

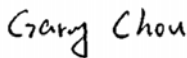
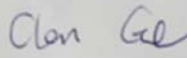
RF TEST REPORT



Report No.: FCC_RF_SL15073101-RUC-023A1_UNII
Supersede Report No.: None

Applicant	:	Ruckus Wireless, Inc.
Product Name	:	ZoneFlex R510 Access Point
Model No.	:	R510
Test Standard	:	47 CFR 15.407
Test Method	:	ANSI C63.4: 2014 789033 D02 General UNII Test Procedures New Rules v01
FCC ID	:	S9GR510
IC ID	:	5912A-R510
Dates of test	:	11/01/2015 to 11/20/2015
Issue Date	:	11/23/2015
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification [X] Equipment did not comply with the specification []		

This Test Report is Issued Under the Authority of:

	
Gary Chou	Chen Ge
Test Engineer	Engineer Reviewer
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only	

Issued By:
SIEMIC Laboratories
775 Montague Expressway, Milpitas, 95035 CA



775 Montague Expressway, Milpitas, CA 95035, USA • Phone: (+1) 408 526 1188 • Facsimile (+1) 408 526 1088

Visit us at: www.siemic.com; Follow us at:



Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC, RF/Wireless, Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless, Telecom
Taiwan	BSMI, NCC, NIST	EMC, RF, Telecom, Safety
Hong Kong	OFTA, NIST	RF/Wireless, Telecom
Australia	NATA, NIST	EMC, RF, Telecom, Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF, Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC, RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, NIST	EMC, RF, Telecom, Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC, RF, Telecom
Canada	IC FCB, NIST	EMC, RF, Telecom
Singapore	iDA, NIST	EMC, RF, Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

CONTENTS

1	REPORT REVISION HISTORY.....	4
2	EXECUTIVE SUMMARY	5
3	CUSTOMER INFORMATION	5
4	TEST SITE INFORMATION.....	5
5	MODIFICATION.....	5
6	EUT INFORMATION.....	6
6.1	EUT Description	6
6.2	Radio Description	6
7	SUPPORTING EQUIPMENT/SOFTWARE AND CABLING DESCRIPTION	8
7.1	Supporting Equipment.....	8
7.2	Cabling Description.....	8
7.3	Test Software Description.....	8
8	TEST SUMMARY	9
9	MEASUREMENT UNCERTAINTY	10
10	MEASUREMENTS, EXAMINATION AND DERIVED RESULTS.....	11
10.1	Conducted Emissions	11
10.2	26 dB Bandwidth	16
10.3	Output Power.....	23
10.4	Peak Spectral Density	26
10.5	Band Edge Measurement	39
10.6	Radiated Spurious Emissions below 1GHz.....	46
10.7	Radiated Spurious Emissions above 1GHz	48
	ANNEX A. TEST INSTRUMENT	57
	ANNEX B. SIEMIC ACCREDITATION	58

1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_RF_SL15073101-RUC-023A1_UNII	None	Original	11/23/2015

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Ruckus Wireless, Inc.
Product: ZoneFlex R510 Access Point
Model: R510

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	:	Ruckus Wireless, Inc.
Applicant Address	:	350 West Java Drive, Sunnyvale, California 94089 U.S.A
Manufacturer Name	:	Ruckus Wireless, Inc.
Manufacturer Address	:	350 West Java Drive, Sunnyvale, California 94089 U.S.A

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Product Name	ZoneFlex R510 Access Point
Model No.	R510
Trade Name	Ruckus
Serial No.	42150600025
Host Model No.	N/A
Input Power	48VDC (PoE)
Power Adapter Manu/Model	N/A
Power Adapter SN	N/A
Date of EUT received	11/02/2015
Equipment Class/ Category	DTS, UNII
Clock Frequencies	N/A
Port/Connectors	PoE, Ethernet
Product Hardware version	705-60429-001
Product Software version	812-72419-002
Radio Hardware version	705-60429-001
Radio Software version	812-72419-002
Test Software version	117-11330-002

6.2 Radio Description

Radio Type	802.11b	802.11g	802.11a	802.11n-20M	802.11n-40M	802.11ac-80M
Operating Frequency	2412-2462MHz	2412-2462MHz	5260-5320MHz 5500-5720MHz 5745-5825MHz	2412-2462MHz 5260-5320MHz 5500-5720MHz 5745-5825MHz	2422-2452MHz 5190-5310MHz 5510-5710MHz 5755-5795MHz	5210MHz, 5290MHz 5530MHz, 5610MHz, 5690MHz, 5775MHz
Modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Spacing	5MHz	5MHz	20MHz	5MHz(2.4GHz), 20MHz (5GHz)	40MHz	80MHz
Number of Channels	11	11	20	11(2.4GH) 20 (5GHz)	9(2.4GH) 10(5GHz)	6
Antenna Type	Internal Omni PCB Antennas					
Antenna Gain (Peak)	1 dBi (2.4GHz), 3 dBi (5 GHz)					
Antenna Connector Type	U.FL					
Note	The two antennas are cross-polarized.					

EUT Power level setting

Mode	Frequency	Power Setting
802.11-a	5260	22
802.11-a	5280	22
802.11-a	5320	22
802.11-n-20	5260	22
802.11-n-20	5280	22
802.11-n-20	5320	22
802.11-n-40	5270	22
802.11-n-40	5310	18
802.11-ac-80	5290	15
802.11-a	5500	19
802.11-a	5580	19
802.11-a	5700	20
802.11-n-20	5500	19
802.11-n-20	5580	19
802.11-n-20	5700	20
802.11-n-40	5510	19
802.11-n-40	5590	22
802.11-n-40	5670	22
802.11-ac-80	5530	15
802.11-ac-80	5610	22

CROSSOVER channels power setting

Mode	Frequency	Power Setting
802.11-a	5720	19
802.11-n-20	5720	19
802.11-n-40	5710	22
802.11-ac-80	5690	22

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	PP01L Latitude C610	CN-06P823-48643-37P-4153	Dell	-
2	EUT power Supply	HK-AD-120A100-US	740-64190-011	Ruckus	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
-	-	-	-	-	-	-	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	Command Line in windows	Set the EUT to transmit continuously in diferent test mode

8 Test Summary

Test Item	Test standard		Test Method/Procedure	Pass / Fail
Restricted Band of Operation	FCC	15.205	ANSI C63.4 – 2014 789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
AC Conducted Emissions Voltage	FCC	15.207(a)	ANSI C63.4 – 2014	☒ Pass ☐ N/A

Test Item	Test standard		Test Method/Procedure	Pass / Fail
26 & 6 dB Emission Bandwidth	FCC	15.407 (a) (2)	789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Maximum conducted Output Power	FCC	15.407 (a) (2)	789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Power reduction (Antenna Gain > 6 dBi)	FCC	15.407 (a) (2)	-	☐ Pass ☒ N/A
Band Edge and Radiated Spurious Emissions	FCC	15.407(b)(2), 15.407(b)(6)	ANSI C63.4 – 2014 789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Power Spectral Density	FCC	15.407 (a) (2)	789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Frequency Stability	FCC	15.407 (g)	-	☐ Pass ☒ N/A
Transmit Power Control (TPC)	FCC	15.407 (h)(1)	-	☐ Pass ☒ N/A
User Manual	FCC	-	-	☒ Pass ☐ N/A

Remark	- All measurement uncertainties are not taken into consideration for all presented test result. - The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.
--------	---

9 Measurement Uncertainty

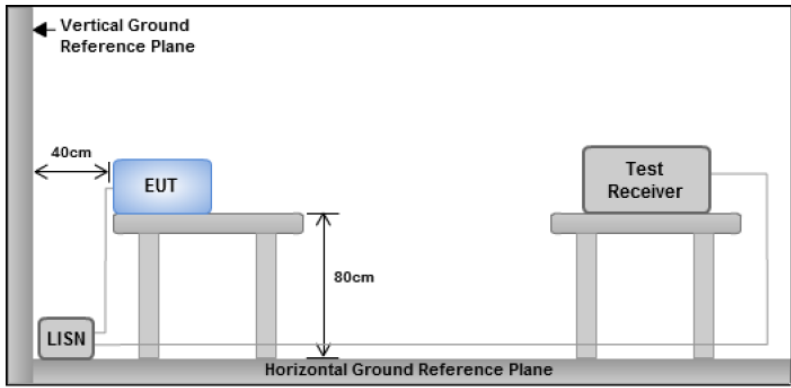
Emissions			
Test Item	Frequency Range	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious Emissions	1GHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+4.3dB/-4.1dB

10 Measurements, Examination and Derived Results

10.1 Conducted Emissions

Conducted Emission Limit

Frequency ranges (MHz)	Limit (dBuV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

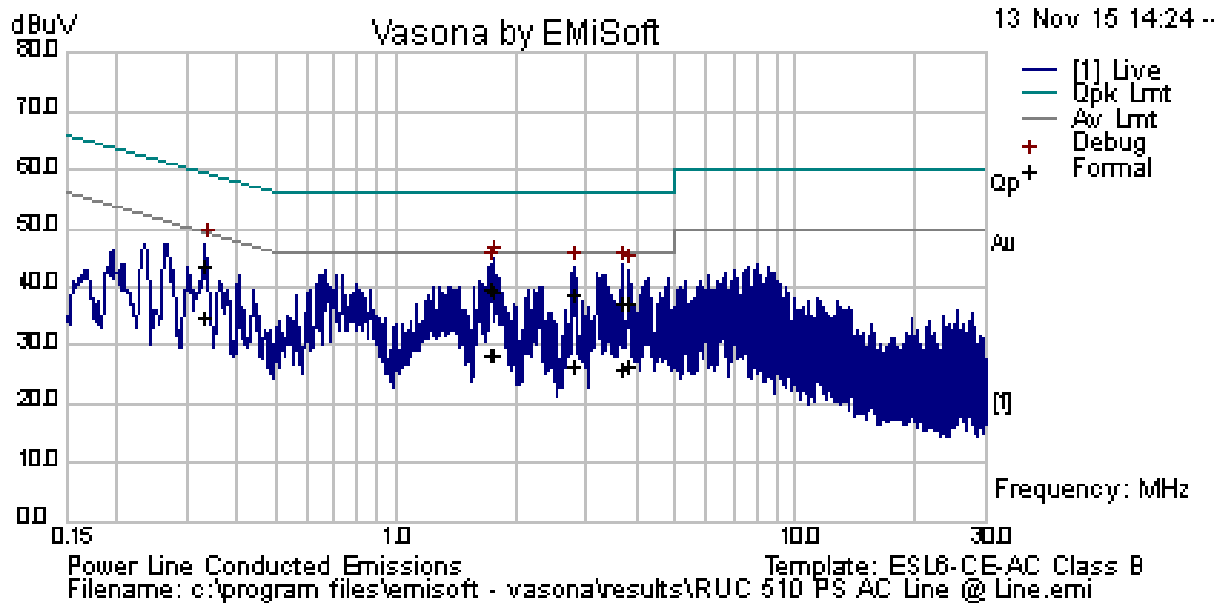
Spec	Item	Requirement	Applicable
47CFR§15.207	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.	☒
Test Setup		 Note: 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes	
Procedure		- The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B. - The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains. - The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. - All other supporting equipment was powered separately from another main supply.	
Remark		EUT tested with AC 120V 60Hz	
Result		☒ Pass ☐ Fail	

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Conducted Emission Test Results

Test specification:	Conducted Emissions				
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail	
	Humidity (%):	42			
	Atmospheric(mbar):	1021			
Mains Power:	120Vac, 60Hz				
Tested by:	Teody Manansala				
Test Date:	11/13/2015				
Remarks	Power Supply, Line				

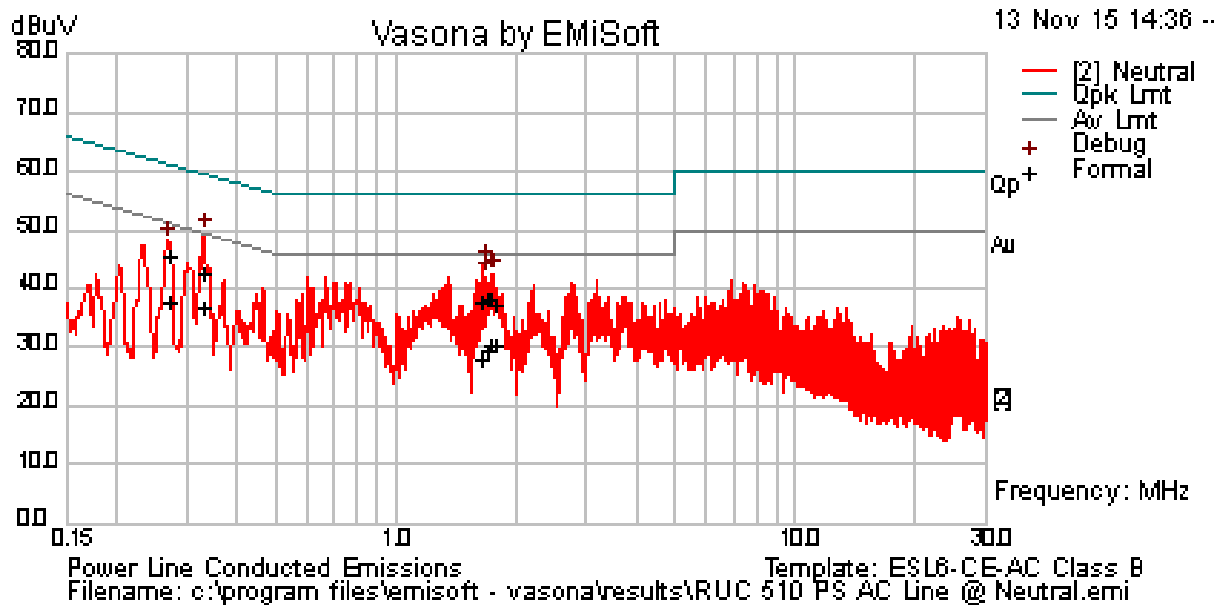


Line Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
1.76	28.86	10.02	0.55	39.43	Quasi Peak	Line	56.00	-16.57	Pass
0.33	32.99	10.01	0.85	43.84	Quasi Peak	Line	59.44	-15.60	Pass
3.68	26.50	10.03	0.55	37.08	Quasi Peak	Line	56.00	-18.92	Pass
1.73	29.13	10.02	0.55	39.71	Quasi Peak	Line	56.00	-16.29	Pass
2.78	28.38	10.03	0.55	38.96	Quasi Peak	Line	56.00	-17.04	Pass
3.81	26.48	10.03	0.55	37.06	Quasi Peak	Line	56.00	-18.94	Pass
1.76	18.01	10.02	0.55	28.59	Average	Line	46.00	-17.41	Pass
0.33	23.98	10.01	0.85	34.83	Average	Line	49.44	-14.60	Pass
3.68	15.20	10.03	0.55	25.78	Average	Line	46.00	-20.22	Pass
1.73	17.95	10.02	0.55	28.53	Average	Line	46.00	-17.47	Pass
2.78	15.86	10.03	0.55	26.43	Average	Line	46.00	-19.57	Pass
3.81	15.82	10.03	0.55	26.40	Average	Line	46.00	-19.60	Pass

Conducted Emission Test Results

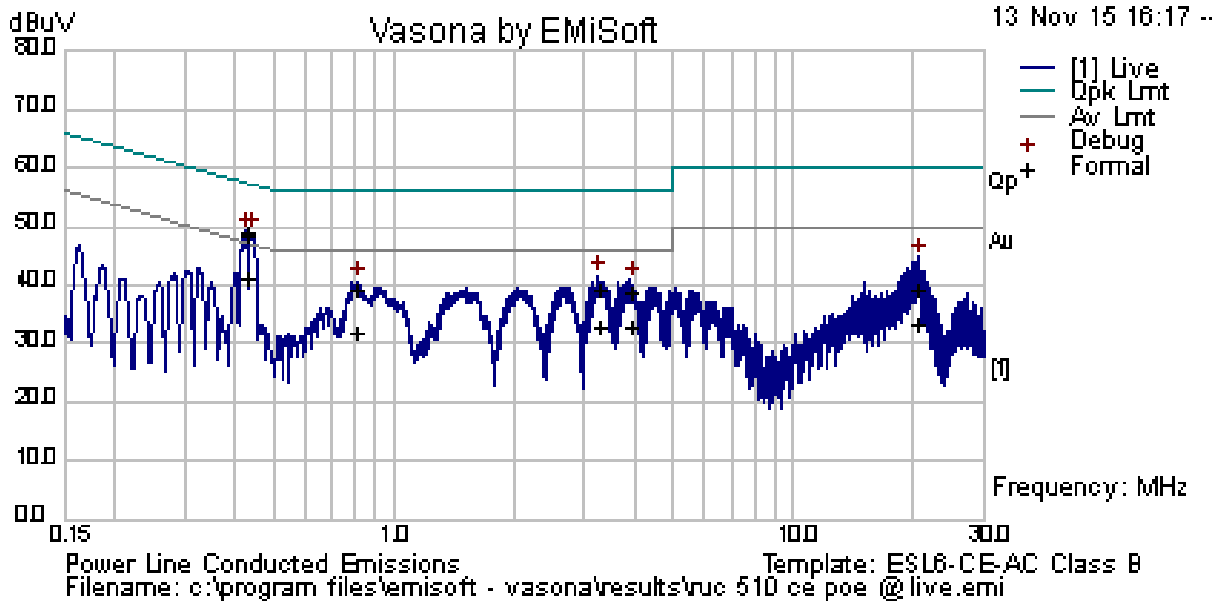
Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Teody Manansala			
Test Date:	11/13/2015			
Remarks	Power Supply, Neutral			



Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
0.33	31.92	10.01	0.85	42.78	Quasi Peak	Neutral	59.46	-16.68	Pass
1.65	27.10	10.02	0.56	37.68	Quasi Peak	Neutral	56.00	-18.32	Pass
0.27	34.42	10.00	1.00	45.42	Quasi Peak	Neutral	61.13	-15.71	Pass
1.71	27.90	10.02	0.56	38.48	Quasi Peak	Neutral	56.00	-17.52	Pass
1.77	26.88	10.02	0.55	37.45	Quasi Peak	Neutral	56.00	-18.55	Pass
1.69	27.71	10.02	0.56	38.29	Quasi Peak	Neutral	56.00	-17.71	Pass
0.33	25.94	10.01	0.85	36.79	Average	Neutral	49.46	-12.67	Pass
1.65	17.19	10.02	0.56	27.77	Average	Neutral	46.00	-18.23	Pass
0.27	26.82	10.00	1.00	37.82	Average	Neutral	51.13	-13.31	Pass
1.71	19.72	10.02	0.56	30.29	Average	Neutral	46.00	-15.71	Pass
1.77	19.92	10.02	0.55	30.50	Average	Neutral	46.00	-15.50	Pass
1.69	18.71	10.02	0.56	29.29	Average	Neutral	46.00	-16.71	Pass

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Teody Manansala			
Test Date:	11/13/2015			
Remarks	POE, Line			

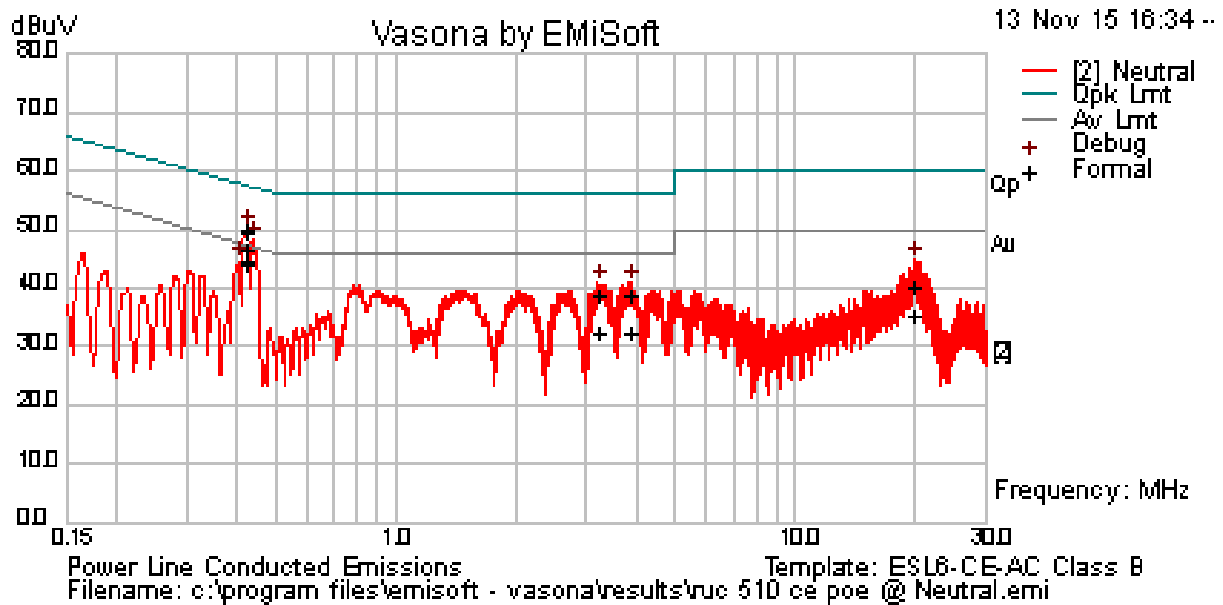


Line Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
0.43	37.61	10.01	0.73	48.35	Quasi Peak	Line	57.30	-8.95	Pass
0.45	38.06	10.01	0.73	48.80	Quasi Peak	Line	57.30	-8.51	Pass
3.26	28.49	10.03	0.55	39.07	Quasi Peak	Line	56.00	-16.93	Pass
3.91	28.20	10.03	0.55	38.78	Quasi Peak	Line	56.00	-17.22	Pass
20.55	28.33	10.07	0.70	39.10	Quasi Peak	Line	60.00	-20.90	Pass
0.81	28.79	10.01	0.60	39.40	Quasi Peak	Line	56.00	-16.60	Pass
0.43	30.39	10.01	0.73	41.12	Average	Line	47.30	-6.18	Pass
0.45	30.61	10.01	0.73	41.35	Average	Line	47.30	-5.95	Pass
3.26	22.21	10.03	0.55	32.79	Average	Line	46.00	-13.21	Pass
3.91	22.25	10.03	0.55	32.84	Average	Line	46.00	-13.16	Pass
20.55	22.66	10.07	0.70	33.43	Average	Line	50.00	-16.57	Pass
0.81	21.16	10.01	0.60	31.77	Average	Line	46.00	-14.23	Pass

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Teody Manansala			
Test Date:	11/13/2015			
Remarks	POE, Neutral			

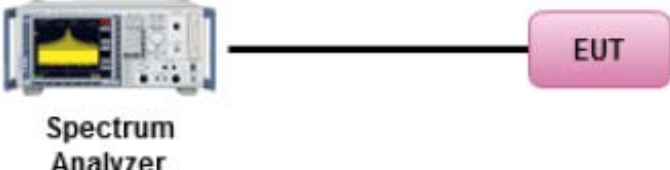


Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
0.43	39.06	10.01	0.73	49.80	Quasi Peak	Neutral	57.32	-7.52	Pass
0.45	39.10	10.01	0.73	49.84	Quasi Peak	Neutral	57.31	-7.47	Pass
0.42	38.56	10.01	0.73	49.30	Quasi Peak	Neutral	57.41	-8.11	Pass
3.90	27.99	10.03	0.55	38.57	Quasi Peak	Neutral	56.00	-17.43	Pass
3.23	28.09	10.03	0.55	38.67	Quasi Peak	Neutral	56.00	-17.33	Pass
19.96	29.66	10.07	0.69	40.42	Quasi Peak	Neutral	60.00	-19.58	Pass
0.43	33.70	10.01	0.73	44.44	Average	Neutral	47.32	-2.88	Pass
0.45	33.50	10.01	0.73	44.24	Average	Neutral	47.31	-3.07	Pass
0.42	36.01	10.01	0.73	46.75	Average	Neutral	47.41	-0.67	Pass
3.90	21.74	10.03	0.55	32.32	Average	Neutral	46.00	-13.68	Pass
3.23	21.75	10.03	0.55	32.33	Average	Neutral	46.00	-13.67	Pass
19.96	24.46	10.07	0.69	35.22	Average	Neutral	50.00	-14.78	Pass

10.2 26 dB Bandwidth

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.407	-	26 dB Emission BW: Report only for reference.	☒
	a) (2)	26 dB Emission BW: Report only for power limit calculation.	☐
Test Setup	 The diagram illustrates the test setup. On the left is a 'Spectrum Analyzer' with a yellow trace on its screen. A black line connects it to a pink rounded rectangle on the right labeled 'EUT'.		
Test Procedure	789033 D02 General UNII Test Procedures New Rules v01 <u>26dB Emission bandwidth measurement procedure (Other than 5.725-5.85 GHz)</u> - Allow the trace to stabilize. - Use the spectrum analyzer built-in measurement function to determine the 26dB BW. - o Set RBW = around 1% of emission bandwidth - o Set VBW > RBW - o Detector = Peak - o Trace mode = max hold - Capture the plot. - Repeat above steps for different test channel and other modulation type.		
Test Date	11/01/2015 – 11/20/2015	Environmental condition	Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A
Test Plot ☒ Yes ☐ N/A

26dB Bandwidth measurement result for 5.3GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5260	Low	29.85
26dB BW	802.11a	5280	Mid	30.00
26dB BW	802.11a	5320	High	29.51
26dB BW	802.11n-20	5260	Low	29.11
26dB BW	802.11n-20	5280	Mid	29.05
26dB BW	802.11n-20	5320	High	29.45
26dB BW	802.11n-40	5270	Low	59.69
26dB BW	802.11n-40	5310	High	53.55
26dB BW	802.11ac-80	5290	Mid	91.98

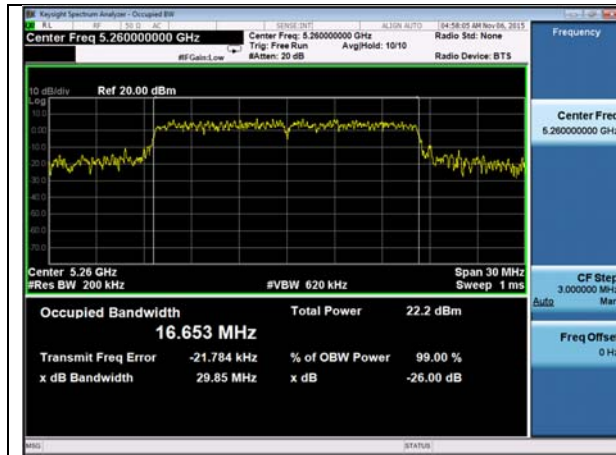
26dB Bandwidth measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5500	Low	27.09
26dB BW	802.11a	5580	Mid	24.96
26dB BW	802.11a	5700	High	20.70
26dB BW	802.11n-20	5500	Low	20.56
26dB BW	802.11n-20	5580	Mid	28.87
26dB BW	802.11n-20	5700	High	24.82
26dB BW	802.11n-40	5510	Low	39.22
26dB BW	802.11n-40	5590	Mid	59.04
26dB BW	802.11n-40	5670	High	56.84
26dB BW	802.11ac-80	5530	Low	83.18
26dB BW	802.11ac-80	5610	High	119.90

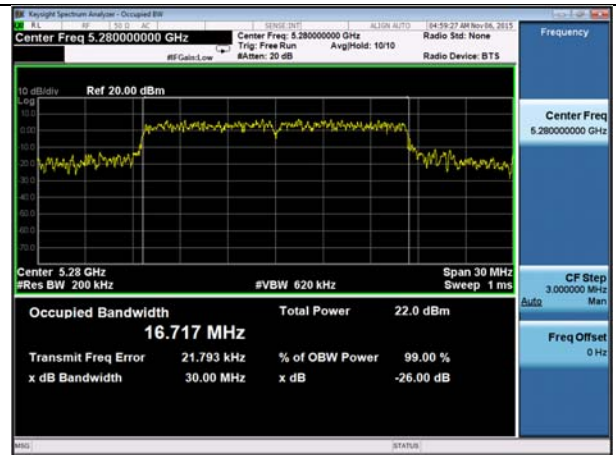
26dB Bandwidth measurement result for CROSSOVER channels

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5720	CROSSOVER	18.90
26dB BW	802.11n-20	5720	CROSSOVER	19.95
26dB BW	802.11n-40	5710	CROSSOVER	38.75
26dB BW	802.11ac-80	5690	CROSSOVER	79.81

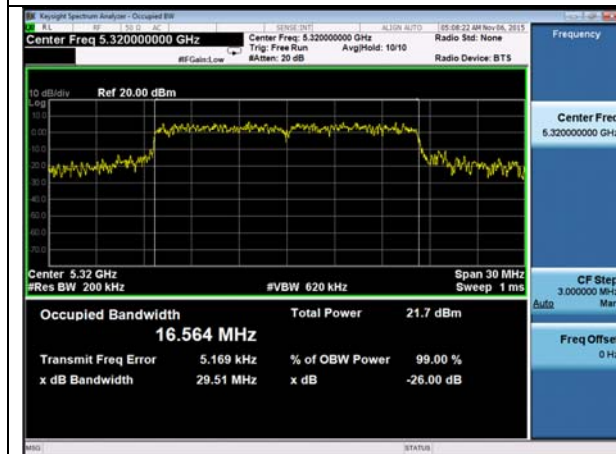
26dB & 6dB Bandwidth Test Plots



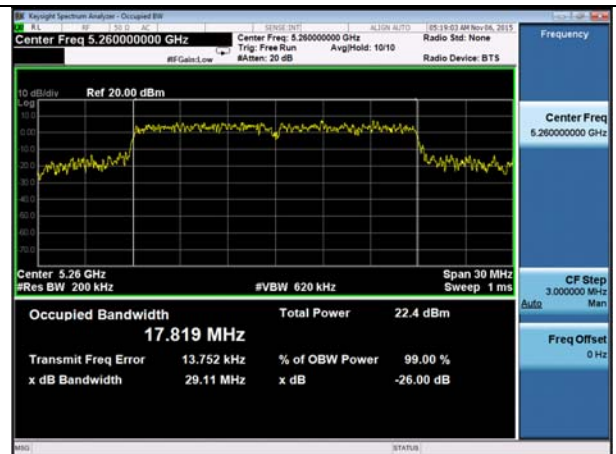
26dB BW -802.11a 5260MHz



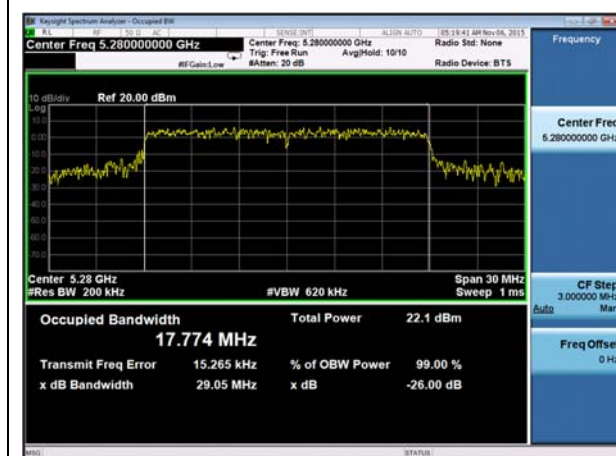
26dB BW -802.11a 5280MHz



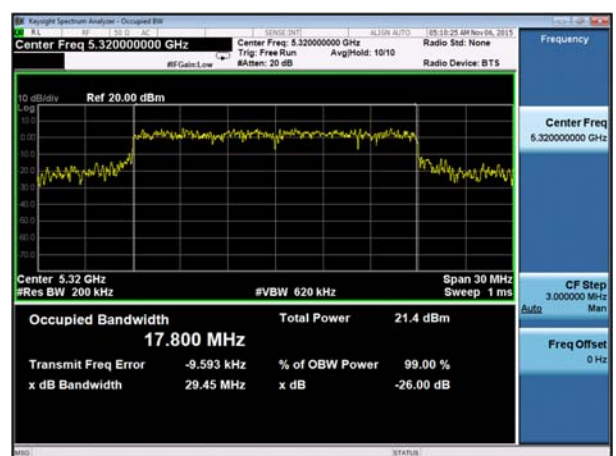
26dB BW -802.11a 5320MHz



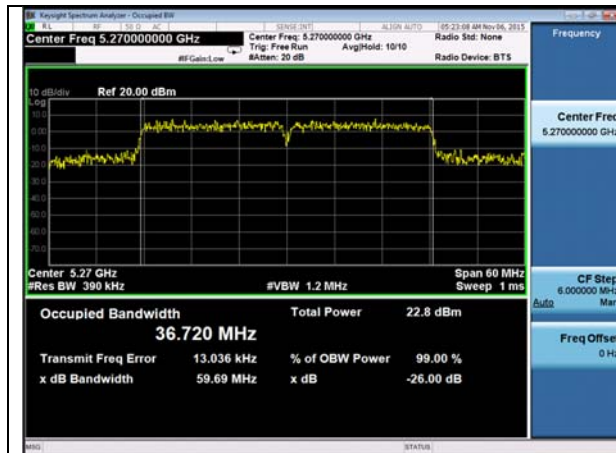
26dB BW -802.11n-20M 5260MHz



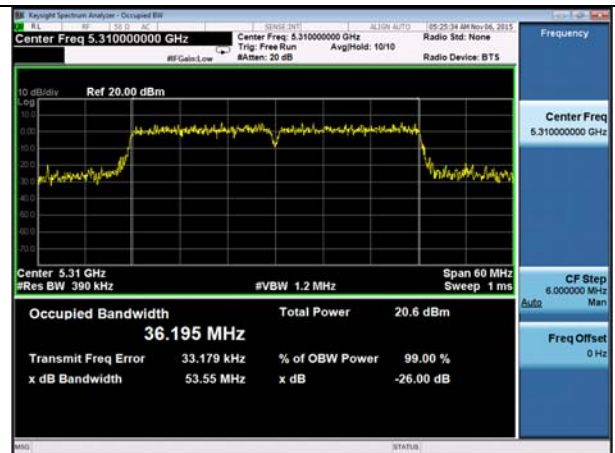
26dB BW -802.11n-20M 5280MHz



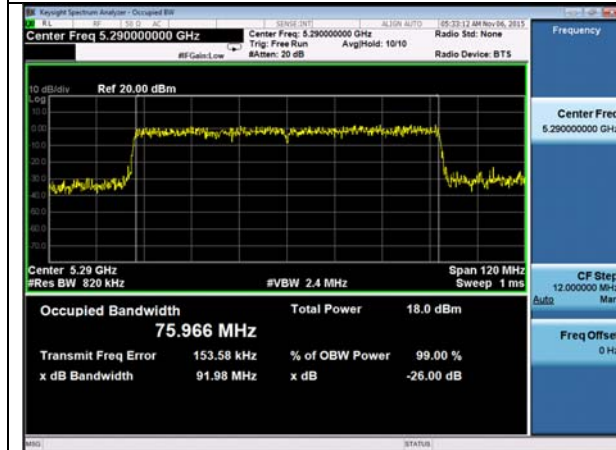
26dB BW -802.11n-20M 5320MHz



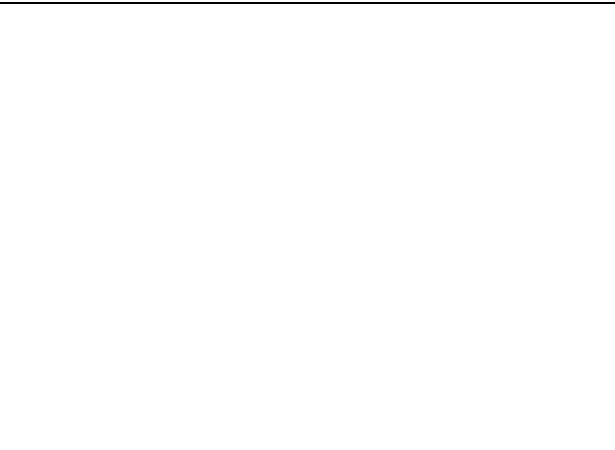
26dB BW -802.11n-40M 5270MHz



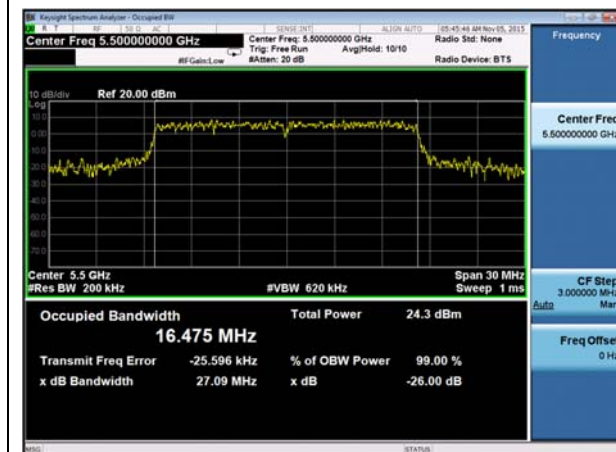
26dB BW -802.11n-40M 5310MHz



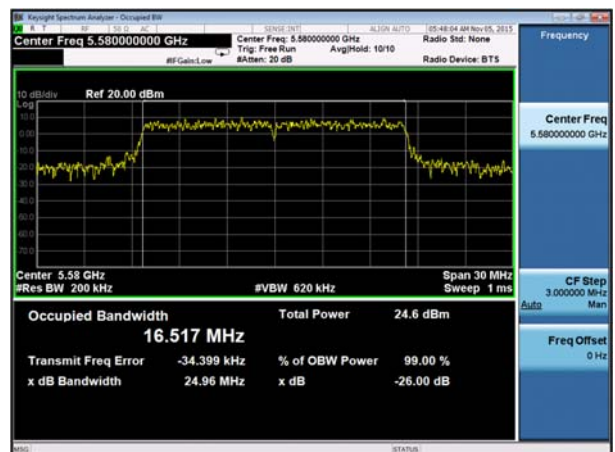
26dB BW -802.11ac-80M 5290MHz



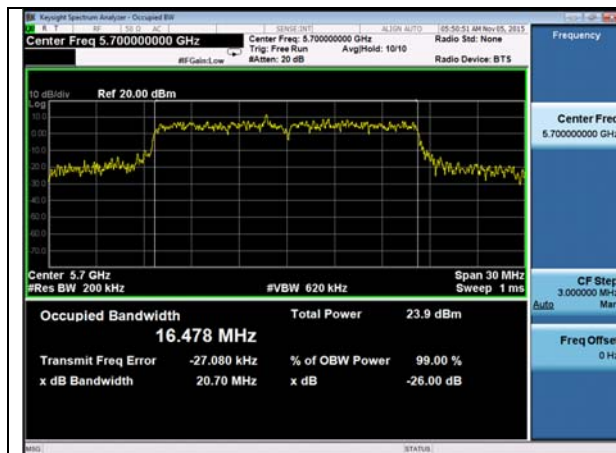
-



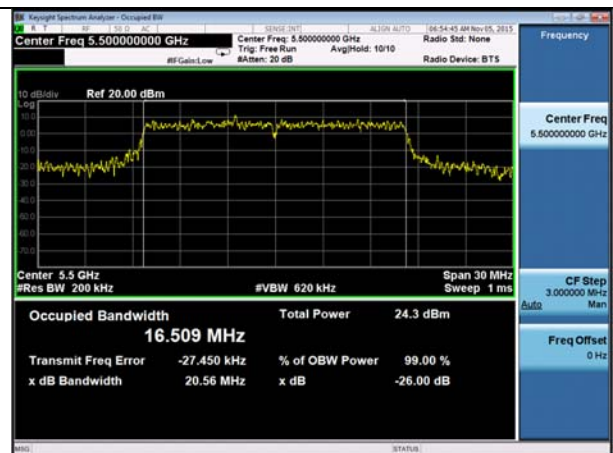
26dB BW -802.11a 5500MHz



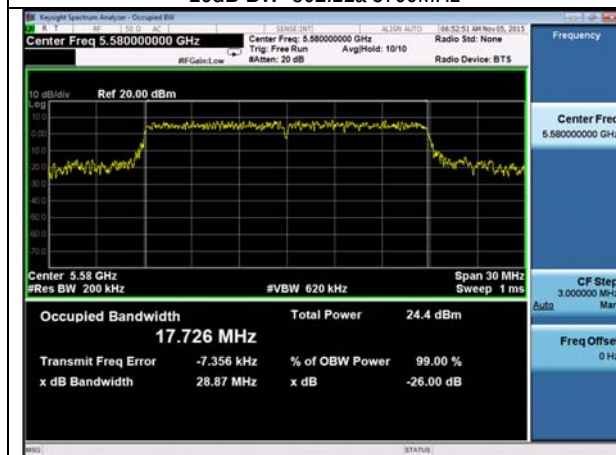
26dB BW -802.11a 5580MHz



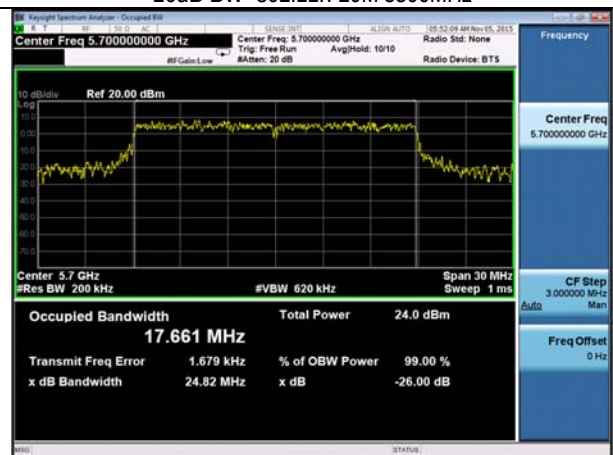
26dB BW -802.11a 5700MHz



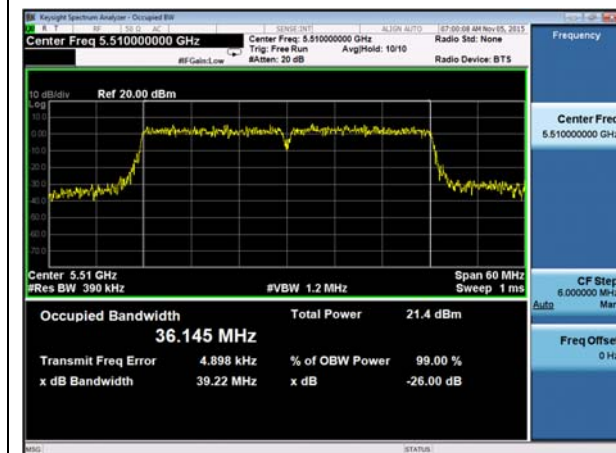
26dB BW -802.11n-20M 5500MHz



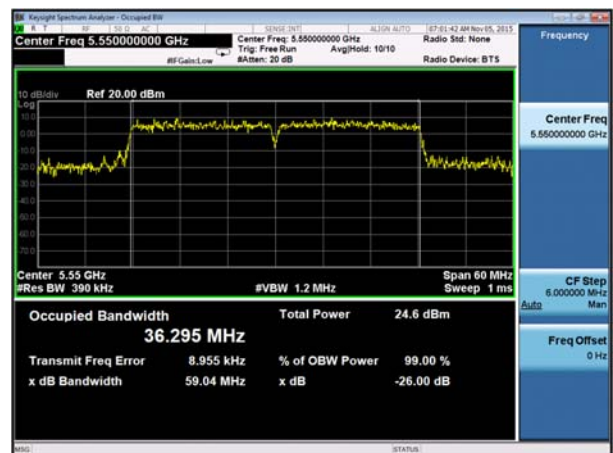
26dB BW -802.11n-20M 5580MHz



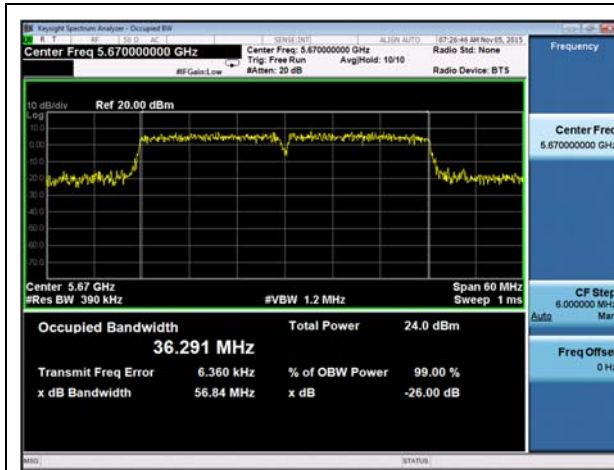
26dB BW -802.11n-20M 5700MHz



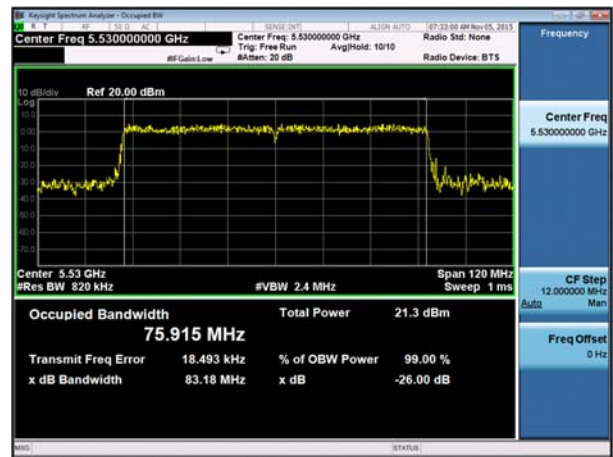
26dB BW -802.11n-40M 5510MHz



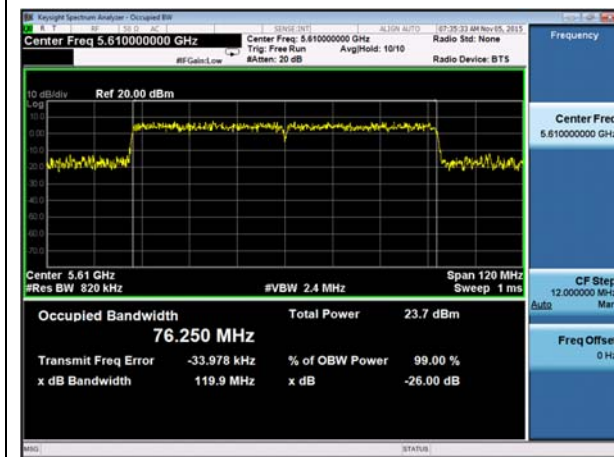
26dB BW -802.11n-40M 5550MHz



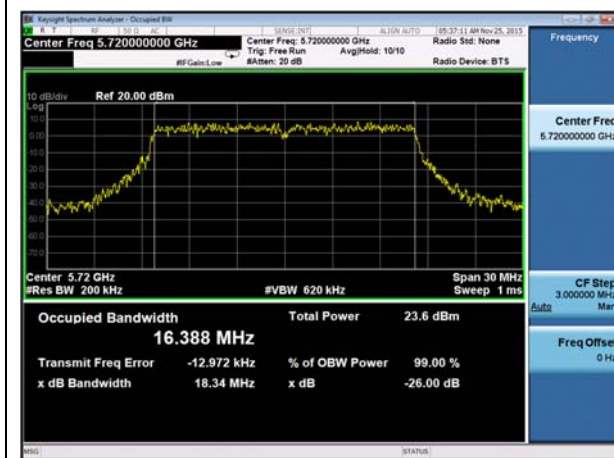
26dB BW -802.11n-40M 5670MHz



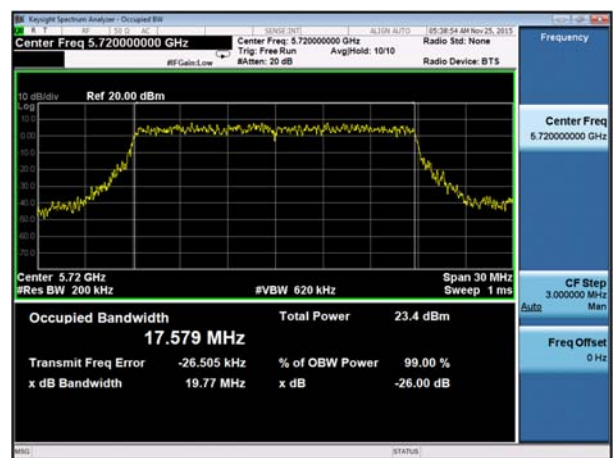
26dB BW -802.11ac-80M 5530MHz



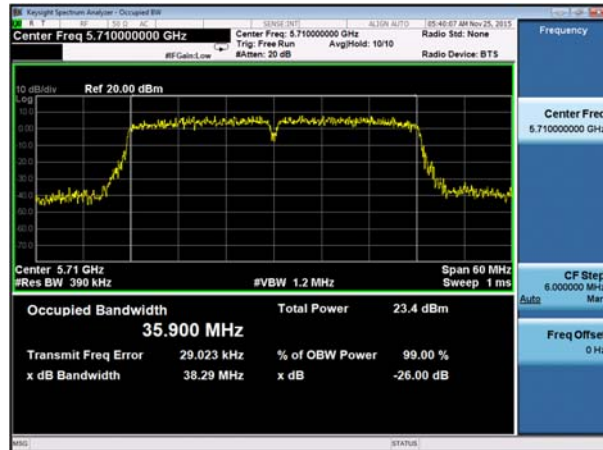
26dB BW -802.11ac-80M 5610MHz



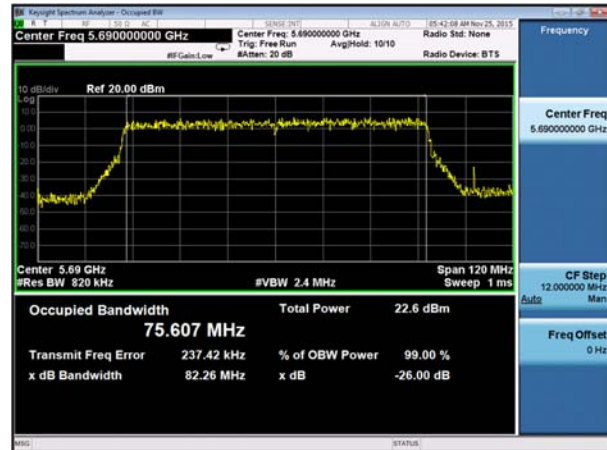
26dB BW -802.11a CROSSOVER 5720MHz



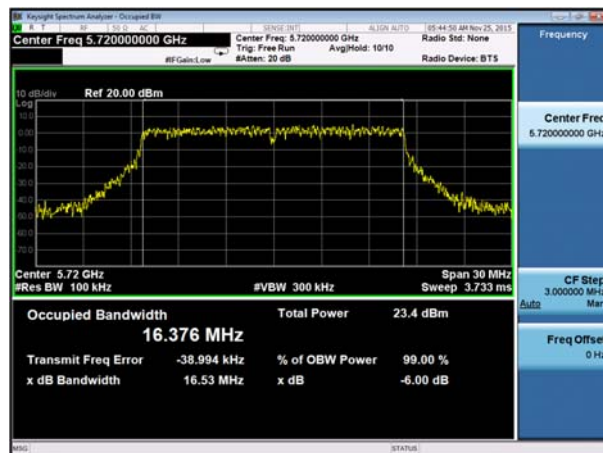
26dB BW -802.11n-20M 5720MHz



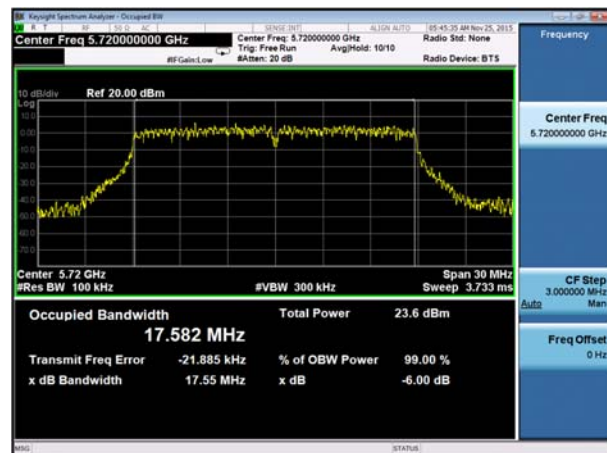
26dB BW -802.11n-40M CROSSOVER 5710MHz



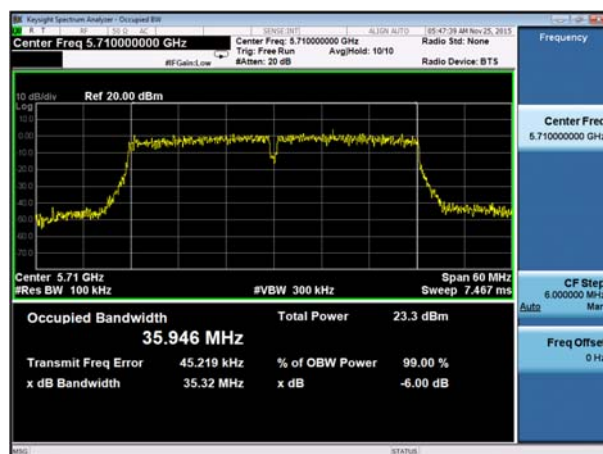
26dB BW -802.11ac CROSSOVER 5690MHz



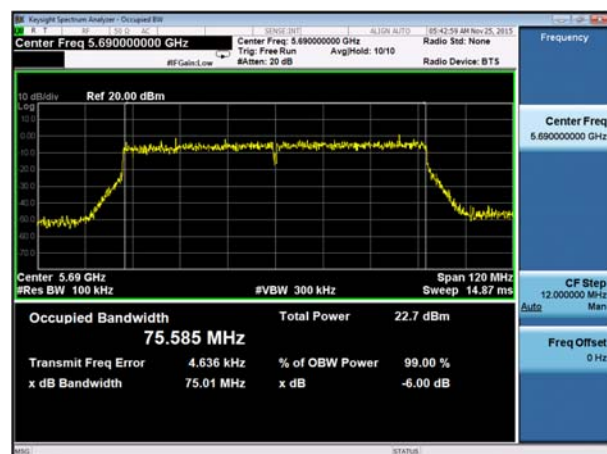
6dB BW -802.11a CROSSOVER 5720MHz



6dB BW -802.11n-20M 5720MHz



6dB BW -802.11n-40M CROSSOVER 5710MHz



6dB BW -802.11ac CROSSOVER 5690MHz

10.3 Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.407	a)(1)(i)	For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).	☐
	a)(1)(ii)	For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.	☐
	a)(1)(iii)	For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.	☐
	a)(1)(iv)	For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.	☐
	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.	☒
	a)(3)	For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.	☒
Test Setup	 Power Meter		
Test Procedure	789033 D02 General UNII Test Procedures New Rules v01 <u>Measurement using a Power Meter (PM)</u> Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required. - Connect EUT's RF output power to power meter - Set EUT to be continuous transmission mode - Measurement the average output power using power meter and record the result - Repeat above steps for different test channel and other modulation type.		
Test Date	11/01/2015 – 11/20/2015	Environmental condition	Temperature 21°C Relative Humidity 40% Atmospheric Pressure 1019mbar
Remark	The EUT has two antennas which are cross-polarized, the directional gain=individual gain of each antenna =3dBi.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A
Test Plot ☐ Yes (See below) ☒ N/A

Output Power measurement result for 5.3GHz

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined Power		
Output	802.11a	5260	Low	19.10	17.90	21.55	24	Pass
Output	802.11a	5280	Mid	18.86	17.94	21.43	24	Pass
Output	802.11a	5320	High	18.74	18.66	21.71	24	Pass
Output	802.11n-20M	5260	Low	19.17	17.90	21.59	24	Pass
Output	802.11n-20M	5280	Mid	18.88	17.98	21.46	24	Pass
Output	802.11n-20M	5320	High	18.77	18.73	21.76	24	Pass
Output	802.11n-40M	5270	Low	19.79	18.74	22.31	24	Pass
Output	802.11n-40M	5310	High	15.28	14.43	17.89	24	Pass
Output	802.11ac-80M	5290	-	12.66	11.44	15.10	24	Pass

Output Power measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined Power		
Output	802.11a	5500	Low	19.82	18.36	22.16	24	Pass
Output	802.11a	5580	Mid	19.47	18.55	22.04	24	Pass
Output	802.11a	5700	High	18.85	18.55	21.71	24	Pass
Output	802.11n-20M	5500	Low	19.95	18.44	22.27	24	Pass
Output	802.11n-20M	5580	Mid	19.51	18.65	22.11	24	Pass
Output	802.11n-20M	5700	High	18.91	18.93	21.93	24	Pass
Output	802.11n-40M	5510	Low	17.74	16.37	20.12	24	Pass
Output	802.11n-40M	5550	Mid	20.62	20.80	23.72	24	Pass
Output	802.11n-40M	5670	High	21.00	20.92	23.97	24	Pass
Output	802.11ac-80M	5530	Low	15.51	14.14	17.89	24	Pass
Output	802.11ac-80M	5610	High	20.62	20.27	23.46	24	Pass

Output Power measurement result for CROSSOVER channels (in band 5470-5725MHz)

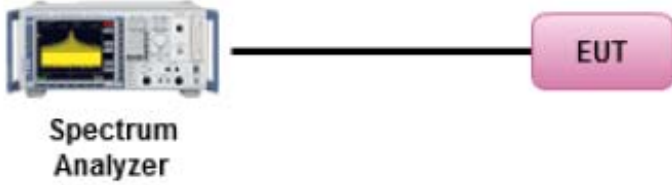
Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined Power		
Output	802.11a	5720	CROSSBAND	18.44	18.29	21.38	24	Pass
Output	802.11n-20M	5720	CROSSBAND	18.51	18.53	21.53	24	Pass
Output	802.11n-40M	5710	CROSSBAND	20.24	20.35	23.31	24	Pass
Output	802.11ac-80M	5690	CROSSBAND	19.77	19.63	22.71	24	Pass

Output Power measurement result for CROSSOVER channels (in band 5725-5850MHz)

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined Power		
Output	802.11a	5720	CROSSBAND	18.44	18.29	21.38	30	Pass
Output	802.11n-20M	5720	CROSSBAND	18.51	18.53	21.53	30	Pass
Output	802.11n-40M	5710	CROSSBAND	20.24	20.35	23.31	30	Pass
Output	802.11ac-80M	5690	CROSSBAND	19.77	19.63	22.71	30	Pass

10.4 Peak Spectral Density

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.407	a)(1)(i)	For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.	☐
	a)(1)(ii)	For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.	☐
	a)(2)	For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.	☒
	a)(3)	For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.	☒
Test Setup			
Test Procedure	789033 D02 General UNII Test Procedures New Rules v01, II.F. Method SA-1 <u>Maximum spectral density measurement procedure</u> - Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal. - Set RBW = 1 MHz - Set VBW ≥ 3 MHz - Detector = RMS. - Sweep time = auto couple. - Trace mode = max hold. - Trace average at least 100 traces in power averaging - Use the peak marker function to determine the maximum amplitude level within the RBW. Apply correction to the result if different RBW is used.		
Test Date	11/01/2015 – 11/20/2015	Environmental condition	Temperature 22°C Relative Humidity 42% Atmospheric Pressure 1020mbar
Remark	The EUT has two antennas which are cross-polarized, the directional gain=individual gain of each antenna =3dBi.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

PSD measurement result for 5.3GHz

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/MHz)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined PSD		
PSD	802.11a	5260	Low	8.02	6.85	10.48	11	Pass
PSD	802.11a	5280	Mid	7.72	6.68	10.24	11	Pass
PSD	802.11a	5320	High	7.71	7.46	10.60	11	Pass
PSD	802.11n-20M	5260	Low	7.66	6.56	10.16	11	Pass
PSD	802.11n-20M	5280	Mid	7.48	6.64	10.09	11	Pass
PSD	802.11n-20M	5320	High	7.49	7.21	10.36	11	Pass
PSD	802.11n-40M	5270	Low	5.37	4.24	7.85	11	Pass
PSD	802.11n-40M	5310	Mid	1.05	-0.33	3.42	11	Pass
PSD	802.11ac-80M	5290	High	-4.68	-6.04	-2.30	11	Pass

PSD measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/MHz)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined PSD		
PSD	802.11a	5500	Low	8.39	7.16	10.83	11	Pass
PSD	802.11a	5580	Mid	8.21	7.32	10.80	11	Pass
PSD	802.11a	5700	High	7.53	7.3	10.43	11	Pass
PSD	802.11n-20M	5500	Low	8.39	6.92	10.73	11	Pass
PSD	802.11n-20M	5580	Mid	8.08	7.14	10.65	11	Pass
PSD	802.11n-20M	5700	High	7.31	7.73	10.54	11	Pass
PSD	802.11n-40M	5510	Low	3.47	1.71	5.69	11	Pass
PSD	802.11n-40M	5550	Mid	7.05	7.00	10.04	11	Pass
PSD	802.11n-40M	5670	High	6.35	6.23	9.30	11	Pass
PSD	802.11ac-80M	5530	Low	-2.22	-3.97	0.00	11	Pass
PSD	802.11ac-80M	5610	High	2.88	2.32	5.62	11	Pass

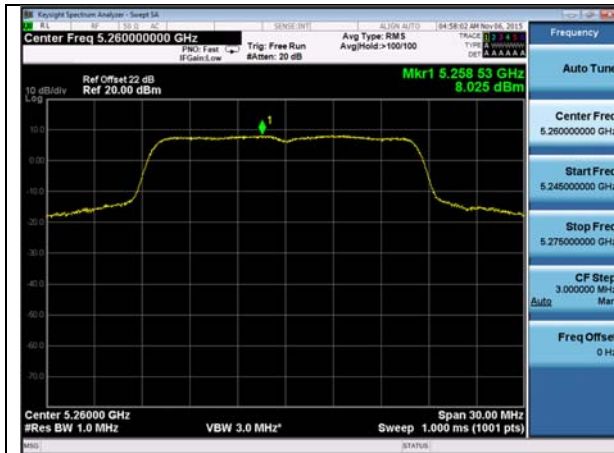
PSD measurement result for CROSSOVER channels (in band 5470-5725MHz)

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/MHz)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined PSD		
PSD	802.11a	5720	CROSSBAND	7.4	7.05	10.24	11	Pass
PSD	802.11n-20M	5720	CROSSBAND	7.02	7.08	10.06	11	Pass
PSD	802.11n-40M	5710	CROSSBAND	6.15	6.14	9.16	11	Pass
PSD	802.11ac-80M	5690	CROSSBAND	2.50	2.50	5.51	11	Pass

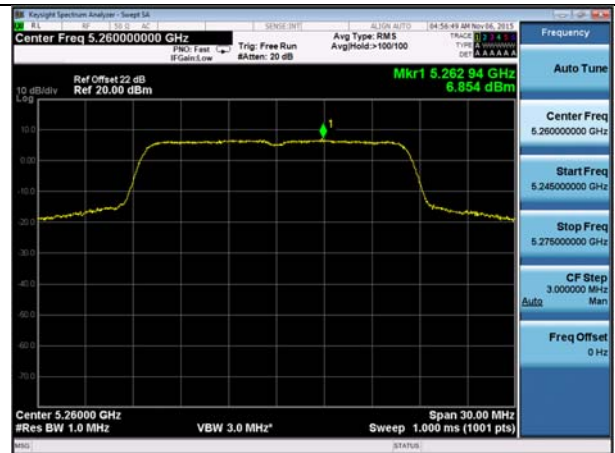
PSD measurement result for CROSSOVER channels (in band 5725-5850MHz)

Band	Test mode	Freq (MHz)	Conducted PSD (dBm/100kHz)			Corrected Level (dBm/500kHz)	Limit (dBm/500kHz)	Result
			Chain 0	Chain 1	Combined PSD			
cross	802.11a	5720	-1.54	-1.81	1.34	8.33	30	Pass
	802.11n-20M	5720	-1.79	-1.69	1.27	8.26	30	Pass
	802.11n-40M	5710	-2.94	-2.72	0.18	7.17	30	Pass
	802.11ac-80M	5690	-7.00	-7.32	-4.15	2.84	30	Pass

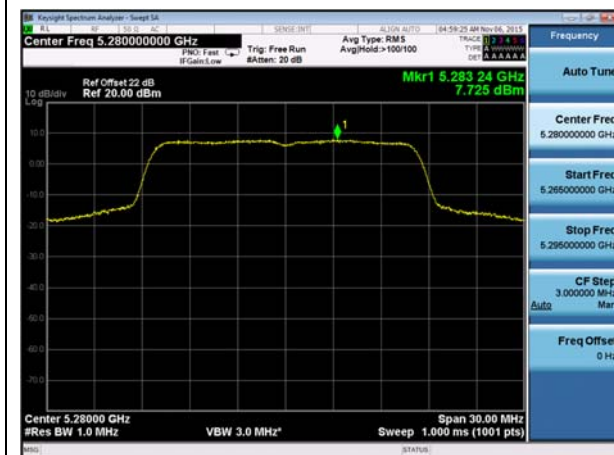
Test Plots



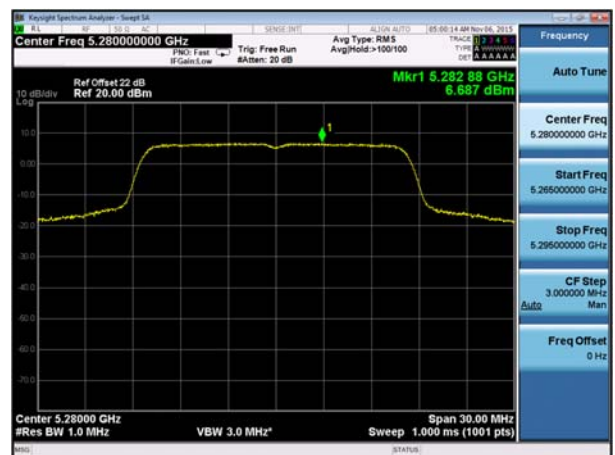
PSD-802.11a-5260M-chain0



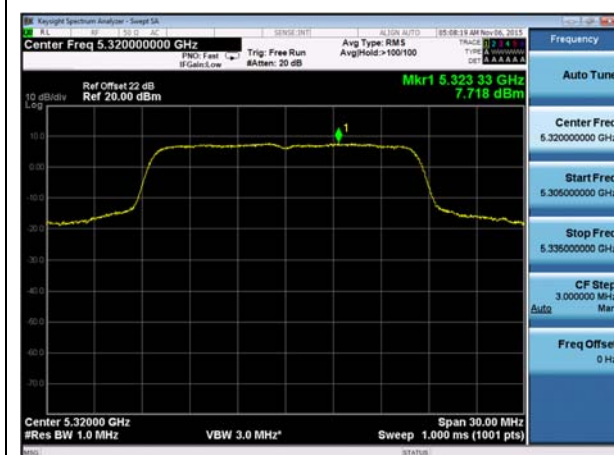
PSD-802.11a-5260M-chain1



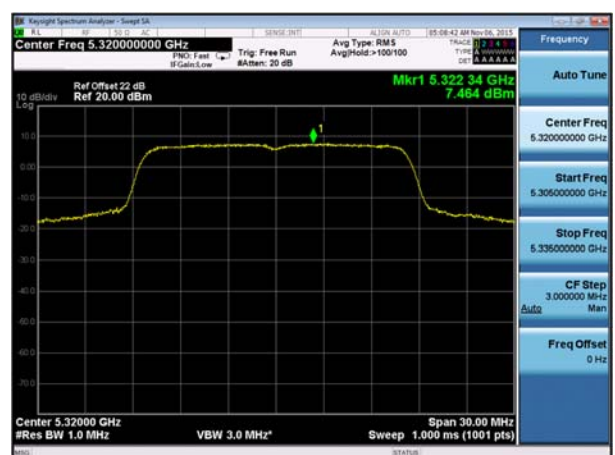
PSD-802.11a-5280M-chain0



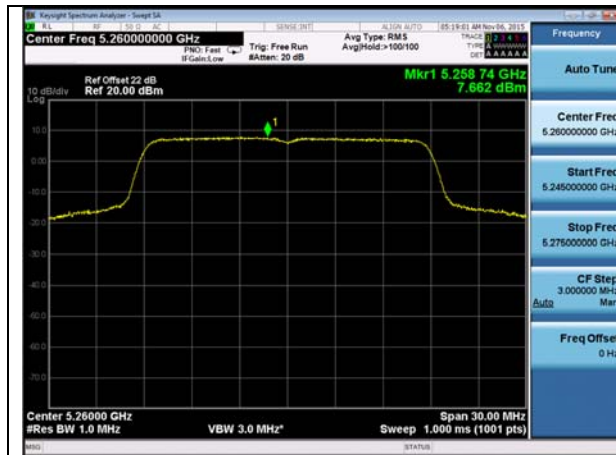
PSD-802.11a-5280M-chain1



PSD-802.11a-5320M-chain0



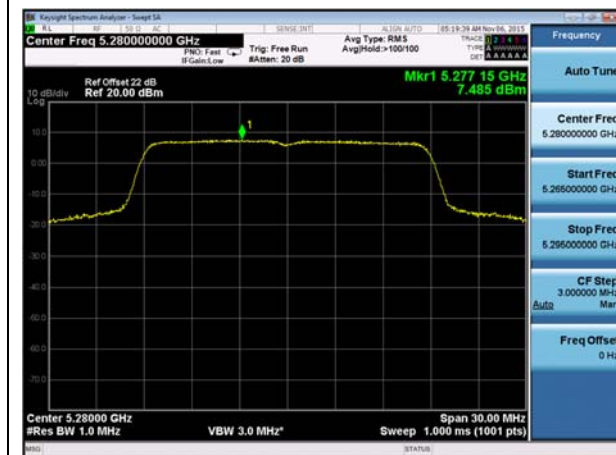
PSD-802.11a-5320M-chain1



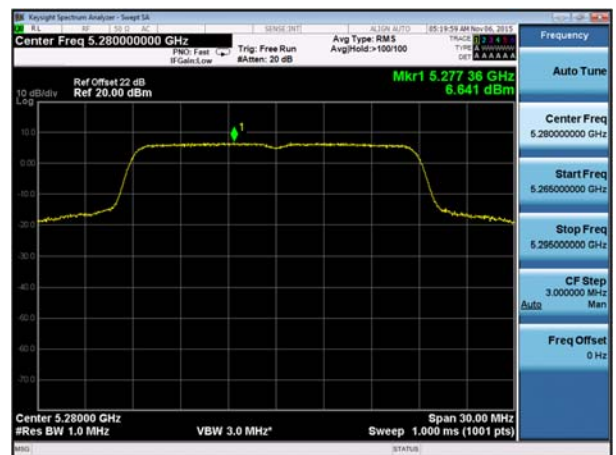
PSD-802.11n-20M-5260M-chain0



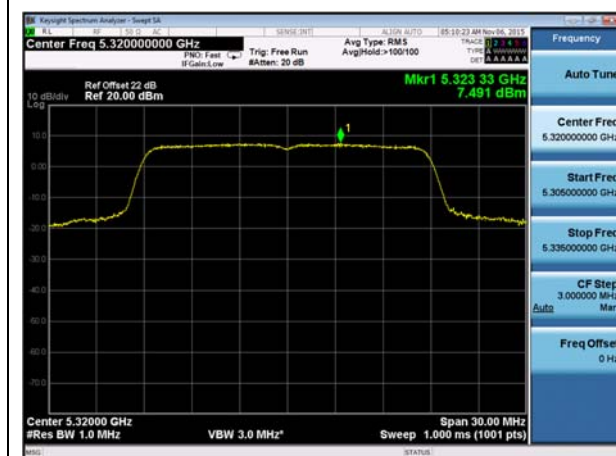
PSD-802.11n-20M-5260M-chain1



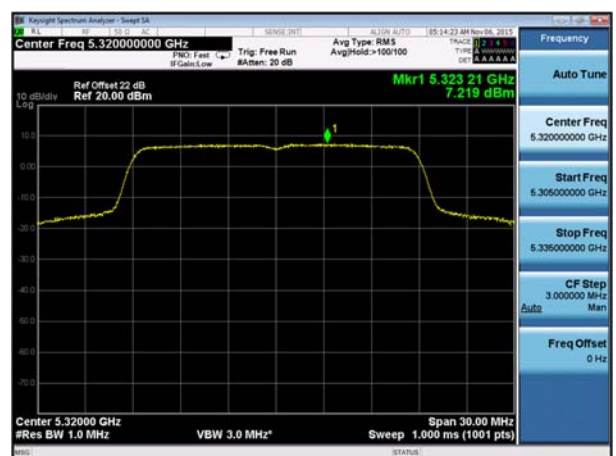
PSD-802.11n-20M-5280M-chain0



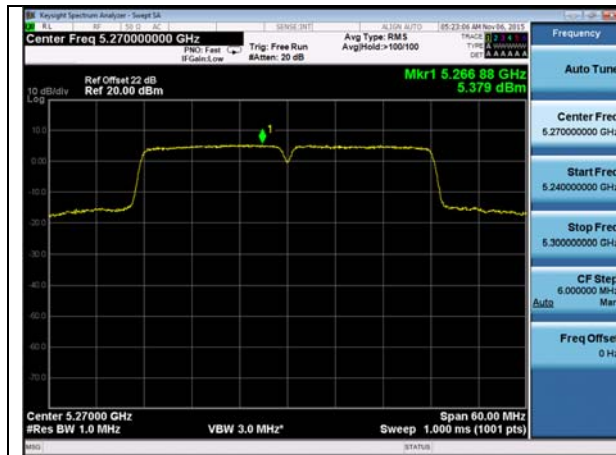
PSD-802.11n-20M-5280M-chain1



PSD-802.11n-20M-5320M-chain0



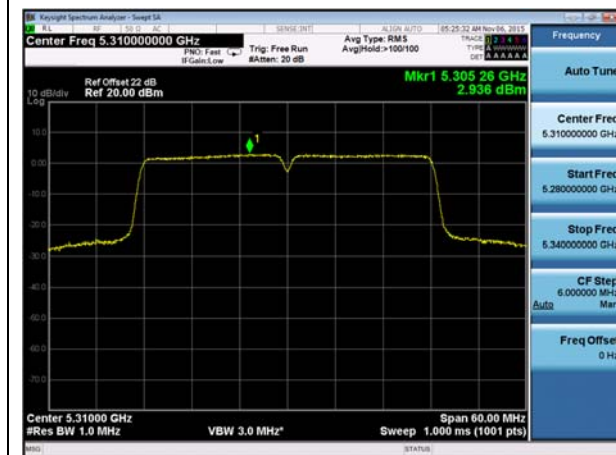
PSD-802.11n-20M-5320M-chain1



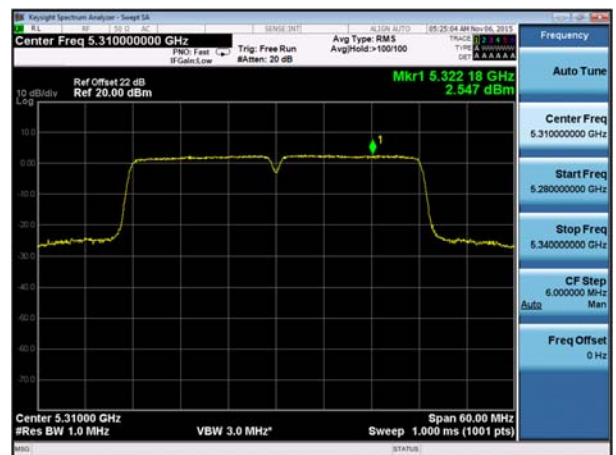
PSD-802.11n-40M-5270M-chain0



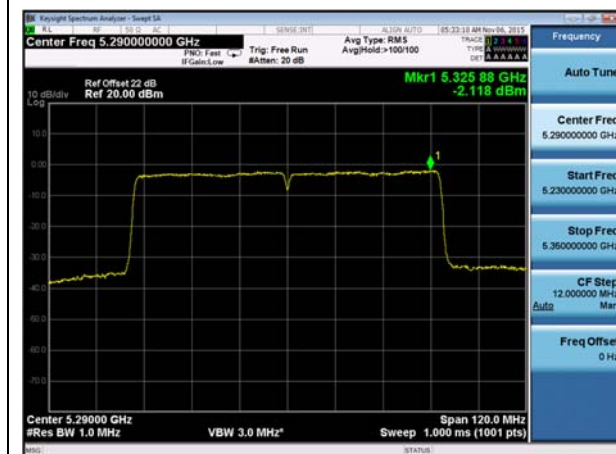
PSD-802.11n-40M-5270M-chain1



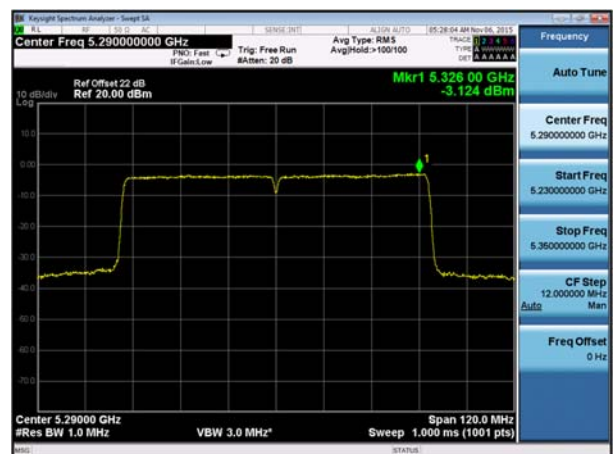
PSD-802.11n-40M-5310M-chain0



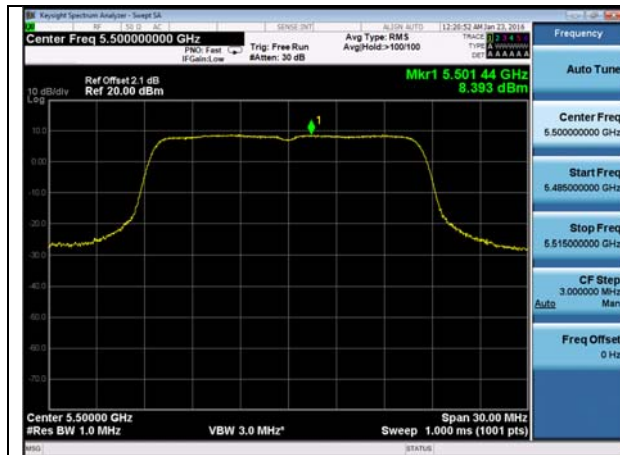
PSD-802.11n-40M-5310M-chain1



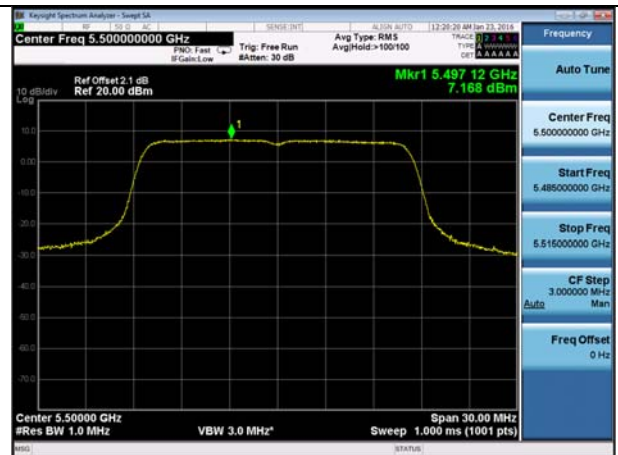
PSD-802.11ac-80M-5290M-chain0



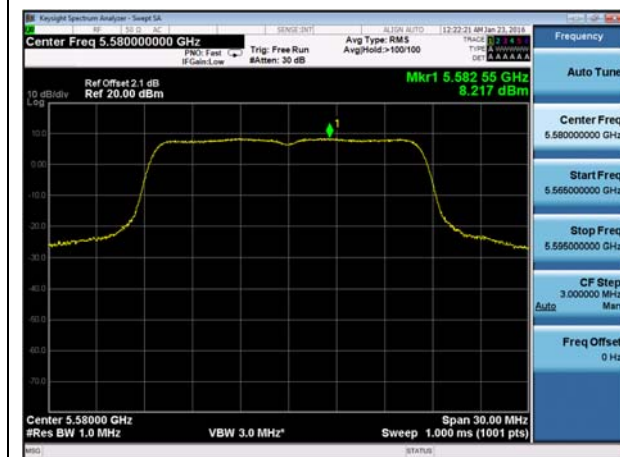
PSD-802.11ac-80M-5290M-chain1



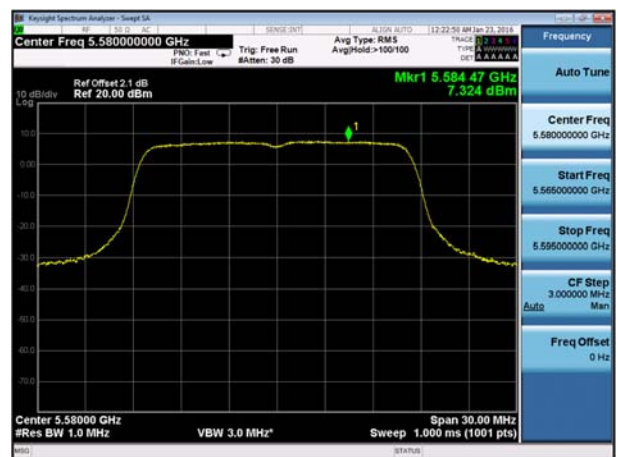
PSD-802.11a-5500M-chain0



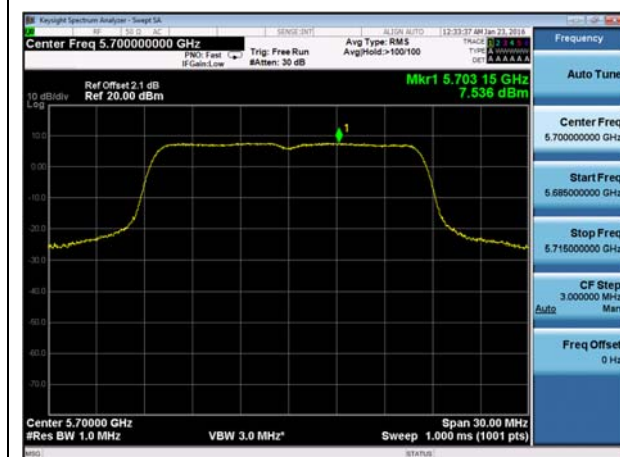
PSD-802.11a-5500M-chain1



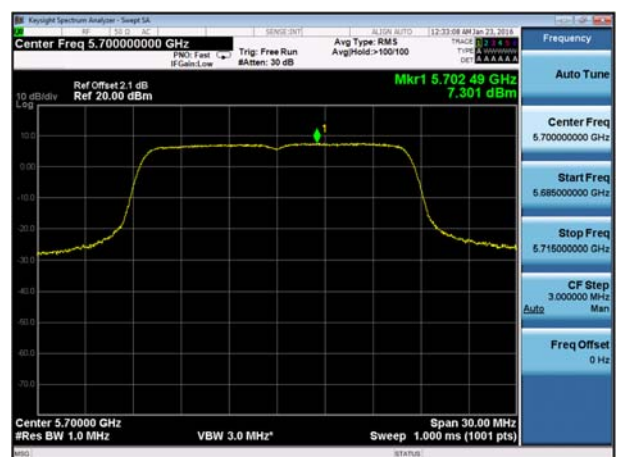
PSD-802.11a-5580M-chain0



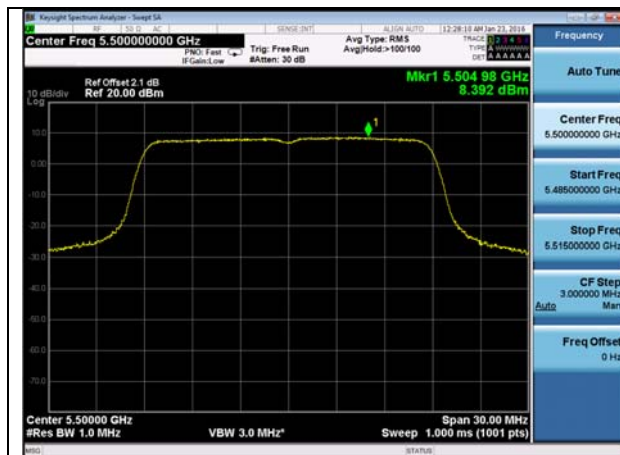
PSD-802.11a-5580M-chain1



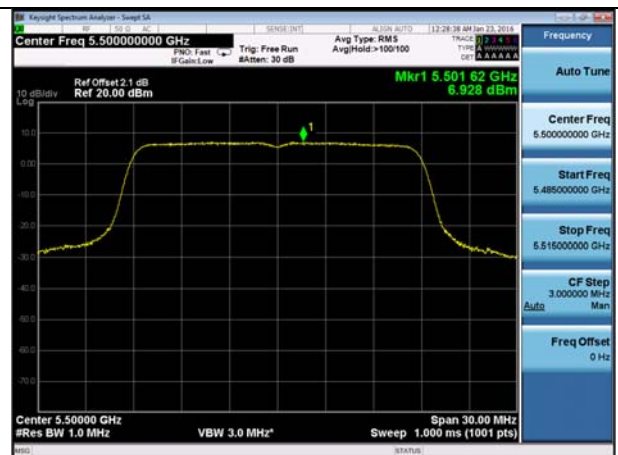
PSD-802.11a-5700M-chain0



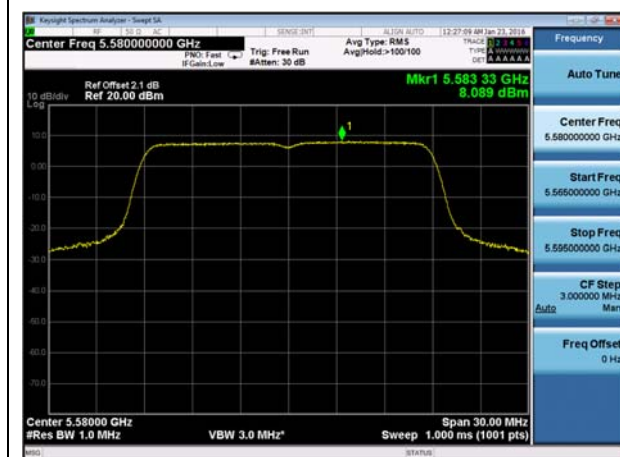
PSD-802.11a-5700M-chain1



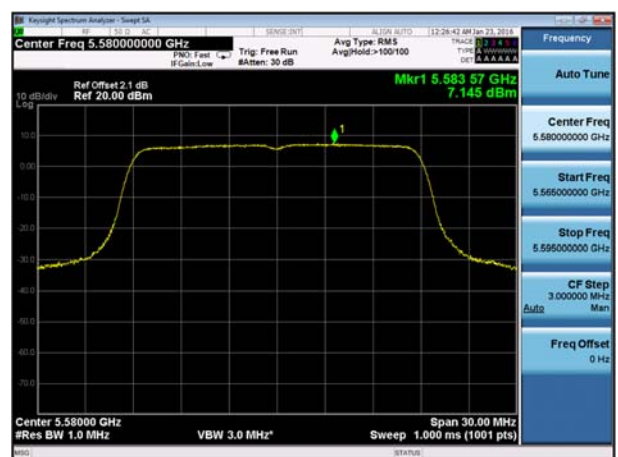
PSD-802.11n-20M-5500M-chain0



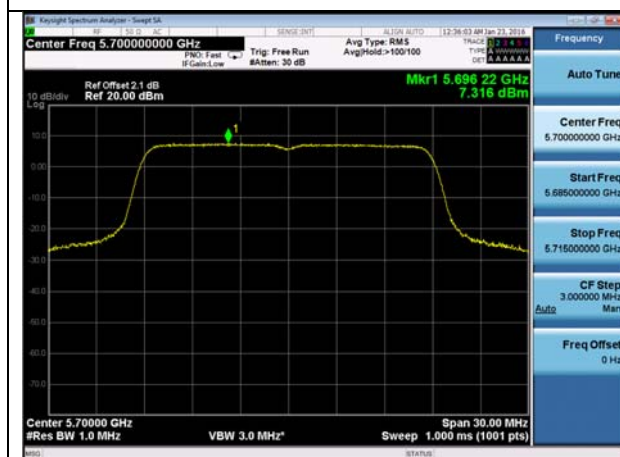
PSD-802.11n-20M-5500M-chain1



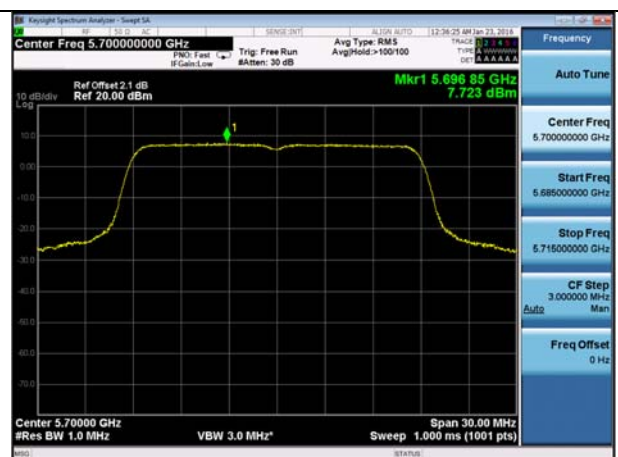
PSD-802.11n-20M-5580M-chain0



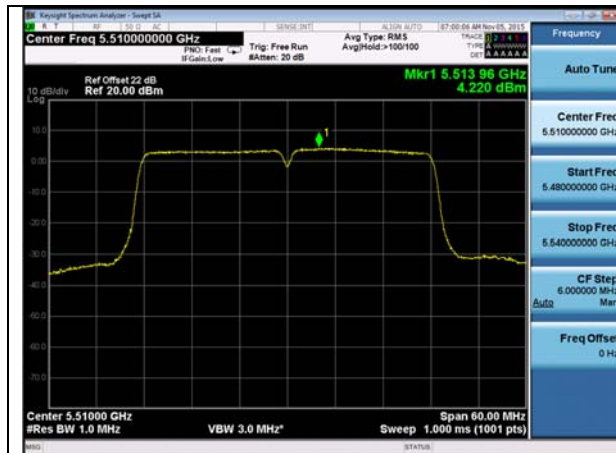
PSD-802.11n-20M-5580M-chain1



PSD-802.11n-20M-5700M-chain0



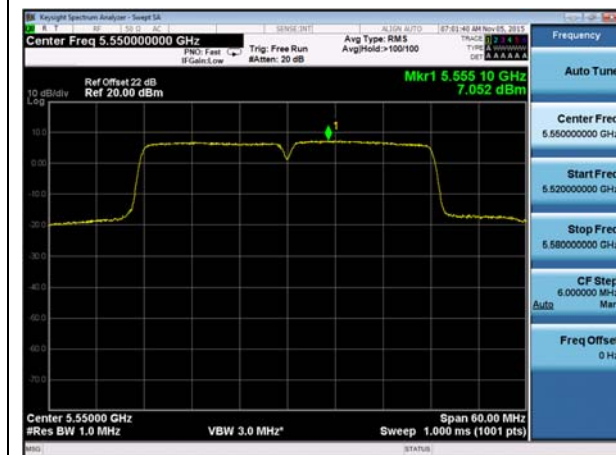
PSD-802.11n-20M-5700M-chain1



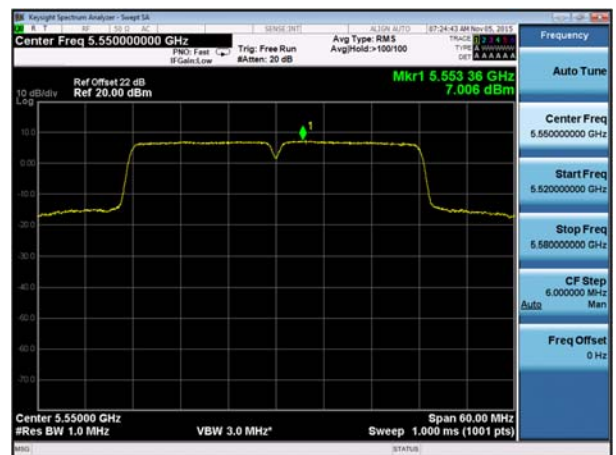
PSD-802.11n-40M-5510M-chain0



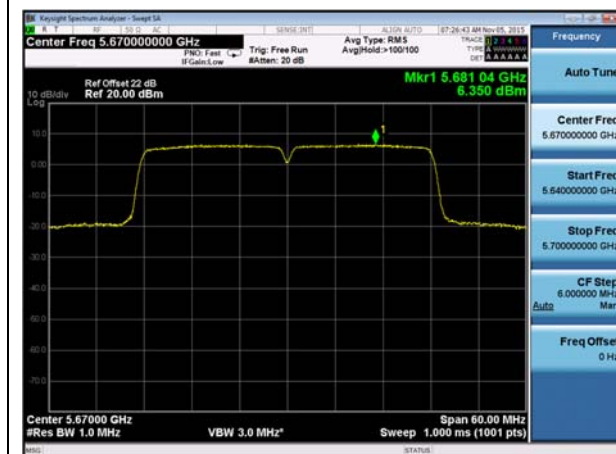
PSD-802.11n-40M-5510M-chain1



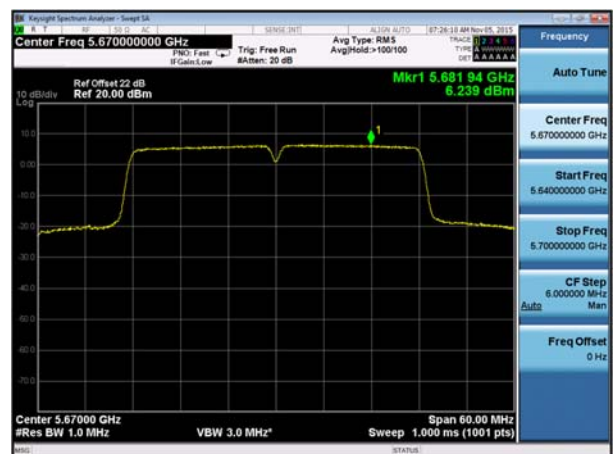
PSD-802.11n-40M-5550M-chain0



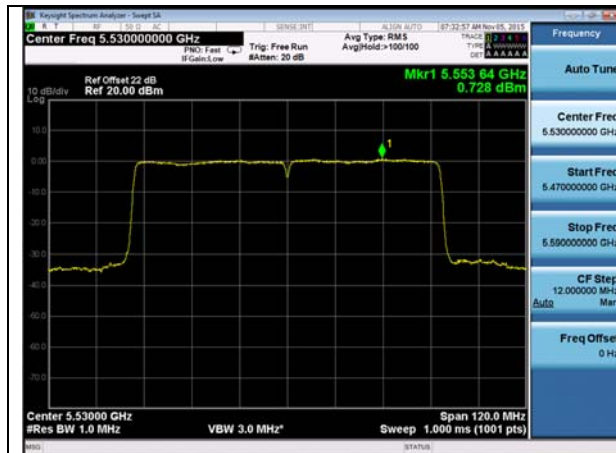
PSD-802.11n-40M-5550M-chain1



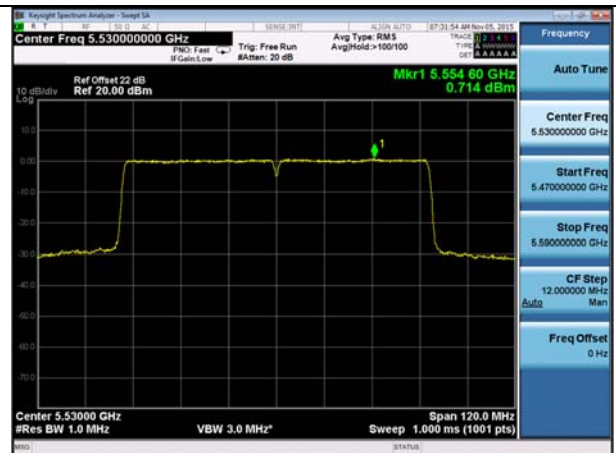
PSD-802.11n-40M-5670M-chain0



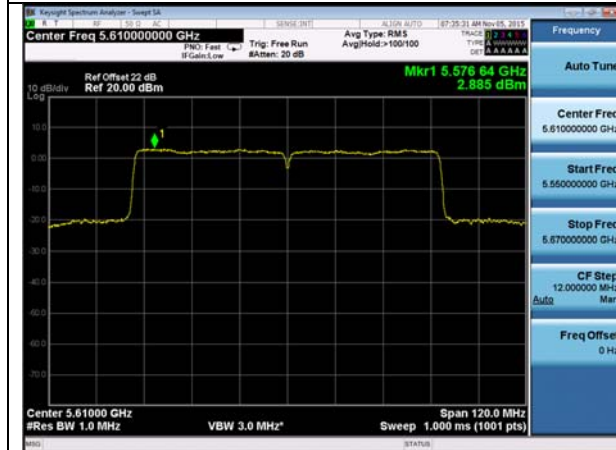
PSD-802.11n-40M-5670M-chain1



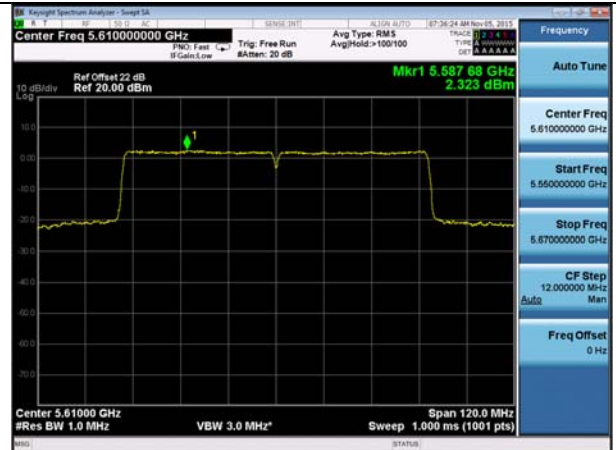
PSD-802.11ac-80M-5530M-chain0



PSD-802.11ac-80M-5530M-chain1

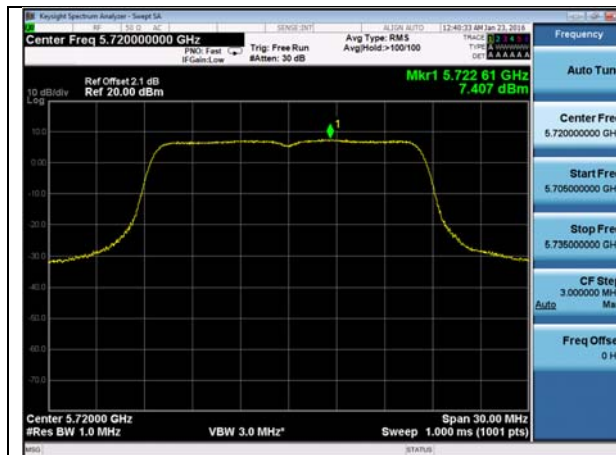


PSD-802.11ac-80M-5610M-chain0

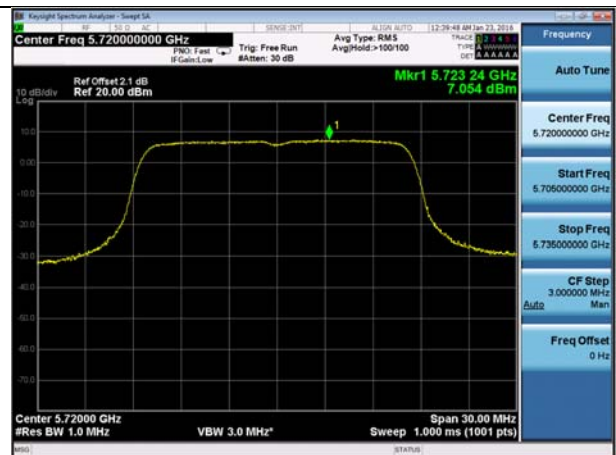


PSD-802.11ac-80M-5610M-chain1

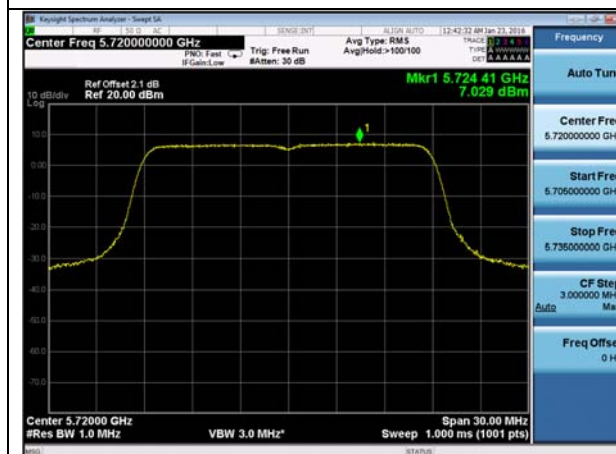
CrossBand, W56 procedure:



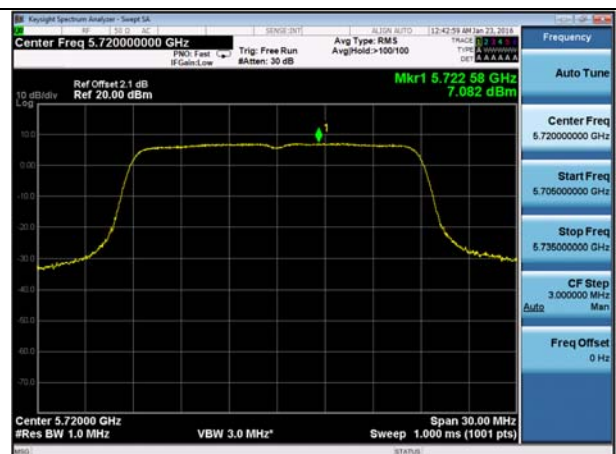
PSD-802.11a-CROSSBAND-5720M-chain0



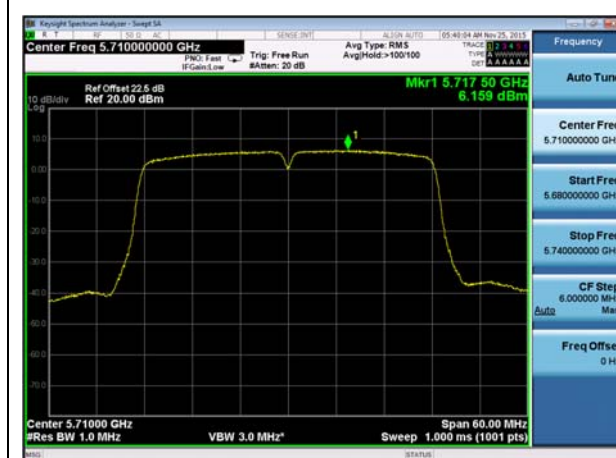
PSD-802.11a-CROSSBAND-5720M-chain1



PSD-802.11n-20M-CROSSBAND-5720M-chain0



PSD-802.11n-20M-CROSSBAND-5720M-chain1



PSD-802.11n-40M-CROSSBAND-5710M-chain0



PSD-802.11n-40M-CROSSBAND-5710M-chain1

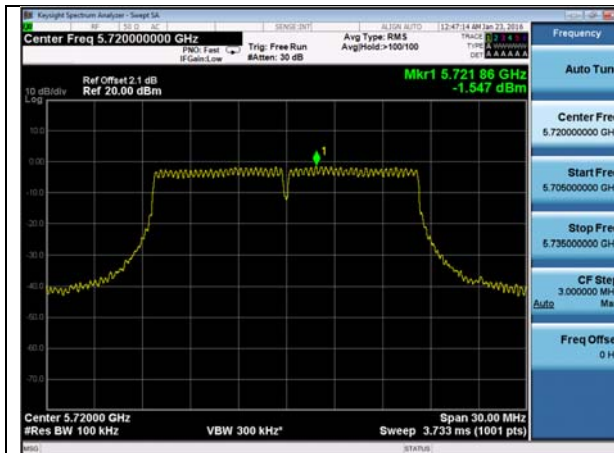


PSD-802.11ac-CROSSBAND-5690M-chain0

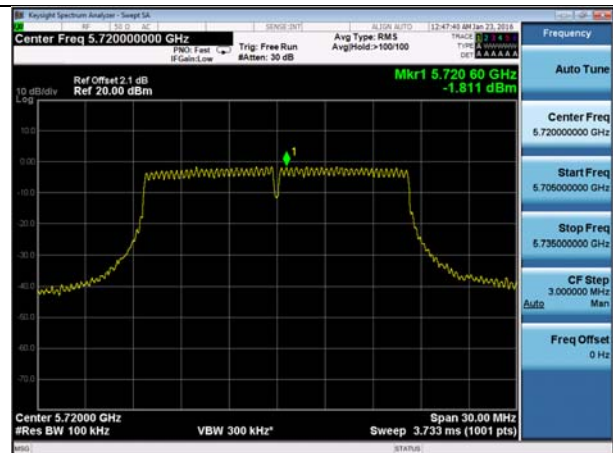


PSD-802.11ac-CROSSBAND-5690M-chain1

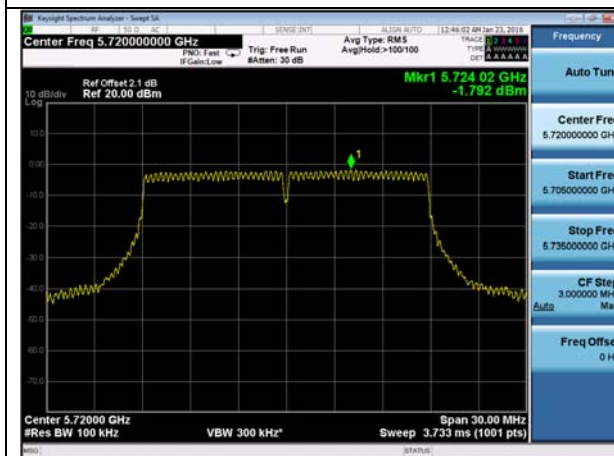
CrossBand, W58 procedure:



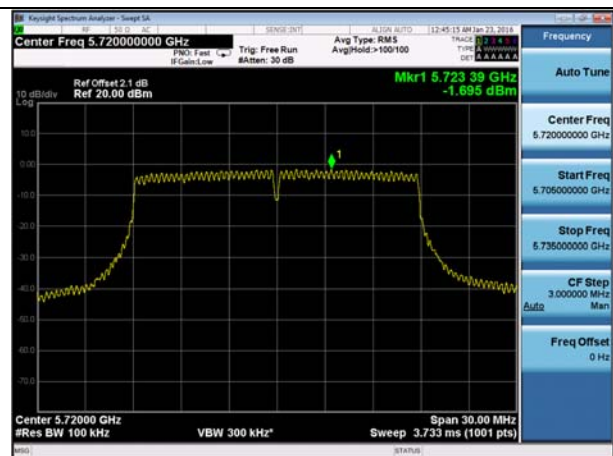
PSD-802.11a-CROSSBAND-5720M-chain0



PSD-802.11a-CROSSBAND-5720M-chain1



PSD-802.11n-20M-CROSSBAND-5720M-chain0



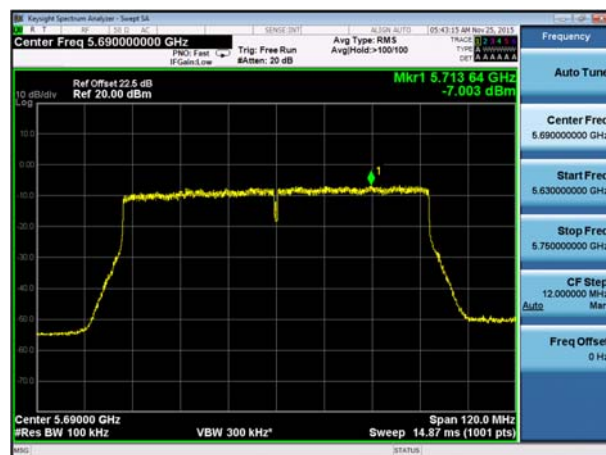
PSD-802.11n-20M-CROSSBAND-5720M-chain1



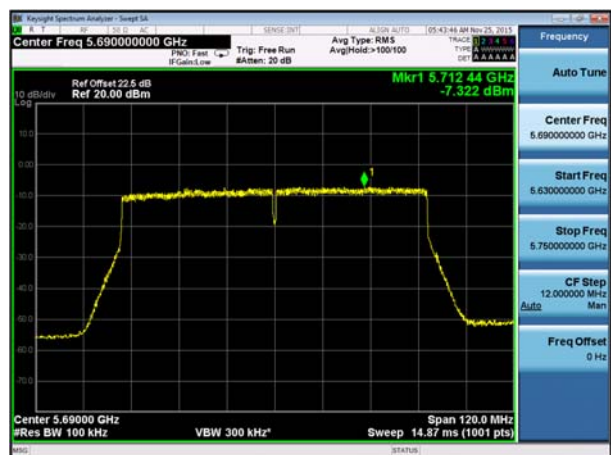
PSD-802.11n-40M-CROSSBAND-5710M-chain0



PSD-802.11n-40M-CROSSBAND-5710M-chain1



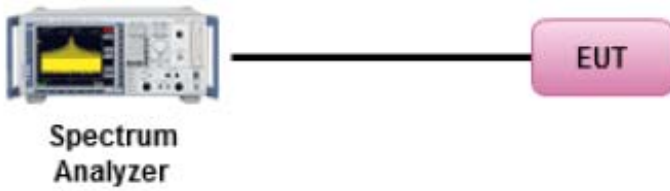
PSD-802.11ac-CROSSBAND-5690M-chain0



PSD-802.11ac-CROSSBAND-5690M-chain1

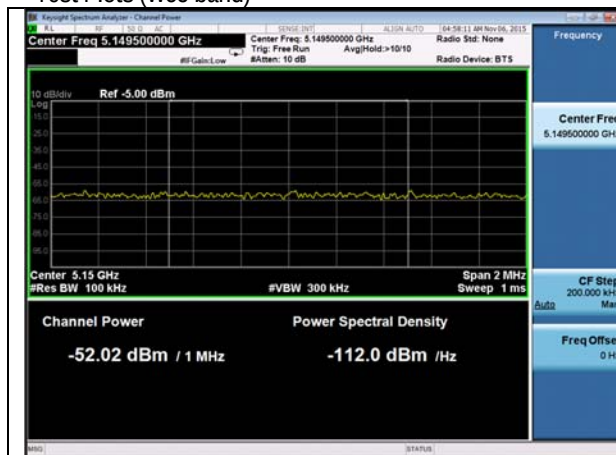
10.5 Band Edge Measurement

Requirement(s):

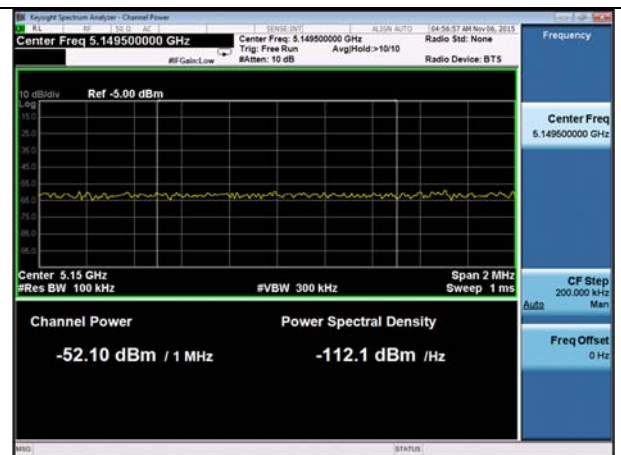
Spec	Item	Requirement	Applicable
47CFR§ 15.407(b)(2), 15.407(b)(6)	(1)	For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.	☒
	(2)	For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.	☐
	(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 EIRP of -27 dBm/MHz.	☐
	(4)	For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.	☒
Test Setup	 The diagram illustrates the test setup. On the left is a Spectrum Analyzer with a yellow signal trace on its screen. A black line connects the Spectrum Analyzer to a pink rounded rectangle on the right labeled 'EUT' (Equipment Under Test).		
Procedure	789033 D02 General UNII Test Procedures New Rules v01, II.F. Method SA-1 <u>Band Edge measurement:</u> - For average emissions measurements, follow the procedures described in section II.G.6., "Procedures for Average Unwanted Emissions Measurements above 1000 MHz", except for the following changes: - Set RBW=100kHz - Set VBW=100kHz - Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.		
Remark	Antenna gain was added to the offset.		
Result	☒ Pass ☐ Fail		

Test Data ☐ Yes (See below) ☒ N/A
 Test Plot ☒ Yes (See below) ☐ N/A

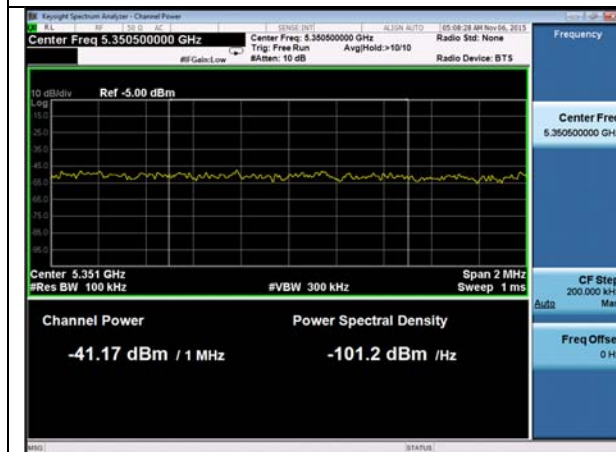
Test Plots (W53 band)



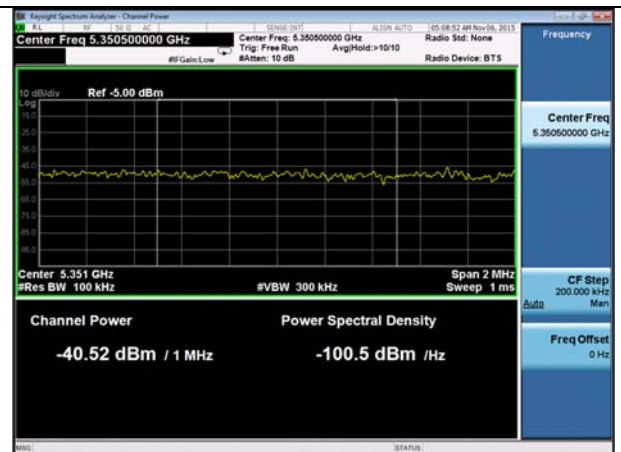
Band Edge-802.11a-5260M-chain0



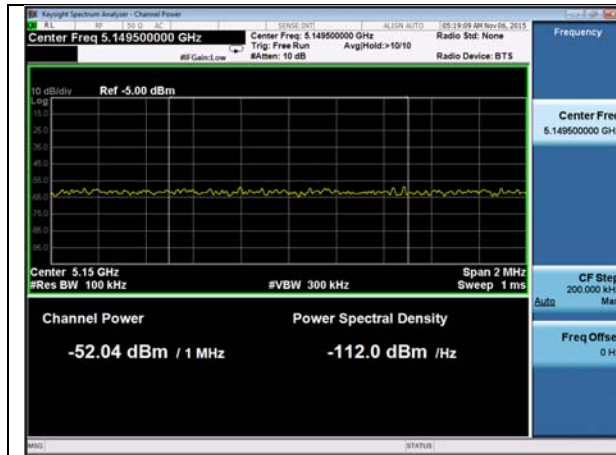
Band Edge-802.11a-5260M-chain1



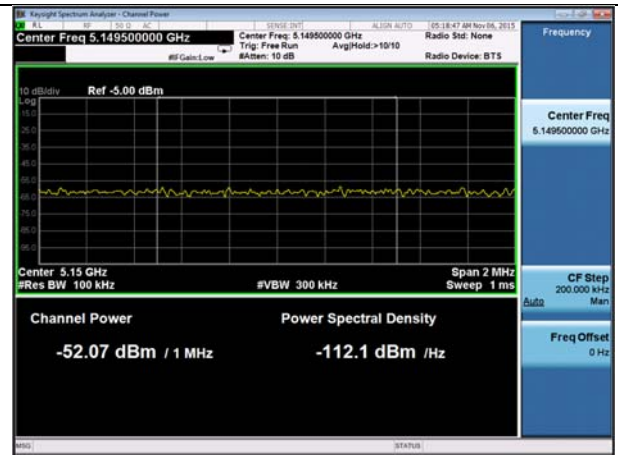
Band Edge -802.11a-5320M-chain0



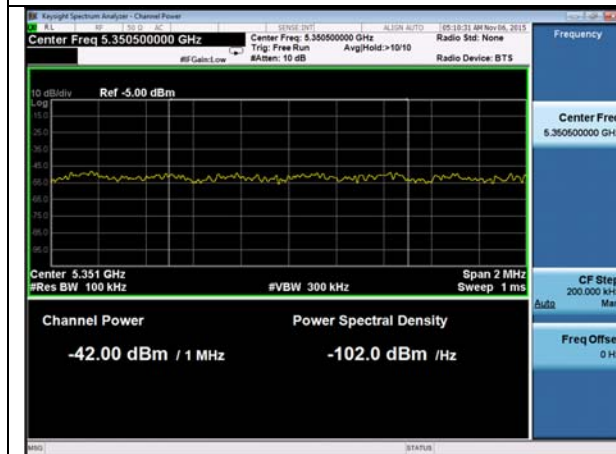
Band Edge -802.11a-5320M-chain1



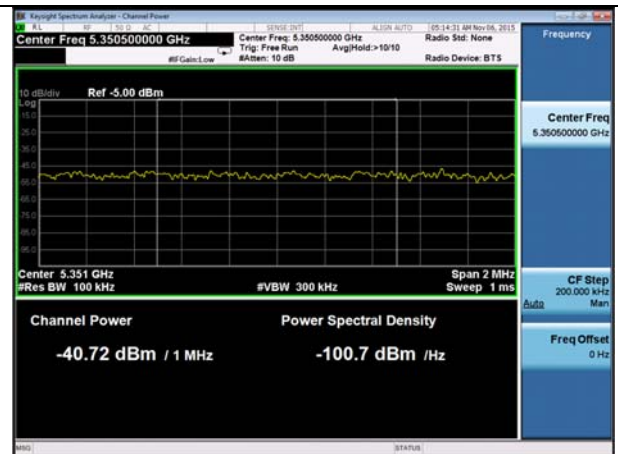
Band Edge -802.11n-20M-5260M-chain0



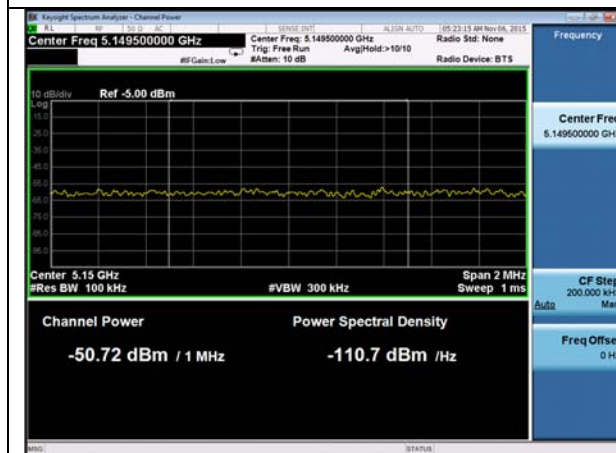
Band Edge -802.11n-20M-5260M-chain1



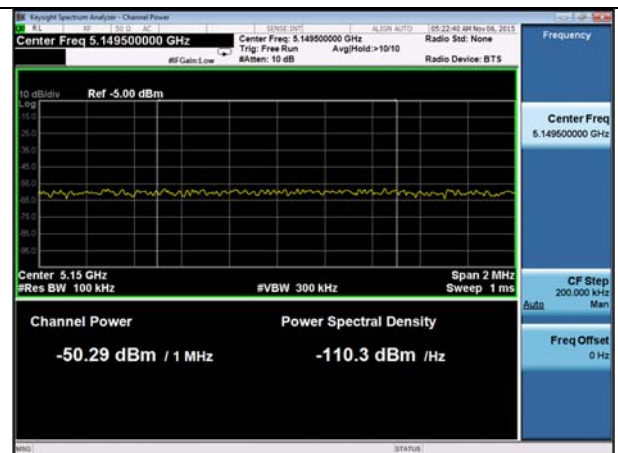
Band Edge -802.11n-20M-5320M-chain0



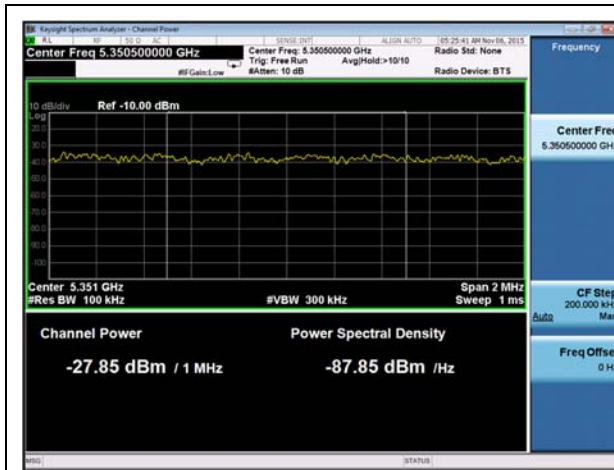
Band Edge -802.11n-20M-5320M-chain1



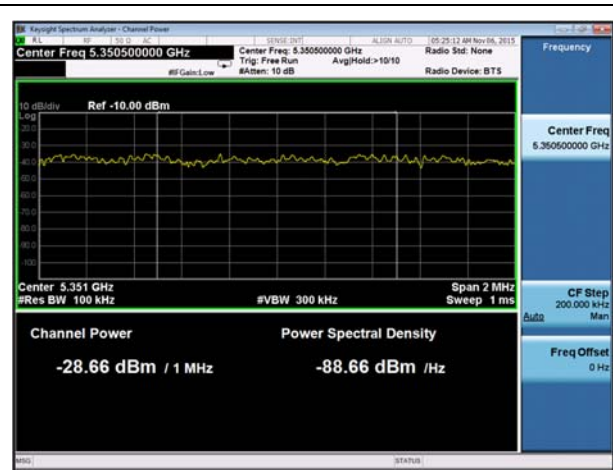
Band Edge -802.11n-40M-5270M-chain0



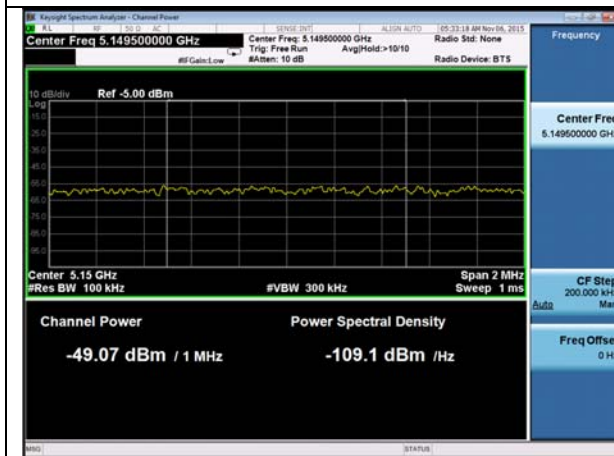
Band Edge -802.11n-40M-5270M-chain1



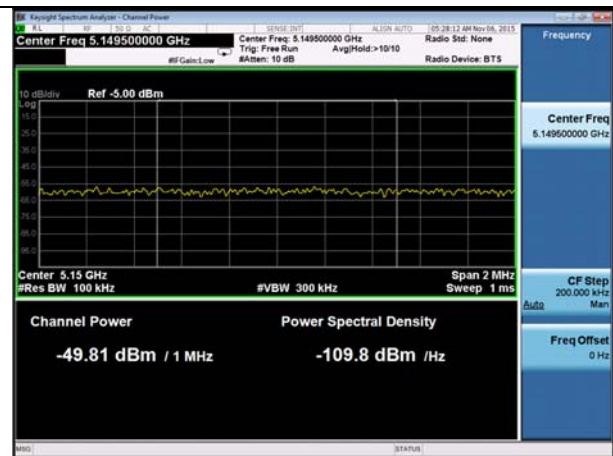
Band Edge -802.11n-40M-5310M-chain0



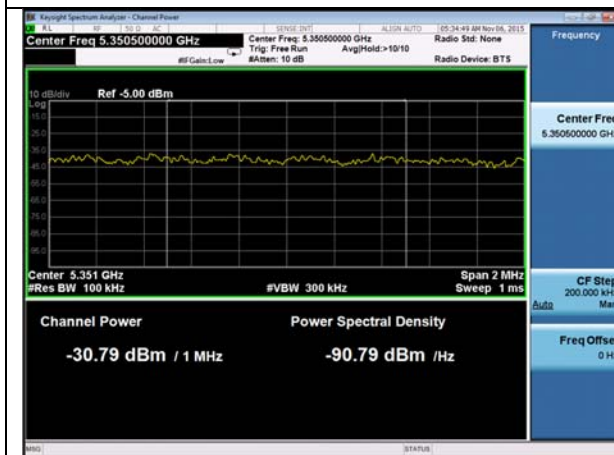
Band Edge -802.11n-40M-5310M-chain1



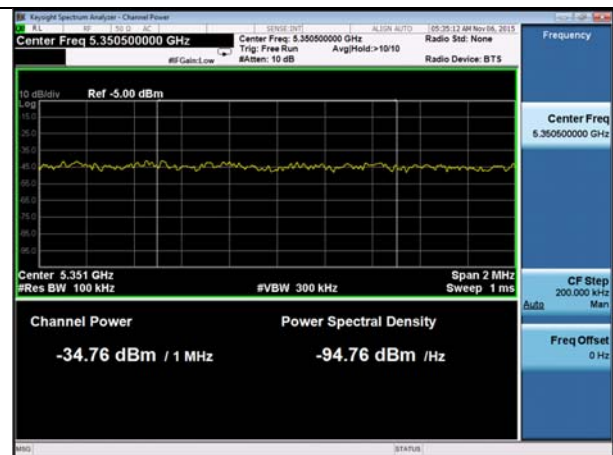
Band Edge -802.11ac-80M-5290M-chain0 (Left)



Band Edge -802.11ac-80M-5290M-chain1(Left)

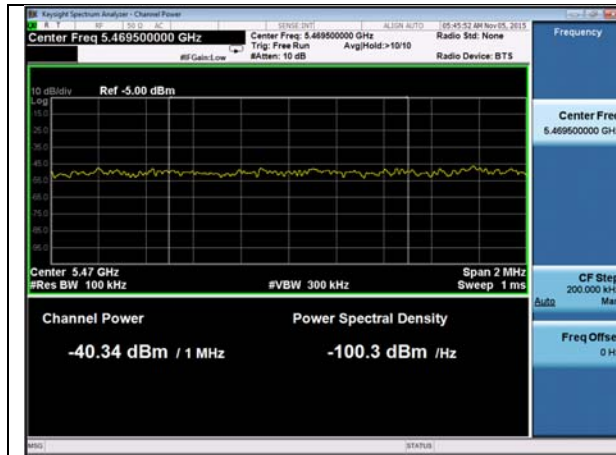


Band Edge -802.11ac-80M-5290M-chain0 (Right)

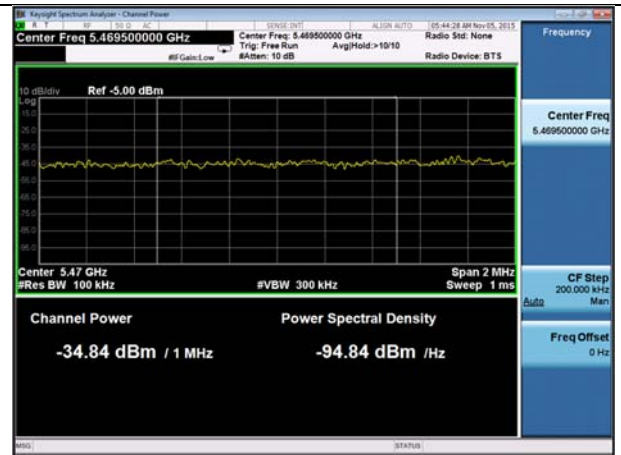


Band Edge -802.11ac-80M-5290M-chain1 (Right)

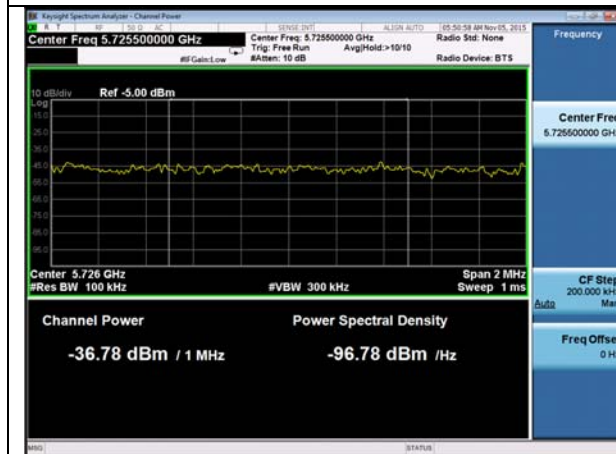
W56 band:



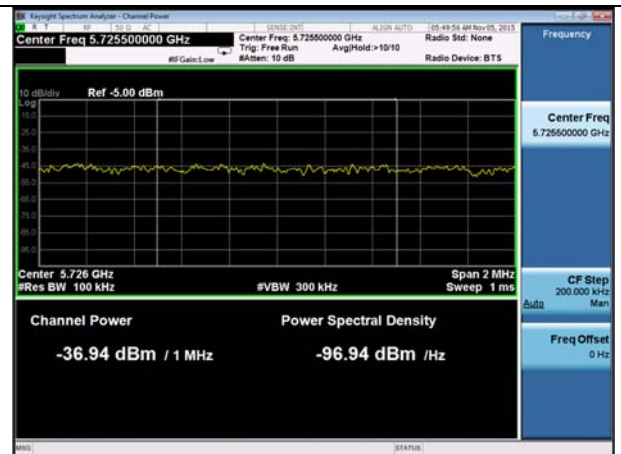
Band Edge -802.11a-5500M-chain0



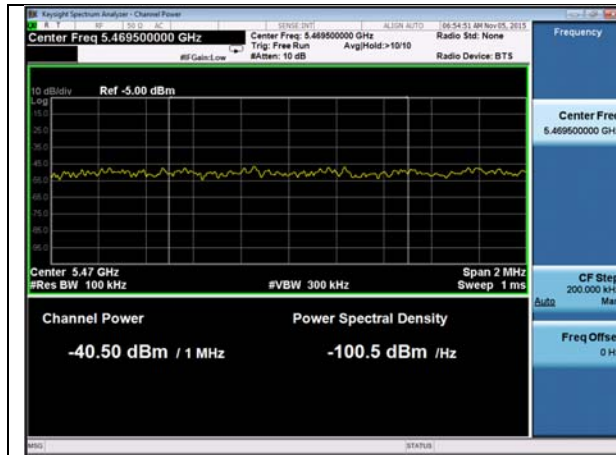
Band Edge -802.11a-5500M-chain1



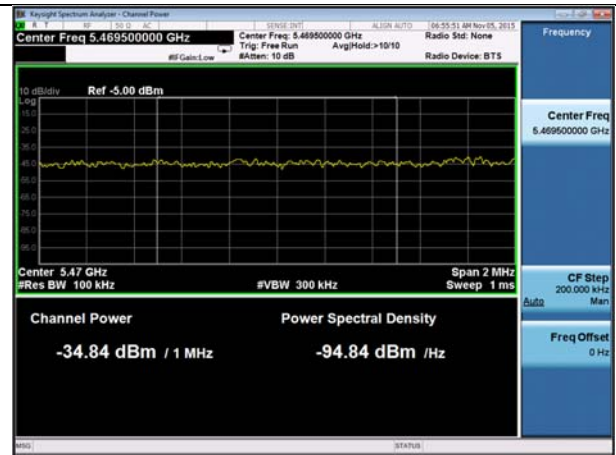
Band Edge -802.11a-5700M-chain0



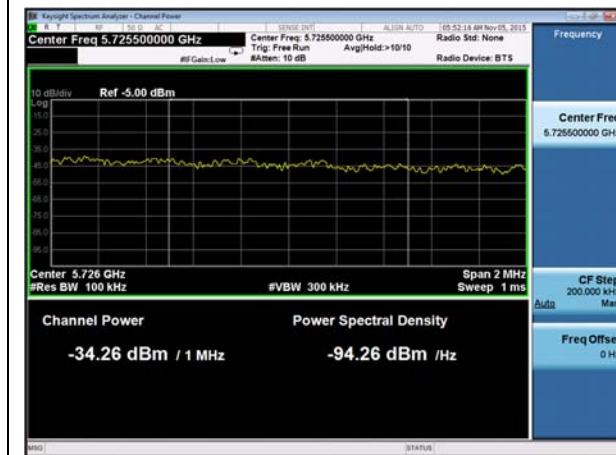
Band Edge -802.11a-5700M-chain1



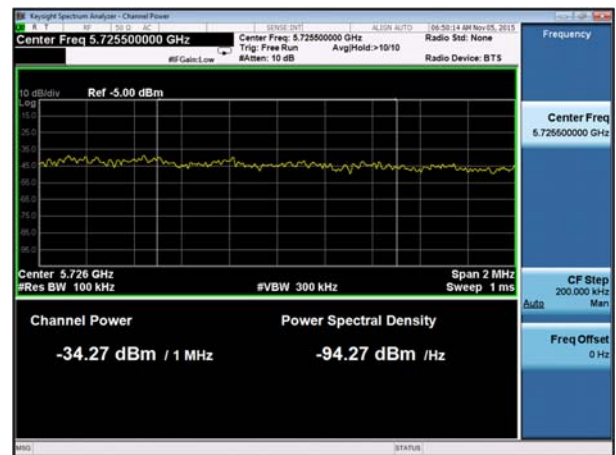
Band Edge -802.11n-20M-5500M-chain0



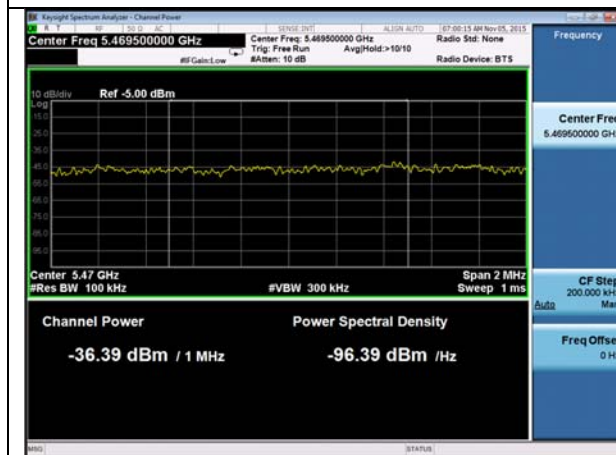
Band Edge -802.11n-20M-5500M-chain1



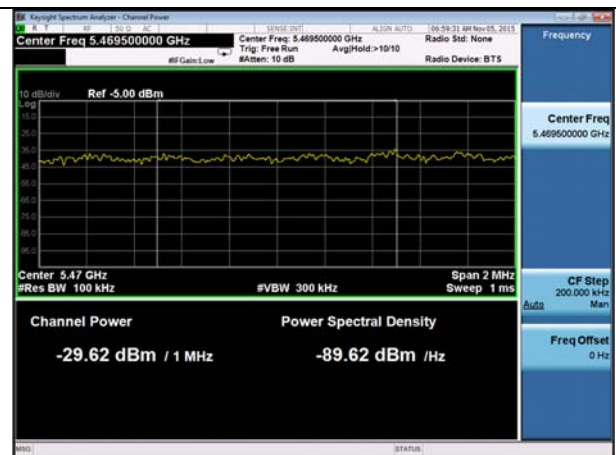
Band Edge -802.11n-20M-5700M-chain0



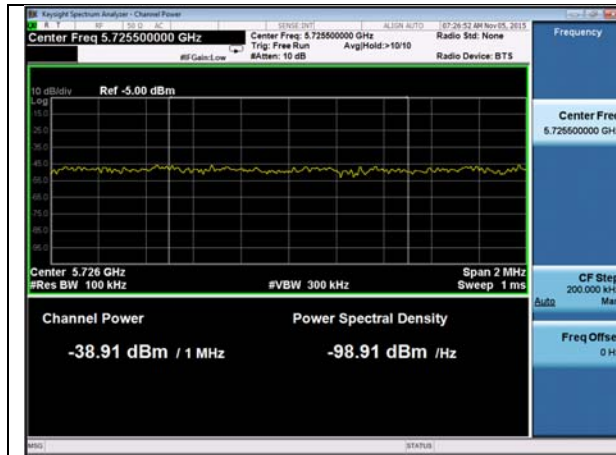
Band Edge -802.11n-20M-5700M-chain1



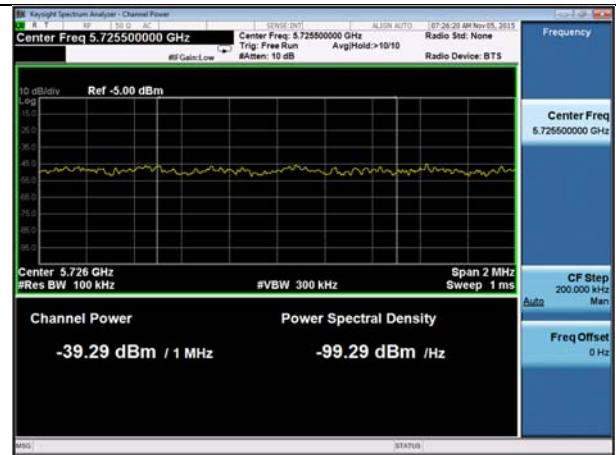
Band Edge -802.11n-40M-5510M-chain0



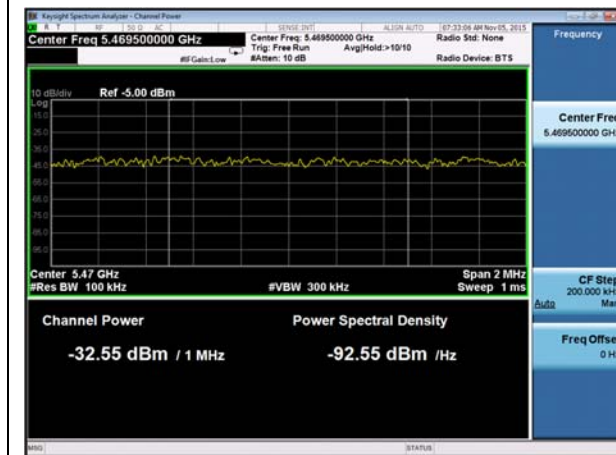
Band Edge -802.11n-40M-5510M-chain1



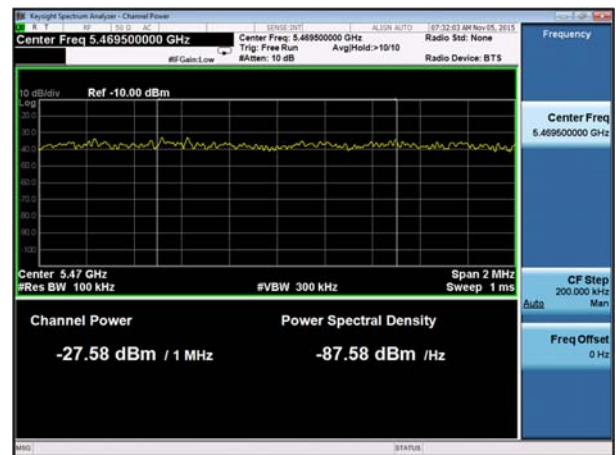
Band Edge -802.11n-40M-5670M-chain0



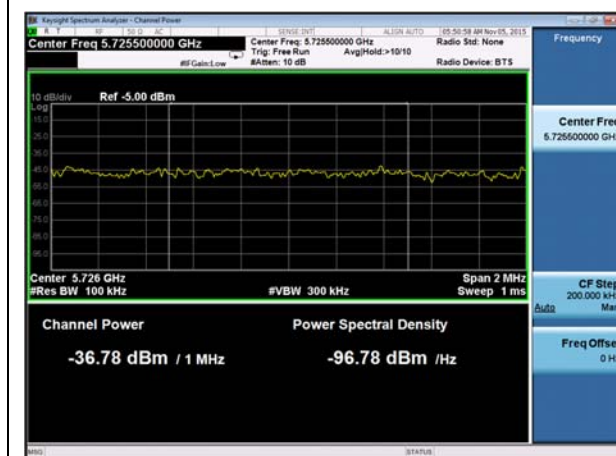
Band Edge -802.11n-40M-5670M-chain1



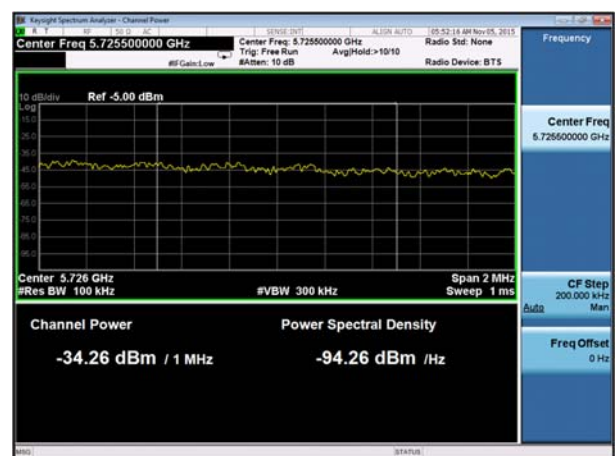
Band Edge -802.11ac-80M-5530M-chain0



Band Edge -802.11ac-80M-5530M-chain1



Band Edge -802.11ac-80M-5610M-chain0



Band Edge -802.11ac-80M-5610M-chain1

10.6 Radiated Spurious Emissions below 1GHz

Requirement(s):

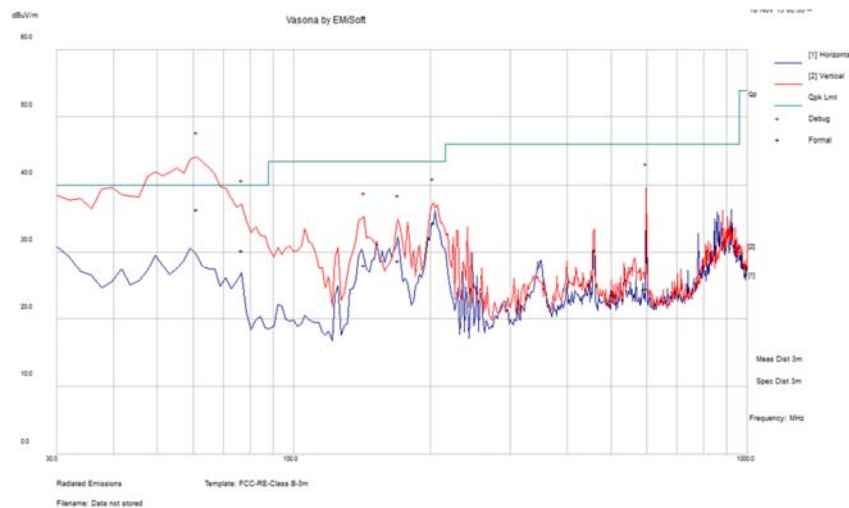
Spec	Requirement	Applicable										
47CFR§ 15.407(b) 15.209 (a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges <table><tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></table>	Frequency range (MHz)	Field Strength (uV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500	☒
Frequency range (MHz)	Field Strength (uV/m)											
30 – 88	100											
88 – 216	150											
216 960	200											
Above 960	500											
Test Setup	Semi Anechoic Chamber Radio Absorbing Material EUT 0.8m 3m Antenna 1.4m Spectrum Analyzer											
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. A Quasi-peak measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.											
Remark	The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.											
Result	☒ Pass ☐ Fail											

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Radiated Emission Test Results (Below 1GHz)

Test specification	below 1GHz			
Environmental Conditions:	Temp (°C):	26	Result	Pass
	Humidity (%)	47		
	Atmospheric (mbar):	1020		
Mains Power:	120VAC, 60Hz			
Tested by:	Gary Chou			
Test Date:	11/17/2015			
Remarks:	Worst case, 802.11n HT40, 5550MHz			



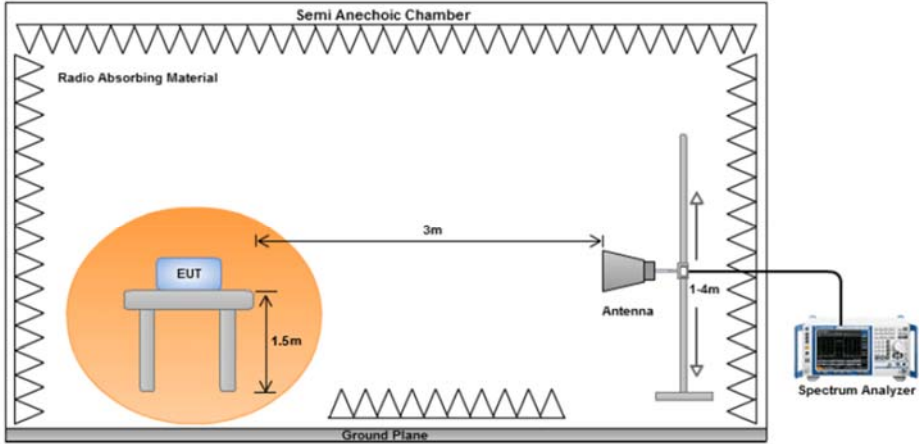
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
61.18	65.53	1.16	-30.24	36.44	Quasi Max	V	100	79	40	-3.56	Pass
76.78	59.35	1.38	-30.46	30.28	Quasi Max	V	100	199	40	-9.72	Pass
203.18	58.23	2.43	-26.24	34.43	Quasi Max	V	100	133	43.52	-9.09	Pass
597.59	39.93	4.27	-19.68	24.52	Quasi Max	V	100	161	46.02	-21.5	Pass
142.69	51.56	1.95	-25.42	28.09	Quasi Max	V	100	93	43.52	-15.43	Pass
169.77	53.74	2.18	-27.13	28.79	Quasi Max	V	100	134	43.52	-14.73	Pass

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

10.7 Radiated Spurious Emissions above 1GHz

Requirement(s):

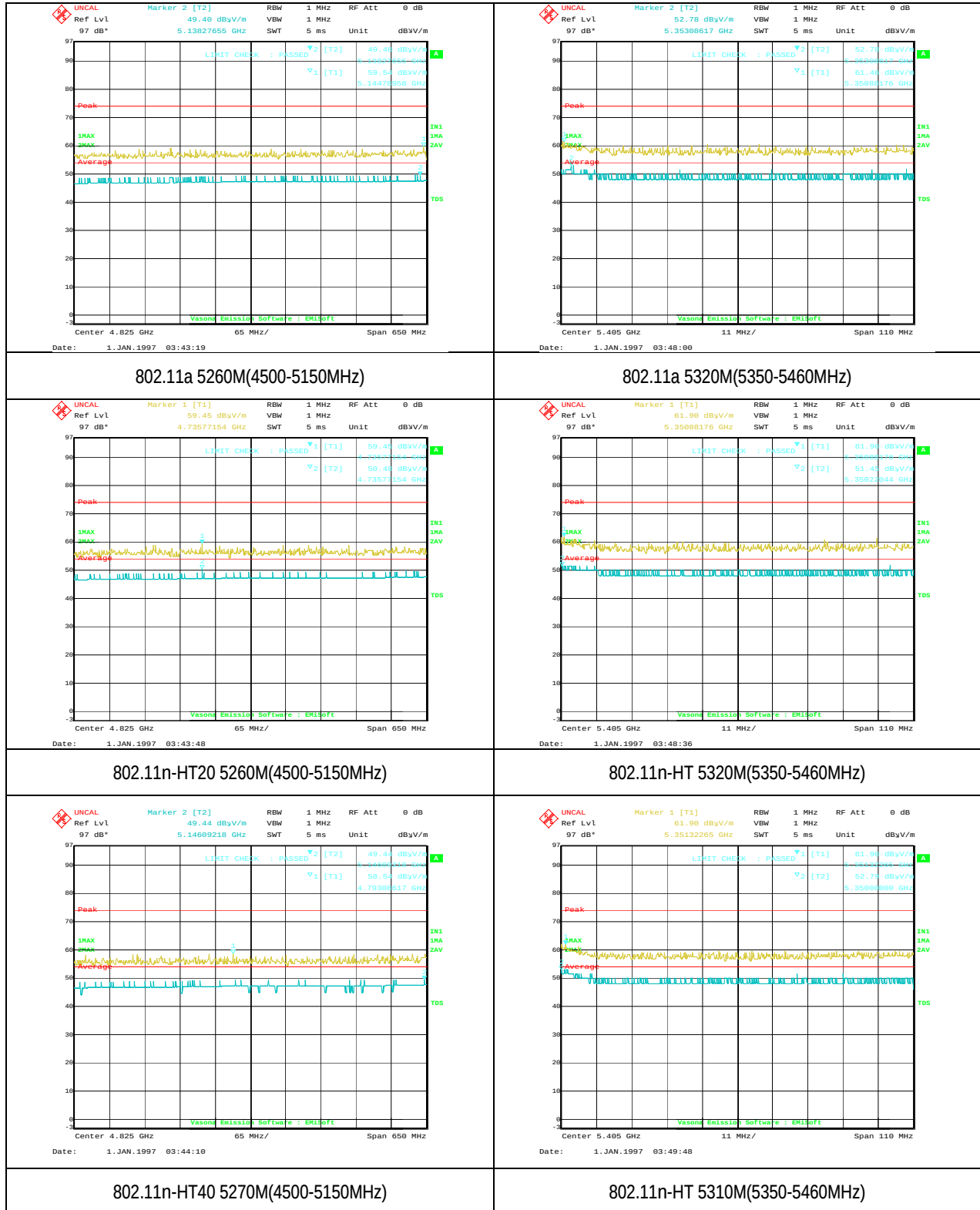
Spec	Item	Requirement	Applicable
47CFR§ 15.407(b)(2), 15.407(b)(6)	(1)	For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.	☐
	(2)	For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.	☒
	(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 EIRP of -27 dBm/MHz.	☒
	(4)	For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.	☐
	(5)	Restricted band, emission must also comply with the radiated emission limits specified in 15.209	☒

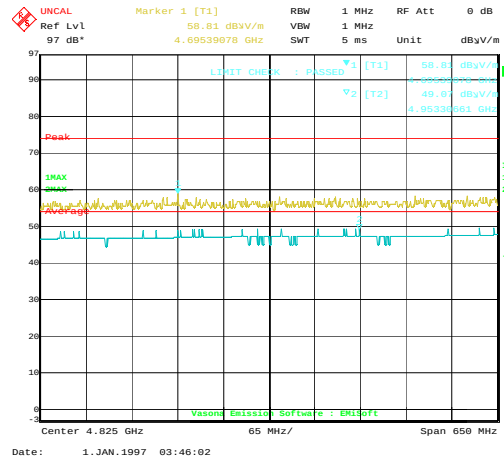
Test Setup	
------------	---

Procedure	- The EUT was switched on and allowed to warm up to its normal operating condition. - The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: - Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. - The EUT was then rotated to the direction that gave the maximum emission. - Finally, the antenna height was adjusted to the height that gave the maximum emission. - An average measurement was then made for that frequency point. - Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	The EUT was scanned up to 40GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.
Result	☒ Pass ☐ Fail

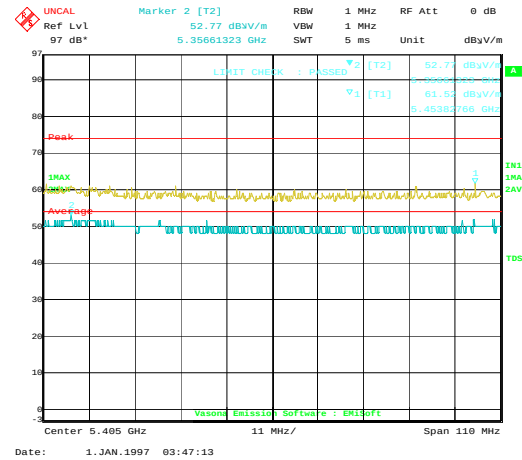
Test Data ☒ Yes (See below) ☐ N/A
Test Plot ☐ Yes (See below) ☒ N/A

Radiated Restricted band Measurement Plots:



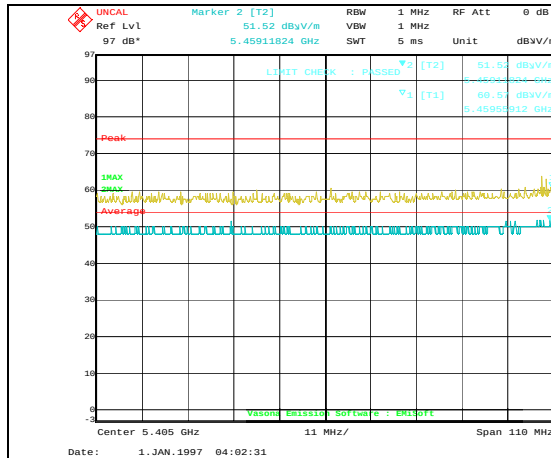


802.11ac-VHT80 5290M(4500-5150MHz)

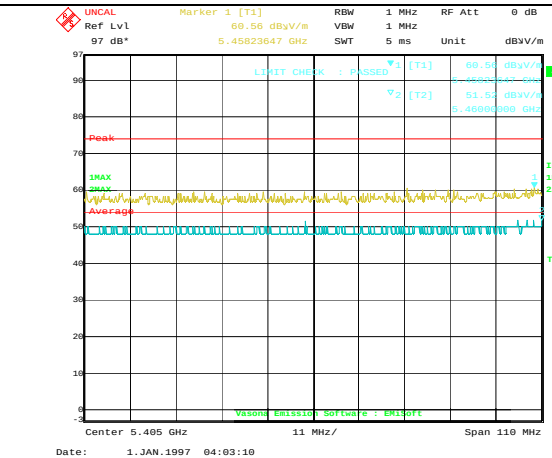


802.11ac-VHT 5290M(5350-5460MHz)

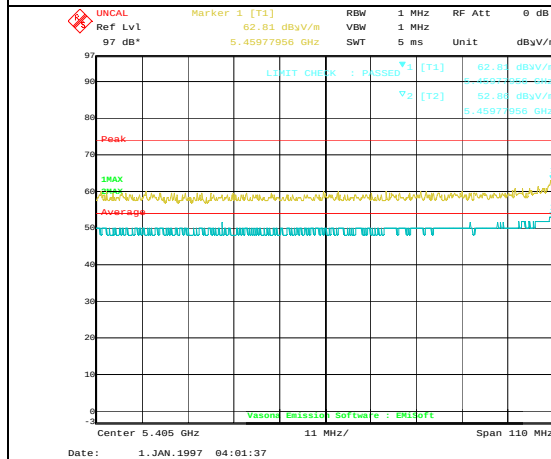




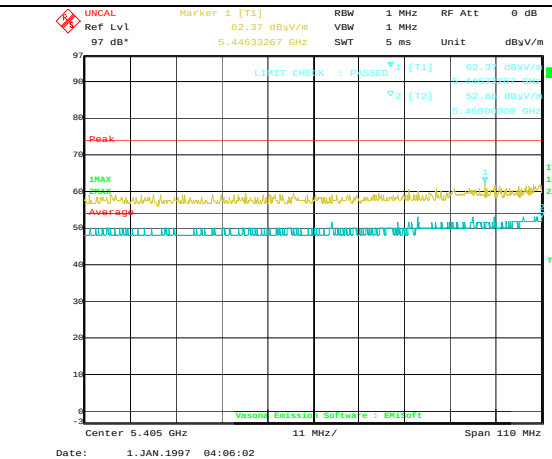
802.11a 5500M(5350-5460MHz)



802.11n-HT20 5500M(5350-5460MHz)



802.11n-HT40 5510M(5350-5460MHz)



802.11ac 5530M(5350-5460MHz)

Radiated Emission Test Results (Above 1GHz)

Above 1GHz-40GHz – 802.11a – 5260MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3868.86	35.17	7.79	15.27	58.24	Peak Max	H	202	359	74	-15.76	Pass
2436.05	33.96	4.73	13.72	52.41	Peak Max	H	226	262	74	-21.59	Pass
3868.86	22.99	7.79	15.27	46.05	Average Max	H	202	359	54	-7.95	Pass
2436.05	21.09	4.73	13.72	39.54	Average Max	H	226	262	54	-14.46	Pass

Above 1GHz-40GHz – 802.11a – 5280MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3867.78	34.33	7.78	15.27	57.38	Peak Max	V	182	25	74	-16.62	Pass
6179.50	32.66	10.7	14.16	57.52	Peak Max	V	178	266	74	-16.48	Pass
3867.78	22.99	7.78	15.27	46.05	Average Max	V	182	25	54	-7.95	Pass
6179.50	20.97	10.7	14.16	45.83	Average Max	V	178	266	54	-8.17	Pass

Above 1GHz-40GHz – 802.11a – 5320MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4198.73	32.85	9	14.88	56.73	Peak Max	V	208	0	74	-17.27	Pass
2433.82	32	4.73	13.72	50.45	Peak Max	V	231	88	74	-23.55	Pass
4198.73	21.7	9	14.88	45.58	Average Max	V	208	0	54	-8.42	Pass
2433.82	20.15	4.73	13.72	38.6	Average Max	V	231	88	54	-15.4	Pass

Above 1GHz-40GHz – 802.11n-20M – 5260MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3900.69	34.84	7.96	15.39	58.2	Peak Max	H	197	110	74	-15.81	Pass
6079.30	33.56	10.58	14.4	58.54	Peak Max	V	137	204	74	-15.46	Pass
3900.69	22.79	7.96	15.39	46.15	Average Max	H	197	110	54	-7.85	Pass
6079.30	20.96	10.58	14.4	45.93	Average Max	V	137	204	54	-8.07	Pass

Above 1GHz-40GHz – 802.11n-20M – 5280MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4217.42	33.68	9.04	14.81	57.53	Peak Max	H	111	354	74	-16.47	Pass
2435.71	33.33	4.73	13.72	51.78	Peak Max	V	146	133	74	-22.22	Pass
4217.42	21.78	9.04	14.81	45.63	Average Max	H	111	354	54	-8.37	Pass
2435.71	20.25	4.73	13.72	38.7	Average Max	V	146	133	54	-15.3	Pass

Above 1GHz-40GHz – 802.11n-20M – 5320MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3879.88	35.01	7.85	15.31	58.17	Peak Max	V	150	224	74	-15.83	Pass
6432.80	32.99	11.01	13.57	57.56	Peak Max	V	243	209	74	-16.44	Pass
3879.88	23.05	7.85	15.31	46.22	Average Max	V	150	224	54	-7.78	Pass
6432.80	21.13	11.01	13.57	45.7	Average Max	V	243	209	54	-8.3	Pass

Above 1GHz-40GHz – 802.11n-40M – 5270MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
6271.35	33.03	10.82	13.94	57.78	Peak Max	H	131	290	74	-16.22	Pass
1755.14	29.29	4.15	12.97	46.41	Peak Max	H	158	301	74	-27.59	Pass
6271.35	21.26	10.82	13.94	46.01	Average Max	H	131	290	54	-7.99	Pass
1755.14	17.76	4.15	12.97	34.88	Average Max	H	158	301	54	-19.12	Pass

Above 1GHz-40GHz – 802.11n-40M – 5310MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4046.06	33.29	8.62	15.55	57.46	Peak Max	V	118	346	74	-16.54	Pass
6284.87	33.52	10.83	13.91	58.26	Peak Max	V	220	145	74	-15.74	Pass
4046.06	21.78	8.62	15.55	45.94	Average Max	V	118	346	54	-8.06	Pass
6284.87	21.3	10.83	13.91	46.04	Average Max	V	220	145	54	-7.96	Pass

Above 1GHz-40GHz – 802.11ac-80M – 5290MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
6151.28	33.55	10.67	14.22	58.45	Peak Max	H	125	67	74	-15.55	Pass
3900.99	34.25	7.97	15.39	57.6	Peak Max	V	118	117	74	-16.4	Pass
6151.28	21.21	10.67	14.22	46.1	Average Max	H	125	67	54	-7.9	Pass
3900.99	22.93	7.97	15.39	46.29	Average Max	V	118	117	54	-7.71	Pass

Above 1GHz-40GHz – 802.11a – 5500MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
6388.51	33.35	10.96	13.67	57.98	Peak Max	H	116	37	74	-16.02	Pass
1752.45	31.51	4.15	12.94	48.6	Peak Max	H	167	25	74	-25.4	Pass
6388.51	21.3	10.96	13.67	45.92	Average Max	H	116	37	54	-8.08	Pass
1752.45	17.92	4.15	12.94	35.02	Average Max	H	167	25	54	-18.99	Pass

Above 1GHz-40GHz – 802.11a – 5580MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
6057.91	32.97	10.55	14.45	57.98	Peak Max	H	181	4	74	-16.02	Pass
3812.37	35.62	7.47	15.06	58.16	Peak Max	V	123	132	74	-15.84	Pass
6057.91	21.25	10.55	14.45	46.25	Average Max	H	181	4	54	-7.75	Pass
3812.37	23.55	7.47	15.06	46.09	Average Max	V	123	132	54	-7.91	Pass

Above 1GHz-40GHz – 802.11a – 5700MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3900.25	34.92	7.96	15.39	58.27	Peak Max	V	108	110	74	-15.73	Pass
6256.57	33.05	10.8	13.97	57.82	Peak Max	V	177	91	74	-16.18	Pass
3900.25	22.99	7.96	15.39	46.34	Average Max	V	108	110	54	-7.66	Pass
6256.57	21.36	10.8	13.97	46.13	Average Max	V	177	91	54	-7.87	Pass

Above 1GHz-40GHz – 802.11n-20M – 5500MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3853.01	35.2	7.7	15.22	58.12	Peak Max	V	222	158	74	-15.89	Pass
6500.12	33.2	11.09	13.41	57.7	Peak Max	V	131	62	74	-16.3	Pass
3853.01	23.32	7.7	15.22	46.24	Average Max	V	222	158	54	-7.76	Pass
6500.12	20.98	11.09	13.41	45.48	Average Max	V	131	62	54	-8.52	Pass

Above 1GHz-40GHz – 802.11n-20M – 5580MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4240.91	37.21	9.1	14.71	61.02	Peak Max	V	121	205	74	-12.98	Pass
6130.40	37.62	10.64	14.27	62.54	Peak Max	H	107	306	74	-11.46	Pass
4240.91	25.77	9.1	14.71	49.58	Average Max	V	121	205	54	-4.42	Pass
6130.40	24.78	10.64	14.27	49.69	Average Max	H	107	306	54	-4.31	Pass

Above 1GHz-40GHz – 802.11n-20M – 5700MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4241.75	36.95	9.1	14.7	60.75	Peak Max	V	179	190	74	-13.25	Pass
6152.69	36.05	10.67	14.22	60.94	Peak Max	H	175	200	74	-13.06	Pass
4241.75	25.67	9.1	14.7	49.48	Average Max	V	179	190	54	-4.52	Pass
6152.69	24.78	10.67	14.22	49.68	Average Max	H	175	200	54	-4.32	Pass

Above 1GHz-40GHz – 802.11n-40M – 5510MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4185.55	37.1	8.97	14.94	61	Peak Max	V	112	11	74	-13	Pass
6152.74	36.71	10.67	14.22	61.61	Peak Max	H	195	326	74	-12.39	Pass
4185.55	25.98	8.97	14.94	49.88	Average Max	V	112	11	54	-4.12	Pass
6152.74	24.86	10.67	14.22	49.75	Average Max	H	195	326	54	-4.25	Pass

Above 1GHz-40GHz – 802.11n-40M – 5550MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4231.94	37.25	9.08	14.74	61.07	Peak Max	V	112	3	74	-12.93	Pass
6120.55	36.51	10.63	14.3	61.44	Peak Max	H	133	207	74	-12.56	Pass
4231.94	25.75	9.08	14.74	49.57	Average Max	V	112	3	54	-4.43	Pass
6120.55	24.69	10.63	14.3	49.62	Average Max	H	133	207	54	-4.38	Pass

Above 1GHz-40GHz – 802.11n-40M – 5670MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4027.89	38.22	8.57	15.63	62.42	Peak Max	H	217	112	74	-11.58	Pass
6207.24	36.75	10.74	14.09	61.58	Peak Max	H	173	133	74	-12.42	Pass
4027.89	25.62	8.57	15.63	49.82	Average Max	H	217	112	54	-4.19	Pass
6207.24	24.61	10.74	14.09	49.44	Average Max	H	173	133	54	-4.56	Pass

Above 1GHz-40GHz – 802.11ac-80M – 5530MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4185.88	37.69	8.97	14.94	61.6	Peak Max	H	108	53	74	-12.4	Pass
1989.96	39.62	4.28	14.92	58.81	Peak Max	V	195	352	74	-15.19	Pass
4185.88	25.77	8.97	14.94	49.68	Average Max	H	108	53	54	-4.32	Pass
1989.96	28.46	4.28	14.92	47.66	Average Max	V	195	352	54	-6.34	Pass

Above 1GHz-40GHz – 802.11ac-80M – 5610MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4072.27	38.12	8.68	15.43	62.23	Peak Max	V	133	113	74	-11.77	Pass
6246.75	36.77	10.79	14	61.55	Peak Max	V	204	359	74	-12.45	Pass
4072.27	25.62	8.68	15.43	49.73	Average Max	V	133	113	54	-4.27	Pass
6246.75	24.63	10.79	14	49.42	Average Max	V	204	359	54	-4.58	Pass

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	☒
CHASE LISN	MN2050B	1018	08/07/2015	1 Year	08/07/2016	☒
Radiated Emissions						
R & S Receiver	ESL6	100178	05/27/2015	1 Year	05/27/2016	☒
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	☒
ETS-Lingren Loop Antenna	6512	00049120	05/12/2015	1 Year	05/12/2016	☒
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2015	1 Year	08/12/2016	☒
3 Meters SAC	3M	N/A	08/08/2015	1 Year	08/08/2016	☒
10 Meters SAC	10M	N/A	09/05/2015	1 Year	09/05/2016	☒
RF Conducted Measurement						
Spectrum Analyzer	N9010A	10SL0219	08/20/2015	1 Year	08/20/2016	☒
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	☒
ETS-Lingren USB RF Power Sensor	7002-006	10SL0190	09/03/2015	1 Year	09/03/2016	☒

Annex B. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1 , A2 , A3 , A4 , B1 , B2 , B3 , B4 , C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		Radio & Telecommunications Terminal Equipment: EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)		Phase I , Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
Hong Kong OFCA		(Phase II) OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		Radio: Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		Radio: A1. Terminal equipment for purpose of calling Telecom: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		EMI: KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI EMS: KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68 Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measurement
Australia CAB Recognition		EMC: AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4 Radio communications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771 Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06, AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016, AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2