ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E AND INDUSTRY CANADA RSS 247 REQUIREMENT

OF

Applicant:	Murata Manufacturing Co., Ltd. 10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555 Japan
Product Name:	Communication Module
Brand Name:	muRata
FCC Model No.:	LBEE5XV1VA
IC Model No.:	LBEE5XV1VA_3ANT, LBEE5XV1VA_2ANT
Model Difference:	LBEE5XV1VA_3ANT: Connect BT_IN to BT_OUT LBEE5XV1VA_2ANT: Connect BT_IN to 50 ohm termination resistor
FCC ID:	VPYLB1VA
IC:	772C-LB1VA
Report Number:	T190506W05-RP4
FCC Rule Part:	§15.407, Cat:NII
IC Rule:	RSS-247 issue 2 Feb. 2017
Issue Date:	Jun. 05, 2019
Date of Test:	May 07, 2019 ~ May 24, 2018
Date of EUT Received:	May 07, 2019

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory
The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.
The test results of this report relate only to the tested sample identified in this report.

Tested By: Peter Weng
Peter Weng / Engineer

Approved By: Kevin Tsai
Kevin Tsai / Deputy Manager

Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
T190506W05-RP4	Rev.00	Initial creation of document	All	Jun. 05, 2019	Elle Chang

Contents

1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	Communication Module
Brand Name:	muRata
Model No.:	LBEE5XV1VA
Model Difference:	N/A
Product SW/HW version:	1.0 / 1.0
Radio SW/HW version:	1.0 / 1.0
Test SW Version:	N/A
RF power setting in TEST SW:	N/A
Power Supply:	3.6Vdc

FCC WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Avg. Power (dBm)	Modulation Technology
11a_20	5150~5250	4	15.97	OFDM
	5250~5350	4	15.99	
	5470~5725	12	15.84	
	5725~5850	5	15.97	
11n_HT / ac_VHT 20M	5150~5250	4	HT: 13.74	OFDM
	5250~5350	4	HT: 18.93	
	5470~5725	12	HT: 18.65	
	5725~5850	5	HT: 18.90	
11n_HT / ac_VHT 40M	5150~5250	2	HT: 14.01	OFDM
	5250~5350	2	HT: 17.89	
	5470~5725	6	HT:17.90	
	5725~5850	2	HT: 17.96	
11ac VHT80M	5150~5250	1	10.62	OFDM
	5250~5350	1	13.45	
	5470~5725	3	17.88	
	5725~5850	1	15.82	
Antenna Designation:		Dipole Antenna, Antenna Gain: 5.79dBi		
Modulation type:		64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only		
Transition Rate:		802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 - 300.0Mbps 802.11 ac_20MHz: 6.5 –144.4Mbps 802.11 ac_40MHz: 13.5 -300.0Mbps 802.11 ac_80MHz: 29.3 – 650Mbps		

IC WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Avg. or EIRP	Rated Power(dBm)	Modulation Technology
11a	5180~5240	4	EIRP	21.76	OFDM
	5260~5320	4	Avg.	15.99	
	5500~5580	5	Avg.	15.84	
	5660~5720	4	Avg.	12.62	
	5745~5825	5	Avg.	15.97	
11n_HT / ac_VHT 20M	5180~5240	4	EIRP	HT: 22.54	OFDM
	5260~5320	4	Avg.	HT: 18.93	
	5500~5580	5	Avg.	HT: 18.65	
	5660~5720	4	Avg.	HT: 12.60	
	5745~5825	5	Avg.	HT: 18.90	
11n_HT / ac_VHT 40M	5190~5230	2	EIRP	HT: 22.81	OFDM
	5270~5310	2	Avg.	HT: 17.89	
	5510~5550	2	Avg.	HT: 17.90	
	5670~5710	2	Avg.	HT: 13.91	
	5755~5795	2	Avg.	HT: 17.96	
11ac VHT80M	5210~5210	1	EIRP	19.42	OFDM
	5290~5290	1	Avg.	13.45	
	5530~5530	1	Avg.	10.31	
	5690~5690	1	Avg.	14.47	
	5775~5775	1	Avg.	15.82	
Modulation type		64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only			
Transition Rate:		802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 72.2Mbps 802.11 n_40MHz: 13.5 – 150.0Mbps 802.11 ac_20MHz: 6.5 –86.7Mbps 802.11 ac_40MHz: 13.5 -200.0Mbps 802.11 ac_80MHz: 29.3 – 433.3Mbps			

1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

KDB 789033 D02 General UNII Test Procedures New Rules V02r01

KDB 662911 D01 Multiple Transmitter Output v02r01

RSS-247 issue 2 Feb. 2017

RSS-Gen. issue 5 Apr. 2018

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

Compliance Certification Services Inc. Wugu Lab. No.11, Wugong 6th Rd.,

Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.) (TAF code 1309)

FCC Designation number: TW1309

Canada Company number: 2324G

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration

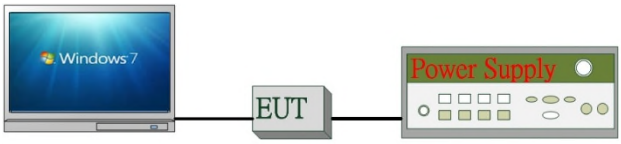


Fig.2-3 Conducted Emission (Antenna Port) Configuration

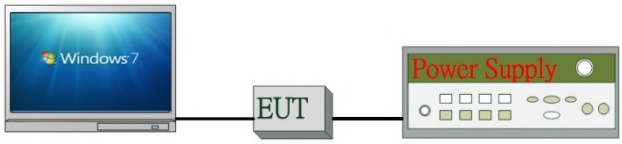


Fig. 2-2 Conducted Emission (AC Power Line) Configuration

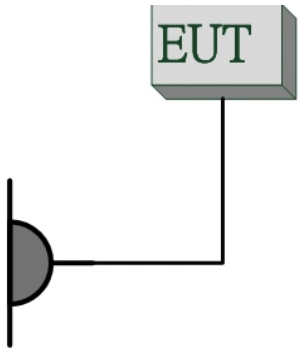


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	Agilent	E3640A	KR93300208	N/A	Unshielded
3.	Notebook	N/A	N/A	N/A	N/A	N/A

3 SUMMARY OF TEST RESULT

FCC Rules	IC Rules	Description Of Test	Result
§15.207	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	RSS-247 §6.2.1~ 4 (1) RSS-Gen §6.7	26 dB & 6dB & 99% Emission Bandwidth	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Maximum Conducted Output Power	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Power Spectral Density	Compliant
§15.205 §15.209 §15.407(b)	RSS-247 §6.2.1~ 4 (2)	Undesirable Radiated Emissions	Compliant
§15.407(c)	RSS-247 §6.4	Transmission in case of Absence of Information	Compliant
§15.407(g)	RSS-Gen §6.11	Frequency Stability	Compliant
§15.203 §15.407(a)	RSS- Gen §6.8	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operated in U-NII Bands

Operated band in 5150 MHz ~5250 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
Channel	Frequency
36	5180
40	5200
44	5220
48	5240

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Frequency
38	5190
46	5230

802.11ac VHT80 Mode	
channel	Frequency
42	5210

Operated band in 5250 MHz ~5350 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
channel	Frequency
52	5260
56	5280
60	5300
64	5320

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Frequency
54	5270
62	5310

802.11ac VHT80 Mode	
Channel	Frequency
58	5290

Operated band in 5470 MHz ~5725 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
Channel	Freq (MHz)
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700
144	5720

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
Channel	Freq (MHz)
102	5510
110	5550
118	5590
126	5630
134	5670
142	5710

802.11ac VHT80 Mode	
Channel	Freq (MHz)
106	5530
122	5610
138	5690

Operated band in 5745 MHz ~5850 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
Channel	Freq (MHz)
149	5745
153	5765
157	5785
161	5805

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Freq (MHz)
151	5755
159	5795

802.11ac VHT80 Mode	
channel	Freq (MHz)
155	5775

4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case. The gevin UE is pre-scanned among below modes.

Modulation	Transmission Chain				Multiple Transmission Spatial
☒ 802.11 a	☒ Ch0	☐ Ch1	☐ Ch2	☐ Ch3	☐ 2TX
☒ 802.11 n	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ MIMO
☒ 802.11 ac	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ MIMO

4. Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items.

RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	Ch0
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	Ch0
802.11ac_VHT80	5290	58	58	OFDM	MCS8	MIMO
802.11a	5500~5720	100 to 140	100,116,140	OFDM	6	Ch0
802.11ac_VHT80	5530~5690	106 to 138	106,122,138	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	Ch0
802.11ac_VHT80	5775	155	155	OFDM	MCS8	MIMO
RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	Ch0
802.11ac_VHT20				OFDM	MCS0	MIMO
802.11ac_VHT40	5190~5230	38 to 46	38,46	OFDM	MCS0	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	Ch0
802.11ac_VHT20				OFDM	MCS0	MIMO
802.11ac_VHT40	5270~5310	54 to 62	54,62	OFDM	MCS0	MIMO
802.11ac_VHT80	5290	58	58	OFDM	MCS0	MIMO

Note:

MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5500~5720	100 to 144	100,116,140	OFDM	6	Ch0
802.11ac_VHT20				OFDM	MCS8	MIMO
802.11ac_VHT40	5510~5710	102 to 142	102,110,134	OFDM	MCS8	MIMO
802.11ac_VHT80	5530~5610	106 to 122	106,122	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	Ch0
802.11ac_VHT20				OFDM	MCS8	MIMO
802.11ac_VHT40	5755~5795	151 to 159	151,159	OFDM	MCS8	MIMO
802.11ac_VHT80	5775	155	155	OFDM	MCS8	MIMO

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/n/ac WLAN Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	Ch0
802.11n_HT20				OFDM	MCS8	MIMO
802.11ac_VHT20					MCS8	
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT40					MCS8	
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	Ch0
802.11n_HT20				OFDM	MCS8	MIMO
802.11ac_VHT20					MCS8	
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO
802.11ac_VHT40					MCS8	
802.11ac_VHT80	5290	58	58	OFDM	MCS8	MIMO
802.11a	5500~5700	100 to 140	100,116,140	OFDM	6	Ch0
802.11n_HT20				OFDM	MCS8	MIMO
802.11ac_VHT20					MCS8	
802.11n_HT40	5510~5670	102 to 134	102,110,134	OFDM	MCS8	MIMO
802.11ac_VHT40					MCS8	
802.11ac_VHT80	5530~5610	106 to 122	106,122	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	Ch0
802.11n_HT20				OFDM	MCS8	MIMO
802.11ac_VHT20					MCS8	
802.11n_HT40	5755~5795	151 to 159	151,159	OFDM	MCS8	MIMO
802.11ac_VHT40					MCS8	
802.11ac_VHT80	5775	155	155	OFDM	MCS8	MIMO

5 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575 dB
26dB & 6dB Emission Bandwidth	+/- 147.256 Hz
The Maximum Output Power	+/- 1.924 dB
Peak Power Spectral Density	+/- 2.038 dB
Frequency Stability	+/- 147.256 Hz
3M Semi Anechoic Chamber / 30M~200M	+/- 4.12 dB
3M Semi Anechoic Chamber / 200M~1000M	+/- 4.68 dB
3M Semi Anechoic Chamber / 1G~8G	+/- 5.18 dB
3M Semi Anechoic Chamber / 8G~18G	+/- 5.47 dB
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81 dB
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87 dB

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency range within 150 kHz to 30 MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

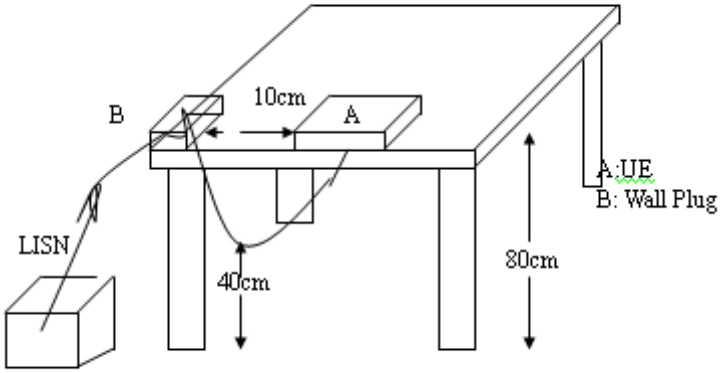
6.2 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUM-BER	LAST CAL.	CAL DUE.
CABLE	EMCI	CFD300-NL	CERF	06/29/2018	06/28/2019
EMI Test Receiver	R&S	ESCI	100064	07/24/2018	07/23/2019
LISN	SCHWARZ-BECK	NSLK 8127	8127-541	01/31/2019	01/30/2020
LISN	SCHAFFNER	NNB 41	03/10013	02/13/2019	02/12/2020
Software	EZ-EMC(CCS-3A1-CE)				

6.3 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The LISN was connected with 120Vac/60Hz power source.

6.4 Test SET-UP



6.5 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed.

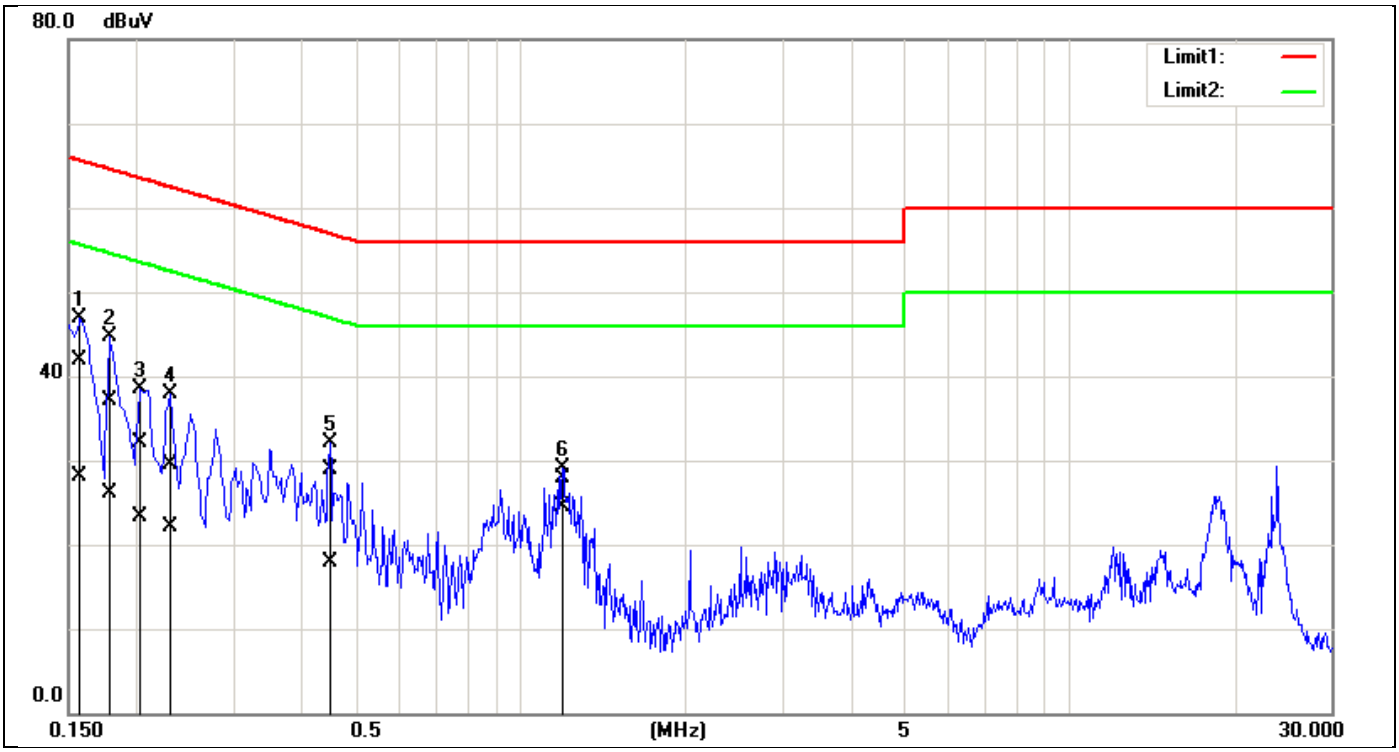
6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit

AC POWER LINE CONDUCTED EMISSION TEST DATA

Description:	**Operation**	**Date:**	**2019/5/21**
Line:	**L1**	**Temp.(℃)/Hum.(%):**	**22.5(℃)/61%**
Test Voltage:	**AC 120V/60Hz**	**Test By:**	**Peter**



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1580	41.75	28.03	0.16	41.91	28.19	65.56	55.57	-23.65	-27.38	Pass
2	0.1780	36.99	26.02	0.15	37.14	26.17	64.57	54.58	-27.43	-28.41	Pass
3	0.2020	31.99	23.18	0.15	32.14	23.33	63.52	53.53	-31.38	-30.20	Pass
4	0.2300	29.40	21.95	0.15	29.55	22.10	62.45	52.45	-32.90	-30.35	Pass
5	0.4500	28.78	17.84	0.16	28.94	18.00	56.87	46.88	-27.93	-28.88	Pass
6*	1.1940	27.73	24.30	0.19	27.92	24.49	56.00	46.00	-28.08	-21.51	Pass

Description:	**Operation**	**Date:**	**2019/5/21**
Line:	**N**	**Temp.(℃)/Hum.(%):**	**22.5(℃)/61%**
Test Voltage:	**AC 120V/60Hz**	**Test By:**	**Peter**

No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1*	0.1539	44.30	32.05	0.10	44.40	32.15	65.78	55.79	-21.38	-23.64	Pass
2	0.1620	37.55	27.72	0.10	37.65	27.82	65.36	55.36	-27.71	-27.54	Pass
3	0.1819	40.04	28.95	0.10	40.14	29.05	64.39	54.40	-24.25	-25.35	Pass
4	0.2460	32.21	22.84	0.10	32.31	22.94	61.89	51.89	-29.58	-28.95	Pass
5	0.3300	27.90	22.56	0.11	28.01	22.67	59.45	49.45	-31.44	-26.78	Pass
6	0.4500	26.06	14.13	0.11	26.17	14.24	56.87	46.88	-30.70	-32.64	Pass

7 DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

Duty Cycle = Ton / (Ton+Toff)

Measurement Procedure:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

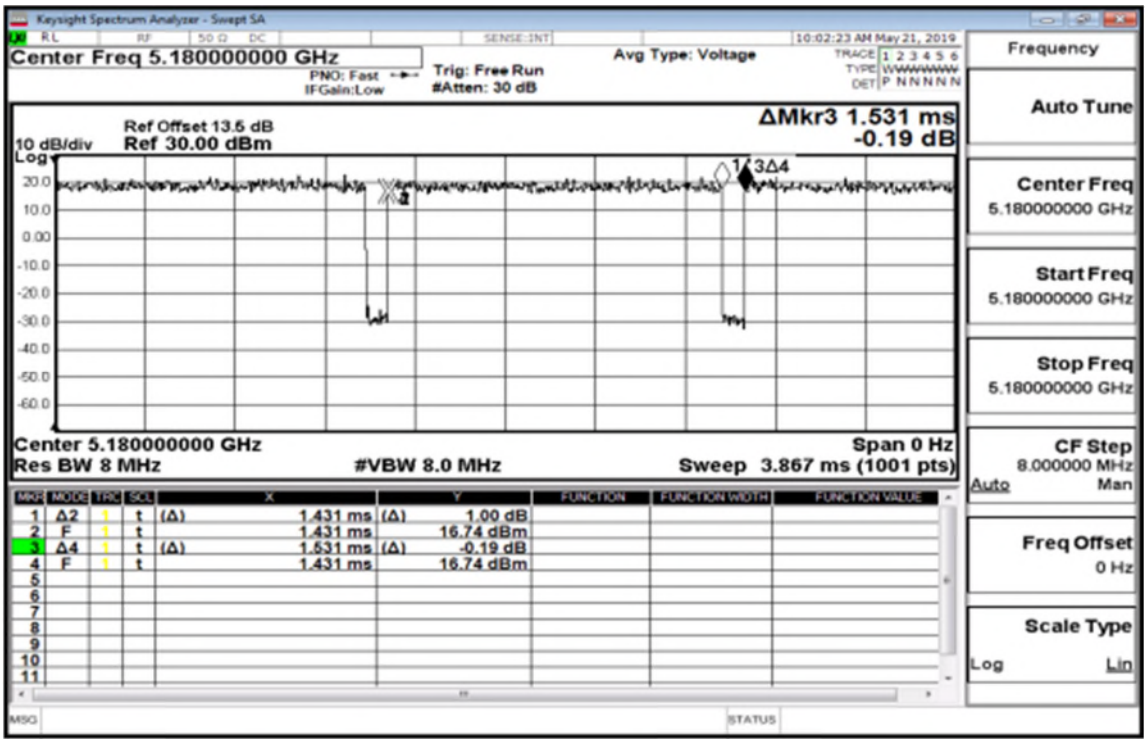
Duty Cycle:

Mode	Duty Cycle (%)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11a	93.30	0.30	0.70	1.00
802.11n_20	92.90	0.32	0.75	1.00
802.11n_40	86.80	0.61	1.51	2.00
802.11ac_80	77.10	1.13	2.99	3.00

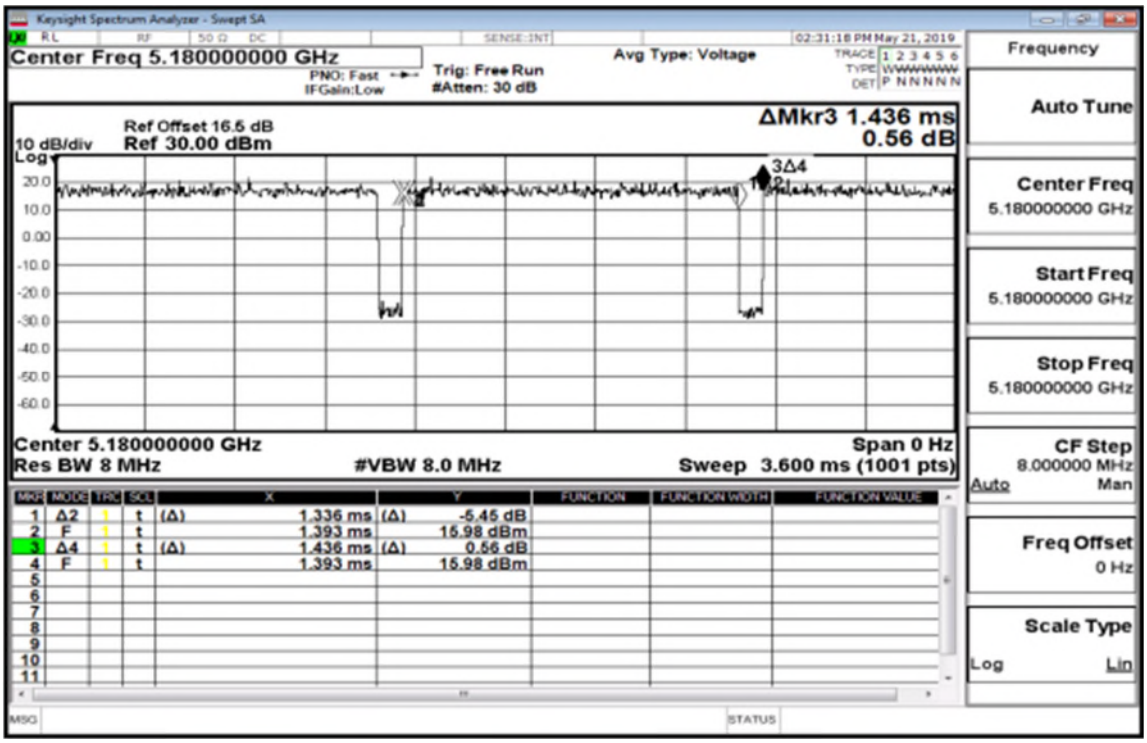
Duty Cycle Factor: 10 * log(1/0.933) = 0.3
Duty Cycle Factor: 10 * log(1/0.929) = 0.32
Duty Cycle Factor: 10 * log(1/0.868) = 0.61
Duty Cycle Factor: 10 * log(1/0.771) = 1.13

DUTY CYCLE TEST SIGNAL Measurement Result

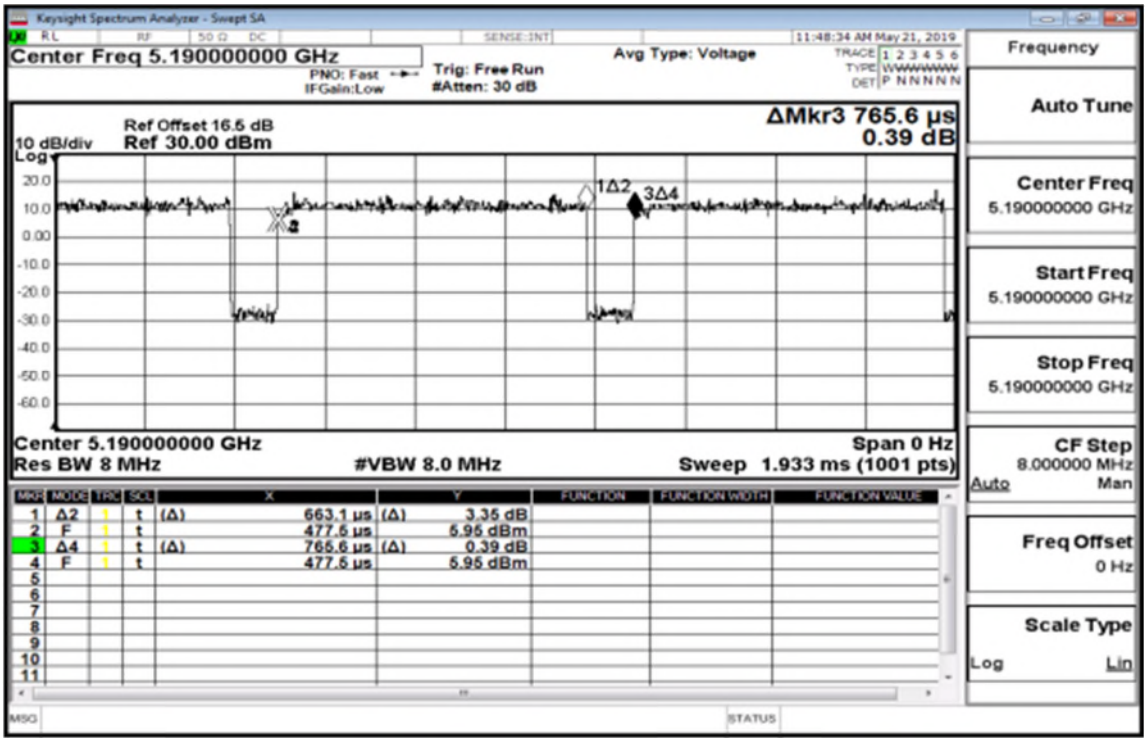
802.11a



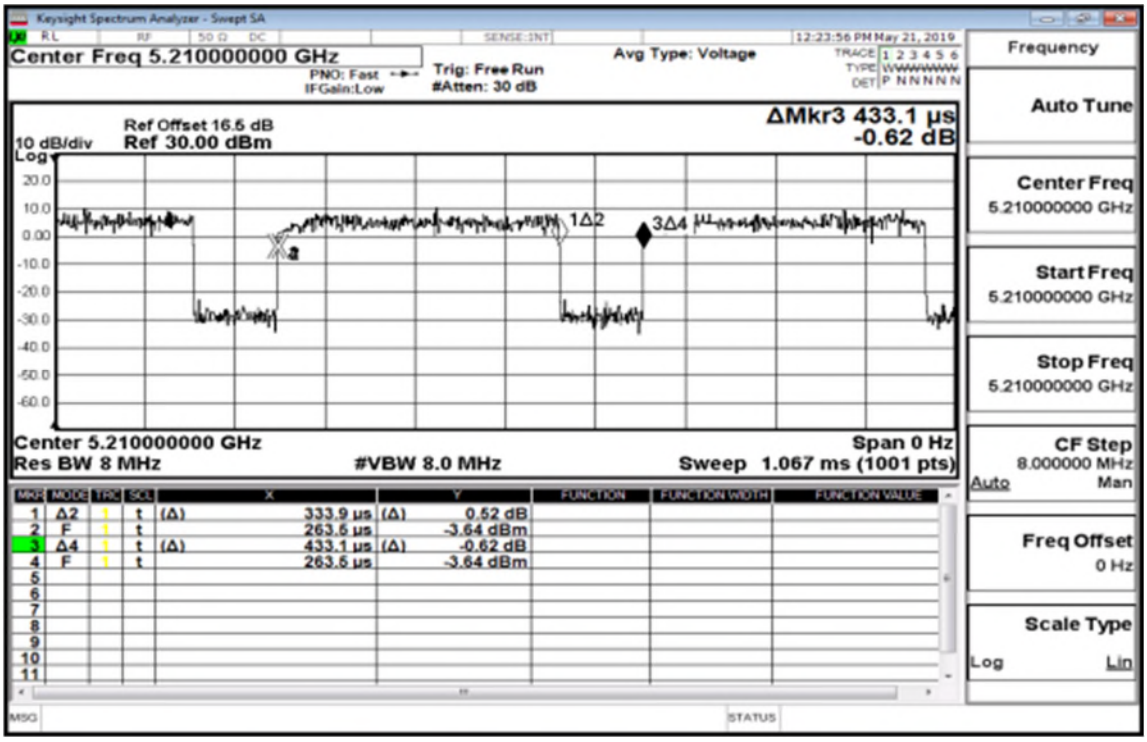
802.11n HT20



802.11n HT 40



802.11 ac VHT 80



8 26DB & 6DB EMISSION BANDWIDTH MEASUREMENT

8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.

The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

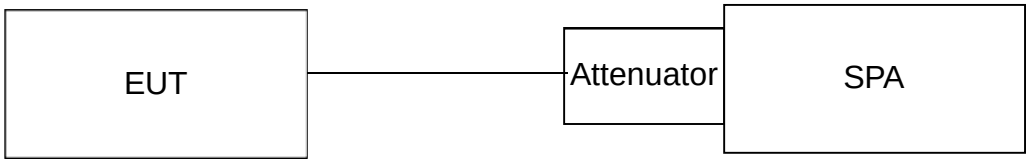
8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the Antenna port to the spectrum analyzer.
   a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW Sweep=auto, Detector = Peak, Trace Mode = Max Hold, Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.
   b. Mark the peak frequency and –26dB (upper and lower) frequency.
4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
5. Minimum Emission Bandwidth for the band 5.725-5.850GHz.
   a. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/50MHz, Detector=Peak,
   Sweep=auto
   b. Mark the peak frequency and –6dB (upper and lower) frequency.
6. Repeat above procedures until all test default channel measured were complete.

8.3 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUM-BER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	KR93300208	08/15/2018	08/14/2019
Spectrum Analyzer	Agilent	N9010A	MY53400256	11/21/2018	11/20/2019
TEMPERATURE	TEMPERA-TURE	HTC-1	EC-HY-01	04/18/2019	04/17/2020
DC Power Supply	GWINSTEK	SPS-3610	GPE880163	01/14/2019	01/13/2020
DC Block	Mini-Circuits	BLK-18-S+	31129(1)	02/26/2019	02/25/2020
Attenuator	Mini-Circuit	BW-S10W2+	1	02/26/2019	02/25/2020

8.4 Test Set-up



8.5 Measurement Result

26dB and 6dB Bandwidth

802.11a_Ch0

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	20.52	13.122
5220	20.5	13.118
5240	20.33	13.081
5260	20.66	13.151
5300	20.95	13.212
5320	20.54	13.126
5500	20.75	13.170
5580	21.02	13.226
5700	20.45	13.107
5720(U-NII 2C)	15.52	11.909
5720 (U-NII 3)	5.76	7.604

802.11a_Ch0

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.41	12.151
5785	16.37	12.140
5825	16.39	12.146

802.11n_HT20_Ch0 **802.11n_HT20_Ch1**

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	21.23	13.269	5180	20.6	13.139
5220	20.55	13.128	5220	20.58	13.134
5240	21.24	13.272	5240	20.55	13.128
5260	20.58	13.134	5260	20.77	13.174
5300	21.38	13.300	5300	21.37	13.298
5320	21.11	13.245	5320	21.09	13.241
5500	21.25	13.274	5500	20.72	13.164
5580	21.26	13.276	5580	21.09	13.241
5700	20.59	13.137	5700	20.72	13.164
5720(U-NII 2C)	21.08	13.239	5720(U-NII 2C)	16.96	12.294
5720 (U-NII 3)	12.16	10.849	5720 (U-NII 3)	8.24	9.159

802.11n_HT20_Ch0 **802.11n_HT20_Ch1**

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.7	12.480	5745	17.57	12.448
5785	17.6	12.455	5785	17.61	12.458
5825	17.62	12.460	5825	17.64	12.465

802.11n _HT40_Ch0 **802.11n _HT40_Ch1**

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	39.66	15.984	5190	38.41	15.844
5230	38.31	15.833	5230	38.41	15.844
5270	38.55	15.860	5270	38.44	15.848
5310	38.35	15.838	5310	38.49	15.853
5510	40.05	16.026	5510	38.44	15.848
5550	**38.59**	15.865	5550	**38.4**	15.843
5670	39.78	15.997	5670	38.33	15.835
5710 (U-NII 2C)	**34.68**	15.401	5710 (U-NII 2C)	**51.24**	17.096
5710 (U-NII 3)	21.96	13.416	5710 (U-NII 3)	18.2	12.601

802.11n_HT40_Ch0 **802.11n_HT40_Ch1**

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.35	15.605	5755	36.36	15.606
5795	36.4	15.611	5795	36.34	15.604

802.11ac _VHT80_Ch0 **802.11ac _VHT80_Ch1**

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	78.71	18.960	5210	78.67	18.958
5290	80.19	19.041	5290	78.26	18.935
5530	79.16	18.985	5530	79.13	18.983
5610	79.5	19.004	5610	83.99	19.242
5690 (U-NII 2C)	103.32	20.142	5690 (U-NII 2C)	102.04	20.088
5690 (U-NII 3)	22.6	13.541	5690 (U-NII 3)	15.72	11.965

802.11ac _VHT80_Ch0 **802.11ac _VHT80_Ch1**

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.5	18.779	5775	75.5	18.779

99% Bandwidth

802.11a_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	17.029	12.312
5220	17.011	12.307
5240	17.05	12.317
5260	16.995	12.303
5300	16.995	12.303
5320	17.039	12.314
5500	16.962	12.295
5580	17.019	12.309
5700	16.993	12.303
5720(U-NII 2C)	13.482	11.298
5720 (U-NII 3)	3.482	5.418

802.11a_Ch0

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.43	12.156
5785	16.58	12.196
5825	16.37	12.140

802.11n_HT20_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	18.063	12.568
5220	18.123	12.582
5240	18.043	12.563
5260	18.097	12.576
5300	18.227	12.607
5320	18.142	12.587
5500	18.01	12.555
5580	18.083	12.573
5700	18.06	12.567
5720(U-NII 2C)	14.0785	11.486
5720 (U-NII 3)	4.0785	6.105

802.11n_HT20_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	18.058	12.567
5220	17.99	12.550
5240	18.085	12.573
5260	18.109	12.579
5300	18.269	12.617
5320	18.099	12.577
5500	18.099	12.577
5580	18.037	12.562
5700	18.106	12.578
5720(U-NII 2C)	14.041	11.474
5720 (U-NII 3)	4.041	6.065

802.11n_HT20_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	18.063	12.568
5220	18.123	12.582
5240	18.043	12.563
5260	18.097	12.576
5300	18.227	12.607
5320	18.142	12.587
5500	18.01	12.555
5580	18.083	12.573
5700	18.06	12.567
5720(U-NII 2C)	14.0785	11.486
5720 (U-NII 3)	4.0785	6.105

802.11n_HT20_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	18.058	12.567
5220	17.99	12.550
5240	18.085	12.573
5260	18.109	12.579
5300	18.269	12.617
5320	18.099	12.577
5500	18.099	12.577
5580	18.037	12.562
5700	18.106	12.578
5720(U-NII 2C)	14.041	11.474
5720 (U-NII 3)	4.041	6.065

802.11n_HT20_Ch0

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.79	12.502
5785	17.71	12.482
5825	17.67	12.472

802.11n_HT20_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.69	12.477
5785	17.7	12.480
5825	17.67	12.472

802.11n _HT40_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	36.27	15.595
5230	36.21	15.588
5270	36.276	15.596
5310	36.258	15.594
5510	36.246	15.593
5550	36.291	15.598
5670	36.26	15.594
5710(U-NII 2C)	33.144	15.204
5710 (U-NII 3)	3.144	4.975

802.11n _HT40_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	36.25	15.593
5230	36.232	15.591
5270	36.277	15.596
5310	36.267	15.595
5510	36.216	15.589
5550	36.27	15.595
5670	36.281	15.597
5710(U-NII 2C)	33.1975	15.211
5710 (U-NII 3)	3.1975	5.048

802.11n _HT40_Ch0

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.41	15.612
5795	36.39	15.610

802.11n _HT40_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.4	15.611
5795	36.51	15.624

802.11ac _VHT80_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5210	75.693	18.791
5290	75.709	18.791
5530	75.714	18.792
5610	75.708	18.791
5690(U-NII 2C)	72.855	18.625
5690 (U-NII 3)	2.855	4.556

802.11ac _VHT80_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5210	75.684	18.790
5290	75.557	18.783
5530	75.663	18.789
5610	75.606	18.786
5690(U-NII 2C)	72.924	18.629
5690 (U-NII 3)	2.924	4.660

802.11ac _VHT80_Ch0

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	76.5	18.837

802.11ac _VHT80_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	76.46	18.834

99% BW verification for DFS Function

802.11a_Ch0

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.24	< 5250
5745	5736.73	> 5725

802.11n_HT20_Ch0

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.92	< 5250
5745	5736.11	> 5725

802.11n_HT20_Ch1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.82	< 5250
5745	5736.08	> 5725

802.11n _HT40_Ch0

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.12	< 5250
5755	5736.89	> 5725

802.11n _HT40_Ch1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.12	< 5250
5755	5736.89	> 5725

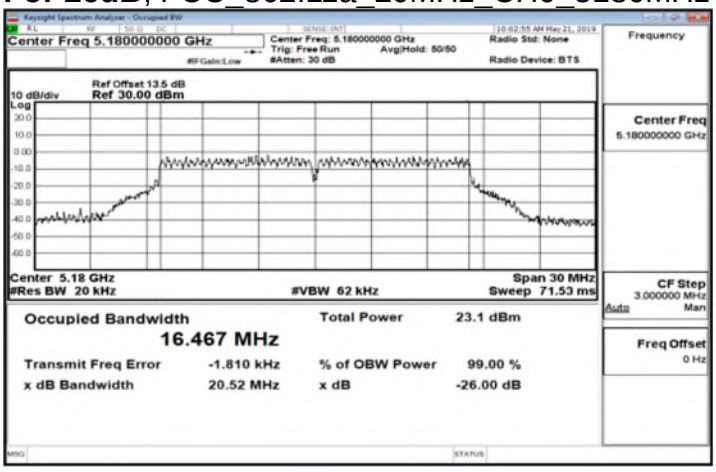
802.11ac _VHT80_Ch0

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5210	5247.88	< 5250
5775	5737.22	> 5725

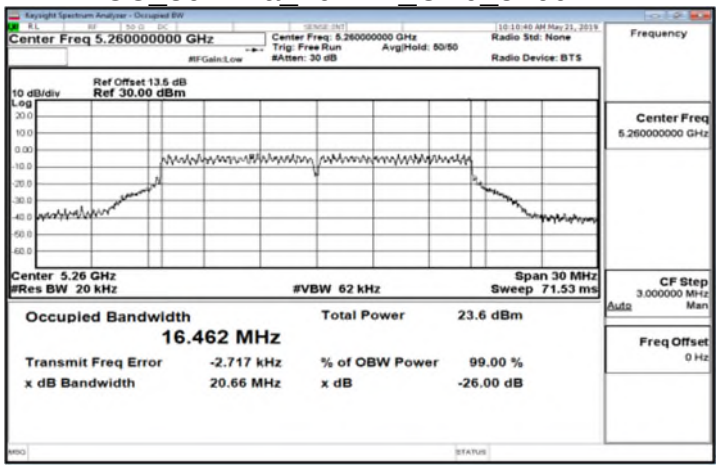
802.11n _HT80_Ch1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5210	5247.83	< 5250
5775	5737.20	> 5725

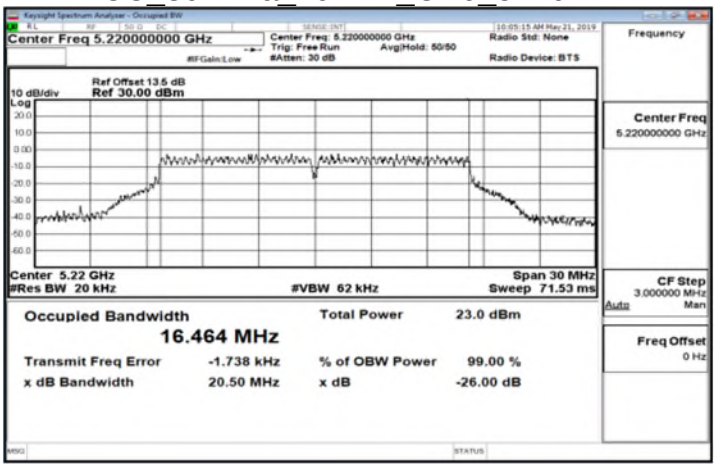
For 26dB, FCC_802.11a_20MHz_CH0_5180MHz



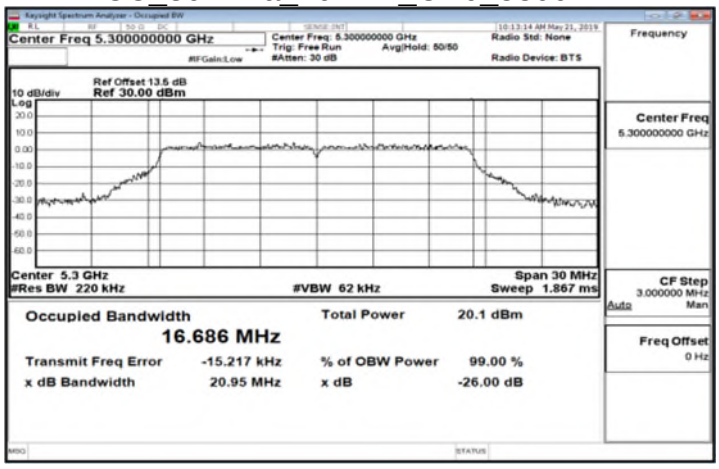
FCC_802.11a_20MHz_CH0_5260MHz



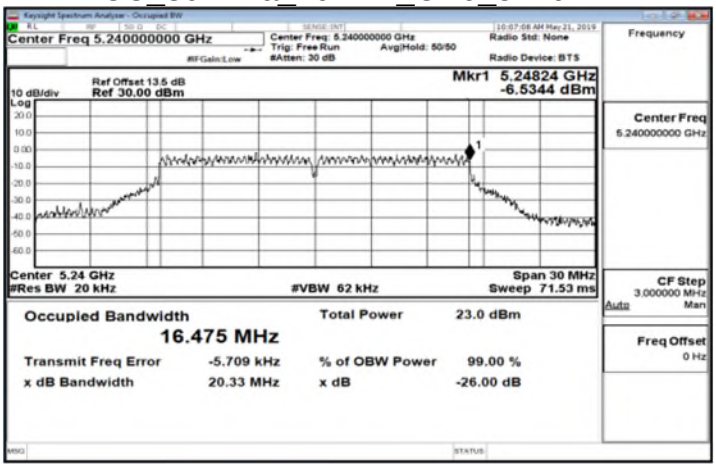
FCC_802.11a_20MHz_CH0_5220MHz



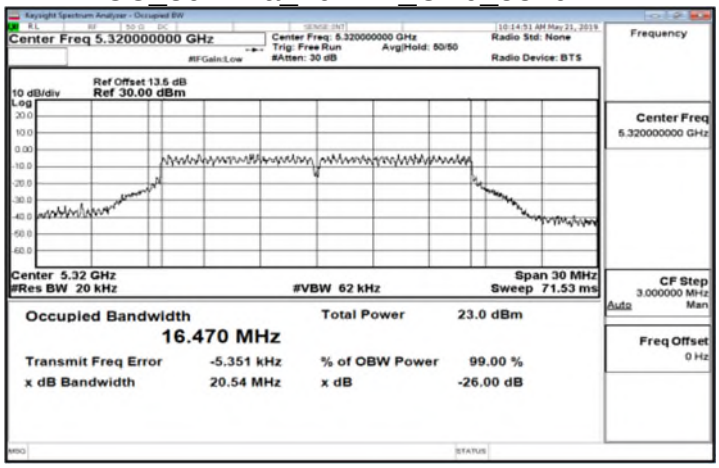
FCC_802.11a_20MHz_CH0_5300MHz



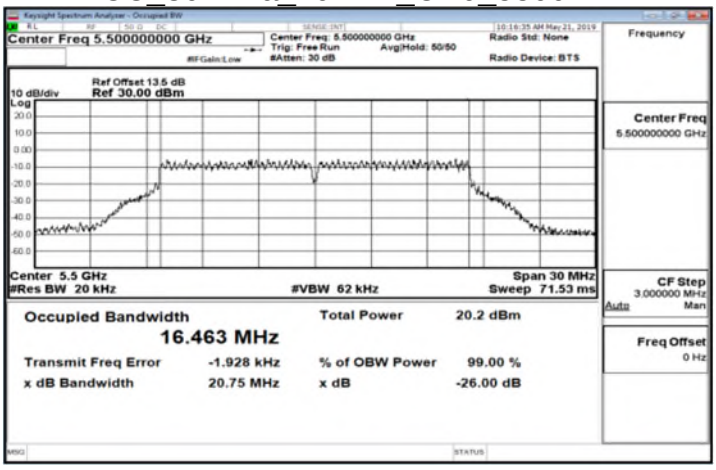
FCC_802.11a_20MHz_CH0_5240MHz



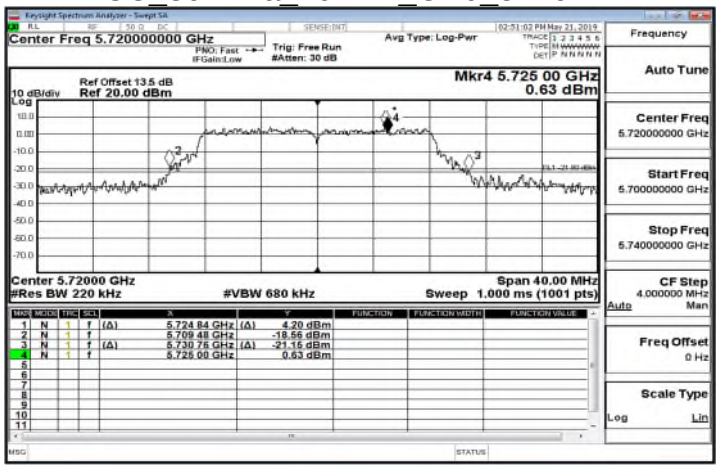
FCC_802.11a_20MHz_CH0_5320MHz



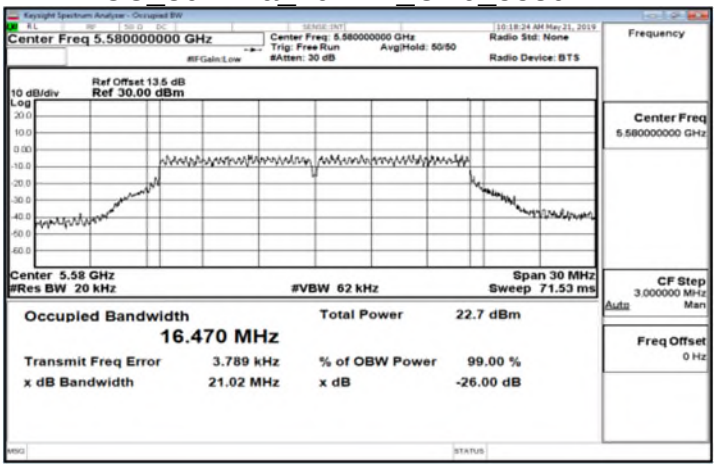
FCC_802.11a_20MHz_CH0_5500MHz



FCC_802.11a_20MHz_CH0_5720MHz



FCC_802.11a_20MHz_CH0_5580MHz



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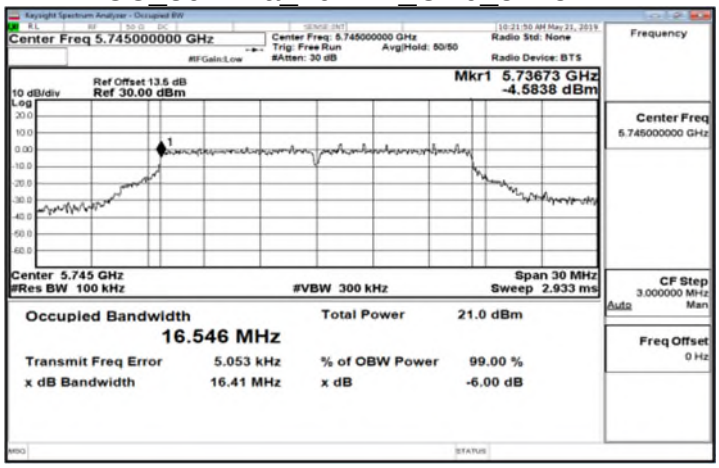
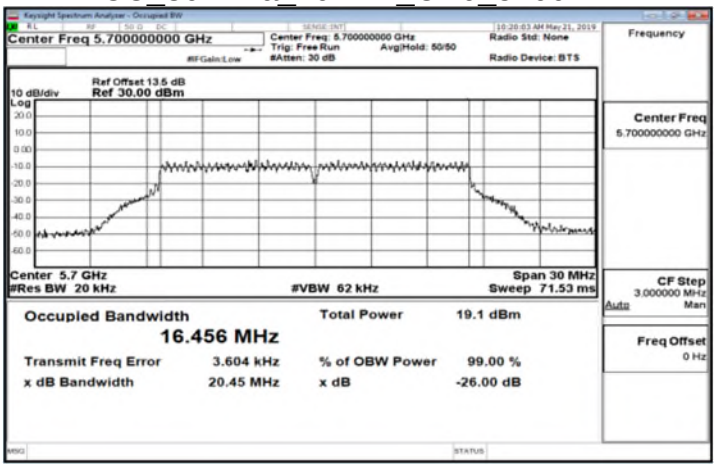
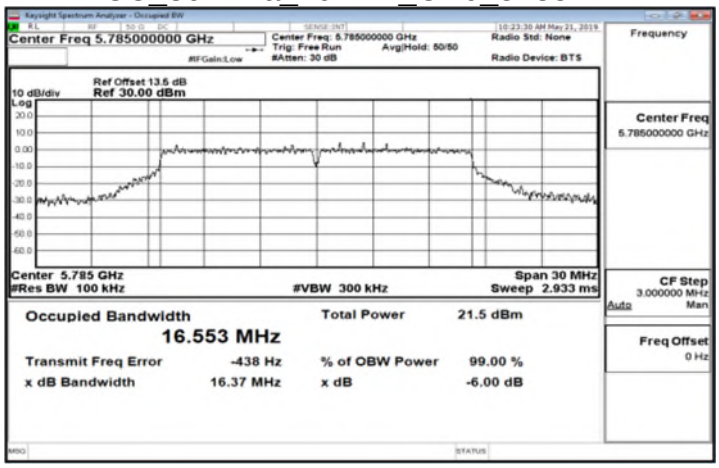


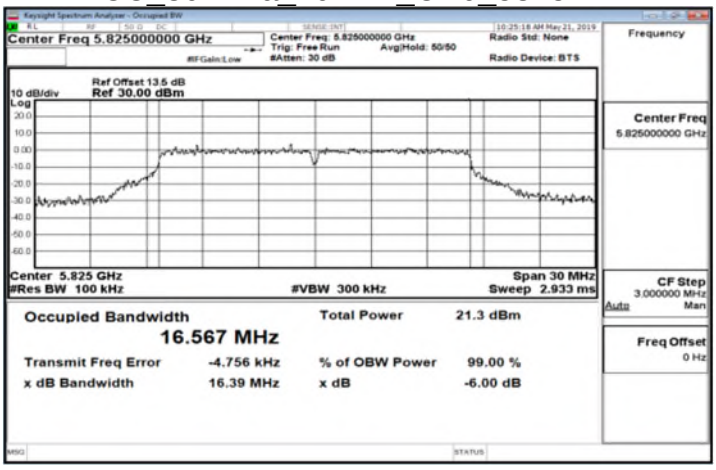
FCC_802.11a_20MHz_CH0_5700MHz



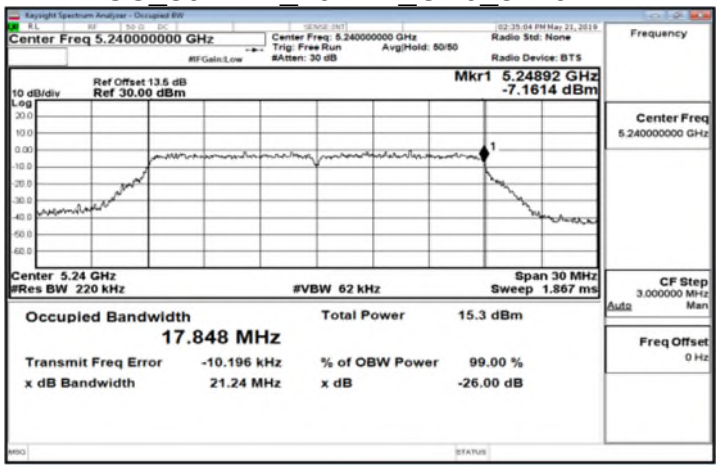
FCC_802.11a_20MHz_CH0_5785MHz



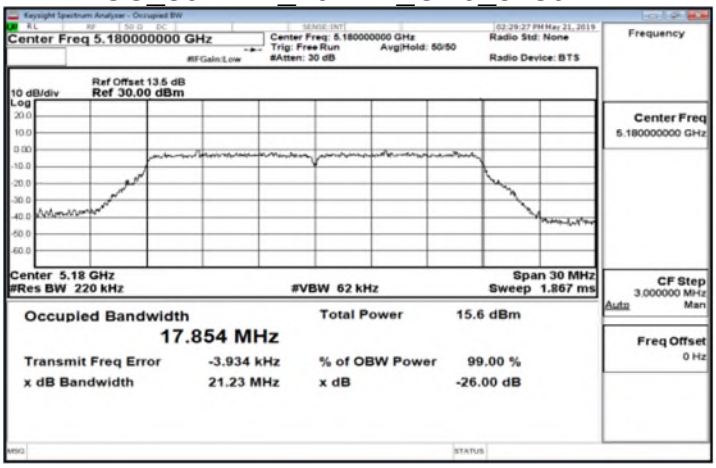
FCC_802.11a_20MHz_CH0_5825MHz



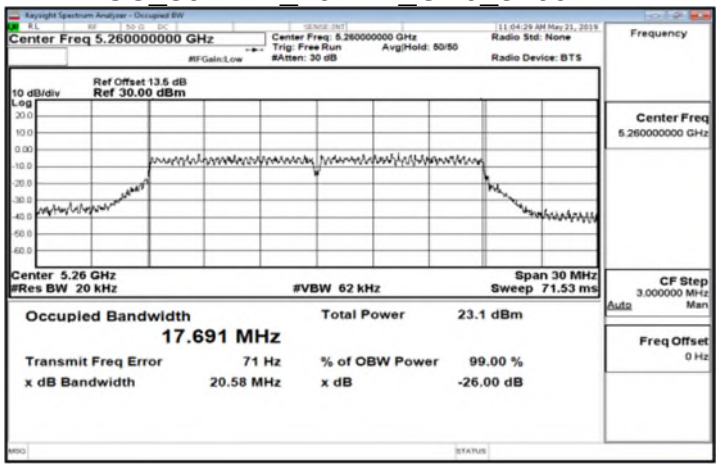
FCC_802.11n_20MHz_CH0_5240MHz



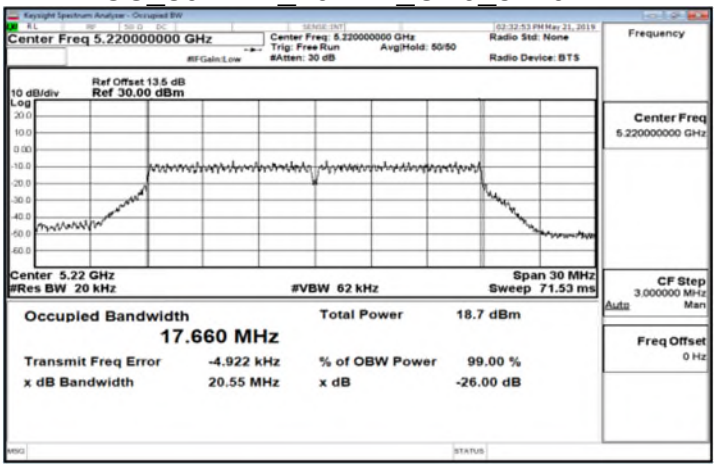
FCC_802.11n_20MHz_CH0_5180MHz



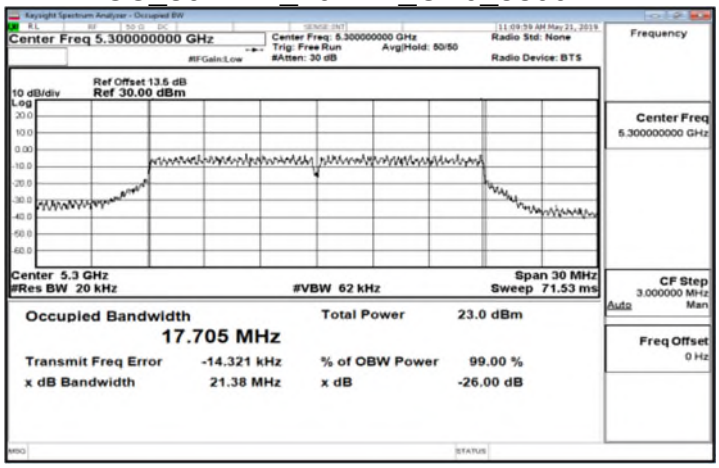
FCC_802.11n_20MHz_CH0_5260MHz



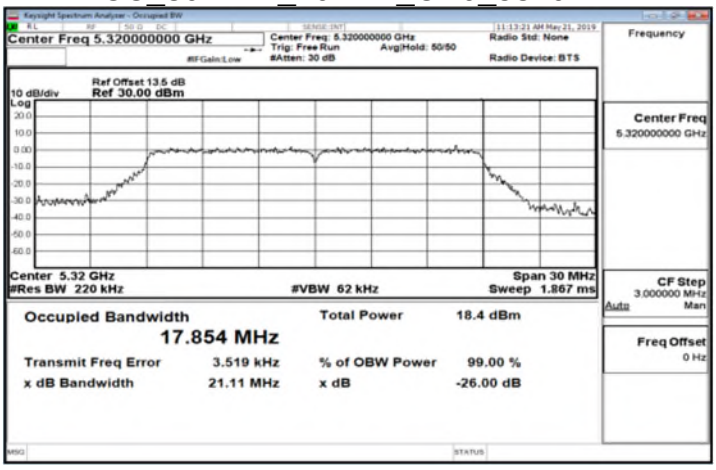
FCC_802.11n_20MHz_CH0_5220MHz



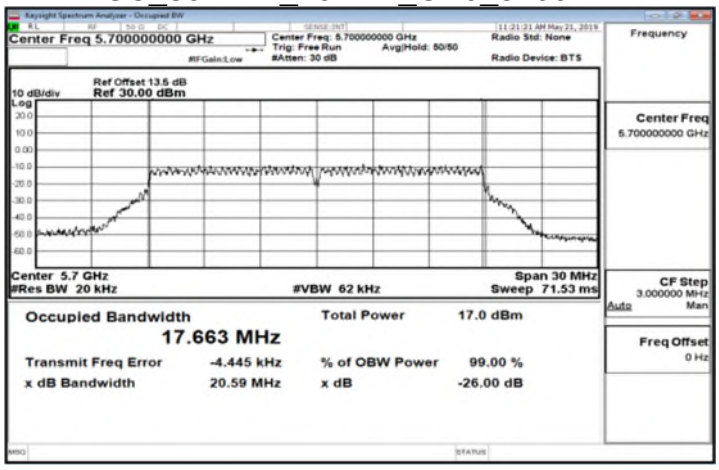
FCC_802.11n_20MHz_CH0_5300MHz



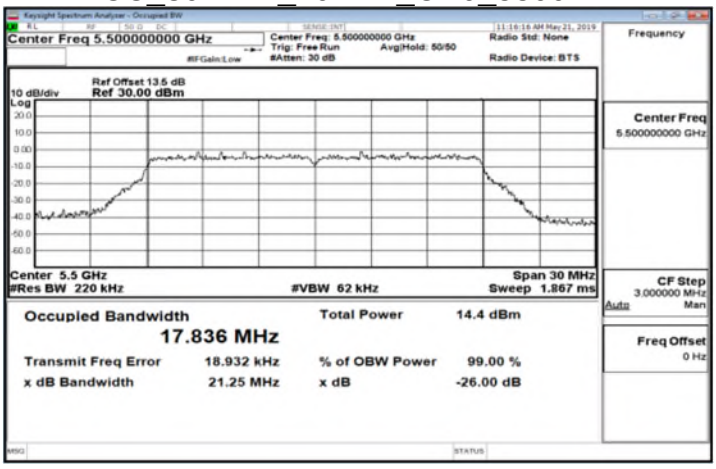
FCC_802.11n_20MHz_CH0_5320MHz



FCC_802.11n_20MHz_CH0_5700MHz



FCC_802.11n_20MHz_CH0_5500MHz



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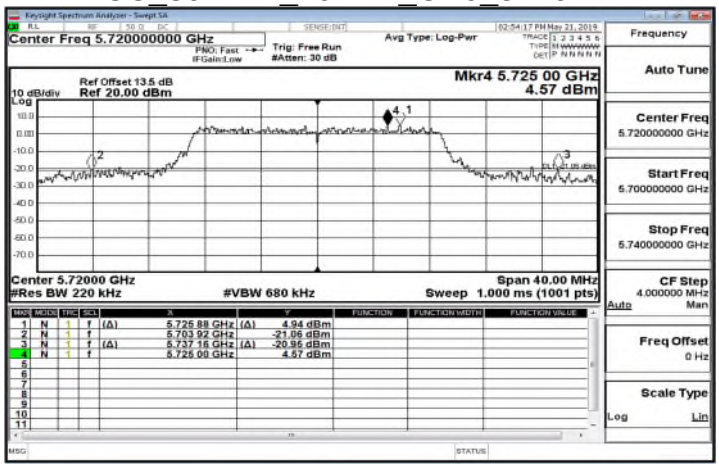
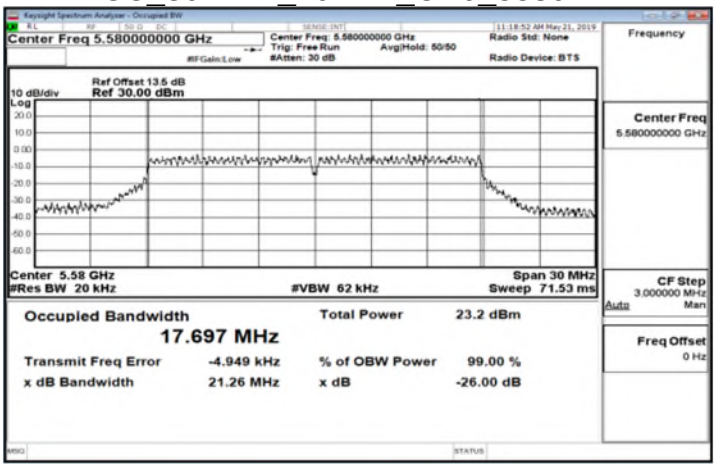
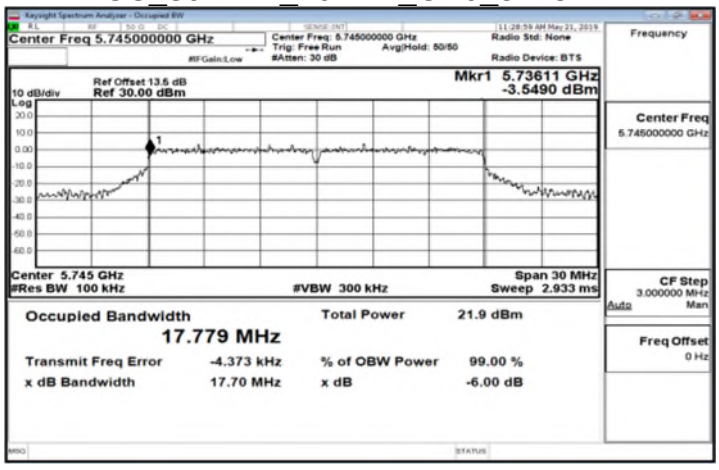


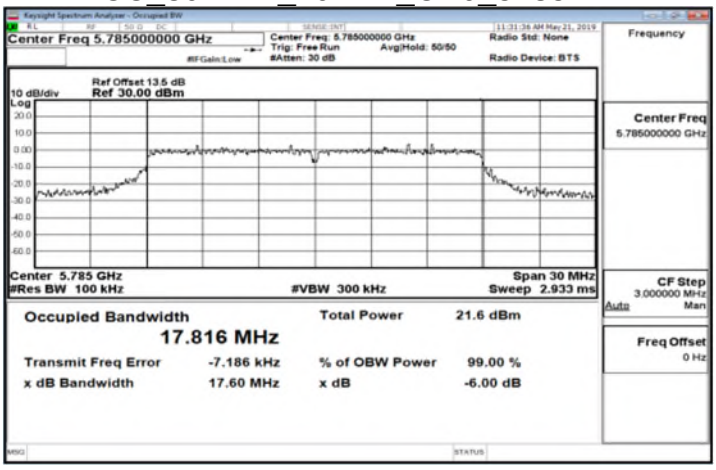
FCC_802.11n_20MHz_CH0_5580MHz



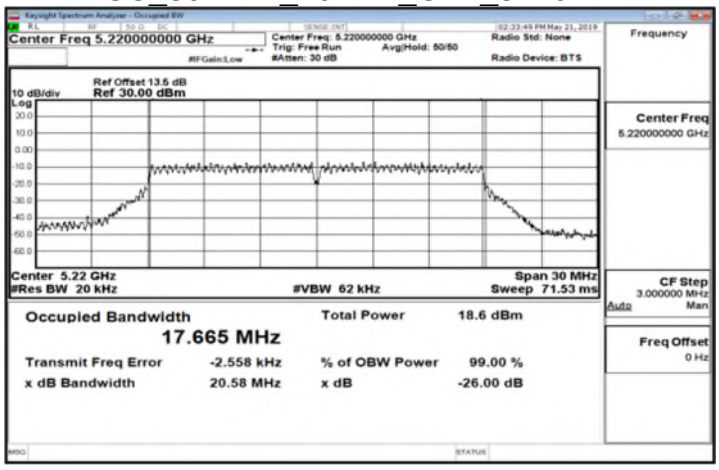
FCC_802.11n_20MHz_CH0_5745MHz



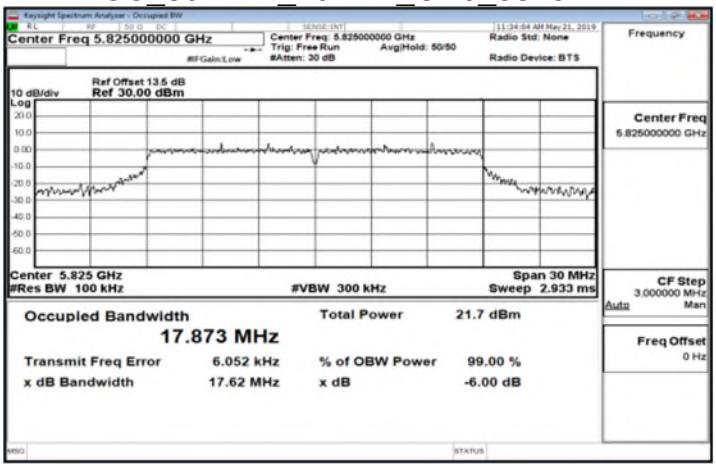
FCC_802.11n_20MHz_CH0_5785MHz



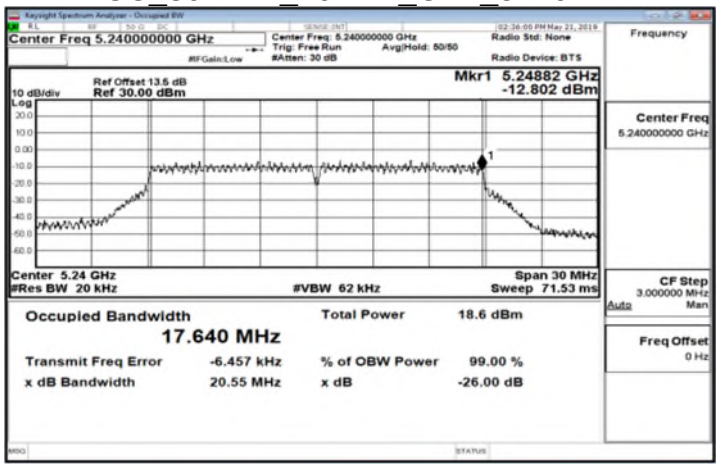
FCC_802.11n_20MHz_CH1_5220MHz



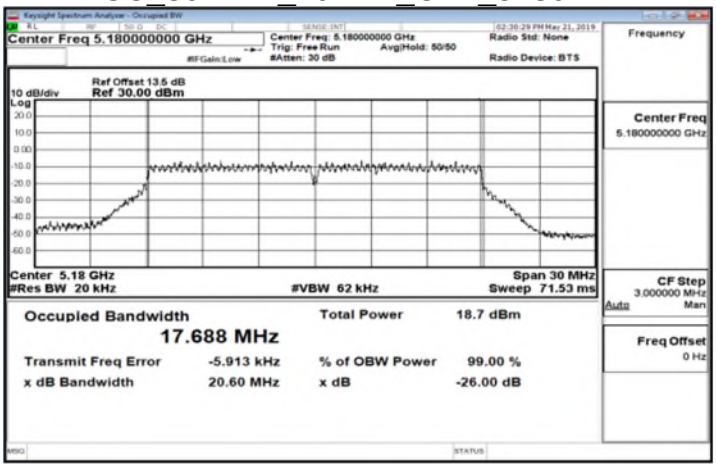
FCC_802.11n_20MHz_CH0_5825MHz



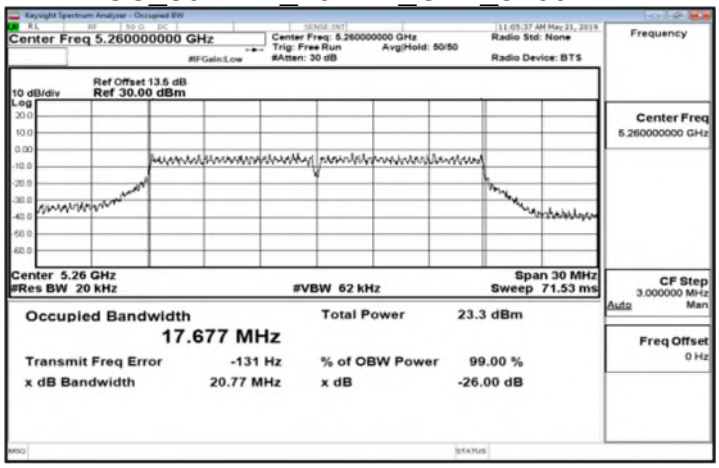
FCC_802.11n_20MHz_CH1_5240MHz



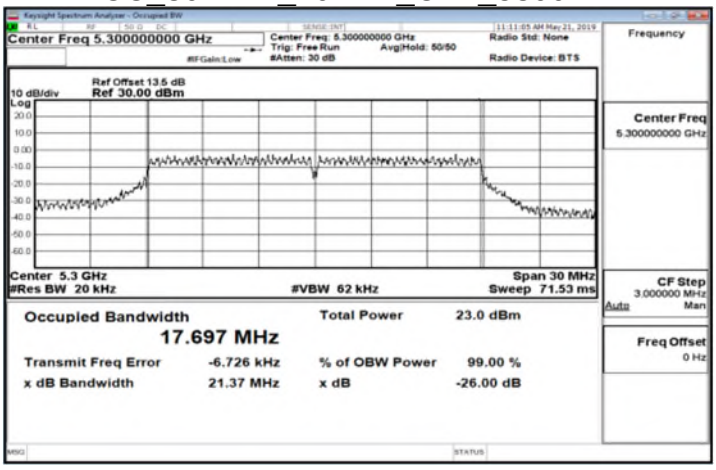
FCC_802.11n_20MHz_CH1_5180MHz



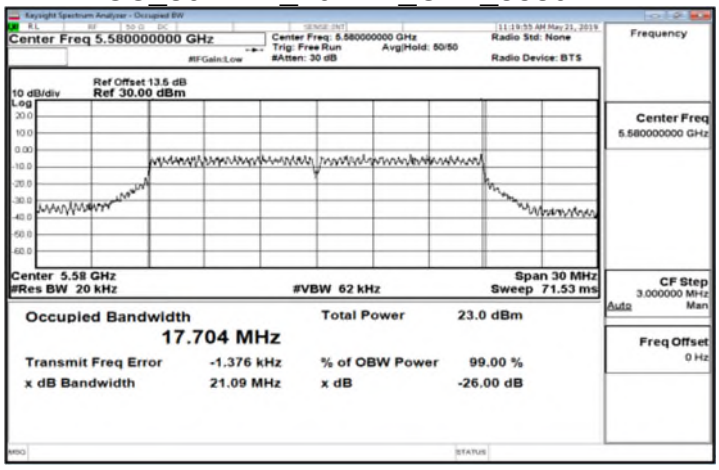
FCC_802.11n_20MHz_CH1_5260MHz



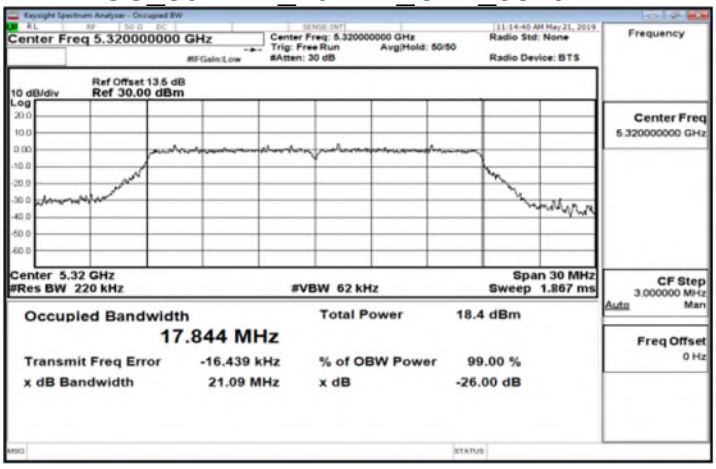
FCC_802.11n_20MHz_CH1_5300MHz



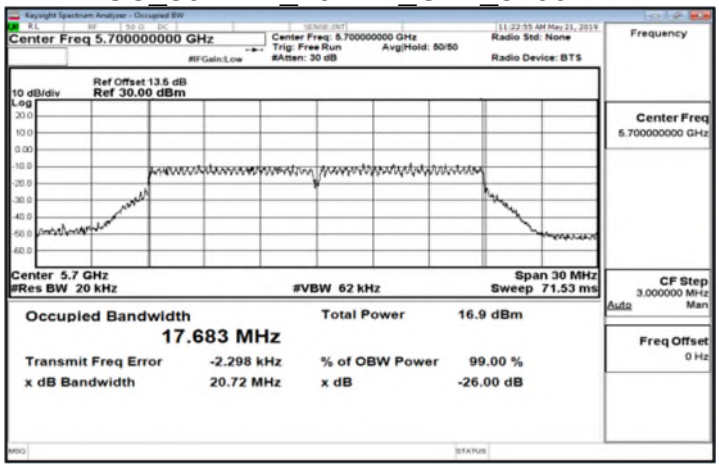
FCC_802.11n_20MHz_CH1_5580MHz



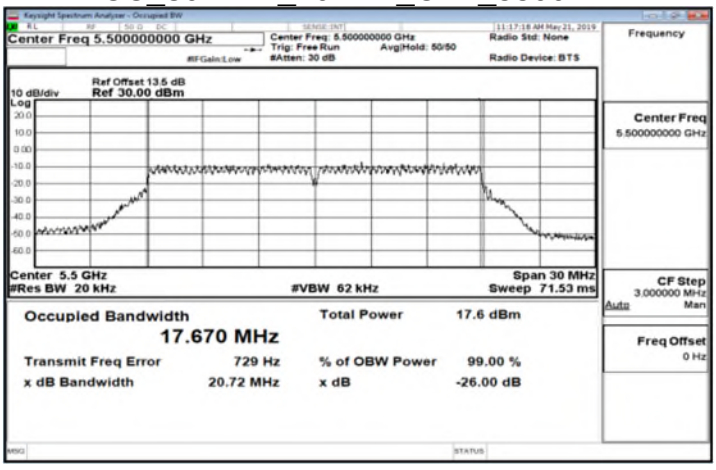
FCC_802.11n_20MHz_CH1_5320MHz



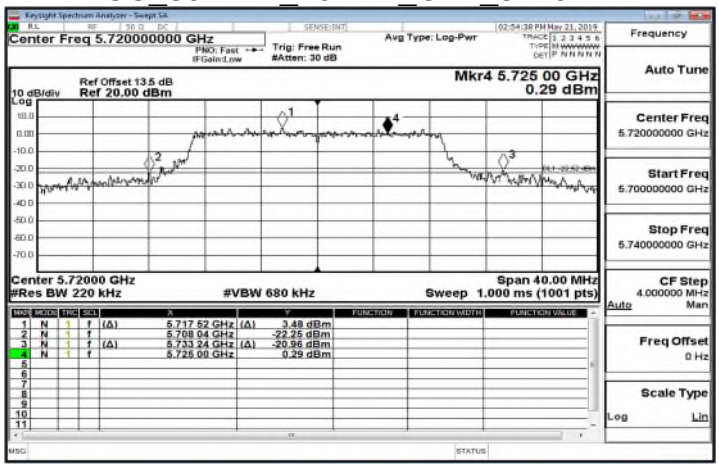
FCC_802.11n_20MHz_CH1_5700MHz



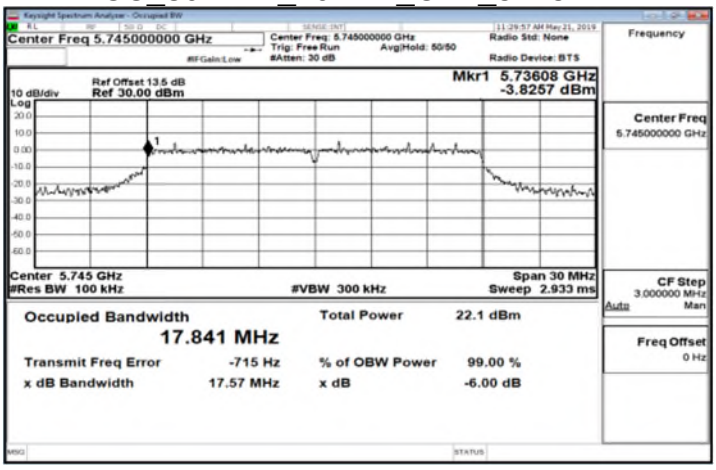
FCC_802.11n_20MHz_CH1_5500MHz



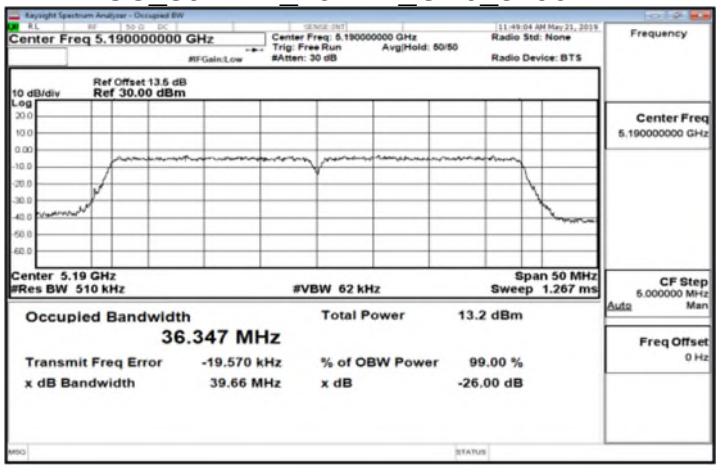
FCC_802.11n_20MHz_CH1_5720MHz



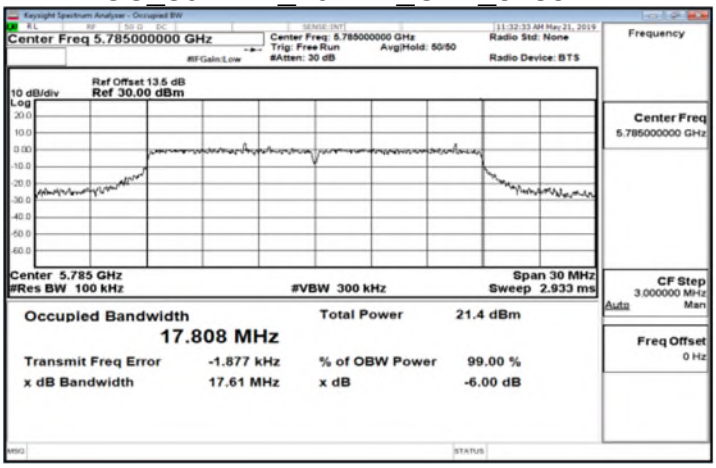
FCC_802.11n_20MHz_CH1_5745MHz



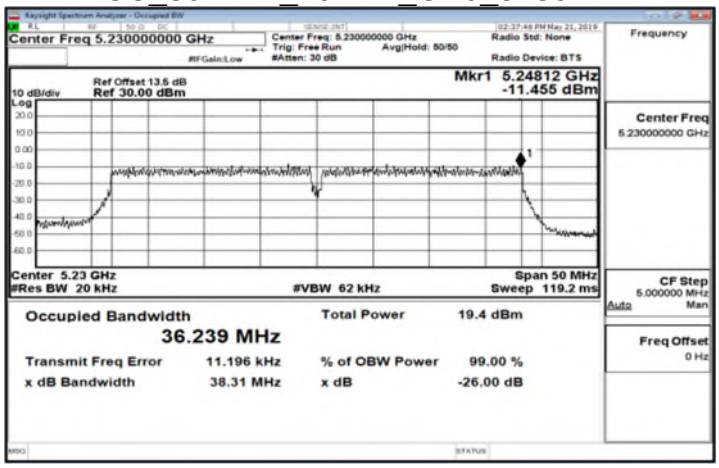
FCC_802.11n_40MHz_CH0_5190MHz



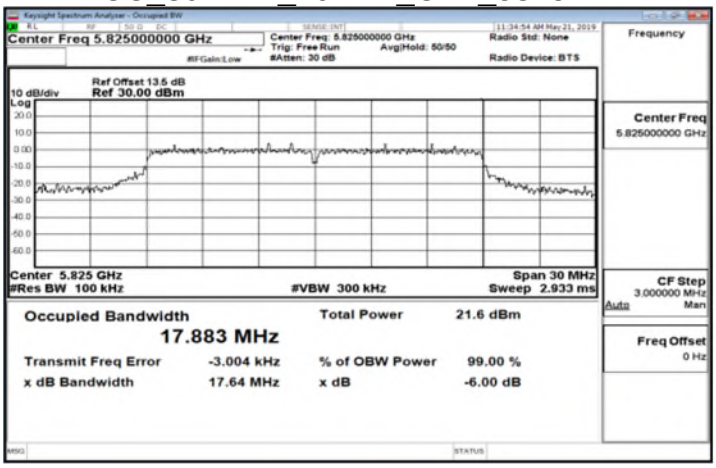
FCC_802.11n_20MHz_CH1_5785MHz



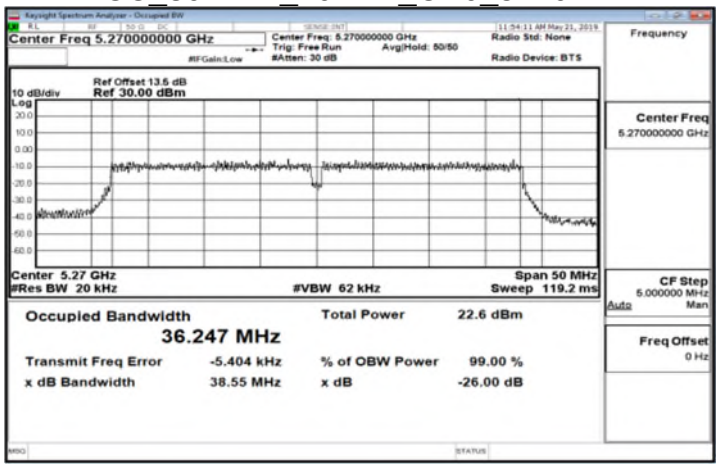
FCC_802.11n_40MHz_CH0_5230MHz



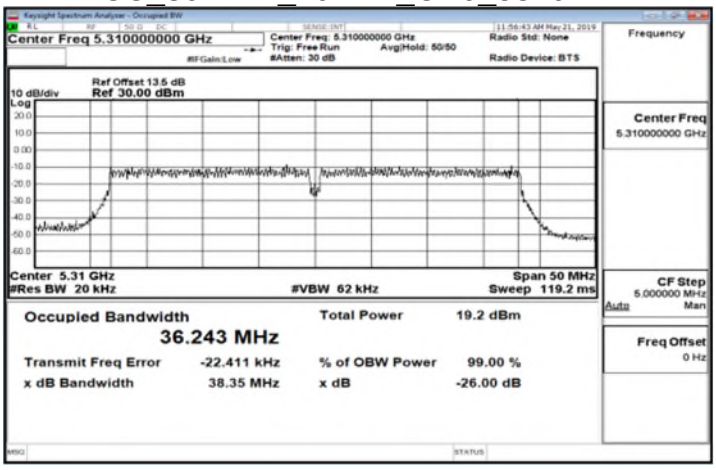
FCC_802.11n_20MHz_CH1_5825MHz



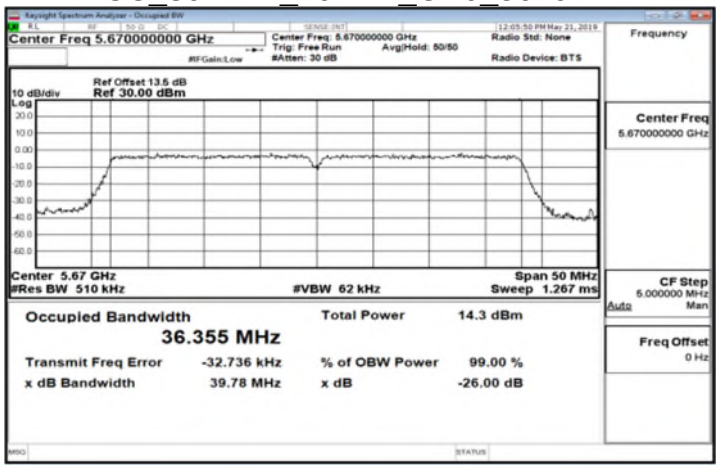
FCC_802.11n_40MHz_CH0_5270MHz



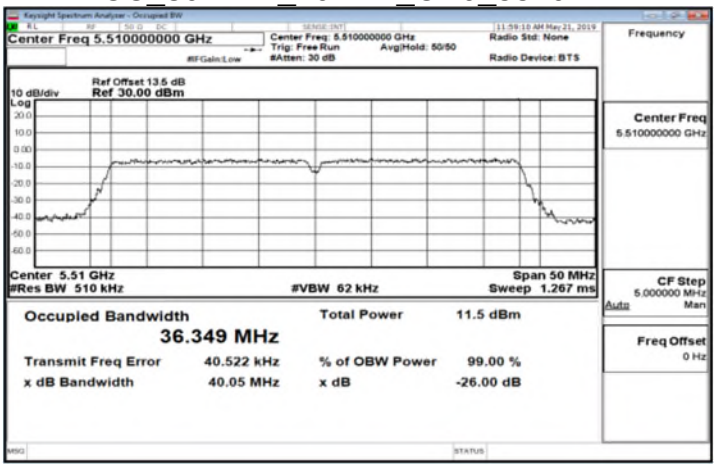
FCC_802.11n_40MHz_CH0_5310MHz



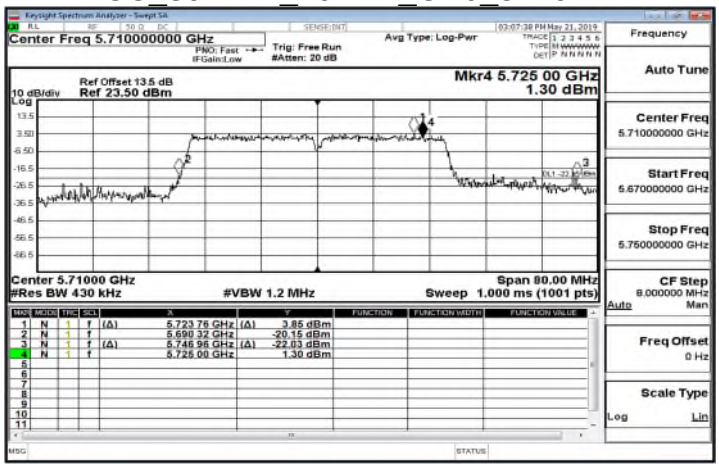
FCC_802.11n_40MHz_CH0_5670MHz



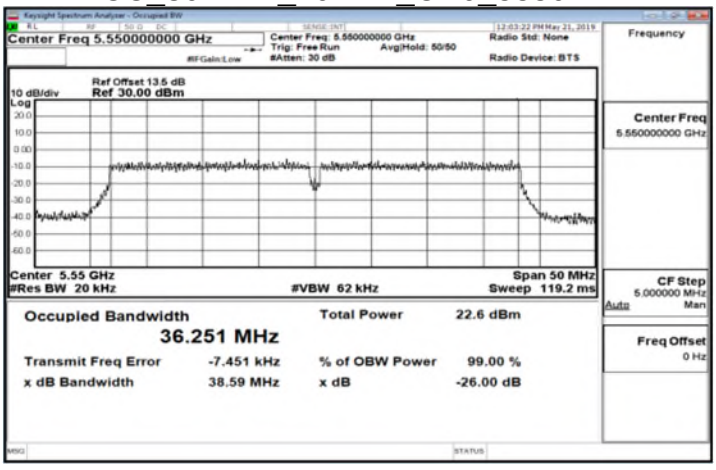
FCC_802.11n_40MHz_CH0_5510MHz



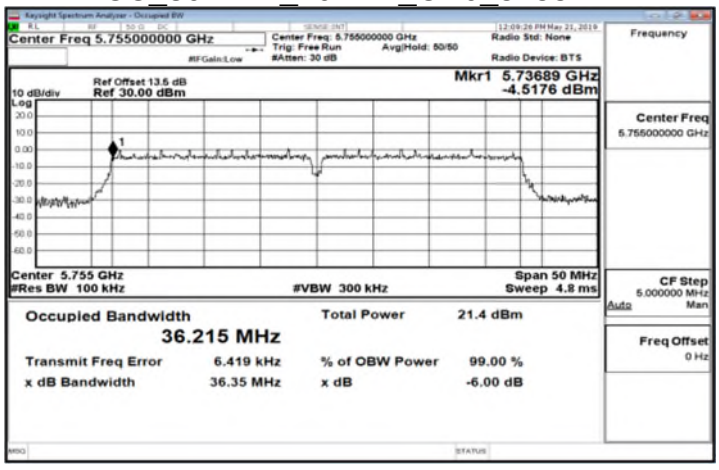
FCC_802.11n_40MHz_CH0_5710MHz



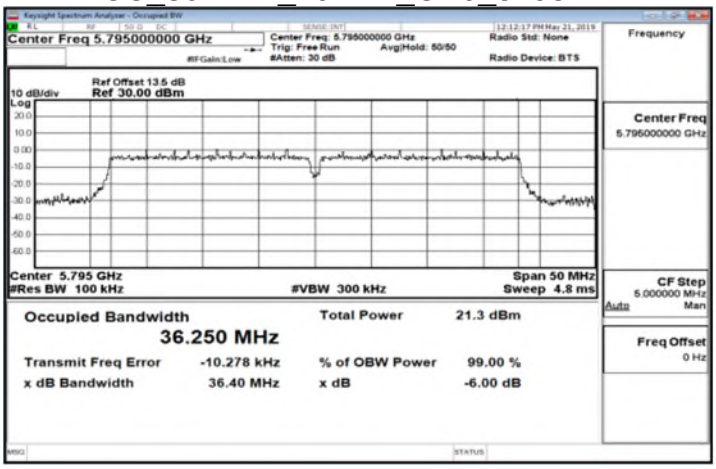
FCC_802.11n_40MHz_CH0_5550MHz



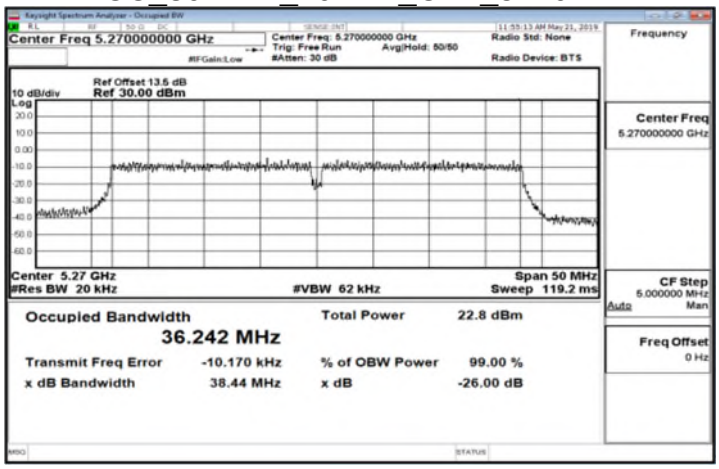
FCC_802.11n_40MHz_CH0_5755MHz



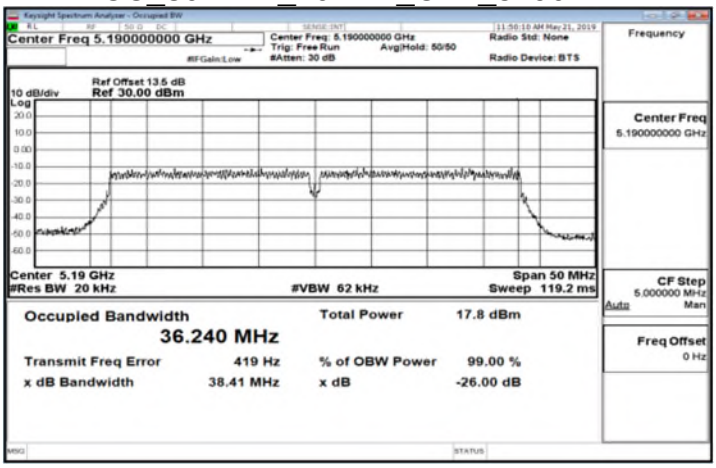
FCC_802.11n_40MHz_CH0_5795MHz



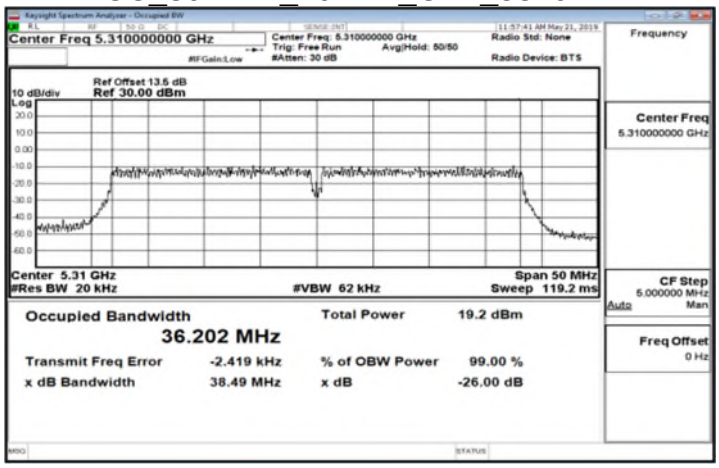
FCC_802.11n_40MHz_CH1_5270MHz



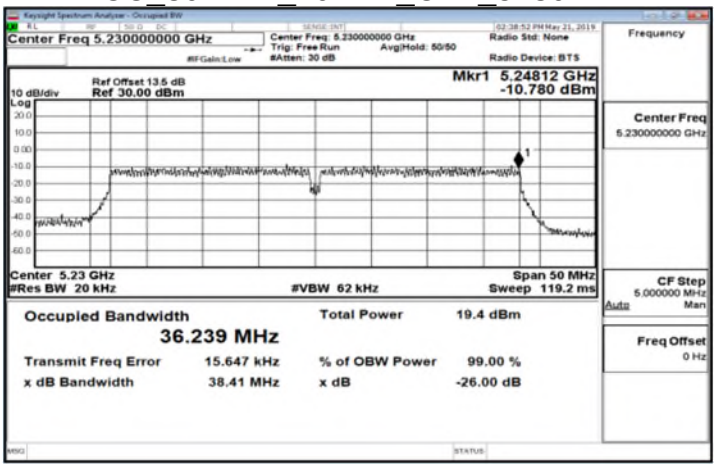
FCC_802.11n_40MHz_CH1_5190MHz



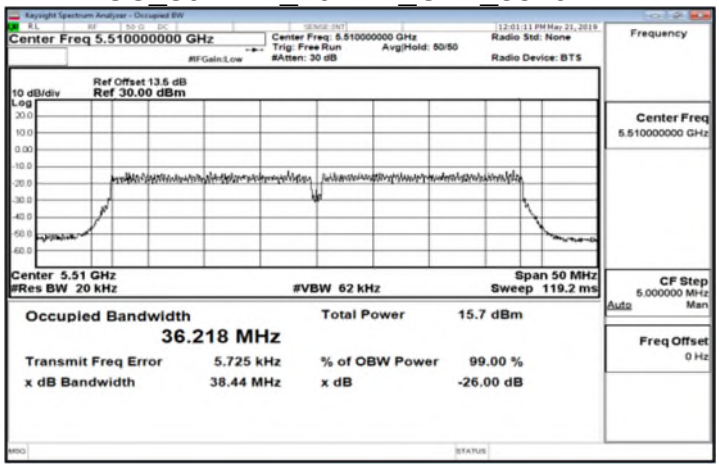
FCC_802.11n_40MHz_CH1_5310MHz



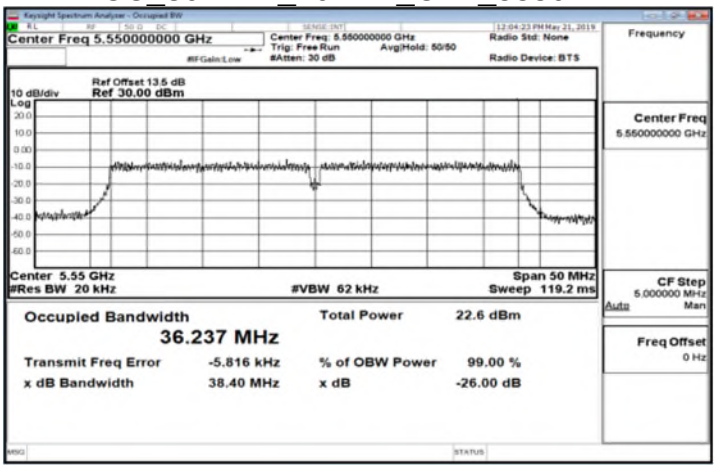
FCC_802.11n_40MHz_CH1_5230MHz



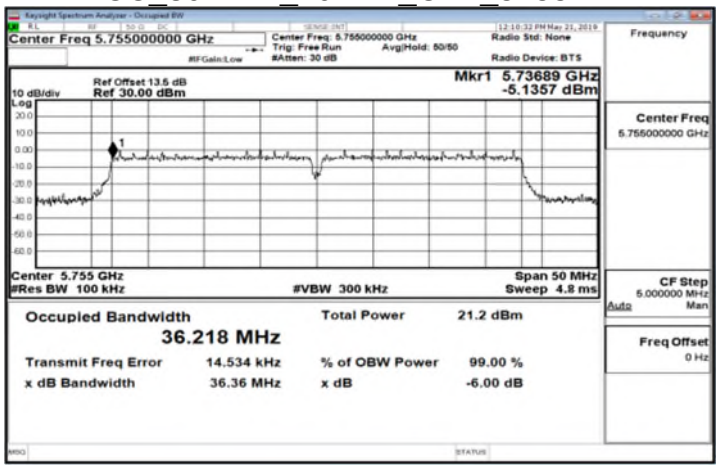
FCC_802.11n_40MHz_CH1_5510MHz



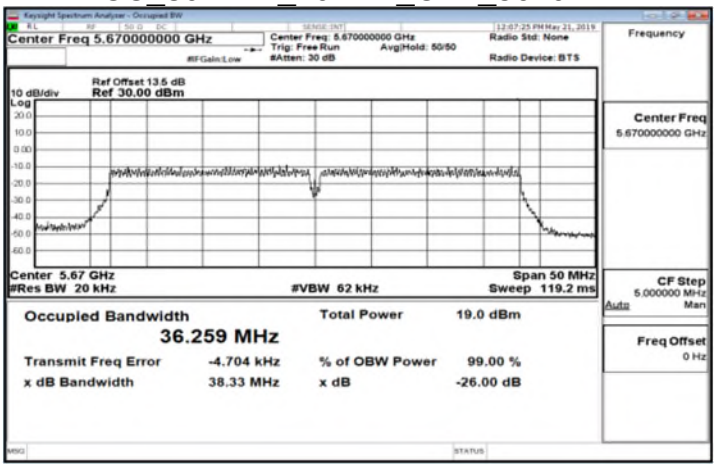
FCC_802.11n_40MHz_CH1_5550MHz



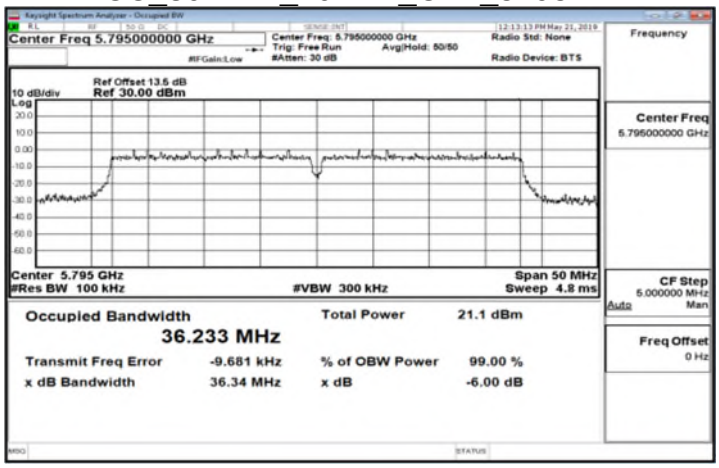
FCC_802.11n_40MHz_CH1_5755MHz



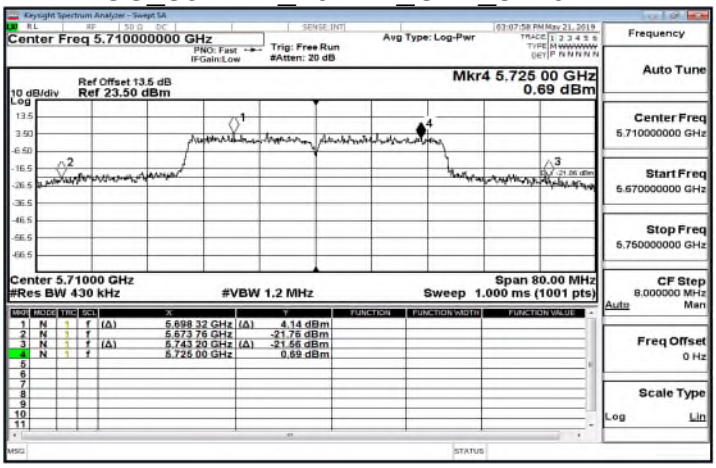
FCC_802.11n_40MHz_CH1_5670MHz



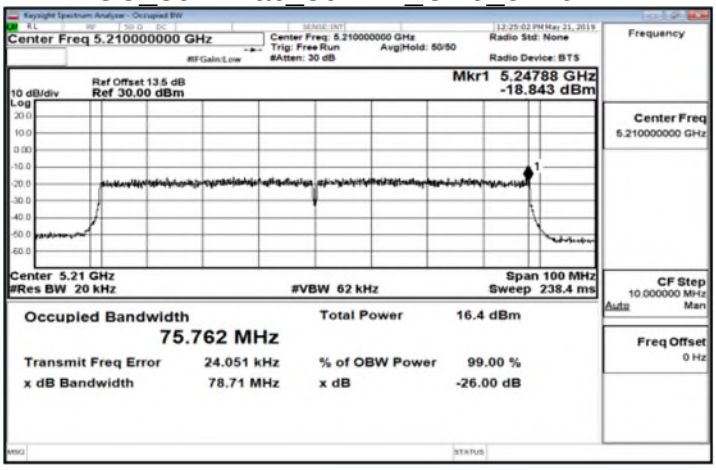
FCC_802.11n_40MHz_CH1_5795MHz



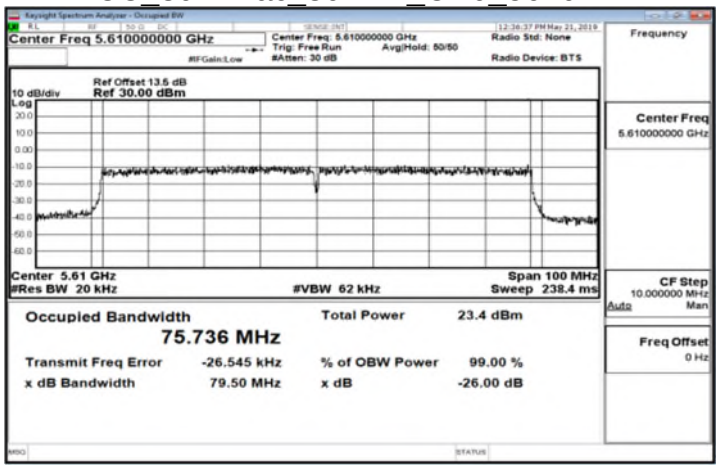
FCC_802.11n_40MHz_CH1_5710MHz



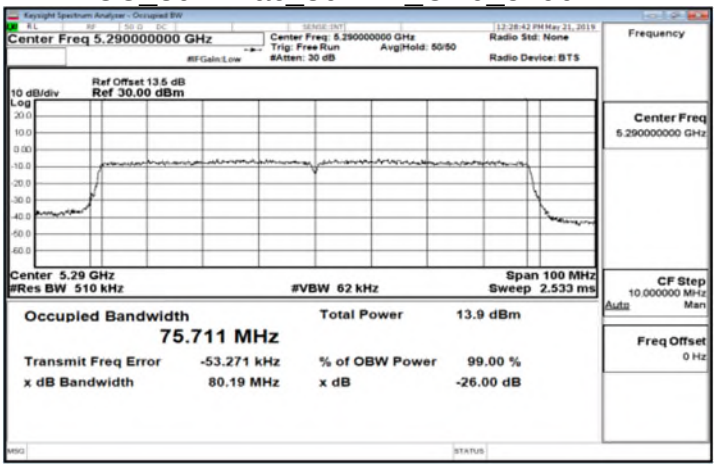
FCC_802.11ac_80MHz_CH0_5210MHz



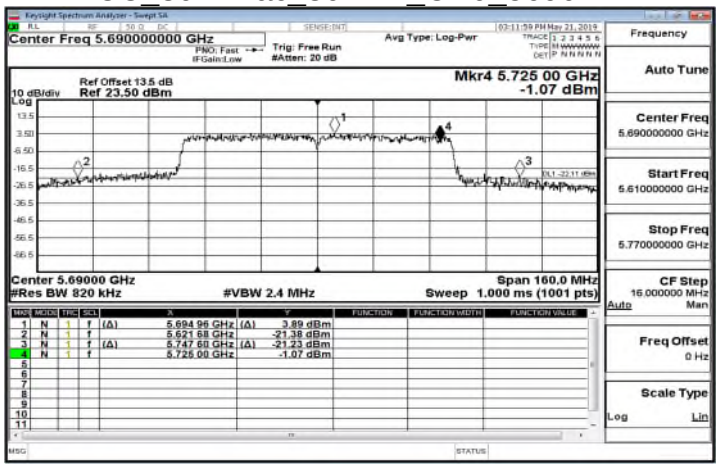
FCC_802.11ac_80MHz_CH0_5610MHz



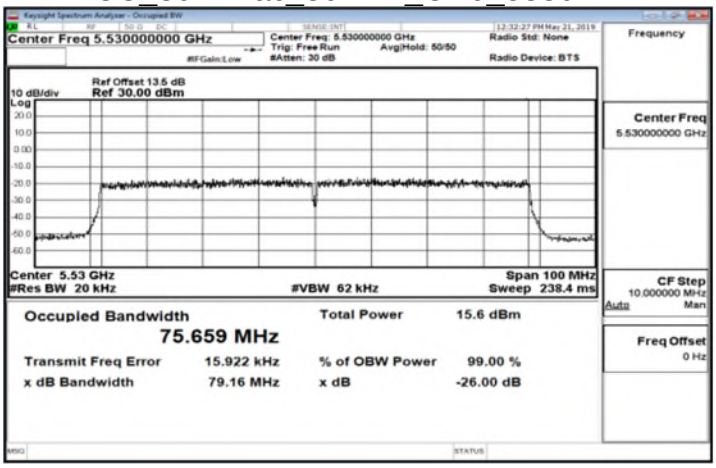
FCC_802.11ac_80MHz_CH0_5290MHz



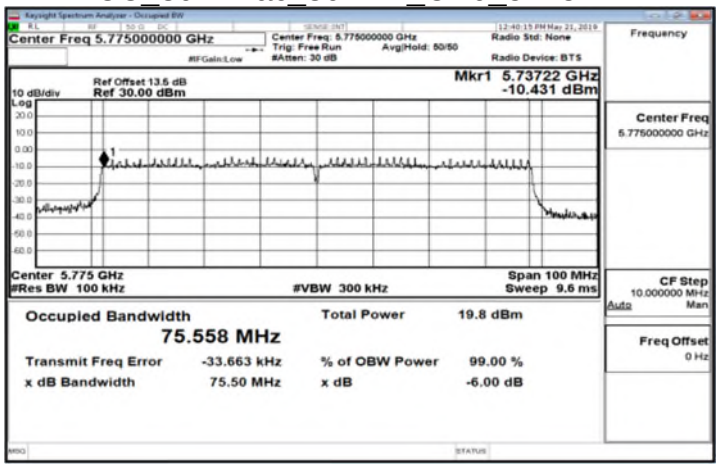
FCC_802.11ac_80MHz_CH0_5690MHz



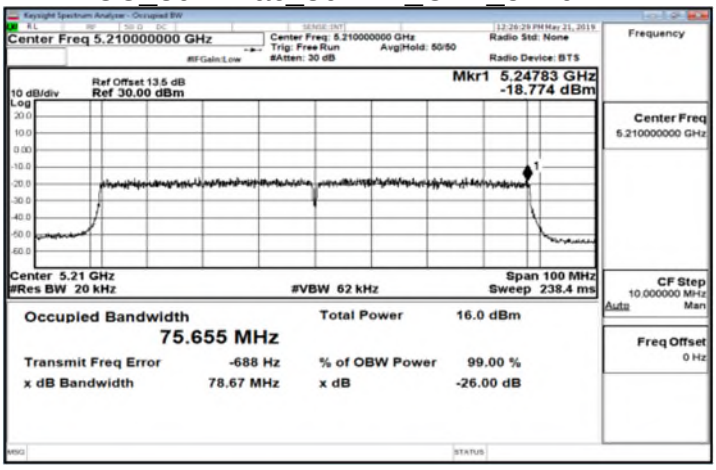
FCC_802.11ac_80MHz_CH0_5530MHz



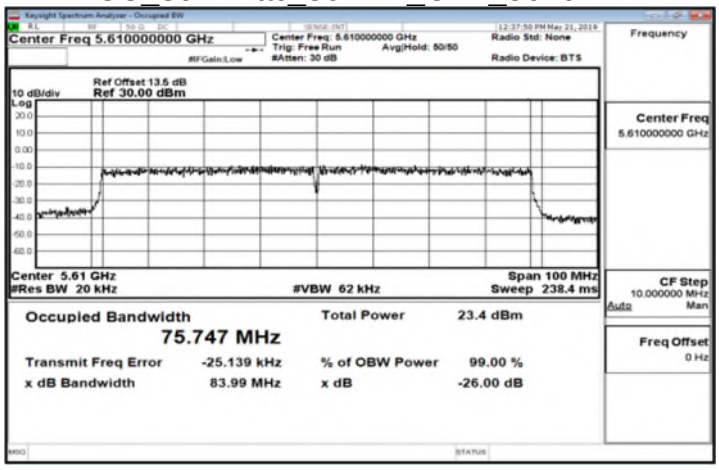
FCC_802.11ac_80MHz_CH0_5775MHz



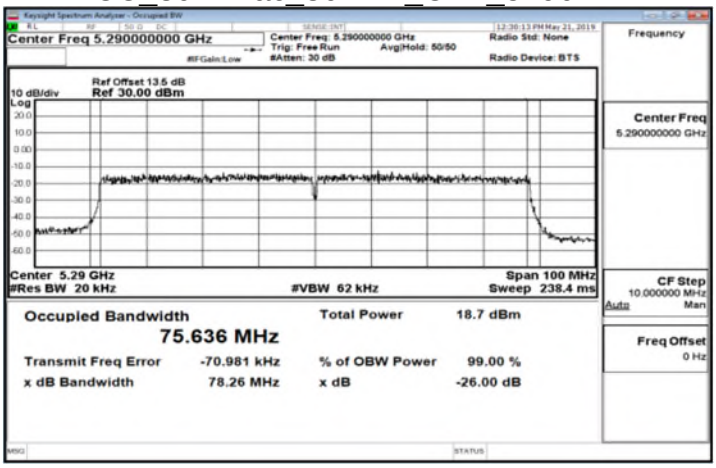
FCC_802.11ac_80MHz_CH1_5210MHz



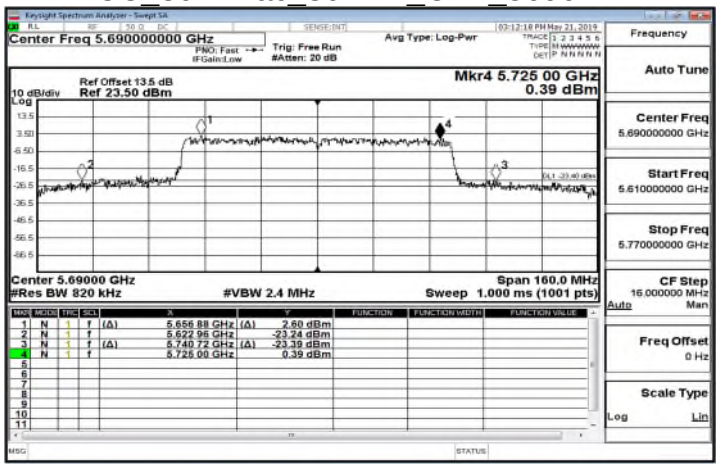
FCC_802.11ac_80MHz_CH1_5610MHz



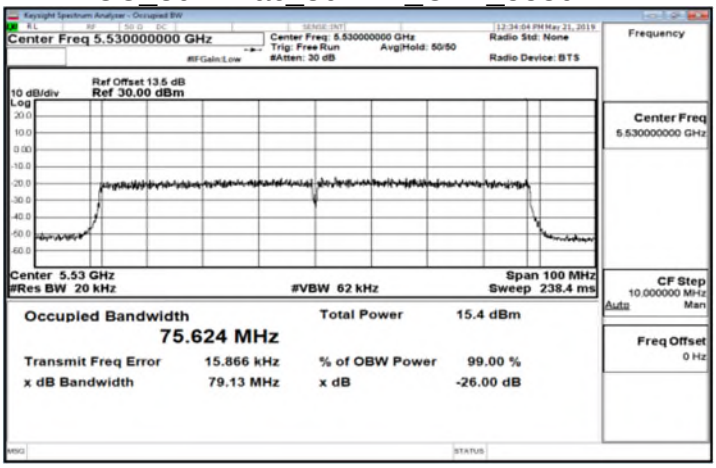
FCC_802.11ac_80MHz_CH1_5290MHz



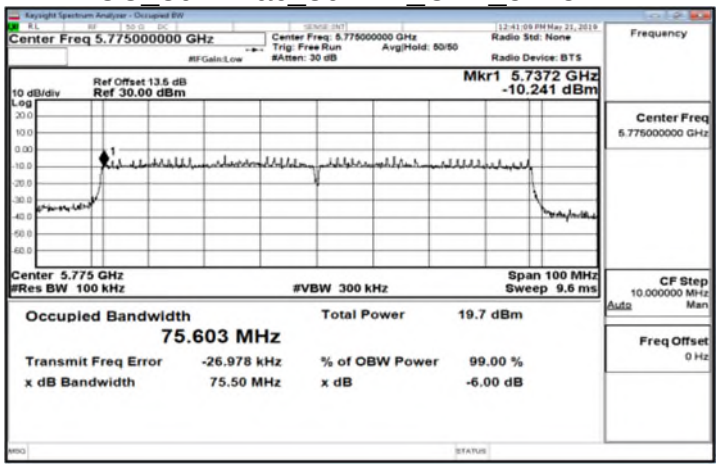
FCC_802.11ac_80MHz_CH1_5690MHz



FCC_802.11ac_80MHz_CH1_5530MHz

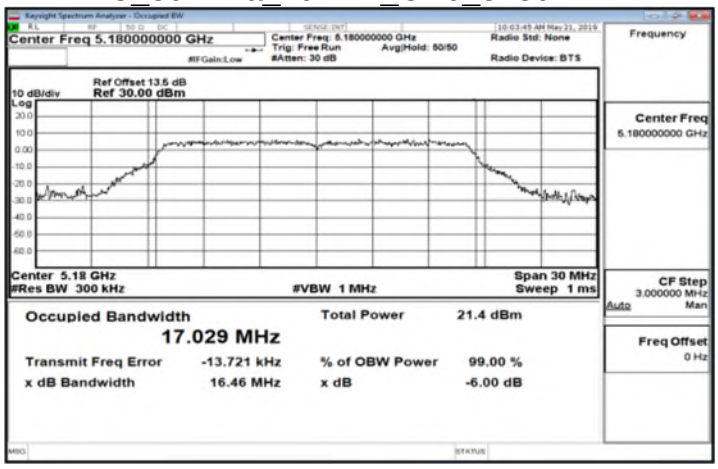


FCC_802.11ac_80MHz_CH1_5775MHz

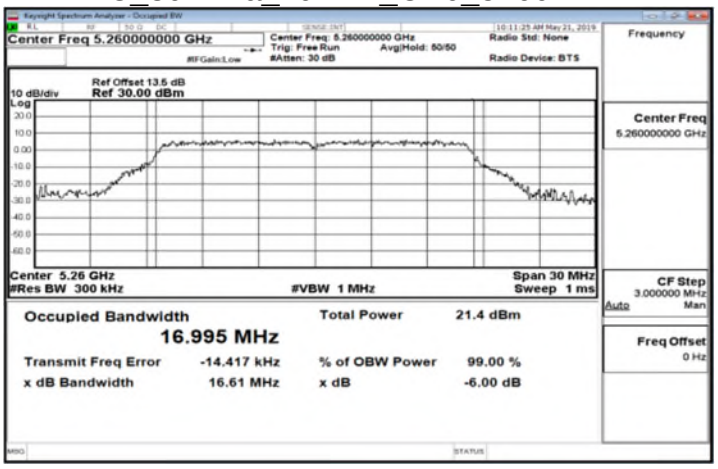


For 99%,

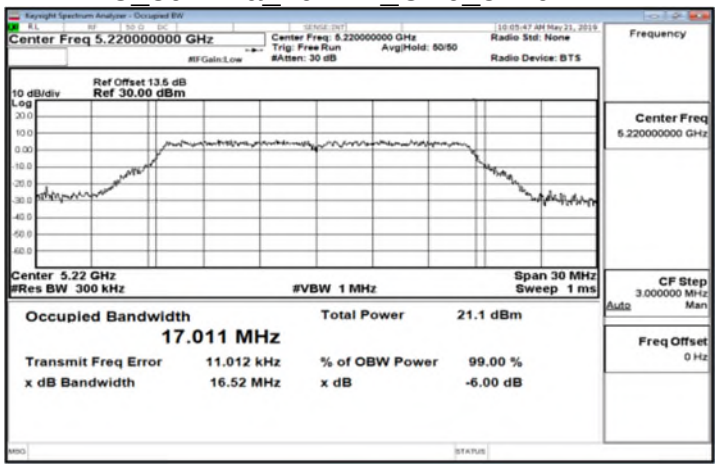
IC_802.11a_20MHz_CH0_5180MHz



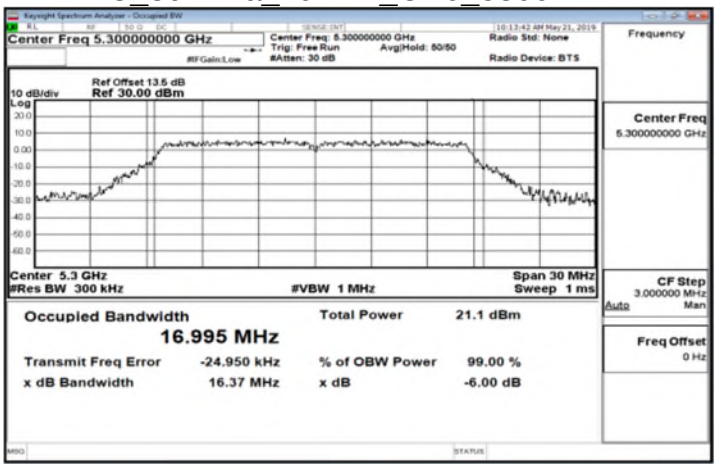
IC_802.11a_20MHz_CH0_5260MHz



IC_802.11a_20MHz_CH0_5220MHz



IC_802.11a_20MHz_CH0_5300MHz



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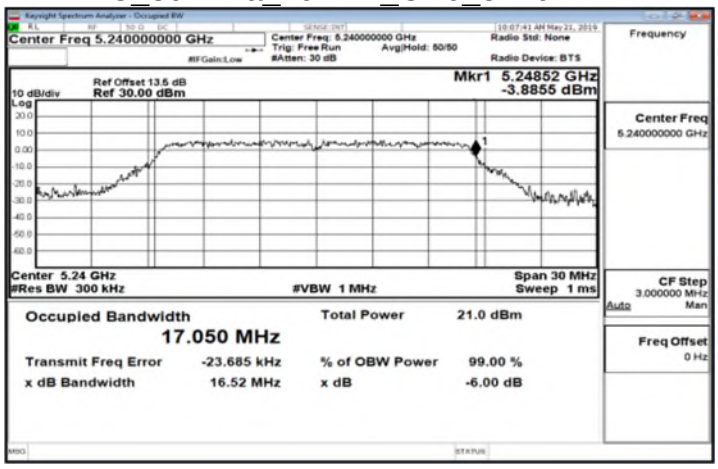

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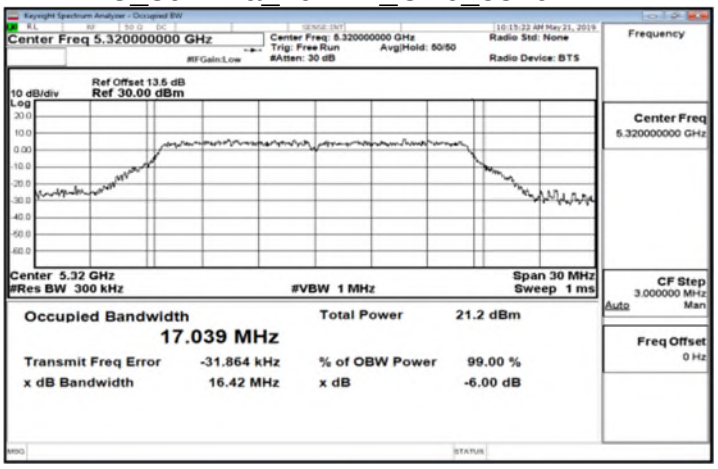

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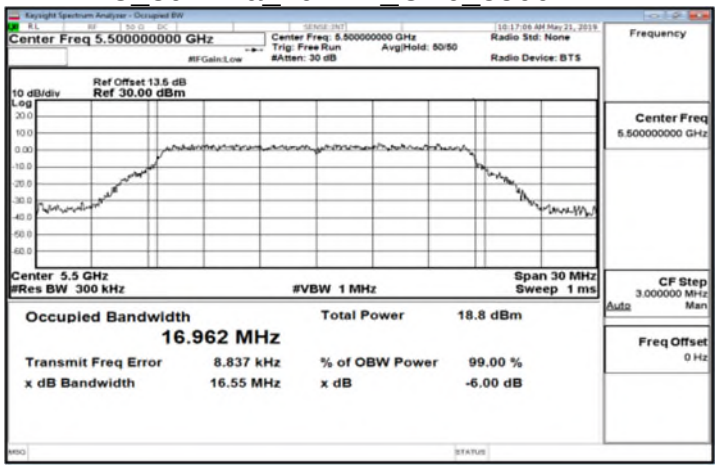
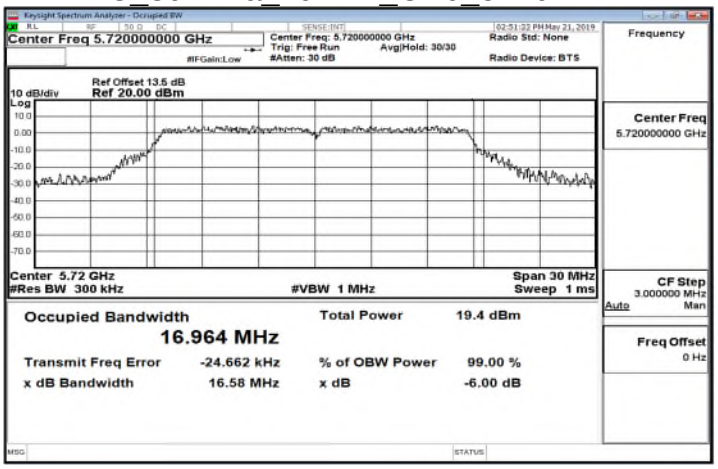


IC_802.11a_20MHz_CH0_5720MHz



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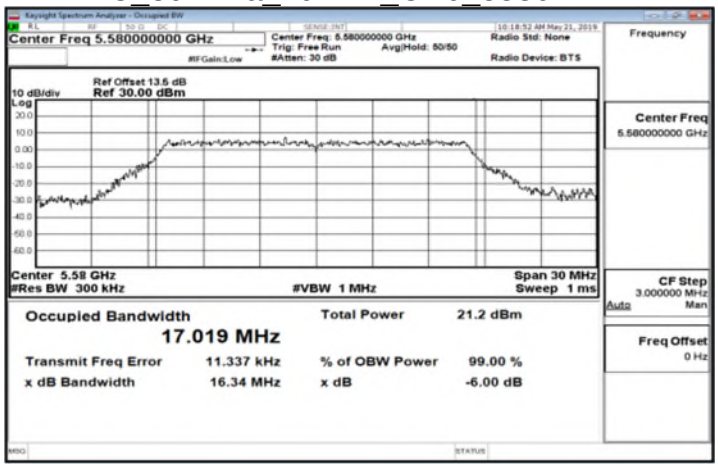
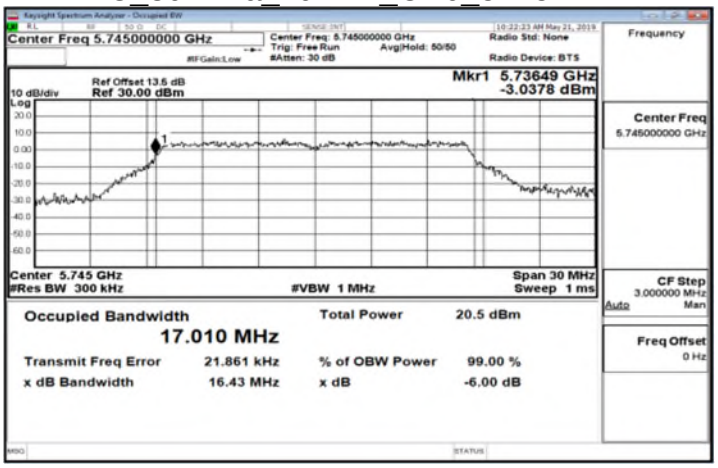


IC_802.11a_20MHz_CH0_5745MHz



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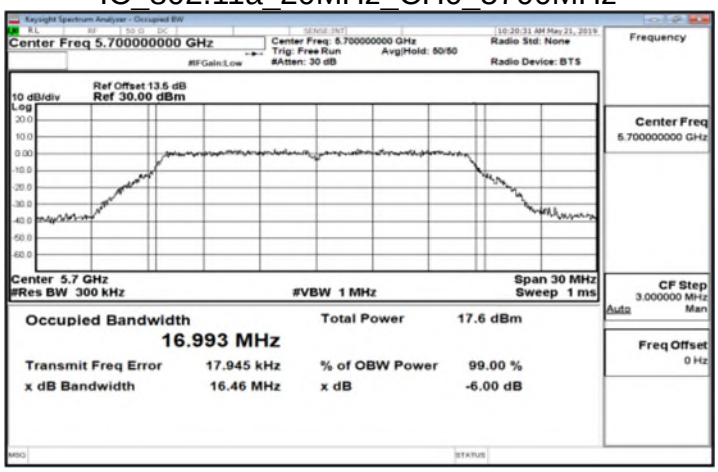

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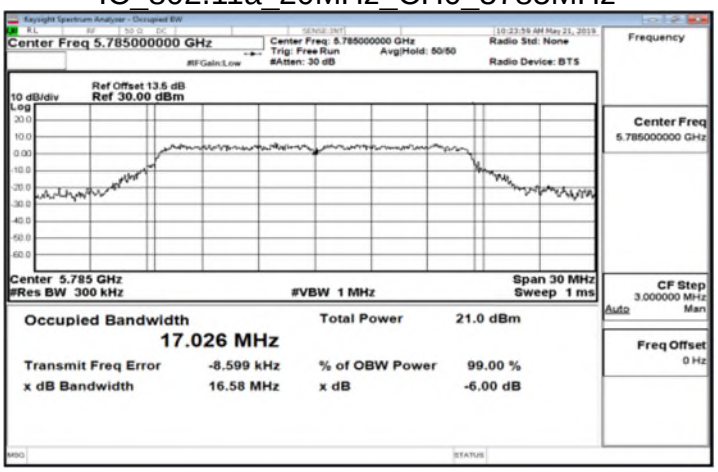

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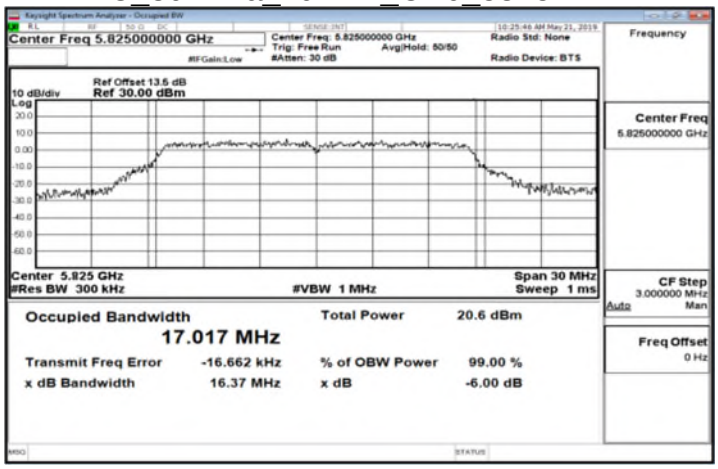

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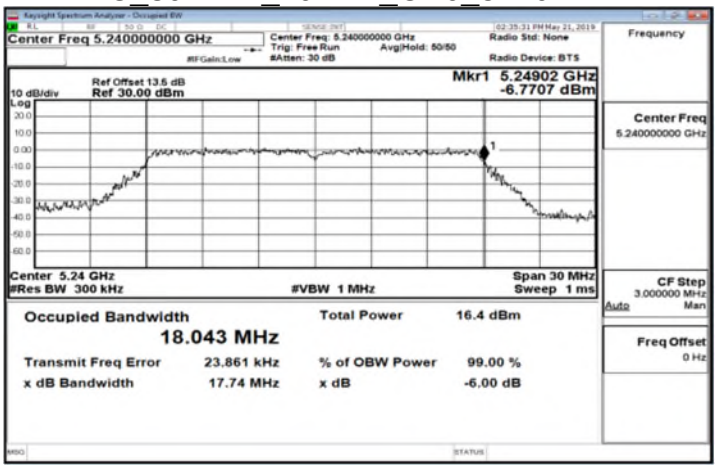

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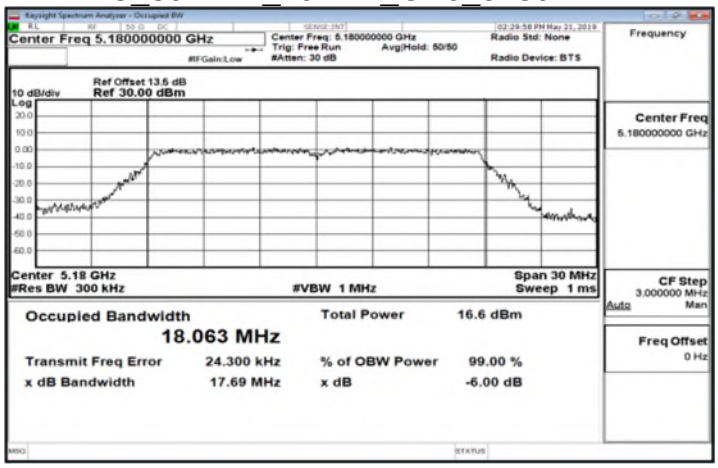

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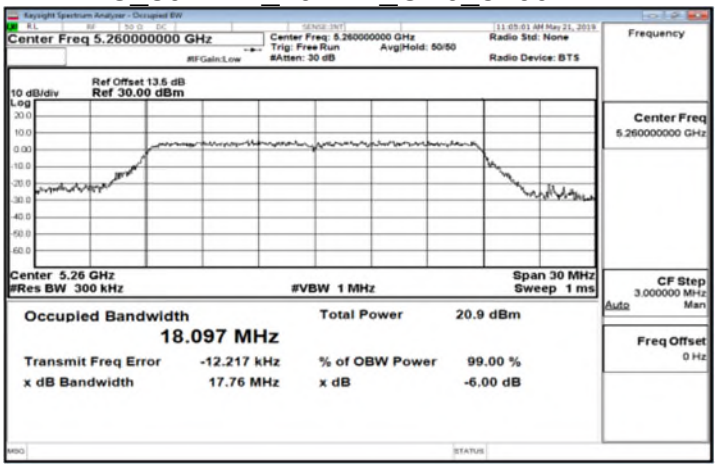
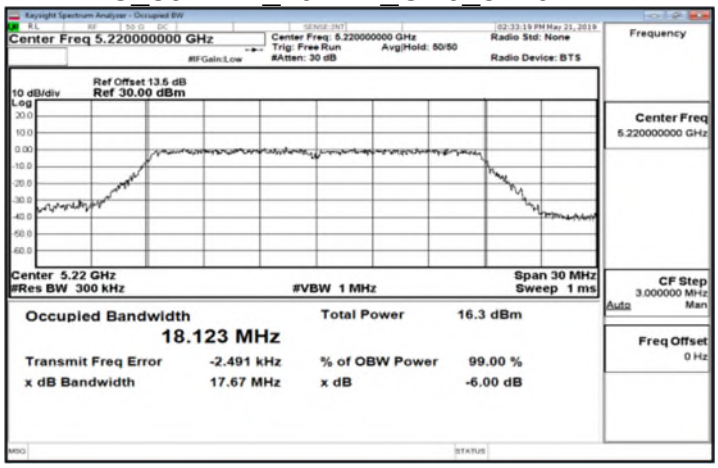


IC_802.11n_20MHz_CH0_5220MHz



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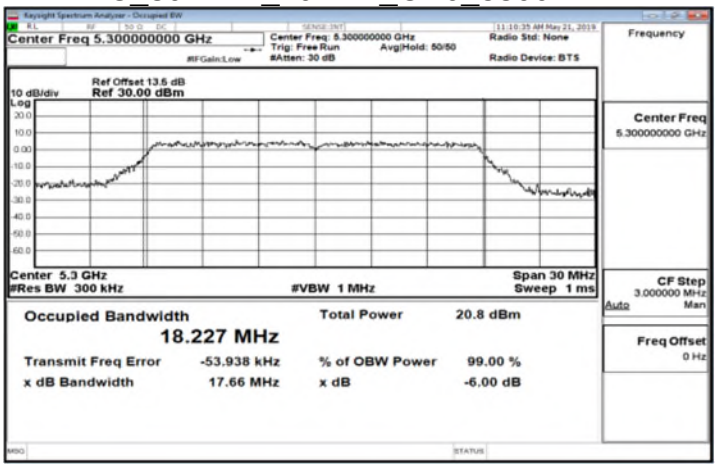
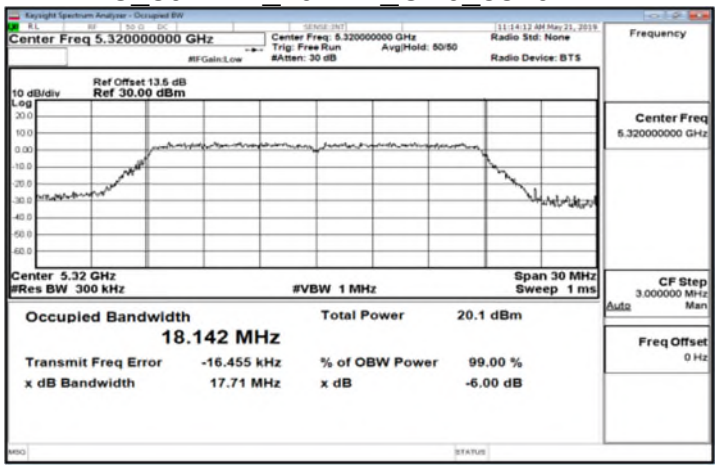
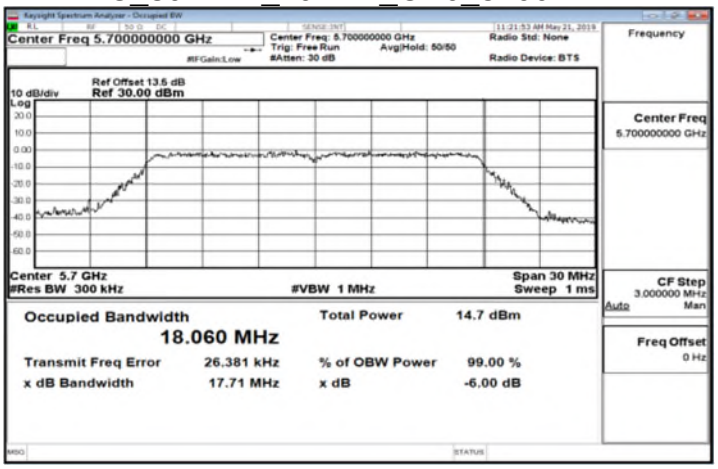


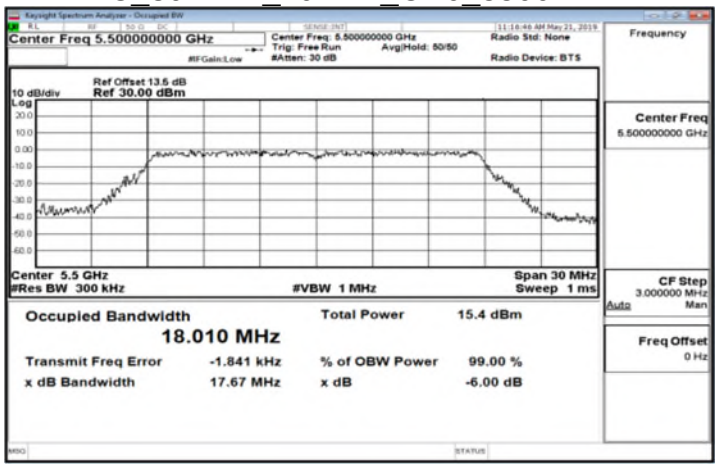
IC_802.11n_20MHz_CH0_5320MHz



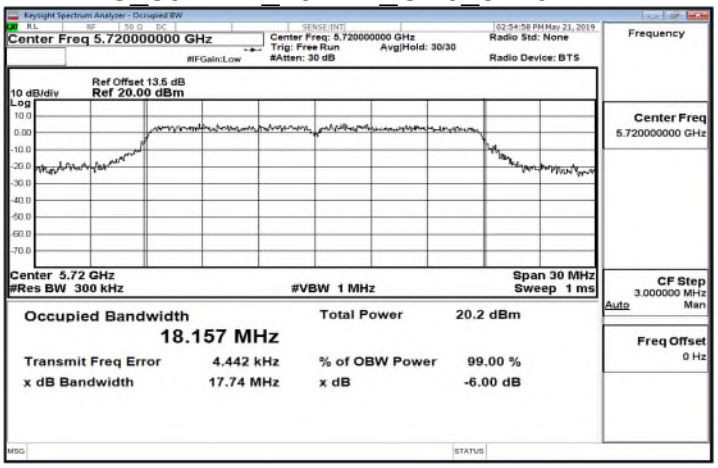
IC_802.11n_20MHz_CH0_5700MHz



IC_802.11n_20MHz_CH0_5500MHz



IC_802.11n_20MHz_CH0_5720MHz



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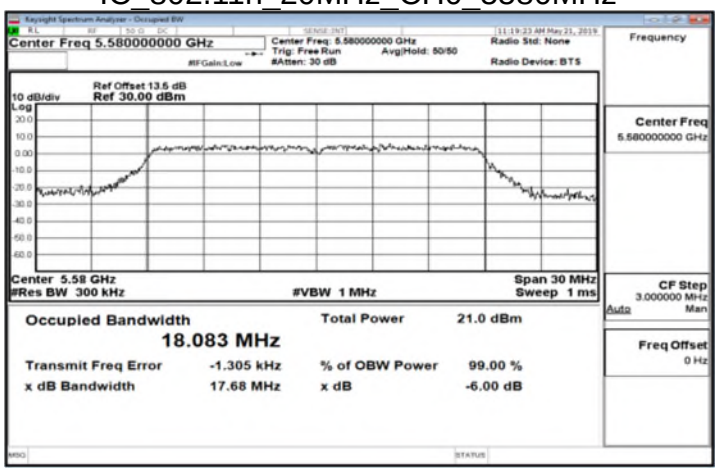

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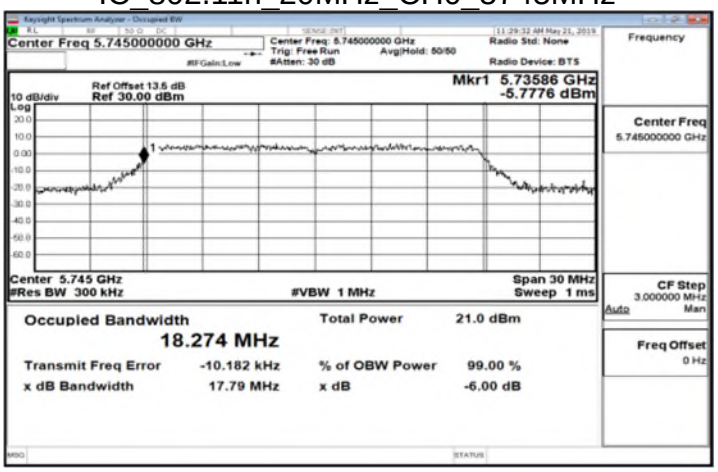

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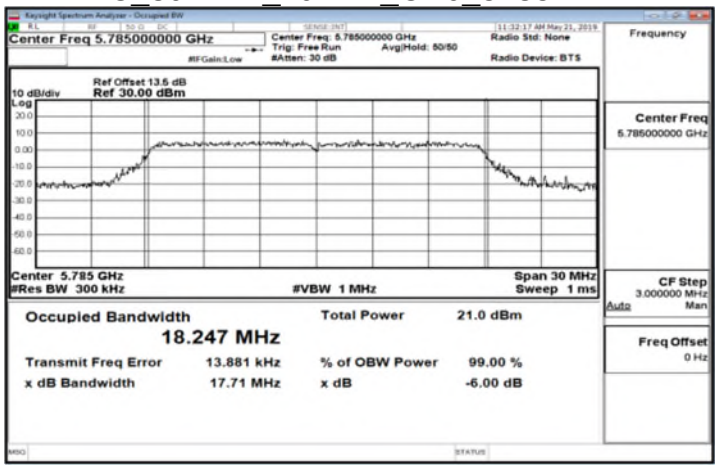
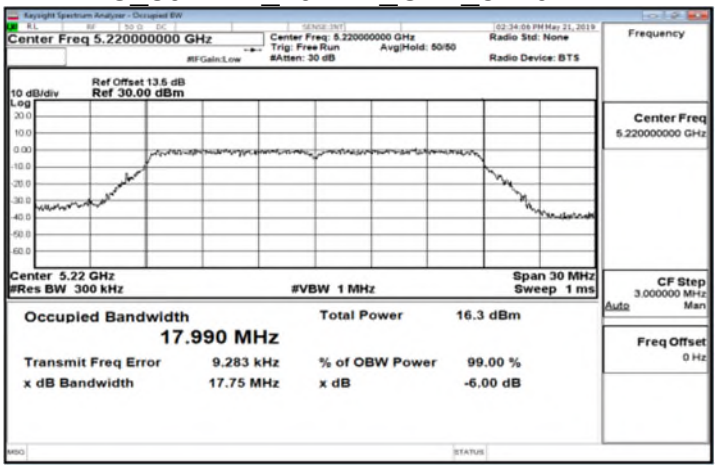
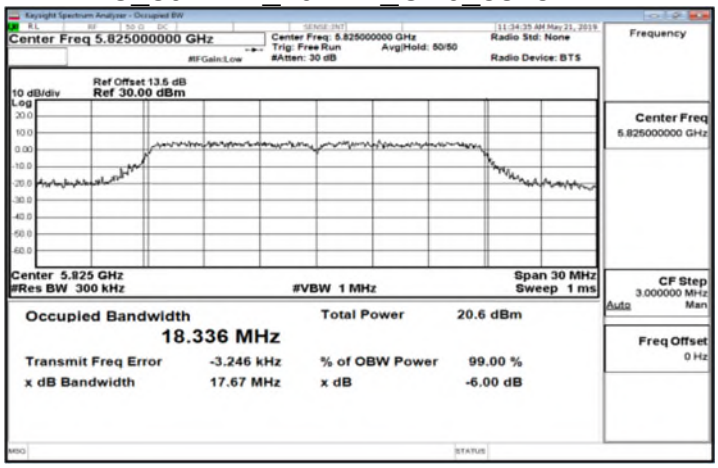


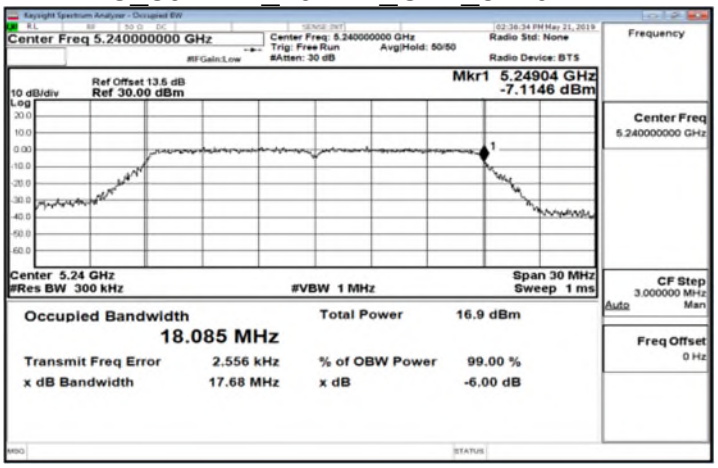
IC_802.11n_20MHz_CH1_5220MHz



IC_802.11n_20MHz_CH0_5825MHz



IC_802.11n_20MHz_CH1_5240MHz



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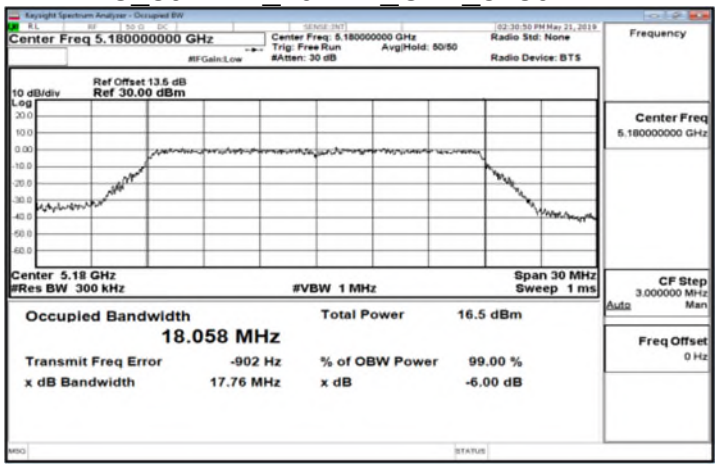

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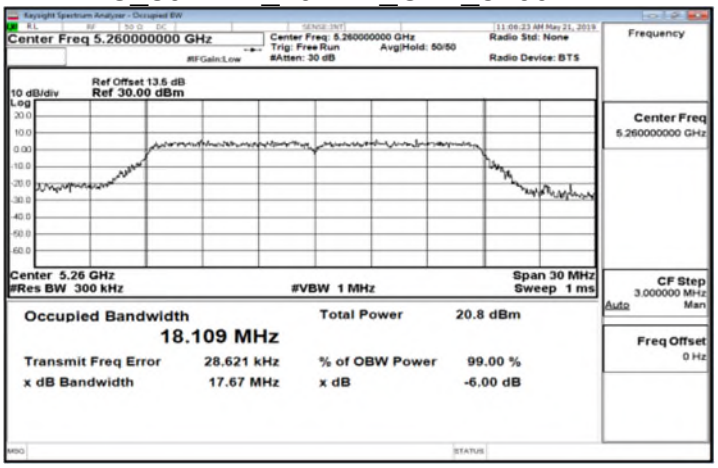

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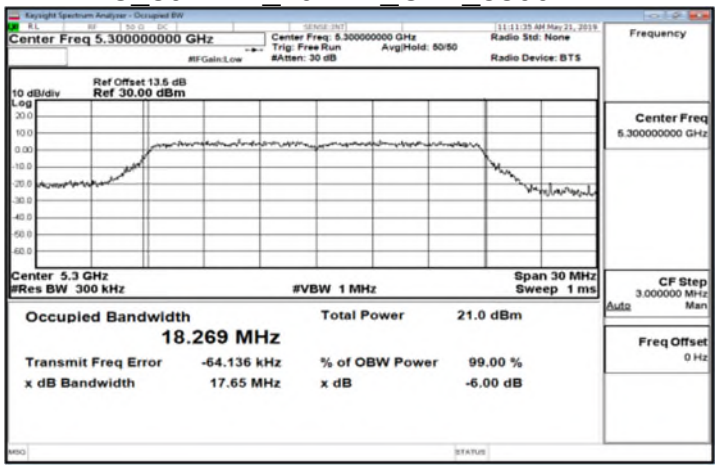
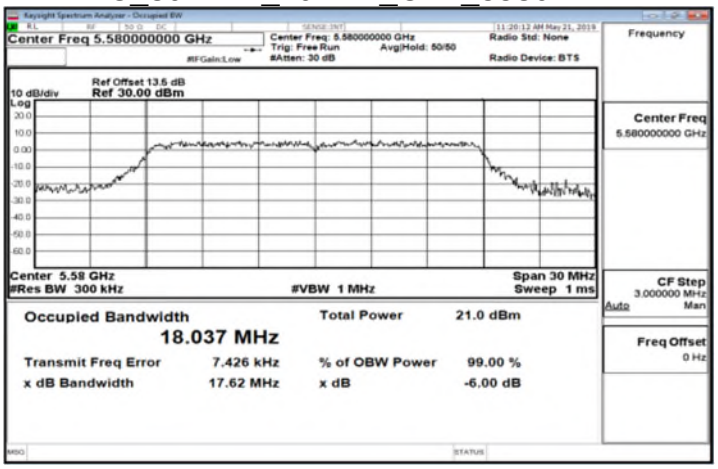
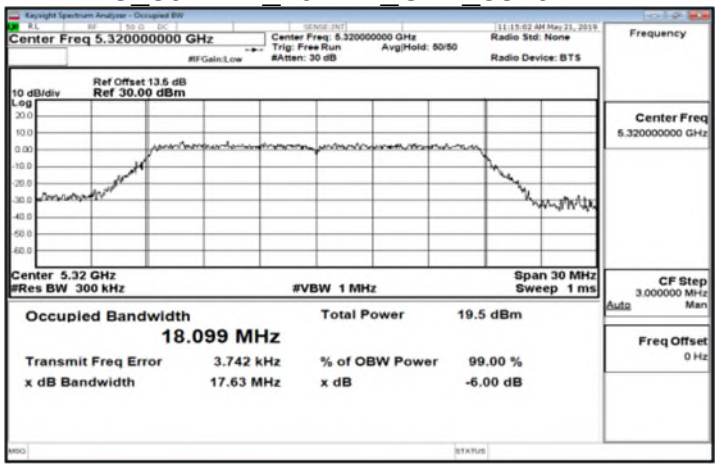


IC_802.11n_20MHz_CH1_5580MHz



IC_802.11n_20MHz_CH1_5320MHz



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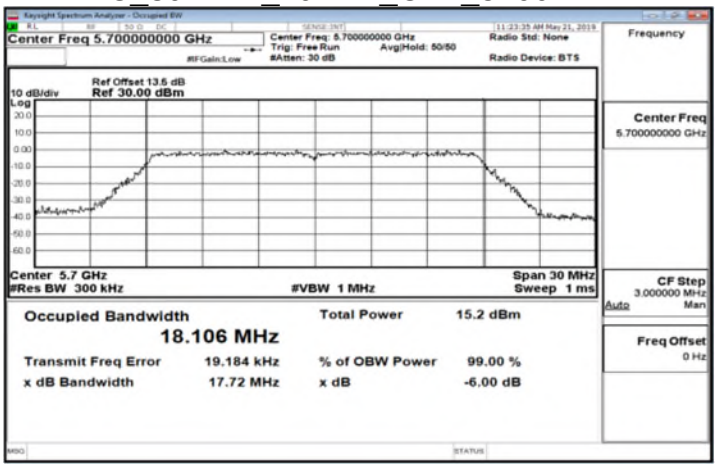

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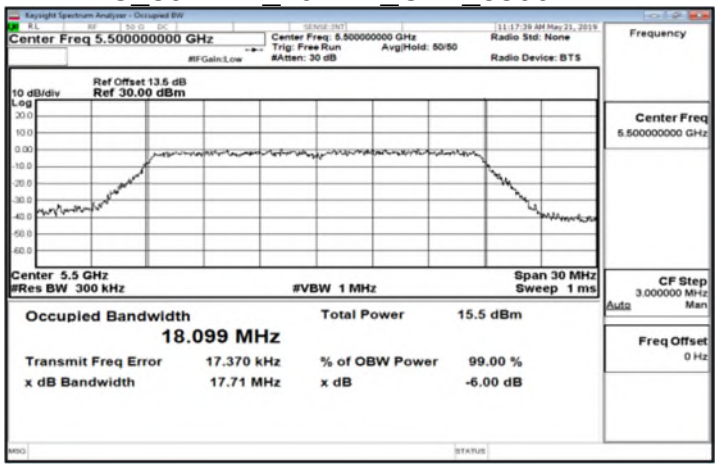
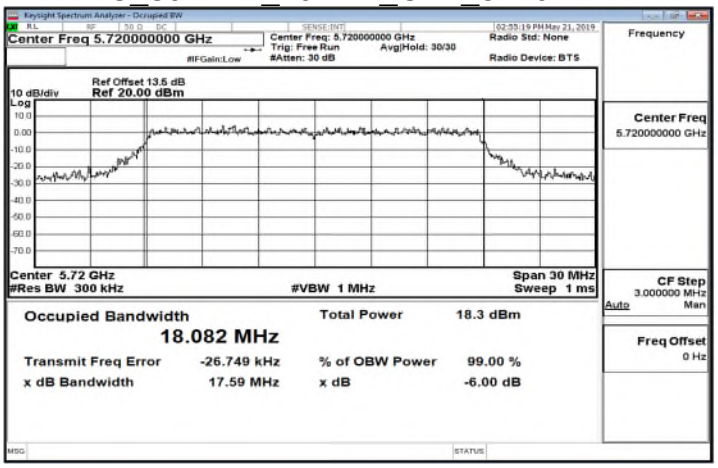
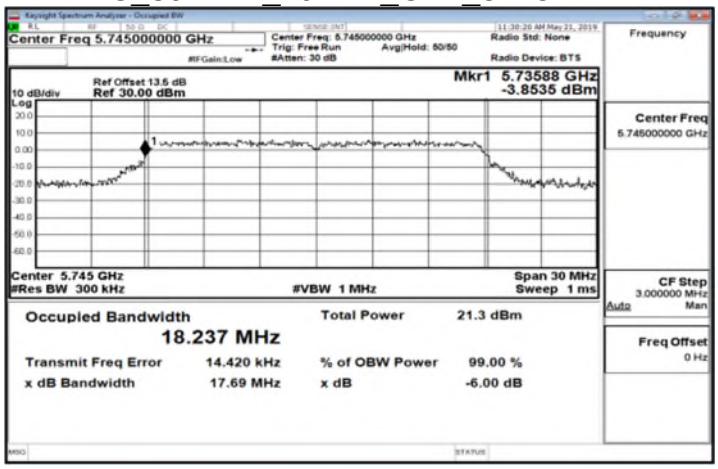


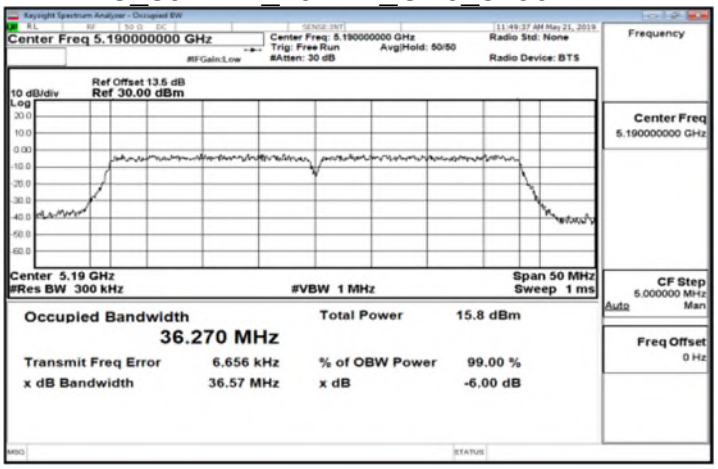
IC_802.11n_20MHz_CH1_5720MHz



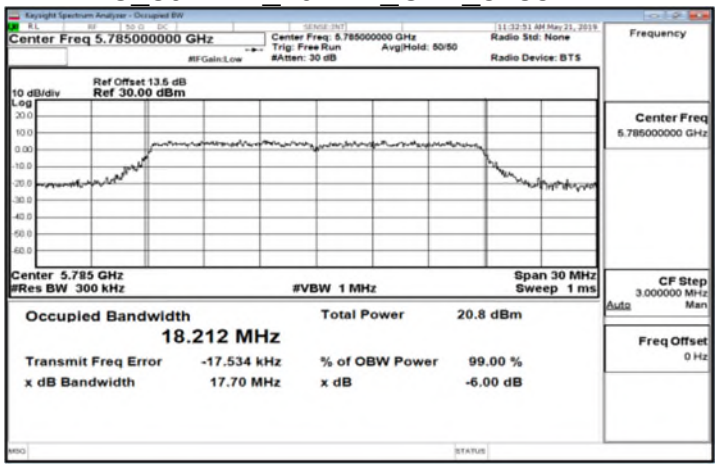
IC_802.11n_20MHz_CH1_5745MHz



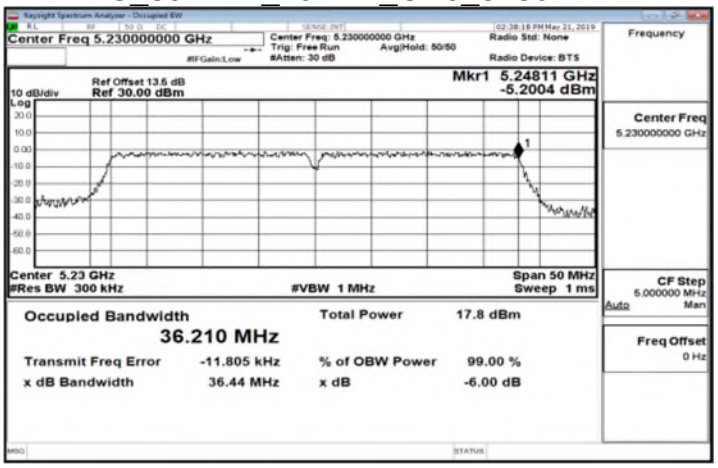
IC_802.11n_40MHz_CH0_5190MHz



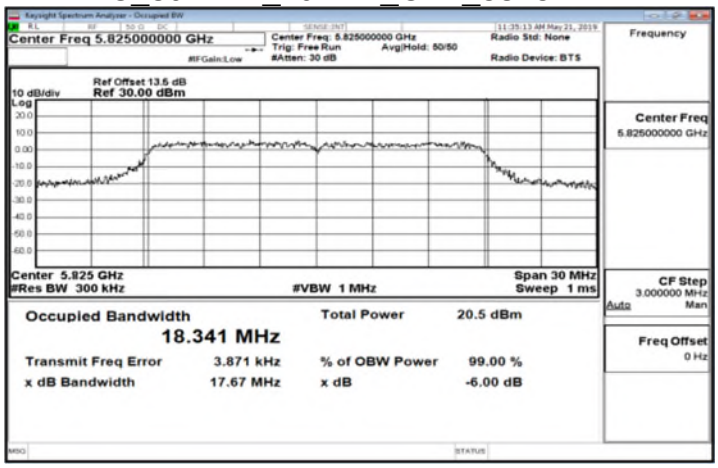
IC_802.11n_20MHz_CH1_5785MHz



IC_802.11n_40MHz_CH0_5230MHz



IC_802.11n_20MHz_CH1_5825MHz



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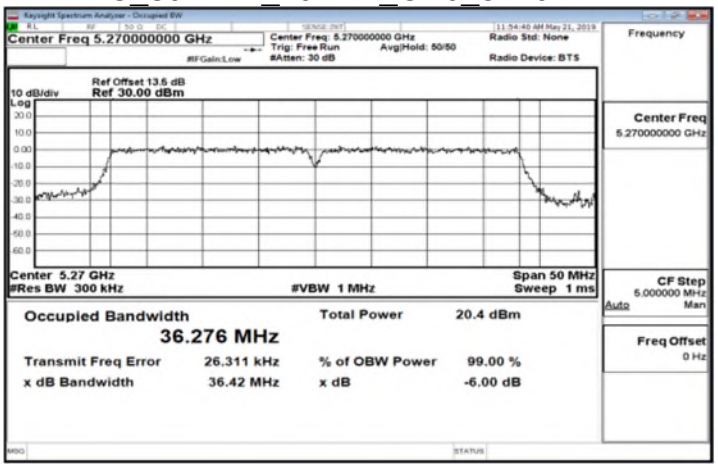
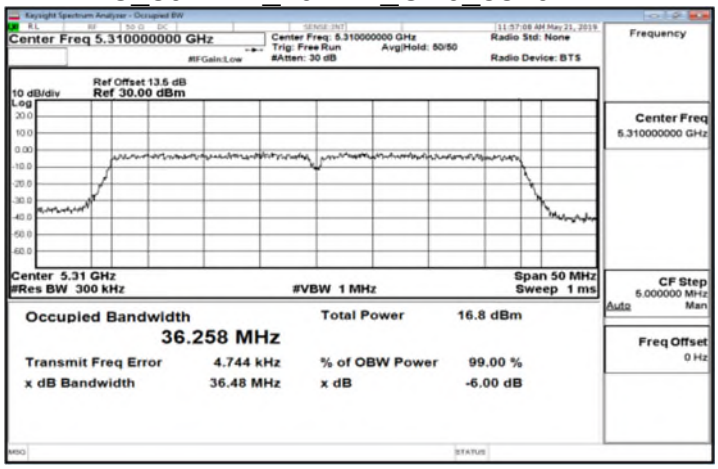
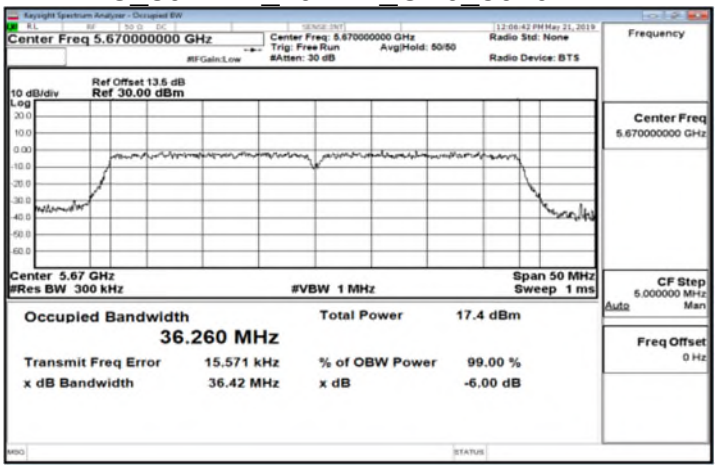


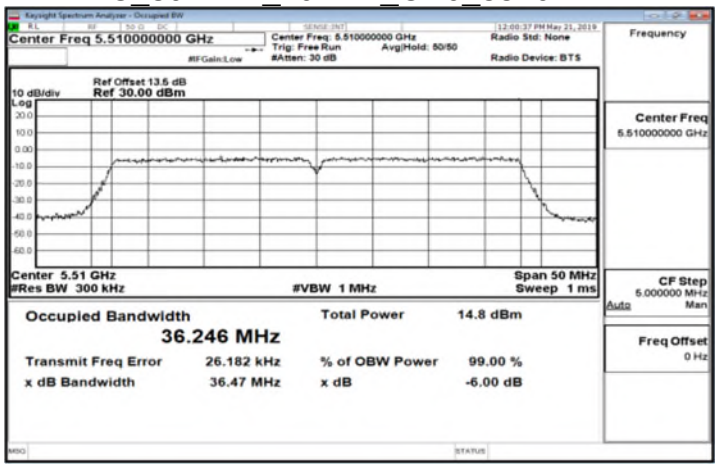
IC_802.11n_40MHz_CH0_5310MHz



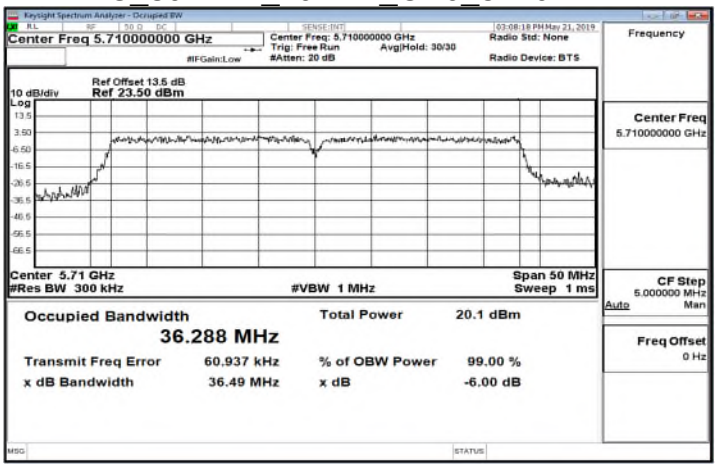
IC_802.11n_40MHz_CH0_5670MHz



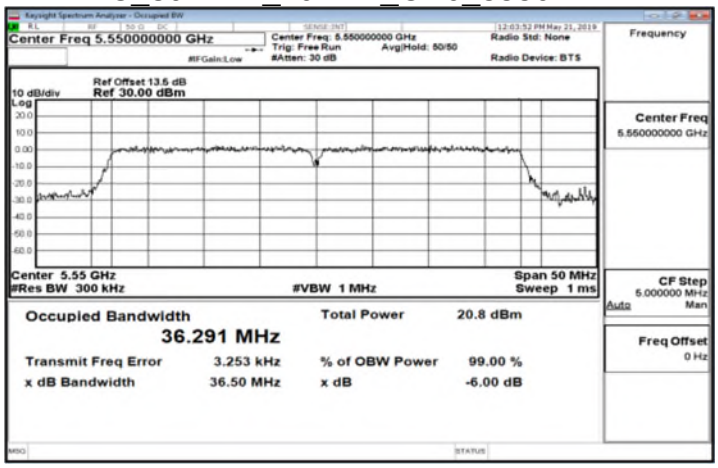
IC_802.11n_40MHz_CH0_5510MHz



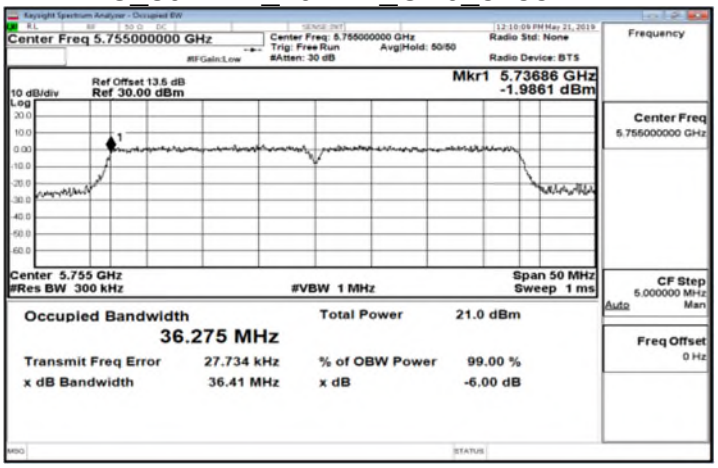
IC_802.11n_40MHz_CH0_5710MHz



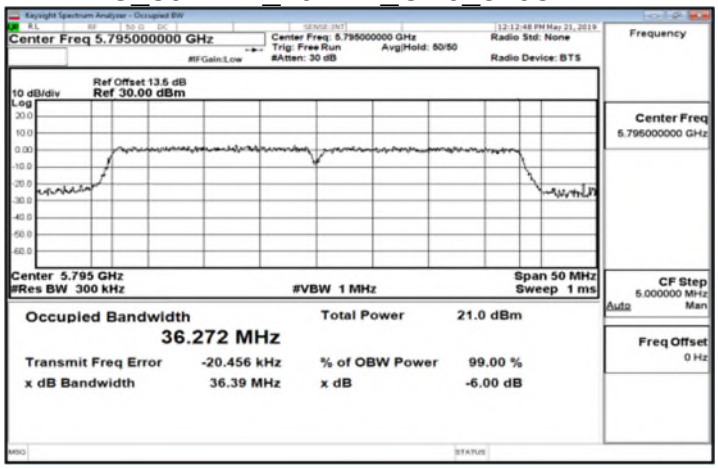
IC_802.11n_40MHz_CH0_5550MHz



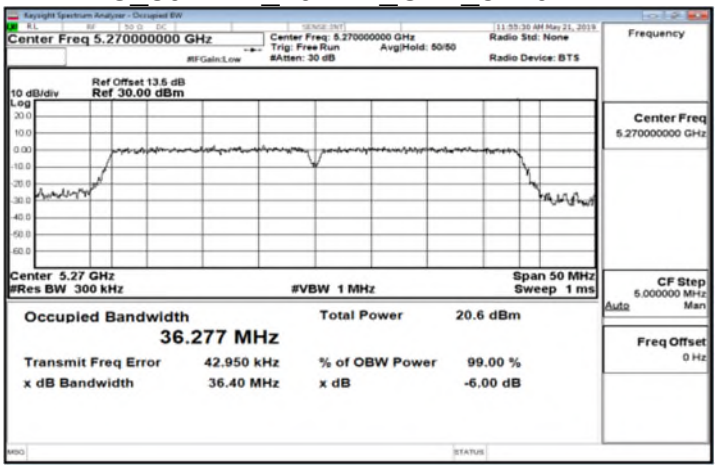
IC_802.11n_40MHz_CH0_5755MHz



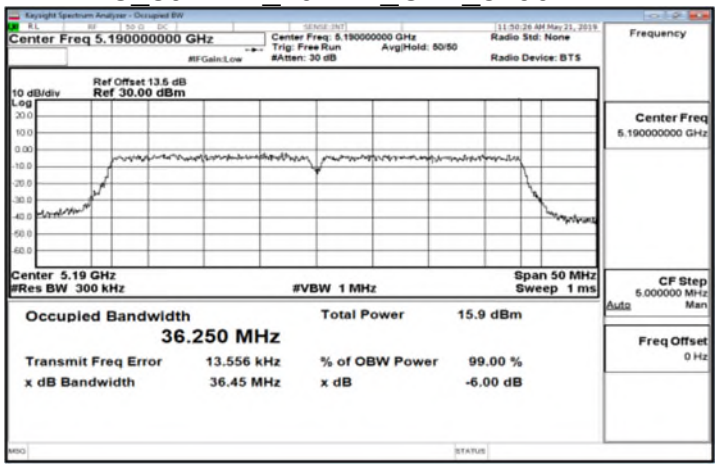
IC_802.11n_40MHz_CH0_5795MHz



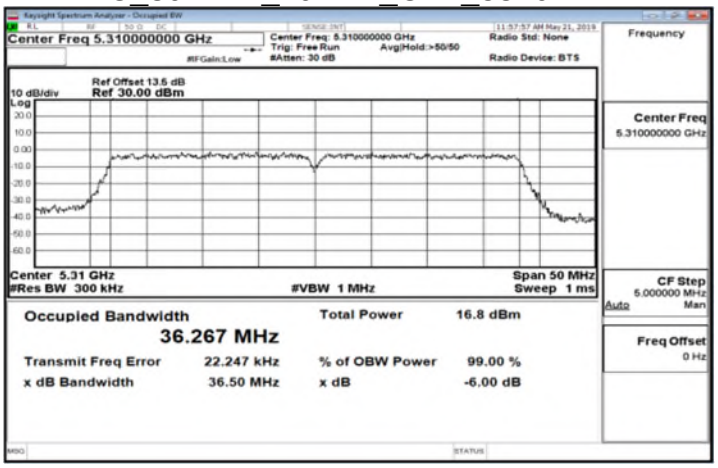
IC_802.11n_40MHz_CH1_5270MHz



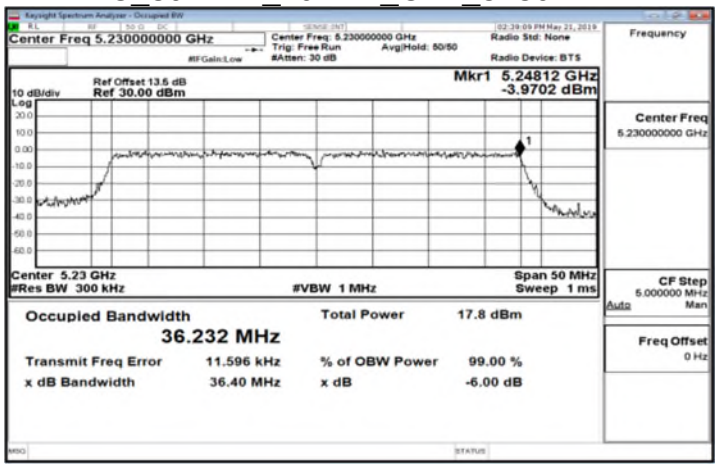
IC_802.11n_40MHz_CH1_5190MHz



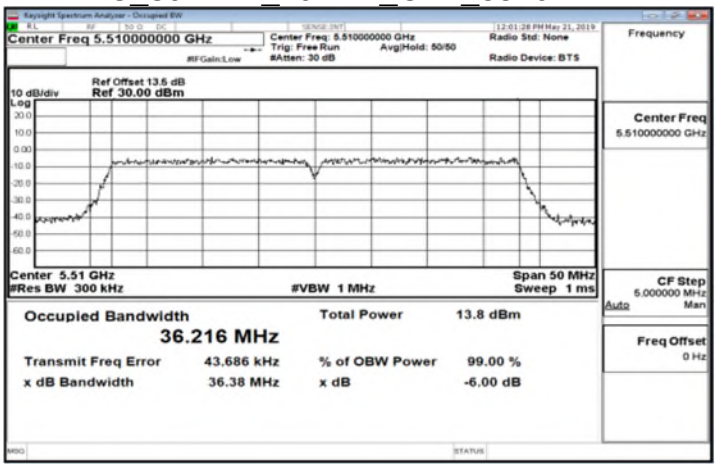
IC_802.11n_40MHz_CH1_5310MHz



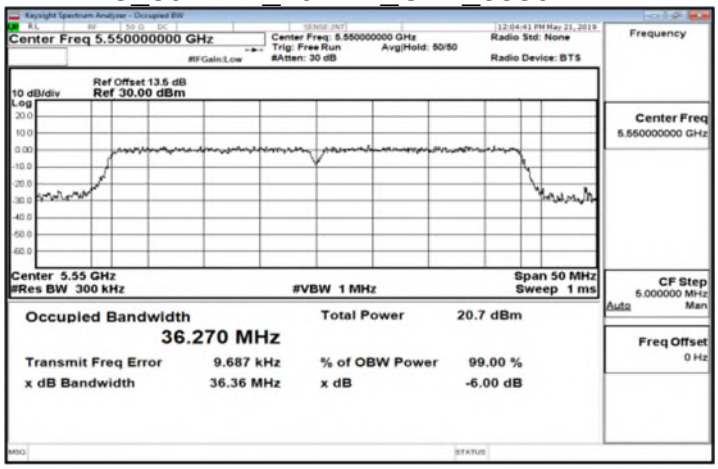
IC_802.11n_40MHz_CH1_5230MHz



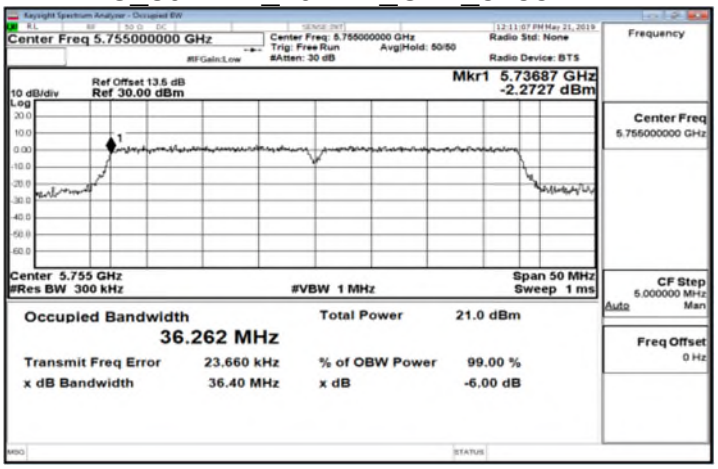
IC_802.11n_40MHz_CH1_5510MHz



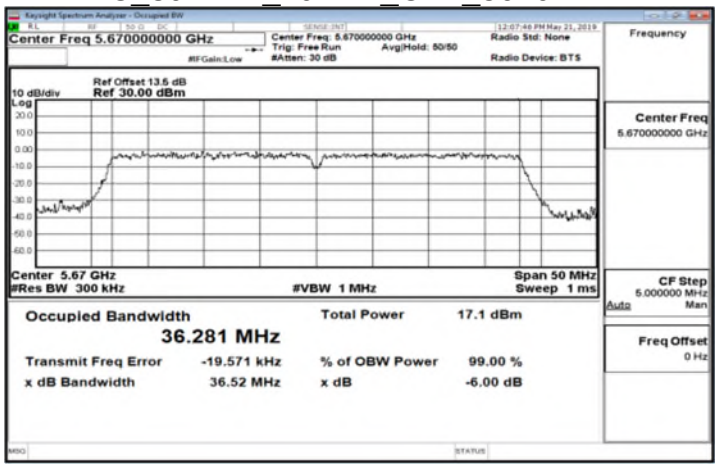
IC_802.11n_40MHz_CH1_5550MHz



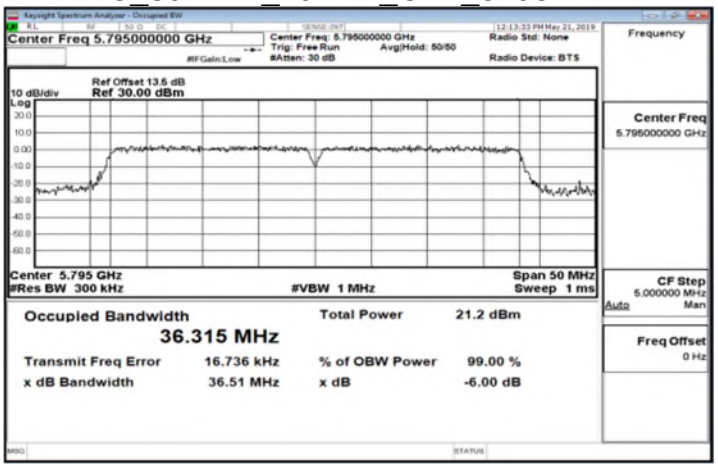
IC_802.11n_40MHz_CH1_5755MHz



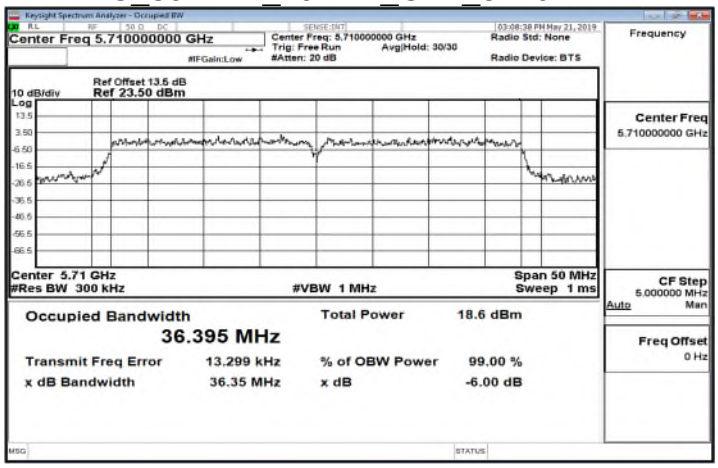
IC_802.11n_40MHz_CH1_5670MHz



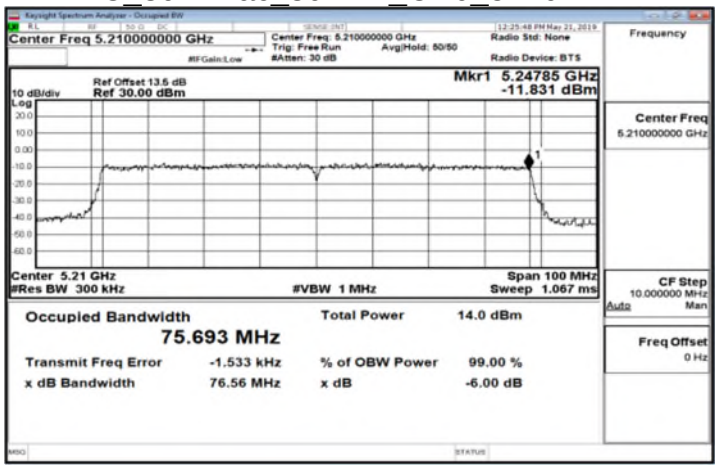
IC_802.11n_40MHz_CH1_5795MHz



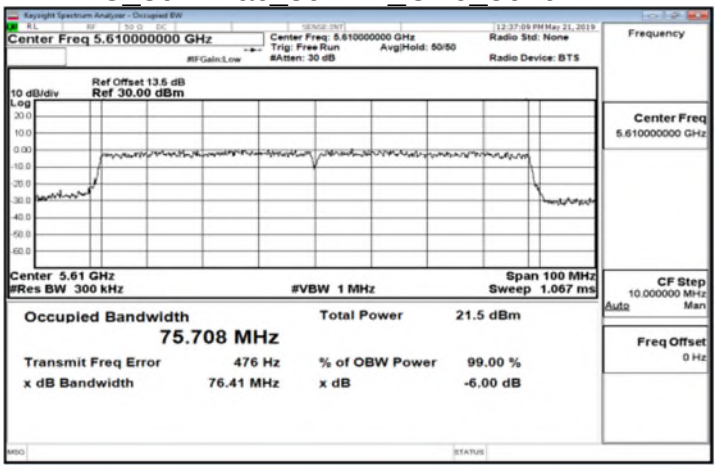
IC_802.11n_40MHz_CH1_5710MHz



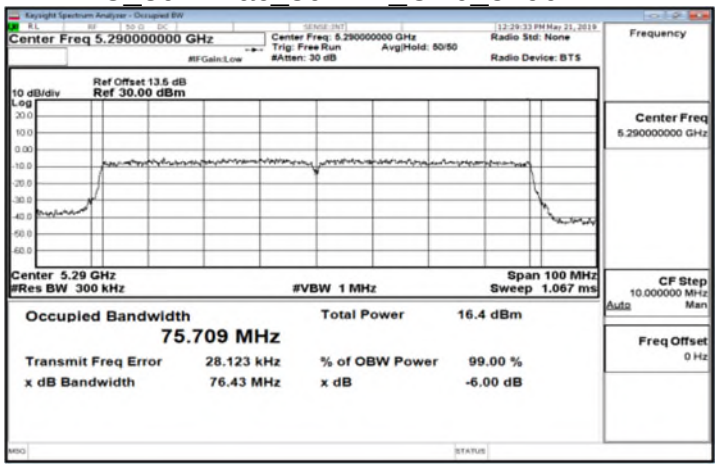
IC_802.11ac_80MHz_CH0_5210MHz



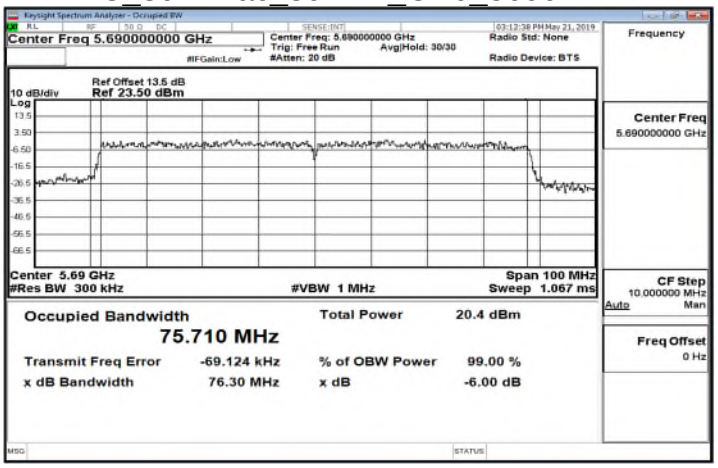
IC_802.11ac_80MHz_CH0_5610MHz



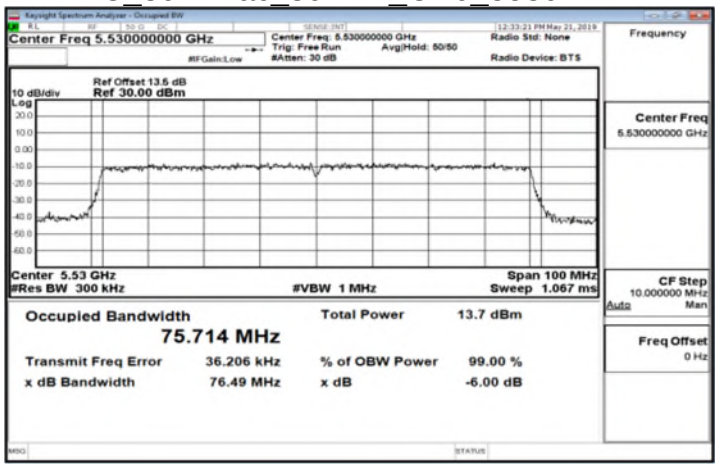
IC_802.11ac_80MHz_CH0_5290MHz



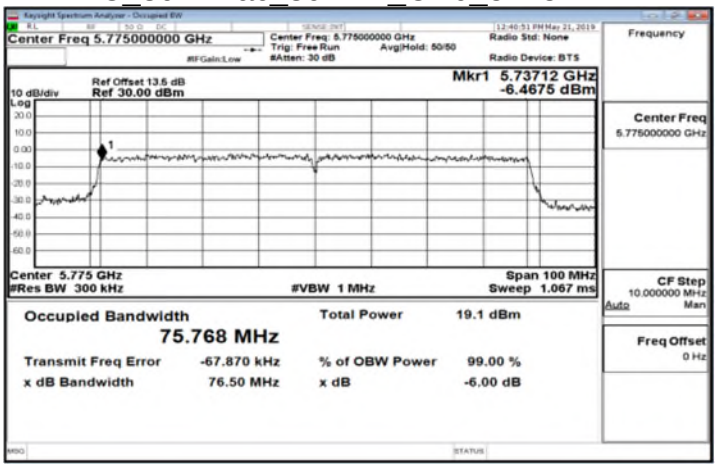
IC_802.11ac_80MHz_CH0_5690MHz



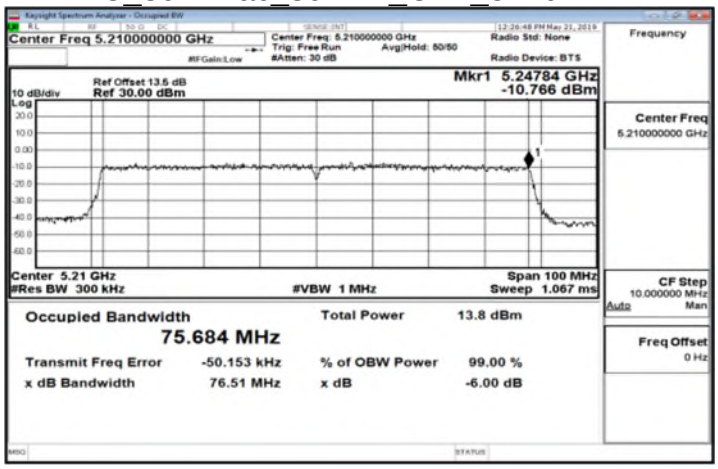
IC_802.11ac_80MHz_CH0_5530MHz



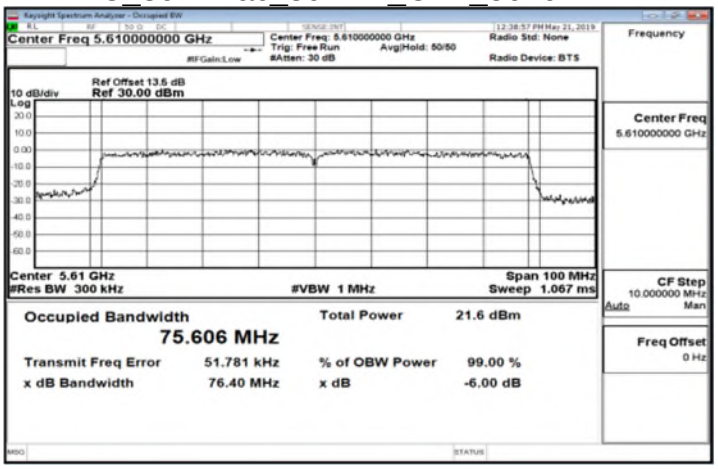
IC_802.11ac_80MHz_CH0_5775MHz



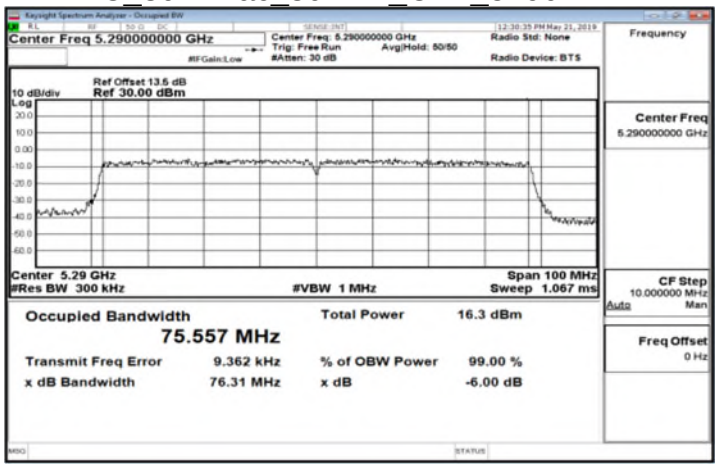
IC_802.11ac_80MHz_CH1_5210MHz



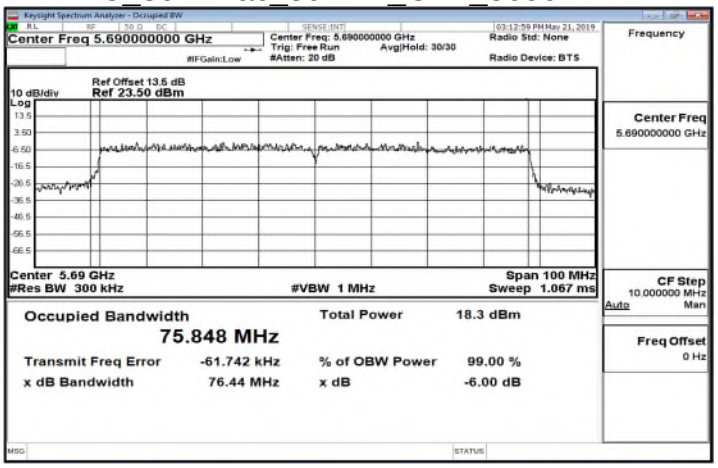
IC_802.11ac_80MHz_CH1_5610MHz



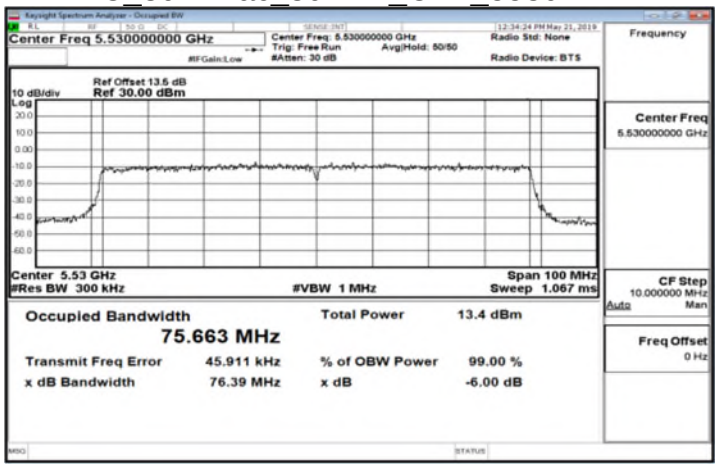
IC_802.11ac_80MHz_CH1_5290MHz



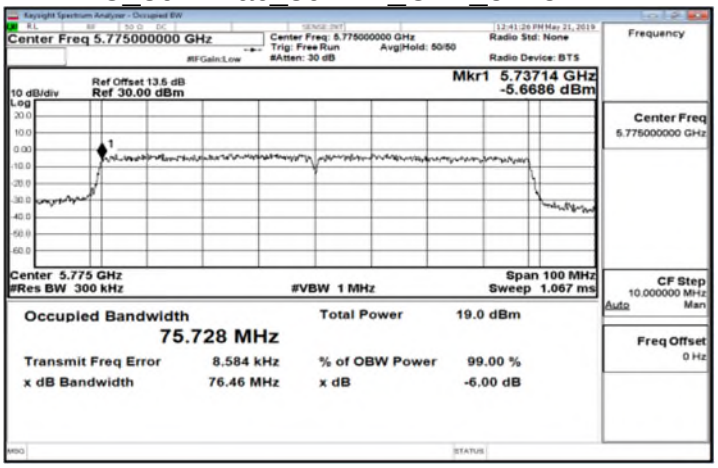
IC_802.11ac_80MHz_CH1_5690MHz



IC_802.11ac_80MHz_CH1_5530MHz



IC_802.11ac_80MHz_CH1_5775MHz



9 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

FCC

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1		Access Point (Mater device)	1 Watt(30dBm)
		Fixed point-to-point Acess Ponit	1 Watt(30dBm)
	√	Mobile and portable clinet device	250mW(23.98dBm)
U-NII-2A	√		250mW(23.98dBm) or 11dBm+10 log B
U-NII-2C	√		250mW(23.98dBm) or 11dBm+10 log B
U-NII-3	√		1 Watt(30dBm)
If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum transmit power shall be reduced by the amount in dB that the direction-al gain of the antenna exceeds 6 dBi.			

ISED

OPERZTION FREQUENCY BAND	LIMIT
5150~5250 MHz	EIRP shall not exceed 200 mW or 10 + 10 $\log_{10}$B, dBm
5250~5350 MHz	Conducted output power shall not exceed 250 mW or 11 +10 $\log_{10}$B EIRP shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm
5470-5600 MHz and 5650-5725 MHz	Conducted output power shall not exceed 250 mW or 11 +10 $\log_{10}$ B EIRP shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm
5725~5850 MHz	Conducted output power shall not exceed 1 W
For equipment operating in the band ***5725-5850*** MHz, If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum transmit power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	

Note:

As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, …, GN dBi.

(i) If transmit signals are correlated, then Directional gain

$= 10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

[Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

The antenna gain is grater than 6 dBi in MIMO mode, therefore the limit needs to be reduced as below:

	Effective Legacy Gain (dBi)	Conducted Power Limit (dBm)
UNII-1	8.80	27.20
UNII-2A	8.80	21.18
U-NII-2C	8.80	21.18
U-NII-3	8.80	27.20

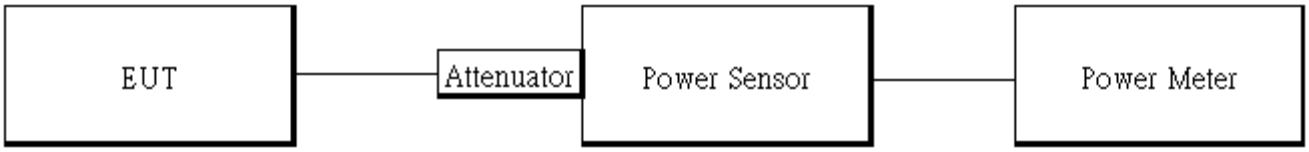
9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
5. Record the max. reading and add 10 log(1/duty cycle).
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

9.3 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUM-BER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1242004	10/23/2018	10/22/2019
Power Sensor	Anritsu	MA2411B	1207365	10/23/2018	10/22/2019
Power Sensor	Anritsu	MA2411B	1207368	10/24/2018	10/23/2019
DC Power Supply	Agilent	E3640A	KR93300208	08/15/2018	08/14/2019
DC Power Supply	GWINSTEK	SPS-3610	GPE880163	01/14/2019	01/13/2020
Attenuator	Mini-Circuit	BW-S10W2+	1	02/26/2019	02/25/2020
Attenuator	Mini-Circuit	BW-S10W2+	3	02/26/2019	02/25/2020

9.4 Test Set-up



9.5 Measurement Result

Conducted output power (FCC)

802.11a_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	15.94	39.275	30	PASS
44	5220	6	**15.97**	39.547	30	PASS
48	5240	6	15.95	39.366	30	PASS
52	5260	6	**15.99**	39.730	23.98 or 11+10log(B) = 24.15	PASS
60	5300	6	15.95	39.366	23.98 or 11+10log(B) = 24.21	PASS
64	5320	6	15.98	39.639	23.98 or 11+10log(B) = 24.13	PASS
100	5500	6	13.62	23.021	23.98 or 11+10log(B) = 24.17	PASS
116	5580	6	**15.84**	38.381	23.98 or 11+10log(B) = 24.23	PASS
140	5700	6	12.62	18.286	23.98 or 11+10log(B) = 24.11	PASS
144	5720(U-NII 2C)	6	11.58	14.372	23.98 or 11+10log(B) = 22.91	PASS
144	5720 (U-NII 3)	6	4.30	2.689	30	PASS
149	5745	6	15.87	38.647	30	PASS
157	5785	6	**15.97**	39.547	30	PASS
165	5825	6	15.95	39.366	30	PASS

802.11n_HT20_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
36	5180	MCS8	10.8	10	**13.74**	23.637	27.20	PASS
44	5220	MCS8	10.9	9.82	13.70	23.419	27.20	PASS
48	5240	MCS8	11	9.42	13.61	22.939	27.20	PASS
52	5260	MCS8	15.7	15.3	18.86	76.913	21.18 or 11+10log(B) = 24.13	PASS
60	5300	MCS8	15.8	15.4	**18.93**	78.218	21.18 or 11+10log(B) = 24.30	PASS
64	5320	MCS8	14.4	13.7	17.41	55.046	21.18 or 11+10log(B) = 24.24	PASS
100	5500	MCS8	10.2	9.57	13.24	21.099	21.18 or 11+10log(B) = 24.16	PASS
116	5580	MCS8	15.8	14.8	**18.65**	73.263	21.18 or 11+10log(B) = 24.24	PASS
140	5700	MCS8	9.64	8.87	12.60	18.206	21.18 or 11+10log(B) = 24.14	PASS
144	5720(U-NII 2C)	MCS8	10.2	10.1	11.98	15.779	21.18 or 11+10log(B) = 23.29	PASS
144	5720 (U-NII 3)	MCS8	5.89	4.89	6.91	4.910	27.20	PASS
149	5745	MCS8	16.1	15	**18.90**	77.603	27.20	PASS
157	5785	MCS8	16	15.1	18.88	77.311	27.20	PASS
165	5825	MCS8	15.8	14.9	18.71	74.360	27.20	PASS

802.11n_HT40_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
38	5190	MCS8	9.68	8.92	12.94	19.687	27.20	PASS
46	5230	MCS8	11.1	9.52	**14.01**	25.191	27.20	PASS
54	5270	MCS8	14.5	14	**17.89**	61.453	21.18 or 11+10log(B) = 26.85	PASS
62	5310	MCS8	11.2	10.4	14.45	27.873	21.18 or 11+10log(B) = 26.84	PASS
102	5510	MCS8	7.83	6.76	10.95	12.454	21.18 or 11+10log(B) = 26.85	PASS
110	5550	MCS8	14.7	13.8	**17.90**	61.622	21.18 or 11+10log(B) = 26.84	PASS
134	5670	MCS8	10.8	9.76	13.91	24.594	21.18 or 11+10log(B) = 26.84	PASS
142	5710(U-NII 2C)	MCS8	9.11	10.2	11.02	12.640	21.18 or 11+10log(B) = 26.40	PASS
142	5720 (U-NII 3)	MCS8	5.77	3.61	6.98	4.985	27.20	PASS
151	5755	MCS8	15	13.6	**17.96**	62.513	27.20	PASS
159	5795	MCS8	14.9	13.7	17.94	62.179	27.20	PASS

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
42	5210	MCS0	6.81	6.12	**10.62**	11.530	27.20	PASS
58	5290	MCS0	9.58	9.03	**13.45**	22.149	21.18 or 11+10log(B) = 29.94	PASS
106	5530	MCS0	6.75	5.51	10.31	10.749	21.18 or 11+10log(B) = 29.98	PASS
122	5610	MCS0	14.2	13.2	**17.88**	61.371	21.18 or 11+10log(B) = 30.00	PASS
138	5690(U-NII 2C)	MCS0	11.4	11.3	14.47	27.984	21.18 or 11+10log(B) = 31.09	PASS
138	5690 (U-NII 3)	MCS0	2.5	1.74	3.16	2.073	27.20	PASS
155	5775	MCS0	12.1	11.2	**15.82**	38.200	27.20	PASS

Conducted output power (IC)

802.11a_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
52	5260	**15.99**	**39.730**	23.98 or 11+10log(B) = 23.30	PASS
60	5300	15.95	39.366	23.98 or 11+10log(B) = 23.30	PASS
64	5320	15.98	39.639	23.98 or 11+10log(B) = 23.31	PASS
100	5500	13.62	23.021	23.98 or 11+10log(B) = 23.29	PASS
116	5580	15.84	**38.381**	23.98 or 11+10log(B) = 23.31	PASS
140	5700	12.62	**18.286**	23.98 or 11+10log(B) = 23.30	PASS
144	5720(U-NII 2C)	11.58	14.372	23.98 or 11+11log(B) = 22.30	PASS
144	5720 (U-NII 3)	4.30	2.689	30	PASS
149	5745	15.87	38.647	30	PASS
157	5785	15.97	**39.547**	30	PASS
165	5825	15.95	39.366	30	PASS

802.11n_HT20_MIMO

CH	Frequency (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
		CH 0	CH 1				
52	5260	15.73	15.32	18.86	76.913	21.18 or 11+10log(B) = 23.58	PASS
60	5300	15.76	15.44	**18.93**	**78.218**	21.18 or 11+10log(B) = 23.61	PASS
64	5320	14.39	13.74	17.41	55.046	21.18 or 11+10log(B) = 23.58	PASS
100	5500	10.23	9.57	13.24	21.099	21.18 or 11+10log(B) = 23.56	PASS
116	5580	15.79	14.79	**18.65**	**73.263**	21.18 or 11+10log(B) = 23.56	PASS
140	5700	9.64	8.87	**12.60**	**18.206**	21.18 or 11+10log(B) = 23.57	PASS
144	5720(U-NII 2C)	10.2	10.07	11.98	15.779	21.18 or 11+10log(B) = 22.47	PASS
144	5720 (U-NII 3)	5.886	4.892	6.91	4.910	27.20	PASS
149	5745	16.11	14.95	**18.90**	**77.603**	27.20	PASS
157	5785	15.97	15.09	18.88	77.311	27.20	PASS
165	5825	15.81	14.91	18.71	74.360	27.20	PASS

802.11n_HT40_MIMO

CH	Frequency (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)			RESULT
		CH 0	CH 1						
54	5270	14.47	14.04	17.89	61.453	21.18	or 11+10log(B) =	26.60	PASS
62	5310	11.24	10.37	14.45	27.873	21.18	or 11+10log(B) =	26.59	PASS
102	5510	7.83	6.76	10.95	12.454	21.18	or 11+10log(B) =	26.59	PASS
110	5550	14.69	13.81	**17.90**	**61.622**	21.18	or 11+10log(B) =	26.60	PASS
134	5670	10.75	9.76	**13.91**	**24.594**	21.18	or 11+10log(B) =	26.59	PASS
142	5710(U-NII 2C)	9.111	10.18	11.02	12.640	21.18	or 11+10log(B) =	26.20	PASS
142	5710 (U-NII 3)	5.769	3.614	6.98	4.985	27.20			PASS
151	5755	14.97	13.59	**17.96**	**62.513**	27.20			PASS
159	5795	14.87	13.67	17.94	62.179	27.20			PASS

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)			RESULT
		CH 0	CH 1						
58	5290	9.58	9.03	**13.45**	22.149	21.18	or 11+10log(B) =	29.78	PASS
106	5530	6.75	5.51	10.31	10.749	21.18	or 11+10log(B) =	29.79	PASS
122	5610	14.22	13.2	**17.88**	**61.371**	21.18	or 11+10log(B) =	29.79	PASS
138	5690(U-NII 2C)	11.43	11.27	14.47	27.984	21.18	or 11+10log(B) =	29.62	PASS
138	5690 (U-NII 3)	2.5	1.737	3.16	2.073	27.20			PASS
155	5775	12.13	11.18	**15.82**	**38.200**	27.20			PASS

EIRP

802.11a_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)			RESULT
36	5180	15.94	5.790	21.73	148.977	23.01	or 10+10log(B)=	22.31	PASS
44	5220	**15.97**	5.790	**21.76**	**150.009**	23.01	or 10+10log(B)=	22.31	PASS
48	5240	15.95	5.790	21.74	149.320	23.01	or 10+10log(B)=	22.32	PASS
52	5260	**15.99**	5.790	**21.78**	**150.702**	30	or 17+10log(B)=	29.30	PASS
60	5300	15.95	5.790	21.74	149.320	30	or 17+10log(B)=	29.30	PASS
64	5320	15.98	5.790	21.77	150.355	30	or 17+10log(B)=	29.31	PASS
100	5500	13.62	5.790	19.41	87.321	30	or 17+10log(B)=	29.29	PASS
116	5580	**15.84**	5.790	**21.63**	**145.586**	30	or 17+10log(B)=	29.31	PASS
140	5700	**12.62**	5.790	**18.41**	**69.361**	30	or 17+10log(B)=	29.30	PASS

802.11n_HT20_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)			RESULT
36	5180	**13.74**	8.800	**22.54**	**179.316**	23.01	or 10+10log(B)=	22.57	PASS
44	5220	13.70	8.800	22.50	177.660	23.01	or 10+10log(B)=	22.55	PASS
48	5240	13.61	8.800	22.41	174.021	23.01	or 10+10log(B)=	22.56	PASS
52	5260	18.86	8.800	27.66	583.483	30	or 17+10log(B)=	29.58	PASS
60	5300	**18.93**	8.800	**27.73**	**593.388**	30	or 17+10log(B)=	29.61	PASS
64	5320	17.41	8.800	26.21	417.599	30	or 17+10log(B)=	29.58	PASS
100	5500	13.24	8.800	22.04	160.065	30	or 17+10log(B)=	29.56	PASS
116	5580	**18.65**	8.800	**27.45**	**555.797**	30	or 17+10log(B)=	29.56	PASS
140	5700	**12.60**	8.800	**21.40**	**138.117**	30	or 17+10log(B)=	29.57	PASS

802.11n_HT40_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)			RESULT
38	5190	12.94	8.800	21.74	149.348	23.01	or 10+10log(B)=	25.59	PASS
46	5230	**14.01**	8.800	**22.81**	**191.107**	23.01	or 10+10log(B)=	25.59	PASS
54	5270	**17.89**	8.800	**26.69**	**466.200**	30	or 17+10log(B)=	32.60	PASS
62	5310	14.45	8.800	23.25	211.454	30	or 17+10log(B)=	32.59	PASS
102	5510	10.95	8.800	19.75	94.477	30	or 17+10log(B)=	32.59	PASS
110	5550	**17.90**	8.800	**26.70**	**467.483**	30	or 17+10log(B)=	32.60	PASS
134	5670	**13.91**	8.800	**22.71**	**186.576**	30	or 17+10log(B)=	32.59	PASS

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)			RESULT
42	5210	**10.62**	8.800	**19.42**	**87.473**	23.01	or 10+10log(B)=	28.79	PASS
58	5290	**13.45**	8.800	**22.25**	**168.026**	30	or 17+10log(B)=	35.78	PASS
106	5530	**10.31**	8.800	**19.11**	**81.549**	30	or 17+10log(B)=	35.79	PASS

10 MAXIMUM POWER SPECTRAL DENSITY

10.1 Standard Applicable

FCC

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1		Access Point (Master device)	17dBm/ MHz
		Fixed point-to-point Access Ponit	
	√	Mobile and portable client device	11dBm/ MHz
U-NII-2A	√		11dBm/ MHz
U-NII-2C	√		11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz
If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.			

ISED

OPERZTION FREQUENCY BAND	LIMIT
5150~5250 MHz	EIRP spectral density 10 dBm / MHz
5250~5350 MHz	11dBm / MHz
5470-5600 MHz and 5650-5725 MHz	11dBm / MHz
5725~5850 MHz	30dBm / 500 kHz
For equipment operating in the band ***5725-5850*** MHz, If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	

Note:

As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, …, GN dBi.

(i) If transmit signals are correlated, then Directional gain

$= 10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

[Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

The antenna gain is grater than 6 dBi in MIMO mode, therefore the limit needs to be reduced as below:

	Effective Legacy Gain (dBi)	PSD Limit	
UNII-1	8.80	14.20	dBm/MHz
UNII-2A	8.80	8.20	dBm/MHz
U-NII-2C	8.80	8.20	dBm/MHz
U-NII-3	8.80	27.20	dBm/500 kHz

10.2 Measurement Procedure

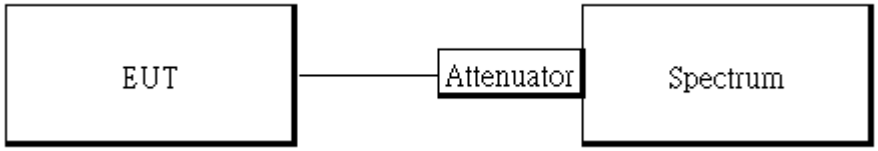
1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
4. **For U-NII1, U-NII-2A, U-NII-2C Band**:
   Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
   For U-NII-3 Band:
   Set RBW=500 kHz, VBW≥ 3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
5. User the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add 10 log(1/duty cycle).
7. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Note: For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome

10.3 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUM-BER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	KR93300208	08/15/2018	08/14/2019
Spectrum Analyzer	Agilent	N9010A	MY53400256	11/21/2018	11/20/2019
TEMPERATURE	TEMPERA-TURE	HTC-1	EC-HY-01	04/18/2019	04/17/2020
DC Power Supply	GWINSTEK	SPS-3610	GPE880163	01/14/2019	01/13/2020
DC Block	Mini-Circuits	BLK-18-S+	31129(1)	02/26/2019	02/25/2020
Attenuator	Mini-Circuit	BW-S10W2+	1	02/26/2019	02/25/2020

10.4 Test Set-up



10.5 Measurement Result

POWER DENSITY 802.11a MODE_Ch0					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5180	1.69	0.30	1.99	17.00	-15.01
5220	3.25	0.30	3.55	17.00	-13.45
5240	4.56	0.30	4.86	17.00	-12.14
5260	2.16	0.30	2.46	11.00	-8.54
5300	3.58	0.30	3.88	11.00	-7.12
5320	4.59	0.30	4.89	11.00	-6.11
5500	-0.88	0.30	-0.58	11.00	-11.58
5580	4.94	0.30	5.24	11.00	-5.76
5700	-1.39	0.30	-1.09	11.00	-12.09
5720 (U-NII 2C)	-1.20	0.30	-0.90	11.00	-11.90
5720 (U-NII 3)	-1.36	0.30	-1.05	30.00	-31.05
5745	7.64	-	7.64	30.00	-22.36
5785	9.58	-	9.58	30.00	-20.42
5825	7.53	-	7.53	30.00	-22.47

POWER DENSITY 802.11n HT20 MODE_MIMO					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5180	2.40	0.32	2.72	14.20	-11.48
5220	1.86	0.32	2.18	14.20	-12.02
5240	1.79	0.32	2.11	14.20	-12.09
5260	6.77	0.32	7.09	8.20	-1.11
5300	6.64	0.32	6.96	8.20	-1.24
5320	5.40	0.32	5.72	8.20	-2.48
5500	1.69	0.32	2.01	8.20	-6.19
5580	4.84	0.32	5.16	8.20	-3.04
5700	0.75	0.32	1.07	8.20	-7.13
5720 (U-NII 2C)	6.59	0.32	6.91	8.20	-1.29
5720 (U-NII 3)	4.62	0.32	4.94	27.20	-22.26
5745	12.54	-	12.54	27.20	-14.66
5785	11.06	-	11.06	27.20	-16.14
5825	10.16	-	10.16	27.20	-17.04

POWER DENSITY 802.11n HT40 MODE_MIMO					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5190	-4.3	0.61	-3.69	14.20	-17.88
5230	0.53	0.61	1.14	14.20	-13.05
5270	0.42	0.61	1.03	8.20	-7.16
5310	-3.67	0.61	-3.06	8.20	-11.25
5510	-6.68	0.61	-6.07	8.20	-14.26
5550	-1.22	0.61	-0.61	8.20	-8.80
5670	-4.38	0.61	-3.77	8.20	-11.96
5710 (U-NII 2C)	-2.12	0.61	-1.51	8.20	-9.71
5710 (U-NII 3)	-8.39	0.61	-7.77	27.20	-34.97
5755	7.46	-	7.46	27.20	-19.74
5795	7.14	-	7.14	27.20	-20.06

POWER DENSITY 802.11ac VHT80 MODE_MIMO					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5210	-6.85	1.13	-5.72	14.20	-19.92
5290	-7.04	1.13	-5.91	8.20	-14.11
5530	-11.50	1.13	-10.37	8.20	-18.57
5610	-1.80	1.13	-0.67	8.20	-8.87
5690 (U-NII 2C)	-4.12	1.13	-2.99	8.20	-11.19
5690 (U-NII 3)	-4.73	1.13	-3.60	27.20	-30.80
5775	1.75	-	1.75	27.20	-25.45

EIRP spectral density 802.11a MODE					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5180	1.99	5.79	7.78	10	-2.22
5220	3.55	5.79	9.34	10	-0.66
5240	4.86	5.79	10.65	10	0.65

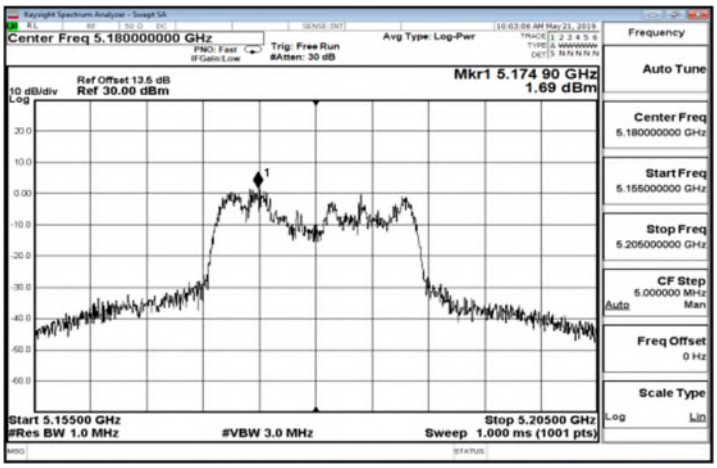
EIRP spectral density 802.11n HT20 MODE					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5180	2.72	8.80	11.52	10	1.52
5220	2.18	8.80	10.98	10	0.98
5240	2.11	8.80	10.91	10	0.91

EIRP spectral density 802.11n HT40 MODE					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5180	-3.69	8.80	5.12	10	-4.88
5220	1.14	8.80	9.95	10	-0.05

EIRP spectral density 802.11ac VHT80 MODE					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5210	-5.72	8.80	3.08	10	-6.92

Note:
Cable Loss= 13.5 dB

802.11a_20MHz_5180MHz



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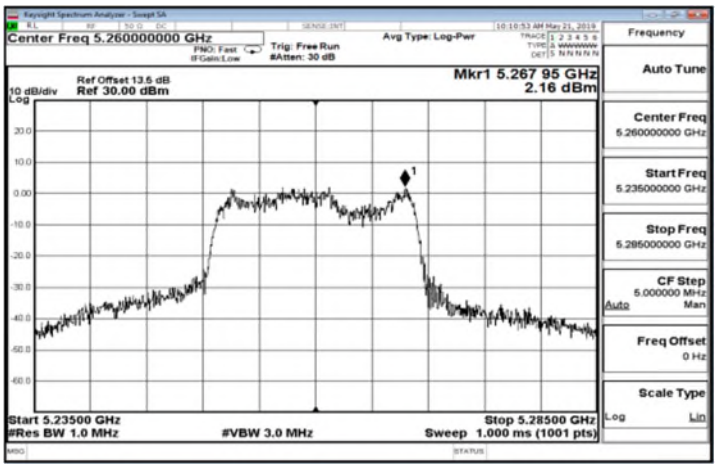

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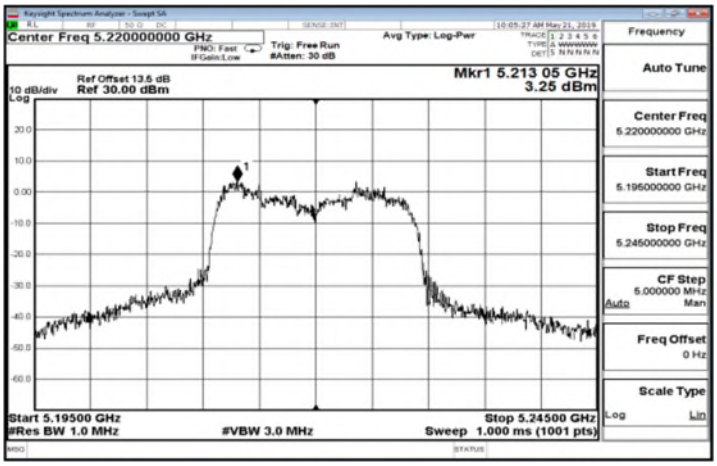

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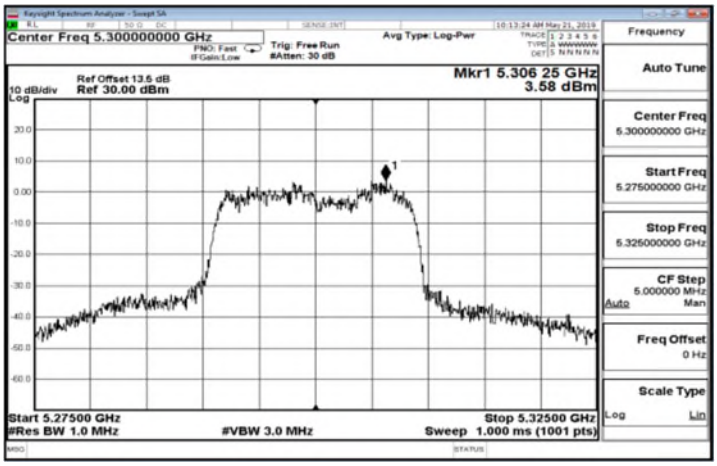

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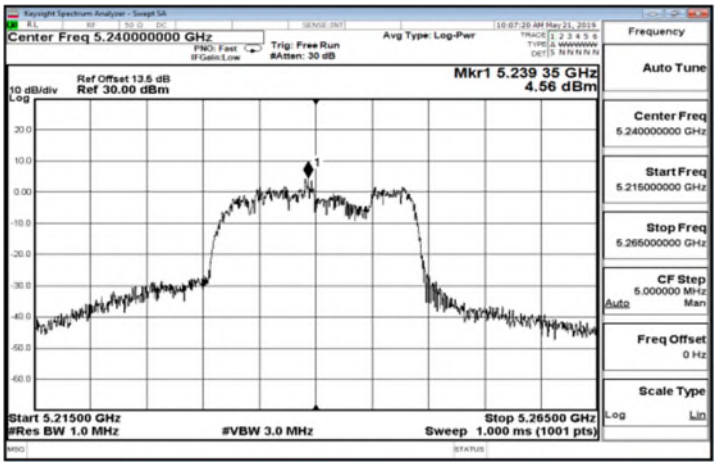

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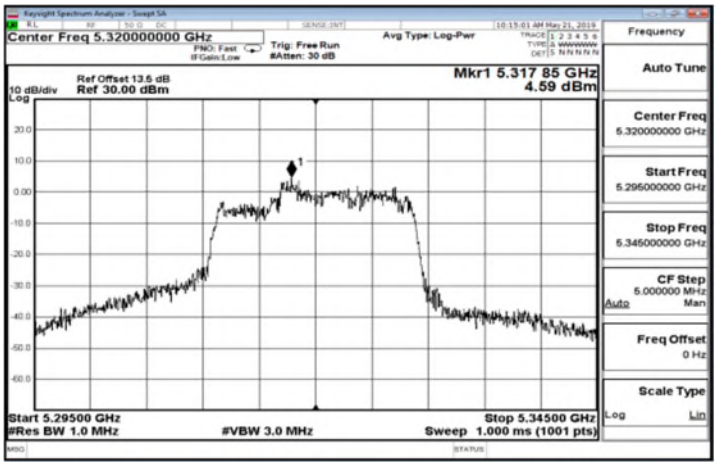

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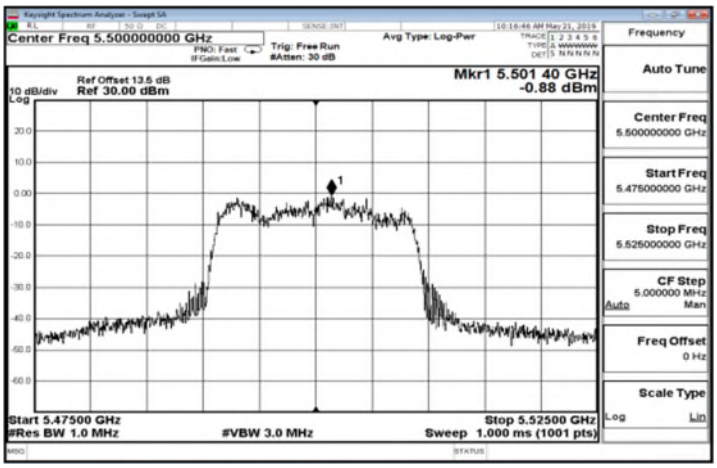
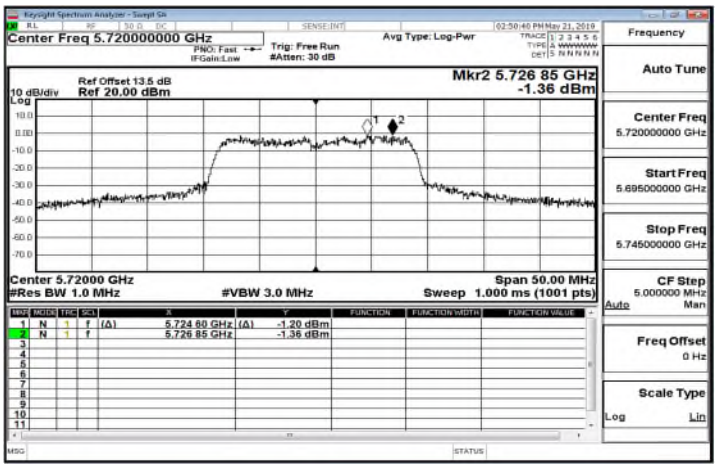


802.11a_20MHz_5720MHz



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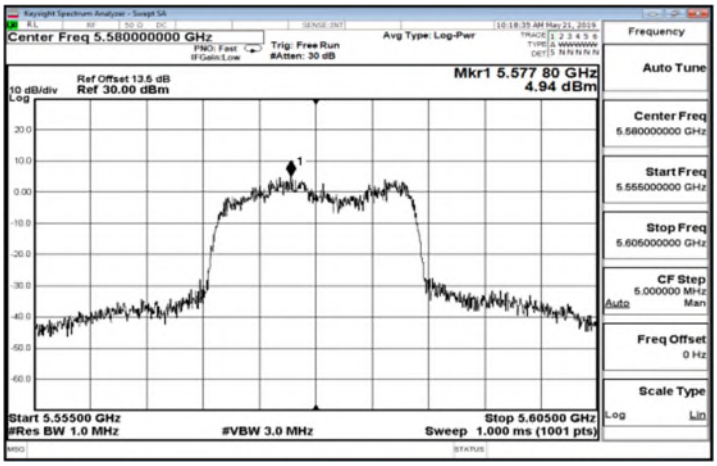

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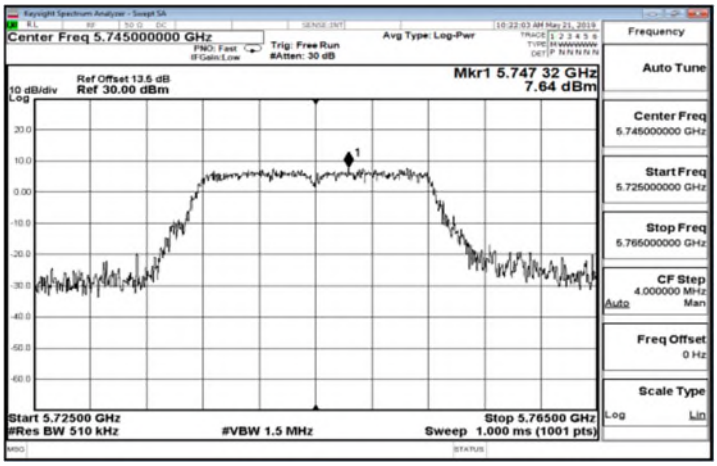

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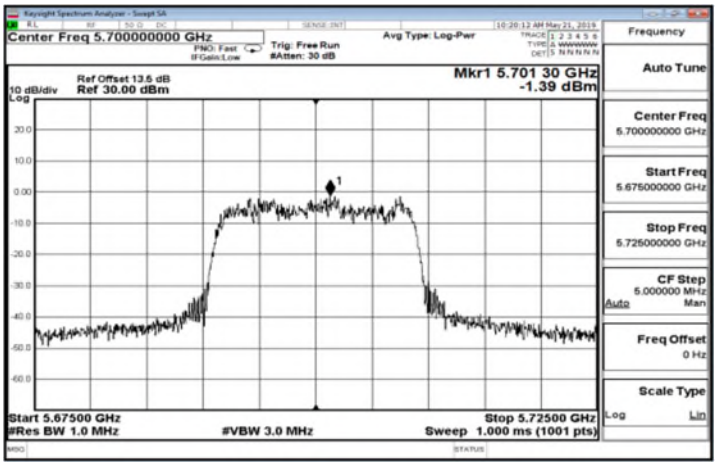

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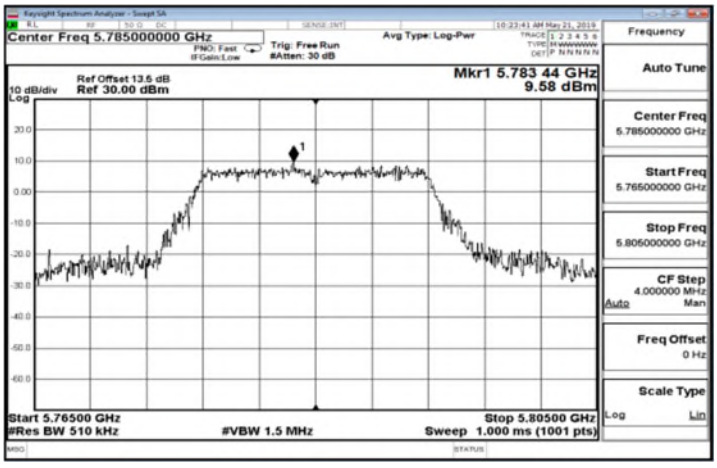

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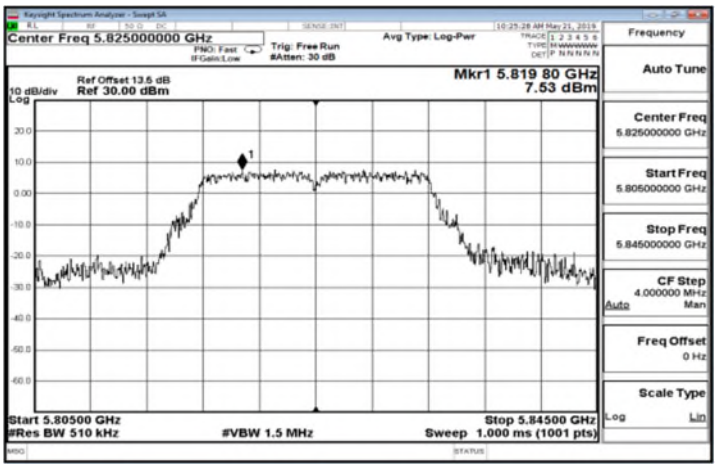

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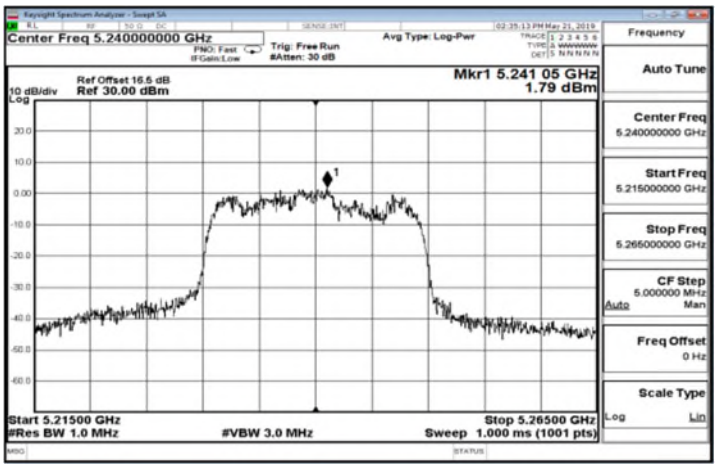
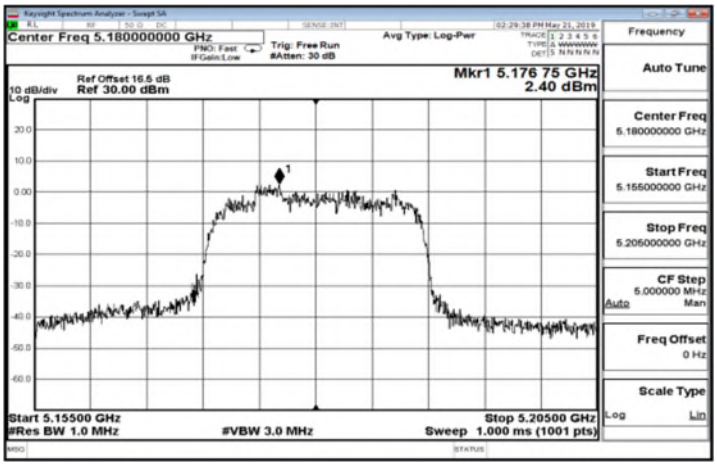


802.11n_20MHz_5180MHz



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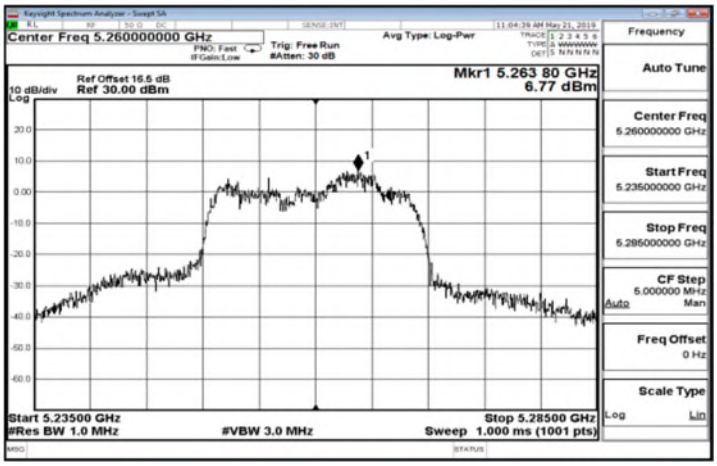

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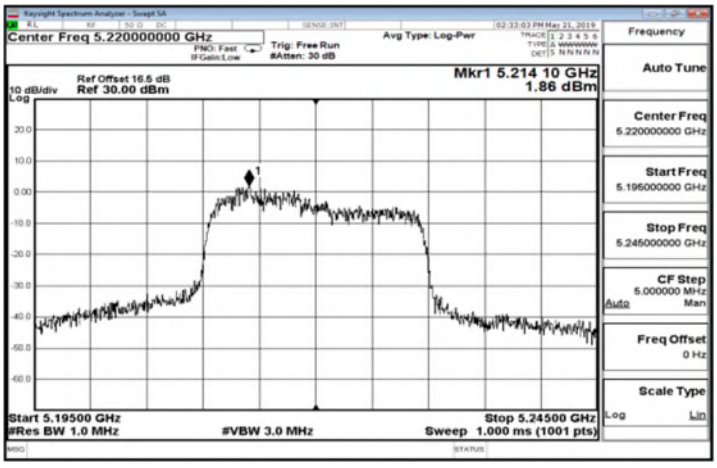
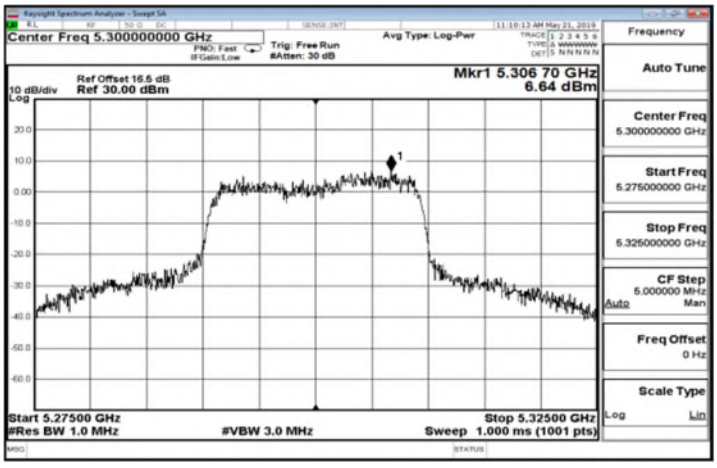


802.11n_20MHz_5300MHz



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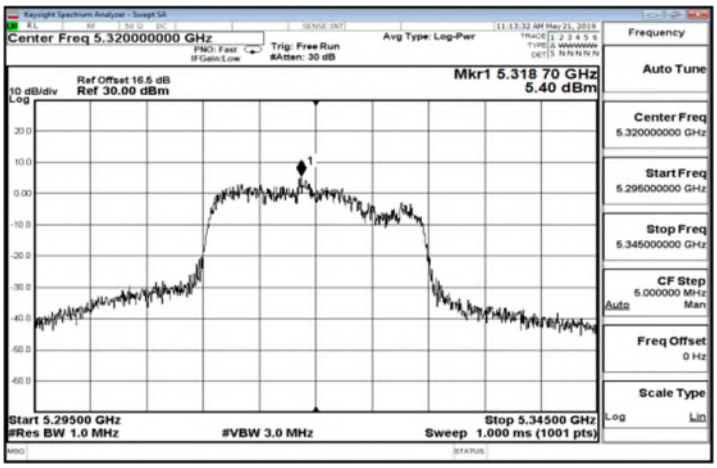

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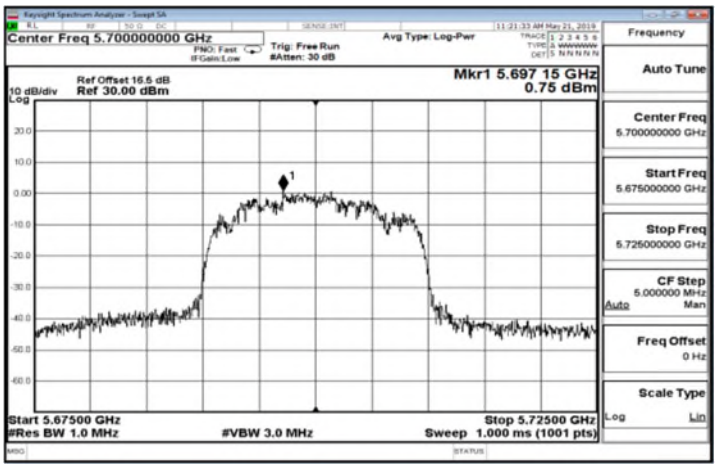

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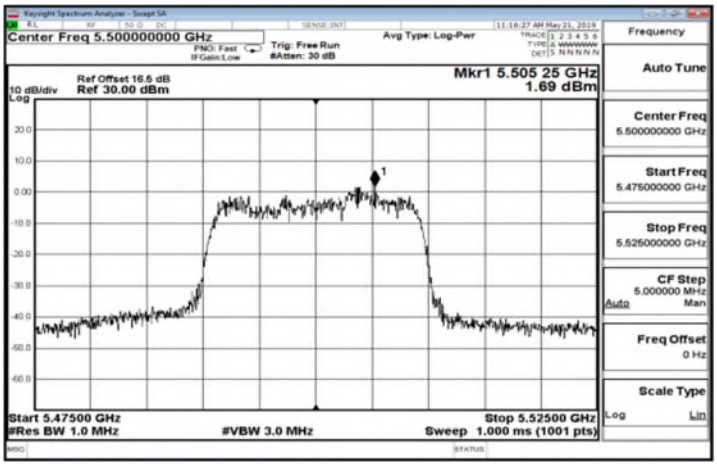

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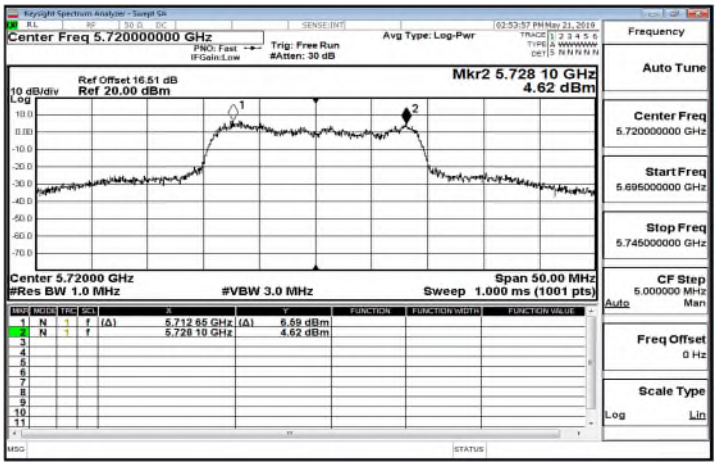

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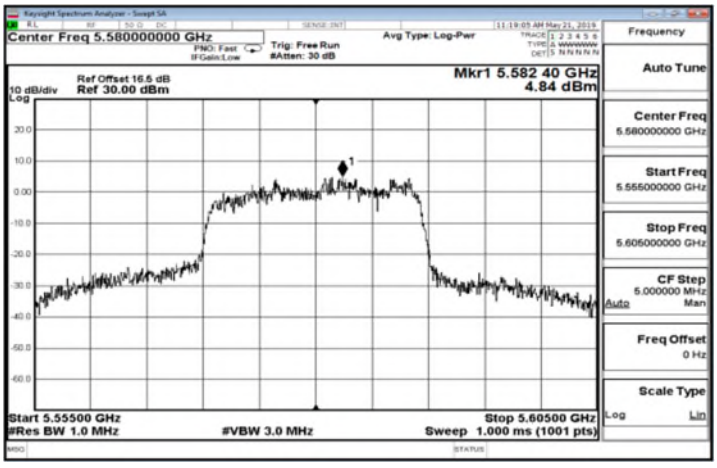

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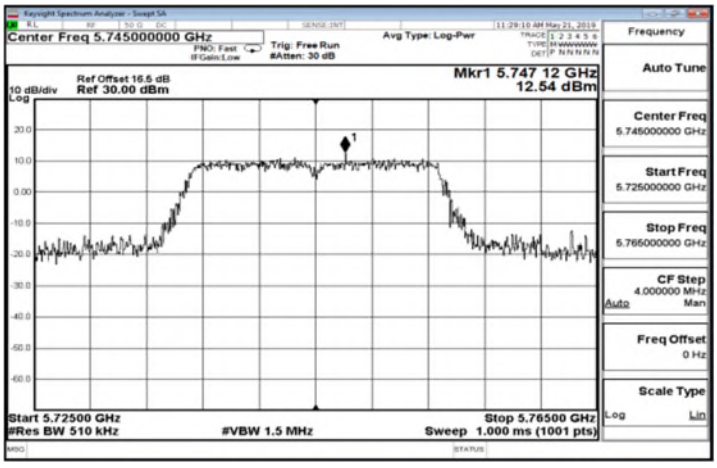
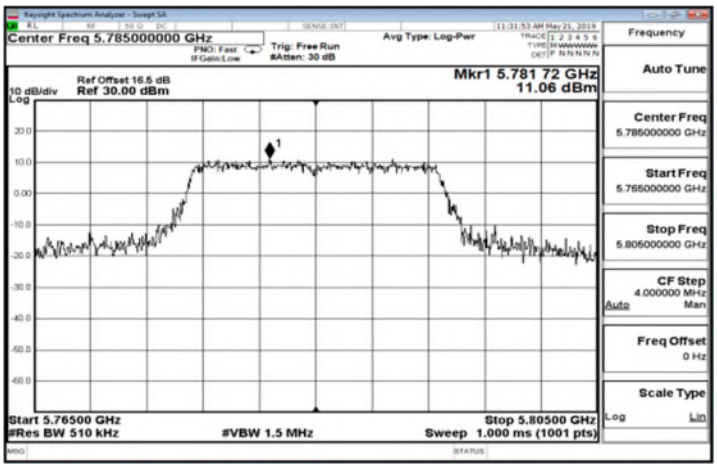
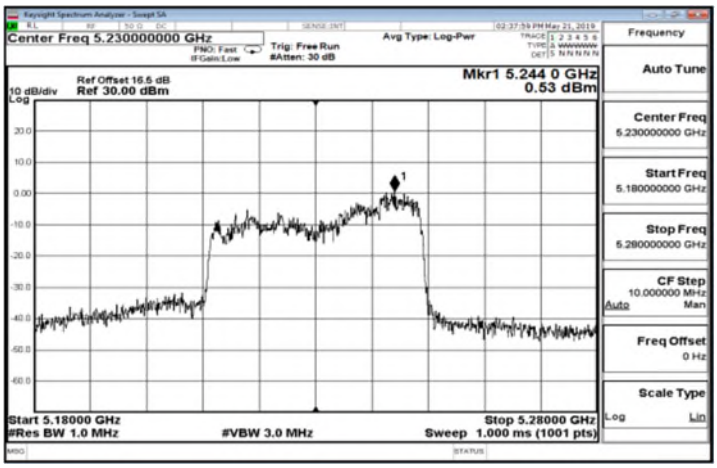


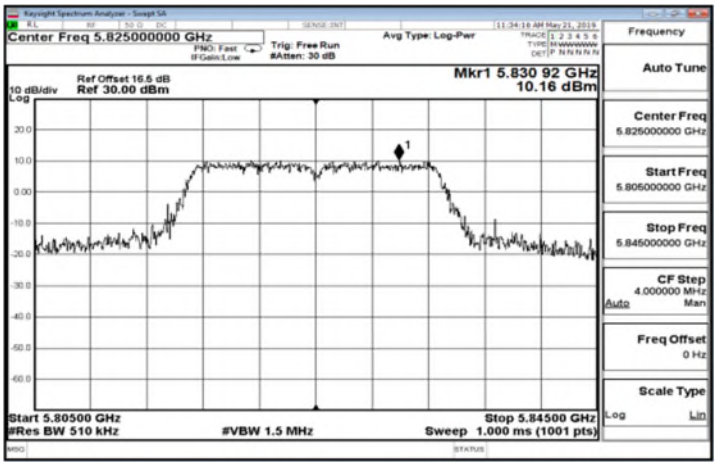
802.11n_20MHz_5785MHz



802.11n_40MHz_5230MHz



802.11n_20MHz_5825MHz



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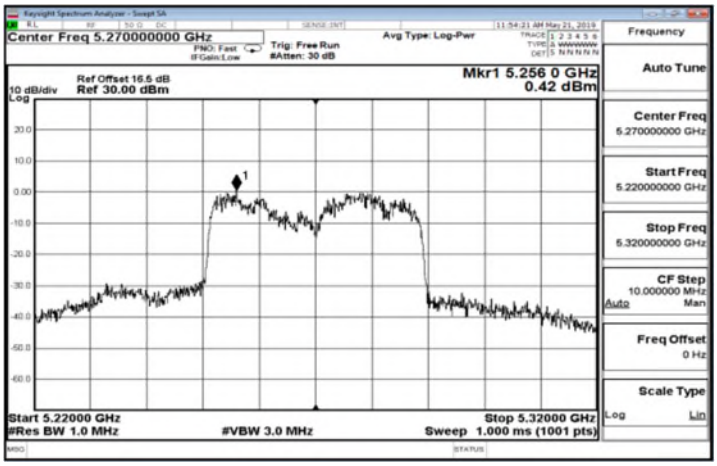

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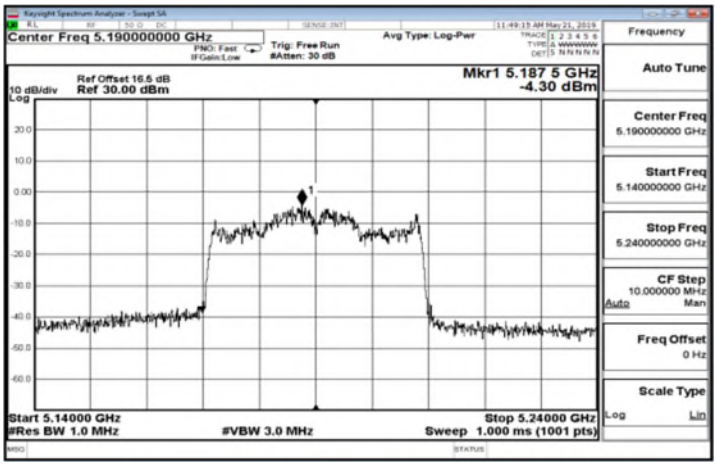
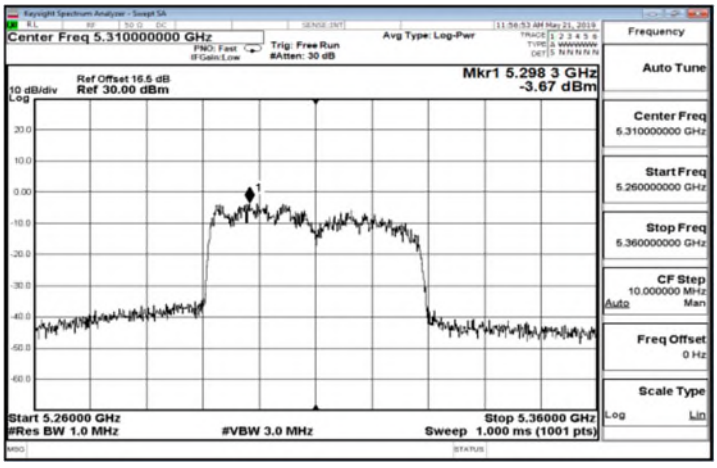
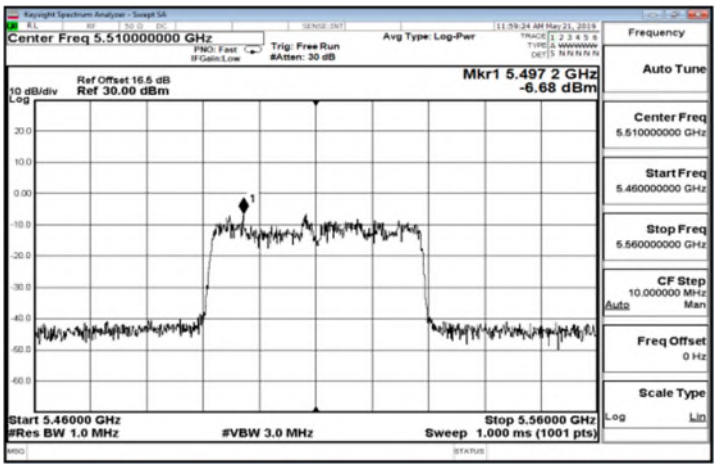


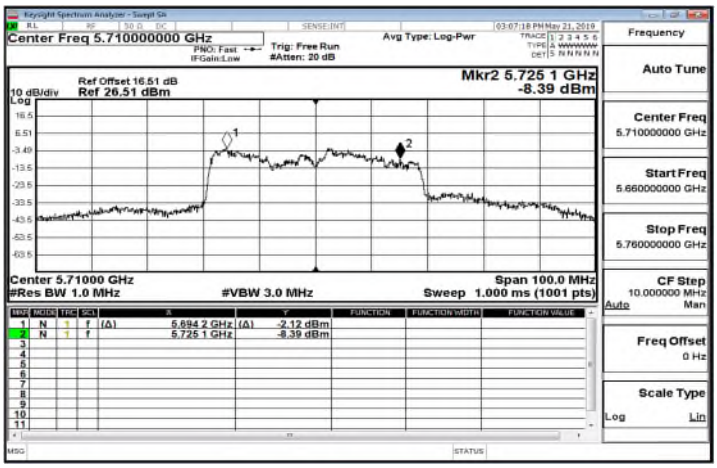
802.11n_40MHz_5310MHz



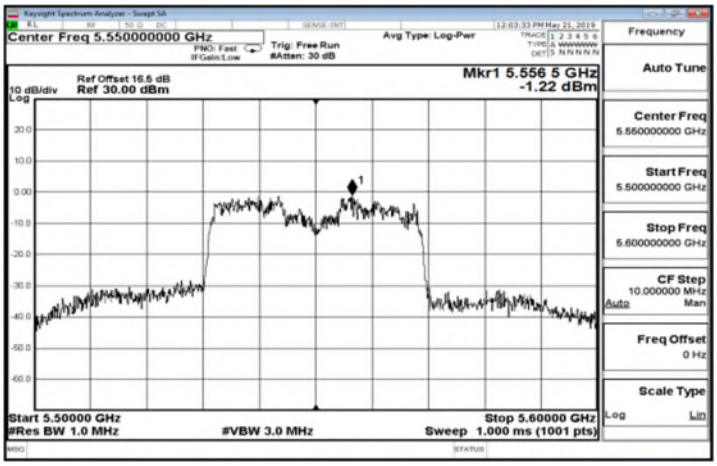
802.11n_40MHz_5510MHz



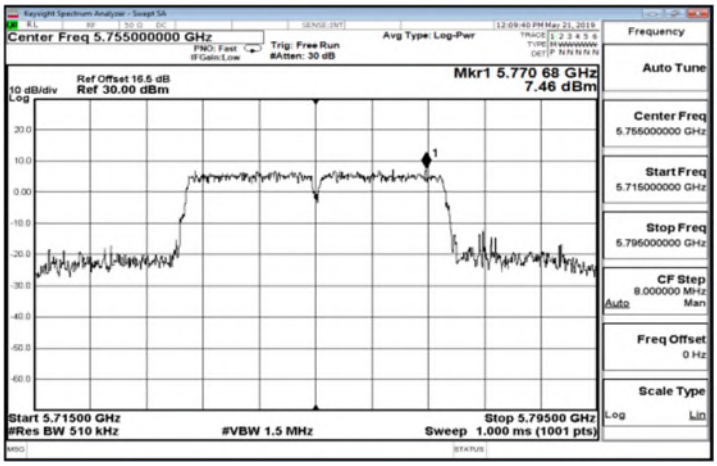
802.11n_40MHz_5710MHz



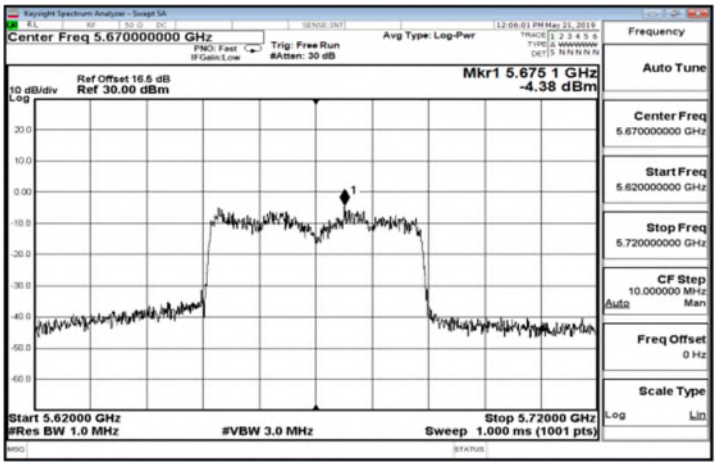
802.11n_40MHz_5550MHz



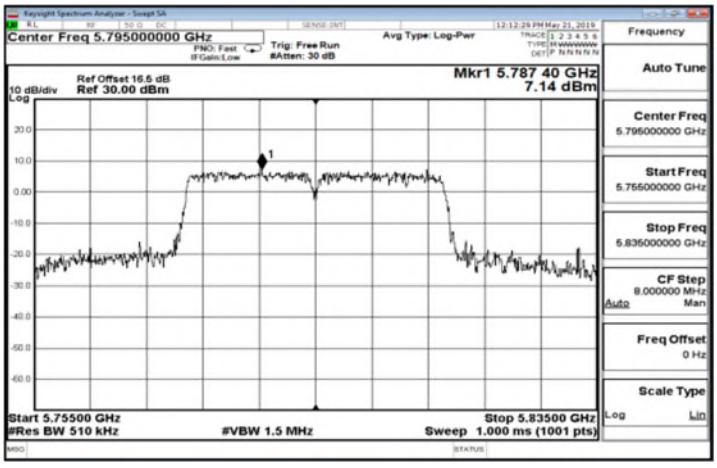
802.11n_40MHz_5755MHz



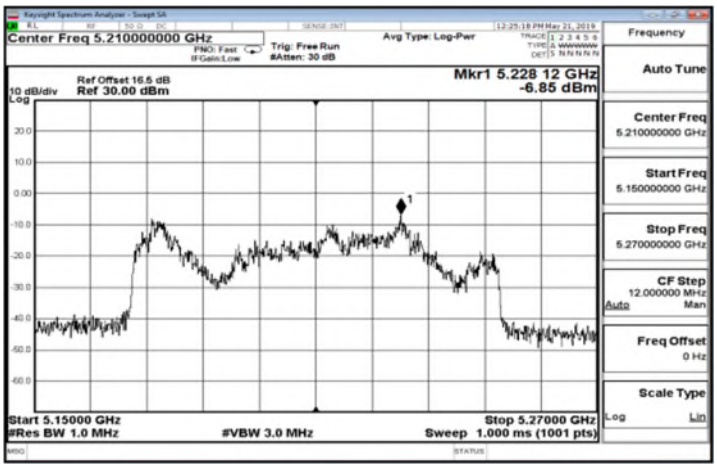
802.11n_40MHz_5670MHz



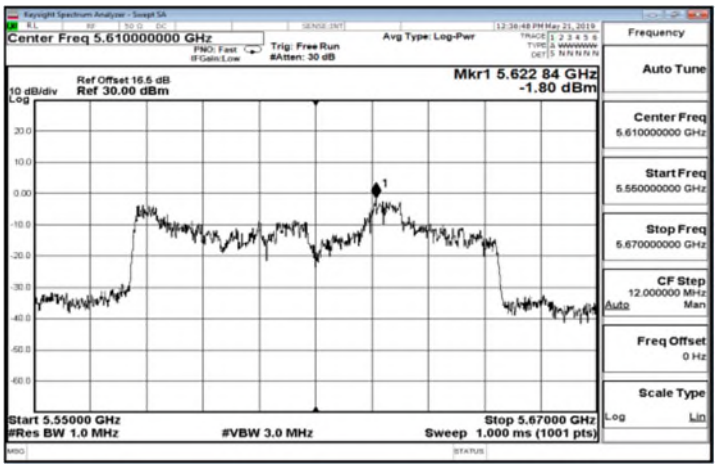
802.11n_40MHz_5795MHz



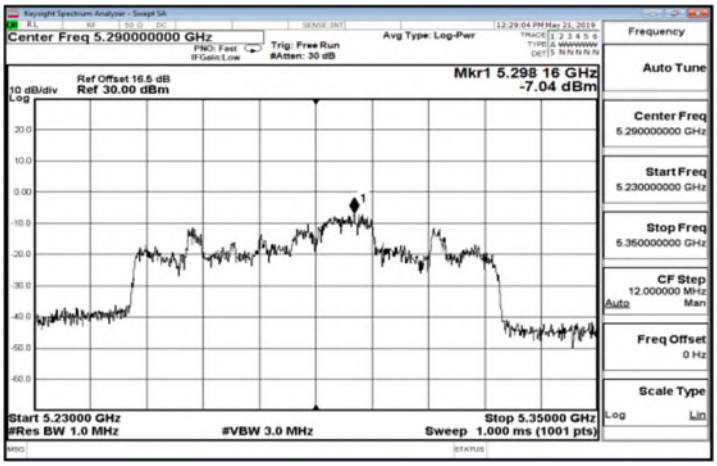
802.11ac_80MHz_5210MHz



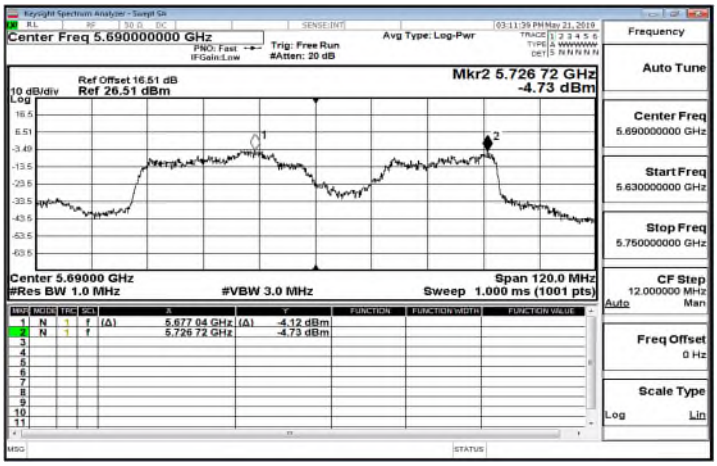
802.11ac_80MHz_5610MHz



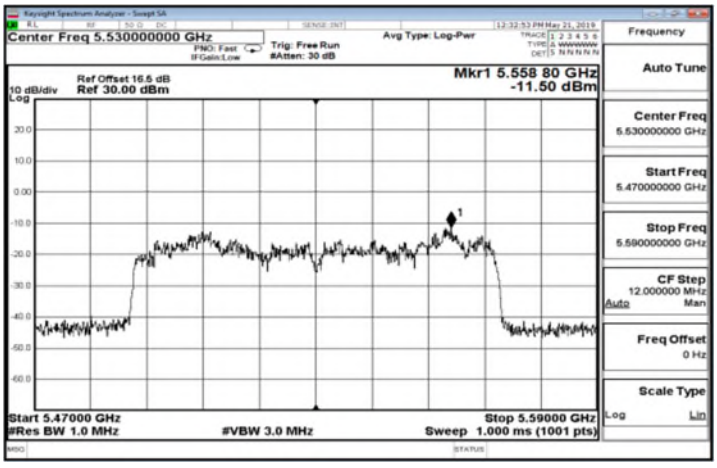
802.11ac_80MHz_5290MHz



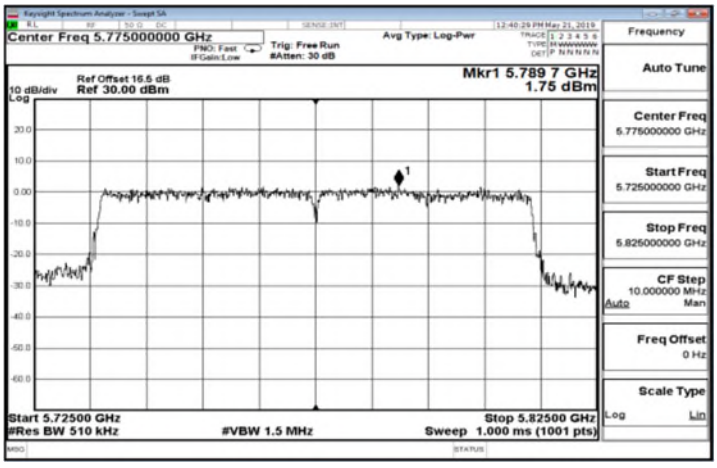
802.11ac_80MHz_5690MHz



802.11ac_80MHz_5530MHz



802.11ac_80MHz_5775MHz



11 UNDESIRABLE RADIATED EMISSION MEASUREMENT

11.1 Standard Applicable

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

1. For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

2. For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

APPLICABLE TO	LIMIT	
FCC KDB 789033 D02 General UNII Test Procedures New Rules	FIELD STRENGTH AT 3m	
	PK: 74 (dBμV/m)	AV 54 (dBμV/m)
APPLICABLE TO	**EIRP LIMIT**	**FIELD STRENGTH AT 3m**
15.407(b)(1) RSS-247 6.2.1.2	PK: -27 (dBm/MHz)	PK: 68.3 (dBμV/m)
15.407(b)(2) RSS-247 6.2.2.2		
15.407(b)(3) RSS-247 6.2.3.2		
15.407(b)(4)(i) RSS-247 6.2.4.2	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK:105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK:122.2 (dBμV/m) *4
*1 beyond 75 MHz or more above of the bandedge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

EIRP = ((E*d)^2) / 30, where E is the field in V/m, d is the measurement distance (3m), EIRP is the equivalent isotropically radiated power in Watts.

Unwanted spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

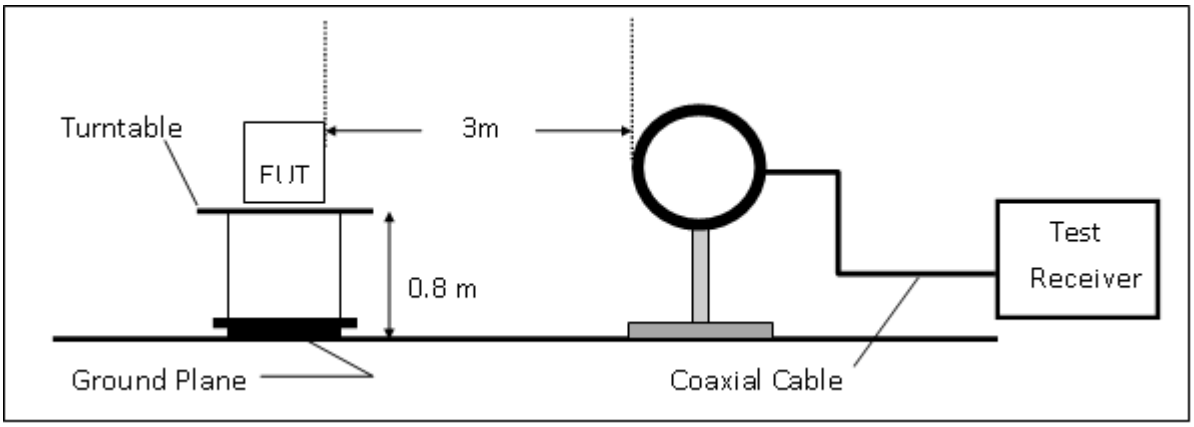
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (dBμV/m)

11.2 Measurement Equipment Used

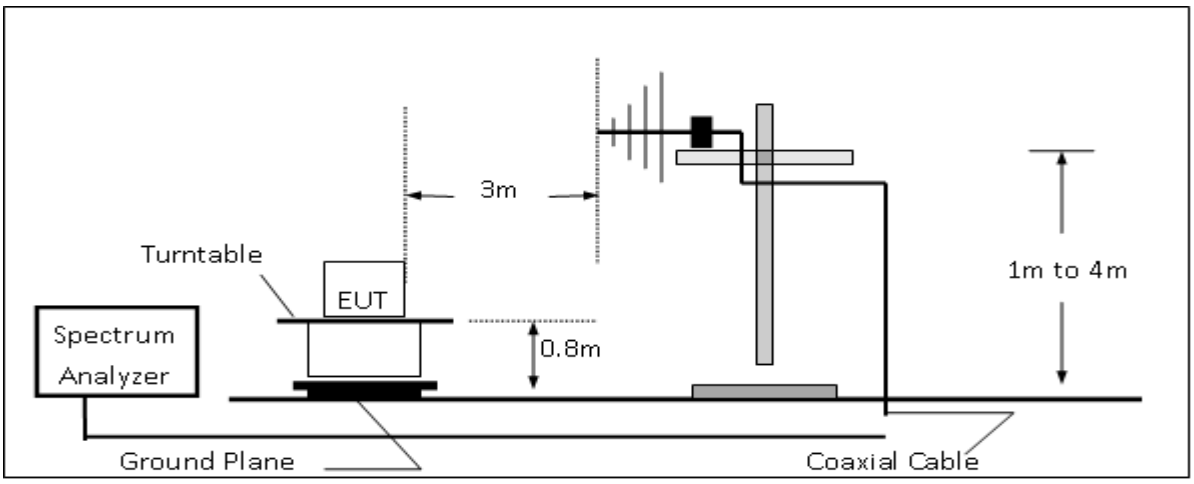
966A Chamber					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Bilog Antenna	Sunol Sciences	JB3	A030105	07/13/2018	07/12/2019
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	02/26/2019	02/25/2020
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/26/2019	02/25/2020
Digital Thermo-Hy-gro Meter	WISEWIND	1206	D07	01/30/2019	01/29/2020
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	08/20/2018	08/19/2019
High Pass Filter	WI	WHKX7.0/18G-8SS	45	02/26/2019	02/25/2020
Horn Antenna	ETS LINDGREN	3116	00026370	12/26/2018	12/25/2019
Loop Antenna	COM-POWER	AL-130	121051	03/22/2019	03/21/2020
Pre-Amplifier	EMEC	EM330	060609	02/26/2019	02/25/2020
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	02/26/2019	02/25/2020
Pre-Amplifier	HP	8449B	3008A00965	02/26/2019	02/25/2020
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	05/31/2018	05/30/2019
DC Power Supply	Agilent	E3640A	KR93300208	08/15/2018	08/14/2019
DC Power Supply	Agilent	E3640A	MY40000811	12/11/2018	12/10/2019
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 V6.11-20180413				

11.3 Test SET-UP

(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz