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

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July 22, 2016

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., TG2492LG as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15.407, Subpart E (UNII 3).

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

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\ARRIS Group Inc.\ EMC89081-FCC407 UNII 3 Rev. 2)

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

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Electromagnetic Compatibility Criteria
Test Report

for the

ARRIS Group Inc.
Model TG2492LG

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

MET Report: EMC89081-FCC407 UNII 3 Rev. 2

July 22, 2016

Prepared For:

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

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

Electromagnetic Compatibility Criteria
Test Report

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ARRIS Group Inc.
Model TG2492LG

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

Surinder Singh, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Parts 15B, 15.407, of the FCC Rules under normal use and maintenance.

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	June 7, 2016	Initial Issue.
1	July 7, 2016	Engineer corrections.
2	July 22, 2016	Updated MPE.

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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. TG2492LG, 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 TG2492LG. 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 TG2492LG, 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 AR1079103. All tests were conducted using measurement procedure ANSI C63.4-2014.

FCC Reference	Description	Results
§15.203	Antenna Requirement	Compliant
§15.403(i)	26 dB Bandwidth	Compliant
§15.407 (a)(3)	Maximum Conducted Output Power	Compliant
§15.407 (a)(3)	Maximum Power Spectral Density	Compliant
§15.407 (b)(4)& (6 - 7)	Undesirable Emissions	Compliant
§15.407(b)(6)	Conducted Emission Limits	Compliant
§15.407(e)	6 dB Bandwidth	Compliant
§15.407(f)	RF Exposure	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by ARRIS Group Inc. to perform testing on the TG2492LG, under ARRIS Group Inc.'s purchase order number AR1079103.

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. TG2492LG.

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

Model(s) Tested:	TG2492LG	
Model(s) Covered:	TG2492LG	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: UIDTG2492	
	Type of Modulations:	OFDM, MCS, MNSS
	Equipment Code:	NII
	Max. RF Output Power:	27.46 dBm
	EUT Frequency Ranges:	5725-5825MHz
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:	Surinder Singh	
Report Date(s):	July 22, 2016	

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 v01r02	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 W. Patapsco Ave., Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

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

D. Description of Test Sample

The ARRIS Group Inc. TG2492LG, Equipment Under Test (EUT), is a DOCSIS® 3.0 Dual Band Concurrent 802.11ac Wireless Telephony Gateway with MoCA®2.0.

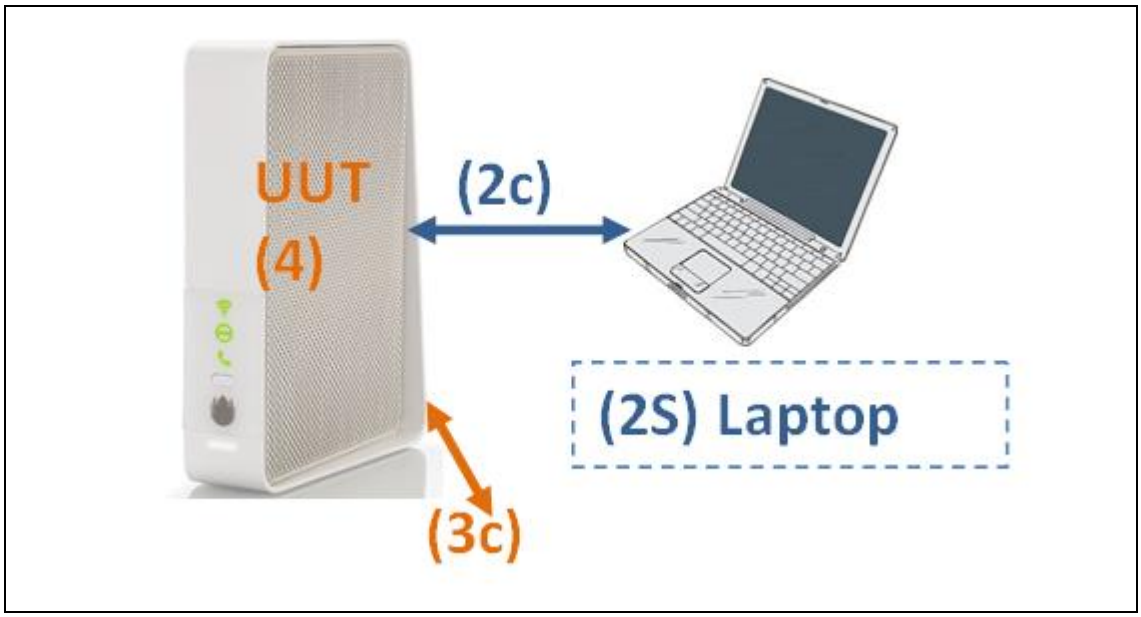


Figure 1. Block Diagram of Test Configuration

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	UUT	TG2492	--	--	--

Table 4. Equipment Configuration

F. Antenna Configuration

Part Number	Type	Frequency Range MHz	Efficiency %	Peak Gain dBi	Return Loss dB
AAAD00179PB	Omni	5150-5350	75%	1.9	<-10
AAAD00179PB	Omni	5725-5850	65%	2.0	<-10

Table 5. Antenna Configuration

TG2492 transmit correlated signal in 802.11b , 802.11g and 802.11a mode.
TG2492 transmit un correlated signal in 802.11n and 802.11ac mode.

Referenced from OET KDB 662911 D01

Total Antenna gain in 802.11b , 802.11g and 802.11a mode: Peak Gain +10*log(Number of Antenna)

Frequency Range MHz	Total Antenna Gain dBi
5150-5350	1.9+4.77= 6.67
5725-5850	2.0+4.77= 6.77

Total Antenna gain in 802.11n and 802.11ac mode is equal to Peak Gain value of one antenna.

Frequency Range MHz	Total Antenna Gain dBi
5150-5350	1.9
5725-5850	2.0

Determination of test mode reduction:
Based upon the preliminary testing results on all data rate for all modulation type- lowest data rate for each modulation type produce maximum emission at the band edge, which happens to be a limiting factor for this EUT to transmit more power. So based upon this determination all other data rate are expected to produce lesser band edge emission when operate with same power level as low data rate modulation.

EUT duty cycle: Manufacturer provided software that placed the radio in a 100% duty cycle transmit mode.

G. 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
2s	Laptop	Assorted	--

Table 6. Support Equipment

H. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
2C	Ethernet	5e Modular 8 pin	1	1	No	--
3C	DC Input	2 conductor	1	2	No	--

Table 7. Ports and Cabling Information

I. Mode of Operation

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

J. Method of Monitoring EUT Operation

All indicator lights are active, both Wi-Fi 2.4G and 5 G passing traffic.

K. 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.

L. 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. EUT has integral antenna.

Test Engineer(s): Surinder Singh

Test Date(s): 04/21/16

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(i) 26 dB Bandwidth

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

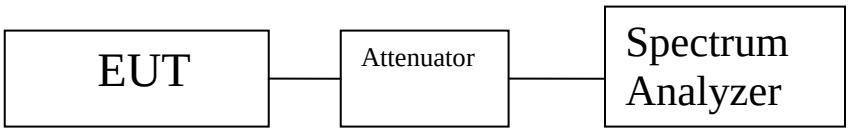
Test Procedure: The transmitter was set to low, mid, and high operating frequencies at the highest output power and connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the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

Note: Occupied Bandwidth measurement was taken at Port 1 of EUT. All ports run of the same radio chip and preliminary testing showed the 26 dB bandwidth was the same on all ports. Therefore, final measurements were only made on Port 1 of the EUT.

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

Test Engineer(s): Surinder Singh

Test Date(s): 05/06/16



Frequency MHz	Mode	Occupied Bandwidth MHz
5745	a	23.273
5785	a	23.474
5825	a	22.608
5745	n	24.76
5785	n	24.424
5825	n	23.743
5745	ac	23.877
5785	ac	23.991
5825	ac	24.803
5755	n	46.162
5795	n	45.404
5785	ac	46.583
5795	ac	46.291
5775	ac	87.984

Table 8. 26 dB Occupied Bandwidth, Test Results

Electromagnetic Compatibility Criteria for Intentional Radiators

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

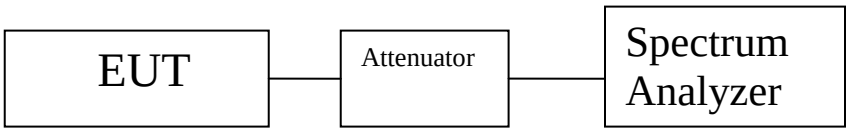
Test Requirements: **§15.407(a)(3):** For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according to measurement method SA-1, as described in 789033 D02 General UNII Test Procedures v01r02.

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

Test Engineer(s): Surinder Singh

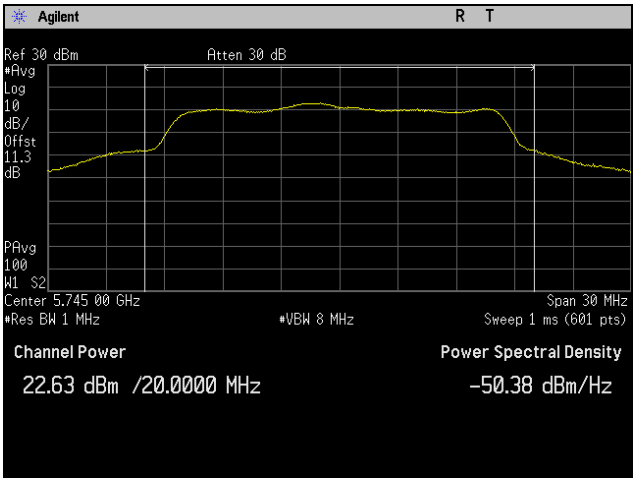
Test Date(s): 04/30/16



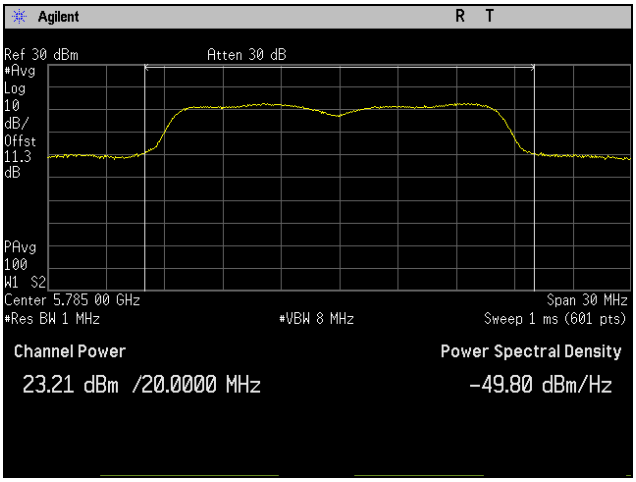
Center Frequency MHz	Bandwidth MHz	Mode	Port 1 Data dBm	Port 2 Data dBm	Port 3 Data dBm	Sum of Three Port dBm	Limit dBm	Antenna Gain dBi	Final limit dBm	Margin dB
Ch 5745M	BW 20M	a mode	22.63	22.42	22.71	27.36	30	6.77	29.23	-1.87
Ch 5745M	BW 20M	ac mode	22.9	22.33	22.67	27.42	30	2	30	-2.58
Ch 5745M	BW 20M	n mode	22.15	22.32	22.34	27.05	30	2	30	-2.95
Ch 5785M	BW 20M	a mode	23.21	22.31	22.24	27.39	30	6.77	29.23	-1.84
Ch 5785M	BW 20M	ac mode	22.58	22.91	22.3	27.38	30	2	30	-2.62
Ch 5785M	BW 20M	n mode	22.88	22.86	22.28	27.46	30	2	30	-2.54
Ch 5825M	BW 20M	a mode	23.14	23.02	21.58	27.41	30	6.77	29.23	-1.82
Ch 5825M	BW 20M	ac mode	22.79	22.83	21.97	27.32	30	2	30	-2.68
Ch 5825M	BW 20M	n mode	22.69	22.95	22.08	27.36	30	2	30	-2.64
Ch 5755M	BW 40M	ac mode	21.78	21.55	21.55	26.4	30	2	30	-3.6
Ch 5755M	BW 40M	n mode	21.41	22.11	21.8	26.56	30	2	30	-3.44
Ch 5795M	BW 40M	ac mode	22.72	22.74	22.43	27.41	30	2	30	-2.59
Ch 5795M	BW 40M	n mode	22.65	22.33	22.6	27.31	30	2	30	-2.69
Ch 5775M	BW 80M	ac mode	18.81	18.89	18.89	23.64	30	2	30	-6.36

Table 9. Conducted Output Power, Test Results

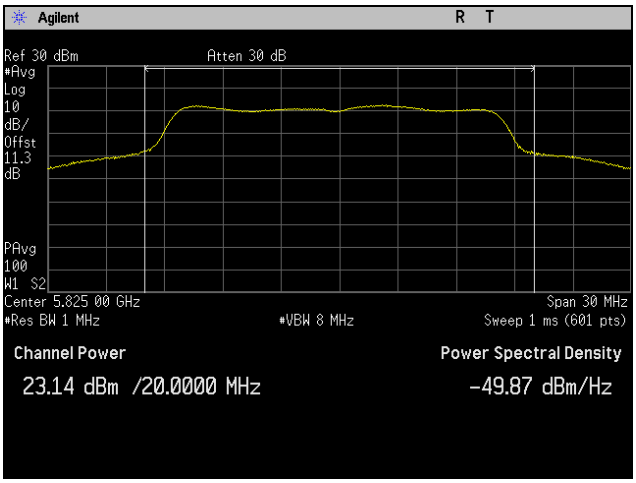
Conducted Output Power, 802.11a 20 MHz, Port 1



Plot 1. Conducted Output Power, Low Channel, 802.11a 20 MHz, Port 1

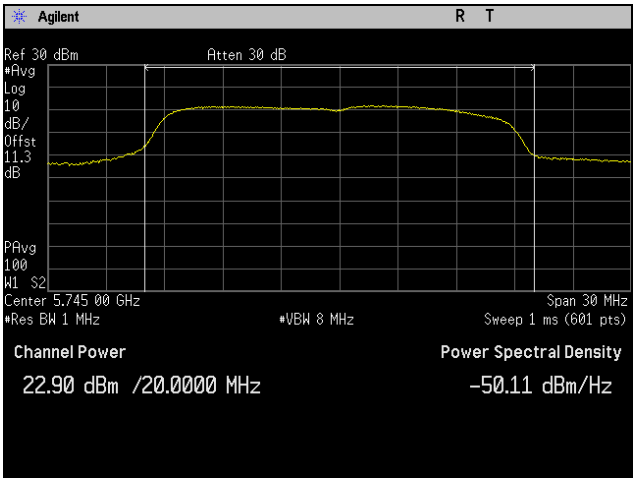


Plot 2. Conducted Output Power, Mid Channel, 802.11a 20 MHz, Port 1

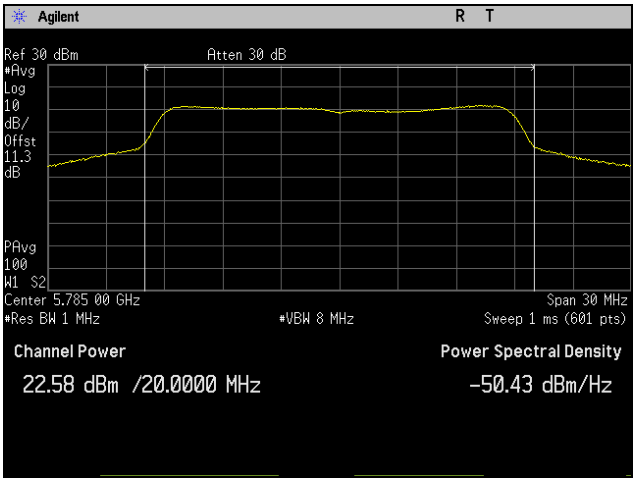


Plot 3. Conducted Output Power, High Channel, 802.11a 20 MHz, Port 1

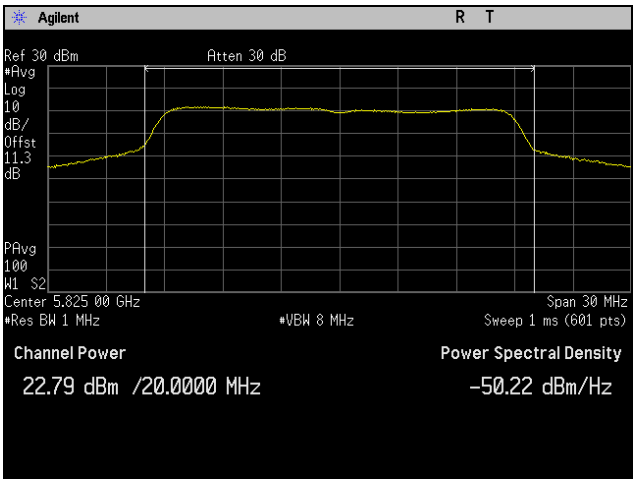
Conducted Output Power, 802.11ac 20 MHz, Port 1



Plot 4. Conducted Output Power, Low Channel, 802.11ac 20 MHz, Port 1

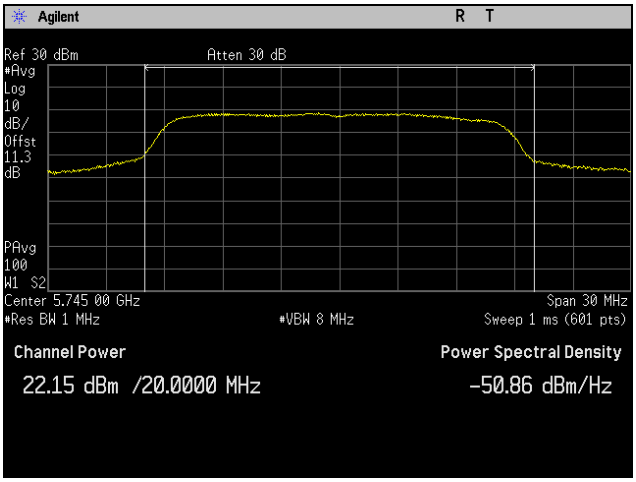


Plot 5. Conducted Output Power, Mid Channel, 802.11ac 20 MHz, Port 1

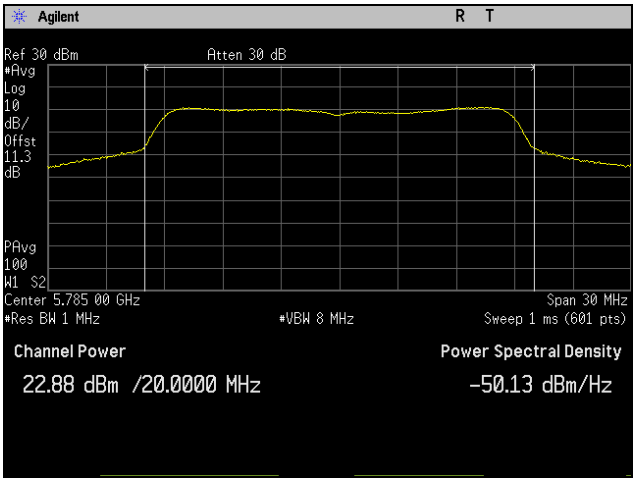


Plot 6. Conducted Output Power, High Channel, 802.11ac 20 MHz, Port 1

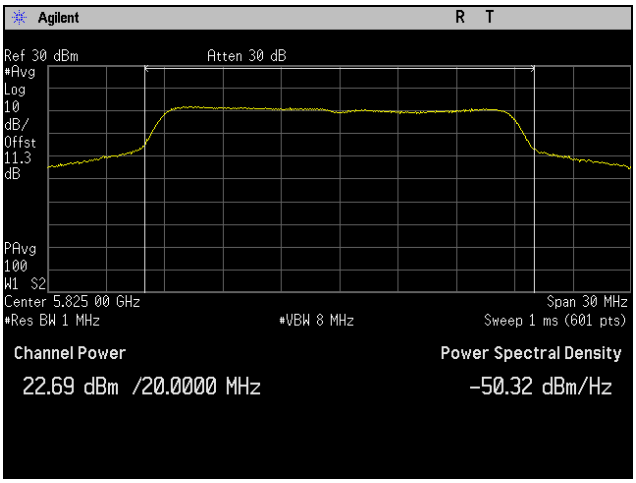
Conducted Output Power, 802.11n 20 MHz, Port 1



Plot 7. Conducted Output Power, Low Channel, 802.11n 20 MHz, Port 1

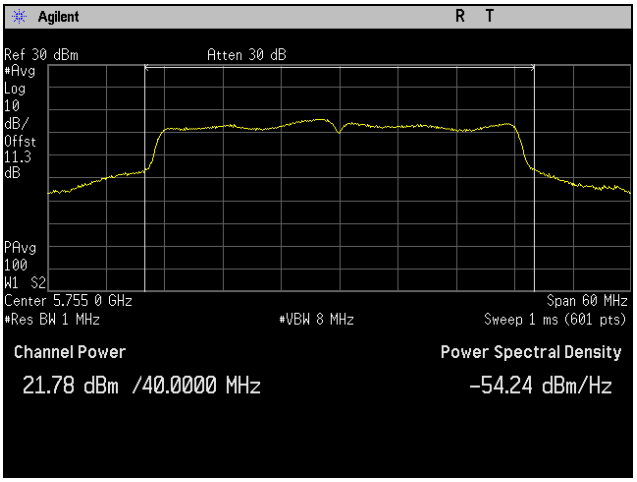


Plot 8. Conducted Output Power, Mid Channel, 802.11n 20 MHz, Port 1

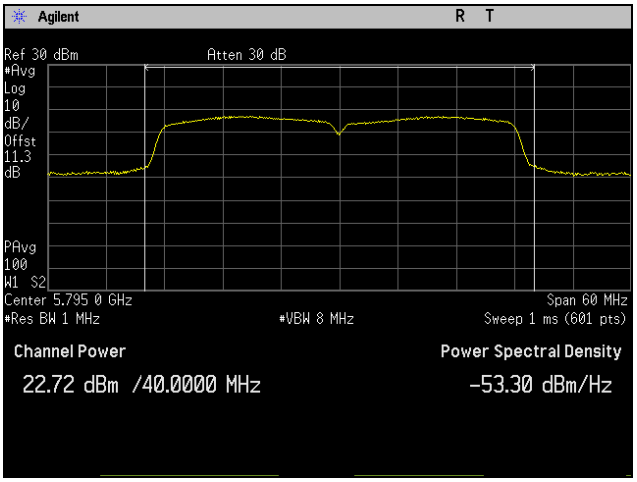


Plot 9. Conducted Output Power, High Channel, 802.11n 20 MHz, Port 1

Conducted Output Power, 802.11ac 40 MHz, Port 1

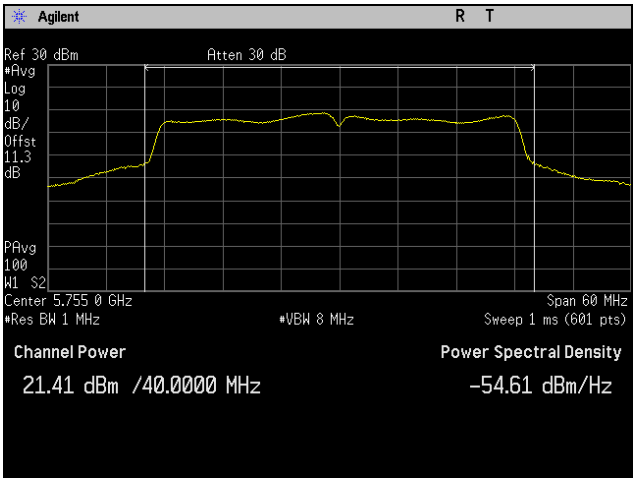


Plot 10. Conducted Output Power, Low Channel, 802.11ac 40 MHz, Port 1

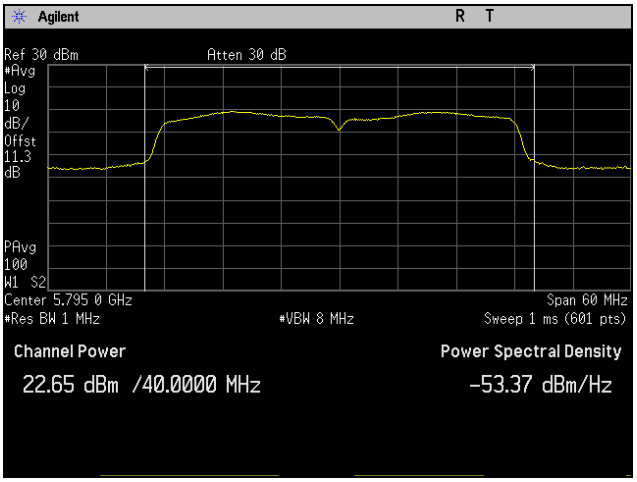


Plot 11. Conducted Output Power, High Channel, 802.11ac 40 MHz, Port 1

Conducted Output Power, 802.11n 40 MHz, Port 1

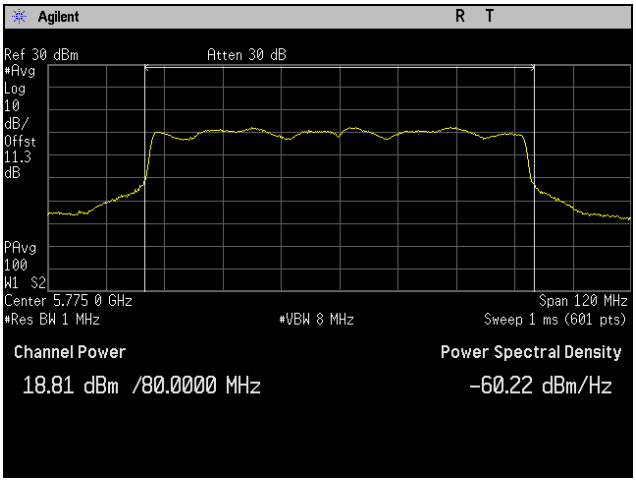


Plot 12. Conducted Output Power, Low Channel, 802.11n 40 MHz, Port 1



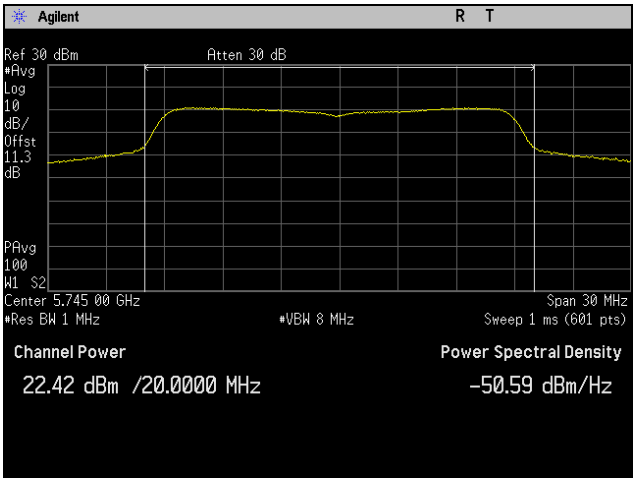
Plot 13. Conducted Output Power, High Channel, 802.11n 40 MHz, Port 1

Conducted Output Power, 802.11ac 80 MHz, Port 1

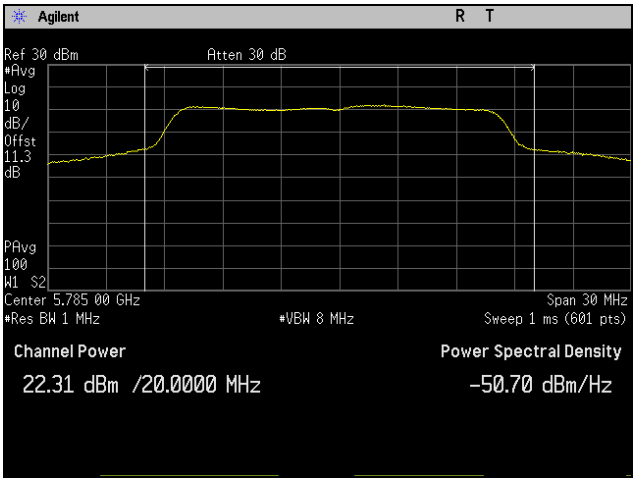


Plot 14. Conducted Output Power, Low Channel, 802.11ac 80 MHz, Port 1

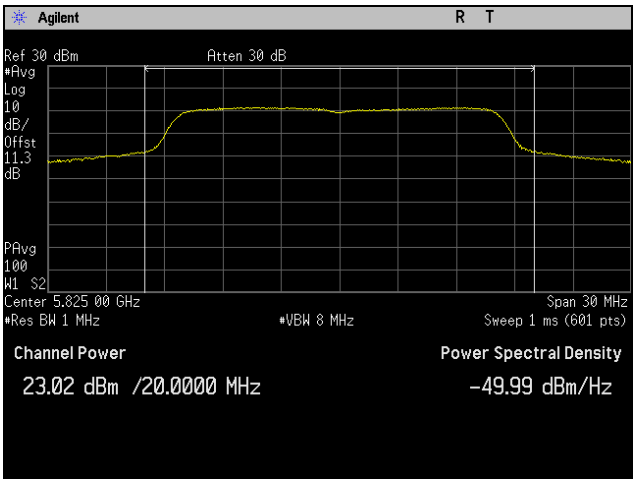
Conducted Output Power, 802.11a 20 MHz, Port 2



Plot 15. Conducted Output Power, Low Channel, 802.11a 20 MHz, Port 2

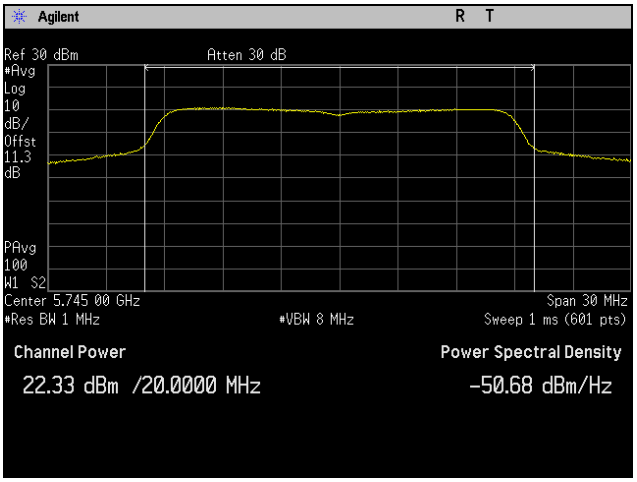


Plot 16. Conducted Output Power, Mid Channel, 802.11a 20 MHz, Port 2

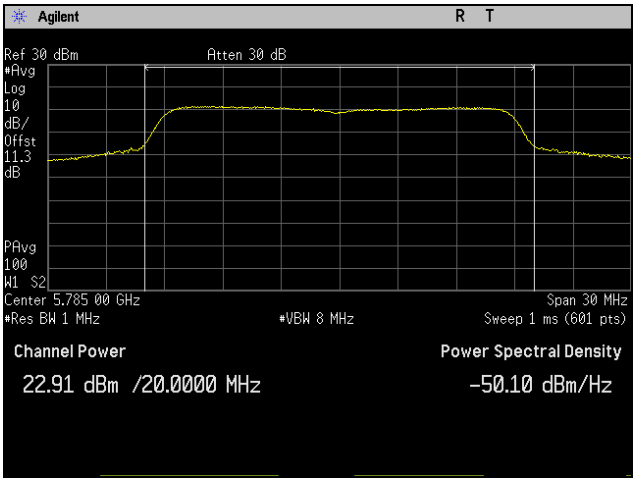


Plot 17. Conducted Output Power, High Channel, 802.11a 20 MHz, Port 2

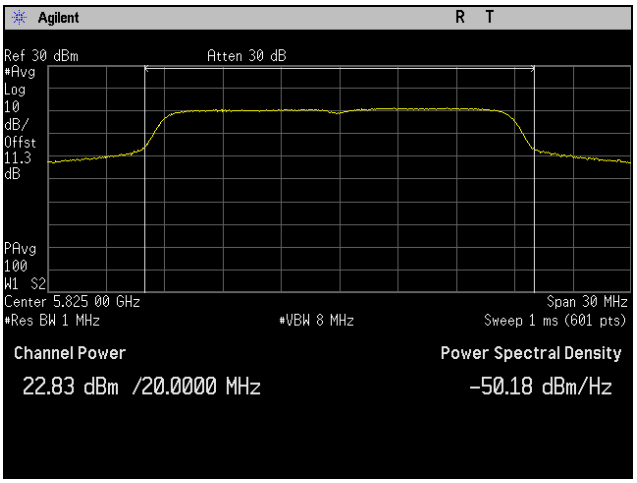
Conducted Output Power, 802.11ac 20 MHz, Port 2



Plot 18. Conducted Output Power, Low Channel, 802.11ac 20 MHz, Port 2

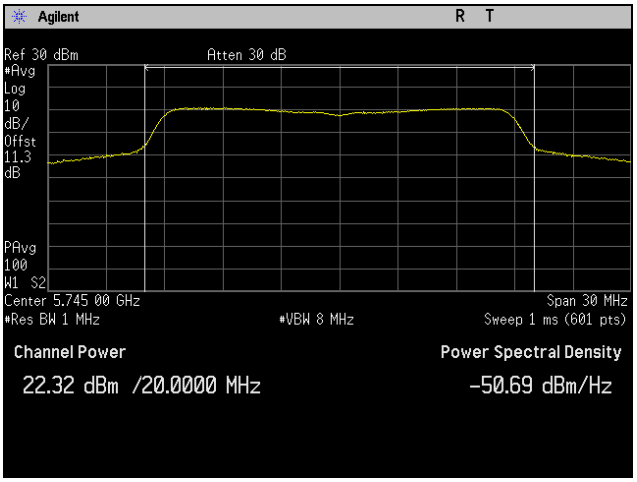


Plot 19. Conducted Output Power, Mid Channel, 802.11ac 20 MHz, Port 2

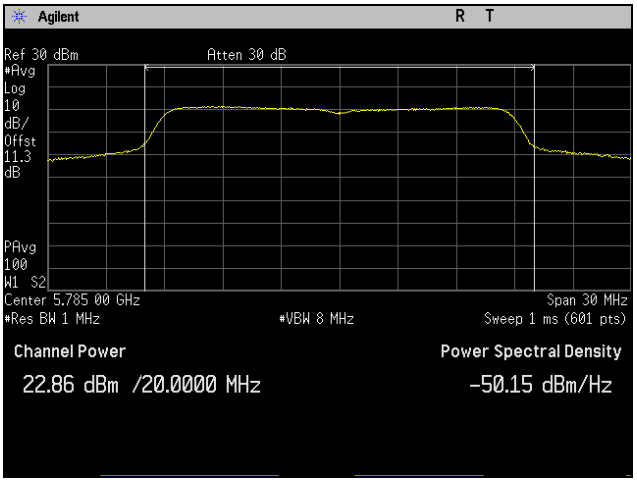


Plot 20. Conducted Output Power, High Channel, 802.11ac 20 MHz, Port 2

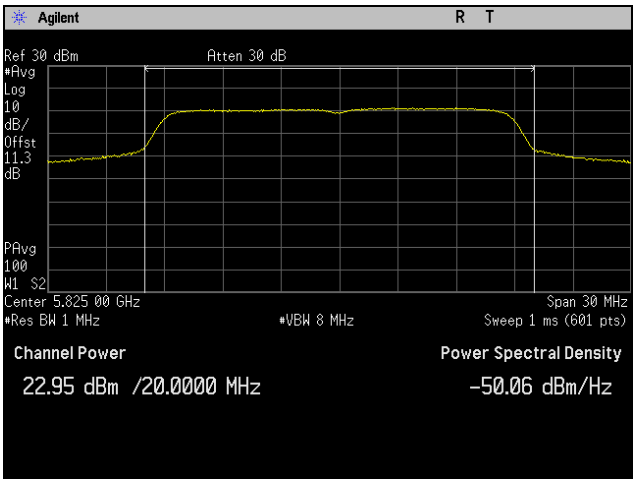
Conducted Output Power, 802.11n 20 MHz, Port 2



Plot 21. Conducted Output Power, Low Channel, 802.11n 20 MHz, Port 2

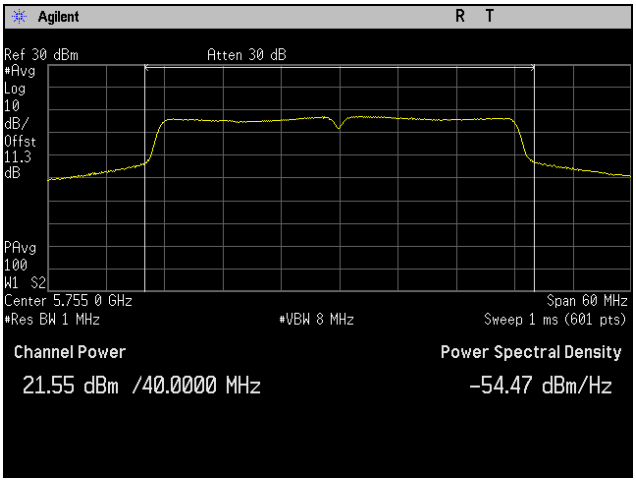


Plot 22. Conducted Output Power, Mid Channel, 802.11n 20 MHz, Port 2

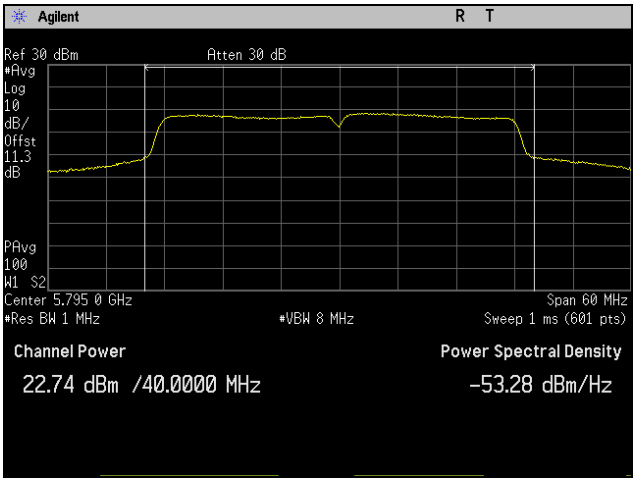


Plot 23. Conducted Output Power, High Channel, 802.11n 20 MHz, Port 2

Conducted Output Power, 802.11ac 40 MHz, Port 2

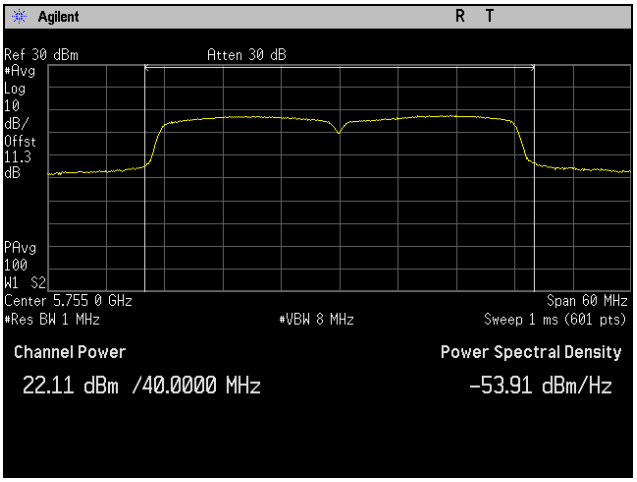


Plot 24. Conducted Output Power, Low Channel, 802.11ac 40 MHz, Port 2

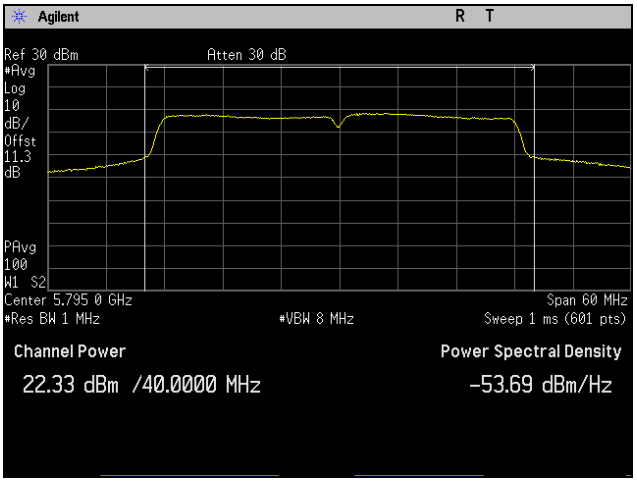


Plot 25. Conducted Output Power, High Channel, 802.11ac 40 MHz, Port 2

Conducted Output Power, 802.11n 40 MHz, Port 2

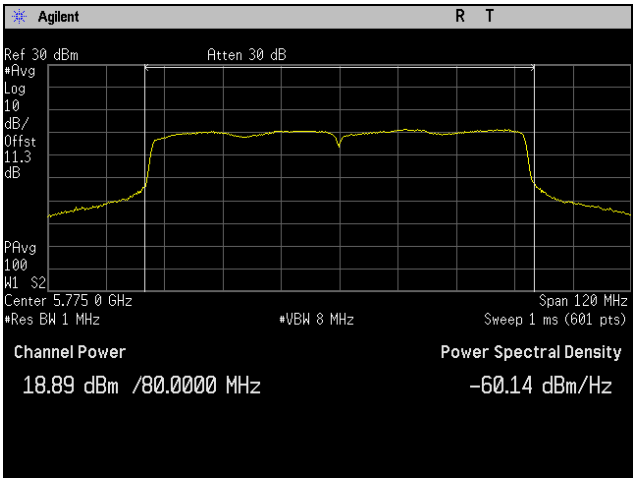


Plot 26. Conducted Output Power, Low Channel, 802.11n 40 MHz, Port 2



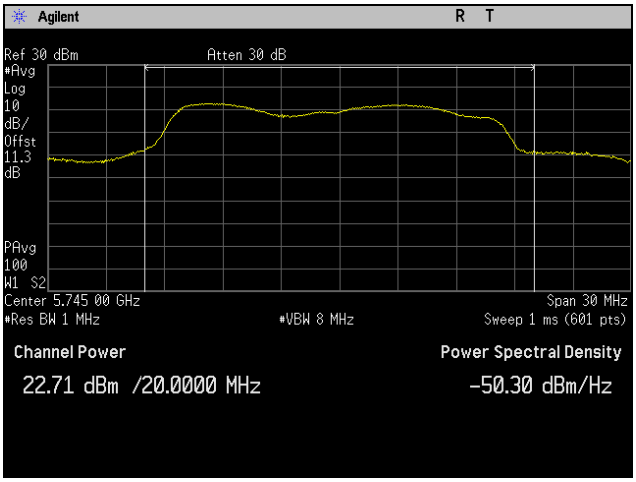
Plot 27. Conducted Output Power, High Channel, 802.11n 40 MHz, Port 2

Conducted Output Power, 802.11ac 80 MHz, Port 2

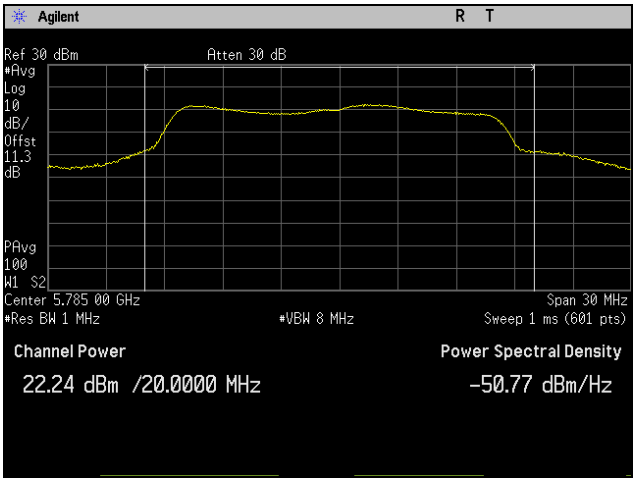


Plot 28. Conducted Output Power, Low Channel, 802.11ac 80 MHz, Port 2

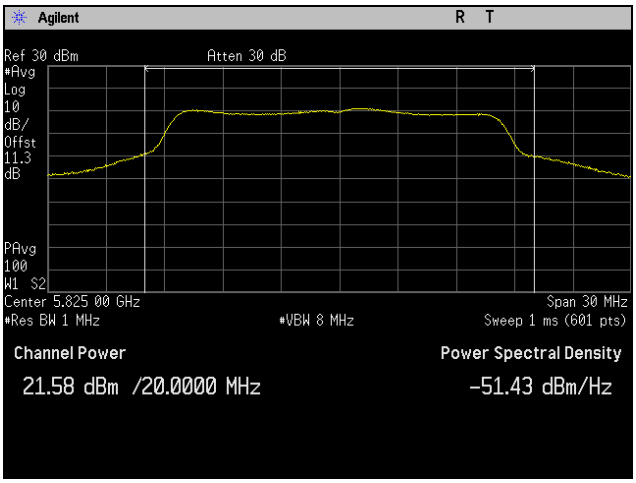
Conducted Output Power, 802.11a 20 MHz, Port 3



Plot 29. Conducted Output Power, Low Channel, 802.11a 20 MHz, Port 3

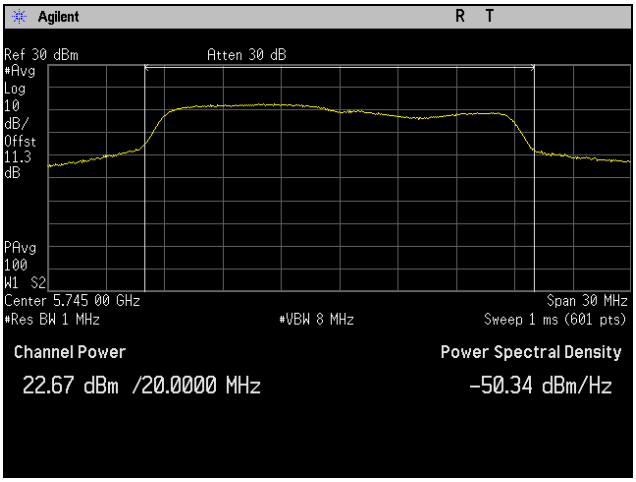


Plot 30. Conducted Output Power, Mid Channel, 802.11a 20 MHz, Port 3

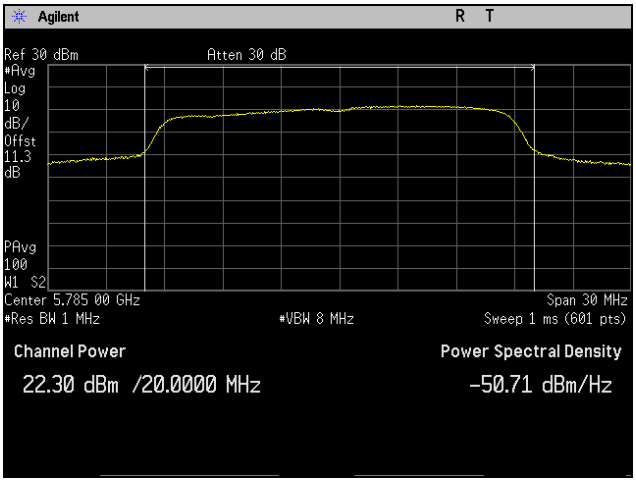


Plot 31. Conducted Output Power, High Channel, 802.11a 20 MHz, Port 3

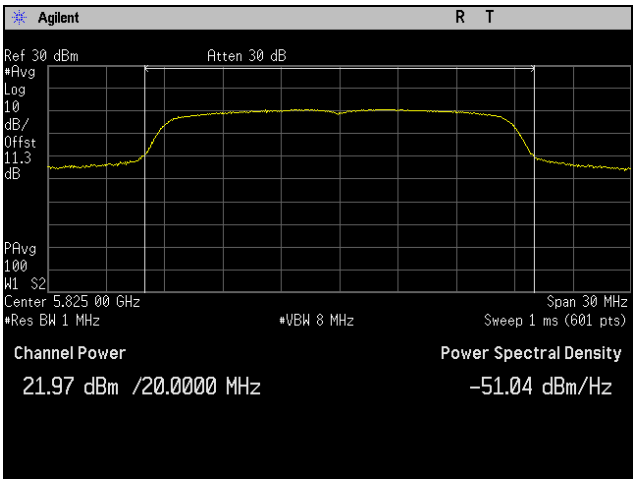
Conducted Output Power, 802.11ac 20 MHz, Port 3



Plot 32. Conducted Output Power, Low Channel, 802.11ac 20 MHz, Port 3

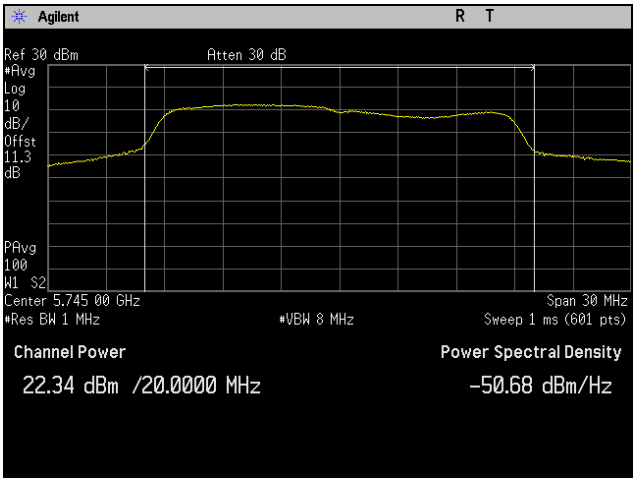


Plot 33. Conducted Output Power, Mid Channel, 802.11ac 20 MHz, Port 3

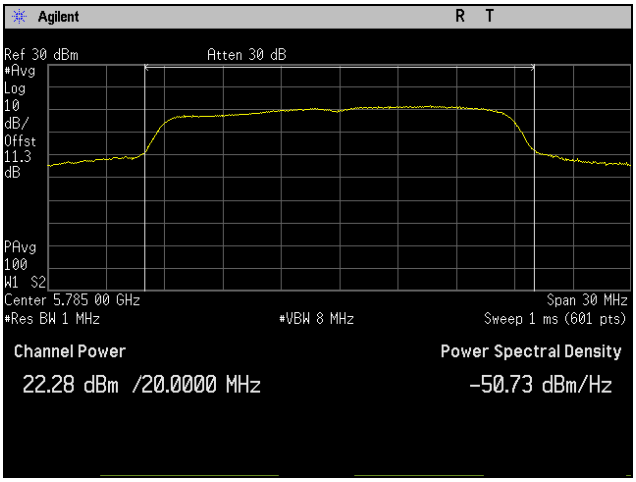


Plot 34. Conducted Output Power, High Channel, 802.11ac 20 MHz, Port 3

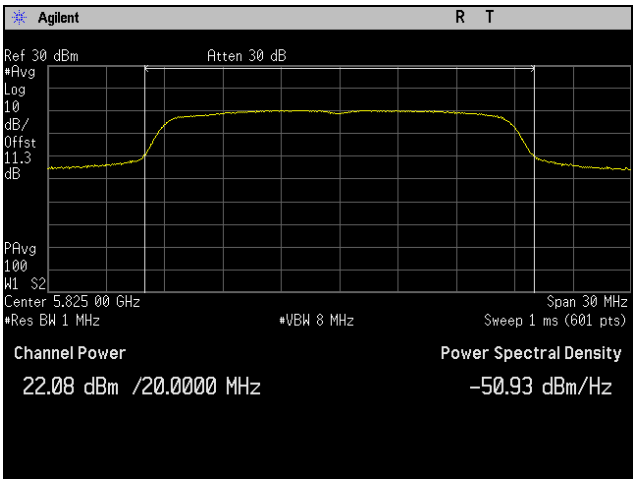
Conducted Output Power, 802.11n 20 MHz, Port 3



Plot 35. Conducted Output Power, Low Channel, 802.11n 20 MHz, Port 3

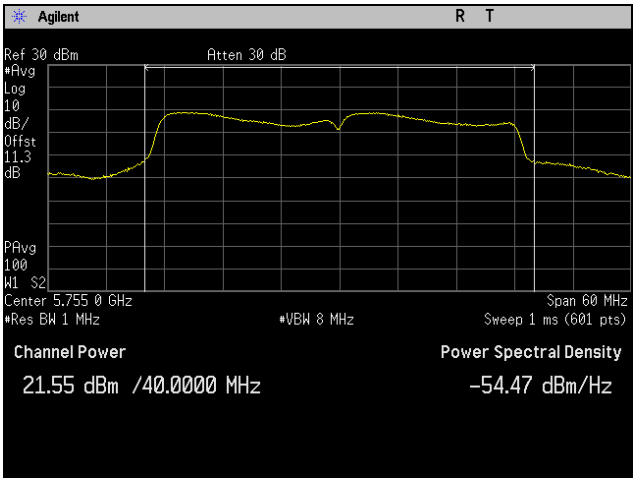


Plot 36. Conducted Output Power, Mid Channel, 802.11n 20 MHz, Port 3

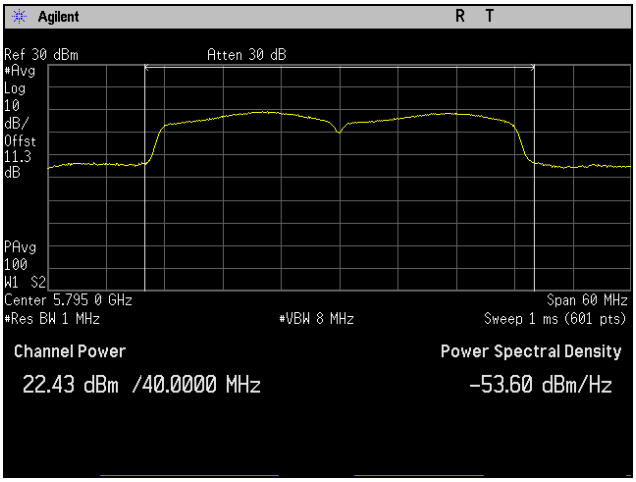


Plot 37. Conducted Output Power, High Channel, 802.11n 20 MHz, Port 3

Conducted Output Power, 802.11ac 40 MHz, Port 3

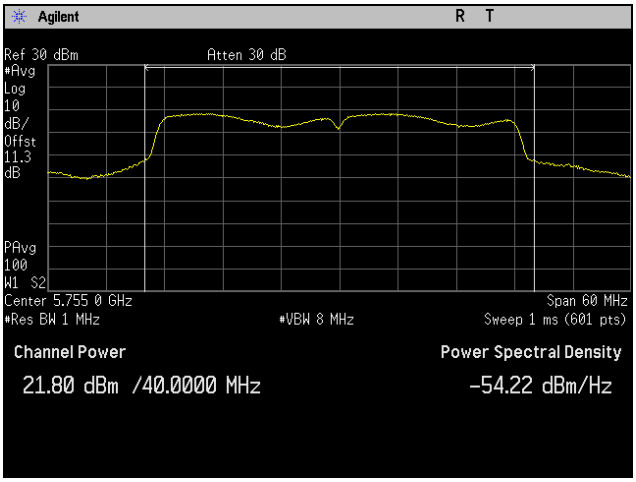


Plot 38. Conducted Output Power, Low Channel, 802.11ac 40 MHz, Port 3

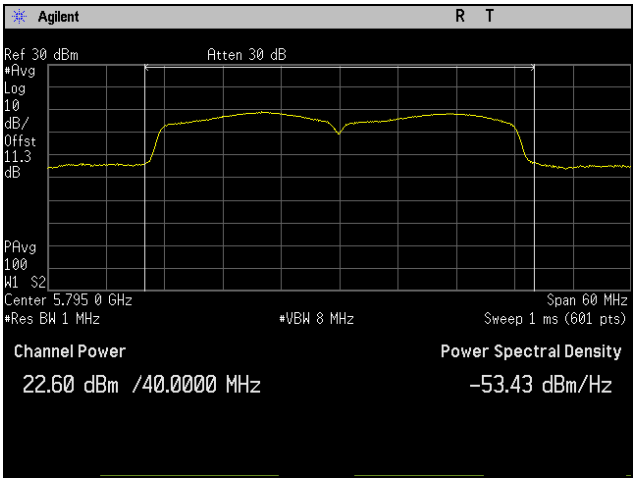


Plot 39. Conducted Output Power, High Channel, 802.11ac 40 MHz, Port 3

Conducted Output Power, 802.11n 40 MHz, Port 3

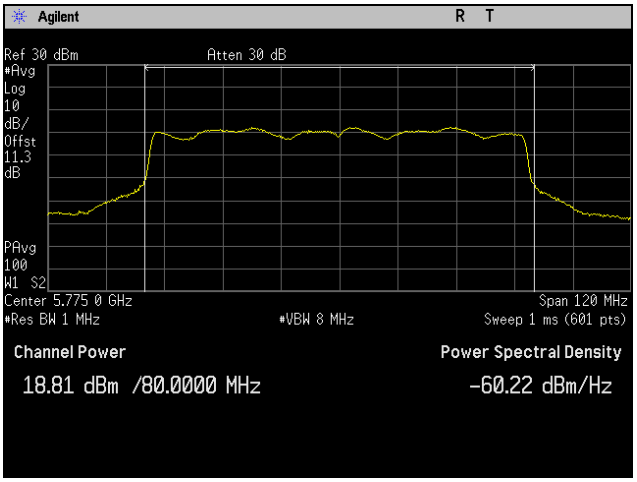


Plot 40. Conducted Output Power, Low Channel, 802.11n 40 MHz, Port 3



Plot 41. Conducted Output Power, High Channel, 802.11n 40 MHz, Port 3

Conducted Output Power, 802.11ac 80 MHz, Port 3



Plot 42. Conducted Output Power, Low Channel, 802.11ac 80 MHz, Port 3

Electromagnetic Compatibility Criteria for Intentional Radiators

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

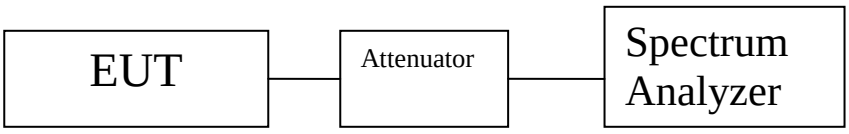
Test Requirements: **§15.407(a)(3):** In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according KDB 789033 D02 General UNII Test Procedures v01 r02. A 1 MHz RBW was used during testing, as this provides a worst-case scenario.
Note: Only Port 2 PSD measurement plots are included in test report. Port 1 and Port 3 PSD data are incorporated in tabular form only.
Sum of three Port(PSD) = 10*Log10(10^(Port1(dBm)/10)+ 10^(Port2(dBm)/10)+ 10^(Port3(dBm)/10))

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

Test Engineer(s): Surinder Singh

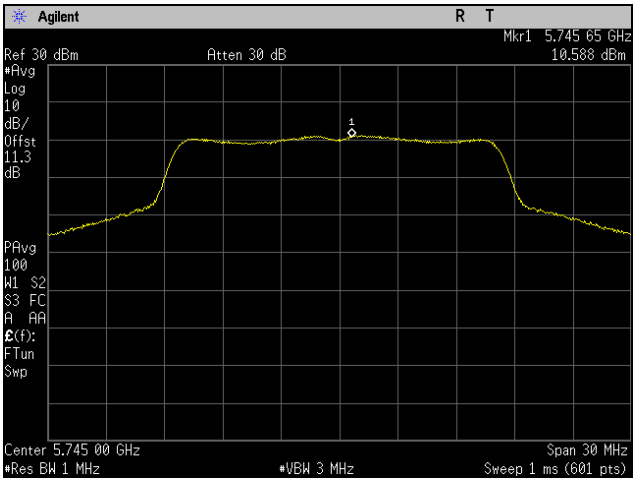
Test Date(s): 04/20/16



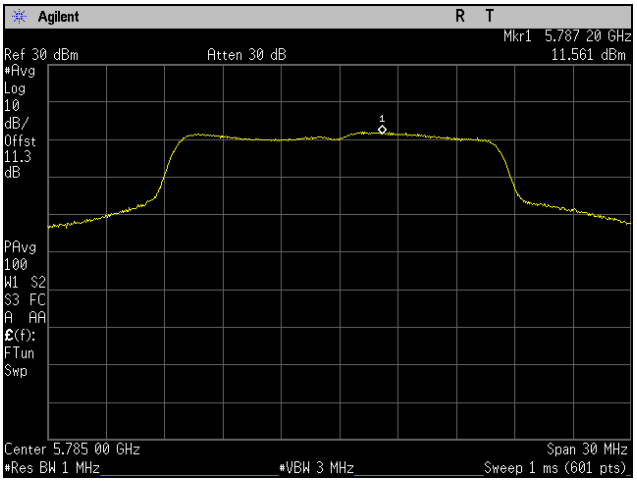
Center Frequency MHz	Bandwidth MHz	Mode	Port 1 Data dBm	Port 2 Data dBm	Port 3 Data dBm	Sum of Three Port dBm	Limit dBm	Antenna Gain dBi	Final limit dBm	Margin dB
Ch 5745M	BW 20M	a mode	10.843	10.588	10.67	15.473	30	6.77	29.23	-13.757
Ch 5745M	BW 20M	ac mode	11.111	10.828	11.08	15.78	30	2	30	-14.22
Ch 5745M	BW 20M	n mode	11.065	11.025	10.974	15.793	30	2	30	-14.207
Ch 5785M	BW 20M	a mode	11.846	11.561	11.649	16.459	30	6.77	29.23	-12.771
Ch 5785M	BW 20M	ac mode	11.638	11.44	11.467	16.288	30	2	30	-13.712
Ch 5785M	BW 20M	n mode	11.547	11.516	11.34	16.24	30	2	30	-13.76
Ch 5825M	BW 20M	a mode	11.323	11.236	11.182	16.019	30	6.77	29.23	-13.211
Ch 5825M	BW 20M	ac mode	11.26	11.089	11.252	15.973	30	2	30	-14.027
Ch 5825M	BW 20M	n mode	11.486	11.187	11.303	16.099	30	2	30	-13.901
Ch 5755M	BW 40M	ac mode	7.23	6.928	7.029	11.836	30	2	30	-18.164
Ch 5755M	BW 40M	n mode	7.607	7.557	7.461	12.314	30	2	30	-17.686
Ch 5795M	BW 40M	ac mode	8.622	8.319	8.459	13.24	30	2	30	-16.76
Ch 5795M	BW 40M	n mode	8.503	8.204	8.343	13.123	30	2	30	-16.877
Ch 5775M	BW 80M	ac mode	1.239	1.087	1.154	5.932	30	2	30	-24.068

Table 10. Power Spectral Density, Test Results

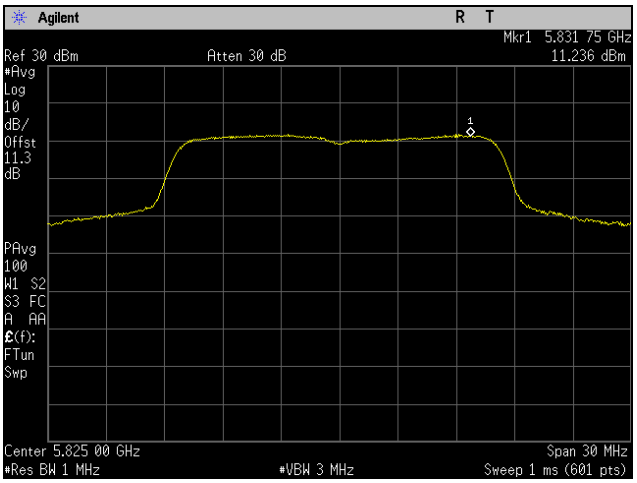
Power Spectral Density, 802.11a 20 MHz, Port 2



Plot 43. Power Spectral Density, Low Channel, 802.11a 20 MHz, Port 2

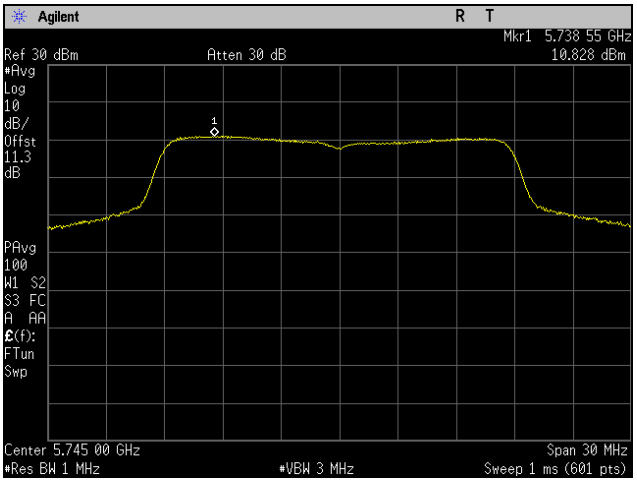


Plot 44. Power Spectral Density, Mid Channel, 802.11a 20 MHz, Port 2

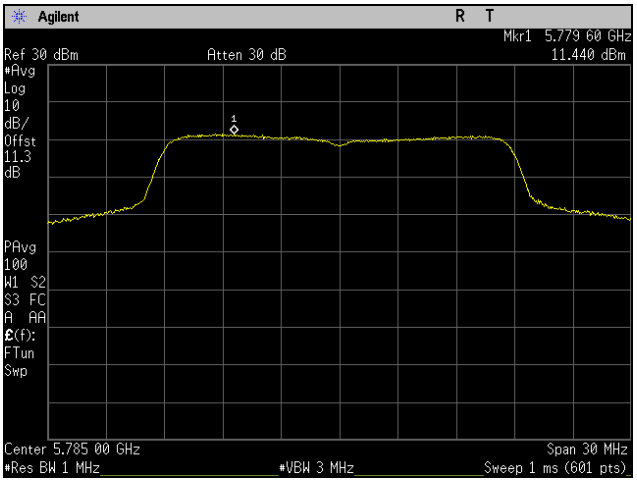


Plot 45. Power Spectral Density, High Channel, 802.11a 20 MHz, Port 2

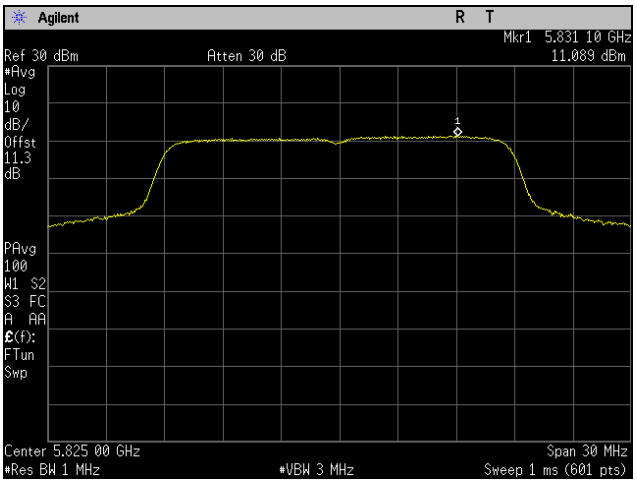
Power Spectral Density, 802.11ac 20 MHz, Port 2



Plot 46. Power Spectral Density, Low Channel, 802.11ac 20 MHz, Port 2

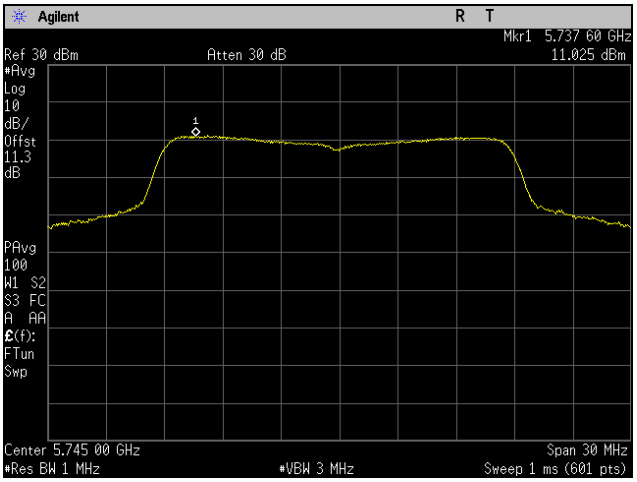


Plot 47. Power Spectral Density, Mid Channel, 802.11ac 20 MHz, Port 2

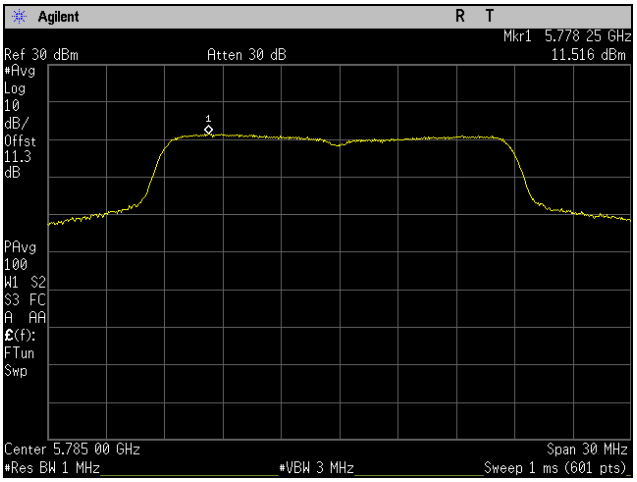


Plot 48. Power Spectral Density, High Channel, 802.11ac 20 MHz, Port 2

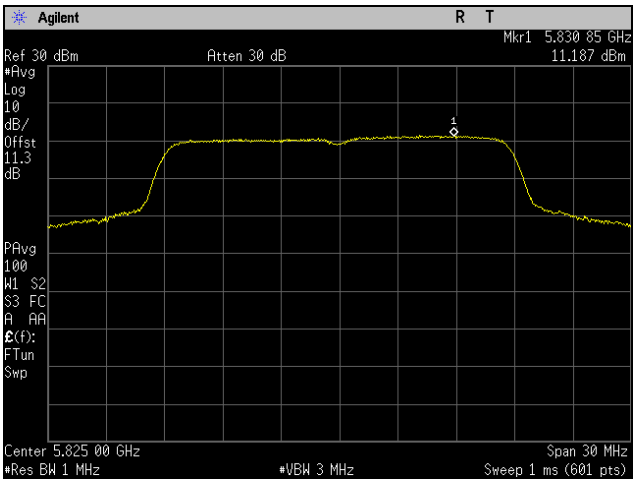
Power Spectral Density, 802.11n 20 MHz, Port 2



Plot 49. Power Spectral Density, Low Channel, 802.11n 20 MHz, Port 2

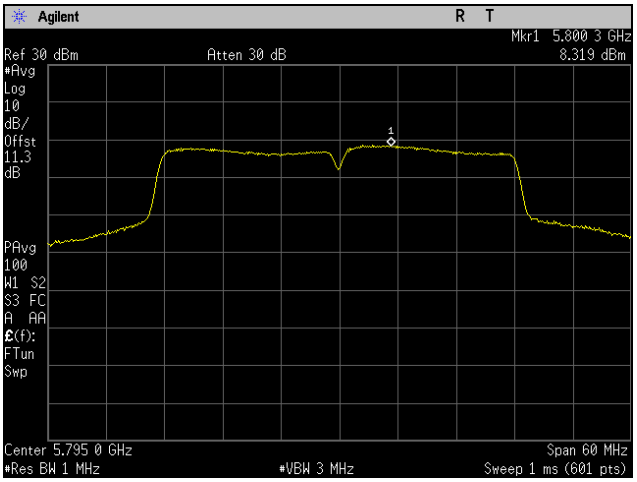


Plot 50. Power Spectral Density, Mid Channel, 802.11n 20 MHz, Port 2

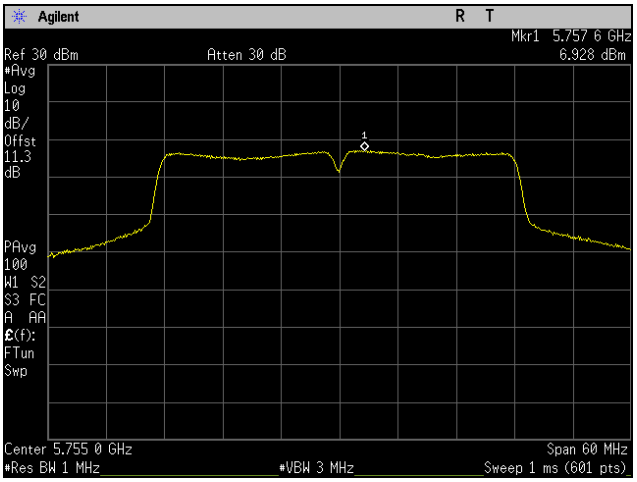


Plot 51. Power Spectral Density, High Channel, 802.11n 20 MHz, Port 2

Power Spectral Density, 802.11ac 40 MHz, Port 2

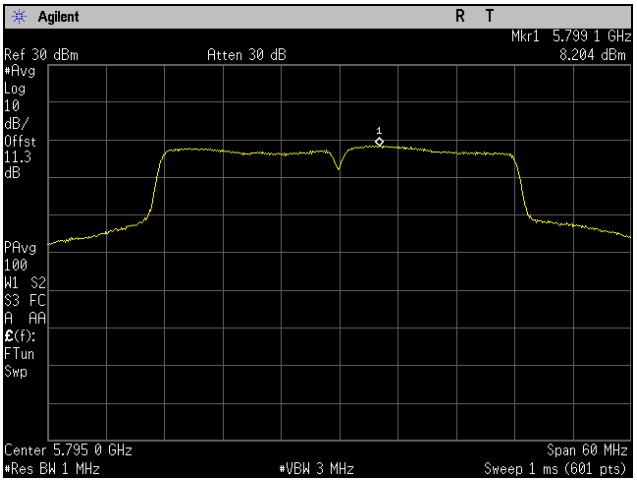


Plot 52. Power Spectral Density, Low Channel, 802.11ac 40 MHz, Port 2

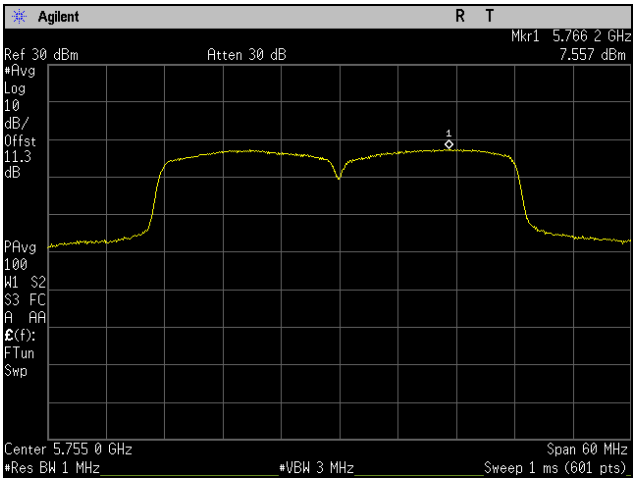


Plot 53. Power Spectral Density, High Channel, 802.11ac 40 MHz, Port 2

Power Spectral Density, 802.11n 40 MHz, Port 2

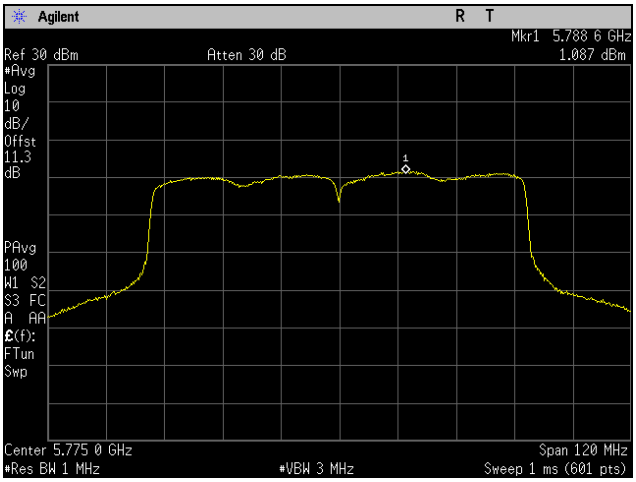


Plot 54. Power Spectral Density, Low Channel, 802.11n 40 MHz, Port 2



Plot 55. Power Spectral Density, High Channel, 802.11n 40 MHz, Port 2

Power Spectral Density, 802.11ac 80 MHz, Port 2



Plot 56. Power Spectral Density, Low Channel, 802.11ac 80 MHz, Port 2

Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements:

§ 15.407(b)(4): For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

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

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

Test Procedure:

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

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

Above 1 GHz, measurements were made pursuant the method described in FCC KDB 789033 D02 General UNII Test Procedure New Rules v01 r02. 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 r02, 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:

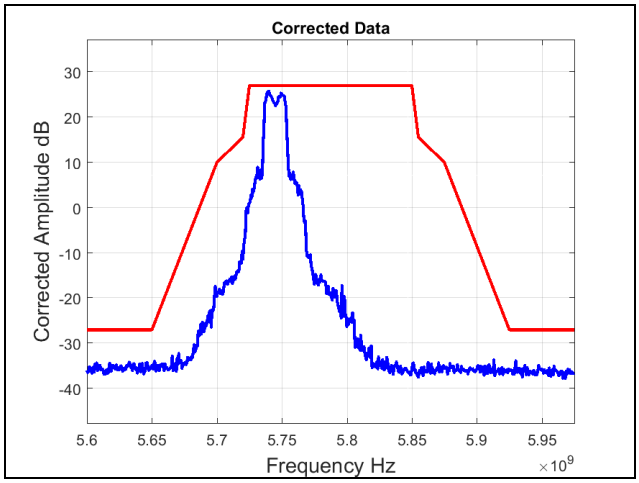
For below 1 GHz, the EUT was compliant with the requirements of this section.

For above 1 GHz, the EUT was compliant with the requirements of this section.
Note: Only noise floor was observed above 7GHz.
Note: ,The Amplitude scale on band edge emission plots referenced to EIRP level in dBm.
Note: ,The Amplitude scale on all other emission plots except band edge referenced to Electric field strength(dBuV) level @ 3 meter measurement distance

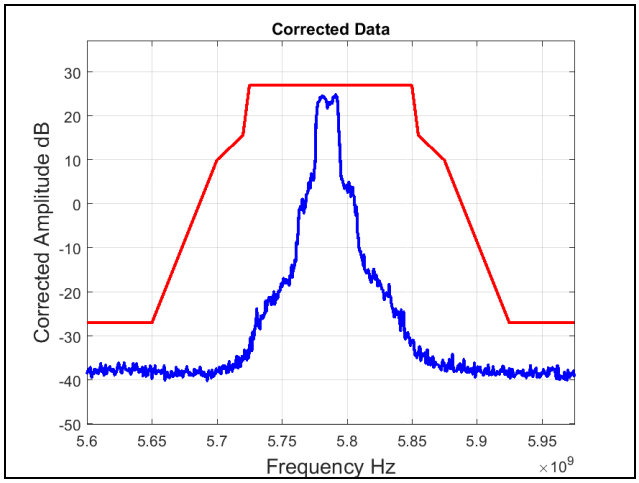
Test Engineer(s): Surinder Singh

Test Date(s): 05/06/16

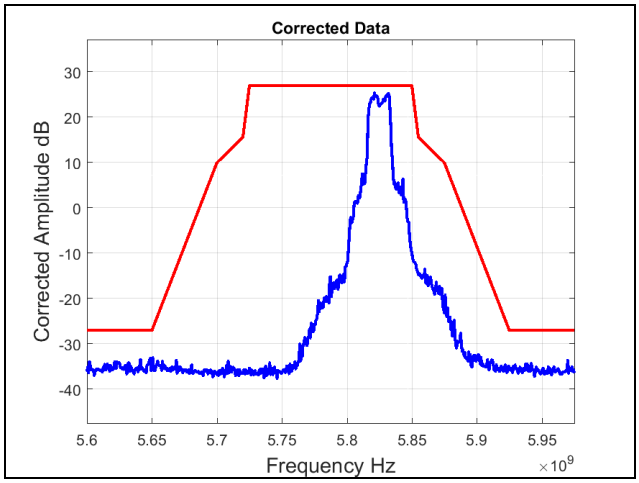
Radiated Spurious Emissions, 802.11a 20 MHz, Mask



Plot 57. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, Mask

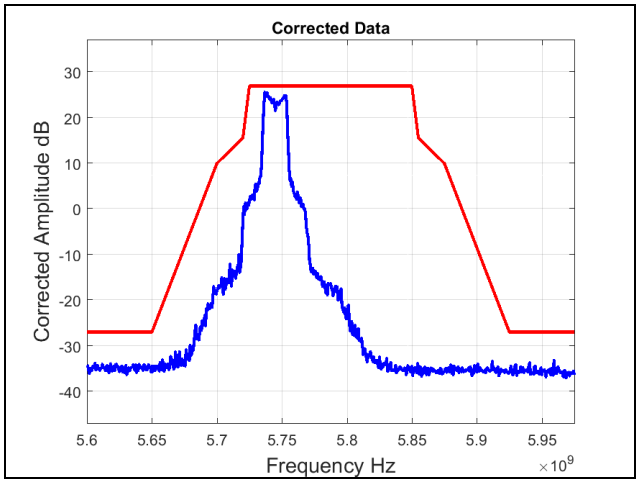


Plot 58. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, Mask

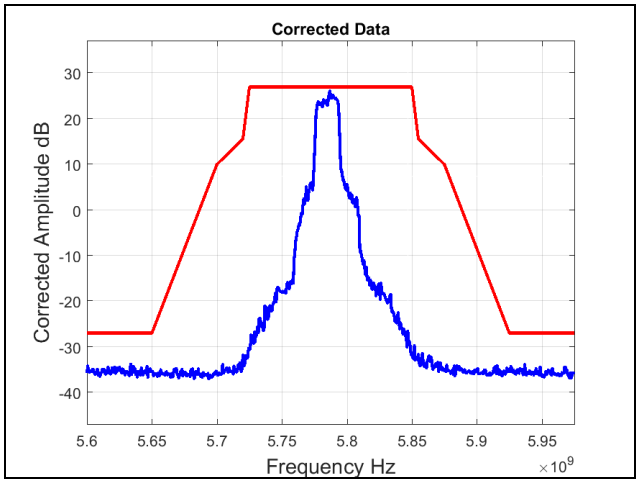


Plot 59. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, Mask

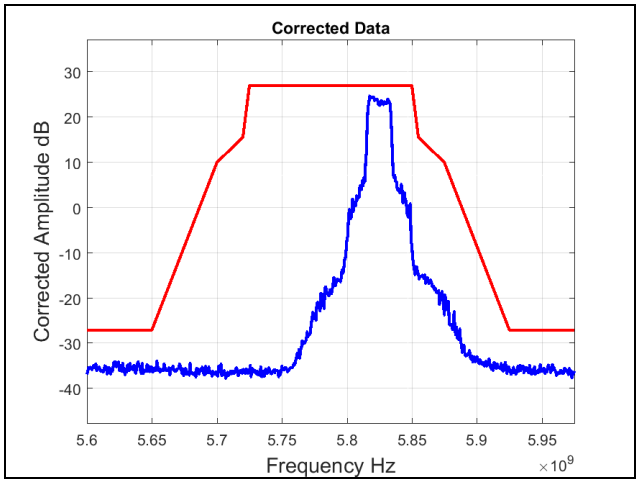
Radiated Spurious Emissions, 802.11ac 20 MHz, Mask



Plot 60. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, Mask

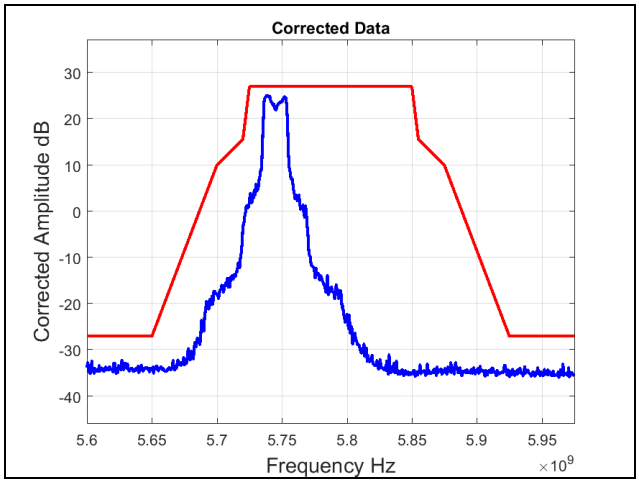


Plot 61. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, Mask

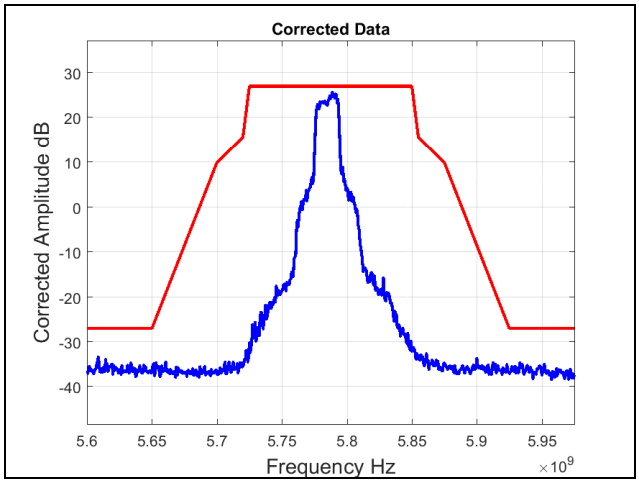


Plot 62. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, Mask

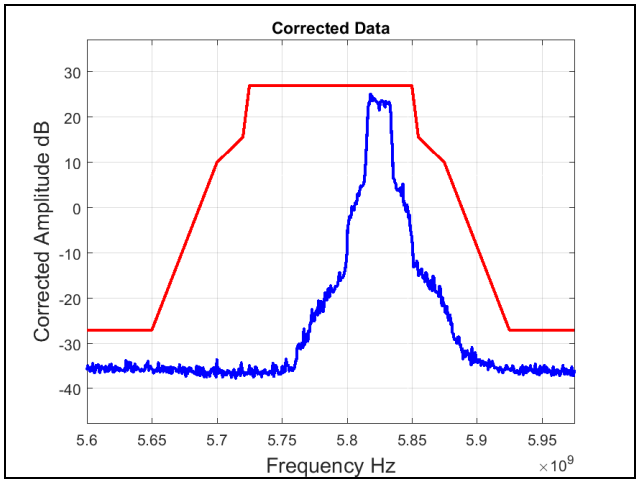
Radiated Spurious Emissions, 802.11n 20 MHz, Mask



Plot 63. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, Mask

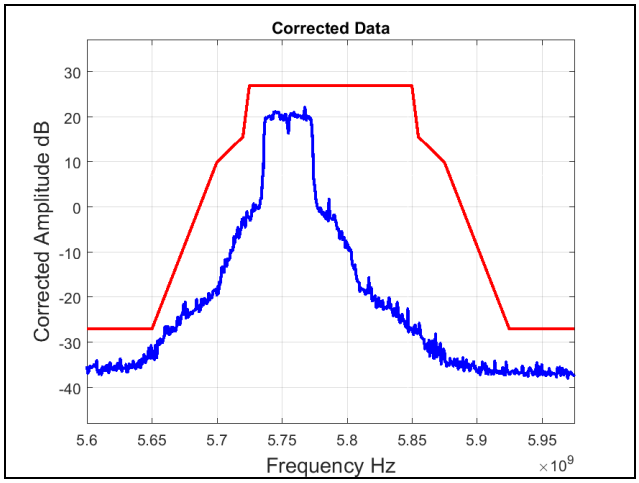


Plot 64. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, Mask

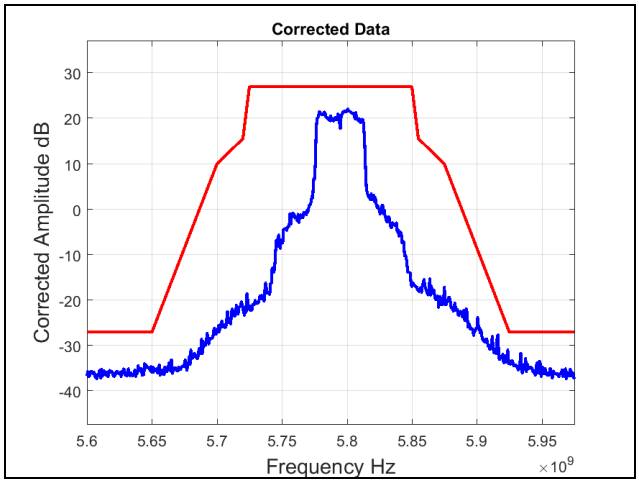


Plot 65. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, Mask

Radiated Spurious Emissions, 802.11ac 40 MHz, Mask

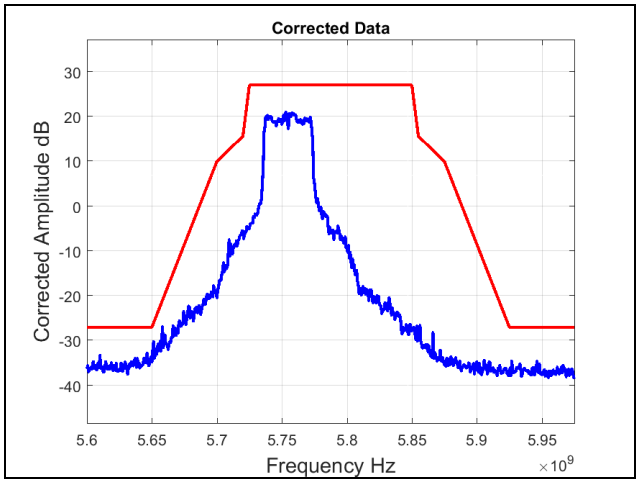


Plot 66. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, Mask

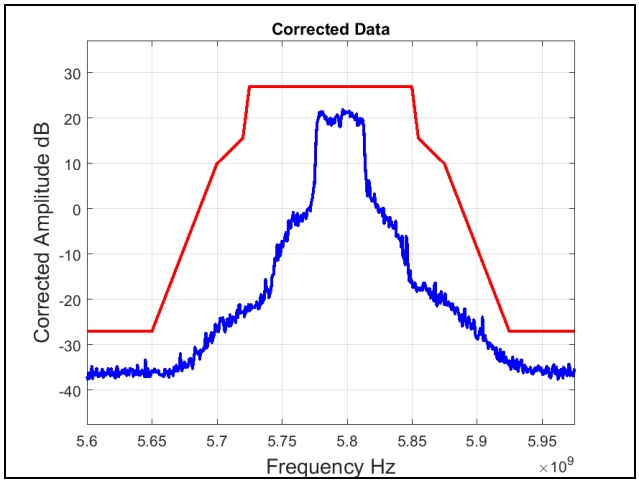


Plot 67. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, Mask

Radiated Spurious Emissions, 802.11n 40 MHz, Mask

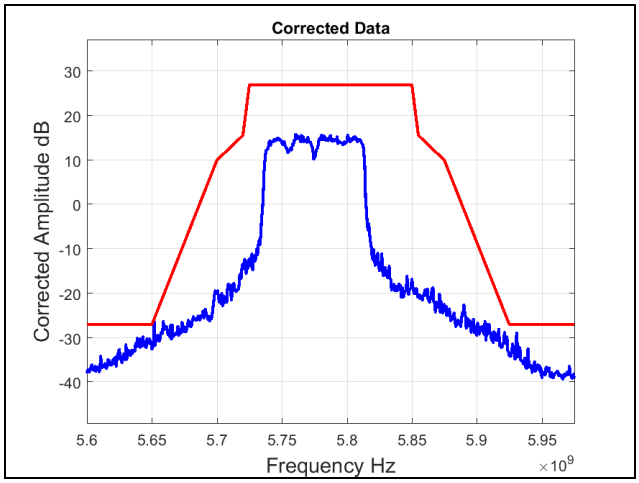


Plot 68. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, Mask



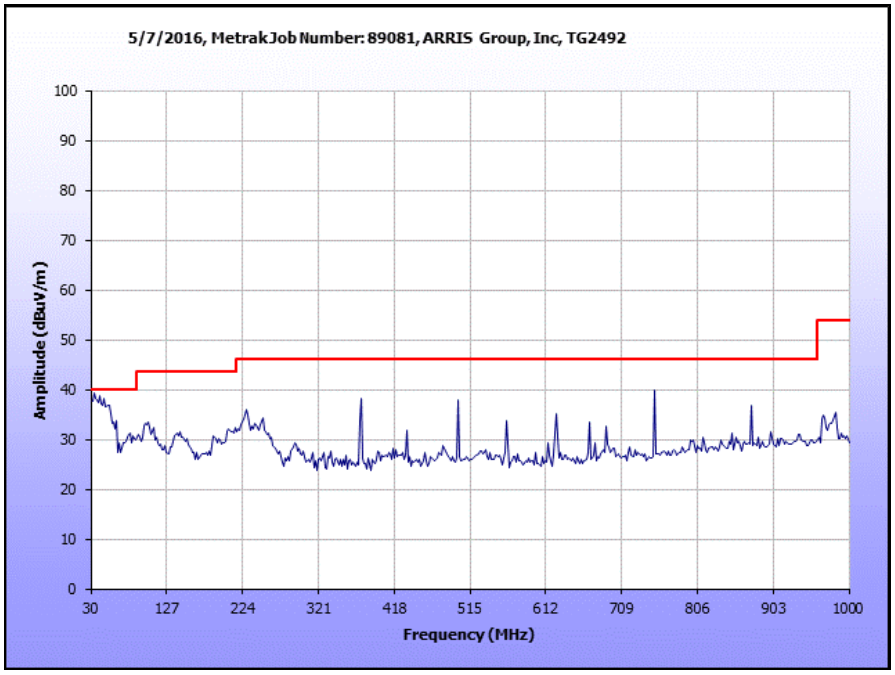
Plot 69. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, Mask

Radiated Spurious Emissions, 802.11ac 80 MHz, Mask



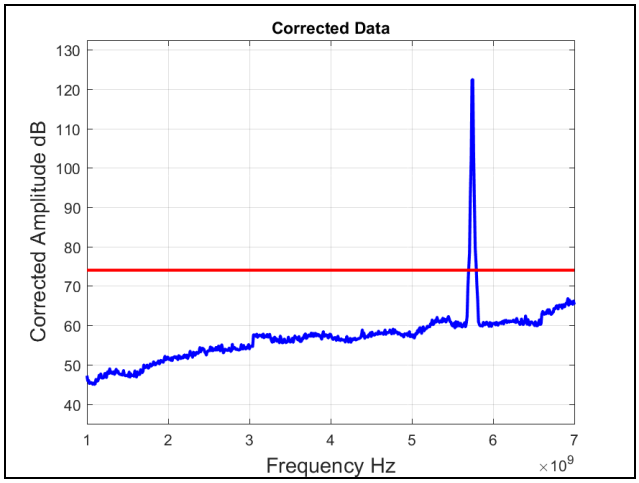
Plot 70. Radiated Spurious Emissions, Low Channel, 802.11ac 80 MHz, Mask

Radiated Spurious Emissions

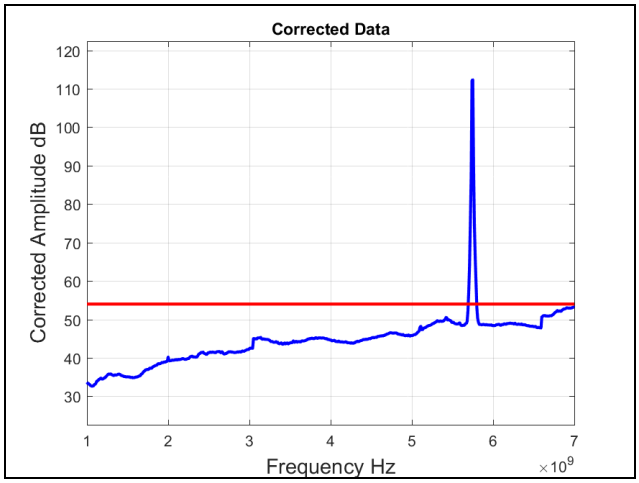


Plot 71. Radiated Spurious Emissions, 30 MHz – 1 GHz, Worst Case Mode

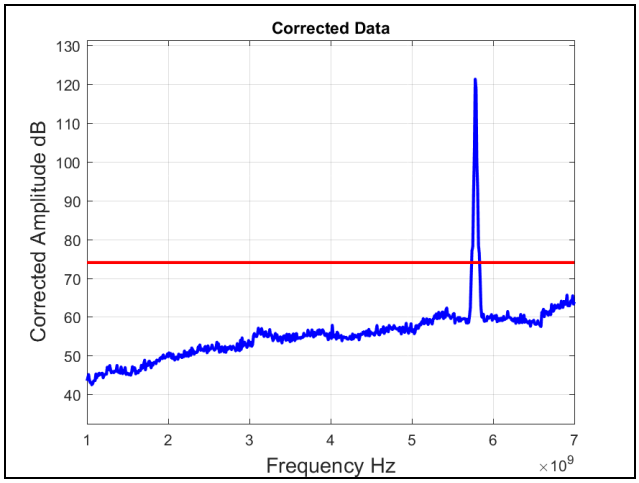
Radiated Spurious Emissions, 802.11a 20 MHz



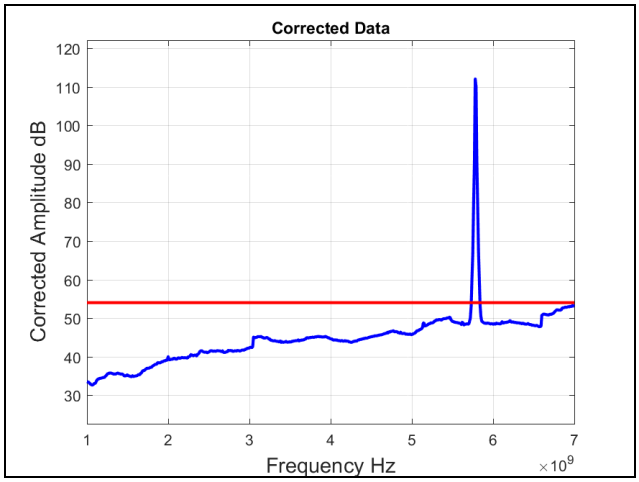
Plot 72. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, 1 GHz – 7 GHz, Peak



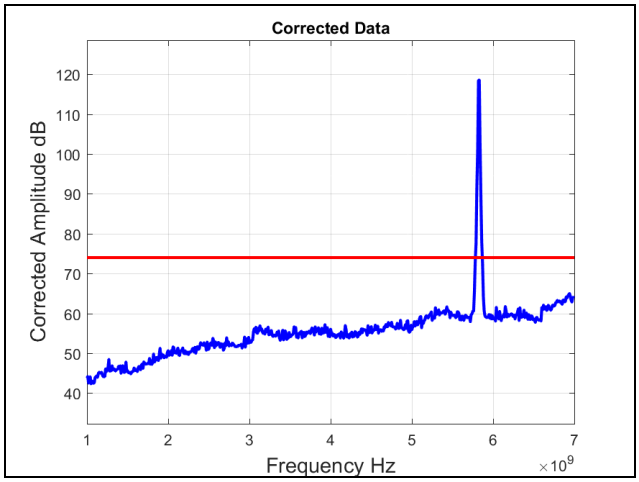
Plot 73. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, 1 GHz – 7 GHz, Average



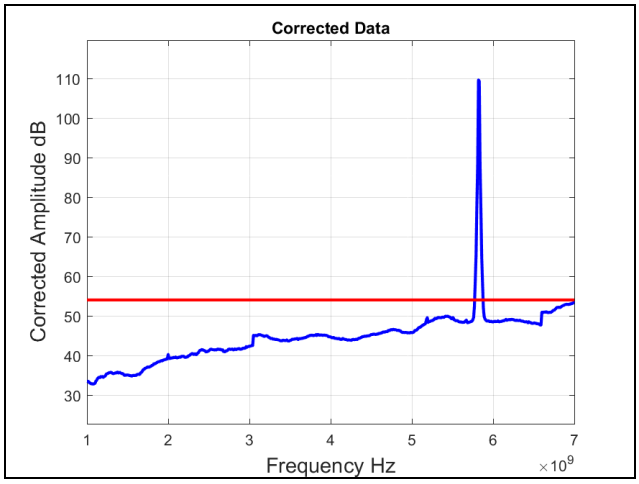
Plot 74. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, 1 GHz – 7 GHz, Peak



Plot 75. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, 1 GHz – 7 GHz, Average

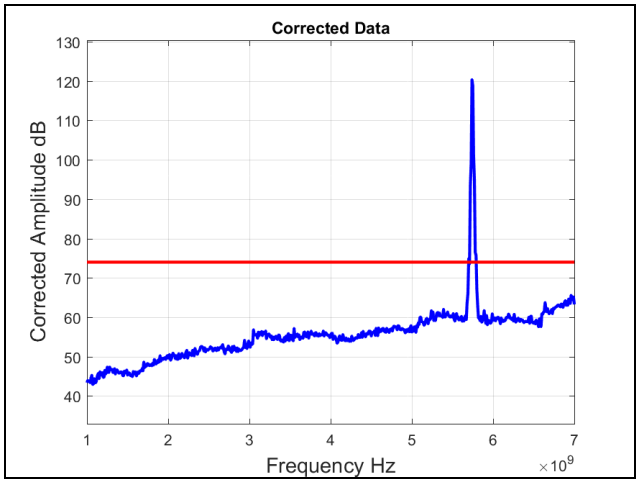


Plot 76. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, 1 GHz – 7 GHz, Peak

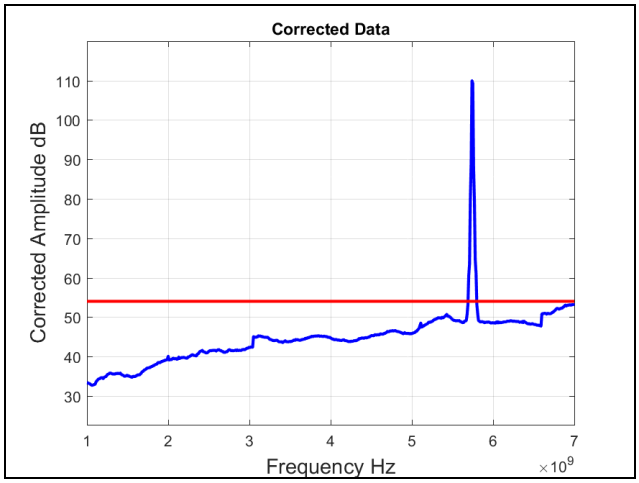


Plot 77. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, 1 GHz – 7 GHz, Average

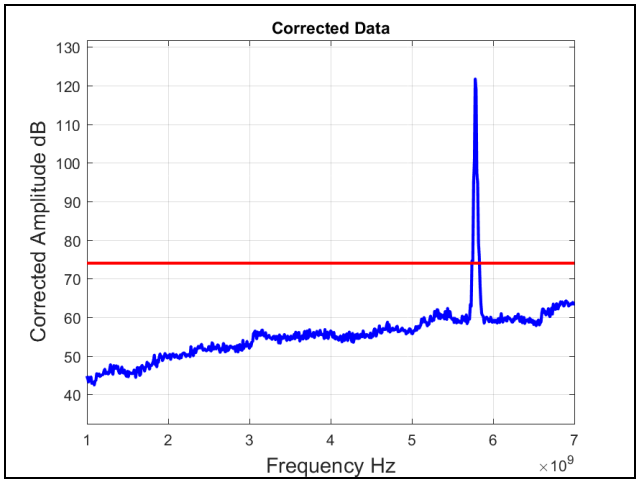
Radiated Spurious Emissions, 802.11ac 20 MHz



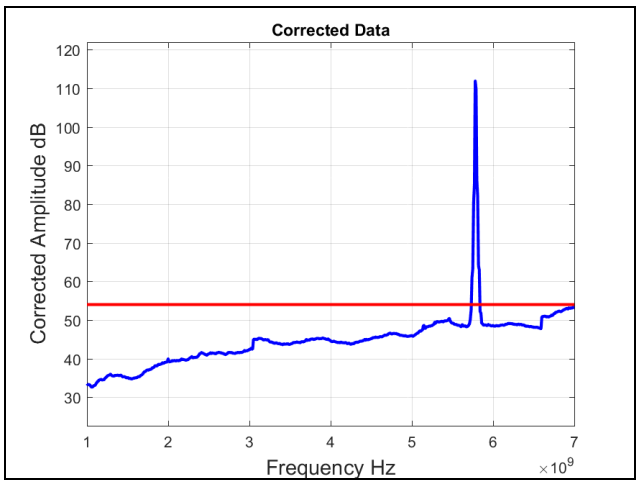
Plot 78. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, 1 GHz – 7 GHz, Peak



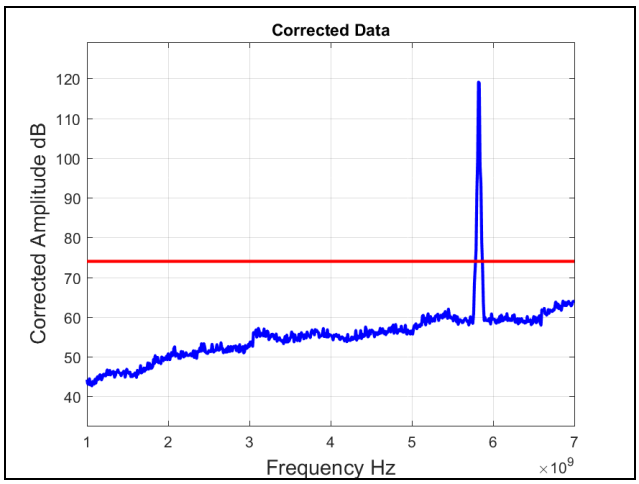
Plot 79. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, 1 GHz – 7 GHz, Average



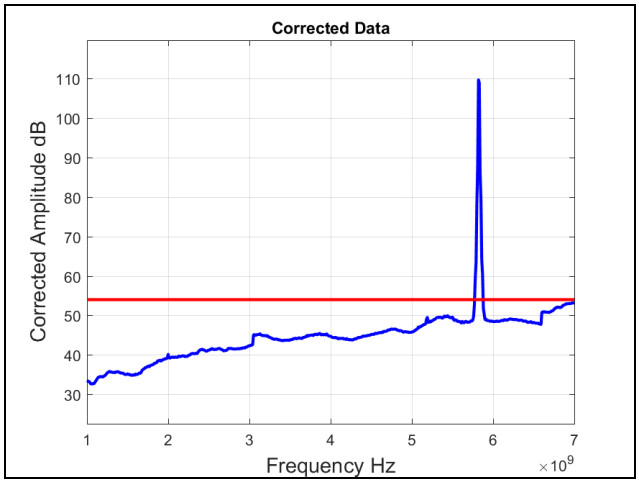
Plot 80. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, 1 GHz – 7 GHz, Peak



Plot 81. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, 1 GHz – 7 GHz, Average

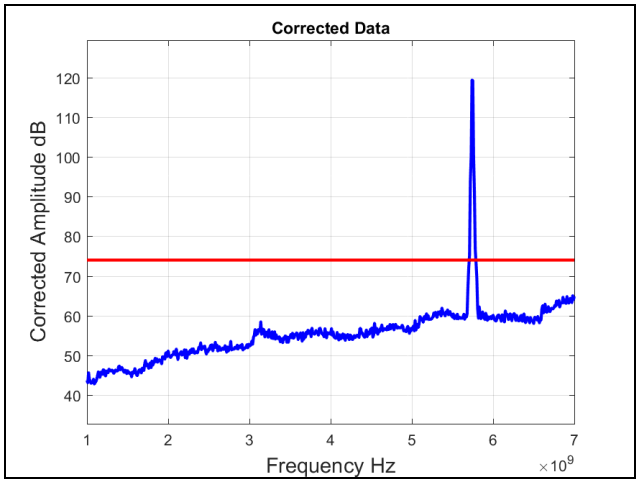


Plot 82. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, 1 GHz – 7 GHz, Peak

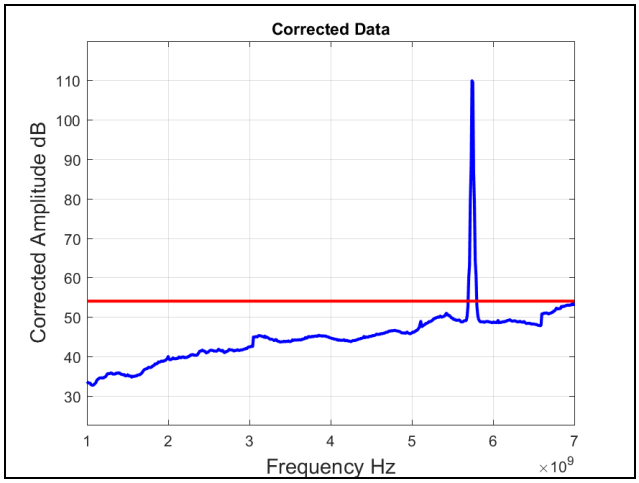


Plot 83. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, 1 GHz – 7 GHz, Average

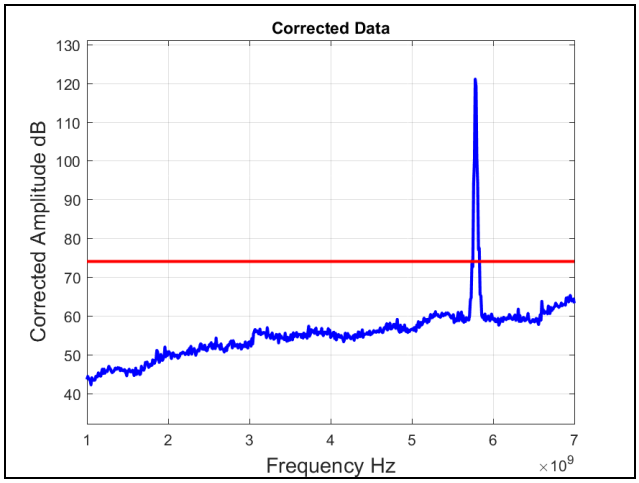
Radiated Spurious Emissions, 802.11n 20 MHz



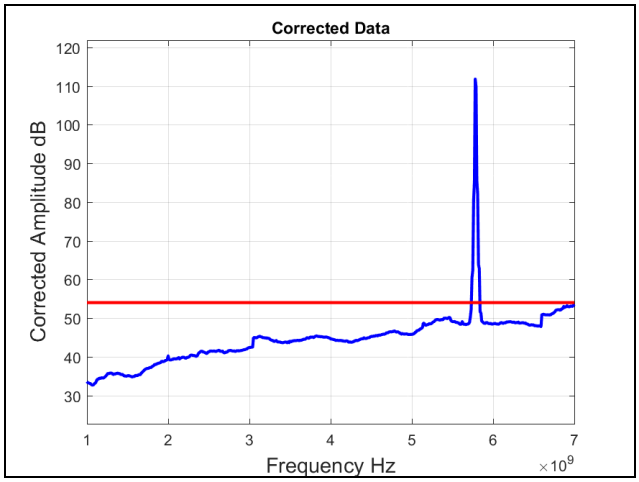
Plot 84. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Peak



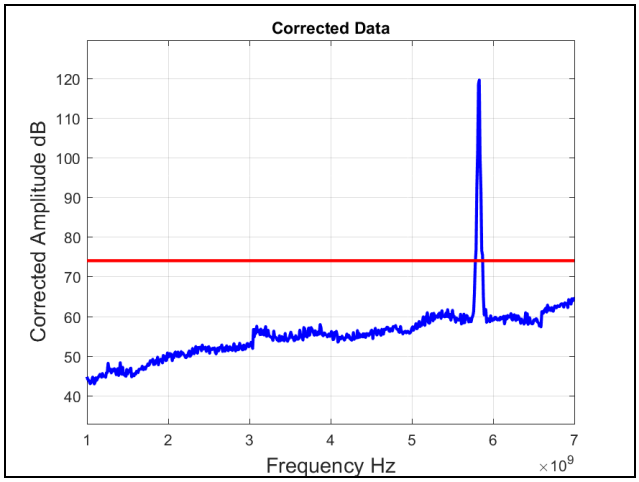
Plot 85. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Average



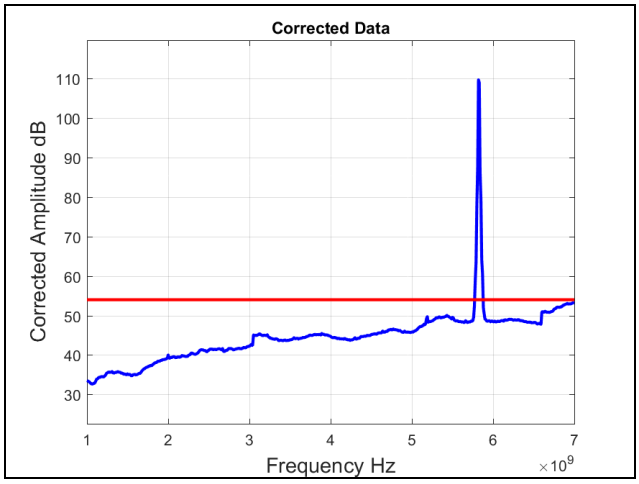
Plot 86. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Peak



Plot 87. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Average

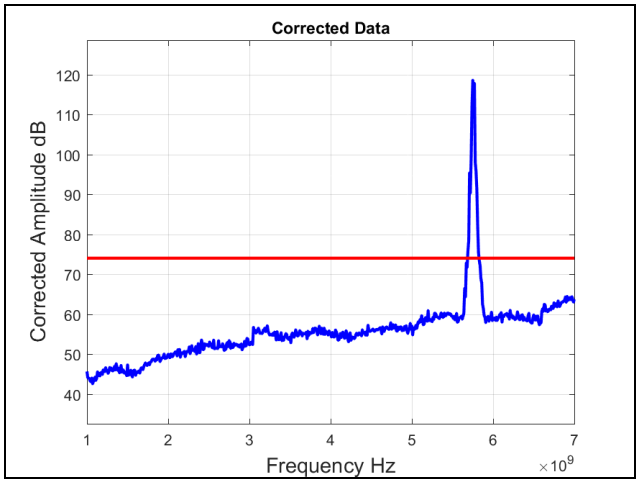


Plot 88. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Peak

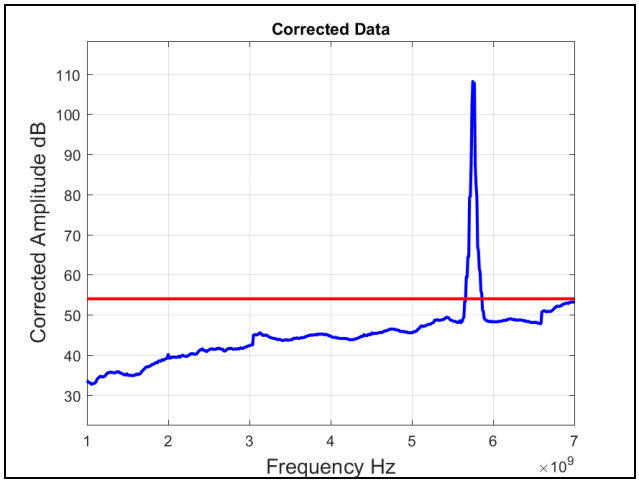


Plot 89. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Average

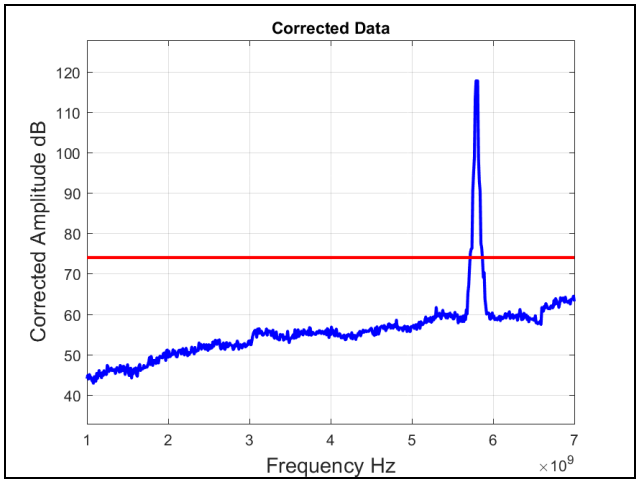
Radiated Spurious Emissions, 802.11ac 40 MHz



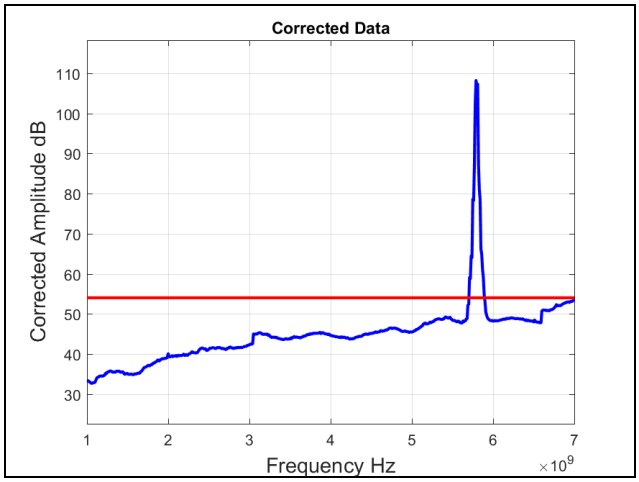
Plot 90. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, 1 GHz – 7 GHz, Peak



Plot 91. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, 1 GHz – 7 GHz, Average

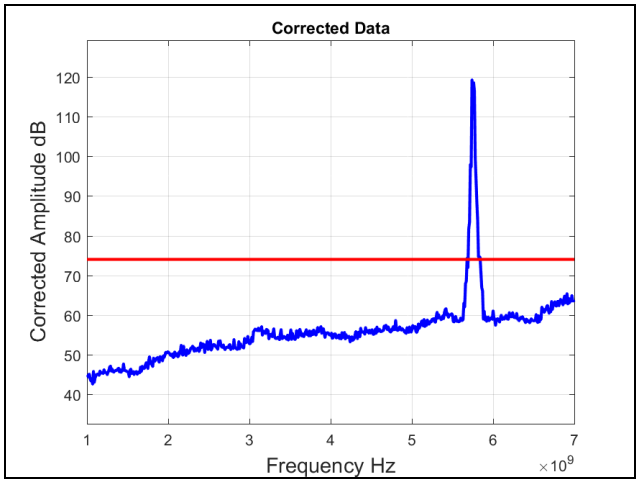


Plot 92. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, 1 GHz – 7 GHz, Peak

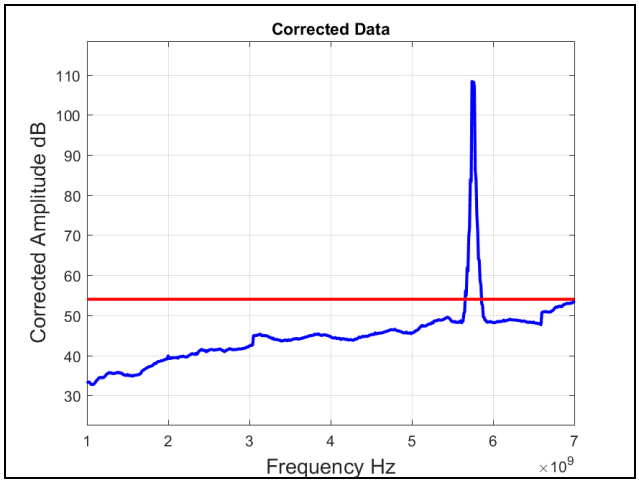


Plot 93. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, 1 GHz – 7 GHz, Average

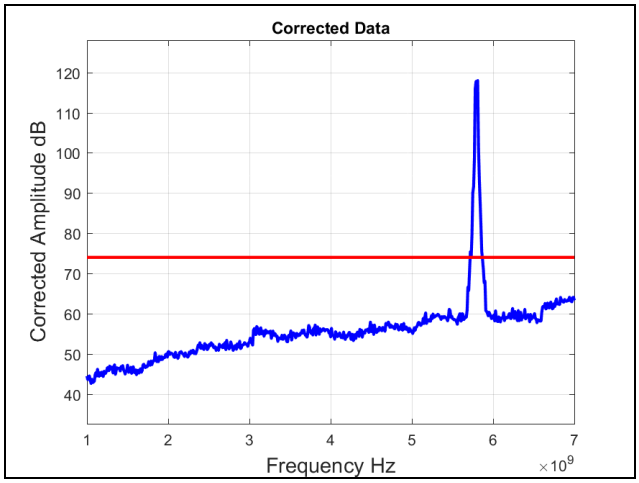
Radiated Spurious Emissions, 802.11n 40 MHz



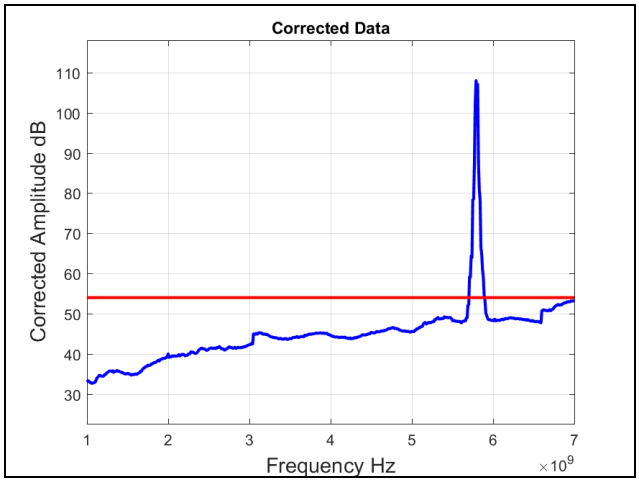
Plot 94. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Peak



Plot 95. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Average

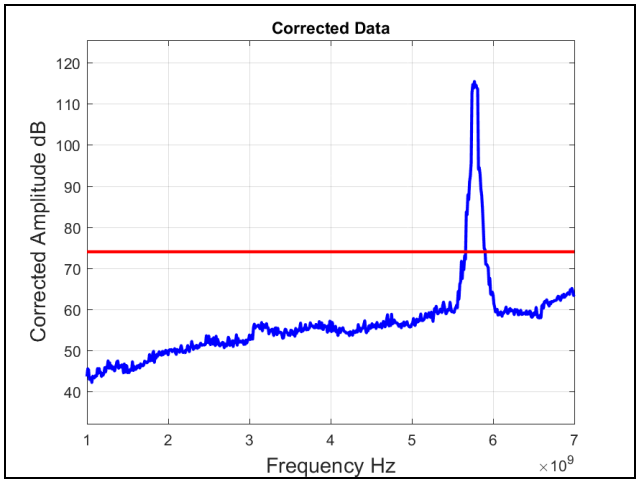


Plot 96. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Peak

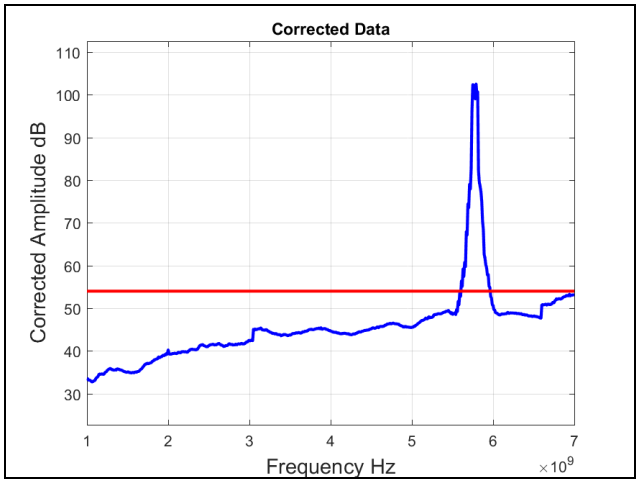


Plot 97. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Average

Radiated Spurious Emissions, 802.11ac 80 MHz



Plot 98. Radiated Spurious Emissions, Low Channel, 802.11ac 80 MHz, 1 GHz – 7 GHz, Peak



Plot 99. Radiated Spurious Emissions, Low Channel, 802.11ac 80 MHz, 1 GHz – 7 GHz, Average

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.

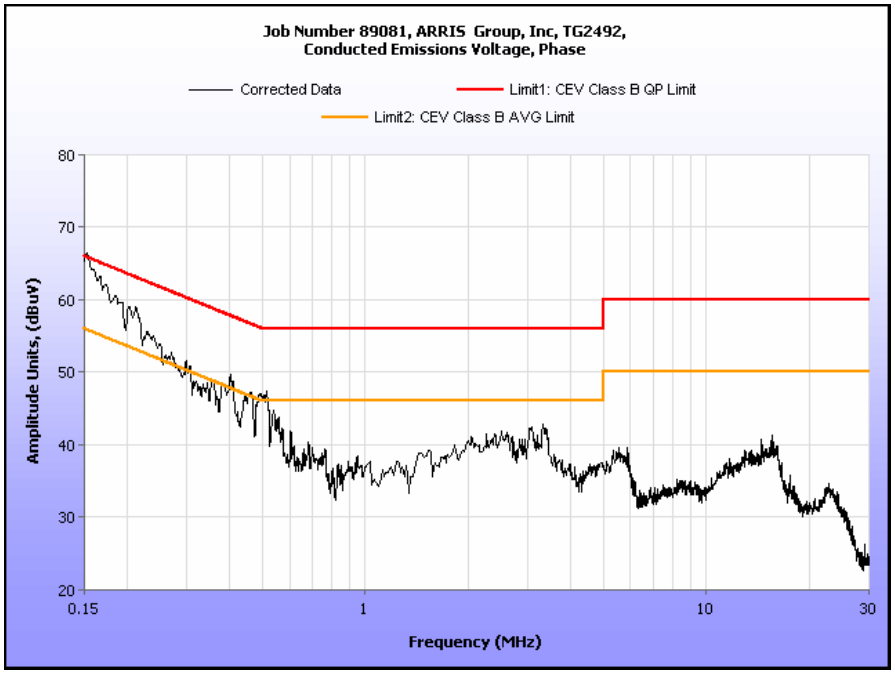
Test Results: The EUT was compliant with requirements of this section.

Test Engineer(s): Surinder Singh

Test Date(s): 04/27/16

Frequency (MHz)	Uncorrected Meter Reading (dBµV) QP	Cable Loss (dB)	Corrected Measurement (dBµV) QP	Limit (dBµV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBµV) Avg.	Cable Loss (dB)	Corrected Measurement (dBµV) AVG	Limit (dBµV) AVG	Margin (dB) AVG
0.15	52.34	0	52.34	66	-13.66	41.31	0	41.31	56	-14.69
0.9	44.37	0	44.37	56	-11.63	30.78	0	30.78	46	-15.22
2.3	32.45	0	32.45	56	-23.55	23.45	0	23.45	46	-22.55
6.7	29.19	0	29.19	60	-30.81	19.63	0	19.63	50	-30.37
15.67	26.48	0.12	26.6	60	-33.4	18.64	0.12	18.76	50	-31.24
25.44	20.19	0.2	20.39	60	-39.61	10.78	0.2	10.98	50	-39.02

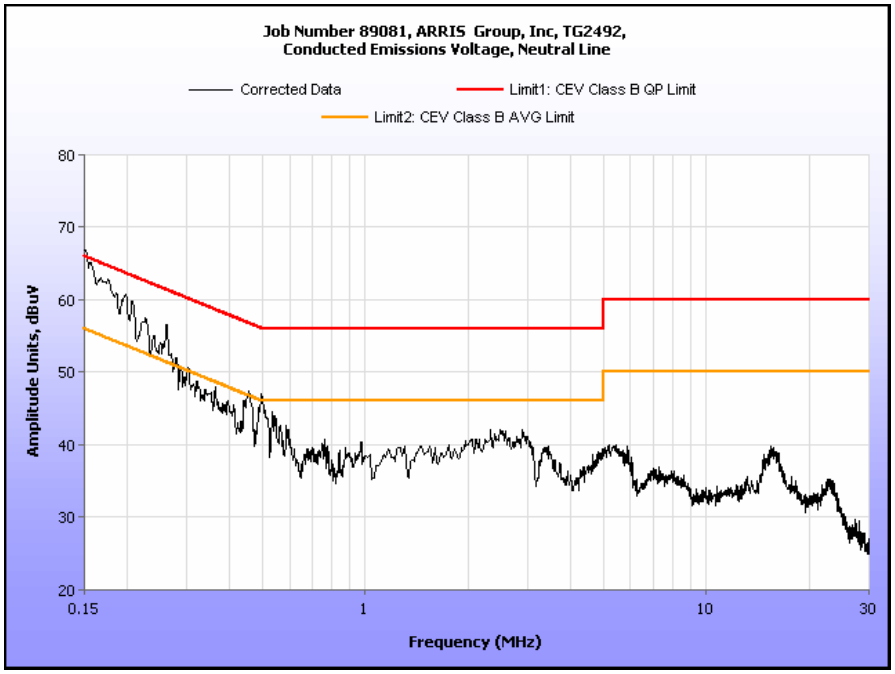
Table 12. Conducted Emissions, Phase Line



Plot 100. Conducted Emissions, Phase Line

Frequency (MHz)	Uncorrected Meter Reading (dBµV) QP	Cable Loss (dB)	Corrected Measurement (dBµV) QP	Limit (dBµV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBµV) Avg.	Cable Loss (dB)	Corrected Measurement (dBµV) AVG	Limit (dBµV) AVG	Margin (dB) AVG
0.15	51.23	0	51.23	66	-14.77	38.16	0	38.16	56	-17.84
0.8	46.35	0	46.35	56	-9.65	29.64	0	29.64	46	-16.36
2.8	30.78	0	30.78	56	-25.22	21.85	0	21.85	46	-24.15
7.2	25.64	0	25.64	60	-34.36	13.69	0	13.69	50	-36.31
16.89	23.89	0.13	24.02	60	-35.98	17.28	0.13	17.41	50	-32.59
26.3	19.84	0.19	20.03	60	-39.97	10.1	0.19	10.29	50	-39.71

Table 13. Conducted Emissions, Neutral Line



Plot 101. Conducted Emissions, Neutral Line

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(e) 6 dB Bandwidth

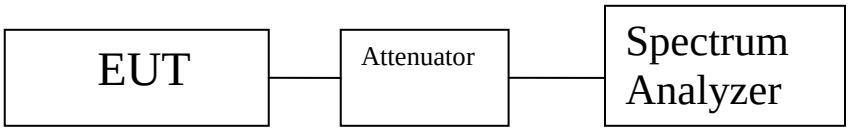
Test Requirements: § 15.407(e): Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

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

Test Results The 6 dB Bandwidth was compliant with the requirements of this section. EUT transmit wide band signal with minimum 6dB bandwidth of 16MHz or more.

Test Engineer(s): Surinder Singh

Test Date(s): 05/06/16



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) Maximum Permissible Exposure

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

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

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

MPE Limit: EUT's operating frequencies @ 5725 - 5825 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**
5745	27.46	557.186	6.77	4.753	0.5269	1	0.4731	20	Pass

Co-Location

MPE (F1)	MPE (F2)	Calculation	Result
Frequency MHz	Frequency MHz	MPE(F1)/limit+MPE(F2)/limit	mW/cm^2
2412-2462	5725-5825	0.5269/1+0.1226/1	0.6495

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

IV. Test Equipment

Test Equipment

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

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T2665	ANTENNA; HORN	EMCO	3115	11/24/2015	5/24/2017
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	10/8/2015	4/8/2017
1T4757	ANTENNA; HORN	ETS-LINDGREN	3117	3/19/2015	9/19/2016
1T4642	SIGNAL TRANSFORMER	SIGNAL TRANSFORMER	DU-1	SEE NOTE	
1T4563	LISN (10 AMP)	SOLAR ELECTRONICS COMPANY	9322-50-R-10-BNC	8/27/2015	2/27/2017
1T4504	SHIELDED ROOM	UNIVERSAL SHIELDING CORP	N/A	NOT REQUIRED	
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	2/6/2015	2/6/2018
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4744	ANTENNA, HORN	ETS-LINDGREN	3116	9/30/2015	9/30/2016
1T4752	PRE-AMPLIFIER	MITEQ	JS44-18004000-35-8P	SEE NOTE	
1T4818	COMB GENERATOR	COM-POWER	CGO-520	SEE NOTE	

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

M. Certification Information

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

§ 2.801 Radio-frequency device defined.

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

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

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

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

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

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

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

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

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

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

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

(i) Compliance testing;

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

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

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

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

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

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

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

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

§ 2.907 Certification.

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

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

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

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

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

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

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

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

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

Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

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

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

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

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

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

End of Report

