



Certificate #4312.01

TEST REPORT

Product Name: IP Phone
Trade Mark: GRANDSTREAM
Model No. / HVIN: GRP2670
Report Number: 210821025RFC-4
Test Standards: FCC 47 CFR Part 15 Subpart E
RSS-247 Issue 2
RSS-Gen Issue 5
FCC ID: YZZGRP2670
IC: 11964A-GRP2670
Test Result: PASS
Date of Issue: October 18, 2021

Prepared for:

Grandstream Networks, Inc.
126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

Prepared by:

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October 18, 2021

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Version

Version No.	Date	Description
V1.0	October 18, 2021	Original



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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Grandstream Networks, Inc.
Address of Applicant:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks, Inc.
Address of Manufacturer:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	IP Phone		
Model No. / HVIN:	GRP2670		
Trade Mark:	GRANDSTREAM		
DUT Stage:	Identical Prototype		
EUT Supports Function:	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
		Bluetooth 5.0	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n/ac
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n/ac
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n/ac
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n/ac
Sample Received Date:	August 21, 2021		
Sample Tested Date:	August 21, 2021 to September 25, 2021		

1.2.2 Description of Accessories

Adapter(1)	
Model No.:	GQ12-120100-AU
Input:	100-240 V~50/60 Hz 0.4A Max
Output:	12 V  1.0 A
DC Cable:	2.5 Meter, Unshielded without ferrite

Adapter(2)	
Model No.:	DSA-12PFU-12 FUS 120100
Input:	100-240 V~50/60 Hz 0.5A
Output:	12 V  1.0 A 12.0W
DC Cable:	2.5 Meter, Unshielded without ferrite

Adapter(3)	
Model No.:	F12US1200100A
Input:	100-240 V~50/60 Hz 0.5A Max
Output:	12 V  1.0 A
DC Cable:	2.5 Meter, Unshielded without ferrite

Cable(1)	
Connector:	Ethernet Cable
Cable Type:	Unshielded without ferrite
Length:	1.5 Meter

Cable(2)	
Connector:	Phone Cord
Cable Type:	Unshielded without ferrite
Length:	3.5 Meter

Others	
1x Handset, 1x Phone Stand	

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Bands:	5150 MHz to 5250 MHz (U-NII-1)
	5250 MHz to 5350 MHz (U-NII-2A)
	5470 MHz to 5725 MHz (U-NII-2C)
	5725 MHz to 5850 MHz (U-NII-3)
Frequency Ranges:	5180 MHz to 5240 MHz
	5260 MHz to 5320 MHz
	5500 MHz to 5700 MHz
	5745 MHz to 5825 MHz
Support Standards:	IEEE 802.11a/n/ac
TPC Function:	Not Support
DFS Operational mode:	Slave without radar Interference detection function
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK)
Channel Spacing:	IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz
	IEEE 802.11n-HT40/ac-VHT40: 40 MHz
	IEEE 802.11ac-VHT80: 80 MHz
Data Rate:	IEEE 802.11a: Up to 54 Mbps
	IEEE 802.11n-HT20: Up to MCS7
	IEEE 802.11n-HT40: Up to MCS7
	IEEE 802.11ac-VHT20: Up to MCS8
	IEEE 802.11ac-VHT40: Up to MCS9
Number of Channels:	IEEE 802.11ac-VHT80: Up to MCS9
	5150 MHz to 5250 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11acVHT80
	5250 MHz to 5350 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11acVHT80
	5470 MHz to 5725 MHz: 11 for IEEE 802.11a/n-HT20/ac-VHT20 5 for IEEE 802.11n-HT40/ac-VHT40

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	2 for IEEE 802.11ac-VHT80				
	5725 MHz to 5850 MHz: 5 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11ac-VHT80				
Antenna Type:	Dipole Antenna				
Antenna Gain:	5150 MHz to 5250 MHz: 4.5 dBi				
	5250 MHz to 5350 MHz: 4.5 dBi				
	5470 MHz to 5725 MHz: 4.5 dBi				
	5725 MHz to 5850 MHz: 4.5 dBi				
Maximum EIRP (dBm):	Chain 0	U-NII-1			
	IEEE 802.11a:	18.88			
	IEEE 802.11n-HT20:	18.51			
	IEEE 802.11n-HT40:	19.50			
	IEEE 802.11ac-VHT20:	18.48			
	IEEE 802.11ac-VHT40:	19.53			
	IEEE 802.11ac-VHT80:	17.28			
Maximum conducted output power (dBm):		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
	IEEE 802.11a:	14.38	14.53	14.59	20.14
	IEEE 802.11n-HT20:	14.01	14.26	14.03	19.16
	IEEE 802.11n-HT40:	15.00	15.13	13.44	19.49
	IEEE 802.11ac-VHT20:	13.98	14.29	14.08	19.07
	IEEE 802.11ac-VHT40:	15.03	15.04	13.13	19.53
	IEEE 802.11ac-VHT80:	12.78	12.92	11.48	18.82
Normal Test Voltage:	120V~60Hz				

1.4 OTHER INFORMATION

Operation Frequency Each of Channel				
	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
IEEE 802.11a, IEEE 802.11n-HT20, IEEE 802.11ac-VHT20	$f = 5000 + 5k, k = 32 + 4n$			$f = 5000 + 5k, k = 145 + 4n$
	$n = 1, \dots, 4$	$n = 5, \dots, 8$	$n = 17, \dots, 27$	$n = 1, \dots, 5$
IEEE 802.11n-HT40, IEEE 802.11ac-VHT40	$f = 5000 + 5k, k = 30 + 8n$			$f = 5000 + 5k, k = 143 + 8n$
	$n = 1, 2$	$n = 1, \dots, 5$	$n = 9, \dots, 13$	$n = 1, 2$
IEEE 802.11ac-VHT80	$f = 5000 + 5k, k = 26 + 16n$			$f = 5000 + 5k, k = 155$
	$n = 1$	$n = 1, 2$	$n = 5, 6$	
Note: f is the operating frequency (MHz); k is the operating channel.				

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	FCC ID	Supplied by
Notebook	Lenovo	B40-80	MP12NEQ6	N/A	UnionTrust
USB disk	Kingston	DTSE9	N/A	N/A	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	N/A	UnionTrust
Headset	YEY	VE120-MV	N/A	N/A	UnionTrust
Wireless Home Router	SAGEMCOM	FAST5280	N/A	VW3FAST5280	UnionTrust
Key-Press Attenuator	Huaxin	KT2.5-90/1S-2S	N/A	N/A	UnionTrust
4 Way Divider	WOKEN	0120A040560002D	N/A	N/A	UnionTrust
IP Phone	GRANDSTREAM	GRP2615	N/A	YZZGRP2615	Applicant

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Ethernet Cable	RJ45	1.5 Unshielded without ferrite	UnionTrust
2	Ethernet Cable	RJ45	2.0 Unshielded without ferrite	UnionTrust
3	Ethernet Cable	RJ45	5.0 Unshielded without ferrite	UnionTrust
4	Antenna Cable	SMA	0.3 Meter	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

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1.7 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories

Shenzhen UnionTrust Quality and Technology Co., Ltd.

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CAB identifier: CN0032

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9kHz-150kHz	±3.2 dB
2	Conducted emission 150kHz-30MHz	±2.7 dB
3	Radiated emission 9kHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.9 dB
5	Radiated emission 1GHz-18GHz	± 4.8 dB
6	Radiated emission 18GHz-26GHz	± 5.1 dB
7	Radiated emission 26GHz-40GHz	± 5.1 dB
8	Conducted spurious emissions	± 2.7 dB
9	RF Power, Conducted	± 0.9 dB
10	Occupied Bandwidth	± 1.86 %
11	Radio Frequency	2.4 GHz: ± 6.5 x 10 ⁻⁸
12	Transmission Time	± 0.19 %

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart E Test Cases			
Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203 FCC 47 CFR Part 15 Subpart E Section 15.407(a)(1) (2) RSS-Gen Issue 5, Section 6.8	N/A	PASS
26 dB emission bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(2)(5) RSS-247 Issue 2 Section 6.2.1.2	KDB 789033 D02 v02r01 Section C.1	PASS
6 dB bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (e) RSS-247 Issue 2 Section 6.2.4.1	KDB 789033 D02 v02r01 Section C.2	PASS
Occupied Bandwidth	RSS-Gen Issue 5, Section 6.7	RSS-Gen Issue 5, section 6.7	PASS
Maximum conducted output power	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3) RSS-247 Issue 2 Section 6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1	KDB 789033 D02 v02r01 Section E.3.a (Method PM)	PASS
Peak Power Spectral Density	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3) RSS-247 Issue 2 Section 6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1	KDB 789033 D02 v02r01 Section F	PASS
Radiated Emissions and Band Edge Measurement	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(1)(2)(3)(4)(6) FCC 47 CFR Part 15 Subpart C Section 15.209/205 RSS-247 Issue 2 Section 6.2.1.2/6.2.2.2/6.2.3.2/6.2.4.2	KDB 789033 D02 v02r01 Section G.3, G.4, G.5, and G.6	PASS
Dynamic Frequency Selection	FCC 47 CFR Part 15 Subpart E Section 15.407 (h) RSS-247 Issue 2 Section 6.3	KDB 905462 D03 Client Without DFS New Rules v01r02	PASS
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(6) FCC 47 CFR Part 15 Subpart C Section 15.207 RSS-Gen Issue 5, Section 8.8	ANSI C63.10-2013, Section 6.2.	PASS
Note: 1) N/A: In this whole report not applicable.			

For Dynamic Frequency Selection

Test Case	Result
Channel Availability Check Time	N/A ¹
U-NII Detection Bandwidth	N/A ¹
Channel Closing Transmission Time	PASS
Channel Move Time	PASS
DFS Detection Threshold	N/A ¹
Non- Occupancy Period	N/A ¹
Note: 1) The EUT is slave, NA In this whole report not applicable.	

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	3m SAC	ETS-LINDGREN	3m	N/A	Jan. 22, 2021	Jan. 21, 2024
☒	Receiver	R&S	ESIB26	100114	Nov. 18, 2020	Nov. 17, 2021
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Apr. 22, 2021	Apr. 21, 2022
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	Nov. 14, 2020	Nov. 13, 2021
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 14, 2020	Nov. 13, 2021
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 14, 2020	Nov.13, 2021
☒	Preamplifier	HP	8447F	2805A02960	Nov. 10, 2020	Nov. 9, 2021
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	Apr. 30, 2021	Apr. 29, 2023
☒	Pre-amplifier	ETS-Lindgren	00118385	00201874	Nov. 10, 2020	Nov. 9, 2021
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Nov. 14, 2020	Nov. 13, 2022
☒	Pre-amplifier	ETS-Lindgren	00118384	00202652	Nov. 17, 2020	Nov. 16, 2022
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☐	Band Rejection Filter (2400MHz~2500MHz)	Micro-Tronics	BRM50702	G248	Nov. 16, 2020	Nov. 15, 2021
☒	Band Rejection Filter (5150MHz~5880MHz)	Micro-Tronics	BRM50716	G186	Nov. 16, 2020	Nov. 15, 2021
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Nov. 18, 2020	Nov.17, 2021
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 18, 2020	Nov.17, 2021
☒	LISN	R&S	ESH2-Z5	860014/024	Nov. 18, 2020	Nov.17, 2021
☒	LISN	ETS-Lindgren	3816/2SH	00201088	Nov. 18, 2020	Nov.17, 2021
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted RF test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Apr. 22, 2021	Apr. 21, 2022
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	Nov. 10, 2020	Nov. 9, 2021
☐	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430023	Nov. 10, 2020	Nov. 9, 2021
☒	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	Nov. 10, 2020	Nov. 9, 2021

4. TEST CONFIGURATION

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4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage	Relative Humidity (%)
NT/NV	+15 to +35	120V~60Hz	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Tested by
26 dB emission bandwidth	24.5	49	99.80	Bert Xiong
6 dB bandwidth				
Occupied Bandwidth				
Maximum conducted output power				
Peak Power Spectral Density				
Radiated Emissions and Band Edge Measurement	25.2	52	100.02	Asia Yan
Dynamic Frequency Selection	24.5	49	99.80	Bert Xiong
AC Power Line Conducted Emission	25.5	53	99.71	Niko Su

4.2 TEST CHANNELS

Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11a IEEE 802.11n-HT20 IEEE 802.11ac-VHT20	5150 MHz to 5250 MHz	Channel 36	Channel 44	Channel 48
		5180 MHz	5220 MHz	5240 MHz
	5250 MHz to 5350 MHz	Channel 52	Channel 60	Channel 64
		5260 MHz	5300 MHz	5320 MHz
	5470 MHz to 5725 MHz	Channel 100	Channel 116	Channel 140
		5500 MHz	5580 MHz	5700 MHz
	5725 MHz to 5850 MHz	Channel 149	Channel 157	Channel 165
		5745 MHz	5785 MHz	5825 MHz
IEEE 802.11n-HT40 IEEE 802.11ac-VHT40	5150 MHz to 5250 MHz	Channel 38	--	Channel 46
		5190 MHz	--	5230 MHz
	5250 MHz to 5350 MHz	Channel 54	--	Channel 62
		5270 MHz	--	5310 MHz
	5470 MHz to 5725 MHz	Channel 102	Channel 110	Channel 134
		5510 MHz	5550 MHz	5670 MHz
	5725 MHz to 5850 MHz	Channel 151	--	Channel 159
		5755 MHz	--	5795 MHz
IEEE 802.11ac-VHT80	5150 MHz to 5250 MHz	--	Channel 42	--
		--	5210 MHz	--
	5250 MHz to 5350 MHz	--	Channel 58	--

	5470 MHz to 5725 MHz	--	5290 MHz	--
		Channel 106	--	--
		5530 MHz	--	--
	5725 MHz to 5850 MHz	--	Channel 155	--
		--	5775 MHz	--

4.3 EUT TEST STATUS

Mode	Tx/Rx Function	Description
IEEE 802.11a/n/ac	1Tx/1Rx	1. Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

Power Setting				
	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
IEEE 802.11a	13	13	13	18
IEEE 802.11n-HT20	13	13	13	18
IEEE 802.11n-HT40	14	14	12	18
IEEE 802.11ac-VHT20	13	13	13	18
IEEE 802.11ac-VHT40	14	14	12	18
IEEE 802.11ac-VHT80	12	12	11	18

Test Software
Test software name: Putty commands;

4.4 PRE-SCAN

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Following data rate was (were) selected for the final test as listed below

Mode	Worst-case data rates
IEEE 802.11a	6 Mbps
IEEE 802.11n-HT20	MCS0
IEEE 802.11n-HT40	MCS0
IEEE 802.11ac-VHT20	MCS0
IEEE 802.11ac-VHT40	MCS0
IEEE 802.11ac-VHT80	MCS0

4.5 TEST SETUP

4.5.1 For Radiated Emissions test setup

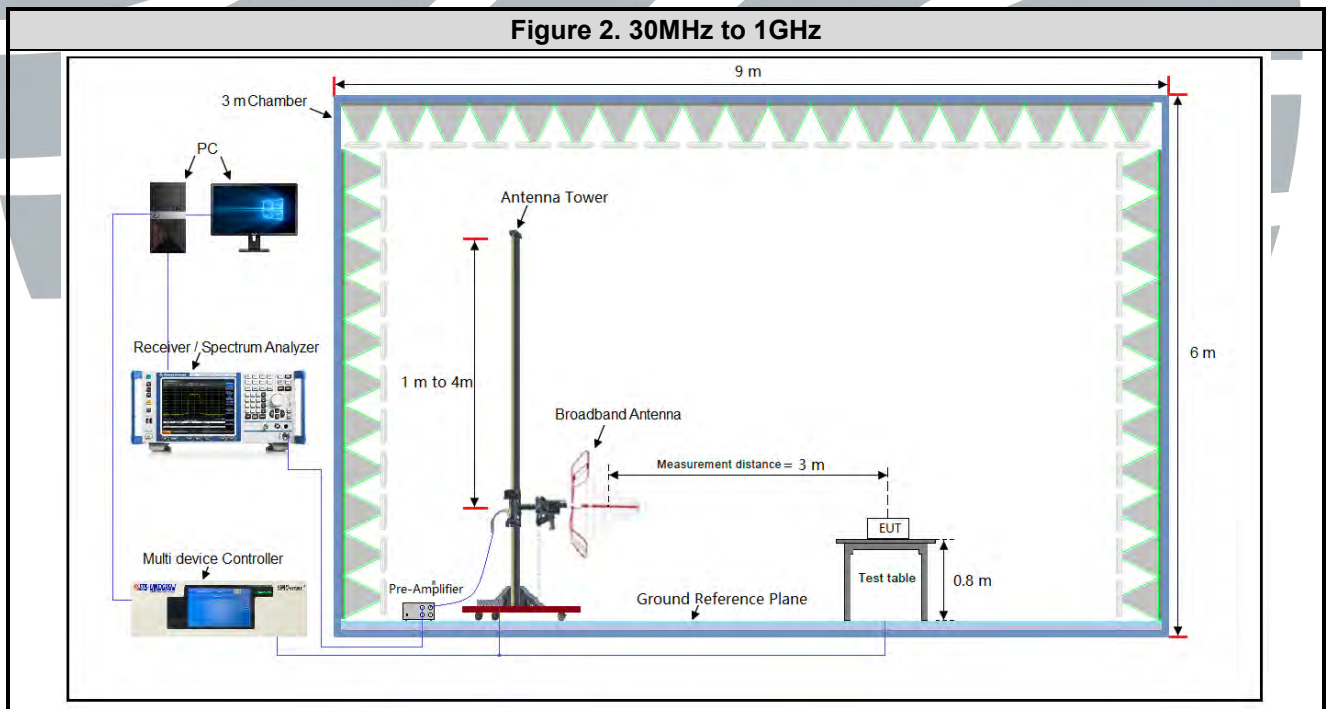
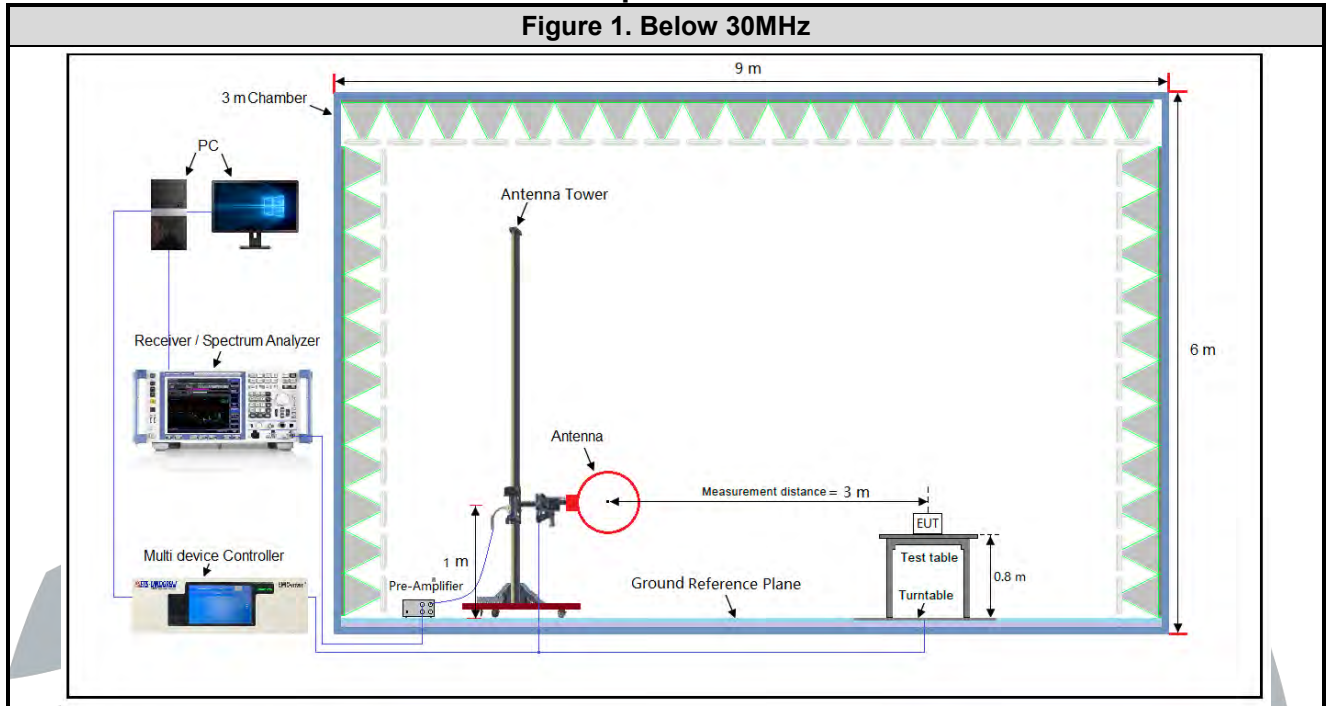
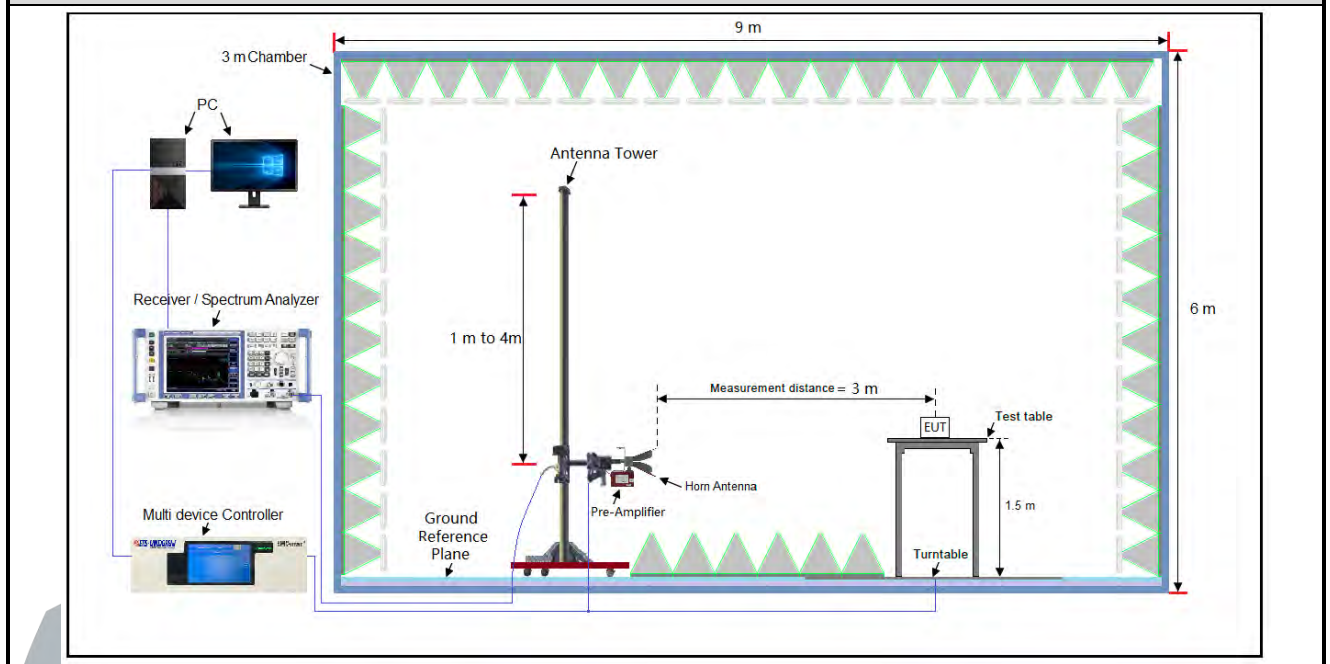
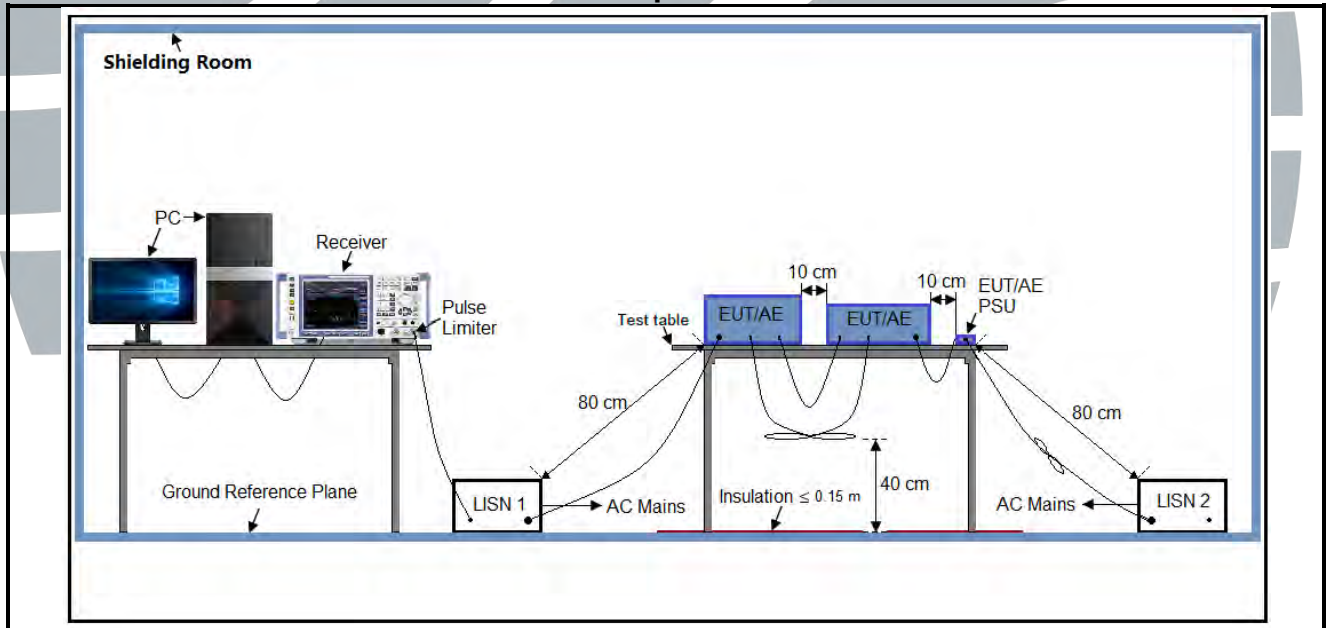


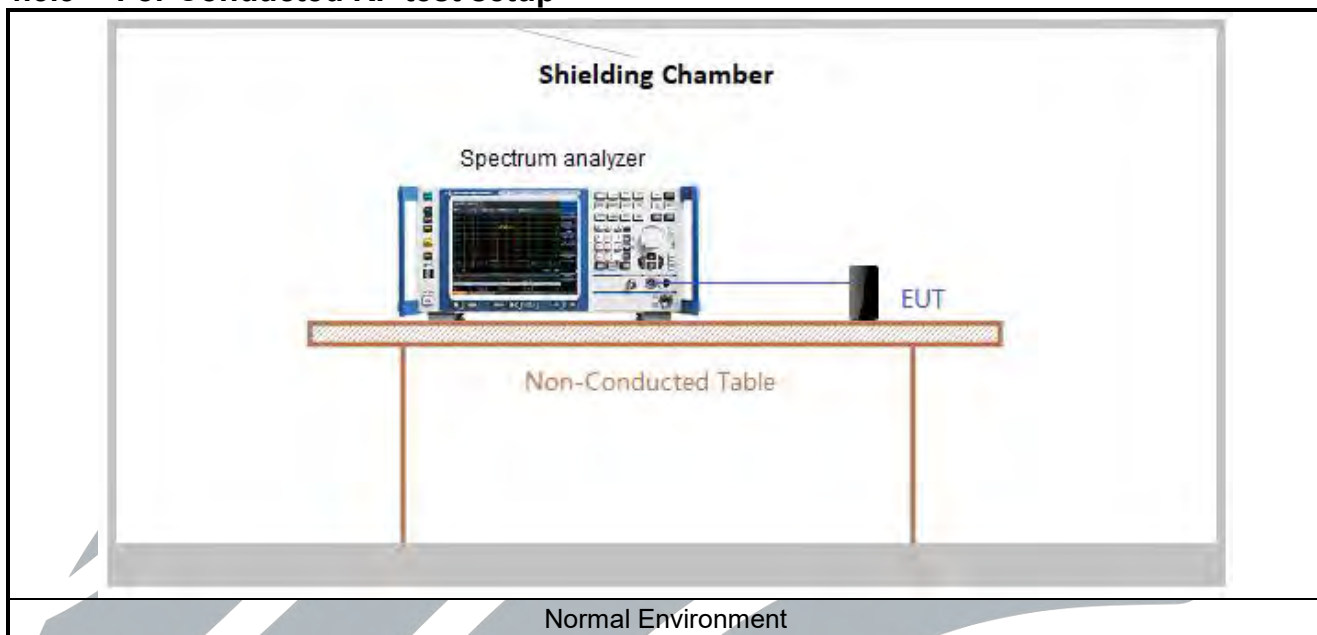
Figure 3. Above 1GHz



4.5.2 For Conducted Emissions test setup



4.5.3 For Conducted RF test setup



4.6 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.7 DUTY CYCLE

Test Procedure: ANSI C63.10-2013 Clause 12.2.

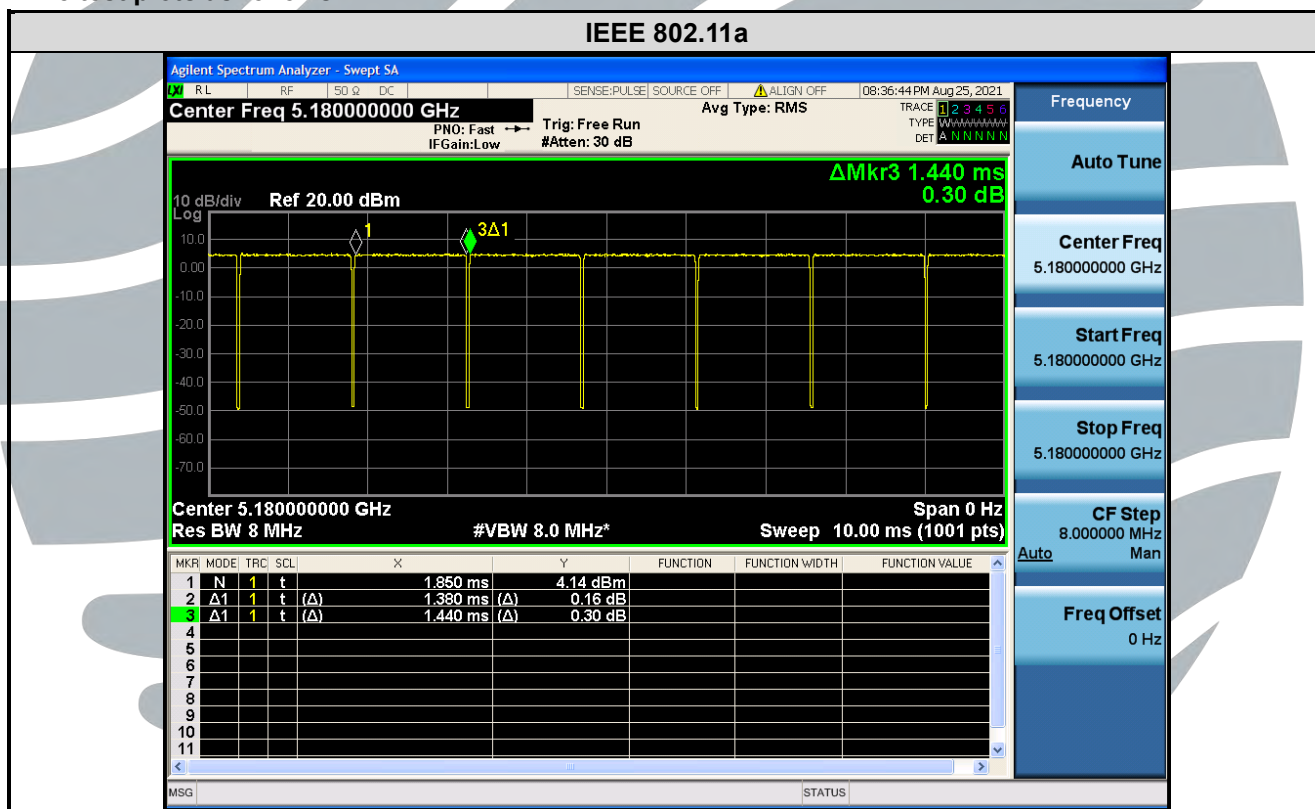
Test Results

Mode	Data rates (Mbps)	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/ T Minimum VBW (kHz)	Average Factor (dB)
IEEE 802.11a	6	1.3800	1.4400	0.96	95.83	0.18	0.72	-0.37
IEEE 802.11n-HT20	MCS0	1.2900	1.3500	0.96	95.56	0.20	0.78	-0.39
IEEE 802.11n-HT40	MCS0	0.6300	0.7000	0.90	90.00	0.46	1.59	-0.92
IEEE 802.11ac-VHT20	MCS0	1.3000	1.3600	0.96	95.59	0.20	0.77	-0.39
IEEE 802.11ac-VHT40	MCS0	0.6400	0.7100	0.90	90.14	0.45	1.56	-0.90
IEEE 802.11ac-VHT80	MCS0	0.3150	0.3650	0.86	86.30	0.64	3.17	-1.28

Remark:

- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = $10 * \log(1/ \text{Duty cycle})$;
- 3) Average factor = $20 \log_{10} \text{Duty Cycle}$.

The test plots as follows



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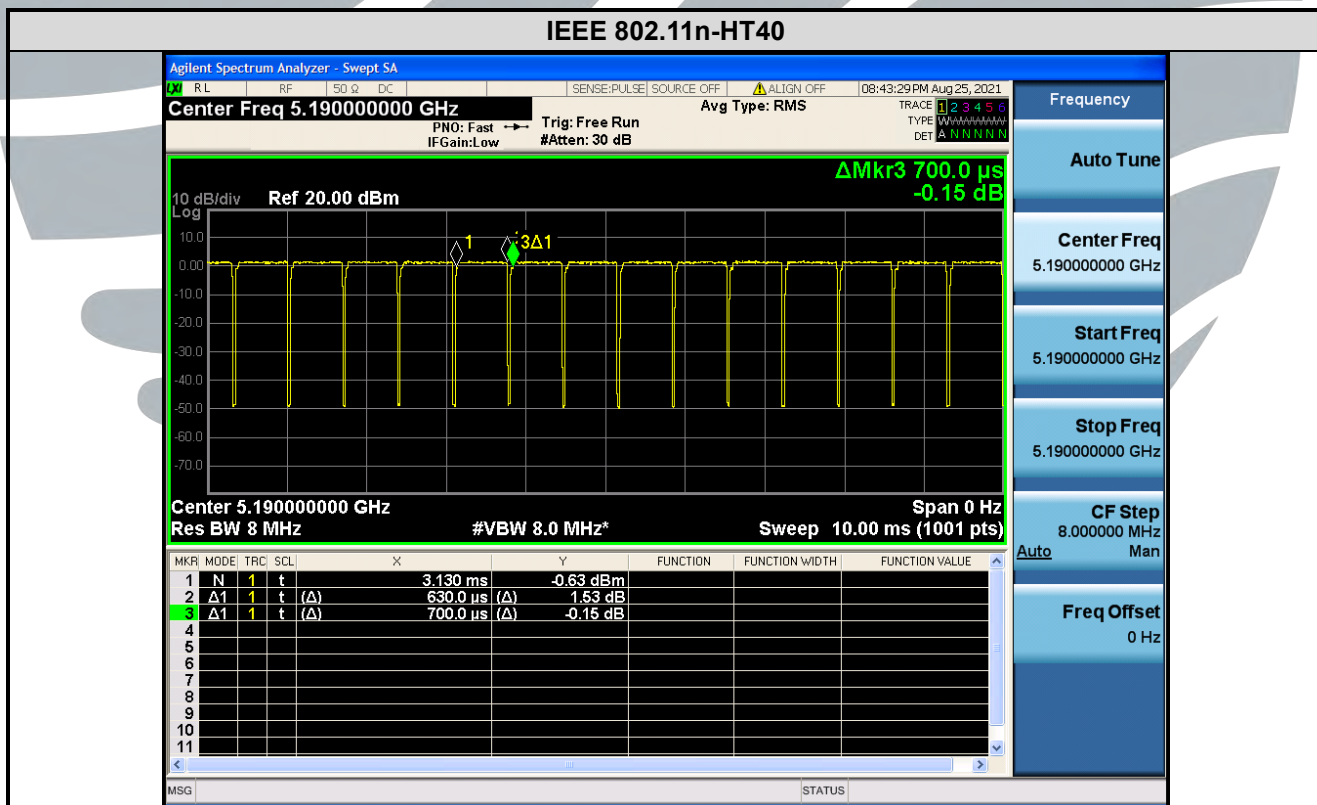
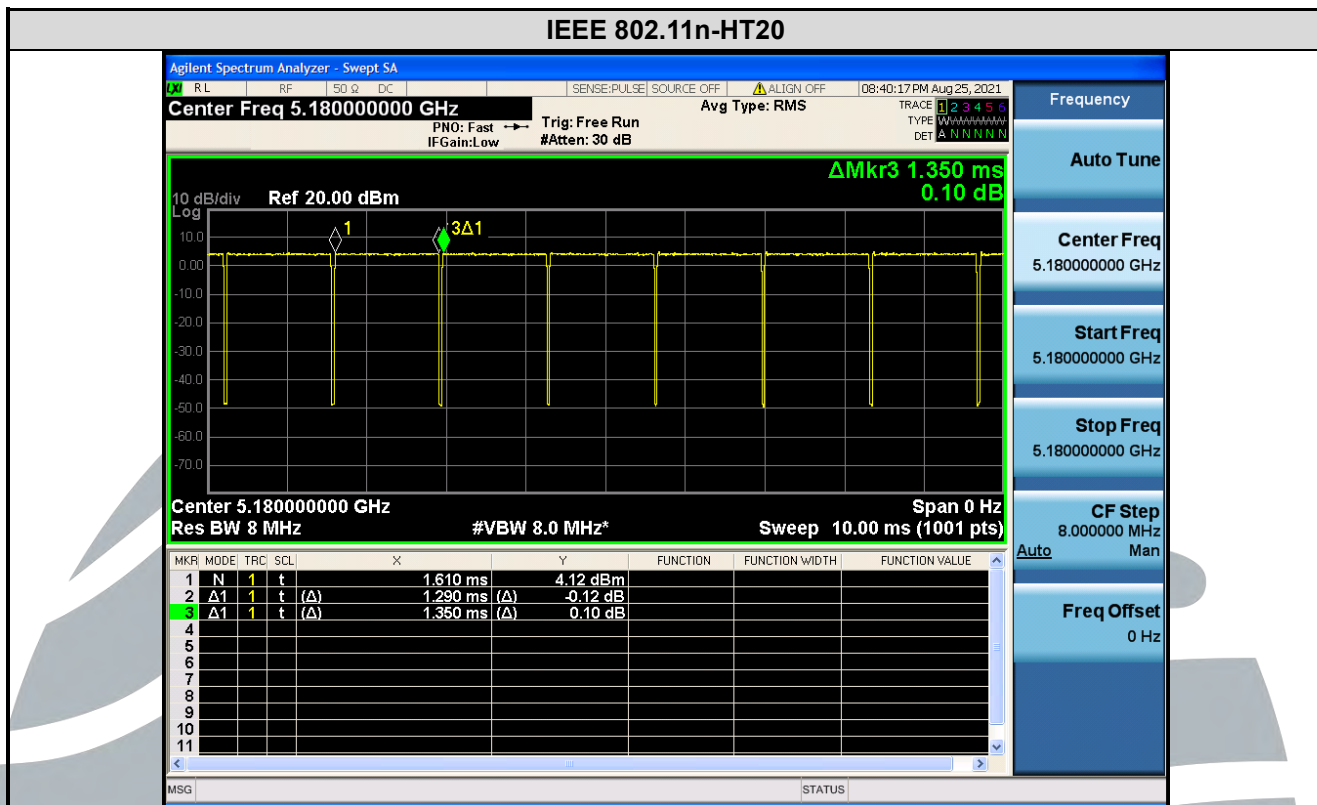
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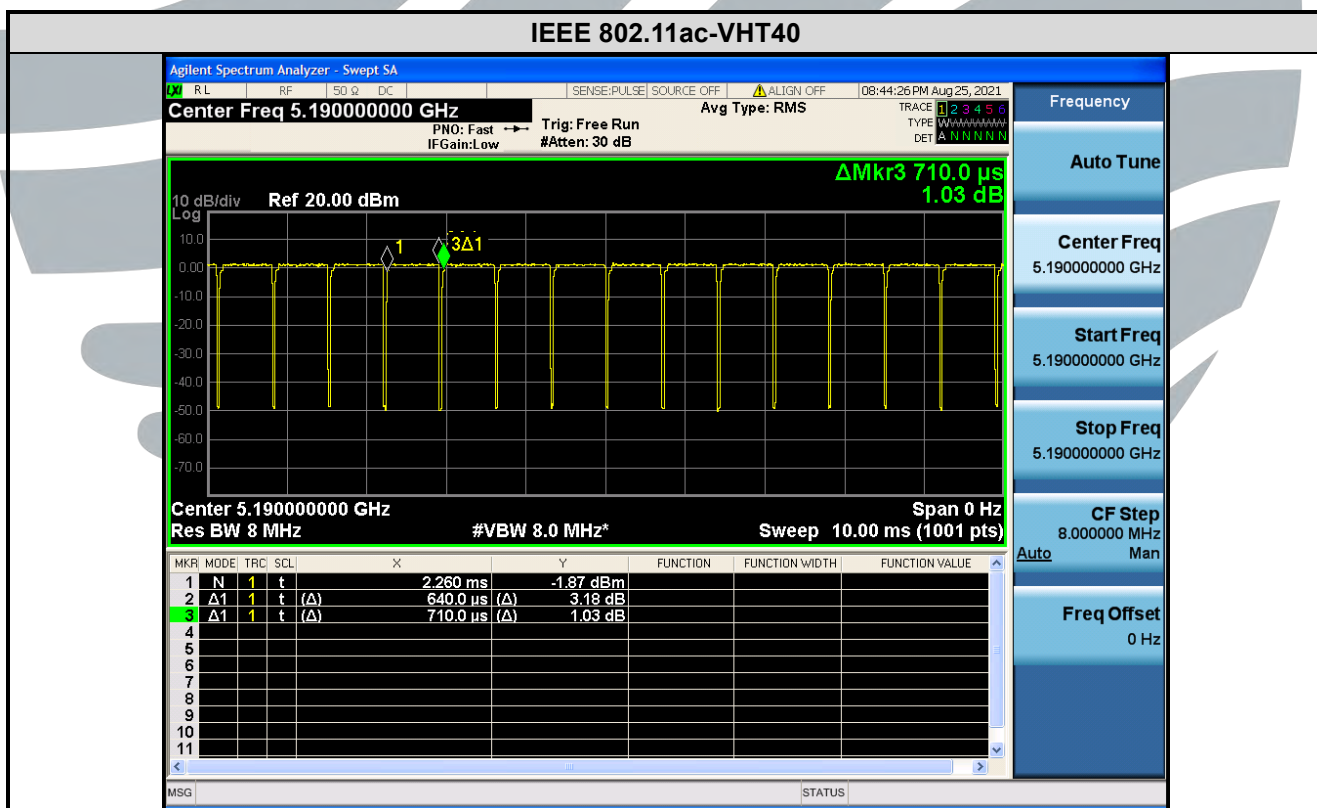
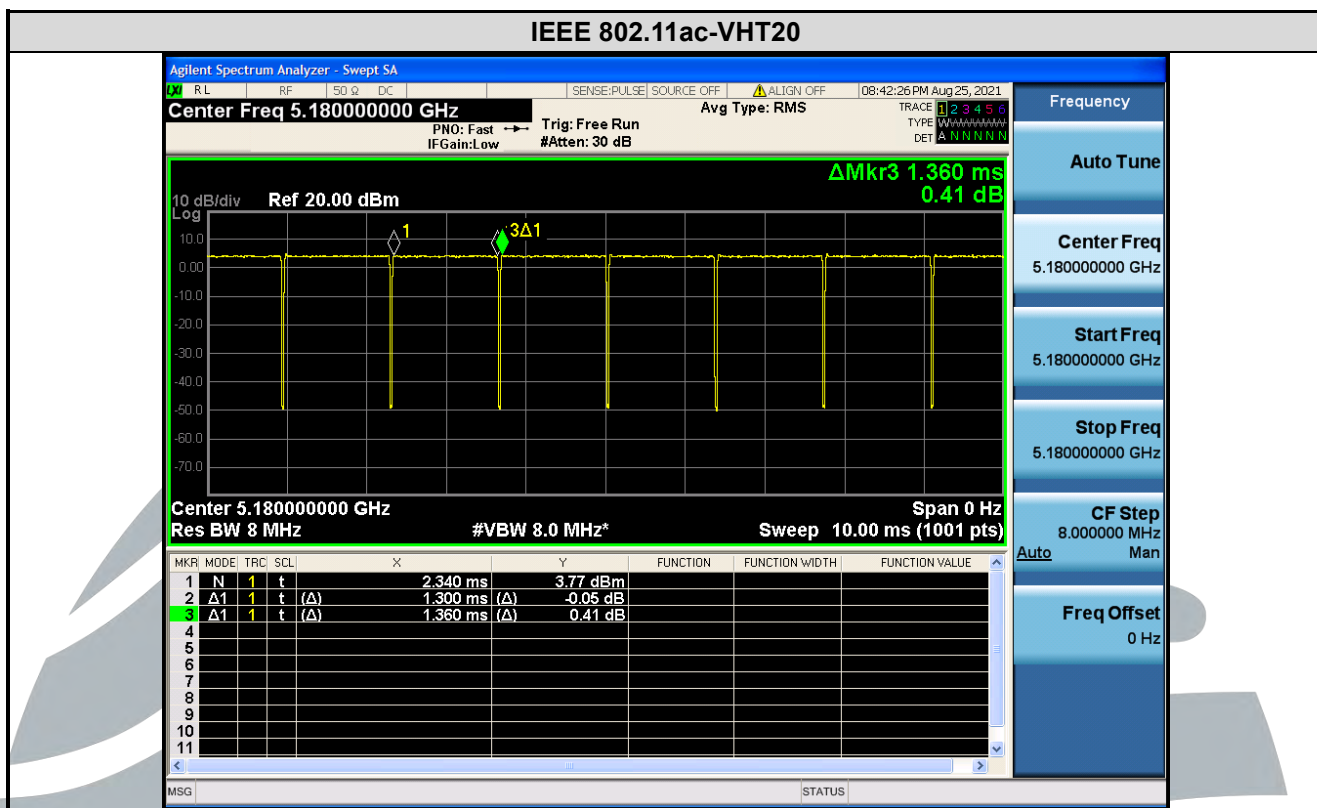
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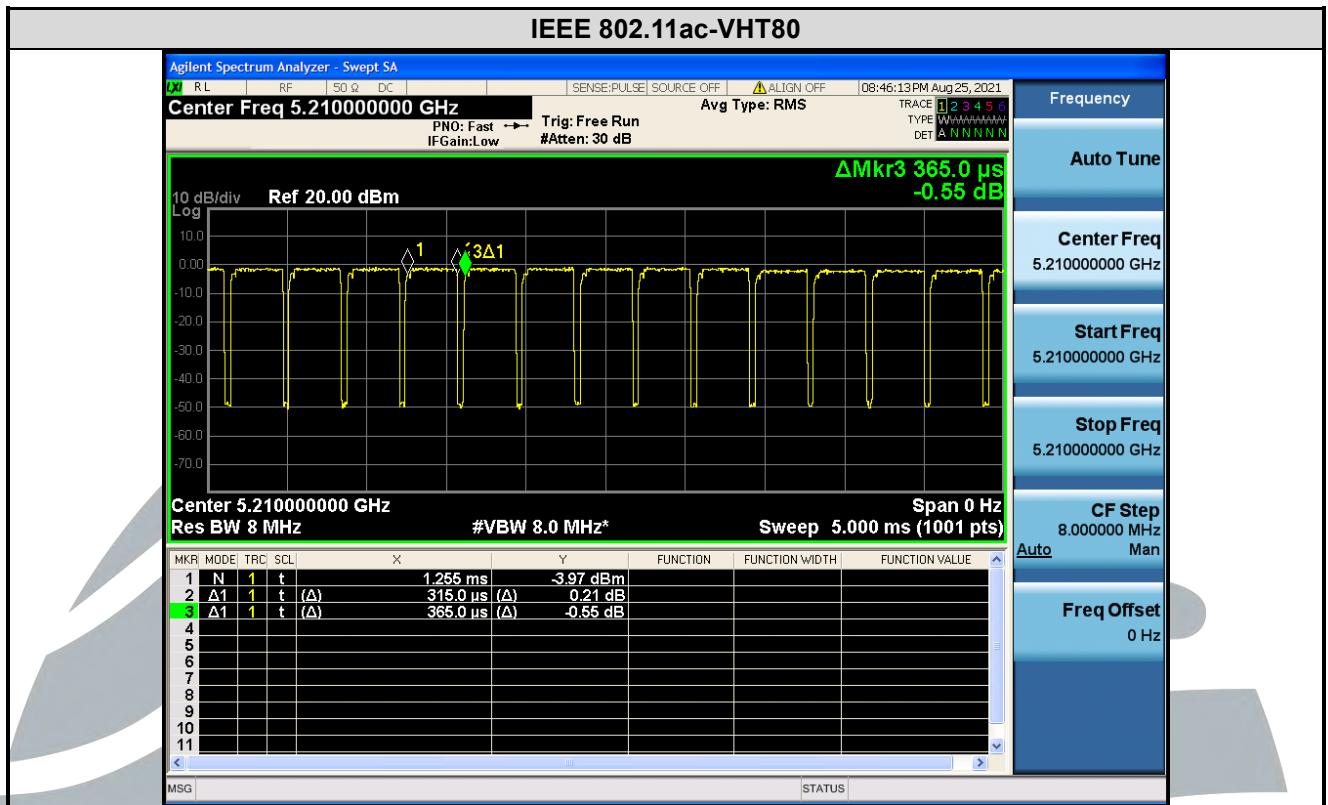
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5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	RSS-247 Issue 2	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
4	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
6	KDB 789033 D02 General UNII Test Procedures New Rules v02r01	Guidelines for compliance testing of unlicensed national information infrastructure (U-NII) device part 15, subpart E
7	KDB 905462 D06 802.11 Channel Plans New Rules v02	Operation in U-NII bands -802.11 channel PLAN(\$15.407)
8	KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02	Compliance measurement procedures for Unlicensed –National Information Infrastructure devices operates in the frequency bands 5250 MHz to 5350 MHz and 5470 MHz to 5725 MHz bands incorporating dynamic frequency selection
9	KDB 905462 D03 Client Without DFS New Rules v01r02	U-NII client devices without radar detection capability

5.2 ANTENNA REQUIREMENT

Standard Requirement
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.407(a)(1) (2) requirement: The conducted output power limit specified in paragraph (a) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (a) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the by the amount in dB that the directional gain of the antenna exceeds 6 dBi. RSS-Gen Issue 5, Section 6.8 requirement: According to RSS-Gen Issue 5, Section 6.8, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. EUT Antenna: Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 4.5 dBi.

5.326 DB BANDWIDTH & OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(2)(5)
RSS-247 Issue 2 Section 6.2.1.2

Test Method: KDB 789033 D02 v02r01 Section C.1

Limit: None; for reporting purposes only.

Test Procedure:

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum analyzer.

Spectrum analyzer according to the following Settings:

- Set RBW = approximately 1 % of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

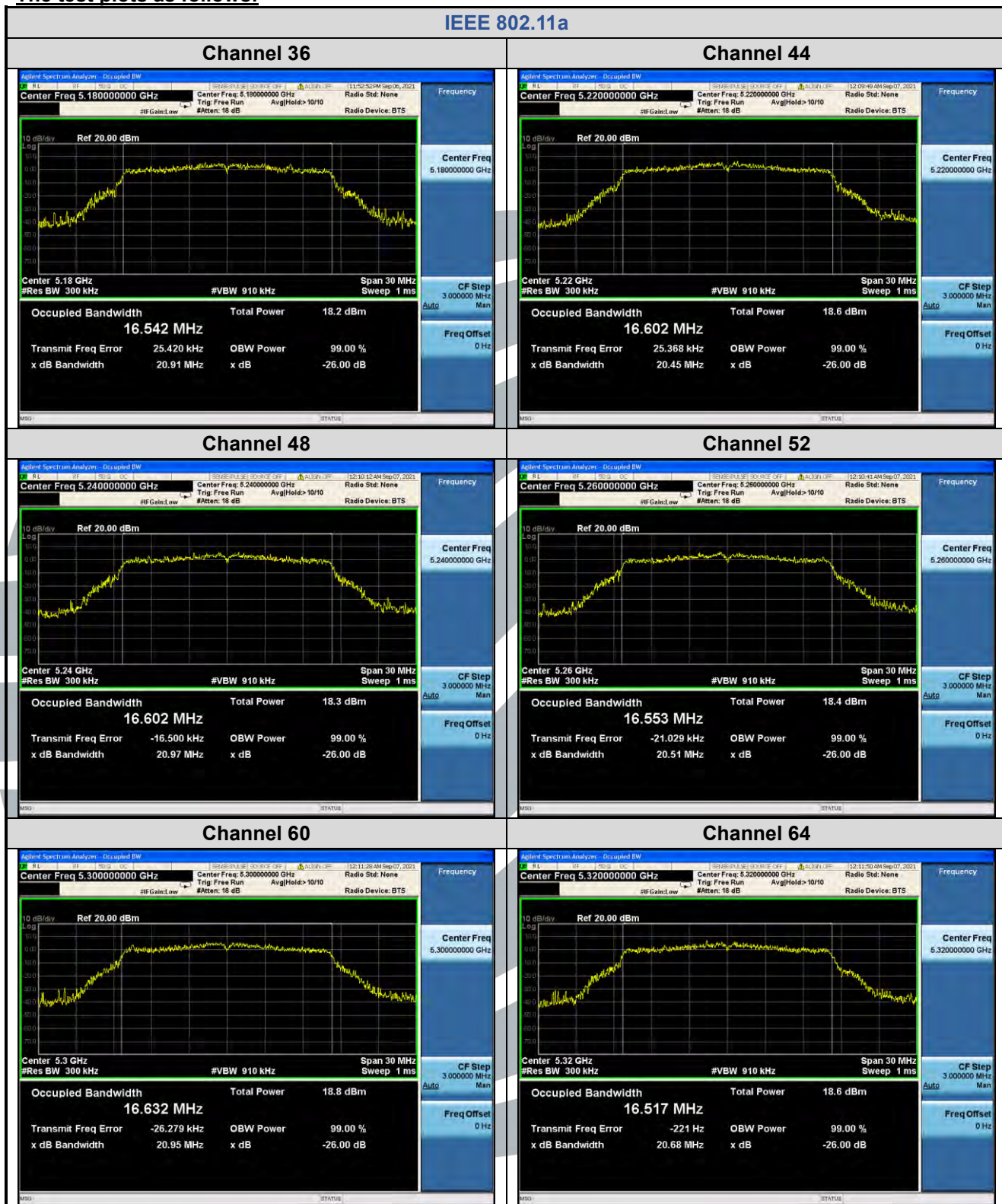
Instruments Used: Refer to section 3 for details

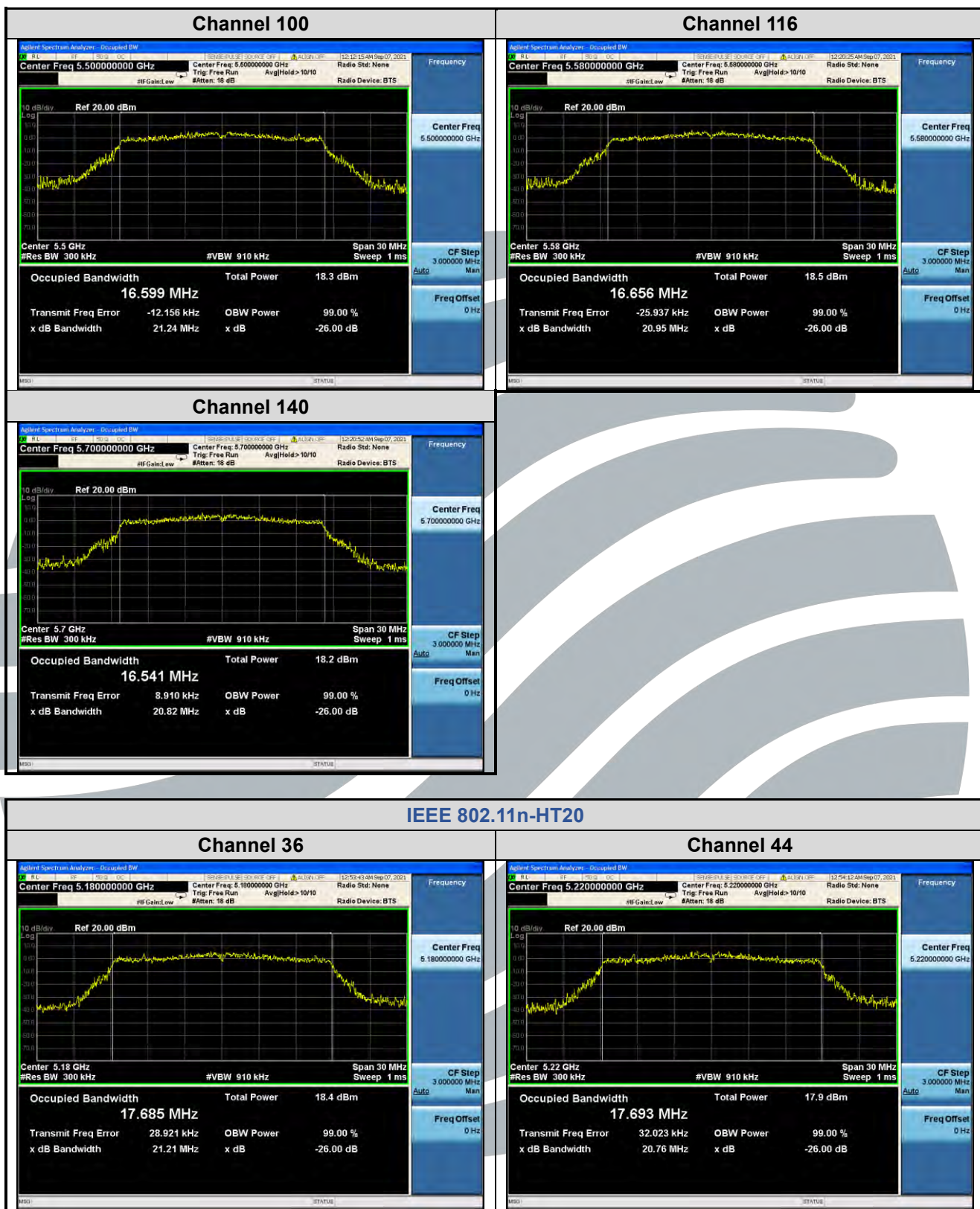
Test Results: Pass

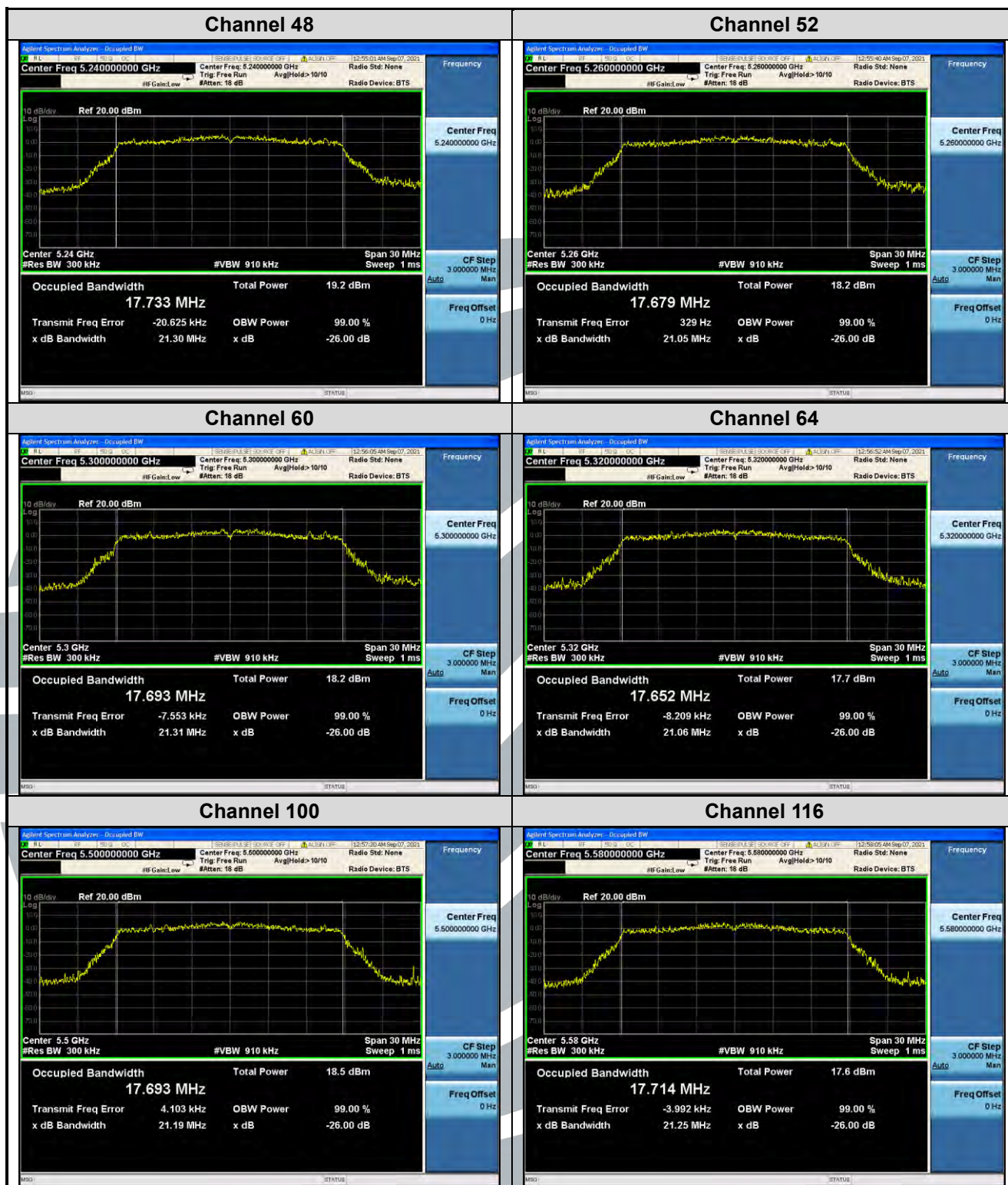
Mode	Channel	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
IEEE 802.11a	36 (5180)	20.91	16.542
	44 (5220)	20.45	16.602
	48 (5240)	20.97	16.602
	52 (5260)	20.51	16.553
	60 (5300)	20.95	16.632
	64 (5320)	20.68	16.517
	100 (5500)	21.24	16.599
	116 (5580)	20.95	16.656
	140 (5700)	20.82	16.541
IEEE 802.11n-HT20	36 (5180)	21.21	17.685
	44 (5220)	20.76	17.693
	48 (5240)	21.30	17.733
	52 (5260)	21.05	17.679
	60 (5300)	21.31	17.693
	64 (5320)	21.06	17.652
	100 (5500)	21.19	17.693
	116 (5580)	21.25	17.714
	140 (5700)	20.82	17.688
IEEE 802.11n-HT40	38 (5190)	39.13	36.108
	46 (5230)	39.28	36.082
	54 (5270)	39.24	36.122
	62 (5310)	39.65	36.075
	102 (5510)	39.14	36.069
	110 (5550)	39.47	36.099
	134 (5670)	39.57	36.160

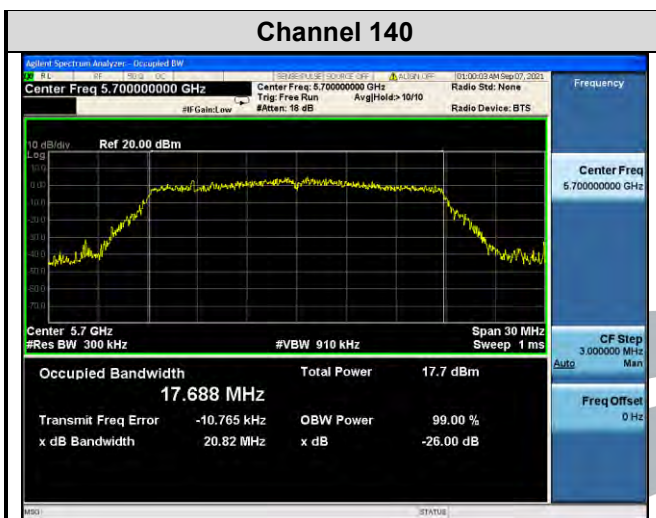
Mode	Channel	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
IEEE 802.11ac-VHT20	36 (5180)	21.08	17.711
	44 (5220)	20.82	17.694
	48 (5240)	21.12	17.678
	52 (5260)	20.81	17.646
	60 (5300)	20.97	17.717
	64 (5320)	21.25	17.679
	100 (5500)	21.17	17.682
	116 (5580)	21.13	17.694
	140 (5700)	20.81	17.654
IEEE 802.11ac-VHT40	38 (5190)	40.02	36.127
	46 (5230)	39.37	36.093
	54 (5270)	39.42	36.125
	62 (5310)	39.49	36.091
	102 (5510)	39.31	36.092
	110 (5550)	39.44	36.074
	134 (5670)	39.39	36.073
	42 (5210)	81.04	75.421
IEEE 802.11ac-VHT80	58 (5290)	80.37	75.404
	106 (5530)	80.62	75.469

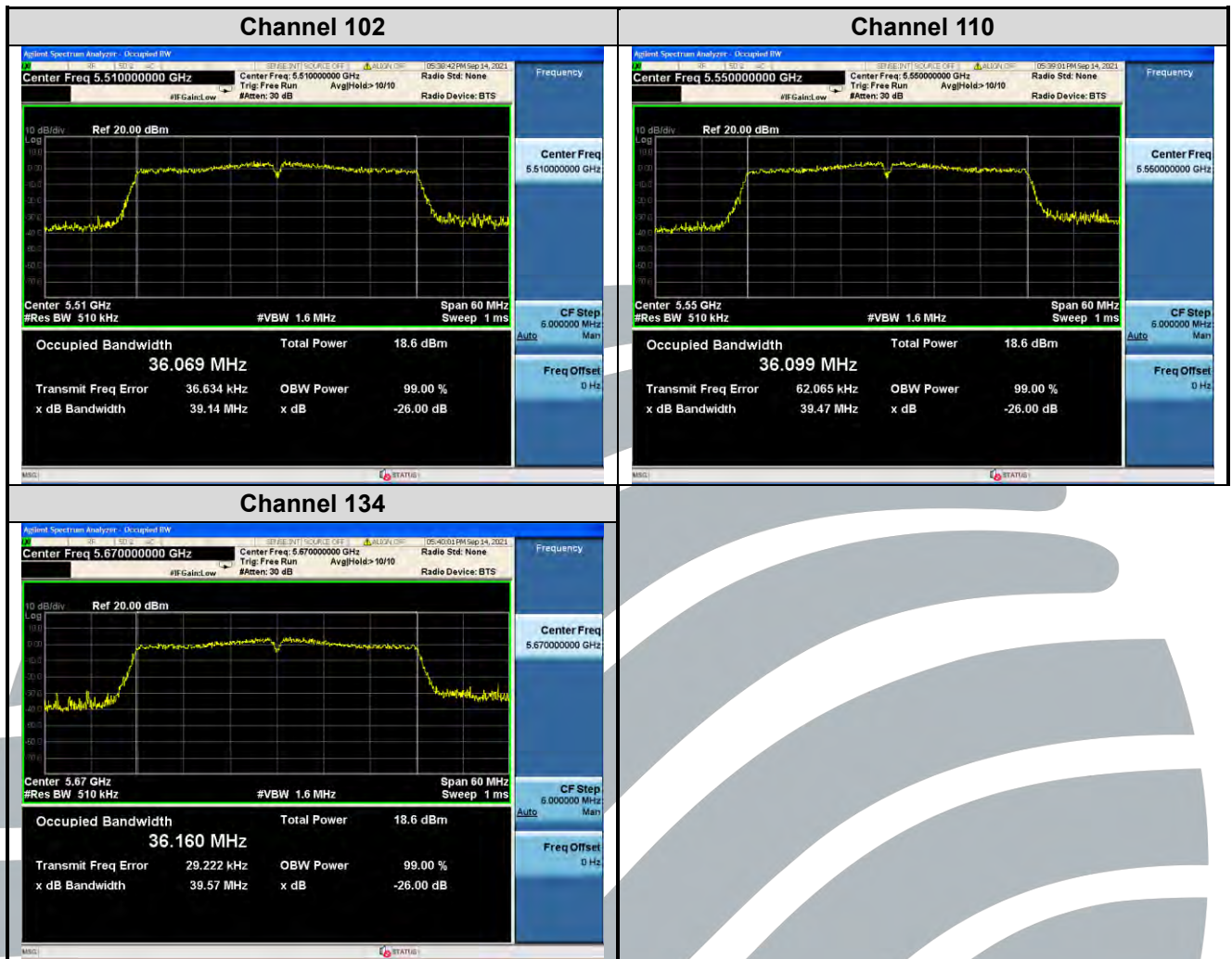
The test plots as follows:











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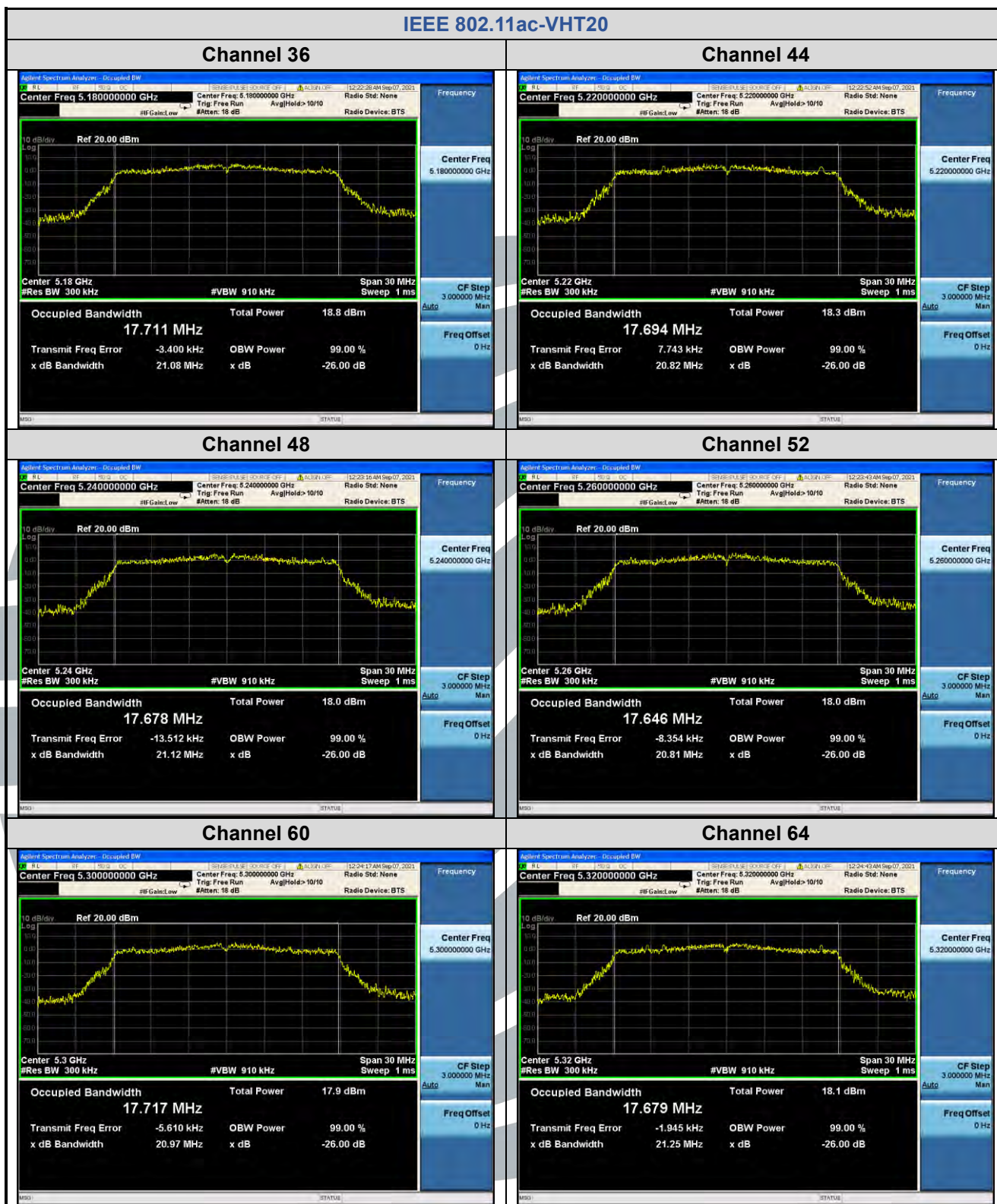
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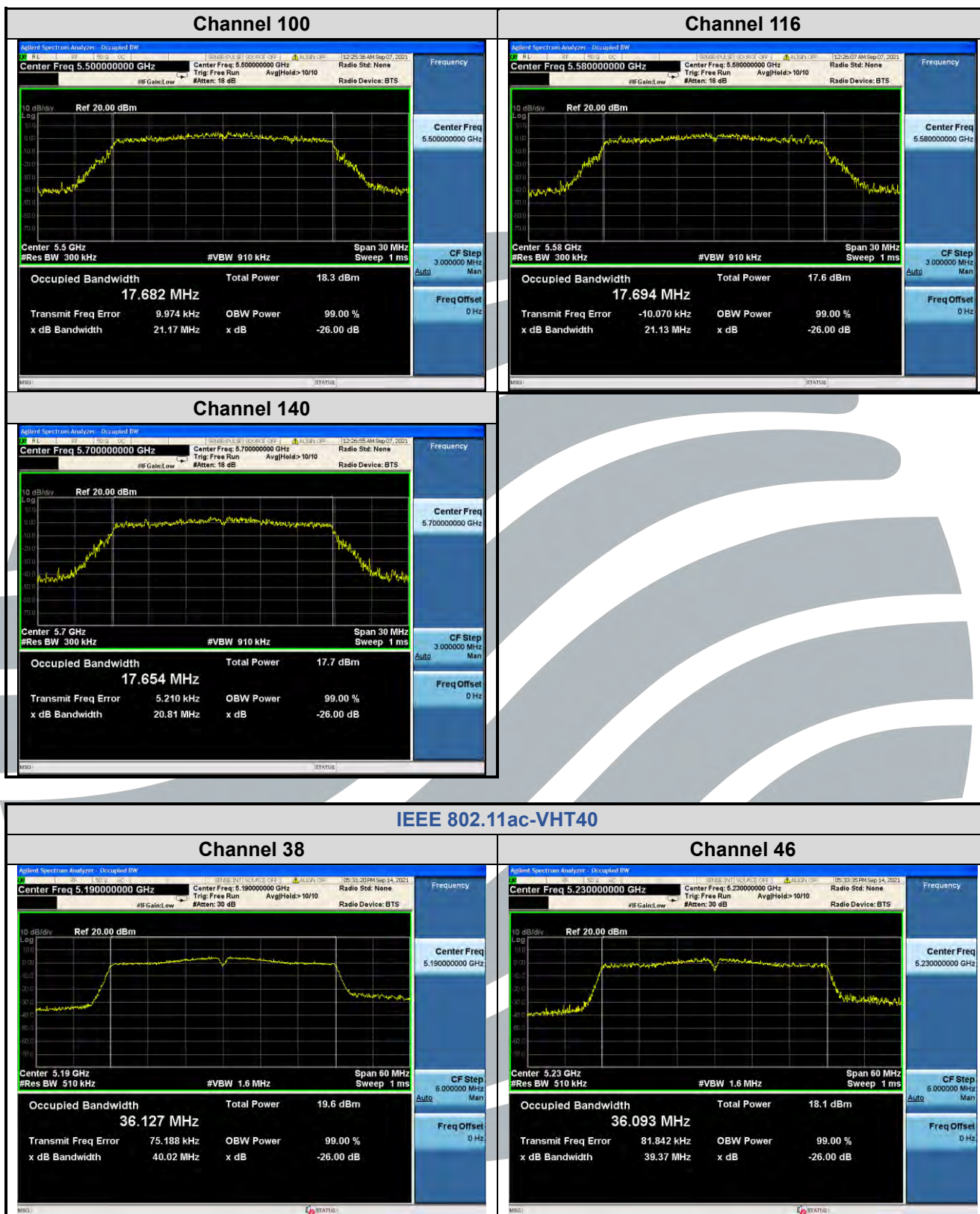
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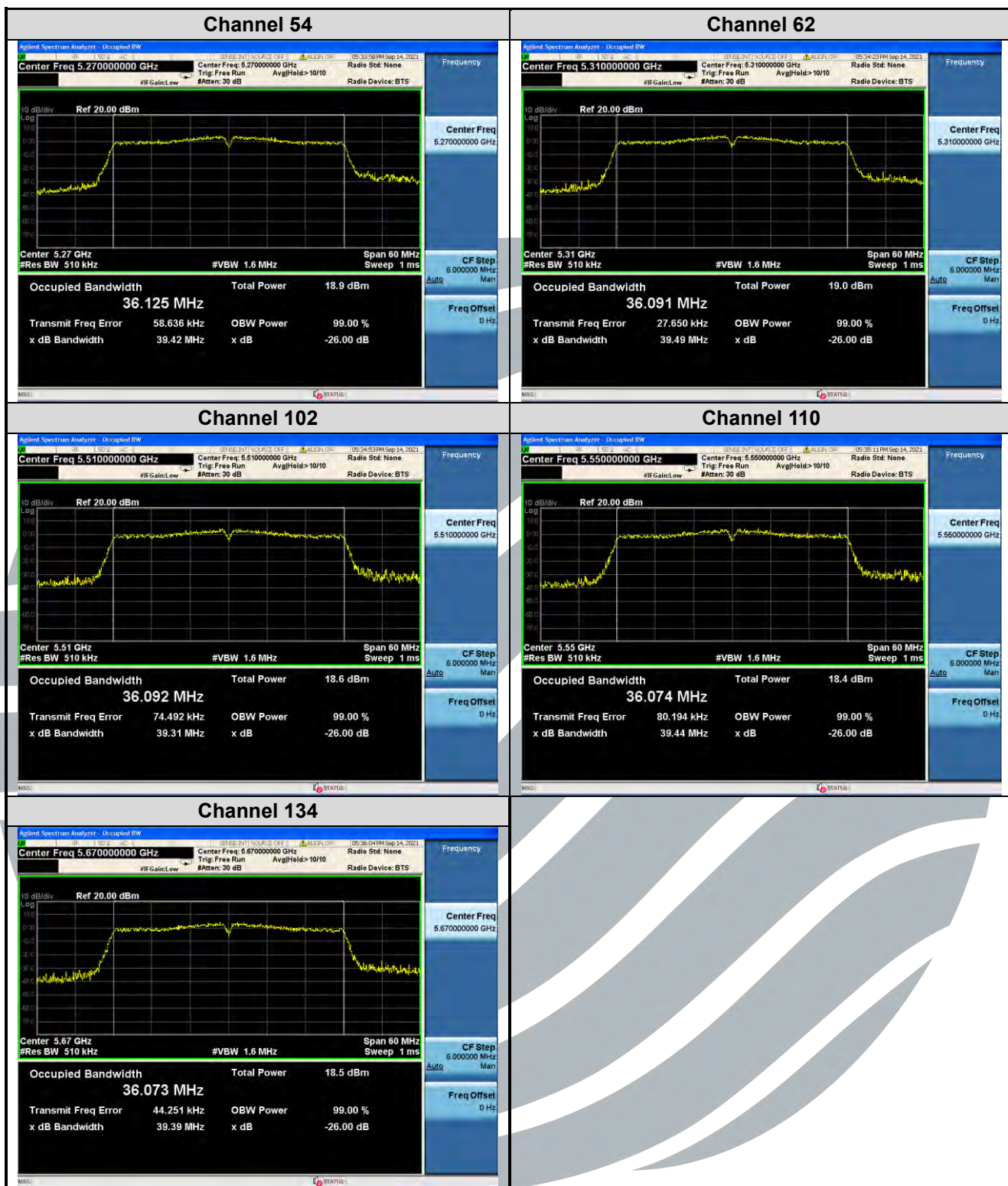
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5.46 DB BANDWIDTH & OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (e)
RSS-247 Issue 2 Section 6.2.4.1

Test Method: KDB 789033 D02 v02r01 Section C.2

Limit: Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure:

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer.

Spectrum analyzer according to the following Settings:

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 * \text{RBW}$.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

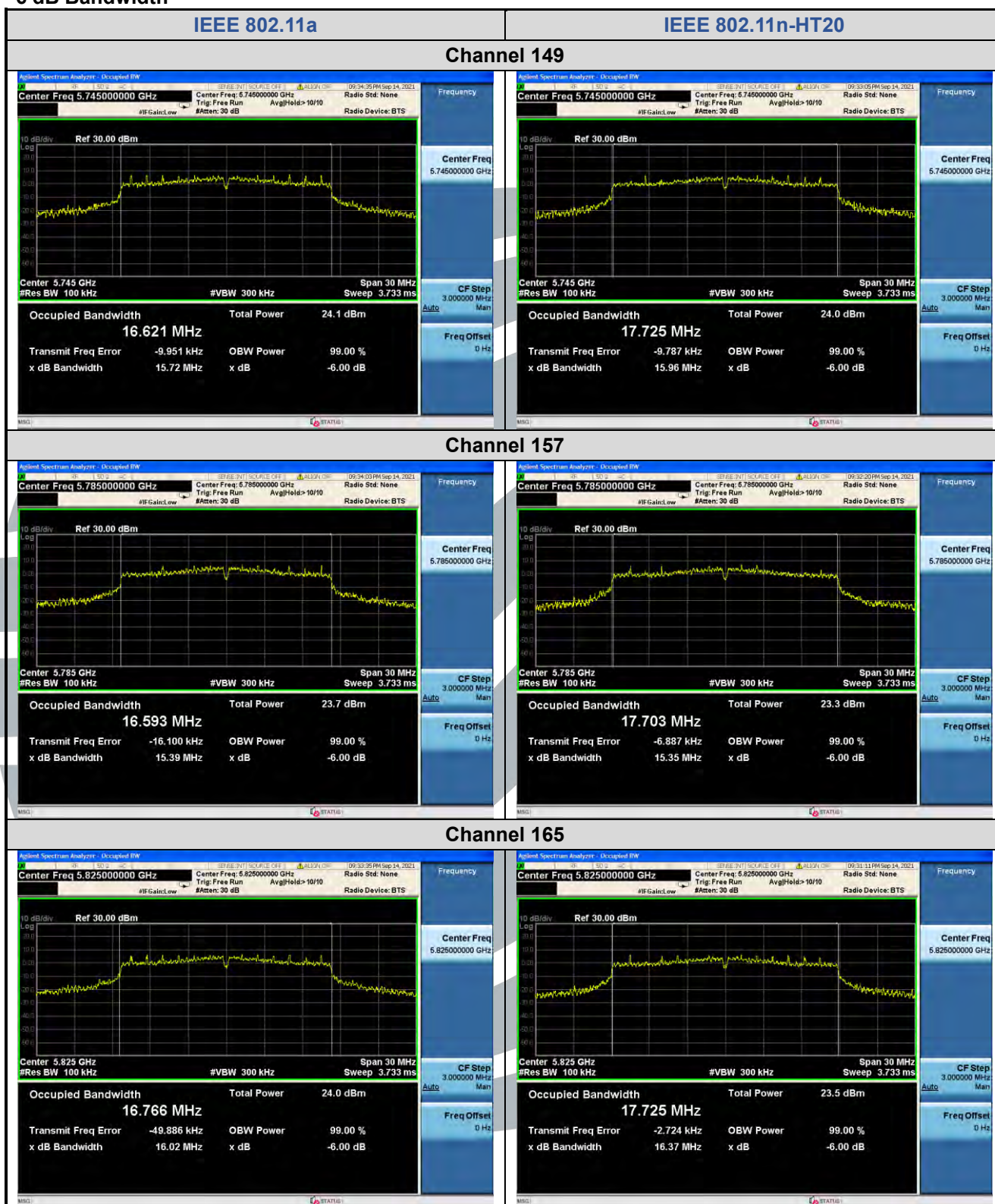
Test Results: Pass

Test Data:

Mode	Channel/ Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limit	Pass / Fail
IEEE 802.11a	149 (5745)	15.72	16.972	> 500 kHz	Pass
	157 (5785)	15.39	16.868	> 500 kHz	Pass
	165 (5825)	16.02	16.893	> 500 kHz	Pass
IEEE 802.11n-HT20	149 (5745)	15.96	17.837	> 500 kHz	Pass
	157 (5785)	15.35	17.924	> 500 kHz	Pass
	165 (5825)	16.37	17.855	> 500 kHz	Pass
IEEE 802.11n-HT40	151 (5755)	35.14	36.506	> 500 kHz	Pass
	159 (5795)	35.31	36.431	> 500 kHz	Pass
IEEE 802.11ac-VHT20	149 (5745)	15.45	17.915	> 500 kHz	Pass
	157 (5785)	15.09	17.895	> 500 kHz	Pass
	165 (5825)	15.15	17.873	> 500 kHz	Pass
IEEE 802.11ac-VHT40	151 (5755)	35.20	36.494	> 500 kHz	Pass
	159 (5795)	35.47	36.591	> 500 kHz	Pass
IEEE 802.11ac-VHT80	155 (5775)	75.15	75.747	> 500 kHz	Pass

The test plots as follows:

6 dB Bandwidth



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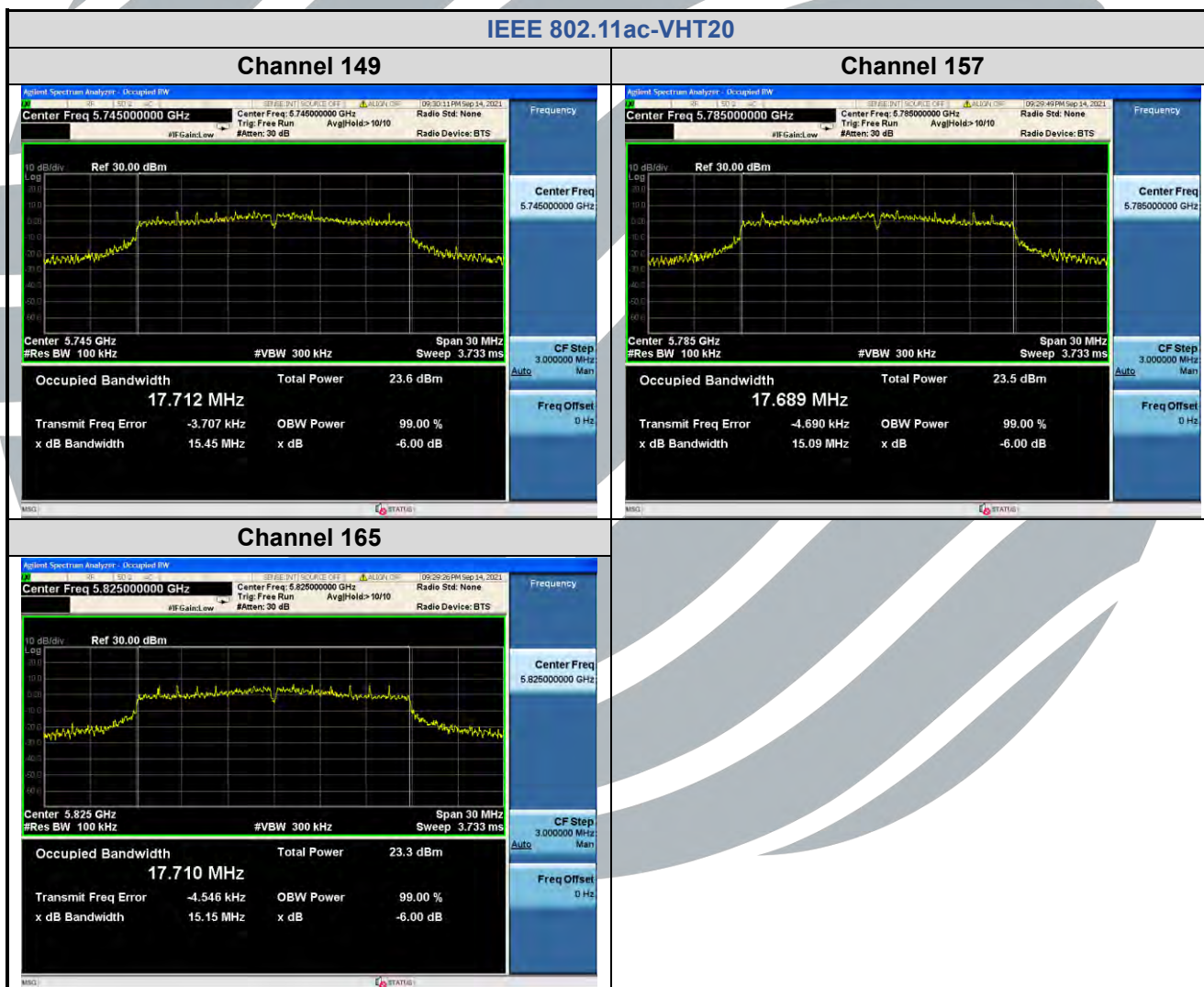
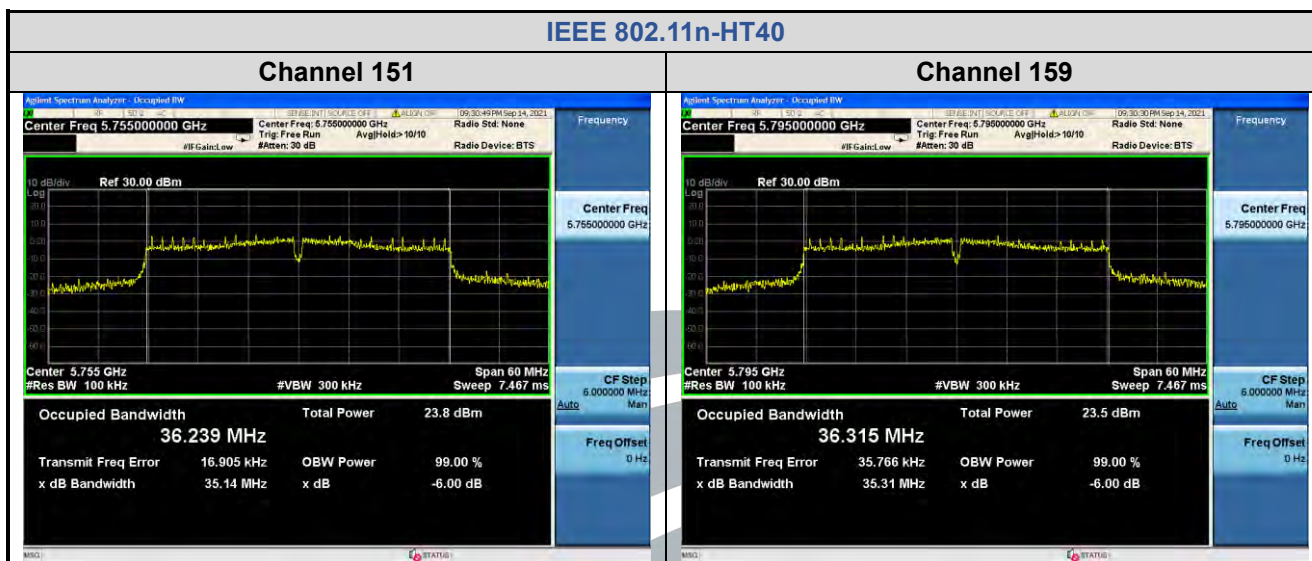
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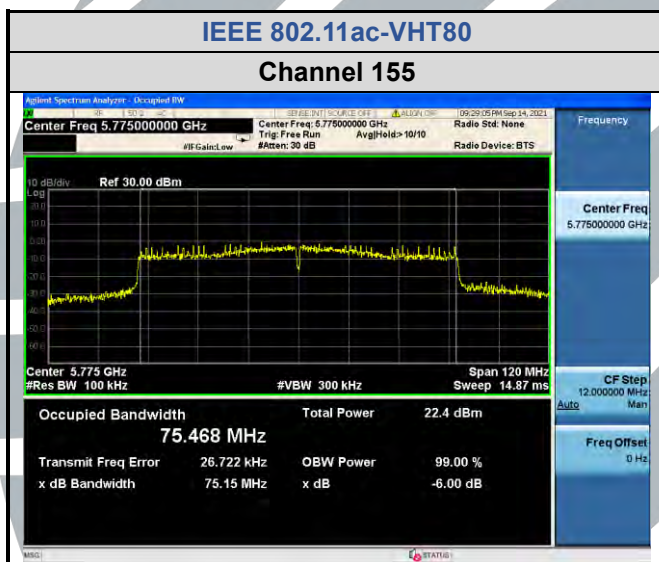
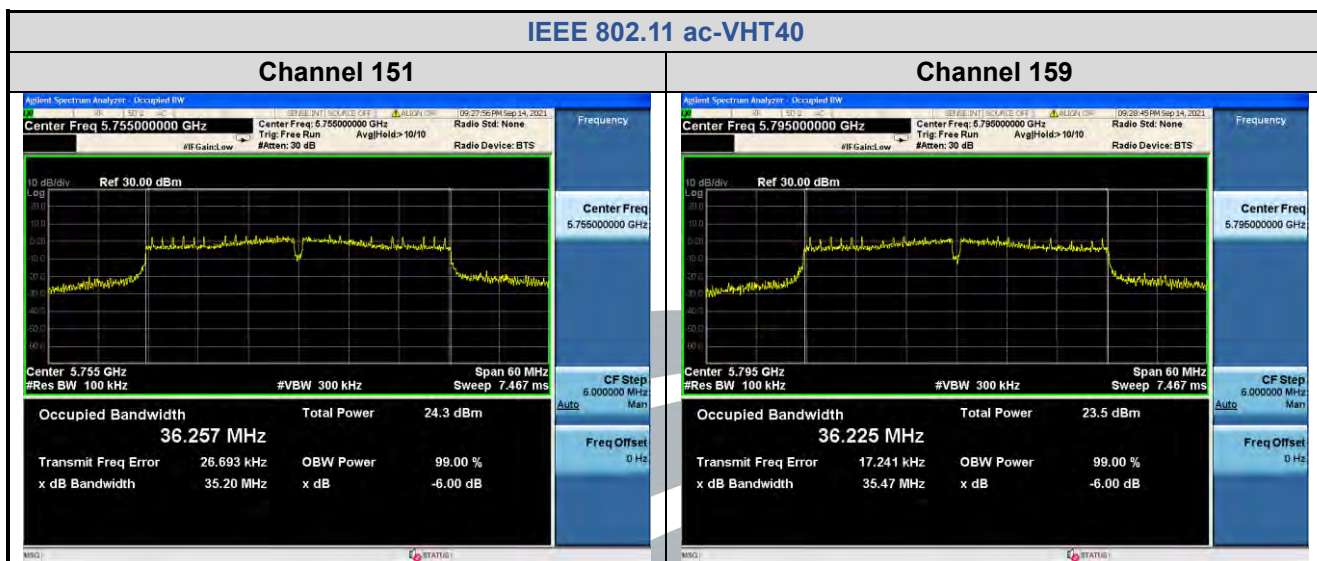
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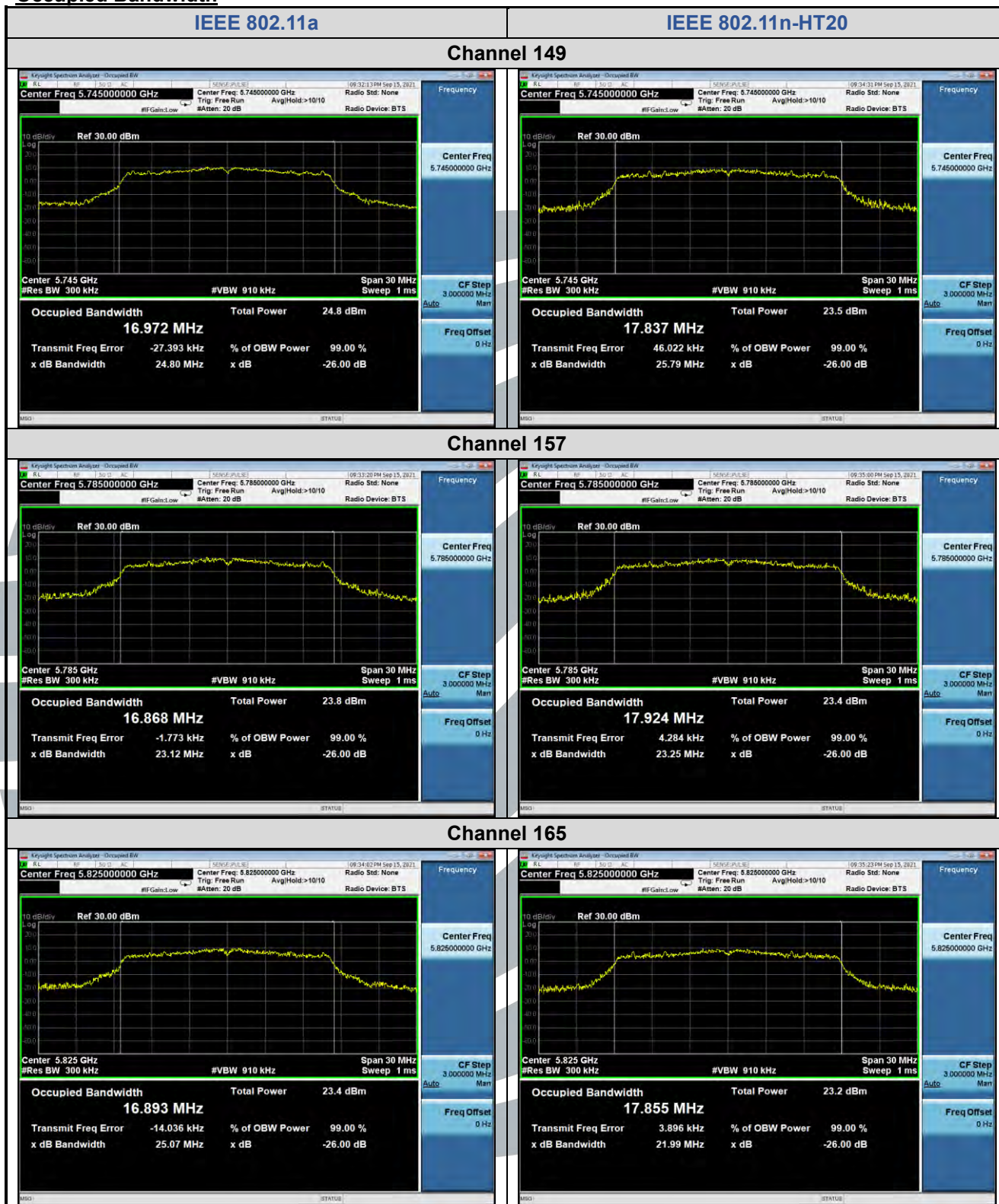
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Occupied Bandwidth



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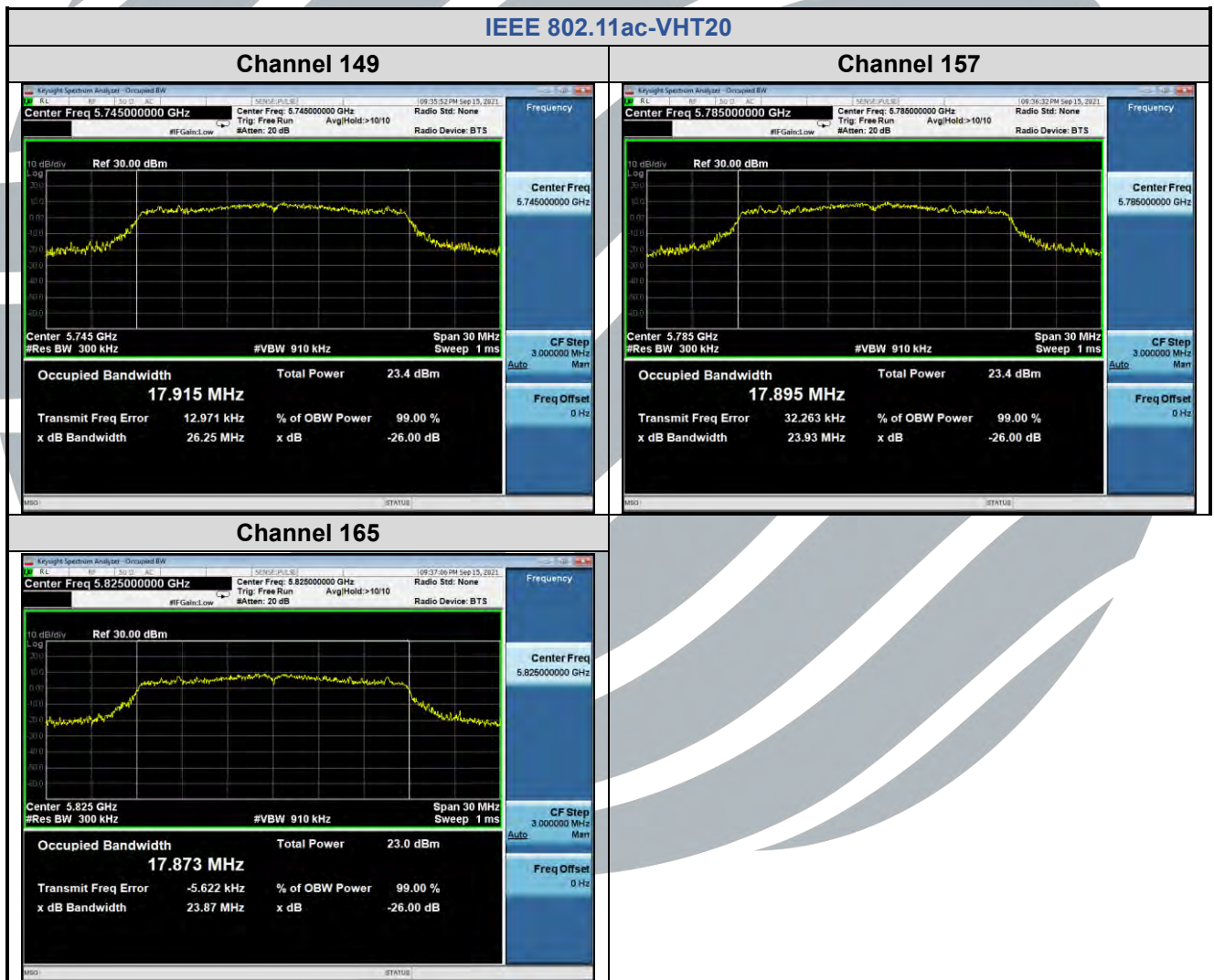
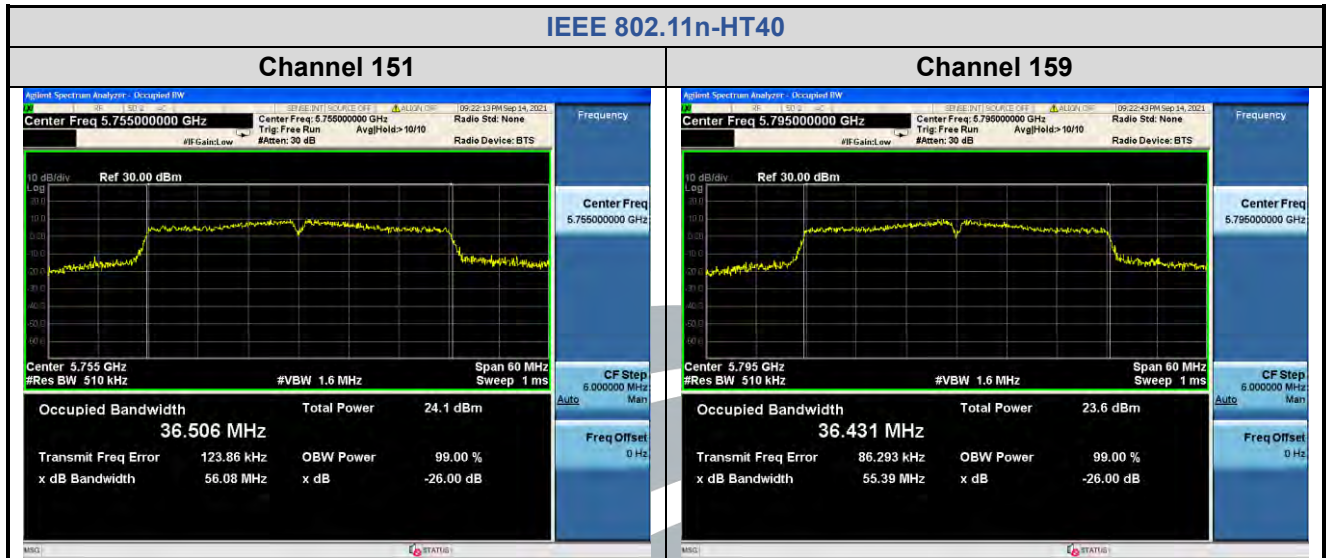
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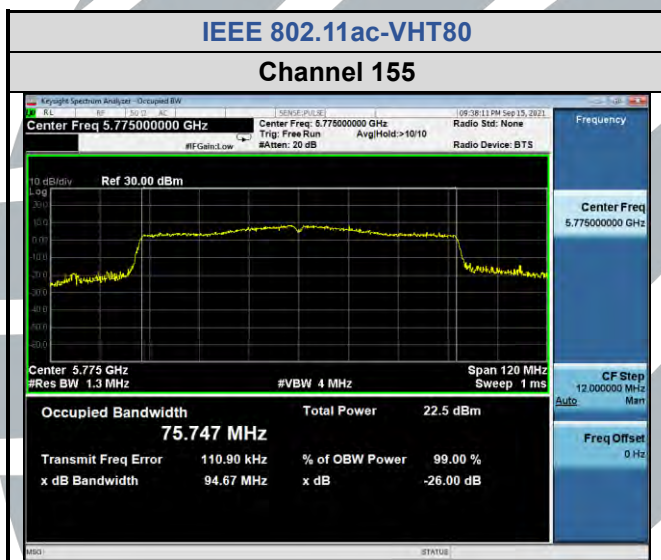
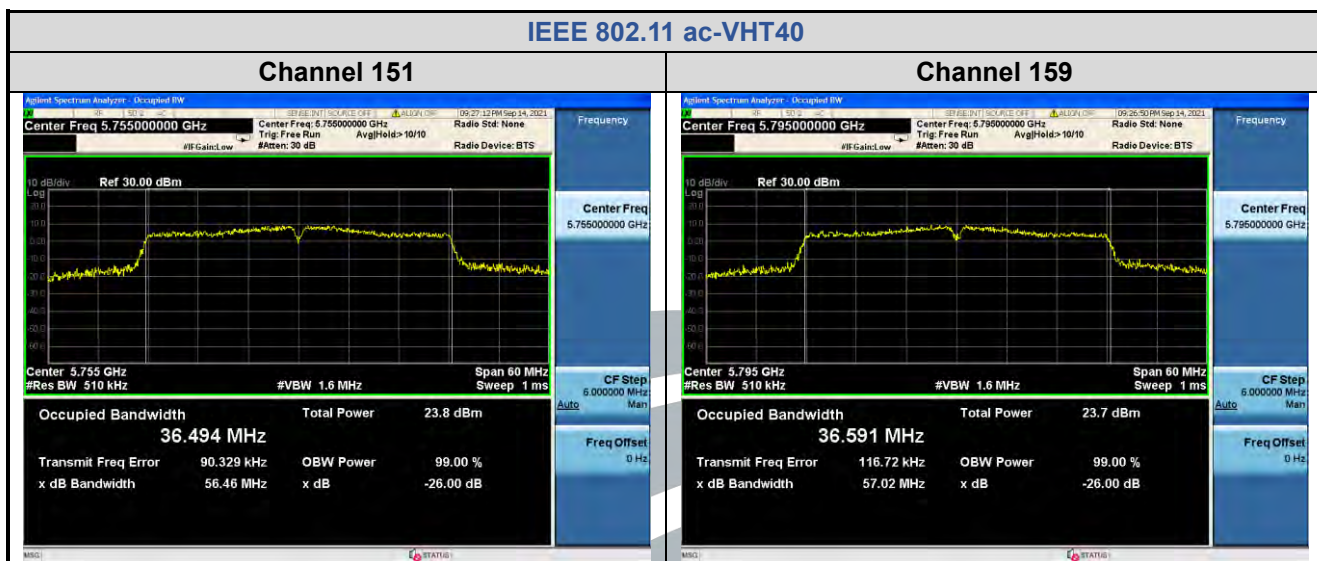
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5.5 MAXIMUM CONDUCTED OUTPUT POWER OR E.I.R.P

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)
RSS-247 Issue 2 Section 6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1

Test Method: KDB 789033 D02 v02r01 Section E.3.a (Method PM)

Limits: FCC 47 CFR Part 15 Subpart E

1. For the band 5.15-5.25 GHz.

(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. In addition, the maximum power spectral density shall not exceed 17 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. 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).

(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. In addition, the maximum power spectral density shall not exceed 17 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.

(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. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For 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. In addition, 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.

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 $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, 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.

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. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

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Limits: RSS-247 Issue 2

1. Frequency band 5150-5250 MHz

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

2. Frequency band 5250-5350 MHz

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

Devices, other than devices installed in vehicles, shall comply with the following:

- a) The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;
- b) The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less, B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Additional requirements

In addition to the above requirements, devices shall comply with the following, where applicable:

- a) Outdoor fixed devices with a maximum e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. at different elevations, where θ is the angle above the local horizontal plane (of the Earth) as shown below:

i. -13 dBW/MHz	for $0^\circ \leq \theta < 8^\circ$
ii. $-13 - 0.716 (\theta - 8)$ dBW/MHz	for $8^\circ \leq \theta < 40^\circ$
iii. $-35.9 - 1.22 (\theta - 40)$ dBW/MHz	for $40^\circ \leq \theta \leq 45^\circ$
iv. -42 dBW/MHz	for $\theta > 45^\circ$

The measurement procedure defined in Annex A of this document shall be used to verify the compliance to the e.i.r.p. at different elevations.

- b) Devices, other than outdoor fixed devices, having an e.i.r.p. greater than 200 mW shall comply with either i. or ii. below:
 - i. devices shall comply with the e.i.r.p. elevation mask in 6.2.2.3(a); or
 - ii. devices shall implement a method to permanently reduce their e.i.r.p. via a firmware feature in the event that the Department requires it. The test report must demonstrate how the device's power table can be updated to meet this firmware requirement. The manufacturer shall provide this firmware to update all systems automatically in compliance with the directions received from the Department.

3. Frequency bands 5470-5600 MHz and 5650-5725 MHz

The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

4. Frequency band 5725-5850 MHz

The maximum conducted output power shall not exceed 1 W. The output power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices

operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint³ systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

Test Procedure:

1. Connected the EUT's antenna port to measure device by 10dB attenuator.
2. Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of Tx on burst.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

Directional gain and the maximum output power limit.
RSS-247 Issue 2

Frequency Band	Antenna Gain (dBi)	Power Limits (dBm)
U-NII-1	4.50	23.00
U-NII-2A	4.50	24.00
U-NII-2C	4.50	24.00
U-NII-3	4.50	30.00

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Frequency Band	Antenna Gain (dBi)	Power Limits (dBm)
U-NII-1	4.50	24.00
U-NII-2A	4.50	24.00
U-NII-2C	4.50	24.00
U-NII-3	4.50	30.00

Frequency band 5150-5250 MHz

RSS-247 Issue 2:

For IEEE 802.11a, the minimum 99% emission bandwidth is 16.542 MHz

$10 \text{ dBm} + 10\log_{10}(16.542) = 22.19 \text{ dBm} < 23 \text{ dBm}$

So the 22.19dB limit applicable

For IEEE 802.11n-HT20/ ac-VHT20, the minimum 99% emission bandwidth is 17.678MHz

$10 \text{ dBm} + 10\log_{10}(17.678) = 22.47 \text{ dBm} < 23 \text{ dBm}$

So the 22.47dB limit applicable

For IEEE 802.11n-HT40/ ac-VHT40/ ac-VHT80, the minimum 99% emission bandwidth is 36.082 MHz

$10 \text{ dBm} + 10\log_{10}(36.082) = 25.57 \text{ dBm} > 23 \text{ dBm}$

So the 23 dB limit applicable

Mode	Channel/ Frequency (MHz)	Maximum e.i.r.p (dBm)	Limit (dBm)	Pass / Fail
IEEE 802.11a	36 (5180)	18.80	22.19	Pass
	44 (5220)	18.71	22.19	Pass
	48 (5240)	18.88	22.19	Pass
IEEE 802.11n-HT20	36 (5180)	18.51	22.47	Pass
	44 (5220)	18.45	22.47	Pass
	48 (5240)	18.35	22.47	Pass
IEEE 802.11n-HT40	38 (5190)	19.48	23.00	Pass
	46 (5230)	19.50	23.00	Pass
IEEE 802.11ac-VHT20	36 (5180)	18.48	22.47	Pass
	44 (5220)	18.44	22.47	Pass
	48 (5240)	18.37	22.47	Pass
IEEE 802.11ac-VHT40	38 (5190)	19.53	23.00	Pass
	46 (5230)	19.45	23.00	Pass
IEEE 802.11ac-VHT80	42 (5210)	17.28	23.00	Pass

Remark:

- Maximum e.i.r.p = Maximum conducted output power + Antenna Gain

FCC 47 CFR Part 15 Subpart E:

Mode	Channel/ Frequency (MHz)	Maximum conducted output power (dBm)		Limit (dBm)	Pass / Fail
		Meas Power	Corr'd Power		
IEEE 802.11a	36 (5180)	14.12	14.30	24.00	Pass
	44 (5220)	14.03	14.21	24.00	Pass
	48 (5240)	14.20	14.38	24.00	Pass
IEEE 802.11n-HT20	36 (5180)	13.81	14.01	24.00	Pass
	44 (5220)	13.75	13.95	24.00	Pass
	48 (5240)	13.65	13.85	24.00	Pass
IEEE 802.11n-HT40	38 (5190)	14.52	14.98	24.00	Pass
	46 (5230)	14.54	15.00	24.00	Pass
IEEE 802.11ac-VHT20	36 (5180)	13.78	13.98	24.00	Pass
	44 (5220)	13.74	13.94	24.00	Pass
	48 (5240)	13.67	13.87	24.00	Pass
IEEE 802.11ac-VHT40	38 (5190)	14.58	15.03	24.00	Pass
	46 (5230)	14.50	14.95	24.00	Pass
IEEE 802.11ac-VHT80	42 (5210)	12.14	12.78	24.00	Pass

Remark:

1. Corr'd Power = Meas Power + Duty Cycle Factor

Frequency band 5250-5350 MHz

RSS-247 Issue 2:

For IEEE 802.11 a, the minimum 99% emission bandwidth is 16.517 MHz

$$11 \text{ dBm} + 10\log_{10}(16.517) = 23.18\text{dBm} < 24\text{dBm}$$

So the 23.18 dB limit applicable

For IEEE 802.11n-HT20/ ac-VHT20, the minimum 99% emission bandwidth is 17.646 MHz

$$11 \text{ dBm} + 10\log_{10}(17.646) = 23.47 \text{ dBm} < 24\text{dBm}$$

So the 23.47 dB limit applicable

For IEEE 802.11 n-HT40/ac-VHT40/ac-VHT80, the minimum 99% emission bandwidth is 36.075 MHz

$$11 \text{ dBm} + 10\log_{10}(36.075) = 26.57\text{dBm} > 24 \text{ dBm (200mW)}$$

So the 24 dB limit applicable

FCC 47 CFR Part 15 Subpart E:

For IEEE 802.11 a/n/ac, the minimum 26 dB emission bandwidth is 20.45MHz

$$11 \text{ dBm} + 10\log_{10}(20.45) = 24.11 \text{ dBm} > 24 \text{ dBm (200mW)}$$

So the 24 dB limit applicable

Mode	Channel/ Frequency (MHz)	Maximum conducted output power (dBm)		Limit (dBm)		Pass / Fail
		Meas Power	Corr'd Power	FCC Part 15E	RSS-247	
IEEE 802.11a	52 (5260)	14.18	14.36	24.00	23.18	Pass
	60 (5300)	14.11	14.29	24.00	23.18	Pass
	64 (5320)	14.35	14.53	24.00	23.18	Pass
IEEE 802.11n-HT20	52 (5260)	13.88	14.08	24.00	23.47	Pass
	60 (5300)	14.01	14.21	24.00	23.47	Pass
	64 (5320)	14.06	14.26	24.00	23.47	Pass
IEEE 802.11n-HT40	54 (5270)	14.66	15.12	24.00	24.00	Pass
	62 (5310)	14.67	15.13	24.00	24.00	Pass
IEEE 802.11ac-VHT20	52 (5260)	13.98	14.18	24.00	23.47	Pass
	60 (5300)	13.92	14.12	24.00	23.47	Pass
	64 (5320)	14.09	14.29	24.00	23.47	Pass
IEEE 802.11ac-VHT40	54 (5270)	14.54	14.99	24.00	24.00	Pass
	62 (5310)	14.59	15.04	24.00	24.00	Pass
IEEE 802.11ac-VHT80	58 (5290)	12.28	12.92	24.00	24.00	Pass

Remark:

- Maximum conducted output power = Conducted output power + Duty Cycle Factor

Frequency bands 5470-5725 MHz (RSS-247 Issue 2 Not including 5600-5650 MHz)

RSS-247 Issue 2:

For IEEE 802.11 a, the minimum 99% emission bandwidth is 16.541MHz

$$11 \text{ dBm} + 10\log_{10}(16.541) = 23.19 \text{ dBm} < 24 \text{ dBm}$$

So the 23.19 dB limit applicable

For IEEE 802.11n-HT20/ac-VHT20, the minimum 99% emission bandwidth is 17.654MHz

$$11 \text{ dBm} + 10\log_{10}(17.654) = 23.47 \text{ dBm} < 24 \text{ dBm}$$

So the 23.47dB limit applicable

For IEEE 802.11 n-HT40/ac-VHT40/ac-VHT80, the minimum 99% emission bandwidth is 36.069 MHz

$$11 \text{ dBm} + 10\log_{10}(36.069) = 26.57 \text{ dBm} > 24 \text{ dBm}$$

So the 24 dB limit applicable

FCC 47 CFR Part 15 Subpart E:

For IEEE 802.11 a/n/ac, the minimum 26 dB emission bandwidth is 20.81 MHz

$$11 \text{ dBm} + 10\log_{10}(20.81) = 24.18 \text{ dBm} > 24 \text{ dBm}$$

So the 24 dB limit applicable

Mode	Channel/ Frequency (MHz)	Maximum conducted output power (dBm)		Limit (dBm)		Pass / Fail
		SISO		FCC Part 15E	RSS-247	
		Meas Power	Corr'd Power			
IEEE 802.11a	100 (5500)	14.34	14.52	24.00	23.19	Pass
	116 (5580)	14.29	14.47	24.00	23.19	Pass
	140 (5700)	14.41	14.59	24.00	23.19	Pass
IEEE 802.11n-HT20	100 (5500)	13.83	14.03	24.00	23.47	Pass
	116 (5580)	13.41	13.61	24.00	23.47	Pass
	140 (5700)	13.45	13.65	24.00	23.47	Pass
IEEE 802.11n-HT40	102 (5510)	12.81	13.27	24.00	24.00	Pass
	110 (5550)	12.79	13.25	24.00	24.00	Pass
	134 (5670)	12.98	13.44	24.00	24.00	Pass
IEEE 802.11ac-VHT20	100 (5500)	13.72	13.92	24.00	23.47	Pass
	116 (5580)	13.84	14.04	24.00	23.47	Pass
	140 (5700)	13.88	14.08	24.00	23.47	Pass
IEEE 802.11ac-VHT40	102 (5510)	12.54	12.99	24.00	24.00	Pass
	110 (5550)	12.68	13.13	24.00	24.00	Pass
	134 (5670)	12.57	13.02	24.00	24.00	Pass
IEEE 802.11ac-VHT80	106 (5530)	10.84	11.48	24.00	24.00	Pass

Remark:

- Maximum conducted output power = Conducted output power + Duty Cycle Factor

Frequency band 5725-5850 MHz

Mode	Channel/ Frequency (MHz)	Maximum conducted output power (dBm)		Limit (dBm)	Pass / Fail
		Meas Power	Corr'd Power		
IEEE 802.11a	149 (5745)	19.16	19.34	30	Pass
	157 (5785)	19.87	20.05	30	Pass
	165 (5825)	19.96	20.14	30	Pass
IEEE 802.11n-HT20	149 (5745)	18.96	19.16	30	Pass
	157 (5785)	18.81	19.01	30	Pass
	165 (5825)	18.60	18.80	30	Pass
IEEE 802.11n-HT40	151 (5755)	19.03	19.49	30	Pass
	159 (5795)	19.01	19.47	30	Pass
IEEE 802.11ac-VHT20	149 (5745)	18.82	19.02	30	Pass
	157 (5785)	18.83	19.03	30	Pass
	165 (5825)	18.87	19.07	30	Pass
IEEE 802.11ac-VHT40	151 (5755)	19.08	19.53	30	Pass
	159 (5795)	19.02	19.47	30	Pass
IEEE 802.11ac-VHT80	155 (5775)	18.18	18.82	30	Pass

Remark:

- Maximum conducted output power = Conducted output power + Duty Cycle Factor

5.6 PEAK POWER SPECTRAL DENSITY

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)
RSS-247 Issue 2 Section 6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1

Test Method: KDB 789033 D02 v02r01 Section F

Limits: FCC 47 CFR Part 15 Subpart E

1. For the band 5.15-5.25 GHz.
 - (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. In addition, the maximum power spectral density shall not exceed 17 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. 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).
 - (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. In addition, the maximum power spectral density shall not exceed 17 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.
 - (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. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
 - (iv) For 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. In addition, 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.
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 $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, 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.
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. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Limits: RSS-247 Issue 2

1. Frequency band 5150-5250 MHz

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

2. Frequency band 5250-5350 MHz

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

Devices, other than devices installed in vehicles, shall comply with the following:

- a) The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;
- b) The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less, B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Additional requirements

In addition to the above requirements, devices shall comply with the following, where applicable:

- a) Outdoor fixed devices with a maximum e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. at different elevations, where θ is the angle above the local horizontal plane (of the Earth) as shown below:

i. -13 dBW/MHz	for $0^\circ \leq \theta < 8^\circ$
ii. $-13 - 0.716 (\theta - 8)$ dBW/MHz	for $8^\circ \leq \theta < 40^\circ$
iii. $-35.9 - 1.22 (\theta - 40)$ dBW/MHz	for $40^\circ \leq \theta \leq 45^\circ$
iv. -42 dBW/MHz	for $\theta > 45^\circ$

The measurement procedure defined in Annex A of this document shall be used to verify the compliance to the e.i.r.p. at different elevations.

- b) Devices, other than outdoor fixed devices, having an e.i.r.p. greater than 200 mW shall comply with either i. or ii. below:
 - iii. devices shall comply with the e.i.r.p. elevation mask in 6.2.2.3(a); or
 - iv. devices shall implement a method to permanently reduce their e.i.r.p. via a firmware feature in the event that the Department requires it. The test report must demonstrate how the device's power table can be updated to meet this firmware requirement. The manufacturer shall provide this firmware to update all systems automatically in compliance with the directions received from the Department.

3. Frequency bands 5470-5600 MHz and 5650-5725 MHz

The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

4. Frequency band 5725-5850 MHz

The maximum conducted output power shall not exceed 1 W. The output power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices

operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint³ systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

Test Procedure:

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer.

Spectrum analyzer according to the following Settings:

1. For U-NII-1, U-NII-2A, U-NII-2C band:

Using method SA-2

- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz, Set VBW $\geq$ 3 RBW, Detector = RMS
- Sweep time = auto, trigger set to "free run".
- Trace average at least 100 traces in power averaging mode.
- Record the max value and add 10 log (1/duty cycle)

2. For U-NII-3 band:

- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 500 kHz, Set VBW $\geq$ 3 RBW, Detector = RMS
- Use the peak marker function to determine the maximum power level in any 500 kHz band segment within the fundamental EBW.
- Sweep time = auto, trigger set to "free run".
- Trace average at least 100 traces in power averaging mode.
- Record the max value and add 10 log (1/duty cycle)

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

Directional gain and the maximum output power limit.

RSS-247 Issue 2:

Frequency Band	Antenna Gain (dBi))	PSD Limits (dBm/MHz or dBm/500kHz)
U-NII-1	4.50	10.00
U-NII-2A	4.50	11.00
U-NII-2C	4.50	11.00
U-NII-3	4.50	30.00

FCC 47 CFR Part 15 Subpart E:

Frequency Band	Antenna Gain (dBi))	PSD Limits (dBm/MHz or dBm/500kHz)
U-NII-1	4.50	11.00
U-NII-2A	4.50	11.00
U-NII-2C	4.50	11.00
U-NII-3	4.50	30.00

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UTTR-RF-RSS247-V1.1

Frequency band 5150-5250 MHz
RSS-247 Issue 2

Mode	Channel/ Frequency (MHz)	e.i.r.p. spectral density (dBm/MHz)	Limit (dBm/MHz)	Pass / Fail
IEEE 802.11a	36 (5180)	9.990	10	Pass
	44 (5220)	9.012	10	Pass
	48 (5240)	9.843	10	Pass
IEEE 802.11n-HT20	36 (5180)	9.631	10	Pass
	44 (5220)	9.520	10	Pass
	48 (5240)	9.303	10	Pass
IEEE 802.11n-HT40	38 (5190)	7.843	10	Pass
	46 (5230)	7.305	10	Pass
IEEE 802.11ac-VHT20	36 (5180)	9.633	10	Pass
	44 (5220)	9.417	10	Pass
	48 (5240)	9.068	10	Pass
IEEE 802.11ac-VHT40	38 (5190)	7.492	10	Pass
	46 (5230)	7.738	10	Pass
IEEE 802.11ac-VHT80	42 (5210)	4.668	10	Pass

Remark:

- e.i.r.p. spectral density = Power spectral density + Duty Cycle Factor + Antenna Gain

FCC 47 CFR Part 15 Subpart E

Mode	Channel/ Frequency (MHz)	Power spectral density (dBm/MHz)		Limit (dBm/MHz)	Pass / Fail
		Meas PSD	Corr'd PSD		
IEEE 802.11a	36 (5180)	5.305	5.490	11	Pass
	44 (5220)	5.227	5.412	11	Pass
	48 (5240)	5.158	5.343	11	Pass
IEEE 802.11n-HT20	36 (5180)	4.934	5.131	11	Pass
	44 (5220)	4.823	5.020	11	Pass
	48 (5240)	4.606	4.803	11	Pass
IEEE 802.11n-HT40	38 (5190)	2.885	3.343	11	Pass
	46 (5230)	2.347	2.805	11	Pass
IEEE 802.11ac-VHT20	36 (5180)	4.937	5.133	11	Pass
	44 (5220)	4.721	4.917	11	Pass
	48 (5240)	4.372	4.568	11	Pass
IEEE 802.11ac-VHT40	38 (5190)	2.541	2.992	11	Pass
	46 (5230)	2.787	3.238	11	Pass
IEEE 802.11ac-VHT80	42 (5210)	-0.472	0.168	11	Pass

Remark:

- Power spectral density = Conducted power spectral density + Duty Cycle Factor

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UTTR-RF-RSS247-V1.1

Frequency band 5250-5350 MHz

Mode	Channel/ Frequency (MHz)	Power spectral density (dBm/MHz)		Limit (dBm/MHz)	Pass / Fail
		Meas PSD	Corr'd PSD		
IEEE 802.11a	52 (5260)	4.901	5.086	11	Pass
	60 (5300)	4.998	5.183	11	Pass
	64 (5320)	5.111	5.296	11	Pass
IEEE 802.11n-HT20	52 (5260)	4.599	4.796	11	Pass
	60 (5300)	4.177	4.374	11	Pass
	64 (5320)	4.402	4.599	11	Pass
IEEE 802.11n-HT40	54 (5270)	2.420	2.878	11	Pass
	62 (5310)	2.307	2.765	11	Pass
IEEE 802.11ac-VHT20	52 (5260)	4.549	4.745	11	Pass
	60 (5300)	4.148	4.344	11	Pass
	64 (5320)	4.195	4.391	11	Pass
IEEE 802.11ac-VHT40	54 (5270)	2.386	2.837	11	Pass
	62 (5310)	2.046	2.497	11	Pass
IEEE 802.11ac-VHT80	58 (5290)	-1.096	-0.456	11	Pass

Remark:

1. Power spectral density = Conducted power spectral density + Duty Cycle Factor

Frequency bands 5470-5725 MHz (RSS-247 Issue 2 Not including 5600-5650 MHz)

Mode	Channel/ Frequency (MHz)	Power spectral density (dBm/MHz)		Limit (dBm/MHz)	Pass / Fail
		Meas PSD	Corr'd PSD		
IEEE 802.11a	100 (5500)	5.007	5.192	11	Pass
	116 (5580)	4.603	4.788	11	Pass
	140 (5700)	4.491	4.676	11	Pass
IEEE 802.11n-HT20	100 (5500)	4.164	4.361	11	Pass
	116 (5580)	3.991	4.188	11	Pass
	140 (5700)	3.897	4.094	11	Pass
IEEE 802.11n-HT40	102 (5510)	-0.690	-0.232	11	Pass
	110 (5550)	2.181	2.639	11	Pass
	134 (5670)	-0.696	-0.238	11	Pass
IEEE 802.11ac-VHT20	100 (5500)	4.275	4.471	11	Pass
	116 (5580)	3.628	3.824	11	Pass
	140 (5700)	4.176	4.372	11	Pass
IEEE 802.11ac-VHT40	102 (5510)	1.099	1.550	11	Pass
	110 (5550)	1.861	2.312	11	Pass
	134 (5670)	1.402	1.853	11	Pass
IEEE 802.11ac-VHT80	106 (5530)	-2.147	-1.507	11	Pass

Remark:

1. Power spectral density = Conducted power spectral density + Duty Cycle Factor

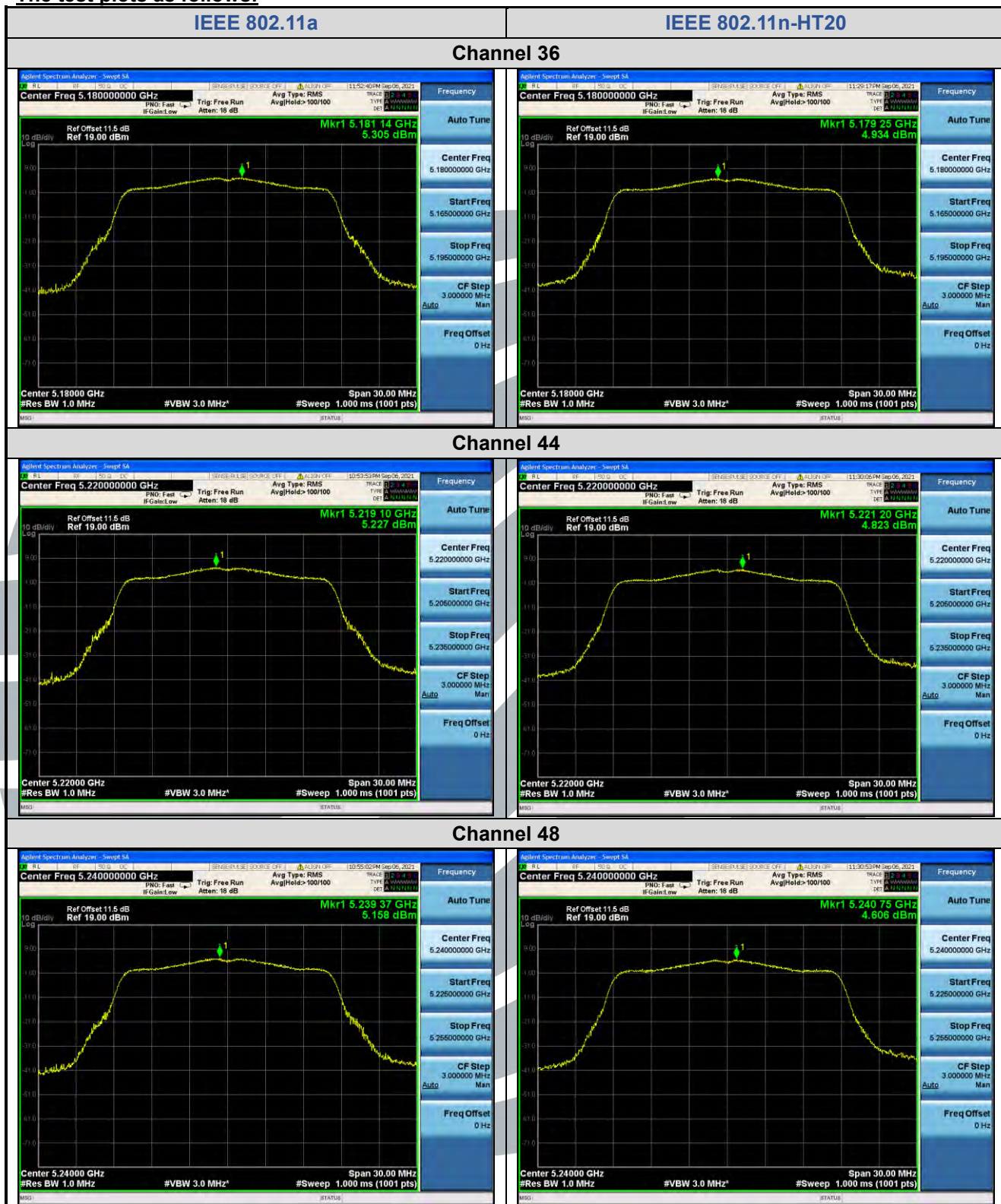
Frequency band 5725-5850 MHz

Mode	Channel/ Frequency (MHz)	Power spectral density (dBm/500kHz)		Limit (dBm/500KHz)	Pass / Fail
		Meas PSD	Corr'd PSD		
IEEE 802.11a	149 (5745)	6.134	6.319	30	Pass
	157 (5785)	6.061	6.246	30	Pass
	165 (5825)	5.605	5.790	30	Pass
IEEE 802.11n-HT20	149 (5745)	5.733	5.930	30	Pass
	157 (5785)	5.310	5.507	30	Pass
	165 (5825)	6.094	6.291	30	Pass
IEEE 802.11n-HT40	151 (5755)	2.588	3.046	30	Pass
	159 (5795)	2.420	2.878	30	Pass
IEEE 802.11ac-VHT20	149 (5745)	5.749	5.945	30	Pass
	157 (5785)	5.399	5.595	30	Pass
	165 (5825)	4.874	5.070	30	Pass
IEEE 802.11ac-VHT40	151 (5755)	2.827	3.278	30	Pass
	159 (5795)	2.771	3.222	30	Pass
IEEE 802.11ac-VHT80	155 (5775)	-1.000	-0.360	30	Pass

Remark:

- Power spectral density = Conducted power spectral density + Duty Cycle Factor

The test plots as follows:



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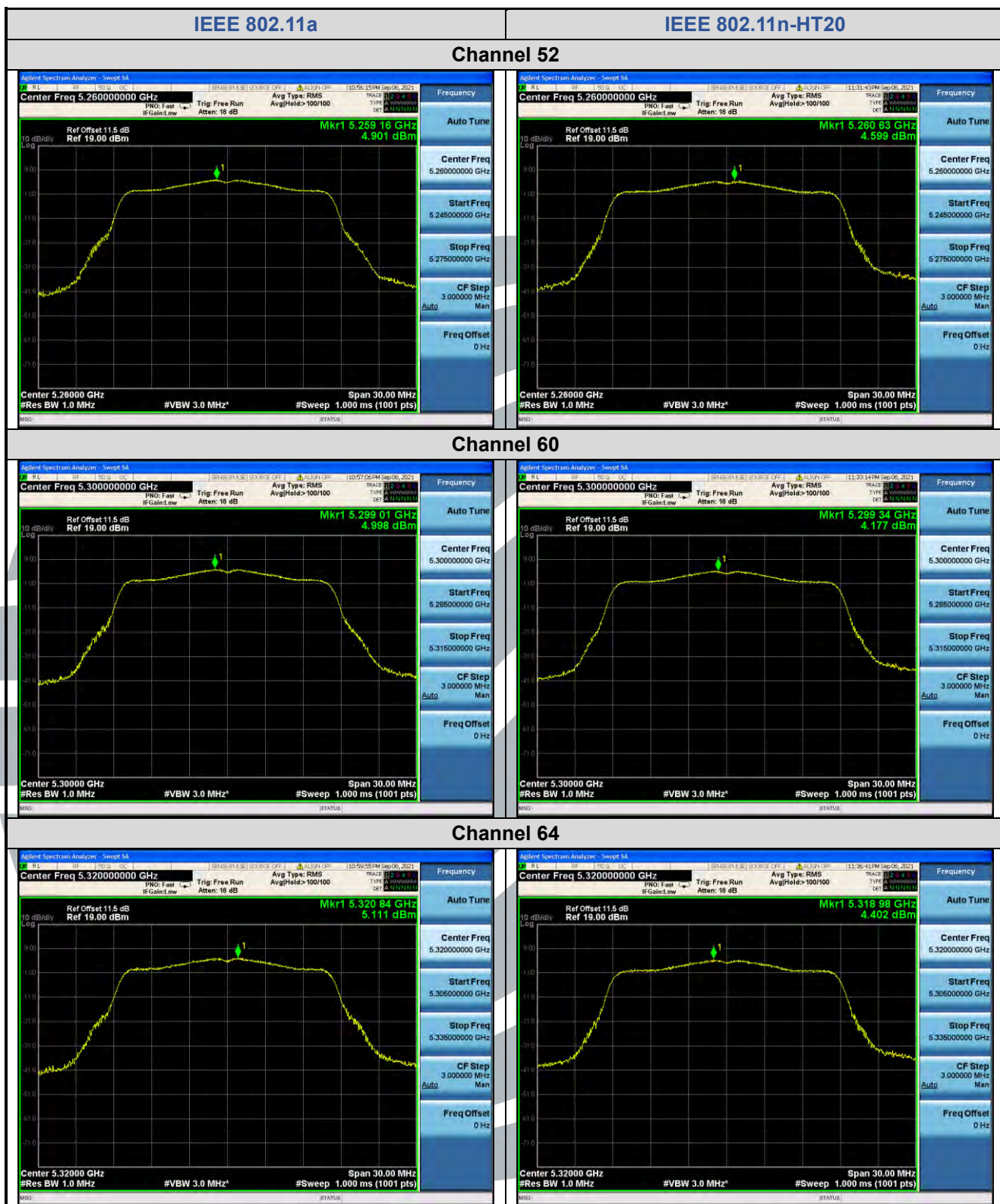
Tel: +86-755-28230888

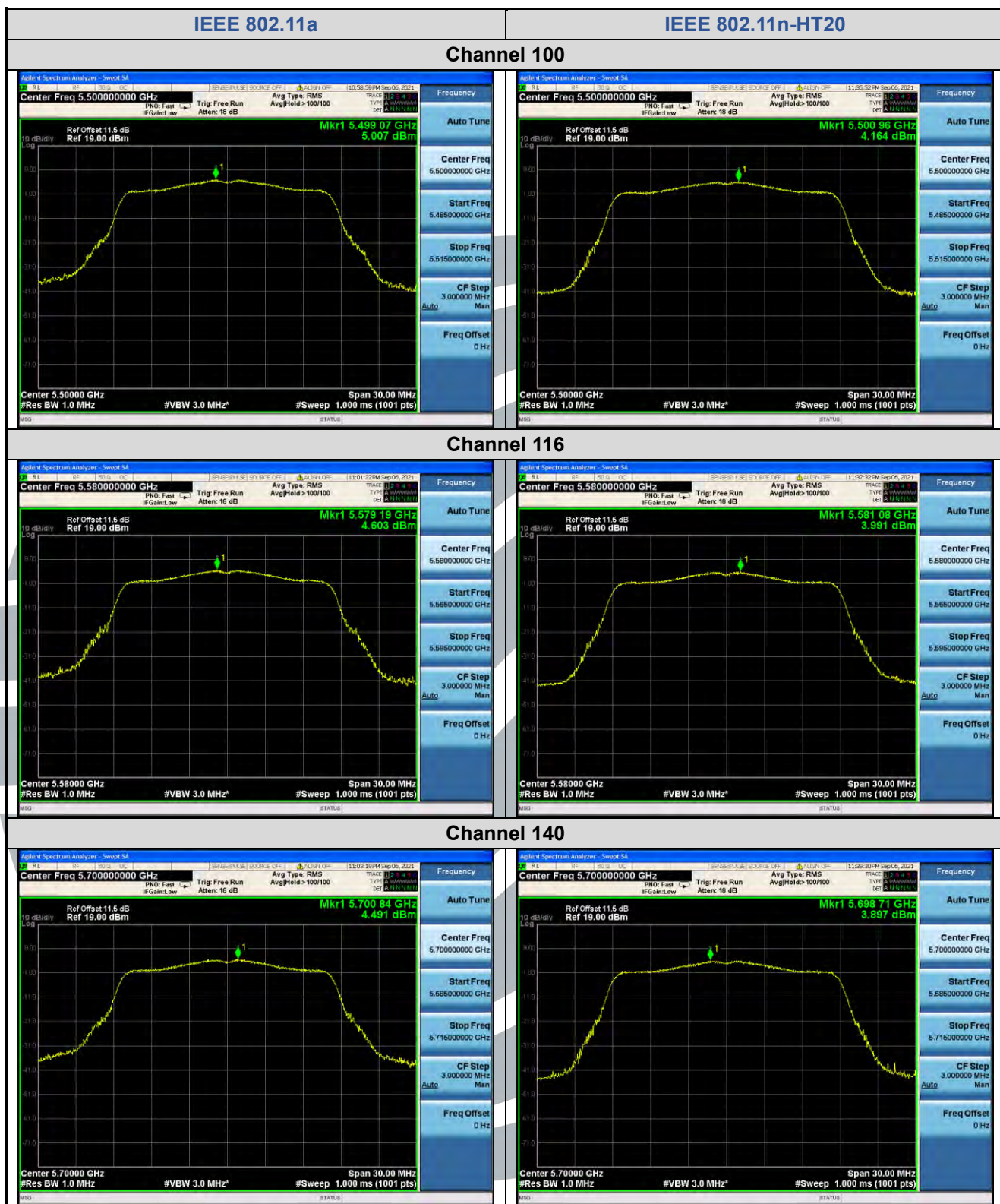
Fax: +86-755-28230886

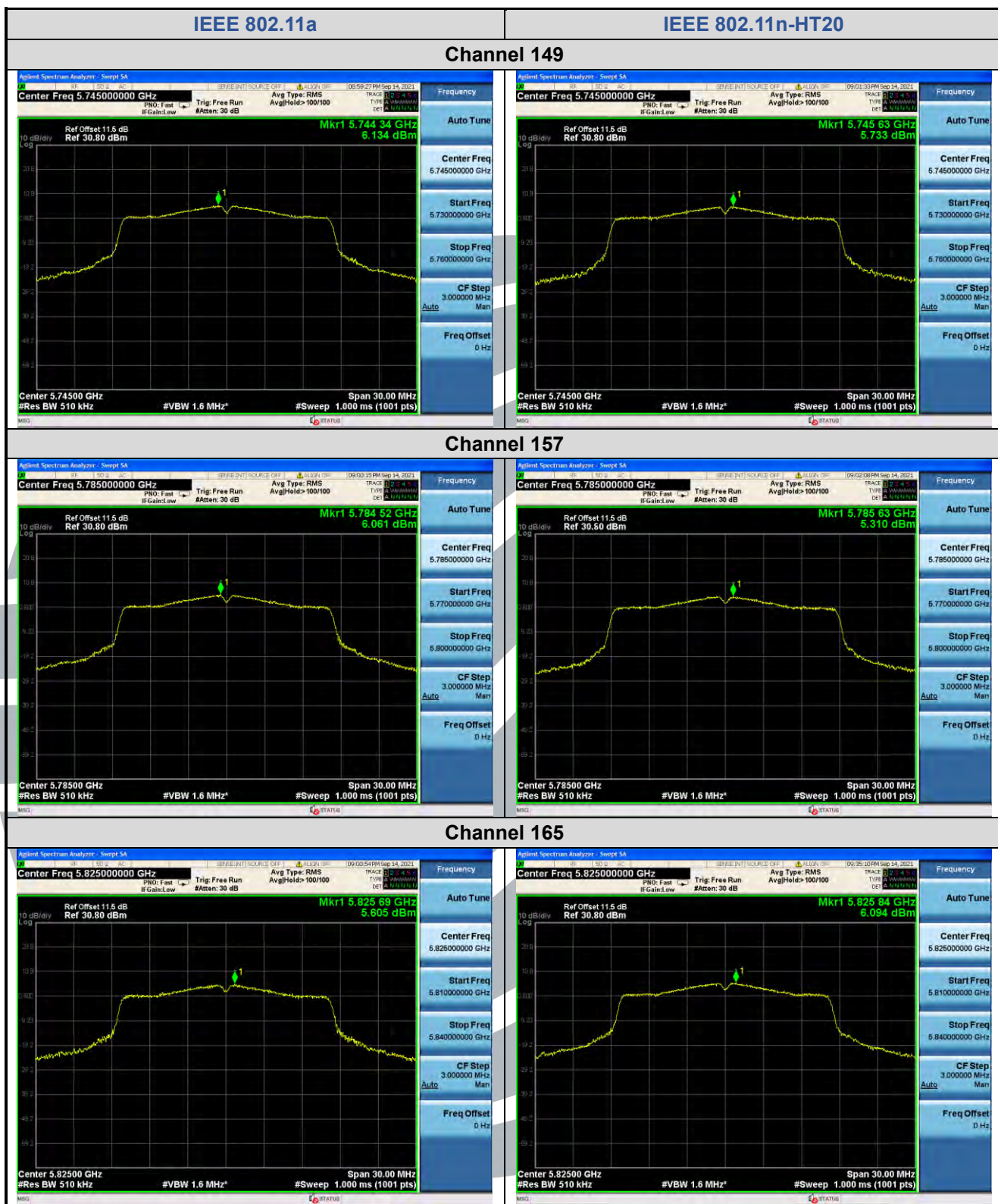
E-mail: info@uttlab.com

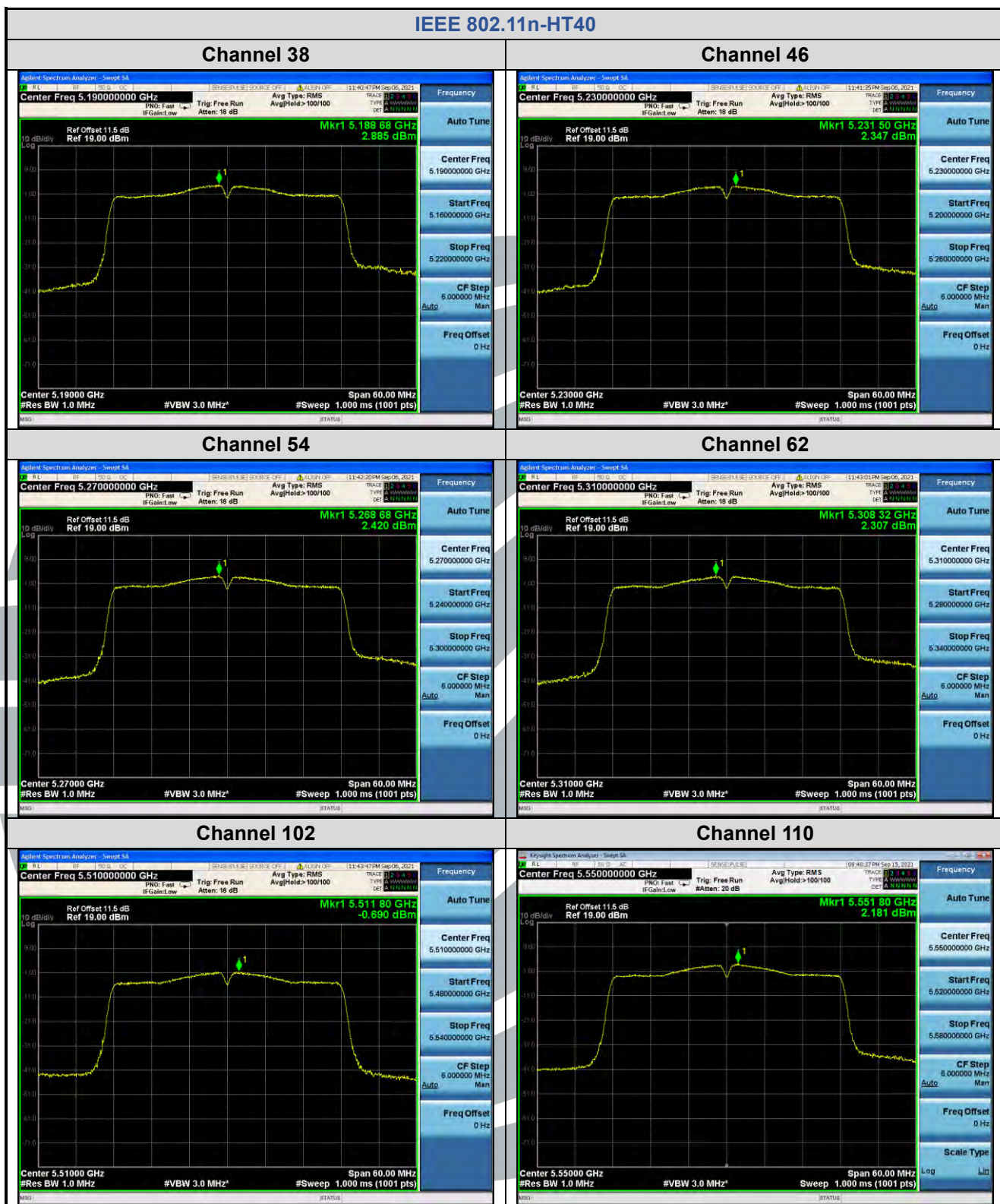
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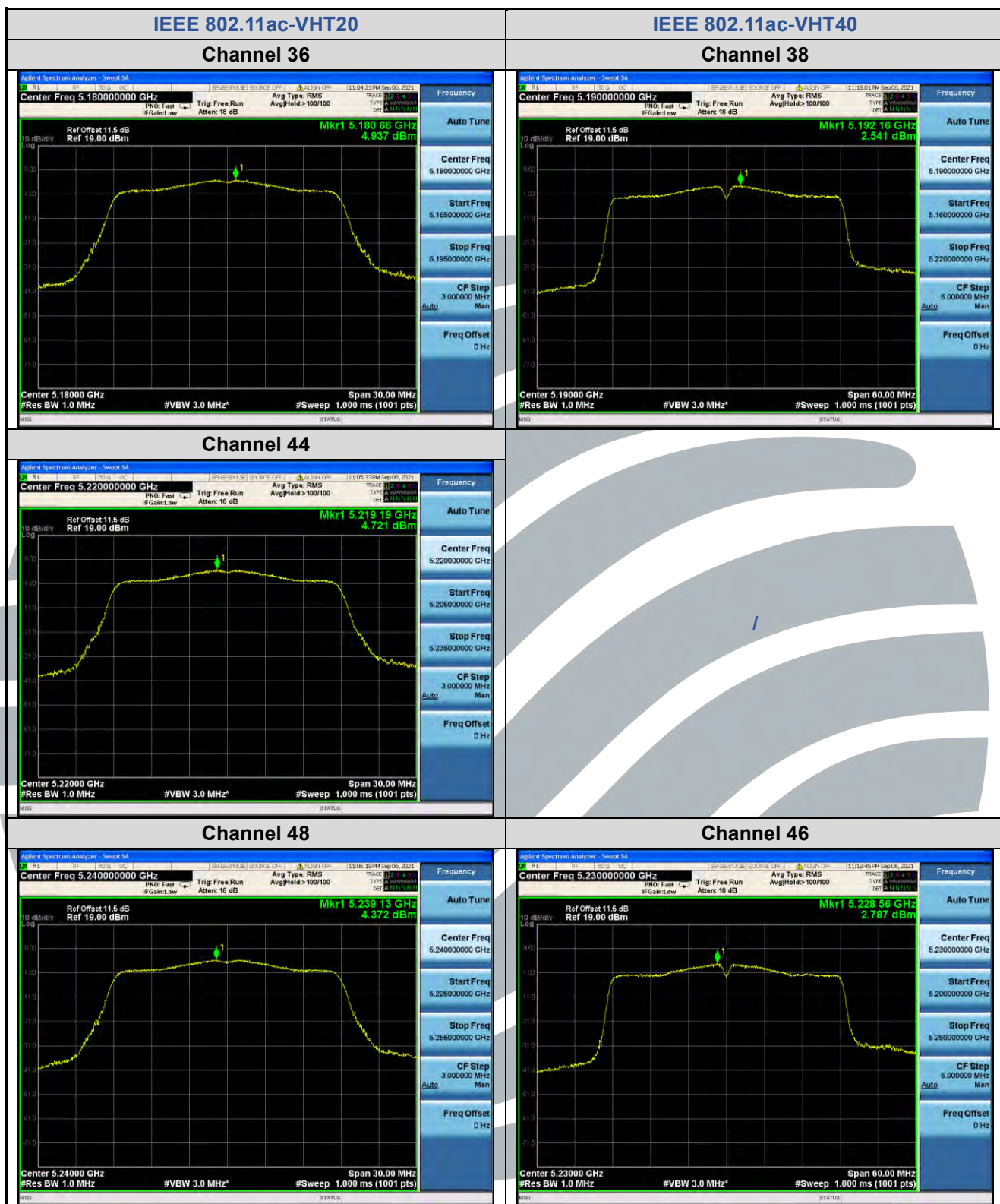


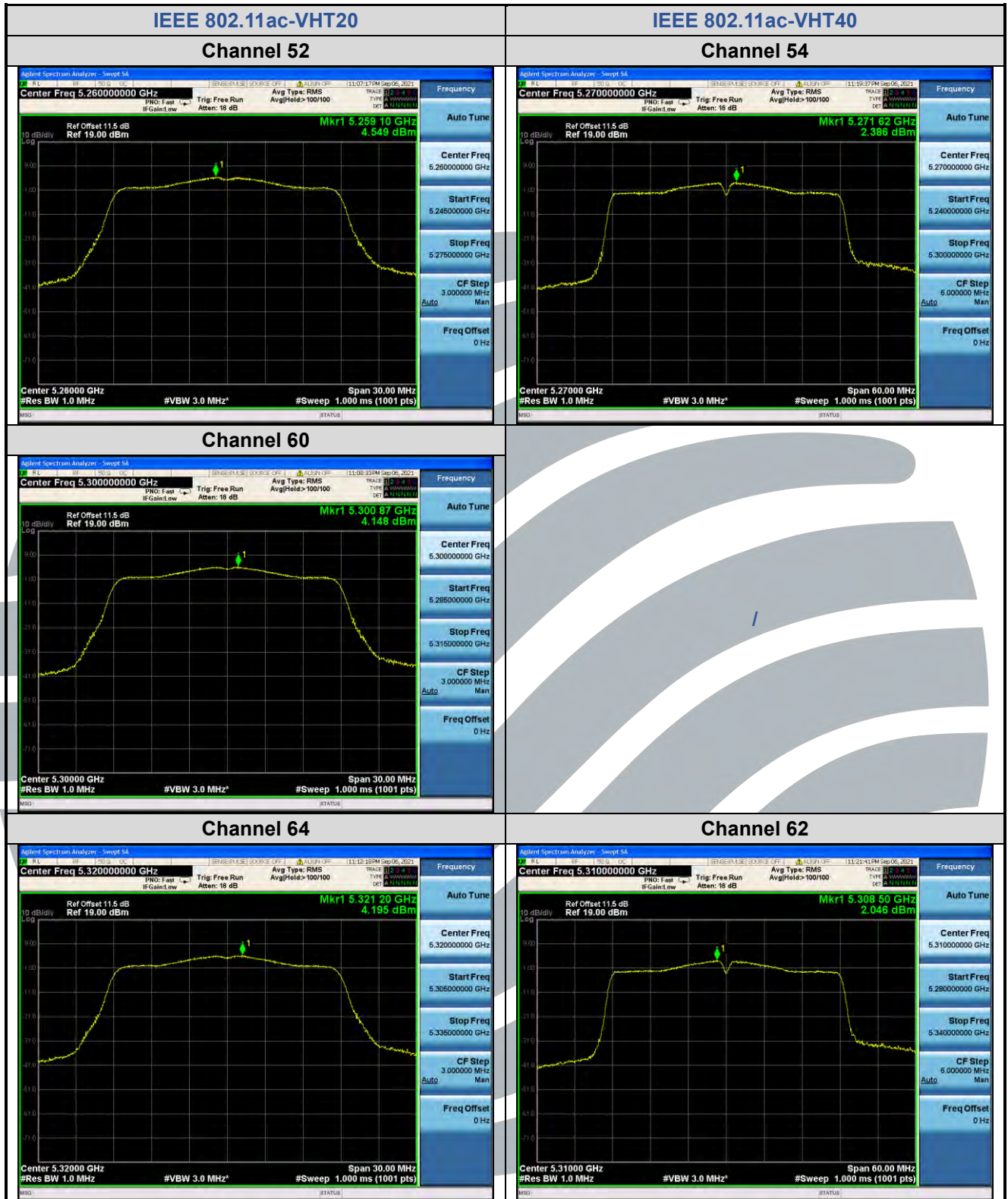


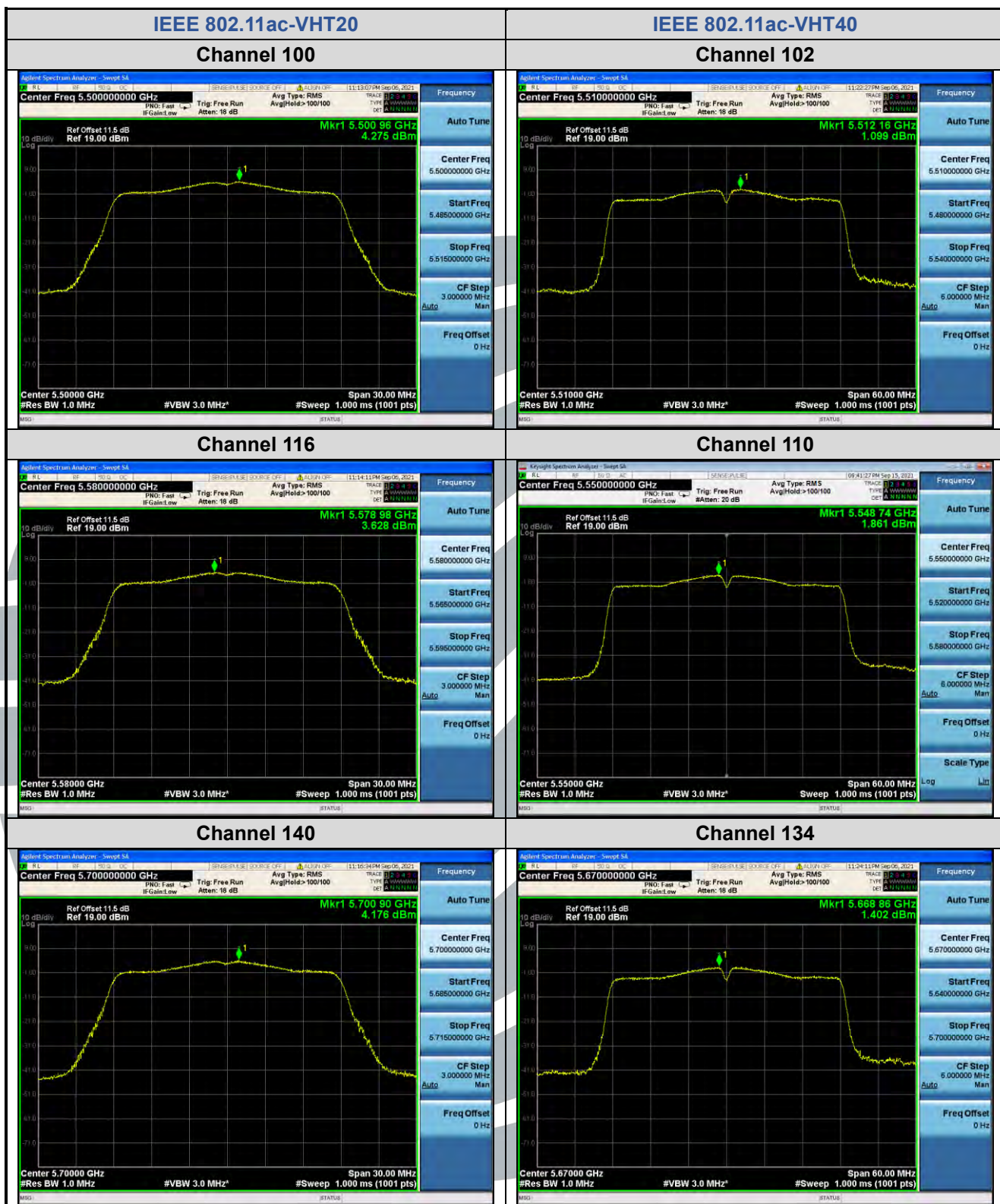


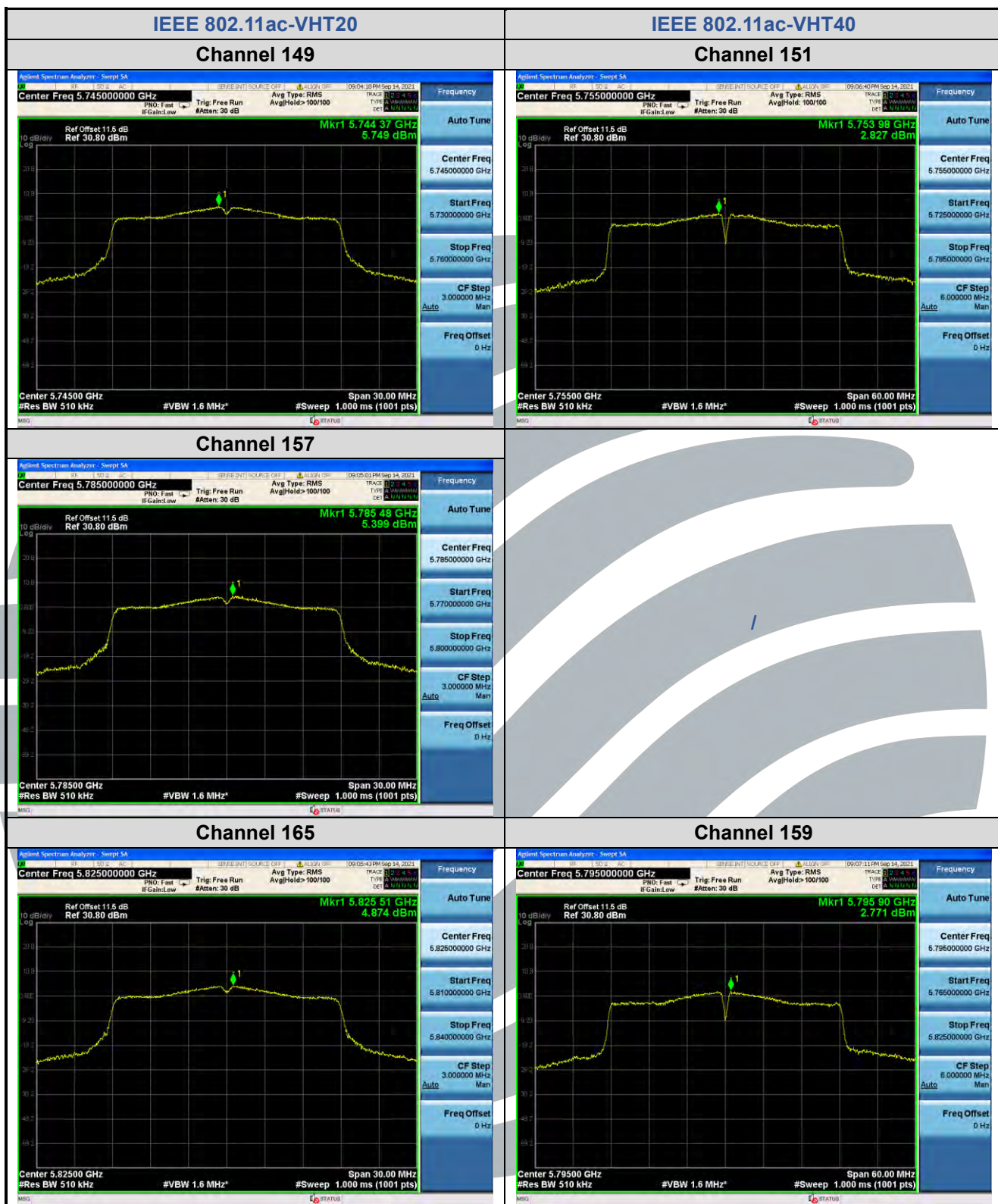


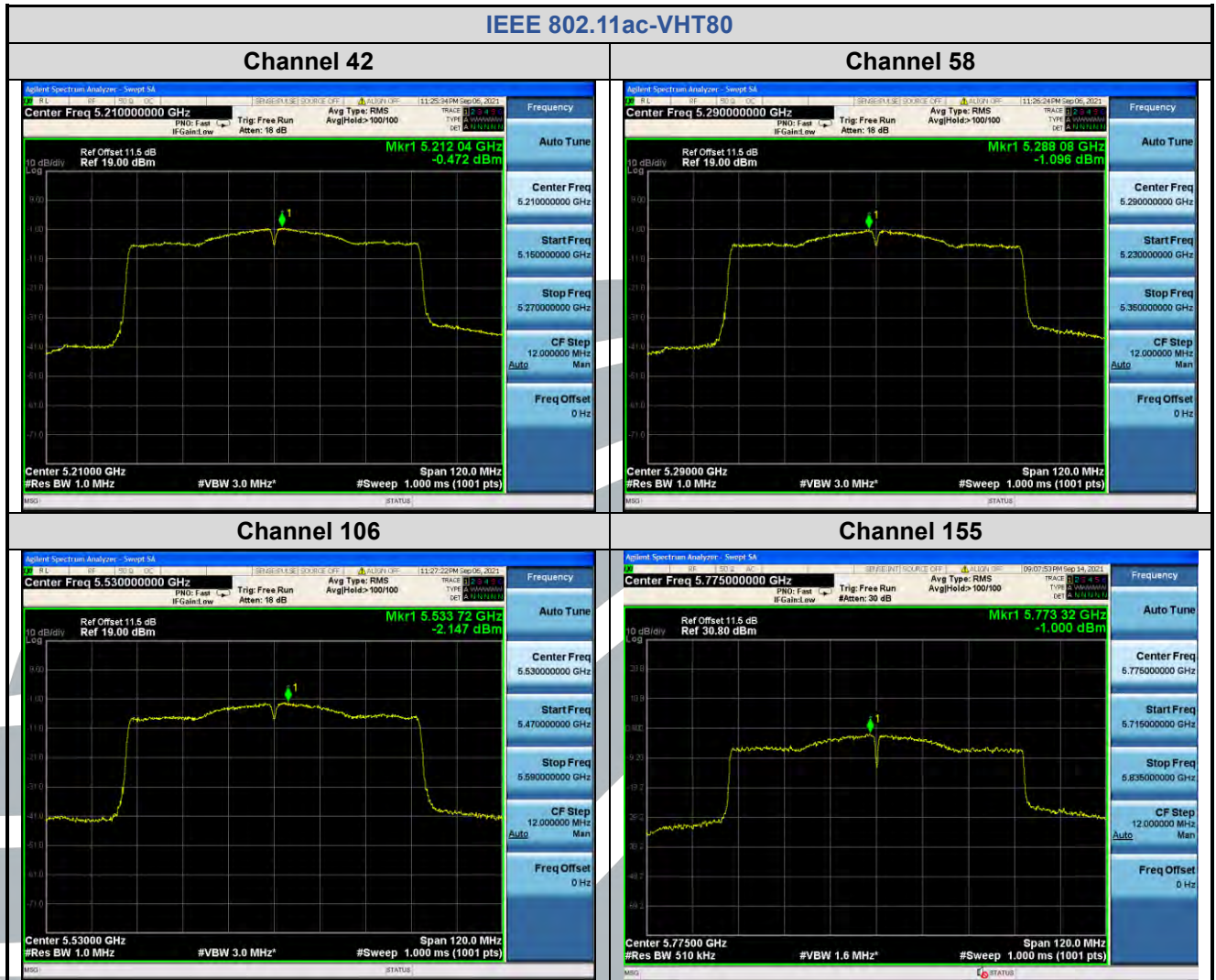












5.7 RADIATED EMISSIONS AND BAND EDGE MEASUREMENT

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(1)(2)(3)(4)(6)
FCC 47 CFR Part 15 Subpart C Section 15.209/205
RSS-247 Issue 2 Section 6.2.1.2/6.2.2.2/6.2.3.2/6.2.4.2

Test Method: KDB 789033 D02 v02r01 Section G.3, G.4, G.5, and G.6

Receiver Setup:

Frequency	RBW
0.009 MHz-0.150 MHz	200/300 kHz
0.150 MHz -30 MHz	9/10 kHz
30 MHz-1 GHz	100/120 kHz
Above 1 GHz	1 MHz

Limits:

1. Limits of Radiated Emission and Band edge Measurement

Radiated emissions that fall in the restricted bands must comply with the general emissions limits in 15.209(a) as below table. Other emissions shall be at least 20 dB below the highest level of the desired power.

Frequency	Field strength (microvolt/meter)	Limit (dB μ V/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

- The lower limit shall apply at the transition frequencies.
- Emission level (dB μ V/m) = 20 log Emission level (uV/m).
- For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

2. Limits of Unwanted Emission Out of the Restricted Bands

Applicable To	Limit	
789033 D02 General U-NII Test Procedures New Rules v01r04	Field Strength at 3 m	
	PK: 74 (dBμV/m)	AV: 54 (dBμV/m)
Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
RSS-247 Issue 2 Section 6.2.1.2	PK: -27 (dBm/MHz)	PK: 74 (dBμV/m)
RSS-247 Issue 2 Section 6.2.2.2	PK: -27 (dBm/MHz)	PK: 74 (dBμV/m)
RSS-247 Issue 2 Section 6.2.3.2	PK: -27 (dBm/MHz)	PK: 68.2 (dBμV/m)
RSS-247 Issue 2 Section 6.2.4.2	27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;	PK: 68.2 (dBμV/m)
	15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;	
	10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges;	
	-27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.	

Test Setup: Refer to section 4.5.1 for details.

Test Procedures:

- The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Remark:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for RMS Average (Duty cycle < 98 %) for Average detection (AV) at frequency above 1 GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle $\geq 98 \%$) or $\geq 1/T$ (duty cycle is < 98%) for Average detection (AV) at frequency above 1 GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

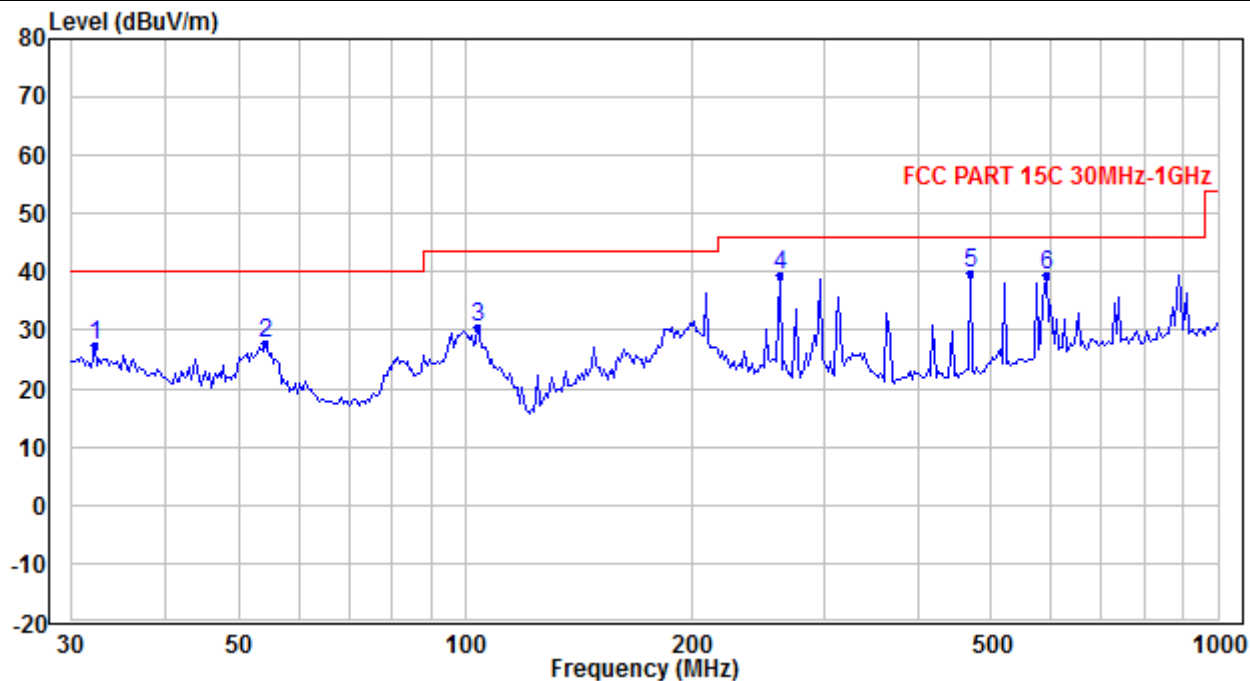
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

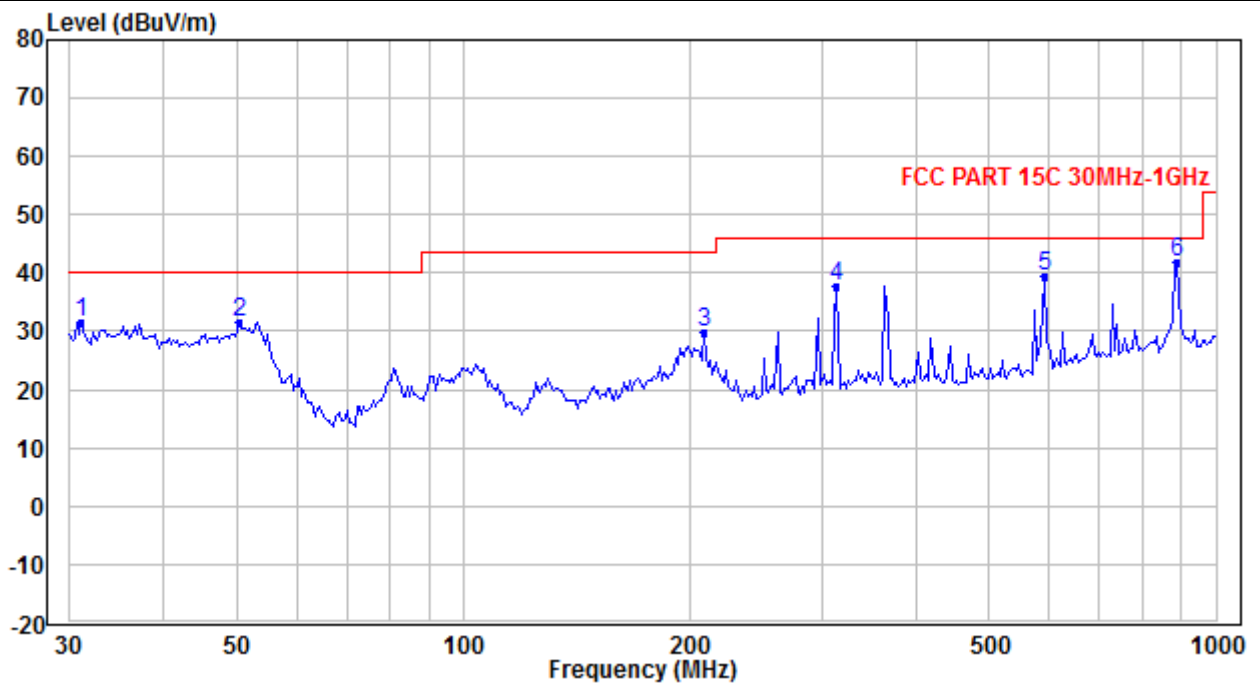
Radiated Emission Test Data (9 KHz ~ 30 MHz):

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Radiated Emission Test Data (30 MHz ~ 1 GHz Worst Case):
Worst-Case Configuration
Horizontal


No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	32.184	32.35	-4.89	27.46	40.00	-12.54	QP
2	54.135	44.69	-16.89	27.80	40.00	-12.20	QP
3	104.064	46.21	-15.78	30.43	43.50	-13.07	QP
4	261.273	47.63	-8.23	39.40	46.00	-6.60	QP
5	468.165	43.24	-3.55	39.69	46.00	-6.31	QP
6	590.351	40.67	-1.28	39.39	46.00	-6.61	QP

Vertical



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	31.073	36.37	-4.68	31.69	40.00	-8.31	QP
2	50.461	46.65	-14.97	31.68	40.00	-8.32	QP
3	208.658	40.83	-10.85	29.98	43.50	-13.52	QP
4	313.648	43.67	-5.97	37.70	46.00	-8.30	QP
5	590.351	40.70	-1.28	39.42	46.00	-6.58	QP
6	887.398	37.83	4.07	41.90	46.00	-4.10	QP

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Radiated Emission Test Data (Above 1GHz):
IEEE 802.11a_Channel 36

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10360.00	41.24	6.24	47.48	74.00	-26.52	Peak	Horizontal
2	10360.00	28.96	6.24	35.20	54.00	-18.80	Average	Horizontal
3	15540.00	38.45	11.38	49.83	74.00	-24.17	Peak	Horizontal
4	15540.00	25.76	11.38	37.14	54.00	-16.86	Average	Horizontal
5	10360.00	41.45	6.24	47.69	74.00	-26.31	Peak	Vertical
6	10360.00	28.85	6.24	35.09	54.00	-18.91	Average	Vertical
7	15540.00	38.10	11.38	49.48	74.00	-24.52	Peak	Vertical
8	15540.00	25.76	11.38	37.14	54.00	-16.86	Average	Vertical

IEEE 802.11a_Channel 44

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10440.00	40.77	6.30	47.07	74.00	-26.93	Peak	Horizontal
2	10440.00	28.68	6.30	34.98	54.00	-19.02	Average	Horizontal
3	15660.00	38.77	11.53	50.30	74.00	-23.70	Peak	Horizontal
4	15660.00	25.81	11.53	37.34	54.00	-16.66	Average	Horizontal
5	10440.00	40.33	6.30	46.63	74.00	-27.37	Peak	Vertical
6	10440.00	28.52	6.30	34.82	54.00	-19.18	Average	Vertical
7	15660.00	38.36	11.53	49.89	74.00	-24.11	Peak	Vertical
8	15660.00	25.89	11.53	37.42	54.00	-16.58	Average	Vertical

MIMO IEEE 802.11a_Channel 48

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10480.00	40.17	6.33	46.50	74.00	-27.50	Peak	Horizontal
2	10480.00	28.42	6.33	34.75	54.00	-19.25	Average	Horizontal
3	15720.00	37.85	11.63	49.48	74.00	-24.52	Peak	Horizontal
4	15720.00	25.70	11.63	37.33	54.00	-16.67	Average	Horizontal
5	10480.00	41.05	6.33	47.38	74.00	-26.62	Peak	Vertical
6	10480.00	28.31	6.33	34.64	54.00	-19.36	Average	Vertical
7	15720.00	37.55	11.63	49.18	74.00	-24.82	Peak	Vertical
8	15720.00	25.70	11.63	37.33	54.00	-16.67	Average	Vertical

IEEE 802.11a_Channel 52

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10520.00	40.96	6.33	47.29	74.00	-26.71	Peak	Horizontal
2	10520.00	28.31	6.33	34.64	54.00	-19.36	Average	Horizontal
3	15780.00	38.03	11.71	49.74	74.00	-24.26	Peak	Horizontal
4	15780.00	25.69	11.71	37.40	54.00	-16.60	Average	Horizontal
5	10520.00	40.85	6.33	47.18	74.00	-26.82	Peak	Vertical
6	10520.00	28.31	6.33	34.64	54.00	-19.36	Average	Vertical
7	15780.00	37.50	11.71	49.21	74.00	-24.79	Peak	Vertical
8	15780.00	25.62	11.71	37.33	54.00	-16.67	Average	Vertical

IEEE 802.11a_Channel 60

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10600.00	40.42	6.30	46.72	74.00	-27.28	Peak	Horizontal
2	10600.00	27.35	6.30	33.65	54.00	-20.35	Average	Horizontal
3	15900.00	39.53	11.89	51.42	74.00	-22.58	Peak	Horizontal
4	15900.00	25.92	11.89	37.81	54.00	-16.19	Average	Horizontal
5	10600.00	40.10	6.30	46.40	74.00	-27.60	Peak	Vertical
6	10600.00	27.35	6.30	33.65	54.00	-20.35	Average	Vertical
7	15900.00	37.76	11.89	49.65	74.00	-24.35	Peak	Vertical
8	15900.00	25.85	11.89	37.74	54.00	-16.26	Average	Vertical

IEEE 802.11a_Channel 64

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10640.00	39.71	6.28	45.99	74.00	-28.01	Peak	Horizontal
2	10640.00	27.37	6.28	33.65	54.00	-20.35	Average	Horizontal
3	15960.00	38.06	11.96	50.02	74.00	-23.98	Peak	Horizontal
4	15960.00	25.78	11.96	37.74	54.00	-16.26	Average	Horizontal
5	10640.00	39.73	6.28	46.01	74.00	-27.99	Peak	Vertical
6	10640.00	27.30	6.28	33.58	54.00	-20.42	Average	Vertical
7	15960.00	38.13	11.96	50.09	74.00	-23.91	Peak	Vertical
8	15960.00	25.85	11.96	37.81	54.00	-16.19	Average	Vertical

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IEEE 802.11a_Channel 100

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11000.00	40.59	6.12	46.71	74.00	-27.29	Peak	Horizontal
2	11000.00	27.84	6.12	33.96	54.00	-20.04	Average	Horizontal
3	16500.00	38.17	12.95	51.12	74.00	-22.88	Peak	Horizontal
4	16500.00	25.65	12.95	38.60	54.00	-15.40	Average	Horizontal
5	11000.00	40.35	6.28	46.63	74.00	-27.37	Peak	Vertical
6	11000.00	27.74	6.28	34.02	54.00	-19.98	Average	Vertical
7	16500.00	37.88	12.95	50.83	74.00	-23.17	Peak	Vertical
8	16500.00	25.65	12.95	38.60	54.00	-15.40	Average	Vertical

IEEE 802.11a_Channel 116

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11160.00	40.23	6.37	46.60	74.00	-27.40	Peak	Horizontal
2	11160.00	26.99	6.37	33.36	54.00	-20.64	Average	Horizontal
3	16740.00	38.00	13.01	51.01	74.00	-22.99	Peak	Horizontal
4	16740.00	25.94	13.01	38.95	54.00	-15.05	Average	Horizontal
5	11160.00	39.16	6.37	45.53	74.00	-28.47	Peak	Vertical
6	11160.00	26.93	6.37	33.30	54.00	-20.70	Average	Vertical
7	16740.00	38.78	13.01	51.79	74.00	-22.21	Peak	Vertical
8	16740.00	25.79	13.01	38.80	54.00	-15.20	Average	Vertical

IEEE 802.11a_Channel 140

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11400.00	40.00	6.73	46.73	74.00	-27.27	Peak	Horizontal
2	11400.00	26.90	6.73	33.63	54.00	-20.37	Average	Horizontal
3	17100.00	37.15	13.34	50.49	74.00	-23.51	Peak	Horizontal
4	17100.00	24.49	13.34	37.83	54.00	-16.17	Average	Horizontal
5	11400.00	39.13	6.73	45.86	74.00	-28.14	Peak	Vertical
6	11400.00	26.90	6.73	33.63	54.00	-20.37	Average	Vertical
7	17100.00	36.97	13.34	50.31	74.00	-23.69	Peak	Vertical
8	17100.00	24.49	13.34	37.83	54.00	-16.17	Average	Vertical

IEEE 802.11a_Channel 149

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11490.00	39.38	6.87	46.25	74.00	-27.75	Peak	Horizontal
2	11490.00	27.18	6.87	34.05	54.00	-19.95	Average	Horizontal
3	17235.00	37.84	13.70	51.54	74.00	-22.46	Peak	Horizontal
4	17235.00	24.90	13.70	38.60	54.00	-15.40	Average	Horizontal
5	11490.00	39.39	6.87	46.26	74.00	-27.74	Peak	Vertical
6	11490.00	27.24	6.87	34.11	54.00	-19.89	Average	Vertical
7	17235.00	37.45	13.70	51.15	74.00	-22.85	Peak	Vertical
8	17235.00	24.90	13.70	38.60	54.00	-15.40	Average	Vertical

IEEE 802.11a_Channel 157

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11570.00	38.48	7.06	45.54	74.00	-28.46	Peak	Horizontal
2	11570.00	26.63	7.06	33.69	54.00	-20.31	Average	Horizontal
3	17355.00	37.81	14.01	51.82	74.00	-22.18	Peak	Horizontal
4	17355.00	25.42	14.01	39.43	54.00	-14.57	Average	Horizontal
5	11570.00	39.59	7.06	46.65	74.00	-27.35	Peak	Vertical
6	11570.00	26.70	7.06	33.76	54.00	-20.24	Average	Vertical
7	17355.00	38.27	14.01	52.28	74.00	-21.72	Peak	Vertical
8	17355.00	25.35	14.01	39.36	54.00	-14.64	Average	Vertical

IEEE 802.11a_Channel 165

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11650.00	40.42	7.26	47.68	74.00	-26.32	Peak	Horizontal
2	11650.00	26.74	7.26	34.00	54.00	-20.00	Average	Horizontal
3	17475.00	37.39	14.33	51.72	74.00	-22.28	Peak	Horizontal
4	17475.00	24.80	14.33	39.13	54.00	-14.87	Average	Horizontal
5	11650.00	39.31	7.26	46.57	74.00	-27.43	Peak	Vertical
6	11650.00	26.67	7.26	33.93	54.00	-20.07	Average	Vertical
7	17475.00	36.72	14.33	51.05	74.00	-22.95	Peak	Vertical
8	17475.00	24.72	14.33	39.05	54.00	-14.95	Average	Vertical

IEEE 802.11n-HT20_Channel 36

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10360.00	41.38	6.30	47.68	74.00	-26.32	Peak	Horizontal
2	10360.00	28.73	6.30	35.03	54.00	-18.97	Average	Horizontal
3	15540.00	38.22	11.53	49.75	74.00	-24.25	Peak	Horizontal
4	15540.00	25.81	11.53	37.34	54.00	-16.66	Average	Horizontal
5	10360.00	41.24	6.30	47.54	74.00	-26.46	Peak	Vertical
6	10360.00	29.00	6.30	35.30	54.00	-18.70	Average	Vertical
7	15540.00	37.97	11.53	49.50	74.00	-24.50	Peak	Vertical
8	15540.00	25.89	11.53	37.42	54.00	-16.58	Average	Vertical

IEEE 802.11n-HT20_Channel 44

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10440.00	41.38	6.30	47.68	74.00	-26.32	Peak	Horizontal
2	10440.00	28.73	6.30	35.03	54.00	-18.97	Average	Horizontal
3	15660.00	38.22	11.53	49.75	74.00	-24.25	Peak	Horizontal
4	15660.00	25.81	11.53	37.34	54.00	-16.66	Average	Horizontal
5	10440.00	41.24	6.30	47.54	74.00	-26.46	Peak	Vertical
6	10440.00	28.73	6.30	35.03	54.00	-18.97	Average	Vertical
7	15660.00	37.97	11.53	49.50	74.00	-24.50	Peak	Vertical
8	15660.00	25.89	11.53	37.42	54.00	-16.58	Average	Vertical

IEEE 802.11n-HT20_Channel 48

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10480.00	40.93	6.33	47.26	74.00	-26.74	Peak	Horizontal
2	10480.00	28.42	6.33	34.75	54.00	-19.25	Average	Horizontal
3	15720.00	37.98	11.63	49.61	74.00	-24.39	Peak	Horizontal
4	15720.00	25.70	11.63	37.33	54.00	-16.67	Average	Horizontal
5	10480.00	41.58	6.33	47.91	74.00	-26.09	Peak	Vertical
6	10480.00	28.48	6.33	34.81	54.00	-19.19	Average	Vertical
7	15720.00	38.00	11.63	49.63	74.00	-24.37	Peak	Vertical
8	15720.00	25.70	11.63	37.33	54.00	-16.67	Average	Vertical

IEEE 802.11n-HT20_Channel 52

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10520.00	41.14	6.33	47.47	74.00	-26.53	Peak	Horizontal
2	10520.00	28.31	6.33	34.64	54.00	-19.36	Average	Horizontal
3	15780.00	38.15	11.71	49.86	74.00	-24.14	Peak	Horizontal
4	15780.00	25.62	11.71	37.33	54.00	-16.67	Average	Horizontal
5	10520.00	41.91	6.33	48.24	74.00	-25.76	Peak	Vertical
6	10520.00	28.37	6.33	34.70	54.00	-19.30	Average	Vertical
7	15780.00	38.60	11.71	50.31	74.00	-23.69	Peak	Vertical
8	15780.00	25.69	11.71	37.40	54.00	-16.60	Average	Vertical

IEEE 802.11n-HT20_Channel 60

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10600.00	40.17	6.30	46.47	74.00	-27.53	Peak	Horizontal
2	10600.00	27.47	6.30	33.77	54.00	-20.23	Average	Horizontal
3	15900.00	38.47	11.89	50.36	74.00	-23.64	Peak	Horizontal
4	15900.00	25.92	11.89	37.81	54.00	-16.19	Average	Horizontal
5	10600.00	40.06	6.30	46.36	74.00	-27.64	Peak	Vertical
6	10600.00	27.41	6.30	33.71	54.00	-20.29	Average	Vertical
7	15900.00	38.22	11.89	50.11	74.00	-23.89	Peak	Vertical
8	15900.00	25.92	11.89	37.81	54.00	-16.19	Average	Vertical

IEEE 802.11n-HT20_Channel 64

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10640.00	40.23	6.28	46.51	74.00	-27.49	Peak	Horizontal
2	10640.00	27.37	6.28	33.65	54.00	-20.35	Average	Horizontal
3	15960.00	38.27	11.96	50.23	74.00	-23.77	Peak	Horizontal
4	15960.00	25.85	11.96	37.81	54.00	-16.19	Average	Horizontal
5	10640.00	40.35	6.28	46.63	74.00	-27.37	Peak	Vertical
6	10640.00	27.37	6.28	33.65	54.00	-20.35	Average	Vertical
7	15960.00	37.91	11.96	49.87	74.00	-24.13	Peak	Vertical
8	15960.00	25.85	11.96	37.81	54.00	-16.19	Average	Vertical

IEEE 802.11n-HT20_Channel 100

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11000.00	39.68	6.12	45.80	74.00	-28.20	Peak	Horizontal
2	11000.00	27.96	6.12	34.08	54.00	-19.92	Average	Horizontal
3	16500.00	37.73	12.95	50.68	74.00	-23.32	Peak	Horizontal
4	16500.00	25.65	12.95	38.60	54.00	-15.40	Average	Horizontal
5	11000.00	40.51	6.12	46.63	74.00	-27.37	Peak	Vertical
6	11000.00	28.02	6.12	34.14	54.00	-19.86	Average	Vertical
7	16500.00	37.94	12.95	50.89	74.00	-23.11	Peak	Vertical
8	16500.00	25.73	12.95	38.68	54.00	-15.32	Average	Vertical

IEEE 802.11n-HT20_Channel 116

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11160.00	38.87	6.37	45.24	74.00	-28.76	Peak	Horizontal
2	11160.00	26.99	6.37	33.36	54.00	-20.64	Average	Horizontal
3	16740.00	39.41	13.01	52.42	74.00	-21.58	Peak	Horizontal
4	16740.00	25.87	13.01	38.88	54.00	-15.12	Average	Horizontal
5	11160.00	39.41	6.37	45.78	74.00	-28.22	Peak	Vertical
6	11160.00	26.99	6.37	33.36	54.00	-20.64	Average	Vertical
7	16740.00	38.95	13.01	51.96	74.00	-22.04	Peak	Vertical
8	16740.00	25.94	13.01	38.95	54.00	-15.05	Average	Vertical

IEEE 802.11n-HT20_Channel 140

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11400.00	38.91	6.73	45.64	74.00	-28.36	Peak	Horizontal
2	11400.00	27.03	6.73	33.76	54.00	-20.24	Average	Horizontal
3	17100.00	36.61	13.34	49.95	74.00	-24.05	Peak	Horizontal
4	17100.00	24.49	13.34	37.83	54.00	-16.17	Average	Horizontal
5	11400.00	39.44	6.87	46.31	74.00	-27.69	Peak	Vertical
6	11400.00	26.82	6.87	33.69	54.00	-20.31	Average	Vertical
7	17100.00	36.95	13.70	50.65	74.00	-23.35	Peak	Vertical
8	17100.00	24.90	13.70	38.60	54.00	-15.40	Average	Vertical

IEEE 802.11n-HT20_Channel 149

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11490.00	40.73	6.87	47.60	74.00	-26.40	Peak	Horizontal
2	11490.00	27.37	6.87	34.24	54.00	-19.76	Average	Horizontal
3	17235.00	37.13	13.70	50.83	74.00	-23.17	Peak	Horizontal
4	17235.00	24.90	13.70	38.60	54.00	-15.40	Average	Horizontal
5	11490.00	40.41	6.87	47.28	74.00	-26.72	Peak	Vertical
6	11490.00	27.31	6.87	34.18	54.00	-19.82	Average	Vertical
7	17235.00	36.73	13.70	50.43	74.00	-23.57	Peak	Vertical
8	17235.00	24.99	13.70	38.69	54.00	-15.31	Average	Vertical

IEEE 802.11n-HT20_Channel 157

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11570.00	38.48	7.06	45.54	74.00	-28.46	Peak	Horizontal
2	11570.00	26.63	7.06	33.69	54.00	-20.31	Average	Horizontal
3	17355.00	37.83	14.01	51.84	74.00	-22.16	Peak	Horizontal
4	17355.00	25.35	14.01	39.36	54.00	-14.64	Average	Horizontal
5	11570.00	38.47	7.06	45.53	74.00	-28.47	Peak	Vertical
6	11570.00	26.77	7.06	33.83	54.00	-20.17	Average	Vertical
7	17355.00	37.41	14.01	51.42	74.00	-22.58	Peak	Vertical
8	17355.00	25.35	14.01	39.36	54.00	-14.64	Average	Vertical

IEEE 802.11n-HT20_Channel 165

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11650.00	39.11	7.26	46.37	74.00	-27.63	Peak	Horizontal
2	11650.00	26.74	7.26	34.00	54.00	-20.00	Average	Horizontal
3	17475.00	36.46	14.33	50.79	74.00	-23.21	Peak	Horizontal
4	17475.00	24.72	14.33	39.05	54.00	-14.95	Average	Horizontal
5	11650.00	39.55	7.26	46.81	74.00	-27.19	Peak	Vertical
6	11650.00	26.80	7.26	34.06	54.00	-19.94	Average	Vertical
7	17475.00	37.66	14.33	51.99	74.00	-22.01	Peak	Vertical
8	17475.00	24.80	14.33	39.13	54.00	-14.87	Average	Vertical

IEEE 802.11n-HT40_Channel 38

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10380.00	41.50	6.25	47.75	74.00	-26.25	Peak	Horizontal
2	10380.00	28.95	6.25	35.20	54.00	-18.80	Average	Horizontal
3	15570.00	37.29	11.41	48.70	74.00	-25.30	Peak	Horizontal
4	15570.00	25.73	11.41	37.14	54.00	-16.86	Average	Horizontal
5	10380.00	40.98	6.25	47.23	74.00	-26.77	Peak	Vertical
6	10380.00	28.95	6.25	35.20	54.00	-18.80	Average	Vertical
7	15570.00	37.71	11.41	49.12	74.00	-24.88	Peak	Vertical
8	15570.00	25.73	11.41	37.14	54.00	-16.86	Average	Vertical

IEEE 802.11n-HT40_Channel 46

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10460.00	40.35	6.32	46.67	74.00	-27.33	Peak	Horizontal
2	10460.00	28.61	6.32	34.93	54.00	-19.07	Average	Horizontal
3	15690.00	38.74	11.59	50.33	74.00	-23.67	Peak	Horizontal
4	15690.00	25.75	11.59	37.34	54.00	-16.66	Average	Horizontal
5	10460.00	41.12	6.32	47.44	74.00	-26.56	Peak	Vertical
6	10460.00	28.61	6.32	34.93	54.00	-19.07	Average	Vertical
7	15690.00	38.54	11.59	50.13	74.00	-23.87	Peak	Vertical
8	15690.00	25.75	11.59	37.34	54.00	-16.66	Average	Vertical

IEEE 802.11n-HT40_Channel 54

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10540.00	41.22	6.32	47.54	74.00	-26.46	Peak	Horizontal
2	10540.00	28.46	6.32	34.78	54.00	-19.22	Average	Horizontal
3	15810.00	38.14	11.75	49.89	74.00	-24.11	Peak	Horizontal
4	15810.00	25.71	11.75	37.46	54.00	-16.54	Average	Horizontal
5	10540.00	40.43	6.32	46.75	74.00	-27.25	Peak	Vertical
6	10540.00	28.51	6.32	34.83	54.00	-19.17	Average	Vertical
7	15810.00	37.90	11.75	49.65	74.00	-24.35	Peak	Vertical
8	15810.00	25.63	11.75	37.38	54.00	-16.62	Average	Vertical

IEEE 802.11n-HT40_Channel 62

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10620.00	39.50	6.29	45.79	74.00	-28.21	Peak	Horizontal
2	10620.00	27.23	6.29	33.52	54.00	-20.48	Average	Horizontal
3	15930.00	38.09	11.93	50.02	74.00	-23.98	Peak	Horizontal
4	15930.00	25.74	11.93	37.67	54.00	-16.33	Average	Horizontal
5	10620.00	40.27	6.29	46.56	74.00	-27.44	Peak	Vertical
6	10620.00	27.29	6.29	33.58	54.00	-20.42	Average	Vertical
7	15930.00	38.80	11.93	50.73	74.00	-23.27	Peak	Vertical
8	15930.00	25.81	11.93	37.74	54.00	-16.26	Average	Vertical

IEEE 802.11n-HT40_Channel 102

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11020.00	39.97	6.15	46.12	74.00	-27.88	Peak	Horizontal
2	11020.00	27.81	6.15	33.96	54.00	-20.04	Average	Horizontal
3	16530.00	37.86	12.97	50.83	74.00	-23.17	Peak	Horizontal
4	16530.00	25.56	12.97	38.53	54.00	-15.47	Average	Horizontal
5	11020.00	40.18	6.15	46.33	74.00	-27.67	Peak	Vertical
6	11020.00	27.87	6.15	34.02	54.00	-19.98	Average	Vertical
7	16530.00	37.58	12.97	50.55	74.00	-23.45	Peak	Vertical
8	16530.00	25.56	12.97	38.53	54.00	-15.47	Average	Vertical

IEEE 802.11n-HT40_Channel 110

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11100.00	38.77	6.27	45.04	74.00	-28.96	Peak	Horizontal
2	11100.00	27.15	6.27	33.42	54.00	-20.58	Average	Horizontal
3	16650.00	38.57	12.99	51.56	74.00	-22.44	Peak	Horizontal
4	16650.00	26.03	12.99	39.02	54.00	-14.98	Average	Horizontal
5	11100.00	39.51	6.27	45.78	74.00	-28.22	Peak	Vertical
6	11100.00	27.15	6.27	33.42	54.00	-20.58	Average	Vertical
7	16650.00	38.16	12.99	51.15	74.00	-22.85	Peak	Vertical
8	16650.00	25.96	12.99	38.95	54.00	-15.05	Average	Vertical

IEEE 802.11n-HT40_Channel 134

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11340.00	38.99	6.64	45.63	74.00	-28.37	Peak	Horizontal
2	11340.00	26.89	6.64	33.53	54.00	-20.47	Average	Horizontal
3	17010.00	37.58	13.11	50.69	74.00	-23.31	Peak	Horizontal
4	17010.00	24.57	13.11	37.68	54.00	-16.32	Average	Horizontal
5	11340.00	38.55	6.64	45.19	74.00	-28.81	Peak	Vertical
6	11340.00	26.89	6.64	33.53	54.00	-20.47	Average	Vertical
7	17010.00	36.72	13.11	49.83	74.00	-24.17	Peak	Vertical
8	17010.00	24.49	13.11	37.60	54.00	-16.40	Average	Vertical

IEEE 802.11n-HT40_Channel 151

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11510.00	39.48	6.91	46.39	74.00	-27.61	Peak	Horizontal
2	11510.00	27.39	6.91	34.30	54.00	-19.70	Average	Horizontal
3	17265.00	37.07	13.78	50.85	74.00	-23.15	Peak	Horizontal
4	17265.00	24.82	13.78	38.60	54.00	-15.40	Average	Horizontal
5	11510.00	40.56	6.91	47.47	74.00	-26.53	Peak	Vertical
6	11510.00	27.33	6.91	34.24	54.00	-19.76	Average	Vertical
7	17265.00	38.07	13.78	51.85	74.00	-22.15	Peak	Vertical
8	17265.00	24.82	13.78	38.60	54.00	-15.40	Average	Vertical

IEEE 802.11n-HT40_Channel 159

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11590.00	40.10	7.11	47.21	74.00	-26.79	Peak	Horizontal
2	11590.00	26.72	7.11	33.83	54.00	-20.17	Average	Horizontal
3	17385.00	38.22	14.09	52.31	74.00	-21.69	Peak	Horizontal
4	17385.00	25.27	14.09	39.36	54.00	-14.64	Average	Horizontal
5	11590.00	38.86	7.11	45.97	74.00	-28.03	Peak	Vertical
6	11590.00	26.58	7.11	33.69	54.00	-20.31	Average	Vertical
7	17385.00	37.99	14.09	52.08	74.00	-21.92	Peak	Vertical
8	17385.00	25.27	14.09	39.36	54.00	-14.64	Average	Vertical

IEEE 802.11ac-VHT80_Channel 42

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10460.00	40.85	6.29	47.14	74.00	-26.86	Peak	Horizontal
2	10460.00	28.58	6.29	34.87	54.00	-19.13	Average	Horizontal
3	15690.00	37.75	11.49	49.24	74.00	-24.76	Peak	Horizontal
4	15690.00	25.93	11.49	37.42	54.00	-16.58	Average	Horizontal
5	10460.00	41.84	6.29	48.13	74.00	-25.87	Peak	Vertical
6	10460.00	28.64	6.29	34.93	54.00	-19.07	Average	Vertical
7	15690.00	38.52	11.49	50.01	74.00	-23.99	Peak	Vertical
8	15690.00	26.00	11.49	37.49	54.00	-16.51	Average	Vertical

IEEE 802.11ac-VHT80_Channel 58

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10580.00	40.71	6.31	47.02	74.00	-26.98	Peak	Horizontal
2	10580.00	28.41	6.31	34.72	54.00	-19.28	Average	Horizontal
3	15870.00	37.59	11.85	49.44	74.00	-24.56	Peak	Horizontal
4	15870.00	25.61	11.85	37.46	54.00	-16.54	Average	Horizontal
5	10580.00	40.94	6.31	47.25	74.00	-26.75	Peak	Vertical
6	10580.00	28.41	6.31	34.72	54.00	-19.28	Average	Vertical
7	15870.00	38.60	11.85	50.45	74.00	-23.55	Peak	Vertical
8	15870.00	25.61	11.85	37.46	54.00	-16.54	Average	Vertical

IEEE 802.11ac-VHT80_Channel 106

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11060.00	39.88	6.21	46.09	74.00	-27.91	Peak	Horizontal
2	11060.00	28.14	6.21	34.35	54.00	-19.65	Average	Horizontal
3	16590.00	37.10	12.98	50.08	74.00	-23.92	Peak	Horizontal
4	16590.00	25.42	12.98	38.40	54.00	-15.60	Average	Horizontal
5	11060.00	40.82	6.21	47.03	74.00	-26.97	Peak	Vertical
6	11060.00	28.08	6.21	34.29	54.00	-19.71	Average	Vertical
7	16590.00	37.46	12.98	50.44	74.00	-23.56	Peak	Vertical
8	16590.00	25.50	12.98	38.48	54.00	-15.52	Average	Vertical

IEEE 802.11ac-VHT80_Channel 155

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11550.00	39.86	7.01	46.87	74.00	-27.13	Peak	Horizontal
2	11550.00	26.98	7.01	33.99	54.00	-20.01	Average	Horizontal
3	17325.00	37.44	13.93	51.37	74.00	-22.63	Peak	Horizontal
4	17325.00	24.67	13.93	38.60	54.00	-15.40	Average	Horizontal
5	11550.00	39.32	7.01	46.33	74.00	-27.67	Peak	Vertical
6	11550.00	27.10	7.01	34.11	54.00	-19.89	Average	Vertical
7	17325.00	37.06	13.93	50.99	74.00	-23.01	Peak	Vertical
8	17325.00	24.67	13.93	38.60	54.00	-15.40	Average	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit

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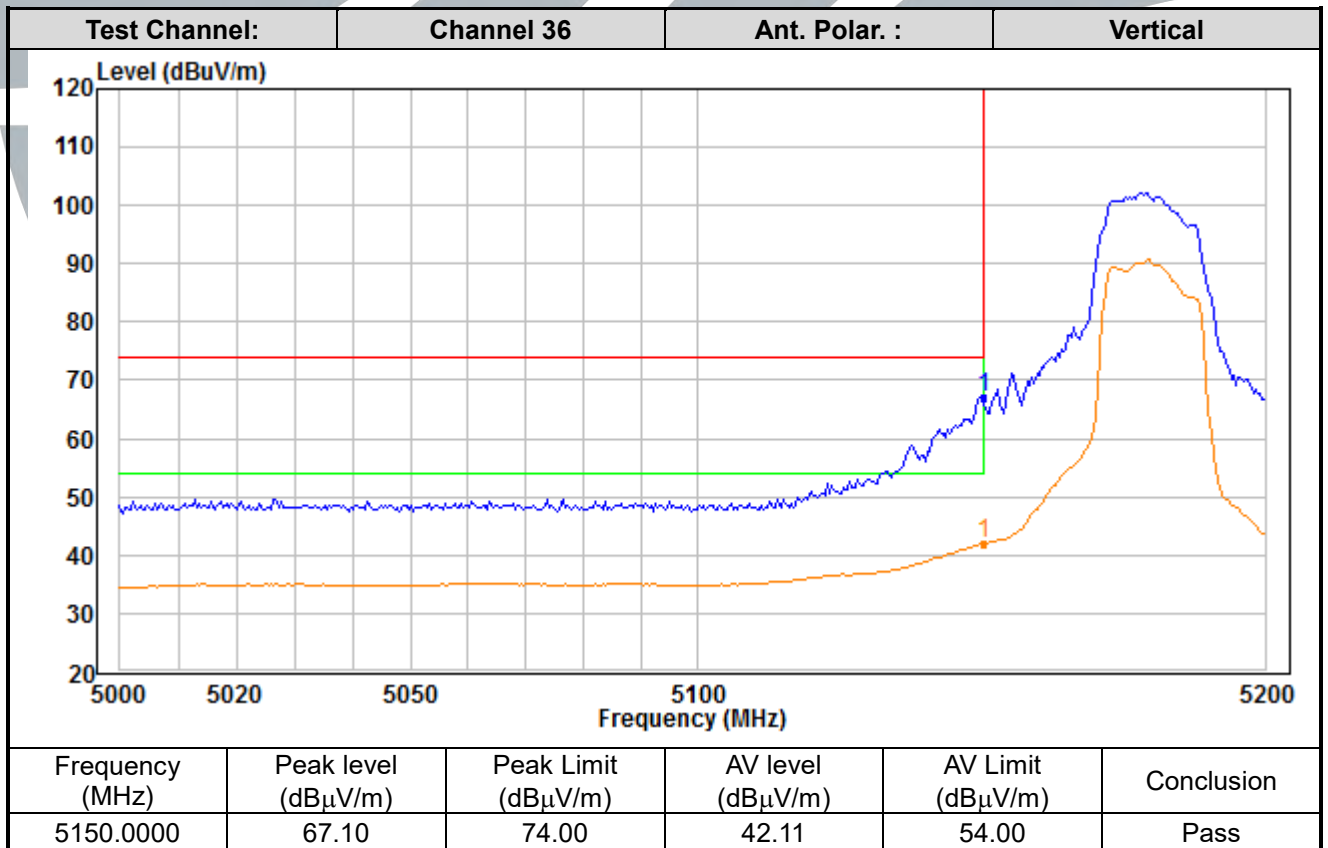
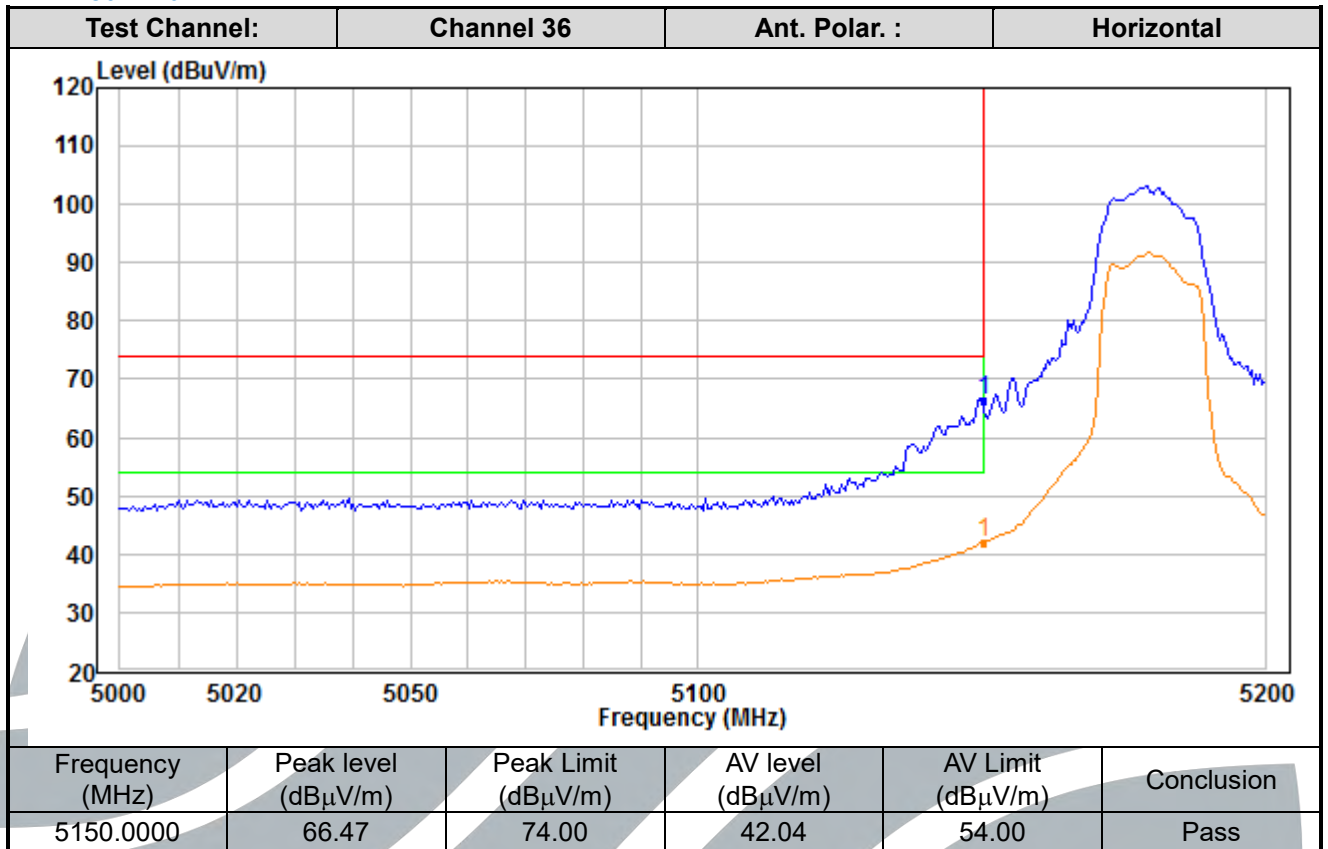
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Band Edge Measurements (Radiated)

IEEE 802.11a



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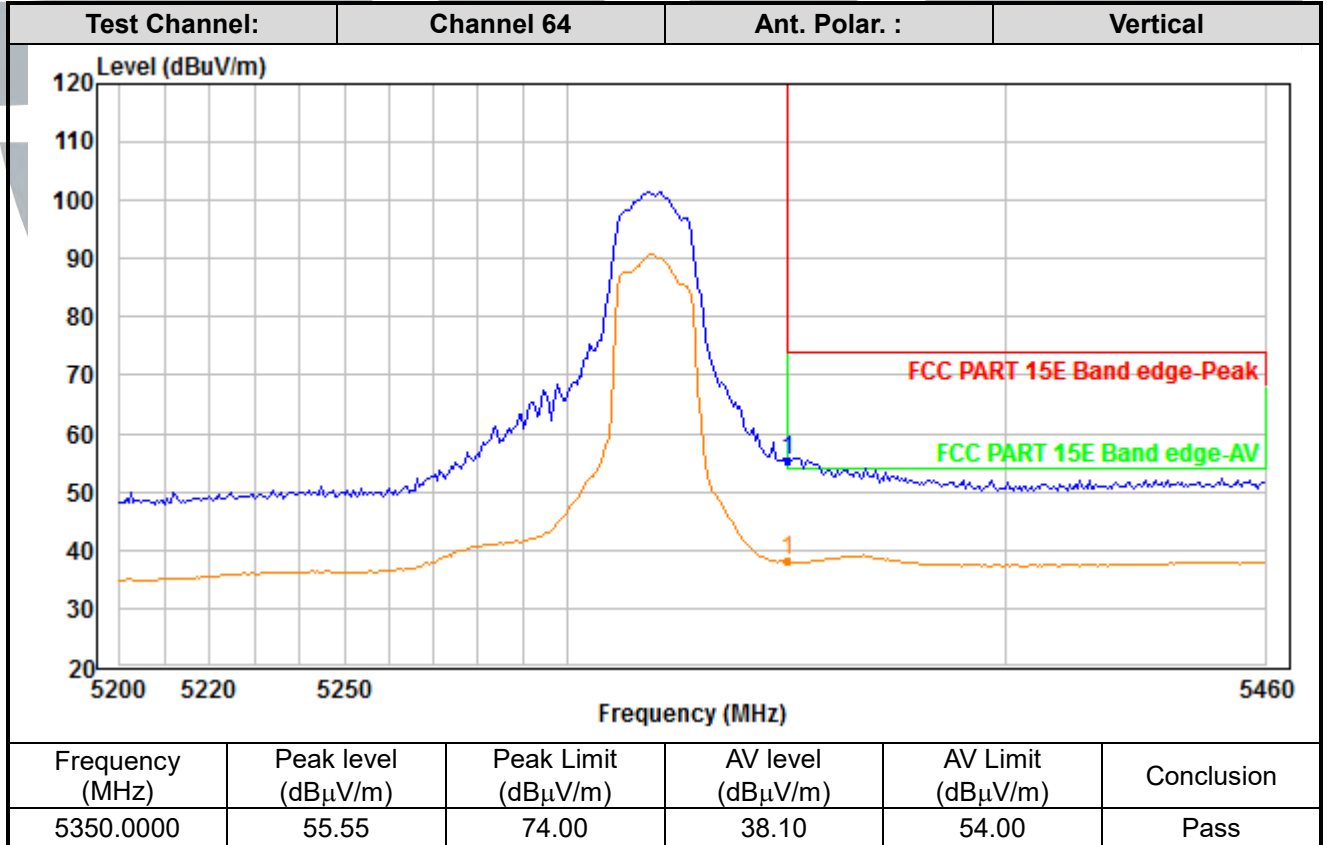
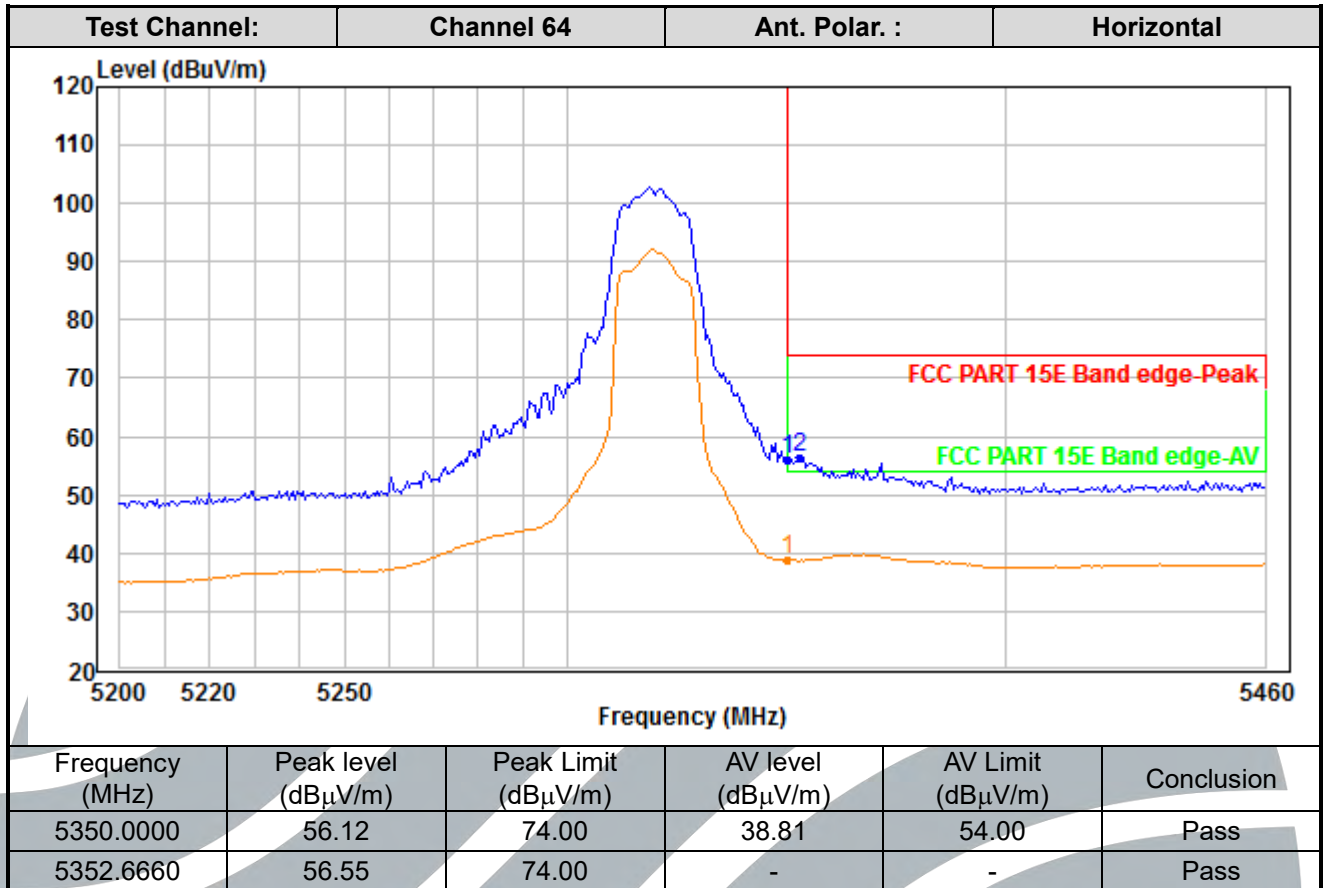
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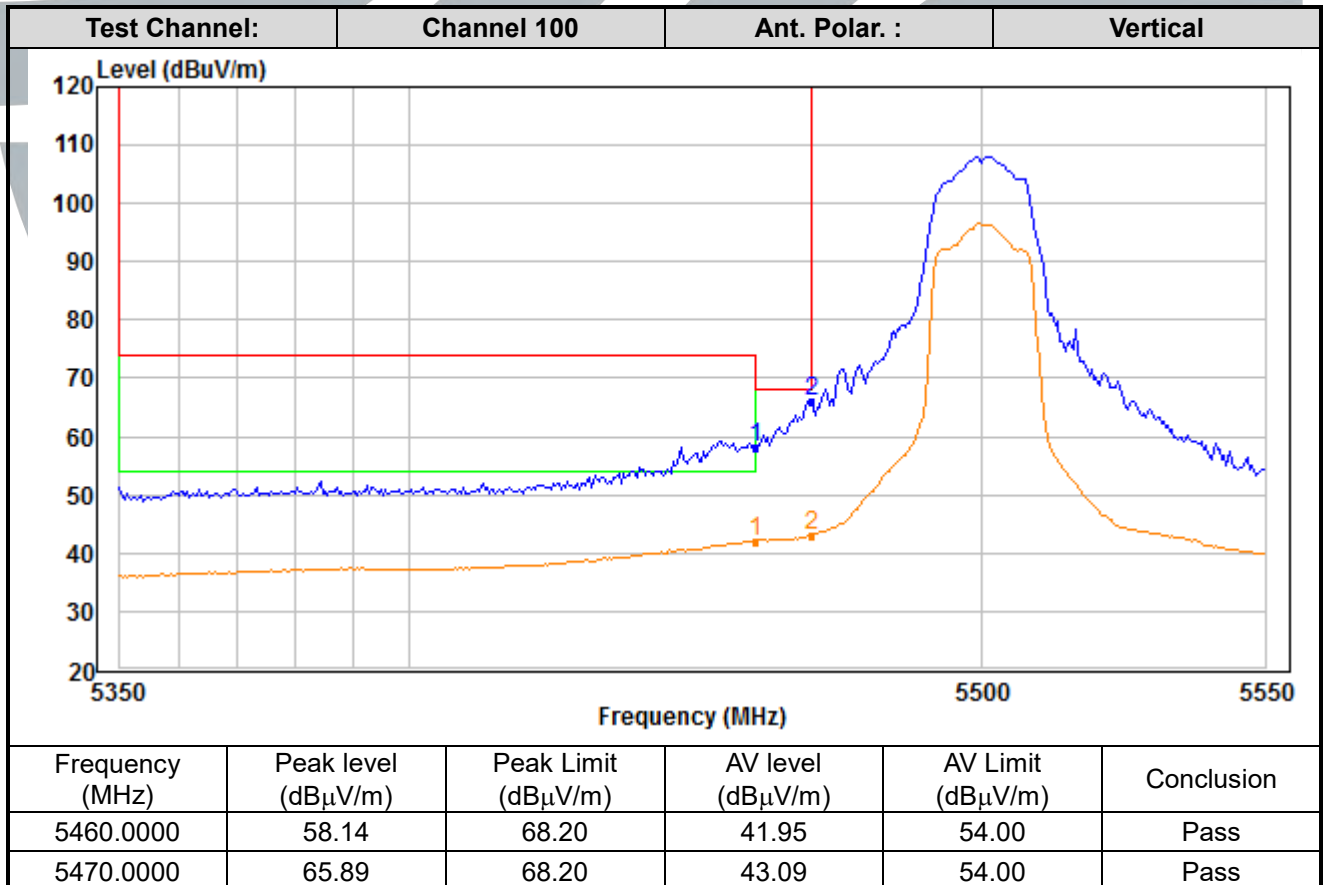
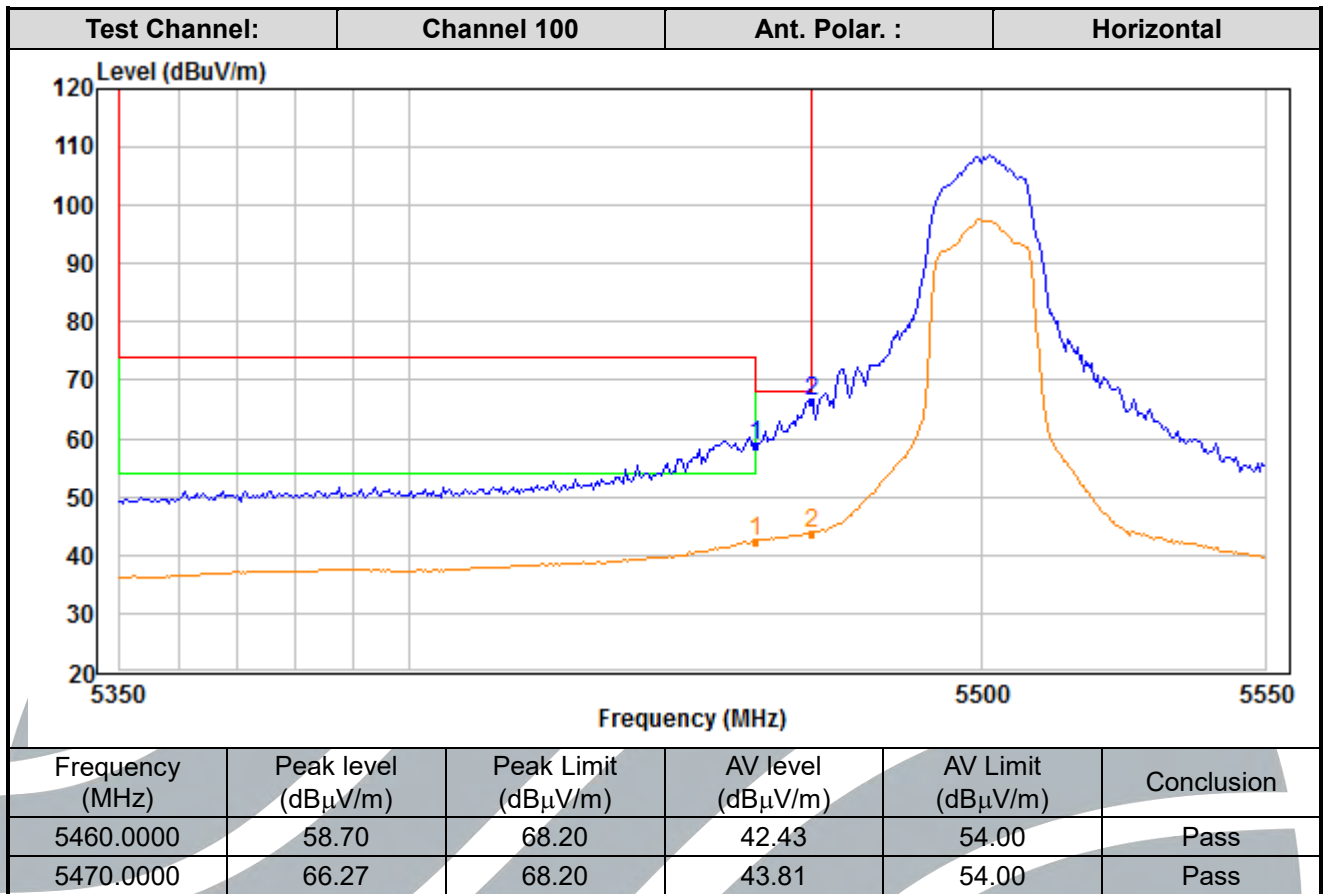
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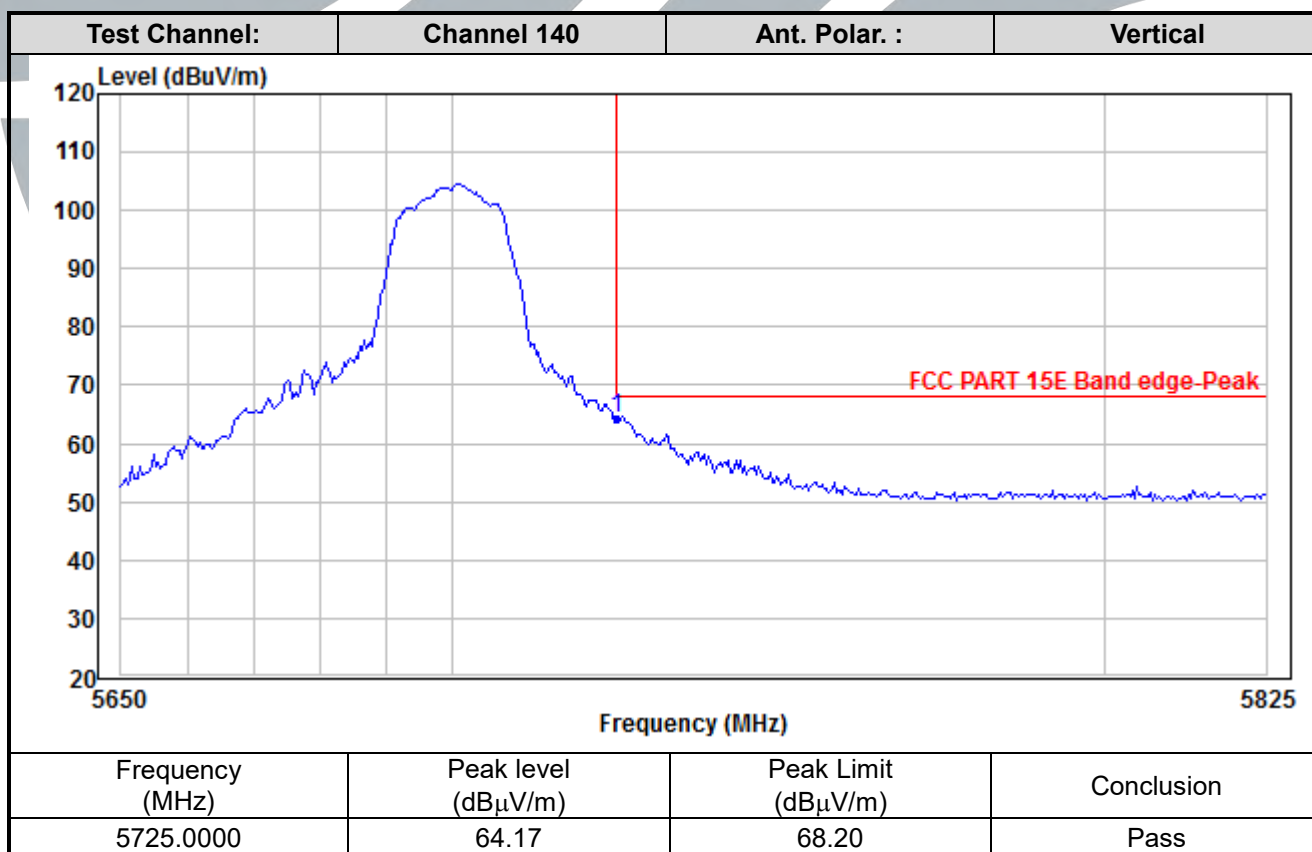
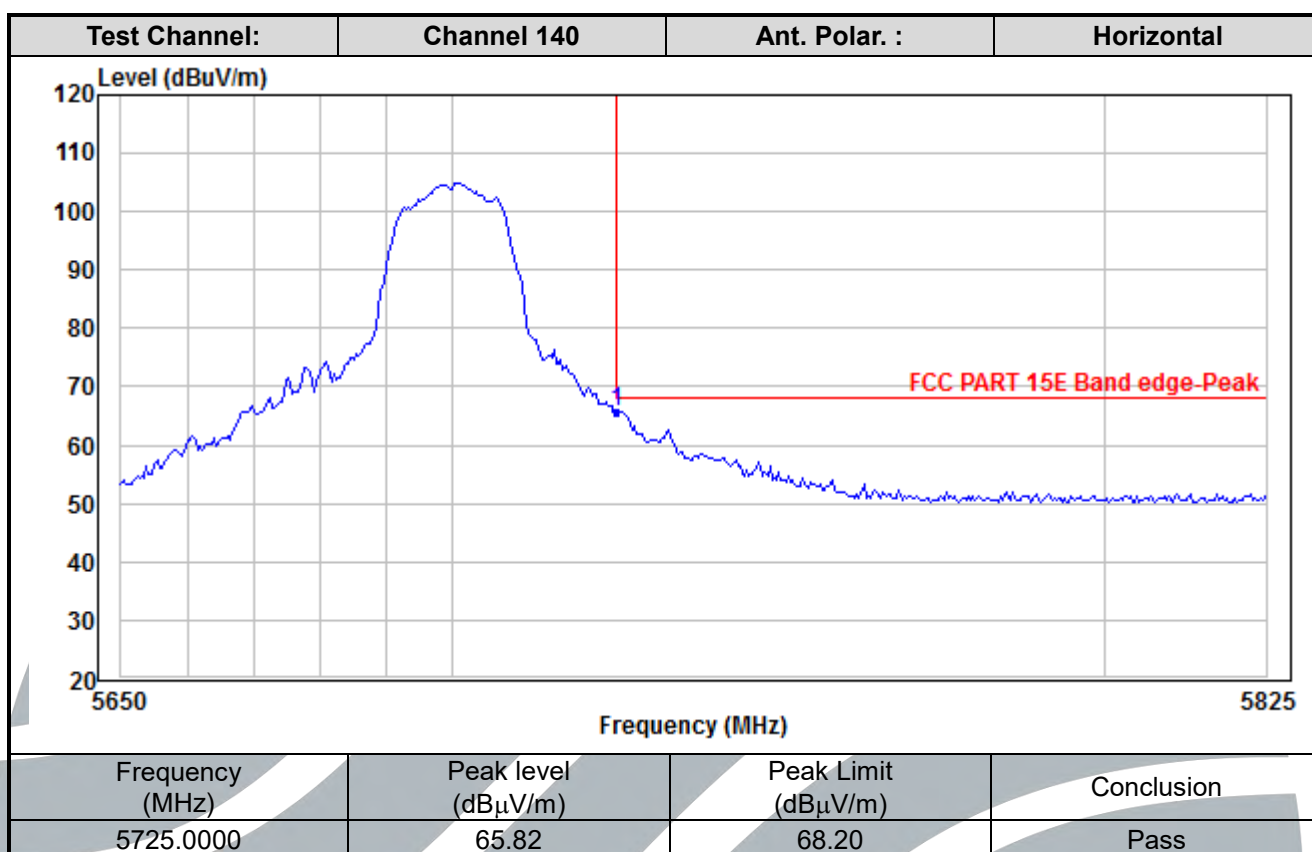
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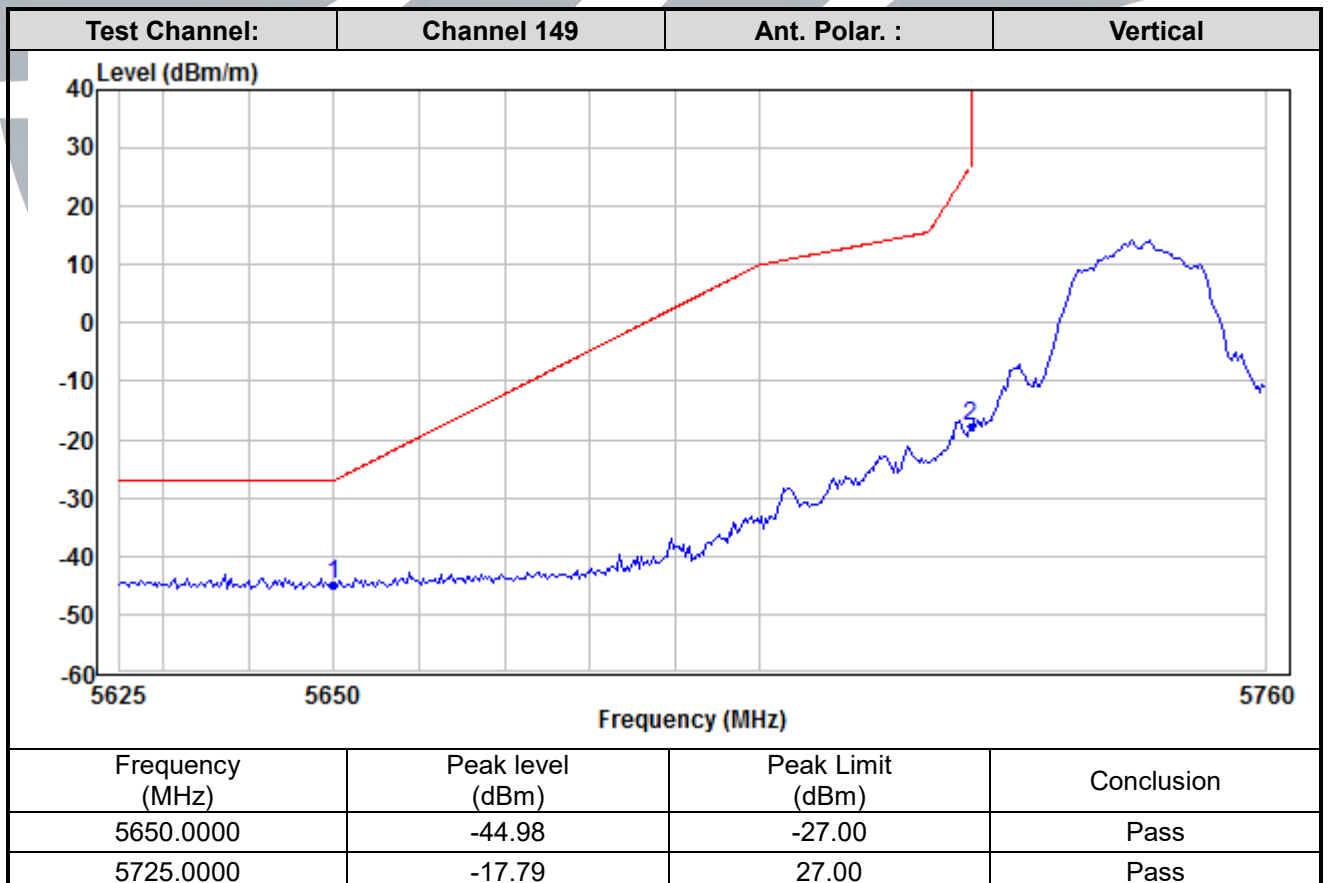
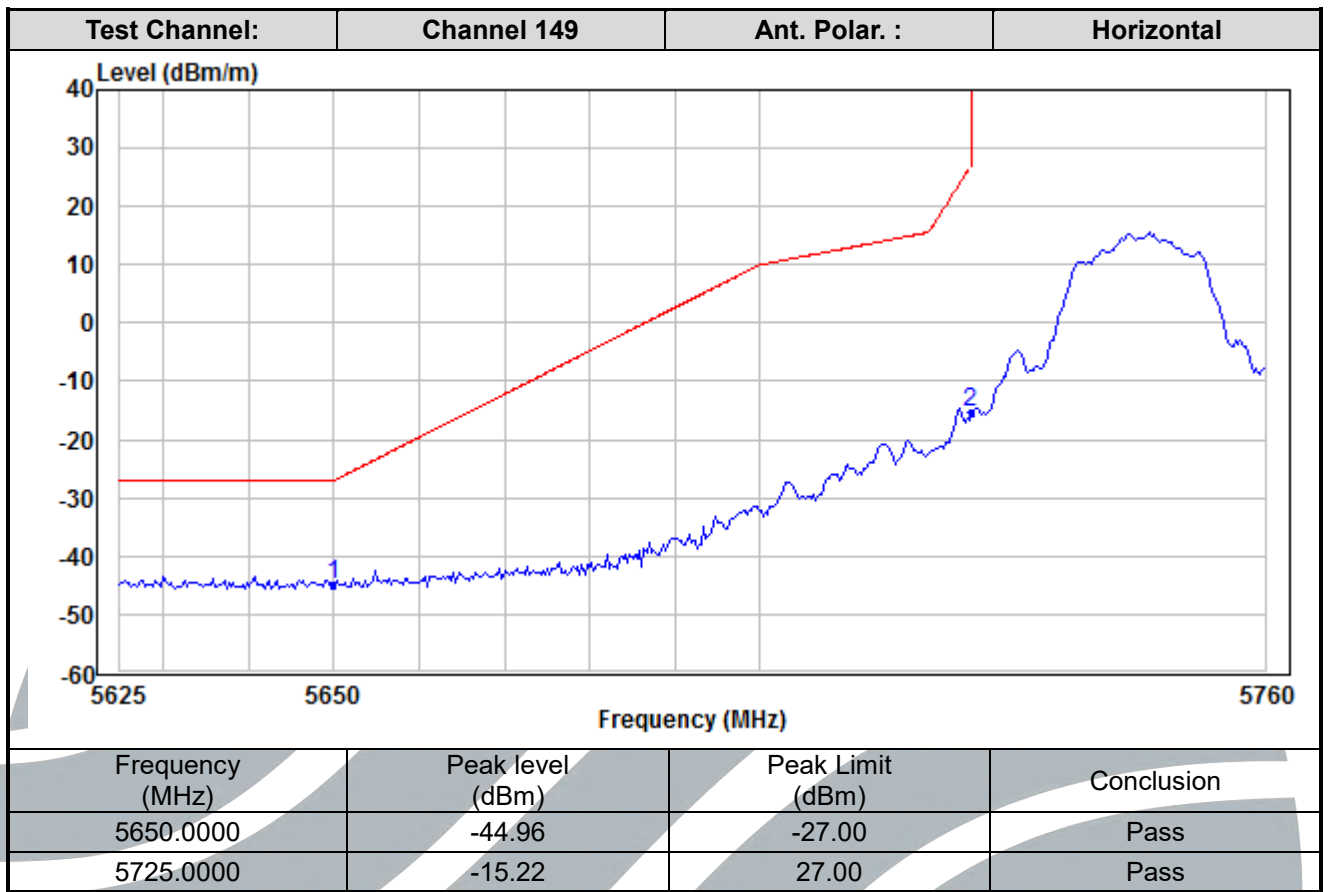
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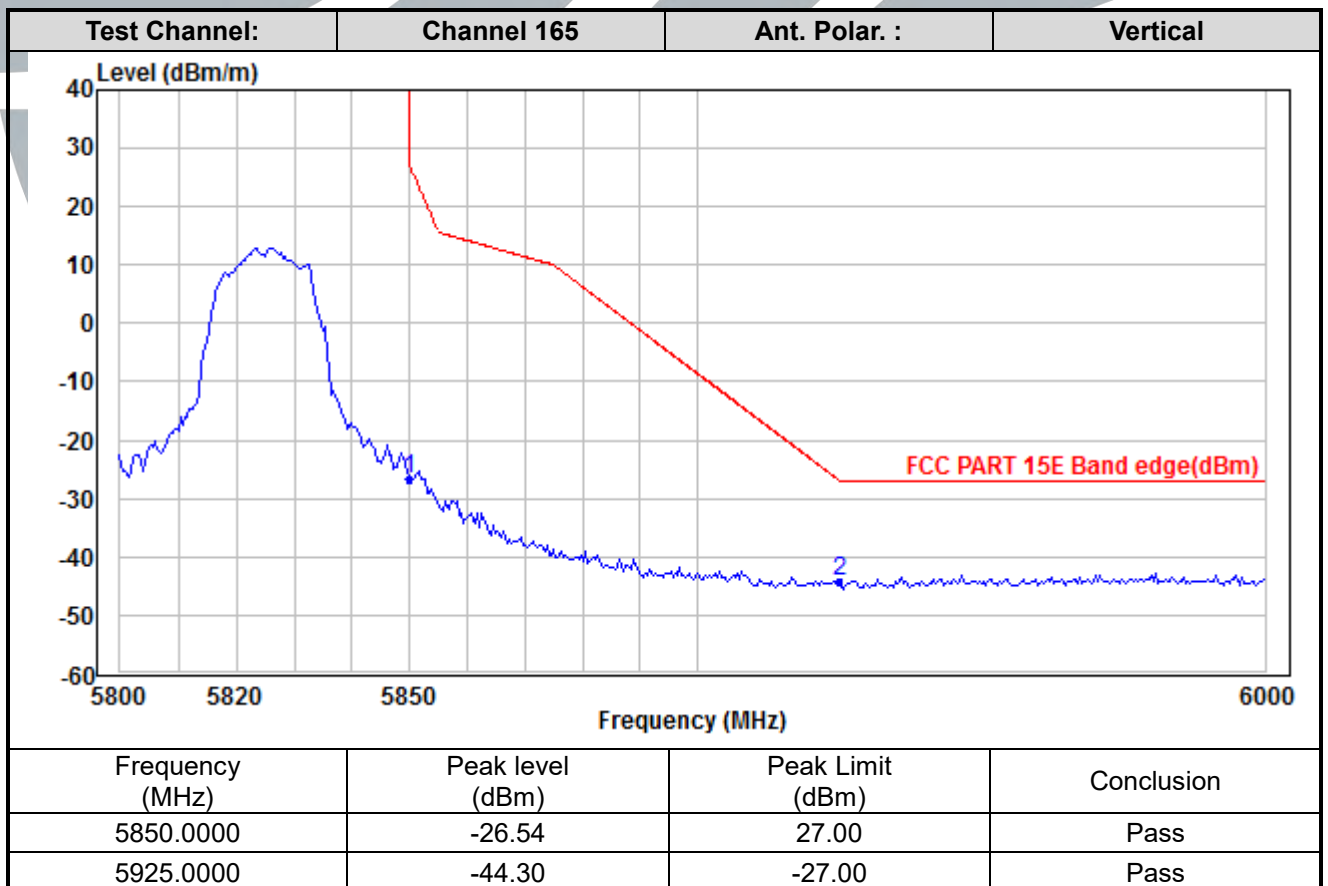
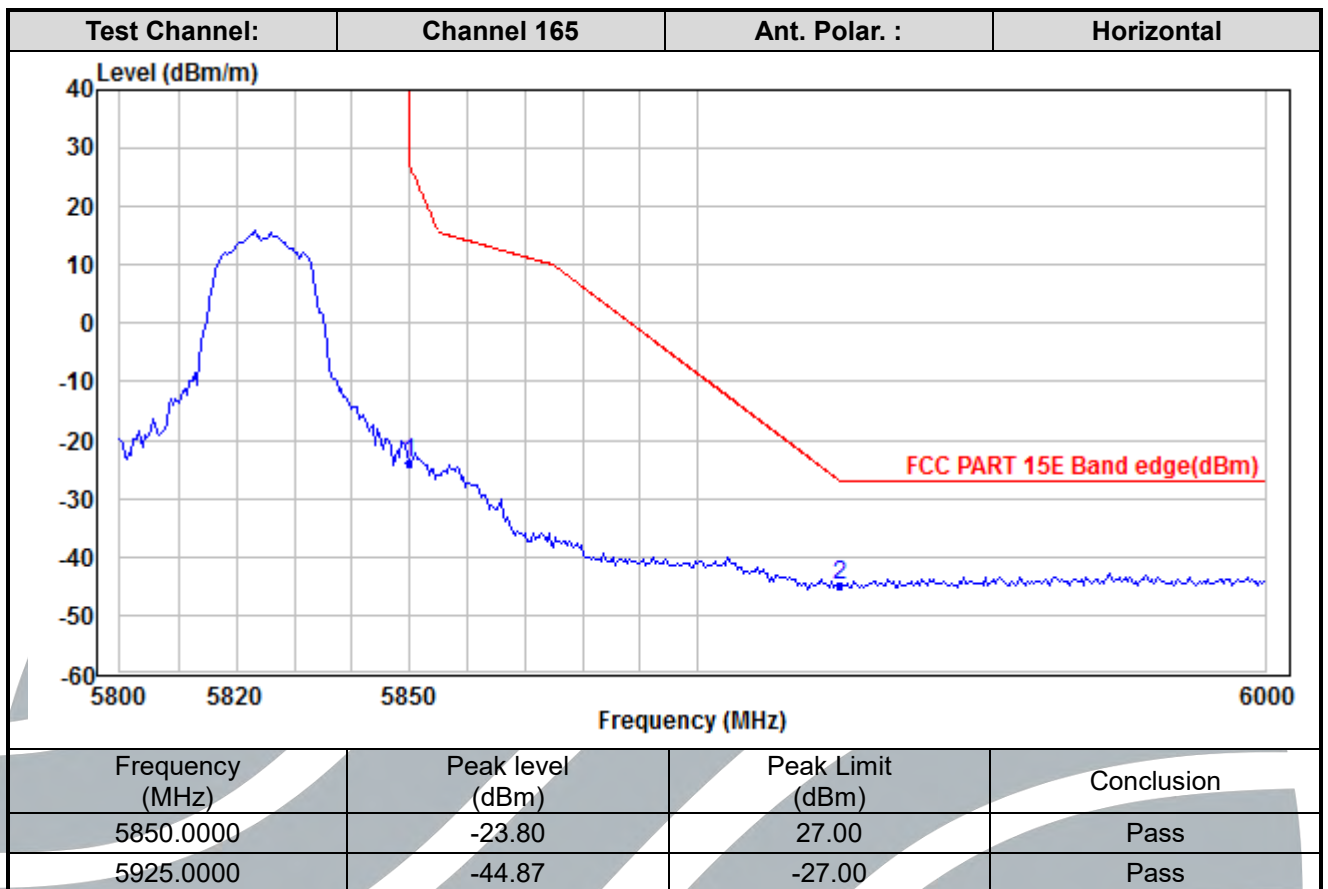
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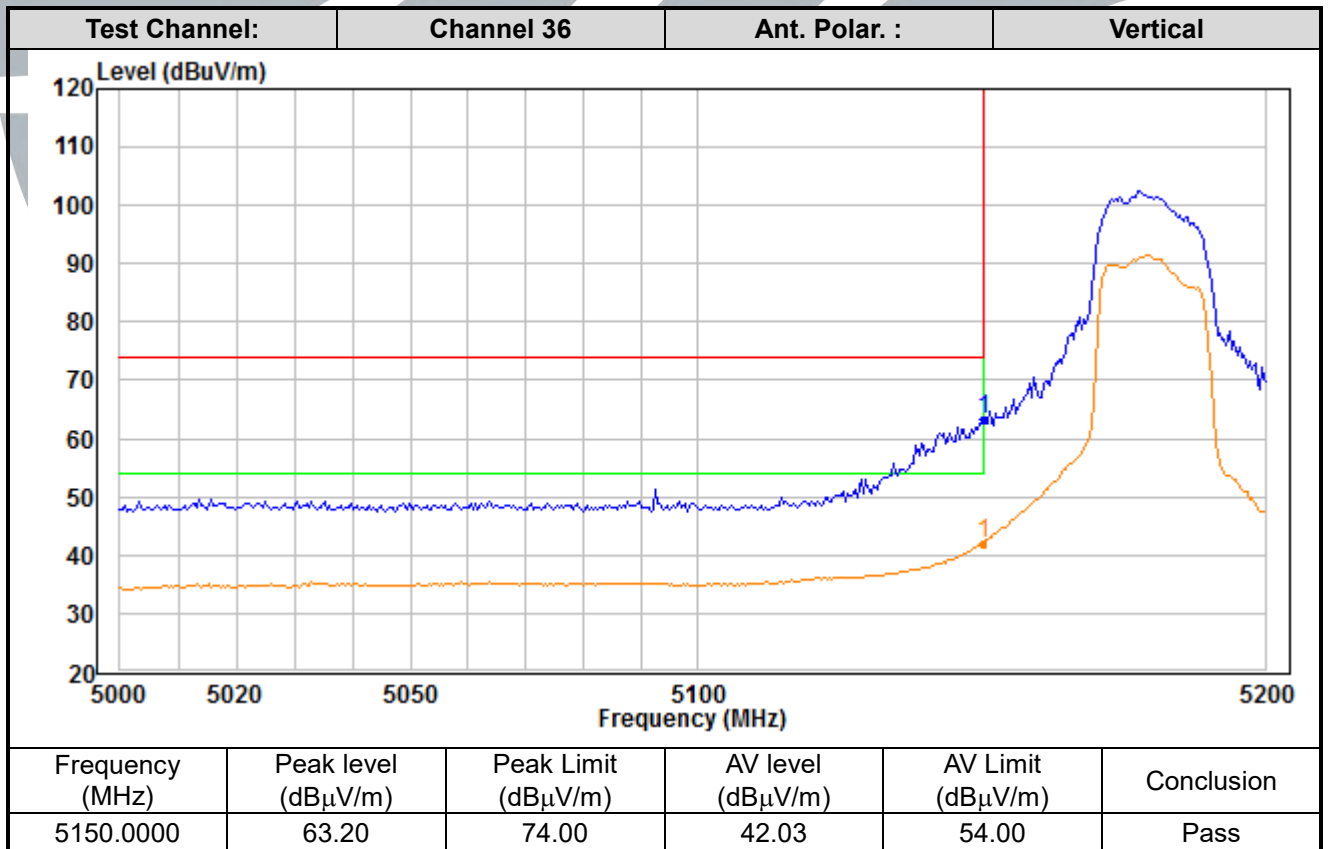
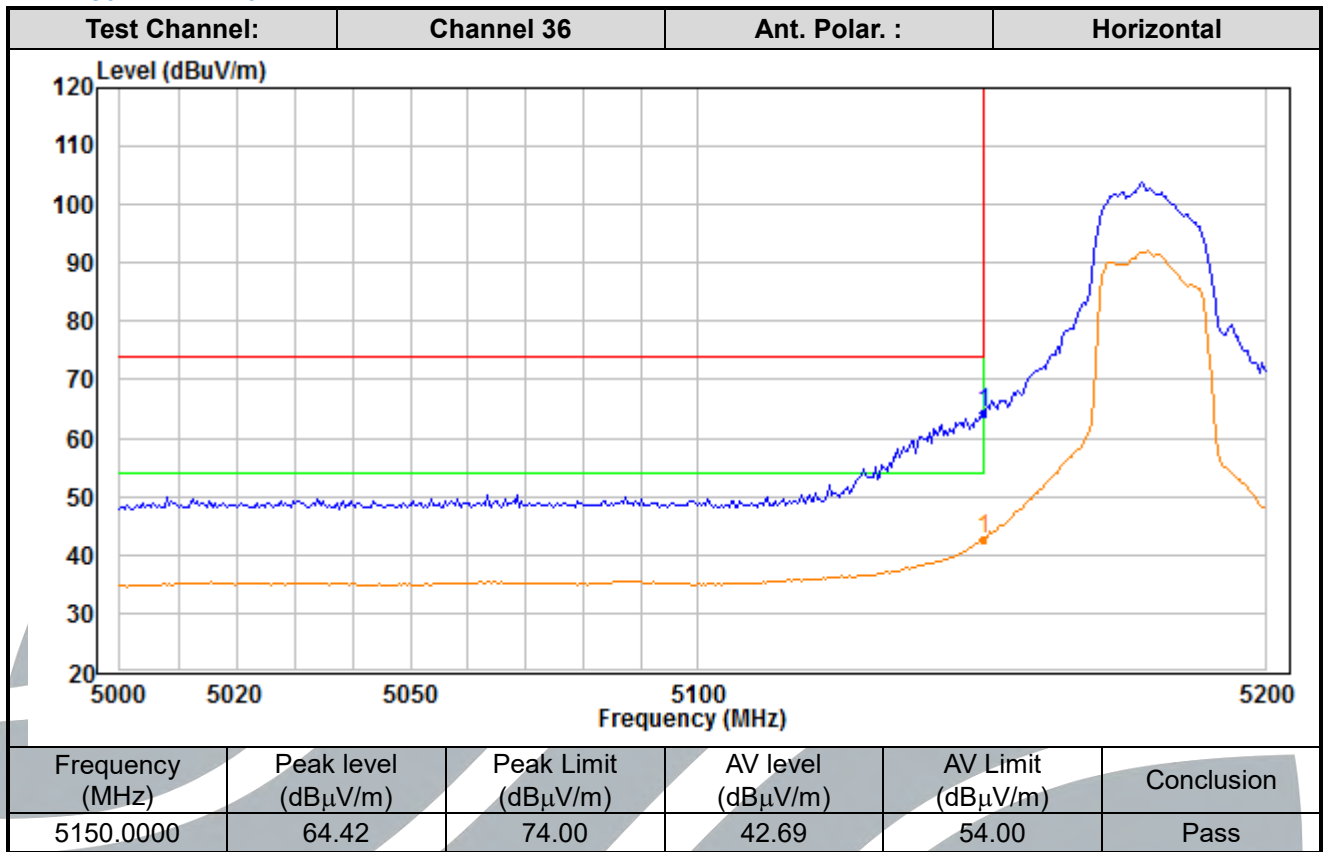
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IEEE 802.11n-HT20



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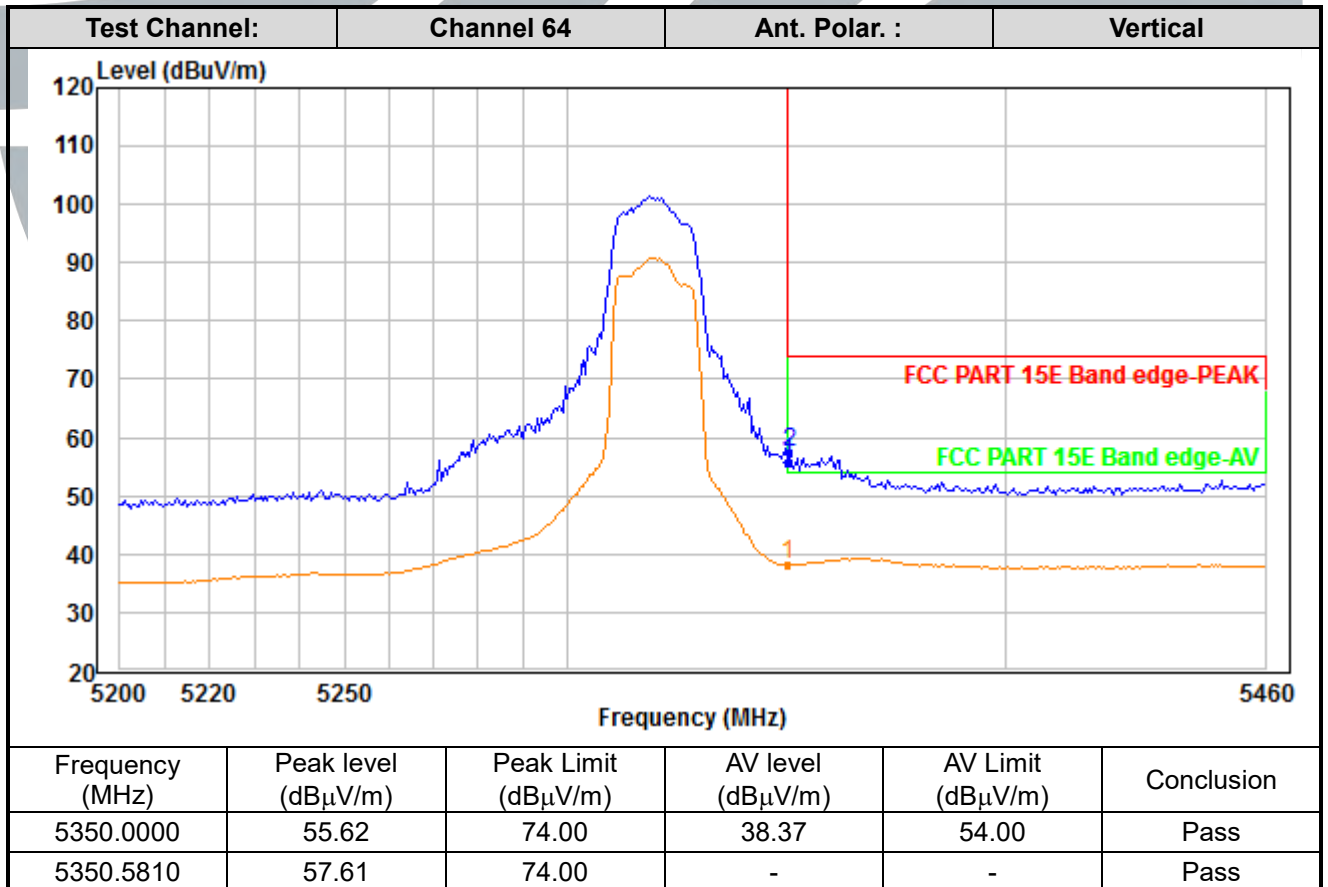
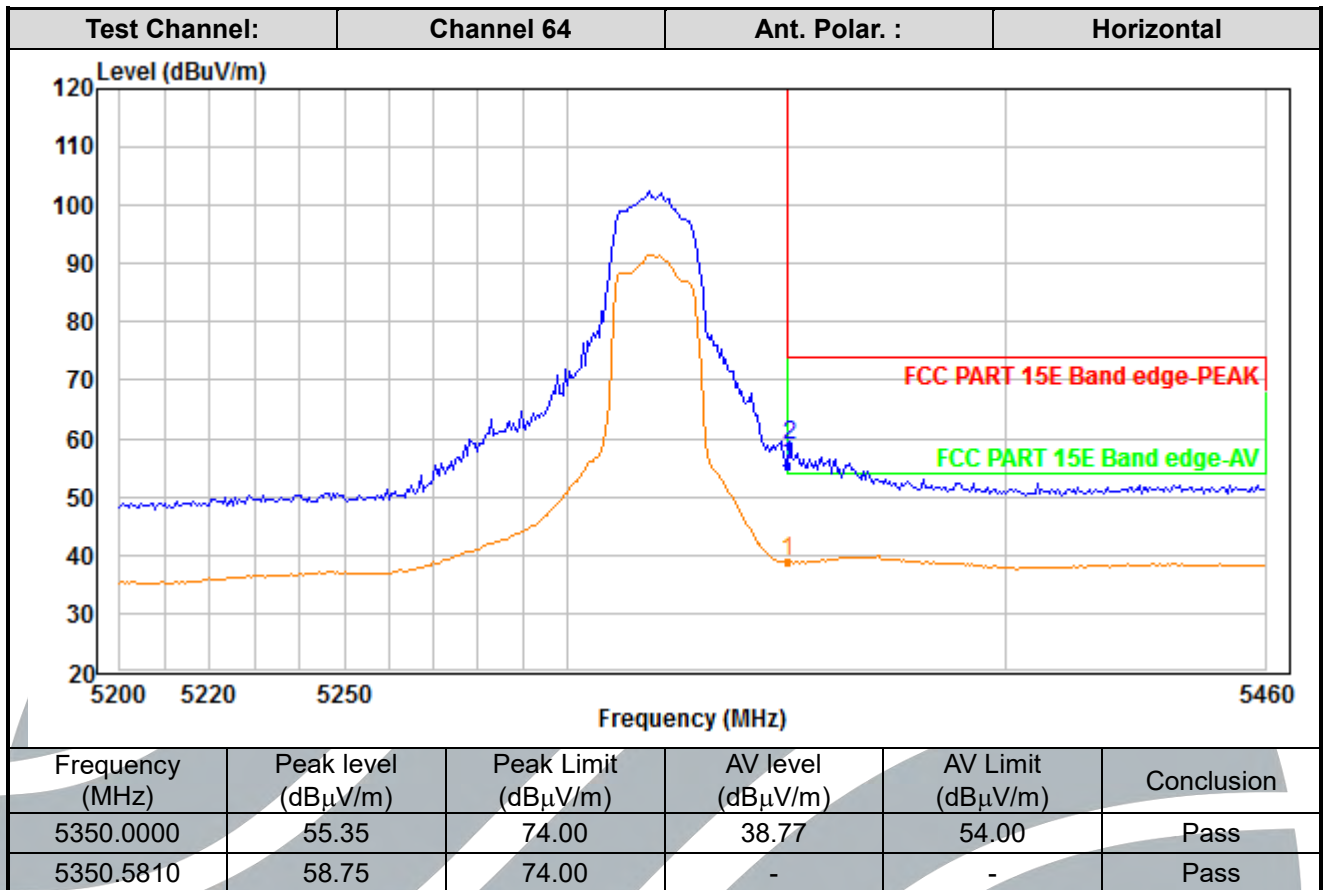
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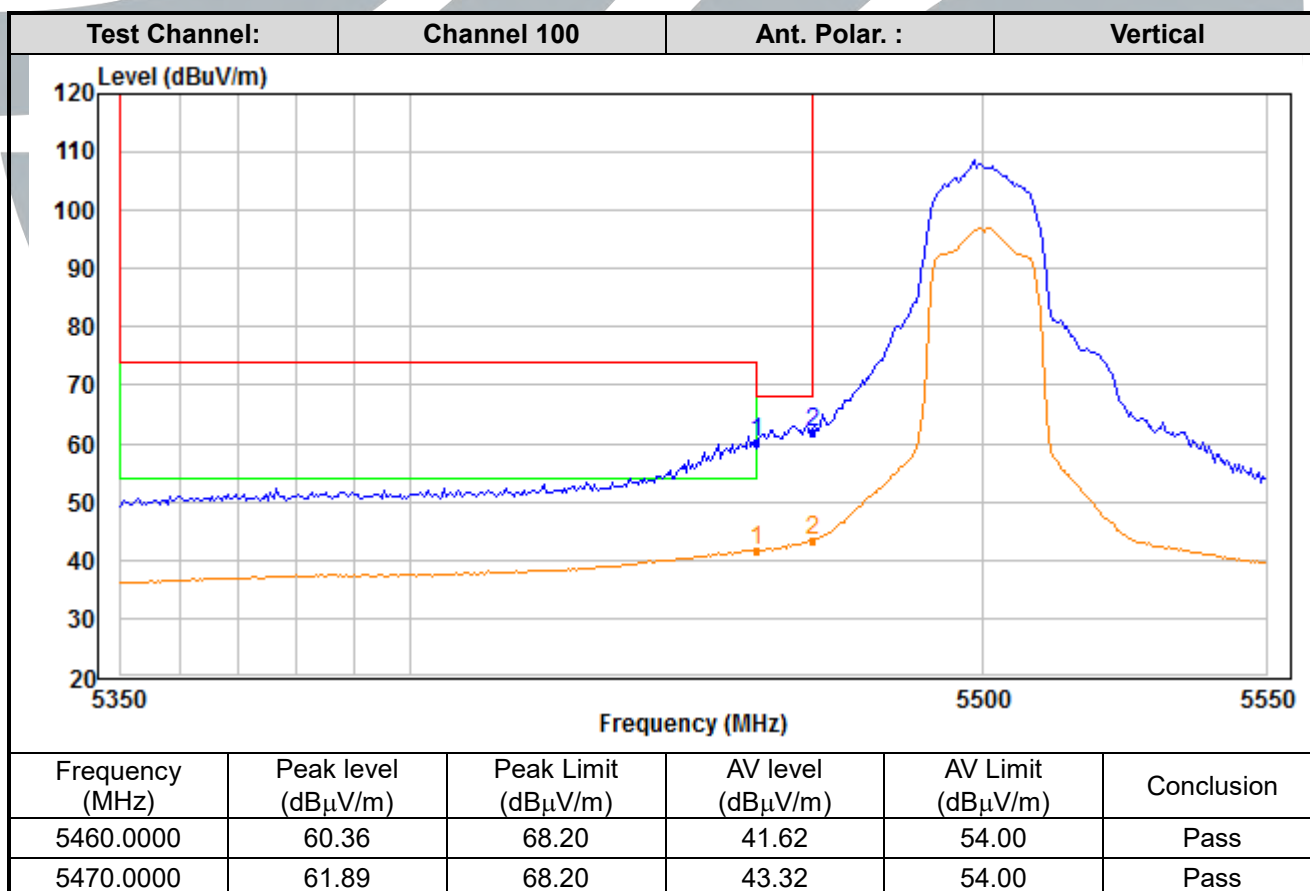
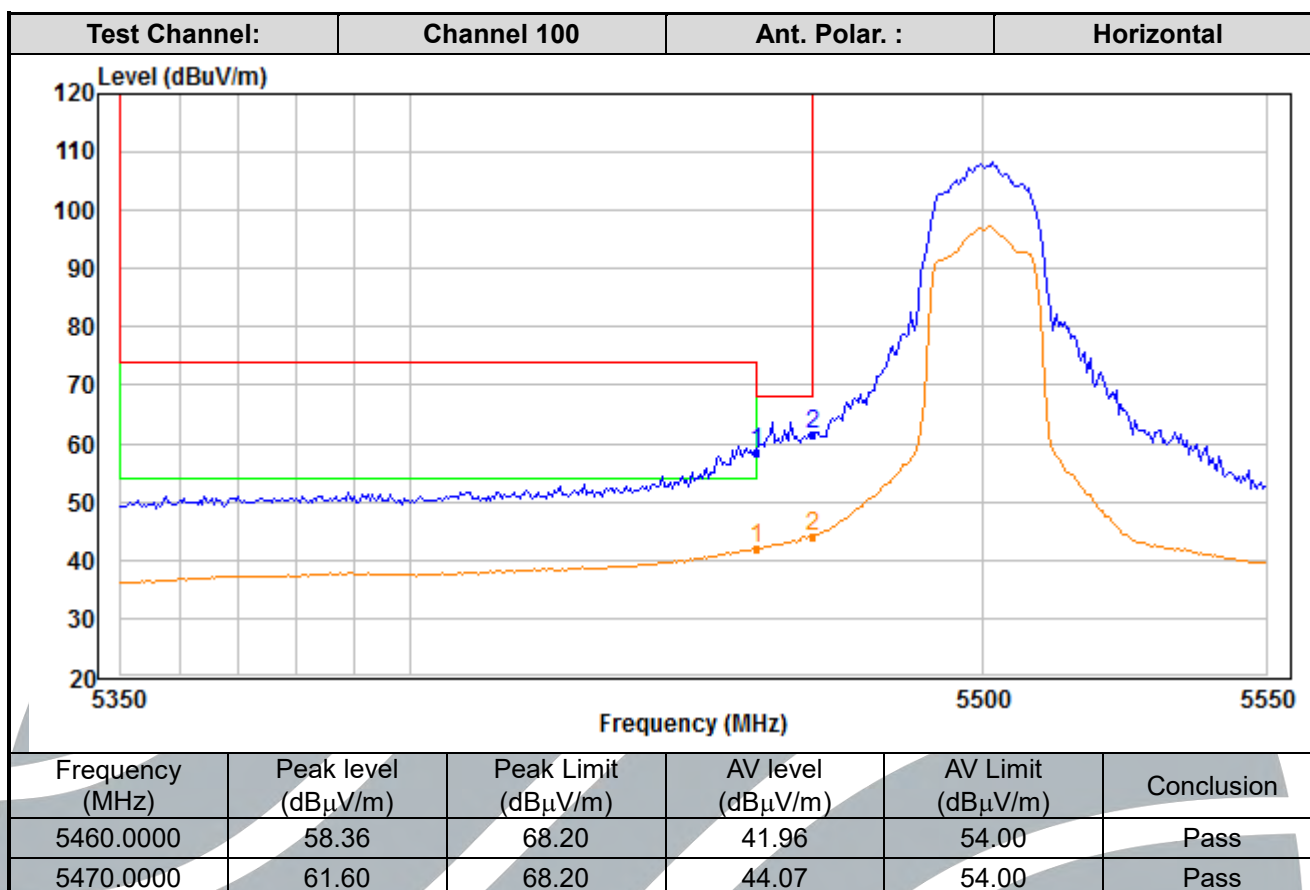
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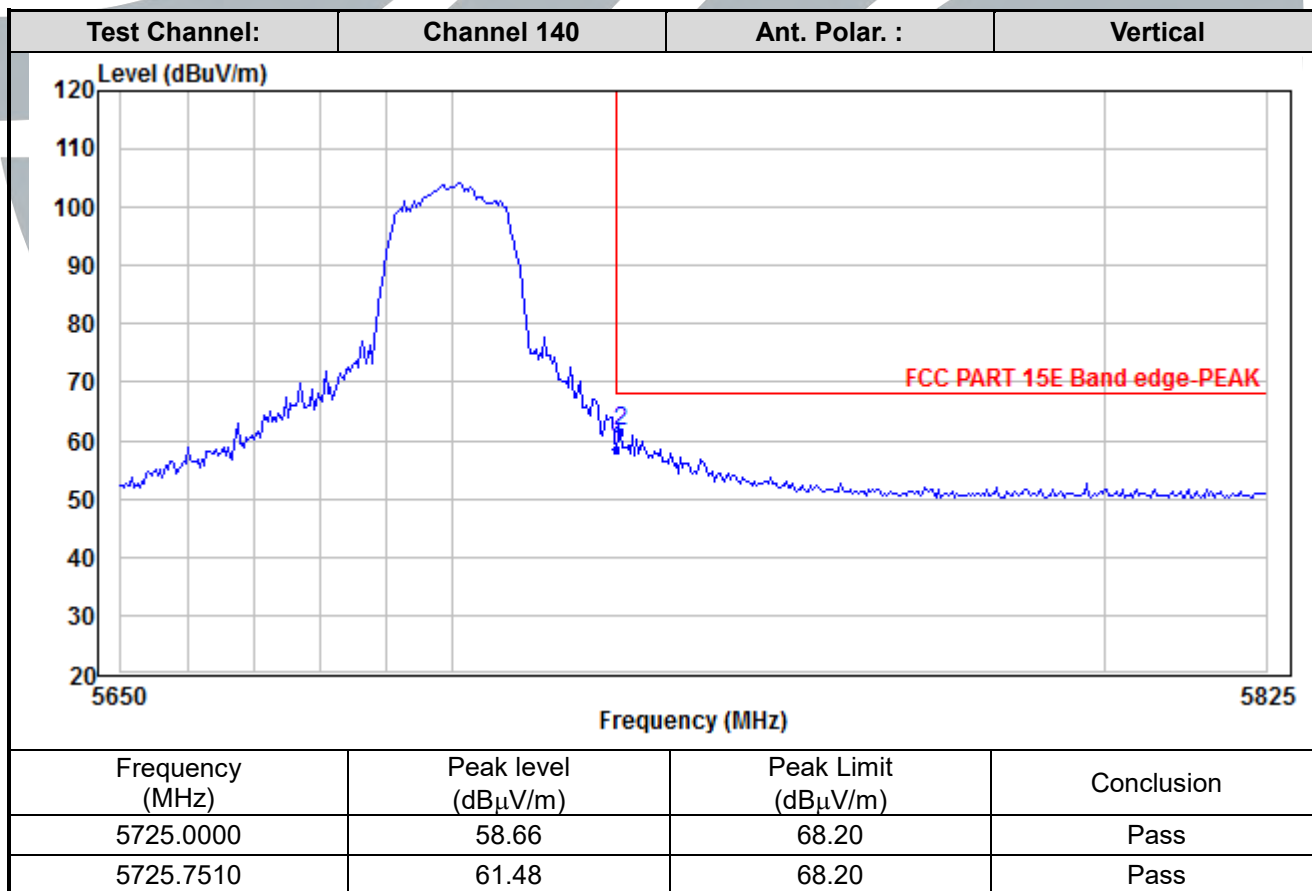
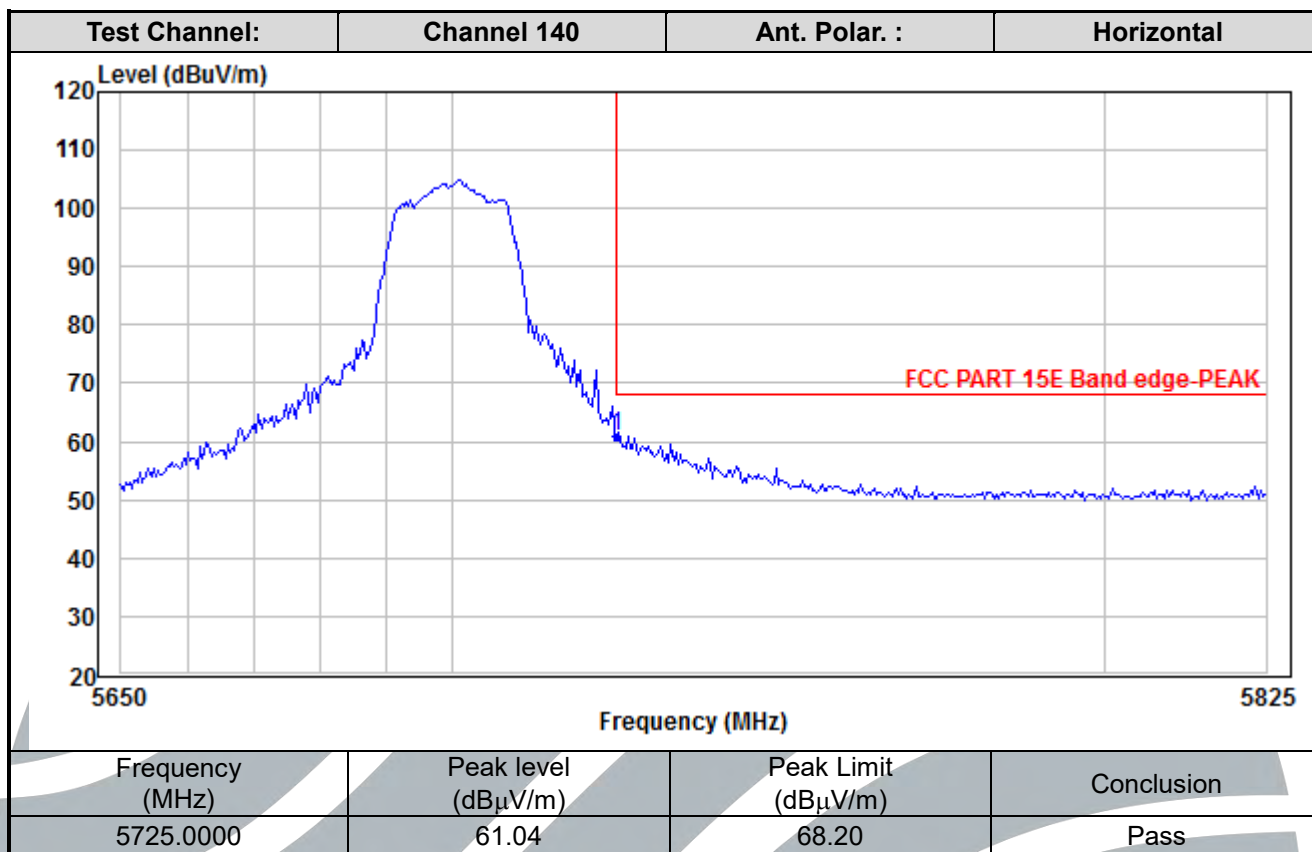
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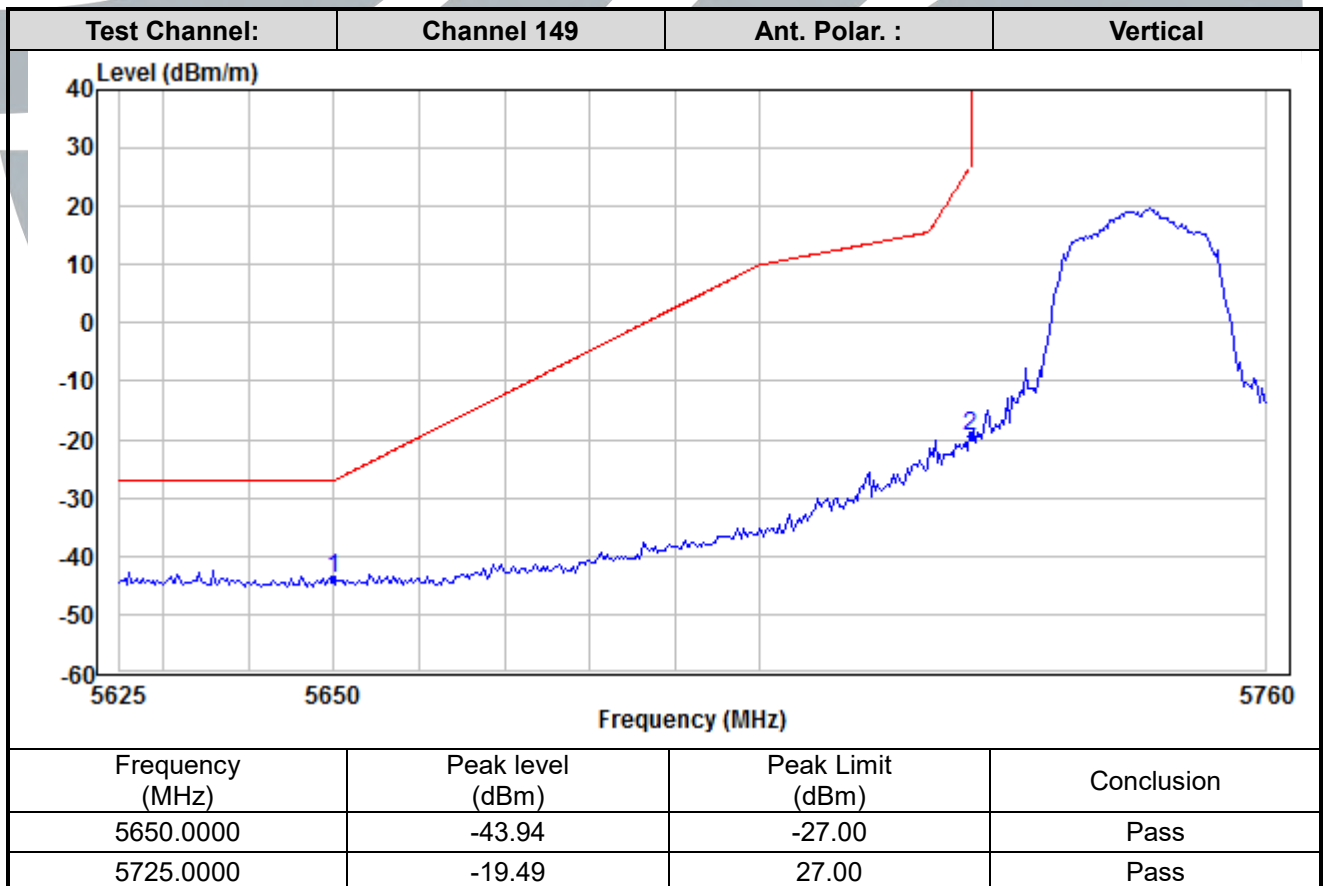
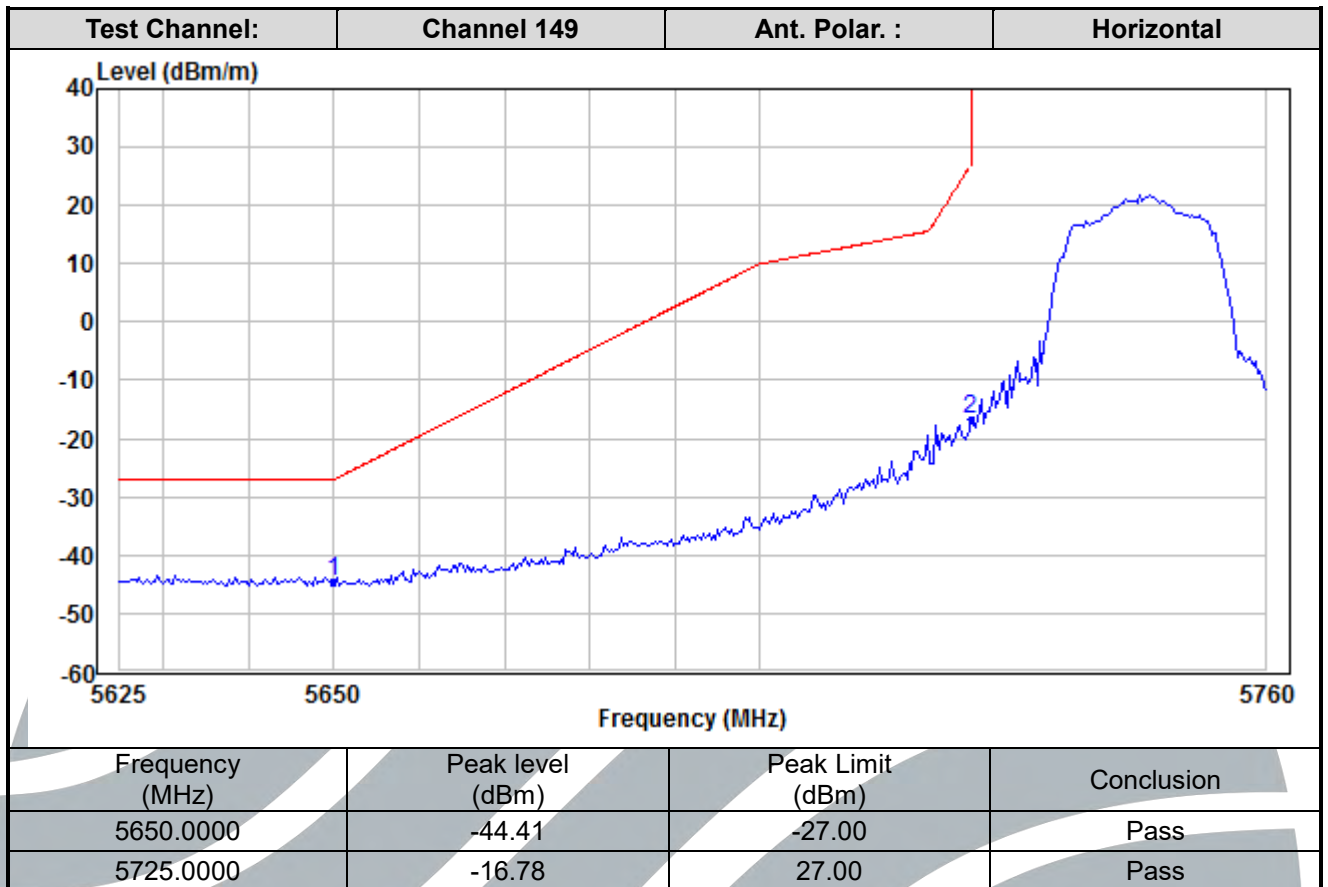
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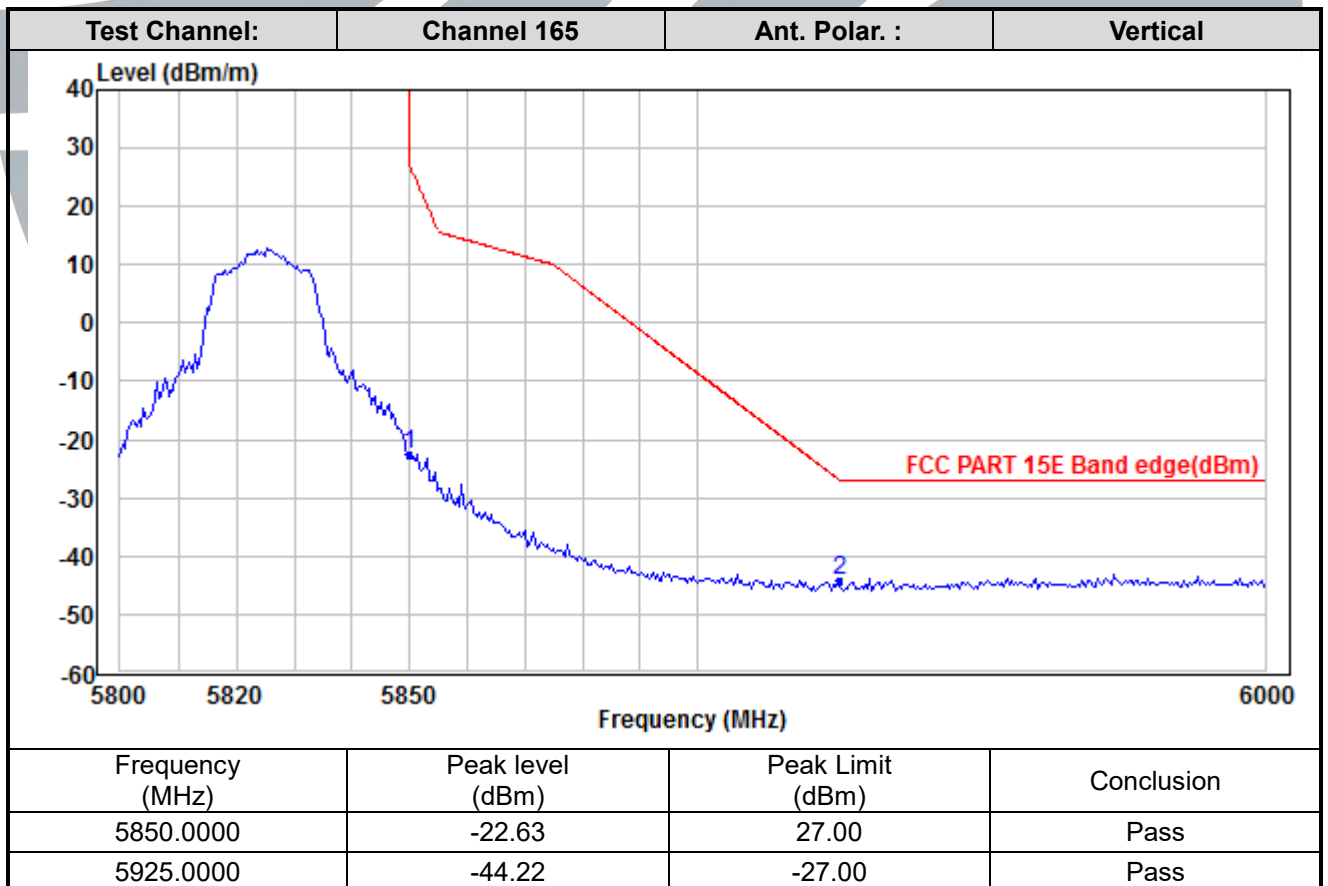
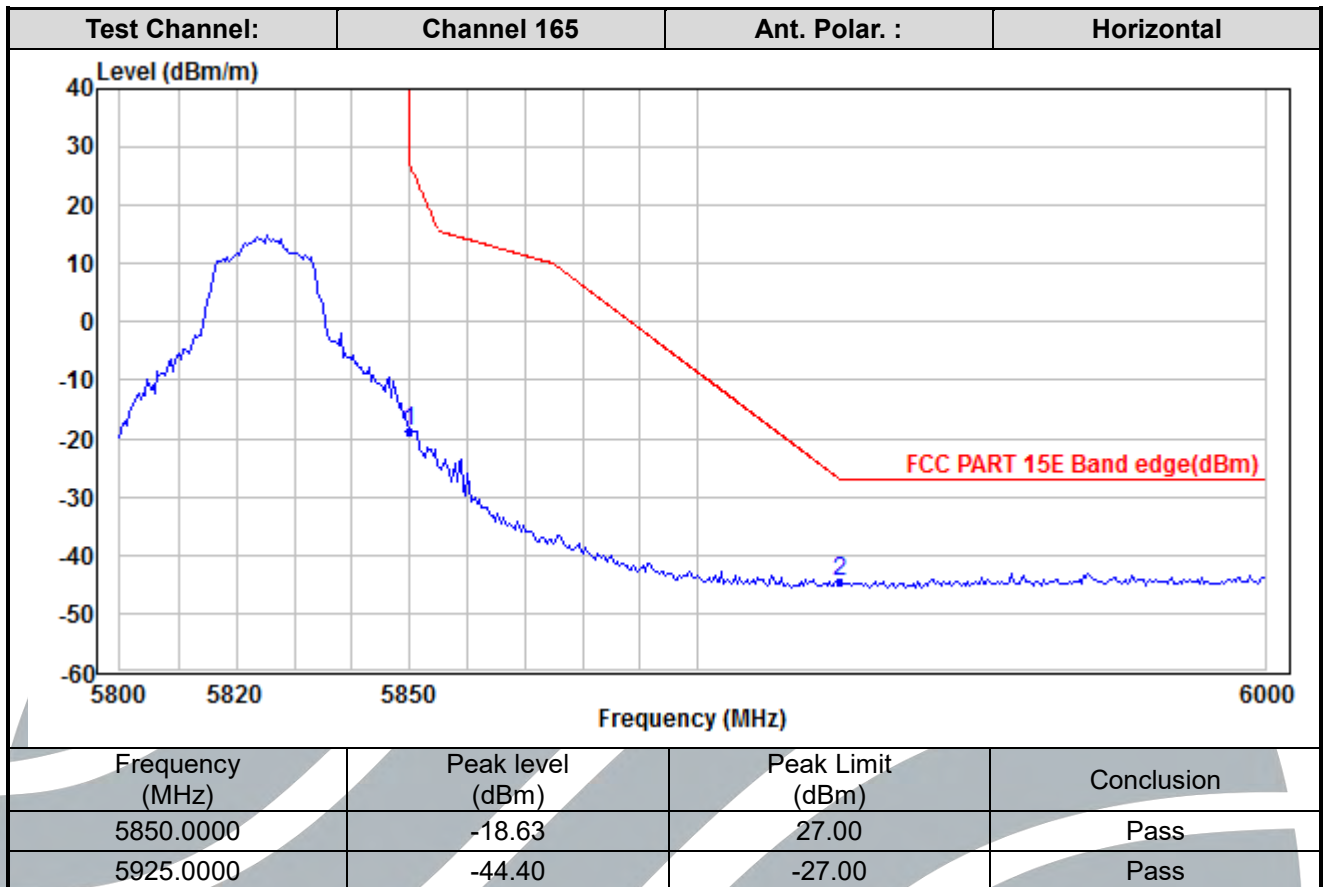
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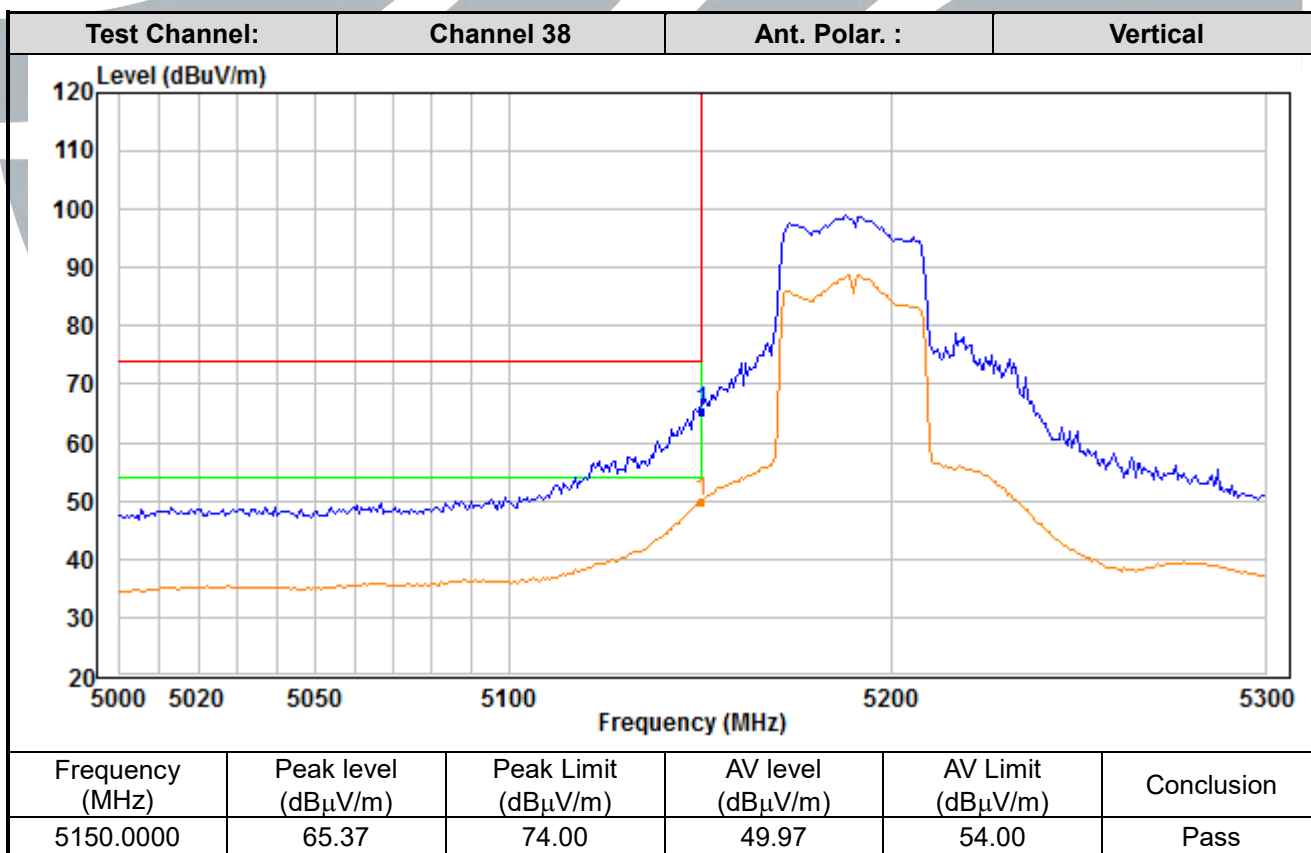
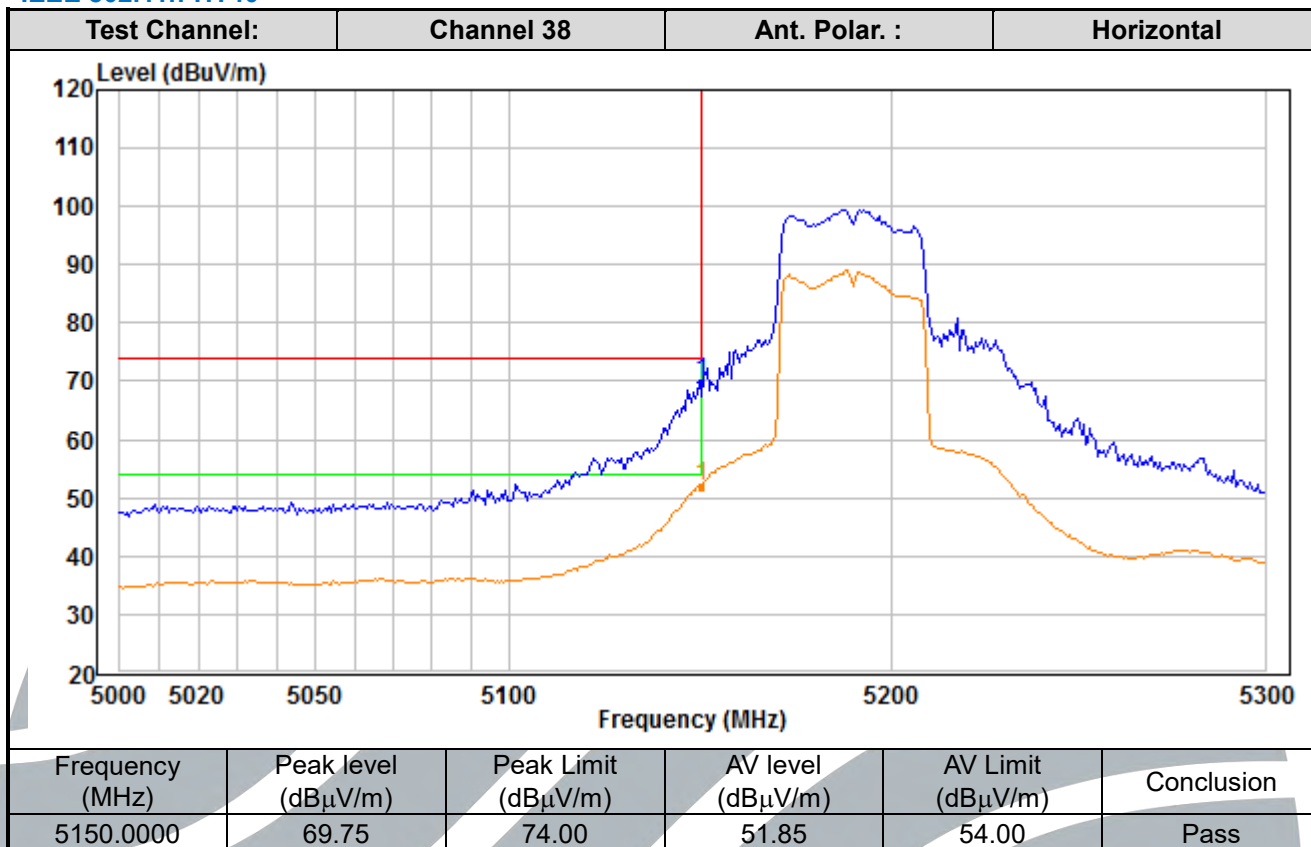
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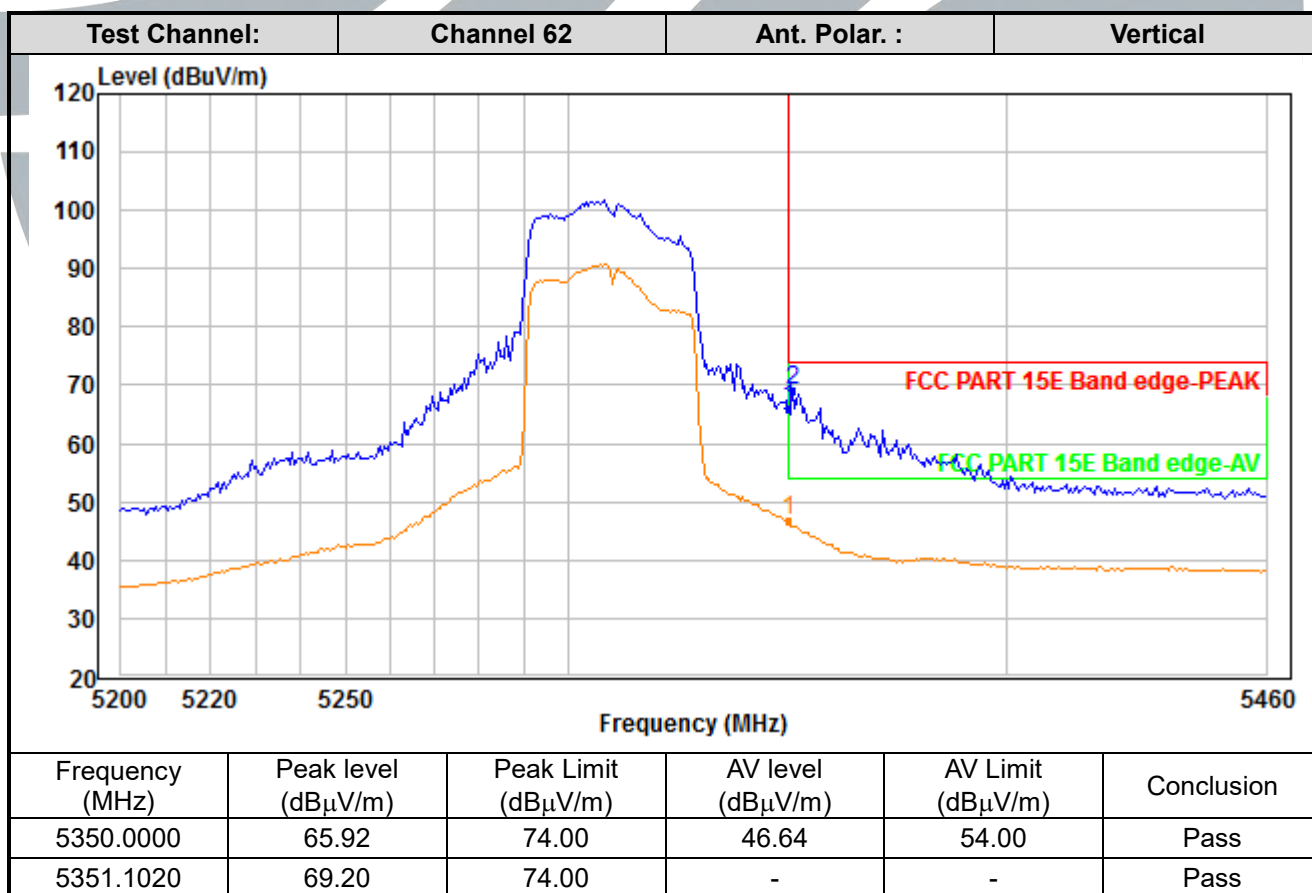
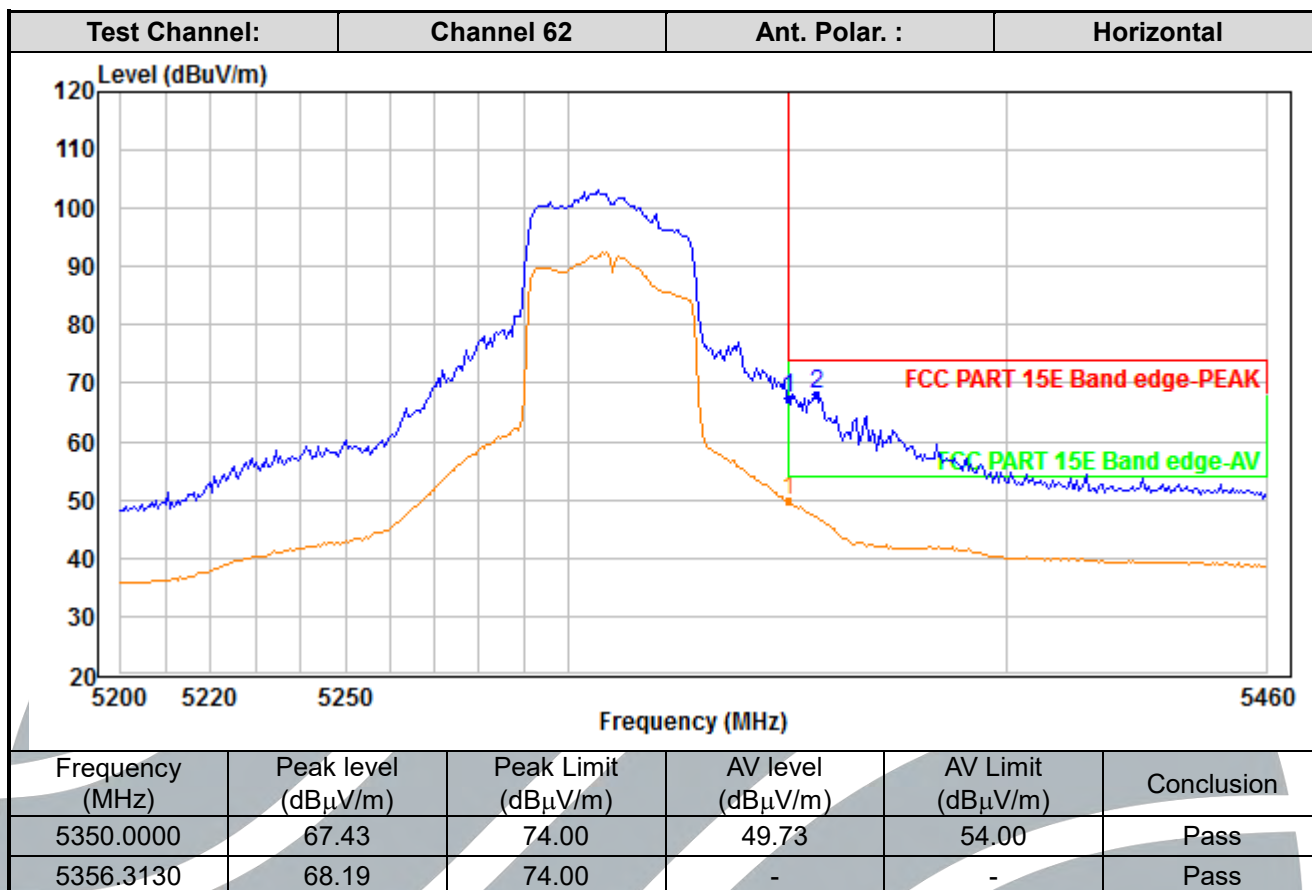
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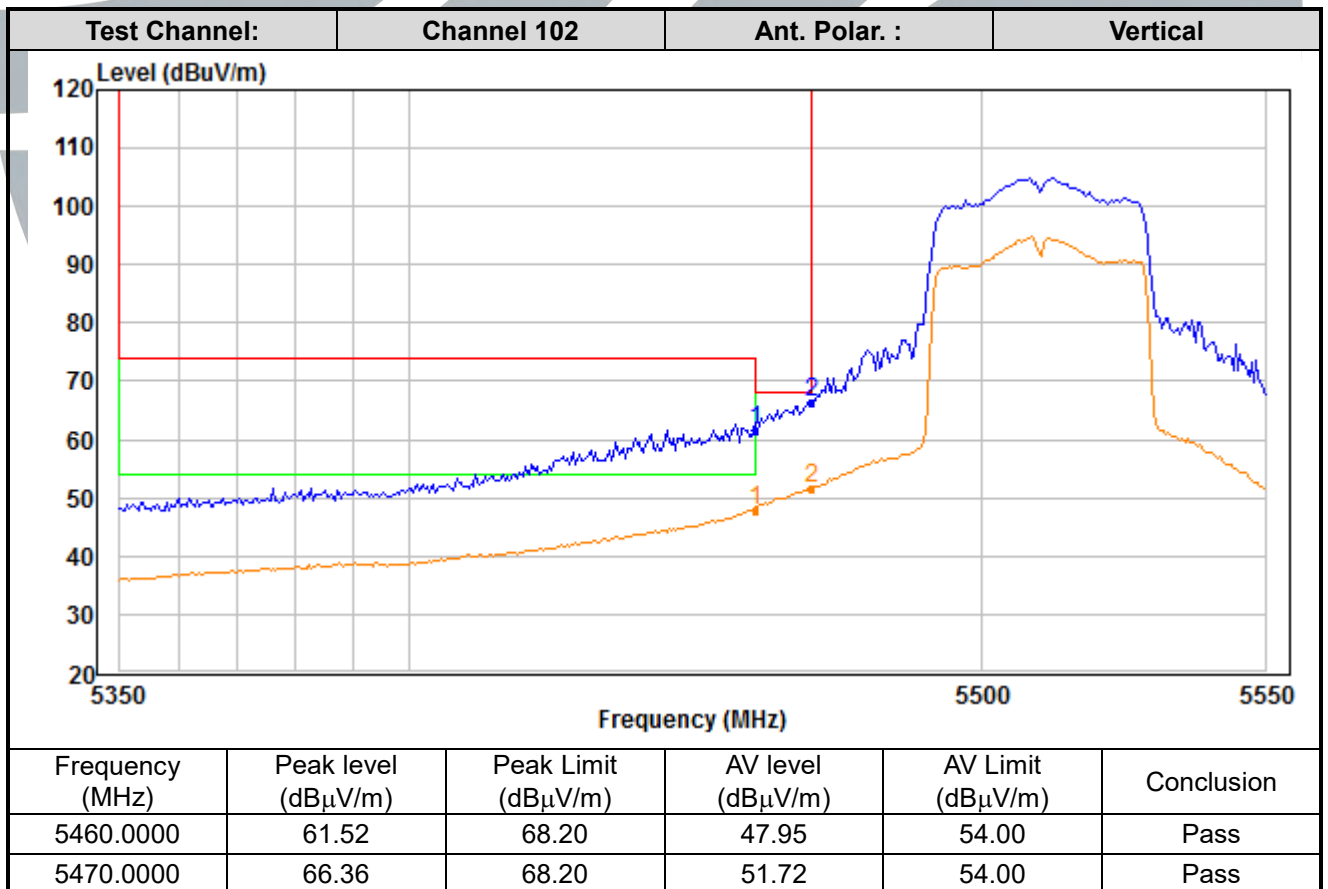
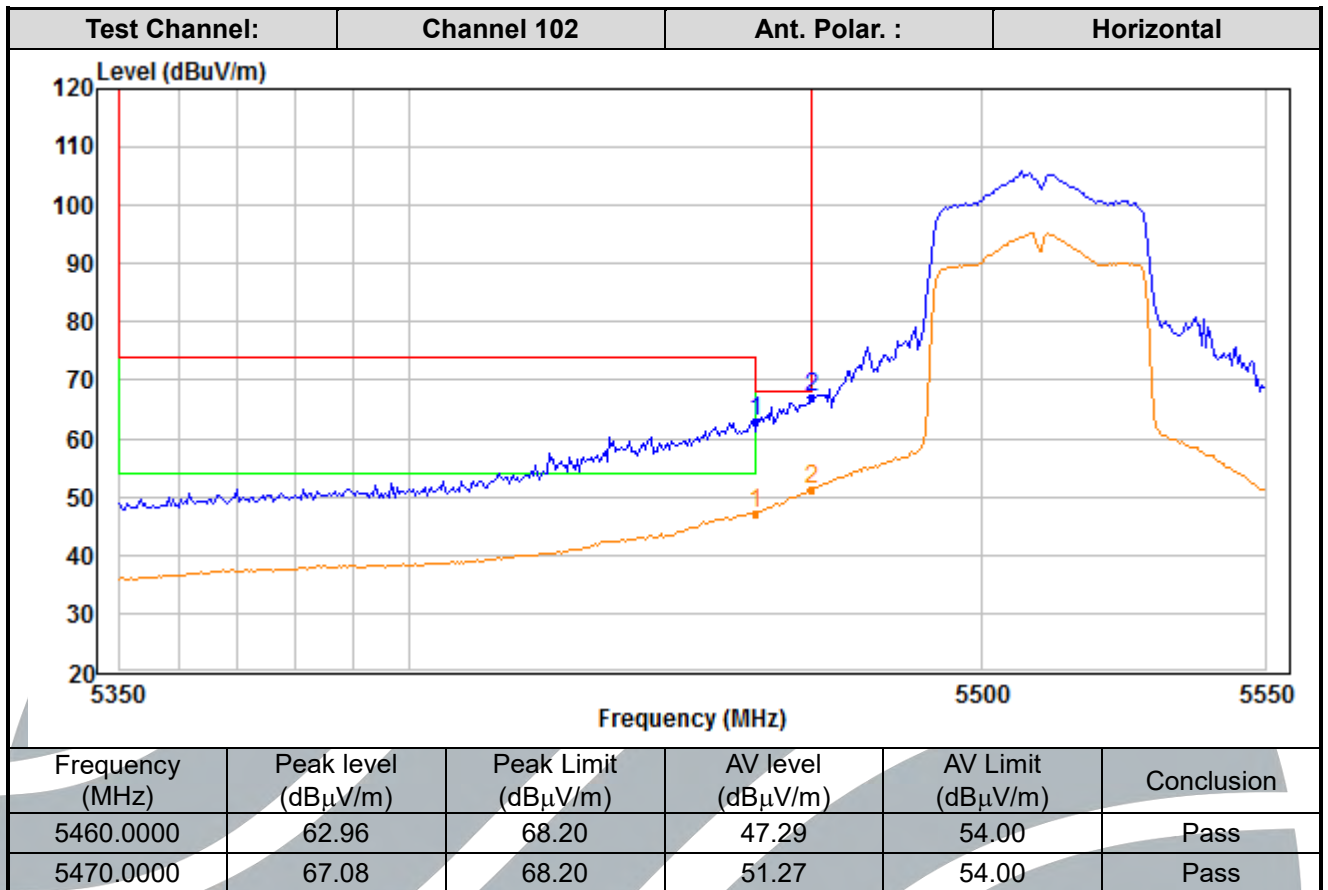
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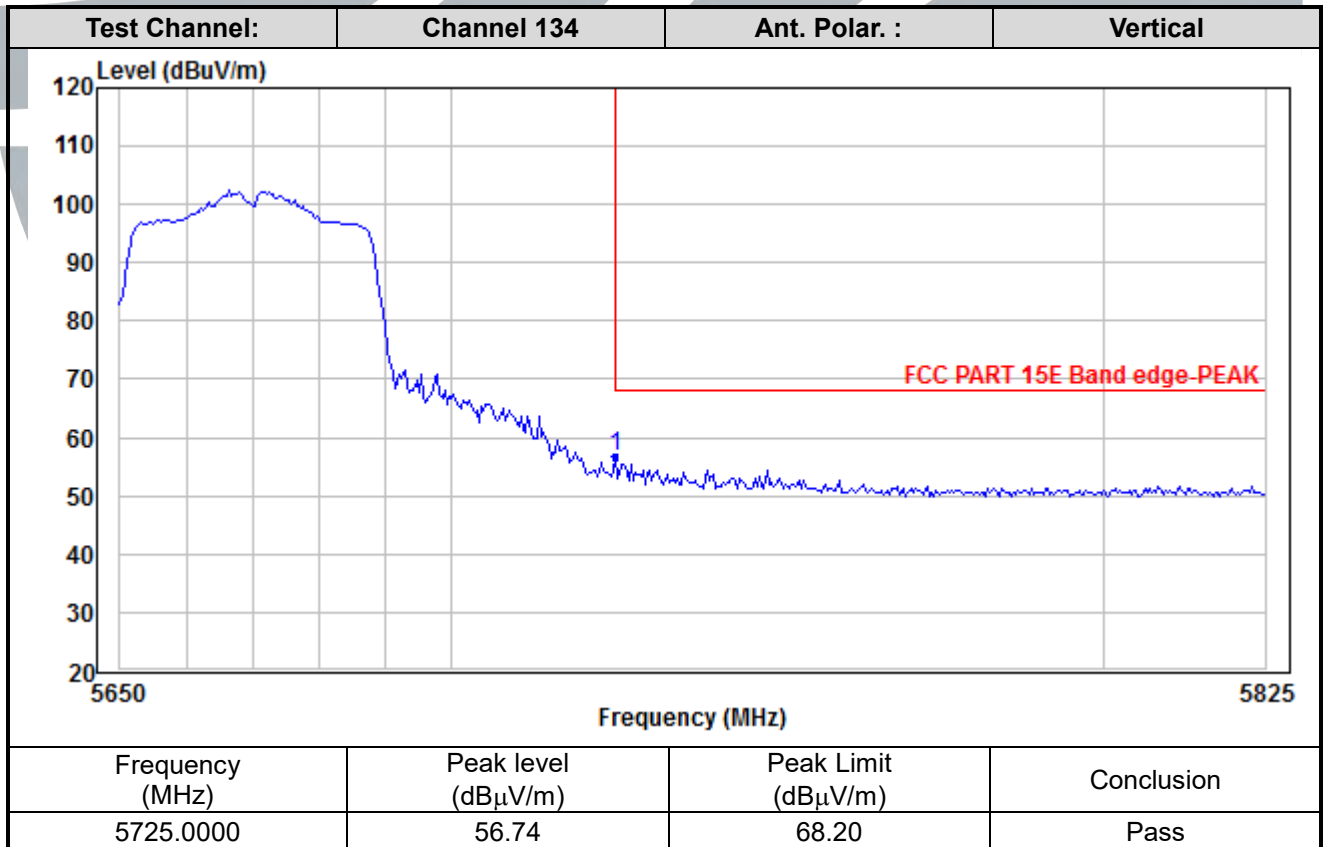
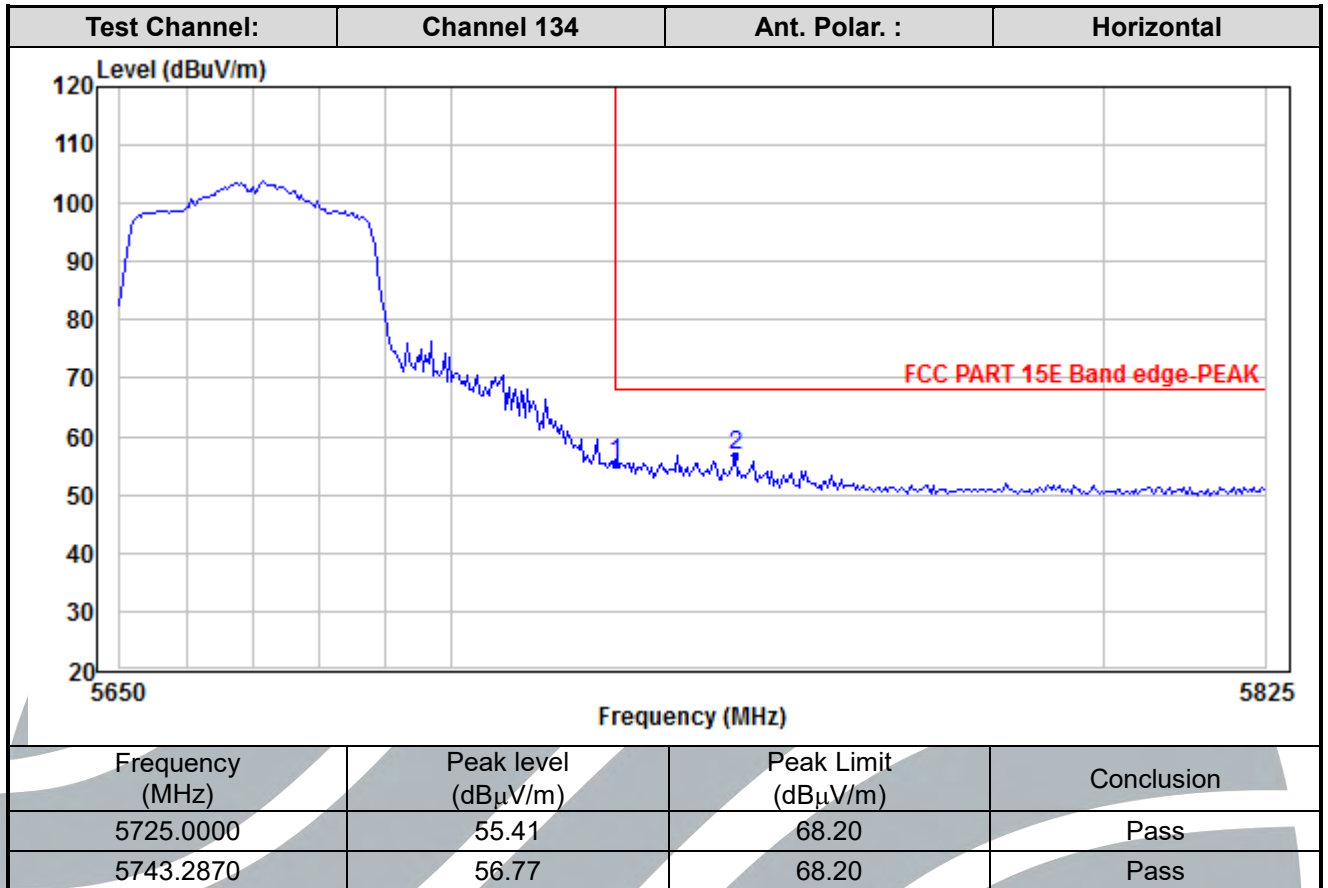
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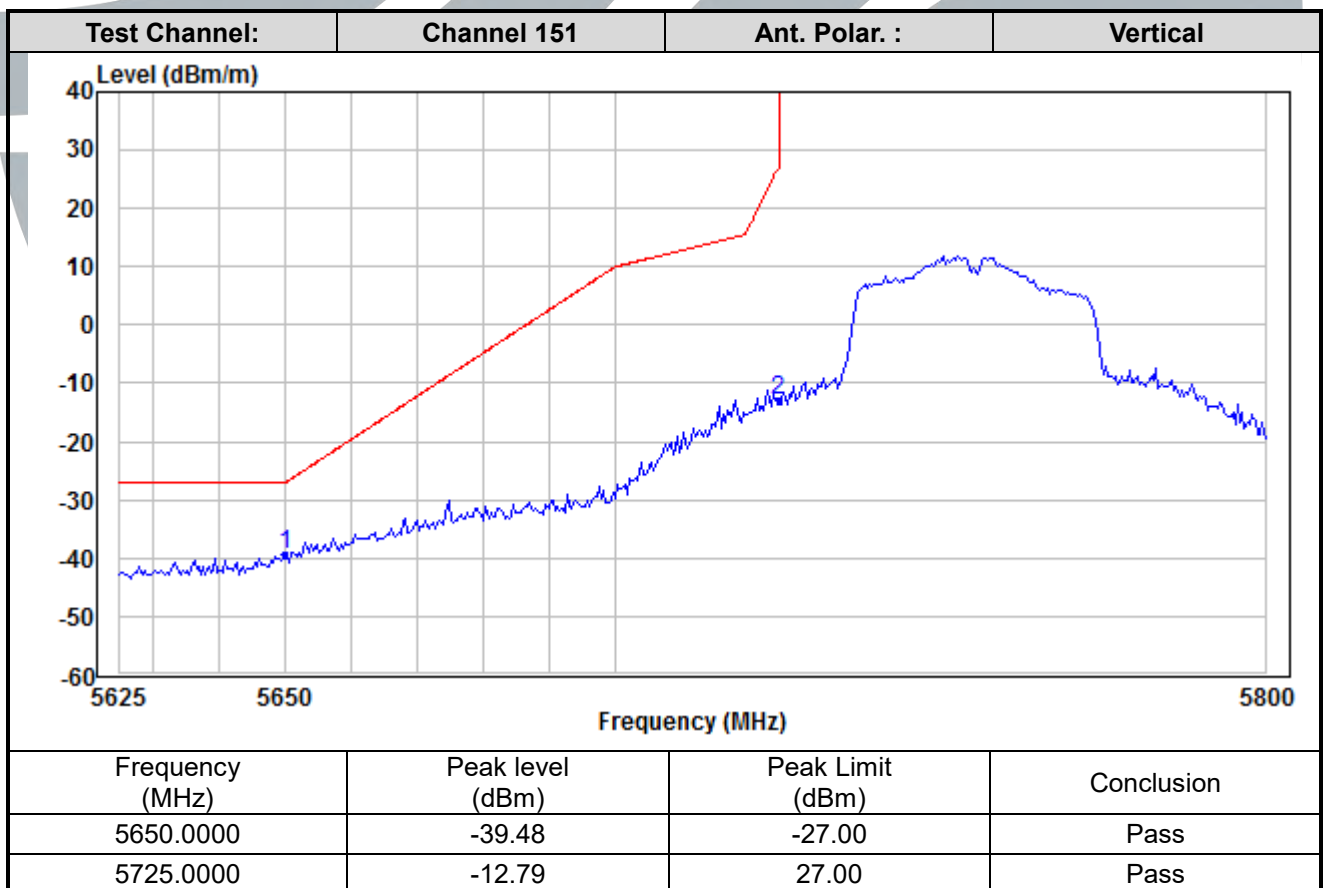
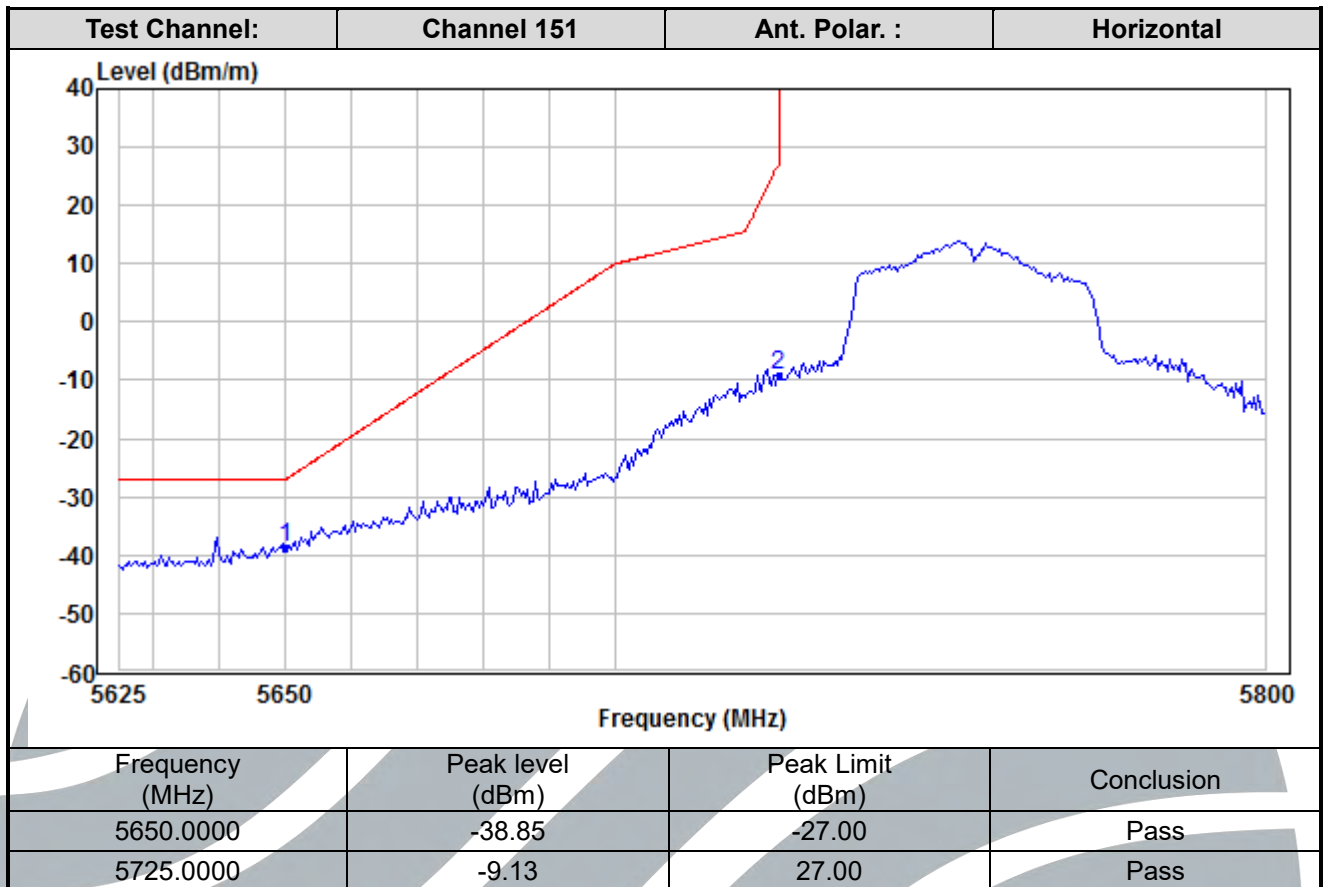
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