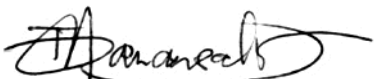


RF TEST REPORT



Report No.: FCC_RF_SL15080601-ICT-016_UNII Rev. 1.0
Supersede Report No.: FCC_RF_SL15080601-ICT-016_UNII

Applicant	:	Intermec Technologies Corporation
Product Name	:	Mobile Computer
Model No.	:	1007CP02
Test Standard	:	47 CFR 15.407
Test Method	:	ANSI C63.10: 2013 789033 D02 General UNII Test Procedures New Rules v01
FCC ID	:	EHA-1007CP02
IC ID	:	1223A-1007C02
Dates of test	:	October 22, 2015 to October 29, 2015
Issue Date	:	December 21, 2015
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification ☒		
Equipment did not comply with the specification ☐		

This Test Report is Issued Under the Authority of:	
	
Teody Manansala	Nima Molaei
Test Engineer	Engineer Reviewer
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only	

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



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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_SL15080601-ICT-016_UNII	None	Original	12/02/2015
FCC_RF_SL15080601-ICT-016_UNII Rev. 1.0	1.0	Adding all the Frequency for 5GHZ band and power setting Adding DFS test data	12/21/2015

2 Executive Summary

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

Company: Intermec Technologies Corporation
Product: Mobile Computer
Model: 1007CP02L with HSM 5603ER

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page. This report is a permissive change for Band 1 and Band 4 on the new rules of UNII Band. You can refer to the original report for Band 2 and Band 3 testing. (FCC Test report SL12011201-ICT-001(WLAN_15.407) Rev1.0.pdf)

3 Customer information

Applicant Name	:	Intermec Technologies Corporation
Applicant Address	:	6001 36th Avenue West, Everett, WA 98203
Manufacturer Name	:	Intermec Technologies Corporation
Manufacturer Address	:	6001 36th Avenue West, Everett, WA 98203

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	:	Mobile Computer
Model No.	:	1007CP02L with HSM 5603ER
Trade Name	:	Intermec
Serial No.	:	N/A
Host Model No.	:	N/A
Input Power	:	4.4/4.7VDC 2/1.5A
Power Adapter Manu/Model	:	PSA10F-050Q
Power Adapter SN	:	N/A
Product Hardware version	:	145-558-004
Product Software version	:	CE OS 5.2.29217
Radio Hardware version	:	LBEH5Z9UWC
Radio Software version	:	1.61.22.72.
Test Software version	:	1.10.00.0027
Date of EUT received	:	October 15, 2015
Equipment Class/ Category	:	UNII
Port/Connectors	:	I/O Port

6.2 Radio Description

Radio Type	802.11a	802.11n-20M
Operating Frequency	5180-5240MHz 5260-5320MHz 5500-5700MHz 5745-5805MHz	5180-5240MHz 5260-5320MHz 5500-5700MHz 5745-5805MHz
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Spacing	20MHz	20MHz
Number of Channels	23	23
Antenna Type	Planar Inverted F-Antenna	
Antenna Gain	4.85dBi (for 5GHz)	
Antenna Connector Type	U.FL connector	

EUT Power Settings

5.2 GHz			
Test mode	Freq(MHz)	CH	Power settings
802.11a	5180	Low	13.25
	5200	Mid	13.25
	5240	High	13.25
802.11n20	5180	Low	11.75
	5200	Mid	11.75
	5240	High	11.75

5.3 GHz			
Test mode	Freq(MHz)	CH	Power settings
802.11a	5260	Low	13.25
	5280	Mid	13.25
	5320	High	13.25
802.11n20	5260	Low	11.75
	5280	Mid	11.75
	5320	High	11.75

5.6 GHz			
Test mode	Freq(MHz)	CH	Power settings
802.11a	5500	Low	13.00
	5580	Mid	13.00
	5700	High	12.50
802.11n20	5500	Low	11.50
	5580	Mid	11.50
	5700	High	11.00

5.8 GHz			
Test mode	Freq(MHz)	CH	Power settings
802.11a	5745	Low	11.375
	5785	Mid	11.375
	5805	High	11.375
802.11n20	5745	Low	9.875
	5785	Mid	9.875
	5805	High	9.875

6.3 EUT Photos - External



Top View



Bottom View



Front View



Rear View



Left View



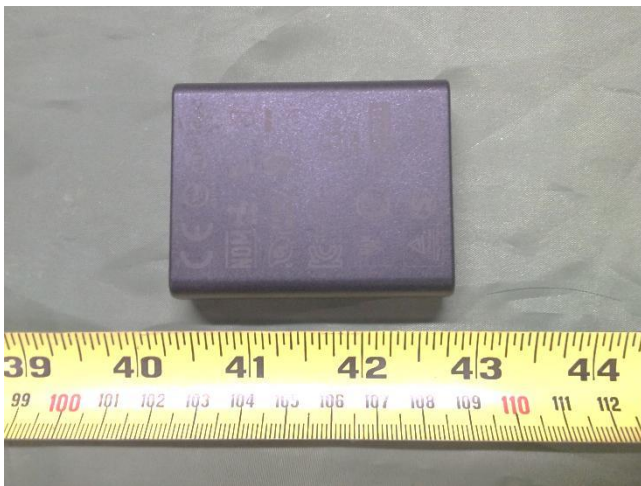
Right View



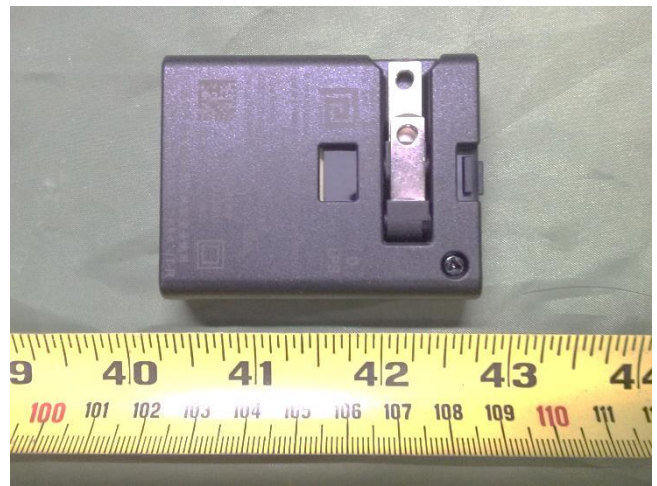
Battery –Top View



Battery –Bottom View



DC Adapter –Top View



DC Adapter –Bottom View

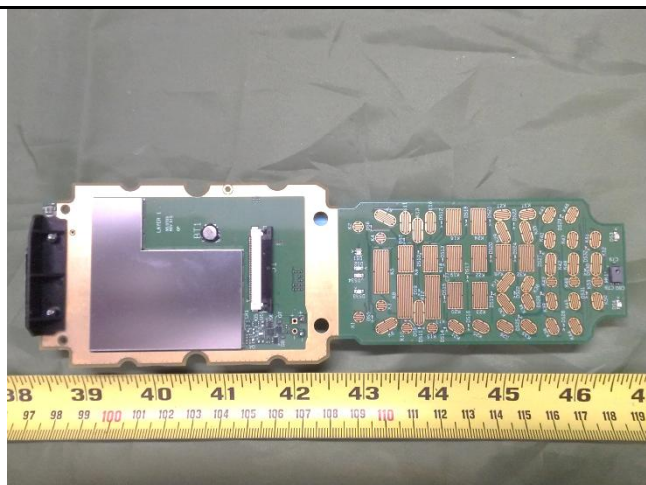
6.4 EUT Photos - Internal



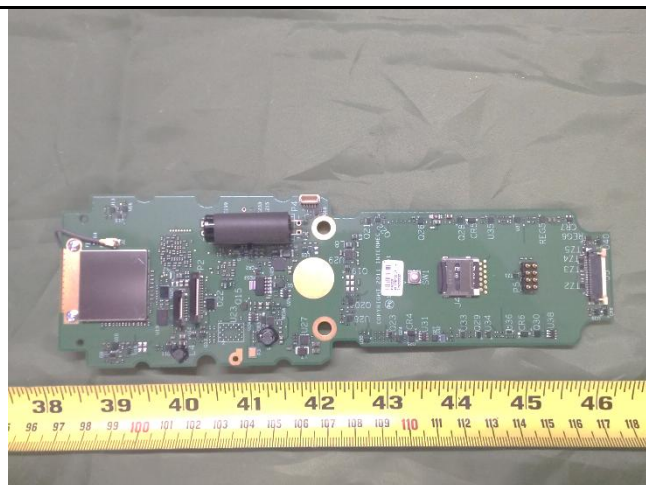
EUT – Rear cover off



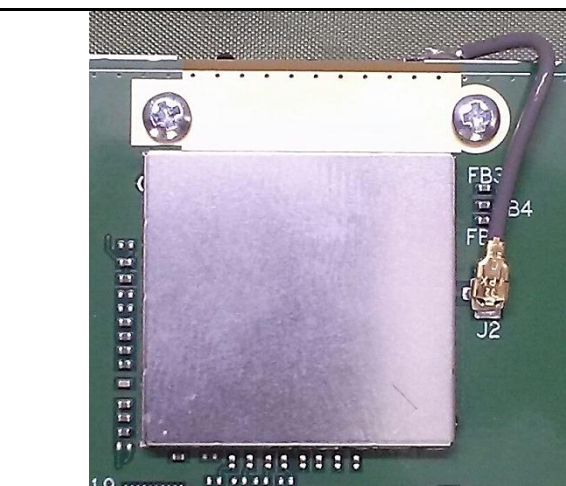
EUT – without scan engine



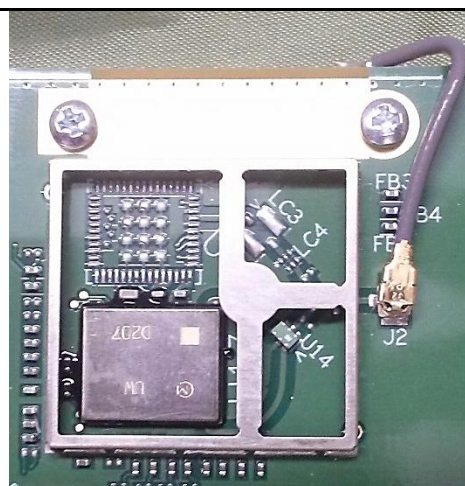
Main Board - Front View



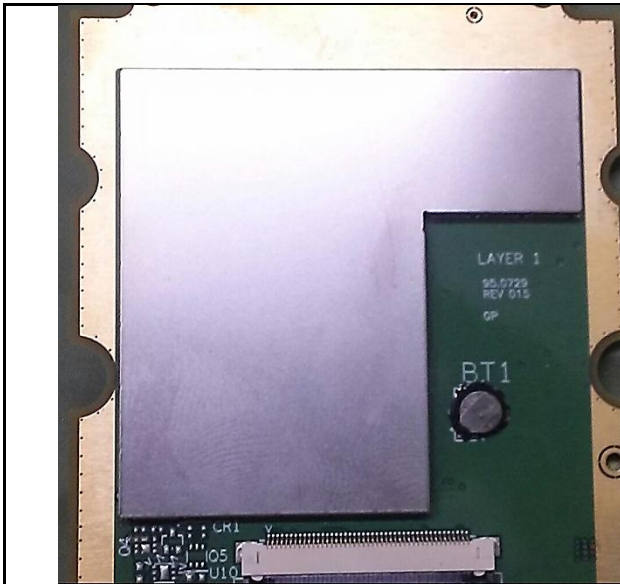
Main Board - Rear View



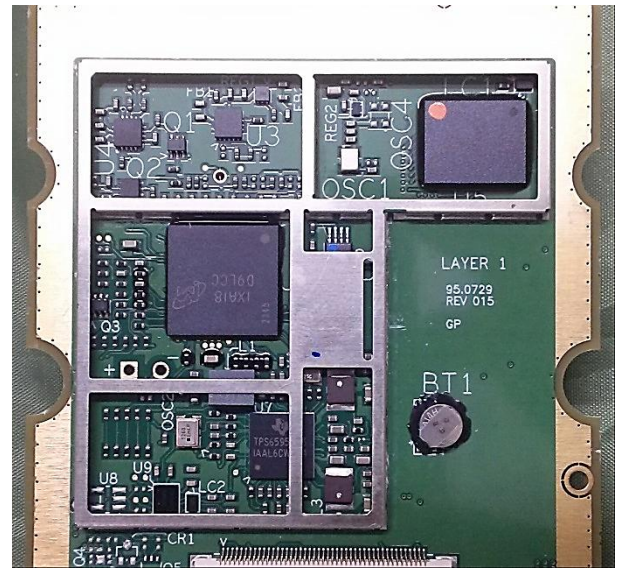
WLAN Board with Shielding



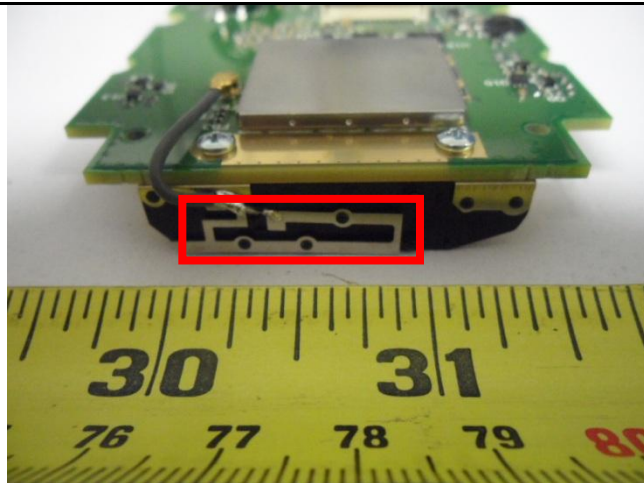
WLAN Board without Shielding



Bluetooth Board with Shielding

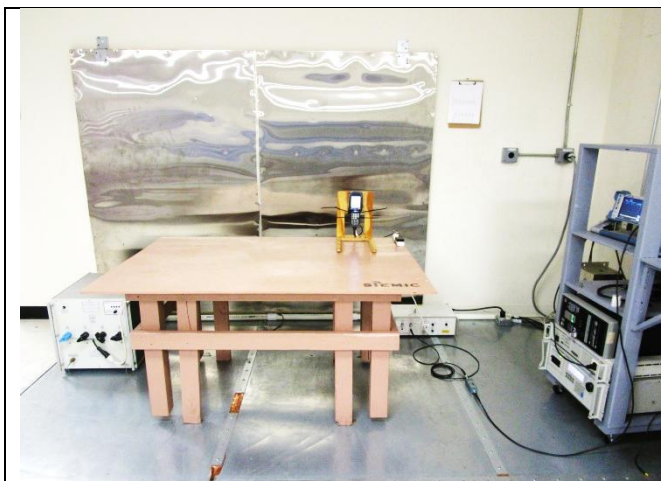


Bluetooth Board without Shielding

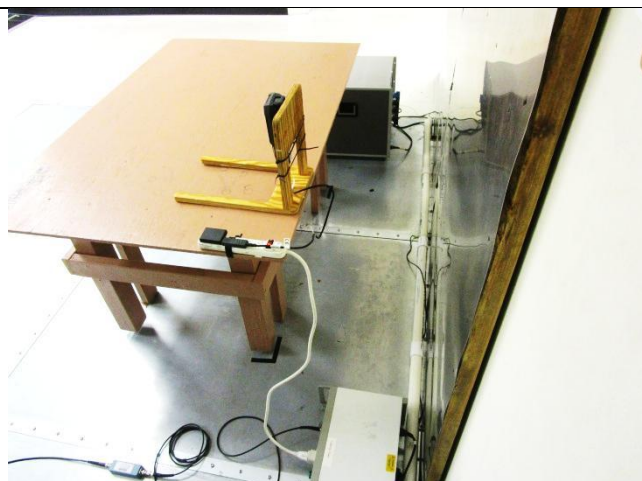


BT & WLAN Antenna View

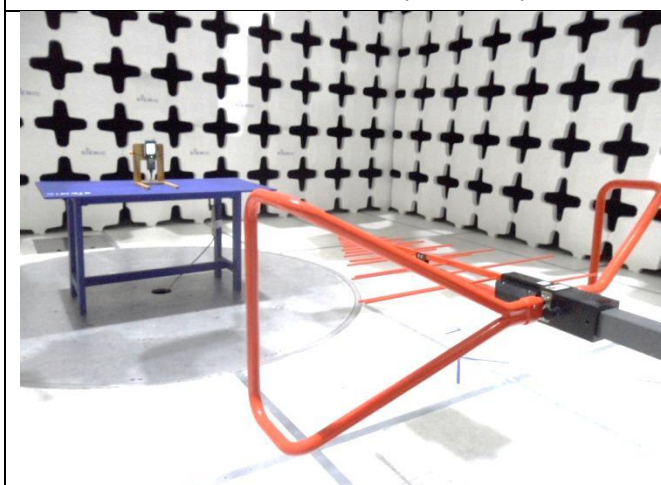
6.5 EUT Test Setup Photos



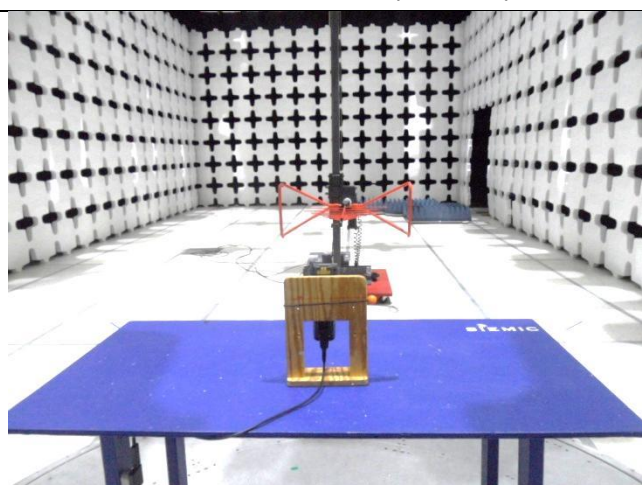
AC Conducted Emission (Front View)



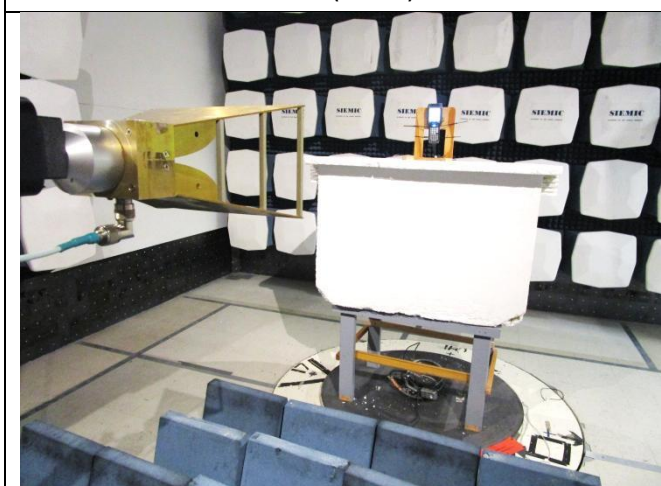
AC Conducted Emission (Rear View)



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	DC charger	PSA10F-050Q	N/A	INTERMEC	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
-	DC Charger	USB	EUT	USB	0.5	Shielded	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	TTE test software	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 C63.10: 2013 789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
AC Conducted Emissions Voltage	FCC	15.207(a)	ANSI C63.10: 2013	☒ Pass ☐ N/A

Test Item	Test standard		Test Method/Procedure	Pass / Fail
26 & 6 dB Emission Bandwidth	FCC	15.407 (a)(2)	789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
99% Occupied Bandwidth	FCC	15.407(a)(2)	789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Maximum conducted Output Power	FCC	15.407 (a)(2)	789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Power reduction (Antenna Gain > 6 dBi)	FCC	15.407 (a)(2)	-	☐ Pass ☒ N/A
Band Edge and Radiated Spurious Emissions	FCC	15.407(b)(2), 15.407(b)(6)	ANSI C63.10: 2013 789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Power Spectral Density	FCC	15.407 (a)(2)	789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Dynamic Frequency Selection (DFS)	FCC	47CFR15.407 (h)	905462 D02 UNII DFS Compliance Procedures New Rules v01	☒ Pass ☐ N/A
Remark	1. All measurement uncertainties are not taken into consideration for all presented test result. 2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual. 3. This report is permissive change on new rules of the UNII Band. Kindly refer to the original report (FCC Test report SL12011201-ICT-001(WLAN_15.407) Rev1.0.pdf)			

9 Measurement Uncertainty

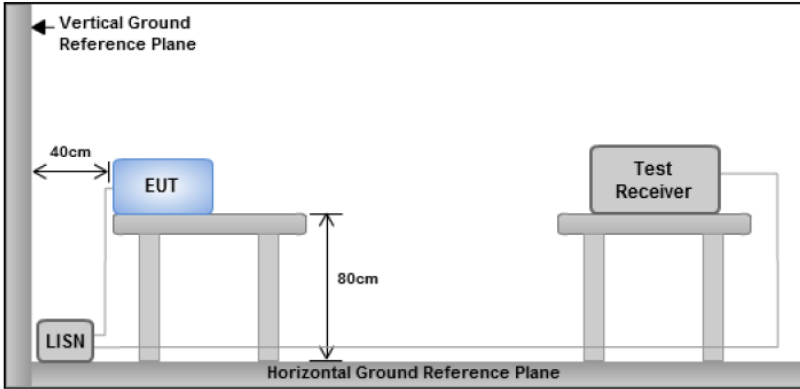
Emissions			
Test Item	Frequency Range	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious 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
Dynamic frequency selection (DFS) Conducted Measurement	5GHz – 6GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2	±1.5dB

10 Measurements, Examination and Derived Results

10.1 Conducted Emissions

Conducted Emission Limit

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

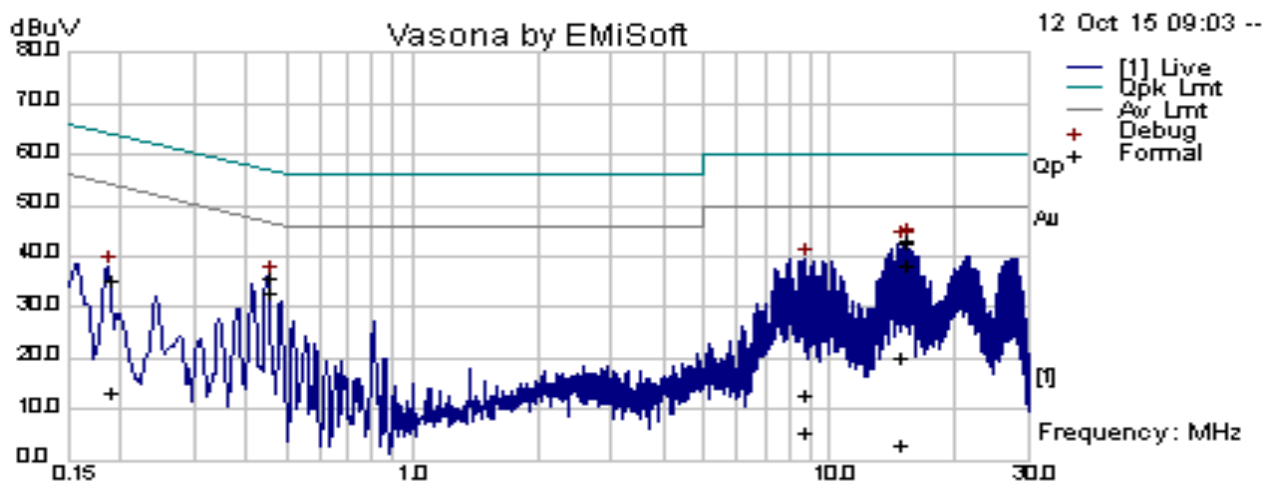
Spec	Item	Requirement	Applicable
47CFR§15.207	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz,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

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Teody Manansala			
Test Date:	10/12/2015			
Remarks	AC Line @ Line			

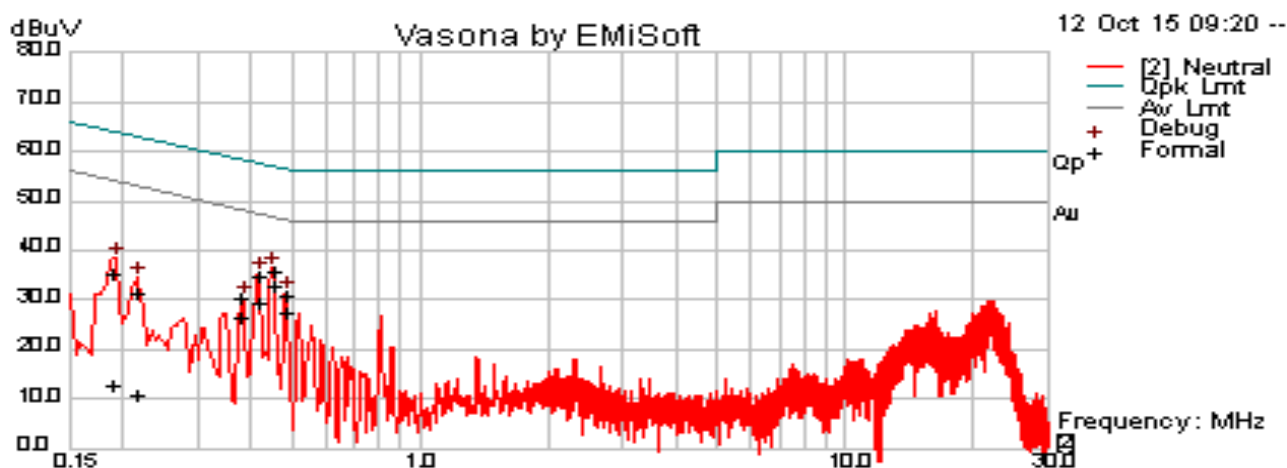


Line Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
15.12	31.83	10.06	0.60	42.49	Quasi Peak	Live	60.00	-17.51	Pass
15.24	32.62	10.06	0.60	43.28	Quasi Peak	Live	60.00	-16.72	Pass
14.65	9.47	10.06	0.60	20.12	Quasi Peak	Live	60.00	-39.88	Pass
8.66	2.09	10.05	0.55	12.69	Quasi Peak	Live	60.00	-47.31	Pass
0.45	25.03	10.01	0.71	35.75	Quasi Peak	Live	56.87	-21.12	Pass
0.19	24.02	10.00	1.39	35.41	Quasi Peak	Live	64.04	-28.63	Pass
15.12	27.64	10.06	0.60	38.31	Average	Live	50.00	-11.69	Pass
15.24	27.44	10.06	0.60	38.10	Average	Live	50.00	-11.90	Pass
14.65	-7.61	10.06	0.60	3.05	Average	Live	50.00	-46.95	Pass
8.66	-5.06	10.05	0.55	5.54	Average	Live	50.00	-44.46	Pass
0.45	21.90	10.01	0.71	32.62	Average	Live	46.87	-14.25	Pass
0.19	1.67	10.00	1.39	13.06	Average	Live	54.04	-40.98	Pass

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Teody Manansala			
Test Date:	10/12/2015			
Remarks	AC Line @ Neutral			



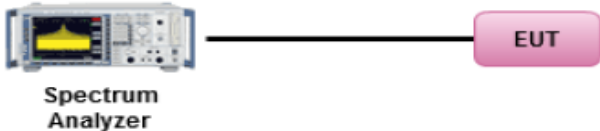
Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.45	25.23	10.01	0.71	35.95	Quasi Peak	Neutral	56.87	-20.92	Pass
0.42	24.02	10.01	0.74	34.77	Quasi Peak	Neutral	57.54	-22.77	Pass
0.48	20.45	10.01	0.69	31.15	Quasi Peak	Neutral	56.26	-25.11	Pass
0.19	24.15	10.00	1.39	35.54	Quasi Peak	Neutral	64.08	-28.54	Pass
0.38	19.74	10.01	0.77	30.52	Quasi Peak	Neutral	58.27	-27.75	Pass
0.22	20.05	10.00	1.22	31.27	Quasi Peak	Neutral	62.94	-31.67	Pass
0.45	22.05	10.01	0.71	32.77	Average	Neutral	46.87	-14.10	Pass
0.42	18.79	10.01	0.74	29.54	Average	Neutral	47.54	-18.00	Pass
0.48	16.60	10.01	0.69	27.29	Average	Neutral	46.26	-18.96	Pass
0.19	1.30	10.00	1.39	12.70	Average	Neutral	54.08	-41.38	Pass
0.38	15.92	10.01	0.77	26.70	Average	Neutral	48.27	-21.57	Pass
0.22	-0.43	10.00	1.22	10.79	Average	Neutral	52.94	-42.15	Pass

Note: The results above show only the worst case.

10.2 26 dB Bandwidth & 6 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.	☒
	e)	Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.	☒
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> - 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. <u>6 dB Minimum emission bandwidth measurement procedure (for 5.725-5.85 GHz)</u> - Allow the trace to stabilize. - Use the spectrum analyzer built-in measurement function to determine the 6dB BW. - o Set RBW = 100 KHz - o Set VBW ≥ 3 x RBW - o Detector = Peak - o Trace mode = max hold - o Sweep = auto couple - Capture the plot. - Repeat above steps for different test channel and other modulation type.		
Test Date	11/19/2015	Environmental condition	Temperature 22°C Relative Humidity 38% Atmospheric Pressure 1020mbar
Remark	None		
Result	☒ Pass ☐ 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	-
6 dB Bandwidth	100 KHz	≥3 x RBW	1.5 - 5 times of OBW	PK	Auto	Maxhold	-

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes ☐ N/A

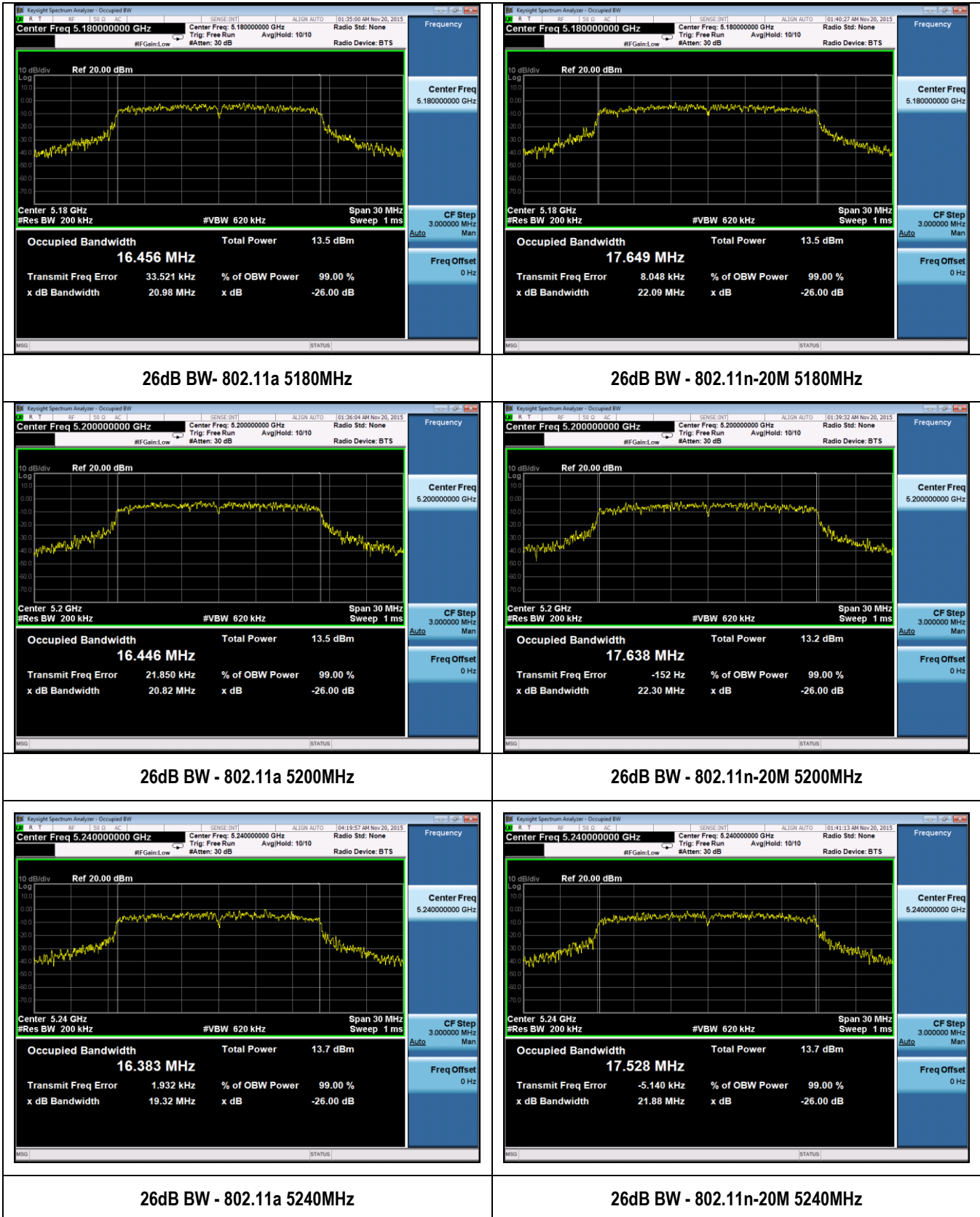
26dB Bandwidth measurement result for 5.2GHz

Test mode	Freq (MHz)	CH	Result(MHz)	Limit (MHz)
			26dB	
802.11a	5180	Low	20.98	-
	5200	Mid	20.82	-
	5240	High	19.32	-
802.11n20	5180	Low	22.09	-
	5200	Mid	22.30	-
	5240	High	21.88	-

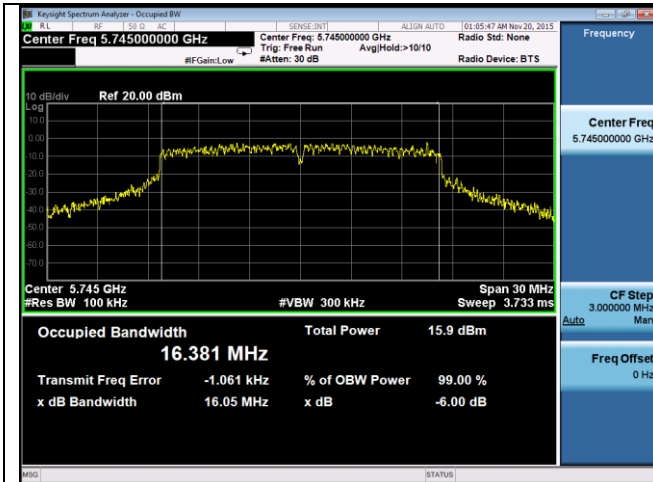
6dB Bandwidth measurement result for 5.8GHz

Test mode	Freq (MHz)	CH	6dB Result(MHz)	Limit (MHz)	Result
802.11a	5745	Low	16.05	>0.5	pass
	5785	Mid	15.63	>0.5	pass
	5805	High	16.34	>0.5	pass
802.11n20	5745	Low	17.55	>0.5	pass
	5785	Mid	17.29	>0.5	pass
	5805	High	17.60	>0.5	pass

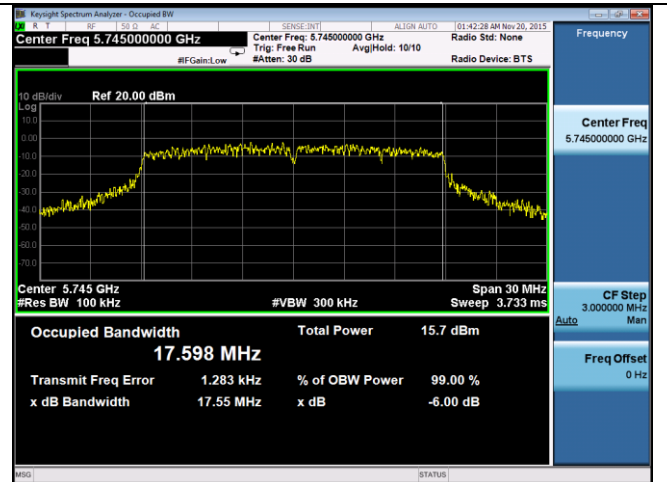
26dB & 99% Bandwidth Test Plots



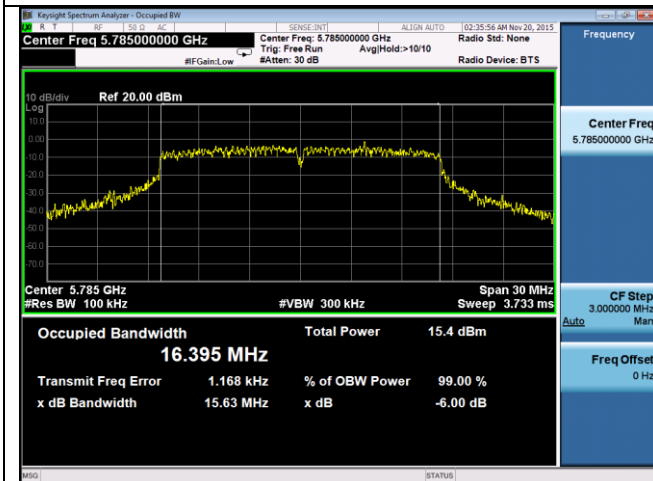
6dB Bandwidth Test Plots



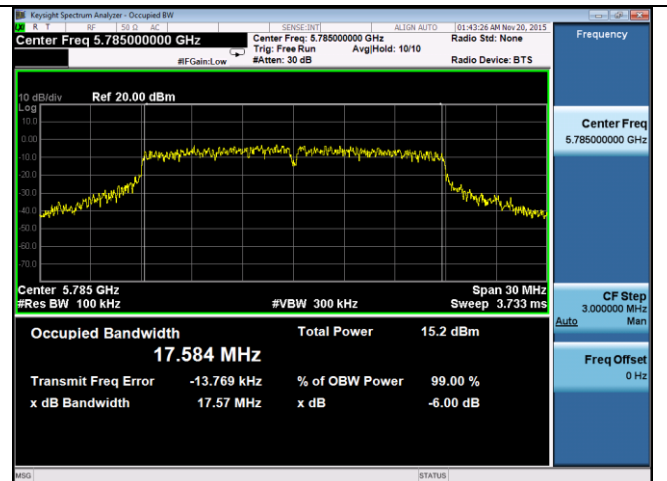
6dB BW 802.11a 5745MHz



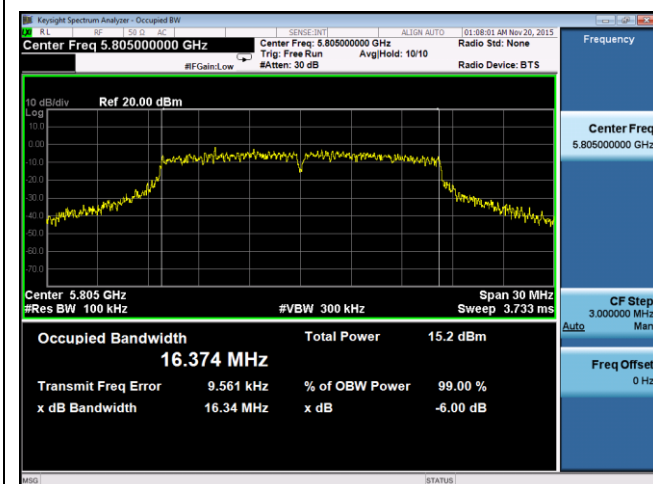
6dB BW 802.11n-20M 5745MHz



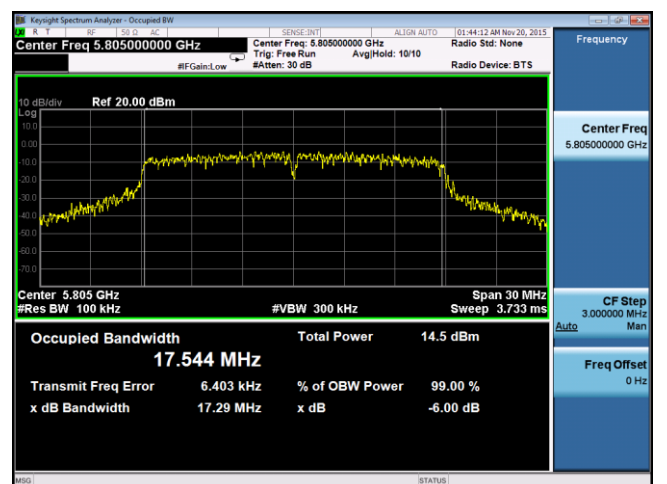
99% & 6dB BW 802.11a 5785MHz



99% & 6dB BW 802.11n-20M 5785MHz



6dB BW 802.11a 5805MHz



6dB BW 802.11n-20M 5805MHz

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).	☐
	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



Test Procedure

789033 D02 General UNII Test Procedures New Rules v01

Measurement using a Power Meter (PM)

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

- Connect EUT's RF output power to power meter
- Set EUT to be continuous transmission mode
- Measurement the average output power using power meter and record the result
- Repeat above steps for different test channel and other modulation type.

Test Date

09/10/2015

Environmental
condition

Temperature	21°C
Relative Humidity	40%
Atmospheric Pressure	1019mbar

Remark

-

Result

☒ Pass ☐ Fail

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

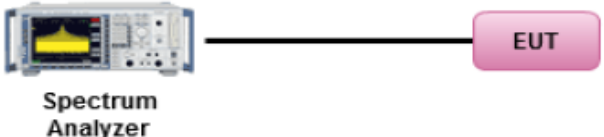
Output Power measurement result :

5.2 GHz					
Test mode	Freq(MHz)	CH	Conducted Power (dBm)	Limit (dBm)	Result
802.11a	5180	Low	11.77	30	pass
	5200	Mid	11.67	30	pass
	5240	High	11.79	30	pass
802.11n20	5180	Low	11.71	30	pass
	5200	Mid	11.59	30	pass
	5240	High	11.79	30	pass

5.8 GHz					
Test mode	Freq(MHz)	CH	Conducted Power (dBm)	Limit (dBm)	Result
802.11a	5745	Low	13.03	30	Pass
	5785	Mid	12.81	30	Pass
	5805	High	12.40	30	Pass
802.11n20	5745	Low	13.01	30	Pass
	5785	Mid	12.75	30	Pass
	5805	High	12.43	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)(iv)	For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	☒
	a)(2)	For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.	☐
	a)(3)	For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.	☒
Test Setup			
Test Procedure	789033 D02 General UNII Test Procedures New Rules v01, II.F. Method SA-1 <u>Maximum spectral density measurement procedure</u> - Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal. - Set RBW = 1 MHz - Set VBW ≥ 3 MHz - Detector = RMS. - Sweep time = auto couple. - Trace mode = max hold. - Trace average at least 100 traces in power averaging - Use the peak marker function to determine the maximum amplitude level within the RBW. Apply correction to the result if different RBW is used.		
Test Date	09/10/2015	Environmental condition	Temperature 22°C Relative Humidity 42% Atmospheric Pressure 1020mbar
Remark	-		
Result	☒ Pass ☐ Fail		

Equipment Setting

Test	RBW	VBW	Span	Detector	Sweep	Trace	Notes
PSD	1MHz	≥3MHz	>EBW	RMS	Auto	Max Hold	-

Test Data ☒ Yes ☐ N/A

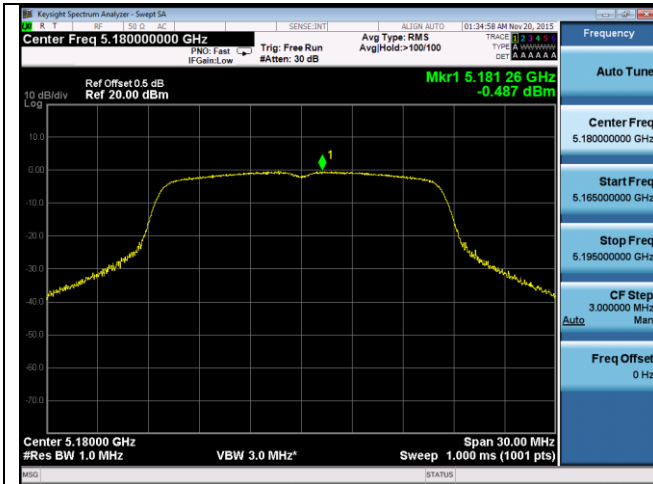
Test Plot ☒ Yes (See below) ☐ N/A

PSD measurement results :

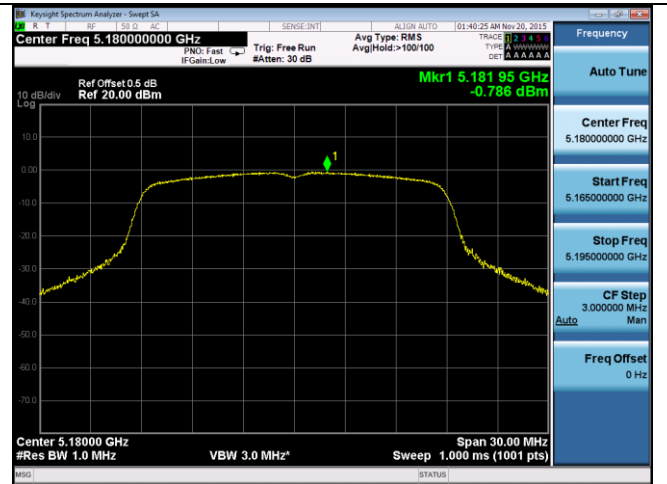
5.2 GHz					
Test mode	Freq(MHz)	CH	Conducted PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11a	5180	Low	-0.487	11	Pass
	5200	Mid	-0.457	11	Pass
	5240	High	-0.219	11	Pass
802.11n20	5180	Low	-0.786	11	Pass
	5200	Mid	-0.712	11	Pass
	5240	High	-0.118	11	Pass

5.8 GHz							
Test mode	Freq(MHz)	CH	Conducted PSD (dBm/100KHz)	Correction Factor*	Combined PSD (dBm/500KHz)	Limit (dBm/500KHz)	Result
802.11a	5745	Low	-6.797	6.99	0.193	30 dBm	Pass
	5785	Mid	-7.686	6.99	-0.696	30 dBm	Pass
	5805	High	-7.976	6.99	-0.986	30 dBm	Pass
802.11n20	5745	Low	-7.634	6.99	-0.644	30 dBm	Pass
	5785	Mid	-7.753	6.99	-0.763	30 dBm	Pass
	5805	High	-8.229	6.99	-1.239	30 dBm	Pass
*Note	BW correction factor = 10log(500kHz/RBW)						

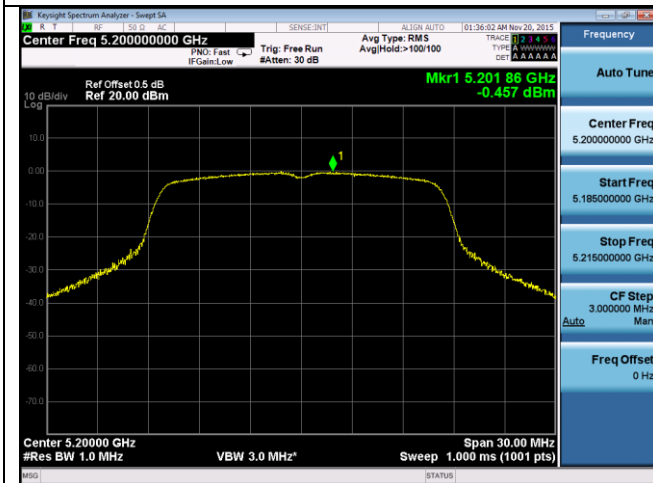
Test Plots



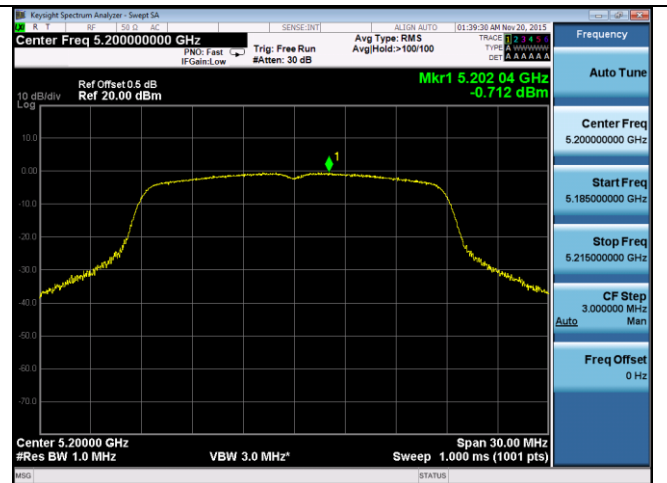
PSD-802.11a 5180MHz



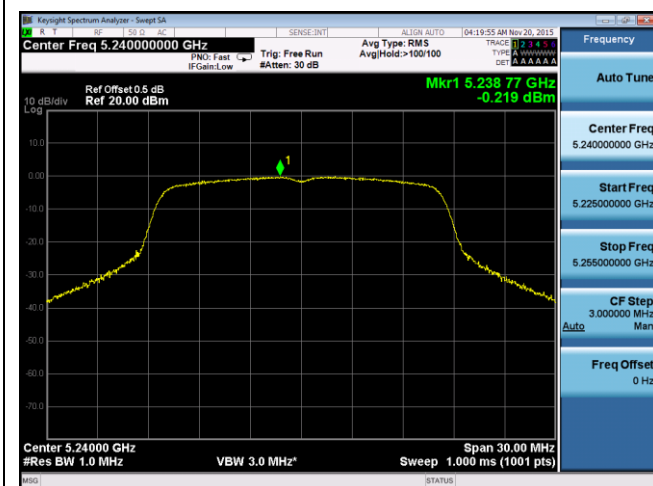
PSD-802.11n-20M 5180MHz



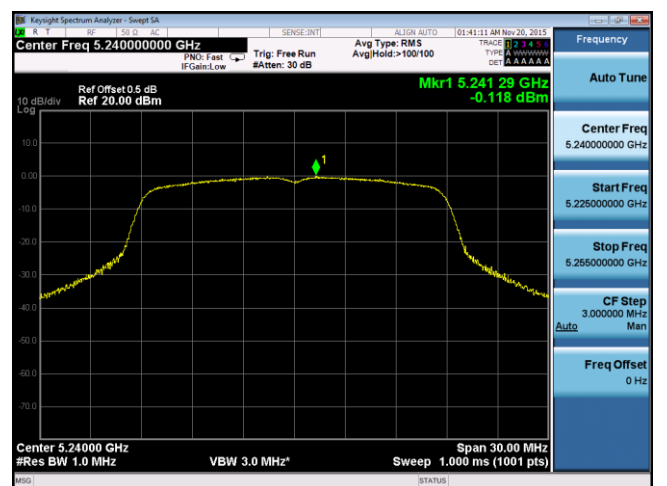
PSD-802.11a 5200MHz



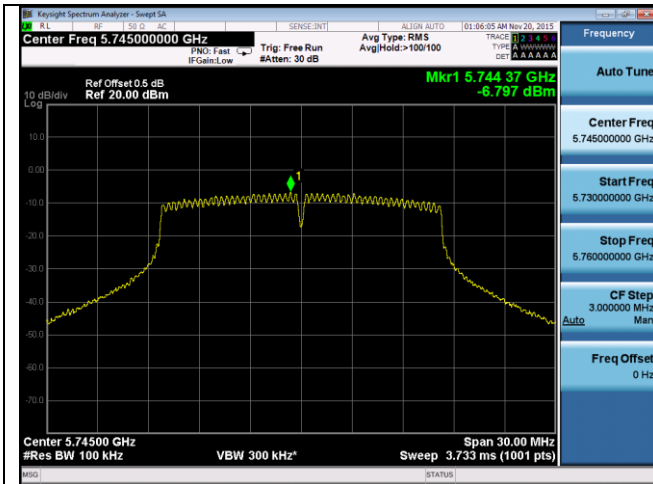
PSD-802.11n-20M 5200 MHz



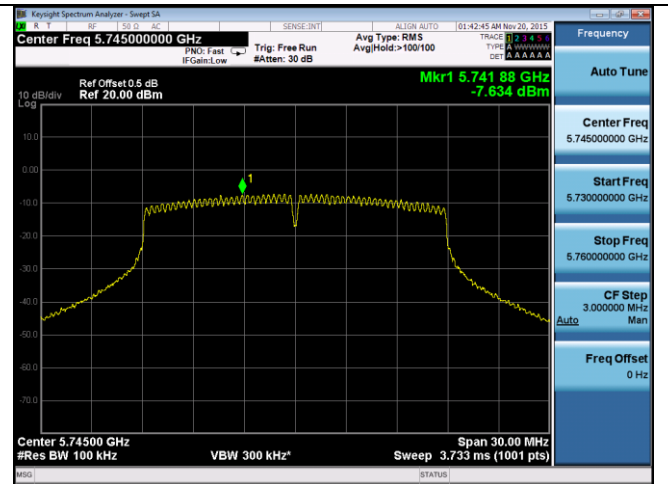
PSD-802.11a 5240MHz



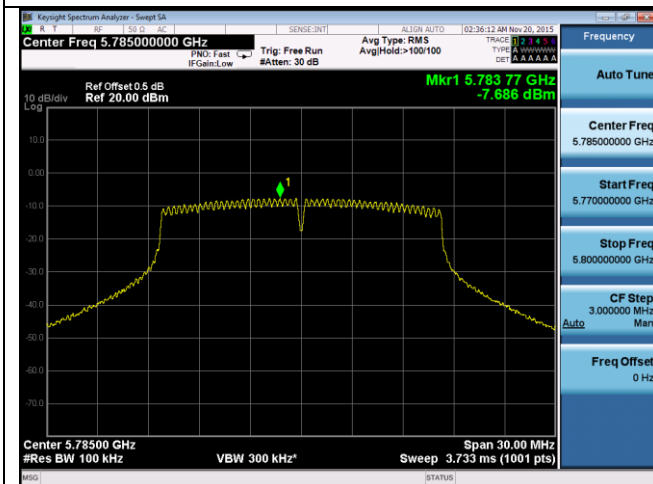
PSD-802.11n-20M 5240MHz



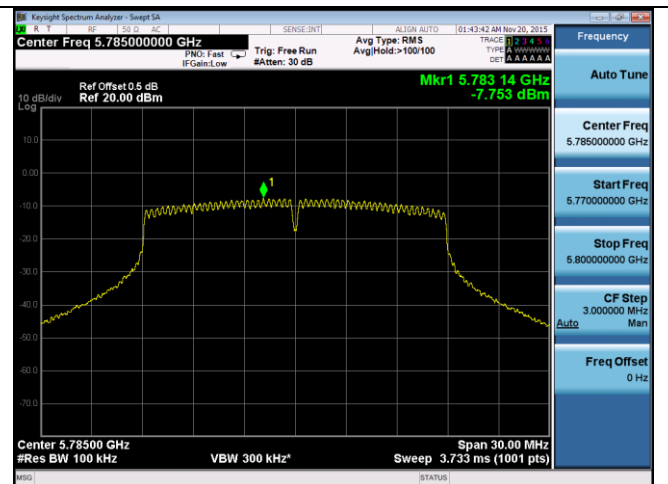
PSD-802.11a 5745MHz



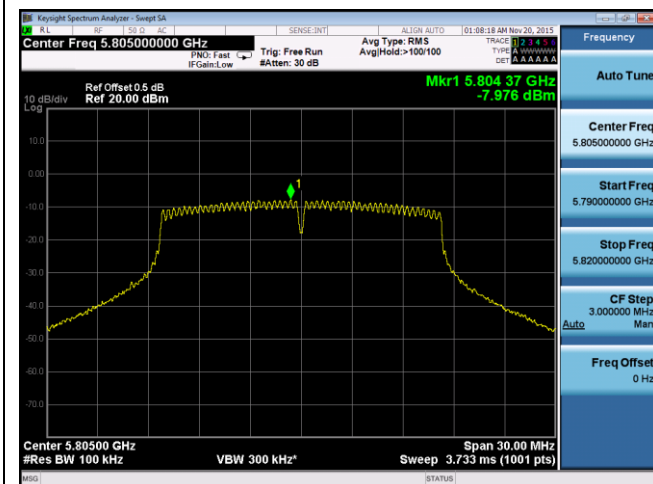
PSD-802.11n-20M 5745MHz



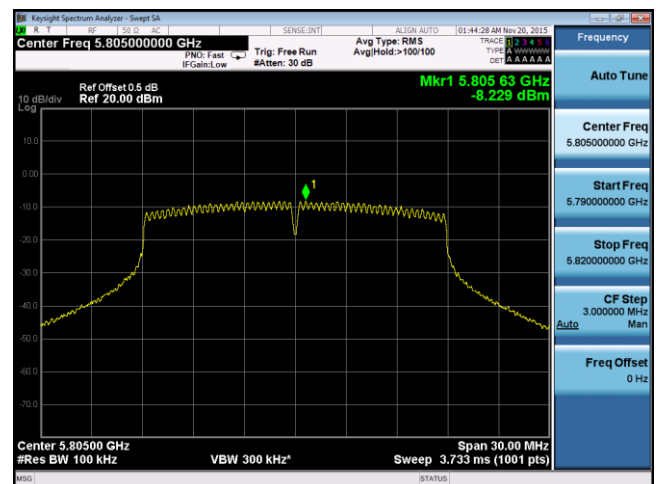
PSD-802.11a 5785MHz



PSD-802.11n-20M 5785MHz



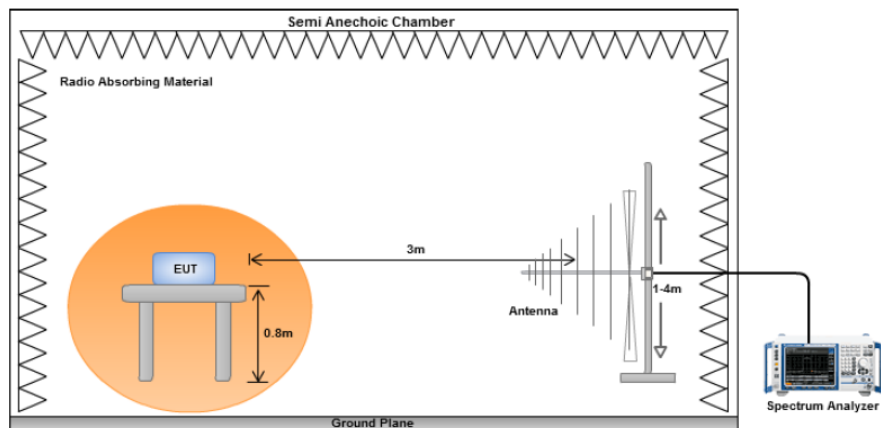
PSD-802.11a 5805MHz



PSD-802.11n-20M 5805MHz

10.5 Radiated Emissions below 1GHz

Requirement(s):

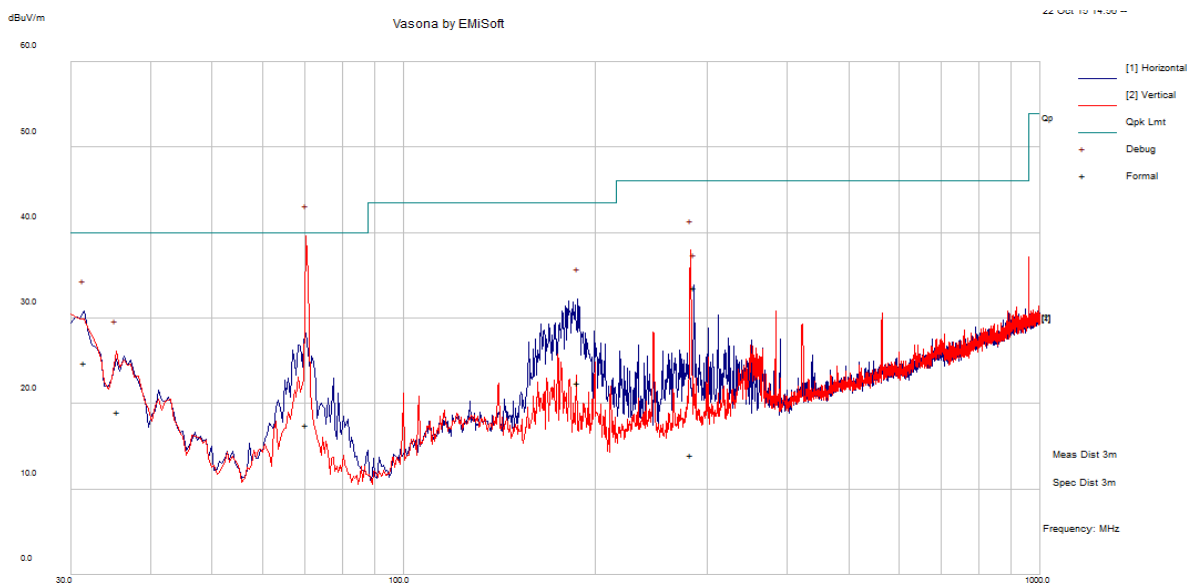
Spec	Requirement	Applicable										
47CFR§ 15.407(b) 15.209 (a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges <table><tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></table>	Frequency range (MHz)	Field Strength (uV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500	☒
Frequency range (MHz)	Field Strength (uV/m)											
30 – 88	100											
88 – 216	150											
216 960	200											
Above 960	500											
Test Setup												
Procedure	1. 2. 3. 4. 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: a. b. c. 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	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) (Omnidirectional Antenna)

Test specification	Above 1GHz			
Environmental Conditions:	Temp (°C):	25.7	Result	Pass
	Humidity (%)	29		
	Atmospheric (mPa):	1021		
Mains Power:	110VAC, 60Hz			
Tested by:	Teody Manansala			
Test Date:	22-Oct-15			
Remarks:	5.2GHz 11a 5200MHz			

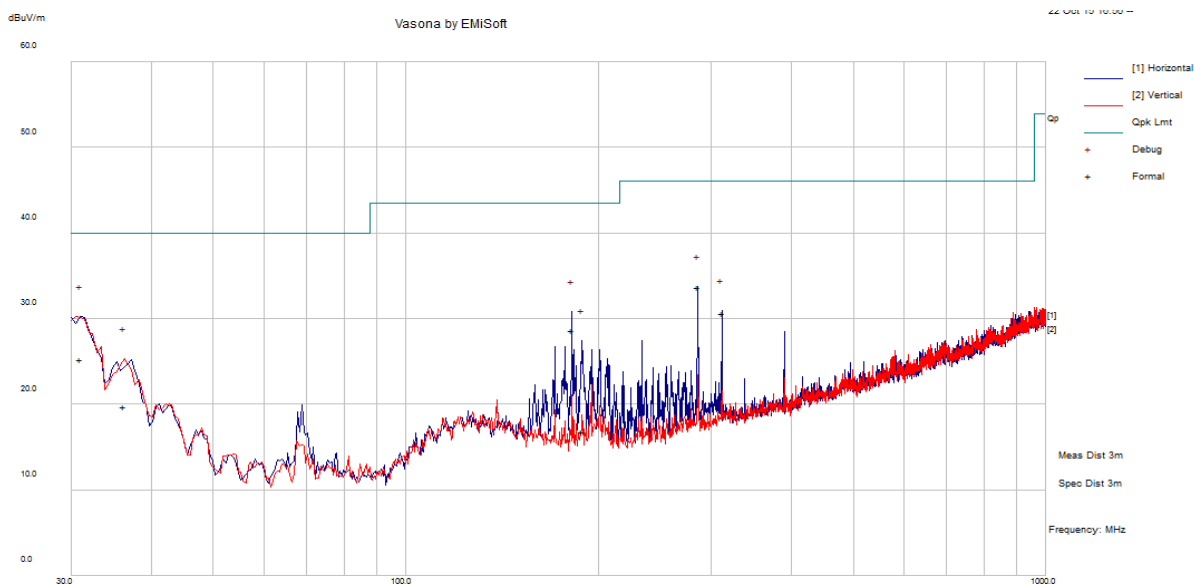


Quasi Max Measurement

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
70.25	46.19	1.35	-30.05	17.48	Quasi Max	V	252.00	301.00	40.00	-22.52	Pass
282.54	36.51	2.91	-25.43	13.99	Quasi Max	V	185.00	231.00	46.02	-32.03	Pass
31.51	39.76	0.81	-15.78	24.79	Quasi Max	H	164.00	93.00	40.00	-15.21	Pass
187.70	47.56	2.32	-27.47	22.41	Quasi Max	H	132.00	144.00	43.52	-21.11	Pass
285.99	56.21	2.91	-25.50	33.62	Quasi Max	H	103.00	54.00	46.02	-12.40	Pass
35.56	37.40	0.87	-19.24	19.02	Quasi Max	V	180.00	179.00	40.00	-20.98	Pass

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

Test specification	Above 1GHz				
Environmental Conditions:	Temp (°C):	25.7	Result	Pass	
	Humidity (%)	29			
	Atmospheric (mPa):	1021			
Mains Power:	110VAC, 60Hz				
Tested by:	Teody Manansala				
Test Date:	10-Sep-15				
Remarks:	5.2GHz 11n20 5785MHz				



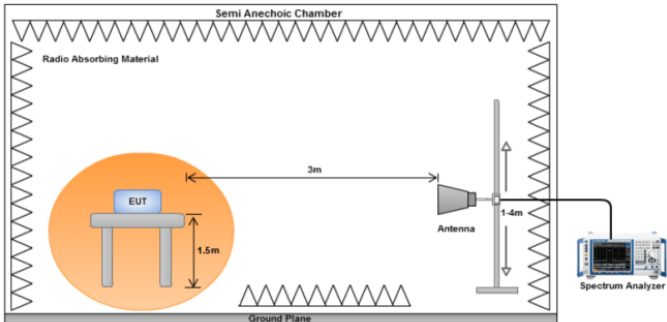
Quasi Max Measurement

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
30.98	39.68	0.81	-15.30	25.19	Quasi Max	H	109.00	13.00	40.00	-14.81	Pass
285.99	56.24	2.91	-25.50	33.64	Quasi Max	H	100.00	54.00	46.02	-12.38	Pass
182.00	54.11	2.25	-27.68	28.69	Quasi Max	H	102.00	164.00	43.52	-14.83	Pass
36.25	38.70	0.87	-19.79	19.78	Quasi Max	V	100.00	7.00	40.00	-20.22	Pass
312.00	52.33	3.08	-24.76	30.65	Quasi Max	H	101.00	126.00	46.02	-15.37	Pass
188.63	41.86	2.33	-27.43	16.76	Quasi Max	H	209.00	347.00	43.52	-26.76	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.	☒
	(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		

Equipment Setting

Test	RBW	VBW	Span	Detector	Sweep	Trace	Notes
Radiated Spurious Emission	1MHz	3MHz	1GHz - 40 GHz	Peak	Auto	Max hold	PK Measurement
Radiated Spurious Emission	1MHz	10Hz	1GHz - 40 GHz	Peak	Auto	Max hold	Ave Measurement

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Radiated Emission Test Results (Above 1GHz)

802.11a – 5180MHz

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
18001.90	92.92	0.00	-31.99	60.93	Peak Max	H	192.00	359.00	74.00	-13.07	Pass
14694.46	39.00	13.45	7.90	60.35	Peak Max	V	227.00	42.00	74.00	-13.65	Pass
1000.22	37.14	2.44	9.68	49.25	Peak Max	H	278.00	65.00	74.00	-24.75	Pass
18001.90	79.92	0.00	-31.99	47.93	Average Max	H	192.00	359.00	54.00	-6.07	Pass
14694.46	26.30	13.45	7.90	47.65	Average Max	V	227.00	42.00	54.00	-6.35	Pass
1000.22	24.07	2.44	9.68	36.19	Average Max	H	278.00	65.00	54.00	-17.81	Pass

802.11a – 5200MHz

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
17693.23	36.94	13.00	10.60	60.53	Peak Max	V	196.00	154.00	74.00	-13.47	Pass
14557.66	39.30	13.20	8.26	60.76	Peak Max	H	248.00	99.00	74.00	-13.24	Pass
1986.27	37.84	3.31	11.37	52.52	Peak Max	H	237.00	293.00	74.00	-21.48	Pass
17693.23	24.34	13.00	10.60	47.94	Average Max	V	196.00	154.00	54.00	-6.06	Pass
14557.66	26.58	13.20	8.26	48.05	Average Max	H	248.00	99.00	54.00	-5.95	Pass
1986.27	25.24	3.31	11.37	39.92	Average Max	H	237.00	293.00	54.00	-14.08	Pass

802.11a – 5240MHz

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
14799.09	39.52	13.63	7.62	60.78	Peak Max	H	212.00	297.00	74.00	-13.22	Pass
3996.66	35.65	5.83	12.22	53.69	Peak Max	H	222.00	99.00	74.00	-20.31	Pass
1034.54	36.09	2.46	9.62	48.18	Peak Max	V	251.00	317.00	74.00	-25.82	Pass
14799.09	26.60	13.63	7.62	47.85	Average Max	H	212.00	297.00	54.00	-6.15	Pass
3996.66	22.81	5.83	12.22	40.85	Average Max	H	222.00	99.00	54.00	-13.15	Pass
1034.54	23.37	2.46	9.62	35.46	Average Max	V	251.00	317.00	54.00	-18.54	Pass

802.11n20 – 5180MHz

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
15034.85	39.73	13.92	6.98	60.64	Peak Max	H	200.00	153.00	74.00	-13.36	Pass
3998.80	36.81	5.83	12.22	54.86	Peak Max	H	164.00	26.00	74.00	-19.14	Pass
2022.13	37.45	3.42	11.41	52.28	Peak Max	H	216.00	349.00	74.00	-21.72	Pass
15034.85	26.40	13.92	6.98	47.30	Average Max	H	200.00	153.00	54.00	-6.70	Pass
3998.80	23.42	5.83	12.22	41.47	Average Max	H	164.00	26.00	54.00	-12.53	Pass
2022.13	24.96	3.42	11.41	39.79	Average Max	H	216.00	349.00	54.00	-14.21	Pass

802.11n20 – 5200MHz

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
5156.72	38.20	6.35	9.58	54.13	Peak Max	V	208.00	46.00	74.00	-19.87	Pass
4167.03	35.83	5.97	11.50	53.30	Peak Max	V	212.00	236.00	74.00	-20.70	Pass
14593.11	39.46	13.27	8.17	60.90	Peak Max	H	287.00	26.00	74.00	-13.10	Pass
5156.72	25.25	6.35	9.58	41.18	Average Max	V	208.00	46.00	54.00	-12.82	Pass
4167.03	22.58	5.97	11.50	40.05	Average Max	V	212.00	236.00	54.00	-13.95	Pass
14593.11	26.67	13.27	8.17	48.10	Average Max	H	287.00	26.00	54.00	-5.90	Pass

802.11n20 – 5240MHz

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
14900.16	39.35	13.81	7.36	60.51	Peak Max	H	203.00	228.00	74.00	-13.49	Pass
17796.98	37.19	13.00	10.70	60.89	Peak Max	H	235.00	92.00	74.00	-13.11	Pass
2023.81	37.32	3.42	11.40	52.15	Peak Max	V	247.00	339.00	74.00	-21.85	Pass
14900.16	26.75	13.81	7.36	47.91	Average Max	H	203.00	228.00	54.00	-6.09	Pass
17796.98	24.07	13.00	10.70	47.78	Average Max	H	235.00	92.00	54.00	-6.22	Pass
2023.81	24.89	3.42	11.40	39.71	Average Max	V	247.00	339.00	54.00	-14.29	Pass

802.11a – 5745MHz

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
6245.39	40.44	7.63	10.48	58.54	Peak Max	V	212.00	0.00	74.00	-15.46	Pass
9685.47	37.92	12.07	7.55	57.55	Peak Max	V	219.00	352.00	74.00	-16.45	Pass
3999.94	36.16	5.83	12.23	54.21	Peak Max	H	146.00	264.00	74.00	-19.79	Pass
6245.39	28.06	7.63	10.48	46.16	Average Max	V	212.00	0.00	54.00	-7.84	Pass
9685.47	25.04	12.07	7.55	44.67	Average Max	V	219.00	352.00	54.00	-9.33	Pass
3999.94	22.92	5.83	12.23	40.98	Average Max	H	146.00	264.00	54.00	-13.02	Pass

802.11a – 5785MHz

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
14626.37	39.10	13.33	8.08	60.50	Peak Max	H	154.00	2.00	74.00	-13.50	Pass
6314.66	40.98	7.83	10.32	59.13	Peak Max	V	211.00	113.00	74.00	-14.87	Pass
4065.85	35.48	5.89	11.94	53.31	Peak Max	V	207.00	55.00	74.00	-20.69	Pass
14626.37	26.59	13.33	8.08	48.00	Average Max	H	154.00	2.00	54.00	-6.00	Pass
6314.66	27.87	7.83	10.32	46.02	Average Max	V	211.00	113.00	54.00	-7.98	Pass
4065.85	22.85	5.89	11.94	40.67	Average Max	V	207.00	55.00	54.00	-13.33	Pass

802.11a – 5805MHz

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
6279.42	40.45	7.73	10.40	58.58	Peak Max	V	152.00	43.00	74.00	-15.42	Pass
12036.97	37.96	12.27	8.55	58.78	Peak Max	H	180.00	239.00	74.00	-15.22	Pass
4100.46	35.35	5.92	11.79	53.05	Peak Max	V	153.00	168.00	74.00	-20.95	Pass
6279.42	27.42	7.73	10.40	45.55	Average Max	V	152.00	43.00	54.00	-8.45	Pass
12036.97	25.38	12.27	8.55	46.21	Average Max	H	180.00	239.00	54.00	-7.79	Pass
4100.46	22.72	5.92	11.79	40.42	Average Max	V	153.00	168.00	54.00	-13.58	Pass

802.11n20 – 5745MHz

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
5565.94	38.43	6.62	9.98	55.02	Peak Max	V	271.00	359.00	74.00	-18.98	Pass
17726.28	37.46	13.00	10.63	61.09	Peak Max	V	215.00	71.00	74.00	-12.91	Pass
14558.11	39.43	13.20	8.26	60.89	Peak Max	H	285.00	1.00	74.00	-13.11	Pass
5565.94	25.00	6.62	9.98	41.60	Average Max	V	271.00	359.00	54.00	-12.40	Pass
17726.28	24.56	13.00	10.63	48.19	Average Max	V	215.00	71.00	54.00	-5.81	Pass
14558.11	26.64	13.20	8.26	48.10	Average Max	H	285.00	1.00	54.00	-5.90	Pass

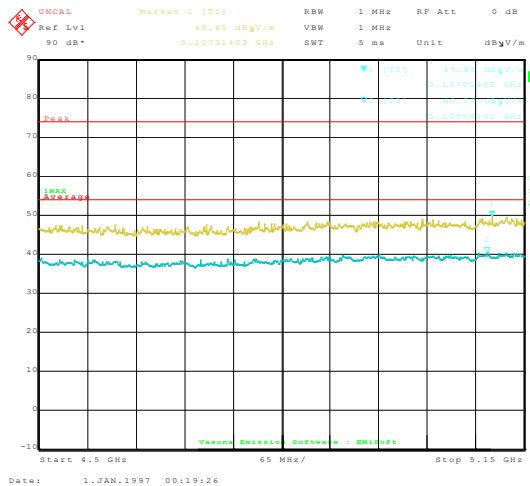
802.11n20 – 5785MHz

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
14559.96	39.69	13.21	8.26	61.15	Peak Max	H	174.00	0.00	74.00	-12.85	Pass
17658.70	37.07	13.00	10.56	60.63	Peak Max	V	250.00	160.00	74.00	-13.37	Pass
6245.21	40.83	7.63	10.48	58.94	Peak Max	V	194.00	56.00	74.00	-15.06	Pass
14559.96	26.66	13.21	8.26	48.12	Average Max	H	174.00	0.00	54.00	-5.88	Pass
17658.70	24.43	13.00	10.56	47.99	Average Max	V	250.00	160.00	54.00	-6.01	Pass
6245.21	28.23	7.63	10.48	46.34	Average Max	V	194.00	56.00	54.00	-7.66	Pass

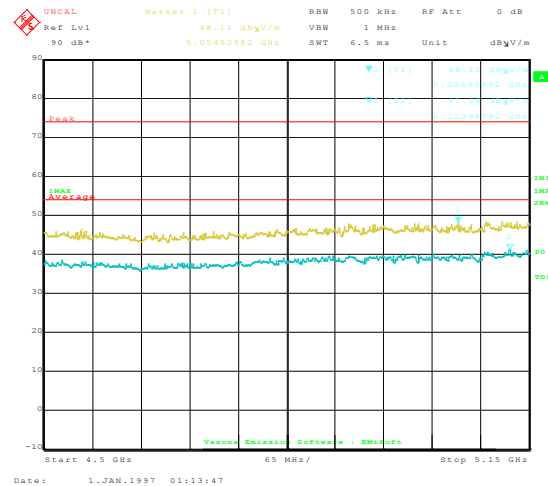
802.11n20 – 5805MHz

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
14763.46	38.88	13.57	7.72	60.16	Peak Max	H	179.00	49.00	74.00	-13.84	Pass
6350.61	40.72	7.94	10.23	58.89	Peak Max	H	229.00	260.00	74.00	-15.11	Pass
4099.43	35.48	5.92	11.79	53.19	Peak Max	H	217.00	335.00	74.00	-20.81	Pass
14763.46	26.58	13.57	7.72	47.86	Average Max	H	179.00	49.00	54.00	-6.14	Pass
6350.61	28.17	7.94	10.23	46.34	Average Max	H	229.00	260.00	54.00	-7.66	Pass
4099.43	22.79	5.92	11.79	40.50	Average Max	H	217.00	335.00	54.00	-13.50	Pass

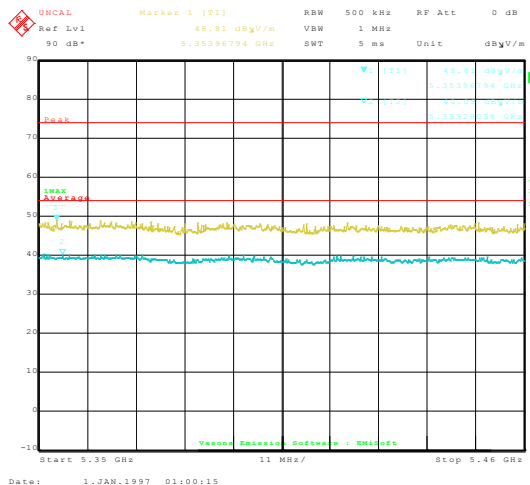
Restricted Band Measurement Plots:



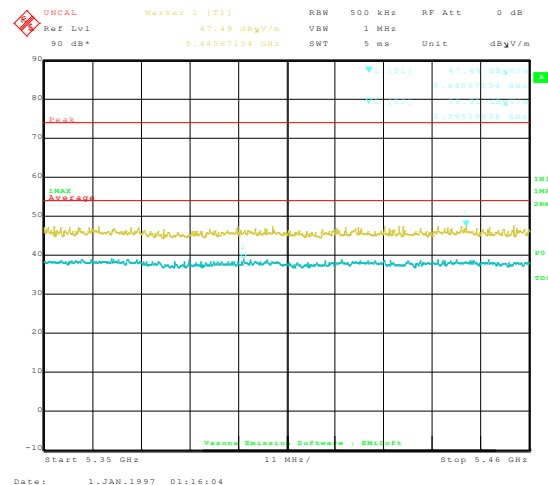
Lower Band 802.11a 5180MHz



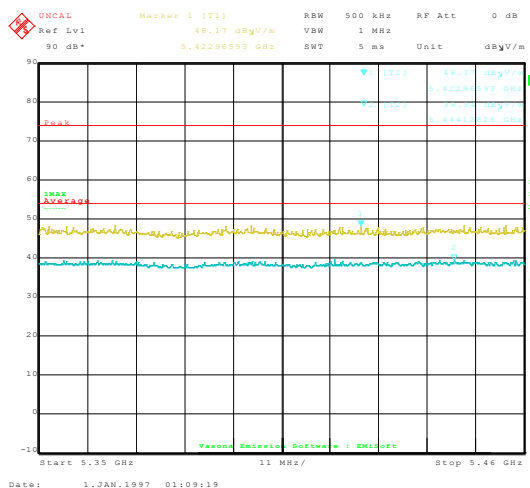
Lower Band 802.11n-20M 5180MHz



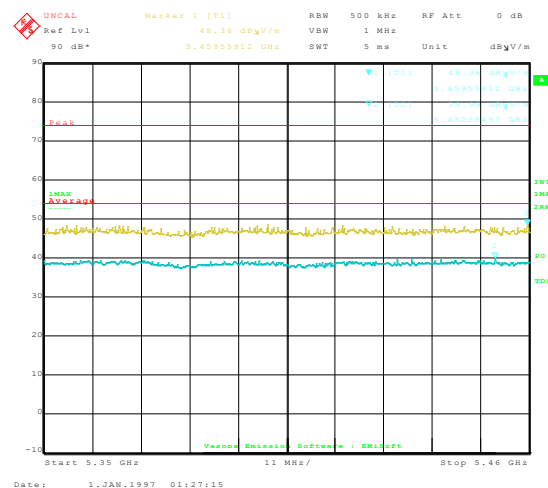
Higher Band 802.11a 5320MHz



Higher Band 802.11n-20M 5320MHz

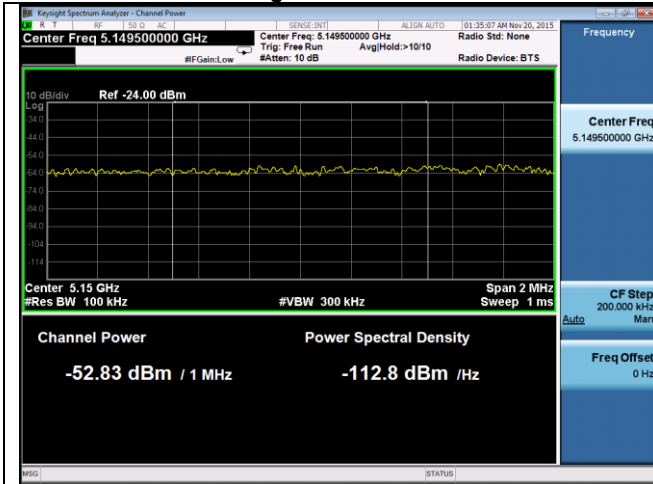


Lower Band 802.11a 5500MHz

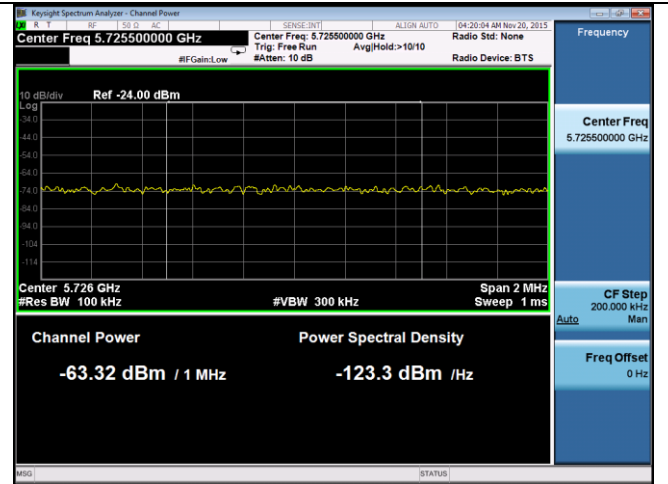


Lower band 802.11n-20M 5500MHz

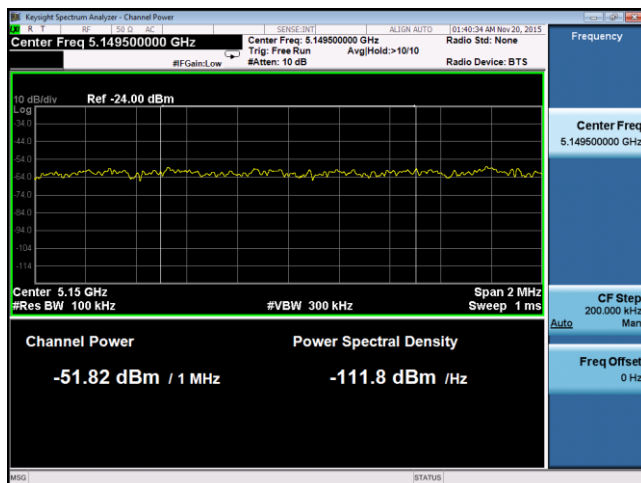
Conducted Band Edge Measurement Plots:



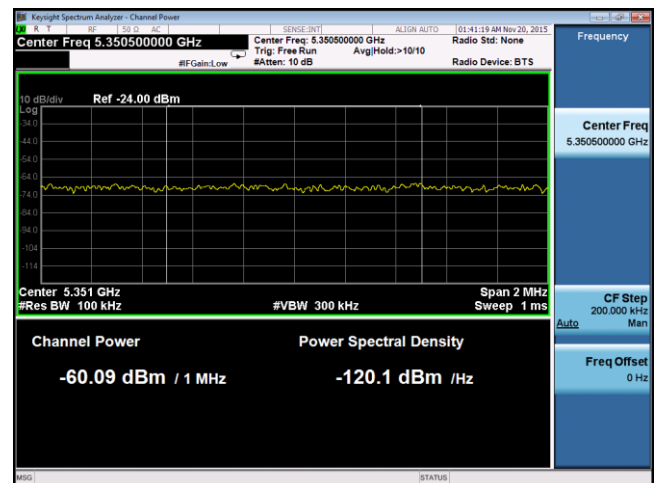
5.2GHz Band Edge-802.11a 5180 MHz (Limit-17 eirp)



5.2GHz Band Edge-802.11a 5240 MHz (Limit-27 eirp)



5.2GHz Band Edge-802.11n20 5180 MHz (Limit-17 eirp)



5.2GHz Band Edge-802.11n20 5240 MHz (Limit-27 eirp)