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Top Victory Electronics(Taiwan) Co. Ltd.

TEST REPORT

Model:
HUB1001****

REPORT NUMBER
221100104THC-001

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Dec. 29, 2022

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Radio Spectrum
TEST REPORT

Applicant:	**Top Victory Electronics(Taiwan) Co. Ltd.** **9F.,No. 230, Liancheng Rd., Zhonghe Dist., New Taipei City 23553, Taiwan**
Product:	**Home Monitoring Platform**
Model No.:	**HUB1001******
Brand Name:	**NOMO**
FCC ID:	**ARS-HUB1001**
Test Method/ Standard:	**47 CFR FCC Part 15.247 & ANSI C63.10 2013** **KDB 558074 D01 v05r02**
Test By:	**Intertek Testing Services Taiwan Ltd.,** **Hsinchu Laboratory** **No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,** **Shiang-Shan District, Hsinchu City, Taiwan**

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Revision History

Report No.	Issue Date	Revision Summary
221100104THC-001	Dec. 29, 2022	Original report

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Summary of Test Data

Test Requirement	Applicable Rule (Section 15.247)	Result
Minimum 6 dB Bandwidth	15.247(a)(2)	Pass
Maximum Peak Conducted Output Power	15.247(b)(3)	Pass
Power Spectral Density	15.247(e)	Pass
Emissions In Non-Restricted Frequency Bands	15.247(d)	Pass
Emissions In Restricted Frequency Bands (Radiated emission measurements)	15.247(d), 15.205, 15.209	Pass
Emission On The Band Edge	15.247(d), 15.205	Pass
AC Power Line Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.
Other Testing: the specification, standard and not taking into account the measurement uncertainty.

1. General Information

1.1 Identification of the EUT

Product:	Home Monitoring Platform
Model No.:	HUB1001R-01
Operating Frequency:	2412 MHz ~ 2462 MHz for 802.11b/g/n (HT20) 2422 MHz ~ 2452 MHz for 802.11n (HT40)
Frequency of Each Channel:	2412+5 k, k＝0 ~ 10 for 802.11b/g/n (HT20) 2422+5 k, k＝0 ~ 6 for 802.11n (HT40)
Rated Power:	DC 5V from adapter
Power Cord:	N/A
Sample receiving date:	2022/11/07
Sample condition:	Workable
Test Date(s):	2022/12/06 ~ 2022/12/16

1.2 Adapter information

The EUT will be supplied with a power supply from below list:

No.	Model no.	Specification
Adapter	S030ABU0500400	I/P: 100-240V~ 50/60Hz 1.0A O/P: 5.0Vdc 4.0A

1.3 Additional information about the EUT

The customer confirmed HUB1001**** is a series model to HUB1001R-01 (EUT).
The "*" can be any alphanumeric character including blank, for marketing differences.

For more detail features, please refer to user's Manual.

1.4 Description of the EUT

Modulation mode	Transmit path	
	Chain 0	Chain 1
802.11b	V	V
802.11g	V	V
802.11 n (HT20)	V	V
802.11 n (HT40)	V	V

1.5 Antenna description

Antenna 0

Antenna Gain : 3.42 dBi
Antenna Type : Printed Antenna
Connector Type : Fixed

Antenna 1

Antenna Gain : 3.42 dBi
Antenna Type : Printed Antenna
Connector Type : Fixed

1.6 Operation mode

The EUT connected to Notebook USB port, executing “EspRFTestTool_v2.8_Manual” and select different frequency and modulation.
With individual verifying, the maximum output power was found out 1 Mbps data rate for 802.11b mode, 6 Mbps data rate for 802.11g mode, 6.5 Mbps data rate for 802.11n(HT20) mode, 13.5 Mbps data rate for 802.11n(HT40) mode the final tests were executed under these conditions recorded in this report individually.

Mode	Channel	Frequency (MHz)	Data rate	Signal on time(ms)	Signal transmit on+off time(ms)	Duty cycle	Duty Cycle factor
802.11b	6	2437	1	100.000	100.000	1.000	0.000
802.11g	6	2437	6	100.000	100.000	1.000	0.000
802.11n (HT20)	6	2437	6.5	100.000	100.000	1.000	0.000
802.11n (HT40)	6	2437	13.5	100.000	100.000	1.000	0.0

1.7 Peripherals equipment

Peripherals	Model No.	Serial No.	Data cable
Notebook PC	HP	HP Probook 440 G3	USB shielded cable 1.5m
Fixture	TEXAS INSTRUMENTS	LAUNCHXL-CC1310	Mini USB 0.3m

2. Minimum 6 dB Bandwidth

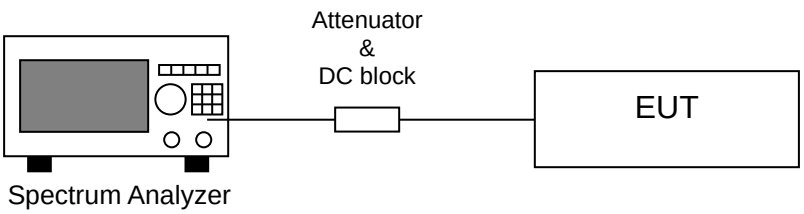
2.1 Instrument Setting

Spectrum Parameter	Setting
Detector	Peak
RBW	100kHz
VBW	≧3 x RBW
Sweep	Auto couple
Trace	Allow the trace to stabilize.
Span	Between two times and five times the occupied bandwidth
Attenuation	Auto

2.2 Test Procedure

Step 1	The transmitter output was connected to the spectrum analyzer.
Step 2	Test was performed accordance with ANSI C63.10.
Step 3	Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

2.3 Test Diagram



2.4 Limit

The minimum 6 dB bandwidth shall be at least 500 kHz.

2.5 Test Results

Temperature (℃) :	19
Relative Humidity (%) :	59
Test date :	2022/12/14

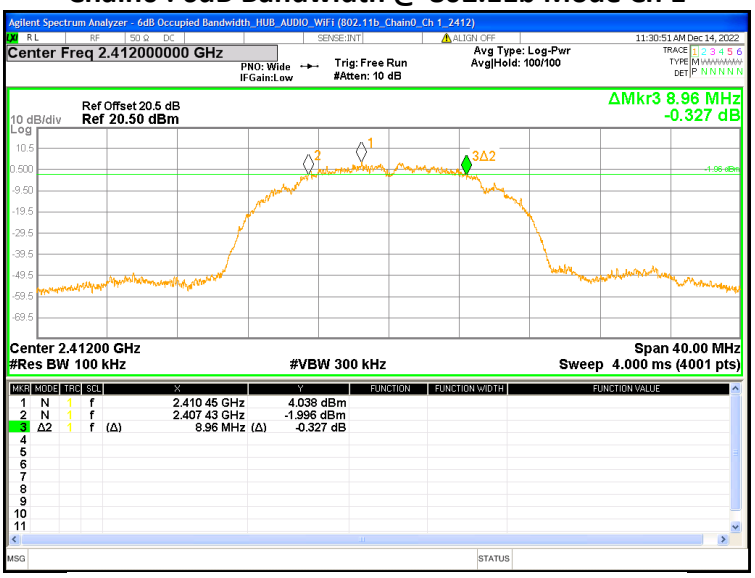
Chain 0

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	1	2412	8.96	>0.5	Pass
	6	2437	9.12	>0.5	Pass
	11	2462	9.12	>0.5	Pass
802.11g	1	2412	16.43	>0.5	Pass
	6	2437	16.46	>0.5	Pass
	11	2462	16.45	>0.5	Pass
802.11n(HT20)	1	2412	17.06	>0.5	Pass
	6	2437	17.31	>0.5	Pass
	11	2462	17.56	>0.5	Pass
802.11n(HT40)	3	2422	33.29	>0.5	Pass
	6	2437	33.62	>0.5	Pass
	9	2452	33.57	>0.5	Pass

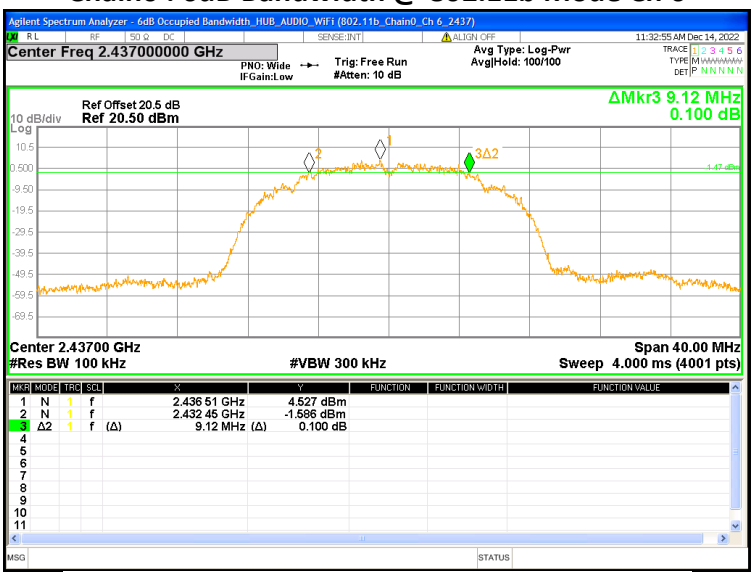
Chain 1

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	1	2412	9.08	>0.5	Pass
	6	2437	9.55	>0.5	Pass
	11	2462	8.78	>0.5	Pass
802.11g	1	2412	16.36	>0.5	Pass
	6	2437	16.39	>0.5	Pass
	11	2462	16.35	>0.5	Pass
802.11n(HT20)	1	2412	17.05	>0.5	Pass
	6	2437	16.95	>0.5	Pass
	11	2462	16.97	>0.5	Pass
802.11n(HT40)	3	2422	32.33	>0.5	Pass
	6	2437	32.49	>0.5	Pass
	9	2452	32.20	>0.5	Pass

Chain0 : 6dB Bandwidth @ 802.11b Mode Ch 1

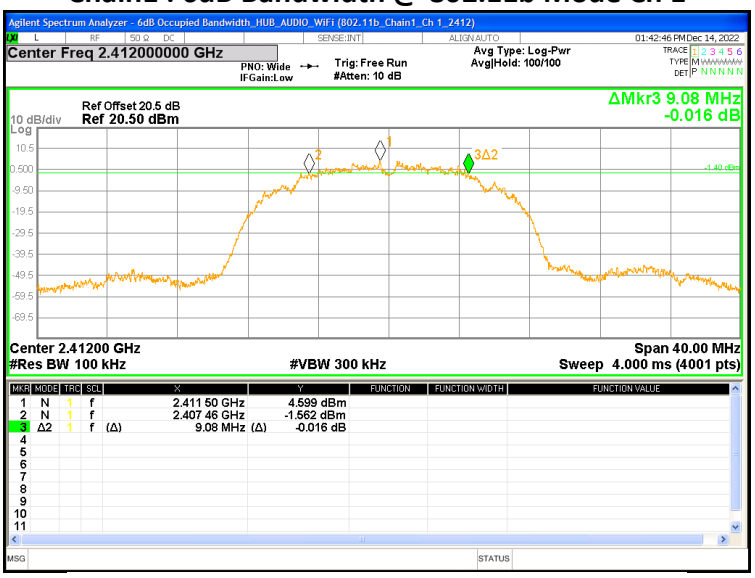


Chain0 : 6dB Bandwidth @ 802.11b Mode Ch 6



Chain0 : 6dB Bandwidth @ 802.11b Mode Ch11

Chain1 : 6dB Bandwidth @ 802.11b Mode Ch 1



Chain1 : 6dB Bandwidth @ 802.11b Mode Ch 6

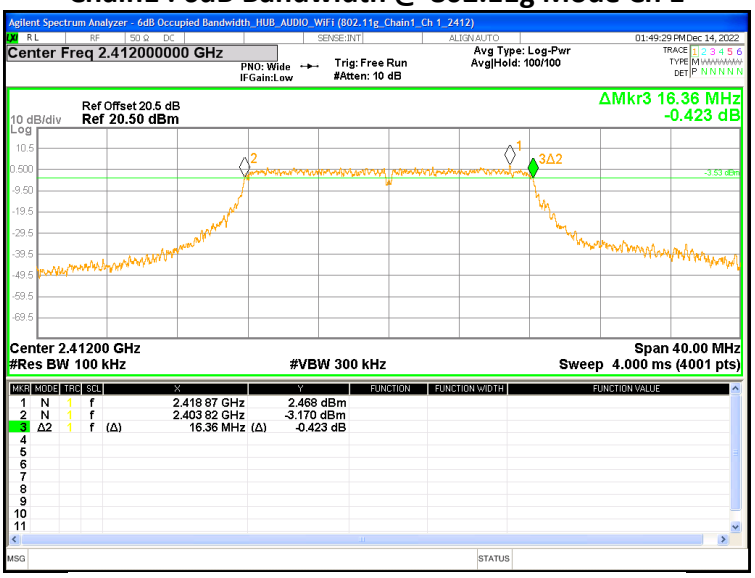
Chain1 : 6dB Bandwidth @ 802.11b Mode Ch11

Chain0 : 6dB Bandwidth @ 802.11g Mode Ch 1

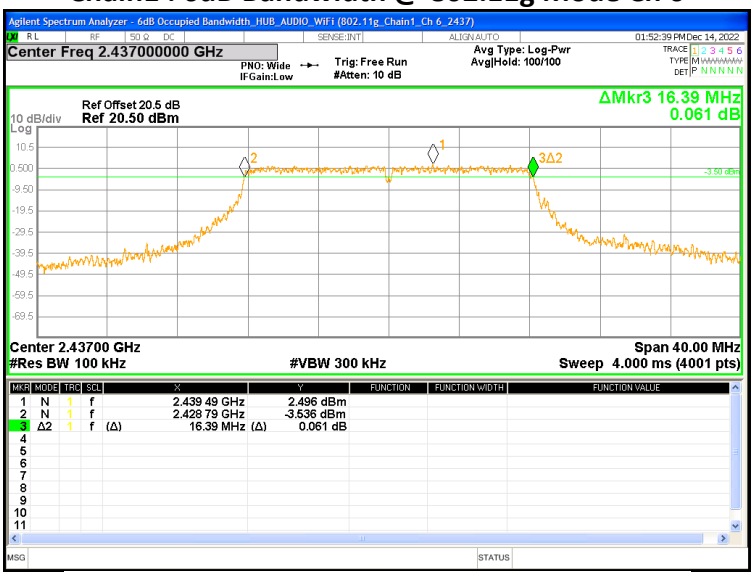
Chain0 : 6dB Bandwidth @ 802.11g Mode Ch 6

Chain0 : 6dB Bandwidth @ 802.11g Mode Ch11

Chain1 : 6dB Bandwidth @ 802.11g Mode Ch 1

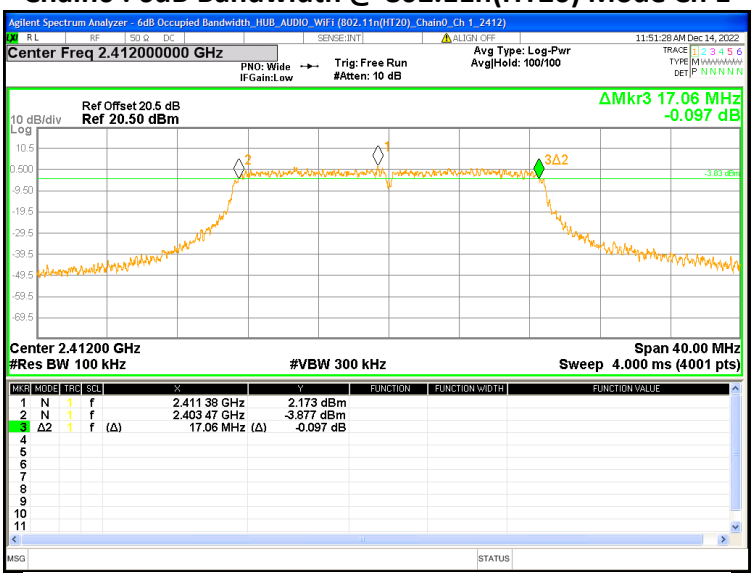


Chain1 : 6dB Bandwidth @ 802.11g Mode Ch 6

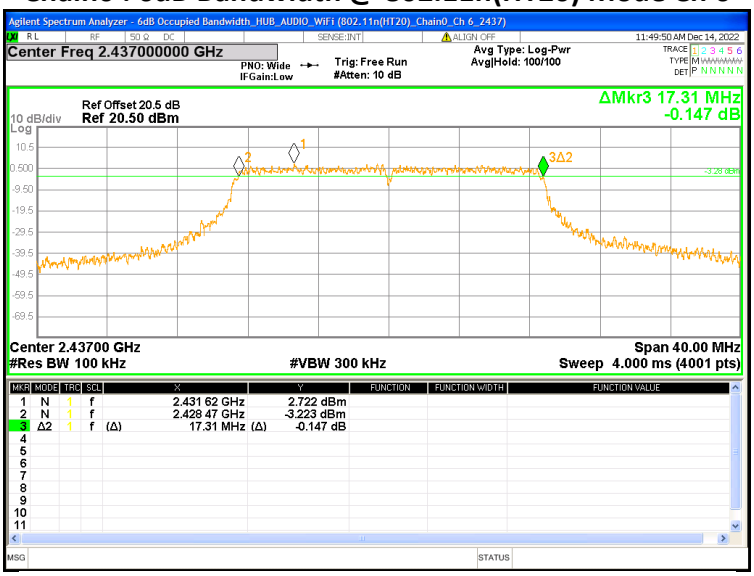


Chain1 : 6dB Bandwidth @ 802.11g Mode Ch11

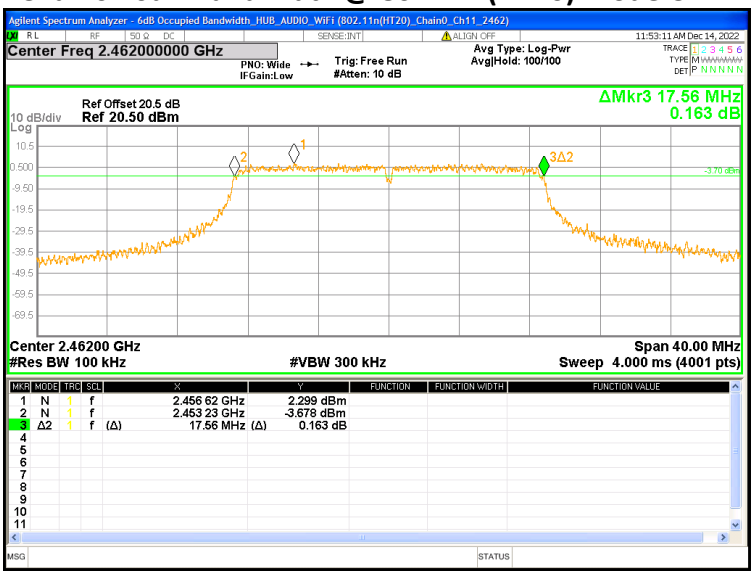
Chain0 : 6dB Bandwidth @ 802.11n(HT20) Mode Ch 1



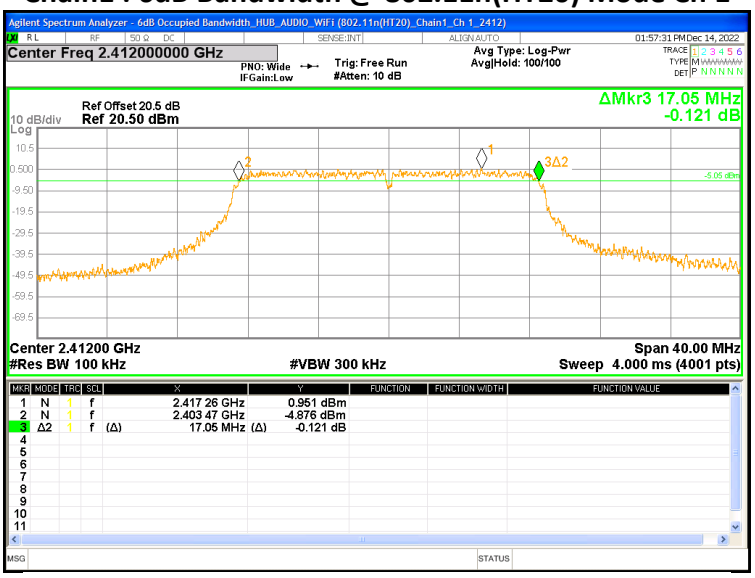
Chain0 : 6dB Bandwidth @ 802.11n(HT20) Mode Ch 6



Chain0 : 6dB Bandwidth @ 802.11n(HT20) Mode Ch11



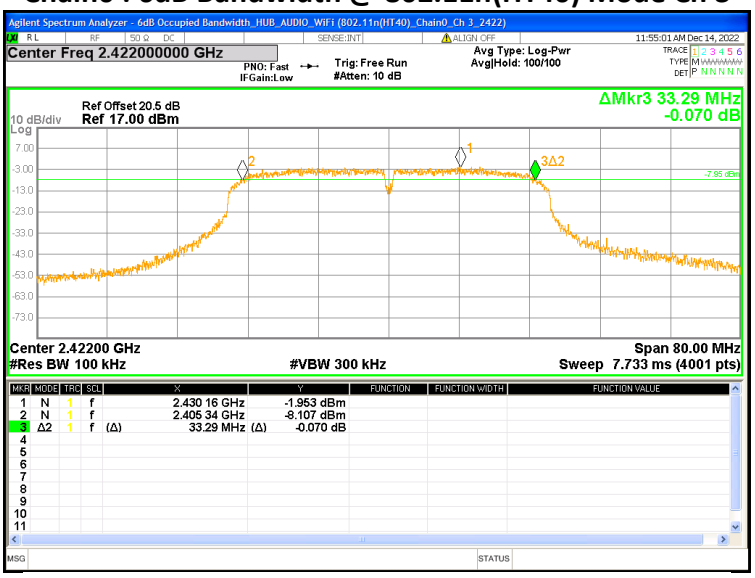
Chain1 : 6dB Bandwidth @ 802.11n(HT20) Mode Ch 1



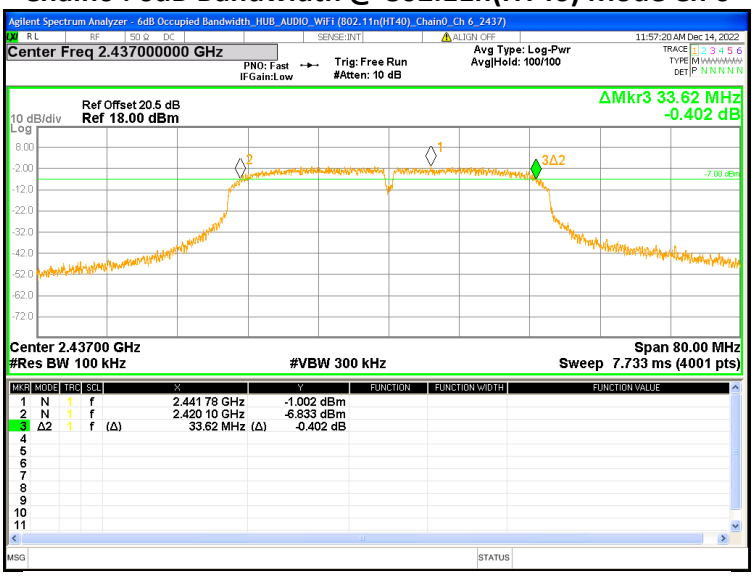
Chain1 : 6dB Bandwidth @ 802.11n(HT20) Mode Ch 6

Chain1 : 6dB Bandwidth @ 802.11n(HT20) Mode Ch11

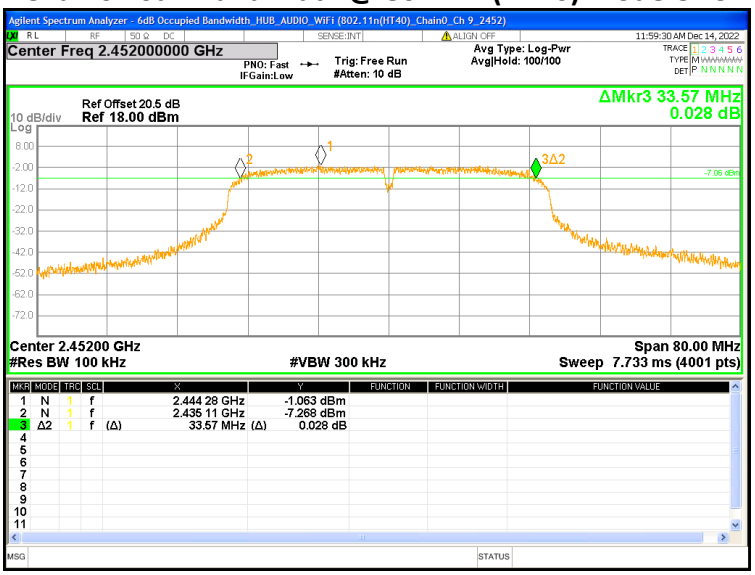
Chain0 : 6dB Bandwidth @ 802.11n(HT40) Mode Ch 3



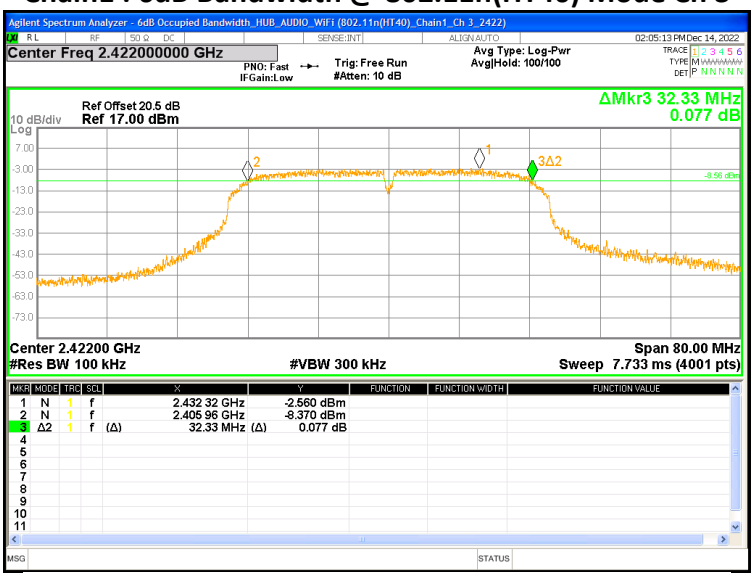
Chain0 : 6dB Bandwidth @ 802.11n(HT40) Mode Ch 6



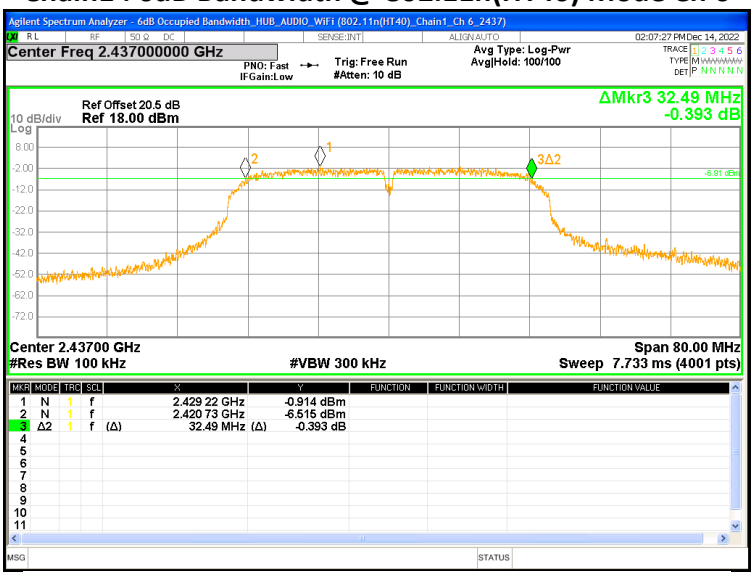
Chain0 : 6dB Bandwidth @ 802.11n(HT40) Mode Ch 9



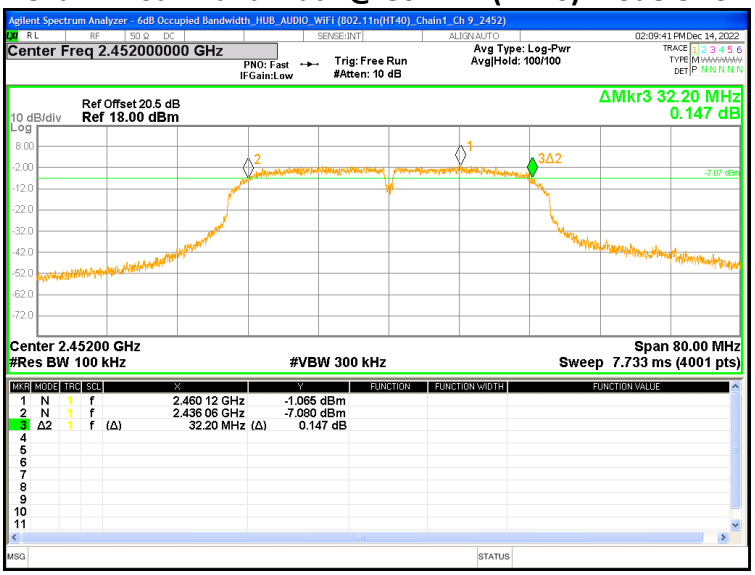
Chain1 : 6dB Bandwidth @ 802.11n(HT40) Mode Ch 3



Chain1 : 6dB Bandwidth @ 802.11n(HT40) Mode Ch 6



Chain1 : 6dB Bandwidth @ 802.11n(HT40) Mode Ch 9



3. Maximum Peak Conducted Output Power

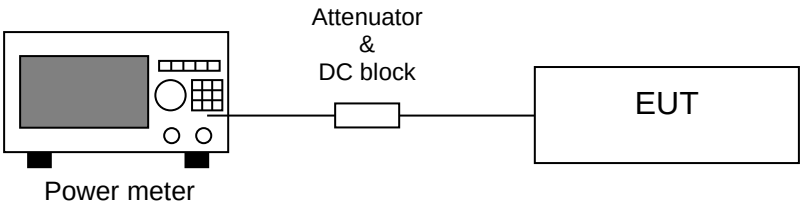
3.1 Instrument Setting

Power Meter Parameter	Setting
Bandwidth	65MHz bandwidth is greater than the EUT emission bandwidth
Detector	Peak & Average

3.2Test Procedure

The preferred methodology is to use integrated average power measurements, as described in 11.9.2 and 11.13.3 of ANSI C63.10. The peak integrated band power methods of 11.9.1.2 and 11.13.3.2 of ANSI C63.10 are not applicable for FCC compliance testing purposes.

3.3 Test Diagram



3.4 Limit

For systems using digital modulation in the 2400-2483.5 MHz: 1 Watt (30dBm)

3.5 Test Results

Temperature (℃) :	19
Relative Humidity (%) :	59
Test date :	2022/12/14

Mode	Ch.	Freq. (MHz)	Data Rate (Mbps)	Output Power (dBm)				Output Power (mW)				Total Power (dBm)				Limit (dBm)	Margin (dB)
				Chian 0		Chain 1		Chain 0		Chian 1		AV		PK			
				AV	PK	AV	PK	AV	PK	AV	PK	0+1 (mW)	0+1 (dBm)	0+1 (mW)	0+1 (dBm)		
802.11b (Chain0+1)	1	2412	1	8.30	11.40	13.40	16.50	6.76	13.80	21.88	44.67	28.64	14.57	58.47	17.67	30.00	-12.33
	6	2437		8.70	11.80	13.50	16.60	7.41	15.14	22.39	45.71	29.80	14.74	60.84	17.84	30.00	-12.16
	11	2462		10.30	13.30	13.60	16.70	10.72	21.38	22.91	46.77	33.62	15.27	68.15	18.33	30.00	-11.67

Mode	Ch.	Freq. (MHz)	Data Rate (Mbps)	Output Power (dBm)				Output Power (mW)				Total Power (dBm)				Limit (dBm)	Margin (dB)
				Chian 0		Chain 1		Chain 0		Chian 1		AV		PK			
				AV	PK	AV	PK	AV	PK	AV	PK	0+1 (mW)	0+1 (dBm)	0+1 (mW)	0+1 (dBm)		
802.11g (Chain0+1)	1	2412	6	11.00	16.40	16.10	20.90	12.59	43.65	40.74	123.03	53.33	17.27	166.68	22.22	30.00	-7.78
	6	2437		11.80	17.40	16.30	21.00	15.14	54.95	42.66	125.89	57.79	17.62	180.85	22.57	30.00	-7.43
	11	2462		13.00	18.30	16.50	21.20	19.95	67.61	44.67	131.83	64.62	18.10	199.43	23.00	30.00	-7.00

Mode	Ch.	Freq. (MHz)	Data Rate (Mbps)	Output Power (dBm)				Output Power (mW)				Total Power (dBm)				Limit (dBm)	Margin (dB)
				Chian 0		Chain 1		Chain 0		Chian 1		AV		PK			
				AV	PK	AV	PK	AV	PK	AV	PK	0+1 (mW)	0+1 (dBm)	0+1 (mW)	0+1 (dBm)		
802.11n (HT20) (Chain0+1)	1	2412	6.5	10.70	16.40	15.50	20.80	11.75	43.65	35.48	120.23	47.23	16.74	163.88	22.15	30.00	-7.85
	6	2437		11.50	17.60	16.40	21.10	14.13	57.54	43.65	128.82	57.78	17.62	186.37	22.70	30.00	-7.30
	11	2462		12.50	18.40	16.10	21.00	17.78	69.18	40.74	125.89	58.52	17.67	195.08	22.90	30.00	-7.10

Mode	Ch.	Freq. (MHz)	Data Rate (Mbps)	Output Power (dBm)				Output Power (mW)				Total Power (dBm)				Limit (dBm)	Margin (dB)
				Chian 0		Chain 1		Chain 0		Chian 1		AV		PK			
				AV	PK	AV	PK	AV	PK	AV	PK	0+1 (mW)	0+1 (dBm)	0+1 (mW)	0+1 (dBm)		
802.11n (HT40) (Chain0+1)	3	2422	13.5	10.00	15.40	14.90	19.70	10.00	34.67	30.90	93.33	40.90	16.12	128.00	21.07	30.00	-8.93
	6	2437		10.80	16.60	15.70	20.80	12.02	45.71	37.15	120.23	49.18	16.92	165.94	22.20	30.00	-7.80
	9	2452		11.60	17.20	15.60	20.50	14.45	52.48	36.31	112.20	50.76	17.06	164.68	22.17	30.00	-7.83

4. Power Spectral Density

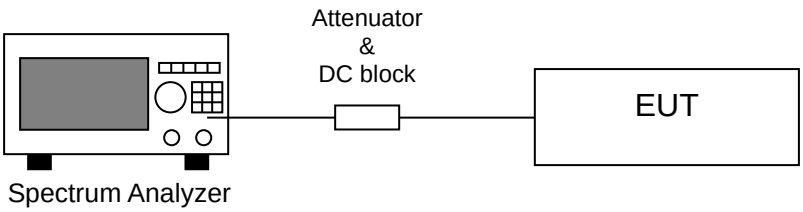
4.1 Instrument Setting

Spectrum Function	Setting
Detector	Peak
RBW	≧3 kHz
VBW	≧3 x RBW
Sweep	Auto couple
Trace	Max hold
Span	1.5 times x 6dB bandwidth
Attenuation	Auto

4.2 Test Procedure

Step 1	Test procedure refer to subclause 11.10 of ANSI C63.10.
Step 2	Using the maximum conducted output power in the fundamental emission demonstrates compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
Step 3	Use the peak marker function to determine the maximum amplitude level within the RBW.

4.3 Test Diagram



4.4 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 10 kHz band during any time interval of continuous transmission

4.5 Test Results

Temperature (℃) :	19
Relative Humidity (%) :	59
Test date :	2022/12/14

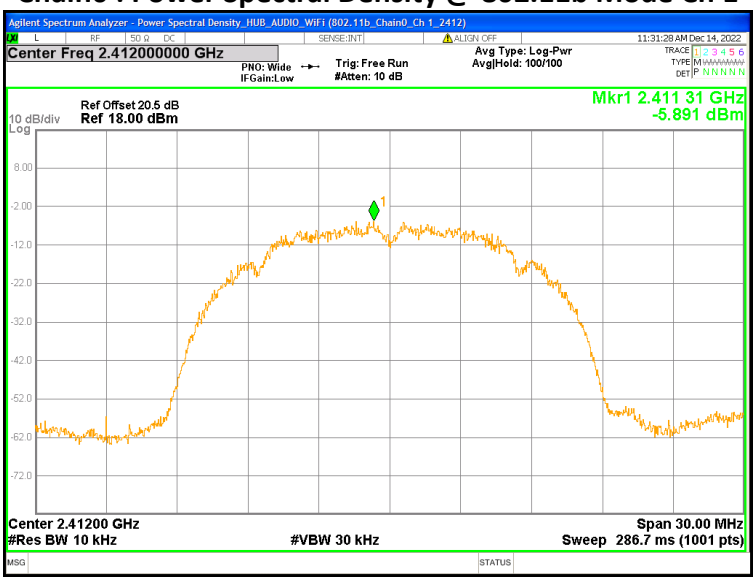
Mode	Channel	Frequency (MHz)	PSD (dBm)		Total PSD		Limit (dBm)	Margin (dB)
			chain0	chain1	mW	dBm		
802.11b (Chain0+1)	1	2412	-5.891	-5.833	0.52	-2.85	8	-10.852
	6	2437	-5.853	-5.838	0.52	-2.84	8	-10.835
	11	2462	-5.471	-5.721	0.55	-2.58	8	-10.584

Mode	Channel	Frequency (MHz)	PSD (dBm)		Total PSD		Limit (dBm)	Margin (dB)
			chain0	chain1	mW	dBm		
802.11g (Chain0+1)	1	2412	-5.968	-6.485	0.48	-3.21	8	-11.209
	6	2437	-5.566	-5.924	0.53	-2.73	8	-10.731
	11	2462	-5.341	-5.687	0.56	-2.50	8	-10.500

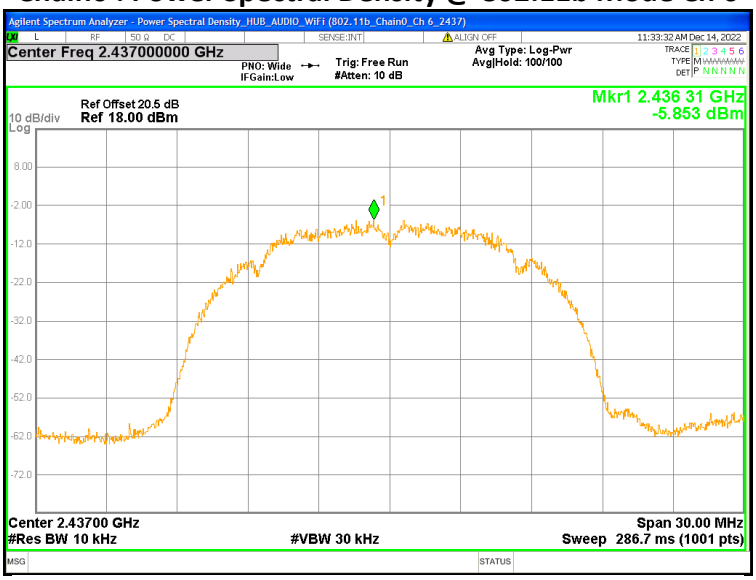
Mode	Channel	Frequency (MHz)	PSD (dBm)		Total PSD		Limit (dBm)	Margin (dB)
			chain0	chain1	mW	dBm		
802.11n(HT20) (Chain0+1)	1	2412	-5.671	-6.271	0.51	-2.95	8	-10.950
	6	2437	-4.723	-5.018	0.65	-1.86	8	-9.858
	11	2462	-4.539	-4.869	0.68	-1.69	8	-9.691

Mode	Channel	Frequency (MHz)	PSD (dBm)		Total PSD		Limit (dBm)	Margin (dB)
			chain0	chain1	mW	dBm		
802.11n(HT40) (Chain0+1)	3	2422	-8.158	-8.652	0.29	-5.39	8	-13.388
	6	2437	-7.313	-8.151	0.34	-4.70	8	-12.702
	9	2452	-8.057	-7.786	0.32	-4.91	8	-12.909

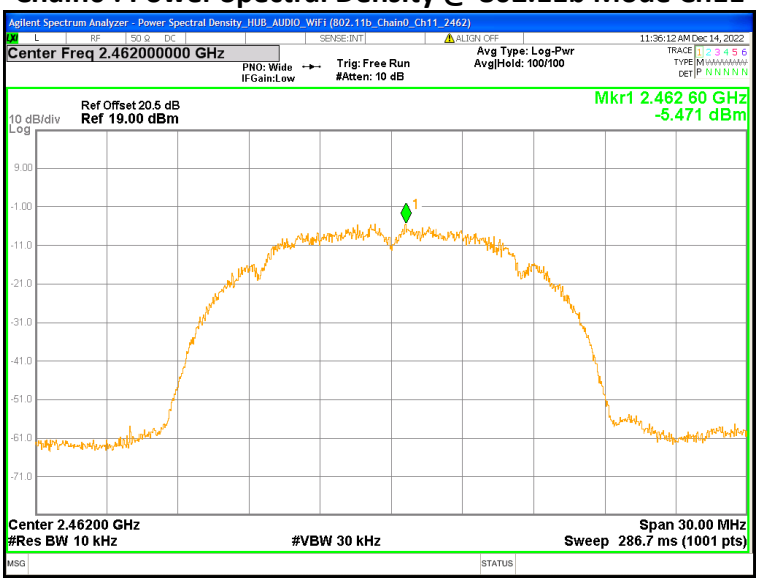
Chain0 : Power Spectral Density @ 802.11b Mode Ch 1



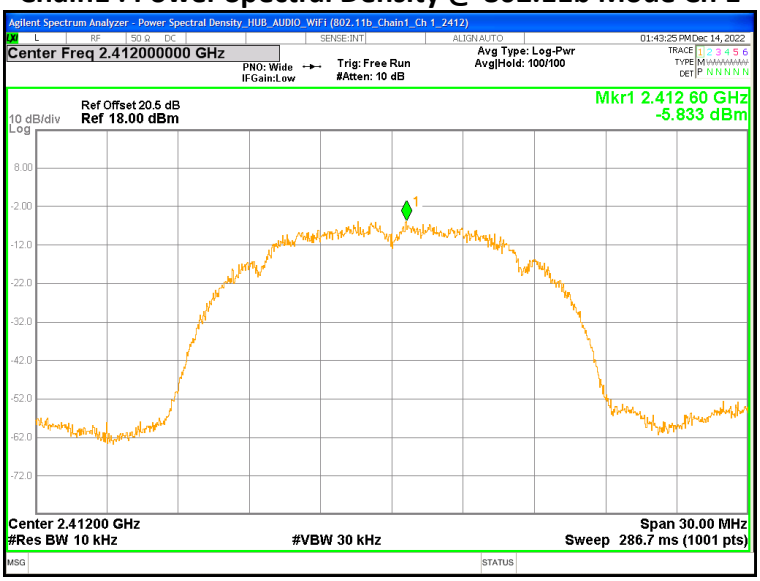
Chain0 : Power Spectral Density @ 802.11b Mode Ch 6



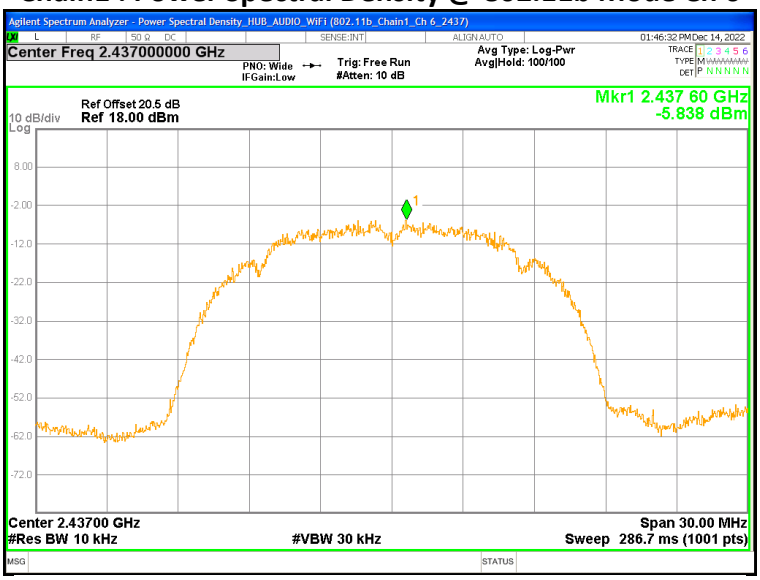
Chain0 : Power Spectral Density @ 802.11b Mode Ch11



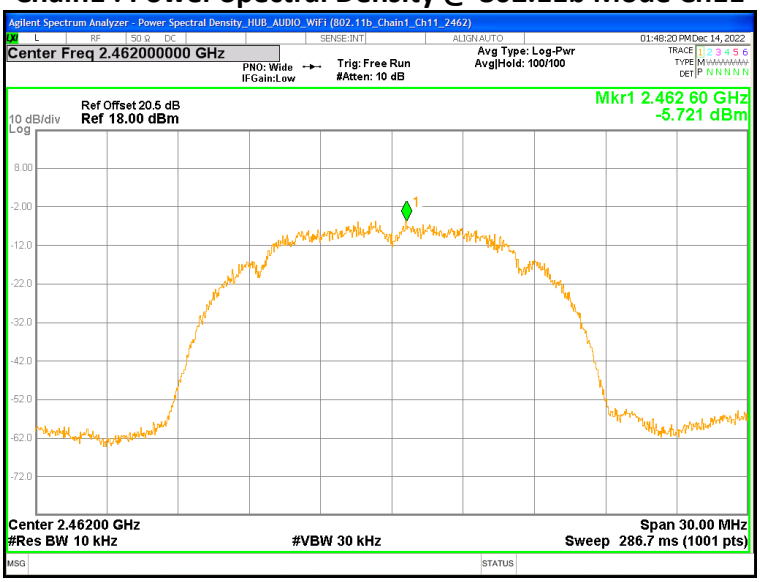
Chain1 : Power Spectral Density @ 802.11b Mode Ch 1



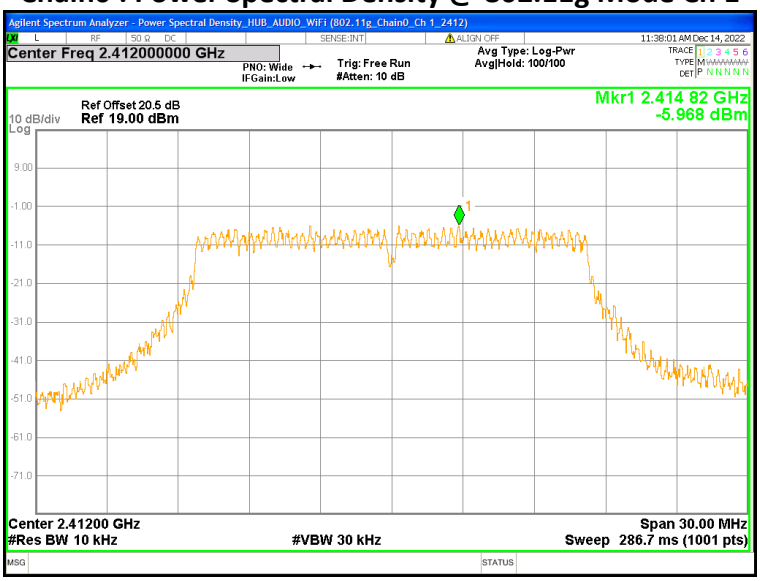
Chain1 : Power Spectral Density @ 802.11b Mode Ch 6



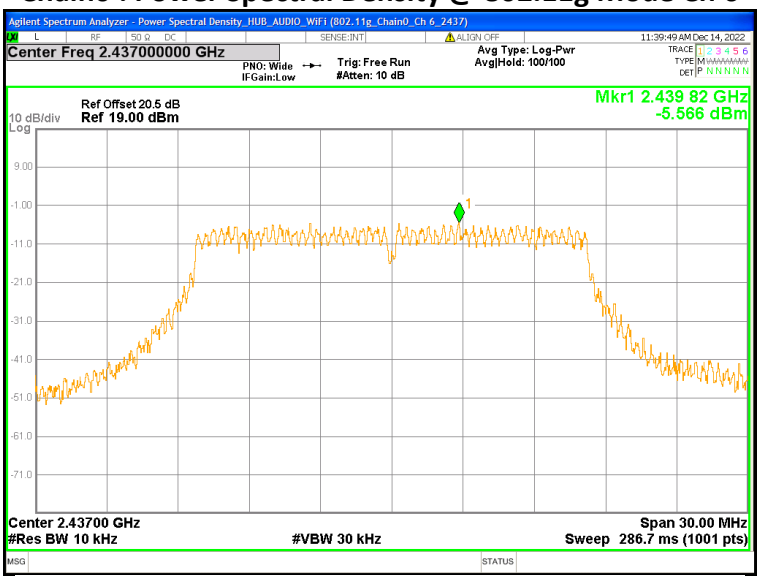
Chain1 : Power Spectral Density @ 802.11b Mode Ch11



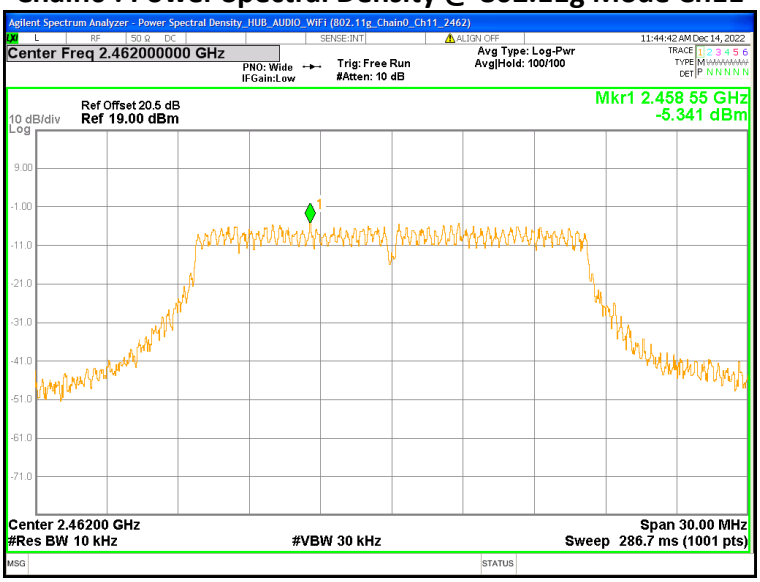
Chain0 : Power Spectral Density @ 802.11g Mode Ch 1



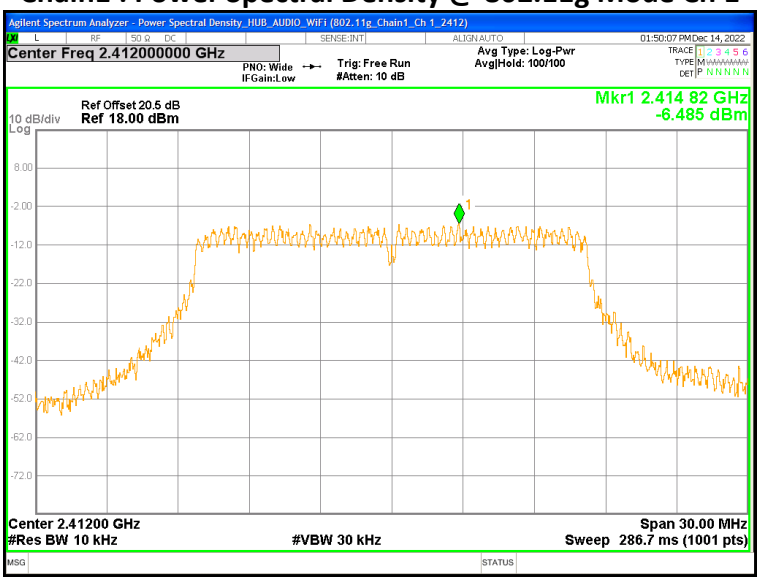
Chain0 : Power Spectral Density @ 802.11g Mode Ch 6



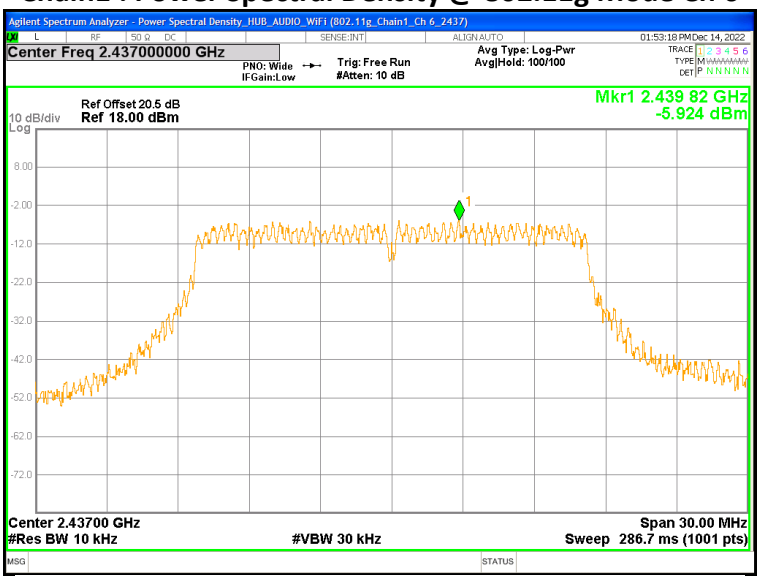
Chain0 : Power Spectral Density @ 802.11g Mode Ch11



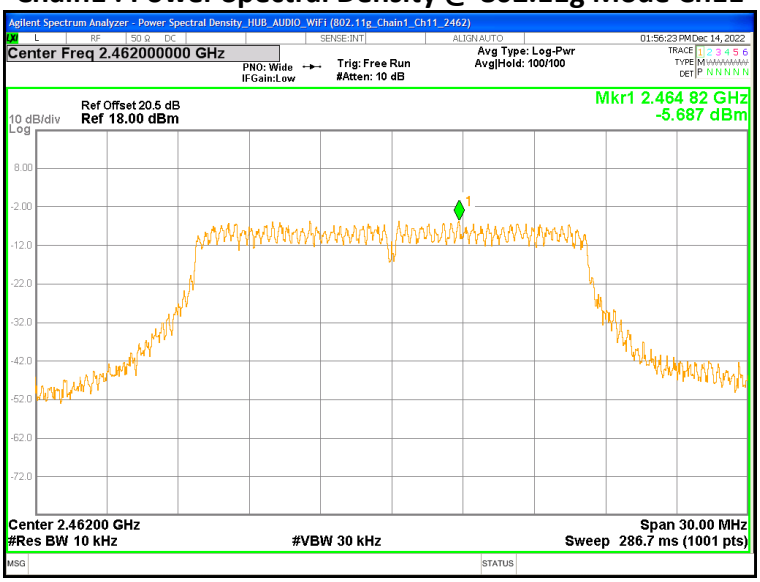
Chain1 : Power Spectral Density @ 802.11g Mode Ch 1



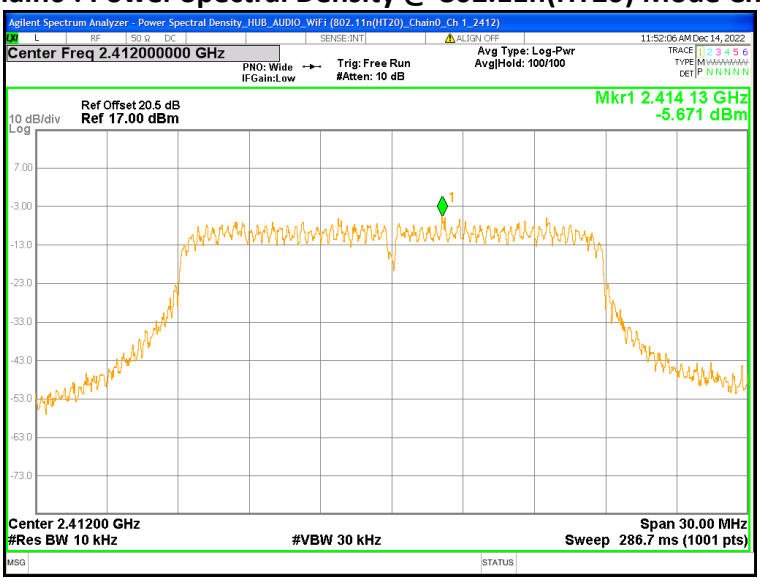
Chain1 : Power Spectral Density @ 802.11g Mode Ch 6



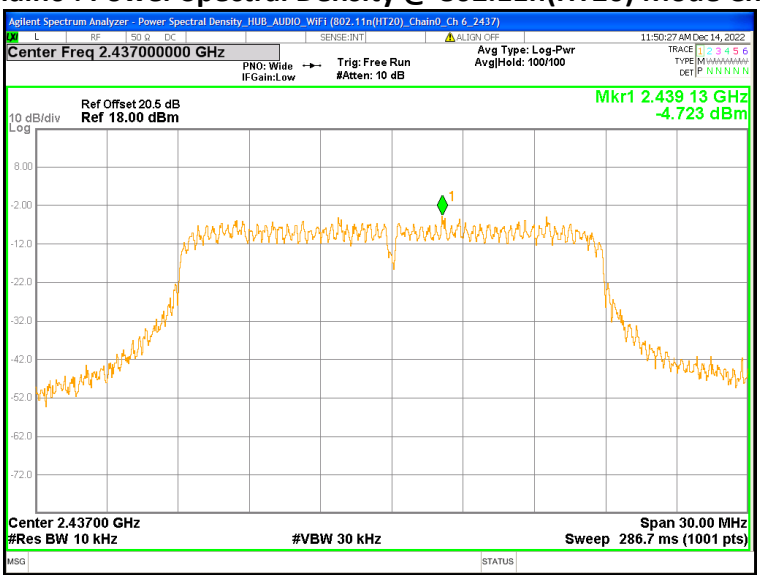
Chain1 : Power Spectral Density @ 802.11g Mode Ch11



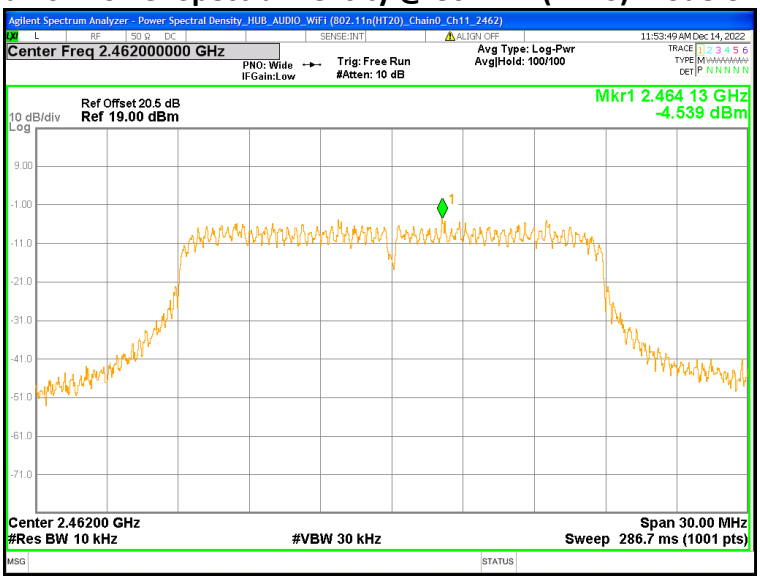
Chain0 : Power Spectral Density @ 802.11n(HT20) Mode Ch 1



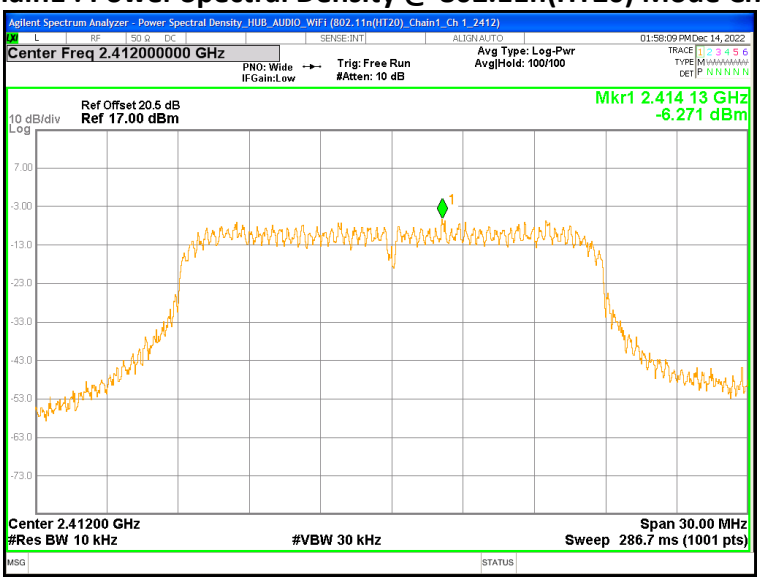
Chain0 : Power Spectral Density @ 802.11n(HT20) Mode Ch 6



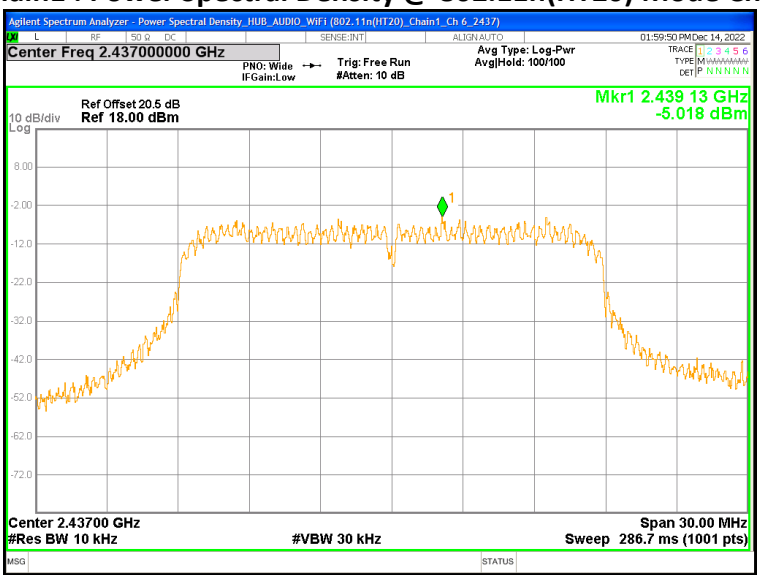
Chain0 : Power Spectral Density @ 802.11n(HT20) Mode Ch11



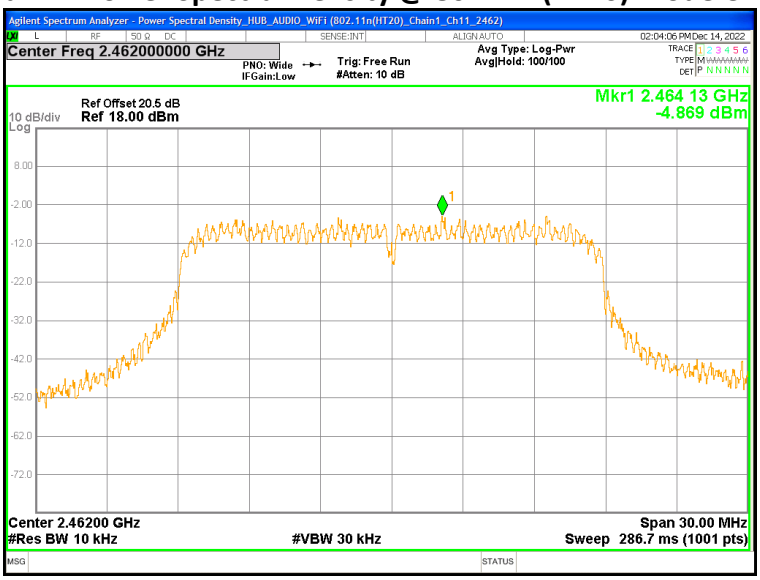
Chain1 : Power Spectral Density @ 802.11n(HT20) Mode Ch 1



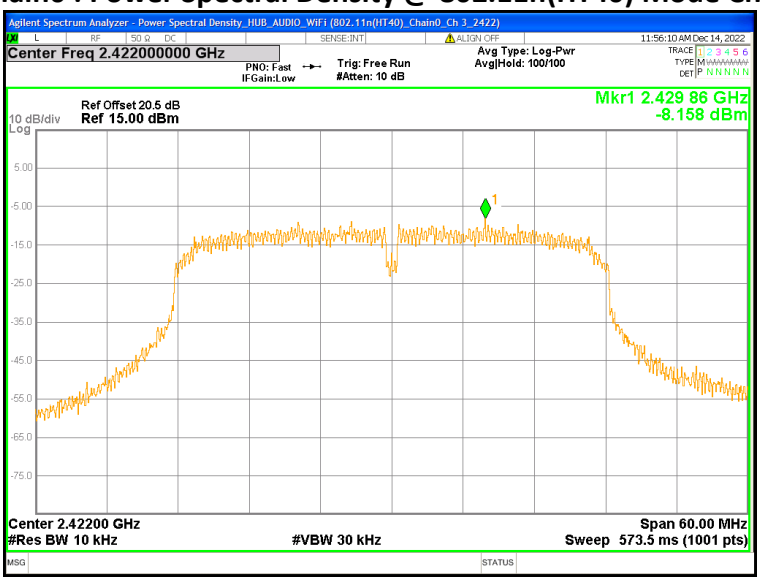
Chain1 : Power Spectral Density @ 802.11n(HT20) Mode Ch 6



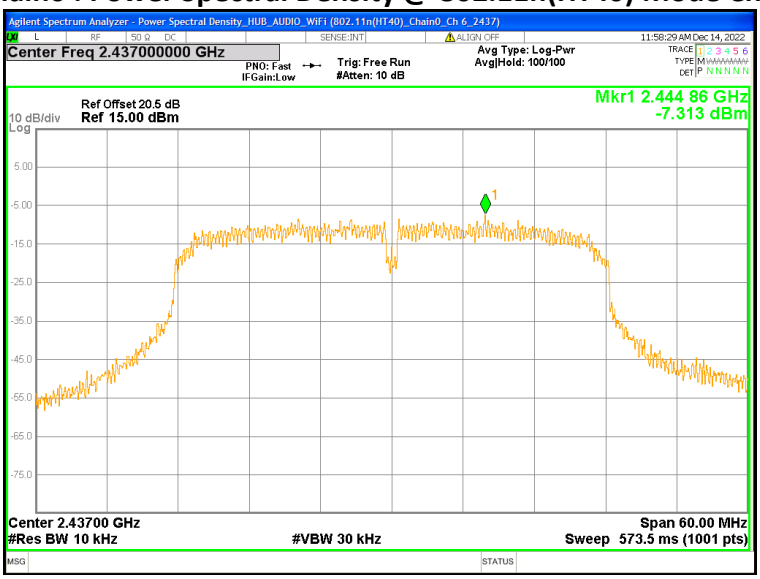
Chain1 : Power Spectral Density @ 802.11n(HT20) Mode Ch11



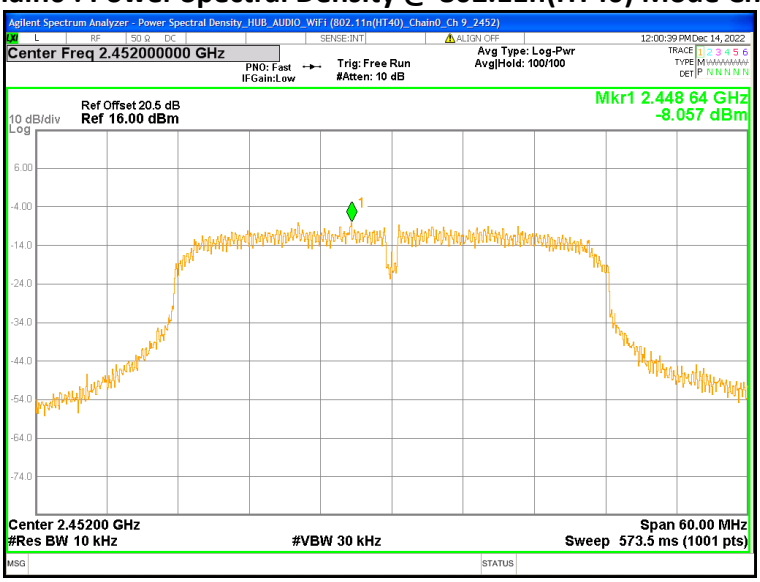
Chain0 : Power Spectral Density @ 802.11n(HT40) Mode Ch 3



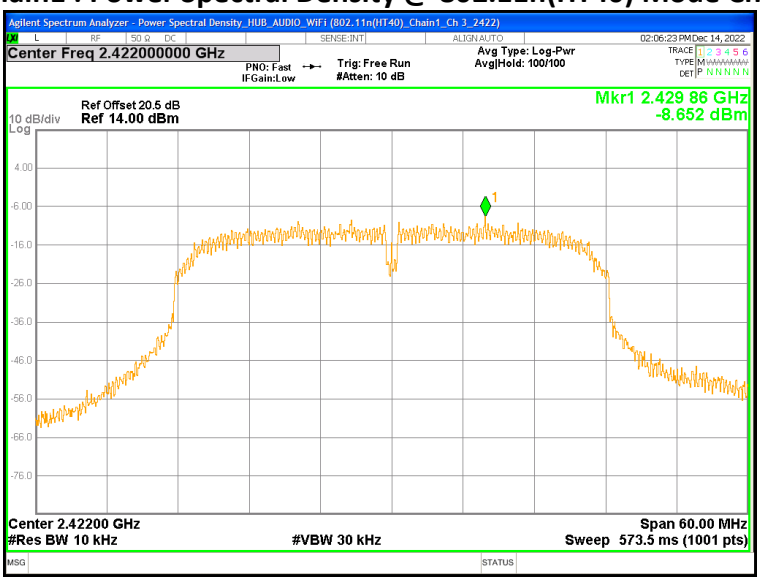
Chain0 : Power Spectral Density @ 802.11n(HT40) Mode Ch 6



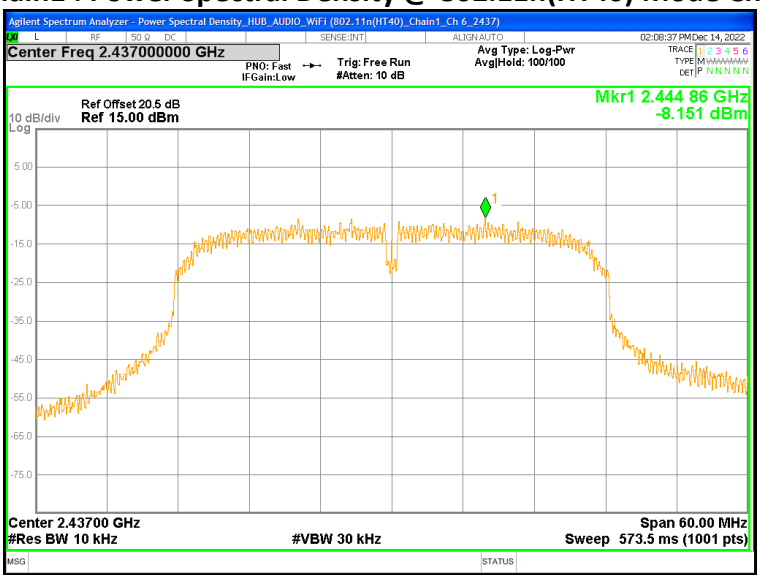
Chain0 : Power Spectral Density @ 802.11n(HT40) Mode Ch 9



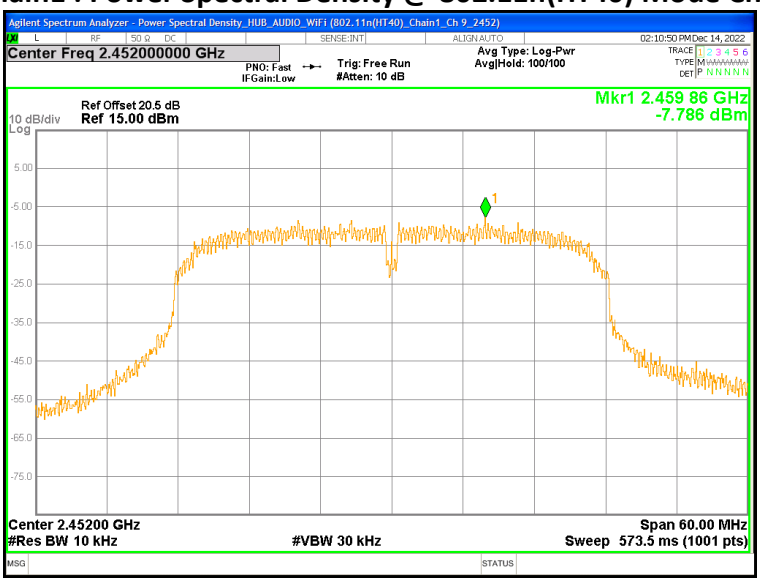
Chain1 : Power Spectral Density @ 802.11n(HT40) Mode Ch 3



Chain1 : Power Spectral Density @ 802.11n(HT40) Mode Ch 6



Chain1 : Power Spectral Density @ 802.11n(HT40) Mode Ch 9



5. Emissions in Non-Restricted Frequency Bands

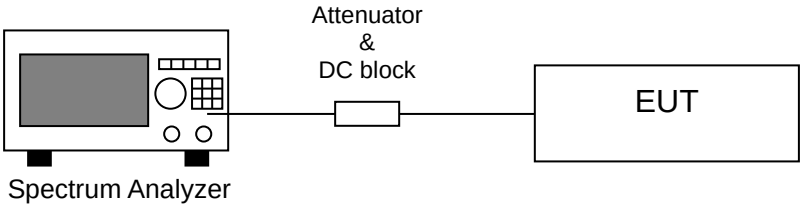
5.1 Instruments Setting

Spectrum Function	Setting (Reference Level)	Setting (Emission Level)
Detector	Peak	Peak
RBW	≧ 100 kHz	≧ 100 kHz
VBW	≧ 3 x RBW	≧ 3 x RBW
Sweep	Auto couple	Auto couple
Trace	Max hold	Max hold
Span	≧ 1.5 time 6dB bandwidth	
Attenuation	Auto	Auto

5.2 Test Procedure

Step 1 The procedure was used in antenna-port conducted and connected to the spectrum analyzer.
Step 2 Set instrument center frequency to center frequency.
Step 3 Use the parameter configured in subclause 11.11 of ANSI C63.10 to measure.
Step 4 Use the peak marker function to determine the maximum amplitude level.

5.3 Test Diagram



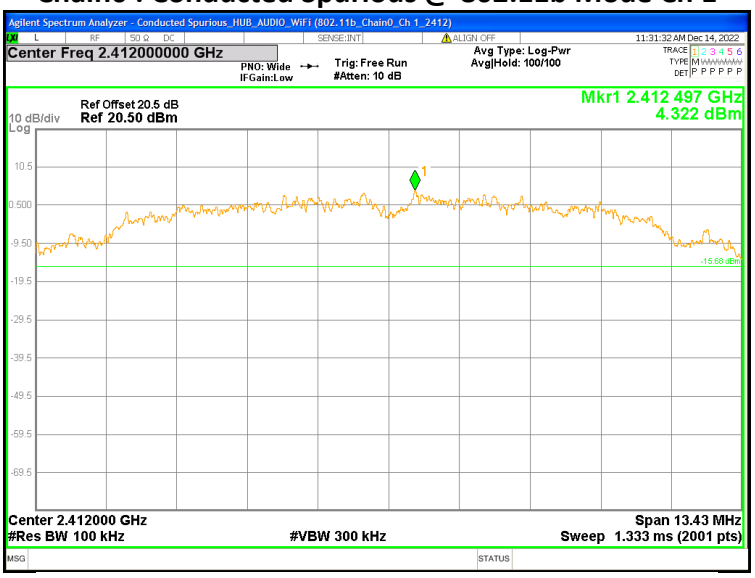
5.4 Limit

The peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz

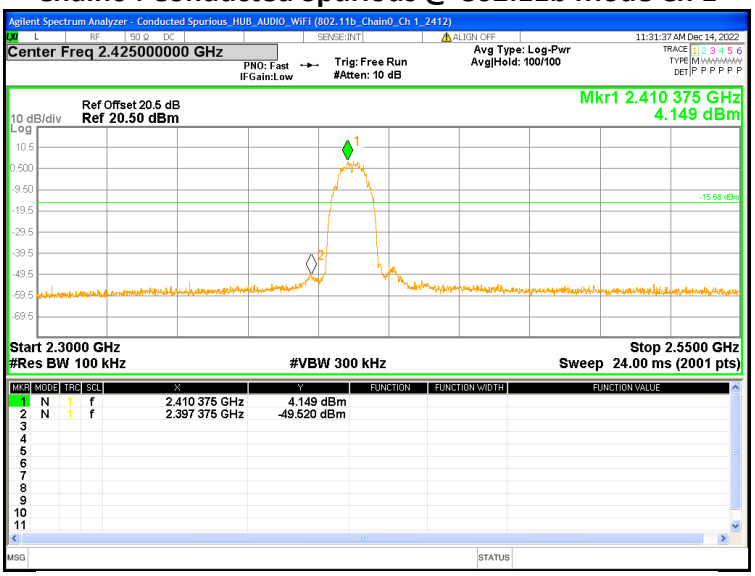
5.5 Test Results

Temperature (℃) :	19
Relative Humidity (%) :	59
Test date :	2022/12/14

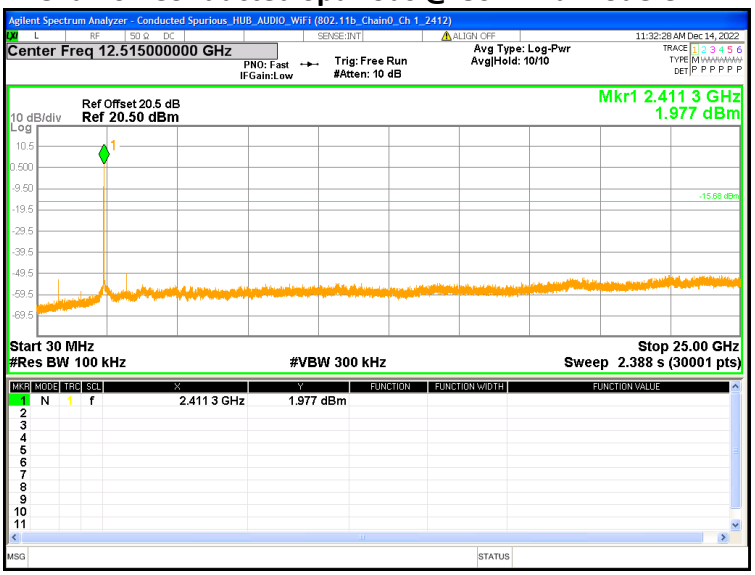
Chain0 : Conducted Spurious @ 802.11b Mode Ch 1



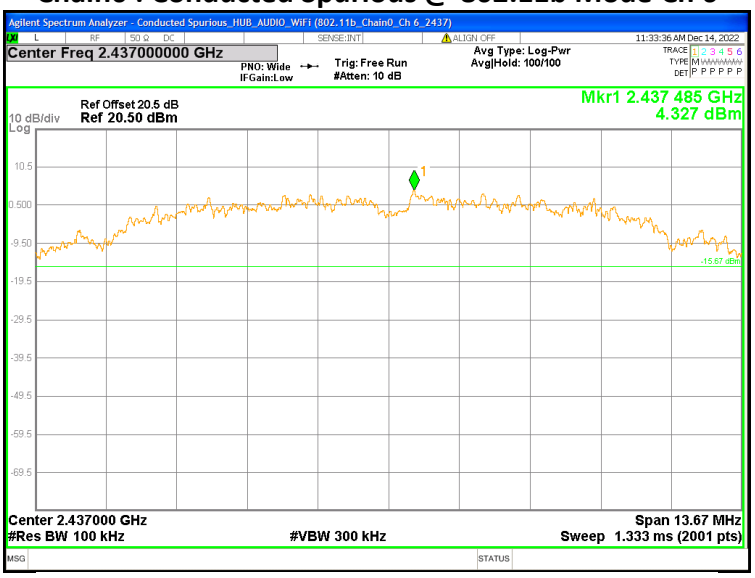
Chain0 : Conducted Spurious @ 802.11b Mode Ch 1



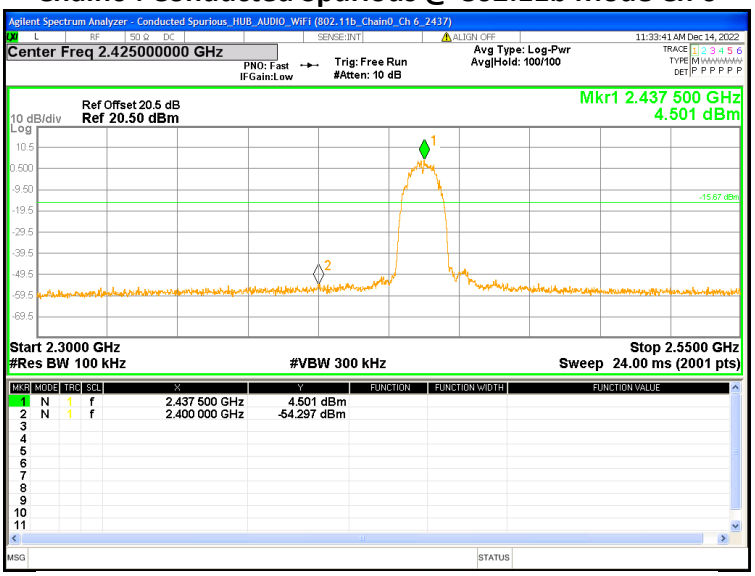
Chain0 : Conducted Spurious @ 802.11b Mode Ch 1



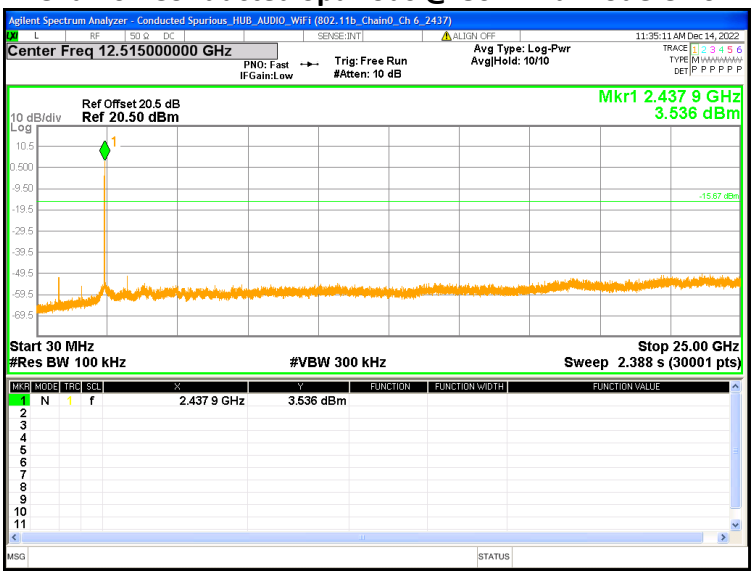
Chain0 : Conducted Spurious @ 802.11b Mode Ch 6



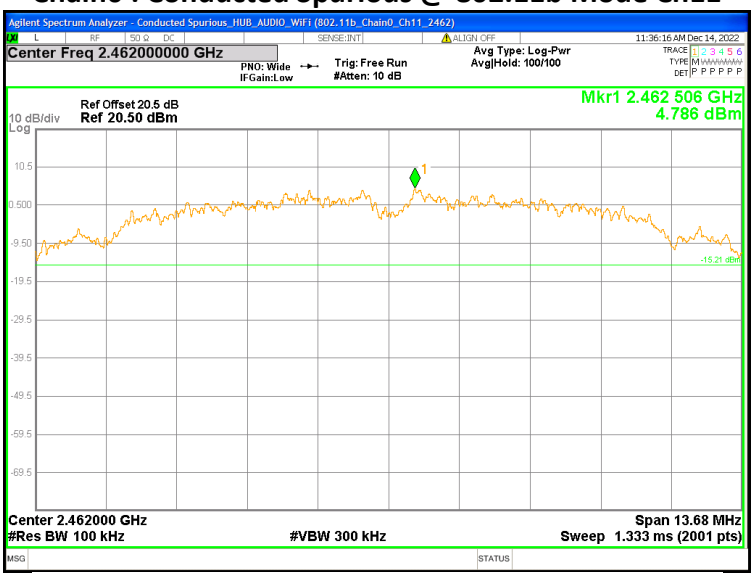
Chain0 : Conducted Spurious @ 802.11b Mode Ch 6



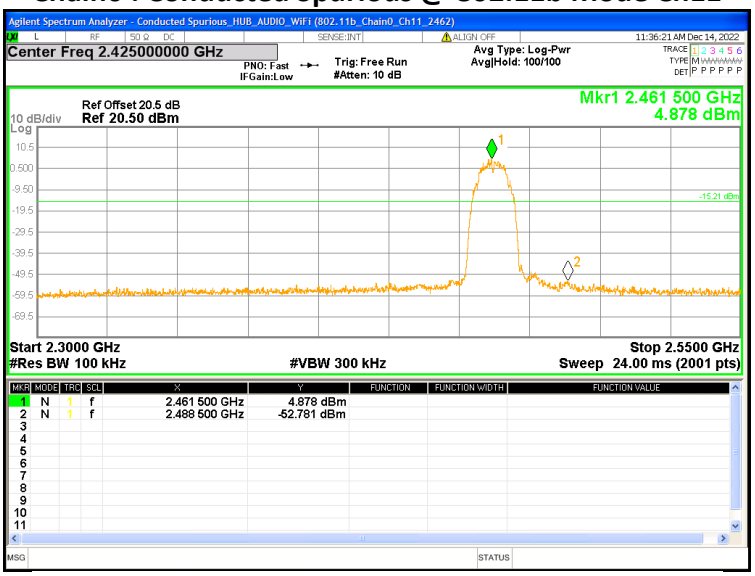
Chain0 : Conducted Spurious @ 802.11b Mode Ch 6



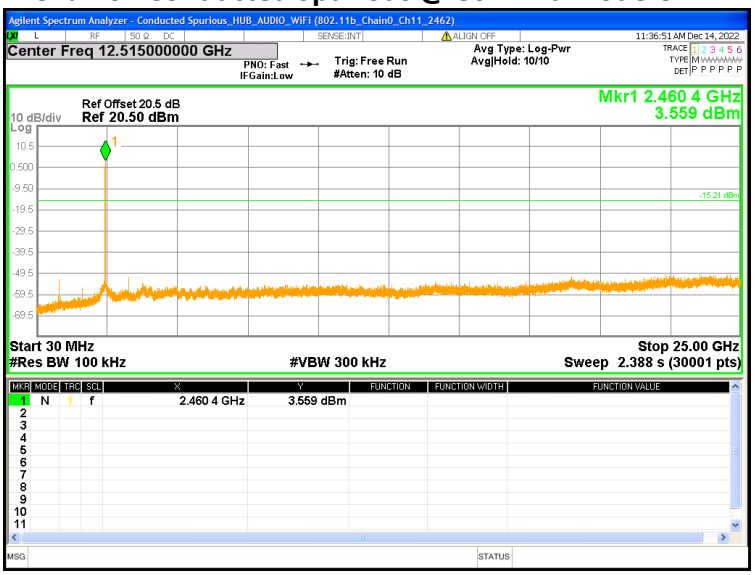
Chain0 : Conducted Spurious @ 802.11b Mode Ch11



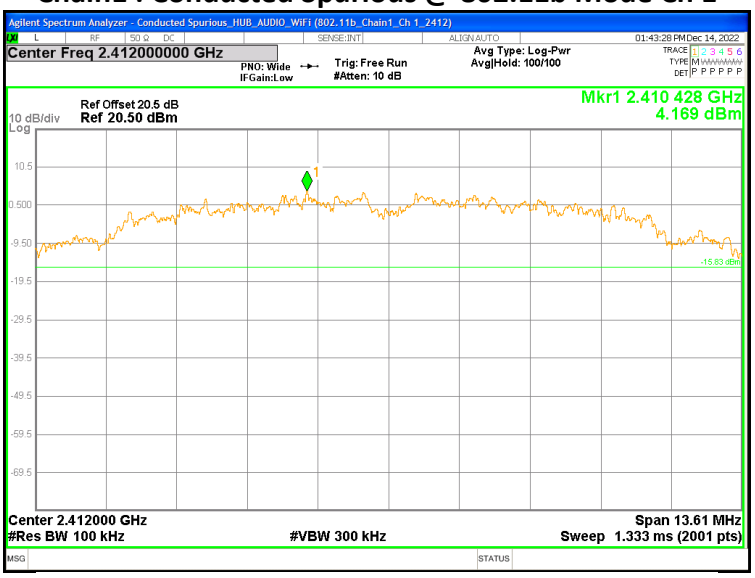
Chain0 : Conducted Spurious @ 802.11b Mode Ch11



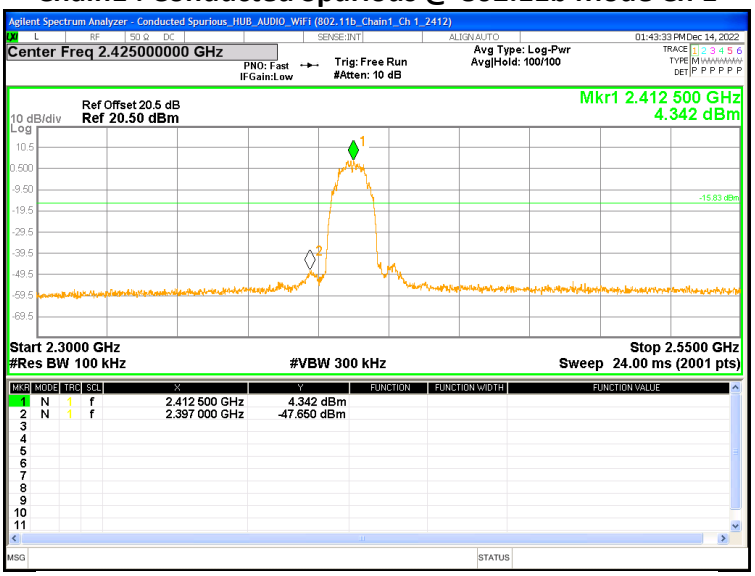
Chain0 : Conducted Spurious @ 802.11b Mode Ch11



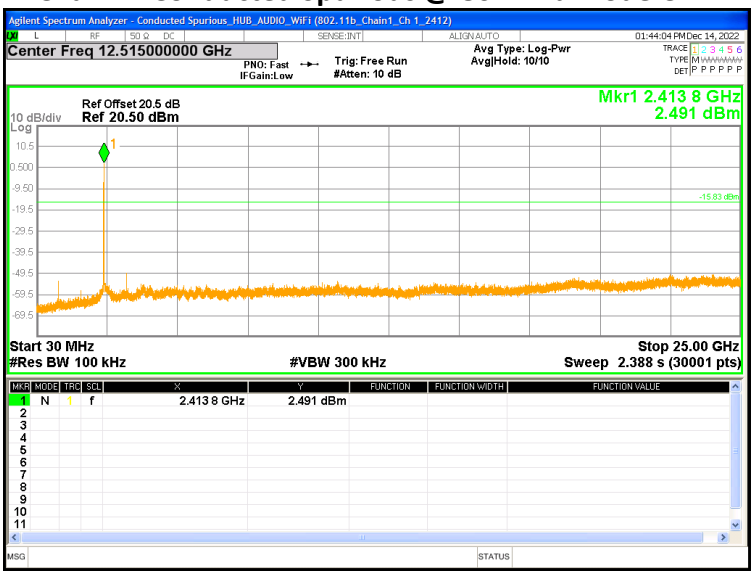
Chain1 : Conducted Spurious @ 802.11b Mode Ch 1



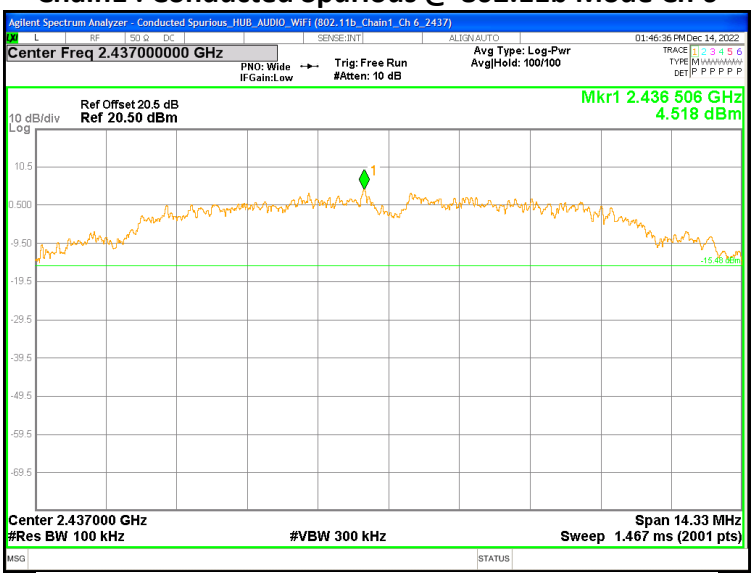
Chain1 : Conducted Spurious @ 802.11b Mode Ch 1



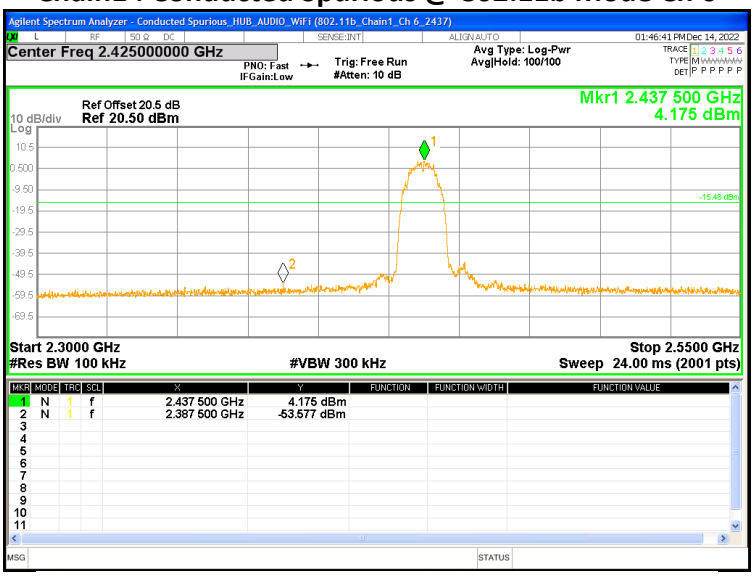
Chain1 : Conducted Spurious @ 802.11b Mode Ch 1



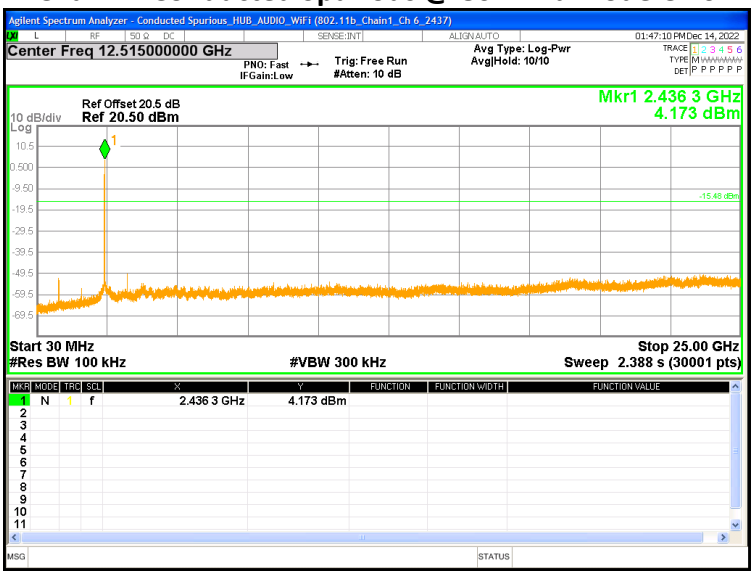
Chain1 : Conducted Spurious @ 802.11b Mode Ch 6



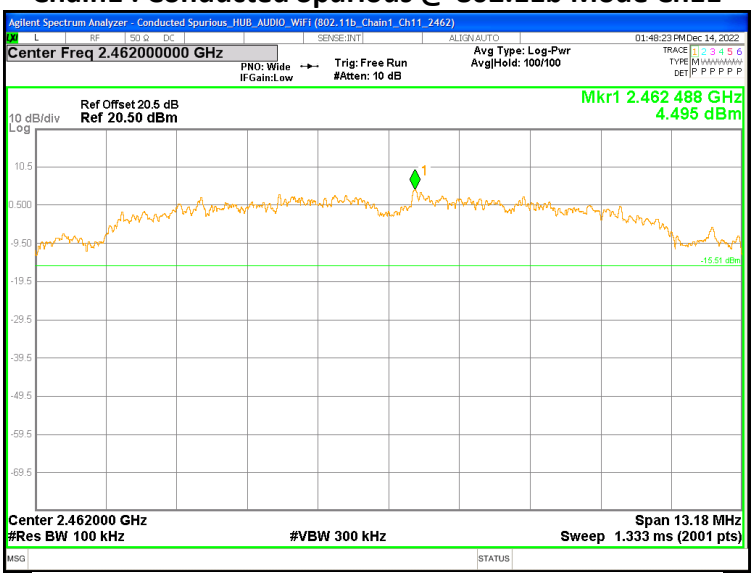
Chain1 : Conducted Spurious @ 802.11b Mode Ch 6



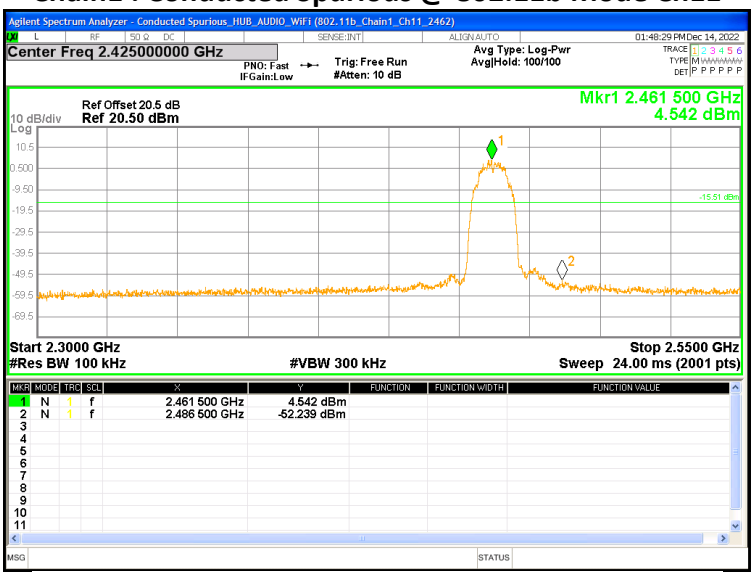
Chain1 : Conducted Spurious @ 802.11b Mode Ch 6



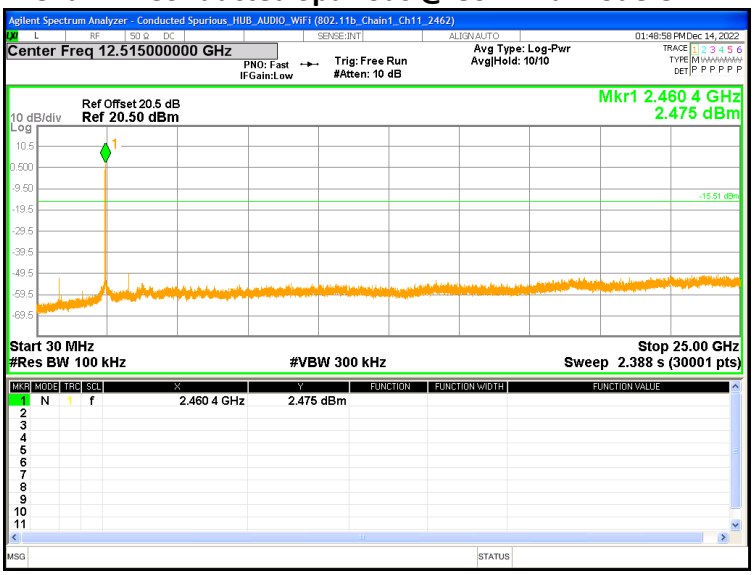
Chain1 : Conducted Spurious @ 802.11b Mode Ch11



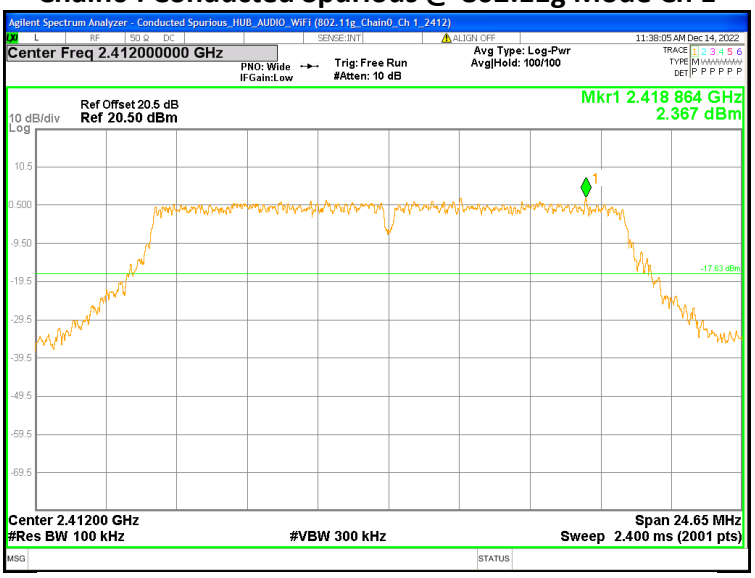
Chain1 : Conducted Spurious @ 802.11b Mode Ch11



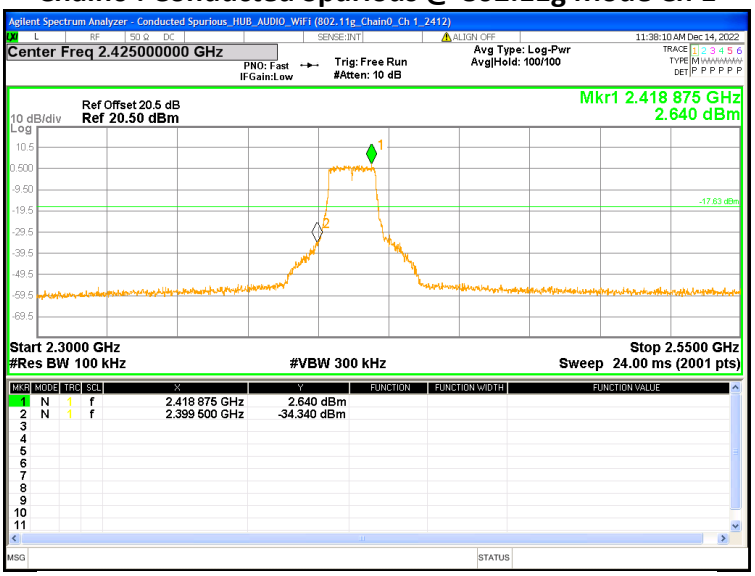
Chain1 : Conducted Spurious @ 802.11b Mode Ch11



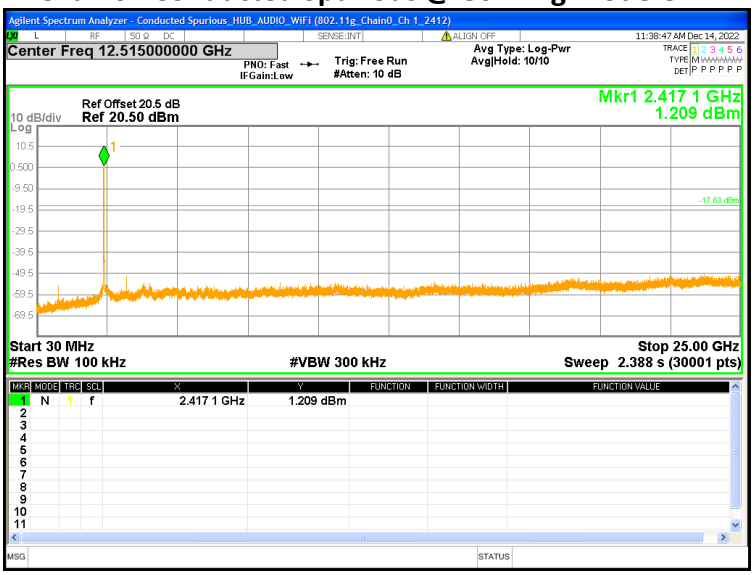
Chain0 : Conducted Spurious @ 802.11g Mode Ch 1



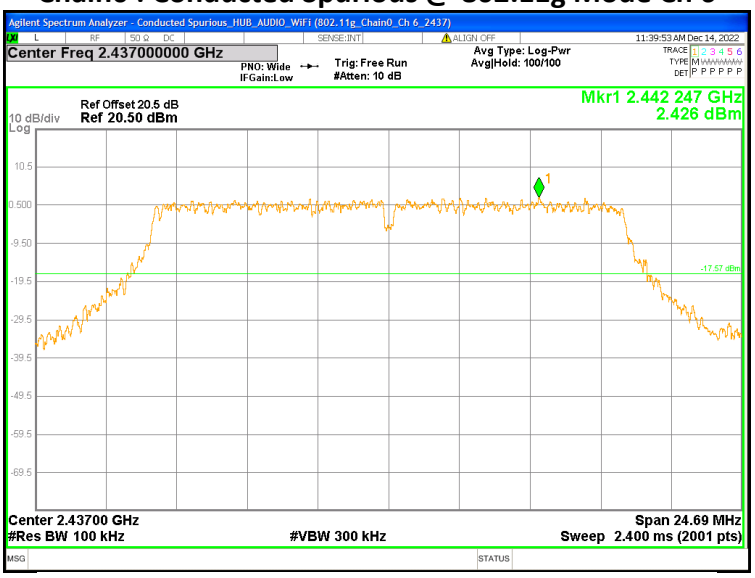
Chain0 : Conducted Spurious @ 802.11g Mode Ch 1



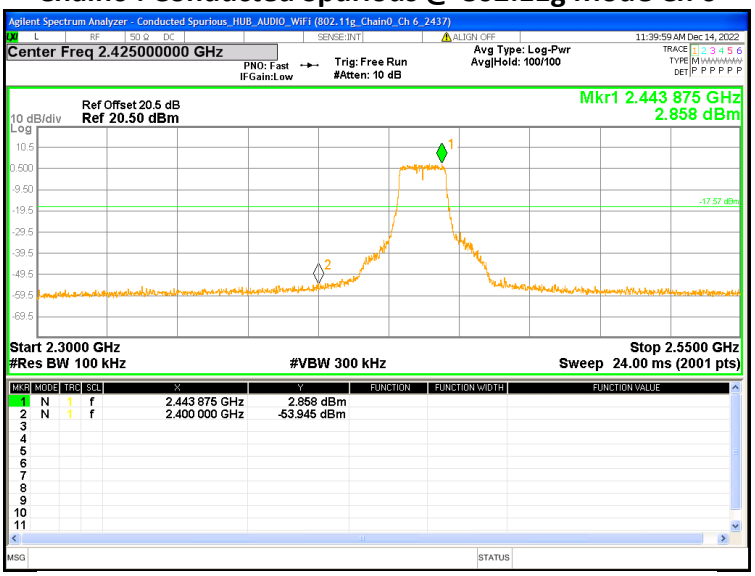
Chain0 : Conducted Spurious @ 802.11g Mode Ch 1



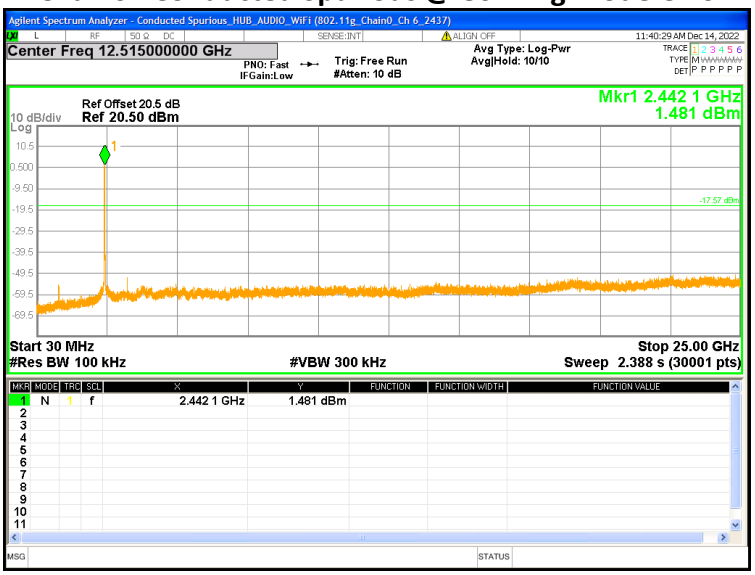
Chain0 : Conducted Spurious @ 802.11g Mode Ch 6



Chain0 : Conducted Spurious @ 802.11g Mode Ch 6



Chain0 : Conducted Spurious @ 802.11g Mode Ch 6



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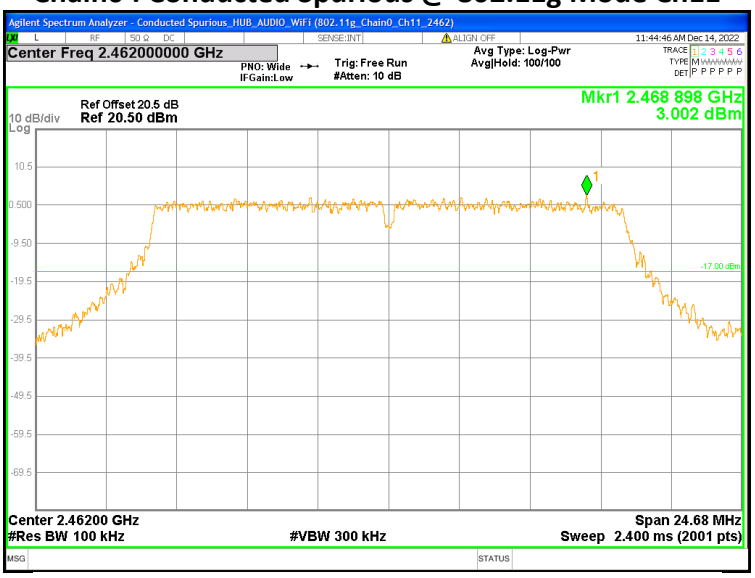

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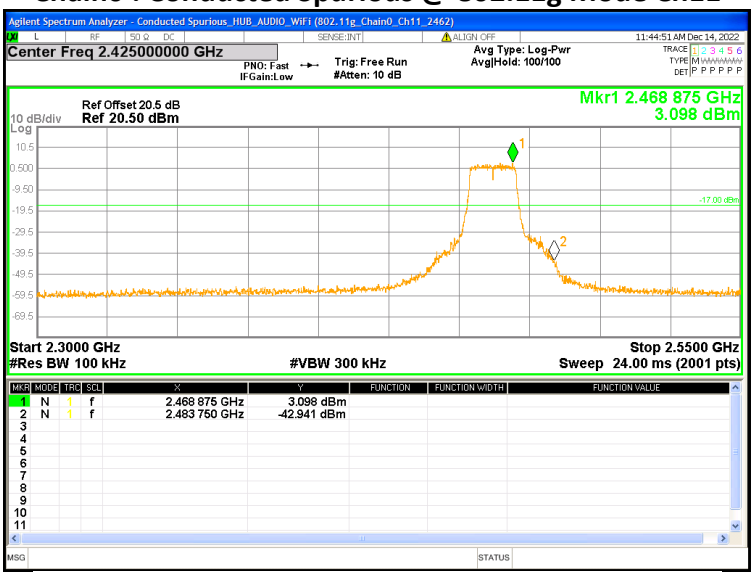

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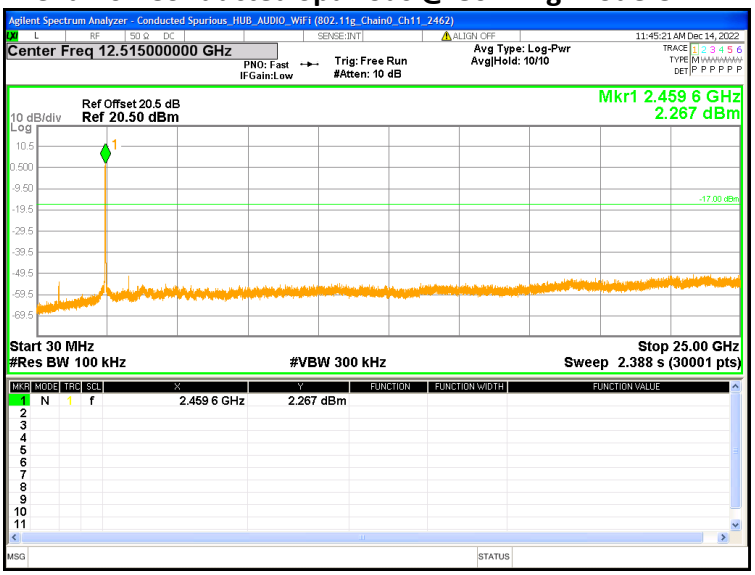
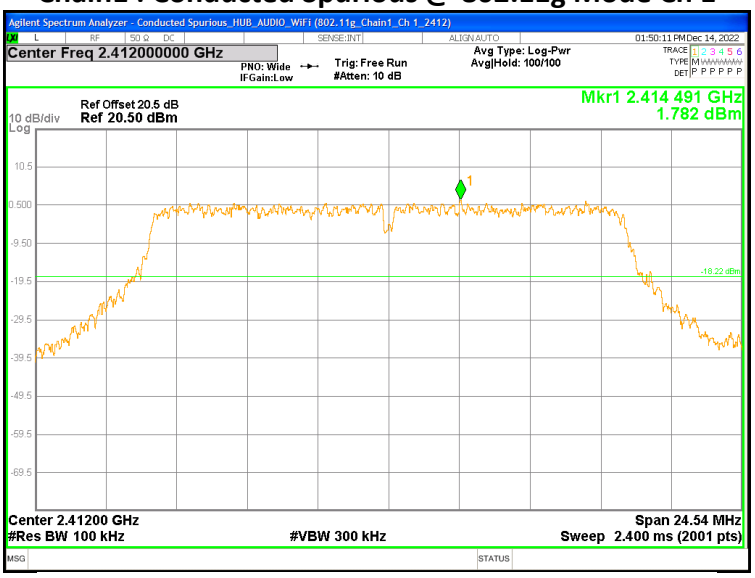


Chain1 : Conducted Spurious @ 802.11g Mode Ch 1



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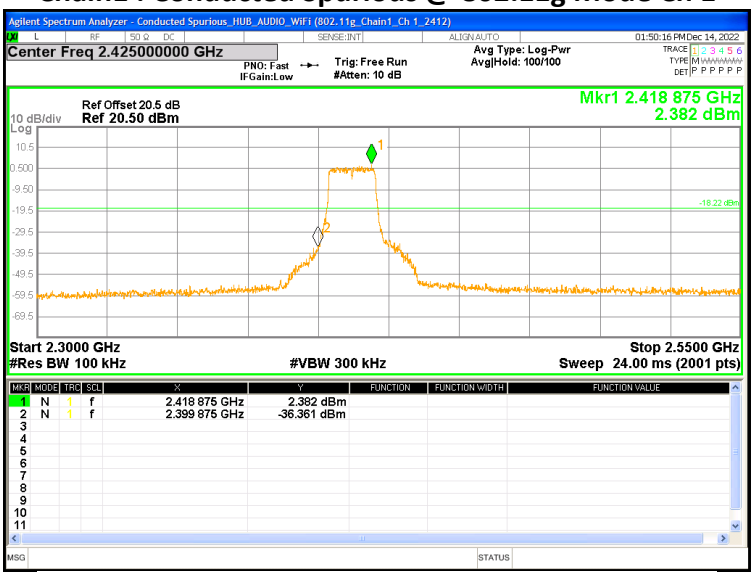
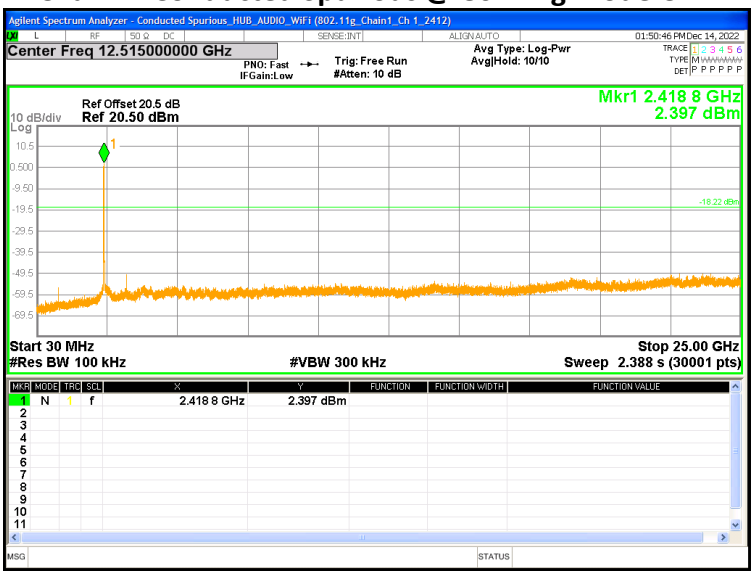


Chain1 : Conducted Spurious @ 802.11g Mode Ch 1



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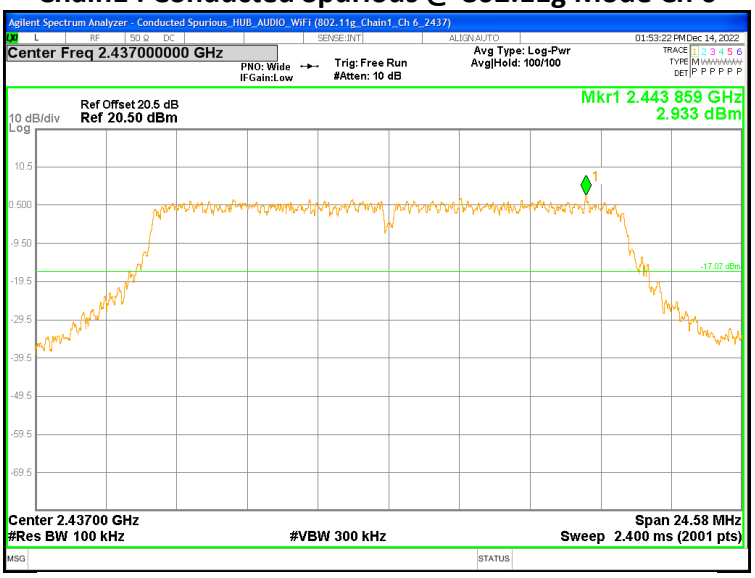
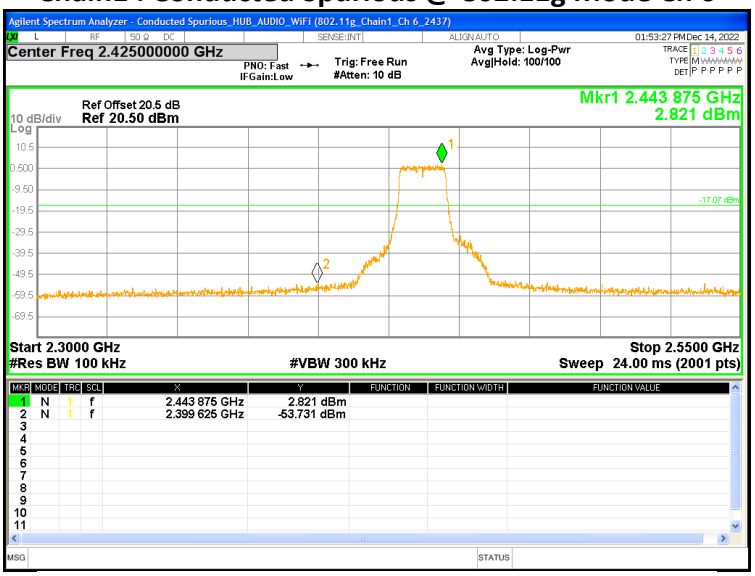
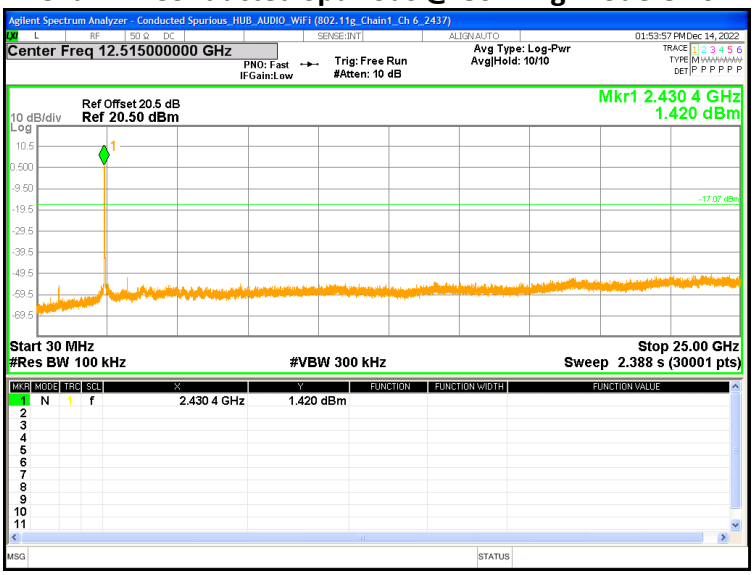


Chain1 : Conducted Spurious @ 802.11g Mode Ch 6



Chain1 : Conducted Spurious @ 802.11g Mode Ch 6



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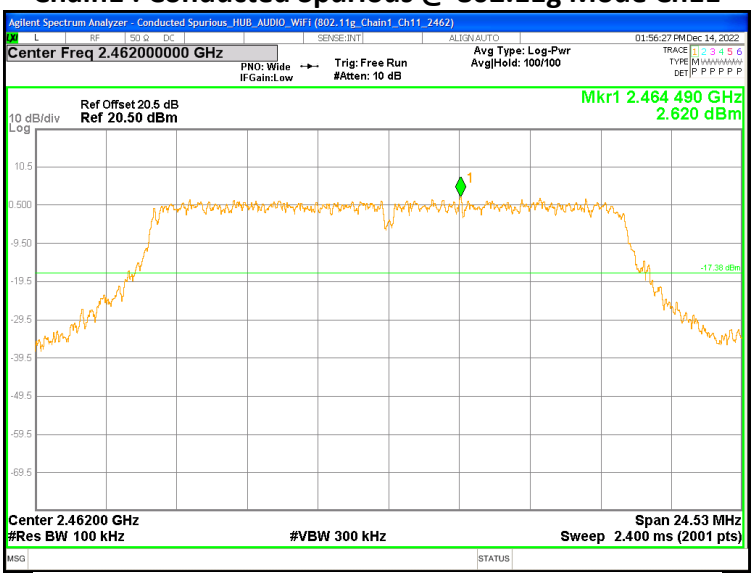
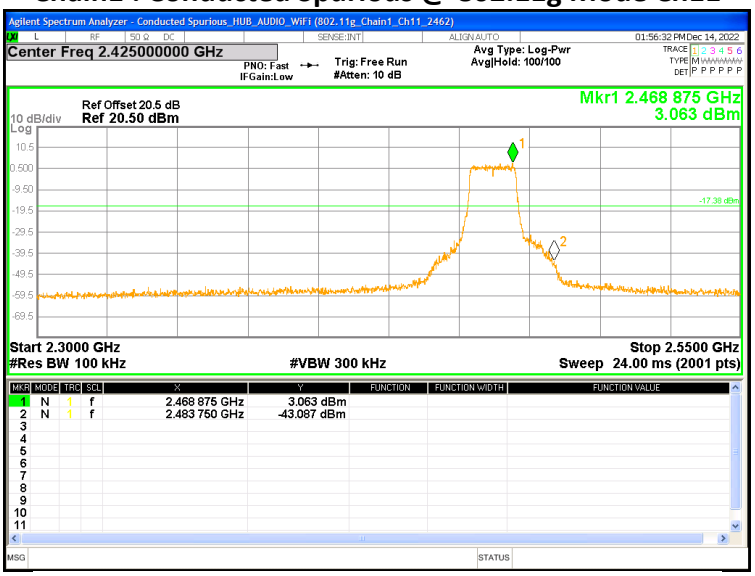
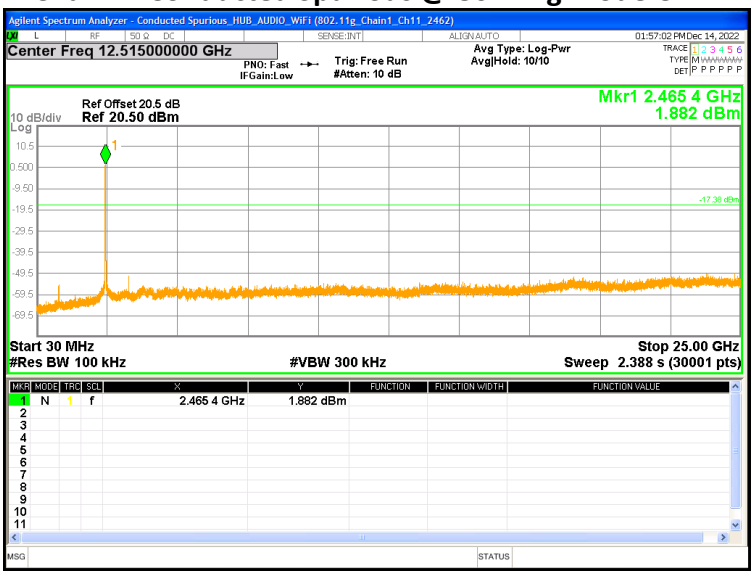


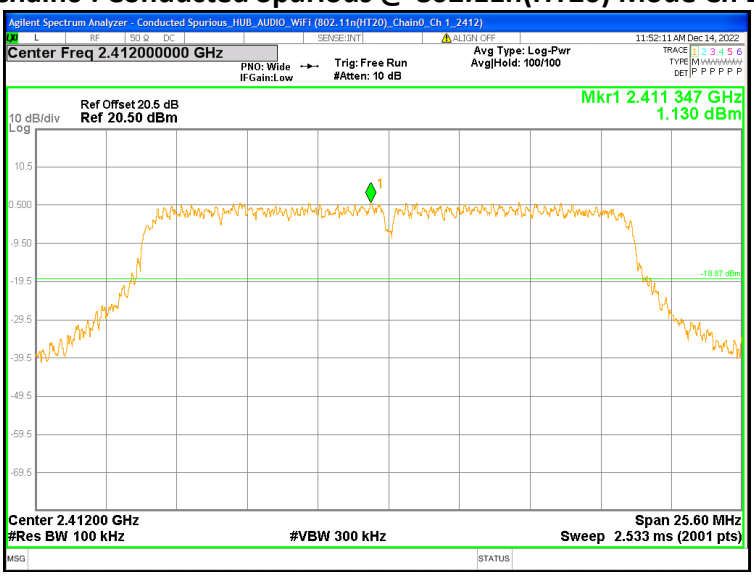
Chain1 : Conducted Spurious @ 802.11g Mode Ch11



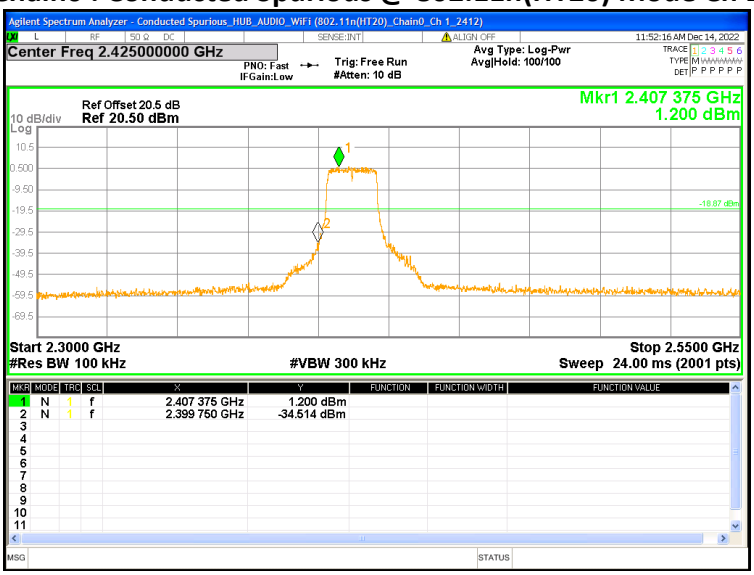
Chain1 : Conducted Spurious @ 802.11g Mode Ch11



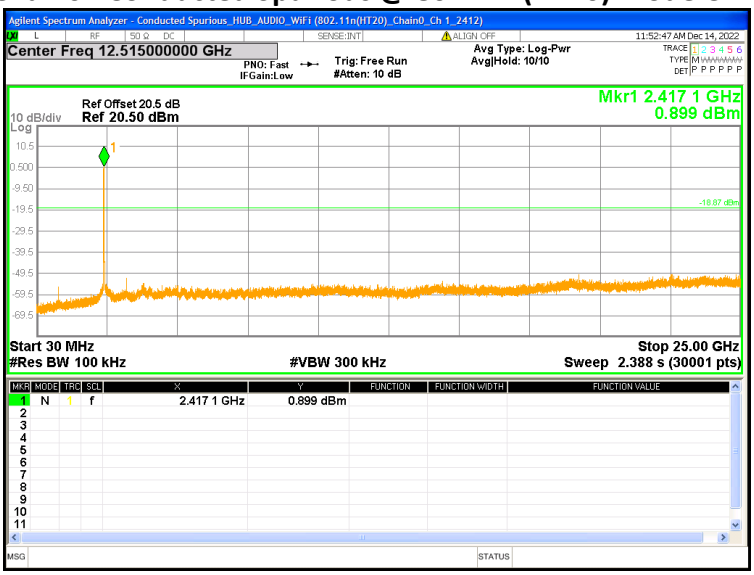
Chain0 : Conducted Spurious @ 802.11n(HT20) Mode Ch 1



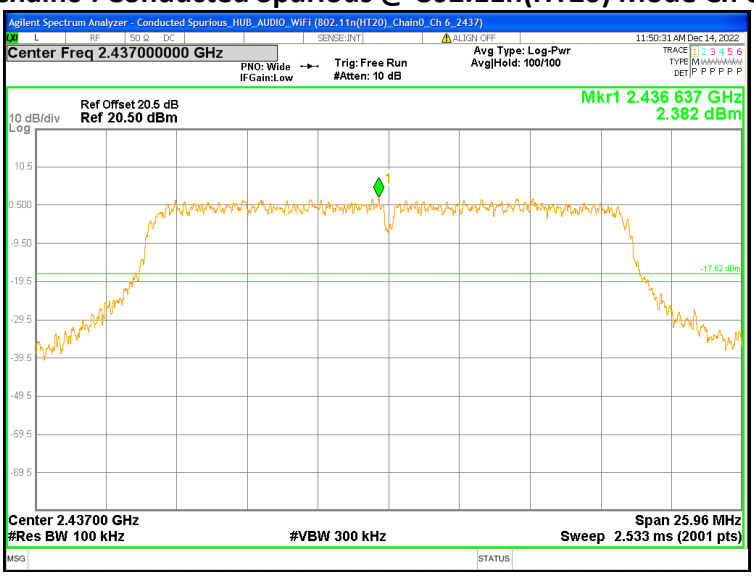
Chain0 : Conducted Spurious @ 802.11n(HT20) Mode Ch 1



Chain0 : Conducted Spurious @ 802.11n(HT20) Mode Ch 1



Chain0 : Conducted Spurious @ 802.11n(HT20) Mode Ch 6



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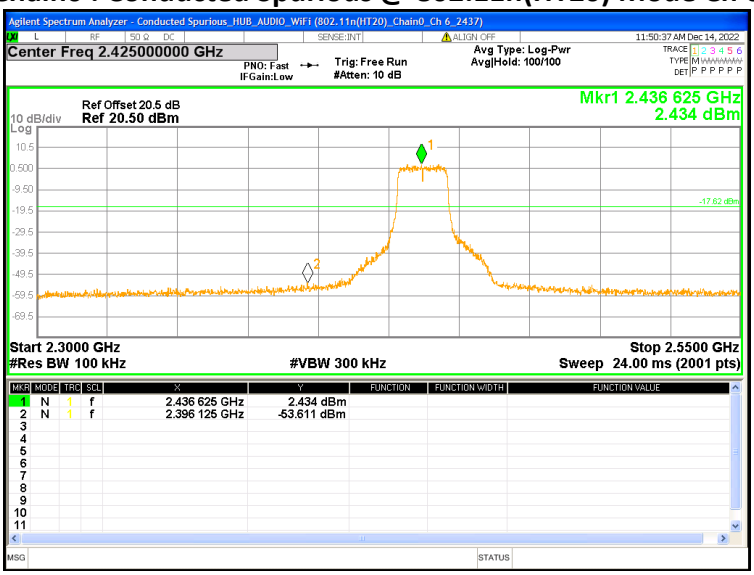
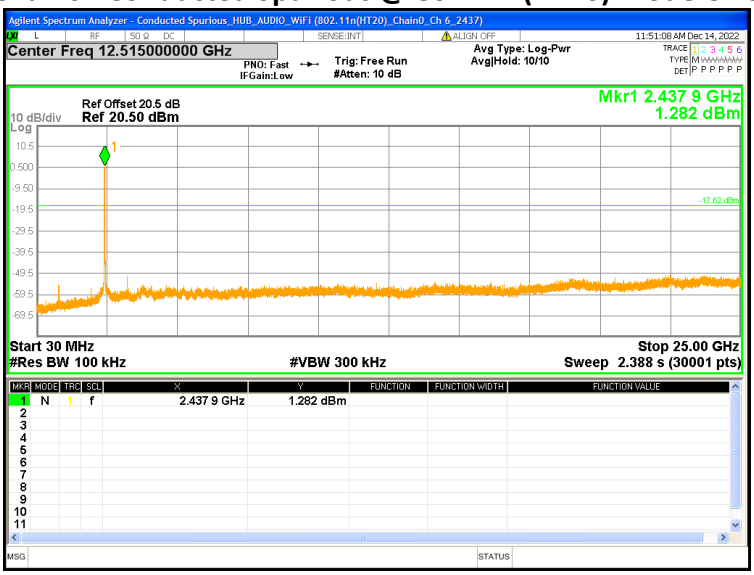
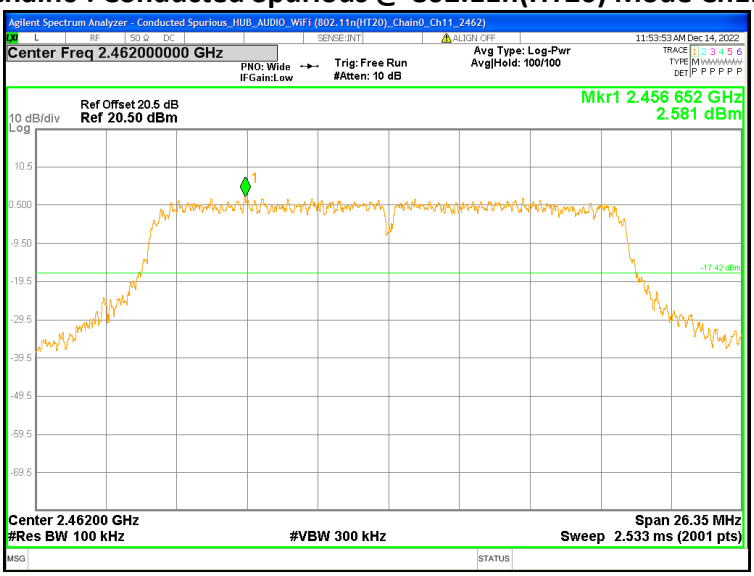


Chain0 : Conducted Spurious @ 802.11n(HT20) Mode Ch 6



Chain0 : Conducted Spurious @ 802.11n(HT20) Mode Ch11



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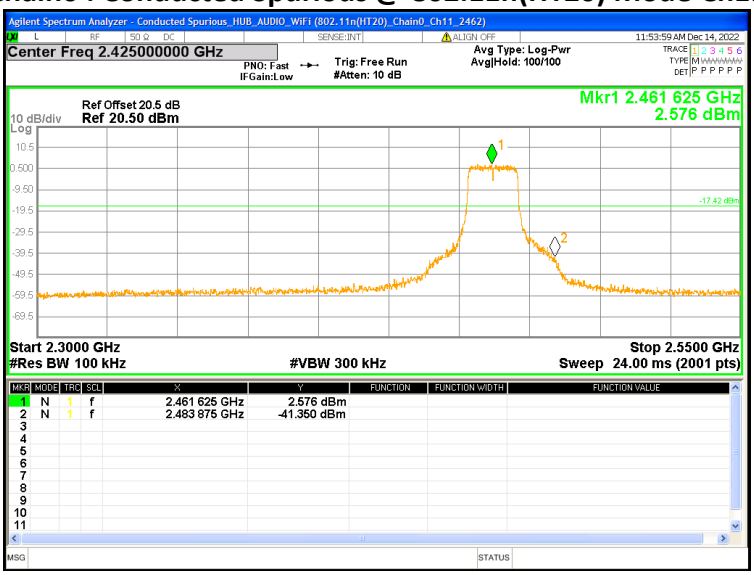

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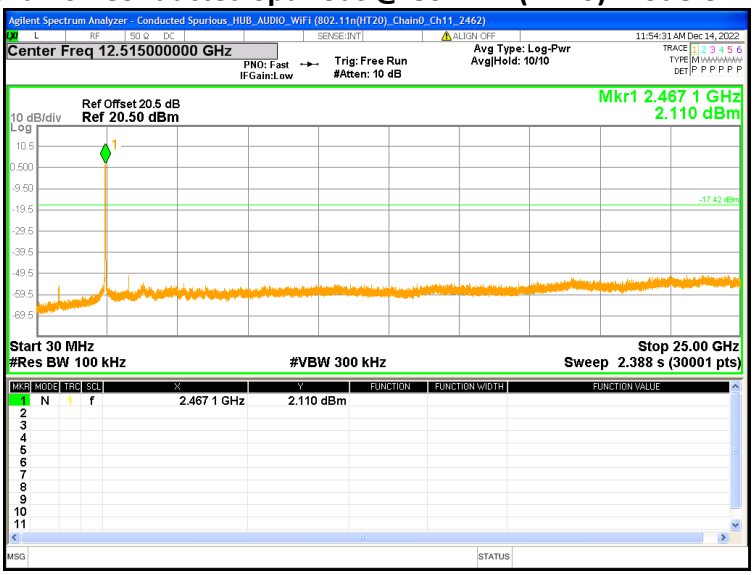
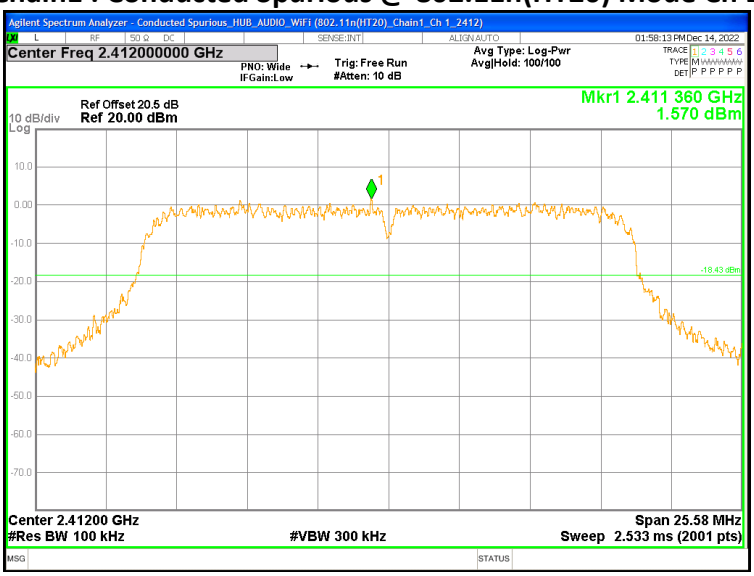
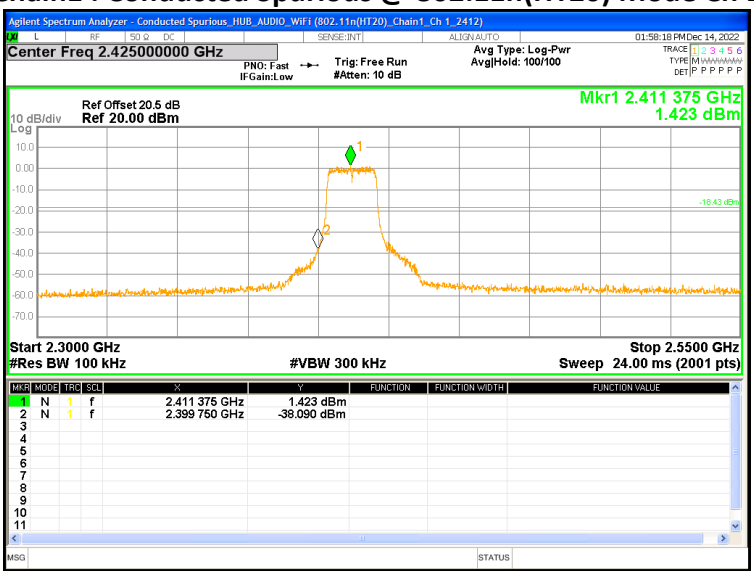


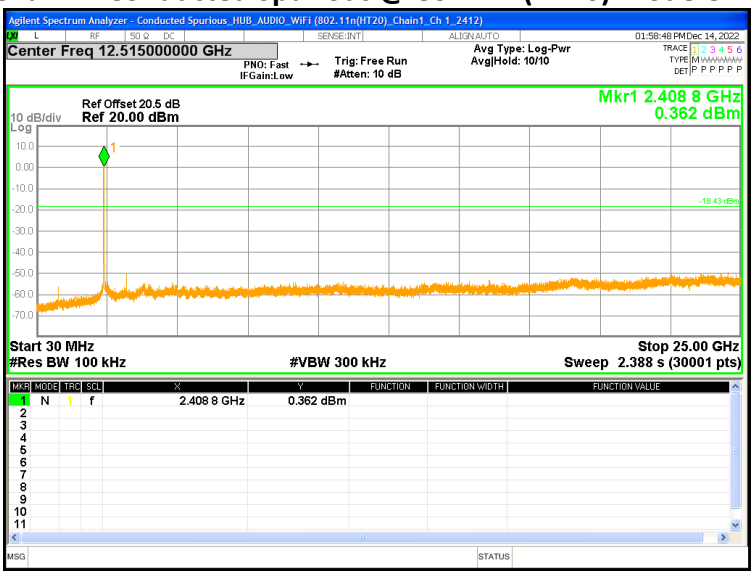
Chain1 : Conducted Spurious @ 802.11n(HT20) Mode Ch 1



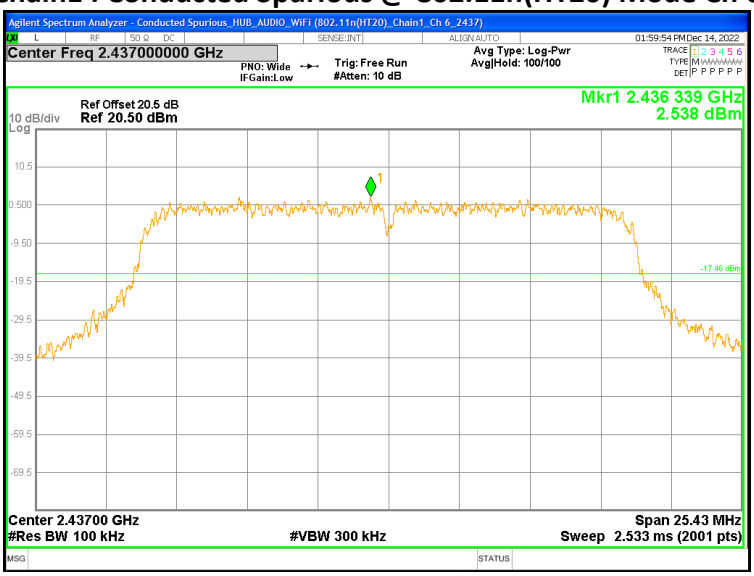
Chain1 : Conducted Spurious @ 802.11n(HT20) Mode Ch 1



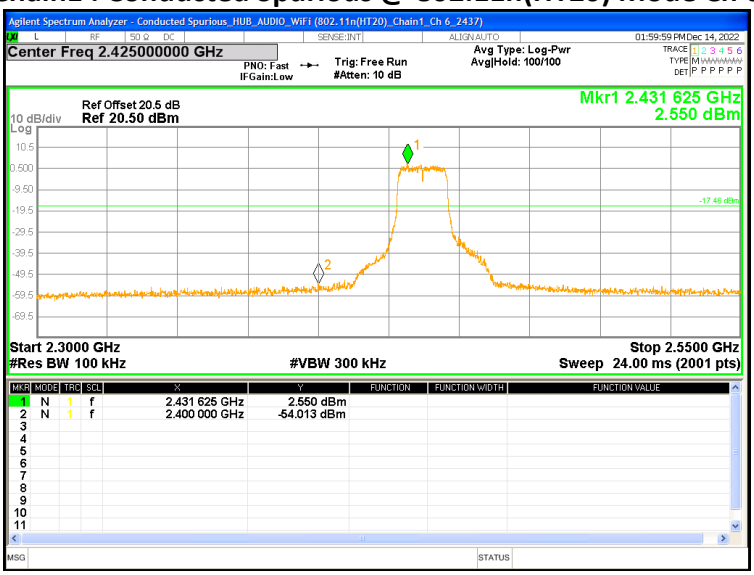
Chain1 : Conducted Spurious @ 802.11n(HT20) Mode Ch 1



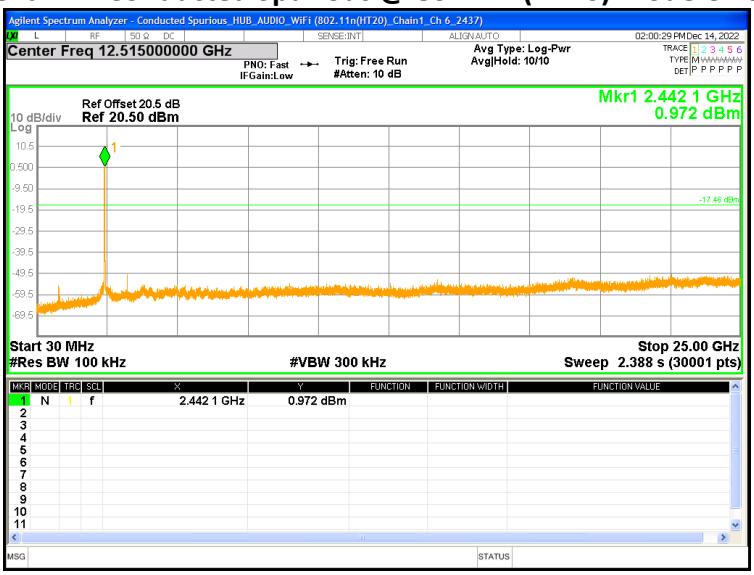
Chain1 : Conducted Spurious @ 802.11n(HT20) Mode Ch 6



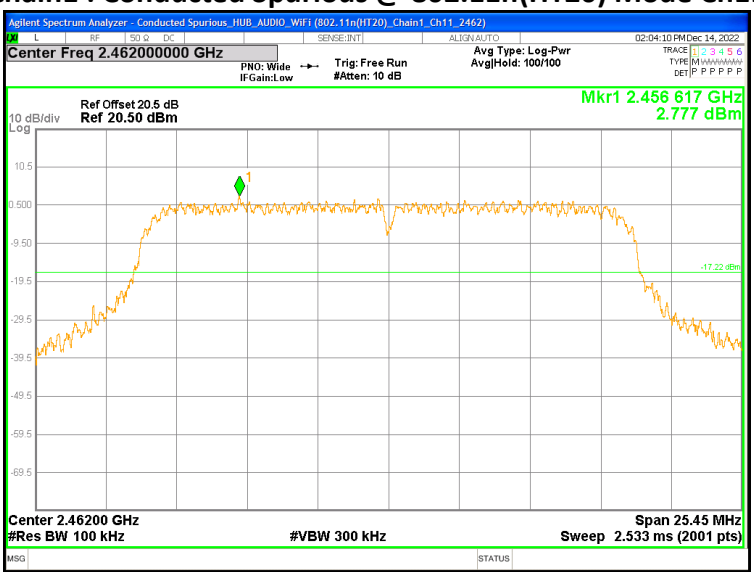
Chain1 : Conducted Spurious @ 802.11n(HT20) Mode Ch 6



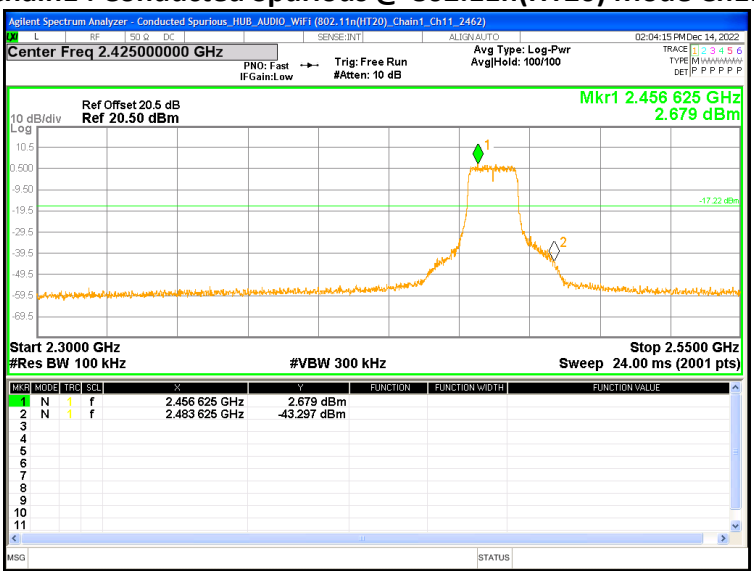
Chain1 : Conducted Spurious @ 802.11n(HT20) Mode Ch 6



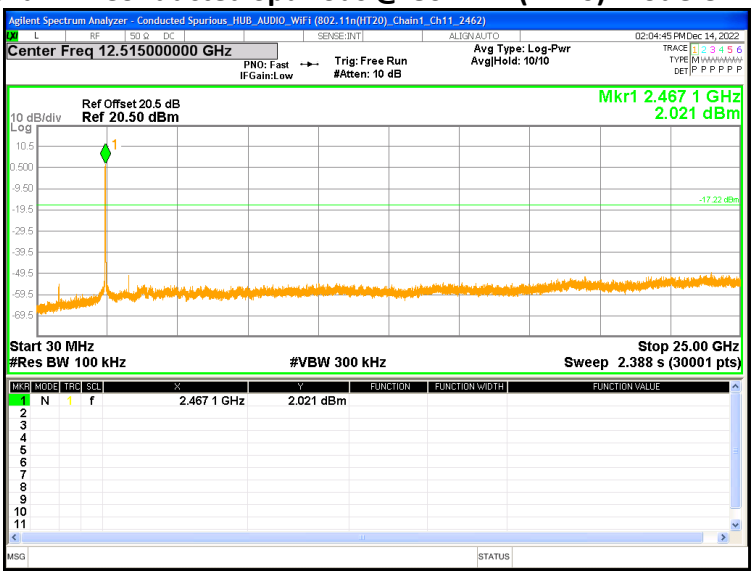
Chain1 : Conducted Spurious @ 802.11n(HT20) Mode Ch11



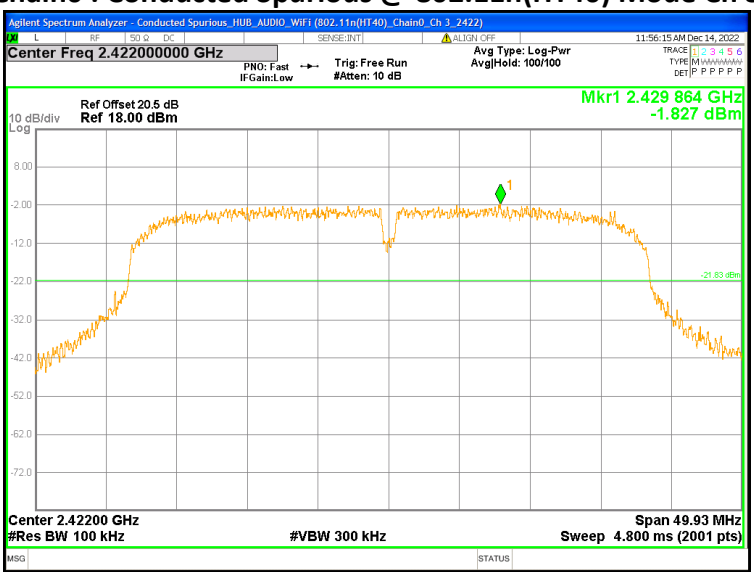
Chain1 : Conducted Spurious @ 802.11n(HT20) Mode Ch11



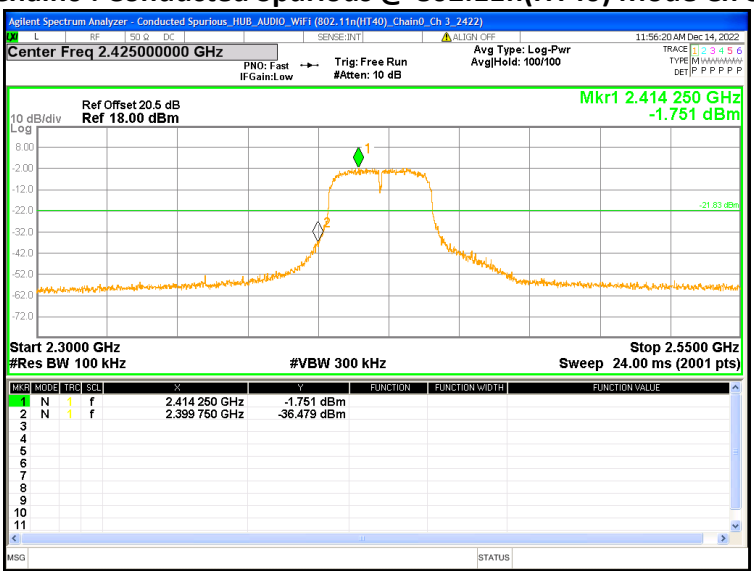
Chain1 : Conducted Spurious @ 802.11n(HT20) Mode Ch11



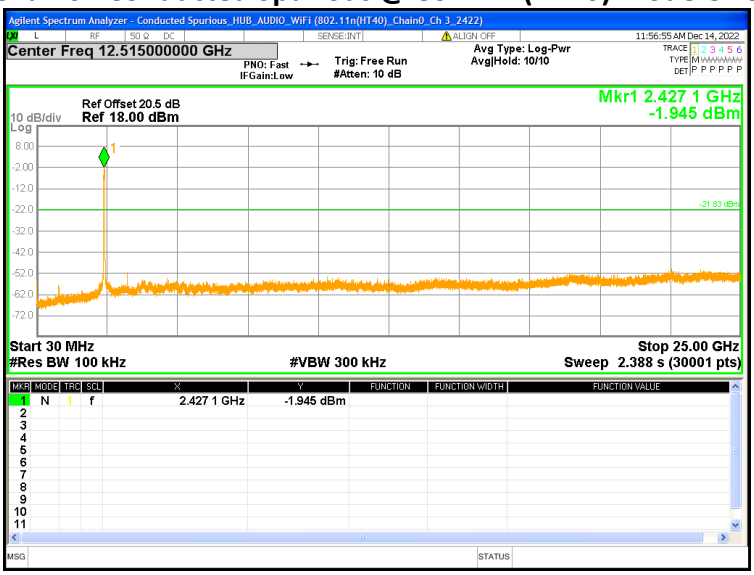
Chain0 : Conducted Spurious @ 802.11n(HT40) Mode Ch 3



Chain0 : Conducted Spurious @ 802.11n(HT40) Mode Ch 3



Chain0 : Conducted Spurious @ 802.11n(HT40) Mode Ch 3



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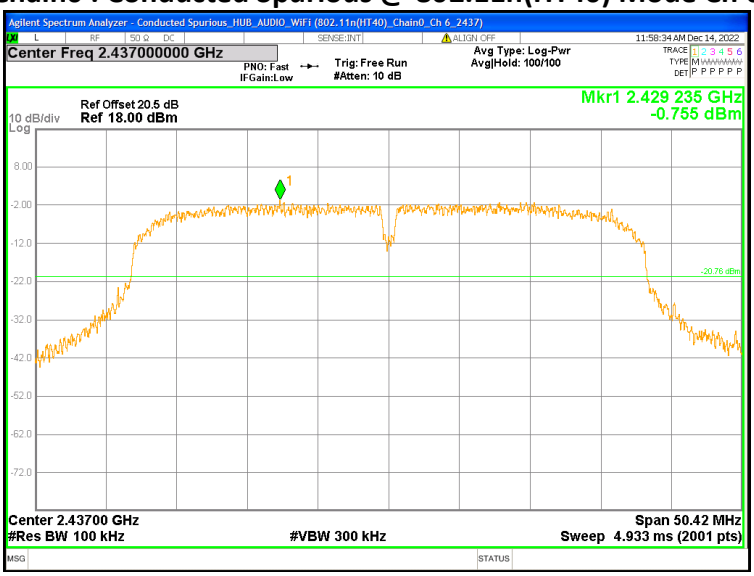
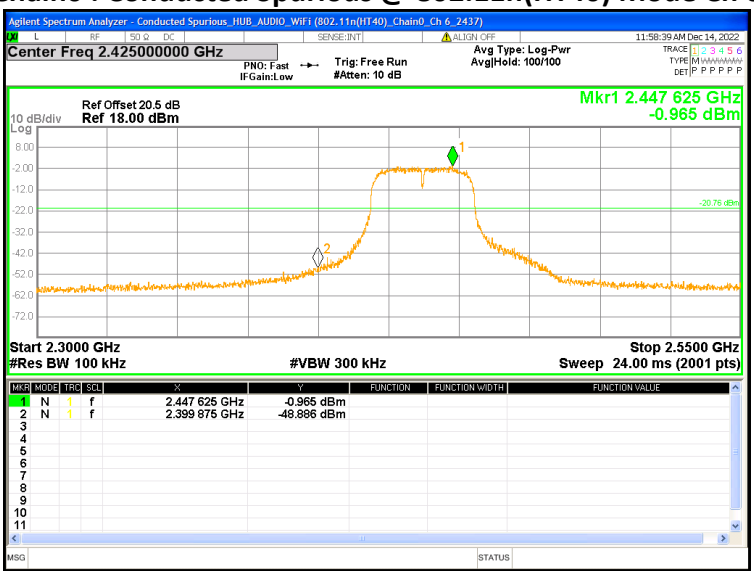
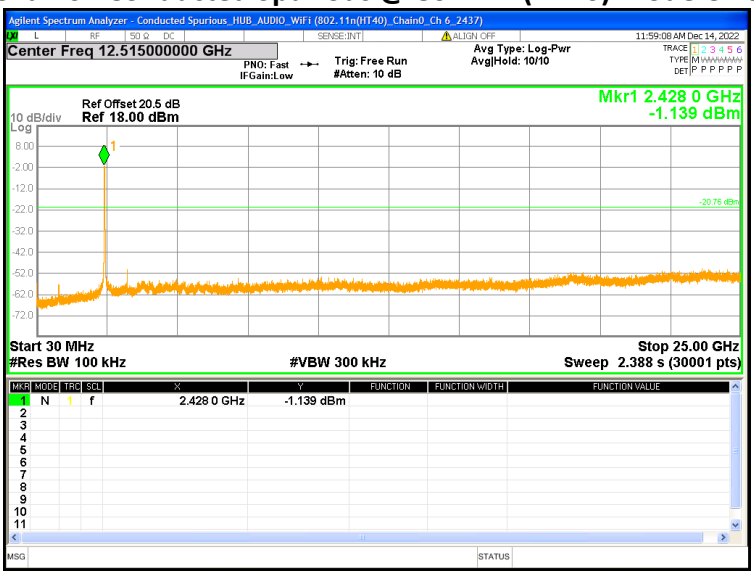


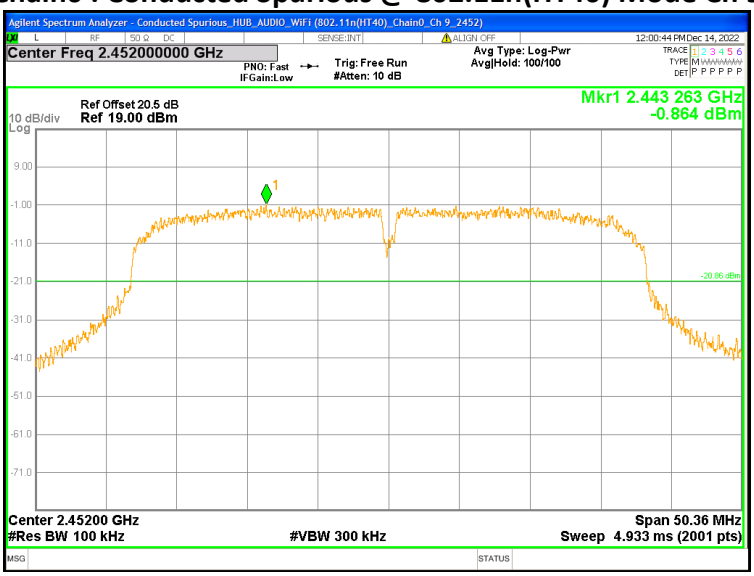
Chain0 : Conducted Spurious @ 802.11n(HT40) Mode Ch 6



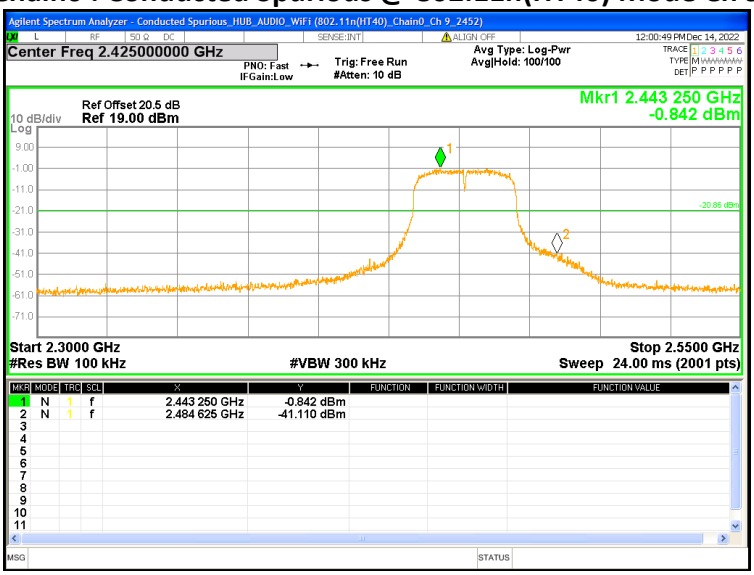
Chain0 : Conducted Spurious @ 802.11n(HT40) Mode Ch 6



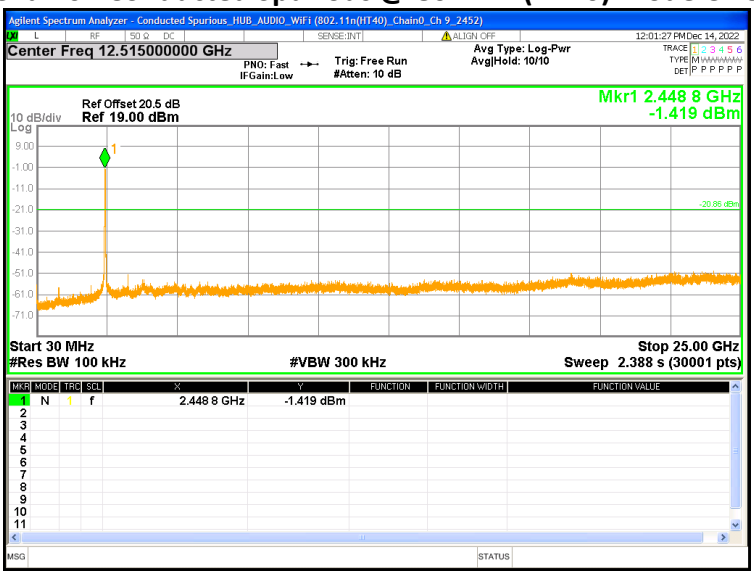
Chain0 : Conducted Spurious @ 802.11n(HT40) Mode Ch 9



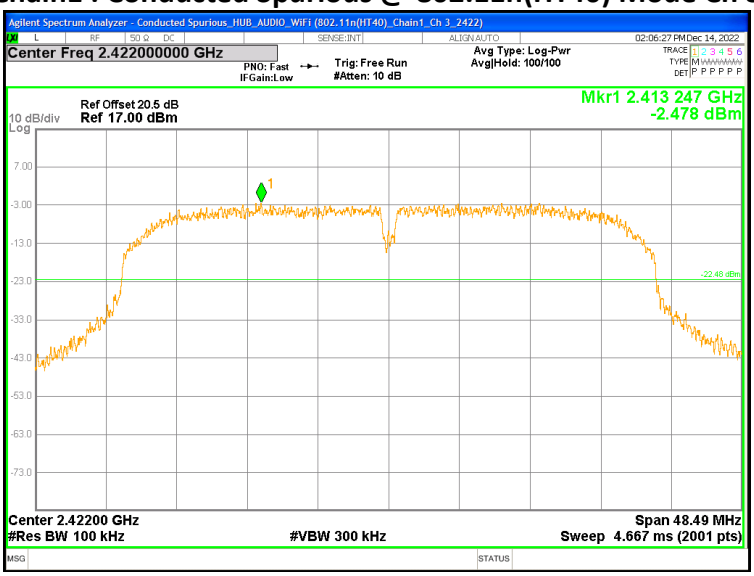
Chain0 : Conducted Spurious @ 802.11n(HT40) Mode Ch 9



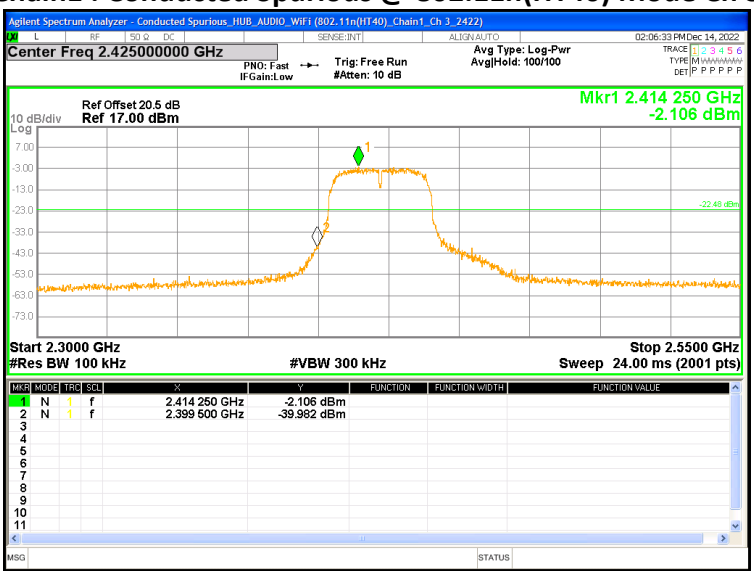
Chain0 : Conducted Spurious @ 802.11n(HT40) Mode Ch 9



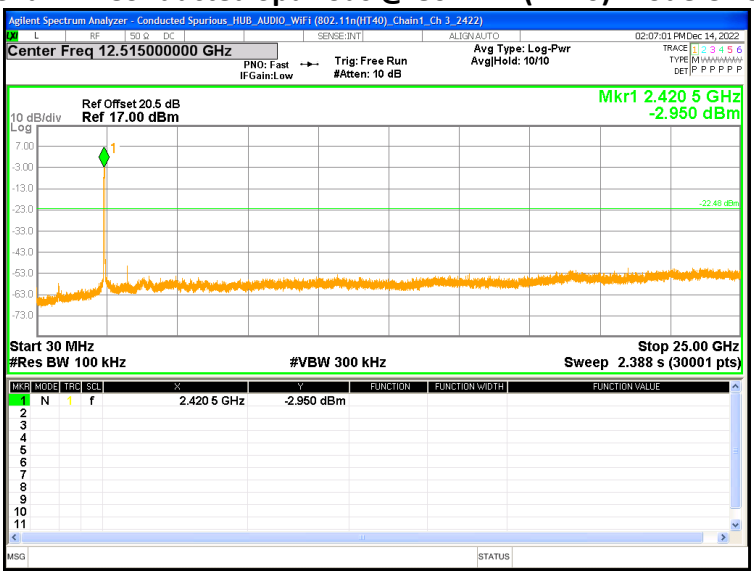
Chain1 : Conducted Spurious @ 802.11n(HT40) Mode Ch 3



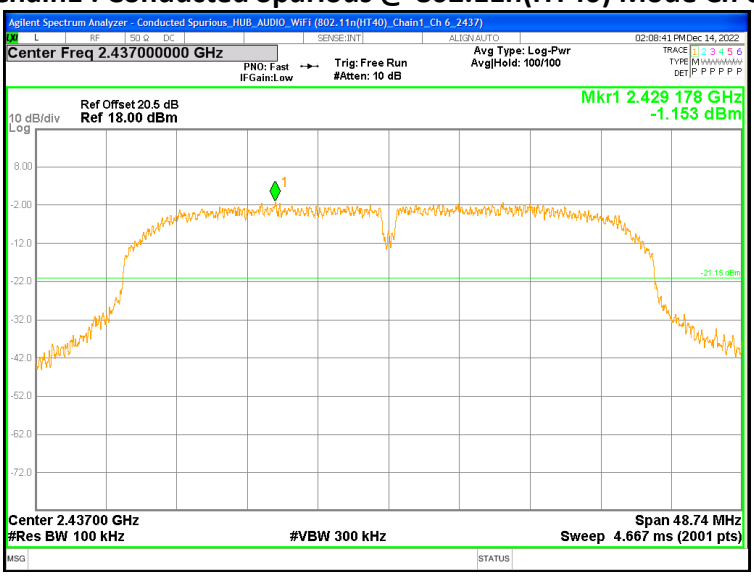
Chain1 : Conducted Spurious @ 802.11n(HT40) Mode Ch 3



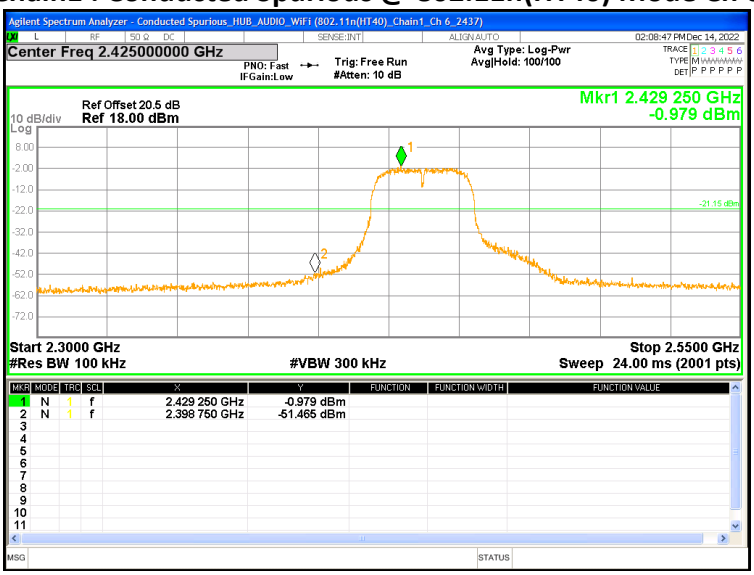
Chain1 : Conducted Spurious @ 802.11n(HT40) Mode Ch 3



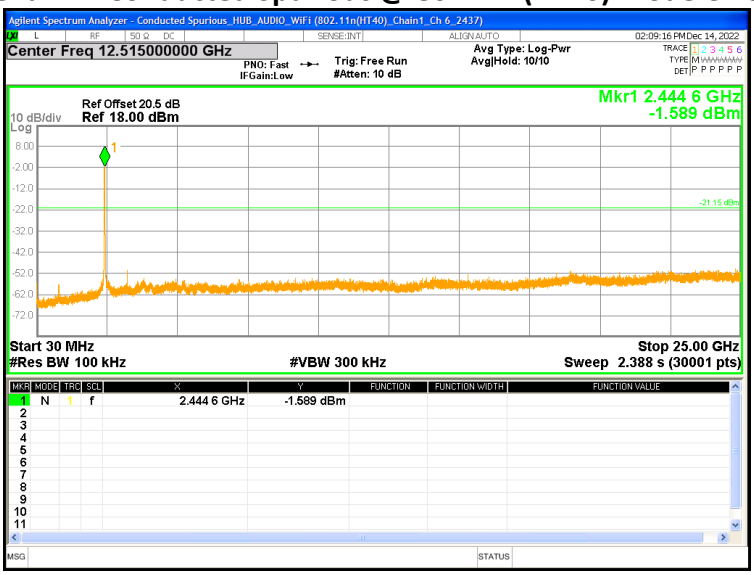
Chain1 : Conducted Spurious @ 802.11n(HT40) Mode Ch 6



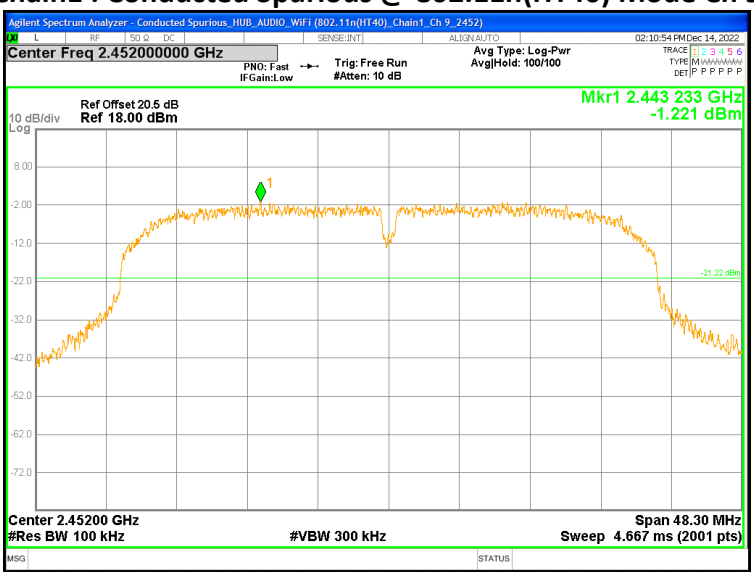
Chain1 : Conducted Spurious @ 802.11n(HT40) Mode Ch 6



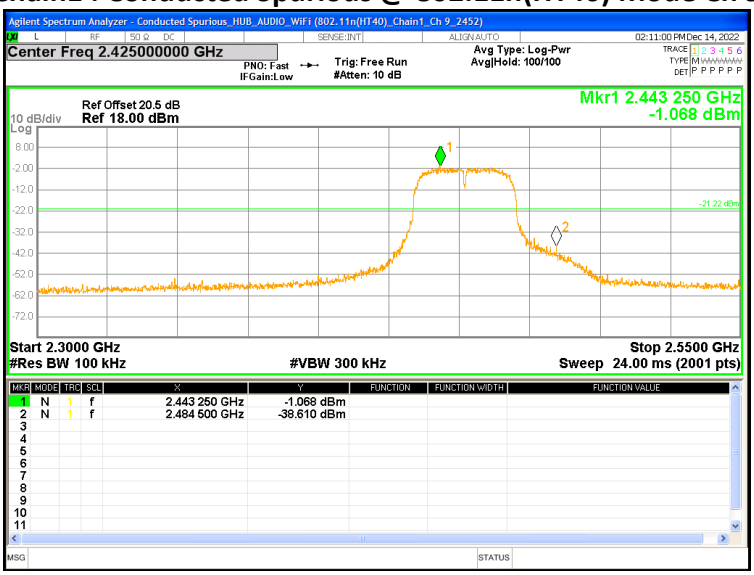
Chain1 : Conducted Spurious @ 802.11n(HT40) Mode Ch 6



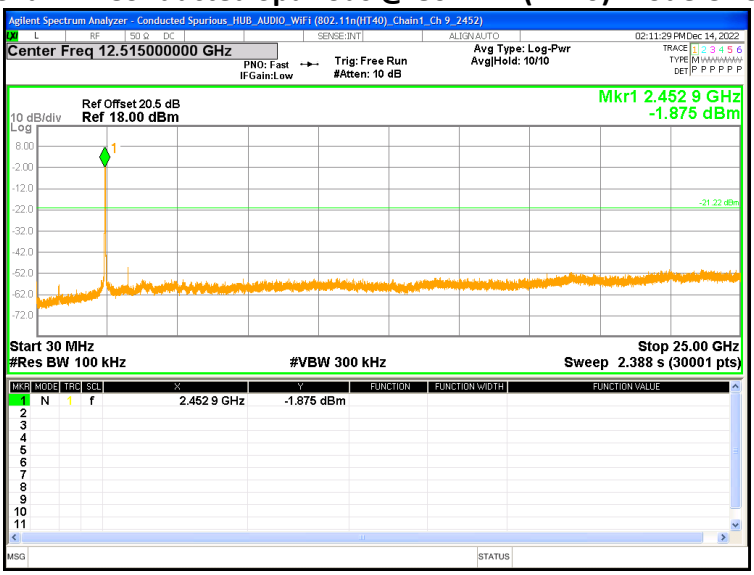
Chain1 : Conducted Spurious @ 802.11n(HT40) Mode Ch 9



Chain1 : Conducted Spurious @ 802.11n(HT40) Mode Ch 9



Chain1 : Conducted Spurious @ 802.11n(HT40) Mode Ch 9



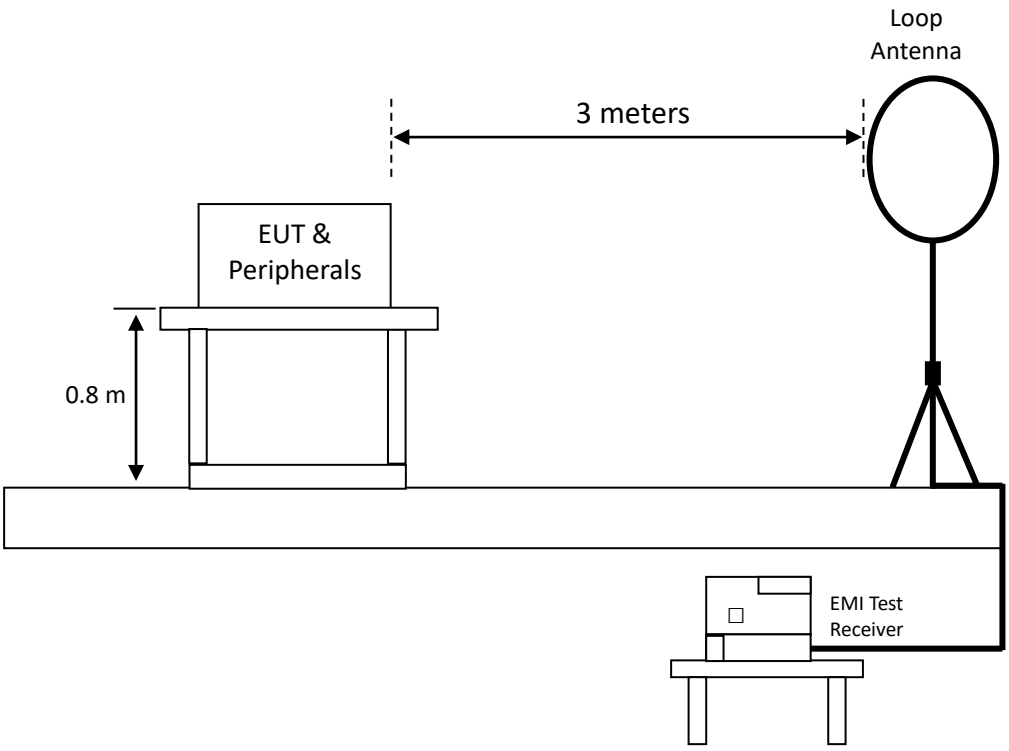
6. Emissions in Restricted Frequency Bands (Radiated emission measurements)

6.1 Instrument Setting

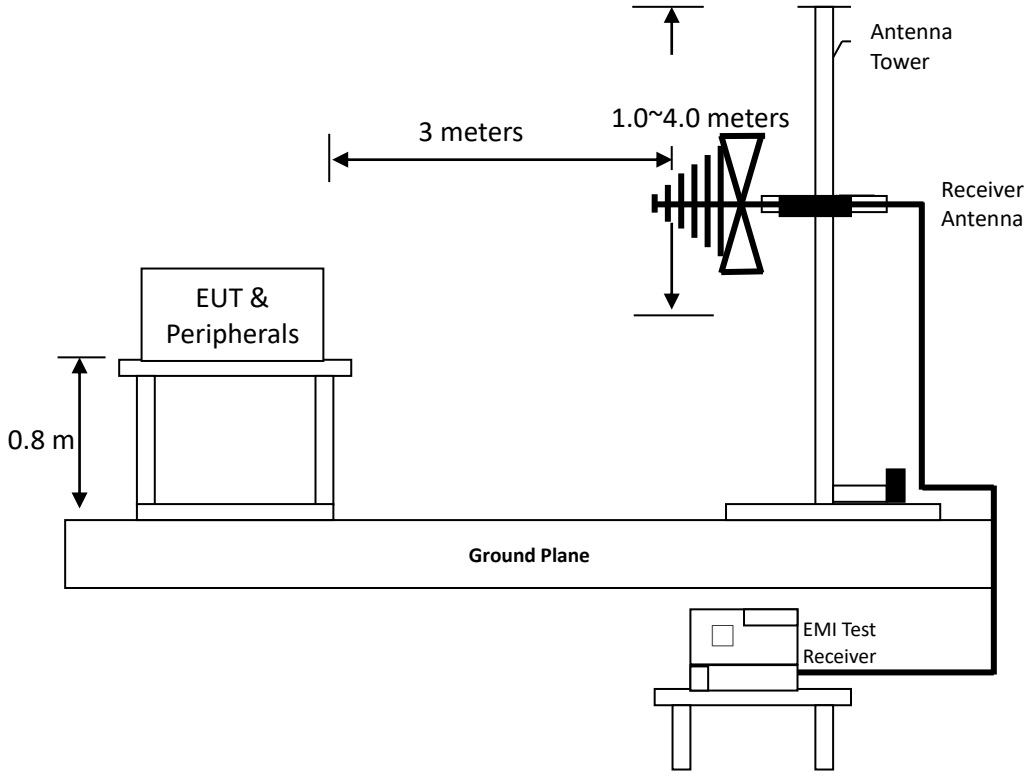
Receiver Function	Setting (Below 1GHz)	Setting (Above 1GHz)
Detector	QP	Peak and Average
RBW	9-150 kHz ; 200-300 Hz 0.15-30 MHz; 9-10 kHz 30-1000 MHz; 100-120 kHz	1MHz
VBW	≧3 x RBW	3MHz & 1/T minimum kHz
Sweep	Auto couple	Auto couple
Start Frequency	9 kHz	1GHz
Stop Frequency	1 GHz	Tenth harmonic
Attenuation	Auto	Auto

6.2 Test setup & procedure

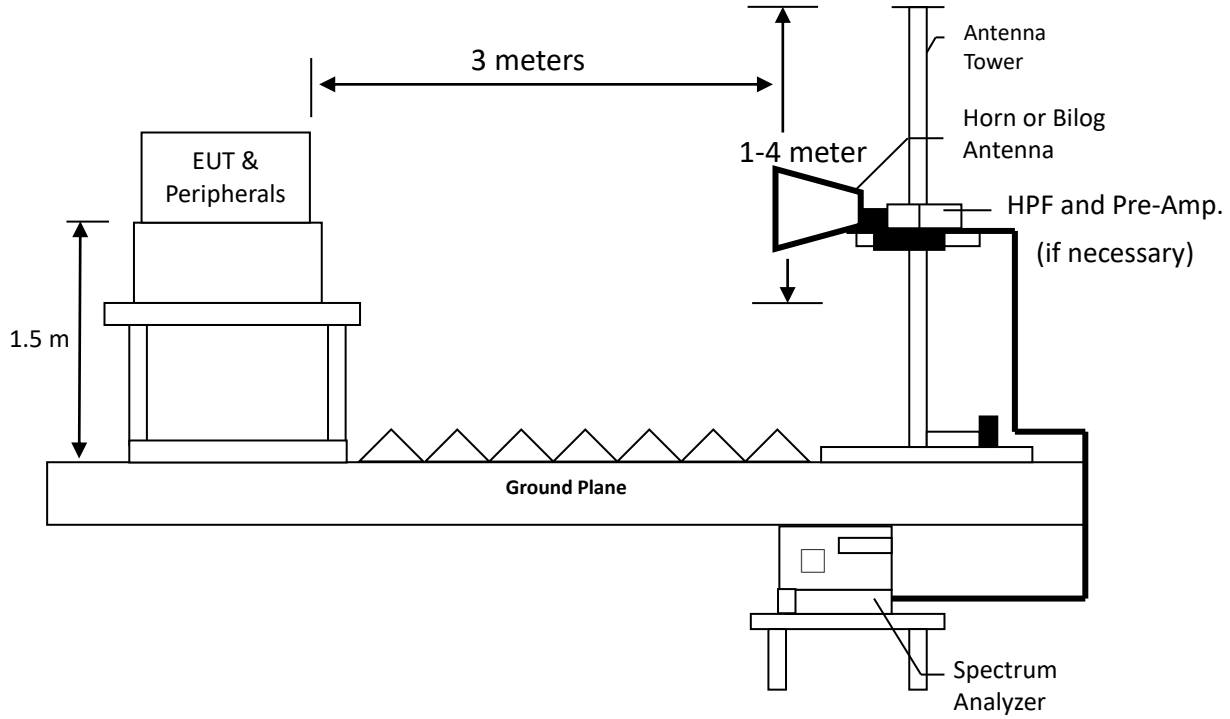
Radiated emission from 9kHz to 30MHz uses Loop Antenna:



Radiated emission below 1GHz using Bilog Antenna



Radiated emission above 1GHz using Horn Antenna



Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 1/T minimum kHz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.
The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

6.3 Limit

Frequency(MHz)	Field Strength(uV/m)	Measurement distance(m)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

6.4 Test Result

6.4.1 Measurement results: frequencies 9kHz to 30MHz

Temperature (℃) :	18
Relative Humidity (%) :	61
Test date :	2022/12/13

The test was performed on EUT under continuously transmitting mode. The worst case occurred at 802.11g Channel 11.

Antenna Polarity	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Perpendicular	0.249	AV	18.45	27.53	45.98	99.68	-53.70
Perpendicular	0.669	QP	18.90	20.06	38.96	71.10	-32.14
Perpendicular	1.119	QP	19.10	18.36	37.46	66.63	-29.17
Perpendicular	1.539	QP	19.10	14.71	33.81	63.86	-30.05
Perpendicular	7.057	QP	20.19	11.81	32.00	69.54	-37.54
Perpendicular	11.526	QP	21.11	10.51	31.62	69.54	-37.92

Remark: Corr. Factor = Antenna Factor + Cable Loss

Antenna Polarity	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Parallel	0.429	AV	18.74	23.56	42.30	94.96	-52.66
Parallel	1.299	QP	19.10	16.25	35.35	65.33	-29.98
Parallel	9.186	QP	20.79	11.30	32.09	69.54	-37.45
Parallel	14.975	QP	21.29	12.33	33.62	69.54	-35.92
Parallel	18.783	QP	21.49	10.21	31.70	69.54	-37.84
Parallel	23.462	QP	21.80	10.12	31.92	69.54	-37.62

Remark: Corr. Factor = Antenna Factor + Cable Loss

Antenna Polarity	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
Ground-parallel	0.759	QP	18.95	18.93	37.88	70.00	-32.12
Ground-parallel	1.868	QP	19.10	14.76	33.86	69.54	-35.68
Ground-parallel	3.638	QP	19.26	12.17	31.43	69.54	-38.11
Ground-parallel	11.915	QP	21.13	10.54	31.67	69.54	-37.87
Ground-parallel	13.415	QP	21.21	10.03	31.24	69.54	-38.30
Ground-parallel	17.494	QP	21.42	10.15	31.57	69.54	-37.97

Remark: Corr. Factor = Antenna Factor + Cable Loss

6.5.2 Measurement results: frequencies below 1 GHz

Temperature (℃) :	18
Relative Humidity (%) :	61
Test date :	2022/12/13

The test was performed on EUT under continuously transmitting mode. The worst case occurred at 802.11g Channel 11.

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Horizontal	159.98	QP	20.00	6.30	26.30	43.50	-17.20
Horizontal	320.03	QP	22.41	9.85	32.26	46.00	-13.74
Horizontal	480.08	QP	26.18	2.12	28.30	46.00	-17.70
Horizontal	640.13	QP	29.40	6.83	36.23	46.00	-9.77
Horizontal	722.58	QP	29.88	3.41	33.29	46.00	-12.71
Horizontal	897.18	QP	32.09	1.47	33.56	46.00	-12.44

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Vertical	57.16	QP	18.20	8.24	26.44	40.00	-13.56
Vertical	70.74	QP	14.05	15.75	29.80	40.00	-10.20
Vertical	320.03	QP	22.41	7.20	29.61	46.00	-16.39
Vertical	480.08	QP	26.18	3.16	29.34	46.00	-16.66
Vertical	640.13	QP	29.40	2.47	31.87	46.00	-14.13
Vertical	725.49	QP	29.85	3.52	33.37	46.00	-12.63

Remark: Corr. Factor = Antenna Factor + Cable Loss

6.5.3 Measurement results: frequency above 1GHz to 25GHz

Temperature (℃) :	24
Relative Humidity (%) :	57
Test date :	2022/12/06

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
802.11b Ch 1 Chain 0+1	3216	PK	H	-13.50	55.98	42.48	74	-31.52
	4824	PK	H	-7.33	66.20	58.87	74	-15.13
	4824	AV	H	-7.33	60.10	52.77	54	-1.23
	3216	PK	V	-13.50	58.24	44.74	74	-29.26
	4824	PK	V	-7.33	60.20	52.87	74	-21.13
802.11b Ch 6 Chain 0+1	3249.3	PK	H	-13.48	57.40	43.92	74	-30.08
	4874	PK	H	-6.99	64.00	57.01	74	-16.99
	4874	AV	H	-6.99	59.50	52.51	54	-1.49
	3249.3	PK	V	-13.48	60.13	46.65	74	-27.35
	4874	PK	V	-6.99	59.10	52.11	74	-21.89
802.11b Ch 11 Chain 0+1	3282.6	PK	H	-13.72	56.87	43.15	74	-30.85
	4924	PK	H	-6.84	64.00	57.16	74	-16.84
	4924	AV	H	-6.84	59.00	52.16	54	-1.84
	3282.6	PK	V	-13.72	61.11	47.39	74	-26.61
	4924	PK	V	-6.84	58.90	52.06	74	-21.94

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
802.11g Ch 1 Chain 0+1	3216	PK	H	-13.50	55.28	41.78	74	-32.22
	4824	PK	H	-7.33	63.50	56.17	74	-17.83
	4824	AV	H	-7.33	52.10	44.77	54	-9.23
	7236	PK	H	1.57	47.49	49.06	74	-24.94
	3216	PK	V	-13.50	56.68	43.18	74	-30.82
	4824	PK	V	-7.33	58.80	51.47	74	-22.53
	7236	PK	V	1.57	46.73	48.30	74	-25.70
802.11g Ch 6 Chain 0+1	3249.3	PK	H	-13.48	58.15	44.67	74	-29.33
	4874	PK	H	-6.99	59.00	52.01	74	-21.99
	3249.3	PK	V	-13.48	61.86	48.38	74	-25.62
	4874	PK	V	-6.99	56.90	49.91	74	-24.09
802.11g Ch 11 Chain 0+1	3282.6	PK	H	-13.72	57.80	44.08	74	-29.92
	4924	PK	H	-6.84	63.20	56.36	74	-17.64
	4924	AV	H	-6.84	52.00	45.16	54	-8.84
	7386	PK	H	1.65	49.20	50.85	74	-23.15
	3282.6	PK	V	-13.72	60.17	46.45	74	-27.55
	4924	PK	V	-6.84	58.30	51.46	74	-22.54
	7386	PK	V	1.65	49.60	51.25	74	-22.75

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
802.11n(HT20) Ch 1 Chain 0+1	3216	PK	H	-13.50	55.60	42.10	74	-31.90
	4824	PK	H	-7.33	65.00	57.67	74	-16.33
	4824	AV	H	-7.33	53.30	45.97	54	-8.03
	7236	PK	H	1.57	51.19	52.76	74	-21.24
	3216	PK	V	-13.50	59.06	45.56	74	-28.44
	4824	PK	V	-7.33	59.70	52.37	74	-21.63
	7236	PK	V	1.57	48.79	50.36	74	-23.64
802.11n(HT20) Ch 6 Chain 0+1	3249.3	PK	H	-13.48	57.60	44.12	74	-29.88
	4874	PK	H	-6.99	62.40	55.41	74	-18.59
	4874	AV	H	-6.99	51.19	44.20	54	-9.80
	7311	PK	H	1.74	49.70	51.44	74	-22.56
	3249.3	PK	V	-13.48	59.94	46.46	74	-27.54
	4874	PK	V	-6.99	60.30	53.31	74	-20.69
	7311	PK	V	1.74	47.40	49.14	74	-24.86
802.11n(HT20) Ch 11 Chain 0+1	3282.6	PK	H	-13.72	58.13	44.41	74	-29.59
	4924	PK	H	-6.84	62.00	55.16	74	-18.84
	4924	AV	H	-6.84	49.80	42.96	54	-11.04
	7386	PK	H	1.65	49.60	51.25	74	-22.75
	3282.6	PK	V	-13.72	61.38	47.66	74	-26.34
	4924	PK	V	-6.84	58.60	51.76	74	-22.24
	7386	PK	V	1.65	49.40	51.05	74	-22.95
802.11n(HT40) Ch 3 Chain 0+1	3229.3	PK	H	-13.50	56.13	42.63	74	-31.37
	4844	PK	H	-7.19	60.50	53.31	74	-20.69
	7266	PK	H	1.64	47.60	49.24	74	-24.76
	3229.3	PK	V	-13.50	58.34	44.84	74	-29.16
	4844	PK	V	-7.19	58.50	51.31	74	-22.69
802.11n(HT40) Ch 6 Chain 0+1	3249.3	PK	H	-13.48	58.47	44.99	74	-29.01
	4874	PK	H	-6.99	60.00	53.01	74	-20.99
	3249.3	PK	V	-13.48	61.46	47.98	74	-26.02
	4874	PK	V	-6.99	56.00	49.01	74	-24.99
802.11n(HT40) Ch 9 Chain 0+1	3269.3	PK	H	-13.62	56.41	42.79	74	-31.21
	4904	PK	H	-6.82	59.41	52.59	74	-21.41
	3269.3	PK	V	-13.62	60.34	46.72	74	-27.28
	4904	PK	V	-6.82	57.41	50.59	74	-23.41

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

7. Emission on Band Edge

7.1 Instrument Setting

Spectrum Function	Setting
Detector	Peak and Average
RBW	1MHz
VBW	3MHz & 1/T minimum kHz
Sweep	Auto couple
Restrict bands	2310 MHz ~ 2390 MHz 2483.5 MHz ~ 2500 MHz
Attenuation	Auto

7.2 Test Procedure

The test procedure is the same as Emissions in Restricted Frequency Bands (Radiated emission measurements).

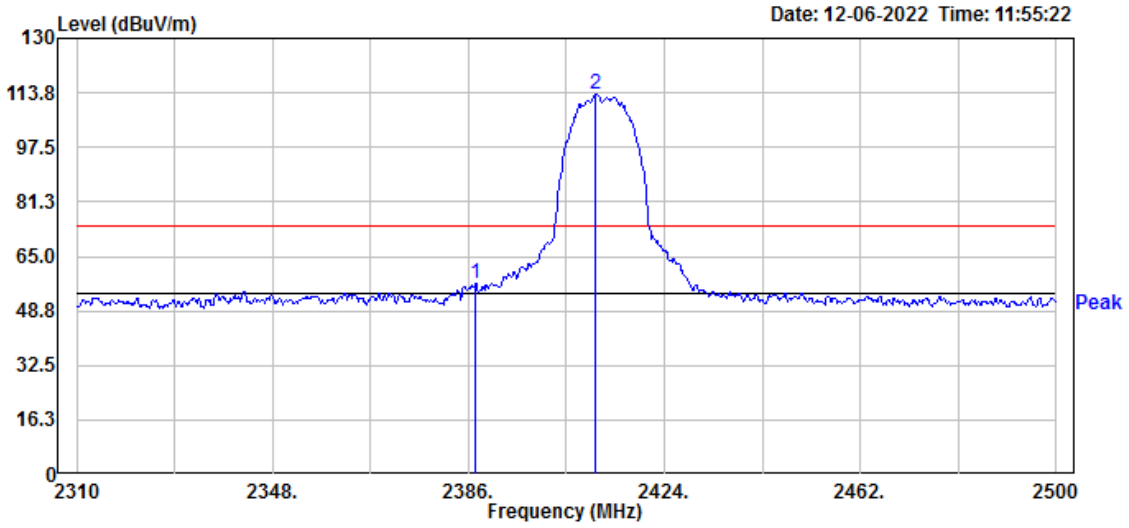
7.3 Test Results

Temperature (℃) :	24
Relative Humidity (%) :	57
Test date :	2022/12/06

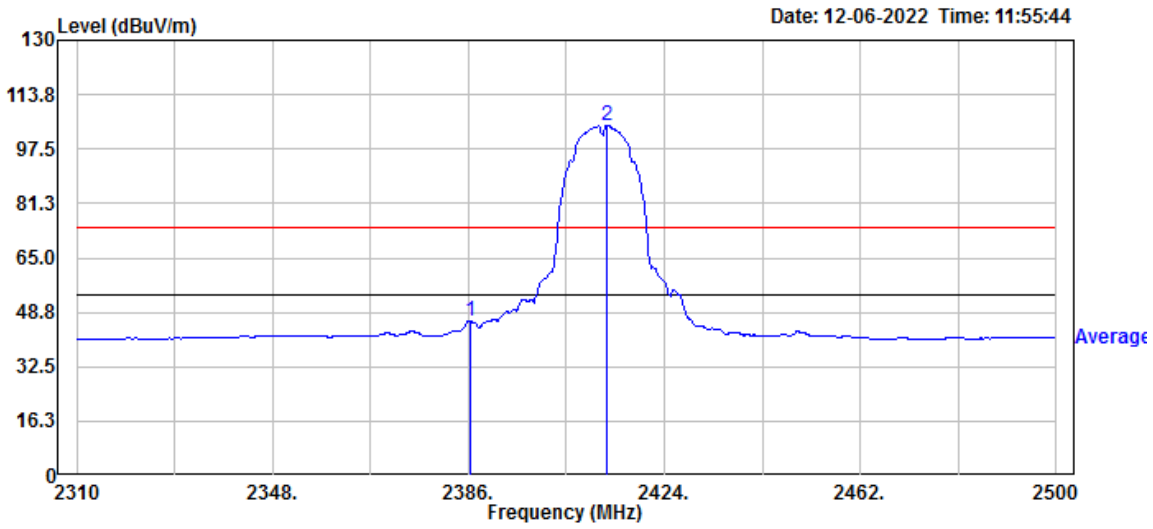
Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)	Restricted band (MHz)
802.11b Chain 0+1	2387.33	PK	H	34.26	22.56	56.82	74	-17.18	2310~2390
	2386.19	AV	H	34.27	12.08	46.35	54	-7.65	
	2484.23	PK	H	34.59	20.45	55.04	74	-18.96	2483.5~2500
	2483.50	AV	H	34.58	8.40	42.98	54	-11.02	
802.11g Chain 0+1	2386.00	PK	H	34.27	29.13	63.40	74	-10.60	2310~2390
	2389.99	AV	H	34.25	18.81	53.06	54	-0.94	
	2484.23	PK	H	34.59	25.84	60.43	74	-13.57	2483.5~2500
	2483.47	AV	H	34.58	15.17	49.75	54	-4.25	
802.11n(HT20) Chain 0+1	2389.61	PK	H	34.25	30.44	64.69	74	-9.31	2310~2390
	2390.00	AV	H	34.25	18.09	52.34	54	-1.66	
	2483.50	PK	H	34.58	27.79	62.37	74	-11.63	2483.5~2500
	2483.50	AV	H	34.58	15.91	50.49	54	-3.51	
802.11n(HT40) Chain 0+1	2389.61	PK	H	34.25	29.78	64.03	74	-9.97	2310~2390
	2389.99	AV	H	34.25	17.61	51.86	54	-2.14	
	2485.94	PK	H	34.60	30.36	64.96	74	-9.04	2483.5~2500
	2483.50	AV	H	34.58	18.45	53.03	54	-0.97	

Remark: Correction Factor = Antenna Factor + Cable Loss

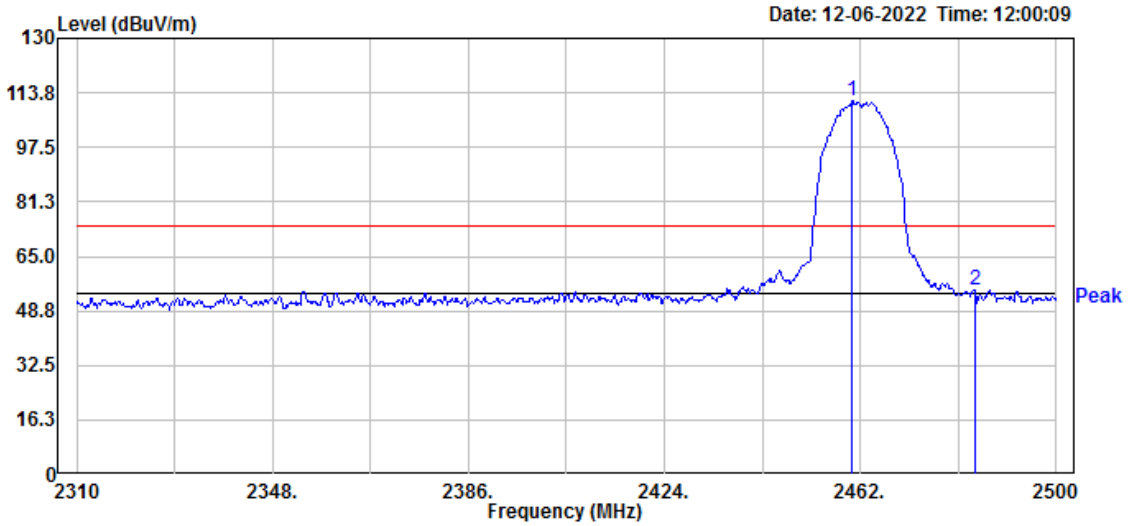
Chain0+1 : Restricted Band Bandedge @ 802.11b Mode Ch1 PK



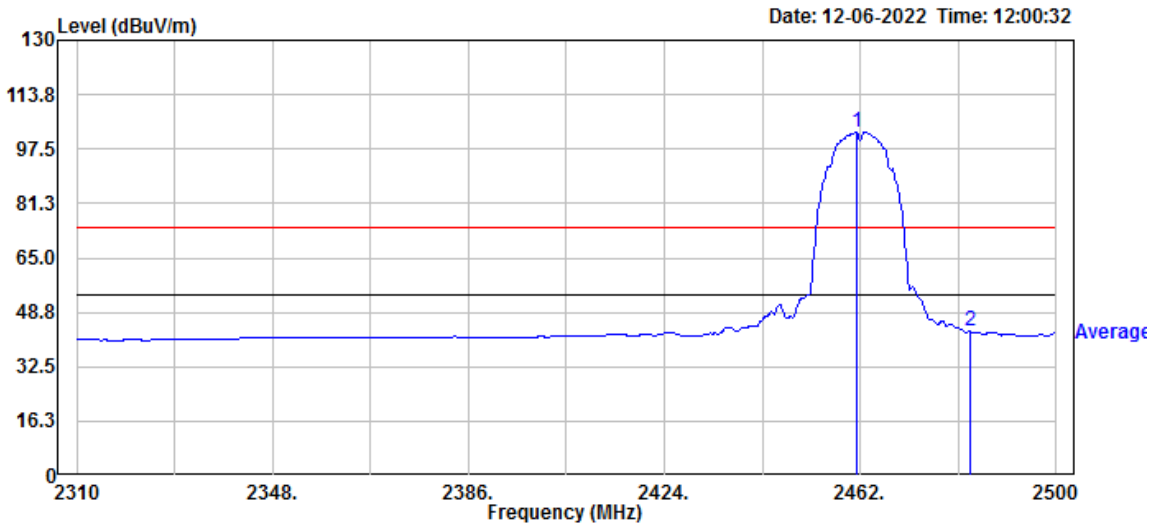
Chain0+1 : Restricted Band Bandedge @ 802.11b Mode Ch1 AV



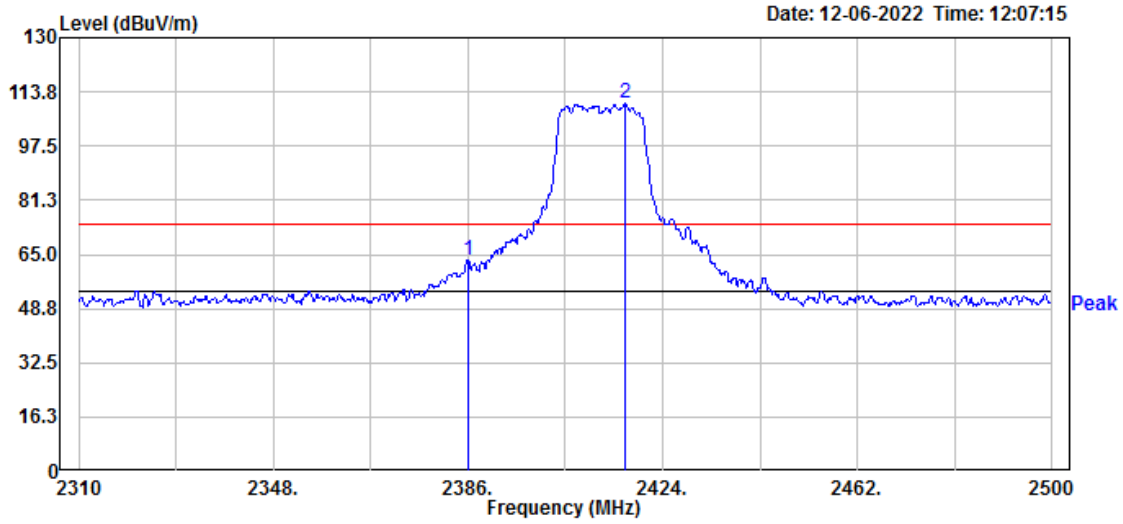
Chain0+1 : Restricted Band Bandedge @ 802.11b Mode Ch11 PK



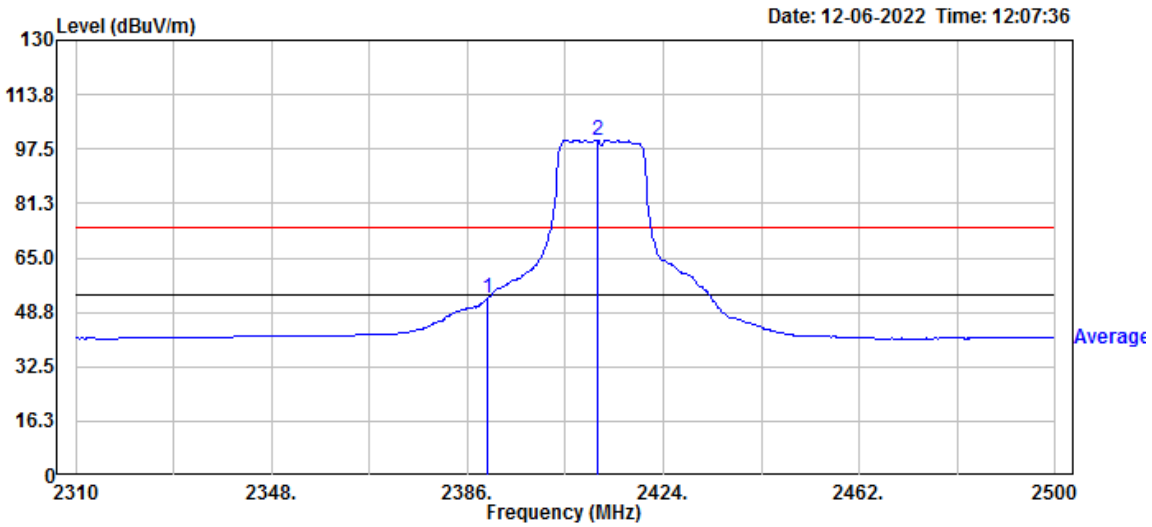
Chain0+1 : Restricted Band Bandedge @ 802.11b Mode Ch11 AV



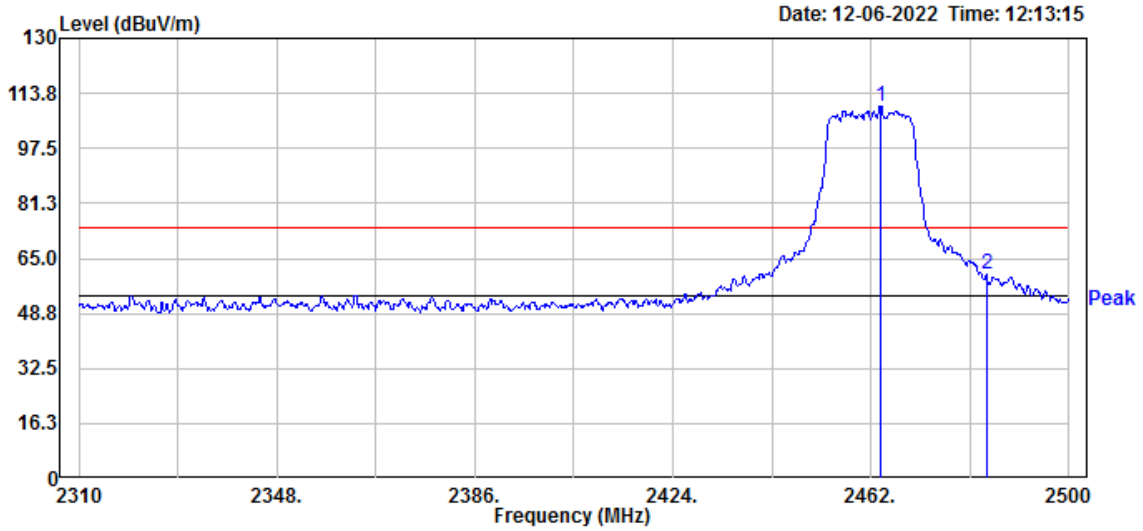
Chain0+1 : Restricted Band Bandedge @ 802.11g Mode Ch1 PK



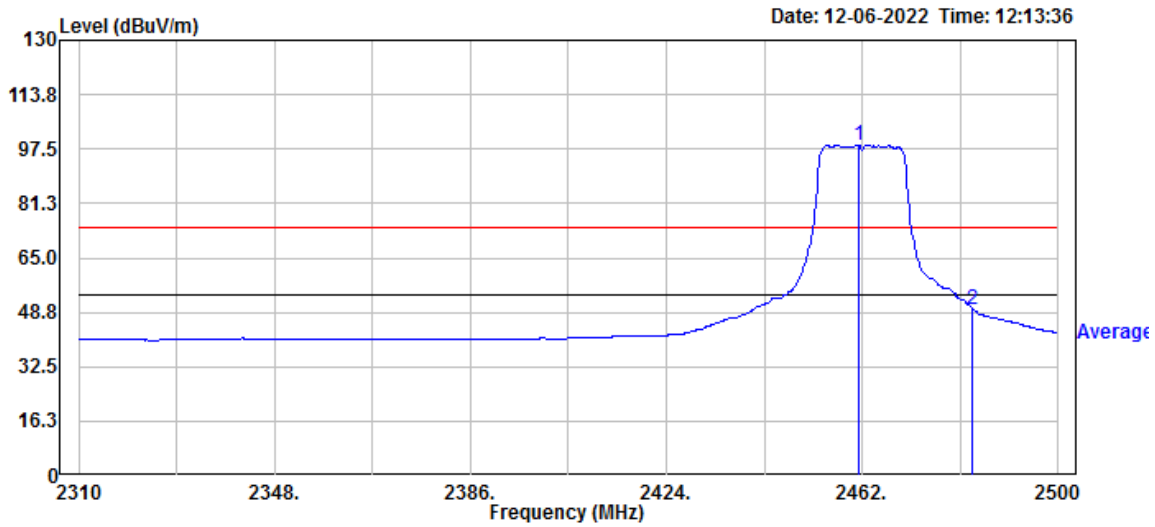
Chain0+1 : Restricted Band Bandedge @ 802.11g Mode Ch1 AV



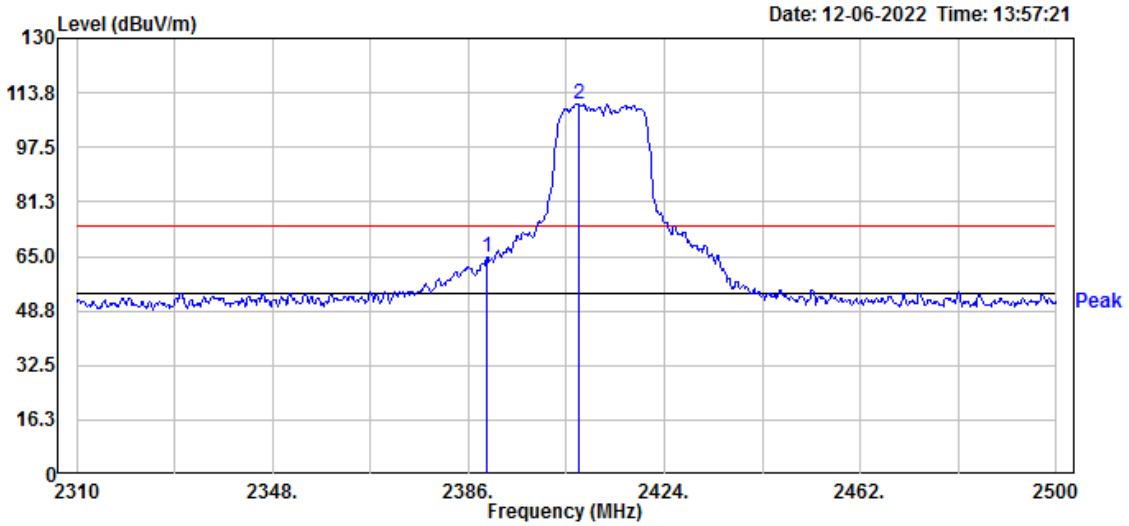
Chain0+1 : Restricted Band Bandedge @ 802.11g Mode Ch11 PK



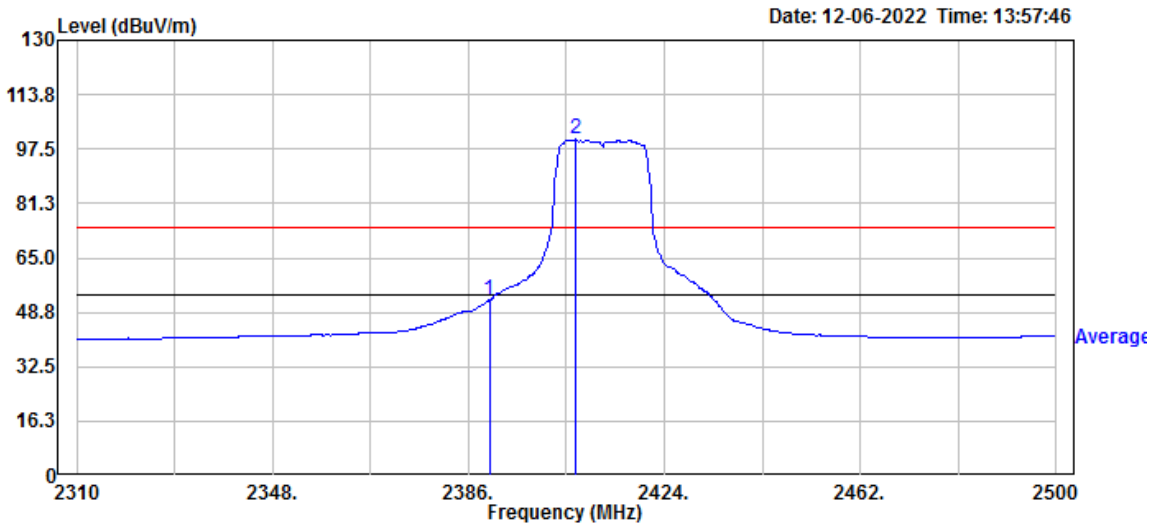
Chain0+1 : Restricted Band Bandedge @ 802.11g Mode Ch11 AV



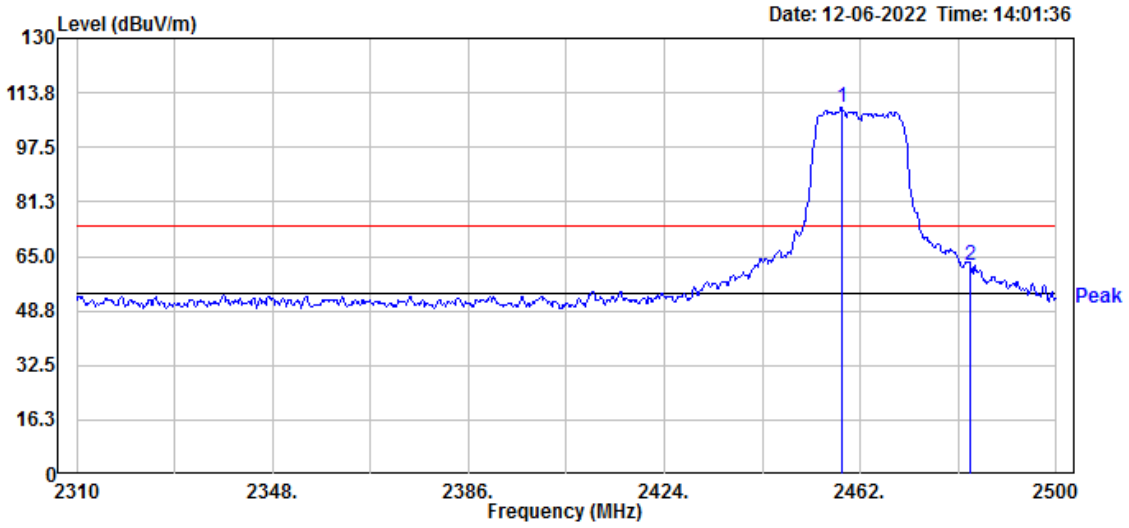
Chain0+1 : Restricted Band Bandedge @ 802.11n(HT20) Mode Ch1 PK



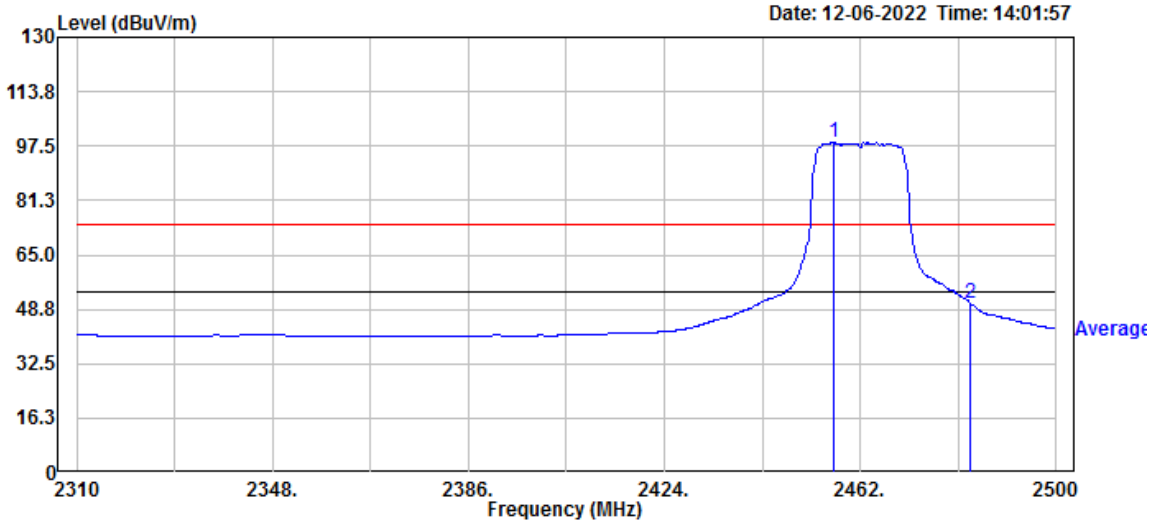
Chain0+1 : Restricted Band Bandedge @ 802.11n(HT20) Mode Ch1 AV



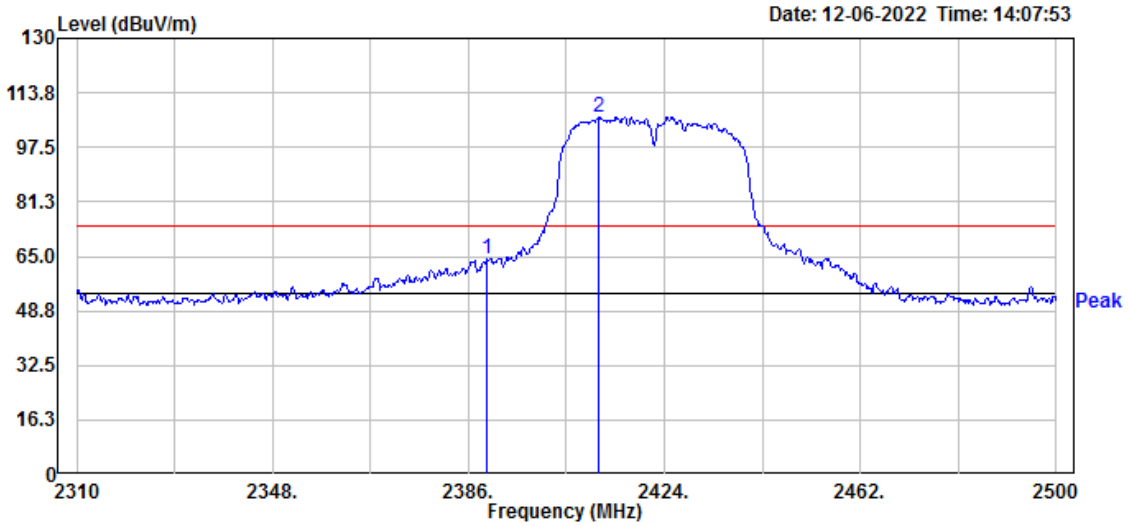
Chain0+1 : Restricted Band Bandedge @ 802.11n(HT20) Mode Ch11 PK



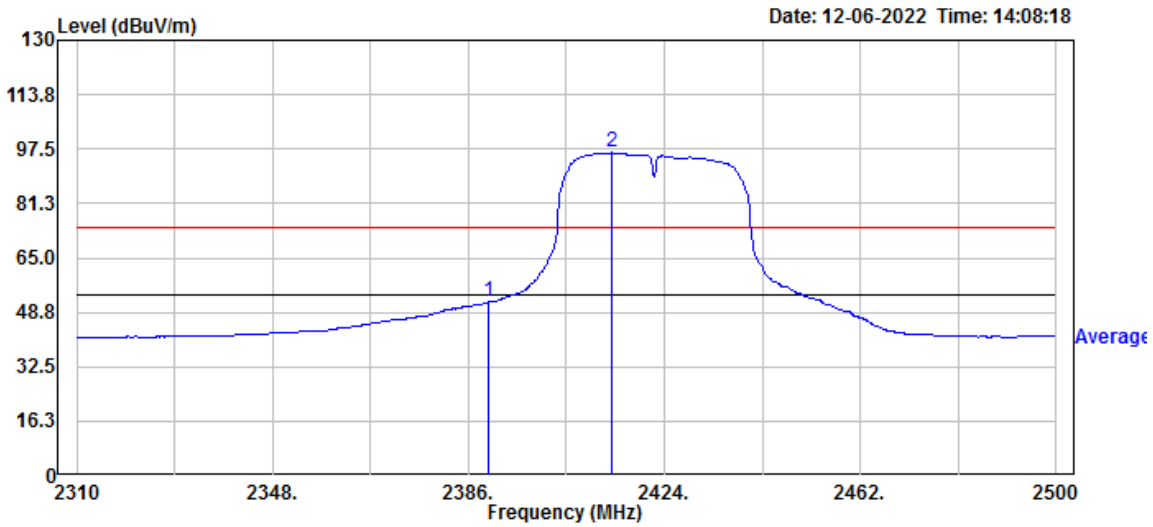
Chain0+1 : Restricted Band Bandedge @ 802.11n(HT20) Mode Ch11 AV



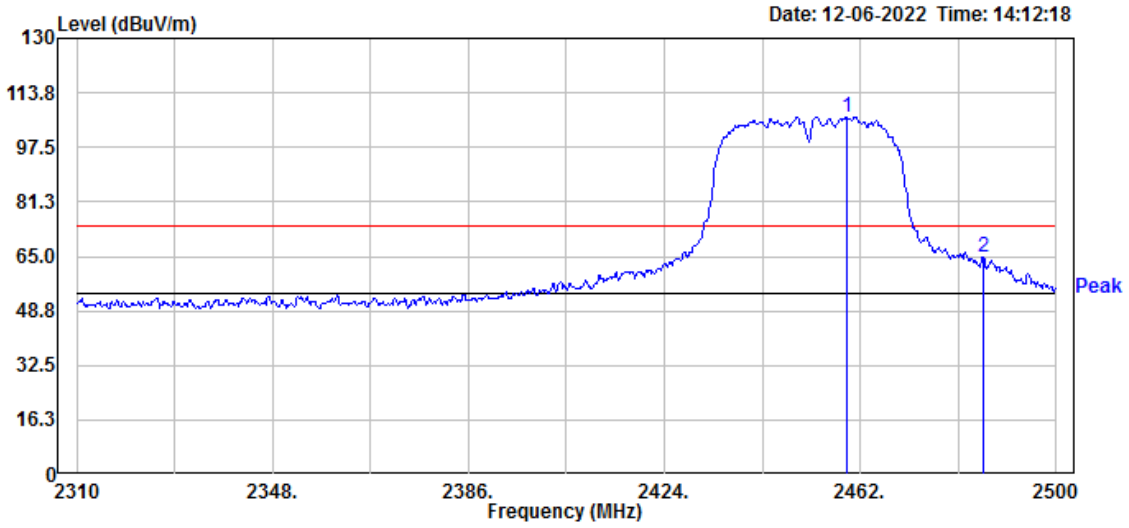
Chain0+1 : Restricted Band Bandedge @ 802.11n(HT40) Mode Ch3 PK



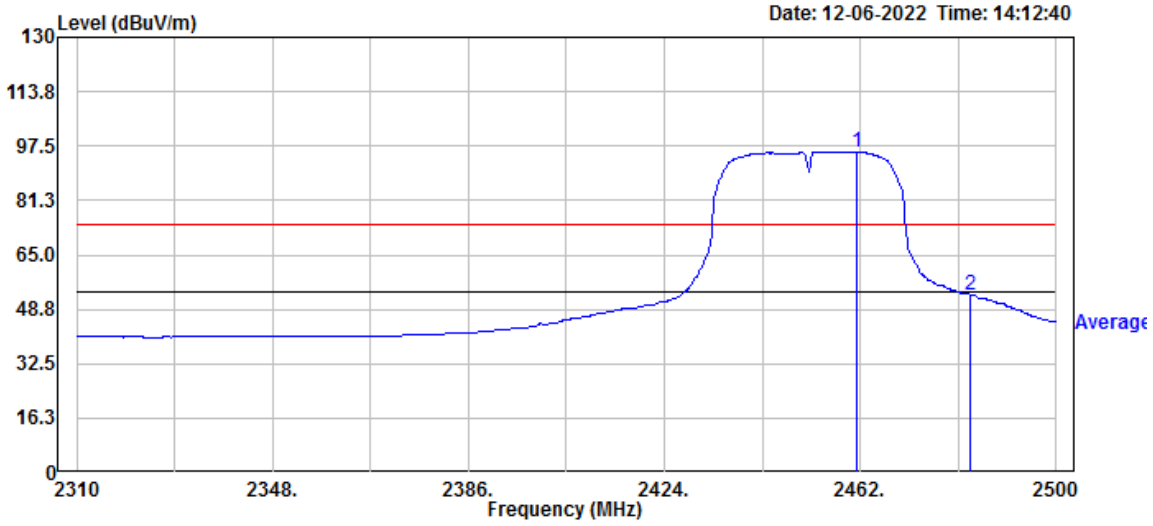
Chain0+1 : Restricted Band Bandedge @ 802.11n(HT40) Mode Ch3 AV



Chain0+1 : Restricted Band Bandedge @ 802.11n(HT40) Mode Ch9 PK



Chain0+1 : Restricted Band Bandedge @ 802.11n(HT40) Mode Ch9 AV



8. AC Power Line Conducted Emission

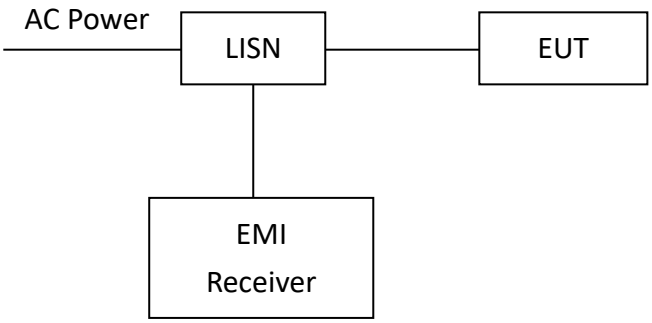
8.1 Measuring instrument setting

Receiver Function	Setting
Detector	QP
Start frequency	0.15MHz
Stop frequency	30MHz
IF bandwidth	9 kHz
Attenuation	10dB

8.2 Test Procedure

Step 1	Configure the EUT according to ANSI C63.10:2013. The EUT or host of EHT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
Step 2	Connect EUT or host of EUT to the power mains through a line impedance stabilization network.
Step 3	All the companion devices are connected to the other LISN. The LISN should provide 50Uh/50ohms coupling impedance.
Step 4	The frequency range from 150 kHz to 30MHz was searched.
Step 5	Set the test-receiver system to peak detector and specified bandwidth with maximum hold mode.
Step 6	The measurement has to be done between each power line and ground at the power terminal.

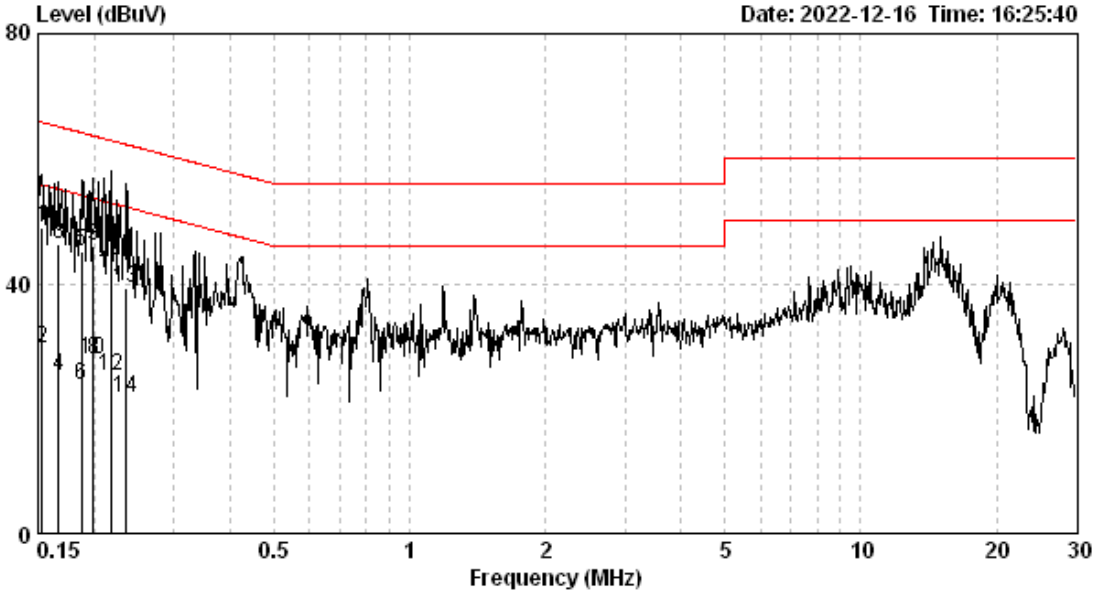
8.3 Test Diagram



8.4 Limit

Frequency (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56	56 – 46
0.50~5.00	56	46
5.00~30.0	60	50

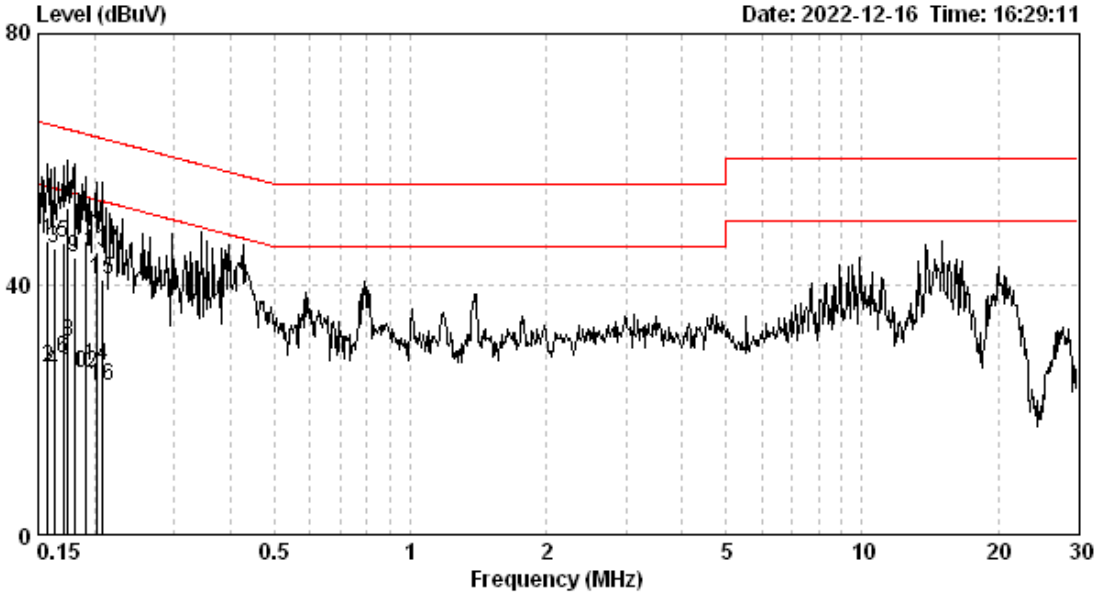
8.5 Test Results



Test voltage :120Vac, 60Hz
Temp./ R.H. :20 °C / 66 %RH
Atmospheric pressure :1008 hPa

Phase	Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB) QP	Margin (dB) AV
LINE	0.153	0.08	48.76	48.84	65.82	29.66	29.74	55.82	-16.99	-26.08
LINE	0.167	0.08	46.09	46.17	65.12	25.18	25.26	55.12	-18.95	-29.86
LINE	0.187	0.08	44.95	45.03	64.15	23.53	23.61	54.15	-19.12	-30.54
LINE	0.199	0.08	45.79	45.87	63.67	27.89	27.97	53.67	-17.80	-25.70
LINE	0.217	0.08	41.65	41.73	62.92	25.20	25.28	52.92	-21.19	-27.64
LINE	0.235	0.08	39.11	39.19	62.26	21.53	21.62	52.26	-23.07	-30.64

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)



Test voltage :120Vac, 60Hz
Temp./ R.H. :20 °C / 66 %RH
Atmospheric pressure :1008 hPa

Phase	Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB) QP	Margin (dB) AV
NEUTRAL	0.157	0.08	46.77	46.85	65.60	26.73	26.81	55.60	-18.75	-28.80
NEUTRAL	0.162	0.08	45.75	45.83	65.34	25.96	26.04	55.34	-19.51	-29.30
NEUTRAL	0.170	0.08	46.52	46.60	64.94	27.96	28.04	54.94	-18.35	-26.90
NEUTRAL	0.175	0.08	52.04	52.12	64.72	30.60	30.68	54.72	-12.60	-24.04
NEUTRAL	0.181	0.08	44.20	44.28	64.46	25.82	25.90	54.46	-20.18	-28.56
NEUTRAL	0.190	0.08	46.85	46.93	64.02	25.72	25.80	54.02	-17.09	-28.22
NEUTRAL	0.202	0.08	44.99	45.07	63.54	26.99	27.07	53.54	-18.47	-26.47
NEUTRAL	0.207	0.08	40.78	40.86	63.32	23.51	23.59	53.32	-22.45	-29.72

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)

Appendix A: Test equipment list

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESR7	101822	2022/08/09	2023/08/08
Signal Analyzer	Agilent	N9030A	MY51380492	2022/08/09	2023/08/08
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2022/04/13	2023/04/12
Bilog Hybrid Antenna	ETC	MCTD 2786B	BLB17J04019 & JB-5-019	2022/10/04	2023/10/03
Horn Antenna	SHWARZBECK	BBHA 9120 D	9120D-456	2022/01/21	2023/01/20
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170159	2020/08/20	2023/08/19
Broadband Amplifier	SGH	SGH118(45dB)	20220105-1	2022/01/07	2023/01/06
Pre-amplifier	SGH	SGH184	20201124-1	2022/11/11	2023/11/10
Power Meter	Anritsu	ML2495A	0844001	2022/07/04	2023/07/03
Power Sensor	Anritsu	MA2491A	031543	2022/03/07	2023/03/06
966-2(A) Cable	SUHNER	SMA / EX 100	N/A	2022/03/04	2023/03/03
966-2(B) Cable	SUHNER	SUCOFLEX 104P	CB0005	2022/03/04	2023/03/03
966-2 Cable	SUHNER	SUCOFLEX 104P	9403/4P	2022/11/25	2023/11/24
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2022/01/14	2023/01/13
Hight Pass Filter	Reactel	7HS-3G/18G-S11	N/A	2022/05/25	2023/05/24
20dB Attenuator	Mini-Circuits	BW-S20W5+	N/A	2022/05/25	2023/05/24
Test software	Audix	e3	V9	NCR	NCR

Note: No Calibration Required (NCR).

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	R&S	ESR7	101232	2022/02/07	2023/02/06
LISN	R&S	ESH3-Z5	835239/023	2022/07/26	2023/07/25
CON-3 Cable	SUHNER	SUCOFLEX 106	27222 /6	2022/01/12	2023/01/11
Test software	Audix	e3	V4.20040112L	NCR	NCR

Note: No Calibration Required (NCR).

Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

Item	Uncertainty
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.16 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.02 dB
Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	5.17 dB
Vertically polarized Radiated disturbances from 18GHz~26.5GHz in a semi-anechoic chamber at a distance of 1m	2.39 dB
Horizontally polarized Radiated disturbances from 18GHz~26.5GHz in a semi-anechoic chamber at a distance of 1m	2.39 dB
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.70 dB
Emission on the Band Edge Test	4.32 dB
RF Antenna Conducted Spurious Test	1.27 dB
Maximum Output Power Test	0.44 dB
Occupied Bandwidth Test	7.78 %
Carrier Frequency Separation Test	1.27 dB
Number of Hopping Frequencies Test	1.27 dB
Time of Occupancy (Dwell Time) Test	1.27 dB
AC Power Line Conducted Emission	3.08 dB