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
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13501 MCCALLEN PASS ● AUSTIN, TX 78753 ● PHONE (512) 287-2500 ● FAX (512) 287-2513

January 26, 2018

Ubiquiti Networks
1250 S. Grove Ave. Suite 100
Barrington, IL 60010

Dear Alex Pavlos,

Enclosed is the EMC Wireless test report for compliance testing of the Ubiquiti Networks, AF-LTU as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15.407, Subpart E (UNII 1).

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.

Joel Huna
Documentation Department

Reference: (\Ubiquiti Networks\ EMC94936-FCC407 UNII 1)

ACCREDITED
TESTING CERT #0591.01

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Electromagnetic Compatibility Criteria
Test Report

for the

Ubiquiti Networks
Model AF-LTU

Tested under
The FCC Certification Rules
contained in
Title 47 of the CFR
15.407 Subpart E

MET Report: EMC94936-FCC407 UNII 1

January 26, 2018

Prepared For:

Ubiquiti Networks
1250 S. Grove Ave. Suite 100
Barrington, IL 60010

Prepared By:
MET Laboratories, Inc.
914 West Patapsco Avenue, Baltimore, MD 21230

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15.407 Subpart E

Donald Salguero, Project Engineer
Electromagnetic Compatibility Lab

Joel Huna
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.

John Mason,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	January 26, 2018	Initial Issue.

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List of Terms and Abbreviations

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

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Ubiquiti Networks AF-LTU, 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 AF-LTU. Ubiquiti Networks should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the AF-LTU, 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 Ubiquiti Networks, purchase order number US101476. All tests were conducted using measurement procedure ANSI C63.4-2014.

FCC Reference	Description	Results
§15.203	Antenna Requirement	Compliant
§15.403(i)	26dB Occupied Bandwidth	Compliant
§15.407 (a)(1)	Maximum Conducted Output Power	Compliant
§15.407 (a)(1)	EIRP above 30 degrees elevation	Not Applicable
§15.407 (a)(1)	Maximum Power Spectral Density	Compliant
§15.407 (b)(1)& (6 - 7)	Undesirable Emissions	Compliant
§15.407(b)(6)	Conducted Emission Limits	Compliant
§15.407(f)	RF Exposure	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Ubiquiti Networks to perform testing on the AF-LTU, under Ubiquiti Networks's purchase order number US101476.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Ubiquiti Networks AF-LTU.

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

Model(s) Tested:	AF-LTU	
Model(s) Covered:	AF-LTU	
EUT Specifications:	Primary Power: 120 VAC 60 Hz	
	FCC ID: SWX-AFLTU	
	Type of Modulations:	OFDM
	Equipment Code:	NII
	Max. RF Output Power:	21.86dBm with 27dBi antenna 24.49dBm with 19dBi antenna 25.08dBm with 13dBi antenna
	EUT Frequency Ranges:	5155 – 5245 MHz
	Bandwidths:	10/20/30/40/50 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Type of Filing:	Original	
Evaluated by:	Donald Salguero	
Report Date(s):	January 26, 2018	

Table 2. EUT Summary

B. References

CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
ANSI C63.4:2014	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 C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
789033 D02 General UNII Test Procedures New Rules v01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
662911 D02 v01	MIMO with Cross Polarized Antenna

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 914 West Patapsco Avenue, 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 Ubiquiti Networks AF-LTU, Equipment Under Test (EUT), is a 5.150GHz – 5.850GHz, Digital Transmission radio that uses OFDM MIMO Uncorrelated Cross-Polarized communication with a 100/80/60/50MHz/40MHz/30MHz/28MHz/ 20MHz/10MHz/ 7MHz/5MHz/3.5MHz bandwidth configuration. The EUT would be used outdoors and pole mounted. It is powered from a PoE adapter. The reverse-polarized connectorized has the ability when professionally installed by a user with cross-polarized antennas. This is the only matter that would be able to create a functional link to work.

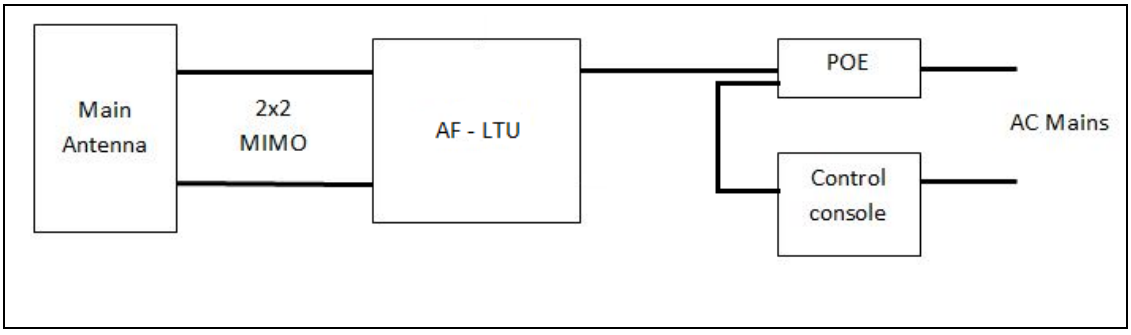


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
1	Switching Gigabit Power Supply	GP-H240-100G-4	1514	0000936	--
	Ethernet Cables	N/A	N/A	N/A	--
	13 dBi Asymmetrical horn	PrismAP-5-90	N/A	N/A	
	19 dBi symmetrical horn	PrismAP-5-30	N/A	N/A	
	27 dBi Slant Dish	LTU-Extend	N/A	N/A	

Table 4. Equipment Configuration

F. Support Equipment

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

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
1	Laptop	HP	Pro Book 430 G1	N/A
2	Laptop	ASUS	X502C	N/A
3	Laptop	Apple	MacBook Pro	N/A

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
1	Data Port	RJ45 Ethernet	1	2	Yes	

Table 6. Ports and Cabling Information

H. Mode of Operation

Using internal test modes only for testing purposes the radio is set up in a continuous transmit mode. This allows for frequency, power, and channel bandwidth to be adjusted for measurement purposes. Scripts and specific command line commands are used to manipulate the radio in test mode.

I. Method of Monitoring EUT Operation

1. A blinking green "Data" LED will indicate error-free data is being transferred on the test cable.
2. Any other LED status besides the blinking green LED (i.e. LED light off, etc) will indicate error-free data is not being transferred on the test cable.

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 Ubiquiti Networks upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

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

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

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

Results: The EUT as tested is compliant the criteria of §15.203. The antenna is professionally installed. The gains of the antennas are 13dBi, 19 dBi, and 27 dBi.They are used for fixed point-to-point operation.

Gain	Model	Type
13 dBi	PrismAP-5-90	Asymmetrical horn
19 dBi	PrismAP-5-30	Symmetrical horn
27 dBi	LTU-Extend	Slant Dish

Table 7. Antenna List

Test Engineer(s): Donald Salguero

Test Date(s): November 29, 2017

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(i) 26dB Bandwidth

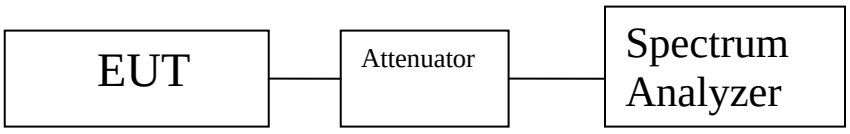
Test Requirements: **§ 15.403(i):** For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of 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 low, mid, and high 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.

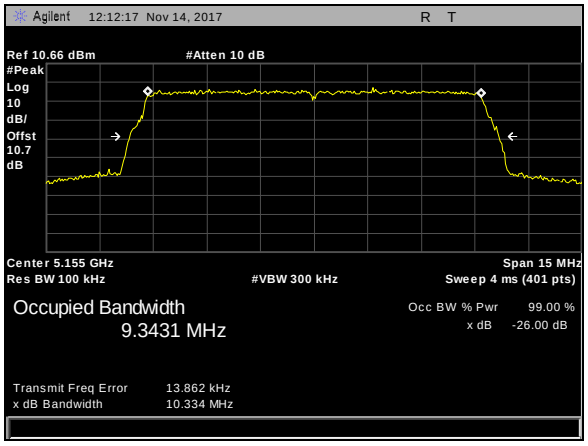
Test Engineer(s): Donald Salguero

Test Date(s): November 2, 2017

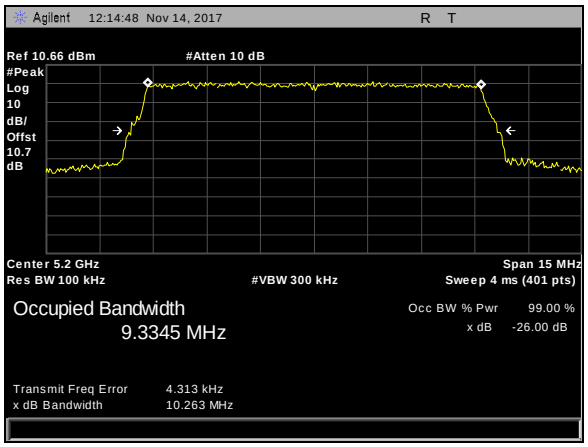


Nominal Channel Bandwidth (MHz)	Center Frequency (MHz)	26dB Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
10	5155	10.334	9.3431
	5200	10.263	9.3345
	5245	10.381	9.3363
20	5160	20.853	18.7578
	5200	20.813	18.7842
	5240	20.865	18.7313
30	5165	31.169	27.9822
	5200	31.256	28.0248
	5235	31.087	28.0304
40	5170	41.305	37.3703
	5200	41.515	37.3354
	5230	41.223	37.278
50	5175	52.719	47.123
	5200	52.829	47.1153
	5225	52.777	47.1413

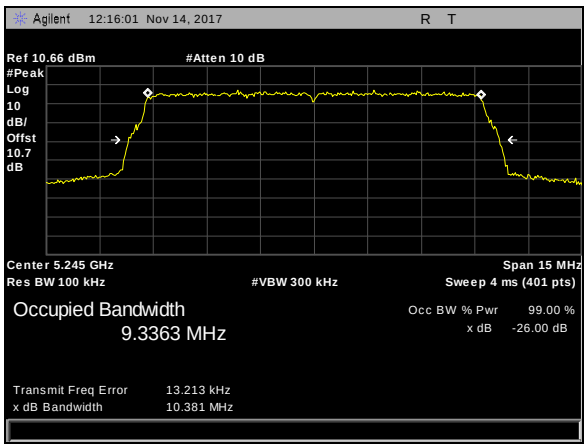
Table 8. 26 dB Occupied Bandwidth, Test Results



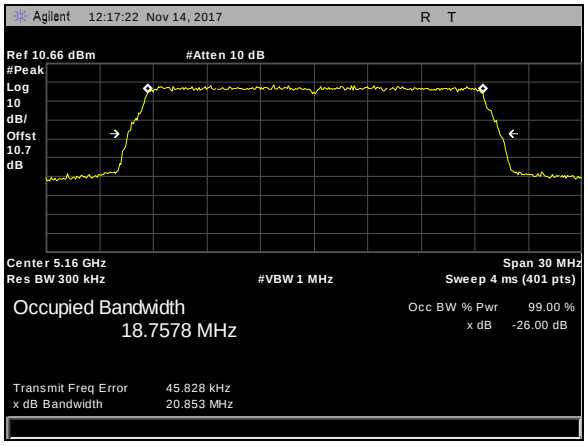
Plot 1. 26 dB - 99% Occupied Bandwidth, BW 10M, CF 5155M



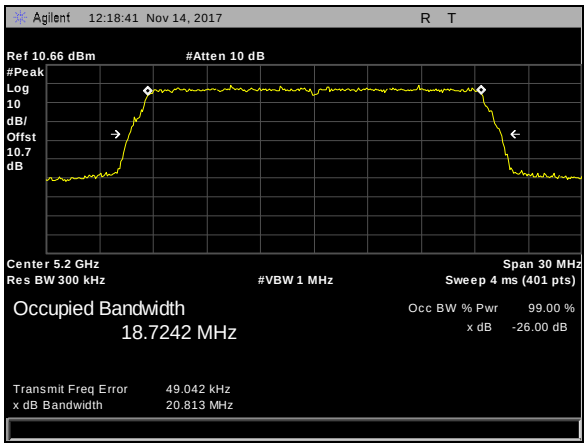
Plot 2. 26 dB - 99% Occupied Bandwidth, BW 10M, CF 5200M



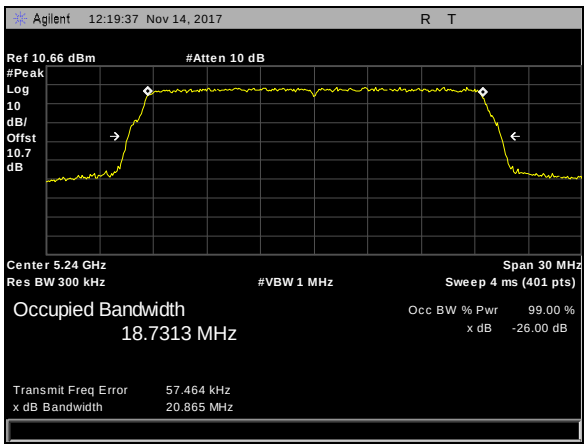
Plot 3. 26 dB - 99% Occupied Bandwidth, BW 10M, CF 5245M



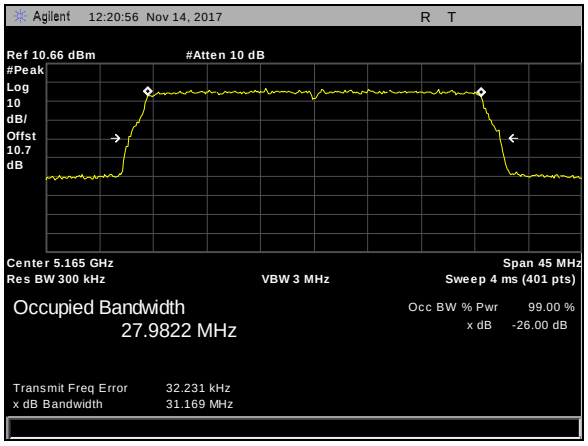
Plot 4. 26 dB - 99% Occupied Bandwidth, BW 20M, CF 5160M



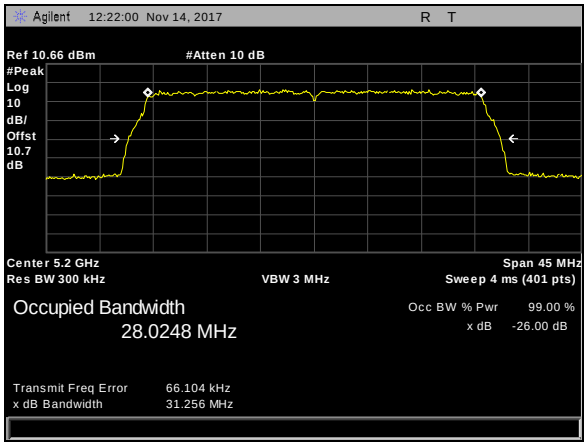
Plot 5. 26 dB - 99% Occupied Bandwidth, BW 20M, CF 5200M



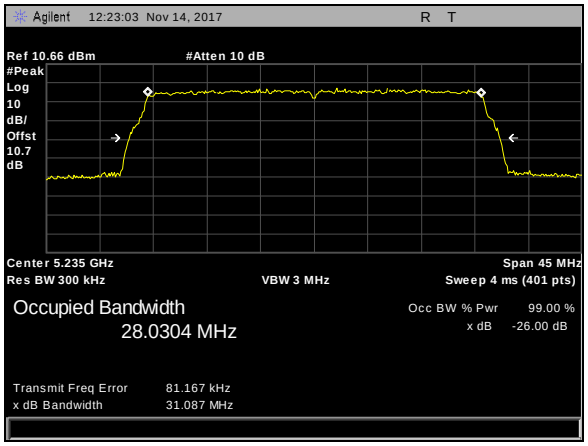
Plot 6. 26 dB - 99% Occupied Bandwidth, BW 20M, CF 5240M



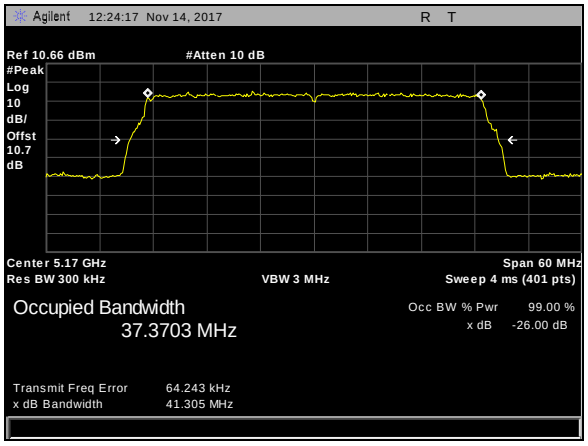
Plot 7. 26 dB - 99% Occupied Bandwidth, BW 30M, CF 5165M



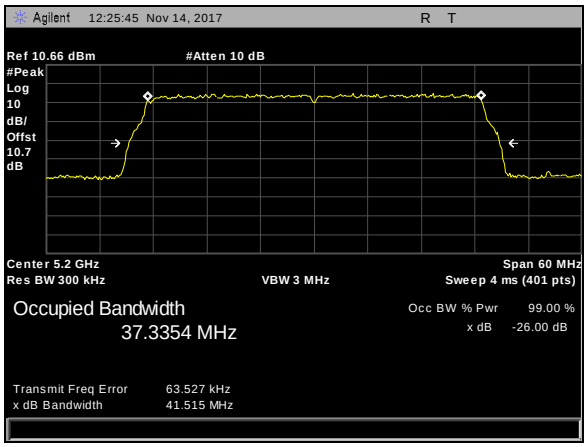
Plot 8. 26 dB - 99% Occupied Bandwidth, BW 30M, CF 5200M



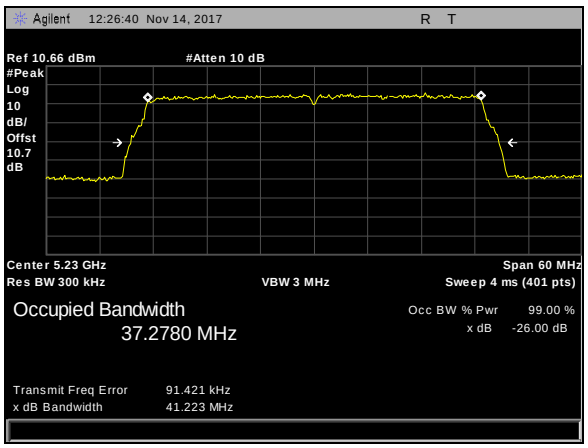
Plot 9. 26 dB - 99% Occupied Bandwidth, BW 30M, CF 5235M



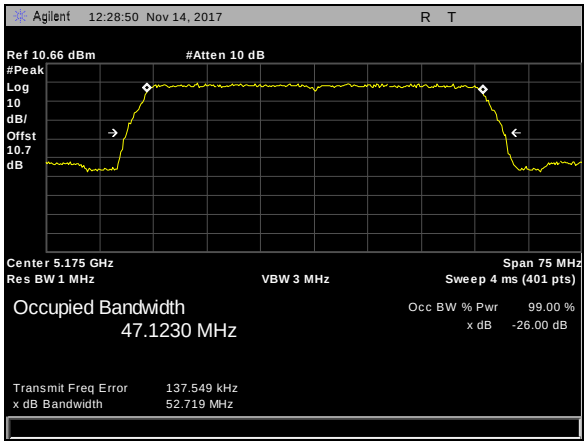
Plot 10. 26 dB - 99% Occupied Bandwidth, BW 40M, CF 5170M



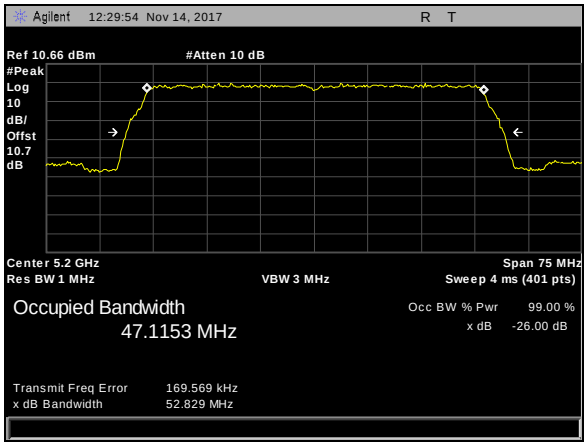
Plot 11. 26 dB - 99% Occupied Bandwidth, BW 40M, CF 5200M



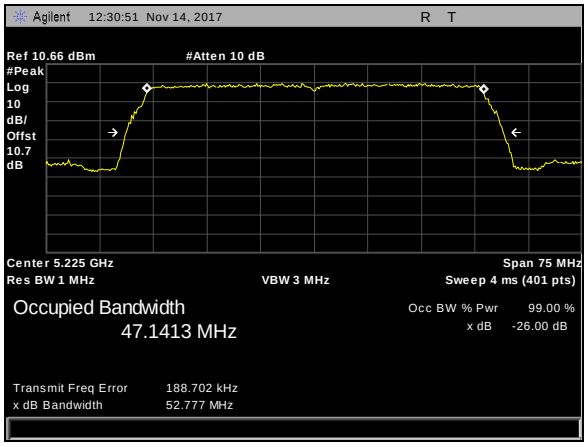
Plot 12. 26 dB - 99% Occupied Bandwidth, BW 40M, CF 5230M



Plot 13. 26 dB - 99% Occupied Bandwidth, BW 50M, CF 5175M



Plot 14. 26 dB - 99% Occupied Bandwidth, BW 50M, CF 5200M



Plot 15. 26 dB - 99% Occupied Bandwidth, BW 50M, CF 5225M

Electromagnetic Compatibility Criteria for Intentional Radiators

§15. 407(a)(1) Maximum Conducted Output Power

Test Requirements:

§15.407(a)(1)(i): For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407(a)(1)(ii): For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407(a)(1)(iii): For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.
Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

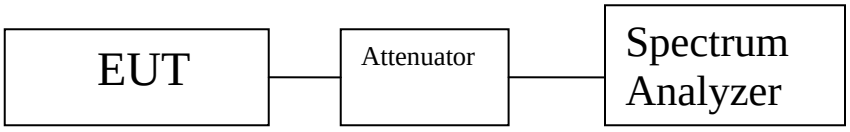
§15.407(a)(1)(iv): For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according to measurement method SA-1, as described in 789033 D02 General UNII Test Procedures v01.

Test Results: The EUT as tested is compliant with the requirements of this section.

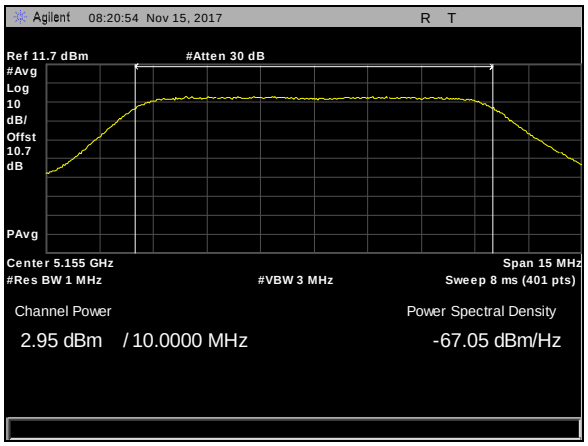
Test Engineer(s): Donald Salguero

Test Date(s): November 29, 2017

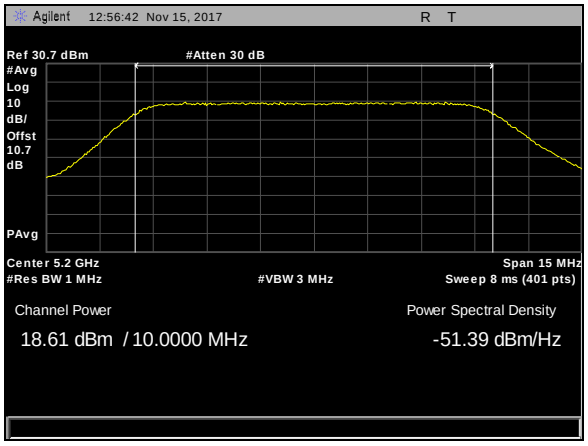


Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Antenna Gain (dBi)	Final Limit (dBm)	Margin
10	5155	2.95	1.01	5.10	30	13	30	-24.9
	5200	18.61	18.28	21.46	30	13	30	-8.54
	5245	18.92	18.78	21.87	30	13	30	-8.13
20	5160	2.92	2.00	5.50	30	13	30	-24.5
	5200	17.99	17.62	20.82	30	13	30	-9.18
	5240	22.02	21.91	24.98	30	13	30	-5.02
30	5165	3.38	3.09	6.25	30	13	30	-23.75
	5200	15.80	15.28	18.56	30	13	30	-11.44
	5235	22.37	21.74	25.08	30	13	30	-4.92
40	5170	3.79	3.01	6.43	30	13	30	-23.57
	5200	13.52	13.07	16.32	30	13	30	-13.68
	5230	21.99	21.71	24.87	30	13	30	-5.13
50	5175	4.01	3.29	6.68	30	13	30	-23.32
	5200	13.40	12.90	16.17	30	13	30	-13.83
	5225	21.90	21.96	24.95	30	13	30	-5.05

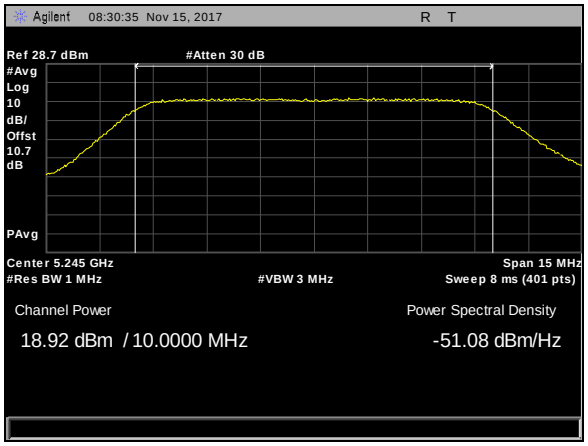
Table 9. Conducted Transmitter Power Output, fixed point-to-point, 13 dBi, 2x2, Test Results



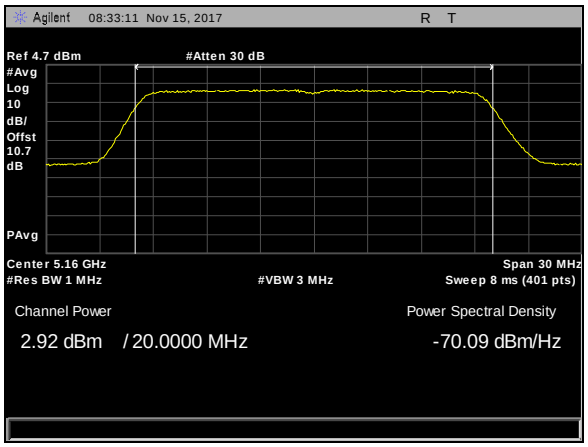
Plot 16. Conducted Transmitter Output Power, BW 10M, CF 5155M, 13dBi, c0



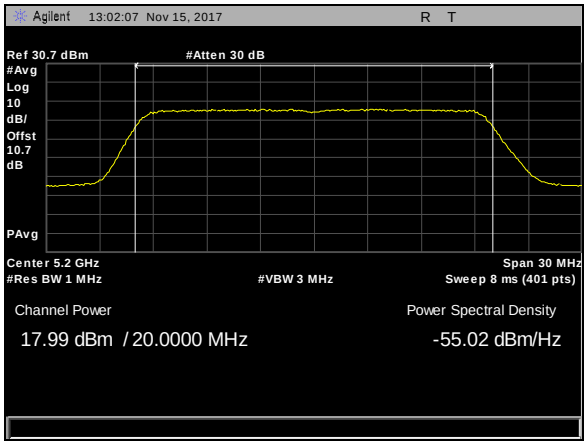
Plot 17. Conducted Transmitter Output Power, BW 10M, CF 5200M, 13dBi, c0



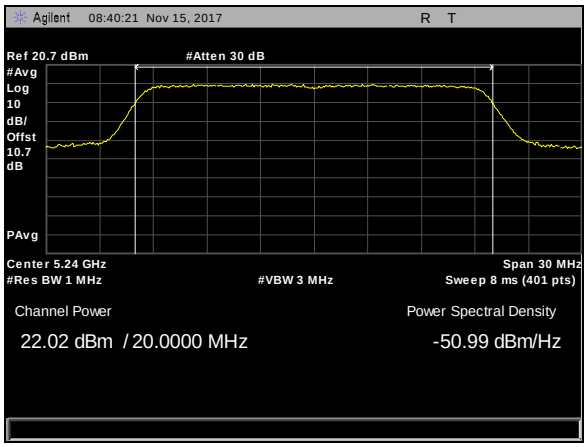
Plot 18. Conducted Transmitter Output Power, BW 10M, CF 5245M, 13dBi, c0



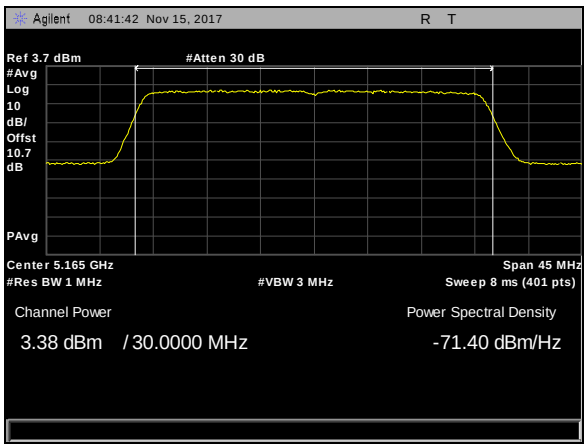
Plot 19. Conducted Transmitter Output Power, BW 20M, CF 5160M, 13dBi, c0



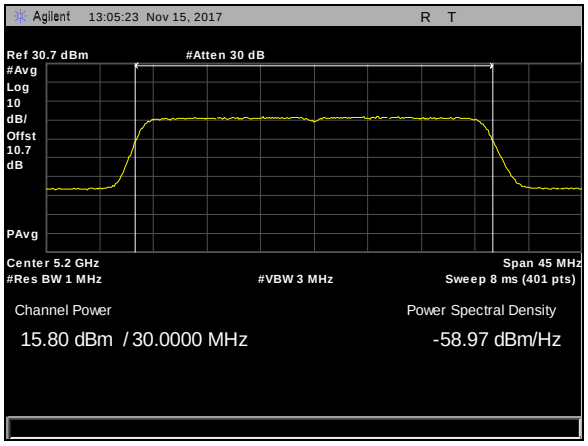
Plot 20. Conducted Transmitter Output Power, BW 20M, CF 5200M, 13dBi, c0



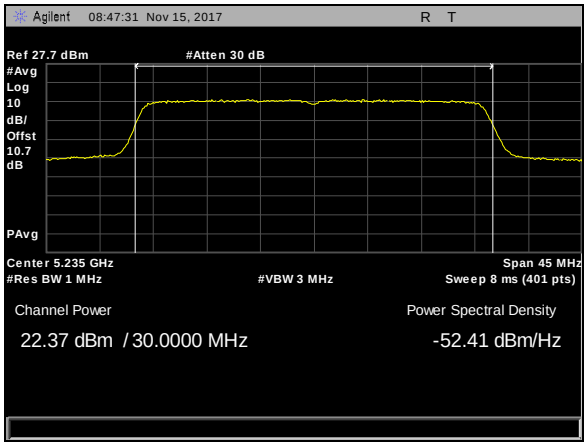
Plot 21. Conducted Transmitter Output Power, BW 20M, CF 5240M, 13dBi, c0



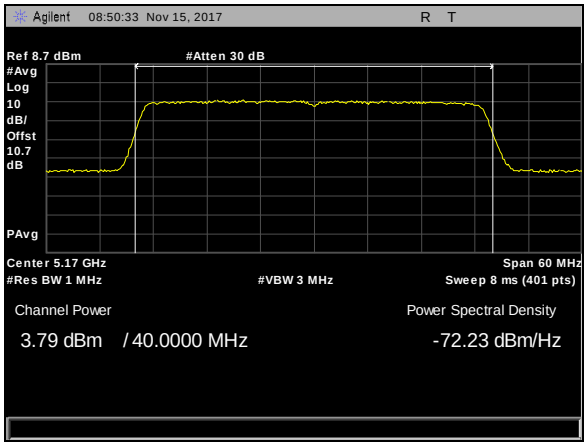
Plot 22. Conducted Transmitter Output Power, BW 30M, CF 5165M, 13dBi, c0



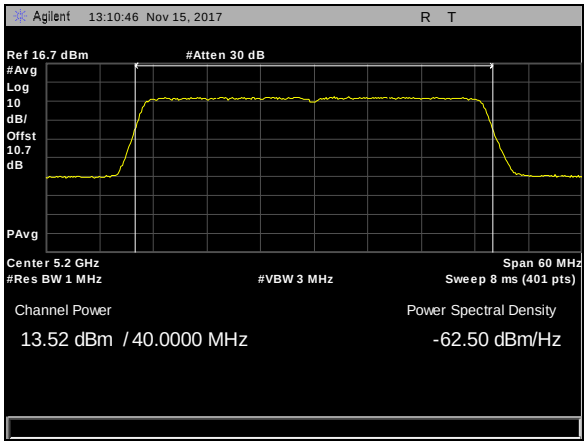
Plot 23. Conducted Transmitter Output Power, BW 30M, CF 5200M, 13dBi, c0



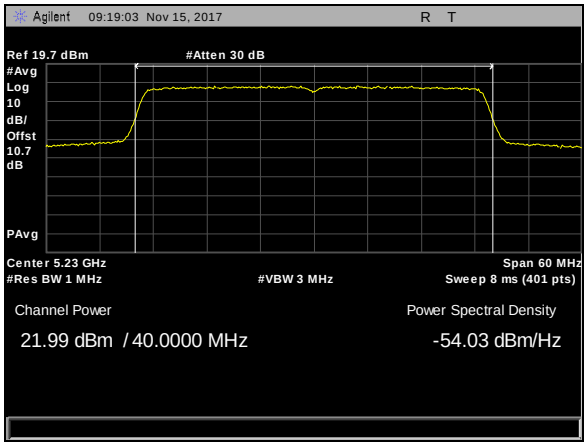
Plot 24. Conducted Transmitter Output Power, BW 30M, CF 5235M, 13dBi, c0



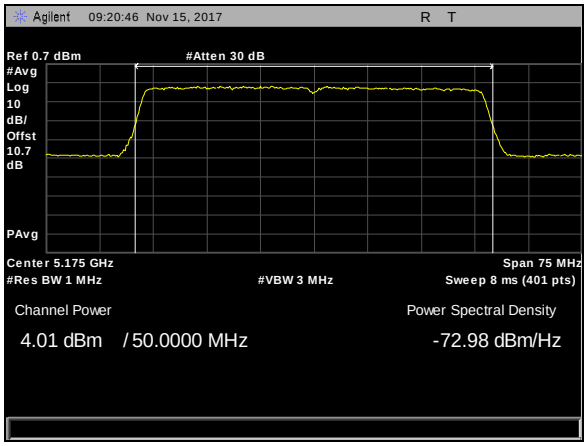
Plot 25. Conducted Transmitter Output Power, BW 40M, CF 5170M, 13dBi, c0



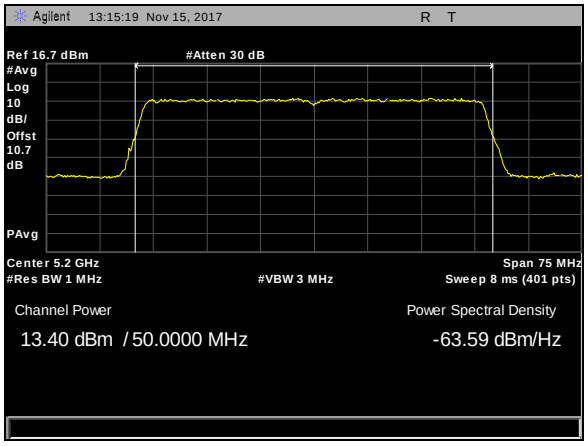
Plot 26. Conducted Transmitter Output Power, BW 40M, CF 5200M, 13dBi, c0



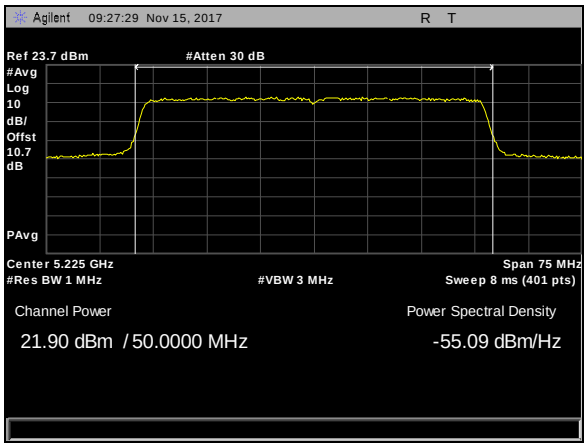
Plot 27. Conducted Transmitter Output Power, BW 40M, CF 5230M, 13dBi, c0



Plot 28. Conducted Transmitter Output Power, BW 50M, CF 5175M, 13dBi, c0



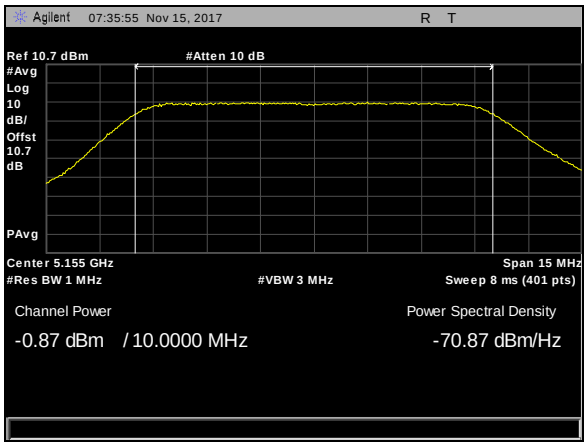
Plot 29. Conducted Transmitter Output Power, BW 50M, CF 5200M, 13dBi, c0



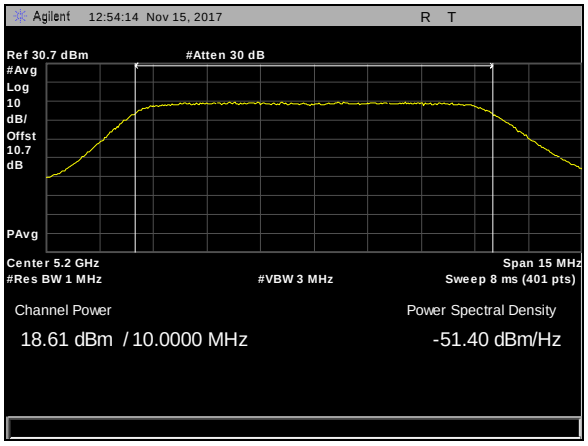
Plot 30. Conducted Transmitter Output Power, BW 50M, CF 5225M, 13dBi, c0

Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Antenna Gain (dBi)	Final Limit (dBm)	Margin
10	5155	-0.87	-2.00	1.62	30	19	30	-28.38
	5200	18.61	18.70	21.67	30	19	30	-8.33
	5245	18.78	18.57	21.69	30	19	30	-8.31
20	5160	-1.47	-1.74	1.41	30	19	30	-28.59
	5200	17.35	16.68	20.04	30	19	30	-9.96
	5240	21.45	21.50	24.49	30	19	30	-5.51
30	5165	0.66	-0.07	3.33	30	19	30	-26.67
	5200	13.43	13.10	16.28	30	19	30	-13.72
	5235	20.53	20.39	23.48	30	19	30	-6.52
40	5170	2.26	1.77	5.04	30	19	30	-24.96
	5200	10.67	10.24	13.48	30	19	30	-16.52
	5230	19.33	18.45	21.93	30	19	30	-8.07
50	5175	0.48	-0.46	3.05	30	19	30	-26.95
	5200	7.46	6.82	10.17	30	19	30	-19.83
	5225	17.18	16.91	20.06	30	19	30	-9.94

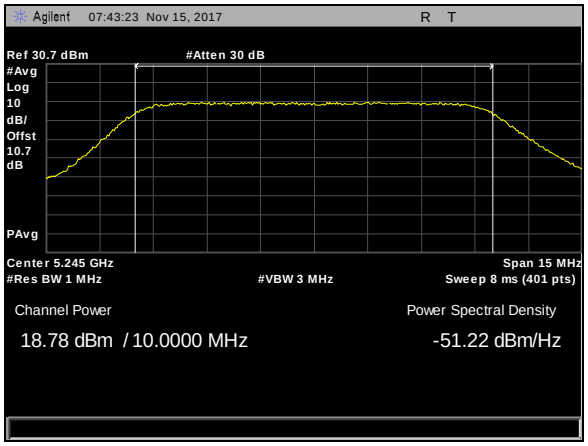
Table 10. Conducted Transmitter Power Output, fixed point-to-point, 19 dBi, 2x2, Test Results



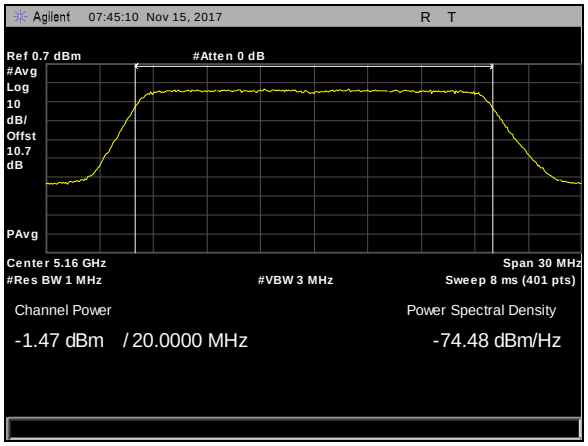
Plot 31. Conducted Transmitter Output Power, BW 10M, CF 5155M, 19dBi, c0



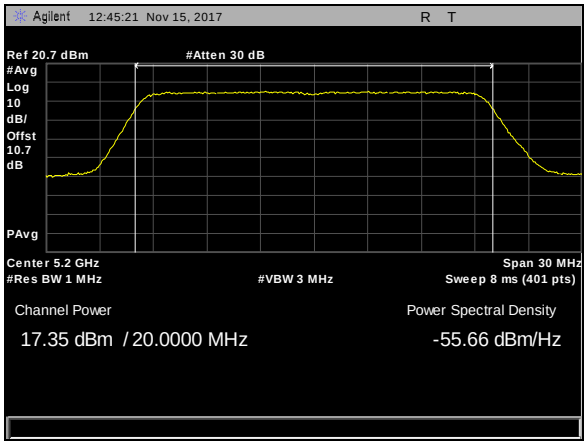
Plot 32. Conducted Transmitter Output Power, BW 10M, CF 5200M, 19dBi, c0



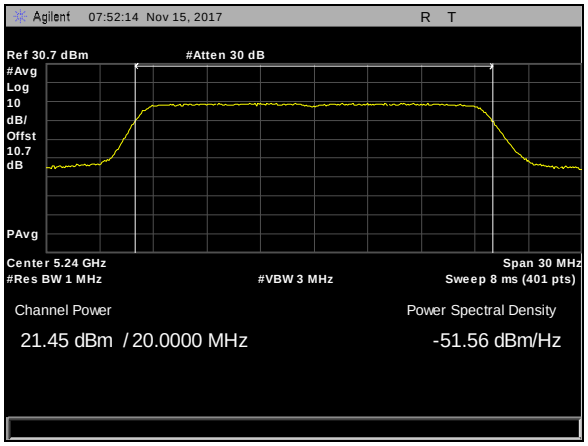
Plot 33. Conducted Transmitter Output Power, BW 10M, CF 5245M, 19dBi, c0



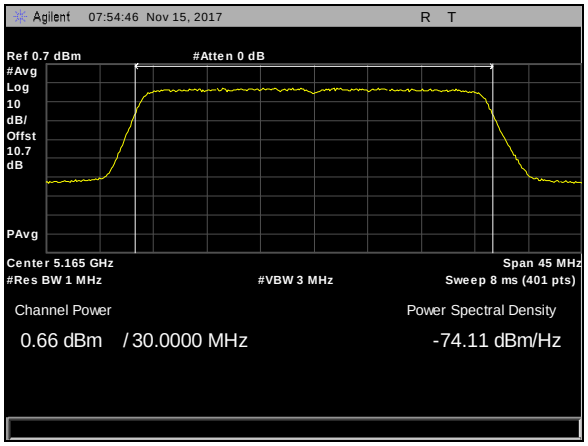
Plot 34. Conducted Transmitter Output Power, BW 20M, CF 5160M, 19dBi, c0



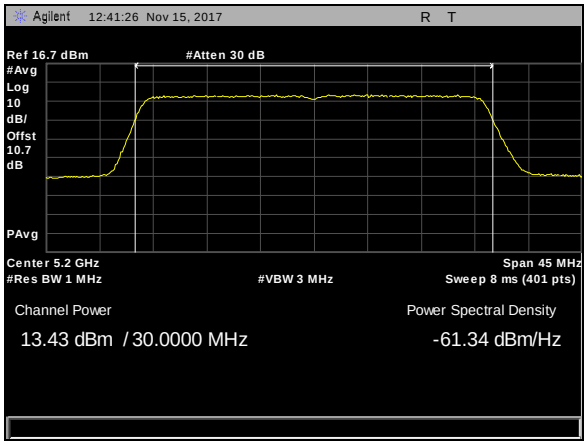
Plot 35. Conducted Transmitter Output Power, BW 20M, CF 5200M, 19dBi, c0



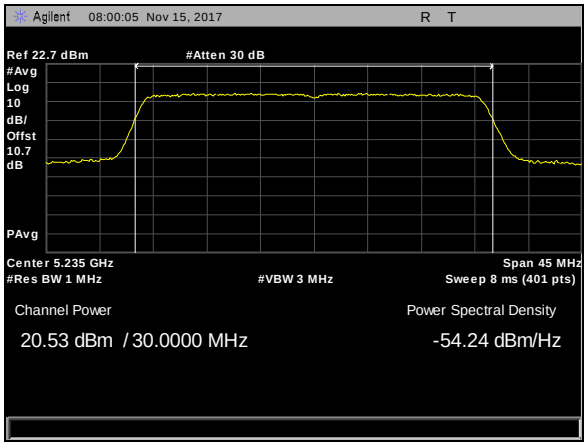
Plot 36. Conducted Transmitter Output Power, BW 20M, CF 5240M, 19dBi, c0



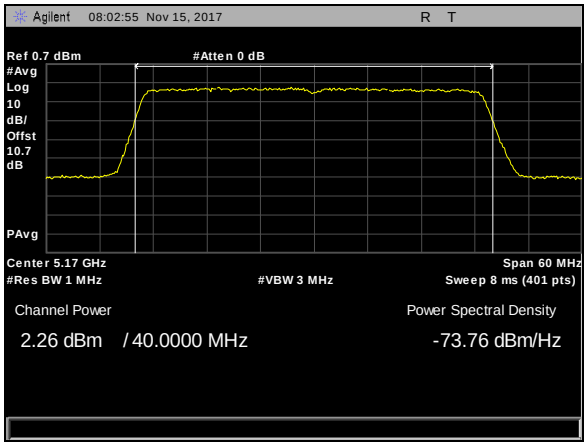
Plot 37. Conducted Transmitter Output Power, BW 30M, CF 5165M, 19dBi, c0



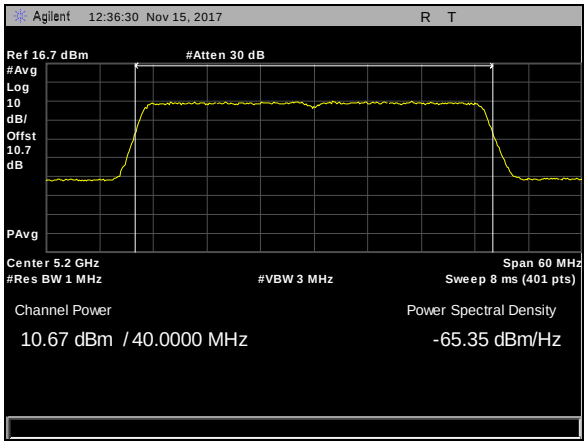
Plot 38. Conducted Transmitter Output Power, BW 30M, CF 5200M, 19dBi, c0



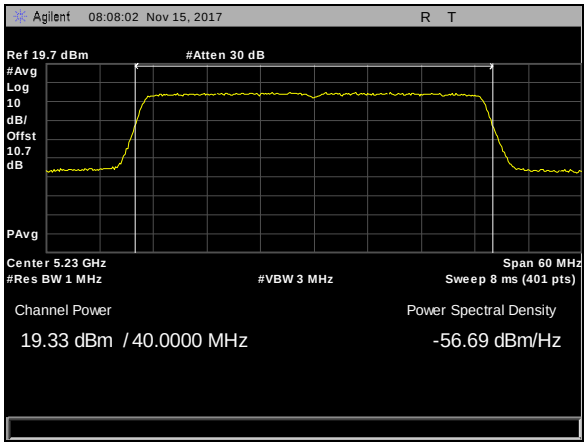
Plot 39. Conducted Transmitter Output Power, BW 30M, CF 5235M, 19dBi, c0



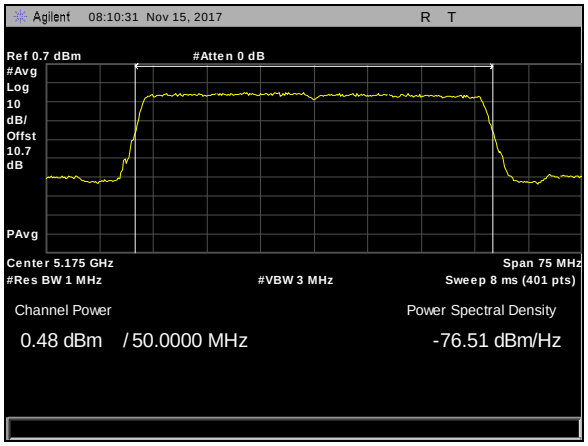
Plot 40. Conducted Transmitter Output Power, BW 40M, CF 5170M, 19dBi, c0



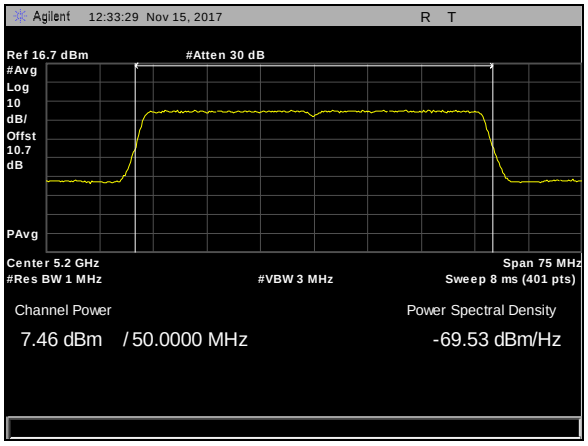
Plot 41. Conducted Transmitter Output Power, BW 40M, CF 5200M, 19dBi, c0



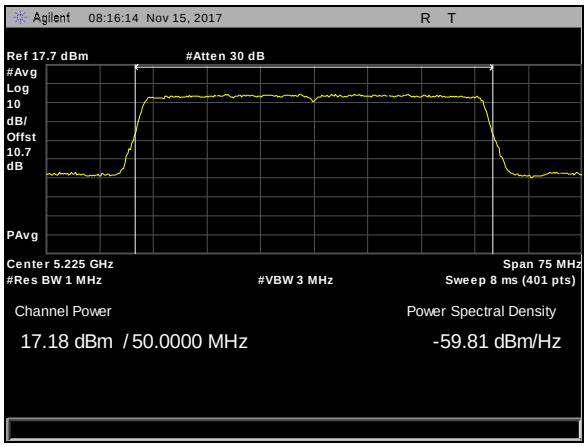
Plot 42. Conducted Transmitter Output Power, BW 40M, CF 5230M, 19dBi, c0



Plot 43. Conducted Transmitter Output Power, BW 50M, CF 5175M, 19dBi, c0



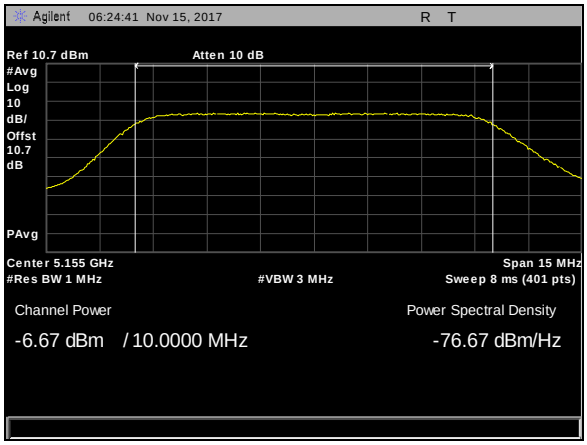
Plot 44. Conducted Transmitter Output Power, BW 50M, CF 5200M, 19dBi, c0



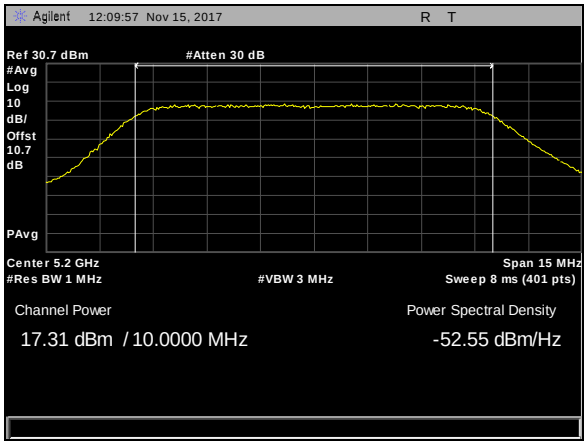
Plot 45. Conducted Transmitter Output Power, BW 50M, CF 5225M, 19dBi, c0

Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Antenna Gain (dBi)	Final Limit (dBm)	Margin
10	5155	-6.67	-8.15	-4.33	30	27	26	-30.33
	5200	17.31	16.74	20.05	30	27	26	-5.95
	5245	19.06	18.61	21.86	30	27	26	-4.14
20	5160	-9.79	-10.49	-7.11	30	27	26	-33.11
	5200	8.91	8.48	11.72	30	27	26	-14.28
	5240	17.91	17.55	20.75	30	27	26	-5.25
30	5165	-6.71	-7.44	-4.04	30	27	26	-30.04
	5200	8.67	8.10	11.41	30	27	26	-14.59
	5235	14.65	14.18	17.44	30	27	26	-8.56
40	5170	-7.82	-8.73	-5.24	30	27	26	-31.24
	5200	6.94	6.34	9.67	30	27	26	-16.33
	5230	11.03	10.60	13.84	30	27	26	-12.16
50	5175	-7.43	-8.64	-4.98	30	27	26	-30.98
	5200	4.93	4.09	7.55	30	27	26	-18.45
	5225	10.67	10.00	13.36	30	27	26	-12.64

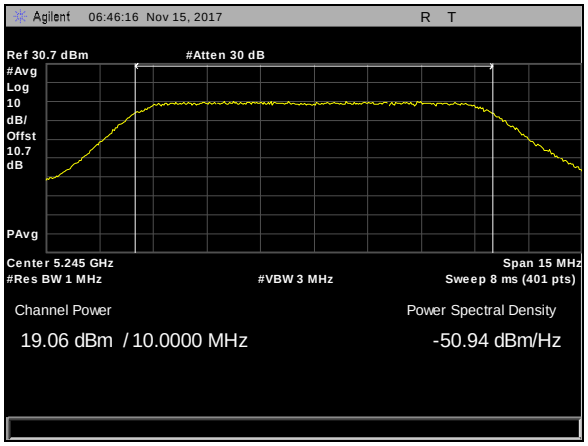
Table 11. Conducted Transmitter Power Output, fixed point-to-point, 27 dBi, 2x2, Test Results



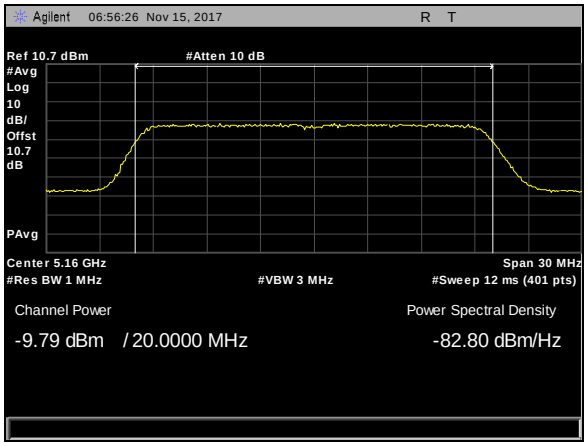
Plot 46. Conducted Transmitter Output Power, BW 10M, CF 5155M, 27dBi, c0



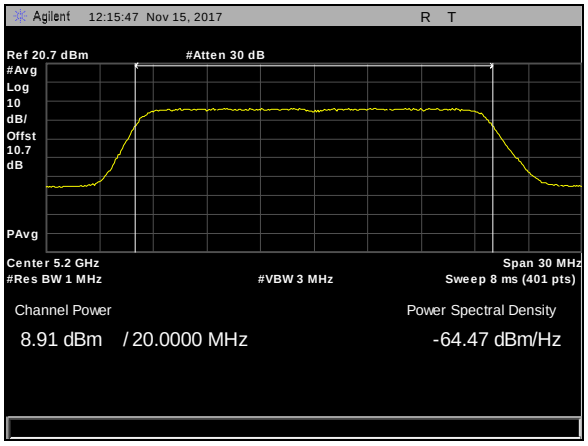
Plot 47. Conducted Transmitter Output Power, BW 10M, CF 5200M, 27dBi, c0



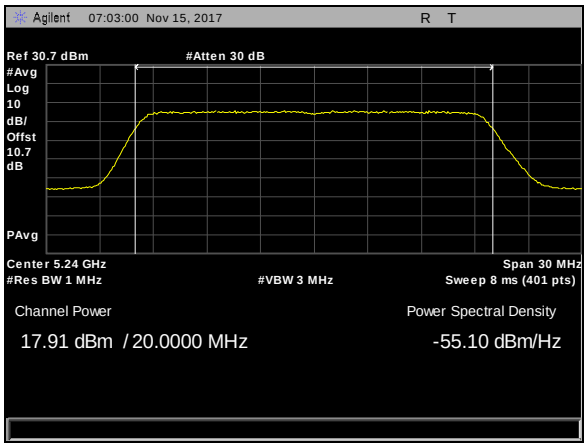
Plot 48. Conducted Transmitter Output Power, BW 10M, CF 5245M, 27dBi, c0



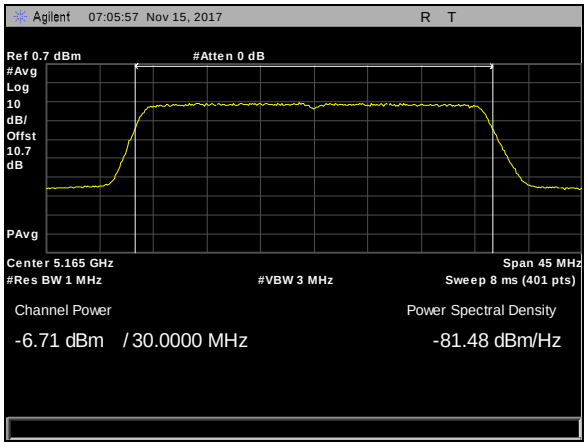
Plot 49. Conducted Transmitter Output Power, BW 20M, CF 5160M, 27dBi, c0



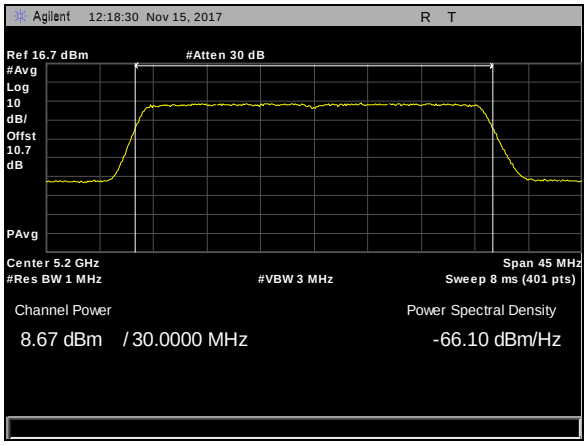
Plot 50. Conducted Transmitter Output Power, BW 20M, CF 5200M, 27dBi, c0



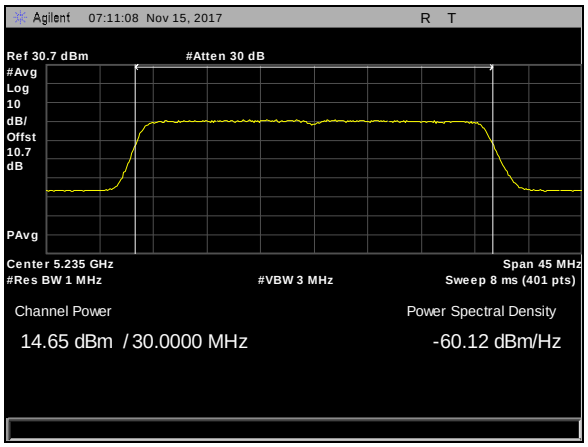
Plot 51. Conducted Transmitter Output Power, BW 20M, CF 5240M, 27dBi, c0



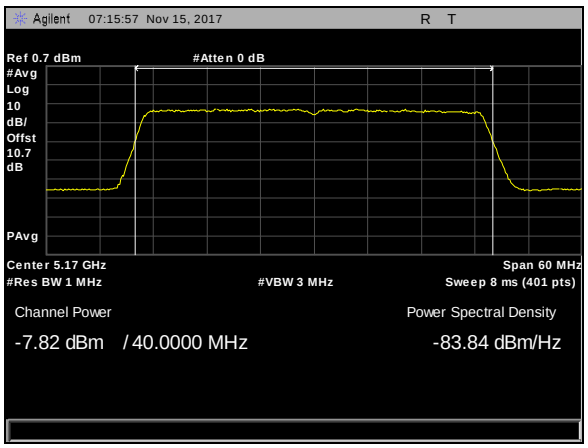
Plot 52. Conducted Transmitter Output Power, BW 30M, CF 5165M, 27dBi, c0



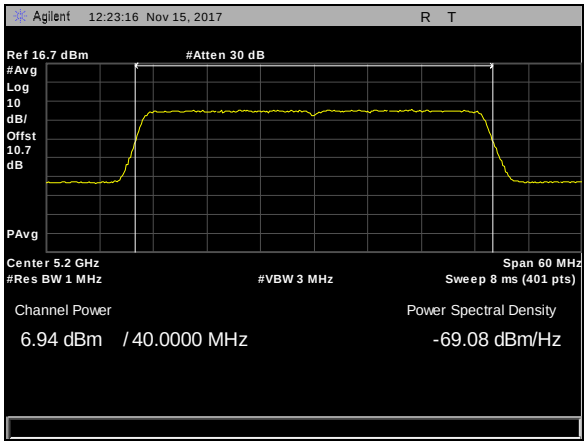
Plot 53. Conducted Transmitter Output Power, BW 30M, CF 5200M, 27dBi, c0



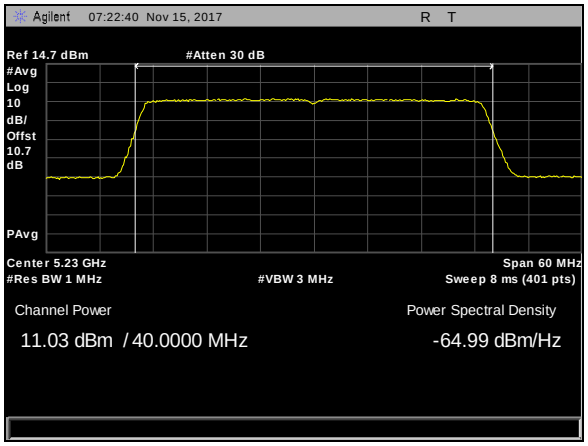
Plot 54. Conducted Transmitter Output Power, BW 30M, CF 5235M, 27dBi, c0



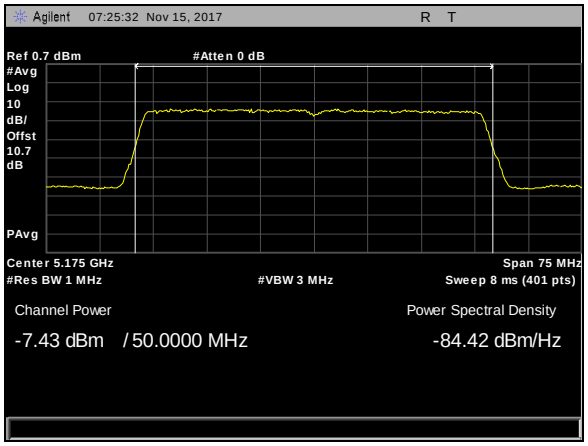
Plot 55. Conducted Transmitter Output Power, BW 40M, CF 5170M, 27dBi, c0



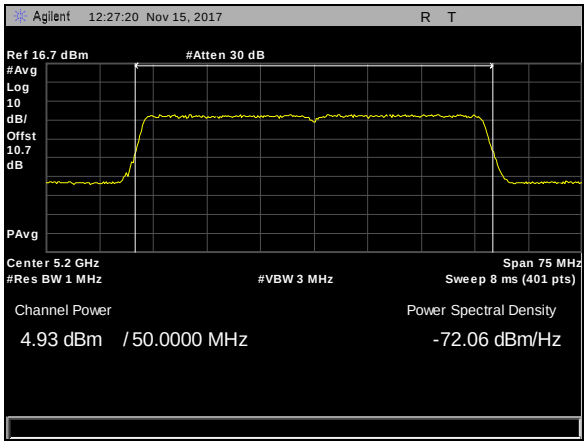
Plot 56. Conducted Transmitter Output Power, BW 40M, CF 5200M, 27dBi, c0



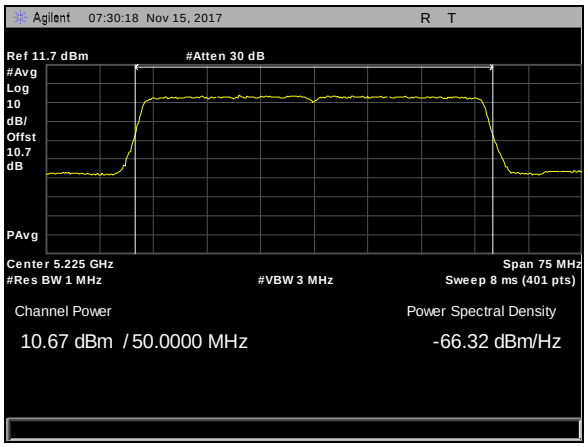
Plot 57. Conducted Transmitter Output Power, BW 40M, CF 5230M, 27dBi, c0



Plot 58. Conducted Transmitter Output Power, BW 50M, CF 5175M, 27dBi, c0



Plot 59. Conducted Transmitter Output Power, BW 50M, CF 5200M, 27dBi, c0



Plot 60. Conducted Transmitter Output Power, BW 50M, CF 5225M, 27dBi, c0

Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements:

§15.407(a)(1)(i): In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407(a)(1)(ii): In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi..

§15.407(a)(1)(iii): In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

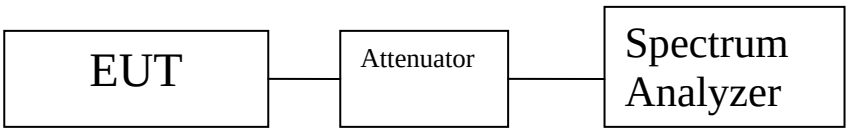
§15.407(a)(1)(iv): In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according KDB 789033 D02 General UNII Test Procedures v01.

Test Results: The EUT as tested is compliant with the requirements of this section.
No anomalies detected..

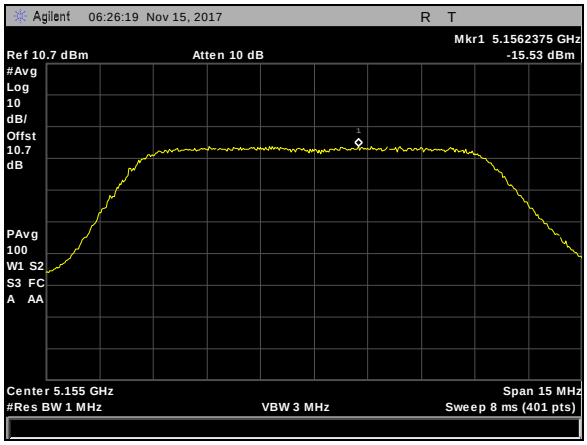
Test Engineer(s): Donald Salguero

Test Date(s): November 29, 2017

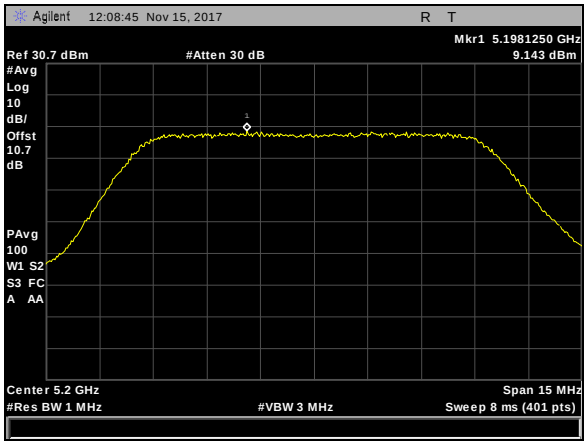


Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Antenna Gain (dBi)	Final Limit (dBm)	Margin
10	5155	-15.530	-16.210	-12.846	17	27	13	-25.846
	5200	9.143	8.191	11.704	17	27	13	-1.296
	5245	9.958	9.947	12.963	17	27	13	-0.037
20	5160	-21.240	-22.070	-18.624	17	27	13	-31.624
	5200	-2.465	-2.803	0.380	17	27	13	-12.62
	5240	6.494	6.291	9.404	17	27	13	-3.596
30	5165	-20.110	-21.230	-17.623	17	27	13	-30.623
	5200	-4.408	-5.138	-1.747	17	27	13	-14.747
	5235	1.832	1.201	4.539	17	27	13	-8.461
40	5170	-21.890	-23.070	-19.429	17	27	13	-32.429
	5200	-7.485	-8.175	-4.806	17	27	13	-17.806
	5230	-3.401	-3.913	-0.639	17	27	13	-13.639
50	5175	-23.170	-24.090	-20.595	17	27	13	-33.595
	5200	-10.680	-11.400	-8.014	17	27	13	-21.014
	5225	-4.395	-5.266	-1.798	17	27	13	-14.798

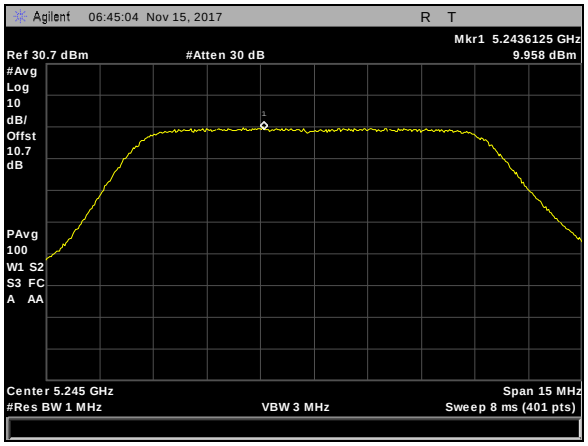
Table 12. Conducted Power Spectral Density, fixed point-to-point, 27 dBi, 2x2, Test Results



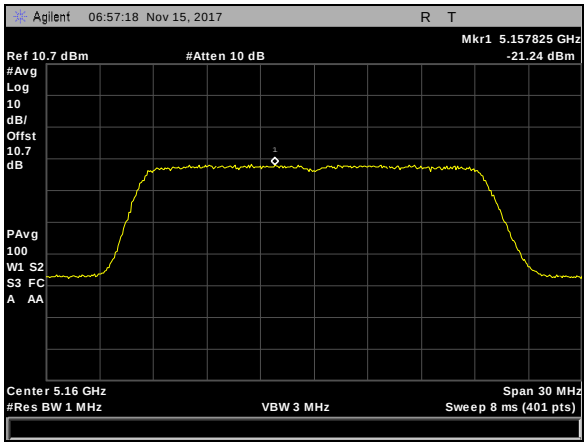
Plot 61. Power Spectral Density, BW 10M, CF 5155M, 27dBi, c0



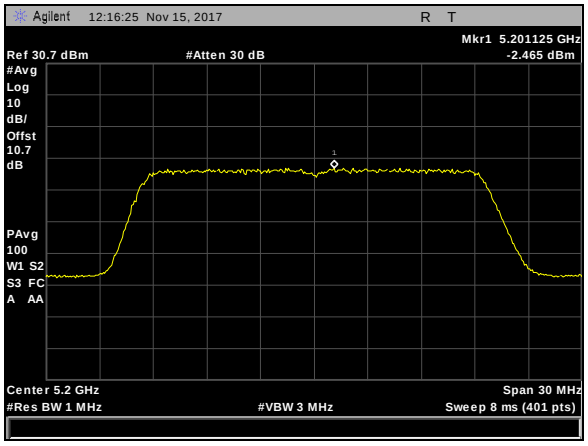
Plot 62. Power Spectral Density, BW 10M, CF 5200M, 27dBi, c0



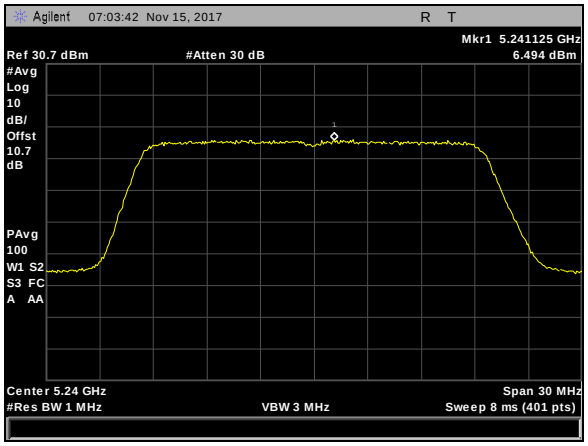
Plot 63. Power Spectral Density, BW 10M, CF 5245M, 27dBi, c0



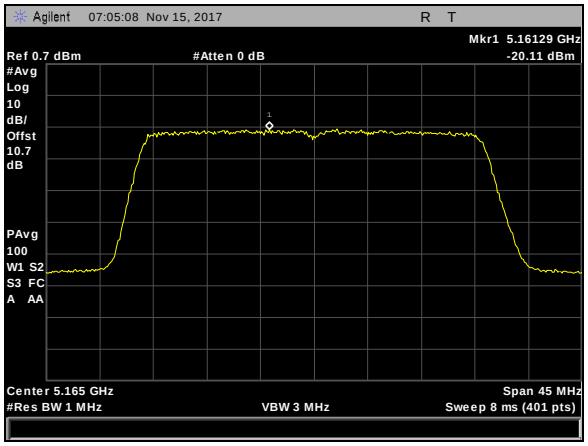
Plot 64. Power Spectral Density, BW 20M, CF 5160M, 27dBi, c0



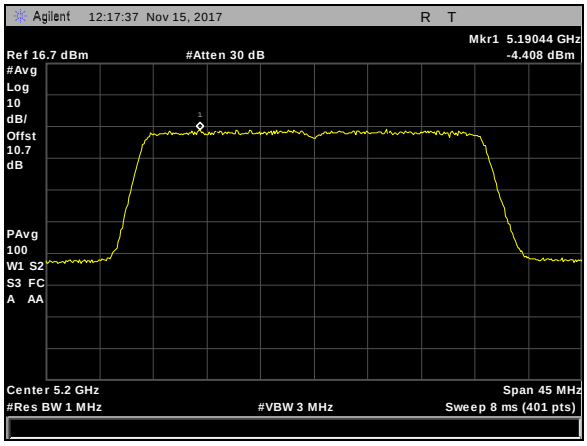
Plot 65. Power Spectral Density, BW 20M, CF 5200M, 27dBi, c0



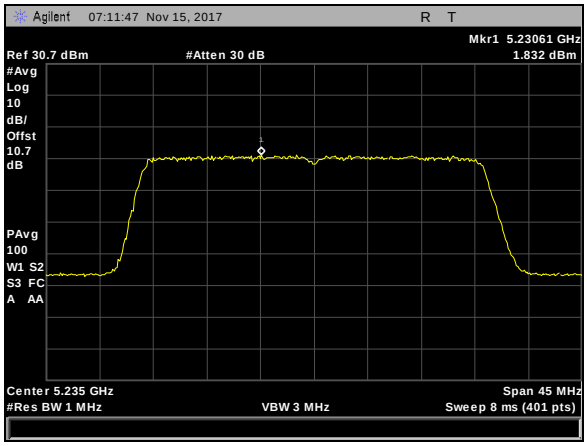
Plot 66. Power Spectral Density, BW 20M, CF 5240M, 27dBi, c0



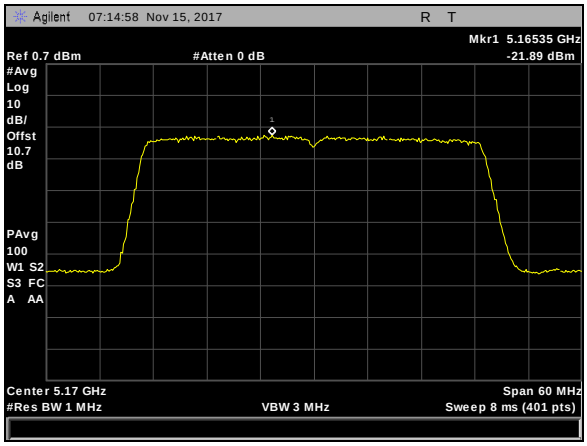
Plot 67. Power Spectral Density, BW 30M, CF 5165M, 27dBi, c0



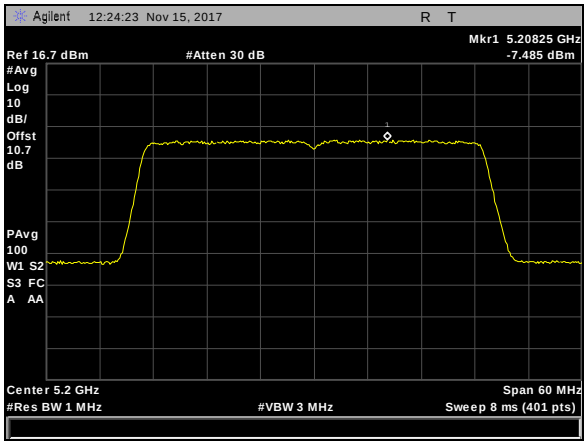
Plot 68. Power Spectral Density, BW 30M, CF 5200M, 27dBi, c0



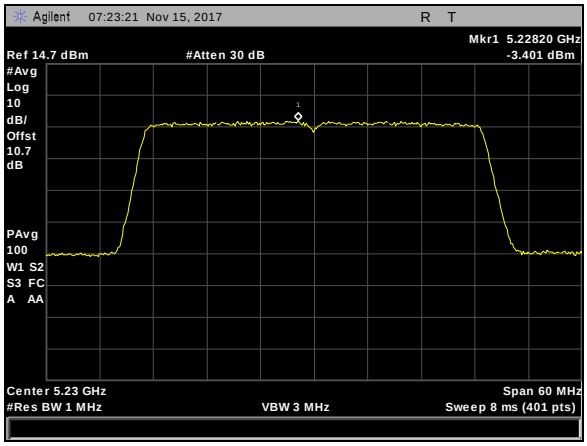
Plot 69. Power Spectral Density, BW 30M, CF 5235M, 27dBi, c0



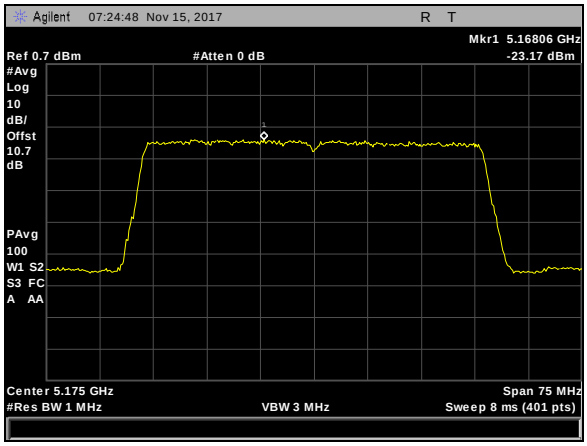
Plot 70. Power Spectral Density, BW 40M, CF 5170M, 27dBi, c0



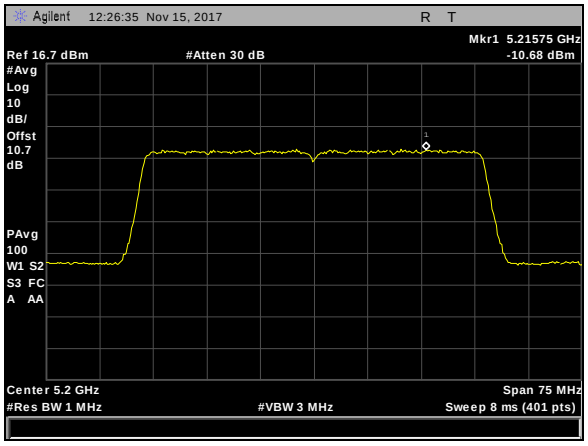
Plot 71. Power Spectral Density, BW 40M, CF 5200M, 27dBi, c0



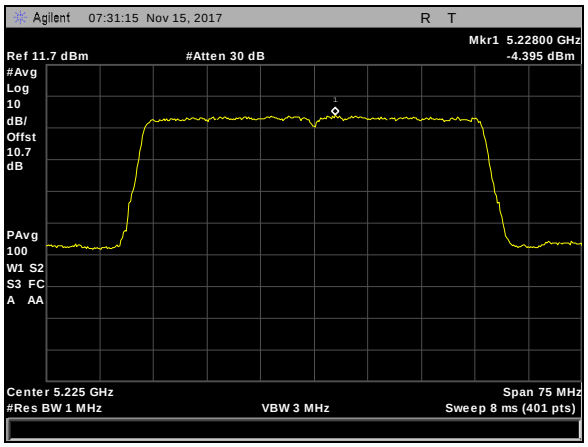
Plot 72. Power Spectral Density, BW 40M, CF 5230M, 27dBi, c0



Plot 73. Power Spectral Density, BW 50M, CF 5175M, 27dBi, c0



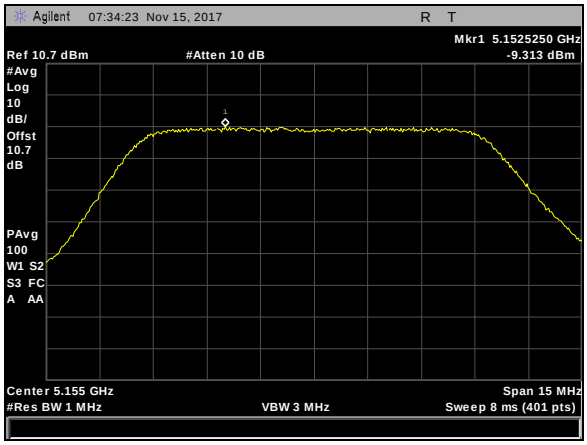
Plot 74.Power Spectral Density, BW 50M, CF 5200M, 27dBi, c0



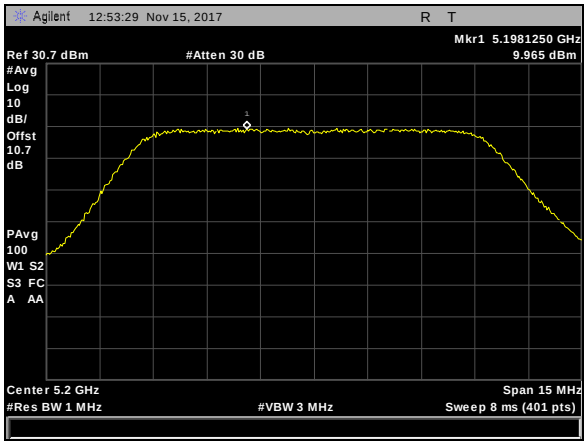
Plot 75. Power Spectral Density, BW 50M, CF 5225M, 27dBi, c0

Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Antenna Gain (dBi)	Final Limit (dBm)	Margin
10	5155	-9.313	-10.680	-6.932	17	19	17	-23.932
	5200	9.965	9.986	12.986	17	19	17	-4.014
	5245	9.985	9.972	12.989	17	19	17	-4.011
20	5160	-12.350	-13.490	-9.872	17	19	17	-26.872
	5200	5.738	5.127	8.454	17	19	17	-8.546
	5240	9.994	9.901	12.959	17	19	17	-4.041
30	5165	-12.350	-13.450	-9.854	17	19	17	-26.854
	5200	0.429	-0.618	2.948	17	19	17	-14.052
	5235	7.659	6.858	10.288	17	19	17	-6.712
40	5170	-12.070	-12.760	-9.391	17	19	17	-26.391
	5200	-3.487	-4.281	-0.855	17	19	17	-17.855
	5230	4.892	4.143	7.544	17	19	17	-9.456
50	5175	-14.720	-15.730	-12.185	17	19	17	-29.185
	5200	-7.799	-8.098	-4.935	17	19	17	-21.935
	5225	1.909	1.505	4.722	17	19	17	-12.278

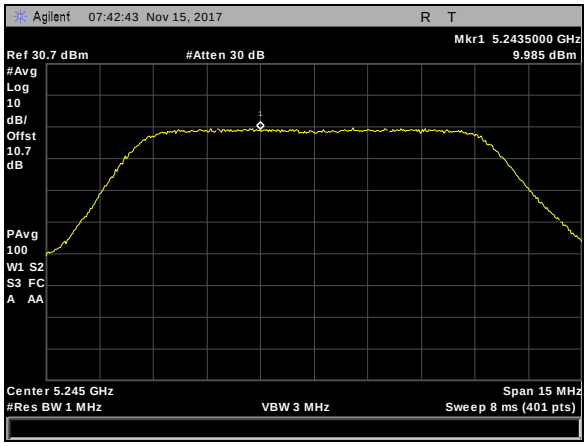
Table 13. Conducted Power Spectral Density, fixed point-to-point, 19 dBi, 2x2, Test Results



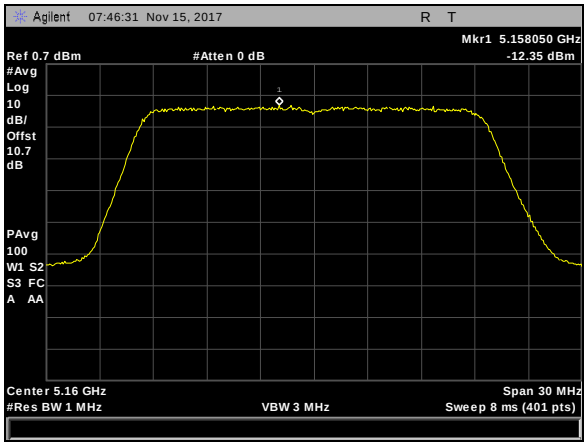
Plot 76. Power Spectral Density, BW 10M, CF 5155M, 19dBi, c0



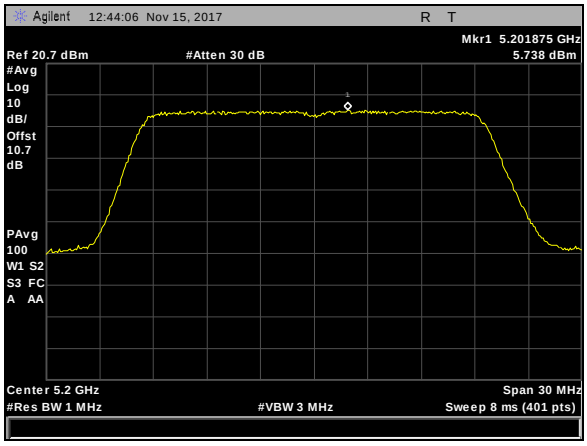
Plot 77. Power Spectral Density, BW 10M, CF 5200M, 19dBi, c0



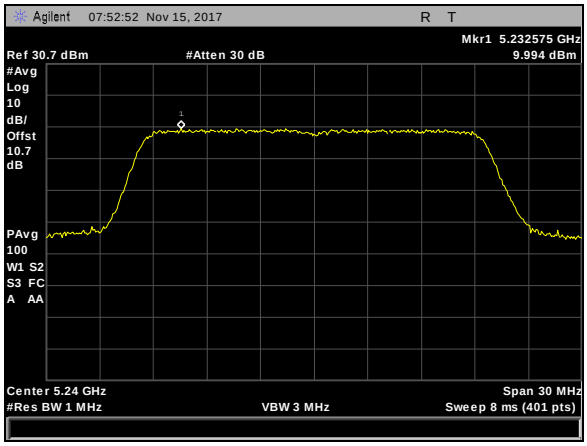
Plot 78. Power Spectral Density, BW 10M, CF 5245M, 19dBi, c0



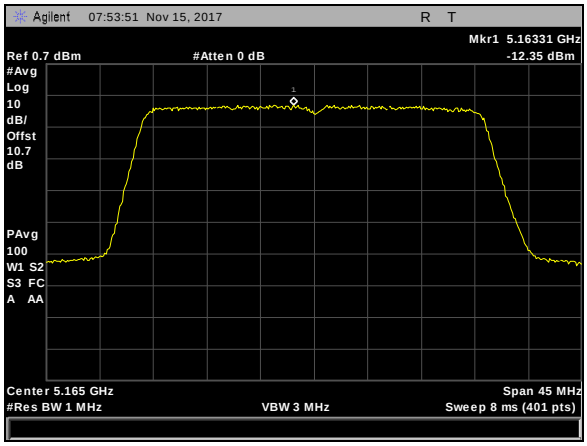
Plot 79. Power Spectral Density, BW 20M, CF 5160M, 19dBi, c0



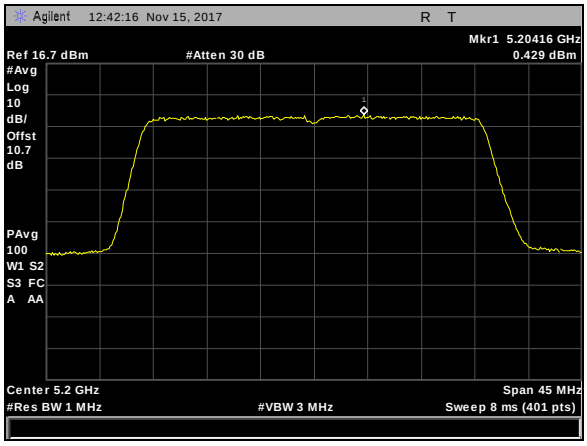
Plot 80. Power Spectral Density, BW 20M, CF 5200M, 19dBi, c0



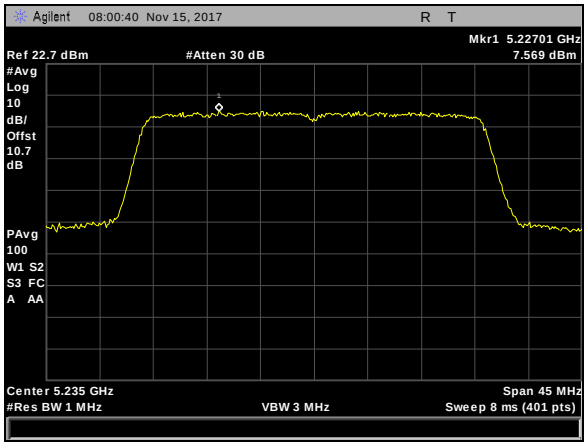
Plot 81. Power Spectral Density, BW 20M, CF 5240M, 19dBi, c0



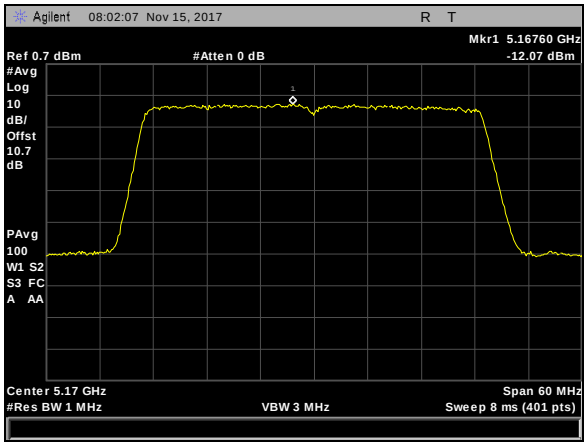
Plot 82. Power Spectral Density, BW 30M, CF 5165M, 19dBi, c0



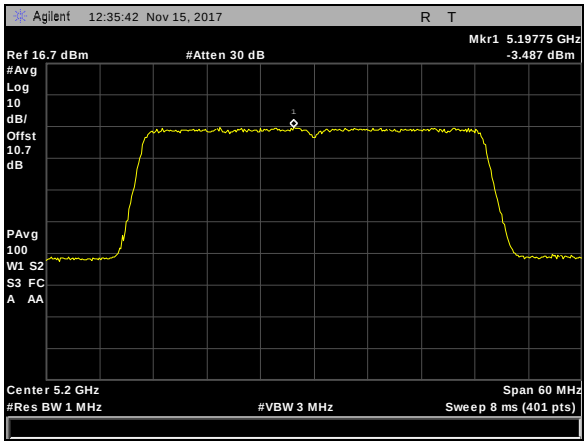
Plot 83. Power Spectral Density, BW 30M, CF 5200M, 19dBi, c0



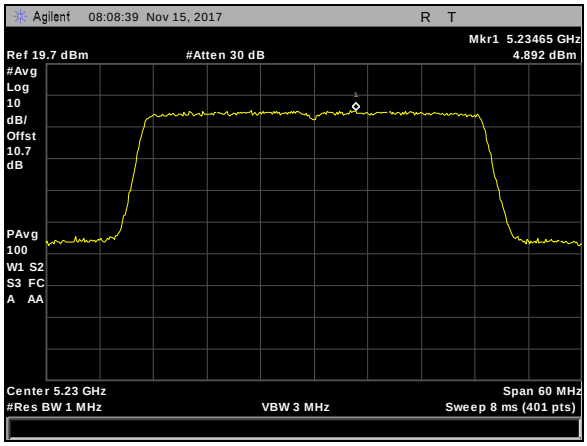
Plot 84. Power Spectral Density, BW 30M, CF 5235M, 19dBi, c0



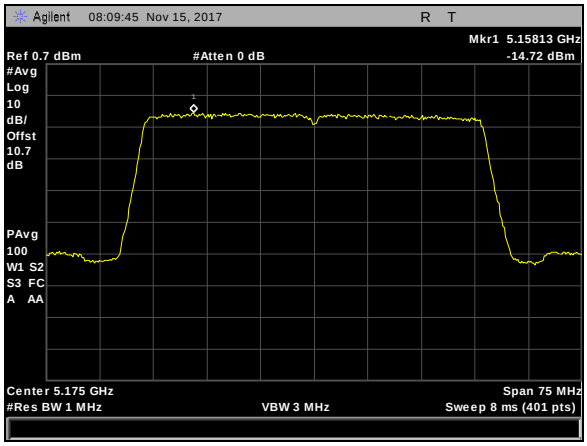
Plot 85. Power Spectral Density, BW 40M, CF 5170M, 19dBi, c0



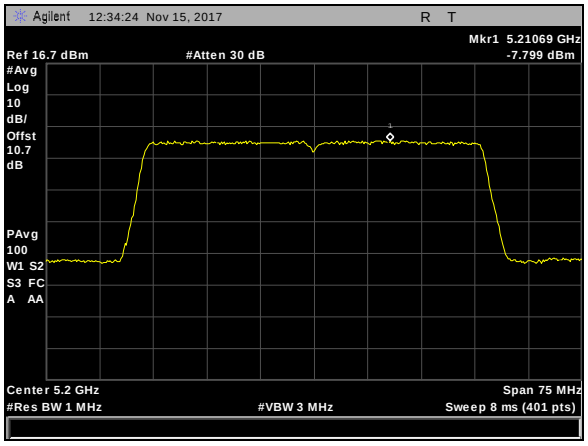
Plot 86. Power Spectral Density, BW 40M, CF 5200M, 19dBi, c0



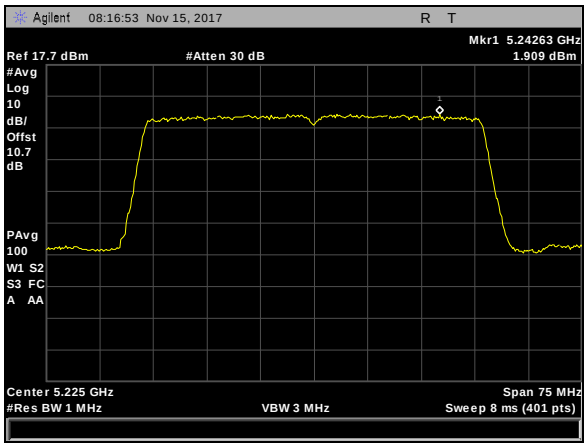
Plot 87. Power Spectral Density, BW 40M, CF 5230M, 19dBi, c0



Plot 88. Power Spectral Density, BW 50M, CF 5175M, 19dBi, c0



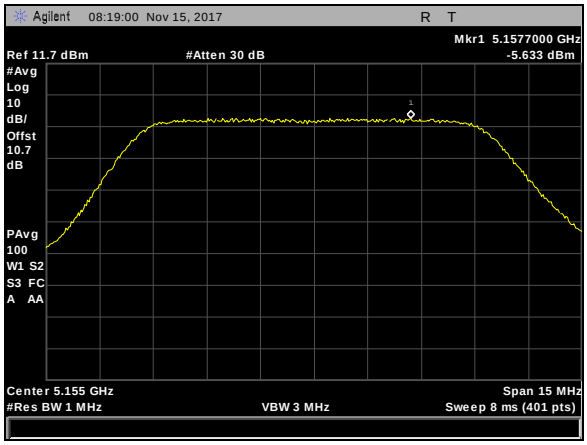
Plot 89.Power Spectral Density, BW 50M, CF 5200M, 19dBi, c0



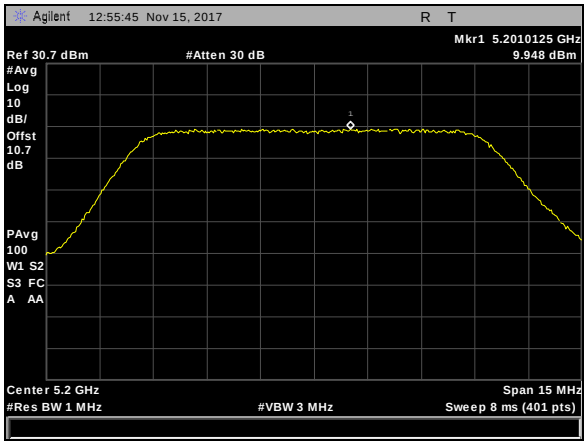
Plot 90. Power Spectral Density, BW 50M, CF 5225M, 19dBi, c0

Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Antenna Gain (dBi)	Final Limit (dBm)	Margin
10	5155	-5.633	-6.698	-3.122	17	13	17	-20.122
	5200	9.948	9.635	12.805	17	13	17	-4.195
	5245	9.990	9.909	12.960	17	13	17	-4.040
20	5160	-8.521	-9.568	-6.002	17	13	17	-23.002
	5200	6.727	6.350	9.553	17	13	17	-7.447
	5240	9.926	9.960	12.954	17	13	17	-4.046
30	5165	-8.966	-9.572	-6.248	17	13	17	-23.248
	5200	2.749	1.791	5.307	17	13	17	-11.693
	5235	9.147	8.980	12.075	17	13	17	-4.925
40	5170	-10.740	-11.540	-8.111	17	13	17	-25.111
	5200	-0.664	-1.390	1.999	17	13	17	-15.001
	5230	8.361	7.719	11.063	17	13	17	-5.937
50	5175	-11.110	-12.290	-8.649	17	13	17	-25.649
	5200	-2.372	-2.873	0.396	17	13	17	-16.604
	5225	6.540	6.365	9.464	17	13	17	-7.536

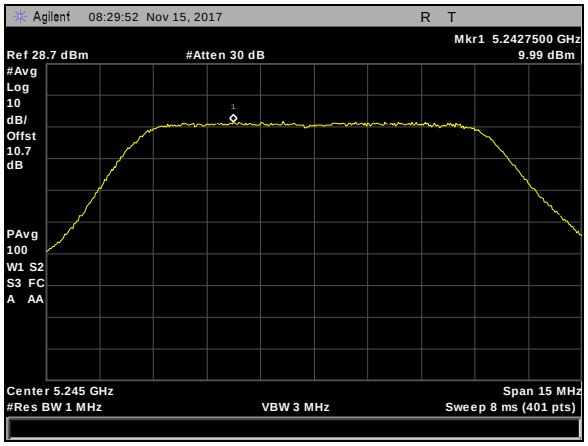
Table 14. Conducted Power Spectral Density, fixed point-to-point, 13 dBi, 2x2, Test Results



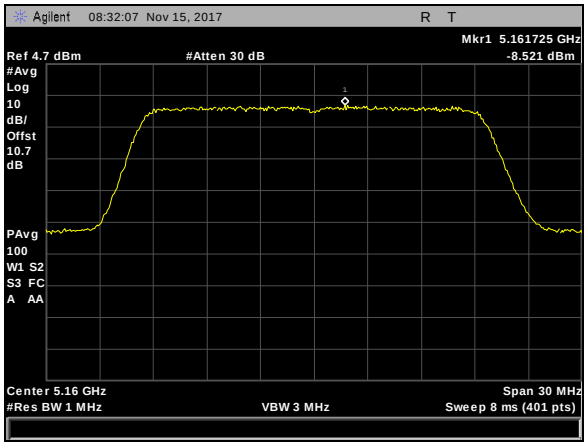
Plot 91. Power Spectral Density, BW 10M, CF 5155M, 13dBi, c0



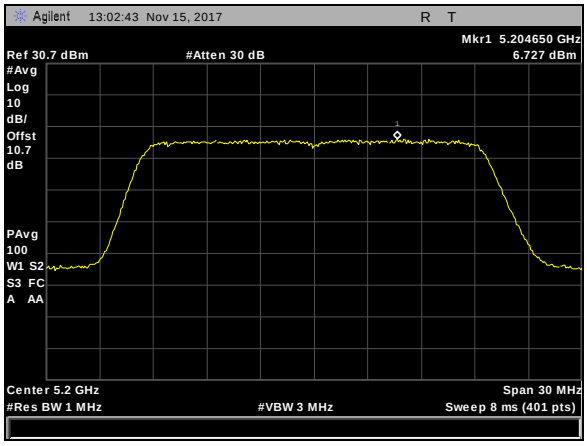
Plot 92. Power Spectral Density, BW 10M, CF 5200M, 13dBi, c0



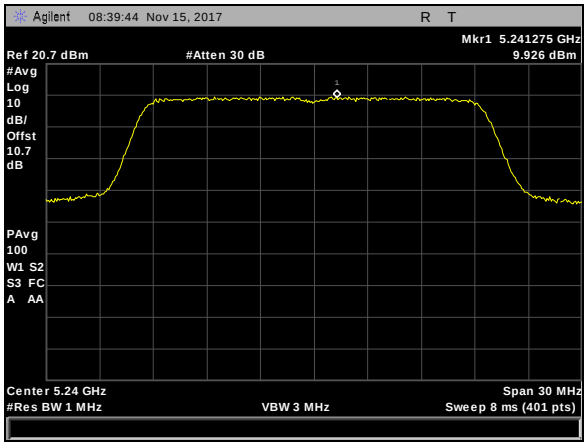
Plot 93. Power Spectral Density, BW 10M, CF 5245M, 13dBi, c0



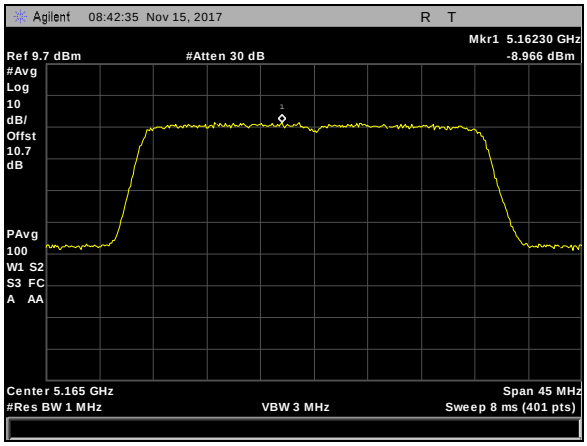
Plot 94. Power Spectral Density, BW 20M, CF 5160M, 13dBi, c0



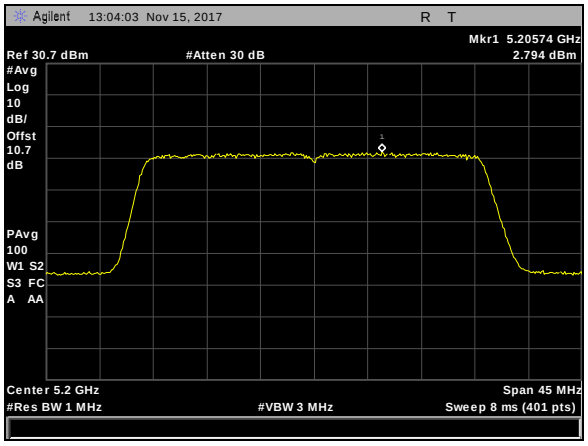
Plot 95. Power Spectral Density, BW 20M, CF 5200M, 13dBi, c0



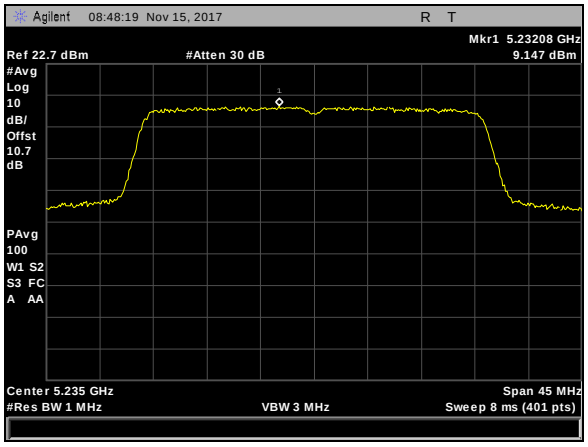
Plot 96. Power Spectral Density, BW 20M, CF 5240M, 13dBi, c0



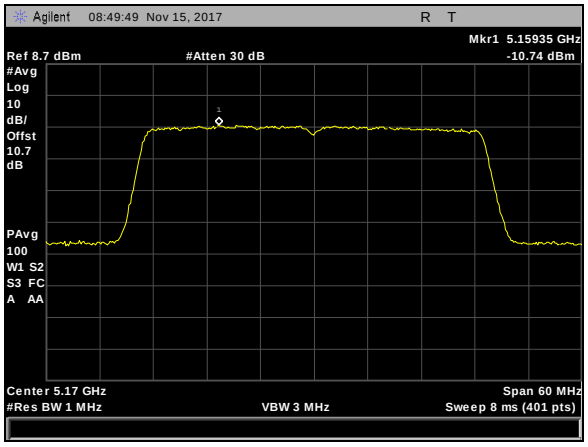
Plot 97. Power Spectral Density, BW 30M, CF 5165M, 13dBi, c0



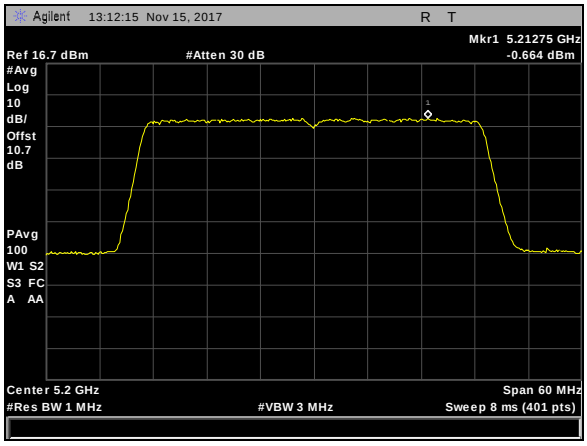
Plot 98. Power Spectral Density, BW 30M, CF 5200M, 13dBi, c0



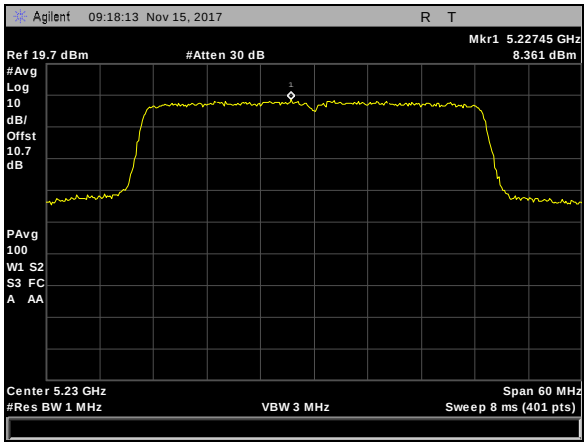
Plot 99. Power Spectral Density, BW 30M, CF 5235M, 13dBi, c0



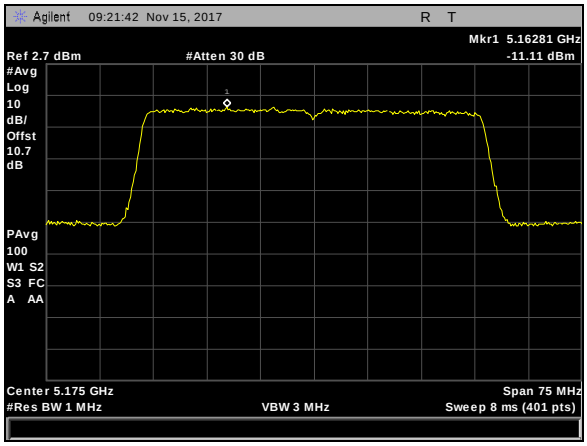
Plot 100. Power Spectral Density, BW 40M, CF 5170M, 13dBi, c0



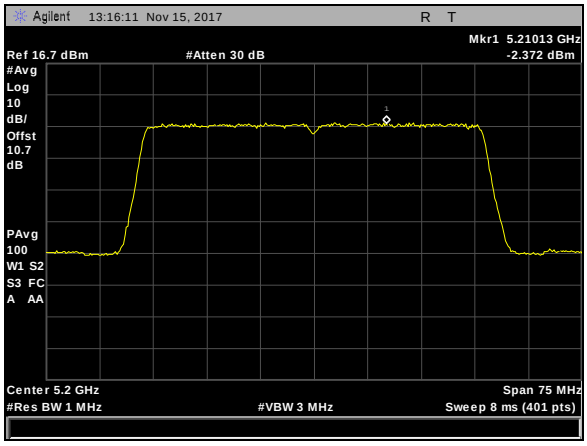
Plot 101. Power Spectral Density, BW 40M, CF 5200M, 13dBi, c0



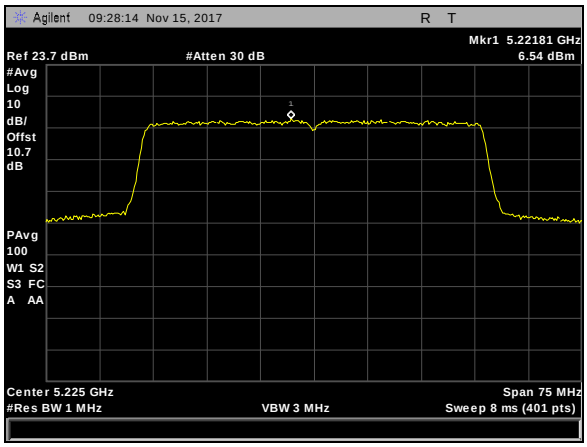
Plot 102. Power Spectral Density, BW 40M, CF 5230M, 13dBi, c0



Plot 103. Power Spectral Density, BW 50M, CF 5175M, 13dBi, c0



Plot 104. Power Spectral Density, BW 50M, CF 5200M, 13dBi, c0



Plot 105. Power Spectral Density, BW 50M, CF 5225M, 13dBi, c0

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.407(b)(1) & (6 – 7) Undesirable Emissions

Test Requirements:

§ 15.407(b)(1): For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 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 EUT was placed on a non-conducting stand on a turntable in a chamber. To find the maximum emission the EUT was set to transmit on low, mid, and high channels. Additionally, the turntable was rotated 360 degrees, the EUT was oriented through its three orthogonal axes, and the receive antenna height was varied in order to maximize emissions.

For frequencies from 30 MHz to 1 GHz, measurements were first made using a peak detector with a 100 kHz resolution bandwidth. Emissions which exceeded the limits were re-measured using a quasi-peak detector with a 120 kHz resolution bandwidth.

Above 1 GHz, measurements were made pursuant the method described in FCC KDB 789033 D02 General UNII Test Procedure New Rules v01. The equation, **EIRP= E + 20 log D – 104.8** was used to convert field strength to EIRP (**E** = field strength (dBµV/m) and **D** = Reference measurement distance**).**

For emissions above 1 GHz and in restricted bands, measurements of the field strength were made with a peak detector and an average detector and compared with the limits of 15.209.

As an alternative, according to FCC KDB 789033 D02 General UNII Test Procedure New Rules v01, all emissions above 1 GHz that comply with the peak and average limits of 15.209 satisfy the requirements of unwanted emissions in 15.407.

Test Results:

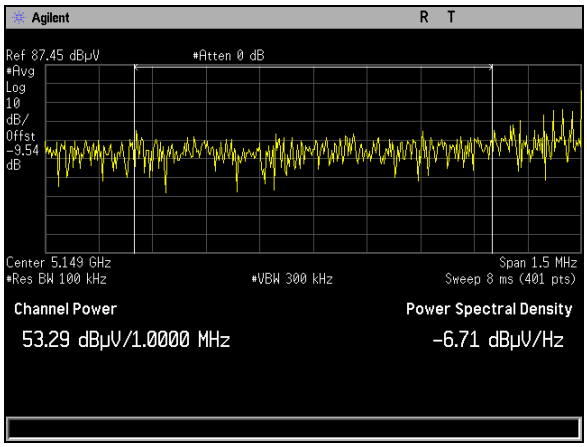
For below 1 GHz, the EUT was compliant with the requirements of this section. The worst case configuration is used to show compliance with the requirements.

For above 1 GHz, the EUT was compliant with the requirements of this section. Plots for band-edge measurements account for cable loss, antenna and distance correction factors

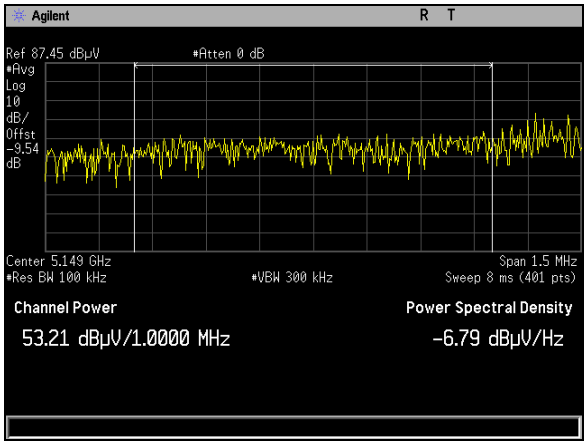
Measured emissions were within applicable limits. Above 18GHz, only noise floor was seen.

Test Engineer(s): Donald Salguero

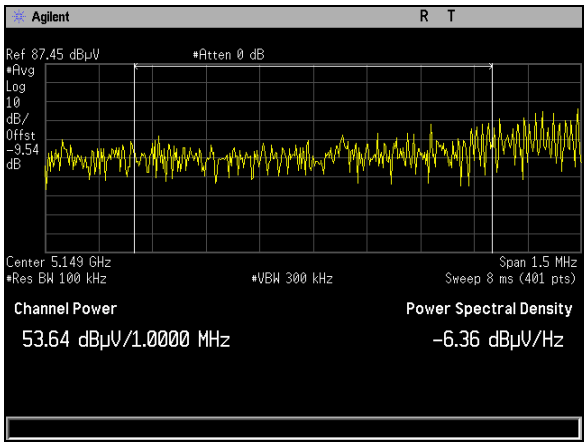
Test Date(s): November 29, 2017



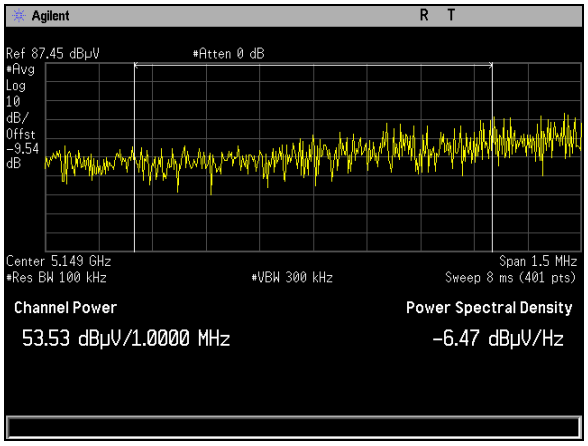
Plot 106. Undesirable Emissions, Average radiated band edge 5150 BW 10M, 5155M, 13dBi, V



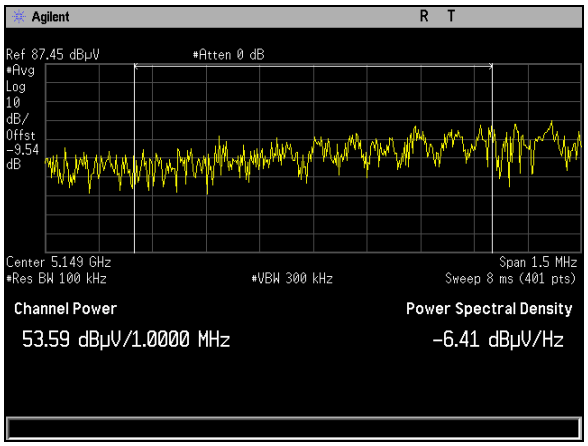
Plot 107. Undesirable Emissions, Average radiated band edge 5150 BW 20M, 5160M, 13dBi, V



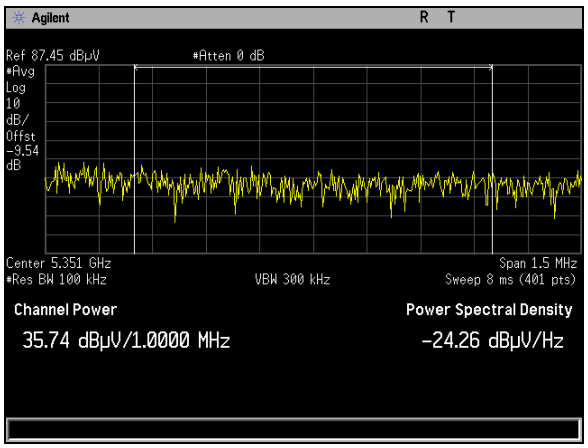
Plot 108. Undesirable Emissions, Average radiated band edge 5150 BW 30M, 5165M, 13dBi, V



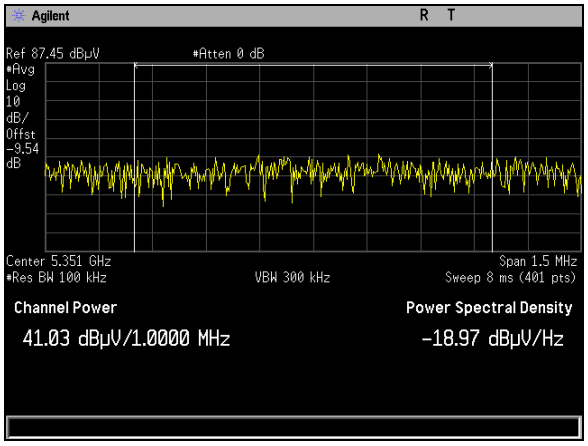
Plot 109. Undesirable Emissions, Average radiated band edge 5150 BW 40M, 5170M, 13dBi, V



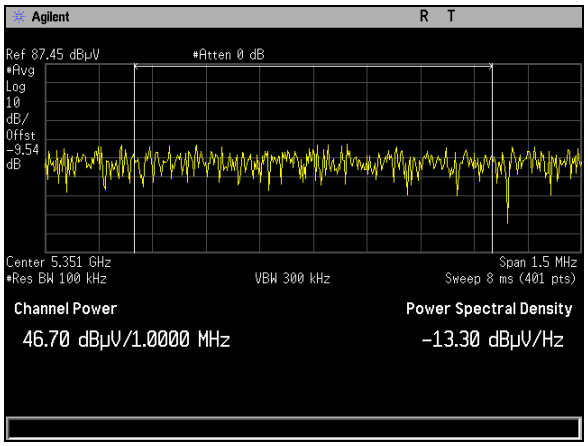
Plot 110. Undesirable Emissions, Average radiated band edge 5150 BW 50M, 5175M, 13dBi, V



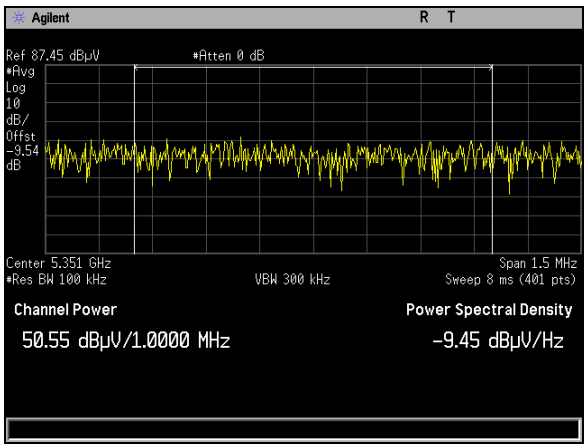
Plot 111. Undesirable Emissions, Average radiated band edge 5350 BW 10M, 5245M, 13dBi, H



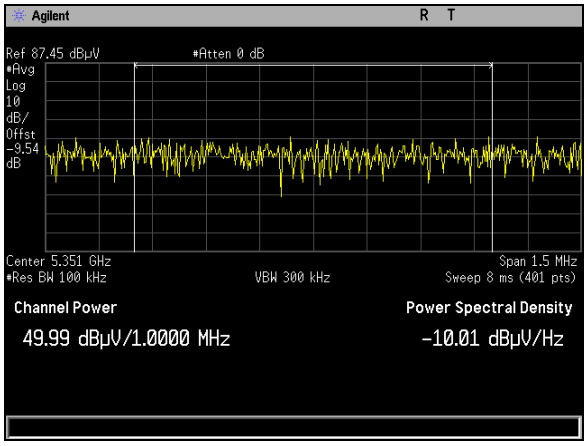
Plot 112. Undesirable Emissions, Average radiated band edge 5350 BW 20M, 5240M, 13dBi, H



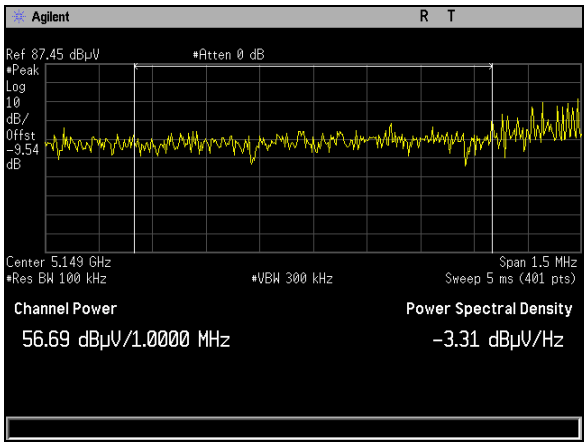
Plot 113. Undesirable Emissions, Average radiated band edge 5350 BW 30M, 5235M, 13dBi, H



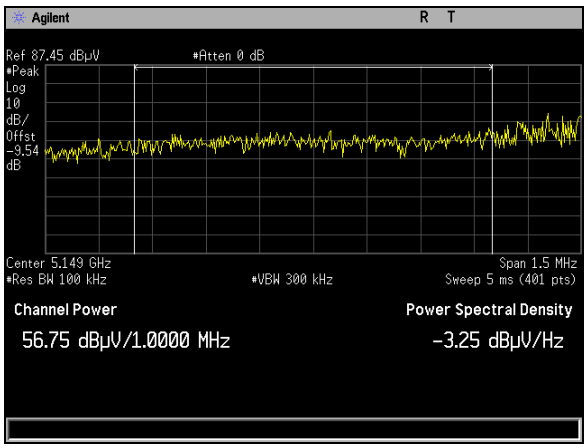
Plot 114. Undesirable Emissions, Average radiated band edge 5350 BW 40M, 5230M, 13dBi, H



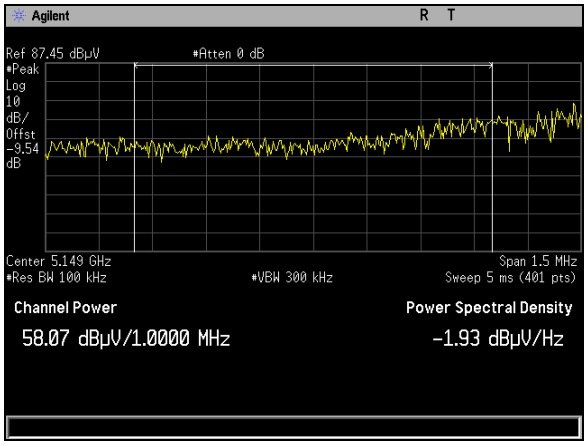
Plot 115. Undesirable Emissions, Average radiated band edge 5350 BW 50M, 5225M, 13dBi, H



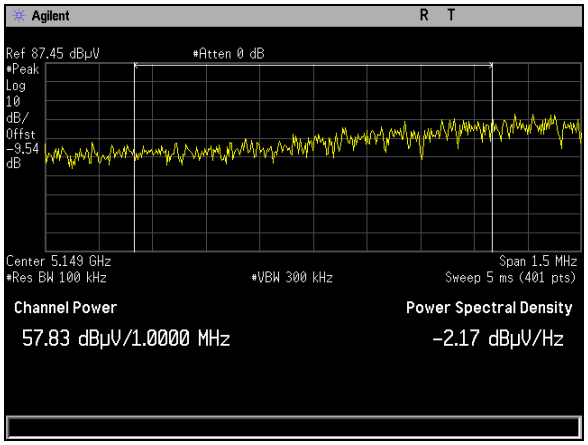
Plot 116. Undesirable Emissions, Peak radiated band edge 5150 BW 10M, 5155M, 13dBi, V



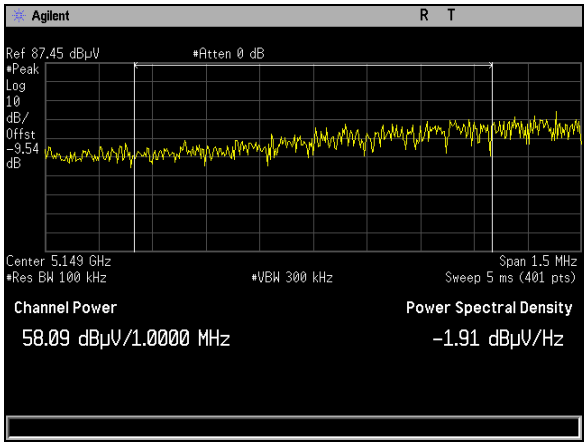
Plot 117. Undesirable Emissions, Peak radiated band edge 5150 BW 20M, 5160M, 13dBi, V



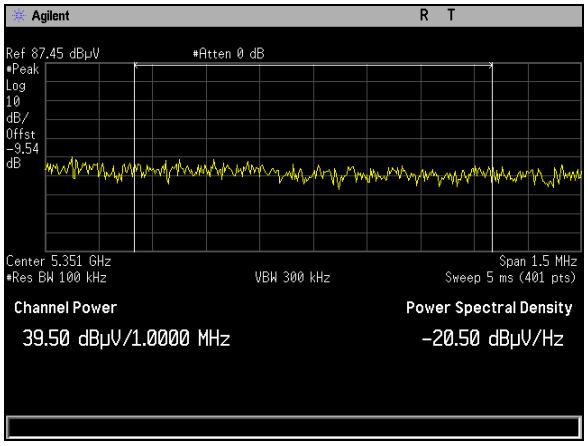
Plot 118. Undesirable Emissions, Peak radiated band edge 5150 BW 30M, 5165M, 13dBi, V



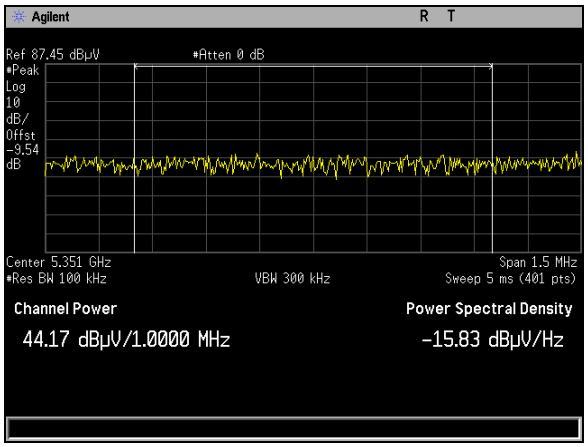
Plot 119. Undesirable Emissions, Peak radiated band edge 5150 BW 40M, 5170M, 13dBi, V



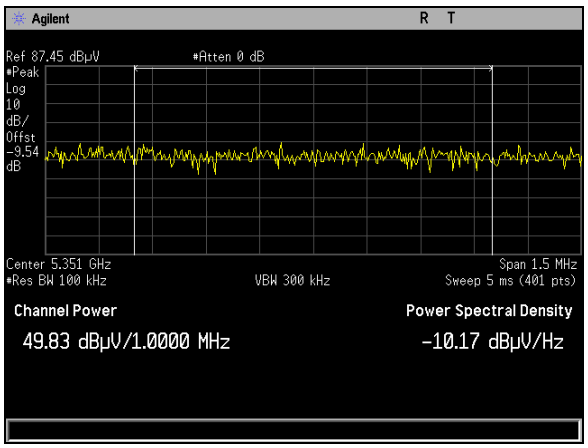
Plot 120. Undesirable Emissions, Peak radiated band edge 5150 BW 50M, 5175M, 13dBi, V



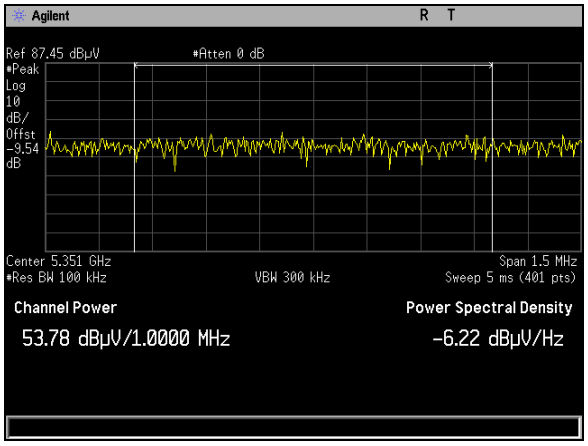
Plot 121. Undesirable Emissions, Peak radiated band edge 5350 BW 10M, 5245M, 13dBi, H



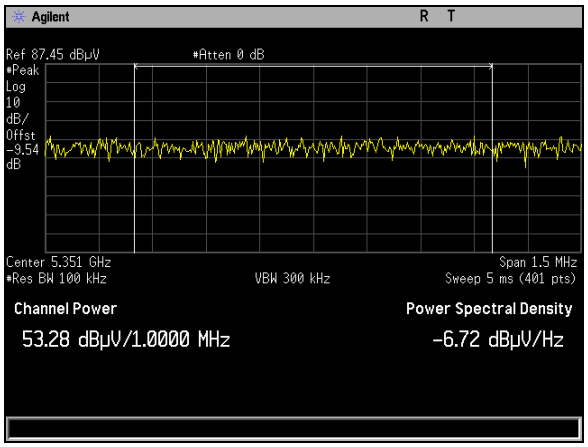
Plot 122. Undesirable Emissions, Peak radiated band edge 5350 BW 20M, 5240M, 13dBi, H



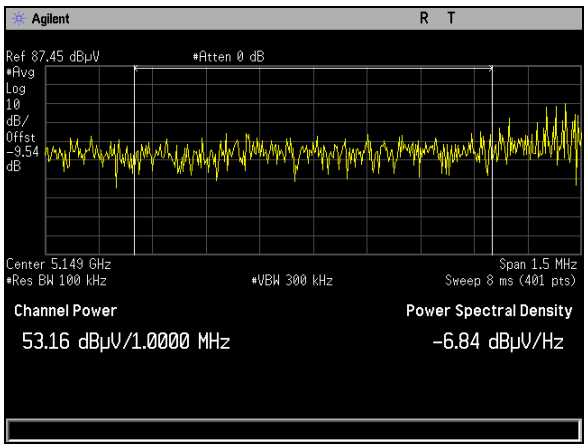
Plot 123. Undesirable Emissions, Peak radiated band edge 5350 BW 30M, 5235M, 13dBi, H



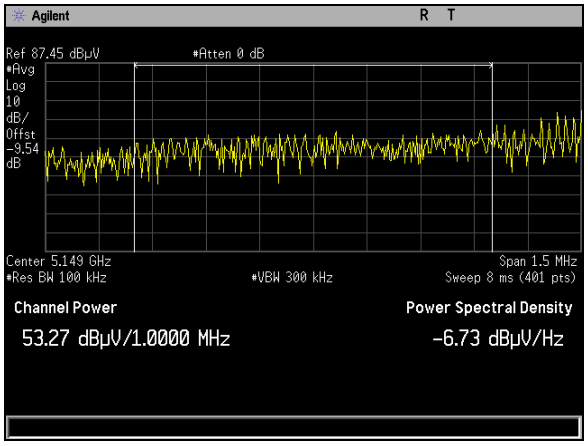
Plot 124. Undesirable Emissions, Peak radiated band edge 5350 BW 40M, 5230M, 13dBi, H



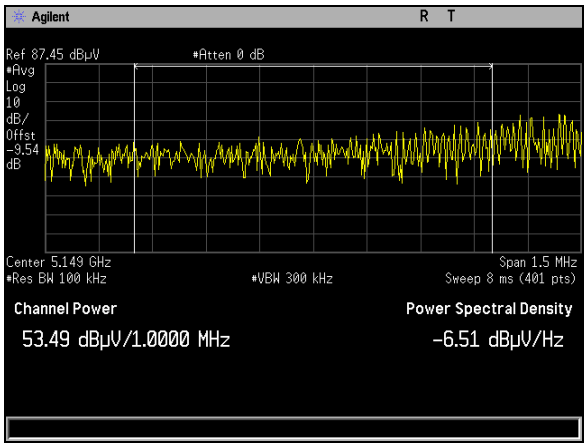
Plot 125. Undesirable Emissions, Peak radiated band edge 5350 BW 50M, 5225M, 13dBi, H



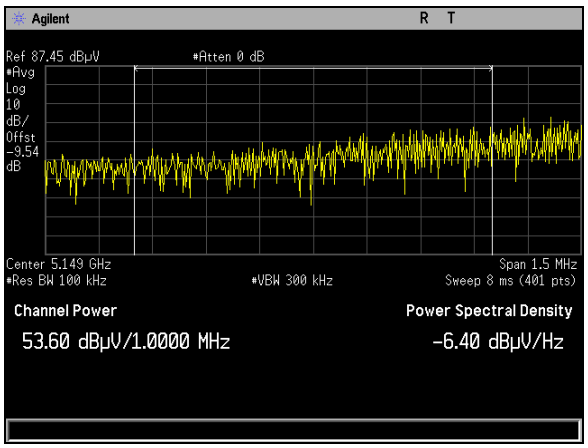
Plot 126.Undesirable Emissions, Average radiated band edge 5150 BW 10M, 5155M, 19dBi, H



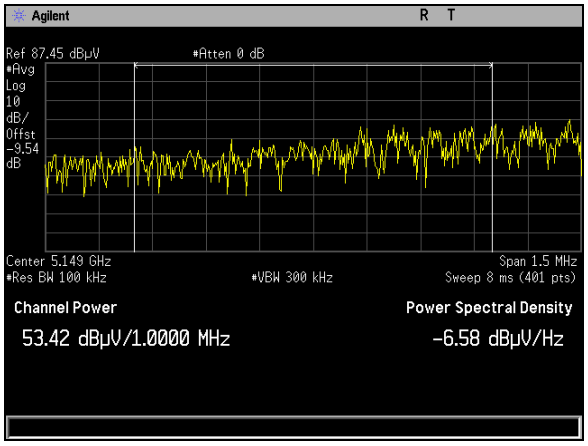
Plot 127. Undesirable Emissions, Average radiated band edge 5150 BW 20M, 5160M, 19dBi, H



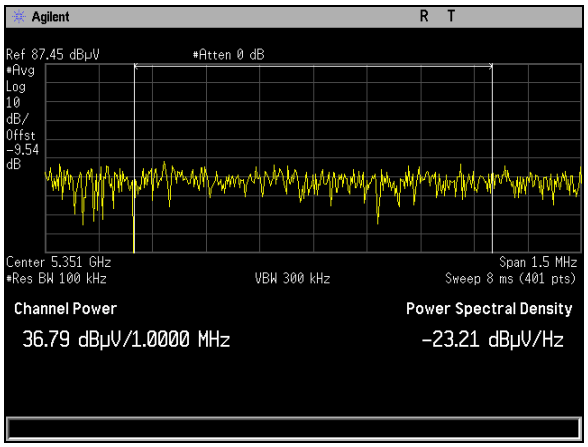
Plot 128. Undesirable Emissions, Average radiated band edge 5150 BW 30M, 5165M, 19dBi, H



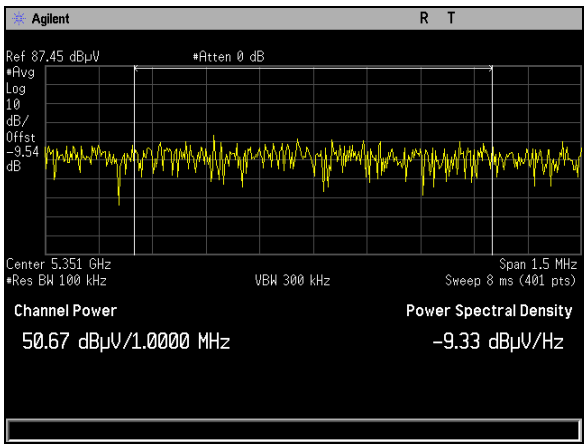
Plot 129. Undesirable Emissions, Average radiated band edge 5150 BW 40M, 5170M, 19dBi, H



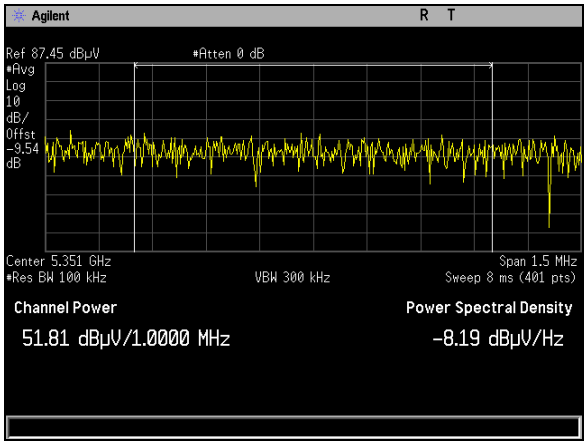
Plot 130. Undesirable Emissions, Average radiated band edge 5150 BW 50M, 5175M, 19dBi, H



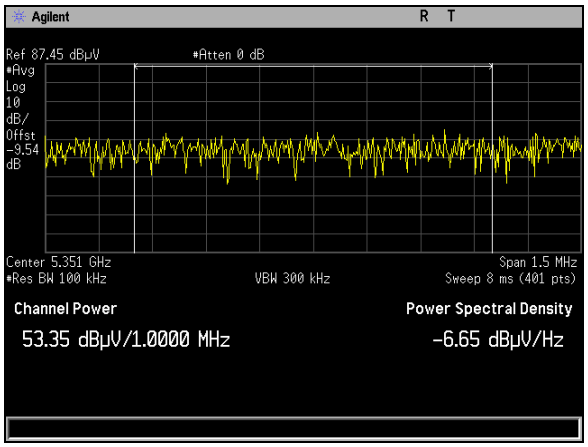
Plot 131. Undesirable Emissions, Average radiated band edge 5350 BW 10M, 5245M, 19dBi, H



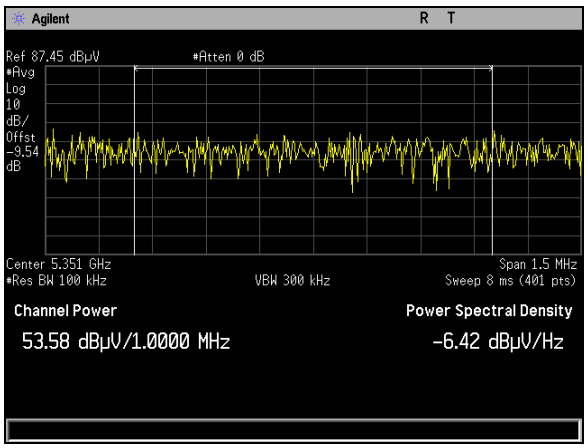
Plot 132. Undesirable Emissions, Average radiated band edge 5350 BW 20M, 5240M, 19dBi, H



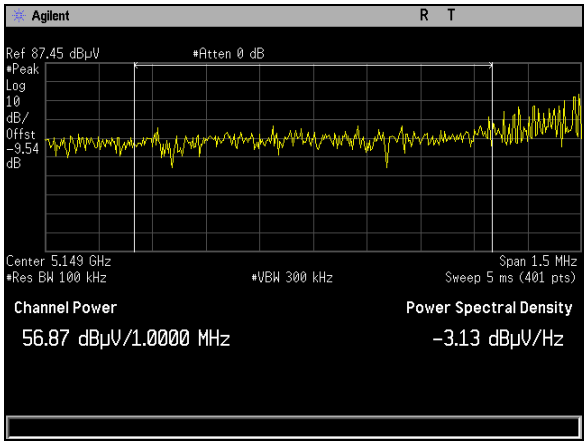
Plot 133. Undesirable Emissions, Average radiated band edge 5350 BW 30M, 5235M, 19dBi, H



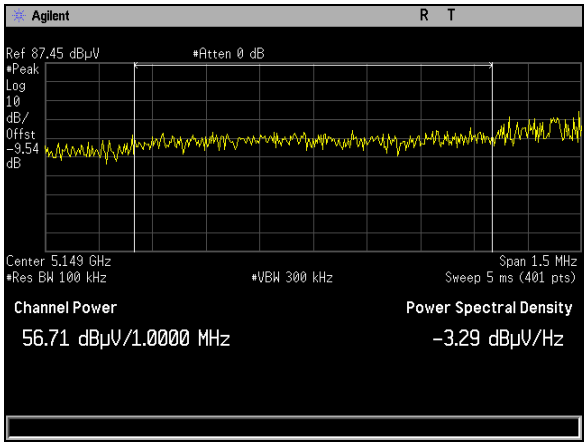
Plot 134. Undesirable Emissions, Average radiated band edge 5350 BW 40M, 5230M, 19dBi, H



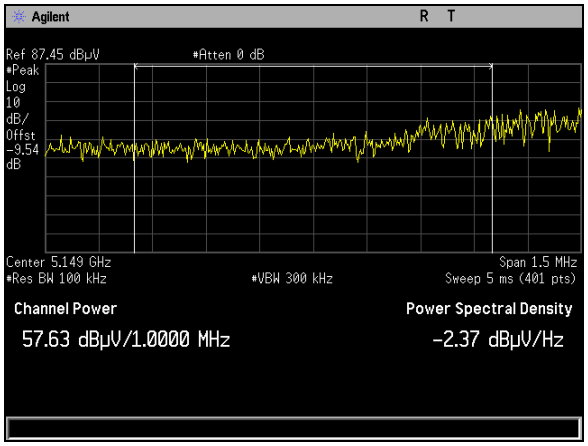
Plot 135. Undesirable Emissions, Average radiated band edge 5350 BW 50M, 5225M, 19dBi, H



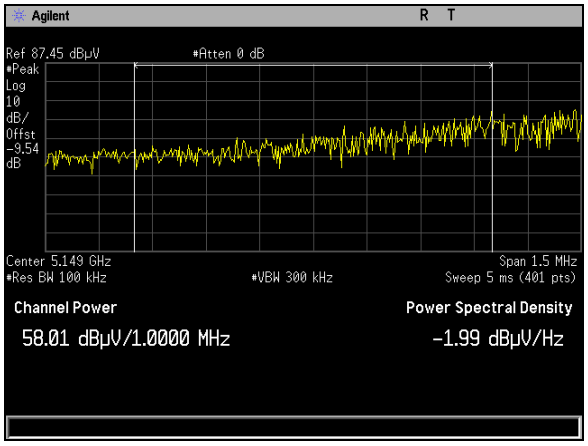
Plot 136. Undesirable Emissions, Peak radiated band edge 5150 BW 10M, 5155M, 19dBi, H



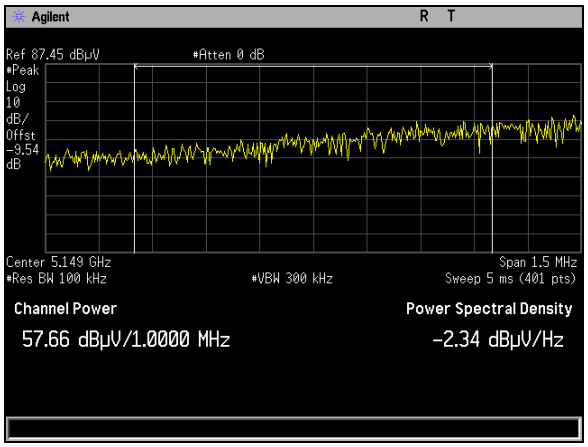
Plot 137. Undesirable Emissions, Peak radiated band edge 5150 BW 20M, 5160M, 19dBi, H



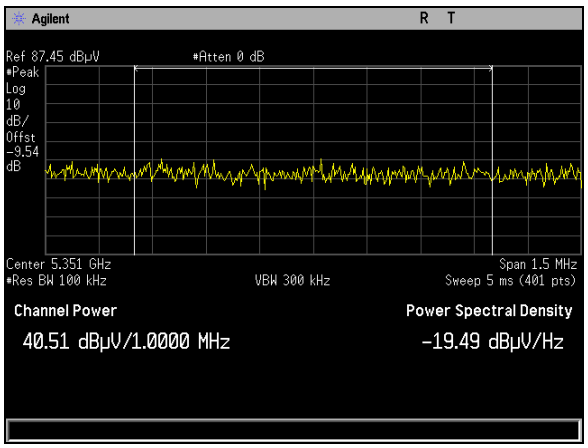
Plot 138. Undesirable Emissions, Peak radiated band edge 5150 BW 30M, 5165M, 19dBi, H



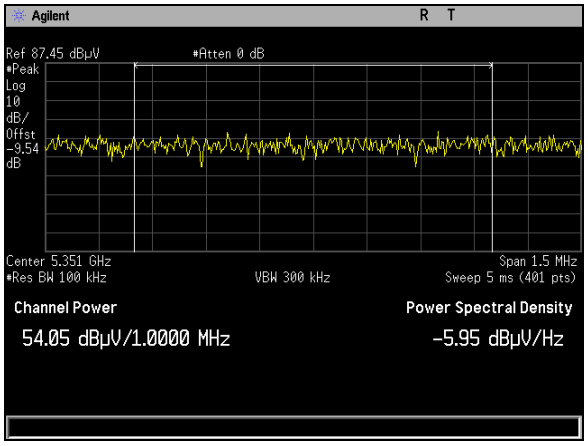
Plot 139. Undesirable Emissions, Peak radiated band edge 5150 BW 40M, 5170M, 19dBi, H



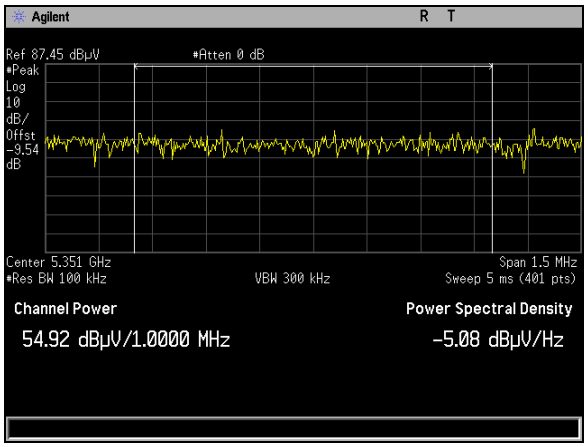
Plot 140. Undesirable Emissions, Peak radiated band edge 5150 BW 50M, 5175M, 19dBi, H



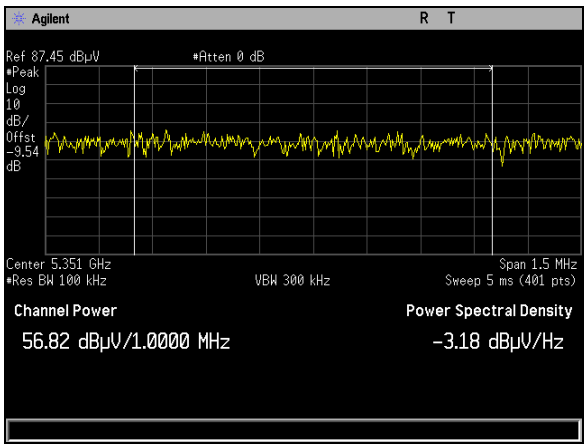
Plot 141. Undesirable Emissions, Peak radiated band edge 5350 BW 10M, 5245M, 19dBi, H



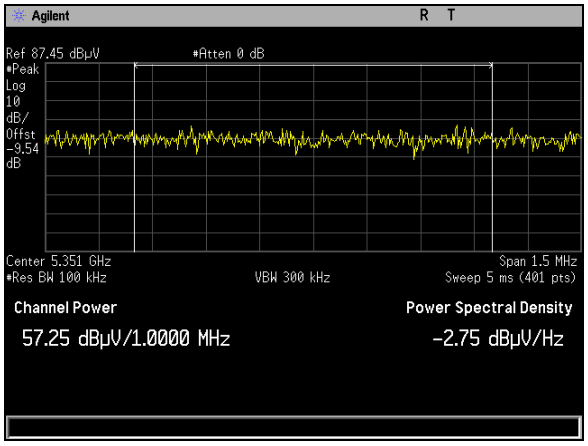
Plot 142. Undesirable Emissions, Peak radiated band edge 5350 BW 20M, 5240M, 19dBi, H



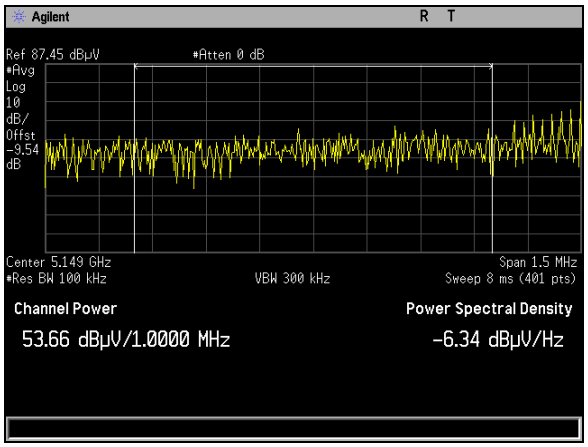
Plot 143. Undesirable Emissions, Peak radiated band edge 5350 BW 30M, 5235M, 19dBi, H



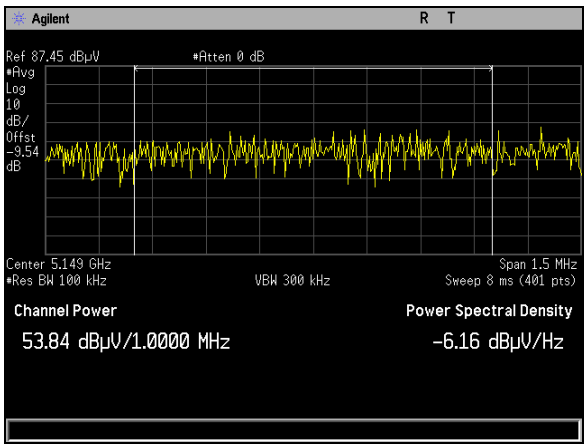
Plot 144. Undesirable Emissions, Peak radiated band edge 5350 BW 40M, 5230M, 19dBi, H



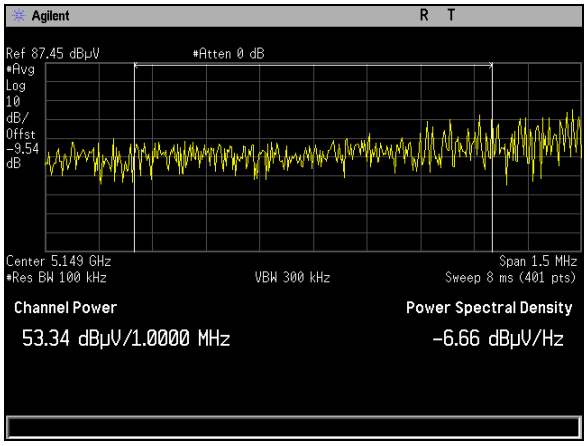
Plot 145. Undesirable Emissions, Peak radiated band edge 5350 BW 50M, 5225M, 19dBi, H



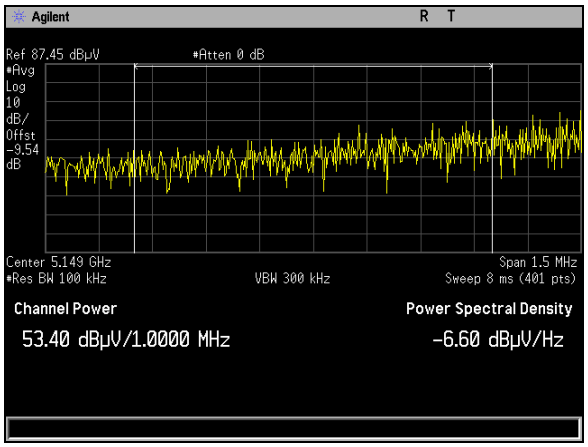
Plot 146. Undesirable Emissions, Average radiated band edge 5150 BW 10M, 5155M, H



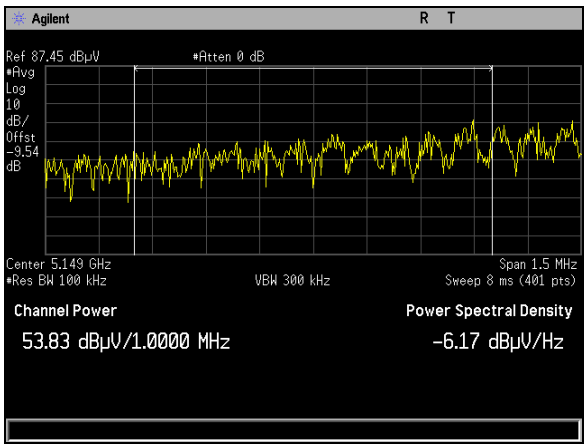
Plot 147. Undesirable Emissions, Average radiated band edge 5150 BW 20M, 5160M, H



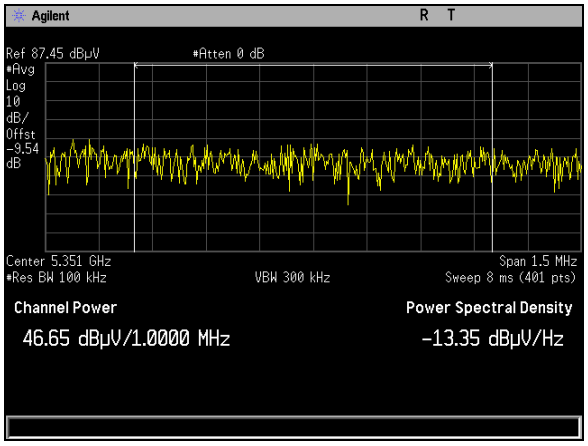
Plot 148. Undesirable Emissions, Average radiated band edge 5150 BW 30M, 5165M, H



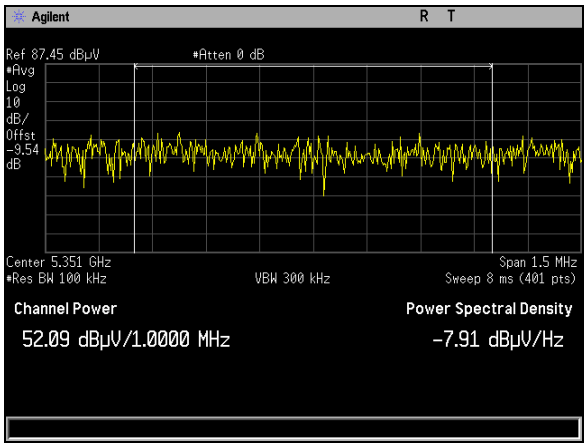
Plot 149. Undesirable Emissions, Average radiated band edge 5150 BW 40M, 5170M, H



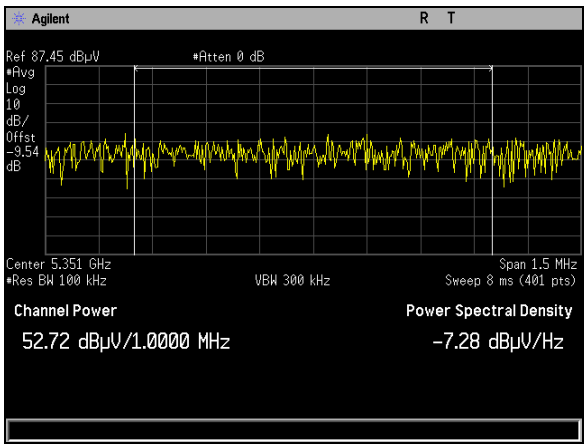
Plot 150. Undesirable Emissions, Average radiated band edge 5150 BW 50M, 5175M, H



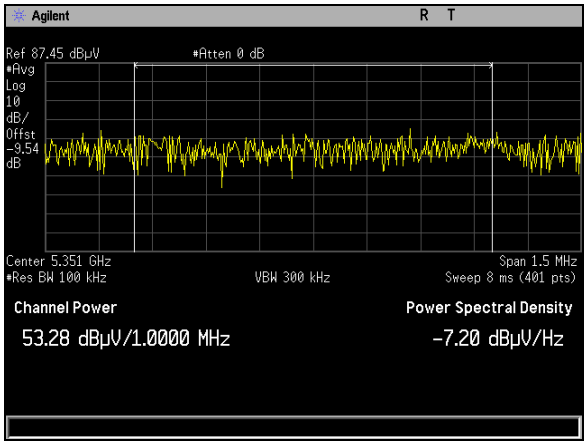
Plot 151. Undesirable Emissions, Average radiated band edge 5350 BW 10M, 5245M, H



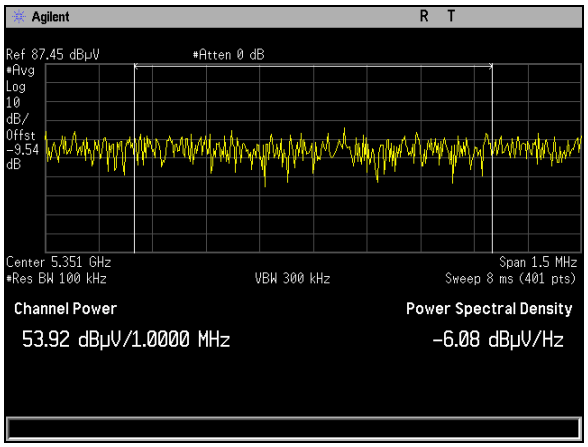
Plot 152. Undesirable Emissions, Average radiated band edge 5350 BW 20M, 5240M, H



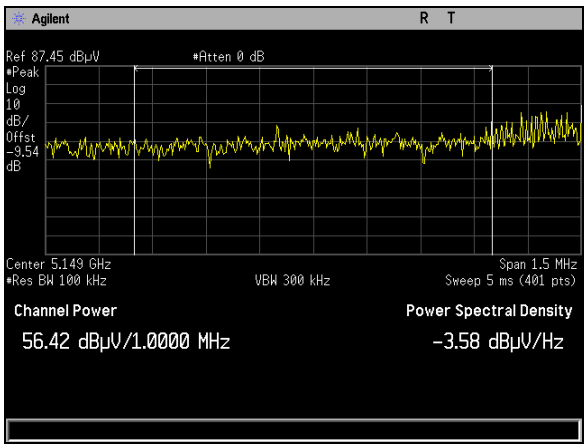
Plot 153. Undesirable Emissions, Average radiated band edge 5350 BW 30M, 5235M, H



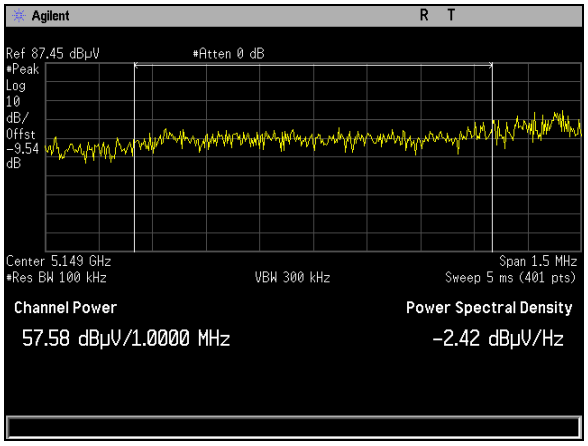
Plot 154. Undesirable Emissions, Average radiated band edge 5350 BW 40M, 5230M, H



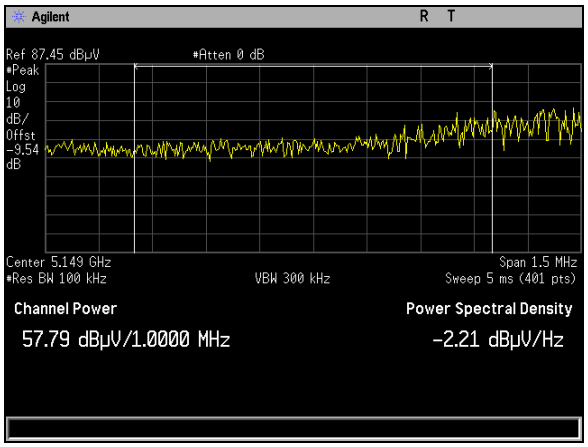
Plot 155. Undesirable Emissions, Average radiated band edge 5350 BW 50M, 5225M, H



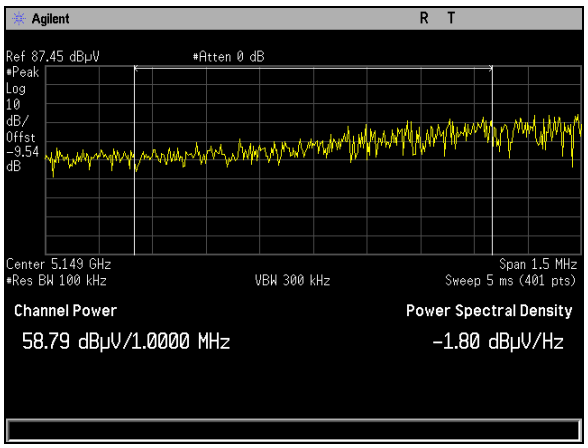
Plot 156. Undesirable Emissions, Peak radiated band edge 5150 BW 10M, 5155M, H



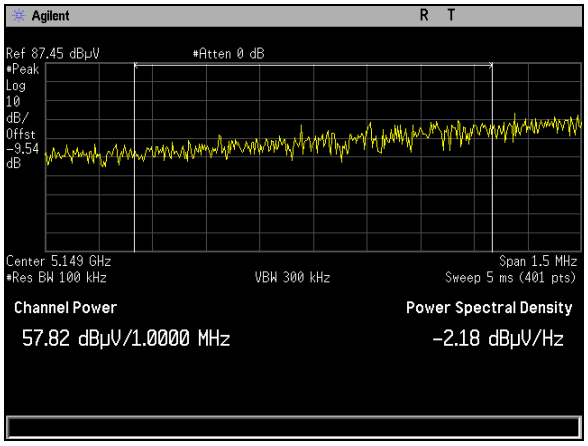
Plot 157. Undesirable Emissions, Peak radiated band edge 5150 BW 20M, 5160M, H



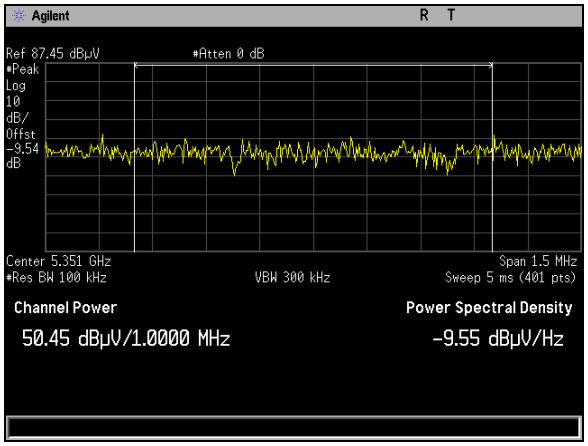
Plot 158. Undesirable Emissions, Peak radiated band edge 5150 BW 30M, 5165M, H



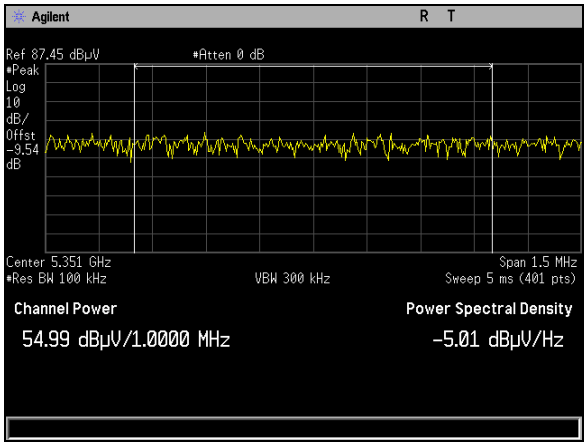
Plot 159. Undesirable Emissions, Peak radiated band edge 5150 BW 40M, 5170M, H



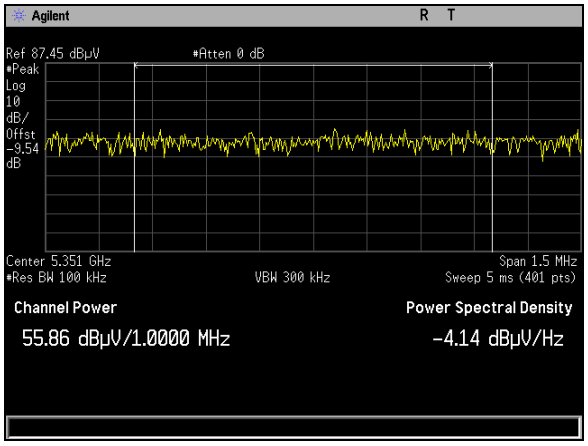
Plot 160. Undesirable Emissions, Peak radiated band edge 5150 BW 50M, 5175M, H



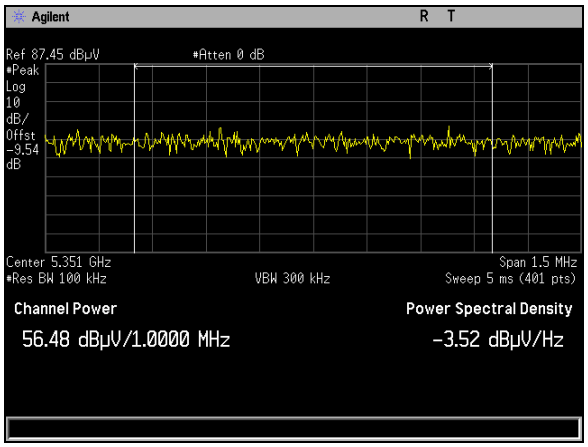
Plot 161. Undesirable Emissions, Peak radiated band edge 5350 BW 10M, 5245M, H



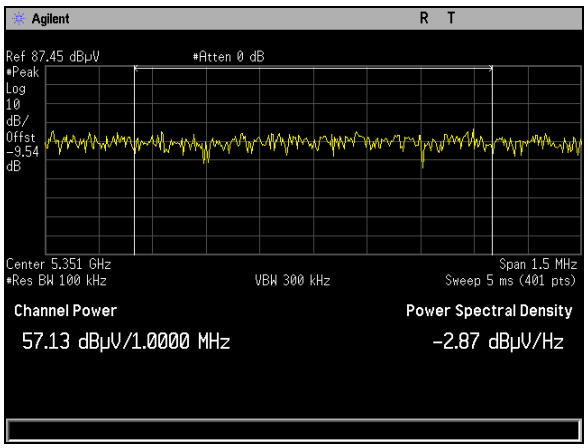
Plot 162. Undesirable Emissions, Peak radiated band edge 5350 BW 20M, 5240M, H



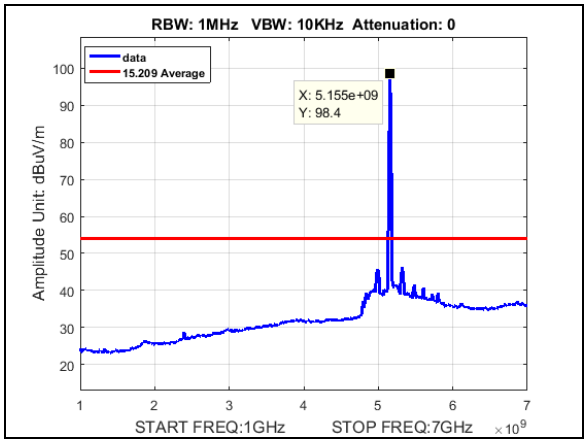
Plot 163. Undesirable Emissions, Peak radiated band edge 5350 BW 30M, 5235M, H



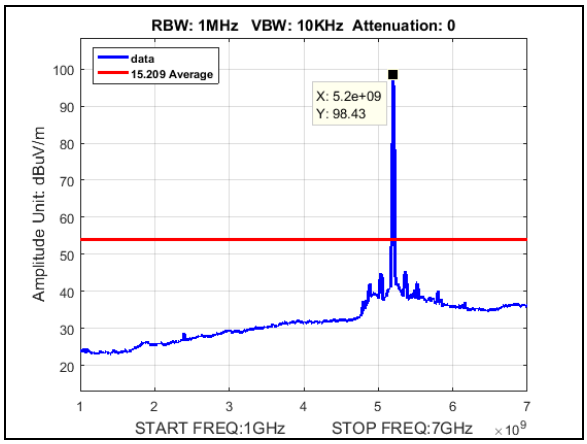
Plot 164. Undesirable Emissions, Peak radiated band edge 5350 BW 40M, 5230M, H



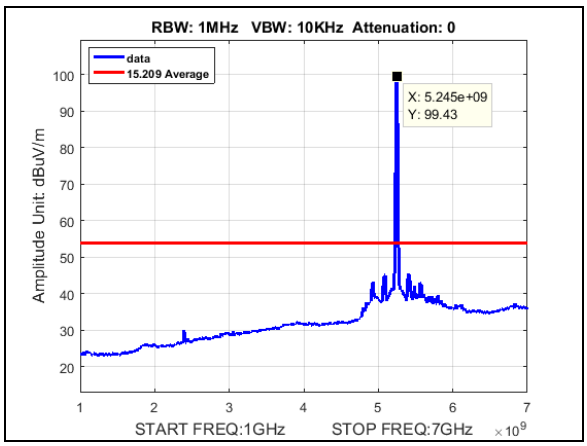
Plot 165. Undesirable Emissions, Peak radiated band edge 5350 BW 50M, 5225M, H



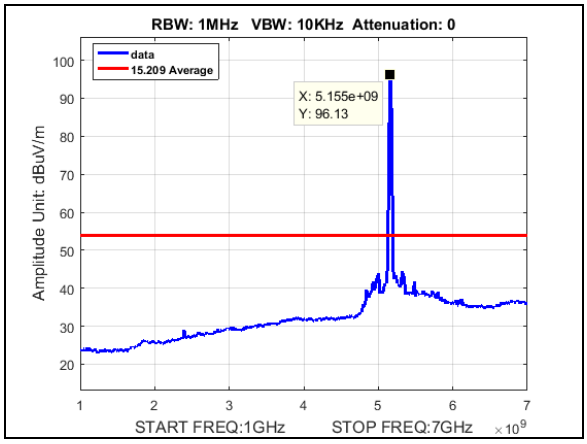
Plot 166. Undesirable Emissions, Average radiated spurious BW 10M, CF 5155M, 19dBi, 1-7GHz



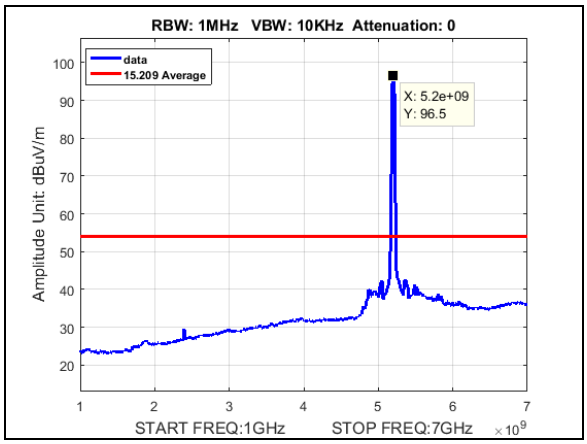
Plot 167. Undesirable Emissions, Average radiated spurious BW 10M, CF 5200M, 19dBi, 1-7GHz



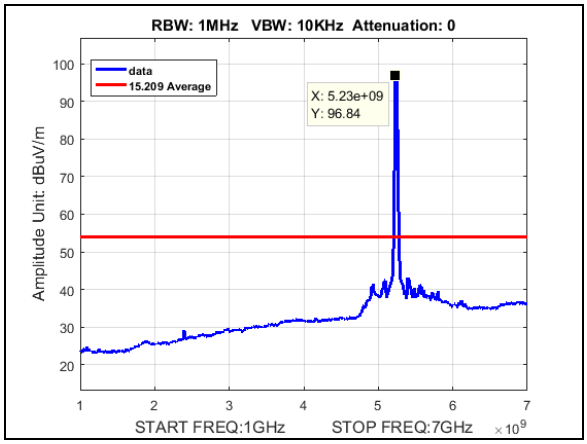
Plot 168. Undesirable Emissions, Average radiated spurious BW 10M, CF 5245M, 19dBi, 1-7GHz



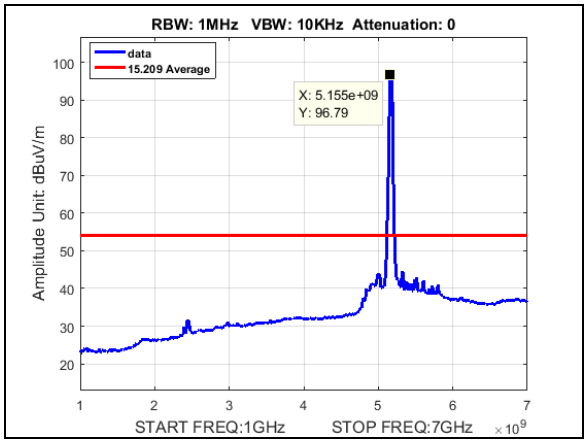
Plot 169. Undesirable Emissions, Average radiated spurious BW 20M, CF 5160M, 19dBi, 1-7GHz



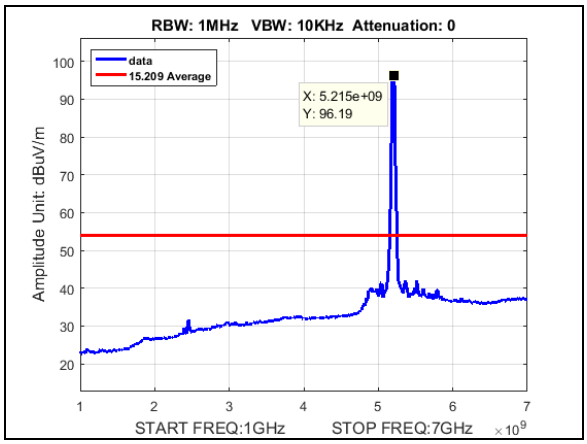
Plot 170. Undesirable Emissions, Average radiated spurious BW 20M, CF 5200M, 19dBi, 1-7GHz



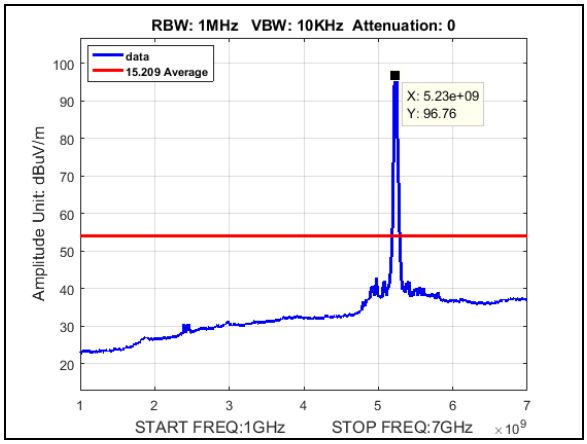
Plot 171. Undesirable Emissions, Average radiated spurious BW 20M, CF 5240M, 19dBi, 1-7GHz



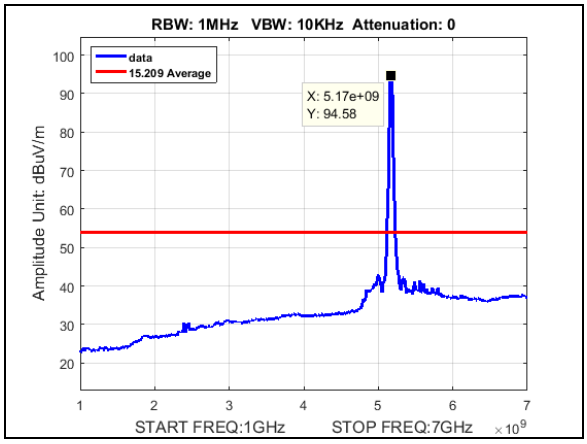
Plot 172. Undesirable Emissions, Average radiated spurious BW 30M, CF 5165M, 19dBi, 1-7GHz



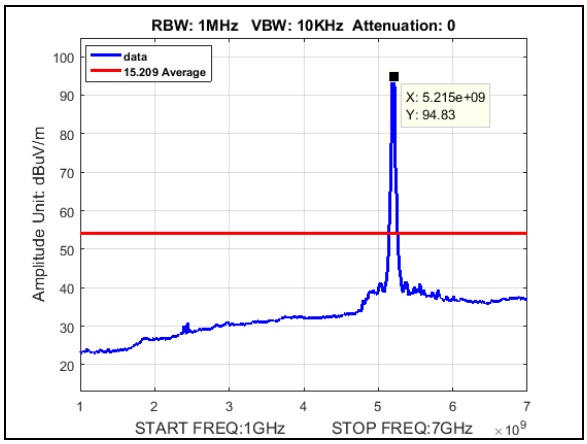
Plot 173. Undesirable Emissions, Average radiated spurious BW 30M, CF 5200M, 19dBi, 1-7GHz



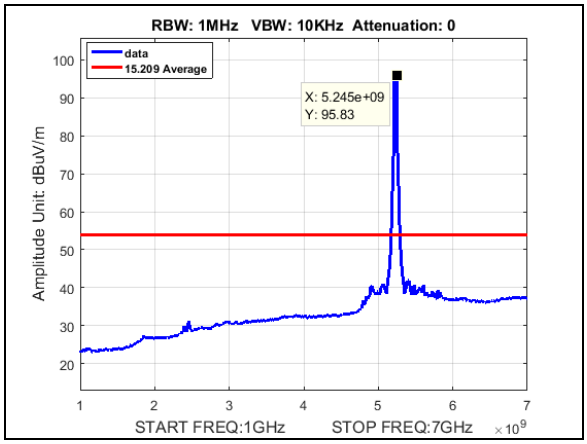
Plot 174. Undesirable Emissions, Average radiated spurious BW 30M, CF 5235M, 19dBi, 1-7GHz



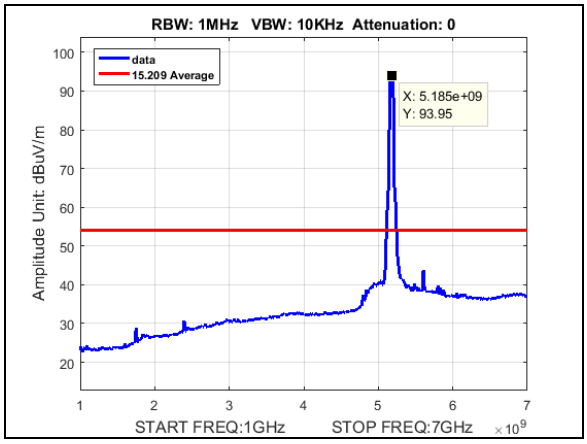
Plot 175. Undesirable Emissions, Average radiated spurious BW 40M, CF 5170M, 19dBi, 1-7GHz



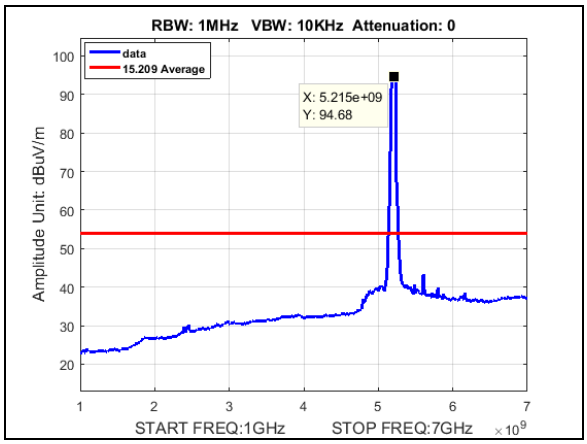
Plot 176. Undesirable Emissions, Average radiated spurious BW 40M, CF 5200M, 19dBi, 1-7GHz



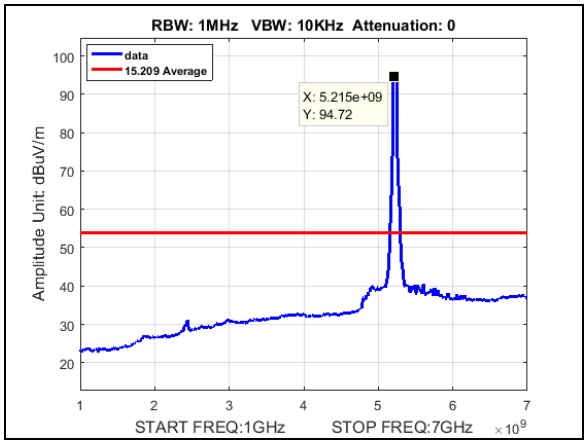
Plot 177. Undesirable Emissions, Average radiated spurious BW 40M, CF 5230M, 19dBi, 1-7GHz



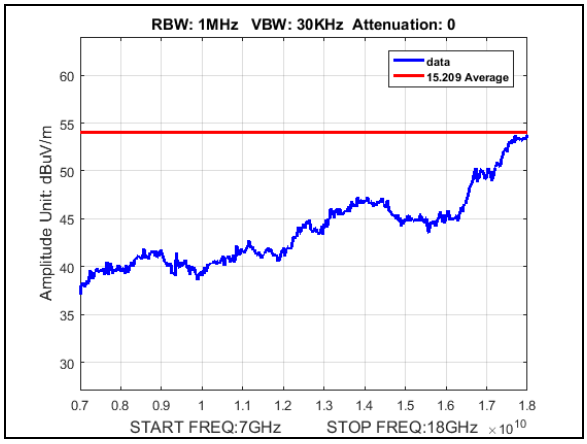
Plot 178. Undesirable Emissions, Average radiated spurious BW 50M, CF 5175M, 19dBi, 1-7GHz



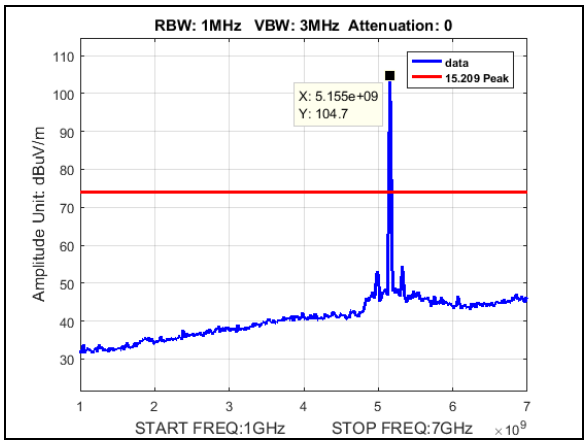
Plot 179. Undesirable Emissions, Average radiated spurious BW 50M, CF 5200M, 19dBi, 1-7GHz



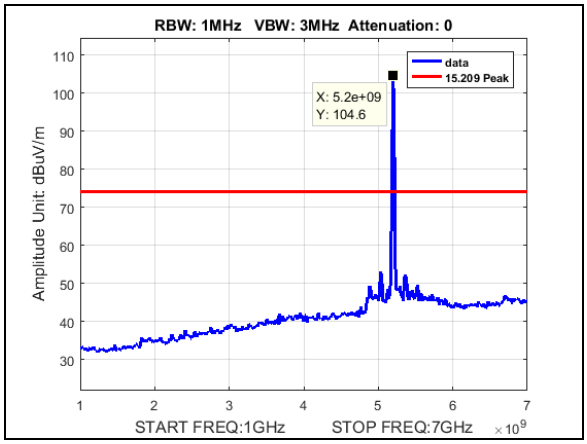
Plot 180. Undesirable Emissions, Average radiated spurious BW 50M, CF 5225M, 19dBi, 1-7GHz



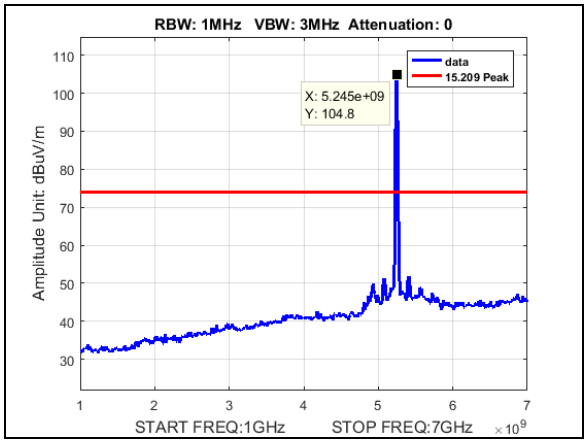
Plot 181. Undesirable Emissions, Average radiated spurious Worst Case 19dBi, 7-18GHz



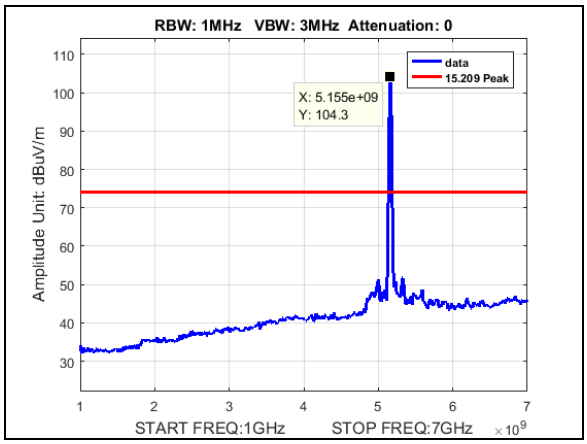
Plot 182. Undesirable Emissions, Peak radiated spurious BW 10M, CF 5155M, 19dBi, 1-7GHz



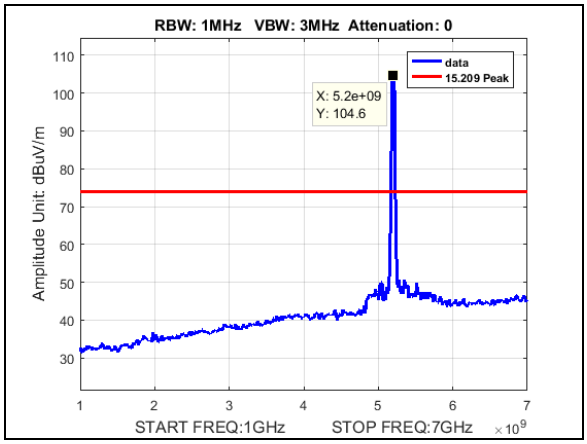
Plot 183. Undesirable Emissions, Peak radiated spurious BW 10M, CF 5200M, 19dBi, 1-7GHz



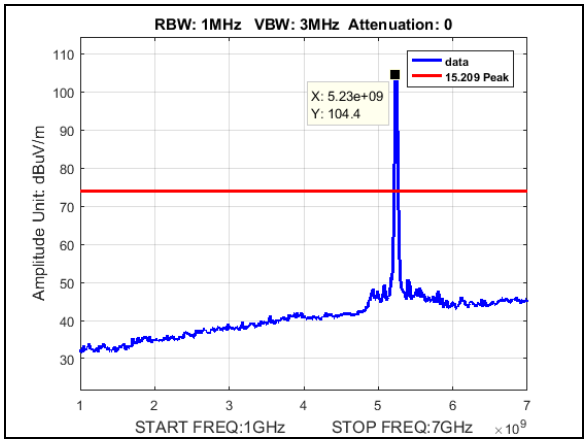
Plot 184. Undesirable Emissions, Peak radiated spurious BW 10M, CF 5245M, 19dBi, 1-7GHz



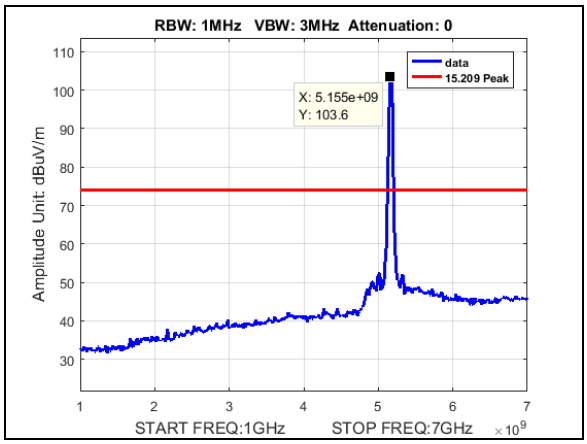
Plot 185. Undesirable Emissions, Peak radiated spurious BW 20M, CF 5160M, 19dBi, 1-7GHz



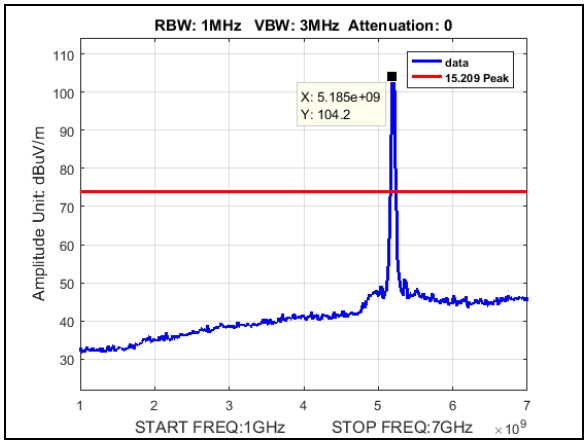
Plot 186. Undesirable Emissions, Peak radiated spurious BW 20M, CF 5200M, 19dBi, 1-7GHz



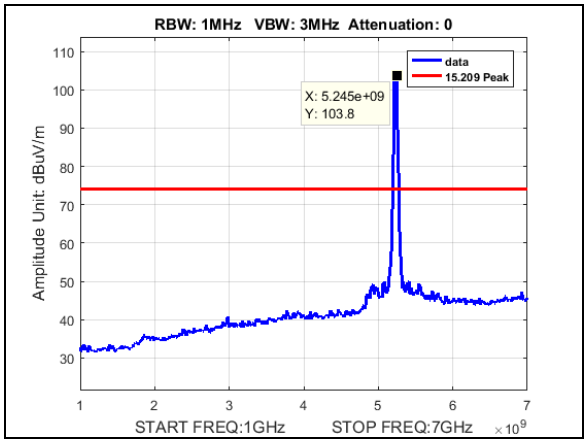
Plot 187. Undesirable Emissions, Peak radiated spurious BW 20M, CF 5240M, 19dBi, 1-7GHz



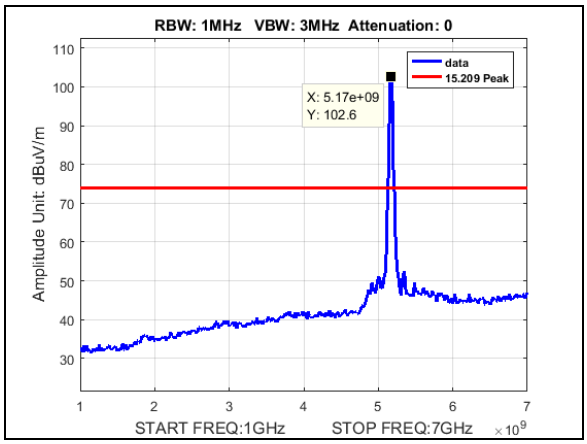
Plot 188. Undesirable Emissions, Peak radiated spurious BW 30M, CF 5165M, 19dBi, 1-7GHz



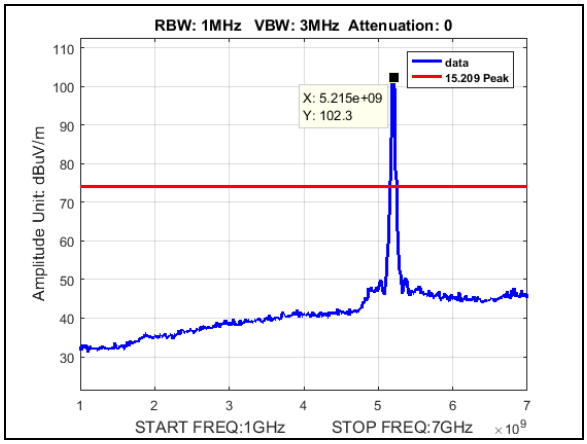
Plot 189. Undesirable Emissions, Peak radiated spurious BW 30M, CF 5200M, 19dBi, 1-7GHz



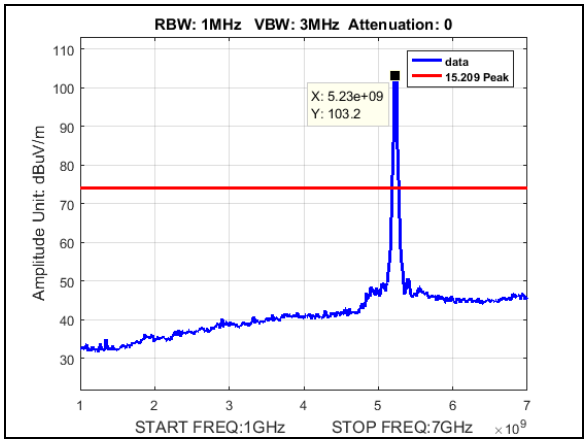
Plot 190. Undesirable Emissions, Peak radiated spurious BW 30M, CF 5235M, 19dBi, 1-7GHz



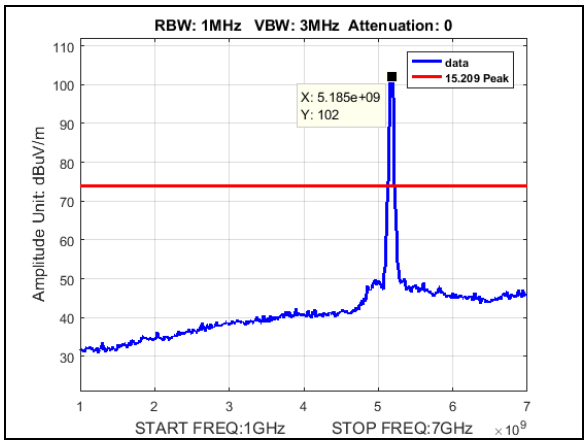
Plot 191. Undesirable Emissions, Peak radiated spurious BW 40M, CF 5170M, 19dBi, 1-7GHz



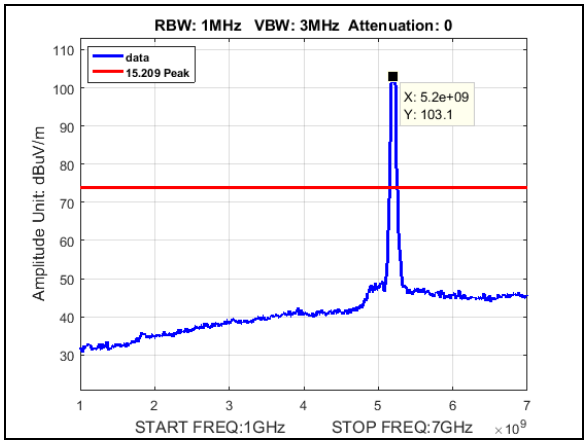
Plot 192. Undesirable Emissions, Peak radiated spurious BW 40M, CF 5200M, 19dBi, 1-7GHz



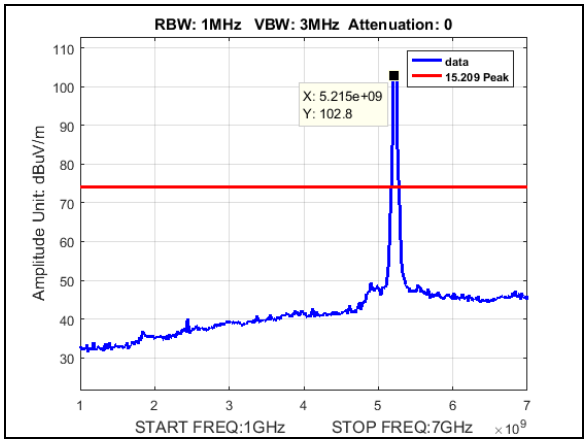
Plot 193. Undesirable Emissions, Peak radiated spurious BW 40M, CF 5230M, 19dBi, 1-7GHz



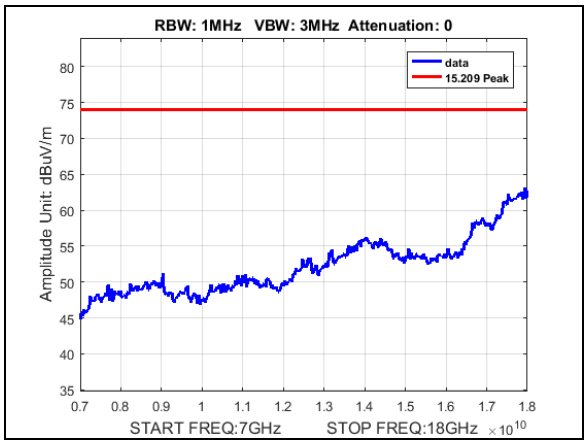
Plot 194. Undesirable Emissions, Peak radiated spurious BW 50M, CF 5175M, 19dBi, 1-7GHz



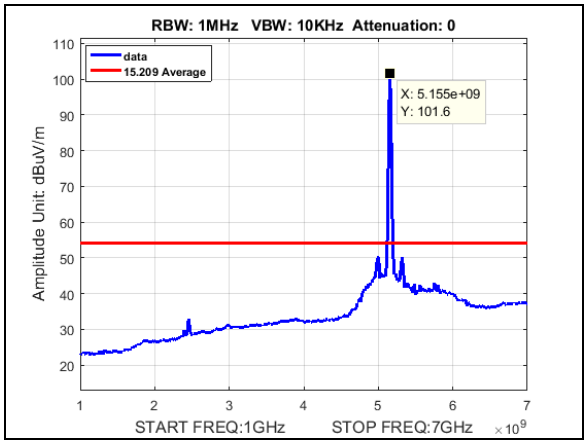
Plot 195. Undesirable Emissions, Peak radiated spurious BW 50M, CF 5200M, 19dBi, 1-7GHz



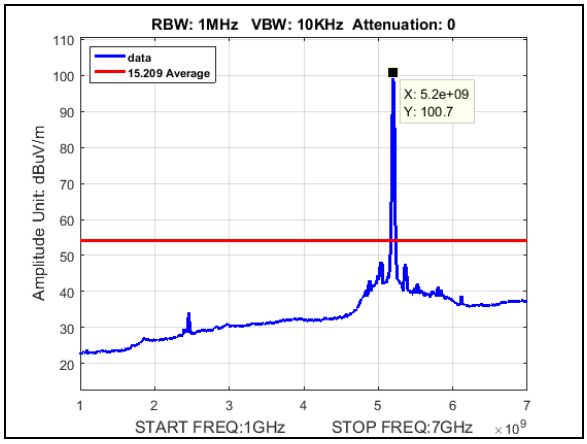
Plot 196. Undesirable Emissions, Peak radiated spurious BW 50M, CF 5225M, 19dBi, 1-7GHz



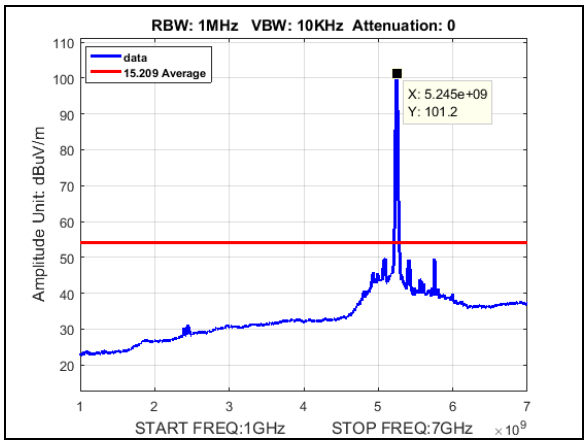
Plot 197. Undesirable Emissions, Peak radiated spurious Worst Case 19dBi, 7-18GHz



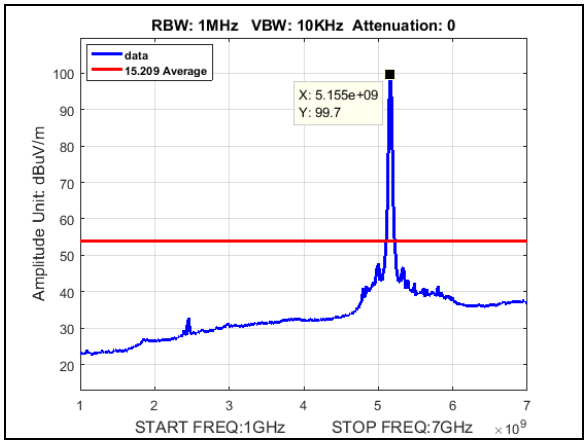
Plot 198. Undesirable Emissions, Average radiated spurious BW 10M, CF 5155M, 27dBi, 1-7GHz



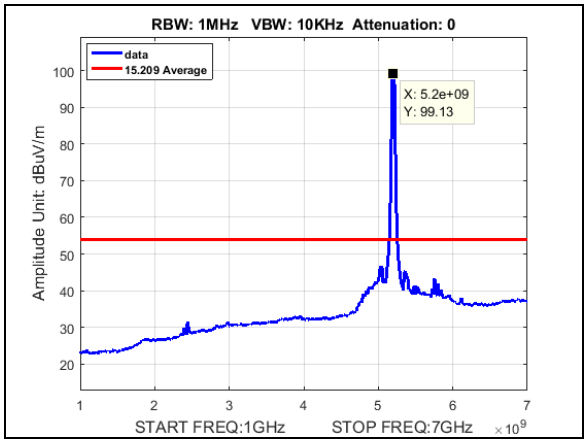
Plot 199. Undesirable Emissions, Average radiated spurious BW 10M, CF 5200M, 27dBi, 1-7GHz



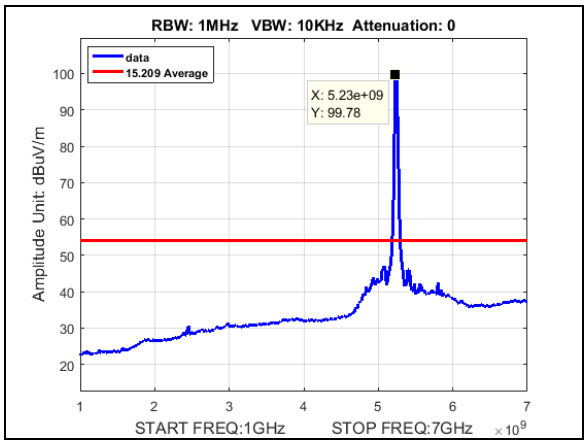
Plot 200. Undesirable Emissions, Average radiated spurious BW 10M, CF 5245M, 27dBi, 1-7GHz



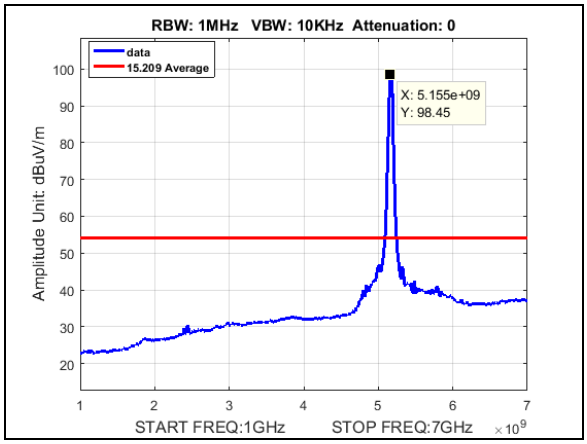
Plot 201. Undesirable Emissions, Average radiated spurious BW 20M, CF 5160M, 27dBi, 1-7GHz



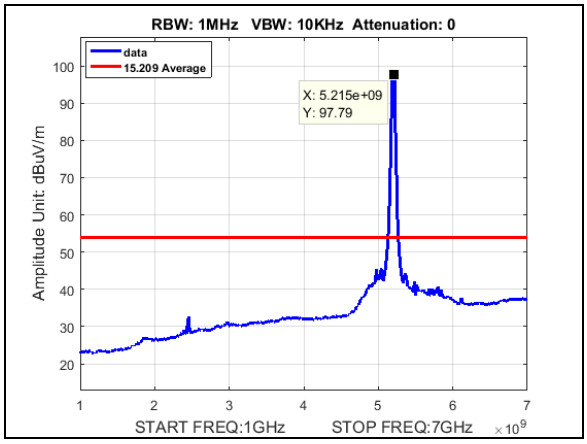
Plot 202. Undesirable Emissions, Average radiated spurious BW 20M, CF 5200M, 27dBi, 1-7GHz



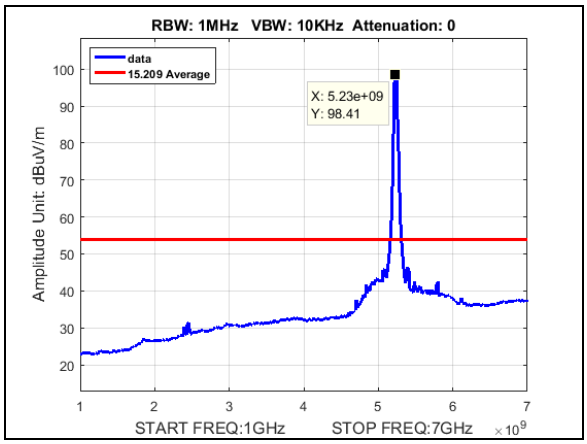
Plot 203. Undesirable Emissions, Average radiated spurious BW 20M, CF 5240M, 27dBi, 1-7GHz



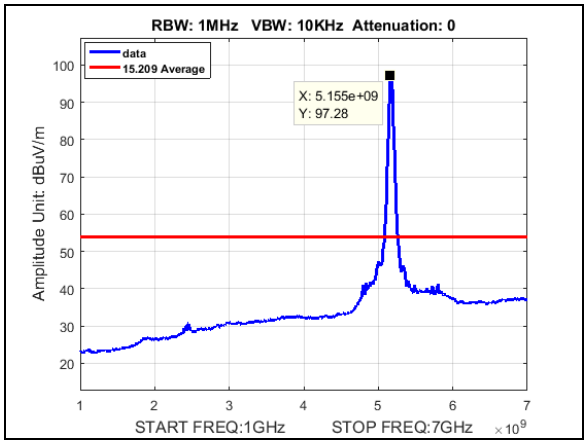
Plot 204. Undesirable Emissions, Average radiated spurious BW 30M, CF 5165M, 27dBi, 1-7GHz



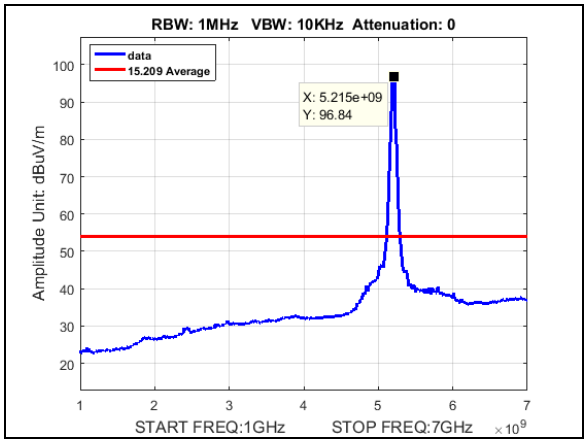
Plot 205. Undesirable Emissions, Average radiated spurious BW 30M, CF 5200M, 27dBi, 1-7GHz



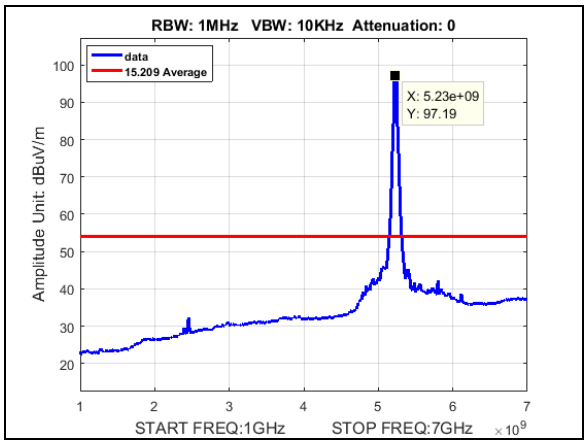
Plot 206. Undesirable Emissions, Average radiated spurious BW 30M, CF 5235M, 27dBi, 1-7GHz



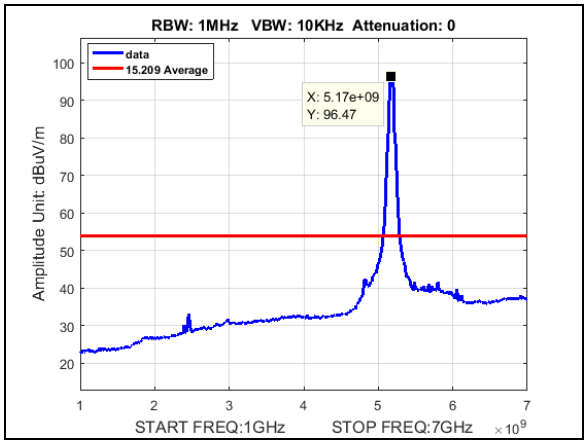
Plot 207. Undesirable Emissions, Average radiated spurious BW 40M, CF 5170M, 27dBi, 1-7GHz



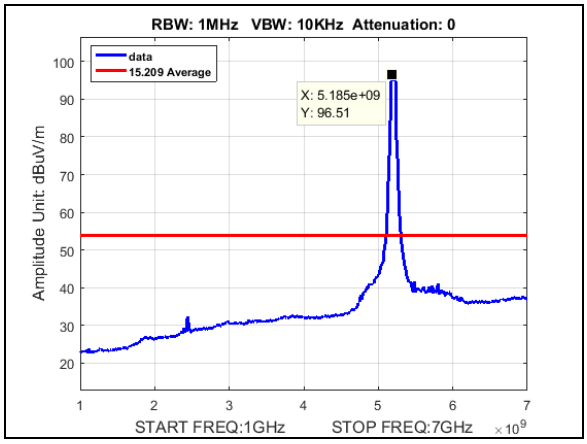
Plot 208. Undesirable Emissions, Average radiated spurious BW 40M, CF 5200M, 27dBi, 1-7GHz



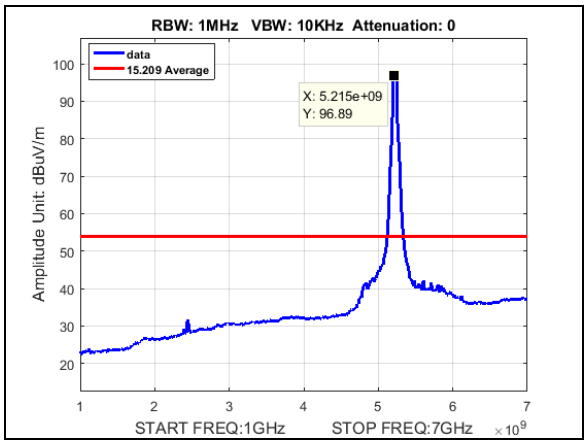
Plot 209. Undesirable Emissions, Average radiated spurious BW 40M, CF 5230M, 27dBi, 1-7GHz



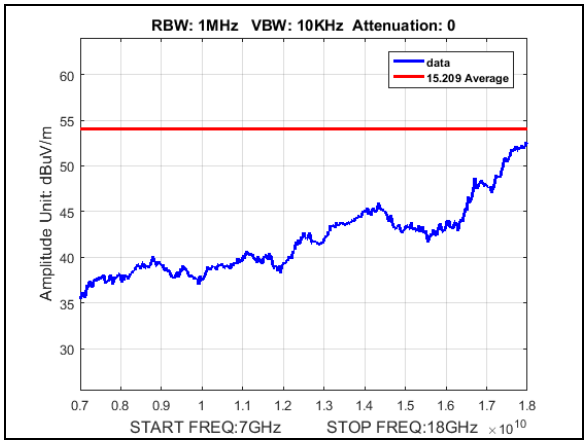
Plot 210. Undesirable Emissions, Average radiated spurious BW 50M, CF 5175M, 27dBi, 1-7GHz



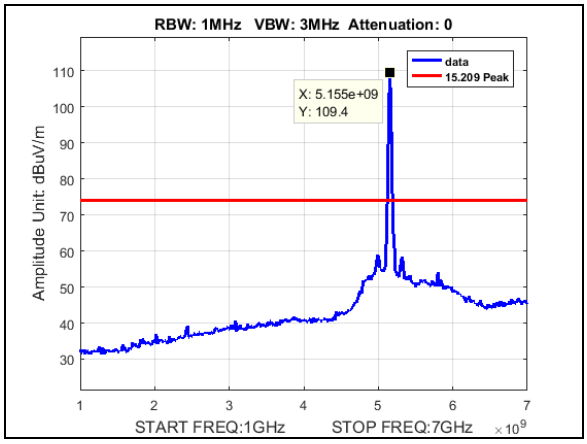
Plot 211. Undesirable Emissions, Average radiated spurious BW 50M, CF 5200M, 27dBi, 1-7GHz



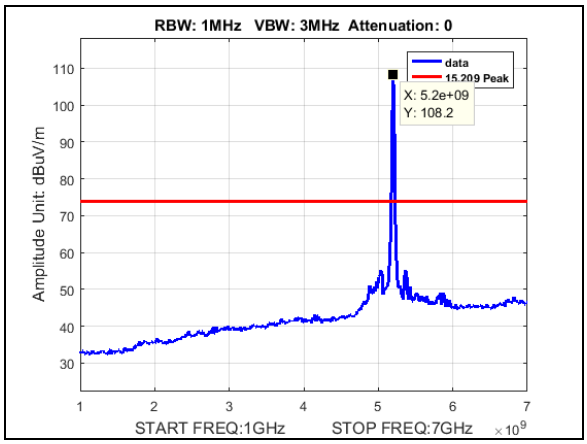
Plot 212. Undesirable Emissions, Average radiated spurious BW 50M, CF 5225M, 27dBi, 1-7GHz



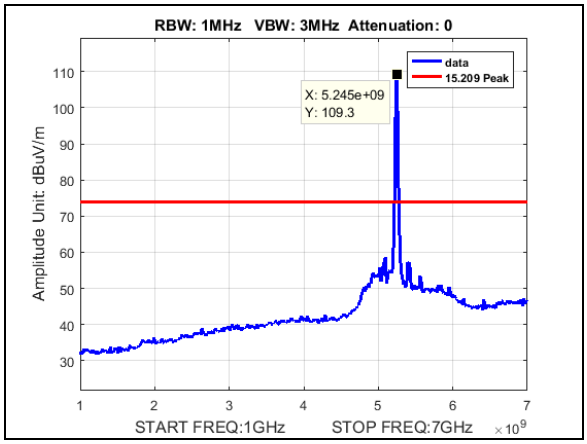
Plot 213. Undesirable Emissions, Average radiated spurious worst case 27dBi, 7-18GHz



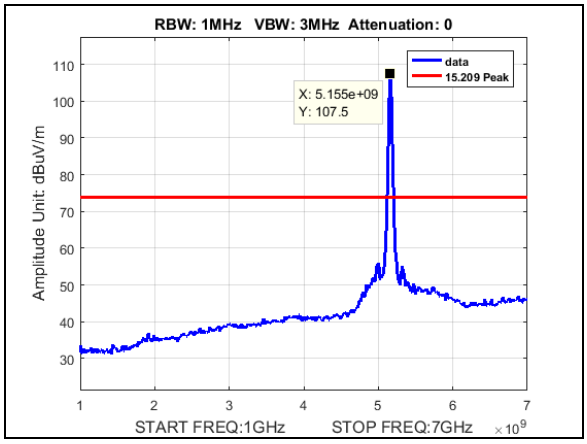
Plot 214. Undesirable Emissions, Peak radiated spurious BW 10M, CF 5155M, 27dBi, 1-7GHz



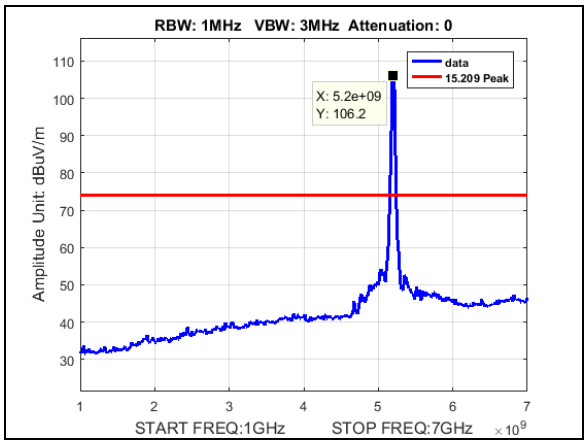
Plot 215. Undesirable Emissions, Peak radiated spurious BW 10M, CF 5200M, 27dBi, 1-7GHz



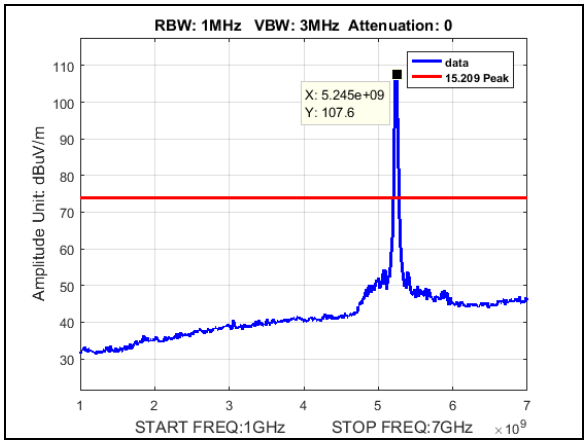
Plot 216. Undesirable Emissions, Peak radiated spurious BW 10M, CF 5245M, 27dBi, 1-7GHz



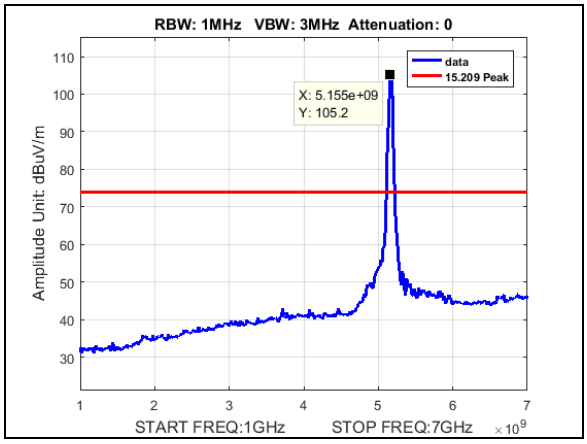
Plot 217. Undesirable Emissions, Peak radiated spurious BW 20M, CF 5160M, 27dBi, 1-7GHz



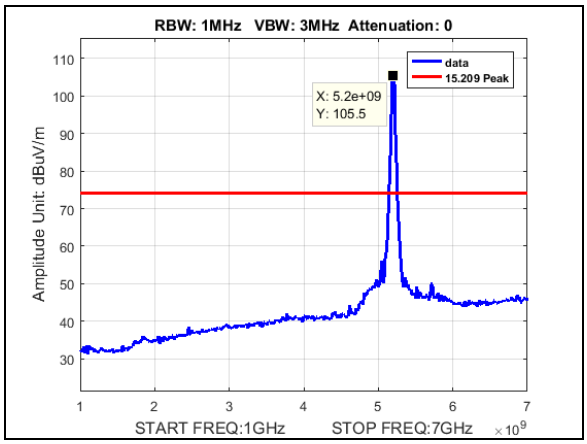
Plot 218. Undesirable Emissions, Peak radiated spurious BW 20M, CF 5200M, 27dBi, 1-7GHz



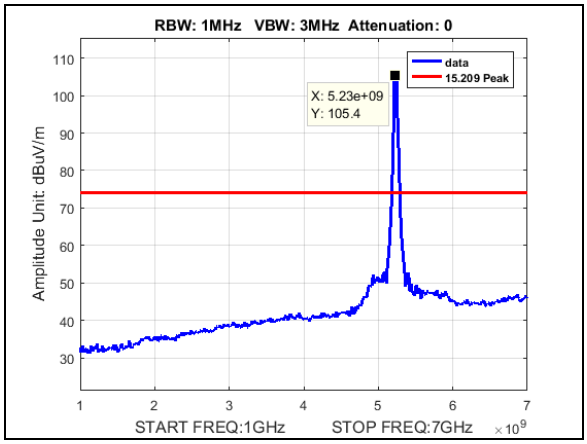
Plot 219. Undesirable Emissions, Peak radiated spurious BW 20M, CF 5240M, 27dBi, 1-7GHz



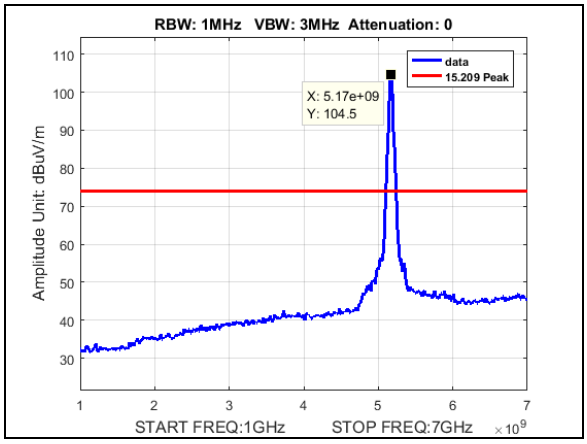
Plot 220. Undesirable Emissions, Peak radiated spurious BW 30M, CF 5165M, 27dBi, 1-7GHz



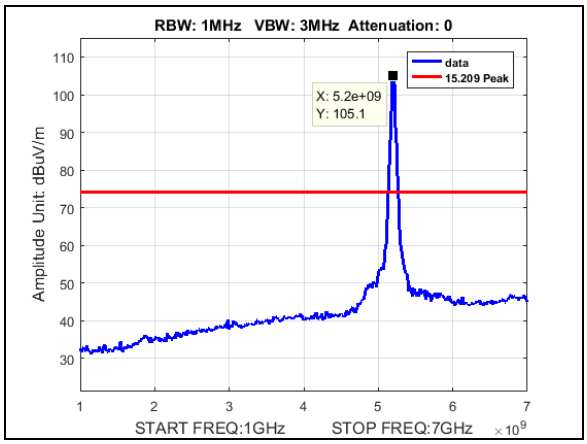
Plot 221. Undesirable Emissions, Peak radiated spurious BW 30M, CF 5200M, 27dBi, 1-7GHz



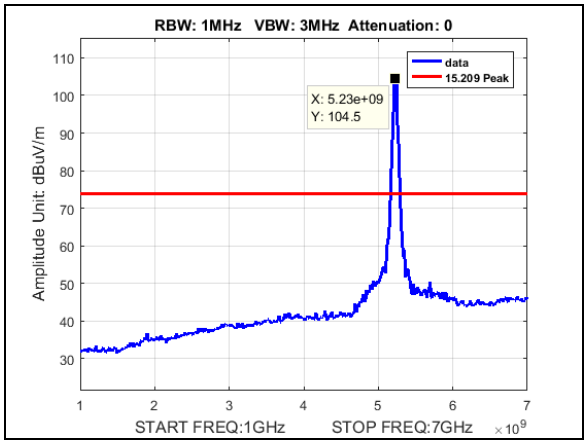
Plot 222. Undesirable Emissions, Peak radiated spurious BW 30M, CF 5235M, 27dBi, 1-7GHz



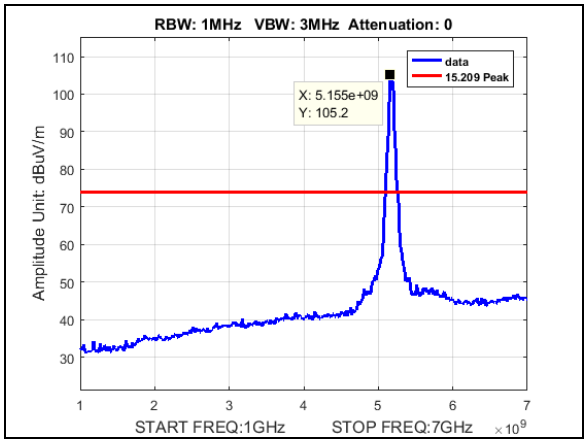
Plot 223. Undesirable Emissions, Peak radiated spurious BW 40M, CF 5170M, 27dBi, 1-7GHz



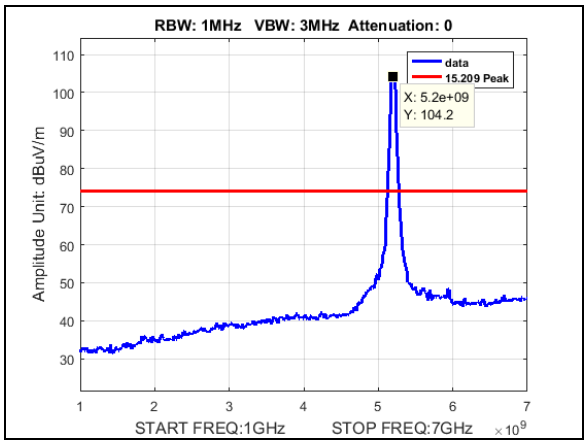
Plot 224. Undesirable Emissions, Peak radiated spurious BW 40M, CF 5200M, 27dBi, 1-7GHz



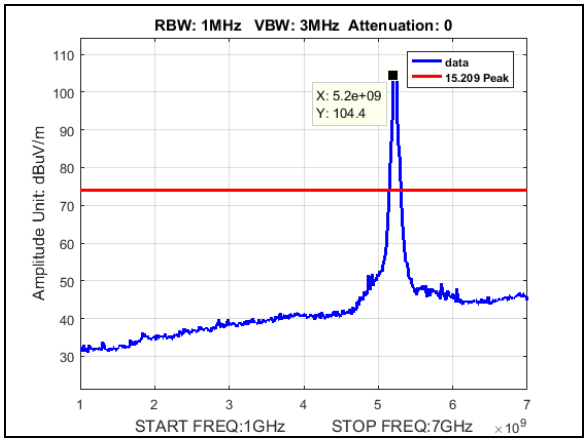
Plot 225. Undesirable Emissions, Peak radiated spurious BW 40M, CF 5230M, 27dBi, 1-7GHz



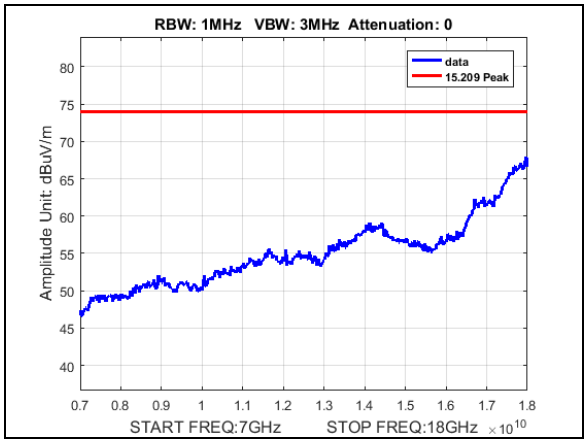
Plot 226. Undesirable Emissions, Peak radiated spurious BW 50M, CF 5175M, 27dBi, 1-7GHz



Plot 227. Undesirable Emissions, Peak radiated spurious BW 50M, CF 5200M, 27dBi, 1-7GHz



Plot 228. Undesirable Emissions, Peak radiated spurious BW 50M, CF 5225M, 27dBi, 1-7GHz



Plot 229. Undesirable Emissions, Peak radiated spurious worst case 27dBi, 7-18GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(6) Conducted Emissions

Test Requirement(s): **§ 15.407 (b)(6):** Any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

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

Test Procedure: The EUT was placed on a non-metallic table inside a screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 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 C63.4-2014 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. Scans were performed with the transmitter on.

Test Results: The EUT was compliant with requirements of this section.

Test Engineer(s): Donald Salguero

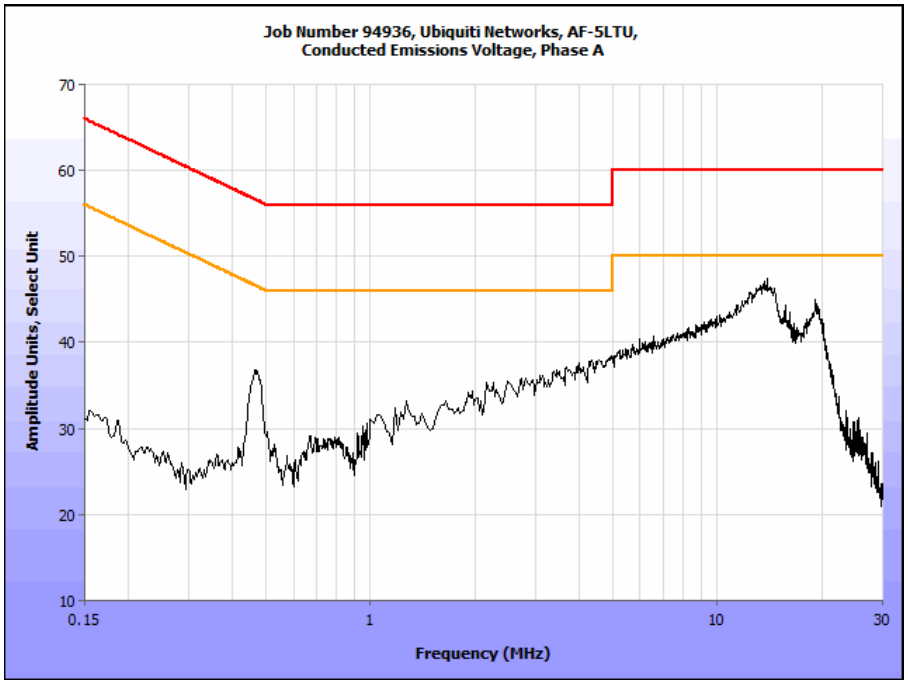
Test Date(s): November 2, 2017

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
13.95	44.12	0	44.12	60	-15.88	38.45	0	38.45	50	-11.55
19.15	40.78	0	40.78	60	-19.22	36.79	0	36.79	50	-13.21

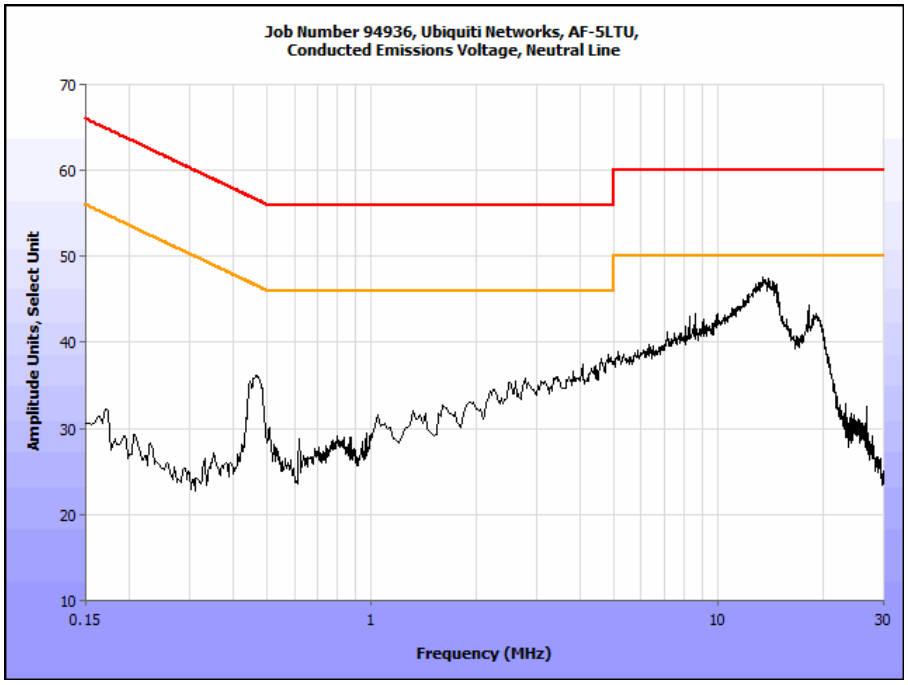
Table 16. Conducted Emissions, Phase, Test Results

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
13.55	43.38	0	43.38	60	-16.62	37.91	0	37.91	50	-12.09
18.25	38.35	0	38.35	60	-21.65	33.81	0	33.81	50	-16.19

Table 17. Conducted Emissions, Neutral, Test Results



Plot 230. Conducted Emissions, Phase



Plot 231. Conducted Emissions, Neutral

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) Maximum Permissible Exposure

Test Requirement(s): **§15.407(f):** U-NII devices are subject to the radio frequency radiation exposure requirements specified in §1.1307(b), §2.1091 and §2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment.

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: EUT's operating frequencies @ 5150-5250 MHz; **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

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

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

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (mW)
G = Antenna Gain (numeric value)
R = Distance (cm)

Test Results:

FCC									
Frequency (MHz)	**Con. Pwr. (dBm)**	**Con. Pwr. (mW)**	**Ant. Gain (dBi)**	**Ant. Gain numeric**	**Pwr. Density (mW/cm^2)**	**Limit (mW/cm^2)**	**Margin**	**Distance (cm)**	**Result**
5235	25.08	322.107	13	19.953	1	1	0	22.615	Pass
5240	24.49	281.19	19	79.433	1	1	0	42.159	Pass
5245	21.86	153.462	27	501.187	1	1	0	78.234	Pass

The safe distance where Power Density is less than the MPE Limit listed above was found to be 78.234 cm.

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
1T4612	Spectrum Analyzer	Agilent Technologies	E4407B	03/30/2017	09/30/2018
1T4565	LISN (24 AMP)	Solar Electronics Company	9252-50-R-24-BNC	08/15/2017	08/15/2018
1T6658	Spectrum Analyzer	Agilent Technologies	E4407B	12/21/2016	12/21/2017
1T4771	PSA Spectrum Analyzer	Agilent Technologies	E4446A	8/10/2016	2/10/2018
1T4753	Antenna - Bilog	Sunol Sciences	JB6	10/24/2016	4/24/2018
1T4483	Antenna; Horn	ETS-Lindgren	3117	4/19/2017	10/19/2018
1T2665	Antenna; Horn	EMCO	3115	6/22/2017	12/22/2018
1T4442	Pre-amplifier, Microwave	Miteq	AFS42-01001800-30-10P	Func Verify	
1T4149	High-Frequency Anechoic Chamber	Ray Proof	81	Not Required	
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	2/6/2015	2/6/2018

Table 18. 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

L. 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.

