

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant: ASUSTeK COMPUTER INC.
1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan

Product Name: ASUS Phone (Mobile Phone)

Brand Name: ASUS

Model No.: ASUS_I003D

Model Difference: N/A

Report Number: ER/2020/30080

FCC ID: MSQI003D

IC: 3568A-I003D

FCC Rule Part: §15.407, Cat: NII

IC RSS: RSS-247 issue 2 Feb. 2017

Issue Date: Aug. 17, 2020

Date of Test: May 06, 2020 ~ Jun. 29, 2020

Date of EUT Received: May 06, 2020

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: _____

Jazz Huang

Jazz Huang / Asst. Supervisor



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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2020/30080	Rev.00	Original.	Aug. 17, 2020	Revised By: Karen Huang

Note:

1、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:	ASUS Phone (Mobile Phone)	
Brand Name:	ASUS	
Model No.:	ASUS_I003D	
Model Difference:	N/A	
Hardware Version:	R2.0B	
Software Version:	Android Q	
AJ dongle:	Model No.: F370002, Supplier: MEILU	
Fan Dongle:	Model No.: I003, Supplier: ASUS	
USB Cable:	Model No.: LA9U2015-CS-R, Supplier: ASAP	
Power Supply:	3.85Vdc from Rechargeable Li-polymer Battery or 5V / 9V / 12V / 15V / 20V from AC/DC Adapter	
	Battery:	Model No.: C11P1903, Supplier: SCUD
	Adapter:	Model No.: A299-200150U-US, Supplier: AOHA1
Modulation type	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only 1024QAM for OFDMA in 802.11ax 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 – 173.3Mbps 802.11 ac_40MHz: 13.5 – 400.0Mbps 802.11 ac_80MHz: 29.3 – 866.7Mbps 802.11 ax_20MHz: 8.6 – 286.8 Mbps 802.11 ax_40MHz: 17.2 – 573.5 Mbps 802.11 ax_80MHz: 36.0 – 1201 Mbps

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1.2 Antenna Designation

Wi-Fi					
Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	Worst Antenna Gain
PIFA	N/A	Ant4	5150~5850	1.6	
		Ant5		1.7	V
		Ant6		3.7	V
		Ant7		2.0	
Note: Pre-scanned was done on the above 4 antennas, the Ant6 results higher Emission at 5GHz. Therefore, the completed set of measurement was done on the antenna to be presented on this test report.					

Below directional gain is used in measurement due to the worse case scenario determined in section 4 of this report designate below antennas for transmissions.

Transmission Chain	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	Directional Gain in the worst case senario (dBi)
Chain0	Ant5	5150~5850	1.7	5.77
Chain1	Ant6		3.7	

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1.3 FCC worst power

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (Avg.) (dBm) (Worst case)	Modulation Technology
a	5150~5250	4	15.33	OFDM
	5250~5350	4	19.73	
	5470~5725	12	19.86	
	5725~5850	5	19.85	
n_HT ac_VHT ax_HE 20M	5150~5250	4	HE: 15.67	OFDM OFDMA
	5250~5350	4	HE: 19.93	
	5470~5725	12	HE: 19.87	
	5725~5850	5	HE: 19.86	
n_HT ac_VHT ax_HE 40M	5150~5250	2	HT: 17.01	OFDM OFDMA
	5250~5350	2	HT: 19.84	
	5470~5725	5	HT: 19.91	
	5725~5850	2	HE: 19.86	
ac_VHT ax_HE 80M	5150~5250	1	VHT: 15.68	OFDM OFDMA
	5250~5350	1	VHT: 15.94	
	5470~5725	2	VHT: 19.91	
	5725~5850	1	HE: 19.77	

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1.4 ISED worst power

Wi-Fi 802.11	Frequency Range	Channels	Avg. or EIRP	Rated Power(dBm) (Worst Case)	Modulation Technology
11a	5150~5250	4	EIRP	21.10	OFDM
	5250~5350	4	Avg.	19.73	
	5470~5725	12	Avg.	19.86	
	5725~5850	5	Avg.	19.85	
n_HT ac_VHT 20M	5150~5250	4	EIRP	HT: 21.29	OFDM
	5250~5350	4	Avg.	HT: 19.87	
	5470~5725	12	Avg.	HT: 19.78	
	5725~5850	5	Avg.	HT: 19.76	
n_HT ac_VHT 40M	5150~5250	2	EIRP	HT: 22.78	OFDM
	5250~5350	2	Avg.	HT: 19.84	
	5470~5725	6	Avg.	HT: 19.91	
	5725~5850	2	Avg.	HT: 19.83	
ac_VHT 80M	5150~5250	1	EIRP	VHT: 21.45	OFDM
	5250~5350	1	Avg.	VHT: 15.94	
	5470~5725	2	Avg.	VHT: 19.91	
	5725~5850	1	Avg.	VHT: 19.76	
ax_HE 20M	5150~5250	4	EIRP	HE: 21.44	OFDMA
	5250~5350	4	Avg.	HE: 19.93	
	5470~5725	12	Avg.	HE: 19.87	
	5725~5850	5	Avg.	HE: 19.86	
ax_HE 40M	5150~5250	2	EIRP	HE: 22.68	OFDMA
	5250~5350	2	Avg.	HE: 19.66	
	5470~5725	6	Avg.	HE: 19.91	
	5725~5850	2	Avg.	HE: 19.86	
ax_HE 80M	5150~5250	1	EIRP	HE: 21.40	OFDMA
	5250~5350	1	Avg.	HE: 15.11	
	5470~5725	2	Avg.	HE: 19.75	
	5725~5850	1	Avg.	HE: 19.77	

Note:

As per guidance in presentation 2018-04-10-03 IC Certification updates of April 2018 TCB workshop, Client (Slave mode) devices without active scanning function, but with the capability of operating in 5600-5650 MHz solely under the control of a certified master device meeting the requirement of RSS-247, are allowed in Canada.

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1.5 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407
FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
RSS-247 issue 2 Feb. 2017
RSS-Gen. issue 5, Amendment 1, March 2019
ANSI C63.10:2013

1.6 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

ISED CAB identifier: TW3702

1.7 Special Accessories

There are no special accessories used while test was conducted.

1.8 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 Conducted (Antenna Port) Emission Configuration

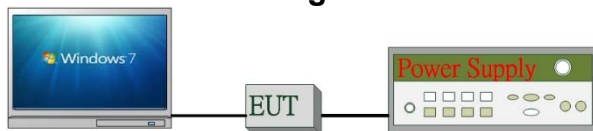


Fig 2-2 Radiated Emission



Fig 2-3 Conduction (AC Power Line) Radiated Emission

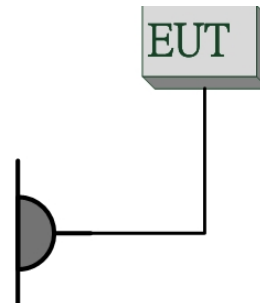


Table 2-1 Equipment Used in Tested System

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	L480	PF-1S9NT5	N/A	N/A
3	DC Power Supply	Agilent	E3640A	MY40005907	N/A	N/A

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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-Gen §6.7 RSS-247 §6.2.4.1	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

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4 DESCRIPTION OF TEST MODES

4.1 802.11a/n/ac/ax 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 is tested under operating condition, test program used to control the EUT for staying in continuous transmitting mode is programmed.
2. WiFi signals can be transmitted from 4 antennas with 4 different modes, only one mode is available at any given time.
 - a. Observations have been done for each mode and found that the **Camera Mode** generates higher output power and emissions.
 - b. The **Camera Mode** is determined as the worst case scenario and the test results being demonstrated in this test report are based on the **Camera Mode**.
 - c. Spot check has been done on radiated spurious emissions of Calling, Normal and Gaming Mode and demonstrated in section 11.7.4 to 11.7.6 in this test report.
 - d. Please refer to **Antenna Location** section of this report for antenna details.

Mode	Antenna
Calling Mode	Chain0 is adapted in Ant4 Chain1 is adapted in Ant6
Camera Mode	Chain0 is adapted in Ant6 Chain1 is adapted in Ant5
Normal Mode	Portrait: Chain0 is adapted in Ant4 Chain1 is adapted in Ant6 Landscape: Chain0 is adapted in Ant4 Chain1 is adapted in Ant5
Gaming Mode	Chain0 is adapted in Ant4 Chain1 is adapted in Ant7

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
☒ 802.11 a	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ 1TX	☒ 2TX
☒ 802.11 n	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ SISO	☒ MIMO
☒ 802.11 ac	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ SISO	☒ MIMO
☒ 802.11 ax	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ SISO	☒ MIMO

4. Observations have been done for 802.11 ax available RU configurations below and found that the lowest, highest and Full RU results higher emissions.
Only one RU can be enabled at any given time.

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802.11ax	20MHz				802.11ax	40MHz			
RU type	26-tone RU		52-tone RU		RU type	26-tone RU		52-tone RU	
RU index and subcarrier range	RU0	[-121: -96]	RU37	[-121: -70]	RU index and subcarrier range	RU0	[-243: -218]	RU37	[-243: -192]
	RU1	[-95: -70]	RU38	[-68: -17]		RU1	[-217: -192]	RU38	[-189: -138]
	RU2	[-68: -43]	RU39	[17: 68]		RU2	[-189: -164]	RU39	[-109: -58]
	RU3	[-42: -17]	RU40	[70: 121]		RU3	[-163: -138]	RU40	[-55: -4]
	RU4	[-16: -4, 4: 16]	RU41	N/A		RU4	[-136: -111]	RU41	[4: 55]
	RU5	[17: 42]	RU42	N/A		RU5	[-109: -84]	RU42	[58: 109]
	RU6	[43: 68]	RU43	N/A		RU6	[-83: -58]	RU43	[138: 189]
	RU7	[70: 95]	RU44	N/A		RU7	[-55: -30]	RU44	[192: 243]
	RU8	[96: 121]	RU45	N/A		RU8	[-29: -4]	RU45	N/A
	RU9	N/A	RU46	N/A		RU9	[4: 29]	RU46	N/A
	RU10	N/A	RU47	N/A		RU10	[30: 55]	RU47	N/A
	RU11	N/A	RU48	N/A		RU11	[58: 83]	RU48	N/A
	RU12	N/A	RU49	N/A		RU12	[84: 109]	RU49	N/A
	RU13	N/A	RU50	N/A		RU13	[111: 136]	RU50	N/A
	RU14	N/A	RU51	N/A		RU14	[138: 163]	RU51	N/A
	RU15	N/A	RU52	N/A		RU15	[164: 189]	RU52	N/A
	RU16	N/A				RU16	[192: 217]		
	RU17	N/A	106-tone RU			RU17	[218: 243]	106-tone RU	
	RU18	N/A	RU53	[-122: -17]		RU18	N/A	RU53	[-243: -138]
	RU19	N/A	RU54	[17: 122]		RU19	N/A	RU54	[-109: -4]
	RU20	N/A	RU55	N/A		RU20	N/A	RU55	[4: 109]
	RU21	N/A	RU56	N/A		RU21	N/A	RU56	[138: 243]
	RU22	N/A	RU57	N/A		RU22	N/A	RU57	N/A
	RU23	N/A	RU58	N/A		RU23	N/A	RU58	N/A
	RU24	N/A	RU59	N/A		RU24	N/A	RU59	N/A
	RU25	N/A	RU60	N/A		RU25	N/A	RU60	N/A
	RU26	N/A				RU26	N/A		
	RU27	N/A	242-tone RU			RU27	N/A	242-tone RU	
	RU28	N/A	RU61	[-122: -2, 2:122]		RU28	N/A	RU61	[-244: -3]
	RU29	N/A	RU62	N/A		RU29	N/A	RU62	[3: 244]
	RU30	N/A	RU63	N/A		RU30	N/A	RU63	N/A
	RU31	N/A	RU64	N/A		RU31	N/A	RU64	N/A
	RU32	N/A				RU32	N/A		
	RU33	N/A				RU33	N/A	484-tone RU	
	RU34	N/A				RU34	N/A	RU65	[-244: -3, 3: 244]
	RU35	N/A				RU35	N/A	RU66	N/A
RU36	N/A			RU36	N/A				

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802.11ax	80MHz			
RU type	26-tone RU		52-tone RU	
RU index and subcarrier range	RU0	[-499: -474]	RU37	[-499: -448]
	RU1	[-473: -448]	RU38	[-445: -394]
	RU2	[-445: -420]	RU39	[-365: -314]
	RU3	[-419: -394]	RU40	[-311: -260]
	RU4	[-392: -367]	RU41	[-257: -206]
	RU5	[-365: -340]	RU42	[-203: -152]
	RU6	[-339: -314]	RU43	[-123: -72]
	RU7	[-311: -286]	RU44	[-69: -18]
	RU8	[-285: -260]	RU45	[18: 69]
	RU9	[-257: -232]	RU46	[72: 123]
	RU10	[-231: -206]	RU47	[152: 203]
	RU11	[-203: -178]	RU48	[206: 257]
	RU12	[-177: -152]	RU49	[260: 311]
	RU13	[-150: -125]	RU50	[314: 365]
	RU14	[-123: -98]	RU51	[394: 445]
	RU15	[-97: -72]	RU52	[448: 499]
	RU16	[-69: -44]	106-tone RU	
	RU17	[-43: -18]	RU53	[-499: -394]
	RU18	[-16: -4, 4: 16]	RU54	[-365: -260]
	RU19	[18: 43]	RU55	[-257: -152]
	RU20	[44: 69]	RU56	[-123: -18]
	RU21	[72: 97]	RU57	[18: 123]
	RU22	[98: 123]	RU58	[152: 257]
	RU23	[125: 150]	RU59	[260: 365]
	RU24	[152: 177]	RU60	[394: 499]
	RU25	[178: 203]	242-tone RU	
	RU26	[206: 231]	RU61	[-500: -259]
	RU27	[232: 257]	RU62	[-258: -17]
	RU28	[260: 285]	RU63	[17: 258]
	RU29	[286: 311]	RU64	[259: 500]
	RU30	[314: 339]	484-tone RU	
	RU31	[340: 365]	RU65	[-500: -17]
	RU32	[367: 392]	RU66	[17: 500]
	RU33	[394: 419]	996-tone RU	
	RU34	[420: 445]	RU67	[-500: -3, 3: 500]
	RU35	[448: 473]		
	RU36	[474: 499]		

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5. 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.

4.2.1 RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	AN-TENNA PORT
802.11a	5180~5240	36 to 48	44	OFDM	6	2TX
	5260~5320	52 to 64	60			
	5500~5720	100 to 144	116			
	5745~5825	149 to 165	157			
802.11ac_VHT80	5210	42	42		MCS0	MIMO
	5290	58	58			
	5530~5690	106 to 138	122			
	5775	155	155			

RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	AN-TENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	2TX
	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		MCS8	MIMO
	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		MCS8	MIMO
	5270~5310	54 to 62	54,62			
	5510~5710	102 to 142	102,110,134,142			
	5755~5795	151 to 159	151,159			
802.11ac_VHT80	5210	42	42		MCS0	MIMO
	5290	58	58			
	5530~5690	106 to 138	106,122,138			
	5775	155	155			

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RADIATED EMISSION TEST (ABOVE 1 GHz)

MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	RU CONFIGURATION	DATA RATE (Mbps)	ANTENNA PORT
802.11ax-HE20	5180~5240	36 to 48	36,44,48	OFDMA	FULL RU 26/0 52/37 106/53	MCS0	MIMO
	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				
802.11ax-HE40	5190~5230	38 to 46	38,46		FULL RU 242/61	MCS0	MIMO
	5270~5310	54 to 62	54,62				
	5510~5710	102 to 142	102,110,134,142				
	5755~5795	151 to 159	151,159				
802.11ax-HE80	5210	42	42		FULL RU 484/65	MCS0	MIMO
	5290	58	58				
	5530~5690	106 to 138	106,122,138				
	5775	155	155				

Note: Observation has been done on all RU configurations, the Full RU configuration yields higher emissions and average output power, and hence the radiated emission results are demonstrated in full RU configuration in this report.

RADIATED EMISSION SPOT CHECK (ABOVE 1 GHz)
Calling Mode, Gaming Mode, Normal Mode

MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11n-HT40	5510~5710	102 to 142	110	OFDM	MCS8	MIMO

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RADIATED EMISSION *SPOT CHECK* (ABOVE 1 GHz)*Calling Mode, Gaiming Mode, Normal Mode*

MODE	FRE- QUENCY BAND (MHz)	AVAILA- BLE CHAN- NEL	TESTED CHANNEL	MODULA- TION	RU CONFIGU- RATION	DATA RATE (Mbps)	AN- TENNA PORT
802.11ax- HE20	5260~5320	52 to 64	60	OFDMA	FULL RU	MCS0	MIMO

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/ax WLAN Transmitter for channel Low, Mid and High, the worst case H position was reported.

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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)	AN-TENNA 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		MCS0	MIMO
	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		MCS0	MIMO
	5270~5310	54 to 62	54,62			
	5510~5710	102 to 142	102,110,134,142			
	5755~5795	151 to 159	151,159			
802.11ac VHT80	5210	42	42		MCS0	MIMO
	5290	58	58			
	5530~5690	106 to 138	106,122,138			
	5775	155	155			

CONDUCTED TEST							
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	RU CONFIGURATION	DATA RATE (Mbps)	AN-TENNA PORT
802.11ax HE20	5180~5240	36 to 48	36,44,48	OFDMA	full 26/8 52/40 106/54	MCS0	MIMO
	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				
802.11ax HE40	5190~5230	38 to 46	38,46		full 242/61	MCS0	MIMO
	5270~5310	54 to 62	54,62				
	5510~5710	102 to 142	102,110,134,142				
	5755~5795	151 to 159	151,159				
802.11ax HE80	5210	42	42		full 484/65	MCS0	MIMO
	5290	58	58				
	5530~5690	106 to 138	106,122,138				
	5775	155	155				

Note: EUT serial number is L4AIGF000585XCH.

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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(μV)	
	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	07/04/2019	07/03/2020
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

Note: N.C.R refers to Not Calibrated Required.

6.3 EUT Setup

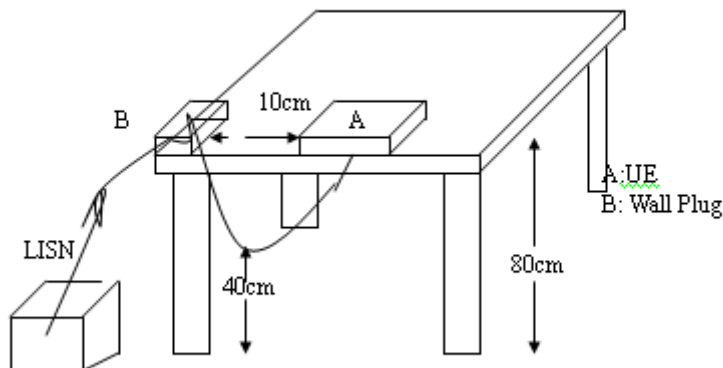
1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The LISN was connected with 120Vac/60Hz 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-2020-30080

Test Site :Conduction 6F

Test Mode :WLAN 5G

Test Date :2020-06-19

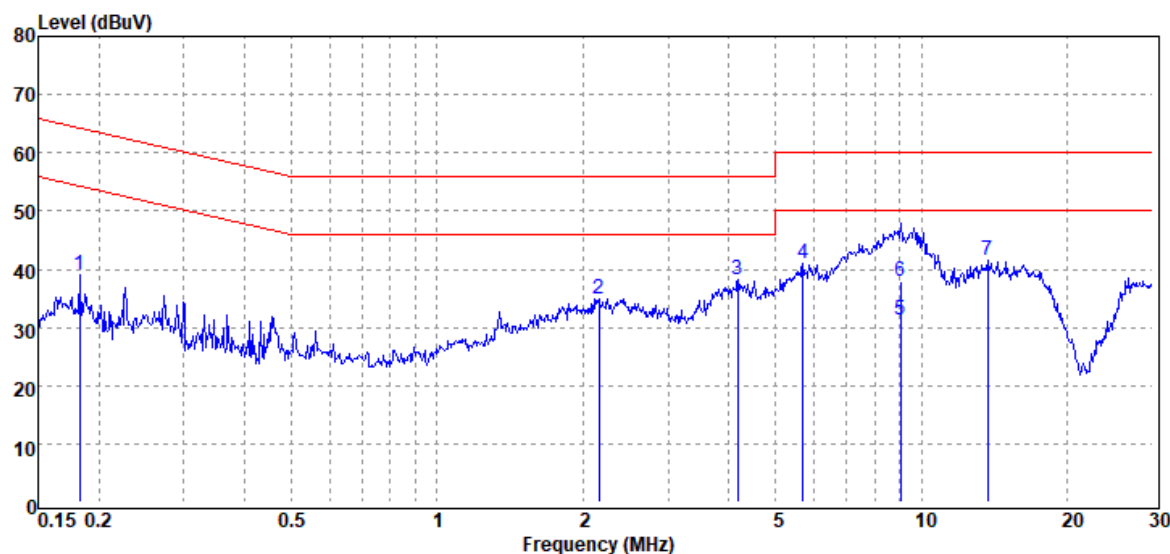
Power :AC 120V/60Hz

Temp./Humi. :25.6/62

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
0.18	Peak	36.81	2.14	38.95	64.37	-25.42
2.16	Peak	32.58	2.28	34.86	56.00	-21.14
4.18	Peak	35.78	2.47	38.25	56.00	-17.75
5.68	Peak	38.26	2.60	40.86	60.00	-19.14
9.06	Average	28.50	2.79	31.29	50.00	-18.71
9.06	QP	35.20	2.79	37.99	60.00	-22.01
13.70	Peak	38.63	2.94	41.57	60.00	-18.43

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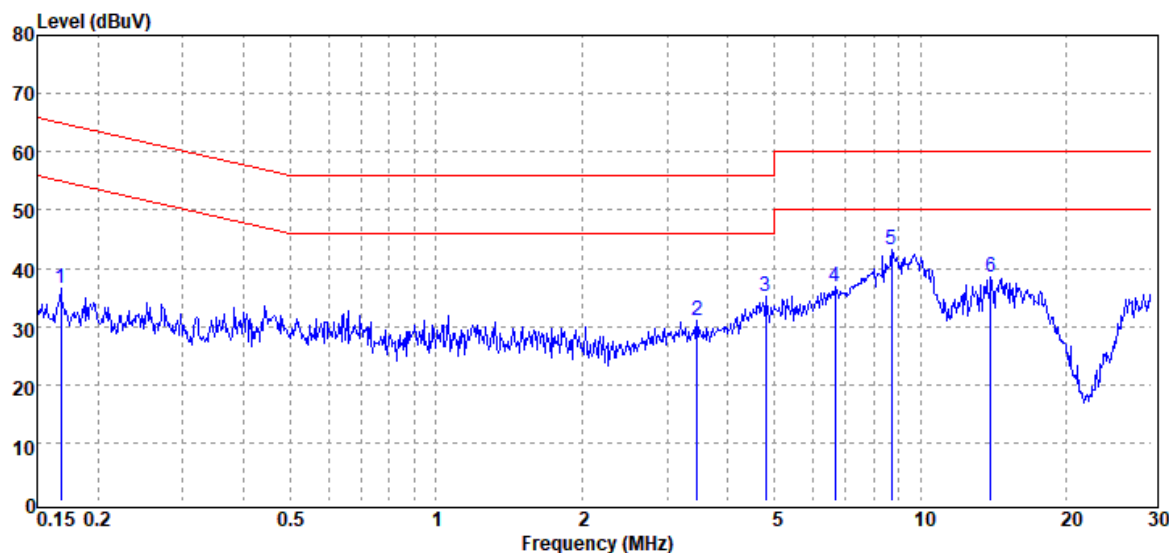
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Report Number :ER-2020-30080
 Test Mode :WLAN 5G
 Power :AC 120V/60Hz
 Probe :N
 Note :

Test Site :Conduction 6F
 Test Date :2020-06-19
 Temp./Humi. :25.6/62
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.17	Peak	34.35	2.21	36.56	65.08	-28.52
3.45	Peak	28.66	2.38	31.04	56.00	-24.96
4.80	Peak	32.76	2.46	35.22	56.00	-20.78
6.66	Peak	34.30	2.57	36.87	60.00	-23.13
8.73	Peak	40.65	2.66	43.31	60.00	-16.69
13.99	Peak	35.49	2.88	38.37	60.00	-21.63

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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	99.24	0.03	0.50	0.01
802.11n_20	99.63	0.02	0.18	0.01
802.11ac_20	99.72	0.01	0.18	0.01
802.11n_40	99.72	0.01	0.18	0.01
802.11ac_40	99.57	0.02	0.18	0.01
802.11ac_80	99.72	0.01	0.18	0.01
802.11ax_20	99.57	0.02	0.18	0.01
802.11ax_40	99.72	0.01	0.18	0.01
802.11ax_80	99.57	0.02	0.18	0.01

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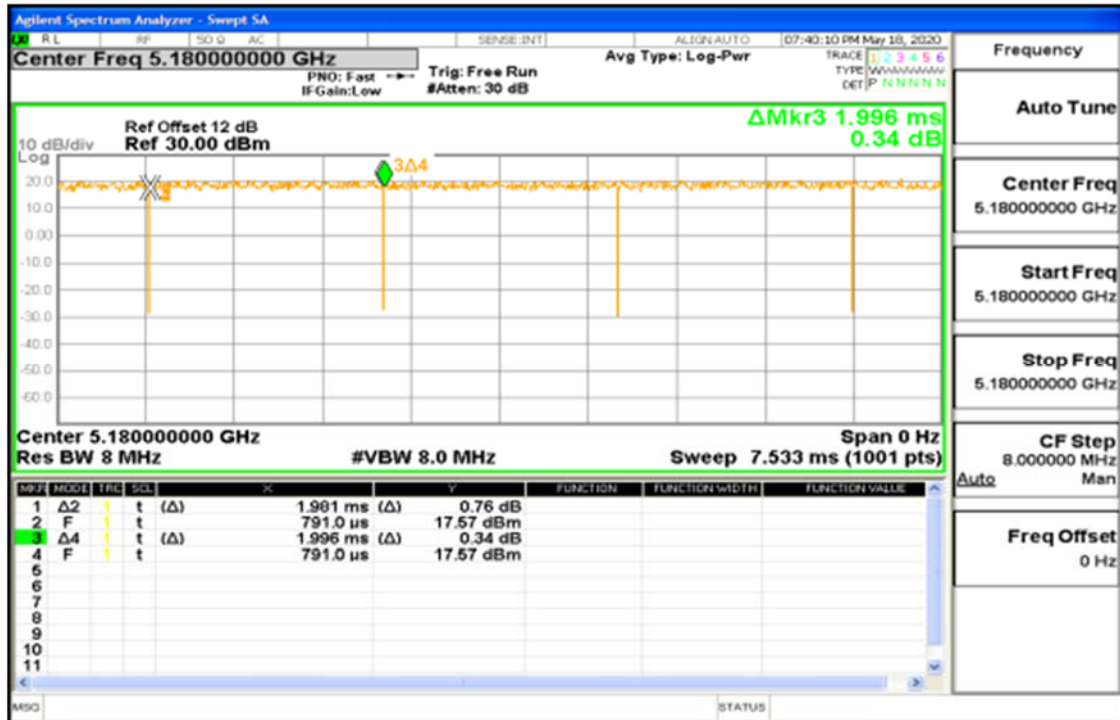
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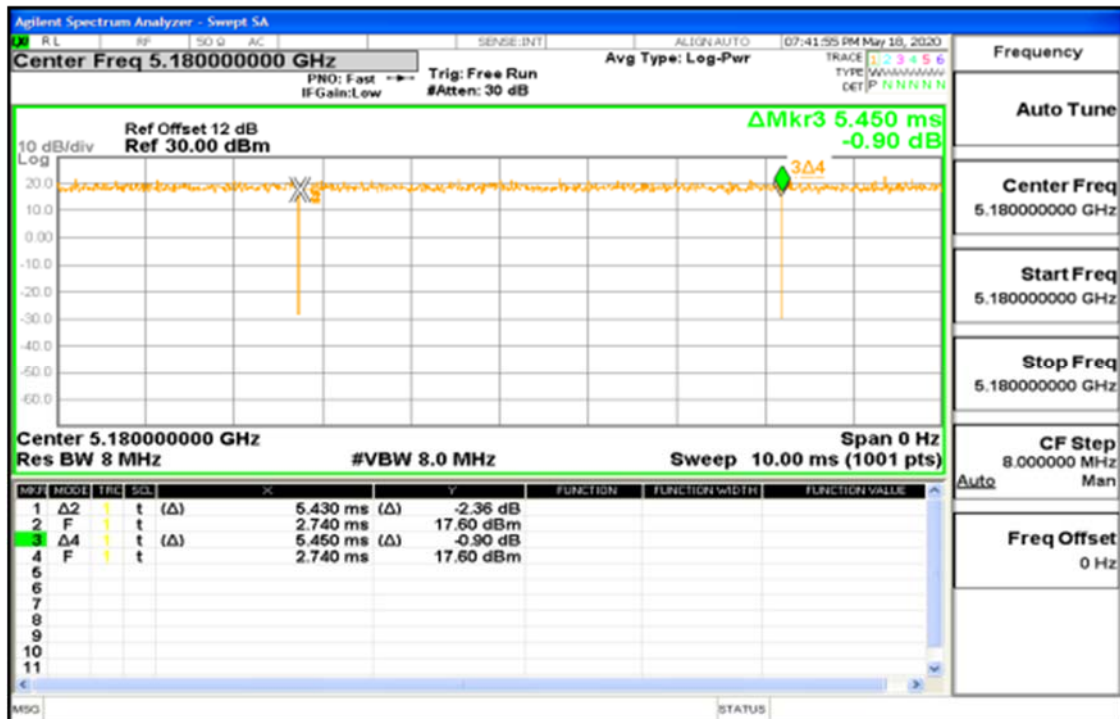
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7.2 DUTY CYCLE TEST SIGNAL MEASUREMENT RESULT

802.11 a mode



802.11n HT20 mode



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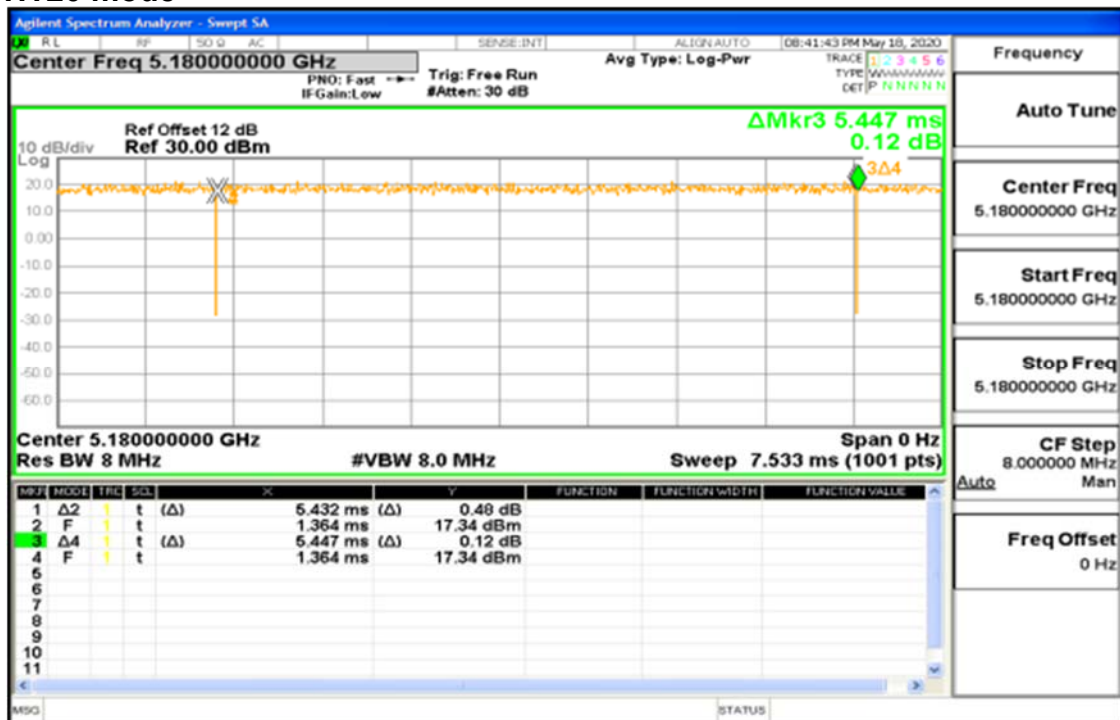
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802.11n HT40 mode



802.11ac VHT20 mode

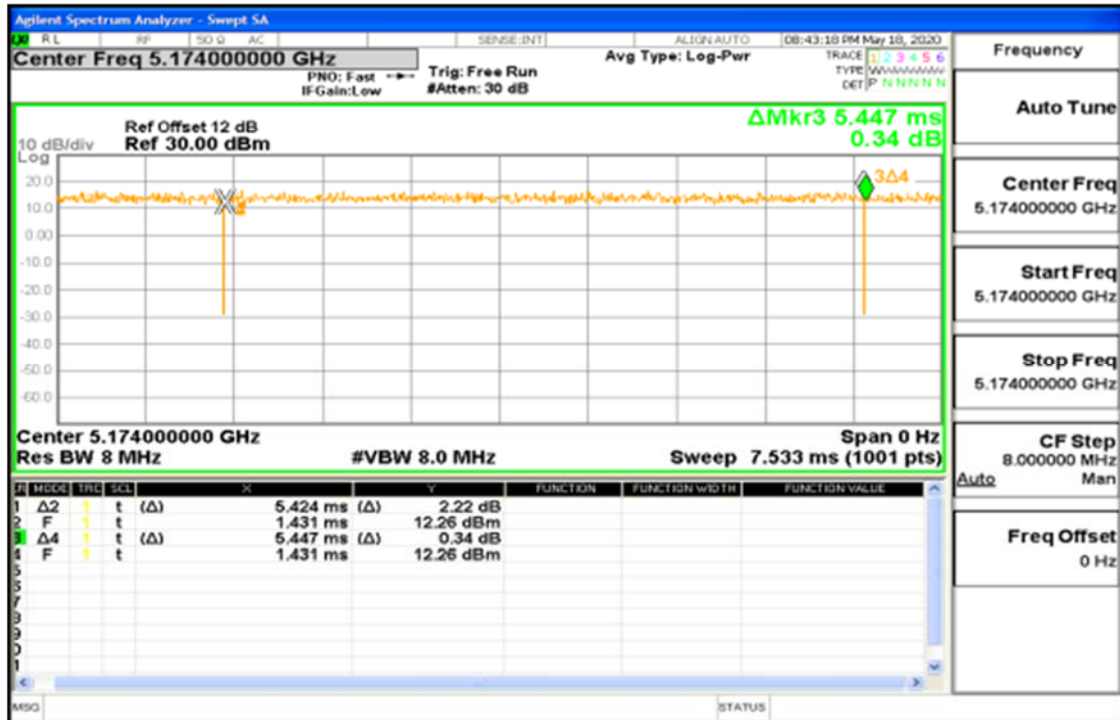


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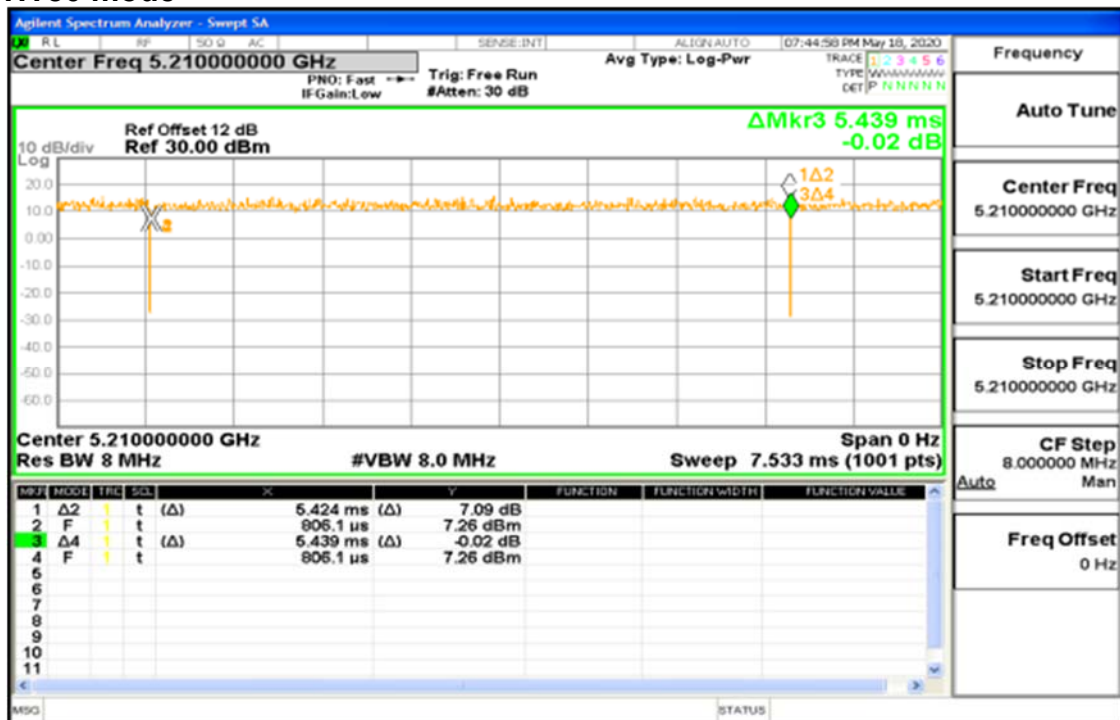
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802.11ac VHT40 mode



802.11ac VHT80 mode



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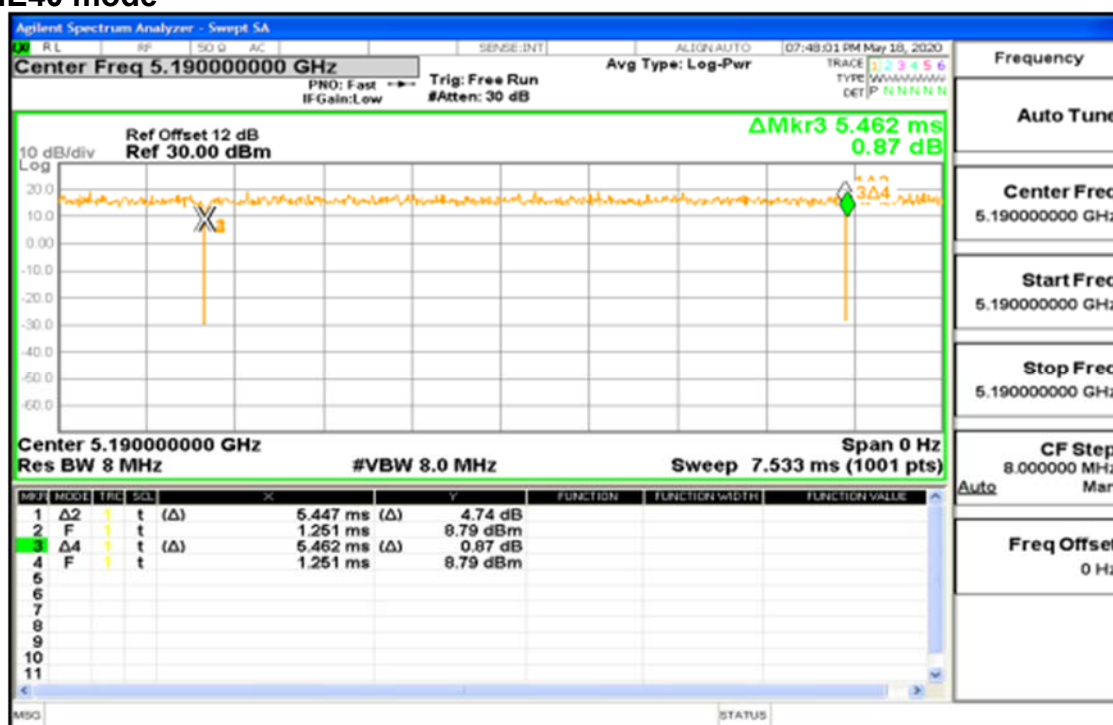
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802.11ax HE20 mode



802.11ax HE40 mode

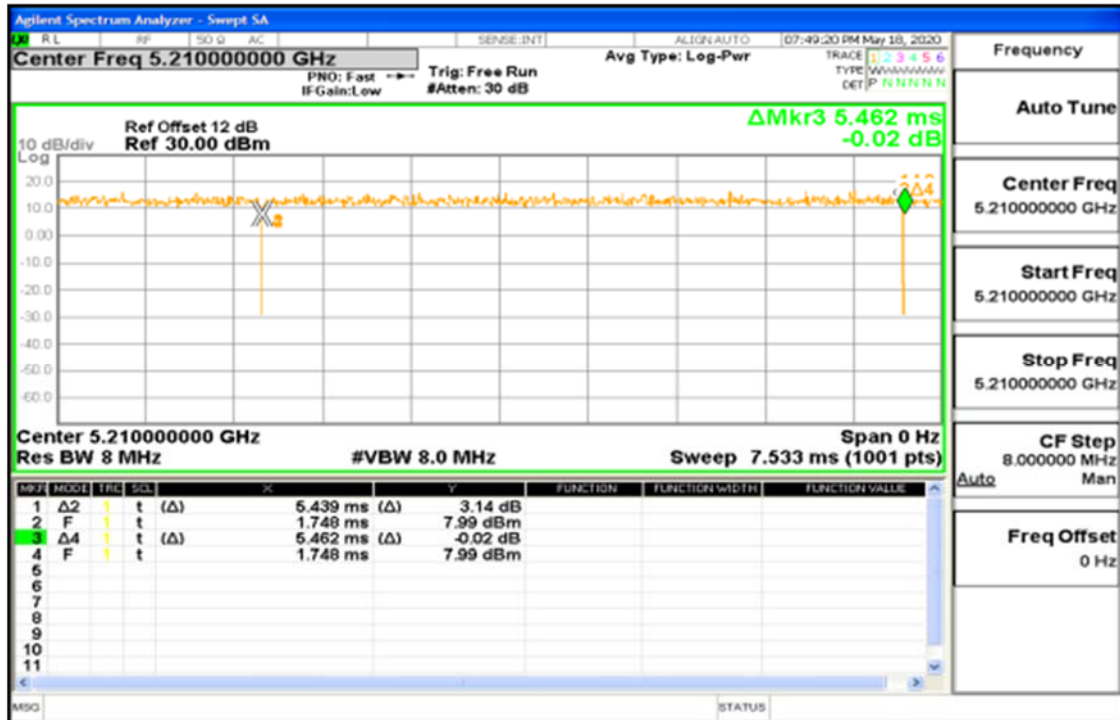


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802.11ax HE80 mode



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8 26DB, 99% & 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. For 99% Bandwidth: Set the spectrum analyzer as
RBW=1%,
VBW = 3*RBW,
Span = 30M/50MHz,
Detector=Sample,
Sweep=auto.
7. Turn on the 99% bandwidth function, max reading.
8. Repeat above procedures until all frequency of interest measured was complete.

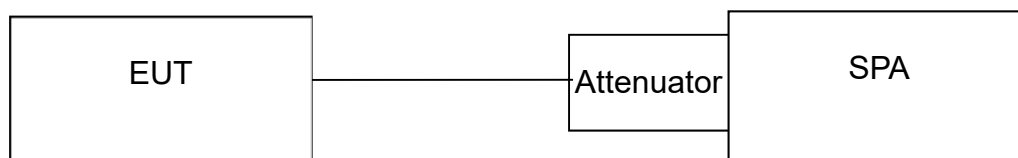
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8.3 Measurement Equipment Used

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/06/2020	05/05/2021
DC Power Supply	Agilent	E3640A	MY40005907	10/22/2019	10/21/2020
Temperature Chamber	TERCHY	MHG-120LF	911009	05/20/2020	05/19/2021
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			802.11a_Ch1		
Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	25.35	14.040	5180	18.97	12.781
5220	22.69	13.558	5220	19	12.788
5240	21.65	13.355	5240	18.97	12.781
5260	20.4	13.096	5260	19.01	12.790
5300	19	12.788	5300	18.95	12.776
5320	21.34	13.292	5320	18.91	12.767
5500	19.89	12.986	5500	19.02	12.792
5580	20.32	13.079	5580	18.99	12.785
5700	21.01	13.224	5700	19.01	12.790
5720	19.87	12.982	5720	18.95	12.776

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802.11n_HT20_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	23.09	13.634	5180	20.25	13.064
5220	23.83	13.771	5220	20.16	13.045
5240	22.23	13.469	5240	20.19	13.051
5260	22.94	13.606	5260	20.12	13.036
5300	22.91	13.600	5300	21.08	13.239
5320	20.29	13.073	5320	20.9	13.201
5500	20.87	13.195	5500	20.36	13.088
5580	21.19	13.261	5580	20.26	13.066
5700	21.19	13.261	5700	21.04	13.230
5720	21.96	13.416	5720	20.6	13.139

802.11n_HT20_Ch1

802.11n_HT40_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	45.08	16.540	5190	39.54	15.970
5230	49.62	16.957	5230	39.7	15.988
5270	46.46	16.671	5270	39.3	15.944
5310	44.53	16.487	5310	39.67	15.985
5510	44.44	16.478	5510	39.92	16.012
5550	43.92	16.427	5550	39.71	15.989
5670	40.14	16.036	5670	39.84	16.003
5710	39.96	16.016	5710	39.74	15.992

802.11n_HT40_Ch1

802.11ac_VHT80_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	94.43	19.751	5210	81.79	19.127
5290	94.52	19.755	5290	81.99	19.138
5530	86.84	19.387	5530	81.78	19.126
5610	84.18	19.252	5610	81.69	19.122
5690	82.83	19.182	5690	82.32	19.155

802.11ac_VHT80_Ch1

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802.11ax_20_Ch0

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5180	full	25.83	14.121
5220	full	22.45	13.512
5240	full	24.02	13.806
5260	full	24.65	13.918
5300	full	24.45	13.883
5320	full	22.48	13.518
5500	full	22.1	13.444
5580	full	21.81	13.387
5700	full	21.65	13.355
5720	full	21.44	13.312

802.11ax_20_Ch1

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5180	full	21.07	13.237
5220	full	21.33	13.290
5240	full	20.87	13.195
5260	full	21.23	13.269
5300	full	21.2	13.263
5320	full	20.96	13.214
5500	full	21.09	13.241
5580	full	21.18	13.259
5700	full	20.9	13.201
5720	full	21.14	13.251

802.11ax_40_Ch0

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5190	full	41.04	16.132
5230	full	43.84	16.419
5270	full	42.74	16.308
5310	full	41.71	16.202
5510	full	40.91	16.118
5550	full	43.12	16.347
5670	full	41.35	16.165
5710	full	40.79	16.106

802.11ax_40_Ch1

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5190	full	40.54	16.079
5230	full	40.27	16.050
5270	full	40.46	16.070
5310	full	40.25	16.048
5510	full	40.74	16.100
5550	full	40.44	16.068
5670	full	40.4	16.064
5710	full	40.43	16.067

802.11ax_80_Ch0

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5210	full	83.88	19.237
5290	full	86.83	19.387
5530	full	83.17	19.200
5610	full	83.07	19.194
5690	full	81.65	19.120

802.11ax_80_Ch1

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5210	full	82.2	19.149
5290	full	82.29	19.153
5530	full	81.54	19.114
5610	full	81.38	19.105
5690	full	81.73	19.124

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

802.11a_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	15.66	11.948
5785	15.89	12.011
5825	16.06	12.057

802.11a_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.35	12.135
5785	16.33	12.130
5825	16.31	12.125

802.11n_HT20_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.82	12.258
5785	16.93	12.287
5825	16.79	12.251

802.11n_HT20_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.19	12.353
5785	17.56	12.445
5825	17.3	12.380

802.11n_HT40_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	35.71	15.528
5795	35.49	15.501

802.11n_HT40_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	35.49	15.501
5795	35.5	15.502

802.11ac_VHT80_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.26	18.766

802.11ac_VHT80_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.29	18.767

802.11ax_20_Ch0

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5745	full	17.96	12.543
5785	full	18.62	12.700
5825	full	18.5	12.672

802.11ax_20_Ch1

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5745	full	18.59	12.693
5785	full	18.23	12.608
5825	full	18.44	12.658

802.11ax_40_Ch0

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5755	full	37.77	15.771
5795	full	37.43	15.732

802.11ax_40_Ch1

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5755	full	37.78	15.773
5795	full	37.4	15.729

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802.11ax_80_Ch0

802.11ax_80_Ch1

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5775	full	77.16	18.874	5775	full	76.23	18.821

8.5.3 26dB BW Verification for DFS Function

802.11a_Ch0

802.11a_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)	Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5240	5248.20	< 5250	5240	5248.18	< 5250
5745	5736.83	> 5725	5745	5736.83	> 5725

802.11n_HT20_Ch0

802.11n_HT20_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)	Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5240	5248.79	< 5250	5240	5248.75	< 5250
5745	5736.21	> 5725	5745	5736.22	> 5725

802.11n_HT40_Ch0

802.11n_HT40_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)	Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5230	5248.04	< 5250	5230	5247.98	< 5250
5755	5737.03	> 5725	5755	5737.02	> 5725

802.11ac_VHT80_Ch0

802.11ac_VHT80_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)	Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5210	5247.72	< 5250	5210	5247.64	< 5250
5775	5737.29	> 5725	5775	5737.32	> 5725

802.11ax_20_Ch0

802.11ax_20_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)	Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5240	5249.47	< 5250	5240	5249.43	< 5250
5745	5735.54	> 5725	5745	5735.57	> 5725

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802.11ax _40_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5230	5248.86	< 5250
5755	5736.16	> 5725

802.11ax _40_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5230	5248.83	< 5250
5755	5736.16	> 5725

802.11ax _VHT80_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5210	5248.56	< 5250
5775	5736.43	> 5725

802.11ax _VHT80_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5210	5248.52	< 5250
5775	5736.51	> 5725

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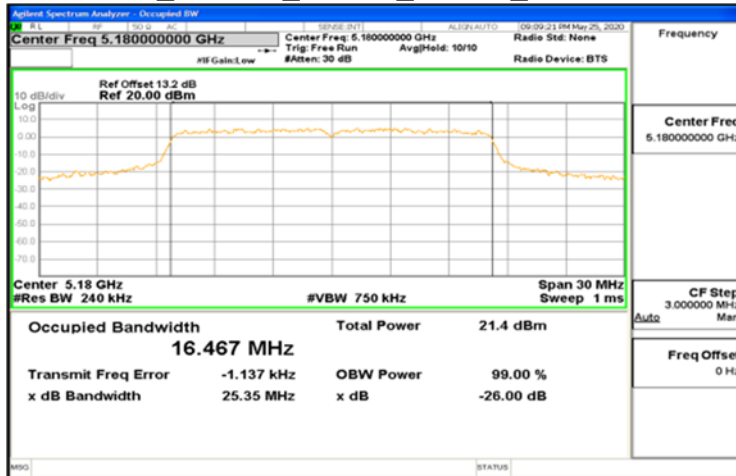
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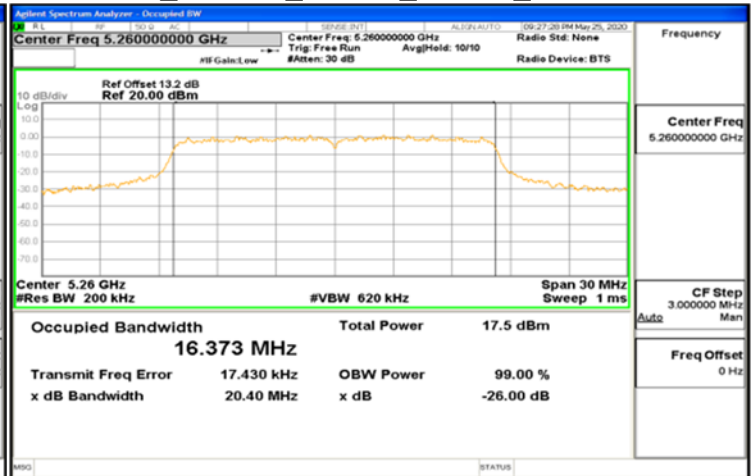
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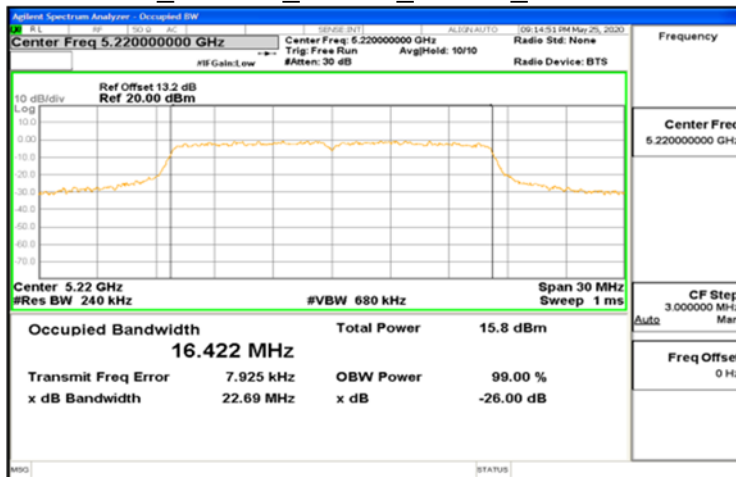
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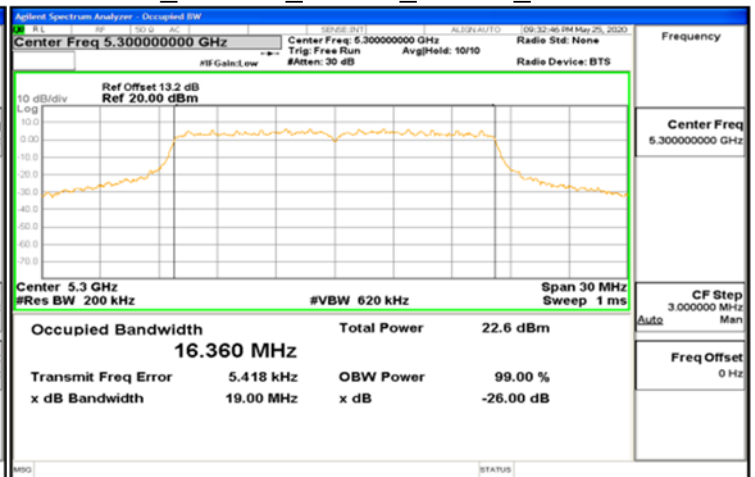
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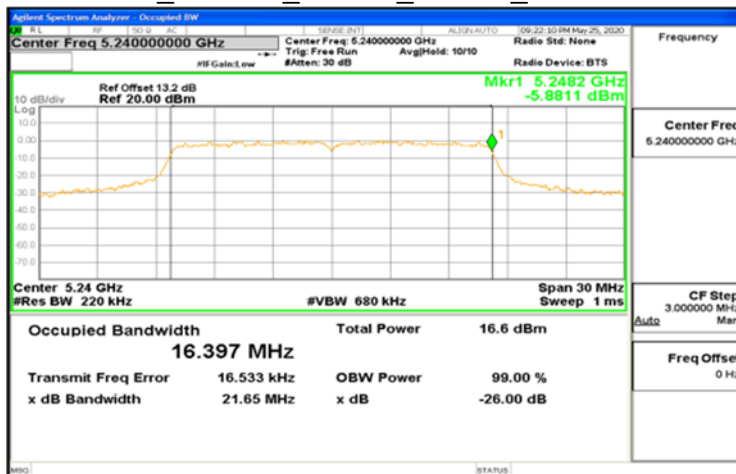
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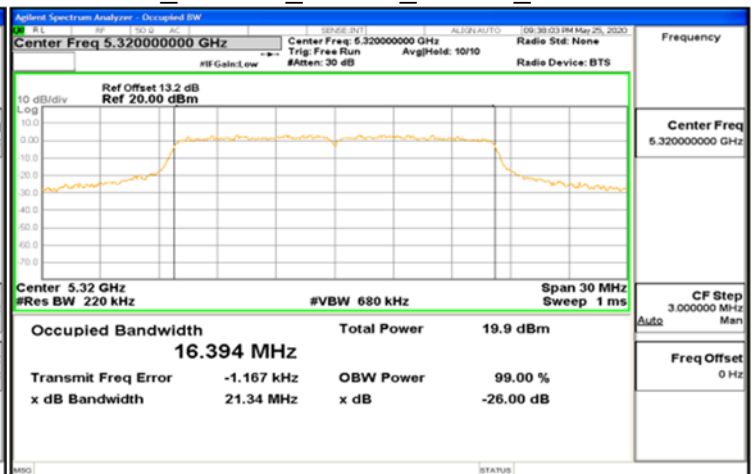
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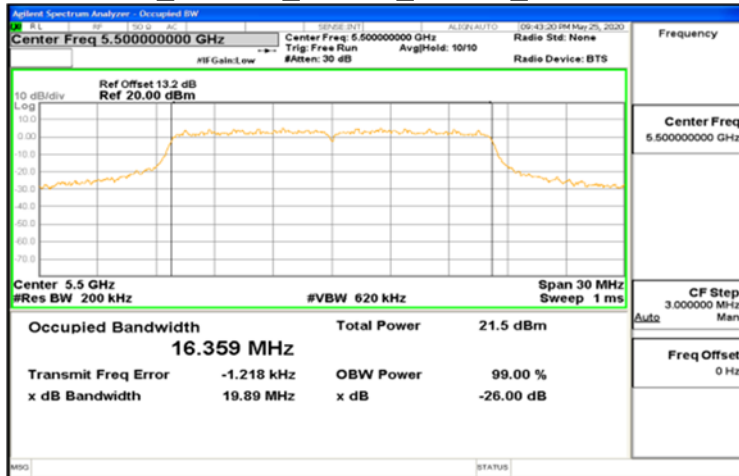


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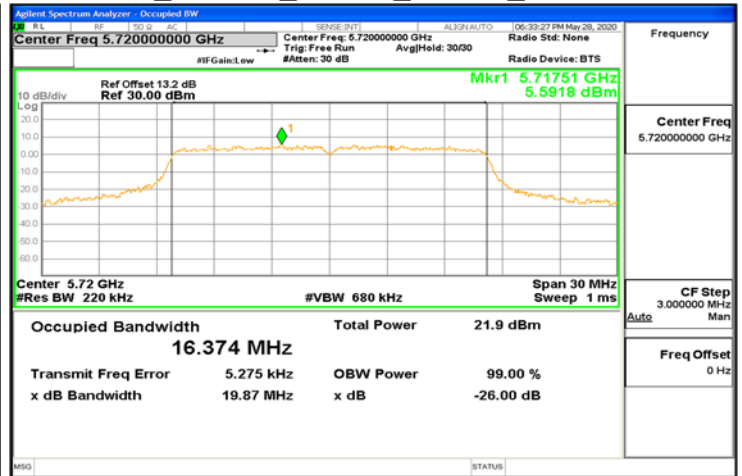
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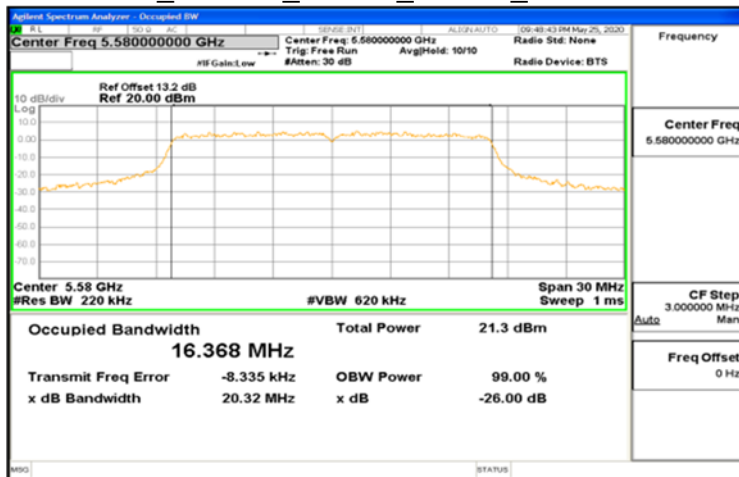
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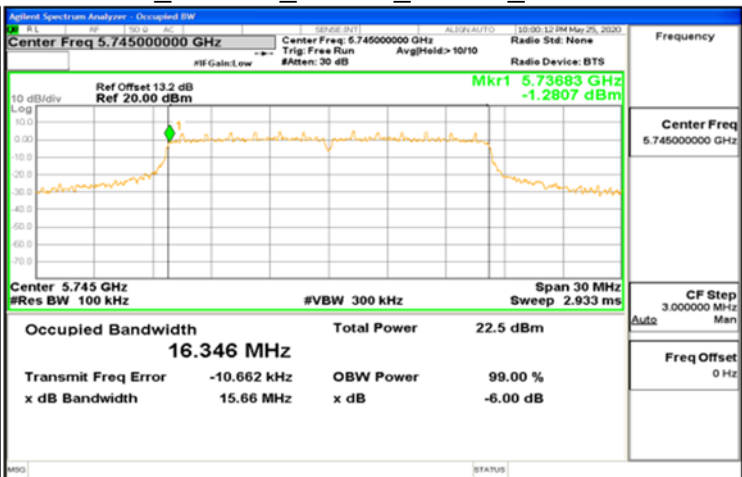
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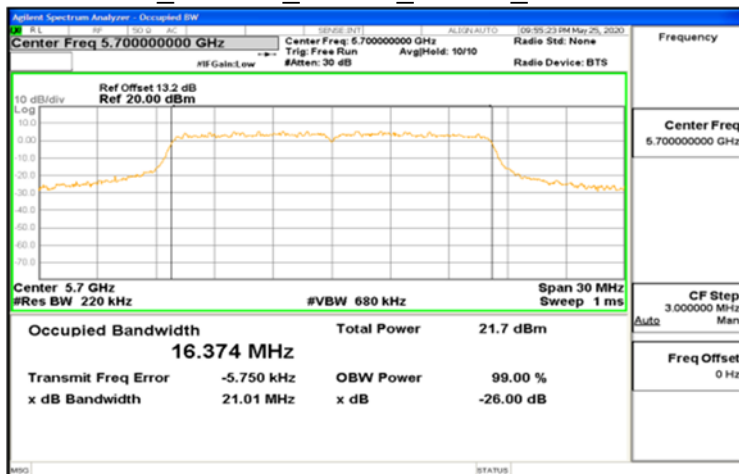
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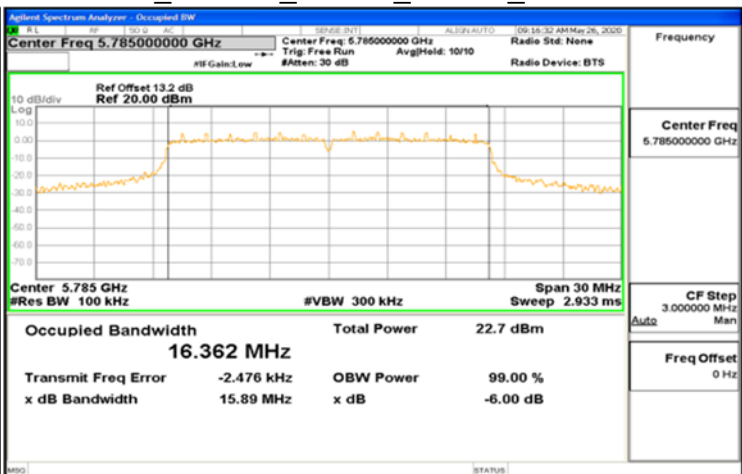
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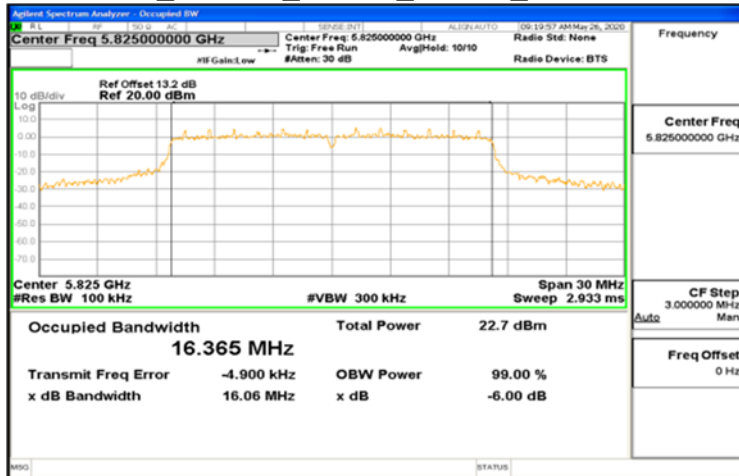


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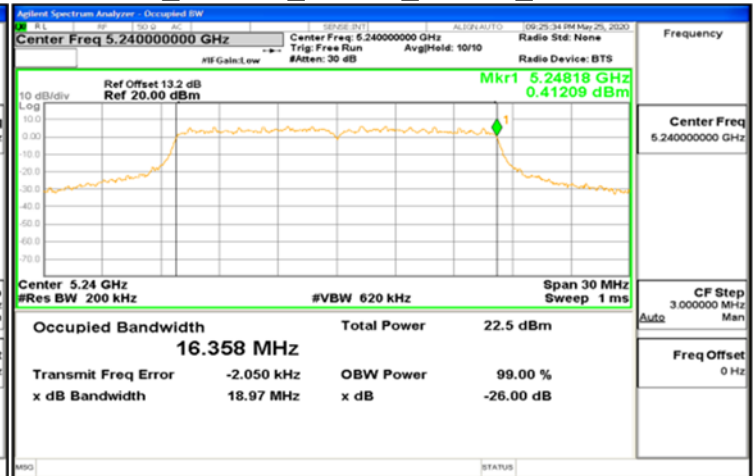
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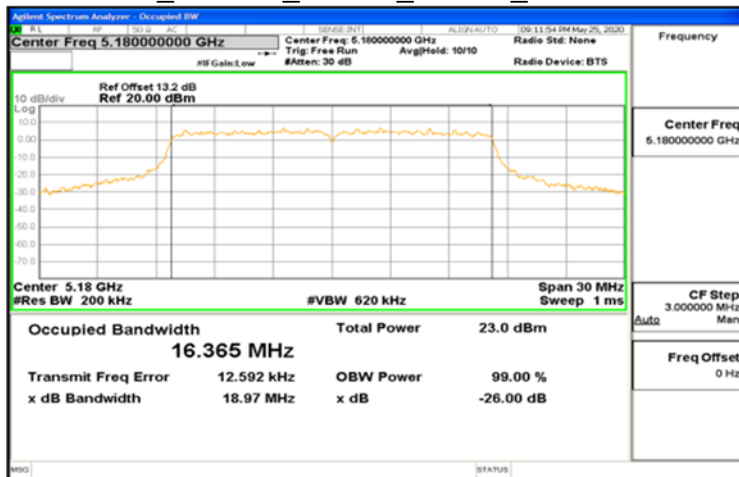
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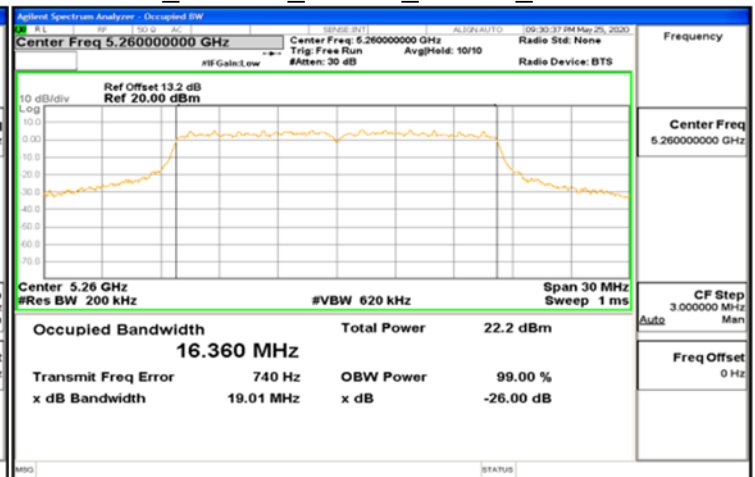
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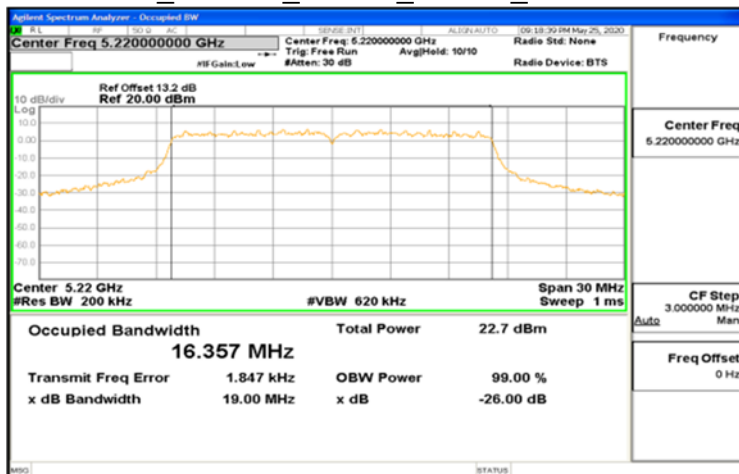
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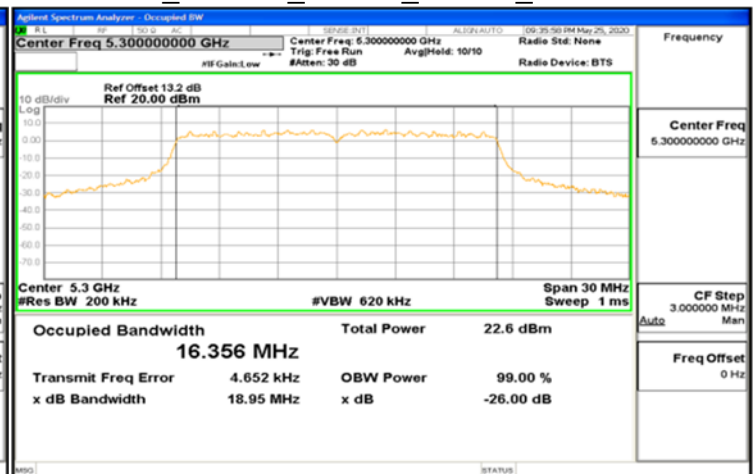
FCC_802.11a_20MHz_Chain1_5260MHz



FCC_802.11a_20MHz_Chain1_5220MHz



FCC_802.11a_20MHz_Chain1_5300MHz



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台灣檢驗科技股份有限公司

No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan/新北市五股區新北產業園區五工路134號

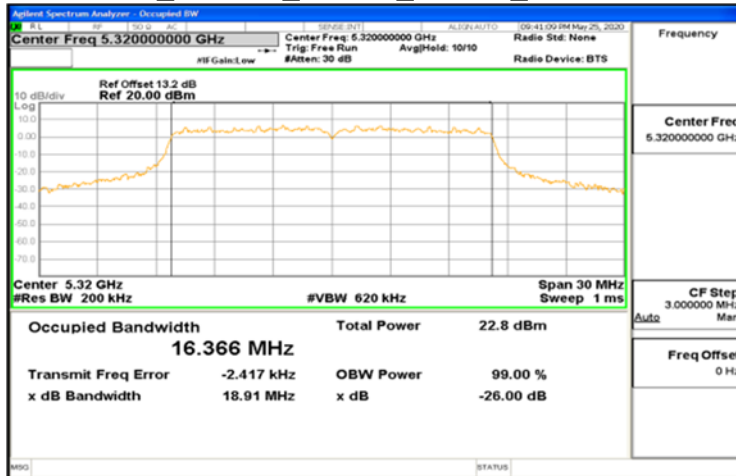
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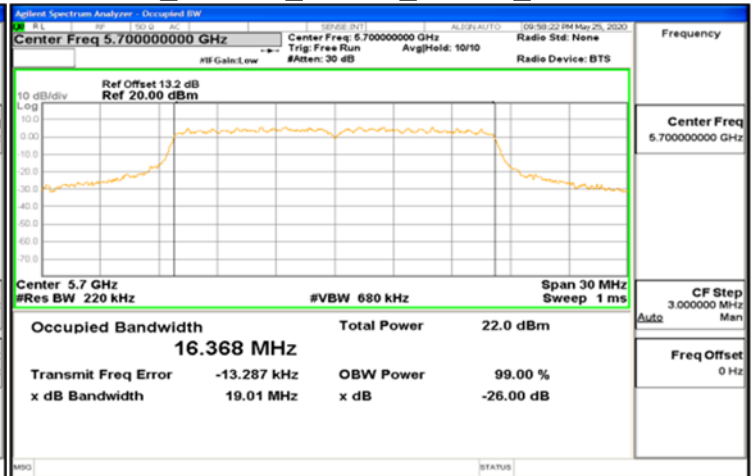
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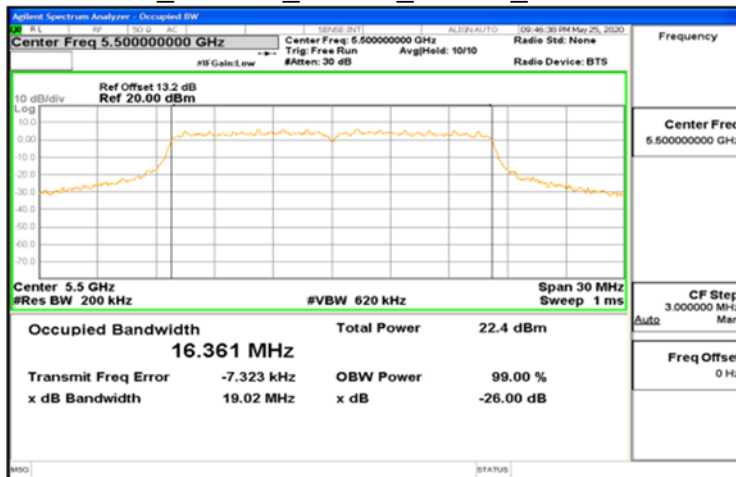
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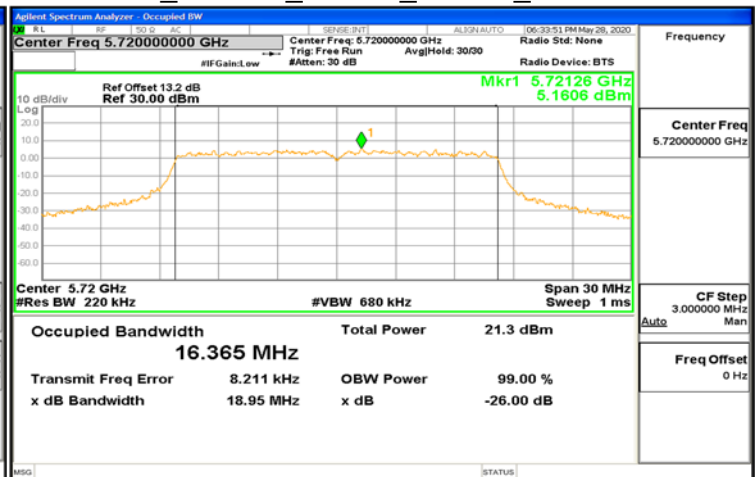
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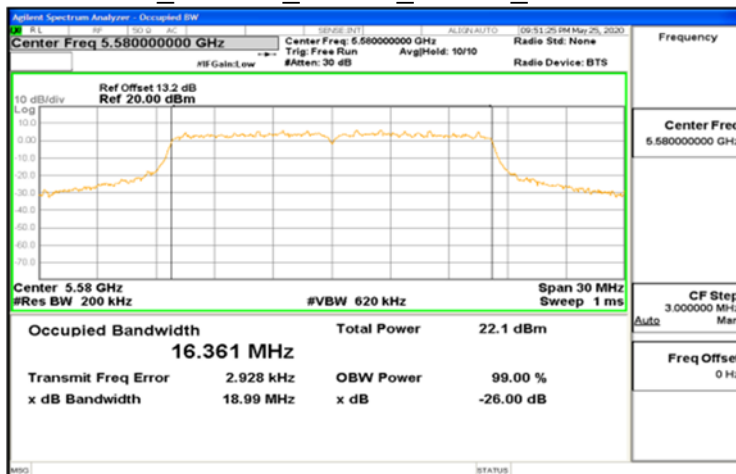
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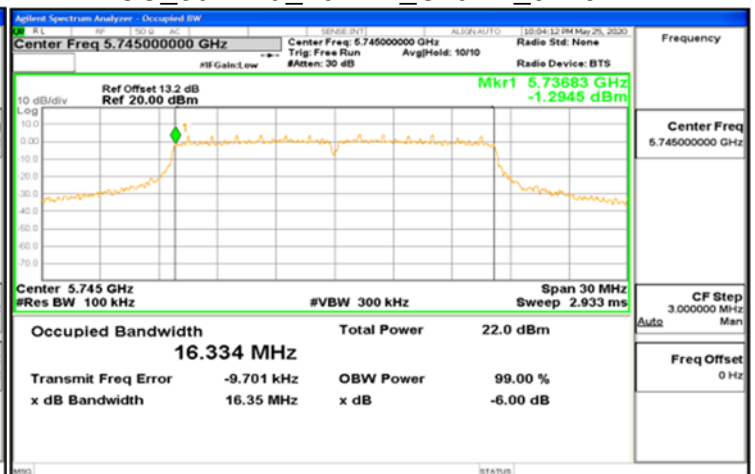
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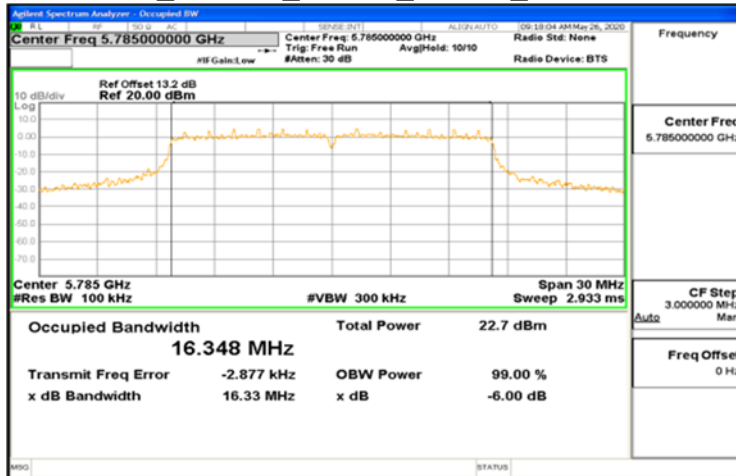


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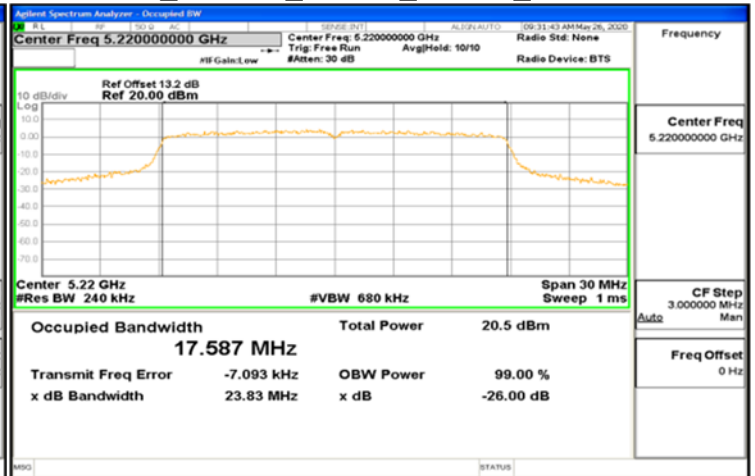
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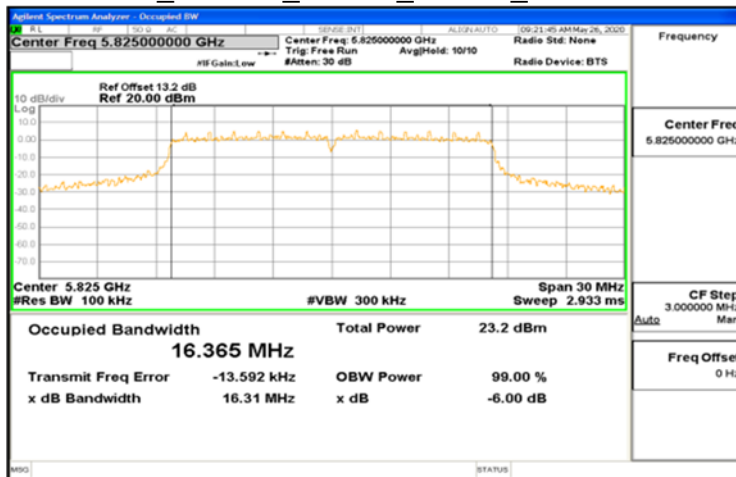
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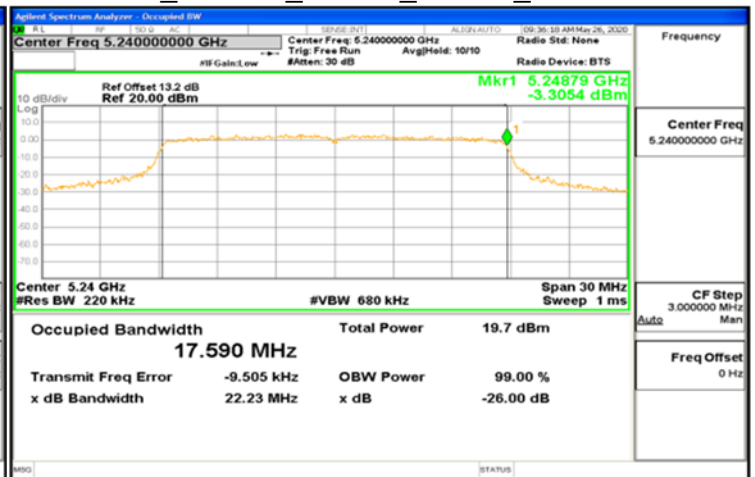
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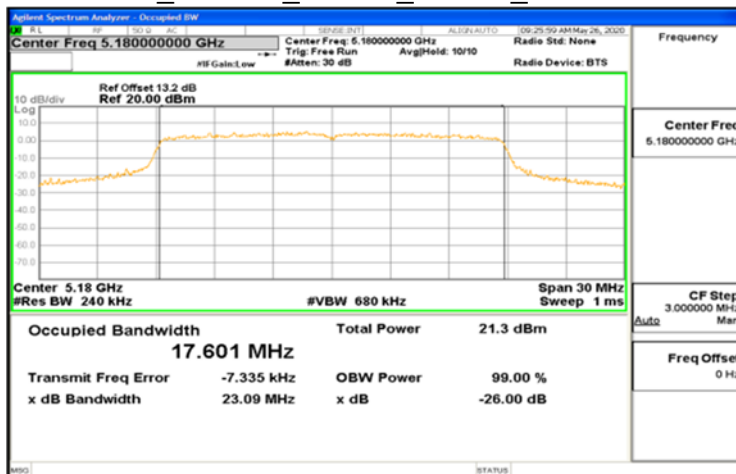
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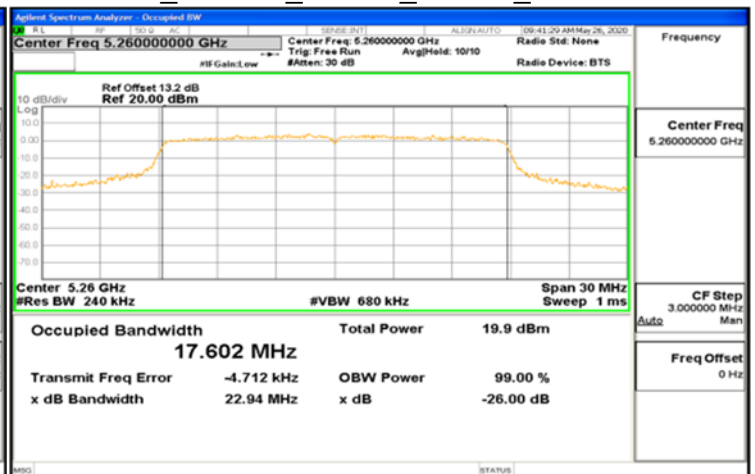
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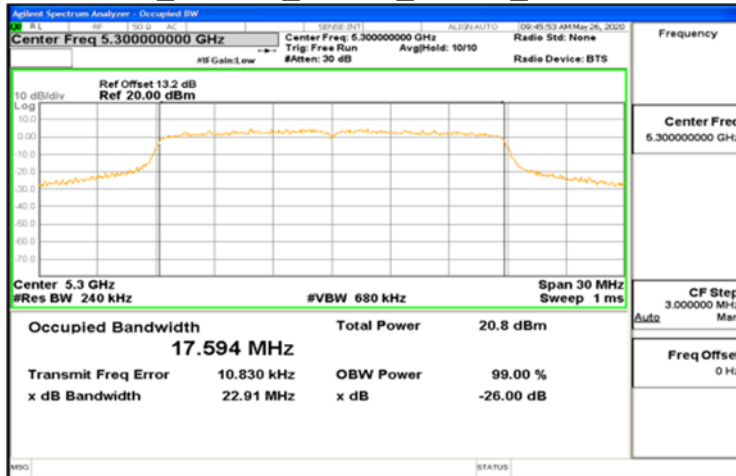


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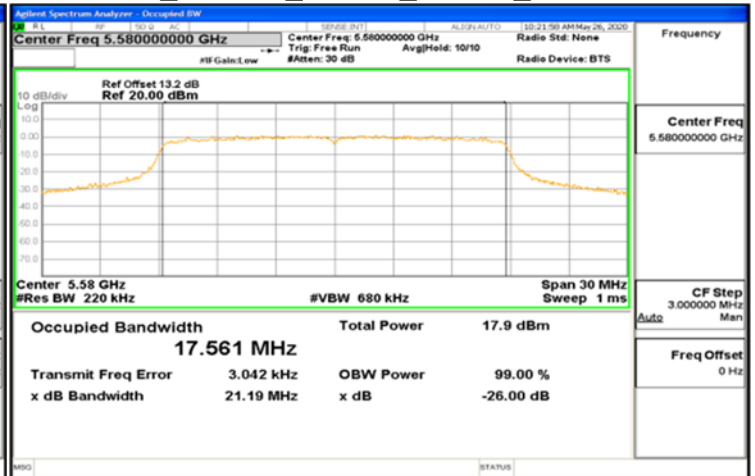
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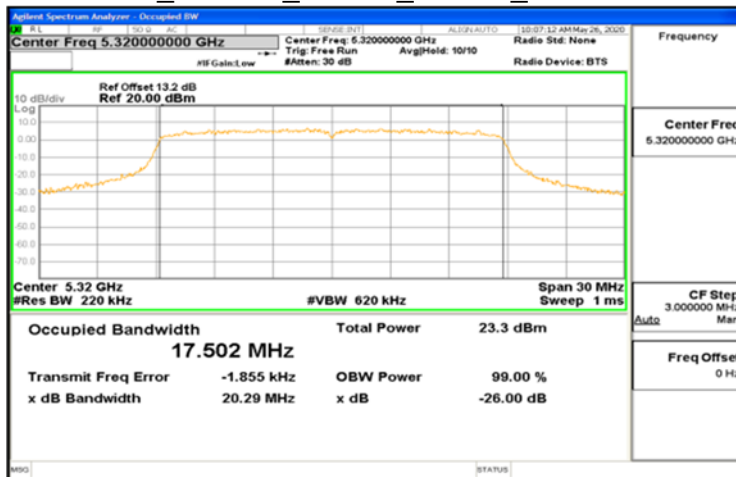
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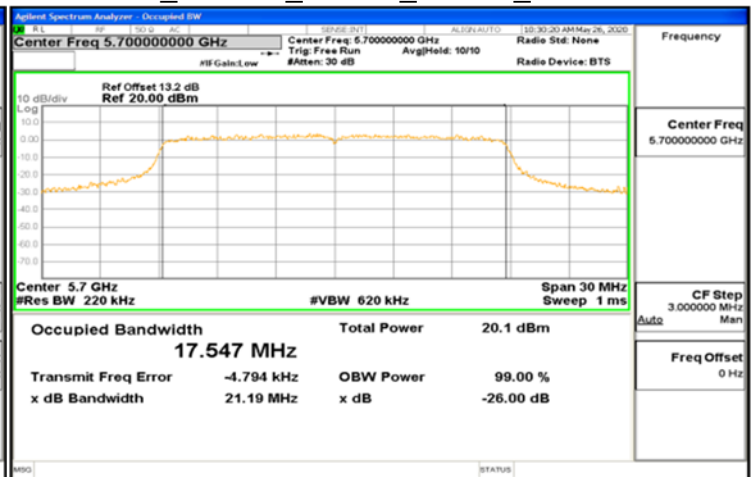
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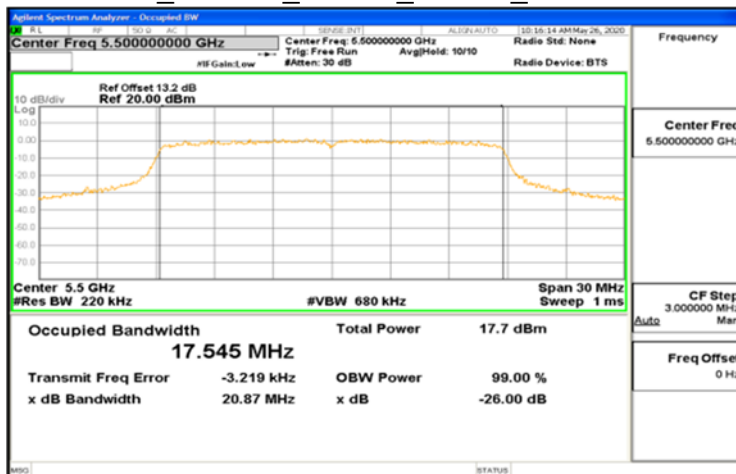
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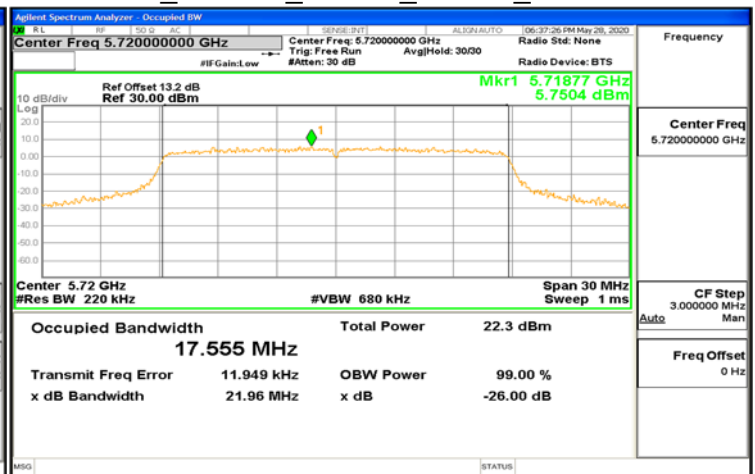
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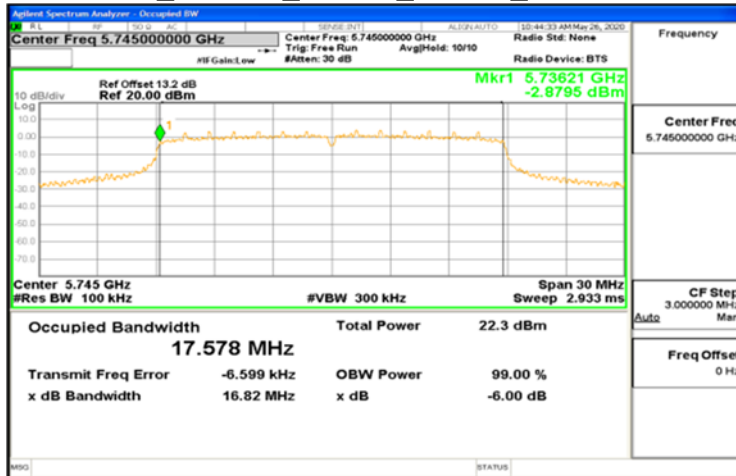


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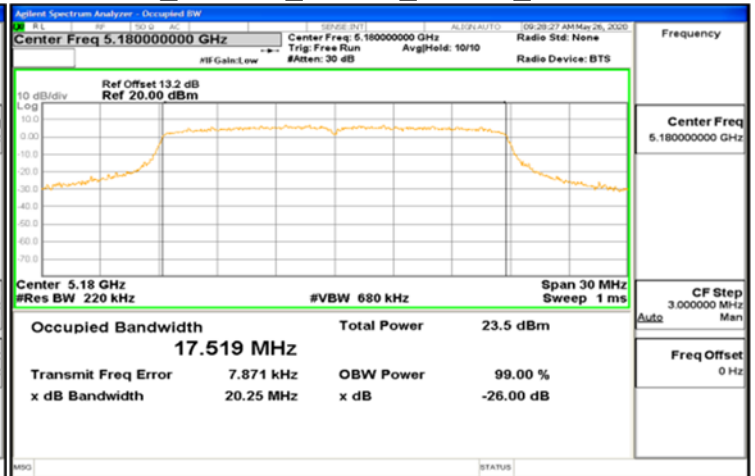
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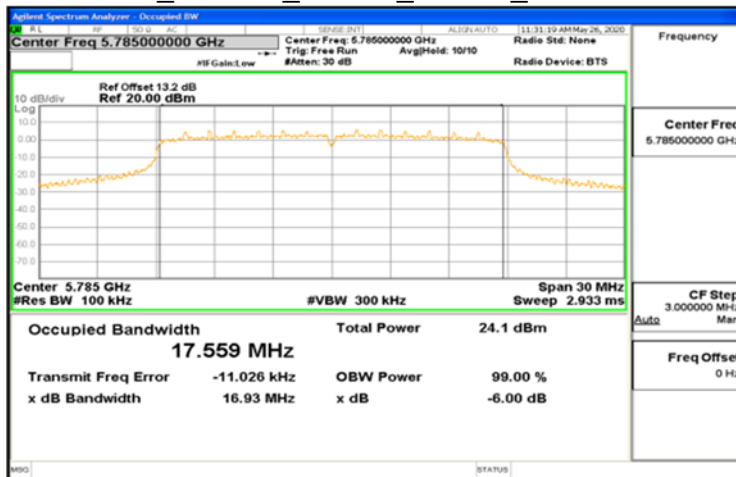
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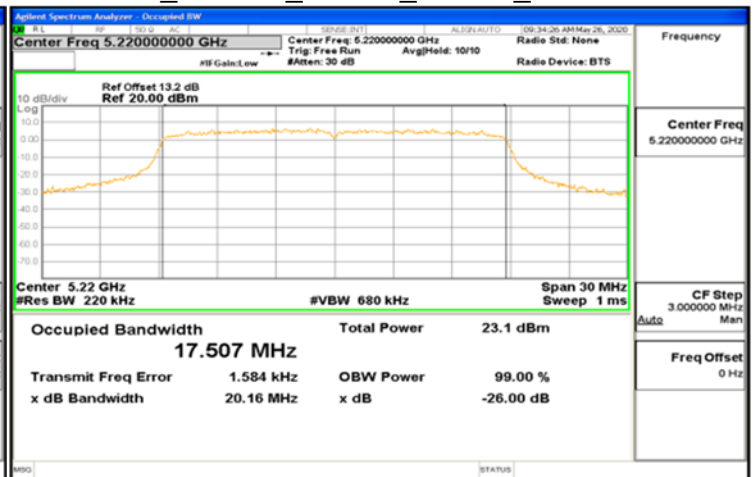
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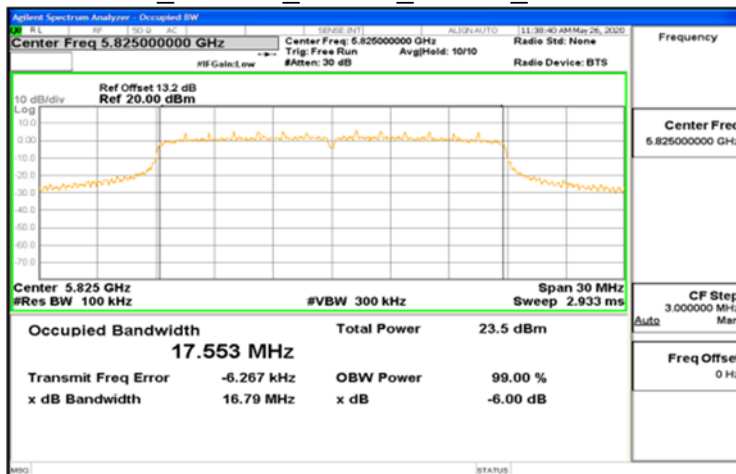
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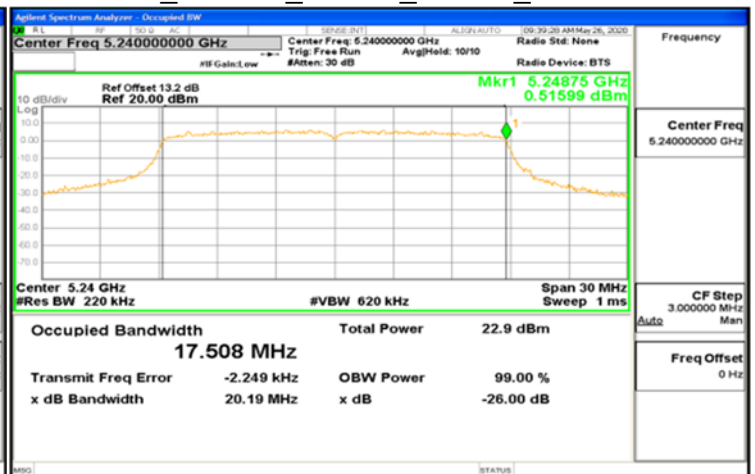
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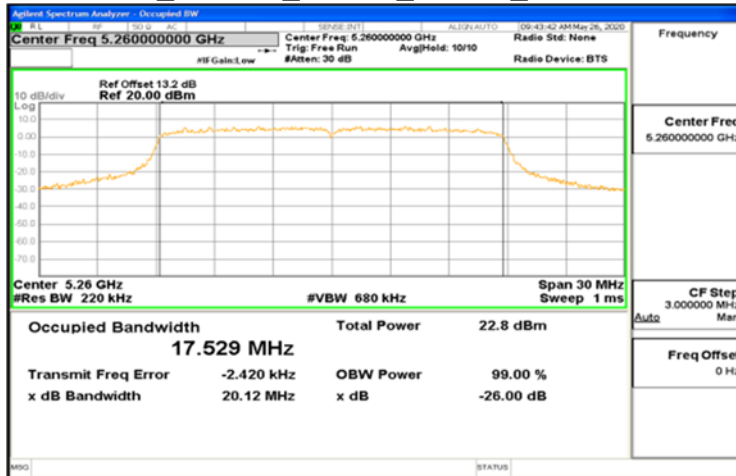


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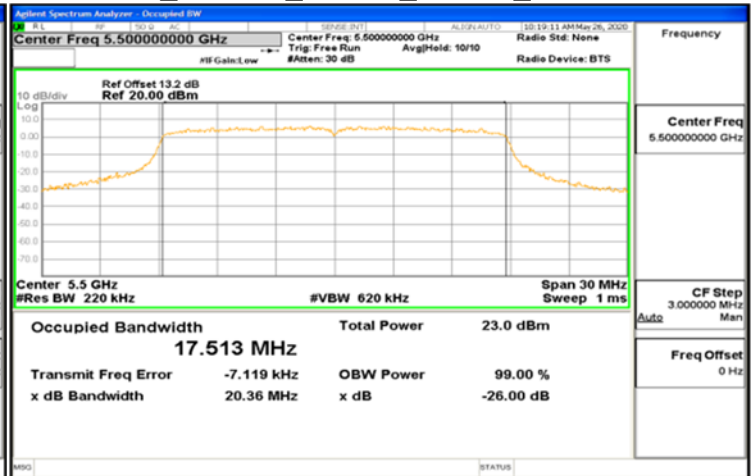
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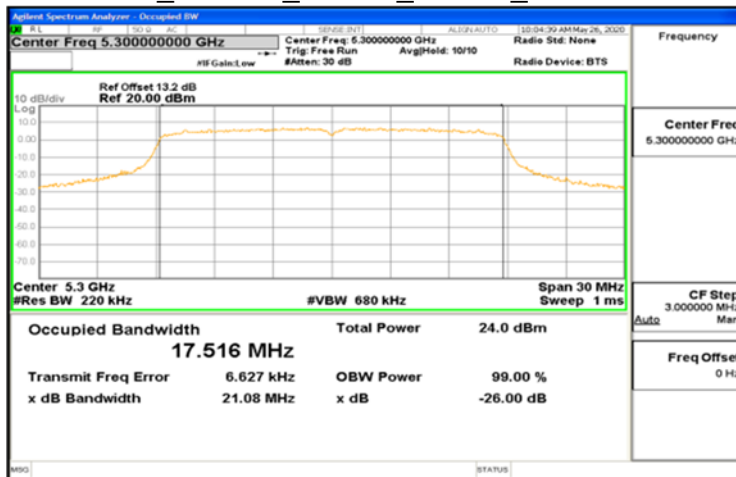
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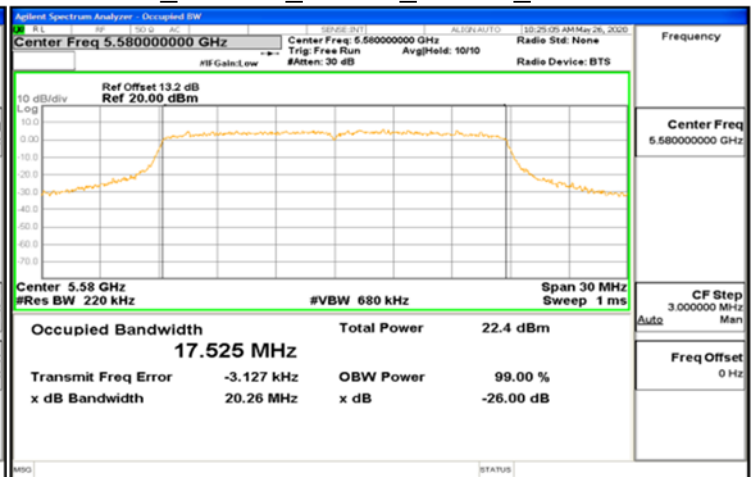
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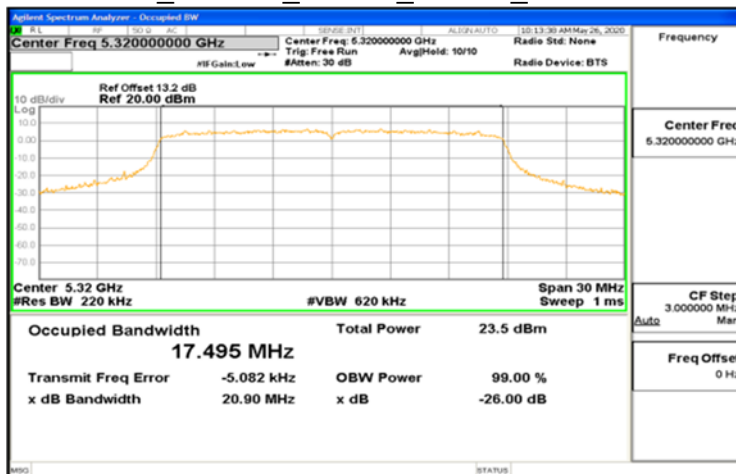
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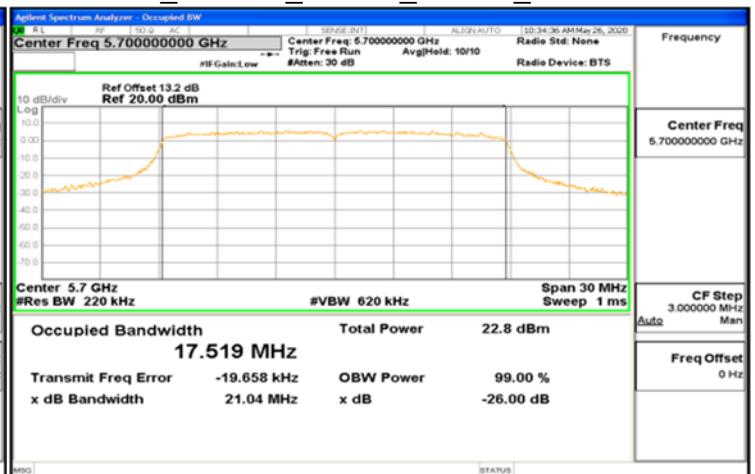
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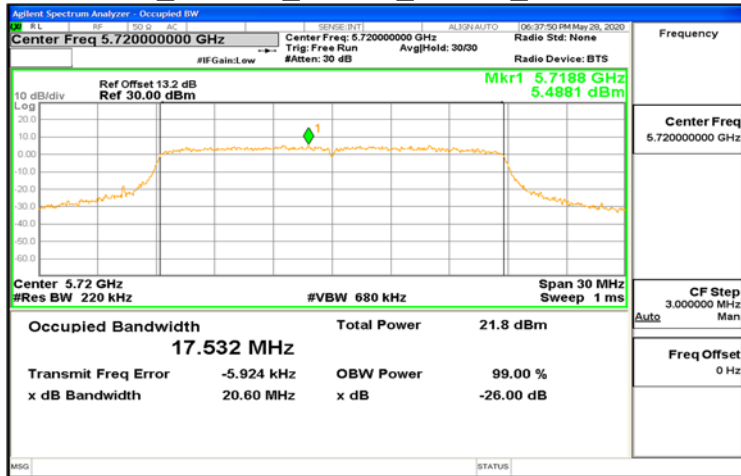


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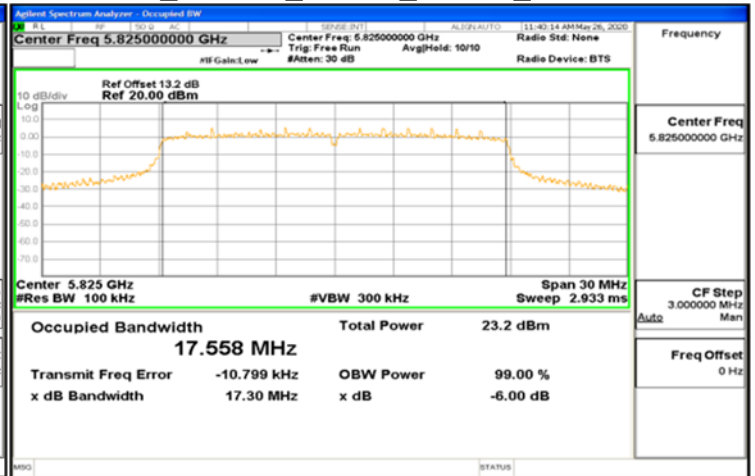
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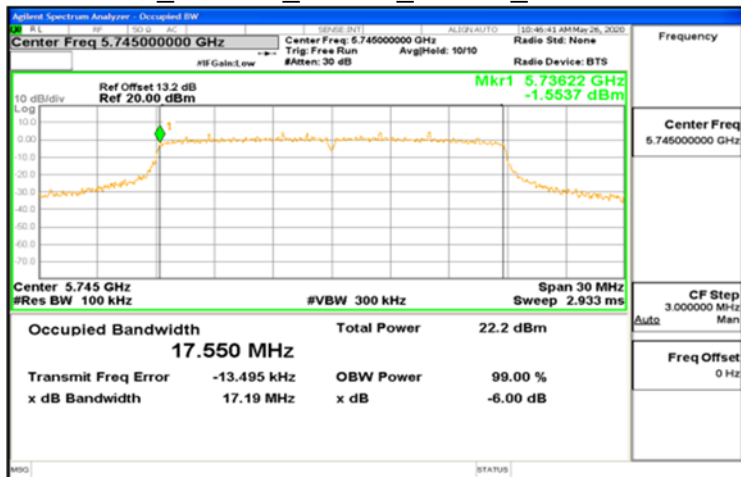
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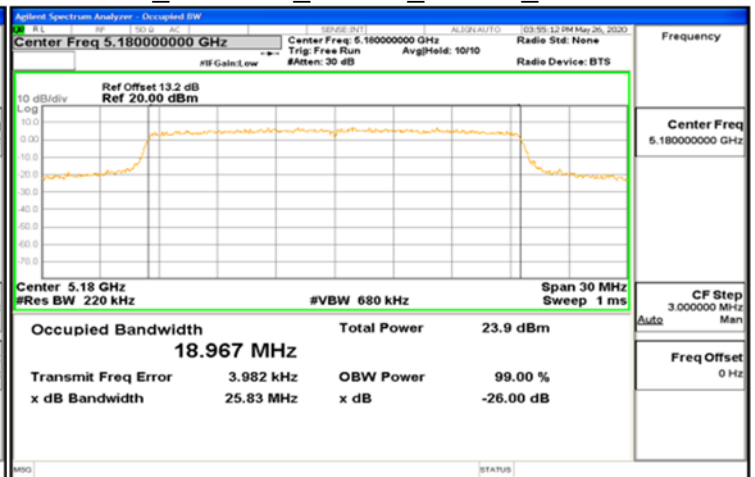
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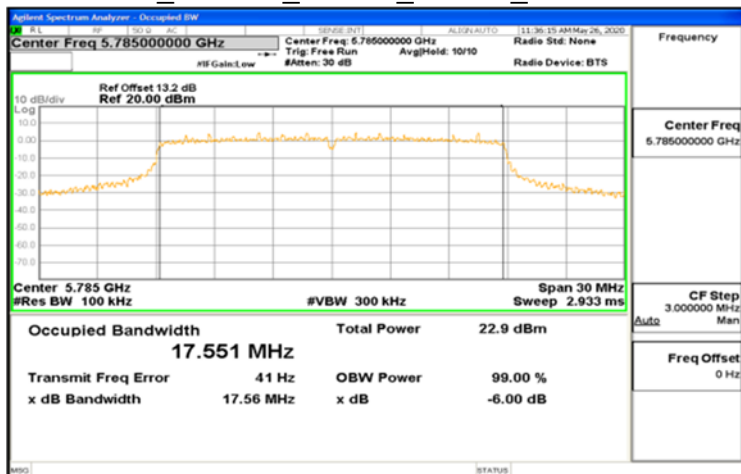
FCC_802.11n_20MHz_Chain1_5745MHz



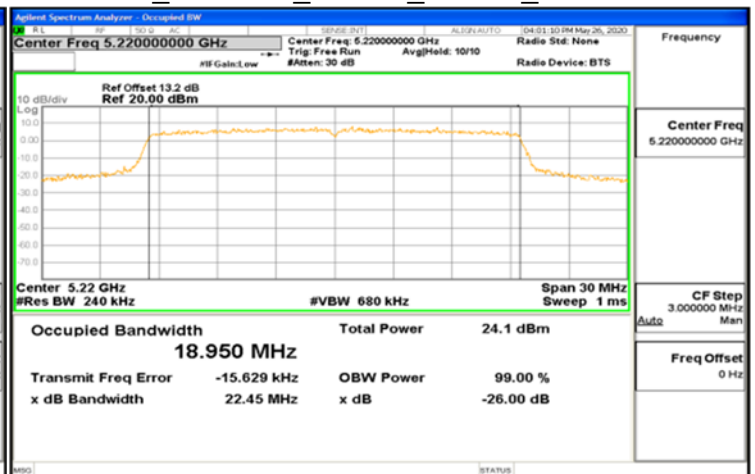
FCC_802.11ax_20MHz_Chain0_5180MHz



FCC_802.11n_20MHz_Chain1_5785MHz



FCC_802.11ax_20MHz_Chain0_5220MHz



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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