

**-ELECTROMAGNETIC EMISSIONS
COMPLIANCE REPORT**

Applicant: Motive Technologies, Inc.
55 Hawthorne St. Suite #400, San Francisco, CA 94105, USA

Manufacturer: Motive Technologies, Inc.
55 Hawthorne St. Suite #400, San Francisco, CA 94105, USA

Product Name: AI Dashcam Plus

Brand Name: Motive

Model No.: DC64-NA.01

/ISED HVIN:

Family No.: DC63-NA.01, DC64-WW.01, DC63-WW.01

/ Family ISED HVIN:

Model Difference: DC64-NA.01 & DC64-WW.01 with 3 cameras design; DC63-NA.01 & DC63-WW.01 with 2 cameras design

ISED PMN: AI Dashcam Plus

Report Number: TERF2404001130ER

FCC ID 2AQM7-DC6

IC: 24516-DC6

Date of EUT Received: April 22, 2024

Date of Test: April 22, 2024 ~ May 30, 2024

Issue Date: December 30, 2024

Approved By**Jim Chang****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, ISED 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
TERF2404001130ER	00	Original	Dec. 2, 2024	Candice Li	
TERF2404001130ER	01	Add PMN, Revision Note 3; Modify FVIN, Section 1.3	Dec. 30, 2024	Candice Li	*

Note:

- 1、The remark "*" indicates modification of the report upon requests from certification body.
- 2、Variant information of model numbers is provided by the applicant, test results of this report are applicable to the sample EUT(s) received.
And are assessed as electrically identical in RF characteristics, therefore, no further assessment required for the variant(s).
- 3、There is no different camera module among HVINs, the DC63-NA.01 and DC63-WW.01 are depopulated 1 camera from the DC64-NA01 and DC64-WW.01. And DC64-WW.01 & DC63-WW.01 just for marketing purpose.

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	AI Dashcam Plus
Brand Name:	Motive
Model No.: /ISED HVIN:	DC64-NA.01
Family No.: / Family ISED HVIN:	DC63-NA.01, DC64-WW.01, DC63-WW.01
Model Difference:	DC64-NA.01 & DC64-WW.01 with 3 cameras design; DC63-NA.01 & DC63-WW.01 with 2 cameras design
Hardware Version:	1
Firmware Version:	N/A
EUT Series No.:	AABV52BE140032
Power Supply:	12-24Vdc
Test Software (Name/Version)	QRCT V4.0

1.2 Modulation & Data Rate

Modulation type:	64QAM, 16QAM, QPSK, BPSK for OFDM in 802.11a, 11n
	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM in 802.11ac
	1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDMA in 802.11ax
Transition Rate:	802.11 a: 6 - 54 Mbps
	802.11 n_HT20: up to 144.4 Mbps
	802.11 n_HT40: up to 300 Mbps
	802.11 ac_VHT20: up to 173.4 Mbps
	802.11 ac_VHT40: up to 400 Mbps
	802.11 ac_VHT80: up to 866.6 Mbps
	802.11 ax_HE20: up to 286.8 Mbps
	802.11 ax_HE40: up to 573.6 Mbps
	802.11 ax_HE80: up to 1201 Mbps

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1.3 Antenna Designation

Antenna Type	Supplier	Antenna Model No.	Freq. (MHz)	ch0/ch1	Peak Antenna Gain (dBi)
IFA	INPAQ	WAG-F-LTE12LB-00-001	5725~5850	ch0	4.59
				ch1	4.49

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.

1.4 FCC

Wi-Fi	Frequency Range	Channels	Rated Power(Avg) (dBm) (Worst Case)	Modulation Technology
802.11a/ 802.11n_HT20/ 802.11ac_VHT20/ 802.11ax_HE20	5745-5825	5	18.40 dBm	OFDMA
802.11n_HT40 802.11ac_VHT40/ 802.11ax_HE40	5755-5795	2	18.49 dBm	OFDM
802.11ac_VHT80/ 802.11ax_HE80	5775	1	17.49 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
802.11a/ 802.11n_HT20/ 802.11ac_VHT20/ 802.11ax_HE20	5745-5825	5	Avg	18.40 dBm	OFDMA
802.11n_HT40 802.11ac_VHT40/ 802.11ax_HE40	5755-5795	2	Avg	18.49 dBm	OFDM
802.11ac_VHT80/ 802.11ax_HE80	5775	1	Avg	17.49 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 662911 D01 Multiple Transmitter Output v02r01

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 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 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 indication 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

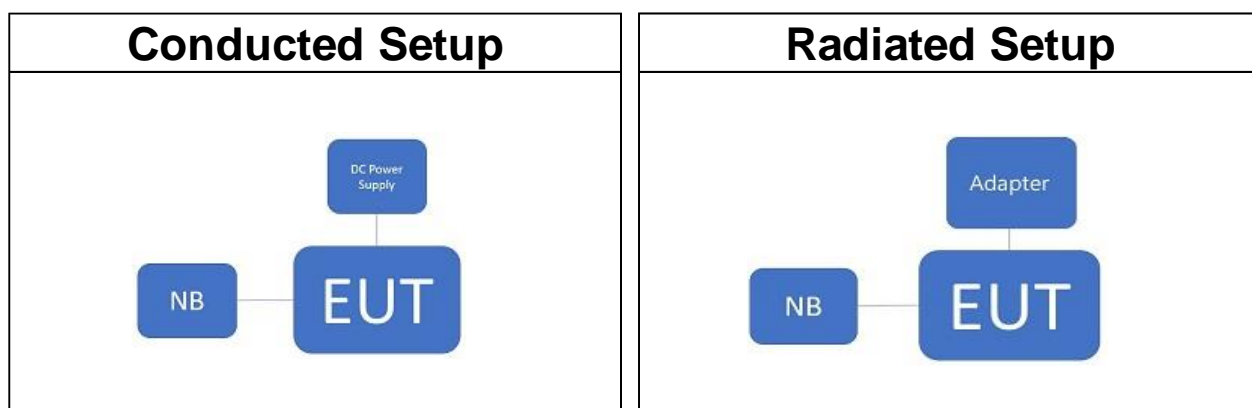
Radiated emission below 30MHz is measured in a 9m*6m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

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



2.6 Control Unit(s)

Conducted Emission Test Site: Conducted F					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	HP	HSN-Q35C-4	P0003860	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
Adapter	iMax	CHAO024-120200	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	Non applicable
§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-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

UNII-3 5725 MHz ~ 5850MHz					
20MHz		40MHz		80MHz	
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				

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	
V	802.11 a	V	Ch0	V	Ch1		Ch2		Ch3	V	1TX		2TX
V	802.11 n	V	Ch0	V	Ch1		Ch2		Ch3		1TX	V	2TX
V	802.11 ac	V	Ch0	V	Ch1		Ch2		Ch3		1TX	V	2TX
V	802.11 ax	V	Ch0	V	Ch1		Ch2		Ch3		1TX	V	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.

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CONDUCTED TEST							
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)		ANTENNA PORT
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6		ch1
802.11n_HT20	5745~5825	149 to 165	149,157,165	OFDM	MCS0		2TX
802.11n_HT40	5755~5795	151 to 159	151,159	OFDM	MCS0		2TX
802.11ac_VHT80	5775	155	155	OFDM	MCS0		2TX
CONDUCTED TEST							
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	RU CONFIGURATION	DATA RATE (Mbps)	ANTENNA PORT
802.11ax_HE20	5745~5825	149 to 165	149,157,165	OFDMA	FULL RU 26/0,26/8 52/37,52/40 106/53,106/54	MCS0	2TX
802.11ax_HE40	5755~5795	151 to 159	151,159	OFDMA	FULL RU 242/61,242/62	MCS0	2TX
802.11ax_HE80	5775	155	155	OFDMA	FULL RU 484/65,484/66	MCS0	2TX
TRANSMIT RADIATED EMISSION TEST (BELOW 1 GHz)							
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)		ANTENNA PORT
802.11a	5745~5825	149 to 165	157	OFDM	6		ch1

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TRANSMIT RADIATED EMISSION TEST (ABOVE 1 GHz)							
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT	
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	ch1	
802.11n_HT20	5745~5825	149 to 165	149,157,165	OFDM	MCS0	2TX	
802.11n_HT40	5755~5795	151 to 159	151,159	OFDM	MCS0	2TX	
802.11ac_VHT80	5775	155	155	OFDM	MCS0	2TX	
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	5745~5825	149 to 165	149,157,165	OFDMA	FULL RU 26/0,26/8 52/37,52/40 106/53,106/54	MCS0	2TX
802.11ax_HE40	5755~5795	151 to 159	151,159	OFDMA	FULL RU 242/61,242/62	MCS0	2TX
802.11ax_HE80	5775	155	155	OFDMA	FULL RU 484/65,484/66	MCS0	2TX

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 Conducted Measurement

Conducted Emission Test Site: Conducted F					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Attenuator	Woken	WATT-218FS-10	RF18	11/15/2023	11/14/2024
Attenuator	Woken	WATT-218FS-10	RF22	11/15/2023	11/14/2024
DC Block	PASTERNAK	PE8210	RF153	11/15/2023	11/14/2024
DC Power Supply	Gwinstek	SPS-3610	GEW902165	01/17/2024	01/16/2025
Power Meter	Anritsu	ML2496A	1326001	08/22/2023	08/21/2024
Power Sensor	Anritsu	MA2411B	1315048	08/22/2023	08/21/2024
Power Sensor	Anritsu	MA2411B	1315049	08/22/2023	08/21/2024
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071570	06/15/2023	06/14/2024
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R

6.2 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	1187	01/24/2024	01/23/2025
Horn Antenna	SCHWARZBECK	BBHA9170	185	08/21/2023	08/20/2024
Active Loop Antenna	COM-POWER	AL-130R	10160105	12/04/2023	12/03/2024
3m Site NSA	SGS	966 chamber D	N/A	04/30/2024	04/29/2025
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	04/03/2024	04/02/2025
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

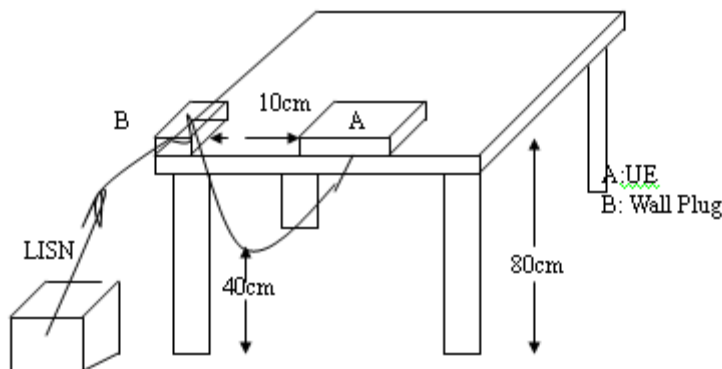
Note

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

N/A; Powered from car battery.

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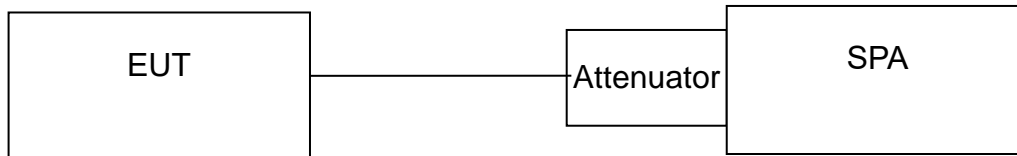
8 EMISSION BANDWIDTH MEASUREMENT

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 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.
 - 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_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	15.70	11.960
5785	16.07	12.060
5825	16.44	12.160

802.11n_HT20_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.17	12.350
5785	17.62	12.460
5825	17.17	12.350

802.11a_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5745	5736.80412	> 5725

802.11n_HT20_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5745	5736.203078	> 5725

802.11n_HT20_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.56	12.450
5785	16.00	12.040
5825	16.76	12.240

802.11n_HT40_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	35.80	15.540
5795	34.84	15.420

802.11n_HT20_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5745	5736.210152	> 5725

802.11n_HT40_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5755	5736.955194	> 5725

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802.11n_HT40_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.35	15.610
5795	36.32	15.600

802.11n_HT40_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5755	5736.948731	> 5725

802.11ac_VHT80_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.07	18.750

802.11ac_VHT80_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5775	5737.358228	> 5725

802.11ac_VHT80_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.41	18.770

802.11ac_VHT80_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5775	5737.230239	> 5725

802.11ax_HE20_Ch0

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5745	full	18.47	12.660
5785	full	18.87	12.760
5825	full	18.97	12.780

802.11ax_HE20_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5745	5735.553477	> 5725

802.11ax_HE20_Ch1

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5745	full	18.89	12.760
5785	full	18.61	12.700
5825	full	17.46	12.420

802.11ax_HE20_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5745	5735.519394	> 5725

802.11ax_HE40_Ch0

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5755	full	37.99	15.800
5795	full	38.10	15.810

802.11ax_HE40_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5755	5736.157675	> 5725

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802.11ax_HE40_Ch1

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5755	full	36.99	15.680
5795	full	36.80	15.660

802.11ax_HE40_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5755	5736.111964	> 5725

802.11ax_HE80_Ch0

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5775	full	75.09	18.760

802.11ax_HE80_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5775	5736.462614	> 5725

802.11ax_HE80_Ch1

Freq. (MHz)	RU config	6dB BW (MHz)	10 Log (B) (dB)
5775	full	77.41	18.890

802.11ax_HE80_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5775	5736.420607	> 5725

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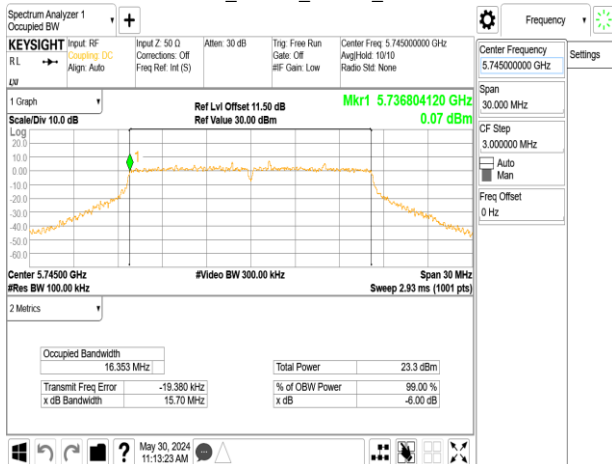
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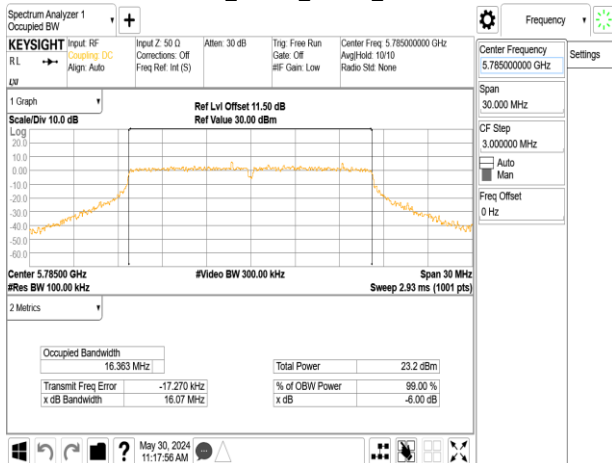
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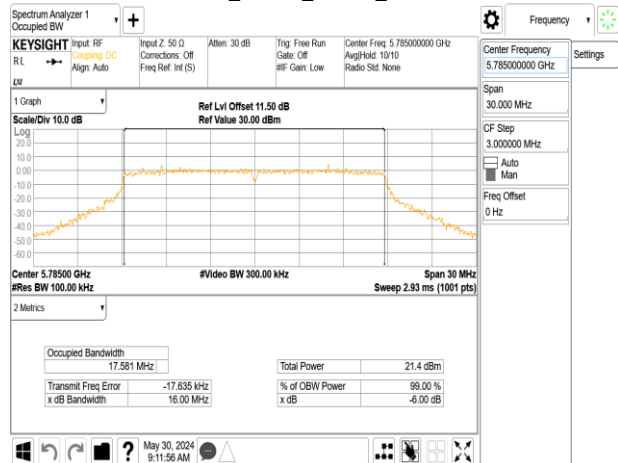
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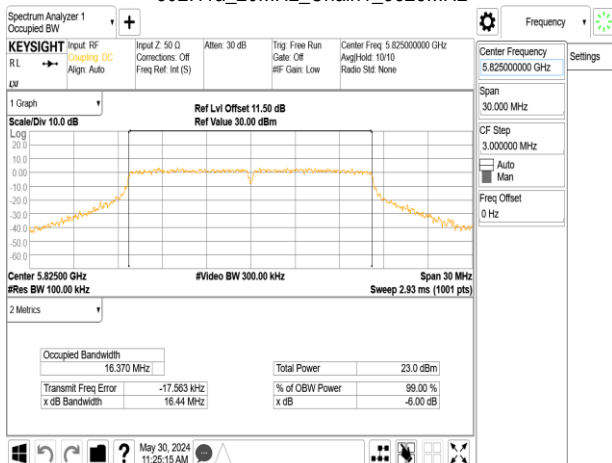
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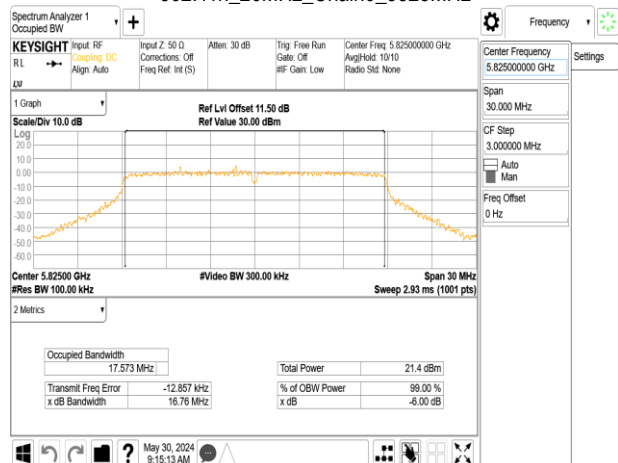
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802.11a_20MHz_Chain1_5825MHz



802.11n_20MHz_Chain0_5825MHz



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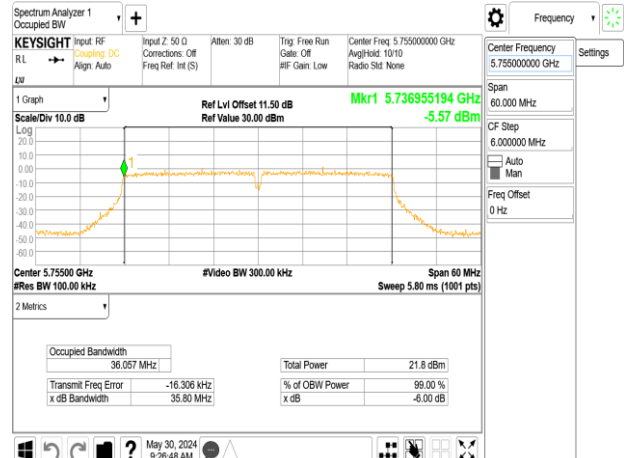
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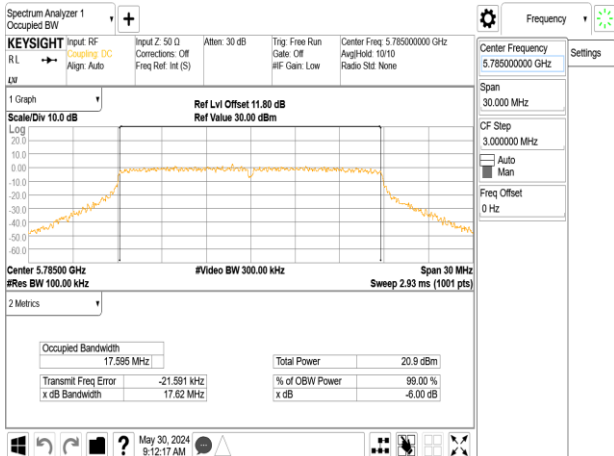
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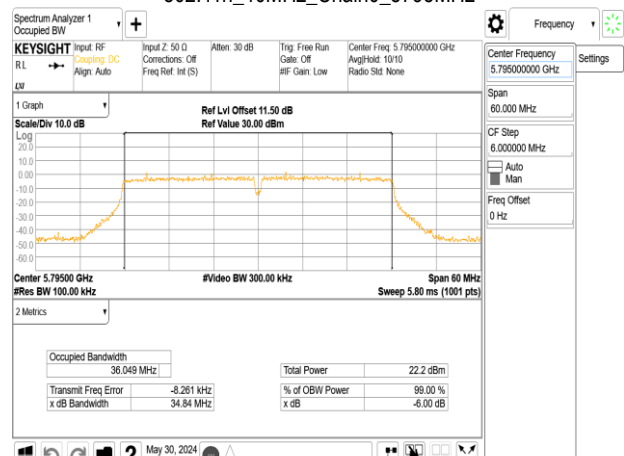
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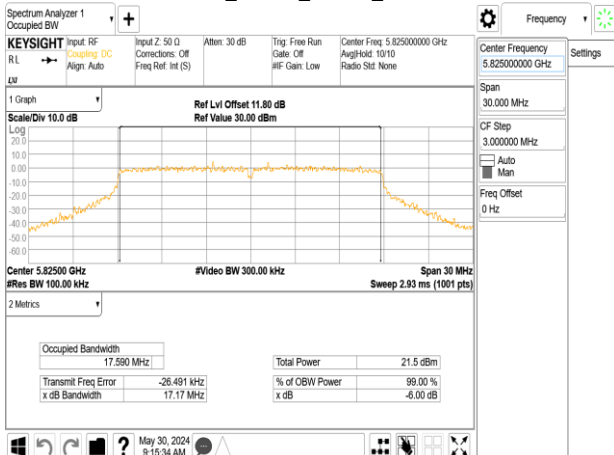
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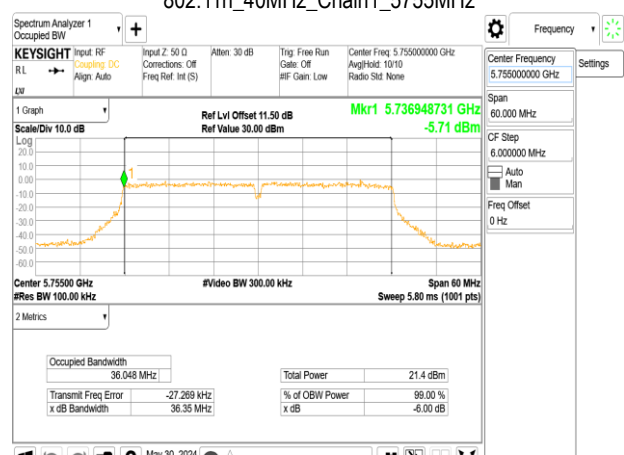
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802.11n_20MHz_Chain1_5825MHz



802.11n_40MHz_Chain1_5755MHz

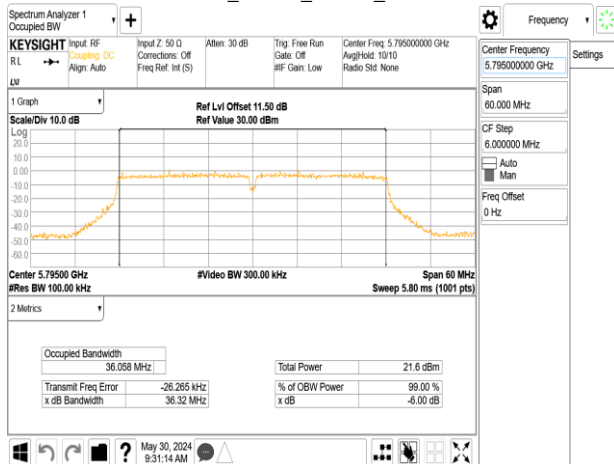


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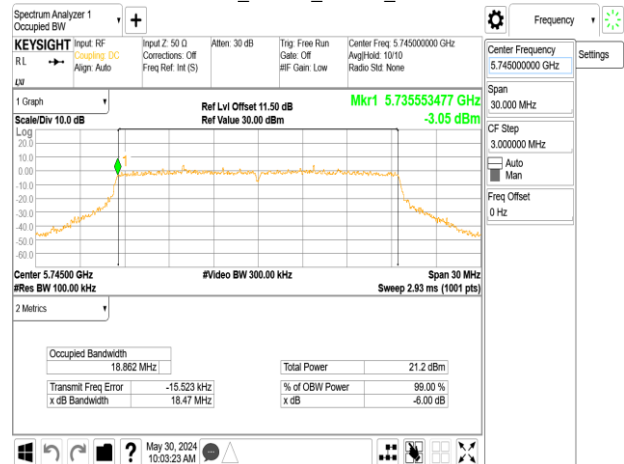
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802.11n_40MHz_Chain1_5795MHz



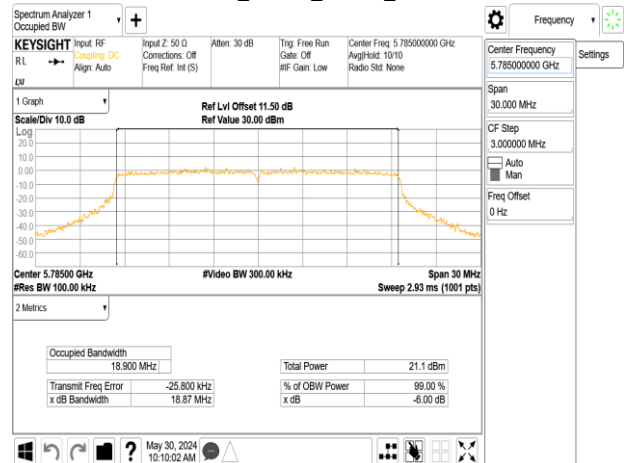
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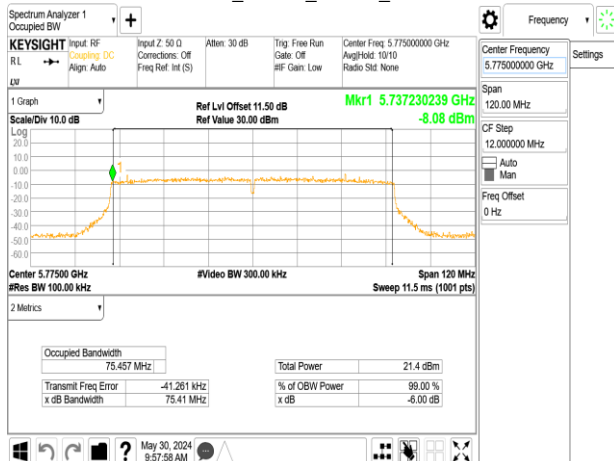
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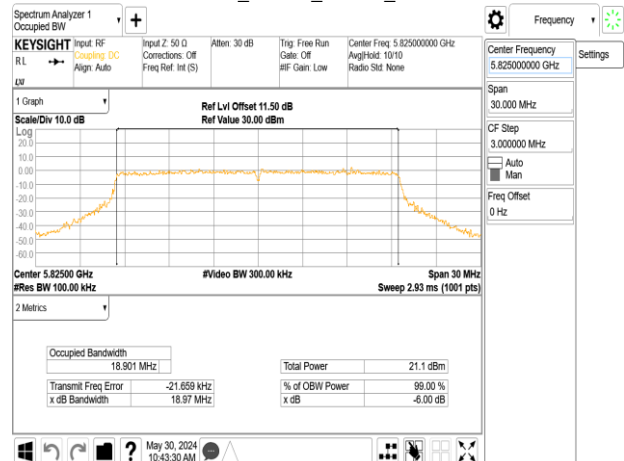
802.11ax_20MHz_Chain0_5785MHz



802.11ac_80MHz_Chain1_5775MHz



802.11ax_20MHz_Chain0_5825MHz



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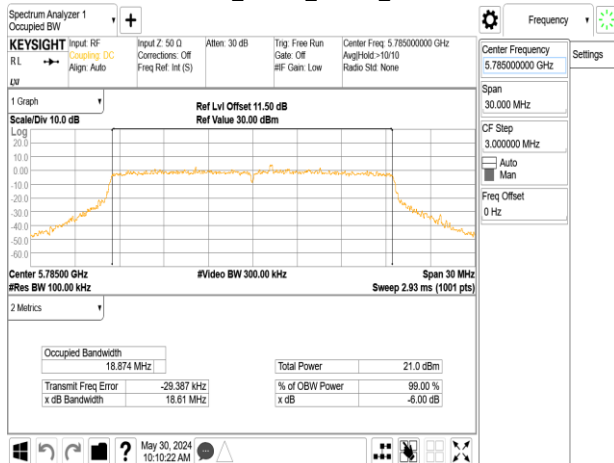
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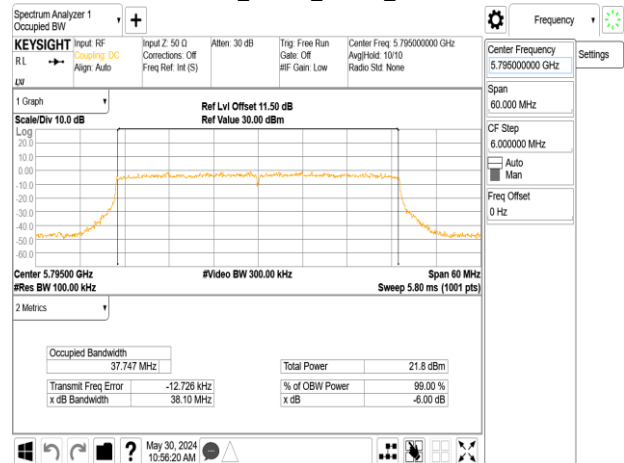
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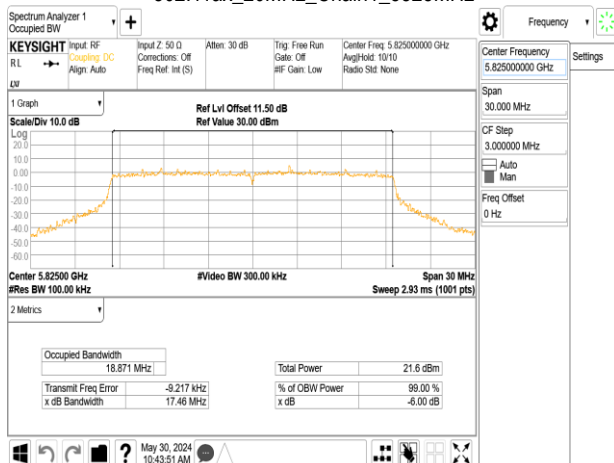
802.11ax_20MHz_Chain1_5785MHz



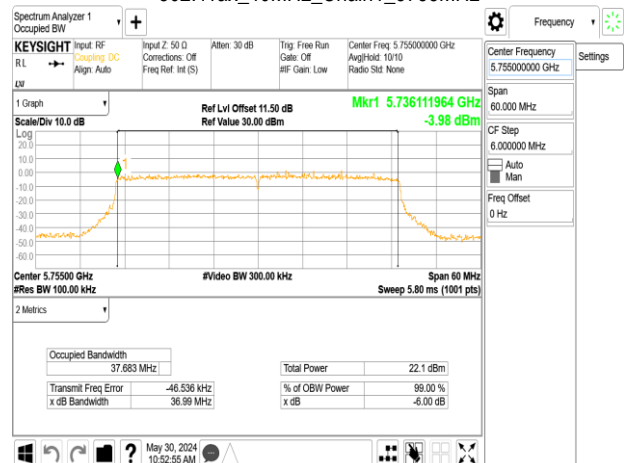
802.11ax_40MHz_Chain0_5795MHz



802.11ax_20MHz_Chain1_5825MHz



802.11ax_40MHz_Chain1_5755MHz

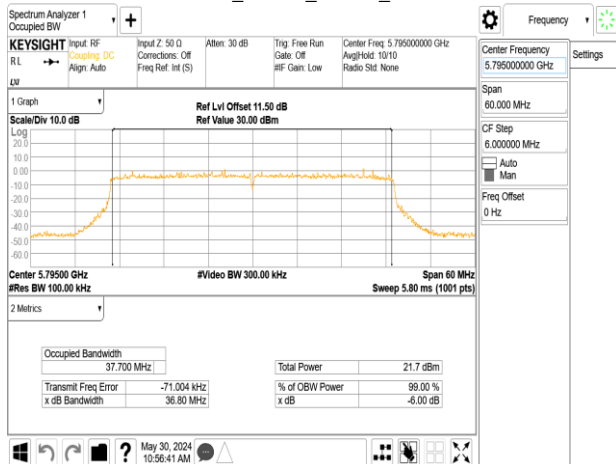


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802.11ax_40MHz_Chain1_5795MHz



802.11ax_80MHz_Chain0_5775MHz



802.11ax_80MHz_Chain1_5775MHz



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8.4.2 ISED Occupied Bandwidth

802.11a_Ch1

Frequency (MHz)	99% BW (MHz)	6dB BW (MHz)
5745	16.385	16.32
5785	16.380	16.32
5825	16.384	16.31

802.11n_HT20_Ch0

Frequency (MHz)	99% BW (MHz)	6dB BW (MHz)
5745	17.573	17.46
5785	17.594	17.57
5825	17.586	17.50

802.11n_HT20_Ch1

Frequency (MHz)	99% BW (MHz)	6dB BW (MHz)
5745	17.584	17.61
5785	17.593	17.54
5825	17.584	17.59

802.11n_HT40_Ch0

Frequency (MHz)	99% BW (MHz)	6dB BW (MHz)
5755	36.038	36.21
5795	36.035	36.16

802.11n_HT40_Ch1

Frequency (MHz)	99% BW (MHz)	6dB BW (MHz)
5755	36.080	36.28
5795	36.039	35.99

802.11ac_VHT80_Ch0

Frequency (MHz)	99% BW (MHz)	6dB BW (MHz)
5775	75.580	76.13

802.11ac_VHT80_Ch1

Frequency (MHz)	99% BW (MHz)	6dB BW (MHz)
5775	75.441	75.67

802.11ax_HE20_Ch0

Frequency (MHz)	RU config	99% BW (MHz)	6dB BW (MHz)
5745	full	18.909	18.83
5785	full	18.891	18.88
5825	full	18.911	18.69

802.11ax_HE20_Ch1

Frequency (MHz)	RU config	99% BW (MHz)	6dB BW (MHz)
5745	full	18.877	18.82
5785	full	18.903	18.66
5825	full	18.915	18.93

802.11ax_HE40_Ch0

Frequency (MHz)	RU config	99% BW (MHz)	6dB BW (MHz)
5755	full	37.733	37.90
5795	full	37.702	37.89

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802.11ax_HE40_Ch1

Frequency (MHz)	RU config	99% BW (MHz)	6dB BW (MHz)
5755	full	37.777	37.87
5795	full	37.723	37.83

802.11ax_HE80_Ch0

Frequency (MHz)	RU config	99% BW (MHz)	6dB BW (MHz)
5775	full	77.189	77.26

802.11ax_HE80_Ch1

Frequency (MHz)	RU config	99% BW (MHz)	6dB BW (MHz)
5775	full	76.940	74.53

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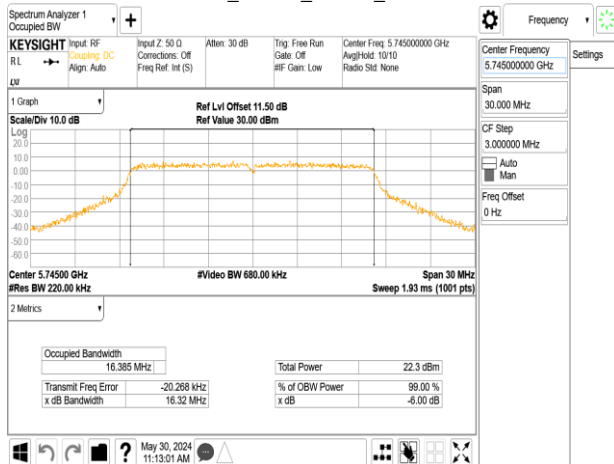
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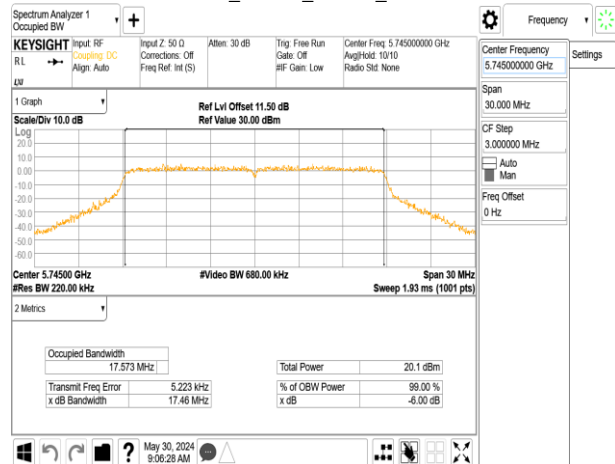
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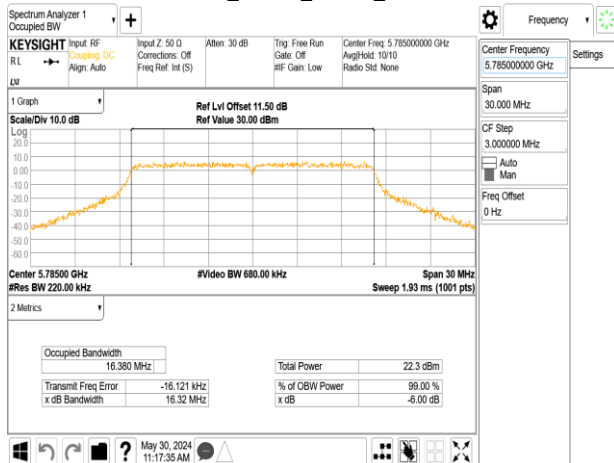
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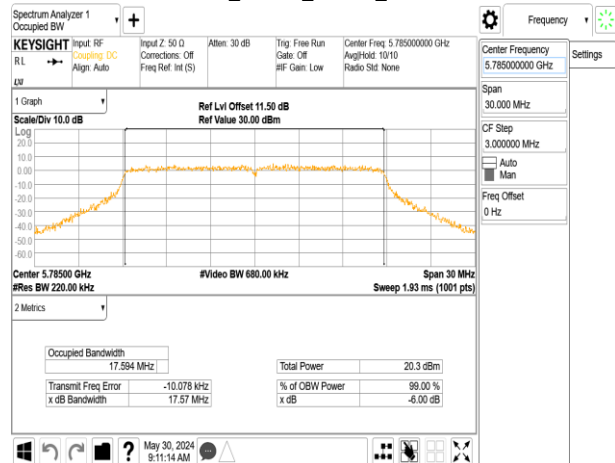
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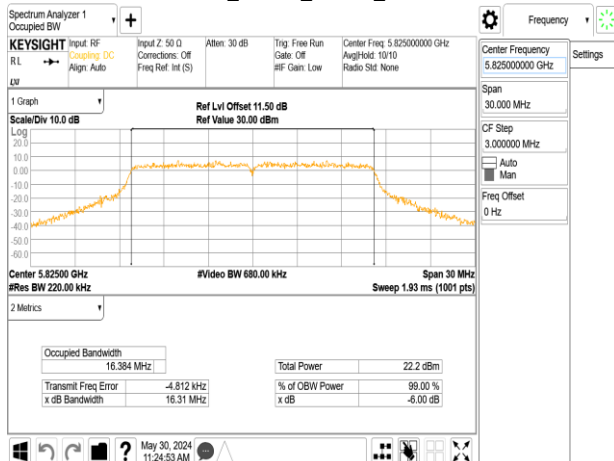
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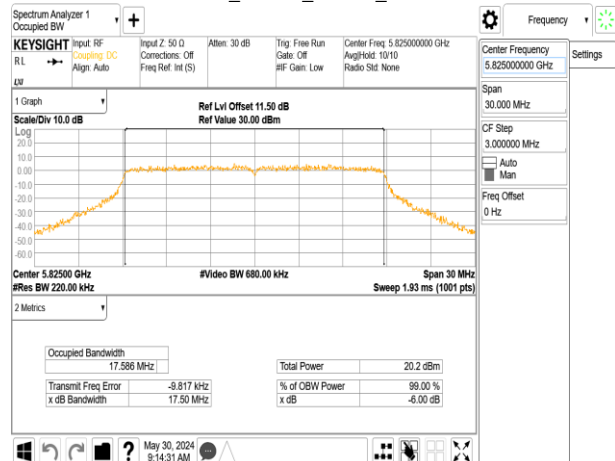
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802.11a_20MHz_Chain1_5825MHz



802.11n_20MHz_Chain0_5825MHz

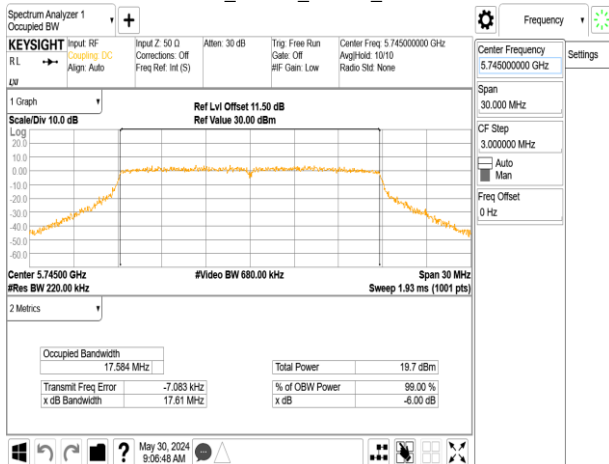


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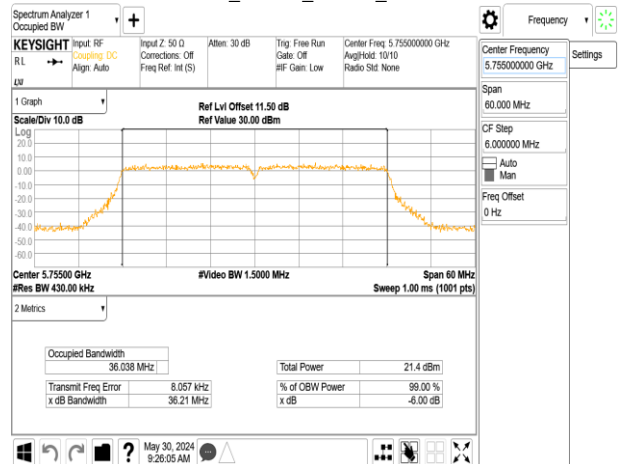
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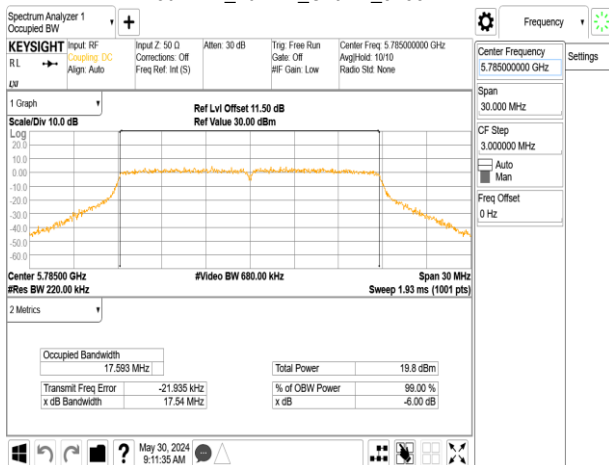
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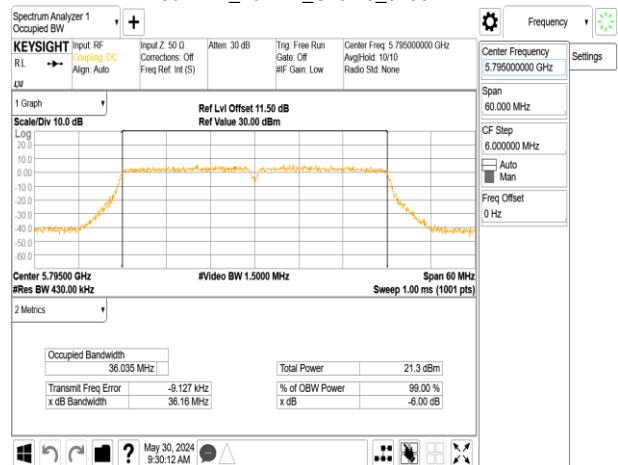
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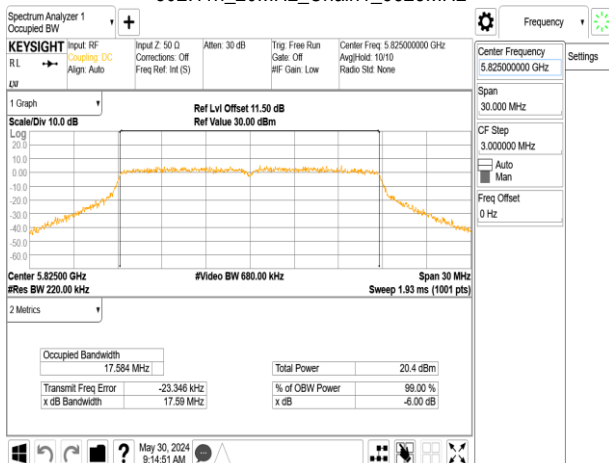
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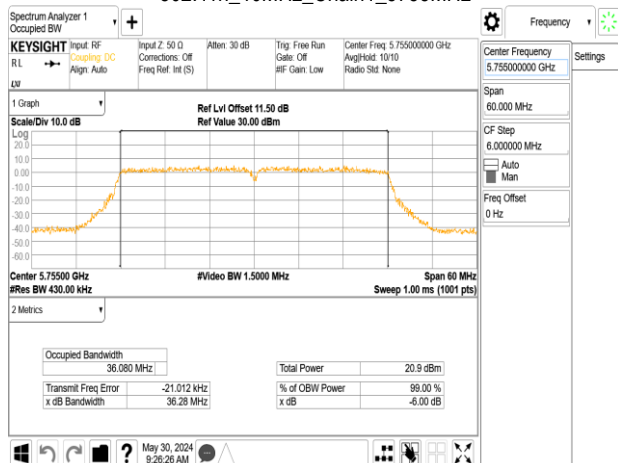
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802.11n_20MHz_Chain1_5825MHz



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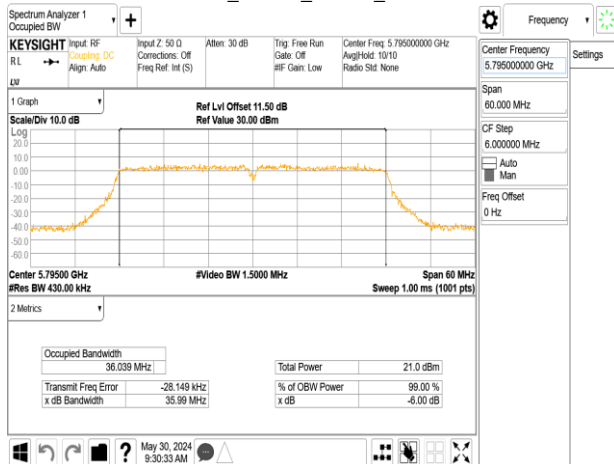


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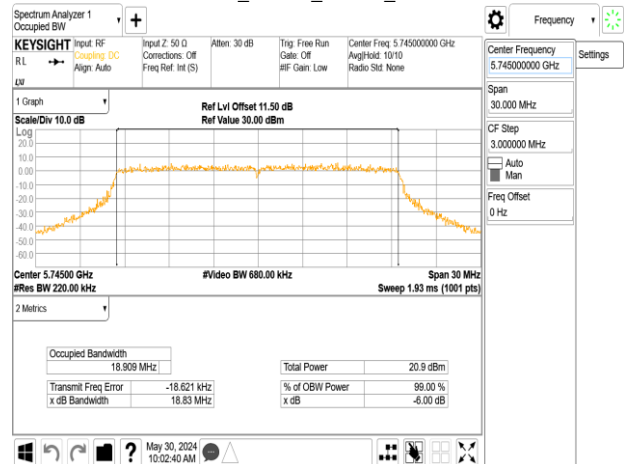
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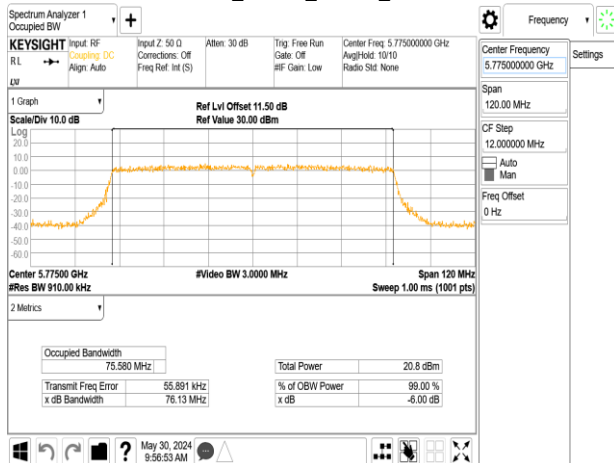
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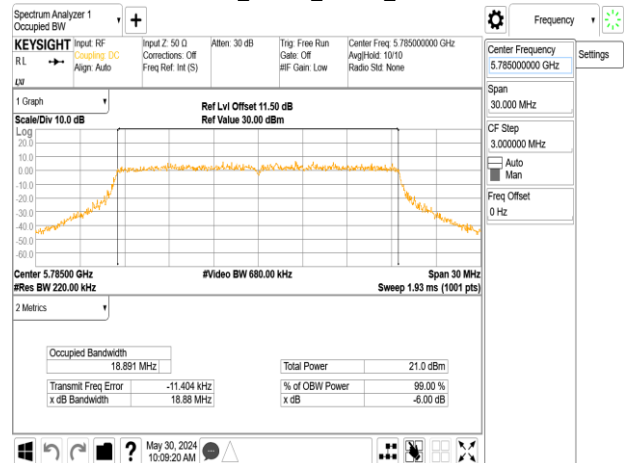
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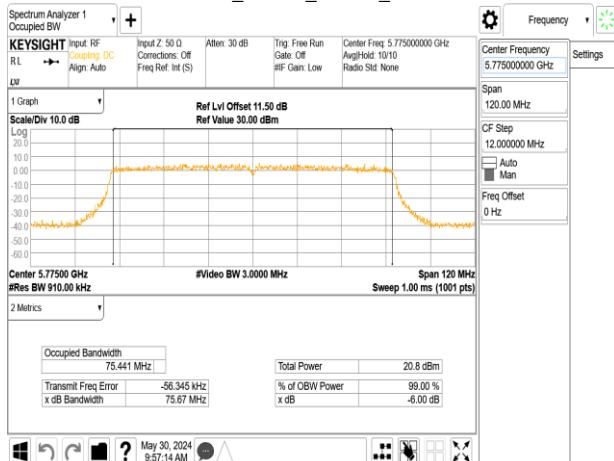
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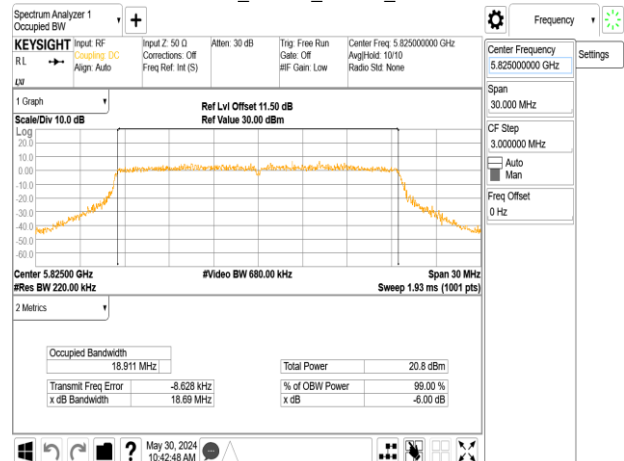
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802.11ac_80MHz_Chain1_5775MHz



802.11ax_20MHz_Chain0_5825MHz

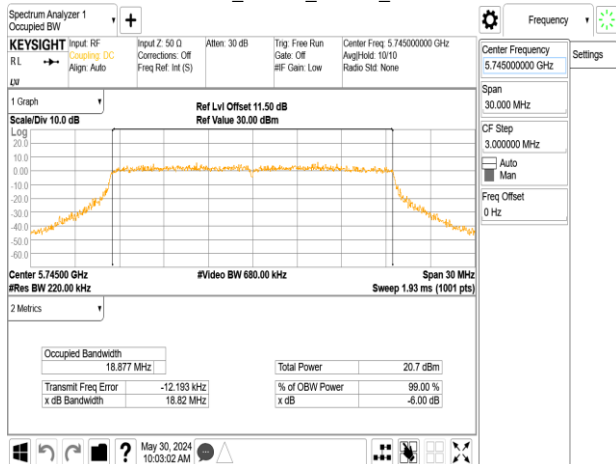


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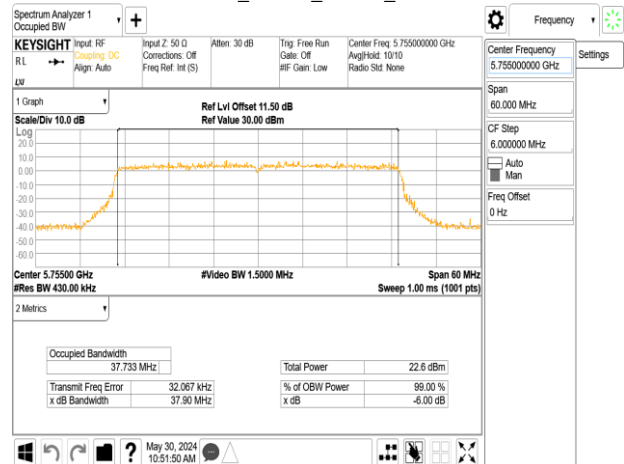
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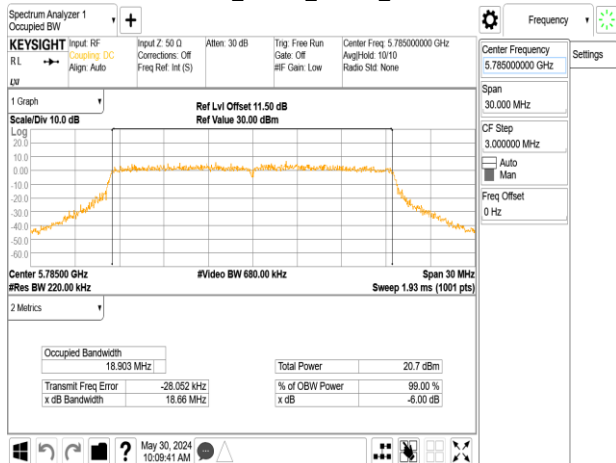
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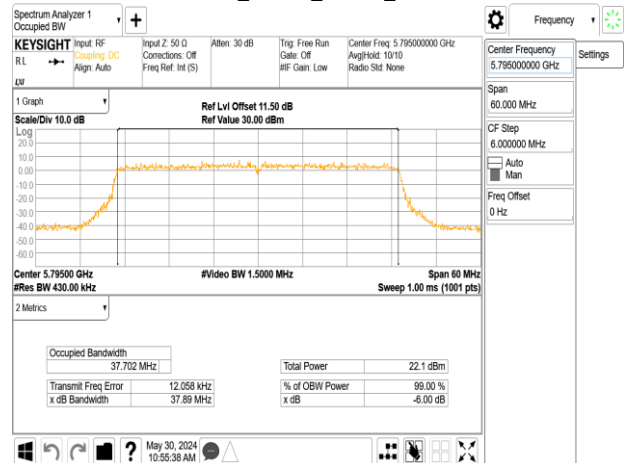
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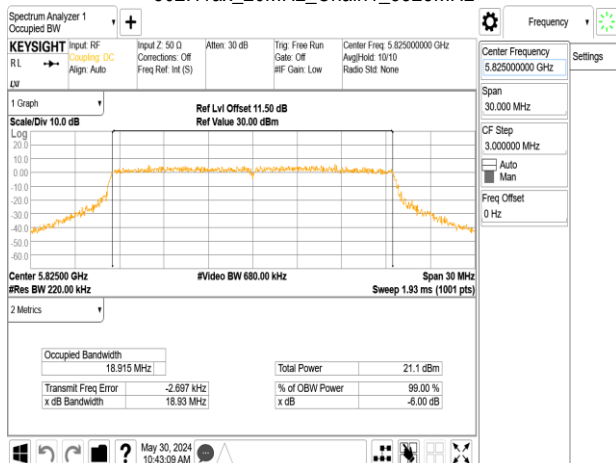
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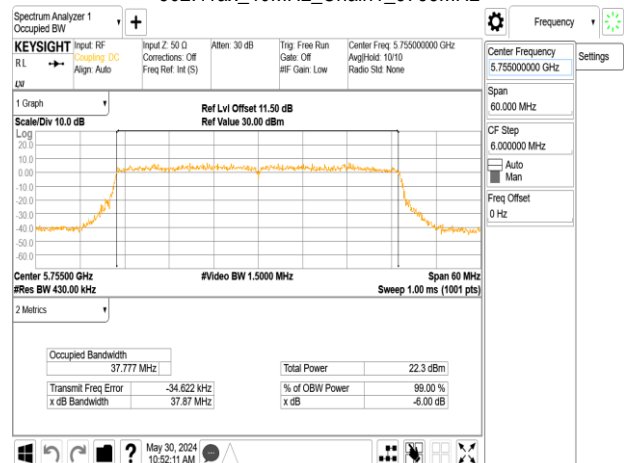
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802.11ax_20MHz_Chain1_5825MHz



802.11ax_40MHz_Chain1_5755MHz

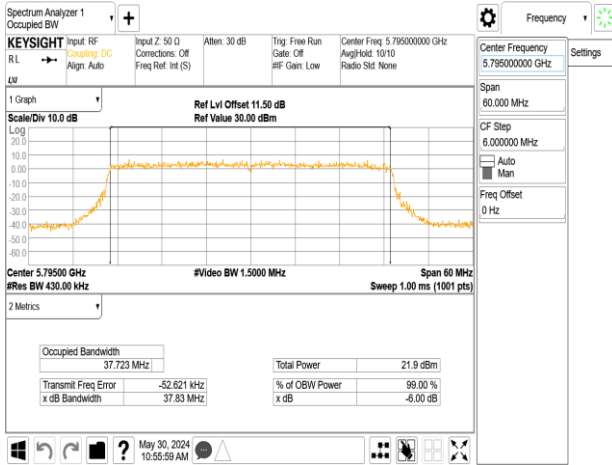


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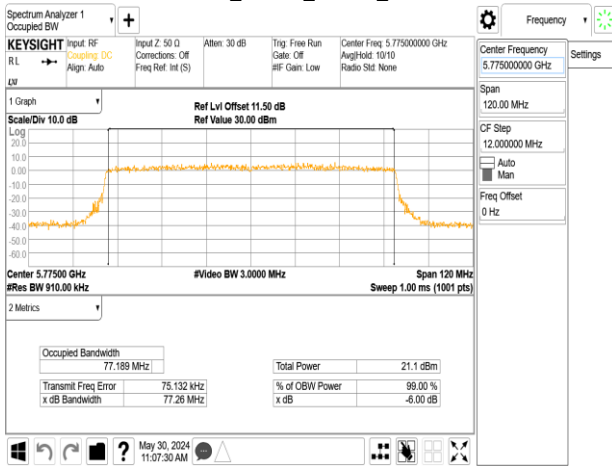
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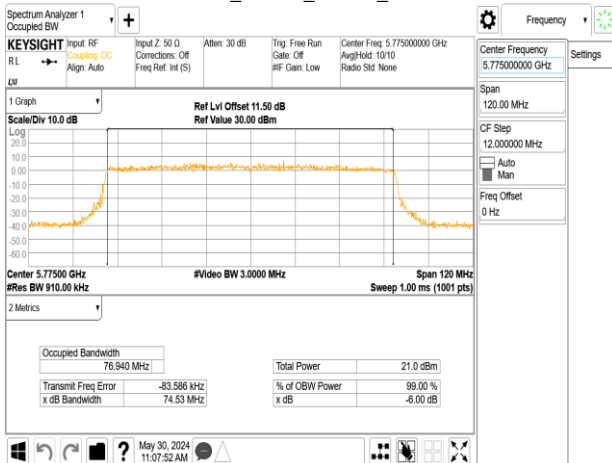
802.11ax_40MHz_Chain1_5795MHz



802.11ax_80MHz_Chain0_5775MHz



802.11ax_80MHz_Chain1_5775MHz



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9 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

9.1.1 Duty Cycle

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.

9.1.2 FCC

Band	EUT CATEGORY		e-CRF Title 47 §15.407			
			Conducted Output Power	EIRP	TPC	Antenna Directional Gain Requirements
U-NII-1		Fixed point-to-point	1 Watt(30dBm)	Not required	Not required	23dBi
		Outdoor AP	1 Watt(30dBm)	Elevation angle above 30 degrees 125mW (21dBm)	Not required	6dBi
		Indoor AP	1 Watt(30dBm)	Not required	Not required	6dBi
		Other	250mW(23.98dBm)	Not required	Not required	6dBi
U-NII-2A		Other	250mW(23.98dBm) or 11dBm+10 log B	Not required	When EIRP >500mW At least 6dB below EIRP 1W (30dBm)	6dBi
U-NII-2C		Other	250mW(23.98dBm) or 11dBm+10 log B	Not required		6dBi
U-NII-3	V	Other	1 Watt(30dBm)	Not required	Not required	6dBi
		Fixed point-to-point	1 Watt(30dBm)	Not required	Not required	Not required
U-NII-4		Indoor AP (a channel spans 5725~5850 and 5850~5895MHz)	Not required	36dBm	Not required	Not required
		indoor client (a channel spans 5725~5850 and 5850~5895MHz)	Not required	30dBm	Not required	Not required
		subordinate device	Not required	36dBm	Not required	Not required

1. If transmitting antennas of directional gain greater than the antenna requirements column, the Maximum transmit power shall be reduced by the amount in dB that the direction-al gain of the antenna.
2. For the 10 log B, B is the 26 dB emission bandwidth.

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9.1.3 ISED

FREQUENCY BAND (MHz)	EUT CATEGORY		RSS-247 §6.2.1~6.2.4		
			EIRP	Conducted Output Power	TPC
5150~5250		OEM devices installed in vehicles	30 mW or $1.76 + 10 \log 10B$	N/A	At least 3dB below 30mW EIRP
		Other device	200 mW or $10 + 10 \log 10B$ dBm	N/A	N/A
5250~5350		OEM devices installed in vehicles	30 mW or $1.76 + 10 \log 10B$	N/A	At least 3dB below 30mW EIRP
		Other device	1.0 W or $17 + 10 \log 10B$ dBm	250 mW or $11 + 10 \log 10B$	EIRP >500mW, at least 6dB below 1W EIRP
		Outdoor Fixed with EIRP>200mW	$-13 \text{ dBW/MHz for } 0^\circ \leq \theta < 8^\circ$ $-13 - 0.716 (\theta - 8) \text{ dBW/MHz for } 8^\circ \leq \theta < 40^\circ$ $-35.9 - 1.22 (\theta - 40) \text{ dBW/MHz for } 40^\circ \leq \theta \leq 45^\circ$ $-42 \text{ dBW/MHz for } \theta > 45^\circ$	N/A	EIRP >500mW, at least 6dB below 1W EIRP
5470-5600 and 5650-5725		All	1.0 W or $17 + 10 \log 10B$ dBm	250 mW or $11 + 10 \log 10B$	EIRP >500mW, at least 6dB below 1W EIRP
5725~5850	V	All	N/A	1 W	N/A

1 For equipment operating in the band 5725-5850 MHz, If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum transmit power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
2. For the $10 \log B$, B is the 99% emission bandwidth.

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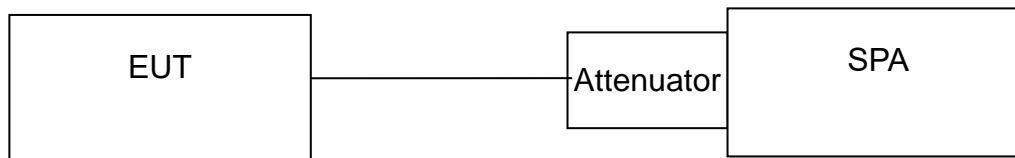
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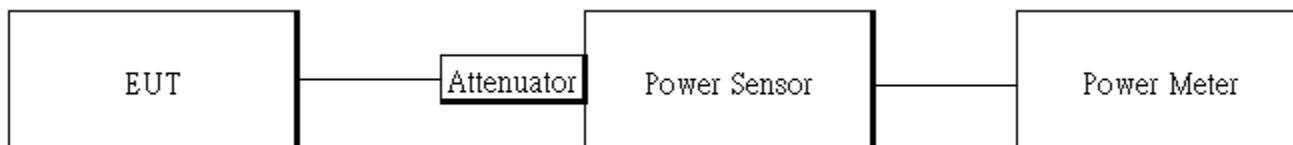
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9.2 Test Setup

9.2.1 Duty Cycle



9.2.2 Output Power



9.3 Measurement Procedure

9.3.1 Duty Cycle Measurements

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

9.3.2 Output Power Measurements

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
5. Record the max. reading and add $10 \log(1/\text{duty cycle})$.
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.
7. MIMO mode: offset is set with “measure and add 10 Log (N)” to measurement for MIMO mode. Offset = cable loss + $10 \log (N)$, where N is number of transmitting antenna, cable loss is specified below.

Note:

For U-NII1, 2A, 2C and 3 Bands, when the antenna gain is greater than 6 dBi, the power limit attenuated accordingly.

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As per section F. 2). e). (ii) of FCC KDB 662911 D01

If antenna gains are not equal and each transmit antenna is driven by only one spatial stream, directional gain may be calculated by either of the following formulas.

$$\bullet \text{ DirectionalGain} = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

NSS = the number of independent spatial streams of data;

NANT = the total number of antennas

$g_{j,k}$ = / 20 10Gk if the kth antenna is being fed by spatial stream j, or zero if it is not;

G_k is the gain in dBi of the kth antenna.

9.4 Duty Cycle Measurement Result

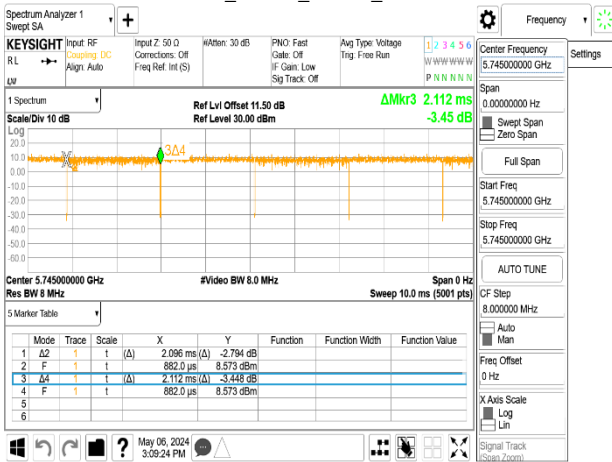
Mode		Duty Cycle (%) =Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11a		99.24	0.03	0.48	0.01
802.11n_20		99.67	0.01	0.18	0.01
802.11ac_20		99.71	0.01	0.18	0.01
802.11n_40		99.71	0.01	0.18	0.01
802.11ac_40		99.71	0.01	0.18	0.01
802.11ac_80		99.67	0.01	0.18	0.01
Mode	RU Config	Duty Cycle (%) =Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11ax_20	Full	99.71	0.01	0.18	0.01
	26 RU	99.69	0.01	0.20	0.01
	52 RU	99.69	0.01	0.20	0.01
	106 RU	99.67	0.01	0.21	0.01
802.11ax_40	Full	99.71	0.01	0.18	0.01
	242 RU	99.42	0.03	0.37	0.01
802.11ax_80	Full	99.67	0.01	0.18	0.01
	484 RU	98.87	0.05	0.71	0.01

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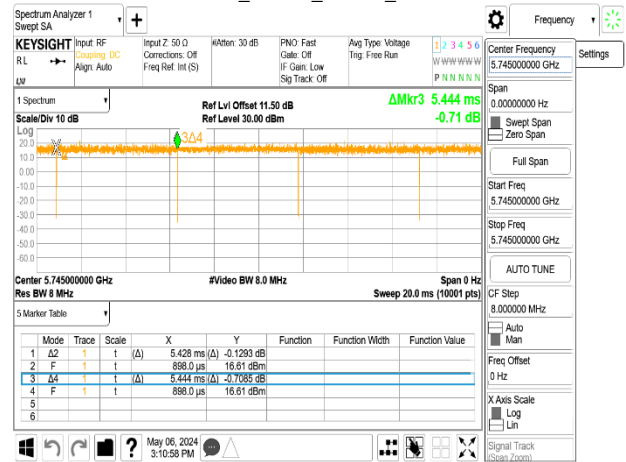
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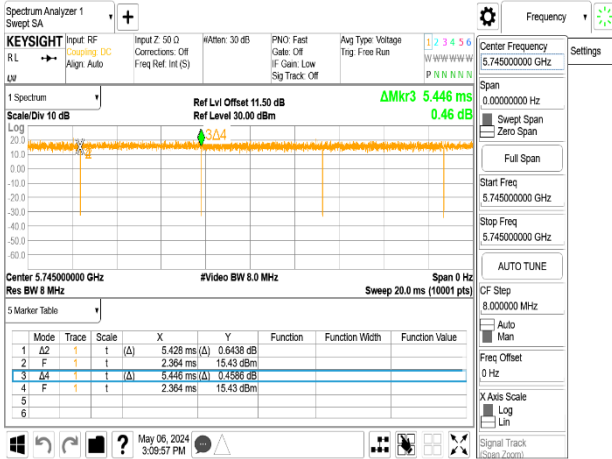
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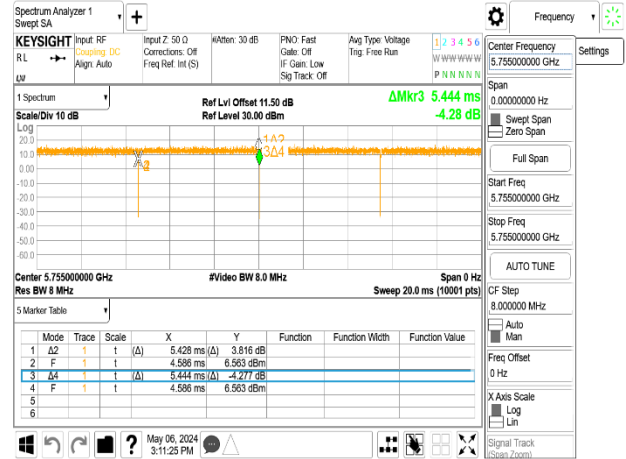
802.11ac_20MHz_Chain0_5745MHz



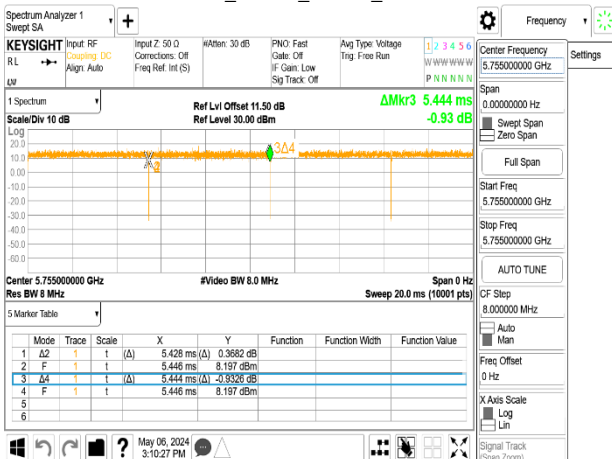
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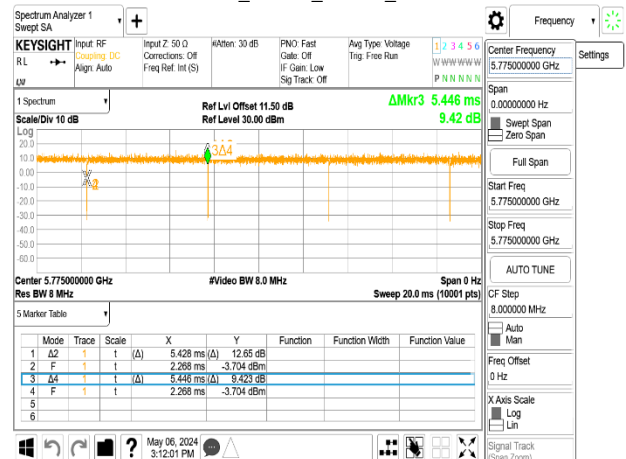
802.11ac_40MHz_Chain0_5755MHz



802.11n_40MHz_Chain0_5755MHz



802.11ac_80MHz_Chain0_5775MHz

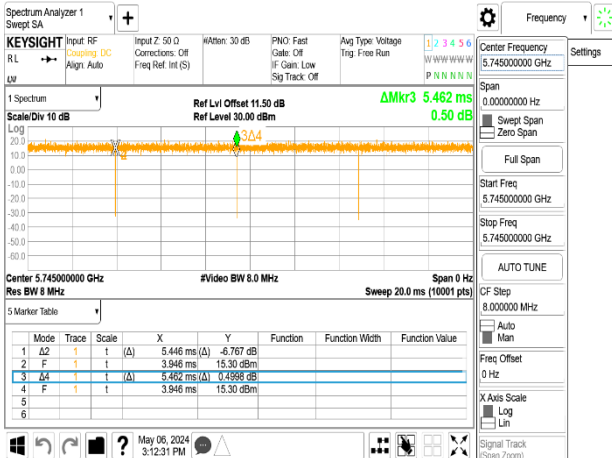


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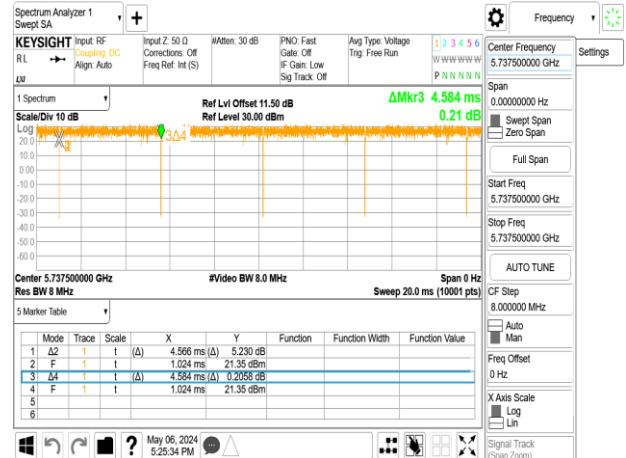
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802.11ax_20MHz_Chain0_5745MHz



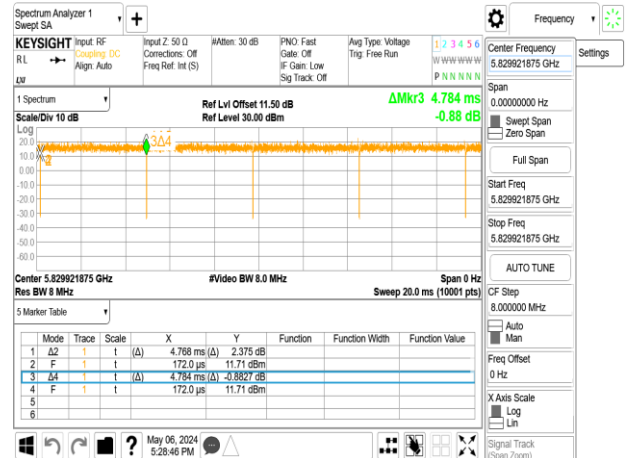
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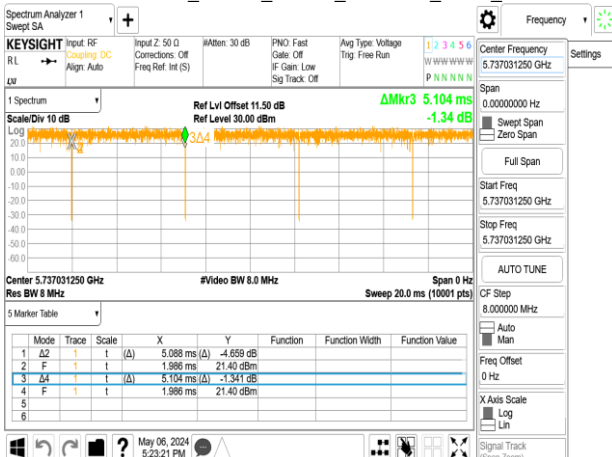
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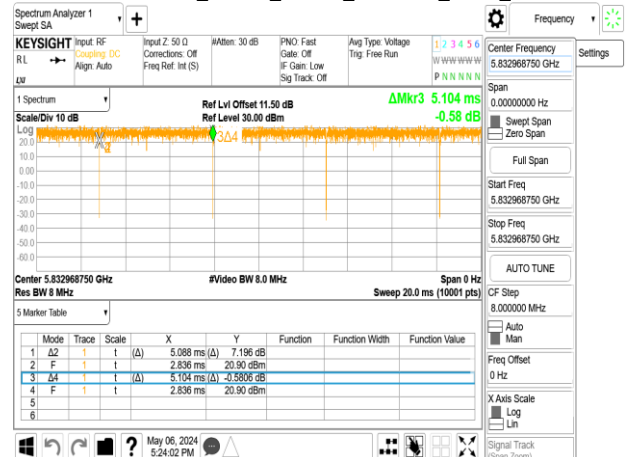
802.11ax_20MHz_Chain0_5825MHz_RU106_54



802.11ax_20MHz_Chain0_5745MHz_RU26_0



802.11ax_20MHz_Chain0_5825MHz_RU26_8



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