

ZUNIDATA SYSTEMS INC.

TEST REPORT

SCOPE OF WORK:

47 CFR FCC Part 15.247 – Radio Spectrum report

Model:

MB545AXXXXXX(X = 0~9 or A~Z or Blank or -)

REPORT NUMBER

211000230THC-001

ISSUE DATE

Dec. 07, 2021

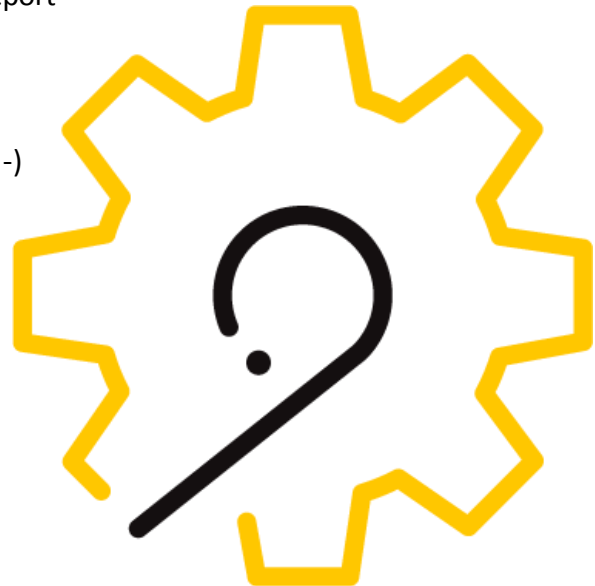
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59

DOCUMENT CONTROL NUMBER

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Radio Spectrum TEST REPORT

Applicant:	ZUNIDATA SYSTEMS INC. 6F, No. 945, Boai Street, Jubei City, Hsinchu, 302045 Taiwan
Product:	Digital Signage Media Box
Model No.:	MB545AXXXXXX (X=0~9 or A~Z or Blank or -)
FCC ID:	Z28-MB545A
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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Reviewer

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TEST REPORT**Revision History**

Report No.	Issue Date	Revision Summary
211000230THC-001	Dec. 07, 2021	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:	Digital Signage Media Box
Model No.:	MB545A
Operating Frequency:	2412 MHz ~ 2462 MHz for 802.11b, 802.11g, 802.11n HT20 2422 MHz ~ 2462 MHz for 802.11n HT40
Frequency of Each Channel:	2412+5 k, k=0 ~ 10 for 802.11b, 802.11g, 802.11n HT20 2422+5 k, k=0 ~ 6 for 802.11n(HT40)
Rated Power:	DC 12V from adapter
Power Cord:	N/A
Sample receiving date:	2021/10/14
Sample condition:	Workable
Test Date(s):	2021/11/20 ~ 2021/12/02

1.2 Adapter information

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

No.	Model no.	Specification
Adapter 1	2AAJ024FC	I/P: 100-240Vac, 50/60Hz, 0.8A O/P: 12Vdc, 2.0A, 24W
Adapter 2	2ABL024F	I/P: 100-240Vac, 50/60Hz, 0.8A O/P: 12Vdc, 2.0A, 24W

1.3 Additional information about the EUT

The customer confirmed MB545AXXXXXX (X=0~9 or A~Z or Blank or -) is a series model to MB545A (EUT), the different model numbers are served as marketing strategy.

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

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1.4 Description of the EUT

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

1.5 Antenna description

Antenna Gain : 2.6 dBi
 Antenna Type : Dipole antenna
 Connector Type : RP-SMA

1.6 Operation mode

Turn on RF TOOL TEST after EUT is powered on and select different frequency and modulation.

With individual verifying, the maximum output power were 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 (Mbps)	Signal on time (ms)	Signal on+off time (ms)	Duty cycle	Duty factor (dB)
802.11b	6	2437	1	8.43	8.47	0.995	0.021
802.11g	6	2437	6	1.39	1.44	0.965	0.154
802.11n(HT20)	6	2437	6.5	1.30	1.35	0.962	0.170
802.11n(HT40)	6	2437	13.5	0.61	0.69	0.889	0.513

1.7 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Description of Data Cable
Notebook PC	HP	HSTNN-Q96C	5CD8021S9J	(1) RJ-45 UTP Cat.5 0.5 meter (2) mini HDMI to HDMI shielded cable 0.5 meter with 2 core
Earphone	HTC	INNOVATION	N/A	N/A
USB mouse	HP	MOHQQUO	N/A	N/A
USB keyboard	DELL	SK-8115	N/A	N/A
Monitor	ViewSoin	VS16024	N/A	HDMI shielded cable 0.5 meter with 2 core
Monitor	PHILIPS	LTC2915/90	N/A	HDMI shielded cable 0.5 meter with 2 core
Monitor	HP	D2827A	KR91049220	HDMI cable 1m
Wireless AP	Burffalo	WZR-AGL300NH	N/A	N/A
Micro SD card	Transcend	UHS-1 MICRO SD 300S	N/A	N/A

2. Minimum 6 dB Bandwidth

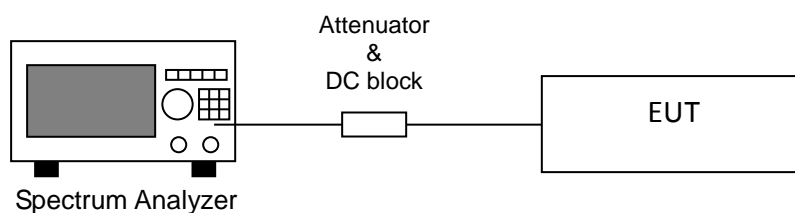
2.1 Instrument Setting

Spectrum Parameter	Setting
Detector	Peak
RBW	100kHz
VBW	$\geq 3 \times \text{RBW}$
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.

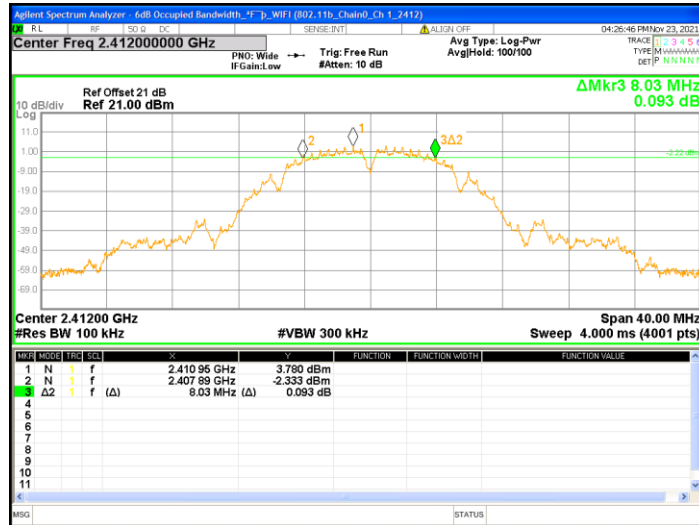
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2.5 Test Results

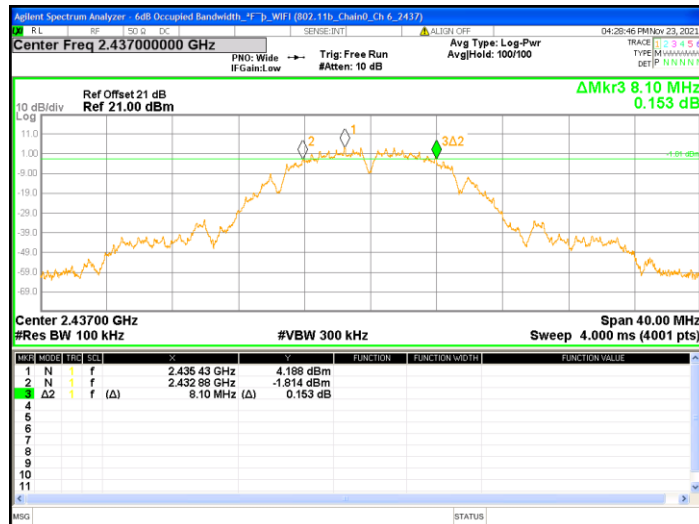
Temperature (°C) :	26
Relative Humidity (%) :	63
Test date :	2021/11/23

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	1	2412	8.03	>0.5	Pass
	6	2437	8.10	>0.5	Pass
	11	2462	8.51	>0.5	Pass
802.11g	1	2412	16.31	>0.5	Pass
	6	2437	16.32	>0.5	Pass
	11	2462	16.04	>0.5	Pass
802.11n(HT20)	1	2412	17.29	>0.5	Pass
	6	2437	15.71	>0.5	Pass
	11	2462	16.06	>0.5	Pass
802.11n(HT40)	3	2422	35.53	>0.5	Pass
	6	2437	35.13	>0.5	Pass
	9	2452	35.48	>0.5	Pass

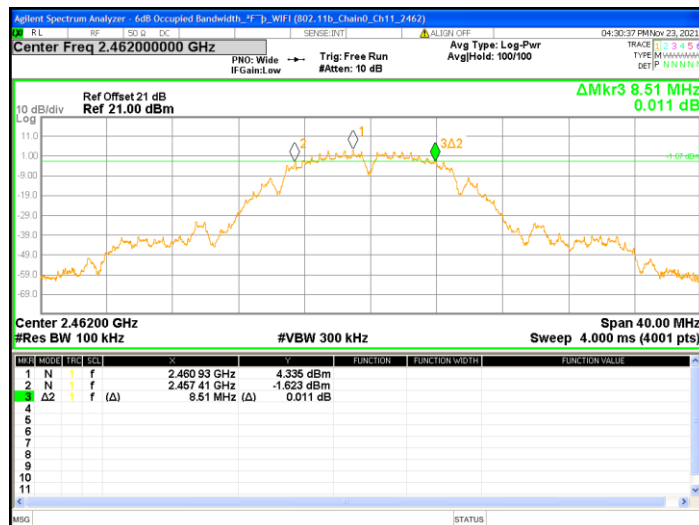
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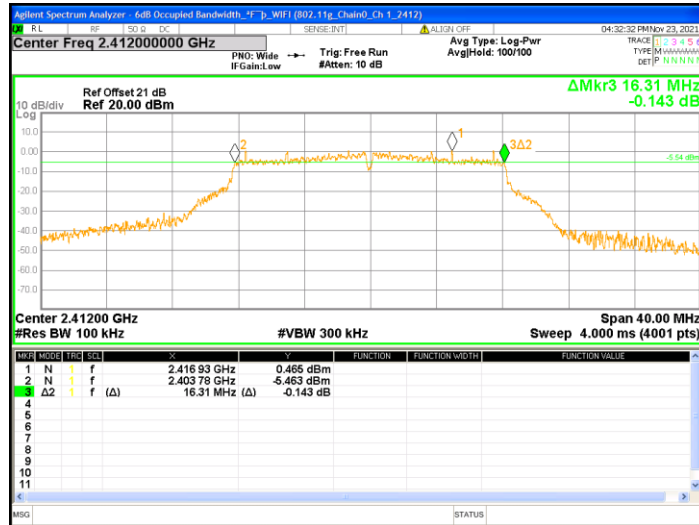
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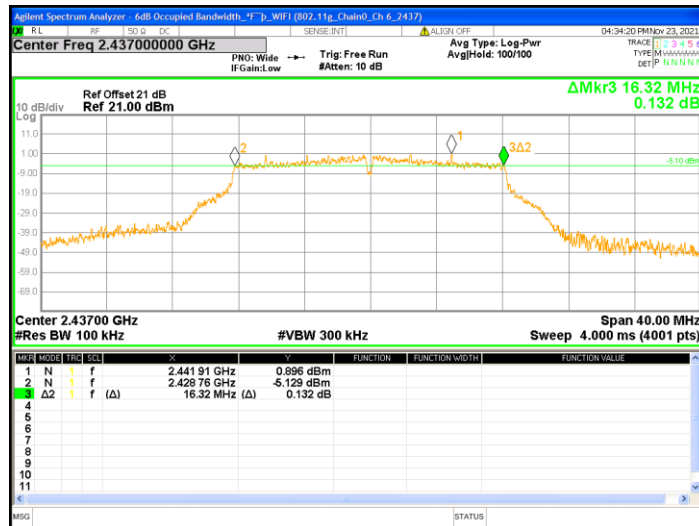
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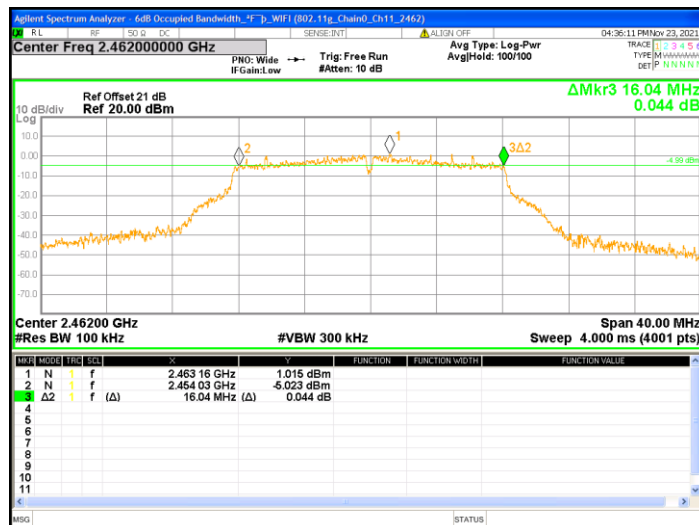
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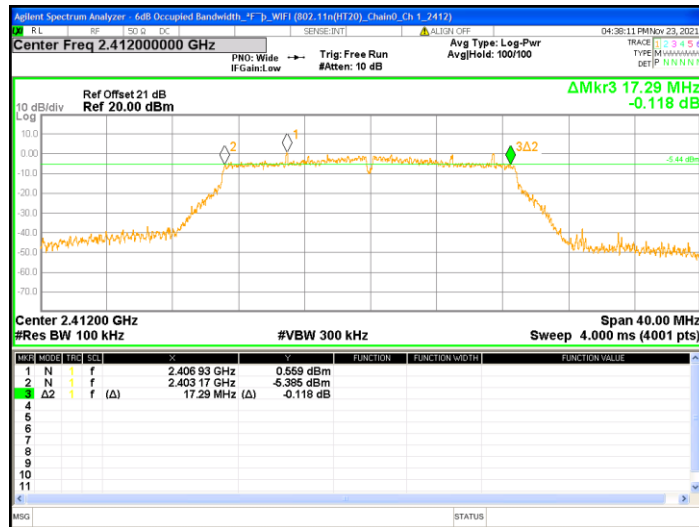
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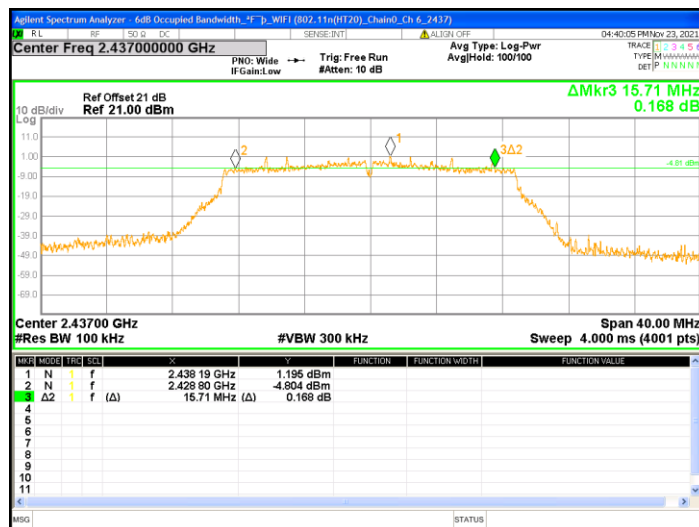
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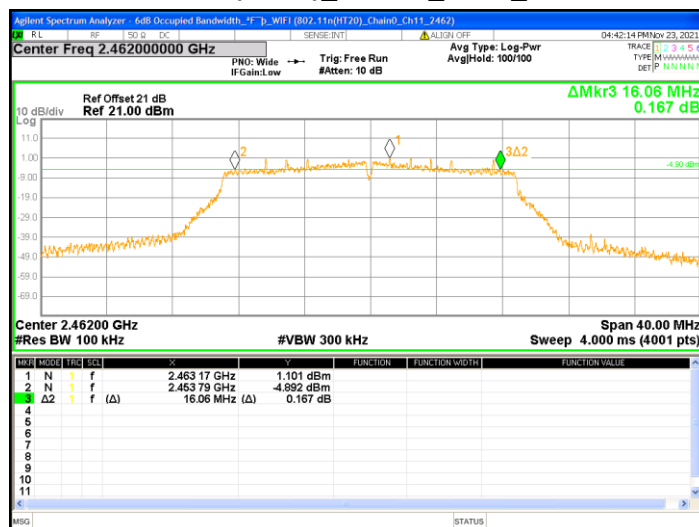
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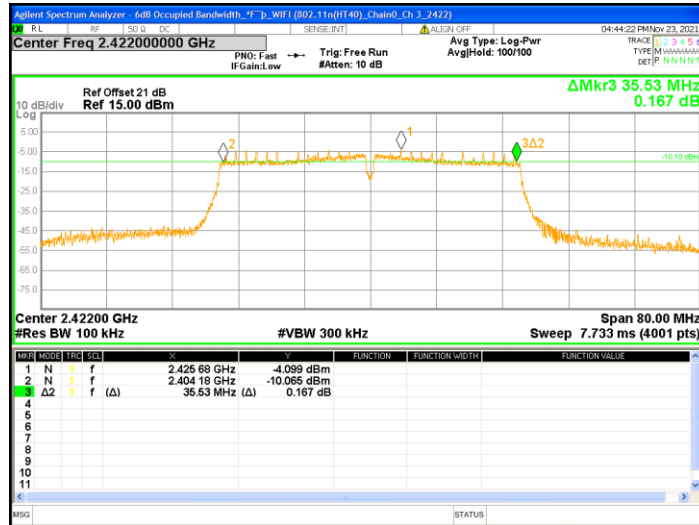
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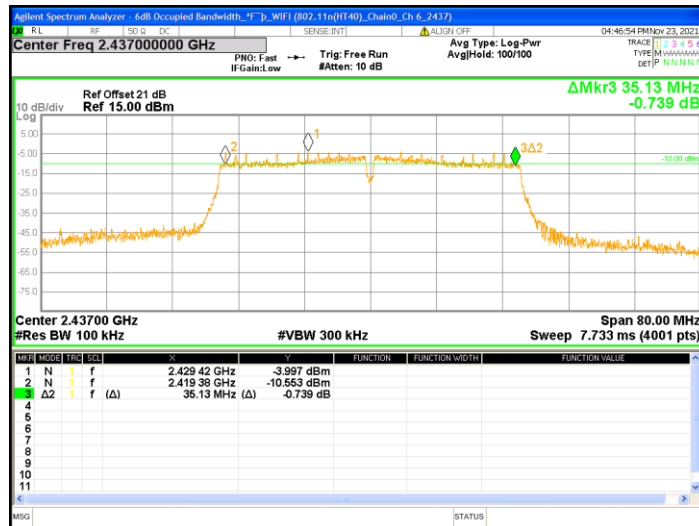
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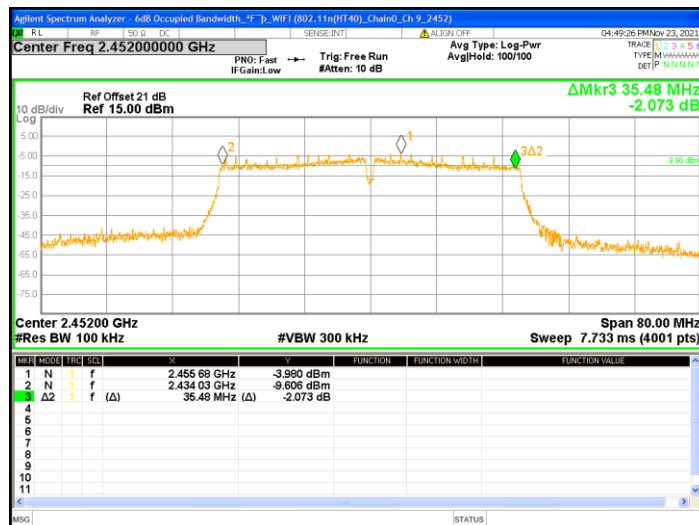
802.11n(HT40)_Chain0_Ch 3_2422



802.11n(HT40)_Chain0_Ch 6_2437



802.11n(HT40)_Chain0_Ch 9_2452



3. Maximum Peak Conducted Output Power

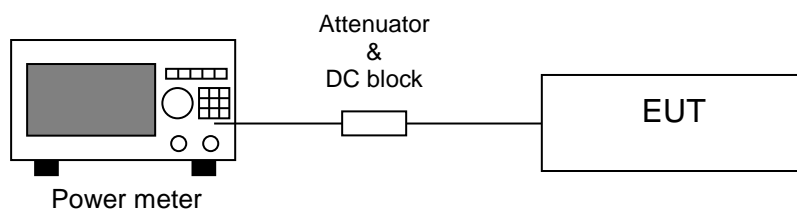
3.1 Instrument Setting

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

3.2 Test 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)

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3.5 Test Results

Temperature (°C) :	26
Relative Humidity (%) :	63
Test date :	2021/11/23

Mode	Channel	Frequency (MHz)	Output Power (AV) (dBm)	Total Power (AV) (mW)	Maximum power (PK) (dBm)	Maximum power (PK) (mW)	Limit (dBm)	Margin (dB)
802.11b	1	2412	12.41	17.42	15.42	34.83	30	-14.58
	6	2437	12.27	16.87	15.22	33.27	30	-14.78
	11	2462	12.60	18.20	15.47	35.24	30	-14.53
802.11g	1	2412	12.40	17.38	21.38	137.40	30	-8.62
	6	2437	12.78	18.97	21.26	133.66	30	-8.74
	11	2462	12.58	18.11	21.70	147.91	30	-8.30
802.11n (HT20)	1	2412	12.10	16.22	21.44	139.32	30	-8.56
	6	2437	12.15	16.41	20.48	111.69	30	-9.52
	11	2462	12.26	16.83	21.64	145.88	30	-8.36
802.11n (HT40)	3	2422	10.01	10.02	18.95	78.52	30	-11.05
	6	2437	9.89	9.75	18.77	75.34	30	-11.23
	9	2452	10.02	10.05	18.25	66.83	30	-11.75

4. Power Spectral Density

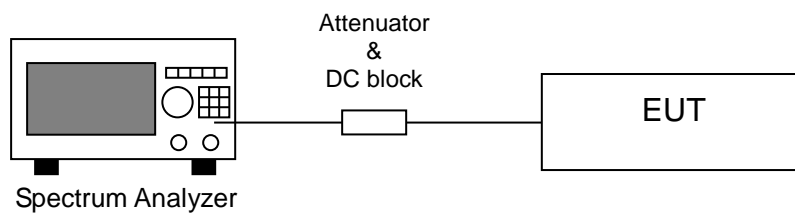
4.1 Instrument Setting

Spectrum Function	Setting
Detector	Peak
RBW	≥ 3 kHz
VBW	$\geq 3 \times$ 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

TEST REPORT

4.5 Test Results

Temperature (°C) :	26
Relative Humidity (%) :	63
Test date :	2021/11/23

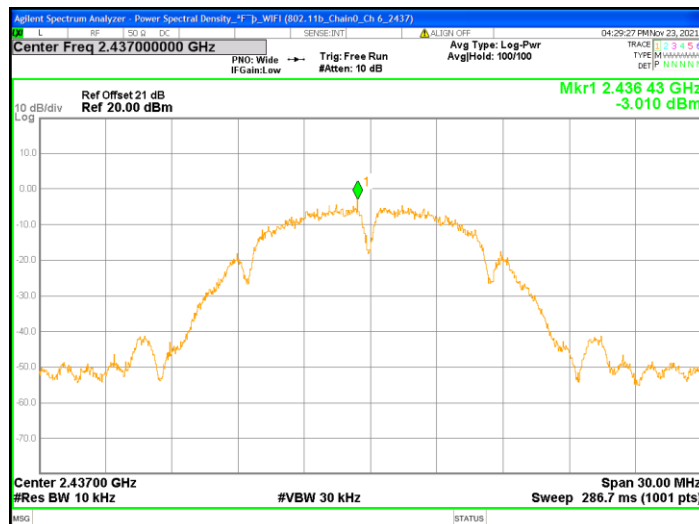
Note: Because using KDB 662911 v02r01 D01 E) 2) c), we found the peak PSD and add 10 log(N_{ANT}) dB, where N_{ANT} is the number of outputs. Before adding 10 log(N_{ANT}).

Mode	Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
802.11b	1	2412	-3.933	8	-11.933
	6	2437	-3.010	8	-11.010
	11	2462	-4.271	8	-12.271
802.11g	1	2412	-5.813	8	-13.813
	6	2437	-5.405	8	-13.405
	11	2462	-5.177	8	-13.177
802.11n(HT20)	1	2412	-5.755	8	-13.755
	6	2437	-6.327	8	-14.327
	11	2462	-4.923	8	-12.923
802.11n(HT40)	3	2422	-10.930	8	-18.930
	6	2437	-10.503	8	-18.503
	9	2452	-10.137	8	-18.137

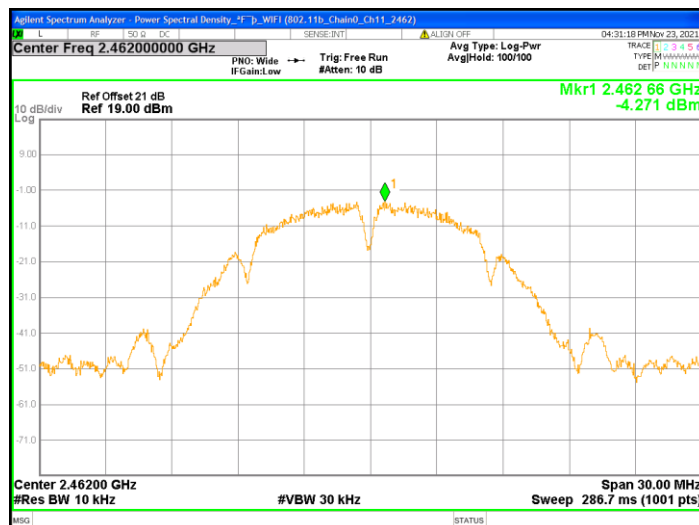
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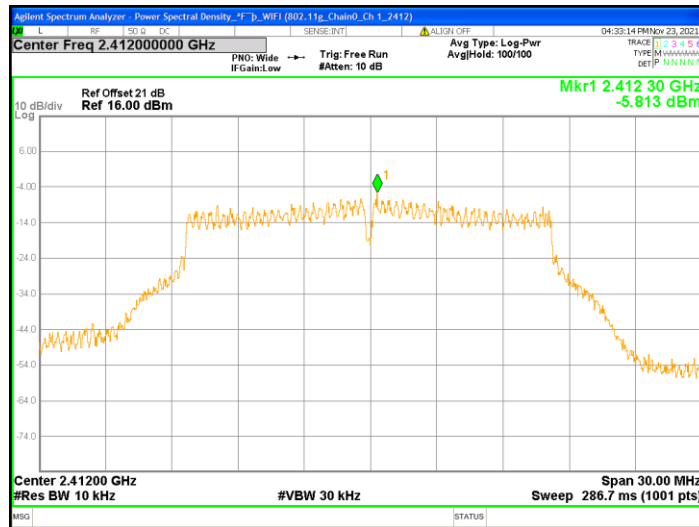
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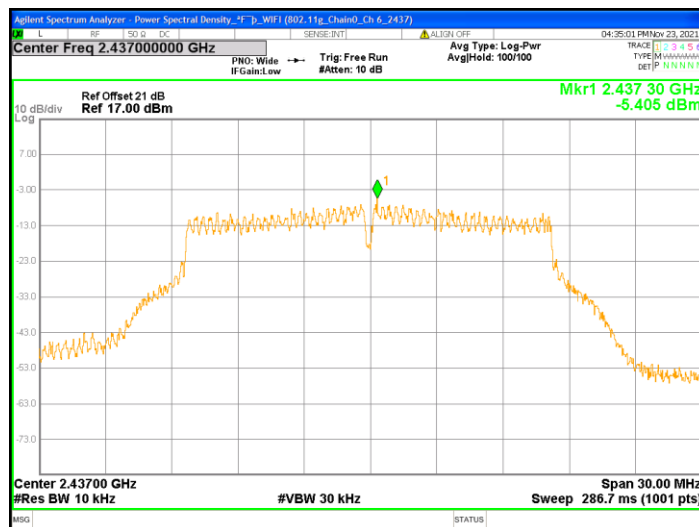
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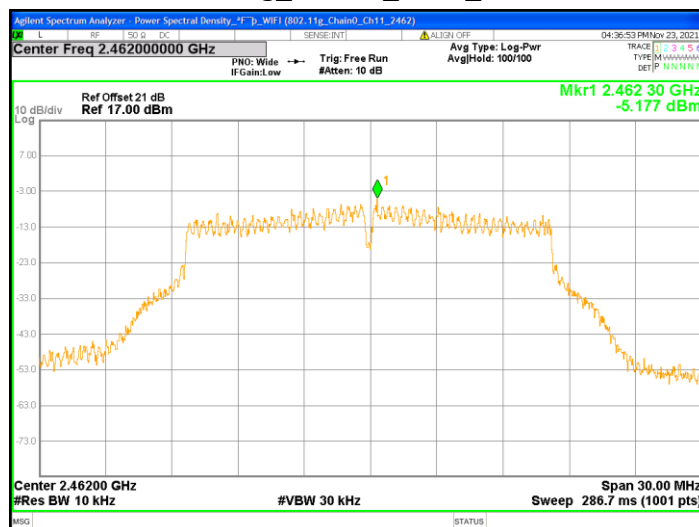
802.11g_Chain0_Ch 1_2412



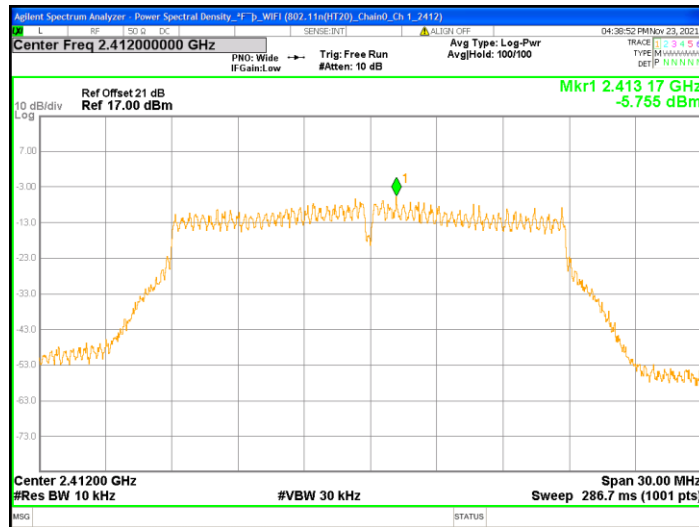
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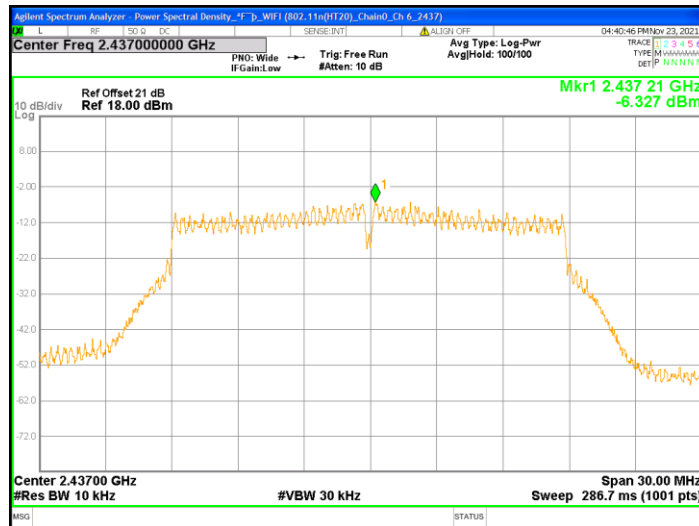
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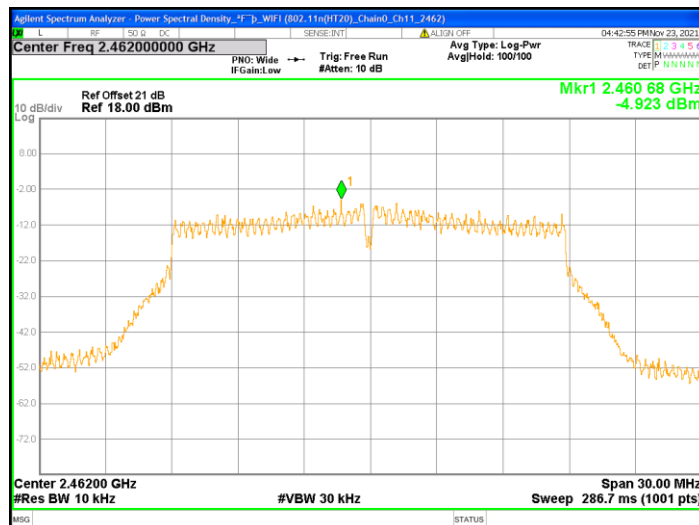
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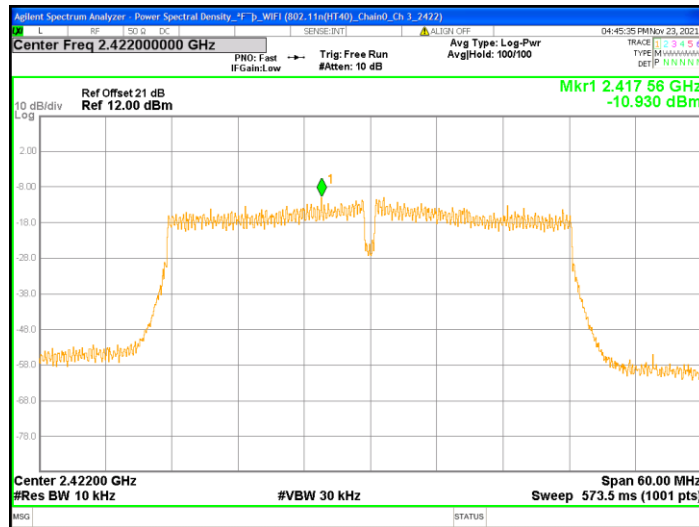
802.11n(HT20)_Chain0_Ch 6_2437



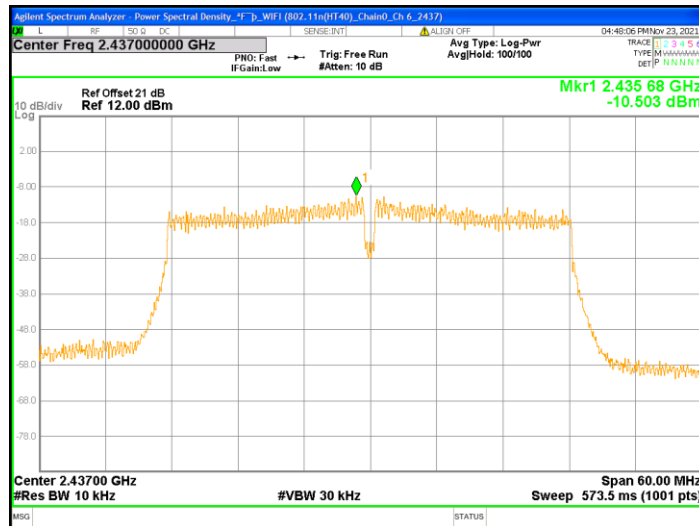
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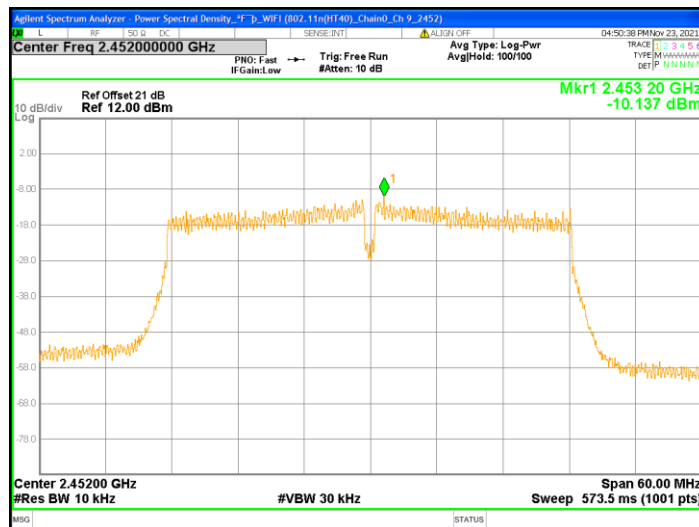
802.11n(HT40)_Chain0_Ch 3_2422



802.11n(HT40)_Chain0_Ch 6_2437



802.11n(HT40)_Chain0_Ch 9_2452



5. Emissions in Non-Restricted Frequency Bands

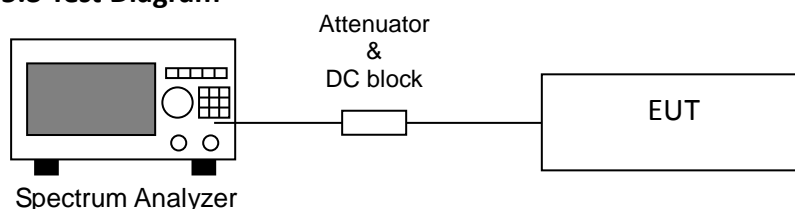
5.1 Instruments Setting

Spectrum Function	Setting (Reference Level)	Setting (Emission Level)
Detector	Peak	Peak
RBW	≥ 100 kHz	≥ 100 kHz
VBW	$\geq 3 \times$ RBW	$\geq 3 \times$ RBW
Sweep	Auto couple	Auto couple
Trace	Max hold	Max hold
Span	≥ 1.5 time 6dB bandwidth	X
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



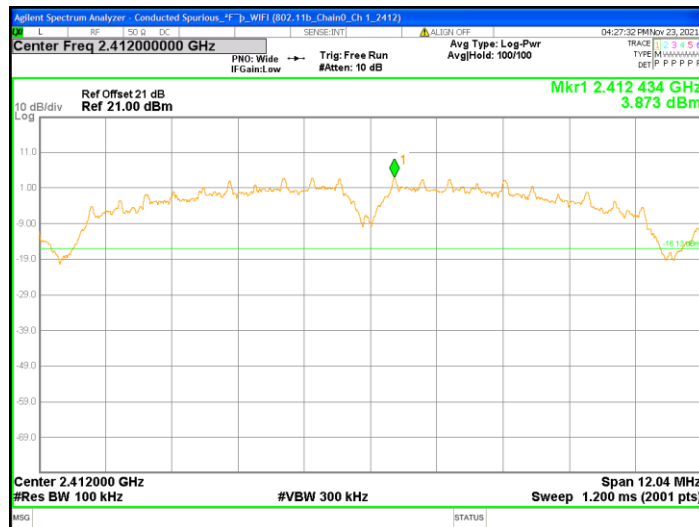
5.4 Limit

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

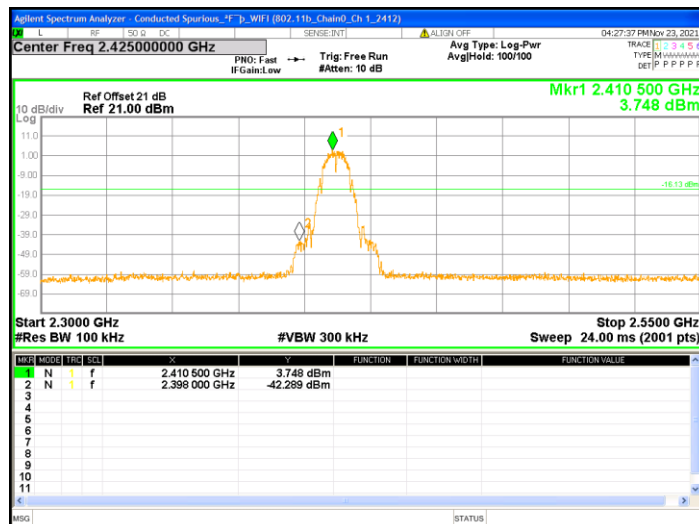
5.5 Test Results

Temperature (°C) :	26
Relative Humidity (%) :	63
Test date :	2021/11/23

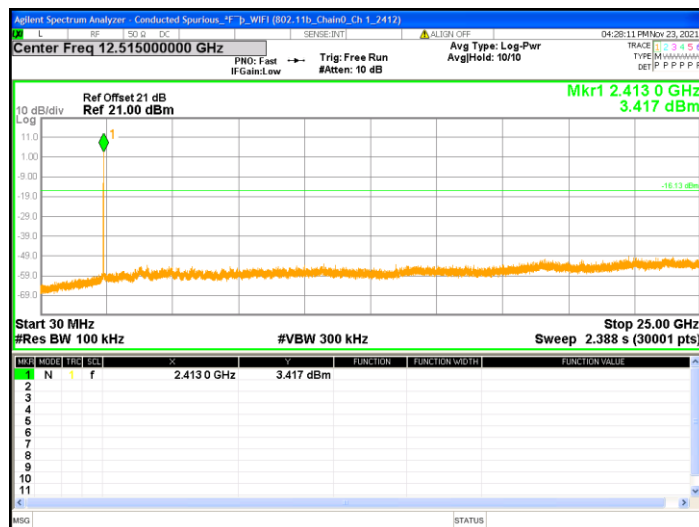
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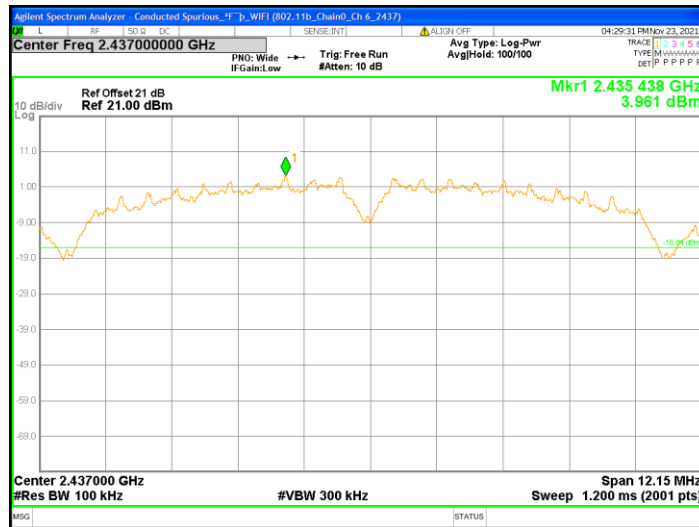
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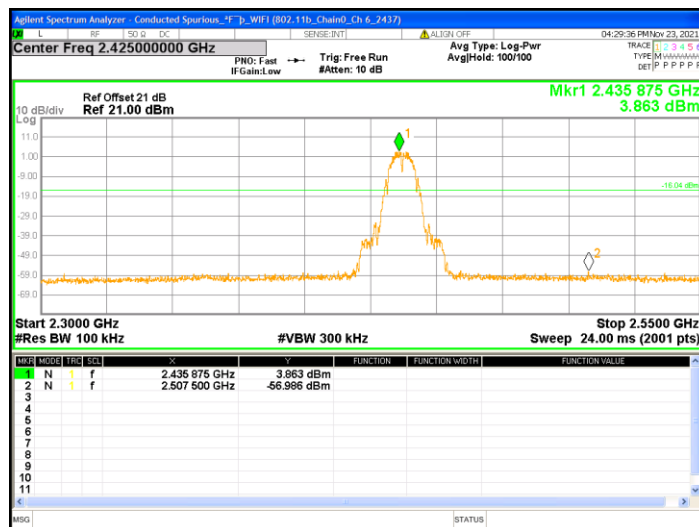
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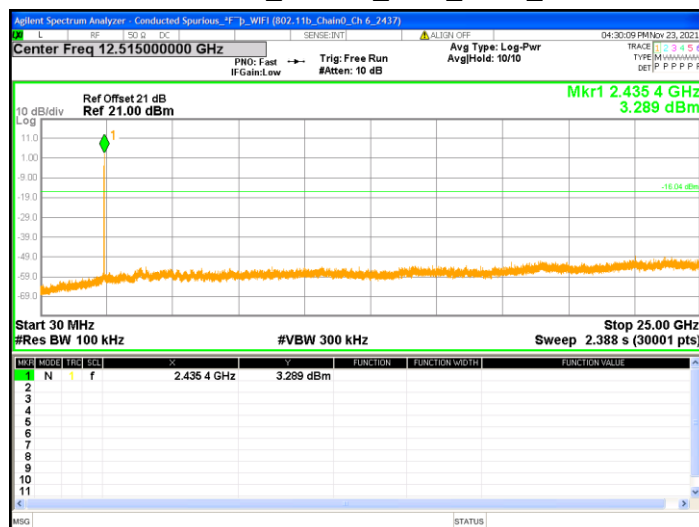
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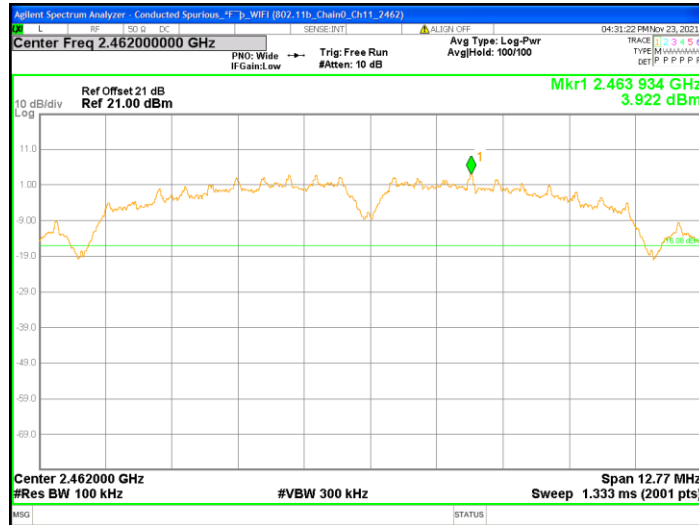
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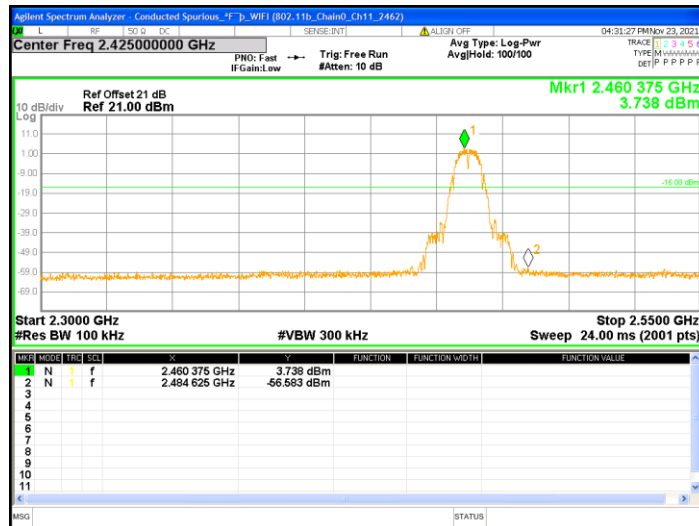
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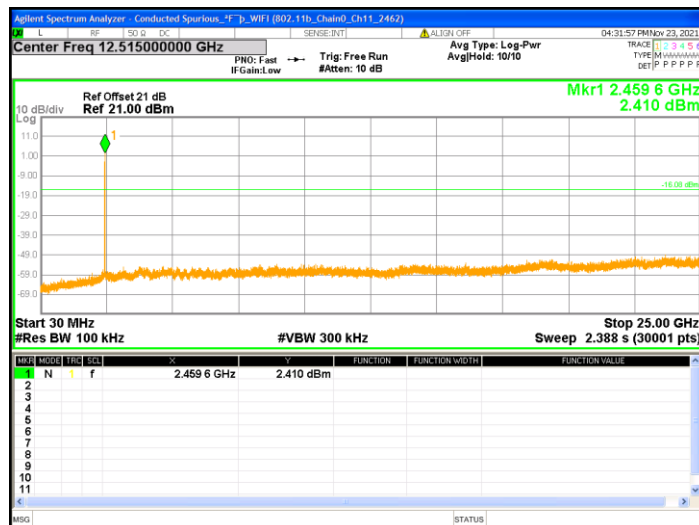
802.11b_Chain0_Ch11_2462_1



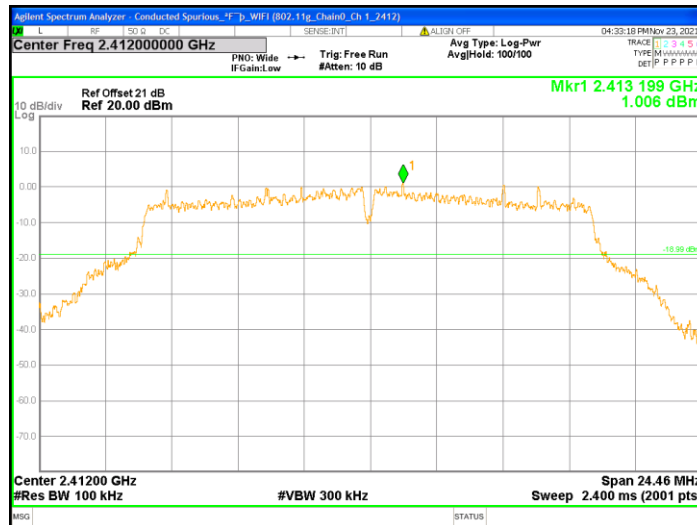
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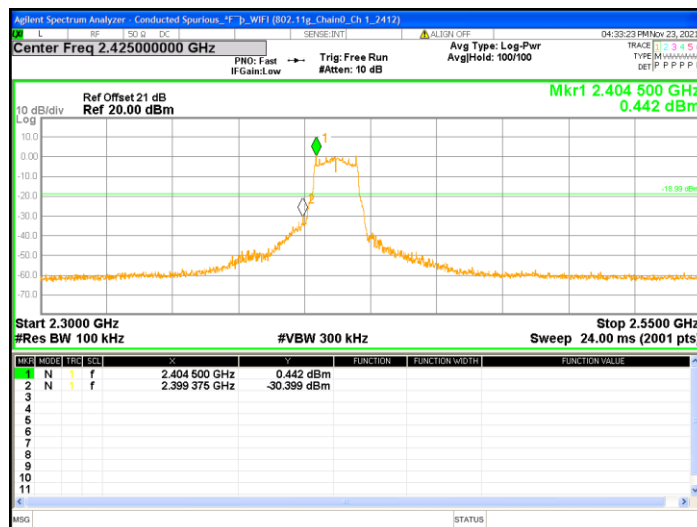
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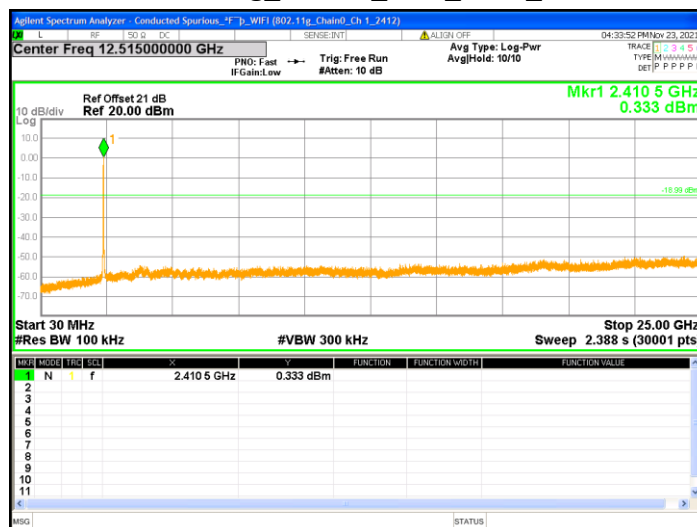
802.11g_Chain0_Ch 1_2412_1



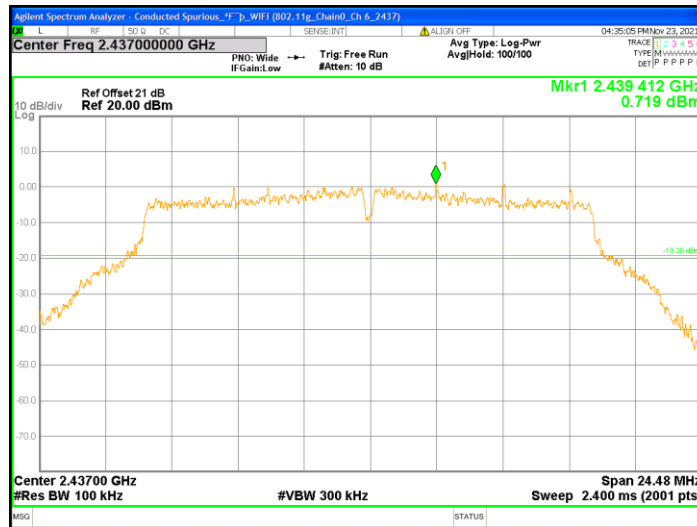
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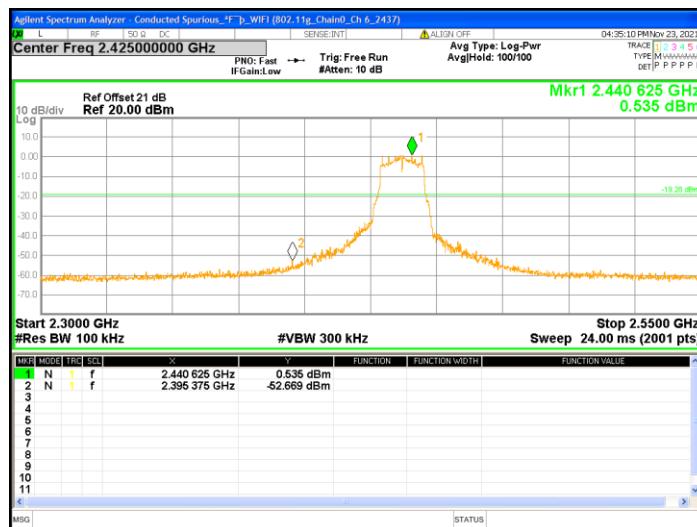
802.11g_Chain0_Ch 1_2412_3



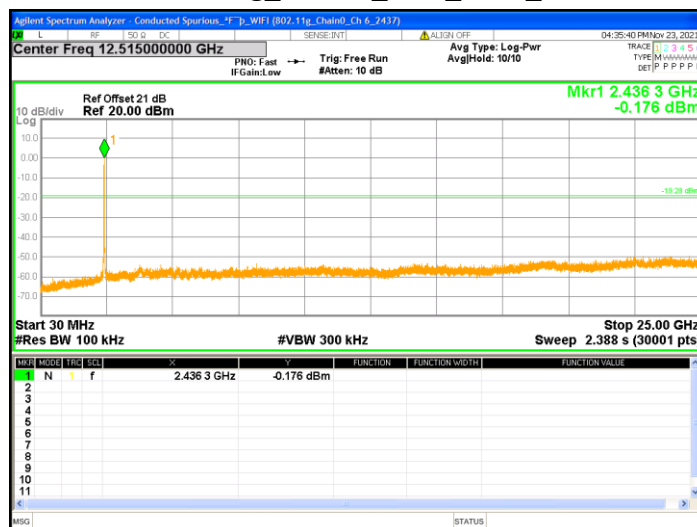
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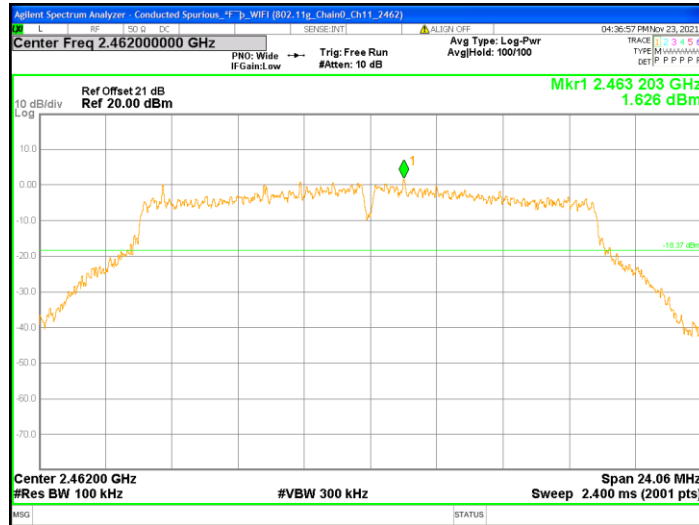
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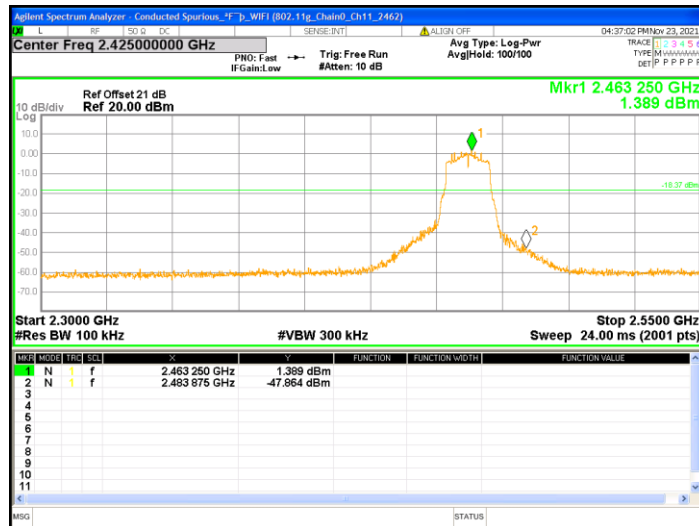
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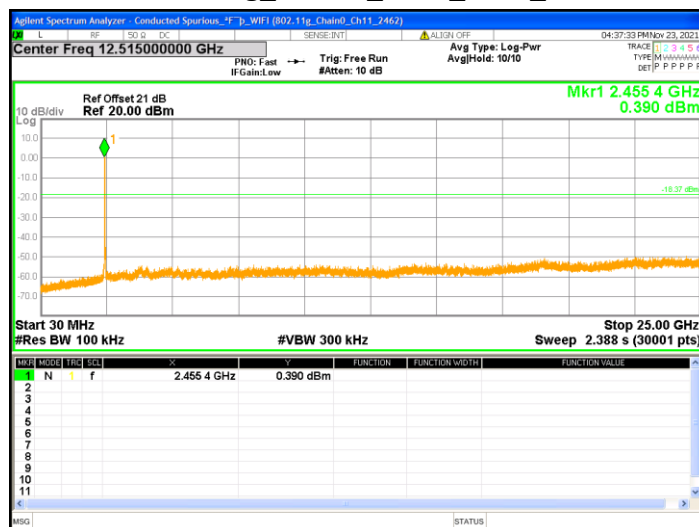
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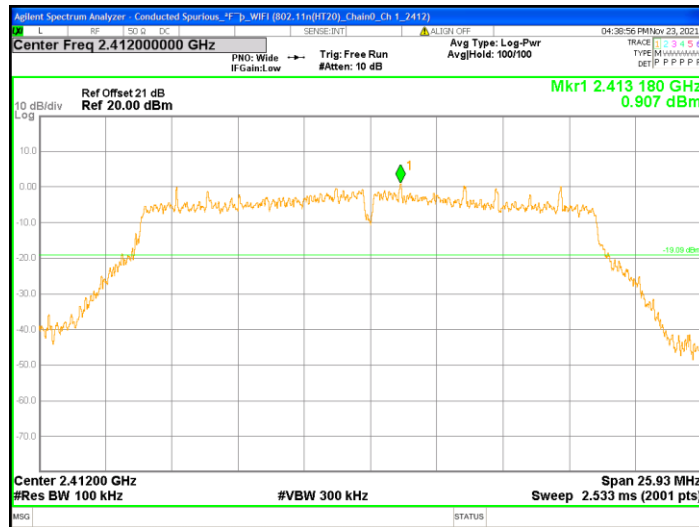
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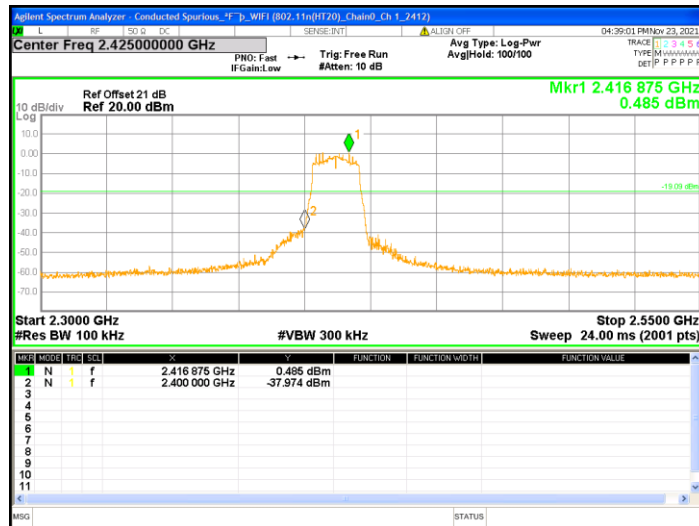
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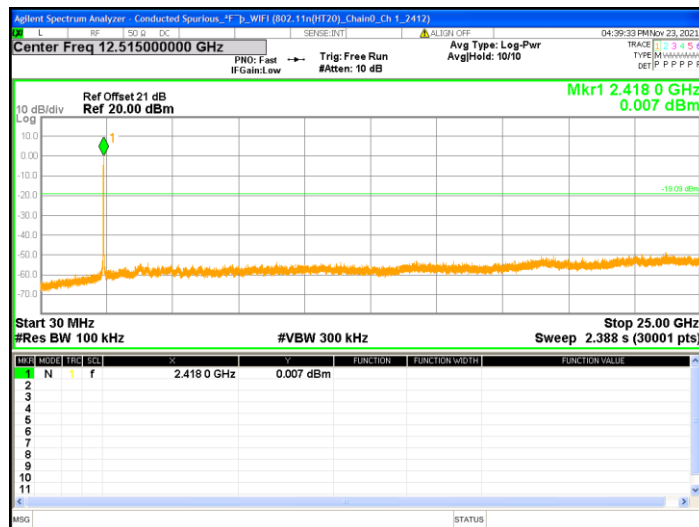
802.11n(HT20)_Chain0_Ch 1_2412_1



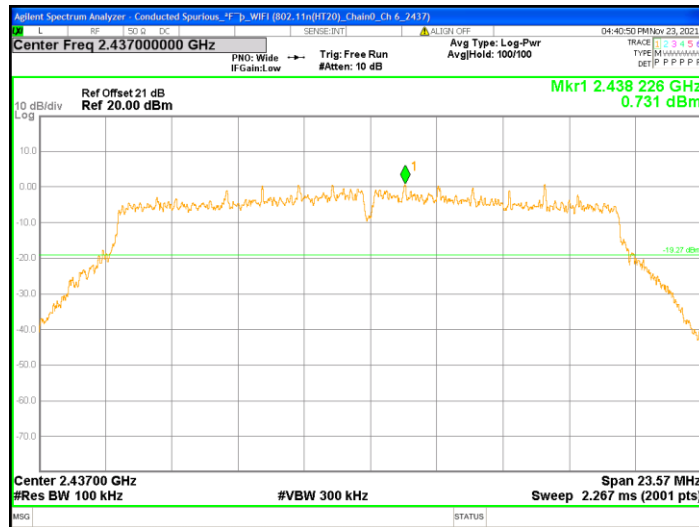
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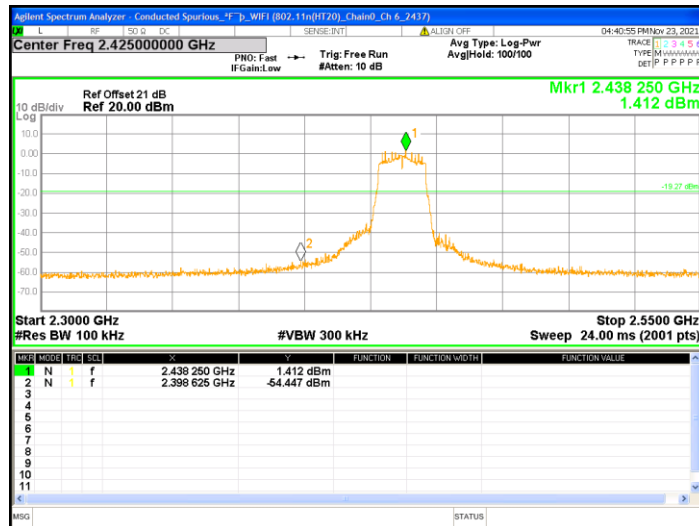
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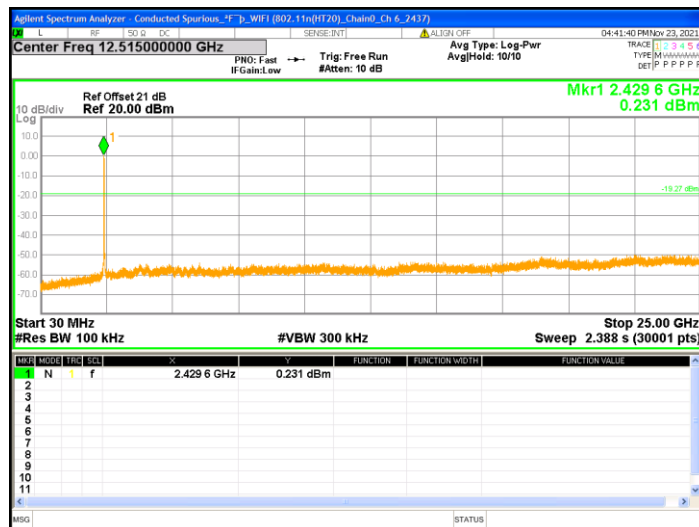
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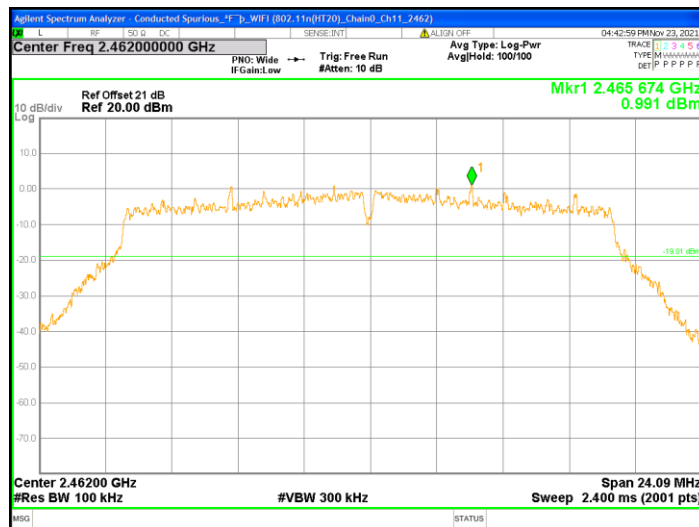
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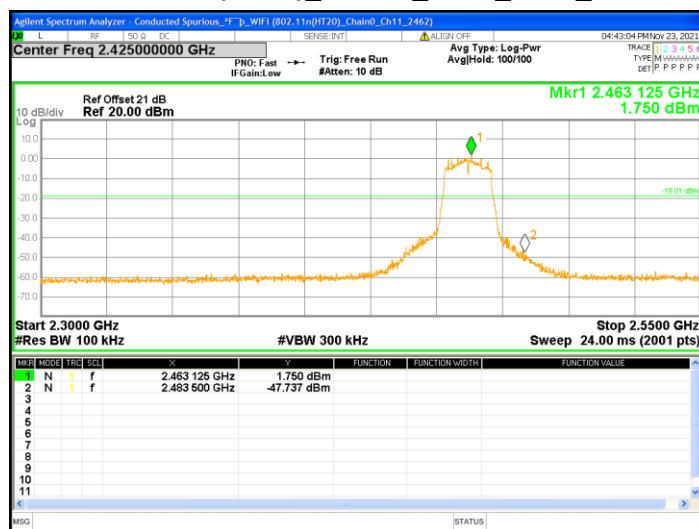
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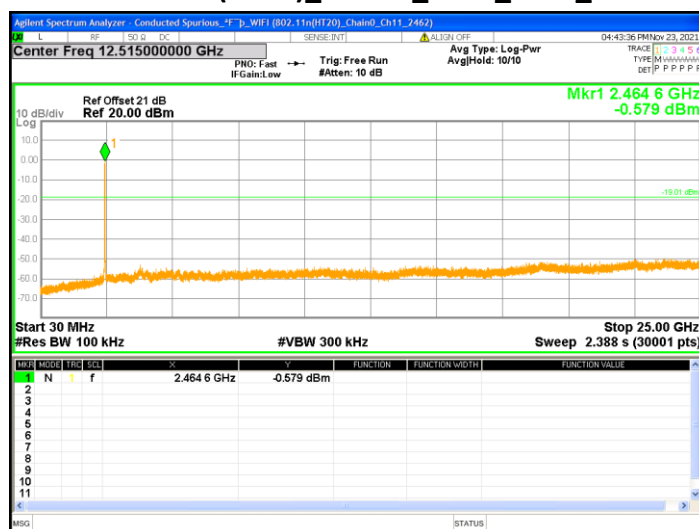
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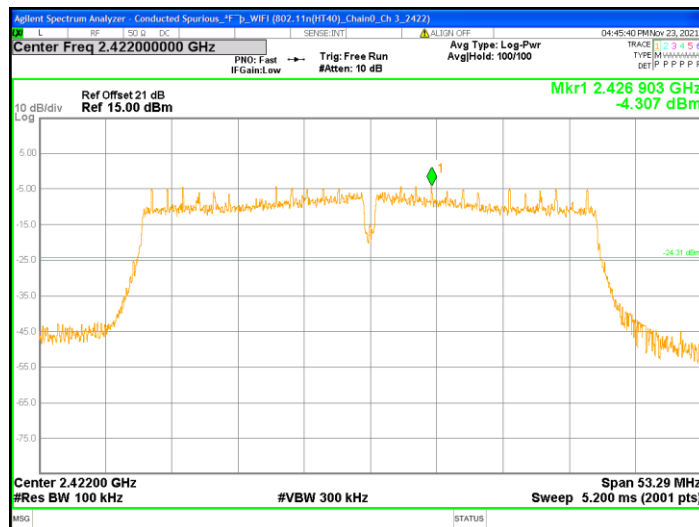
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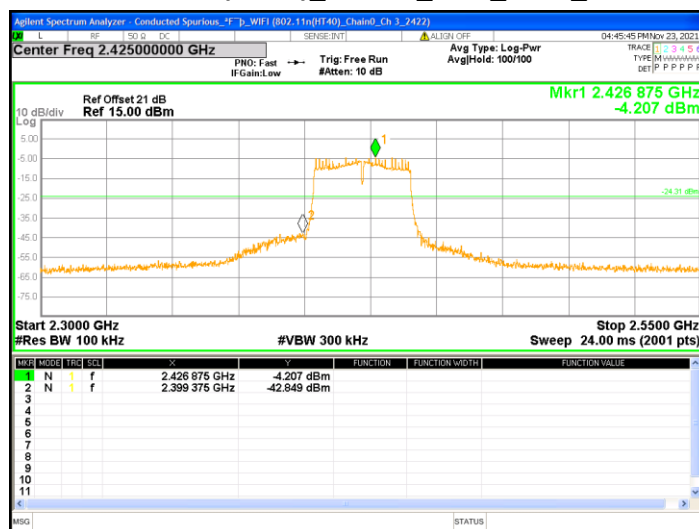
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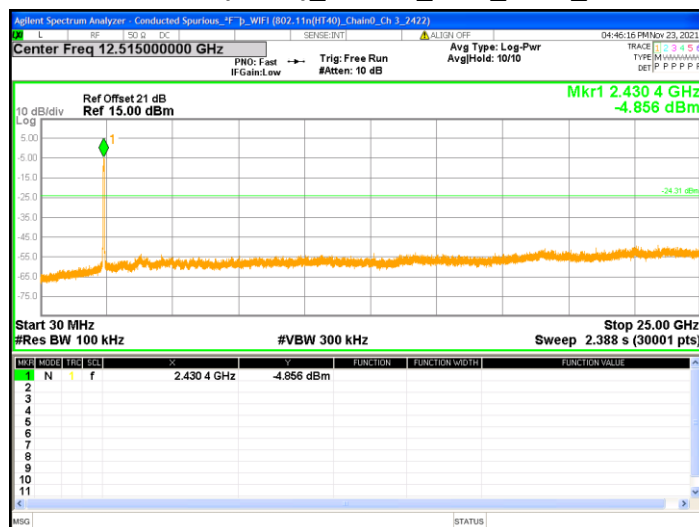
802.11n(HT40)_Chain0_Ch 3_2422_1



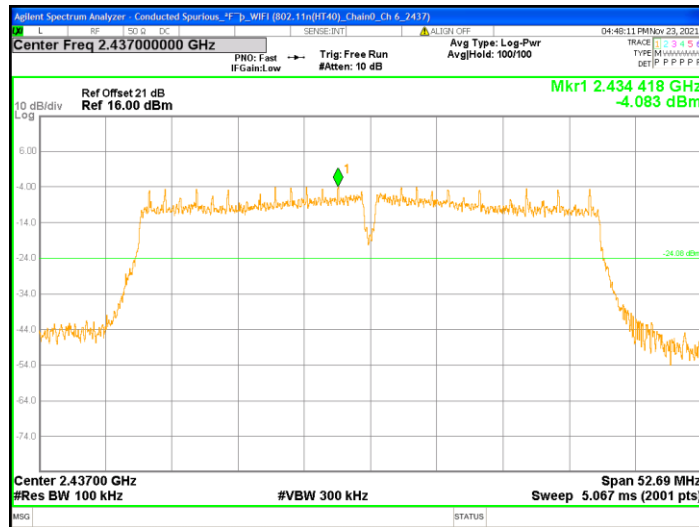
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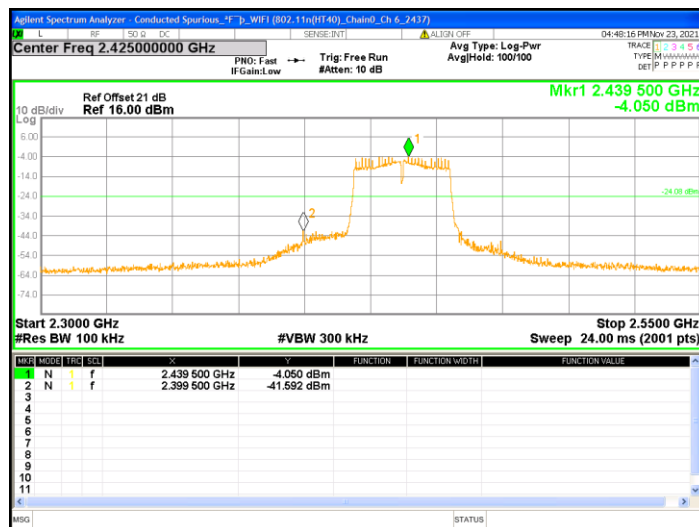
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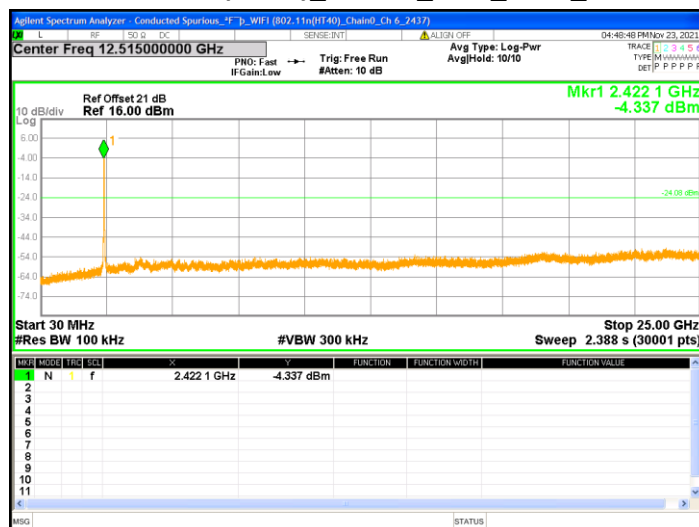
802.11n(HT40)_Chain0_Ch 6_2437_1



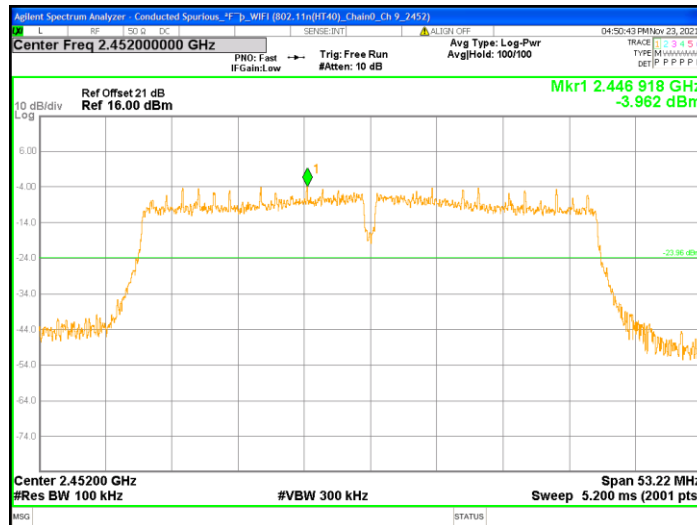
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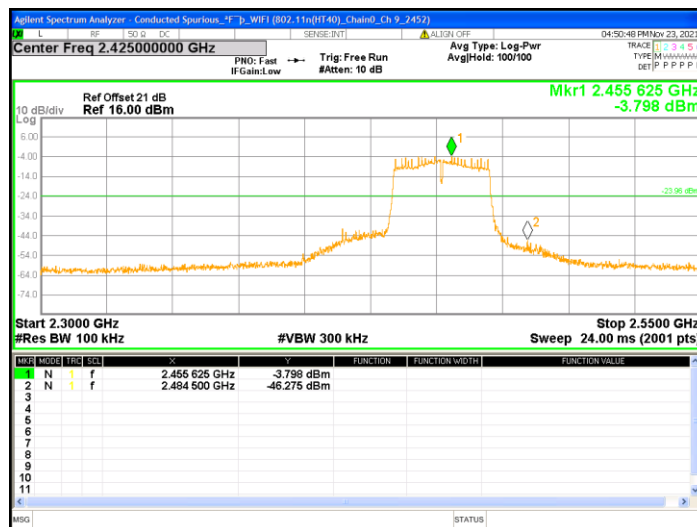
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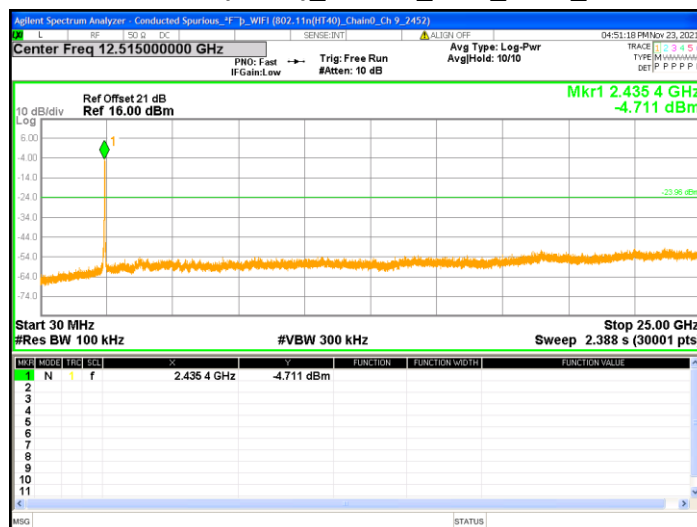
802.11n(HT40)_Chain0_Ch 9_2452_1



802.11n(HT40)_Chain0_Ch 9_2452_2



802.11n(HT40)_Chain0_Ch 9_2452_3



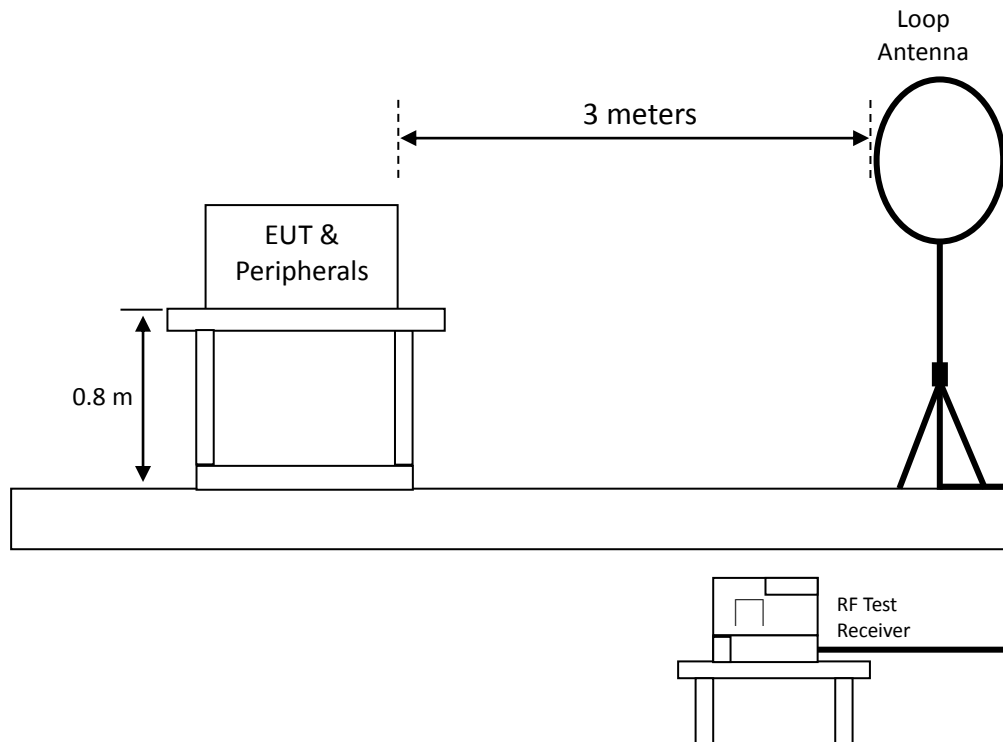
6. Emissions in Restricted Frequency Bands (Radiated emission measurements)

6.1 Instrument Setting

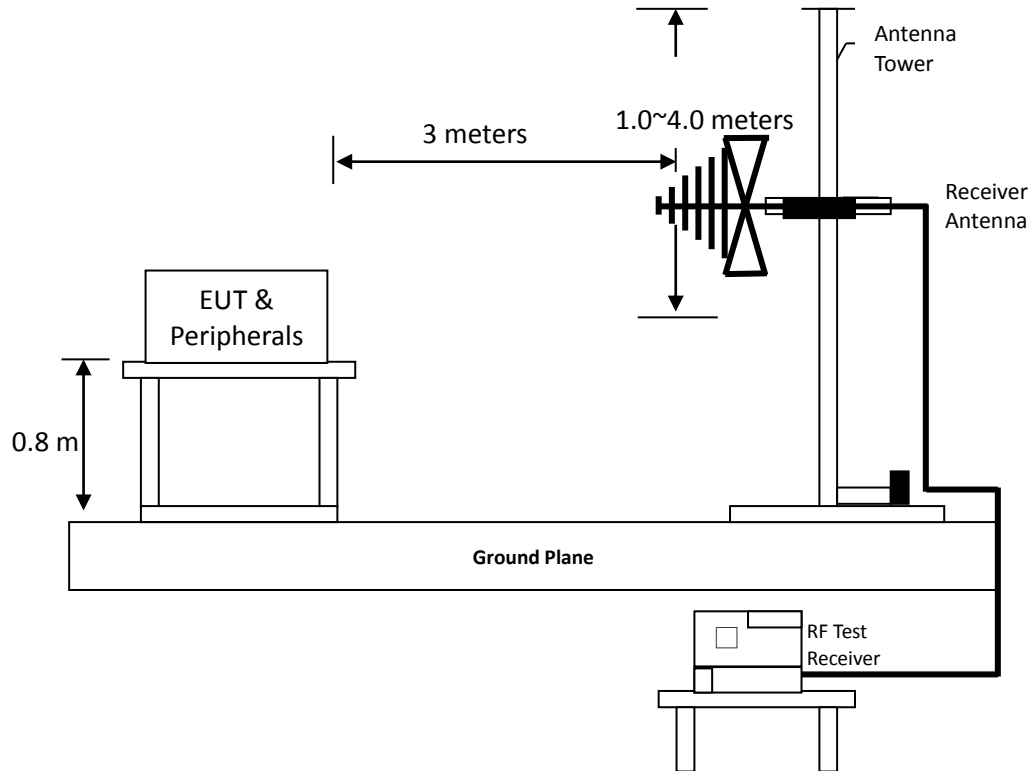
Receiver Function	Setting (Below 1GHz)	Setting (Above 1GHz)
Detector	QP	Peak and Average
RBW	9-150 kHz ; 200-300 Hz 0.15-30 MHz; 9-10 kHz 30-1000 MHz; 100-120 kHz	1MHz
VBW	$\geq 3 \times \text{RBW}$	3MHz & 1/T minimum kHz
Sweep	Auto couple	Auto couple
Start Frequency	9 kHz	1GHz
Stop Frequency	1 GHz	Tenth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

6.2 Test setup & procedure

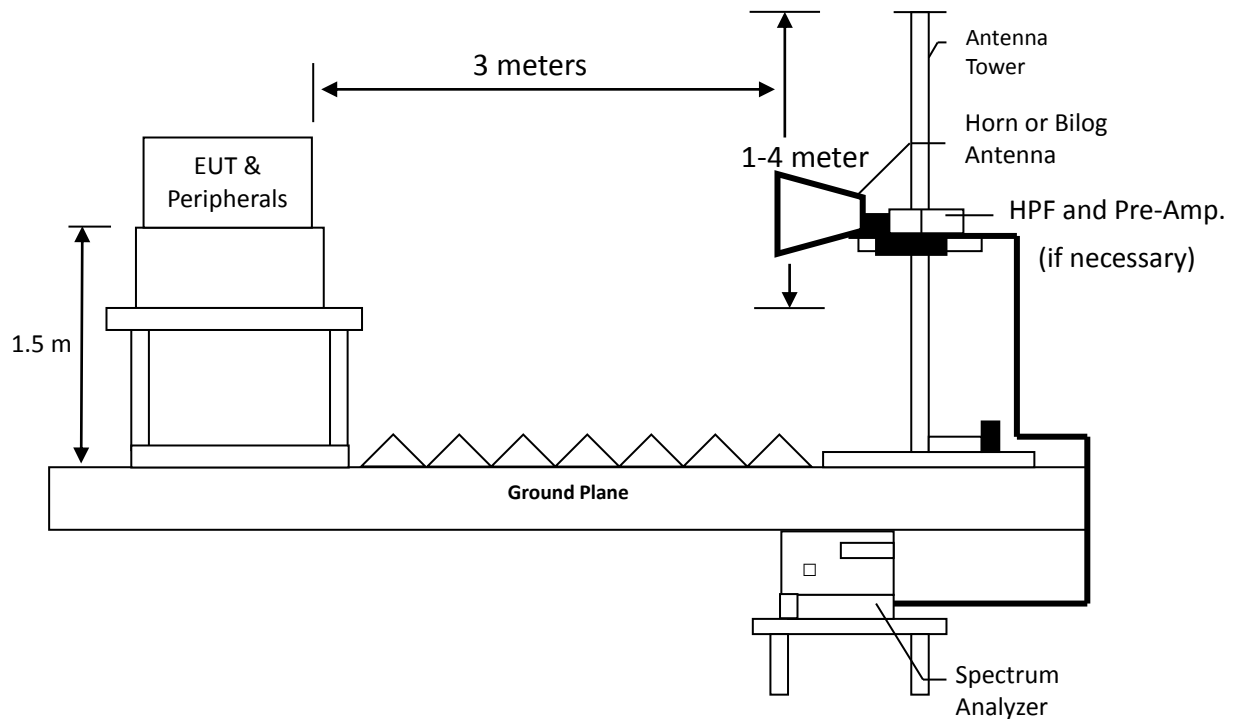
Radiated emission from 9kHz to 30MHz uses Loop Antenna:



Radiated emission below 1GHz using Bilog Antenna



Radiated emission above 1GHz using Horn Antenna



TEST REPORT

Radiated emissions were investigated 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

TEST REPORT

6.4 Test Result

6.4.1 Measurement results: frequencies 9kHz to 30MHz

Temperature (°C) :	25
Relative Humidity (%) :	63
Test date :	2021/11/20

The test was performed on EUT under continuously transmitting mode. The worst case occurred at 802.11g Chain11.

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Perpendicular	0.159	AV	18.57	52.62	71.19	103.63	-32.44
Perpendicular	0.219	AV	18.75	50.22	68.97	100.85	-31.88
Perpendicular	0.279	AV	18.72	44.41	63.13	98.73	-35.60
Perpendicular	0.489	AV	19.34	39.43	58.77	93.82	-35.05
Perpendicular	0.549	QP	19.37	36.34	55.71	72.86	-17.15
Perpendicular	0.819	QP	19.65	30.45	50.10	69.36	-19.26

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Parallel	0.159	AV	18.57	52.95	71.52	103.63	-32.11
Parallel	0.219	AV	18.75	50.38	69.13	100.85	-31.72
Parallel	0.309	AV	18.72	43.82	62.54	97.82	-35.28
Parallel	0.489	AV	19.34	40.68	60.02	93.82	-33.80
Parallel	0.549	QP	19.37	37.21	56.58	72.86	-16.28
Parallel	0.849	QP	19.64	30.02	49.66	69.07	-19.41

TEST REPORT

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dB μ V)	Corrected Reading (dB μ V/m)	Limit @ 3 m (dB μ V/m)	Margin (dB)
Ground-parallel	0.159	AV	18.57	52.22	70.79	103.63	-32.84
Ground-parallel	0.219	AV	18.75	49.78	68.53	100.85	-32.32
Ground-parallel	0.279	AV	18.72	46.21	64.93	98.73	-33.80
Ground-parallel	0.399	AV	18.85	40.46	59.31	95.59	-36.28
Ground-parallel	0.459	AV	19.17	40.00	59.17	94.38	-35.21
Ground-parallel	0.819	QP	19.65	29.99	49.64	69.36	-19.72

TEST REPORT

6.5.2 Measurement results: frequencies below 1 GHz

Temperature (°C) :	25
Relative Humidity (%) :	63
Test date :	2021/11/20

The test was performed on EUT under continuously transmitting mode. The worst case occurred at 802.11g Chain11.

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	134.76	QP	20.29	9.36	29.65	43.50	-13.85
Horizontal	238.55	QP	20.13	16.41	36.54	46.00	-9.46
Horizontal	375.32	QP	23.86	20.40	44.26	46.00	-1.74
Horizontal	500.45	QP	27.02	9.25	36.27	46.00	-9.73
Horizontal	625.58	QP	29.86	7.68	37.54	46.00	-8.46
Horizontal	875.84	QP	33.17	4.66	37.83	46.00	-8.17

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	20.59	7.53	28.12	40.00	-11.88
Vertical	134.76	QP	20.29	12.71	33.00	43.50	-10.50
Vertical	238.55	QP	20.13	17.10	37.23	46.00	-8.77
Vertical	375.32	QP	23.86	18.35	42.21	46.00	-3.79
Vertical	500.45	QP	27.02	10.07	37.09	46.00	-8.91
Vertical	625.58	QP	29.86	9.12	38.98	46.00	-7.02

Remark: Corr. Factor = Antenna Factor + Cable Loss

TEST REPORT

6.5.3 Measurement results: frequency above 1GHz to 25GHz

Temperature (°C) :	25
Relative Humidity (%) :	63
Test date :	2021/11/20

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_Ch1	4824	PK	H	17.62	21.66	39.28	74	-34.72
	4824	PK	V	17.62	22.53	40.15	74	-33.85
802.11b_Ch6	4874	PK	H	17.67	21.78	39.45	74	-34.55
	4874	PK	V	17.67	22.29	39.96	74	-34.04
802.11b_Ch11	4924	PK	H	17.78	21.41	39.19	74	-34.81
	4924	PK	V	17.78	21.76	39.54	74	-34.46
802.11g_Ch1	4824	PK	H	17.62	22.45	40.07	74	-33.93
	4824	PK	V	17.62	22.13	39.75	74	-34.25
802.11g_Ch6	4874	PK	H	17.67	22.07	39.74	74	-34.26
	4874	PK	V	17.67	23.36	41.03	74	-32.97
802.11g_Ch11	4924	PK	H	17.78	20.67	38.45	74	-35.55
	4924	PK	V	17.78	20.76	38.54	74	-35.46
802.11n(HT20) Ch1	4824	PK	H	17.62	22.24	39.86	74	-34.14
	4824	PK	V	17.62	22.09	39.71	74	-34.29
802.11n(HT20) Ch6	4874	PK	H	17.67	22.68	40.35	74	-33.65
	4874	PK	V	17.67	21.73	39.40	74	-34.60
802.11n(HT20) Ch11	4924	PK	H	17.78	21.24	39.02	74	-34.98
	4924	PK	V	17.78	21.30	39.08	74	-34.92
802.11n(HT40) Ch3	4844	PK	H	17.69	24.10	41.79	74	-32.21
	4844	PK	V	17.69	21.94	39.63	74	-34.37
802.11n(HT40) Ch6	4874	PK	H	17.67	21.87	39.54	74	-34.46
	4874	PK	V	17.67	21.68	39.35	74	-34.65
802.11n(HT40) Ch9	4904	PK	H	17.68	22.46	40.14	74	-33.86
	4904	PK	V	17.68	21.78	39.46	74	-34.54

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).

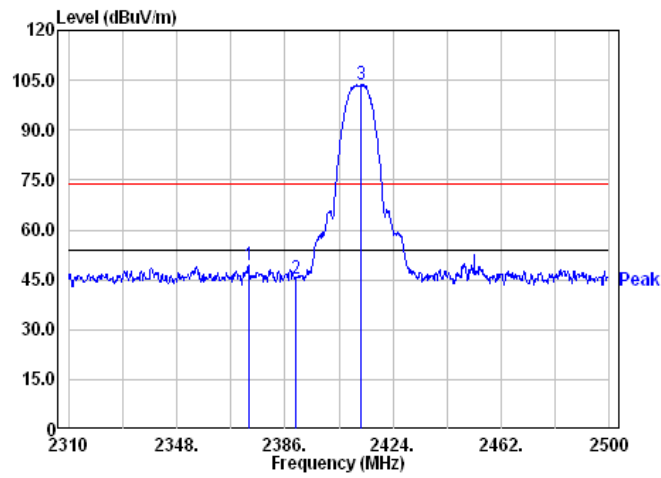
7.3 Test Results

Temperature (°C) :	25
Relative Humidity (%) :	63
Test date :	2021/11/20

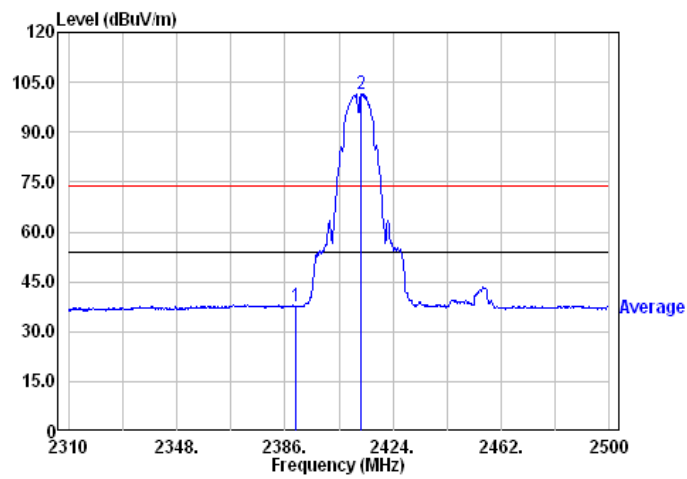
Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
802.11b	2373.27	PK	V	34.86	14.52	49.38	74	-24.62	2310~2390
	2390.00	AV	V	34.86	2.76	37.62	54	-16.38	
	2488.41	PK	V	34.80	13.33	48.13	74	-25.87	2483.5~2500
	2483.50	AV	V	34.80	4.27	39.07	54	-14.93	
802.11g	2390.00	PK	V	34.86	25.33	60.19	74	-13.81	2310~2390
	2390.00	AV	V	34.86	14.02	48.88	54	-5.12	
	2483.50	PK	V	34.80	24.29	59.09	74	-14.91	2483.5~2500
	2483.50	AV	V	34.80	10.34	45.14	54	-8.86	
802.11n (HT20)	2390.00	PK	V	34.86	22.94	57.80	74	-16.20	2310~2390
	2390.00	AV	V	34.86	11.97	46.83	54	-7.17	
	2484.42	PK	V	34.81	21.46	56.27	74	-17.73	2483.5~2500
	2483.50	AV	V	34.80	10.73	45.53	54	-8.47	
802.11n (HT40)	2389.04	PK	V	34.86	28.31	63.17	74	-10.83	2310~2390
	2389.99	AV	V	34.86	15.46	50.32	54	-3.68	
	2488.60	PK	V	34.80	22.33	57.13	74	-16.87	2483.5~2500
	2487.46	AV	V	34.81	10.59	45.40	54	-8.60	

Remark: Correction Factor = Antenna Factor + Cable Loss

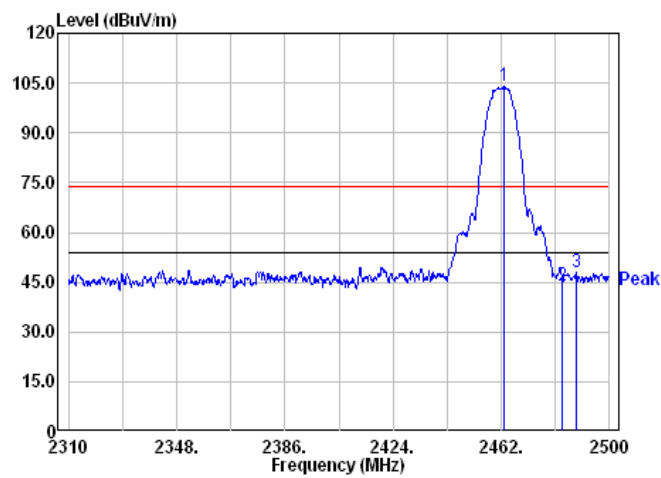
Bandedge 802.11b ch1 PK



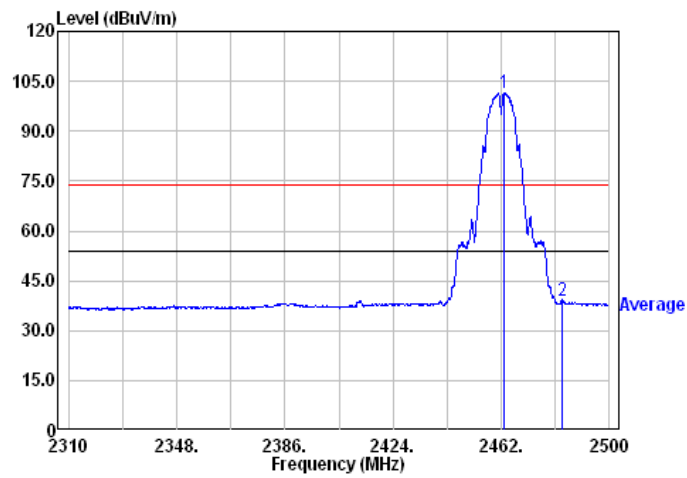
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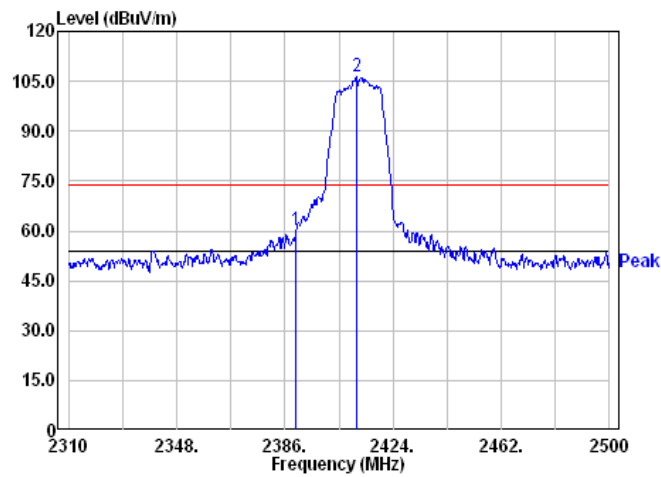
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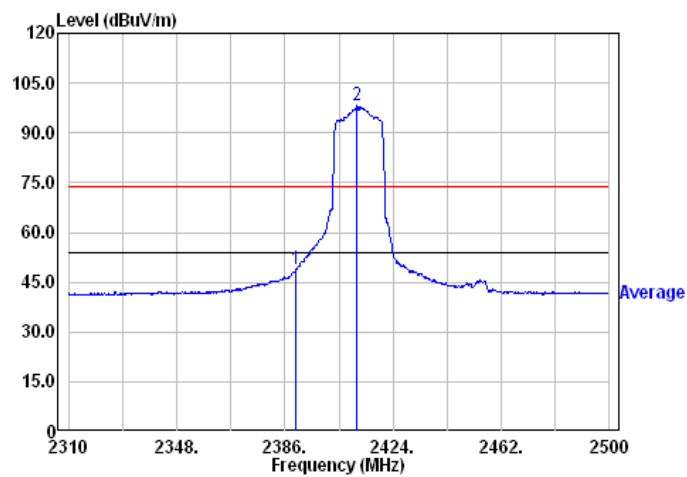
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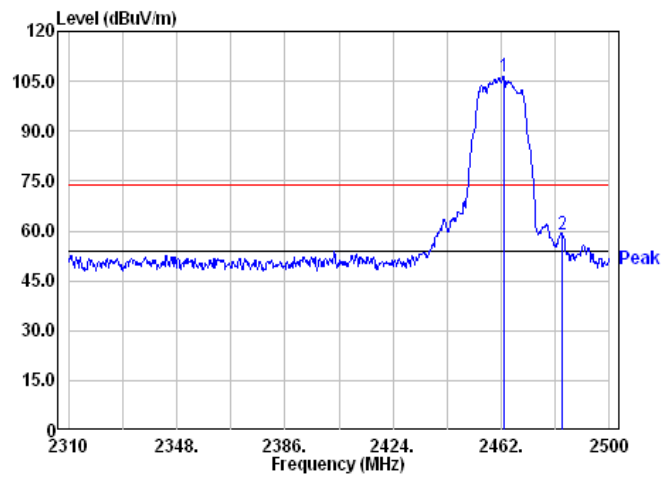
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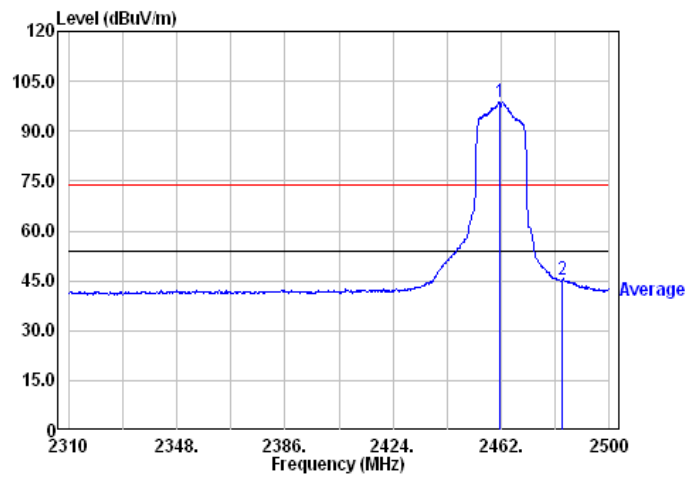
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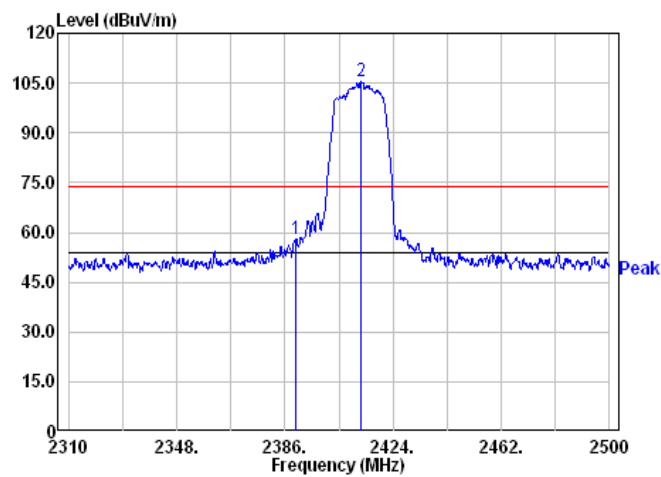
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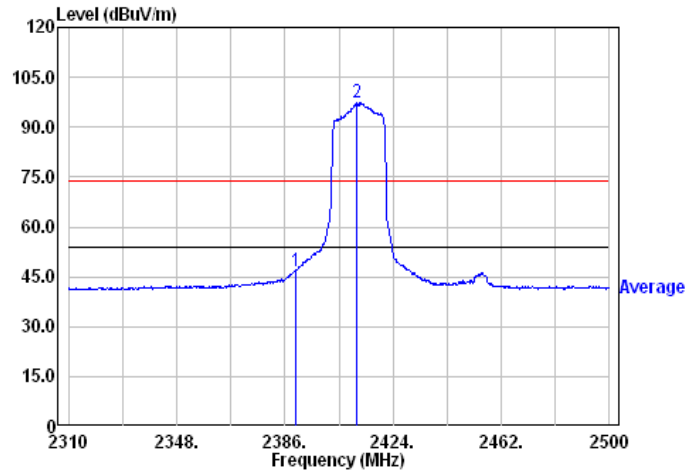
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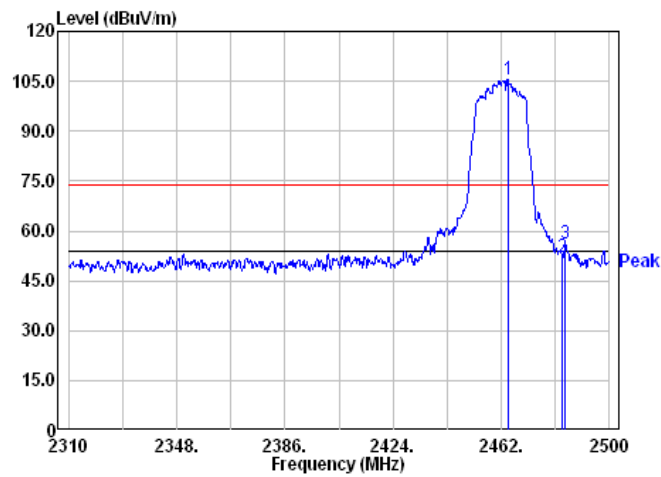
Bandedge 802.11n(HT20) ch1 PK



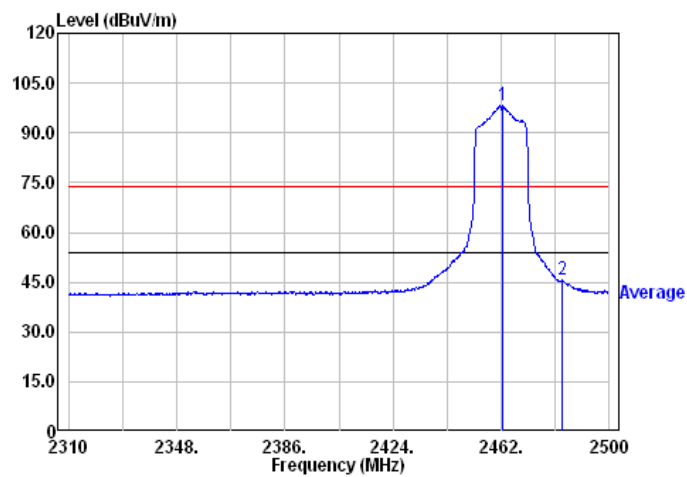
Bandedge 802.11n(HT20) ch1 AV



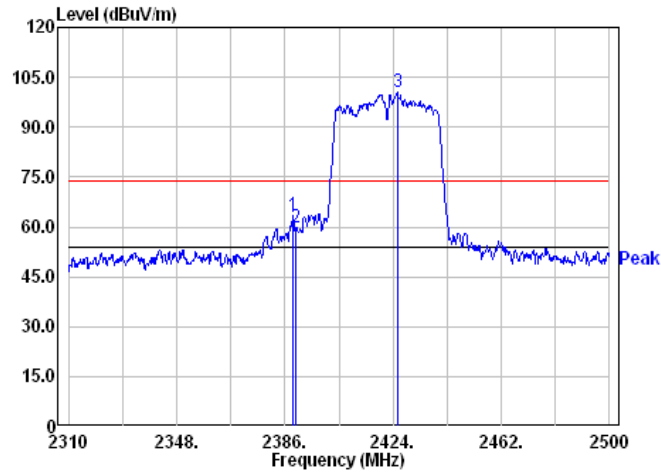
Bandedge 802.11n(HT20) ch11 PK



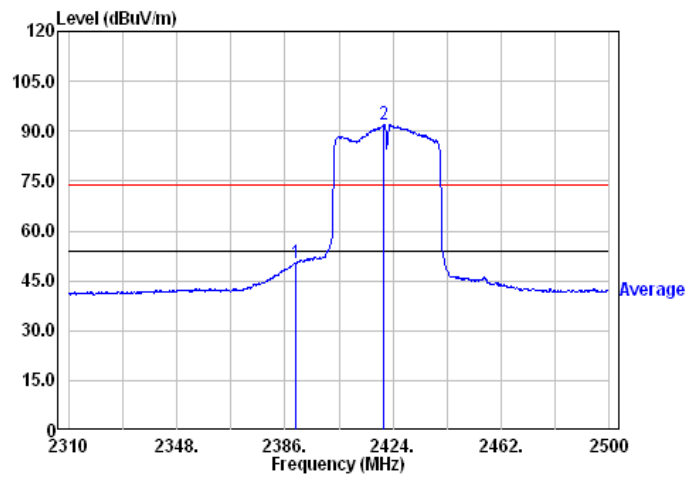
Bandedge 802.11n(HT20) ch11 AV



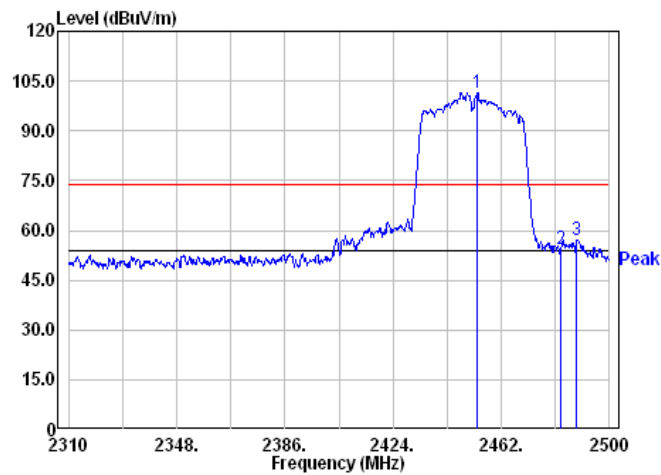
Bandedge 802.11n(HT40) ch3 PK



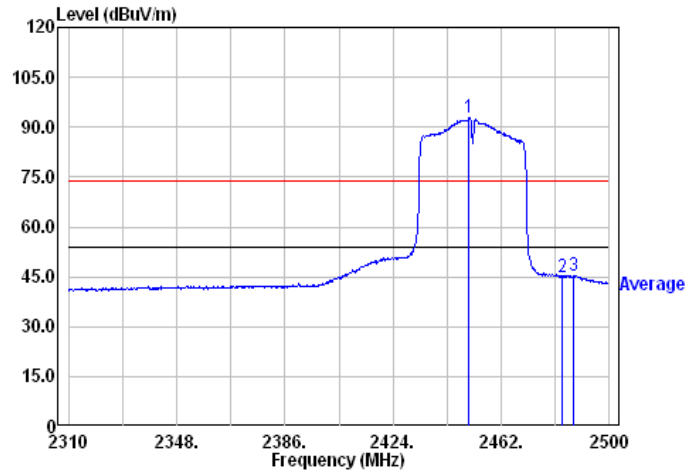
Bandedge 802.11n(HT40) ch3 AV



Bandedge 802.11n(HT40) ch9 PK



Bandedge 802.11n(HT40) ch9 AV



8. AC Power Line Conducted Emission

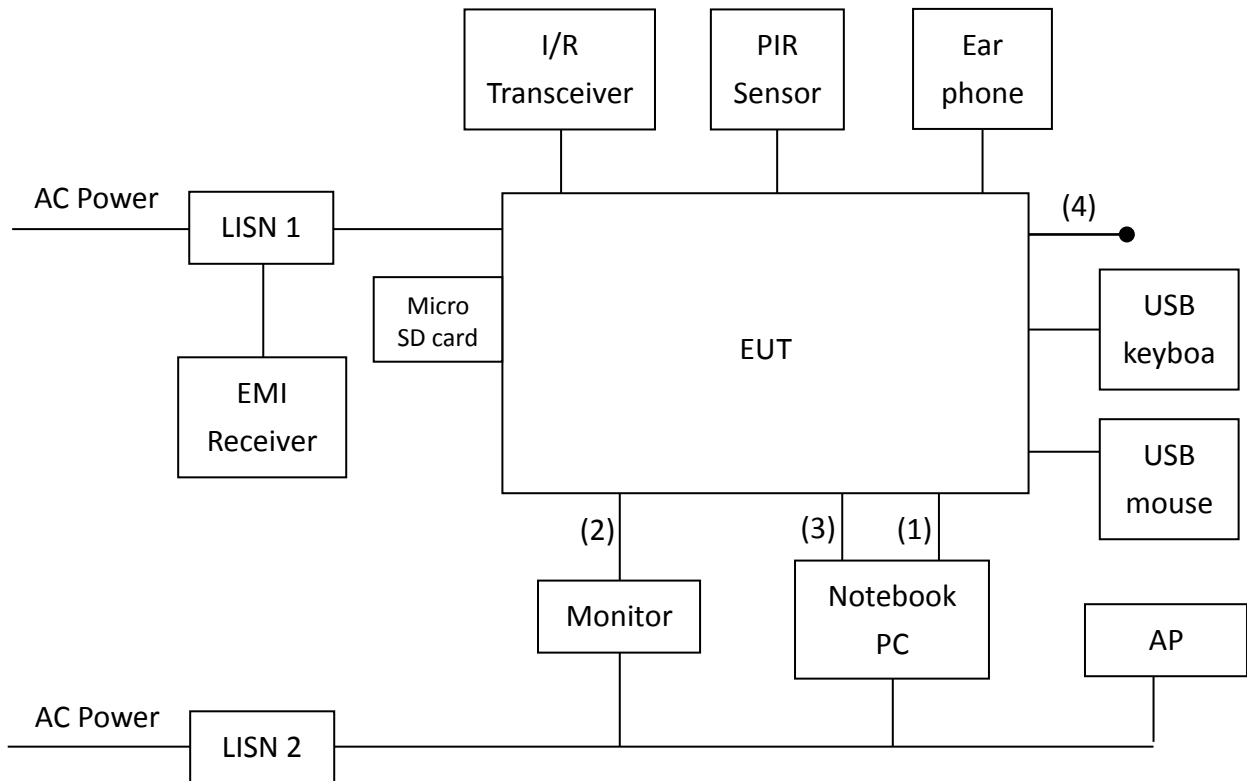
8.1 Measuring instrument setting

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



- (1) RJ-45 UTP Cat.5 0.5 meter
- (2) HDMI shielded cable 0.5 meter with 2 core
- (3) mini HDMI to HDMI shielded cable 0.5 meter with 2 core
- (4) RS-232 unshielded cable 1.5 meter

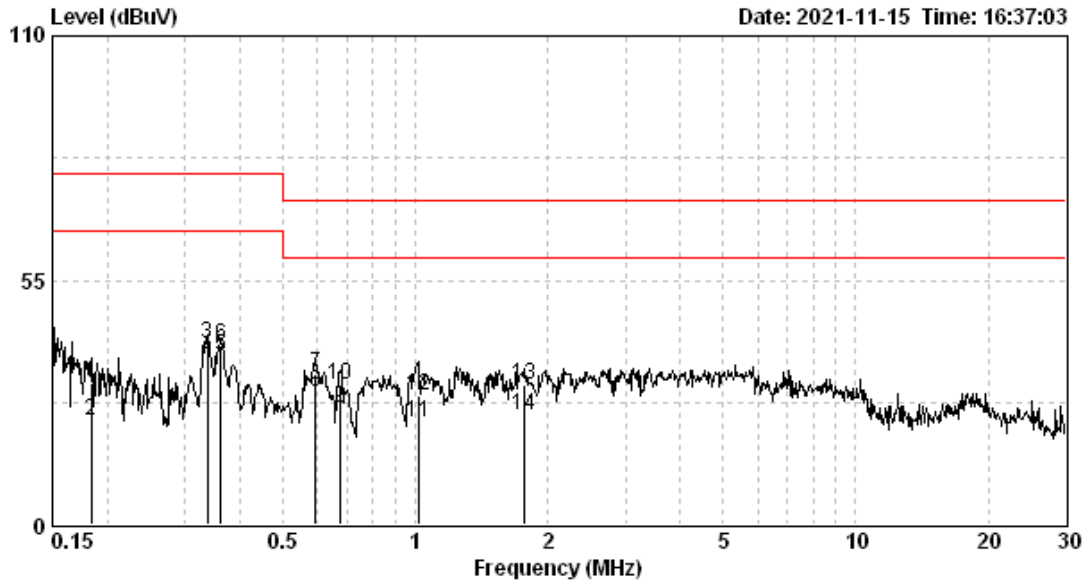
8.4 Limit

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

TEST REPORT

8.5 Test Results

Test Condition: Tx mode
 Adapter: 2AAJ024FC

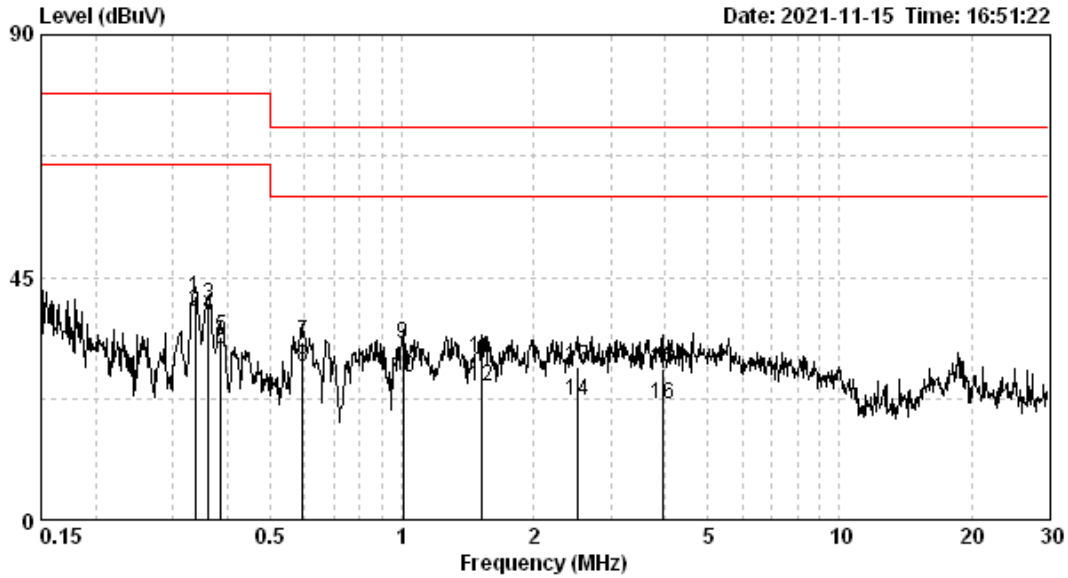


Test voltage :AC 120V 60Hz
 Temp. / R.H. :24°C/46%RH
 Atmospheric pressure :1005 hPa

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	AV
LINE	0.183	9.64	22.38	32.02	79.00	13.77	23.41	66.00	-46.98	-42.59
LINE	0.337	9.75	30.81	40.56	79.00	27.53	37.28	66.00	-38.44	-28.72
LINE	0.361	9.76	30.36	40.12	79.00	28.16	37.92	66.00	-38.88	-28.08
LINE	0.595	9.82	23.97	33.80	73.00	19.97	29.79	60.00	-39.20	-30.21
LINE	0.675	9.82	21.66	31.47	73.00	16.52	26.34	60.00	-41.53	-33.66
LINE	1.016	9.80	19.29	29.09	73.00	13.16	22.96	60.00	-43.91	-37.04
LINE	1.762	9.84	21.77	31.61	73.00	14.85	24.69	60.00	-41.39	-35.31

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 :AC 120V 60Hz
 Temp. / R.H. :24°C/46%RH
 Atmospheric pressure :1005 hPa

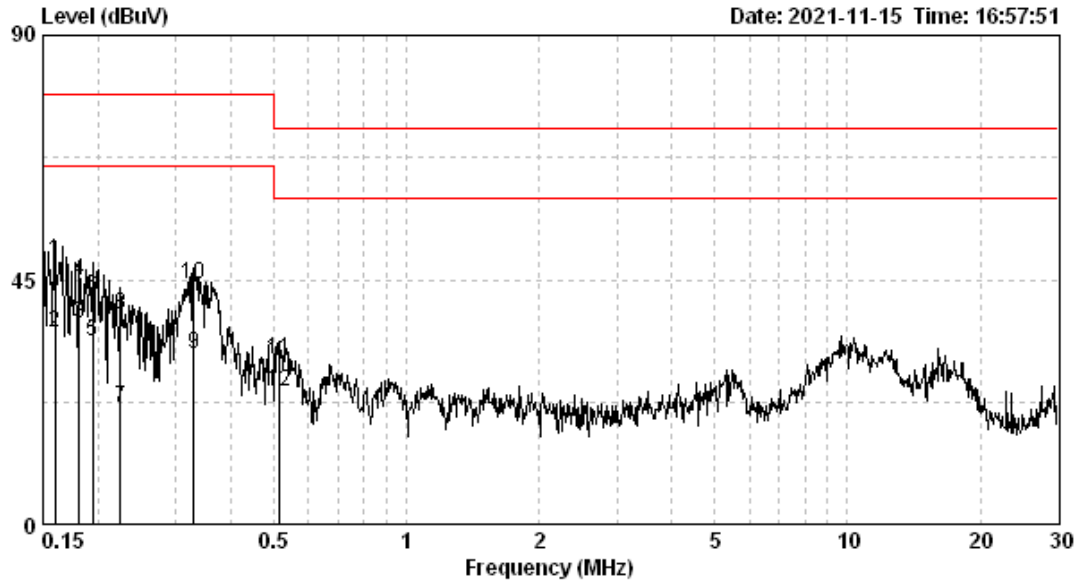
Phase	Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB)	
									QP	AV
NEUTRAL	0.337	9.75	31.58	41.32	79.00	28.89	38.63	66.00	-37.68	-27.37
NEUTRAL	0.361	9.76	30.18	39.94	79.00	28.14	37.91	66.00	-39.06	-28.09
NEUTRAL	0.387	9.78	24.14	33.91	79.00	22.01	31.79	66.00	-45.09	-34.21
NEUTRAL	0.595	9.82	23.01	32.83	73.00	18.41	28.24	60.00	-40.17	-31.76
NEUTRAL	1.005	9.80	22.75	32.55	73.00	16.60	26.40	60.00	-40.45	-33.60
NEUTRAL	1.519	9.83	20.01	29.84	73.00	14.99	24.82	60.00	-43.16	-35.18
NEUTRAL	2.513	9.85	18.57	28.42	73.00	12.23	22.07	60.00	-44.58	-37.93
NEUTRAL	3.943	9.82	18.22	28.04	73.00	11.73	21.55	60.00	-44.96	-38.45

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 REPORT

Test Condition: Tx mode
 Adapter: 2ABL024F



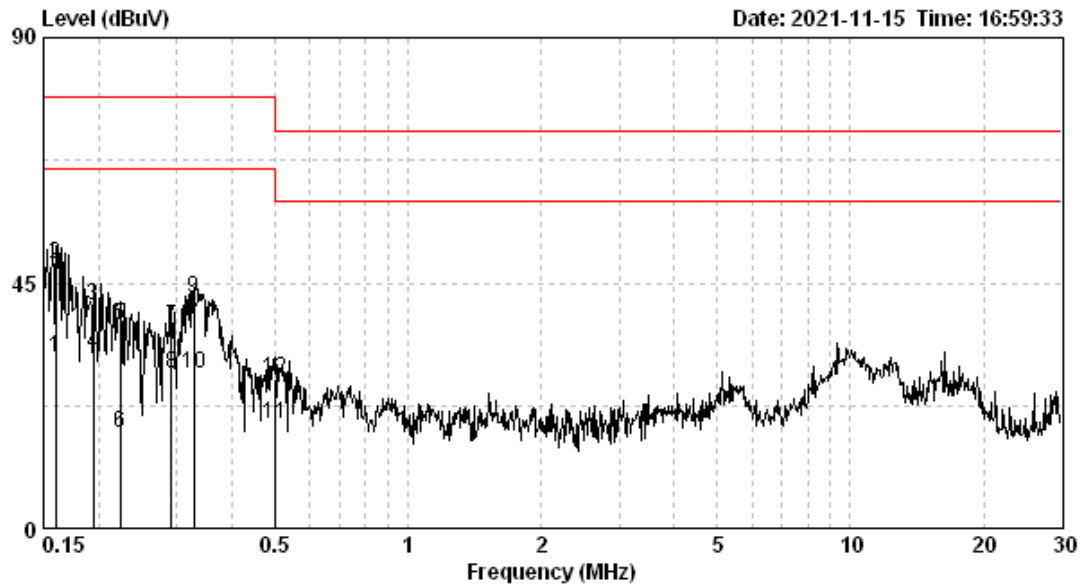
Test voltage :AC 120V 60Hz
 Temp. / R.H. :24°C/46%RH
 Atmospheric pressure :1005 hPa

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	AV
LINE	0.160	9.63	38.98	48.61	79.00	25.56	35.19	66.00	-30.39	-30.81
LINE	0.182	9.63	35.09	44.72	79.00	27.34	36.97	66.00	-34.28	-29.03
LINE	0.194	9.64	32.18	41.82	79.00	23.96	33.60	66.00	-37.18	-32.40
LINE	0.224	9.67	28.98	38.64	79.00	11.79	21.45	66.00	-40.36	-44.55
LINE	0.330	9.74	34.35	44.10	79.00	21.64	31.38	66.00	-34.90	-34.62
LINE	0.516	9.83	20.45	30.28	73.00	14.55	24.38	60.00	-42.72	-35.62

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 REPORT



Test voltage :AC 120V 60Hz
 Temp. / R. H. :24°C/46%RH
 Atmospheric pressure :1005 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	AV
NEUTRAL	0.160	9.63	38.67	48.30	79.00	21.83	31.46	66.00	-30.70	-34.54
NEUTRAL	0.194	9.64	31.35	40.99	79.00	22.26	31.90	66.00	-38.01	-34.10
NEUTRAL	0.223	9.66	27.61	37.28	79.00	7.89	17.56	66.00	-41.72	-48.44
NEUTRAL	0.292	9.72	27.08	36.80	79.00	18.65	28.37	66.00	-42.20	-37.63
NEUTRAL	0.329	9.74	32.48	42.22	79.00	18.67	28.41	66.00	-36.78	-37.59
NEUTRAL	0.499	9.83	17.43	27.26	79.00	9.14	18.97	66.00	-51.74	-47.03

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 REPORT

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	2021/08/16	2022/08/15
Signal Analyzer	Agilent	N9030A	MY51380492	2021/08/17	2022/08/16
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2021/04/14	2022/04/13
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2021/01/29	2022/01/28
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-456	2021/01/11	2022/01/10
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA917015 9	2020/08/20	2023/08/19
Pre-Amplifier	AML	AML0120L3401	0419-114	2020/12/16	2021/12/15
Pre-amplifier	SGH	SGH184	20201124-1	2020/12/16	2021/12/15
Power Meter	Anritsu	ML2495A	0844001	2021/10/17	2022/10/16
Power Sensor	Anritsu	MA2411B	0738452	2021/10/17	2022/10/16
966-2(A) Cable	SUHNER	SMA / EX 100	N/A	2021/03/08	2022/03/07
966-2(B) Cable	SUHNER	SUCOFLEX 104P	CB0005	2021/03/08	2022/03/07
RF Cable	SUHNER	SUCOFLEX 104P	CB0006	2021/04/29	2022/04/28
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2021/01/15	2022/01/14
Hight Pass Filter	Reactel	7HS-3G/18G-S11	N/A	2021/05/26	2022/05/25
20dB Attenuator	Mini-Circuits	BW-S20W5+	N/A	2021/05/26	2022/05/25
Test software	Audix	e3	V9	NCR	NCR

Note: No Calibration Required (NCR).

TEST REPORT

Test Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	R&S	ESCI	100018	2021/11/16	2022/11/15
LISN	R&S	ENV216	101160	2021/07/14	2022/07/13
CON-2 Cable	SUHNER	EMCCFD300-B M-NM-6000	170502	2021/04/29	2022/04/28
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