

RF TEST REPORT



Report No.: FCC_RF_SL16032301-RUC-014A1_UNII Rev 3.0

Supersede Report No.: FCC_RF_SL16032301-RUC-014A1_UNII Rev 2.0

Applicant	:	Ruckus Wireless, Inc.
Product Name	:	H510 Access Point
Model No.	:	H510
Test Standard	:	47 CFR 15.407
Test Method	:	ANSI C63.4: 2014 789033 D02 General UNII Test Procedures New Rules v01r02
FCC ID	:	S9GH510
IC ID	:	5912A-H510
Dates of test	:	05/27/2016 to 06/20/2016
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
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
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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/RRR, 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_SL16032301-RUC-014A1_UNII	None	Original	06/22/2016
FCC_RF_SL16032301-RUC-014A1_UNII Rev 1.0	1.0	Updated per customer	07/06/2016
FCC_RF_SL16032301-RUC-014A1_UNII Rev 2.0	2.0	Updated per TCB reviewer	07/18/2016
FCC_RF_SL16032301-RUC-014A1_UNII Rev 3.0	3.0	Updated test information	08/09/2016

2 Executive Summary

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

Company: Ruckus Wireless, Inc.
Product: H510 Access Point
Model: H510

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	H510 Access Point
Model No.	H510
Trade Name	Ruckus
Serial No.	141606000019
Host Model No.	N/A
Input Power	48VDC (PoE)
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	48MHz XTAL Frequency, 25MHz Clock
Port/Connectors	PoE, Ethernet
Product Hardware version	705-60455-001
Product Software version	812-72425-001
Radio Hardware version	705-60455-001
Radio Software version	812-72425-001
Test Software version	117-11343-001

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, 256QAM)
Channel Spacing	20MHz	20MHz	40MHz	80MHz
Number of Channels	16	16	8	4
Antenna Type	Internal Omni PCB Antenna			
Antenna Gain (Peak)	5GHz: 1dBi			
Antenna Connector Type	U.FL			
Note	2.4GHz and 5GHz Radio transmit simultaneously			

EUT Power level setting

Mode	Frequency	Power Setting
802.11-a	5260	19
802.11-a	5280	19
802.11-a	5320	17.5
802.11-n-20	5260	19
802.11-n-20	5280	19
802.11-n-20	5320	18
802.11-n-40	5270	20
802.11-n-40	5310	13.5
802.11-ac-80	5290	13
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	16
802.11-n-40	5590	20
802.11-n-40	5670	20
802.11-ac-80	5530	13.5
802.11-ac-80	5610	20

Crossband channels power setting

Mode	Frequency	Power Setting
802.11-a	5720	20
802.11-n-20	5720	20
802.11-n-40	5710	21
802.11-ac-80	5690	21

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 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	- 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

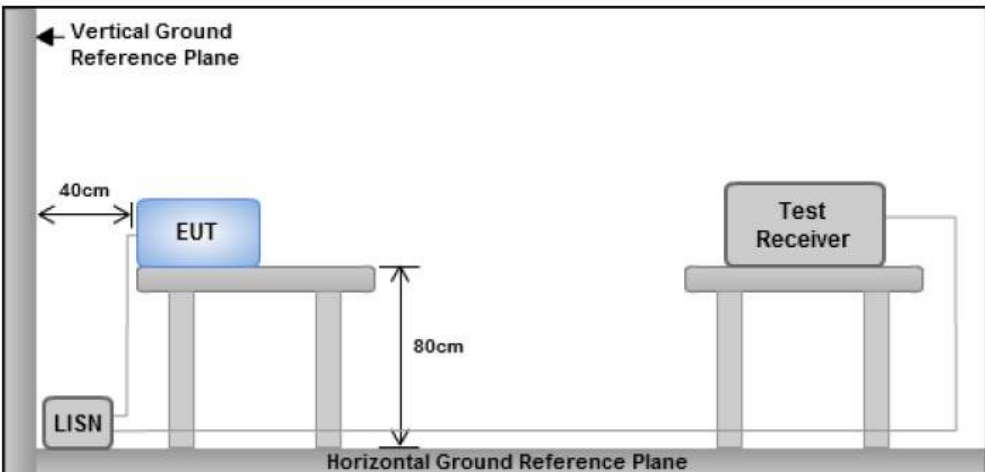
Emissions			
Test Item	Frequency Range	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious 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
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 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 was tested at 120VAC, 60Hz		
Result	☒ Pass ☐ Fail		

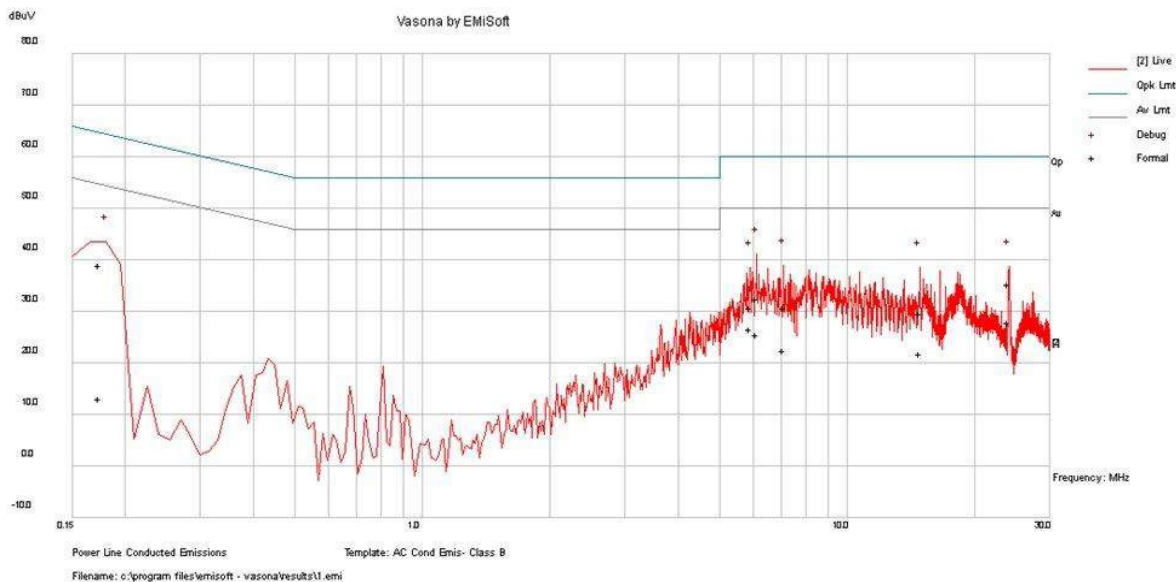
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Gary Chou 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:	Gary Chou			
Test Date:	06/22/2016			
Remarks	Power Supply, Line			

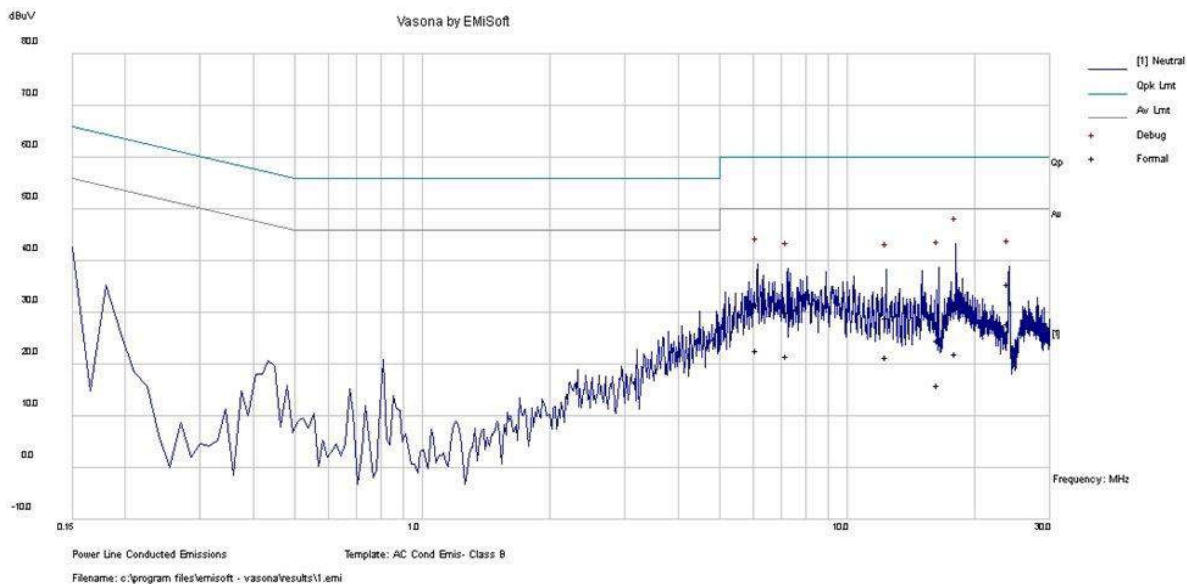


Line Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
6.13	22.03	10.04	0.55	32.62	Quasi Peak	Line	60	-27.38	Pass
7.07	20.14	10.04	0.55	30.73	Quasi Peak	Line	60	-29.27	Pass
0.17	27.63	10	1.51	39.15	Quasi Peak	Line	64.76	-25.61	Pass
24.00	24.53	10.08	0.76	35.37	Quasi Peak	Line	60	-24.63	Pass
5.90	20.32	10.04	0.55	30.91	Quasi Peak	Line	60	-29.09	Pass
14.81	18.99	10.06	0.6	29.65	Quasi Peak	Line	60	-30.35	Pass
6.13	15.01	10.04	0.55	25.6	Average	Line	50	-24.4	Pass
7.07	12.05	10.04	0.55	22.64	Average	Line	50	-27.36	Pass
0.17	1.63	10	1.51	13.15	Average	Line	54.76	-41.61	Pass
24.00	17.2	10.08	0.76	28.03	Average	Line	50	-21.97	Pass
5.90	16.21	10.04	0.55	26.8	Average	Line	50	-23.2	Pass
14.81	11.29	10.06	0.6	21.95	Average	Line	50	-28.05	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:	Gary Chou			
Test Date:	06/22/2016			
Remarks	Power Supply, Neutral			

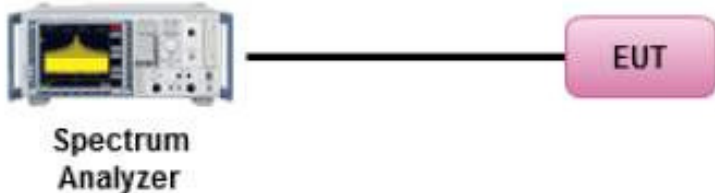


Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
18.03	20.42	10.07	0.66	31.14	Quasi Peak	Neutral	60	-28.86	Pass
6.13	21.16	10.04	0.55	31.75	Quasi Peak	Neutral	60	-28.25	Pass
23.99	24.74	10.08	0.76	35.57	Quasi Peak	Neutral	60	-24.43	Pass
16.38	14.07	10.06	0.63	24.76	Quasi Peak	Neutral	60	-35.24	Pass
7.24	19.64	10.04	0.55	30.24	Quasi Peak	Neutral	60	-29.76	Pass
12.35	18.37	10.05	0.58	29	Quasi Peak	Neutral	60	-31	Pass
18.03	11.34	10.07	0.66	22.06	Average	Neutral	50	-27.94	Pass
6.13	12.14	10.04	0.55	22.73	Average	Neutral	50	-27.27	Pass
23.99	17.24	10.08	0.76	28.07	Average	Neutral	50	-21.93	Pass
16.38	5.31	10.06	0.63	16	Average	Neutral	50	-34	Pass
7.24	11.05	10.04	0.55	21.65	Average	Neutral	50	-28.35	Pass
12.35	10.94	10.05	0.58	21.57	Average	Neutral	50	-28.43	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			
Test Procedure	789033 D02 General UNII Test Procedures New Rules v01r02 <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	05/28/2016 – 06/03/2016	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

Test was done by Gary Chou 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	30.00
	802.11a	5280	Mid	29.98
	802.11a	5320	High	29.50
	802.11n-20	5260	Low	29.95
	802.11n-20	5280	Mid	30.00
	802.11n-20	5320	High	29.79
	802.11n-40	5270	Low	60.00
	802.11n-40	5310	High	38.50
	802.11ac-80	5290	Mid	81.33

26dB Bandwidth measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5500	Low	29.50
	802.11a	5580	Mid	29.86
	802.11a	5700	High	29.66
	802.11n-20	5500	Low	28.68
	802.11n-20	5580	Mid	29.90
	802.11n-20	5700	High	30.00
	802.11n-40	5510	Low	38.37
	802.11n-40	5590	Mid	60.00
	802.11n-40	5670	High	59.99
	802.11ac-80	5530	Low	88.26
	802.11ac-80	5610	High	120.00

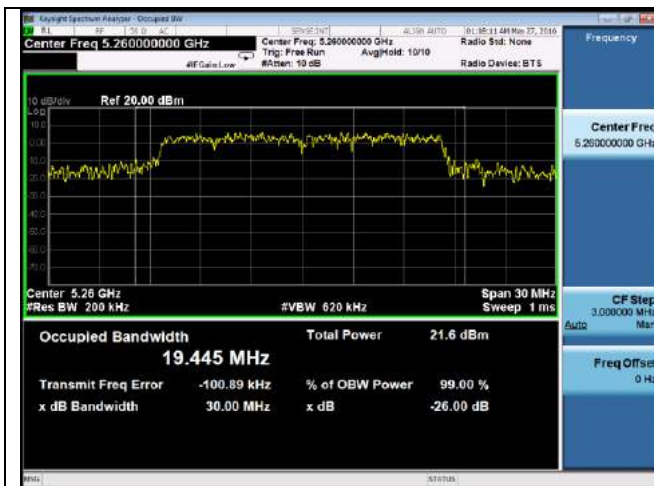
26dB Bandwidth measurement result for CROSSBAND channels

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5720	CROSSBAND	30.00
	802.11n-20	5720	CROSSBAND	30.00
	802.11n-40	5710	CROSSBAND	60.00
	802.11ac-80	5690	CROSSBAND	120.00

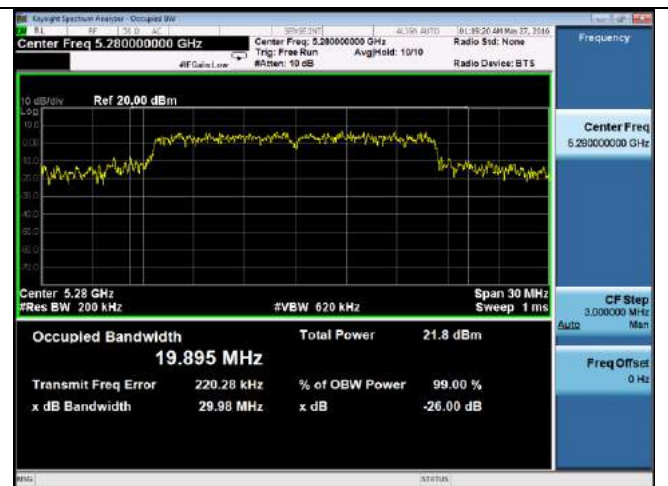
6dB Bandwidth measurement result for CROSSBAND channels

Type	Test mode	Freq (MHz)	CH	Result (MHz)
6dB BW	802.11a	5720	CROSSBAND	15.85
	802.11n-20	5720	CROSSBAND	17.70
	802.11n-40	5710	CROSSBAND	34.94
	802.11ac-80	5690	CROSSBAND	74.66

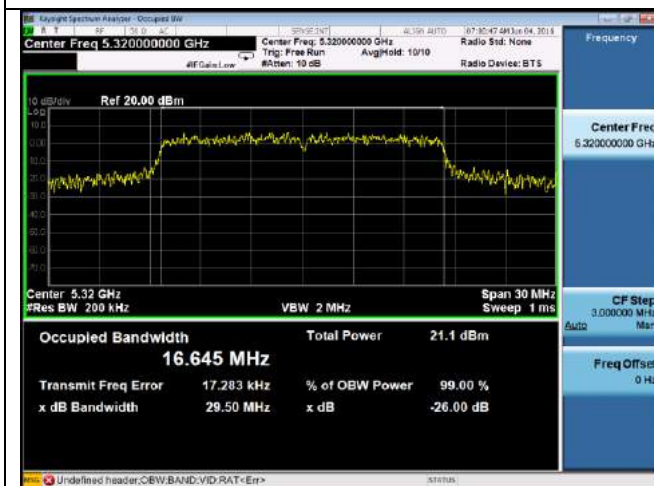
26dB & 6dB Bandwidth Test Plots



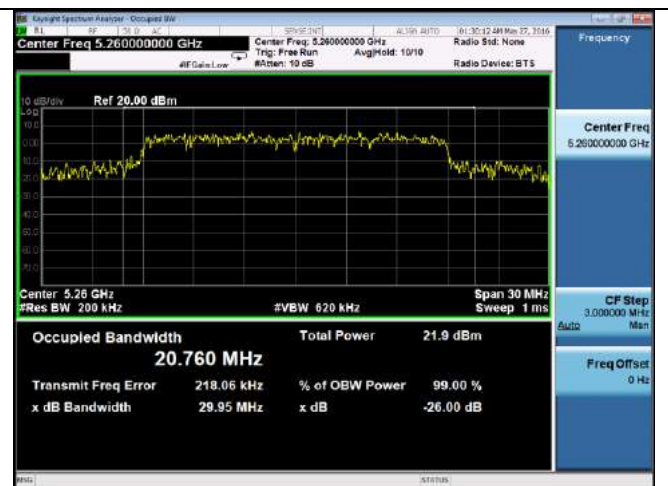
26dB BW -802.11a 5260MHz



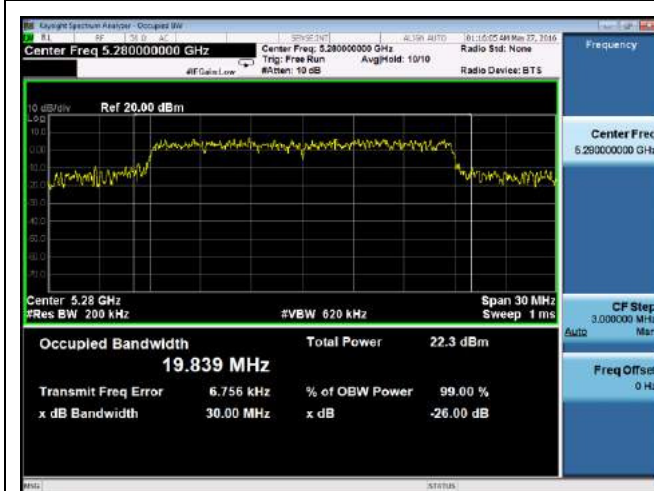
26dB BW -802.11a 5280MHz



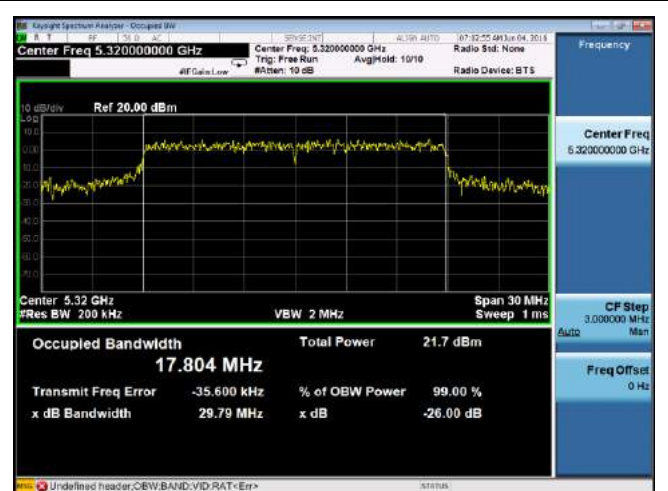
26dB BW -802.11a 5320MHz



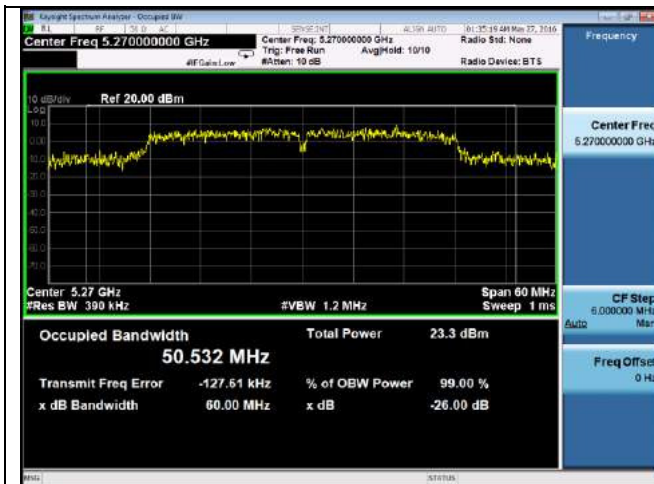
26dB BW -802.11n-20M 5260MHz



26dB BW -802.11n-20M 5280MHz



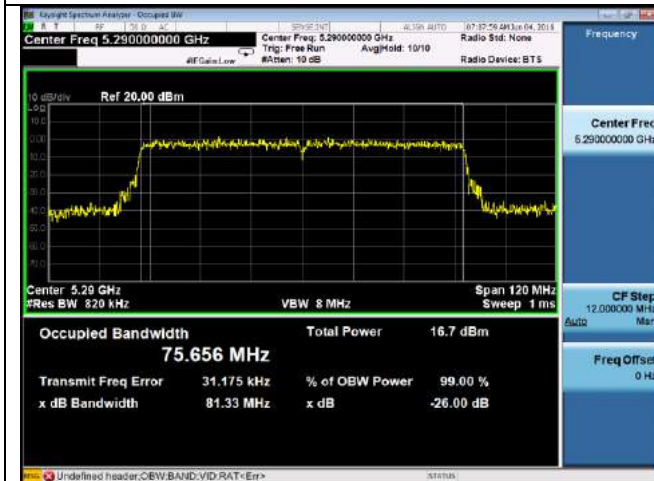
26dB BW -802.11n-20M 5320MHz



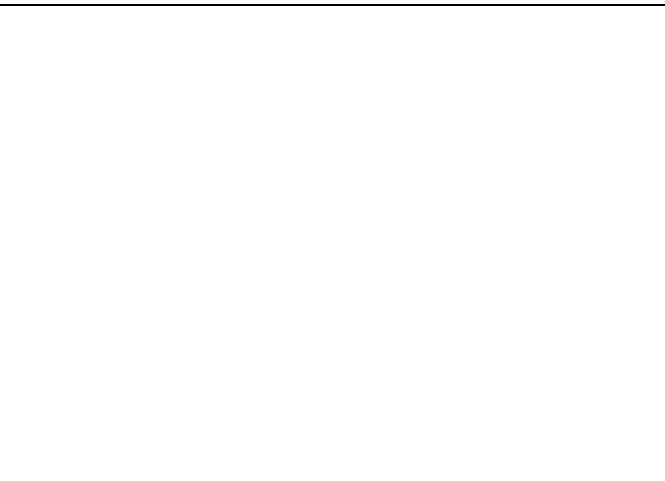
26dB BW -802.11n-40M 5270MHz



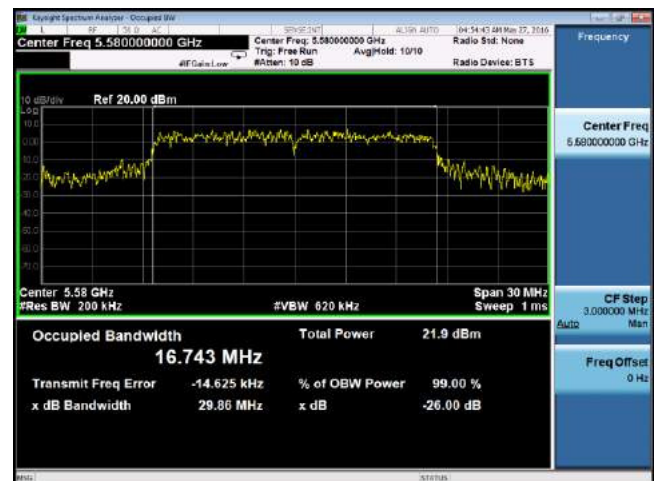
26dB BW -802.11n-40M 5310MHz



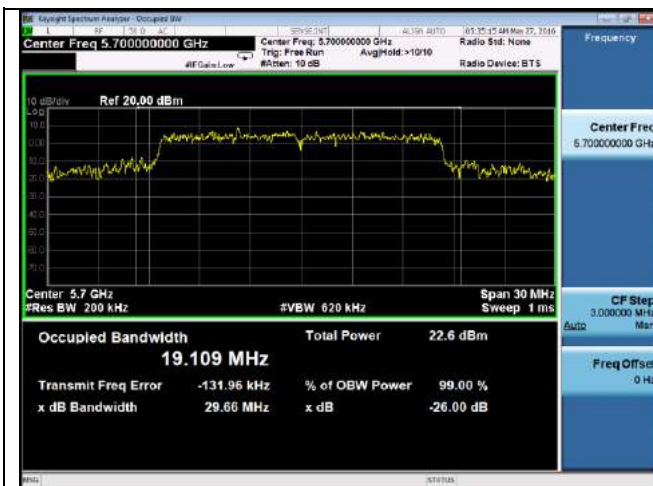
26dB BW -802.11ac-80M 5290MHz



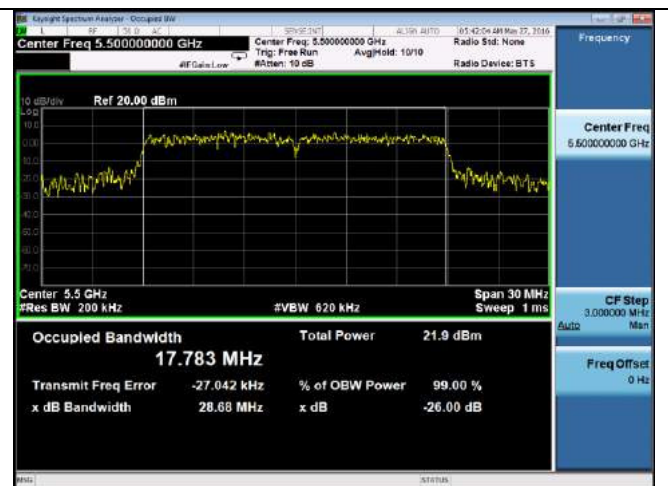
26dB BW -802.11a 5500MHz



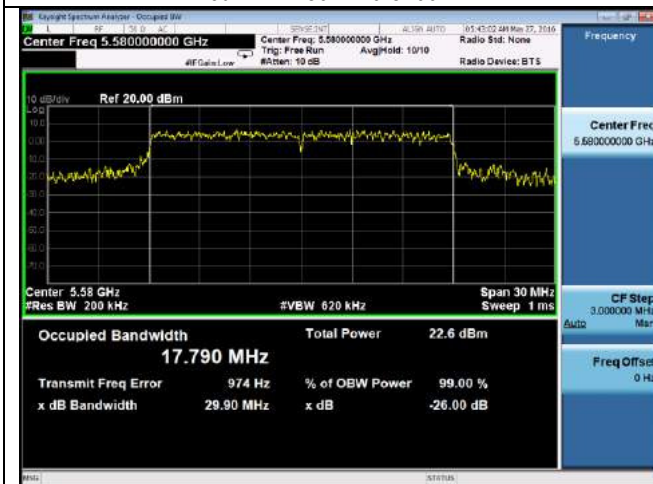
26dB BW -802.11a 5580MHz



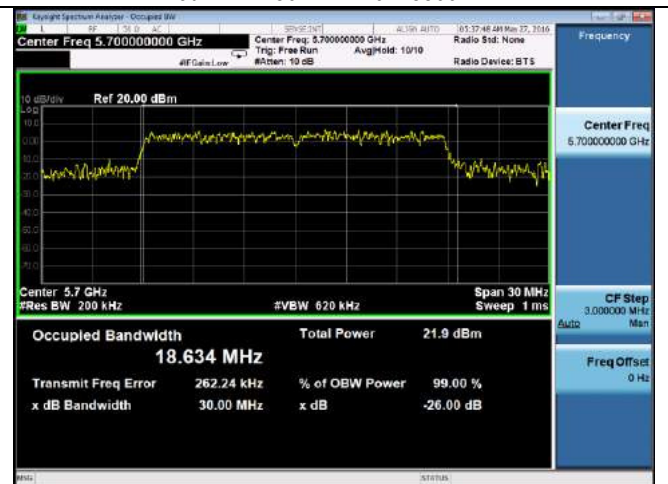
26dB BW -802.11a 5700MHz



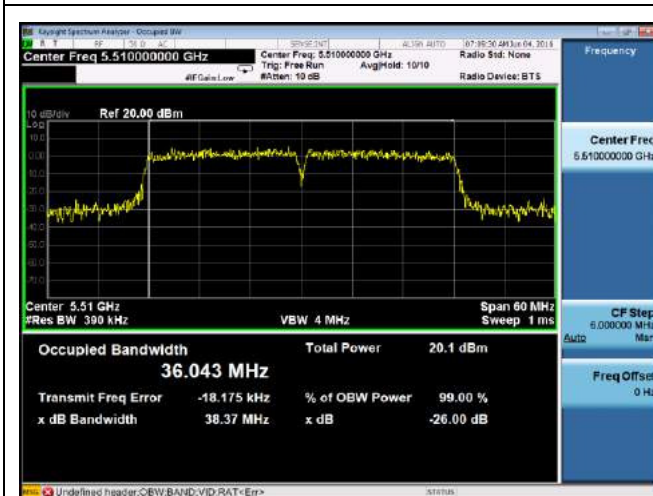
26dB BW -802.11n-20M 5500MHz



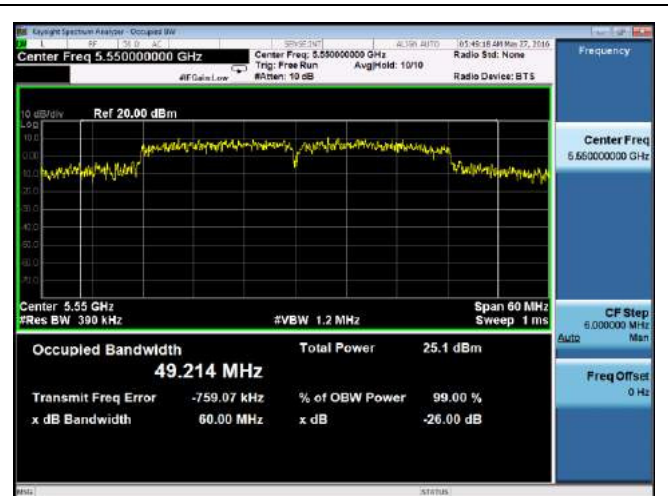
26dB BW -802.11n-20M 5580MHz



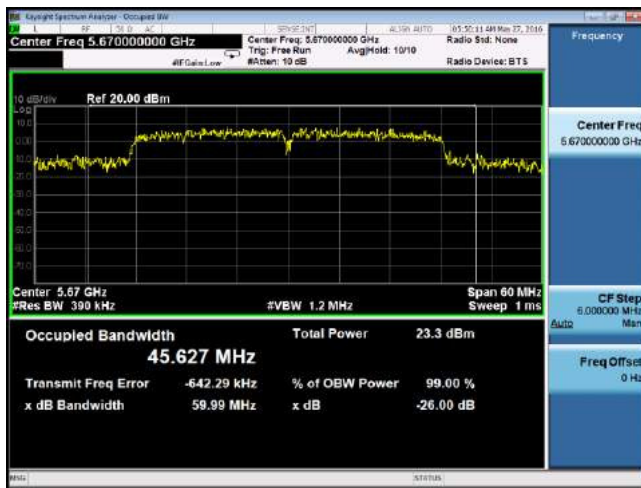
26dB BW -802.11n-20M 5700MHz



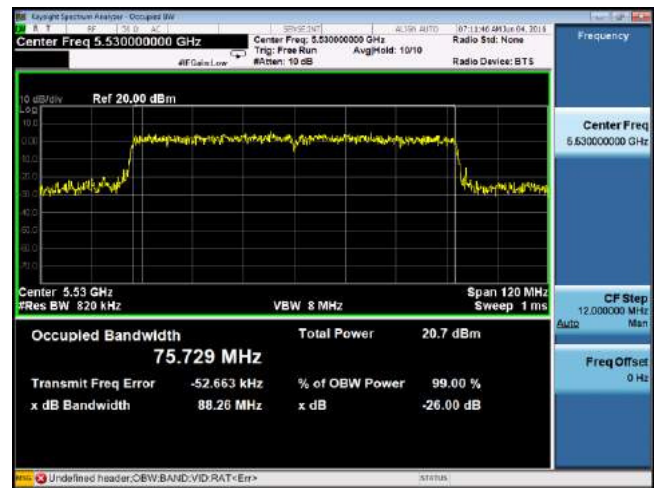
26dB BW -802.11n-40M 5510MHz



26dB BW -802.11n-40M 5550MHz



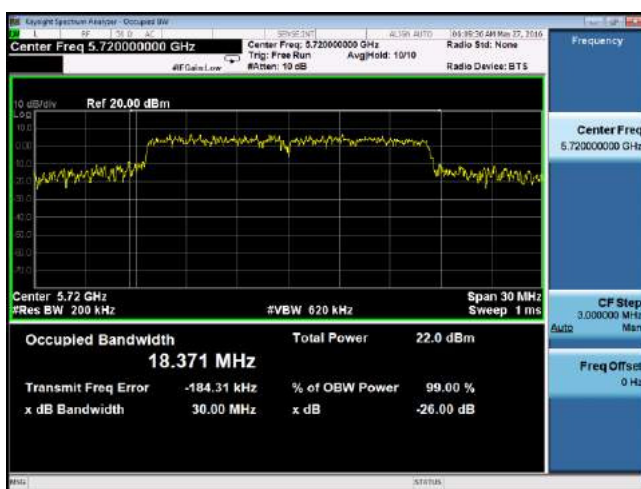
26dB BW -802.11n-40M 5670MHz



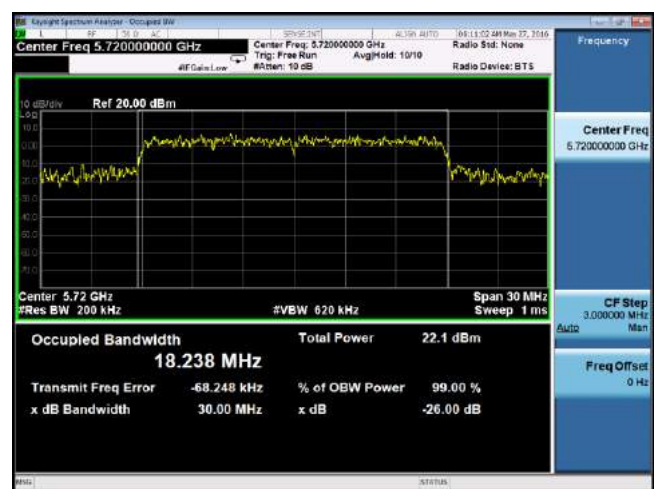
26dB BW -802.11ac-80M 5530MHz



26dB BW -802.11ac-80M 5610MHz



26dB BW -802.11a CROSSBAND 5720MHz



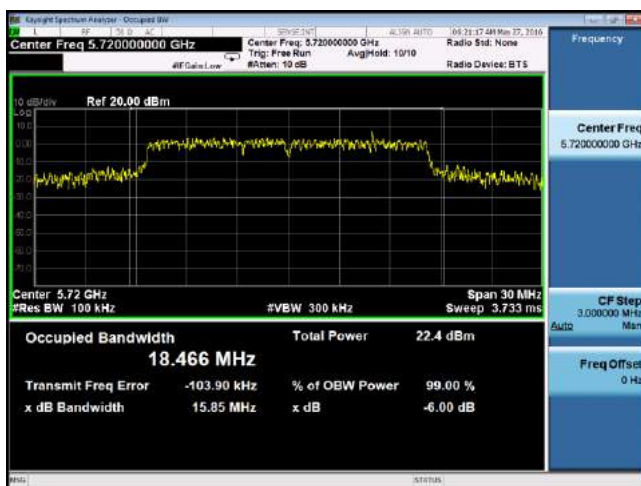
26dB BW -802.11n-20M 5720MHz



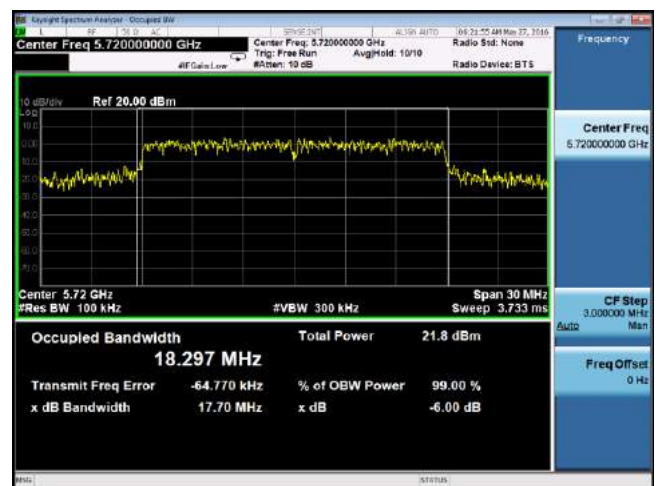
26dB BW -802.11n-40M CROSSBAND 5710MHz



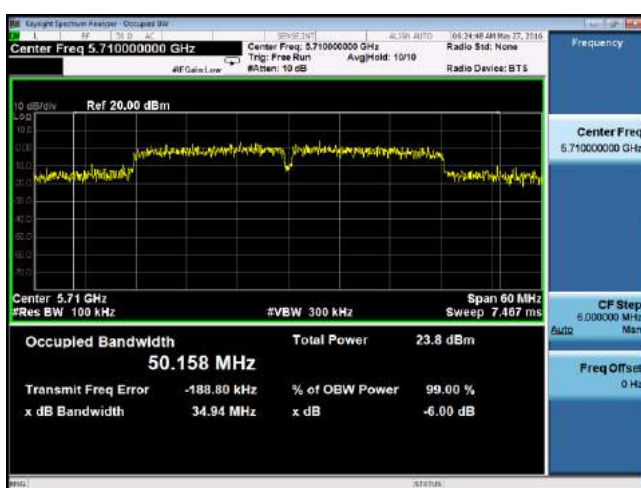
26dB BW -802.11ac CROSSBAND 5690MHz



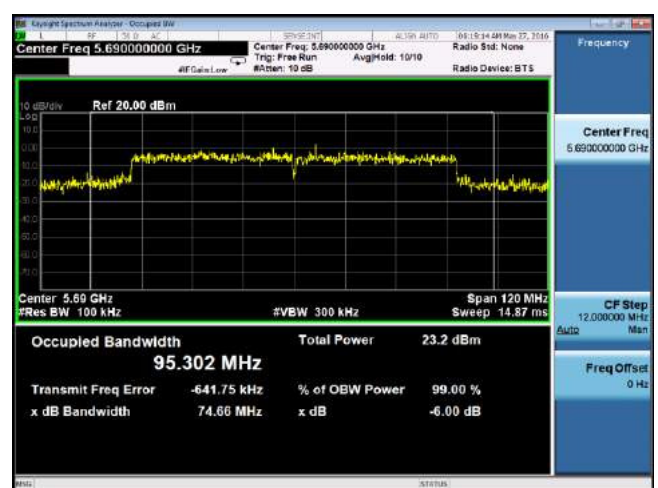
6dB BW -802.11a CROSSBAND 5720MHz



6dB BW -802.11n-20M 5720MHz



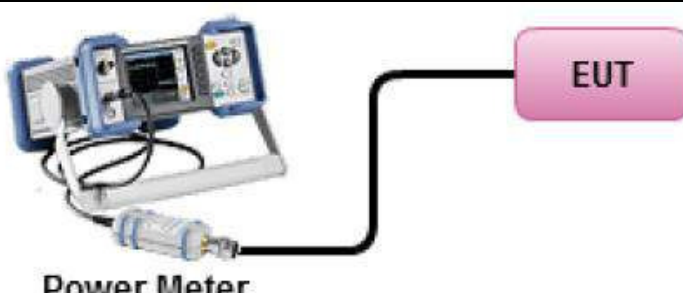
6dB BW -802.11n-40M CROSSBAND 5710MHz



6dB BW -802.11ac CROSSBAND 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	 The diagram illustrates the test setup for measuring the output power of the EUT. A Power Meter is connected to the EUT via a cable. The EUT is represented by a pink box labeled 'EUT', and the Power Meter is represented by a blue box labeled 'Power Meter'.		
Test Procedure	789033 D02 General UNII Test Procedures New Rules v01r02 <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	05/27/2016 – 06/03/2016	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 =1dBi.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test was done by Gary Chou at RF test site.

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 power	802.11a	5260	Low	18.89	18.85	21.88	24	Pass
		5280	Mid	18.71	18.81	21.77	24	Pass
		5320	High	17.88	17.83	20.87	24	Pass
	802.11n-20M	5260	Low	18.98	19.00	22.00	24	Pass
		5280	Mid	18.83	18.81	21.83	24	Pass
		5320	High	18.29	18.29	21.30	24	Pass
	802.11n-40M	5270	Low	20.35	20.79	23.59	24	Pass
		5310	High	14.54	14.24	17.40	24	Pass
	802.11ac-80M	5290	-	13.82	13.69	16.77	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 power	802.11a	5500	Low	18.94	18.95	21.96	24	Pass
		5580	Mid	19.15	19.06	22.12	24	Pass
		5700	High	18.99	19.39	22.20	24	Pass
	802.11n-20M	5500	Low	18.98	19.00	22.00	24	Pass
		5580	Mid	19.12	19.12	22.13	24	Pass
		5700	High	19.11	19.48	22.31	24	Pass
	802.11n-40M	5510	Low	17.12	17.09	20.12	24	Pass
		5550	Mid	20.98	20.83	23.91	24	Pass
		5670	High	20.18	20.43	23.32	24	Pass
	802.11ac-80M	5530	Low	17.91	17.67	20.80	24	Pass
		5610	High	19.68	19.79	22.75	24	Pass

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

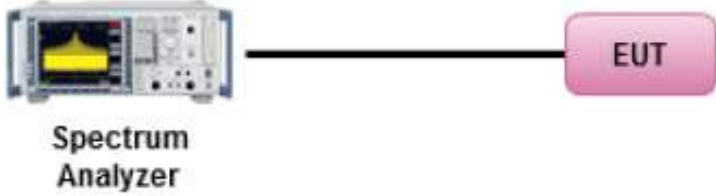
Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined Power		
Output power	802.11a	5720	CROSSBAND	18.79	19.13	21.97	24	Pass
	802.11n-20M	5720	CROSSBAND	18.85	19.27	22.08	24	Pass
	802.11n-40M	5710	CROSSBAND	20.53	20.76	23.66	24	Pass
	802.11ac-80M	5690	CROSSBAND	20.03	20.52	23.29	24	Pass

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

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined Power		
Output power	802.11a	5720	CROSSBAND	18.79	19.13	21.97	30	Pass
	802.11n-20M	5720	CROSSBAND	18.85	19.27	22.08	30	Pass
	802.11n-40M	5710	CROSSBAND	20.53	20.76	23.66	30	Pass
	802.11ac-80M	5690	CROSSBAND	20.03	20.52	23.29	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 v01r02, 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 $\geq$ 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	05/27/2016 – 06/04/2016	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 =0dBi.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Gary Chou at RF test site.

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	7.82	7.39	10.62	11	Pass
		5280	Mid	7.36	7.28	10.33	11	Pass
		5320	High	6.45	6.31	9.39	11	Pass
	802.11n-20M	5260	Low	7.36	7.53	10.46	11	Pass
		5280	Mid	7.42	7.33	10.39	11	Pass
		5320	High	6.51	6.87	9.70	11	Pass
	802.11n-40M	5270	Low	5.74	6.34	9.06	11	Pass
		5310	Mid	0.23	0.20	3.23	11	Pass
	802.11ac-80M	5290	High	-3.78	-3.97	-0.86	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	7.78	7.65	10.73	11	Pass
		5580	Mid	7.87	7.53	10.71	11	Pass
		5700	High	7.71	8.03	10.88	11	Pass
	802.11n-20M	5500	Low	7.60	7.61	10.62	11	Pass
		5580	Mid	7.41	7.53	10.48	11	Pass
		5700	High	7.38	7.81	10.61	11	Pass
	802.11n-40M	5510	Low	2.57	2.89	5.74	11	Pass
		5550	Mid	7.75	6.14	10.03	11	Pass
		5670	High	5.82	6.10	8.97	11	Pass
	802.11ac-80M	5530	Low	0.36	0.19	3.29	11	Pass
		5610	High	2.59	2.38	5.50	11	Pass

PSD measurement result for CROSSBAND 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	7.45	7.86	10.67	11	Pass
	802.11n-20M	5720	CROSSBAND	7.43	7.65	10.55	11	Pass
	802.11n-40M	5710	CROSSBAND	6.08	6.20	9.15	11	Pass
	802.11ac-80M	5690	CROSSBAND	2.76	3.45	6.13	11	Pass

PSD measurement result for CROSSBAND 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	-1.25	-0.88	1.95	8.94	30	Pass
	802.11n-20M	5720	-1.52	-1.26	1.62	8.61	30	Pass
	802.11n-40M	5710	-2.91	-2.15	0.50	7.49	30	Pass
	802.11ac-80M	5690	-5.70	-4.93	-2.29	4.70	30	Pass

Correction factor=10*log(500/100)=6.99

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



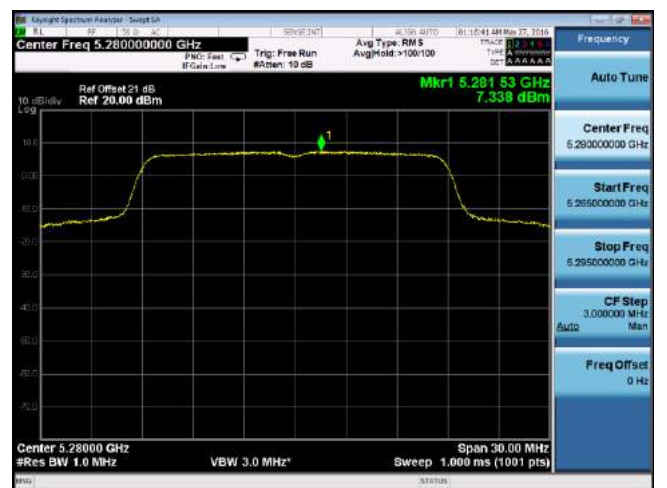
PSD-802.11n-20M-5260M-chain0



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



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



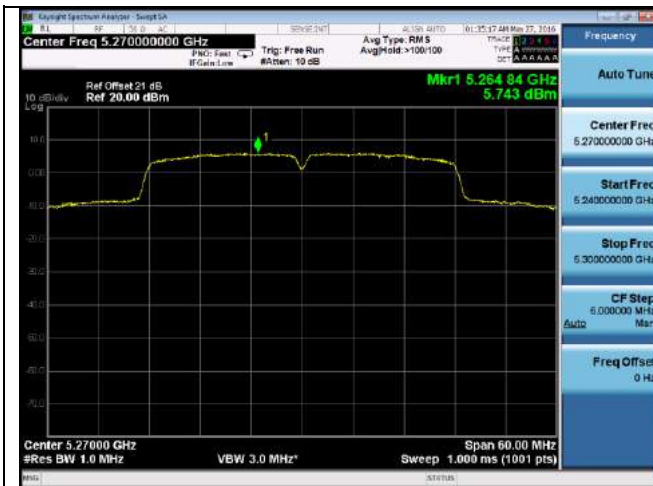
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PSD-802.11n-20M-5320M-chain0



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



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



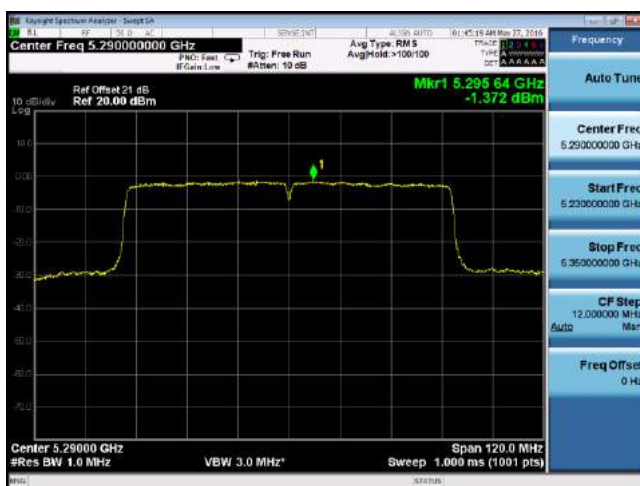
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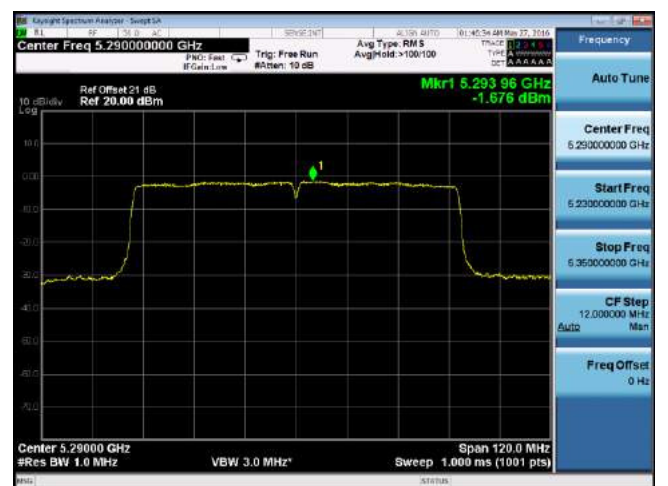
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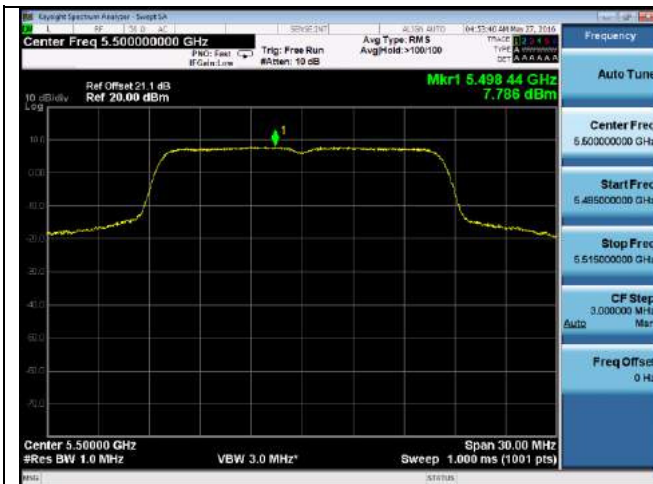
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PSD-802.11ac-80M-5290M-chain0



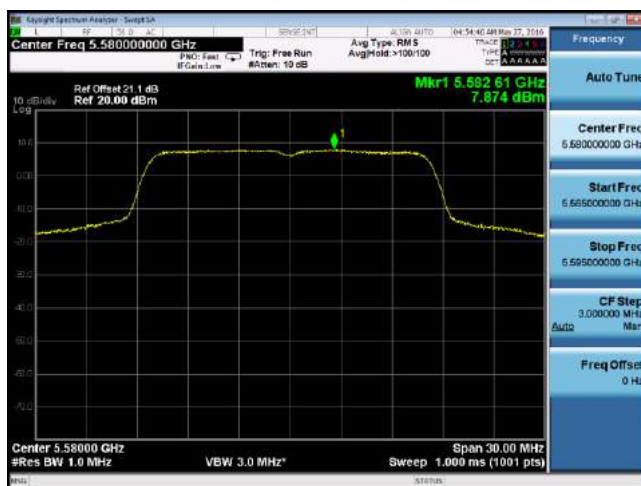
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PSD-802.11a-5500M-chain0



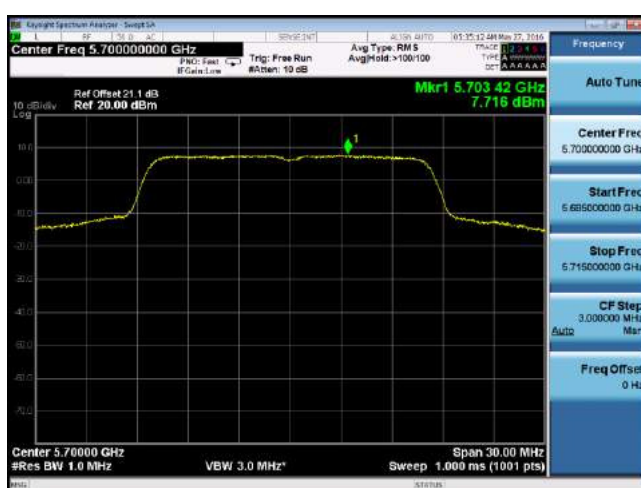
PSD-802.11a-5500M-chain1



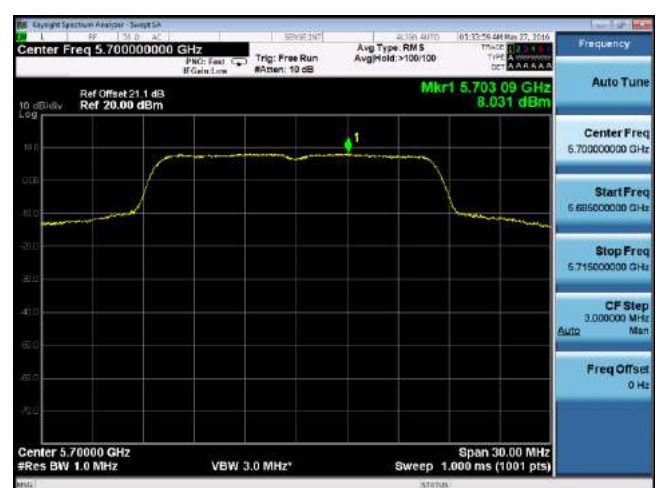
PSD-802.11a-5580M-chain0



PSD-802.11a-5580M-chain1



PSD-802.11a-5700M-chain0



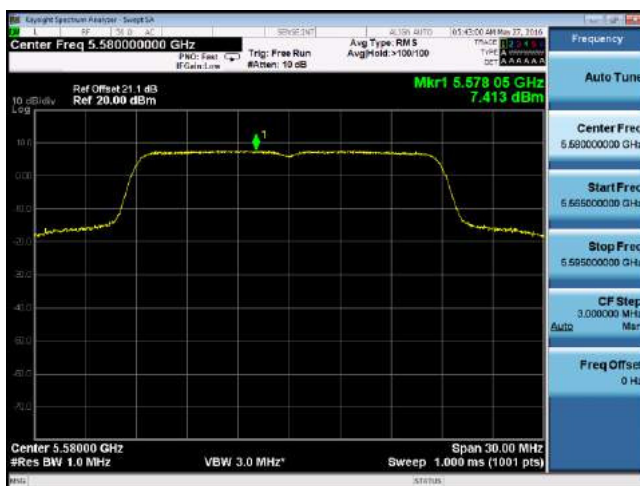
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PSD-802.11n-20M-5500M-chain0



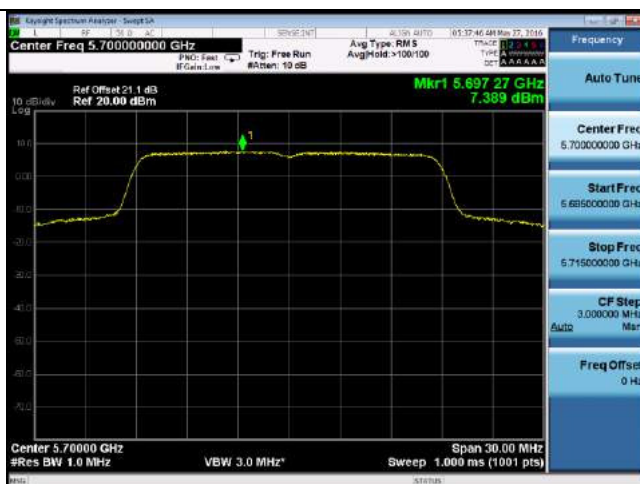
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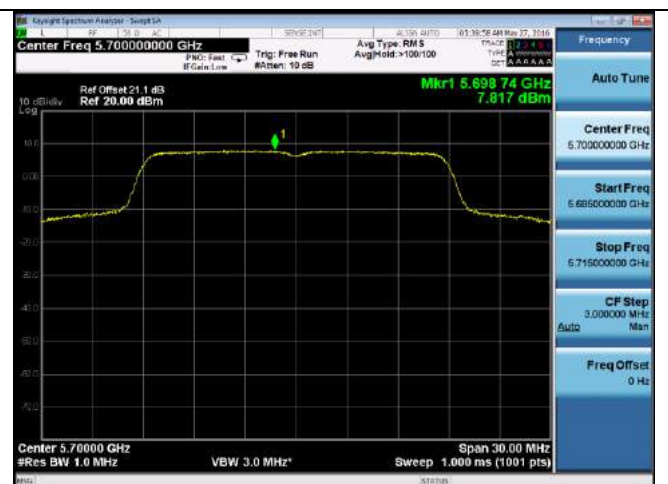
PSD-802.11n-20M-5580M-chain0



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



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



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



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



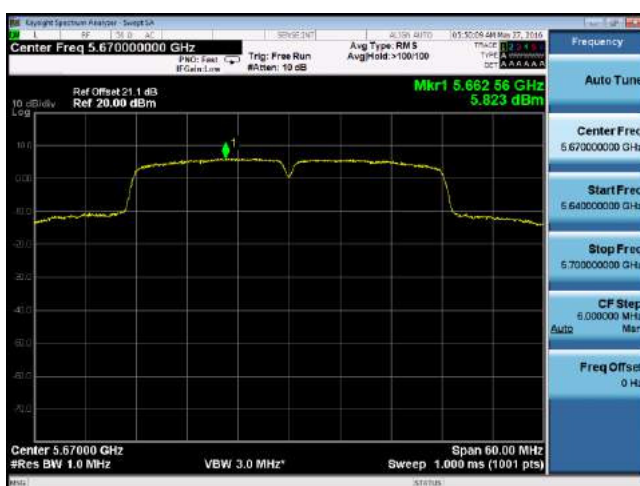
PSD-802.11n-40M-5510M-chain1



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



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



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



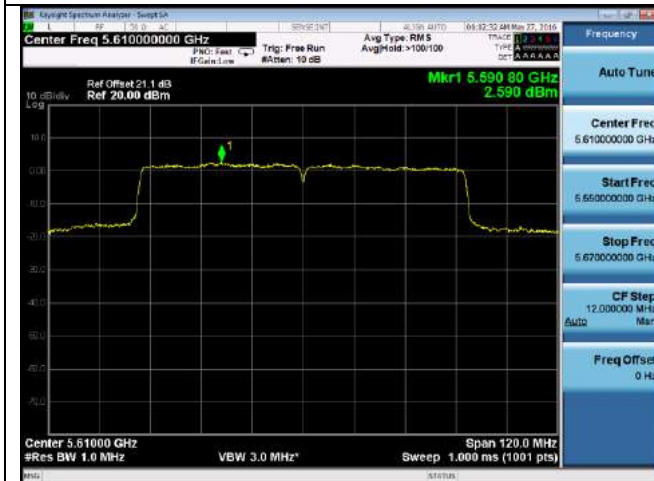
PSD-802.11n-40M-5670M-chain1



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

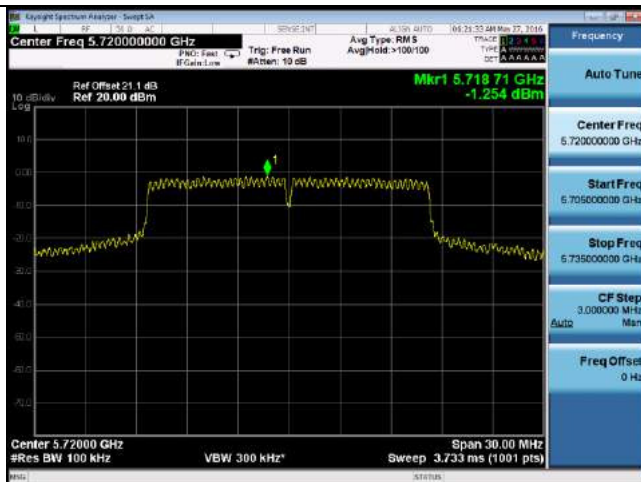


PSD-802.11ac-CROSSBAND-5690M-chain0

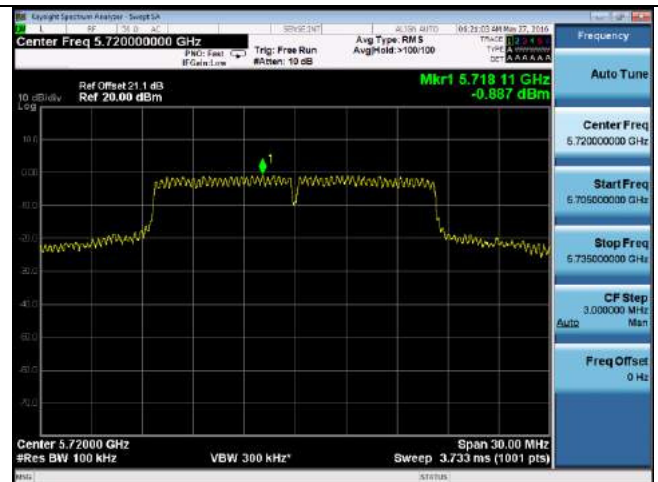


PSD-802.11ac-CROSSBAND-5690M-chain1

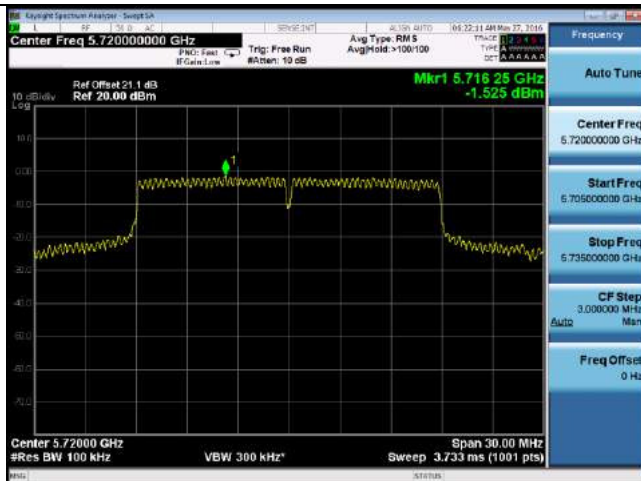
CrossBand, W58 procedure:



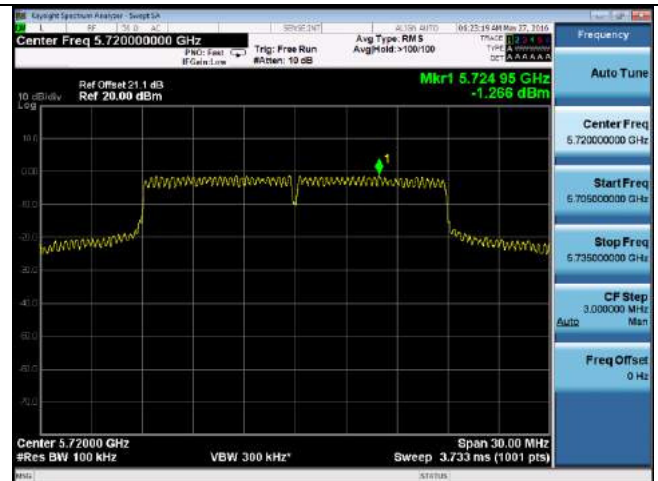
PSD-802.11a-CROSSBAND-5720M-chain0



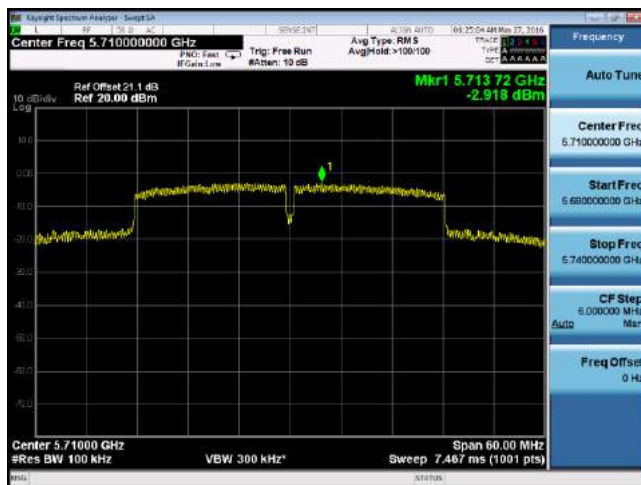
PSD-802.11a-CROSSBAND-5720M-chain1



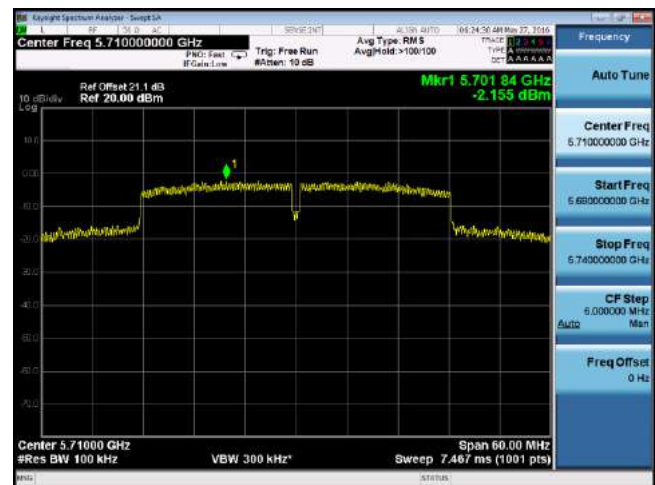
PSD-802.11n-20M-CROSSBAND-5720M-chain0



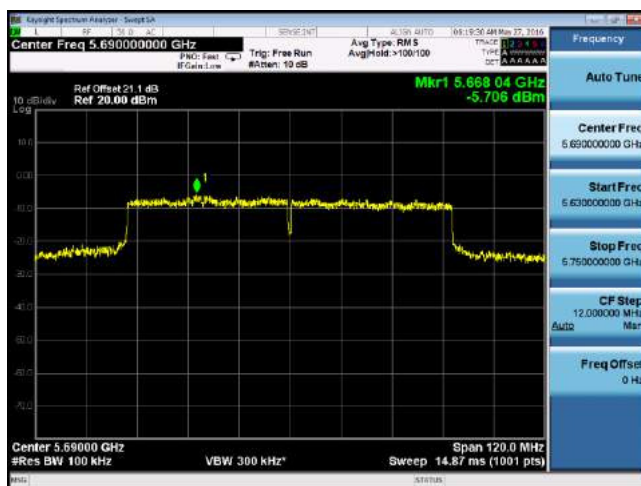
PSD-802.11n-20M-CROSSBAND-5720M-chain1



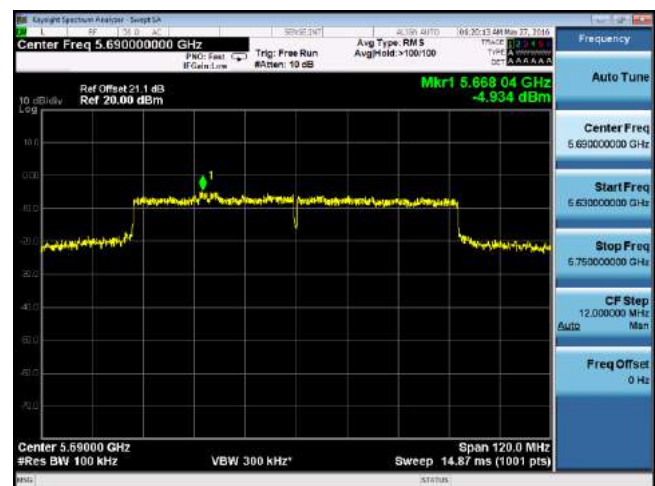
PSD-802.11n-40M-CROSSBAND-5710M-chain0



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



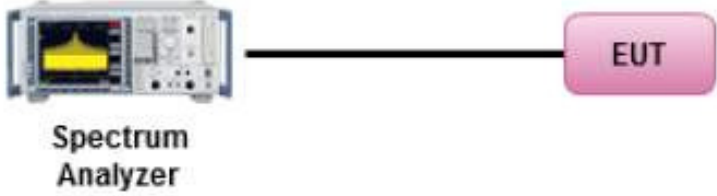
PSD-802.11ac-CROSSBAND-5690M-chain0



PSD-802.11ac-CROSSBAND-5690M-chain1

10.5 Band Edge Measurement

Requirement(s):

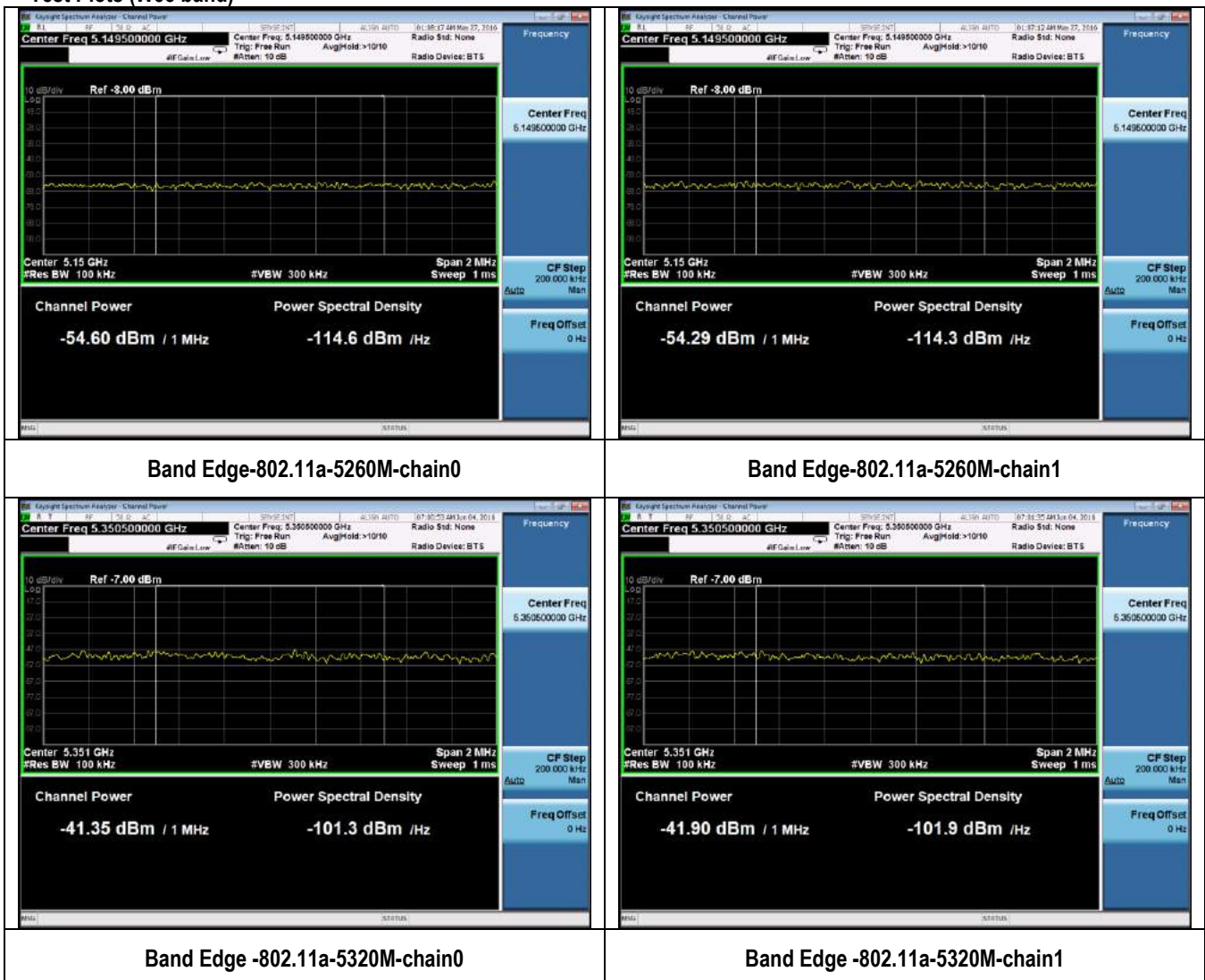
Spec	Item	Requirement	Applicable
47CFR§ 15.407(b)(2), 15.407(b)(6)	(1)	For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.	☒
	(2)	For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 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			
Procedure	789033 D02 General UNII Test Procedures New Rules v01r02, 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		

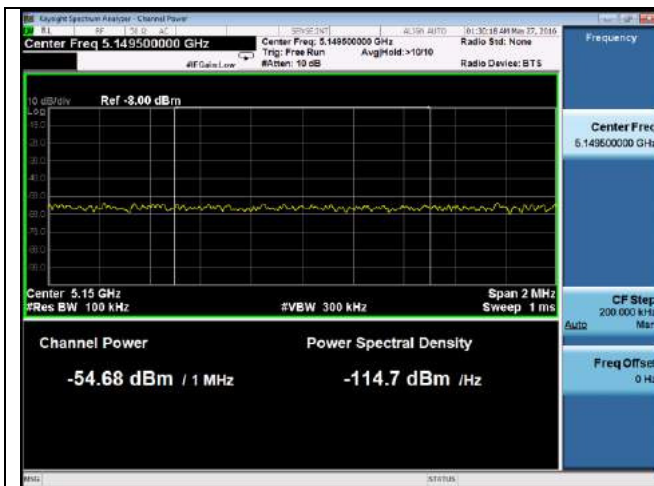
Test Data ☐ Yes (See below) ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

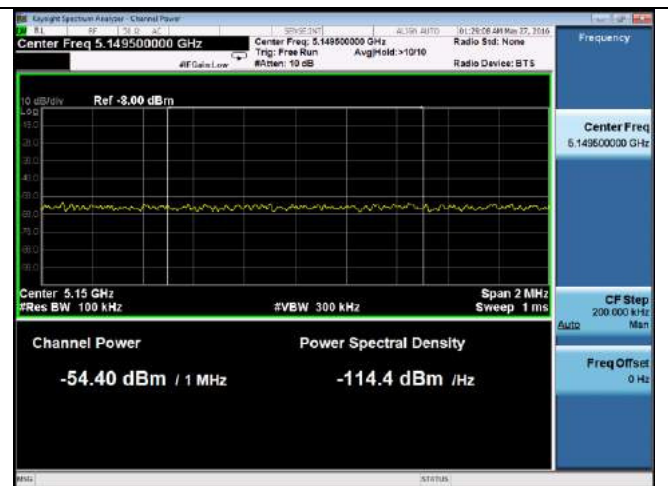
Test was done by Gary Chou at RF test site.

Test Plots (W53 band)

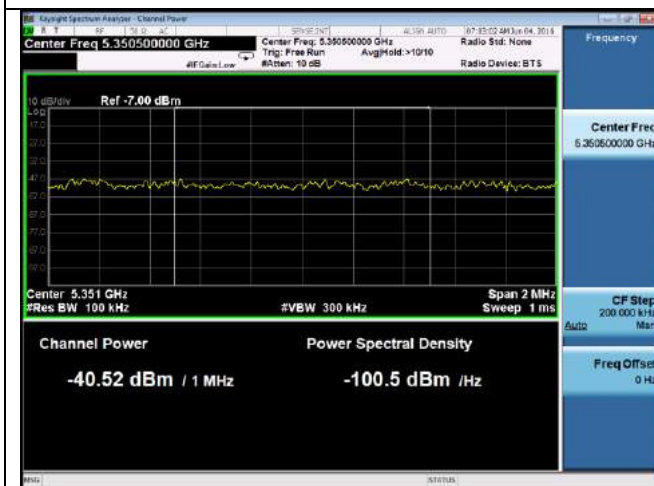




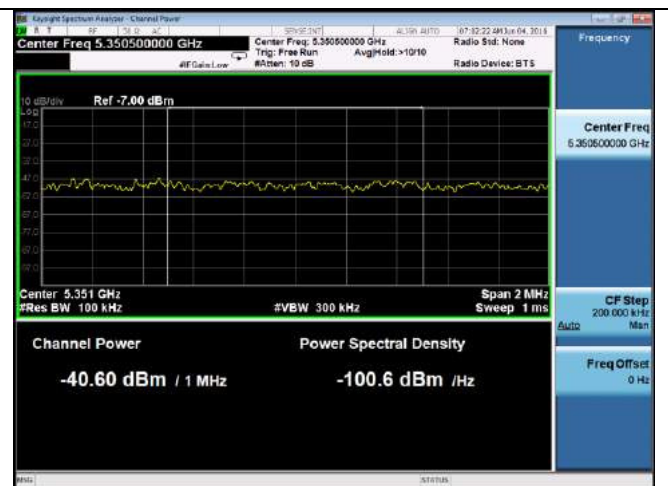
Band Edge -802.11n-20M -5260M-chain0



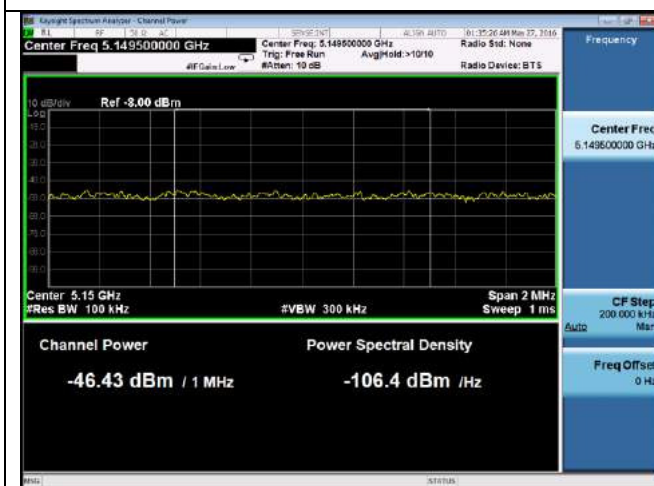
Band Edge -802.11n-20M -5260M-chain1



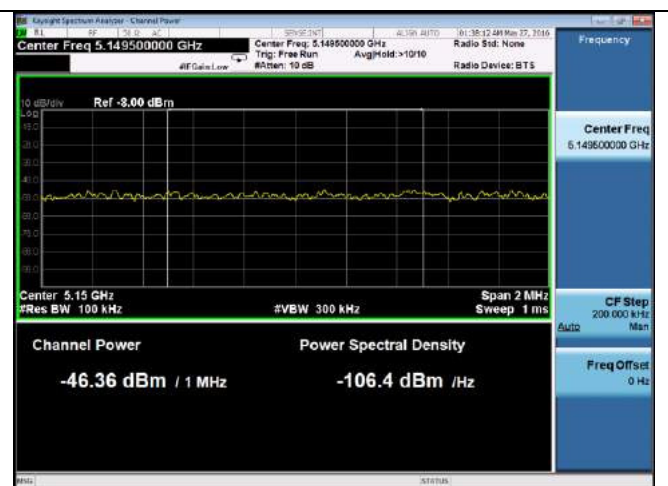
Band Edge -802.11n-20M -5320M-chain0



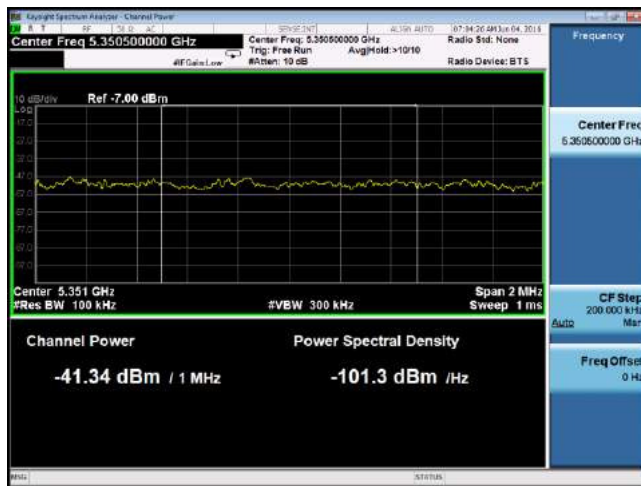
Band Edge -802.11n-20M -5320M-chain1



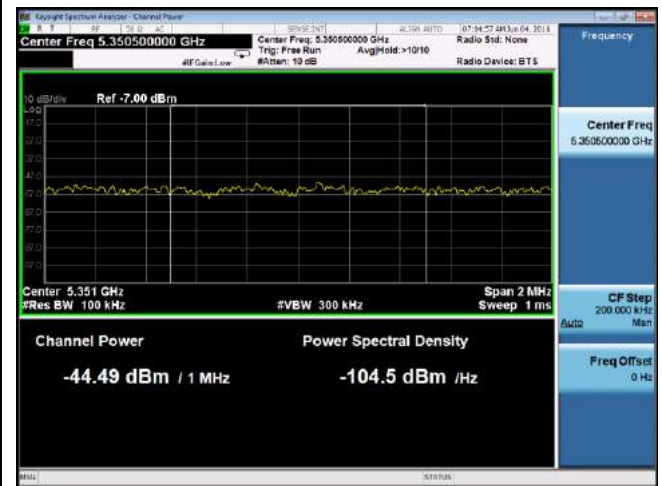
Band Edge -802.11n-40M -5270M-chain0



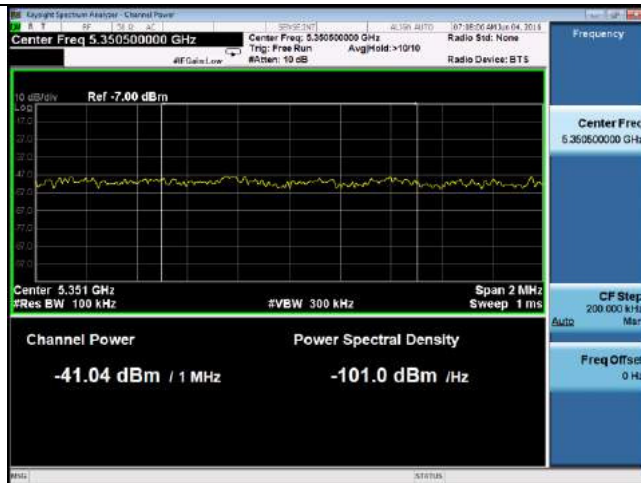
Band Edge -802.11n-40M -5270M-chain1



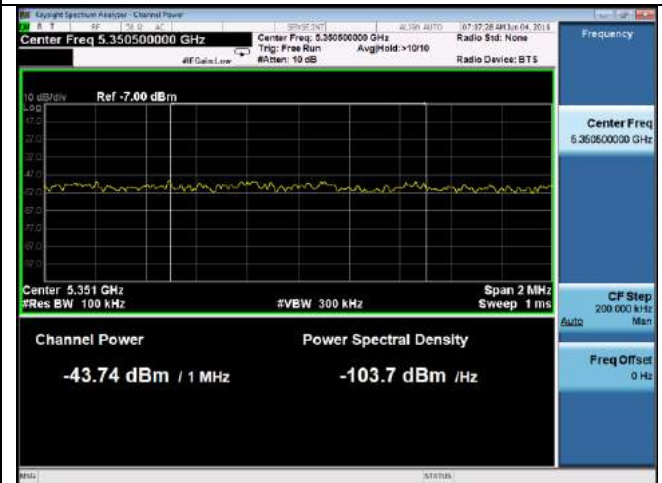
Band Edge -802.11n-40M-5310M-chain0



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

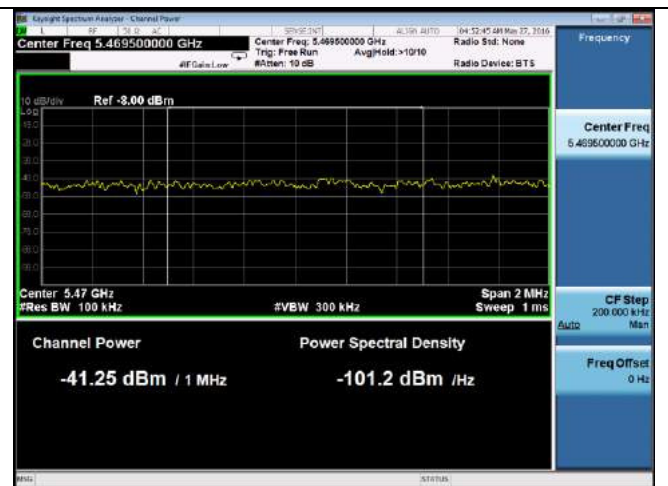
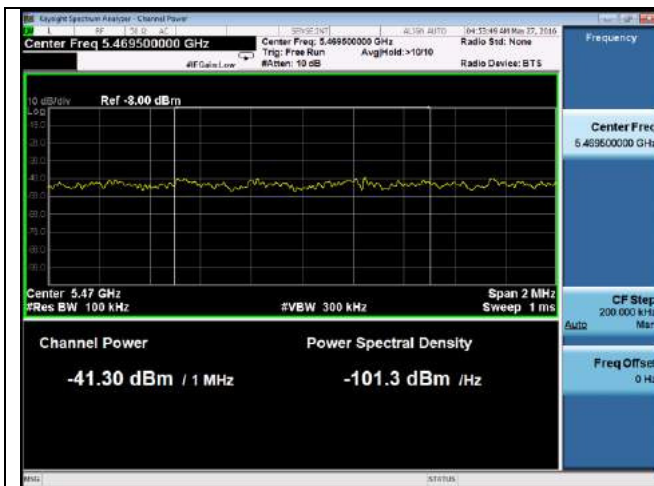


Band Edge -802.11ac-80M-5290M-chain0



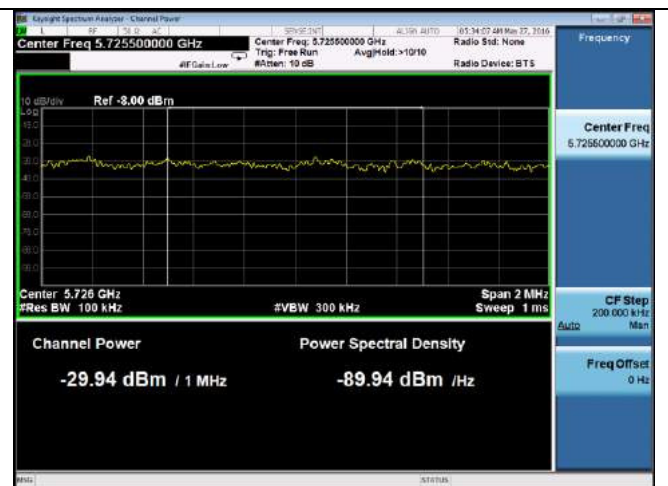
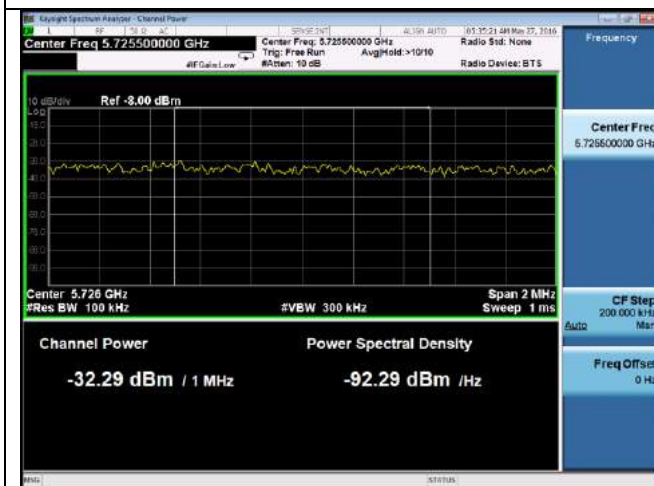
Band Edge -802.11ac-80M-5290M-chain1

W56 band:



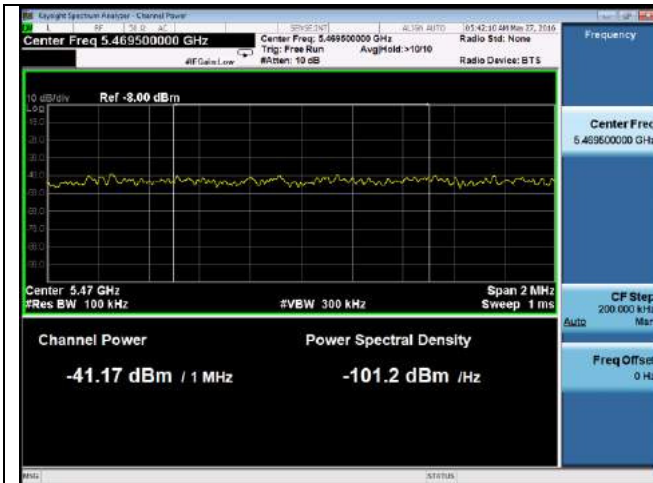
Band Edge -802.11a-5500M-chain0

Band Edge -802.11a-5500M-chain1

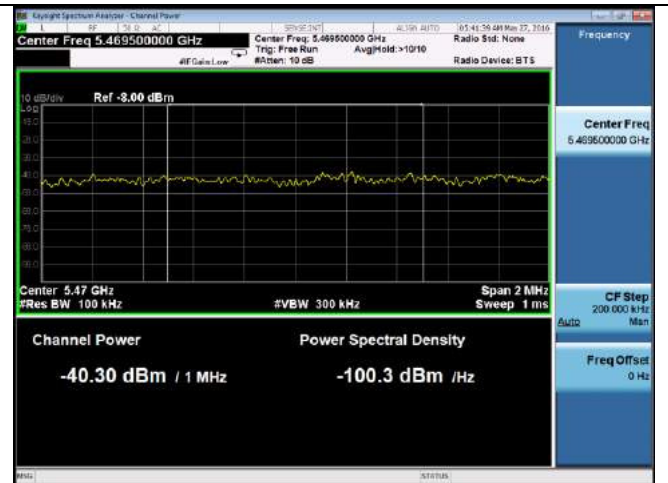


Band Edge -802.11a-5700M-chain0

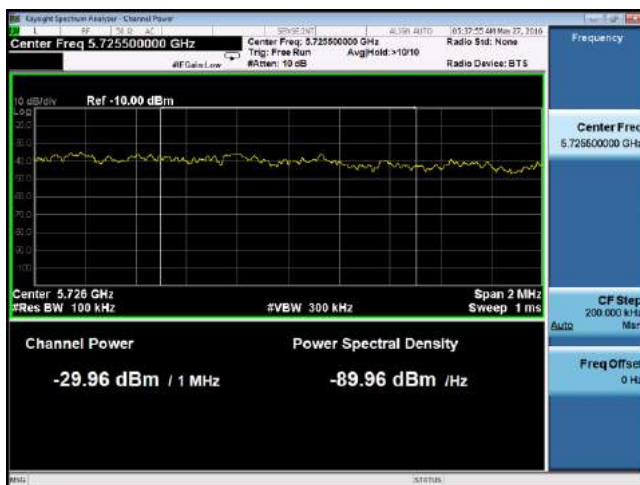
Band Edge -802.11a-5700M-chain1



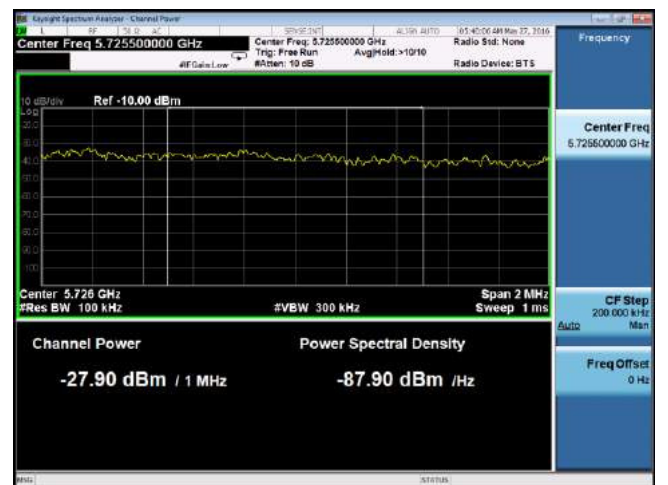
Band Edge -802.11n-20M -5500M-chain0



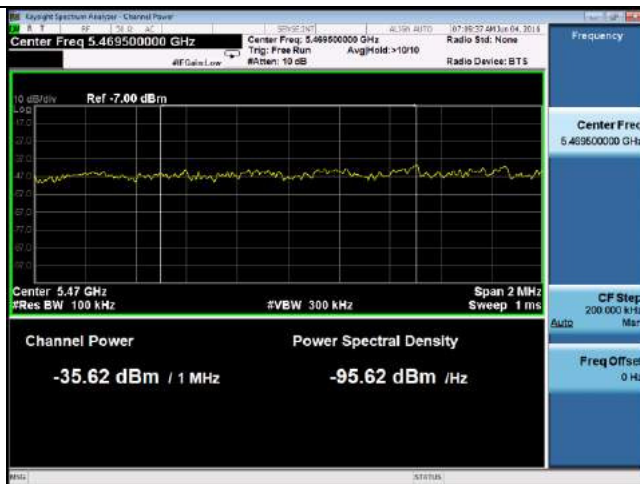
Band Edge -802.11n-20M -5500M-chain1



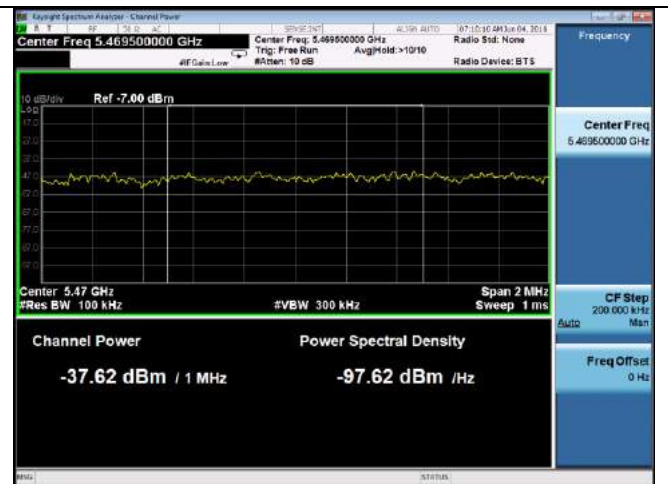
Band Edge -802.11n-20M -5700M-chain0



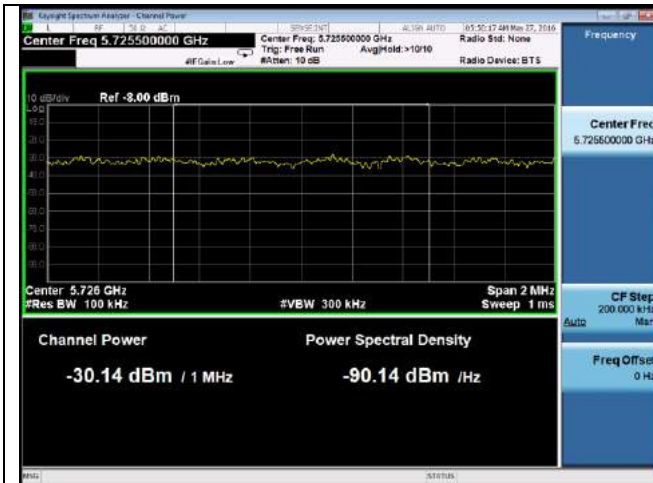
Band Edge -802.11n-20M -5700M-chain1



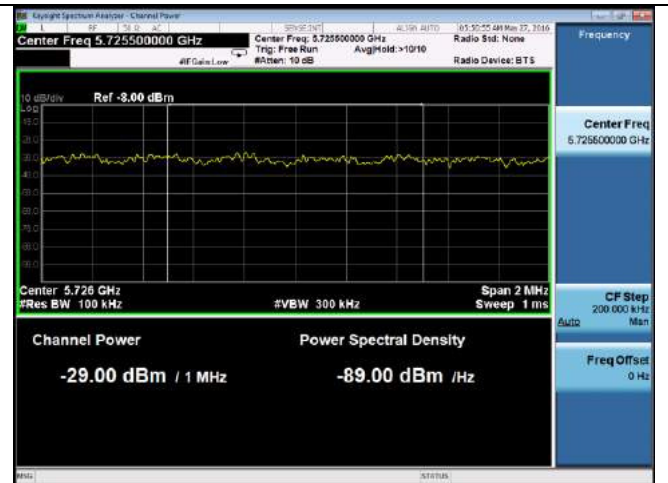
Band Edge -802.11n-40M -5510M-chain0



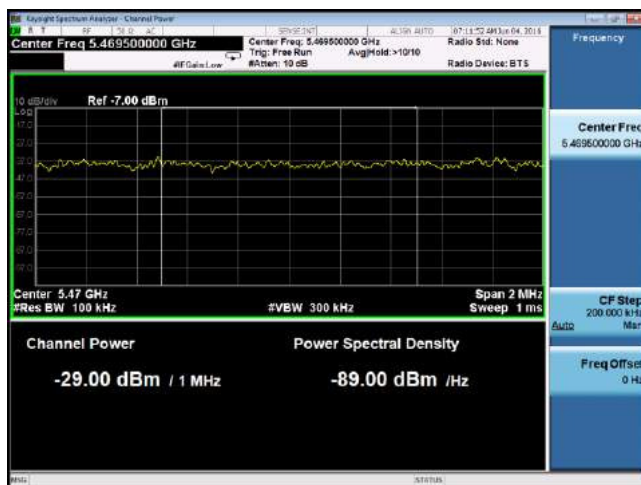
Band Edge -802.11n-40M -5510M-chain1



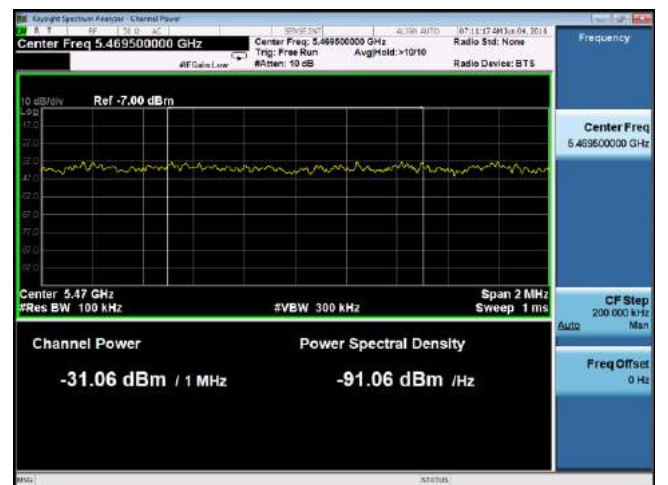
Band Edge -802.11n-40M-5670M-chain0



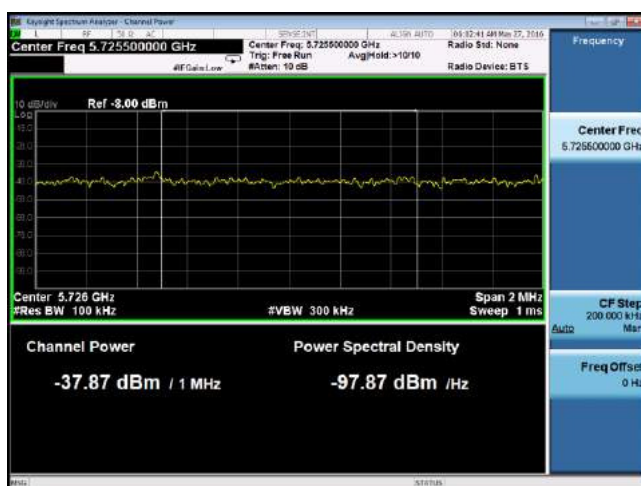
Band Edge -802.11n-40M-5670M-chain1



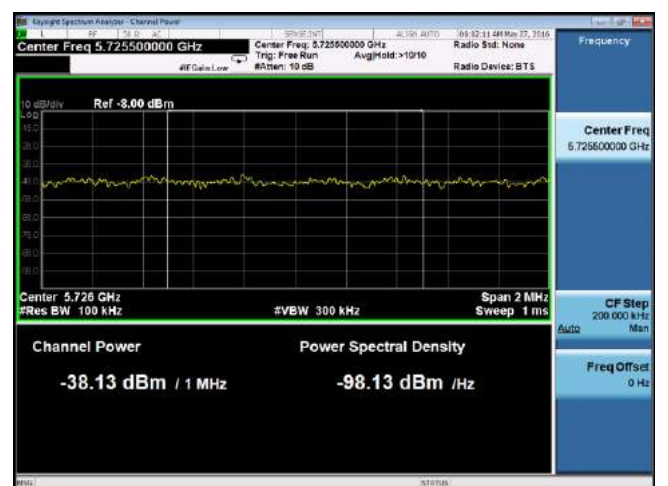
Band Edge -802.11ac-80M-5530M-chain0



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



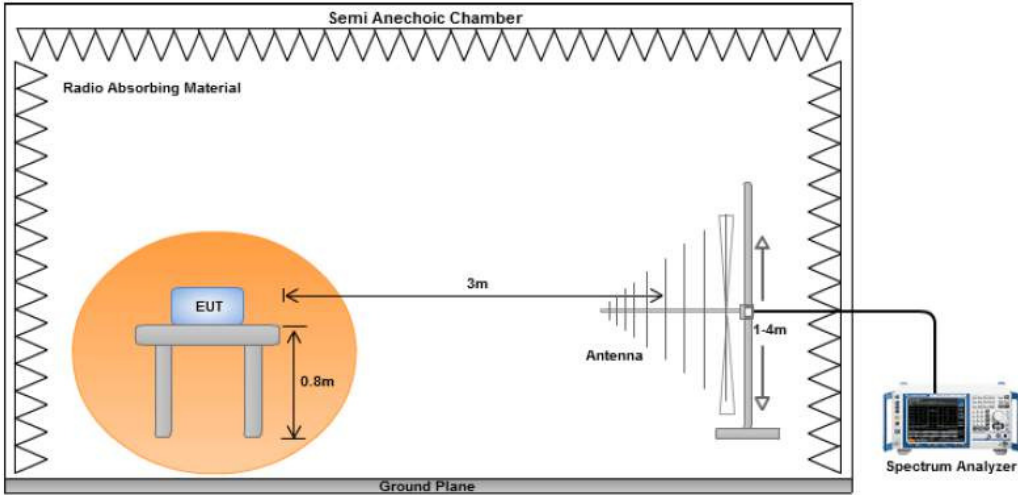
Band Edge -802.11ac-80M-5610M-chain0



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><thead><tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr></thead><tbody><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></tbody></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												
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											

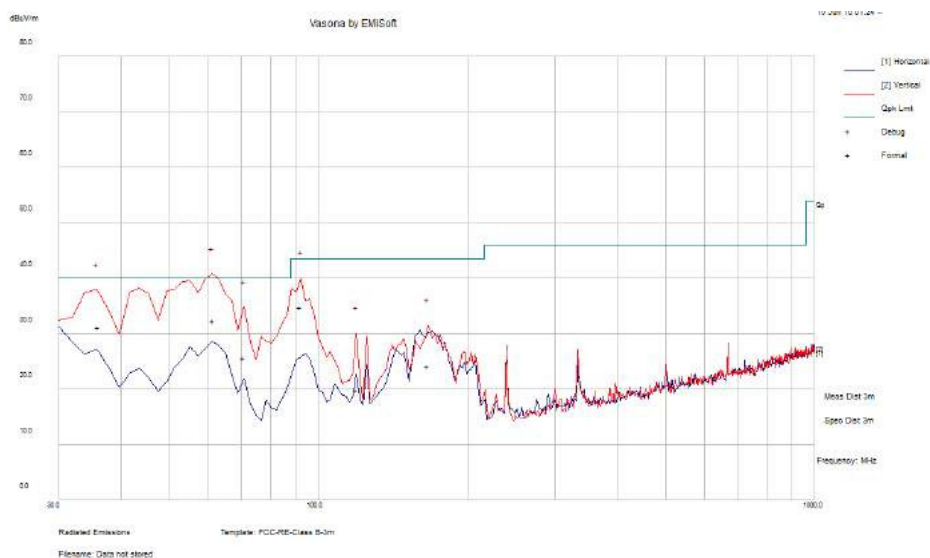
Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Gary Chou 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:	Gary Chou			
Test Date:	06/10/2016			
Remarks:	802.11ac VHT80, 5530MHz			

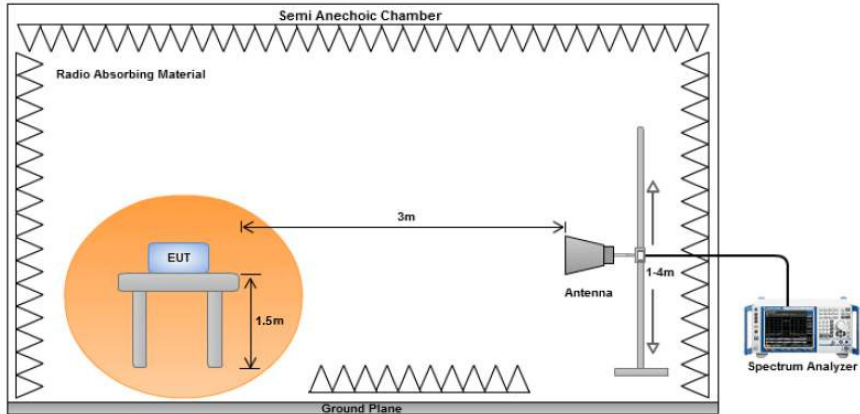


Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
61.34	62.14	1.21	-31.13	32.22	Quasi Max	V	122	181	40	-7.78	Pass
36.00	51.07	0.87	-20.77	31.16	Quasi Max	V	182	217	40	-8.84	Pass
92.06	64.41	1.49	-31.16	34.73	Quasi Max	V	146	344	43.52	-8.79	Pass
70.70	55.26	1.26	-30.9	25.62	Quasi Max	V	145	340	40	-14.38	Pass
165.86	49.86	1.94	-27.64	24.17	Quasi Max	V	141	13	43.52	-19.35	Pass
119.59	43.91	1.64	-25.6	19.95	Quasi Max	V	101	295	43.52	-23.57	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):

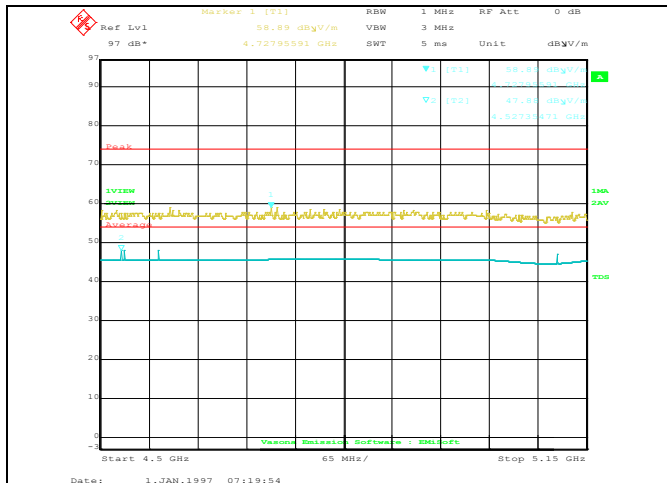
Spec	Item	Requirement	Applicable
47CFR§ 15.407(b)(2), 15.407(b)(6)	(1)	For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.	☐
	(2)	For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 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

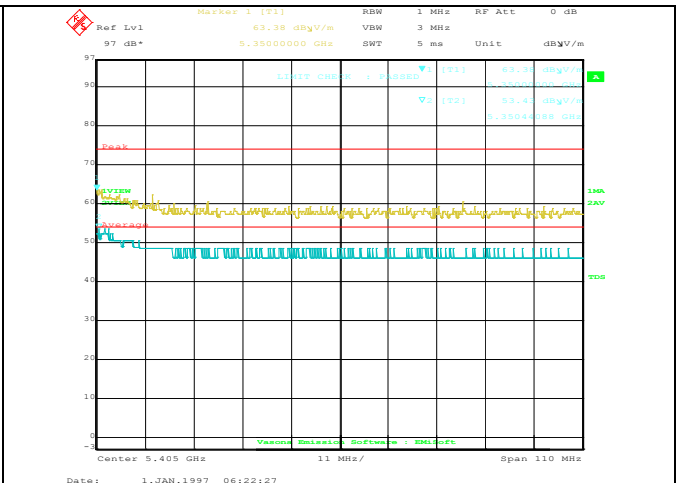
Test Plot ☐ Yes (See below) ☒ N/A

Test was done by Gary Chou at 10m chamber.

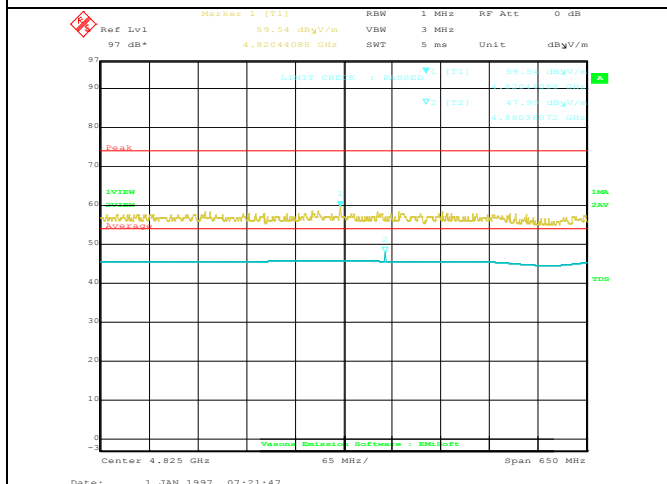
Radiated Restricted band Measurement Plots:



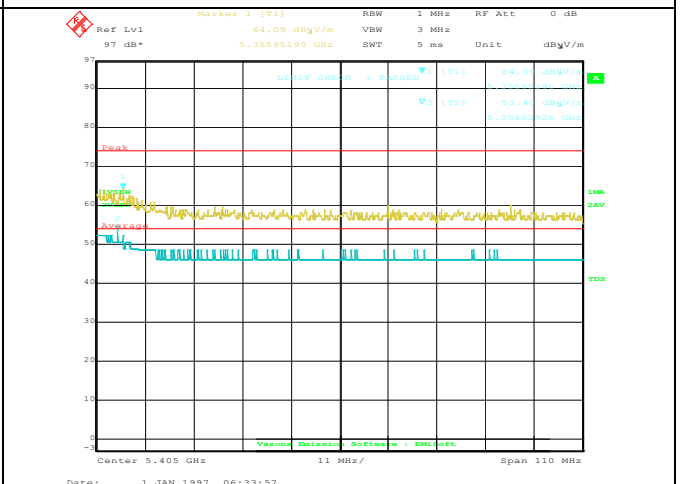
802.11a 5260M(4500-5150MHz)



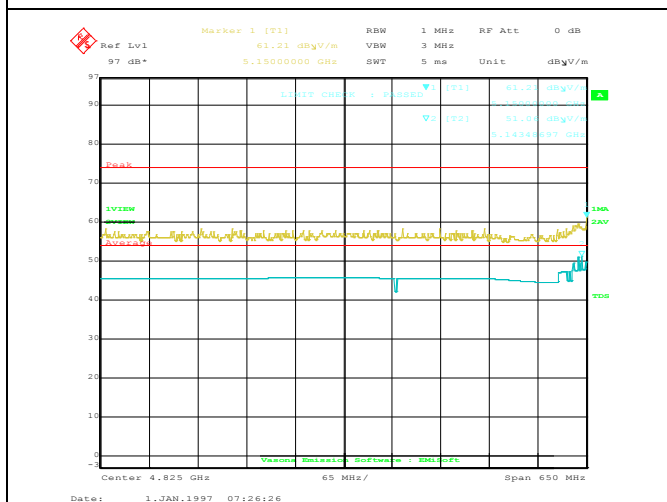
802.11a 5320M(5350-5460MHz)



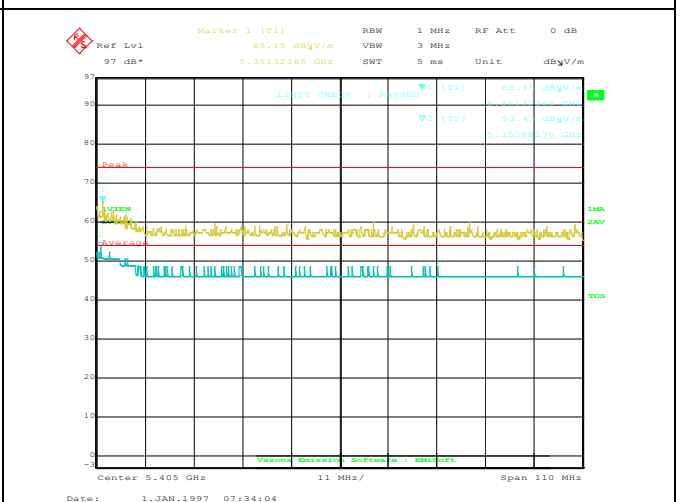
802.11n-HT20 5260M(4500-5150MHz)



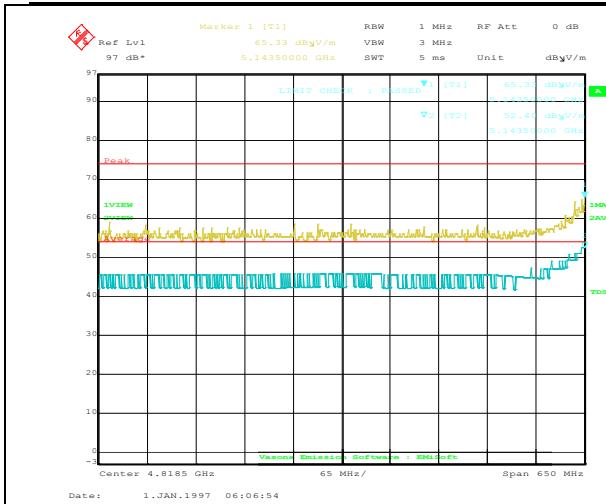
802.11n-HT 5320M(5350-5460MHz)



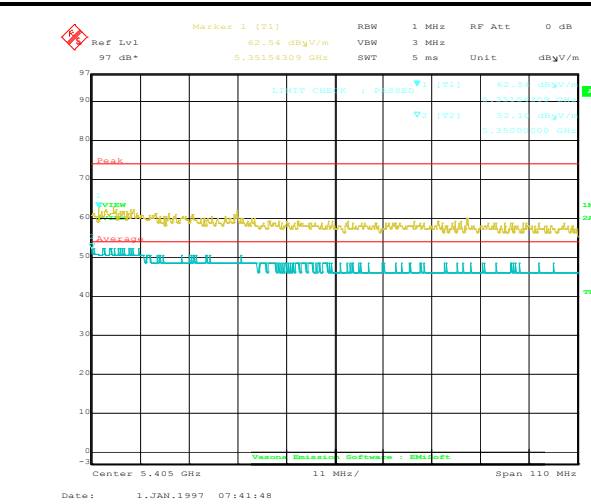
802.11n-HT40 5270M(4500-5150MHz)



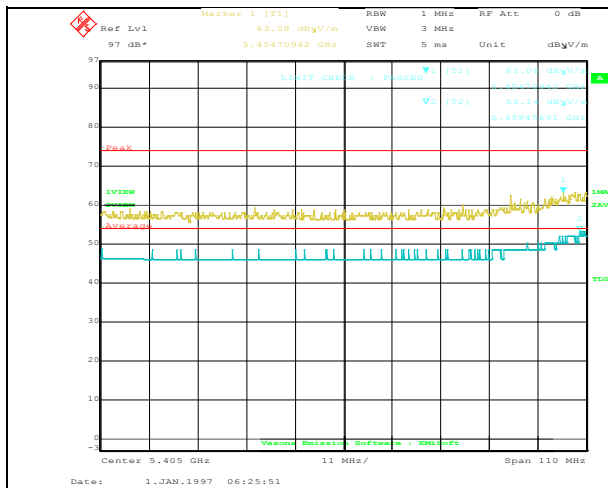
802.11n-HT 5310M(5350-5460MHz)



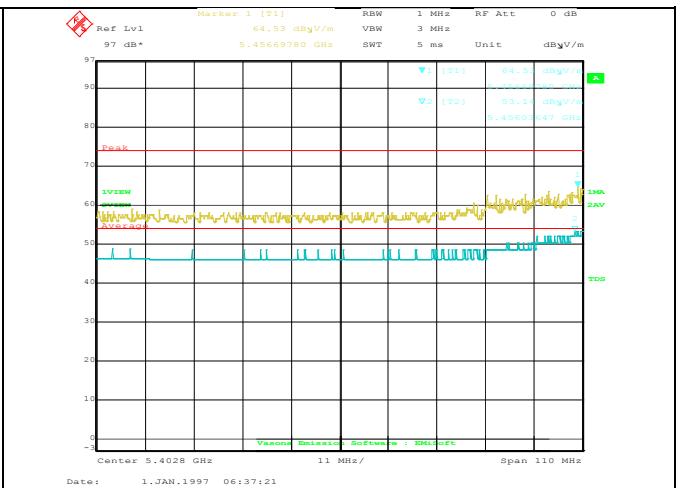
802.11ac-VHT80 5290M(4500-5150MHz)



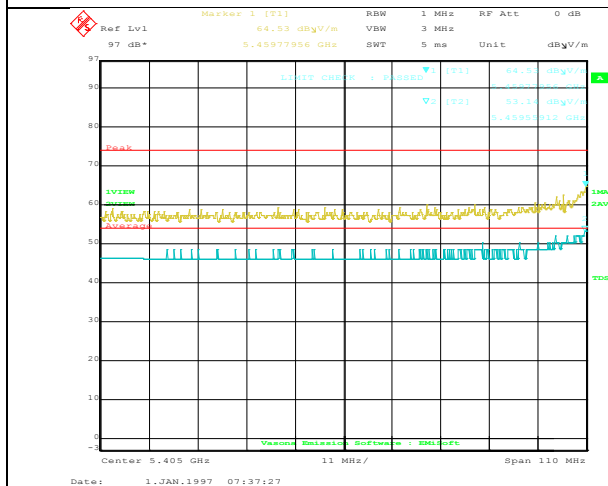
802.11ac-VHT80 5290M(5350-5460MHz)



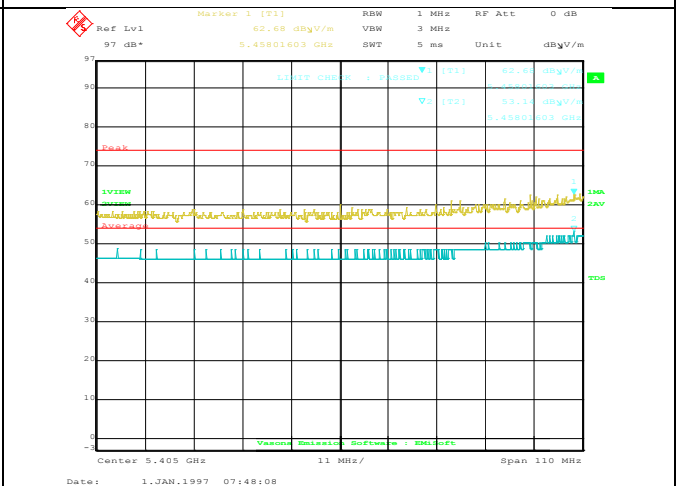
802.11a 5500M(5350-5460MHz)



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



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



802.11ac 5530M(5350-5460MHz)

Radiated Emission Test Results (Above 1GHz)

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
10520.46	36.75	8.54	9.42	54.71	Peak Max	V	115	174	74	-19.29	Pass
15780.46	44.6	9.04	8.96	62.6	Peak Max	V	194	327	74	-11.4	Pass
10520.25	37.1	8.54	9.42	55.06	Peak Max	H	110	356	74	-18.94	Pass
15780.25	44.9	9.04	8.96	62.9	Peak Max	H	110	356	74	-11.1	Pass
10520.46	26.78	8.54	9.42	44.74	Average Max	V	115	174	54	-9.26	Pass
15780.46	34.09	9.04	8.96	52.09	Average Max	V	194	327	54	-1.91	Pass
10520.25	27.15	8.54	9.42	45.11	Average Max	H	110	356	54	-8.89	Pass
15780.25	35.01	9.04	8.96	53.01	Average Max	H	110	356	54	-0.99	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
10560.15	34.68	8.32	9.39	52.39	Peak Max	V	115	174	74	-21.61	Pass
15840.15	44.19	9.04	8.96	62.19	Peak Max	V	194	327	74	-11.81	Pass
10560.34	37.11	8.32	9.39	54.82	Peak Max	H	110	356	74	-19.18	Pass
15840.34	44.44	9.04	8.96	62.44	Peak Max	H	110	356	74	-11.56	Pass
10560.15	25.17	8.32	9.39	42.88	Average Max	V	115	174	54	-11.12	Pass
15840.15	33.06	9.04	8.96	51.06	Average Max	V	194	327	54	-2.94	Pass
10560.34	27.24	8.32	9.39	44.95	Average Max	H	110	356	54	-9.05	Pass
15840.34	34.72	9.04	8.96	52.72	Average Max	H	110	356	54	-1.28	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
10640.18	37.44	8.32	8.96	54.72	Peak Max	V	115	174	74	-19.28	Pass
15960.18	42.23	9.07	8.74	60.04	Peak Max	V	194	327	74	-13.96	Pass
10640.32	37.48	8.32	8.96	54.76	Peak Max	H	110	356	74	-19.24	Pass
15960.32	42.86	9.07	8.74	60.67	Peak Max	H	110	356	74	-13.33	Pass
10640.18	26.51	8.32	8.96	43.79	Average Max	V	115	174	54	-10.21	Pass
15960.18	32.13	9.07	8.74	49.94	Average Max	V	194	327	54	-4.06	Pass
10640.32	27.29	8.32	8.96	44.57	Average Max	H	110	356	54	-9.43	Pass
15960.32	33.67	9.07	8.74	51.48	Average Max	H	110	356	54	-2.52	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
10520.46	36.77	8.54	9.42	54.73	Peak Max	V	115	174	74	-19.27	Pass
15780.46	44.7	9.04	8.96	62.7	Peak Max	V	194	327	74	-11.3	Pass
10520.25	36.69	8.54	9.42	54.65	Peak Max	H	110	356	74	-19.35	Pass
15780.25	45.47	9.04	8.96	63.47	Peak Max	H	110	356	74	-10.53	Pass
10520.46	25.93	8.54	9.42	43.89	Average Max	V	115	174	54	-10.11	Pass
15780.46	34.06	9.04	8.96	52.06	Average Max	V	194	327	54	-1.94	Pass
10520.25	26.1	8.54	9.42	44.06	Average Max	H	110	356	54	-9.94	Pass
15780.25	34.54	9.04	8.96	52.54	Average Max	H	110	356	54	-1.46	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
10560.15	37.1	8.32	9.39	54.81	Peak Max	V	115	174	74	-19.19	Pass
15840.15	45.38	9.04	8.96	63.38	Peak Max	V	194	327	74	-10.62	Pass
10560.34	38.06	8.32	9.39	55.77	Peak Max	H	110	356	74	-18.23	Pass
15840.34	45.87	9.04	8.96	63.87	Peak Max	H	110	356	74	-10.13	Pass
10560.15	26.84	8.32	9.39	44.55	Average Max	V	115	174	54	-9.45	Pass
15840.15	34.24	9.04	8.96	52.24	Average Max	V	194	327	54	-1.76	Pass
10560.34	27.43	8.32	9.39	45.14	Average Max	H	110	356	54	-8.86	Pass
15840.34	34.71	9.04	8.96	52.71	Average Max	H	110	356	54	-1.29	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
10640.18	34.97	8.32	8.96	52.25	Peak Max	V	115	174	74	-21.75	Pass
15960.18	43.7	9.07	8.74	61.51	Peak Max	V	194	327	74	-12.49	Pass
10640.32	34.8	8.32	8.96	52.08	Peak Max	H	110	356	74	-21.92	Pass
15960.32	44.97	9.07	8.74	62.78	Peak Max	H	110	356	74	-11.22	Pass
10640.18	25.09	8.32	8.96	42.37	Average Max	V	115	174	54	-11.63	Pass
15960.18	32.52	9.07	8.74	50.33	Average Max	V	194	327	54	-3.67	Pass
10640.32	25.9	8.32	8.96	43.18	Average Max	H	110	356	54	-10.82	Pass
15960.32	33.46	9.07	8.74	51.27	Average Max	H	110	356	54	-2.73	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
10540.42	34.73	8.54	9.42	52.69	Peak Max	V	115	174	74	-21.31	Pass
15810.26	41.58	9.04	8.92	59.54	Peak Max	V	194	327	74	-14.46	Pass
10540.42	34.97	8.54	9.42	52.93	Peak Max	H	110	356	74	-21.07	Pass
15810.26	43.08	9.04	8.92	61.04	Peak Max	H	110	356	74	-12.96	Pass
10540.42	24.58	8.54	9.42	42.54	Average Max	V	115	174	54	-11.46	Pass
15810.26	31.31	9.04	8.92	49.27	Average Max	V	194	327	54	-4.73	Pass
10540.42	24.8	8.54	9.42	42.76	Average Max	H	110	356	54	-11.24	Pass
15810.26	33.12	9.04	8.92	51.08	Average Max	H	110	356	54	-2.92	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
10620.18	36.02	8.32	8.94	53.28	Peak Max	V	115	174	74	-20.72	Pass
15930.18	38.18	9.07	8.81	56.06	Peak Max	V	194	327	74	-17.94	Pass
10620.25	35.82	8.32	8.94	53.08	Peak Max	H	110	356	74	-20.92	Pass
15930.25	38.52	9.07	8.81	56.4	Peak Max	H	110	356	74	-17.6	Pass
10620.18	24.9	8.32	8.94	42.16	Average Max	V	115	174	54	-11.84	Pass
15930.18	26.81	9.07	8.81	44.69	Average Max	V	194	327	54	-9.31	Pass
10620.25	24.88	8.32	8.94	42.14	Average Max	H	110	356	54	-11.86	Pass
15930.25	26.82	9.07	8.81	44.7	Average Max	H	110	356	54	-9.3	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
10580.46	34.84	8.32	8.96	52.12	Peak Max	V	115	174	74	-21.88	Pass
15870.46	36.64	9.04	8.81	54.49	Peak Max	V	194	327	74	-19.51	Pass
10580.25	35.83	8.32	8.96	53.11	Peak Max	H	110	356	74	-20.89	Pass
15870.25	38.06	9.04	8.81	55.91	Peak Max	H	110	356	74	-18.09	Pass
10580.46	24.36	8.32	8.96	41.64	Average Max	V	115	174	54	-12.36	Pass
15870.46	26.64	9.04	8.81	44.49	Average Max	V	194	327	54	-9.51	Pass
10580.25	24.48	8.32	8.96	41.76	Average Max	H	110	356	54	-12.24	Pass
15870.25	26.33	9.04	8.81	44.18	Average Max	H	110	356	54	-9.82	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
11000.24	38.79	8.33	8	55.12	Peak Max	V	115	174	74	-18.88	Pass
16500.63	39.87	9.35	8.72	57.94	Peak Max	V	194	327	74	-16.06	Pass
11000.18	40.33	8.33	8	56.66	Peak Max	H	110	356	74	-17.34	Pass
16500.18	38.53	9.35	8.72	56.6	Peak Max	H	110	356	74	-17.4	Pass
11000.24	28.16	8.33	8	44.49	Average Max	V	115	174	54	-9.51	Pass
16500.63	27.58	9.35	8.72	45.65	Average Max	V	194	327	54	-8.35	Pass
11000.18	29.15	8.33	8	45.48	Average Max	H	110	356	54	-8.52	Pass
16500.18	28.17	9.35	8.72	46.24	Average Max	H	110	356	54	-7.76	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
11160.45	42.31	8.55	8.31	59.17	Peak Max	V	115	174	74	-14.83	Pass
16740.45	42.45	9.35	6.06	57.86	Peak Max	V	194	327	74	-16.14	Pass
11160.36	41.86	8.55	8.31	58.72	Peak Max	H	110	356	74	-15.28	Pass
16740.36	43.36	9.35	6.06	58.77	Peak Max	H	110	356	74	-15.23	Pass
11160.45	32.58	8.55	8.31	49.44	Average Max	V	115	174	54	-4.56	Pass
16740.45	32.15	9.35	6.06	47.56	Average Max	V	194	327	54	-6.44	Pass
11160.36	31.88	8.55	8.31	48.74	Average Max	H	110	356	54	-5.26	Pass
16740.36	32.17	9.35	6.06	47.58	Average Max	H	110	356	54	-6.42	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
11400.25	43.9	8.54	8.09	60.53	Peak Max	V	115	174	74	-13.47	Pass
17100.25	44.51	9.32	4.93	58.76	Peak Max	V	194	327	74	-15.24	Pass
11400.33	44.27	8.54	8.09	60.9	Peak Max	H	110	356	74	-13.1	Pass
17100.33	43.8	9.32	4.93	58.05	Peak Max	H	110	356	74	-15.95	Pass
11400.25	34.61	8.54	8.09	51.24	Average Max	V	115	174	54	-2.76	Pass
17100.25	33.57	9.32	4.93	47.82	Average Max	V	194	327	54	-6.18	Pass
11400.33	34.43	8.54	8.09	51.06	Average Max	H	110	356	54	-2.94	Pass
17100.33	33.86	9.32	4.93	48.11	Average Max	H	110	356	54	-5.89	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
11000.24	37.03	8.33	8	53.36	Peak Max	V	115	174	74	-20.64	Pass
16500.63	39.48	9.35	8.72	57.55	Peak Max	V	194	327	74	-16.45	Pass
11000.18	39.09	8.33	8	55.42	Peak Max	H	110	356	74	-18.58	Pass
16500.18	39.37	9.35	8.72	57.44	Peak Max	H	110	356	74	-16.56	Pass
11000.24	27.39	8.33	8	43.72	Average Max	V	115	174	54	-10.28	Pass
16500.63	28.2	9.35	8.72	46.27	Average Max	V	194	327	54	-7.73	Pass
11000.18	28.18	8.33	8	44.51	Average Max	H	110	356	54	-9.49	Pass
16500.18	28.17	9.35	8.72	46.24	Average Max	H	110	356	54	-7.76	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
11160.45	39.13	8.55	8.31	55.99	Peak Max	V	115	174	74	-18.01	Pass
16740.45	42.8	9.35	6.06	58.21	Peak Max	V	194	327	74	-15.79	Pass
11160.36	41.06	8.55	8.31	57.92	Peak Max	H	110	356	74	-16.08	Pass
16740.36	42.51	9.35	6.06	57.92	Peak Max	H	110	356	74	-16.08	Pass
11160.45	27.98	8.55	8.31	44.84	Average Max	V	115	174	54	-9.16	Pass
16740.45	31.42	9.35	6.06	46.83	Average Max	V	194	327	54	-7.17	Pass
11160.36	30.24	8.55	8.31	47.1	Average Max	H	110	356	54	-6.9	Pass
16740.36	31.03	9.35	6.06	46.44	Average Max	H	110	356	54	-7.56	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
11400.25	43.23	8.54	8.09	59.86	Peak Max	V	115	174	74	-14.14	Pass
17100.25	42.77	9.32	4.93	57.02	Peak Max	V	194	327	74	-16.98	Pass
11400.33	44	8.54	8.09	60.63	Peak Max	H	110	356	74	-13.37	Pass
17100.33	44.13	9.32	4.93	58.38	Peak Max	H	110	356	74	-15.62	Pass
11400.25	32.49	8.54	8.09	49.12	Average Max	V	115	174	54	-4.88	Pass
17100.25	32.89	9.32	4.93	47.14	Average Max	V	194	327	54	-6.86	Pass
11400.33	32.36	8.54	8.09	48.99	Average Max	H	110	356	54	-5.01	Pass
17100.33	33.02	9.32	4.93	47.27	Average Max	H	110	356	54	-6.73	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
11020.43	37.14	8.33	8	53.47	Peak Max	V	115	174	74	-20.53	Pass
16530.43	38.25	9.35	8.72	56.32	Peak Max	V	194	327	74	-17.68	Pass
11020.09	35.87	8.33	8	52.2	Peak Max	H	110	356	74	-21.8	Pass
16530.09	37.15	9.35	8.72	55.22	Peak Max	H	110	356	74	-18.78	Pass
11020.43	26.27	8.33	8	42.6	Average Max	V	115	174	54	-11.4	Pass
16530.43	27.28	9.35	8.72	45.35	Average Max	V	194	327	54	-8.65	Pass
11020.09	26.4	8.33	8	42.73	Average Max	H	110	356	54	-11.27	Pass
16530.09	27.55	9.35	8.72	45.62	Average Max	H	110	356	54	-8.38	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
11100.23	38.1	8.55	8.31	54.96	Peak Max	V	115	174	74	-19.04	Pass
16650.23	41.28	9.35	6.06	56.69	Peak Max	V	194	327	74	-17.31	Pass
11100.43	39.02	8.55	8.31	55.88	Peak Max	H	110	356	74	-18.12	Pass
16650.43	41.08	9.35	6.06	56.49	Peak Max	H	110	356	74	-17.51	Pass
11100.23	27.8	8.55	8.31	44.66	Average Max	V	115	174	54	-9.34	Pass
16650.23	29.96	9.35	6.06	45.37	Average Max	V	194	327	54	-8.63	Pass
11100.43	28.97	8.55	8.31	45.83	Average Max	H	110	356	54	-8.17	Pass
16650.43	31.19	9.35	6.06	46.6	Average Max	H	110	356	54	-7.4	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
11340.64	41.6	8.54	8.09	58.23	Peak Max	V	115	174	74	-15.77	Pass
17010.64	42.05	9.32	4.93	56.3	Peak Max	V	194	327	74	-17.7	Pass
11340.32	40.73	8.54	8.09	57.36	Peak Max	H	110	356	74	-16.64	Pass
17010.32	42.9	9.32	4.93	57.15	Peak Max	H	110	356	74	-16.85	Pass
11340.64	32.23	8.54	8.09	48.86	Average Max	V	115	174	54	-5.14	Pass
17010.64	32.19	9.32	4.93	46.44	Average Max	V	194	327	54	-7.56	Pass
11340.32	31.46	8.54	8.09	48.09	Average Max	H	110	356	54	-5.91	Pass
17010.32	31.25	9.32	4.93	45.5	Average Max	H	110	356	54	-8.5	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
11060.41	36.08	8.33	8	52.41	Peak Max	V	115	174	74	-21.59	Pass
16590.41	42.33	9.35	6.3	57.98	Peak Max	V	194	327	74	-16.02	Pass
11060.37	35.98	8.33	8	52.31	Peak Max	H	110	356	74	-21.69	Pass
16590.37	39.54	9.35	6.3	55.19	Peak Max	H	110	356	74	-18.81	Pass
11060.41	24.91	8.33	8	41.24	Average Max	V	115	174	54	-12.76	Pass
16590.41	29.57	9.35	6.3	45.22	Average Max	V	194	327	54	-8.78	Pass
11060.37	25.05	8.33	8	41.38	Average Max	H	110	356	54	-12.62	Pass
16590.37	29.5	9.35	6.3	45.15	Average Max	H	110	356	54	-8.85	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
11220.62	37.76	8.33	8.31	54.4	Peak Max	V	115	174	74	-19.6	Pass
16830.62	40.37	9.35	6.21	55.93	Peak Max	V	194	327	74	-18.07	Pass
11220.45	38.26	8.33	8.31	54.9	Peak Max	H	110	356	74	-19.1	Pass
16830.45	40.07	9.35	6.21	55.63	Peak Max	H	110	356	74	-18.37	Pass
11220.62	27.64	8.33	8.31	44.28	Average Max	V	115	174	54	-9.72	Pass
16830.62	29.76	9.35	6.21	45.32	Average Max	V	194	327	54	-8.68	Pass
11220.45	28.33	8.33	8.31	44.97	Average Max	H	110	356	54	-9.03	Pass
16830.45	29.15	9.35	6.21	44.71	Average Max	H	110	356	54	-9.29	Pass

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	☒
Horn Antenna (26GHz~40GHz)	AH-840	101013	08/28/2015	1 Year	08/28/2016	☒
Pre-Amp (30MHz~40GHz)	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