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_I006D
Model Difference:	N/A
Report Number:	ER/2021/20007
FCC ID	MSQI006D
IC:	3568A-I006D
FCC Rule Part:	§15.407, Cat: U-NII
ISED RSS:	RSS-247 issue 2 Feb. 2017
Issue Date:	April 12, 2021
Date of Test:	January 26, 2021 - April 6, 2021
Date of EUT Received:	January 26, 2021

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: _____

Blue Yang / Asst. Manager

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Revision History				
Report Number	**Revision**	**Description**	**Issue Date**	**Revised By**
ER/2021/20007	Rev.00	Original.	April 12, 2021	Viola Su

Note:

1、 Disclaimer
Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

2、 Test data is referenced from original report
Measurement results in the original test report ER/2021/10056 are partially leveraged in this test report with spot check to demonstrate compliance.

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	ASUS Phone (Mobile Phone)	
Brand Name:	ASUS	
Model No.:	ASUS_I006D	
Model Difference:	N/A	
Hardware Version:	V4	
Software Version:	Android 11	
EUT Series No.:	N/A	
Power Supply:	3.87Vdc from Rechargeable Li-polymer Battery or 5 / 9 / 12 / 15 / 20 Vdc from AC/DC Adapter	
	Battery	Model No: C11P2003 Brand: ASUS
	Adapter	Model No: A299-200150U-US Brand: ASUS

1.2 Modulation & Data Rate

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: 6.5 - 54 Mbps
	802.11 n_20MHz: 6.5 - 144.4 Mbps
	802.11 n_40MHz: 13.5 - 300 Mbps
	802.11 ac_20MHz: 6.5 - 173.4 Mbps
	802.11 ac_40MHz: 13.5 - 400 Mbps
	802.11 ac_80MHz: 29.3 - 866.6 Mbps
	802.11 ax_20MHz: 8.6 - 286.8 Mbps
	802.11 ax_40MHz: 17.2 - 573.6 Mbps
	802.11 ax_80MHz: 36 - 1201 Mbps
	802.11 ax_160MHz: 68 - 2402 Mbps

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1.3 Antenna Designation

天線型式	Brand	Model No.	發射頻帶(MHz)	天線增益(dBi)
PIFA	ASUS	ZS590KS	5150~5250	-0.66
			5250~5350	-0.66
			5470~5725	0.61
			5725~5850	-0.25
PIFA	ASUS	ZS590KS	5150~5250	-2.54
			5250~5350	-1.18
			5470~5725	-1.12
			5725~5850	-0.34

Note: Investigation has been done to determine the worst case scenario for the above antennas demonstrated with measurements in this report.

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1.4 FCC

WLAN 5 GHz

Wi-Fi	Frequency Range	Channels	Rated Power(Avg) (dBm) (Worst Case)	Modulation Technology
a n_HT ac_VHT ax_HE 20M	5180~5240	4	20.34 dBm	OFDM
	5260~5320	4	20.99 dBm	OFDM
	5500~5720	12	20.78 dBm	OFDM
	5745-5825	5	20.99 dBm	OFDM
n_HT ac_VHT ax_HE 40M	5190~5230	2	19.60 dBm	OFDM
	5270~5310	2	20.15 dBm	OFDM
	5510~5710	6	20.12 dBm	OFDM
	5755-5795	2	20.69 dBm	OFDM
ac_VHT ax_HE 80M	5210	1	18.23 dBm	OFDM
	5290	1	18.69 dBm	OFDM
	5530~5690	3	20.49 dBm	OFDM
	5775	1	20.52 dBm	OFDM
ax_HE 160M	5250	1	15.84 dBm	OFDMA
	5570	1	15.68 dBm	OFDMA

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1.5 *ISED*

WLAN 5 GHz for ISED(Slave)

Wi-Fi	Frequency Range	Channels	EIRP/Avg	Rated Power(EIRP/Avg) (dBm) (Worst Case)	Modulation Technology
a n_HT ac_VHT ax_HE 20M	5180~5240	4	EIRP	21.80 dBm	OFDM
	5260~5320	4	Avg	20.99 dBm	OFDM
	5500~5700	11	Avg	20.78 dBm	OFDM
	5720 (U-NII 2C)	1	Avg	19.65 dBm	OFDM
	5720 (U-NII 3)	1	Avg	14.60 dBm	OFDM
	5745-5825	5	Avg	20.99 dBm	OFDM
n_HT ac_VHT ax_HE 40M	5190~5230	2	EIRP	21.06 dBm	OFDM
	5270~5310	2	Avg	20.15 dBm	OFDM
	5510~5670	5	Avg	19.63 dBm	OFDM
	5710 (U-NII 2C)	1	Avg	20.12 dBm	OFDM
	5710 (U-NII 3)	1	Avg	11.40 dBm	OFDM
	5755-5795	2	Avg	20.69 dBm	OFDM
ac_VHT ax_HE 80M	5210	1	EIRP	19.69 dBm	OFDM
	5290	1	Avg	18.69 dBm	OFDM
	5530~5610	2	Avg	18.69 dBm	OFDM
	5690 (U-NII 2C)	1	Avg	20.49 dBm	OFDM
	5690 (U-NII 3)	1	Avg	9.06 dBm	OFDM
	5775	1	Avg	20.52 dBm	OFDM
ax_HE 160M	5250	1	Avg	15.84 dBm	OFDMA
	5570	1	Avg	15.68 dBm	OFDMA

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 cabability 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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1.6 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

1.7 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction A	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		

Note: Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.

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1.8 Special Accessories

There are no special accessories used while test was conducted.

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

2.3.2 Conducted Test (RF)

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

2.3.3 Radiated Emissions

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

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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

Conducted Setup & Radiated Setup

Conduction Setup

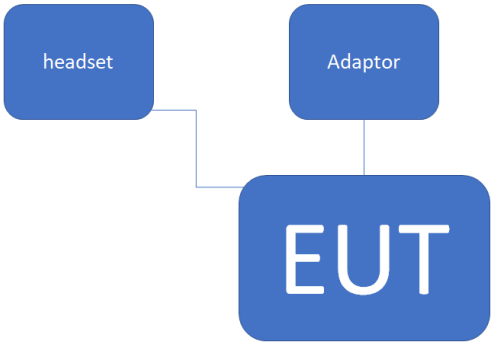

Table 2-1 Equipment Used in Tested System

Item	Equipment	MRF/BRAND	Model/Type No.	Series No.	Version
1.	QRCT4	N/A	N/A	N/A	4.0.00142.0
2.	Notebook	Lenovo	L480	PF-1S9NT5	N/A
3.	Adapter	ASUS	A299-200150U-US	NA	N/A
4.	Headset	1MORE	EARPHONE BLK YODA	NA	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
§15.407(e)	RSS-Gen §6.7 RSS-247 §6.2.4.1	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
§15.203 §15.407(a)	N/A	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 Operating 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		160 M	
CH	Freq (MHz)	CH	Freq (MHz)	CH	Freq (MHz)	CH	Freq (MHz)
52	5260	54	5270	58	5290	50	5250
56	5280	62	5310				
60	5300						
64	5320						

Operated band in 5470 MHz ~5725 MHz:

20 M		40 M		80 M		160 M	
CH	Freq (MHz)	CH	Freq (MHz)	CH	Freq (MHz)	CH	Freq (MHz)
100	5500	102	5510	106	5530	114	5570
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 gevin 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

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

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

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

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.

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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	2TX
	5260~5320	52 to 64	60			
	5500~5720	100 to 144	116			
	5745~5825	149 to 165	157			
802.11ax_HE160	5290	58	58	OFDMA	MCS0	MIMO
	5530~5610	106 to 138	106			

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	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	OFDM	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	OFDM	MCS8	MIMO
	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	MIMO
	5290	58	58			
	5530~5610	106 to 138	106,122,138			
	5775	155	155			
802.11ax_HE160	5250	50	50	OFDM	MCS0	MIMO
	5570	114	114			

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RADIATED EMISSION TEST (ABOVE 1 GHz)							
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	RU CONFIGURATI	DATA RATE (Mbps)	ANTENNA PORT
802.11ax_HE20	5180~5240	36 to 48	36,44,48	OFDMA	FULL RU 26/0,26/8 52/37,52/40 106/53,106/54	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	OFDMA	FULL RU 242/61,242/62	MCS0	MIMO
	5270~5310	54 to 62	54,62				
	5510~5670	102 to 142	102,110,134,142				
	5755~5795	151 to 159	151,159				
802.11ax_HE80	5210	42	42	OFDMA	FULL RU 484/65,484/66	MCS0	MIMO
	5290	58	58				
	5530~5610	106 to 138	106,122,138				
	5775	155	155				
802.11ax_HE160	5290	58	58	OFDMA	FULL RU 484/65,484/66	MCS0	MIMO
	5530~5610	106 to 138	106,122,138				

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for channel Low, Mid and High, the worst case E2 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)	ANTENNA 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	OFDM	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	OFDM	MCS8	MIMO
	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	MIMO
	5290	58	58			
	5530~5610	106 to 138	106,122,138			
	5775	155	155			
802.11ax_HE160	5250	50	50	OFDM	MCS0	MIMO
	5570	114	114			

CONDUCTED TEST							
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	RU CONFIGURATI	DATA RATE (Mbps)	ANTENNA PORT
802.11ax_HE20	5180~5240	36 to 48	36,44,48	OFDMA	FULL RU 26/0,26/8 52/37,52/40 106/53,106/54	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	OFDMA	FULL RU 242/61,242/62	MCS0	MIMO
	5270~5310	54 to 62	54,62				
	5510~5670	102 to 142	102,110,134,142				
	5755~5795	151 to 159	151,159				
802.11ax_HE80	5210	42	42	OFDMA	FULL RU 484/65,484/66	MCS0	MIMO
	5290	58	58				
	5530~5610	106 to 138	106,122,138				
	5775	155	155				
802.11ax_HE160	5290	58	58	OFDMA	FULL RU 484/65,484/66	MCS0	MIMO
	5530~5610	106 to 138	106,122,138				

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.34 dB
26dB & 6dB Emission Bandwidth	+/- 1.54 Hz
The Maximum Output Power Measurement	+/- 1 dB
Peak Power Spectral Density Measurement	+/- 1.54 dB
Frequency Stability	+/- 1.54 Hz
Temperature	+/- 0.4 °C
Humidity	+/- 3.5 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 1%

Radiated Spurious Emission Measurement Uncertainty				
Polarization: Vertical	+/-	2.64	dB	9kHz~30MHz: +-2.3dB
	+/-	4.93	dB	30MHz - 1000MHz: +/- 3.37dB
	+/-	4.81	dB	1GHz - 18GHz: +/- 4.04dB
	+/-	4.52	dB	18GHz - 40GHz: +/- 4.04dB
Polarization: Horizontal	+/-	2.64	dB	9kHz~30MHz: +-2.3dB
	+/-	4.45	dB	30MHz - 1000MHz: +/- 4.22dB
	+/-	4.81	dB	1GHz - 18GHz: +/- 4.08dB
	+/-	4.52	dB	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

Radiated Emission Test Site: Conduction 1					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
LISN	SCHWARZBECK	NSLK 8127	8127-465	04/09/2020	04/08/2021
Coaxial Cables	N/A	Coaxial Cable	161207	12/07/2020	12/06/2021
Test Software	audix	e3	Ver. 6.11-20180413	01/01/2021	12/31/2021
EMI Test Receiver	R&S	ESCI 7	100759	07/13/2020	07/12/2021

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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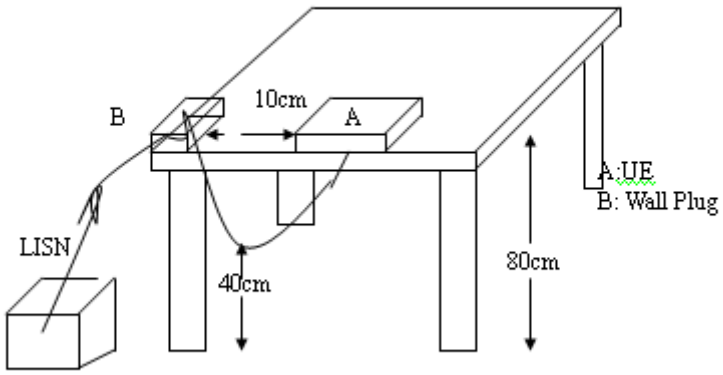
6.4 Test SET-UP



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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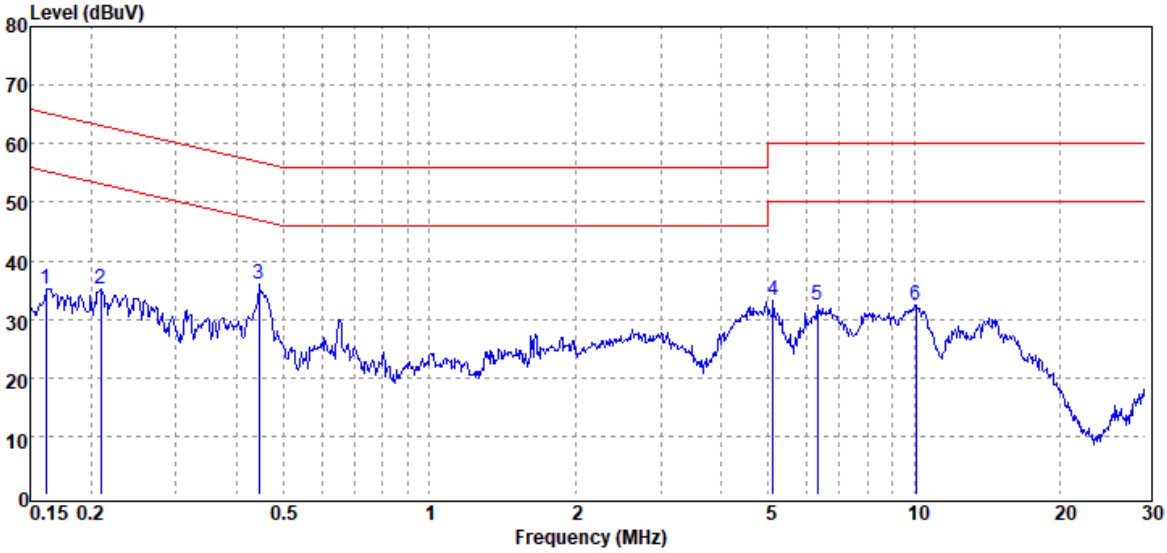
AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:ER-2021-20007	Test Site	:Conduction 6F
Test Mode	:WLAN 5G	Test Date	:2021-02-20
Power	:AC 120V/60Hz	Temp./Humi.	:22.5/47
Probe	:L	Engineer	:Neo Tsai
Note:	:		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.16	Peak	35.23	0.04	35.27	65.38	-30.11
0.21	Peak	35.06	0.04	35.10	63.23	-28.13
0.44	Peak	35.77	0.13	35.90	56.98	-21.08
5.11	Peak	32.79	0.55	33.34	60.00	-26.66
6.32	Peak	31.75	0.64	32.39	60.00	-27.61
10.07	Peak	31.49	0.83	32.32	60.00	-27.68

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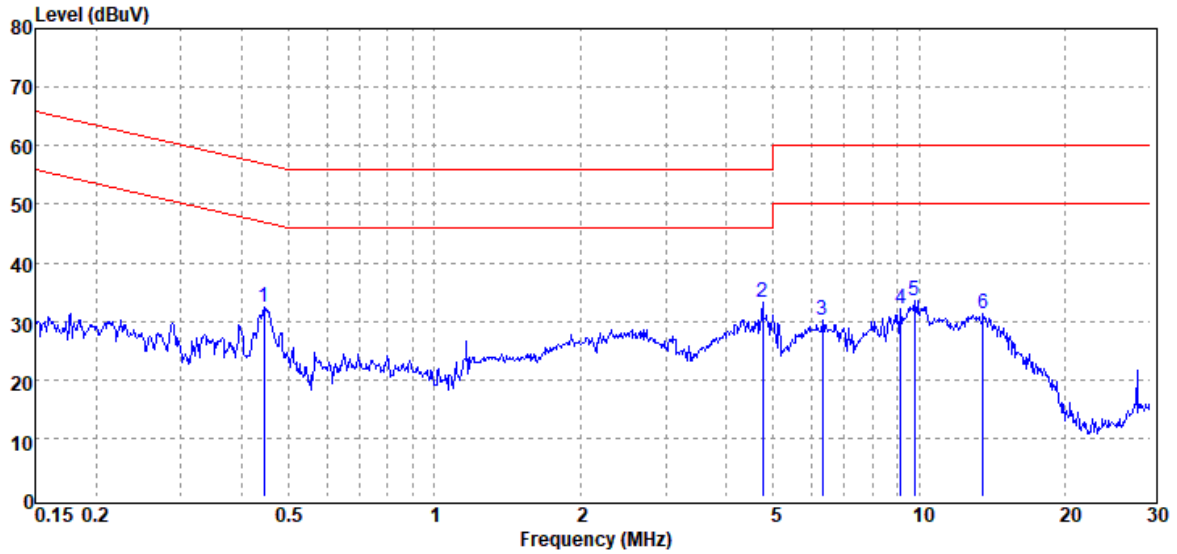
Report Number	:ER-2021-20007	Test Site	:Conduction 6F
Test Mode	:WLAN 5G	Test Date	:2021-02-20
Power	:AC 120V/60Hz	Temp./Humi.	:22.5/47
Probe	:N	Engineer	:Neo Tsai
Note:	:		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.44	Peak	32.12	0.19	32.31	56.98	-24.67
4.75	Peak	32.76	0.46	33.22	56.00	-22.78
6.32	Peak	29.57	0.55	30.12	60.00	-29.88
9.16	Peak	31.36	0.67	32.03	60.00	-27.97
9.76	Peak	32.78	0.69	33.47	60.00	-26.53
13.55	Peak	30.46	0.90	31.36	60.00	-28.64

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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	99.00	0.04	0.51	0.01
802.11n_20	100.00	0.00	0.00	0.01
802.11ac_20	100.00	0.00	0.00	0.01
802.11n_40	100.00	0.00	0.00	0.01
802.11ac_40	100.00	0.00	0.00	0.01
802.11ac_80	99.00	0.04	0.37	0.01
802.11ax_20	100.00	0.00	0.00	0.01
802.11ax_40	100.00	0.00	0.00	0.01
802.11ax_80	99.00	0.04	0.45	0.01
802.11ax_160	99.00	0.04	0.46	0.01

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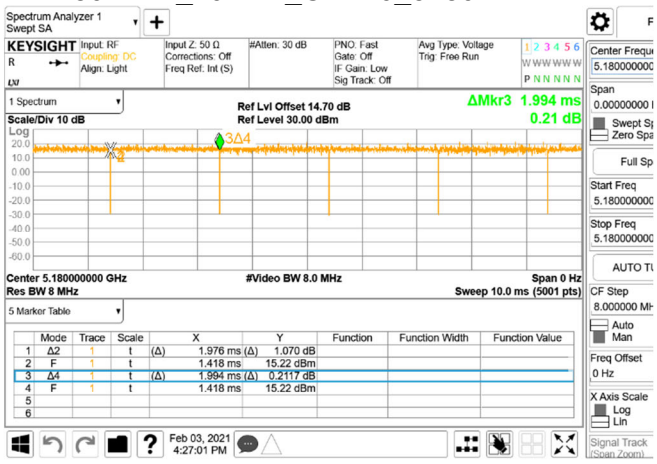
7.2 DUTY CYCLE TEST SIGNAL MEASUREMENT RESULT

802.11a_20MHz_Chain0_5180MHz



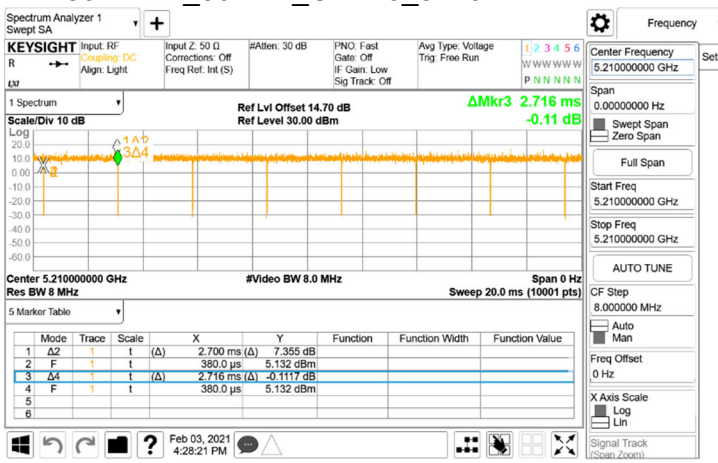
802.11ac_20MHz_Chain0_5180MHz

802.11n_20MHz_Chain0_5180MHz

802.11ac_40MHz_Chain0_5190MHz

802.11n_40MHz_Chain0_5190MHz

802.11ac_80MHz_Chain0_5210MHz



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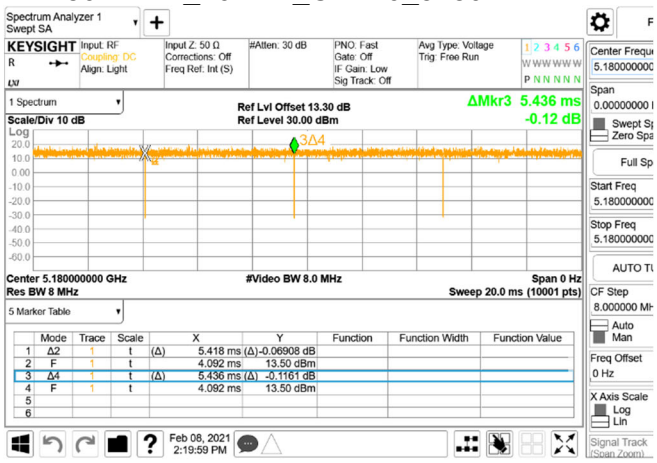
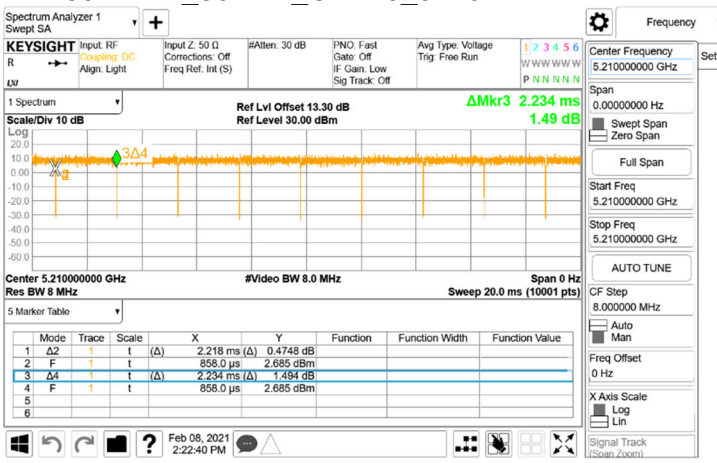
802.11ax_20MHz_Chain0_5180MHz



802.11ax_80MHz_Chain0_5210MHz



802.11ax_40MHz_Chain0_5190MHz

802.11ax_160MHz_Chain0_5250MHz

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8 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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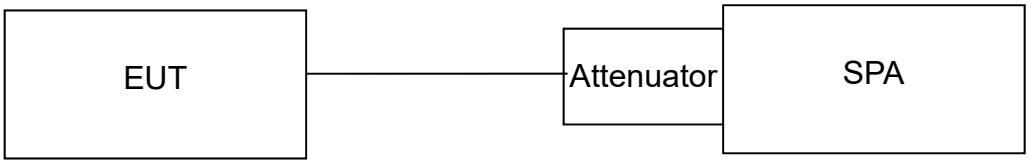
8.3 Measurement Equipment Used

Conducted Emission Test Site: Conducted 2					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY59071571	06/27/2020	06/26/2021
DC Block	Mini-Circuits	BLK-18-S+	1	12/16/2020	12/15/2021

8.4 Test Set-up



8.5 Measurement Result

8.5.1 FCC 26dB Bandwidth

802.11a_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	19.00	12.790
5220	18.84	12.750
5240	19.09	12.810
5260	18.75	12.730
5300	18.45	12.660
5320	15.59	11.930
5500	18.74	12.730
5580	18.65	12.710
5700	18.80	12.740

802.11a_Ch1

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	18.54	12.680
5220	18.65	12.710
5240	18.83	12.750
5260	18.72	12.720
5300	18.66	12.710
5320	19.02	12.790
5500	18.80	12.740
5580	18.71	12.720
5700	18.69	12.720

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802.11n_HT20_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	19.81	12.970
5220	20.03	13.020
5240	20.04	13.020
5260	20.23	13.060
5300	20.00	13.010
5320	20.11	13.030
5500	20.10	13.030
5580	20.04	13.020
5700	19.88	12.980

802.11n_HT20_Ch1

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	20.22	13.060
5220	19.62	12.930
5240	19.83	12.970
5260	19.84	12.980
5300	19.74	12.950
5320	19.72	12.950
5500	19.51	12.900
5580	19.80	12.970
5700	19.94	13.000

802.11n _HT40_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	39.65	15.980
5230	39.17	15.930
5270	39.37	15.950
5310	39.50	15.970
5510	39.56	15.970
5550	**39.40**	15.950
5670	39.65	15.980

802.11n _HT40_Ch1

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	38.90	15.900
5230	39.10	15.920
5270	38.70	15.880
5310	38.99	15.910
5510	39.19	15.930
5550	**38.85**	15.890
5670	39.23	15.940

802.11ac _VHT80_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	81.45	19.110
5290	81.66	19.120
5530	81.15	19.090
5610	81.58	19.120

802.11ac _VHT80_Ch1

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	81.11	19.090
5290	80.96	19.080
5530	80.55	19.060
5610	80.90	19.080

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802.11ax_20_Ch0

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5180	full	21.03	13.230
5220	full	20.88	13.200
5240	full	20.78	13.180
5260	full	20.46	13.110
5300	full	20.60	13.140
5320	full	20.67	13.150
5500	full	20.54	13.130
5580	full	20.59	13.140
5700	full	20.56	13.130

802.11ax_20_Ch1

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5180	full	20.56	13.130
5220	full	20.97	13.220
5240	full	20.37	13.090
5260	full	20.93	13.210
5300	full	20.61	13.140
5320	full	20.87	13.200
5500	full	20.96	13.210
5580	full	21.06	13.230
5700	full	20.86	13.190

802.11ax _40_Ch0

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5190	full	39.86	16.010
5230	full	40.06	16.030
5270	full	40.49	16.070
5310	full	40.22	16.040
5510	full	40.10	16.030
5550	full	**40.06**	16.030
5670	full	40.08	16.030

802.11ax _40_Ch1

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5190	full	39.87	16.010
5230	full	40.33	16.060
5270	full	40.30	16.050
5310	full	40.15	16.040
5510	full	40.02	16.020
5550	full	**40.00**	16.020
5670	full	40.09	16.030

802.11ax _80_Ch0

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5210	full	81.31	19.100
5290	full	81.63	19.120
5530	full	81.92	19.130
5610	full	80.91	19.080

802.11ax _80_Ch1

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5210	full	81.21	19.100
5290	full	81.58	19.120
5530	full	81.81	19.130
5610	full	81.65	19.120

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802.11ax _160_Ch0

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5250	full	165.30	22.180
5570	full	163.80	22.140

802.11ax _160_Ch1

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5250	full	164.40	22.160
5570	full	165.40	22.190

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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	16.33	12.130
5785	16.32	12.130
5825	16.37	12.140

802.11a_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.34	12.130
5785	16.35	12.140
5825	16.36	12.140

802.11n_HT20_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.58	12.450
5785	17.66	12.470
5825	17.56	12.450

802.11n_HT20_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.64	12.460
5785	17.60	12.460
5825	17.69	12.480

802.11n_HT40_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	34.70	15.400
5795	35.57	15.510

802.11n_HT40_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.38	15.610
5795	36.39	15.610

802.11ac _VHT80_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.51	18.780

802.11ac _VHT80_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.11	18.760

802.11ax_20_Ch0

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5745	full	19.00	12.790
5785	full	18.92	12.770
5825	full	19.09	12.810

802.11ax_20_Ch1

Freq. (MHz)	RU con-fig	6dB BW (MHz)	10 Log (B) (dB)
5745	full	18.74	12.730
5785	full	18.81	12.740
5825	full	18.88	12.760

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802.11ax_40_Ch0

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5755	full	38.08	15.810
5795	full	37.77	15.770

802.11ax_40_Ch1

Freq. (MHz)	RU con-fig	6dB BW (MHz)	10 Log (B) (dB)
5755	full	36.11	15.580
5795	full	38.06	15.800

802.11ax _80_Ch0

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5775	full	**77.36**	18.890

802.11ax _80_Ch1

Freq. (MHz)	RU con-fig	6dB BW (MHz)	10 Log (B) (dB)
5775	full	**76.65**	18.850

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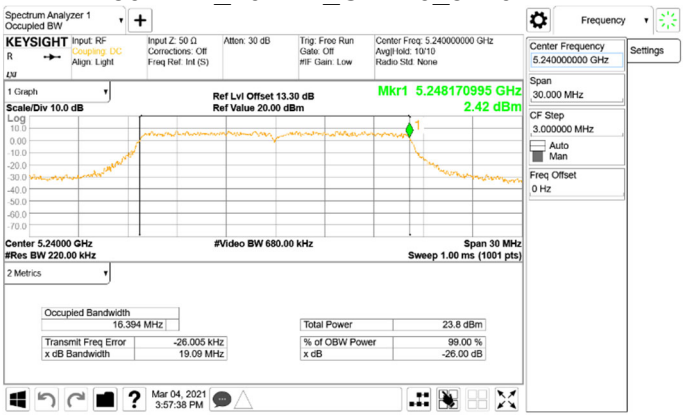
802.11a_20MHz_Chain0_5180MHz

802.11a_20MHz_Chain0_5260MHz

802.11a_20MHz_Chain0_5220MHz

802.11a_20MHz_Chain0_5300MHz

802.11a_20MHz_Chain0_5240MHz



802.11a_20MHz_Chain0_5320MHz

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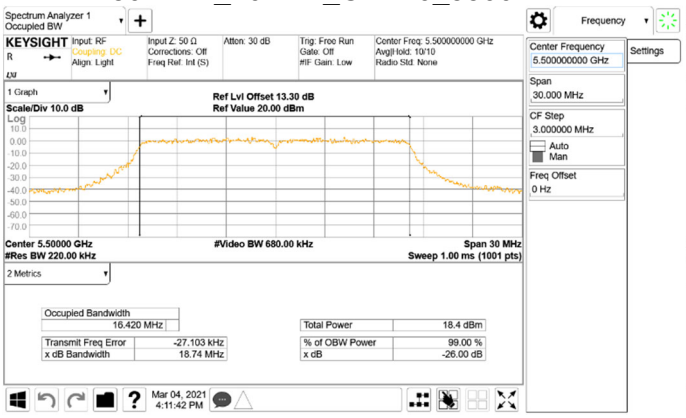
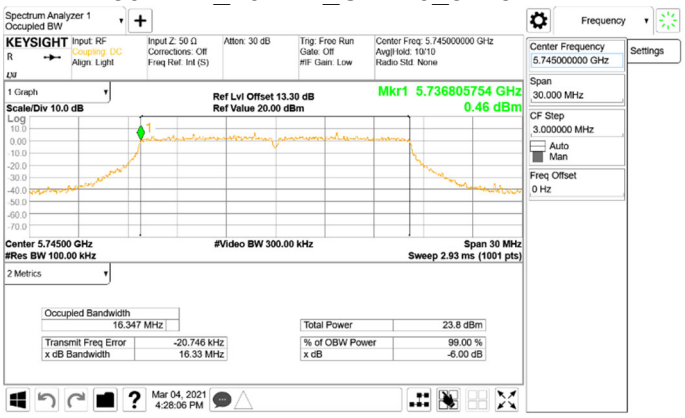
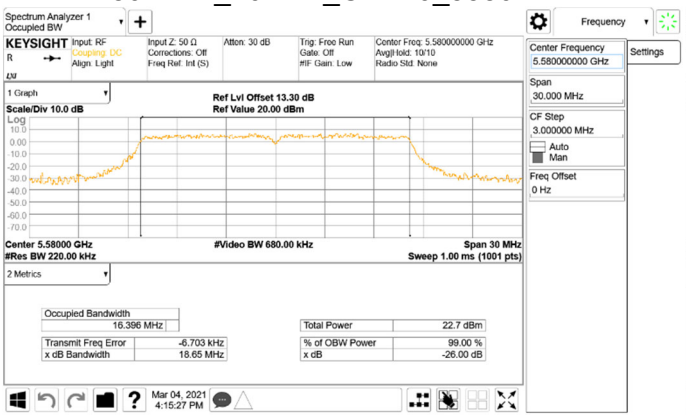
802.11a_20MHz_Chain0_5500MHz



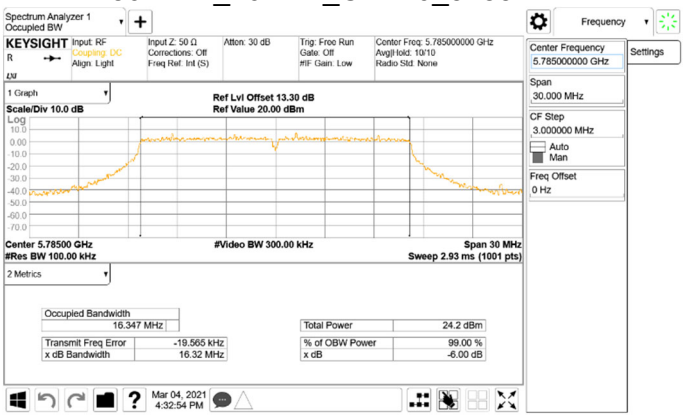
802.11a_20MHz_Chain0_5745MHz



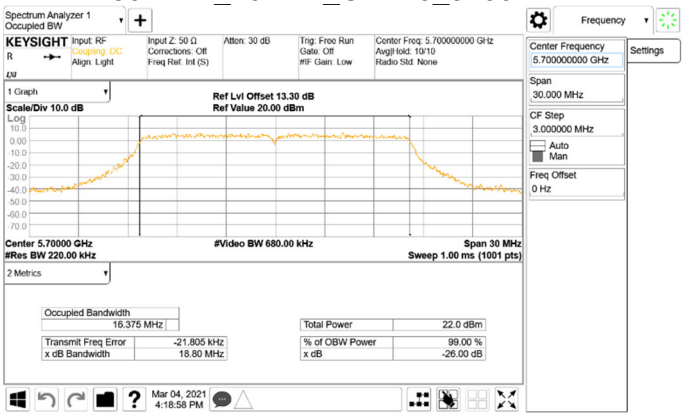
802.11a_20MHz_Chain0_5580MHz



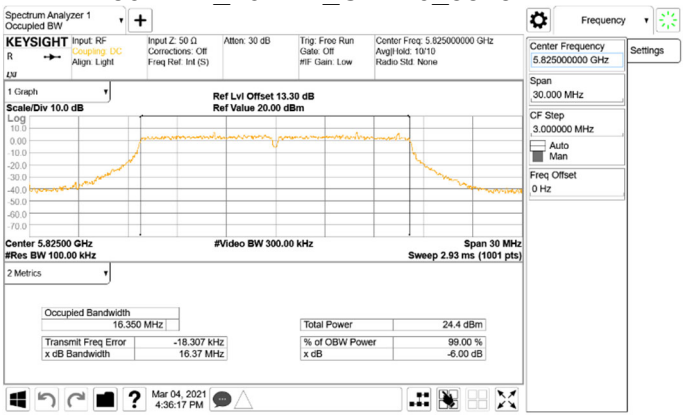
802.11a_20MHz_Chain0_5785MHz



802.11a_20MHz_Chain0_5700MHz



802.11a_20MHz_Chain0_5825MHz



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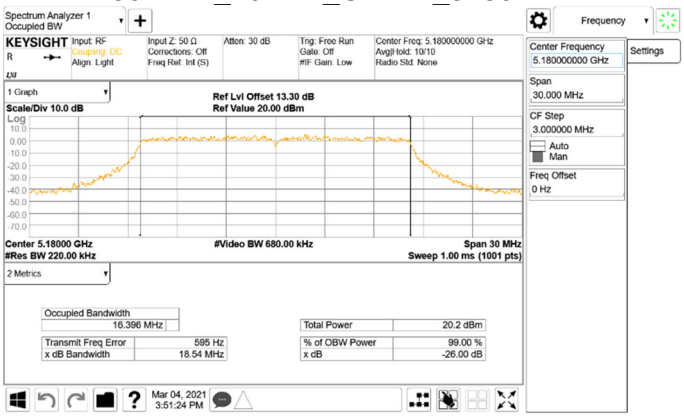
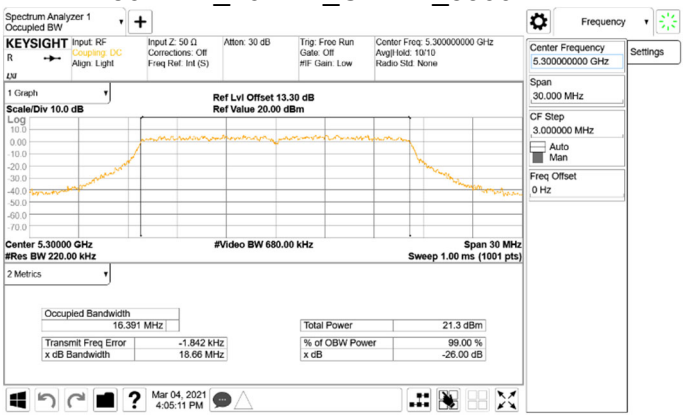
802.11a_20MHz_Chain1_5180MHz



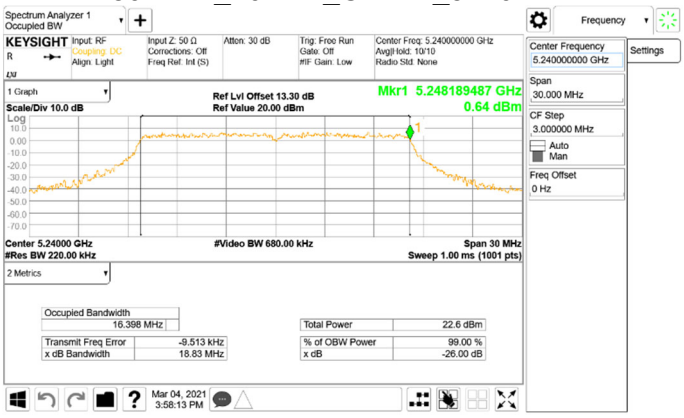
802.11a_20MHz_Chain1_5260MHz

802.11a_20MHz_Chain1_5220MHz

802.11a_20MHz_Chain1_5300MHz



802.11a_20MHz_Chain1_5240MHz



802.11a_20MHz_Chain1_5320MHz

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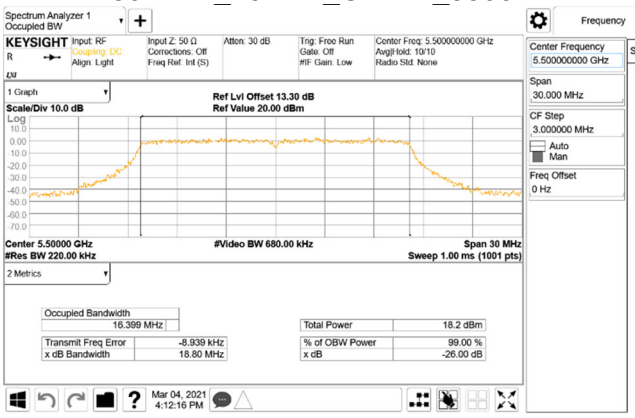
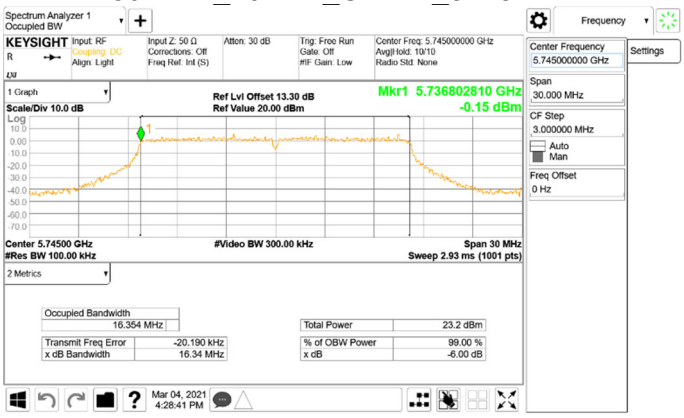
802.11a_20MHz_Chain1_5500MHz

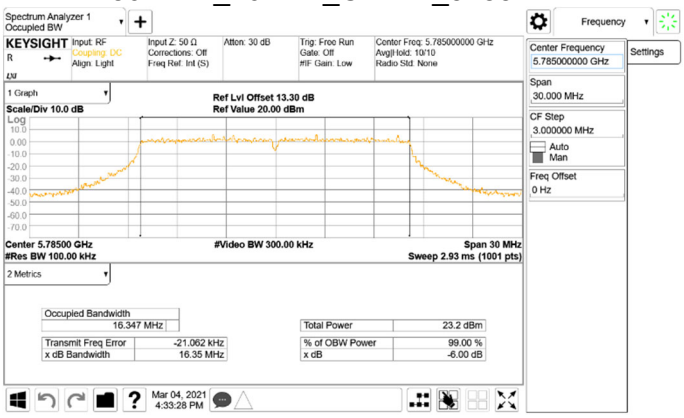


802.11a_20MHz_Chain1_5745MHz

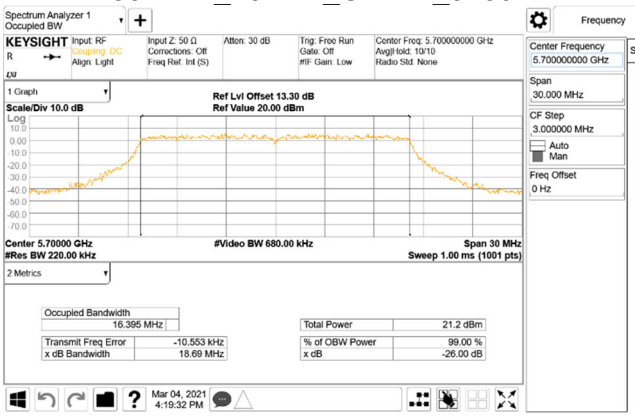


802.11a_20MHz_Chain1_5580MHz

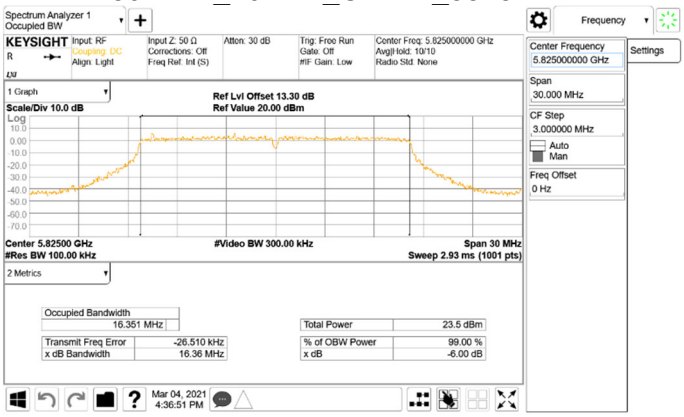
802.11a_20MHz_Chain1_5785MHz



802.11a_20MHz_Chain1_5700MHz



802.11a_20MHz_Chain1_5825MHz



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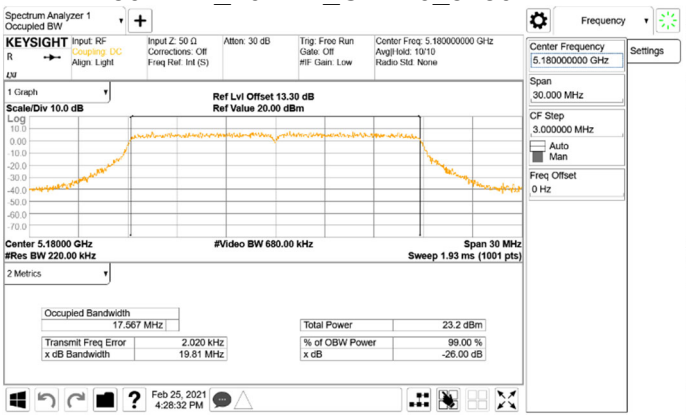
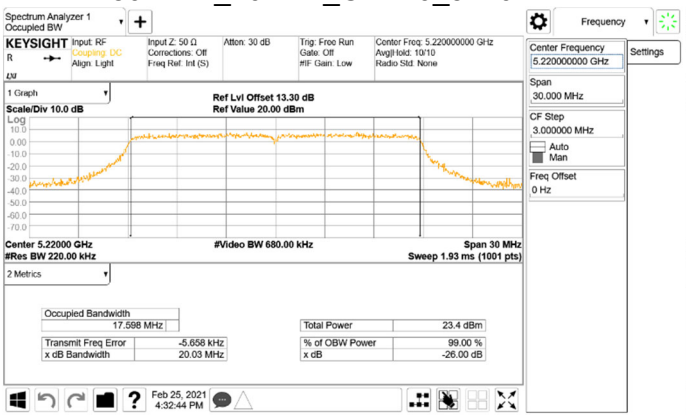
802.11n_20MHz_Chain0_5180MHz

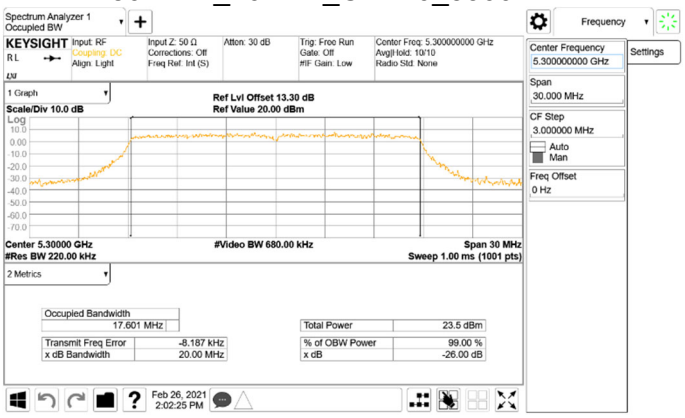


802.11n_20MHz_Chain0_5260MHz

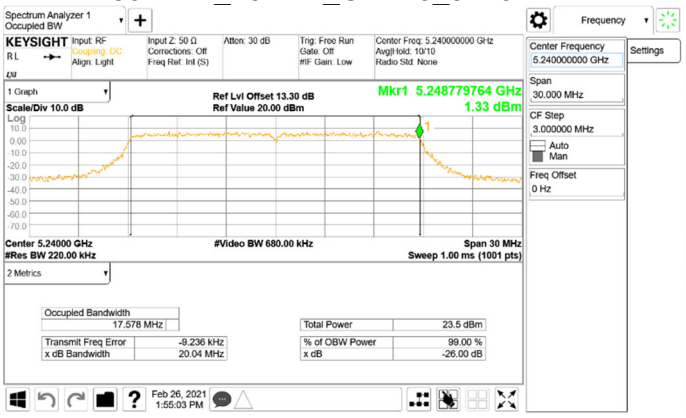
802.11n_20MHz_Chain0_5220MHz



802.11n_20MHz_Chain0_5300MHz



802.11n_20MHz_Chain0_5240MHz



802.11n_20MHz_Chain0_5320MHz

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