RF TEST REPORT

SIEMIC
GLOBAL TESTING & CERTIFICATIONS
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Report No.: FCC_RF_SL15101901-SLX-027_W5356 Rev 1.0
Supersede Report No.: FCC_RF_SL15101901-SLX-027_W5356

Applicant	:	Silex Technology, Inc.
Product Name	:	802.11a/b/g/n/ac + BT4.1 module
Model No.	:	SX-SDPAC
Test Standard	:	47 CFR 15.407
Test Method	:	ANSI C63.4: 2014 789033 D02 General UNII Test Procedures New Rules v01r02
FCC ID	:	N6C-SDPAC
IC ID	:	4908A-SDPAC
Dates of test	:	06/01/2016 to 06/30/2016
Issue Date	:	08/09/2016
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
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

ilac-MRA
A2LA ACCREDITED
TESTING CERT # 2742-01

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

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_RF_SL15101901-SLX-027_W5356	None	Original	07/05/2016
FCC_RF_SL15101901-SLX-027_W5356 Rev 1.0	1.0	Updated per TCB reviewer	08/09/2016

2 Executive Summary

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

Company: Silex Technology, Inc.
Product: 802.11a/b/g/n/ac + BT 4.1 module
Model: SX-SDPAC

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	Silex Technology, Inc
Applicant Address	2-3-1 Hikaridai, Seika-cho, Kyoto, 619-0237 Japan
Manufacturer Name	Silex Technology, Inc
Manufacturer Address	2-3-1 Hikaridai, Seika-cho, Kyoto, 619-0237 Japan

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	802.11a/b/g/n/ac + BT 4.1 module
Model No.	SX-SDPAC
Trade Name	Silex
Serial No.	N/A
Host Model No.	N/A
Input Power	5VDC
Power Adapter Manu/Model	N/A
Power Adapter SN	N/A
Date of EUT received	05/26/2016
Equipment Class/ Category	DTS, UNII
Clock Frequencies	N/A
Port/Connectors	PoE, Ethernet

6.2 Radio Description

Radio Type	802.11a	802.11n-20M	802.11n-40M	802.11ac-80M
Operating Frequency	5260-5320MHz 5500-5720MHz	5260-5320MHz 5500-5720MHz	5270-5310MHz 5510-5710MHz	5290MHz, 5530MHz 5610MHz, 5690MHz
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Spacing	20MHz	20MHz	40MHz	80MHz
Number of Channels	16	16	8	4
Antenna Type	PCB Antenna			
Antenna Gain (Peak)	5GHz: 5.0 dBi			
Antenna Connector Type	U.FL			
Note	N/A			

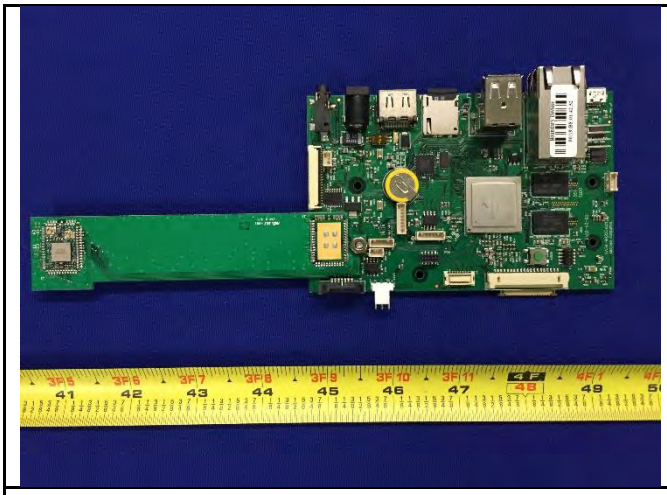
EUT Power level setting

Mode	Frequency	Power Setting
802.11-a	5260	14
802.11-a	5280	14
802.11-a	5320	13
802.11-n-20	5260	13
802.11-n-20	5280	13
802.11-n-20	5320	14
802.11-n-40	5270	14
802.11-n-40	5310	14
802.11-ac-80	5290	12
802.11-a	5500	14
802.11-a	5580	13
802.11-a	5700	13
802.11-n-20	5500	14
802.11-n-20	5580	13
802.11-n-20	5700	13
802.11-n-40	5510	14
802.11-n-40	5590	13
802.11-n-40	5670	14
802.11-ac-80	5530	13
802.11-ac-80	5610	13

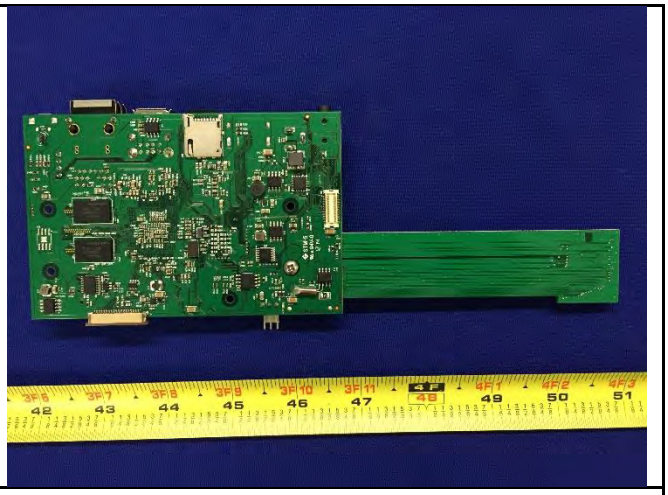
6.3 Antenna Description

Vendor	Part Number	Antenna type	W24	W52	W53	W56
Molex	146153	PCB type di-pole antenna	3.2	4.75	4.75	4.75
Unictron	H2B1PC1A1C (AA258)	PCB type di-pole antenna	2.67	3.35	3.35	3.35
Unictron	H2B1PD1A1C (AA222)	PCB type di-pole antenna	2.57	3.15	3.15	3.15

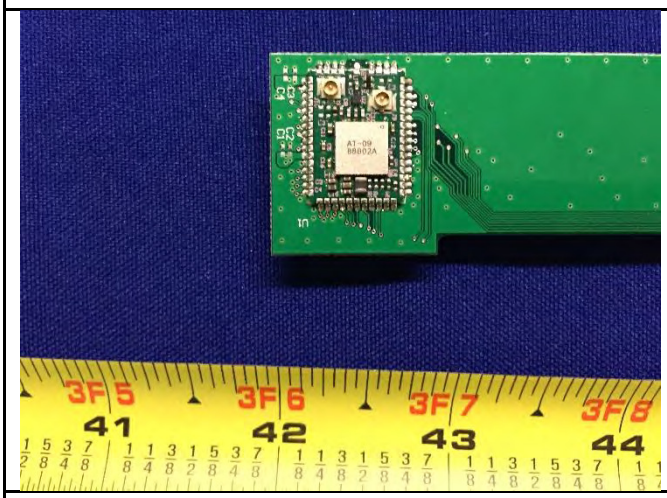
6.4 EUT Photos



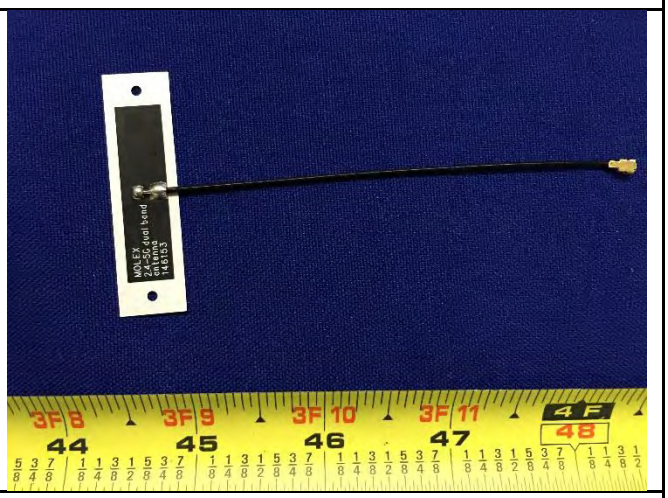
Top View



Bottom View



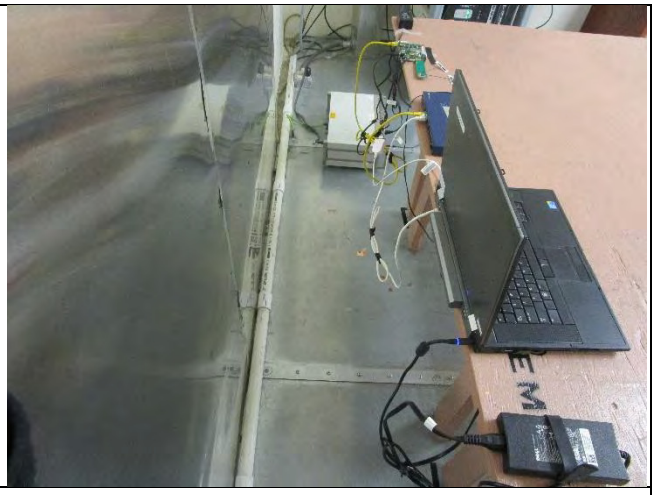
Radio Module View



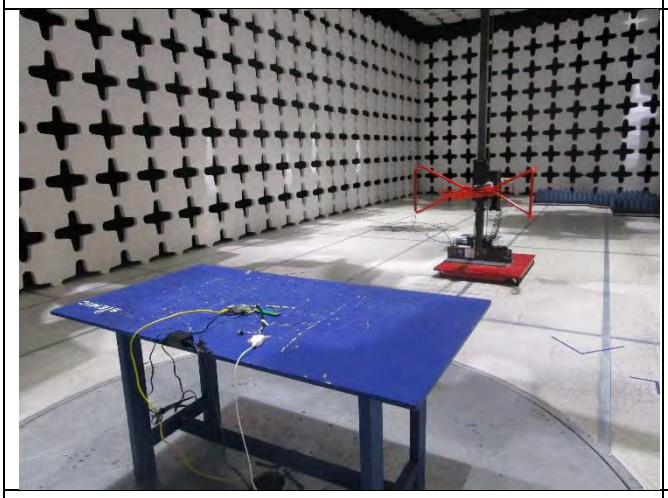
Antenna View

6.5 EUT Test Setup Photos

AC Line Conducted Emissions – Front View

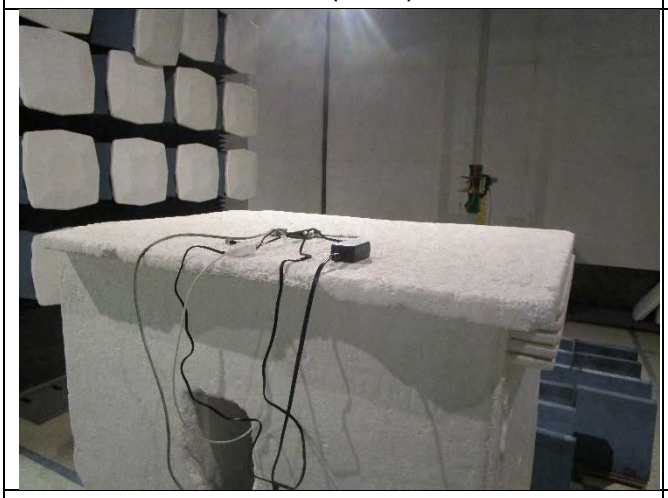


AC Line Conducted Emissions – Rear View



Radiated Emissions (<1GHz) – Front View

Radiated Emissions (<1GHz) – Rear View



Radiated Emissions (>1GHz) – Front View

Radiated Emissions (>1GHz) – Rear View

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	Latitude E6510	N/A	Dell	-
2	Hub	DS108	N/A	NetGear	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
USB	EUT	Laptop	EUT	Laptop	1	Unshielded	-
RJ45	EUT	Hub	Laptop	Hub	1	Unshielded	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	QRCT	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 v01r02	☒ 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 v01r02	☒ Pass ☐ N/A
Maximum conducted Output Power	FCC	15.407 (a) (2)	789033 D02 General UNII Test Procedures New Rules v01r02	☒ 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 v01r02	☒ Pass ☐ N/A
Power Spectral Density	FCC	15.407 (a) (2)	789033 D02 General UNII Test Procedures New Rules v01r02	☒ 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	1. All measurement uncertainties are not taken into consideration for all presented test result. 2. 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

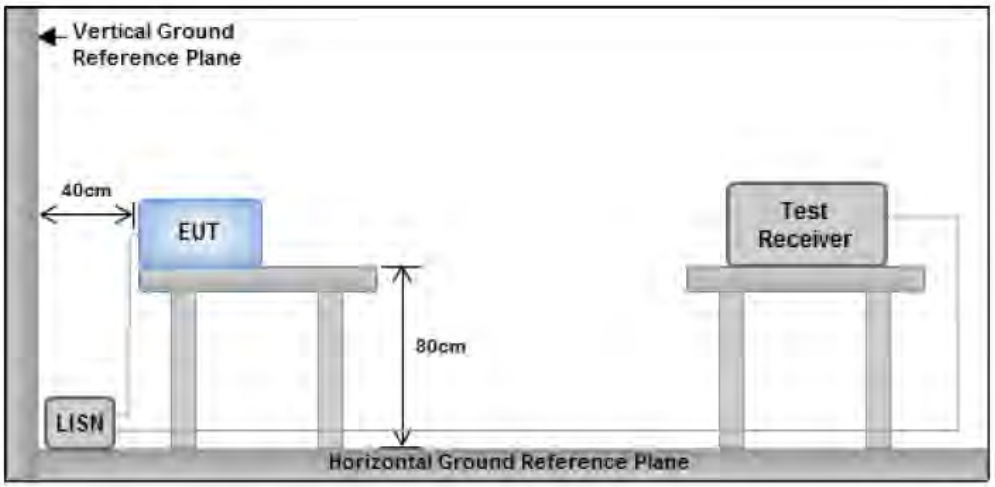
10.1 Conducted Emissions

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
RSS247(A8.1)	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 µH/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 was tested at 120VAC, 60Hz
Result	☒ Pass ☐ Fail

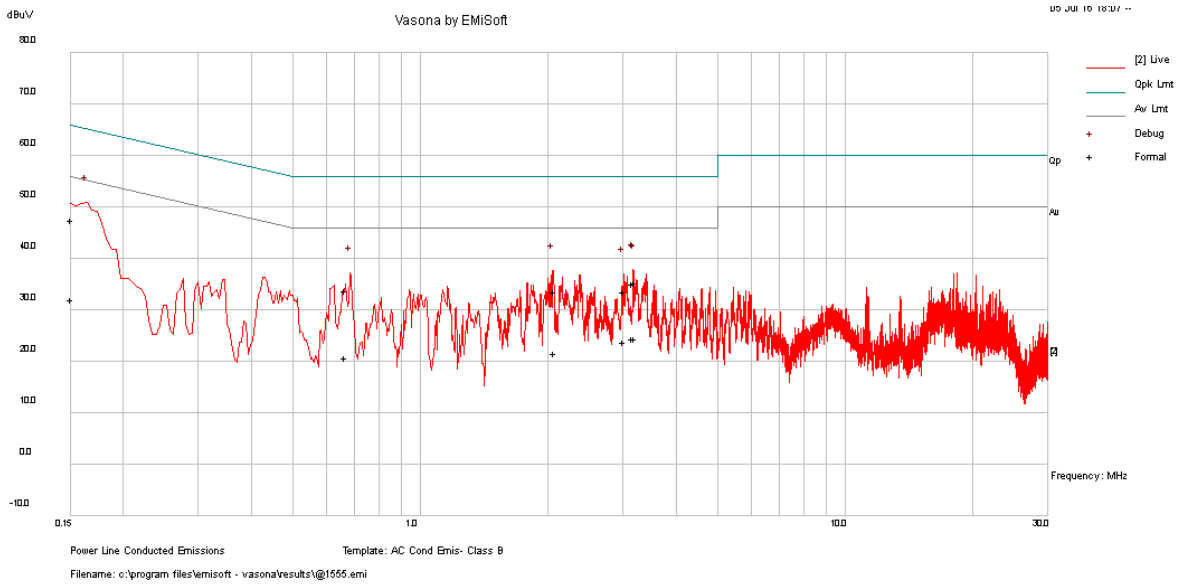
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Chen Ge at Conducted Emission test site.

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:	Chen Ge			
Test Date:	07/05/2016			
Remarks	AC Line @ Line			



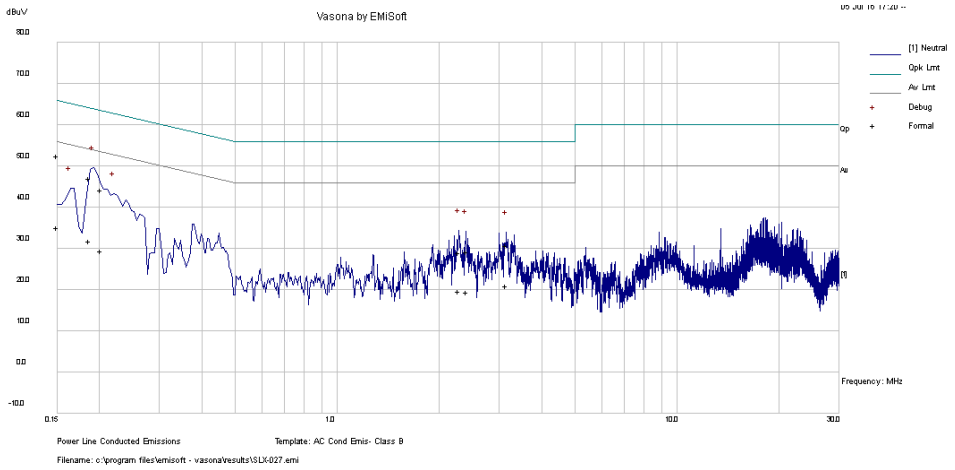
Line Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.15	35.87	10	1.78	47.65	Quasi Peak	Live	65.93	-18.27	Pass
3.16	24.6	10.03	0.55	35.18	Quasi Peak	Live	56	-20.82	Pass
2.07	23.11	10.02	0.55	33.69	Quasi Peak	Live	56	-22.31	Pass
3.20	24.82	10.03	0.55	35.4	Quasi Peak	Live	56	-20.6	Pass
0.67	23.32	10.01	0.62	33.95	Quasi Peak	Live	56	-22.05	Pass
3.01	23.11	10.03	0.55	33.69	Quasi Peak	Live	56	-22.31	Pass
0.15	20.43	10	1.78	32.22	Average	Live	55.93	-23.71	Pass
3.16	13.88	10.03	0.55	24.46	Average	Live	46	-21.54	Pass
2.07	11.19	10.02	0.55	21.76	Average	Live	46	-24.24	Pass
3.20	13.85	10.03	0.55	24.43	Average	Live	46	-21.57	Pass
0.67	10.1	10.01	0.62	20.73	Average	Live	46	-25.27	Pass
3.01	13.34	10.03	0.55	23.92	Average	Live	46	-22.08	Pass

Note: The results above show only the worst case.

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:	Chen Ge			
Test Date:	07/05/2016			
Remarks	AC Line @ Neutral			



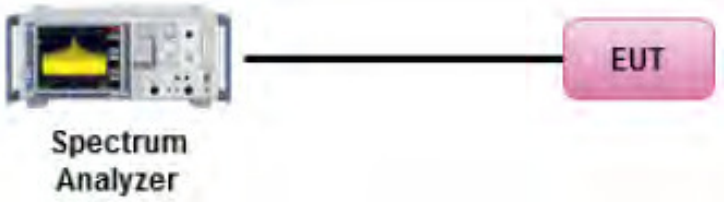
Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.19	35.67	10	1.41	47.09	Quasi Peak	Neutral	64.17	-17.09	Pass
0.20	33.08	10	1.3	44.39	Quasi Peak	Neutral	63.53	-19.14	Pass
0.15	40.7	10	1.8	52.5	Quasi Peak	Neutral	66	-13.5	Pass
2.29	18.5	10.02	0.55	29.08	Quasi Peak	Neutral	56	-26.92	Pass
2.41	18.74	10.03	0.55	29.32	Quasi Peak	Neutral	56	-26.68	Pass
3.15	20.21	10.03	0.55	30.79	Quasi Peak	Neutral	56	-25.21	Pass
0.19	20.57	10	1.41	31.99	Average	Neutral	54.17	-22.19	Pass
0.20	18.21	10	1.3	29.51	Average	Neutral	53.53	-24.02	Pass
0.15	23.43	10	1.8	35.24	Average	Neutral	56	-20.76	Pass
2.29	9.26	10.02	0.55	19.84	Average	Neutral	46	-26.16	Pass
2.41	8.91	10.03	0.55	19.49	Average	Neutral	46	-26.51	Pass
3.15	10.54	10.03	0.55	21.12	Average	Neutral	46	-24.88	Pass

Note: The results above show only the worst case.

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			

Test Procedure	789033 D02 General UNII Test Procedures New Rules v01r02
	
	26dB Emission bandwidth measurement procedure (Other than 5.725-5.85 GHz)
	- Allow the trace to stabilize.
	- Use the spectrum analyzer built-in measurement function to determine the 26dB BW.
	  ○ Set RBW = around 1% of emission bandwidth
	  ○ Set VBW > RBW
	  ○ Detector = Peak
	  ○ Trace mode = max hold
	- Capture the plot.
	- Repeat above steps for different test channel and other modulation type.		

Test Date	06/18/2016 – 06/28/2016	Environmental condition	Temperature 23ºC Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A		
Result	☒ Pass ☐ Fail		

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

Test was done by Chen Ge at RF test site.

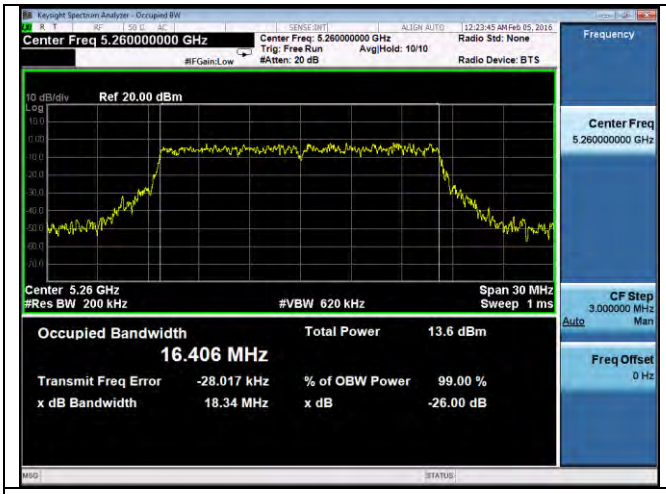
26dB Bandwidth measurement result for 5.3GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5260	Low	18.34
	802.11a	5280	Mid	18.69
	802.11a	5320	High	18.55
	802.11n-20	5260	Low	19.68
	802.11n-20	5280	Mid	19.57
	802.11n-20	5320	High	19.72
	802.11n-40	5270	Low	37.99
	802.11n-40	5310	High	38.48
	802.11ac-80	5290	Mid	82.45

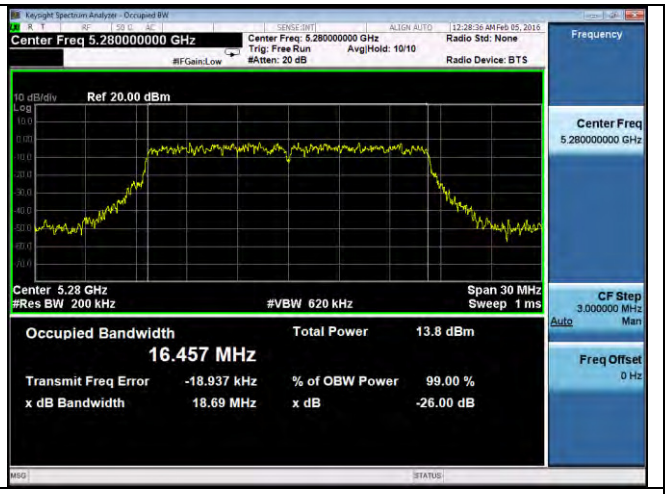
26dB Bandwidth measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5500	Low	20.78
	802.11a	5580	Mid	18.59
	802.11a	5700	High	19.41
	802.11n-20	5500	Low	20.42
	802.11n-20	5580	Mid	19.70
	802.11n-20	5700	High	20.02
	802.11n-40	5510	Low	52.89
	802.11n-40	5590	Mid	41.98
	802.11n-40	5670	High	40.71
	802.11ac-80	5530	Low	95.21
	802.11ac-80	5610	High	90.64

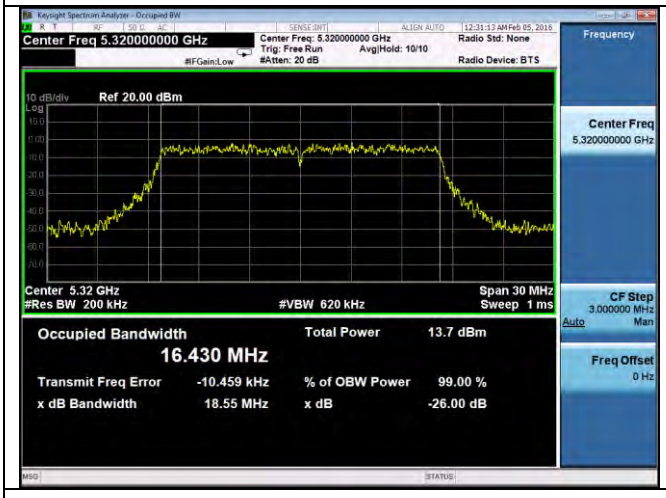
26dB & 6dB &99% Bandwidth Test Plots



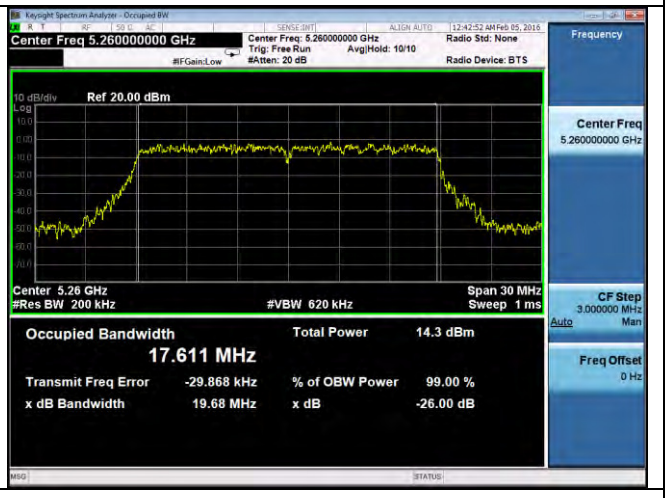
26dB BW -802.11a 5260MHz



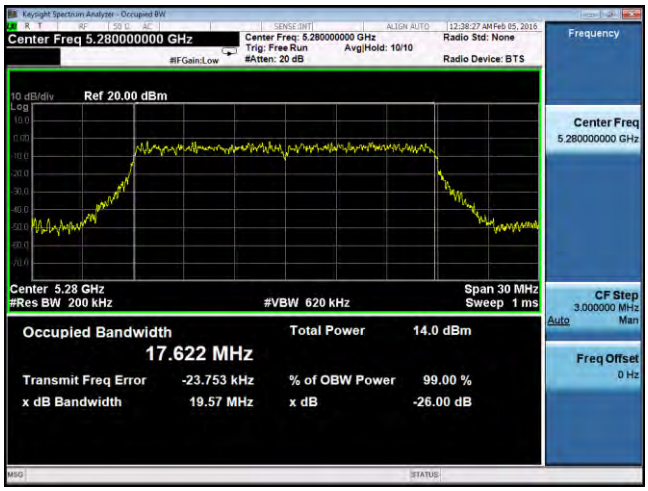
26dB BW -802.11a 5280MHz



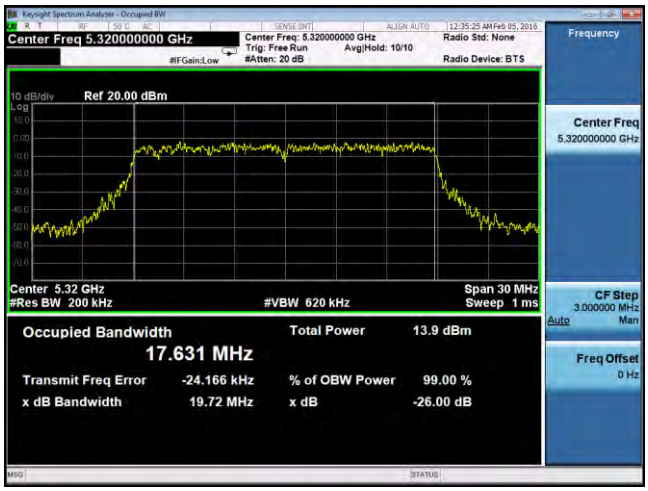
26dB BW -802.11a 5320MHz



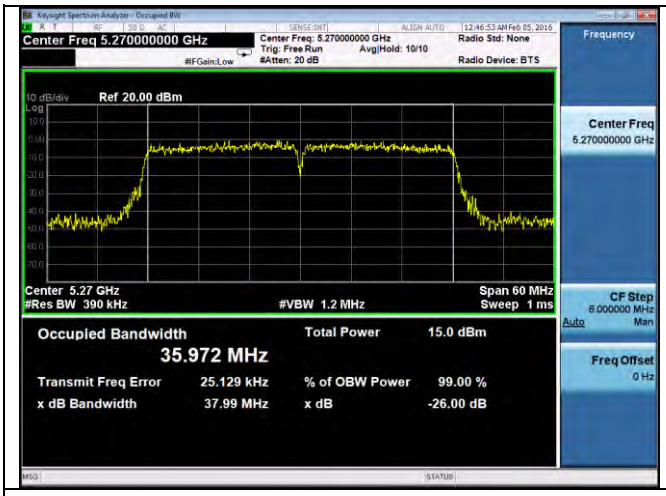
26dB BW -802.11n-20M 5260MHz



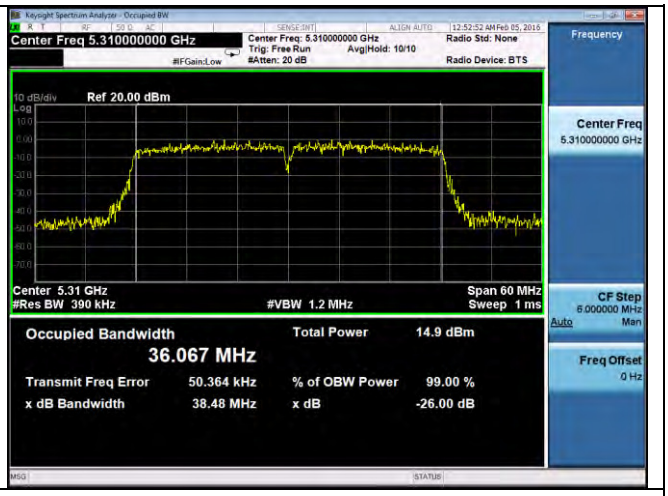
26dB BW -802.11n-20M 5280MHz



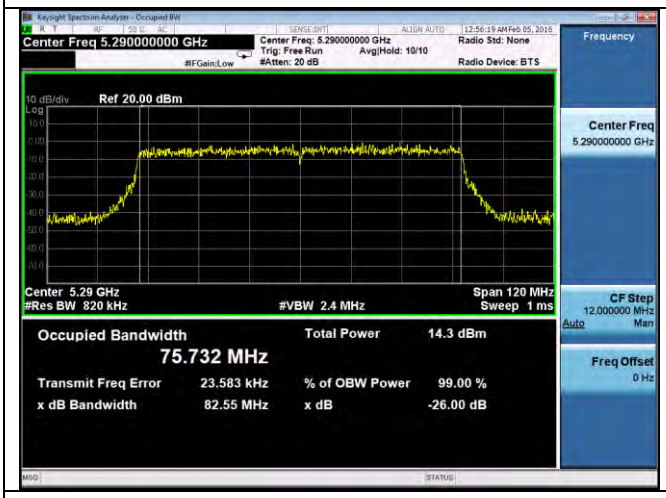
26dB BW -802.11n-20M 5320MHz



26dB BW -802.11n-40M 5270MHz

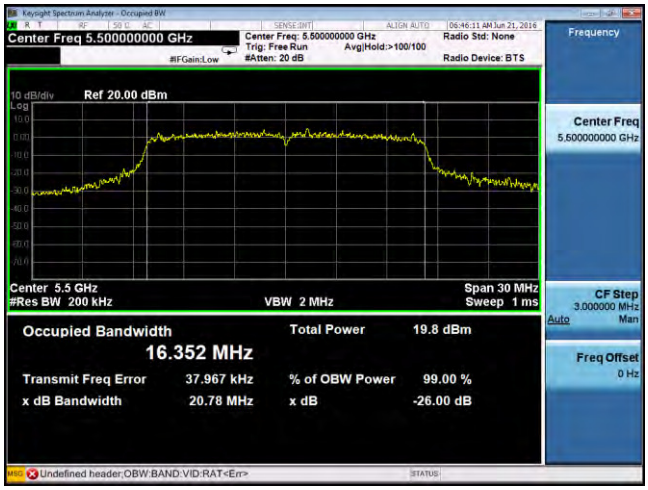


26dB BW -802.11n-40M 5310MHz

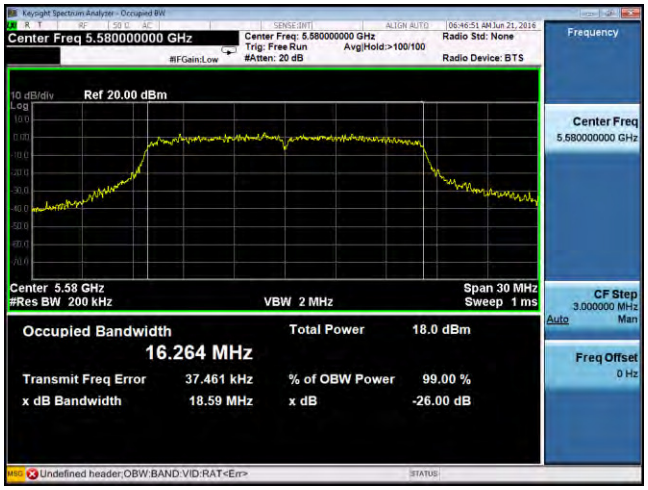


26dB BW -802.11ac-80M 5290MHz

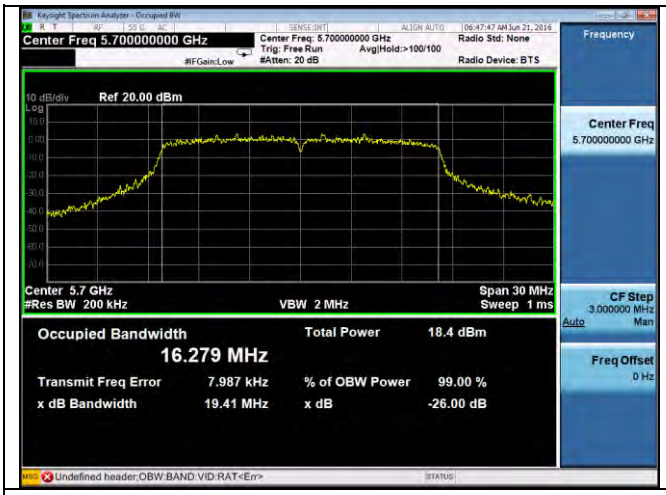
-



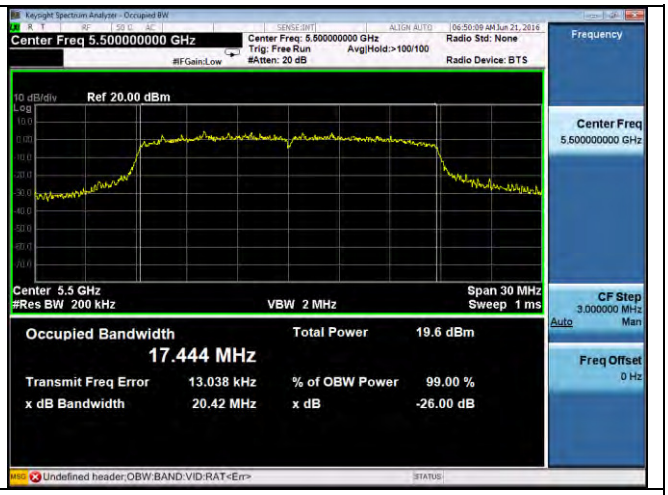
26dB BW -802.11a 5500MHz



26dB BW -802.11a 5580MHz

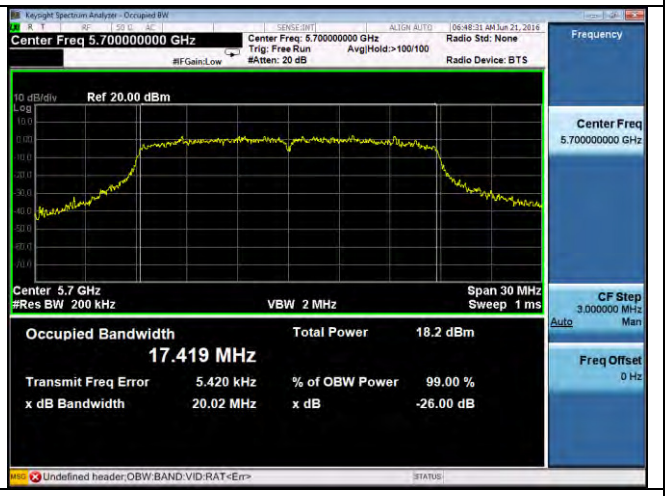


26dB BW -802.11a 5700MHz

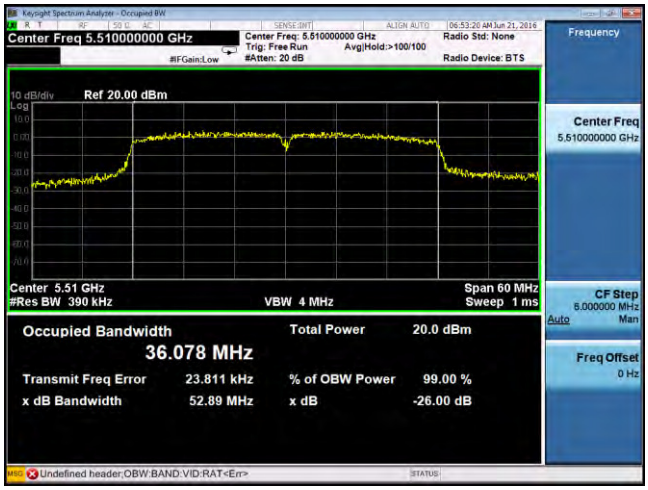


26dB BW -802.11n-20M 5500MHz

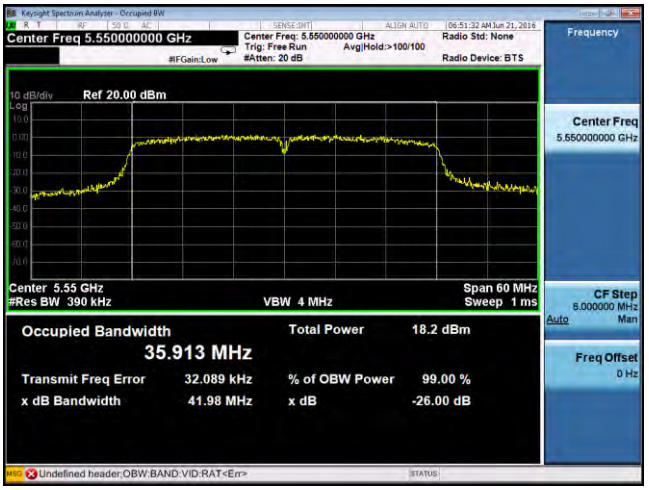
26dB BW -802.11n-20M 5580MHz



26dB BW -802.11n-20M 5700MHz



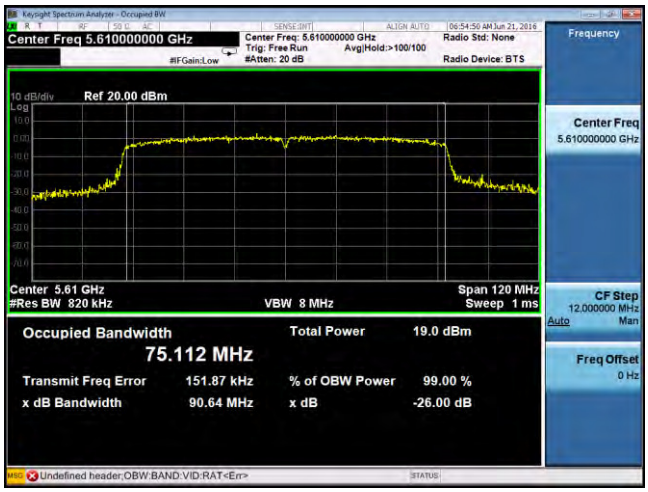
26dB BW -802.11n-40M 5510MHz



26dB BW -802.11n-40M 5550MHz

26dB BW -802.11n-40M 5670MHz

26dB BW -802.11ac-80M 5530MHz



26dB BW -802.11ac-80M 5610MHz

10.3 Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
§ 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.	☒
	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			
Test Procedure	789033 D02 General UNII Test Procedures New Rules v01r02 Measurement using a Power Meter (PM) 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	06/18/2016 – 06/25/2016	Environmental condition	Temperature 21ºC Relative Humidity 40% Atmospheric Pressure 1019mbar
Remark	N/A		
Result	☒ Pass ☐ Fail		

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

Test was done by Chen Ge at RF test site.

Output Power measurement result for 5.3GHz

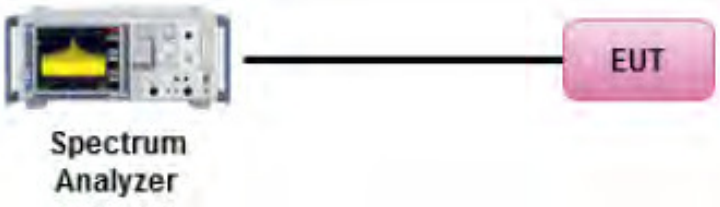
Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)	Limit (dBm)	Result
Output power	802.11a	5260	Low	12.20	24	Pass
		5280	Mid	12.35	24	Pass
		5320	High	13.28	24	Pass
	802.11n-20M	5260	Low	12.05	24	Pass
		5280	Mid	12.20	24	Pass
		5320	High	13.24	24	Pass
	802.11n-40M	5270	Low	12.60	24	Pass
		5310	High	11.61	24	Pass
	802.11ac-80M	5290	Mid	10.90	24	Pass

Output Power measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)	Limit (dBm)	Result
Output power	802.11a	5500	Low	14.18	24	Pass
		5580	Mid	12.38	24	Pass
		5700	High	12.73	24	Pass
	802.11n-20M	5500	Low	13.73	24	Pass
		5580	Mid	12.15	24	Pass
		5700	High	12.57	24	Pass
	802.11n-40M	5510	Low	14.31	24	Pass
		5550	Mid	12.65	24	Pass
		5670	High	14.50	24	Pass
	802.11ac-80M	5530	Low	13.13	24	Pass
		5610	High	13.48	24	Pass

10.4 Peak Spectral Density

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.407	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 v01r02, II.F. Method SA-1 Maximum spectral density measurement procedure - 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	06/18/2016 – 06/22/2016	Environmental condition	Temperature 22ºC Relative Humidity 42% Atmospheric Pressure 1020mbar
Remark	N/A		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Chen Ge at RF test site.

PSD measurement result for 5.3GHz

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm/MHz)	Limit (dBm/MHz)	Result
PSD	802.11a	5260	Low	1.54	11	Pass
		5280	Mid	1.53	11	Pass
		5320	High	2.48	11	Pass
	802.11n-20M	5260	Low	1.22	11	Pass
		5280	Mid	1.46	11	Pass
		5320	High	2.41	11	Pass
	802.11n-40M	5270	Low	-1.41	11	Pass
		5310	High	-2.24	11	Pass
	802.11ac-80M	5290	Mid	-5.95	11	Pass

PSD measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/MHz)	Limit (dBm)	Result
PSD	802.11a	5500	Low	3.47	11	Pass
		5580	Mid	1.67	11	Pass
		5700	High	2.24	11	Pass
	802.11n-20M	5500	Low	2.98	11	Pass
		5580	Mid	1.20	11	Pass
		5700	High	1.87	11	Pass
	802.11n-40M	5510	Low	0.50	11	Pass
		5550	Mid	-1.43	11	Pass
		5670	High	0.71	11	Pass
	802.11ac-80M	5530	Low	-3.53	11	Pass
		5610	High	-3.53	11	Pass

Test Plots

PSD-802.11a-5260M

PSD-802.11a-5280M

PSD-802.11a-5320M

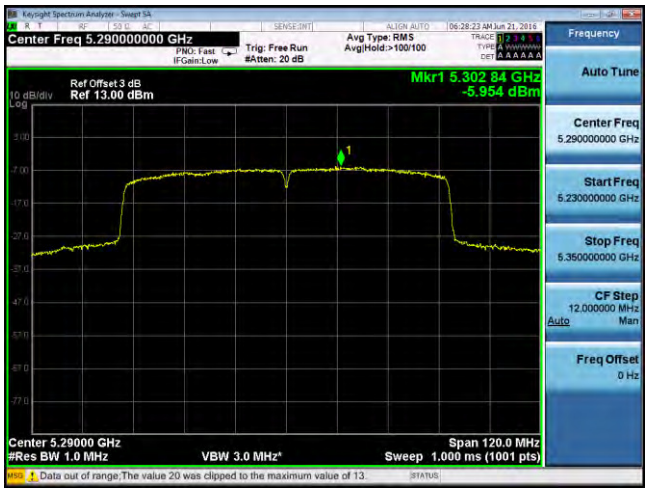
PSD-802.11n-20M-5260M

PSD-802.11n-20M-5280M

PSD-802.11n-20M-5320M

PSD-802.11n-40M-5270M

PSD-802.11n-40M-5310M

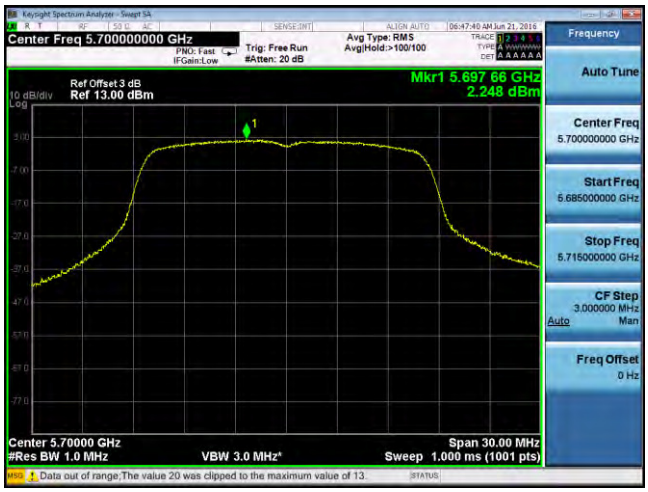


PSD-802.11ac-80M-5290M

-

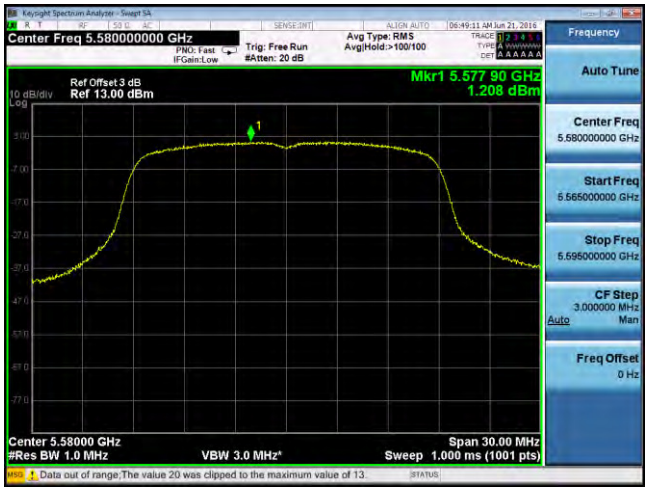
PSD-802.11a-5500M

PSD-802.11a-5580M



PSD-802.11a-5700M

PSD-802.11n-20M-5500M



PSD-802.11n-20M-5580M

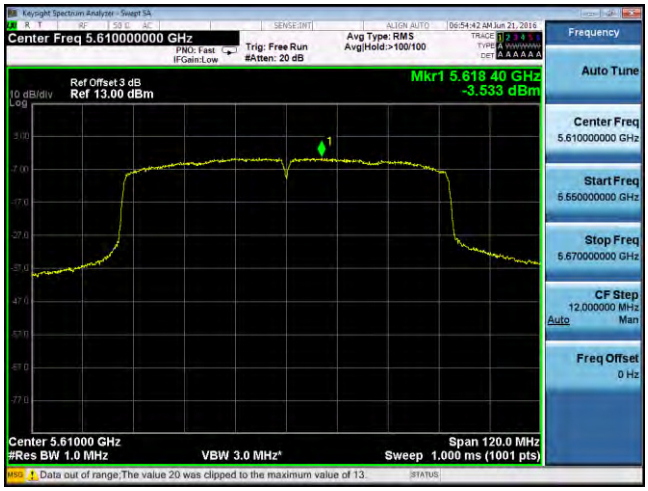
PSD-802.11n-20M-5700M

PSD-802.11n-40M-5510M

PSD-802.11n-40M-5550M

PSD-802.11n-40M-5670M

PSD-802.11ac-80M-5530M



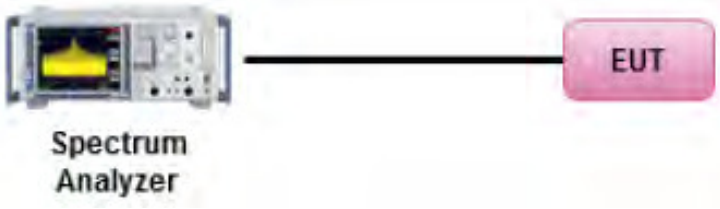
PSD-802.11ac-80M-5610M

-

-

10.5 Band Edge Measurement

Requirement(s):

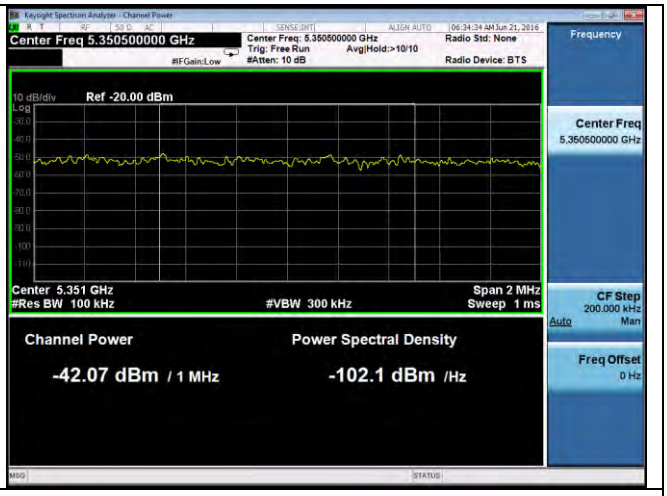
Spec	Item	Requirement	Applicable
47CFR§ 15.407(b)(2),	(1)	For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.	☒
15.407(b)(6)	(4)	For transmitters operating in the 5.725-5.825 GHz band: all emissions within the 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			
Procedure	789033 D02 General UNII Test Procedures New Rules v01r02, II.F. Method SA-1 Band Edge measurement: - 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 was done by Chen Ge at RF test site.

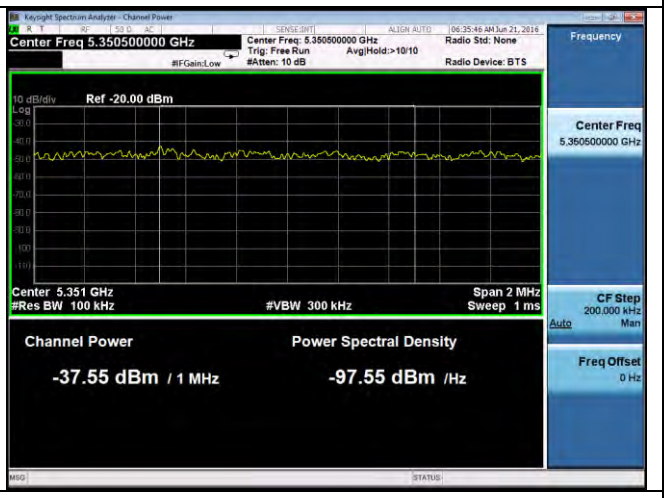
Test Plots (W53 band)

Band Edge-802.11a-5260M

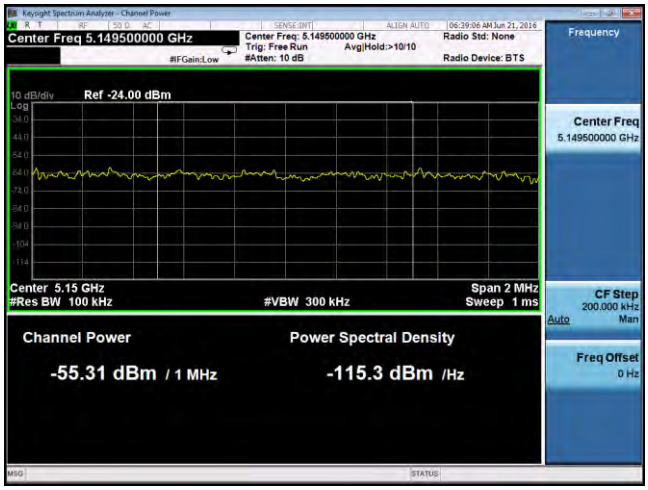


Band Edge-802.11a-5320M

Band Edge -802.11n-20M -5260M



Band Edge -802.11n-20M -5320M



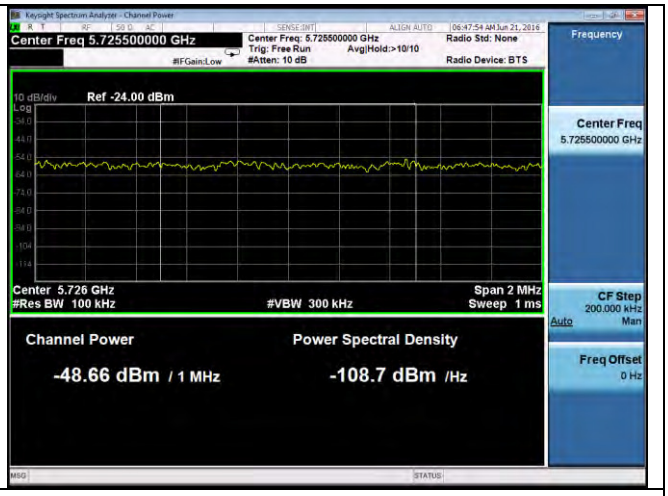
Band Edge -802.11n-40M-5270M

Band Edge -802.11n-40M-5310M

	
Band Edge -802.11ac-80M-5290M	**-**

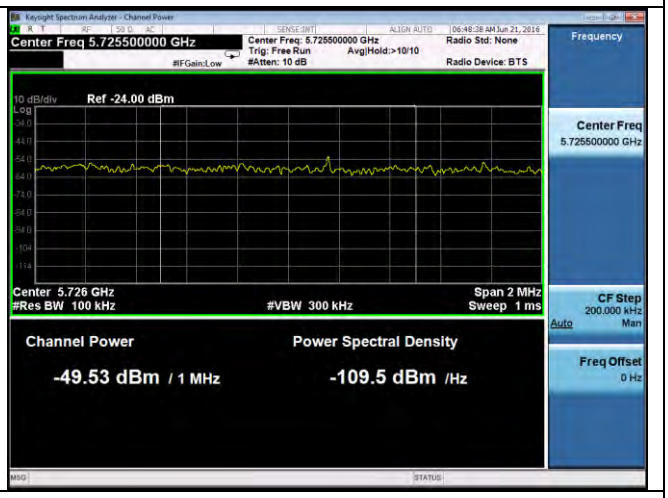
W56 band:

Band Edge -802.11a-5500M

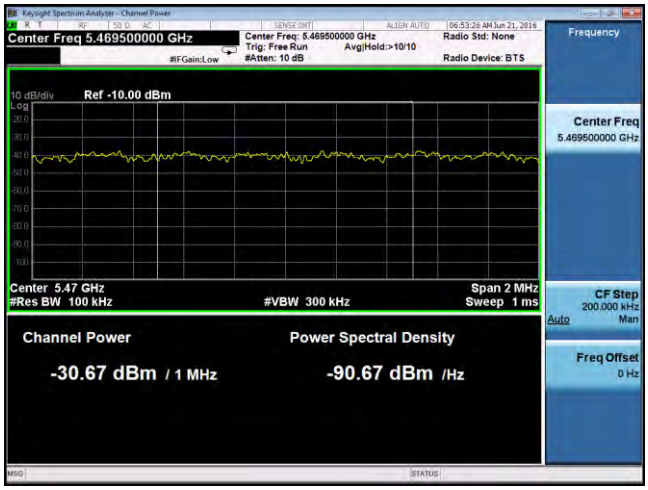


Band Edge -802.11a-5700M

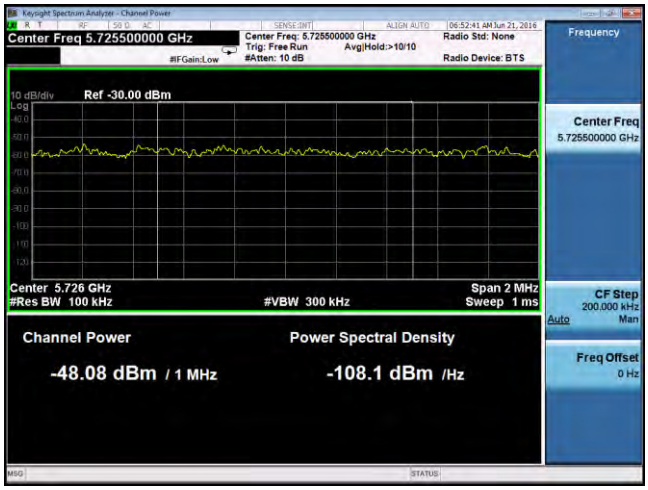
Band Edge -802.11n-20M -5500M



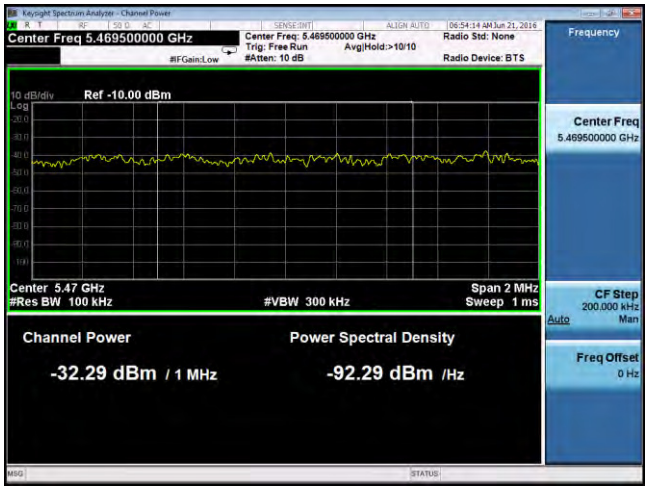
Band Edge -802.11n-20M -5700M



Band Edge -802.11n-40M-5510M

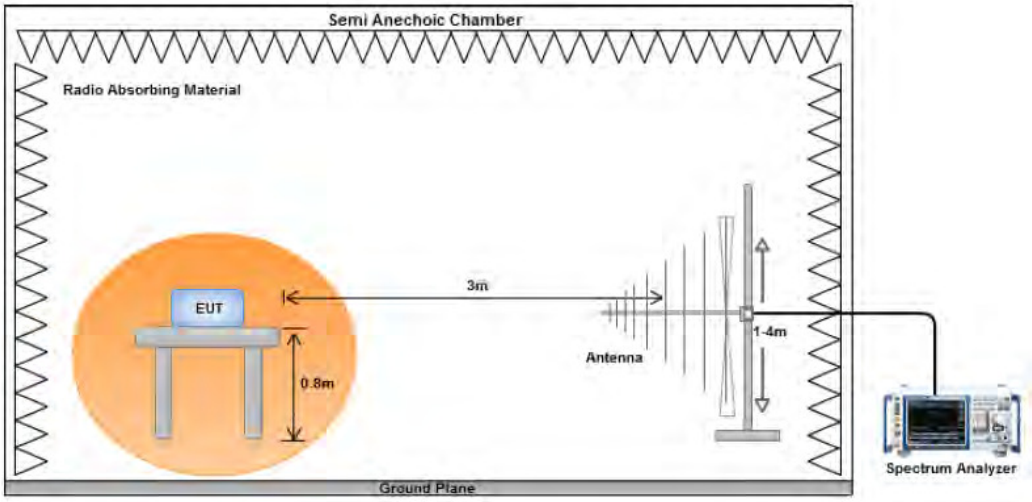


Band Edge -802.11n-40M-5670M

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

10.6 Radiated Spurious Emissions below 1GHz

Requirement(s):

<table>
<tr><th>Spec</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§
15.407(b)
15.209 (a)</td><td>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></td><td>☒</td></tr>
<tr><td>Test Setup</td><td> 
</td><td></td></tr>
<tr><td>Procedure</td><td>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.</td><td></td></tr>
<tr><td>Remark</td><td>The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.</td><td></td></tr>
<tr><td>Result</td><td>☒ Pass ☐ Fail</td><td></td></tr>
</table>

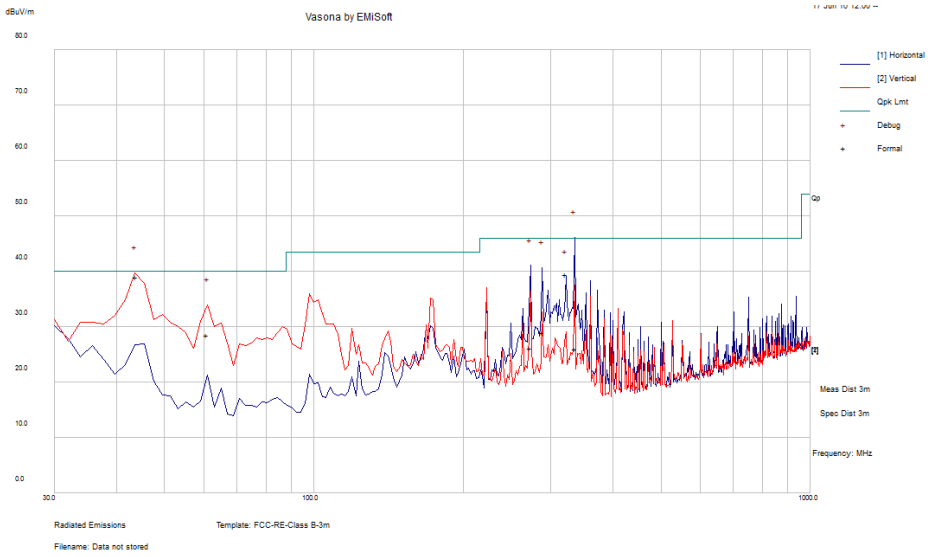
Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Chen Ge at 10m chamber.

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:	Chen Ge			
Test Date:	06/10/2016			
Remarks:	802.11ac VHT80, 5530MHz			

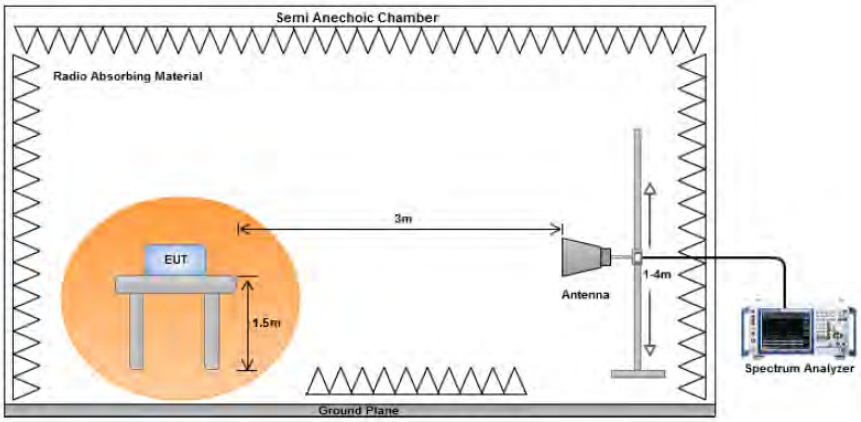


Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
335.43	48.4	2.79	-25.15	26.05	Quasi Max	H	133	160	46.02	-19.97	Pass
43.79	64.28	0.99	-26.36	38.91	Quasi Max	V	101	134	40	-1.09	Pass
272.74	49.93	2.53	-26.31	26.15	Quasi Max	H	101	192	46.02	-19.87	Pass
288.49	52.75	2.58	-26.32	29.01	Quasi Max	H	111	233	46.02	-17.01	Pass
60.86	58.44	1.21	-31.15	28.5	Quasi Max	V	100	129	40	-11.5	Pass
321.74	61.93	2.73	-25.25	39.41	Quasi Max	H	101	356	46.02	-6.61	Pass

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

10.7 Radiated Spurious Emissions above 1GHz

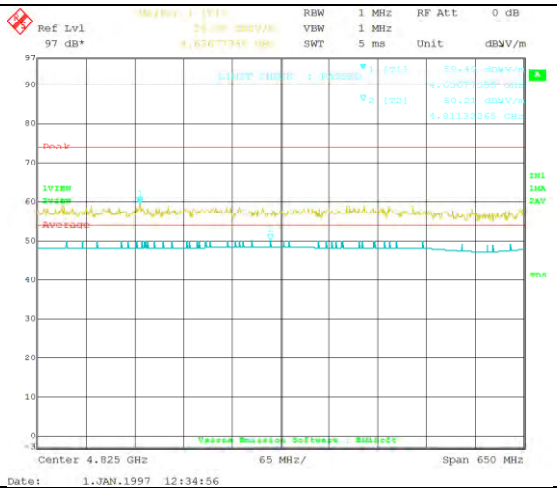
Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§ 15.407(b)(2), 15.407(b)(6)	(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.	☒
	(5)	Restricted band, emission must also comply with the radiated emission limits specified in 15.209	☒
Test Setup			
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. An average 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 40GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.		
Result	☒ Pass ☐ Fail		

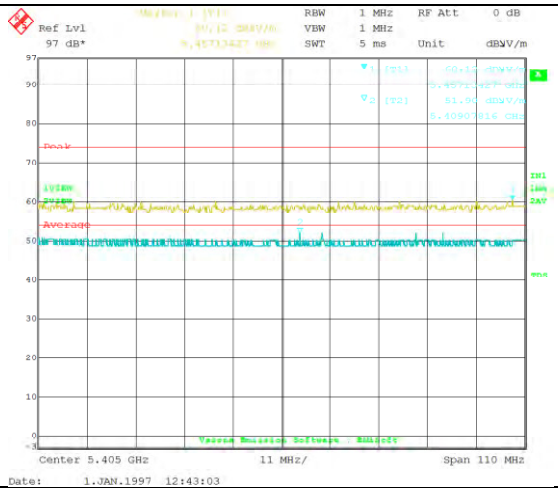
Test Data ☒ Yes (See below) ☐ N/A
Test Plot ☐ Yes (See below) ☒ N/A

Test was done by Chen Ge at 10m chamber.

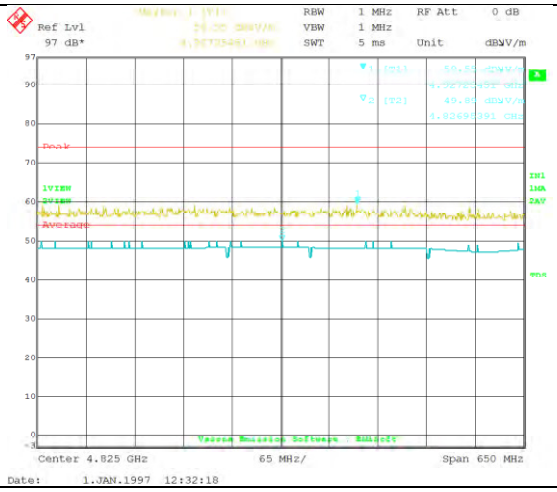
Radiated Restricted band Measurement Plots:



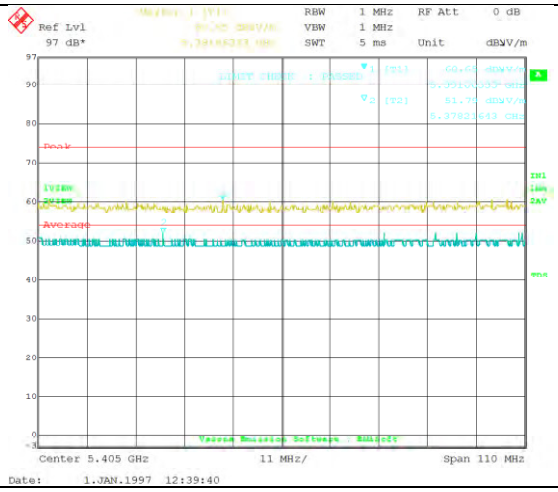
802.11a 5260M(4500-5150MHz)



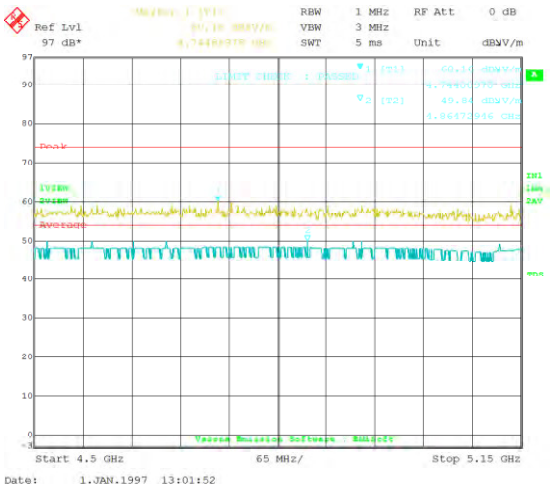
802.11a 5320M(5350-5460MHz)



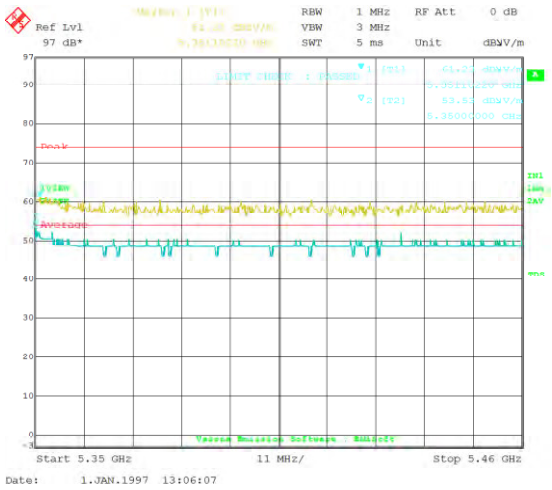
802.11n-HT20 5260M(4500-5150MHz)



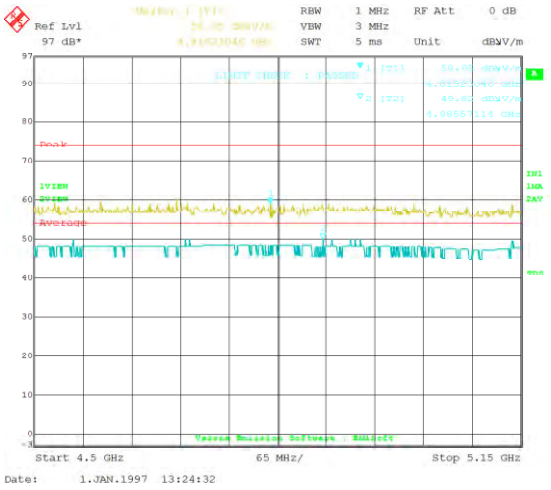
802.11n-HT 5320M(5350-5460MHz)



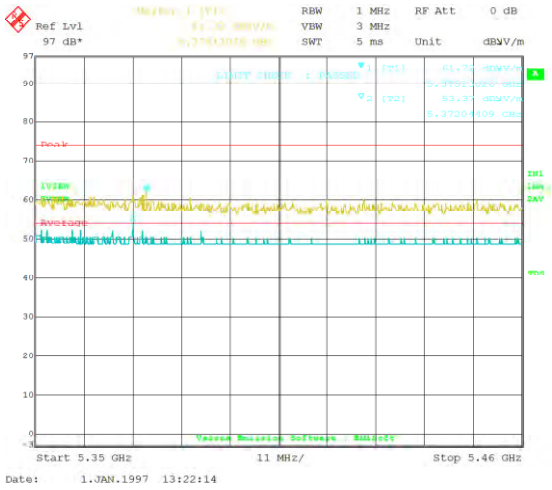
802.11n-HT40 5270M(4500-5150MHz)



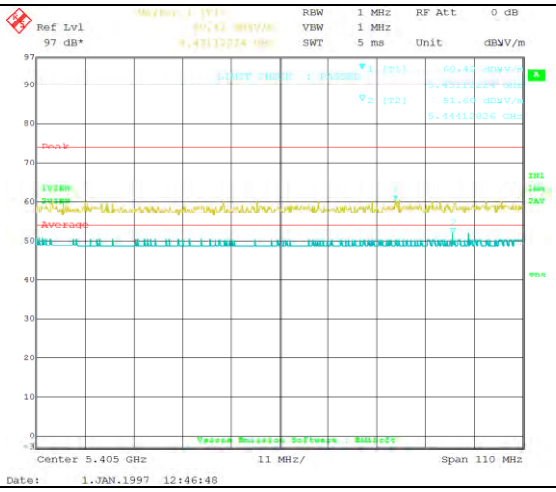
802.11n-HT 5310M(5350-5460MHz)



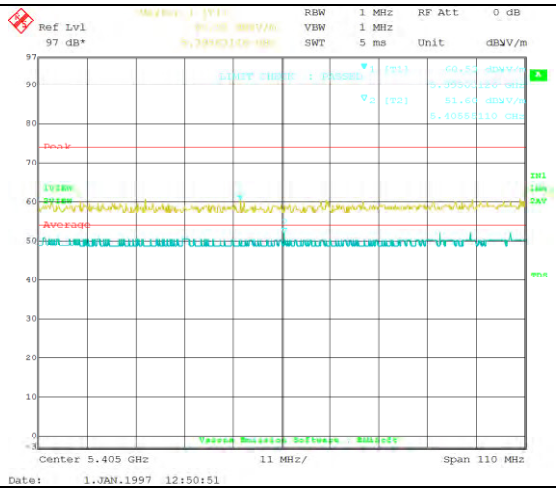
802.11ac-VHT80 5290M(4500-5150MHz)



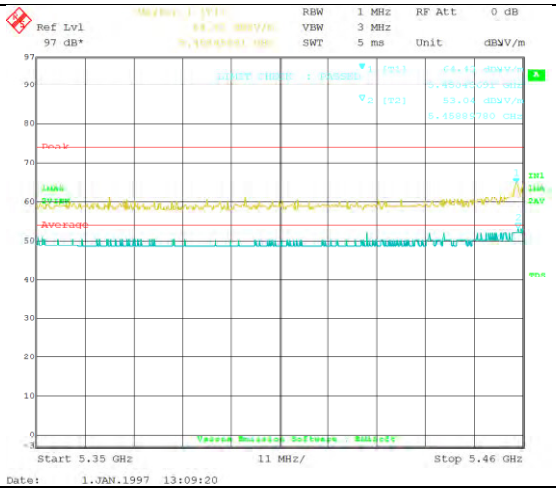
802.11ac-VHT80 5290M(5350-5460MHz)



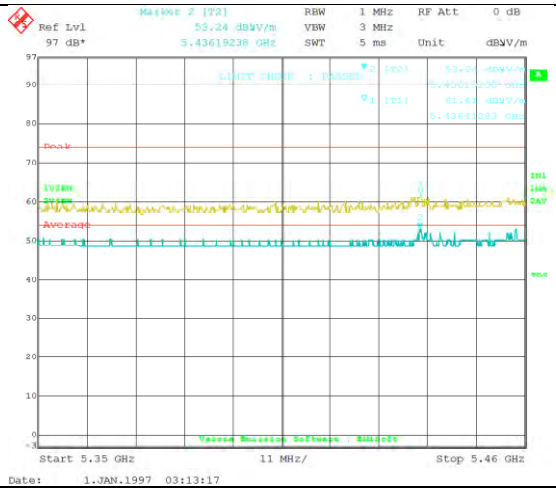
802.11a 5500M(5350-5460MHz)



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



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



802.11ac 5530M(5350-5460MHz)

Radiated Emission Test Results (Above 1GHz)

W53 Band:
Above 1GHz-40GHz – 802.11a – 5260MHz

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
10519.5	40.46	8.32	48.58	38.92	39.12	Peak Max	H	192	215	74	-34.88	Pass
15780.2	46.46	9.02	48.24	39.89	47.13	Peak Max	H	244	159	74	-26.87	Pass
10519.5	28.3	8.32	48.58	38.92	26.96	Average Max	H	192	215	54	-27.04	Pass
15780.2	33.12	9.02	48.24	39.89	33.79	Average Max	H	244	159	54	-20.21	Pass

Above 1GHz-40GHz – 802.11a – 5280MHz

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
10558.4	40.3	8.27	48.58	39.42	39.41	Peak Max	V	117	215	74	-34.59	Pass
15837	46.75	9.03	48.24	39.89	47.43	Peak Max	H	173	360	74	-26.57	Pass
10558.4	28.56	8.27	48.58	39.42	27.67	Average Max	V	117	215	54	-26.33	Pass
15837	34.46	9.03	48.24	39.89	35.14	Average Max	H	173	360	54	-18.86	Pass

Above 1GHz-40GHz – 802.11a – 5320MHz

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
10639.3	42.97	8.26	48.58	39.42	42.07	Peak Max	H	176	118	74	-31.93	Pass
15962.5	46.21	9.03	48.24	39.69	46.69	Peak Max	V	214	159	74	-27.31	Pass
10639.3	28.62	8.26	48.58	39.42	27.72	Average Max	V	217	32	54	-26.28	Pass
15962.5	34.71	9.03	48.24	39.69	35.19	Average Max	H	113	243	54	-18.81	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
10519.4	42.12	8.28	48.58	38.92	40.74	Peak Max	H	222	328	74	-33.26	Pass
15782.6	46.47	9.04	48.24	39.89	47.16	Peak Max	H	105	319	74	-26.84	Pass
10519.4	29.82	8.28	48.58	38.92	28.44	Average Max	V	184	329	54	-25.56	Pass
15782.6	36.04	9.04	48.24	39.89	36.73	Average Max	H	105	319	54	-17.27	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
10561.9	46.68	9.03	48.58	39.42	46.55	Peak Max	V	161	219	74	-27.45	Pass
15843.4	41.53	8.28	48.24	39.89	41.46	Peak Max	V	100	194	74	-32.54	Pass
10561.9	34.25	9.03	48.58	39.42	34.12	Average Max	V	161	219	54	-19.88	Pass
15843.4	33.93	8.28	48.24	39.89	33.86	Average Max	H	192	360	54	-20.14	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
10643.3	40.4	8.25	48.58	39.42	39.49	Peak Max	H	246	360	74	-34.51	Pass
15960.6	43.66	9.02	48.24	39.69	44.13	Peak Max	H	246	161	74	-29.87	Pass
10643.3	29.32	8.25	48.58	39.42	28.41	Average Max	V	145	252	54	-25.59	Pass
15960.6	33.21	9.02	48.24	39.69	33.68	Average Max	H	246	161	54	-20.32	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
10538.6	40.24	8.32	48.58	38.92	38.9	Peak Max	H	214	0	74	-35.1	Pass
15809.2	43.92	9.05	48.24	39.89	44.62	Peak Max	V	177	158	74	-29.38	Pass
10538.6	28	8.32	48.58	38.92	26.66	Average Max	H	214	0	54	-27.34	Pass
15809.2	32.2	9.05	48.24	39.89	32.9	Average Max	V	177	158	54	-21.1	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
10621.3	41.54	8.3	48.58	39.42	40.68	Peak Max	H	161	86	74	-33.32	Pass
15929.6	44.43	9.04	48.24	39.96	45.19	Peak Max	H	178	291	74	-28.81	Pass
10621.3	27.92	8.3	48.58	39.42	27.06	Average Max	H	161	86	54	-26.94	Pass
15929.6	32.03	9.04	48.24	39.96	32.79	Average Max	V	135	0	54	-21.21	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
15868.9	43.94	9.06	48.24	39.96	44.72	Peak Max	V	132	242	74	-29.28	Pass
10578.2	36.67	8.32	48.58	39.42	35.83	Peak Max	H	139	223	74	-38.17	Pass
15868.9	31.97	9.06	48.24	39.96	32.75	Average Max	V	132	242	54	-21.25	Pass
10578.2	24.22	8.32	48.58	39.42	23.38	Average Max	H	139	223	54	-30.62	Pass

W56 band:
Above 1GHz-40GHz – 802.11a – 5500MHz

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
11002.4	35.63	8.33	47.94	39.15	35.17	Peak Max	H	212	319	74	-38.83	Pass
16500.3	44.1	9.35	46.84	40.49	47.1	Peak Max	H	225	155	74	-26.9	Pass
11002.4	23.78	8.33	47.94	39.15	23.32	Average Max	V	167	55	54	-30.68	Pass
16500.3	32.18	9.35	46.84	40.49	35.18	Average Max	V	173	132	54	-18.82	Pass

Above 1GHz-40GHz – 802.11a – 5580MHz

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
11162.9	36.55	8.4	47.94	39.45	36.46	Peak Max	V	123	89	74	-37.54	Pass
16740.4	43.98	9.33	46.84	40.98	47.45	Peak Max	H	169	198	74	-26.55	Pass
11162.9	24.23	8.4	47.94	39.45	24.14	Average Max	V	123	89	54	-29.86	Pass
16740.4	31.56	9.33	46.84	40.98	35.03	Average Max	H	169	198	54	-18.97	Pass

Above 1GHz-40GHz – 802.11a – 5700MHz

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
11401.4	35.39	8.5	47.5	39.92	36.31	Peak Max	V	98	240	74	-37.69	Pass
17101.2	43.51	9.33	46.33	42.85	49.36	Peak Max	V	212	74	74	-24.64	Pass
11401.4	23.82	8.5	47.5	39.92	24.74	Average Max	V	98	240	54	-29.26	Pass
17101.2	31.33	9.33	46.33	42.85	37.18	Average Max	H	187	4	54	-16.82	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
16499.9	44.35	9.35	46.84	40.49	47.35	Peak Max	H	189	0	74	-26.65	Pass
10999.9	39.79	8.33	47.94	39.15	39.33	Peak Max	H	102	91	74	-34.67	Pass
16499.9	32.62	9.35	46.84	40.49	35.62	Average Max	H	189	0	54	-18.38	Pass
10999.9	27.54	8.33	47.94	39.15	27.08	Average Max	H	102	91	54	-26.92	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
16742.8	45.04	9.33	46.84	40.98	48.51	Peak Max	H	227	252	74	-25.49	Pass
11158.8	40.25	8.4	47.94	39.45	40.16	Peak Max	V	218	0	74	-33.84	Pass
16742.8	32.05	9.33	46.84	40.98	35.52	Average Max	V	246	287	54	-18.48	Pass
11158.8	28.17	8.4	47.94	39.45	28.08	Average Max	H	174	329	54	-25.92	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
17100.2	44.13	9.33	46.33	42.85	49.98	Peak Max	H	114	191	74	-24.02	Pass
11403.5	39.65	8.5	47.5	39.92	40.57	Peak Max	V	111	146	74	-33.43	Pass
17100.2	31.8	9.33	46.33	42.85	37.65	Average Max	V	241	181	54	-16.35	Pass
11403.5	27.79	8.5	47.5	39.92	28.71	Average Max	H	210	71	54	-25.29	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
16527.9	45.28	9.35	46.84	40.49	48.28	Peak Max	V	213	278	74	-25.72	Pass
11021.8	39.5	8.34	47.94	39.15	39.05	Peak Max	H	151	59	74	-34.95	Pass
16527.9	32.49	9.35	46.84	40.49	35.49	Average Max	V	213	278	54	-18.51	Pass
11021.8	27.24	8.34	47.94	39.15	26.79	Average Max	V	172	102	54	-27.21	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
16652.7	44.8	9.34	46.84	40.98	48.28	Peak Max	V	124	308	74	-25.72	Pass
11099.1	39.63	8.37	47.94	39.44	39.5	Peak Max	V	176	122	74	-34.5	Pass
16652.7	32.53	9.34	46.84	40.98	36.01	Average Max	V	124	308	54	-17.99	Pass
11099.1	27.82	8.37	47.94	39.44	27.69	Average Max	V	176	122	54	-26.31	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
11342.9	40.47	8.48	47.5	39.83	41.28	Peak Max	V	135	42	74	-32.72	Pass
17010.8	43.92	9.31	46.33	41.97	48.87	Peak Max	V	189	34	74	-25.13	Pass
11342.9	27.95	8.48	47.5	39.83	28.76	Average Max	V	135	42	54	-25.24	Pass
17010.8	31.67	9.31	46.33	41.97	36.62	Average Max	V	189	34	54	-17.38	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
11061.8	39.55	8.36	47.94	39.44	39.41	Peak Max	V	221	309	74	-34.59	Pass
16588	44.46	9.34	46.84	40.96	47.92	Peak Max	V	210	11	74	-26.08	Pass
11061.8	27.59	8.36	47.94	39.44	27.45	Average Max	V	221	309	54	-26.55	Pass
16588	32.59	9.34	46.84	40.96	36.05	Average Max	V	210	11	54	-17.95	Pass

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

Frequency MHz	Raw dBuV	Cable Loss	Amp dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
11222.9	39.6	8.42	47.94	39.45	39.53	Peak Max	H	224	68	74	-34.47	Pass
16831.2	44.7	9.32	46.33	40.99	48.68	Peak Max	V	232	0	74	-25.32	Pass
11222.9	27.4	8.42	47.94	39.45	27.33	Average Max	V	146	299	54	-26.67	Pass
16831.2	32.05	9.32	46.33	40.99	36.03	Average Max	V	232	0	54	-17.97	Pass

10.8 Dynamic Frequency Selection (DFS)

10.8.1 General introduction

Interference Threshold values, Master or Client incorporating In-Service Monitoring

Maximum Transmit Power	Value (see note)
≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectra density requirement	-64 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. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

DFS Response requirement values

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 100% of the UNII 99% transmission power bandwidth See Note 3.
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. 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 a Channel move (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 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

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

1. Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup { (1/360) * (19*10^6/PRI_{usec}	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A	-		
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
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

2. Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per *Burst*	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.

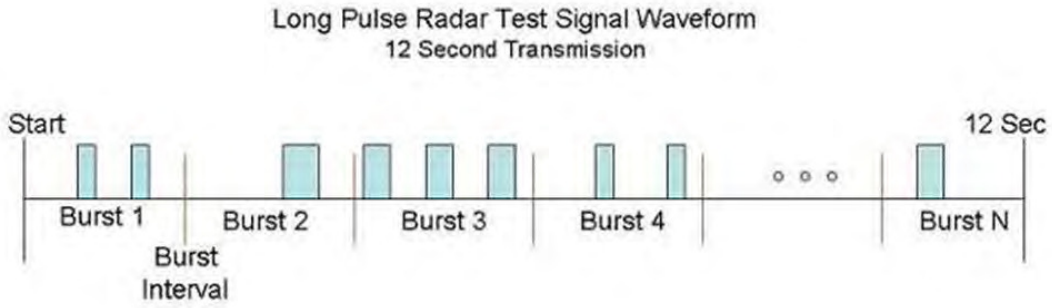
Each waveform is defined as follows:

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 a 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 s9tart 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).



3. Frequency Hopping Radar Type

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 selected 1 from the hopping sequence defined by the following algorithm:

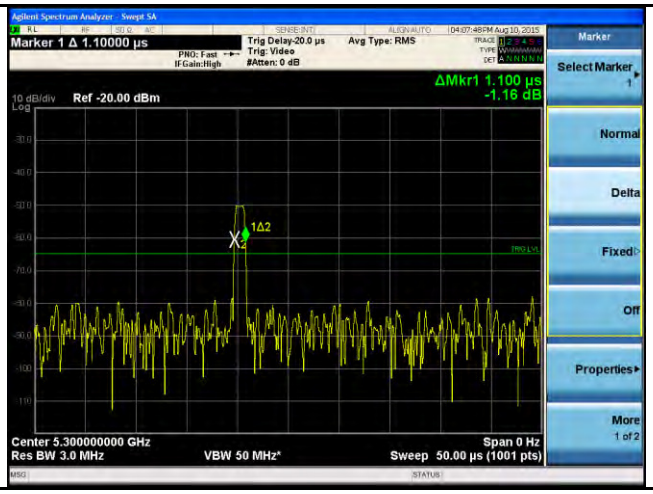
The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues 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.

10.8.2 Radar Waveform Calibration

The following equipment setup was used to calibrate the conducted 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 resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz.

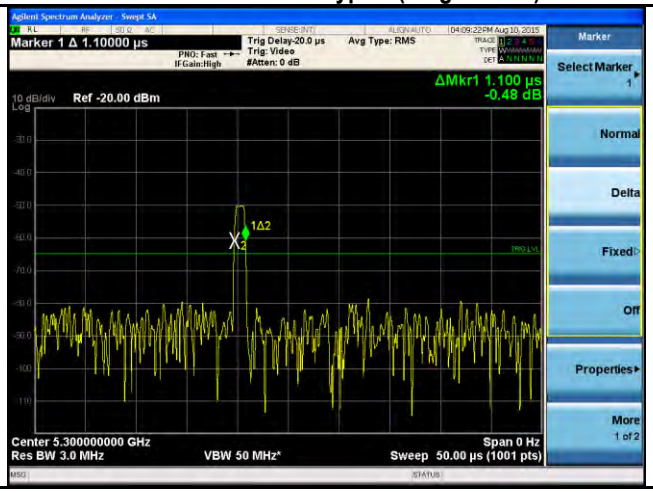
Calibration Test Plots

Radar Calibration - Type 0

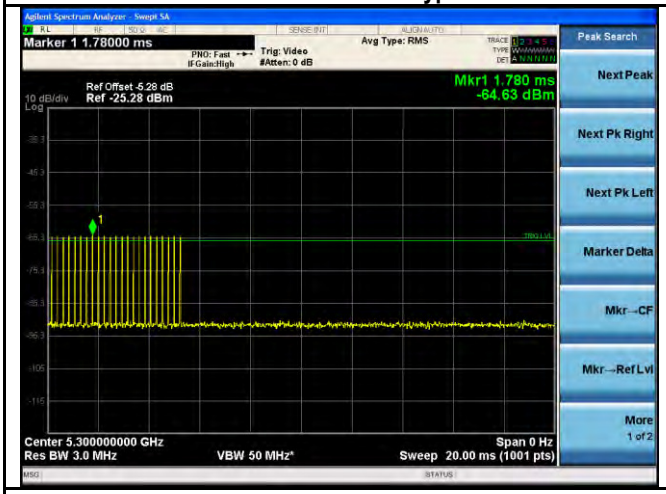


Radar Calibration - Type 0 (Single Burst)

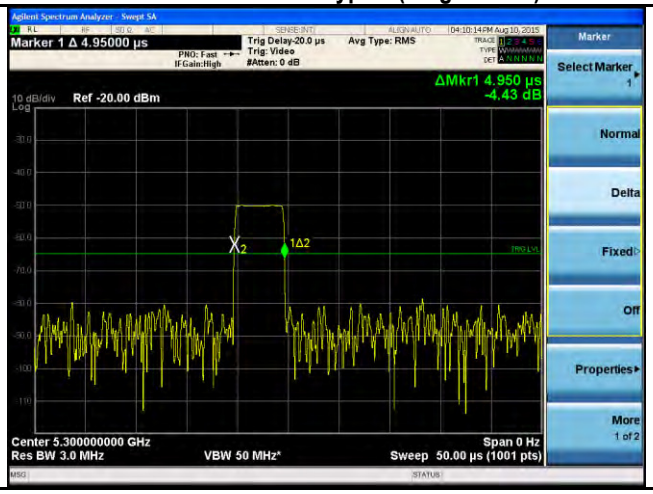
Radar Calibration - Type 1



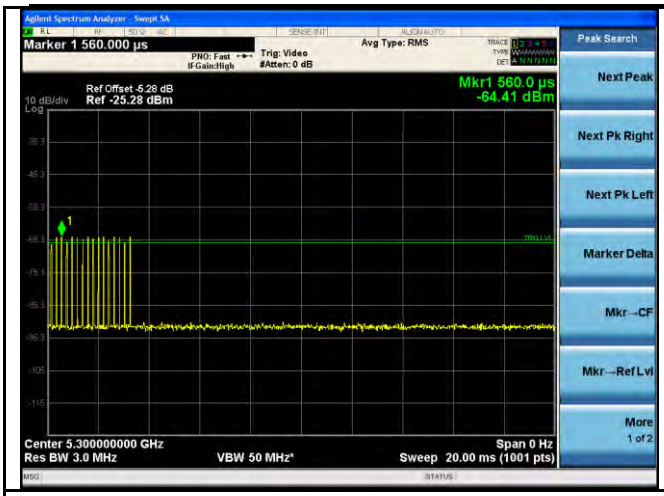
Radar Calibration - Type 1 (Single Burst)



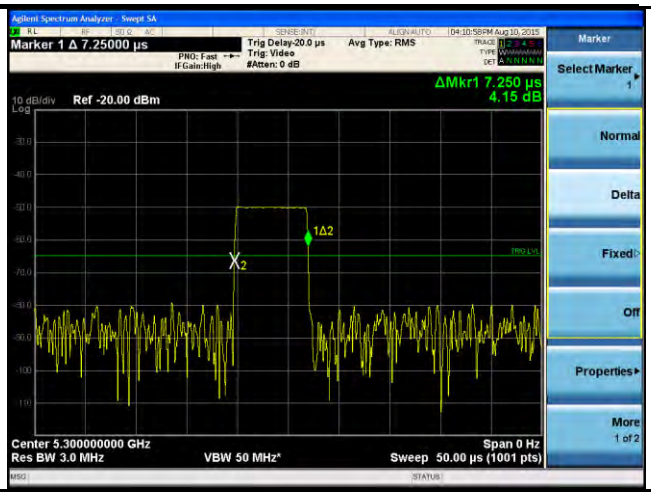
Radar Calibration - Type 2



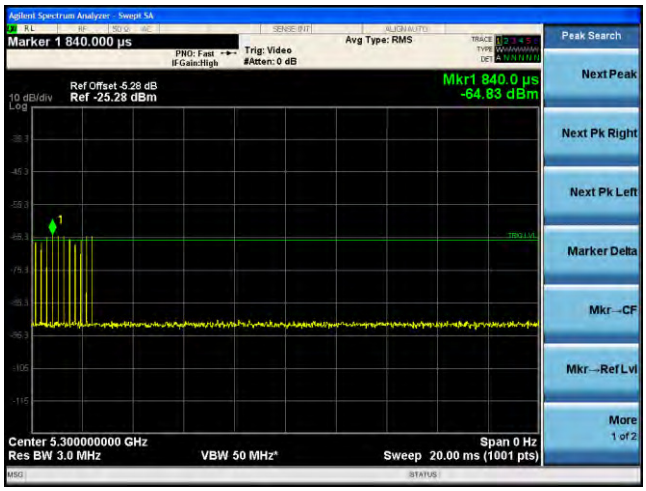
Radar Calibration - Type 2 (Single Burst)



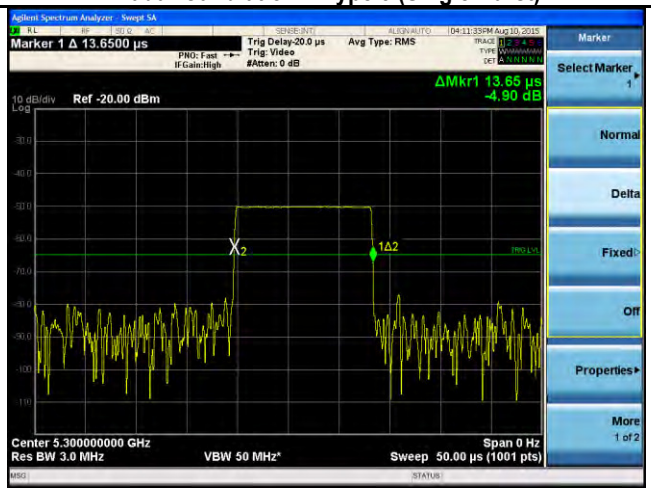
Radar Calibration - Type 3



Radar Calibration - Type 3 (Single Burst)

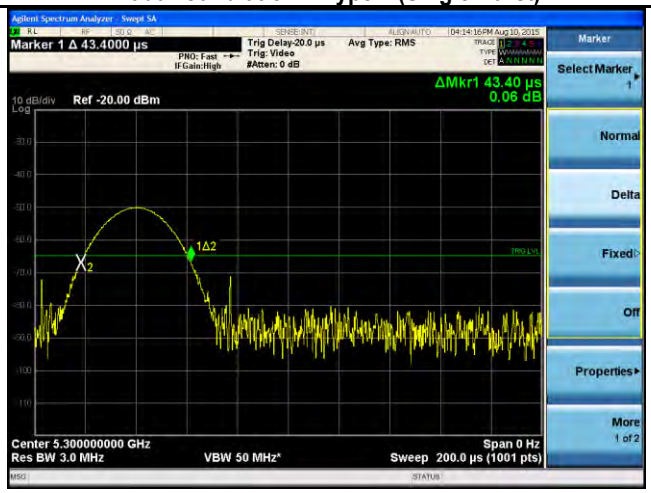


Radar Calibration - Type 4

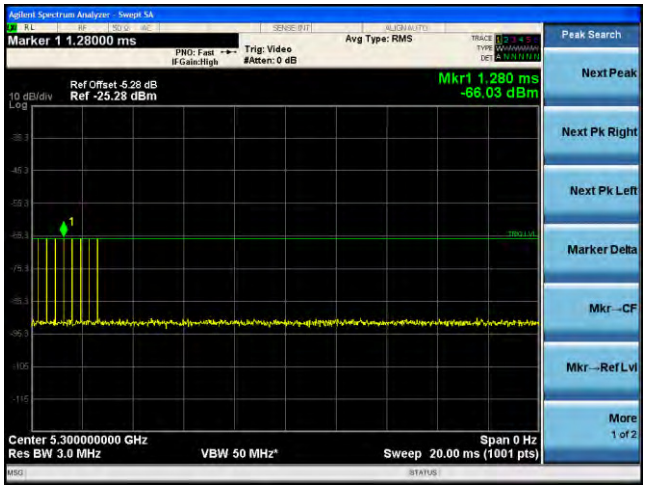


Radar Calibration - Type 4 (Single Burst)

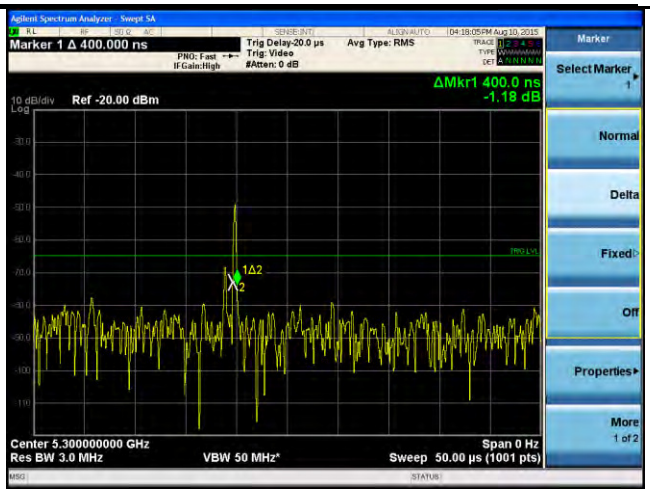
Radar Calibration - Type 5



Radar Calibration - Type 5 (Single Burst)



Radar Calibration - Type 6



Radar Calibration - Type 6 (Single Burst)

10.8.3 Test Procedure

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

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 is generated on the Operating Channel of the U-NII device.

UUT operating as a Client Device will associate with the (Master) at Mid Channel. DFS testing while the System testing was performed with the designated MPEG test file that streams full motion video at 30 frames per second from the Master to the Client IP based system

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

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.

Channel Closing Transmission Time- Measurement

A type 1 waveform was introduced to the EUT and the Spectrum Analyzer sweep time was set to 1s for monitoring and capturing the plot. A LabView program was created to collect trace data and capturing the plot. The program will calculate the channel closing time base on the spectrum analyzer result. The result will be calculated based on FCC procedure.

C= N*Dwell

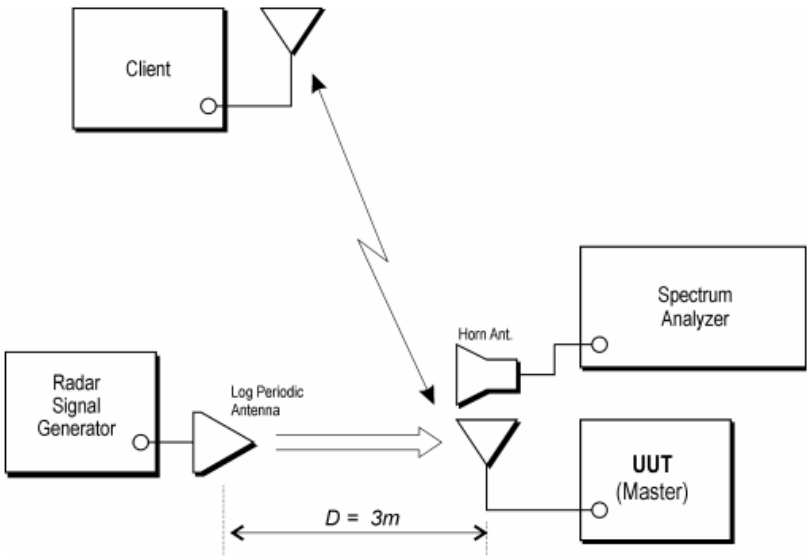
C is the closing time, N is the number of spectrum analyzer sampling bins showing a U-NII transmission and dwell is the dwell time per bin.

Dwell= S/B

Where Dwell is the dwell time per spectrum analyzer sampling bin, S is the sweep time and B is the number 0f spectrum analyzer sampling bins.

10.8.4 DFS Test Setup

Test Setup Block Diagram



The radio was set at the center channel frequency of tested Channel.
A FCC approved Client device – (FCC ID: S9GH510) Ruckus R600 Wireless AP was used to link with the UUT (slave) device.

For the frequency bands 5470MHz to 5725MHz the master device provides, on aggregate, uniform loading of the spectrum across all devices by selecting an operating channel among the available channels using a random algorithm.

The rated output power of the Master unit is > 23 dBm (EIRP). Therefore the required interference threshold is – 64 dBm. After correction for procedural adjustment, the required radiated threshold at the antenna port is -64 + 1 = -63 dBm.

The calibrated radiated DFS detection threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides margining to the limit.

Channel Closing Transmission Time- Measurement

A type 1 waveform was introduced to the EUT and the Spectrum Analyzer sweep time was set to 1s for monitoring and capturing the plot. A LabView program was created to collect trace data and capturing the plot. The program will calculate the channel closing time base on the spectrum analyzer result. The result will be calculated based on FCC procedure.

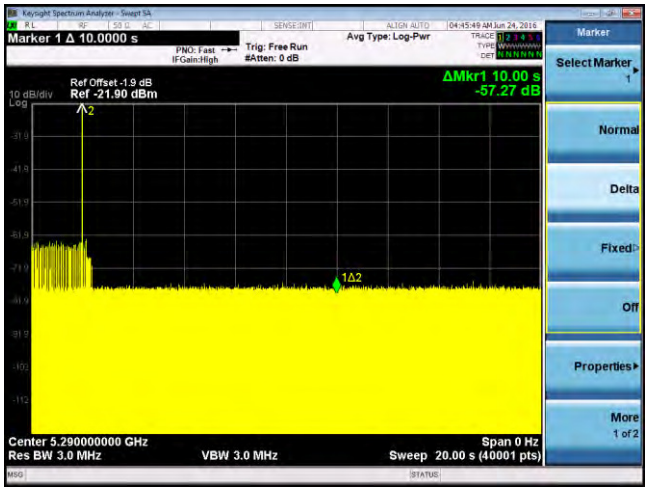
C= N*Dwell

C is the closing time, N is the number of spectrum analyzer sampling bins showing a U-NII transmission and dwell is the dwell time per bin.

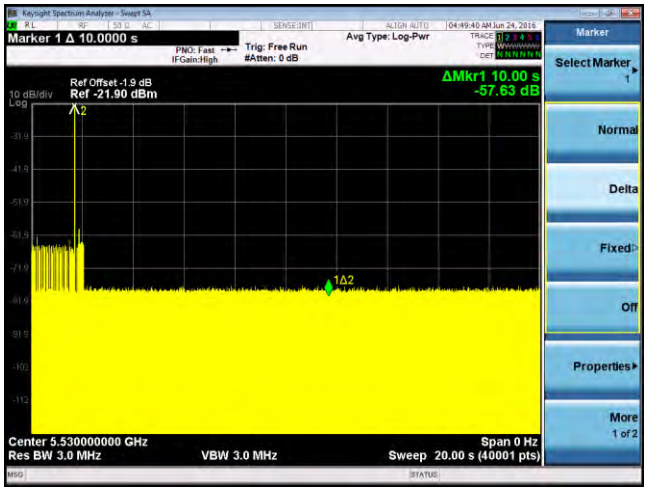
Dwell= S/B

Where Dwell is the dwell time per spectrum analyzer sampling bin, S is the sweep time and B is the number of spectrum analyzer sampling bins.

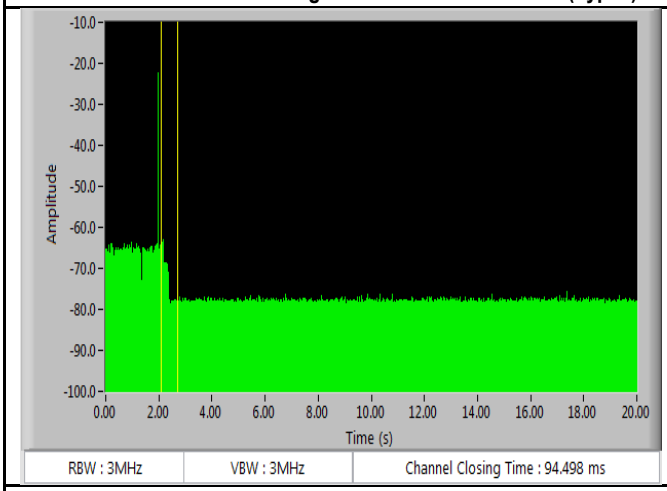
Test Result



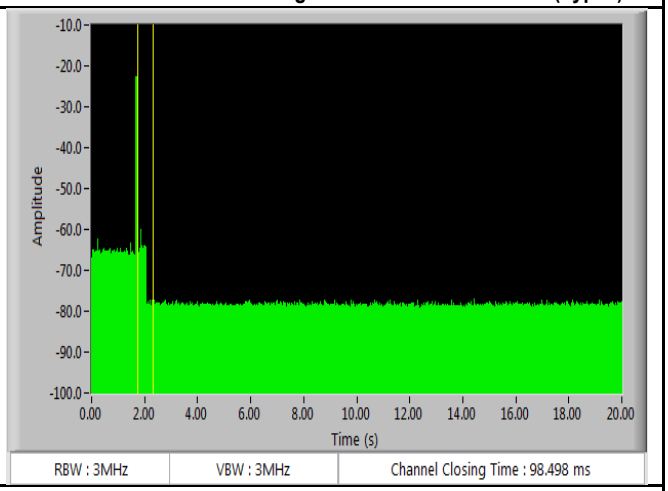
Channel Move Time& Closing Time - 802.11ac-5290MHz (Type0)



Channel Move Time& Closing Time - 802.11ac-5530MHz (Type0)



Channel Move Time& Closing Time - 802.11ac-5290MHz (Type0)



Channel Move Time& Closing Time - 802.11ac-5530MHz (Type0)

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
R & S Receiver	ESIB 40	100179	06/08/2016	1 Year	06/08/2017	☑
CHASE LISN	MN2050B	1018	08/07/2015	1 Year	08/07/2016	☑
Radiated Emissions						
R & S Receiver	ESIB 40	1018	08/07/2015	1 Year	08/07/2016	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2015	1 Year	08/12/2016	☑
Horn Antenna (1GHz~26GHz)	3115	100059	08/25/2015	1 Year	08/25/2016	☑
Pre-Amplifier	LPA-6-30	11140711	02/10/2016	1 Year	02/10/2017	☑
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	06/08/2016	1 Year	06/08/2017	☑
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