

RF TEST REPORT



Report No.: FCC_RF_SL14121601-RUC-016A1_UNII
Supersede Report No.: None

Applicant	:	Ruckus Wireless, Inc.
Product Name	:	Access Point
Model No.	:	R710
Test Standard	:	47 CFR 15.407
Test Method	:	ANSI C63.4: 2014 789033 D02 General UNII Test Procedures New Rules v01
FCC ID	:	S9GR710
IC ID	:	5912A-R710
Dates of test	:	01/16/2015 – 02/19/2015
Issue Date	:	02/20/2015
Test Result	:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Equipment complied with the specification <input checked="" type="checkbox"/>		
Equipment did not comply with the specification <input type="checkbox"/>		

This Test Report is Issued Under the Authority of:	
Ricky Wang	David Zhang
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/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_SL14121601-RUC-016A1_UNII	None	Original	02/20/2015

2 Executive Summary

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

Company: Ruckus Wireless, Inc.
Product: Access Point
Model: R710

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	:	Access Point
Model No.	:	R710
Trade Name	:	Ruckus
Serial No.	:	911543202059
Host Model No.	:	N/A
Input Power	:	48VDC (PoE)
Power Adapter Manu/Model	:	N/A
Power Adapter SN	:	N/A
Product Hardware version	:	705-60398-001
Product Software version	:	812-11303-301
Radio Hardware version	:	705-60398-001
Radio Software version	:	812-11303-301
Test Software version	:	4_9_802_1_CS
Date of EUT received	:	01/05/2015
Equipment Class/ Category	:	DTS, UNII
Clock Frequencies	:	N/A
Port/Connectors	:	PoE, Ethernet

6.2 Radio Description

Radio Type	802.11b	802.11g	802.11a	802.11n-20M	802.11n-40M	802.11ac-80M
Operating Frequency	2412-2462MHz	2412-2462MHz	5180-5320MHz 5500-5720MHz 5745-5825MHz	2412-2462MHz 5180-5320MHz 5500-5720MHz 5745-5825MHz	2422-2452MHz 5190-5310MHz 5510-5710MHz 5755-5795MHz	5210MHz, 5290MHz 5530MHz, 5690MHz, 5775MHz
Modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Spacing	5MHz	5MHz	20MHz	5MHz(2.4GHz), 20MHz (5GHz)	40MHz	80MHz
Number of Channels	11	11	20	11(2.4GH) 20 (5GHz)	9(2.4GH) 10(5GHz)	5
Antenna Type	Internal Patch Antenna					
Antenna Gain (Peak)	2.5 dBi (2.4GHz), 3.5 dBi (5 GHz)					
Antenna Connector Type	U.FL					
Note	<p>EUT has 4 antennas, 2 antennas are in horizontal polarity, and 2 antennas in vertical polarity. The 802.11b/g/a is in CDD mode with all 4 antenna transmit simultaneously.</p> <p>Since they're in 90 deg phase shift between the horizontal and vertical antennas, for radiated limit, the result from different polarization antenna will not be combined. So only the result for 2 vertical polarity antennas and 2 horizontal polarity antennas will be combined for MIMO mode separately. For cross-polarized antenna, the total gain—including array gain—is computed separately for each of polarizations using the procedures presented in this document. The highest of the total gains shall apply. For this case, the highest of the total gain will be the directional gain of 2 antennas.</p> <p>For conducted limit like power and psd, the result from all 4 chains will be summed.</p> <p>For 802.11b/g/a mode under CDD mode, the array gain for power will be 0 and for PSD will be 10 log (Nant/Nss) dB to be calculated separately for horizontal and vertical polarity. Reference to the following KDB for clarification. 662911 D01 Multiple Transmitter Output v02r01 662911 D02 MIMO with Cross-Polarized Antennas v01</p>					

EUT Power level setting

Mode	Frequency	Power Setting
802.11-a	5260	15.5
802.11-a	5280	15.5
802.11-a	5320	15.5
802.11-n-20	5260	15.5
802.11-n-20	5280	15.5
802.11-n-20	5320	15.5
802.11-n-40	5270	17.5
802.11-n-40	5310	17.5
802.11-ac-80	5290	17.5
802.11-a	5500	16
802.11-a	5580	16
802.11-a	5700	15.5
802.11-n-20	5500	16
802.11-n-20	5580	16
802.11-n-20	5700	16
802.11-n-40	5510	17.5
802.11-n-40	5590	17.5
802.11-n-40	5670	17.5
802.11-ac-80	5530	17.5

CROSSOVER channels power setting

Mode	Frequency	Power Setting
802.11-a	5720	16.5
802.11-n-20	5720	16
802.11-n-40	5710	17.5
802.11-ac-80	5690	17.5

6.3 EUT Photos - External



Top View



Bottom View



Front View



Rear View

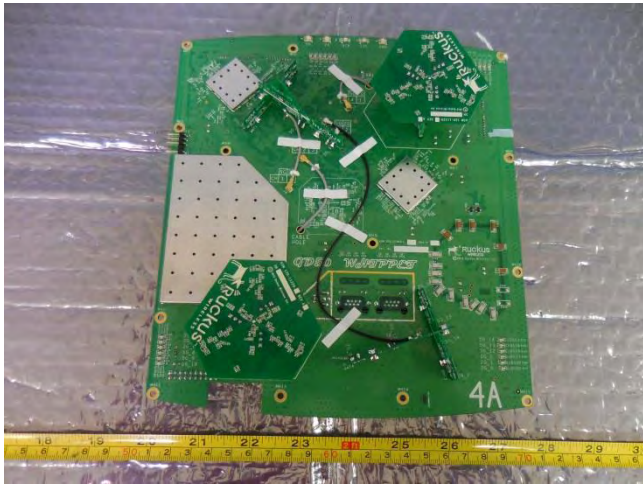


Left Side View



Right Side View

6.4 EUT Photos – Internal



EUT Main PCBA Top View

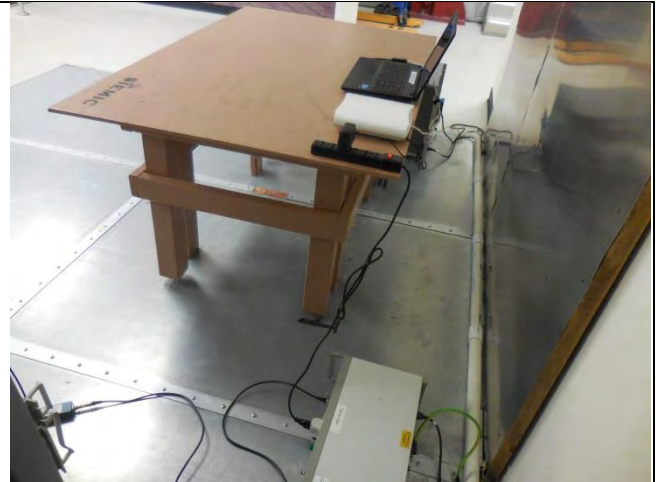


EUT Main PCBA Bottom View

6.5 EUT Test Setup Photos



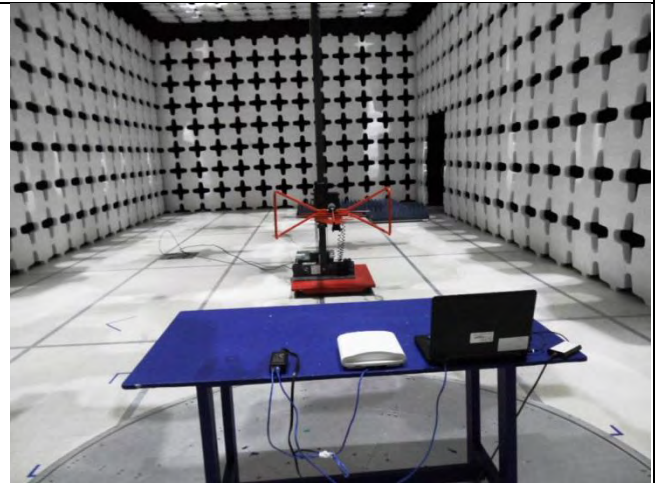
AC Line Conducted Emissions – Front View



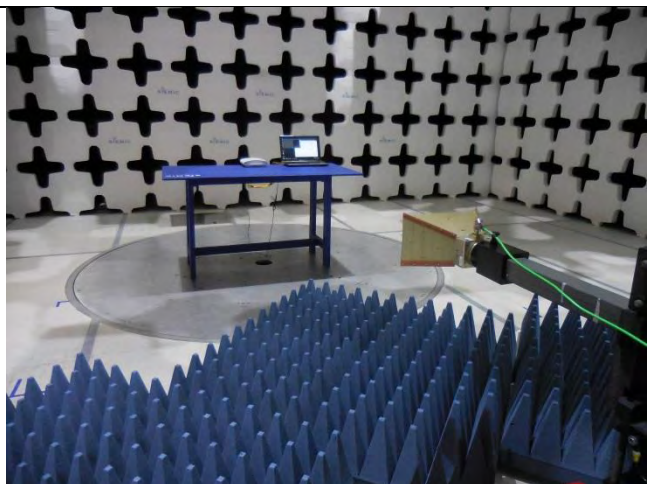
AC Line Conducted Emissions – Rear View



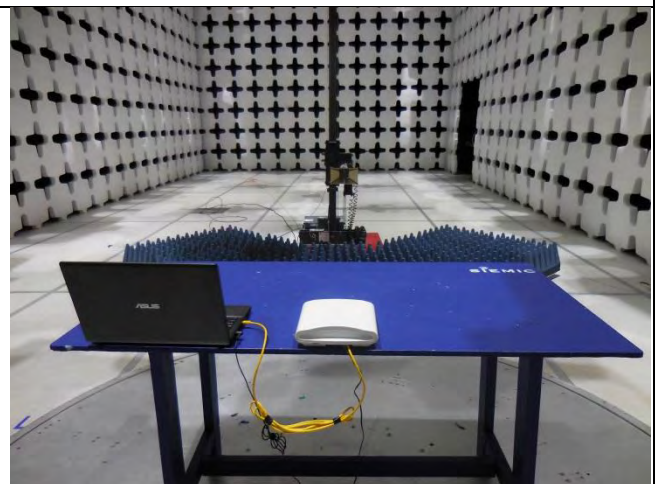
Radiated Emissions (<1GHz) – Front View



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	PP01L Latitude C610	CN-06P823-48643-37P-4153	Dell	-
2	EUT power Supply	HK-AD-120A100-US	740-64190-011	Ruckus	-

7.2 Cabling Description

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

7.3 Test Software Description

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

8 Test Summary

Test Item	Test standard		Test Method/Procedure	Pass / Fail
Restricted Band of Operation	FCC	15.205	ANSI C63.4 – 2014 789033 D02 General UNII Test Procedures New Rules v01	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
AC Conducted Emissions Voltage	FCC	15.207(a)	ANSI C63.4 – 2014	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A

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

Remark	<ol style="list-style-type: none"> 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.
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9 Measurement Uncertainty

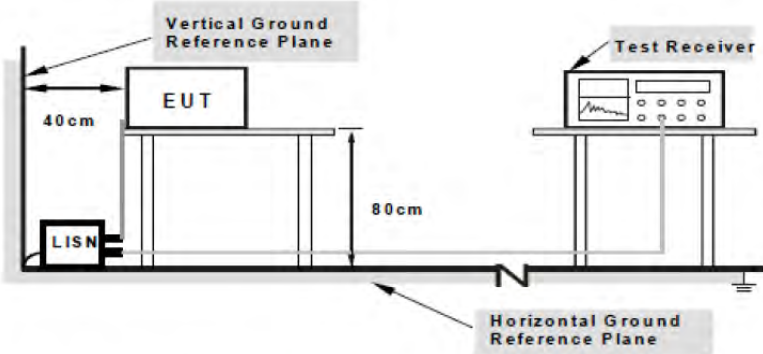
Emissions			
Test Item	Frequency Range	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious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

10 Measurements, Examination and Derived Results

10.1 Conducted Emissions

Conducted Emission Limit

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

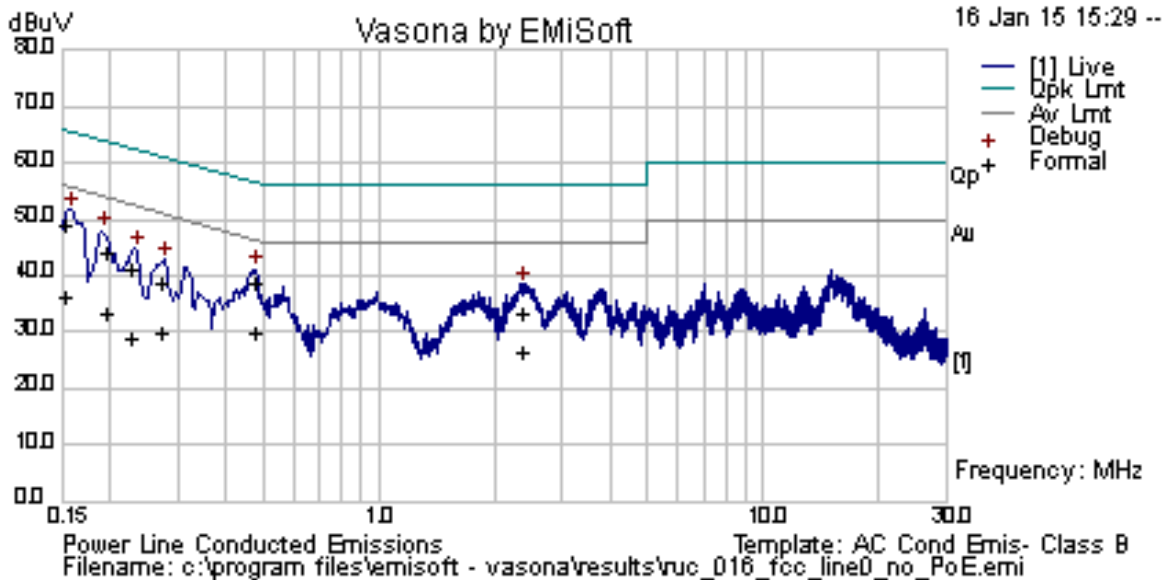
Spec	Item	Requirement	Applicable
47CFR§15.207	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</p>		
Procedure	<ul style="list-style-type: none"> - The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B. - The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains. - The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. - All other supporting equipment was powered separately from another main supply. 		
Remark	EUT tested with AC 120V 60Hz		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data Yes N/A

Test Plot Yes (See below) N/A

Conducted Emission Test Results (Line)

Test specification:	Conducted Emissions			Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Environmental Conditions:	Temp(°C):	21			
	Humidity (%):	42			
	Atmospheric(mbar):	1021			
Mains Power:	120Vac, 60Hz				
Tested by:	George Arias				
Test Date:	01/16/2015				
Remarks	Line				

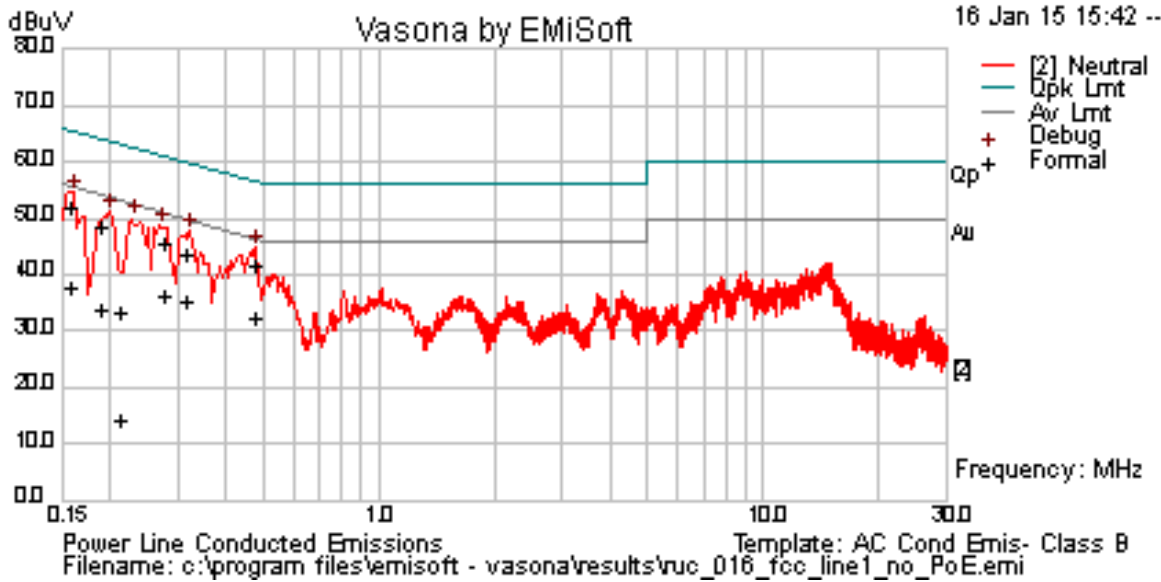


Live Line Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.15	38.10	10.00	0.76	48.86	Quasi Peak	Line	65.86	-17.00	Pass
0.15	25.70	10.00	0.76	36.46	Average	Line	55.86	-19.40	Pass
0.19	33.46	10.00	0.74	44.20	Quasi Peak	Line	63.85	-19.65	Pass
0.19	22.66	10.00	0.74	33.41	Average	Line	53.85	-20.44	Pass
0.23	30.55	10.00	0.73	41.28	Quasi Peak	Line	62.54	-21.25	Pass
0.23	18.13	10.00	0.73	28.87	Average	Line	52.54	-23.67	Pass
0.27	28.02	10.00	0.72	38.74	Quasi Peak	Line	61.02	-22.28	Pass
0.27	19.17	10.00	0.72	29.89	Average	Line	51.02	-21.12	Pass
0.47	27.98	10.01	0.73	38.72	Quasi Peak	Line	56.44	-17.73	Pass
0.47	19.09	10.01	0.73	29.83	Average	Line	46.44	-16.61	Pass
2.36	22.20	10.02	0.96	33.19	Quasi Peak	Line	56.00	-22.81	Pass
2.36	15.70	10.02	0.96	26.68	Average	Line	46.00	-19.32	Pass

Conducted Emission Test Results (Neutral)

Test specification:	Conducted Emissions			Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Environmental Conditions:	Temp(°C):	21			
	Humidity (%):	42			
	Atmospheric(mbar):	1021			
Mains Power:	120Vac, 60Hz				
Tested by:	George Arias				
Test Date:	01/16/2015				
Remarks	Neutral				




Neutral Line@ 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.16	41.30	10.00	0.75	52.06	Quasi Peak	Neutral	65.55	-13.49	Pass
0.16	27.15	10.00	0.75	37.91	Average	Neutral	55.55	-17.64	Pass
0.19	37.71	10.00	0.75	48.46	Quasi Peak	Neutral	64.08	-15.62	Pass
0.19	22.91	10.00	0.75	33.66	Average	Neutral	54.08	-20.42	Pass
0.21	22.76	10.00	0.74	33.50	Quasi Peak	Neutral	63.10	-29.60	Pass
0.21	3.72	10.00	0.74	14.46	Average	Neutral	53.10	-38.64	Pass
0.27	34.83	10.00	0.72	45.55	Quasi Peak	Neutral	61.00	-15.45	Pass
0.27	25.41	10.00	0.72	36.13	Average	Neutral	51.00	-14.87	Pass
0.31	33.01	10.00	0.71	43.72	Quasi Peak	Neutral	59.91	-16.19	Pass
0.31	24.38	10.00	0.71	35.09	Average	Neutral	49.91	-14.81	Pass
0.47	30.93	10.01	0.73	41.68	Quasi Peak	Neutral	56.43	-14.75	Pass
0.47	21.70	10.01	0.73	32.44	Average	Neutral	46.43	-13.98	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.	<input checked="" type="checkbox"/>
	a) (2)	26 dB Emission BW: Report only for power limit calculation.	<input type="checkbox"/>
Test Setup			
Test Procedure	789033 D02 General UNII Test Procedures New Rules v01 <u>26dB Emission bandwidth measurement procedure (Other than 5.725-5.85 GHz)</u> <ul style="list-style-type: none"> - Allow the trace to stabilize. - Use the spectrum analyzer built-in measurement function to determine the 26dB BW. <ul style="list-style-type: none"> 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	01/20/2015	Environmental condition	Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
26 dB Emission Bandwidth	1% of 26 dB EBW	>RBW	>EBW	PK	Auto	Maxhold	-

Test Data Yes N/A
Test Plot Yes N/A

26dB Bandwidth measurement result for 5.3GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Power calculation (dBm) 11 dBm+10 log B
26dB BW	802.11a	5260	Low	16.68	23.22
26dB BW	802.11a	5280	Mid	18.91	23.77
26dB BW	802.11a	5320	High	18.50	23.67
26dB BW	802.11n-20	5260	Low	19.70	23.94
26dB BW	802.11n-20	5280	Mid	19.96	24.00
26dB BW	802.11n-20	5320	High	19.58	23.92
26dB BW	802.11n-40	5270	Low	39.07	26.92
26dB BW	802.11n-40	5310	High	39.03	26.91
26dB BW	802.11ac-80	5290	Mid	80.03	30.03

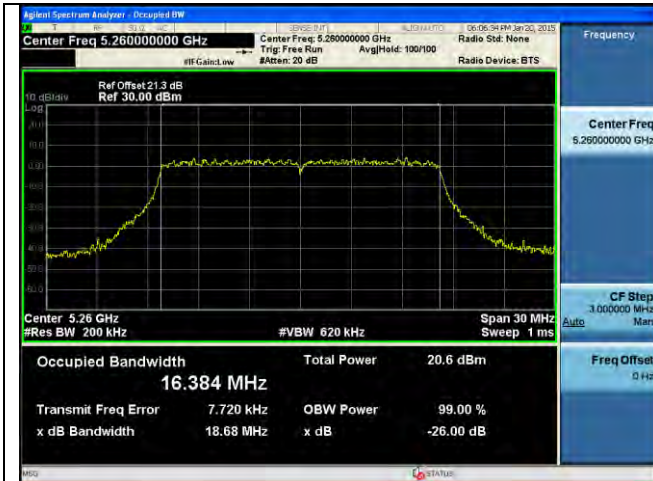
26dB Bandwidth measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Power calculation (dBm) 11 dBm+10 log B
26dB BW	802.11a	5500	Low	18.51	23.67
26dB BW	802.11a	5580	Mid	18.69	23.72
26dB BW	802.11a	5700	High	18.74	23.73
26dB BW	802.11n-20	5500	Low	19.66	23.94
26dB BW	802.11n-20	5580	Mid	19.58	23.92
26dB BW	802.11n-20	5700	High	19.79	23.96
26dB BW	802.11n-40	5510	Low	38.84	26.89
26dB BW	802.11n-40	5590	Mid	38.88	26.90
26dB BW	802.11n-40	5670	High	38.96	26.91
26dB BW	802.11ac-80	5530	Low	80.10	30.04

26dB Bandwidth measurement result for CROSSOVER channels

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Power calculation (dBm) 11 dBm+10 log B
26dB BW	802.11a	5720	CROSSOVER	18.90	23.76
26dB BW	802.11n-20	5720	CROSSOVER	19.95	24.00
26dB BW	802.11n-40	5710	CROSSOVER	38.75	26.88
26dB BW	802.11ac-80	5690	CROSSOVER	79.81	30.02

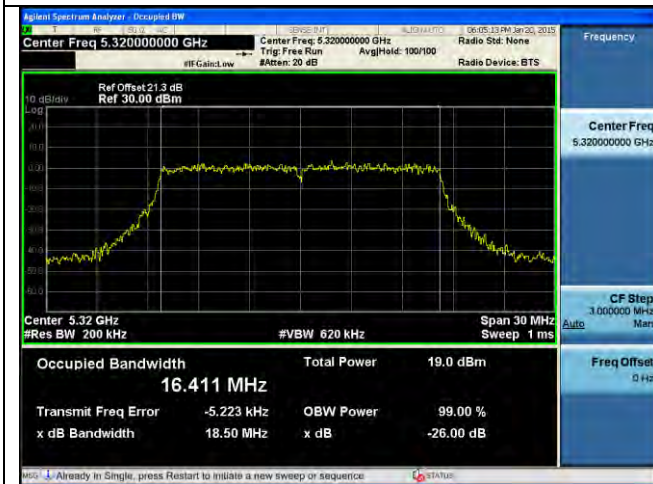
26dB Bandwidth Test Plots



26dB BW -802.11a 5260MHz



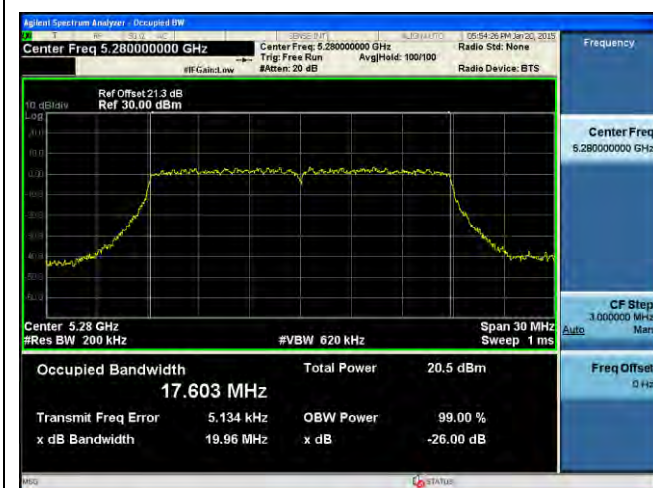
26dB BW -802.11a 5280MHz



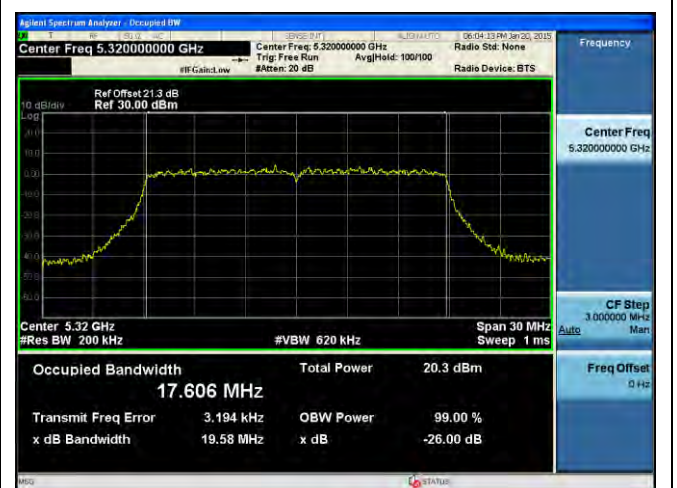
26dB BW -802.11a 5320MHz



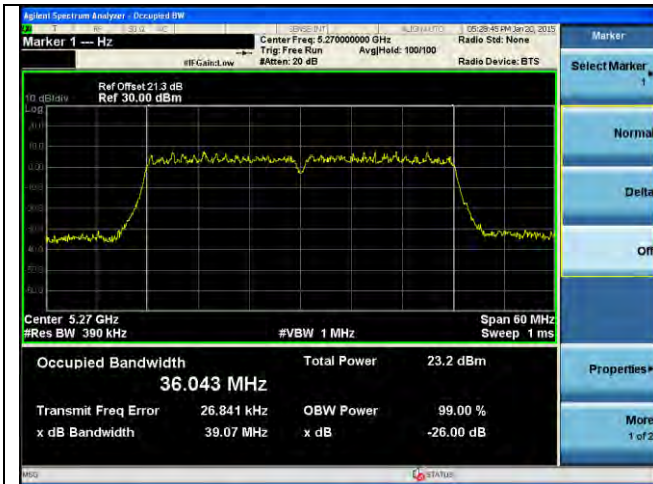
26dB BW -802.11n-20M 5260MHz



26dB BW -802.11n-20M 5280MHz



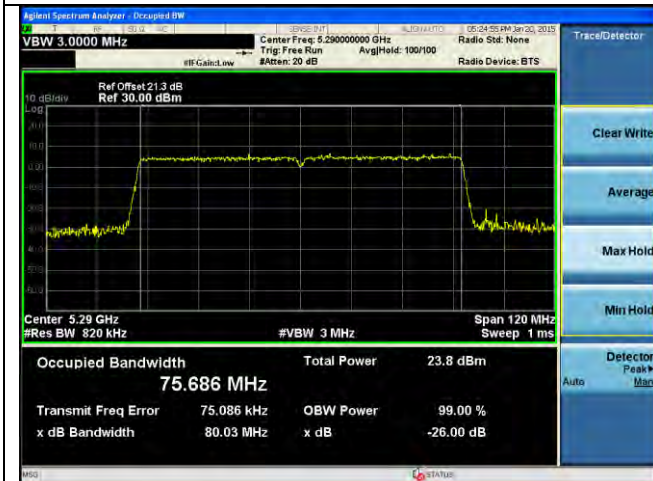
26dB BW -802.11n-20M 5320MHz



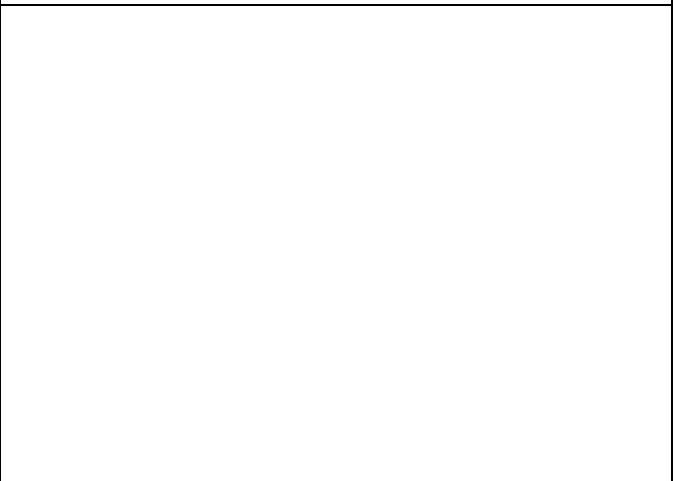
26dB BW -802.11n-40M 5270MHz



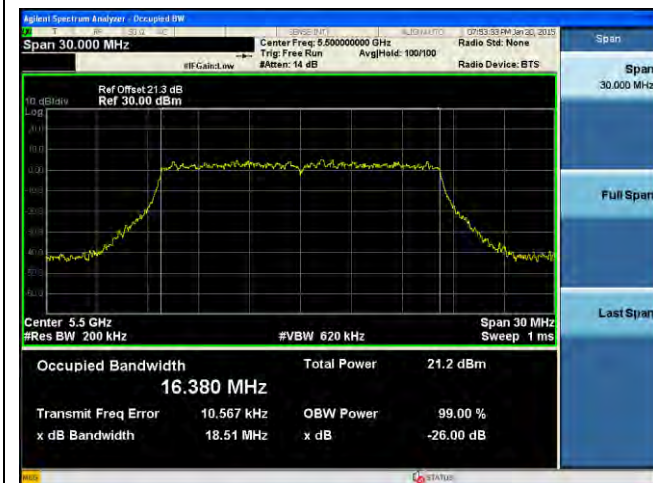
26dB BW -802.11n-40M 5310MHz



26dB BW -802.11ac-80M 5290MHz

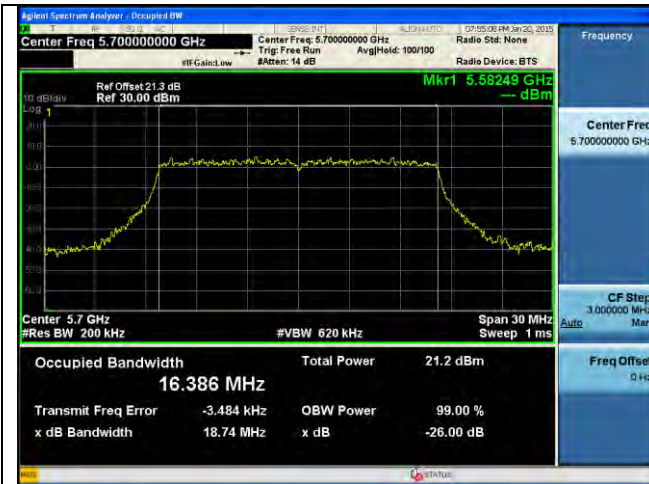


26dB BW -802.11a 5580MHz



26dB BW -802.11a 5500MHz

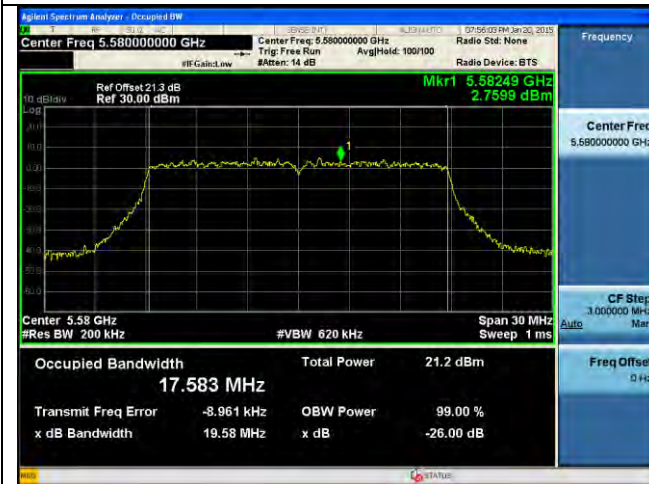




26dB BW -802.11a 5700MHz



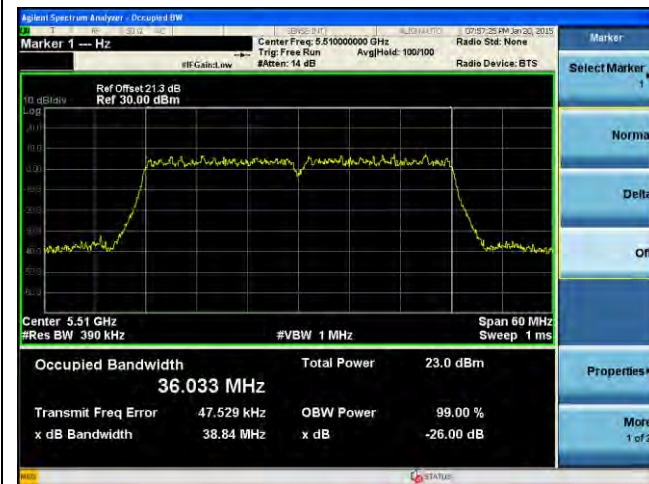
26dB BW -802.11n-20M 5500MHz



26dB BW -802.11n-20M 5580MHz



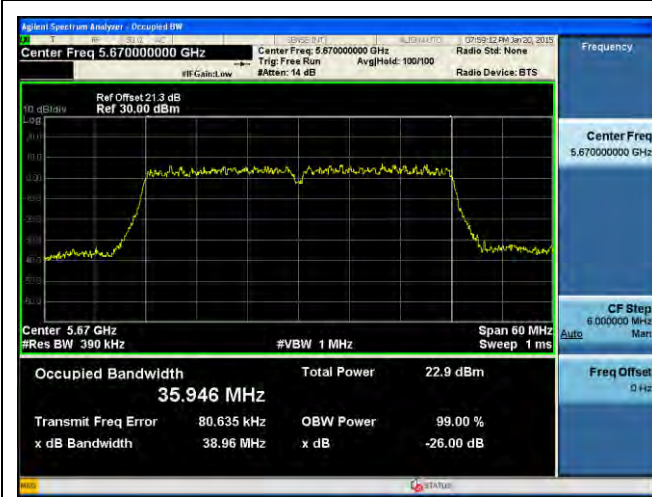
26dB BW -802.11n-20M 5700MHz



26dB BW -802.11n-40M 5510MHz



26dB BW -802.11n-40M 5550MHz



26dB BW -802.11n-40M 5670MHz



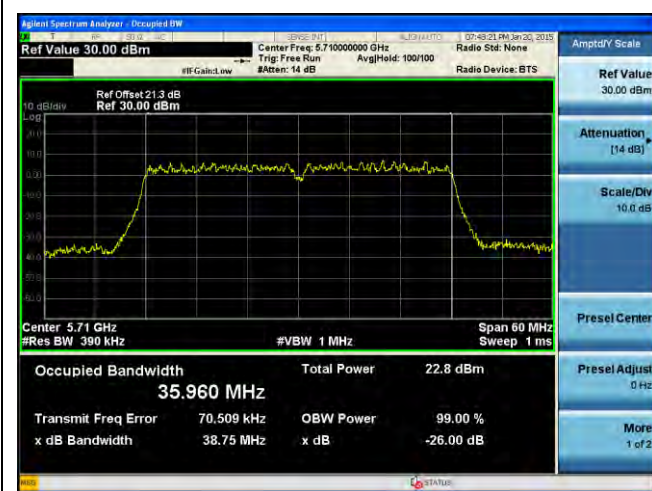
26dB BW -802.11ac-80M 5530MHz



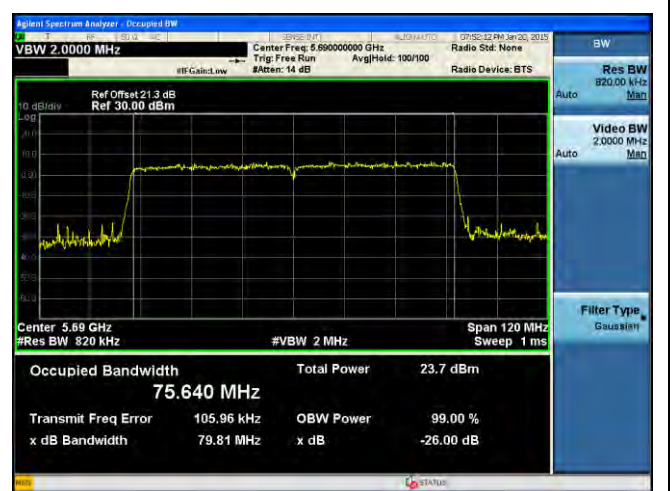
26dB BW -802.11a CROSSOVER 5720MHz



26dB BW -802.11n-20M 5720MHz




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



26dB BW -802.11ac CROSSOVER 5690MHz

10.3 Peak 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).	<input type="checkbox"/>
	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.	<input type="checkbox"/>
	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.	<input type="checkbox"/>
	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.	<input type="checkbox"/>
	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.	<input checked="" type="checkbox"/>
	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.	<input checked="" type="checkbox"/>
Test Setup			
Test Procedure	<p>789033 D02 General UNII Test Procedures New Rules v01</p> <p><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.</p> <ul style="list-style-type: none"> - 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	01/20/2015	Environmental condition	Temperature 23°C Relative Humidity 44% Atmospheric Pressure 1021mbar
Remark	<p>Per KDB 662911 D01 Multiple Transmitter Output v02r01, the direction gain for horizontal polarization and vertical polarization is calculated separately. For 5Ghz band, peak antenna gain = 3.5 dBi, directional gain = 3 dB, total gain = 6.5 dBi Highest of total gain is 6.5 dBi. The power limit and PSD limit will be reduced by amount of 0.5 dB. For the cross band channels, the output power of full bandwidth is compared to the power limit in 5.5G and 5.8G as the worst case.</p>		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

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

Output Power measurement result for 5.3GHz

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)					Limit (dBm)	Result
				Chain1	Chain2	Chain3	Chain4	Combined Power		
Output	802.11a	5260	Low	14.80	14.91	14.70	14.83	20.83	23.5	Pass
Output	802.11a	5280	Mid	14.74	14.85	14.74	14.74	20.79	23.5	Pass
Output	802.11a	5320	High	14.60	14.65	14.75	14.85	20.73	23.5	Pass
Output	802.11n-20M	5260	Low	14.93	15.00	14.74	14.87	20.91	23.5	Pass
Output	802.11n-20M	5280	Mid	14.85	14.93	14.77	14.78	20.85	23.5	Pass
Output	802.11n-20M	5320	High	14.70	14.73	14.77	14.82	20.78	23.5	Pass
Output	802.11n-40M	5270	Low	16.98	17.10	16.93	16.82	22.98	23.5	Pass
Output	802.11n-40M	5310	Mid	16.70	17.12	16.80	16.61	22.83	23.5	Pass
Output	802.11ac-80M	5290	High	16.70	17.06	16.93	16.63	22.85	23.5	Pass

Output Power measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)					Limit (dBm)	Result
				Chain1	Chain2	Chain3	Chain4	Combined Power		
Output	802.11a	5500	Low	15.32	15.33	15.40	15.38	21.38	23.5	Pass
Output	802.11a	5580	Mid	15.35	15.38	15.26	15.26	21.33	23.5	Pass
Output	802.11a	5700	High	14.33	14.58	14.50	14.65	20.54	23.5	Pass
Output	802.11n-20M	5500	Low	15.45	15.43	15.44	15.85	21.57	23.5	Pass
Output	802.11n-20M	5580	Mid	15.50	15.47	15.33	15.79	21.55	23.5	Pass
Output	802.11n-20M	5700	High	15.42	15.71	15.67	15.71	21.65	23.5	Pass
Output	802.11n-40M	5510	Low	16.49	16.59	16.50	16.76	22.61	23.5	Pass
Output	802.11n-40M	5550	Mid	16.45	16.61	16.41	16.83	22.60	23.5	Pass
Output	802.11n-40M	5670	High	16.54	16.82	16.43	16.75	22.66	23.5	Pass
Output	802.11ac-80M	5530	Low	16.55	16.53	16.31	16.81	22.57	23.5	Pass

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


Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)					Limit (dBm)	Result
				Chain1	Chain2	Chain3	Chain4	Combined Power		
Output	802.11a	5720	CROSSOVER	14.76	14.55	14.70	14.33	20.61	23.5	Pass
Output	802.11n-20M	5720	CROSSOVER	15.48	15.63	15.58	15.82	21.65	23.5	Pass
Output	802.11n-40M	5710	CROSSOVER	16.38	16.54	16.51	16.70	22.55	23.5	Pass
Output	802.11ac-80M	5690	CROSSOVER	16.46	16.59	16.38	16.58	22.52	23.5	Pass

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

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)					Limit (dBm)	Result
				Chain1	Chain2	Chain3	Chain4	Combined Power		
Output	802.11a	5720	CROSSOVER	14.76	14.55	14.70	14.33	20.61	29.5	Pass
Output	802.11n-20M	5720	CROSSOVER	15.48	15.63	15.58	15.82	21.65	29.5	Pass
Output	802.11n-40M	5710	CROSSOVER	16.38	16.54	16.51	16.70	22.55	29.5	Pass
Output	802.11ac-80M	5690	CROSSOVER	16.46	16.59	16.38	16.58	22.52	29.5	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.	<input type="checkbox"/>
	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.	<input type="checkbox"/>
	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.	<input checked="" type="checkbox"/>
	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.	<input checked="" type="checkbox"/>
Test Setup			
Test Procedure	<p>789033 D02 General UNII Test Procedures New Rules v01, II.F. Method SA-1</p> <p><u>Maximum spectral density measurement procedure</u></p> <ul style="list-style-type: none"> - 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. <p>Apply correction to the result if different RBW is used.</p>		
Test Date	01/20/2015	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	<p>Per KDB 662911 D01 Multiple Transmitter Output v02r01, the direction gain for horizontal polarization and vertical polarization is calculated separately.</p> <p>For 5Ghz band, peak antenna gain = 3.5 dBi, directional gain = 3 dB, total gain = 6.5 dBi Highest of total gain is 6.5 dBi. The power limit and PSD limit will be reduced by amount of 0.5 dB.</p> <p>For the cross band channels, the PSD of full bandwidth is compared to the PSD limit in 5.5G and 5.8G as the worst case. For 5.8GHz band, the PSD measurement on cross band channel is using 1MHz BW as the worst case.</p>		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
PSD	1MHz	\geq 3MHz	>EBW	RMS	Auto	Average	-

Test Data Yes N/A

Test Plot Yes (See below) N/A

PSD measurement result for 5.3GHz

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/MHz)					Limit (dBm)	Result
				Chain1	Chain2	Chain3	Chain4	Combined Power		
PSD	802.11a	5260	Low	3.98	3.79	3.88	3.96	9.92	10.5	Pass
PSD	802.11a	5280	Mid	3.81	4.00	3.88	3.68	9.86	10.5	Pass
PSD	802.11a	5320	High	3.54	3.67	3.71	3.93	9.74	10.5	Pass
PSD	802.11n-20M	5260	Low	3.59	3.68	3.41	3.51	9.57	10.5	Pass
PSD	802.11n-20M	5280	Mid	3.45	3.81	3.71	3.40	9.62	10.5	Pass
PSD	802.11n-20M	5320	High	3.68	3.78	3.58	3.45	9.64	10.5	Pass
PSD	802.11n-40M	5270	Low	2.69	2.66	2.64	2.58	8.66	10.5	Pass
PSD	802.11n-40M	5310	Mid	2.63	2.92	2.49	2.45	8.65	10.5	Pass
PSD	802.11ac-80M	5290	High	-0.68	-0.06	-0.49	-0.80	5.52	10.5	Pass

PSD measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/MHz)					Limit (dBm)	Result
				Chain1	Chain2	Chain3	Chain4	Combined Power		
PSD	802.11a	5500	Low	4.25	4.32	4.35	4.42	10.36	10.5	Pass
PSD	802.11a	5580	Mid	4.45	4.40	4.42	4.34	10.42	10.5	Pass
PSD	802.11a	5700	High	3.23	3.77	3.38	3.78	9.57	10.5	Pass
PSD	802.11n-20M	5500	Low	4.14	4.12	4.09	4.47	10.23	10.5	Pass
PSD	802.11n-20M	5580	Mid	4.38	4.20	4.29	4.45	10.35	10.5	Pass
PSD	802.11n-20M	5700	High	4.44	4.27	4.29	4.48	10.39	10.5	Pass
PSD	802.11n-40M	5510	Low	2.06	2.18	2.19	2.37	8.22	10.5	Pass
PSD	802.11n-40M	5550	Mid	2.28	2.27	1.96	2.52	8.28	10.5	Pass
PSD	802.11n-40M	5670	High	2.21	2.48	2.20	2.51	8.37	10.5	Pass
PSD	802.11ac-80M	5530	Low	-1.11	-0.86	-1.52	-0.72	4.98	10.5	Pass

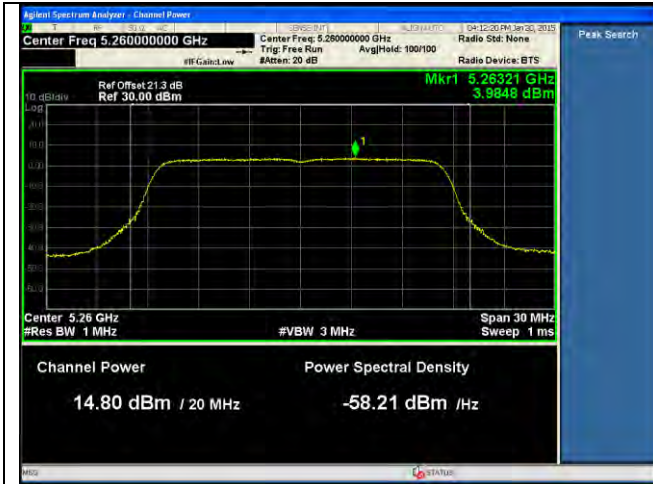
PSD measurement result for CROSSOVER channels (in band 5470-5725MHz)

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/MHz)					Limit (dBm)	Result
				Chain1	Chain2	Chain3	Chain4	Combined Power		
PSD	802.11a	5720	CROSSOVER	3.78	3.62	3.91	3.38	9.70	10.5	Pass
PSD	802.11n-20M	5720	CROSSOVER	4.37	4.41	4.26	4.52	10.41	10.5	Pass
PSD	802.11n-40M	5710	CROSSOVER	2.02	2.20	2.21	2.54	8.27	10.5	Pass
PSD	802.11ac-80M	5690	CROSSOVER	-1.01	-1.06	-0.87	-0.69	5.12	10.5	Pass

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

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/MHz)					Limit (dBm)	Result
				Chain1	Chain2	Chain3	Chain4	Combined Power		
PSD	802.11a	5720	CROSSOVER	3.78	3.62	3.91	3.38	9.70	29.5	Pass
PSD	802.11n-20M	5720	CROSSOVER	4.37	4.41	4.26	4.52	10.41	29.5	Pass
PSD	802.11n-40M	5710	CROSSOVER	2.02	2.20	2.21	2.54	8.27	29.5	Pass
PSD	802.11ac-80M	5690	CROSSOVER	-1.01	-1.06	-0.87	-0.69	5.12	29.5	Pass

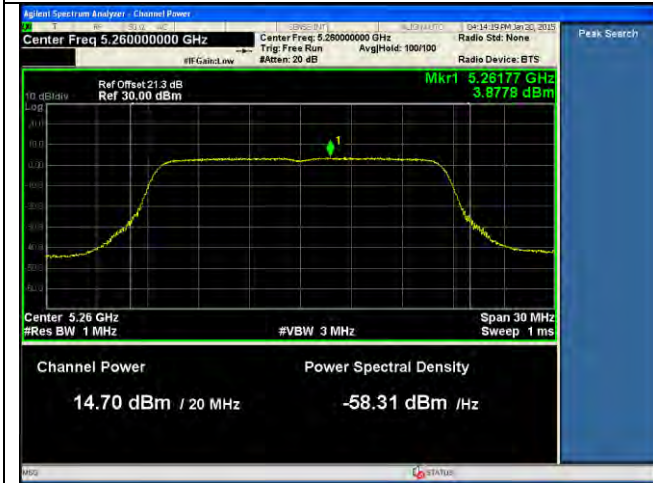
Test Plots



PSD-802.11a-5260M-chain1



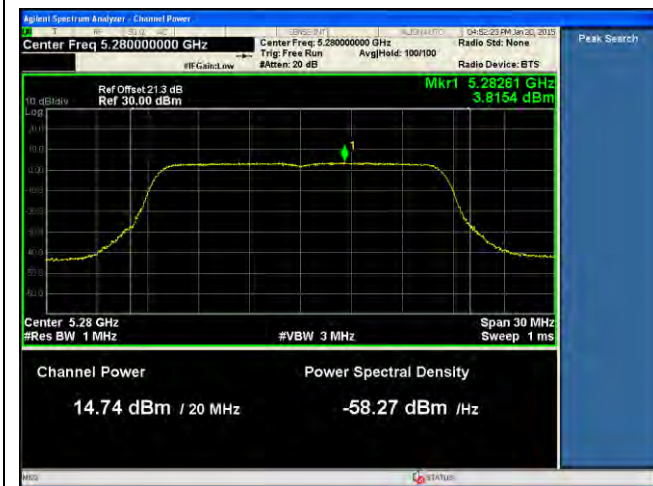
PSD-802.11a-5260M-chain2



PSD-802.11a-5260M-chain3



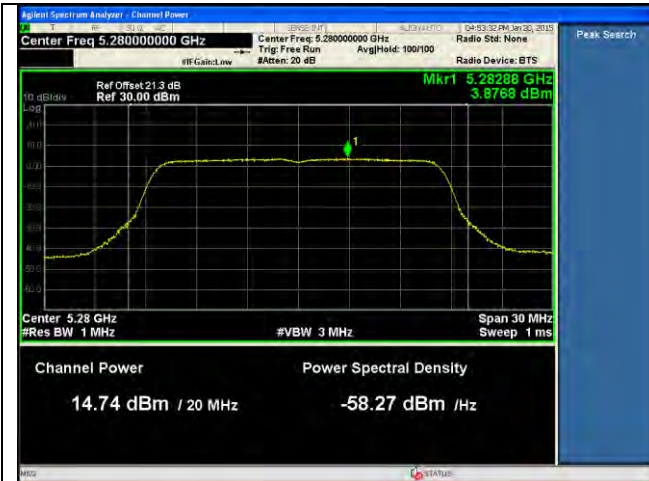
PSD-802.11a-5260M-chain4



PSD-802.11a-5280M-chain1



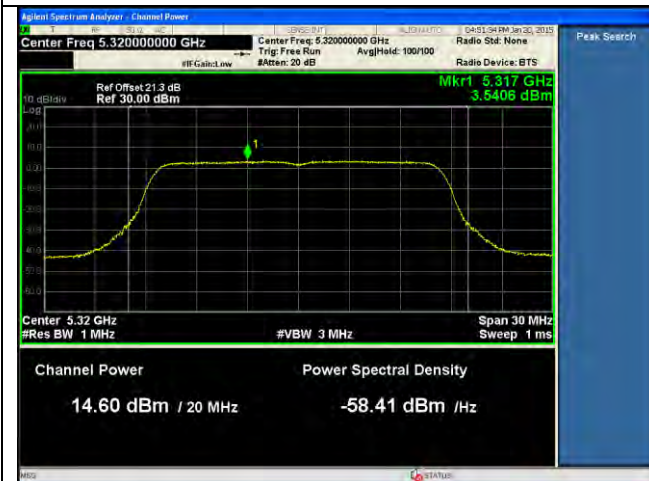
PSD-802.11a-5280M-chain2



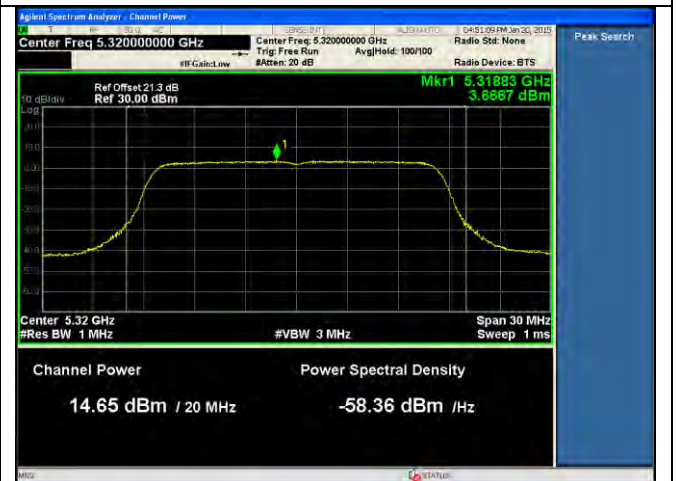
PSD-802.11a-5280M-chain3



PSD-802.11a-5280M-chain4



PSD-802.11a-5320M-chain1



PSD-802.11a-5320M-chain2



PSD-802.11a-5320M-chain3



PSD-802.11a-5320M-chain4



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



PSD-802.11n-20M-5260M-chain2



PSD-802.11n-20M-5260M-chain3



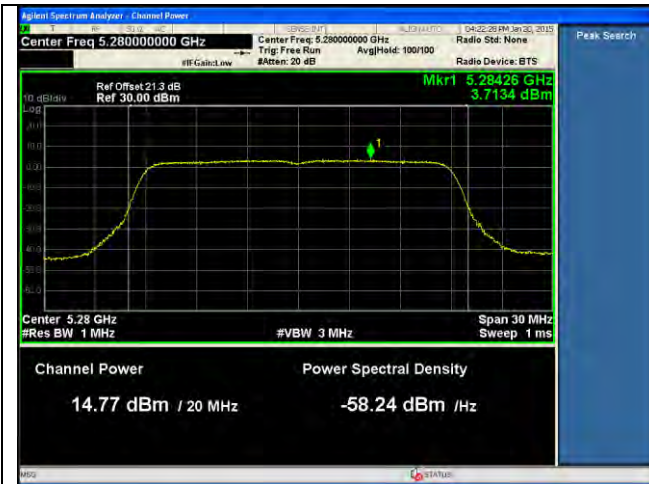
PSD-802.11n-20M-5260M-chain4



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



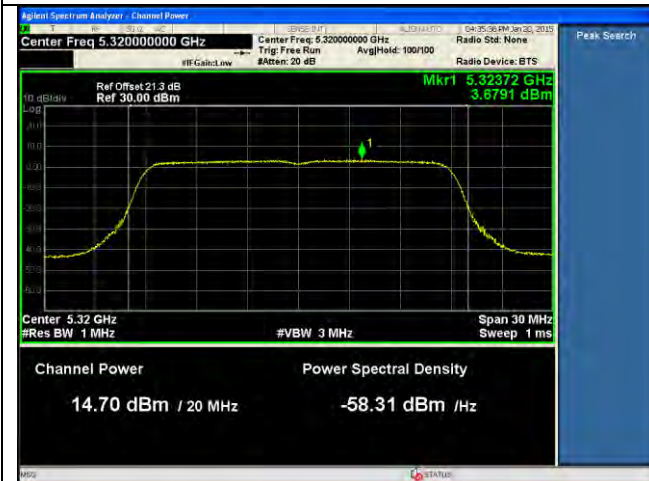
PSD-802.11n-20M-5280M-chain2



PSD-802.11n-20M-5280M-chain3



PSD-802.11n-20M-5280M-chain4



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



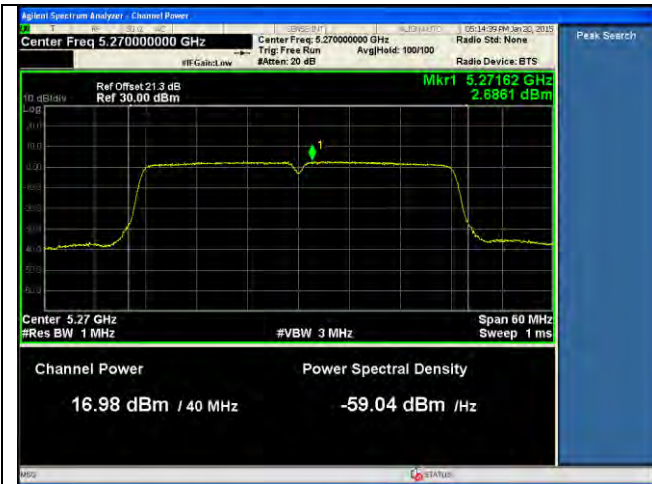
PSD-802.11n-20M-5320M-chain2



PSD-802.11n-20M-5320M-chain3



PSD-802.11n-20M-5320M-chain4



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



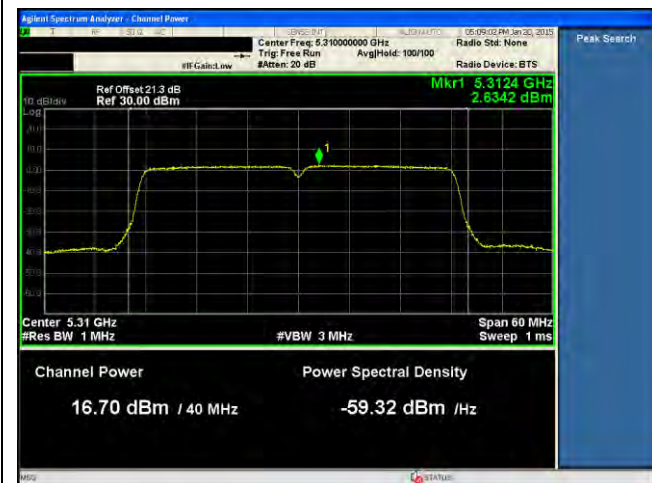
PSD-802.11n-40M-5270M-chain2



PSD-802.11n-40M-5270M-chain3



PSD-802.11n-40M-5270M-chain4



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



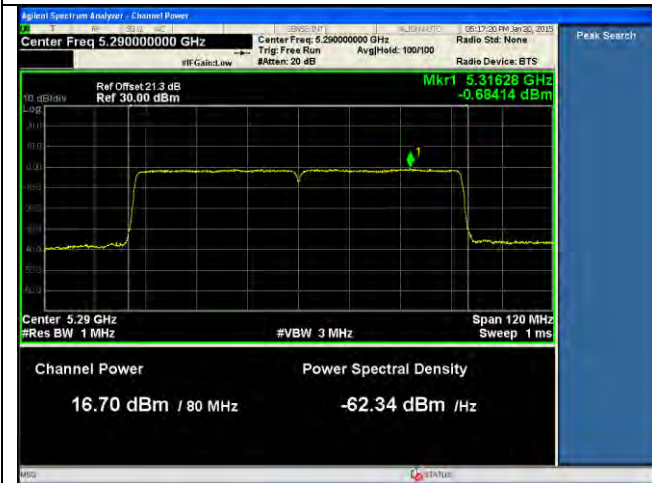
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PSD-802.11n-40M-5310M-chain3



PSD-802.11n-40M-5310M-chain4



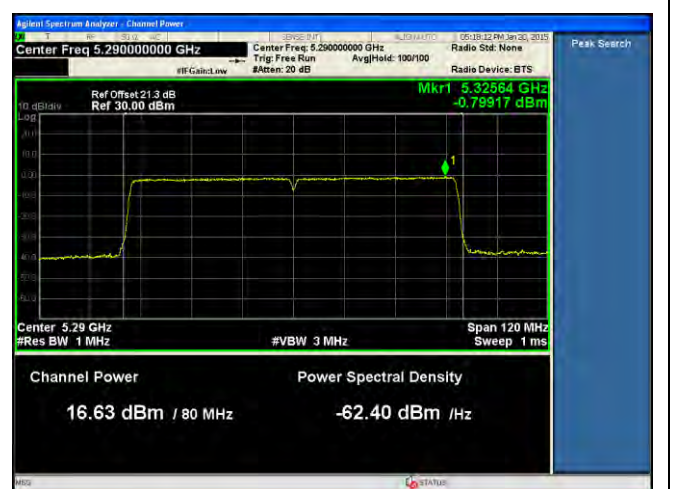
PSD-802.11ac-80M-5290M-chain1



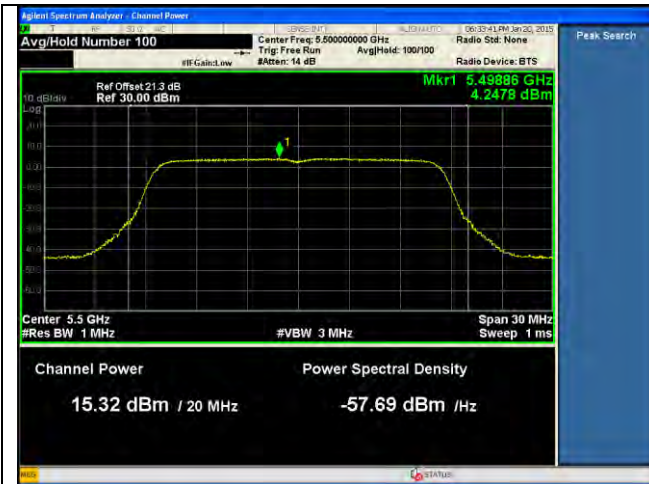
PSD-802.11ac-80M-5290M-chain2



PSD-802.11ac-80M-5290M-chain3



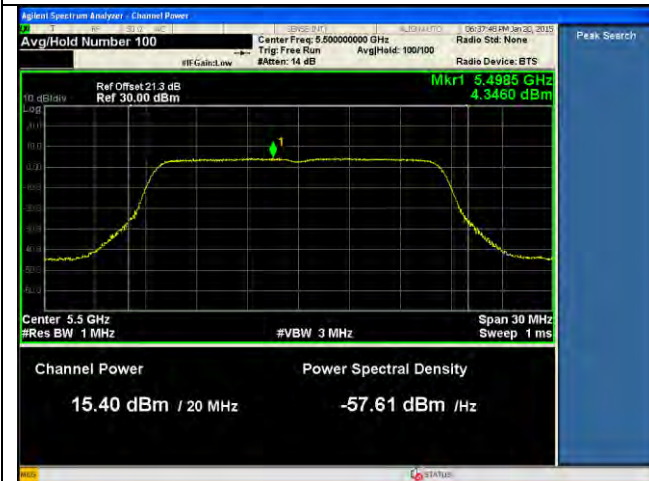
PSD-802.11ac-80M-5290M-chain4



PSD-802.11a-5500M-chain1



PSD-802.11a-5500M-chain2



PSD-802.11a-5500M-chain3



PSD-802.11a-5500M-chain4



PSD-802.11a-5580M-chain1



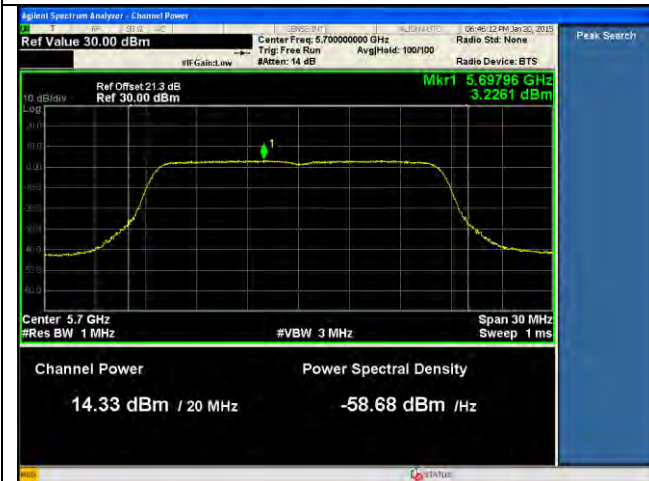
PSD-802.11a-5580M-chain2



PSD-802.11a-5580M-chain3



PSD-802.11a-5580M-chain4



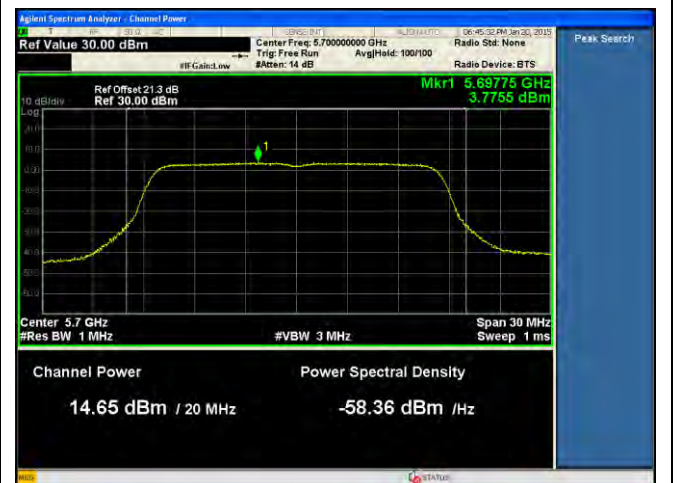
PSD-802.11a-5700M-chain1



PSD-802.11a-5700M-chain2



PSD-802.11a-5700M-chain3



PSD-802.11a-5700M-chain4



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



PSD-802.11n-20M-5500M-chain2



PSD-802.11n-20M-5500M-chain3



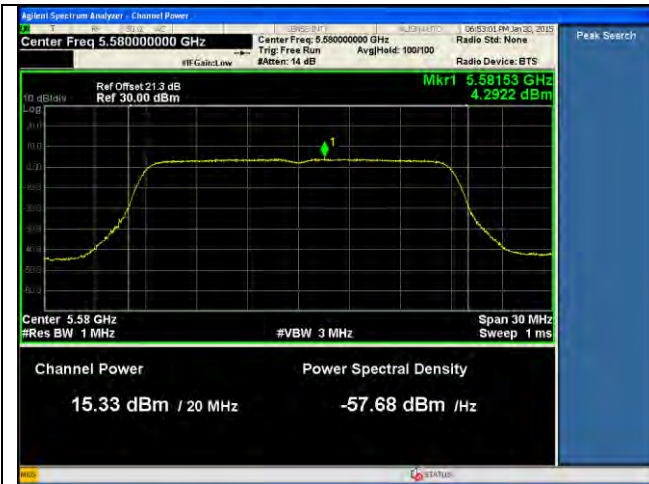
PSD-802.11n-20M-5500M-chain4



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



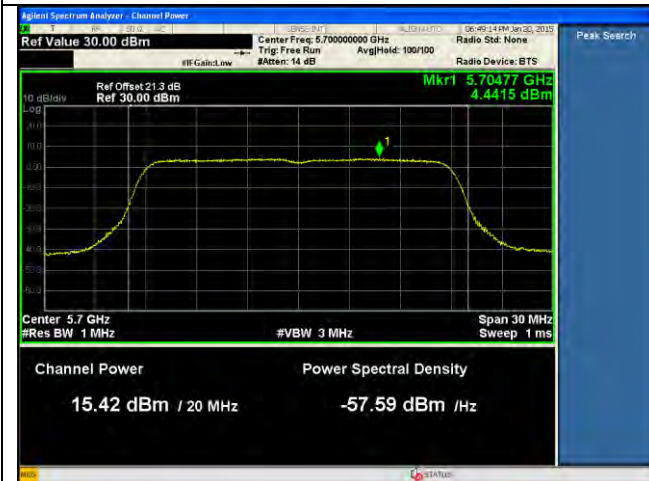
PSD-802.11n-20M-5580M-chain2



PSD-802.11n-20M-5580M-chain3



PSD-802.11n-20M-5580M-chain4



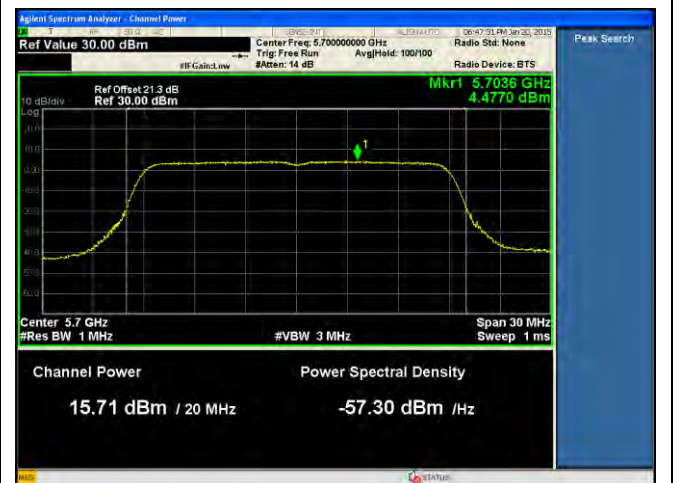
PSD-802.11n-20M-5700M-chain1



PSD-802.11n-20M-5700M-chain2



PSD-802.11n-20M-5700M-chain3



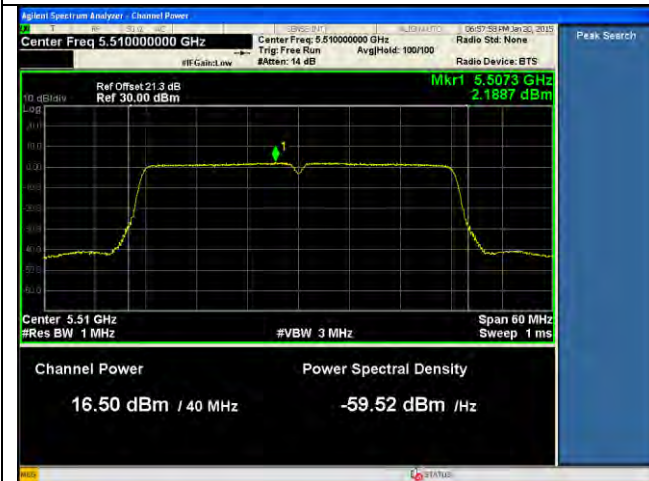
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PSD-802.11n-40M-5510M-chain1



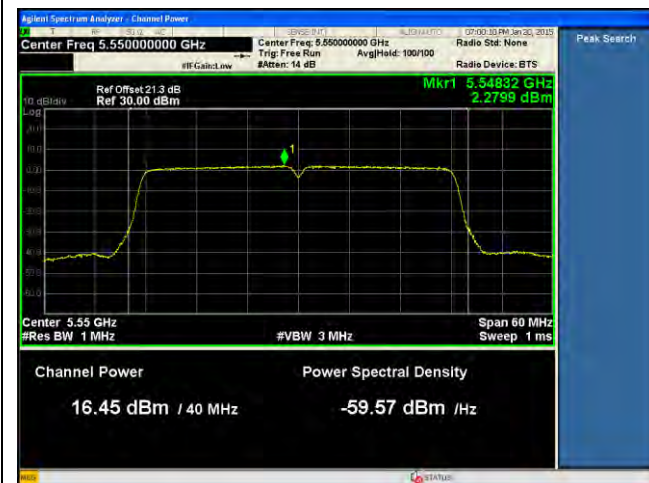
PSD-802.11n-40M-5510M-chain2



PSD-802.11n-40M-5510M-chain3



PSD-802.11n-40M-5510M-chain4



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



PSD-802.11n-40M-5550M-chain2



PSD-802.11n-40M-5550M-chain3



PSD-802.11n-40M-5550M-chain4



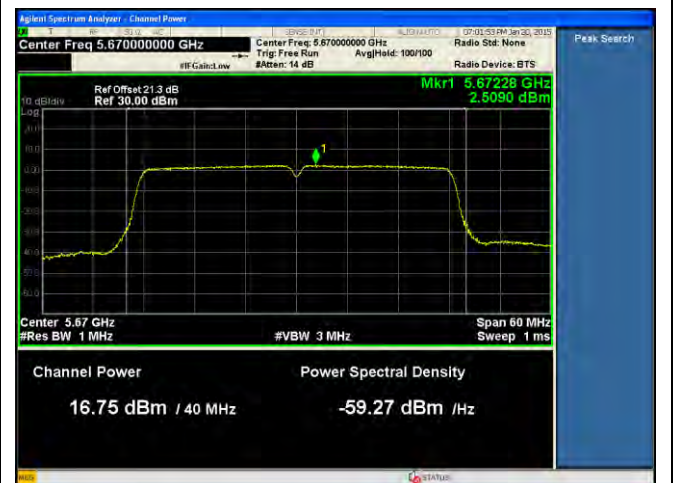
PSD-802.11n-40M-5670M-chain1



PSD-802.11n-40M-5670M-chain2



PSD-802.11n-40M-5670M-chain3



PSD-802.11n-40M-5670M-chain4



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



PSD-802.11ac-80M-5530M-chain2



PSD-802.11ac-80M-5530M-chain3



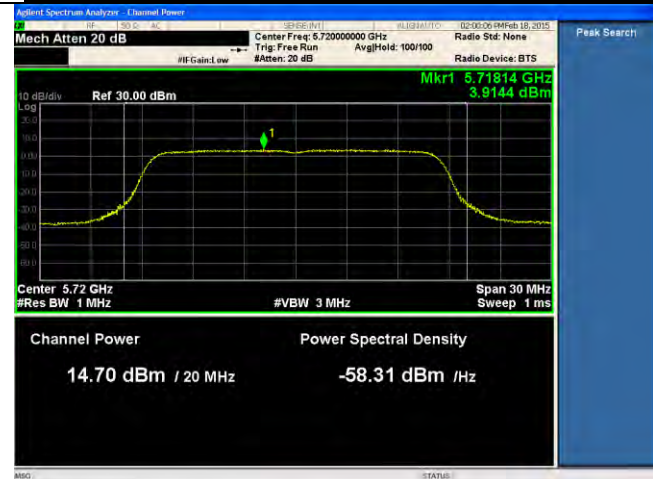
PSD-802.11ac-80M-5530M-chain4



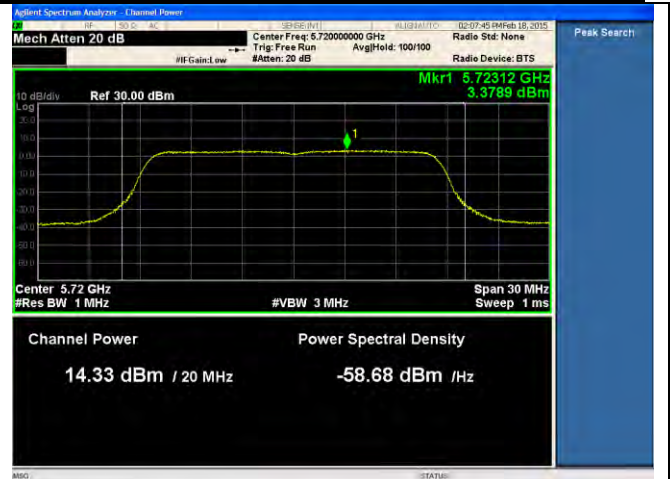
PSD-802.11a-CROSSOVER-5720M-chain1



PSD-802.11a-CROSSOVER-5720M-chain2



PSD-802.11a-CROSSOVER-5720M-chain3



PSD-802.11a-CROSSOVER-5720M-chain4



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



PSD-802.11n-20M-CROSSOVER-5720M-chain2



PSD-802.11n-20M-CROSSOVER-5720M-chain3



PSD-802.11n-20M-CROSSOVER-5720M-chain4



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



PSD-802.11n-40M-CROSSOVER-5710M-chain2



PSD-802.11n-40M-CROSSOVER-5710M-chain3



PSD-802.11n-40M-CROSSOVER-5710M-chain4



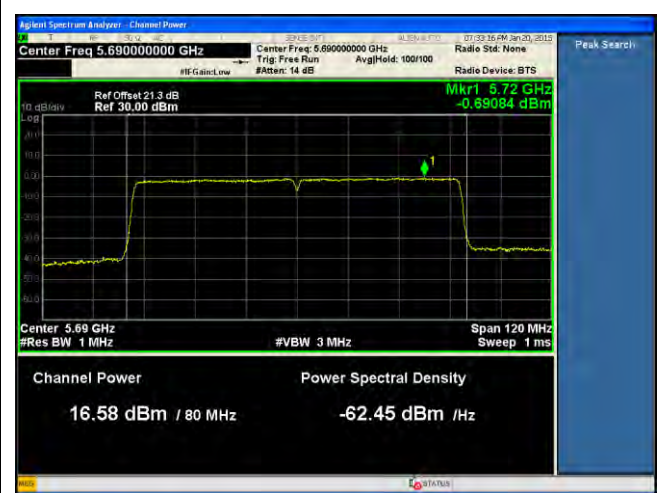
PSD-802.11ac-CROSSOVER-5690M-chain1



PSD-802.11ac-CROSSOVER-5690M-chain2



PSD-802.11ac-CROSSOVER-5690M-chain3



PSD-802.11ac-CROSSOVER-5690M-chain4

10.5 Radiated Spurious Emissions below 1GHz

Requirement(s):

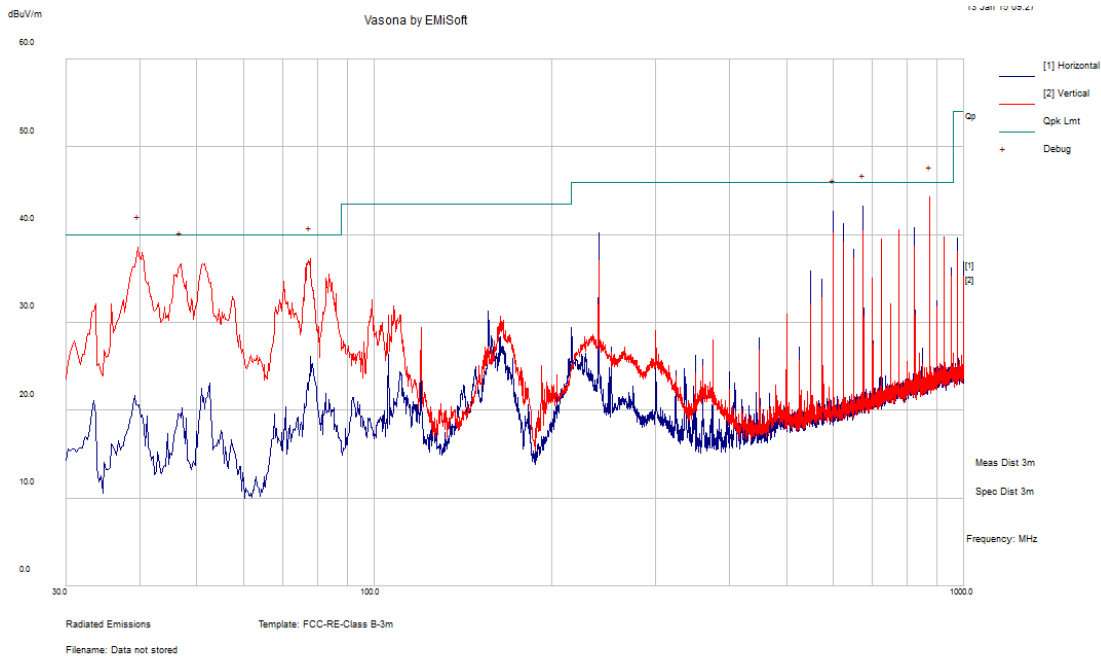
Spec	Requirement	Applicable										
47CFR§ 15.407(b) 15.209 (a)	<p>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges</p> <table border="1"> <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	<ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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. A Quasi-peak 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 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.											
Result	☒ Pass ☐ Fail											

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Radiated Emission Test Results (Below 1GHz)

Test specification	below 1GHz			Result	Pass
Environmental Conditions:	Temp (°C):	26.1			
	Humidity (%)	47.5			
	Atmospheric (mbar):	1020			
Mains Power:	120VAC, 60Hz				
Tested by:	Ricky Wang				
Test Date:	01/29/2015				
Remarks:	N/A				



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
39.53	55.71	1.16	-25.82	31.05	Quasi Max	V	108.00	179.00	40.00	-8.95	Pass
875.00	50.66	4.96	-17.04	38.58	Quasi Max	V	100.00	202.00	46.00	-7.42	Pass
674.99	57.38	4.42	-19.57	42.23	Quasi Max	H	188.00	183.00	46.00	-3.77	Pass
77.84	63.87	1.48	-31.43	33.92	Quasi Max	V	124.00	277.00	40.00	-6.08	Pass
46.94	61.10	1.16	-28.76	33.50	Quasi Max	V	100.00	191.00	40.00	-6.50	Pass
599.99	58.06	4.17	-20.60	41.63	Quasi Max	H	100.00	62.00	46.00	-4.37	Pass

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

10.6 Radiated Spurious Emissions above 1GHz

Requirement(s):

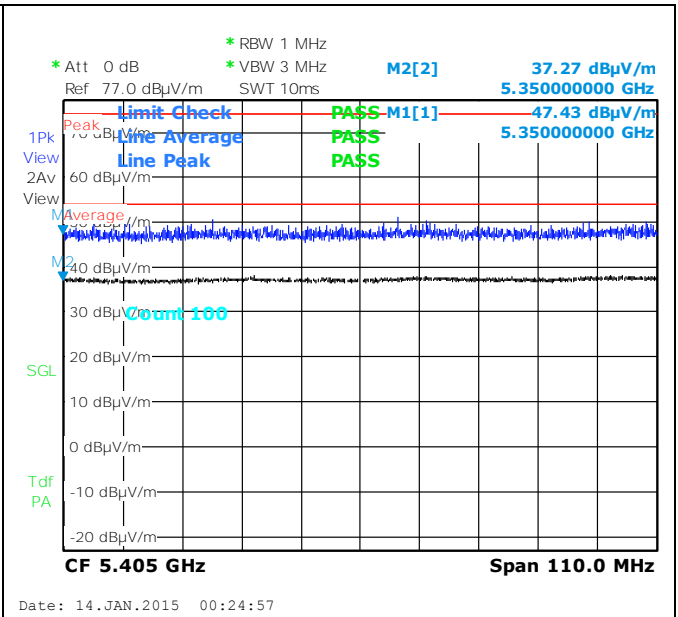
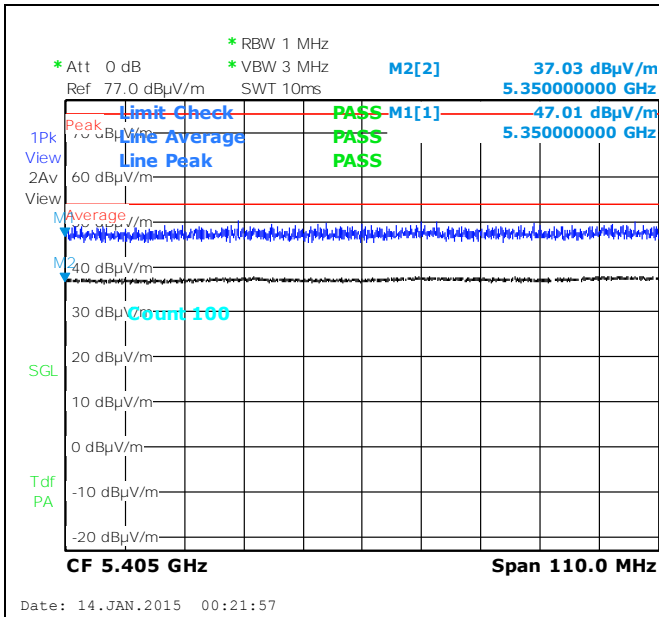
Spec	Item	Requirement	Applicable
47CFR§ 15.407(b)(2), 15.407(b)(6)	(1)	For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.	<input type="checkbox"/>
	(2)	For transmitters operating in the 5.25-5.35 GHz band: all 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.	<input checked="" type="checkbox"/>
	(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.	<input checked="" type="checkbox"/>
	(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.	<input type="checkbox"/>
	(5)	Restricted band, emission must also comply with the radiated emission limits specified in 15.209	<input checked="" type="checkbox"/>
Test Setup			
Procedure	<ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
Radiated Spurious Emission	1MHz	3MHz	1GHz - 25 GHz	Peak	Auto	Max hold	PK Measurement
Radiated Spurious Emission	1MHz	10Hz	1GHz - 25 GHz	Peak	Auto	Max hold	Ave Measurement

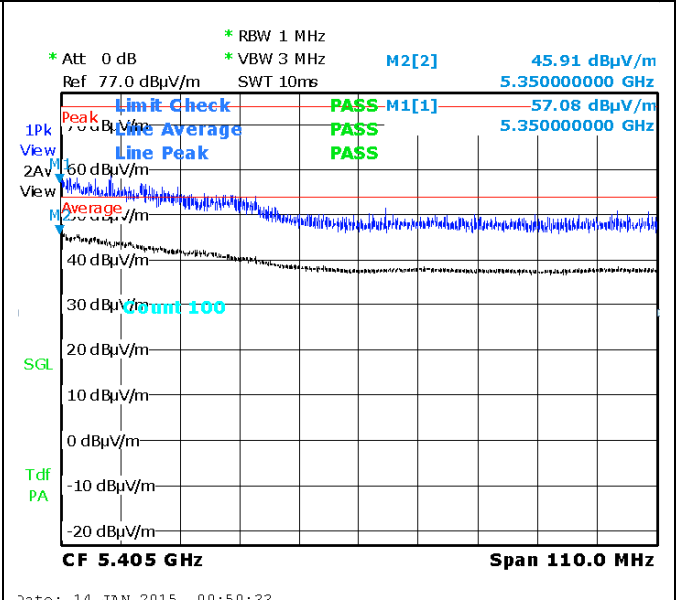
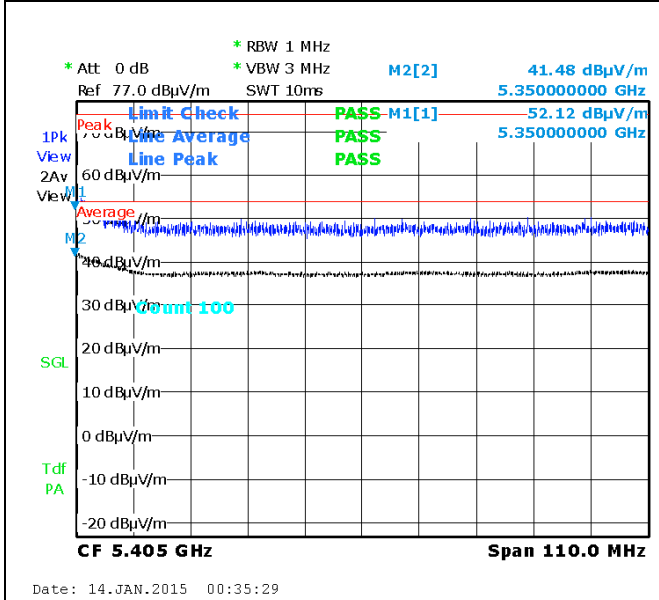
Test Data Yes (See below) N/A
Test Plot Yes (See below) N/A

Radiated Restricted band and Band Edge Measurement Plots:



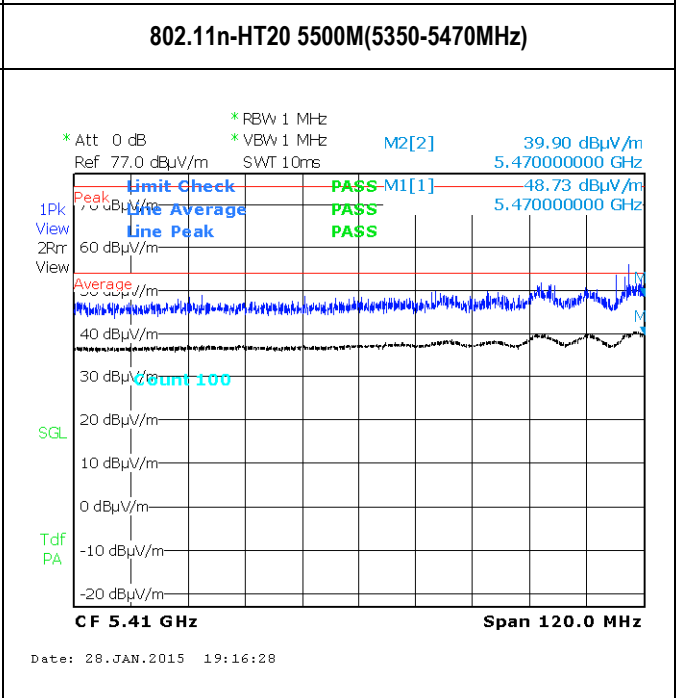
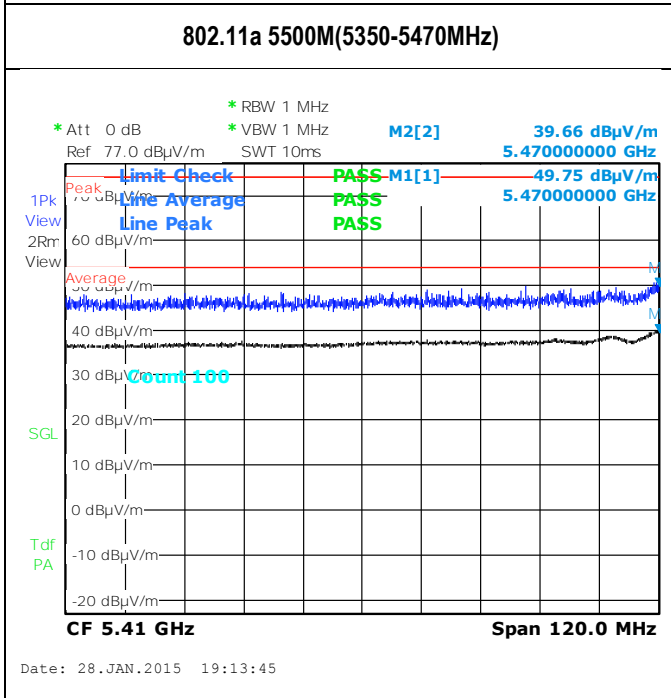
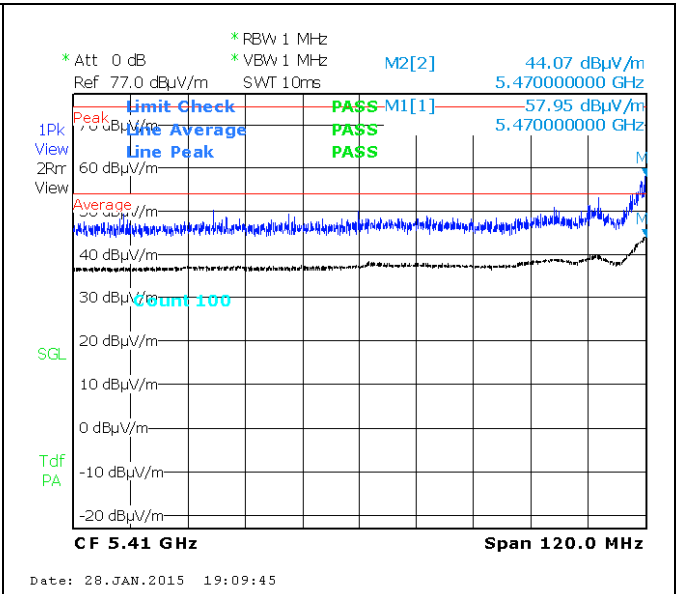
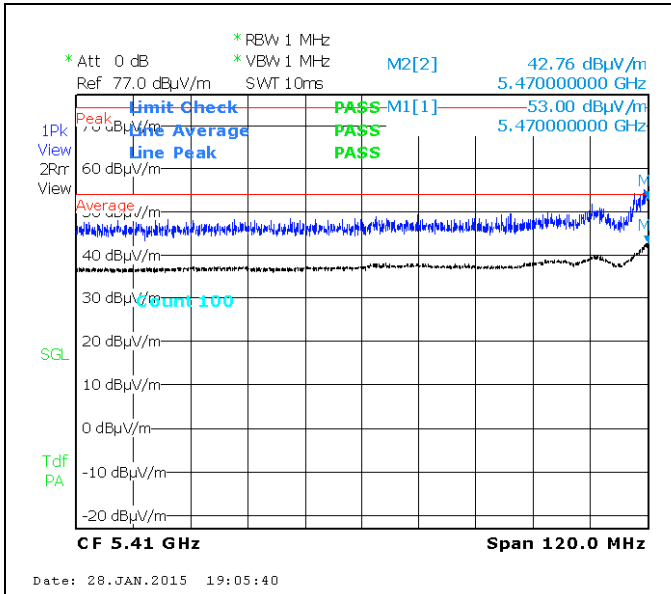
802.11a 5320M(5350-5460MHz)

802.11n-HT20 5320M(5350-5460MHz)



802.11n-HT40 5310M(5350-5460MHz)

802.11ac 5290M(5350-5460MHz)



Band Edge measurement result for edge frequency at 5725MHz – operating at 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
5725.00	56.47	3.51	1.04	61.02	Peak Max	V	199.00	30.00	74.00	-12.98	Pass
5725.00	48.26	3.51	1.04	52.81	Average Max	V	199.00	30.00	54.00	-1.19	Pass

(Note: Both horizontal and vertical polarization have been verified, only the worst case data is presented here)

Band Edge measurement result for edge frequency at 5725MHz – operating at 11n-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
5725.00	58.73	3.51	1.04	63.28	Peak Max	V	193.00	49.00	74.00	-10.72	Pass
5725.00	48.99	3.51	1.04	53.54	Average Max	V	193.00	49.00	54.00	-0.46	Pass

(Note: Both horizontal and vertical polarization have been verified, only the worst case data is presented here)

Band Edge measurement result for edge frequency at 5725MHz – operating at 11n40-5670MHz

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
5725.00	54.67	3.51	1.04	59.22	Peak Max	V	192.00	48.00	74.00	-14.78	Pass
5725.00	44.38	3.51	1.04	48.93	Average Max	V	192.00	48.00	54.00	-5.07	Pass

(Note: Both horizontal and vertical polarization have been verified, only the worst case data is presented here)

Band Edge measurement result for edge frequency at 5725MHz – operating at 11ac80-5530MHz

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
5725.00	47.63	3.51	1.04	47.63	Peak Max	H	208.00	104.00	74.00	-21.82	Pass
5725.00	39.33	3.51	1.04	39.33	Average Max	H	208.00	104.00	54.00	-10.12	Pass

(Note: Both horizontal and vertical polarization have been verified, only the worst case data is presented here)

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
17779.14	40.63	13.00	10.68	64.31	Peak Max	H	123.00	257.00	74.00	-9.69	Pass
17779.14	27.14	13.00	10.68	50.83	Average Max	H	123.00	257.00	54.00	-3.17	Pass
2190.85	43.48	4.05	10.88	58.42	Peak Max	V	154.00	161.00	74.00	-15.58	Pass
2190.85	29.89	4.05	10.88	44.82	Average Max	V	154.00	161.00	54.00	-9.18	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
1001.08	45.50	2.44	9.68	57.62	Peak Max	H	253.00	123.00	74.00	-16.38	Pass
1987.10	44.05	3.32	11.38	58.74	Peak Max	V	186.00	18.00	74.00	-15.26	Pass
1001.08	32.36	2.44	9.68	44.48	Average Max	H	253.00	123.00	54.00	-9.52	Pass
1987.10	29.64	3.32	11.38	44.33	Average Max	V	186.00	18.00	54.00	-9.67	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
1028.97	45.76	2.46	9.63	57.85	Peak Max	V	140.00	180.00	74.00	-16.15	Pass
17717.18	40.50	13.00	10.62	64.12	Peak Max	H	280.00	165.00	74.00	-9.88	Pass
1028.97	32.13	2.46	9.63	44.22	Average Max	V	140.00	180.00	54.00	-9.78	Pass
17717.18	27.39	13.00	10.62	51.02	Average Max	H	280.00	165.00	54.00	-2.98	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
1033.56	45.37	2.46	9.62	57.45	Peak Max	H	301.00	186.00	74.00	-16.55	Pass
1033.56	31.92	2.46	9.62	44.00	Average Max	H	301.00	186.00	54.00	-10.00	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
1020.12	45.50	2.44	9.68	57.62	Peak Max	V	137.00	271.00	74.00	-16.38	Pass
1020.12	32.43	2.44	9.68	44.55	Average Max	V	137.00	271.00	54.00	-9.45	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
1066.18	45.10	2.48	9.57	57.16	Peak Max	V	196.00	137.00	74.00	-16.84	Pass
1066.18	31.57	2.48	9.57	43.63	Average Max	V	196.00	137.00	54.00	-10.37	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
1021.86	45.50	2.44	9.68	57.62	Peak Max	H	171.00	348.00	74.00	-16.38	Pass
1021.86	32.30	2.44	9.68	44.42	Average Max	H	171.00	348.00	54.00	-9.58	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
1020.85	45.76	2.44	9.68	57.88	Peak Max	V	285.00	176.00	74.00	-16.12	Pass
1020.85	32.44	2.44	9.68	44.55	Average Max	V	285.00	176.00	54.00	-9.45	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
4600.26	36.60	3.11	-0.16	39.55	Peak Max	H	212.00	331.00	74.00	-34.45	Pass
4600.26	23.39	3.11	-0.16	26.34	Average Max	H	212.00	331.00	54.00	-27.66	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
1004.93	46.02	2.44	9.67	58.14	Peak Max	V	207.00	275.00	74.00	-15.86	Pass
2231.84	43.60	4.20	10.76	58.57	Peak Max	V	101.00	66.00	74.00	-15.43	Pass
1004.93	32.50	2.44	9.67	44.61	Average Max	V	207.00	275.00	54.00	-9.39	Pass
2231.84	29.40	4.20	10.76	44.37	Average Max	V	101.00	66.00	54.00	-9.63	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
1022.22	45.24	2.45	9.64	57.33	Peak Max	V	179.00	277.00	74.00	-16.67	Pass
2094.54	43.25	3.70	11.18	58.12	Peak Max	H	111.00	3.00	74.00	-15.88	Pass
1022.22	32.16	2.45	9.64	44.25	Average Max	V	179.00	277.00	54.00	-9.75	Pass
2094.54	30.17	3.70	11.18	45.05	Average Max	H	111.00	3.00	54.00	-8.95	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
1001.45	44.70	2.44	9.68	56.81	Peak Max	V	142.00	239.00	74.00	-17.19	Pass
2159.80	42.96	3.94	10.98	57.87	Peak Max	H	175.00	31.00	74.00	-16.13	Pass
1001.45	31.53	2.44	9.68	43.64	Average Max	V	142.00	239.00	54.00	-10.36	Pass
2159.80	29.59	3.94	10.98	44.51	Average Max	H	175.00	31.00	54.00	-9.49	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
2057.86	43.79	3.56	11.29	58.64	Peak Max	V	275.00	203.00	74.00	-15.36	Pass
2057.86	30.14	3.56	11.29	44.99	Average Max	V	275.00	203.00	54.00	-9.01	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
1989.25	43.10	3.32	11.39	57.82	Peak Max	V	239.00	139.00	74.00	-16.18	Pass
1989.25	29.68	3.32	11.39	44.39	Average Max	V	239.00	139.00	54.00	-9.61	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
1952.52	42.64	3.28	11.10	57.03	Peak Max	V	193.00	277.00	74.00	-16.97	Pass
1952.52	29.62	3.28	11.10	44.00	Average Max	V	193.00	277.00	54.00	-10.00	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
11588.04	41.79	5.19	5.95	52.94	Peak Max	H	118.00	58.00	74.00	-21.06	Pass
11588.04	28.19	5.19	5.95	39.34	Average Max	H	118.00	58.00	54.00	-14.66	Pass

Above 1GHz-40GHz – 802.11n-40M – 5590MHz

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
12061.25	40.92	5.36	6.51	52.79	Peak Max	V	99.00	204.00	74.00	-21.21	Pass
12061.25	28.16	5.36	6.51	40.02	Average Max	V	99.00	204.00	54.00	-13.98	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
12063.34	40.92	5.36	6.50	52.79	Peak Max	V	130.00	94.00	74.00	-21.21	Pass
12063.34	28.19	5.36	6.50	40.05	Average Max	V	130.00	94.00	54.00	-13.95	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
12265.26	40.62	5.43	6.38	52.43	Peak Max	V	239.00	270.00	74.00	-21.57	Pass
12265.26	27.84	5.43	6.38	39.65	Average Max	V	239.00	270.00	54.00	-14.35	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
12111.27	40.66	5.38	6.47	52.52	Peak Max	V	203.00	50.00	74.00	-21.48	Pass
12111.27	27.84	5.38	6.47	39.69	Average Max	V	203.00	50.00	54.00	-14.31	Pass

















Above 1GHz-25GHz- Collocation testing (2.4GHz WLAN & 5GHz WLAN on the main-board transmitting simultaneously)








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
10629.33	36.41	5.05	5.98	47.43	Peak Max	V	148.00	4.00	74.00	-26.57	Pass
10629.33	23.74	5.05	5.98	34.77	Average Max	V	148.00	4.00	54.00	-19.23	Pass

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
R & S Receiver	ESHS10	830223/0009	04/08/2014	1 Year	04/08/2015	<input checked="" type="checkbox"/>
Spectrum Analyzer	FSIQ7	825555/013	05/31/2014	1 Year	04/08/2015	<input checked="" type="checkbox"/>
Schwarzbeck LISN	NNLK 8129	8129-190	08/11/2014	1 Year	08/11/2015	<input checked="" type="checkbox"/>
CHASE LISN	MN2050B	1018	07/31/2014	1 Year	07/31/2015	<input checked="" type="checkbox"/>
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2014	1 Year	05/25/2015	<input checked="" type="checkbox"/>
Radiated Emissions						
R & S Receiver	ESL6	100178	03/01/2014	1 Year	03/04/2015	<input checked="" type="checkbox"/>
R & S Receiver	ESIB 40	100179	05/24/2014	1 Year	05/24/2015	<input checked="" type="checkbox"/>
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2014	1 Year	08/12/2015	<input checked="" type="checkbox"/>
Horn Antenna (1-26.5GHz)	3115	10SL0059	08/11/2014	1 Year	08/11/2015	<input checked="" type="checkbox"/>
Horn Antenna (18-40 GHz)	AH-840	101013	08/11/2014	1 Year	08/11/2015	<input checked="" type="checkbox"/>
Pre-Amplifier (100KHz-7GHz)	LPA-6-30	11140711	02/18/2014	1 Year	02/18/2015	<input checked="" type="checkbox"/>
Microwave Preamplifier (18-40 GHz)	PA-840	181251	02/12/2014	1 Year	02/12/2015	<input checked="" type="checkbox"/>
3 Meters SAC	3M	N/A	03/04/2014	1 Year	03/04/2015	<input checked="" type="checkbox"/>
10 Meters SAC	10M	N/A	09/05/2014	1 Year	09/05/2015	<input checked="" type="checkbox"/>
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2014	1 Year	05/25/2015	<input checked="" type="checkbox"/>
RF Conducted Measurement						
Spectrum Analyzer	N9010A	MY50210206	05/30/2014	1 Year	05/30/2015	<input checked="" type="checkbox"/>
Spectrum Analyzer	E4407B	US88441016	05/31/2014	1 Year	05/31/2015	<input type="checkbox"/>
R & S Receiver	ESIB 40	100179	04/20/2014	1 Year	04/20/2015	<input checked="" type="checkbox"/>

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		<p>Radio: A1. Terminal equipment for purpose of calling</p> <p>Telecom: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law</p>
Korea CAB Accreditation		<p>EMI: KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI</p> <p>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</p>
		<p>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</p>
		<p>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</p>
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		<p>EMC: AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4</p>
		<p>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</p>
		<p>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</p>
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