

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

FCC Applicant: Sharp Corporation, Mobile Communication B.U.
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739-0192, Japan

FCC Manufacturer: Sharp Corporation
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Product Name: Smart phone

Report Number: ER/2020/C0014

FCC ID APYHRO00293

FCC Rule Part: §15.407, Cat: U-NII

Issue Date: January 20, 2021

Date of Test: November 17, 2020 - December 16, 2020 (Original),
December 9, 2020 - January 14, 2021 (Spot check)

Date of EUT Received: November 17, 2020 (Original),
December 9, 2020 (Spot check)

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab. 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.

Approved By: _____



Jim Chang / Manager



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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2020/C0014	Rev.00	Original.	January 20, 2021	Revised By: Karen Huang

Note:

- 1、Test data is referenced from cross authorization(s)
Measurement results in the original test report **ER/2020/B0093** under FCC ID: APY-HRO00291 are fully leveraged in this test report with spot check on page 148-155 to demonstrate compliance.
- 2、Disclaimer
Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	Smart phone	
Hardware Version:	DVT	
Software Version:	N/A	
Power Supply:	3.85 Vdc from Rechargeable Li-polymer Battery	
Modulation type	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only	
Antenna Designation:	Inverted-F Antenna, 5150~5250MHz Gain: -2.20dBi 5250~5350MHz Gain: -2.20dBi 5470~5725MHz Gain: -2.40dBi 5725~5850MHz Gain: -5.10dBi	
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

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1.2 FCC worst power

Wi-Fi 802.11	Frequency Range(MHz)	Channels	Rated Power (Avg.) (dBm) (Worst case)	Modulation Technology
a	5150~5250	4	11.85	OFDM
	5250~5350	4	11.84	
	5470~5725	12	11.91	
	5725~5850	5	11.81	
n_HT ac_VHT 20M	5150~5250	4	HT: 11.92 (Worst Case)	OFDM
	5250~5350	4	HT: 11.82 (Worst Case)	
	5470~5725	12	HT: 11.91 (Worst Case)	
	5725~5850	5	HT: 11.74 (Worst Case)	
n_HT ac_VHT 40M	5150~5250	2	HT: 11.77 (Worst Case)	OFDM
	5250~5350	2	HT: 11.72 (Worst Case)	
	5470~5725	5	HT: 11.82 (Worst Case)	
	5725~5850	2	HT: 10.56 (Worst Case)	
ac_VHT 80M	5150~5250	1	11.92	OFDM
	5250~5350	1	11.96	
	5470~5725	2	11.98	
	5725~5850	1	11.65	

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1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

ANSI C63.10:2013

1.4 Test Facility

SGS Taiwan Ltd. Central RF Lab (TAF code 3702)

No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

FCC Designation number: TW0027

1.5 Special Accessories

There are no special accessories used while test was conducted.

1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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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 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 30 MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50 μ H/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 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.

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2.4 Measurement Results Explanation Example

2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

2.4.2 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.

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2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration



Fig. 2-3 Conducted (AC powerline) Emission Configuration



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

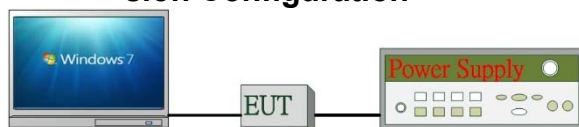


Table 2-1 Equipment Used in Tested System

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.	Notebook	Lenovo	L430	PK-126TN	N/A	N/A
3.	Notebook	Lenovo	X250	PC-06A4E7	N/A	N/A
4.	Adapter	Sharp	XN-2QC25	NA	N/A	N/A
5.	Headphone	Panasonic	RP-HJS150-K	NA	N/A	N/A
6.	DC Power Supply	Agilent	E3640A	MY40000811	N/A	N/A

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3 SUMMARY OF TEST RESULT

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	26 dB & 6dB Emission Bandwidth	Compliant
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.205 §15.209 §15.407(b)	Undesirable Radiated Emissions	Compliant
§15.407(c)	Transmission in case of Absence of Information	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.203 §15.407(a)	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 802.11a/n/ac operated in U-NII Bands

Operated band in 5150 MHz ~5250 MHz:

20 M		40 M		80 M	
CH	Freq (MHz)	CH	Freq (MHz)	CH	Freq (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

Operated band in 5250 MHz ~5350 MHz:

20 M		40 M		80 M	
CH	Freq (MHz)	CH	Freq (MHz)	CH	Freq (MHz)
52	5260	54	5270	58	5290
56	5280	62	5310		
60	5300				
64	5320				

Operated band in 5470 MHz ~5725 MHz:

20 M		40 M		80 M	
CH	Freq (MHz)	CH	Freq (MHz)	CH	Freq (MHz)
100	5500	102	5510	106	5530
104	5520	110	5550	122	5610
108	5540	118	5590	138	5690
112	5560	126	5630		
116	5580	134	5670		
120	5600	142	5710		
124	5620				
128	5640				
132	5660				
136	5680				
140	5700				
144	5720				

Operated band in 5745 MHz ~5850 MHz:

20 M		40 M		80 M	
CH	Freq (MHz)	CH	Freq (MHz)	CH	Freq (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				

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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 given UE is pre-scanned among below modes.

Modulation	Transmission Chain				Single Transmission Spatial	Multiple Transmission Spatial
<input checked="" type="checkbox"/> 802.11 a	<input checked="" type="checkbox"/> Ch0	<input type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input checked="" type="checkbox"/> 1TX	<input type="checkbox"/> 2TX
<input checked="" type="checkbox"/> 802.11 n	<input checked="" type="checkbox"/> Ch0	<input type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input checked="" type="checkbox"/> SISO	<input type="checkbox"/> MIMO
<input checked="" type="checkbox"/> 802.11 ac	<input checked="" type="checkbox"/> Ch0	<input type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input checked="" type="checkbox"/> SISO	<input type="checkbox"/> 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.

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4.2.1 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	44	OFDM	6	ch0
	5260~5320	52 to 64	60			
	5500~5720	100 to 144	116			
	5745~5825	149 to 165	157			

Note:

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.

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
	5260~5320	52 to 64	52,60,64			
	5500~5720	100 to 144	100,116,140,144			
	5745~5825	149 to 165	149,157,165			
802.11n_HT20	5180~5240	36 to 48	36,44,48	OFDM	MCS0	ch0
	5260~5320	52 to 64	52,60,64			
	5500~5720	100 to 144	100,116,140,144			
	5745~5825	149 to 165	149,157,165			
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS0	ch0
	5270~5310	54 to 62	54,62			
	5510~5670	102 to 142	102,110,134,142			
	5755~5795	151 to 159	151,159			
802.11ac_VHT80	5210	42	42	OFDM	MCS0	ch0
	5290	58	58			
	5530~5610	106 to 138	106,122,138			
	5775	155	155			

For spot check,

RADIATED EMISSION TEST (ABOVE 1 GHz)

MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5260~5320	52 to 64	52	OFDM	6	ch0
	5745~5825	149 to 165	157			
802.11n_HT20	5180~5240	36 to 48	44	OFDM	MCS0	ch0
802.11ac_VHT80	5530~5610	106 to 138	138	OFDM	MCS0	ch0

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4.2.2 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
	5260~5320	52 to 64	52,60,64			
	5500~5720	100 to 144	100,116,140,144			
	5745~5825	149 to 165	149,157,165			
802.11n_HT20	5180~5240	36 to 48	36,44,48	OFDM	MCS0	ch0
	5260~5320	52 to 64	52,60,64			
	5500~5720	100 to 144	100,116,140,144			
	5745~5825	149 to 165	149,157,165			
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS0	ch0
	5270~5310	54 to 62	54,62			
	5510~5670	102 to 142	102,110,134,142			
	5755~5795	151 to 159	151,159			
802.11ac_VHT80	5210	42	42	OFDM	MCS0	ch0
	5290	58	58			
	5530~5610	106 to 138	106,122,138			
	5775	155	155			

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26dB & 6dB Emission Bandwidth	+/- 123.36 Hz
The Maximum Output Power Measurement	+/- 0.96 dB
Peak Power Spectral Density Measurement	+/- 1.67 dB
Frequency Stability	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

Radiated Spurious Emission Measurement Uncertainty	
Polarization: Vertical	9kHz~30MHz: +2.3dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB
Polarization: Horizontal	9kHz~30MHz: +2.3dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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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

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI 7	100759	07/13/2020	07/12/2021
LISN	SCHWARZBECK	NSLK 8127	8127-465	04/09/2020	04/08/2021
Coaxial Cables	N/A	Coaxial Cable	161207	12/07/2019	12/06/2020
Test Software	audix	e3	Ver. 6.11-20180413	N.C.R	N.C.R

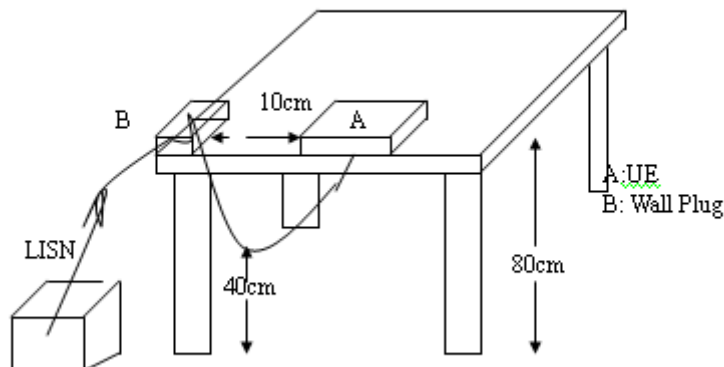
6.3 EUT Setup

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.

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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.

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AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number :ER-2020-B0093

Test Site :Conduction 6F

Test Mode :WLAN 5G

Test Date :2020-12-05

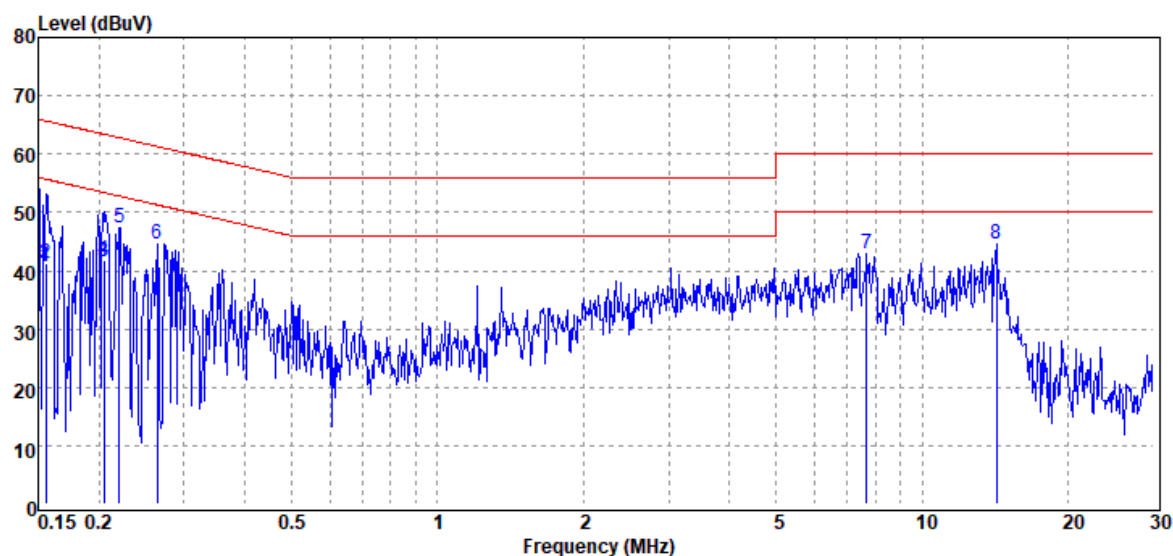
Power :AC 120V/60Hz

Temp./Humi. :23.7/56

Probe :L

Engineer :Neo

Note :



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.16	Average	38.47	2.14	40.61	55.69	-15.08
0.16	QP	39.14	2.14	41.28	65.69	-24.41
0.21	Average	39.27	2.14	41.41	53.40	-11.99
0.21	QP	39.68	2.14	41.82	63.40	-21.58
0.22	Peak	45.20	2.14	47.34	62.79	-15.45
0.26	Peak	42.44	2.14	44.58	61.29	-16.71
7.69	Peak	40.27	2.72	42.99	60.00	-17.01
14.21	Peak	41.49	2.96	44.45	60.00	-15.55

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Report Number :ER-2020-B0093

Test Mode :WLAN 5G

Power :AC 120V/60Hz

Probe :N

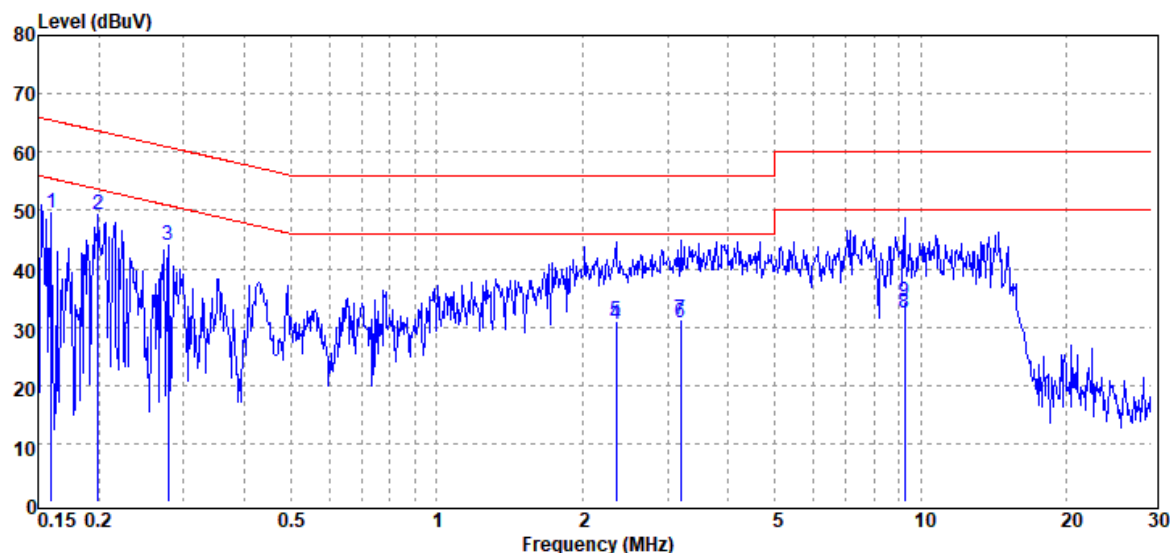
Note: :

Test Site :Conduction 6F

Test Date :2020-12-05

Temp./Humi. :23.7/56

Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.16	Peak	47.40	2.21	49.61	65.47	-15.86
0.20	Peak	47.06	2.21	49.27	63.62	-14.35
0.28	Peak	41.77	2.21	43.98	60.85	-16.87
2.35	Average	28.02	2.32	30.34	46.00	-15.66
2.35	QP	28.67	2.32	30.99	56.00	-25.01
3.19	Average	28.40	2.37	30.77	46.00	-15.23
3.19	QP	29.03	2.37	31.40	56.00	-24.60
9.25	Average	29.85	2.67	32.52	50.00	-17.48
9.25	QP	31.77	2.67	34.44	60.00	-25.56

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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.

7.1 Measurement Procedure:

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

Duty Cycle:

Mode	Duty Cycle (%) =Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11a	98.00	0.09	0.49	0.01
802.11n_20	98.00	0.09	0.53	0.01
802.11n_40	96.00	0.18	1.08	2.00
802.11ac_80	93.00	0.32	2.19	3.00

Duty Cycle Factor: $10 * \log(1/0.98) = 0.09$

Duty Cycle Factor: $10 * \log(1/0.98) = 0.09$

Duty Cycle Factor: $10 * \log(1/0.96) = 0.18$

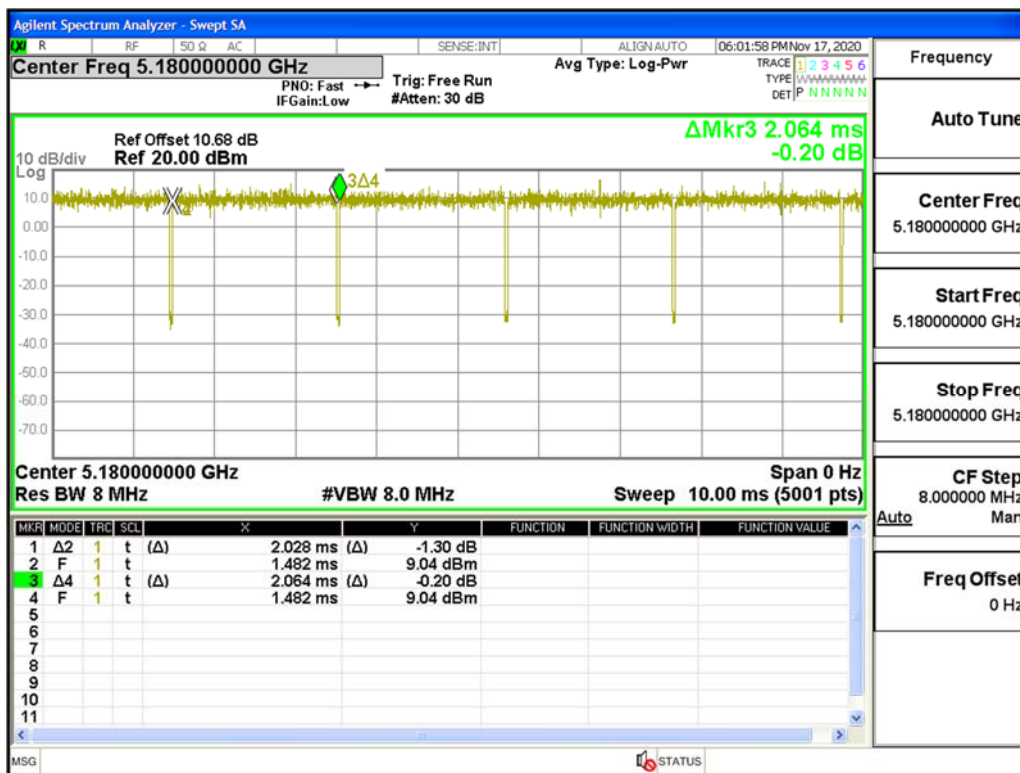
Duty Cycle Factor: $10 * \log(1/0.93) = 0.32$

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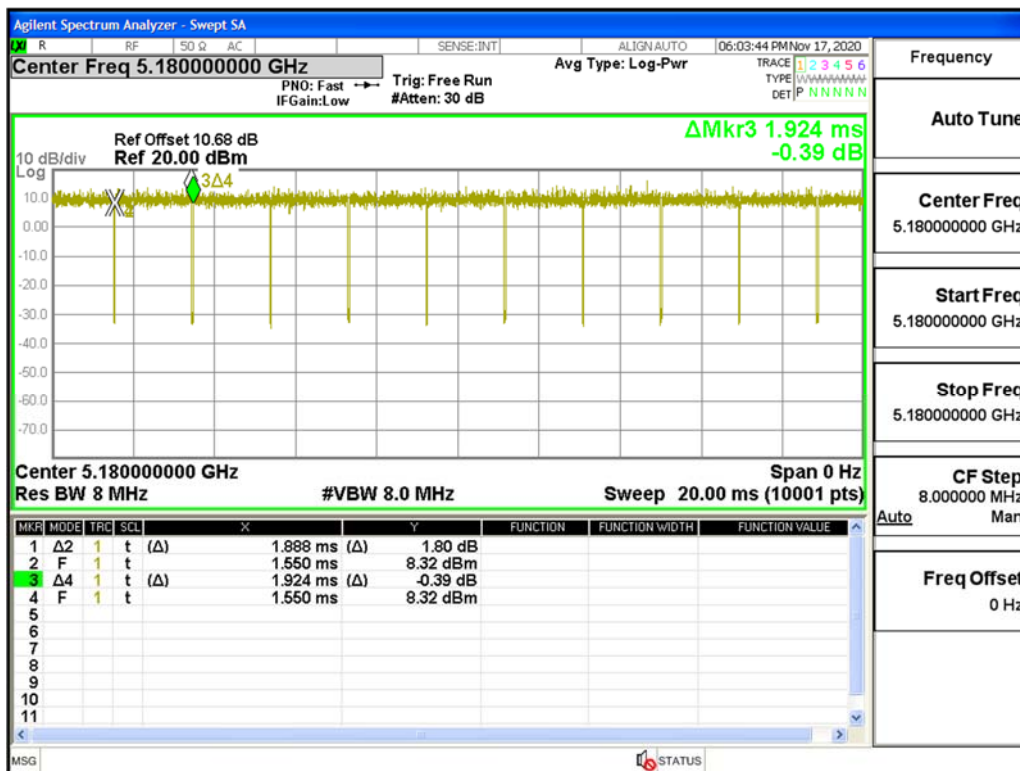
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7.2 DUTY CYCLE TEST SIGNAL MEASUREMENT RESULT

802.11a



802.11n HT20

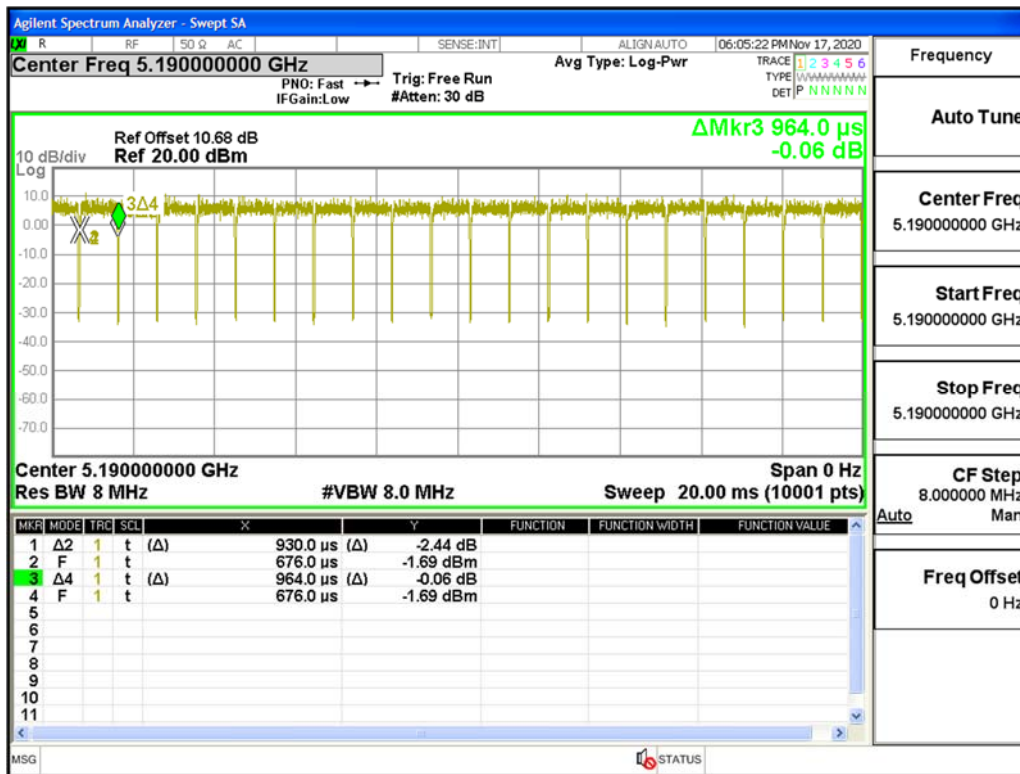


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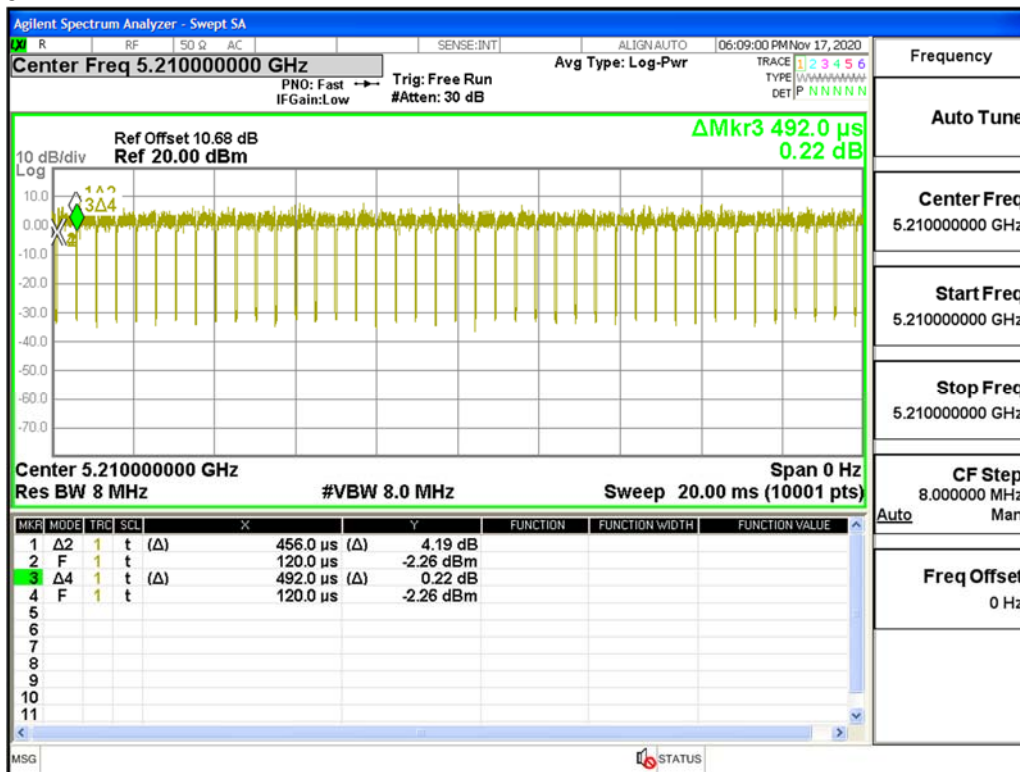
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802.11n HT 40



802.11 ac VHT 80



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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.
 - 3.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.
 - 3.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 frequency of interest measured was complete.

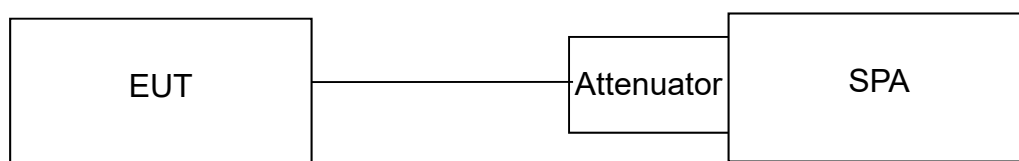
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8.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
DC Power Supply	Agilent	E3640A	MY40000811	12/23/2019	12/22/2020
EXM Spectrum Analyzer	KEYSIGHT	N9010B	MY59071571	06/27/2020	06/26/2021
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2020	01/01/2021
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2020	01/01/2021

8.4 Test Set-up



8.5 Measurement Result

8.5.1 FCC 26dB Bandwidth

802.11a_Ch0

802.11n_HT20_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	22.52	13.530	5180	22.98	13.610
5220	21.81	13.390	5220	22.74	13.570
5240	21.91	13.410	5240	23.00	13.620
5260	21.78	13.380	5260	23.09	13.630
5300	21.97	13.420	5300	22.89	13.600
5320	21.72	13.370	5320	22.67	13.550
5500	21.87	13.400	5500	22.94	13.610
5580	21.89	13.400	5580	22.85	13.590
5700	22.25	13.470	5700	22.58	13.540
5720	21.99	13.420	5720	22.73	13.570

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802.11n_HT40_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)	802.11ac_VHT80_Ch0		
5190	42.40	16.270	Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5230	42.74	16.310			
5270	42.40	16.270			
5310	41.99	16.230	5210	85.40	19.310
5510	41.91	16.220	5290	84.46	19.270
5550	42.43	16.280	5530	85.74	19.330
5670	42.15	16.250	5610	85.21	19.300
5710	42.44	16.280	5690	85.11	19.300

8.5.2 6dB Bandwidth (5725 MHz~ 5850 MHz) measure with Peak detector for FCC

802.11a_Ch0

802.11n_HT20_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.39	12.150	5745	17.62	12.460
5785	16.40	12.150	5785	17.63	12.460
5825	16.39	12.150	5825	17.64	12.460

802.11n_HT40_Ch0

802.11ac_VHT80_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.39	15.610			
5795	36.40	15.610	5775	76.34	18.830

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8.5.1 26dB BW Verification for DFS Function

802.11a_Ch0			802.11n_HT20_Ch0		
Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)	Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5240	5248.35	< 5250	5240	5248.94	< 5250
5745	5736.74	> 5725	5745	5736.13	> 5725

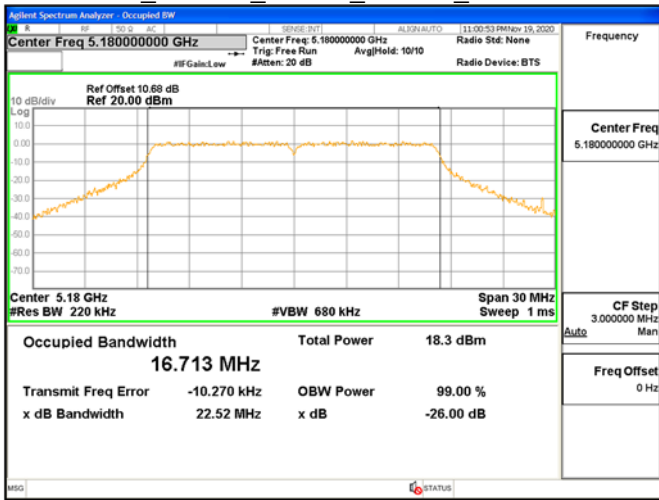
802.11n_HT40_Ch0			802.11ac_VHT80_Ch0		
Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)	Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5230	5248.24	< 5250	5210	5248.06	< 5250
5755	5736.86	> 5725	5775	5737.15	> 5725

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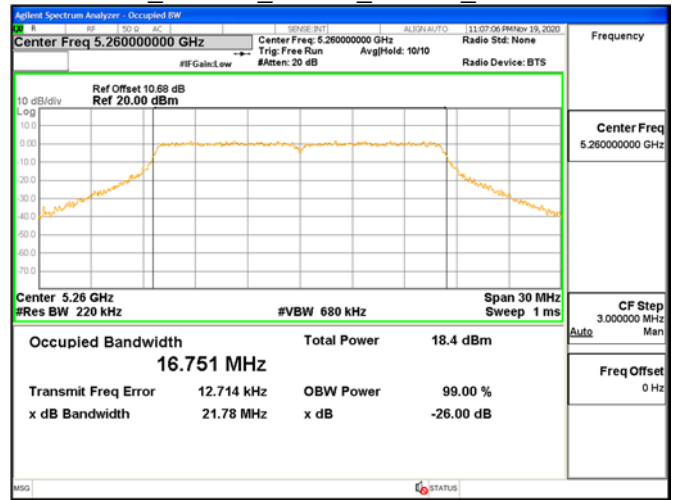
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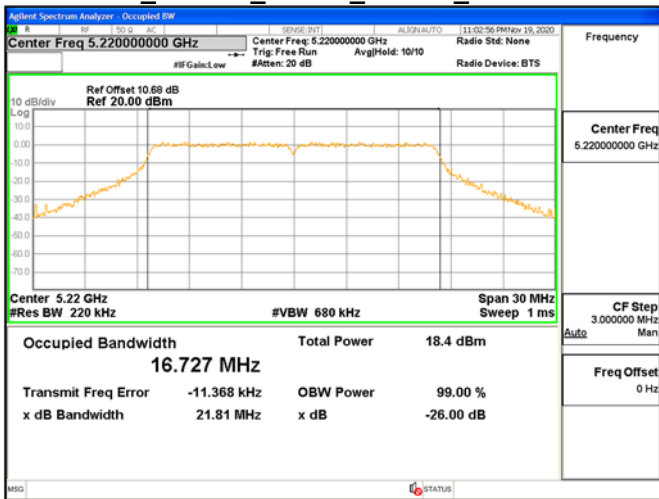
FCC 802.11a_20MHz_Chain0_5180MHz



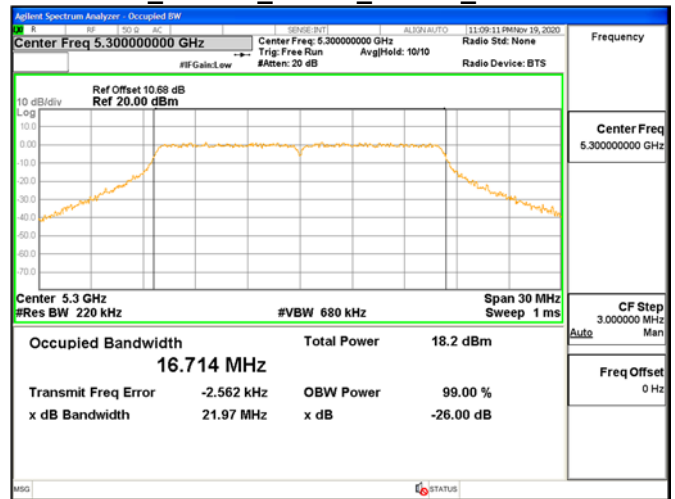
FCC 802.11a_20MHz_Chain0_5260MHz



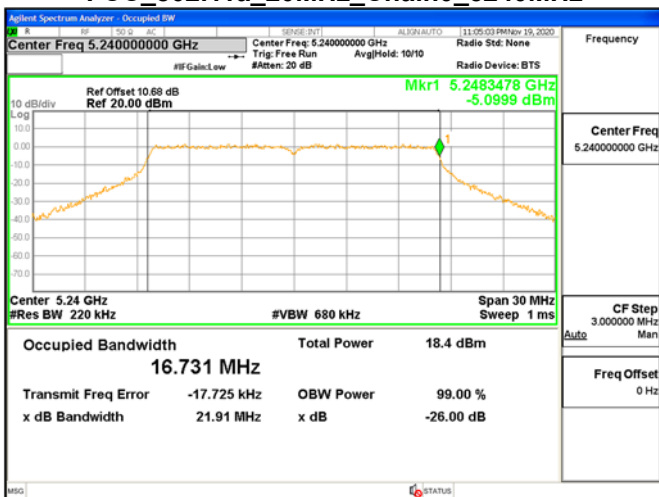
FCC 802.11a_20MHz_Chain0_5220MHz



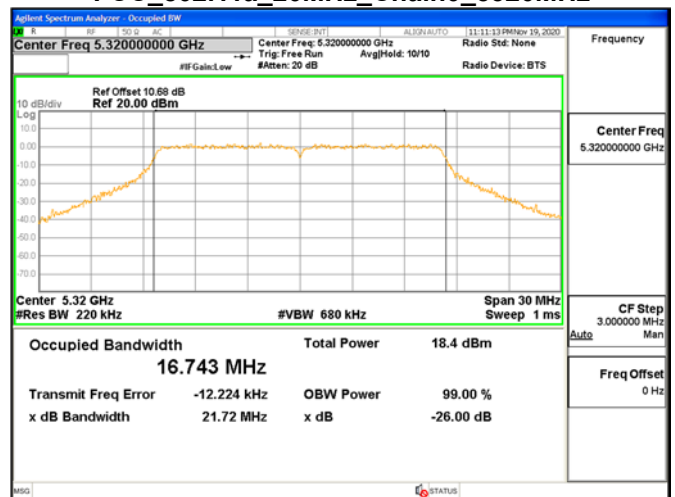
FCC 802.11a_20MHz_Chain0_5300MHz



FCC 802.11a_20MHz_Chain0_5240MHz



FCC 802.11a_20MHz_Chain0_5320MHz

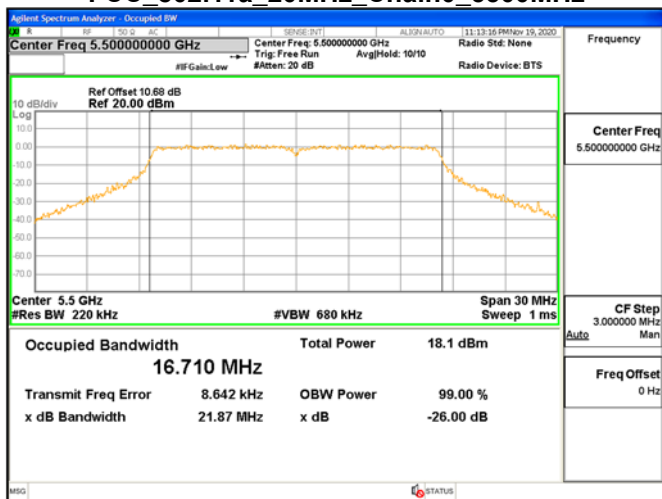


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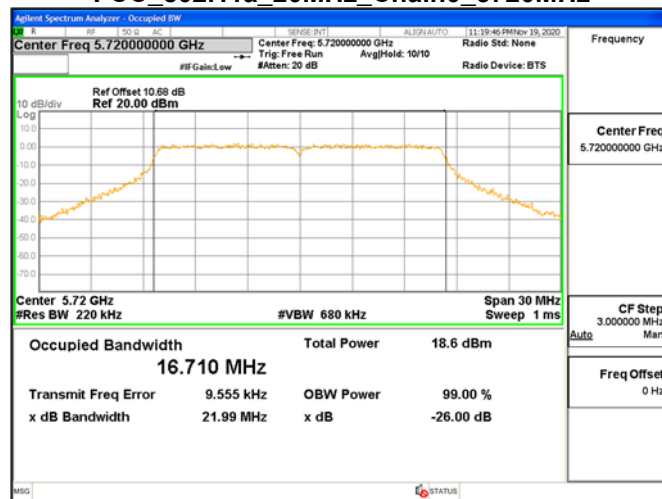
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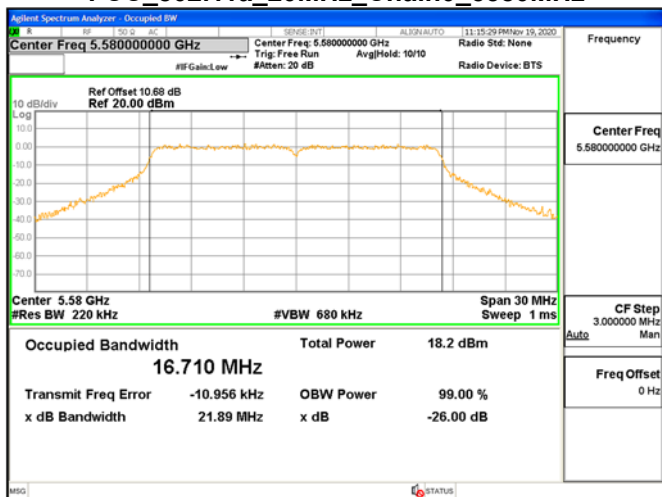
FCC 802.11a_20MHz_Chain0_5500MHz



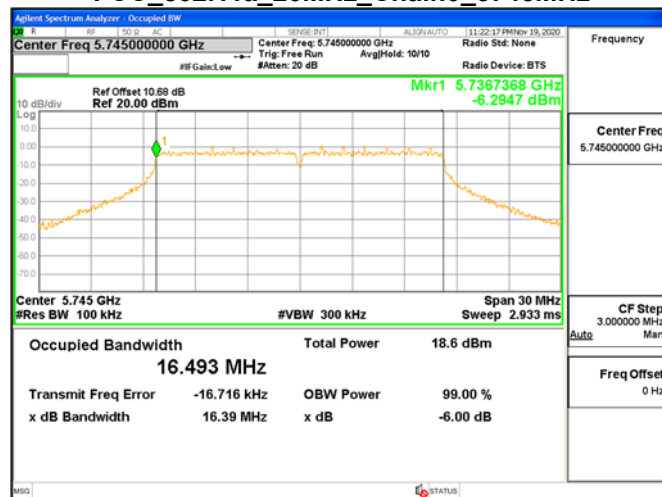
FCC 802.11a_20MHz_Chain0_5720MHz



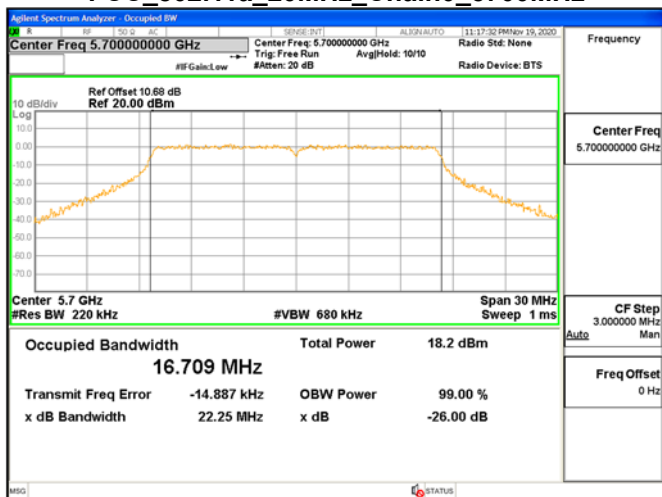
FCC 802.11a_20MHz_Chain0_5580MHz



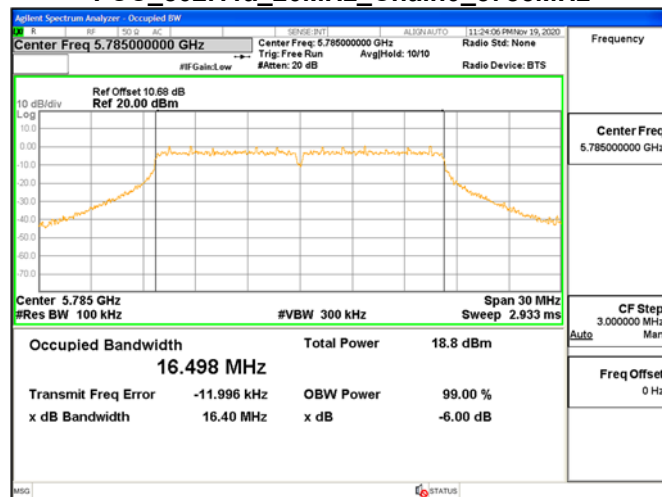
FCC 802.11a_20MHz_Chain0_5745MHz



FCC 802.11a_20MHz_Chain0_5700MHz



FCC 802.11a_20MHz_Chain0_5785MHz

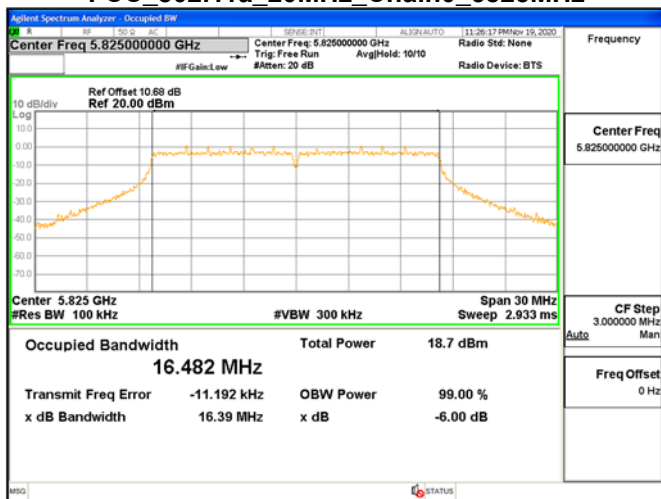


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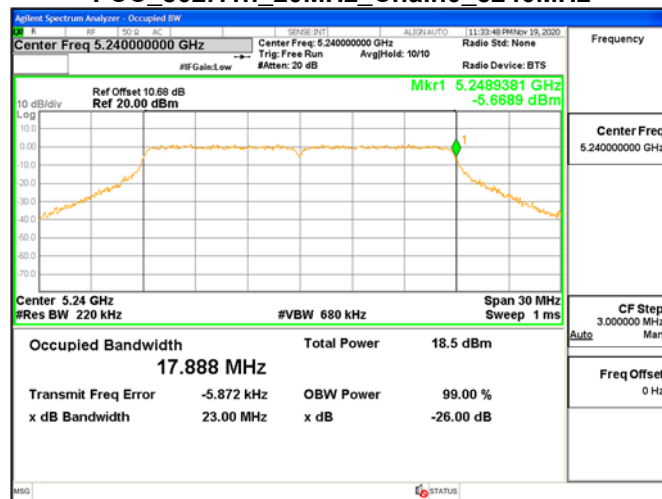
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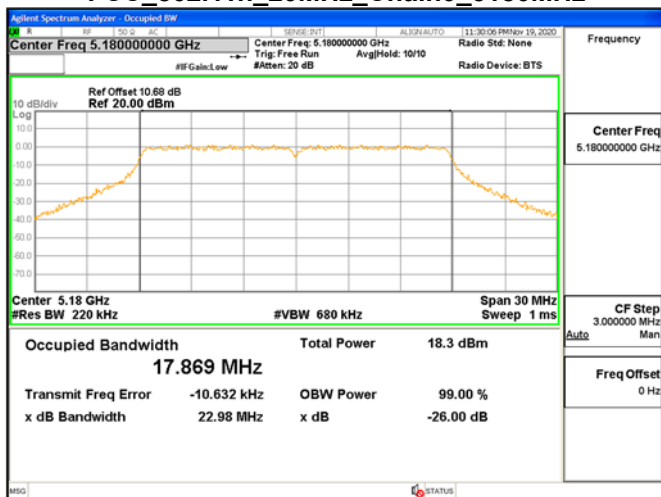
FCC 802.11a_20MHz_Chain0_5825MHz



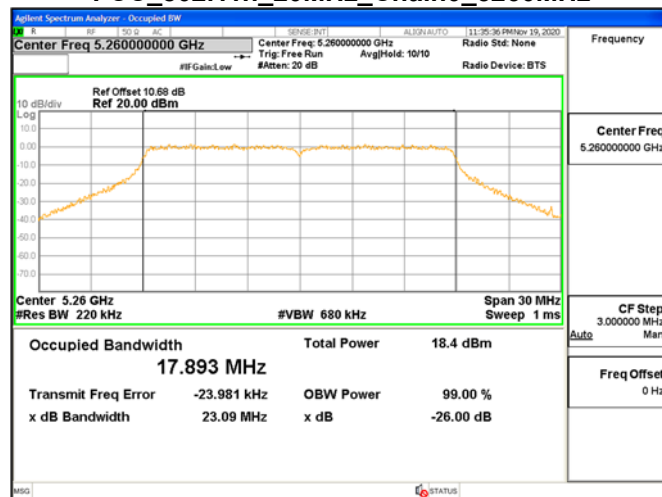
FCC 802.11n_20MHz_Chain0_5240MHz



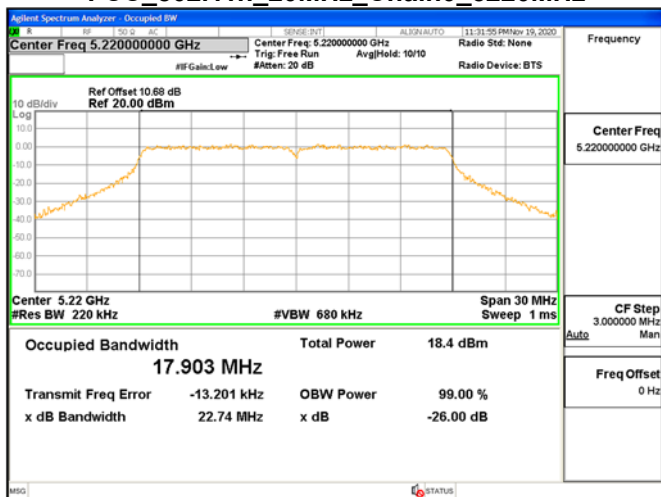
FCC 802.11n_20MHz_Chain0_5180MHz



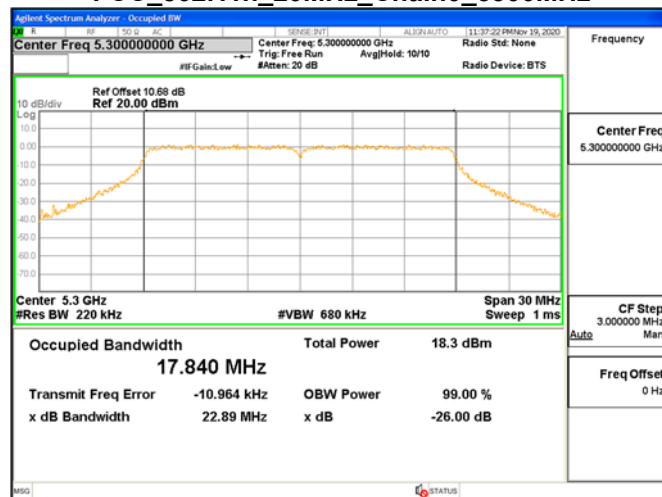
FCC 802.11n_20MHz_Chain0_5260MHz



FCC 802.11n_20MHz_Chain0_5220MHz



FCC 802.11n_20MHz_Chain0_5300MHz

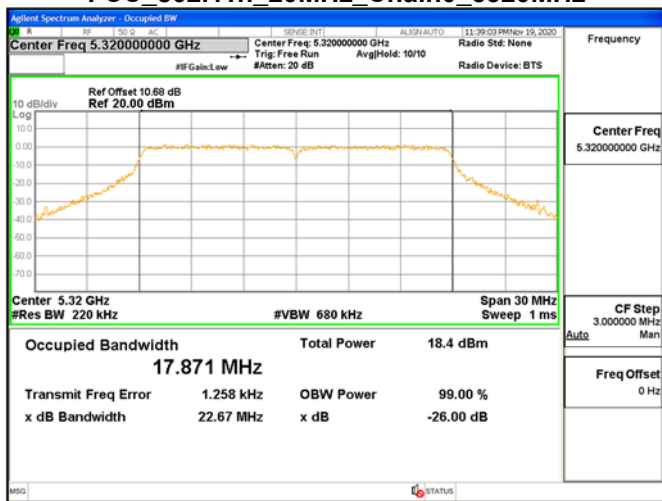


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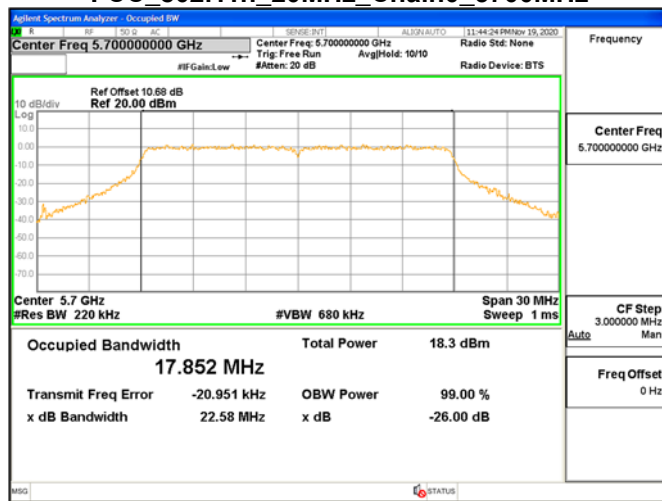
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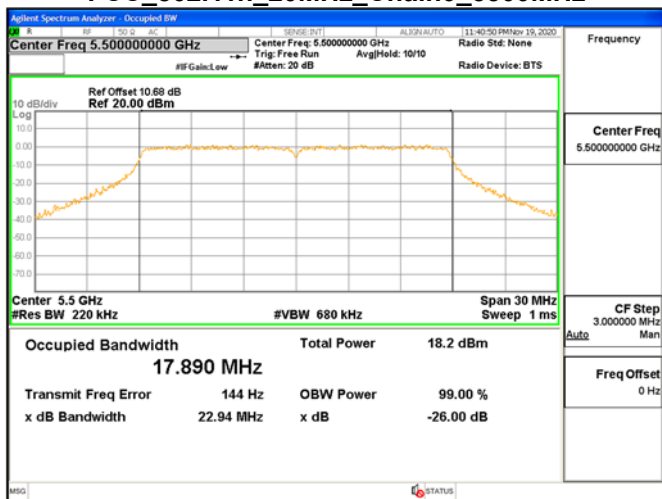
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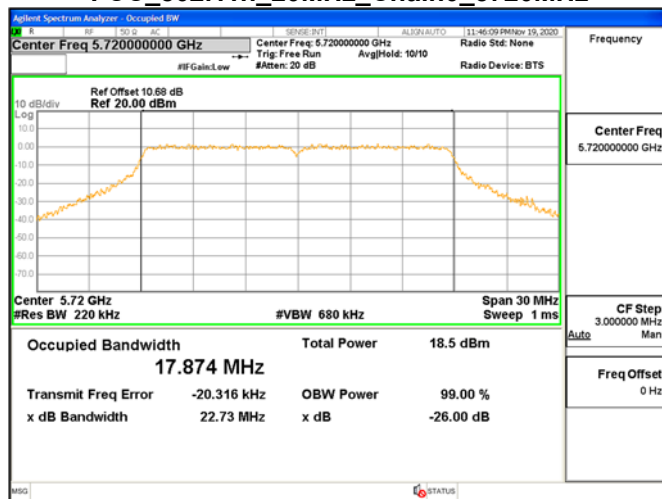
FCC 802.11n_20MHz_Chain0_5700MHz



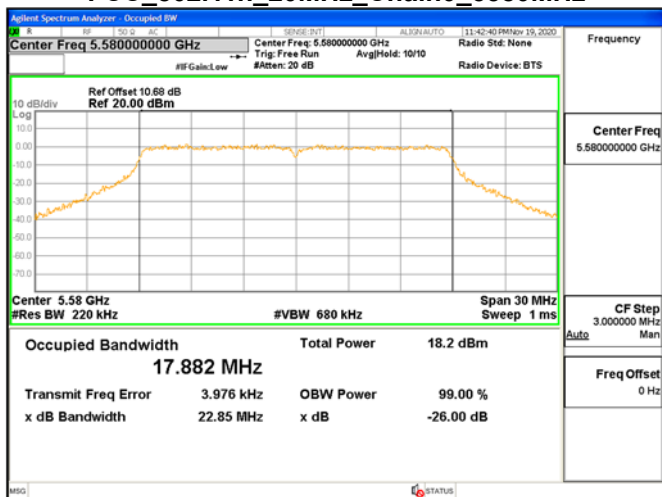
FCC 802.11n_20MHz_Chain0_5500MHz



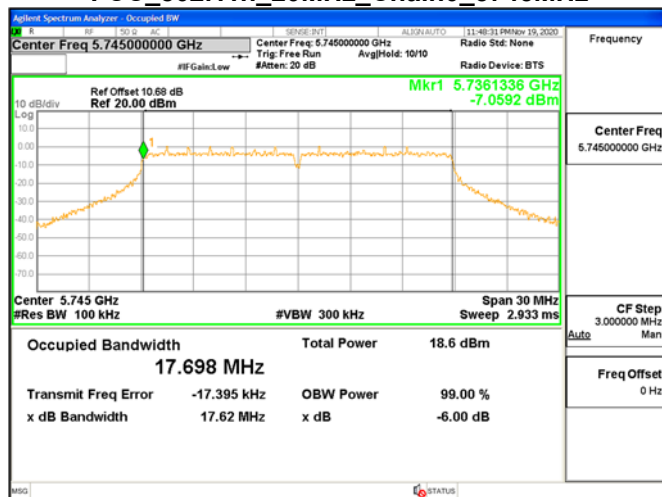
FCC 802.11n_20MHz_Chain0_5720MHz



FCC 802.11n_20MHz_Chain0_5580MHz



FCC 802.11n_20MHz_Chain0_5745MHz

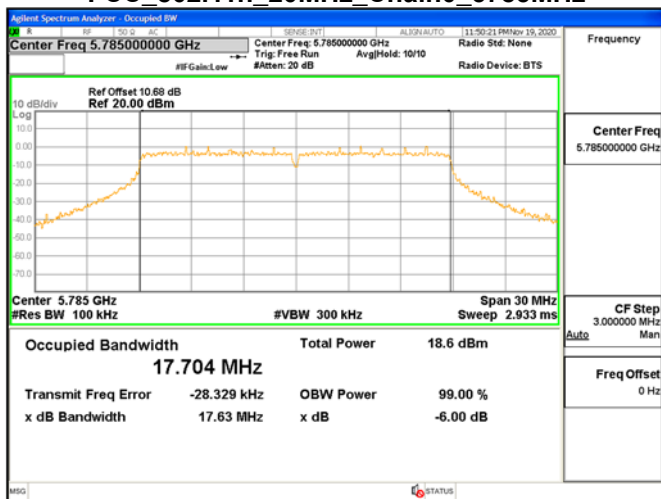


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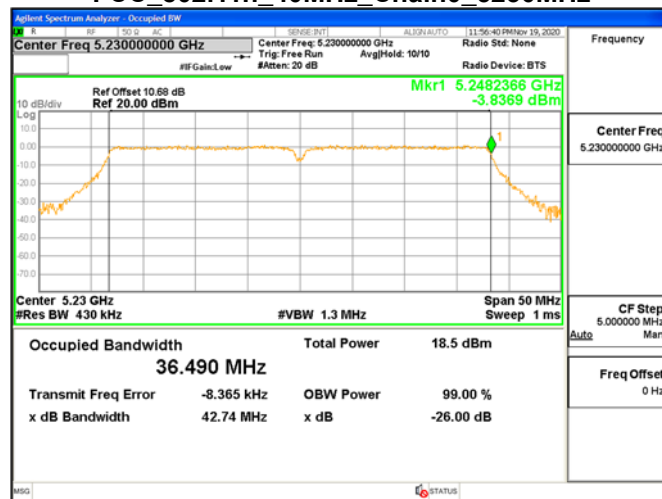
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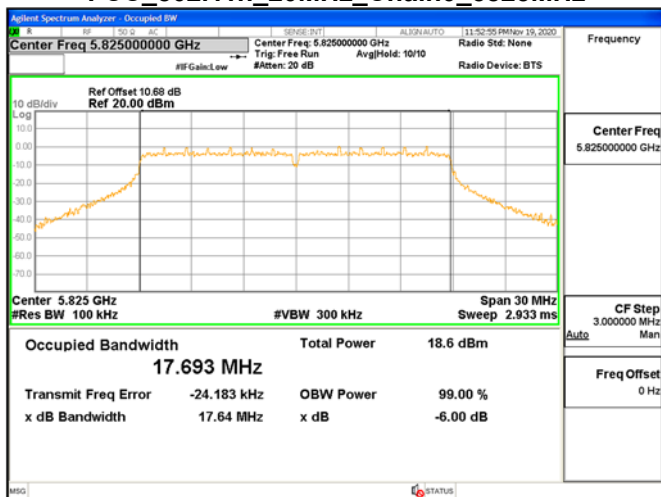
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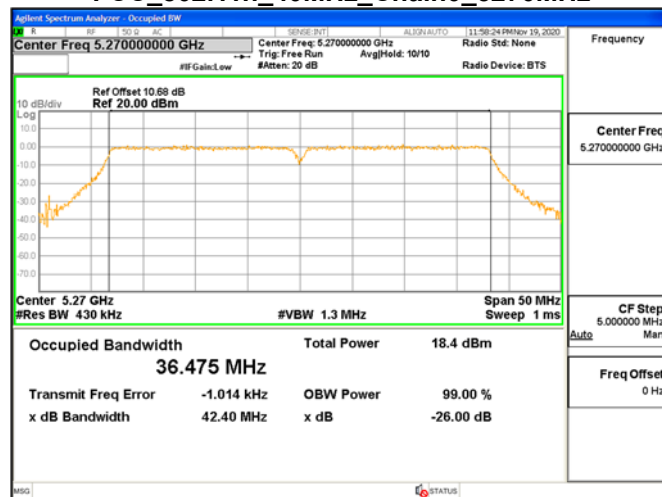
FCC 802.11n_40MHz_Chain0_5230MHz



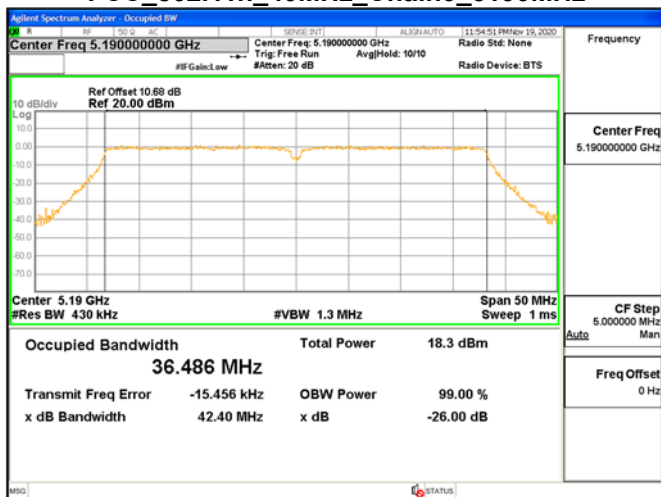
FCC 802.11n_20MHz_Chain0_5825MHz



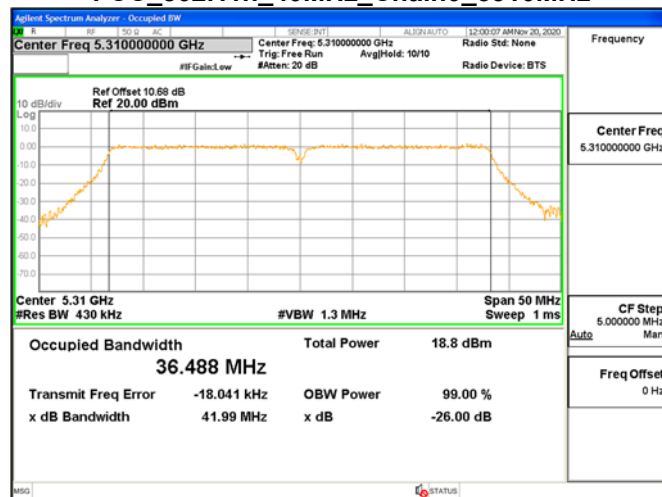
FCC 802.11n_40MHz_Chain0_5270MHz



FCC 802.11n_40MHz_Chain0_5190MHz



FCC 802.11n_40MHz_Chain0_5310MHz

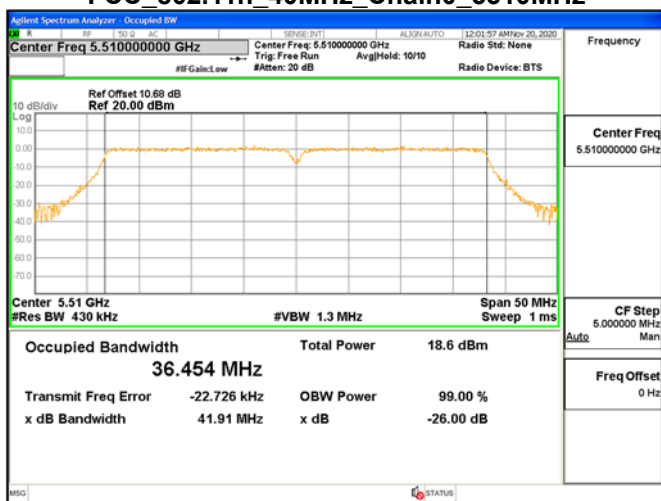


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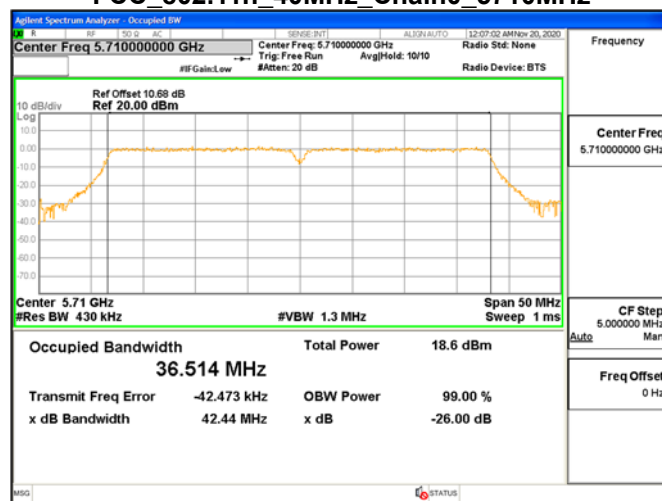
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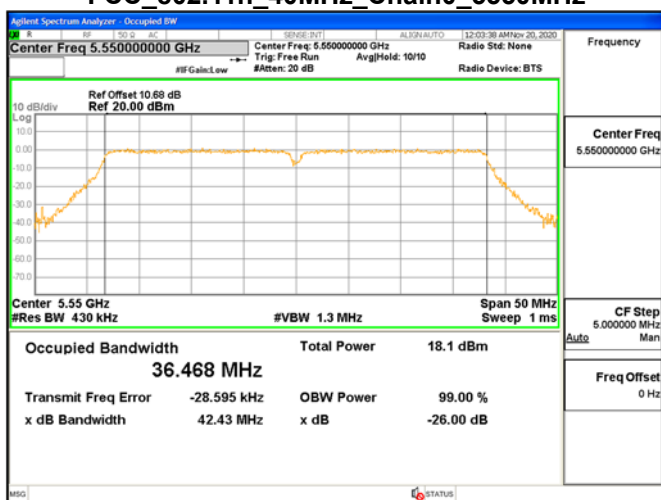
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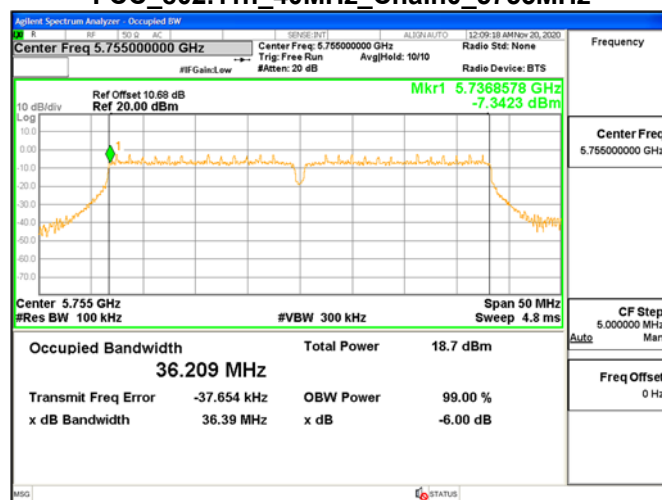
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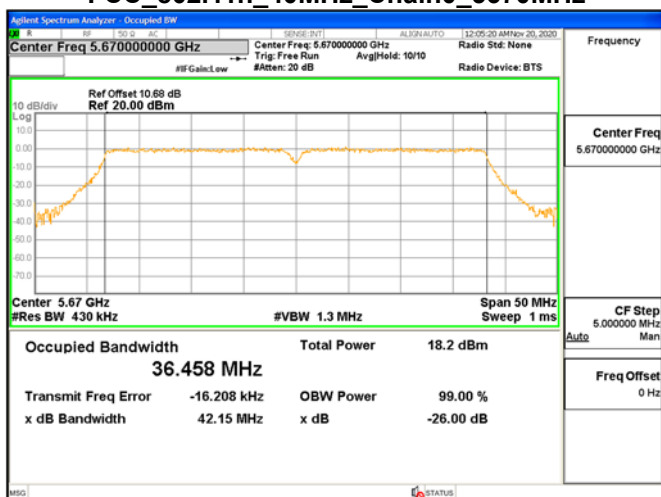
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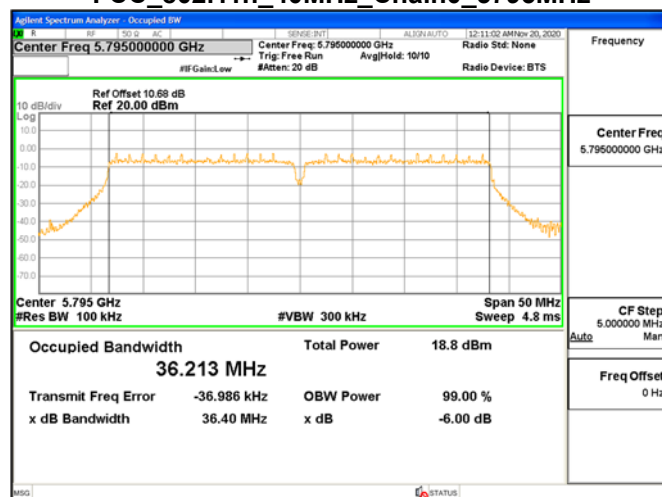
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FCC 802.11n_40MHz_Chain0_5670MHz



FCC 802.11n_40MHz_Chain0_5795MHz

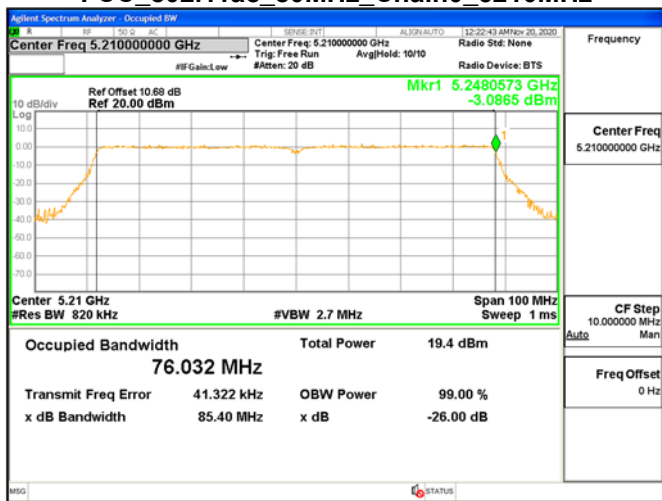


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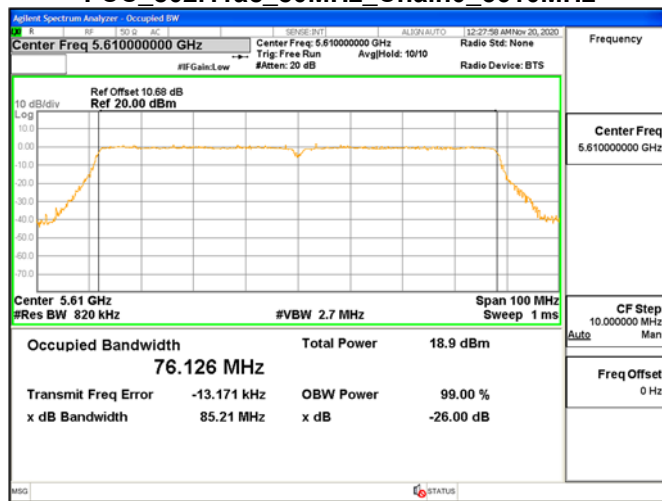
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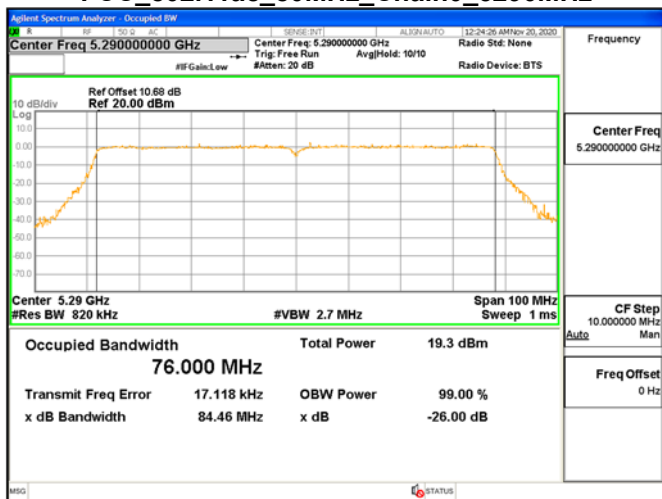
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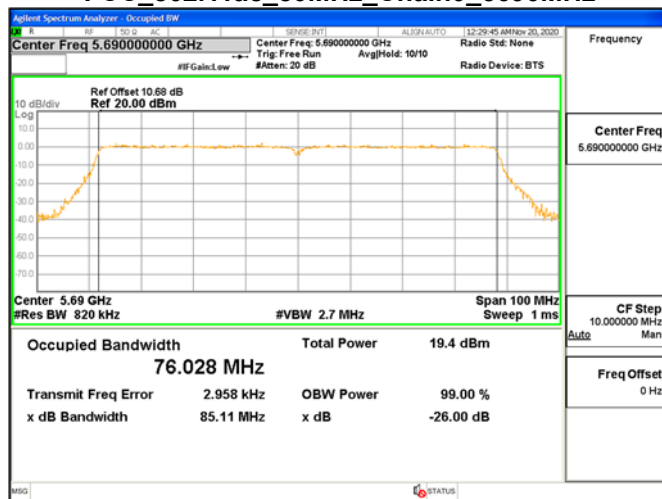
FCC 802.11ac_80MHz_Chain0_5610MHz



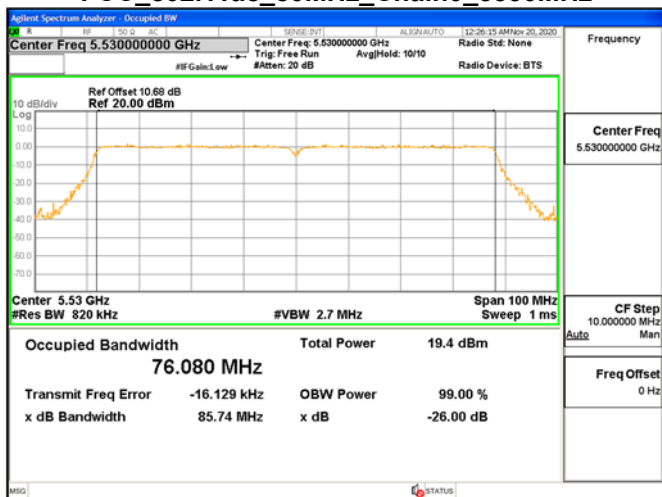
FCC 802.11ac_80MHz_Chain0_5290MHz



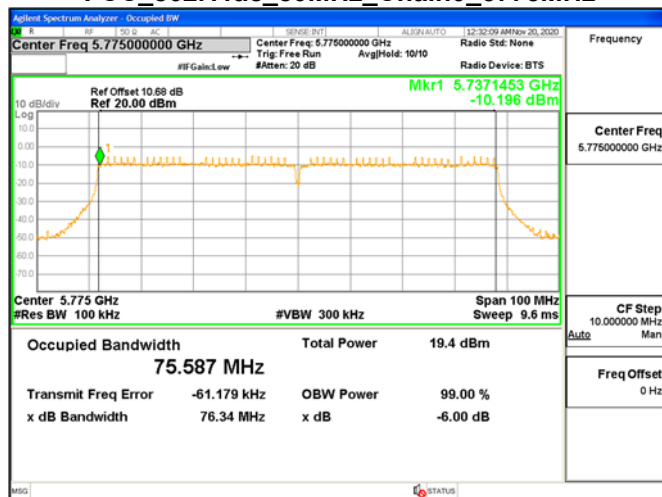
FCC 802.11ac_80MHz_Chain0_5690MHz



FCC 802.11ac_80MHz_Chain0_5530MHz



FCC 802.11ac_80MHz_Chain0_5775MHz



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9 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

FCC

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1		Access Point (Master device)	1 Watt(30dBm)
		Fixed point-to-point Access Ponit	1 Watt(30dBm)
	√	Mobile and portable client 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.			

The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

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

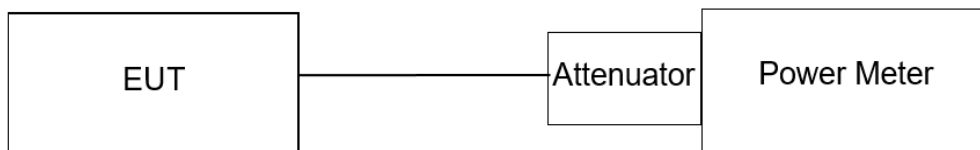
SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Meter	Anritsu	ML2496A	1804001	02/20/2020	02/19/2021
Power Sensor	Anritsu	MA2411B	1726104	02/20/2020	02/19/2021
Power Sensor	Anritsu	MA2411B	1726107	02/20/2020	02/19/2021
DC Power Supply	Agilent	E3640A	MY40000811	12/23/2019	12/22/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2020	01/01/2021

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9.4 Test Set-up



9.5 Measurement Result

9.5.1 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	10.71	11.770	23.98	PASS
44	5220	6	11.85	15.303	23.98	PASS
48	5240	6	11.80	15.128	23.98	PASS
52	5260	6	11.84	15.268	23.98 or $11+10\log(B) = 24.38$	PASS
60	5300	6	11.61	14.480	23.98 or $11+10\log(B) = 24.42$	PASS
64	5320	6	10.60	11.476	23.98 or $11+10\log(B) = 24.37$	PASS
100	5500	6	10.67	11.662	23.98 or $11+10\log(B) = 24.40$	PASS
116	5580	6	11.91	15.516	23.98 or $11+10\log(B) = 24.40$	PASS
140	5700	6	10.98	12.525	23.98 or $11+10\log(B) = 24.47$	PASS
144	5720(U-NII 2C)	6	11.81	15.16	23.98 or $11+10\log(B) = 24.42$	PASS
144	5720 (U-NII 3)	6	11.81	15.16	30	PASS
149	5745	6	10.72	11.797	30	PASS
157	5785	6	11.81	15.163	30	PASS
165	5825	6	10.80	12.016	30	PASS

802.11n_HT20_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	10.67	11.662	23.98	PASS
44	5220	MCS0	11.92	15.552	23.98	PASS
48	5240	MCS0	11.86	15.338	23.98	PASS
52	5260	MCS0	11.82	15.198	23.98 or $11+10\log(B) = 24.63$	PASS
60	5300	MCS0	11.55	14.282	23.98 or $11+10\log(B) = 24.60$	PASS
64	5320	MCS0	10.96	12.467	23.98 or $11+10\log(B) = 24.55$	PASS
100	5500	MCS0	10.65	11.608	23.98 or $11+10\log(B) = 24.61$	PASS
116	5580	MCS0	11.91	15.516	23.98 or $11+10\log(B) = 24.59$	PASS
140	5700	MCS0	10.90	12.296	23.98 or $11+10\log(B) = 24.54$	PASS
144	5720(U-NII 2C)	MCS0	11.80	15.13	23.98 or $11+10\log(B) = 24.57$	PASS
144	5720 (U-NII 3)	MCS0	11.80	15.13	30	PASS
149	5745	MCS0	10.76	11.906	30	PASS
157	5785	MCS0	11.74	14.920	30	PASS
165	5825	MCS0	10.66	11.635	30	PASS

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802.11n_HT40_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	MCS0	10.97	12.495	23.98	PASS
46	5230	MCS0	11.77	15.022	23.98	PASS
54	5270	MCS0	11.72	14.850	23.98 or $11+10\log(B) = 27.27$	PASS
62	5310	MCS0	10.80	12.015	23.98 or $11+10\log(B) = 27.23$	PASS
102	5510	MCS0	10.81	12.043	23.98 or $11+10\log(B) = 27.22$	PASS
110	5550	MCS0	11.60	14.445	23.98 or $11+10\log(B) = 27.28$	PASS
134	5670	MCS0	10.56	11.369	23.98 or $11+10\log(B) = 27.25$	PASS
142	5710(U-NII 2C)	MCS0	11.82	15.20	23.98 or $11+10\log(B) = 27.28$	PASS
142	5710 (U-NII 3)	MCS0	11.82	15.20	30	PASS
151	5755	MCS0	10.51	11.239	30	PASS
159	5795	MCS0	10.56	11.369	30	PASS

802.11ac_VHT80_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
42	5210	MCS0	11.92	15.542	23.98	PASS
58	5290	MCS0	11.69	14.741	23.98 or $11+10\log(B) = 30.27$	PASS
106	5530	MCS0	11.91	15.507	23.98 or $11+10\log(B) = 30.33$	PASS
122	5610	MCS0	11.59	14.405	23.98 or $11+10\log(B) = 30.30$	PASS
138	5690(U-NII 2C)	MCS0	11.98	15.76	23.98 or $11+10\log(B) = 30.30$	PASS
138	5690 (U-NII 3)	MCS0	11.98	15.76	30	PASS
155	5775	MCS0	11.65	14.606	30	PASS

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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.			

The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

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=300kHz, VBW≥ 3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto, detector = RMS or sample, traces 100 sweeps of video averaging.
- Set RBW=500kHz, VBW≥ 3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto, detector = RMS or sample, traces 100 sweeps of video averaging.
5. Use 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.

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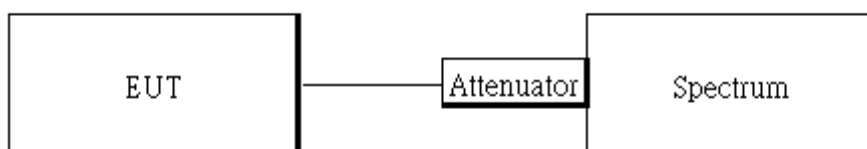
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10.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
DC Power Supply	Agilent	E3640A	MY40000811	12/23/2019	12/22/2020
EXM Spectrum Analyzer	KEYSIGHT	N9010B	MY59071571	06/27/2020	06/26/2021
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2020	01/01/2021
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2020	01/01/2021

10.4 Test Set-up



10.5 Measurement Result

10.5.1 Power spectral density

POWER DENSITY 802.11a MODE				
Frequency (MHz)	ch0 meas PSD	Maximum Corr'd PSD	Limit	Margin (dB)
5180.00	-2.17	-2.17	11.00 dBm/MHz	-13.17
5220.00	-1.79	-1.79	11.00 dBm/MHz	-12.79
5240.00	-1.57	-1.57	11.00 dBm/MHz	-12.57
5260.00	-1.83	-1.83	11.00 dBm/MHz	-12.83
5300.00	-1.87	-1.87	11.00 dBm/MHz	-12.87
5320.00	-1.96	-1.96	11.00 dBm/MHz	-12.96
5500.00	-2.15	-2.15	11.00 dBm/MHz	-13.15
5580.00	-1.88	-1.88	11.00 dBm/MHz	-12.88
5700.00	-1.90	-1.90	11.00 dBm/MHz	-12.90
5720 (U-NII 2C)	-1.99	-1.99	11.00 dBm/MHz	-12.99
5720 (U-NII 3)	-5.23	-5.23	30.00 dBm/500kHz	-35.23
5745.00	-4.52	-4.52	30.00 dBm/500kHz	-34.52
5785.00	-4.80	-4.80	30.00 dBm/500kHz	-34.80
5825.00	-4.69	-4.69	30.00 dBm/500kHz	-34.69

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POWER DENSITY 802.11n HT20 MODE				
Frequency (MHz)	ch0 meas PSD	Maximum Corr'd PSD	Limit	Margin (dB)
5180.00	-1.98	-1.98	11.00 dBm/MHz	-12.98
5220.00	-2.30	-2.30	11.00 dBm/MHz	-13.30
5240.00	-1.93	-1.93	11.00 dBm/MHz	-12.93
5260.00	-2.19	-2.19	11.00 dBm/MHz	-13.19
5300.00	-2.16	-2.16	11.00 dBm/MHz	-13.16
5320.00	-2.14	-2.14	11.00 dBm/MHz	-13.14
5500.00	-2.14	-2.14	11.00 dBm/MHz	-13.14
5580.00	-2.43	-2.43	11.00 dBm/MHz	-13.43
5700.00	-2.09	-2.09	11.00 dBm/MHz	-13.09
5720 (U-NII 2C)	-1.61	-1.61	11.00 dBm/MHz	-12.61
5720 (U-NII 3)	-5.43	-5.43	30.00 dBm/500kHz	-35.43
5745.00	-5.56	-5.56	30.00 dBm/500kHz	-35.56
5785.00	-5.03	-5.03	30.00 dBm/500kHz	-35.03
5825.00	-5.13	-5.13	30.00 dBm/500kHz	-35.13

POWER DENSITY 802.11n HT40 MODE				
Frequency (MHz)	ch0 meas PSD	Maximum Corr'd PSD	Limit	Margin (dB)
5190.00	-6.37	-6.19	11.00 dBm/MHz	-17.19
5230.00	-5.99	-5.81	11.00 dBm/MHz	-16.81
5270.00	-6.02	-5.84	11.00 dBm/MHz	-16.84
5310.00	-5.18	-5.00	11.00 dBm/MHz	-16.00
5510.00	-5.80	-5.62	11.00 dBm/MHz	-16.62
5550.00	-6.03	-5.85	11.00 dBm/MHz	-16.85
5670.00	-6.24	-6.06	11.00 dBm/MHz	-17.06
5710 (U-NII 2C)	-5.83	-5.65	11.00 dBm/MHz	-16.65
5710 (U-NII 3)	-10.08	-9.90	30.00 dBm/500kHz	-39.90
5755.00	-8.81	-8.63	30.00 dBm/500kHz	-38.63
5795.00	-8.21	-8.03	30.00 dBm/500kHz	-38.03

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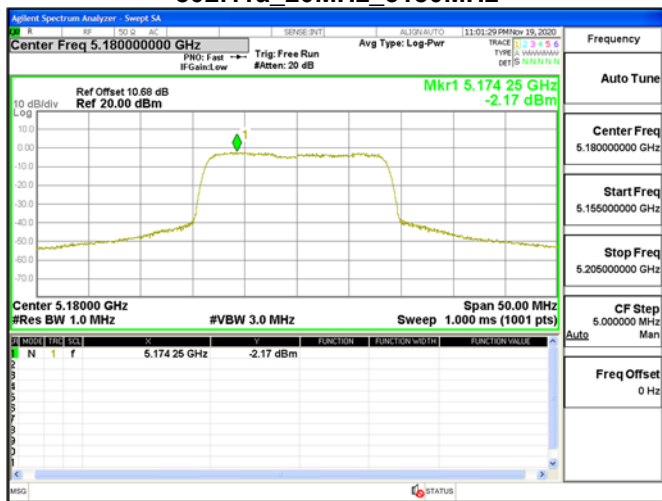
POWER DENSITY 802.11ac VHT80 MODE				
Frequency (MHz)	ch0 meas PSD	Maximum Corr'd PSD	Limit	Margin (dB)
5210.00	-10.38	-10.06	11.00 dBm/MHz	-21.06
5290.00	-10.06	-9.74	11.00 dBm/MHz	-20.74
5530.00	-9.71	-9.39	11.00 dBm/MHz	-20.39
5610.00	-10.12	-9.80	11.00 dBm/MHz	-20.80
5690 (U-NII 2C)	-9.99	-9.67	11.00 dBm/MHz	-20.67
5690 (U-NII 3)	-14.39	-14.07	30.00 dBm/500kHz	-44.07
5775.00	-12.97	-12.65	30.00 dBm/500kHz	-42.65

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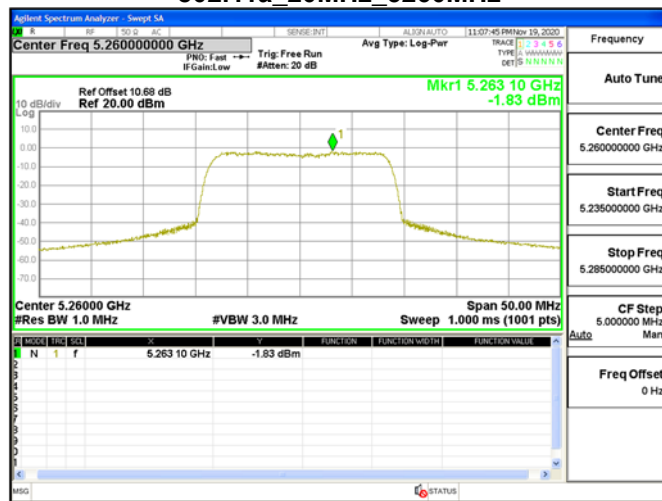
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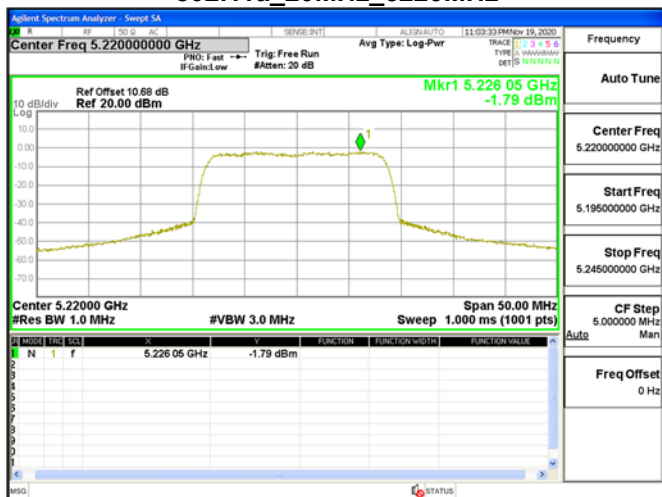
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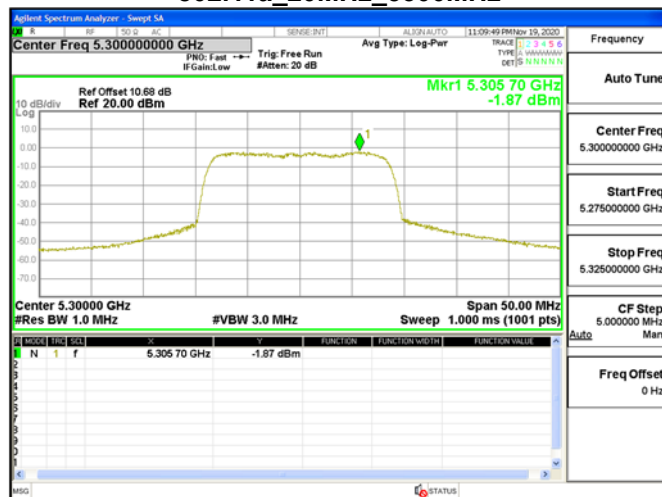
802.11a_20MHz_5260MHz



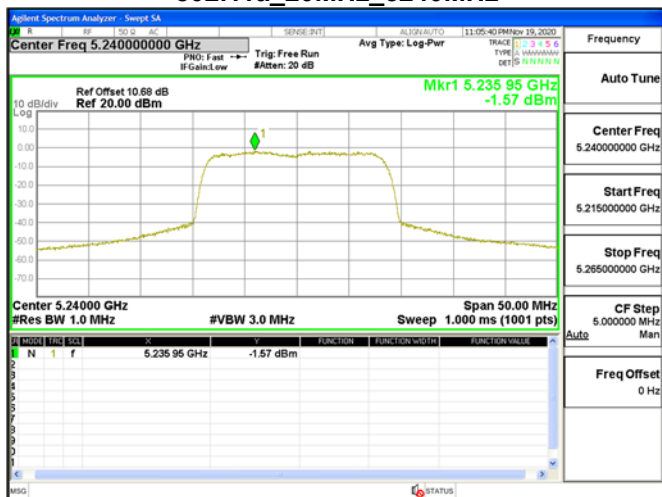
802.11a_20MHz_5220MHz



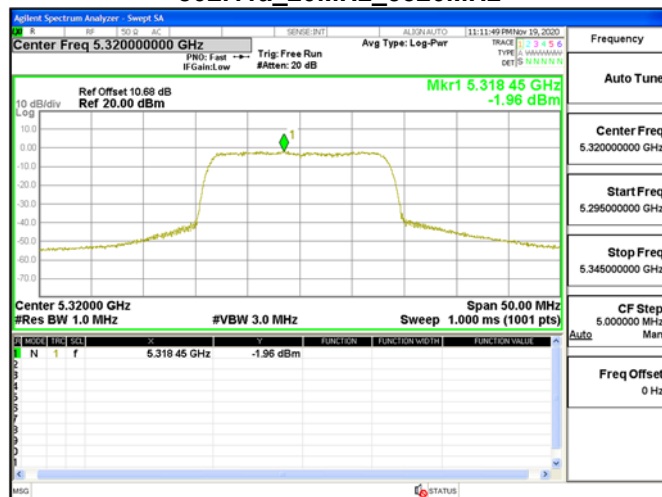
802.11a_20MHz_5300MHz



802.11a_20MHz_5240MHz



802.11a_20MHz_5320MHz

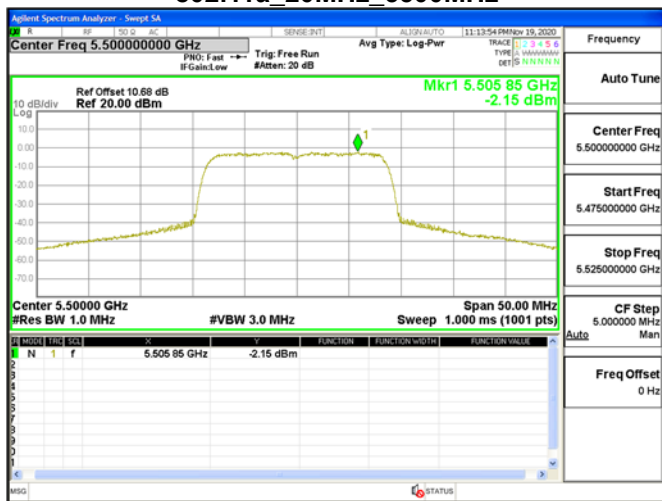


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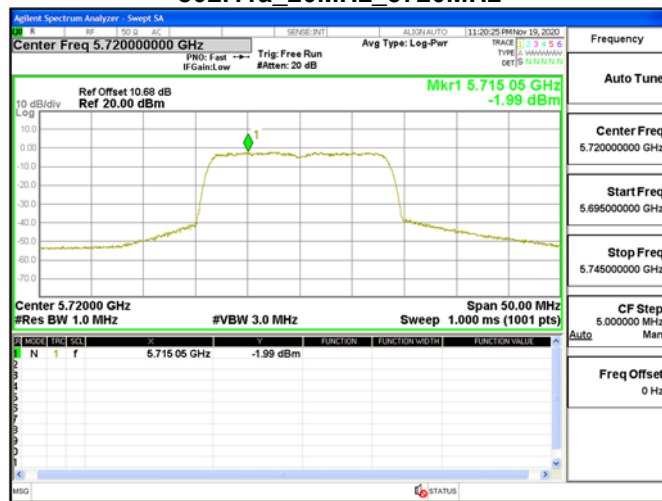
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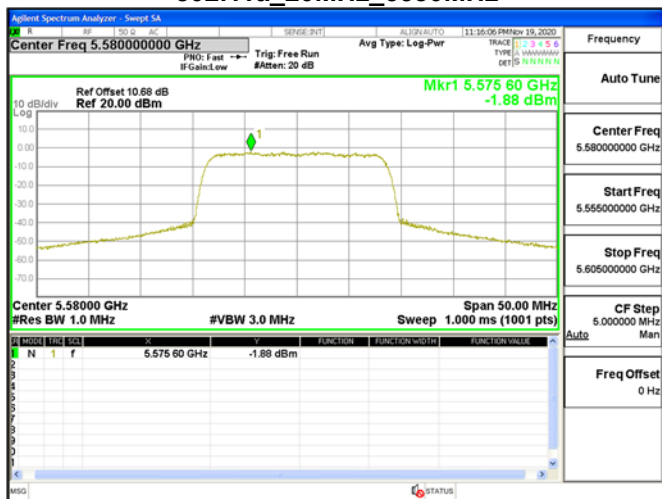
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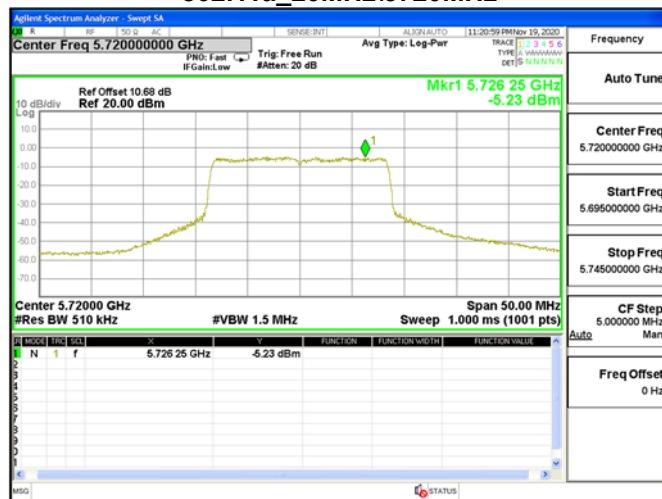
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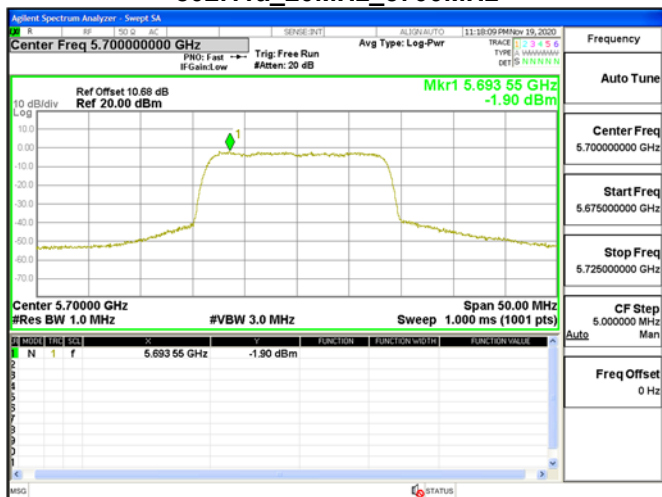
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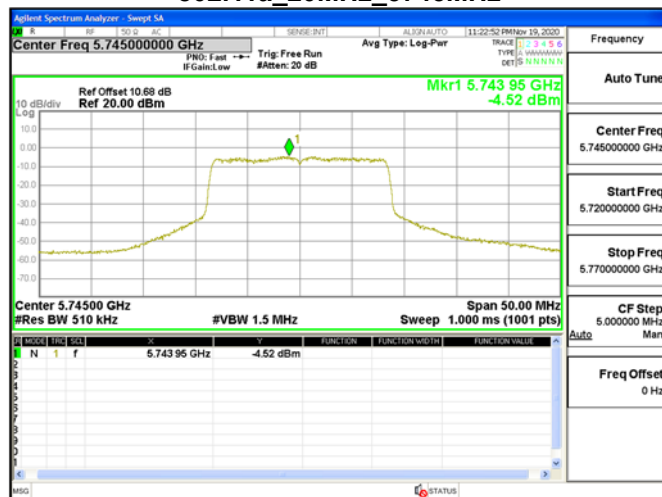
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802.11a_20MHz_5700MHz



802.11a_20MHz_5745MHz

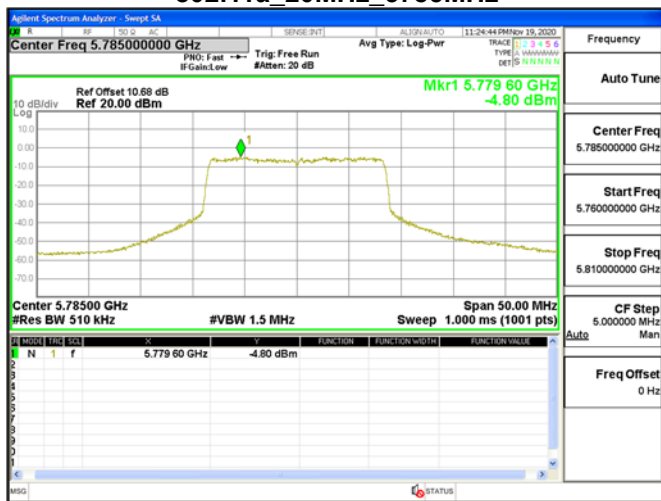


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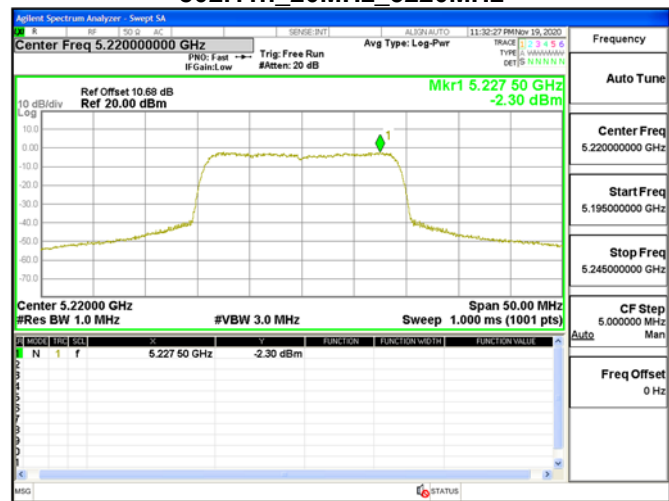
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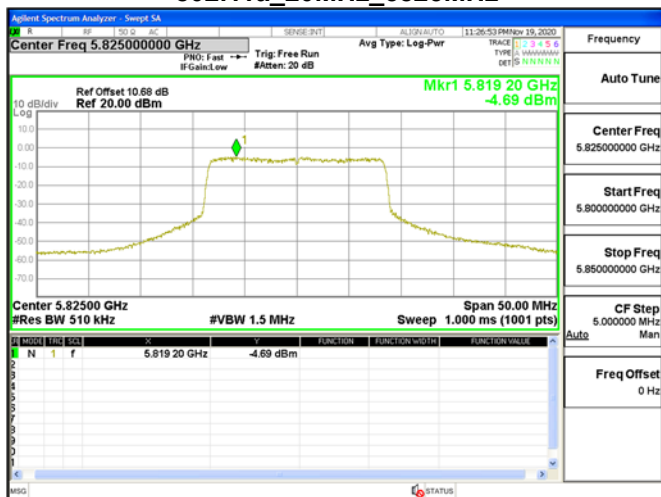
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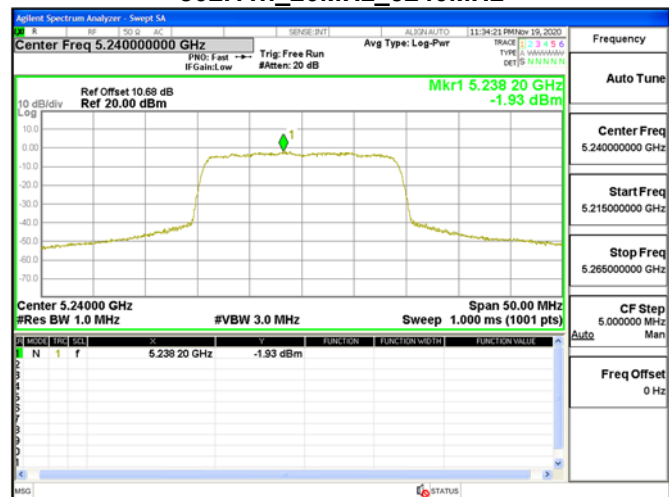
802.11n_20MHz_5220MHz



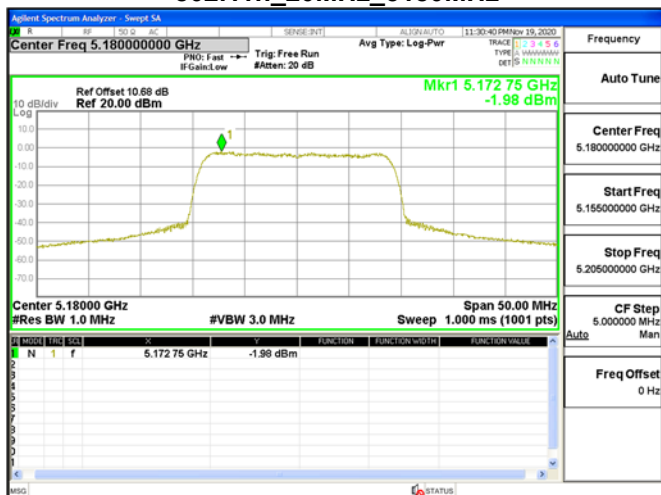
802.11a_20MHz_5825MHz



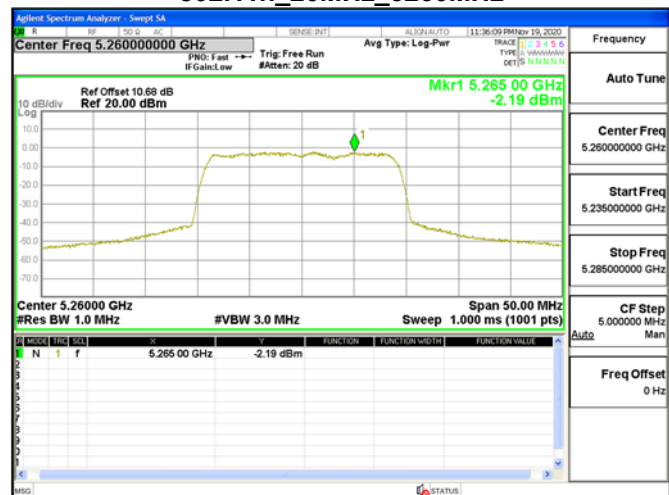
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802.11n_20MHz_5180MHz



802.11n_20MHz_5260MHz

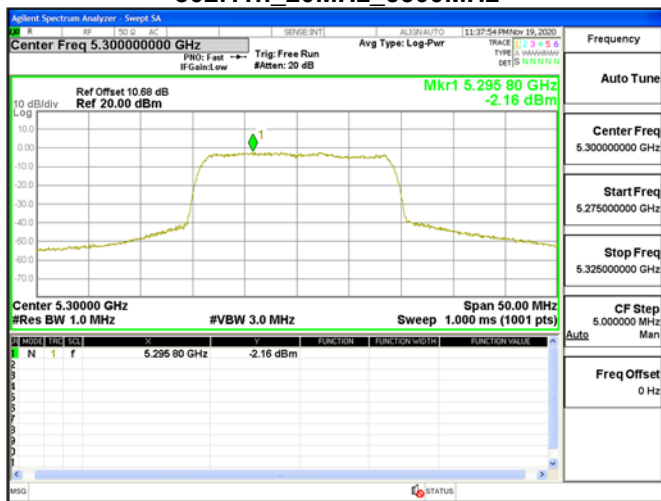


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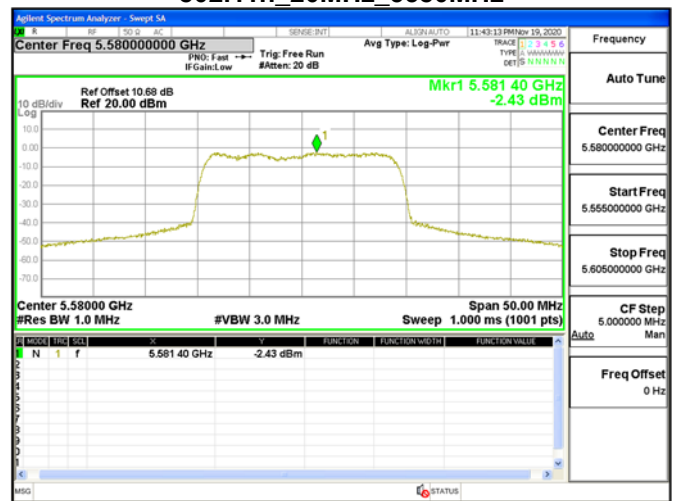
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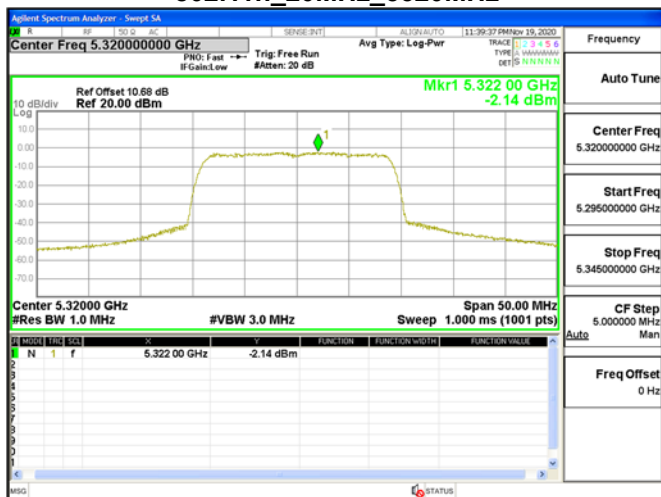
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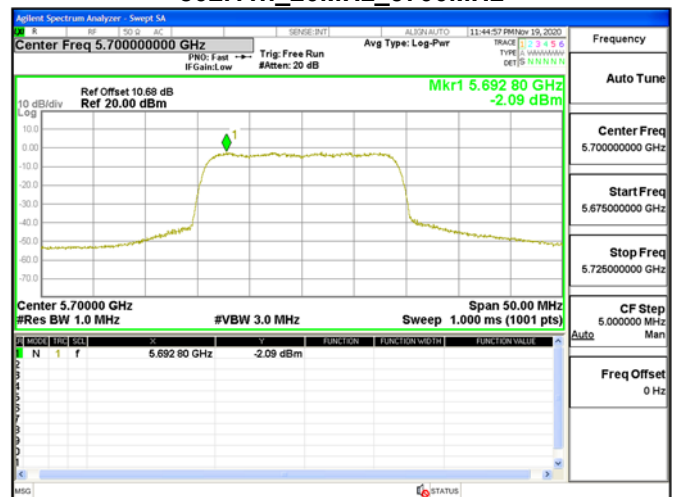
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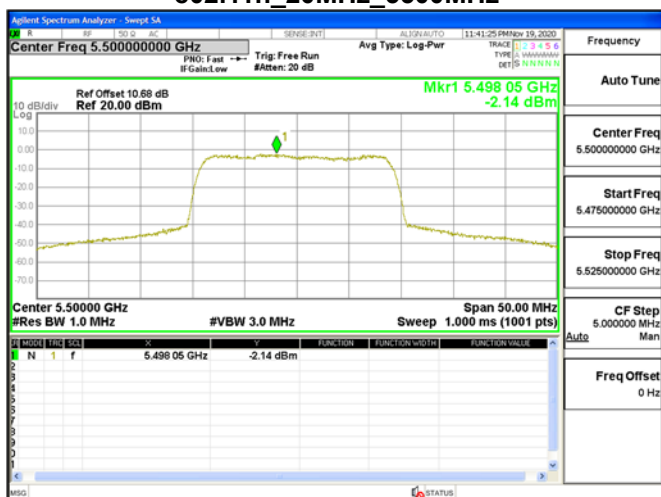
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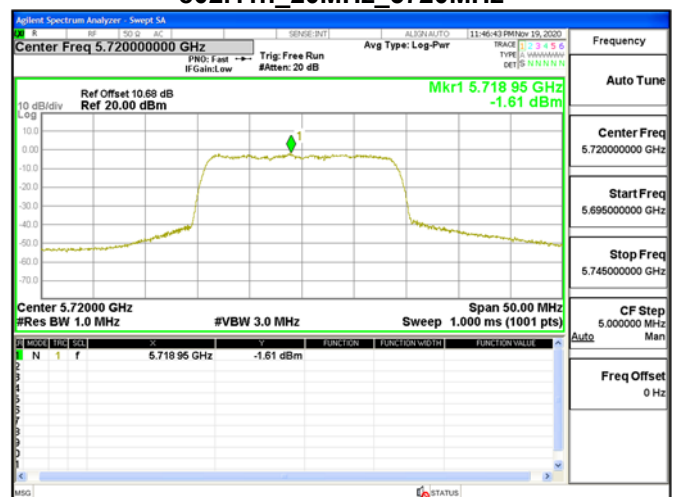
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802.11n_20MHz_5500MHz



802.11n_20MHz_5720MHz

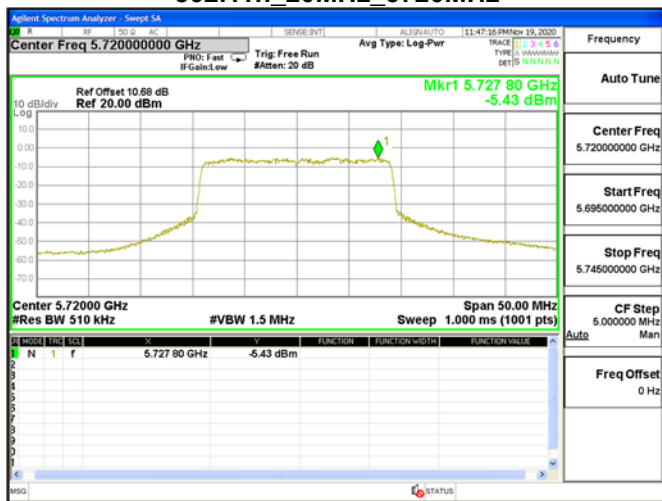


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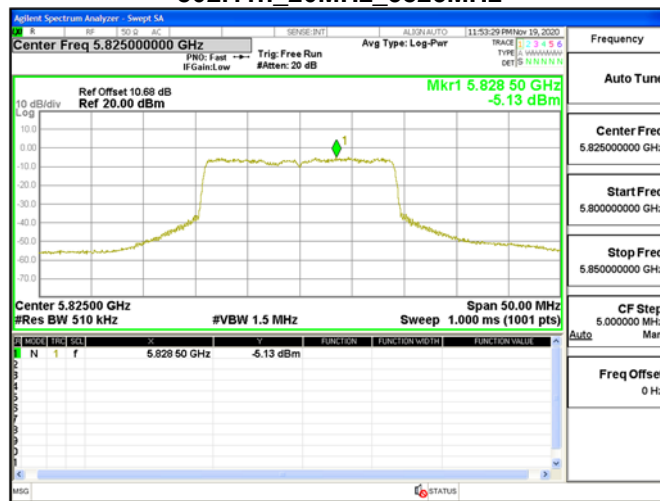
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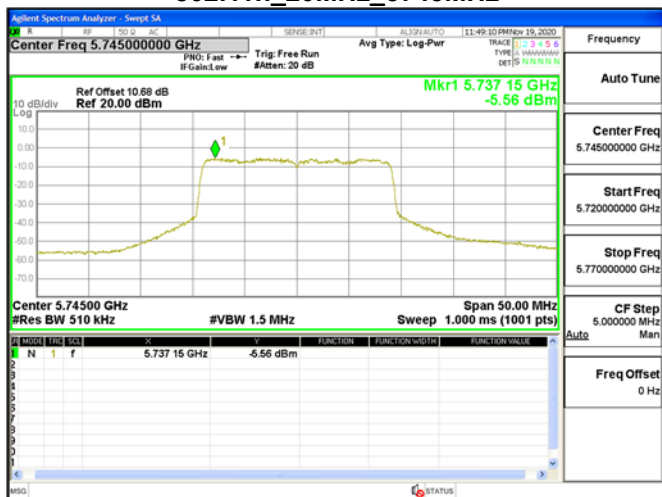
802.11n_20MHz_5720MHz



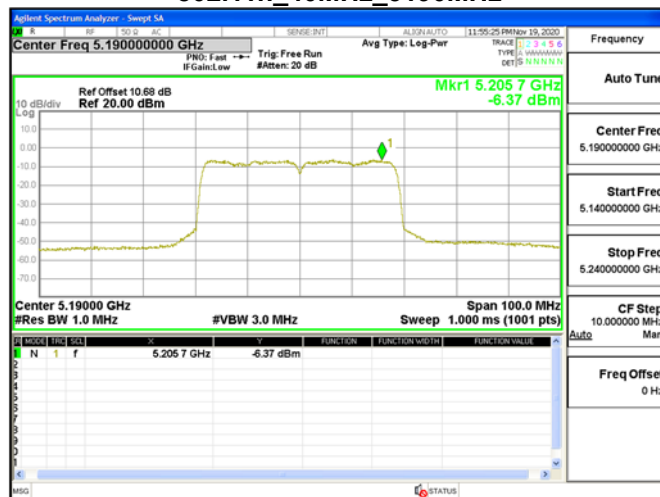
802.11n_20MHz_5825MHz



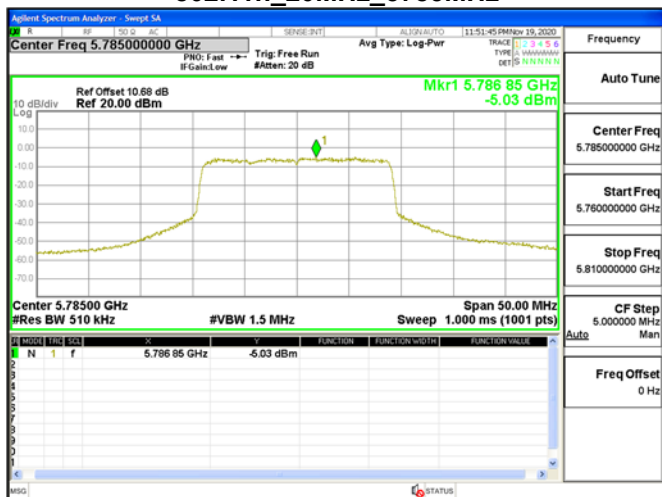
802.11n_20MHz_5745MHz



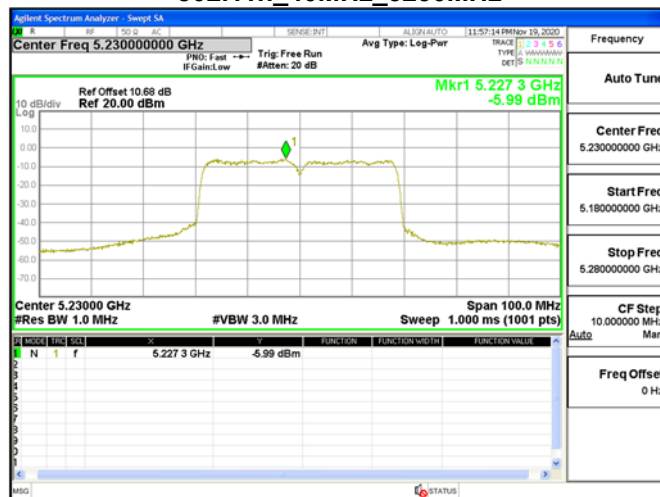
802.11n_40MHz_5190MHz



802.11n_20MHz_5785MHz



802.11n_40MHz_5230MHz



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