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February 1, 2016

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

Dear Tony Figueiredo,

Enclosed is the EMC Wireless test report for Class II Permissive Change compliance testing of the ARRIS Group, Inc., TG1682G 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 for Intentional Radiators.

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

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\ARRIS Group, Inc.\EMC87008-FCC407 UNII 2 Rev. 1)

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Electromagnetic Compatibility Criteria
Class II Permissive Change Test Report

for the

ARRIS Group, Inc.
Model TG1682G

Tested under
the Certification Rules
contained in
Title 47 of the CFR, Part 15.407 Subpart E
for Intentional Radiators

MET Report: EMC87008-FCC407 UNII 2 Rev. 1

February 1, 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

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Title 47 of the CFR, Part 15.407 Subpart E
for Intentional Radiators

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 Part 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
∅	January 20, 2016	Initial Issue.
1	February 1, 2016	Revised to reflect engineer corrections.

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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	**Deci**bels
dBμA	**Deci**bels above one **micro**amp
dBμV	**Deci**bels above one **micro**volt
dBμA/m	**Deci**bels above one **micro**amp **per m**eter
dBμV/m	**Deci**bels 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**st**atic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
μ**H**	**microh**enry
μ	**microf**arad
μ**s**	**micros**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the ARRIS Group, Inc. TG1682G, 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 TG1682G. 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 TG1682G, 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 AR1067910. All tests were conducted using measurement procedure ANSI C63.4-2009.

FCC Reference	Description	Results
Title 47 of the CFR, Part 15 §15.203;;	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.403 (i)	26dB Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.407 (a)(2)	Conducted Transmitter Output Power	Compliant
Title 47 of the CFR, Part 15 §15.407 (a)(2)	Power Spectral Density	Compliant
Title 47 of the CFR, Part 15 §15.407 (b)(2), (3), (5), (6)	Out of Band Undesirable Emissions	Compliant
Title 47 of the CFR, Part 15 §15.407(f)	RF Exposure	Compliant
Title 47 of the CFR, Part 15 §15.407(h)	DFS Requirements	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 TG1682G, under ARRIS Group, Inc.'s purchase order number AR1067910.

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. TG1682G.

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

Model(s) Tested:	TG1682G	
Model(s) Covered:	TG1682G	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	Class II Permissive Change FCC ID: UIDTG1682-3	
	Type of Modulations:	CCK, OFDM, MCS
	Equipment Code:	NII
	Peak RF Output Power:	22.95dBm, 23.12dBm
	EUT Frequency Ranges:	5260-5320MHz & 5500-5720MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Surinder Singh	
Report Date(s):	February 1, 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 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 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. TG1682G, Equipment Under Test (EUT), is a DOCSIS® 3.0 Dual Band Concurrent 802.11ac Wireless Telephony Gateway with MoCA®2.0

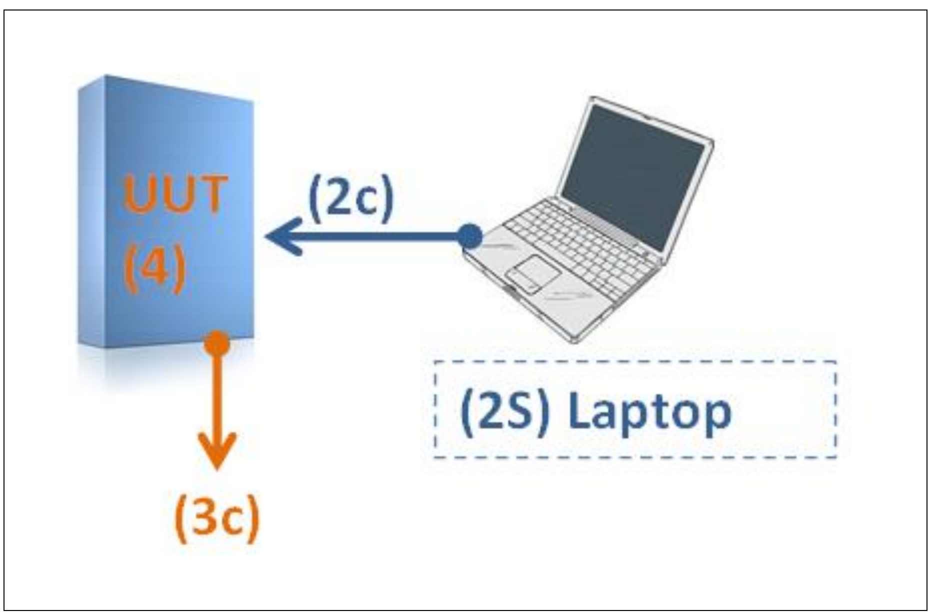


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
4	UUT	TG1682G	--	--	--

Table 4. Equipment Configuration

F. Support Equipment

Ref. ID	Name / Description	Manufacturer	Model Number
2s	Laptop	Assorted	N/A

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
2C	Ethernet	5e Modular 8 pin	1	1	No	--
3C	AC Input	2 conductor, 18 AWG	1	2	No	(115v/60Hz)

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.

I. Method of Monitoring EUT Operation

All indicator lights are active and pinging constantly through system, 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 to the criteria of §15.203. EUT employs internal antennas.

Test Engineer(s): Surinder Singh

Test Date(s): 10/05/15

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(6) Conducted Emissions Limits

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.

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

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

Table 7. 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.

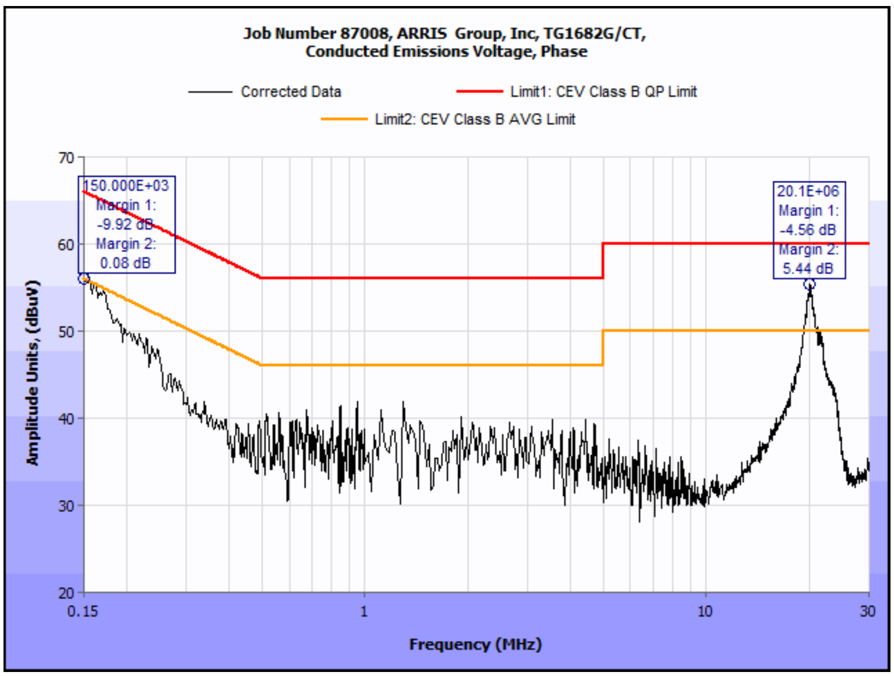
Test Engineer(s): Surinder Singh

Test Date(s): 06/12/15

Conducted Emissions Test Results

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
0.155	57.21	0	57.21	65.73	-8.52	34.31	0	34.31	55.73	-21.42
0.518	34.28	0	34.28	56	-21.72	35.89	0	35.89	46	-10.11
3.34	28.66	0	28.66	56	-27.34	21.88	0	21.88	46	-24.12
5.65	26.87	0.17	27.04	60	-32.96	20.45	0.17	20.62	50	-29.38
19.95	53.17	0	53.17	60	-6.83	47.24	0	47.24	50	-2.76
20.02	53.61	0	53.61	60	-6.39	47.45	0	47.45	50	-2.55

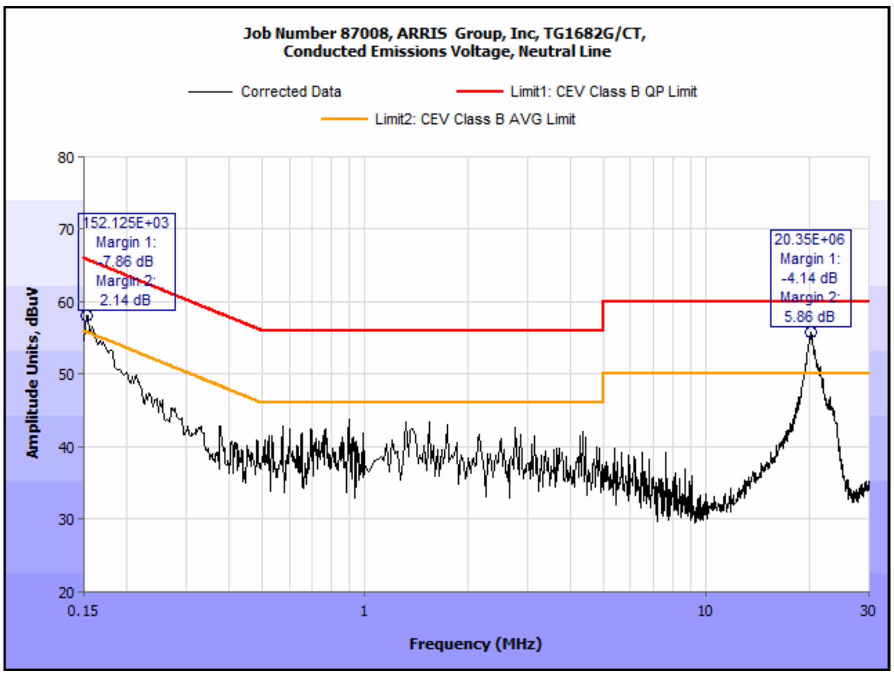
Table 8. Conducted Emissions, Phase Line, Test Results



Plot 1. 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	48.57	0	48.57	66	-17.43	29.64	0	29.64	56	-26.36
0.714	32.64	0	32.64	56	-23.36	22.6	0	22.6	46	-23.4
2.25	30.52	0	30.52	56	-25.48	22.12	0	22.12	46	-23.88
5.125	28.53	0	28.53	60	-31.47	21.32	0	21.32	50	-28.68
19.53	53.74	0	53.74	60	-6.26	48.55	0	48.55	50	-1.45
20.3	54.49	0	54.49	60	-5.51	49.14	0	49.14	50	-0.86

Table 9. Conducted Emissions, Neutral Line, Test Results



Plot 2. Conducted Emissions, Neutral Line

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): Surinder Singh

Test Date(s): 12/15/15

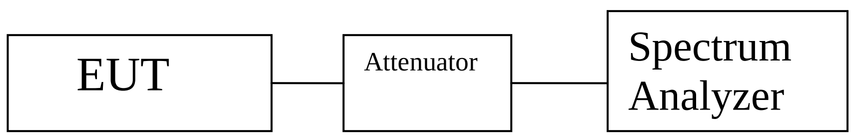


Figure 2. Occupied Bandwidth, Test Setup

26 dB Occupied Bandwidth Test Results

26dB Occupied Bandwidth		
Frequency MHz	**Occupied Bandwidth**	**Mode**
5260	22.2065	a
5300	22.0344	a
5320	22.0724	a
5500	22.614	a
5580	22.5181	a
5720	22.2364	a
5260	23.7085	n
5300	23.0257	n
5320	23.3271	n
5500	23.2845	n
5580	23.5708	n
5720	23.5929	n
5260	23.1393	ac
5300	23.3652	ac
5320	23.3322	ac
5500	23.4819	ac
5580	23.5289	ac
5720	23.5627	ac
5270	45.2058	n
5310	45.5068	n
5510	45.4884	n
5630	45.1212	n
5710	45.0887	n
5270	45.3716	ac
5310	45.7156	ac
5510	45.2538	ac
5630	45.4364	ac
5710	45.1669	ac
5290	88.5601	ac
5530	88.1902	ac
5610	88.3772	ac
5690	88.5212	ac

Table 10. 26 dB Occupied Bandwidth, Test Results

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(2) Maximum Conducted Output Power

Test Requirements: **§15.407(a)(2):** For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the peak transmit power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak 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 peak transmit power and the peak 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.

Note: Only antenna port 1 plots were incorporated in the test report. However measurement were taken on all three antenna ports and has reported in tabular form as under.

Test Results: Equipment was compliant with the Power Output limits of **§ 15.407(a)(2)**.

Test Engineer(s): Surinder Singh

Test Date(s): 12/28/15

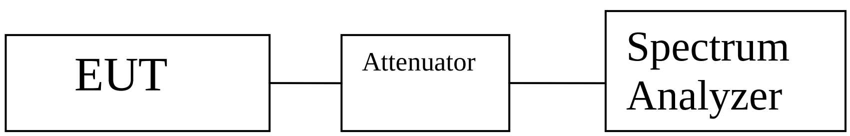


Figure 3. Power Output Test Setup

Power Output Test Results

Maximum Conducted Output Power 20MHz Band 802.11a/n/ac Mode MIMO								
Frequency MHz	**Measured Maximum Output Power (dBm)/20MHz Ant 0**	**Measured Maximum Output Power (dBm)/20MHz Ant 1**	**Measured Maximum Output Power (dBm)/20MHz Ant 2**	**Mode**	**Total power dBm**	**Power Limit (dBm)**	**Antenna Gain dBi**	**Margin**
5260	16.03	16.25	16.75	a	21.13	22.23	7.77	-1.1
5260	17.51	17.61	18.22	n	22.57	24	3	-1.43
5260	17.26	17.57	17.99	ac	22.39	24	3	-1.61
5300	15.73	15.74	15.77	a	20.52	22.23	7.77	-1.71
5300	17.54	17.68	18.22	n	22.6	24	3	-1.4
5300	17.75	17.87	18.46	ac	22.81	24	3	-1.19
5320	15.57	15.82	16.25	a	20.67	22.23	7.77	-1.56
5320	17.56	17.82	18.3	n	22.68	24	3	-1.32
5320	17.97	18.03	18.5	ac	22.95	24	3	-1.05
5500	15.49	15.65	15.9	a	20.46	22.63	7.37	-2.17
5500	18.1	18.24	18.66	n	23.12	24	2.6	-0.88
5500	18.11	18.32	18.43	ac	23.06	24	2.6	-0.94
5580	14.82	15.05	15.5	a	19.91	22.63	7.37	-2.72
5580	18.1	18.34	18.37	n	23.05	24	2.6	-0.95
5580	17.99	18.08	18.26	ac	22.89	24	2.6	-1.11
5720	15.08	15.3	15.33	a	20.01	22.63	7.37	-2.62
5720	17.05	17.26	17.33	n	21.99	24	2.6	-2.01
5720	17.33	17.38	17.9	ac	22.32	24	2.6	-1.68

Table 11. Maximum Conducted Output Power, 20 MHz

Note: 802.11a mode transmit correlated data from all antenna ports. This is reason it has 10*log(N) higher antenna gain value compare to 802.11n and ac mode where N is number of transmit chain

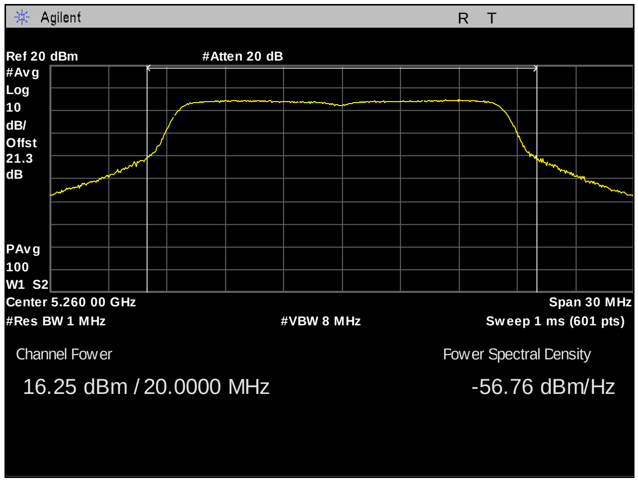
Maximum Conducted Output Power 40MHz Band n and ac Mode MIMO (3*3)								
Frequency MHz	**Measured Maximum Output Power (dBm)/40MHz Ant 0**	**Measured Maximum Output Power (dBm)/40MHz Ant 1**	**Measured Maximum Output Power (dBm)/40MHz Ant 2**	**mode**	**Total OutPut Power**	**Antenna Gain dBi**	**Power Limit (dBm)**	**Margin**
5270	17.96	17.99	17.62	n	22.64	3	24	-1.36
5270	18.12	18.24	17.84	ac	22.85	3	24	-1.15
5310	17.34	17.58	17.36	n	22.2	3	24	-1.8
5310	17.39	17.47	17.42	ac	22.2	3	24	-1.8
5510	17.74	17.89	17.83	n	22.6	2.6	24	-1.4
5510	17.8	17.85	17.75	ac	22.58	2.6	24	-1.42
5670	17.53	17.72	17.37	n	22.32	2.6	24	-1.68
5670	17.46	17.52	17.42	ac	22.24	2.6	24	-1.76
5710	17.16	17.29	16.95	n	21.91	2.6	24	-2.09
5710	17.29	17.47	17.37	ac	22.15	2.6	24	-1.85

Table 12. Maximum Conducted Output Power, 40 MHz

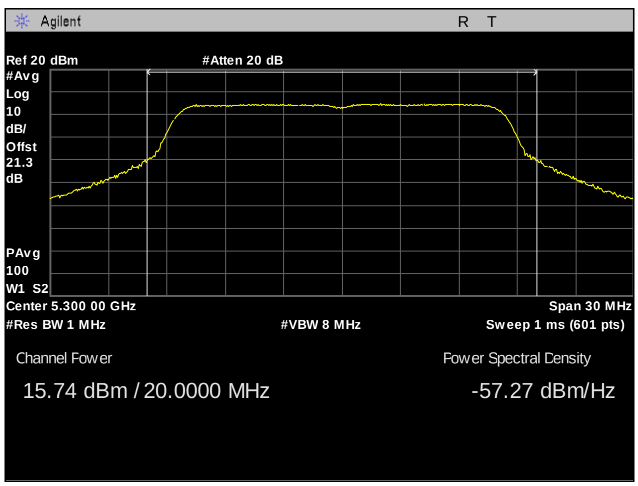
Maximum Conducted Output Power 80MHz Band n Mode MIMO (3*3)								
Frequency MHz	**Measured Maximum Output Power (dBm)/80MHz Ant 0**	**Measured Maximum Output Power (dBm)/80MHz Ant 1**	**Measured Maximum Output Power (dBm)/80MHz Ant 2**	**mode**	**Total OutPut Power**	**Antenna Gain dBi**	**Power Limit (dBm)**	**Margin**
5290	12.35	**12.82**	**12.94**	ac	17.49	3	24	-6.51
5530	12.64	**13.23**	**13.22**	ac	17.81	2.6	24	-6.19
5610	12.19	**12.64**	**12.84**	ac	17.34	2.6	24	-6.66
5690	17.15	**17.72**	**17.24**	ac	22.15	2.6	24	-1.85

Table 13. Maximum Conducted Output Power, 80 MHz

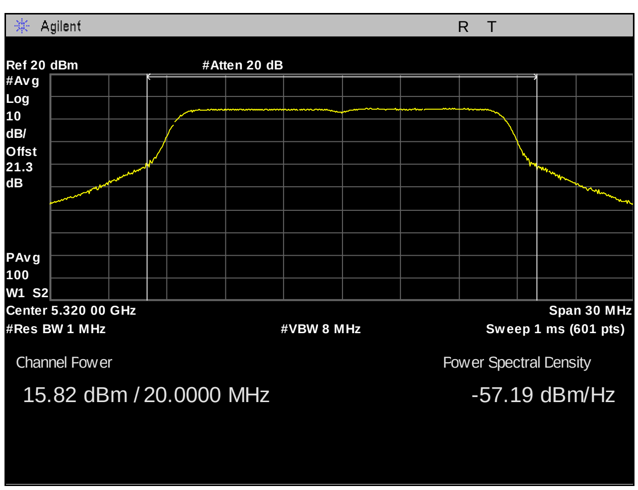
Maximum Conducted Output Power, 802.11a 20 MHz



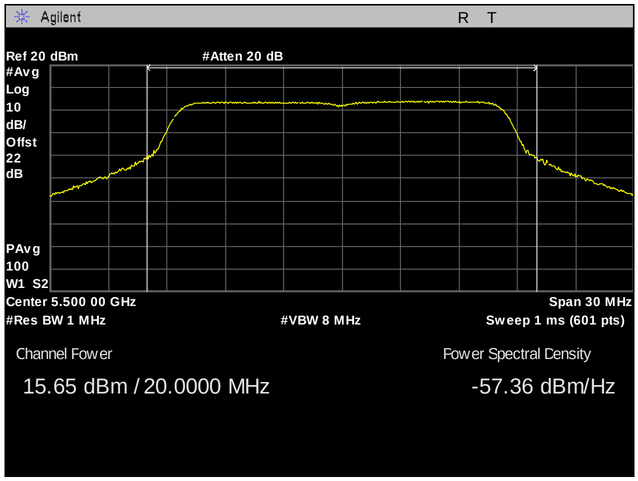
Plot 3. Maximum Conducted Output Power, Channel 52, 802.11a 20 MHz



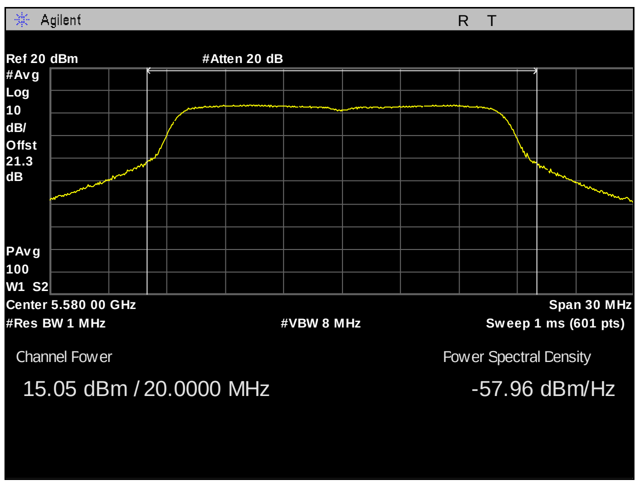
Plot 4. Maximum Conducted Output Power, Channel 60, 802.11a 20 MHz



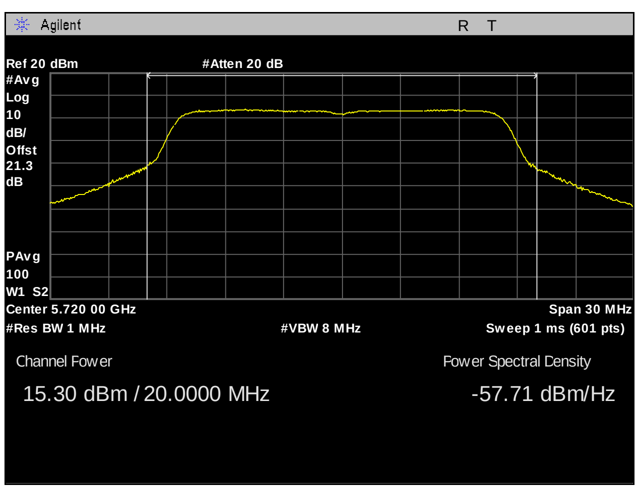
Plot 5. Maximum Conducted Output Power, Channel 64, 802.11a 20 MHz



Plot 6. Maximum Conducted Output Power, Channel 100, 802.11a 20 MHz

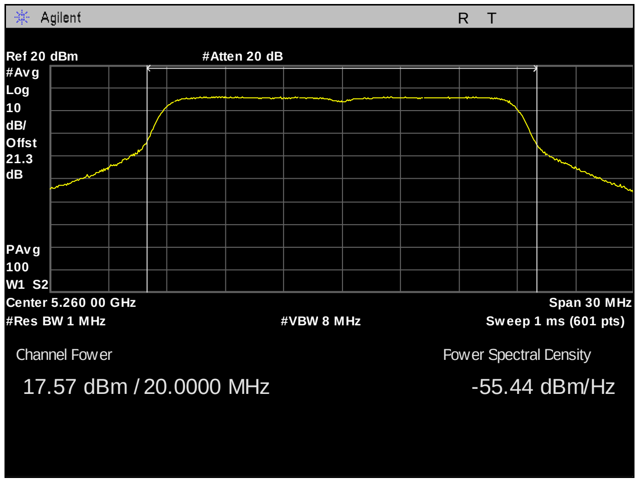


Plot 7. Maximum Conducted Output Power, Channel 116, 802.11a 20 MHz

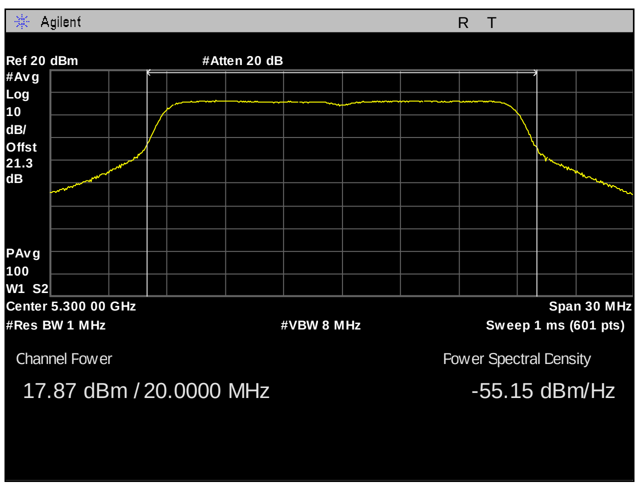


Plot 8. Maximum Conducted Output Power, Channel 144, 802.11a 20 MHz

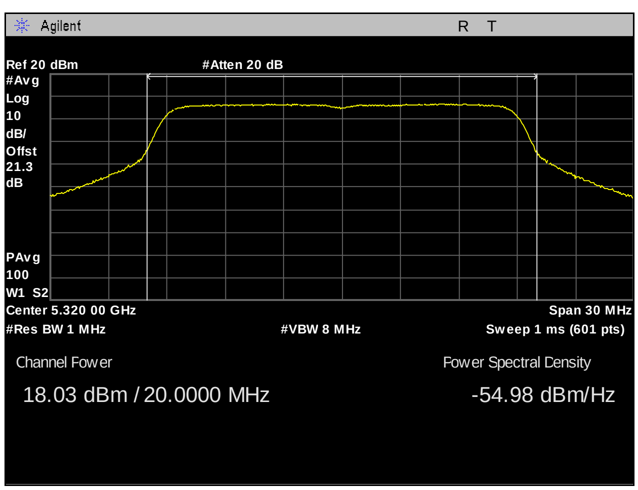
Maximum Conducted Output Power, 802.11ac 20 MHz



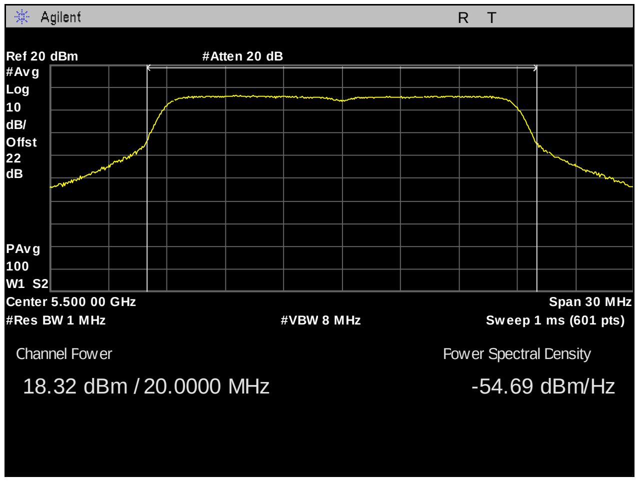
Plot 9. Maximum Conducted Output Power, Channel 52, 802.11ac 20 MHz



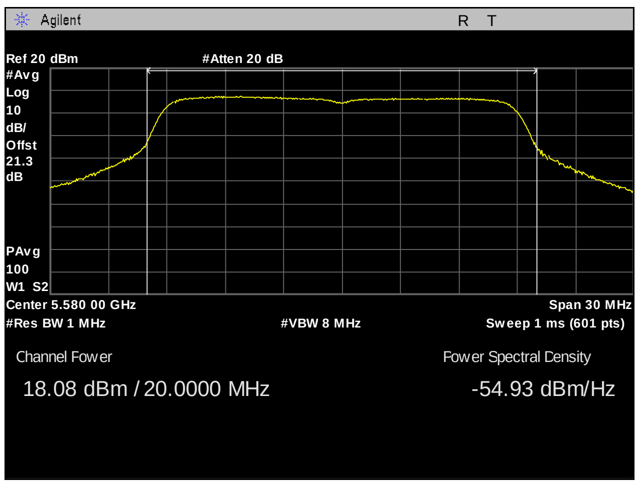
Plot 10. Maximum Conducted Output Power, Channel 60, 802.11ac 20 MHz



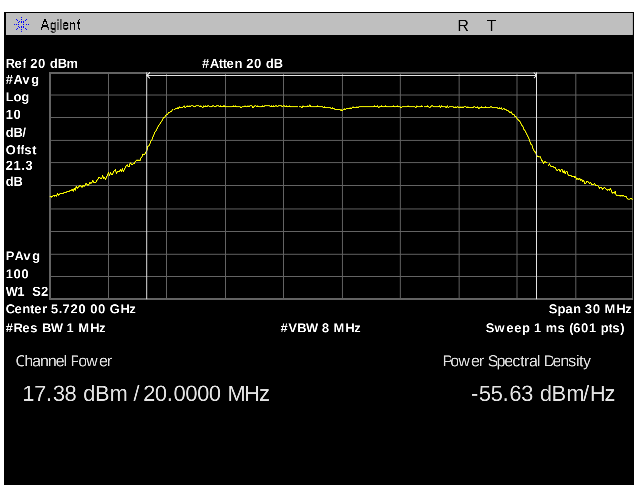
Plot 11. Maximum Conducted Output Power, Channel 64, 802.11ac 20 MHz



Plot 12. Maximum Conducted Output Power, Channel 100, 802.11a 20 MHz

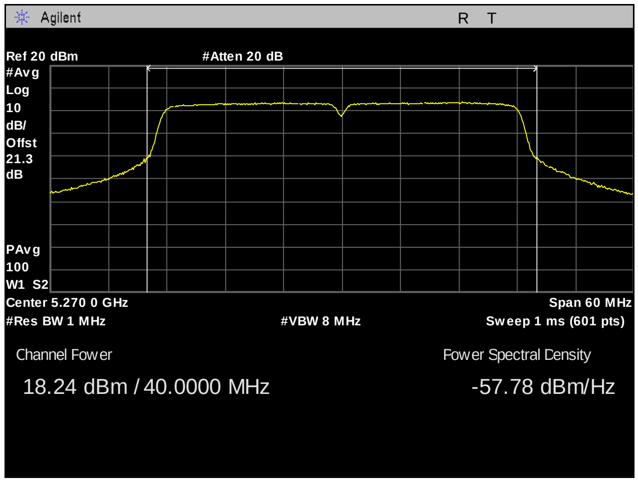


Plot 13. Maximum Conducted Output Power, Channel 116, 802.11ac 20 MHz

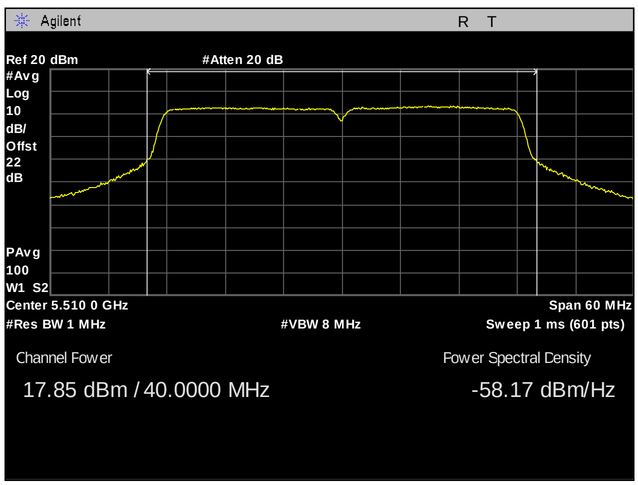


Plot 14. Maximum Conducted Output Power, Channel 144, 802.11ac 20 MHz

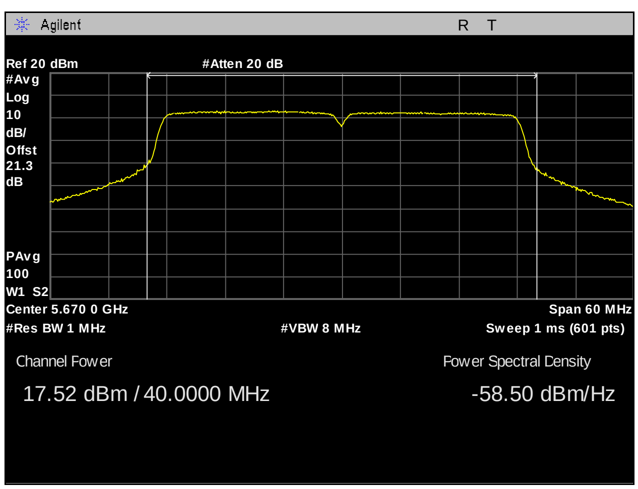
Maximum Conducted Output Power, 802.11ac 40 MHz



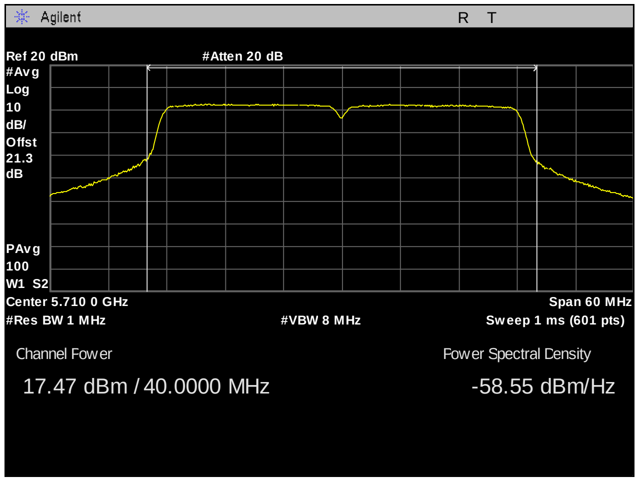
Plot 15. Maximum Conducted Output Power, Channel 52, 802.11ac 40 MHz



Plot 16. Maximum Conducted Output Power, Channel 100, 802.11ac 40 MHz

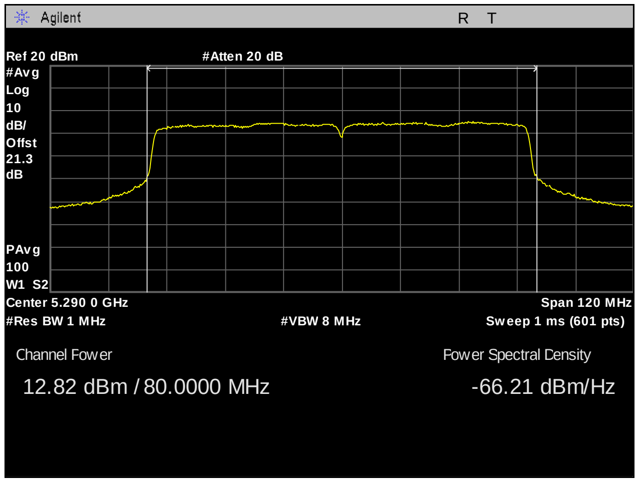


Plot 17. Maximum Conducted Output Power, Channel 132, 802.11ac 40 MHz

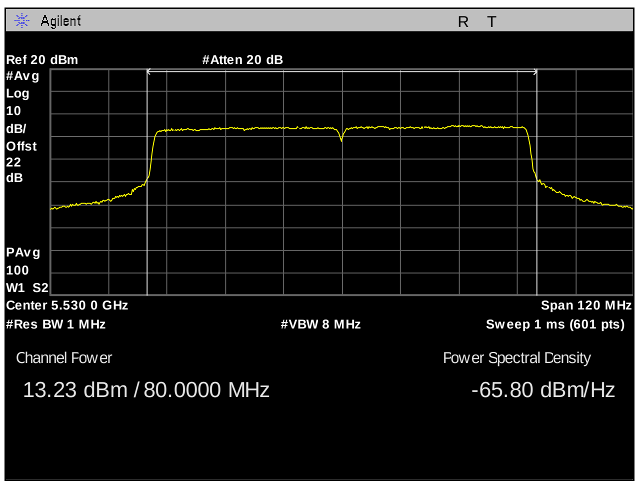


Plot 18. Maximum Conducted Output Power, Channel 140, 802.11ac 40 MHz

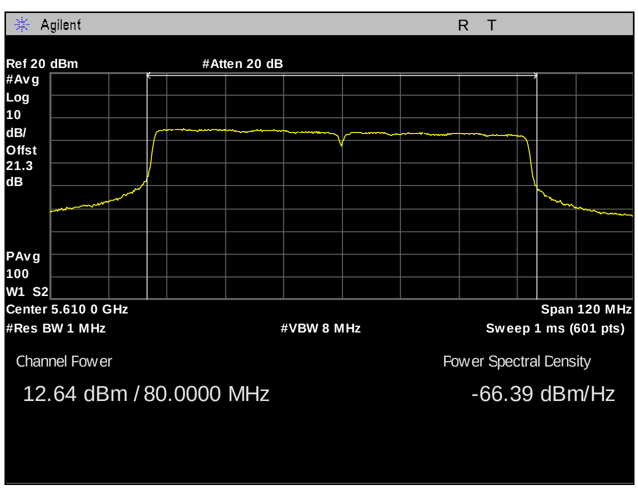
Maximum Conducted Output Power, 802.11ac 80 MHz



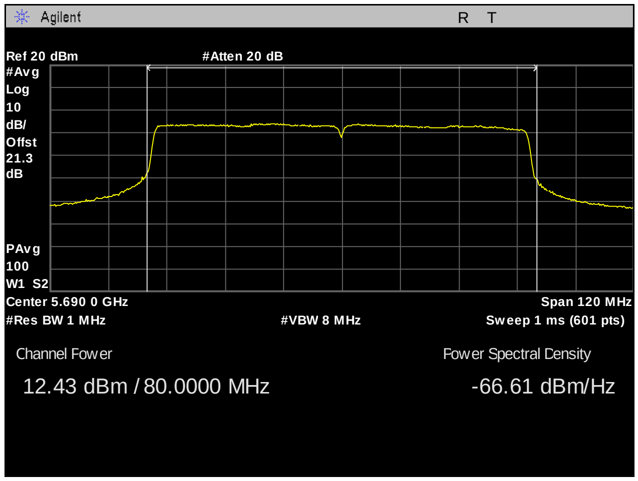
Plot 19. Maximum Conducted Output Power, Channel 52, 802.11ac 80 MHz



Plot 20. Maximum Conducted Output Power, Channel 100, 802.11ac 80 MHz

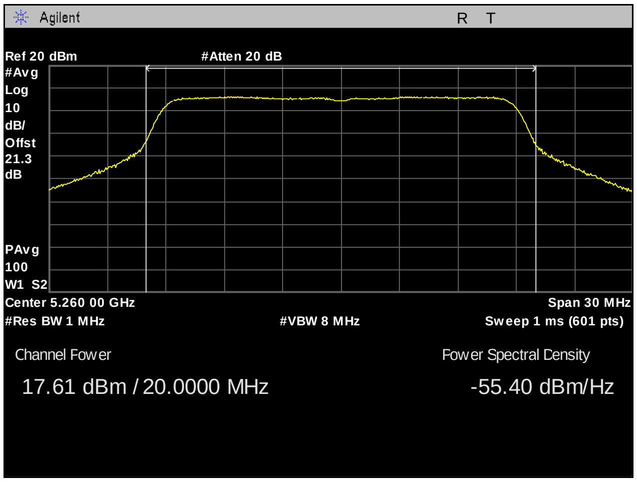


Plot 21. Maximum Conducted Output Power, Channel 116, 802.11ac 80 MHz

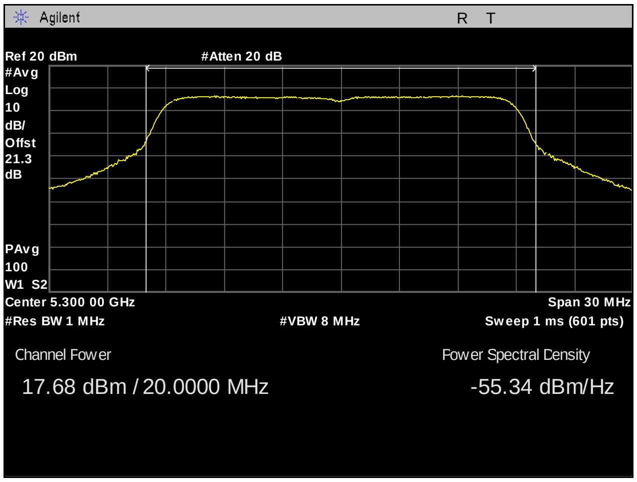


Plot 22. Maximum Conducted Output Power, Channel 132, 802.11ac 80 MHz

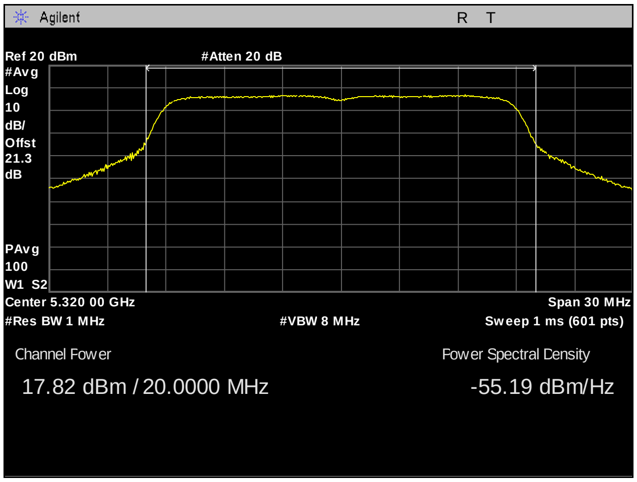
Maximum Conducted Output Power, 802.11n 20 MHz



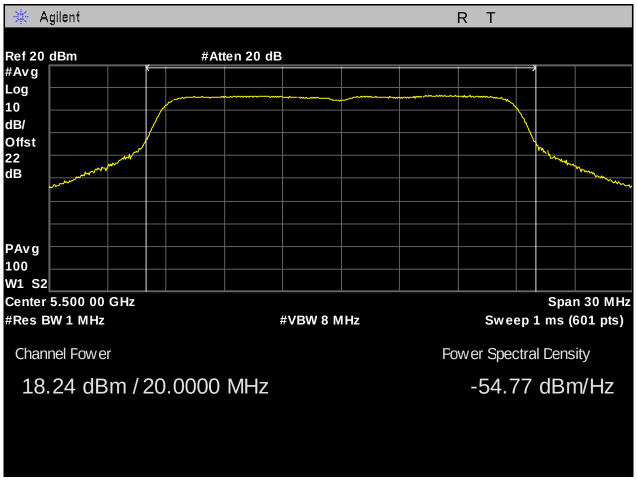
Plot 23. Maximum Conducted Output Power, Channel 52, 802.11n 20 MHz



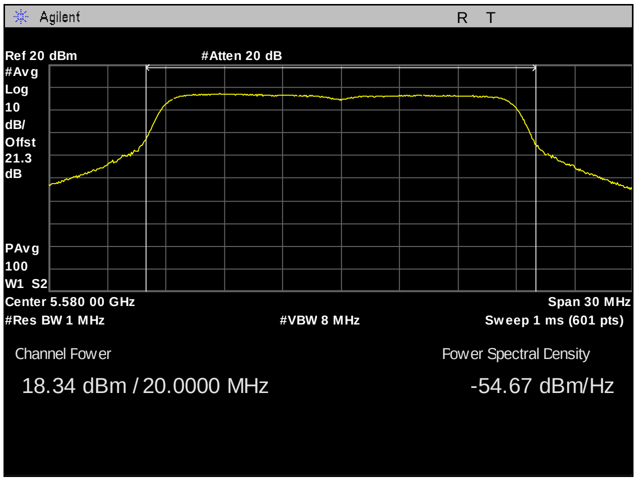
Plot 24. Maximum Conducted Output Power, Channel 60, 802.11n 20 MHz



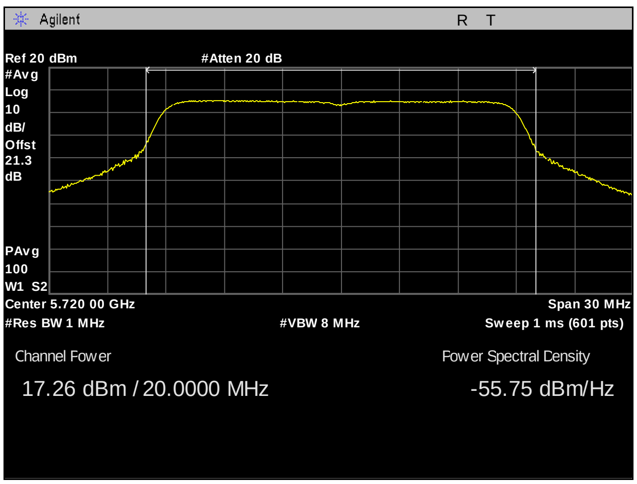
Plot 25. Maximum Conducted Output Power, Channel 64, 802.11n 20 MHz



Plot 26 Maximum Conducted Output Power, Channel 100, 802.11n 20 MHz

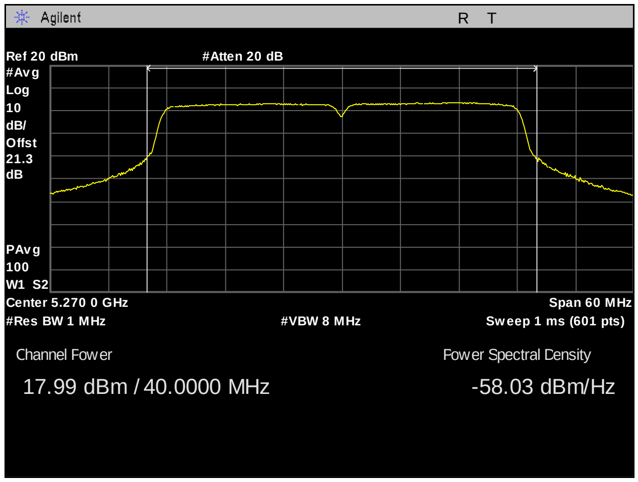


Plot 27. Maximum Conducted Output Power, Channel 116, 802.11n 20 MHz

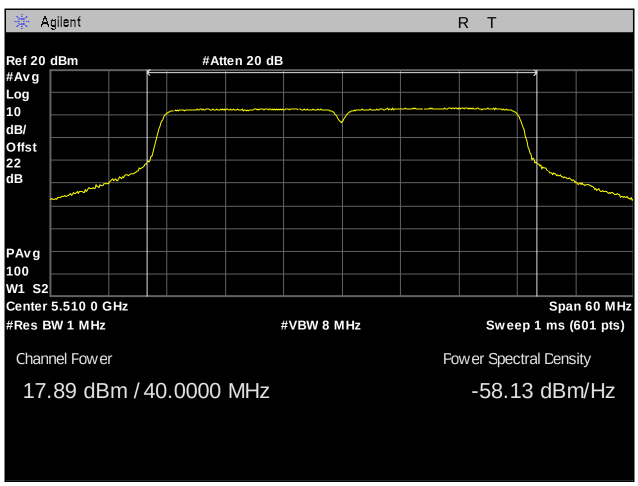


Plot 28. Maximum Conducted Output Power, Channel 144, 802.11n 20 MHz

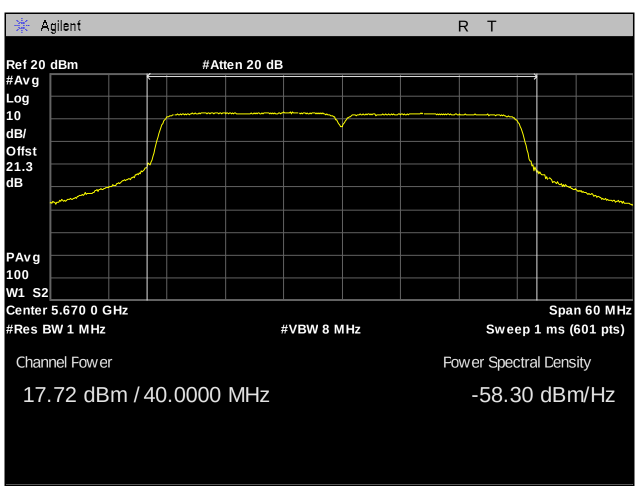
Maximum Conducted Output Power, 802.11n 40 MHz



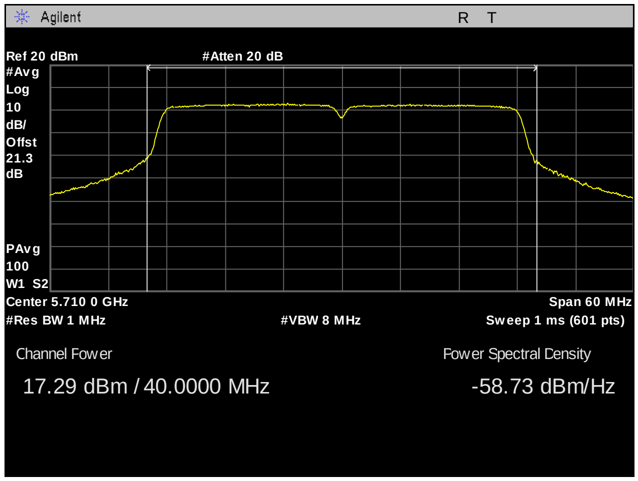
Plot 29. Maximum Conducted Output Power, Channel 52, 802.11n 40 MHz



Plot 30. Maximum Conducted Output Power, Channel 100, 802.11n 40 MHz



Plot 31. Maximum Conducted Output Power, Channel 132, 802.11n 40 MHz



Plot 32. Maximum Conducted Output Power, Channel 140, 802.11n 40 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

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

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

Test Date(s): 12/28/15

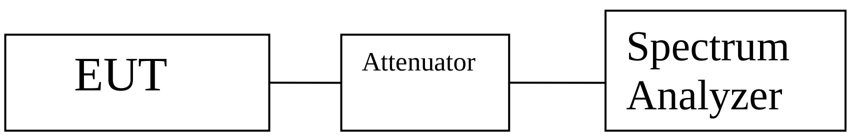


Figure 4. Power Spectral Density Test Setup

Peak Power Spectral Density Test Results

Maximum Conducted Output PSD 20MHz Band 802.11a/n/ac Mode MIMO								
Frequency MHz	**Measured Maximum Output PSD (dBm)/1MHz Ant 0**	**Measured Maximum Output PSD (dBm)/1MHz Ant 1**	**Measured Maximum Output PSD (dBm)/1MHz Ant 2**	**Mode**	**Total PSD dBm**	**PSD Limit (dBm)**	**Antenna Gain dBi**	**Margin**
5260	4.09	4.24	4.27	a	8.98	9.23	7.77	-0.25
5260	6.01	6.03	6.14	n	10.84	11	3	-0.16
5260	5.61	5.7	5.72	ac	10.45	11	3	-0.55
5300	4.15	4.22	4.32	a	9.01	9.23	7.77	-0.22
5300	6.03	6.36	6.19	n	10.97	11	3	-0.03
5300	5.94	6.45	6.21	ac	10.98	11	3	-0.02
5320	4.15	4.7	4.24	a	9.15	9.23	7.77	-0.08
5320	6.02	6.32	6.21	n	10.96	11	3	-0.04
5320	6.13	6.177	6.19	ac	10.94	11	3	-0.06
5500	3.49	3.57	3.68	a	8.36	9.63	7.37	-1.27
5500	5.85	5.87	5.88	n	10.64	11	2.6	-0.36
5500	5.77	5.87	5.96	ac	10.64	11	2.6	-0.36
5580	3.46	3.5	3.59	a	8.29	9.63	7.37	-1.34
5580	5.48	6.31	6.48	n	10.89	11	2.6	-0.11
5580	5.94	6.6	6.074	ac	10.99	11	2.6	-0.01
5700	3.39	3.51	3.56	a	8.26	9.63	7.37	-1.37
5700	5.12	5.19	5.22	n	9.95	11	2.6	-1.05
5700	5.53	5.54	5.63	ac	10.34	11	2.6	-0.66

Table 14. Maximum Power Spectral Density, Test Results, 20 MHz
Note: 802.11a mode transmit correlated data from all antenna ports. This is reason it has 10*log(N) higher antenna gain value compare to 802.11n and ac mode where N is number of transmit chain

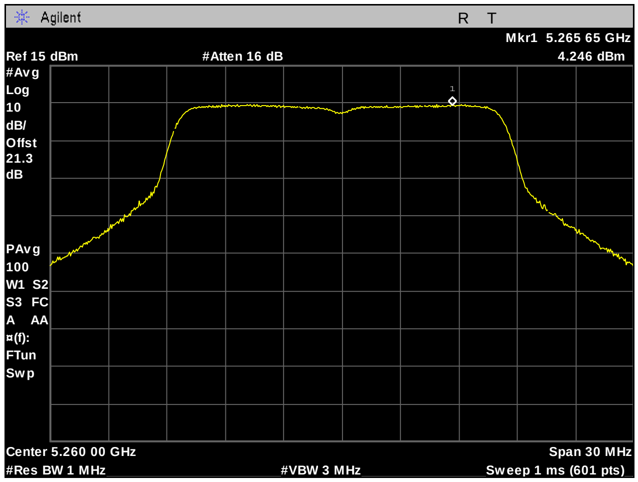
Maximum Conducted Output PSD 40MHz Band n and ac Mode MIMO (3*3)								
Frequency MHz	**Measured Maximum Output PSD (dBm)/1MHz Ant 0**	**Measured Maximum Output PSD (dBm)/1MHz Ant 1**	**Measured Maximum Output PSD (dBm)/1MHz Ant 2**	**mode**	**Total OutPut PSD**	**Antenna Gain dBi**	**PSD Limit (dBm)**	**Margin**
5270	3.49	3.63	3.83	n	8.43	3	11	-2.57
5270	3.23	3.28	3.34	ac	8.06	3	11	-2.94
5310	3.08	3.11	3.27	n	7.93	3	11	-3.07
5310	2.94	2.98	3.14	ac	7.8	3	11	-3.2
5510	2.82	2.91	2.99	n	7.68	2.6	11	-3.32
5510	3.29	3.36	3.48	ac	8.15	2.6	11	-2.85
5590	2.72	2.77	2.79	n	7.54	2.6	11	-3.46
5590	2.65	2.78	2.8	ac	7.52	2.6	11	-3.48
5670	2.83	2.92	3.04	n	7.71	2.6	11	-3.29
5670	2.57	2.65	2.82	ac	7.46	2.6	11	-3.54

Table 15. Maximum Power Spectral Density, Test Results, 40 MHz

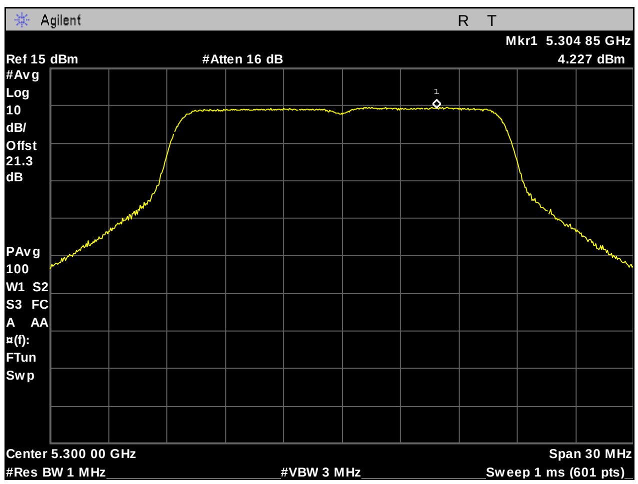
Maximum Conducted Output PSD 80MHz Band n Mode MIMO (3*3)								
Frequency MHz	**Measured Maximum Output PSD (dBm)/1MHz Ant 0**	**Measured Maximum Output PSD (dBm)/1MHz Ant 1**	**Measured Maximum Output PSD (dBm)/1MHz Ant 2**	**mode**	**Total OutPut PSD**	**Antenna Gain dBi**	**PSD Limit (dBm)**	**Margin**
5290	-4.99	-4.96	-4.8	ac	-0.14	3	11	-11.14
5530	-5.57	-5.53	-5.37	ac	-0.71	2.6	11	-11.71
5610	-5.36	-5.27	-5.19	ac	-0.5	2.6	11	-11.5
5670	-6.8	-6.73	-6.61	ac	-1.94	2.6	11	-12.94

Table 16. Maximum Power Spectral Density, Test Results, 80 MHz

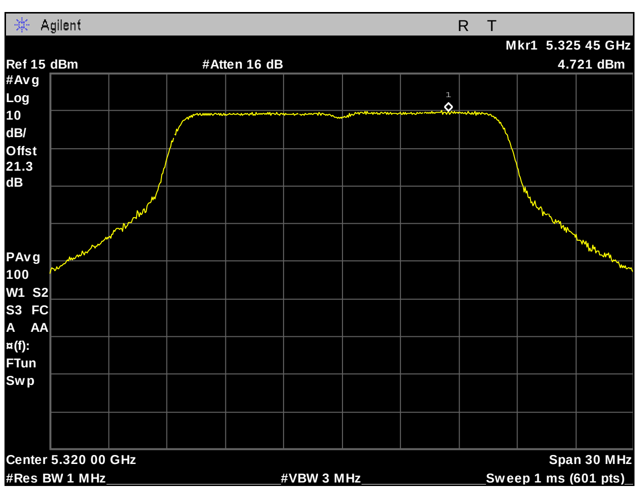
Peak Power Spectral Density, 802.11a 20 MHz



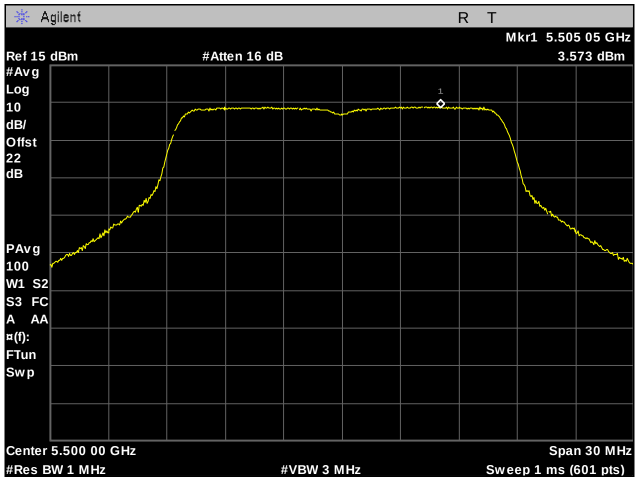
Plot 33. Peak Power Spectral Density, Channel 52, 802.11a 20 MHz



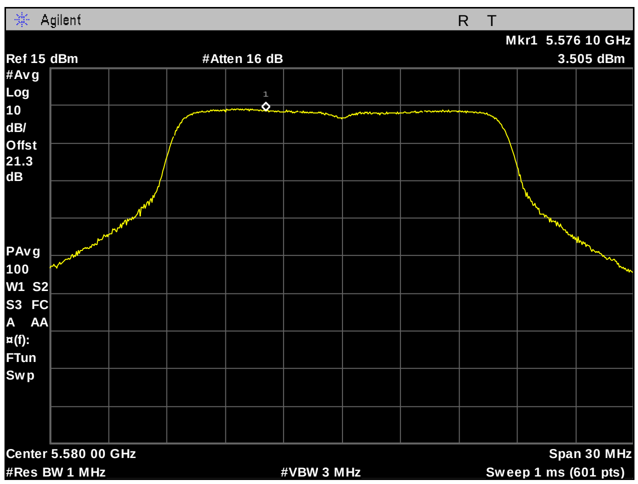
Plot 34. Peak Power Spectral Density, Channel 60, 802.11a 20 MHz



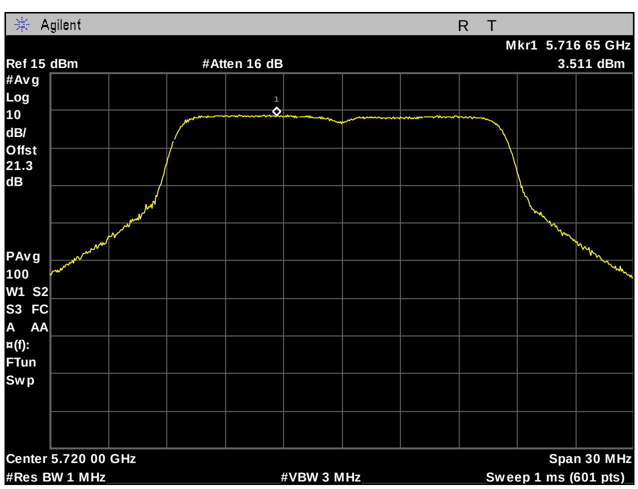
Plot 35. Peak Power Spectral Density, Channel 64, 802.11a 20 MHz



Plot 36. Peak Power Spectral Density, Channel 100, 802.11a 20 MHz

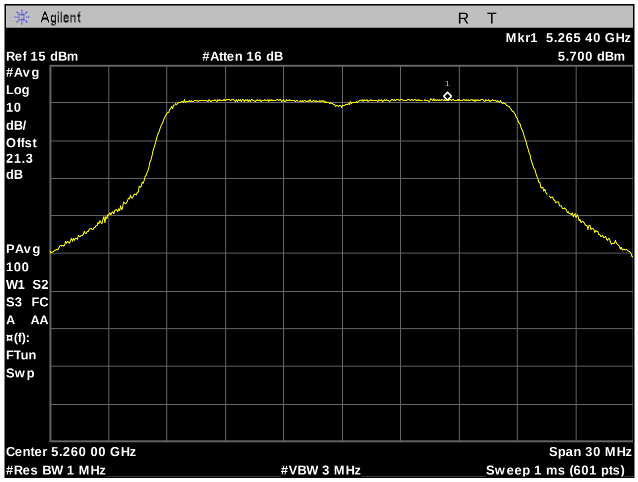


Plot 37. Peak Power Spectral Density, Channel 116, 802.11a 20 MHz

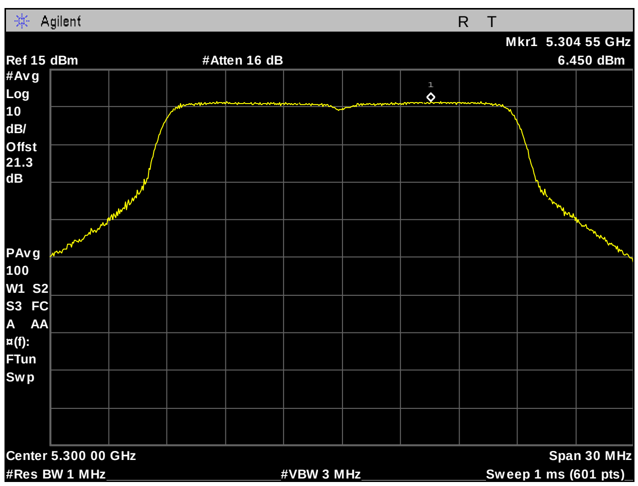


Plot 38. Peak Power Spectral Density, Channel 144, 802.11a 20 MHz

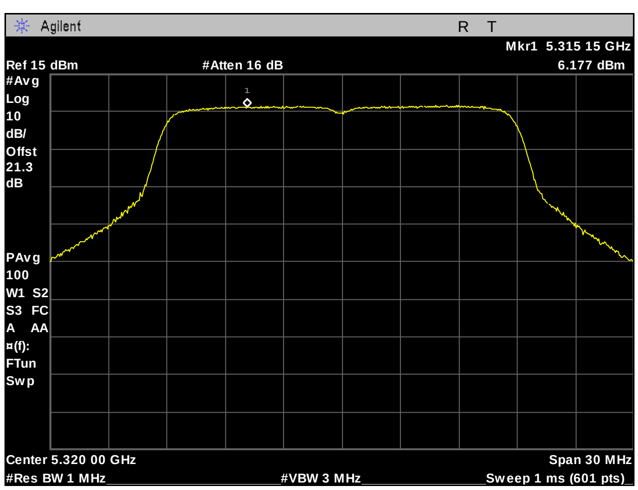
Peak Power Spectral Density, 802.11ac 20 MHz



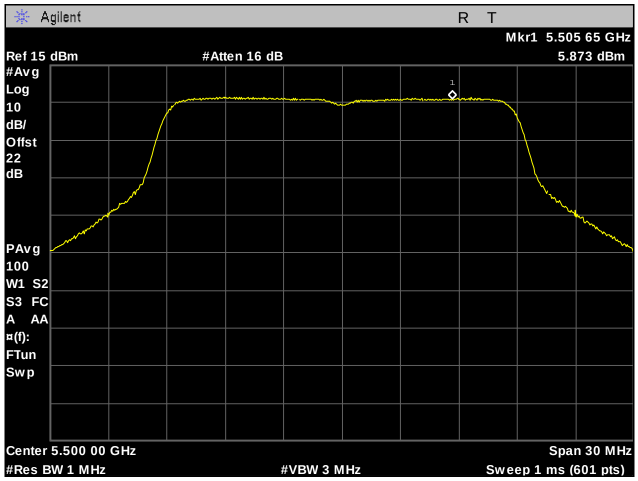
Plot 39. Peak Power Spectral Density, Channel 52, 802.11ac 20 MHz



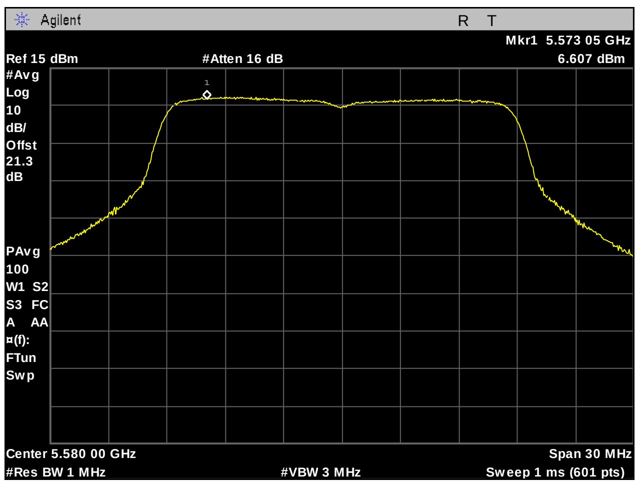
Plot 40. Peak Power Spectral Density, Channel 60, 802.11ac 20 MHz



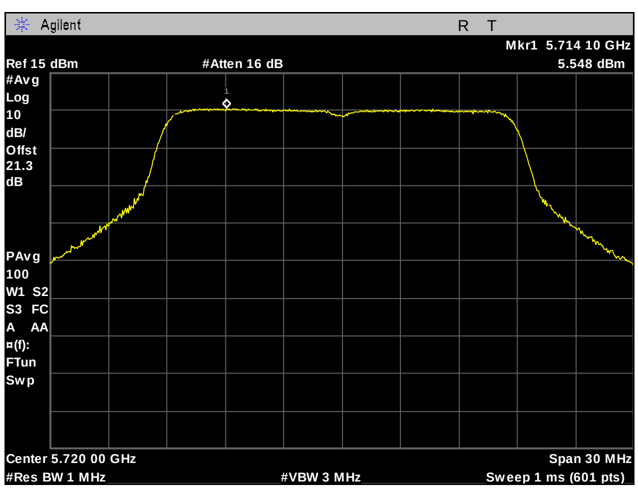
Plot 41. Peak Power Spectral Density, Channel 64, 802.11ac 20 MHz, Ant. 0



Plot 42. Peak Power Spectral Density, Channel 100, 802.11ac 20 MHz

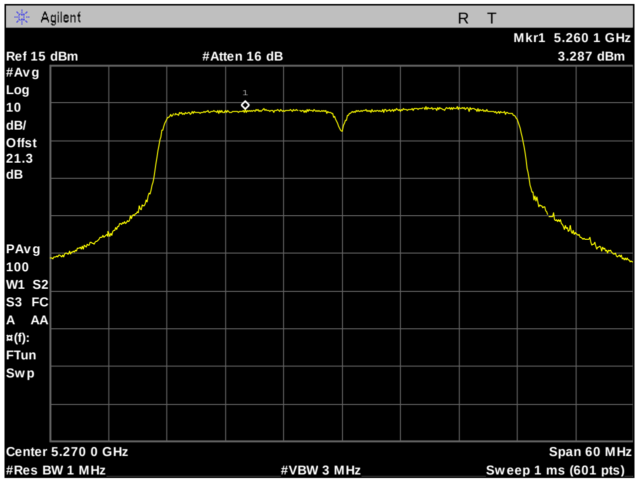


Plot 43. Peak Power Spectral Density, Channel 116, 802.11ac 20 MHz

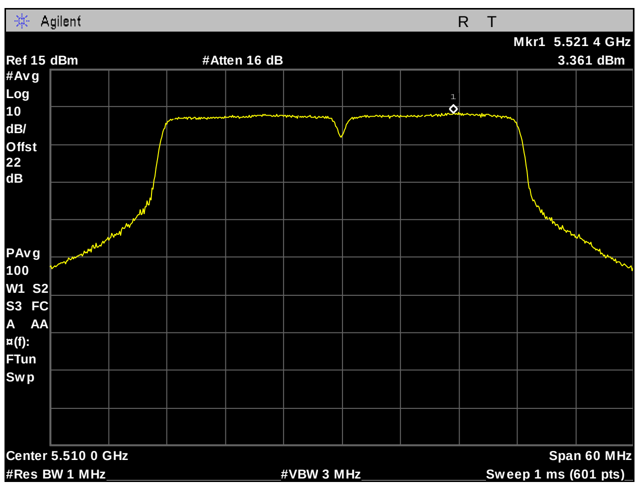


Plot 44. Peak Power Spectral Density, Channel 144, 802.11ac 20 MHz

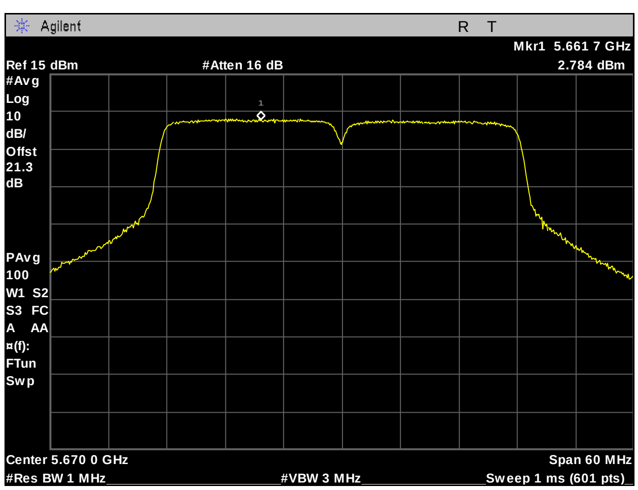
Peak Power Spectral Density, 802.11ac 40 MHz



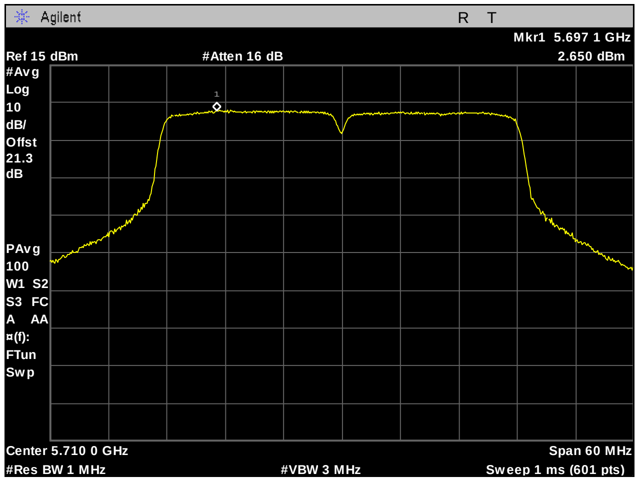
Plot 45. Peak Power Spectral Density, Channel 52, 802.11ac 40 MHz



Plot 46. Peak Power Spectral Density, Channel 100, 802.11ac 40 MHz

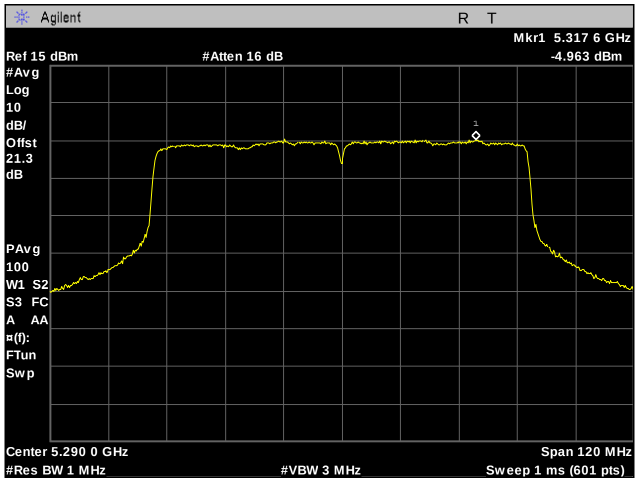


Plot 47. Peak Power Spectral Density, Channel 132, 802.11ac 40 MHz

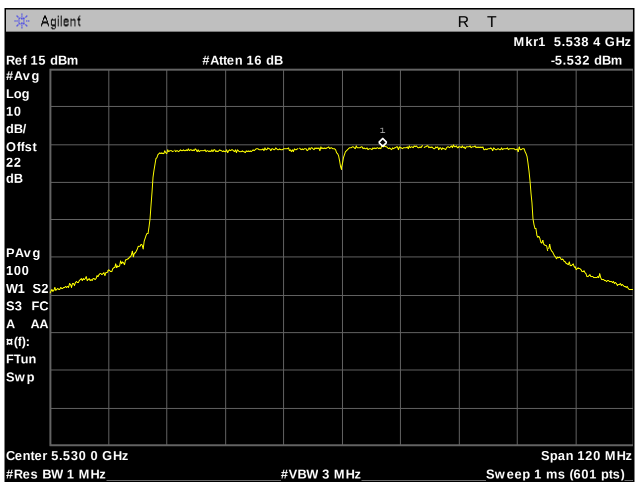


Plot 48. Peak Power Spectral Density, Channel 140, 802.11ac 40 MHz

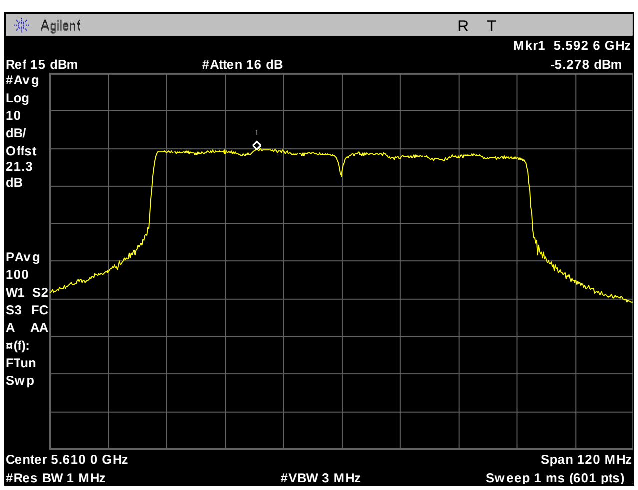
Peak Power Spectral Density, 802.11ac 80 MHz



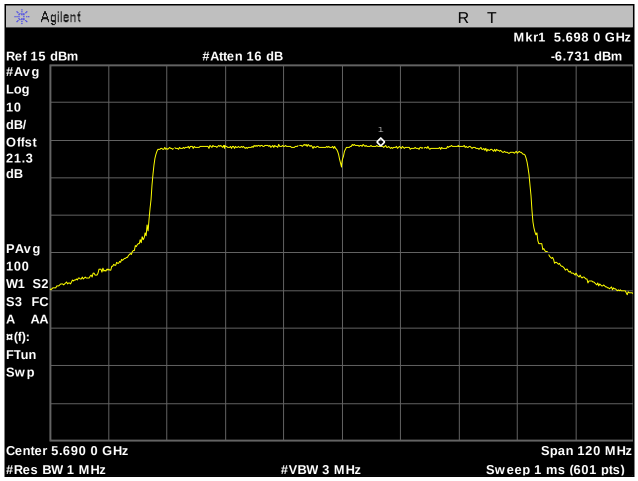
Plot 49. Peak Power Spectral Density, Channel 52, 802.11ac 80 MHz



Plot 50. Peak Power Spectral Density, Channel 100, 802.11ac 80 MHz

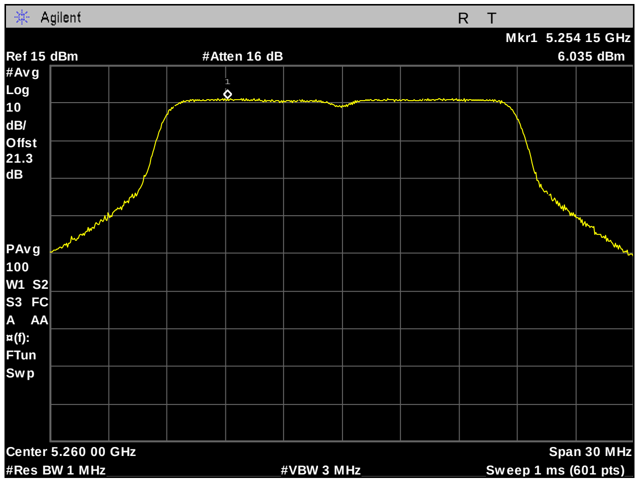


Plot 51. Peak Power Spectral Density, Channel 116, 802.11ac 80 MHz, Ant. 2

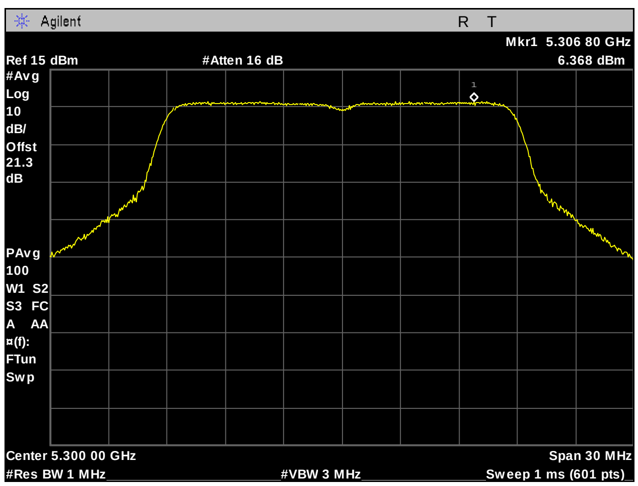


Plot 52. Peak Power Spectral Density, Channel 132, 802.11ac 80 MHz, Ant. 2

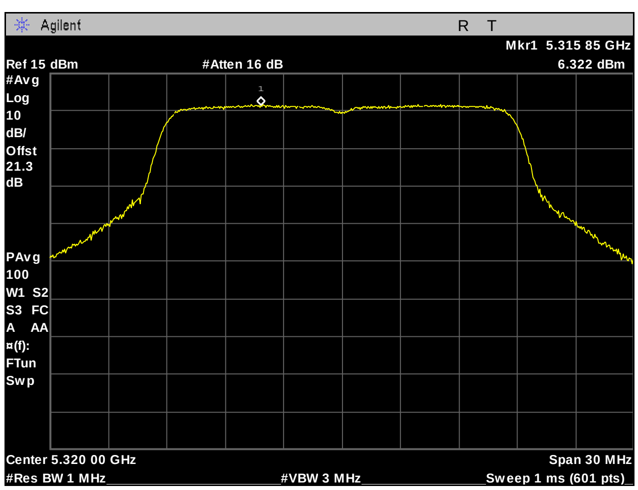
Peak Power Spectral Density, 802.11n 20 MHz



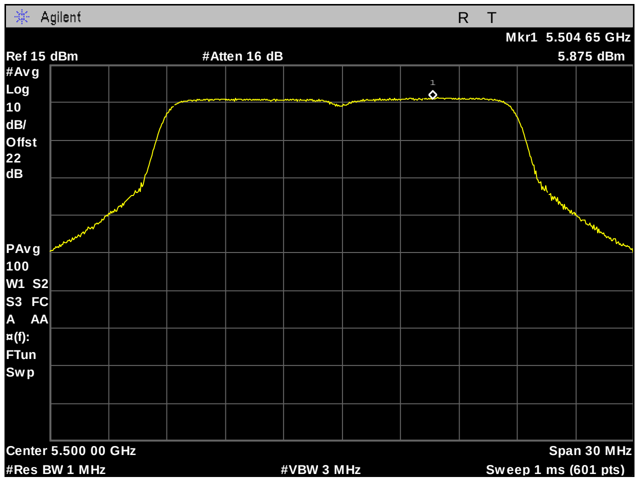
Plot 53. Peak Power Spectral Density, Channel 52, 802.11n 20 MHz



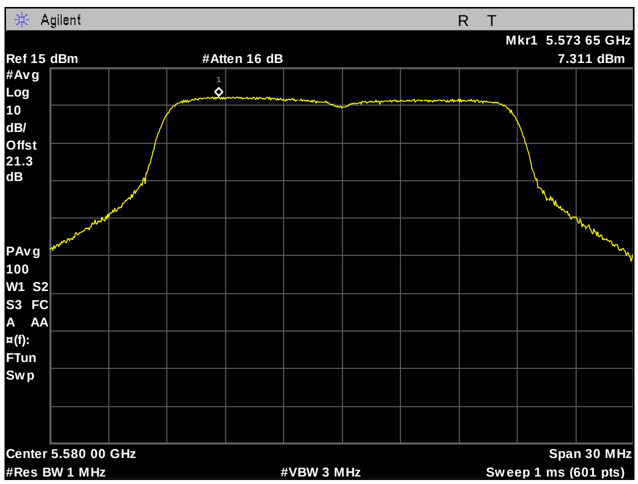
Plot 54. Peak Power Spectral Density, Channel 60, 802.11n 20 MHz



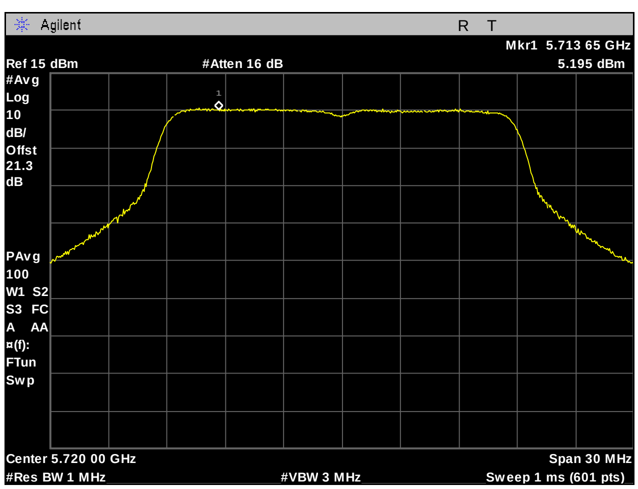
Plot 55. Peak Power Spectral Density, Channel 64, 802.11n 20 MHz



Plot 56. Peak Power Spectral Density, Channel 100, 802.11n 20 MHz

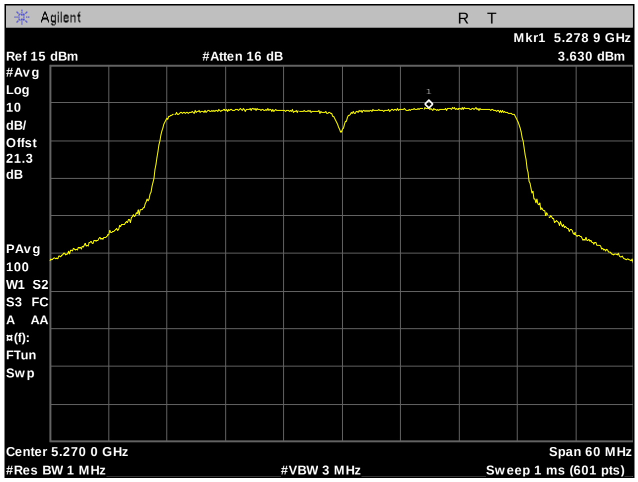


Plot 57. Peak Power Spectral Density, Channel 116, 802.11n 20 MHz

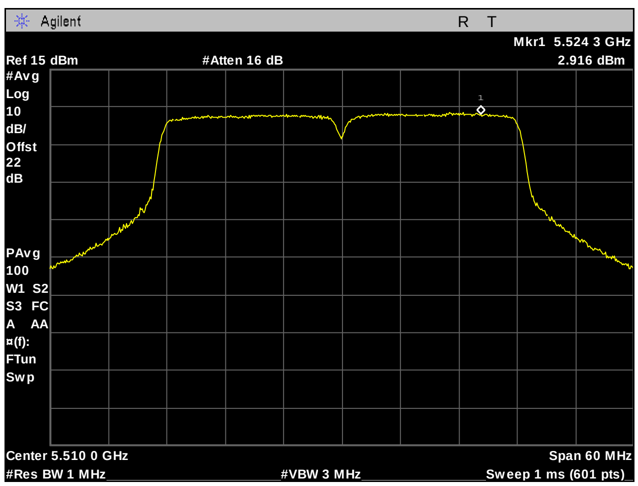


Plot 58. Peak Power Spectral Density, Channel 144, 802.11n 20 MHz

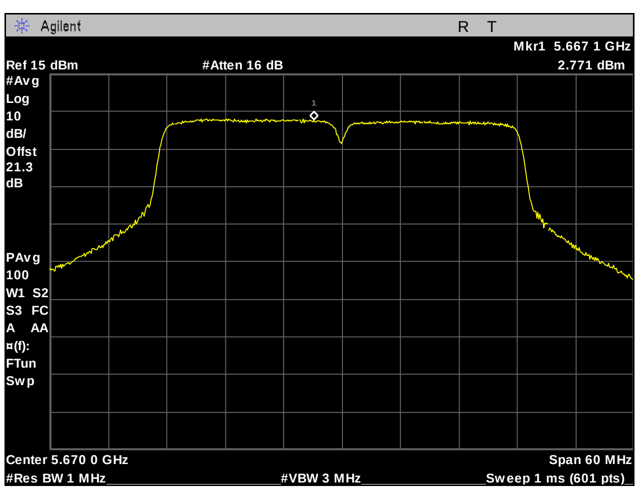
Peak Power Spectral Density, 802.11n 40 MHz



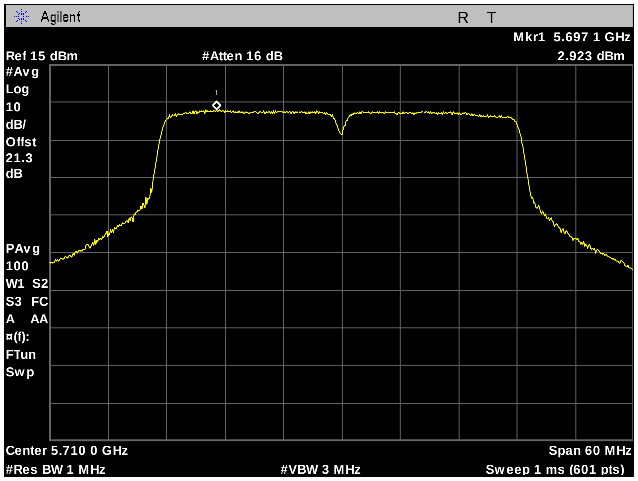
Plot 59. Peak Power Spectral Density, Channel 52, 802.11ac 40 MHz



Plot 60. Peak Power Spectral Density, Channel 100, 802.11n 40 MHz



Plot 61. Peak Power Spectral Density, Channel 132, 802.11n 40 MHz



Plot 62. Peak Power Spectral Density, Channel 140, 802.11n 40 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

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

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

§ 15.407(b)(2): For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

§ 15.407(b)(3): For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an 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

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 measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with the limits of RSS-GEN. Emissions were explored up to 40 GHz.

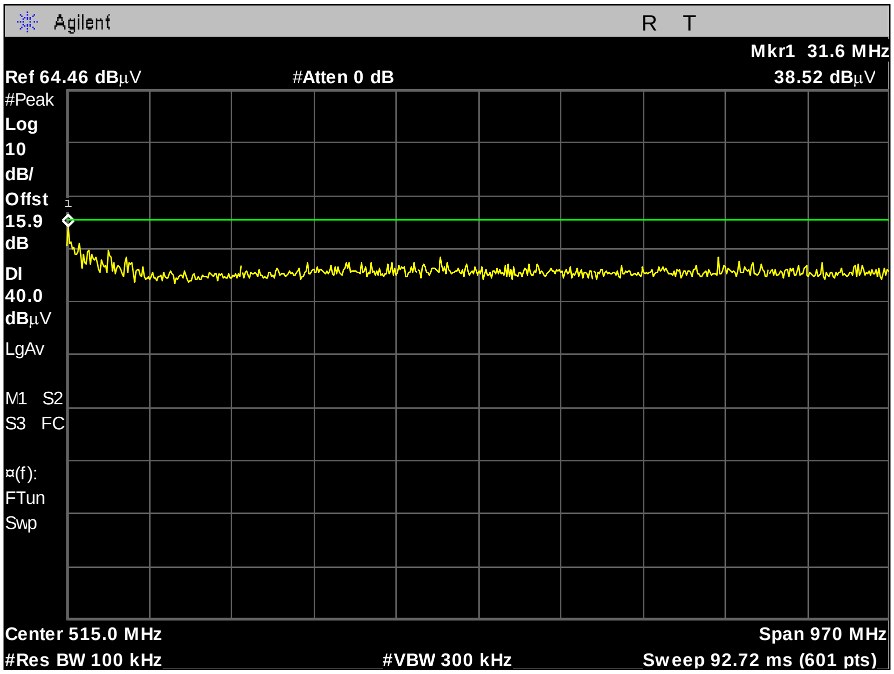
Test Results: For below 1 GHz, the EUT was compliant with the requirements of this section.

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

Test Engineer(s): Surinder Singh

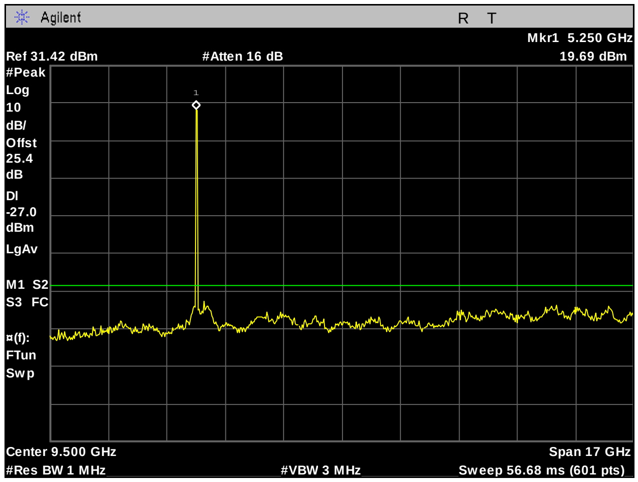
Test Date(s): 12/28/15

Radiated Spurious Emissions, Below 1 GHz

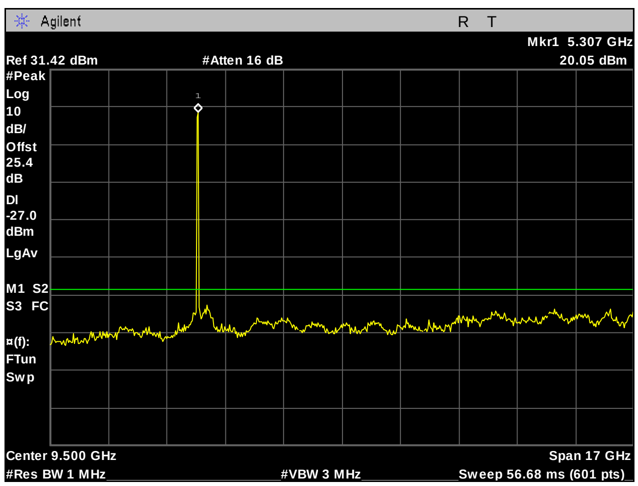


Plot 63. Radiated Spurious Emissions, 30 MHz – 1 GHz, Worst Case Emission

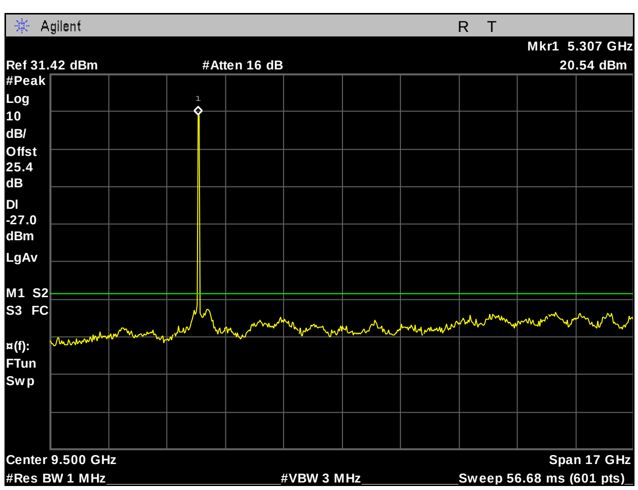
Radiated Spurious Emissions, 802.11a 20 MHz



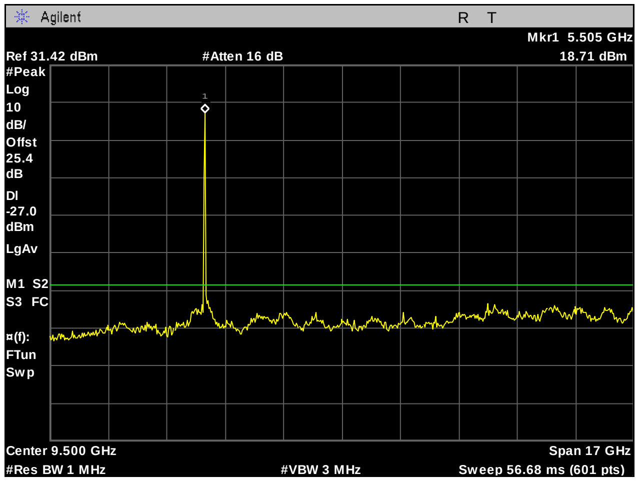
Plot 64. Radiated Spurious Emissions, Above 1 GHz, Channel 52, 802.11a 20 MHz



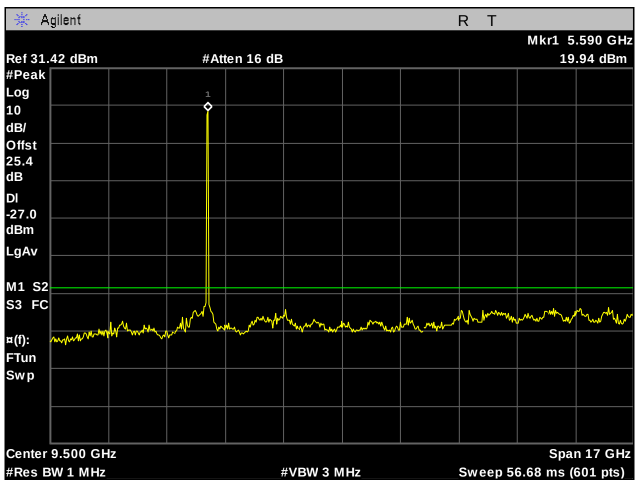
Plot 65. Radiated Spurious Emissions, Above 1 GHz, Channel 60, 802.11a 20 MHz



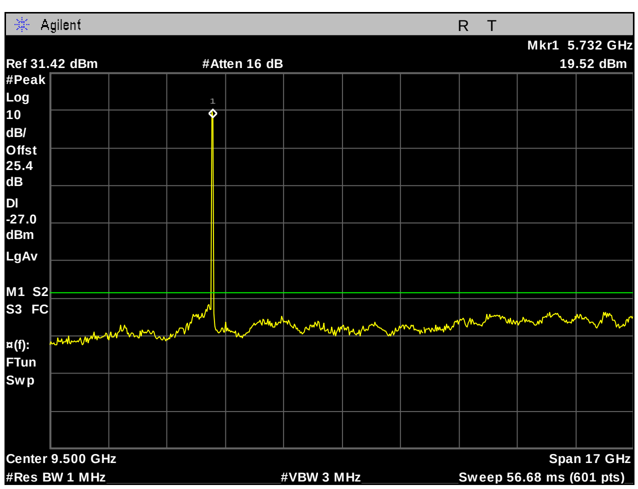
Plot 66. Radiated Spurious Emissions, Above 1 GHz, Channel 64, 802.11a 20 MHz



Plot 67. Radiated Spurious Emissions, Above 1 GHz, Channel 100, 802.11a 20 MHz

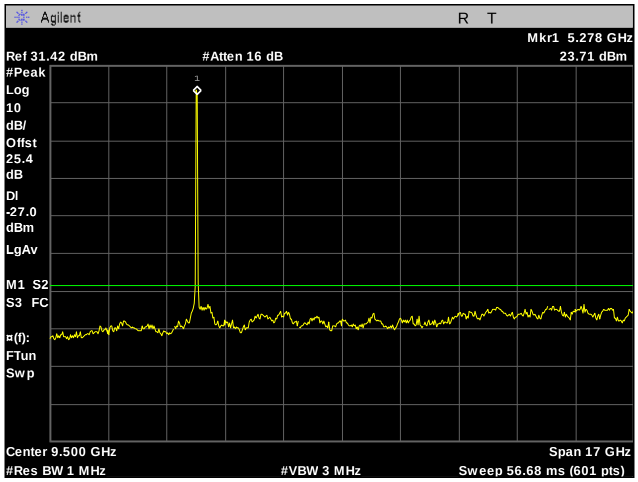


Plot 68. Radiated Spurious Emissions, Above 1 GHz, Channel 116, 802.11a 20 MHz

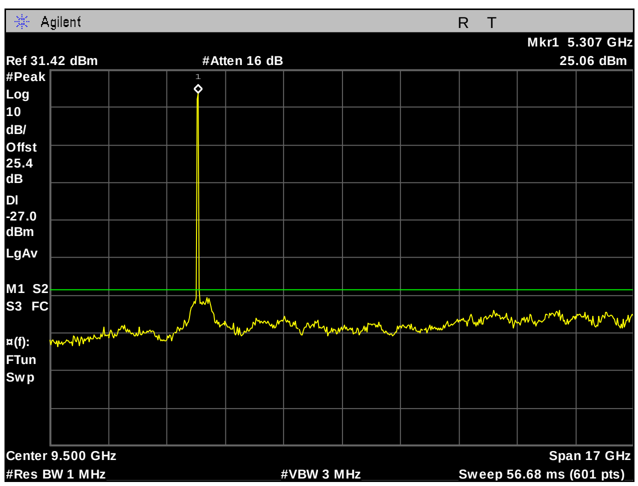


Plot 69. Radiated Spurious Emissions, Above 1 GHz, Channel 144, 802.11a 20 MHz

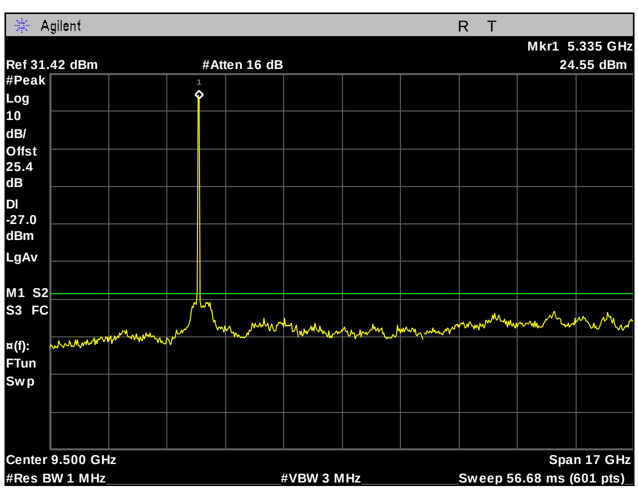
Radiated Spurious Emissions, 802.11ac 20 MHz



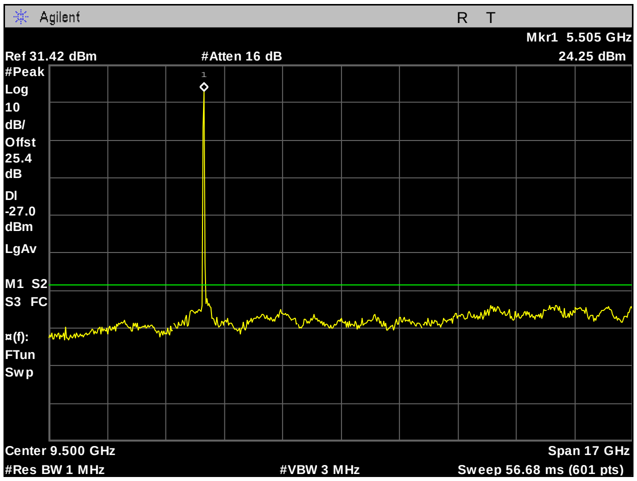
Plot 70. Radiated Spurious Emissions, Above 1 GHz, Channel 52, 802.11ac 20 MHz



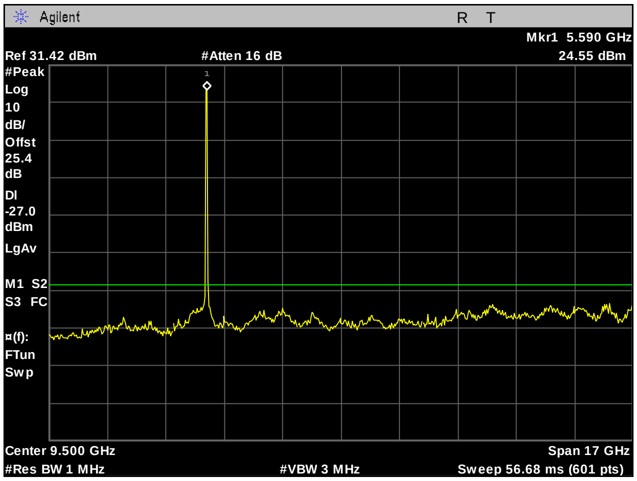
Plot 71. Radiated Spurious Emissions, Above 1 GHz, Channel 60, 802.11ac 20 MHz



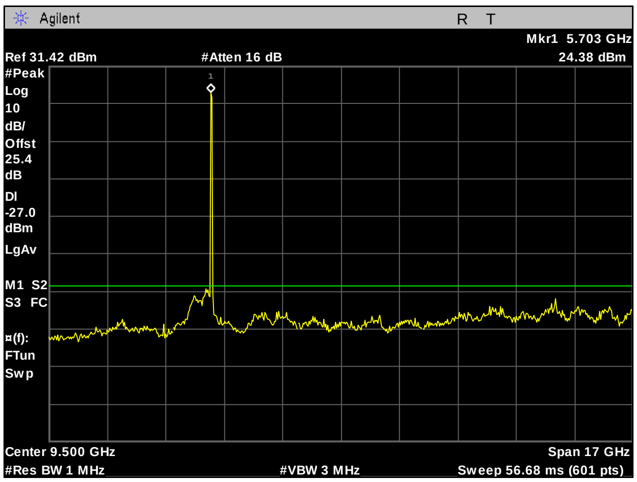
Plot 72. Radiated Spurious Emissions, Above 1 GHz, Channel 64, 802.11ac 20 MHz



Plot 73. Radiated Spurious Emissions, Above 1 GHz, Channel 100, 802.11ac 20 MHz

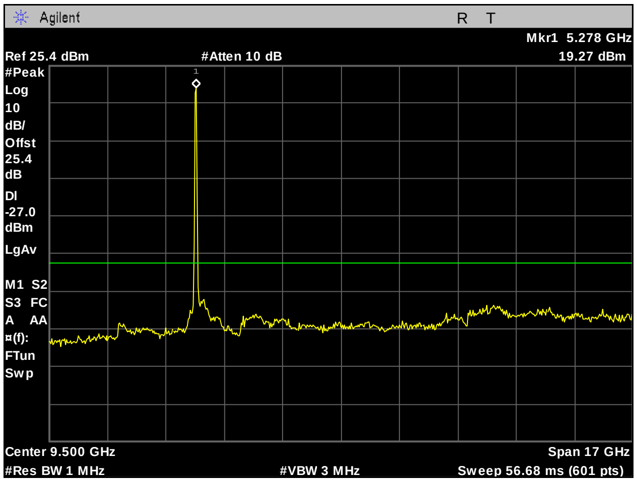


Plot 74. Radiated Spurious Emissions, Above 1 GHz, Channel 116, 802.11ac 20 MHz

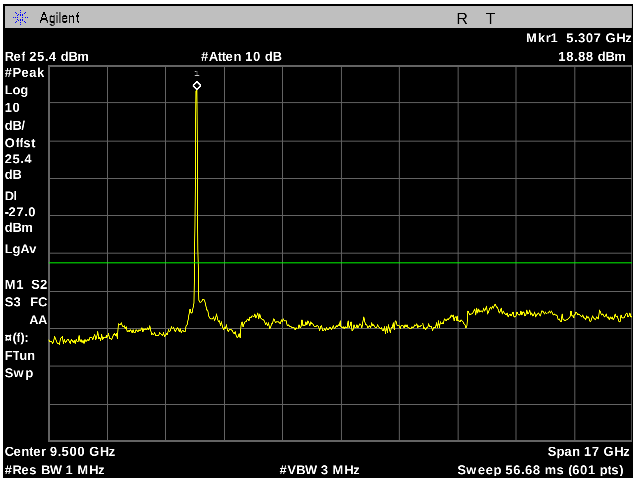


Plot 75. Radiated Spurious Emissions, Above 1 GHz, Channel 144, 802.11ac 20 MHz

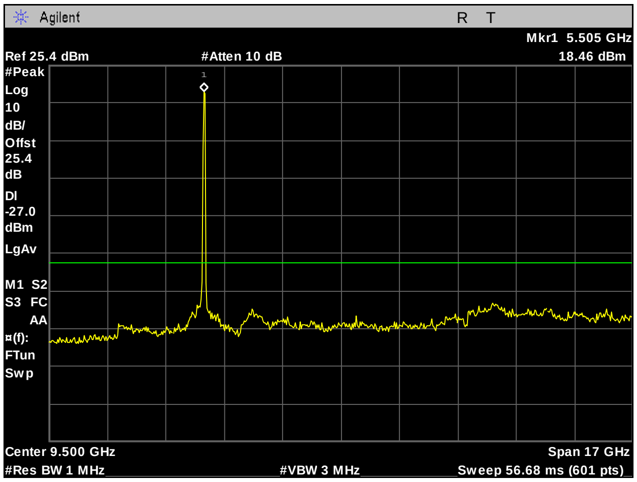
Radiated Spurious Emissions, 802.11ac 40 MHz



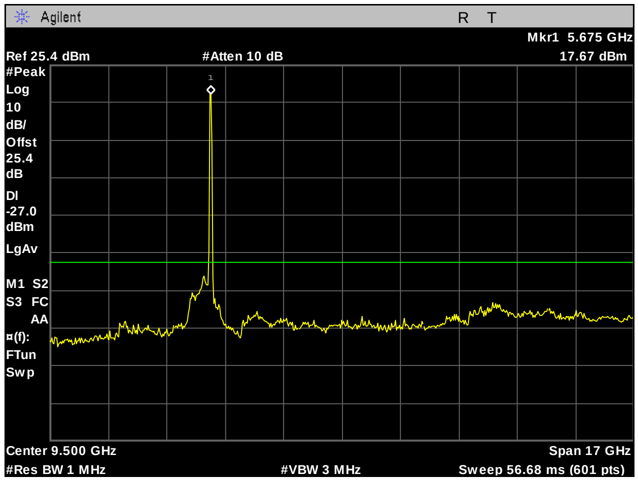
Plot 76. Radiated Spurious Emissions, Above 1 GHz, Channel 52, 802.11ac 40 MHz



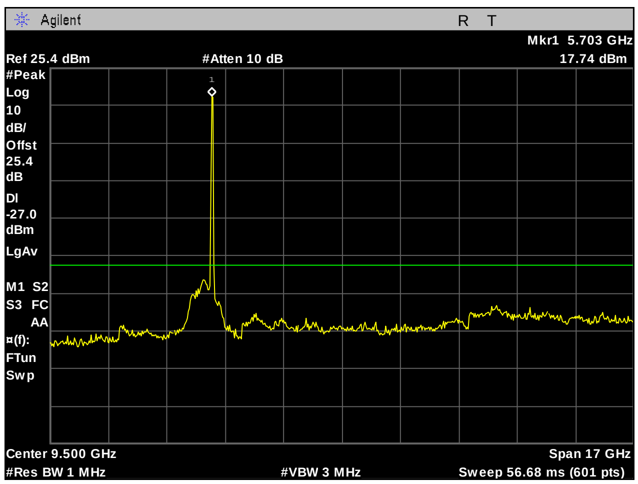
Plot 77. Radiated Spurious Emissions, Above 1 GHz, Channel 60, 802.11ac 40 MHz



Plot 78. Radiated Spurious Emissions, Above 1 GHz, Channel 100, 802.11ac 40 MHz

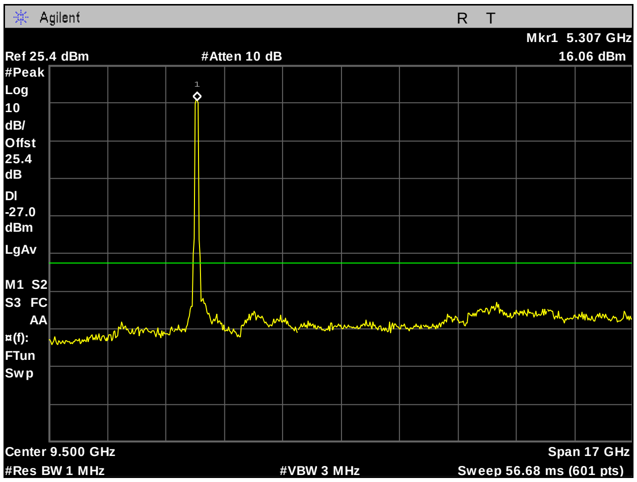


Plot 79. Radiated Spurious Emissions, Above 1 GHz, Channel 132, 802.11ac 40 MHz

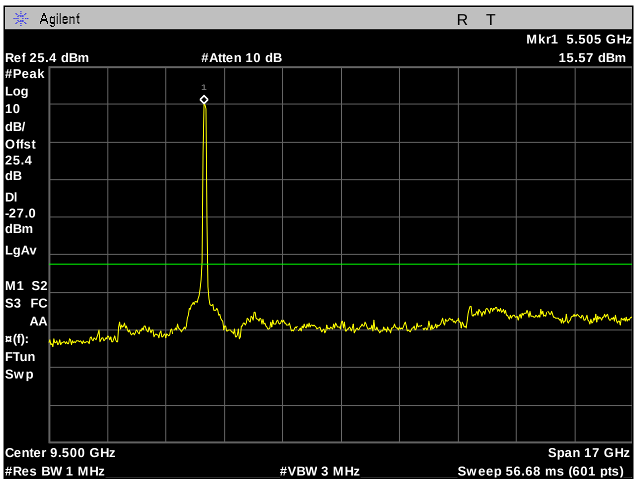


Plot 80. Radiated Spurious Emissions, Above 1 GHz, Channel 140, 802.11ac 40 MHz

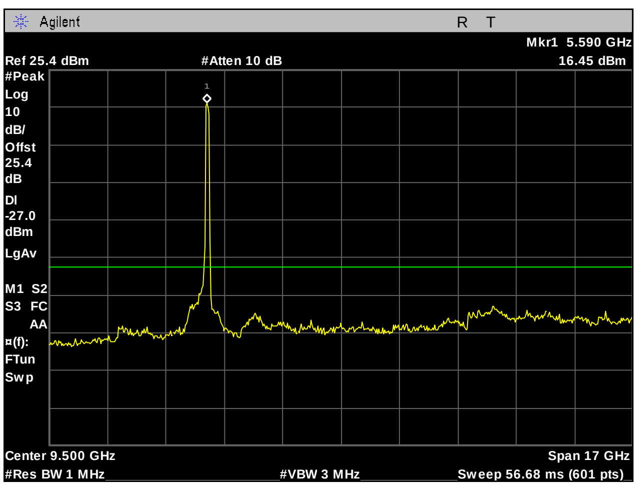
Radiated Spurious Emissions, 802.11ac 80 MHz



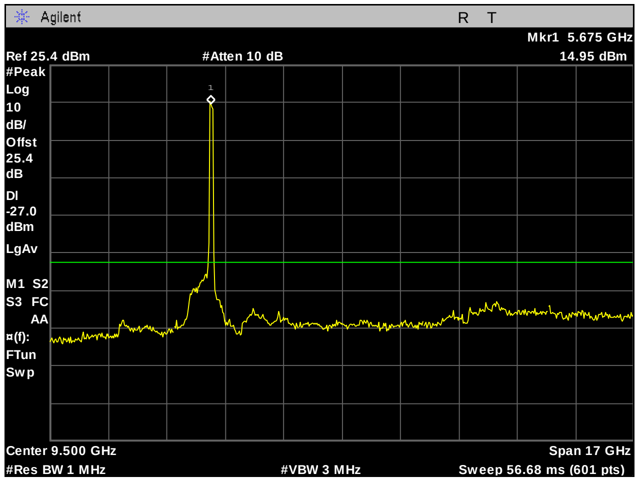
Plot 81. Radiated Spurious Emissions, Above 1 GHz, Channel 52, 802.11ac 80 MHz



Plot 82. Radiated Spurious Emissions, Above 1 GHz, Channel 100, 802.11ac 80 MHz

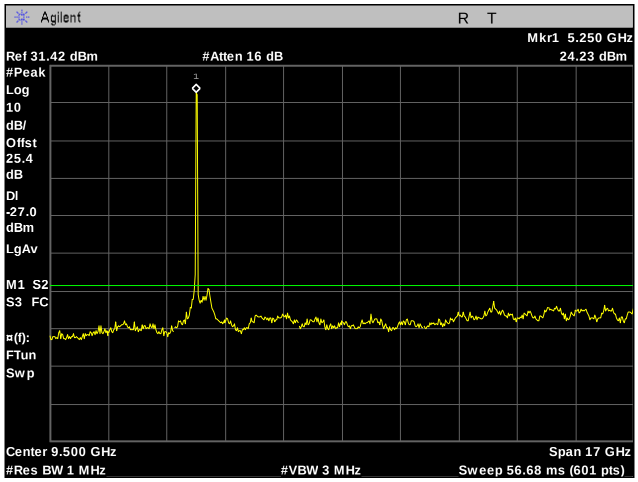


Plot 83. Radiated Spurious Emissions, Above 1 GHz, Channel 116, 802.11ac 80 MHz

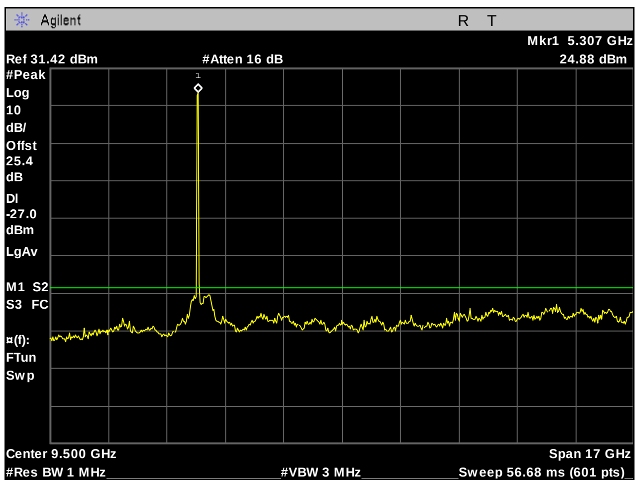


Plot 84. Radiated Spurious Emissions, Above 1 GHz, Channel 132, 802.11ac 80 MHz

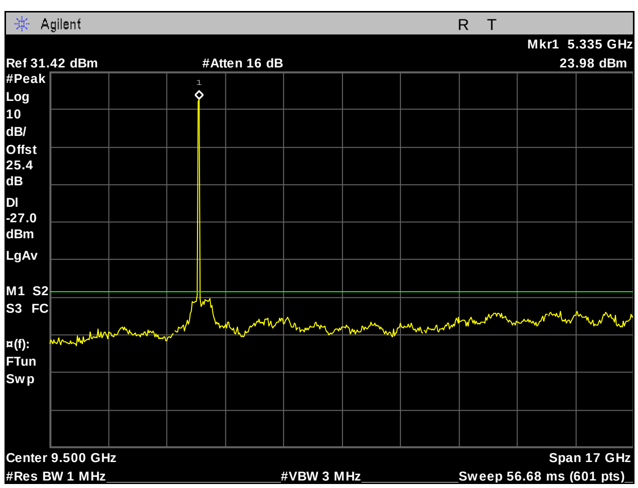
Radiated Spurious Emissions, 802.11n 20 MHz



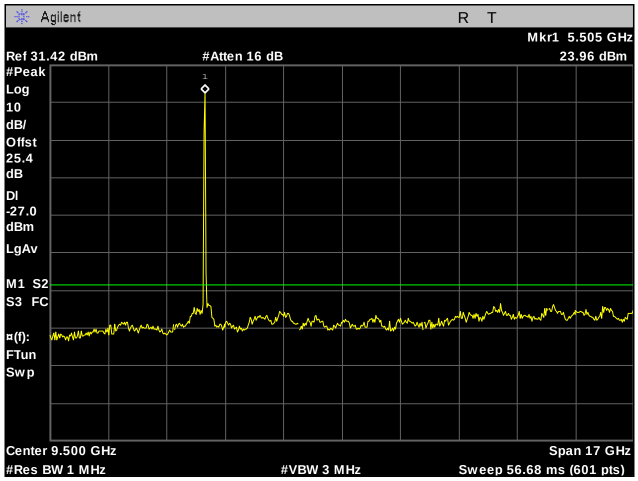
Plot 85. Radiated Spurious Emissions, Above 1 GHz, Channel 52, 802.11n 20 MHz



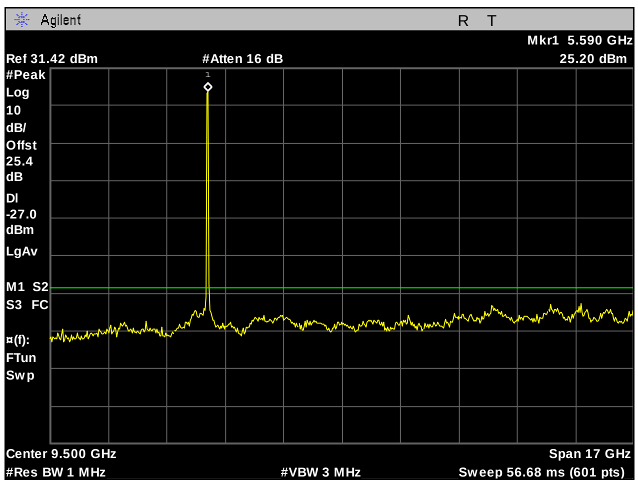
Plot 86. Radiated Spurious Emissions, Above 1 GHz, Channel 60, 802.11n 20 MHz



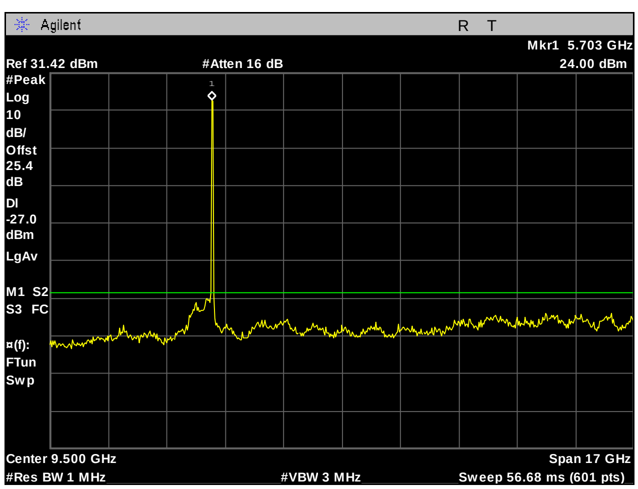
Plot 87. Radiated Spurious Emissions, Above 1 GHz, Channel 64, 802.11n 20 MHz



Plot 88. Radiated Spurious Emissions, Above 1 GHz, Channel 100, 802.11n 20 MHz

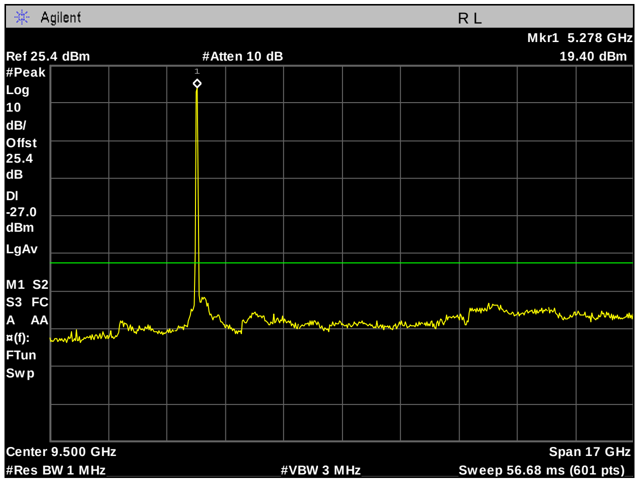


Plot 89. Radiated Spurious Emissions, Above 1 GHz, Channel 116, 802.11n 20 MHz

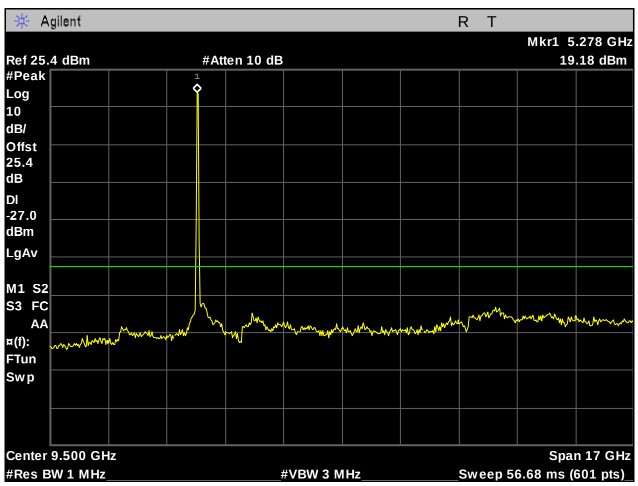


Plot 90. Radiated Spurious Emissions, Above 1 GHz, Channel 144, 802.11n 20 MHz

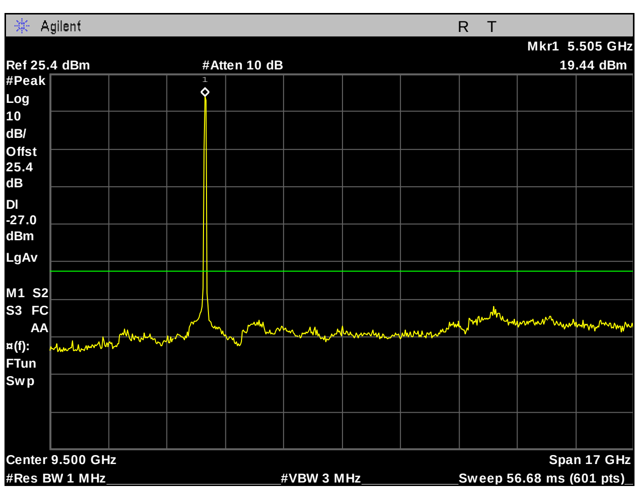
Radiated Spurious Emissions, 802.11n 40 MHz



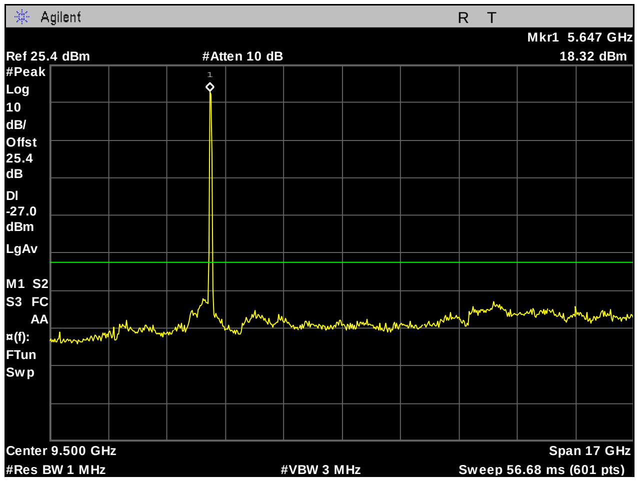
Plot 91. Radiated Spurious Emissions, Above 1 GHz, Channel 52, 802.11n 40 MHz



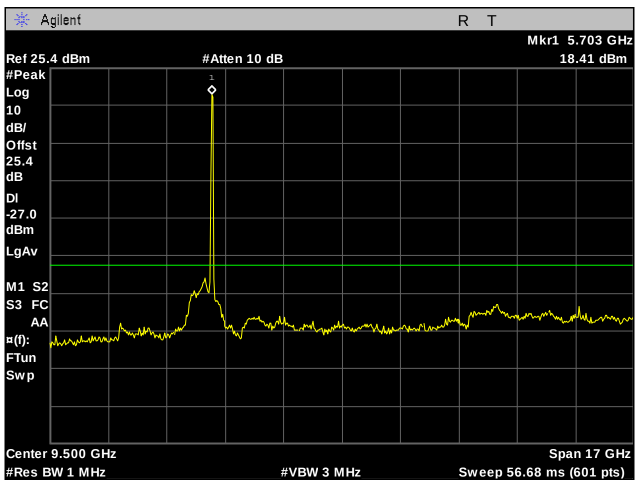
Plot 92. Radiated Spurious Emissions, Above 1 GHz, Channel 60, 802.11n 40 MHz



Plot 93. Radiated Spurious Emissions, Above 1 GHz, Channel 100, 802.11n 40 MHz

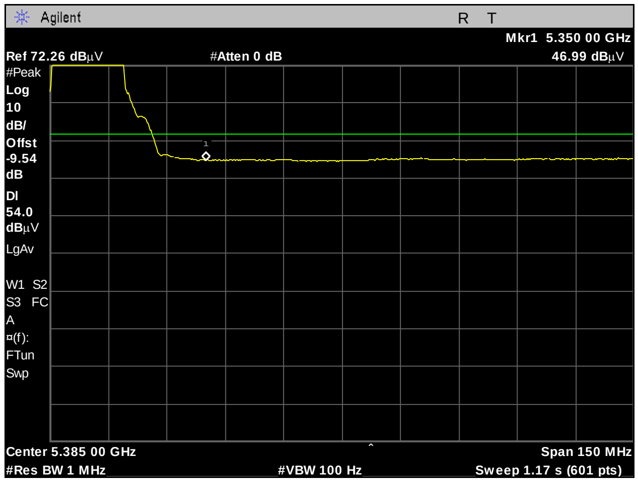


Plot 94. Radiated Spurious Emissions, Above 1 GHz, Channel 132, 802.11n 40 MHz

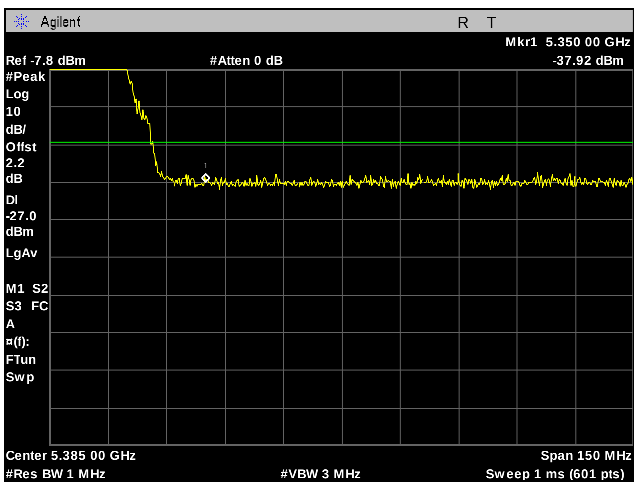


Plot 95. Radiated Spurious Emissions, Above 1 GHz, Channel 140, 802.11n 40 MHz

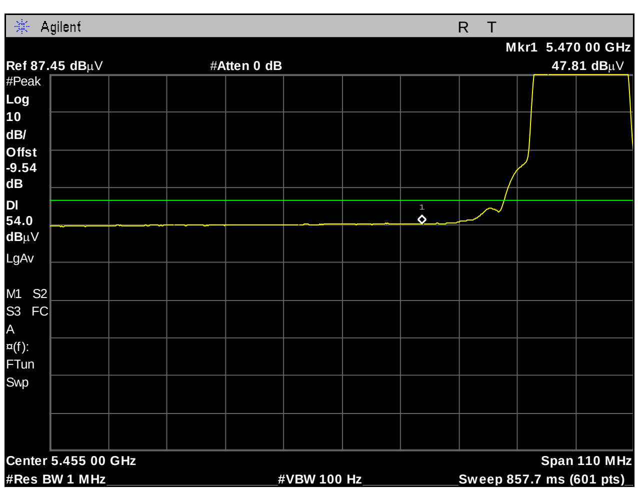
Radiated Band Edge, 802.11a 20 MHz



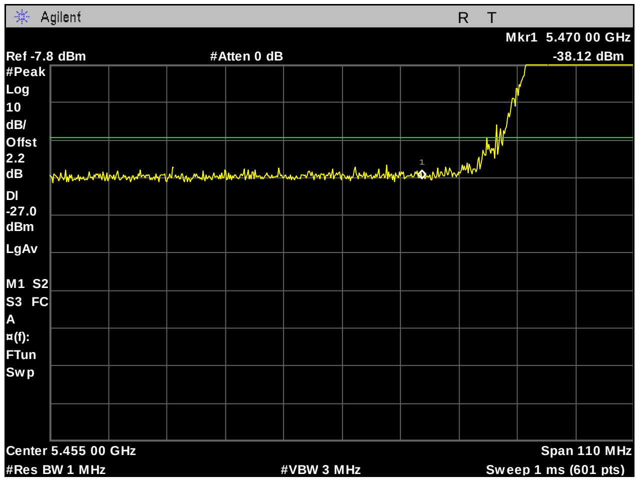
Plot 96. Radiated Band Edge, Channel 60, 802.11a 20 MHz, Average



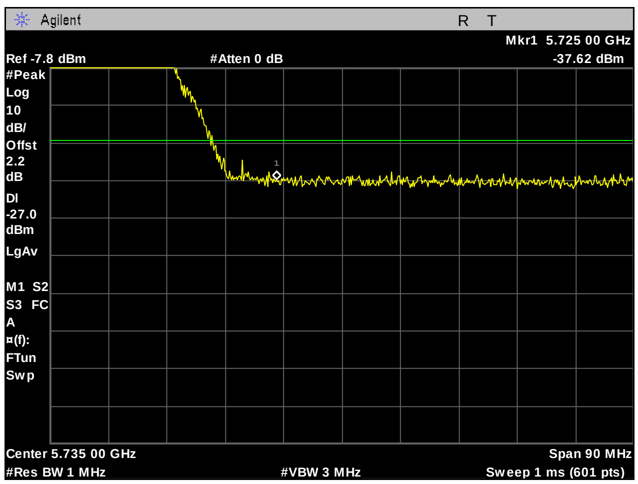
Plot 97. Radiated Band Edge, Channel 64, 802.11a 20 MHz, Peak



Plot 98. Radiated Band Edge, , Channel 100, 802.11a 20 MHz, Average

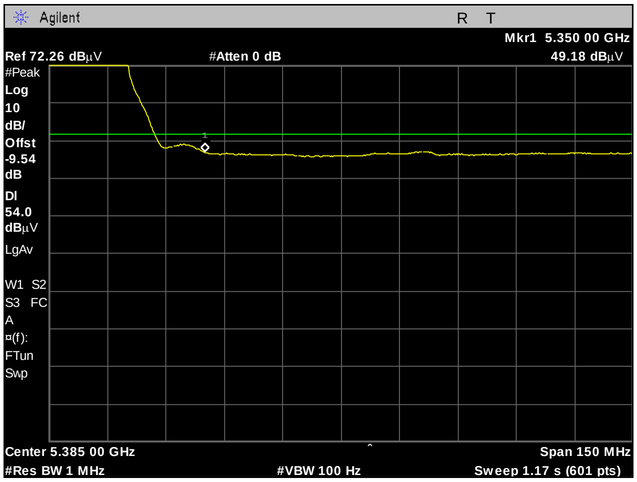


Plot 99. Radiated Band Edge, , Channel 100, 802.11a 20 MHz, Peak

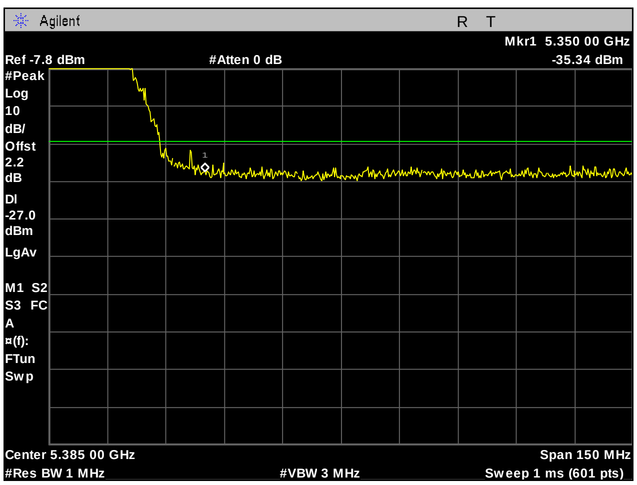


Plot 100. Radiated Band Edge, , Channel 140, 802.11a 20 MHz, Peak

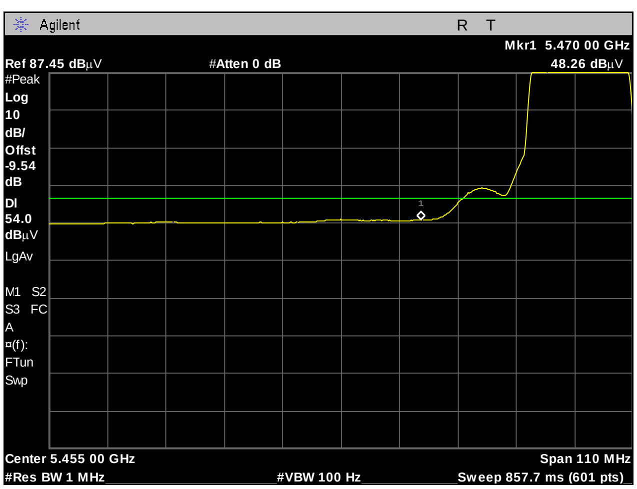
Radiated Band Edge, , 802.11ac 20 MHz



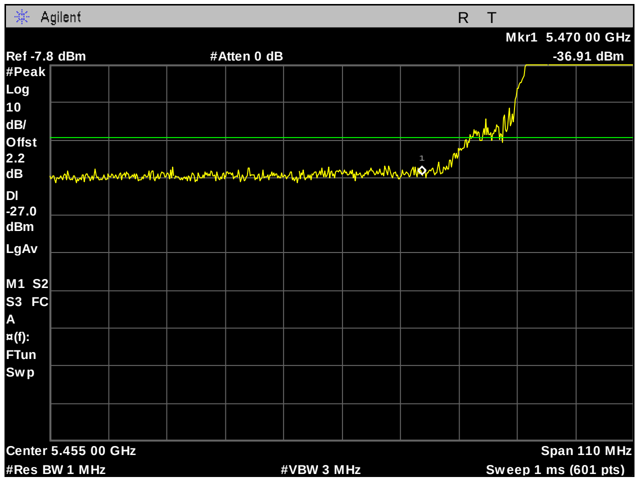
Plot 101. Radiated Band Edge, Channel 64, 802.11ac 20 MHz, Average



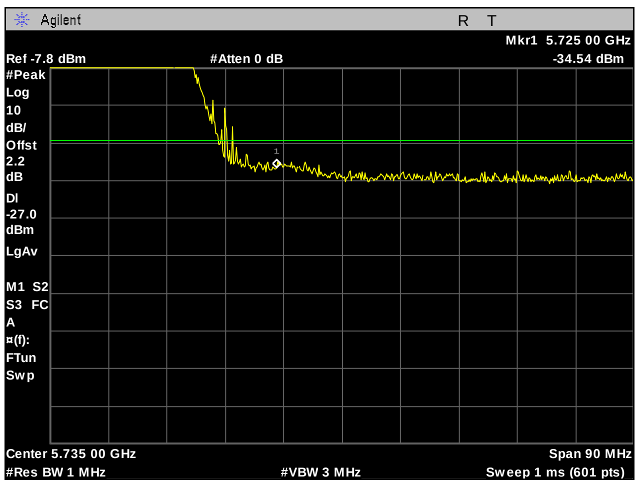
Plot 102. Radiated Band Edge, Channel 64, 802.11ac 20 MHz, Peak



Plot 103. Radiated Band Edge, Channel 100, 802.11ac 20 MHz, Average

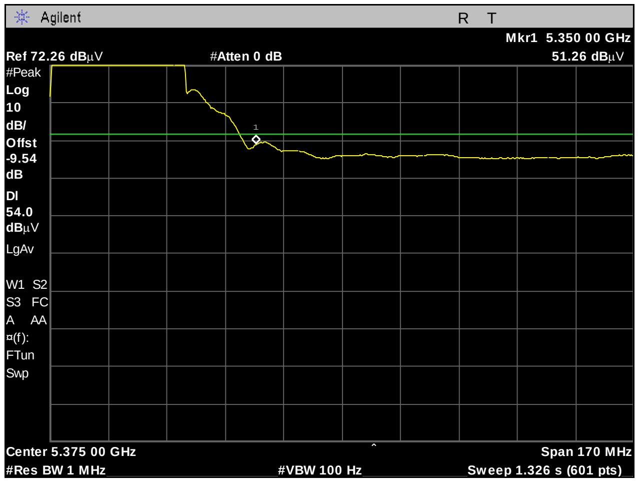


Plot 104. Radiated Band Edge, Channel 100, 802.11ac 20 MHz, Peak

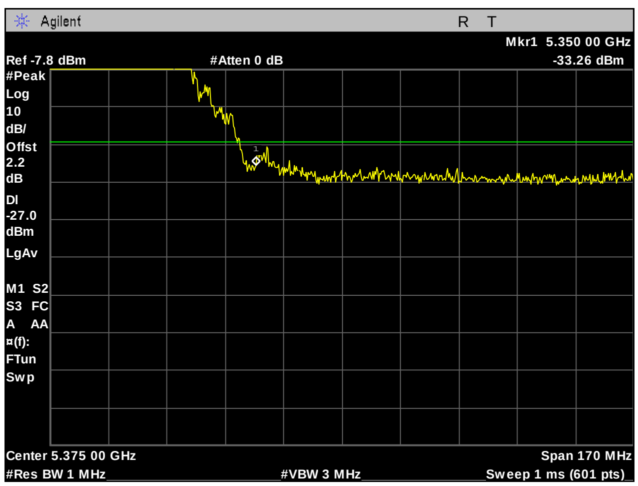


Plot 105. Radiated Band Edge, Channel 140, 802.11ac 20 MHz, Peak

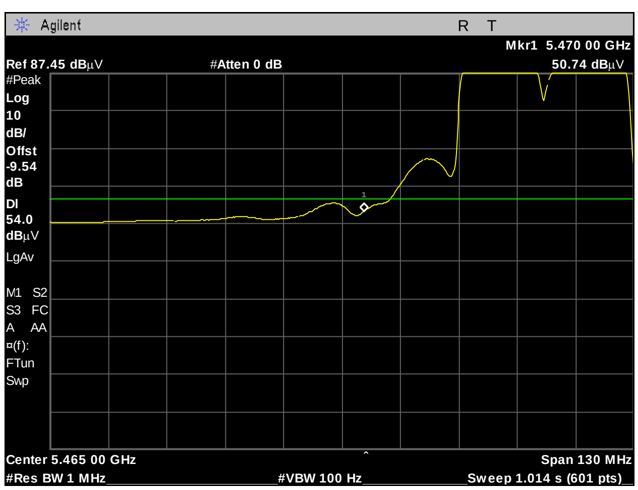
Radiated Band Edge, 802.11ac 40 MHz



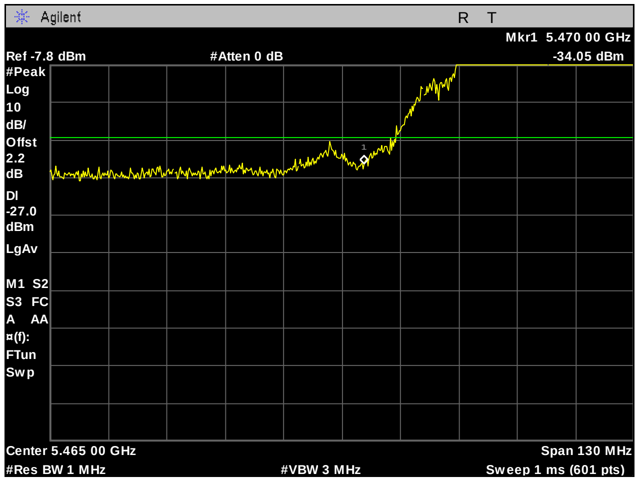
Plot 106. Radiated Band Edge, Channel 56, 802.11ac 40 MHz, Average



Plot 107. Radiated Band Edge, Channel 56, 802.11ac 40 MHz, Peak

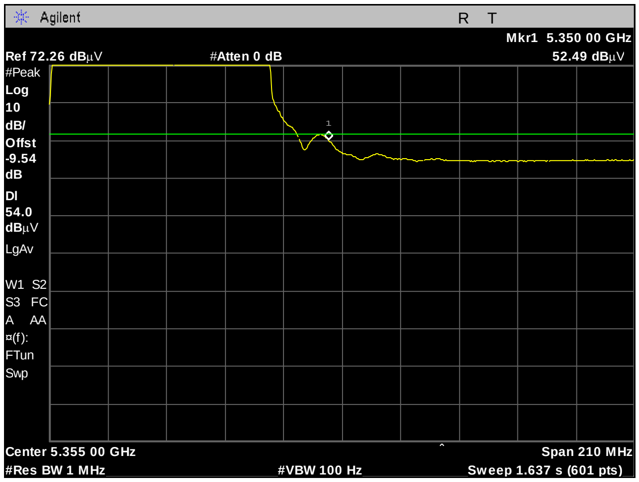


Plot 108. Radiated Band Edge, Channel 100, 802.11ac 40 MHz, Average

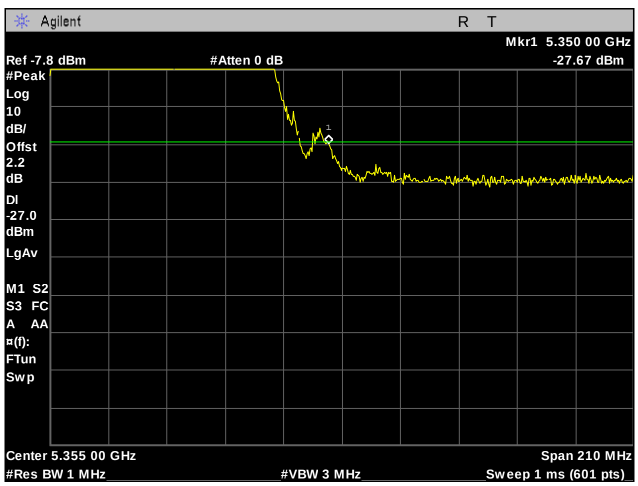


Plot 109. Radiated Band Edge, Channel 100, 802.11ac 40 MHz, Peak

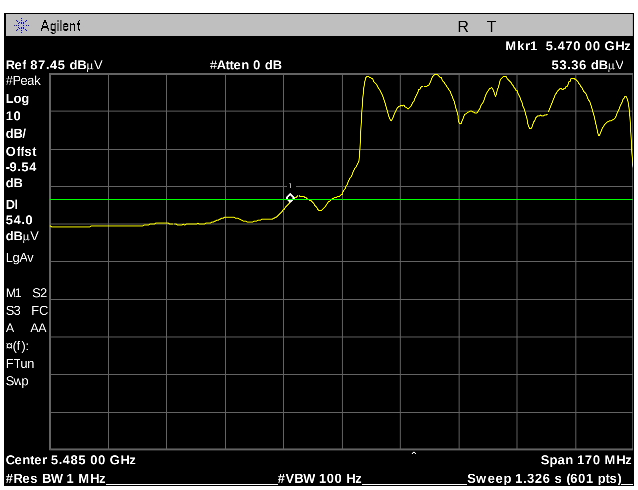
Radiated Band Edge, 802.11ac 80 MHz



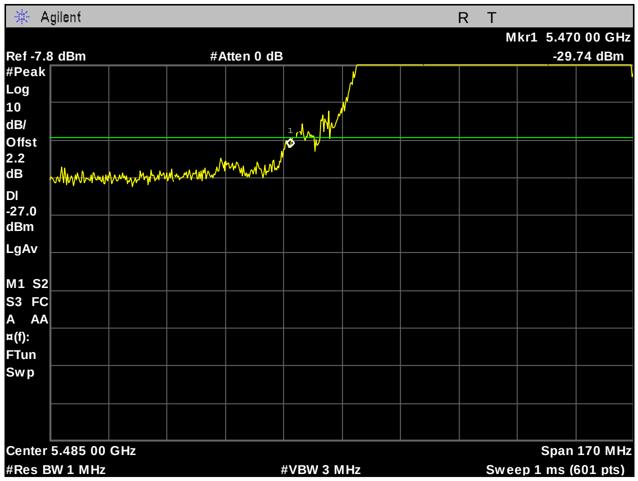
Plot 110. Radiated Band Edge, Channel 52, 802.11ac 80 MHz, Average



Plot 111. Radiated Band Edge, Channel 52, 802.11ac 80 MHz, Peak

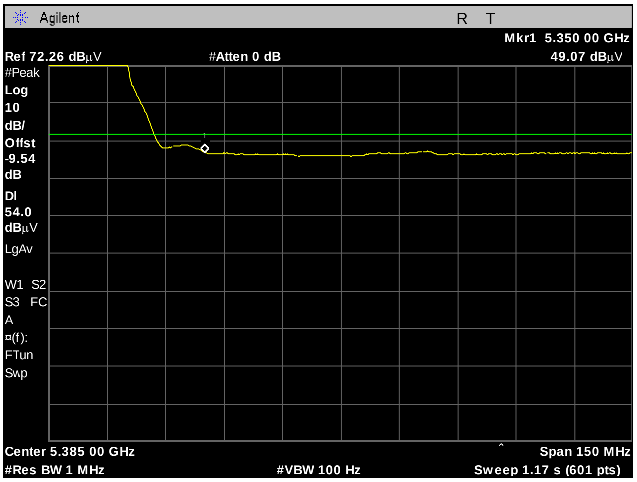


Plot 112. Radiated Band Edge, Channel 100, 802.11ac 80 MHz, Average

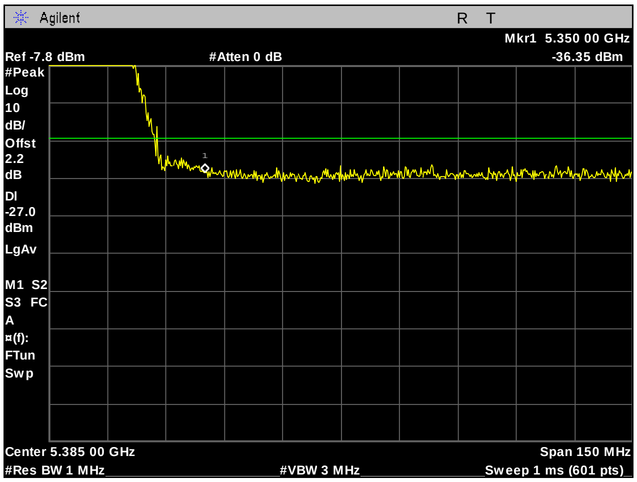


Plot 113. Radiated Band Edge, Channel 100, 802.11ac 80 MHz, Peak

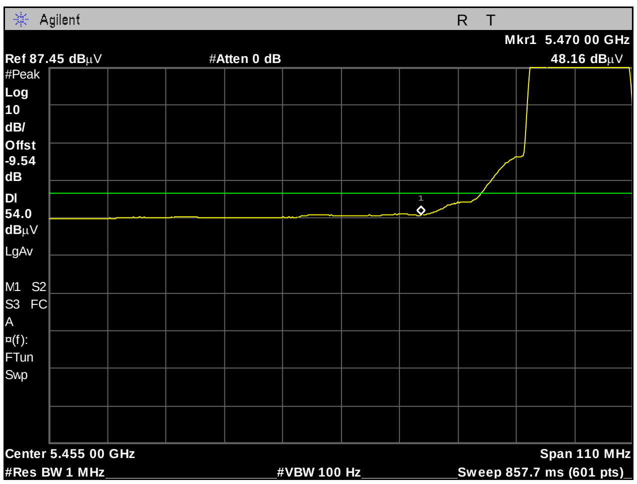
Radiated Band Edge, 802.11n 20 MHz



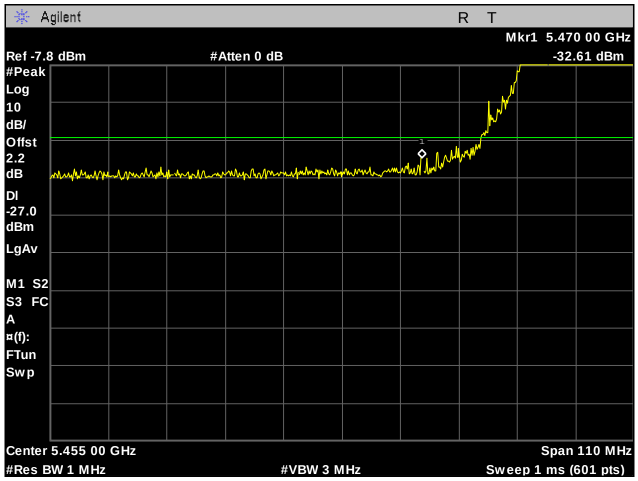
Plot 114. Radiated Band Edge, Channel 64, 802.11n 20 MHz, Average



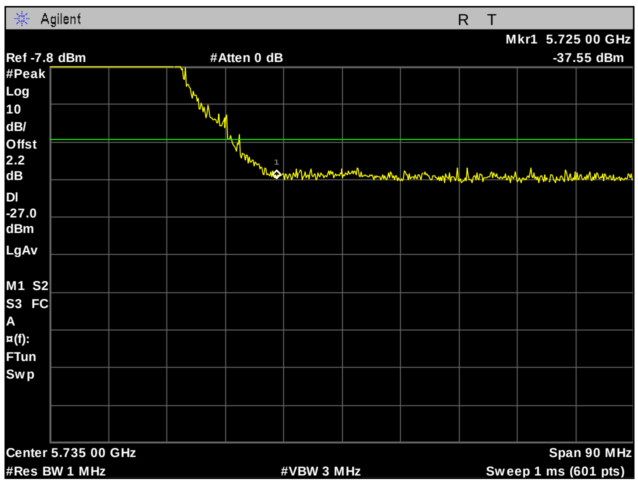
Plot 115. Radiated Band Edge, Channel 64 802.11n 20 MHz, Peak



Plot 116. Radiated Band Edge, Channel 100, 802.11n 20 MHz, Average

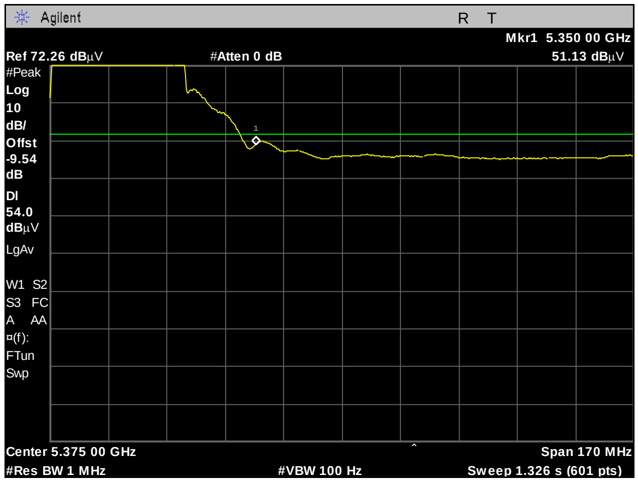


Plot 117. Radiated Band Edge, Channel 100, 802.11n 20 MHz, Peak

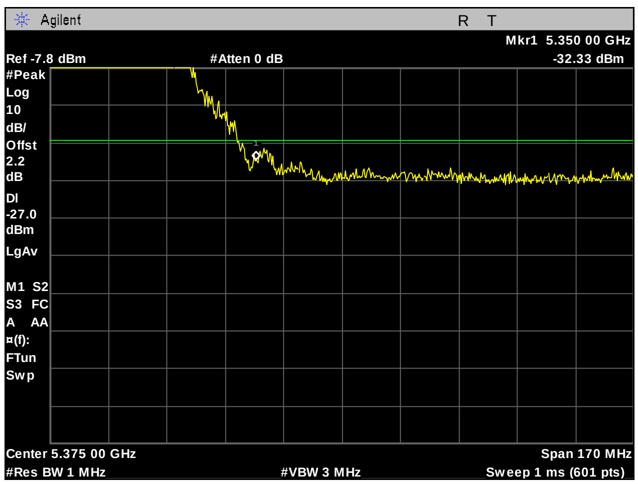


Plot 118. Radiated Band Edge, Channel 140, 802.11n 20 MHz, Peak

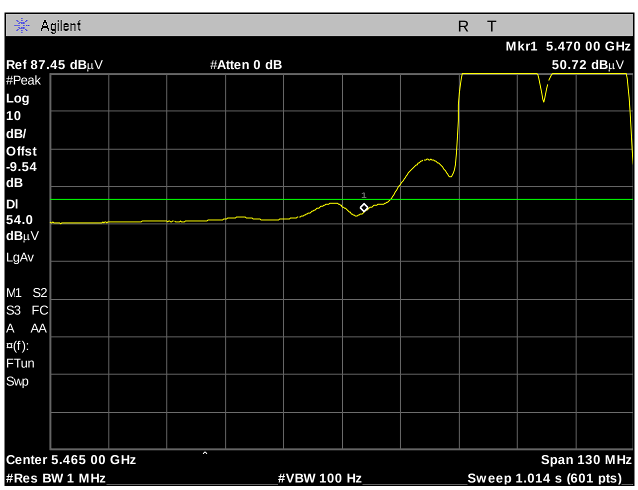
Radiated Band Edge, 802.11n 40 MHz



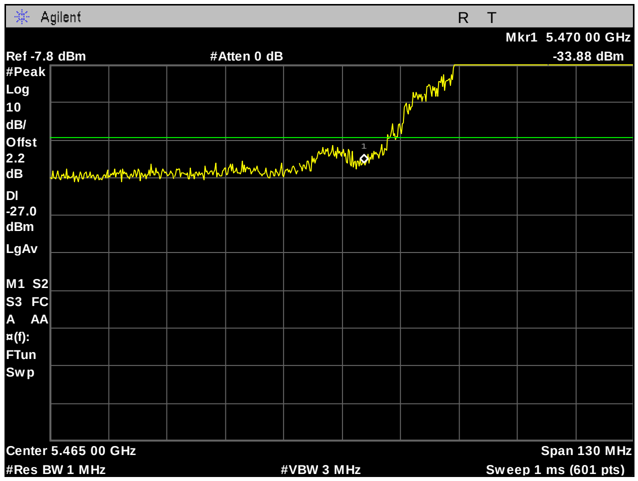
Plot 119. Radiated Band Edge, Channel 56, 802.11n 40 MHz, Average



Plot 120. Radiated Band Edge, Channel 56, 802.11n 40 MHz, Peak



Plot 121. Radiated Band Edge, Channel 100, 802.11n 40 MHz, Average



Plot 122. Radiated Band Edge, Channel 100, 802.11n 40 MHz, Peak

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) RF Exposure

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

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

Output Power = 23.12

Antenna Gain = 7.77

Power density =0.244 mW/cm^2

At a distance of 20cm

IV. DFS Requirements and Radar Waveform Description & Calibration

A. DFS Requirements

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

Table 17. Applicability of DFS Requirements Prior to Use of a Channel

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

Table 18. Applicability of DFS Requirements During Normal Operation

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

Table 19. DFS Detection Thresholds for Master or Client Devices Incorporating DFS

Parameter	**Value**
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2
U-NII Detection Bandwidth	Minimum 80% of the 99% power bandwidth. See Note 3.
Note 1: The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows: • For the Short pulse radar Test Signals this instant is the end of the *Burst*. • For the Frequency Hopping radar Test Signal, this instant is the end of the last radar *Burst* generated. • For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission. **Note 2:** The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required facilitating *Channel* changes (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. **Note 3:** During the *U-NII Detection Bandwidth* detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90%. Measurements are performed with no data traffic.	

Table 20. DFS Response Requirement Values

B. Radar Test Waveforms

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

Short Pulse Radar Test Waveforms

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

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

Long Pulse Radar Test Waveform

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

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

Each waveform is defined as follows:

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

A representative example of a Long Pulse radar test waveform:

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

Graphical Representation of a Long Pulse radar Test Waveform

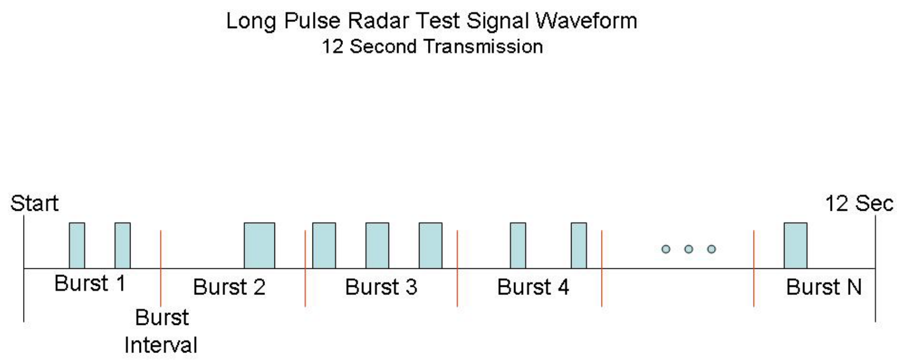


Figure 5. Long Pulse Radar Test Signal Waveform

Frequency Hopping Radar Test Waveform

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

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

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

C. Radar Waveform Calibration

The following equipment setup was used to calibrate the radiated Radar Waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the Master or Client Device. The spectrum analyzer was switched to the zero span (Time Domain) mode at the frequency of the Radar Waveform generator. Peak detection was utilized. The spectrum analyzer's resolution bandwidth (RBW) was set to 3 MHz and the video bandwidth (VBW) was set to 3 MHz. The calibration setup is diagrammed in Figure 6, and the radar test signal generator is shown in Photograph 1.

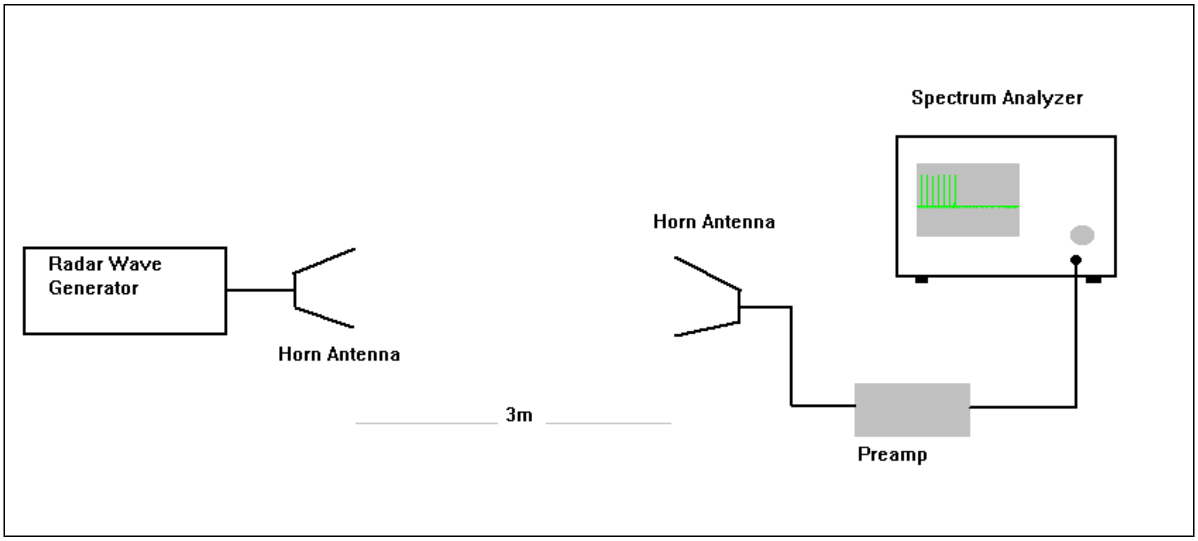
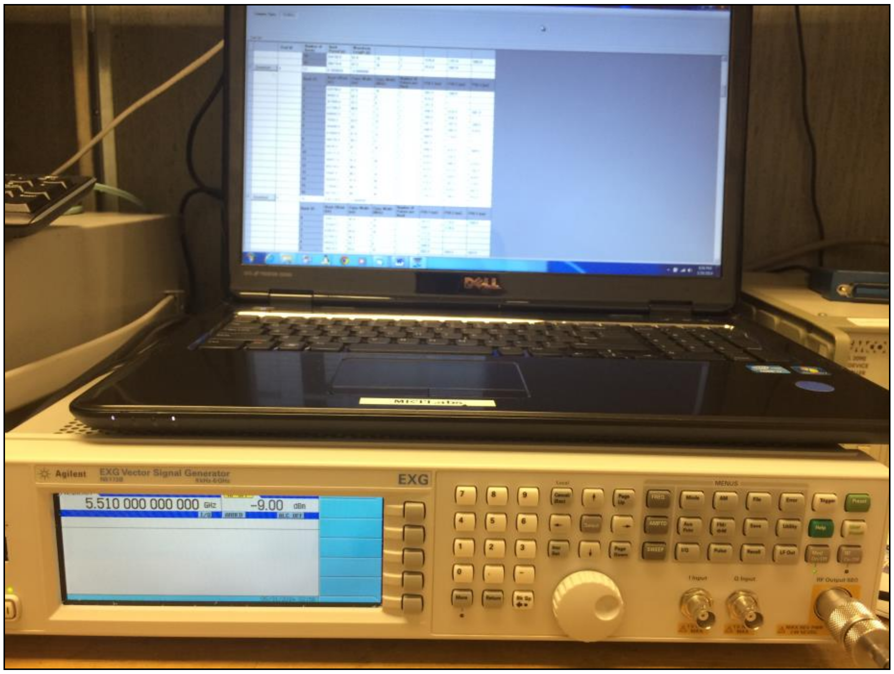
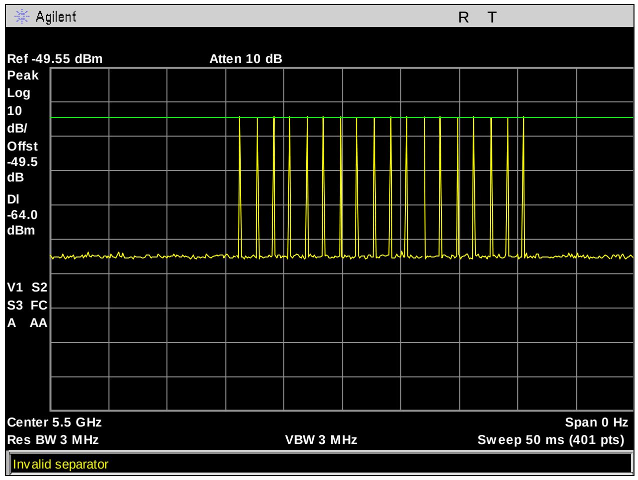


Figure 6. Calibration Test setup

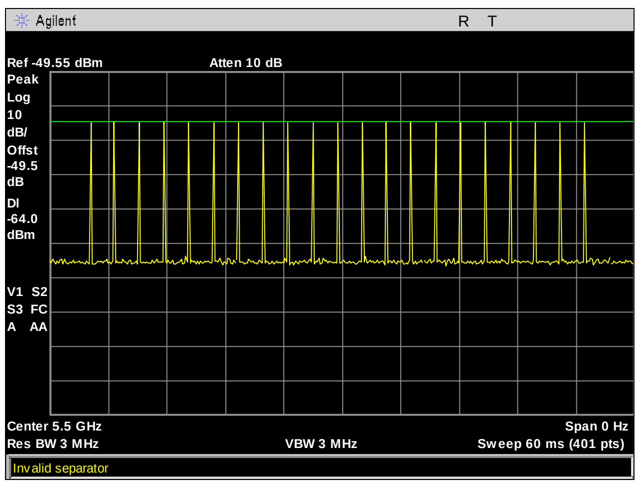


Photograph 1. DFS Radar Test Signal Generator

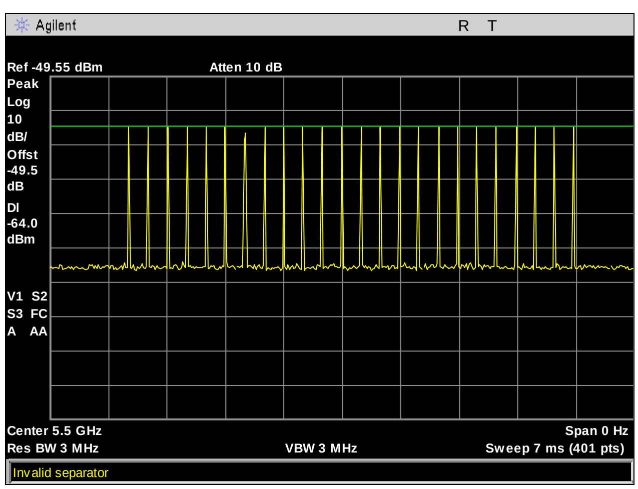
Radar Waveform Calibration



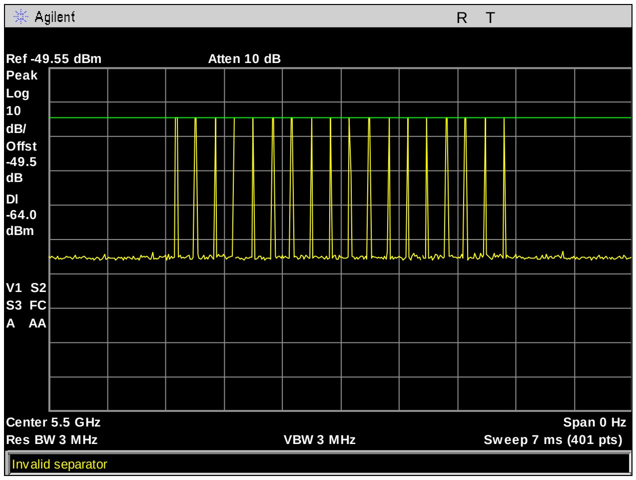
Plot 123. Calibration, Type 0



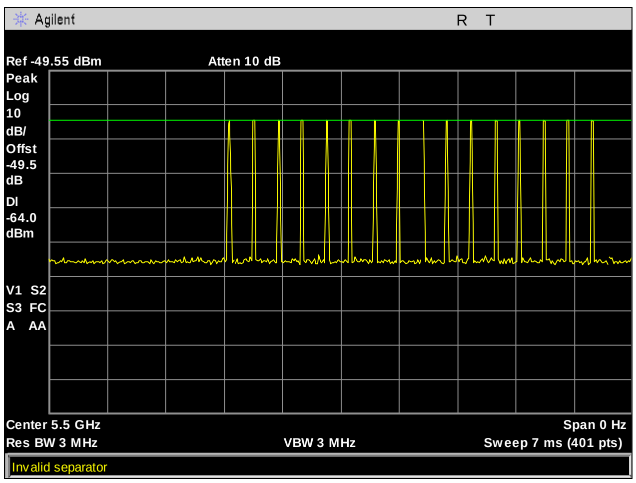
Plot 124. Calibration, Type 1



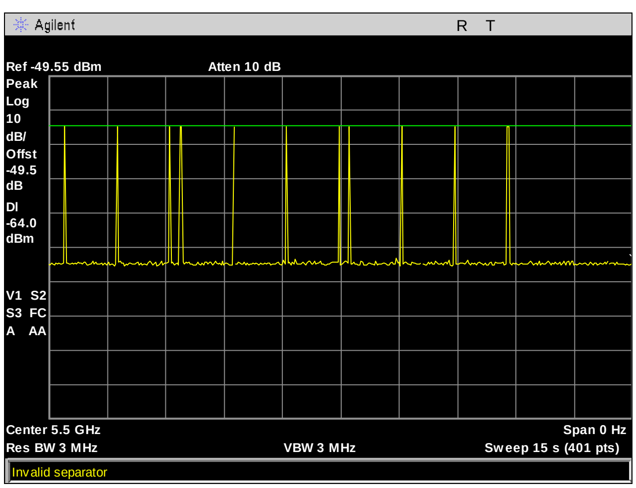
Plot 125. Calibration, Type 2



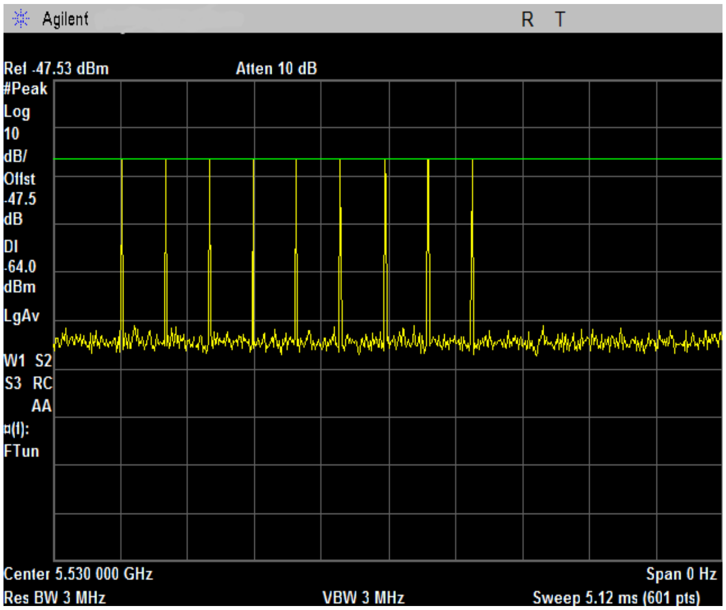
Plot 126. Calibration, Type 3



Plot 127. Calibration, Type 4



Plot 128. Calibration, Type 5



Calibration, Type 6

V. DFS Test Procedure and Test Results

A. DFS Test Setup

1. A spectrum analyzer is used as a monitor to verify that the Unit Under Test (UUT) has vacated the Channel within the Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the detection and subsequent Channel move. It is also used to monitor UUT transmissions during the Channel Availability Check Time.
2. The test setup, which consists of test equipment and equipment under test (EUT), is diagrammed in Figure 7.

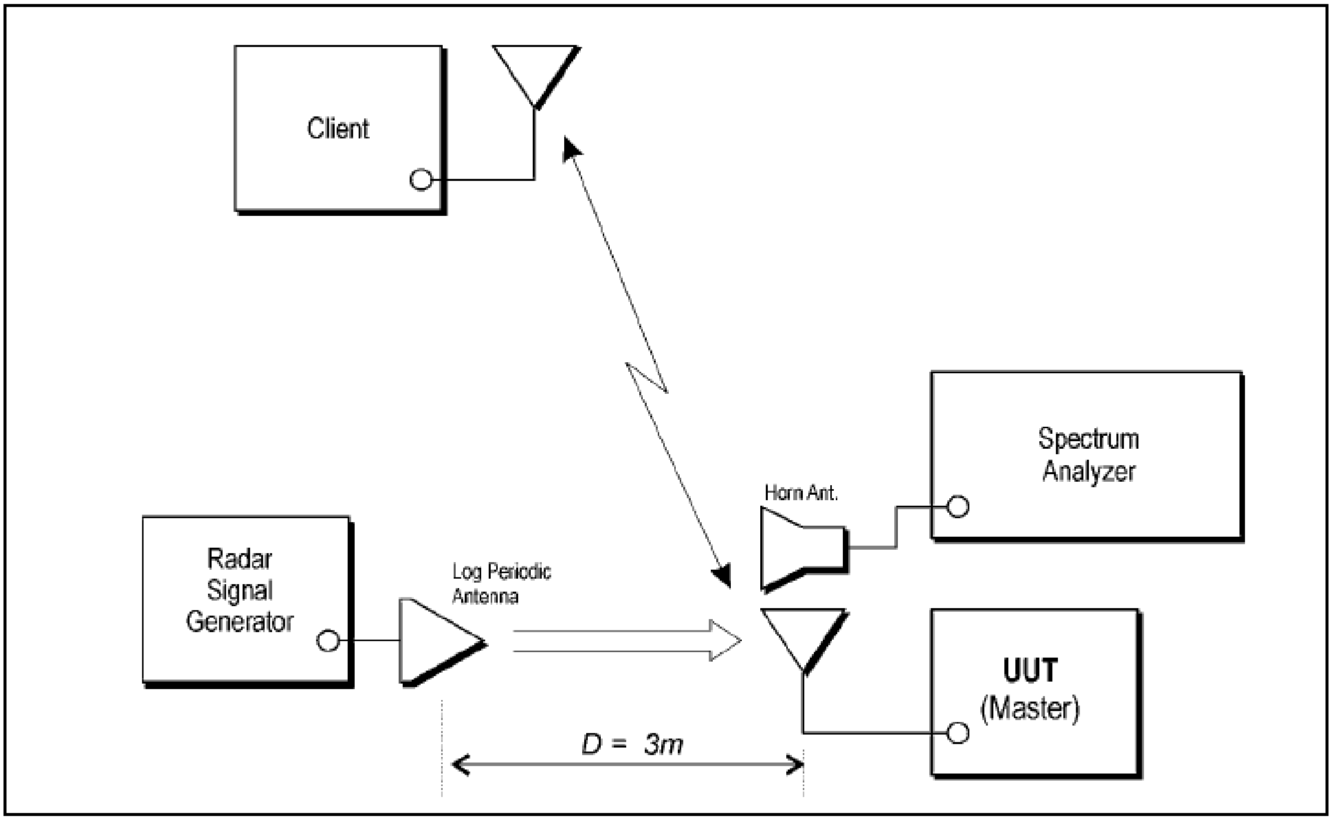


Figure 7. Test Setup Diagram

B. EUT Information

1. Operating Frequency Range: 5260 MHz – 5320 MHz 5500 MHz-5710MHz
2. Modes of Operation: Master Device
3. List all antennas and associated gains: 7.77dBi
4. List output power ranges: 14.3-23.12dBm
5. List antenna impedance: 50Ohm
6. Antenna gain verification: See antenna data sheets
7. State test file that is transmitted: 6.5half magical hours
8. Time for master to complete its power-on-cycle: 6seconds.

C. UNII Detection Bandwidth

Test Requirement(s): **§ 15.407** A minimum 100% detection rate is required across an EUT's 99% bandwidth.

Test Procedure: The center frequency used for 20MHz, 40MHz and 80MHz channel bandwidth was 5500MHz, 5510MHz and 5530MHz respectively.

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

The radar frequency is increased in 5 ot 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The highest frequency at which detection is greater than or equal to 90% is denoted F_H.

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

The U-NII Detection Bandwidth is calculated as follows:

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

Test Engineer: Surinder Singh

Test Date: 01/08/16

UNII Detection Bandwidth – Test Results

EUT Frequency- 5300MHz											
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Frequency (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5490	1	1	1	1	1	1	1	1	1	1	100
5491	1	1	1	1	1	1	1	1	1	1	100
5492	1	1	1	1	1	1	1	1	1	1	100
5493	1	1	1	1	1	1	1	1	1	1	100
5494	1	1	1	1	1	1	1	1	1	1	100
5495	1	1	1	1	1	1	1	1	1	1	100
5500	1	1	1	1	1	1	1	1	1	1	100
5505	1	1	1	1	1	1	1	1	1	1	100
5506	1	1	1	1	1	1	1	1	1	1	100
5507	1	1	1	1	1	1	1	1	1	1	100
5508	1	1	1	1	1	1	1	1	1	1	100
5509	1	1	1	1	1	1	1	1	1	1	100
5510	1	1	1	1	1	1	1	1	1	1	100
											100%
Detection Bandwidth = f_h - f_l = 5510 MHz-5490MHz = 20MHz											
EUT 99% Bandwidth = 16.97MHz											

Table 21. UNII Detection Bandwidth, Test Results, 20 MHz

EUT Frequency- 5510MHz											
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Frequency (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5490	1	1	1	1	1	1	1	1	1	1	100
5495	1	1	1	1	1	1	1	1	1	1	100
5500	1	1	1	1	1	1	1	1	1	1	100
5505	1	1	1	1	1	1	1	1	1	1	100
5510	1	1	1	1	1	1	1	1	1	1	100
5515	1	1	1	1	1	1	1	1	1	1	100
5520	1	1	1	1	1	1	1	1	1	1	100
5525	1	1	1	1	1	1	1	1	1	1	100
5530	1	1	1	1	1	1	1	1	1	1	100
											100%
Detection Bandwidth = f_h - f_l = 5530 MHz-5490MHz = 40MHz											
EUT 99% Bandwidth = 36.18MHz											

Table 22. UNII Detection Bandwidth, Test Results, 40 MHz

EUT Frequency- 5530MHz											
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Frequency (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5490	1	1	1	1	1	1	1	1	1	1	100
5495	1	1	1	1	1	1	1	1	1	1	100
5500	1	1	1	1	1	1	1	1	1	1	100
5510	1	1	1	1	1	1	1	1	1	1	100
5515	1	1	1	1	1	1	1	1	1	1	100
5520	1	1	1	1	1	1	1	1	1	1	100
5525	1	1	1	1	1	1	1	1	1	1	100
5530	1	1	1	1	1	1	1	1	1	1	100
5535	1	1	1	1	1	1	1	1	1	1	100
5540	1	1	1	1	1	1	1	1	1	1	100
5545	1	1	1	1	1	1	1	1	1	1	100
5550	1	1	1	1	1	1	1	1	1	1	100
5555	1	1	1	1	1	1	1	1	1	1	100
5560	1	1	1	1	1	1	1	1	1	1	100
5565	1	1	1	1	1	1	1	1	1	1	100
5570	1	1	1	1	1	1	1	1	1	1	100
											100%
Detection Bandwidth = f_h - f_l = 5570MHz-5490MHz = 80MHz											
EUT 99% Bandwidth = 75.62MHz											

Table 23. UNII Detection Bandwidth, Test Results, 80 MHz

D. Initial Channel Availability Check Time

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

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

Test Procedure: The U-NII device is powered on and instructed to operate at 5500 MHz. At the same time the UUT is powered on, the spectrum analyzer is set to 5500 MHz with a zero span and a 100 seconds sweep time. The analyzer is triggered at the same time power is applied to the U-NII device.

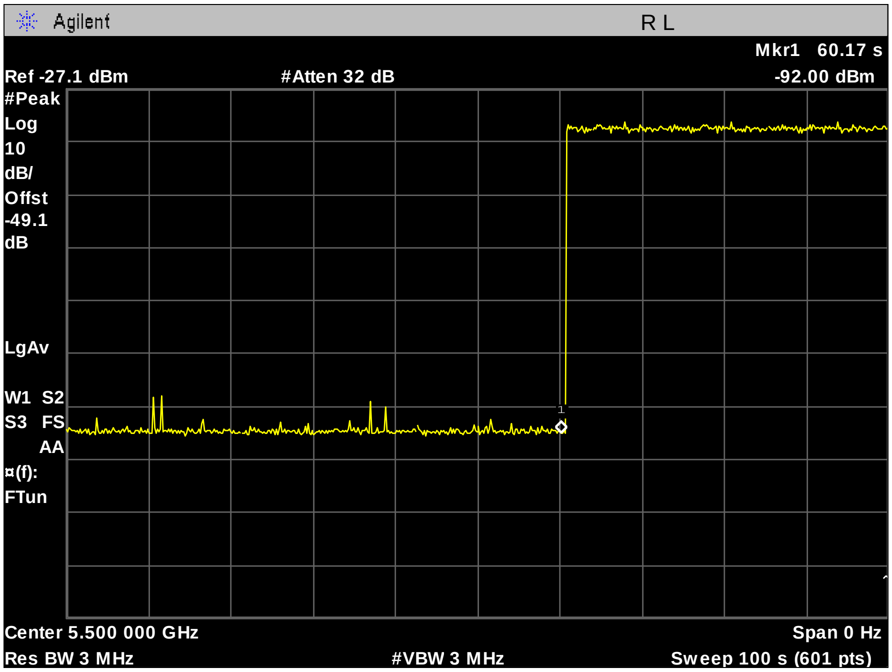
Test Results: Marker 1R on plot 129 indicate the start of the channel availability check time. Initial beacon/data transmission is indicated by marker 1.

The Equipment was compliant with § 15.407 Initial Channel Availability Check Time.

Test Engineer: Surinder Singh

Test Date: 01/08/16

Initial Channel Availability Check Time – Plot



Plot 129. Initial Channel Availability Check Time

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

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

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

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

Visual indication of the UUT of successful detection of the radar Burst will be recorded and reported. Observation of transmission at 5530MHz will continue for 100 seconds after the radar Burst has been generated.

Verify that during the 100 seconds measurement window, no UUT transmissions occur at 5530MHz.

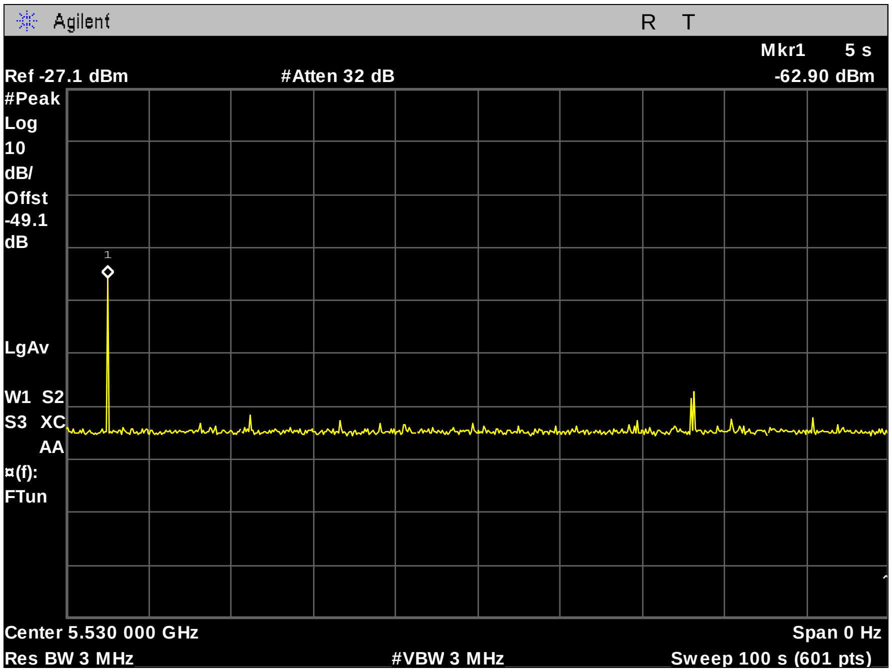
Test Results Plot 130 below indicates that there were no UUT transmissions during the 100 seconds measurement window when a radar burst was injected 6 seconds into the CACT. Therefore, the UUT detected the presence of a radar during the CACT and moved away from that channel.

The equipment was compliant with § 15.407 Radar Burst at the Beginning of the Channel Availability Check Time.

Test Engineer: Surinder Singh

Test Date: 01/08/16

Radar Burst at the Beginning of Channel Availability Check Time – Plot



Plot 130. Radar Burst at the Beginning of CACT

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

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

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

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

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

Visual indication on the UUT of successful detection of the radar Burst will be recorded and reported. Observation of emissions at 5530MHz will continue for 100 seconds after the radar Burst has been generated.

Verify that during the 100 seconds measurement window no UUT transmissions occurred at 5530MHz.

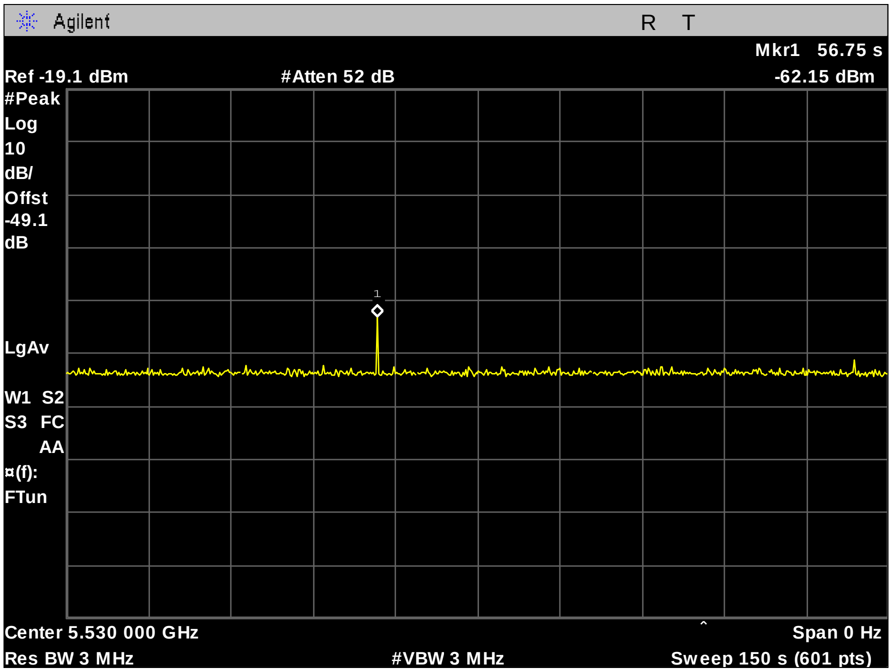
Test Results: Plot 131 indicates that no UUT transmissions occurred during the 100 seconds measurement window when a radar burst was injected 6 seconds before the end of the CACT. Therefore, the UUT detected the presence of a radar and moved away from that channel.

The equipment was compliant with § 15.407 Radar Burst at the End of the Channel Availability Check Time.

Test Engineer: Surinder Singh

Test Date: 01/08/16

Radar Burst at the End of Channel Availability Check Time – Plot



Plot 131. Radar Burst at the End of CACT

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

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

When a radar burst occurs, the UUT has 200 milliseconds, plus an aggregate of 60 milliseconds over remaining 10 second period, to cease transmission in the operating test channel. This 200 ms + 60 ms over remaining 10 second period requirement is termed Channel Closing Transmission Time (CCT).

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

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

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

A U-NII device operating as a Client Device will associate with the UUT (Master) at 5530 MHz. Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test.

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

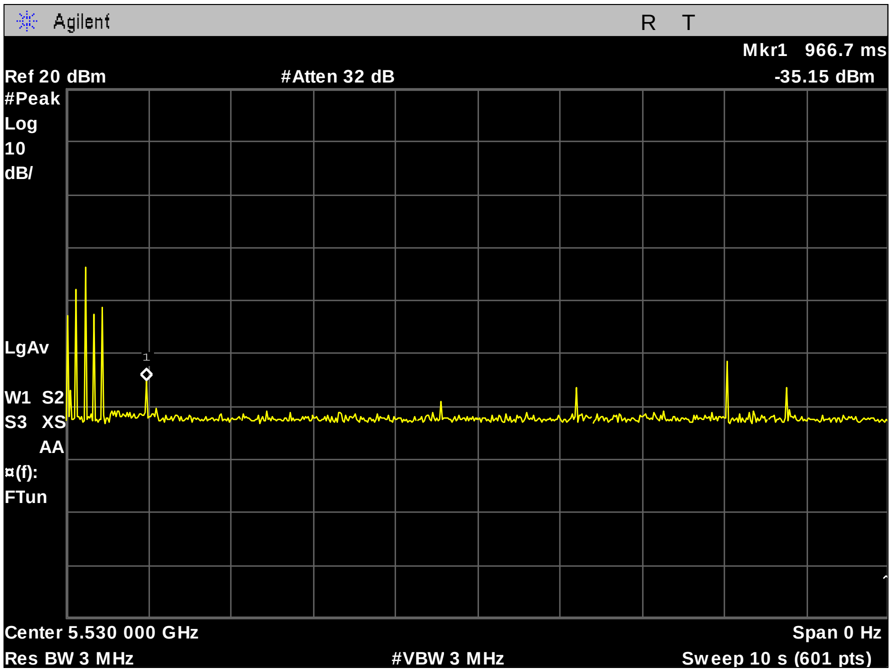
Observe the transmissions of the UUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing Transmission Time results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

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

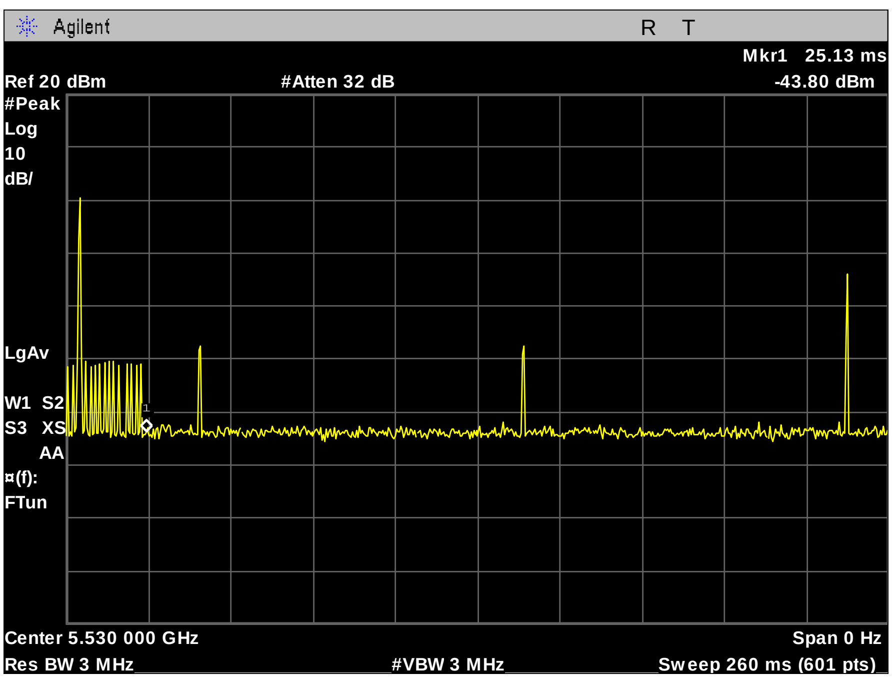
Test Engineer: Surinder Singh

Test Date: 01/08/16

Channel Move Time – Plots

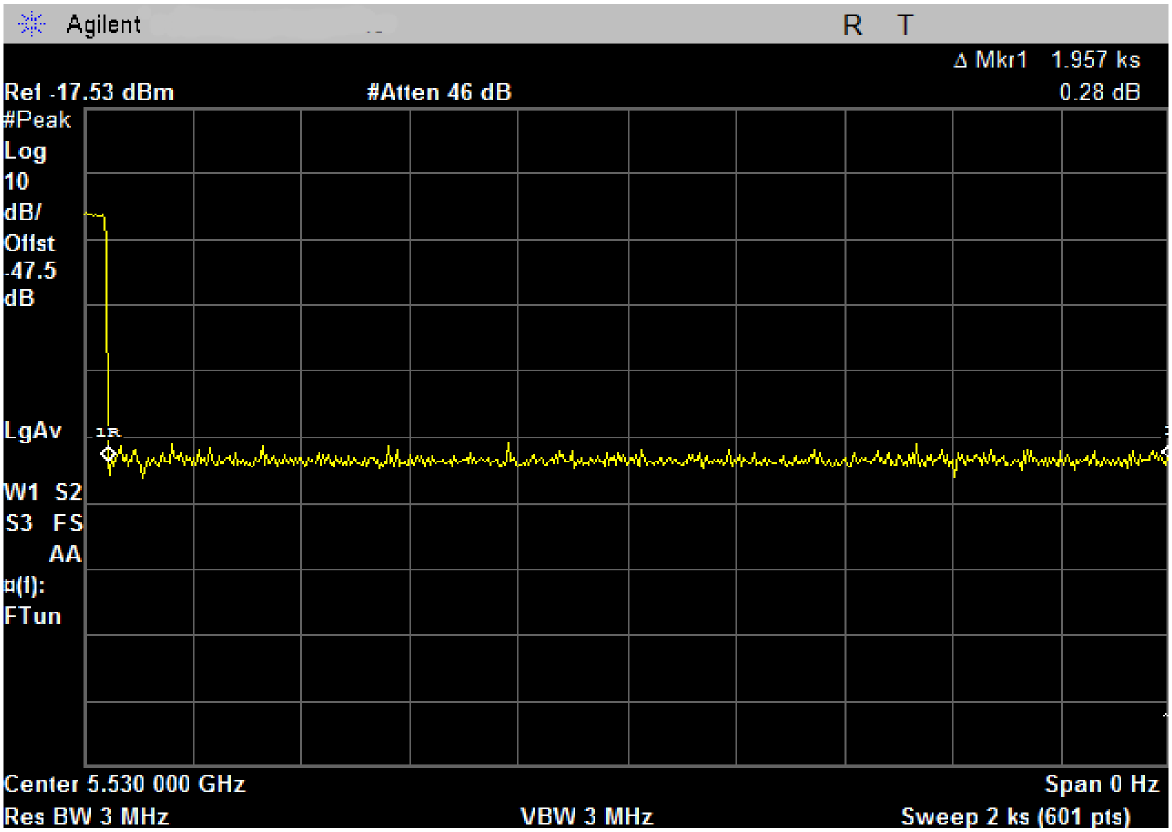


Plot 132. Channel Move Time



Plot 133. Channel Closing Transmission Time

Non-Occupancy Period – Plot



Plot 134. Non-Occupancy Period

H. Statistical Performance Check

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

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

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

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

Test Results: The equipment was compliant with § 15.407 Statistical Performance Check.

Test Engineer: Surinder Singh

Test Date: 01/08/16

Statistical Performance Check – Radar Type 1, 20 MHz

Radar Type	Trial #	Pulses Repetition Frequency Number (1-23)	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (µsec)	Detection 1 = Yes, 0 = No
1	1	9	1139.0	878	1
	2	14	1567.4	638	1
	3	2	1792.1	558	1
	4	5	1165.5	858	1
	5	15	1253.1	798	1
	6	19	1519.8	658	1
	7	8	1432.7	698	1
	8	1	1730.1	578	1
	9	11	1618.1	618	1
	10	18	1319.3	758	1
	11	3	1858.7	538	1
	12	22	1222.5	818	1
	13	7	1193.3	838	1
	14	17	326.2	3066	1
	15	4	1355.0	738	1
	16	n/a	545.3	1834	1
	17	n/a	445.0	2247	1
	18	n/a	522.7	1913	1
	19	n/a	441.9	2263	1
	20	n/a	1455.6	687	1
	21	n/a	397.1	2518	1
	22	n/a	362.8	2756	1
	23	n/a	1572.3	636	1
	24	n/a	564.0	1773	1
	25	n/a	335.6	2980	1
	26	n/a	390.5	2561	1
	27	n/a	459.3	2177	1
	28	n/a	371.6	2691	1
	29	n/a	457.5	2186	1
	30	n/a	563.1	1776	1
Detection Percentage					100% (> 60%)
EUT Test Frequency					5594 - 5526 MHz
Radar Frequency					5594 - 5526 MHz

Table 24. Statistical Performance Check – Radar Type 1, 20 MHz

Statistical Performance Check – Radar Type 2, 20 MHz

Radar Type	Trial #	Pulse Width 1 to 5 µsec	PRI 150 to 230 µsec	Pulses per Burst 23 to 29	Detection 1 = Yes, 0 = No
2	1	2	171	24	1
	2	1.4	170	23	1
	3	2.9	174	26	1
	4	4.1	185	28	1
	5	3.6	187	27	1
	6	2.7	195	26	1
	7	2.4	203	25	1
	8	4.8	181	29	1
	9	1.4	213	23	1
	10	3.6	155	27	1
	11	1.1	180	23	1
	12	2	218	24	1
	13	2.3	226	25	1
	14	5	167	29	1
	15	3.7	217	27	1
	16	3.6	229	27	1
	17	2.1	211	24	1
	18	3.5	186	27	1
	19	3.8	161	27	1
	20	3.8	157	27	1
	21	4.8	193	29	1
	22	1.3	194	23	1
	23	1.6	177	24	1
	24	2.5	225	25	1
	25	4.2	230	28	1
	26	1.6	150	24	1
	27	4.2	206	28	1
	28	2.2	163	25	1
	29	4.3	158	28	1
	30	4.6	209	29	1
	Detection Percentage				100% (>60%)

Table 25. Statistical Performance Check – Radar Type 2, 20 MHz

Statistical Performance Check – Radar Type 3, 20 MHz

Radar Type	Trial #	Pulses per Burst	Pulse Width 6 to 10 µsec	PRI (µsec) PRI 200 to 500 µsec	Detection 1 = Yes, 0 = No
3	1	7	418	16	1
	2	6.4	308	16	1
	3	7.9	392	17	1
	4	9.1	478	18	1
	5	8.6	306	17	1
	6	7.7	235	17	1
	7	7.4	404	17	1
	8	9.8	435	18	1
	9	6.4	469	16	1
	10	8.6	461	17	1
	11	6.1	423	16	1
	12	7	428	16	1
	13	7.3	349	16	1
	14	10	348	18	1
	15	8.7	463	18	1
	16	8.6	380	17	1
	17	7.1	383	16	1
	18	8.5	249	17	1
	19	8.8	270	18	1
	20	8.8	210	18	1
	21	9.8	477	18	1
	22	6.3	389	16	1
	23	6.6	370	16	1
	24	7.5	449	17	1
	25	9.2	322	18	1
	26	6.6	361	16	1
	27	9.2	204	18	1
	28	7.2	395	16	1
	29	9.3	298	18	1
	30	9.6	236	18	1
	Detection Percentage				**100% (> 60%)**

Table 26. Statistical Performance Check – Radar Type 3, 20 MHz

Statistical Performance Check – Radar Type 4, 20 MHz

Radar Type	Trial #	Pulses per Burst	Pulse Width 11 to 20 µsec	PRI (µsec) PRI 200 to 500 µsec	Detection 1 = Yes, 0 = No
4	1	13.2	418	13	1
	2	12	308	12	1
	3	15.2	392	14	1
	4	18	478	15	1
	5	16.9	306	15	1
	6	14.9	235	14	1
	7	14.2	404	13	1
	8	19.5	435	16	1
	9	11.9	469	12	1
	10	16.8	461	15	1
	11	11.2	423	12	1
	12	13.2	428	13	1
	13	13.9	349	13	1
	14	20	348	16	1
	15	17.2	463	15	1
	16	16.9	380	15	1
	17	13.5	383	13	1
	18	16.5	249	15	1
	19	17.4	270	15	1
	20	17.3	210	15	1
	21	19.6	477	16	1
	22	11.8	389	12	1
	23	12.4	370	12	1
	24	14.4	449	13	1
	25	18.2	322	15	1
	26	12.5	361	12	1
	27	18.2	204	15	1
	28	13.7	395	13	1
	29	18.4	298	16	1
	30	9.6	236	18	1
	Detection Percentage				**100% (> 60%)**

Table 27. Statistical Performance Check – Radar Type 4, 20 MHz

Radar Type	Number of Trials	Number of Successful Detections	Minimum Percentage of Successful Detections
1	30	30	100%
2	30	30	100%
3	30	30	100%
4	30	30	100%
Aggregate = (100% + 100% + 100% + 100%)/4 = 100%			

Table 28. Statistical Performance Check – Aggregate, 20 MHz

Statistical Performance Check – Radar Type 5, 20 MHz

Radar Type	Trial #	Pulses per Burst 8 to20	Pulse Width 50 to 100 µsec	PRI (µsec) PRI 1000 to 2000 µsec	Detection 1 = Yes, 0 = No
5	1	11	1.0909091	12	1
	2	9	1.3333333	12	1
	3	14	0.8571429	12	1
	4	18	0.6666667	12	1
	5	16	0.75	12	0
	6	13	0.9230769	12	1
	7	12	1	12	1
	8	20	0.6	12	1
	9	9	1.3333333	12	1
	10	16	0.75	12	1
	11	8	1.5	12	1
	12	11	1.0909091	12	1
	13	12	1	12	1
	14	20	0.6	12	1
	15	16	0.75	12	1
	16	16	0.75	12	1
	17	11	1.0909091	12	1
	18	15	0.8	12	1
	19	17	0.7058824	12	0
	20	17	0.7058824	12	1
	21	20	0.6	12	1
	22	9	1.3333333	12	1
	23	10	1.2	12	1
	24	12	1	12	1
	25	18	0.6666667	12	0
	26	10	1.2	12	1
	27	18	0.6666667	12	1
	28	11	1.0909091	12	1
	29	18	0.6666667	12	1
	30	19	0.6315789	12	1
	Detection Percentage				**90% (> 80%)**

Table 29. Statistical Performance Check – Radar Type 5, 20 MHz

Statistical Performance Check – Radar Type 6, 20 MHz

Radar Type	Trial #	Frequency (MHz)	Pulses/Hop	Pulse Width (μsec)	PRI (μsec)	Detection 1 = Yes, 0 = No
6	1	5494-5526	9	1	333	1
	2	5494-5526	9	1	333	1
	3	5494-5526	9	1	333	1
	4	5494-5526	9	1	333	1
	5	5494-5526	9	1	333	1
	6	5494-5526	9	1	333	1
	7	5494-5526	9	1	333	1
	8	5494-5526	9	1	333	1
	9	5494-5526	9	1	333	1
	10	5494-5526	9	1	333	1
	11	5494-5526	9	1	333	1
	12	5494-5526	9	1	333	1
	13	5494-5526	9	1	333	1
	14	5494-5526	9	1	333	1
	15	5494-5526	9	1	333	1
	16	5494-5526	9	1	333	1
	17	5494-5526	9	1	333	1
	18	5494-5526	9	1	333	1
	19	5494-5526	9	1	333	1
	20	5494-5526	9	1	333	1
	21	5494-5526	9	1	333	1
	22	5494-5526	9	1	333	1
	23	5494-5526	9	1	333	1
	24	5494-5526	9	1	333	1
	25	5494-5526	9	1	333	1
	26	5494-5526	9	1	333	1
	27	5494-5526	9	1	333	1
	28	5494-5526	9	1	333	1
	29	5494-5526	9	1	333	1
	30	5494-5526	9	1	333	1
	Detection Percentage					**100% (> 70%)**

Table 30. Statistical Performance Check – Radar Type 6, 20 MHz

Statistical Performance Check – Radar Type 1, 40 MHz

Radar Type	Trial #	Pulses Repetition Frequency Number (1-23)	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (µsec)	Detection 1 = Yes, 0 = No
1	1	9	1139.0	878	1
	2	14	1567.4	638	1
	3	2	1792.1	558	1
	4	5	1165.5	858	1
	5	15	1253.1	798	1
	6	19	1519.8	658	1
	7	8	1432.7	698	1
	8	1	1730.1	578	1
	9	11	1618.1	618	1
	10	18	1319.3	758	1
	11	3	1858.7	538	1
	12	22	1222.5	818	1
	13	7	1193.3	838	1
	14	17	326.2	3066	1
	15	4	1355.0	738	1
	16	n/a	545.3	1834	1
	17	n/a	445.0	2247	1
	18	n/a	522.7	1913	1
	19	n/a	441.9	2263	1
	20	n/a	1455.6	687	1
	21	n/a	397.1	2518	1
	22	n/a	362.8	2756	1
	23	n/a	1572.3	636	1
	24	n/a	564.0	1773	1
	25	n/a	335.6	2980	1
	26	n/a	390.5	2561	1
	27	n/a	459.3	2177	1
	28	n/a	371.6	2691	1
	29	n/a	457.5	2186	1
	30	n/a	563.1	1776	1
	Detection Percentage				**100% (> 60%)**
	EUT Test Frequency				**5594 - 5526 MHz**
	Radar Frequency				**5594 - 5526 MHz**

Table 31. Statistical Performance Check – Radar Type 1, 40 MHz

Statistical Performance Check – Radar Type 2, 40 MHz

Radar Type	Trial #	Pulse Width 1 to 5 µsec	PRI 150 to 230 µsec	Pulses per Burst 23 to 29	Detection 1 = Yes, 0 = No
2	1	2	171	24	1
	2	1.4	170	23	1
	3	2.9	174	26	1
	4	4.1	185	28	1
	5	3.6	187	27	1
	6	2.7	195	26	1
	7	2.4	203	25	1
	8	4.8	181	29	1
	9	1.4	213	23	1
	10	3.6	155	27	1
	11	1.1	180	23	1
	12	2	218	24	1
	13	2.3	226	25	1
	14	5	167	29	1
	15	3.7	217	27	1
	16	3.6	229	27	1
	17	2.1	211	24	1
	18	3.5	186	27	1
	19	3.8	161	27	1
	20	3.8	157	27	1
	21	4.8	193	29	1
	22	1.3	194	23	1
	23	1.6	177	24	1
	24	2.5	225	25	1
	25	4.2	230	28	1
	26	1.6	150	24	1
	27	4.2	206	28	1
	28	2.2	163	25	1
	29	4.3	158	28	1
	30	4.6	209	29	1
	Detection Percentage				100% (>60%)

Table 32. Statistical Performance Check – Radar Type 2, 40 MHz

Statistical Performance Check – Radar Type 3, 40 MHz

Radar Type	Trial #	Pulses per Burst	Pulse Width 6 to 10 µsec	PRI (µsec) PRI 200 to 500 µsec	Detection 1 = Yes, 0 = No
3	1	7	418	16	1
	2	6.4	308	16	1
	3	7.9	392	17	1
	4	9.1	478	18	1
	5	8.6	306	17	1
	6	7.7	235	17	1
	7	7.4	404	17	1
	8	9.8	435	18	1
	9	6.4	469	16	1
	10	8.6	461	17	1
	11	6.1	423	16	1
	12	7	428	16	1
	13	7.3	349	16	1
	14	10	348	18	1
	15	8.7	463	18	1
	16	8.6	380	17	1
	17	7.1	383	16	1
	18	8.5	249	17	1
	19	8.8	270	18	1
	20	8.8	210	18	1
	21	9.8	477	18	1
	22	6.3	389	16	1
	23	6.6	370	16	1
	24	7.5	449	17	1
	25	9.2	322	18	1
	26	6.6	361	16	1
	27	9.2	204	18	1
	28	7.2	395	16	1
	29	9.3	298	18	1
	30	9.6	236	18	1
	Detection Percentage				**100% (> 60%)**

Table 33. Statistical Performance Check – Radar Type 3, 40 MHz

Statistical Performance Check – Radar Type 4, 40 MHz

Radar Type	Trial #	Pulses per Burst	Pulse Width 11 to 20 µsec	PRI (µsec) PRI 200 to 500 µsec	Detection 1 = Yes, 0 = No
4	1	13.2	418	13	1
	2	12	308	12	1
	3	15.2	392	14	1
	4	18	478	15	1
	5	16.9	306	15	1
	6	14.9	235	14	1
	7	14.2	404	13	1
	8	19.5	435	16	1
	9	11.9	469	12	1
	10	16.8	461	15	1
	11	11.2	423	12	1
	12	13.2	428	13	1
	13	13.9	349	13	1
	14	20	348	16	1
	15	17.2	463	15	1
	16	16.9	380	15	1
	17	13.5	383	13	1
	18	16.5	249	15	1
	19	17.4	270	15	1
	20	17.3	210	15	1
	21	19.6	477	16	1
	22	11.8	389	12	1
	23	12.4	370	12	1
	24	14.4	449	13	1
	25	18.2	322	15	1
	26	12.5	361	12	1
	27	18.2	204	15	1
	28	13.7	395	13	1
	29	18.4	298	16	1
	30	9.6	236	18	1
	Detection Percentage				100% (> 60%)

Table 34. Statistical Performance Check – Radar Type 4, 40 MHz

Radar Type	Number of Trials	Number of Successful Detections	Minimum Percentage of Successful Detections
1	30	30	100%
2	30	30	100%
3	30	30	100%
4	30	30	100%
Aggregate = (100% + 100% + 100% + 100%)/4 = 100%			

Table 35. Statistical Performance Check – Aggregate, 40 MHz

Statistical Performance Check – Radar Type 5, 40 MHz

Radar Type	Trial #	Pulses per Burst 8 to20	Pulse Width 50 to 100 μsec	PRI (μsec) PRI 1000 to 2000 μsec	Detection 1 = Yes, 0 = No
5	1	11	1.0909091	12	1
	2	9	1.3333333	12	1
	3	14	0.8571429	12	1
	4	18	0.6666667	12	1
	5	16	0.75	12	1
	6	13	0.9230769	12	1
	7	12	1	12	1
	8	20	0.6	12	1
	9	9	1.3333333	12	1
	10	16	0.75	12	1
	11	8	1.5	12	1
	12	11	1.0909091	12	1
	13	12	1	12	1
	14	20	0.6	12	1
	15	16	0.75	12	1
	16	16	0.75	12	1
	17	11	1.0909091	12	1
	18	15	0.8	12	1
	19	17	0.7058824	12	1
	20	17	0.7058824	12	1
	21	20	0.6	12	1
	22	9	1.3333333	12	1
	23	10	1.2	12	1
	24	12	1	12	1
	25	18	0.6666667	12	1
	26	10	1.2	12	1
	27	18	0.6666667	12	1
	28	11	1.0909091	12	1
	29	18	0.6666667	12	1
	30	19	0.6315789	12	1
	Detection Percentage				**1000% (> 60%)**

Table 36. Statistical Performance Check – Radar Type 5, 40 MHz

Statistical Performance Check – Radar Type 6, 40 MHz

Radar Type	Trial #	Frequency (MHz)	Pulses/Hop	Pulse Width (μsec)	PRI (μsec)	Detection 1 = Yes, 0 = No
6	1	5494-5526	9	1	333	1
	2	5494-5526	9	1	333	1
	3	5494-5526	9	1	333	1
	4	5494-5526	9	1	333	1
	5	5494-5526	9	1	333	1
	6	5494-5526	9	1	333	1
	7	5494-5526	9	1	333	1
	8	5494-5526	9	1	333	1
	9	5494-5526	9	1	333	1
	10	5494-5526	9	1	333	1
	11	5494-5526	9	1	333	1
	12	5494-5526	9	1	333	1
	13	5494-5526	9	1	333	1
	14	5494-5526	9	1	333	1
	15	5494-5526	9	1	333	1
	16	5494-5526	9	1	333	1
	17	5494-5526	9	1	333	1
	18	5494-5526	9	1	333	1
	19	5494-5526	9	1	333	1
	20	5494-5526	9	1	333	1
	21	5494-5526	9	1	333	1
	22	5494-5526	9	1	333	1
	23	5494-5526	9	1	333	1
	24	5494-5526	9	1	333	1
	25	5494-5526	9	1	333	1
	26	5494-5526	9	1	333	1
	27	5494-5526	9	1	333	1
	28	5494-5526	9	1	333	1
	29	5494-5526	9	1	333	1
	30	5494-5526	9	1	333	1
	Detection Percentage					**100% (> 70%)**

Table 37. Statistical Performance Check – Radar Type 6, 40 MHz

Statistical Performance Check – Radar Type 1, 80 MHz

Radar Type	Trial #	Pulses Repetition Frequency Number (1-23)	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (µsec)	Detection 1 = Yes, 0 = No
1	1	9	1139.0	878	1
	2	14	1567.4	638	1
	3	2	1792.1	558	1
	4	5	1165.5	858	1
	5	15	1253.1	798	1
	6	19	1519.8	658	1
	7	8	1432.7	698	1
	8	1	1730.1	578	1
	9	11	1618.1	618	1
	10	18	1319.3	758	1
	11	3	1858.7	538	1
	12	22	1222.5	818	1
	13	7	1193.3	838	1
	14	17	326.2	3066	1
	15	4	1355.0	738	1
	16	n/a	545.3	1834	1
	17	n/a	445.0	2247	1
	18	n/a	522.7	1913	1
	19	n/a	441.9	2263	1
	20	n/a	1455.6	687	1
	21	n/a	397.1	2518	1
	22	n/a	362.8	2756	1
	23	n/a	1572.3	636	1
	24	n/a	564.0	1773	1
	25	n/a	335.6	2980	1
	26	n/a	390.5	2561	1
	27	n/a	459.3	2177	1
	28	n/a	371.6	2691	1
	29	n/a	457.5	2186	1
	30	n/a	563.1	1776	1
	Detection Percentage				100% (> 60%)
	EUT Test Frequency				5594 - 5526 MHz
	Radar Frequency				5594 - 5526 MHz

Table 38. Statistical Performance Check – Radar Type 1, 80 MHz

Statistical Performance Check – Radar Type 2, 80 MHz

Radar Type	Trial #	Pulse Width 1 to 5 µsec	PRI 150 to 230 µsec	Pulses per Burst 23 to 29	Detection 1 = Yes, 0 = No
2	1	2	171	24	1
	2	1.4	170	23	1
	3	2.9	174	26	1
	4	4.1	185	28	1
	5	3.6	187	27	1
	6	2.7	195	26	1
	7	2.4	203	25	1
	8	4.8	181	29	1
	9	1.4	213	23	1
	10	3.6	155	27	1
	11	1.1	180	23	1
	12	2	218	24	1
	13	2.3	226	25	1
	14	5	167	29	1
	15	3.7	217	27	1
	16	3.6	229	27	1
	17	2.1	211	24	1
	18	3.5	186	27	1
	19	3.8	161	27	1
	20	3.8	157	27	1
	21	4.8	193	29	1
	22	1.3	194	23	1
	23	1.6	177	24	1
	24	2.5	225	25	1
	25	4.2	230	28	1
	26	1.6	150	24	1
	27	4.2	206	28	1
	28	2.2	163	25	1
	29	4.3	158	28	1
	30	4.6	209	29	1
	Detection Percentage				**100% (> 60%)**

Table 39. Statistical Performance Check – Radar Type 2, 80 MHz

Statistical Performance Check – Radar Type 3, 80 MHz

Radar Type	Trial #	Pulses per Burst	Pulse Width 6 to 10 µsec	PRI (µsec) PRI 200 to 500 µsec	Detection 1 = Yes, 0 = No
3	1	7	418	16	1
	2	6.4	308	16	1
	3	7.9	392	17	1
	4	9.1	478	18	1
	5	8.6	306	17	1
	6	7.7	235	17	1
	7	7.4	404	17	1
	8	9.8	435	18	1
	9	6.4	469	16	1
	10	8.6	461	17	1
	11	6.1	423	16	1
	12	7	428	16	1
	13	7.3	349	16	1
	14	10	348	18	1
	15	8.7	463	18	1
	16	8.6	380	17	1
	17	7.1	383	16	1
	18	8.5	249	17	1
	19	8.8	270	18	1
	20	8.8	210	18	1
	21	9.8	477	18	1
	22	6.3	389	16	1
	23	6.6	370	16	1
	24	7.5	449	17	1
	25	9.2	322	18	1
	26	6.6	361	16	1
	27	9.2	204	18	1
	28	7.2	395	16	1
	29	9.3	298	18	1
	30	9.6	236	18	1
	Detection Percentage				**100% (> 60%)**

Table 40. Statistical Performance Check – Radar Type 3, 80 MHz

Statistical Performance Check – Radar Type 4, 80 MHz

Radar Type	Trial #	Pulses per Burst	Pulse Width 11 to 20 μsec	PRI (μsec) PRI 200 to 500 μsec	Detection 1 = Yes, 0 = No
4	1	13.2	418	13	1
	2	12	308	12	1
	3	15.2	392	14	1
	4	18	478	15	1
	5	16.9	306	15	1
	6	14.9	235	14	1
	7	14.2	404	13	1
	8	19.5	435	16	1
	9	11.9	469	12	1
	10	16.8	461	15	1
	11	11.2	423	12	1
	12	13.2	428	13	1
	13	13.9	349	13	1
	14	20	348	16	1
	15	17.2	463	15	1
	16	16.9	380	15	1
	17	13.5	383	13	1
	18	16.5	249	15	1
	19	17.4	270	15	1
	20	17.3	210	15	1
	21	19.6	477	16	1
	22	11.8	389	12	1
	23	12.4	370	12	1
	24	14.4	449	13	1
	25	18.2	322	15	1
	26	12.5	361	12	1
	27	18.2	204	15	1
	28	13.7	395	13	1
	29	18.4	298	16	1
	30	9.6	236	18	1
	Detection Percentage				100% (> 60%)

Table 41. Statistical Performance Check – Radar Type 4, 80 MHz

Radar Type	Number of Trials	Number of Successful Detections	Minimum Percentage of Successful Detections
1	30	30	100%
2	30	30	100%
3	30	30	100%
4	30	30	100%
Aggregate = (100% + 100% + 100% + 100%)/4 = 100%			

Table 42. Statistical Performance Check – Aggregate, 80 MHz

Statistical Performance Check – Radar Type 5, 80 MHz

Radar Type	Trial #	Pulses per Burst 8 to20	Pulse Width 50 to 100 µsec	PRI (µsec) PRI 1000 to 2000 µsec	Detection 1 = Yes, 0 = No
5	1	11	1.0909091	12	1
	2	9	1.3333333	12	1
	3	14	0.8571429	12	1
	4	18	0.6666667	12	1
	5	16	0.75	12	1
	6	13	0.9230769	12	1
	7	12	1	12	1
	8	20	0.6	12	1
	9	9	1.3333333	12	1
	10	16	0.75	12	1
	11	8	1.5	12	1
	12	11	1.0909091	12	1
	13	12	1	12	1
	14	20	0.6	12	1
	15	16	0.75	12	1
	16	16	0.75	12	1
	17	11	1.0909091	12	1
	18	15	0.8	12	1
	19	17	0.7058824	12	1
	20	17	0.7058824	12	1
	21	20	0.6	12	1
	22	9	1.3333333	12	1
	23	10	1.2	12	1
	24	12	1	12	1
	25	18	0.6666667	12	1
	26	10	1.2	12	1
	27	18	0.6666667	12	1
	28	11	1.0909091	12	1
	29	18	0.6666667	12	1
	30	19	0.6315789	12	1
	Detection Percentage				100% (> 80%)

Table 43. Statistical Performance Check – Radar Type 5, 80 MHz

Statistical Performance Check – Radar Type 6, 80 MHz

Radar Type	Trial #	Frequency (MHz)	Pulses/Hop	Pulse Width (µsec)	PRI (µsec)	Detection 1 = Yes, 0 = No
6	1	5494-5526	9	1	333	1
	2	5494-5526	9	1	333	1
	3	5494-5526	9	1	333	1
	4	5494-5526	9	1	333	1
	5	5494-5526	9	1	333	1
	6	5494-5526	9	1	333	1
	7	5494-5526	9	1	333	1
	8	5494-5526	9	1	333	1
	9	5494-5526	9	1	333	1
	10	5494-5526	9	1	333	1
	11	5494-5526	9	1	333	1
	12	5494-5526	9	1	333	1
	13	5494-5526	9	1	333	1
	14	5494-5526	9	1	333	1
	15	5494-5526	9	1	333	1
	16	5494-5526	9	1	333	1
	17	5494-5526	9	1	333	1
	18	5494-5526	9	1	333	1
	19	5494-5526	9	1	333	1
	20	5494-5526	9	1	333	1
	21	5494-5526	9	1	333	1
	22	5494-5526	9	1	333	1
	23	5494-5526	9	1	333	1
	24	5494-5526	9	1	333	1
	25	5494-5526	9	1	333	1
	26	5494-5526	9	1	333	1
	27	5494-5526	9	1	333	1
	28	5494-5526	9	1	333	1
	29	5494-5526	9	1	333	1
	30	5494-5526	9	1	333	1
	Detection Percentage					**100% (> 70%)**

Table 44. Statistical Performance Check – Radar Type 6, 80 MHz

V. 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
1T4871	VECTOR SIGNAL GENERATOR	AGILENT	N5172B	7/16/2014	1/16/2016
1T4870	THERM./CLOCK/HUMIDITY MONITOR	CONTROL COMPANY	06-662-4, FB70258	3/14/2014	3/14/2016
1T4829	SPECTRUM ANALYZER	AGILENT	E4407B	9/30/2014	3/30/2016
1T4818	COMB GENERATOR	COM-POWER	CGO-520	SEE NOTE	
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	7/29/2014	1/29/2016
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4418	LISN	SOLAR ELECTRONICS	9233-50-TS-50-N	10/24/2014	4/24/2016
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	7/18/2014	7/18/2016
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	2/6/2015	2/6/2018
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	81	NOT REQUIRED	
1T4483	Antenna; Horn	ETS-Lindgren	3117	10/8/2015	4/8/2017

Table 45. Test Equipment List

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

VI. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

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

§ 2.801 Radio-frequency device defined.

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

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

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

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

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

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

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

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

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

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

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

(i) Compliance testing;

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

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

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

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

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

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

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

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

§ 2.907 Certification.

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

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

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

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

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

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

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

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

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

Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

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

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

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

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

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

End of Report