

**ELECTROMAGNETIC EMISSIONS
COMPLIANCE REPORT**

Applicant: Murata Electronics North America
2200 Lake Park Drive Smyrna Georgia United States 30080-7604

Manufacturer: Murata Electronics North America
2200 Lake Park Drive Smyrna Georgia United States 30080-7604

Product Name: LBES0ZZ2FR

Brand Name: Murata Electronics North America

Model No./ISED HVIN: LBES0ZZ2FR

Report Number: TERF2312003244E2

FCC ID HSW2FR

IC: 4492A-2FR

Date of EUT Received: Dec. 29, 2023

Date of Test: Dec. 29, 2023 ~ Jun. 27, 2024

Issue Date: Aug. 13, 2024

*Approved By***Arno Hsieh****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 comply with FCC rule part §15.407, ISSED RSS-247.

The results of this report relate only to the sample identified in this report.

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Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2312003244E2	00	Original.	Aug. 13, 2024	Yami Kuo	

Note:

- 1、The remark "" indicates modification of the report upon requests from certification body.

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Contents

1	GENERAL INFORMATION	4
2	SYSTEM TEST CONFIGURATION	7
3	SUMMARY OF TEST RESULT	10
4	DESCRIPTION OF TEST MODES	11
5	MEASUREMENT UNCERTAINTY	14
6	MEASUREMENT EQUIPMENT USED	15
7	CONDUCTED EMISSION TEST	16
8	EMISSION BANDWIDTH MEASUREMENT	19
9	MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT	42
10	MAXIMUM POWER SPECTRAL DENSITY	56
11	UNDESIRABLE RADIATED EMISSION MEASUREMENT	85
12	TRANSMISSION IN THE ABSENCE OF DATA	598
13	ANTENNA REQUIREMENT	599

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	LBES0ZZ2FR
Brand Name:	Murata Electronics North America
Model No./ISED HVIN:	LBES0ZZ2FR
Hardware Version:	1
Firmware Version:	1
EUT Series No.:	NO.2-1
Power Supply:	3.3Vdc, 1.8Vdc
Test Software (Name/Version)	DutApiSisoApApp_RW610

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 - 54 Mbps
	802.11 n_20MHz: up to 72.2 Mbps
	802.11 ac_20MHz: up to 86.7 Mbps
	802.11 ax_20MHz: up to 143.4 Mbps

1.3 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
PCB Monopole	Murata	Type2FR	5150-5850	3.6
Flex Dipole	Molex	146153	5150-5850	4.25

Note:

1. Pre-scanned was done on the above antennas, measurements were demonstrated by using the antenna with the highest gain as the worst case scenarios.
2. Antenna information is provided by the applicant.

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1.4 FCC

Wi-Fi	Frequency Range	Channels	Rated Power(Avg) (dBm) (Worst Case)	Modulation Technology
a n_HT ac_VHT ax_HE 20M	5180~5240	4	18.55 dBm	OFDMA
	5260~5320	4	19.91 dBm	OFDM
	5500~5700	11	19.87 dBm	OFDMA
	5745-5825	5	19.98 dBm	OFDMA
	5850-5895	3	19.98 dBm	OFDMA

1.5 ISCED

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	24.15 dBm	OFDMA
	5260~5320	4	Avg	19.91 dBm	OFDM
	5500~5700	11	Avg	19.87 dBm	OFDMA
	5720 (U-NII 2C)	1	Avg	18.20 dBm	OFDM
	5720 (U-NII 3)	1	Avg	14.34 dBm	OFDM
	5745-5825	5	Avg	19.98 dBm	OFDMA

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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 291074 D02 EMC Measurement v01

RSS-247 issue 3 Aug. 2023

RSS-Gen, Issue 5 April 2018, Amendment 2 (February 2021)

ANSI C63.10:2013

1.7 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designa- tion 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 2		
		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 C	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 indica- tion where measurements occurred in specific test site and address.				

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 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 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*6m*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.

2.5 Test Configuration

Conduction Setup	Conducted Setup
	
Radiated Setup	
	

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2.6 Control Unit(s)

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	L480	P0002332	N/A	N/A
USB Cable	PowerSync	CUBCVARA0010	N/A	N/A	N/A

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	T14	P0003332	N/A	N/A
USB Cable	PowerSync	CUBCVARA0010	N/A	N/A	N/A

Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	L480	P0002332	N/A	N/A
USB Cable	PowerSync	CUBCVARA0010	N/A	N/A	N/A

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3 SUMMARY OF TEST RESULT

FCC Rules	ISED Rules	Description Of Test	Result
§15.207	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.407(e)	RSS-Gen §6.7	Emission Bandwidth	Compliant
§15.407(a)	RSS-247 §6.2.1~4 (1) RSS-247 §6.2.5 (2)	Maximum Conducted Output Power	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1) RSS-247 §6.2.5 (2)	Power Spectral Density	Compliant
§15.205 §15.209 §15.407(b)	RSS-Gen 8.10 RSS-247 §6.2.1~3 (2) §6.2.4 (3) RSS-247 §6.2.5 (3)	Undesirable Radiated Emissions	Compliant
§15.407(c)	RSS-247 §6.4	Transmission in case of Absence of Information	Compliant
§15.203	N/A	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 Operating Frequencies

Operated band in 5150 MHz ~5250 MHz:

20 M	
CH	Freq (MHz)
36	5180
40	5200
44	5220
48	5240

Operated band in 5250 MHz ~5350 MHz:

20 M	
CH	Freq (MHz)
52	5260
56	5280
60	5300
64	5320

Operated band in 5470 MHz ~5725 MHz:

20 M	
CH	Freq (MHz)
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700

Operated band in 5725 MHz ~5850 MHz:

20 M	
CH	Freq (MHz)
149	5745
153	5765
157	5785
161	5805
165	5825

Operated band in 5850 MHz ~5895 MHz:

20 M	
CH	Freq (MHz)
169	5845
173	5865
177	5885

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

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.

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				
	5845~5885	169 to 177	169,173,177				
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				
	5845~5885	169 to 177	169,173,177				
CONDUCTED TEST							
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	RU CONFIGURATI	DATA (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	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				
	5845~5885	169 to 177	169,173,177				

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TRANSMIT 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			
	5845~5885	169 to 177	173			

TRANSMIT 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			
	5845~5885	169 to 177	169,173,177			
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			
	5845~5885	169 to 177	169,173,177			

TRANSMIT 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 26/0,26/8 52/37,52/40 106/53,106/54	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				
	5845~5885	169 to 177	169,173,177				

Note:

The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 1.54 dB
Output Power measurement	+/- 0.97 dB
Emission Bandwidth	+/- 1.38 Hz
Conducted emission measurement	+/- 0.77 dB
Peak Power Density	+/- 0.61 dB
Temperature	+/- 0.6 °C
Humidity	+/- 3 %
DC / AC Power Source	+/- 1 %

Radiated Spurious Emission Measurement Uncertainty			
Polarization: Vertical	+/-	1.89 dB	9kHz~30MHz
	+/-	4.15 dB	30MHz - 1000MHz
	+/-	3.43 dB	1GHz - 18GHz
	+/-	3.86 dB	18GHz - 40GHz
Polarization: Horizontal	+/-	1.89 dB	9kHz~30MHz
	+/-	4.02 dB	30MHz - 1000MHz
	+/-	3.43 dB	1GHz - 18GHz
	+/-	3.86 dB	18GHz - 40GHz
Radiated Spurious Emission	+/-	2 dB	33GHz-50GHz
	+/-	1.59 dB	50GHz-60GHz
	+/-	1.7 dB	60GHz-90GHz
	+/-	1.64 dB	90GHz-140GHz
	+/-	3.83 dB	140GHz-220GHz

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 MEASUREMENT EQUIPMENT USED

6.1 Emission from AC power line

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	06/19/2023	06/18/2024
EMI Test Receiver	R&S	ESCI	101342	04/24/2023	04/23/2024
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2023	03/26/2024
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2023	03/26/2024
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R

6.2 Conducted Measurement

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	05/23/2023	05/22/2024
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	05/24/2024	05/23/2025
Power Meter	Anritsu	ML2496A	2138005	09/25/2023	09/24/2024
Power Sensor	Anritsu	MA2411B	1911395	09/25/2023	09/24/2024
Power Sensor	Anritsu	MA2411B	1911396	09/25/2023	09/24/2024
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R
Attenuator	Woken	WATT-218FS-10	RF18	11/15/2023	11/14/2024
Attenuator	Woken	WATT-218FS-10	RF19	11/15/2023	11/14/2024
DC Block	PASTERNAK	PE8210	RF155	11/15/2023	11/14/2024

6.3 Radiated Measurement

Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-617	12/14/2023	12/13/2024
Horn Antenna	Schwarzbeck	BBHA9120D	1341	05/26/2023	05/25/2024
Loop Antenna	ETS.LINDGREN	6502	143303	05/23/2023	05/22/2024
Horn Antenna	SCHWARZBECK	BBHA9170	185	08/21/2023	08/20/2024
3m Site NSA	SGS	966 chamber D	N/A	04/30/2023	04/29/2024
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/29/2023	03/28/2024
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R
Pre-Amplifier	EMC Instruments	EMC18405SEE	980881	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC12630SE	980273	11/15/2023	11/14/2024
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	11/15/2023	11/14/2024
Coaxial Cable	Huber+Suhner	EMC106-SM-SM- 7200	150703	11/15/2023	11/14/2024

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

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7 CONDUCTED EMISSION TEST

7.1 Standard Applicable

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

Frequency range MHz	Limits (dBuV)	
	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

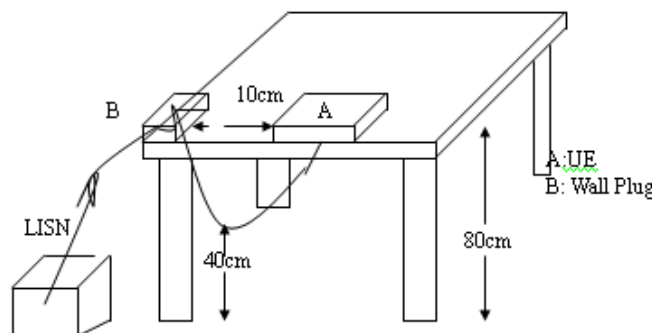
Note

- 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.

7.2 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 EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

7.3 Test SET-UP



7.4 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.

7.5 Measurement Result

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

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

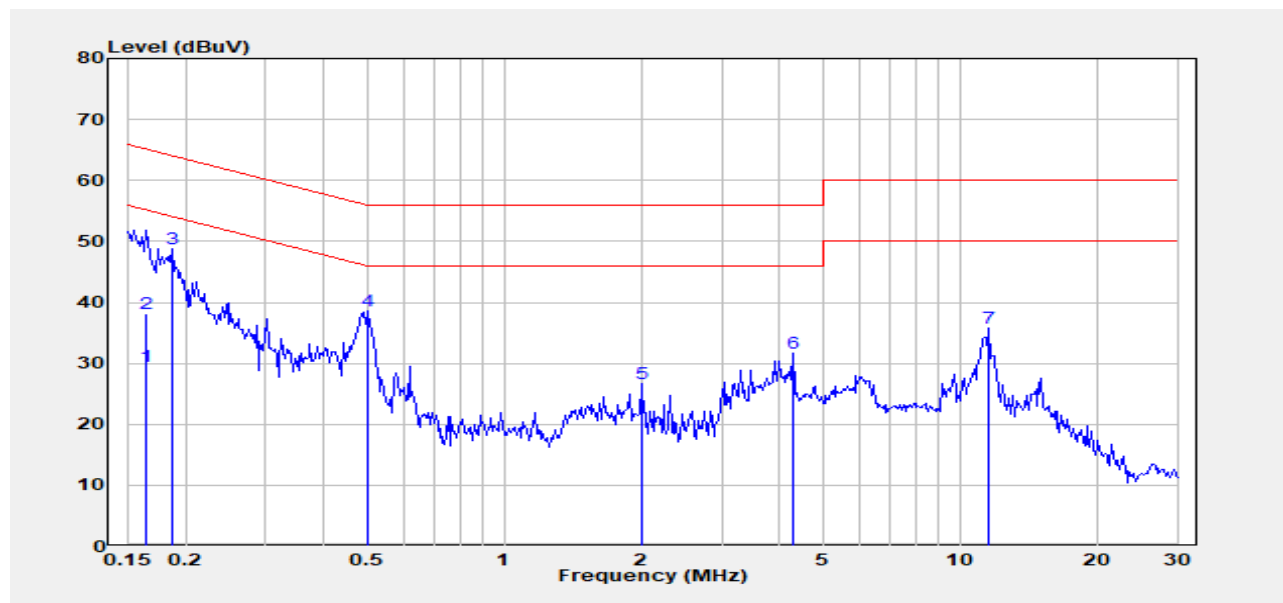
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number :TERF2312003244E2 Test Site :Conduction C
Test Mode :5G Test Date :2024-01-08
Power :120V/60Hz Temp./Humi. :21.9°C/54%
Probe :L1 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.163	Average	18.80	10.69	29.49	55.29	-25.81
0.163	QP	27.40	10.69	38.09	65.29	-27.21
0.187	Peak	38.17	10.68	48.86	64.17	-15.31
0.501	Peak	27.92	10.63	38.55	56.00	-17.45
1.999	Peak	15.78	10.78	26.56	56.00	-29.44
4.292	Peak	20.81	10.93	31.74	56.00	-24.26
11.591	Peak	24.86	11.01	35.87	60.00	-24.13

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Report Number :TERF2312003244E2

Test Site :Conduction C

Test Mode :5G

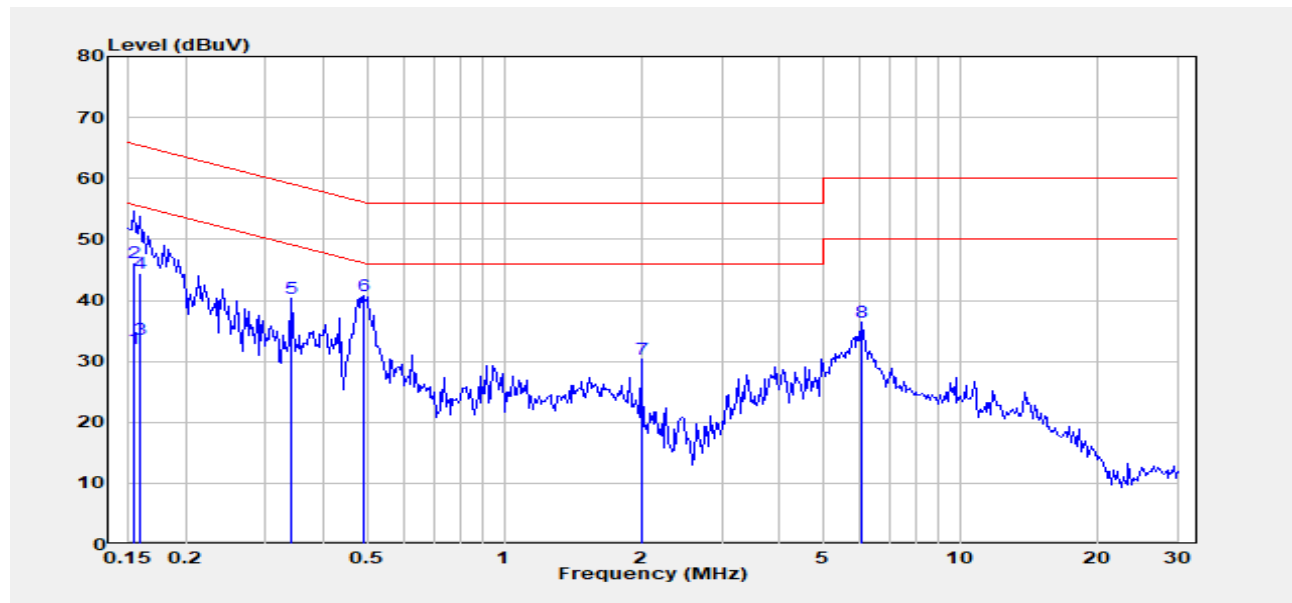
Test Date :2024-01-08

Power :120V/60Hz

Temp./Humi. :21.9°C/54%

Probe :N

Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V	Limit dB μ V	Margin dB
0.154	Average	21.50	10.67	32.17	55.79	-23.62
0.154	QP	35.50	10.67	46.17	65.79	-19.62
0.159	Average	22.90	10.67	33.57	55.51	-21.94
0.159	QP	33.70	10.67	44.37	65.51	-21.14
0.342	Peak	29.76	10.63	40.39	59.16	-18.76
0.492	Peak	30.22	10.62	40.83	56.13	-15.29
1.999	Peak	19.63	10.77	30.40	56.00	-25.60
6.079	Peak	25.35	10.98	36.33	60.00	-23.67

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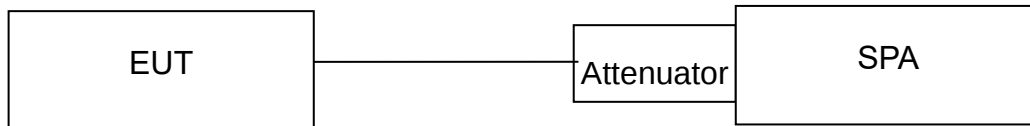
8 EMISSION BANDWIDTH MEASUREMENT

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 & UNII-4.

8.2 Test Setup



8.3 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 & 5.850~5.895GHz.
 - a. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = large enough to capture all products of the modulation process, 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 = large enough to capture all products of the modulation process, 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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8.4 Measurement Result

8.4.1 FCC Occupied Bandwidth

802.11a_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	19.76	12.960
5220	20.19	13.050
5240	20.24	13.060
5260	19.99	13.010
5300	20.15	13.040
5320	19.86	12.980
5500	19.76	12.960
5580	20.16	13.040
5700	19.79	12.960
5720(U-NII 2C)	15.19	11.810
5720(U-NII 3)	5.19	7.150

802.11a_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.32	12.130
5785	16.38	12.140
5825	16.38	12.140
5845	16.39	12.150
5865	16.35	12.140
5885	16.36	12.140

802.11a_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5240	5248.311714	< 5250
5745	5736.717738	> 5725

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802.11n_HT20_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	20.34	13.080
5220	20.27	13.070
5240	20.34	13.080
5260	20.61	13.140
5300	20.67	13.150
5320	20.32	13.080
5500	19.93	13.000
5580	20.68	13.160
5700	20.11	13.030
5720(U-NII 2C)	17.00	12.300
5720(U-NII 3)	7.00	8.450

802.11n_HT20_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.05	12.320
5785	17.30	12.380
5825	17.03	12.310
5845	17.20	12.360
5865	16.97	12.300
5885	17.33	12.390

802.11n_HT20_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5240	5248.802552	< 5250
5745	5736.156847	> 5725

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802.11ax_HE20_Ch0

Freq. (MHz)	RU config	26dB BW (MHz)	10 Log (B) (dB)
5180	full	20.35	13.090
5220	full	20.47	13.110
5240	full	20.57	13.130
5260	full	20.56	13.130
5300	full	20.32	13.080
5320	full	20.17	13.050
5500	full	20.42	13.100
5580	full	20.73	13.170
5700	full	20.27	13.070
5720 (U-NII 2C)	full	16.13	12.070
5720 (U-NII 3)	full	6.13	7.870

802.11ax_HE20_Ch0

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5745	full	17.45	12.420
5785	full	17.65	12.470
5825	full	17.70	12.480
5845	full	18.07	12.570
5865	full	17.54	12.440
5885	full	18.35	12.640

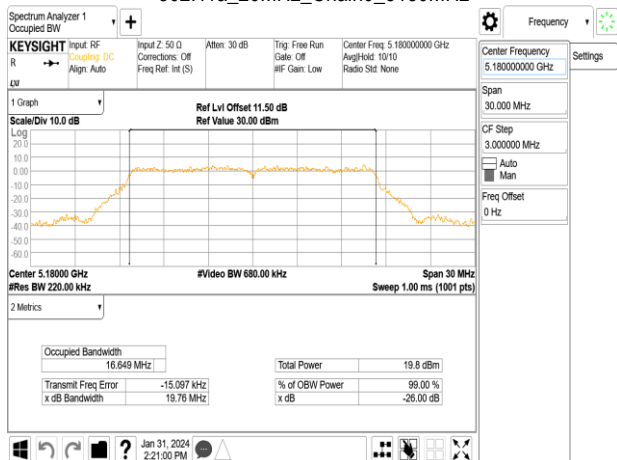
802.11ax_HE20_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5240	5249.360230	< 5250
5745	5735.549683	> 5725

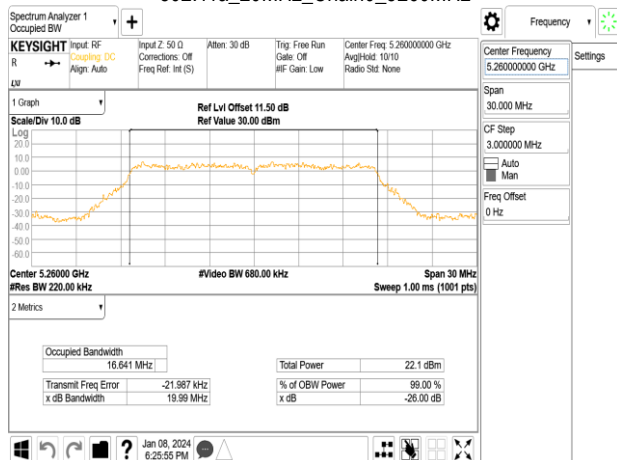
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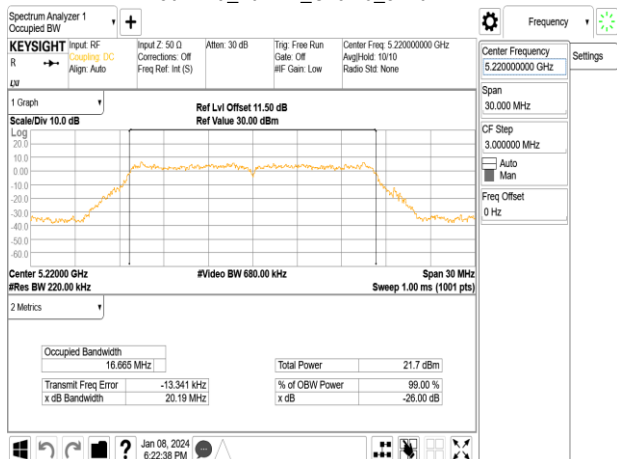
802.11a_20MHz_Chain0_5180MHz



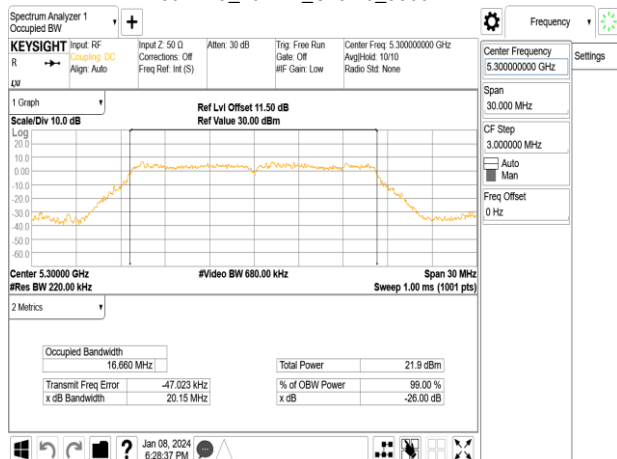
802.11a_20MHz_Chain0_5260MHz



802.11a_20MHz_Chain0_5220MHz



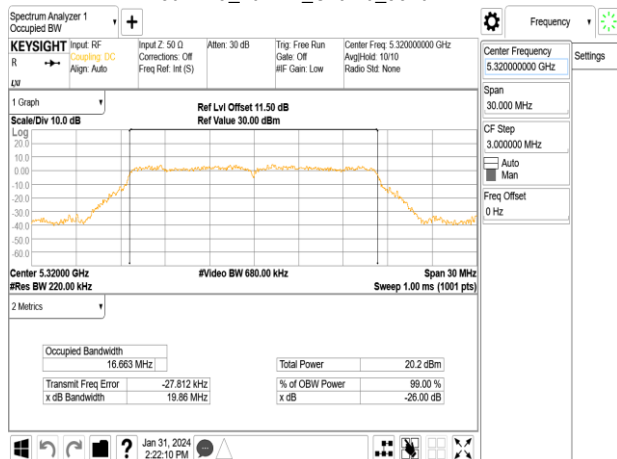
802.11a_20MHz_Chain0_5300MHz



802.11a_20MHz_Chain0_5240MHz



802.11a_20MHz_Chain0_5320MHz

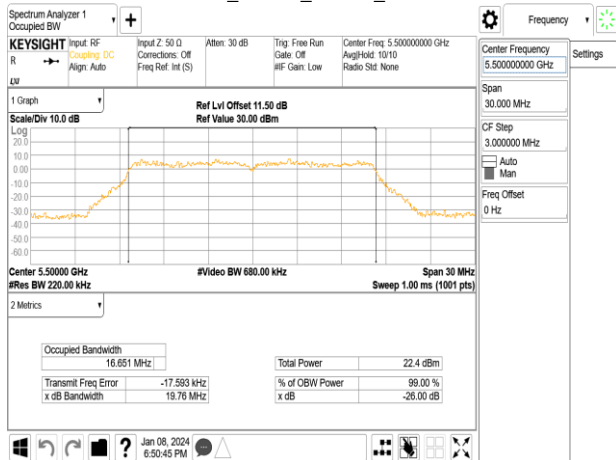


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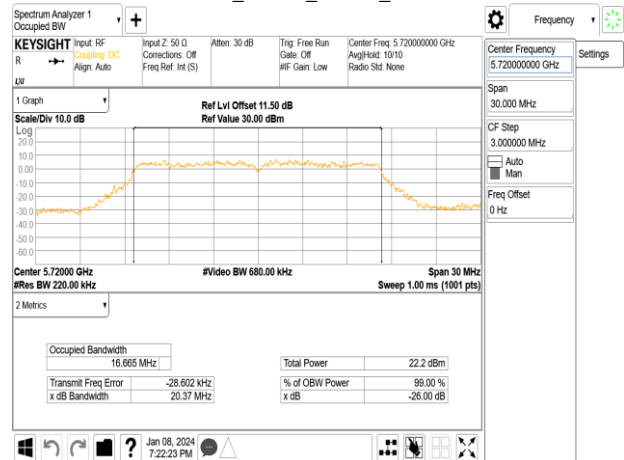
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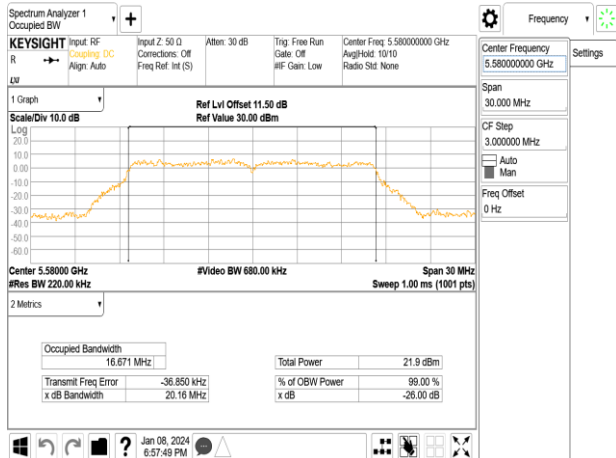
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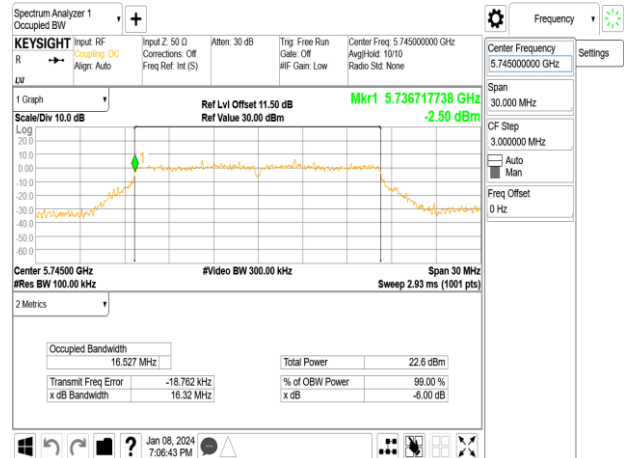
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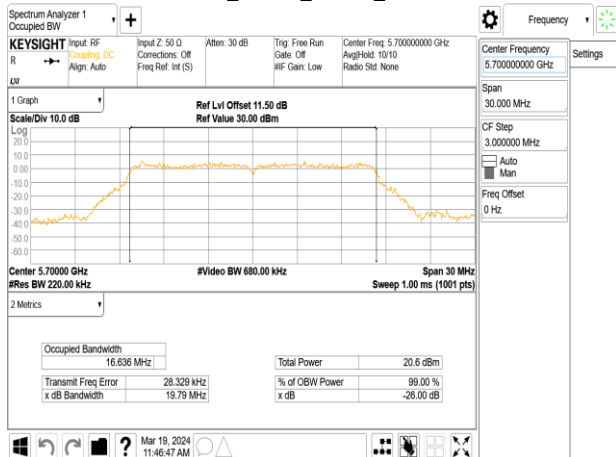
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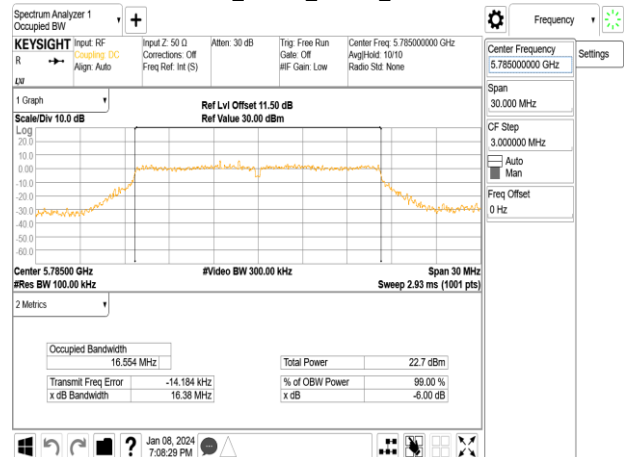
802.11a_20MHz_Chain0_5745MHz



802.11a_20MHz_Chain0_5700MHz



802.11a_20MHz_Chain0_5785MHz

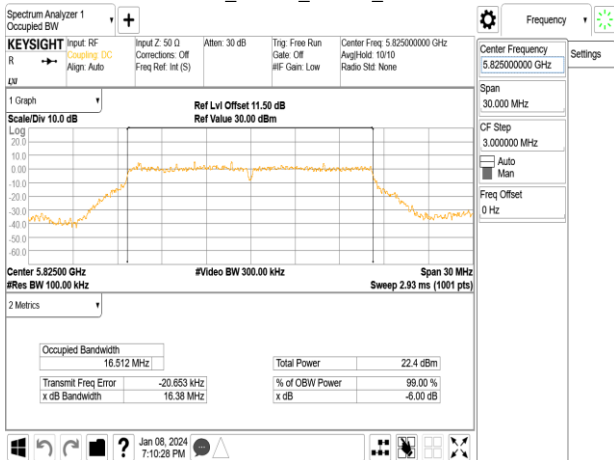


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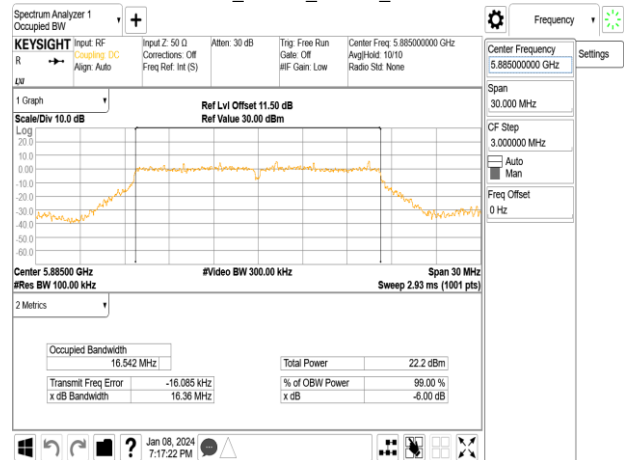
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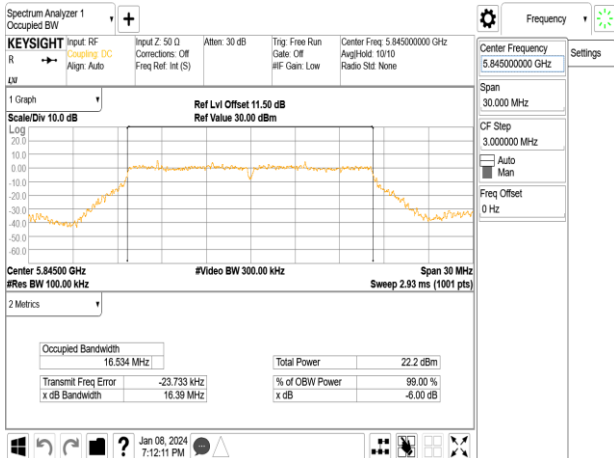
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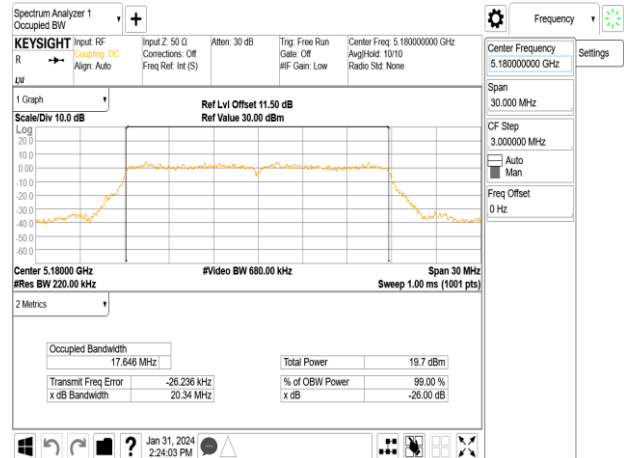
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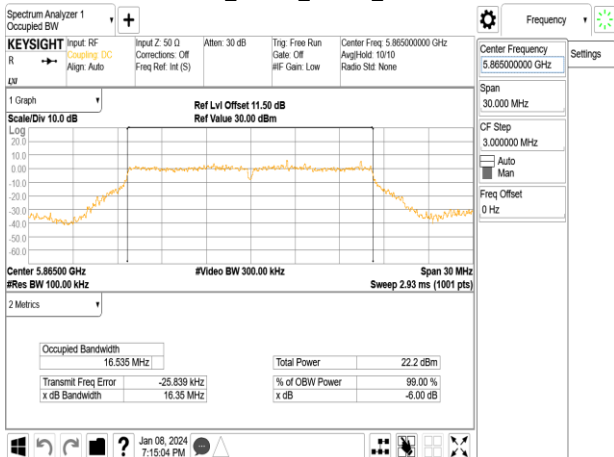
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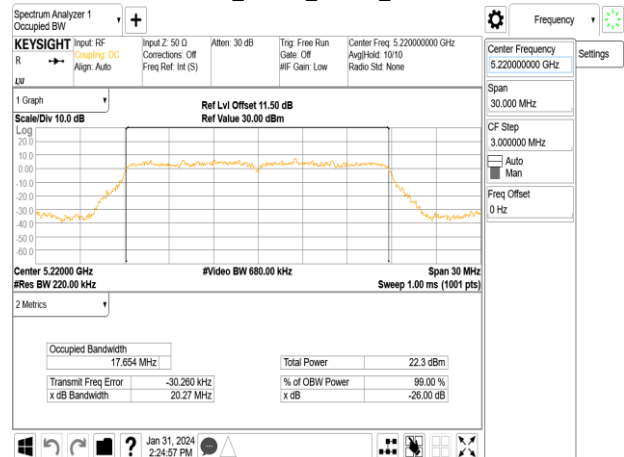
802.11n_20MHz_Chain0_5180MHz



802.11a_20MHz_Chain0_5865MHz



802.11n_20MHz_Chain0_5220MHz

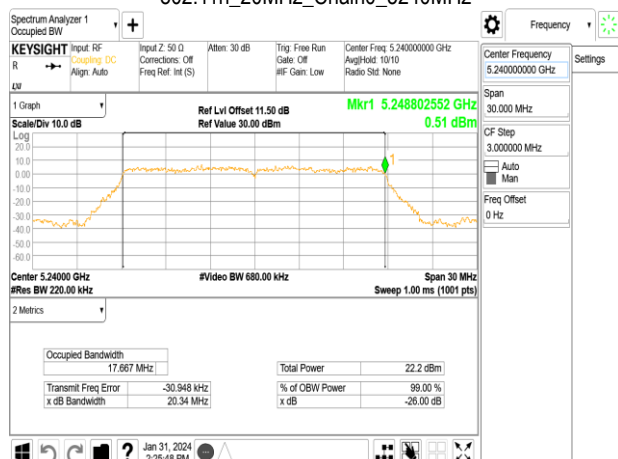


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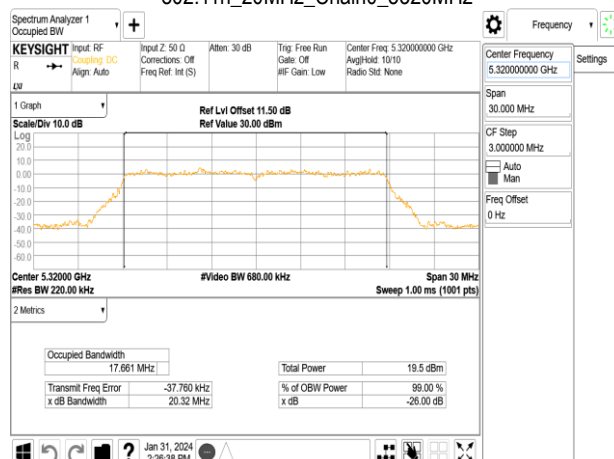
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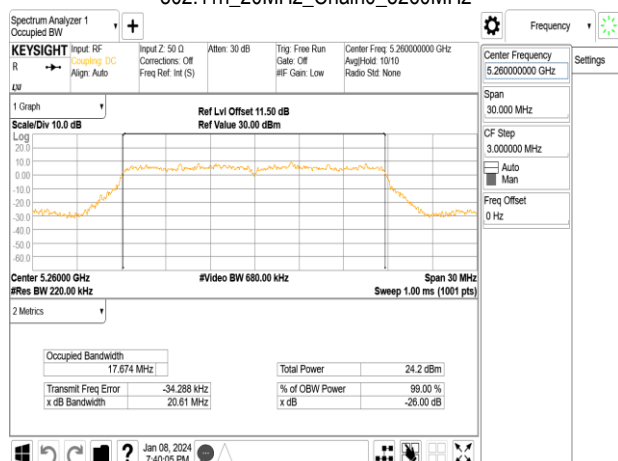
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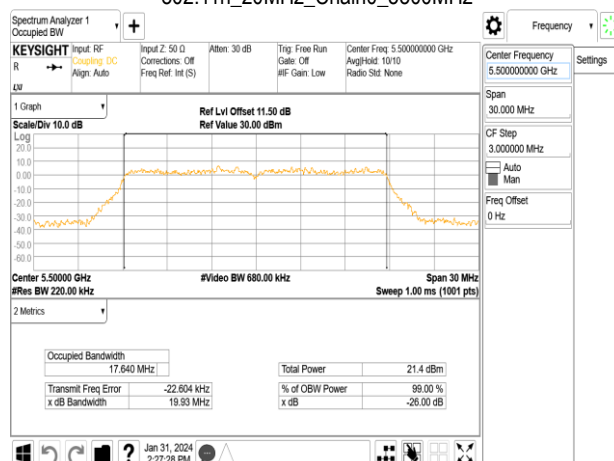
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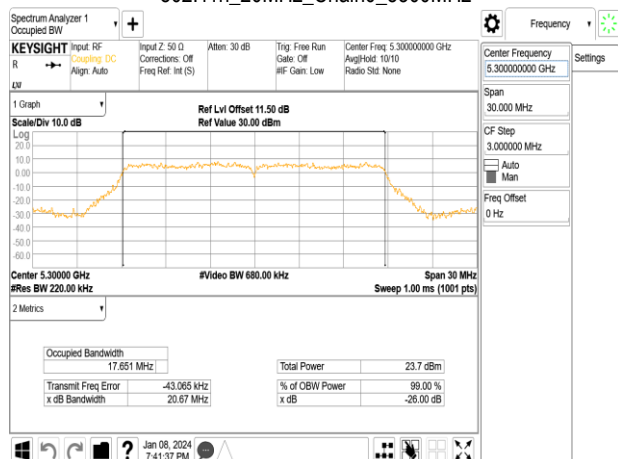
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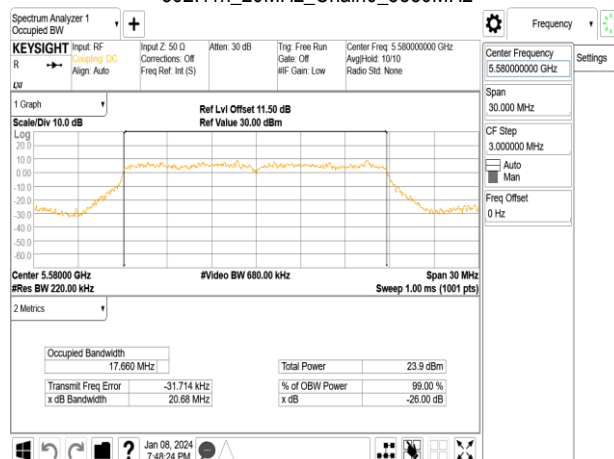
802.11n_20MHz_Chain0_5500MHz



802.11n_20MHz_Chain0_5300MHz



802.11n_20MHz_Chain0_5580MHz

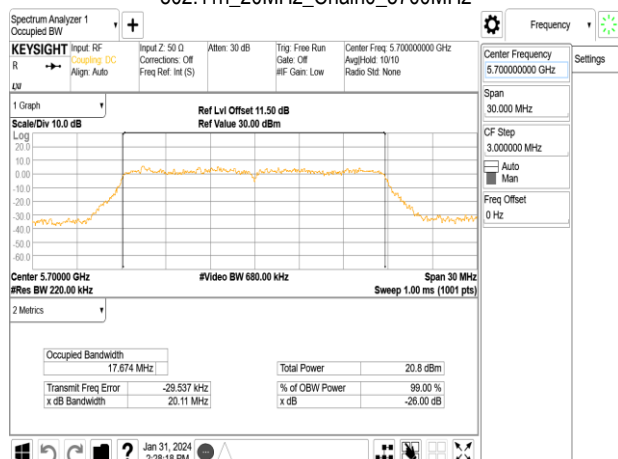


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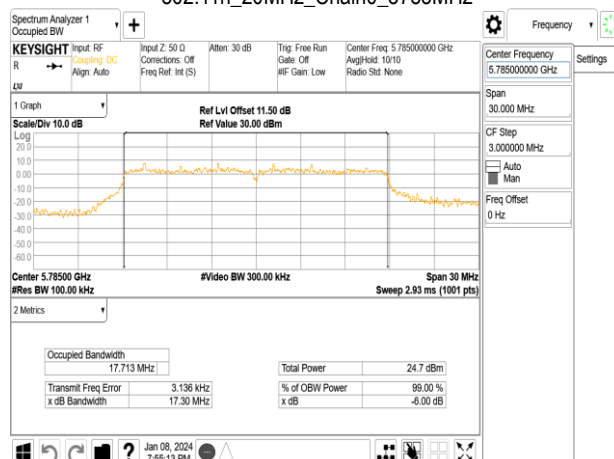
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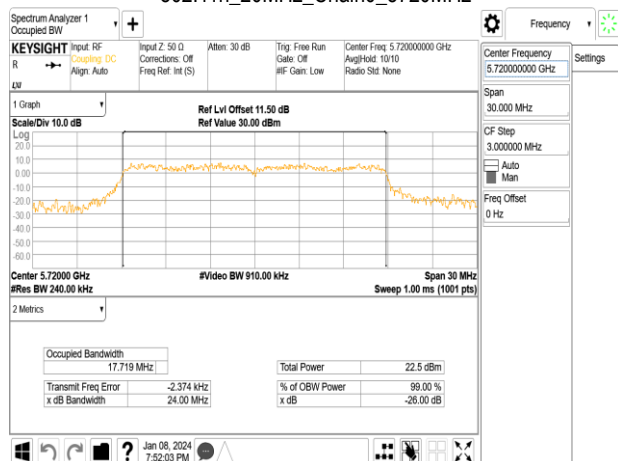
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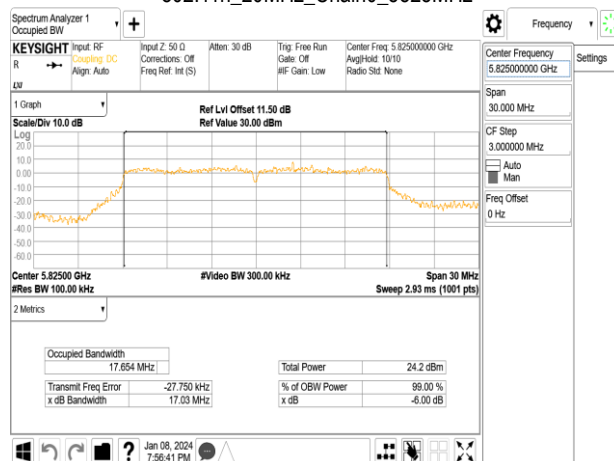
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802.11n_20MHz_Chain0_5720MHz



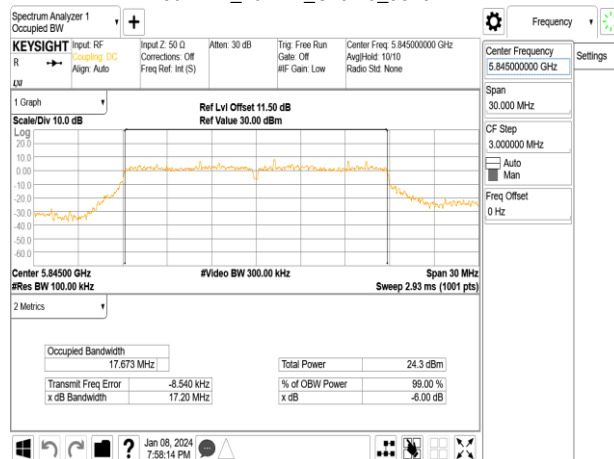
802.11n_20MHz_Chain0_5825MHz



802.11n_20MHz_Chain0_5745MHz



802.11n_20MHz_Chain0_5845MHz

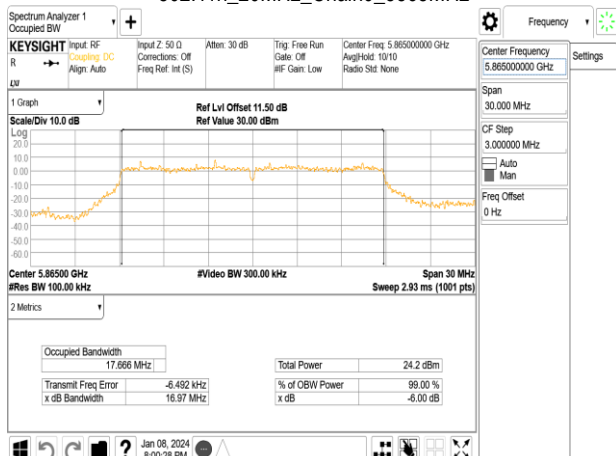


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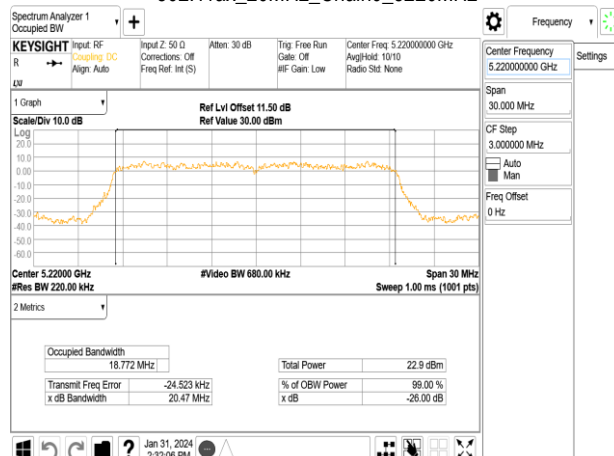
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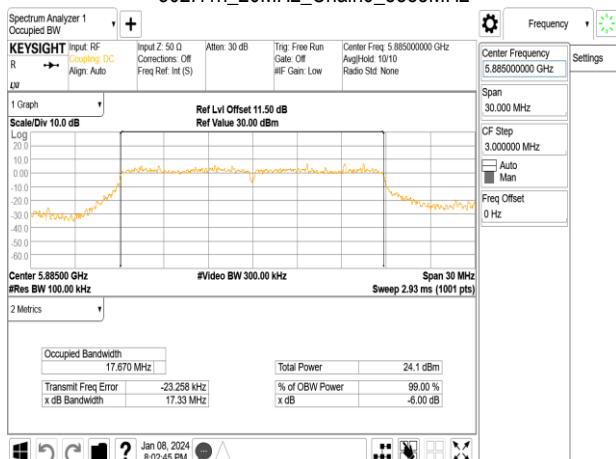
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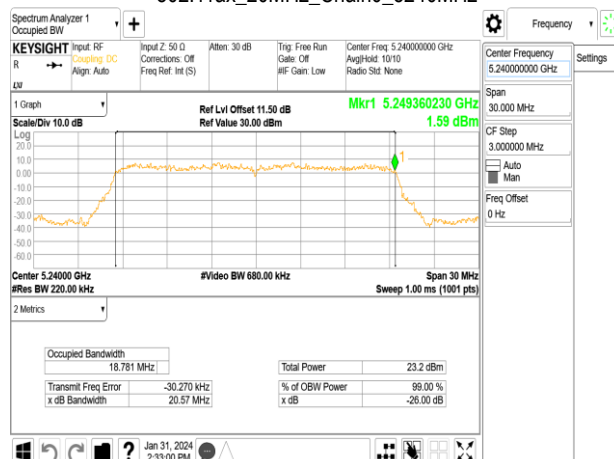
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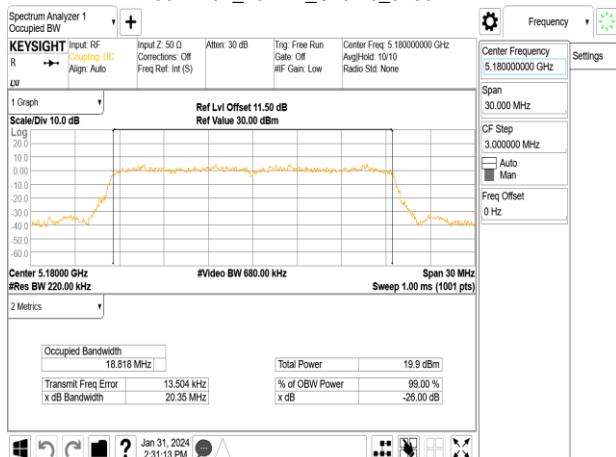
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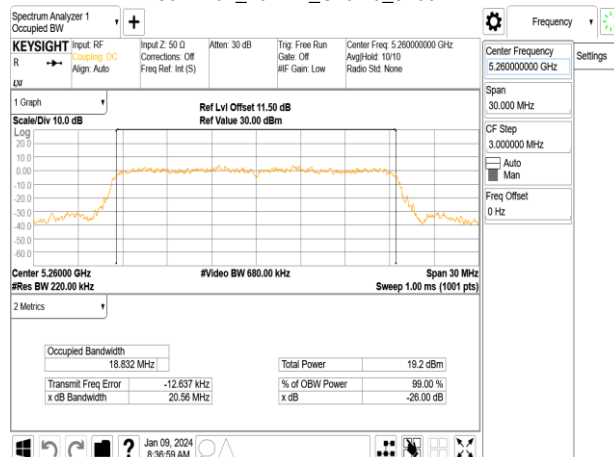
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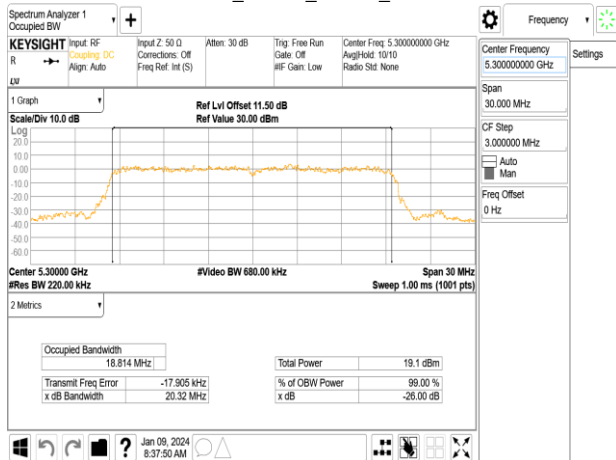


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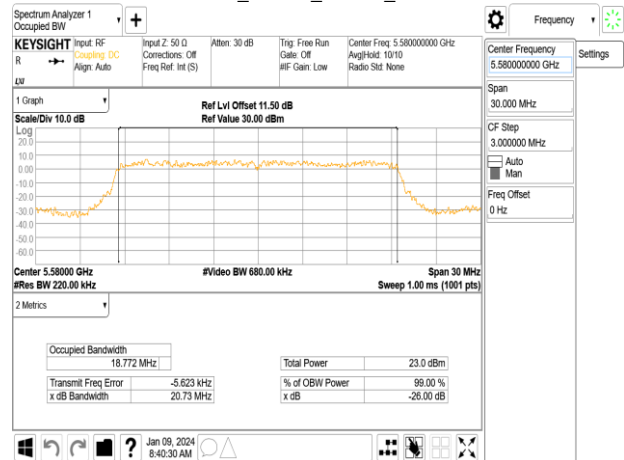
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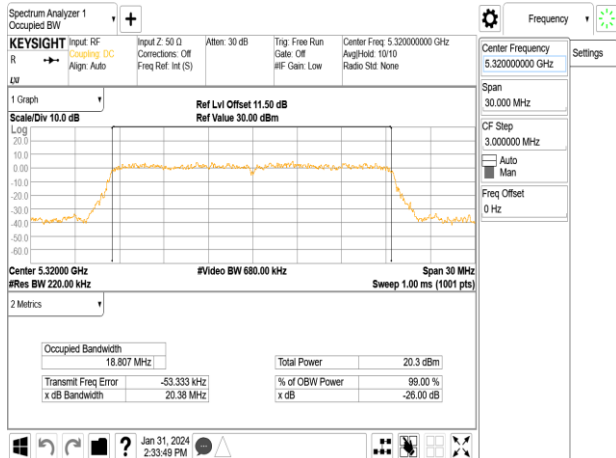
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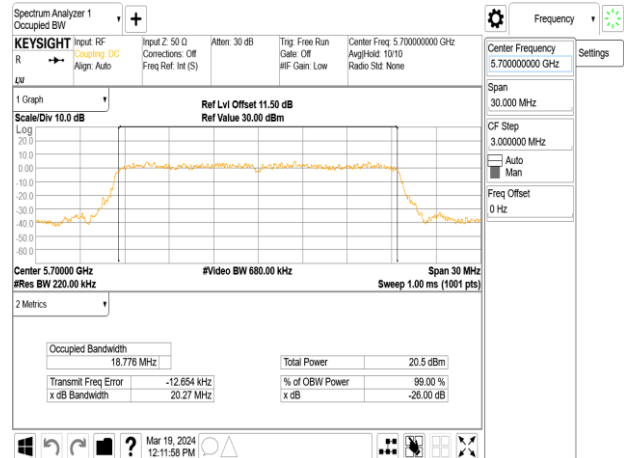
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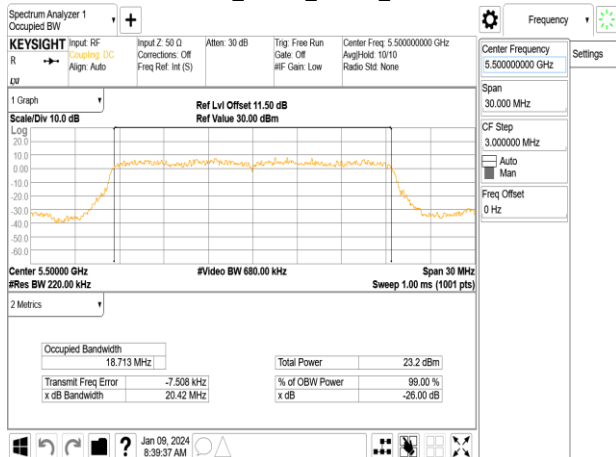
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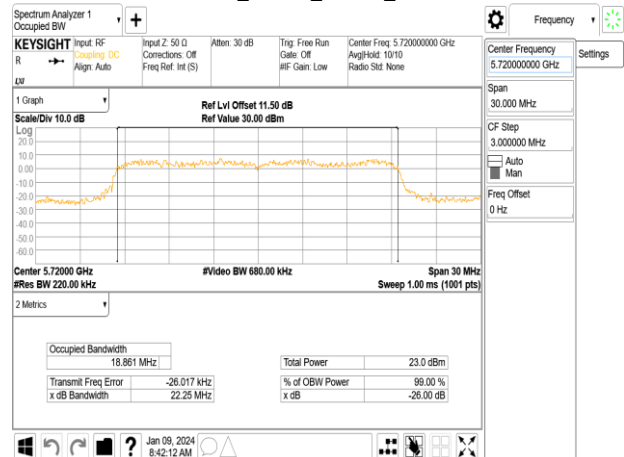
802.11ax_20MHz_Chain0_5700MHz



802.11ax_20MHz_Chain0_5500MHz



802.11ax_20MHz_Chain0_5720MHz



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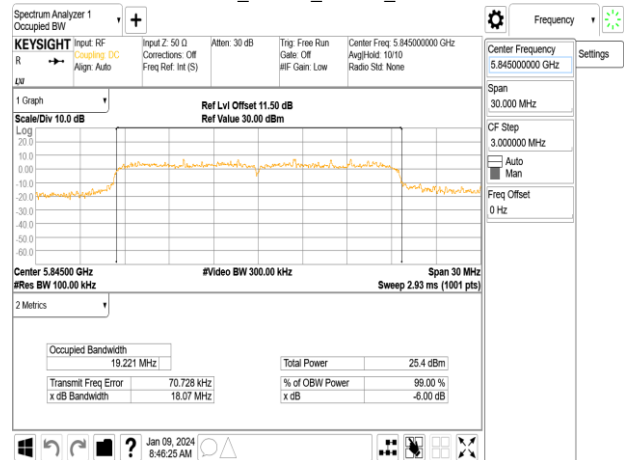
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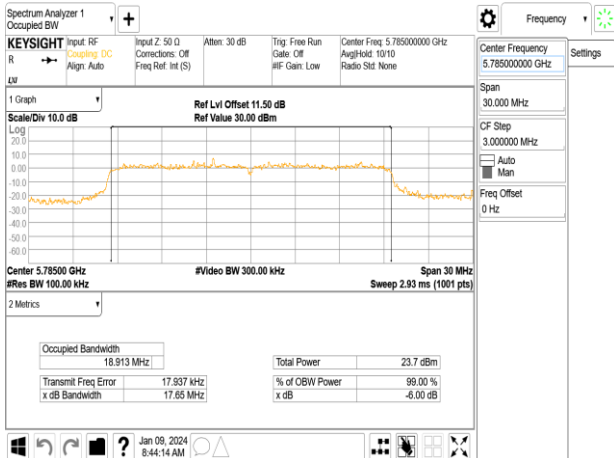
802.11ax_20MHz_Chain0_5745MHz



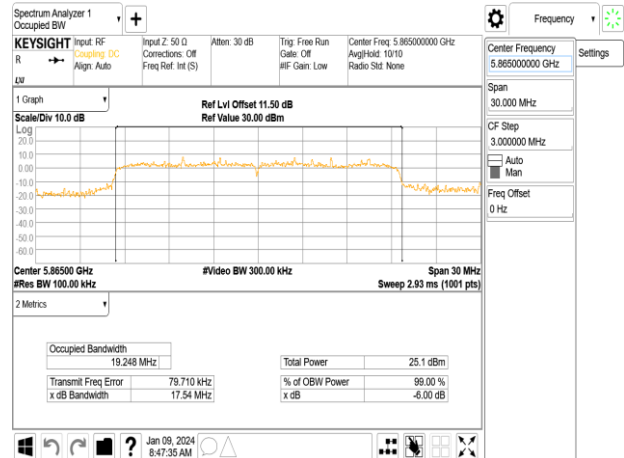
802.11ax_20MHz_Chain0_5845MHz



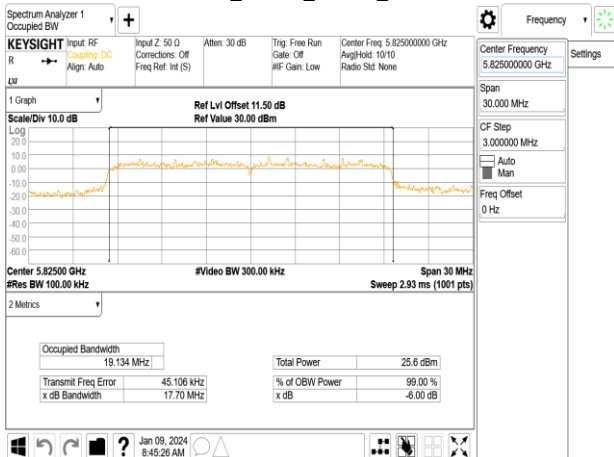
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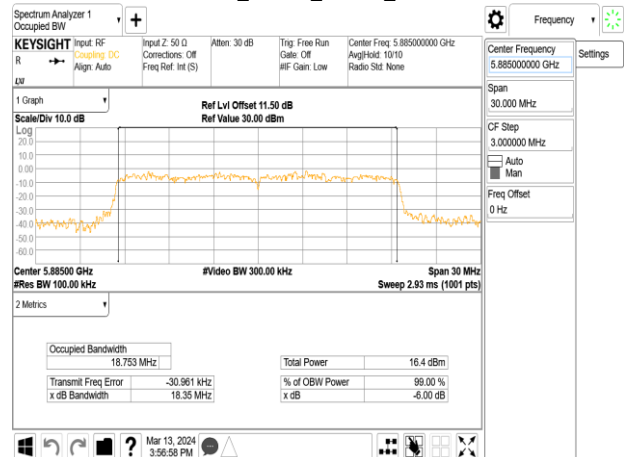
802.11ax_20MHz_Chain0_5865MHz



802.11ax_20MHz_Chain0_5825MHz



802.11ax_20MHz_Chain0_5885MHz



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8.4.2 ISED Occupied Bandwidth

802.11a_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	16.615	12.210
5220	16.617	12.210
5240	16.584	12.200
5260	16.629	12.210
5300	16.581	12.200
5320	16.609	12.200
5500	16.657	12.220
5580	16.600	12.200
5700	16.610	12.200
5720(U-NII 2C)	13.323	11.250
5720(U-NII 3)	3.323	5.220

802.11a_Ch0

Frequency (MHz)	99% BW (MHz)	6dB BW (MHz)
5745	16.626	16.360
5785	16.677	16.320
5825	16.658	16.420
5845	16.625	16.400
5865	16.649	16.370
5885	16.647	16.460

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802.11n_HT20_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	17.681	12.480
5220	17.644	12.470
5240	17.626	12.460
5260	17.658	12.470
5300	17.640	12.460
5320	17.653	12.470
5500	17.610	12.460
5580	17.664	12.470
5700	17.672	12.470
5720(U-NII 2C)	22.170	13.460
5720(U-NII 3)	3.873	5.880

802.11n_HT20_Ch0

Frequency (MHz)	99% BW (MHz)	6dB BW (MHz)
5745	17.787	17.490
5785	17.767	17.410
5825	17.737	17.540
5845	17.697	17.520
5865	17.731	17.520
5885	17.731	17.360

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802.11ax_HE20_Ch0

Frequency (MHz)	RU config	99% BW (MHz)	10 Log (B) (dB)
5180	full	18.769	12.730
5220	full	18.793	12.740
5240	full	18.741	12.730
5260	full	18.792	12.740
5300	full	18.758	12.730
5320	full	18.747	12.730
5500	full	18.801	12.740
5580	full	18.789	12.740
5700	full	18.739	12.730
5720(U-NII 2C)	full	14.409	11.590
5720(U-NII 3)	full	4.409	6.440

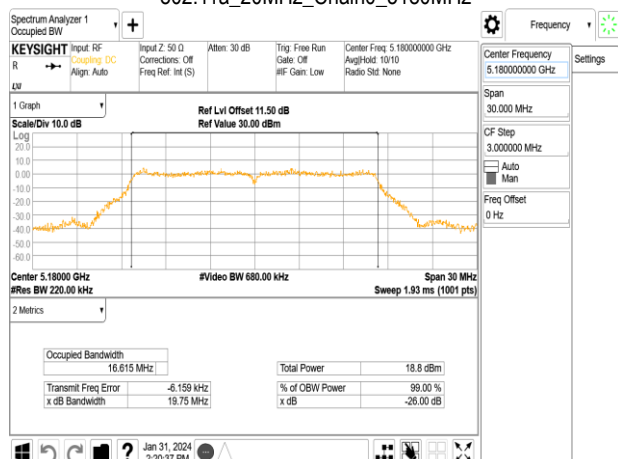
802.11ax_HE20_Ch0

Frequency (MHz)	RU config	99% BW (MHz)	6dB BW (MHz)
5745	full	18.834	18.640
5785	full	18.950	18.710
5825	full	19.114	18.760
5845	full	19.074	18.510
5865	full	19.095	18.380
5885	full	18.750	18.600

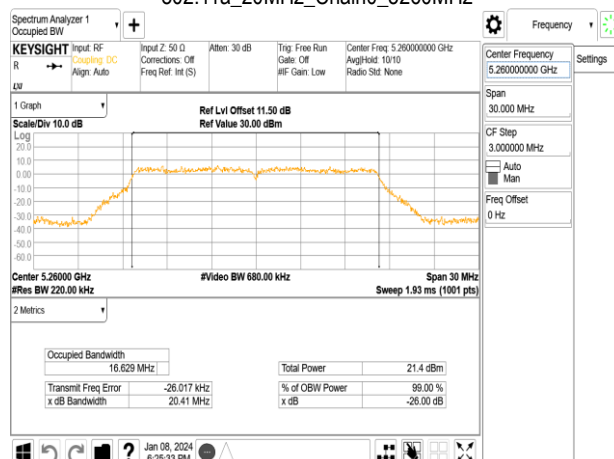
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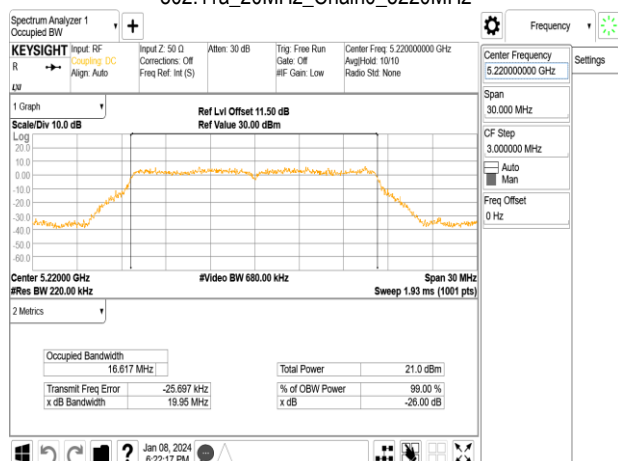
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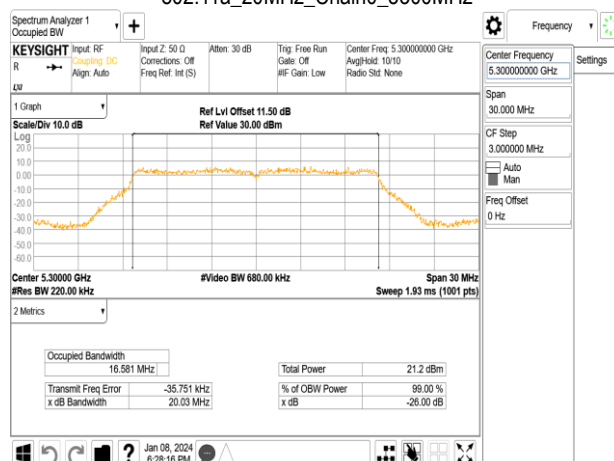
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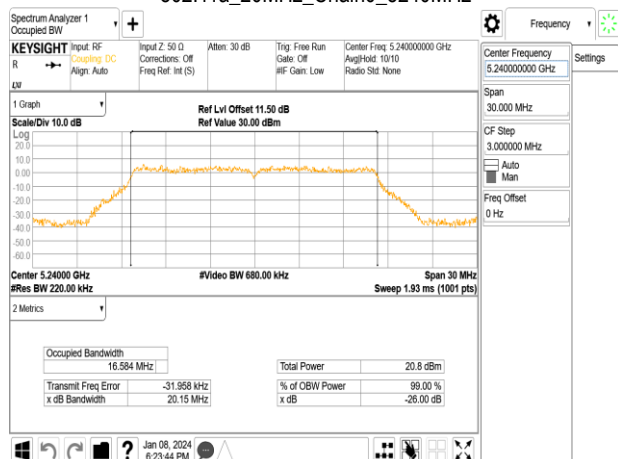
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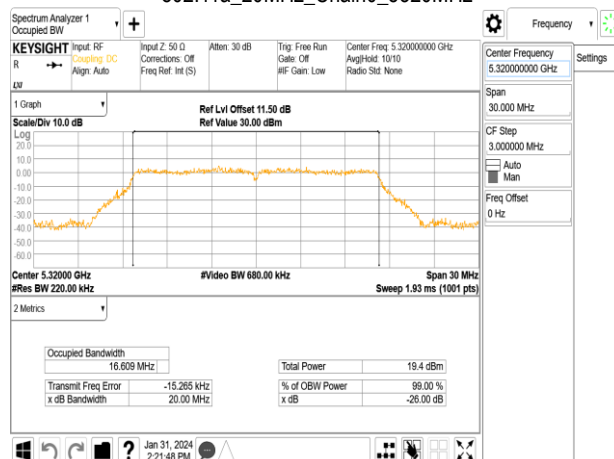
802.11a_20MHz_Chain0_5300MHz



802.11a_20MHz_Chain0_5240MHz



802.11a_20MHz_Chain0_5320MHz

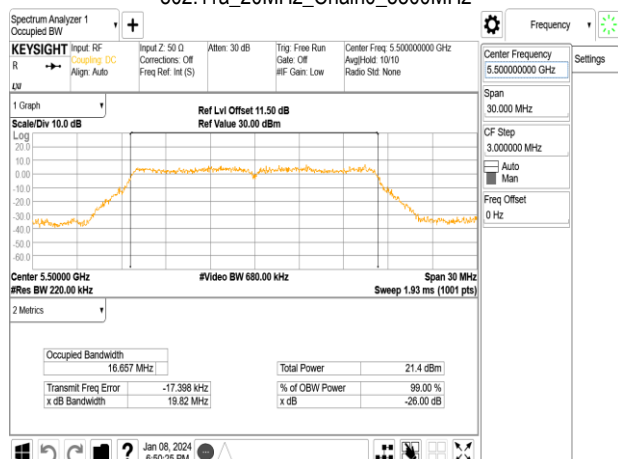


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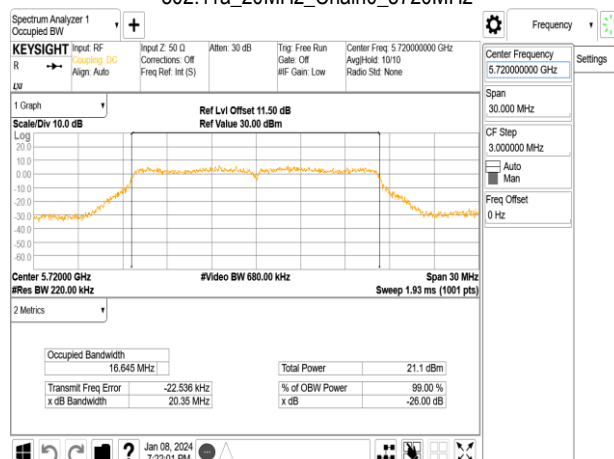
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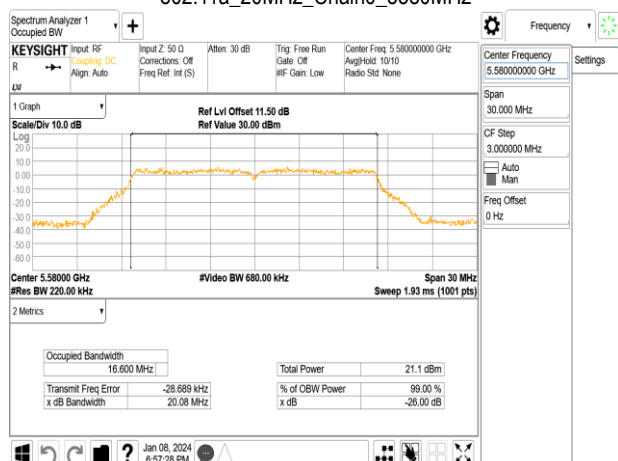
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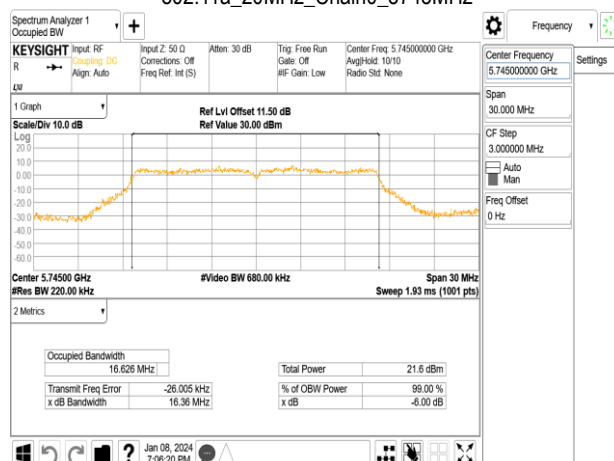
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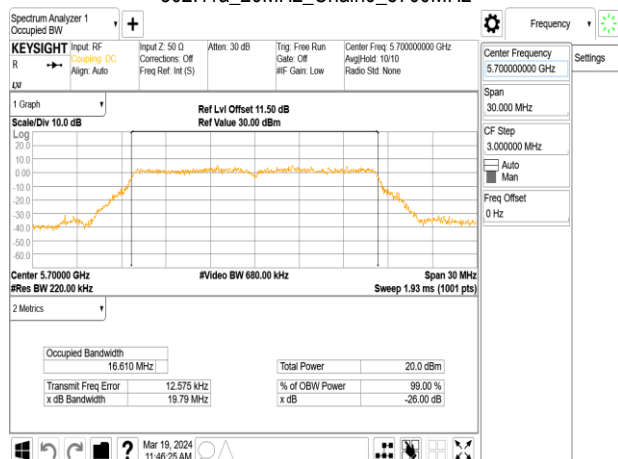
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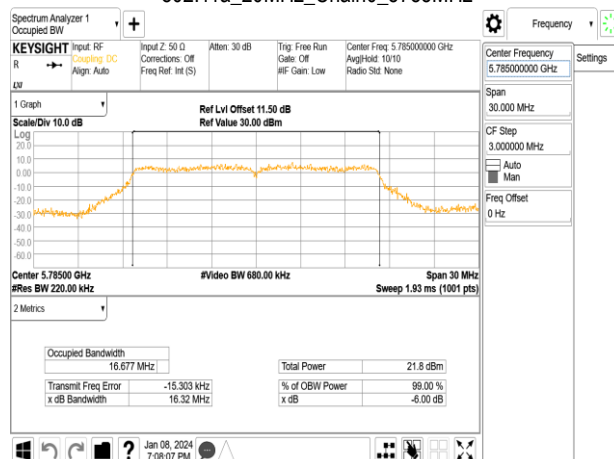
802.11a_20MHz_Chain0_5745MHz



802.11a_20MHz_Chain0_5700MHz



802.11a_20MHz_Chain0_5785MHz

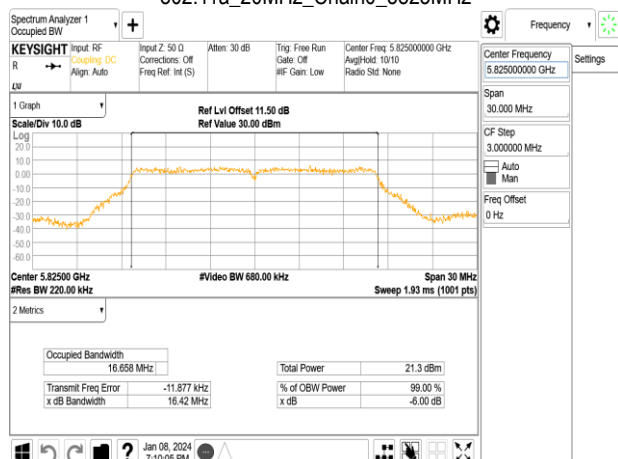


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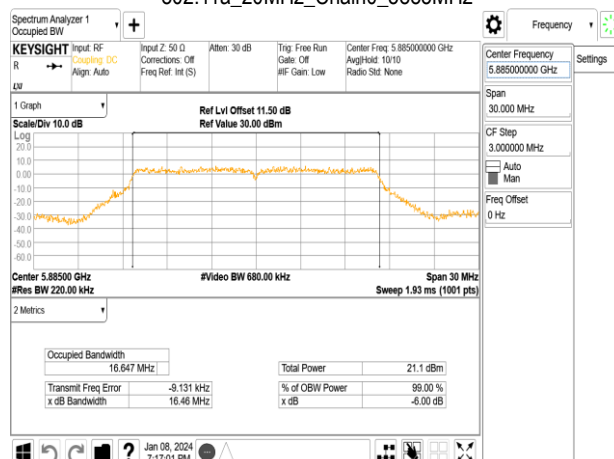
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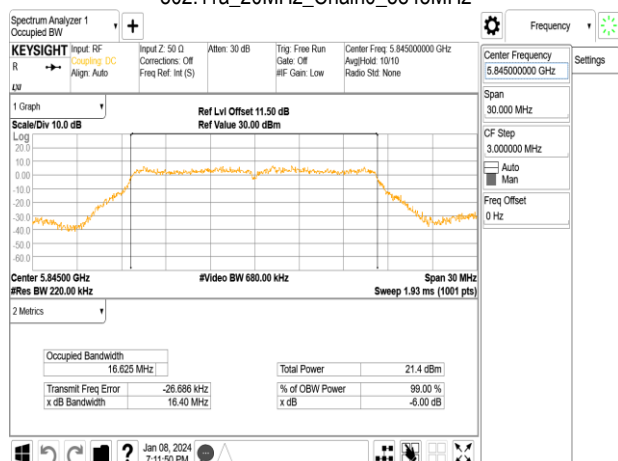
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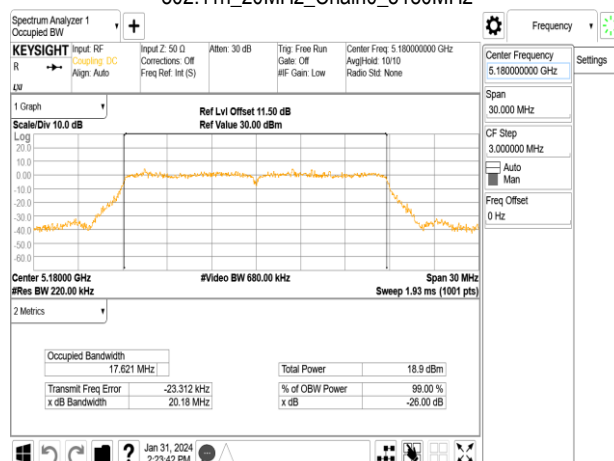
802.11a_20MHz_Chain0_5885MHz



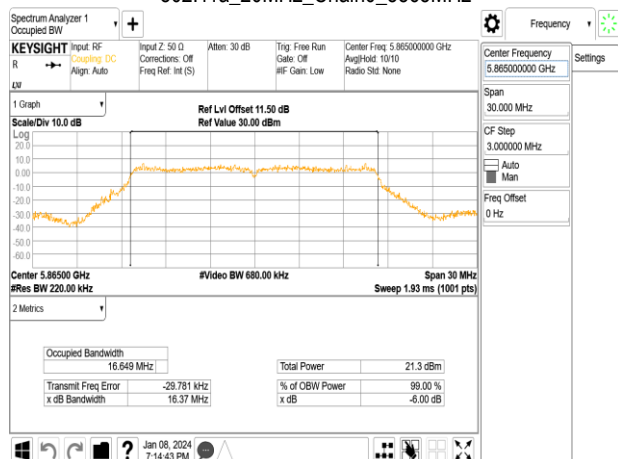
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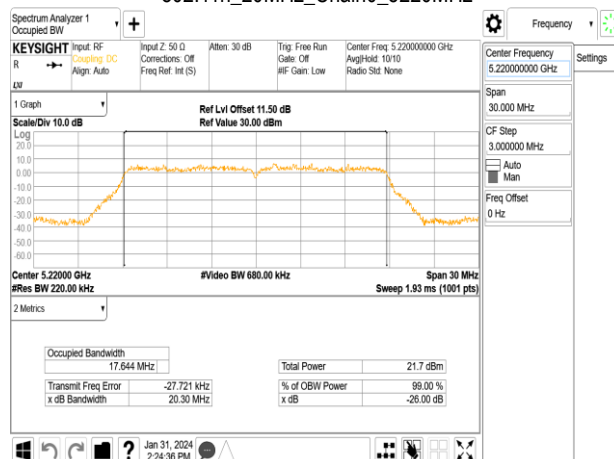
802.11n_20MHz_Chain0_5180MHz



802.11a_20MHz_Chain0_5865MHz



802.11n_20MHz_Chain0_5220MHz



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