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

914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372
3162 BELICK STREET ● SANTA CLARA, CALIFORNIA 95054 ● PHONE (408) 748-3585 ● FAX (510) 489-6372
13501 MCCALLEN PASS ● AUSTIN, TX 78753 ● PHONE (512) 287-2500 ● FAX (512) 287-2513

January 5, 2018

Arris Group Inc.
3871 Lakefield Drive Suite 300
Suwanee, GA 30024

Dear Tony Figueiredo,

Enclosed is the EMC Wireless test report for compliance testing of the Arris Group Inc., TG3492LG as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15.407, Subpart E (UNII 1).

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Joel Huna
Documentation Department

Reference: (\Arris Group Inc.\ EMC95965-FCC407 UNII 1)

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

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Electromagnetic Compatibility Criteria
Test Report

for the

Arris Group Inc.
Model TG3492LG

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

MET Report: EMC95965-FCC407 UNII 1

January 5, 2018

Prepared For:

Arris Group Inc.
3871 Lakefield Drive Suite 300
Suwanee, GA 30024

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

Electromagnetic Compatibility Criteria
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Title 47 of the CFR
15.407 Subpart E

Bradley Jones, 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 5, 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 Arris Group Inc. TG3492LG, 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 TG3492LG. Arris Group Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the TG3492LG, 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 Arris Group Inc., purchase order number AR1115506. All tests were conducted using measurement procedure ANSI C63.4-2014.

FCC Reference	Description	Results
§15.203	Antenna Requirement	Compliant
§15.403(i)	26dB Occupied Bandwidth	Compliant
§15.407 (a)(1)	Maximum Conducted Output Power	Compliant
§15.407 (a)(1)(i)	EIRP Above 30 degrees Elevation	Not Applicable - Unit is for indoor use so EIRP is not applicable.
§15.407 (a)(1)	Maximum Power Spectral Density	Compliant
§15.407 (b)(1)& (6 - 7)	Undesirable Emissions	Compliant
§15.407(b)(6)	Conducted Emission Limits	Compliant
§15.407(f)	RF Exposure	Compliant
§15.407(g)	Frequency Stability	Data for frequency stability compliance with the requirements of this section is provided by the customer as a separate exhibit.

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Arris Group Inc. to perform testing on the TG3492LG, under Arris Group Inc.'s purchase order number AR1115506.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Arris Group Inc. TG3492LG.

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

Model(s) Tested:	TG3492LG	
Model(s) Covered:	TG3492LG	
EUT Specifications:	Primary Power: 120 VAC 60 Hz	
	FCC ID: UIDTG3492LG	
	Type of Modulations:	OFDM
	Equipment Code:	NII
	Max. RF Output Power:	29.75 dBm
	EUT Frequency Ranges:	5150 – 5250 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Type of Filing:	Original	
Evaluated by:	Bradley Jones	
Report Date(s):	January 5, 2018	

Table 2. EUT Summary

B. References

CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
789033 D02 General UNII Test Procedures New Rules v01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E

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 Arris Group Inc. TG3492LG, Equipment Under Test (EUT), is TG3492LGx (where x is any alphanumeric characters denoting markets, or customers).

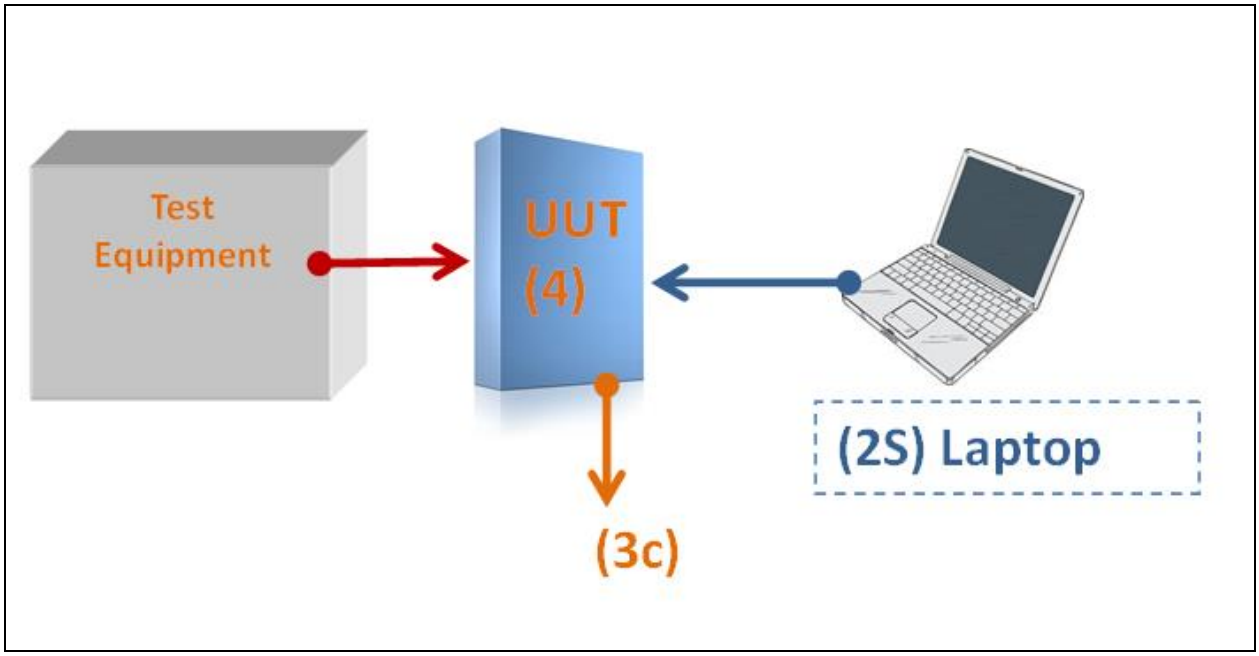


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

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

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
4	n/a	UUT	TG3492	E4574000DD03	

Table 4. Equipment Configuration

F. Support Equipment

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

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
2s	Laptop	Assorted	N/A	N/A
The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.				

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
2C	Ethernet	5e Modular 8 pin	1	1	1	No	

Table 6. Ports and Cabling Information

H. Mode of Operation

The provided instructions and software will configure the unit for operation at each required test mode. See Configuration.

I. Method of Monitoring EUT Operation

Indicator LED on, both Wi-Fi 2.4G and 5 G passing traffic.

J. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Arris Group Inc. upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

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

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

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

Results: The EUT as tested is compliant the criteria of §15.203.

Test Engineer(s): Bradley Jones

Test Date(s): September 11, 2017

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(i) 26dB Bandwidth

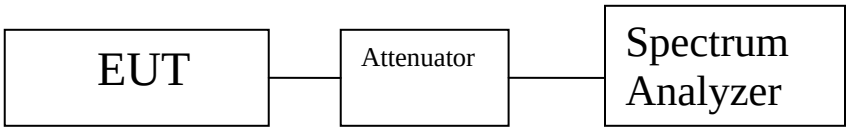
Test Requirements: **§ 15.403(i):** For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of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

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

Test Results The 26 dB Bandwidth was compliant with the requirements of this section.

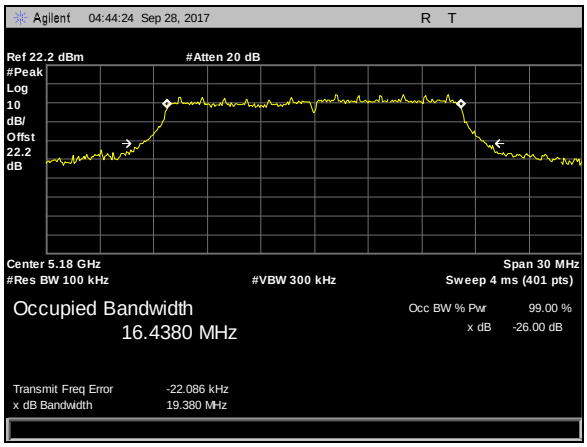
Test Engineer(s): Bradley Jones

Test Date(s): October 3, 2017

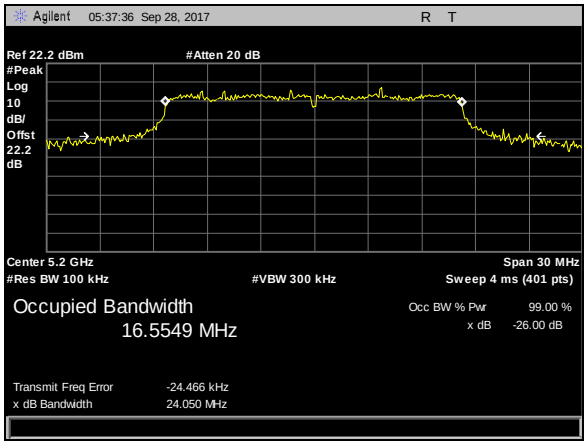


802.11a		
Frequency (MHz)	Channel (WLAN)	Chain 0 (MHz)
5180	36	19.38
5200	40	24.05
5240	48	25.451
802.11n HT20		
Frequency (MHz)	Channel (WLAN)	Chain 0 (MHz)
5180	36	21.3105
5200	40	22.9175
5240	48	22.2501
802.11ac VHT20		
Frequency (MHz)	Channel (WLAN)	Chain 0 (MHz)
5180	36	21.0327
5220	44	21.4876
5240	48	23.7491
802.11n HT40		
Frequency (MHz)	Channel (WLAN)	Chain 0 (MHz)
5190	38	38.715
5230	46	53.3636
802.11ac VHT40		
Frequency (MHz)	Channel (WLAN)	Chain 0 (MHz)
5190	38	38.818
5230	46	51.9951
802.11ac VHT80		
Frequency (MHz)	Channel (WLAN)	Chain 0 (MHz)
5210	44	78.414

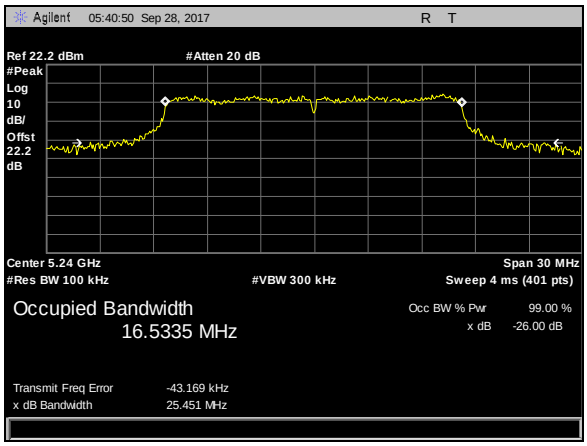
Table 7. 26 dB Occupied Bandwidth, Test Results



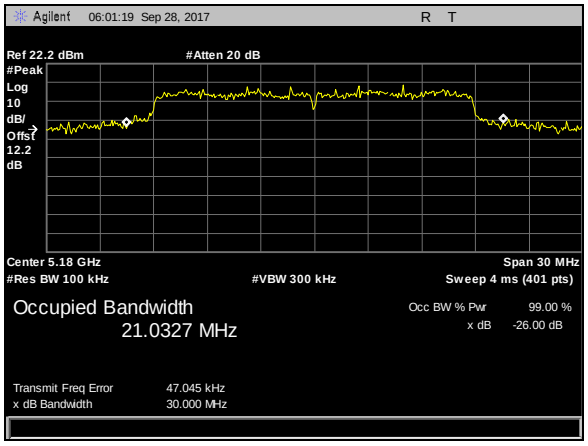
Plot 1. 26 dB Occupied Bandwidth, 20M a 5180 channel36 chain0



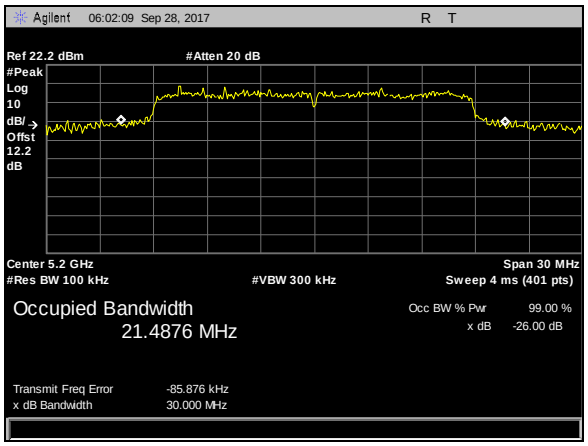
Plot 2. 26 dB Occupied Bandwidth, 20M a 5200 channel40 chain0



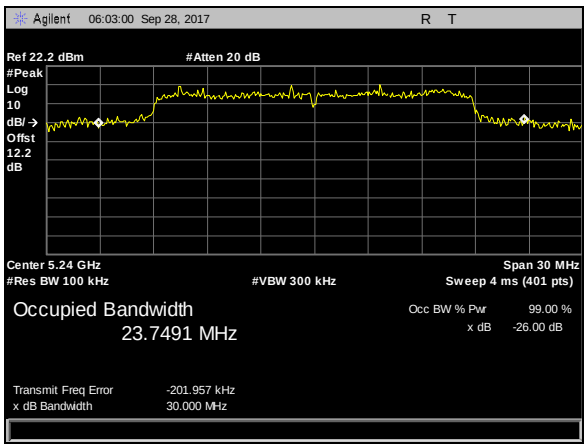
Plot 3. 26 dB Occupied Bandwidth, 20M a 5240 channel48 chain0



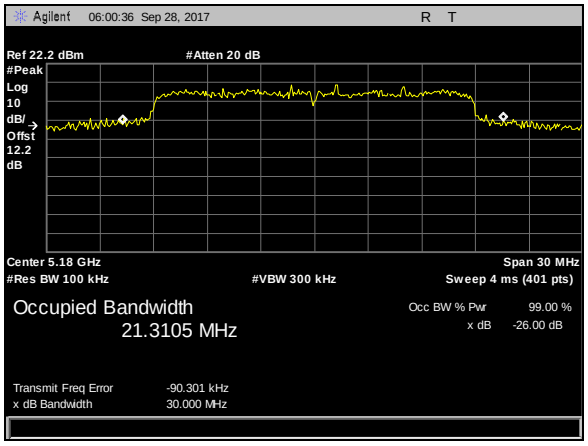
Plot 4. 26 dB Occupied Bandwidth, 20M ac 5240 channel36 chain0



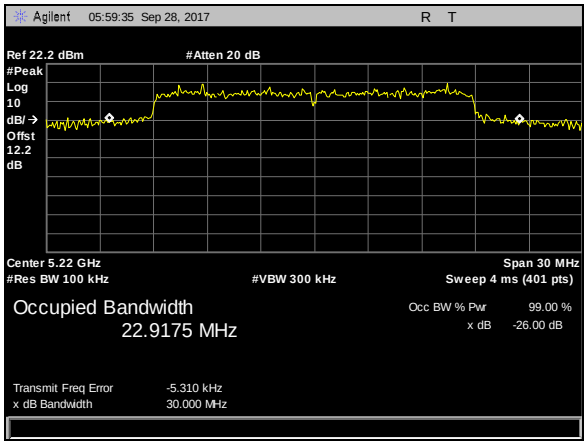
Plot 5. 26 dB Occupied Bandwidth, 20M ac 5240 channel40 chain0



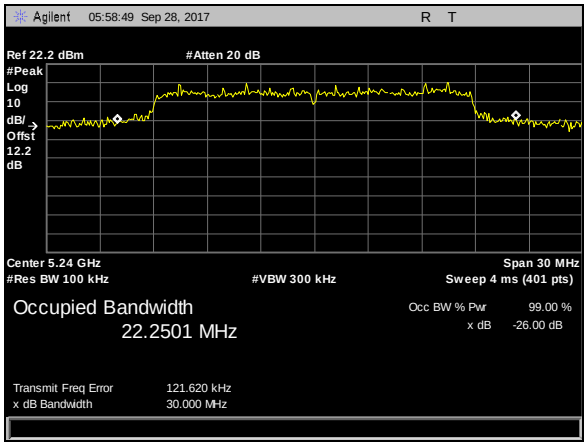
Plot 6. 26 dB Occupied Bandwidth, 20M ac 5240 channel48 chain0



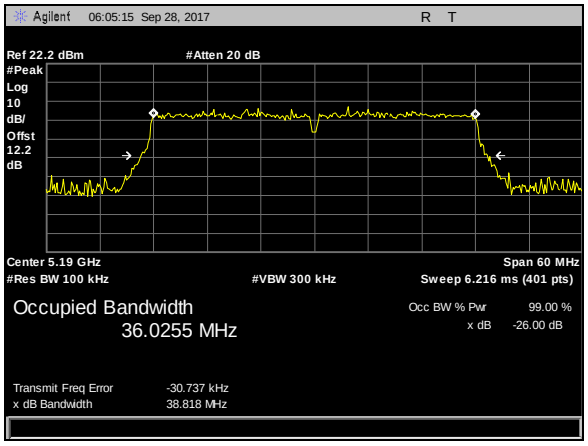
Plot 7. 26 dB Occupied Bandwidth, 20M n 5240 channel36 chain0



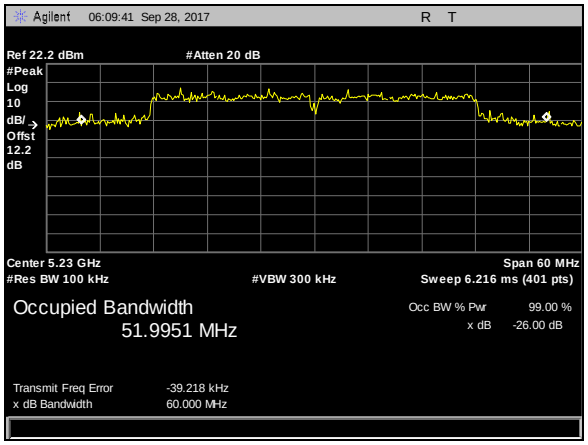
Plot 8. 26 dB Occupied Bandwidth, 20M n 5240 channel44 chain0



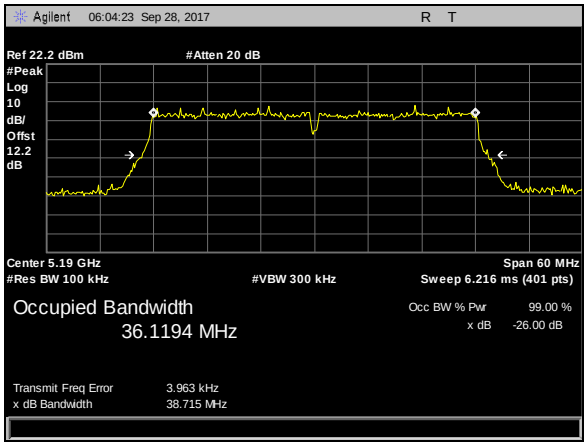
Plot 9. 26 dB Occupied Bandwidth, 20M n 5240 channel48 chain0



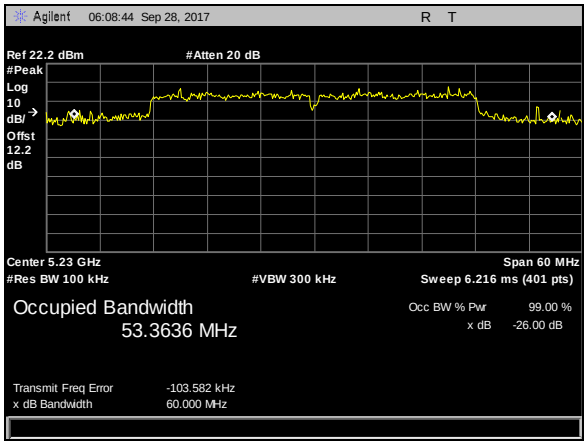
Plot 10. 26 dB Occupied Bandwidth, 40M ac 5190 channel38 chain0



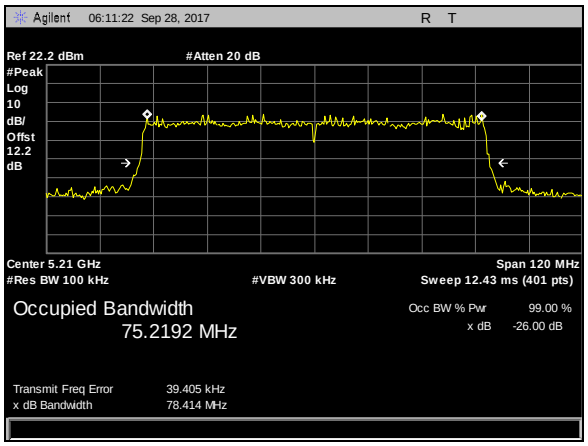
Plot 11. 26 dB Occupied Bandwidth, 40M ac 5230 channel46 chain0



Plot 12. 26 dB Occupied Bandwidth, 40M n 5190 channel38 chain0



Plot 13. 26 dB Occupied Bandwidth, 40M n 5230 channel46 chain0



Plot 14. 26 dB Occupied Bandwidth, 80M ac 5210 channel42 chain0

Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements:

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

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

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

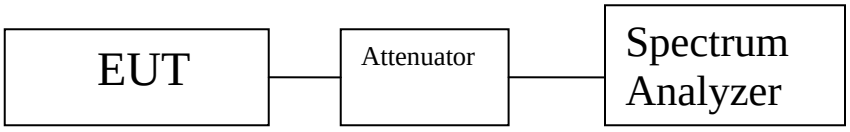
§15.407(a)(1)(iv): For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.
If transmitting antennas of directional gain greater than 6 dBi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

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

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

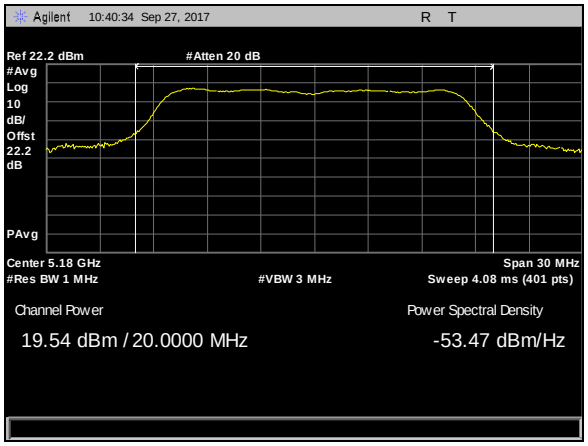
Test Engineer(s): Bradley Jones

Test Date(s): September 28, 2017

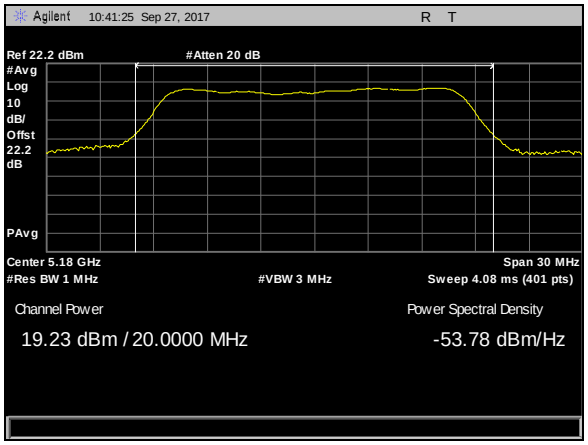


802.11a													
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power	Antenna Gain	Limit dBm	Margin	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting
5180	36	11.57	11.86	10.49	11.26	17.34	8.10	27.9	-10.56	22	25	28	28
5200	40	12.29	11.93	11.53	11.75	17.90	8.10	27.9	-10.00	22	25	28	28
5220	44	12.17	11.76	11.18	11.53	17.70	8.10	27.9	-10.20	22	25	28	28
5240	48	12.67	11.87	11.24	10.29	17.62	8.10	27.9	-10.28	22	25	28	28
802.11n HT20													
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power	Antenna Gain	Limit dBm	Margin	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting
5180	36	11.21	11.16	10.83	12.14	17.38	5.30	30	-12.62	22	25	28	28
5200	40	12.36	11.95	11.12	10.91	17.65	5.10	30	-12.35	22	25	28	28
5220	44	12.14	11.69	10.97	11.59	17.64	5.10	30	-12.36	22	25	28	28
5240	48	12.54	12.27	10.31	10.74	17.59	5.00	30	-12.41	22	25	28	28
802.11ac VHT20													
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power	Antenna Gain	Limit dBm	Margin	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting
5180	36	10.99	10.02	9.64	11.03	16.48	5.30	30	-13.52	22	25	28	28
5200	40	12.31	11.87	10.84	11.28	17.63	5.10	30	-12.37	22	25	28	28
5220	44	12.69	12.04	10.72	11.15	17.74	5.10	30	-12.26	22	25	28	28
5240	48	12.79	11.69	10.57	11.44	17.72	5.00	30	-12.28	22	25	28	28
802.11n HT40													
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power	Antenna Gain	Limit dBm	Margin	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting
5190	38	6.91	6.36	4.73	5.17	11.90	5.20	30	-18.10	15	18	21	21
5230	46	9.89	9.29	6.82	8.46	14.78	5.00	30	-15.22	15	18	21	21
802.11ac VHT40													
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power	Antenna Gain	Limit dBm	Margin	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting
5190	38	5.56	5.39	4.43	4.95	11.12	5.20	30	-18.88	16	19	22	22
5230	46	7.93	8.35	6.95	7.26	13.68	5.00	30	-16.32	16	19	22	22
802.11ac VHT80													
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power	Antenna Gain	Limit dBm	Margin	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting
5210	44	8.71	7.37	6.54	7.24	13.56	5.10	30	-16.44	14	17	20	20

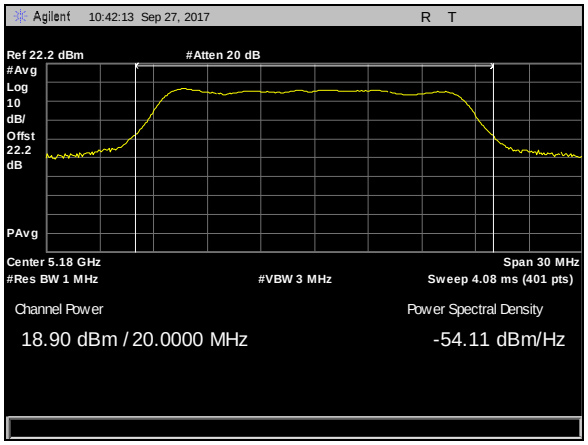
Table 8. Conducted Transmitter Power, Test Results



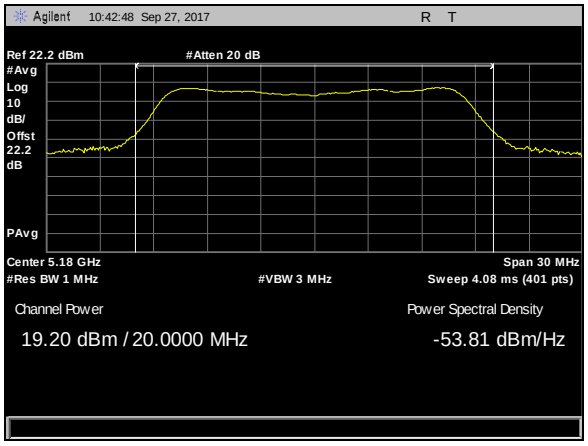
Plot 15. Conducted Transmitter Output Power, 20M a 5180 channel36 chain0



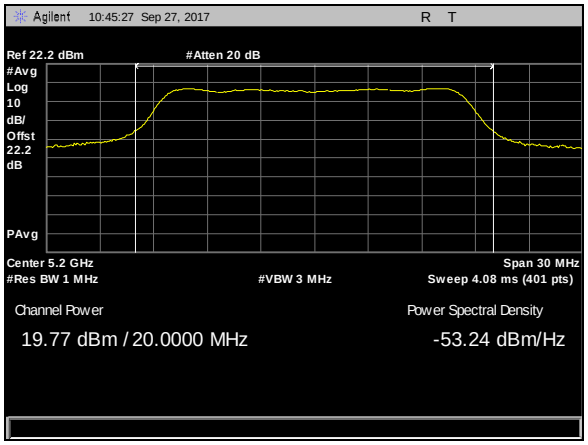
Plot 16. Conducted Transmitter Output Power, 20M a 5180 channel36 chain1



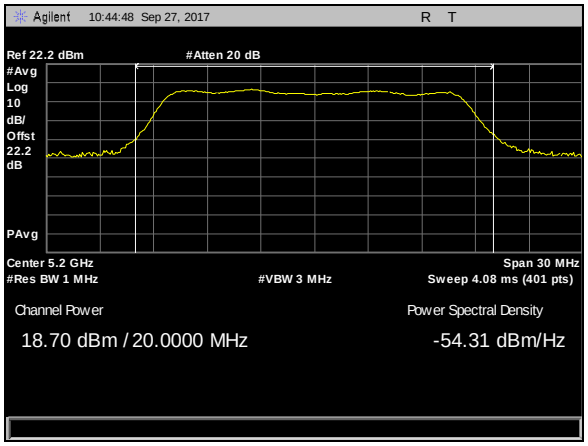
Plot 17. Conducted Transmitter Output Power, 20M a 5180 channel36 chain2



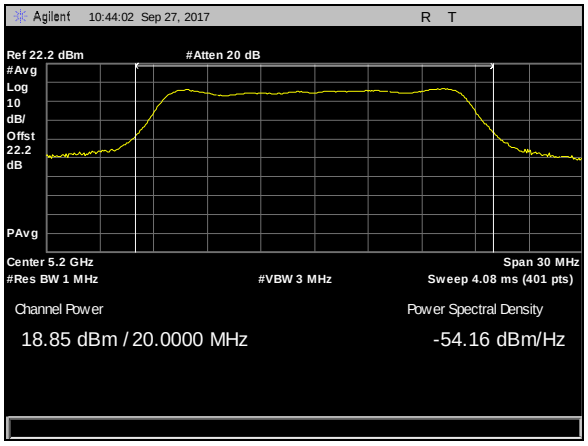
Plot 18. Conducted Transmitter Output Power, 20M a 5180 channel36 chain3



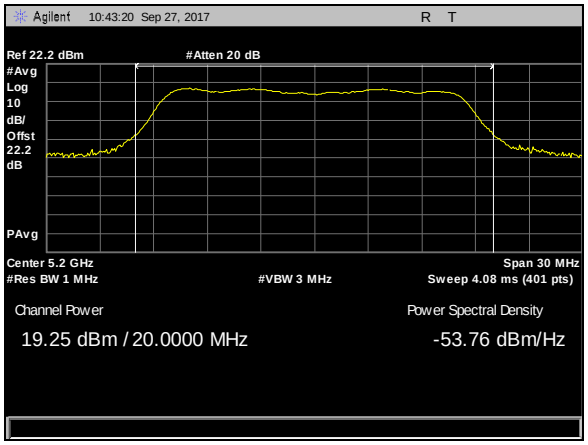
Plot 19. Conducted Transmitter Output Power, 20M a 5200 channel40 chain0



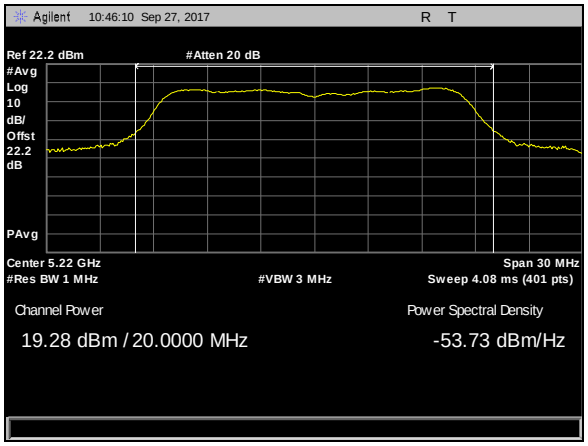
Plot 20. Conducted Transmitter Output Power, 20M a 5200 channel40 chain1



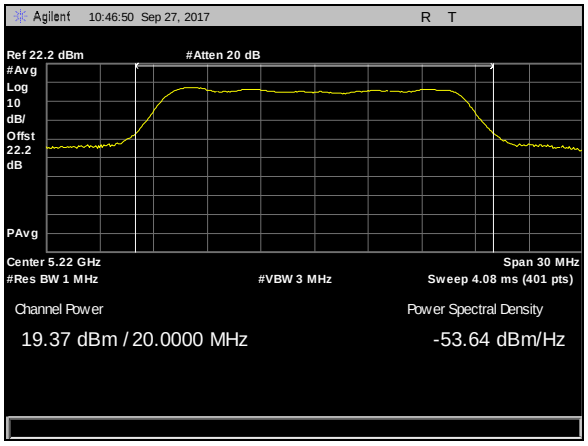
Plot 21. Conducted Transmitter Output Power, 20M a 5200 channel40 chain2



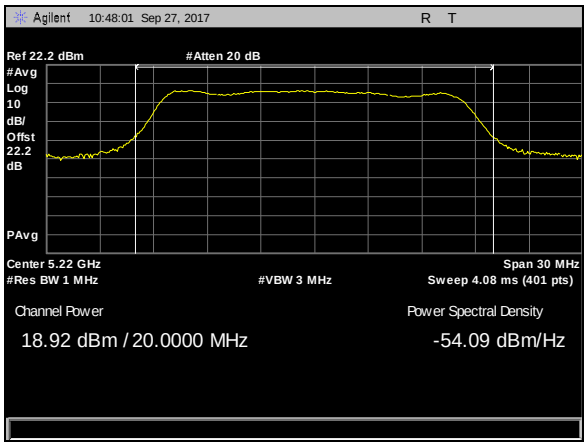
Plot 22. Conducted Transmitter Output Power, 20M a 5200 channel40 chain3



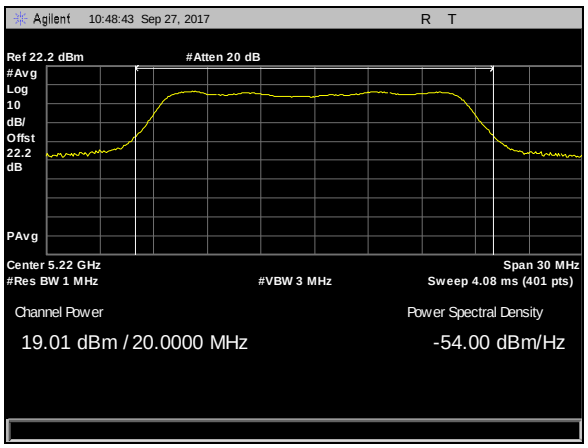
Plot 23. Conducted Transmitter Output Power, 20M a 5220 channel44 chain0



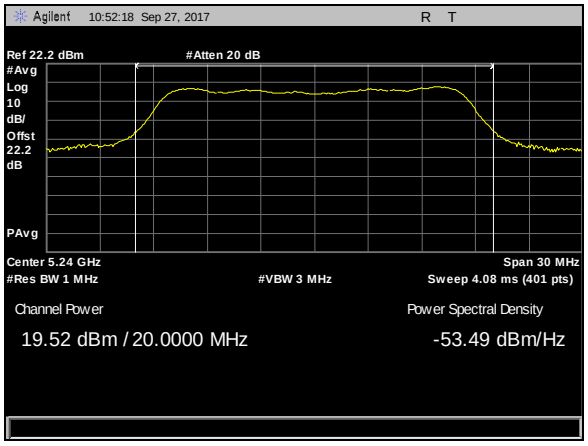
Plot 24. Conducted Transmitter Output Power, 20M a 5220 channel44 chain1



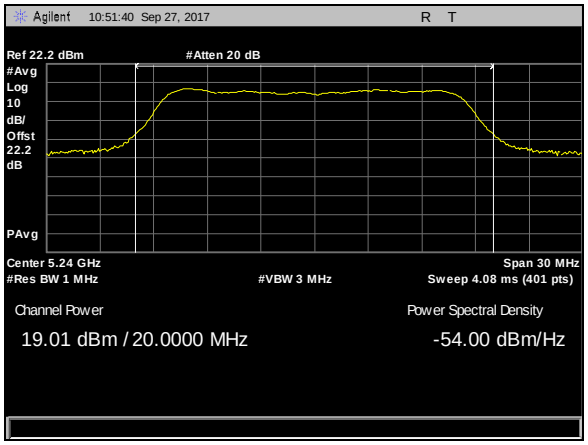
Plot 25. Conducted Transmitter Output Power, 20M a 5220 channel44 chain2



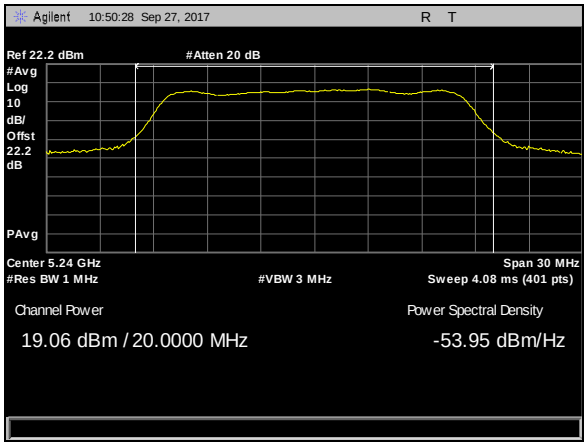
Plot 26. Conducted Transmitter Output Power, 20M a 5220 channel44 chain3



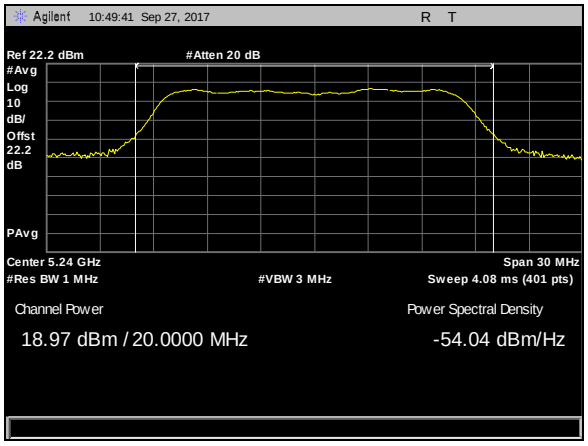
Plot 27. Conducted Transmitter Output Power, 20M a 5240 channel48 chain0



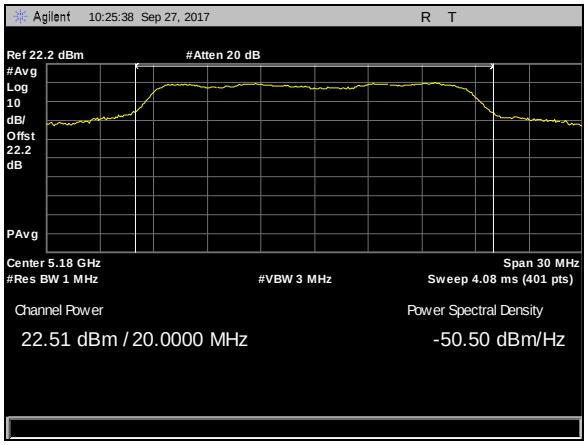
Plot 28. Conducted Transmitter Output Power, 20M a 5240 channel48 chain1



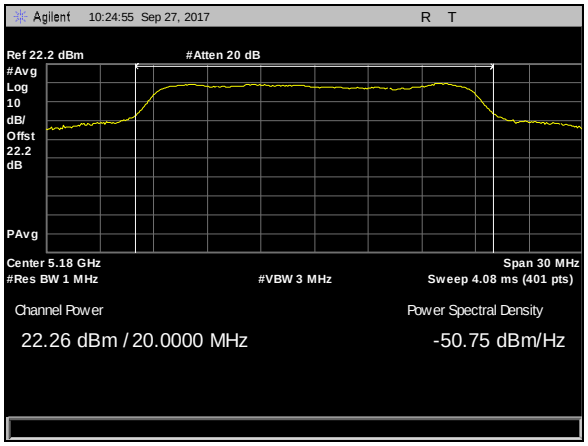
Plot 29. Conducted Transmitter Output Power, 20M a 5240 channel48 chain2



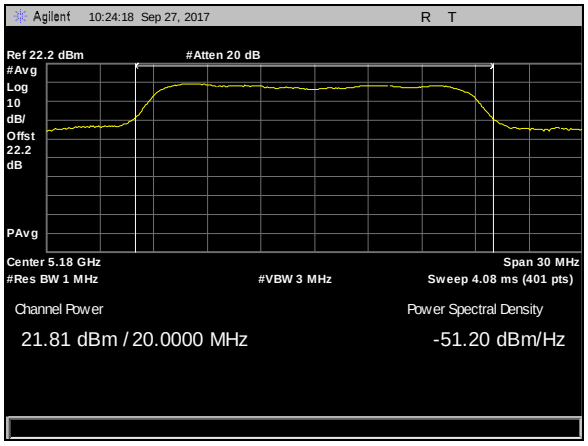
Plot 30. Conducted Transmitter Output Power, 20M a 5240 channel48 chain3



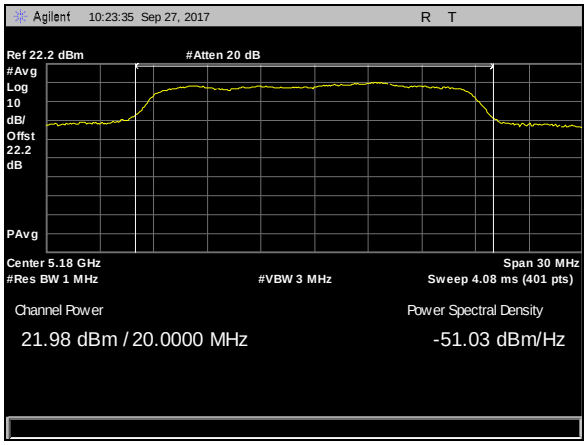
Plot 31. Conducted Transmitter Output Power, 20M ac 5180 channel36 chain0



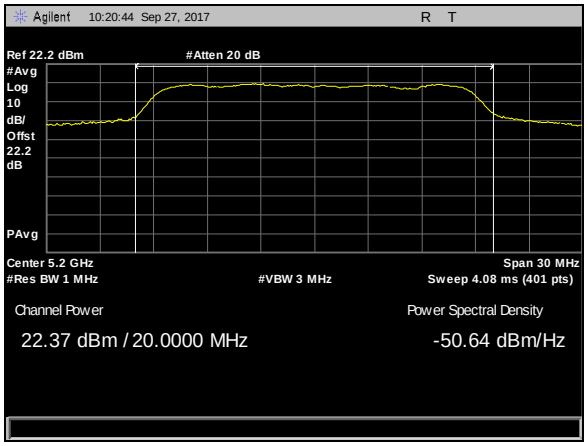
Plot 32. Conducted Transmitter Output Power, 20M ac 5180 channel36 chain1



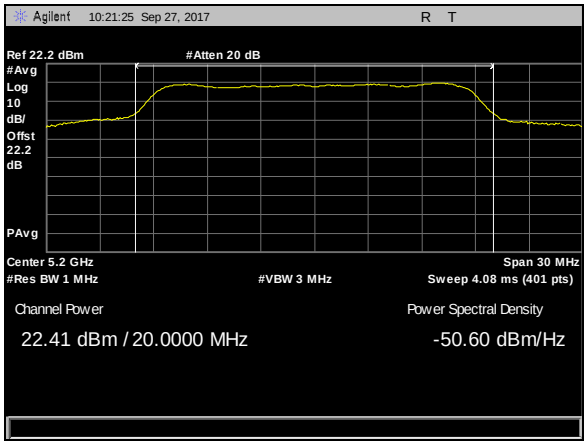
Plot 33. Conducted Transmitter Output Power, 20M ac 5180 channel36 chain2



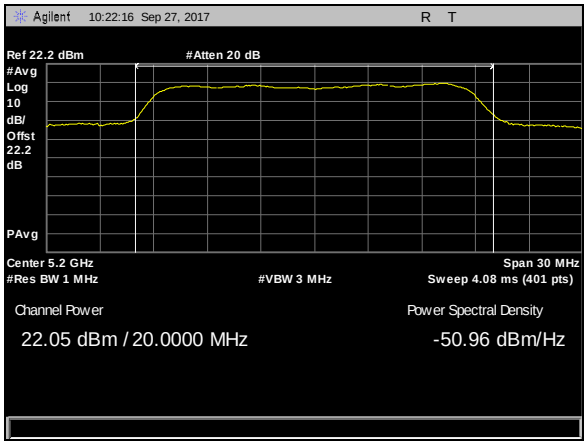
Plot 34. Conducted Transmitter Output Power, 20M ac 5180 channel36 chain3



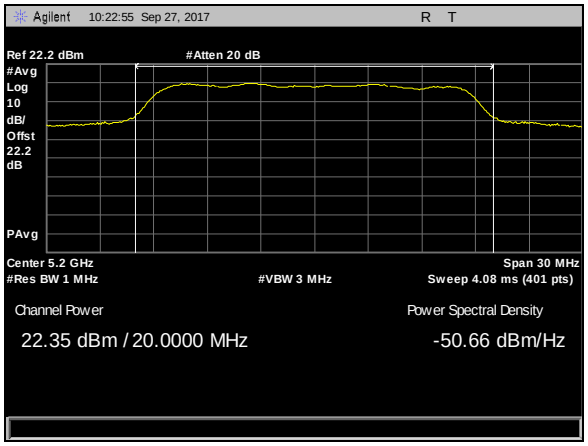
Plot 35. Conducted Transmitter Output Power, 20M ac 5200 channel40 chain0



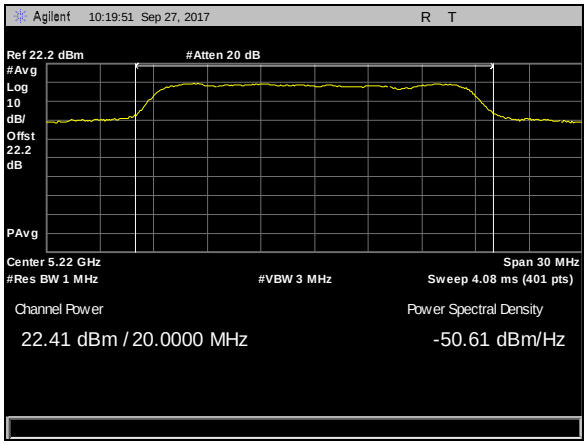
Plot 36. Conducted Transmitter Output Power, 20M ac 5200 channel40 chain1



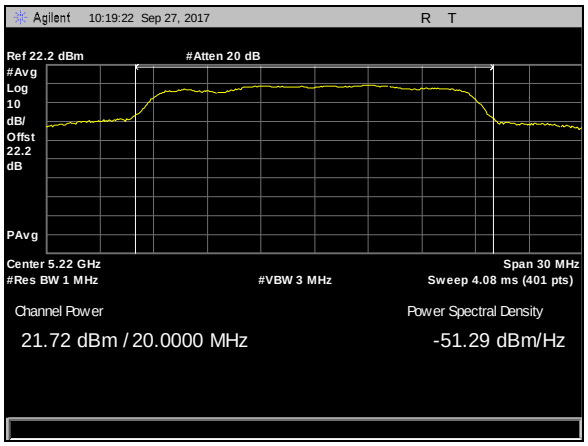
Plot 37. Conducted Transmitter Output Power, 20M ac 5200 channel40 chain2



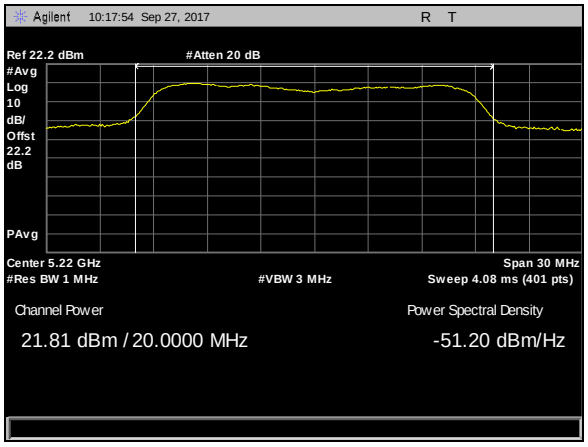
Plot 38. Conducted Transmitter Output Power, 20M ac 5200 channel40 chain3



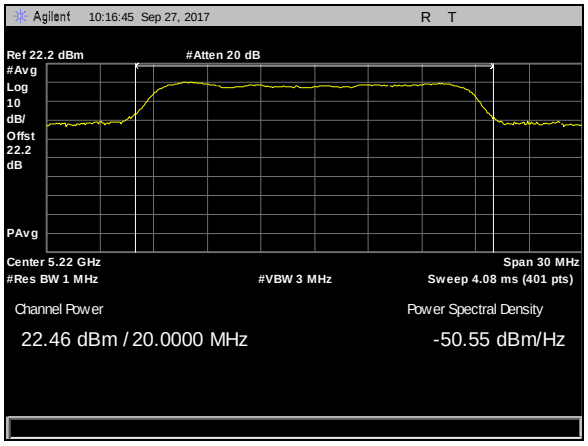
Plot 39. Conducted Transmitter Output Power, 20M ac 5220 channel44 chain0



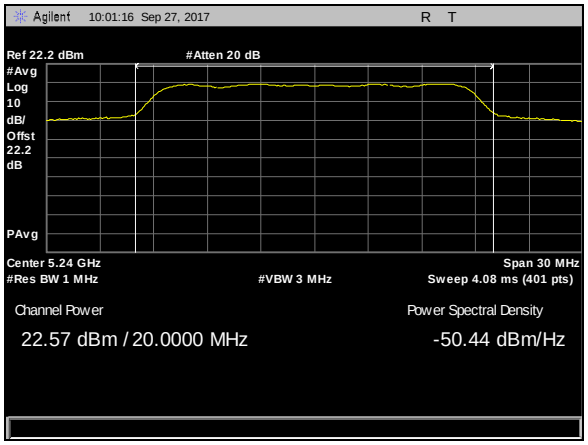
Plot 40. Conducted Transmitter Output Power, 20M ac 5220 channel44 chain1



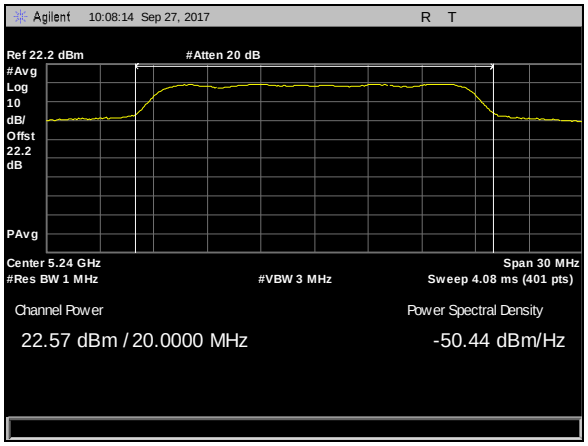
Plot 41. Conducted Transmitter Output Power, 20M ac 5220 channel44 chain2



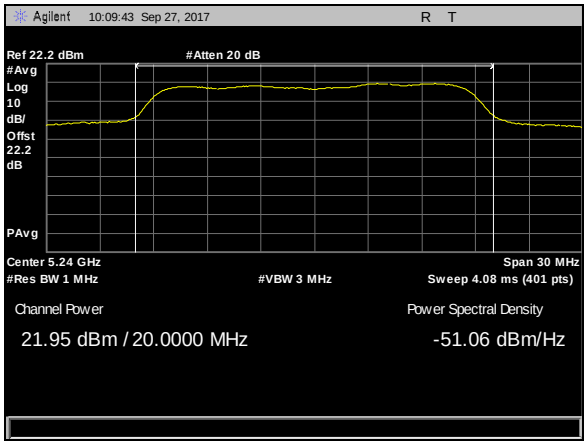
Plot 42. Conducted Transmitter Output Power, 20M ac 5220 channel44 chain3



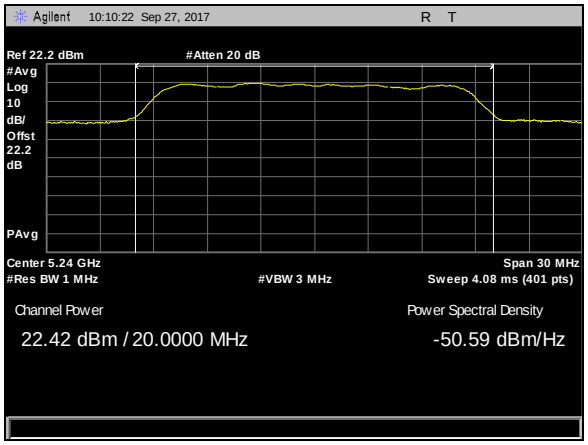
Plot 43. Conducted Transmitter Output Power, 20M ac 5240 channel48 chain0



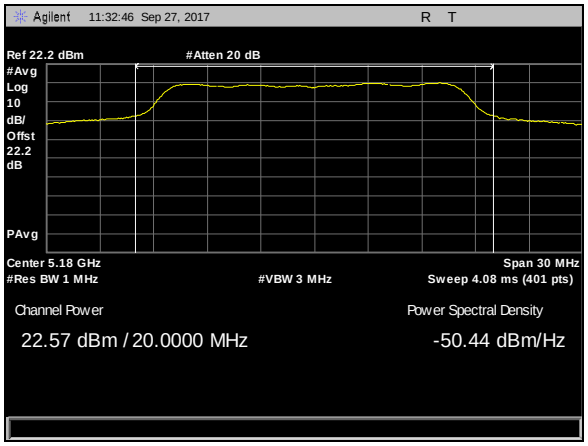
Plot 44. Conducted Transmitter Output Power, 20M ac 5240 channel48 chain1



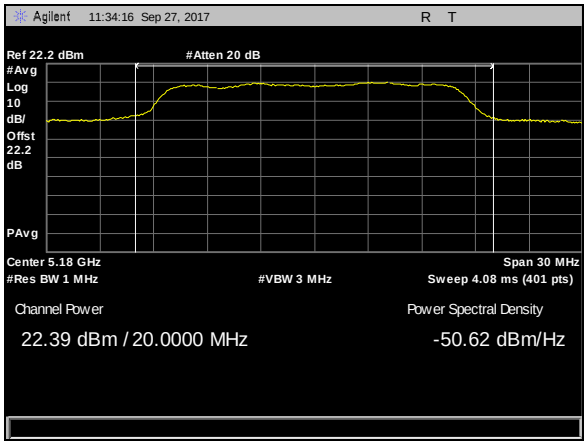
Plot 45. Conducted Transmitter Output Power, 20M ac 5240 channel48 chain2



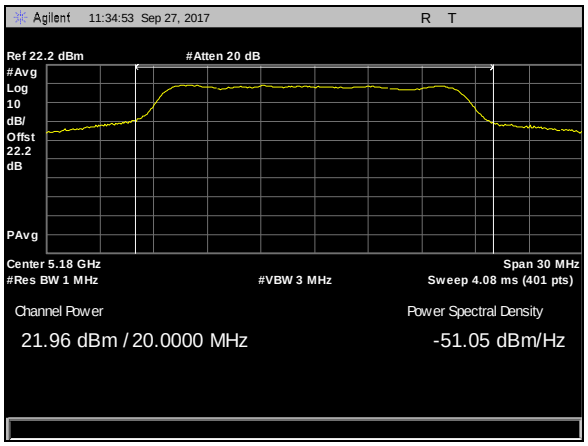
Plot 46. Conducted Transmitter Output Power, 20M ac 5240 channel48 chain3



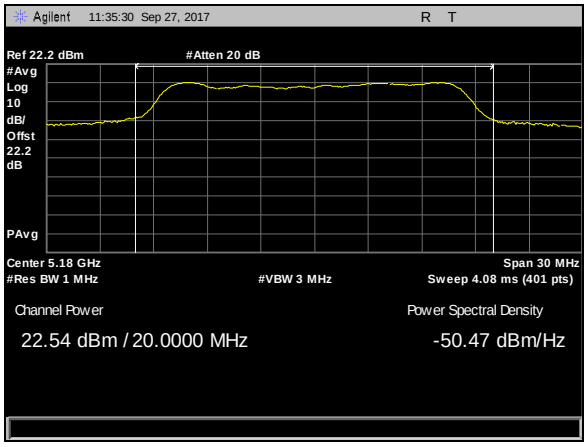
Plot 47. Conducted Transmitter Output Power, 20M n 5180 channel36 chain0



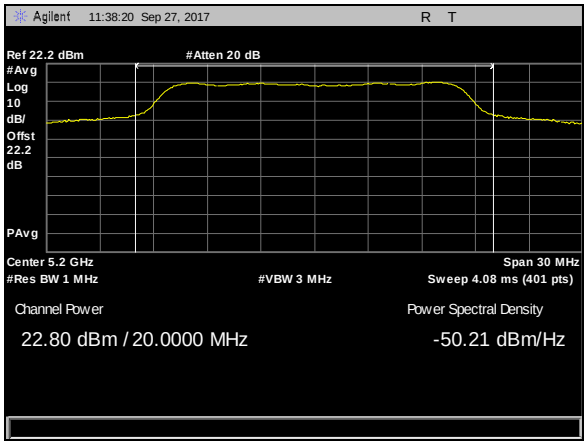
Plot 48. Conducted Transmitter Output Power, 20M n 5180 channel36 chain1



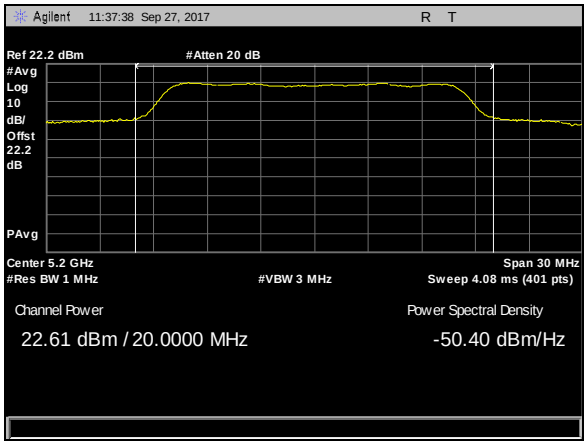
Plot 49. Conducted Transmitter Output Power, 20M n 5180 channel36 chain2



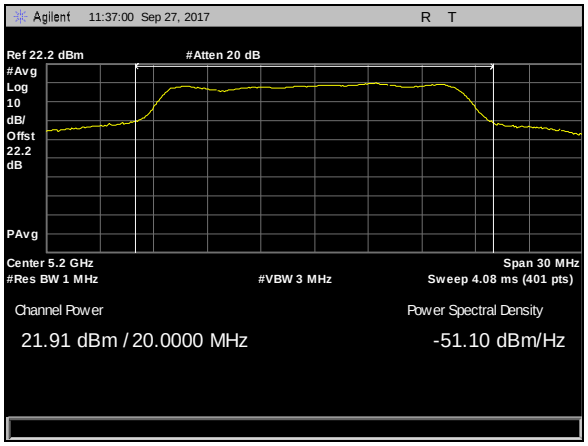
Plot 50. Conducted Transmitter Output Power, 20M n 5180 channel36 chain3



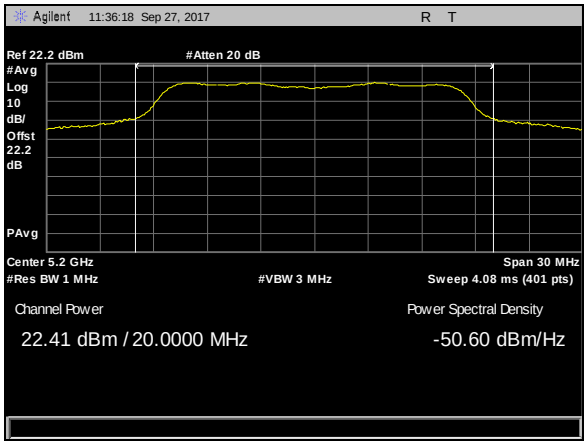
Plot 51. Conducted Transmitter Output Power, 20M n 5200 channel40 chain0



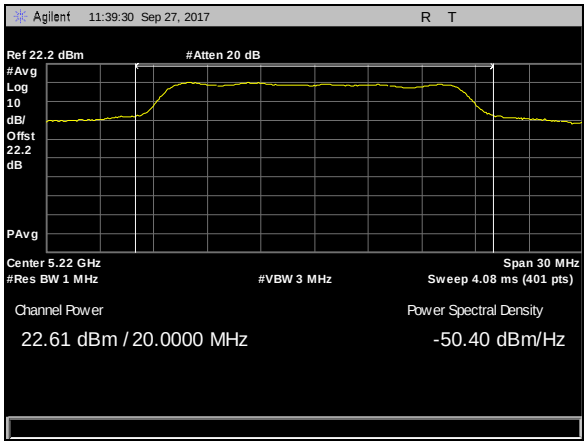
Plot 52. Conducted Transmitter Output Power, 20M n 5200 channel40 chain1



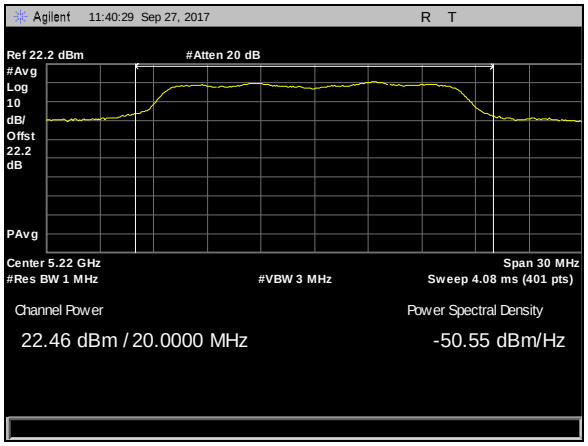
Plot 53. Conducted Transmitter Output Power, 20M n 5200 channel40 chain2



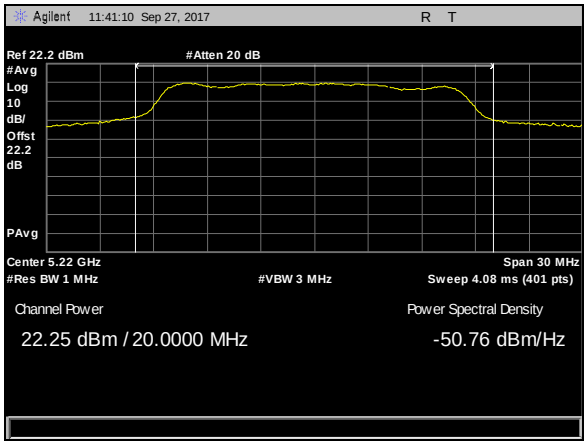
Plot 54. Conducted Transmitter Output Power, 20M n 5200 channel40 chain3



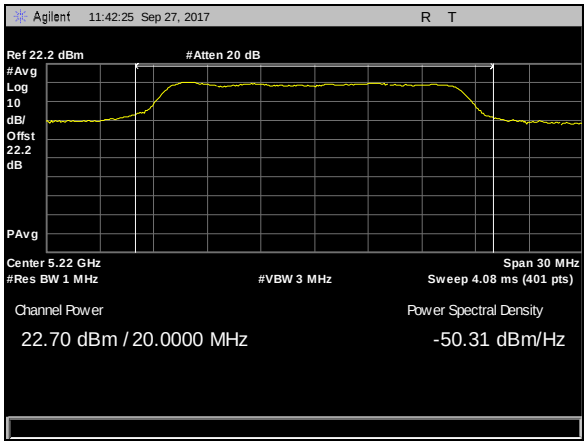
Plot 55. Conducted Transmitter Output Power, 20M n 5220 channel44 chain0



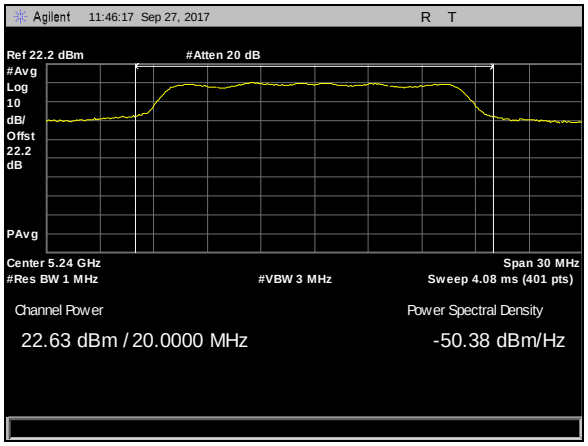
Plot 56. Conducted Transmitter Output Power, 20M n 5220 channel44 chain1



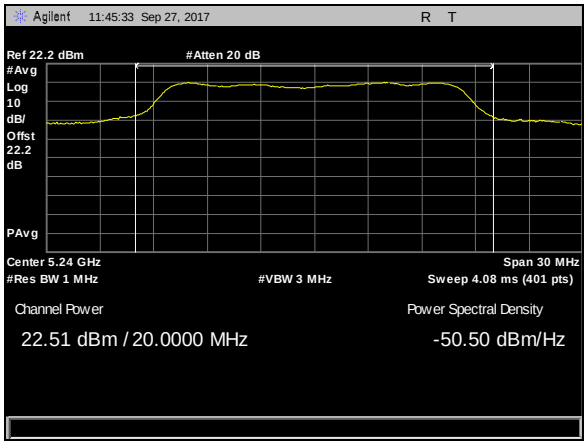
Plot 57. Conducted Transmitter Output Power, 20M n 5220 channel44 chain2



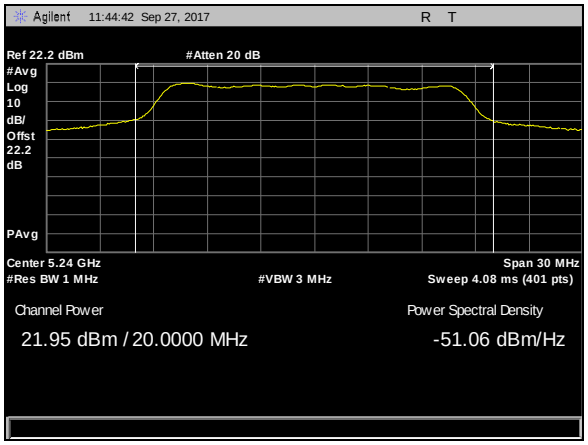
Plot 58. Conducted Transmitter Output Power, 20M n 5220 channel44 chain3



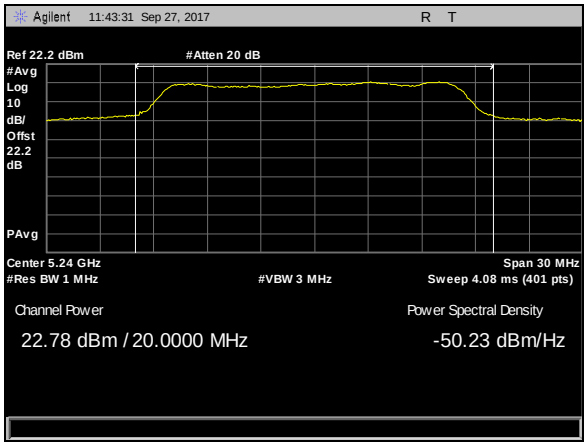
Plot 59. Conducted Transmitter Output Power, 20M n 5240 channel48 chain0



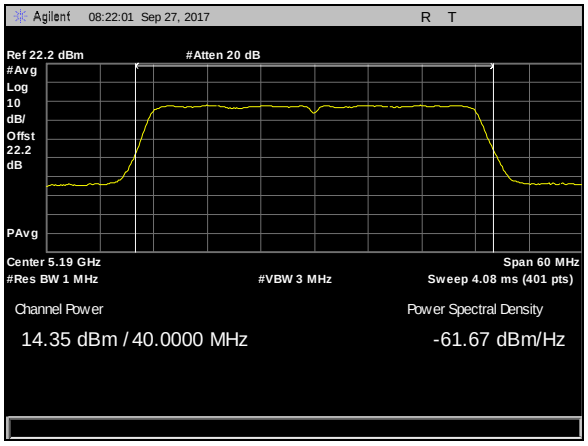
Plot 60. Conducted Transmitter Output Power, 20M n 5240 channel48 chain1



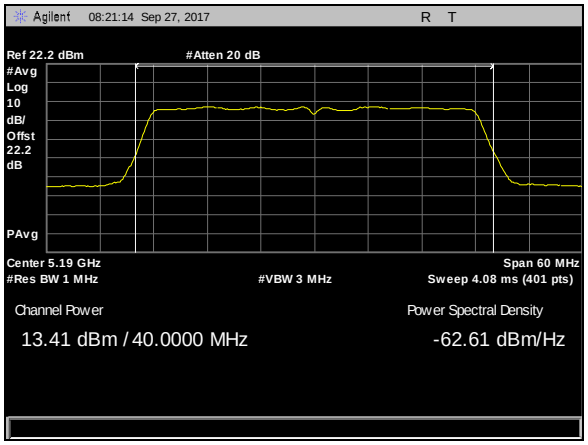
Plot 61. Conducted Transmitter Output Power, 20M n 5240 channel48 chain2



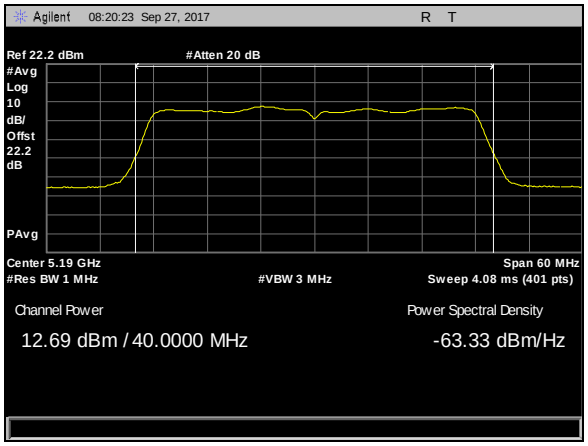
Plot 62. Conducted Transmitter Output Power, 20M n 5240 channel48 chain3



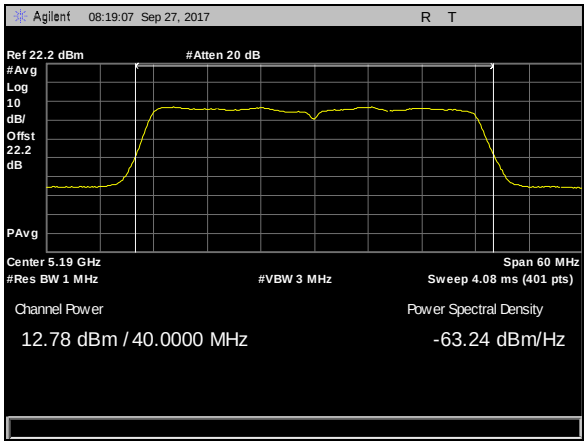
Plot 63. Conducted Transmitter Output Power, 40M ac 5190 channel38 chain0



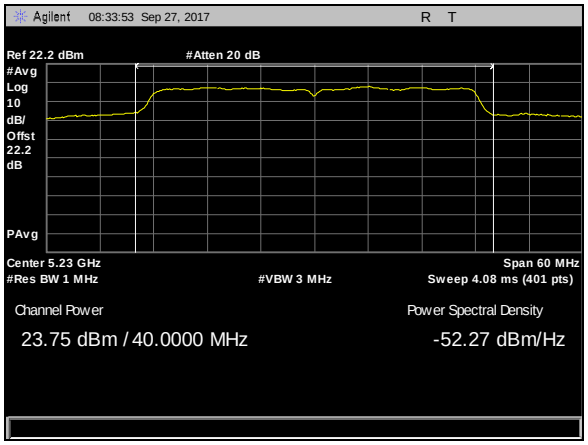
Plot 64. Conducted Transmitter Output Power, 40M ac 5190 channel38 chain1



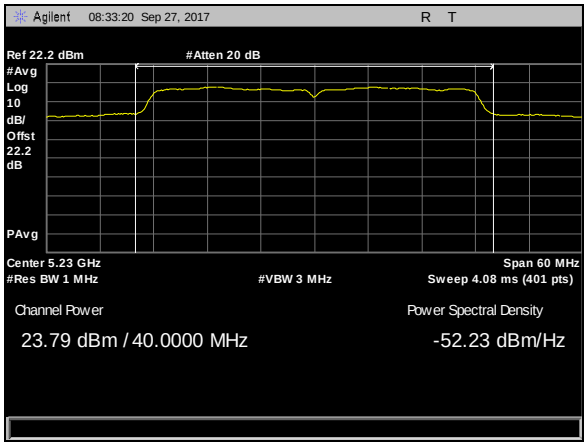
Plot 65. Conducted Transmitter Output Power, 40M ac 5190 channel38 chain2



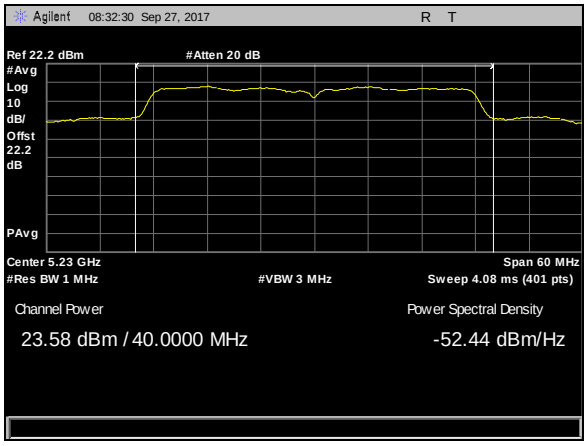
Plot 66. Conducted Transmitter Output Power, 40M ac 5190 channel38 chain3



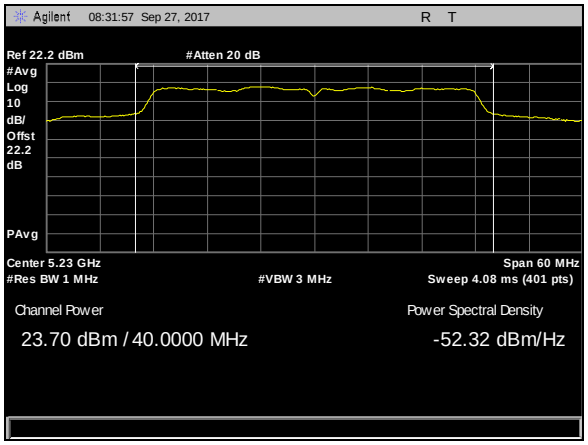
Plot 67. Conducted Transmitter Output Power, 40M ac 5230 channel46 chain0



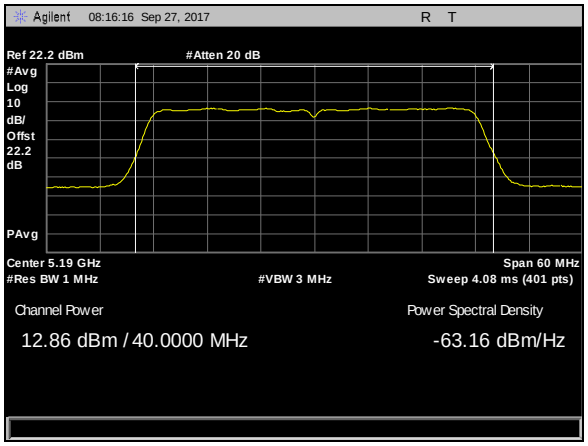
Plot 68. Conducted Transmitter Output Power, 40M ac 5230 channel46 chain1



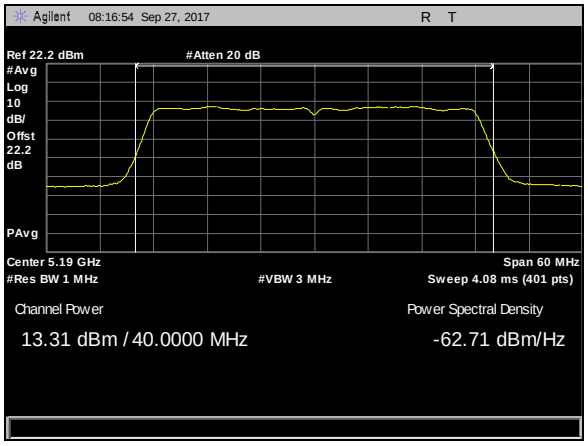
Plot 69. Conducted Transmitter Output Power, 40M ac 5230 channel46 chain2



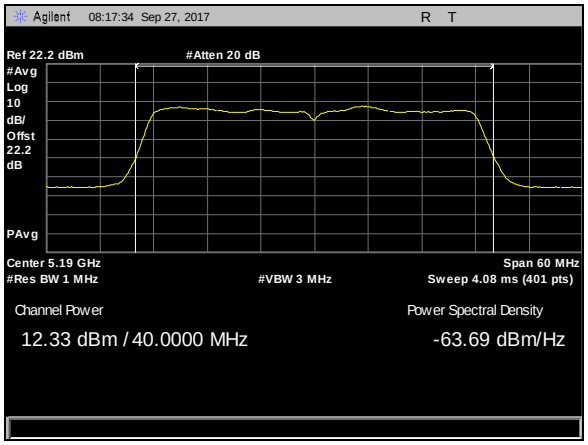
Plot 70. Conducted Transmitter Output Power, 40M ac 5230 channel46 chain3



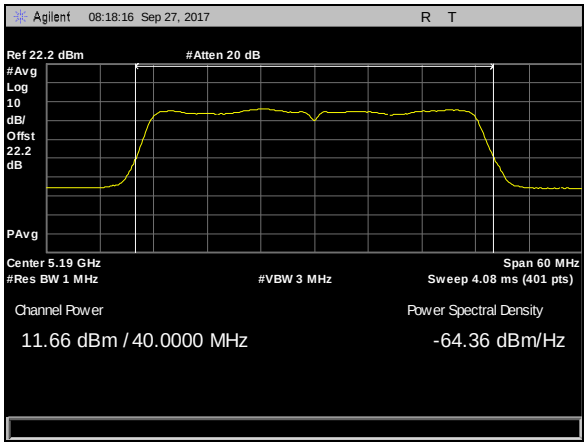
Plot 71. Conducted Transmitter Output Power, 40M n 5190 channel38 chain0



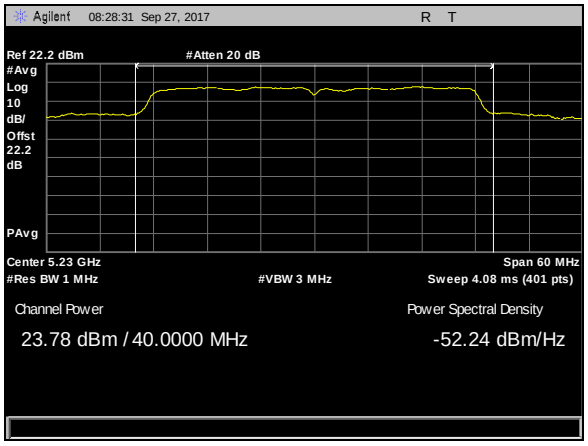
Plot 72. Conducted Transmitter Output Power, 40M n 5190 channel38 chain1



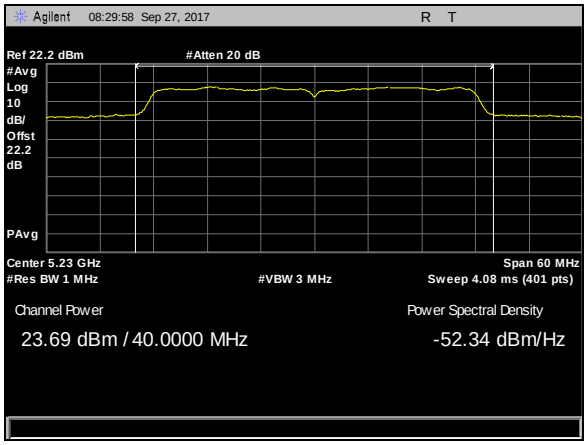
Plot 73. Conducted Transmitter Output Power, 40M n 5190 channel38 chain2



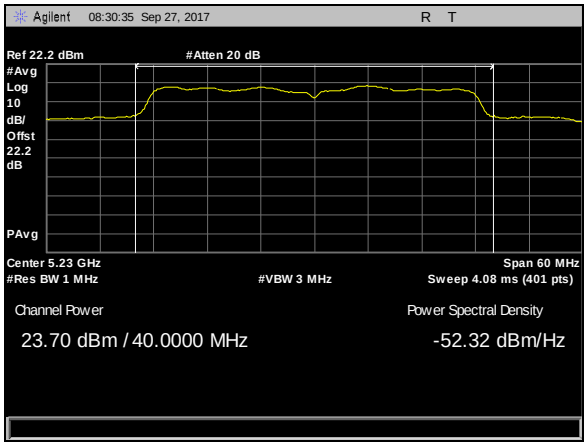
Plot 74. Conducted Transmitter Output Power, 40M n 5190 channel38 chain3



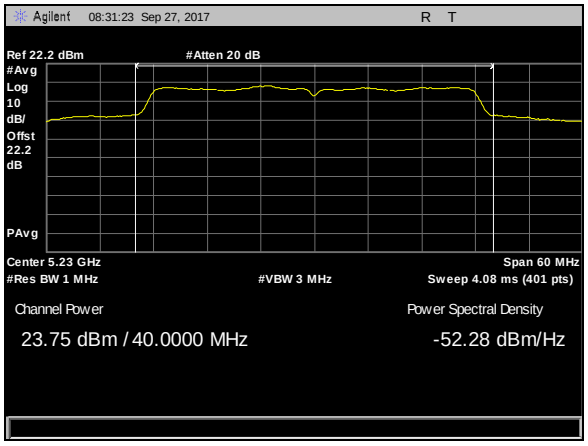
Plot 75. Conducted Transmitter Output Power, 40M n 5230 channel46 chain0



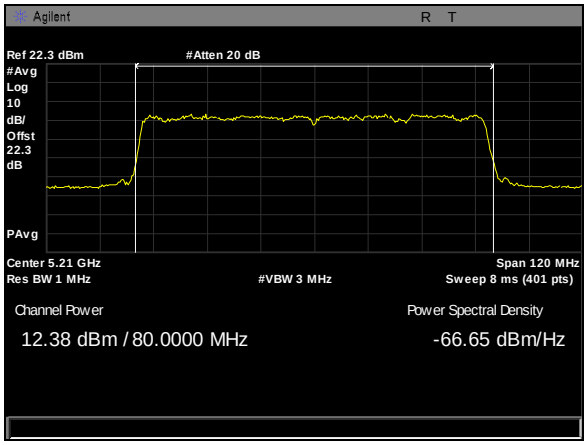
Plot 76. Conducted Transmitter Output Power, 40M n 5230 channel46 chain1



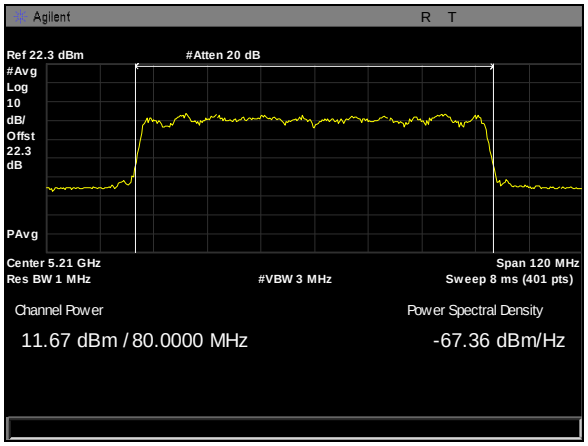
Plot 77. Conducted Transmitter Output Power, 40M n 5230 channel46 chain2



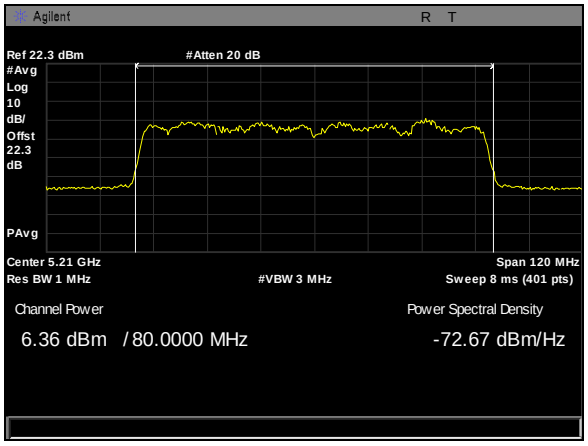
Plot 78. Conducted Transmitter Output Power, 40M n 5230 channel46 chain3



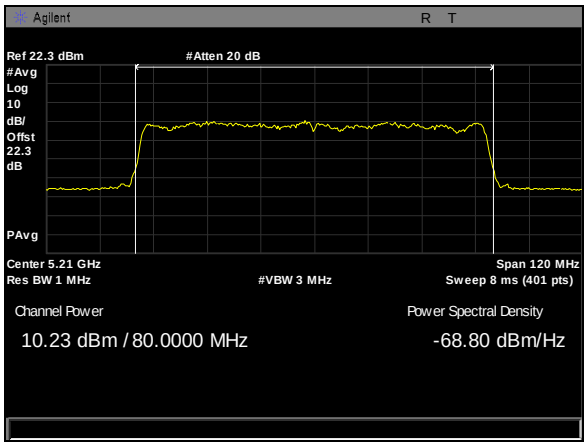
Plot 79. Conducted Transmitter Output Power, 80M ac 5210 channel42 chain0



Plot 80. Conducted Transmitter Output Power, 80M ac 5210 channel42 chain1



Plot 81. Conducted Transmitter Output Power, 80M ac 5210 channel42 chain2



Plot 82. Conducted Transmitter Output Power, 80M ac 5210 channel42 chain3

Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements:

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

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

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

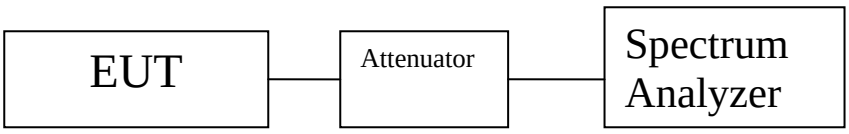
§15.407(a)(1)(iv): In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in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

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

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

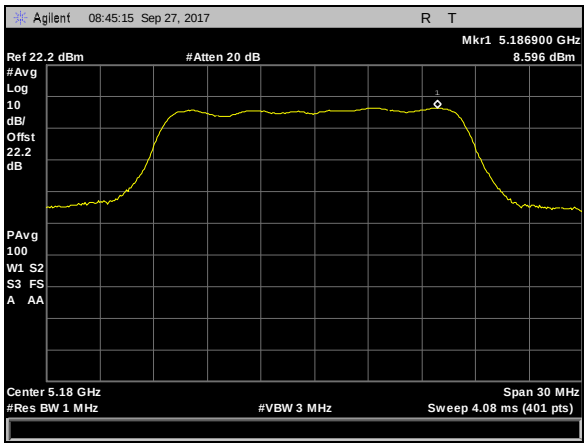
Test Engineer(s): Bradley Jones

Test Date(s): September 28, 2017

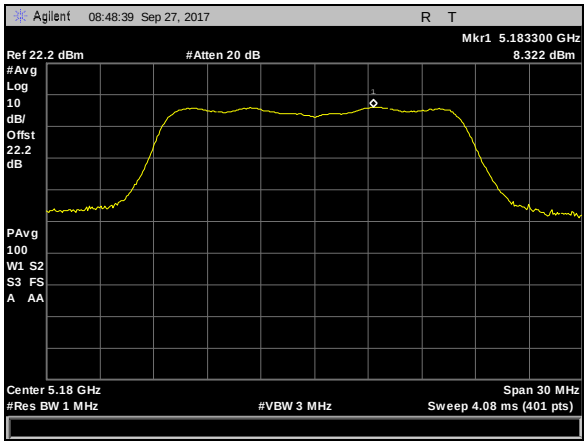


802.11a													
Frequency (MHz)	Channel (WLAN)	Antenna Gain	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting	PSD Chain 0 (dBm)	PSD Chain 1 (dBm)	PSDChain 2 (dBm)	PSD Chain 3 (dBm)	Total PSD	Limit dBm	PSD Margin
5180	36	8.10	26	27	29	29	8.596	8.322	8.78	8.511	14.58	14.90	-0.32
5200	40	8.10	27	27	29	29	8.785	8.766	8.263	8.802	14.68	14.90	-0.22
5220	44	8.10	27	27	29	29	8.576	8.602	8.494	8.434	14.55	14.90	-0.35
5240	48	8.10	26	26	30	30	8.688	8.282	8.848	8.664	14.65	14.90	-0.25
802.11n HT20													
Frequency (MHz)	Channel (WLAN)	Antenna Gain	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting	PSD Chain 0 (dBm)	PSD Chain 1 (dBm)	PSDChain 2 (dBm)	PSD Chain 3 (dBm)	Total PSD	Limit dBm	PSD Margin
5180	36	5.30	36	37	37	37	11.56	11.65	11.54	11.57	17.60	17.70	-0.10
5200	40	5.10	37	37	37	37	11.48	11.38	11.82	11.45	17.56	17.90	-0.34
5220	44	5.10	37	38	38	39	11.43	11.52	11.87	11.85	17.69	17.90	-0.21
5240	48	5.00	37	37	38	40	11.69	11.93	11.96	11.84	17.88	18.00	-0.12
802.11ac VHT20													
Frequency (MHz)	Channel (WLAN)	Antenna Gain	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting	PSD Chain 0 (dBm)	PSD Chain 1 (dBm)	PSDChain 2 (dBm)	PSD Chain 3 (dBm)	Total PSD	Limit dBm	PSD Margin
5180	36	5.30	36	37	37	37	11.65	11.2	11.69	11.56	17.55	17.70	-0.15
5200	40	5.10	36	36	37	37	11.42	11.11	11.63	11.71	17.49	17.90	-0.41
5220	44	5.10	36	36	37	38	11.75	11.34	11.11	11.49	17.45	17.90	-0.45
5240	48	5.00	37	37	39	39	11.67	11.92	11.57	11.56	17.70	18.00	-0.30
802.11n HT40													
Frequency (MHz)	Channel (WLAN)	Antenna Gain	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting	PSD Chain 0 (dBm)	PSD Chain 1 (dBm)	PSDChain 2 (dBm)	PSD Chain 3 (dBm)	Total PSD	Limit dBm	PSD Margin
5190	38	5.20	15	15	15	15	-1.669	-0.844	-0.322	-0.98	5.09	17.80	-12.71
5230	46	5.00	45	45	45	45	9.114	9.68	9.978	10	15.73	18.00	-2.27
802.11ac VHT40													
Frequency (MHz)	Channel (WLAN)	Antenna Gain	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting	PSD Chain 0 (dBm)	PSD Chain 1 (dBm)	PSDChain 2 (dBm)	PSD Chain 3 (dBm)	Total PSD	Limit dBm	PSD Margin
5190	38	5.20	16	16	16	16	1.1	-0.488	0.799	-0.608	6.29	17.80	-11.51
5230	46	5.00	45	45	45	45	9.509	9.086	9.476	8.628	15.21	18.00	-2.79
802.11ac VHT80													
Frequency (MHz)	Channel (WLAN)	Antenna Gain	POW 0 setting	POW 1 setting	POW 2 setting	POW 3 setting	PSD Chain 0 (dBm)	PSD Chain 1 (dBm)	PSDChain 2 (dBm)	PSD Chain 3 (dBm)	Total PSD	Limit dBm	PSD Margin
5210	42	5.10	14	14	14	14	-4.376	-5.745	-7.267	-6.736	0.13	17.90	-17.77

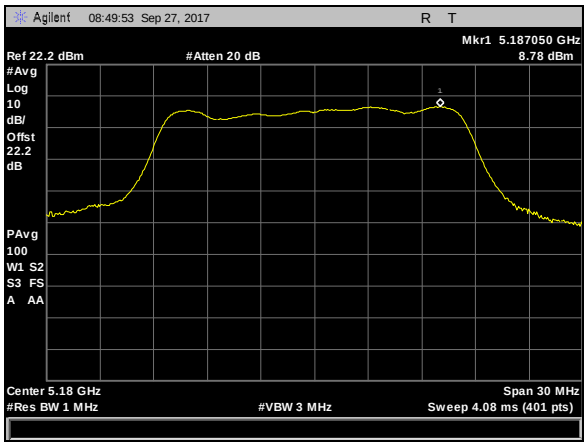
Table 9. Maximum Power Spectral Density, Test Results



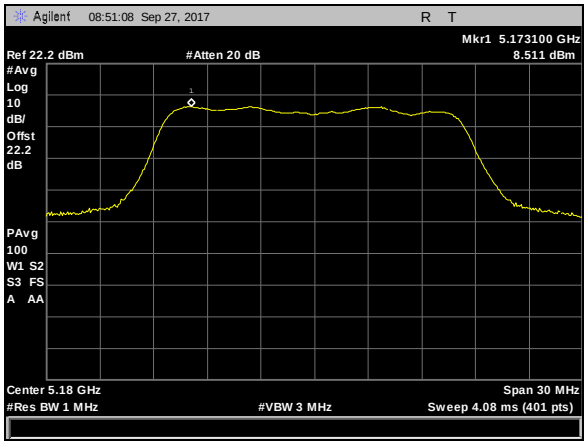
Plot 83. Power Spectral Density, 20M a 5180 channel36 chain0



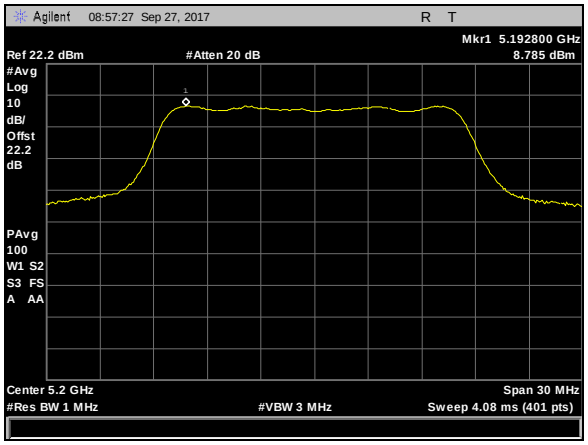
Plot 84. Power Spectral Density, 20M a 5180 channel36 chain1



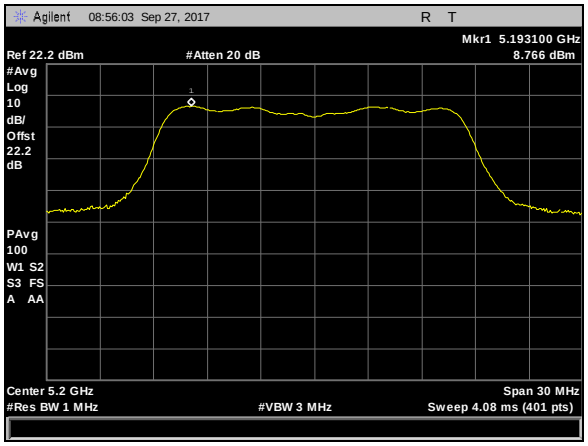
Plot 85. Power Spectral Density, 20M a 5180 channel36 chain2



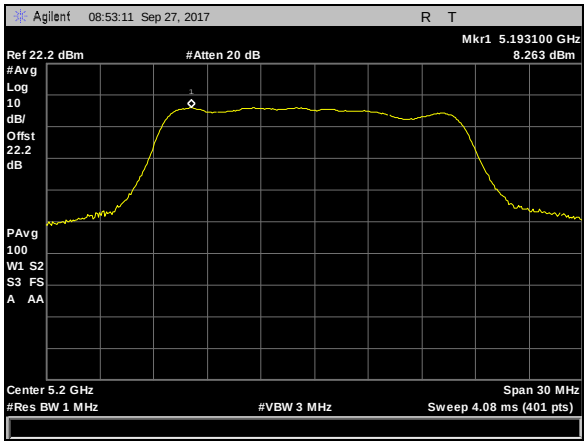
Plot 86. Power Spectral Density, 20M a 5180 channel36 chain3



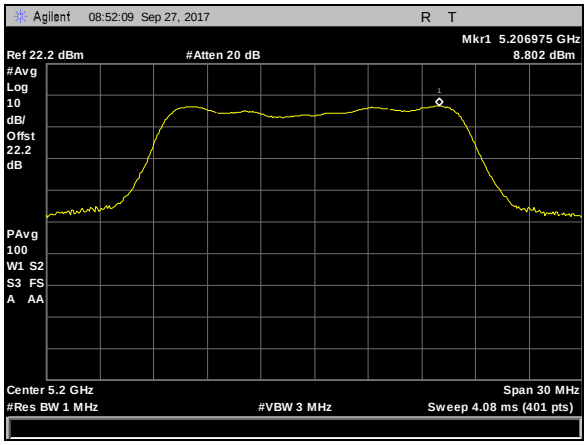
Plot 87. Power Spectral Density, 20M a 5200 channel40 chain0



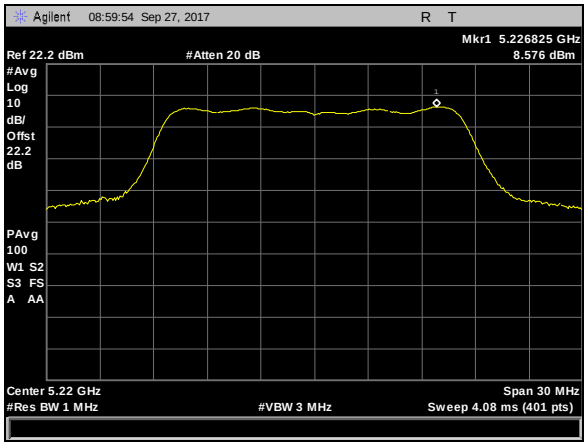
Plot 88. Power Spectral Density, 20M a 5200 channel40 chain1



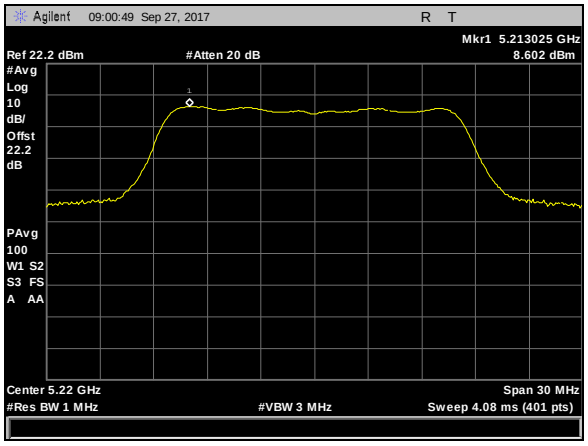
Plot 89. Power Spectral Density, 20M a 5200 channel40 chain2



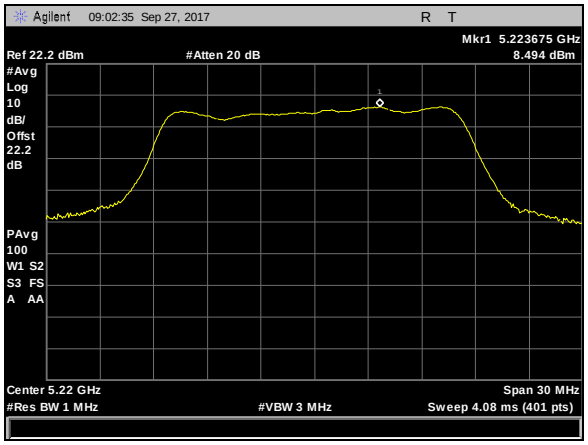
Plot 90. Power Spectral Density, 20M a 5200 channel40 chain3



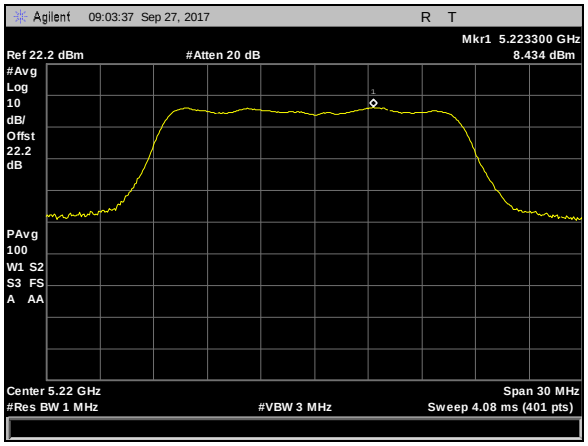
Plot 91. Power Spectral Density, 20M a 5220 channel44 chain0



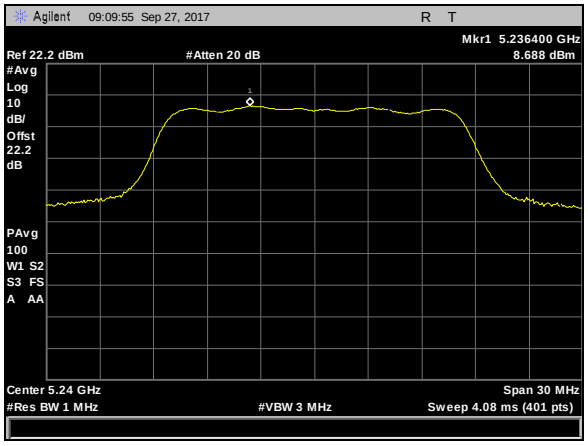
Plot 92. Power Spectral Density, 20M a 5220 channel44 chain1



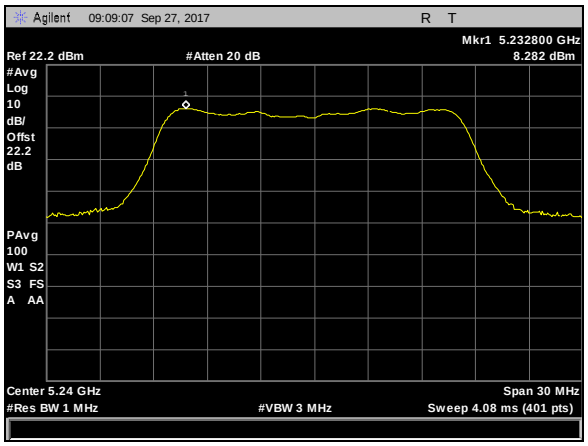
Plot 93. Power Spectral Density, 20M a 5220 channel44 chain2



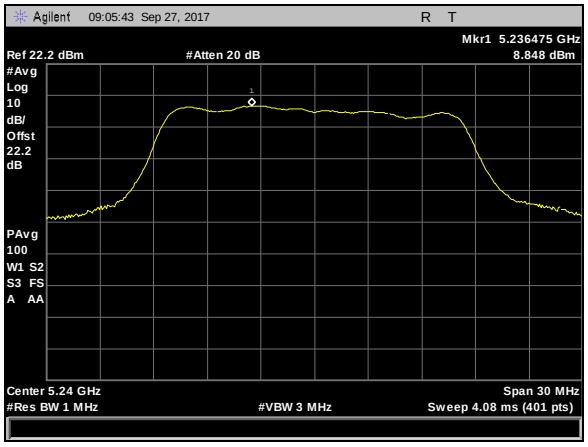
Plot 94. Power Spectral Density, 20M a 5220 channel44 chain3



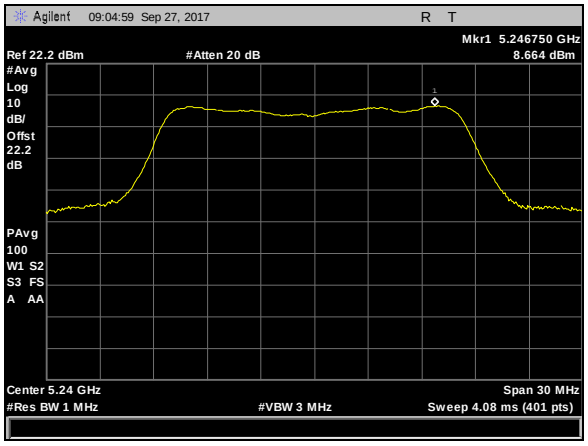
Plot 95. Power Spectral Density, 20M a 5240 channel48 chain0



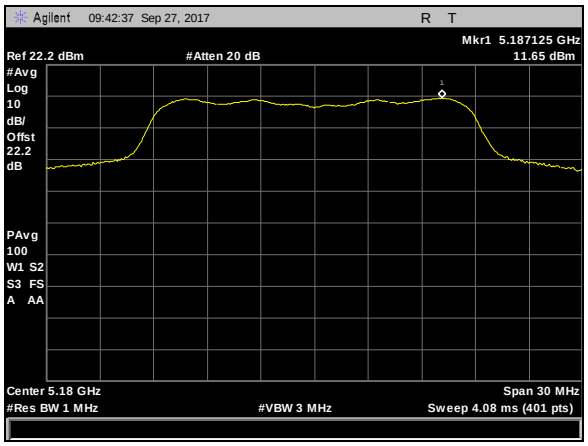
Plot 96. Power Spectral Density, 20M a 5240 channel48 chain1



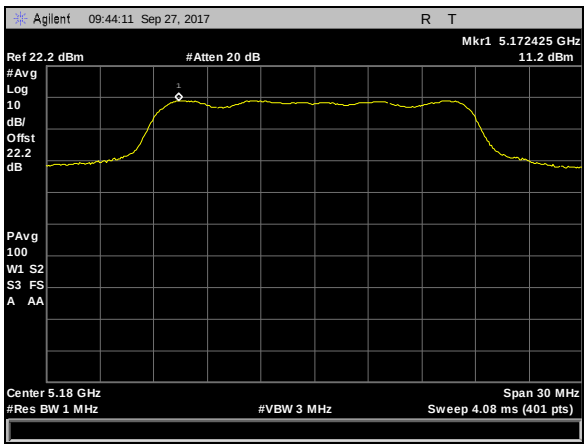
Plot 97. Power Spectral Density, 20M a 5240 channel48 chain2



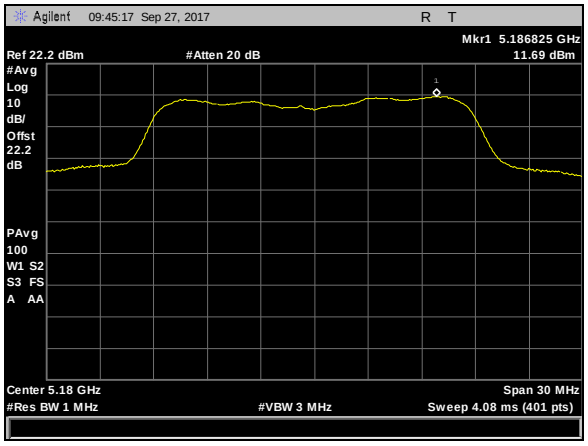
Plot 98. Power Spectral Density, 20M a 5240 channel48 chain3



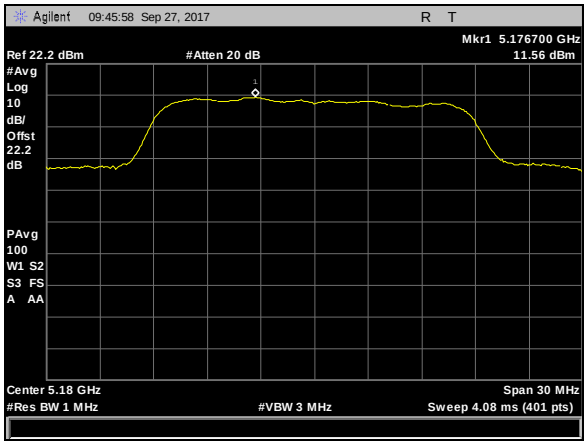
Plot 99. Power Spectral Density, 20M ac 5180 channel36 chain0



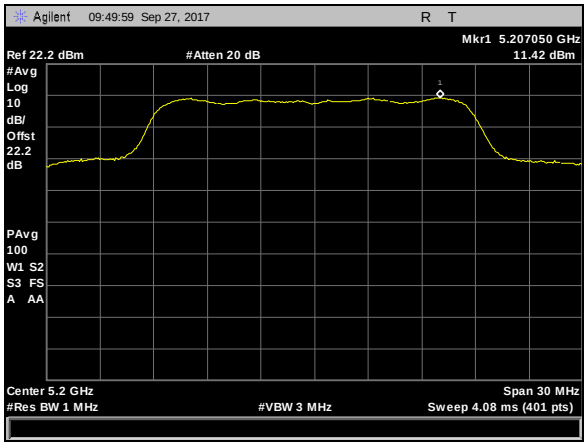
Plot 100. Power Spectral Density, 20M ac 5180 channel36 chain1



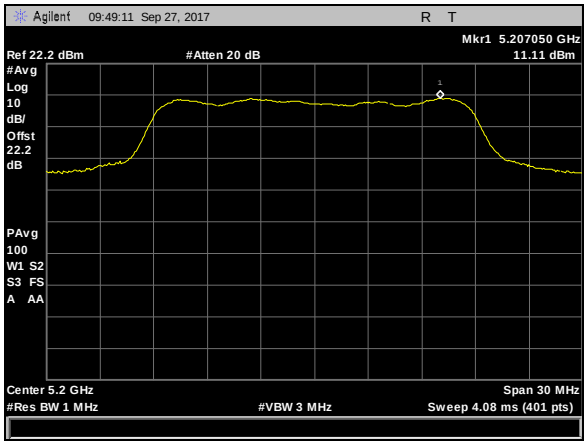
Plot 101. Power Spectral Density, 20M ac 5180 channel36 chain2



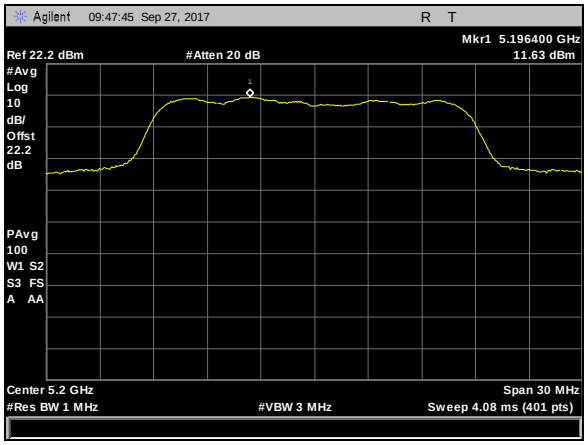
Plot 102. Power Spectral Density, 20M ac 5180 channel36 chain3



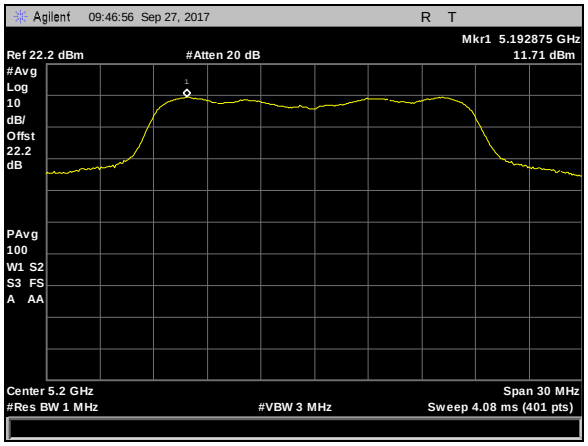
Plot 103. Power Spectral Density, 20M ac 5200 channel40 chain0



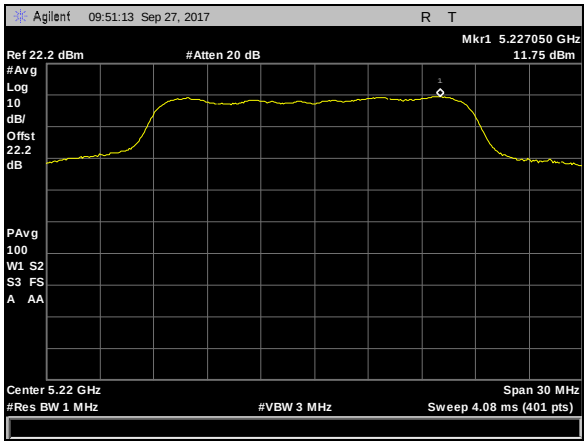
Plot 104. Power Spectral Density, 20M ac 5200 channel40 chain1



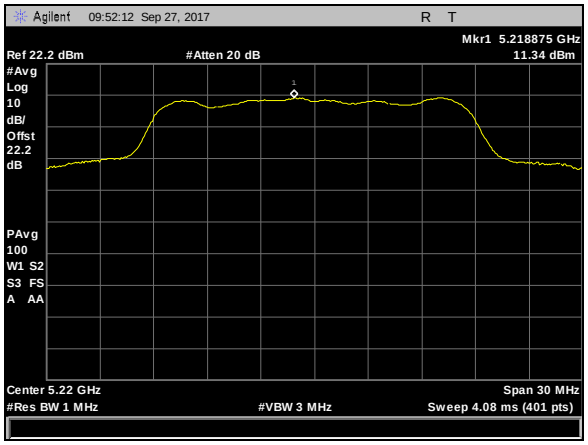
Plot 105. Power Spectral Density, 20M ac 5200 channel40 chain2



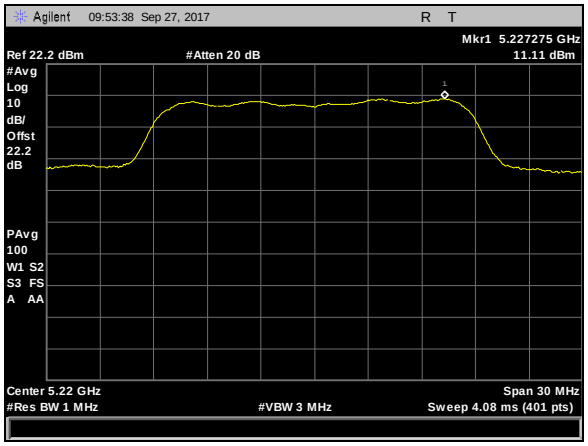
Plot 106. Power Spectral Density, 20M ac 5200 channel40 chain3



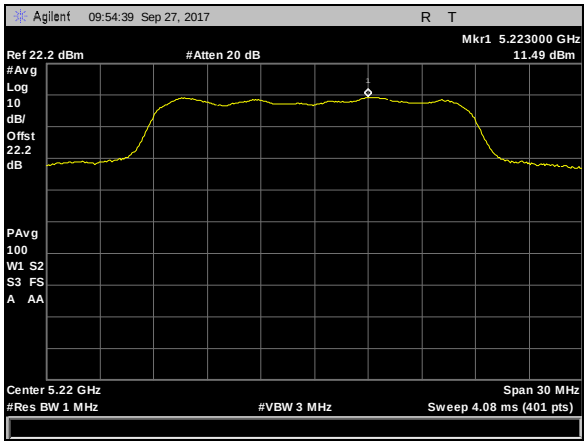
Plot 107. Power Spectral Density, 20M ac 5220 channel44 chain0



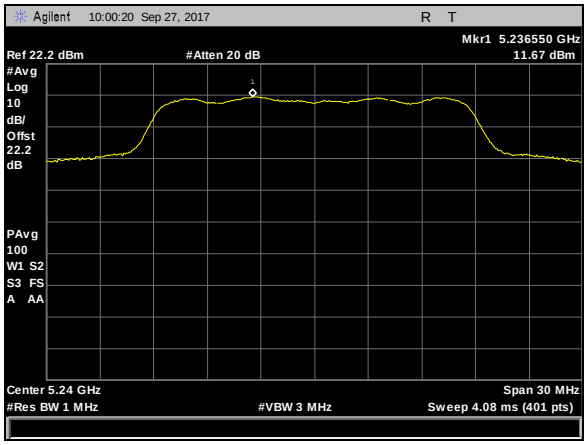
Plot 108. Power Spectral Density, 20M ac 5220 channel44 chain1



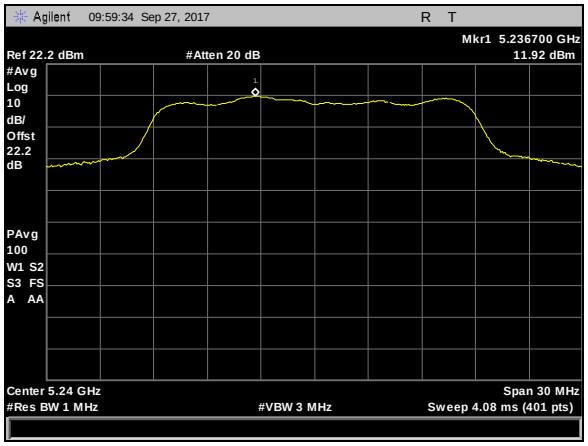
Plot 109. Power Spectral Density, 20M ac 5220 channel44 chain2



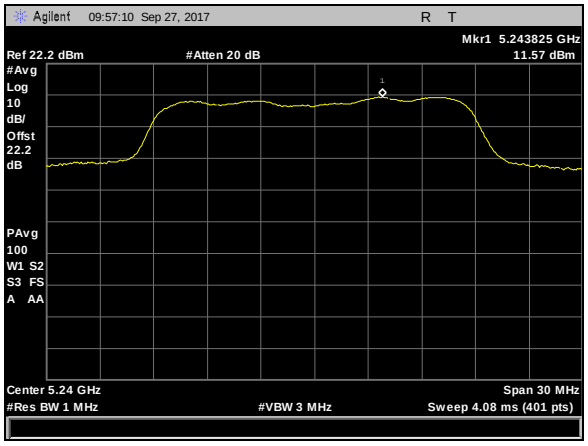
Plot 110. Power Spectral Density, 20M ac 5220 channel44 chain3



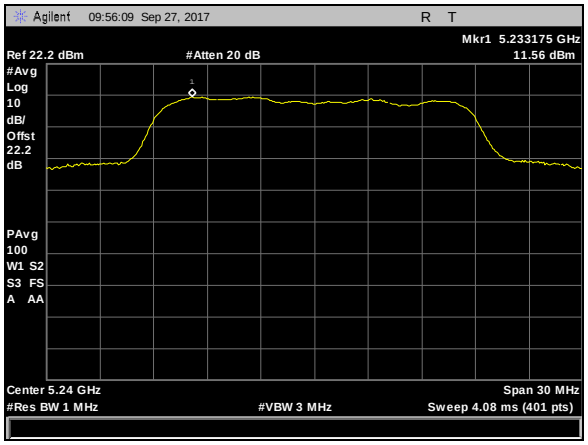
Plot 111. Power Spectral Density, 20M ac 5240 channel48 chain0



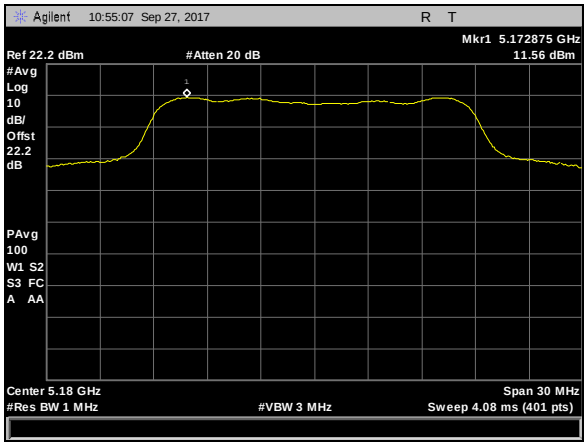
Plot 112. Power Spectral Density, 20M ac 5240 channel48 chain1



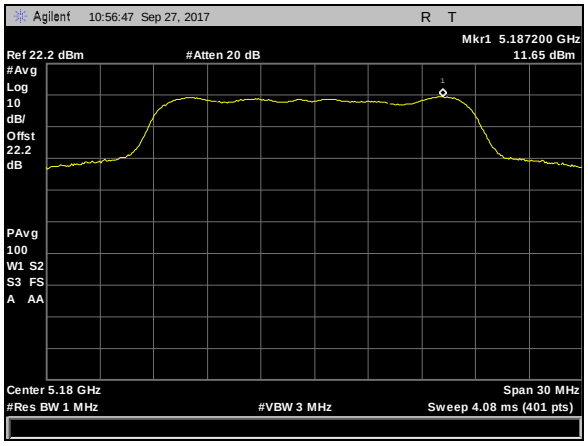
Plot 113. Power Spectral Density, 20M ac 5240 channel48 chain2



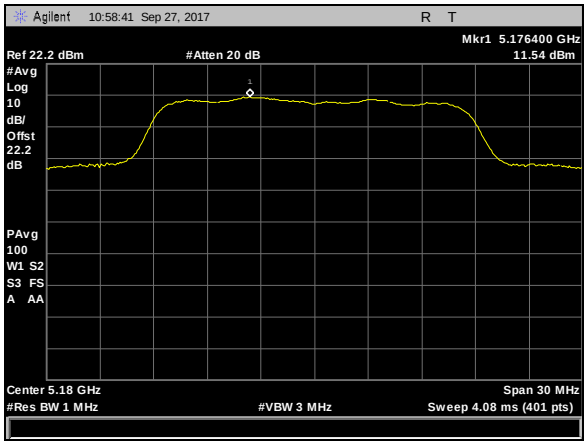
Plot 114. Power Spectral Density, 20M ac 5240 channel48 chain3



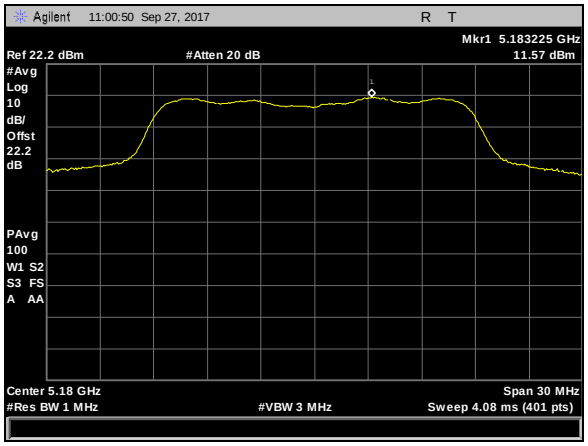
Plot 115. Power Spectral Density, 20M n 5180 channel36 chain0



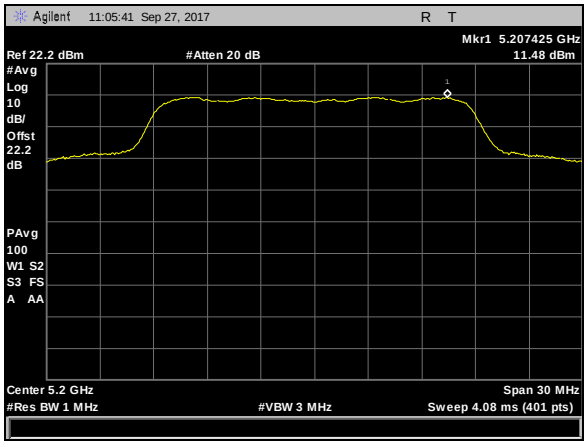
Plot 116. Power Spectral Density, 20M n 5180 channel36 chain1



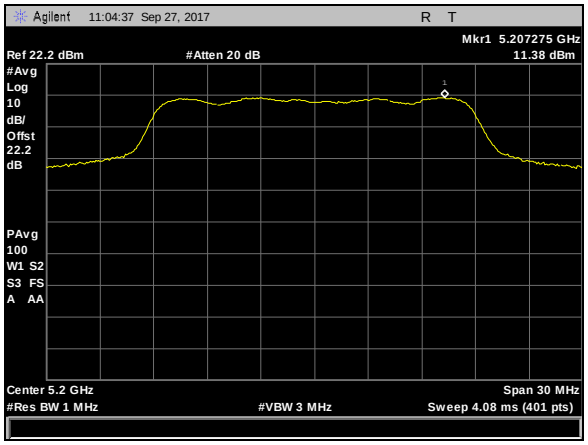
Plot 117. Power Spectral Density, 20M n 5180 channel36 chain2



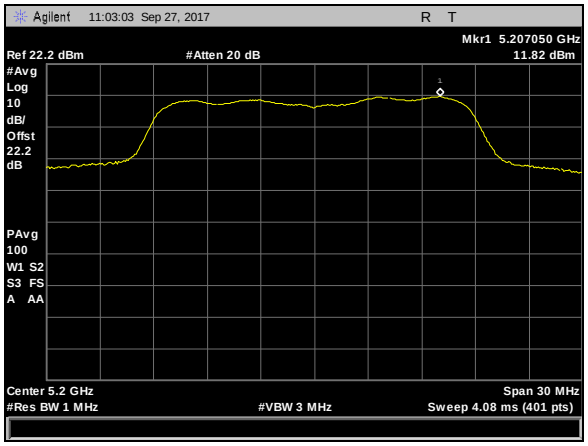
Plot 118. Power Spectral Density, 20M n 5180 channel36 chain3



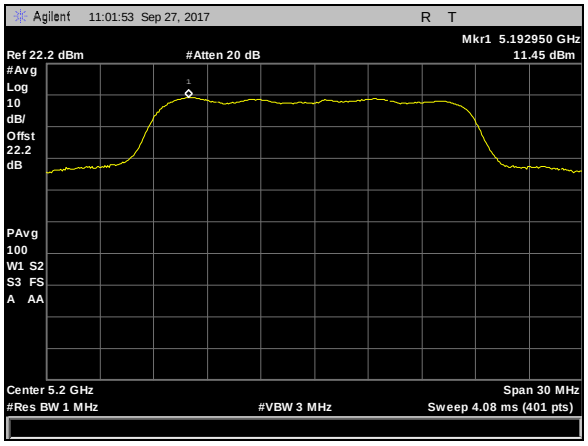
Plot 119. Power Spectral Density, 20M n 5200 channel40 chain0



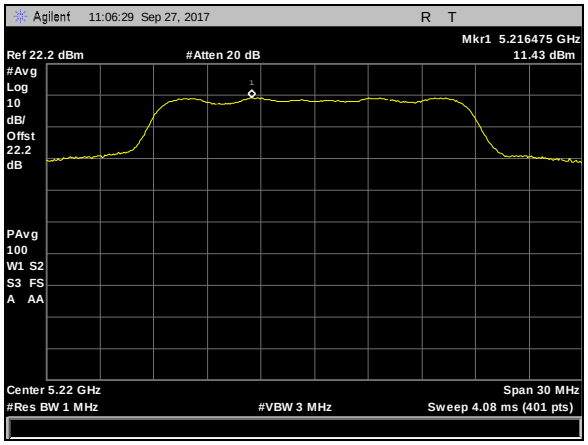
Plot 120. Power Spectral Density, 20M n 5200 channel40 chain1



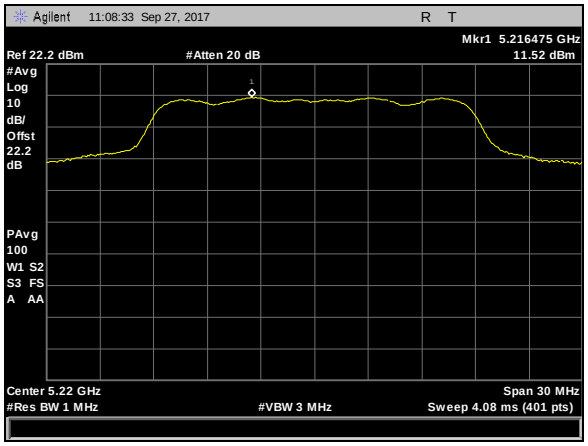
Plot 121. Power Spectral Density, 20M n 5200 channel40 chain2



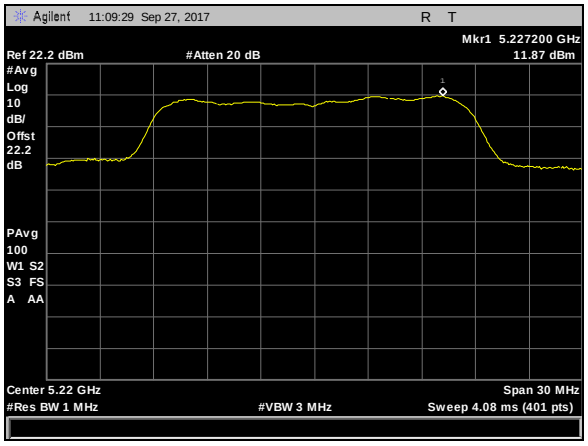
Plot 122. Power Spectral Density, 20M n 5200 channel40 chain3



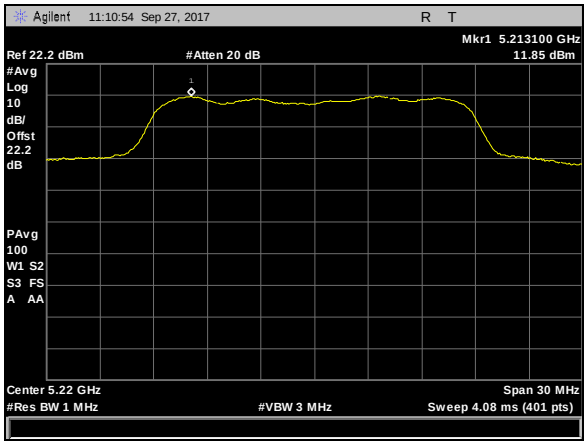
Plot 123. Power Spectral Density, 20M n 5220 channel44 chain0



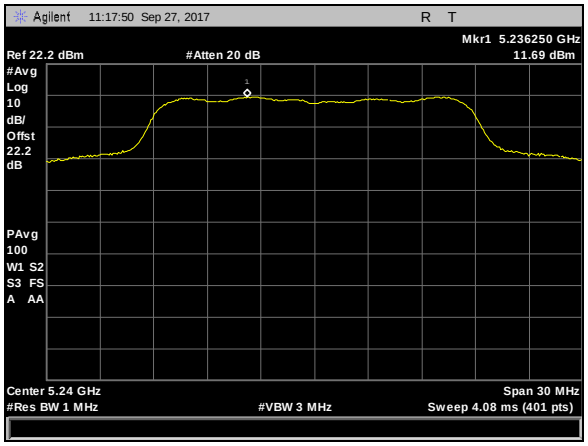
Plot 124. Power Spectral Density, 20M n 5220 channel44 chain1



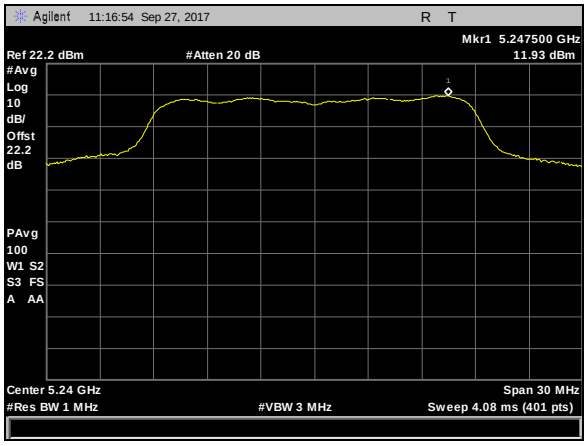
Plot 125. Power Spectral Density, 20M n 5220 channel44 chain2



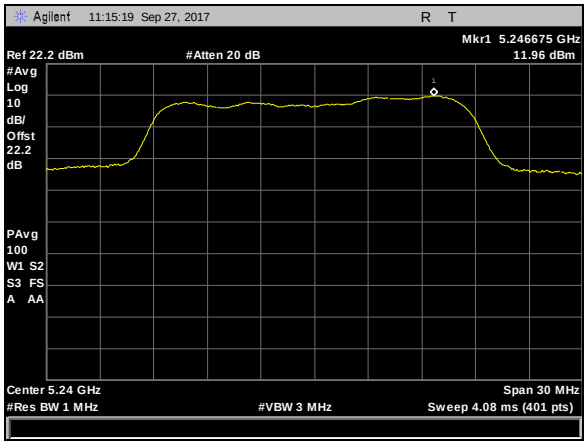
Plot 126. Power Spectral Density, 20M n 5220 channel44 chain3



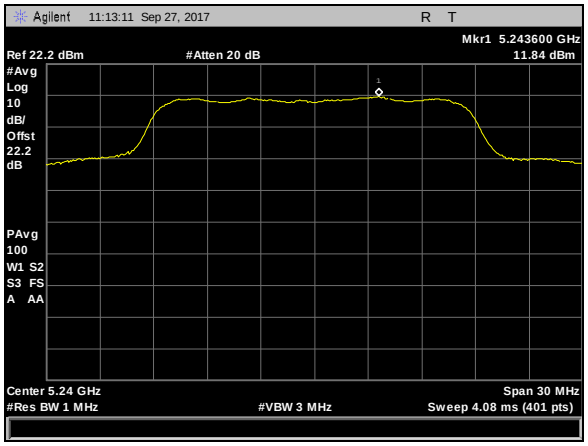
Plot 127. Power Spectral Density, 20M n 5240 channel48 chain0



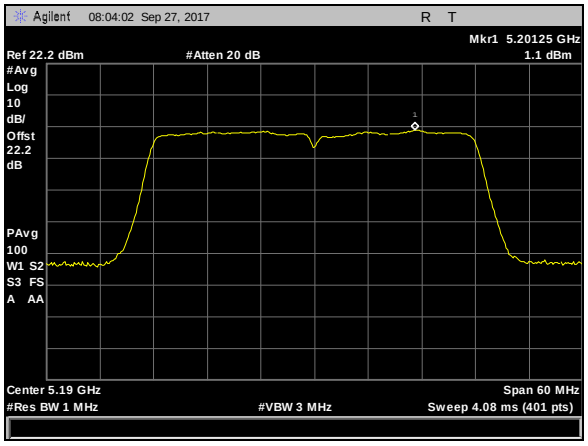
Plot 128. Power Spectral Density, 20M n 5240 channel48 chain1



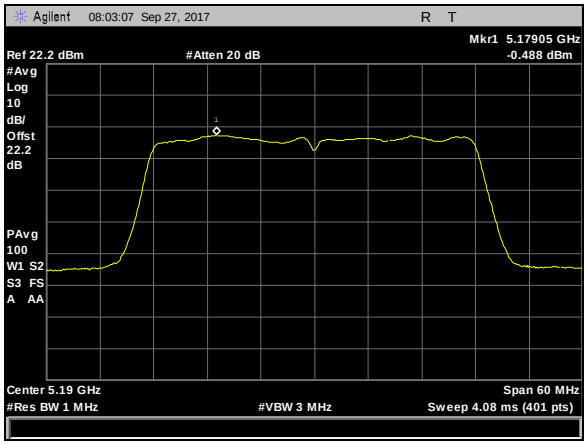
Plot 129. Power Spectral Density, 20M n 5240 channel48 chain2



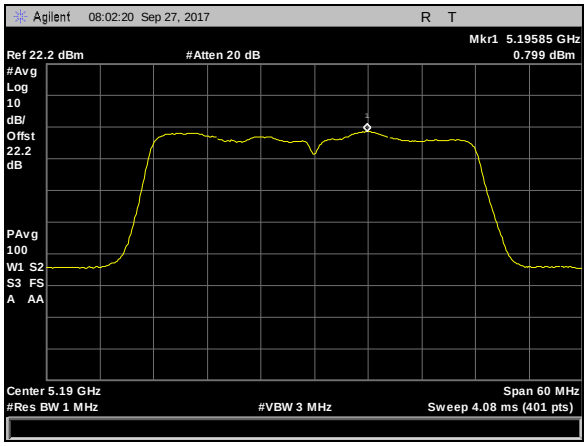
Plot 130. Power Spectral Density, 20M n 5240 channel48 chain3



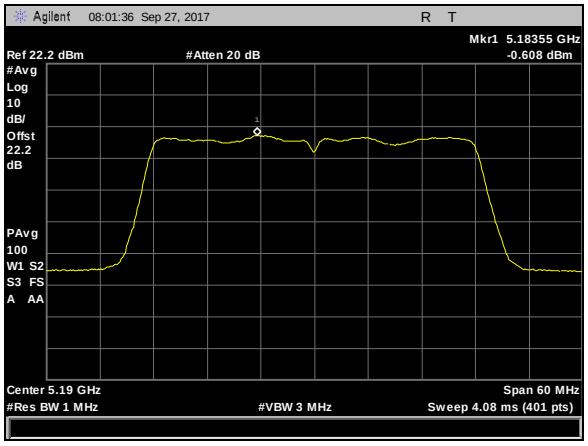
Plot 131. Power Spectral Density, 40M ac 5190 channel38 chain0



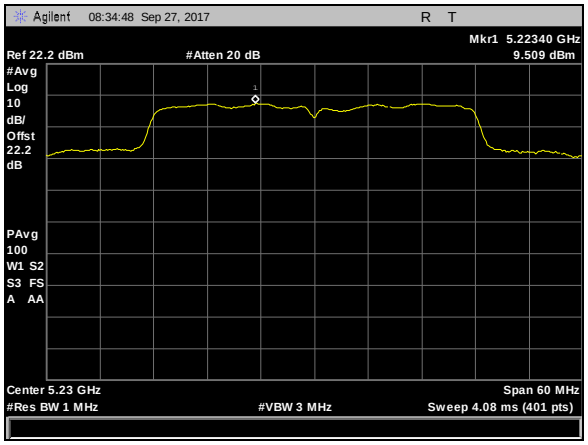
Plot 132. Power Spectral Density, 40M ac 5190 channel38 chain1



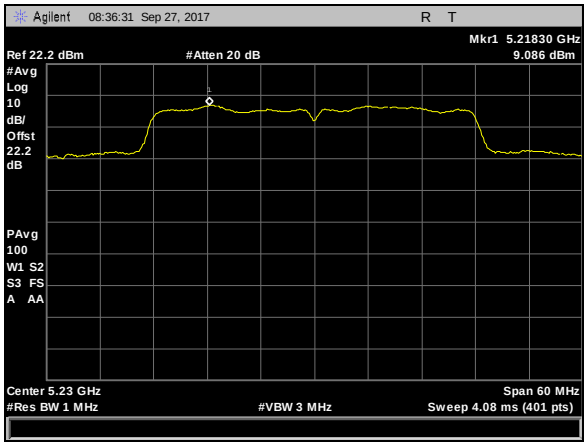
Plot 133. Power Spectral Density, 40M ac 5190 channel38 chain2



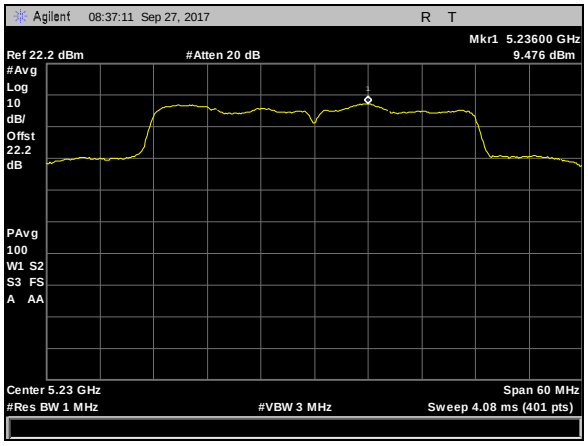
Plot 134. Power Spectral Density, 40M ac 5190 channel38 chain3



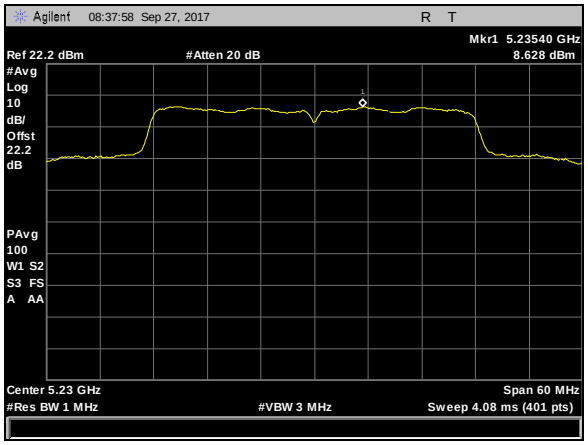
Plot 135. Power Spectral Density, 40M ac 5230 channel46 chain0



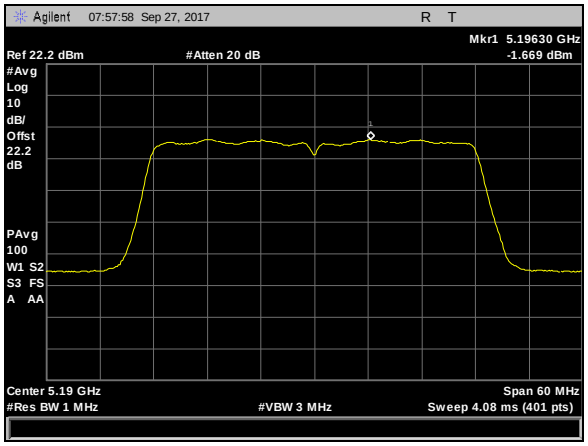
Plot 136. Power Spectral Density, 40M ac 5230 channel46 chain1



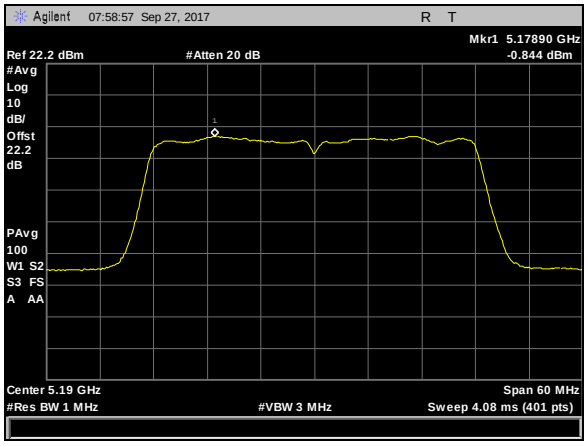
Plot 137. Power Spectral Density, 40M ac 5230 channel46 chain2



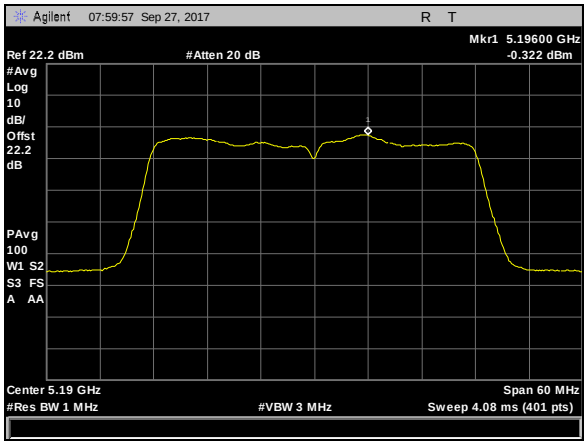
Plot 138. Power Spectral Density, 40M ac 5230 channel46 chain3



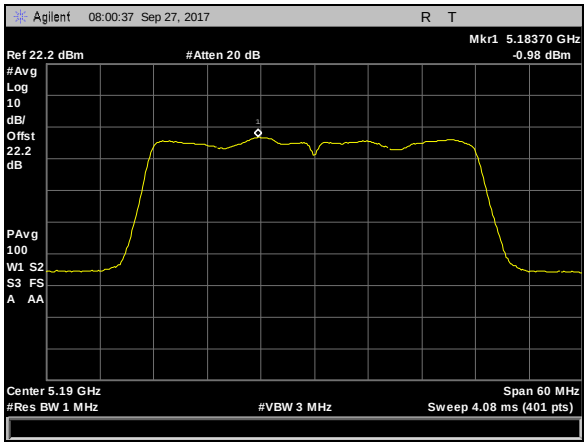
Plot 139. Power Spectral Density, 40M n 5190 channel38 chain0



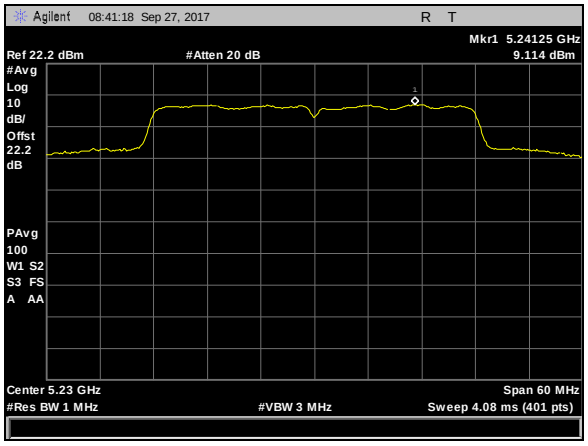
Plot 140. Power Spectral Density, 40M n 5190 channel38 chain1



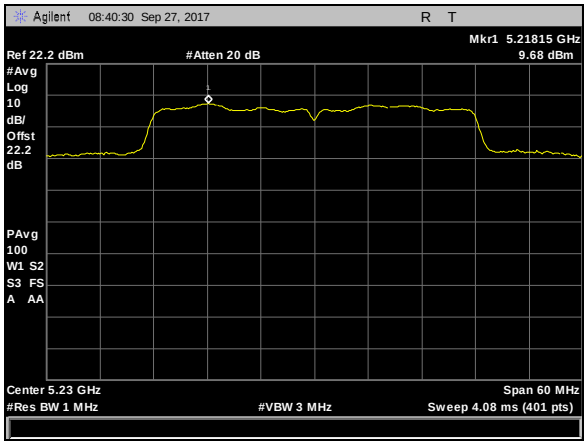
Plot 141. Power Spectral Density, 40M n 5190 channel38 chain2



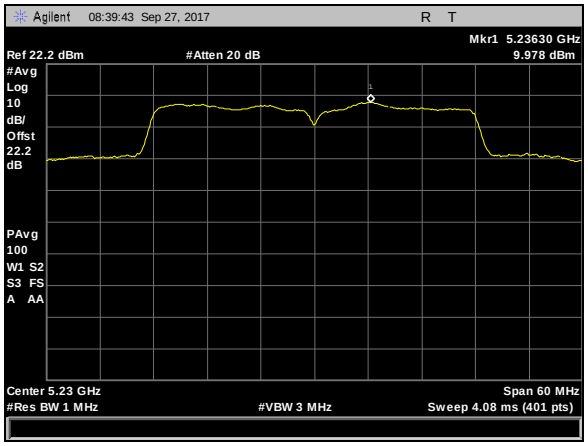
Plot 142. Power Spectral Density, 40M n 5190 channel38 chain3



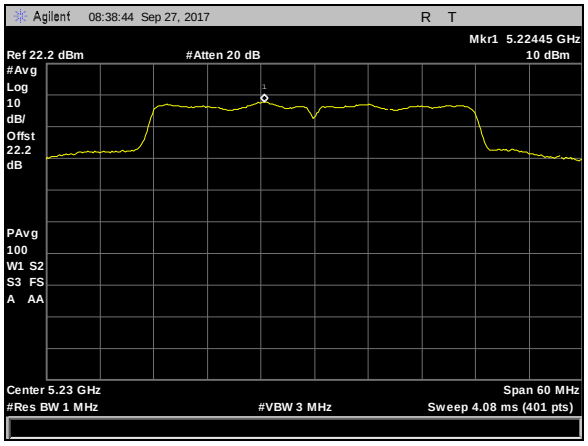
Plot 143. Power Spectral Density, 40M n 5230 channel46 chain0



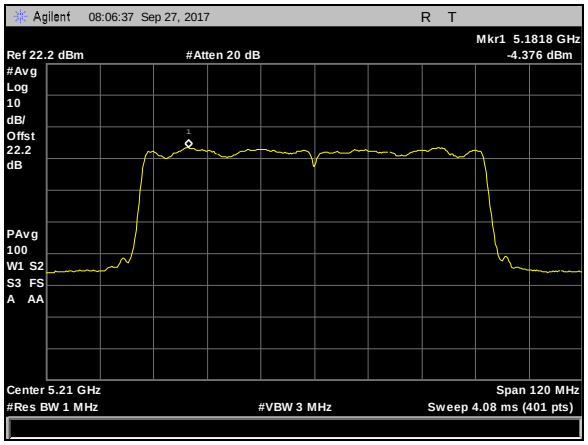
Plot 144. Power Spectral Density, 40M n 5230 channel46 chain1



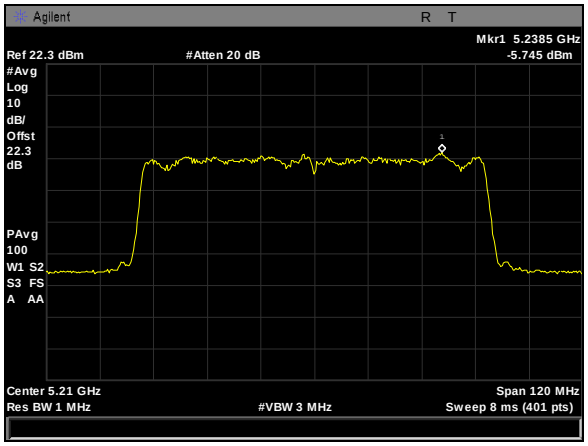
Plot 145. Power Spectral Density, 40M n 5230 channel46 chain2



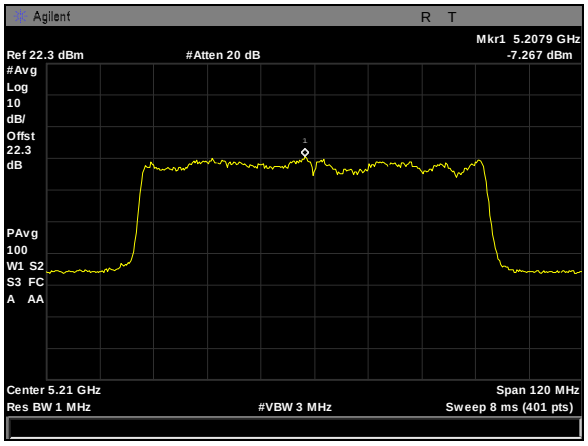
Plot 146. Power Spectral Density, 40M n 5230 channel46 chain3



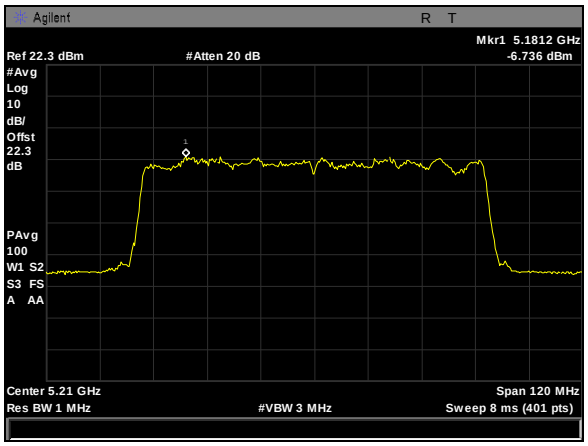
Plot 147. Power Spectral Density, 80M ac 5210 channel44 chain0



Plot 148. Power Spectral Density, 80M ac 5210 channel44 chain1



Plot 149. Power Spectral Density, 80M ac 5210 channel44 chain2



Plot 150. Power Spectral Density, 80M ac 5210 channel44 chain3

Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements: **§ 15.407(b)(1):** For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

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

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

Test Procedure: The EUT was placed on a non-conducting stand on a turntable in a chamber. To find the maximum emission the EUT was set to transmit on low, mid, and high channels. Additionally, the turntable was rotated 360 degrees, the EUT was oriented through its three orthogonal axes, and the receive antenna height was varied in order to maximize emissions.

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

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

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

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

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

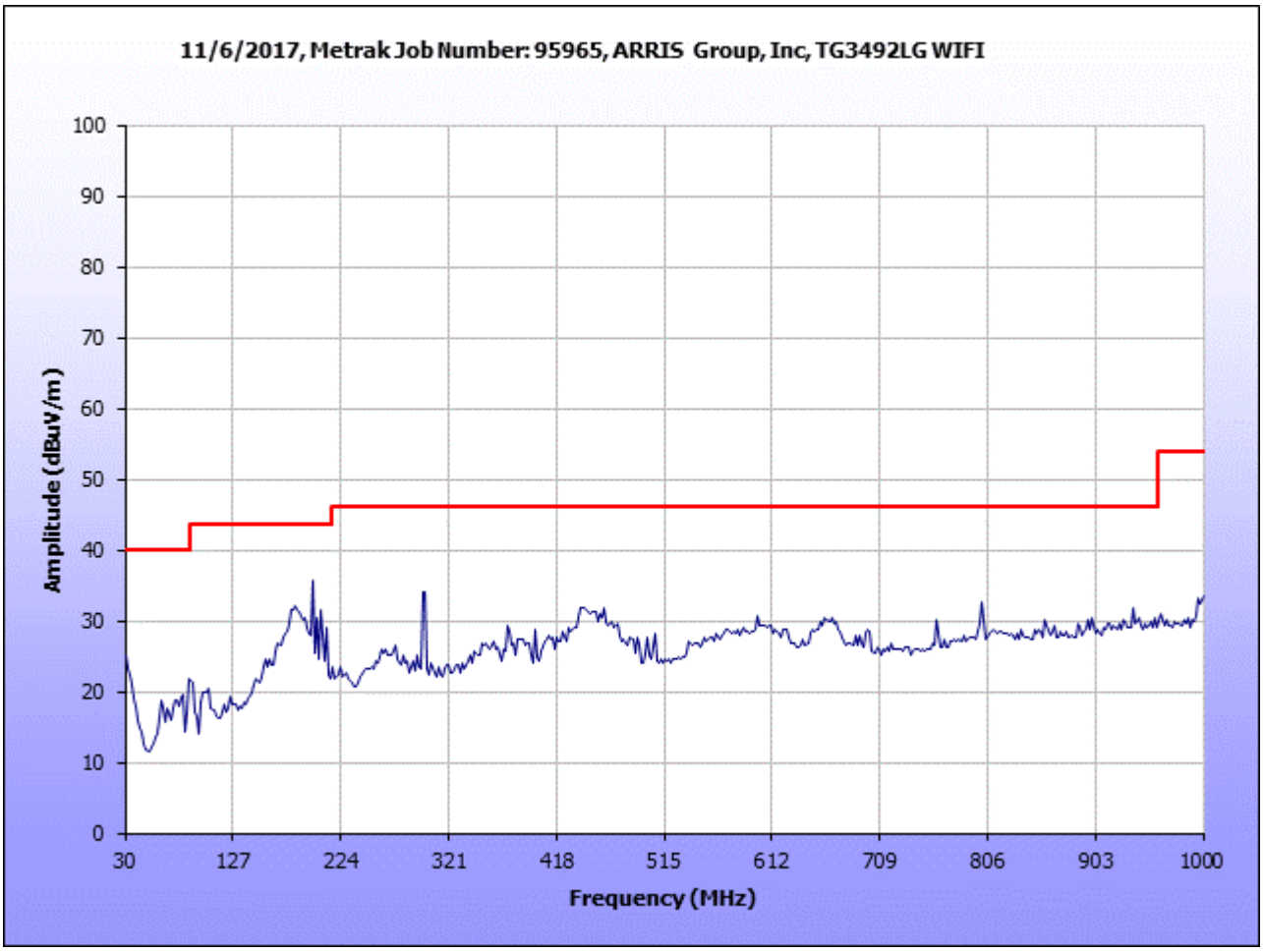
For above 1 GHz, the EUT was compliant with the requirements of this section.

Test Engineer(s): Bradley Jones

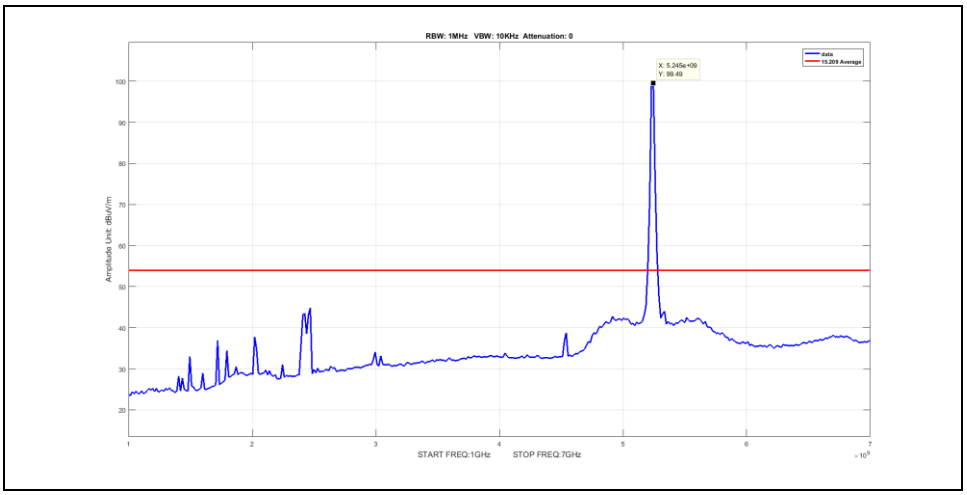
Test Date(s): October 2 and November 6, 2017

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected EMI Meter Reading (dBuV)	Antenna Correction Factor (dB/m) (+)	Cable Loss/Pre-amp (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.17404	118.7	H	1.6495	18.06	13.62	1.51	0	33.19	43.5	-10.31
199.17404	129	V	1	19.15	13.62	1.51	0	34.28	43.5	-9.22
298.76912	289	H	1	14.72	14.35	2.48	0	31.55	46	-14.45
298.76912	104.2	V	2.0947	16.41	14.35	2.48	0	33.24	46	-12.76

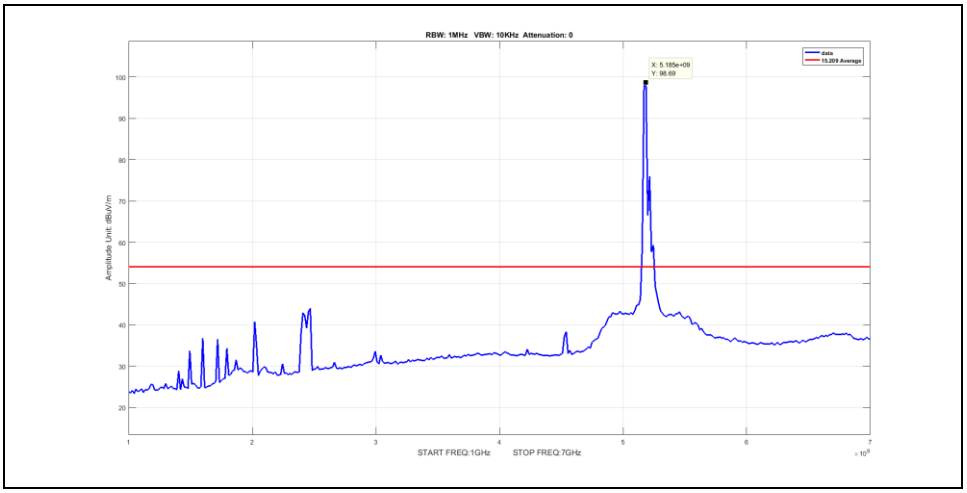
Table 10. Undesirable Emissions, 10 kHz to 1 GHz, Test Results



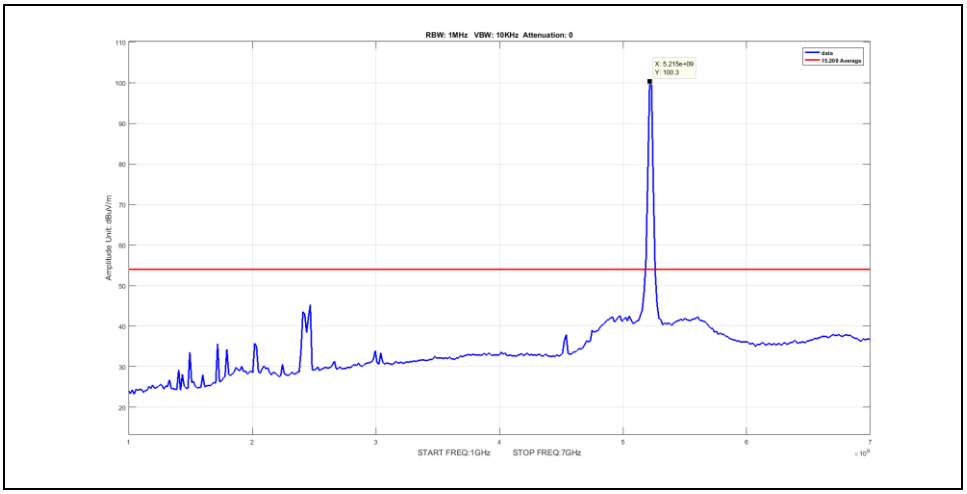
Plot 151. Undesirable Emissions, 80 MHz, Channel 42, Power 14, Below 1 GHz, Test Results



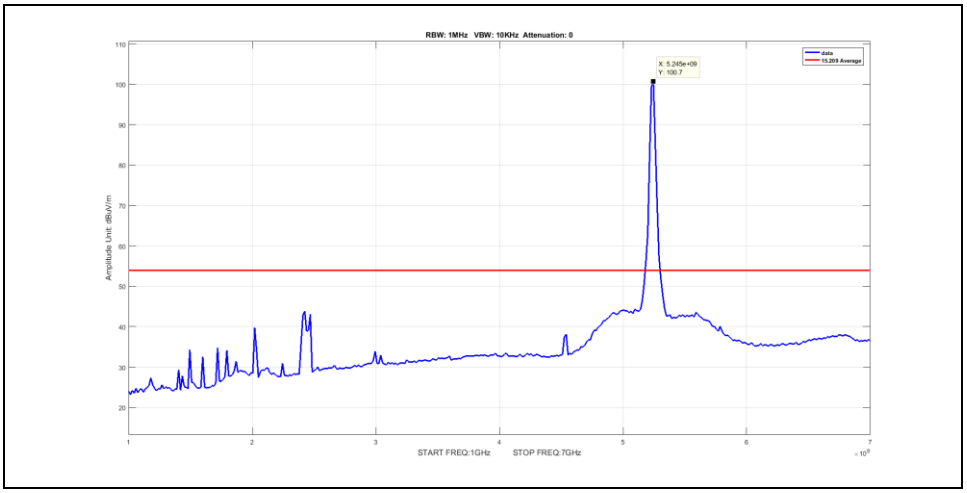
Plot 152. Undesirable Emissions, average, 1-7G, 20M, a, high, channel48



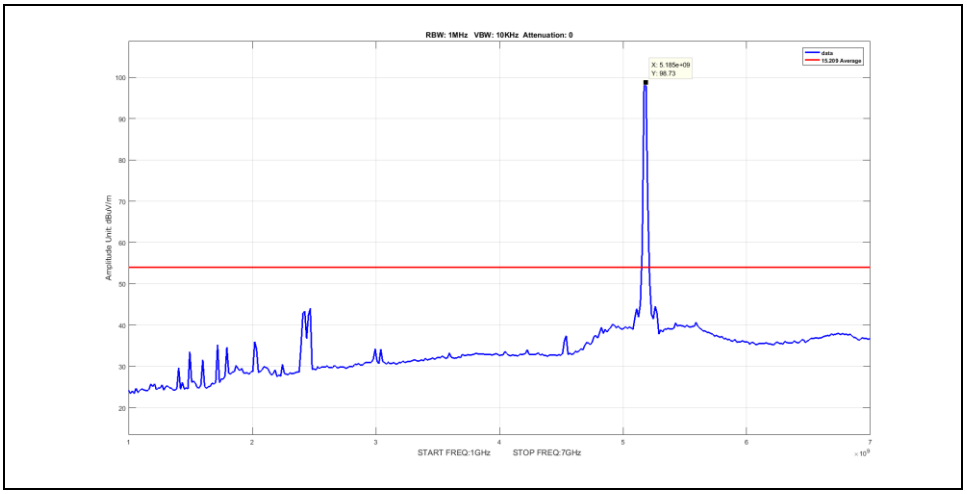
Plot 153. Undesirable Emissions, average, 1-7G, 20M, a, low, channel36



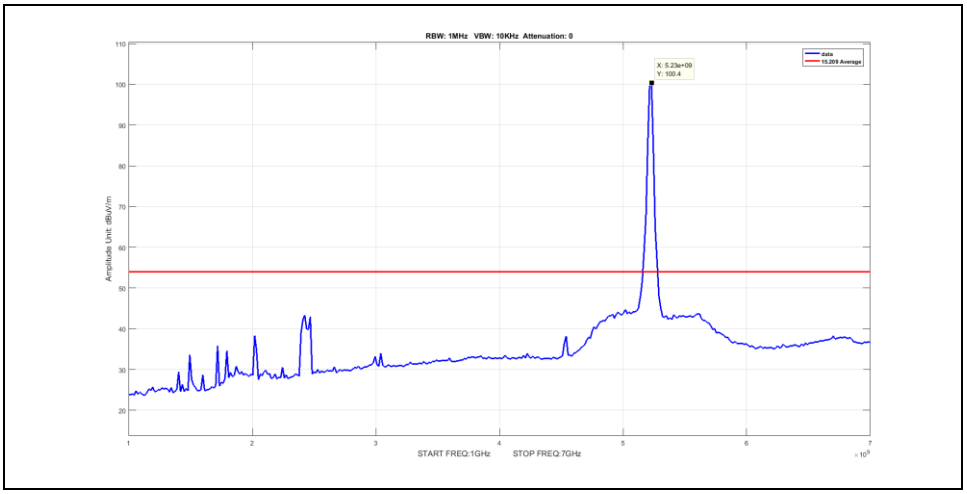
Plot 154,. Undesirable Emissions, average, 1-7G, 20M, a, mid, channel44



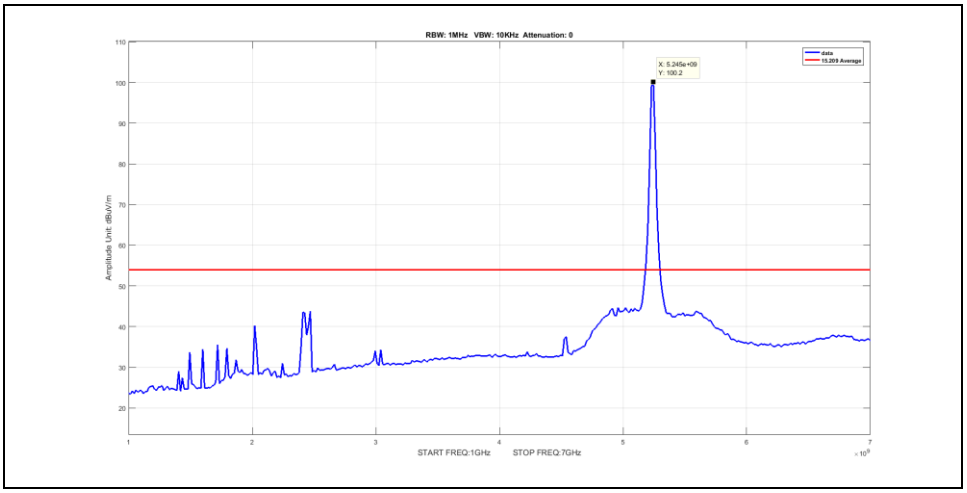
Plot 155. Undesirable Emissions, average, 1-7G, 20M, ac, high, channel48



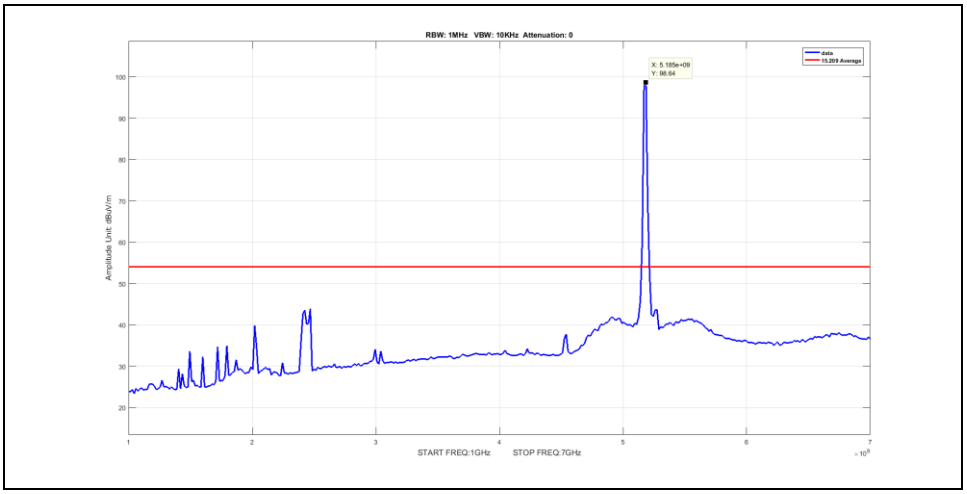
Plot 156. Undesirable Emissions, average, 1-7G, 20M, ac, low, channel36



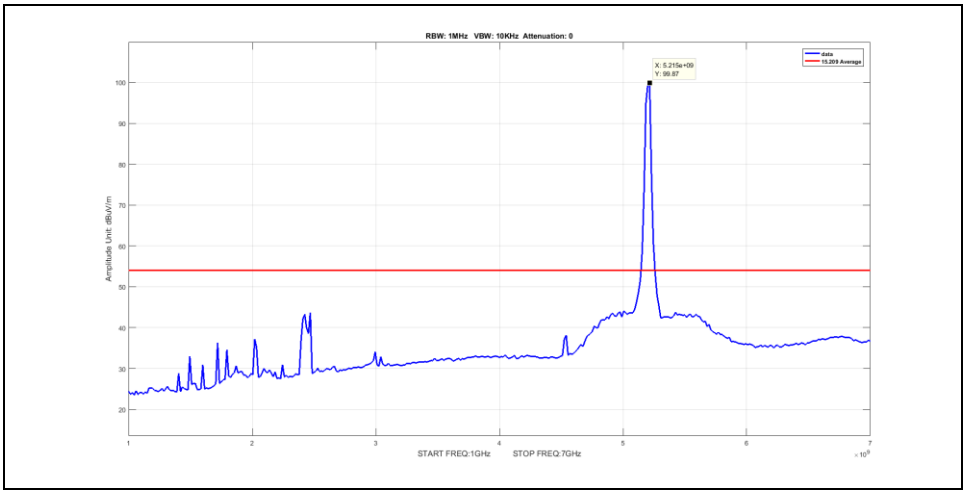
Plot 157. Undesirable Emissions, average, 1-7G, 20M, ac, mid, channel44



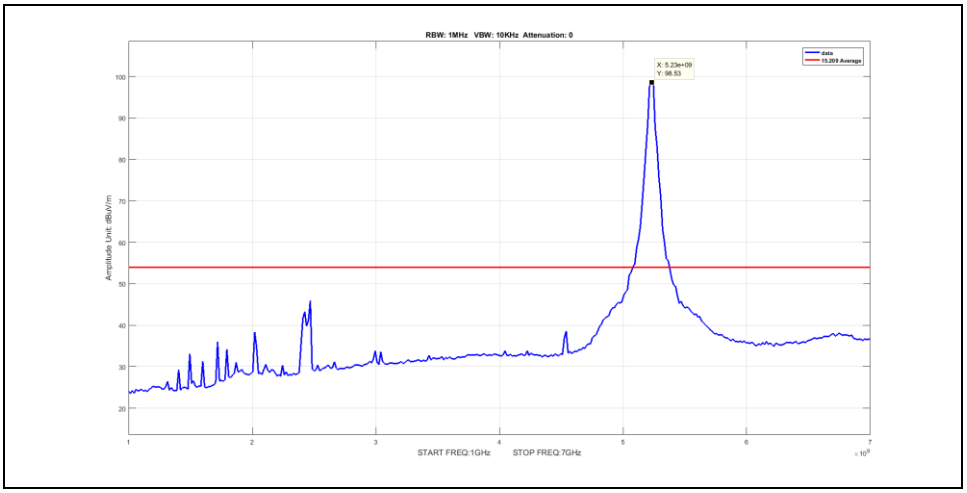
Plot 158. Undesirable Emissions, average, 1-7G, 20M, n, high, channel48



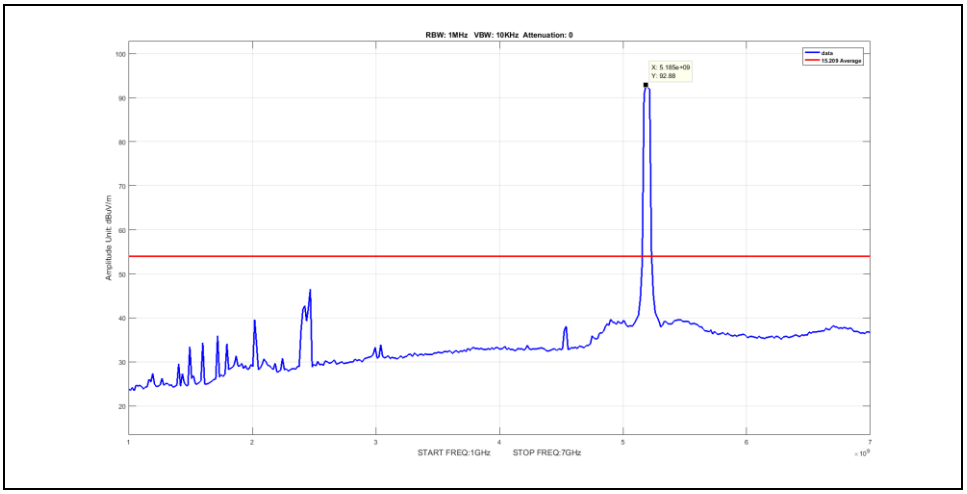
Plot 159. Undesirable Emissions, average, 1-7G, 20M, n, low, channel36



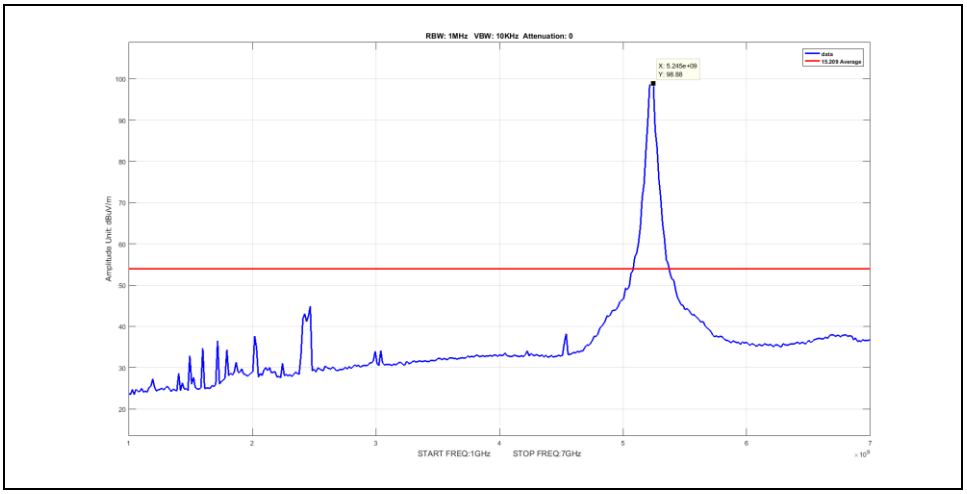
Plot 160. Undesirable Emissions, average, 1-7G, 20M, n, mid, channel40



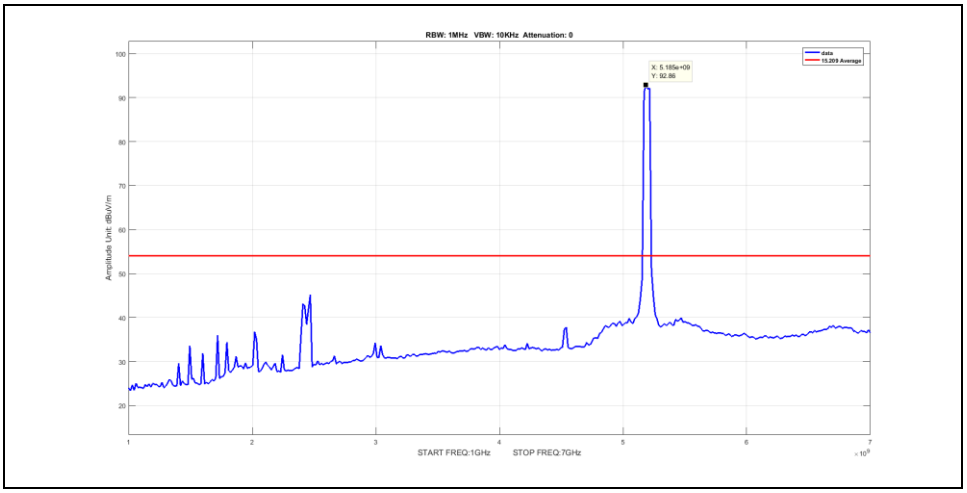
Plot 161. Undesirable Emissions, average, 1-7G, 40M, ac, high, channel46



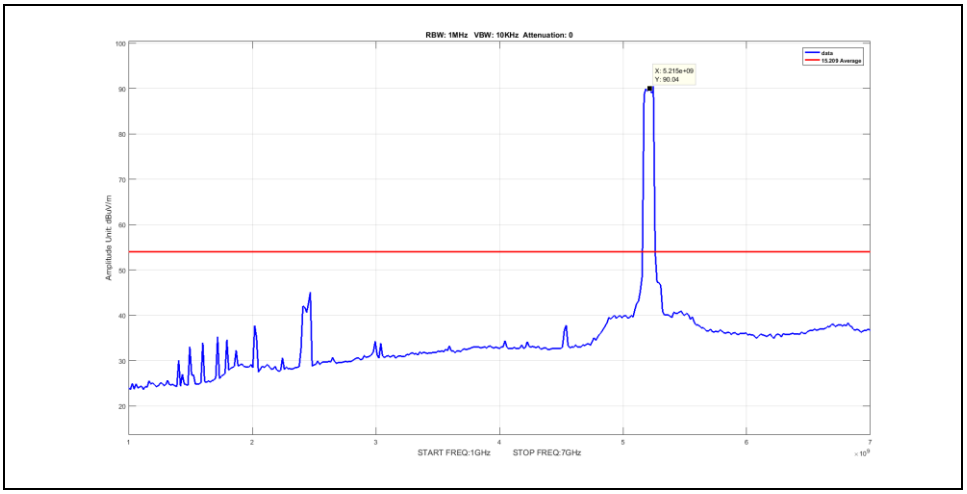
Plot 162. Undesirable Emissions, average, 1-7G, 40M, ac, low, channel38



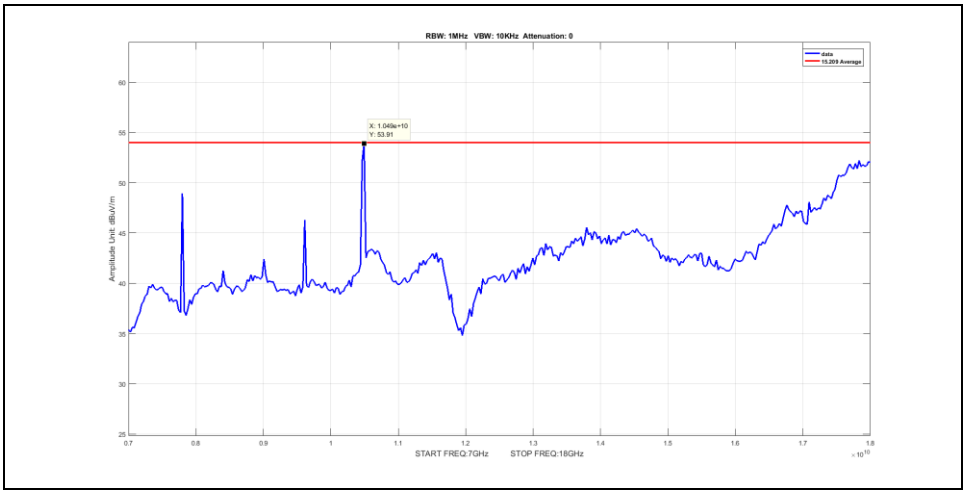
Plot 163. Undesirable Emissions, average, 1-7G, 40M, n, high, channel46



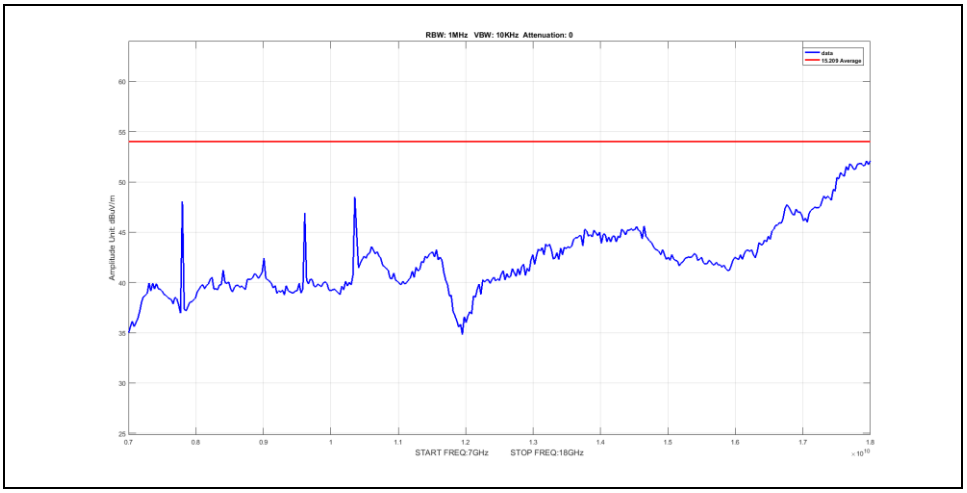
Plot 164. Undesirable Emissions, average, 1-7G, 40M, n, low, channel38



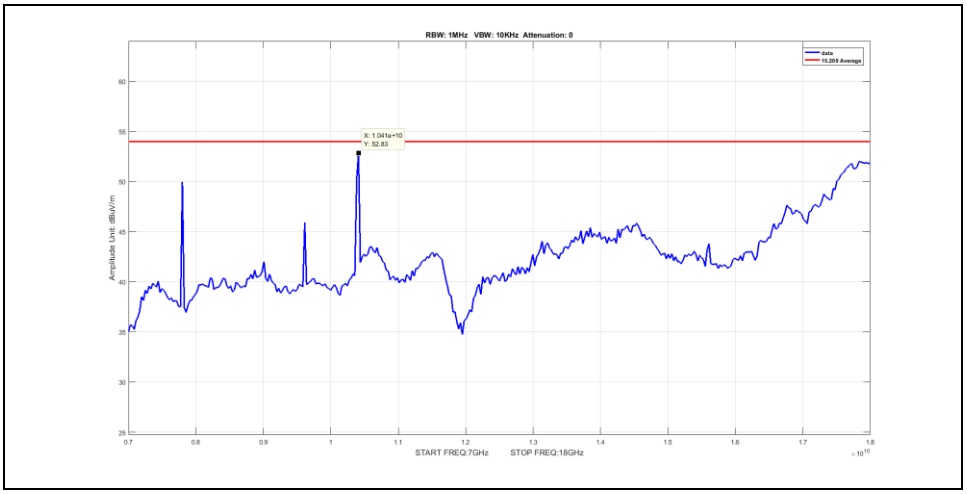
Plot 165. Undesirable Emissions, average, 1-7G, 80M, ac, mid, channel42



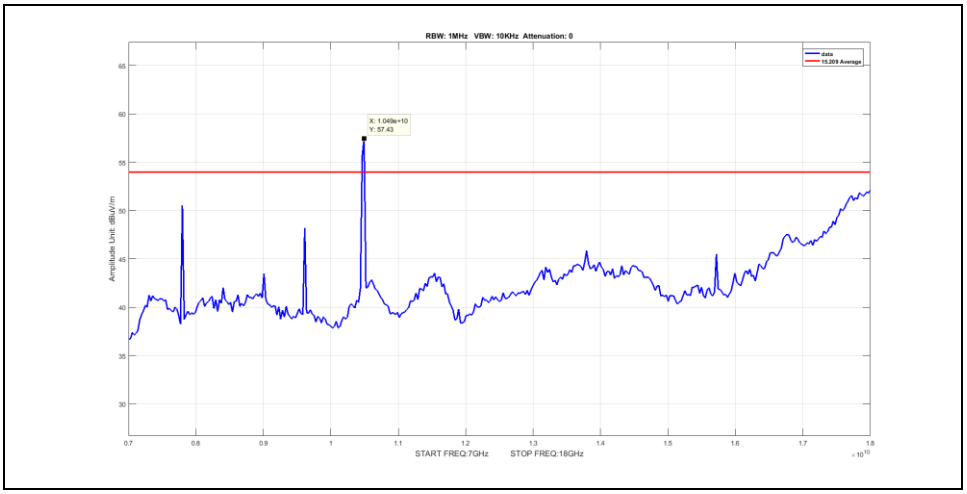
Plot 166. Undesirable Emissions, average, 7-18G, 20M, a, high, channel48



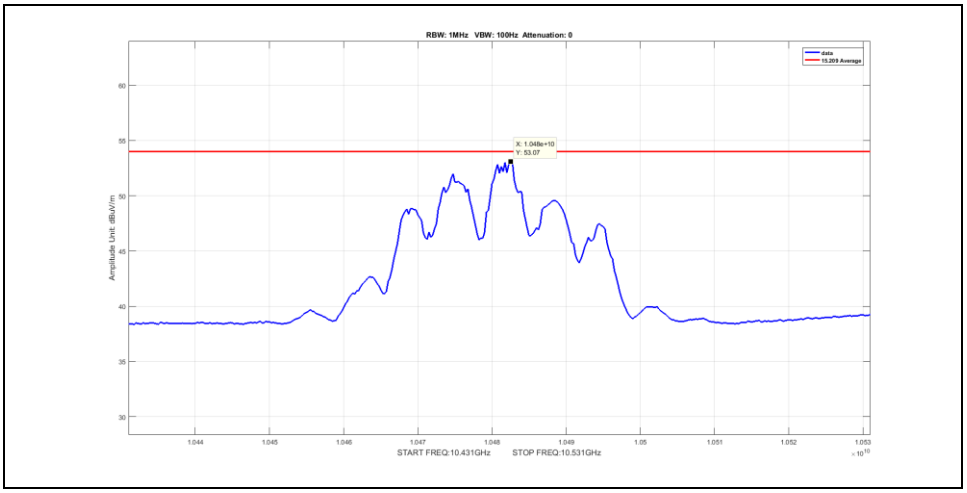
Plot 167. Undesirable Emissions, average, 7-18G, 20M, a, low, channel36



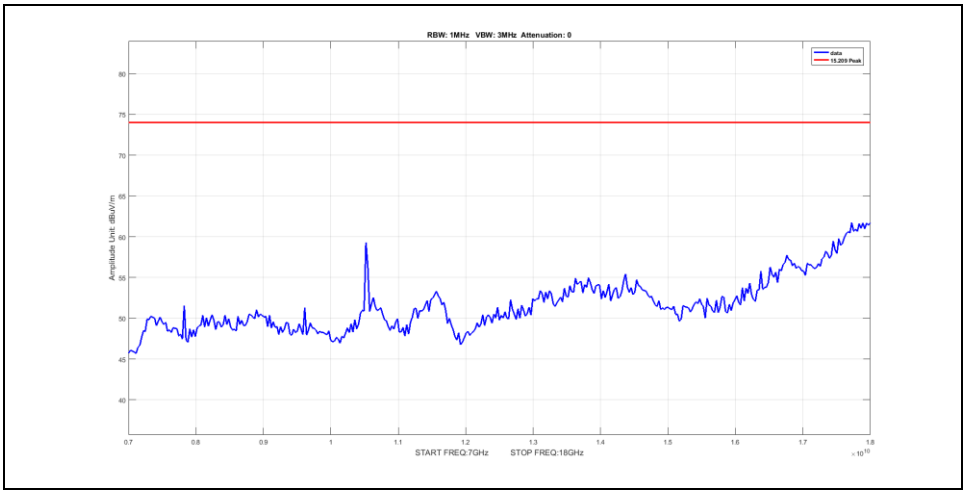
Plot 168. Undesirable Emissions, average, 7-18G, 20M, a, mid, channel40



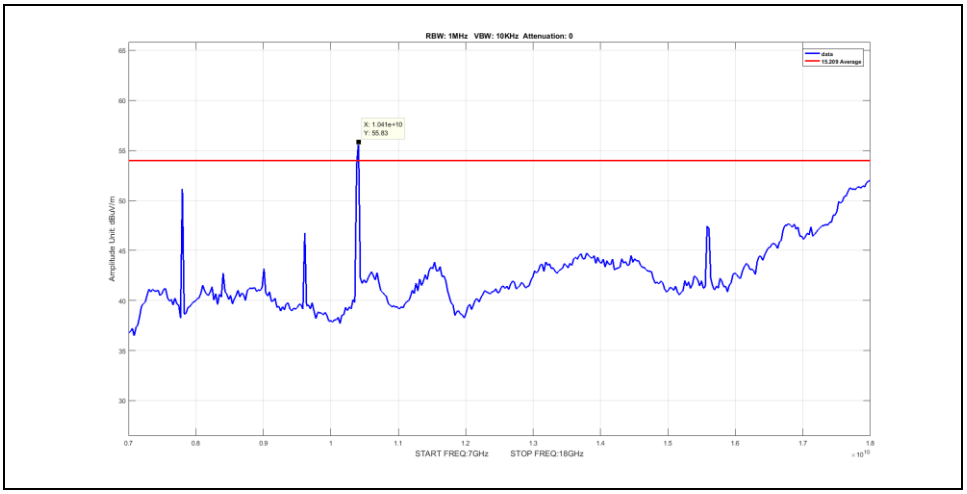
Plot 169. Undesirable Emissions, average, 7-18G, 20M, ac, high, channel48



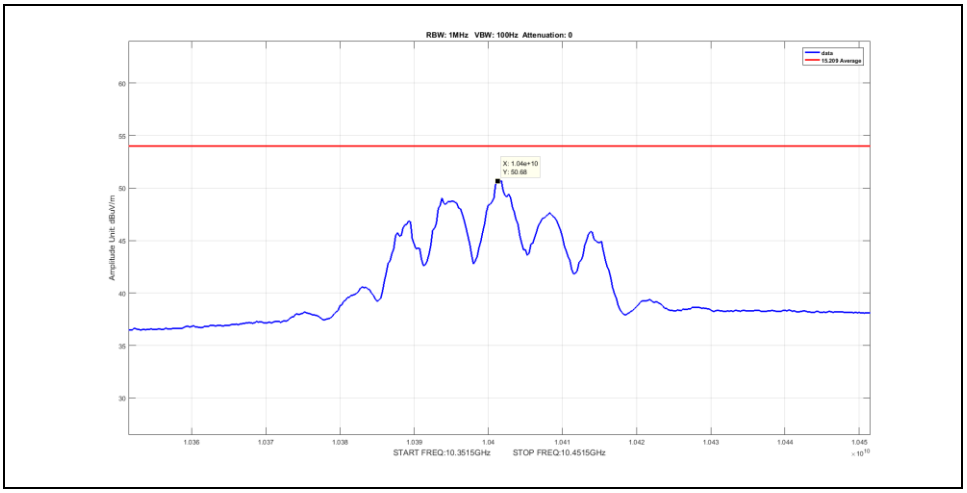
Plot 170. Undesirable Emissions, average, 7-18G, 20M, ac, high, channel48, zoom



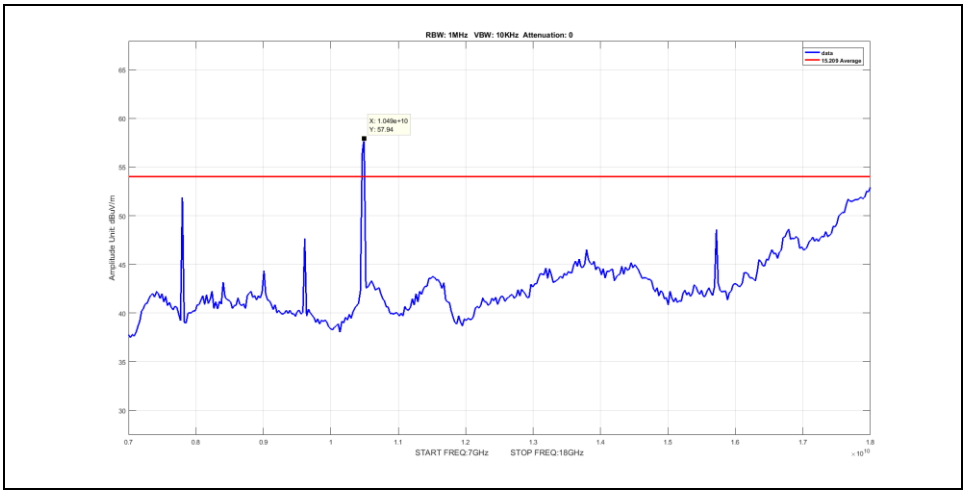
Plot 171. Undesirable Emissions, average, 7-18G, 20M, ac, low, channel36



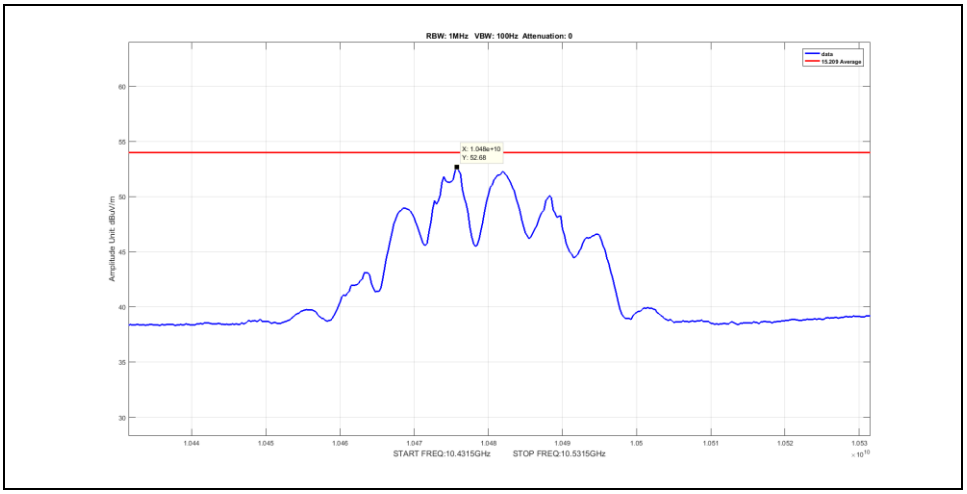
Plot 172. Undesirable Emissions, average, 7-18G, 20M, ac, mid, channel40



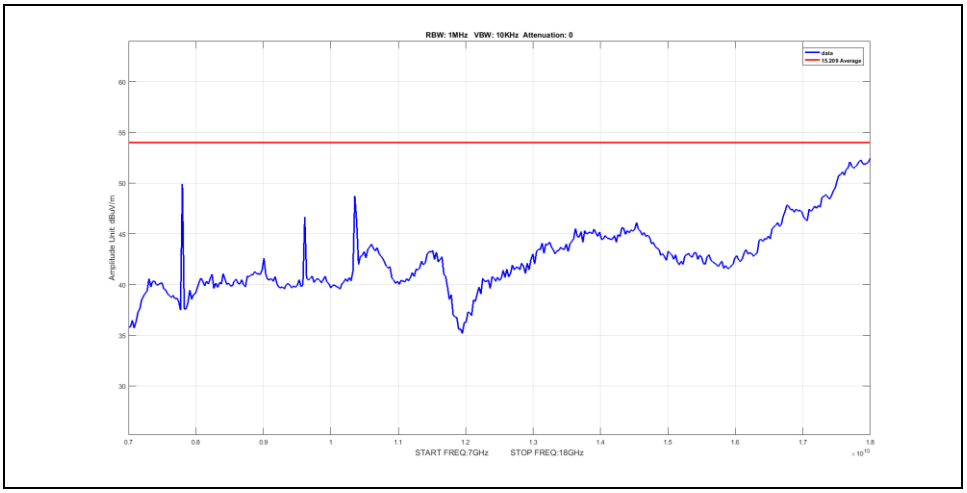
Plot 173. Undesirable Emissions, average, 7-18G, 20M, ac, mid, channel40, zoom



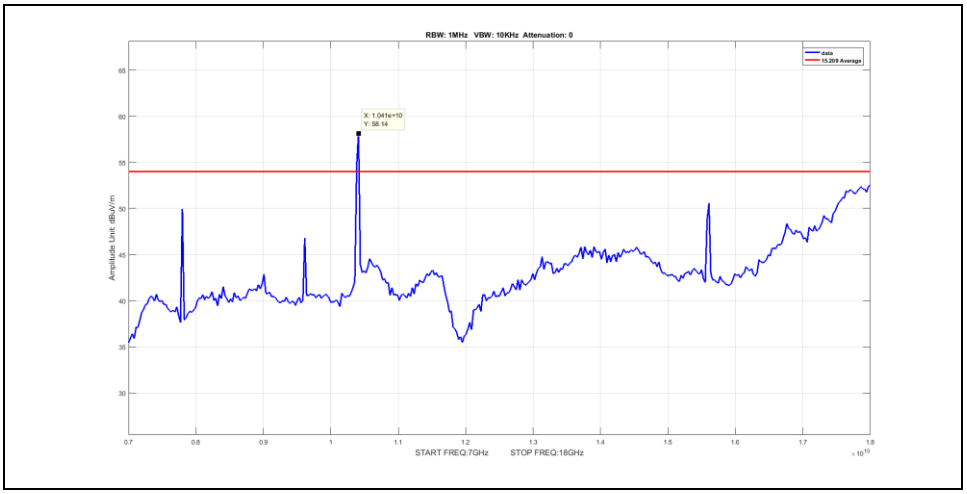
Plot 174. Undesirable Emissions, average, 7-18G, 20M, n, high, channel48



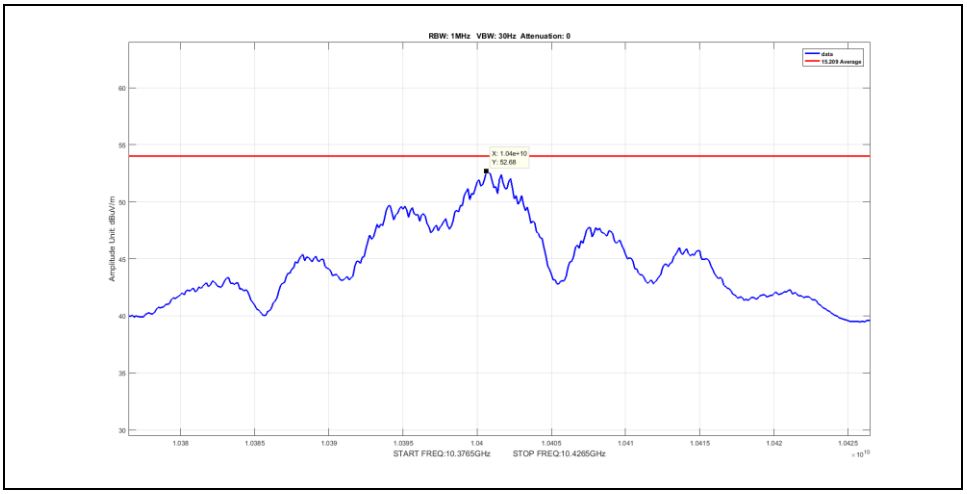
Plot 175. Undesirable Emissions, average, 7-18G, 20M, n, high, channel48, zoom



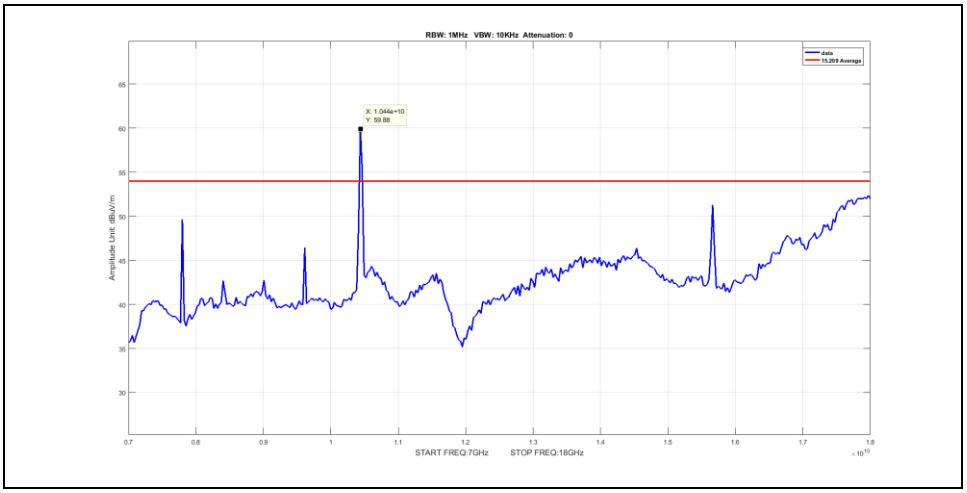
Plot 176. Undesirable Emissions, average, 7-18G, 20M, n, low, channel36



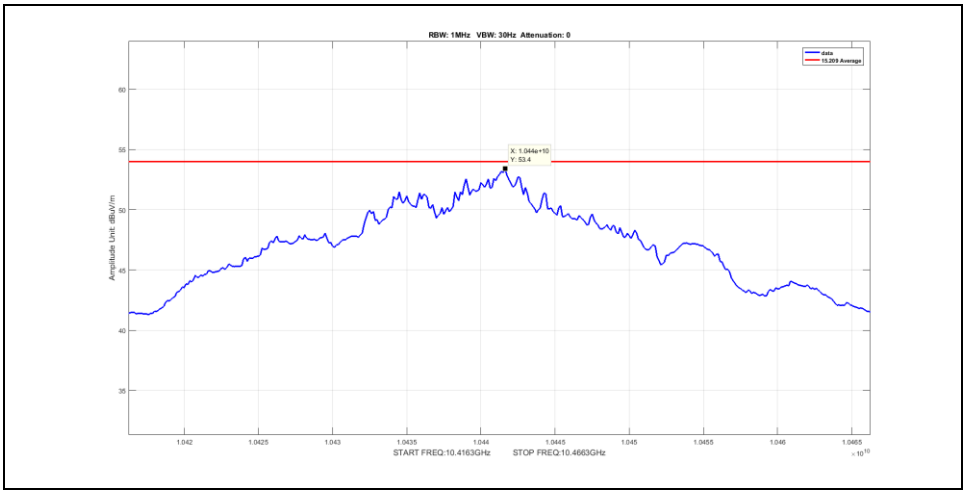
Plot 177. Undesirable Emissions, average, 7-18G, 20M, n, mid, channel40



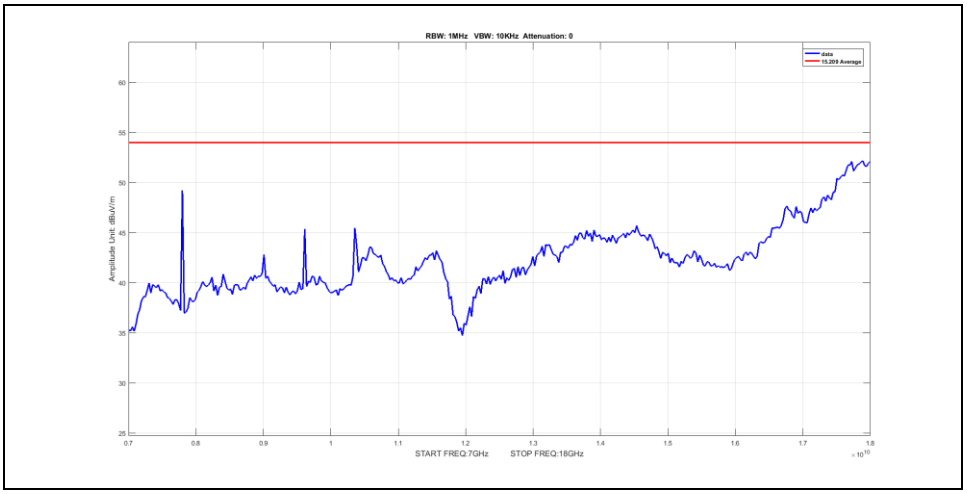
Plot 178. Undesirable Emissions, average, 7-18G, 20M, n, mid, channel40, zoom



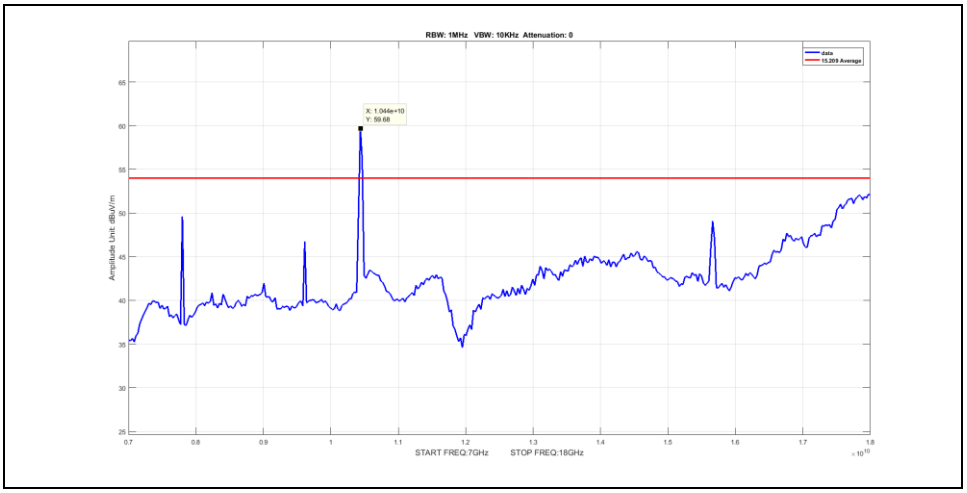
Plot 179. Undesirable Emissions, average, 7-18G, 40M, ac, high, channel46



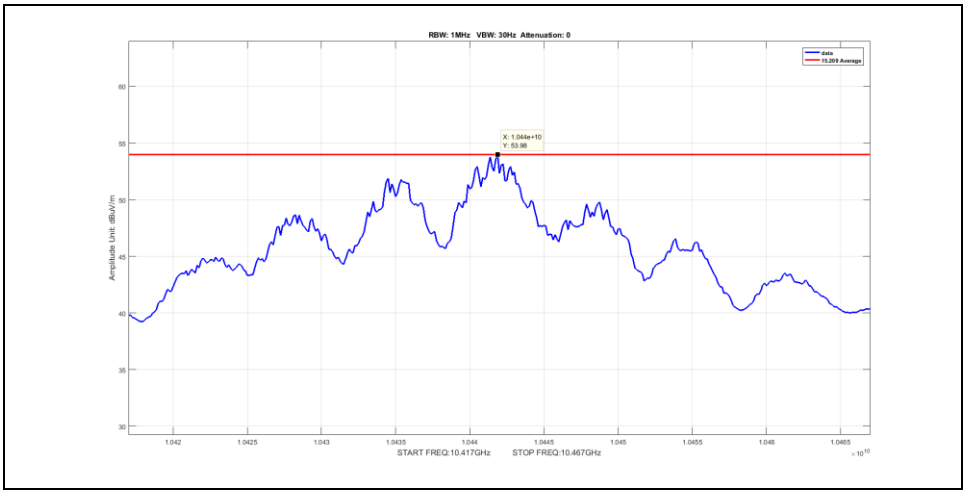
Plot 180. Undesirable Emissions, average, 7-18G, 40M, ac, high, channel46, zoom



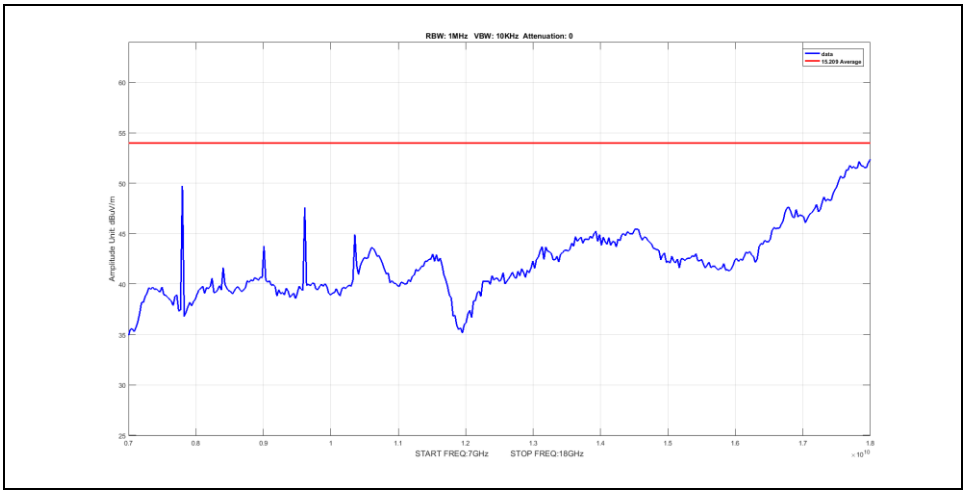
Plot 181. Undesirable Emissions, average, 7-18G, 40M, ac, low, channel38



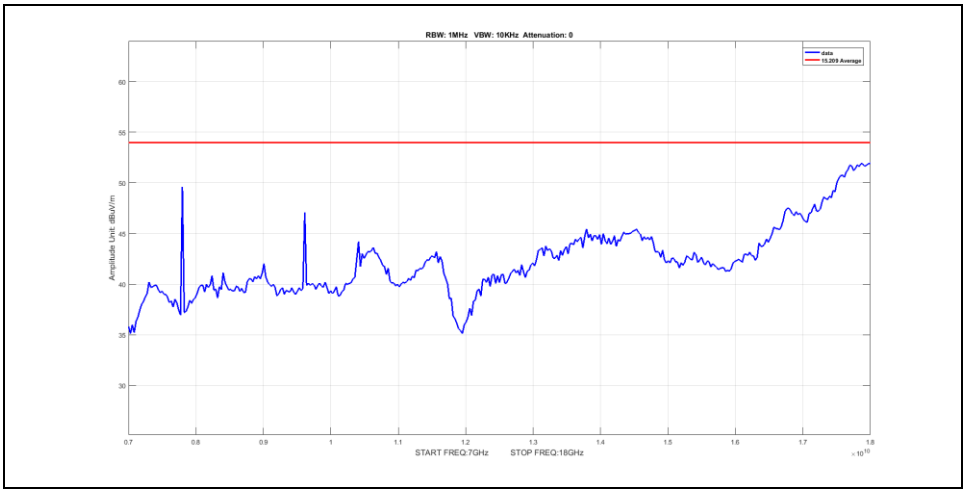
Plot 182. Undesirable Emissions, average, 7-18G, 40M, n, high, channel46



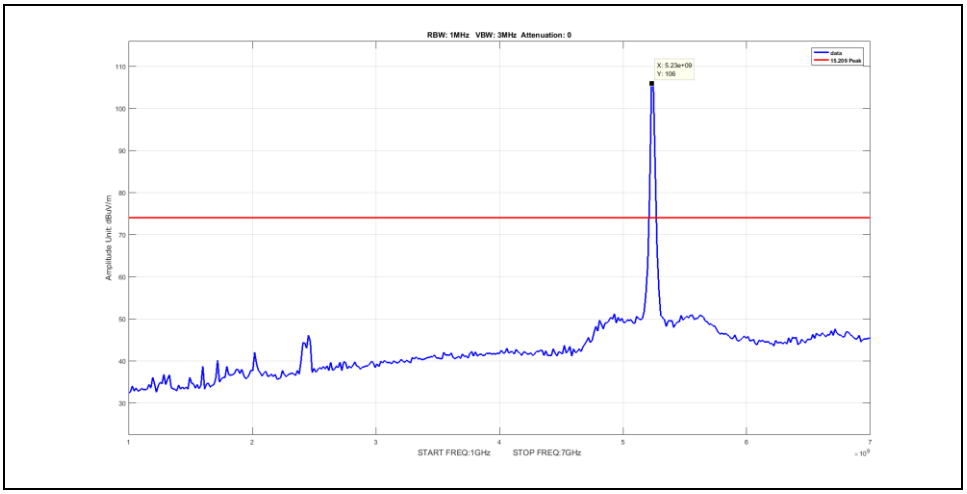
Plot 183. Undesirable Emissions, average, 7-18G, 40M, n, high, channel46, zoom



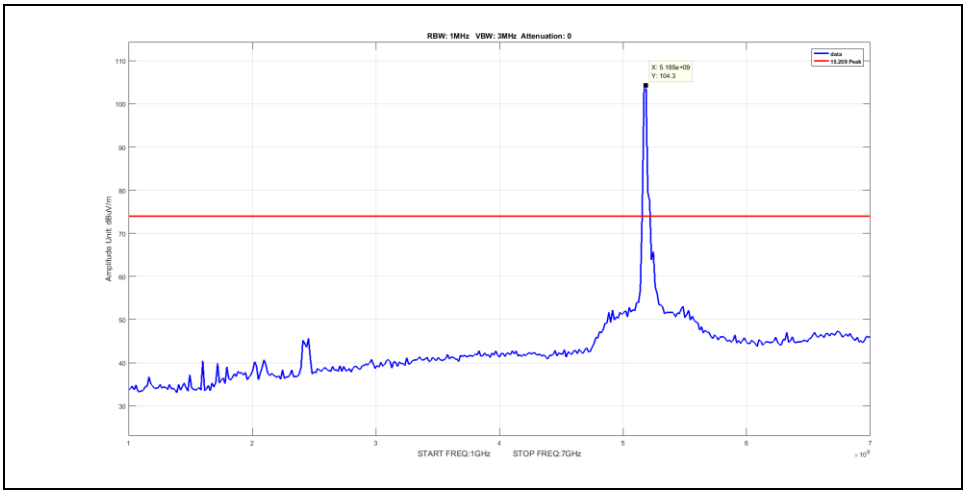
Plot 184. Undesirable Emissions, average, 7-18G, 40M, n, low, channel38



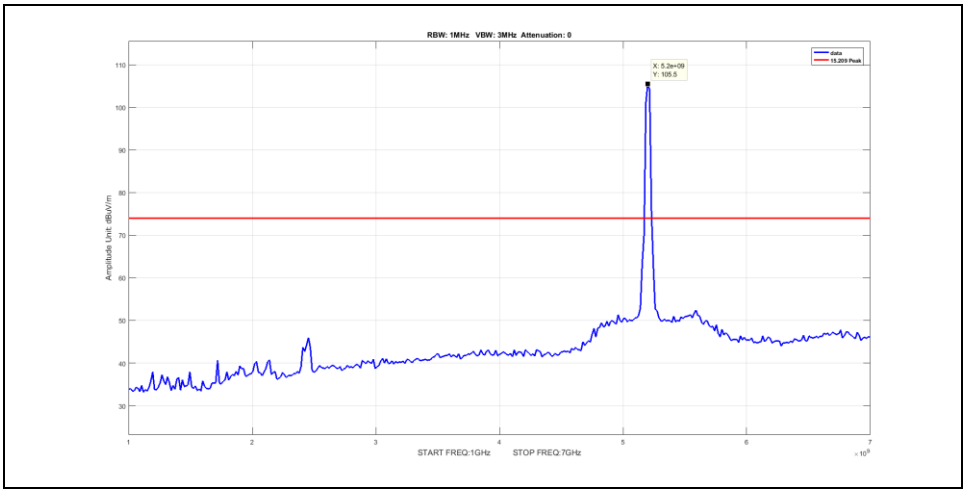
Plot 185. Undesirable Emissions, average, 7-18G, 80M, a, mid, channel42



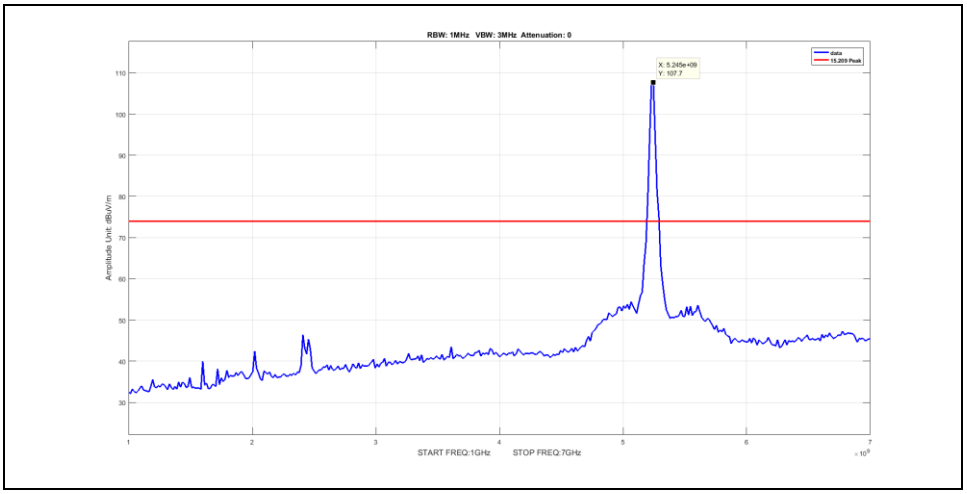
Plot 186. Undesirable Emissions, peak, 1-7G, 20M, a, high, channel48



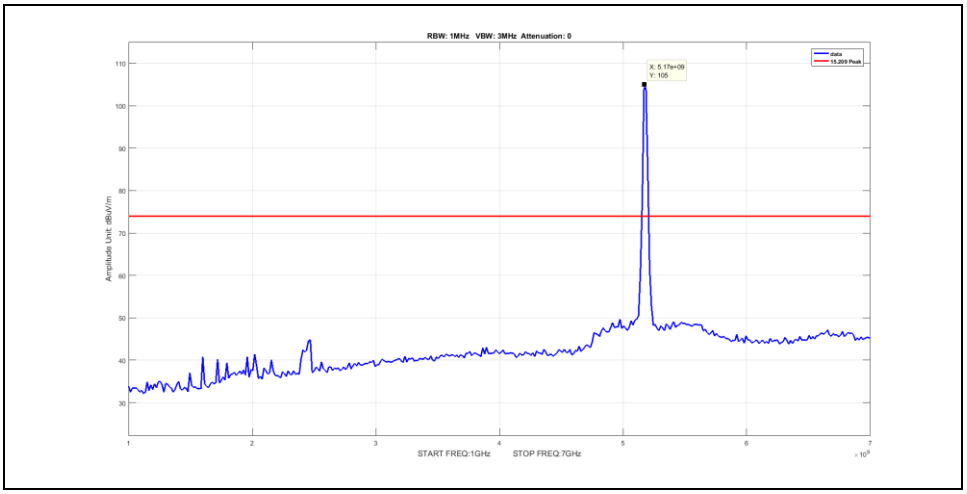
Plot 187. Undesirable Emissions, peak, 1-7G, 20M, a, low, channel36



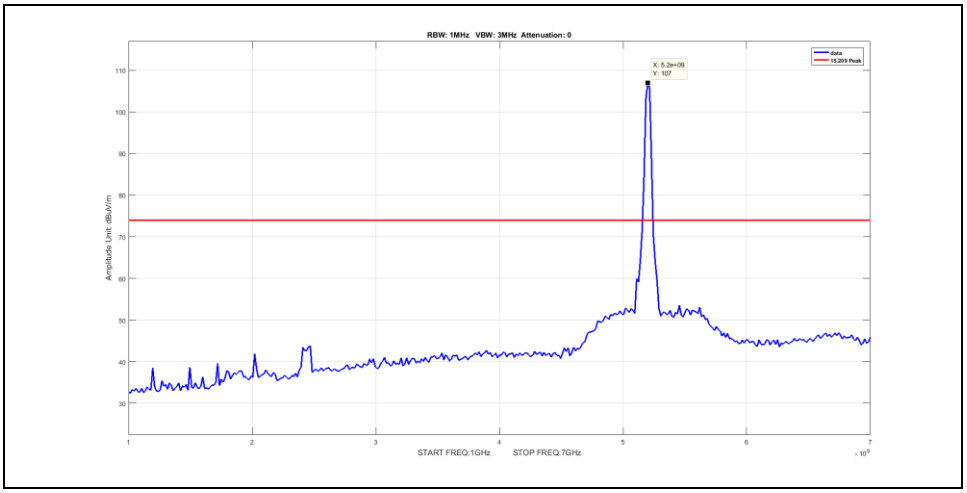
Plot 188. Undesirable Emissions, peak, 1-7G, 20M, a, mid, channel40



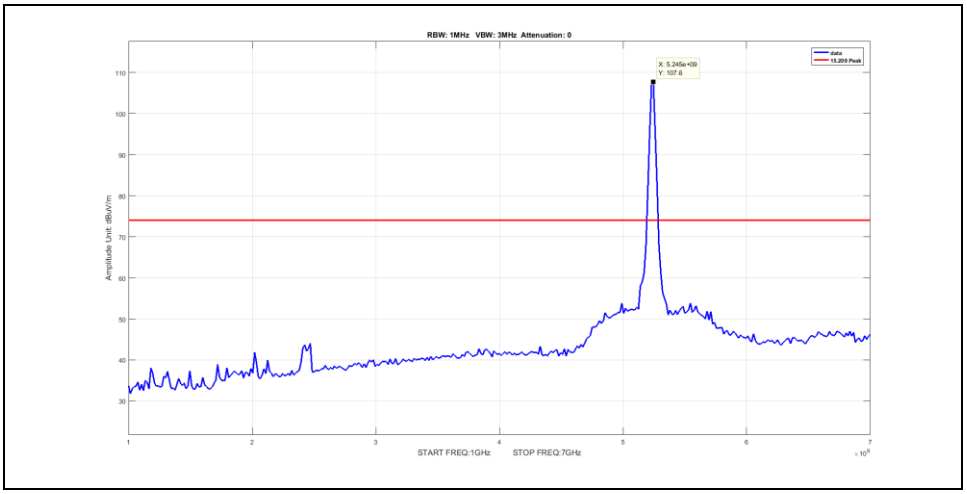
Plot 189. Undesirable Emissions, peak, 1-7G, 20M, ac, high, channel48



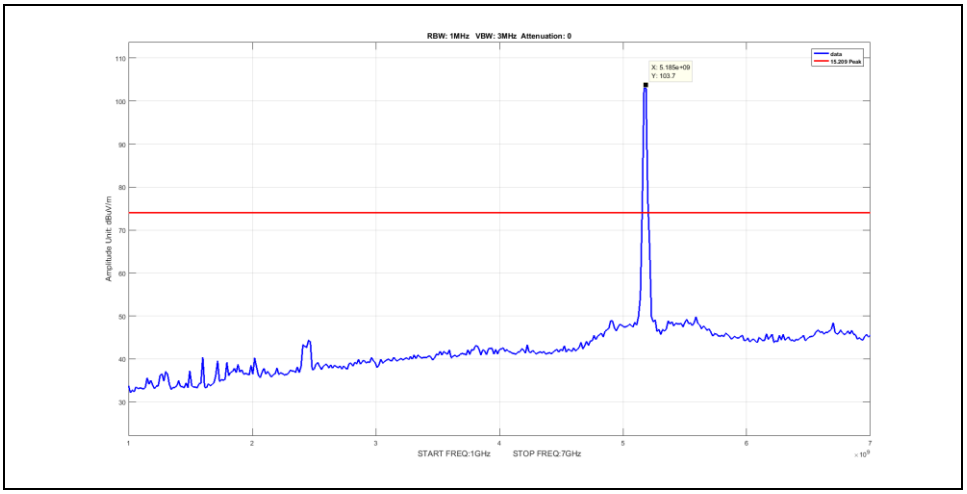
Plot 190. Undesirable Emissions, peak, 1-7G, 20M, ac, low, channel36



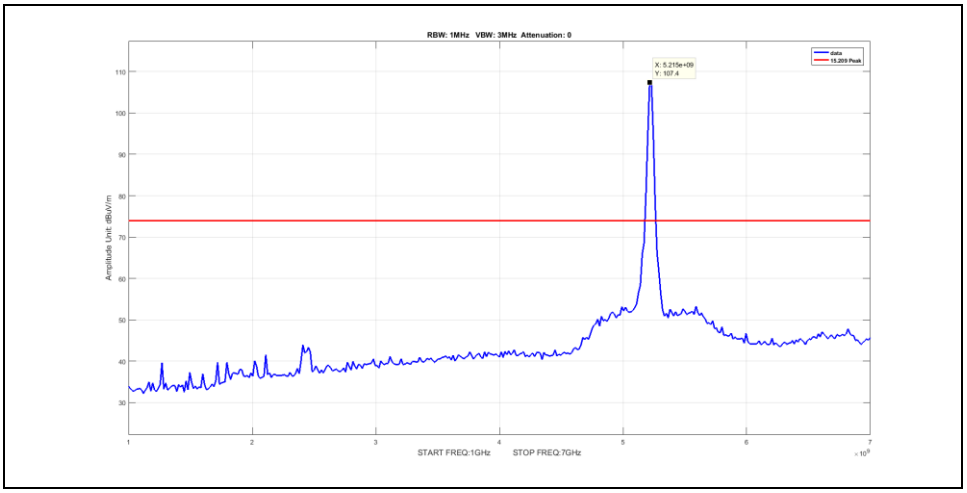
Plot 191. Undesirable Emissions, peak, 1-7G, 20M, ac, mid, channel40



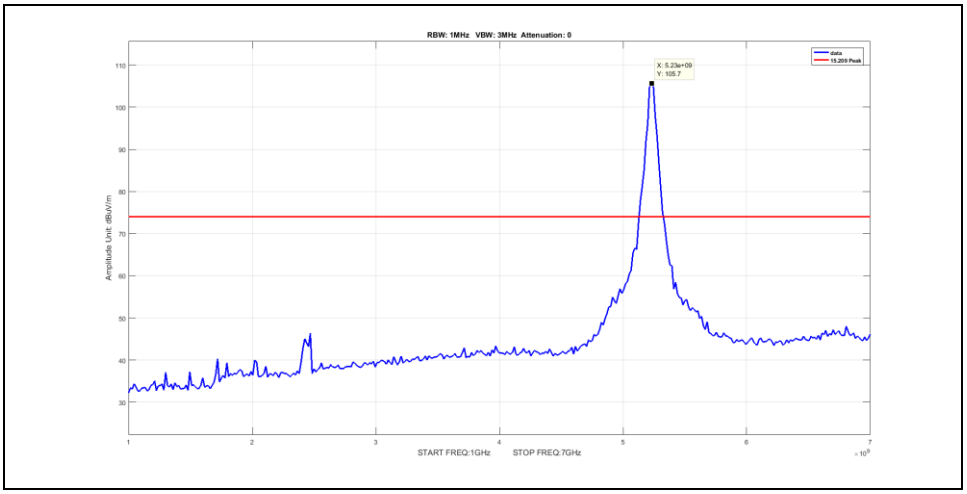
Plot 192. Undesirable Emissions, peak, 1-7G, 20M, n, high, channel48



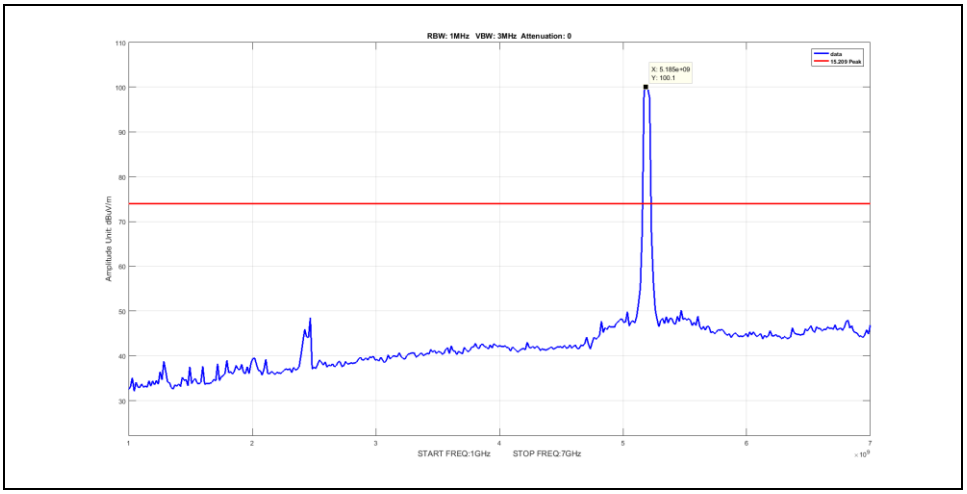
Plot 193. Undesirable Emissions, peak, 1-7G, 20M, n, low, channel36



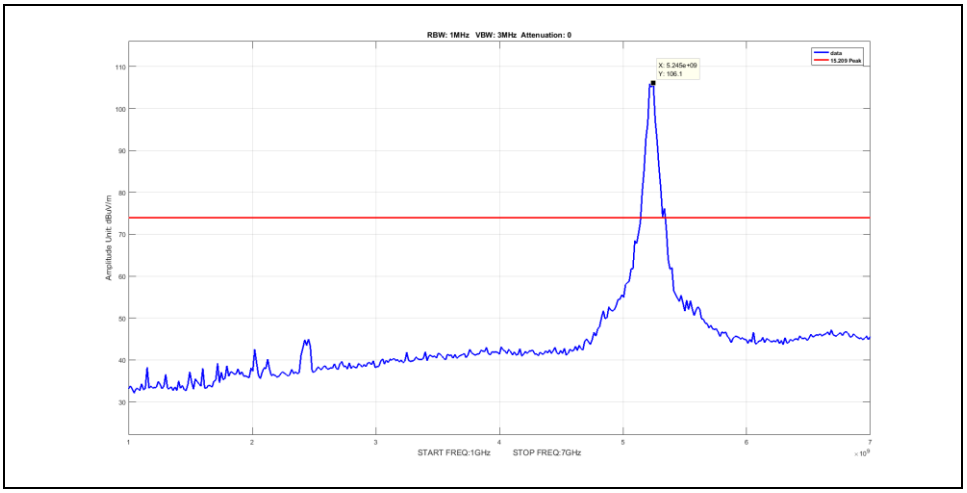
Plot 194. Undesirable Emissions, peak, 1-7G, 20M, n, mid, channel44



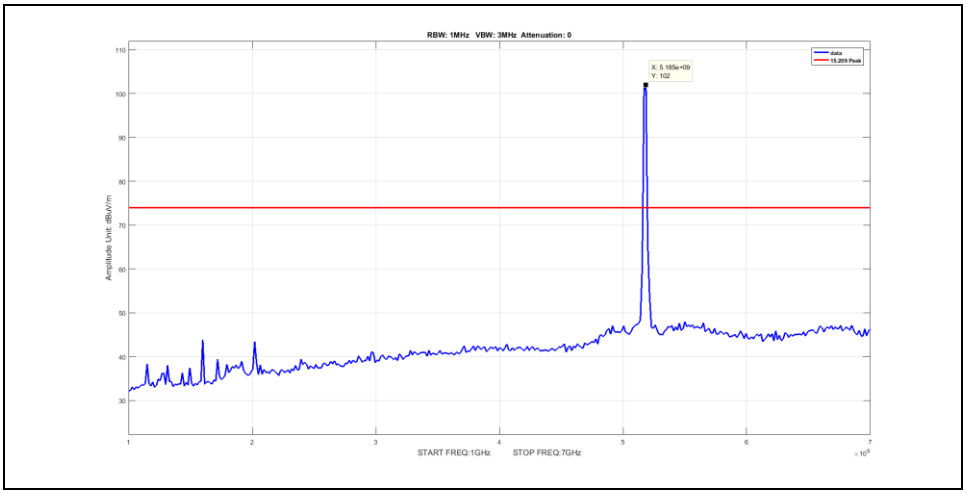
Plot 195. Undesirable Emissions, peak, 1-7G, 40M, ac, high, channel46



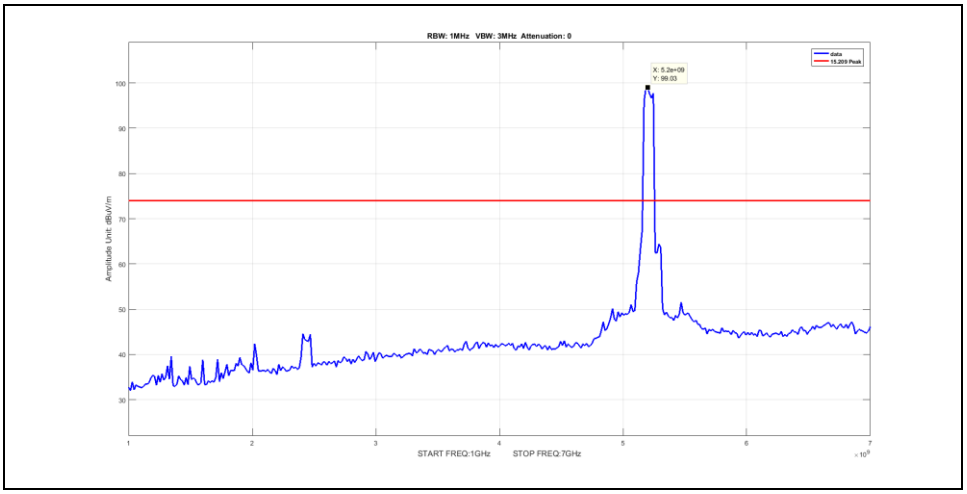
Plot 196. Undesirable Emissions, peak, 1-7G, 40M, ac, low, channel38



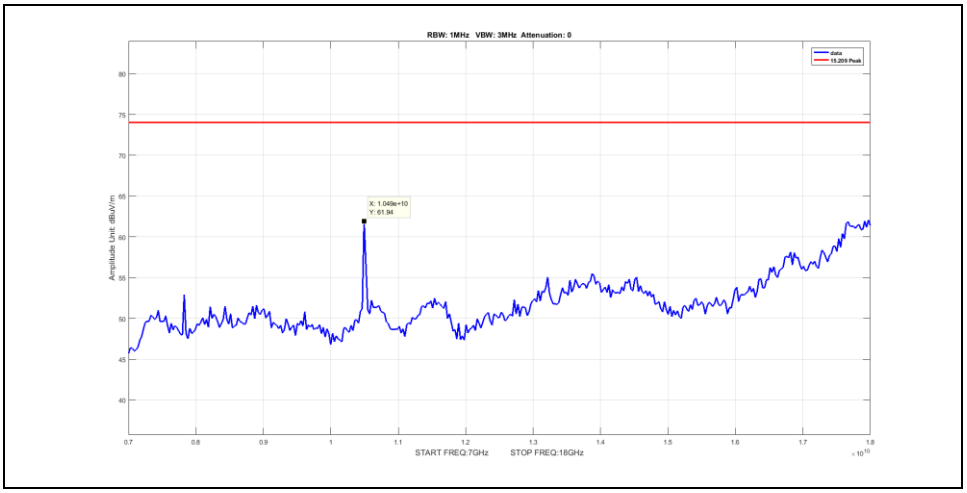
Plot 197. Undesirable Emissions, peak, 1-7G, 40M, n, high, channel46



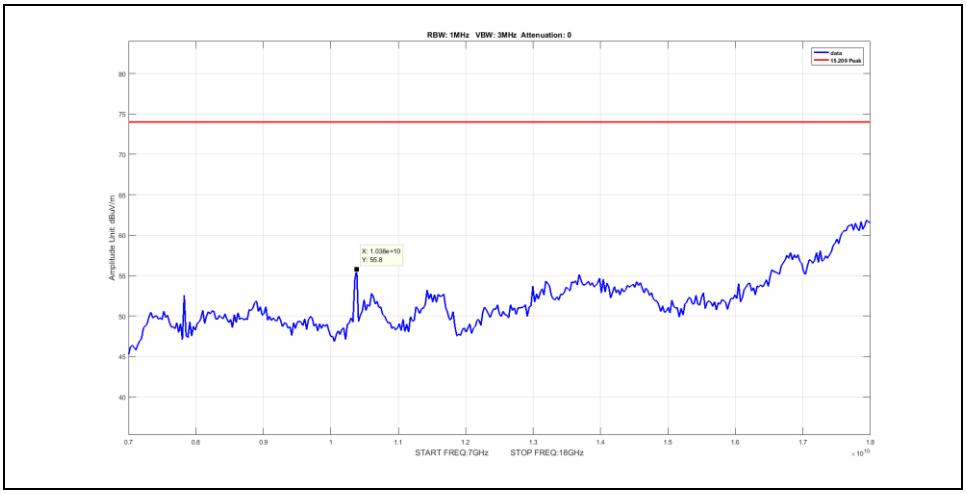
Plot 198. Undesirable Emissions, peak, 1-7G, 40M, n, low, channel38



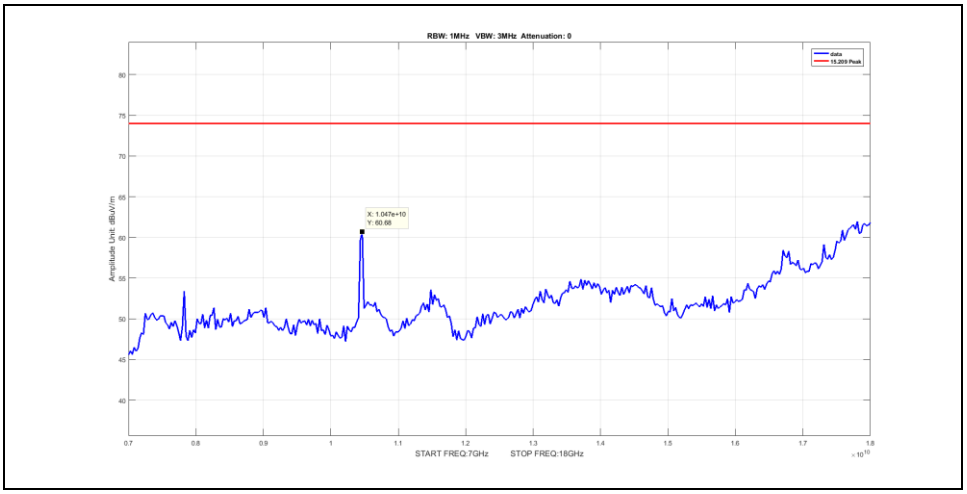
Plot 199. Undesirable Emissions, peak, 1-7G, 80M, ac, mid, channel42



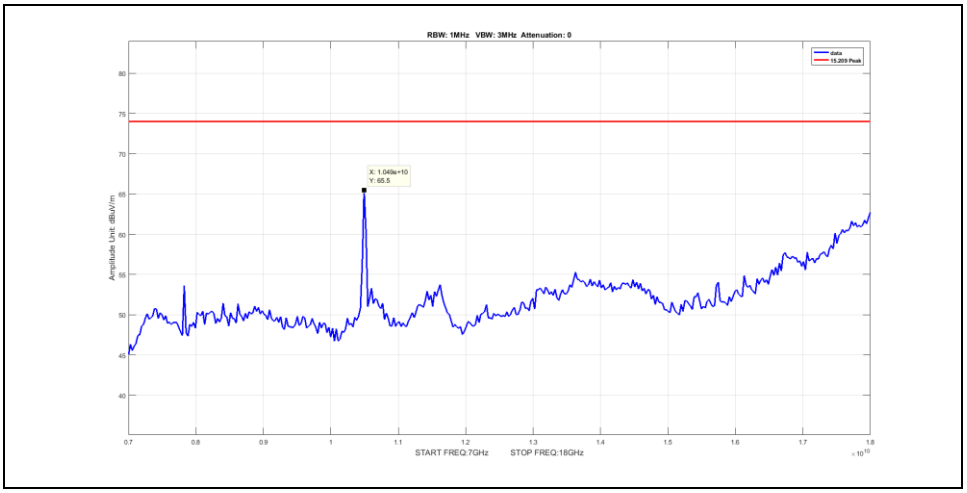
Plot 200. Undesirable Emissions, peak, 7-18G, 20M, a, high, channel48



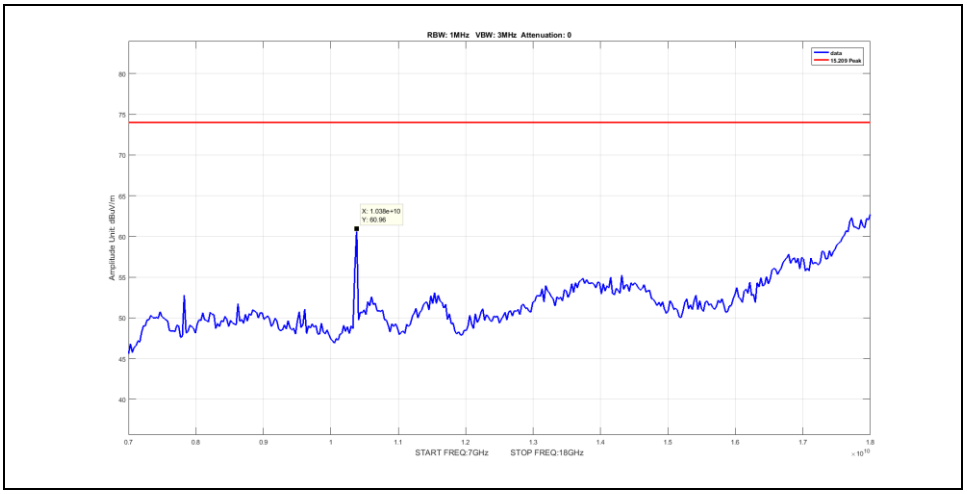
Plot 201. Undesirable Emissions, peak, 7-18G, 20M, a, low, channel36



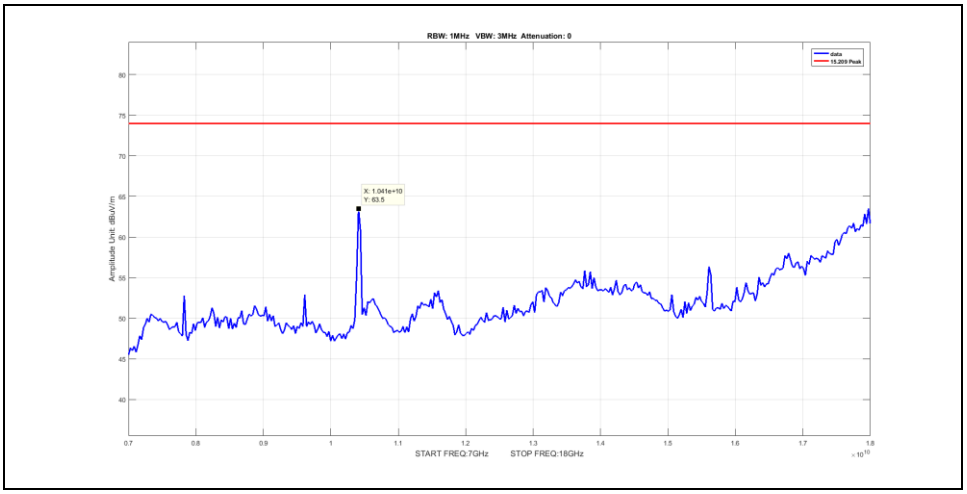
Plot 202. Undesirable Emissions, peak, 7-18G, 20M, a, mid, channel44



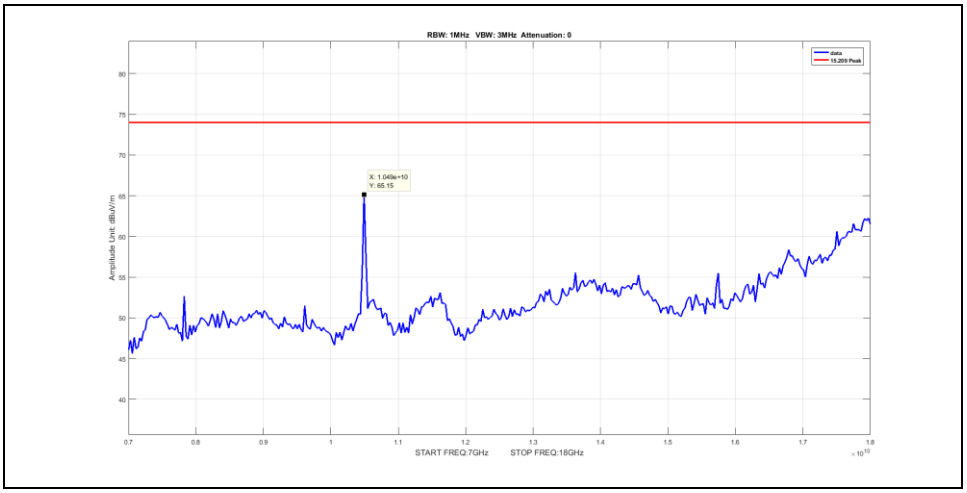
Plot 203. Undesirable Emissions, peak, 7-18G, 20M, ac, high, channel48



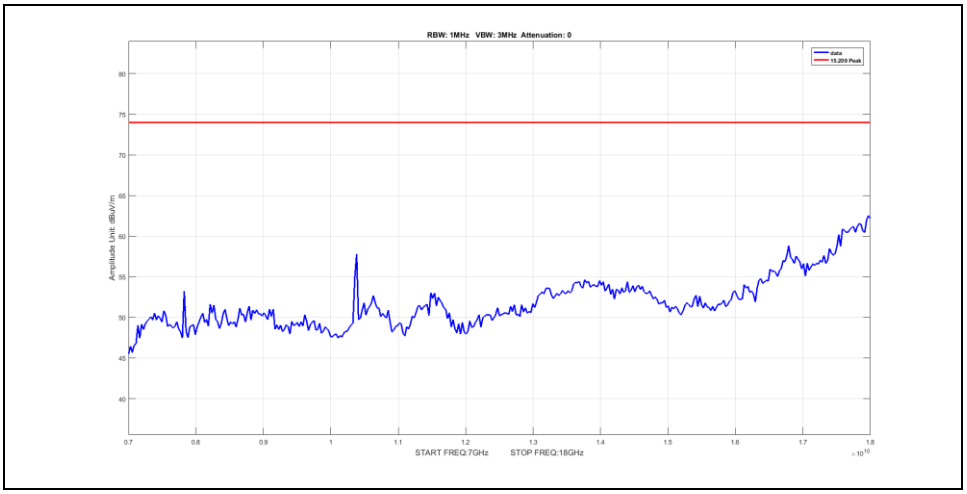
Plot 204. Undesirable Emissions, peak, 7-18G, 20M, ac, low, channel36



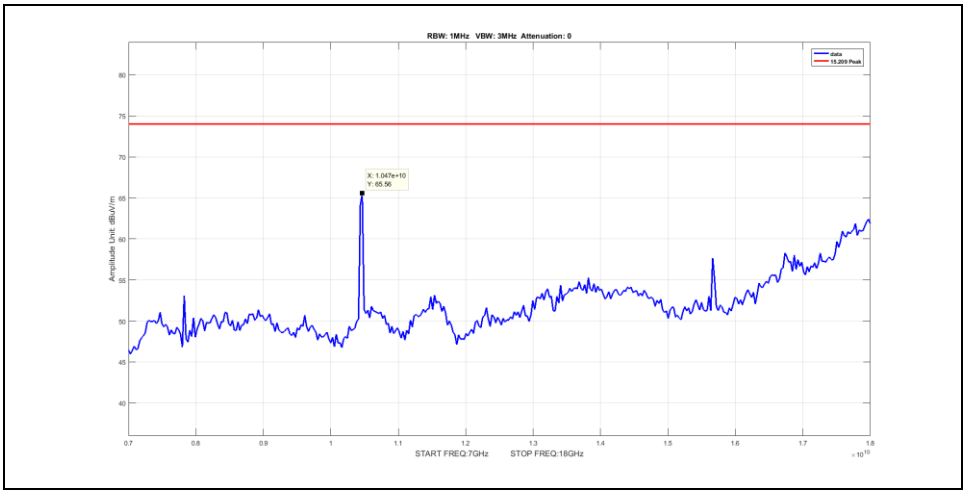
Plot 205. Undesirable Emissions, peak, 7-18G, 20M, ac, mid, channel40



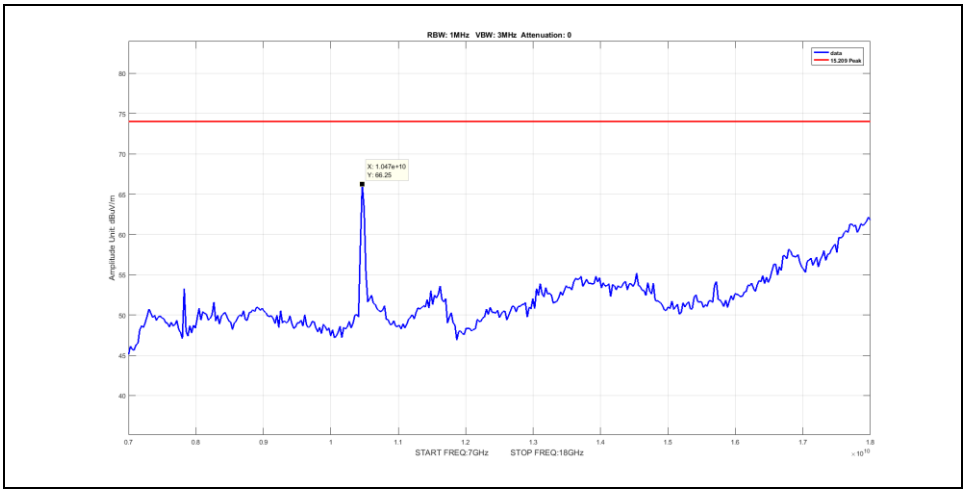
Plot 206. Undesirable Emissions, peak, 7-18G, 20M, n, high, channel48



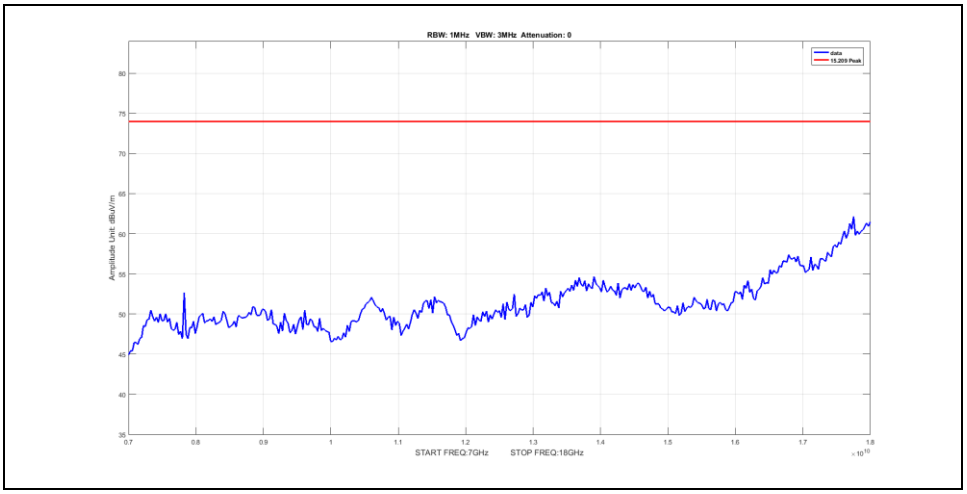
Plot 207. Undesirable Emissions, peak, 7-18G, 20M, n, low, channel36



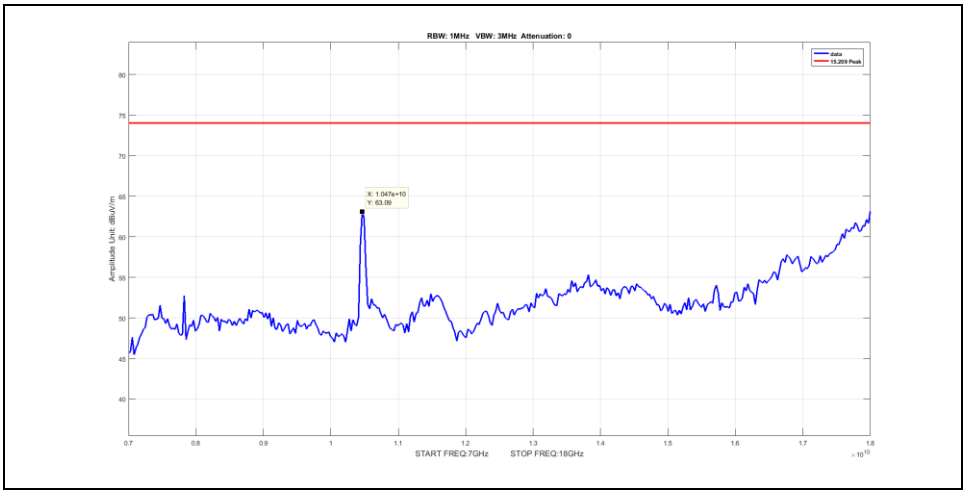
Plot 208. Undesirable Emissions, peak, 7-18G, 20M, n, mid, channel44.



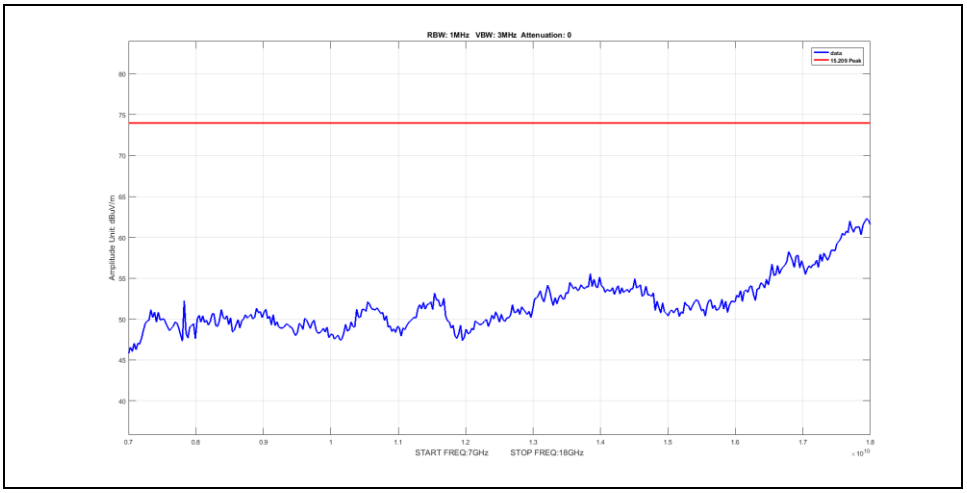
Plot 209. Undesirable Emissions, peak, 7-18G, 40M, ac, high, channel46



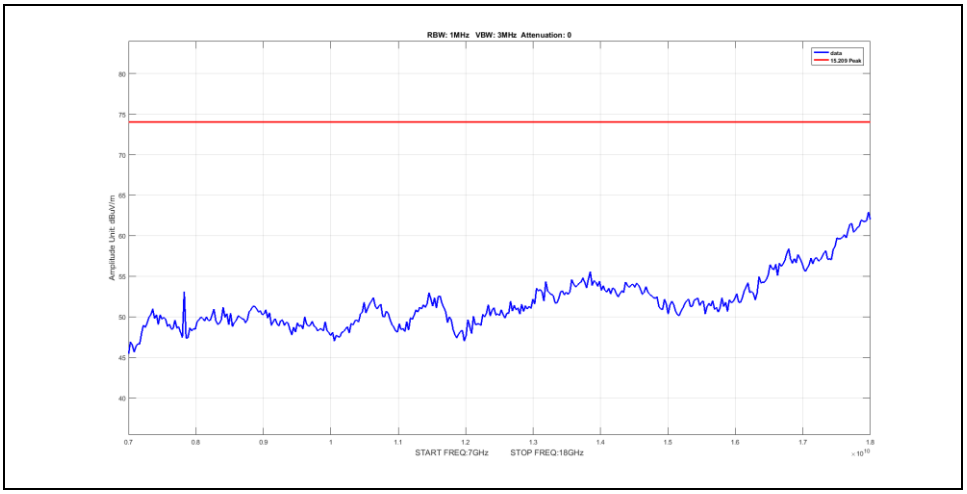
Plot 210. Undesirable Emissions, peak, 7-18G, 40M, ac, low, channel38



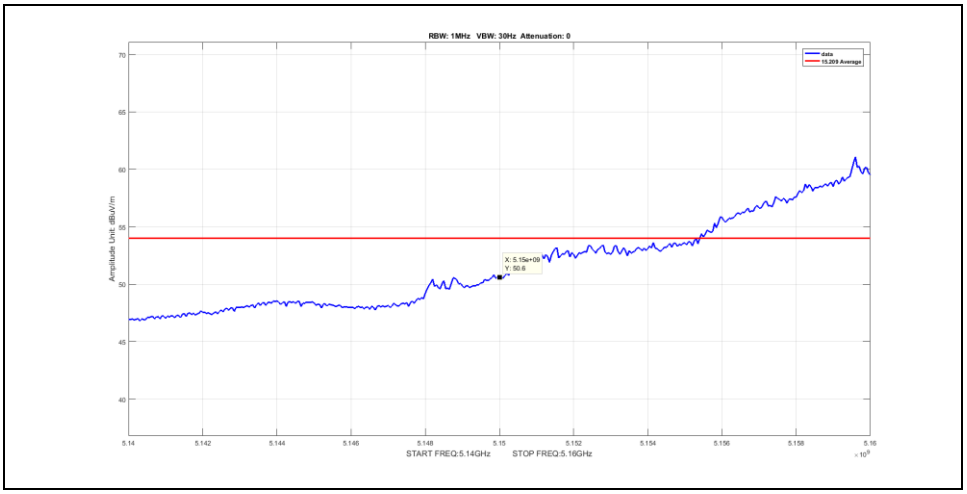
Plot 211. Undesirable Emissions, peak, 7-18G, 40M, n, high, channel46



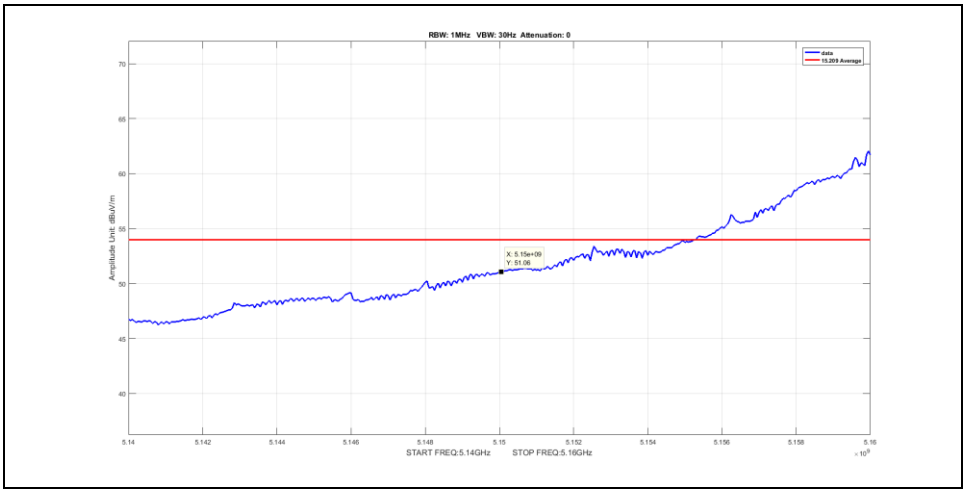
Plot 212. Undesirable Emissions, peak, 7-18G, 40M, n, low, channel38



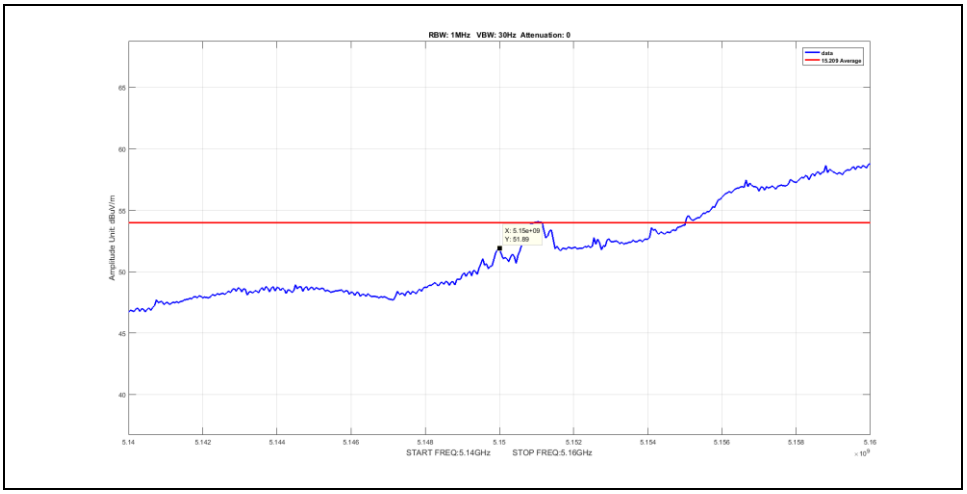
Plot 213. Undesirable Emissions, peak, 7-18G, 80M, ac, mid, channel42



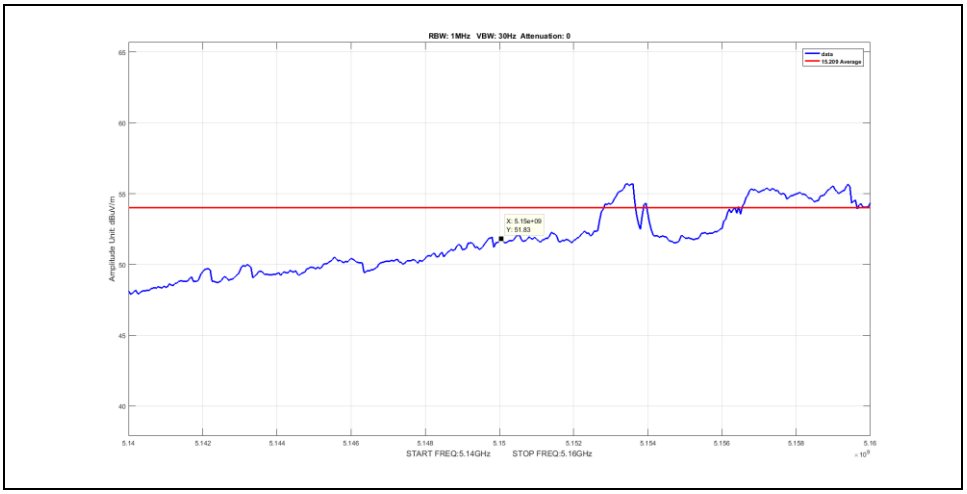
Plot 214. Undesirable Emissions, Band Edge, average, 20M, a, low5150



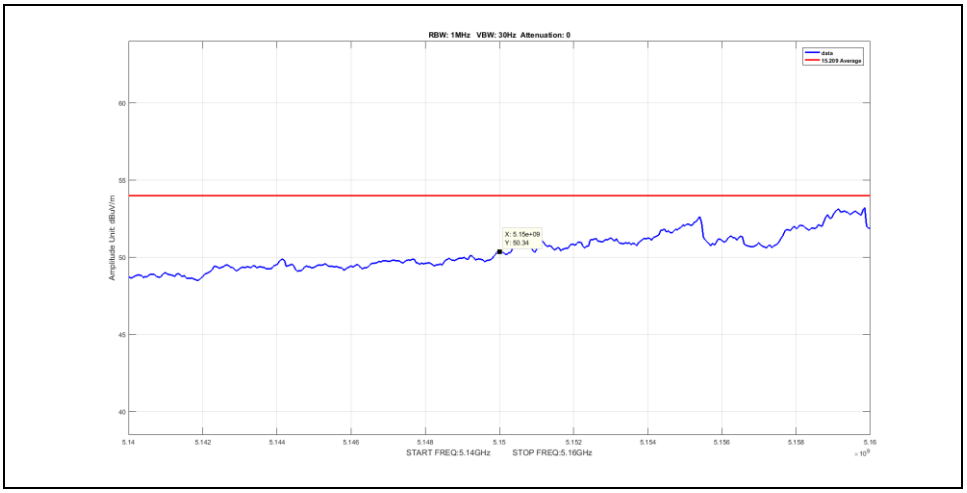
Plot 215. Undesirable Emissions, Band Edge, average, 20M, ac, low5150



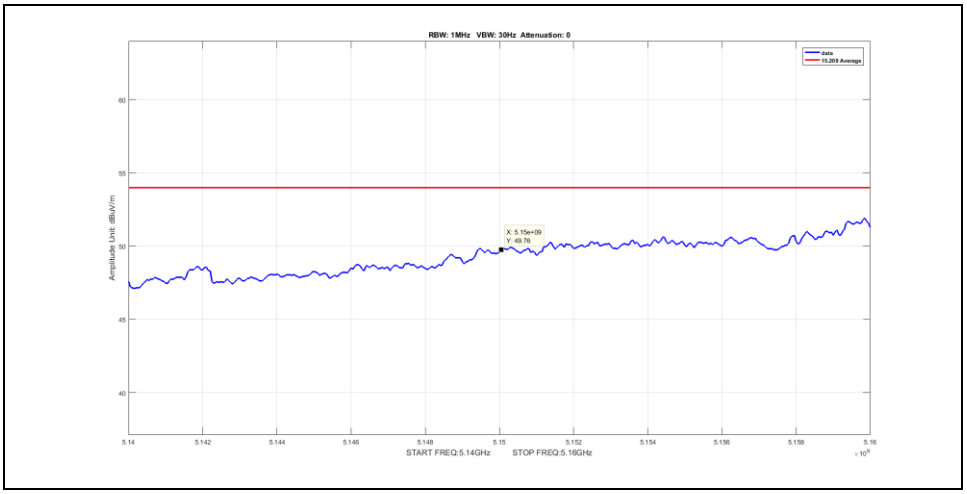
Plot 216. Undesirable Emissions, Band Edge, average, 20M, n, low5150



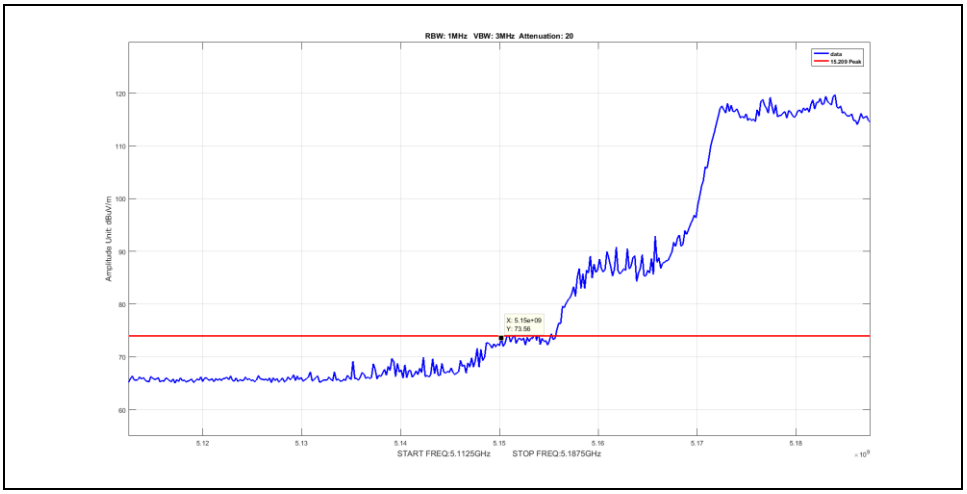
Plot 217. Undesirable Emissions, Band Edge, average, 40M, ac, low5150



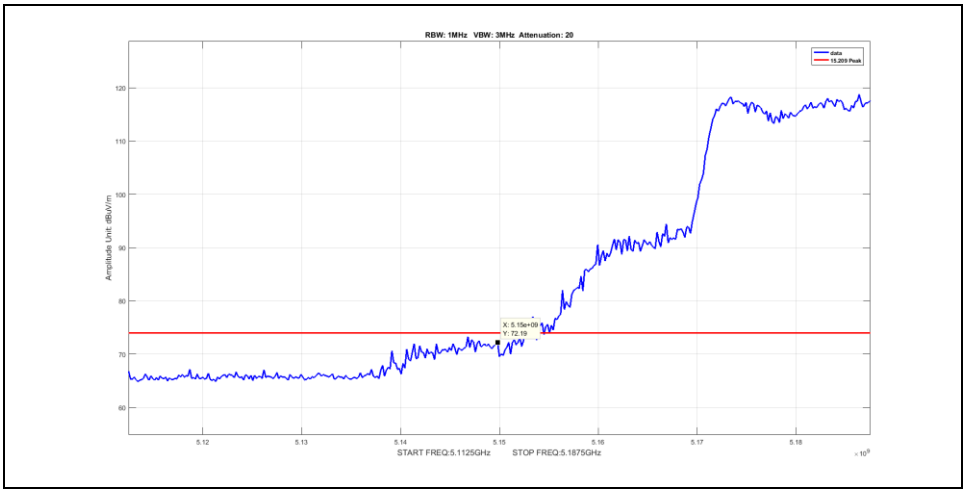
Plot 218. Undesirable Emissions, Band Edge, average, 40M, n, low5150



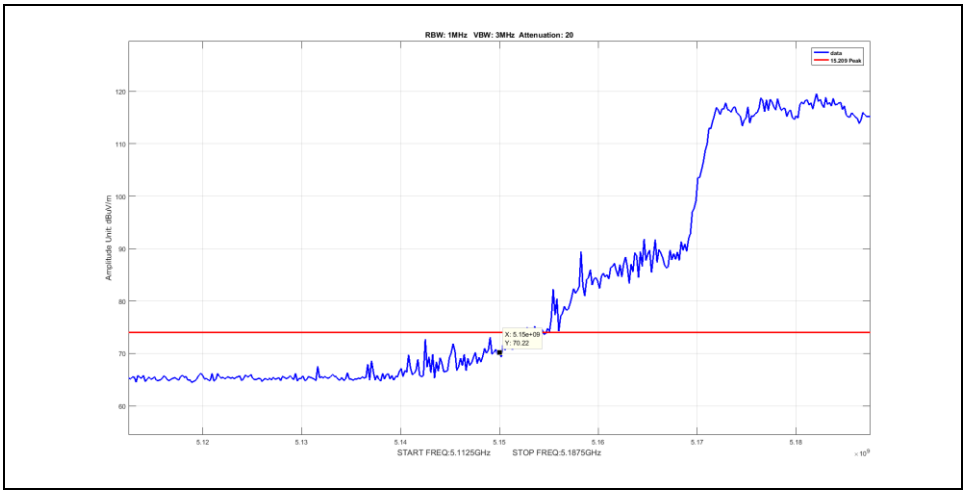
Plot 219. Undesirable Emissions, Band Edge, average, 80M, ac, low5150



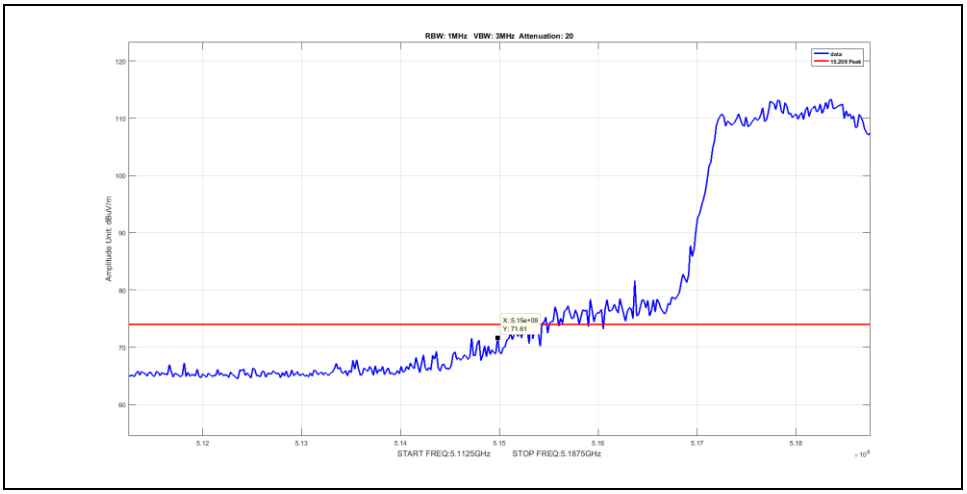
Plot 220.Undesirable Emissions, Band Edge, peak, 20M, a, low5150



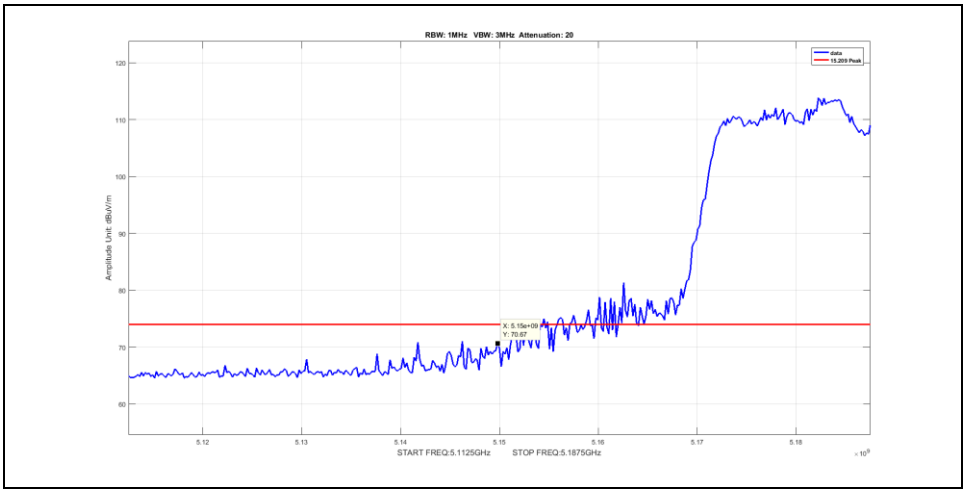
Plot 221. Undesirable Emissions, Band Edge, peak, 20M, ac, low5150



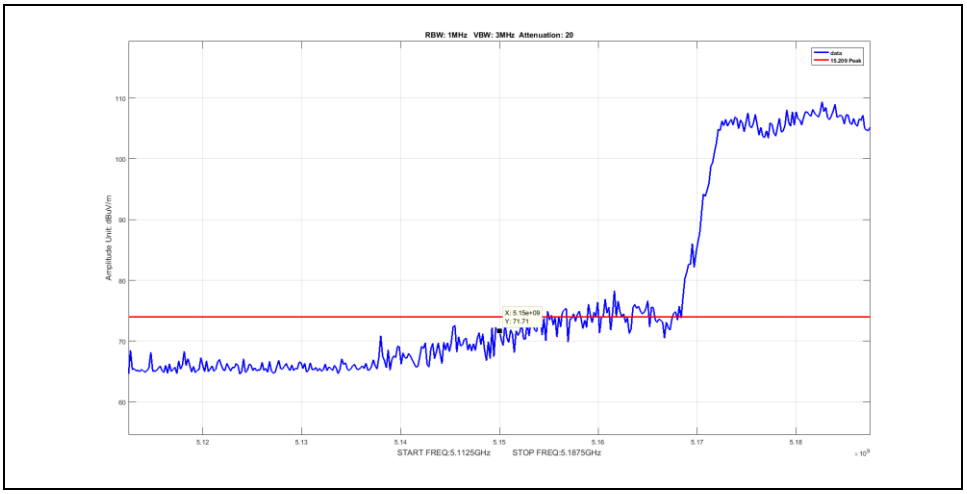
Plot 222. Undesirable Emissions, Band Edge, peak, 20M, n, low5150



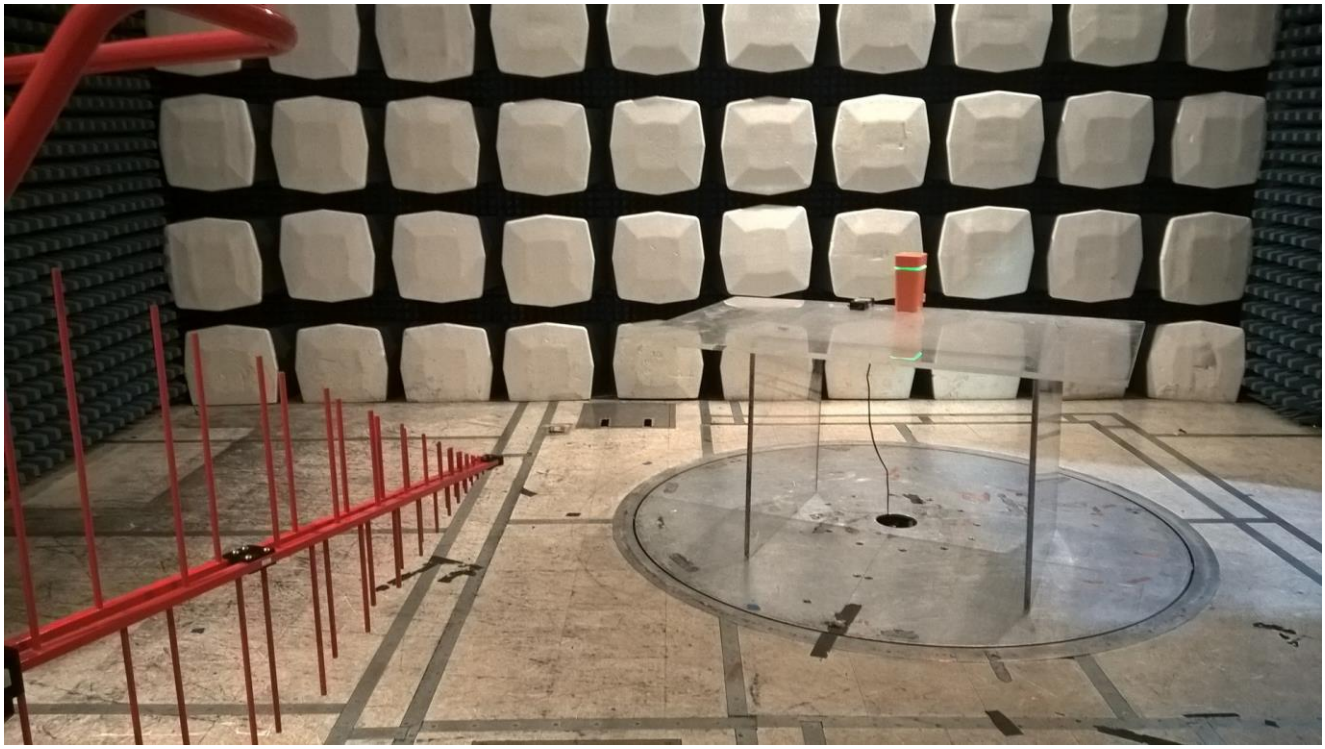
Plot 223. Undesirable Emissions, Band Edge, peak, 40M, ac, low5150



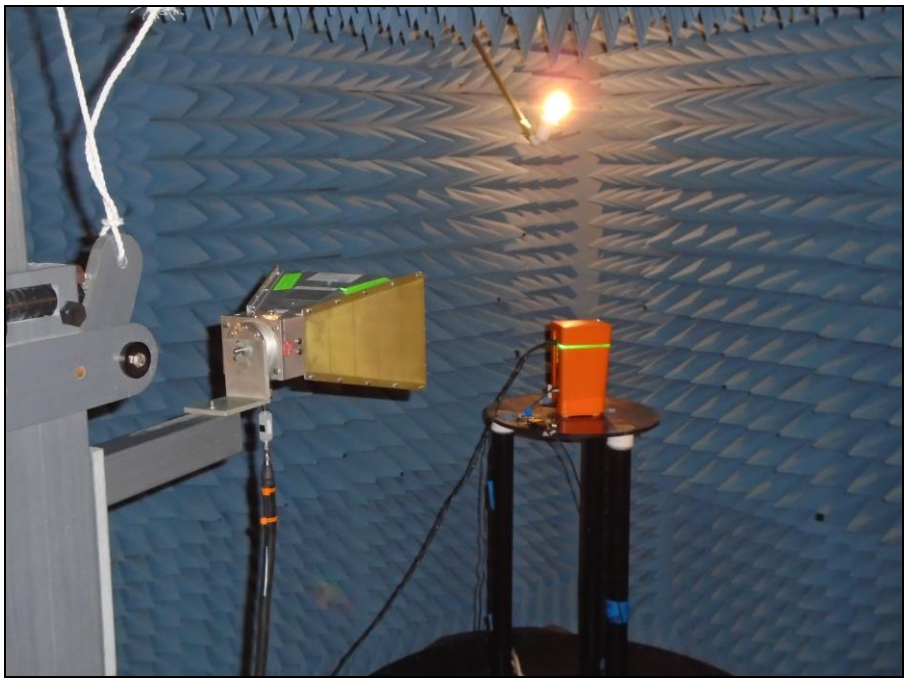
Plot 224. Undesirable Emissions, Band Edge, peak, 40M, n, low5150



Plot 225. Undesirable Emissions, Band Edge, peak, 80M, ac, low5150



Photograph 1. Undesirable Emissions, Below 1 GHz, Test Setup



Photograph 2. Undesirable Emissions, Above 1 GHz, Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(6) Conducted Emissions

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

§ 15.207 (a): For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Σ line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

Table 11. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Procedure: The EUT was placed on a non-metallic table inside a screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-2014 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. Scans were performed with the transmitter on.

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

Test Engineer(s): Bradley Jones

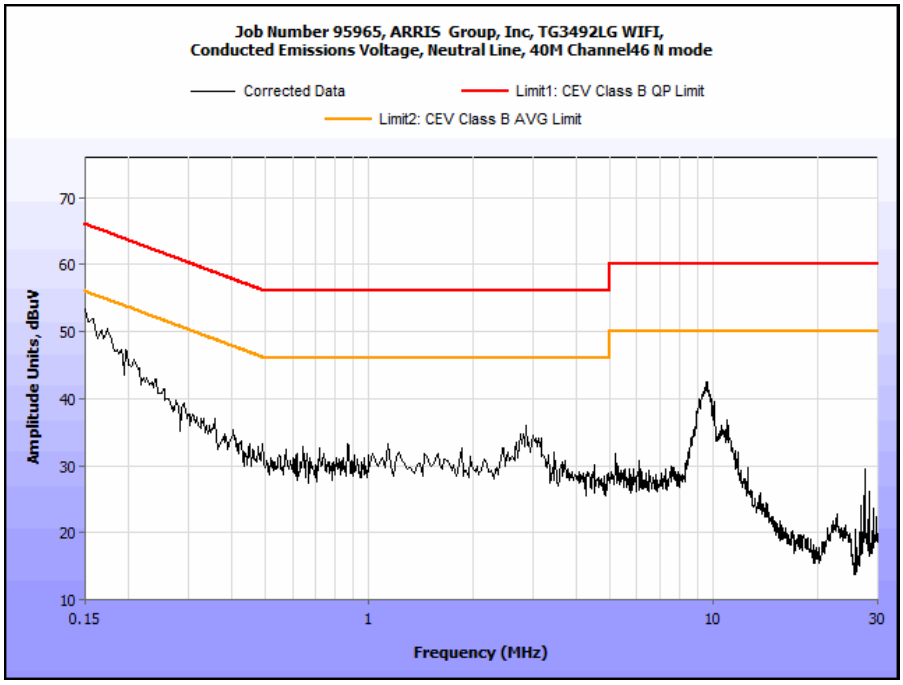
Test Date(s): October 9, 2017

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
9.695	47.81	0	47.81	73	-25.19	19.81	0	19.81	60	-40.19
0.765	16.21	0	16.21	73	-56.79	4.303	0	4.303	60	-55.697

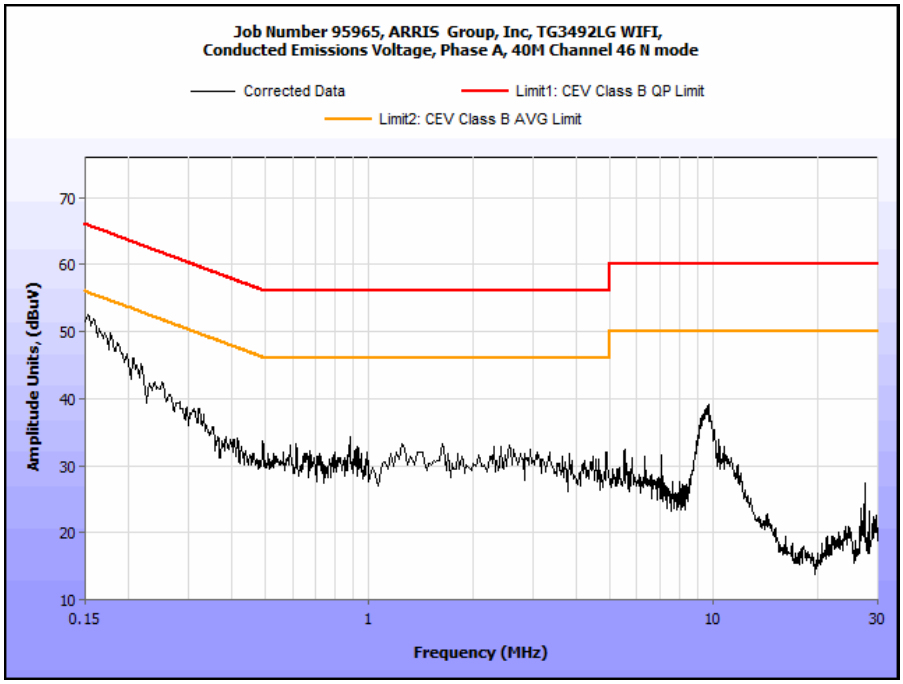
Table 12. Conducted Emissions, Phase, Test Results

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
9.646	46.44	0	46.44	73	-26.56	19.7	0	19.7	60	-40.3
3.021	19.21	0	19.21	73	-53.79	8.25	0	8.25	60	-51.75

Table 13. Conducted Emissions, Neutral, Test Results



Plot 226. Conducted Emissions, neutral, 40M, channel46, n(1)



Plot 227. Conducted Emissions, phase, 40M, channel46, n

Photograph 3. Conducted Emissions, Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) Maximum Permissible Exposure

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

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

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

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

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

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

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

Test Results:

FCC									
Frequency (MHz)	**Con. Pwr. (dBm)**	**Con. Pwr. (mW)**	**Ant. Gain (dBi)**	**Ant. Gain numeric**	**Pwr. Density (mW/cm^2)**	**Limit (mW/cm^2)**	**Margin**	**Distance (cm)**	**Result**
5230	29.75	944.061	6	3.981	0.7477	1	0.2523	20	Pass

The safe distance where Power Density is less than the MPE Limit listed above was found to be 20 cm.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(g) Frequency Stability

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

Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The 1st trace of the Spectrum Analyzer was taken at ambient conditions and used as a reference. A 2nd trace was used to show the drift of the carrier at extreme conditions. A delta marker was used to find the drift at a given extreme condition.

Test Results: Data for frequency stability compliance with the requirements of this section is provided by the customer as a separate exhibit.

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
1T4455	Compass	SUUNTO	KB-14/360	Functional verified	
1T4712	Gauss Meter	F.W. Bell	5180	11/7/2014	5/7/2016
1T4486	1,3 Phase Power Line FIlter	Schaffner	FN258-55-07	See Note	
1T4870	Therm./Clock/Humidity Monitor	Control Company	06-662-4, FB70258	3/14/2014	3/14/2016
1T4406	HELMHOLTZ COIL	MET Laboratories	N/A	See Note	
1T4442	Pre-amplifier, Microwave	Miteq	AFS42-01001800-30-10P	See Note	
1T4149	High-Frequency Anechoic Chamber	Ray Proof	3/21/1900	8/23/2001	8/23/2002
1T8818	Spectrum Analyzer	Agilent Technologies	E4407B	2/24/2017	2/24/2018
1T2665	Antenna; Horn	EMCO	7/11/1908	6/22/2017	12/22/2018
1T4483	Antenna; Horn	ETS-Lindgren	7/13/1908	4/19/2017	10/19/2018
1T4612	Spectrum Analyzer	Agilent Technologies	E4407B	3/30/2017	9/30/2018
1T4753	Antenna - Bilog	Sunol Sciences	JB6	10/24/2016	4/24/2018
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	2/6/2015	2/6/2018
1T4409	EMI Receiver	Rohde & Schwarz	ESIB7	12/7/2016	12/7/2018

Table 14. Test Equipment List

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

V. Certification & User's Manual Information

Certification & User's Manual Information

L. Certification Information

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

§ 2.801 Radio-frequency device defined.

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

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

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

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

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

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

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

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

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

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

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

(i) Compliance testing;

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

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

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

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

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

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

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

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

§ 2.907 Certification.

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

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

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

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

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

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

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

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

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

Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

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

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

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

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

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

