

TEST REPORT

Product Name: TVB Anywhere
Trade Mark: TVB Anywhere
Model No. / HVIN: A15
Add. Model No. / HVIN: A151
Report Number: 200629016RFC-2
Test Standards: FCC 47 CFR Part 15 Subpart E
RSS-247 Issue 2
RSS-Gen Issue 5
FCC ID: 2AWYC-A15
IC: 21882-A15
Test Result: PASS
Date of Issue: September 17, 2020

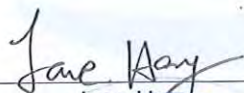
Prepared for:

TVB Anywhere Limited
TVB City, 77 Chun Choi Street, Tseung Kwan O Industrial Estate,
Tseung Kwan O, Kowloon, Hong Kong

Prepared by:

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Version

Version No.	Date	Description
V1.0	September 17, 2020	Original



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UTTR-RF-RSS247-V1.0

CONTENTS

1. GENERAL INFORMATION	4
1.1 CLIENT INFORMATION	4
1.2 EUT INFORMATION	4
1.2.1 GENERAL DESCRIPTION OF EUT	4
1.2.2 DESCRIPTION OF ACCESSORIES.....	5
1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD	5
1.4 OTHER INFORMATION.....	7
1.5 DESCRIPTION OF SUPPORT UNITS	7
1.6 TEST LOCATION.....	7
1.7 TEST FACILITY.....	8
1.8 DEVIATION FROM STANDARDS.....	8
1.9 ABNORMALITIES FROM STANDARD CONDITIONS.....	8
1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER	8
1.11 MEASUREMENT UNCERTAINTY	8
2. TEST SUMMARY	9
3. EQUIPMENT LIST	10
4. TEST CONFIGURATION	11
4.1 ENVIRONMENTAL CONDITIONS FOR TESTING.....	11
4.1.1 NORMAL OR EXTREME TEST CONDITIONS	11
4.1.2 RECORD OF NORMAL ENVIRONMENT.....	11
4.2 TEST CHANNELS	12
4.3 EUT TEST STATUS	12
4.4 PRE-SCAN.....	13
4.5 TEST SETUP	14
4.5.1 FOR RADIATED EMISSIONS TEST SETUP	14
4.5.2 FOR CONDUCTED EMISSIONS TEST SETUP	15
4.5.3 FOR CONDUCTED RF TEST SETUP	16
4.6 SYSTEM TEST CONFIGURATION.....	17
4.7 DUTY CYCLE	18
5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION	22
5.1 REFERENCE DOCUMENTS FOR TESTING	22
5.2 ANTENNA REQUIREMENT	22
5.3 26 dB BANDWIDTH & OCCUPIED BANDWIDTH.....	23
5.4 6 dB BANDWIDTH & OCCUPIED BANDWIDTH.....	42
5.5 MAXIMUM CONDUCTED OUTPUT POWER OR E.I.R.P	54
5.6 PEAK POWER SPECTRAL DENSITY	62
5.7 RADIATED EMISSIONS AND BAND EDGE MEASUREMENT.....	89
5.8 DYNAMIC FREQUENCY SELECTION	142
5.9 AC POWER LINE CONDUCTED EMISSION	152
APPENDIX 1 PHOTOS OF TEST SETUP.....	155
APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS.....	155

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	TVB Anywhere Limited
Address of Applicant:	TVB City, 77 Chun Choi Street, Tseung Kwan O Industrial Estate, Tseung Kwan O, Kowloon, Hong Kong
Manufacturer:	TVB Anywhere Limited
Address of Manufacturer:	TVB City, 77 Chun Choi Street, Tseung Kwan O Industrial Estate, Tseung Kwan O, Kowloon, Hong Kong

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	TVB Anywhere		
Model No. / HVIN:	A15		
Add. Model No. / HVIN:	A151		
Trade Mark:	TVB Anywhere		
DUT Stage:	Production Unit		
EUT Supports Function:	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
	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
Software Version:	V1.0		
Hardware Version:	V2.0		
Sample Received Date:	July 6, 2020		
Sample Tested Date:	July 16, 2020 to September 16, 2020		
Note: The additional model A151 is identical with the test model A15 except the different color.			

1.2.2 Description of Accessories

Adapter	
Model No.:	NBS12E120100UV
Input:	100-240 V~50/60 Hz 0.3 A Max
Output:	12.0 V $\overline{\text{---}}$ 1 A
DC Cable:	1.80 Meter, Unshielded without ferrite
Manufacturer:	Mass Power Electronic Limited

Cable	
Model No.:	N/A
Description:	AUX Cable
Cable Type:	Unshielded without ferrite
Length:	1.0 Meter

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)
	5 725 MHz to 5 850 MHz (U-NII-3)
Frequency Ranges:	5180 MHz to 5240 MHz
	5260 MHz to 5320 MHz
	5500 MHz to 5700 MHz
	5 745 MHz to 5 825 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 MCS15
	IEEE 802.11n-HT40: Up to MCS15
	IEEE 802.11ac-VHT20: Up to MCS8
	IEEE 802.11ac-VHT40: Up to MCS9
	IEEE 802.11ac-VHT80: Up to MCS9
Number of Channels:	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:

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	11 for IEEE 802.11a/n-HT20/ac-VHT20 5 for IEEE 802.11n-HT40/ac-VHT40 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:	Chain 0	PIFA Antenna				
	Chain 1	PIFA Antenna				
Antenna Gain:	Chain 0	5150 MHz to 5250 MHz: 2.0 dBi				
		5250 MHz to 5350 MHz: 2.0 dBi				
		5470 MHz to 5725 MHz: 2.0 dBi				
		5725 MHz to 5850 MHz: 2.0 dBi				
	Chain 1	5150 MHz to 5250 MHz: 2.0 dBi				
		5250 MHz to 5350 MHz: 2.0 dBi				
		5470 MHz to 5725 MHz: 2.0 dBi				
		5725 MHz to 5850 MHz: 2.0 dBi				
Maximum EIRP (dBm):	SISO_Chain 0		U-NII-1			
	IEEE 802.11a:		15.88			
	SISO_Chain 1		U-NII-1			
	IEEE 802.11a:		19.06			
	MIMO_Chain 0+1		U-NII-1			
	IEEE 802.11n-HT20:		16.29			
	IEEE 802.11n-HT40:		12.82			
	IEEE 802.11ac-VHT20:		16.41			
	IEEE 802.11ac-VHT40:		12.79			
	IEEE 802.11ac-VHT80:		11.53			
Maximum conducted output power (dBm):	SISO_Chain 0		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
	IEEE 802.11a:		13.88	16.19	13.39	16.83
	SISO_Chain 1		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
	IEEE 802.11a:		17.06	16.39	13.03	16.32
	MIMO_Chain 0+1		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
	IEEE 802.11n-HT20:		15.21	14.80	13.78	15.58
	IEEE 802.11n-HT40:		11.76	11.84	10.38	15.63
	IEEE802.11ac-VHT20:		15.30	14.79	13.74	15.54
	IEEE 802.11ac-VHT40:		11.73	11.80	10.36	15.72
	IEEE 802.11ac-VHT80:		10.48	10.92	9.54	15.83
Normal Test Voltage:	120V~60Hz					

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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,..., 4	n = 5,..., 8	n = 17,..., 27	n = 1,..., 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,..., 5	n = 9,..., 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	E450	SL10G10780	N/A	UnionTrust
Monitor	DELL	P2416Db	N/A	N/A	UnionTrust
USB Disk	Kingston	DT101 G2	N/A	N/A	UnionTrust
Mouse	DELL	MOCZUL	CN-0V7623-73826 -65K-00XR	N/A	UnionTrust
Remote Control	Hybroad Vision (Hong Kong) Technology Company Limited	N/A	N/A	N/A	Applicant
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

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.15 Unshielded without ferrite	UnionTrust
2	HDMI Cable	HDMI	1.5 Unshielded without ferrite	UnionTrust
3	Ethernet Cable	RJ45	1.0 Unshielded without ferrite	Applicant

1.6 TEST LOCATION

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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/EN 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: 2005 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

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	± 4.6 dB
5	Radiated emission 1GHz-18GHz	± 4.4 dB
6	Radiated emission 18GHz-26GHz	± 4.6 dB
7	Radiated emission 26GHz-40GHz	± 4.6 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 %

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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

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 application.

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 Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 03, 2018	Dec. 03, 2021
☒	Receiver	R&S	ESIB26	100114	Nov. 24, 2019	Nov. 23, 2020
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Nov. 24, 2019	Nov. 23, 2020
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	Nov. 16, 2019	Nov. 15, 2020
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 16, 2019	Nov. 15, 2020
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 16, 2019	Nov. 15, 2020
☒	Preamplifier	HP	8447F	2805A02960	Nov. 24, 2019	Nov. 23, 2020
☐	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	Nov. 24, 2019	Nov. 23, 2020
☐	6dB Attenuator	Talent	RA6A5-N-18	18103002	Nov. 24, 2019	Nov. 23, 2020
☐	Horn Antenna	ETS-LINDGREN	3117	00164202	Nov. 16, 2019	Nov. 15, 2020
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	Jan. 10, 2020	Jan. 10, 2021
☐	Horn Antenna	ETS-LINDGREN	3116C	00200180	Jun. 19, 2020	Jun. 18, 2021
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Nov. 16, 2019	Nov. 15, 2020
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☐	Band Rejection Filter (2400MHz~2500MHz)	Micro-Tronics	BRM50702	G248	Nov. 24, 2019	Nov. 23, 2020
☒	Band Rejection Filter (5150MHz~5880MHz)	Micro-Tronics	BRM50716	G1868	Nov. 24, 2019	Nov. 23, 2020
☒	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. 24, 2019	Nov. 23, 2020
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 24, 2019	Nov. 23, 2020
☒	LISN	R&S	ESH2-Z5	860014/024	Nov. 24, 2019	Nov. 23, 2020
☐	LISN	ETS-Lindgren	3816/2SH	00201088	Nov. 24, 2019	Nov. 23, 2020
☒	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	Nov. 24, 2019	Nov. 23, 2020
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	Nov. 24, 2019	Nov. 23, 2020
☐	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430023	Nov. 24, 2019	Nov. 23, 2020
☒	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	Nov. 24, 2019	Nov. 23, 2020

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4. TEST CONFIGURATION

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/ 240V~50Hz	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	25.2	50	100.01	Swift Liu
6 dB bandwidth	25.2	50	100.01	Swift Liu
Occupied Bandwidth	25.2	50	100.01	Swift Liu
Maximum conducted output power	25.2	50	100.01	Swift Liu
Peak Power Spectral Density	25.2	50	100.01	Swift Liu
Radiated Emissions and Band Edge Measurement	25.5	56	100.20	Fire Huo
Dynamic Frequency Selection	25.2	50	100.01	Gavin Xu
AC Power Line Conducted Emission	22.9	57	99.16	Tripp Jiang

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	--
		--	5290 MHz	--
	5470 MHz to 5725 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 or 2Tx/2Rx	1. Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

Power Setting								
Mode	U-NII-1		U-NII-2A		U-NII-2C		U-NII-3	
	Chain 0	Chain 1	Chain 0	Chain 1	Chain 0	Chain 1	Chain 0	Chain 1
IEEE 802.11a	52	62	60	58	53	50	62	60
IEEE 802.11n-HT20	44	44	42	42	42	42	45	45
IEEE 802.11n-HT40	30	30	30	30	28	28	43	43
IEEE 802.11ac-VHT20	44	44	42	42	42	42	45	45
IEEE 802.11ac-VHT40	30	30	30	30	28	28	43	43
IEEE 802.11ac-VHT80	26	26	29	29	30	30	46	46

Test Software
Test software name: Ampak RFTesTool, VER:7.0

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4.4PRE-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	MCS8
IEEE 802.11n-HT40	MCS8
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 1. Below 30MHz

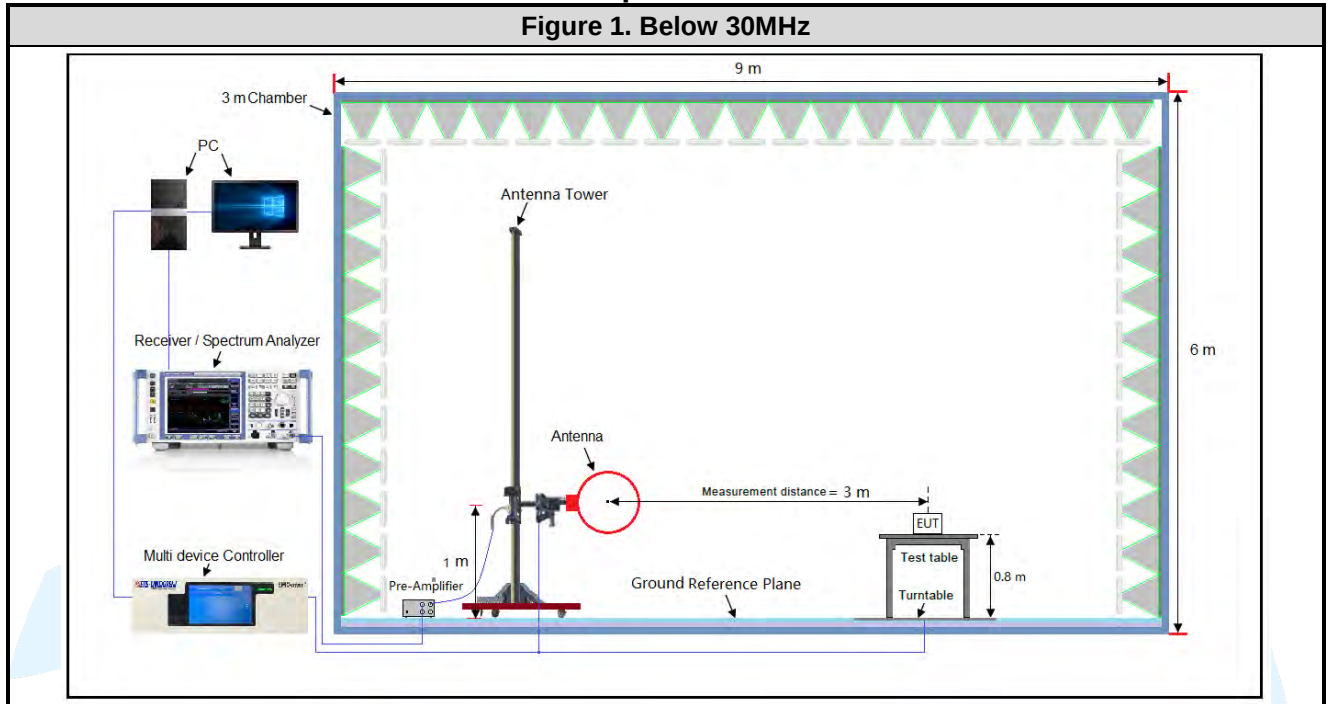
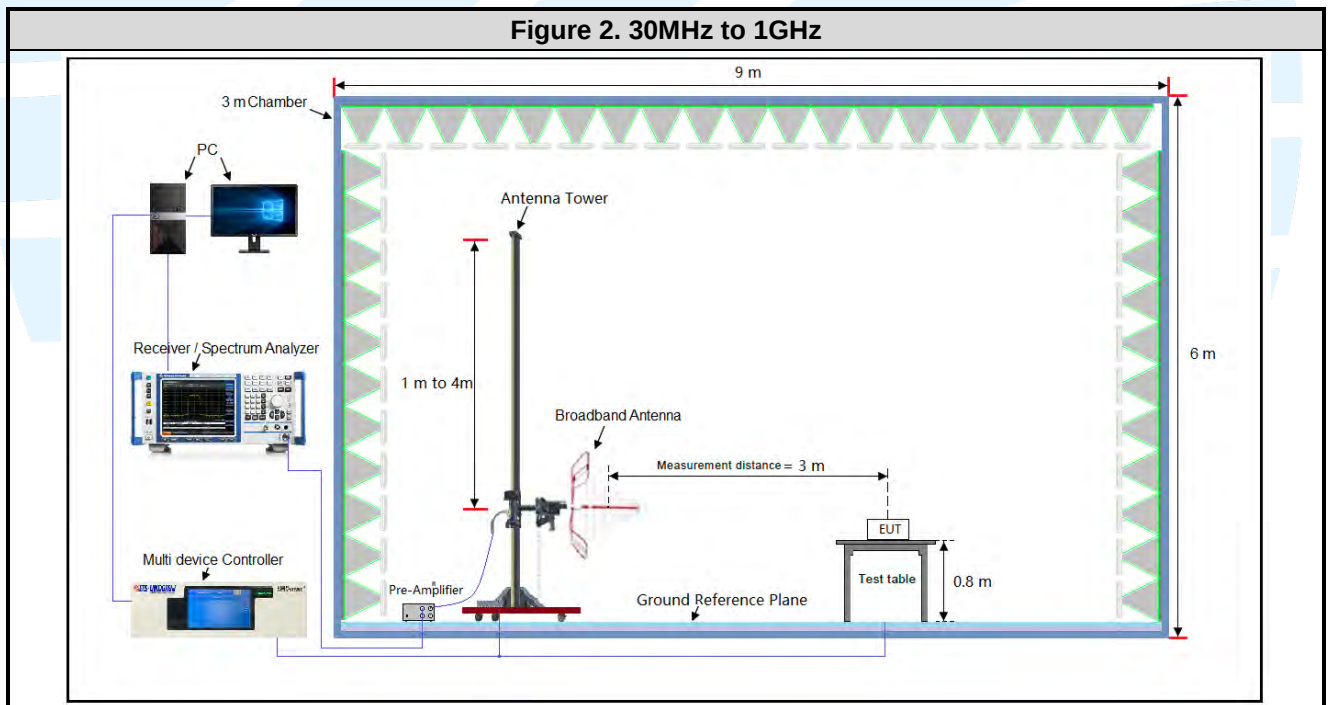
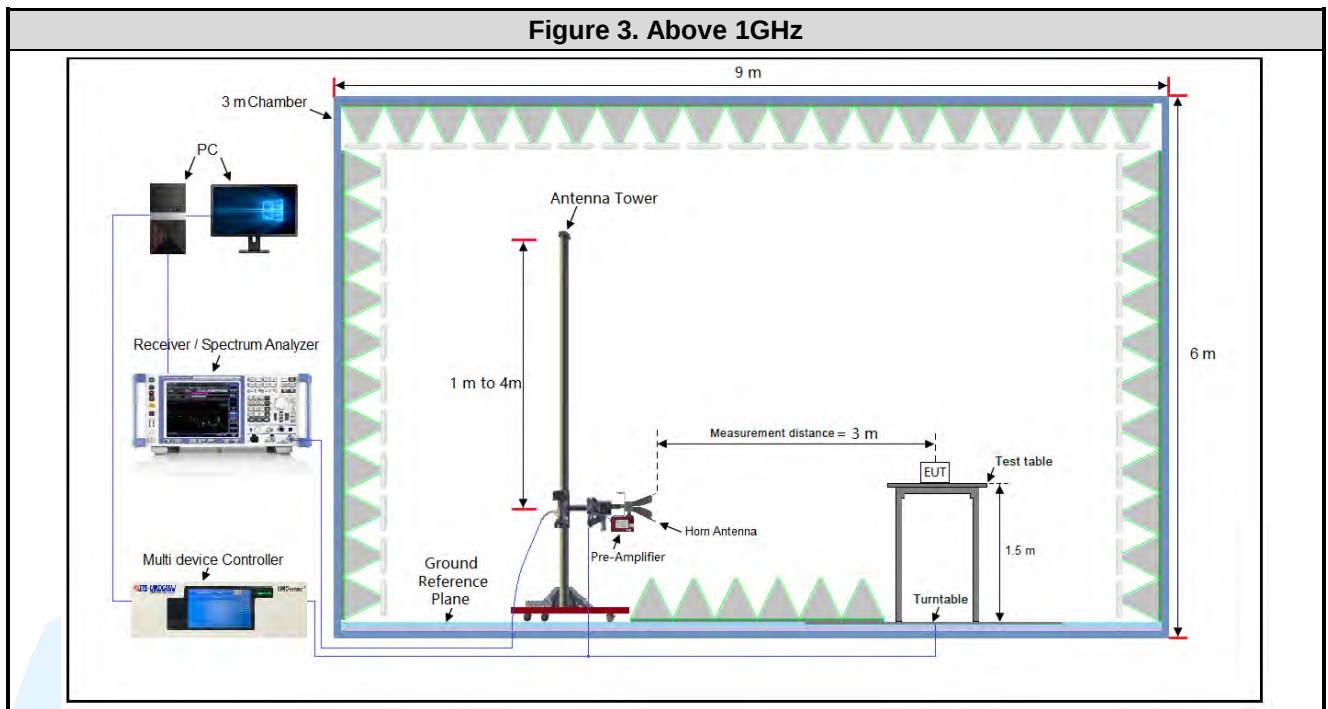
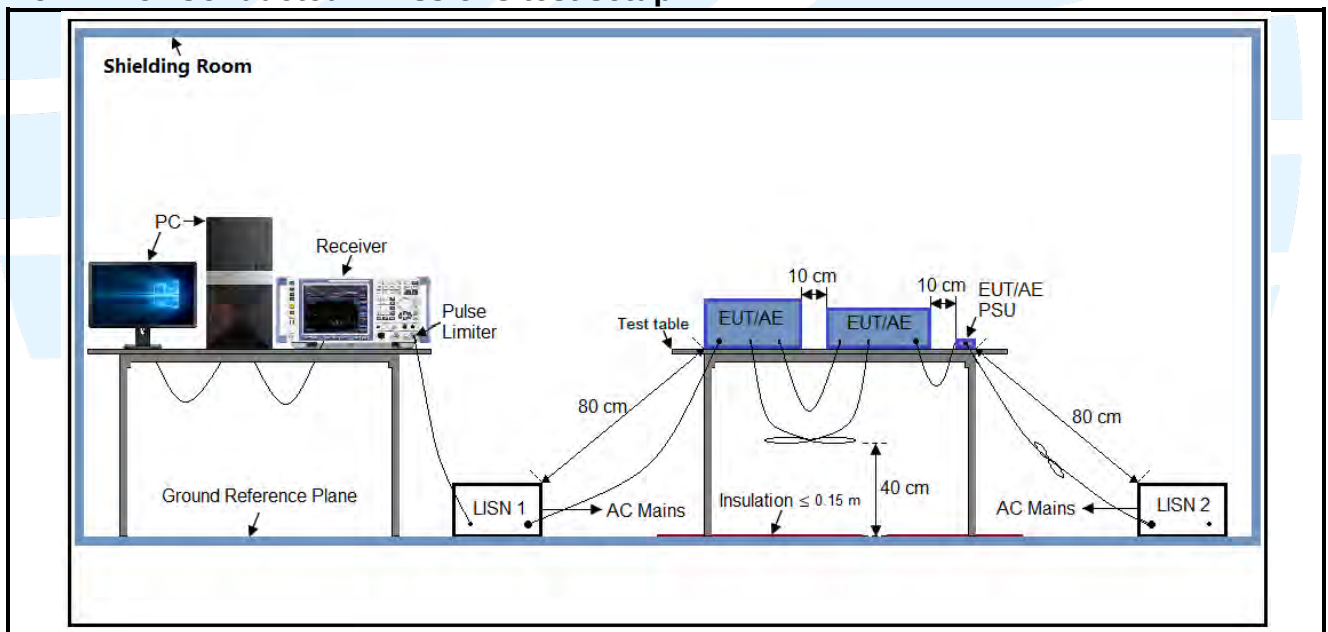


Figure 2. 30MHz to 1GHz

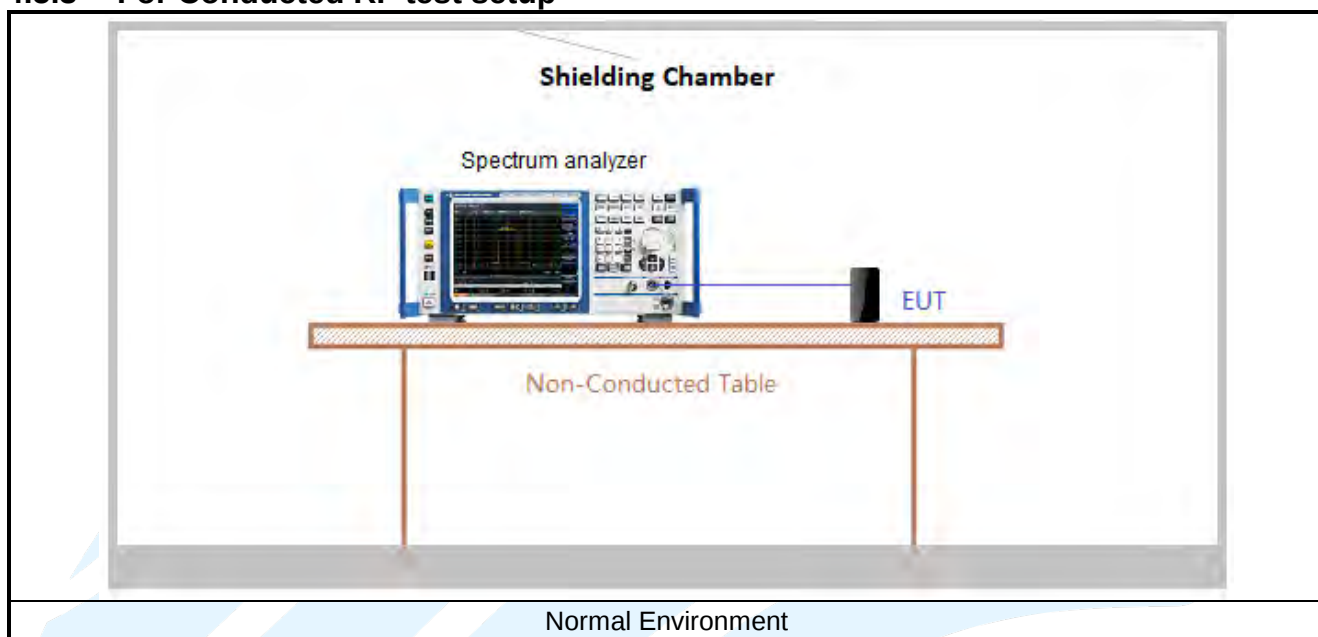




4.5.2 For Conducted Emissions test setup



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. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Above 1GHz	1TX	Chain 0	Z axis
	1TX	Chain 1	Z axis
	2TX	Chain 0+1	Z axis

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.

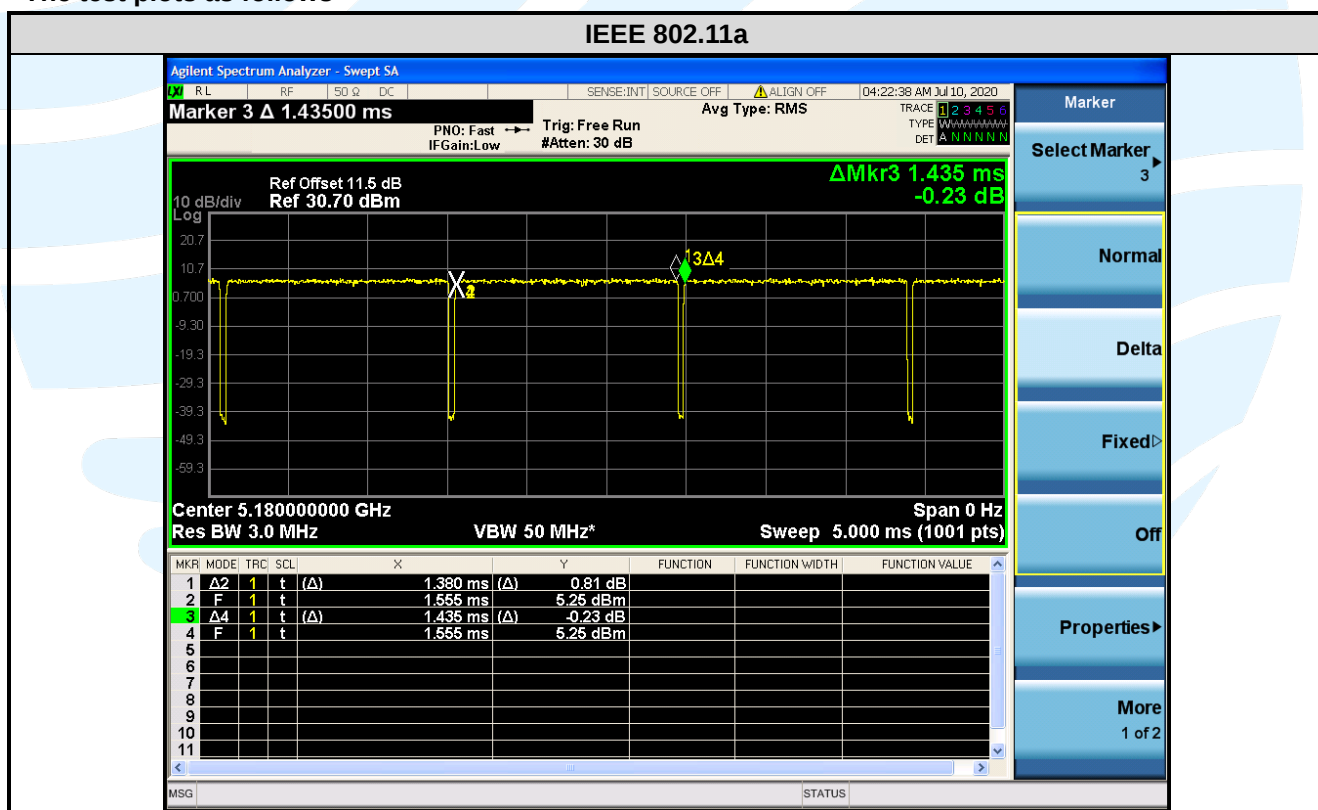
Test Results

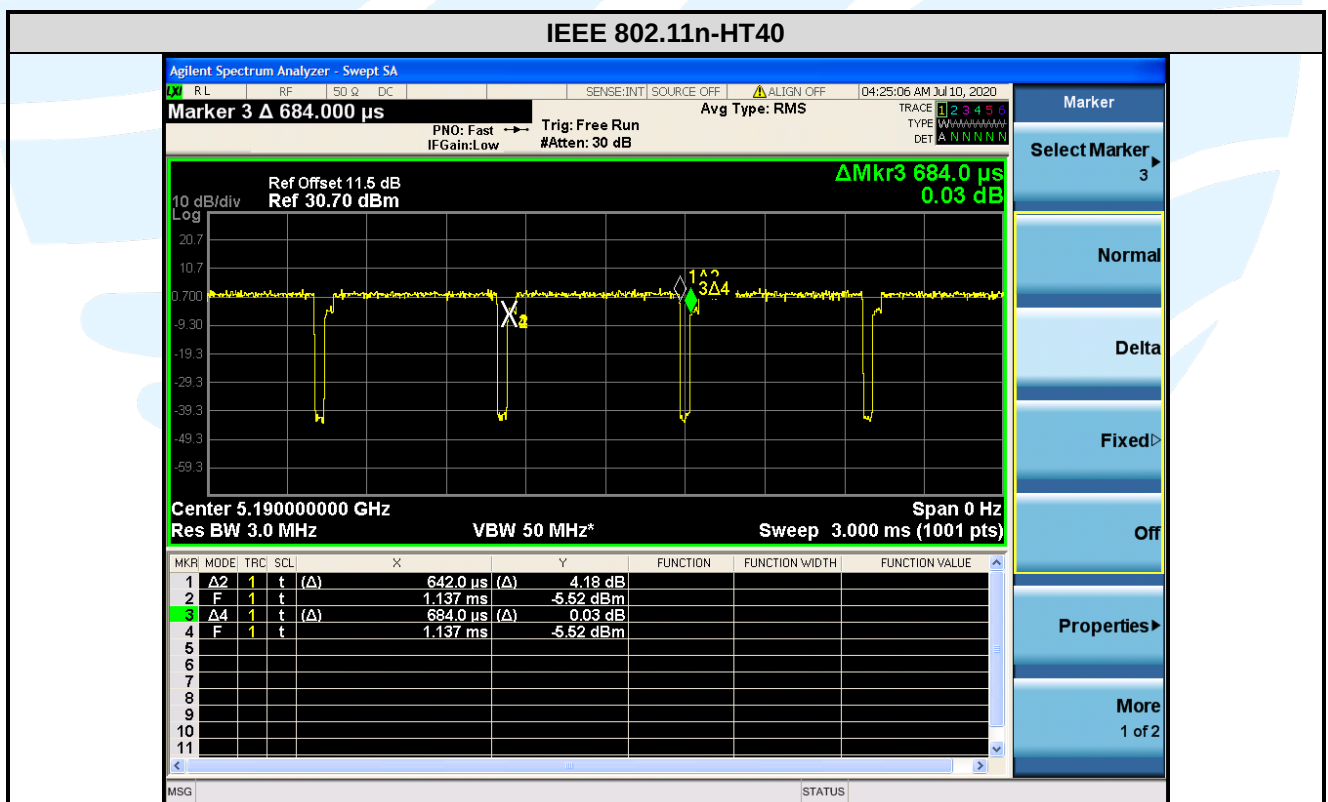
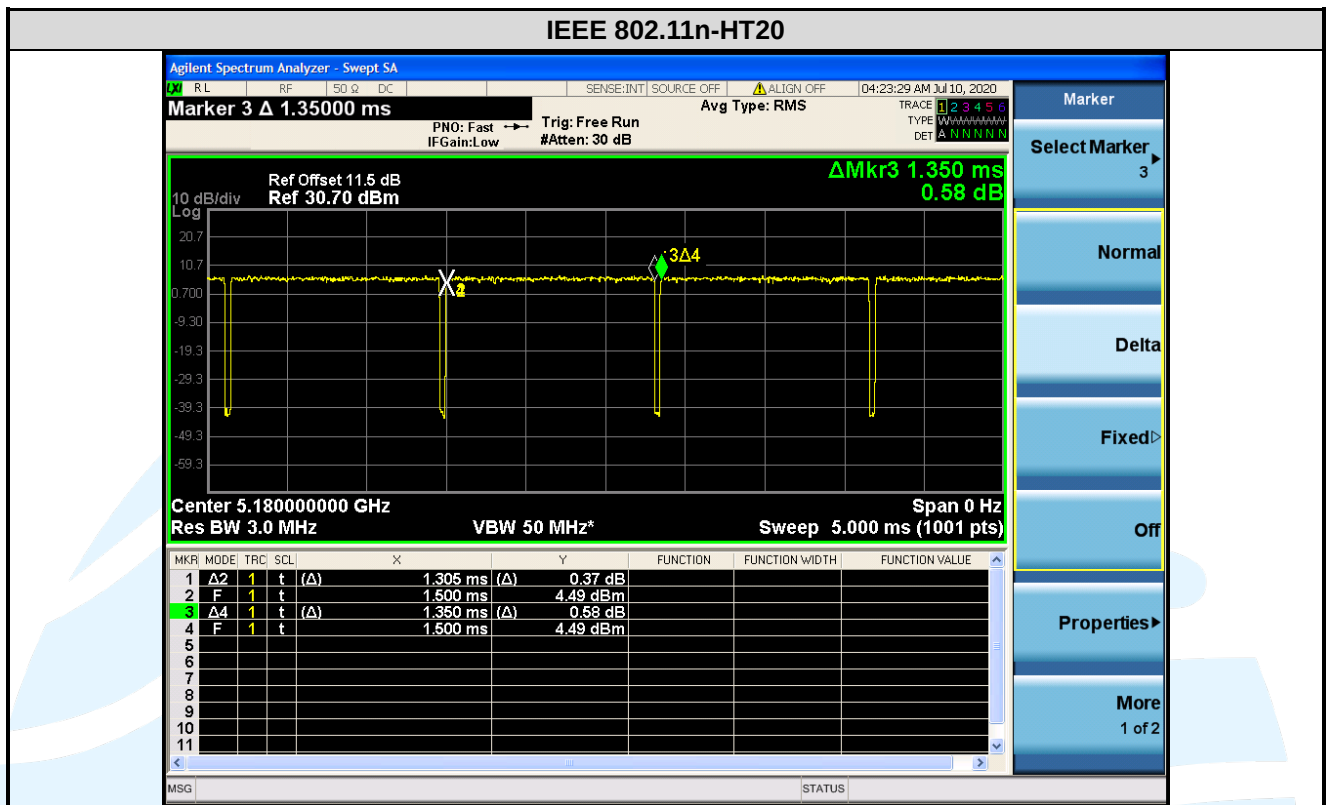
Mode	Data rates (Mbps)	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/ T Minimum VBW (kHz)	Average Factor (dB)
IEEE 802.11a	6	1.3800	1.4350	0.96	96.17	0.17	0.72	-0.34
IEEE 802.11n-HT20	MCS8	1.3050	1.3500	0.97	96.67	0.15	0.77	-0.29
IEEE 802.11n-HT40	MCS8	0.6420	0.6840	0.94	93.86	0.28	1.56	-0.55
IEEE 802.11ac-VHT20	MCS0	1.3100	1.3550	0.97	96.68	0.15	0.76	-0.29
IEEE 802.11ac-VHT40	MCS0	0.6420	0.6870	0.93	93.45	0.29	1.56	-0.59
IEEE 802.11ac-VHT80	MCS0	0.3180	0.3660	0.87	86.89	0.61	3.14	-1.22

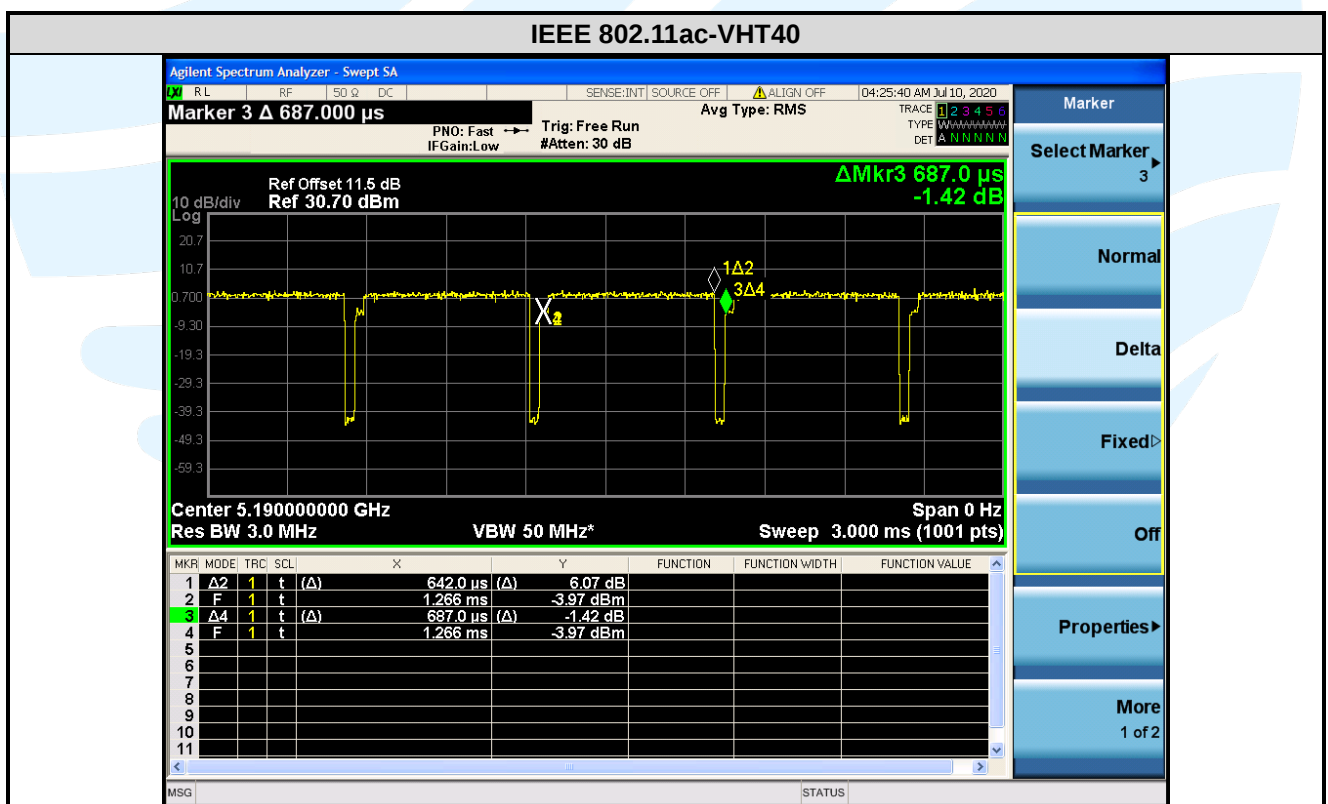
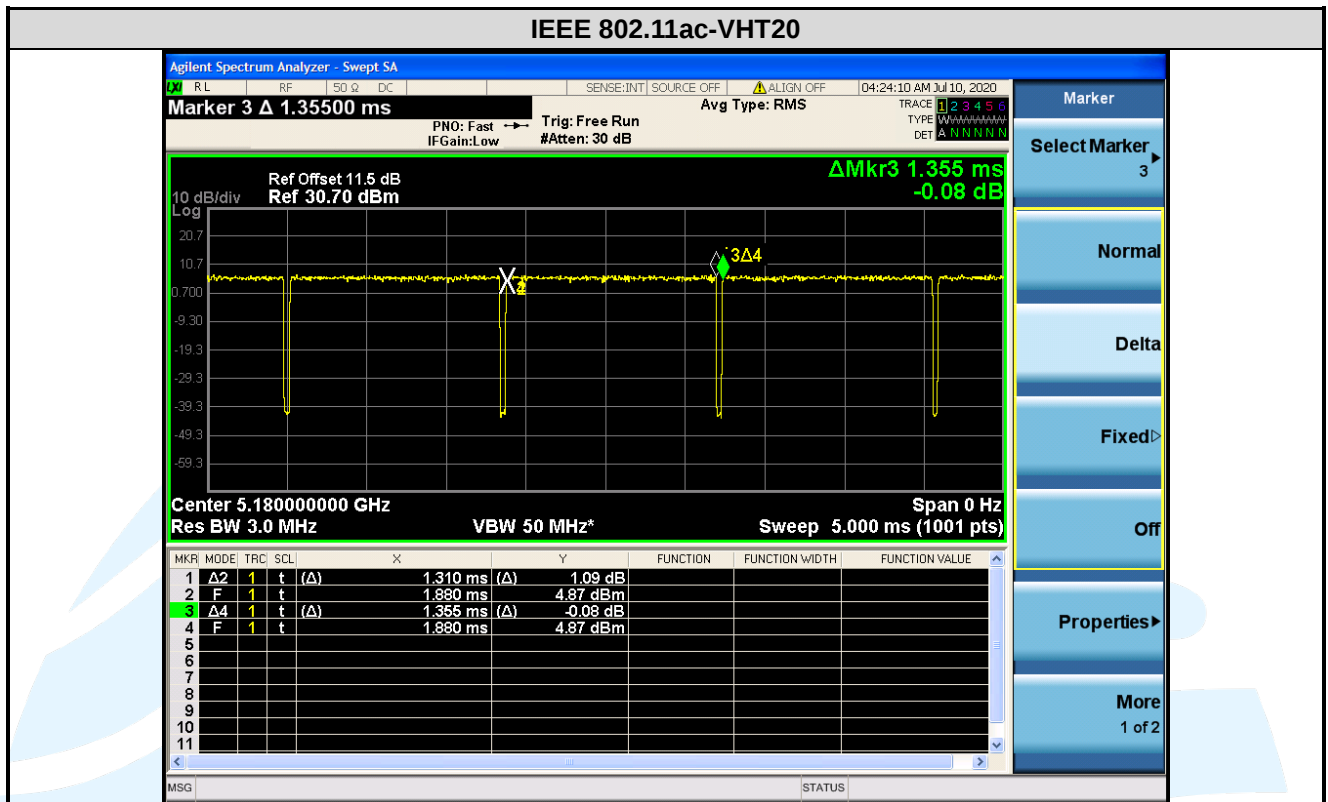
Remark:

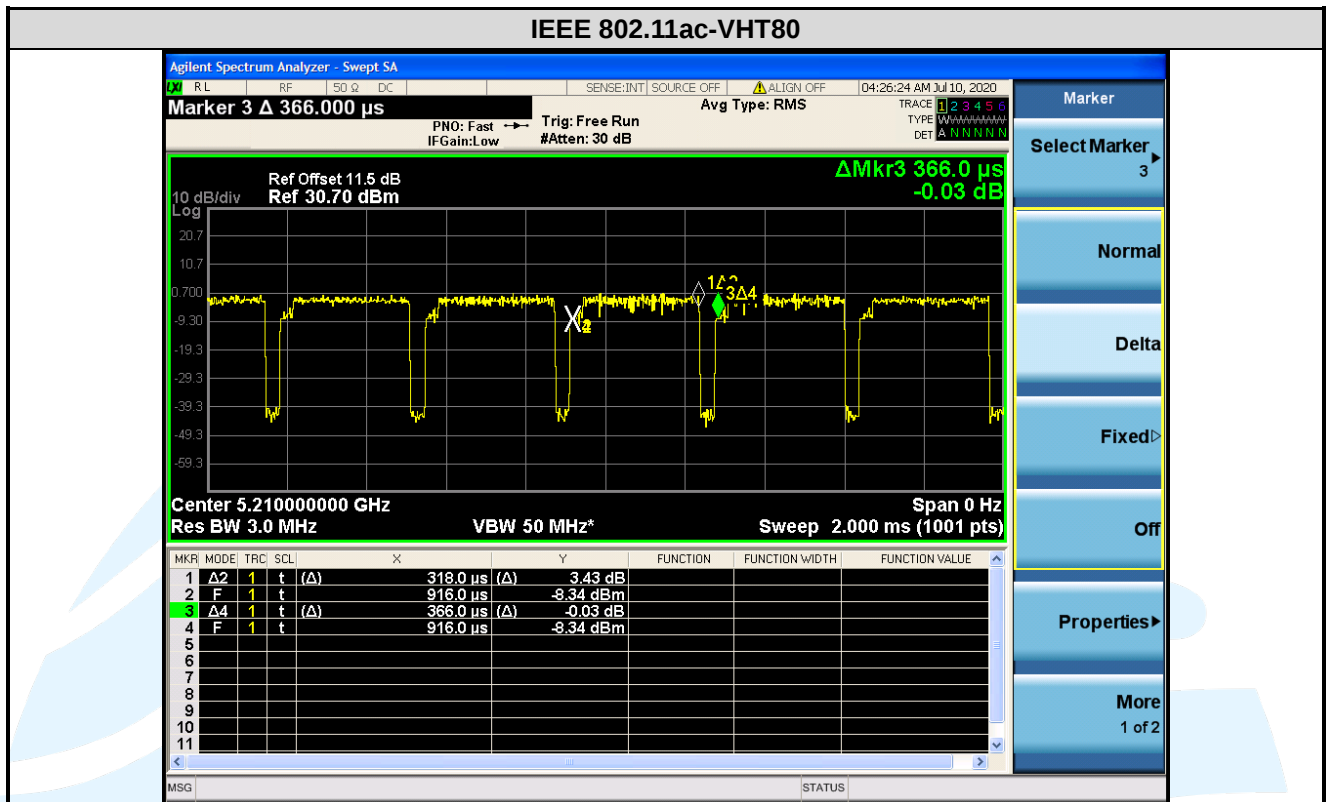
- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = $10 * \log(1/ \text{Duty cycle})$;
- 3) Average factor = $20 \log_{10} \text{Duty Cycle}$.

The test plots as follows









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UTTR-RF-RSS247-V1.0

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
10	KDB 662911 D01 Multiple Transmitter Output v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

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: Both antenna in the interior of the equipment and no consideration of replacement. The transmit signals are correlated with each other and the antenna gain of both chains is completely consistent, the best case directional gain of the antenna is 5 .01dBi (See section 5.5).

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:

a) Set RBW = approximately 1 % of the emission bandwidth.

b) Set the VBW > RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) 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)	
		Chain 0	Chain 1	Chain 0	Chain 1
IEEE 802.11a	36 (5180)	21.69	21.44	17.083	16.917
	44 (5220)	21.59	21.61	17.059	17.035
	48 (5240)	21.73	21.57	16.927	16.913
	52 (5260)	21.44	21.51	16.901	17.076
	60 (5300)	21.21	21.38	16.942	17.004
	64 (5320)	21.79	21.61	16.955	17.005
	100 (5500)	21.55	21.58	16.909	17.000
	116 (5580)	21.64	21.57	17.149	17.049
	140 (5700)	21.56	21.46	16.956	16.995
IEEE 802.11n-HT20	36 (5180)	21.66	21.55	17.980	18.074
	44 (5220)	21.61	21.60	18.059	18.004
	48 (5240)	21.61	21.66	18.075	17.990
	52 (5260)	21.61	21.79	18.060	18.009
	60 (5300)	21.84	21.73	18.110	17.994
	64 (5320)	21.56	21.45	18.028	17.952
	100 (5500)	21.52	21.72	17.965	17.935
	116 (5580)	21.68	21.62	17.999	18.036
	140 (5700)	21.28	21.50	18.119	18.029
IEEE 802.11n-HT40	38 (5190)	39.84	39.75	36.343	36.351
	46 (5230)	39.96	40.11	36.310	36.346
	54 (5270)	39.98	39.48	36.242	36.348
	62 (5310)	40.26	39.58	36.347	36.342
	102 (5510)	40.28	39.60	36.326	36.348
	110 (5550)	39.86	39.66	36.331	36.373
	134 (5670)	40.07	39.91	36.365	36.327

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IEEE 802.11ac-VHT20	36 (5180)	21.67	21.59	18.033	17.985
	44 (5220)	21.63	21.66	18.009	17.969
	48 (5240)	21.35	21.48	18.039	17.994
	52 (5260)	21.65	21.64	18.028	17.999
	60 (5300)	21.52	21.53	18.012	17.983
	64 (5320)	21.53	21.64	17.988	18.070
	100 (5500)	21.92	21.65	18.083	18.019
	116 (5580)	21.68	21.48	18.042	17.979
	140 (5700)	21.78	21.45	18.072	18.031
IEEE 802.11ac-VHT40	38 (5190)	40.05	39.21	36.329	36.313
	46 (5230)	39.57	39.49	36.324	36.270
	54 (5270)	39.92	39.66	36.334	36.388
	62 (5310)	40.35	39.85	36.209	36.341
	102 (5510)	39.80	39.79	36.319	36.359
	110 (5550)	40.02	39.37	36.314	36.384
	134 (5670)	40.13	39.99	36.411	36.232
IEEE 802.11ac-VHT80	42 (5210)	81.70	81.25	75.829	75.883
	58 (5290)	82.62	81.71	75.911	75.808
	106 (5530)	81.73	81.58	76.081	75.991
	122 (5610)	82.58	81.77	75.959	75.832

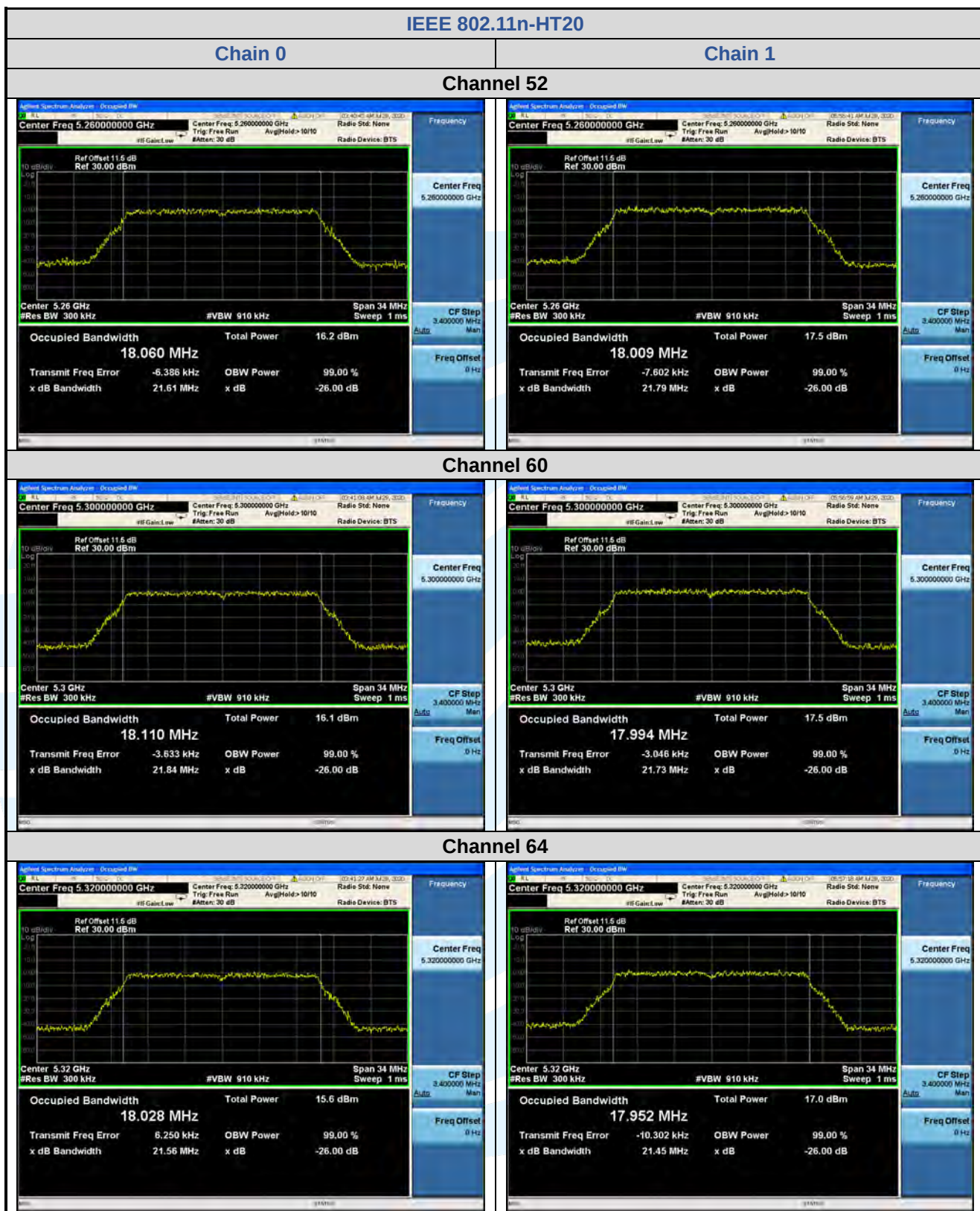
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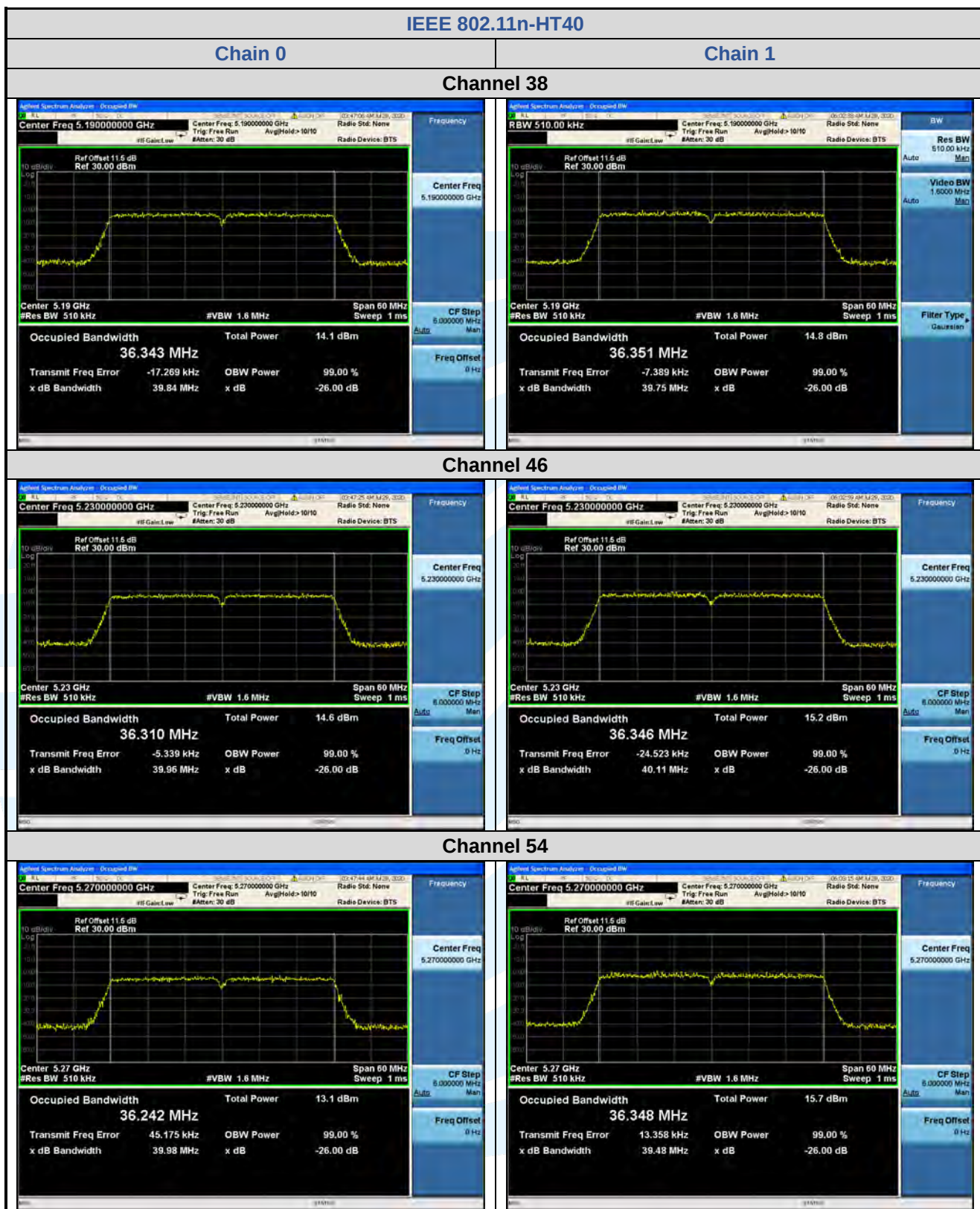




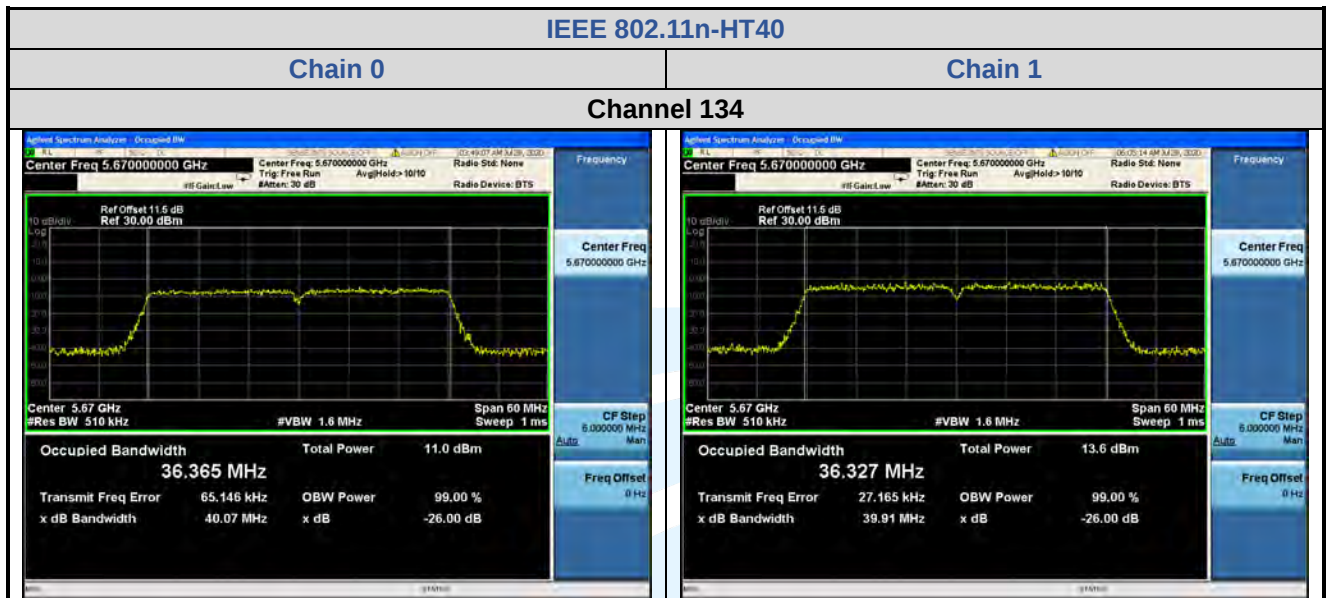












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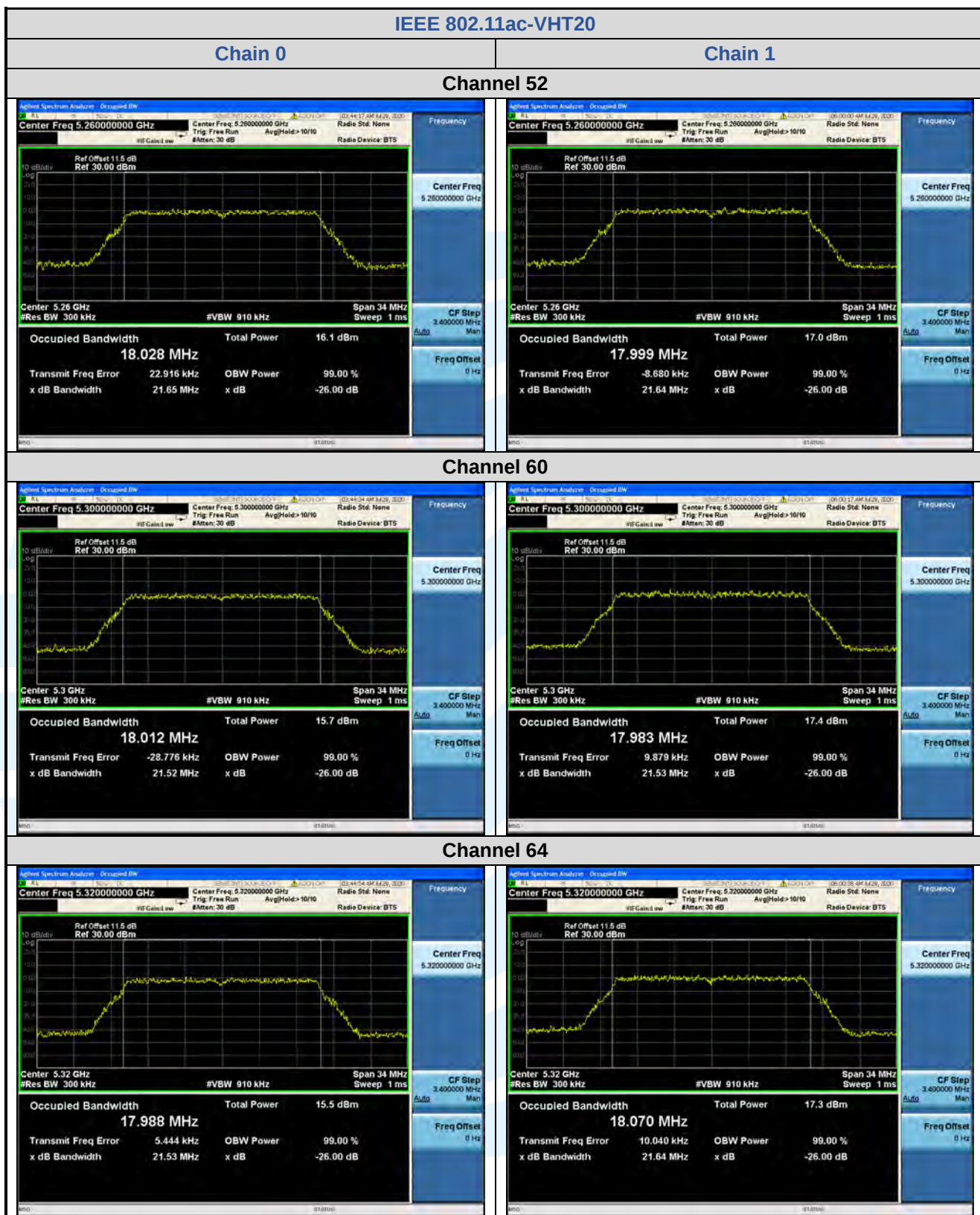
Fax: +86-755-28230886

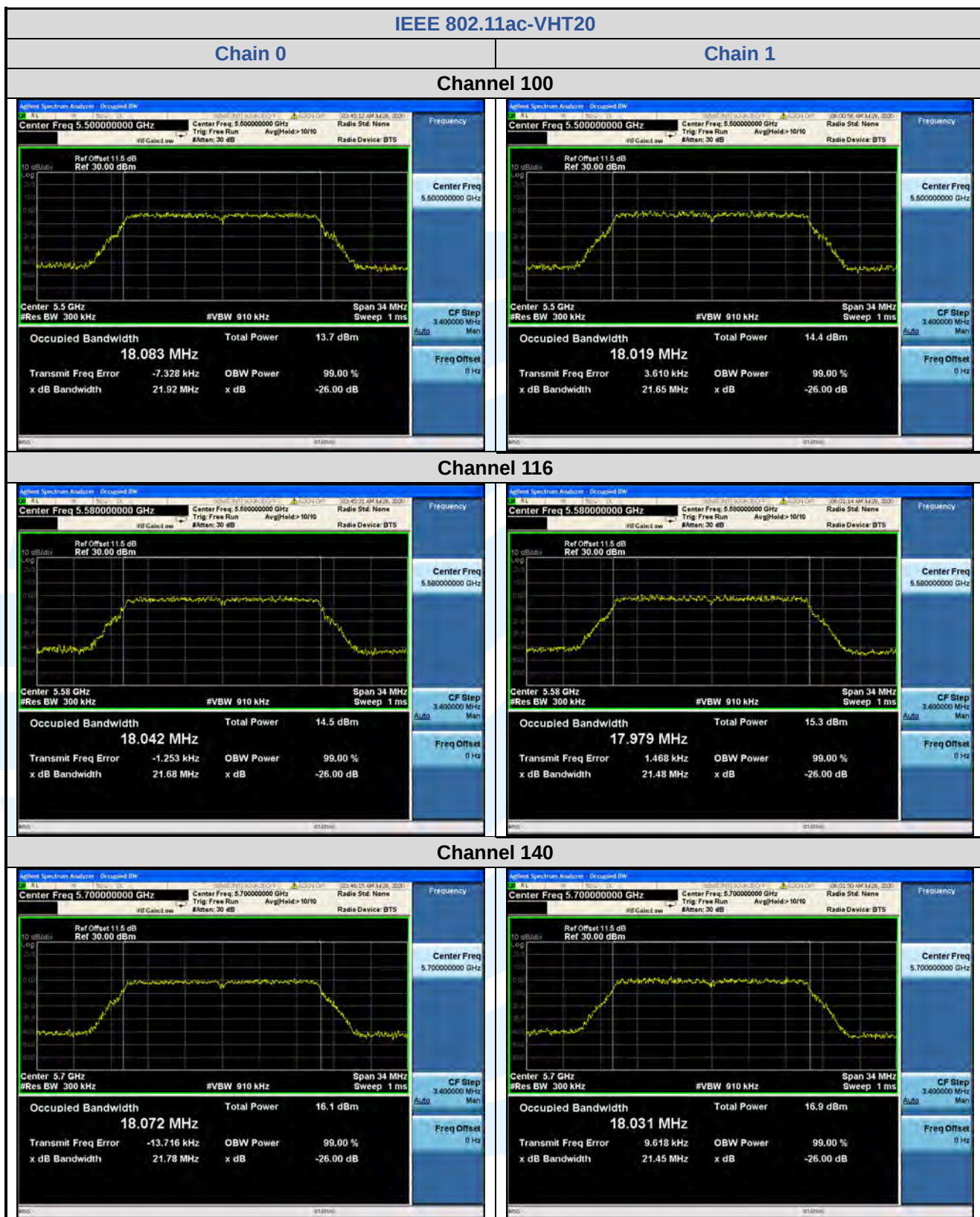
E-mail: info@uttlab.com

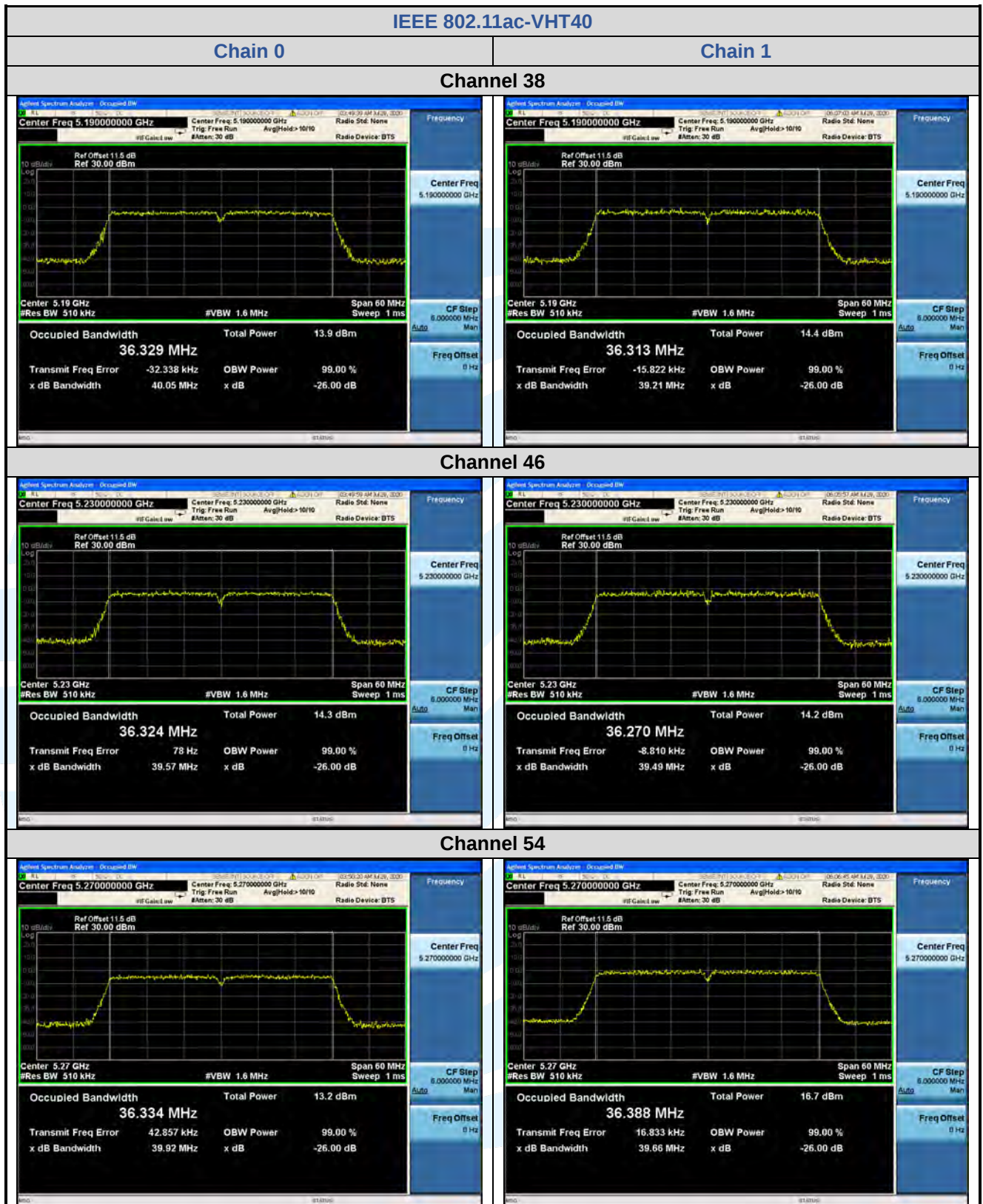
<http://www.uttlab.com>

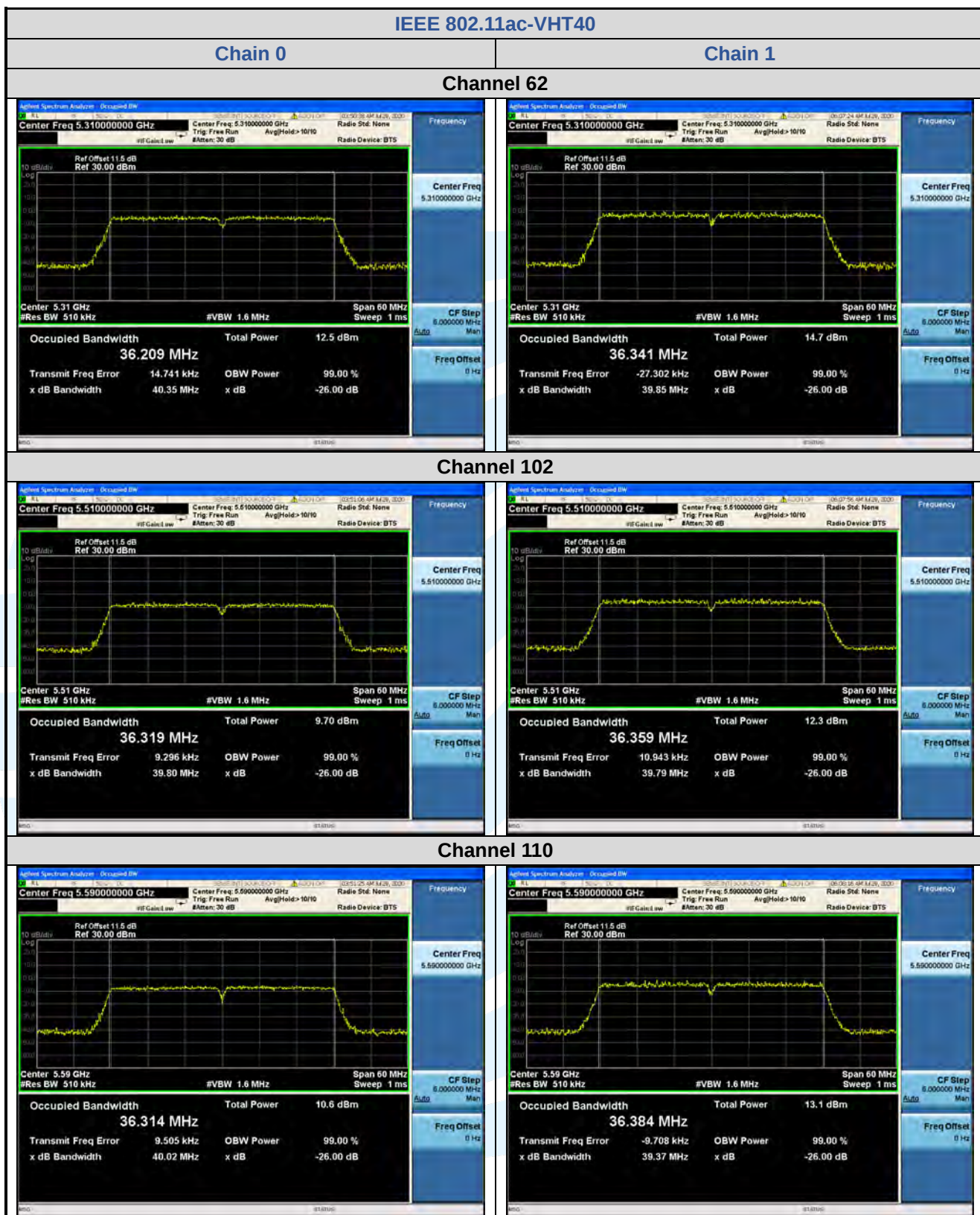
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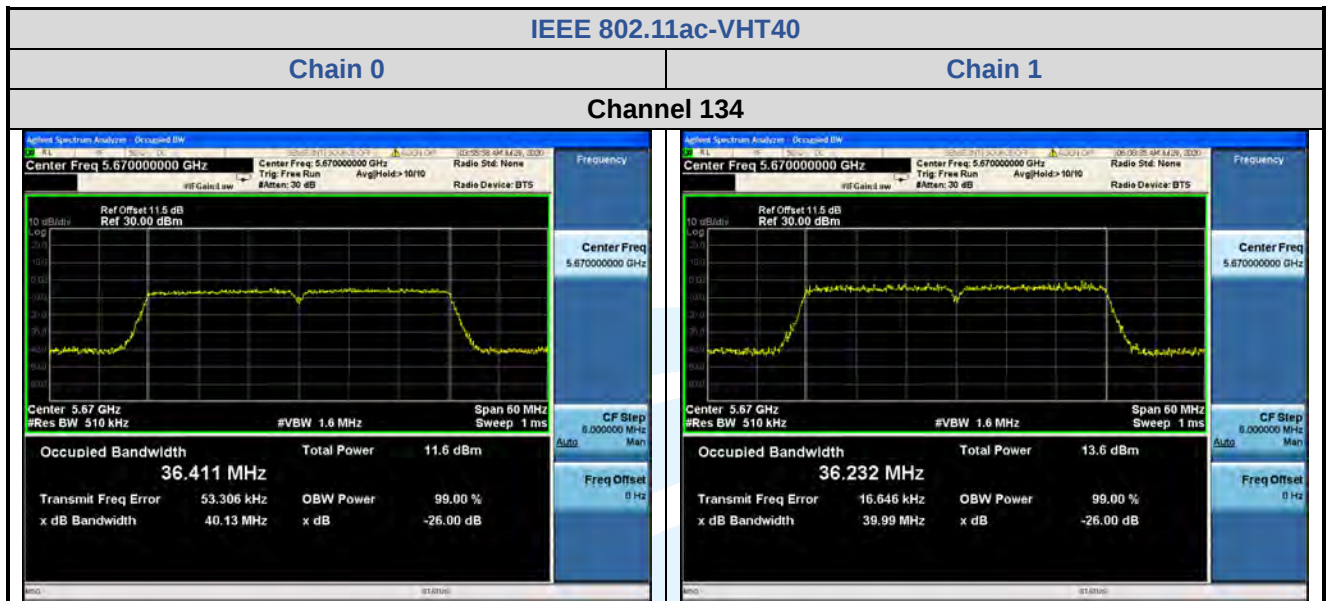












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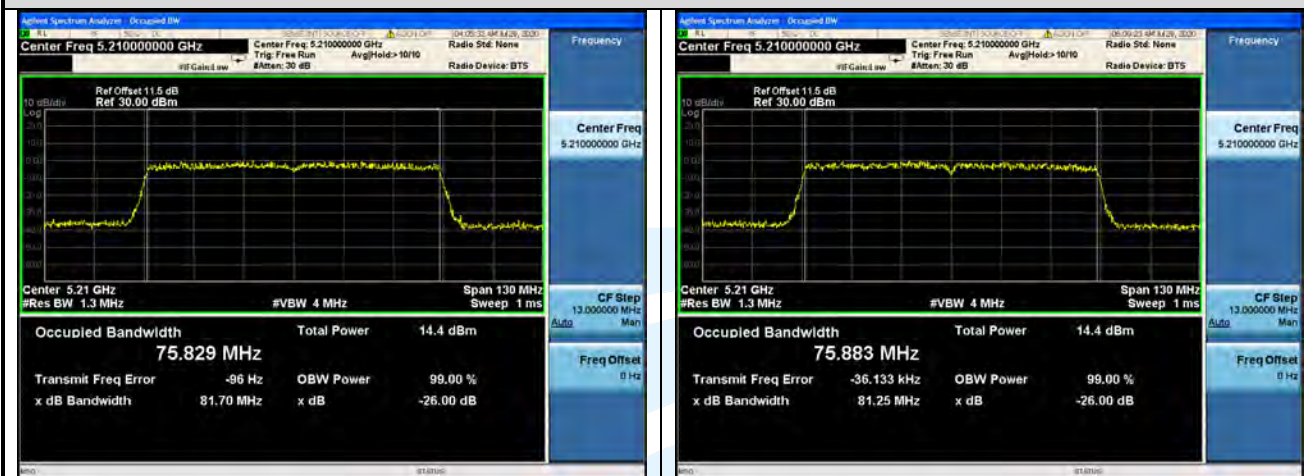
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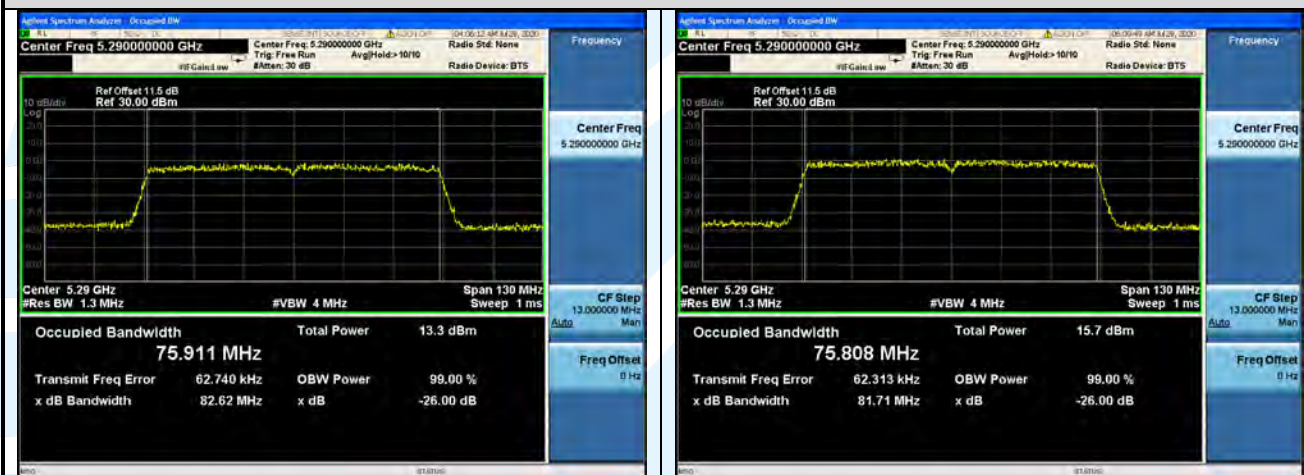
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IEEE 802.11ac-VHT80

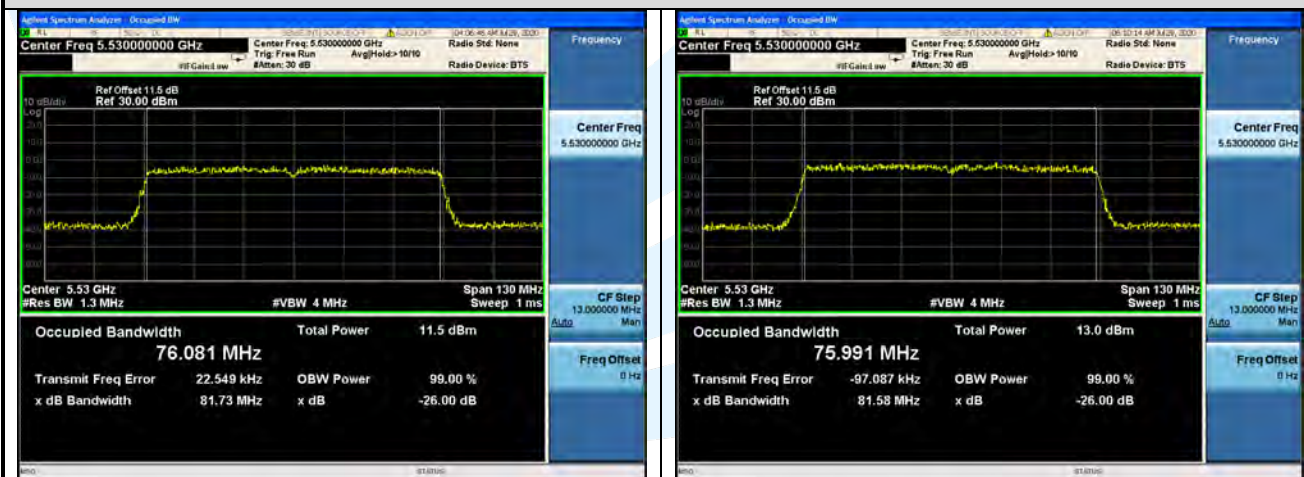
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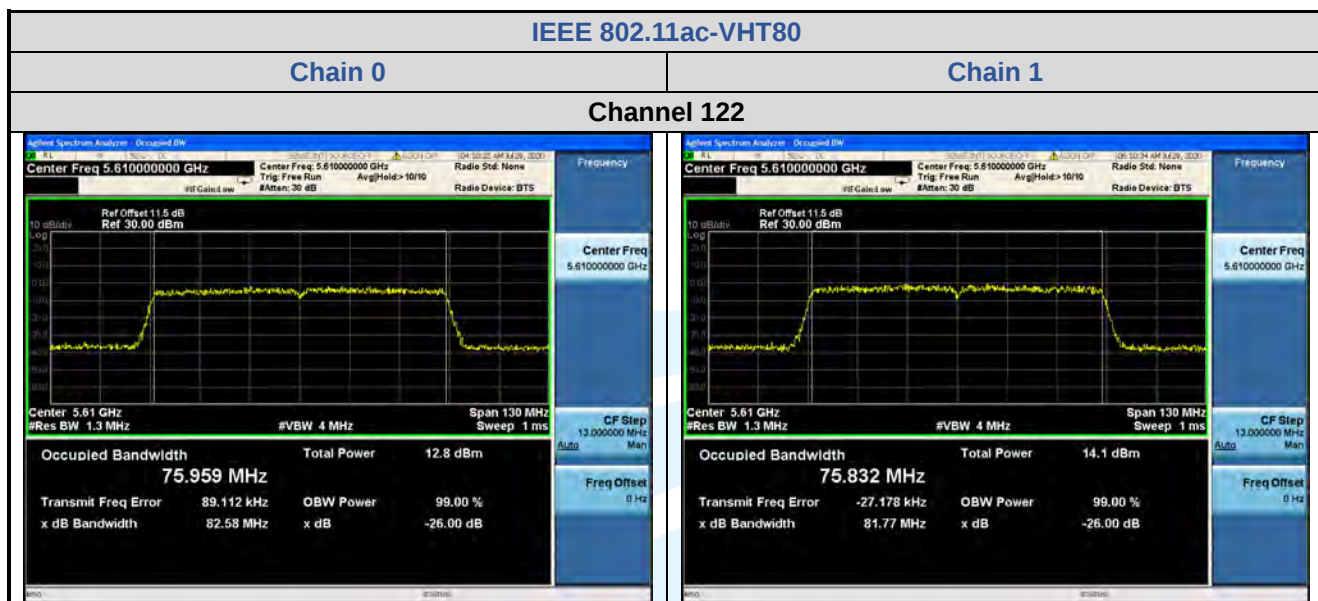


Channel 58



Channel 106





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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:

6dB Bandwidth

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 * \text{RBW}$.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) 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.

Occupied Bandwidth

- a) Set RBW = 1% to 5% of the occupied bandwidth
- b) Set the video bandwidth (VBW) $\geq 3 \times \text{RBW}$.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.

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
		Chain 0	Chain 1	Chain 0	Chain 1		
IEEE 802.11a	149 (5745)	16.41	16.39	17.053	17.041	> 500 kHz	Pass
	157 (5785)	16.39	16.38	17.017	17.095	> 500 kHz	Pass
	165 (5825)	16.36	16.35	17.013	16.979	> 500 kHz	Pass
IEEE 802.11n-HT20	149 (5745)	17.63	17.64	18.057	17.964	> 500 kHz	Pass
	157 (5785)	17.61	17.62	18.141	18.012	> 500 kHz	Pass
	165 (5825)	17.55	17.64	18.072	18.062	> 500 kHz	Pass
IEEE 802.11n-HT40	151 (5755)	36.37	36.38	36.330	36.418	> 500 kHz	Pass
	159 (5795)	36.36	36.46	36.322	36.366	> 500 kHz	Pass
IEEE 802.11ac-VHT20	149 (5745)	17.71	17.74	18.025	17.969	> 500 kHz	Pass
	157 (5785)	17.66	17.60	17.996	17.982	> 500 kHz	Pass
	165 (5825)	17.64	17.60	18.169	18.018	> 500 kHz	Pass
IEEE 802.11ac-VHT40	151 (5755)	36.11	36.37	36.296	36.411	> 500 kHz	Pass
	159 (5795)	36.39	36.40	36.333	36.343	> 500 kHz	Pass
IEEE 802.11ac-VHT80	155 (5775)	75.26	75.83	75.736	75.691	> 500 kHz	Pass

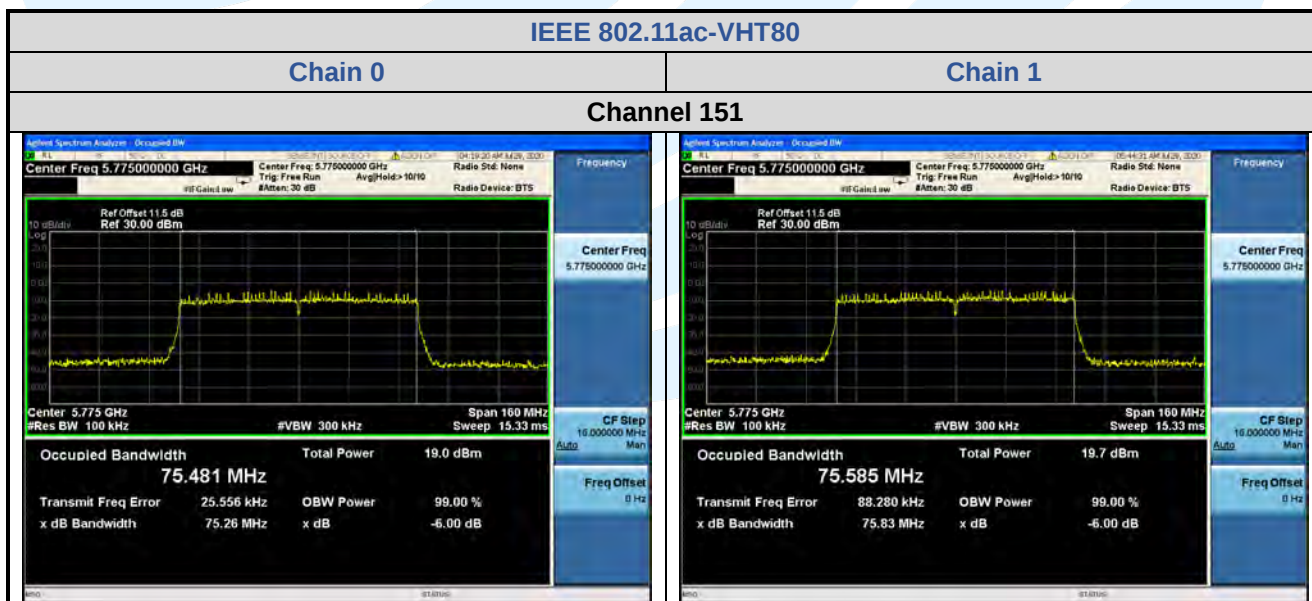
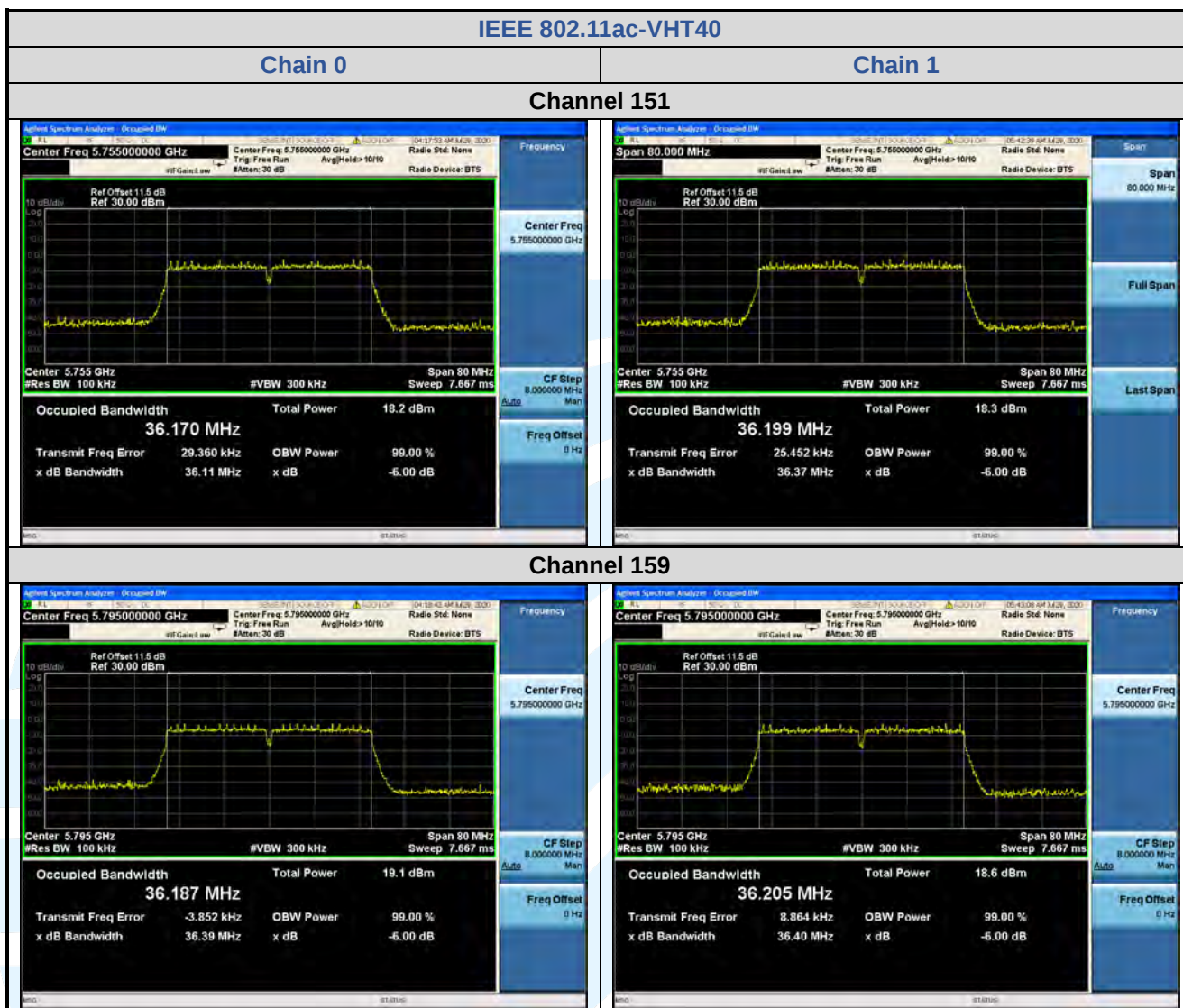
The test plots as follows:
6 dB Bandwidth











Occupied Bandwidth





