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

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January 3, 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 3).

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 3)

ACCREDITED
TESTINGCERT #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 3

January 3, 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

Electromagnetic Compatibility Criteria
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Tested under
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Title 47 of the CFR
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 3, 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)	26 dB Bandwidth	Compliant
§15.407 (a)(3)	Maximum Conducted Output Power	Compliant
§15.407 (a)(1)(i)	EIRP Above 30 degrees Elevation	Not Applicable
§15.407 (a)(3)	Maximum Power Spectral Density	Compliant
§15.407 (b)(4)& (6 - 7)	Undesirable Emissions	Compliant
§15.407(b)(6)	Conducted Emission Limits	Compliant
§15.407(e)	6 dB Bandwidth	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-AF5LTU	
	Type of Modulations:	OFDM
	Equipment Code:	NII
	Max. RF Output Power:	29.95 dBm with 27dBi antenna
	EUT Frequency Ranges:	5730 – 5845 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	
Evaluated by:	Donald Salguero	
Report Date(s):	January 3, 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

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

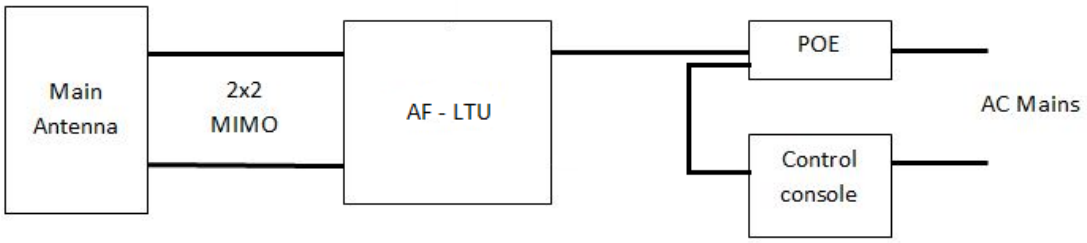


Figure 1. Block Diagram of Test Configuration

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

E. 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

F. 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

G. 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.

H. Method of Monitoring EUT Operation

I. 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.

J. 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. Antennas are used for Point-to-Point and Point-to-multipoint 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): December 12, 2017

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(i) 26 dB 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.

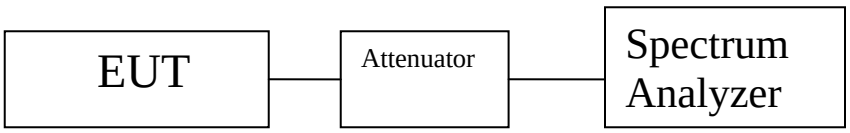
Test Procedure: The transmitter was set to low, mid, and high operating frequencies at the highest output power and connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the 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.

No anomalies detected.

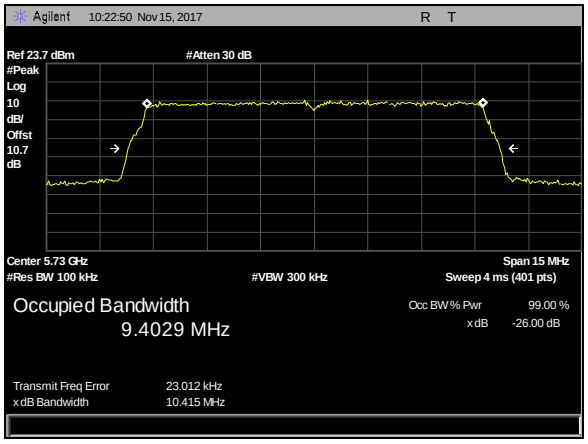
Test Engineer(s): Donald Salguero

Test Date(s): December 7, 2017

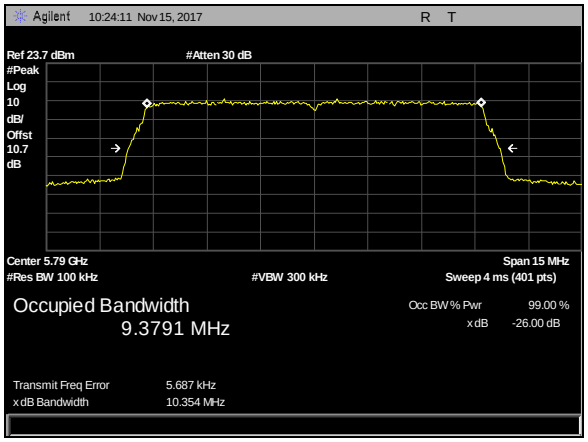


Channel BW (MHz)	Frequency (MHz)	26dB BW (MHz)
10	5730	10.415
	5790	10.354
	5845	10.415
20	5735	20.873
	5790	20.966
	5840	20.997
30	5740	31.18
	5790	31.295
	5835	31.254
40	5745	41.569
	5790	41.58
	5830	41.323
50	5750	52.766
	5790	52.8
	5825	52.913

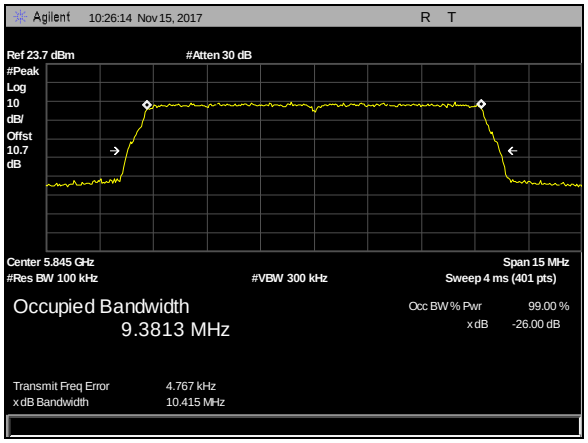
Table 8. 26 dB Occupied Bandwidth, Test Results



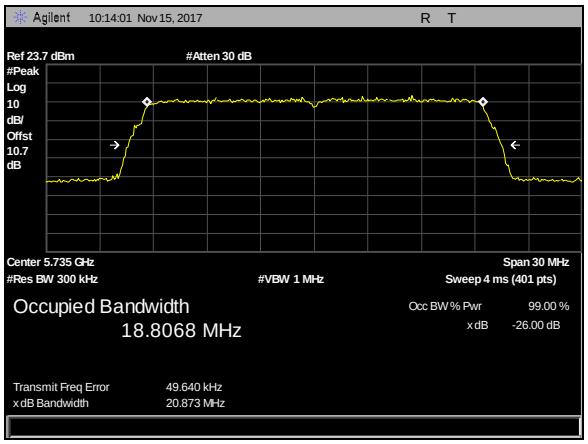
Plot 1. 26 dB Occupied Bandwidth, BW 10M, CF 5730M



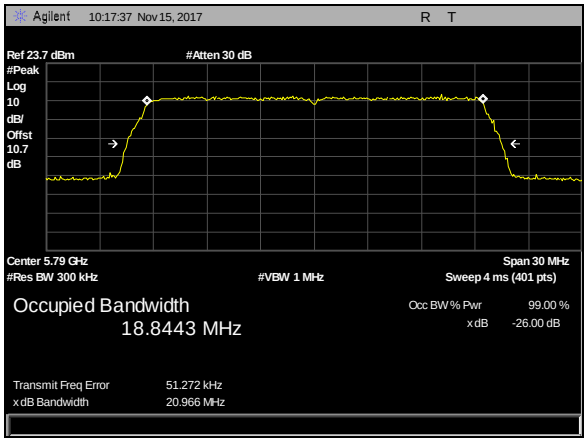
Plot 2. 26 dB Occupied Bandwidth, BW 10M, CF 5790M



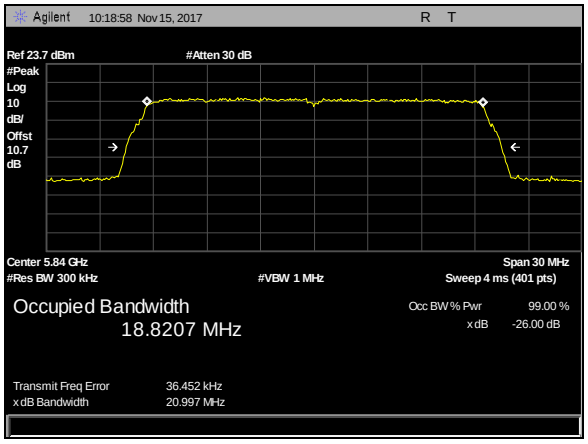
Plot 3. 26 dB Occupied Bandwidth, BW 10M, CF 5845M



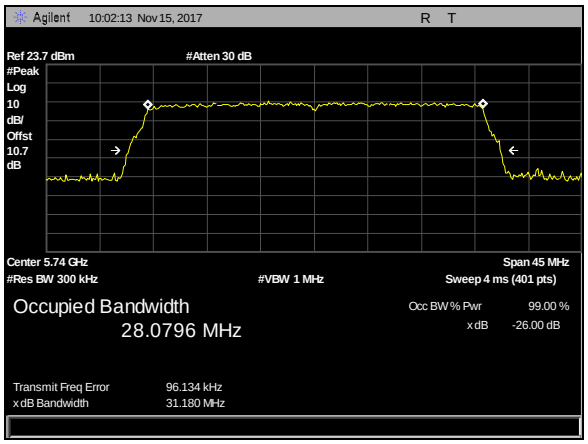
Plot 4. 26 dB Occupied Bandwidth, BW 20M, CF 5735M



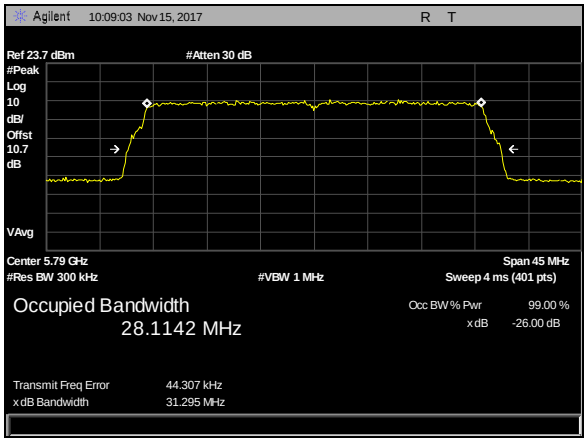
Plot 5. 26 dB Occupied Bandwidth, BW 20M, CF 5790M



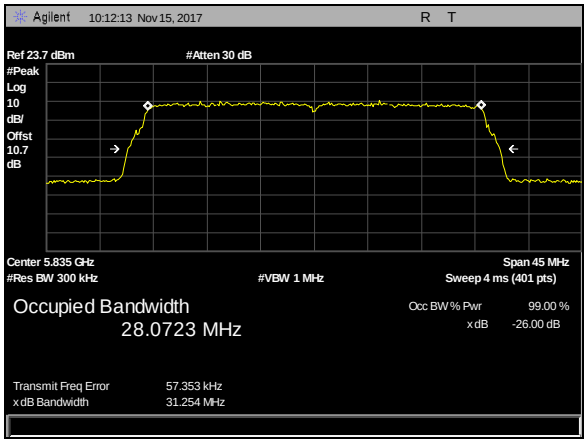
Plot 6. 26 dB Occupied Bandwidth, BW 20M, CF 5840M



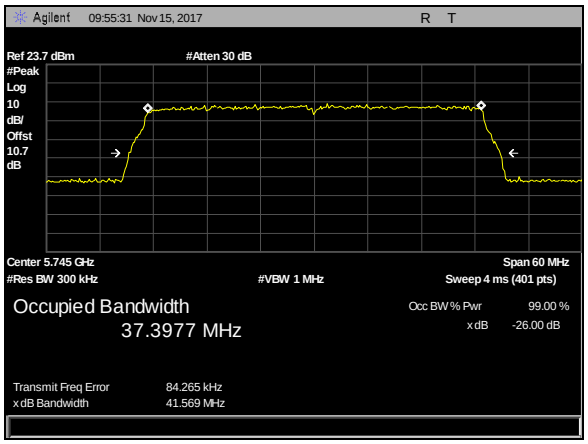
Plot 7. 26 dB Occupied Bandwidth, BW 30M, CF 5740M



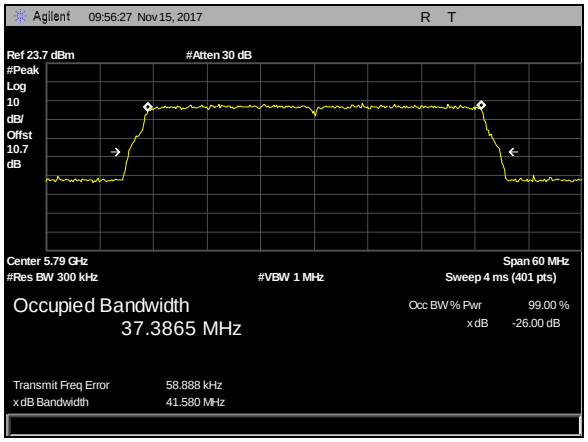
Plot 8. 26 dB Occupied Bandwidth, BW 30M, CF 5790M



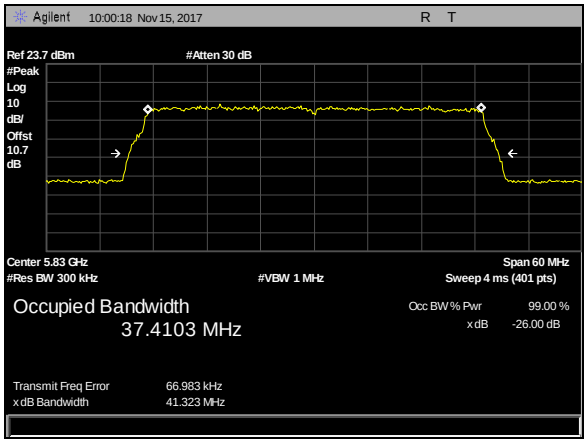
Plot 9. 26 dB Occupied Bandwidth, BW 30M, CF 5835M



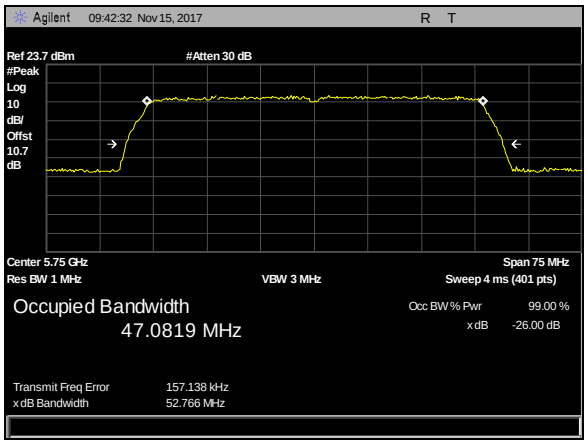
Plot 10. 26 dB Occupied Bandwidth, BW 40M, CF 5745M



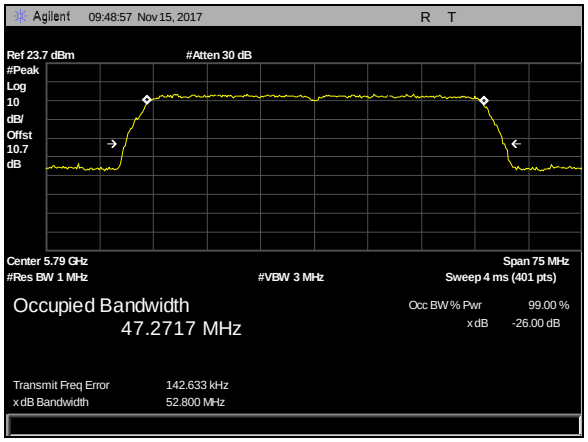
Plot 11. 26 dB Occupied Bandwidth, BW 40M, CF 5790M



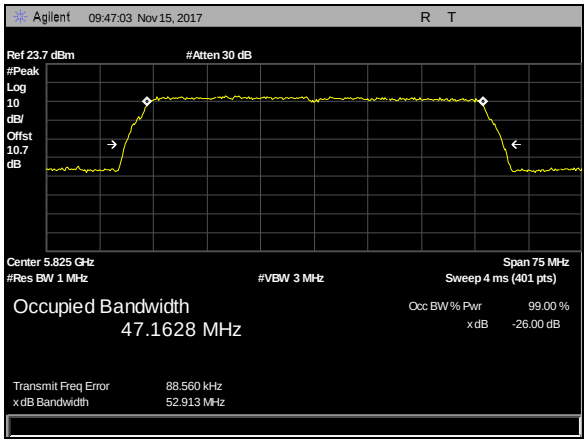
Plot 12. 26 dB Occupied Bandwidth, BW 40M, CF 5830M



Plot 13. 26 dB Occupied Bandwidth, BW 50M, CF 5750M



Plot 14. 26 dB Occupied Bandwidth, BW 50M, CF 5790M



Plot 15. 26 dB Occupied Bandwidth, BW 50M, CF 5825M

Electromagnetic Compatibility Criteria for Intentional Radiators

§15. 407(a)(3) Maximum Conducted Output Power

Test Requirements: **§15.407(a)(3):** For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.
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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

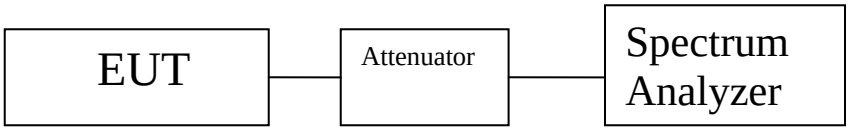
Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according to measurement method SA-1, as described in 789033 D02 General UNII Test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

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

No anomalies detected.

Test Engineer(s): Donald Salguero

Test Date(s): December 19, 2017



Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Margin (dB)
10	5730	26.83	26.62	29.74	30	-0.26
	5790	27.25	26.61	29.95	30	-0.05
	5845	26.78	26.54	29.67	30	-0.33
20	5735	26.95	26.72	29.85	30	-0.15
	5790	26.51	26.85	29.69	30	-0.31
	5840	26.43	26.84	29.65	30	-0.35
30	5740	26.69	26.82	29.77	30	-0.23
	5790	26.62	26.72	29.68	30	-0.32
	5835	26.97	26.85	29.92	30	-0.08
40	5745	26.82	26.61	29.73	30	-0.27
	5790	26.92	26.67	29.81	30	-0.19
	5830	26.98	26.86	29.93	30	-0.07
50	5750	27.14	26.61	29.89	30	-0.11
	5790	26.82	26.94	29.89	30	-0.11
	5825	26.41	26.96	29.70	30	-0.3

Table 9. Conducted Transmitter Output Power, Fixed point-to-point, 2x2, Test Results

Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Directional Gain (dBi)	Final Limit (dBm)	Margin (dB)
10	5730	19.99	19.97	22.99	30	13	23	-0.009
	5790	19.95	19.92	22.95	30	13	23	-0.054
	5845	19.92	19.93	22.94	30	13	23	-0.064
20	5735	20.01	19.87	22.95	30	13	23	-0.049
	5790	19.9	20.04	22.98	30	13	23	-0.019
	5840	19.95	19.93	22.95	30	13	23	-0.049
30	5740	19.96	19.82	22.9	30	13	23	-0.099
	5790	19.89	19.84	22.88	30	13	23	-0.124
	5835	19.82	19.96	22.9	30	13	23	-0.099
40	5745	19.86	19.94	22.91	30	13	23	-0.089
	5790	19.95	19.99	22.98	30	13	23	-0.019
	5830	19.95	19.81	22.89	30	13	23	-0.109
50	5750	20.03	19.88	22.97	30	13	23	-0.034
	5790	20.07	19.73	22.91	30	13	23	-0.086
	5825	19.94	19.85	22.91	30	13	23	-0.094

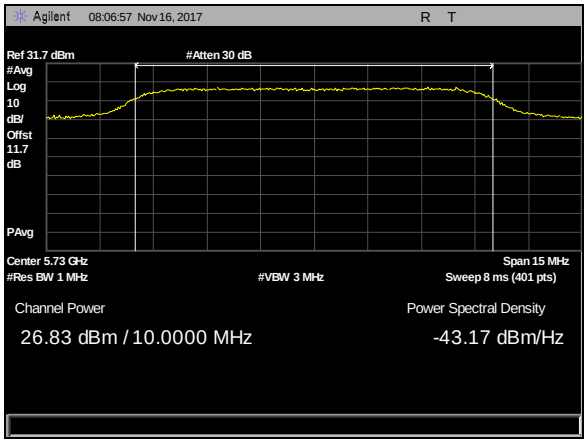
Table 10. Conducted Transmitter Output Power, point-to-multipoint, 13 dBi, 2x2, Test Results

Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Directional Gain (dBi)	Final Limit (dBm)	Margin (dB)
10	5730	14	13.93	16.98	30	19	17	-0.024
	5790	14.01	13.96	17	30	19	17	-0.004
	5845	13.92	13.97	16.96	30	19	17	-0.044
20	5735	13.97	13.85	16.92	30	19	17	-0.079
	5790	13.99	13.9	16.96	30	19	17	-0.044
	5840	13.84	13.97	16.92	30	19	17	-0.084
30	5740	13.89	13.96	16.94	30	19	17	-0.064
	5790	13.88	13.95	16.93	30	19	17	-0.074
	5835	13.92	13.91	16.93	30	19	17	-0.074
40	5745	13.86	13.98	16.93	30	19	17	-0.069
	5790	13.95	14	16.99	30	19	17	-0.014
	5830	13.9	13.97	16.95	30	19	17	-0.054
50	5750	13.98	13.91	16.96	30	19	17	-0.044
	5790	13.92	14.01	16.98	30	19	17	-0.024
	5825	13.94	13.99	16.98	30	19	17	-0.024

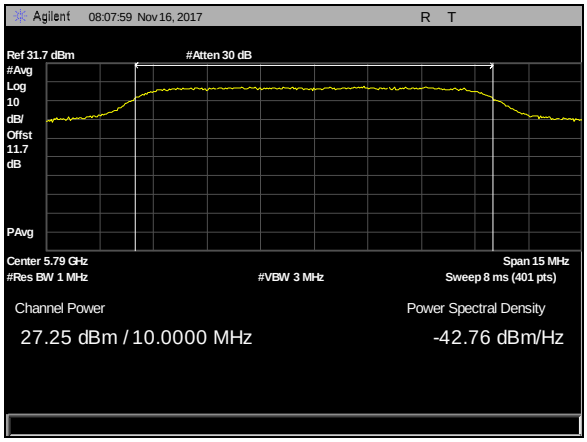
Table 11. Conducted Transmitter Output power, point-to-multipoint, 19 dBi, 2x2, Test Results

Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Directional Gain (dBi)	Final Limit (dBm)	Margin (dB)
10	5730	5.91	5.92	8.926	30	27	9	-0.074
	5790	5.98	5.99	8.996	30	27	9	-0.004
	5845	5.99	5.91	8.961	30	27	9	-0.039
20	5735	5.93	5.96	8.956	30	27	9	-0.044
	5790	5.94	6.00	8.981	30	27	9	-0.019
	5840	5.94	5.95	8.956	30	27	9	-0.044
30	5740	5.99	5.94	8.976	30	27	9	-0.024
	5790	5.95	5.94	8.956	30	27	9	-0.044
	5835	5.89	5.91	8.911	30	27	9	-0.089
40	5745	5.97	5.91	8.951	30	27	9	-0.049
	5790	5.93	5.92	8.936	30	27	9	-0.064
	5830	5.91	5.93	8.931	30	27	9	-0.069
50	5750	5.99	5.97	8.991	30	27	9	-0.009
	5790	5.92	5.97	8.956	30	27	9	-0.044
	5825	5.95	5.97	8.971	30	27	9	-0.029

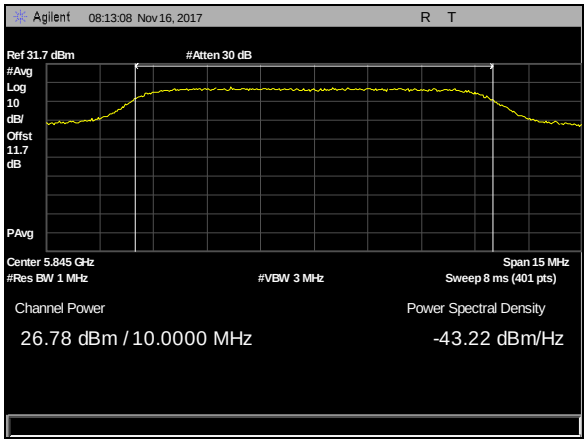
Table 12. Conducted Transmitter Ouptut Power, point-to-multipoint, 27 dBi, 2x2, Test Results



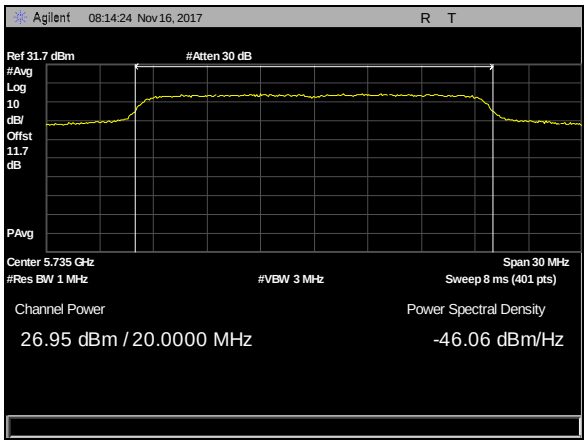
Plot 16. Conducted Transmitter Output Power, BW 10, CF 5730, fixed ptp, c0



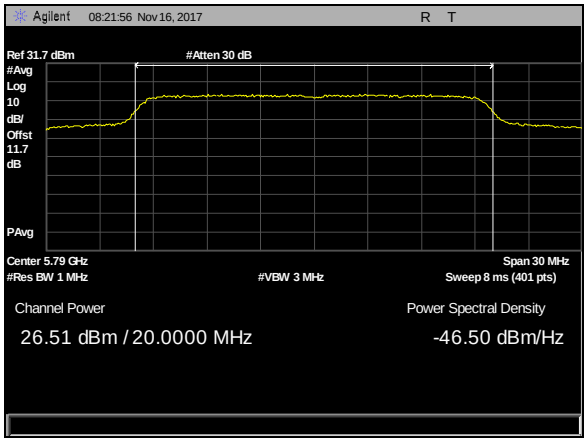
Plot 17. Conducted Transmitter Output Power, BW 10, CF 5790, fixed ptp, c0



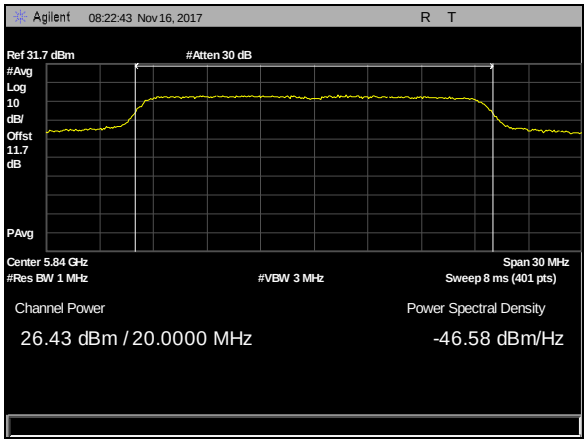
Plot 18. Conducted Transmitter Output Power, BW 10, CF 5845, fixed ptp, c0



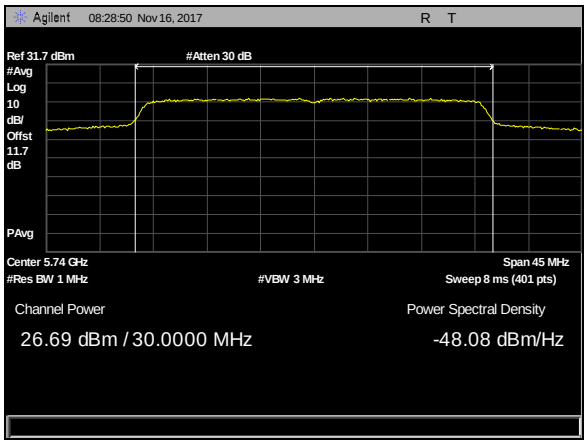
Plot 19. Conducted Transmitter Output Power, BW 20, CF 5735, fixed ptp, c0



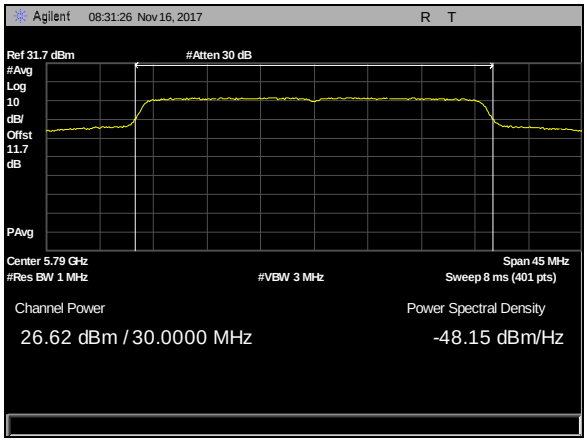
Plot 20. Conducted Transmitter Output Power, BW 20, CF 5790, fixed ptp, c0



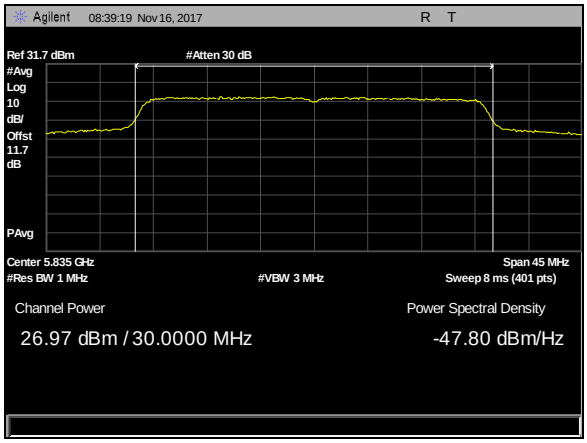
Plot 21. Conducted Transmitter Output Power, BW 20, CF 5840, fixed ptp, c0



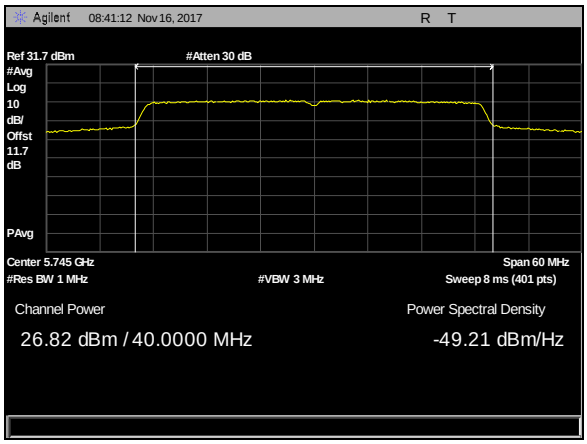
Plot 22. Conducted Transmitter Output Power, BW 30, CF 5740, fixed ptp, c0



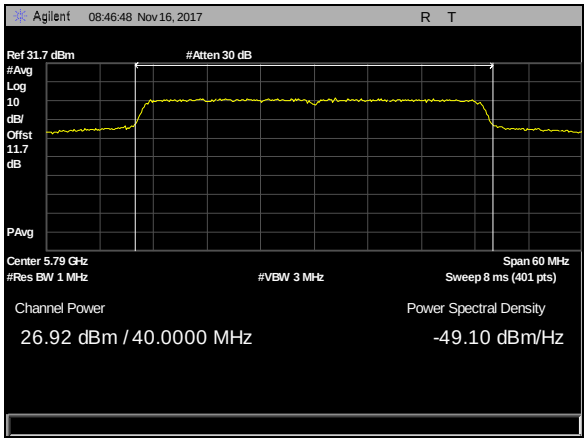
Plot 23. Conducted Transmitter Output Power, BW 30, CF 5790, fixed ptp, c0



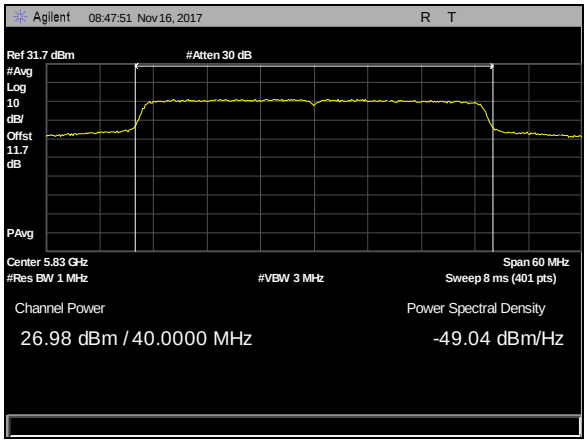
Plot 24. Conducted Transmitter Output Power, BW 30, CF 5835, fixed ptp, c0



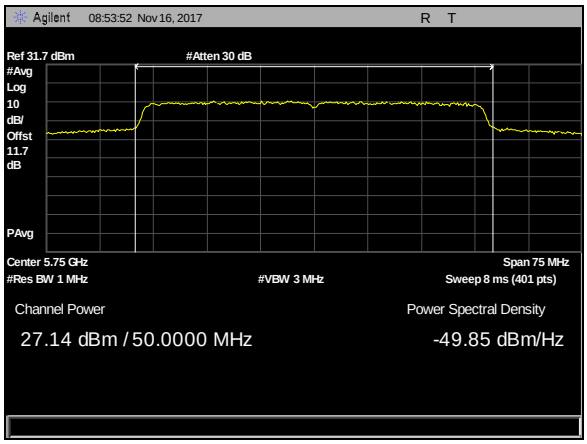
Plot 25. Conducted Transmitter Output Power, BW 40, CF 5745, fixed ptp, c0



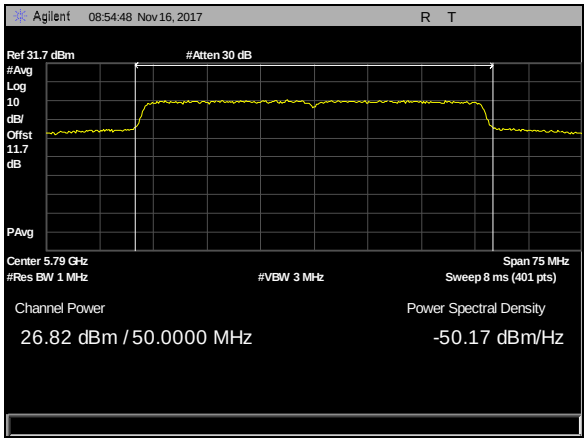
Plot 26. Conducted Transmitter Output Power, BW 40, CF 5790, fixed ptp, c0



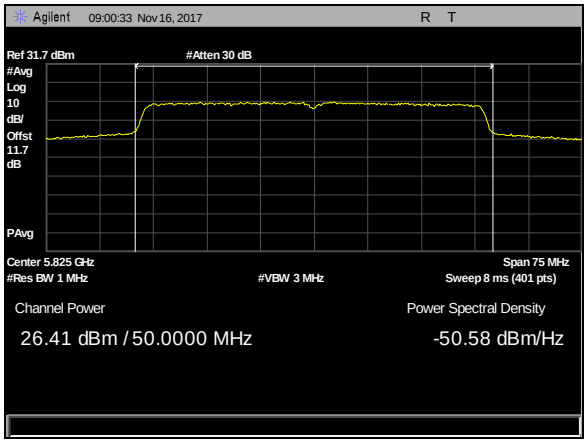
Plot 27. Conducted Transmitter Output Power, BW 40, CF 5830, fixed ptp, c0



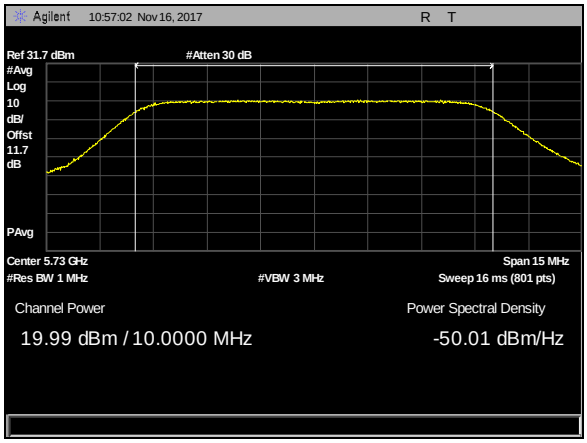
Plot 28. Conducted Transmitter Output Power, BW 50, CF 5750, fixed ptp, c0



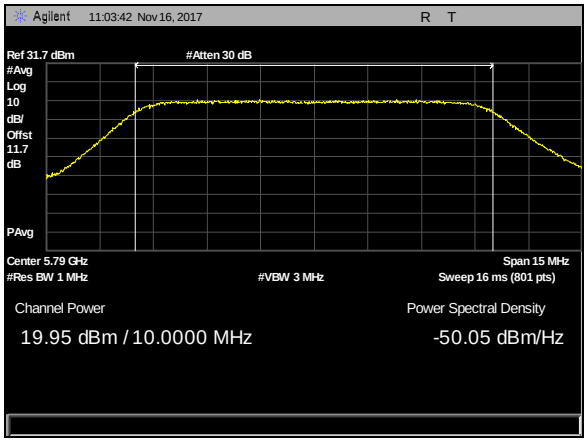
Plot 29. Conducted Transmitter Output Power, BW 50, CF 5790, fixed ptp, c0



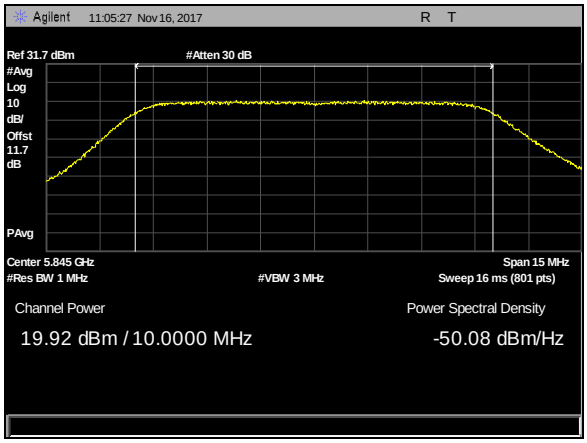
Plot 30. Conducted Transmitter Output Power, BW 50, CF 5825, fixed ptp, c0



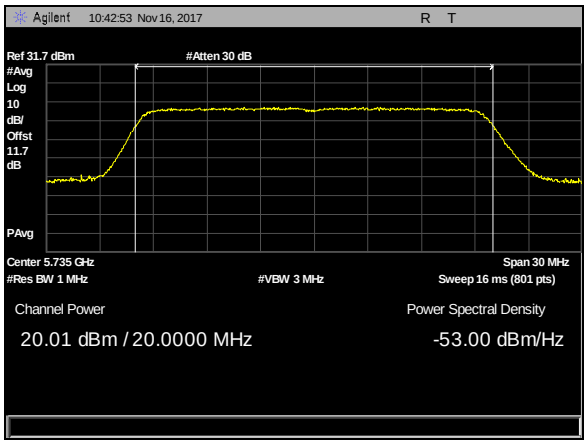
Plot 31. Conducted Transmitter Output Power, BW 10M, CF 5730M, 13dBi, PtMP, c0



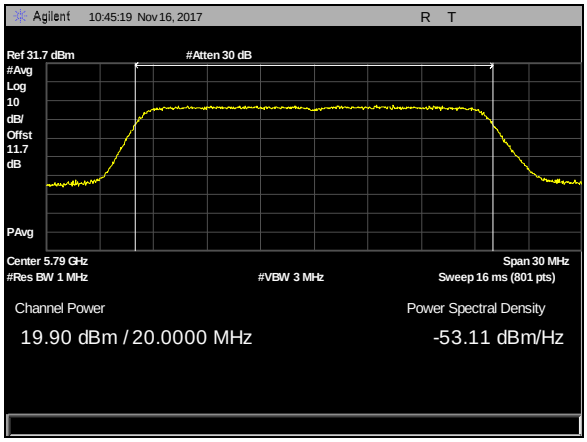
Plot 32. Conducted Transmitter Output Power, BW 10M, CF 5790M, 13dBi, PtMP, c0



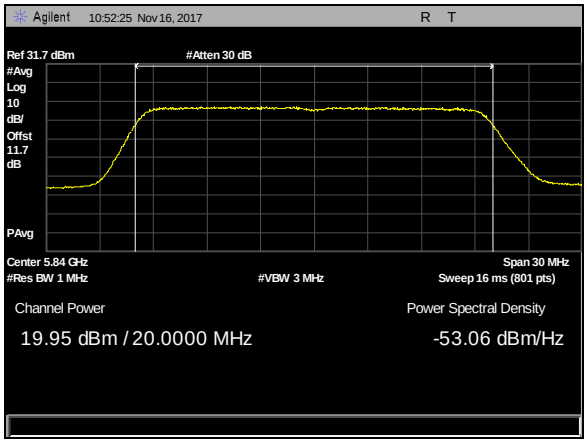
Plot 33. Conducted Transmitter Output Power, BW 10M, CF 5845M, 13dBi, PtMP, c0



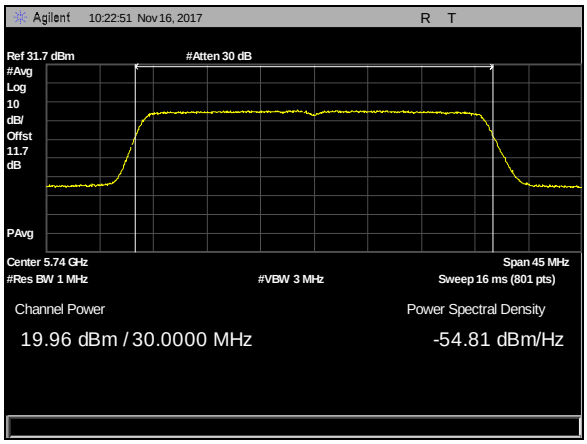
Plot 34. Conducted Transmitter Output Power, BW 20M, CF 5735M, 13dBi, PtMP, c0



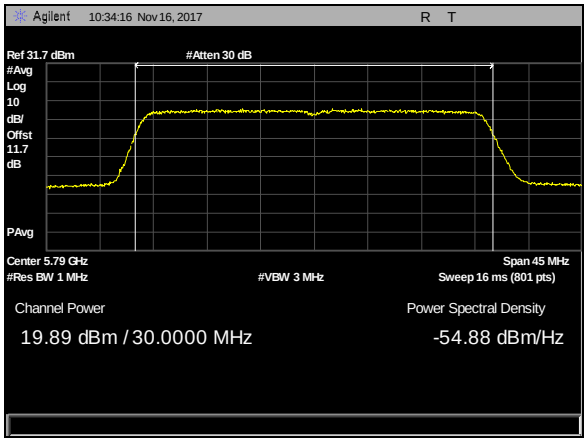
Plot 35. Conducted Transmitter Output Power, BW 20M, CF 5790M, 13dBi, PtMP, c0



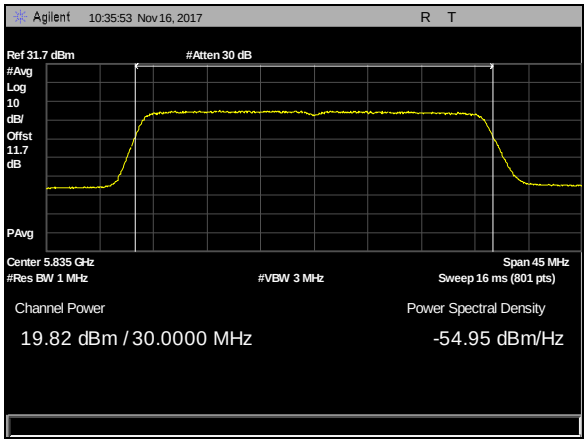
Plot 36. Conducted Transmitter Output Power, BW 20M, CF 5840M, 13dBi, PtMP, c0



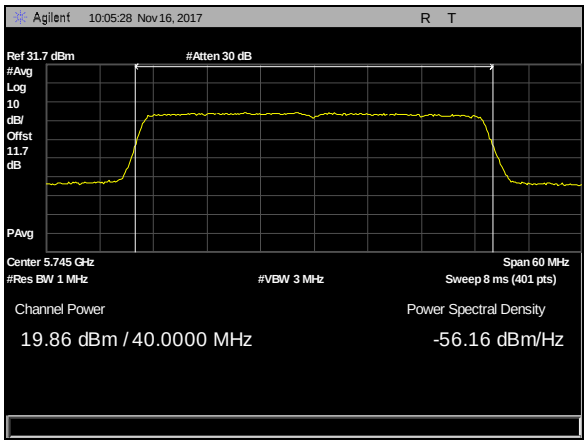
Plot 37. Conducted Transmitter Output Power, BW 30M, CF 5740M, 13dBi, PtMP, c0



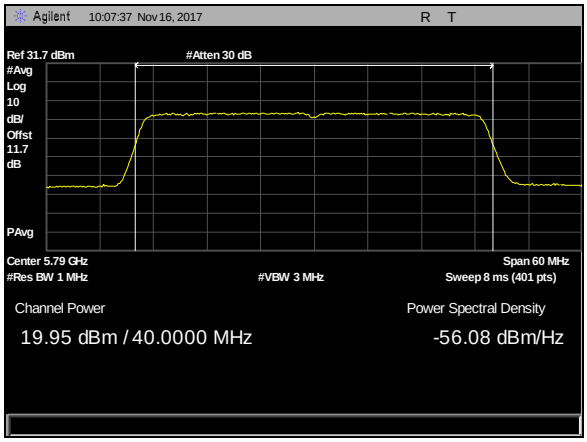
Plot 38. Conducted Transmitter Output Power, BW 30M, CF 5790M, 13dBi, PtMP, c0



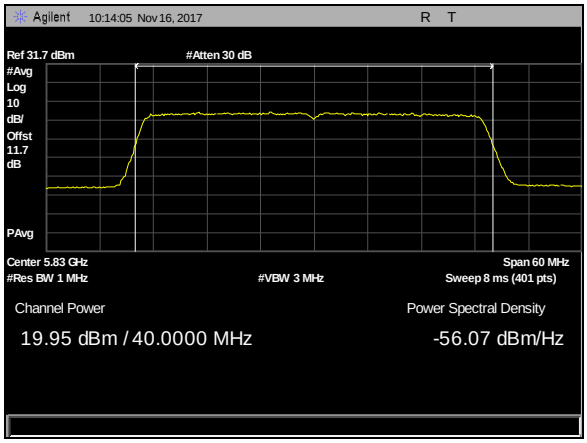
Plot 39. Conducted Transmitter Output Power, BW 30M, CF 5835M, 13dBi, PtMP, c0



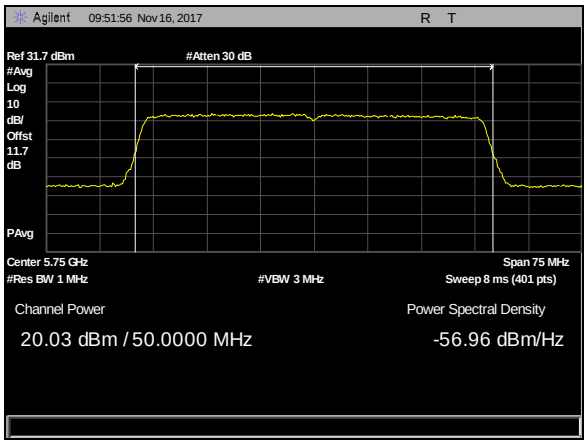
Plot 40. Conducted Transmitter Output Power, BW 40M, CF 5745M, 13dBi, PtMP, c0



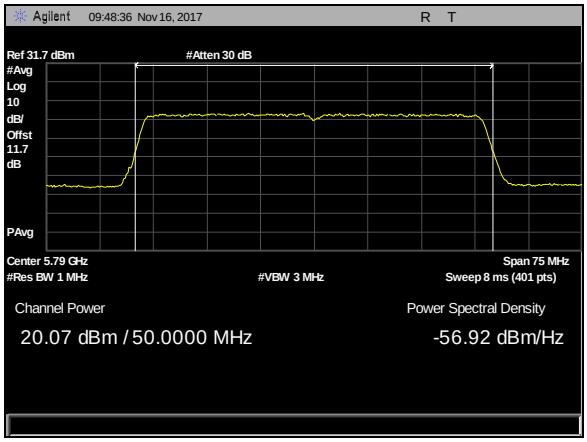
Plot 41. Conducted Transmitter Output Power, BW 40M, CF 5790M, 13dBi, PtMP, c0



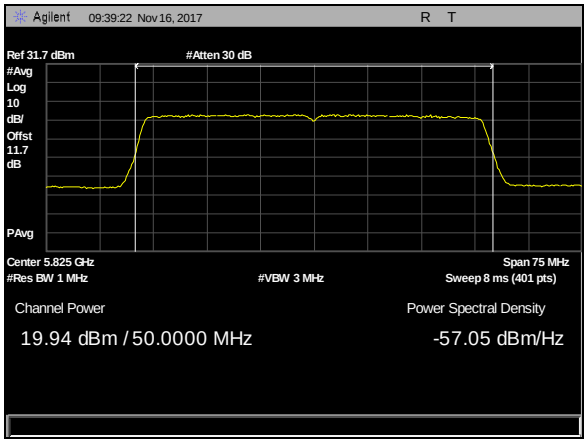
Plot 42. Conducted Transmitter Output Power, BW 40M, CF 5830M, 13dBi, PtMP, c0



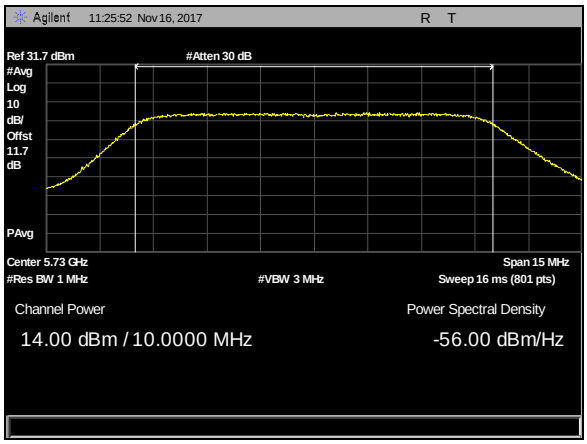
Plot 43. Conducted Transmitter Output Power, BW 50M, CF 5750M, 13dBi, PtMP, c0



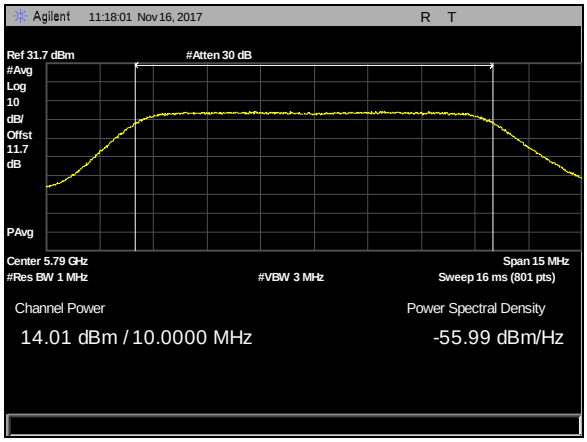
Plot 44. Conducted Transmitter Output Power, BW 50M, CF 5790M, 13dBi, PtMP, c0



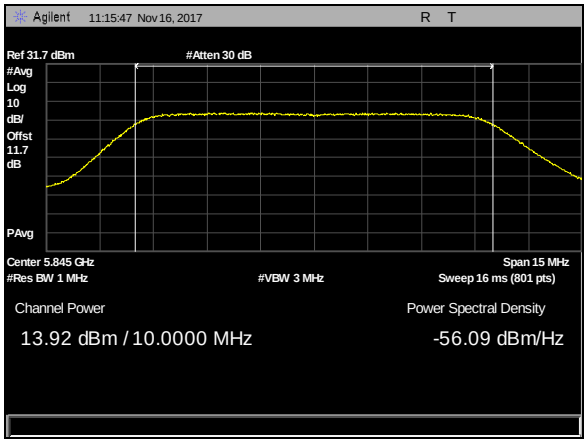
Plot 45. Conducted Transmitter Output Power, BW 50M, CF 5825M, 13dBi, PtMP, c0



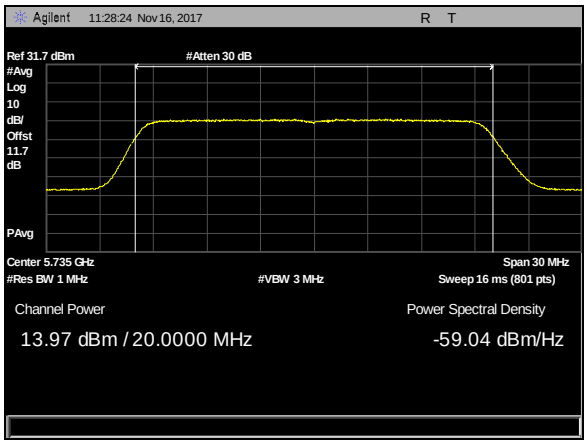
Plot 46. Conducted Transmitter Output Power, BW 10M, CF 5730M, 19dBi, PtMP, c0



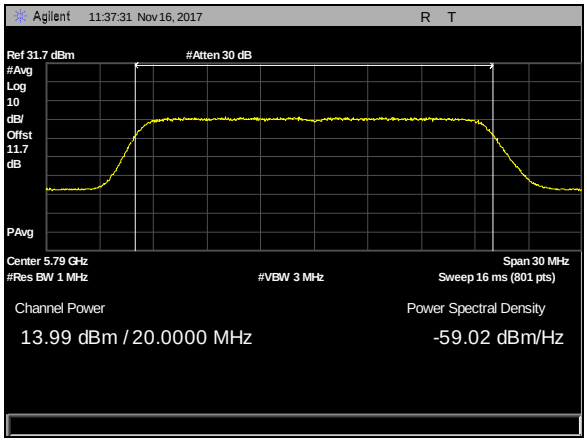
Plot 47. Conducted Transmitter Output Power, BW 10M, CF 5790M, 19dBi, PtMP, c0



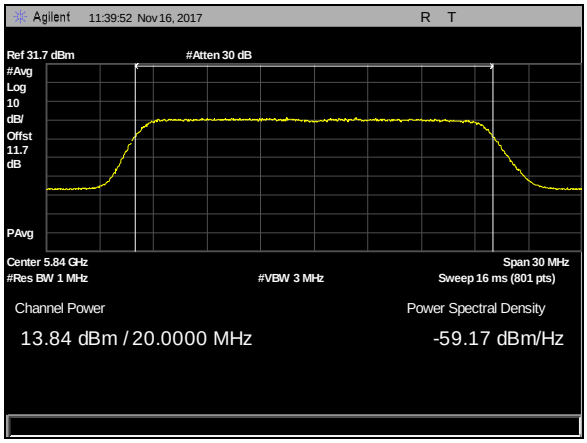
Plot 48. Conducted Transmitter Output Power, BW 10M, CF 5845M, 19dBi, PtMP, c0



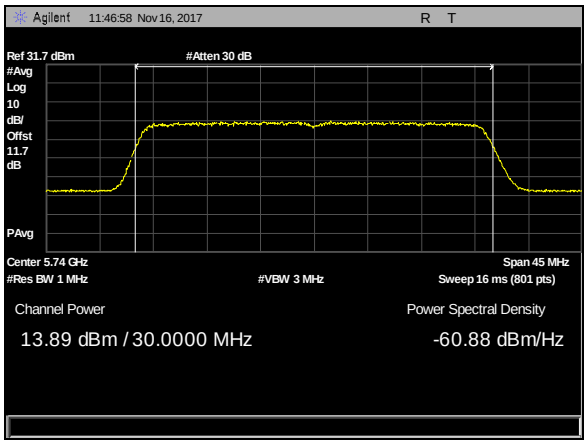
Plot 49. Conducted Transmitter Output Power, BW 20M, CF 5735M, 19dBi, PtMP, c0



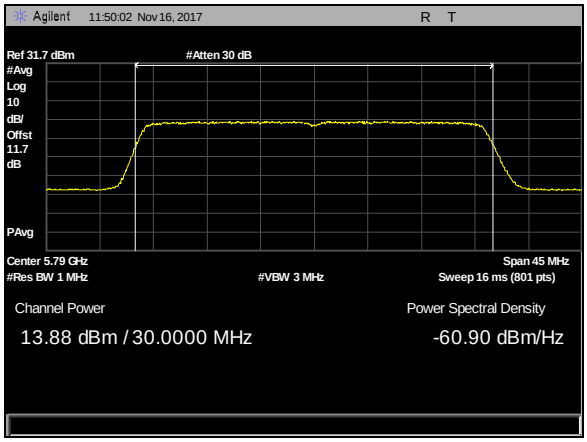
Plot 50. Conducted Transmitter Output Power, BW 20M, CF 5790M, 19dBi, PtMP, c0



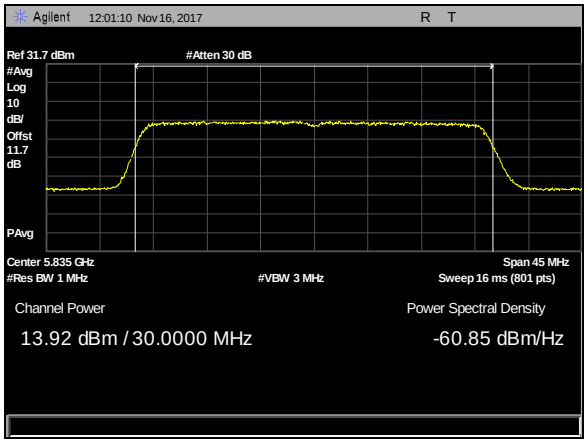
Plot 51. Conducted Transmitter Output Power, BW 20M, CF 5840M, 19dBi, PtMP, c0



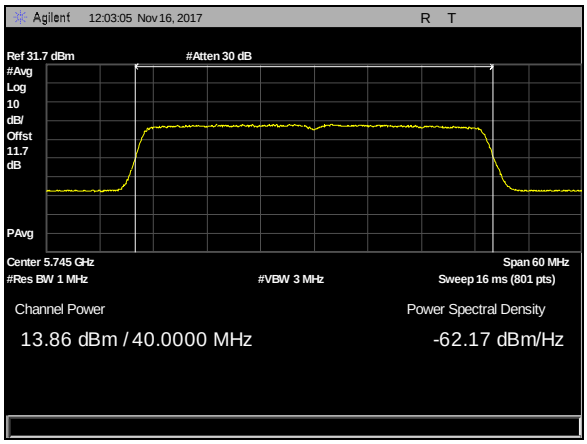
Plot 52. Conducted Transmitter Output Power, BW 30M, CF 5740M, 19dBi, PtMP, c0



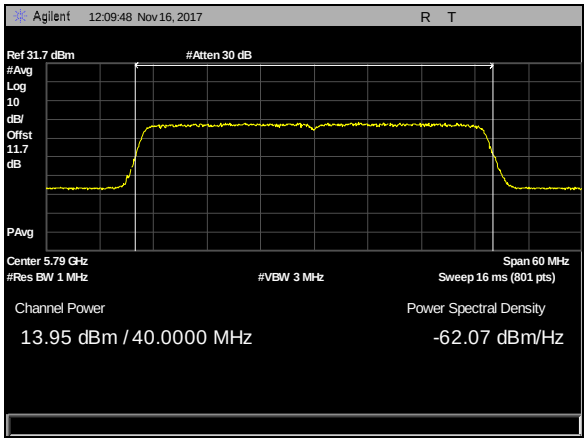
Plot 53. Conducted Transmitter Output Power, BW 30M, CF 5790M, 19dBi, PtMP, c0



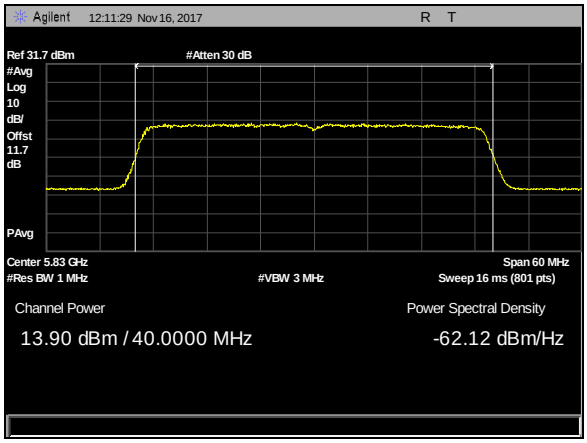
Plot 54. Conducted Transmitter Output Power, BW 30M, CF 5835M, 19dBi, PtMP, c0



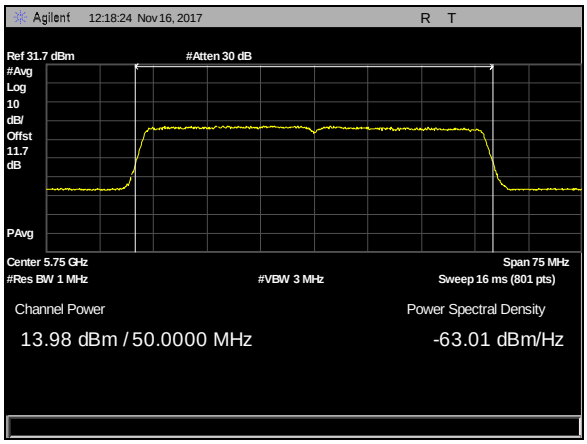
Plot 55. Conducted Transmitter Output Power, BW 40M, CF 5745M, 19dBi, PtMP, c0



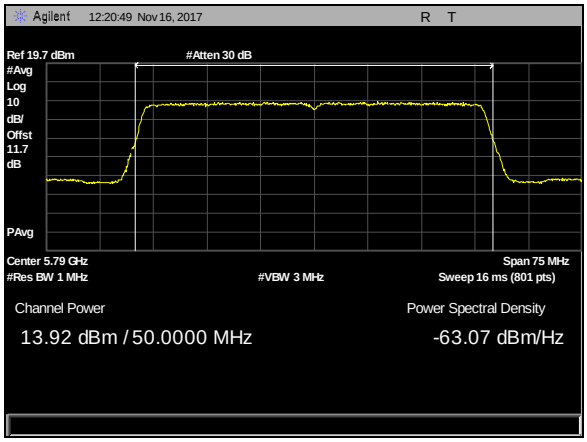
Plot 56. Conducted Transmitter Output Power, BW 40M, CF 5790M, 19dBi, PtMP, c0



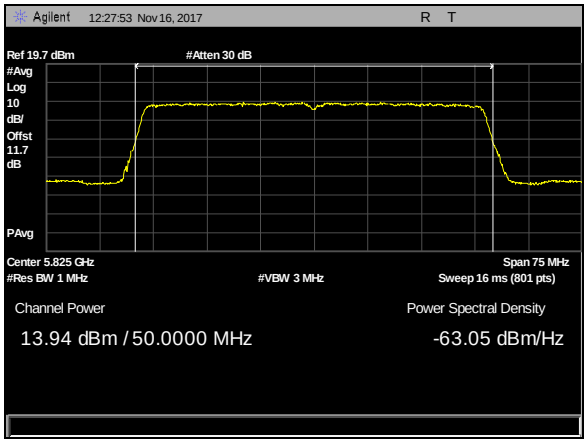
Plot 57. Conducted Transmitter Output Power, BW 40M, CF 5830M, 19dBi, PtMP, c0



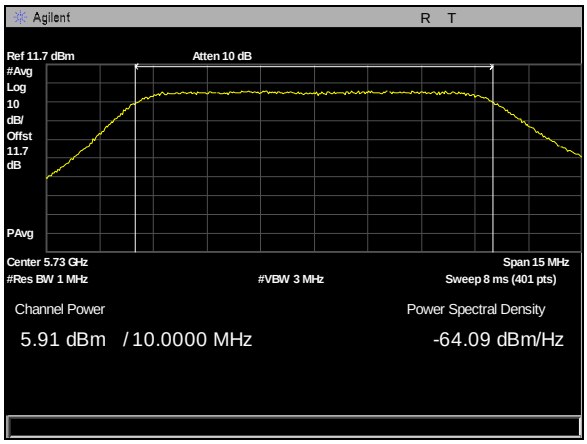
Plot 58. Conducted Transmitter Output Power, BW 50M, CF 5750M, 19dBi, PtMP, c0



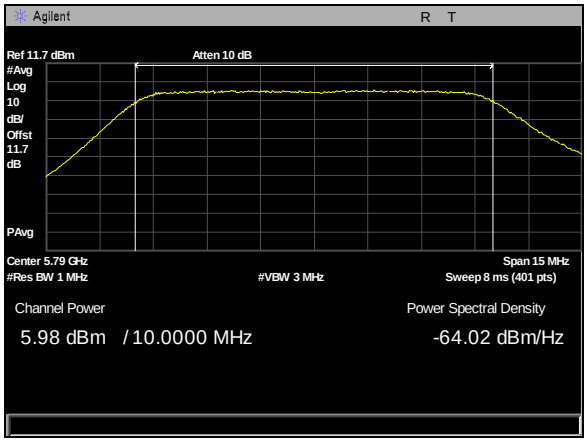
Plot 59. Conducted Transmitter Output Power, BW 50M, CF 5790M, 19dBi, PtMP, c0



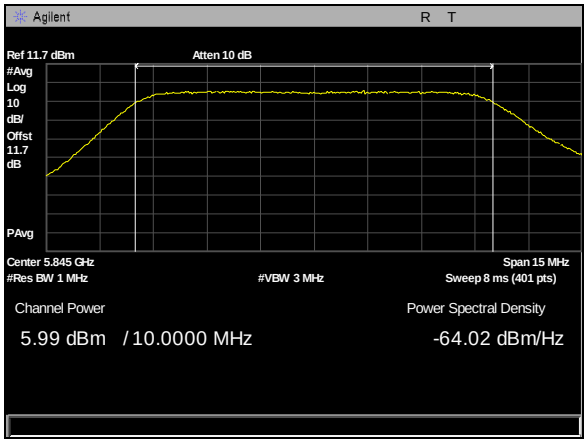
Plot 60. Conducted Transmitter Output Power, BW 50M, CF 5825M, 19dBi, PtMP, c0



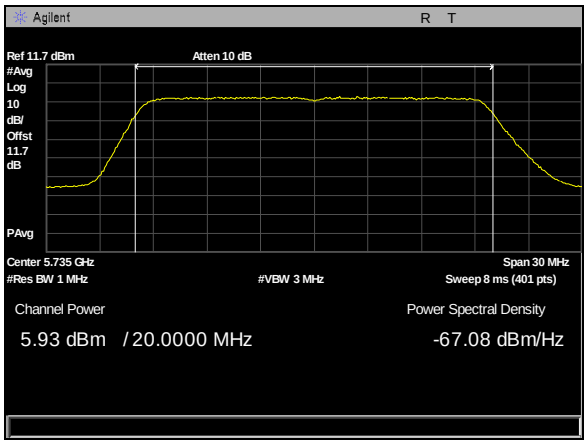
Plot 61. Conducted Transmitter Output Power, BW 10M, CF 5730M, 27dBi, PtMP, c0



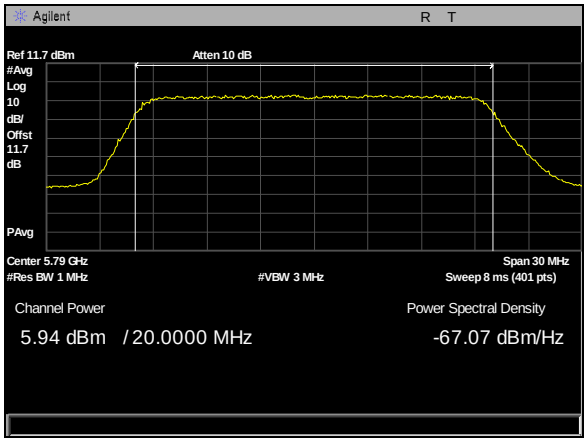
Plot 62. Conducted Transmitter Output Power, BW 10M, CF 5790M, 27dBi, PtMP, c0



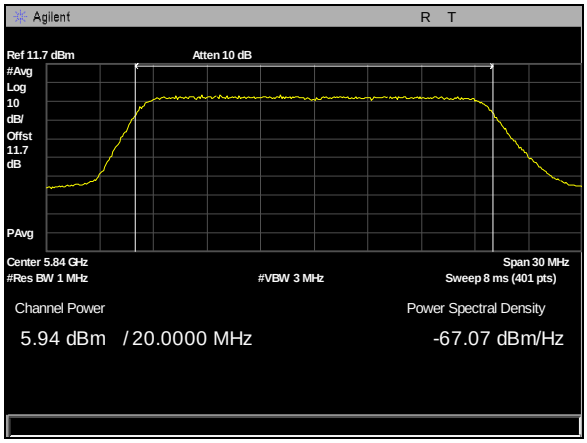
Plot 63. Conducted Transmitter Output Power, BW 10M, CF 5845M, 27dBi, PtMP, c0



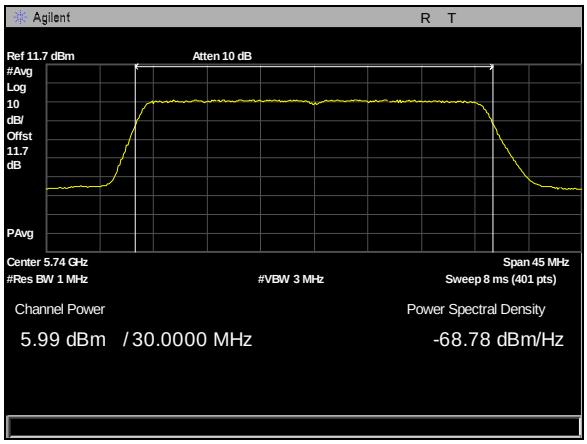
Plot 64. Conducted Transmitter Output Power, BW 20M, CF 5735M, 27dBi, PtMP, c0



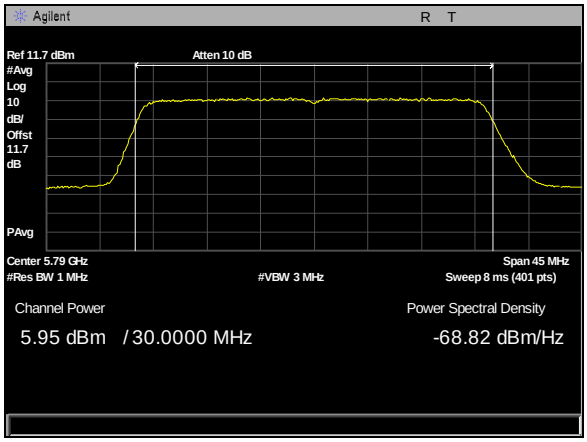
Plot 65. Conducted Transmitter Output Power, BW 20M, CF 5790M, 27dBi, PtMP, c0



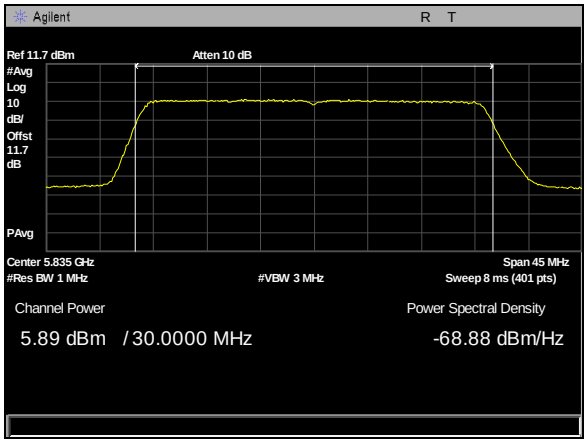
Plot 66. Conducted Transmitter Output Power, BW 20M, CF 5840M, 27dBi, PtMP, c0



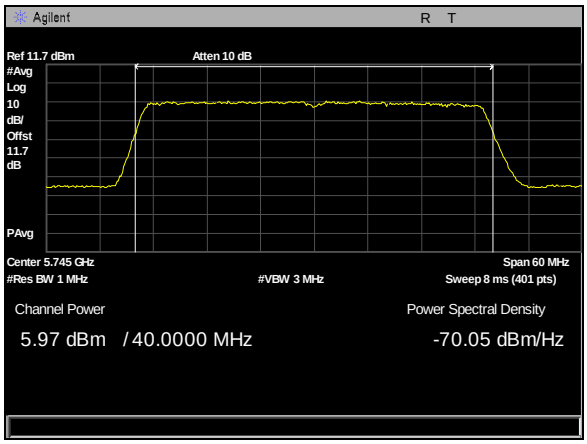
Plot 67. Conducted Transmitter Output Power, BW 30M, CF 5740M, 27dBi, PtMP, c0



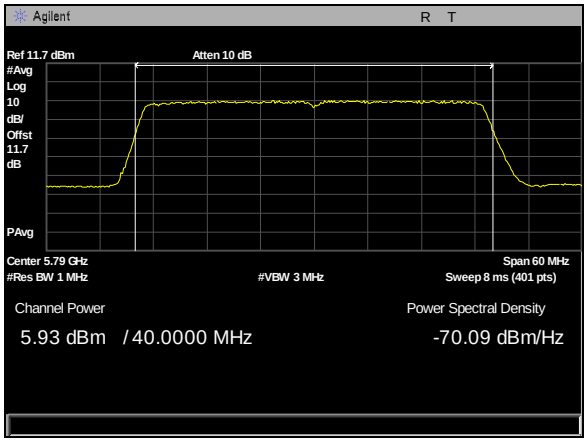
Plot 68. Conducted Transmitter Output Power, BW 30M, CF 5790M, 27dBi, PtMP, c0



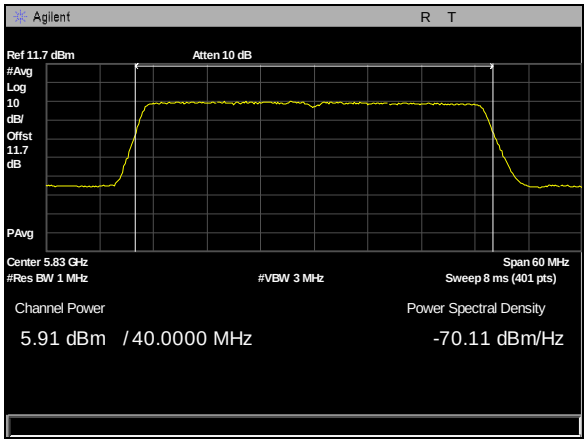
Plot 69. Conducted Transmitter Output Power, BW 30M, CF 5835M, 27dBi, PtMP, c0



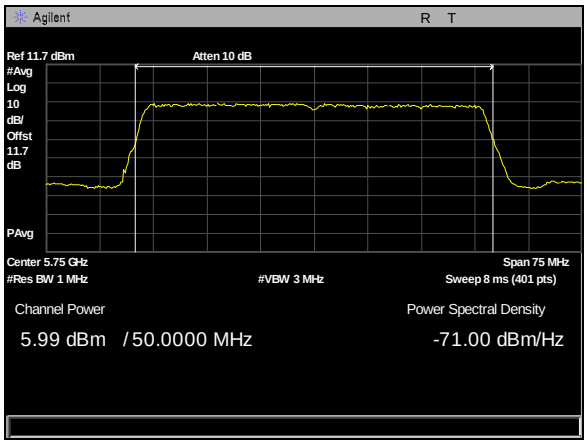
Plot 70. Conducted Transmitter Output Power, BW 40M, CF 5745M, 27dBi, PtMP, c0



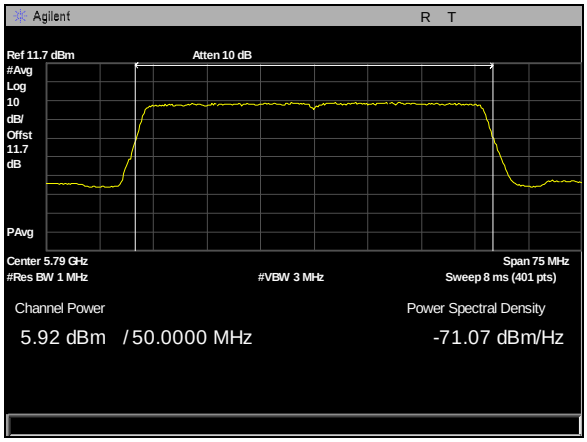
Plot 71. Conducted Transmitter Output Power, BW 40M, CF 5790M, 27dBi, PtMP, c0



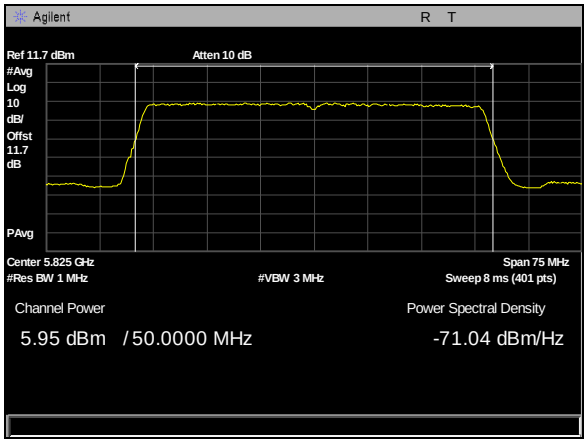
Plot 72. Conducted Transmitter Output Power, BW 40M, CF 5830M, 27dBi, PtMP, c0



Plot 73. Conducted Transmitter Output Power, BW 50M, CF 5750M, 27dBi, PtMP, c0



Plot 74. Conducted Transmitter Output Power, BW 50M, CF 5790M, 27dBi, PtMP, c0



Plot 75. Conducted Transmitter Output Power, BW 50M, CF 5825M, 27dBi, PtMP, c0

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.407(a)(3) Maximum Power Spectral Density

Test Requirements: **§15.407(a)(3):** In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

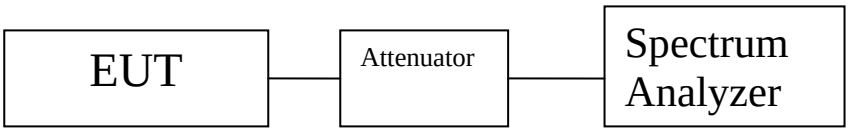
Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according KDB 789033 D02 General UNII Test Procedures v01. A 1 MHz RBW was used during testing, as this provides a worst-case scenario.

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): December 19, 2017



Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Margin (dB)
10	5730	18.83	18.42	21.641	30	-8.359
	5790	19.16	18.33	21.776	30	-8.224
	5845	18.8	18.53	21.678	30	-8.322
20	5735	15.89	15.57	18.744	30	-11.256
	5790	15.01	15.32	18.179	30	-11.821
	5840	15.04	15.52	18.297	30	-11.703
30	5740	13.52	13.95	16.751	30	-13.249
	5790	13.93	14.01	16.981	30	-13.019
	5835	14.27	14.07	17.182	30	-12.818
40	5745	12.74	12.15	15.466	30	-14.534
	5790	12.77	12.63	15.711	30	-14.289
	5830	12.77	12.8	15.796	30	-14.204
50	5750	11.59	11.78	14.697	30	-15.303
	5790	11.99	11.8	14.907	30	-15.093
	5825	11.56	12.12	14.86	30	-15.14

Table 13. Power Spectral Density, Fixed, point-to-point, 2x2, Test Results

Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Directional Gain (dBi)	Final Limit (dBm)	Margin (dB)
10	5730	11.86	12.13	15.008	30	13	23	-7.992
	5790	12.1	11.54	14.84	30	13	23	-8.16
	5845	11.87	11.91	14.901	30	13	23	-8.099
20	5735	8.692	8.771	11.742	30	13	23	-11.258
	5790	8.9	9.017	11.97	30	13	23	-11.03
	5840	9.169	8.691	11.947	30	13	23	-11.053
30	5740	7.437	6.992	10.231	30	13	23	-12.769
	5790	6.88	6.97	9.936	30	13	23	-13.064
	5835	7.142	7.005	10.085	30	13	23	-12.915
40	5745	6.079	6.162	9.131	30	13	23	-13.869
	5790	5.35	5.833	8.609	30	13	23	-14.391
	5830	6.007	5.881	8.955	30	13	23	-14.045
50	5750	5.363	5.235	8.31	30	13	23	-14.69
	5790	4.998	4.38	7.711	30	13	23	-15.289
	5825	4.765	4.269	7.535	30	13	23	-15.465

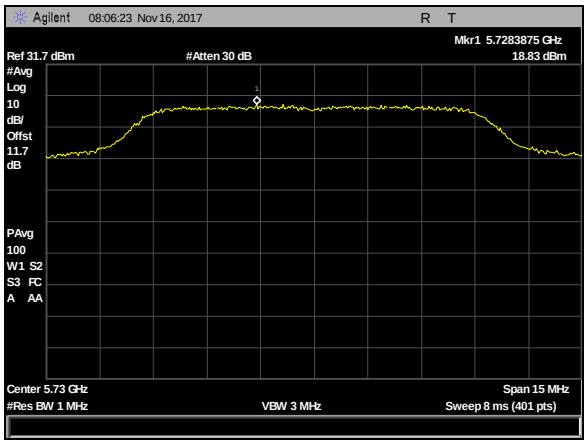
Table 14. Power Spectral Density, point-to-multipoint, 13 dBi, 2x2, Test Results

Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Directional Gain (dBi)	Final Limit (dBm)	Margin (dB)
10	5730	5.846	5.918	8.893	30	19	17	-8.107
	5790	5.819	6.049	8.946	30	19	17	-8.054
	5845	5.926	5.624	8.788	30	19	17	-8.212
20	5735	2.664	3.154	5.927	30	19	17	-11.073
	5790	2.858	2.603	5.743	30	19	17	-11.257
	5840	2.507	2.844	5.69	30	19	17	-11.31
30	5740	1.06	0.96	4.021	30	19	17	-12.979
	5790	0.983	0.982	3.993	30	19	17	-13.007
	5835	1.032	1.284	4.171	30	19	17	-12.829
40	5745	-0.214	0.013	2.912	30	19	17	-14.088
	5790	-0.362	-0.101	2.781	30	19	17	-14.219
	5830	-0.205	0.151	2.987	30	19	17	-14.013
50	5750	-1.251	-1.068	1.852	30	19	17	-15.148
	5790	-1.054	-0.871	2.049	30	19	17	-14.951
	5825	-0.977	-1.097	1.974	30	19	17	-15.026

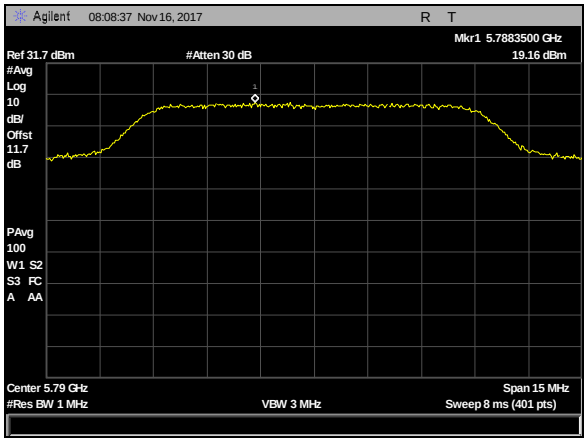
Table 15. Power Spectral Density, point-to-multipoint, 19 dBi, 2x2, Test Results

Channel BW (MHz)	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Limit (dBm)	Directional Gain (dBi)	Final Limit (dBm)	Margin (dB)
10	5730	-2.68	-2.16	0.599	30	27	9	-8.401
	5790	-2.361	-2.399	0.631	30	27	9	-8.369
	5845	-2.493	-2.41	0.559	30	27	9	-8.441
20	5735	-5.328	-5.486	-2.395	30	27	9	-11.395
	5790	-5.445	-5.365	-2.394	30	27	9	-11.394
	5840	-5.334	-5.59	-2.449	30	27	9	-11.449
30	5740	-7.029	-6.719	-3.86	30	27	9	-12.86
	5790	-7.008	-6.925	-3.956	30	27	9	-12.956
	5835	-7.11	-7.161	-4.125	30	27	9	-13.125
40	5745	-8.072	-8.133	-5.092	30	27	9	-14.092
	5790	-8.046	-7.783	-4.902	30	27	9	-13.902
	5830	-8.281	-8.388	-5.323	30	27	9	-14.323
50	5750	-8.75	-9.09	-5.906	30	27	9	-14.906
	5790	-9.307	-9.051	-6.166	30	27	9	-15.166
	5825	-9.244	-9.294	-6.258	30	27	9	-15.258

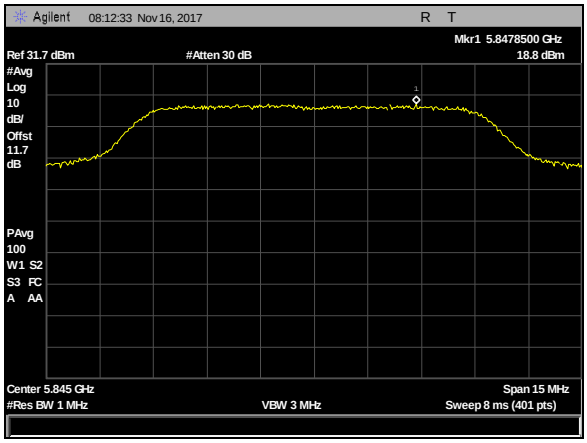
Table 16. Power Spectral Density, point-to-multipoint, 27 dBi, 2x2, Test Results



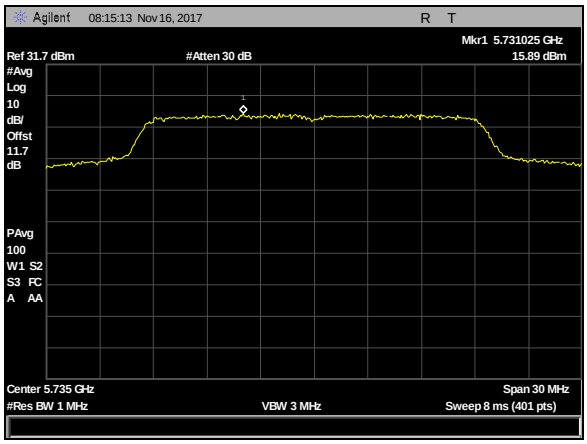
Plot 76. Power Spectral Density, BW 10, CF 5730, fixed ptp, c0



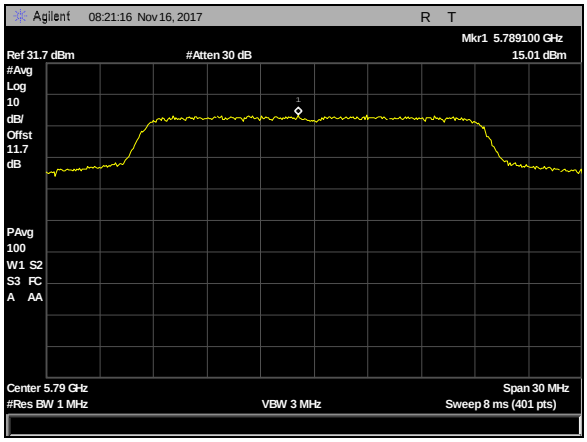
Plot 77. Power Spectral Density, BW 10, CF 5790, fixed ptp, c0



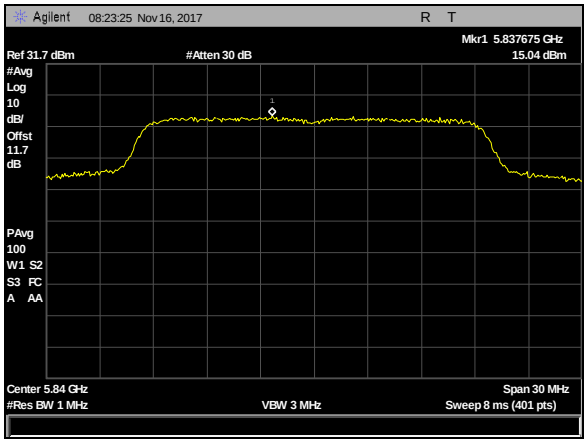
Plot 78. Power Spectral Density, BW 10, CF 5845, fixed ptp, c0



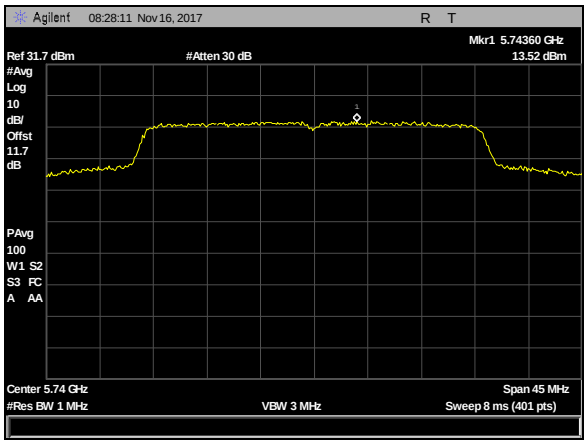
Plot 79. Power Spectral Density, BW 20, CF 5735, fixed ptp, c0



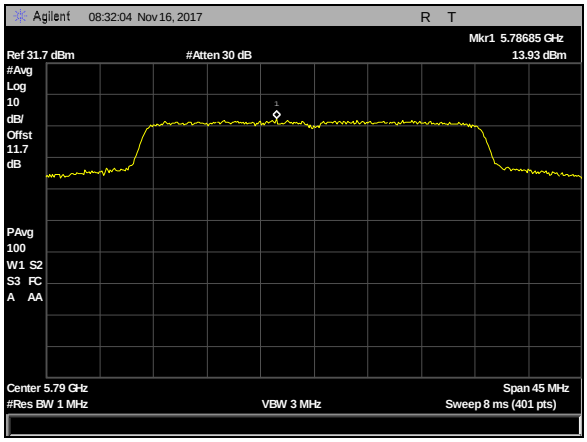
Plot 80. Power Spectral Density, BW 20, CF 5790, fixed ptp, c0



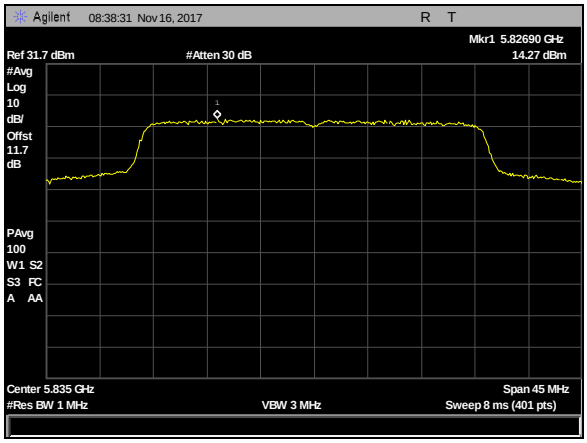
Plot 81. Power Spectral Density, BW 20, CF 5840, fixed ptp, c0



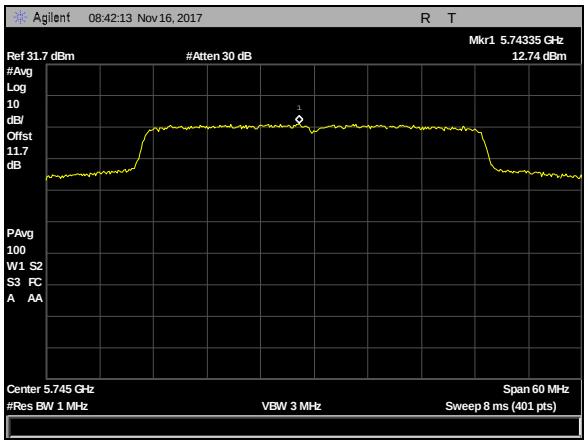
Plot 82. Power Spectral Density, BW 30, CF 5740, fixed ptp, c0



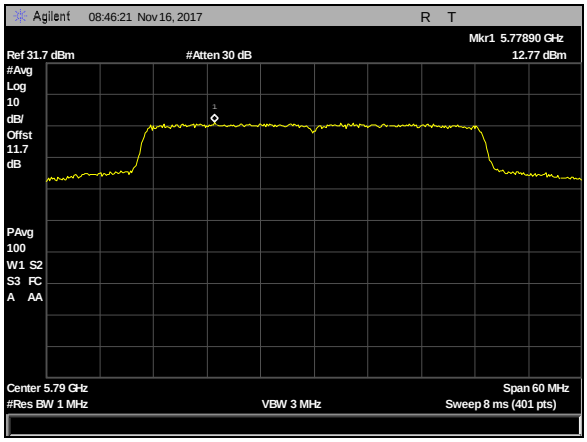
Plot 83. Power Spectral Density, BW 30, CF 5790, fixed ptp, c0



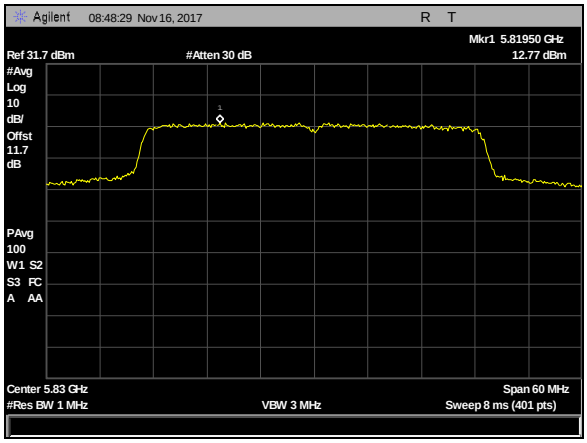
Plot 84. Power Spectral Density, BW 30, CF 5835, fixed ptp, c0



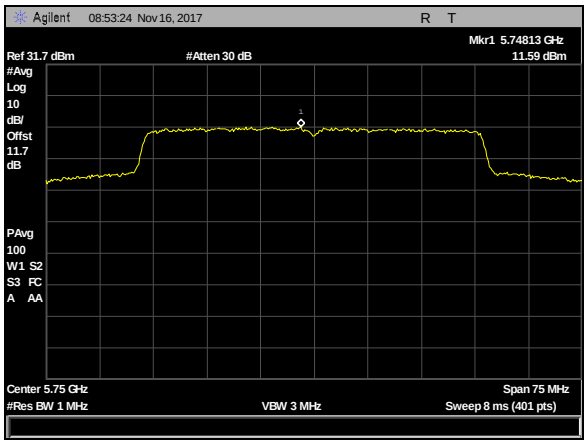
Plot 85. Power Spectral Density, BW 40, CF 5745, fixed ptp, c0



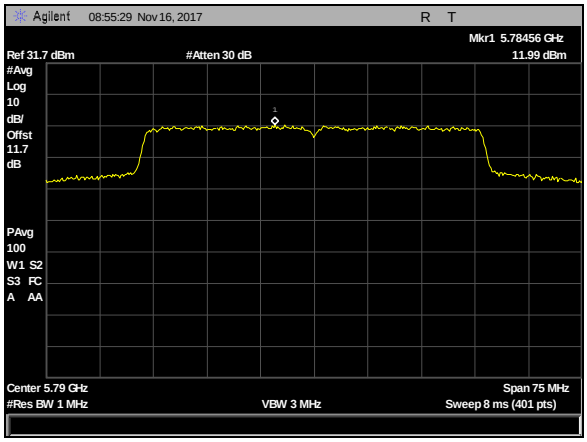
Plot 86. Power Spectral Density, BW 40, CF 5790, fixed ptp, c0



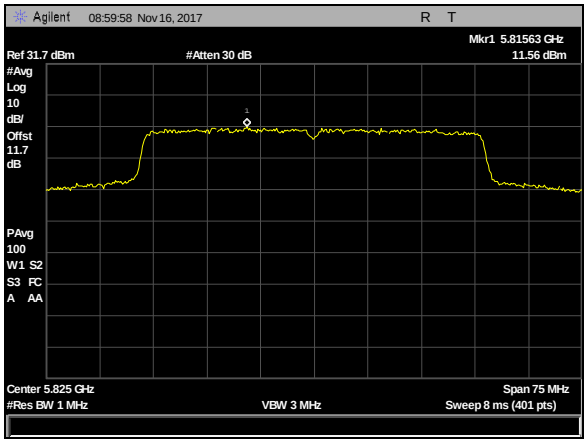
Plot 87. Power Spectral Density, BW 40, CF 5830, fixed ptp, c0



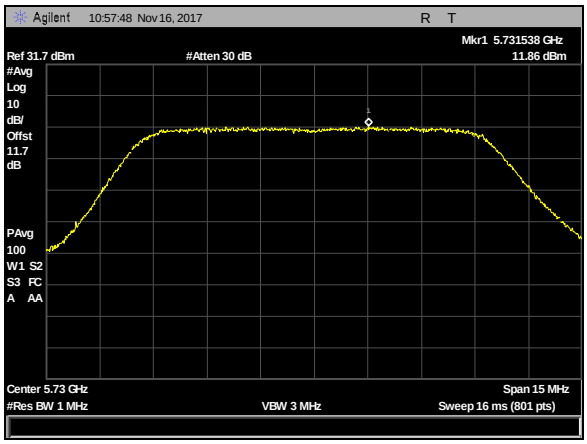
Plot 88. Power Spectral Density, BW 50, CF 5750, fixed ptp, c0



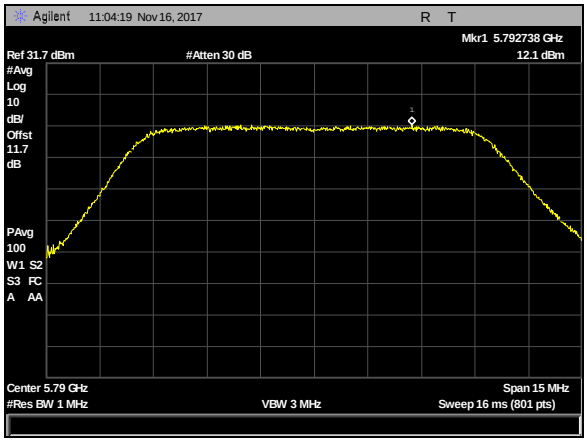
Plot 89. Power Spectral Density, BW 50, CF 5790, fixed ptp, c0



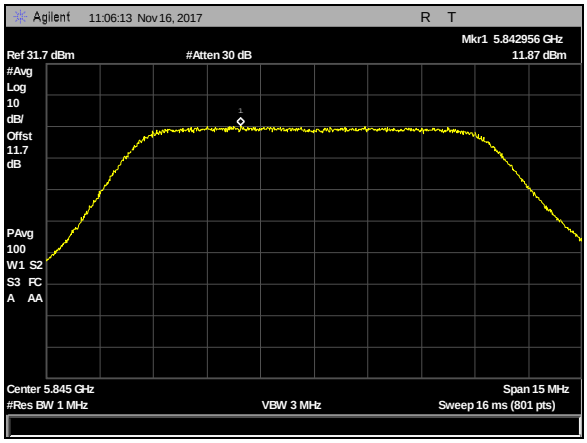
Plot 90. Power Spectral Density, BW 50, CF 5825, fixed ptp, c0



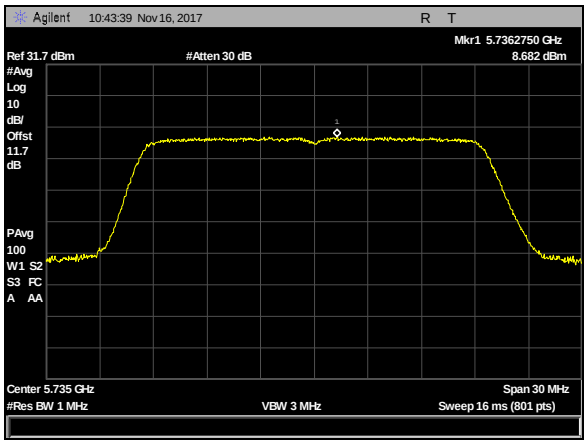
Plot 91. Power Spectral Density, BW 10M, CF 5730M, 13dBi, PtMP, c0



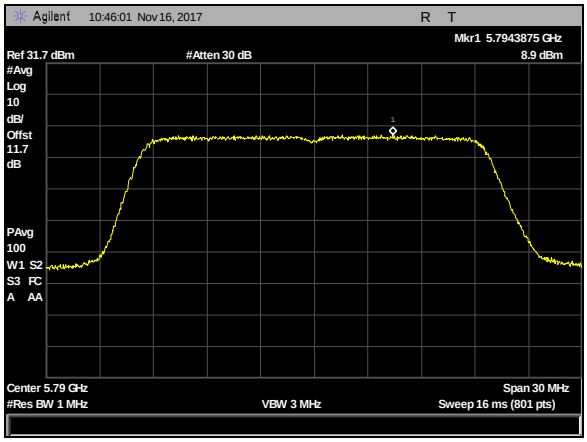
Plot 92. Power Spectral Density, BW 10M, CF 5790M, 13dBi, PtMP, c0



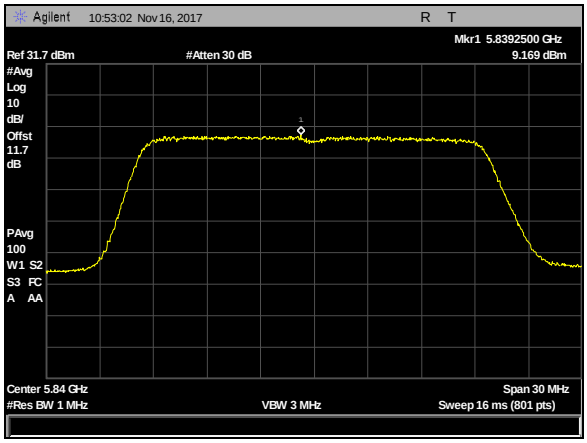
Plot 93. Power Spectral Density, BW 10M, CF 5845M, 13dBi, PtMP, c0



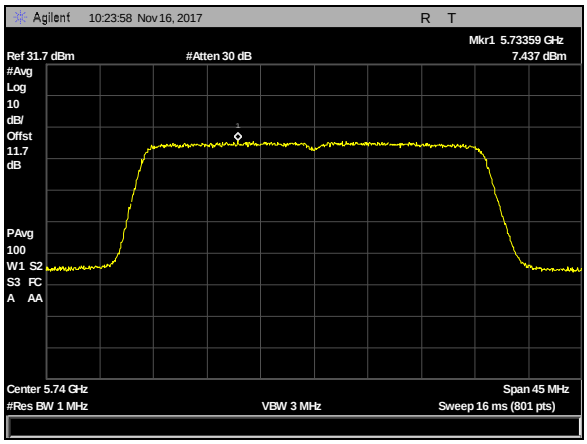
Plot 94. Power Spectral Density, BW 20M, CF 5735M, 13dBi, PtMP, c0



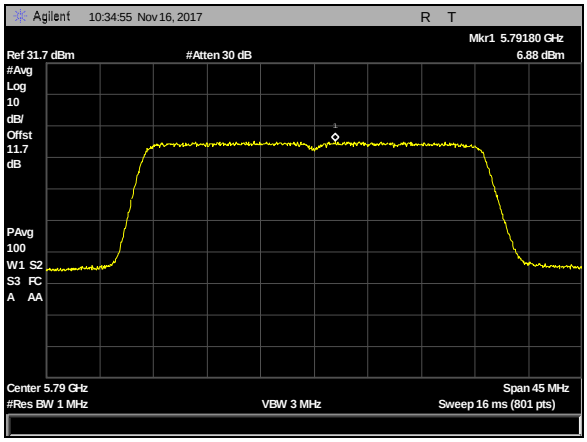
Plot 95. Power Spectral Density, BW 20M, CF 5790M, 13dBi, PtMP, c0



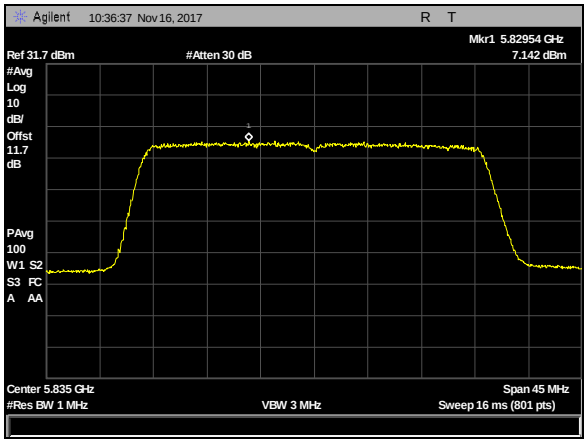
Plot 96. Power Spectral Density, BW 20M, CF 5840M, 13dBi, PtMP, c0



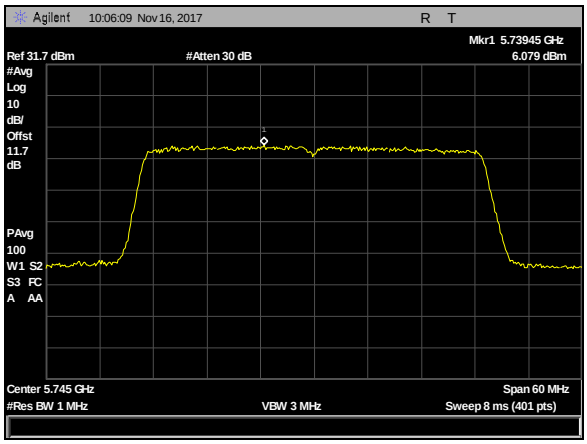
Plot 97. Power Spectral Density, BW 30M, CF 5740M, 13dBi, PtMP, c0



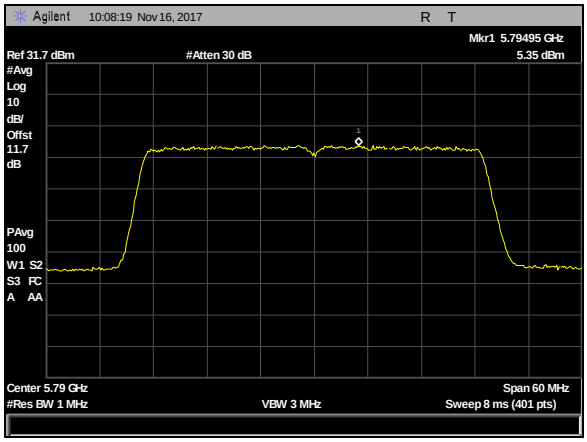
Plot 98. Power Spectral Density, BW 30M, CF 5790M, 13dBi, PtMP, c0



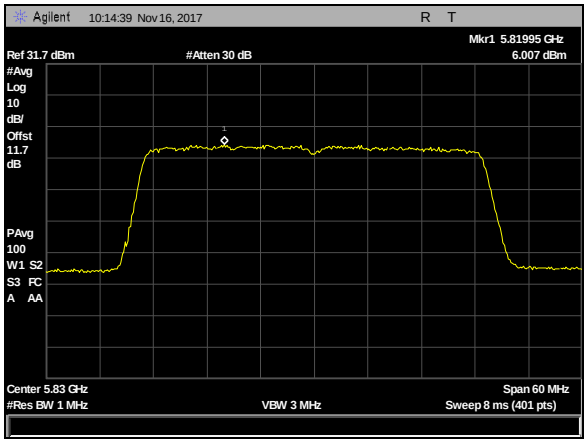
Plot 99. Power Spectral Density, BW 30M, CF 5835M, 13dBi, PtMP, c0



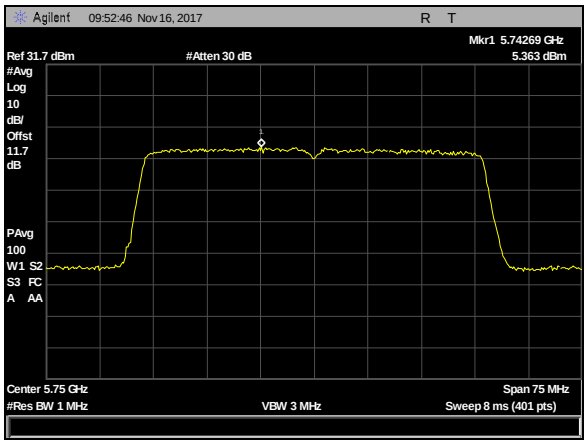
Plot 100. Power Spectral Density, BW 40M, CF 5745M, 13dBi, PtMP, c0



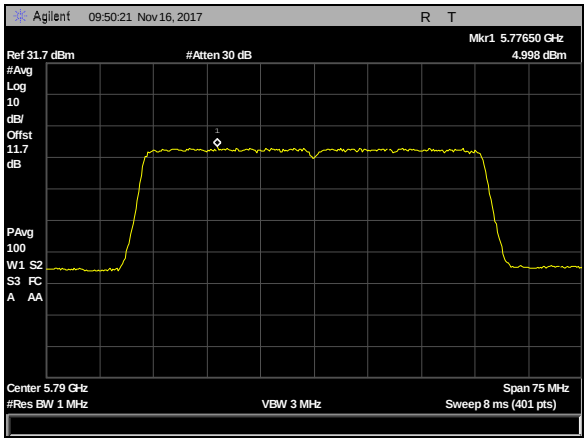
Plot 101. Power Spectral Density, BW 40M, CF 5790M, 13dBi, PtMP, c0



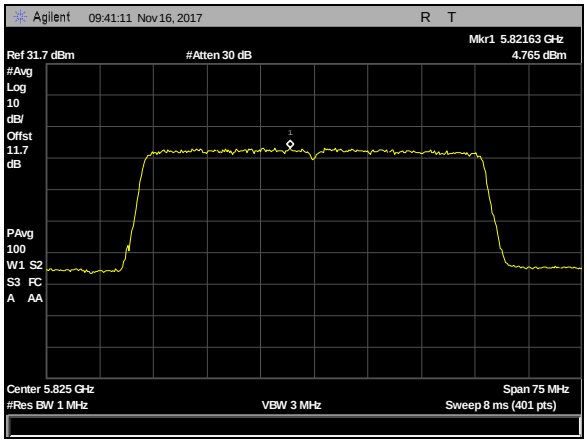
Plot 102. Power Spectral Density, BW 40M, CF 5830M, 13dBi, PtMP, c0



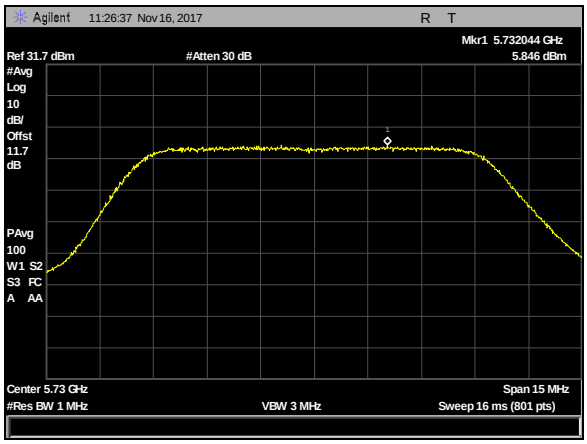
Plot 103. Power Spectral Density, BW 50M, CF 5750M, 13dBi, PtMP, c0



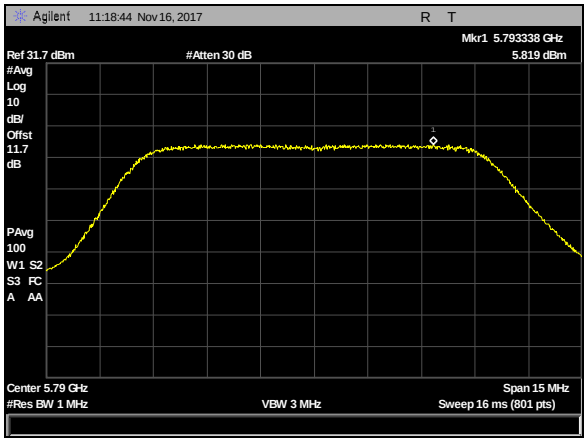
Plot 104. Power Spectral Density, BW 50M, CF 5790M, 13dBi, PtMP, c0



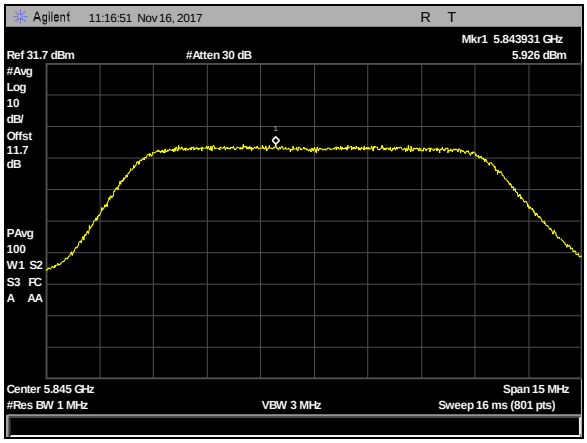
Plot 105. Power Spectral Density, BW 50M, CF 5825M, 13dBi, PtMP, c0



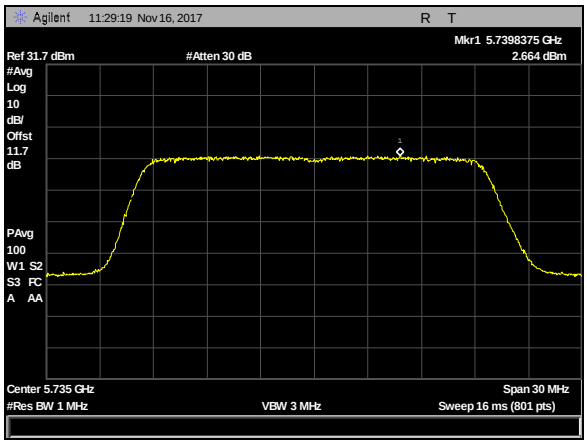
Plot 106. Power Spectral Density, BW 10M, CF 5730M, 19dBi, PtMP, c0



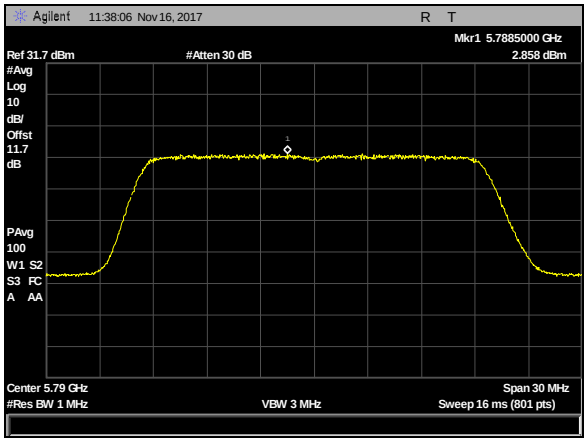
Plot 107. Power Spectral Density, BW 10M, CF 5790M, 19dBi, PtMP, c0



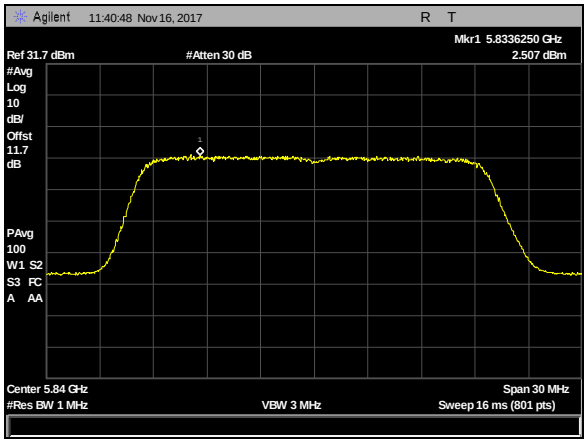
Plot 108. Power Spectral Density, BW 10M, CF 5845M, 19dBi, PtMP, c0



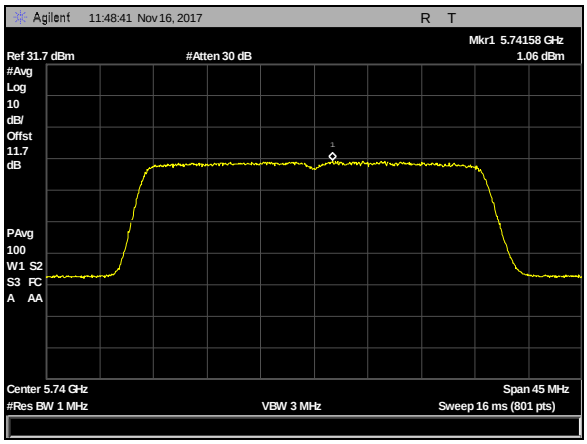
Plot 109. Power Spectral Density, BW 20M, CF 5735M, 19dBi, PtMP, c0



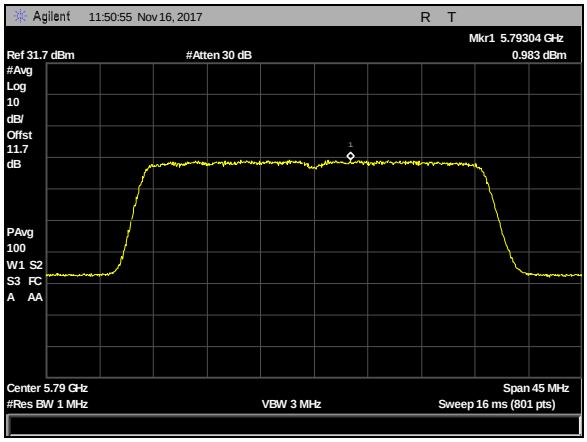
Plot 110. Power Spectral Density, BW 20M, CF 5790M, 19dBi, PtMP, c0



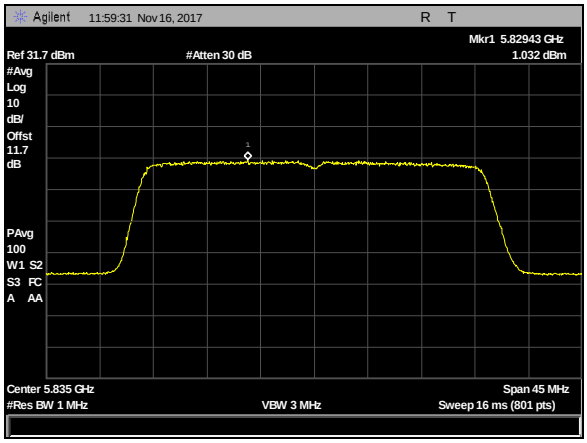
Plot 111. Power Spectral Density, BW 20M, CF 5840M, 19dBi, PtMP, c0



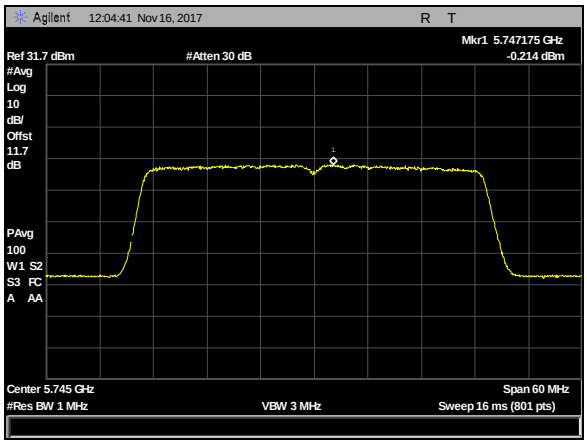
Plot 112. Power Spectral Density, BW 30M, CF 5740M, 19dBi, PtMP, c0



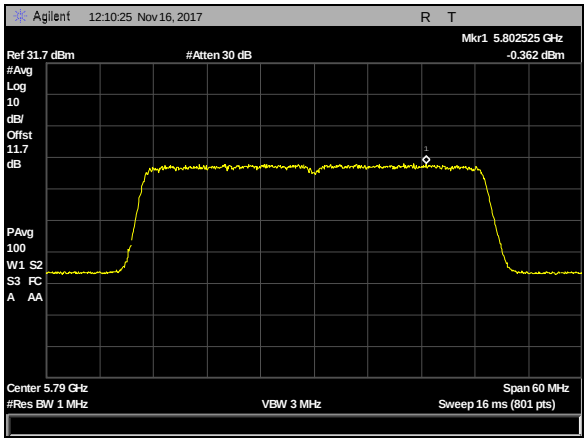
Plot 113. Power Spectral Density, BW 30M, CF 5790M, 19dBi, PtMP, c0



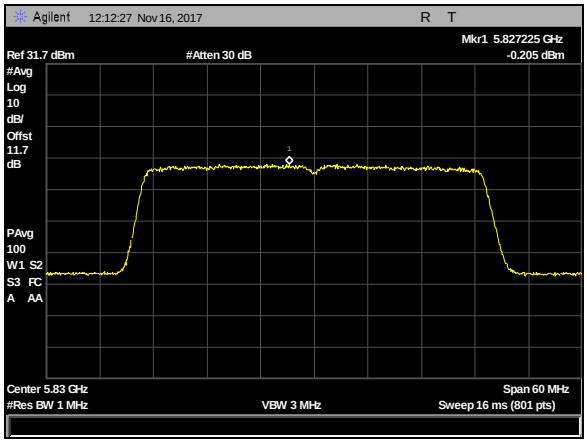
Plot 114. Power Spectral Density, BW 30M, CF 5835M, 19dBi, PtMP, c0



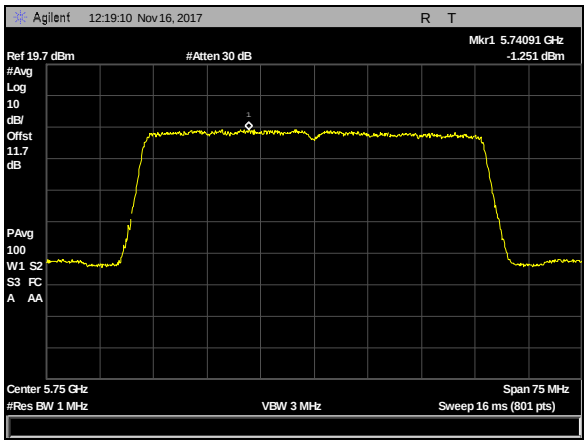
Plot 115. Power Spectral Density, BW 40M, CF 5745M, 19dBi, PtMP, c0



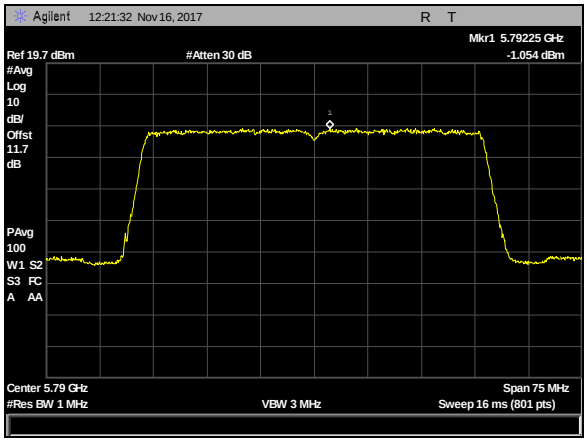
Plot 116. Power Spectral Density, BW 40M, CF 5790M, 19dBi, PtMP, c0



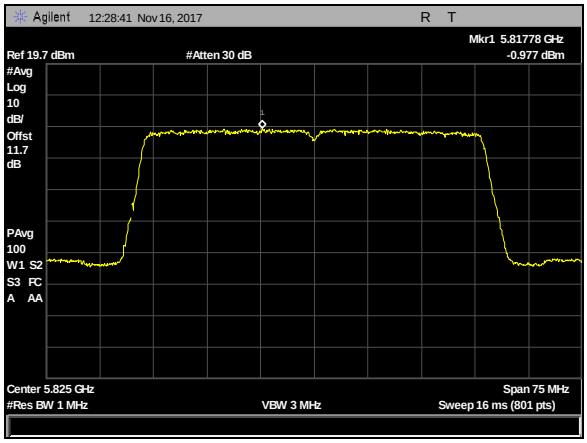
Plot 117. Power Spectral Density, BW 40M, CF 5830M, 19dBi, PtMP, c0



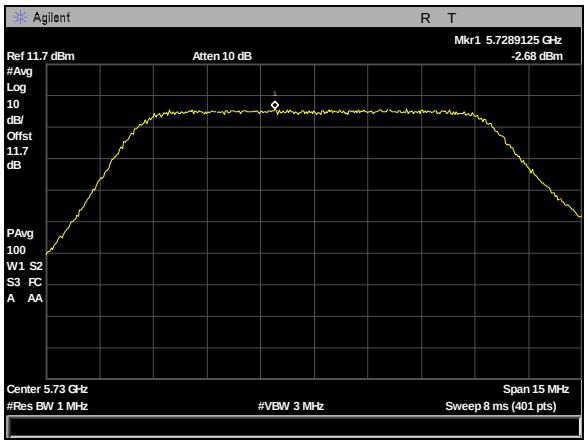
Plot 118. Power Spectral Density, BW 50M, CF 5750M, 19dBi, PtMP, c0



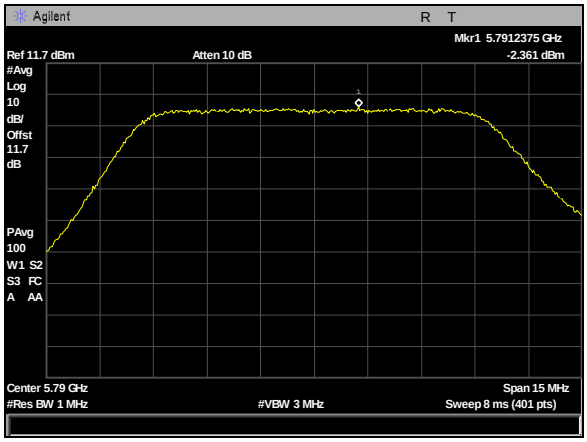
Plot 119. Power Spectral Density, BW 50M, CF 5790M, 19dBi, PtMP, c0



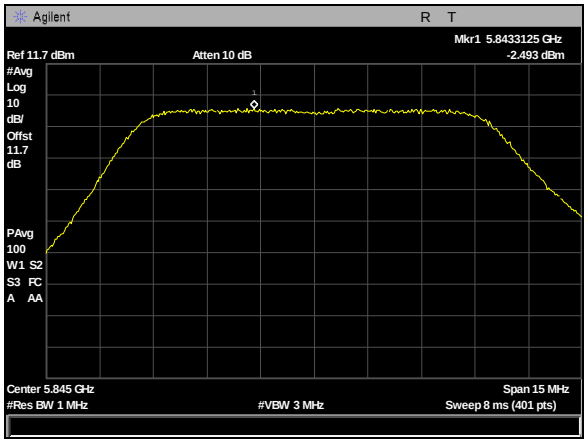
Plot 120. Power Spectral Density, BW 50M, CF 5825M, 19dBi, PtMP, c0



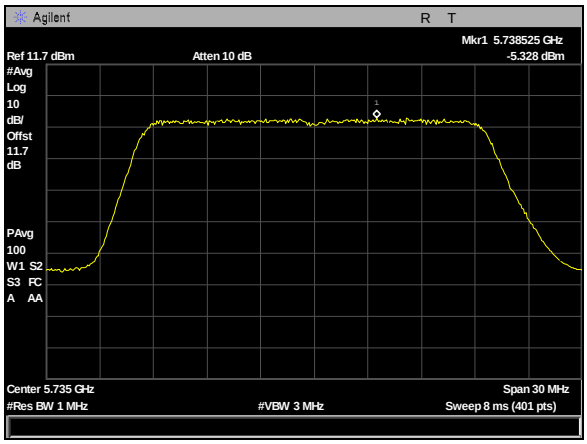
Plot 121. Power Spectral Density, BW 10M, CF 5730M, 27dBi, PtMP, c0



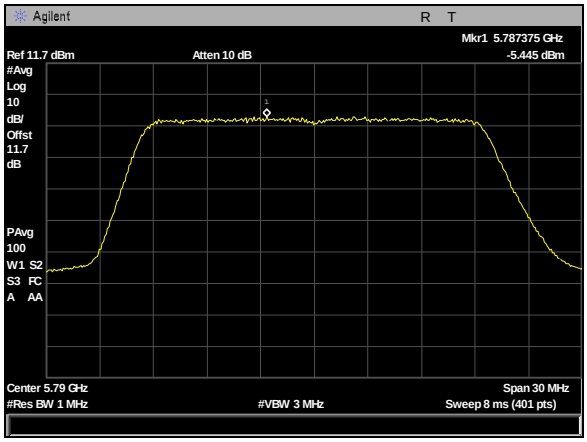
Plot 122. Power Spectral Density, BW 10M, CF 5790M, 27dBi, PtMP, c0



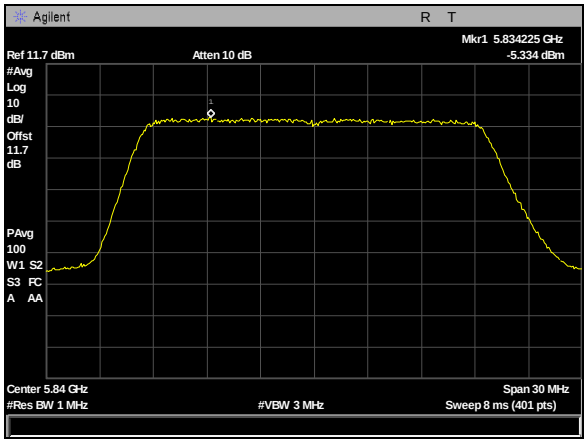
Plot 123. Power Spectral Density, BW 10M, CF 5845M, 27dBi, PtMP, c0



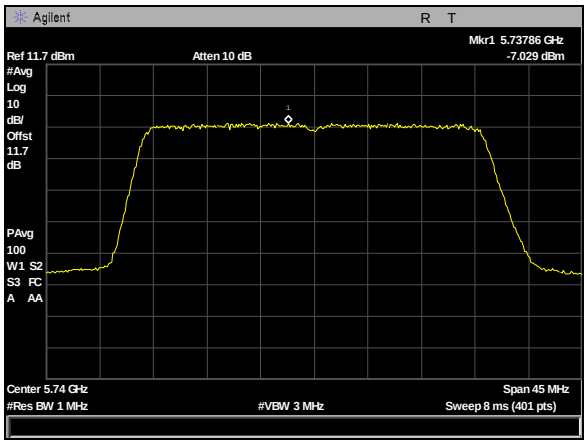
Plot 124. Power Spectral Density, BW 20M, CF 5735M, 27dBi, PtMP, c0



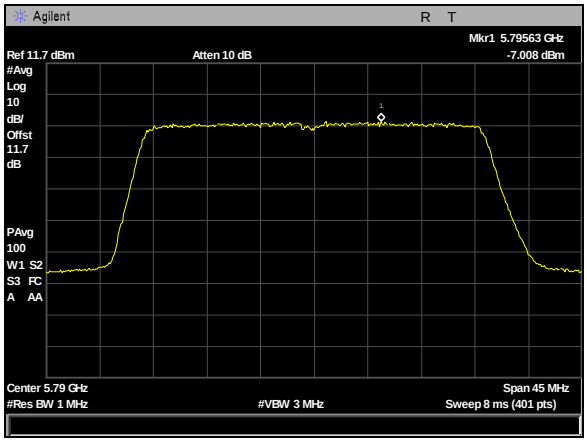
Plot 125. Power Spectral Density, BW 20M, CF 5790M, 27dBi, PtMP, c0



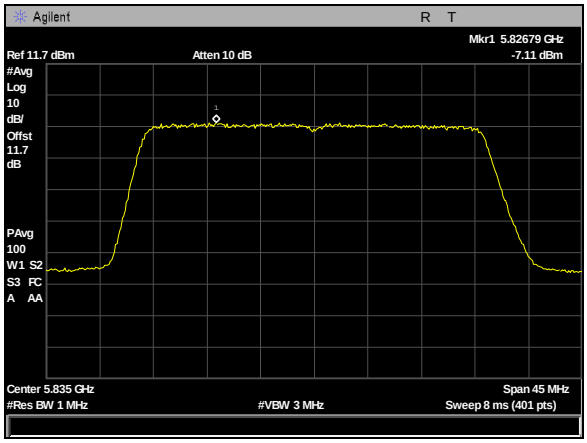
Plot 126. Power Spectral Density, BW 20M, CF 5840M, 27dBi, PtMP, c0



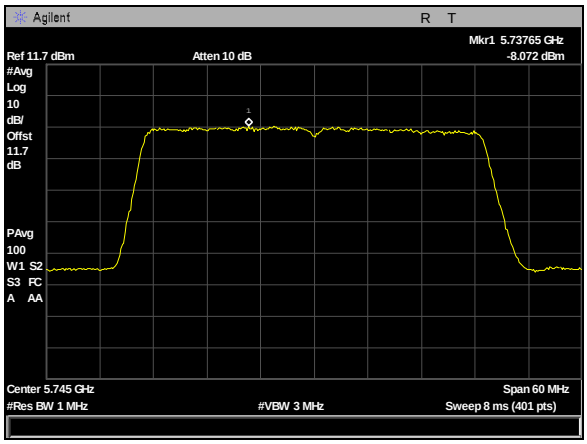
Plot 127. Power Spectral Density, BW 30M, CF 5740M, 27dBi, PtMP, c0



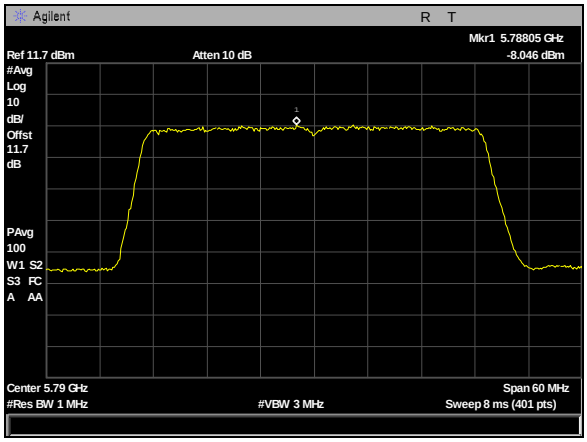
Plot 128. Power Spectral Density, BW 30M, CF 5790M, 27dBi, PtMP, c0



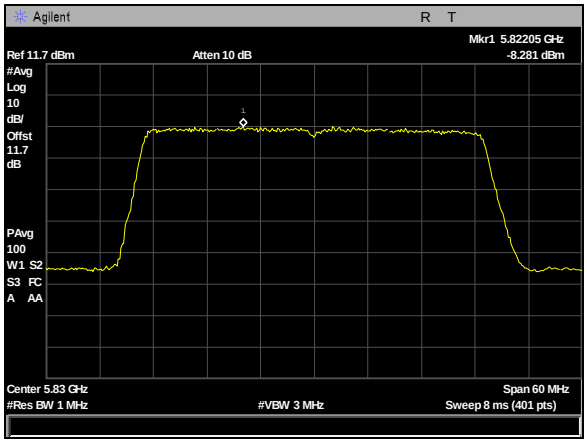
Plot 129. Power Spectral Density, BW 30M, CF 5835M, 27dBi, PtMP, c0



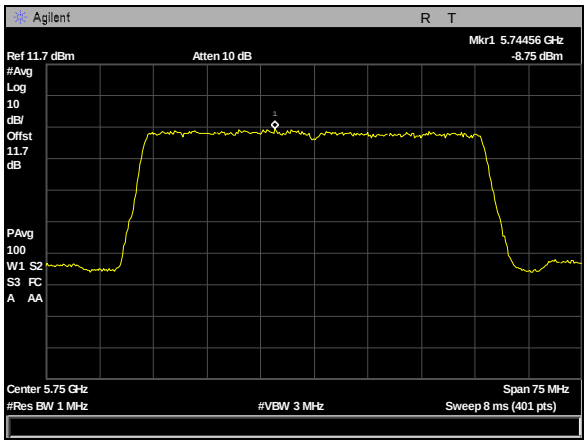
Plot 130. Power Spectral Density, BW 40M, CF 5745M, 27dBi, PtMP, c0



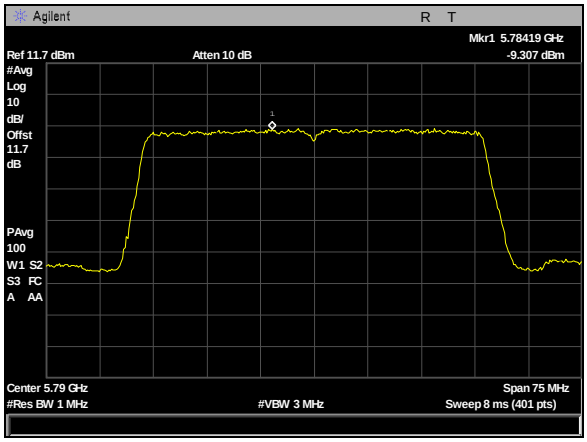
Plot 131. Power Spectral Density, BW 40M, CF 5790M, 27dBi, PtMP, c0



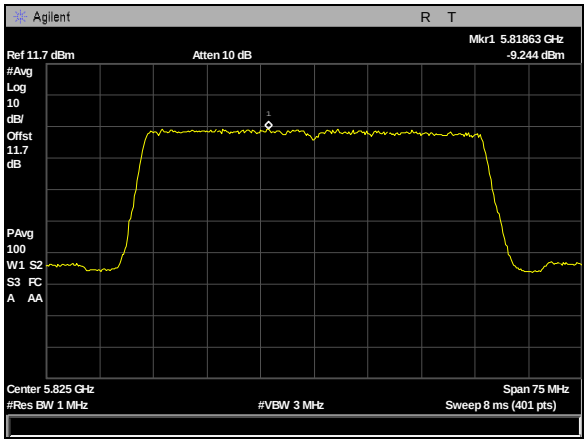
Plot 132. Power Spectral Density, BW 40M, CF 5830M, 27dBi, PtMP, c0



Plot 133. Power Spectral Density, BW 50M, CF 5750M, 27dBi, PtMP, c0



Plot 134. Power Spectral Density, BW 50M, CF 5790M, 27dBi, PtMP, c0



Plot 135. Power Spectral Density, BW 50M, CF 5825M, 27dBi, PtMP, c0

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.407(b)(4) & (6 – 7) Undesirable Emissions

Test Requirements:

§ 15.407(b)(4): For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. 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:

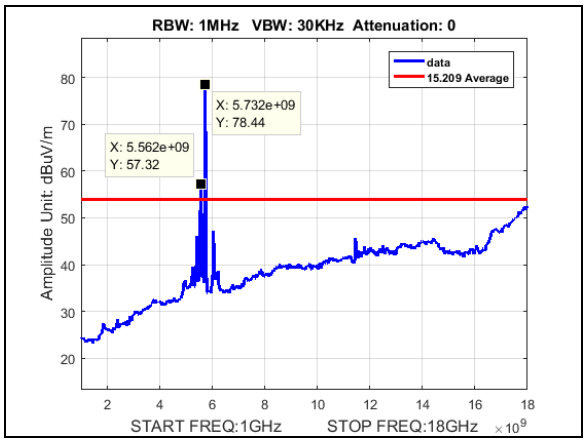
For below 1 GHz, the EUT was compliant with the requirements of this section.

For above 1 GHz, the EUT was compliant with the requirements of this section.

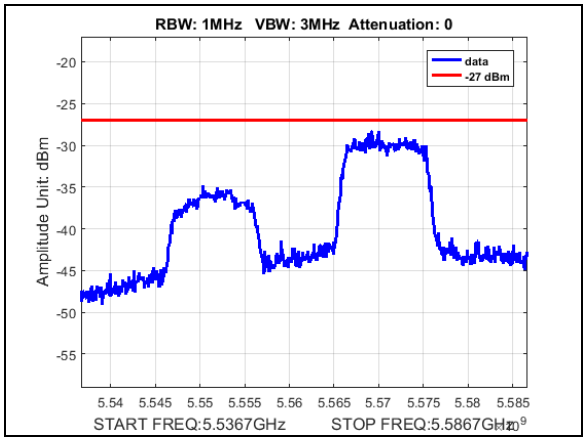
Measured emissions were within applicable limits.

Test Engineer(s): Donald Salguero

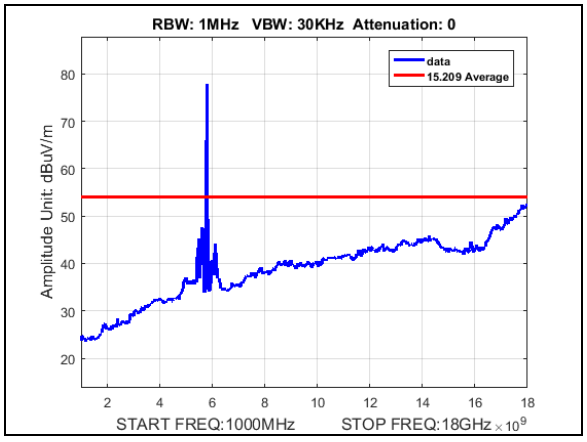
Test Date(s): December 19, 2017



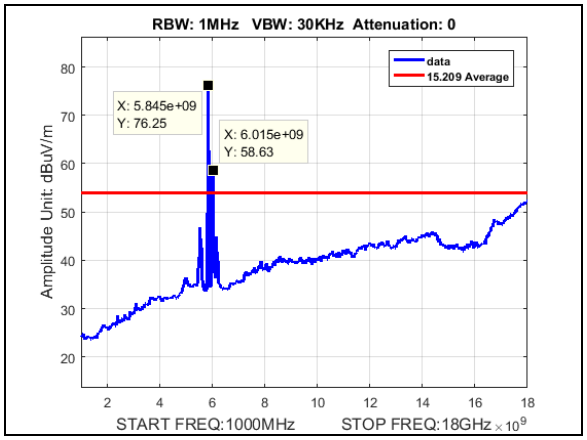
Plot 136. Undesirable Emissions, Average, radiated spurious emissions, 10M, 5730, 1-18GHz



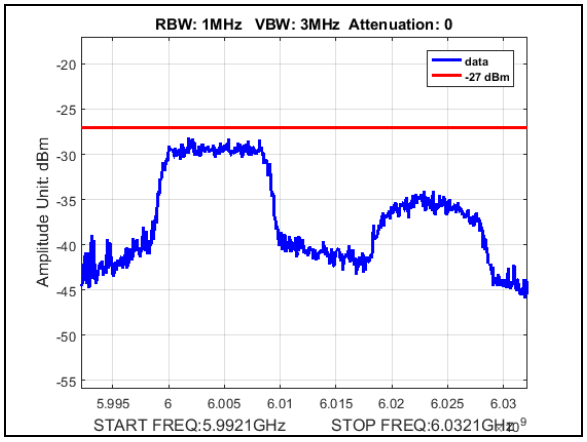
Plot 137. Undesirable Emissions, Average, radiated spurious emissions, 10M, 5730, 5562M spur



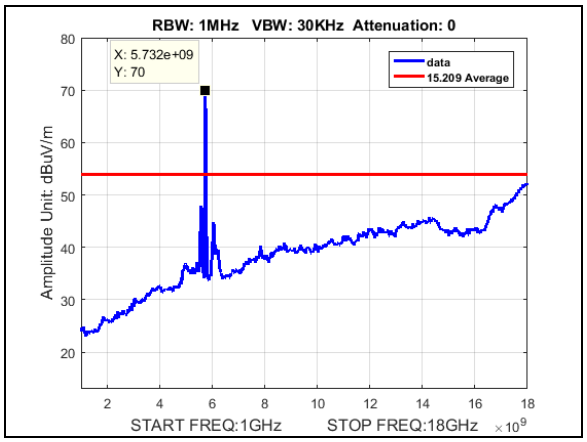
Plot 138. Undesirable Emissions, Average, radiated spurious emissions, 10M, 5790, 1-18GHz



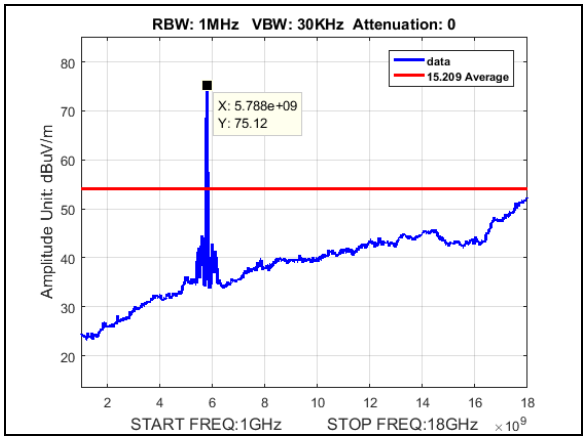
Plot 139. Undesirable Emissions, Average, radiated spurious emissions, 10M, 5845, 1-18GHz



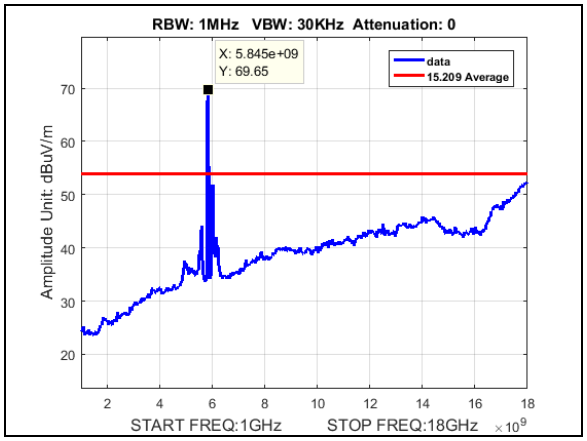
Plot 140. Undesirable Emissions, Average, radiated spurious emissions, 10M, 5845, 6015M spur



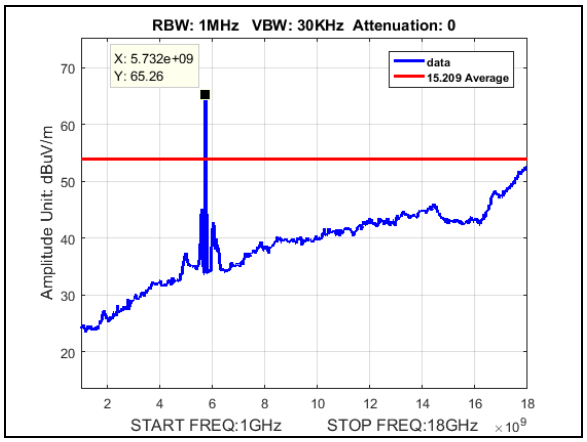
Plot 141. Undesirable Emissions, Average, radiated spurious emissions, 20M, 5735, 1-18GHz



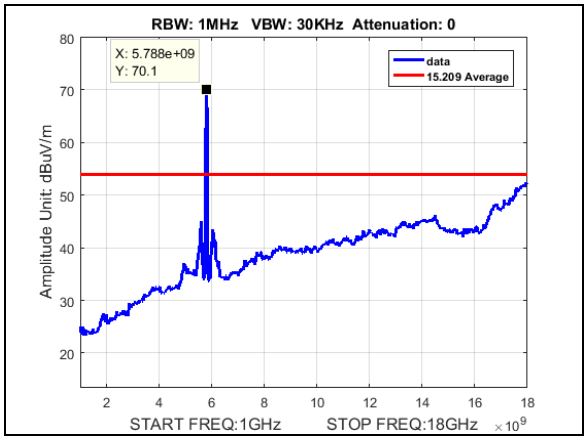
Plot 142. Undesirable Emissions, Average, radiated spurious emissions, 20M, 5790, 1-18GHz



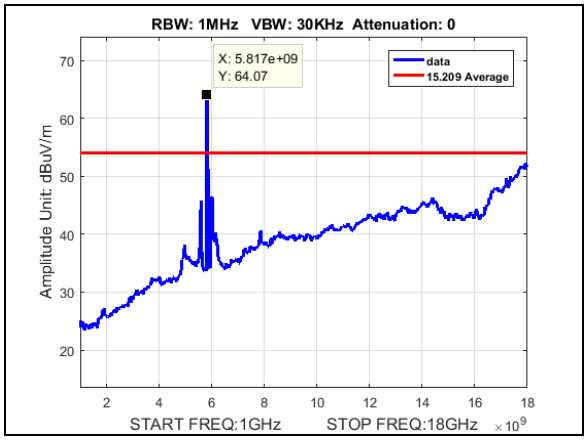
Plot 143. Undesirable Emissions, Average, radiated spurious emissions, 20M, 5840, 1-18GHz



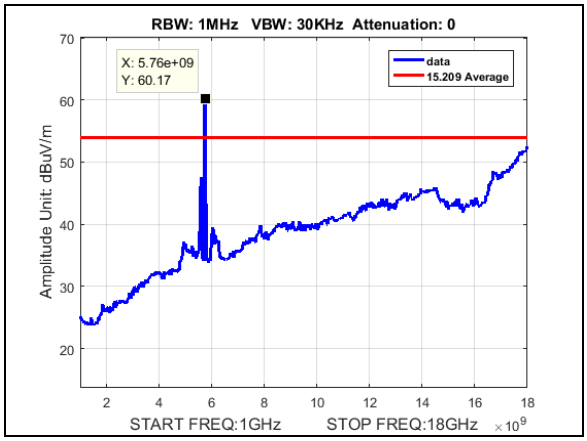
Plot 144. Undesirable Emissions, Average, radiated spurious emissions, 30M, 5740, 1-18GHz



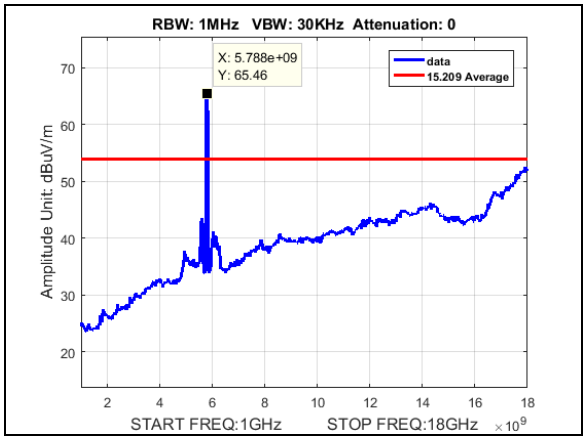
Plot 145. Undesirable Emissions, Average, radiated spurious emissions, 30M, 5790, 1-18GHz



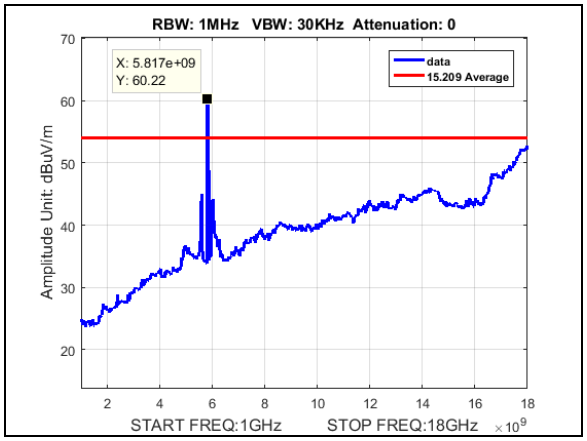
Plot 146. Undesirable Emissions, Average, radiated spurious emissions, 30M, 5835, 1-18GHz



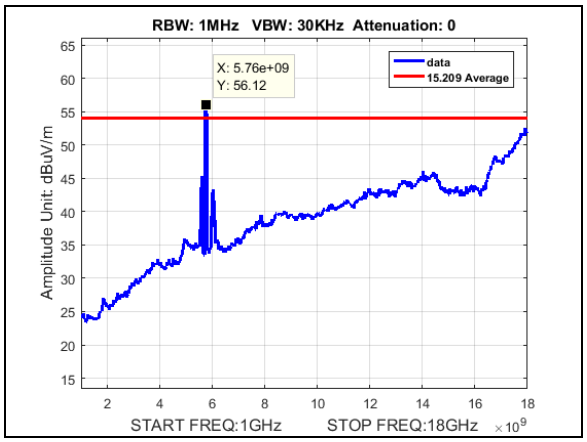
Plot 147. Undesirable Emissions, Average, radiated spurious emissions, 40M, 5745, 1-18GHz



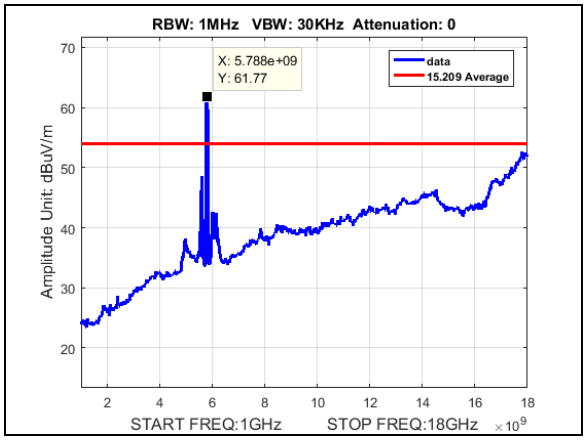
Plot 148. Undesirable Emissions, Average, radiated spurious emissions, 40M, 5790, 1-18GHz



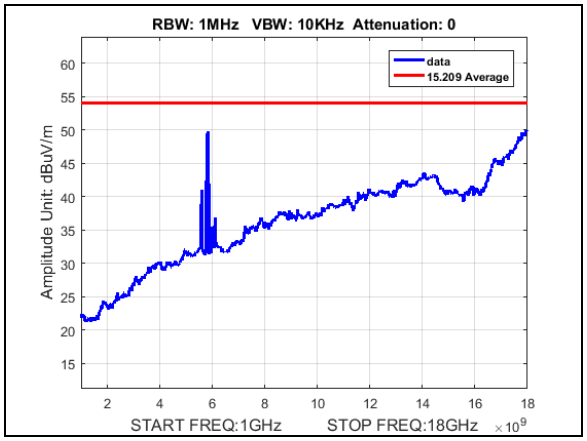
Plot 149. Undesirable Emissions, Average, radiated spurious emissions, 40M, 5830, 1-18GHz



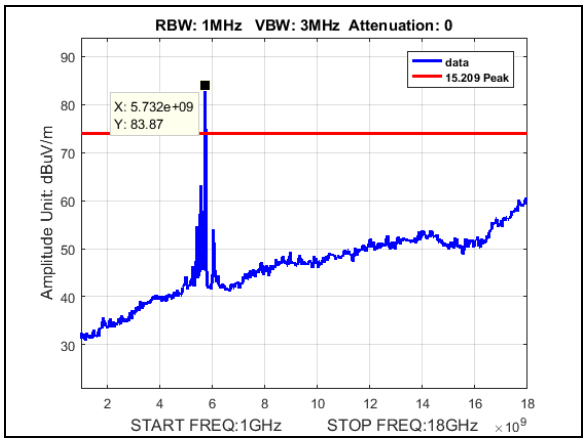
Plot 150. Undesirable Emissions, Average, radiated spurious emissions, 50M, 5750, 1-18GHz



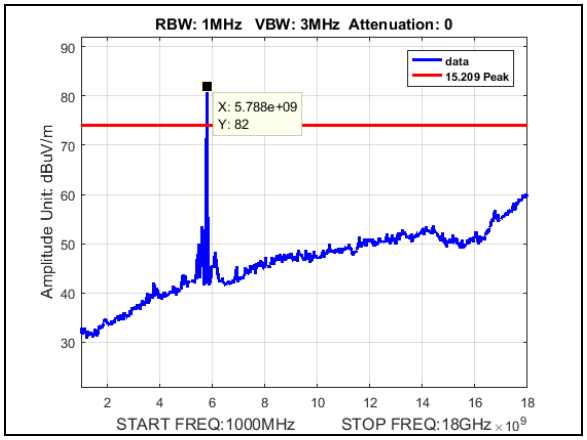
Plot 151. Undesirable Emissions, Average, radiated spurious emissions, 50M, 5790, 1-18GHz



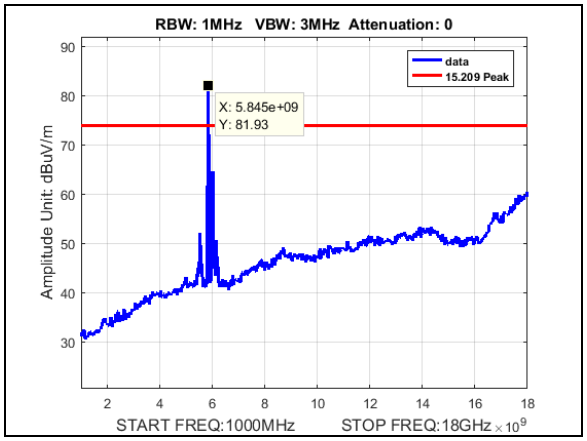
Plot 152. Undesirable Emissions, Average, radiated spurious emissions, 50M, 5825, 1-18GHz



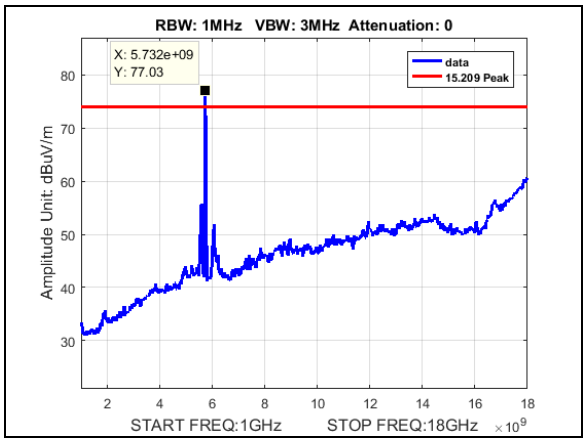
Plot 153. Undesirable Emissions, Peak, radiated spurious emissions, 10M, 5730, 1-18GHz



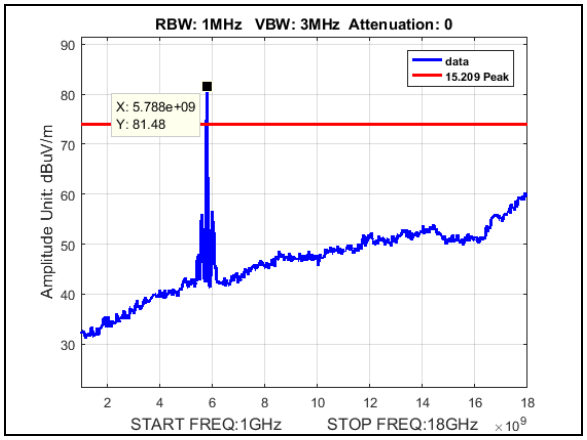
Plot 154. Undesirable Emissions, Peak, radiated spurious emissions, 10M, 5790, 1-18GHz



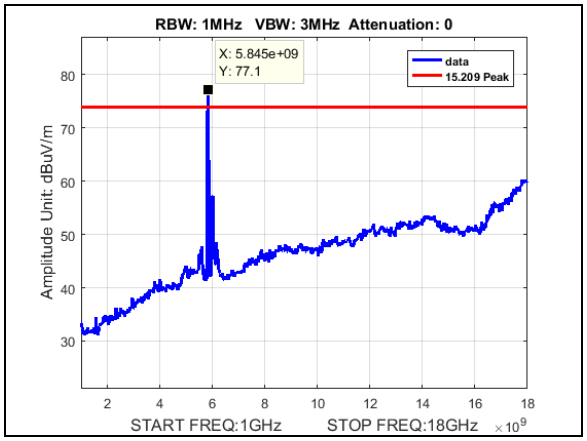
Plot 155. Undesirable Emissions, Peak, radiated spurious emissions, 10M, 5845, 1-18GHz



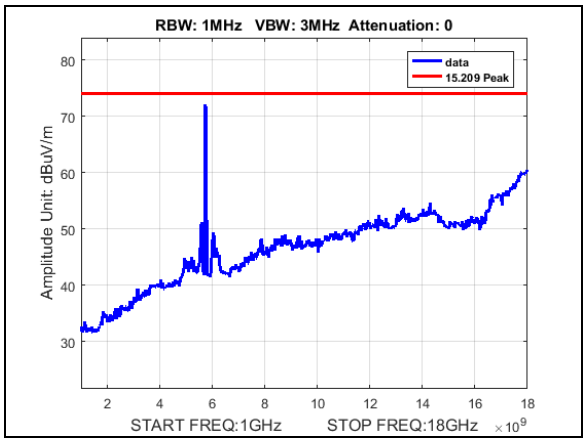
Plot 156. Undesirable Emissions, Peak, radiated spurious emissions, 20M, 5735, 1-18GHz



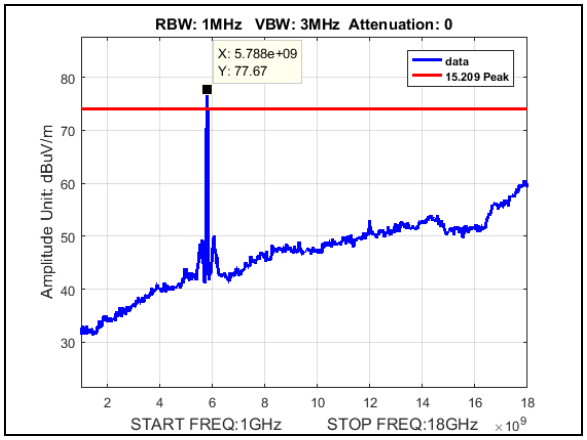
Plot 157. Undesirable Emissions, Peak, radiated spurious emissions, 20M, 5790, 1-18GHz



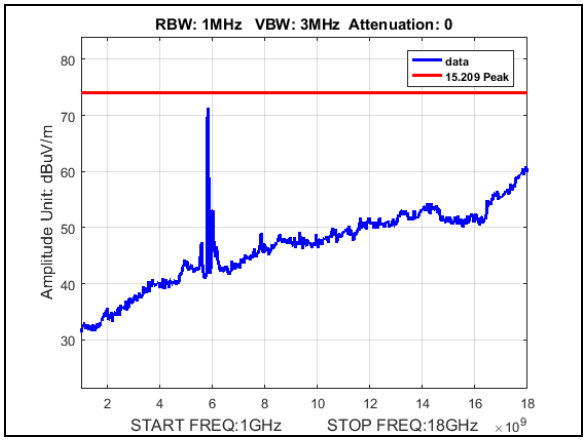
Plot 158. Undesirable Emissions, Peak, radiated spurious emissions, 20M, 5840, 1-18GHz



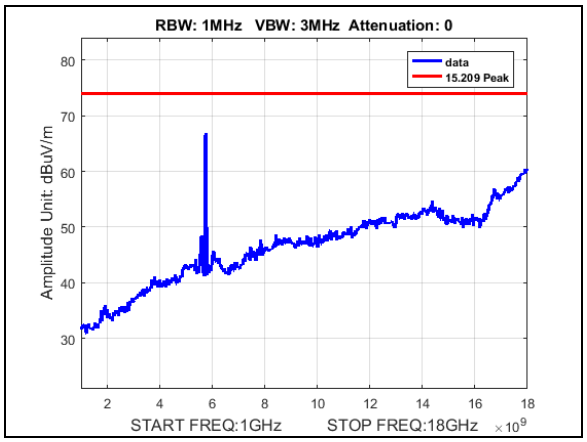
Plot 159. Undesirable Emissions, Peak, radiated spurious emissions, 30M, 5740, 1-18GHz



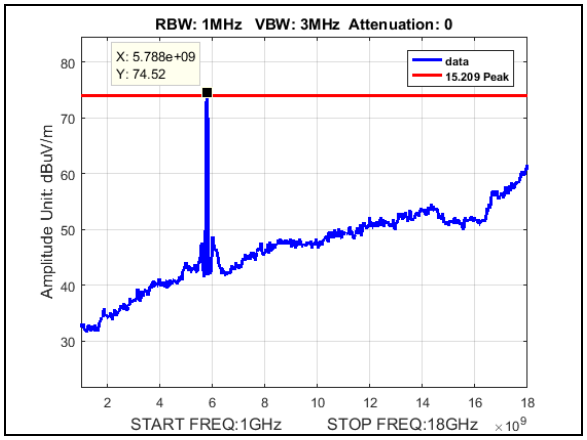
Plot 160. Undesirable Emissions, Peak, radiated spurious emissions, 30M, 5790, 1-18GHz



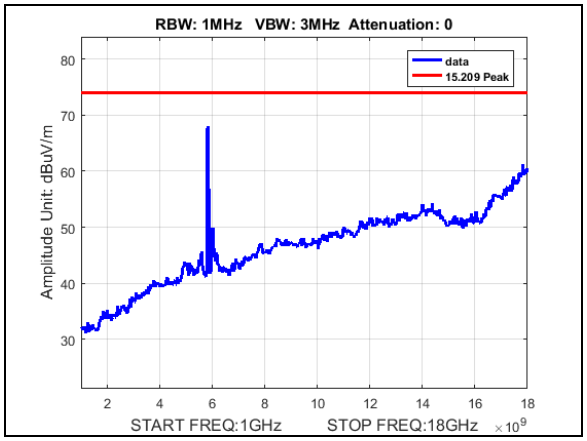
Plot 161. Undesirable Emissions, Peak, radiated spurious emissions, 30M, 5835, 1-18GHz



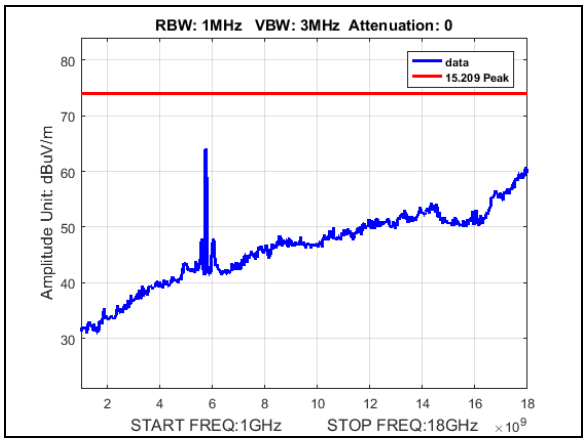
Plot 162. Undesirable Emissions, Peak, radiated spurious emissions, 40M, 5745, 1-18GHz



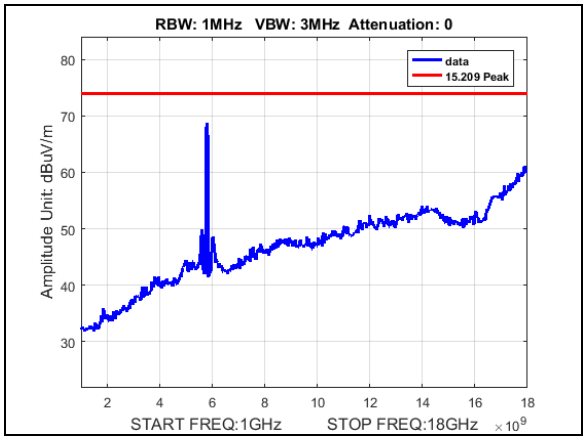
Plot 163. Undesirable Emissions, Peak, radiated spurious emissions, 40M, 5790, 1-18GHz



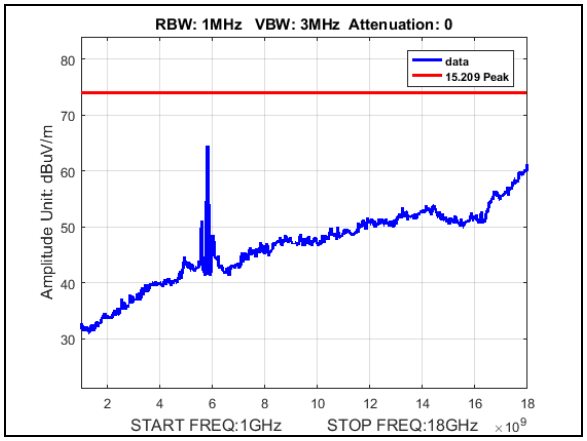
Plot 164. Undesirable Emissions, Peak, radiated spurious emissions, 40M, 5830, 1-18GHz



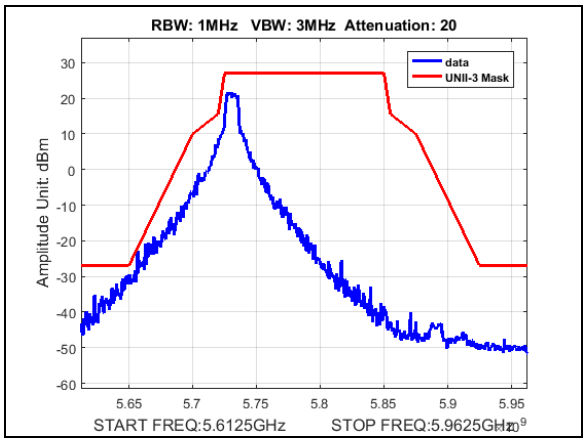
Plot 165. Undesirable Emissions, Peak, radiated spurious emissions, 50M, 5750, 1-18GHz



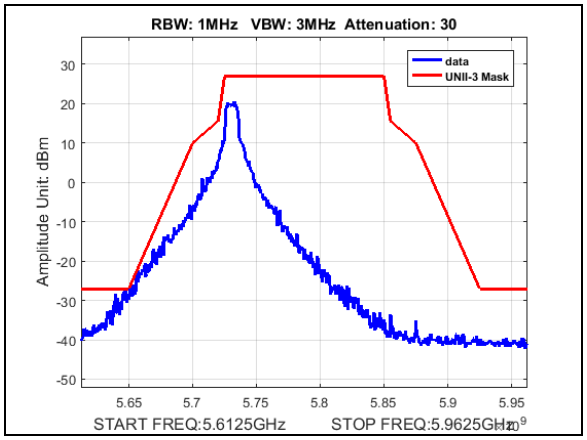
Plot 166. Undesirable Emissions, Peak, radiated spurious emissions, 50M, 5790, 1-18GHz



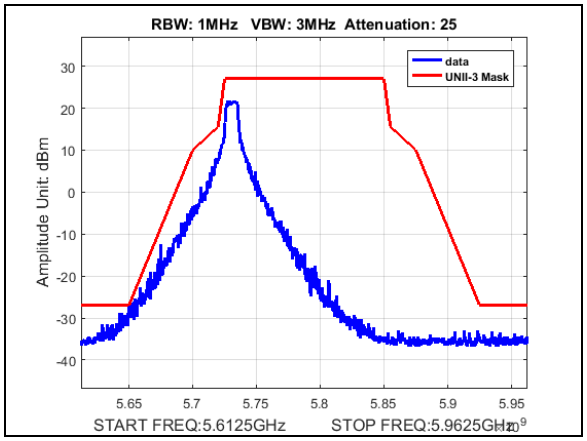
Plot 167. Undesirable Emissions, Peak, radiated spurious emissions, 50M, 5825, 1-18GHz



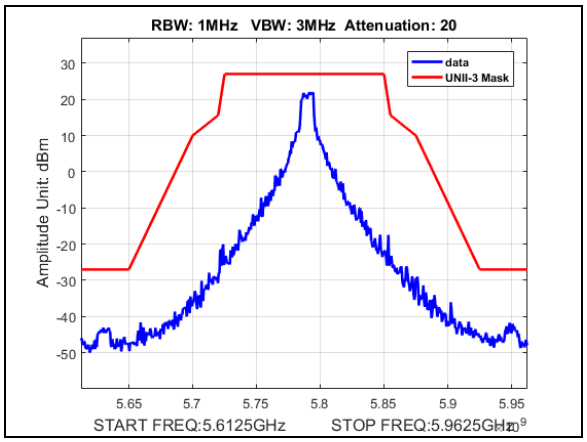
Plot 168. Undesirable Emissions, UNII3, emission mask, BW 10M, CF 5730M, 13dBi



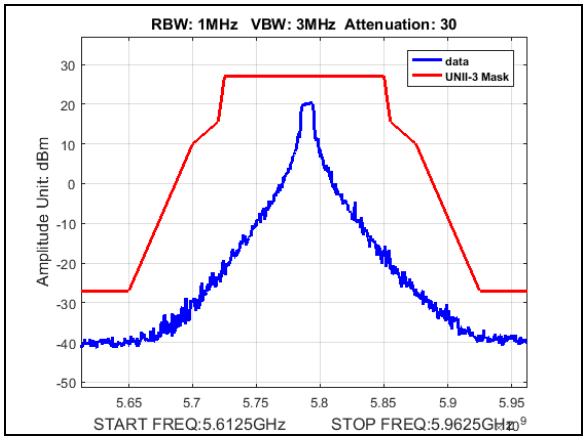
Plot 169. Undesirable Emissions, UNII3, emission mask, BW 10M, CF 5730M, 19dBi



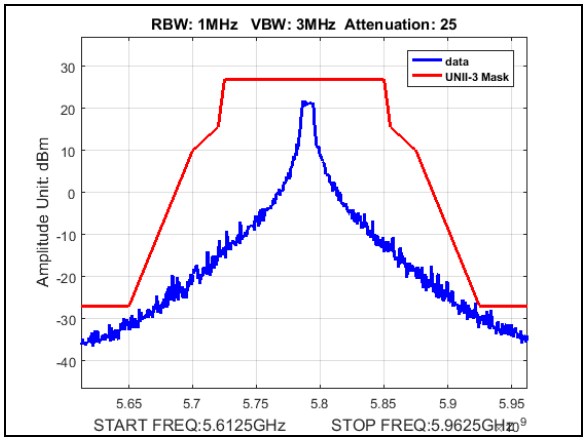
Plot 170. Undesirable Emissions, UNII3, emission mask, BW 10M, CF 5730M, 27dBi



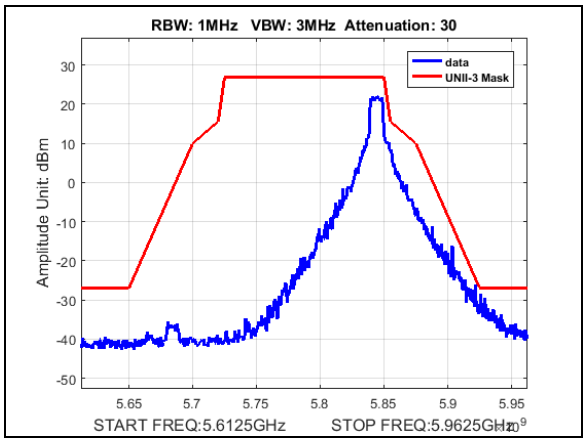
Plot 171. Undesirable Emissions, UNII3, emission mask, BW 10M, CF 5790M, 13dBi



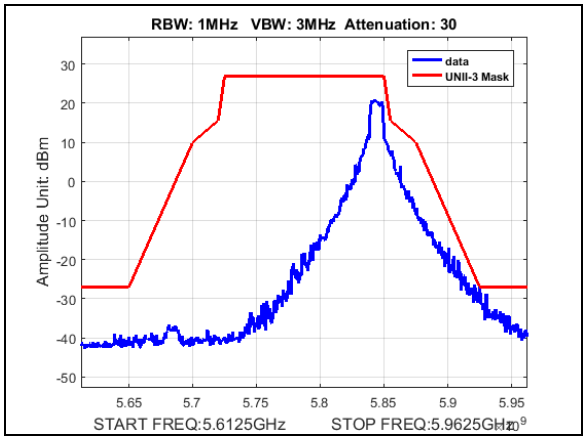
Plot 172. Undesirable Emissions, UNII3, emission mask, BW 10M, CF 5790M, 19dBi



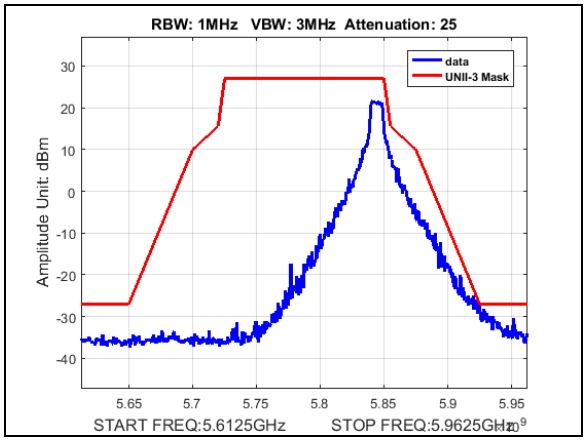
Plot 173. Undesirable Emissions, UNII3, emission mask, BW 10M, CF 5790M, 27dBi



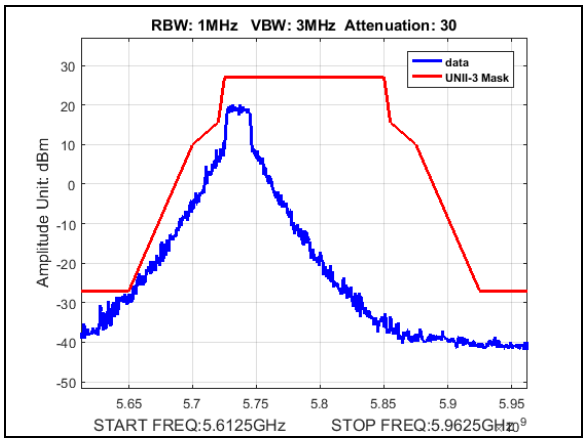
Plot 174. Undesirable Emissions, UNII3, emission mask, BW 10M, CF 5845M, 13dBi



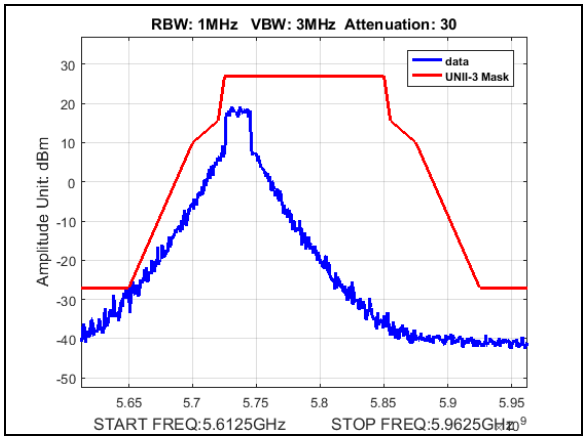
Plot 175. Undesirable Emissions, UNII3, emission mask, BW 10M, CF 5845M, 19dBi



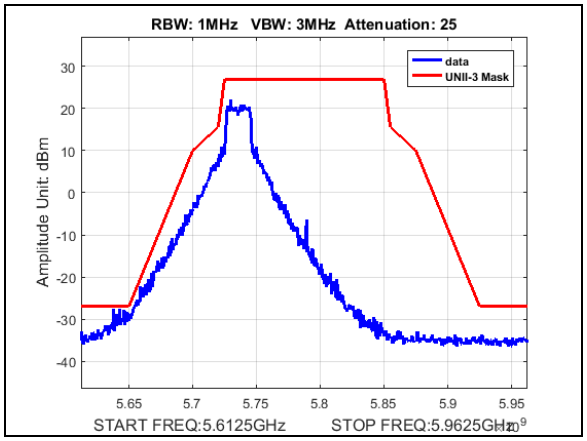
Plot 176. Undesirable Emissions, UNII3, emission mask, BW 10M, CF 5845M, 27dBi



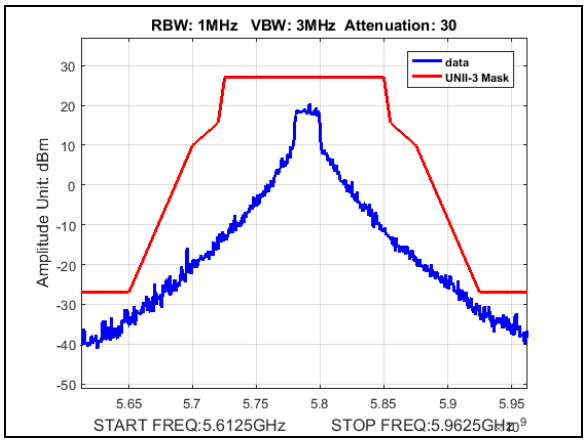
Plot 177. Undesirable Emissions, UNII3, emission mask, BW 20M, CF 5735M, 13dBi



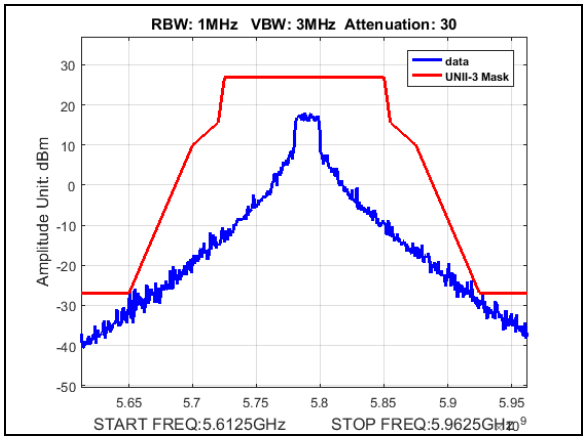
Plot 178. Undesirable Emissions, UNII3, emission mask, BW 20M, CF 5735M, 19dBi



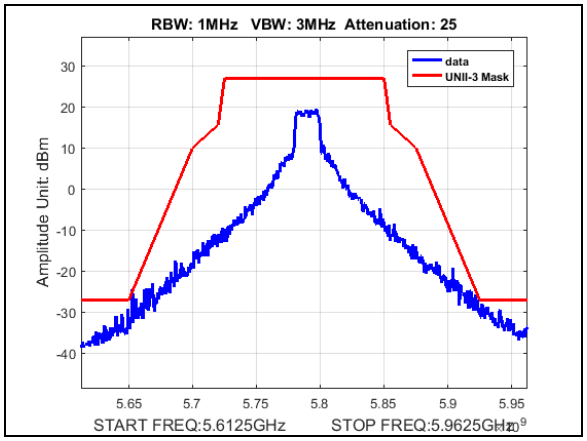
Plot 179. Undesirable Emissions, UNII3, emission mask, BW 20M, CF 5735M, 27dBi



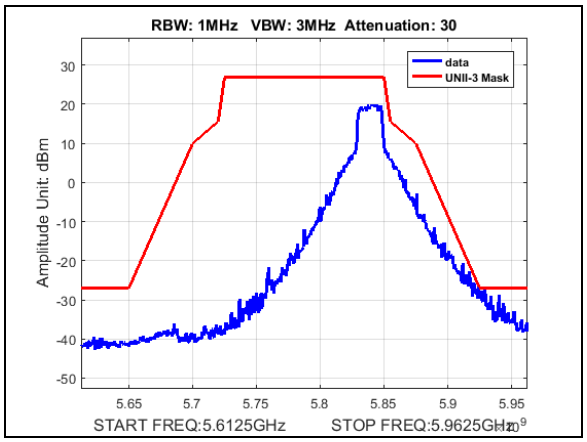
Plot 180. Undesirable Emissions, UNII3, emission mask, BW 20M, CF 5790M, 13dBi



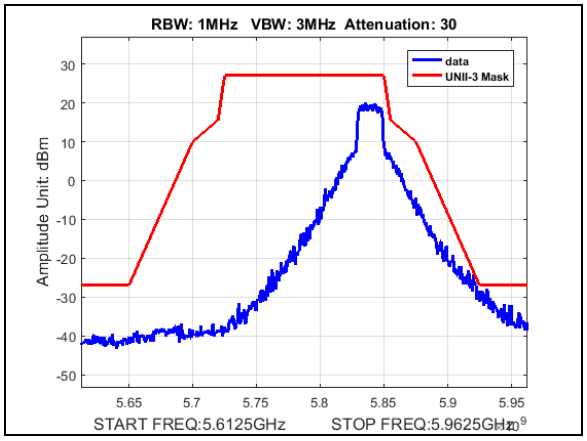
Plot 181. Undesirable Emissions, UNII3, emission mask, BW 20M, CF 5790M, 19dBi



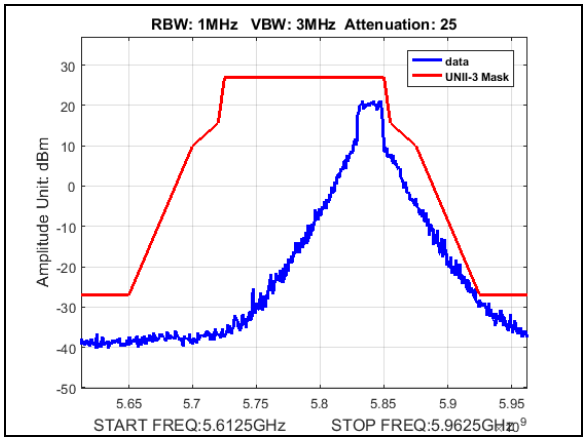
Plot 182. Undesirable Emissions, UNII3, emission mask, BW 20M, CF 5790M, 27dBi



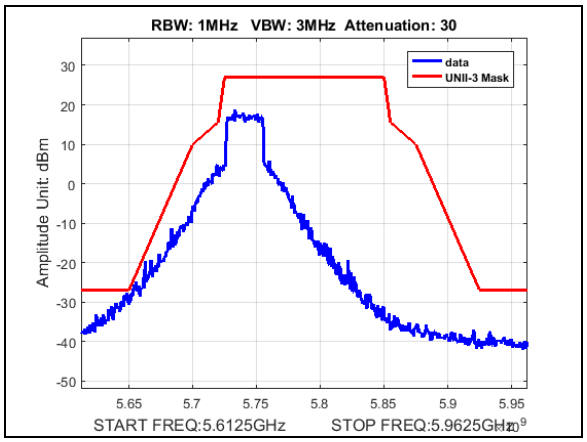
Plot 183. Undesirable Emissions, UNII3, emission mask, BW 20M, CF 5840M, 13dBi



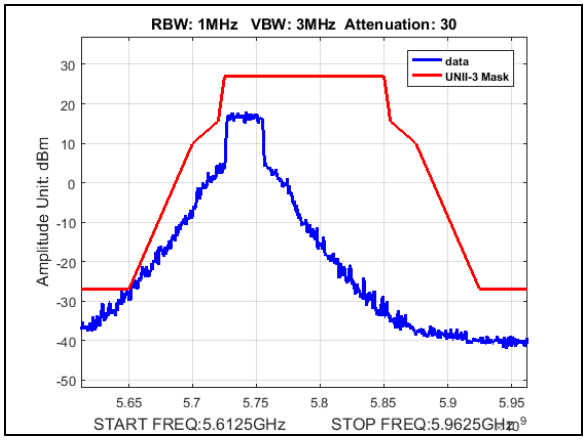
Plot 184. Undesirable Emissions, UNII3, emission mask, BW 20M, CF 5840M, 19dBi



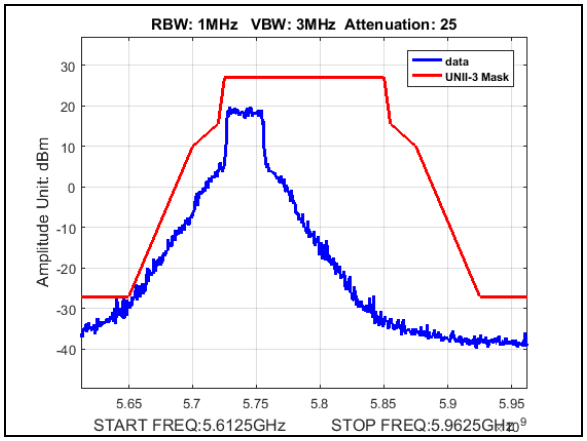
Plot 185. Undesirable Emissions, UNII3, emission mask, BW 20M, CF 5840M, 27dBi



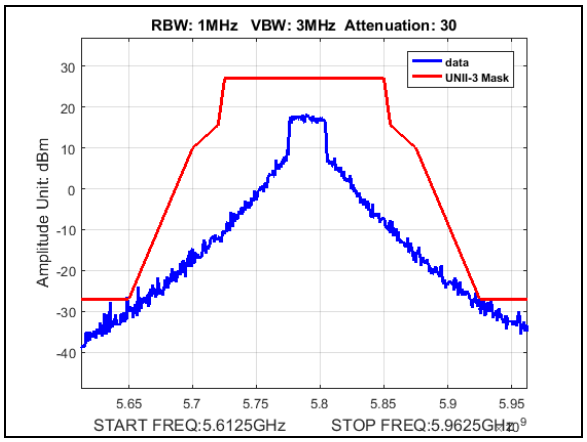
Plot 186. Undesirable Emissions, UNII3, emission mask, BW 30M, CF 5740M, 13dBi



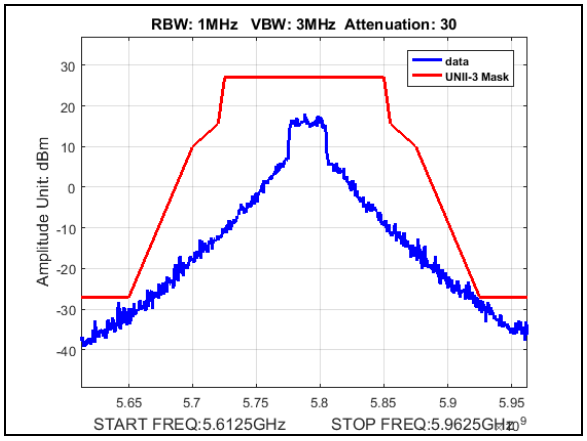
Plot 187. Undesirable Emissions, UNII3, emission mask, BW 30M, CF 5740M, 19dBi



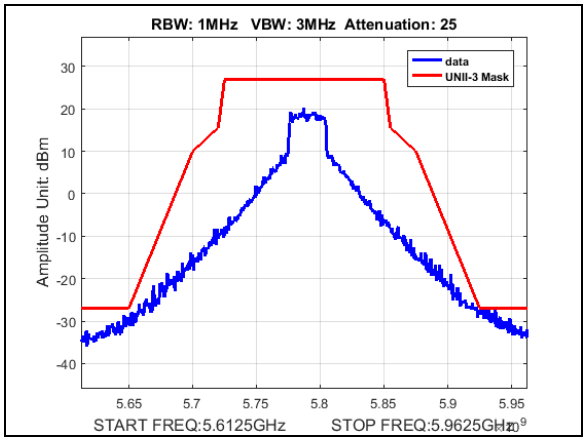
Plot 188. Undesirable Emissions, UNII3, emission mask, BW 30M, CF 5740M, 27dBi



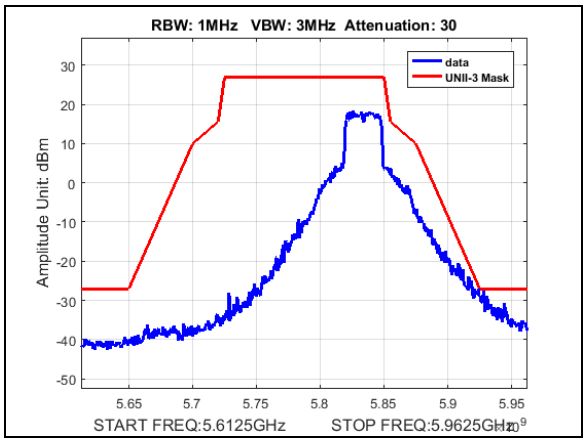
Plot 189. Undesirable Emissions, UNII3, emission mask, BW 30M, CF 5790M, 13dBi



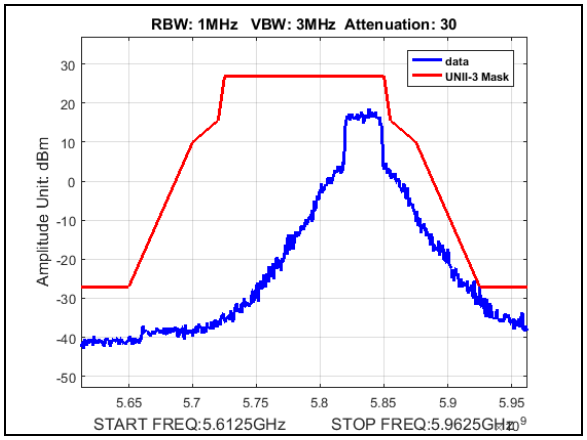
Plot 190. Undesirable Emissions, UNII3, emission mask, BW 30M, CF 5790M, 19dBi



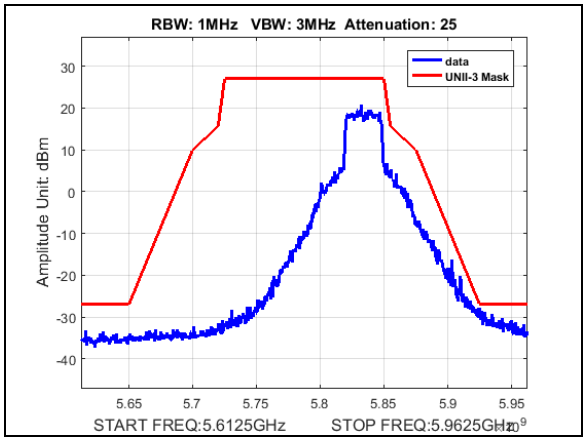
Plot 191. Undesirable Emissions, UNII3, emission mask, BW 30M, CF 5790M, 27dBi



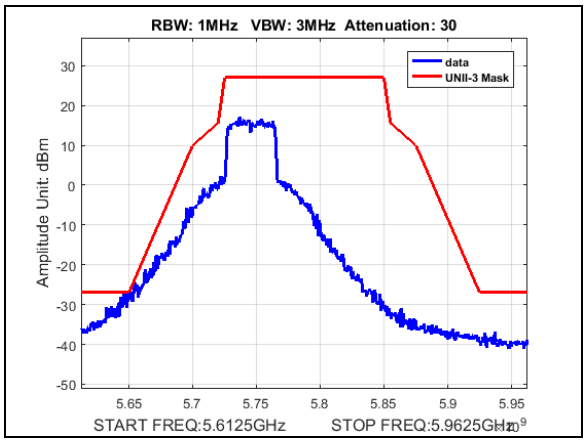
Plot 192. Undesirable Emissions, UNII3, emission mask, BW 30M, CF 5835M, 13dBi



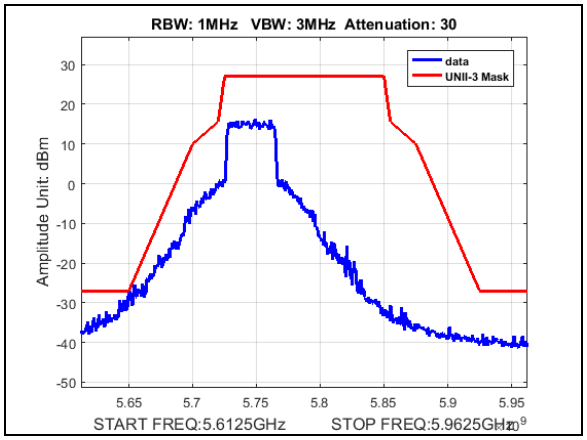
Plot 193. Undesirable Emissions, UNII3, emission mask, BW 30M, CF 5835M, 19dBi



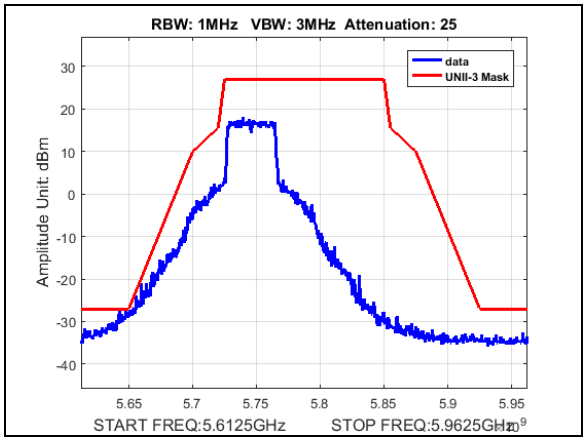
Plot 194. Undesirable Emissions, UNII3, emission mask, BW 30M, CF 5835M, 27dBi



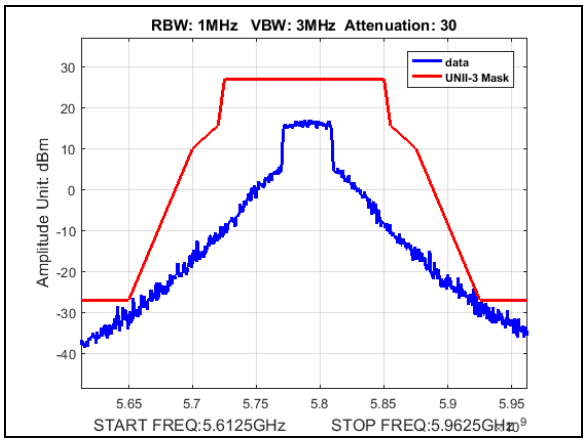
Plot 195. Undesirable Emissions, UNII3, emission mask, BW 40M, CF 5745M, 13dBi



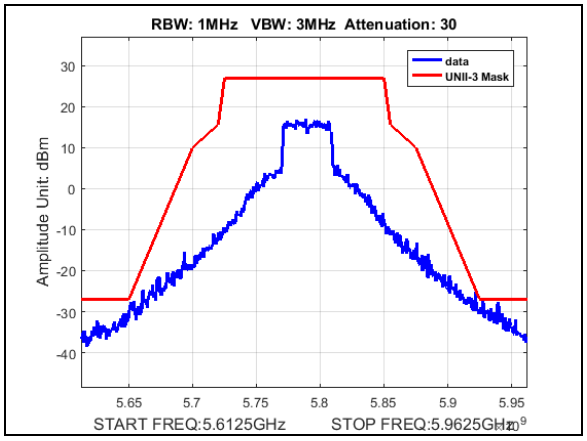
Plot 196. Undesirable Emissions, UNII3, emission mask, BW 40M, CF 5745M, 19dBi



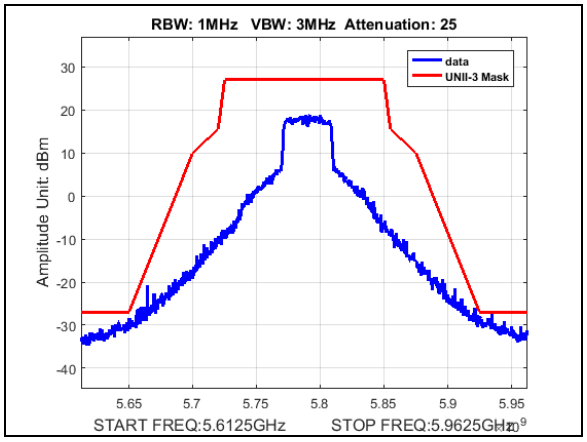
Plot 197. Undesirable Emissions, UNII3, emission mask, BW 40M, CF 5745M, 27dBi



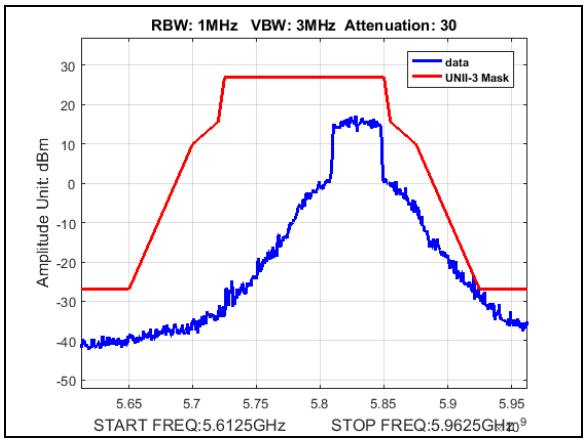
Plot 198. Undesirable Emissions, UNII3, emission mask, BW 40M, CF 5790M, 13dBi



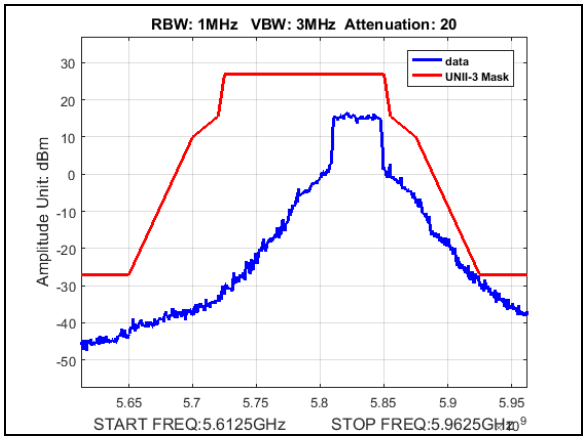
Plot 199. Undesirable Emissions, UNII3, emission mask, BW 40M, CF 5790M, 19dBi



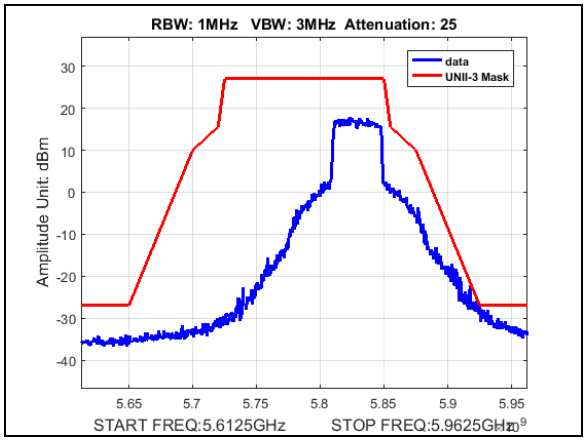
Plot 200. Undesirable Emissions, UNII3, emission mask, BW 40M, CF 5790M, 27dBi



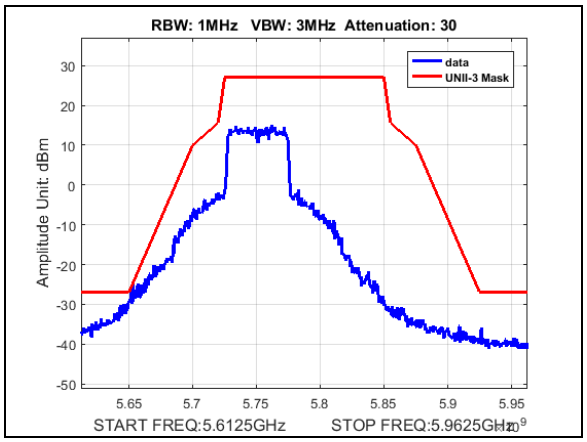
Plot 201. Undesirable Emissions, UNII3, emission mask, BW 40M, CF 5830M, 13dBi



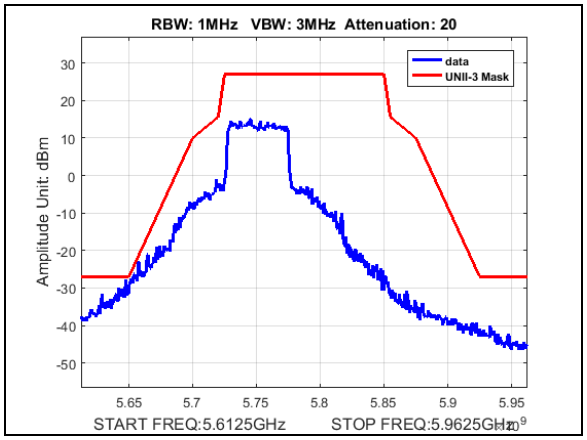
Plot 202. Undesirable Emissions, UNII3, emission mask, BW 40M, CF 5830M, 19dBi



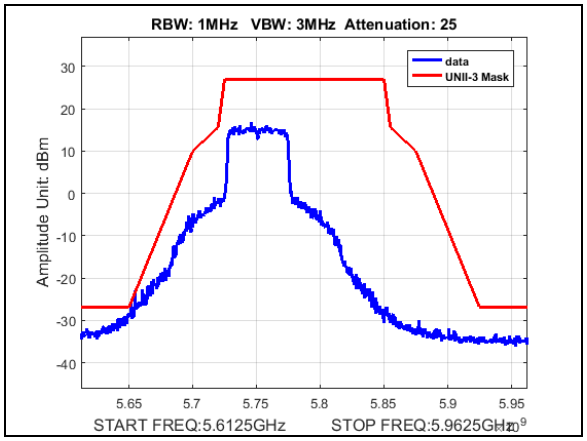
Plot 203. Undesirable Emissions, UNII3, emission mask, BW 40M, CF 5830M, 27dBi



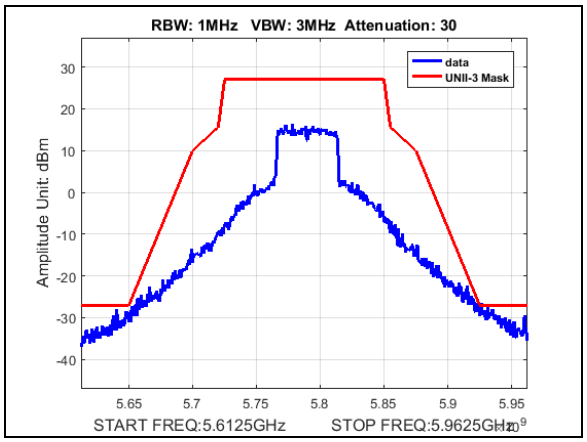
Plot 204. Undesirable Emissions, UNII3, emission mask, BW 50M, CF 5750M, 13dBi



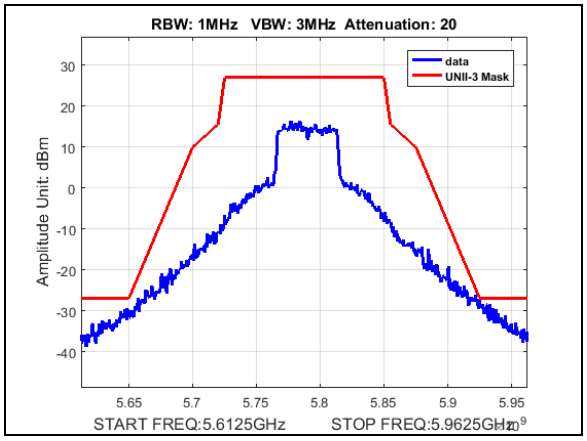
Plot 205. Undesirable Emissions, UNII3, emission mask, BW 50M, CF 5750M, 19dBi



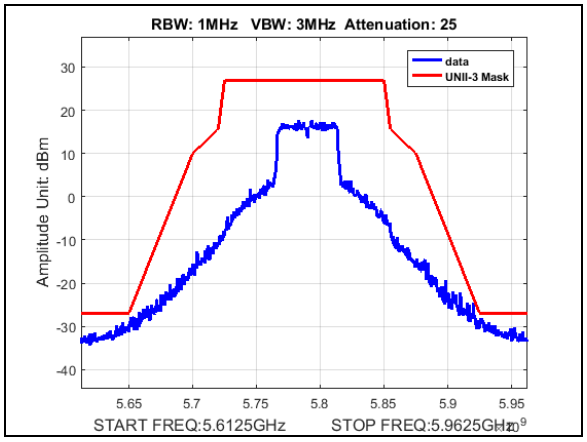
Plot 206. Undesirable Emissions, UNII3, emission mask, BW 50M, CF 5750M, 27dBi



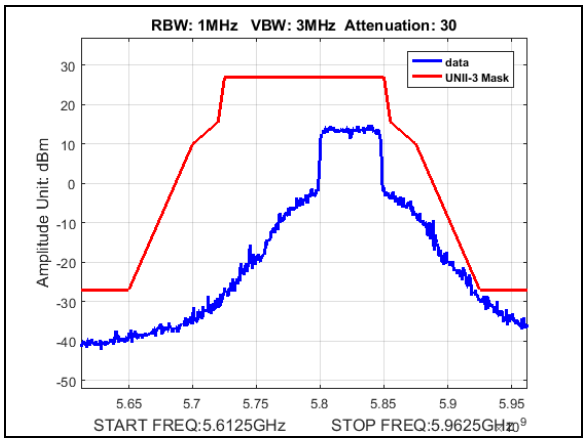
Plot 207. Undesirable Emissions, UNII3, emission mask, BW 50M, CF 5790M, 13dBi



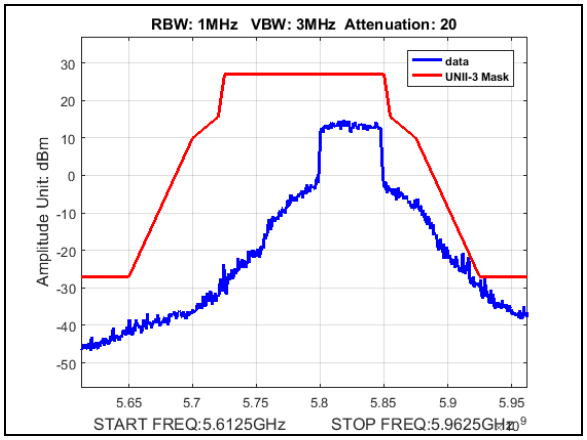
Plot 208. Undesirable Emissions, UNII3, emission mask, BW 50M, CF 5790M, 19dBi



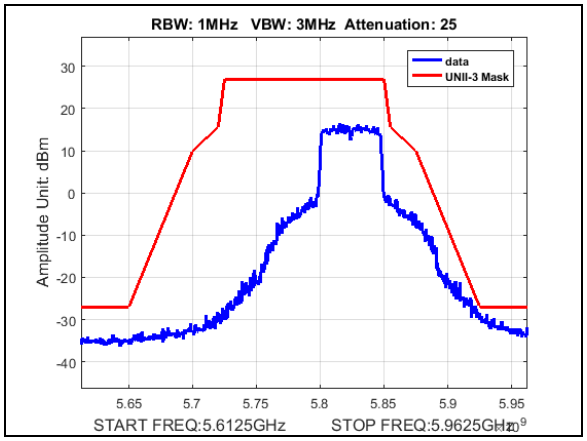
Plot 209. Undesirable Emissions, UNII3, emission mask, BW 50M, CF 5790M, 27dBi



Plot 210. Undesirable Emissions, UNII3, emission mask, BW 50M, CF 5825M, 13dBi



Plot 211. Undesirable Emissions, UNII3, emission mask, BW 50M, CF 5825M, 19dBi



Plot 212. Undesirable Emissions, UNII3, emission mask, BW 50M, CF 5825M, 27dBi

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 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.45	66 – 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 17. 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.

Measured emissions were within applicable limits.

Test Engineer(s): Donald Salguero

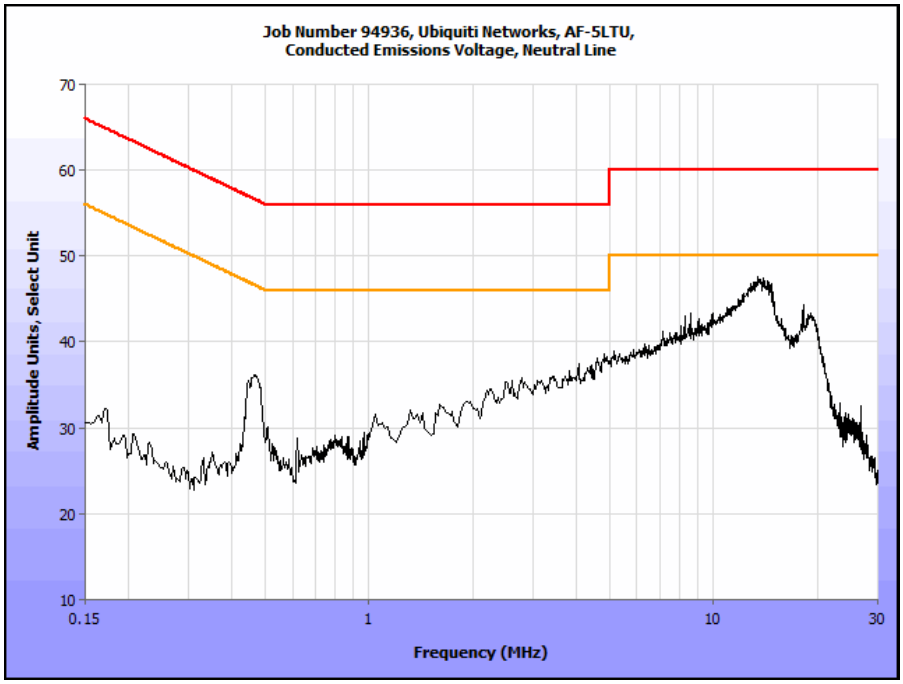
Test Date(s): November 2, 2017

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

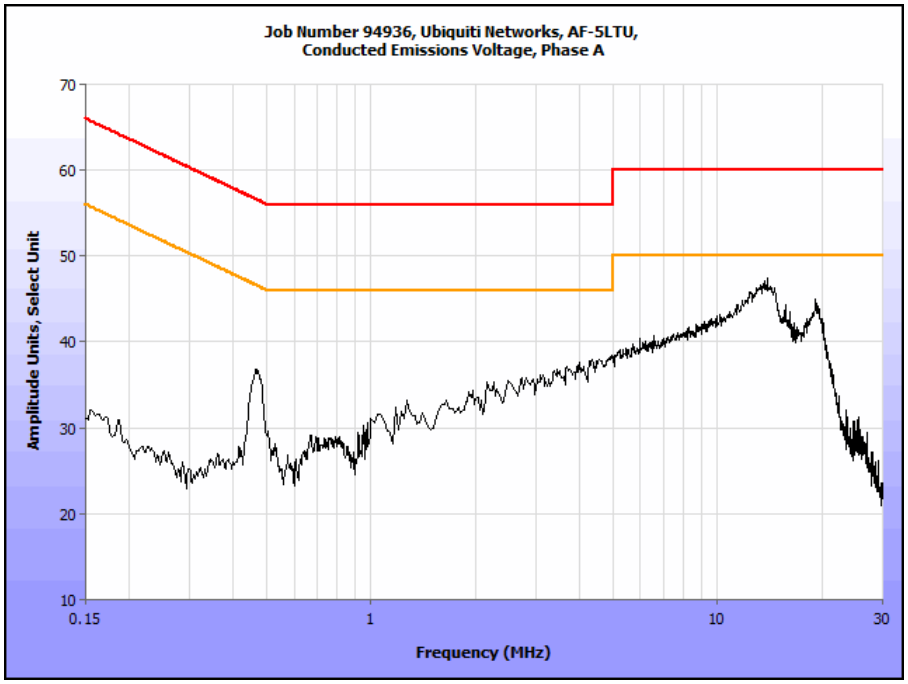
Table 18. Conducted Emissions, Phase, Test Results

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 19. Conducted Emissions, Neutral, Test Results



Plot 213. Conducted Emissions, Neutral, no legend



Plot 214. Conducted Emissions, Phase, no legend

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(e) 6 dB Bandwidth

Test Requirements: **§ 15.407(e):** Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

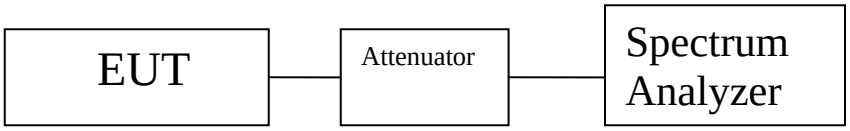
Test Procedure: The transmitter was set to low, mid, and high operating frequencies at the highest output power and connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth, VBW > RBW. The 6 dB Bandwidth was measured and recorded.

Test Results The 6 dB Bandwidth was compliant with the requirements of this section.

No anomalies detected.

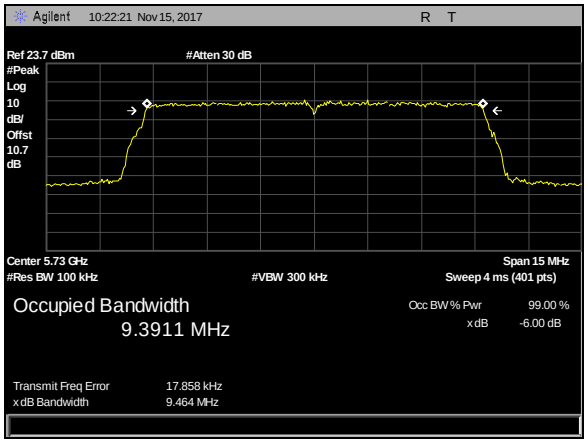
Test Engineer(s): Donald Salguero

Test Date(s): December 7, 2017

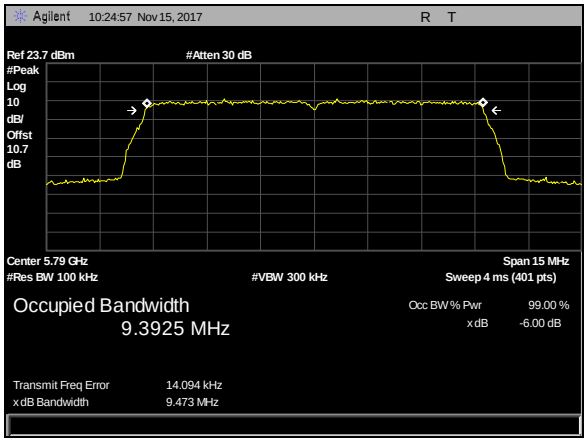


Channel BW (MHz)	Frequency (MHz)	6dB BW (MHz)
10	5730	9.464
	5790	9.473
	5845	9.473
20	5735	18.918
	5790	18.968
	5840	18.927
30	5740	28.418
	5790	28.456
	5835	28.436
40	5745	37.927
	5790	37.965
	5830	37.925
50	5750	47.497
	5790	47.503
	5825	47.466

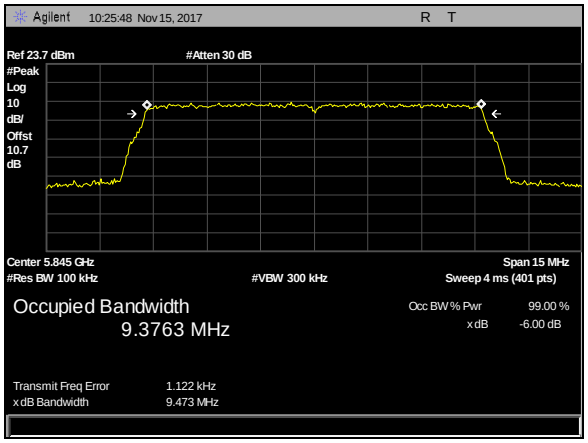
Table 20. 6 dB Occupied Bandwidth, Test Results



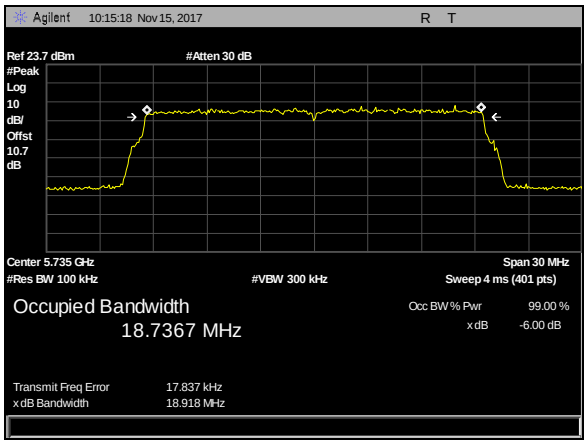
Plot 215. 6 dB Occupied Bandwidth, BW 10M, CF 5730M



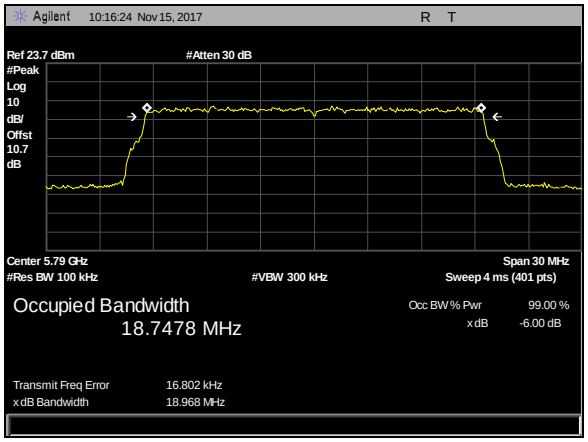
Plot 216. 6 dB Occupied Bandwidth, BW 10M, CF 5790M



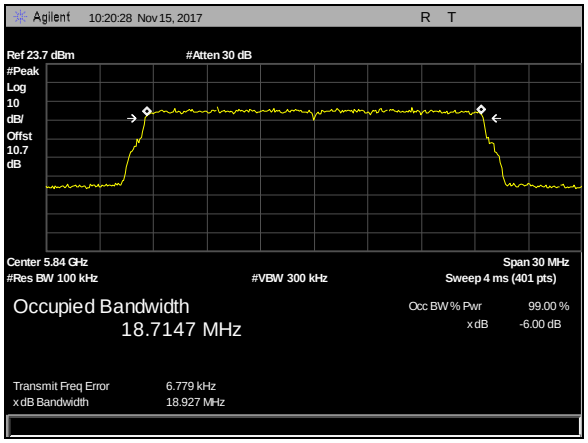
Plot 217. 6 dB Occupied Bandwidth, BW 10M, CF 5845M



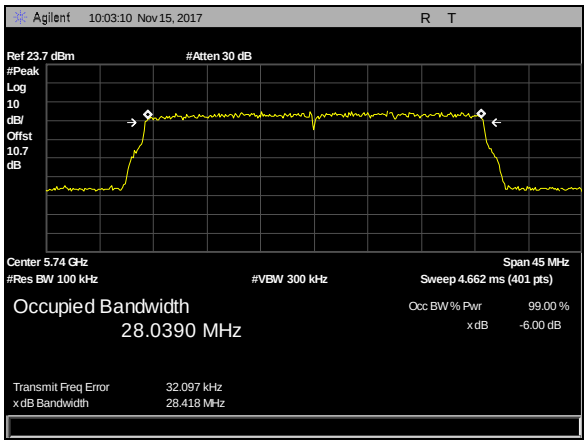
Plot 218. 6 dB Occupied Bandwidth, BW 20M, CF 5735M



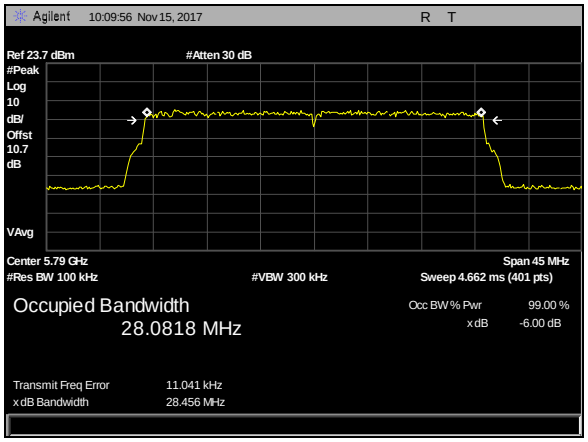
Plot 219. 6 dB Occupied Bandwidth, BW 20M, CF 5790M



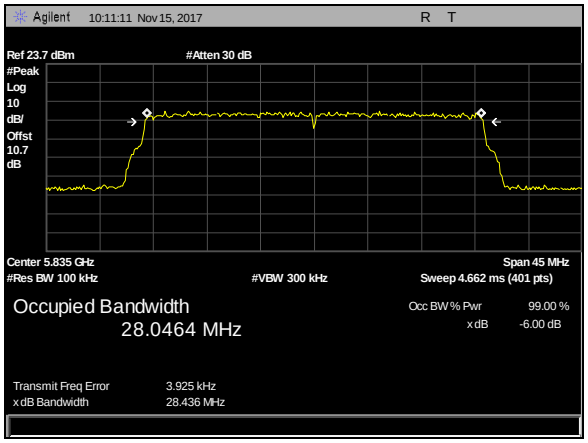
Plot 220. 6 dB Occupied Bandwidth, BW 20M, CF 5840M



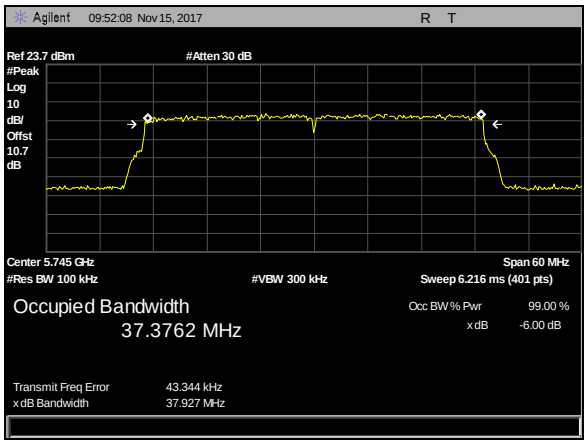
Plot 221. 6 dB Occupied Bandwidth, BW 30M, CF 5740M



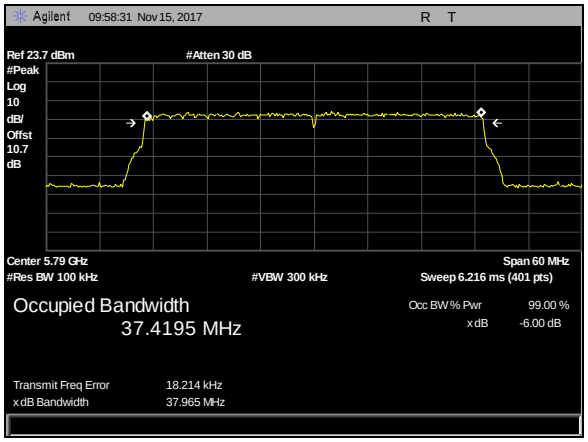
Plot 222. 6 dB Occupied Bandwidth, BW 30M, CF 5790M



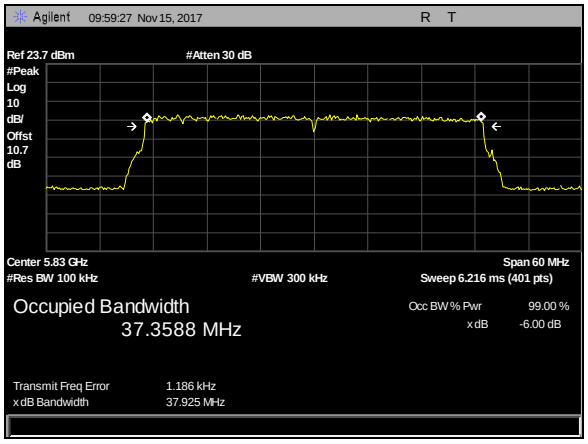
Plot 223. 6 dB Occupied Bandwidth, BW 30M, CF 5835M



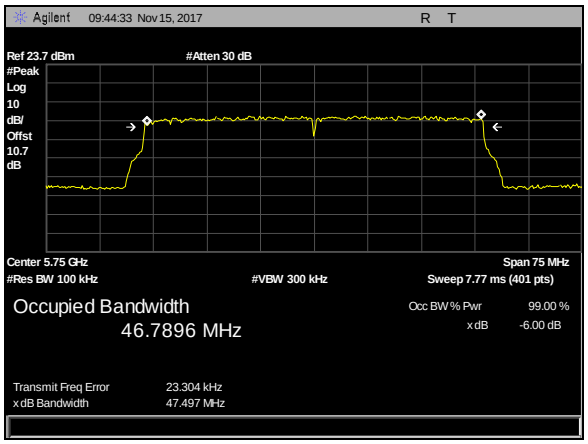
Plot 224. 6 dB Occupied Bandwidth, BW 40M, CF 5745M



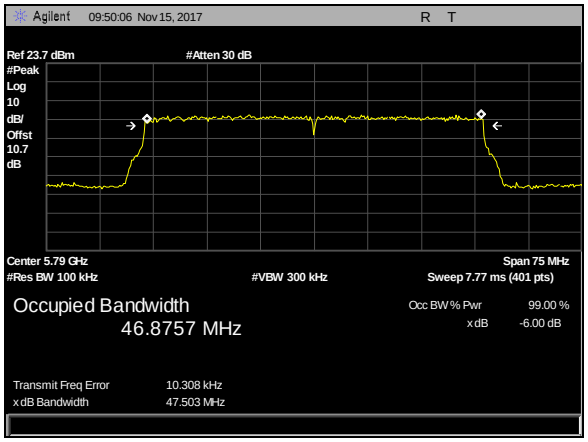
Plot 225. 6 dB Occupied Bandwidth, BW 40M, CF 5790M



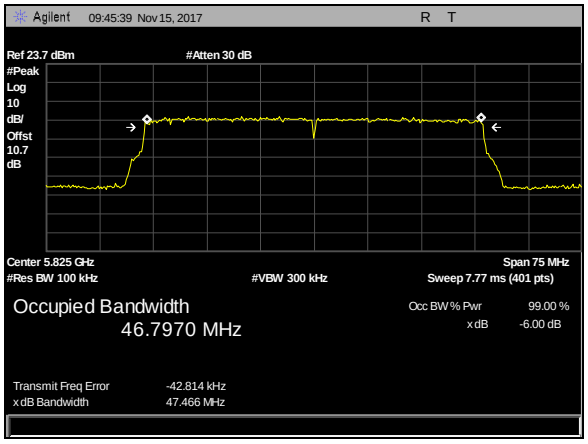
Plot 226. 6 dB Occupied Bandwidth, BW 40M, CF 5830M



Plot 227. 6 dB Occupied Bandwidth, BW 50M, CF 5750M



Plot 228. 6 dB Occupied Bandwidth, BW 50M, CF 5790M



Plot 229. 6 dB Occupied Bandwidth, BW 50M, CF 5825M

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 @ 5725 - 5850 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**
5790	29.95	988.553	27	501.187	1	1	0	198.562	Pass

The safe distance where Power Density is less than the MPE Limit listed above was found to be 198.562 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 21. 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

K. Certification Information

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

§ 2.801 Radio-frequency device defined.

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

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

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

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

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

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

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

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

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

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

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

(i) Compliance testing;

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

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

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

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

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

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

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

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

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

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

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

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

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

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

Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

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

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

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.

End of Report

