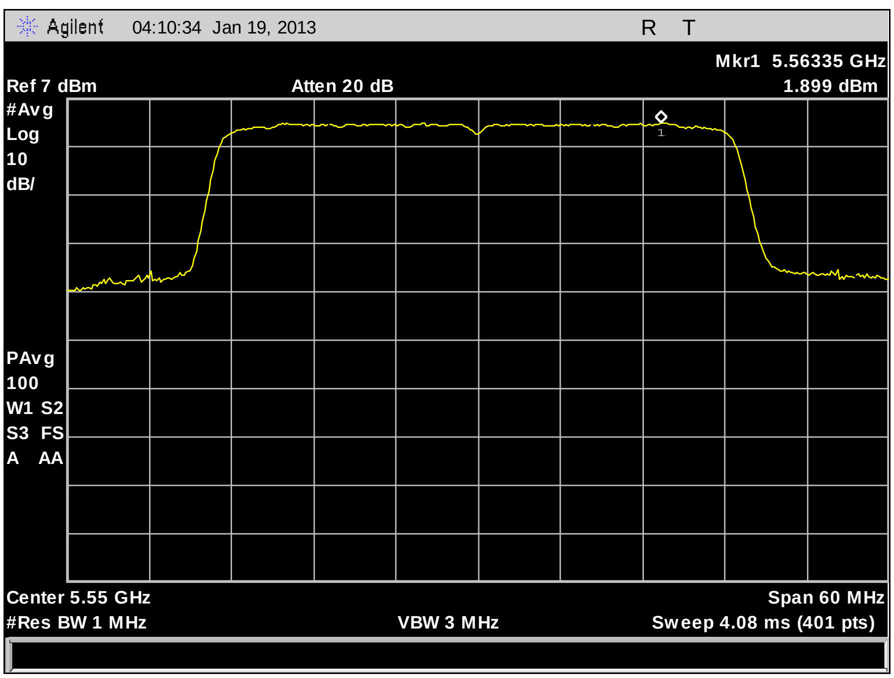
Plot 164. Power Spectral Density, 5510 MHz, Port 3



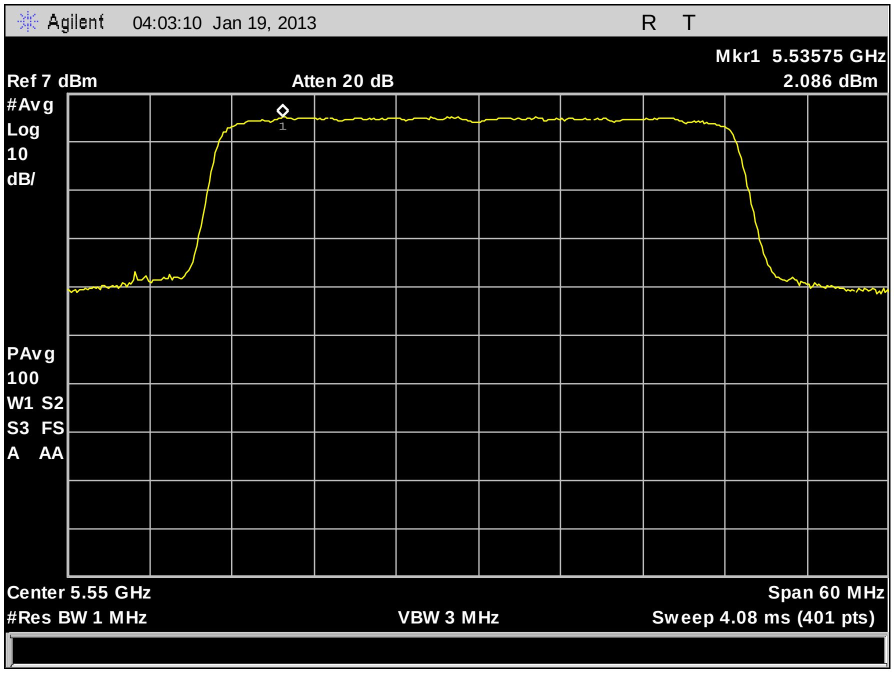
Plot 165. Power Spectral Density, 5510 MHz, Port 4



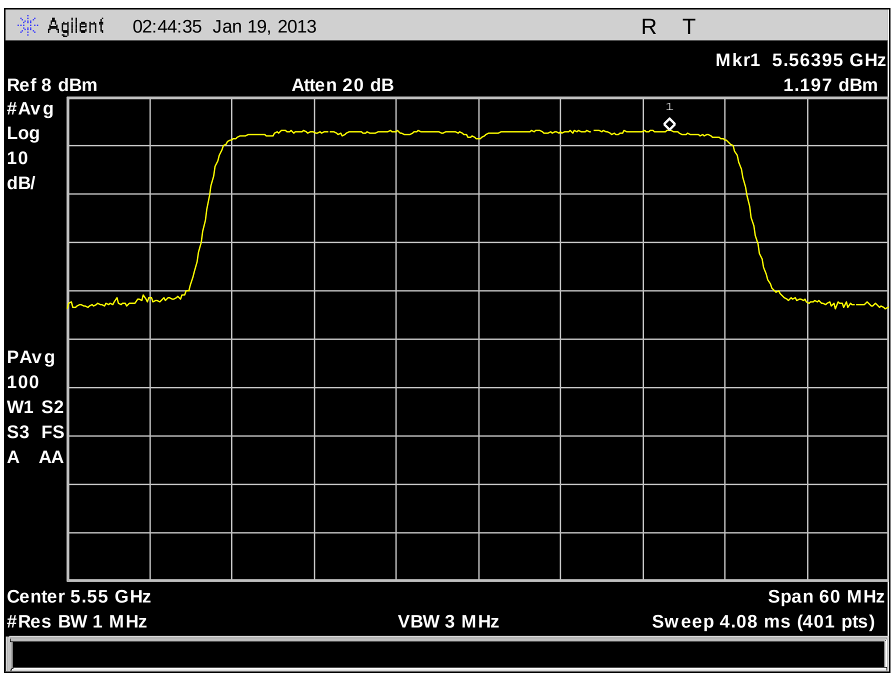
Plot 166. Power Spectral Density, 5550 MHz, Port 1



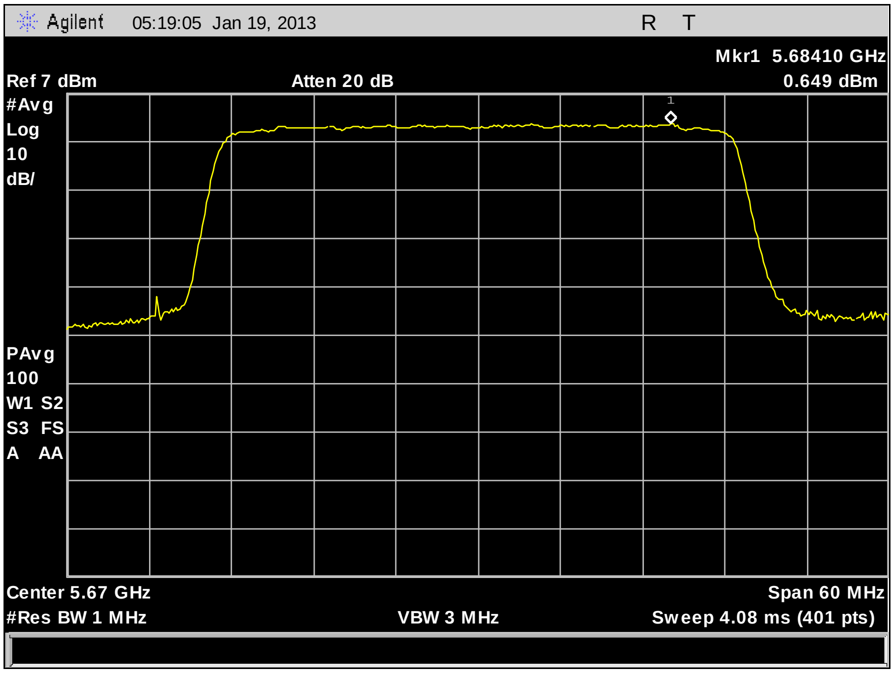
Plot 167. Power Spectral Density, 5550 MHz, Port 2



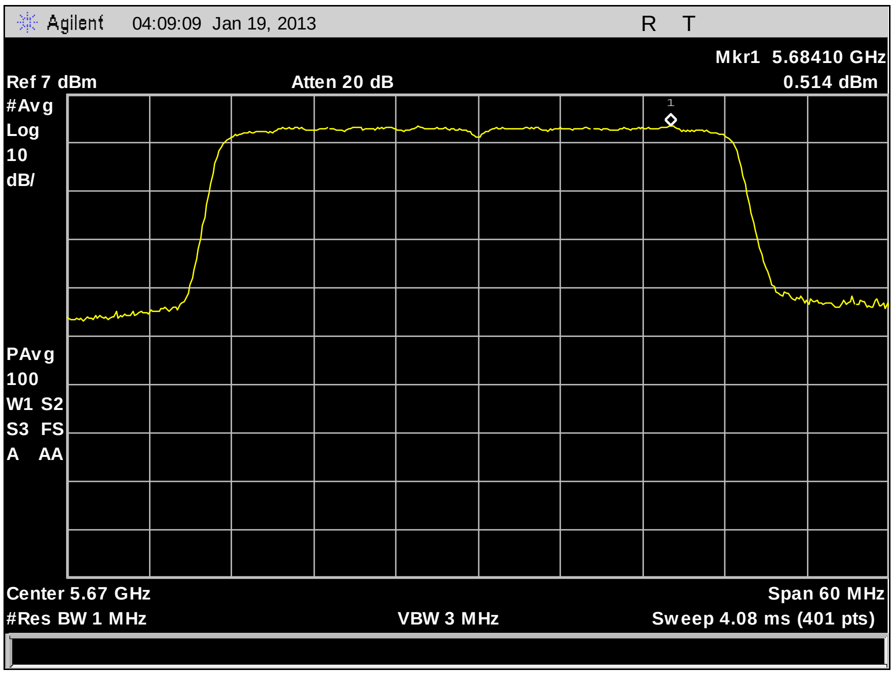
Plot 168. Power Spectral Density, 5550 MHz, Port 3



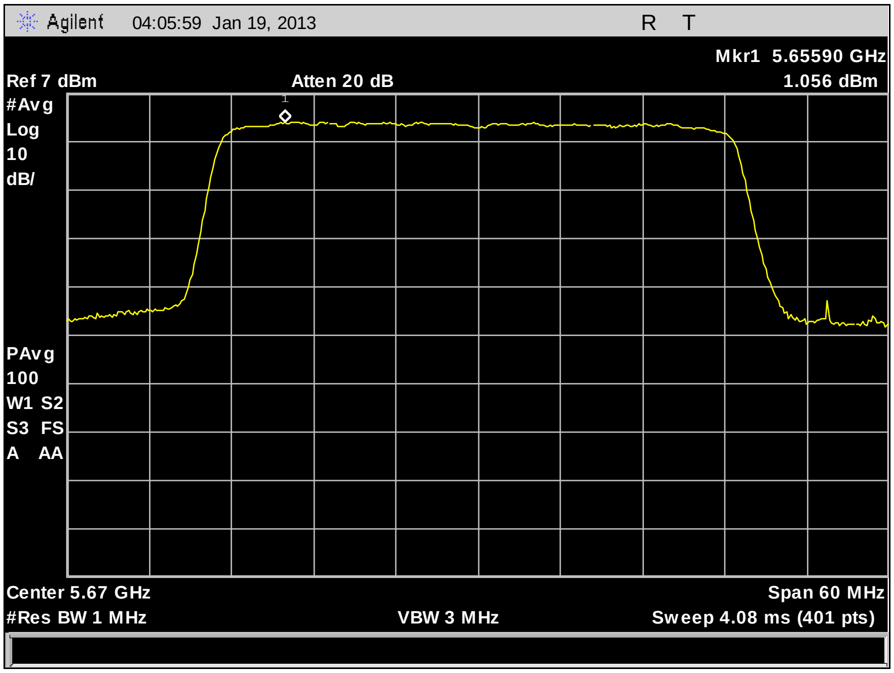
Plot 169. Power Spectral Density, 5550 MHz, Port 4



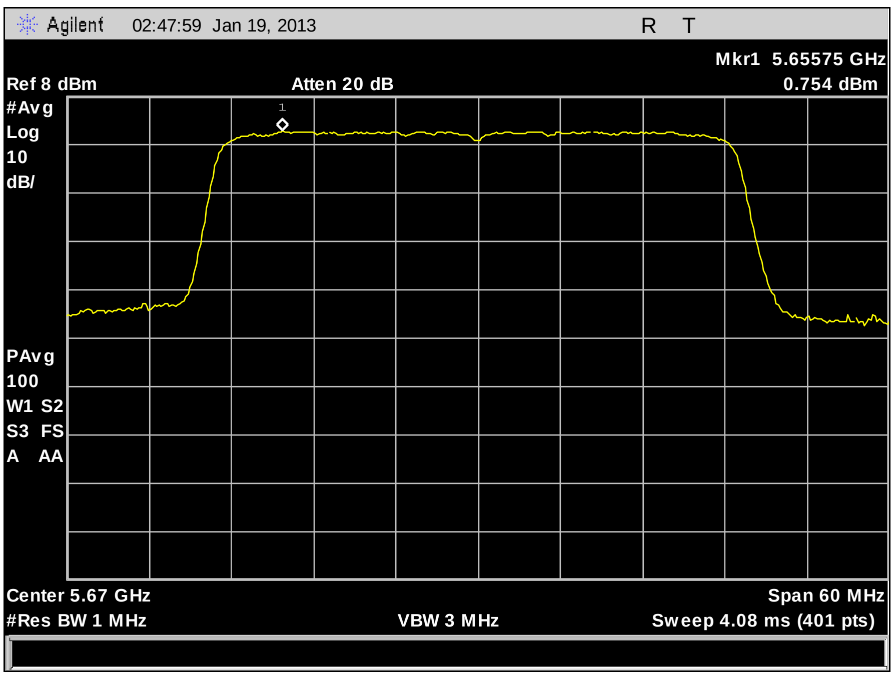
Plot 170. Power Spectral Density, 5670 MHz, Port 1



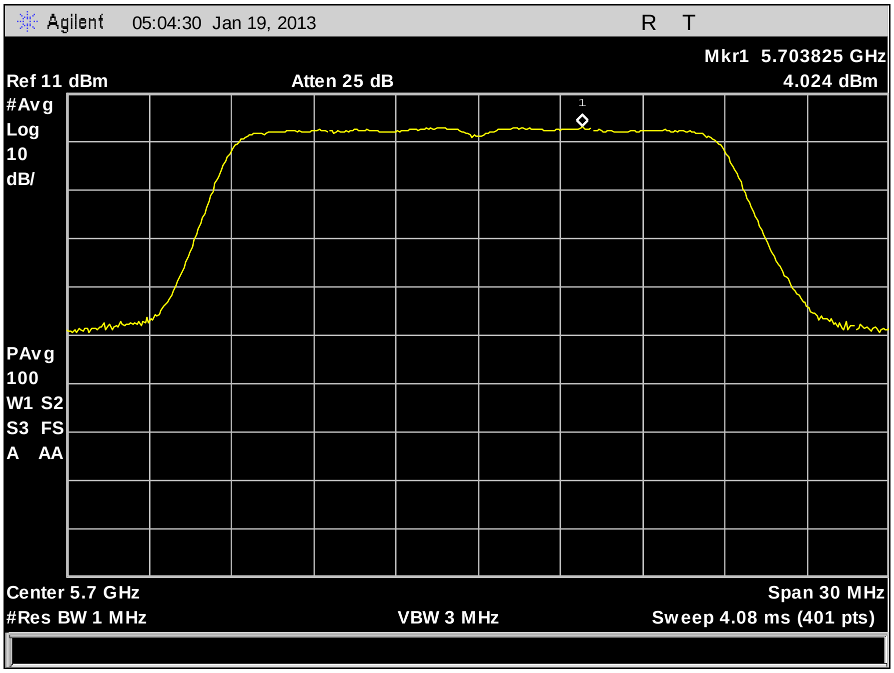
Plot 171. Power Spectral Density, 5670 MHz, Port 2



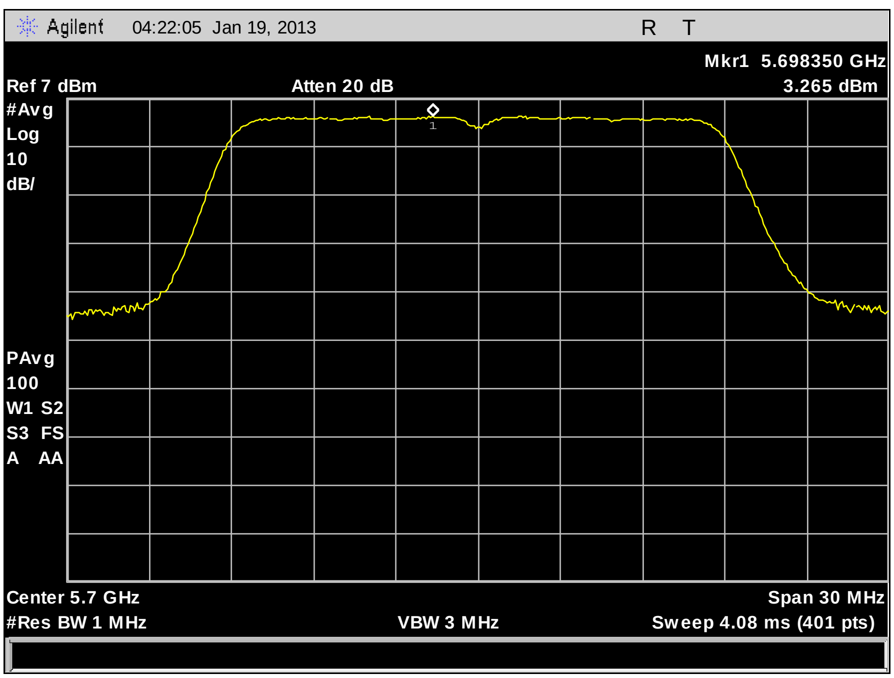
Plot 172. Power Spectral Density, 5670 MHz, Port 3



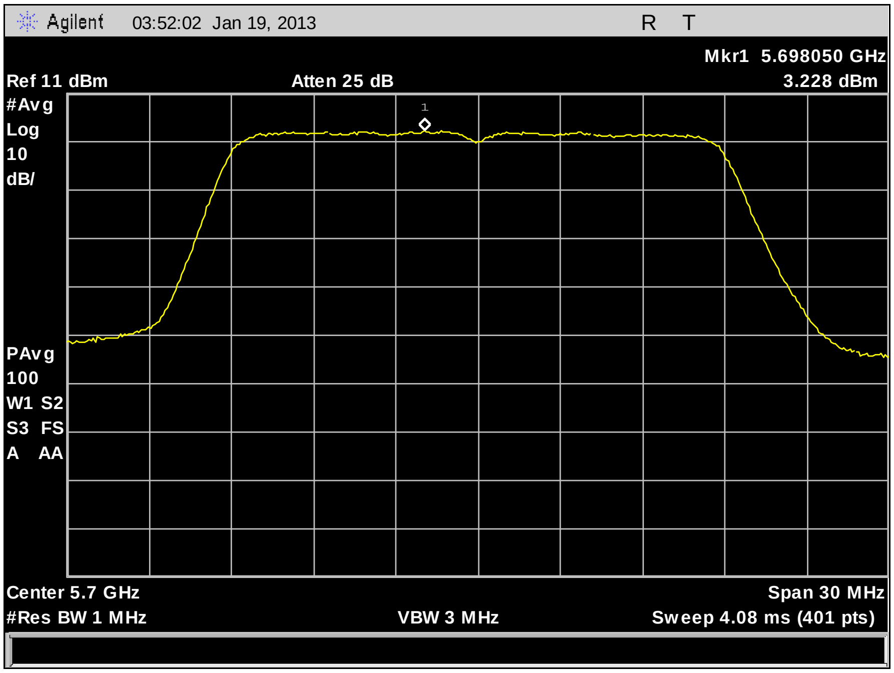
Plot 173. Power Spectral Density, 5670 MHz, Port 4



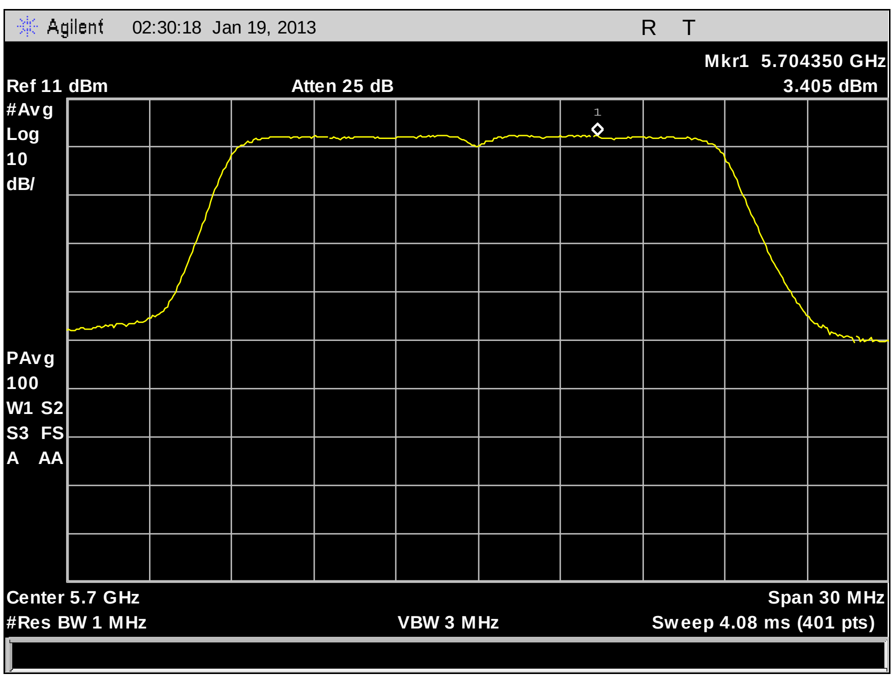
Plot 174. Power Spectral Density, 5700 MHz, Port 1



Plot 175. Power Spectral Density, 5700 MHz, Port 2



Plot 176. Power Spectral Density, 5700 MHz, Port 3



Plot 177. Power Spectral Density, 5700 MHz, Port 4

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 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

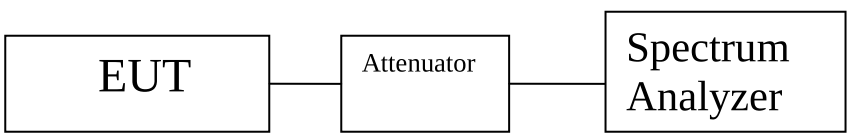
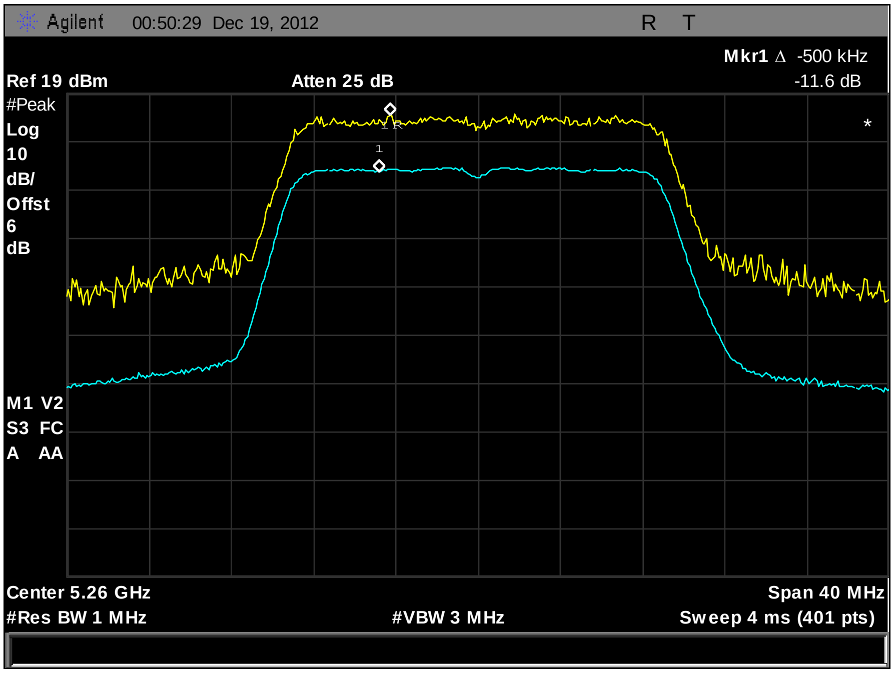
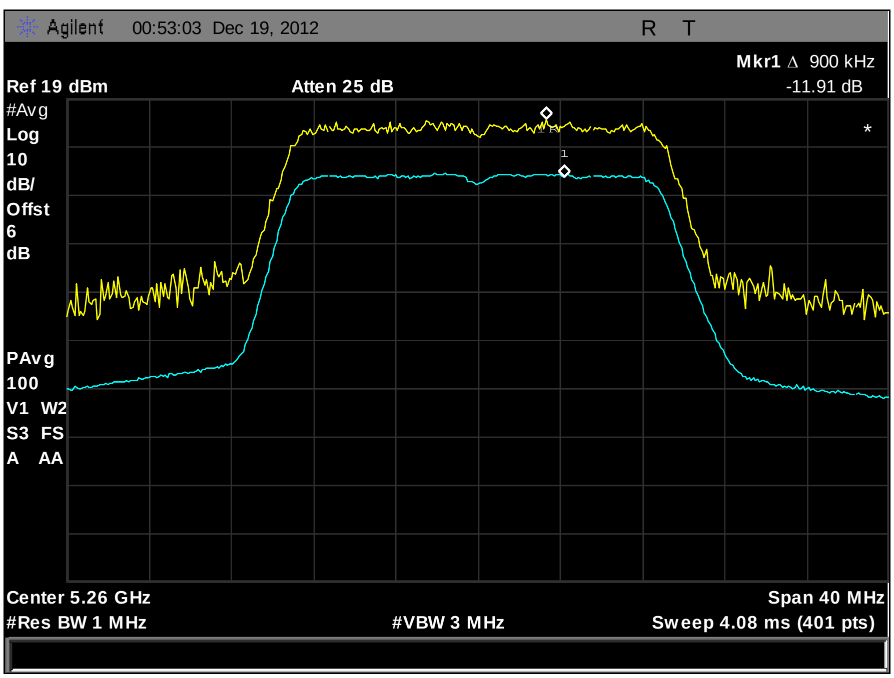


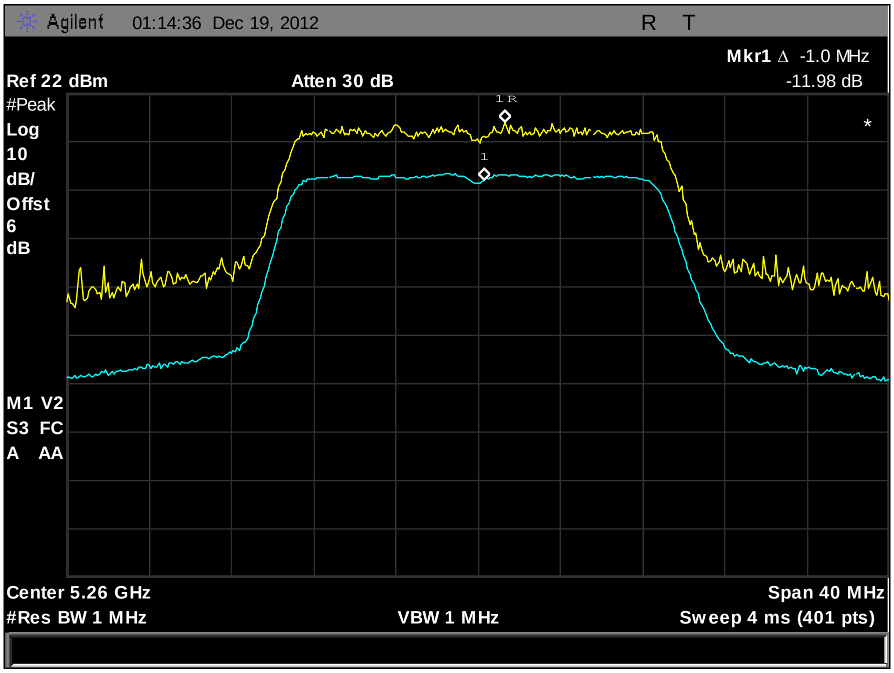
Figure 5. Peak Excursion Ration Test Setup



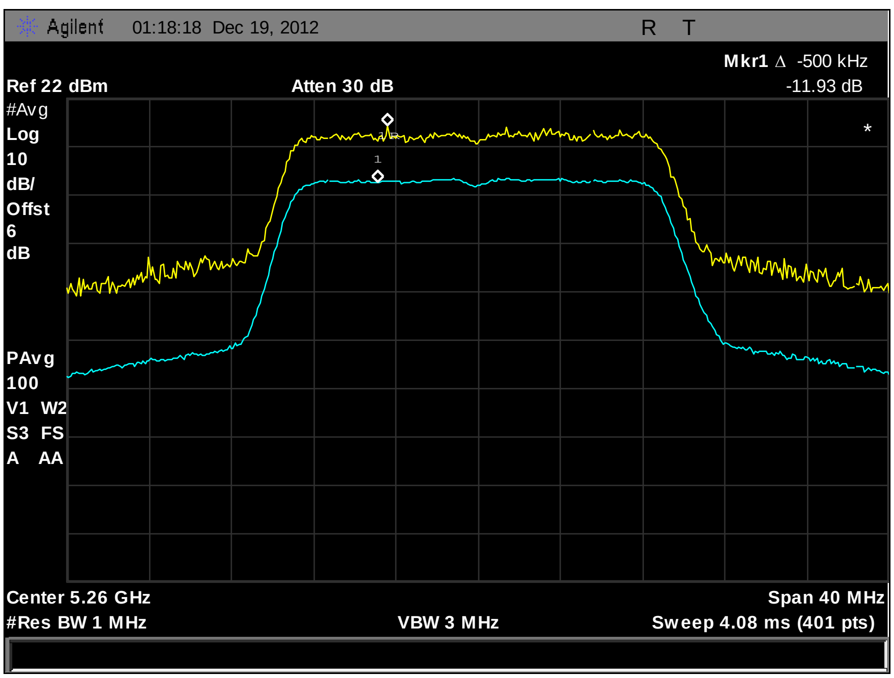
Plot 178. Peak Excursion Ratio, 5260 MHz, 20 MHz, Port 1



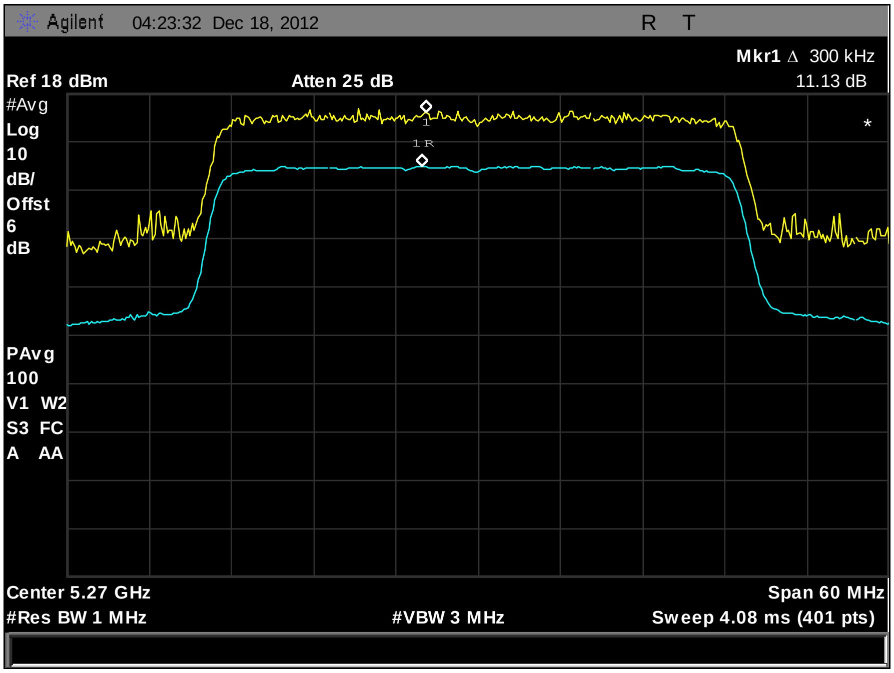
Plot 179. Peak Excursion Ratio, 5260 MHz, 20 MHz, Port 2



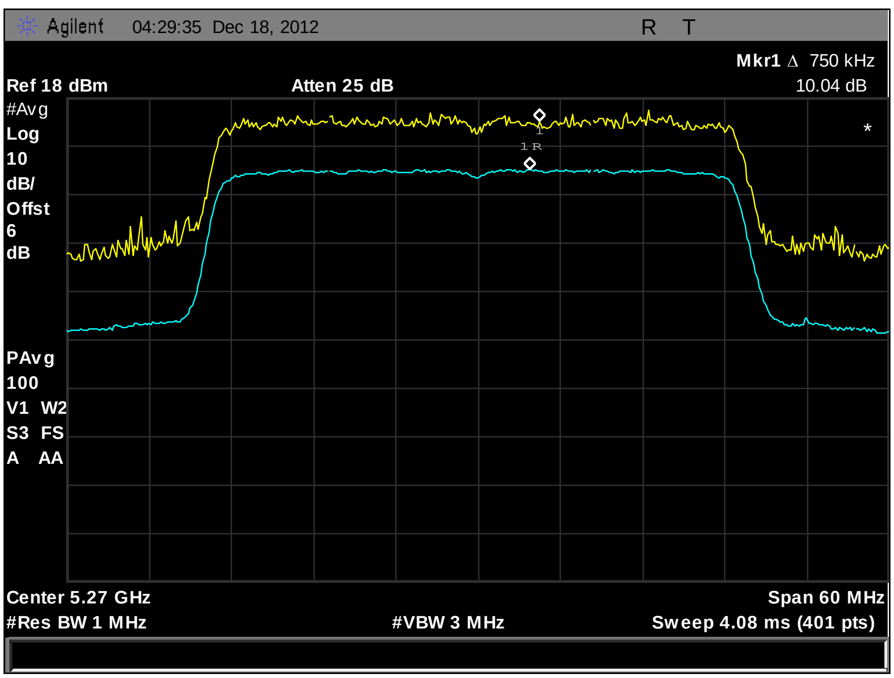
Plot 180. Peak Excursion Ratio, 5260 MHz, 20 MHz, Port 3



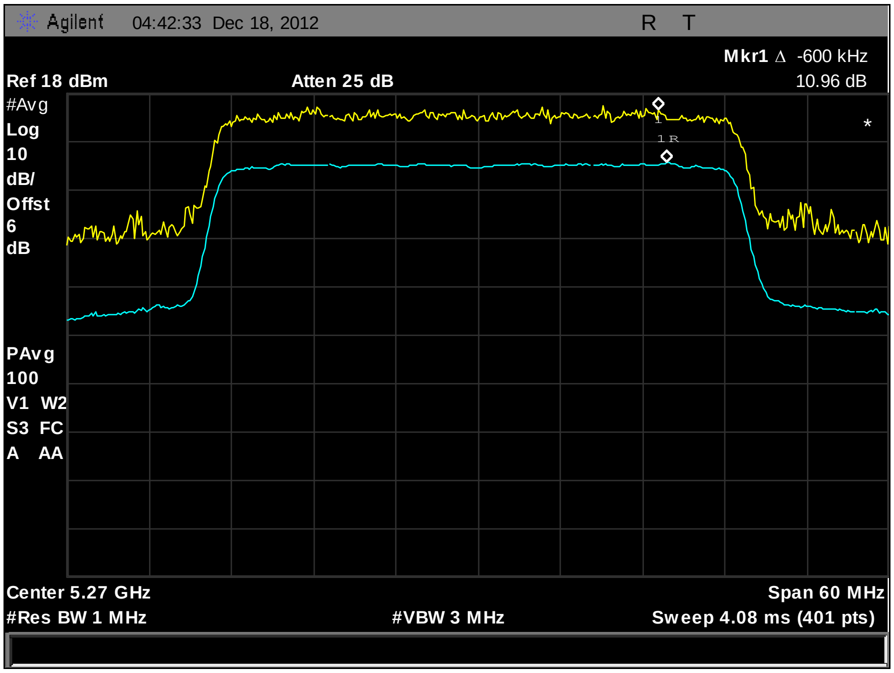
Plot 181. Peak Excursion Ratio, 5260 MHz, 20 MHz, Port 4



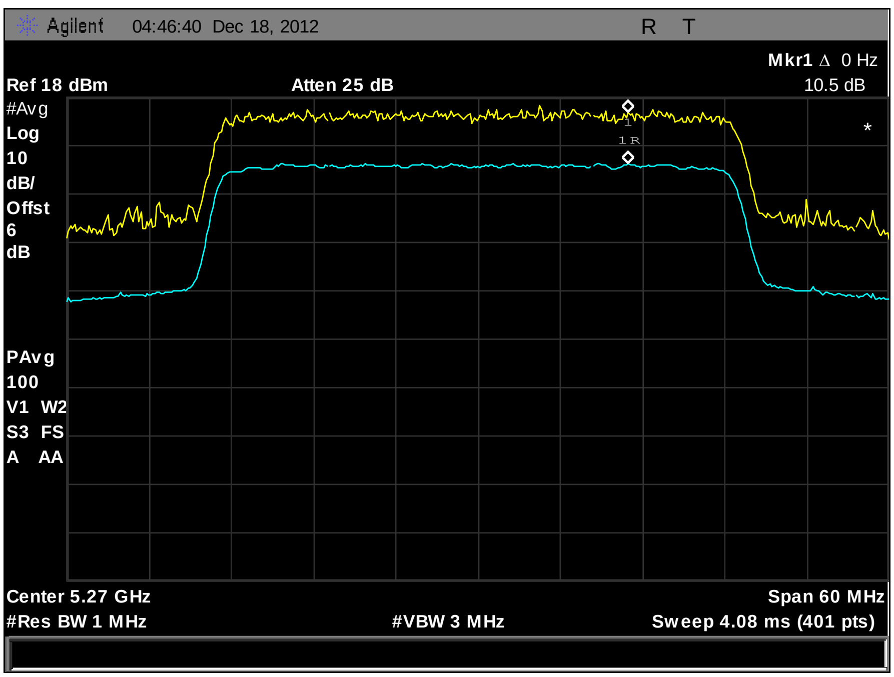
Plot 182. Peak Excursion Ratio, 5270 MHz, 40 MHz, Port 1



Plot 183. Peak Excursion Ratio, 5270 MHz, 40 MHz, Port 2



Plot 184. Peak Excursion Ratio, 5270 MHz, 40 MHz, Port 3



Plot 185. Peak Excursion Ratio, 5270 MHz, 40 MHz, Port 4

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(2), (3), (6), (7) Undesirable Emissions

Test Requirements: **§ 15.407(b)(2), (3), (6), (7)**; **§15.205:** Emissions outside the frequency band.

§ 15.407(b)(2): For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

§ 15.407(b)(3): For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/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.

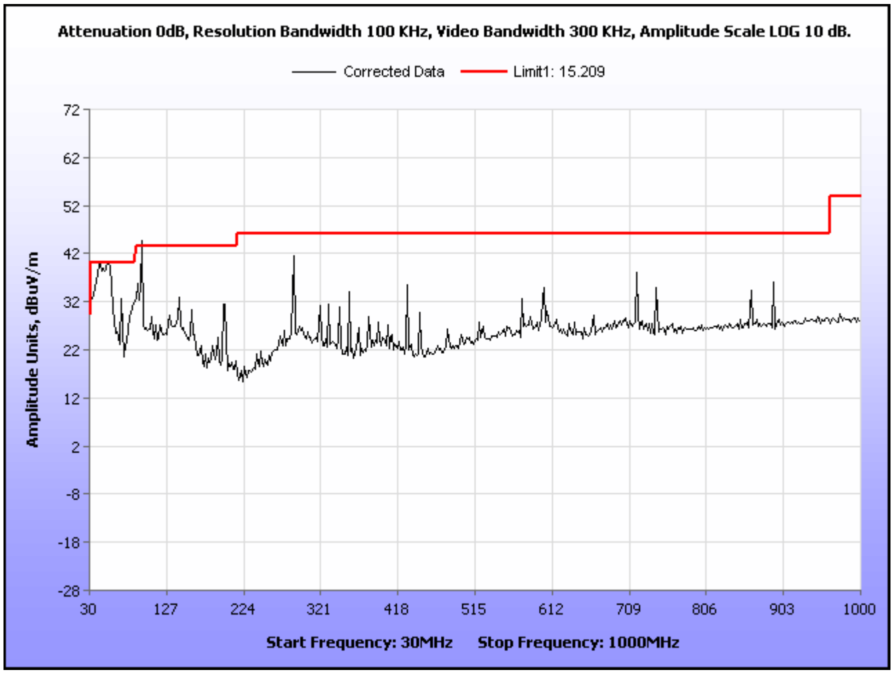
For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with 15.209 limits. Emissions were explored up to 40 GHz. Only noise floor was observed above 18GHz.
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

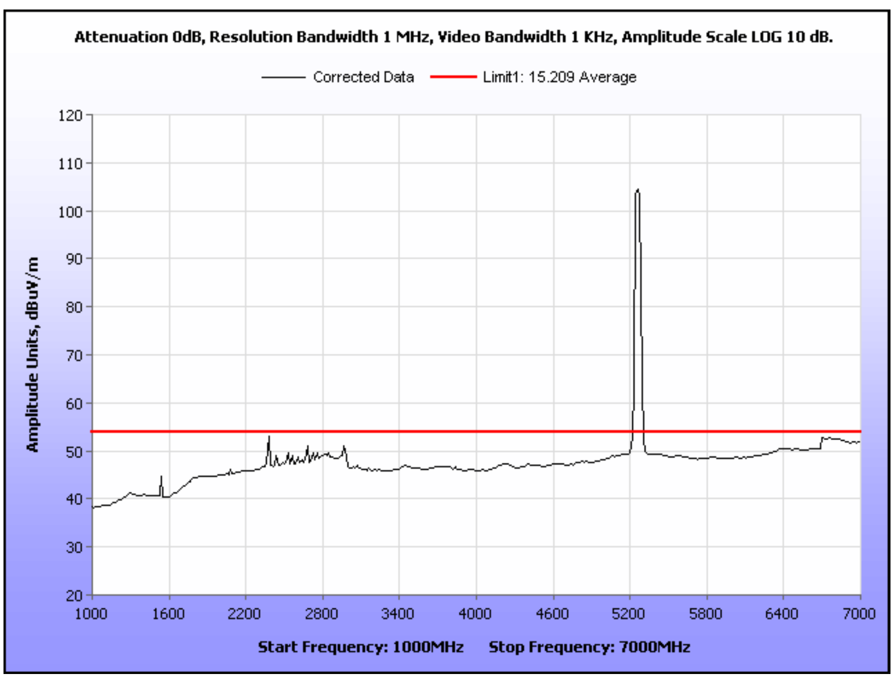
Test Date(s): 12/18/12 – 01/24/13

§ 15.209 Radiated Emissions Limits

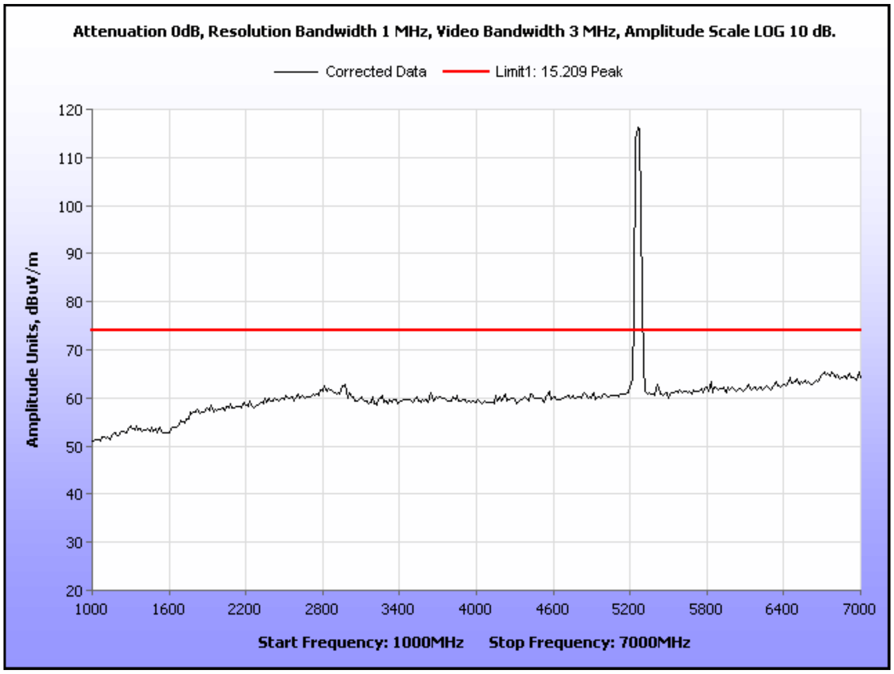


Plot 186. Radiated Spurious Emissions, 5260 MHz, 20 MHz Channel, Tx Power 17.5, 30 MHz – 1 GHz

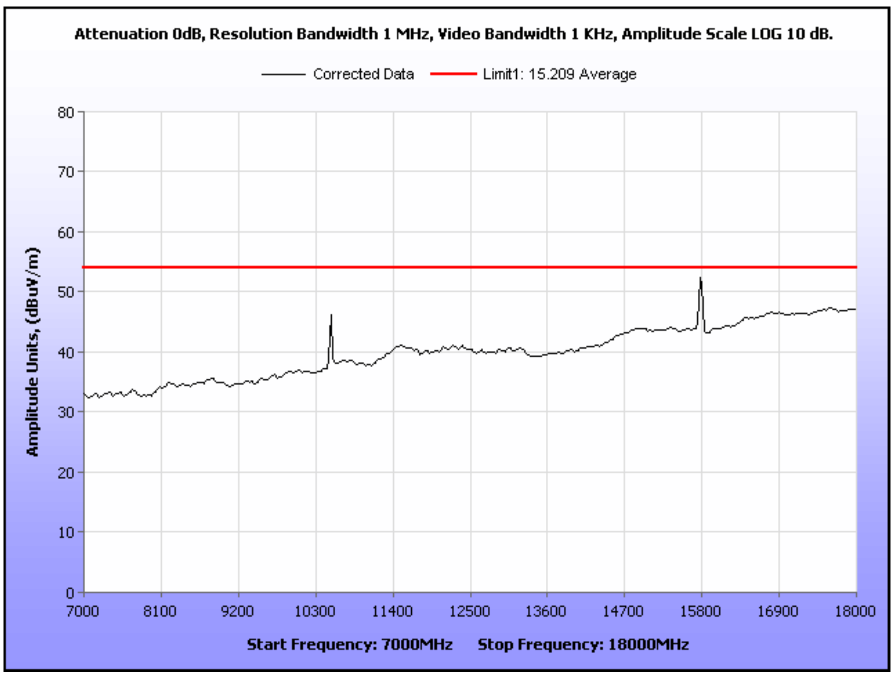
Emissions which exceed the 15.209 limit are digital and meet the Class B limit of 15.109. Refer to Table 11.



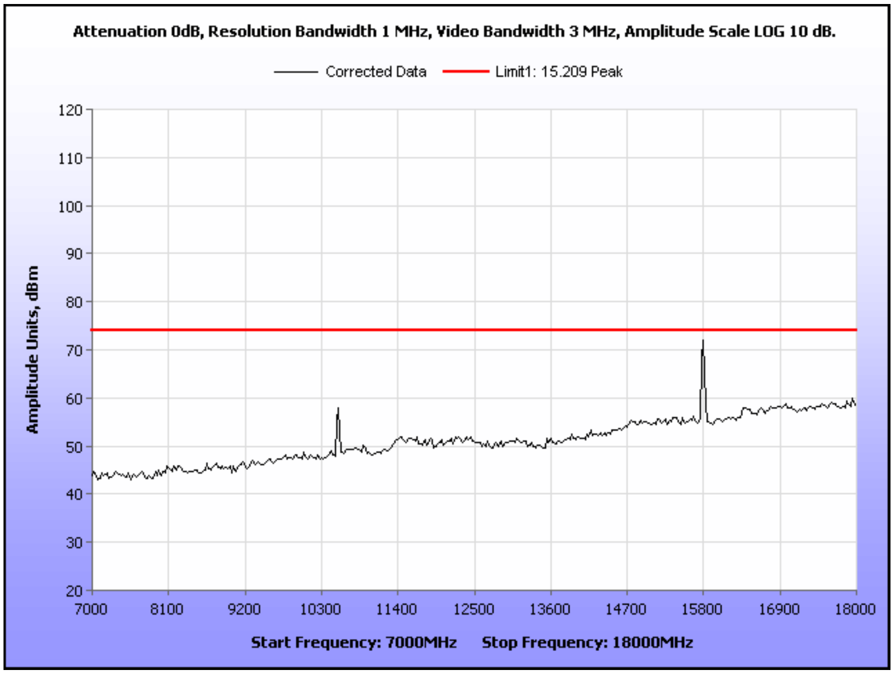
Plot 187. Radiated Spurious Emissions, 5260 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Average



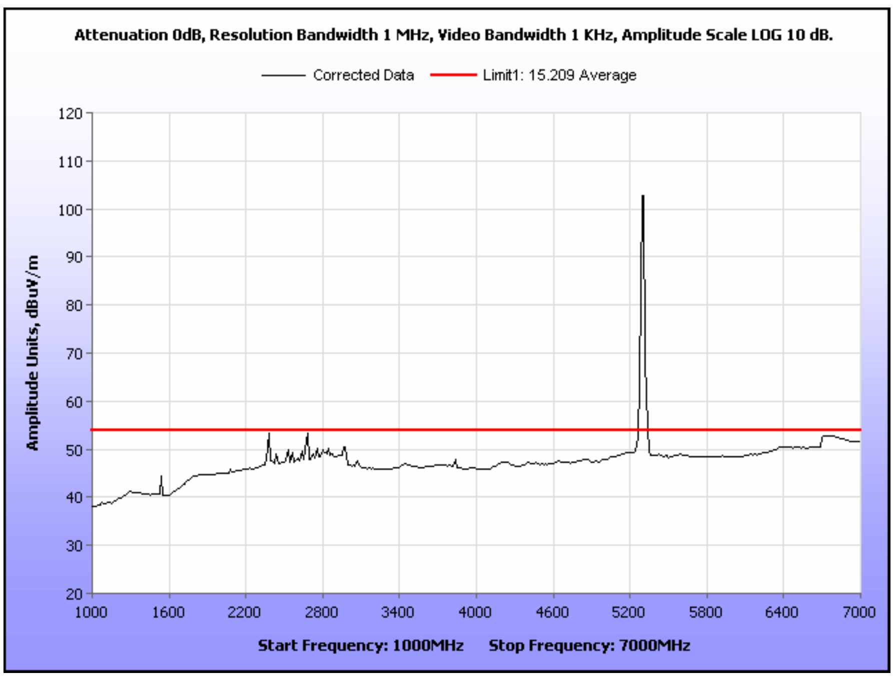
Plot 188. Radiated Spurious Emissions, 5260 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Peak



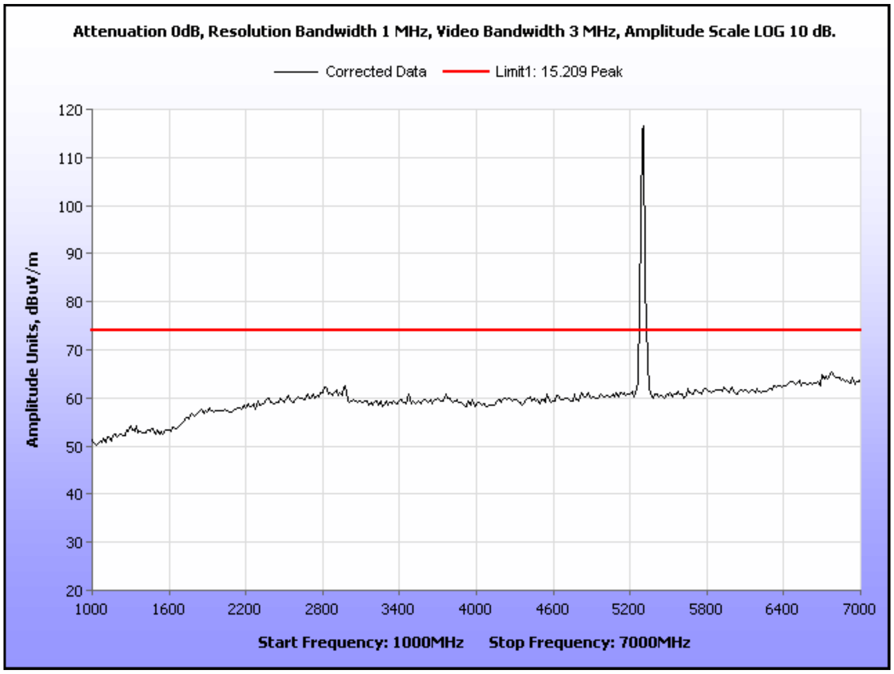
Plot 189. Radiated Spurious Emissions, 5260 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Average



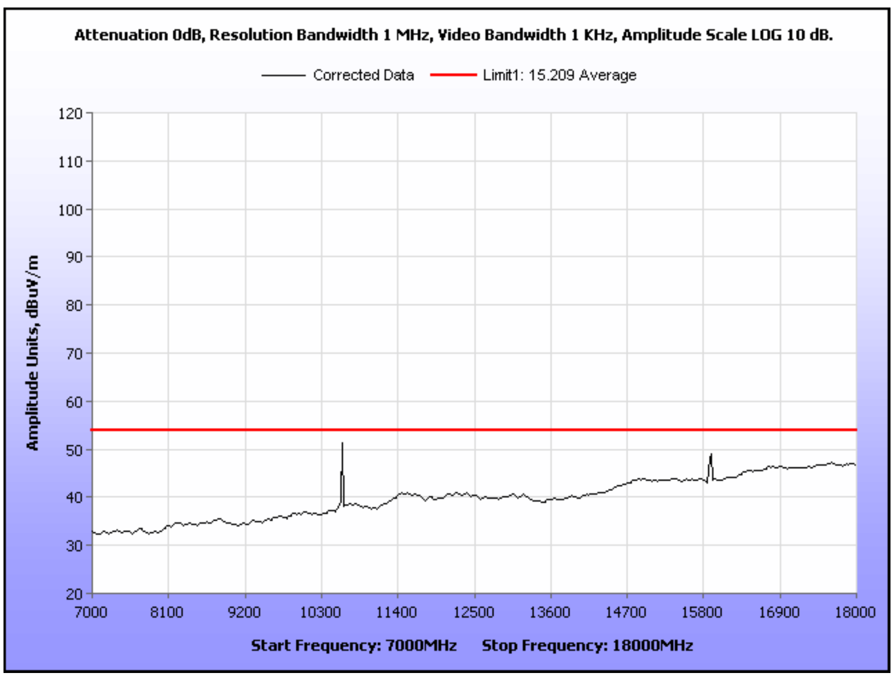
Plot 190. Radiated Spurious Emissions, 5260 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Peak



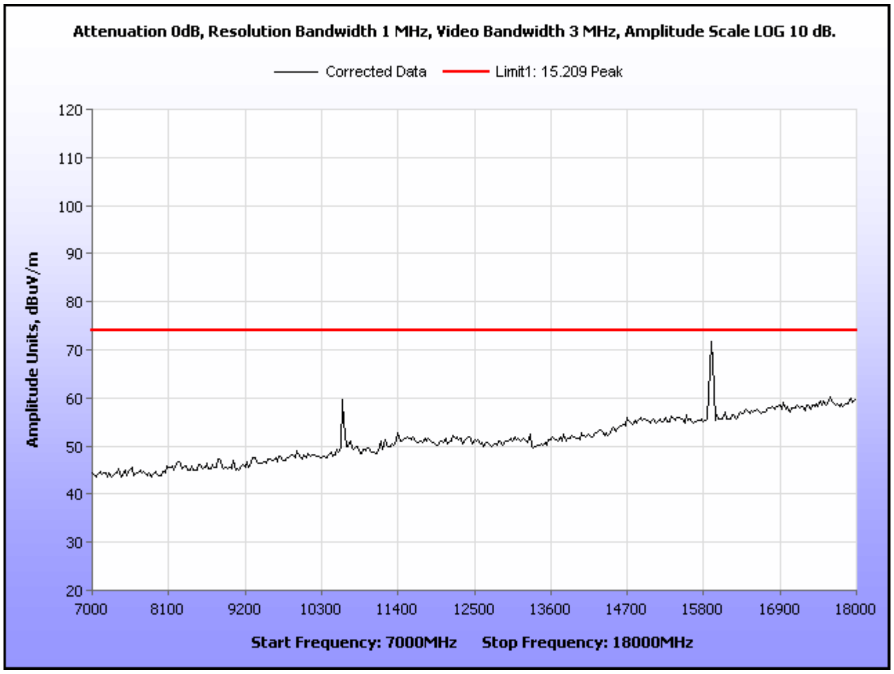
Plot 191. Radiated Spurious Emissions, 5300 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Average



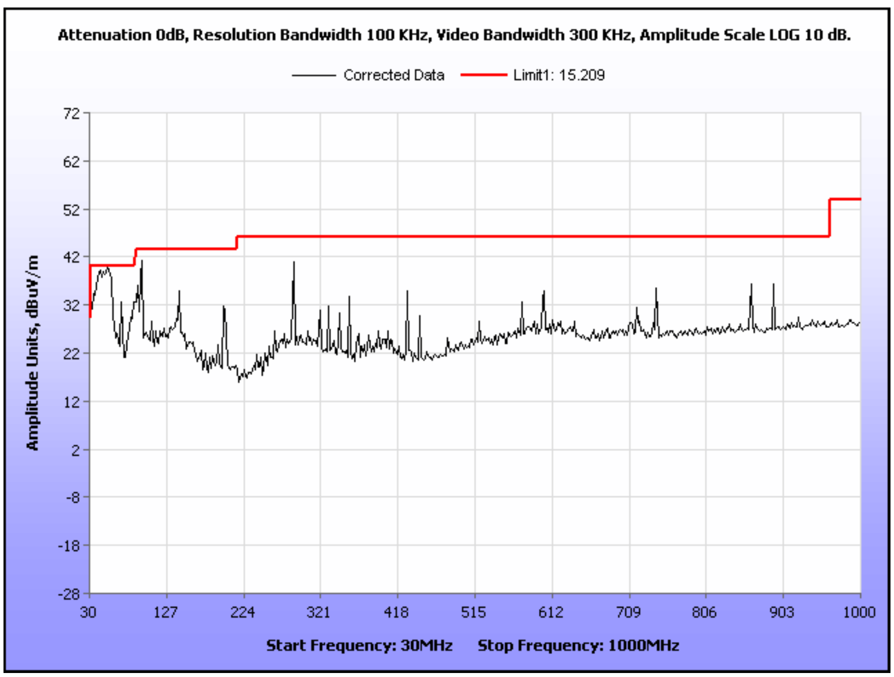
Plot 192. Radiated Spurious Emissions, 5300 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 193. Radiated Spurious Emissions, 5300 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Average

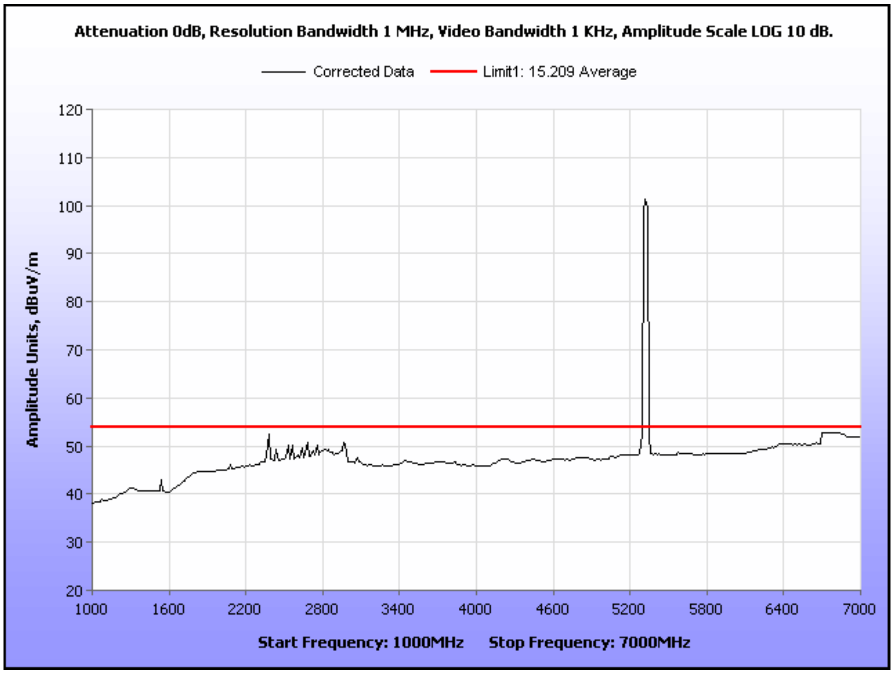


Plot 194. Radiated Spurious Emissions, 5300 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Peak

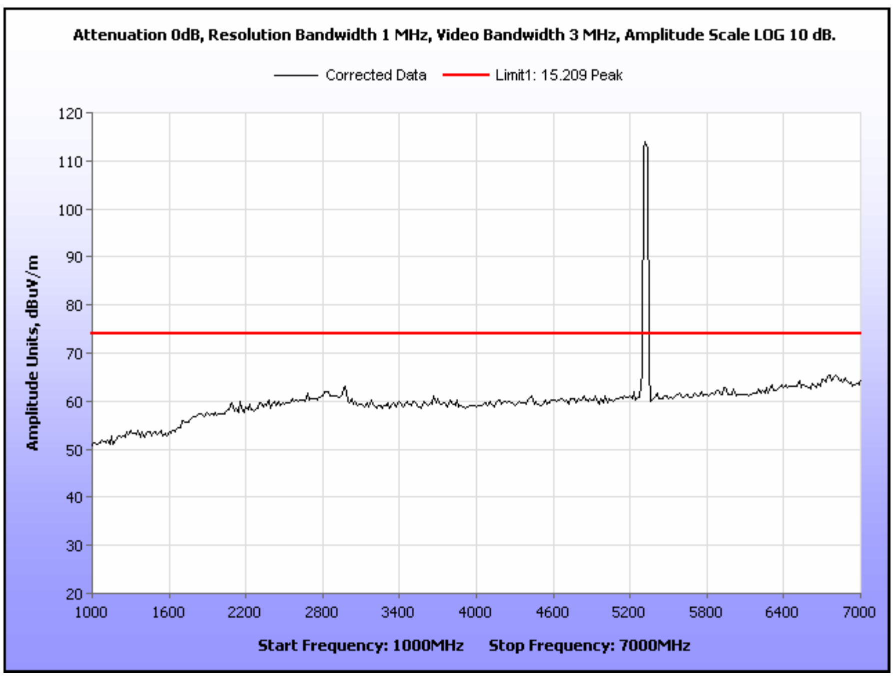


Plot 195. Radiated Spurious Emissions, 5320 MHz, 20 MHz Channel, Tx Power 15, 30 MHz – 1 GHz

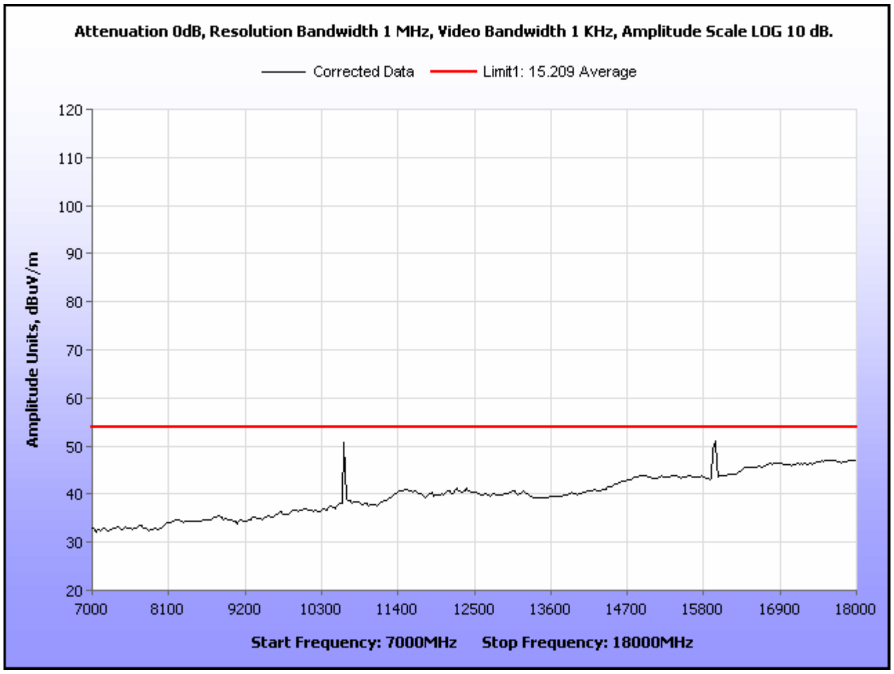
Emissions which exceed the 15.209 limit are digital and meet the Class B limit of 15.109. Refer to Table 11.



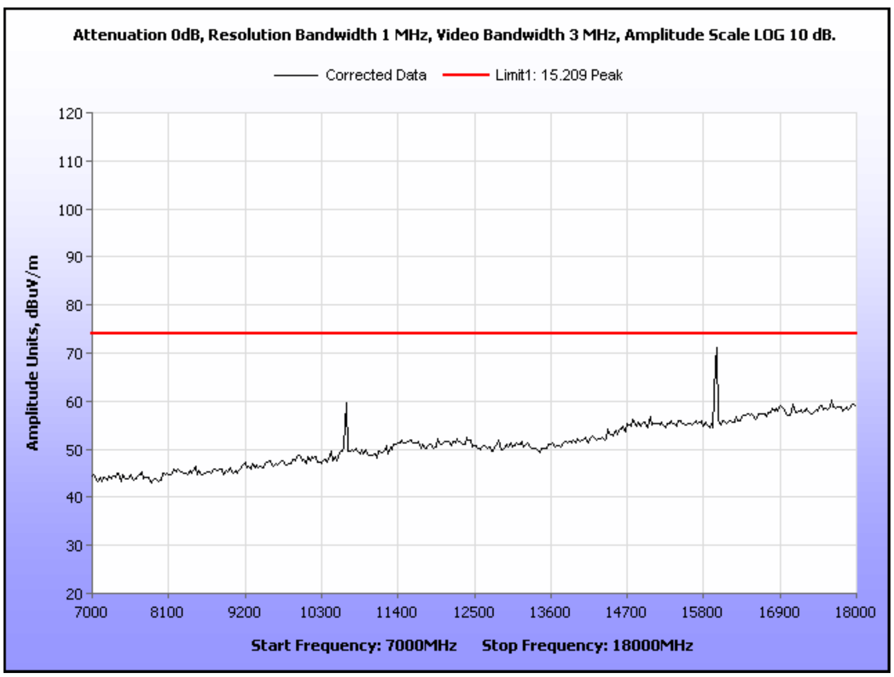
Plot 196. Radiated Spurious Emissions, 5320 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Average



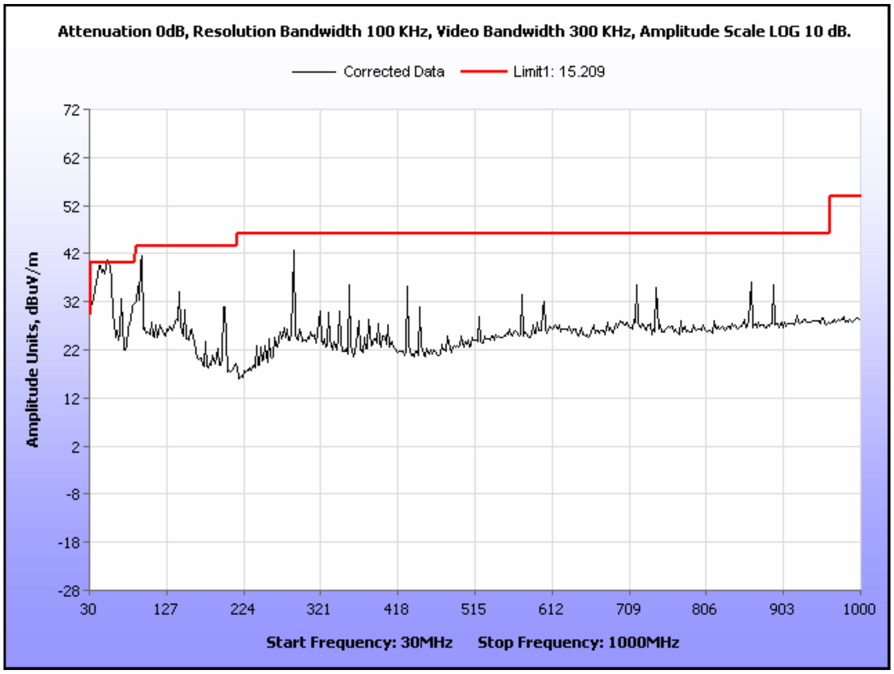
Plot 197. Radiated Spurious Emissions, 5320 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 198. Radiated Spurious Emissions, 5320 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Average

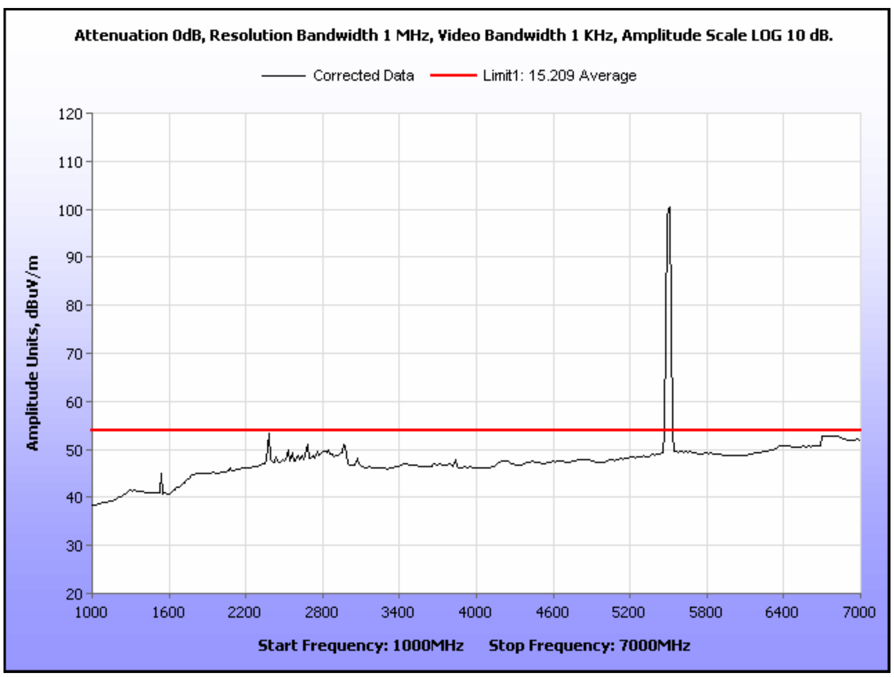


Plot 199. Radiated Spurious Emissions, 5320 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Peak

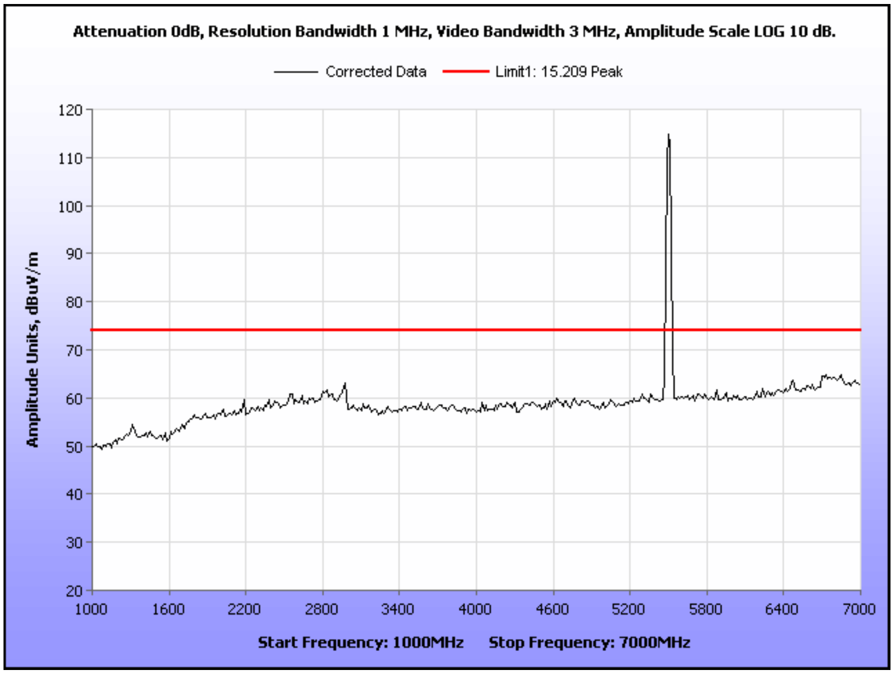


Plot 200. Radiated Spurious Emissions, 5500 MHz, 20 MHz Channel, Tx Power 16, 30 MHz – 1 GHz

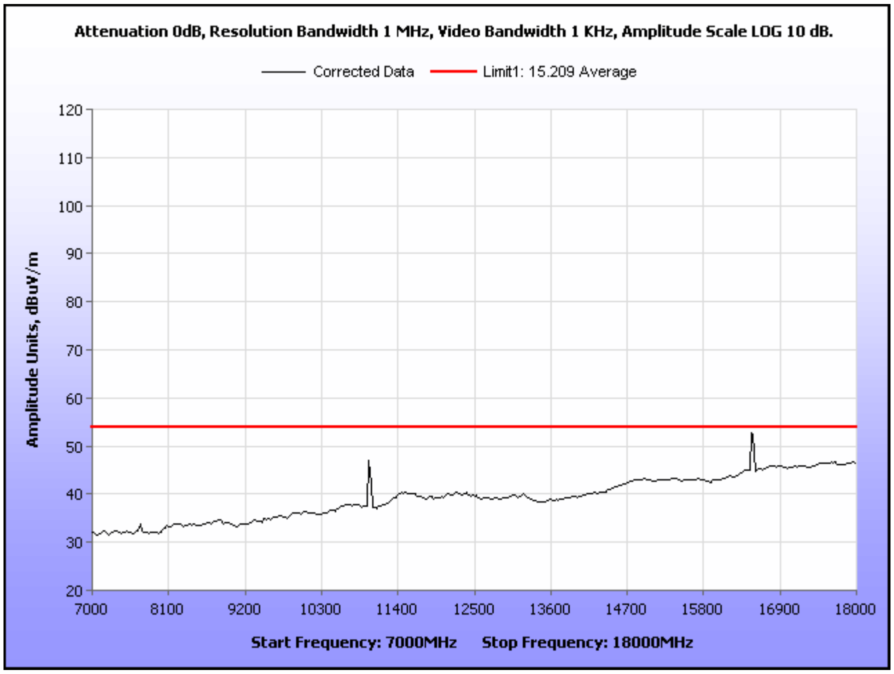
Emissions which exceed the 15.209 limit are digital and meet the Class B limit of 15.109. Refer to Table 11.



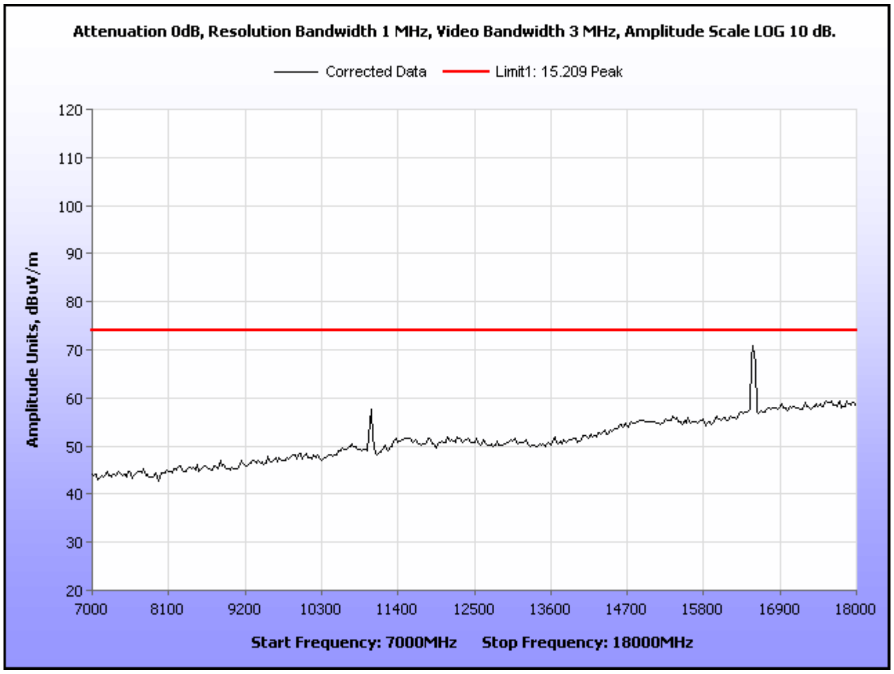
Plot 201. Radiated Spurious Emissions, 5500 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Average



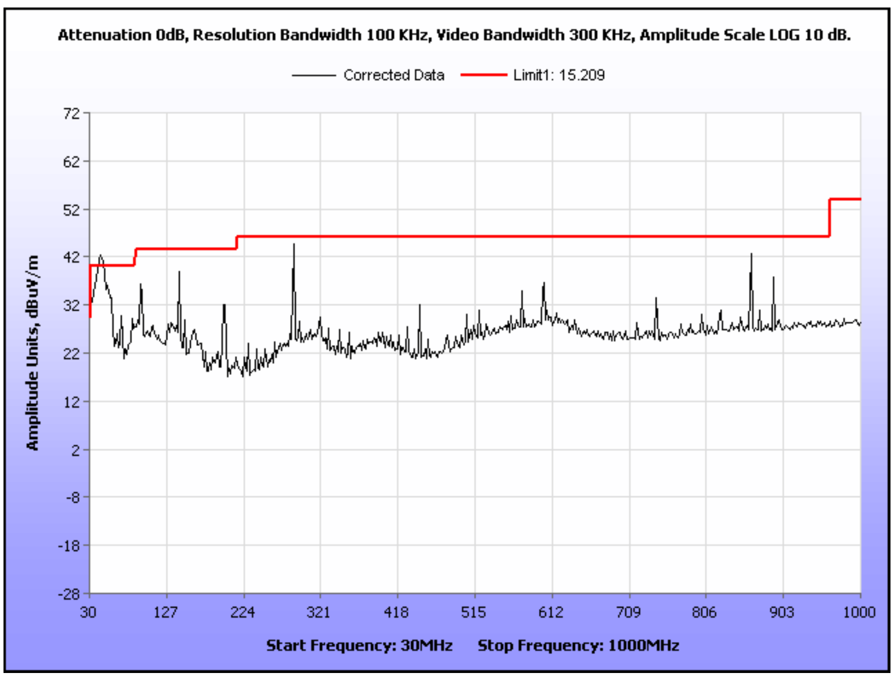
Plot 202. Radiated Spurious Emissions, 5500 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 203. Radiated Spurious Emissions, 5500 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Average

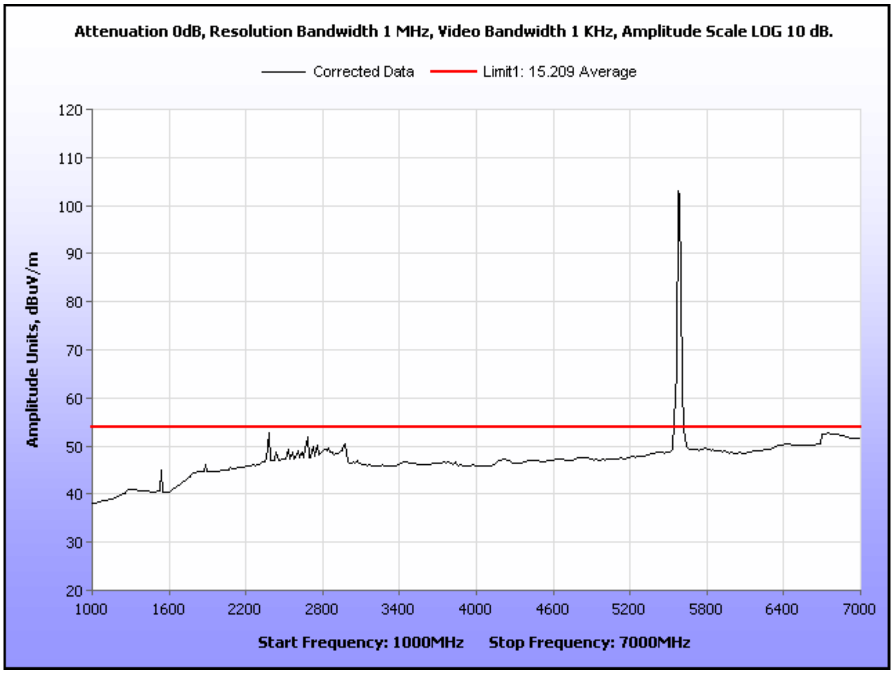


Plot 204. Radiated Spurious Emissions, 5500 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Peak

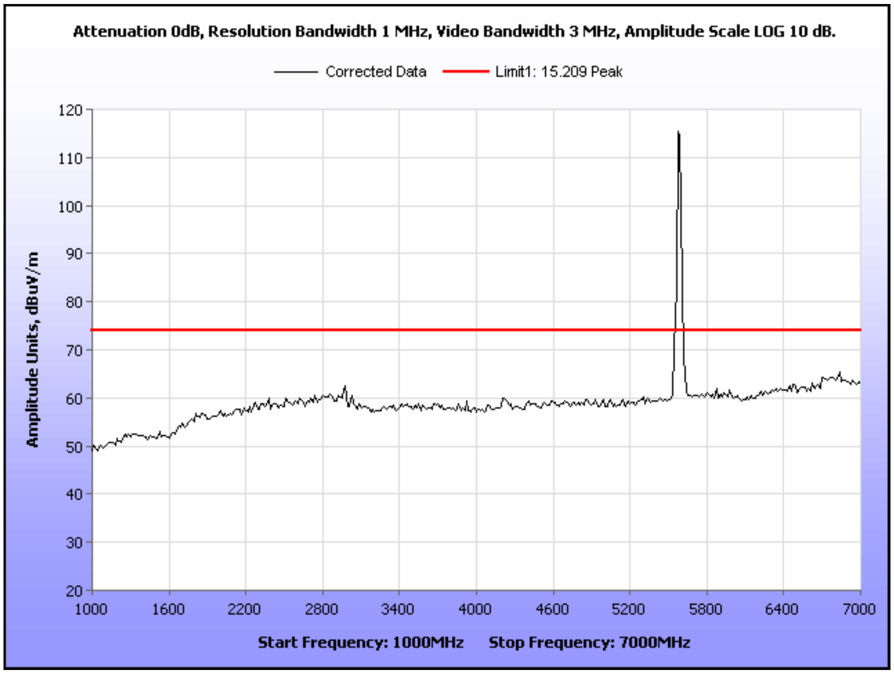


Plot 205. Radiated Spurious Emissions, 5580 MHz, 20 MHz Channel, Tx Power 17, 30 MHz – 1 GHz

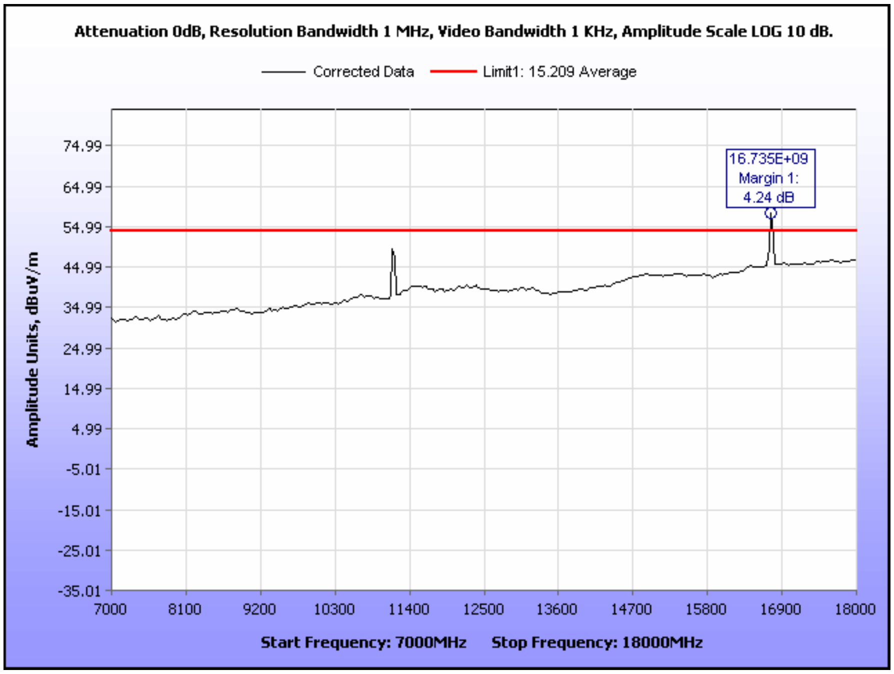
Emissions which exceed the 15.209 limit are digital and meet the Class B limit of 15.109. Refer to Table 11.



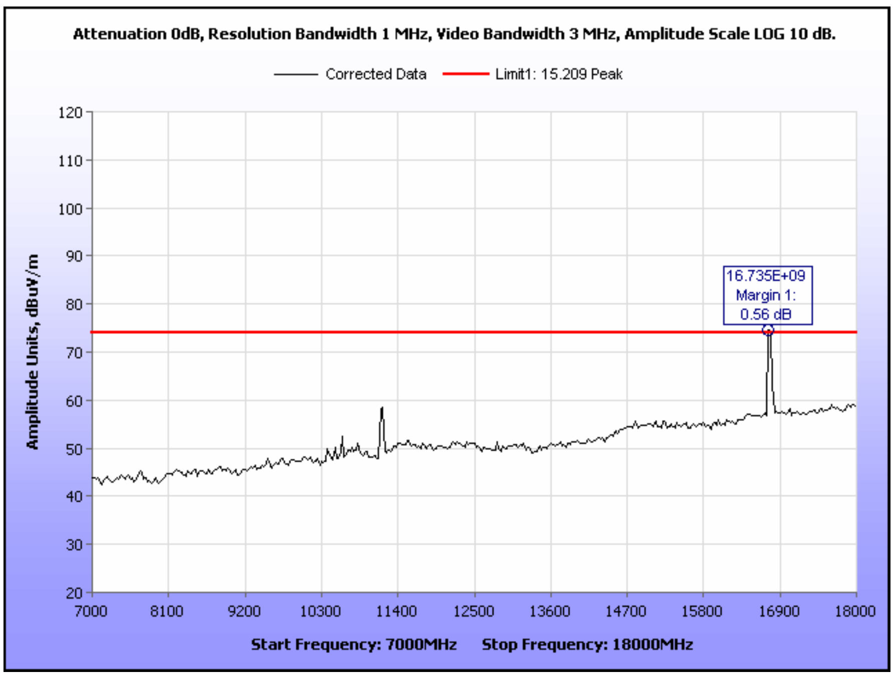
Plot 206. Radiated Spurious Emissions, 5580 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Average



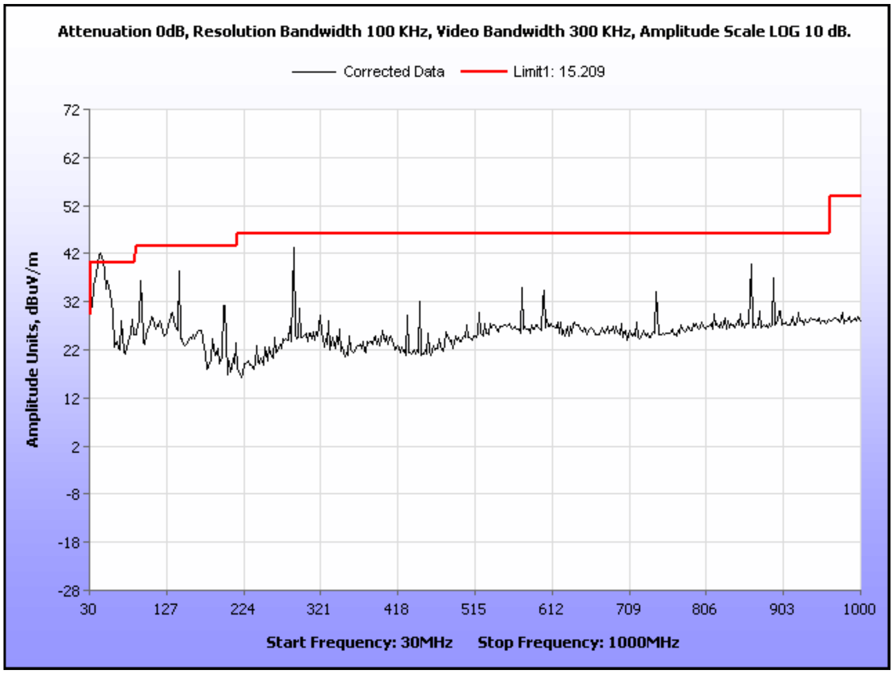
Plot 207. Radiated Spurious Emissions, 5580 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 208. Radiated Spurious Emissions, 5580 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Average

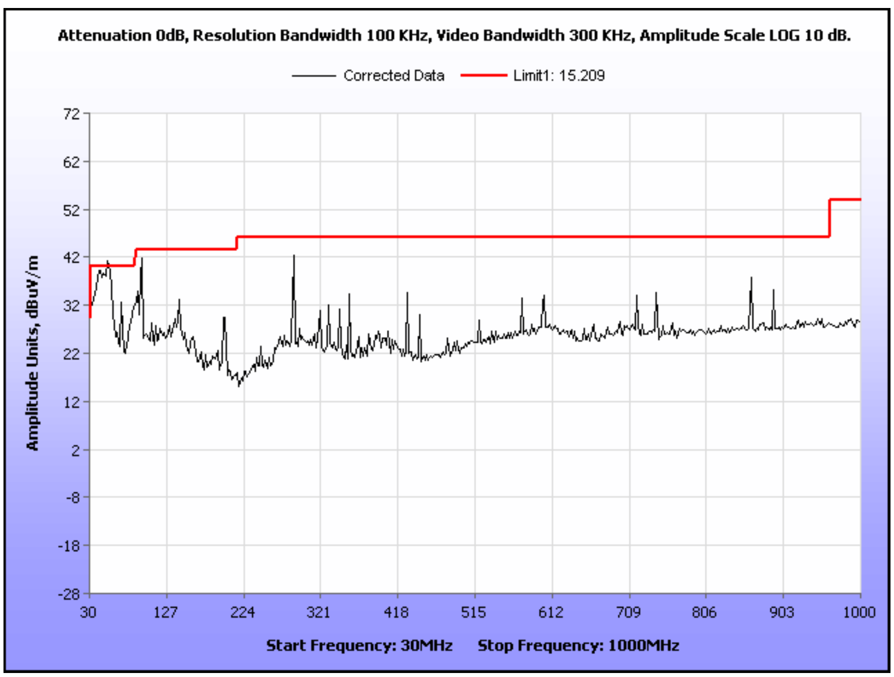


Plot 209. Radiated Spurious Emissions, 5580 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Peak



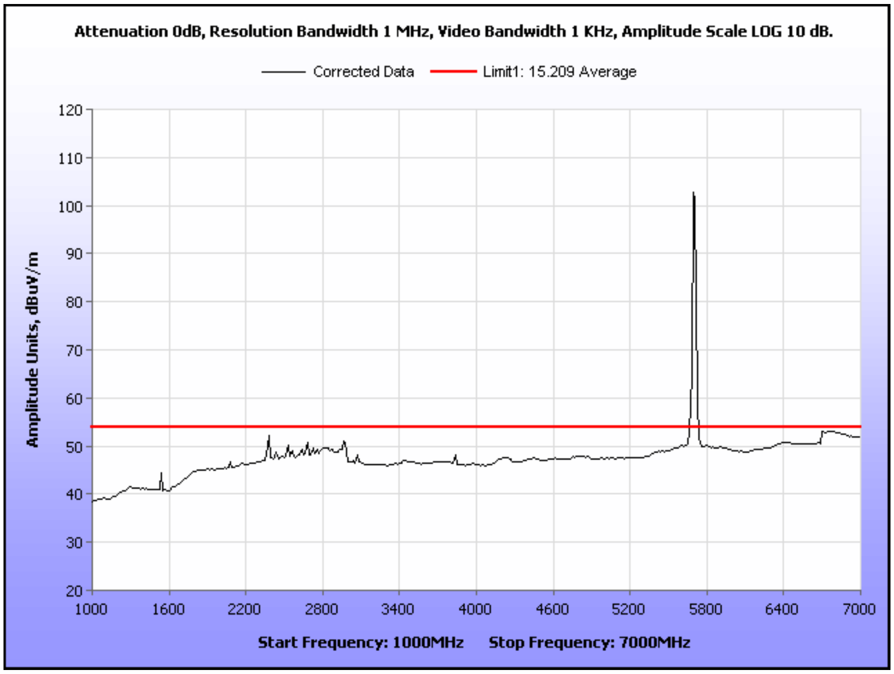
Plot 210. Radiated Spurious Emissions, 5680 MHz, 20 MHz Channel, Tx Power 20, 30 MHz – 1 GHz

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

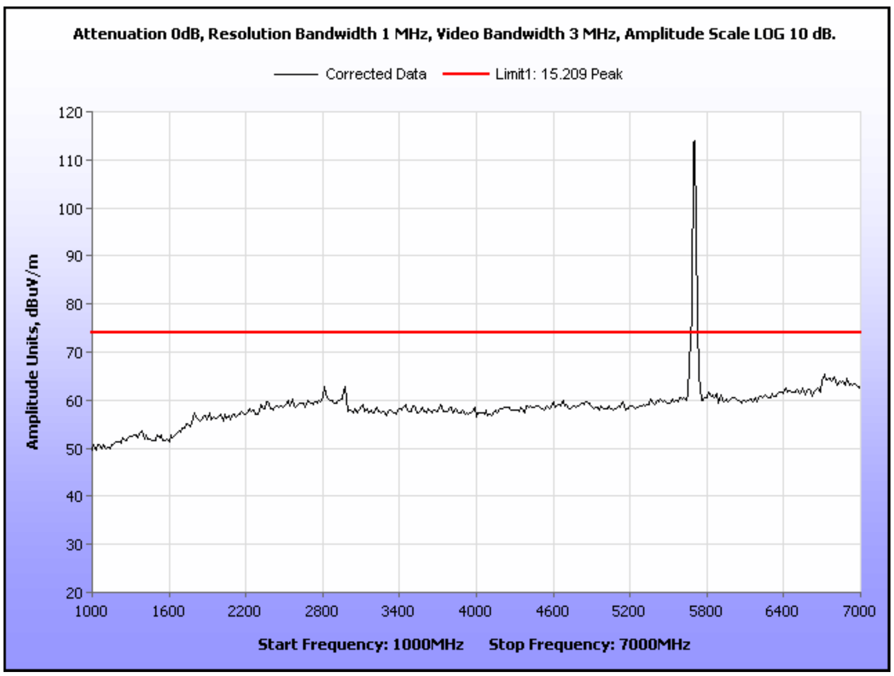


Plot 211. Radiated Spurious Emissions, 5700 MHz, 20 MHz Channel, Tx Power 14.5, 30 MHz – 1 GHz

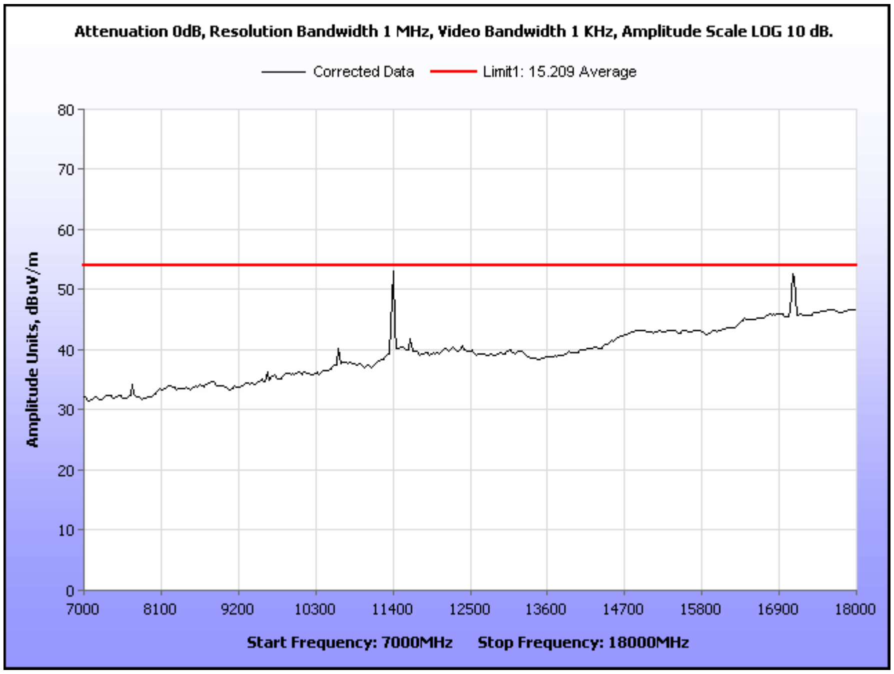
Emissions which exceed the 15.209 limit are digital and meet the Class B limit of 15.109. Refer to Table 11.



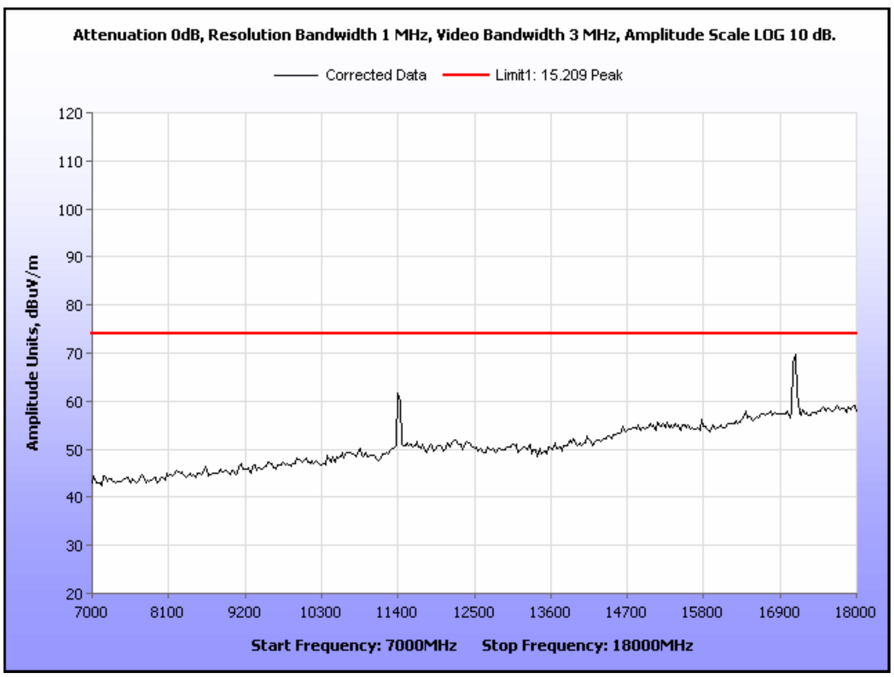
Plot 212. Radiated Spurious Emissions, 5700 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Average



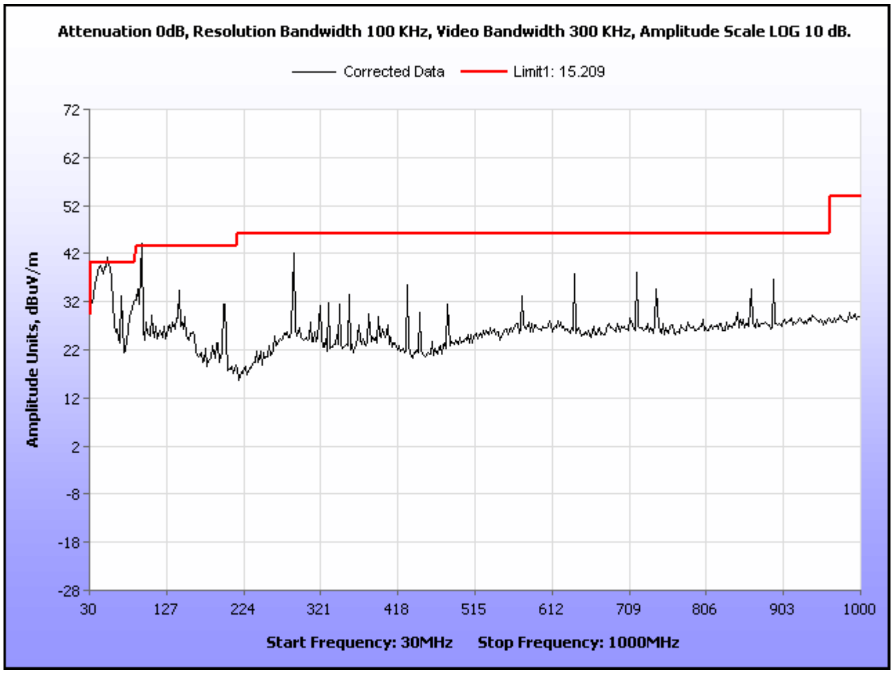
Plot 213. Radiated Spurious Emissions, 5700 MHz, 20 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 214. Radiated Spurious Emissions, 5700 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Average

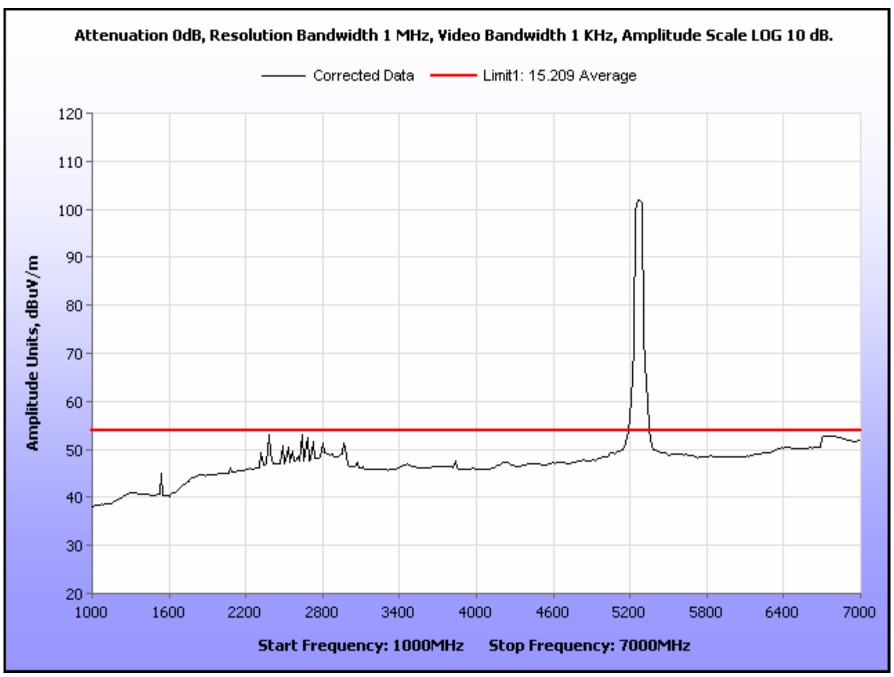


Plot 215. Radiated Spurious Emissions, 5700 MHz, 20 MHz Channel, 7 GHz – 18 GHz, Peak

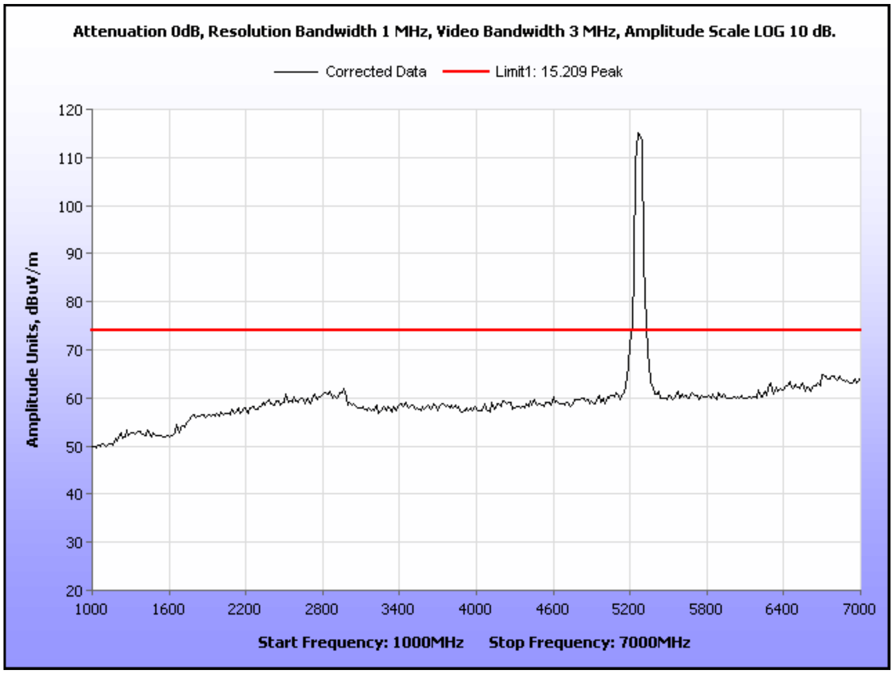


Plot 216. Radiated Spurious Emissions, 5270 MHz, 40 MHz Channel, Tx Power 19, 30 MHz – 1 GHz

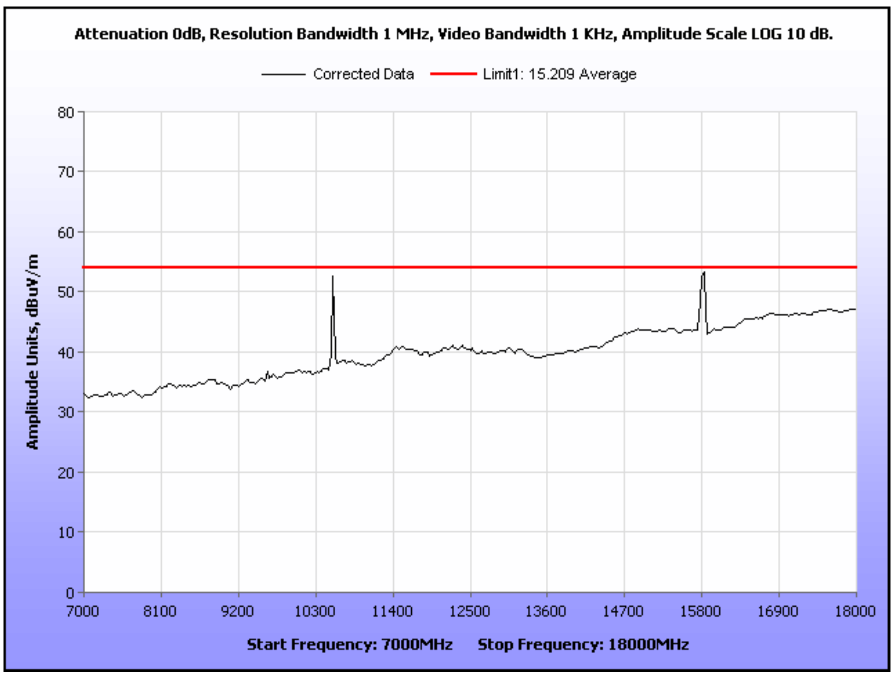
Emissions which exceed the 15.209 limit are digital and meet the Class B limit of 15.109. Refer to Table 11.



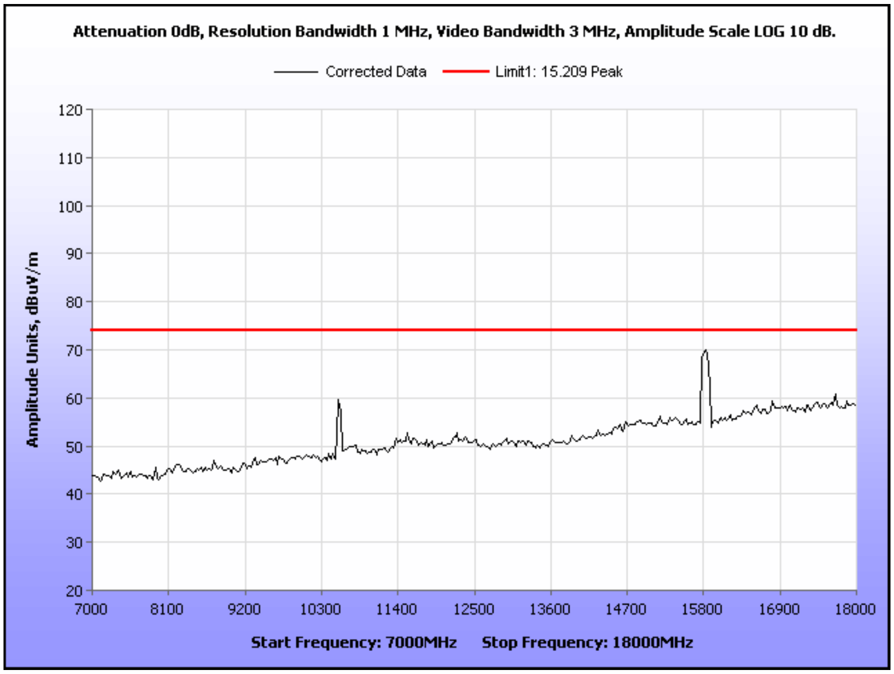
Plot 217. Radiated Spurious Emissions, 5270 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Average



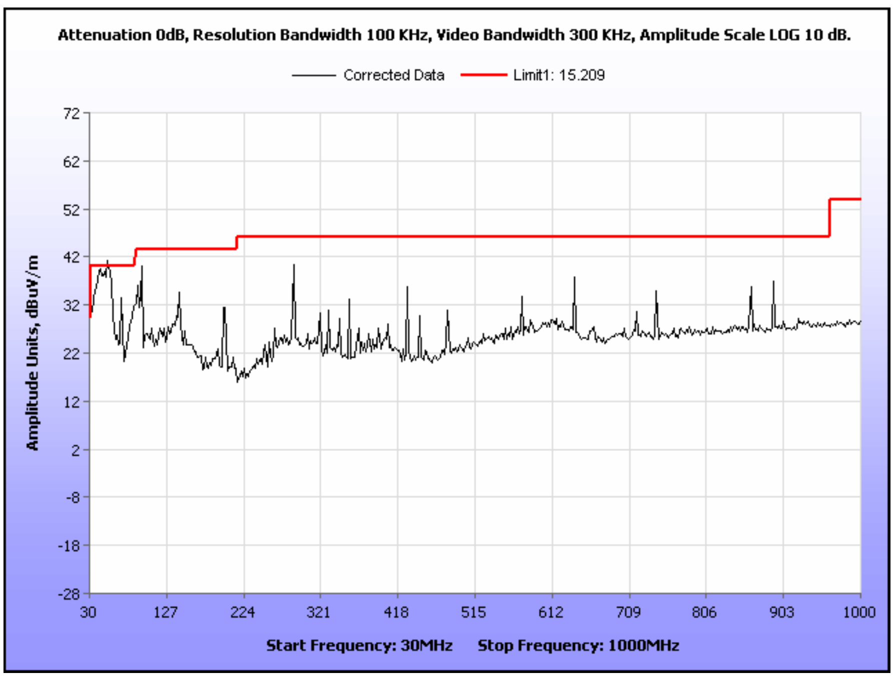
Plot 218. Radiated Spurious Emissions, 5270 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 219. Radiated Spurious Emissions, 5270 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Average

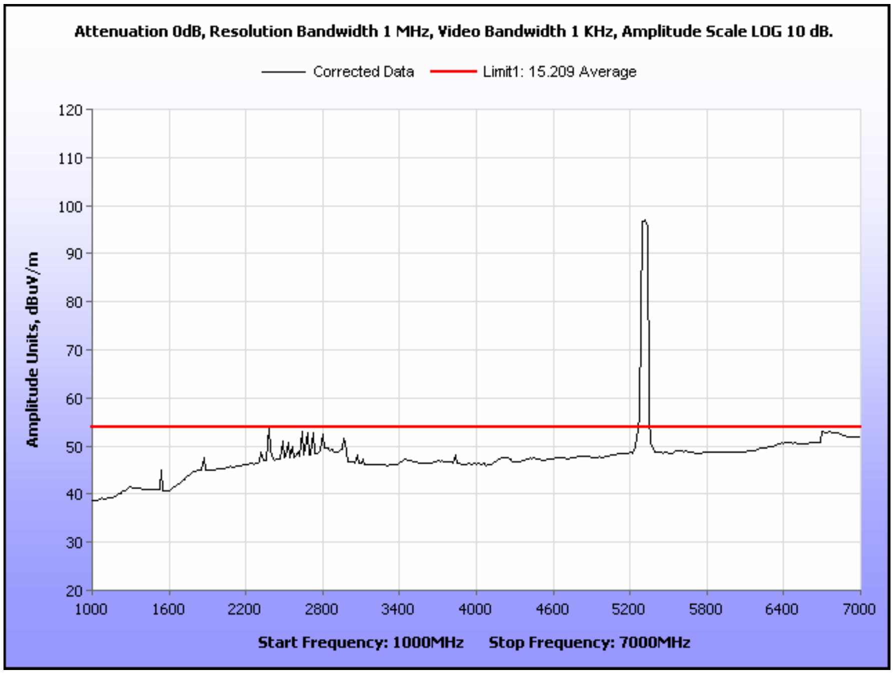


Plot 220. Radiated Spurious Emissions, 5270 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Peak

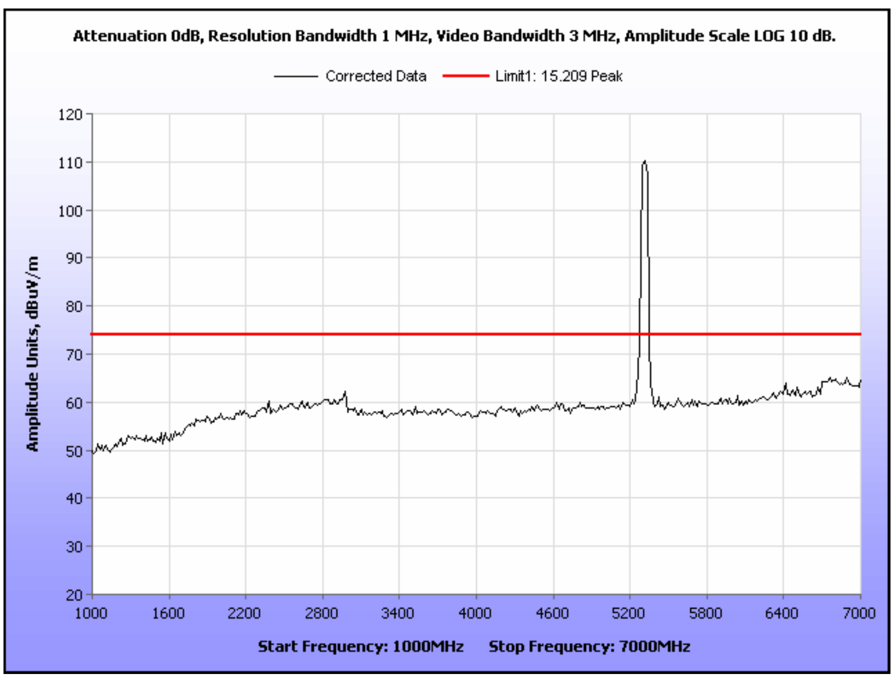


Plot 221. Radiated Spurious Emissions, 5310 MHz, 40 MHz Channel, Tx Power 14, 30 MHz – 1 GHz

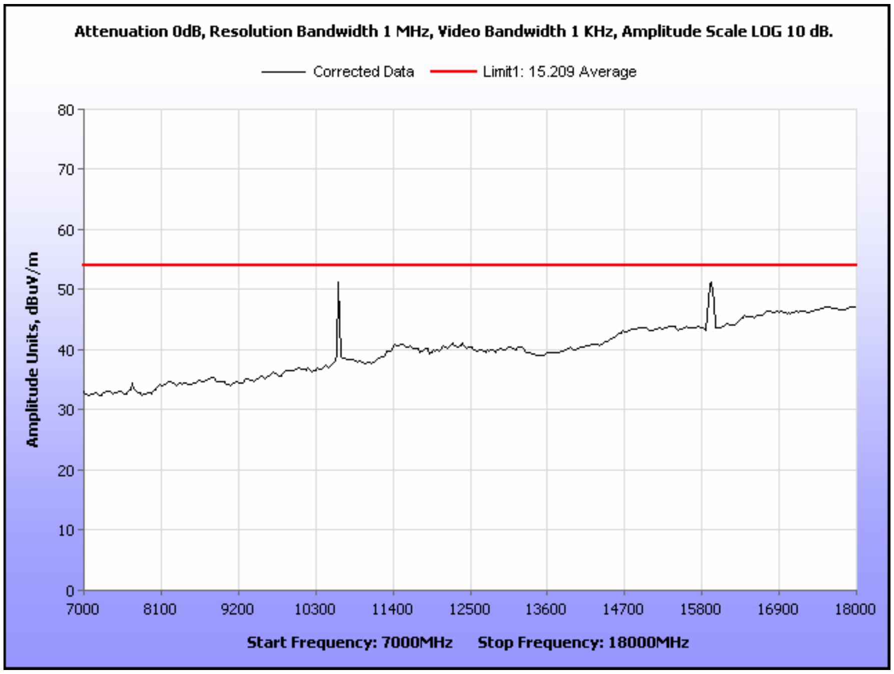
Emissions which exceed the 15.209 limit are digital and meet the Class B limit of 15.109. Refer to Table 11.



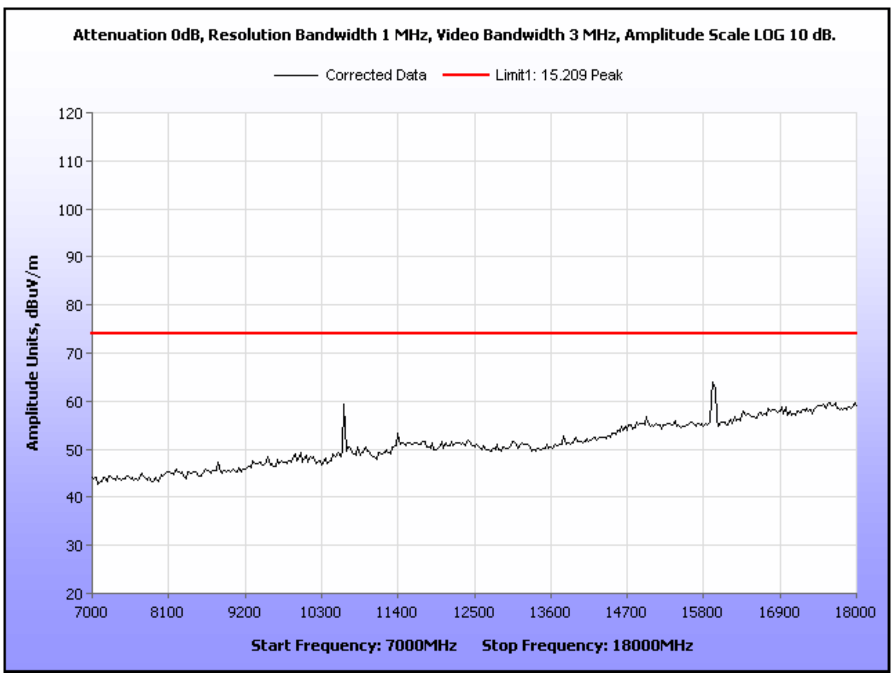
Plot 222. Radiated Spurious Emissions, 5310 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Average



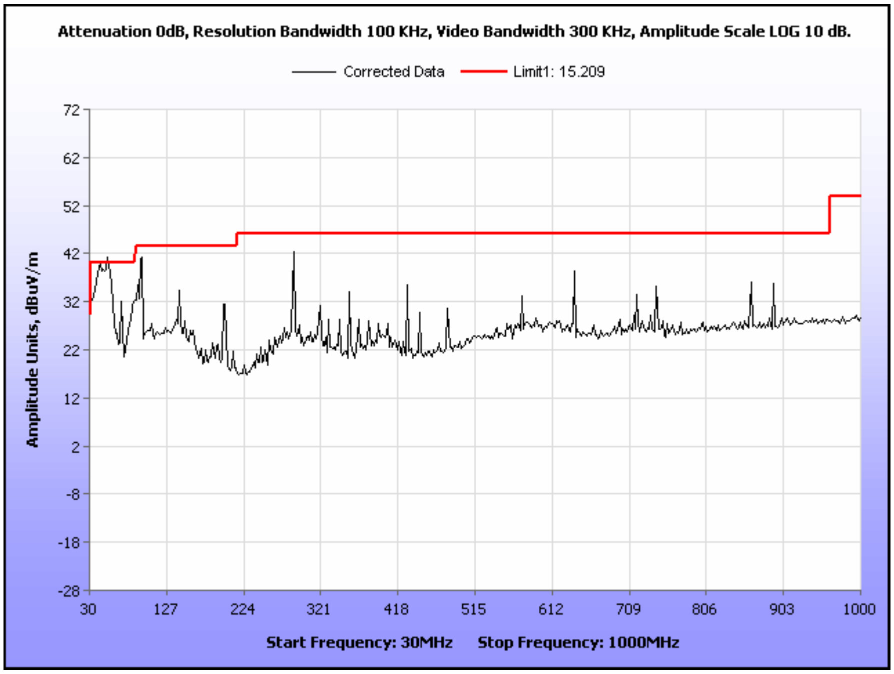
Plot 223. Radiated Spurious Emissions, 5310 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 224. Radiated Spurious Emissions, 5310 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Average

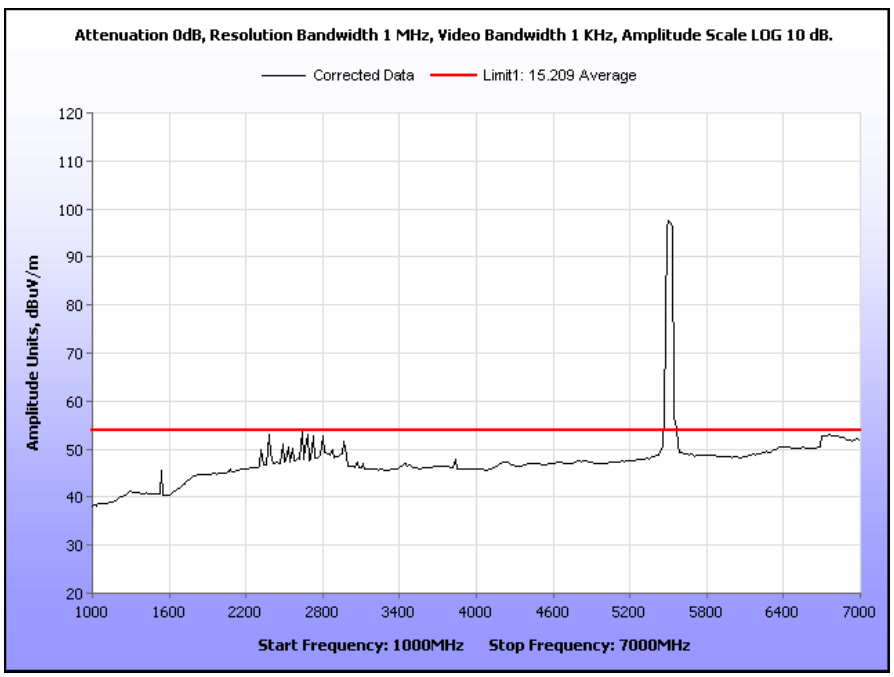


Plot 225. Radiated Spurious Emissions, 5310 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Peak

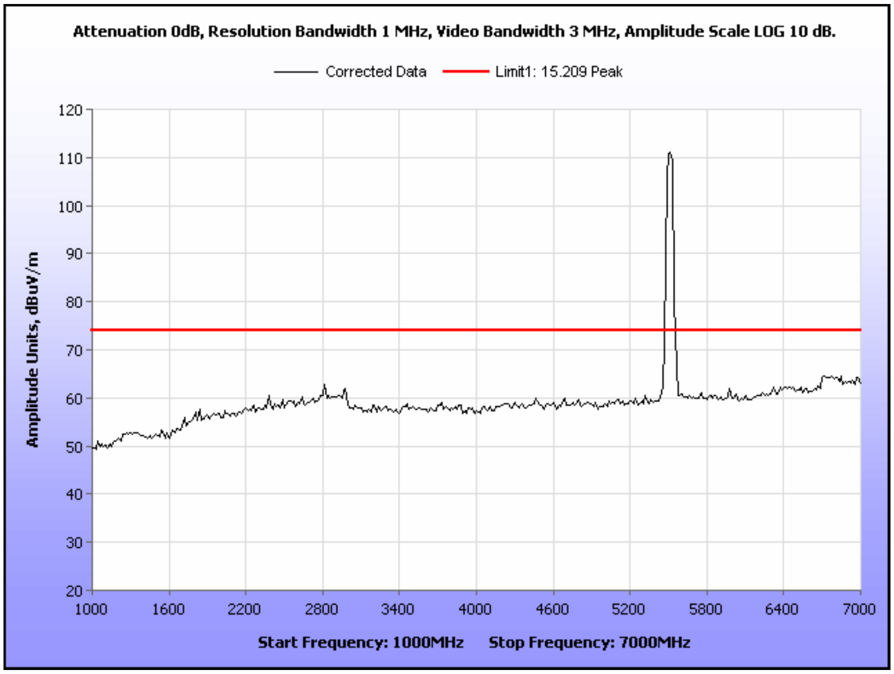


Plot 226. Radiated Spurious Emissions, 5510 MHz, 40 MHz Channel, Tx Power 16, 30 MHz – 1 GHz

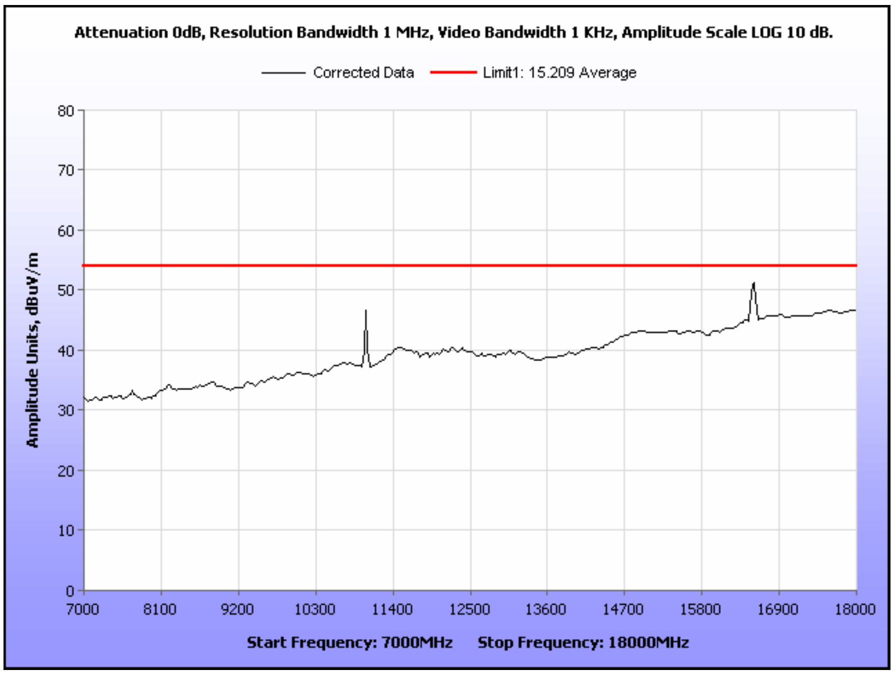
Emissions which exceed the 15.209 limit are digital and meet the Class B limit of 15.109. Refer to Table 11.



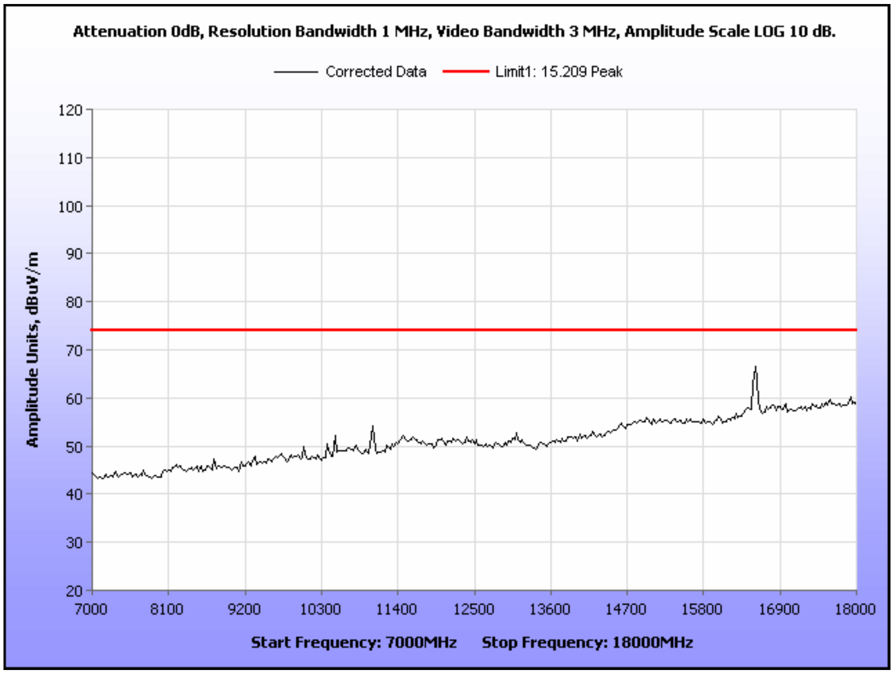
Plot 227. Radiated Spurious Emissions, 5510 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Average



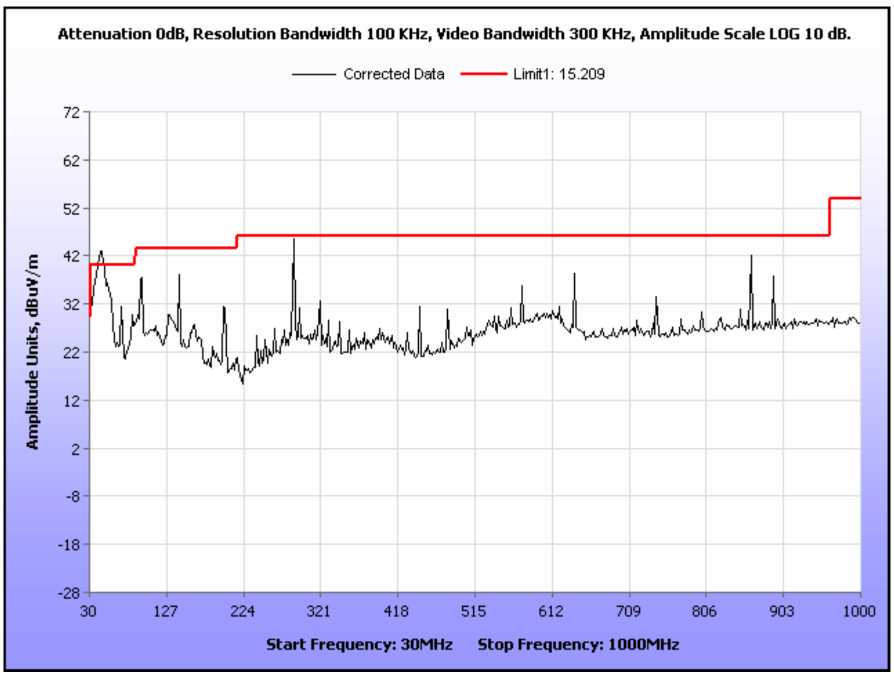
Plot 228. Radiated Spurious Emissions, 5510 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 229. Radiated Spurious Emissions, 5510 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Average

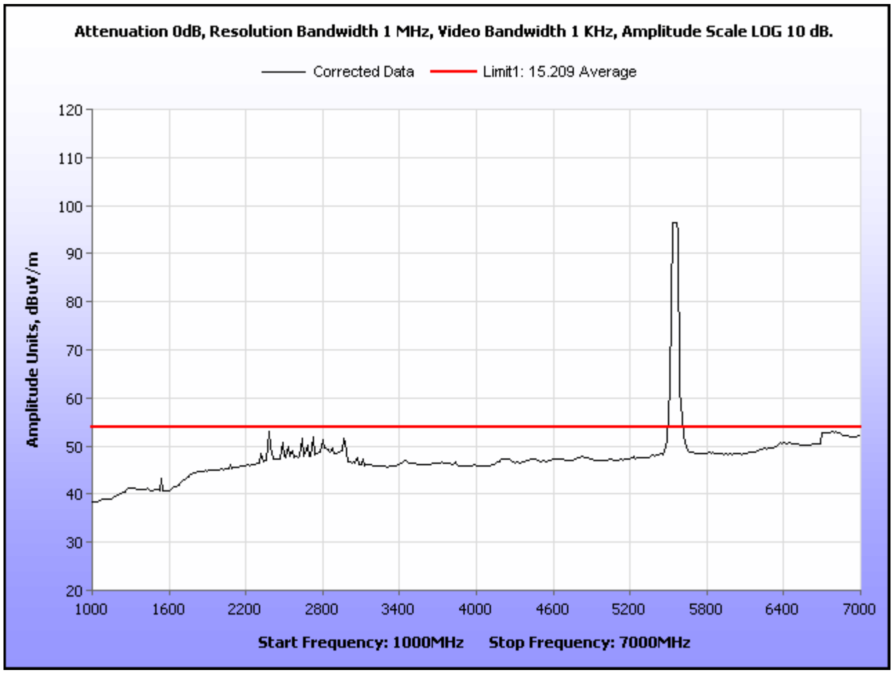


Plot 230. Radiated Spurious Emissions, 5510 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Peak

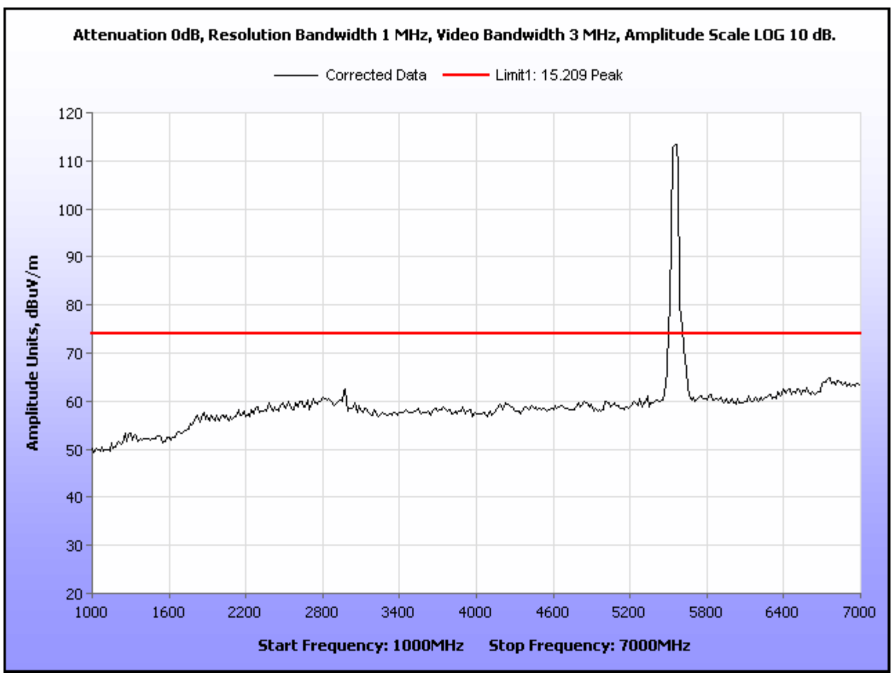


Plot 231. Radiated Spurious Emissions, 5550 MHz, 40 MHz Channel, Tx Power 20, 30 MHz – 1 GHz

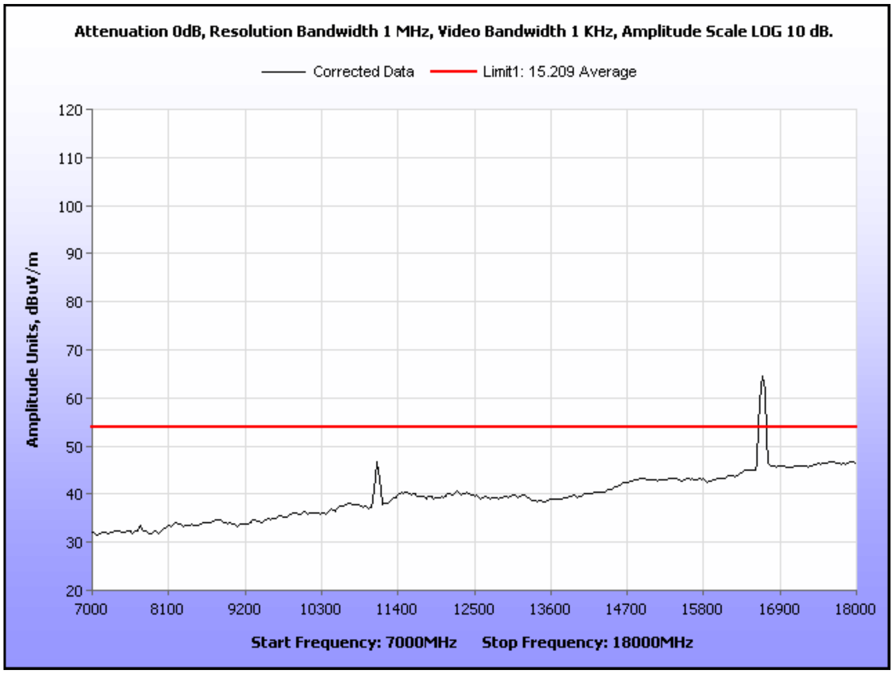
Emissions which exceed the 15.209 limit are digital and meet the Class B limit of 15.109. Refer to Table 11.



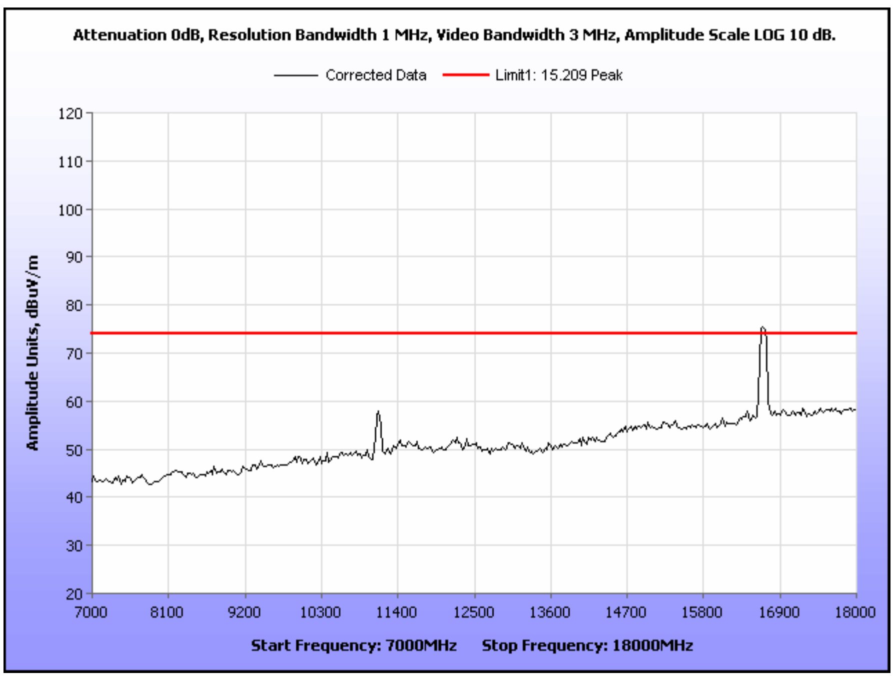
Plot 232. Radiated Spurious Emissions, 5550 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Average



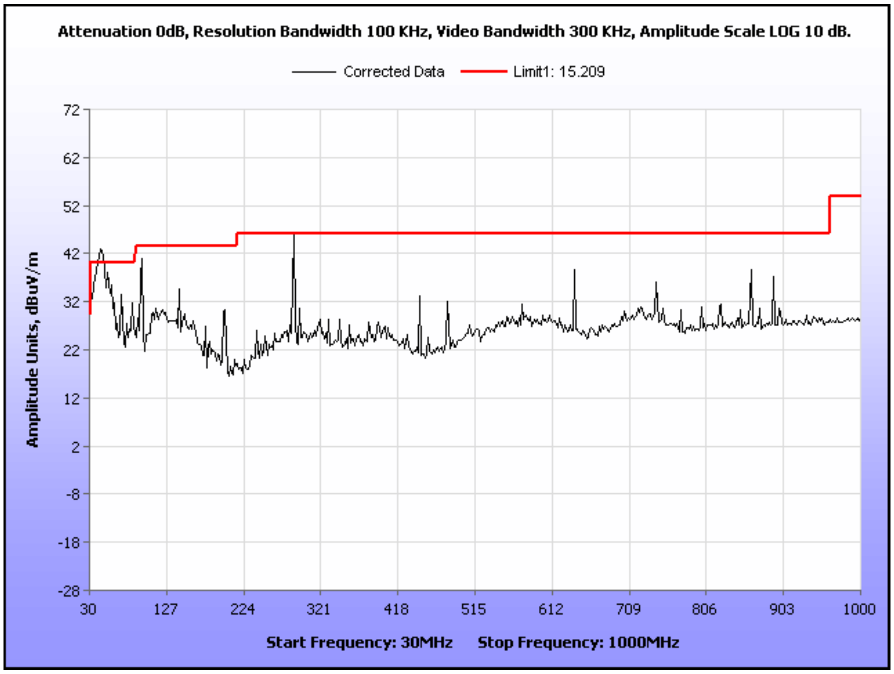
Plot 233. Radiated Spurious Emissions, 5550 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 234. Radiated Spurious Emissions, 5550 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Average

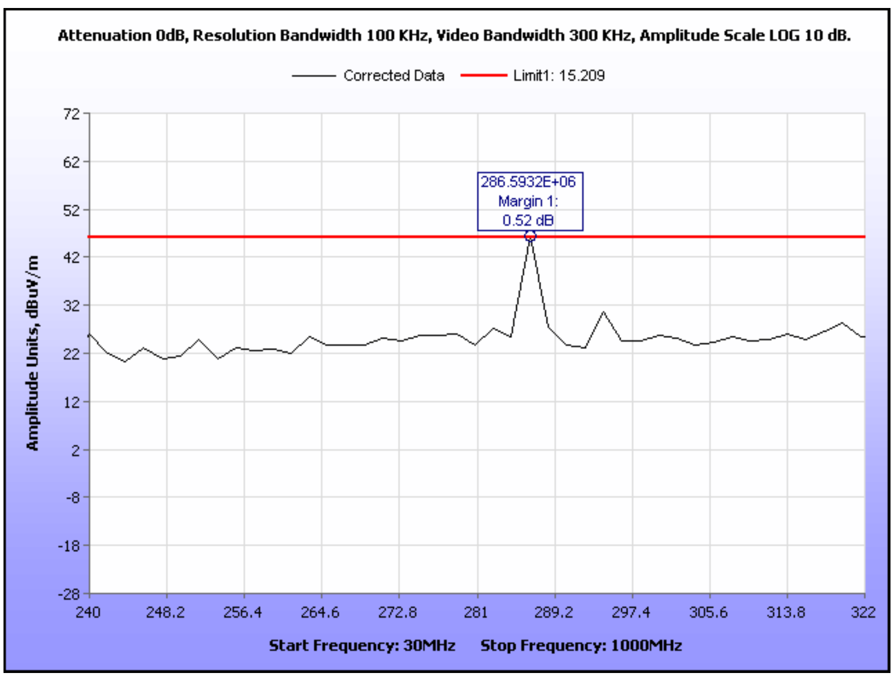


Plot 235. Radiated Spurious Emissions, 5550 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Peak

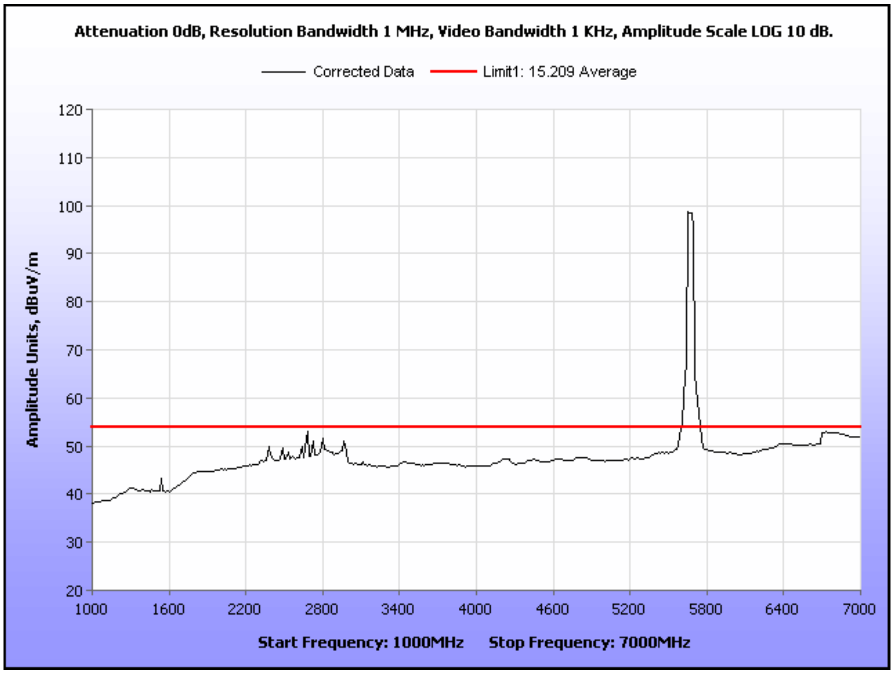


Plot 236. Radiated Spurious Emissions, 5670 MHz, 40 MHz Channel, Tx Power 20, 30 MHz – 1 GHz

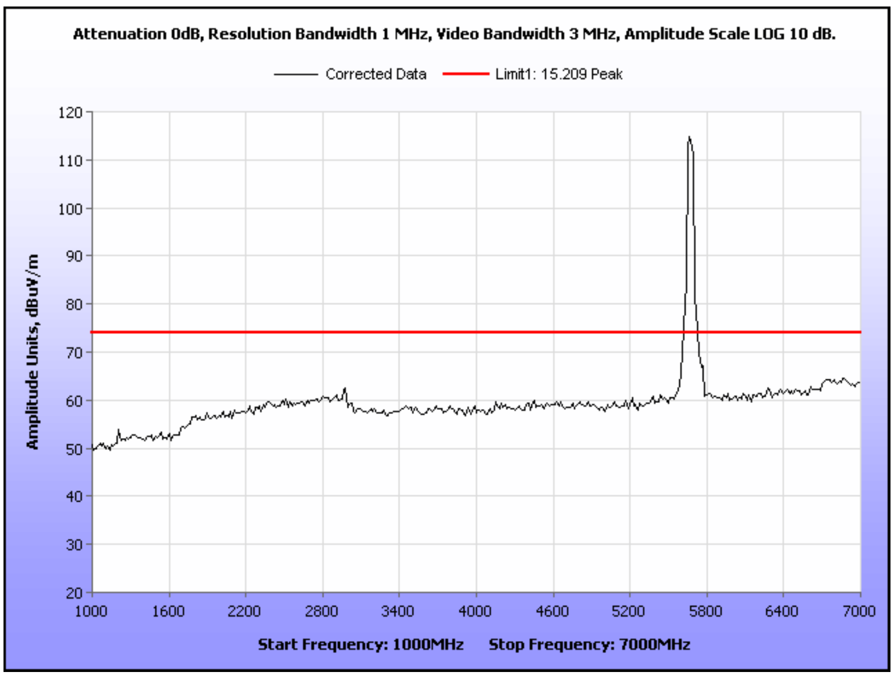
Emissions which exceed the 15.209 limit are digital and meet the Class B limit of 15.109. Refer to Table 11.



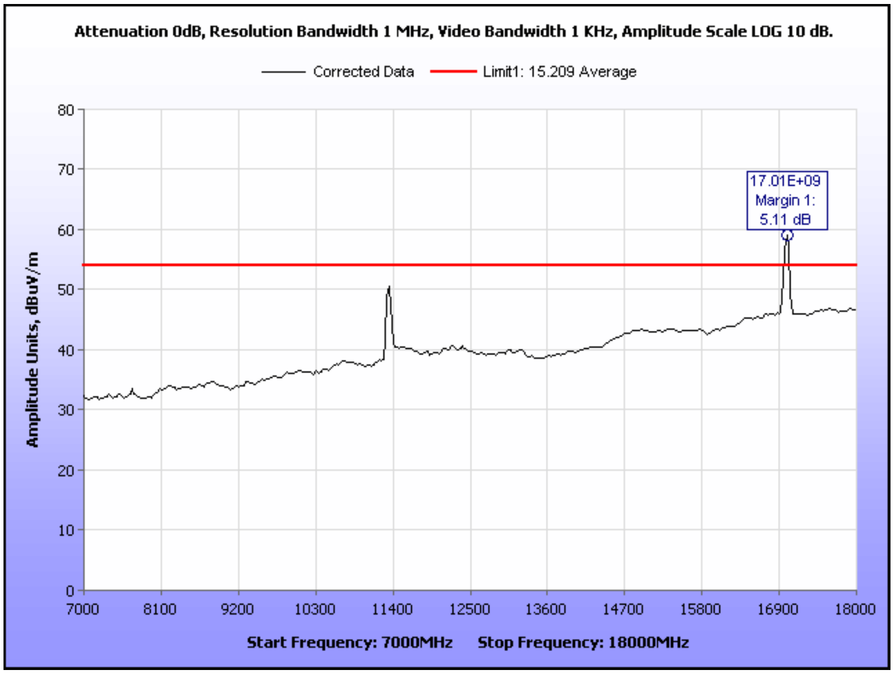
Plot 237. Radiated Spurious Emissions, 5670 MHz, 40 MHz Channel, Tx Power 20, 240 MHz – 322 MHz



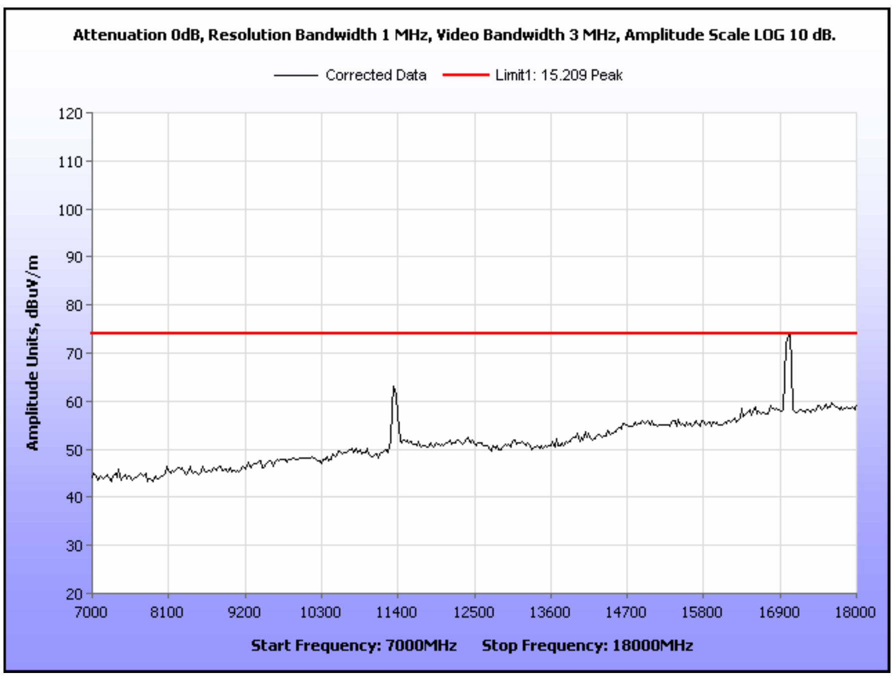
Plot 238. Radiated Spurious Emissions, 5670 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Average



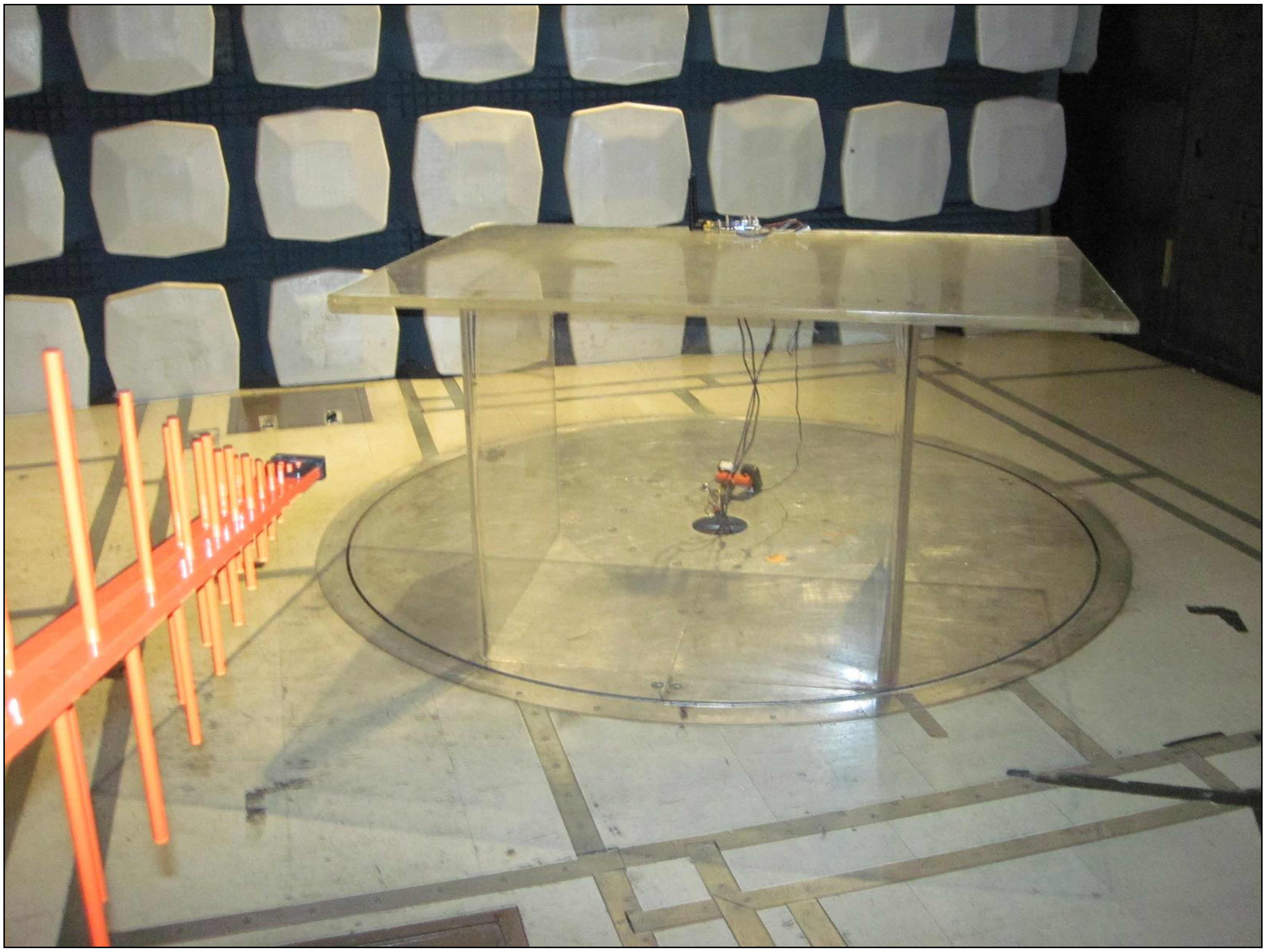
Plot 239. Radiated Spurious Emissions, 5670 MHz, 40 MHz Channel, 1 GHz – 7 GHz, Peak



Plot 240. Radiated Spurious Emissions, 5670 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Average

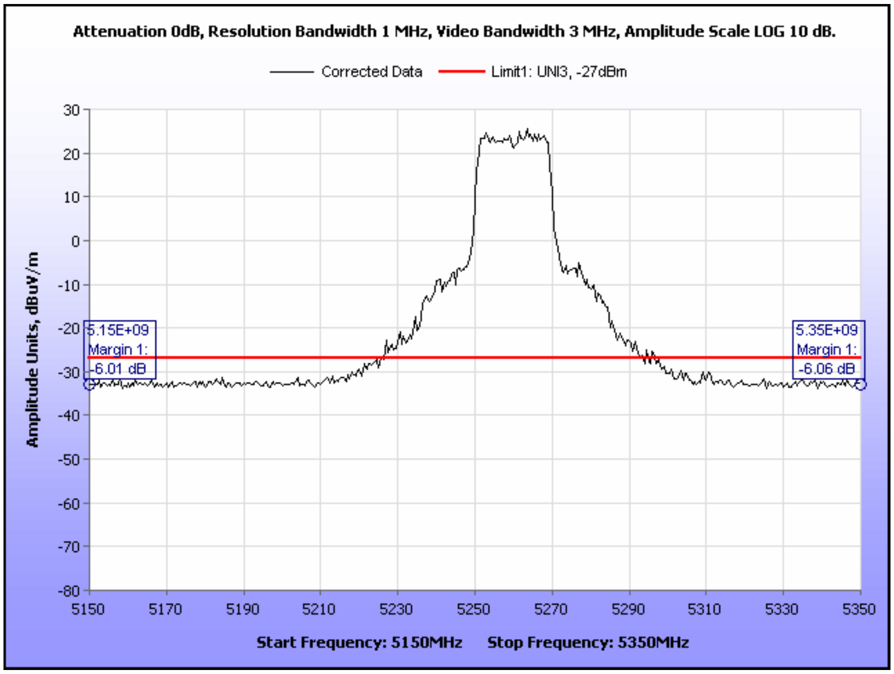


Plot 241. Radiated Spurious Emissions, 5670 MHz, 40 MHz Channel, 7 GHz – 18 GHz, Peak

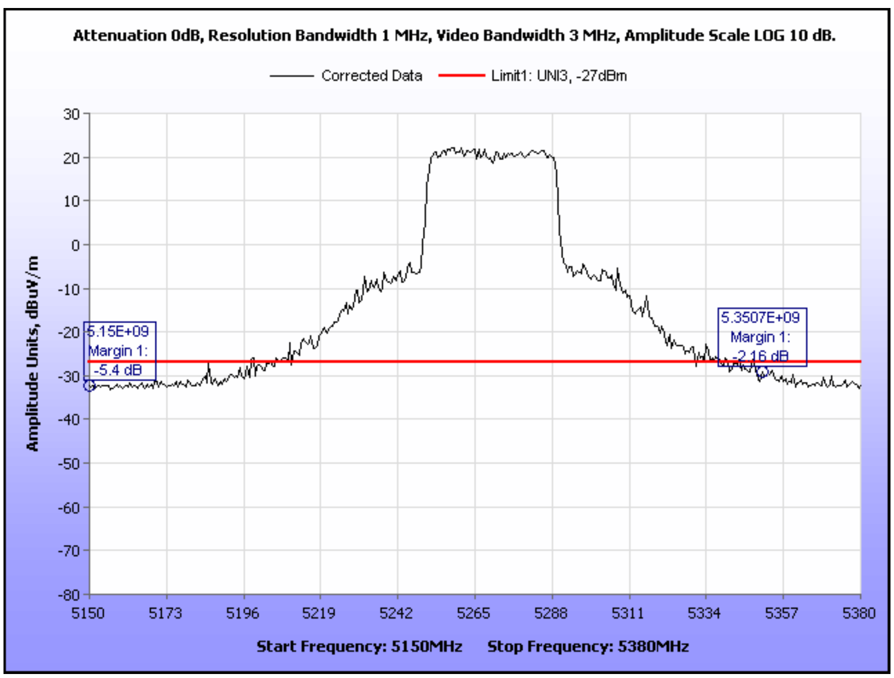


Photograph 5. Radiated Spurious Emissions, Test Setup

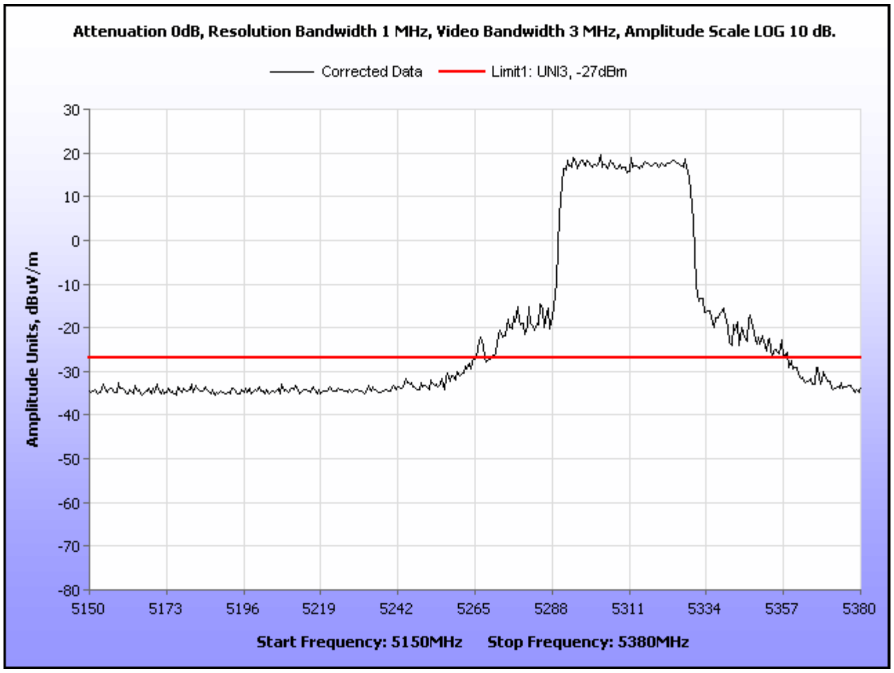
EIRP



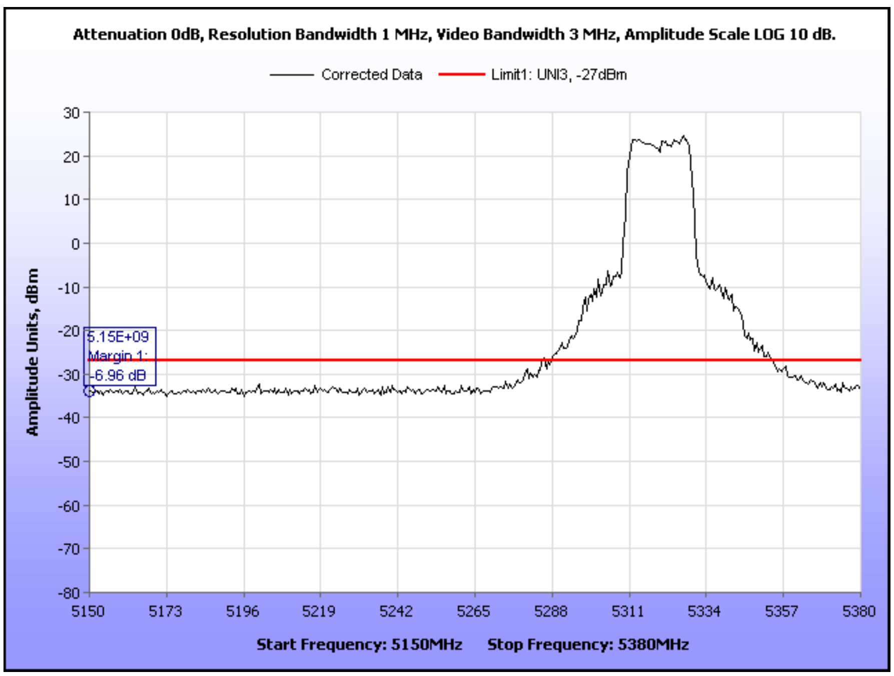
Plot 242. E.I.R.P., 5260 MHz, 20 MHz, Band Edge



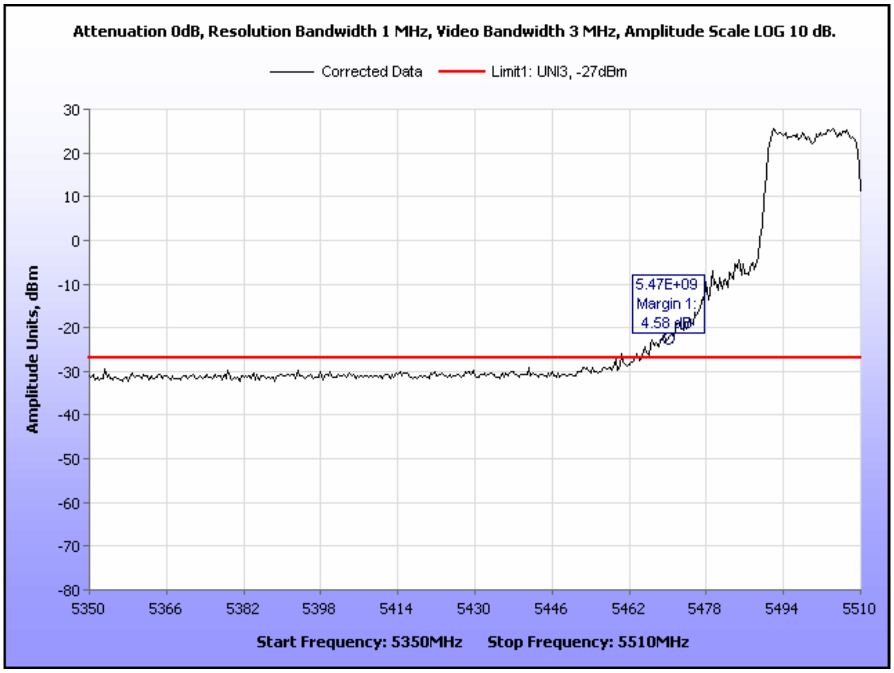
Plot 243. E.I.R.P., 5270 MHz, 40 MHz, Band Edge



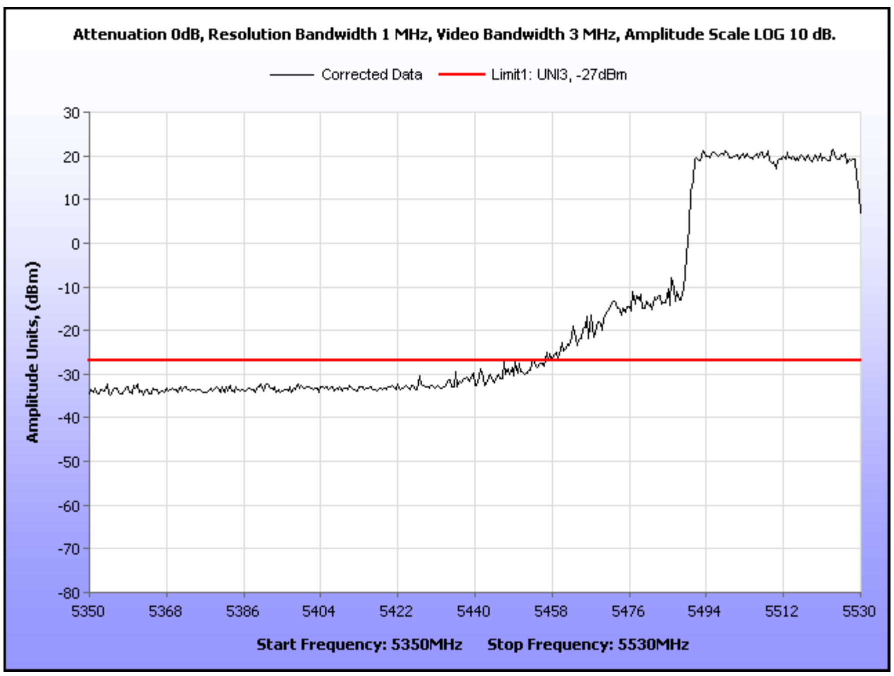
Plot 244. E.I.R.P., 5310 MHz, 40 MHz, Band Edge



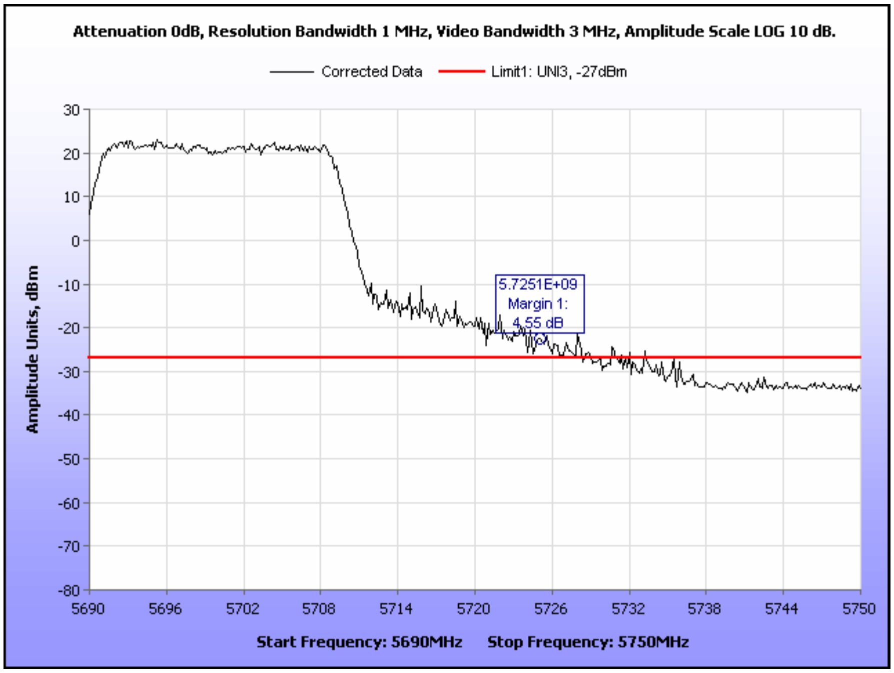
Plot 245. E.I.R.P., 5320 MHz, 20 MHz, Band Edge



Plot 246. E.I.R.P., 5500 MHz, 20 MHz, Band Edge

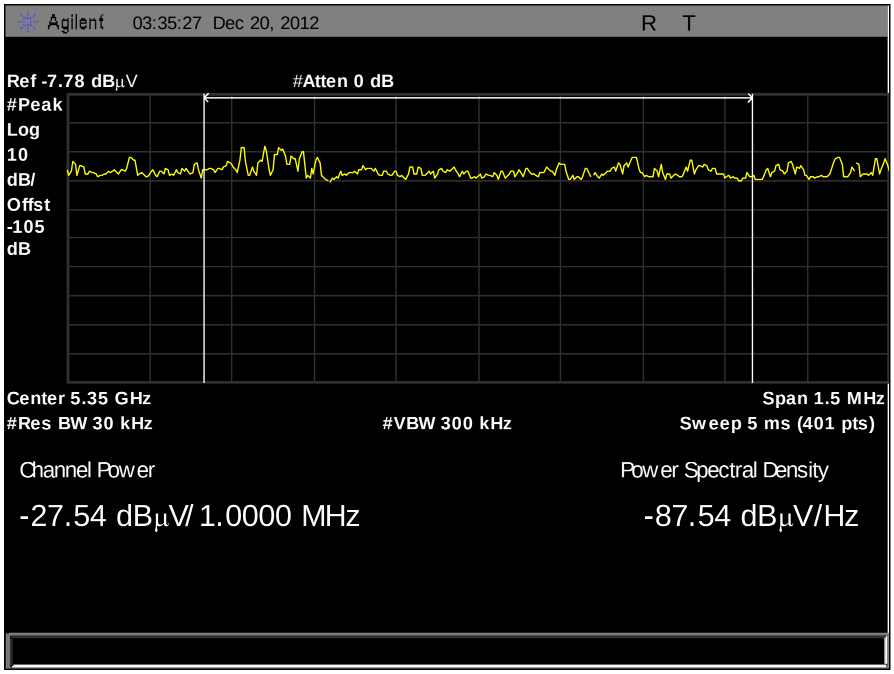


Plot 247. E.I.R.P., 5510 MHz, 40 MHz, Band Edge

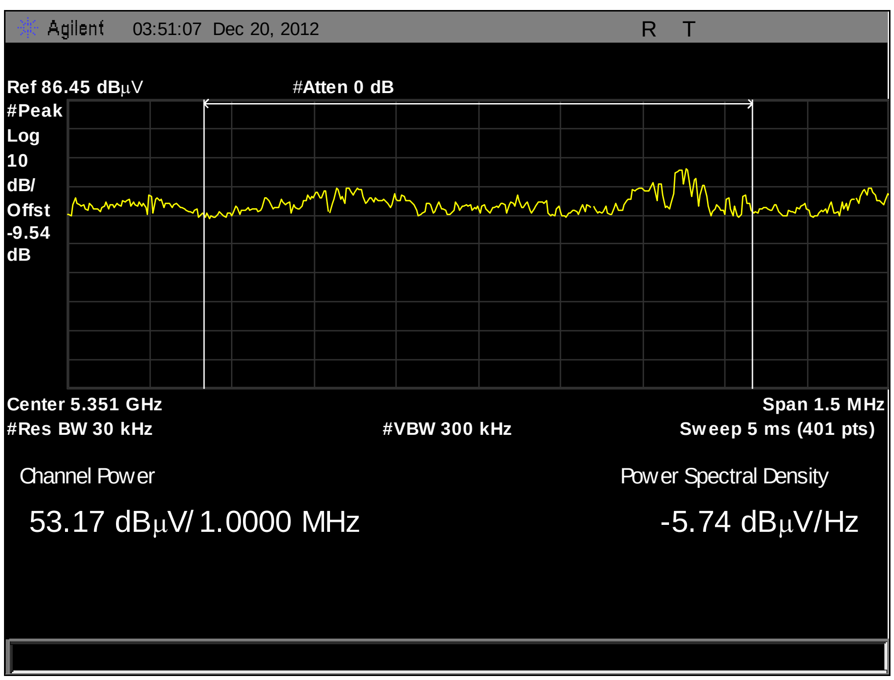


Plot 248. E.I.R.P., 5700 MHz, 20 MHz, Band Edge

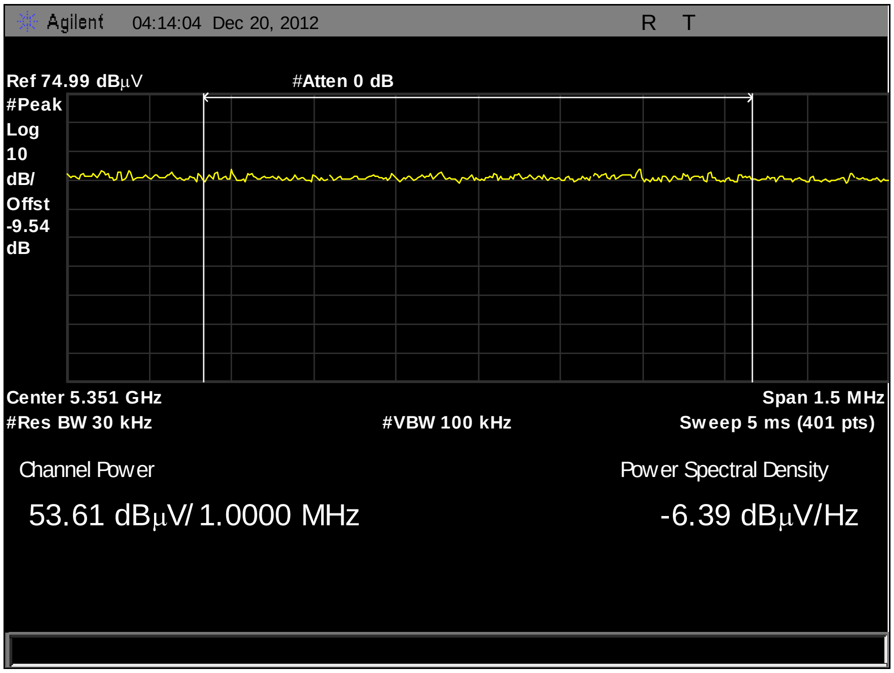
Restricted Band



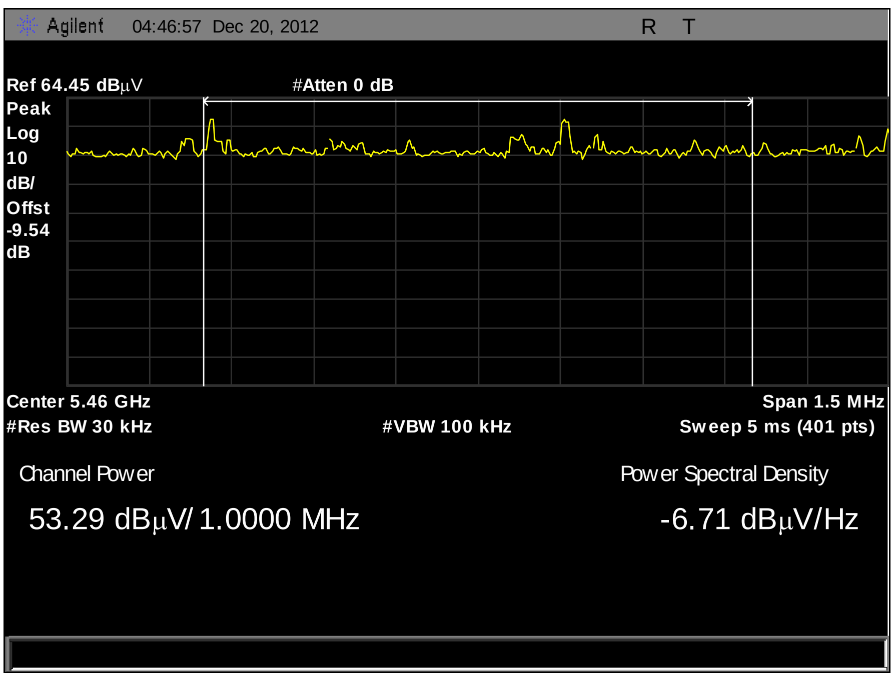
Plot 249. Restricted Band Emissions, 5310 MHz, 40 MHz, Band Edge Integration



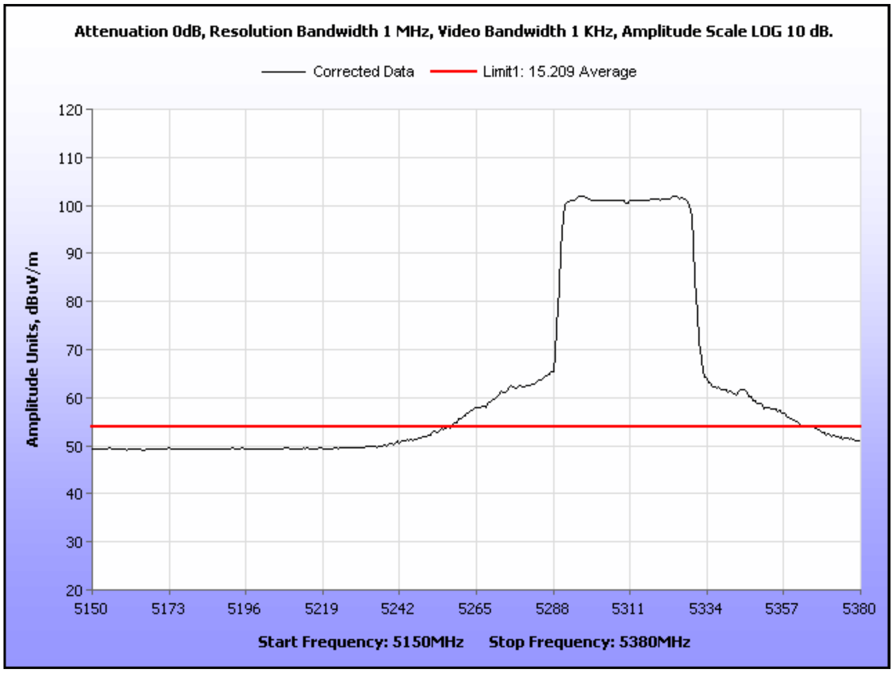
Plot 250. Restricted Band Emissions, 5310 MHz, 40 MHz, Restricted Edge, Average, Integration



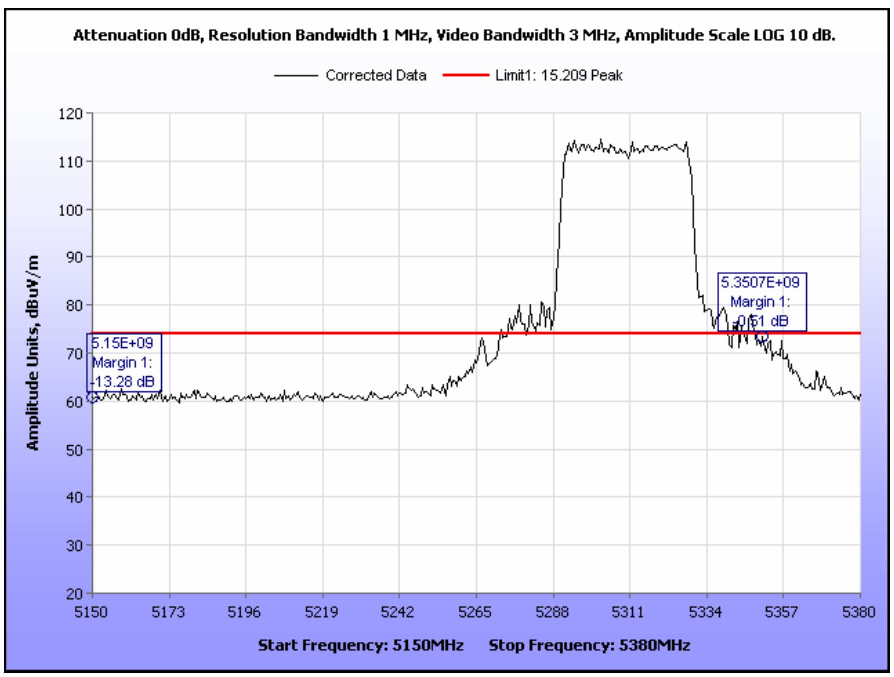
Plot 251. Restricted Band Emissions, 5320 MHz, 20 MHz, Average, Integration



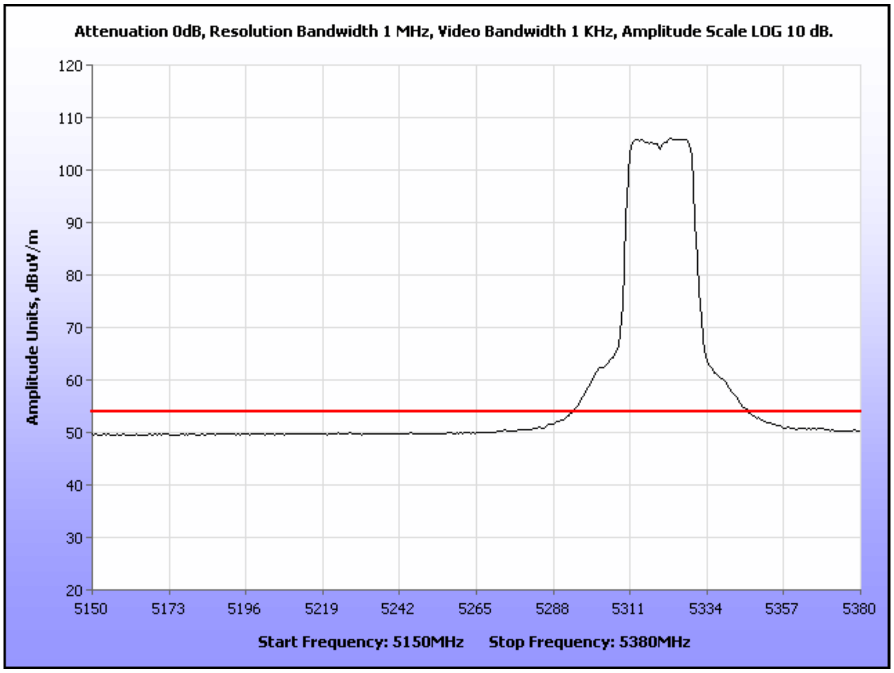
Plot 252. Restricted Band Emissions, 5510 MHz, 40 MHz, Average, Integration



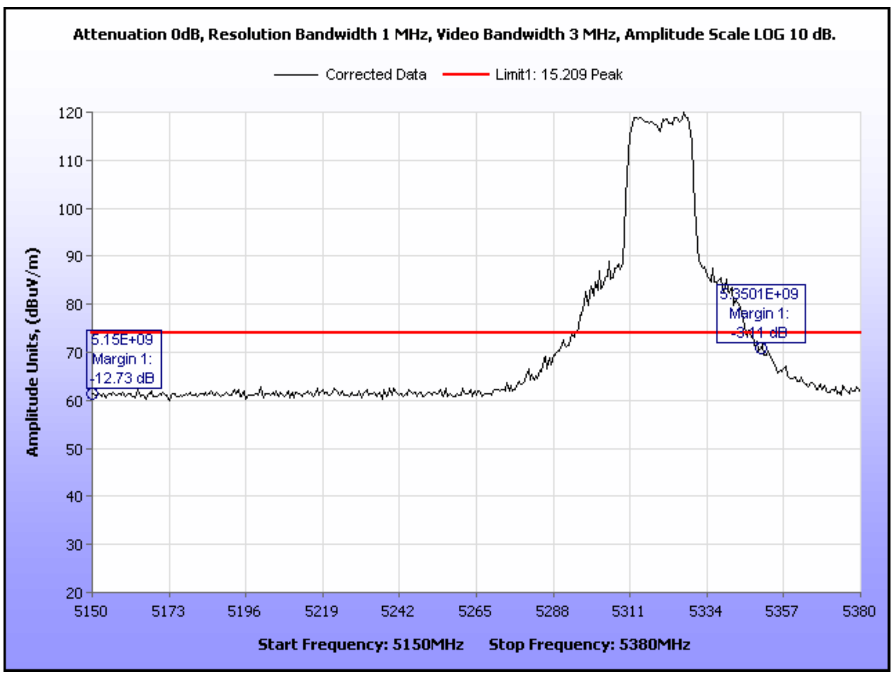
Plot 253. Restricted Band Emissions, 5310 MHz, 40 MHz, Average



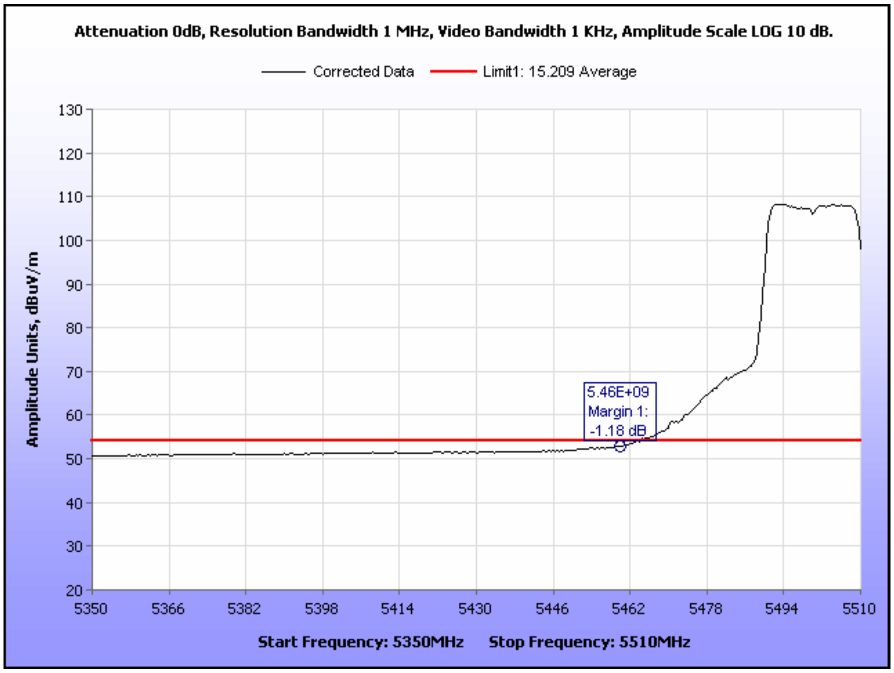
Plot 254. Restricted Band Emissions, 5310 MHz, 40 MHz, Peak



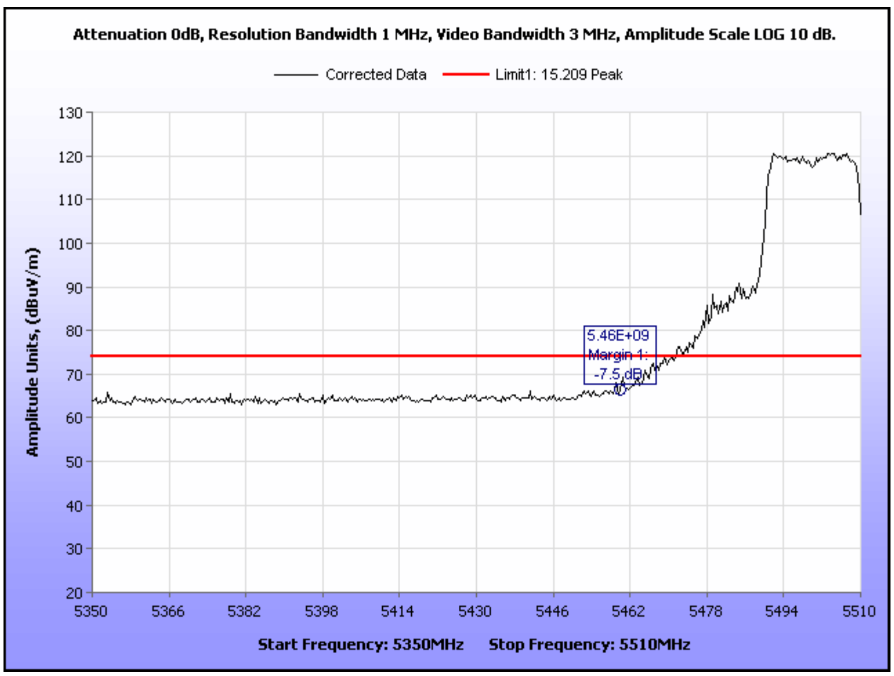
Plot 255. Restricted Band Emissions, 5320 MHz, 20 MHz, Average



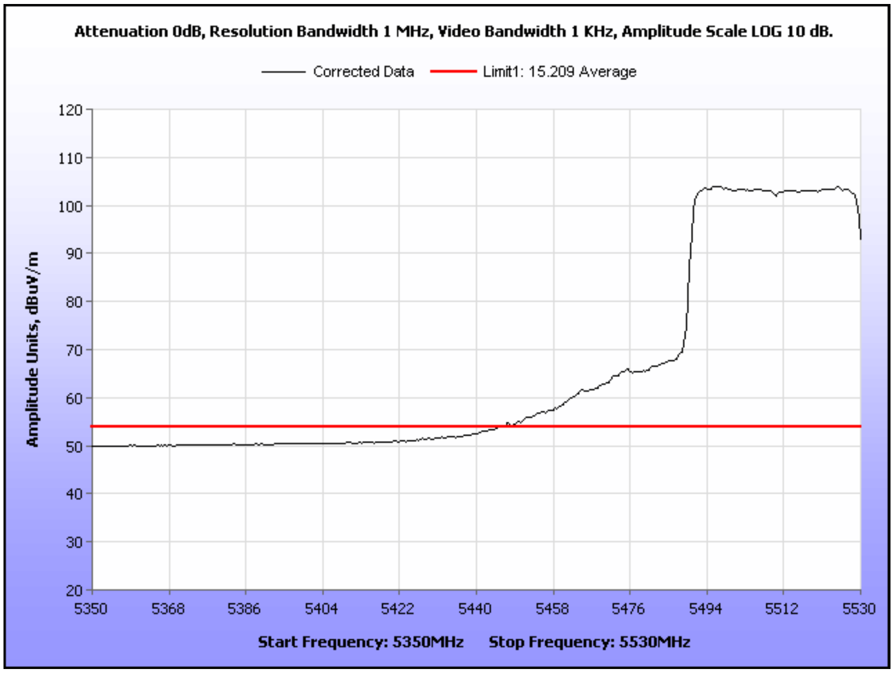
Plot 256. Restricted Band Emissions, 5320 MHz, 20 MHz, Peak



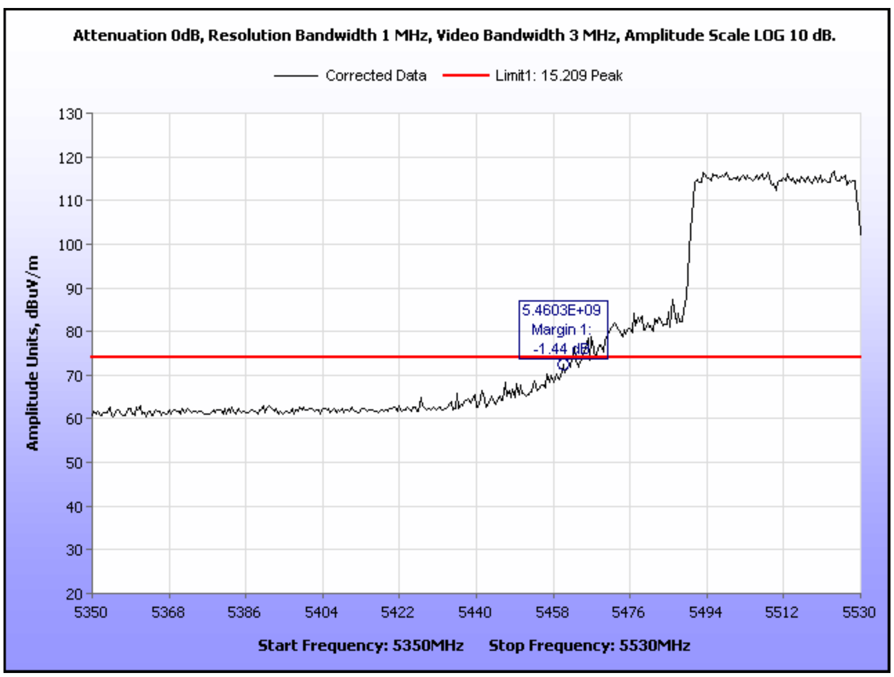
Plot 257. Restricted Band Emissions, 5500 MHz, 20 MHz, Average



Plot 258. Restricted Band Emissions, 5500 MHz, 20 MHz, Peak



Plot 259. Restricted Band Emissions, 5510 MHz, 40 MHz, Average



Plot 260. Restricted Band Emissions, 5510 MHz, 40 MHz, Peak

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 @ 5260-5320MHz and 5500-5700MHz; highest conducted power = 22.49 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 (177.53 mW)
G = Antenna Gain (3.16)
R = Minimum Distance between User and Antenna (20 cm)

$S = (177.53 * 3.16)/(4*3.14*20^2) = 0.11$ mW/cm^2

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

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 10 KHz. The 1st trace of the Spectrum Analyzer was used as a reference at 23°C. A 2nd trace was used to show the drift of the carrier at extreme conditions. A delta marker was used to find the drift at a given extreme condition. The two frequencies (i.e. 5300 MHz and 5550 MHz) are derived from one oscillator. Therefore, only one channel was investigated for frequency stability.

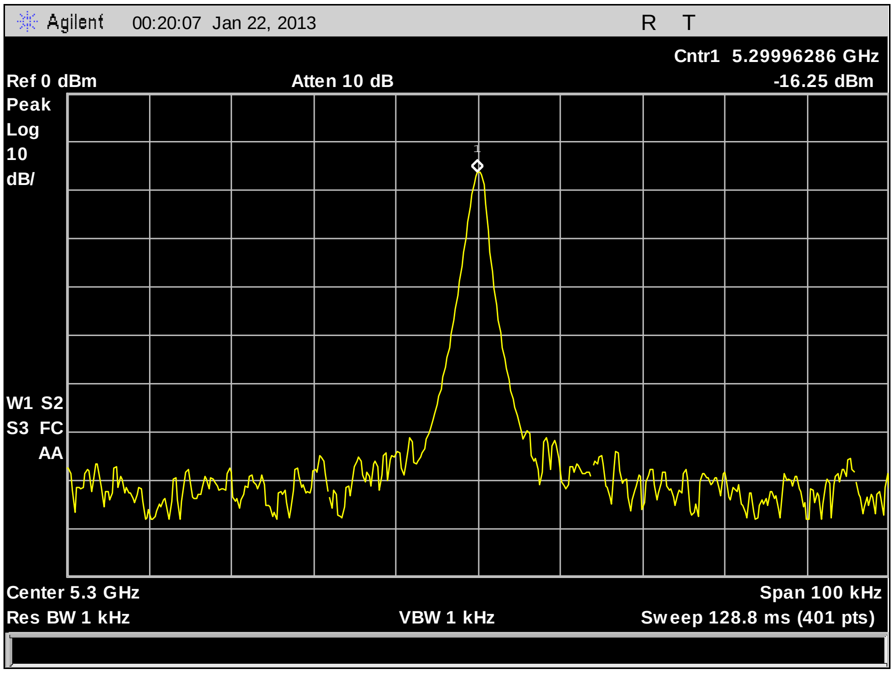
Test Results: The EUT was compliant with the requirements of **§15.407(g)**.

Test Engineer(s): Jeff Pratt

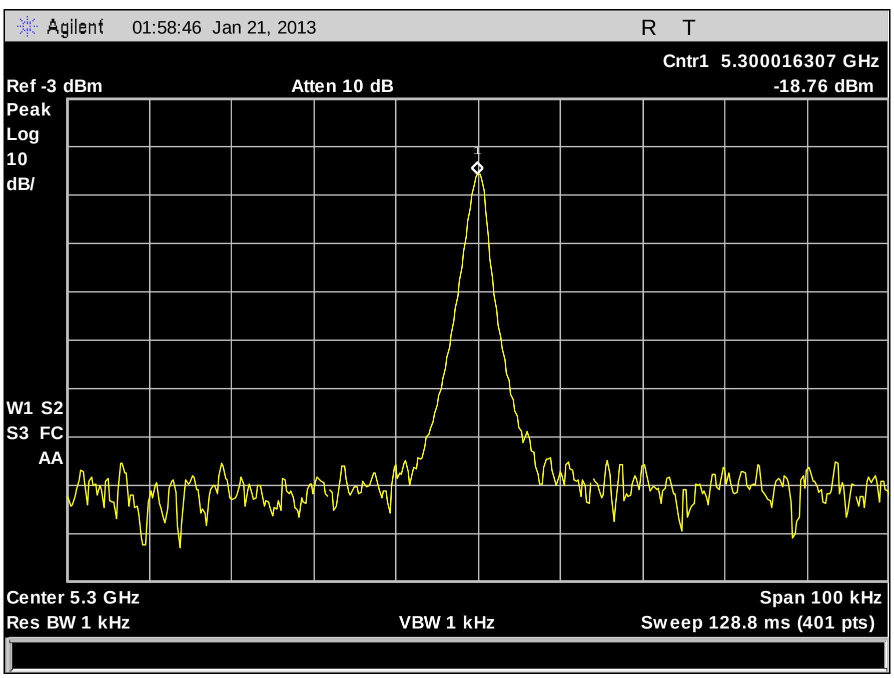
Test Date(s): 01/22/13

Frequency	5300 MHz	UNII2	
Temperature (C)	**Voltage (V)**	**Center Frequency (MHz)**	**Drift (PPM)**
-20	120	5300.016307	4.653592
-10	120	5300.001459	1.851984
0	120	5300.00476	2.47491
10	120	5300.002458	2.040569
20	108	5299.99168	0.006981
20	120	5299.991643	0
20	132	5299.991669	0.004906
30	120	5299.986096	-1.04661
40	120	5299.986058	-1.05378
50	120	5299.95156	-7.562842
55	120	5299.95835	-6.281708

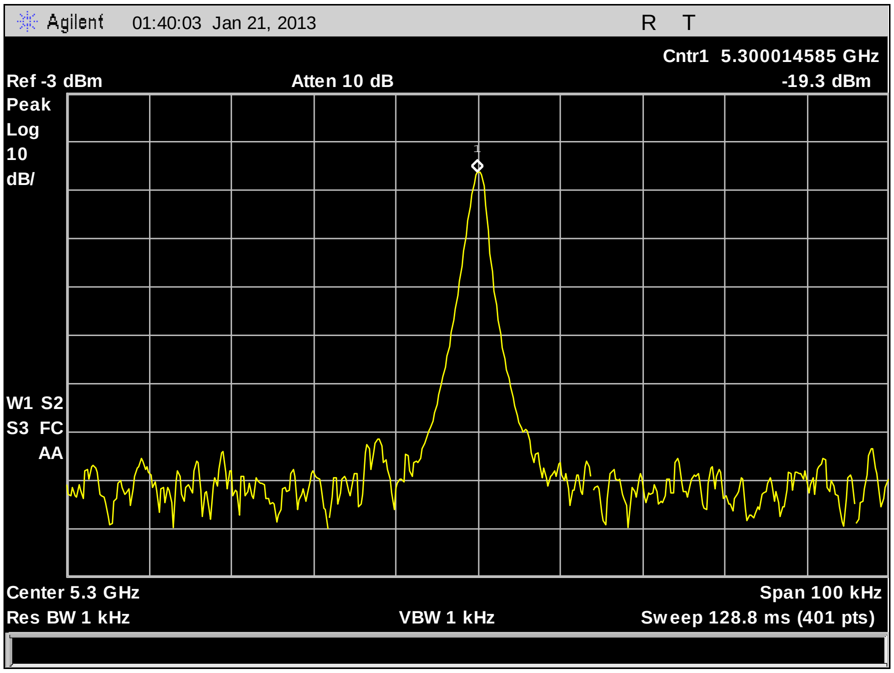
Table 17. Frequency Stability, Test Results



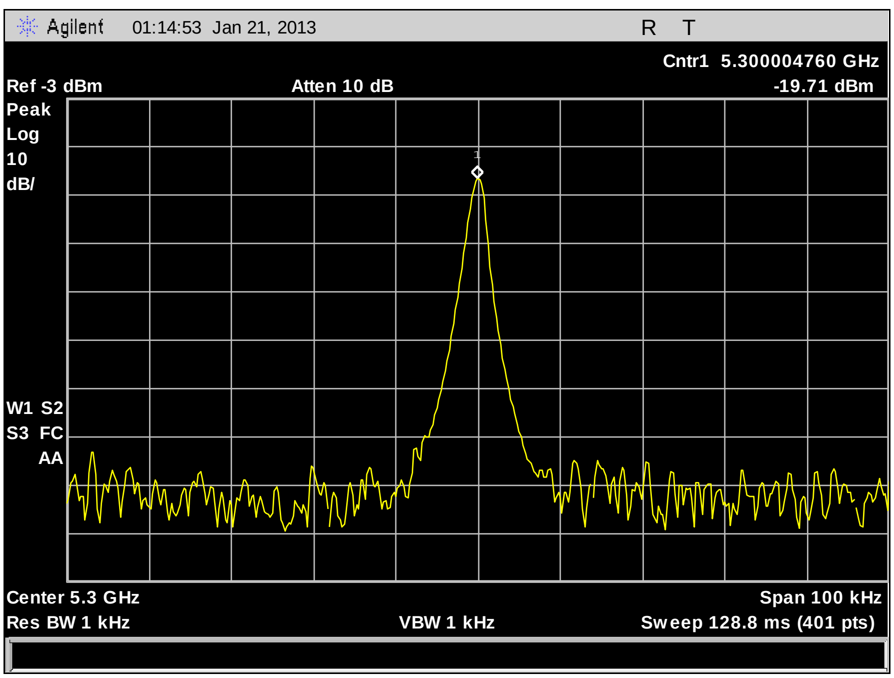
Plot 261. Frequency Stability, 5300 MHz, -30°C, 120 V



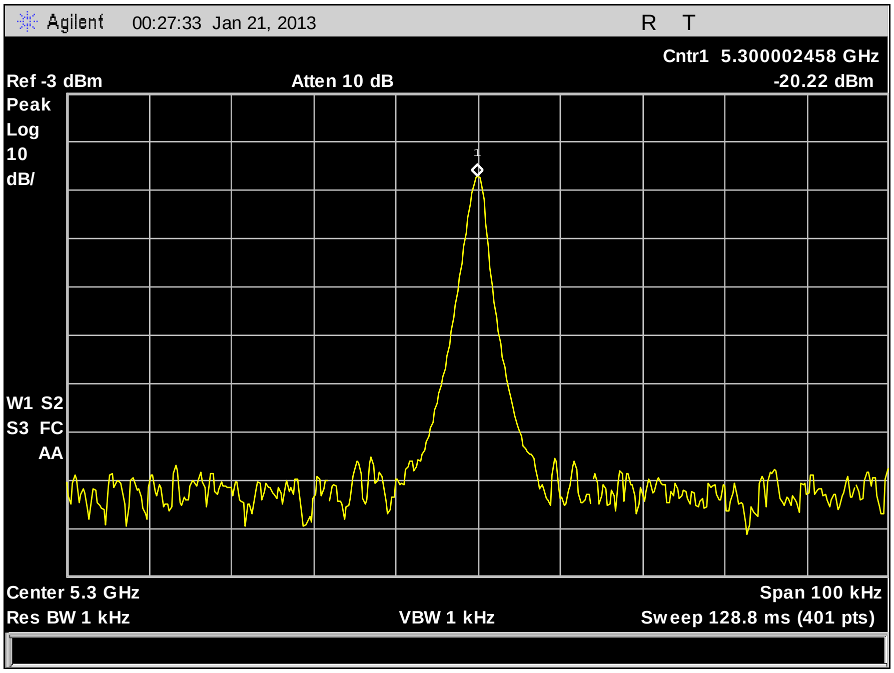
Plot 262. Frequency Stability, 5300 MHz, -20°C, 120 V



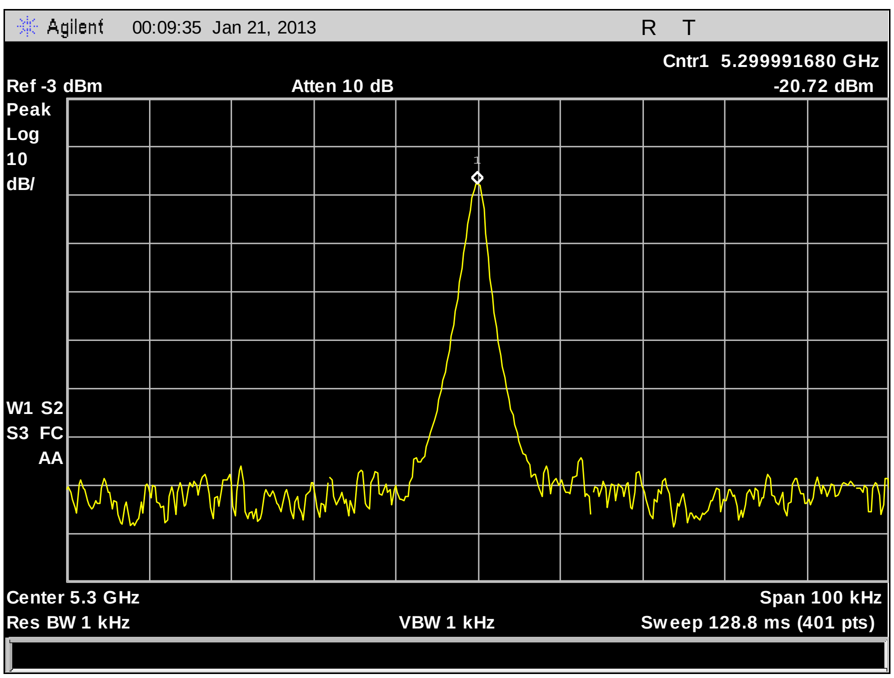
Plot 263. Frequency Stability, 5300 MHz, -10°C, 120 V



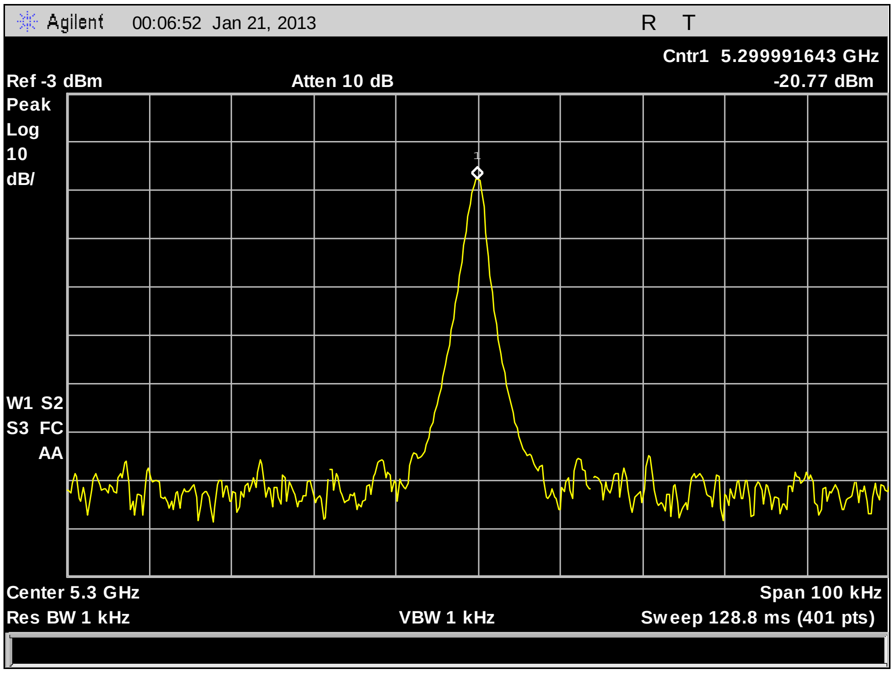
Plot 264. Frequency Stability, 5300 MHz, 0°C, 120 V



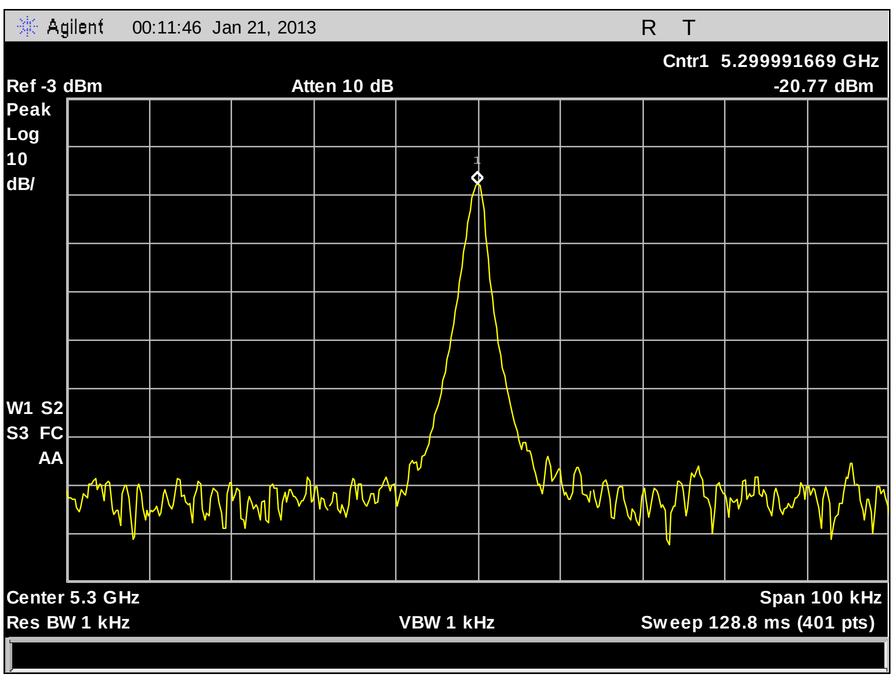
Plot 265. Frequency Stability, 5300 MHz, 10°C, 120 V



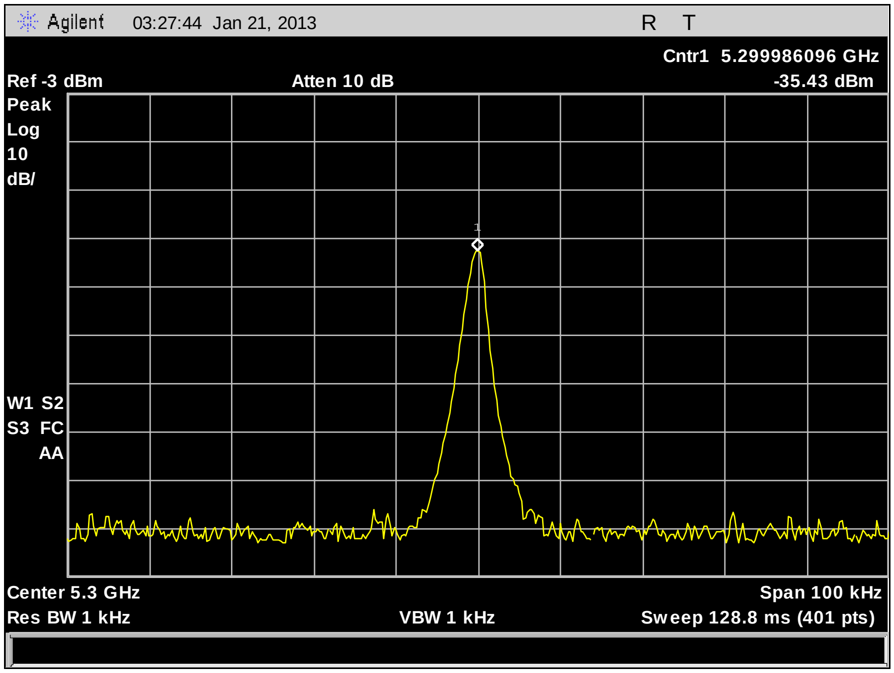
Plot 266. Frequency Stability, 5300 MHz, 20°C, 108V



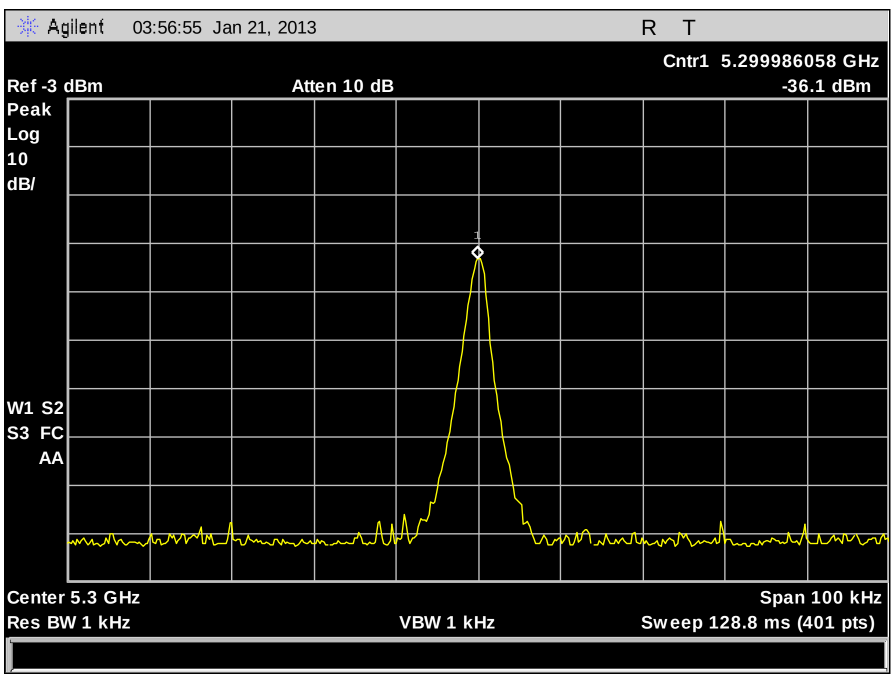
Plot 267. Frequency Stability, 5300 MHz, 20°C, 120 V



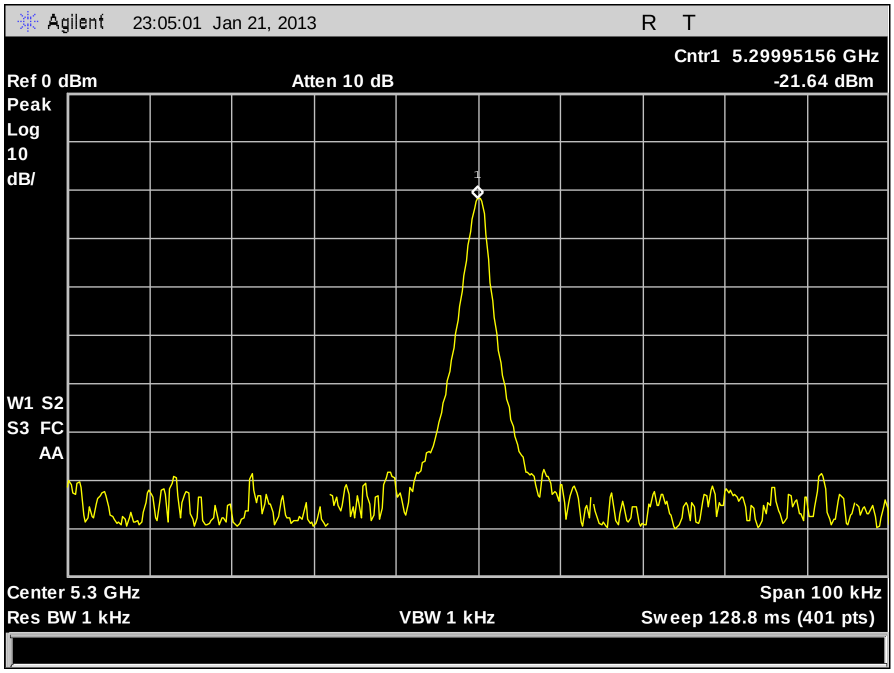
Plot 268. Frequency Stability, 5300 MHz, 20°C, 132 V



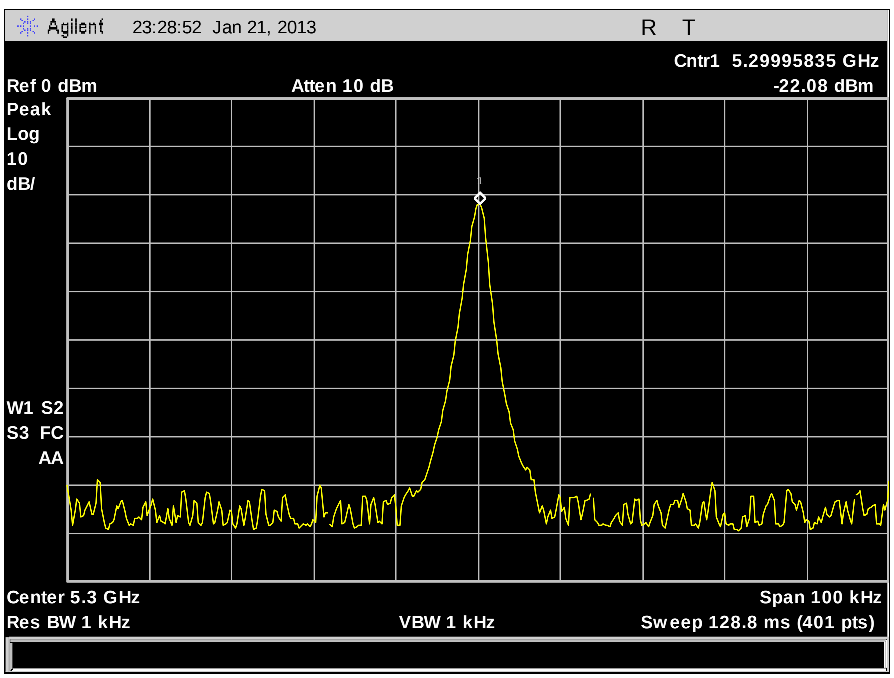
Plot 269. Frequency Stability, 5300 MHz, 30°C, 120 V



Plot 270. Frequency Stability, 5300 MHz, 40°C, 120 V



Plot 271. Frequency Stability, 5300 MHz, 50°C, 120 V



Plot 272. Frequency Stability, 5300 MHz, 55°C, 120 V

V. DFS Requirements and Radar Waveform Description & Calibration

A. DFS Requirements

Requirement	Operational Mode		
	Master	**Client Without Radar Detection**	**Client With Radar Detection**
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
Uniform Spreading	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 18. Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	**Client Without Radar Detection**	**Client With Radar Detection**
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 19. Applicability of DFS Requirements During Normal Operation

Maximum Transmit Power	Value
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna **Note 2:** Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.	

Table 20. DFS Detection Thresholds for Master or Client Devices Incorporating DFS

<table>
<tr><th>Parameter</th><th>Value</th></tr>
<tr><td>Non-occupancy period</td><td>Minimum 30 minutes</td></tr>
<tr><td>Channel Availability Check Time</td><td>60 seconds</td></tr>
<tr><td>Channel Move Time</td><td>10 seconds See Note 1</td></tr>
<tr><td>Channel Closing Transmission Time</td><td>200 milliseconds. See note 1</td></tr>
<tr><td>U-NII Detection Bandwidth</td><td>Minimum 80% of the 99% power bandwidth. See Note 3.</td></tr>
<tr><td colspan="2">Note 1: The instant that the Channel Move Time and the Channel Closing Transmission Time begins is as follows:
• For the Short pulse radar Test Signals this instant is the end of the Burst.
• For the Frequency Hopping radar Test Signal, this instant is the end of the last radar Burst generated.
• For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission.
Note 2: During the U-NII Detection Bandwidth detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90%. Measurements are performed with no data traffic.</td></tr>
</table>

Table 21. DFS Response Requirement Values

B. Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Trials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

A minimum of 30 unique waveforms are required for each of the short pulse radar types 2 through 4. For short pulse radar type 1, the same waveform is used a minimum of 30 times. If more than 30 waveforms are used for short pulse radar types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. The aggregate is the average of the percentage of successful detections of short pulse radar types 1-4.

Long Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Bursts	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse radar test signal. If more than 30 waveforms are used for the Long Pulse radar test signal, then each additional waveform must also be unique and not repeated from the previous waveforms.

Each waveform is defined as follows:

1) The transmission period for the Long Pulse Radar test signal is 12 seconds.
2) There are a total of 8 to 20 Bursts in the 12 second period, with the number of Bursts being randomly chosen. This number is Burst_Count.
3) Each Burst consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each Burst within the 12 second sequence may have a different number of pulses.
4) The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a Burst will have the same pulse width. Pulses in different Bursts may have different pulse widths.
5) Each pulse has a linear FM chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a Burst will have the same chirp width. Pulses in different Bursts may have different chirp widths. The chirp is centered on the pulse. For example, with radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz.
6) If more than one pulse is present in a Burst, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a Burst, the time between the first and second pulses is chosen independently of the time between the second and third pulses.
7) The 12 second transmission period is divided into even intervals. The number of intervals is equal to Burst_Count. Each interval is of length (12,000,000 / Burst_Count) microseconds. Each interval contains one Burst. The start time for the Burst, relative to the beginning of the interval, is between 1 and [(12,000,000 / Burst_Count) – (Total Burst Length) + (One Random PRI Interval)] microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each Burst is chosen independently.

A representative example of a Long Pulse radar test waveform:

1) The total test signal length is 12 seconds.
2) 8 Bursts are randomly generated for the Burst_Count.
3) Burst 1 has 2 randomly generated pulses.
4) The pulse width (for both pulses) is randomly selected to be 75 microseconds.
5) The PRI is randomly selected to be at 1213 microseconds.
6) Bursts 2 through 8 are generated using steps 3 – 5.
7) Each Burst is contained in even intervals of 1,500,000 microseconds. The starting location for Pulse 1, Burst 1 is randomly generated (1 to 1,500,000 minus the total Burst 1 length + 1 random PRI interval) at the 325,001 microsecond step. Bursts 2 through 8 randomly fall in successive 1,500,000 microsecond intervals (i.e. Burst 2 falls in the 1,500,001 – 3,000,000 microsecond range).

Graphical Representation of a Long Pulse radar Test Waveform

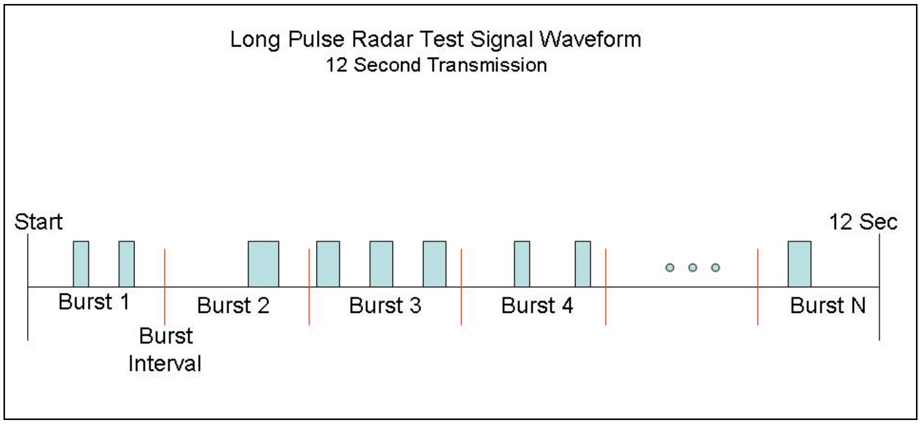


Figure 6. Long Pulse Radar Test Signal Waveform

Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	.333	300	70%	30

For the Frequency Hopping Radar Type, the same *Burst* parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected1 from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

C. Radar Waveform Calibration

The following equipment setup was used to calibrate the radiated Radar Waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the Master or Client Device. The spectrum analyzer was switched to the zero span (Time Domain) mode at the frequency of the Radar Waveform generator. Peak detection was utilized. The spectrum analyzer's resolution bandwidth (RBW) was set to 3 MHz and the video bandwidth (VBW) was set to 3 MHz. The calibration setup is diagrammed in Figure 7, and the radar test signal generator is shown in Photograph 6.

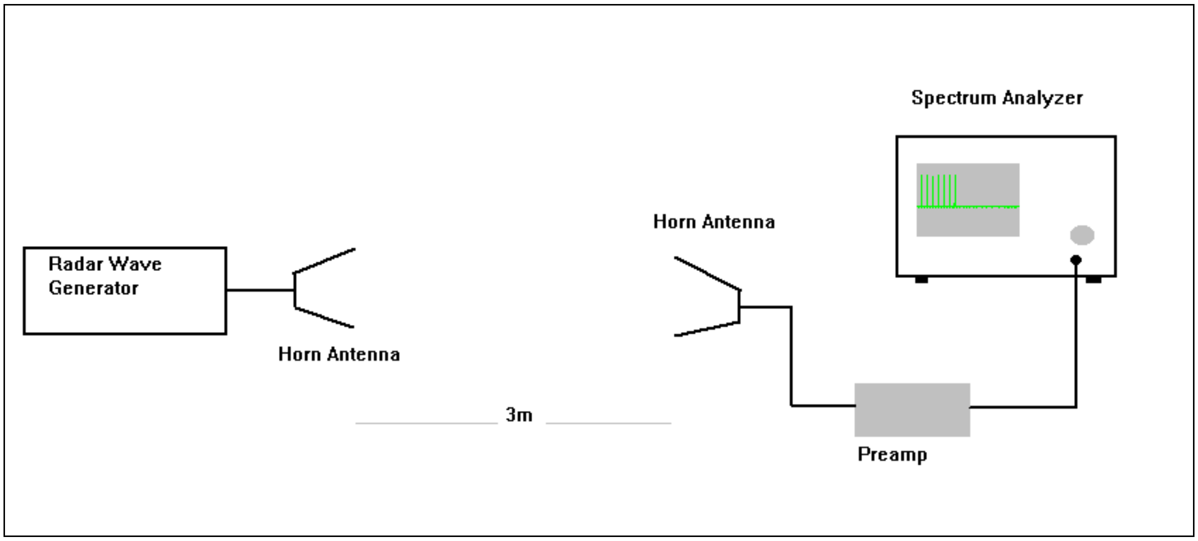
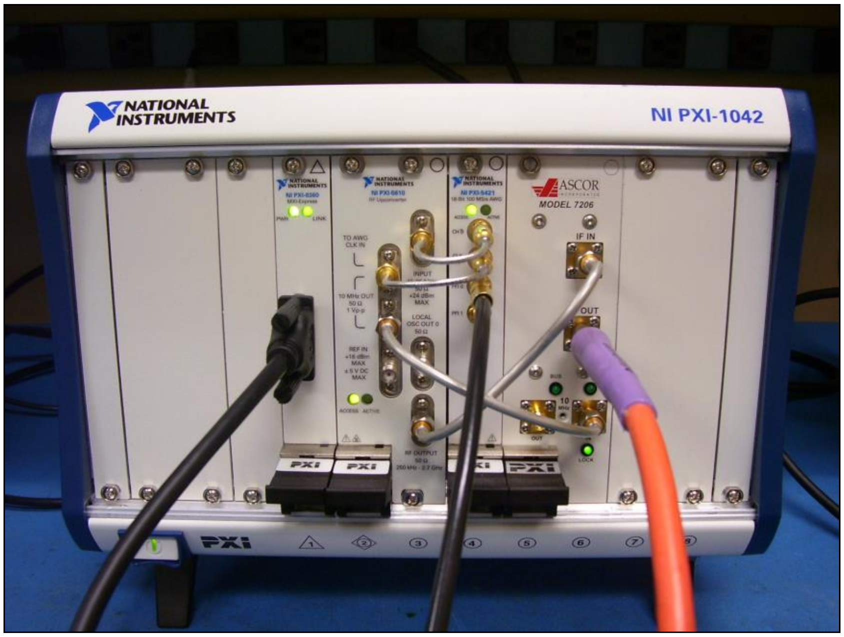
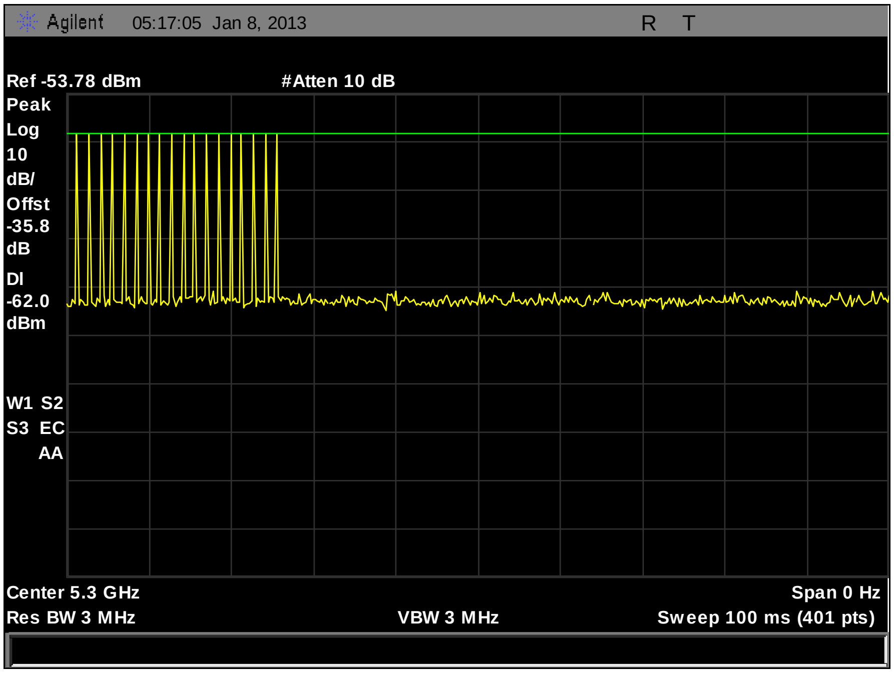


Figure 7. Calibration Test setup

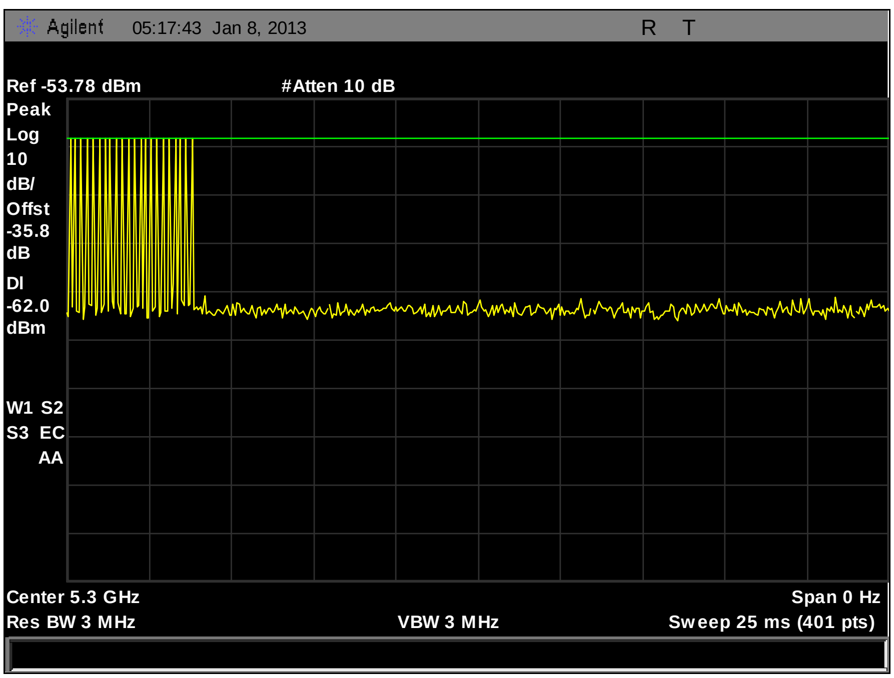


Photograph 6. DFS Radar Test Signal Generator

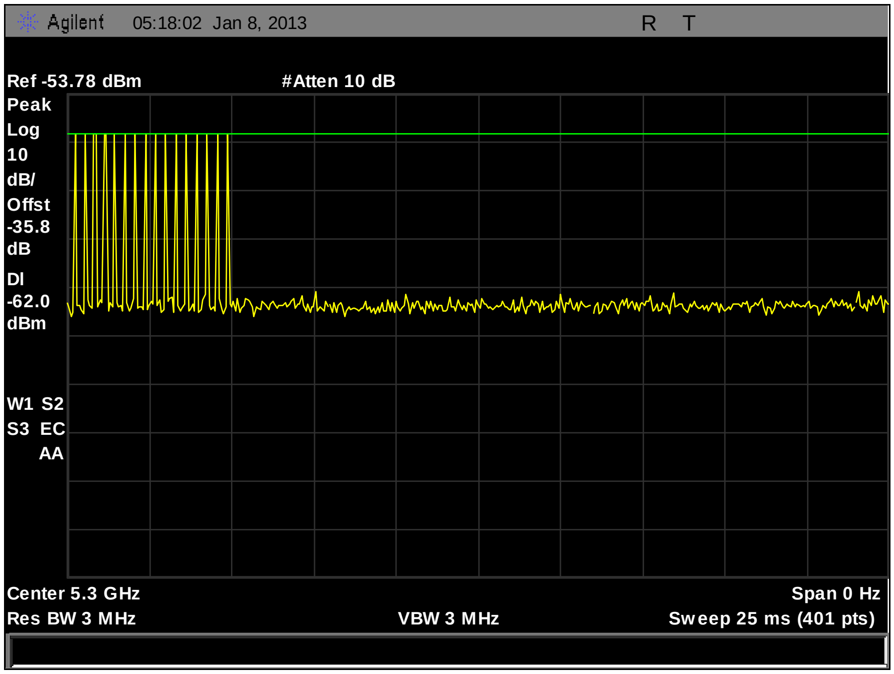
Radar Waveform Calibration



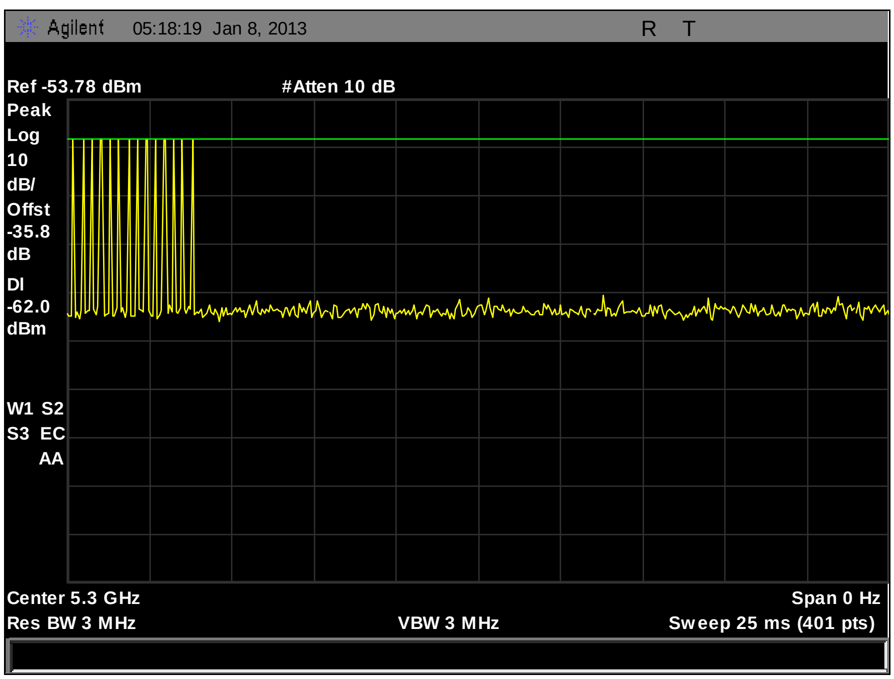
Plot 273. Bin 1 Calibration, 5300 MHz



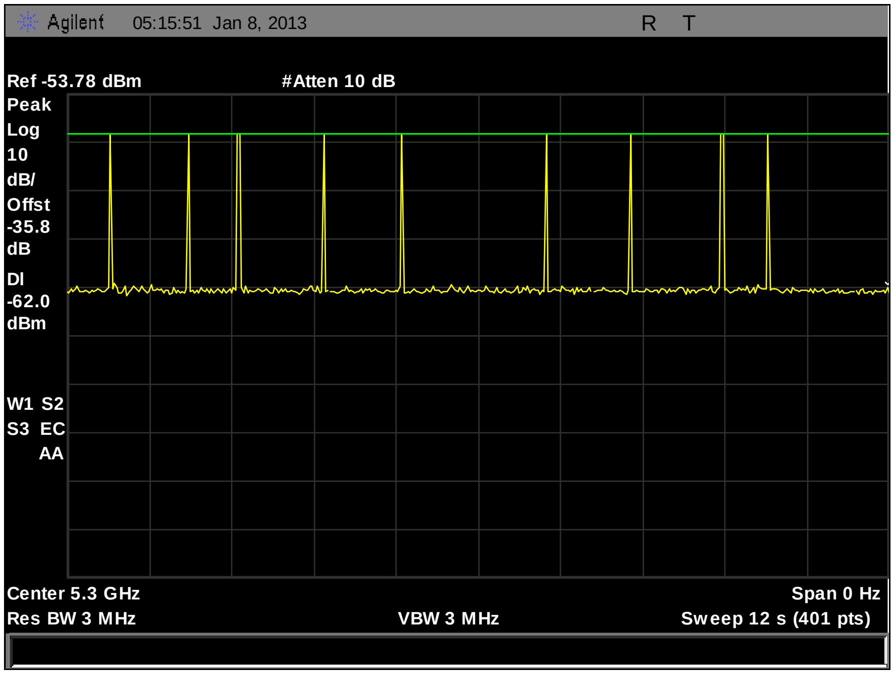
Plot 274. Bin 2 Calibration, 5300 MHz



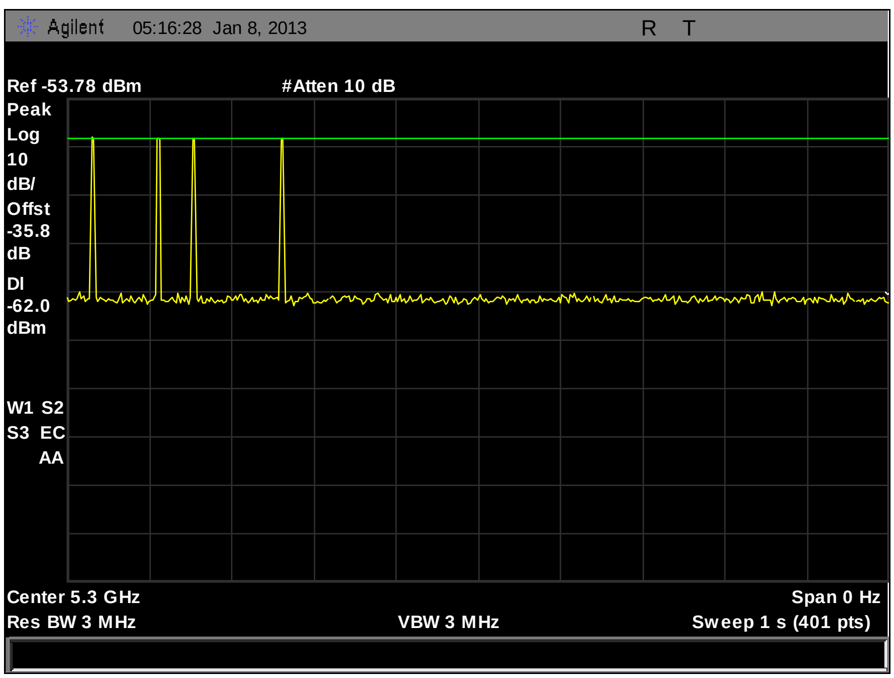
Plot 275. Bin 3 Calibration, 5300 MHz



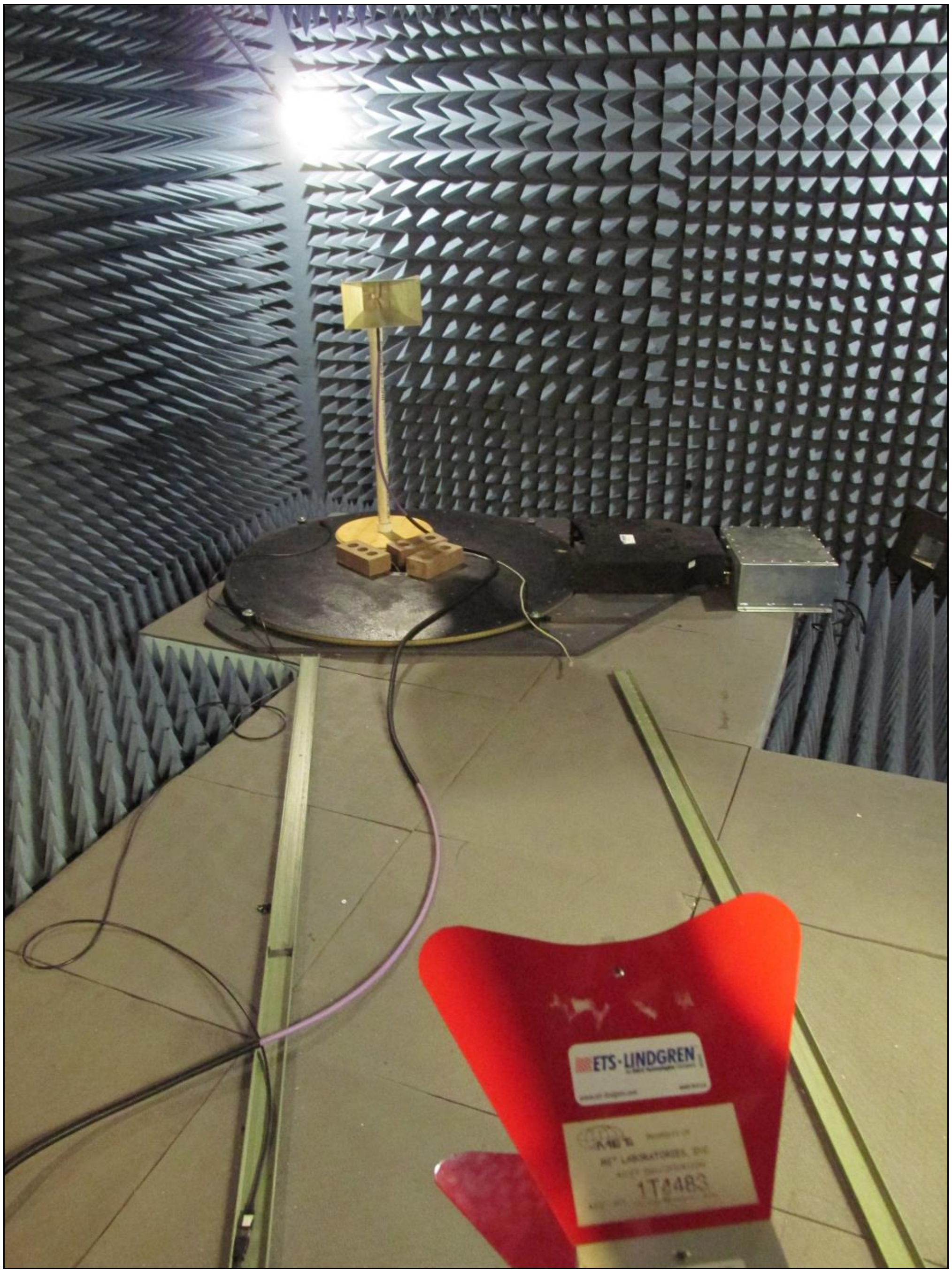
Plot 276. Bin 4 Calibration, 5300 MHz



Plot 277. Bin 5 Calibration, 5300 MHz



Plot 278. Bin 6 Calibration, 5300 MHz



Photograph 7. Calibration, Test Setup

D. EUT Information

1. Operating frequency range is 5150-5825 MHz
2. The EUT is a Client device without radar detection
3. The Client device does not have radar capability. It was tested with an approved Master (FCC ID: VQSAMN36254)
4. Highest EIRP = 27.49 dBm; Lowest EIRP = 2dBm
5. 2dBi and 5 dBi Omni-directional antennas
6. For loading the channel in 96% of the time we transmit 1080p60 video resolution pattern. This video pattern is played from video source device that is connected to Falcon TX module through HDMI cable.
7. The goal of the TPC is to maintain average input power of the received antennas within a certain range.
   The RX should measure the Pin of the 5 received antennas, calculate the average power ant then instruct the TX how much output power to transmit.

8. System block diagram is included in user manual Data rate - 63Mbps per channel Channel BW - 20MHz or 40MHz Frame based.
9. 60 seconds to complete power-on cycle.
10. Manufacturer statement confirming that information regarding the parameters of the detected Radar Waveforms is not available to the end user is submitted as a separate declaration in the filing.

VI. DFS Test Procedure and Test Results

A. DFS Test Setup

1. A spectrum analyzer is used as a monitor to verify that the Unit Under Test (UUT) has vacated the Channel within the Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the detection and subsequent Channel move. It is also used to monitor UUT transmissions during the Channel Availability Check Time.
2. The test setup, which consists of test equipment and equipment under test (EUT), is diagrammed in Figure 8 and pictured in Photograph 8. Testing was performed on the client radio with 2dBi omnidirectional antennas (Wanshih WSS002) attached to its antenna ports. Refer to section 15.203.

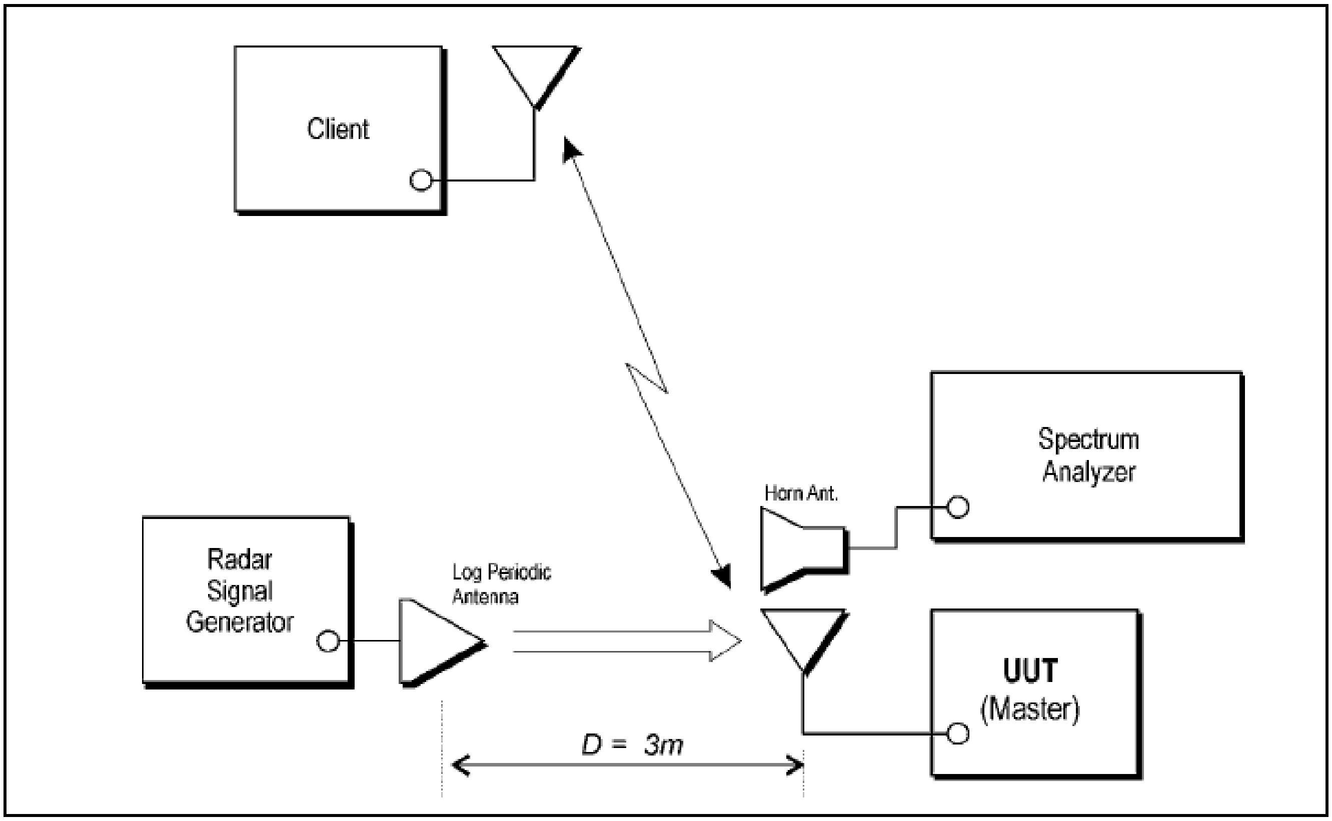
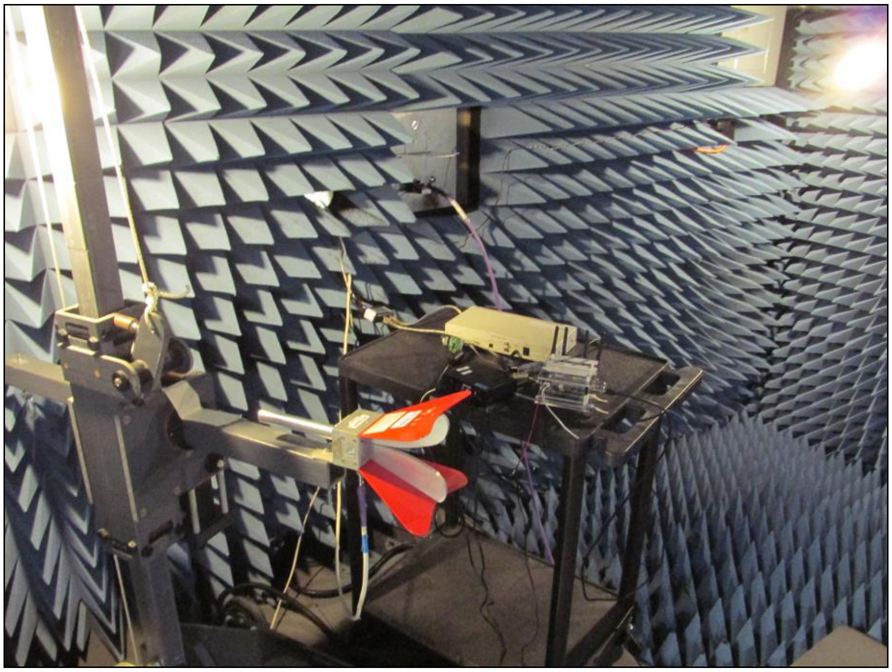
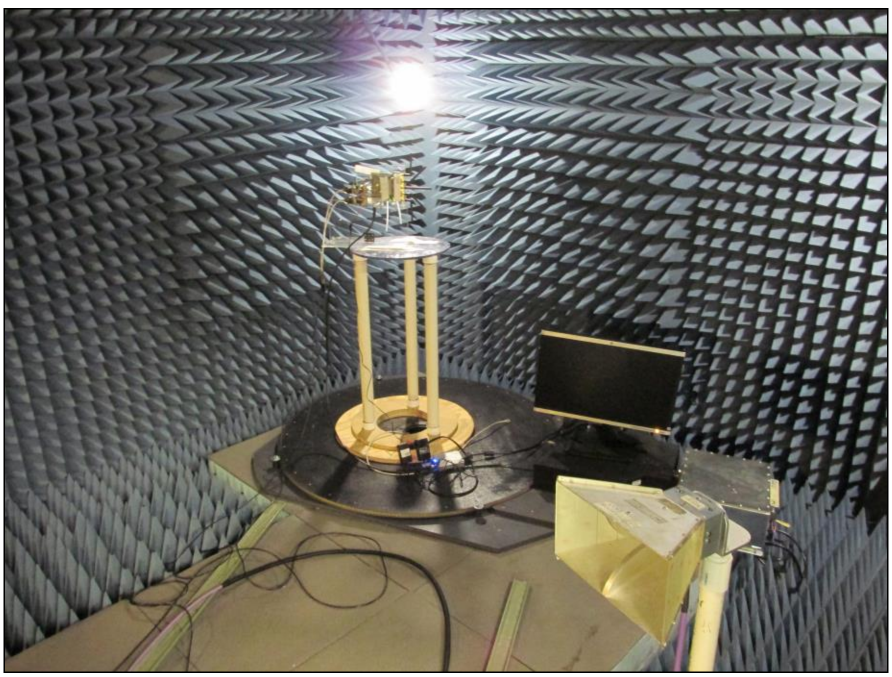


Figure 8. Test Setup Diagram, Client with Injection at Master



Photograph 8. DFS Test Setup, Client



Photograph 9. DFS Test Setup, Master, Amimon Falcon RX Module (FCC ID: VQSAMN36254)

B. UNII Detection Bandwidth

Test Requirement(s): **§ 15.407** A minimum 80% detection rate is required across an EUT's 99% bandwidth.

Test Procedure: All UNII channels for this device have identical channel bandwidths.

A single burst of the short pulse radar type 1 is produced at 5300 MHz, at the -63dBm test level. The UUT is set up as a standalone device (no associated client, and no data traffic).

A single radar burst is generated for a minimum of 10 trials, and the response of the UUT is recorded. The UUT must detect the radar waveform 90% or more of the time.

The radar frequency is increased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The highest frequency at which detection is greater than or equal to 90% is denoted F_H.

The radar frequency is decreased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The lowest frequency at which detection is greater than or equal to 90% is denoted F_L.

The U-NII Detection Bandwidth is calculated as follows:

$$\text{U-NII Detection Bandwidth} = F_H – F_L$$

Test Results: The EUT was not applicable with this requirement. Client device doesn't have radar detection implanted.

C. Initial Channel Availability Check Time

Test Requirements: **§ 15.407** The Initial Channel Availability Check Time tests that the UUT does not emit beacon, control, or data signals on the test channel until the power-up sequence has been completed and the U-NII device has checked for radar waveforms, for one minute, on the test channel. This test does not use any of the radar waveforms and only needs to be performed once.

The UUT should not make any transmissions over the test channel, for at least 1 minute after completion of its power-on cycle.

Test Procedure: The U-NII device is powered on and instructed to operate at 5300 MHz. At the same time the UUT is powered on, the spectrum analyzer is set to 5300MHz with a zero span and a 2.5 minute sweep time. The analyzer is triggered at the same time power is applied to the U-NII device.

Test Results: The Equipment was not applicable with § 15.407 Initial Channel Availability Check Time. Client device doesn't have radar detection implemented.

D. Radar Burst at the Beginning of Channel Availability Check Time

Test Requirements: **§ 15.407** A Radar Burst at the Beginning of the Channel Availability Check Time tests that the UUT does not emit beacon, control, or data signals on the test Channel if it has detected a radar burst during that time period until the power-up sequence has been completed and the U-NII device checks for Radar Waveforms for one minute on the test Channel. The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-63dBm) occurs at the beginning of the Channel Availability Check Time.

Test Procedure: The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence. The Channel Availability Check Time commences at instant T1 and will end no sooner than T1 + 60 seconds.

A single Burst of short pulse radar type 1, at -63 dBm, will commence within a 6 second window starting at T1.

Visual indication of the UUT of successful detection of the radar Burst will be recorded and reported. Observation of transmission at 5300MHz will continue for 2.5 minutes after the radar Burst has been generated.

Verify that during the 2.5 minute measurement window, no UUT transmissions occurr at 5300MHz.

Test Results The equipment was not applicable with § 15.407 Radar Burst at the Beginning of the Channel Availability Check Time. Client device doesn't have radar detection implemented.

E. Radar Burst at the End of Channel Availability Check Time

Test Requirements: **§ 15.407** A Radar Burst at the End of the Channel Availability Check Time tests that the UUT does not emit beacon, control, or data signals on the test Channel if it has detected a radar burst during that time period until the power-up sequence has been completed and the U-NII device checks for Radar Waveforms for one minute on the test Channel. The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-63dBm) occurs at the end of the Channel Availability Check Time.

Test Procedure: The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-63dBm) occurs at the end of the Channel Availability Check Time.

The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence. The Channel Availability Check Time commences at instant T1 and will end no sooner than T1 + 60 seconds.

A single Burst of short pulse of radar type 1 at -63 dBm will commence within a 6 second window starting at T1+ 54 seconds.

Visual indication on the UUT of successful detection of the radar Burst will be recorded and reported. Observation of emissions at 5300MHz will continue for 2.5 minutes after the radar Burst has been generated.

Verify that during the 2.5 minute measurement window no UUT transmissions occurred at 5300MHz.

Test Results: The equipment was not applicable with § 15.407 Radar Burst at the End of the Channel Availability Check Time. Client device doesn't have radar detection implemented.

F. In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time, and Non-Occupancy Period

Test Requirements: **§ 15.407** (Refer to DFS Response Requirement Values table in section III-A of this report.) The UUT shall continuously monitor for radar transmissions in the operating test channel. When a radar burst occurs in the test channel, it has 10 seconds to move to another channel. This 10 second window is termed Channel Move Time (CMT).

After a radar burst occurs, the UUT has 200 milliseconds to cease transmission in the operating test channel.

After radar burst and subsequent move to another channel, the UUT shall not resume transmission, on the channel it moved from, for a period of 30 minutes. This requirement is termed Non-Occupancy Period (NOP).

Test Procedure: These tests define how the following DFS parameters are verified during In-Service Monitoring: Channel Closing Transmission Time, Channel Move Time, and Non-Occupancy Period.

The steps below define the procedure to determine the above mentioned parameters when a radar Burst with a level equal to the DFS Detection Threshold + 1dB (-63dBm) is generated on the Operating Channel of the U-NII device.

A U-NII device operating as a Client Device will associate with the UUT (Master) at 5300 MHz. Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test.

At time T0 the Radar Waveform generator sends a Burst of pulses for each of the radar types at -63dBm.

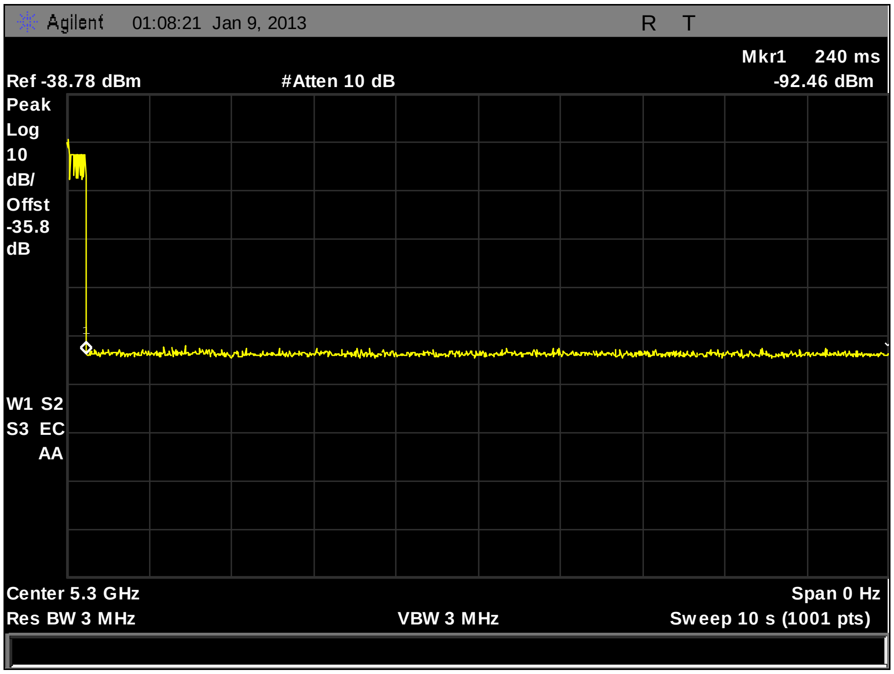
Observe the transmissions of the UUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing Transmission Time results to the limits defined in the *DFS Response Requirement Values table*.

Test Results: The EUT was compliant with § 15.407 In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time, and Non-Occupancy Period.

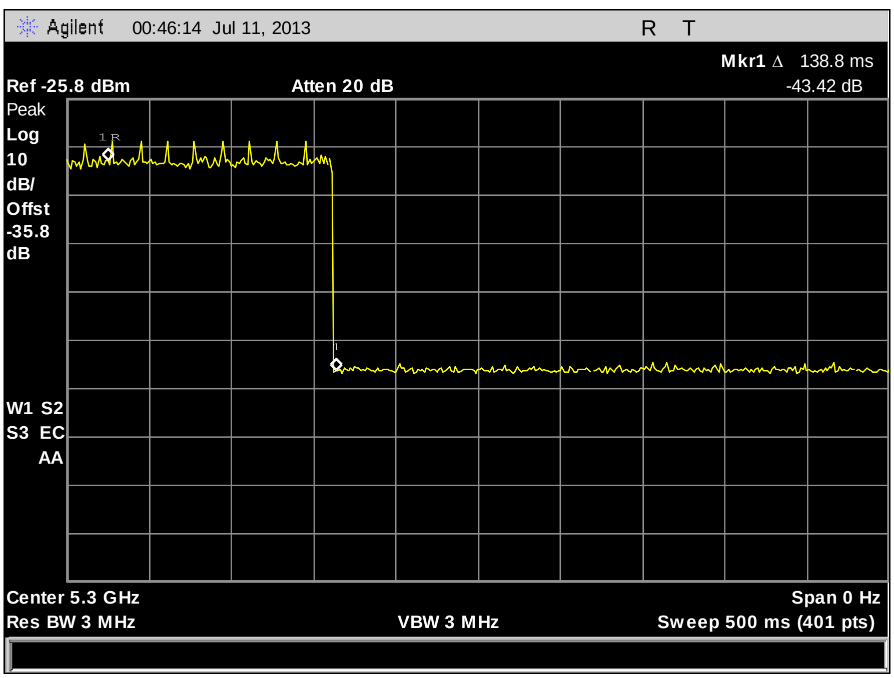
Test Engineer: Jeff Pratt

Test Date: 01/09/13

Channel Move Time – Plots

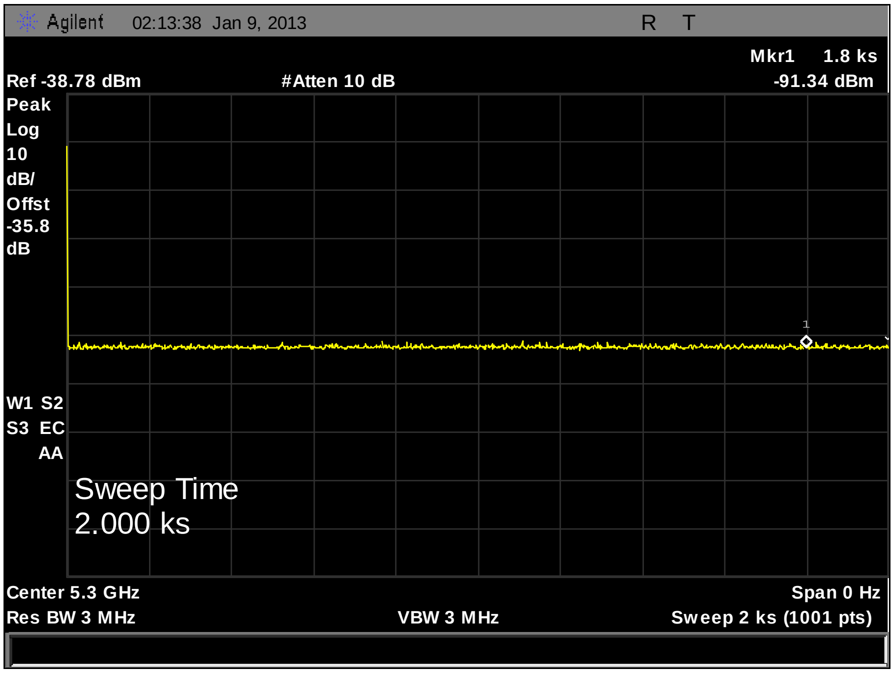


Plot 279. Channel Move Time



Plot 280. Channel Closing Transmission Time

Note: Short pulse radar type 1 was used for this test (duration = 25ms). The delta markers are from the end of the radar burst to the end of the transmission.



Plot 281. Non-Occupancy Period

G. Statistical Performance Check

Test Requirements: **§ 15.407** During In-Service Monitoring, the EUT requires a minimum percentage of successful radar detections from all required radar waveforms at a level equal to the DFS Detection Threshold + 1dB.

Test Procedure: Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test. The Radar Waveform generator sends the individual waveform for each of the radar types 1-6 at -63dbm. Statistical data is gathered to determine the ability of the device to detect the radar test waveforms. The device can utilize a test mode to demonstrate when detection occurs to prevent the need to reset the device between trial runs. The percentage of successful detection is calculated by:

$$\frac{TotalWaveformDetections}{TotalWaveformTrials} \times 100$$

The Minimum number of trails, minimum percentage of successful detection and the average minimum percentage of successful detection are found in the Radar Test Waveforms section.

Test Results: The equipment was not applicable with § 15.407 Statistical Performance Check. Client device doesn't have radar detection implemented.

IV. Test Equipment

Test Equipment

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

MET ASSET #	EQUIPMENT	MANUFACTURER	MODEL	LAST CAL DATE	CAL DUE DATE
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
1T4503	SHIELDED ROOM	UNIVERSAL SHIELDING CORP	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
1T2278	SWEPT SIGNAL GENERATOR	HEWLETT PACKARD	83650B	10/31/2012	10/31/2013
1T4771	PSA SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4446A	12/12/2012	12/12/2013
1T4745	ANTENNA; HORN	ETS-LINDGREN	3116	10/19/2012	10/19/2013
1T4681	PSA SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4448A	10/18/2012	4/18/2014
1T4504	SHIELDED ROOM	UNIVERSAL SHIELDING CORP	N/A	SEE NOTE	
1T4752	PRE-AMPLIFIER	MITEQ	JS44-18004000-35-8P	SEE NOTE	
1S2602	DFS SIGNAL GENERATOR	NATIONAL INSTRUMENTS	NIPXI-1042	SEE NOTE	
1T4568	RADIATING NOISE SOURCE	MET LABORATORIES	N/A	SEE NOTE	
1T4814	COMB GENERATOR	COM-POWER	CGO-5100	SEE NOTE	
1T4479	POWER SUPPLY PROGRAMMABLE	CALIFORNIA INSTRUMENTS	1501TC	SEE NOTE	

Table 22. Test Equipment List

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

V. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

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

§ 2.801 Radio-frequency device defined.

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

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

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

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

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

(i) Compliance testing;

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

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

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

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

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

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

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[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.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

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

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

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

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

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

Certification & User's Manual Information

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.

End of Report