

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 1 of 50

Applicant : Shanghai XinMiaoLink Technology Co., Ltd.
Address of Applicant : Floor 1, building 28, No. 6055, Jinhai highway, Fengxian District, Shanghai, China

Product Name : Wi-Fi&BLE Module
Model No. : X-C13SM-0, X-C13SM-1
Sample No. : E21120050-01#01
E21120050-02#01
E21120050-02#03
FCC ID : 2A3M5-X-C13SM

Standards : FCC CFR47 Part 15, Subpart C

Date of Receipt : 2021-12-15
Date of Test : 2021-12-16 ~ 2022-01-24
Date of Issue : 2022-01-24

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Prepared by:



(Erik Yang)

Reviewed by:



(Jennifer Zhou)

Approved by:



(Authorized signatory: Guoyou Chi)

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 2 of 50

Contents

1 GENERAL INFORMATION	3
1.1 TESTING LABORATORY	3
1.2 DETAILS OF APPLICATION	3
1.3 DETAILS OF EUT	3
1.4 TEST METHODOLOGY	4
1.5 TEST SUMMARY	4
2 TEST CONDITION	5
2.1 TEST FACILITY	5
2.2 ENVIRONMENTAL CONDITIONS	5
2.3 EQUIPMENT LIST	5
2.4 MEASUREMENT UNCERTAINTY	5
3 TEST SET-UP AND OPERATION MODES	6
3.1 DETAILS OF TEST MODE	6
3.2 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	7
3.3 SUPPORT SOFTWARE	7
3.4 TEST SETUP DIAGRAM	8
4 TEST RESULTS	10
4.1 TRANSMITTER REQUIREMENT & TEST SUITES	10
4.1.1 Antenna Requirement	10
4.1.2 Peak Output Power	11
4.1.3 6dB Bandwidth	12
4.1.4 Power Spectral Density	18
4.1.5 Conducted Spurious Emission & Authorized-band band-edge	24
4.1.6 Radiated Spurious Emission	42
4.1.7 Band Edge (Restricted-band band-edge)	43
4.2 MAINS EMISSIONS	44
4.2.1 Conducted Emission on AC Mains	44
5 APPENDIXES	47
5.1 PHOTOGRAPHS OF THE SAMPLE	47
5.2 SET-UP FOR CONDUCTED EMISSIONS	49
5.3 SET-UP FOR CONDUCTED RF TEST AT ANTENNA PORT	49
5.4 SET-UP FOR SPURIOUS EMISSIONS BELOW 1GHz	50
5.5 SET-UP FOR SPURIOUS EMISSIONS ABOVE 1GHz	50

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 3 of 50

1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Service (Shanghai) Co., Ltd.
Address	No.1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Applicant Company Name	Shanghai XinMiaoLink Technology Co., Ltd.
Address	Floor 1, building 28, No. 6055, Jinhai highway, Fengxian District, Shanghai,China
Contact Person	Yue liren
Telephone	13818419836
Email	tomas@chipfresh.com
Manufacturer Company Name	Shanghai XinMiaoLink Technology Co., Ltd.
Address	Floor 1, building 28, No. 6055, Jinhai highway, Fengxian District, Shanghai,China

1.3 Details of EUT

Product Name	Wi-Fi&BLE Module
Brand Name	N/A
Test Model No.	X-C13SM-0
Series Model No.	X-C13SM-1
Difference Description	All the same except for the model name and antenna type
FCC ID	2A3M5-X-C13SM
Mode of Operation	WLAN 802.11b/g/n(HT20)
Frequency Range	2400MHz ~ 2483.5MHz
Channel Separation	5 MHz
Modulation Type	DSSS, OFDM
Antenna Type	X-C13SM-0:External antenna X-C13SM-1:PCB antenna
Antenna Gain	X-C13SM-0:3dBi X-C13SM-1:2dBi
Test Voltage	DC 3.3V
Hardware version	V1.0
Software version	V1.00.10
Test SW Version	BL410_R;BL410_E

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 4 of 50

RF power setting in TEST SW	Bouffalo Lab Dev Cube V1.6.5
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1.4 Test Methodology

47 CFR Part 15, Subpart C (10-1-16 Edition)	Miscellaneous Wireless Communications Services
KDB Publication 558074 D01 v05r02	15.247 Meas Guidance.
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

1.5 Test Summary

Test Item	FCC Rules	Result
Antenna Requirement	FCC Part 15.247(b)(4), Part 15.203	PASS
Peak Output Power	FCC Part 15.247(b)(3)	PASS
6dB Bandwidth	FCC Part 15.247(a)(2)	PASS
Power Spectral Density	FCC Part 15.247(e)	PASS
Conducted Spurious Emission & Authorized-band band-edge	FCC Part 15.247(d)	PASS
Radiated Spurious Emission	FCC Part 15.247(d), 15.205, 15.209	PASS
Band Edge (Restricted-band band-edge)	FCC Part 15.247(d), 15.205, 15.209	PASS
Conducted Emission on AC Mains	FCC Part 15.207(a)	PASS

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 5 of 50

2 Test Condition

2.1 Test Facility

2.2 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.3 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2021-08-17	2022-08-16
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2021-06-10	2022-06-09
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-10	2022-06-09
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2021-06-10	2022-06-09
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-06-10	2022-06-09
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2021-08-13	2022-08-12
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08	2022-06-07
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2021-06-08	2022-06-07
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2020-11-23	2022-11-22
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2021-06-12	2022-06-11
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2020-06-09	2023-06-08
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2020-06-09	2023-06-08
Test Software	BL	BL410_E	N/A	N/A	N/A
Test Software	BL	BL410_R	N/A	N/A	N/A

2.4 Measurement Uncertainty

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3.42 dB
	> 1GHz	± 4.20 dB
Conducted Emission on AC Mains	9 kHz to 30 MHz	± 1.71 dB

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 6 of 50

3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

For 802.11b/g/n (HT20)

Channel	Frequency
The lowest channel(CH1)	2412MHz
The middle channel(CH6)	2437MHz
The Highest channel(CH11)	2462MHz

Through Pre-scan under all rate at lowest channel, the data rate as below table described is the worst case, so we choose these data rate for test.

Type	Data rate
802.11b	11Mbps
802.11g	54Mbps
802.11n(20M)	MCS5

The basic operation modes are:

- A. On
 - 1. WLAN mode
 - a. Transmitting
 - i. Low Channel
 - ii. Middle Channel
 - iii. High Channel
 - b. Receiving
- B. Standby
- C. Off

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 7 of 50

3.2 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	TP00083A	N/A
Laptop 2	HP	HP ZHAN 66 Pro G1	5CD7438R1G
USB Cable	N/A	N/A	N/A

3.3 Support Software

Description	Manufacturer	Software Name
Software	Bouffalo Lab	Bouffalo Lab Dev Cube V1.6.5

TEST REPORT

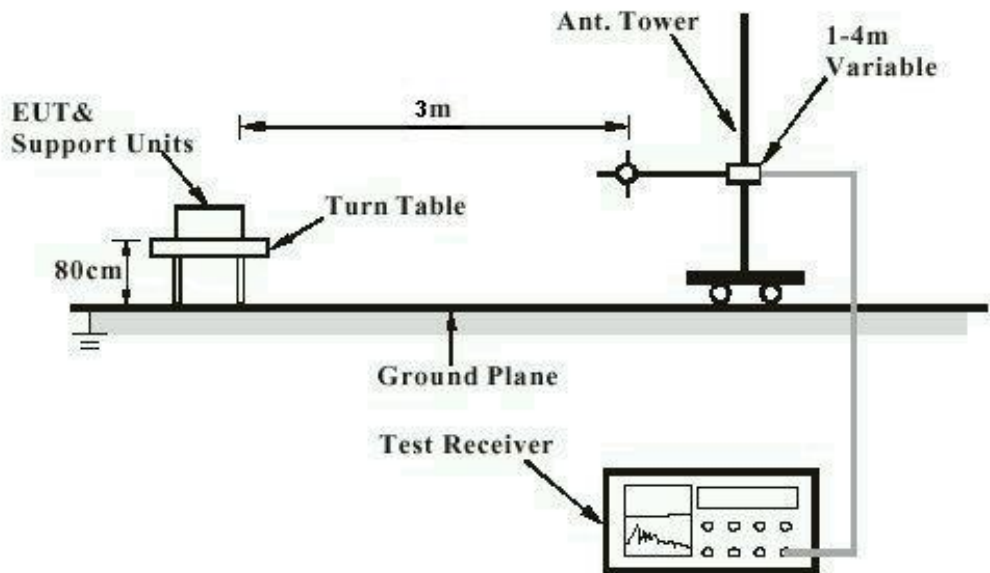
Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 8 of 50

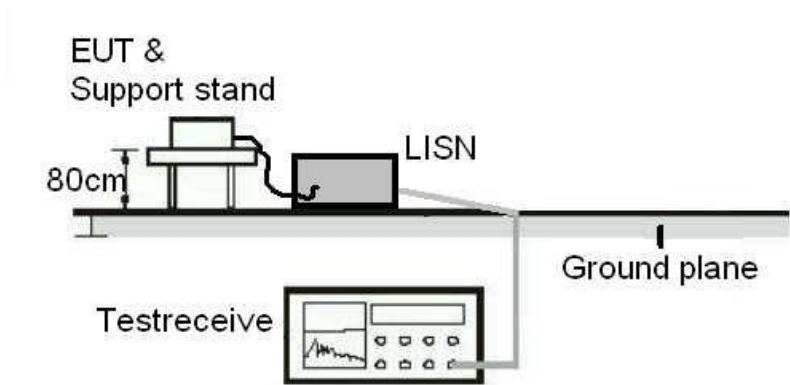
3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement



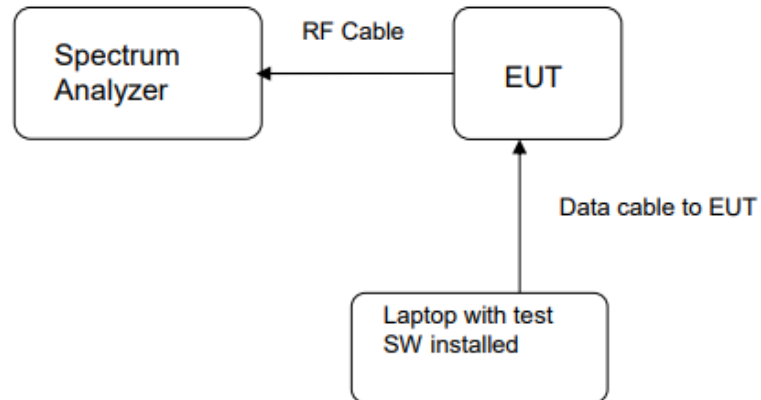
TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 9 of 50

Diagram of Measurement Equipment Configuration for Transmitter Measurement



TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 10 of 50

4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT:

PASS

Test standard : FCC Part 15.247(b)(4), Part 15.203

Requirement : The use of approved antennas only with directional gains that do not exceed 6dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 3dBi. The antenna is an external antenna with no possibility of replacement with a non-approved antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 11 of 50

4.1.2 Peak Output Power

RESULT:

PASS

Test standard : FCC Part 15.247(b)(3)

Requirement : ANSI C63.10-2013, KDB 558074

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1.a

Ambient temperature : 25°C

Relative humidity : 52%

Table 1: Peak Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power	Peak Output Power	Limit (W)
		(dBm)	(mW)	
802.11b	2412	16.68	46.56	≤1
	2437	16.75	47.32	
	2462	16.52	44.87	
802.11g	2412	15.46	35.16	
	2437	15.55	35.89	
	2462	15.37	34.43	
802.11n(HT20)	2412	14.26	26.67	
	2437	14.30	26.92	
	2462	14.20	26.30	

Note: configure the operation of the EUT transmits continuously at its maximum power control level (100% duty cycle).

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 12 of 50

4.1.3 6dB Bandwidth

RESULT:

PASS

Test standard : FCC Part 15.247(a)(2)

Requirement : ANSI C63.10-2013, KDB 558074

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1.a

Ambient temperature : 25°C

Relative humidity : 52%

Table 2: 6dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	6 dB Bandwidth Limit (MHz)
802.11b	2412	8.092	≥ 0.5
	2437	9.089	
	2462	9.401	
802.11g	2412	16.370	
	2437	16.400	
	2462	16.430	
802.11n(HT20)	2412	16.410	
	2437	16.480	
	2462	16.850	

TEST REPORT

Figure 1: 6dB Bandwidth and 99% Bandwidth, 802.11b, 2412MHz

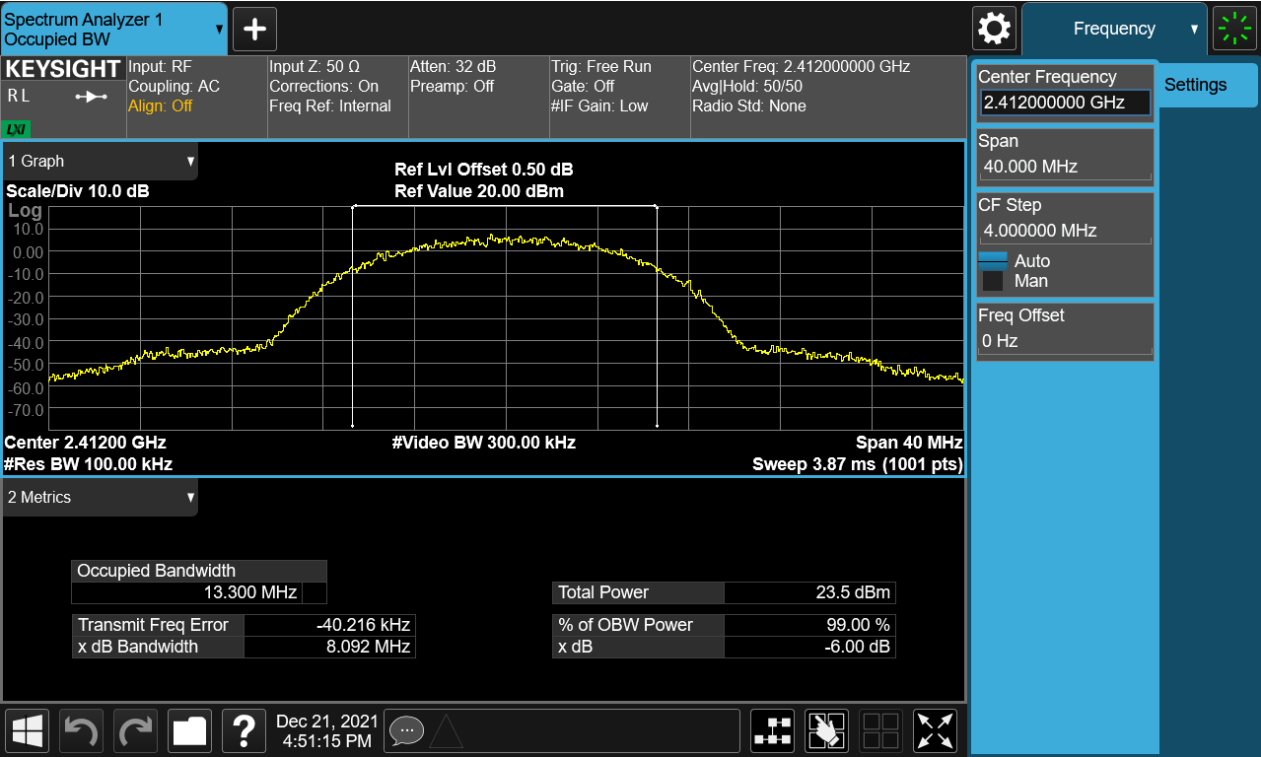
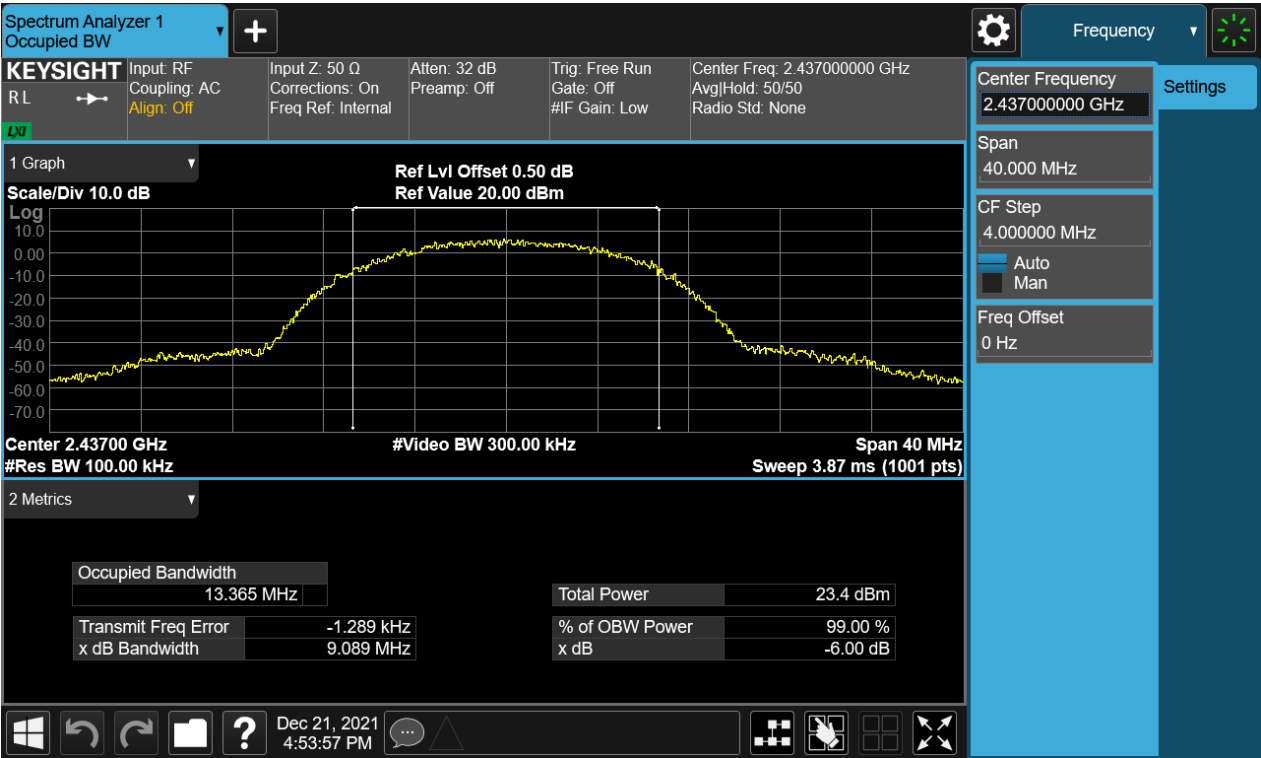


Figure 2: 6dB Bandwidth and 99% Bandwidth, 802.11b, 2437MHz



TEST REPORT

Report No.: SHE21120050-02AE

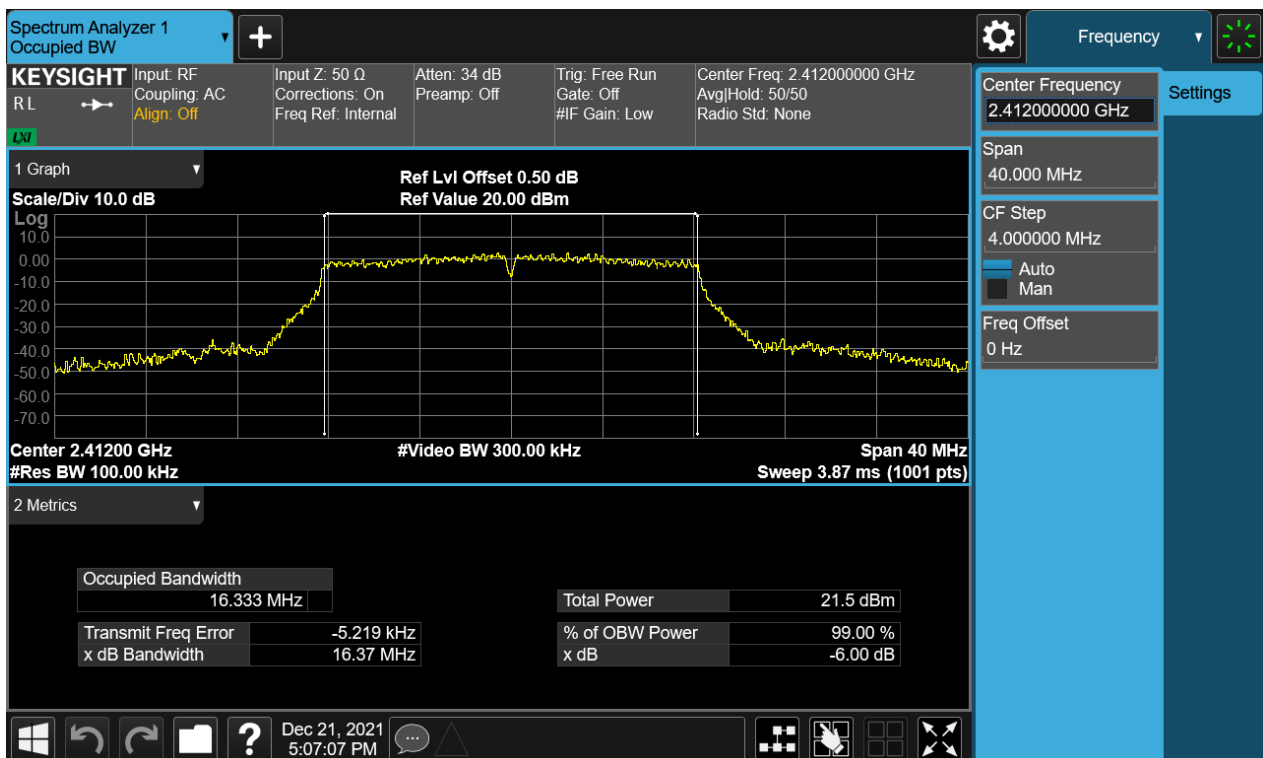
Date: 2022-01-24

Page 14 of 50

Figure 3: 6dB Bandwidth and 99% Bandwidth, 802.11b, 2462MHz



Figure 4: 6dB Bandwidth and 99% Bandwidth, 802.11g, 2412MHz



TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 15 of 50

Figure 5: 6dB Bandwidth and 99% Bandwidth, 802.11g, 2437MHz

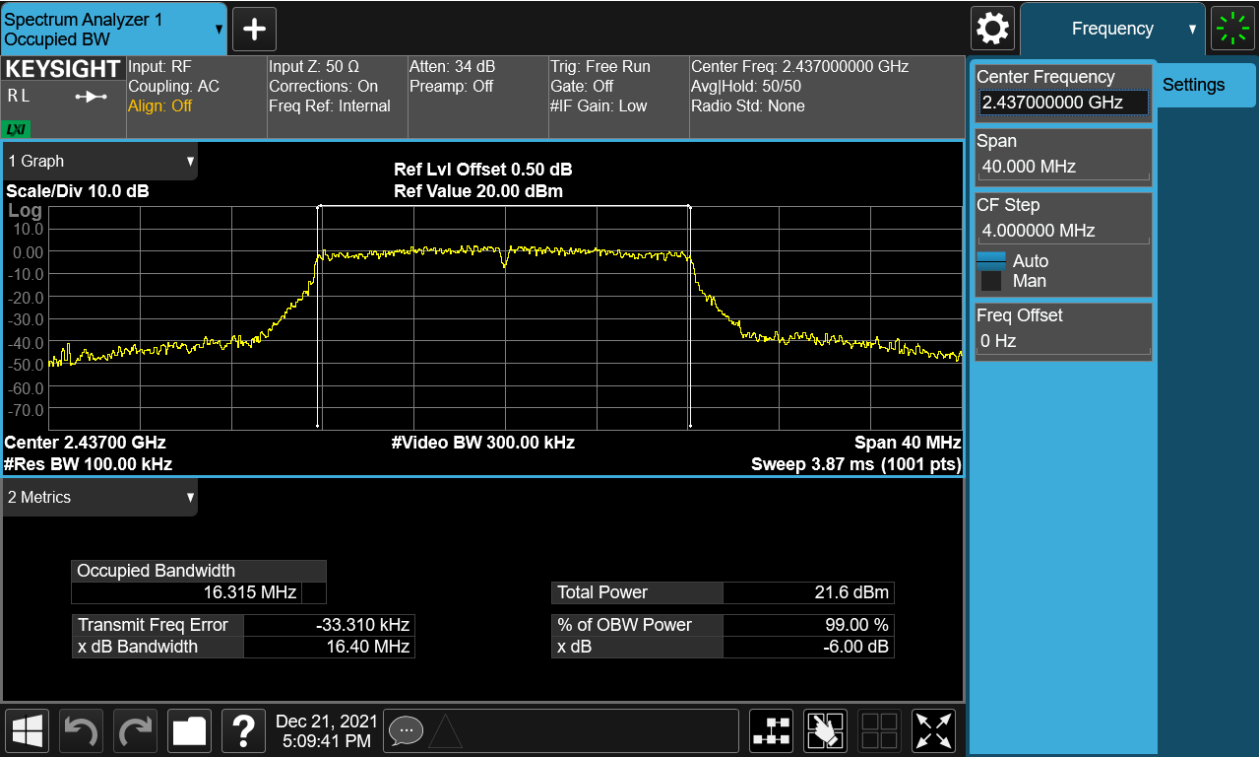
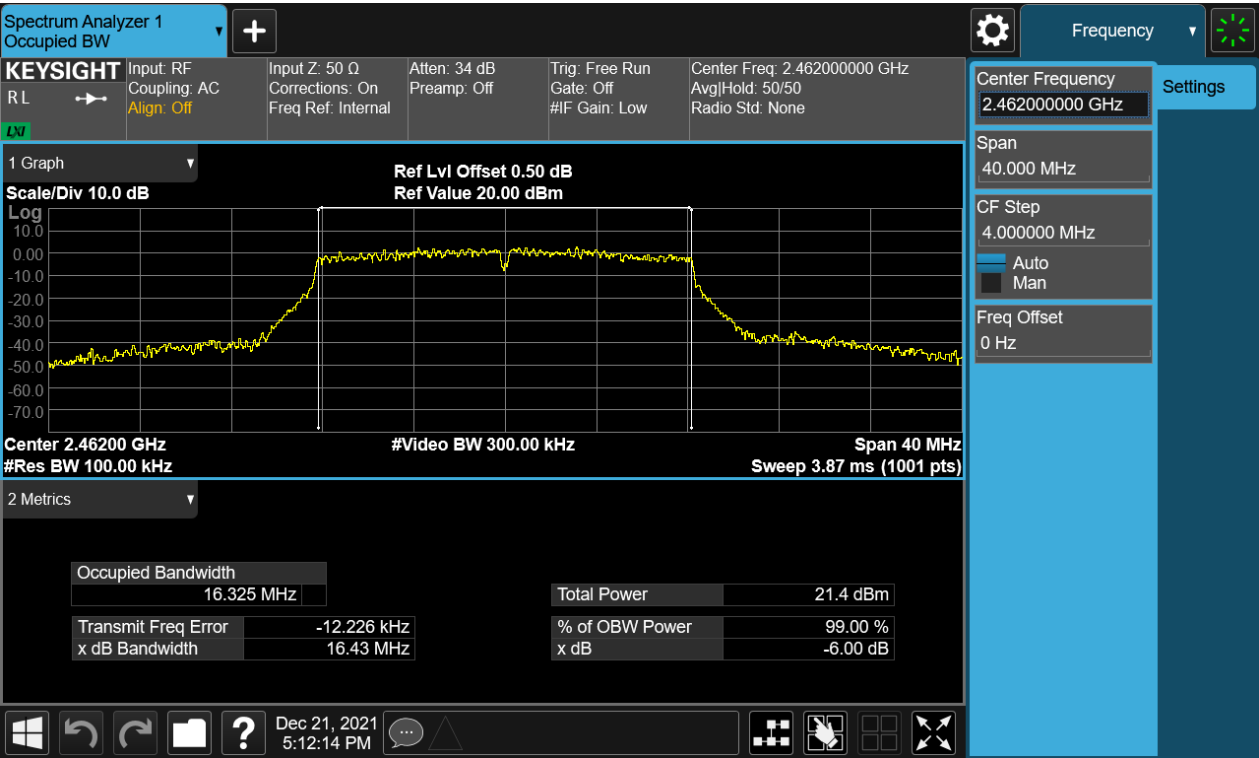


Figure 6: 6dB Bandwidth and 99% Bandwidth, 802.11g, 2462MHz



TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 16 of 50

Figure 7: 6dB Bandwidth and 99% Bandwidth, 802.11n(HT20), 2412MHz

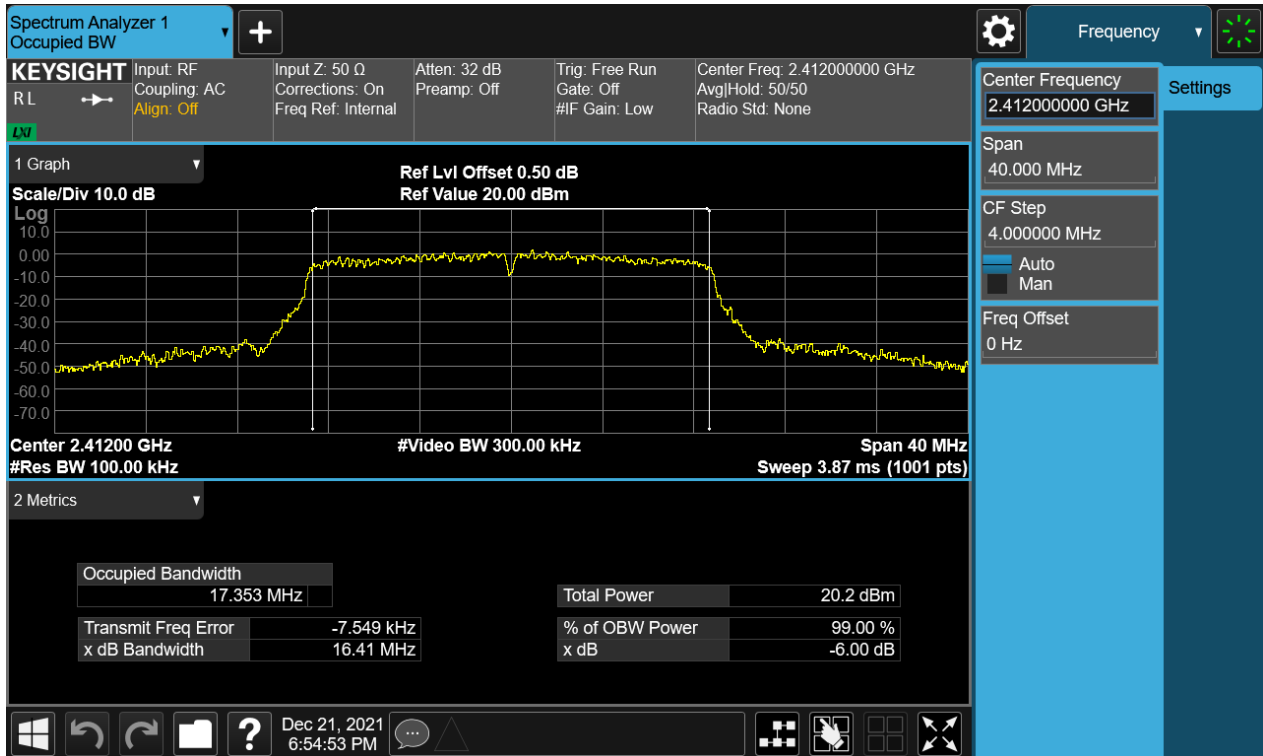
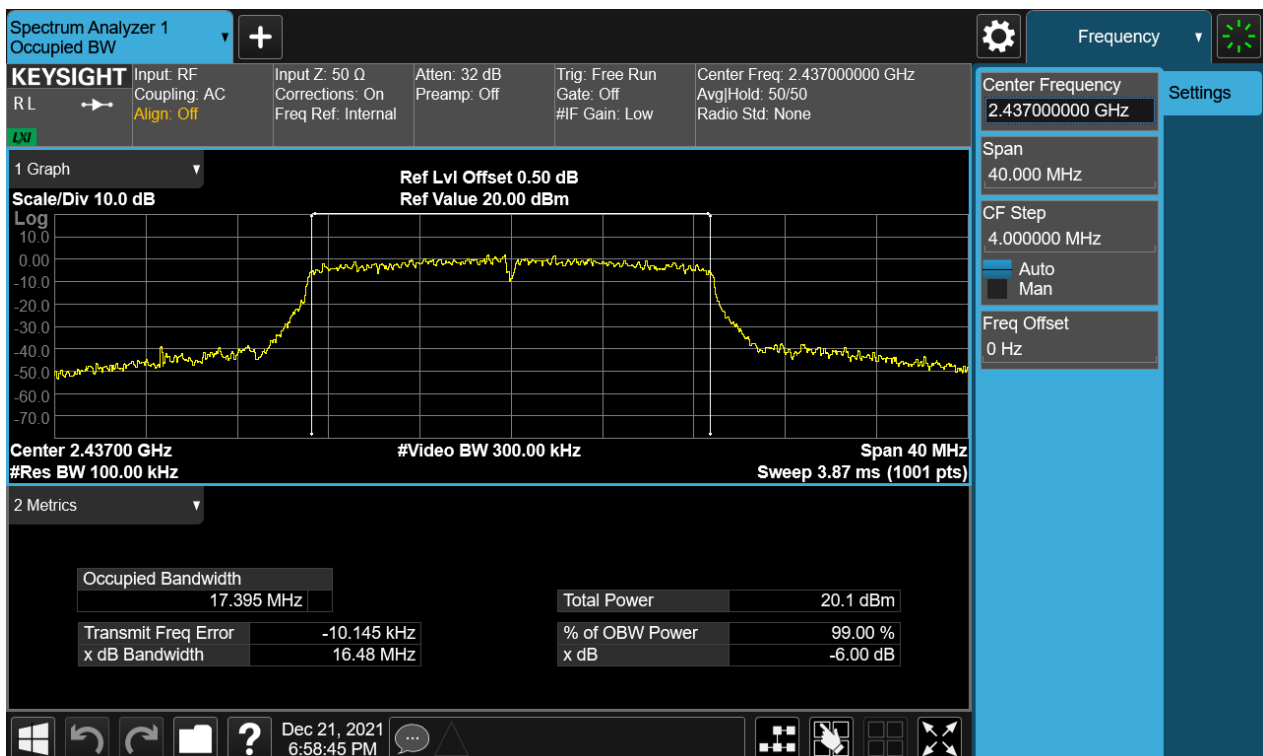
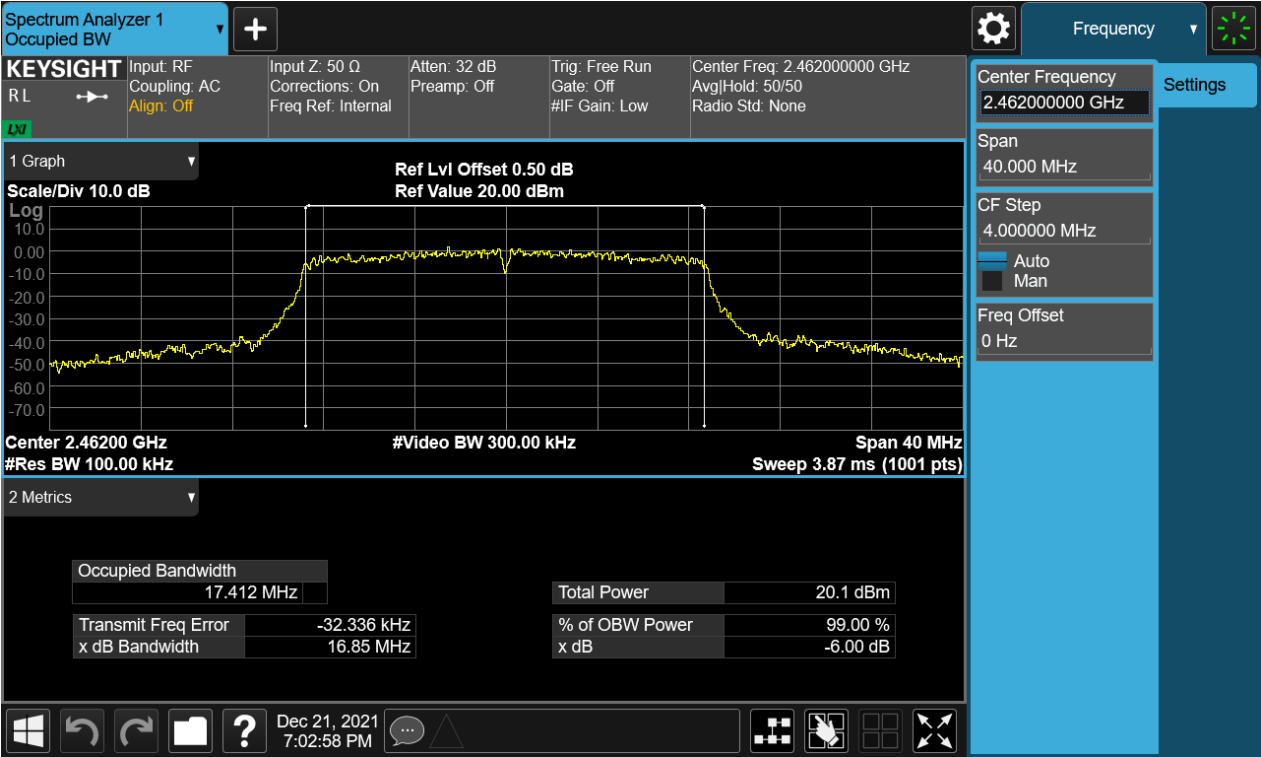


Figure 8: 6dB Bandwidth and 99% Bandwidth, 802.11n(HT20), 2437MHz



TEST REPORT

Figure 9: 6dB Bandwidth and 99% Bandwidth, 802.11n(HT20), 2462MHz



TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 18 of 50

4.1.4 Power Spectral Density

RESULT:

PASS

Test standard : FCC Part 15.247(e)

Requirement : ANSI C63.10-2013, KDB 558074

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1.a

Ambient temperature : 25°C

Relative humidity : 52%

Table 3: Power Spectral Density

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	2412	-8.29	≤8
	2437	-7.14	
	2462	-7.35	
802.11g	2412	-9.77	
	2437	-9.62	
	2462	-10.48	
802.11n(HT20)	2412	-11.26	
	2437	-11.15	
	2462	-11.69	

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 19 of 50

Figure 10: Power Spectral Density, 802.11b, 2412MHz

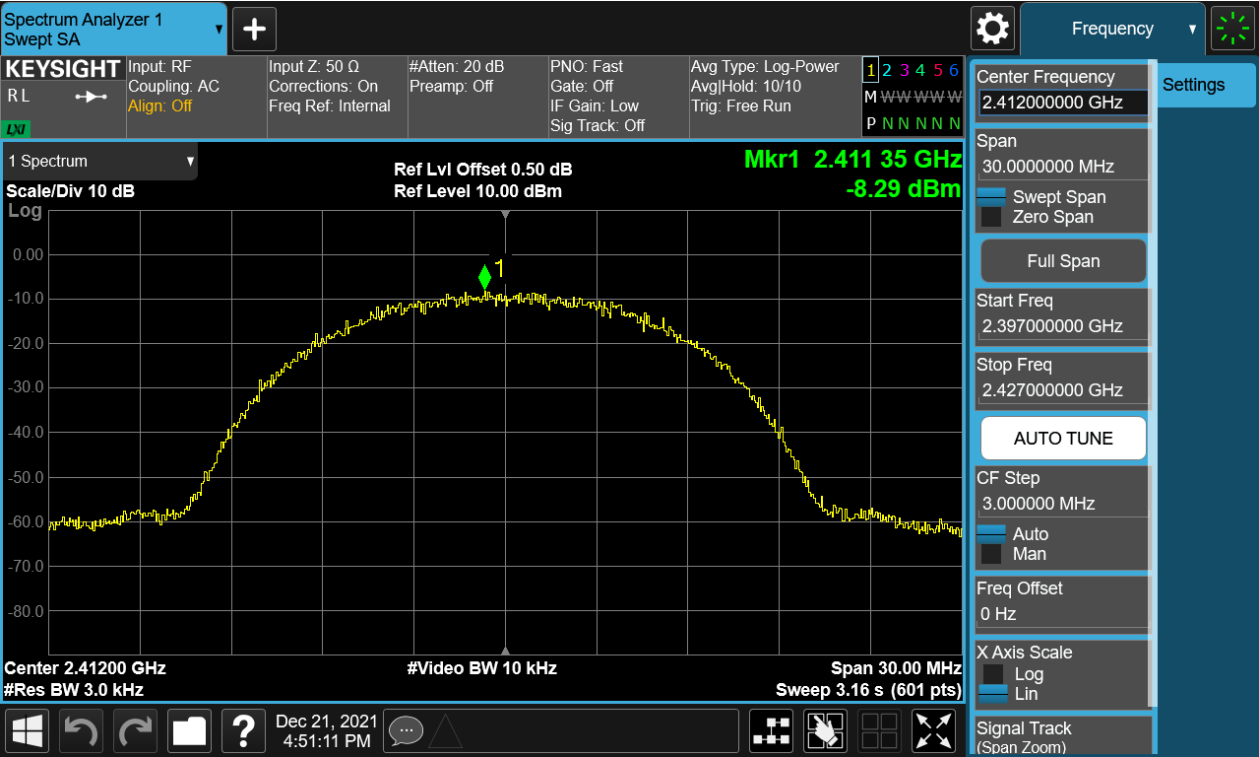


Figure 11: Power Spectral Density, 802.11b, 2437MHz



TEST REPORT

Figure 12: Power Spectral Density, 802.11b, 2462MHz

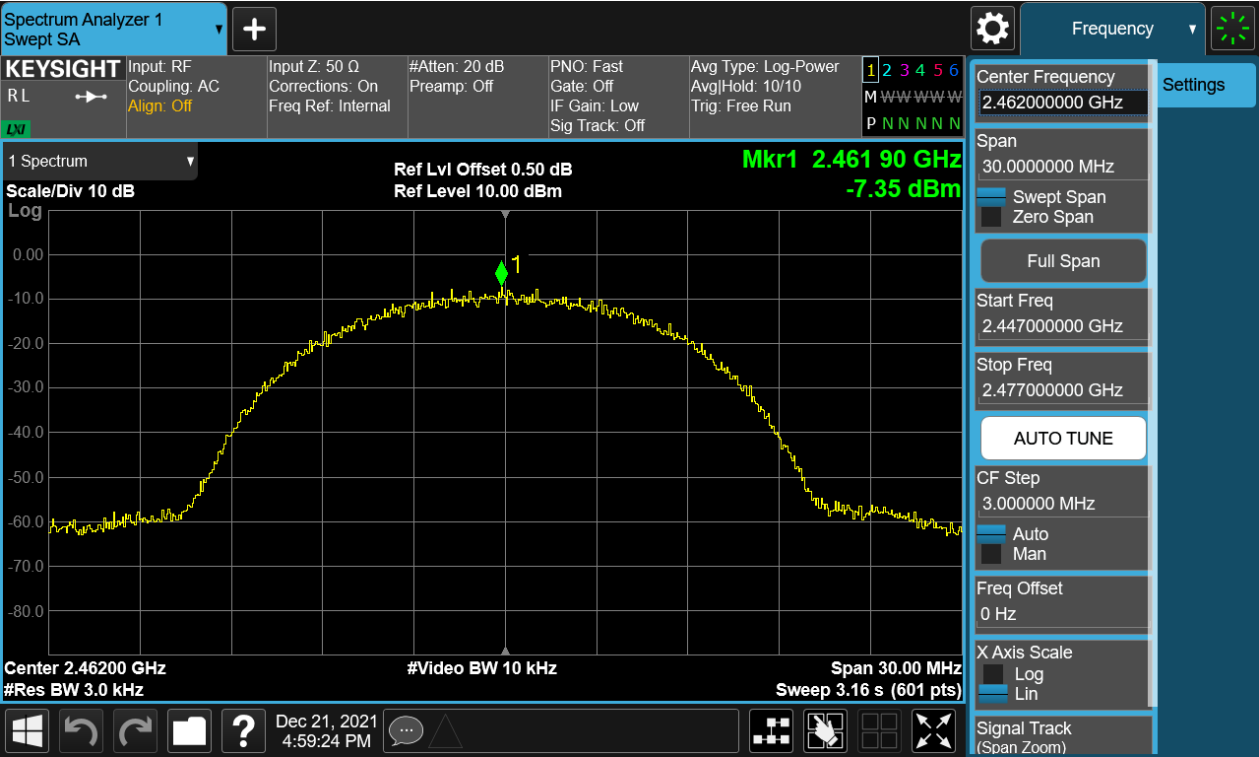
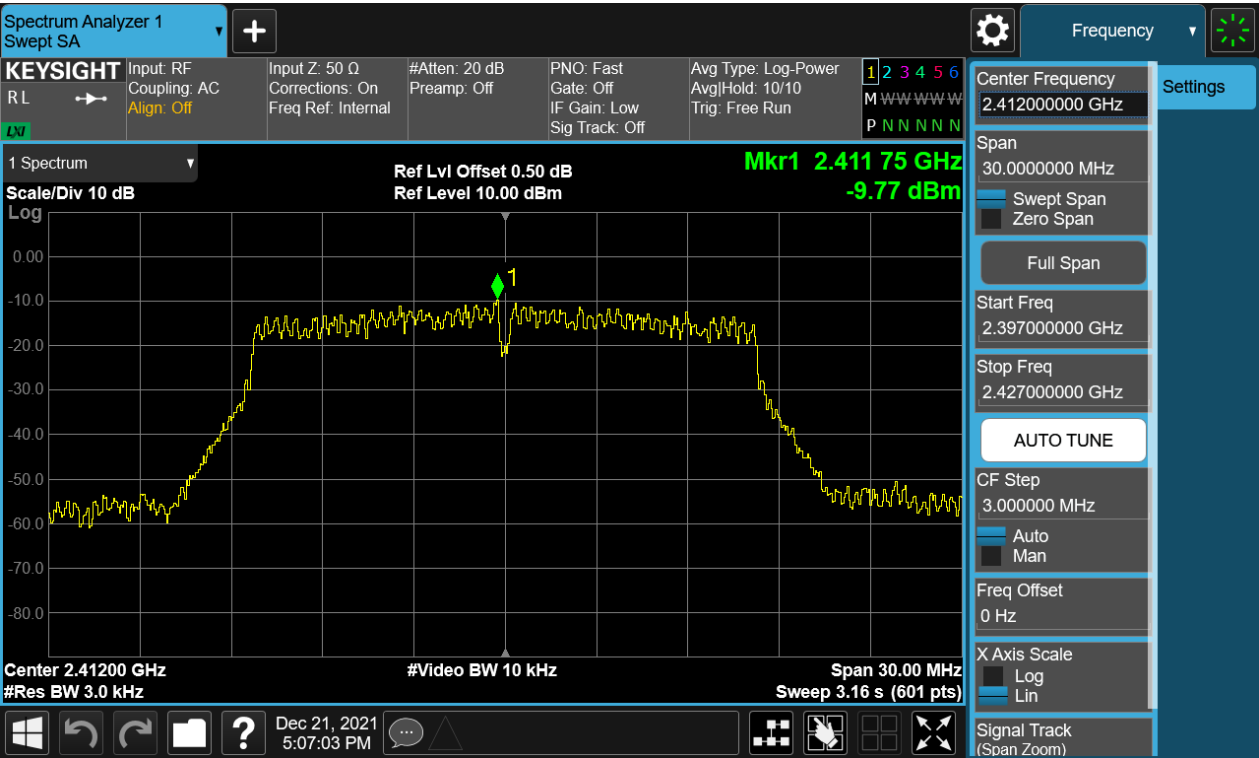


Figure 13: Power Spectral Density, 802.11g, 2412MHz



TEST REPORT

Figure 14: Power Spectral Density, 802.11g, 2437MHz

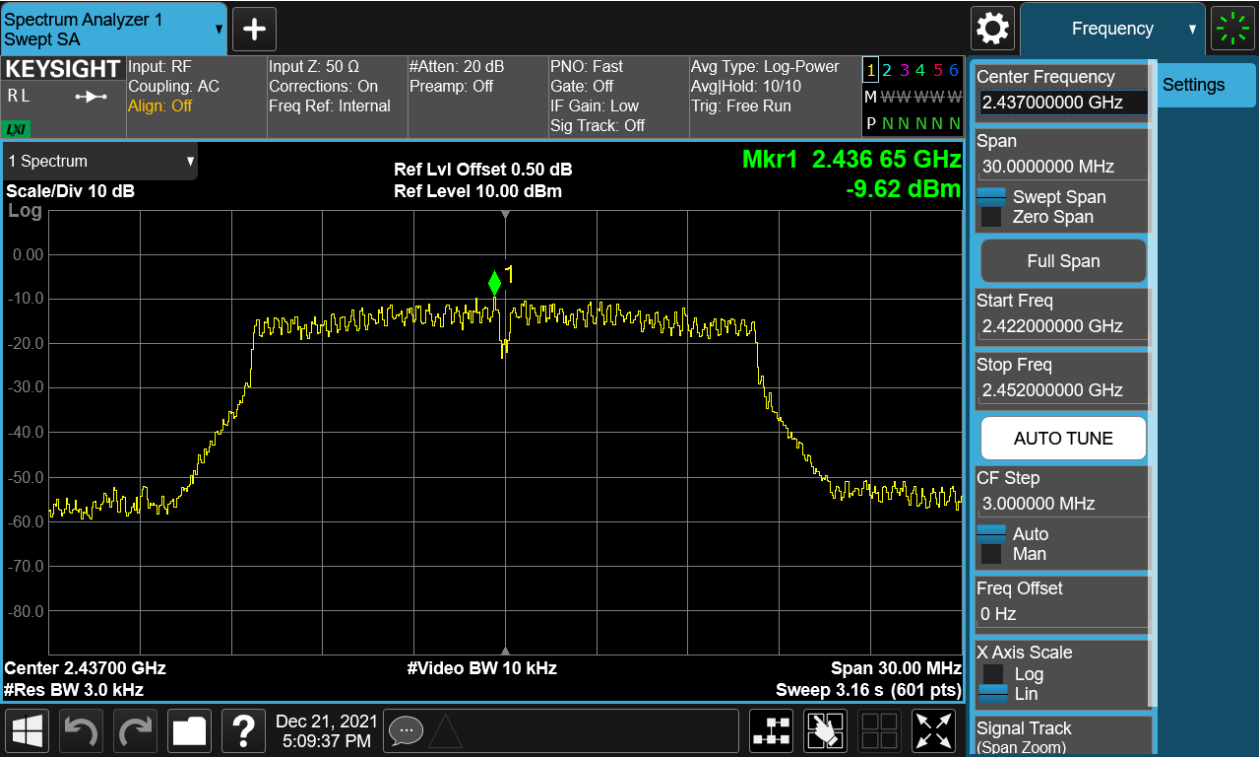
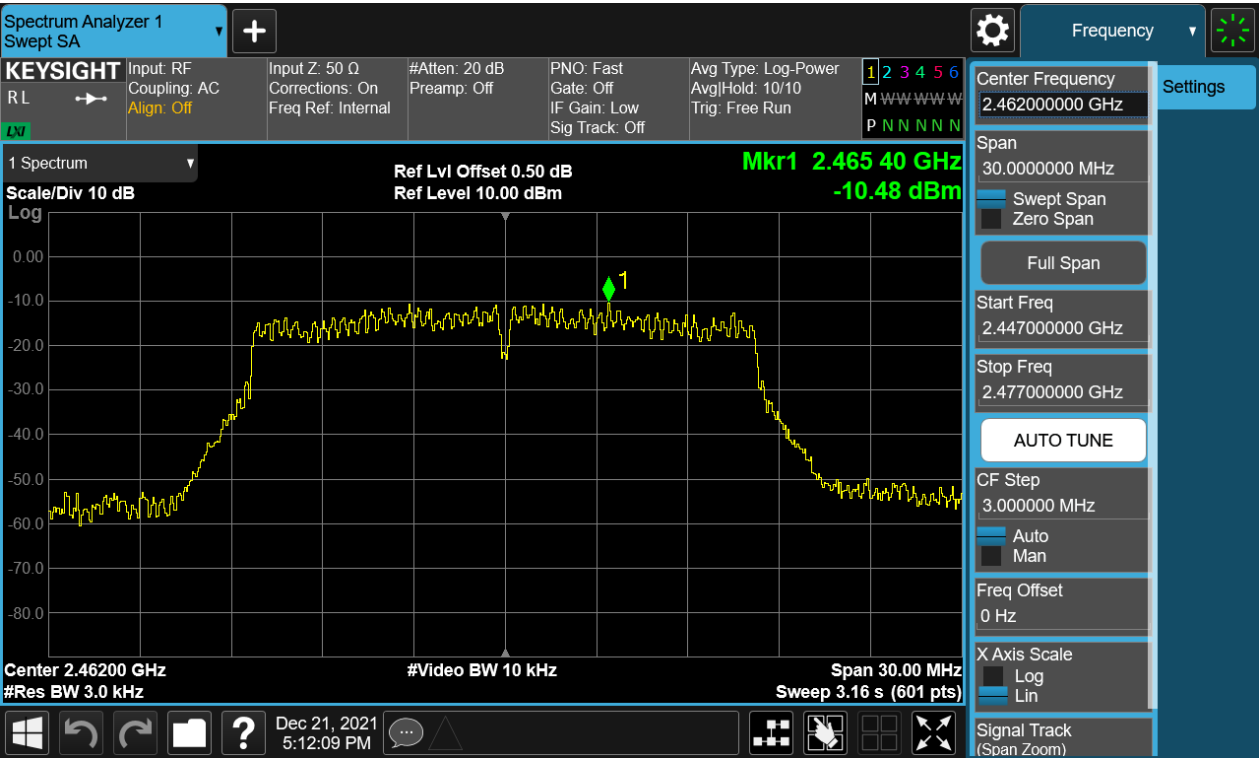


Figure 15: Power Spectral Density, 802.11g, 2462MHz



TEST REPORT

Figure 16: Power Spectral Density, 802.11n(HT20), 2412MHz

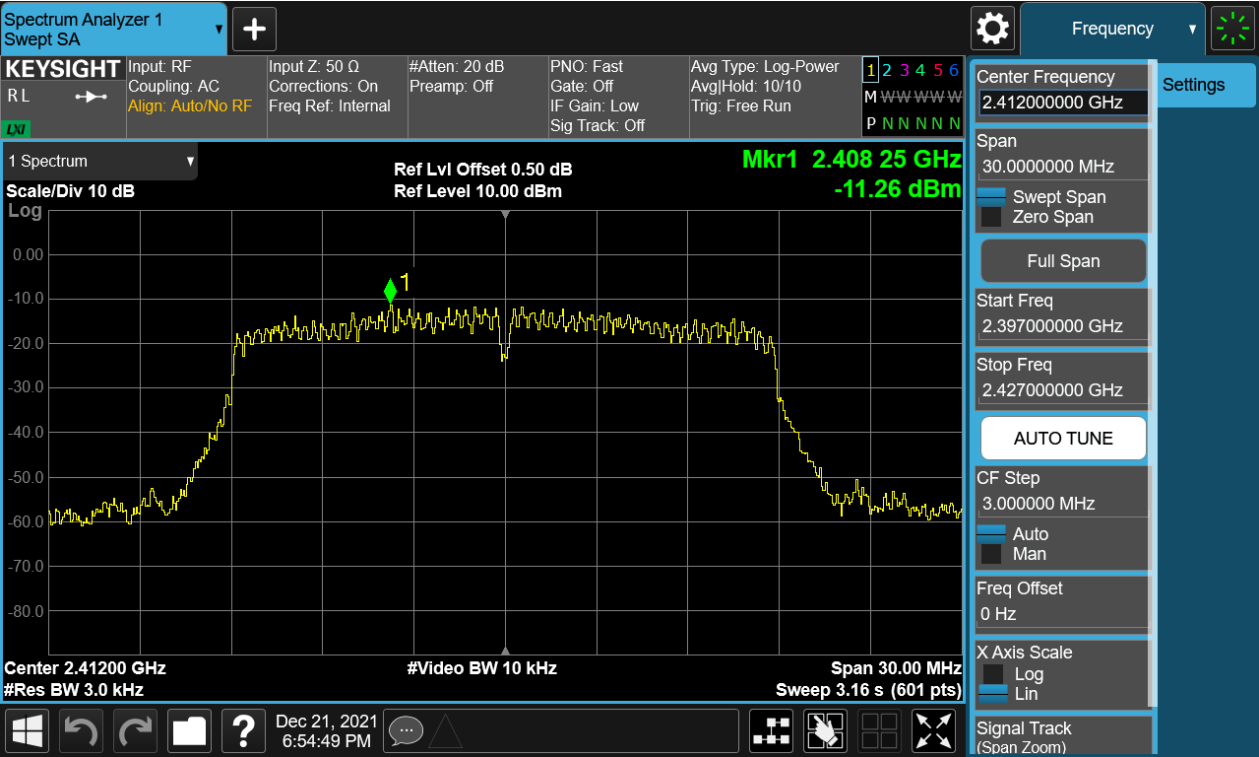
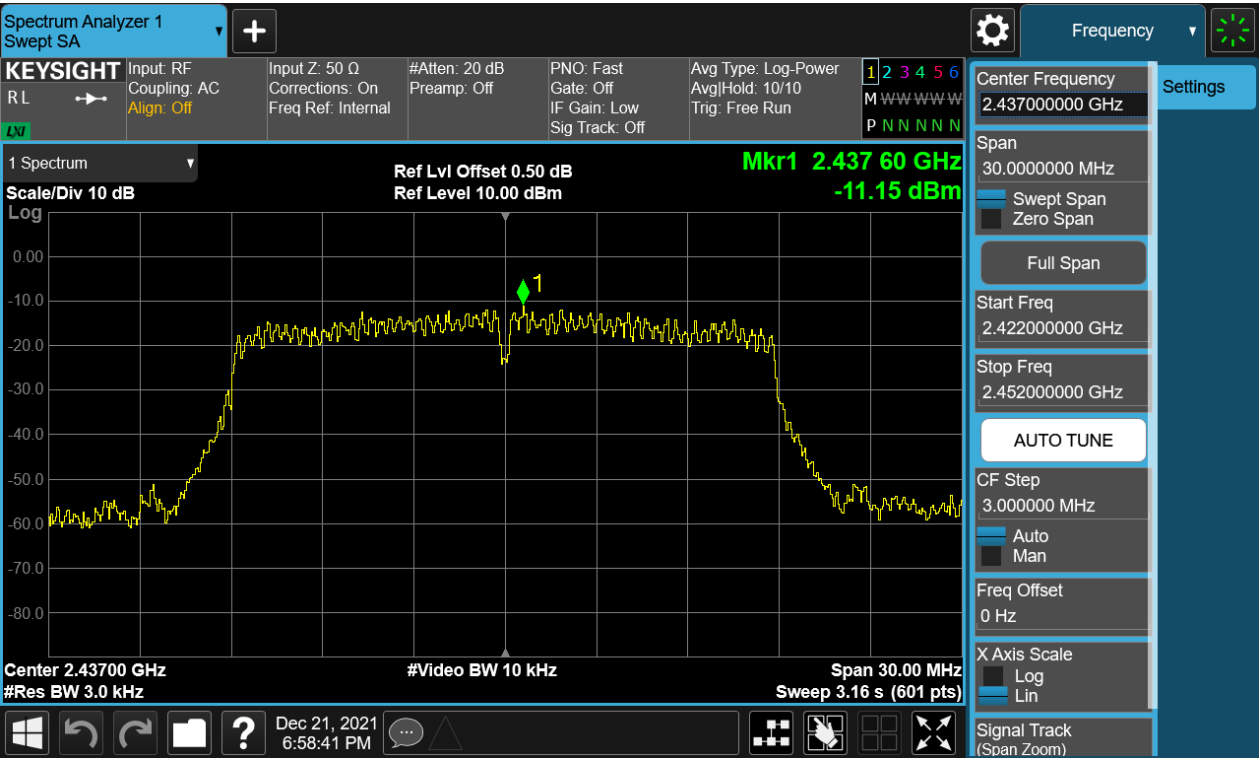


Figure 17: Power Spectral Density, 802.11n(HT20), 2437MHz



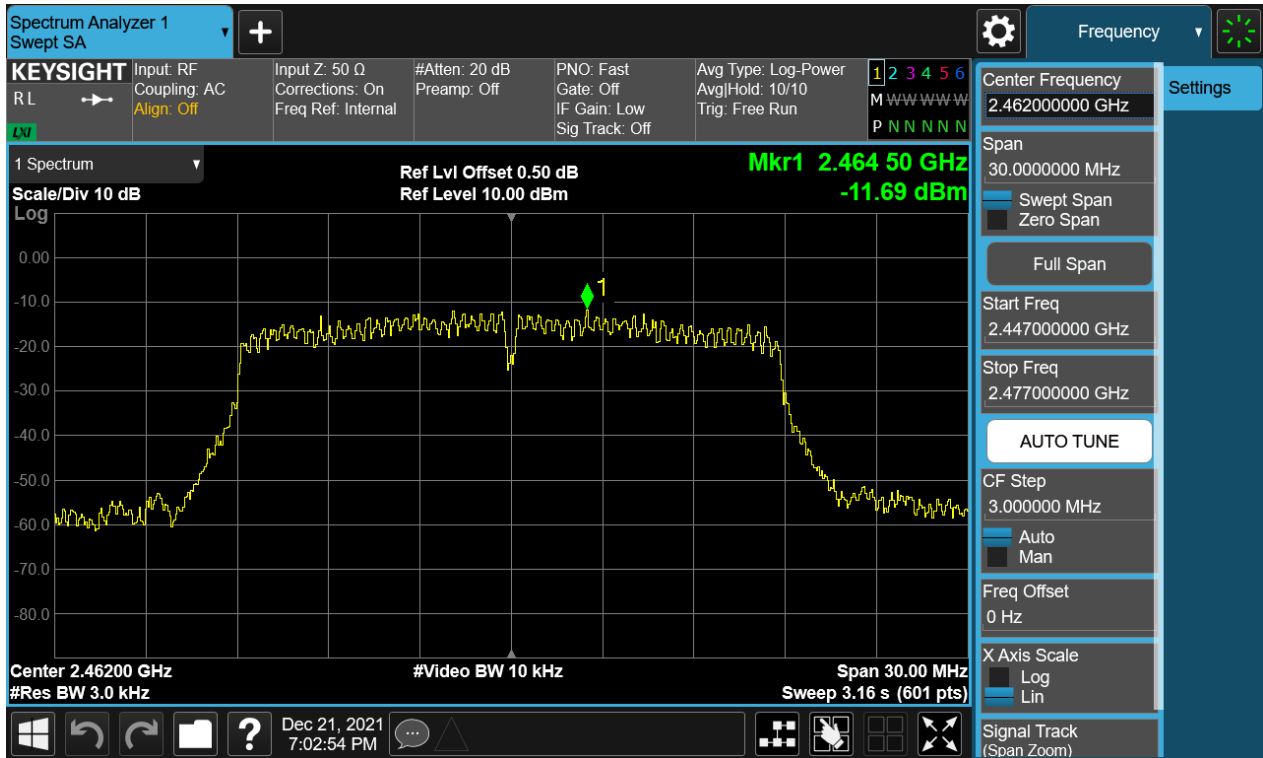
TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 23 of 50

Figure 18: Power Spectral Density, 802.11n(HT20), 2462MHz



TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 24 of 50

4.1.5 Conducted Spurious Emission & Authorized-band band-edge

RESULT:

PASS

Test standard	: FCC Part 15.247(d), 15.209
Requirement	: ANSI C63.10-2013, KDB 558074
Kind of test site	: Shielded room

Test setup

Test Channel	: Low/Middle/High for spurious, Low/High for Band Edge
Operation Mode	: A.1.a
Ambient temperature	: 25°C
Relative humidity	: 52%

For details refer to following test plot.

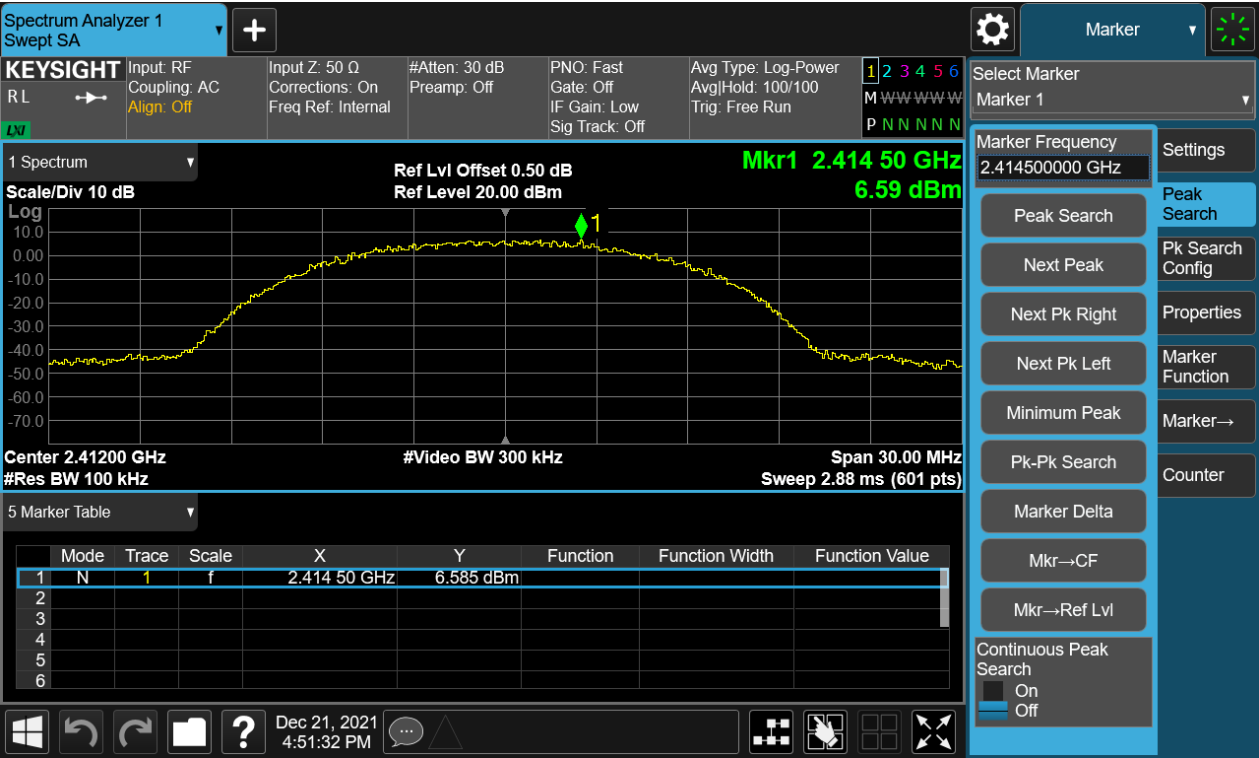
TEST REPORT

Report No.: SHE21120050-02AE

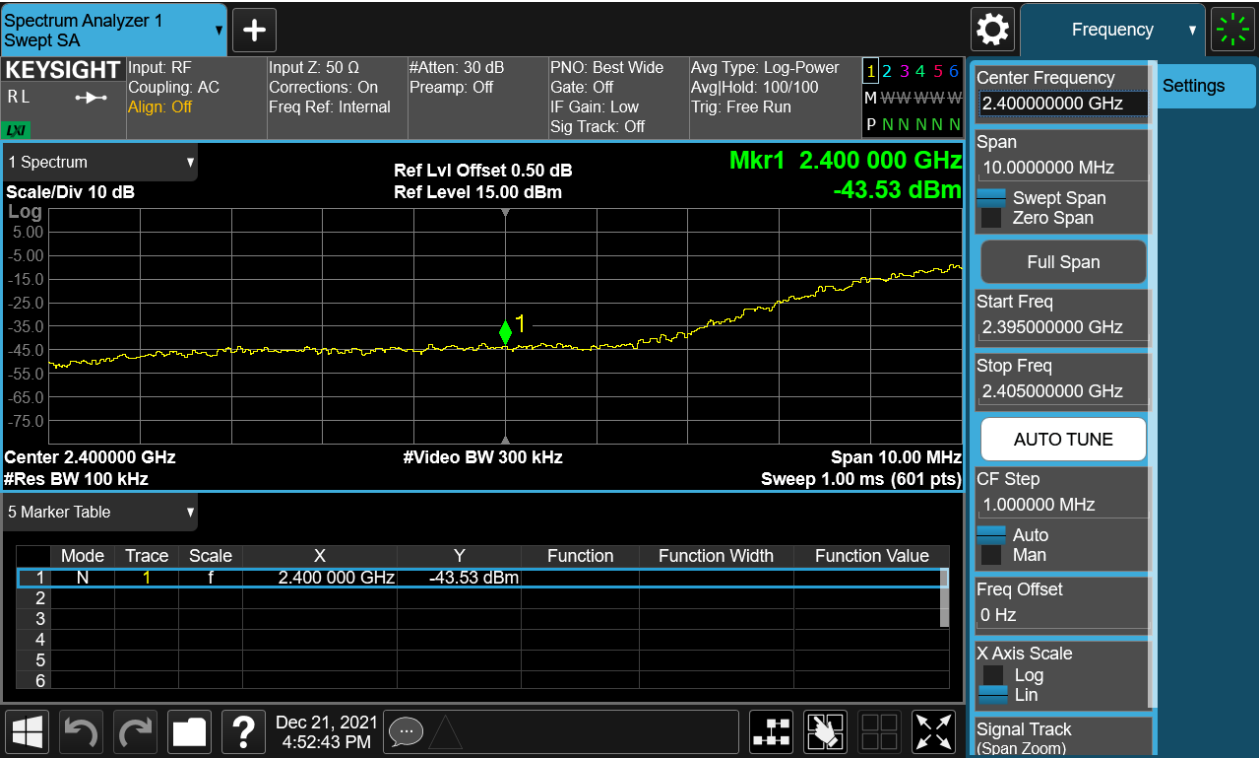
Date: 2022-01-24

Page 25 of 50

Figure 19: Conducted Spurious Emission & Authorized-band band-edge, 802.11b, 2412MHz
Carrier Level



Band Edge



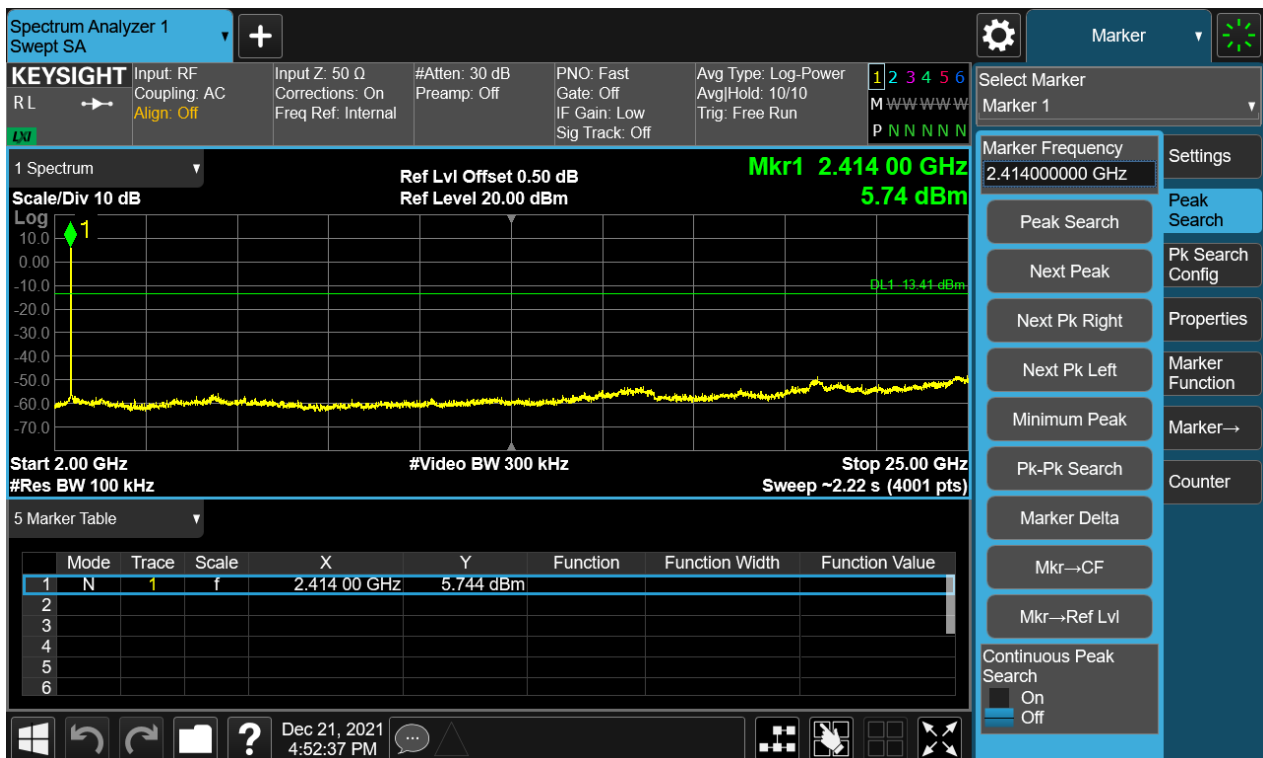
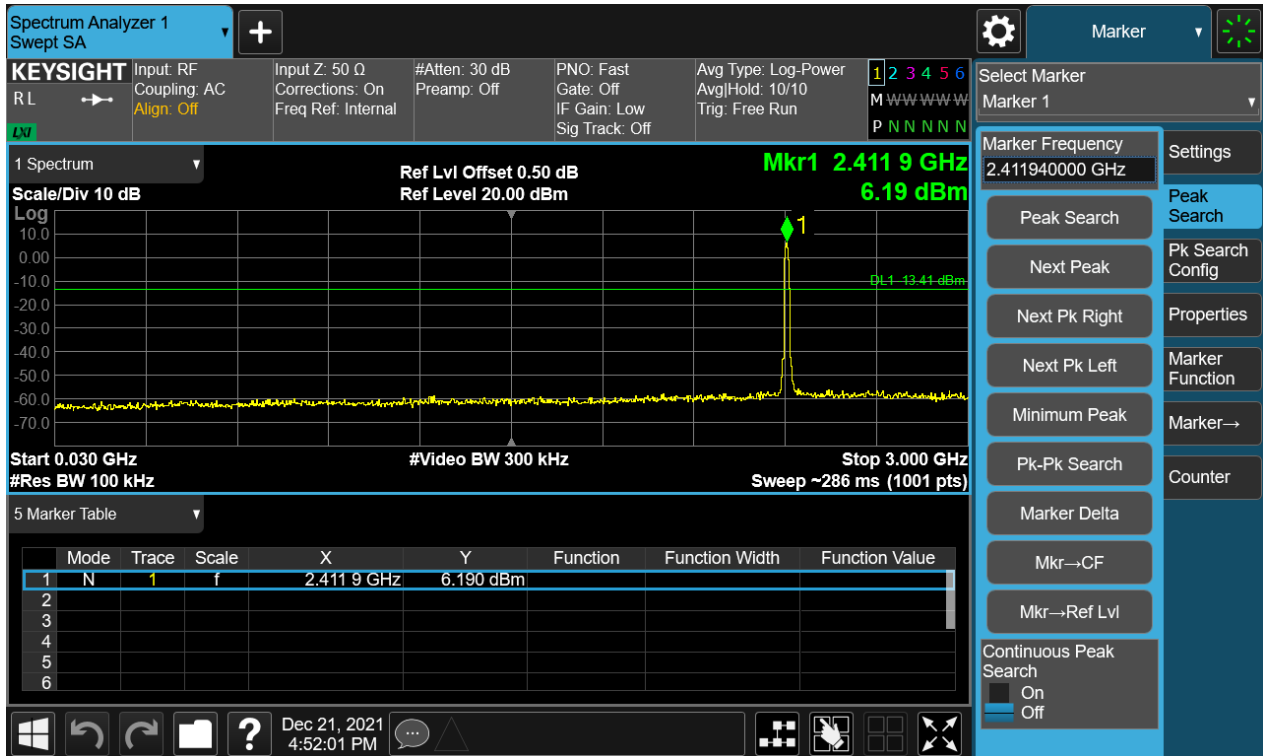
TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

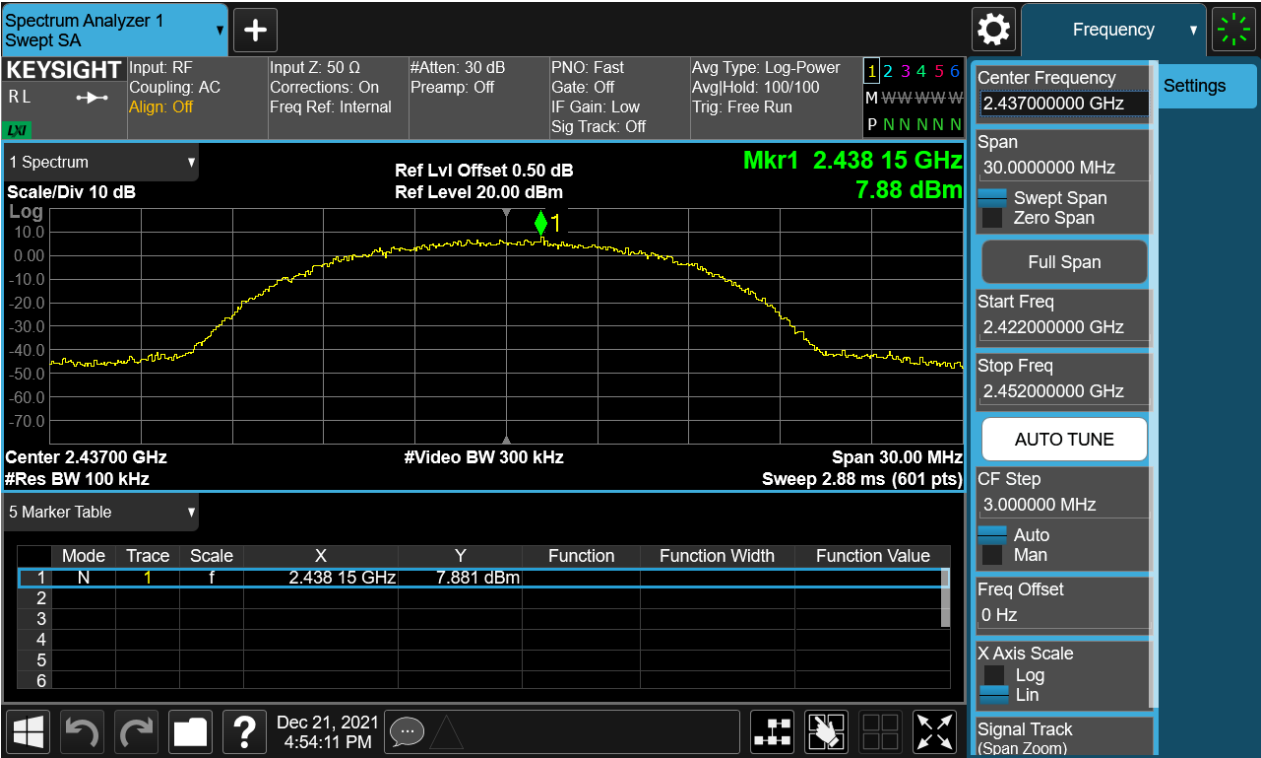
Page 26 of 50

Conducted spurious emissions 30MHz-25GHz

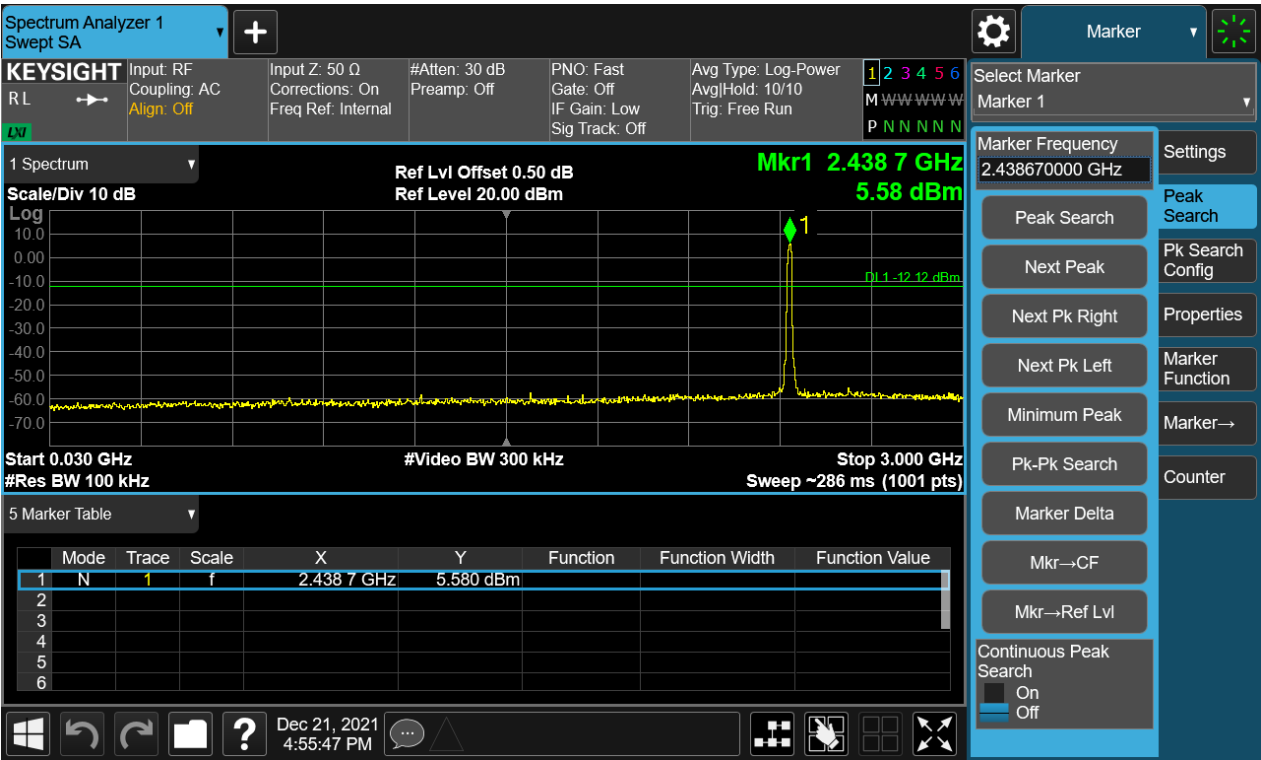


TEST REPORT

Figure 20: Conducted Spurious Emission & Authorized-band band-edge, 802.11b, 2437MHz
Carrier Level



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 28 of 50

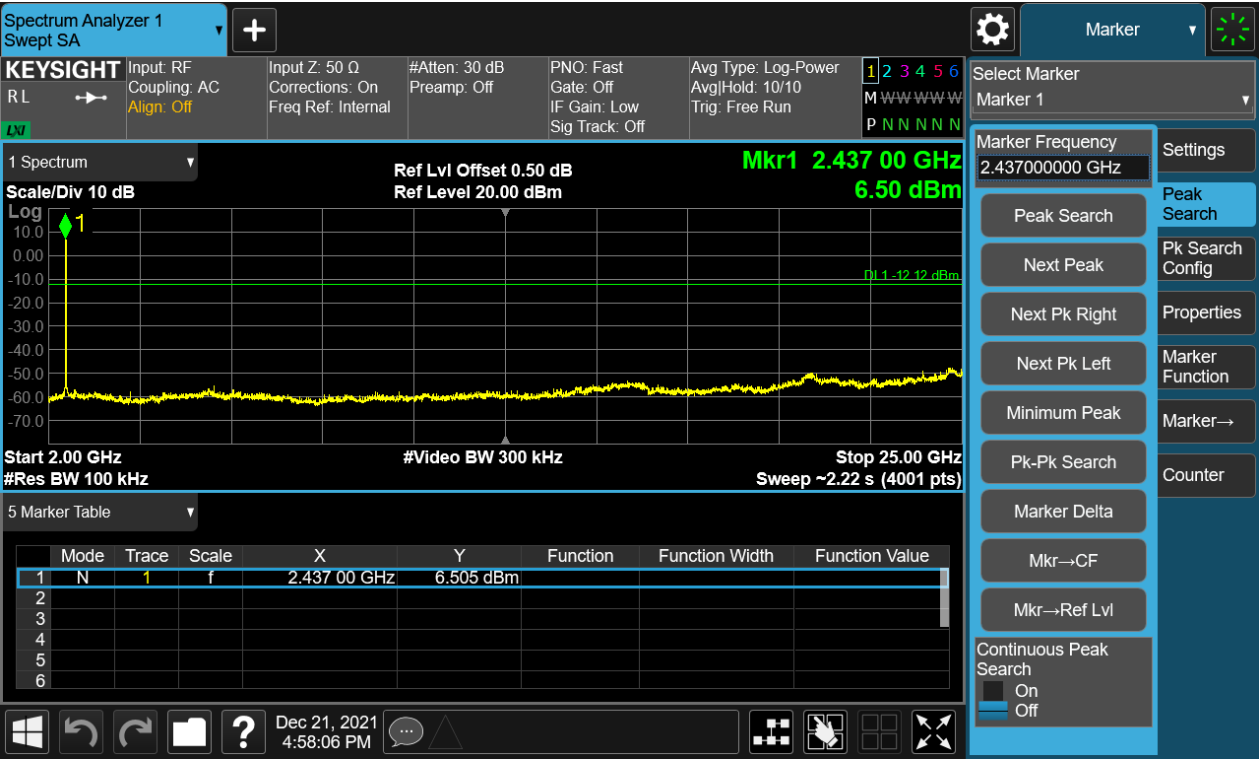
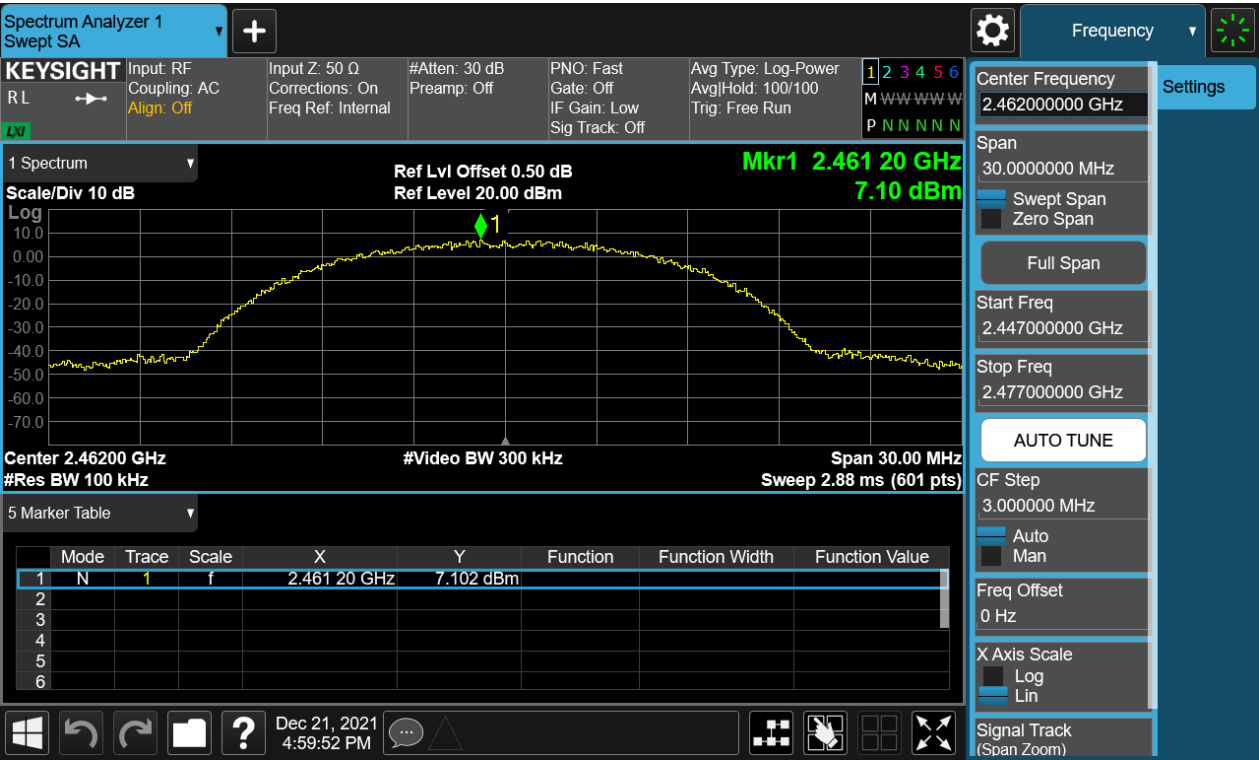


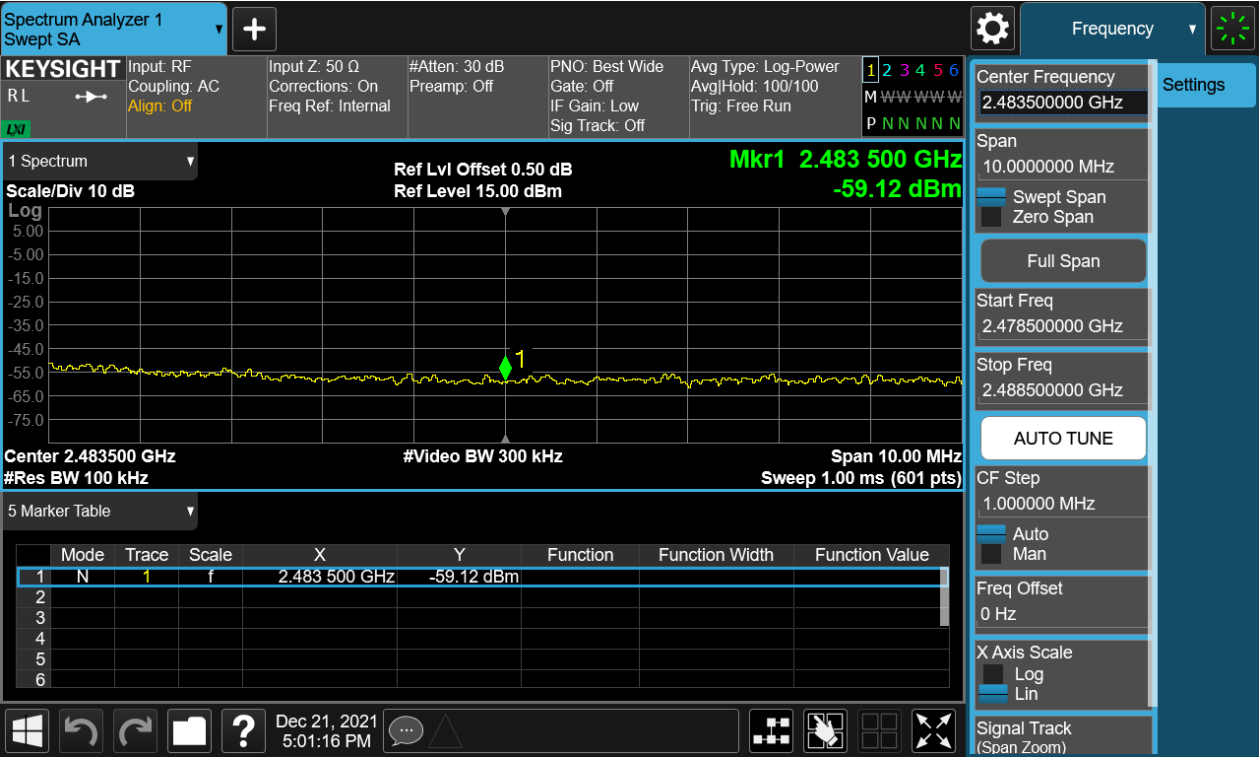
Figure 21: Conducted Spurious Emission & Authorized-band band-edge, 802.11b, 2462MHz Carrier Level



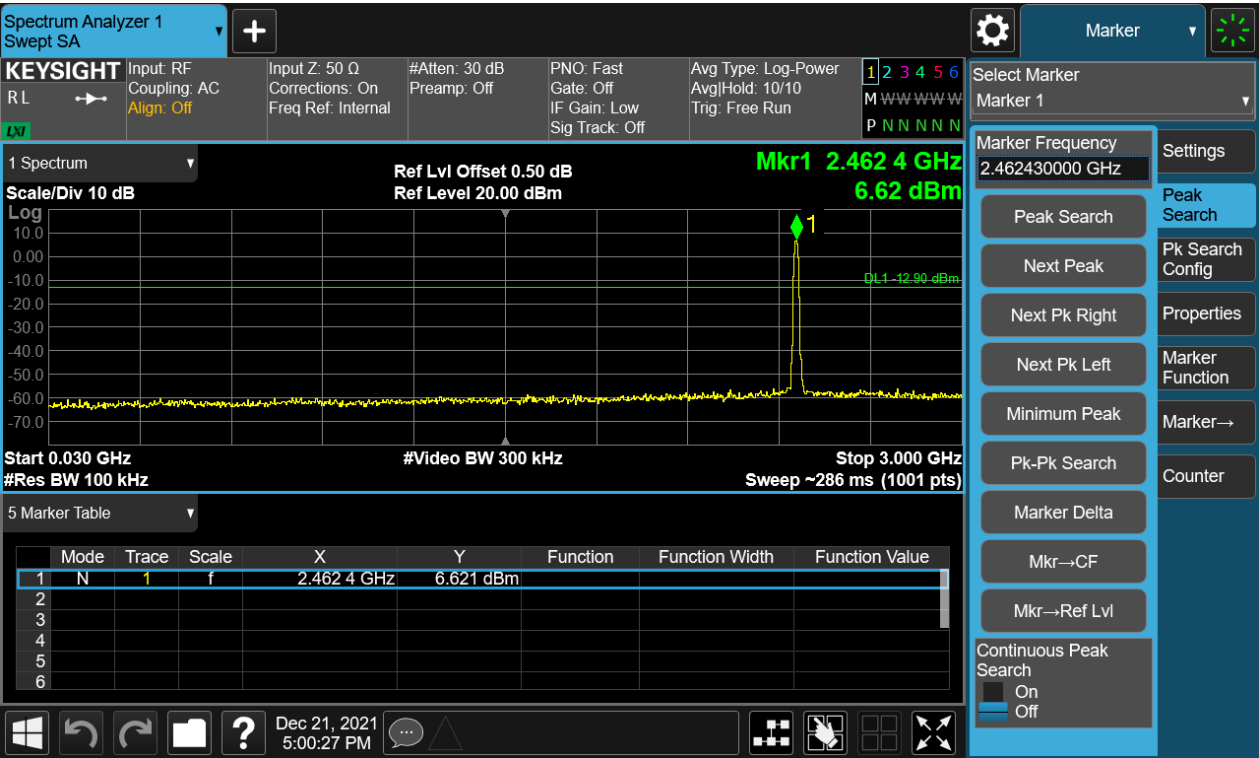
TEST REPORT

Report No.: SHE21120050-02AE Date: 2022-01-24 Page 29 of 50

Band Edge



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHE21120050-02AE Date: 2022-01-24 Page 30 of 50

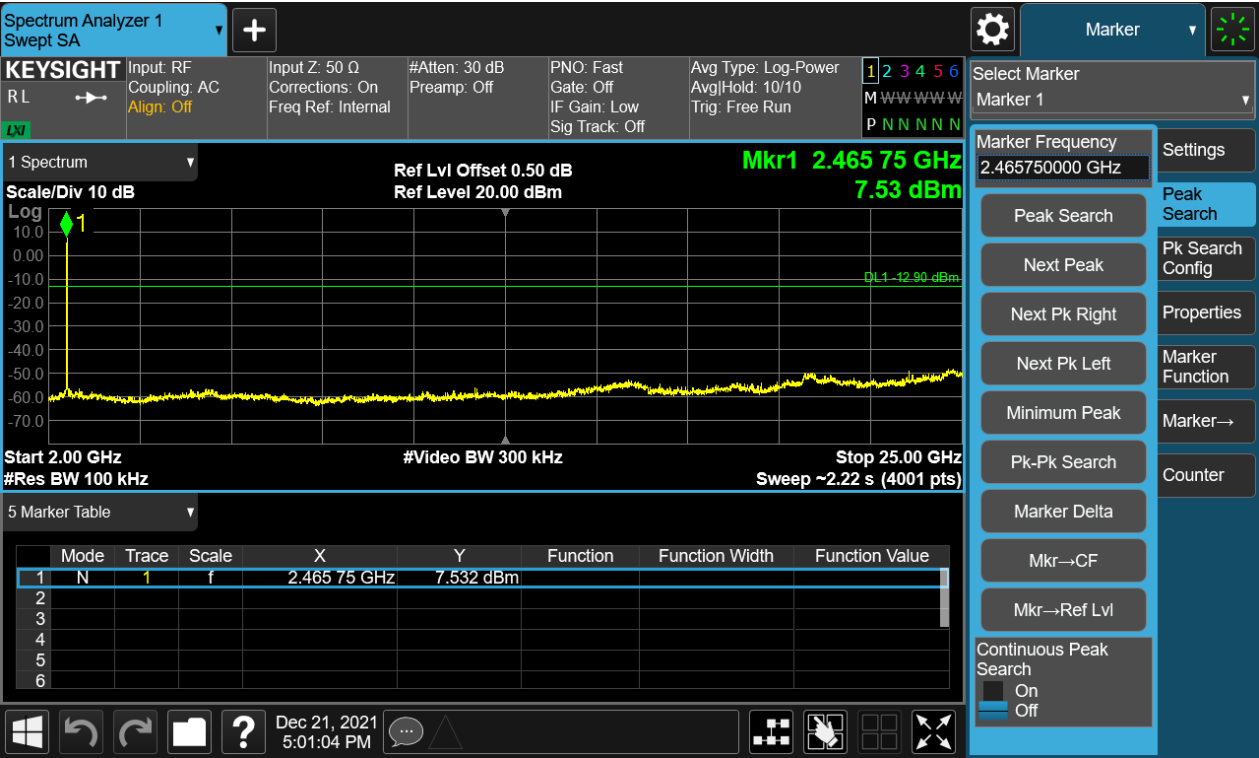
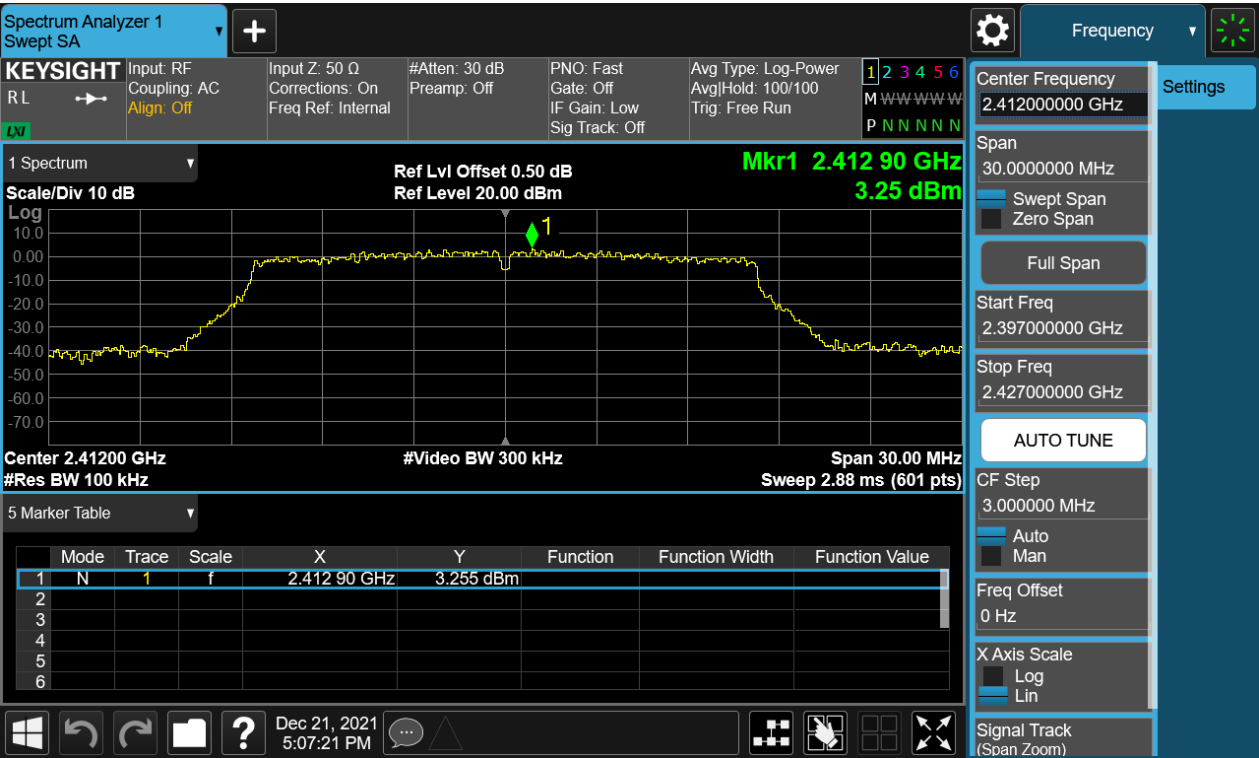


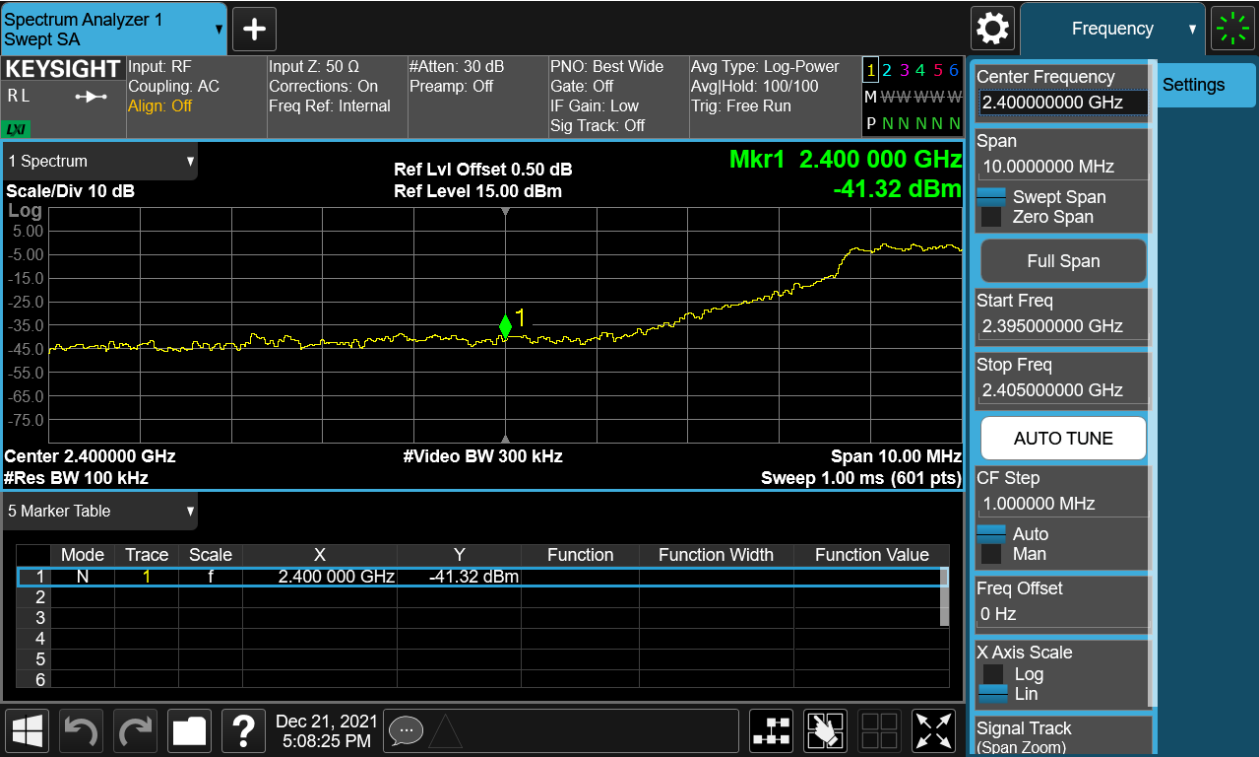
Figure 22: Conducted Spurious Emission & Authorized-band band-edge, 802.11g, 2412MHz Carrier Level



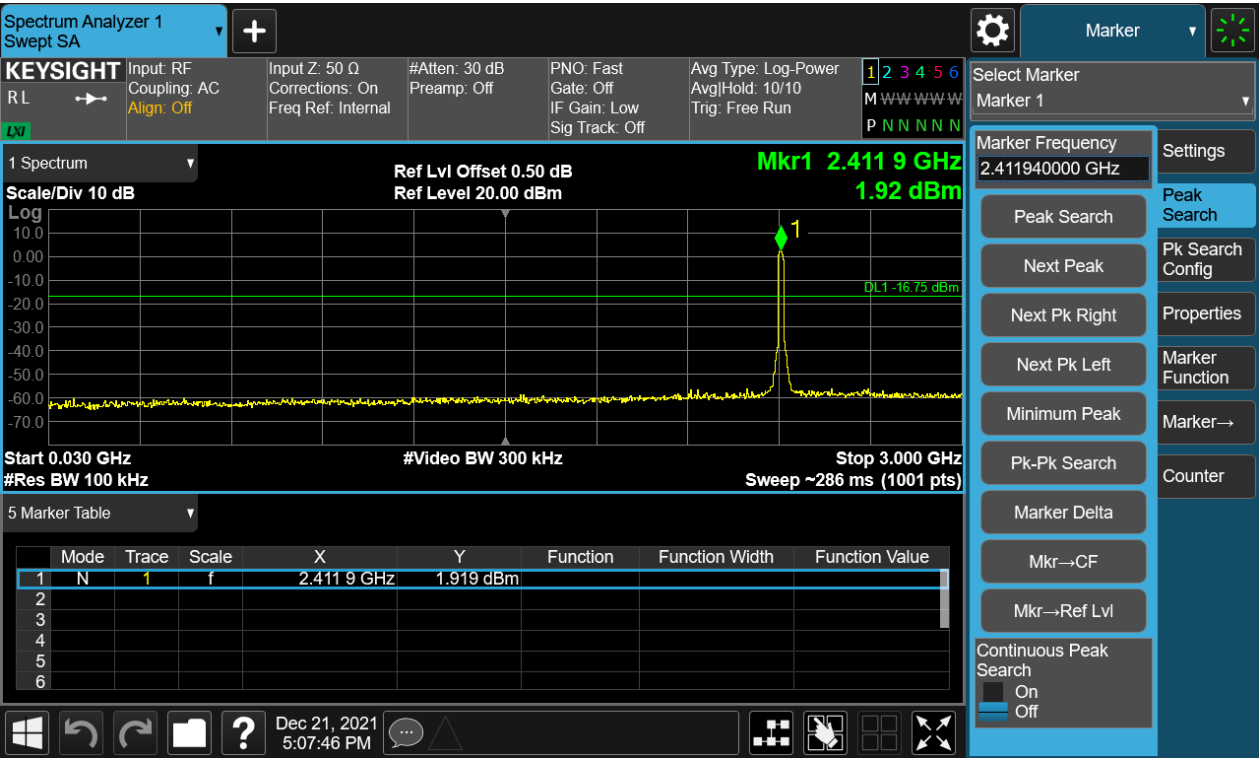
TEST REPORT

Report No.: SHE21120050-02AE Date: 2022-01-24 Page 31 of 50

Band Edge



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 32 of 50

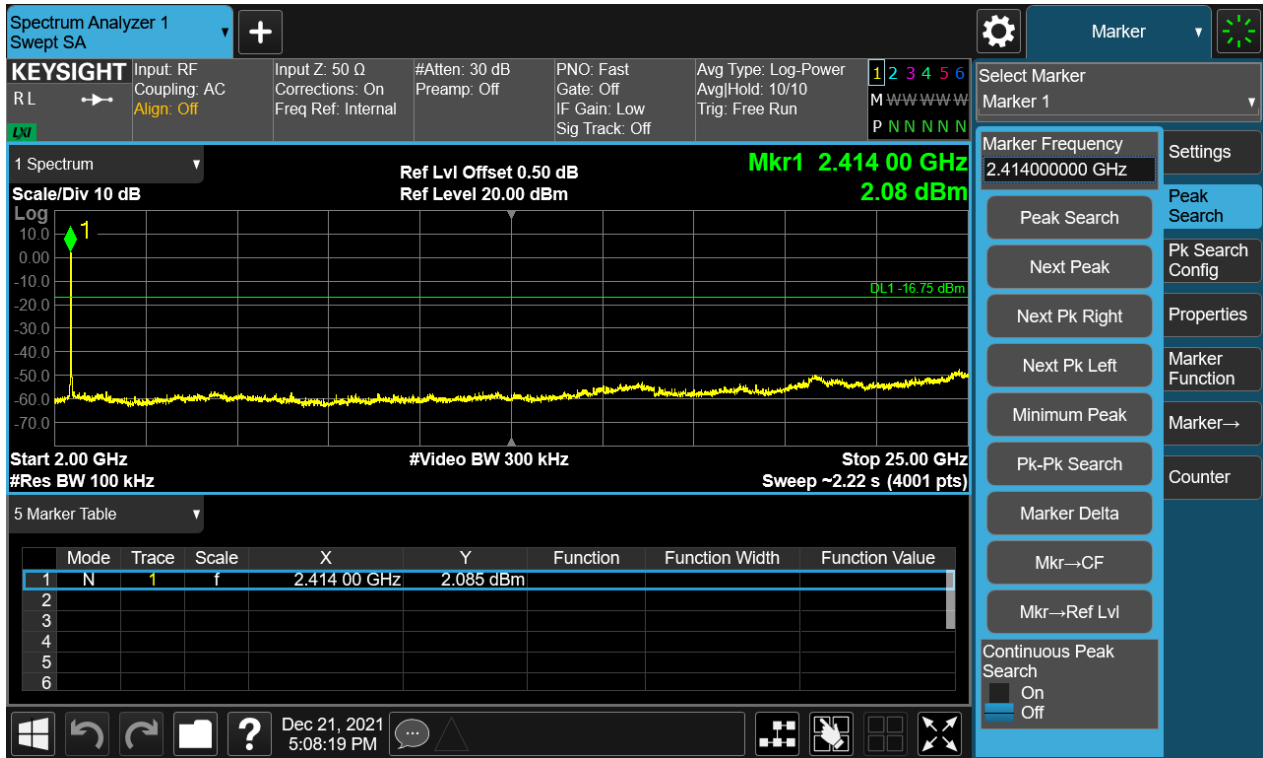
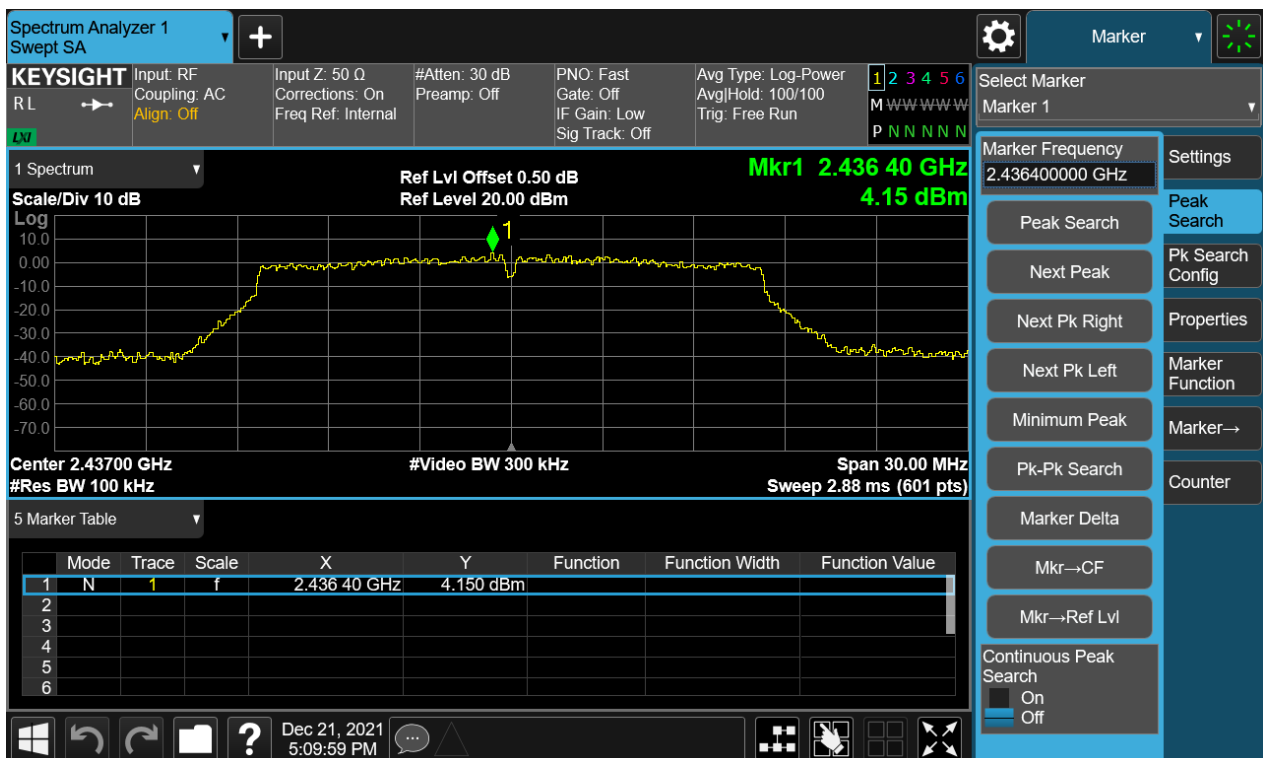


Figure 23: Conducted Spurious Emission & Authorized-band band-edge, 802.11g, 2437MHz Carrier Level



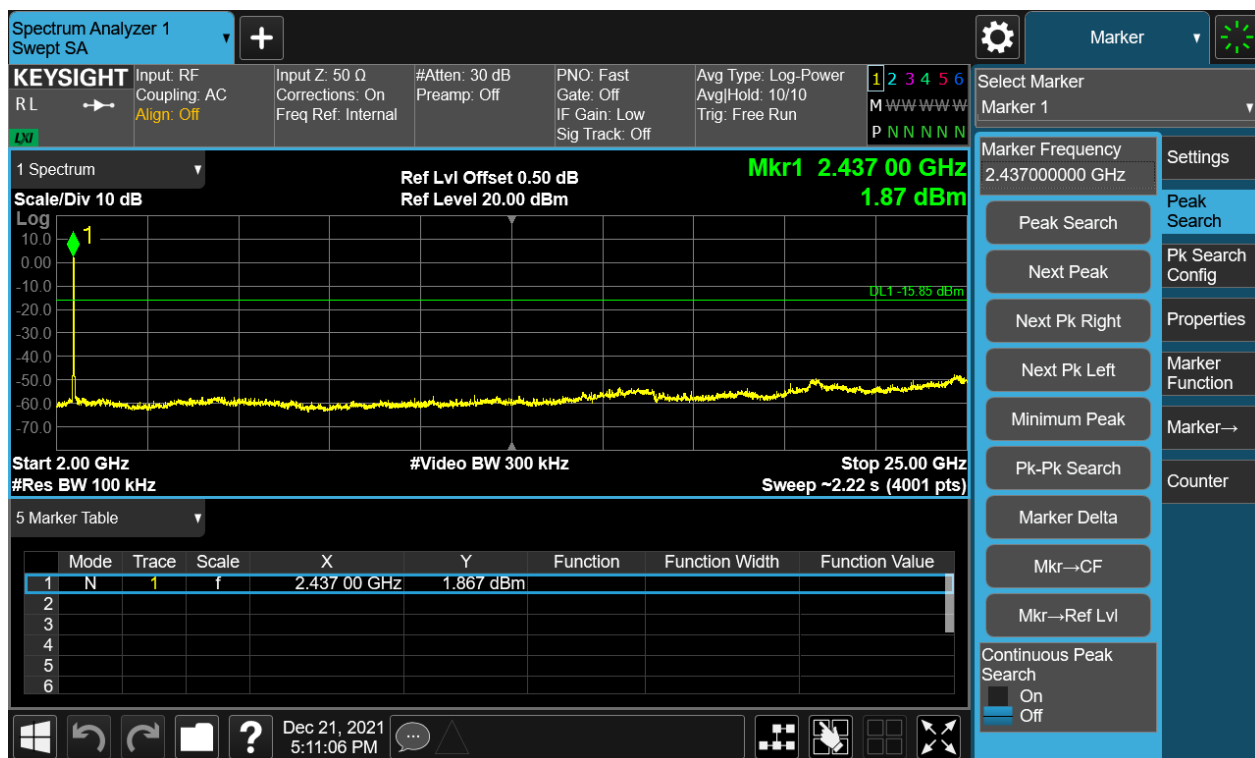
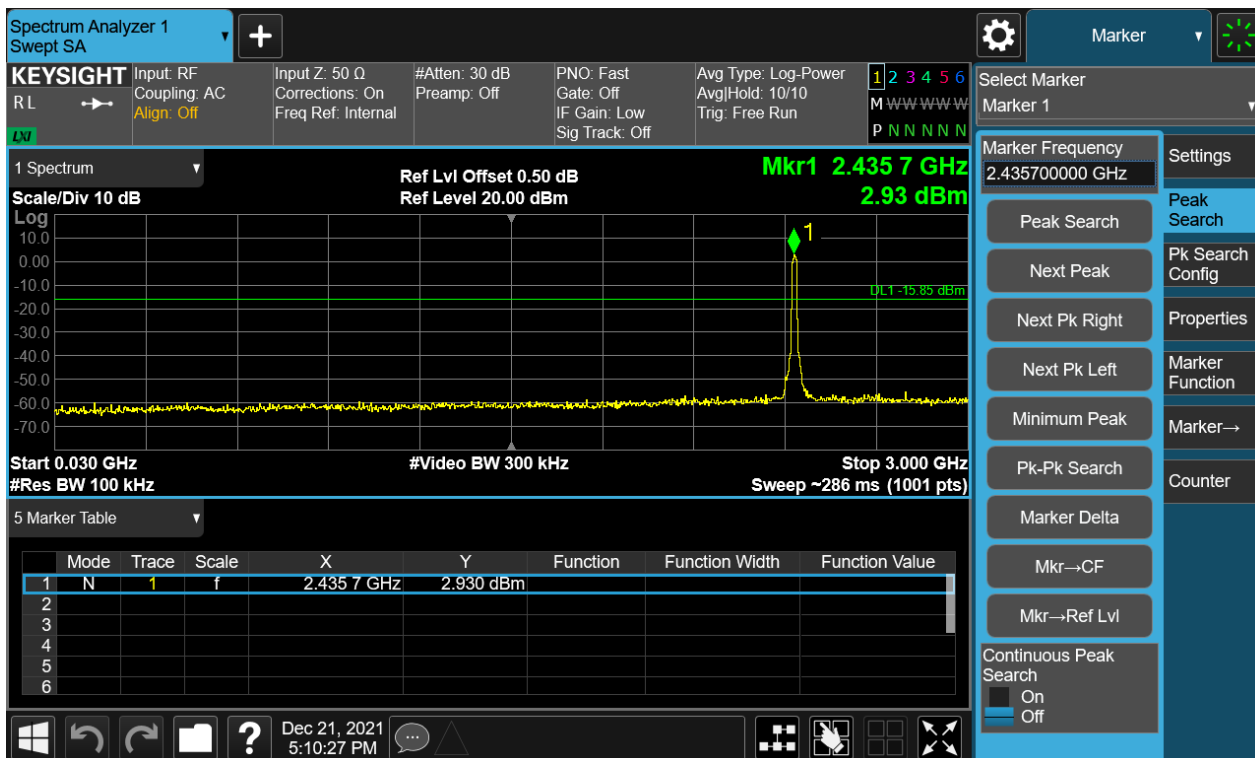
TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 33 of 50

Conducted spurious emissions 30MHz-25GHz



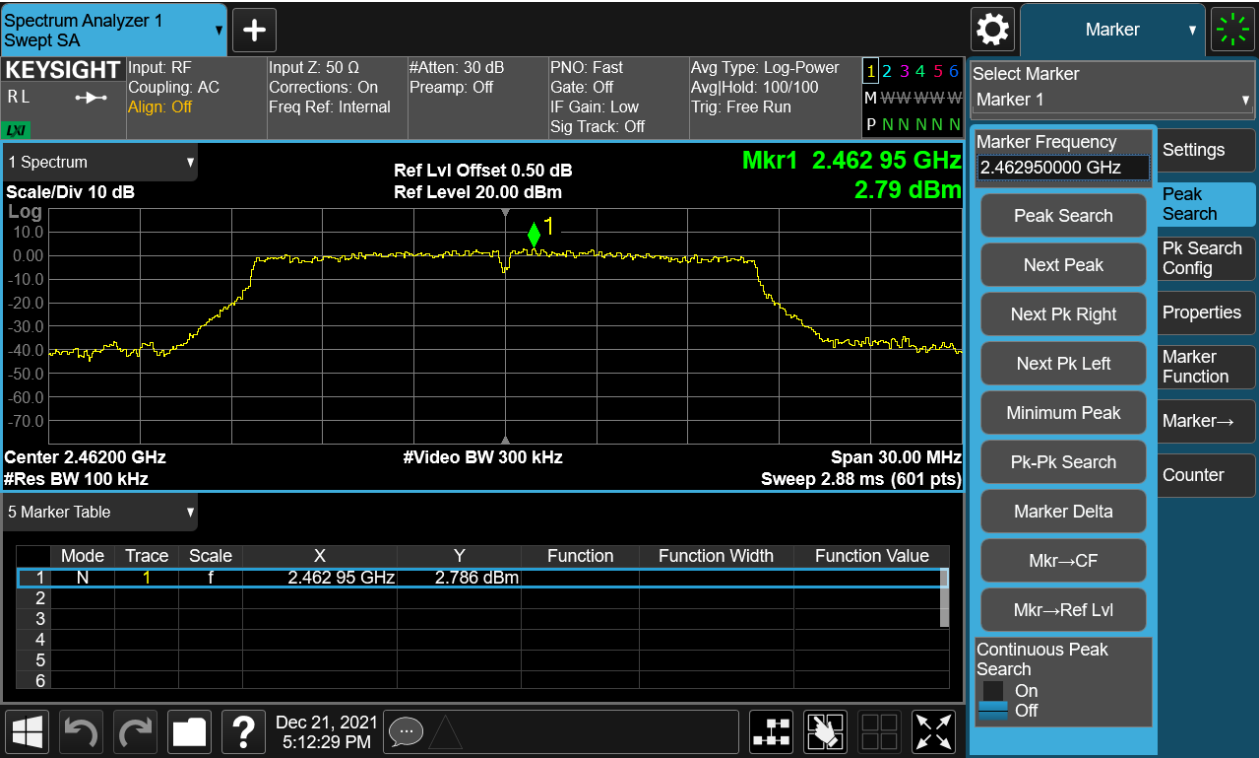
TEST REPORT

Report No.: SHE21120050-02AE

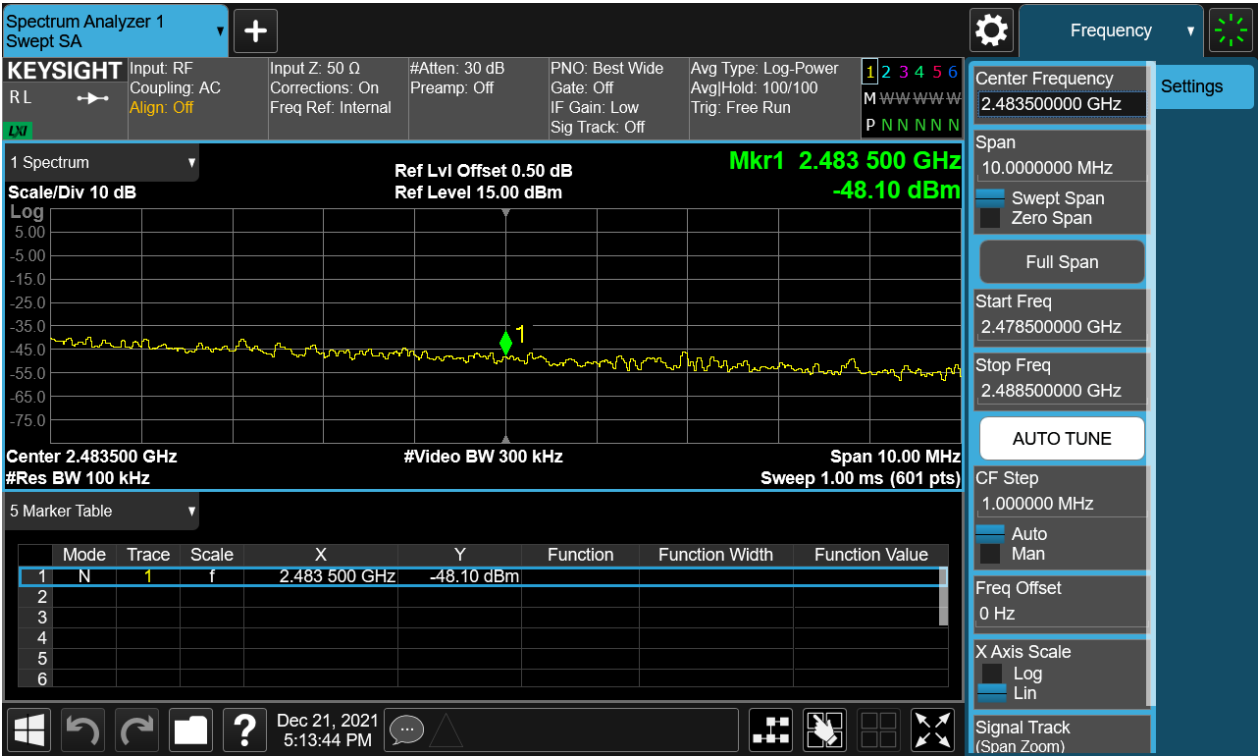
Date: 2022-01-24

Page 34 of 50

Figure 24: Conducted Spurious Emission & Authorized-band band-edge, 802.11g, 2462MHz Carrier Level



Band Edge



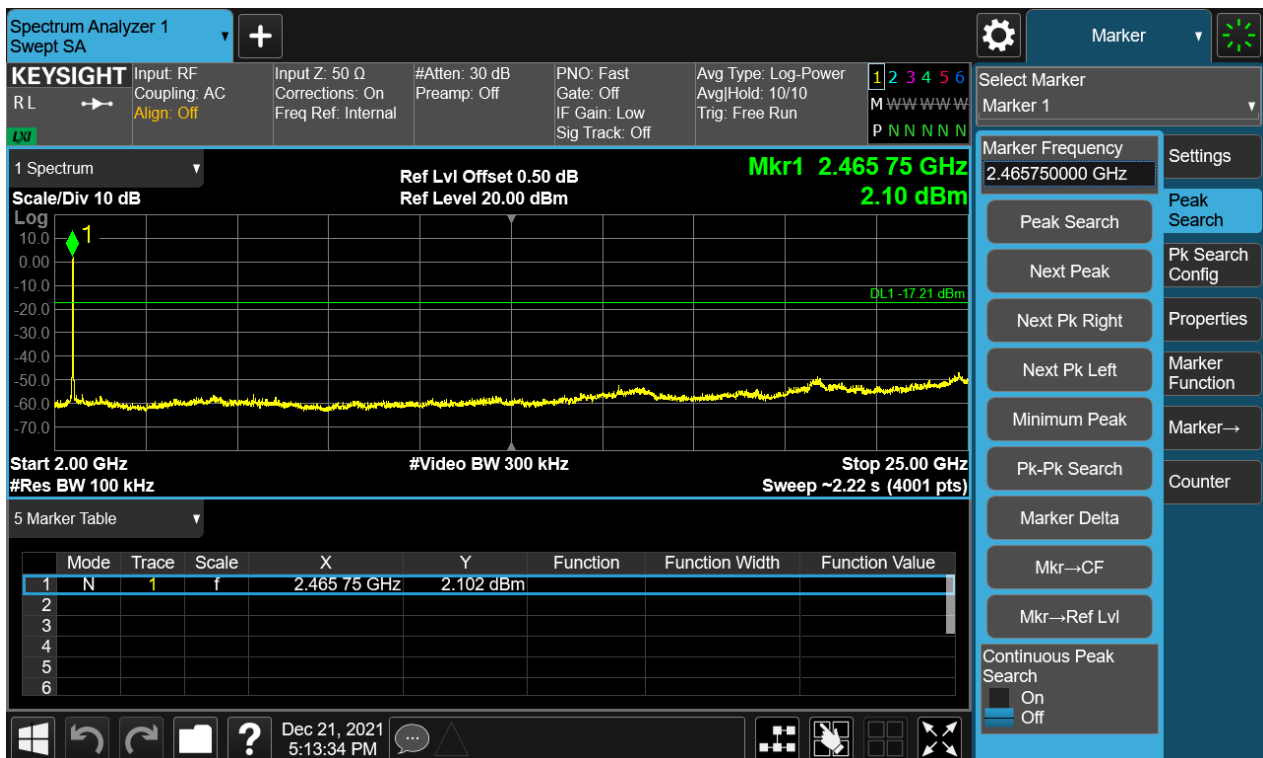
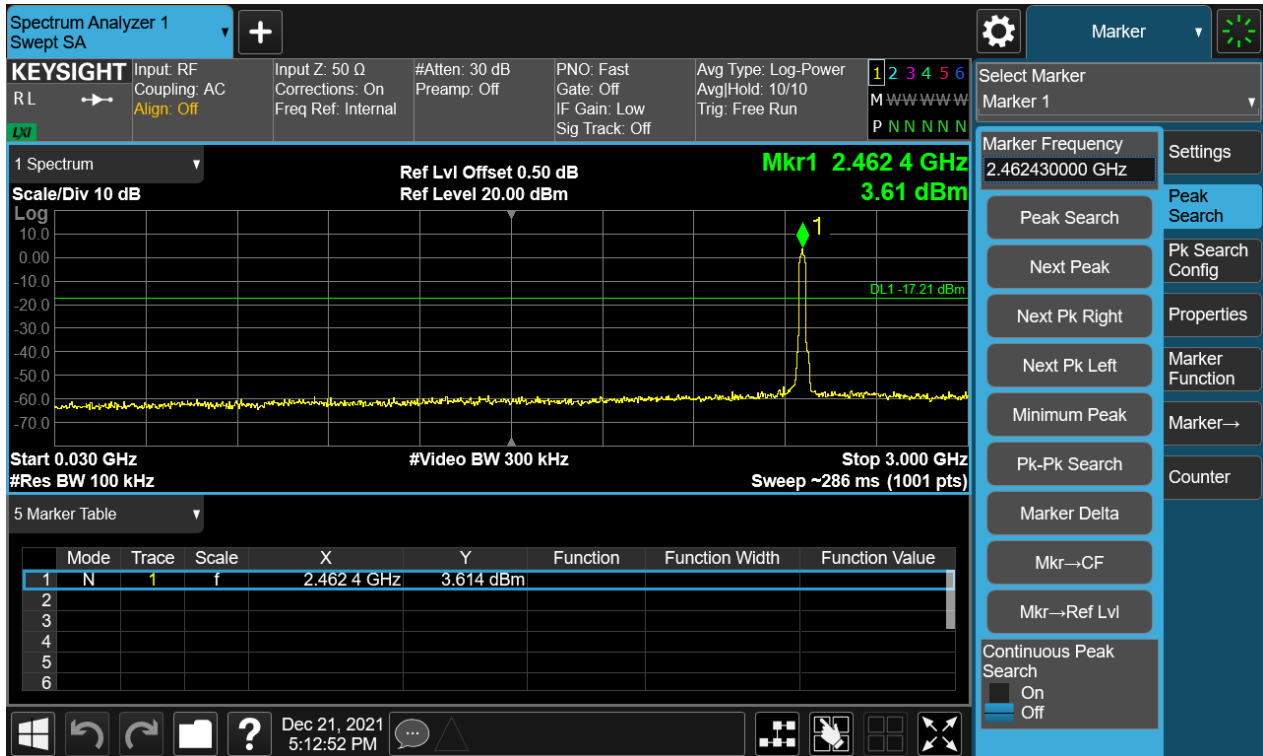
TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 35 of 50

Conducted spurious emissions 30MHz-25GHz



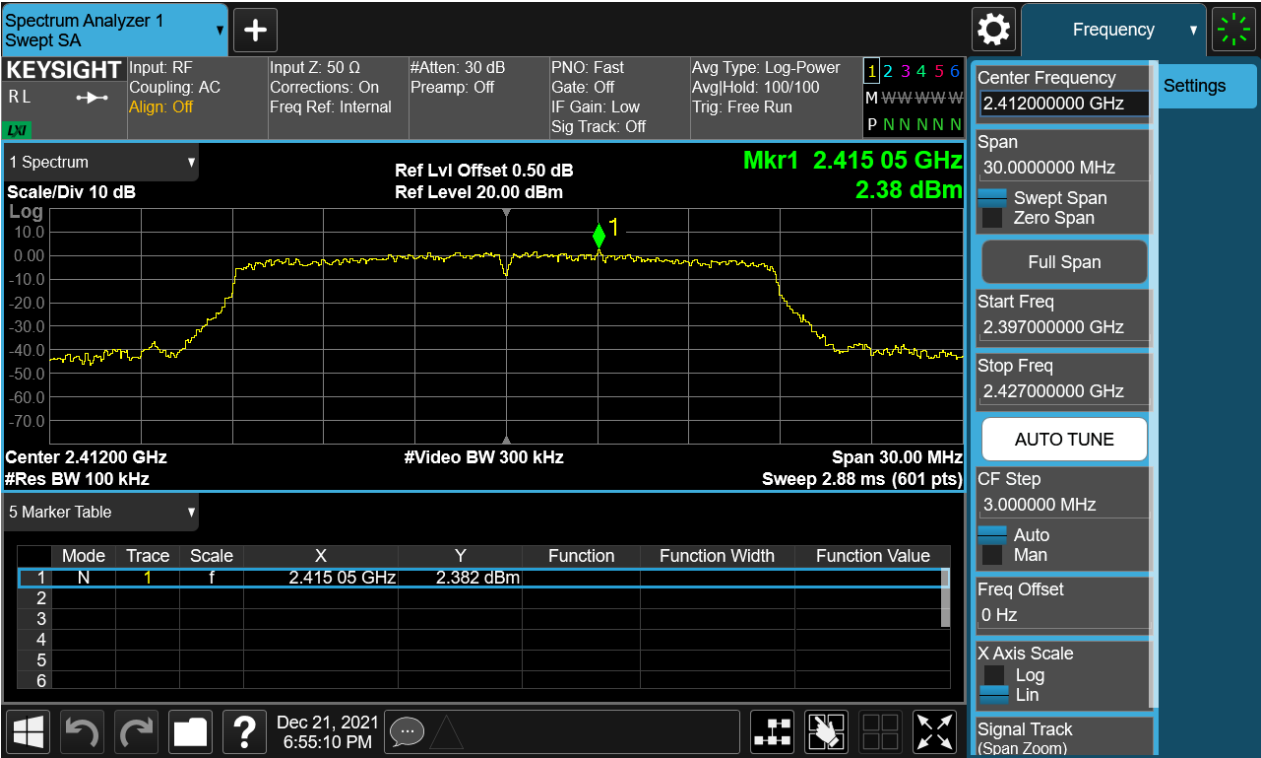
TEST REPORT

Report No.: SHE21120050-02AE

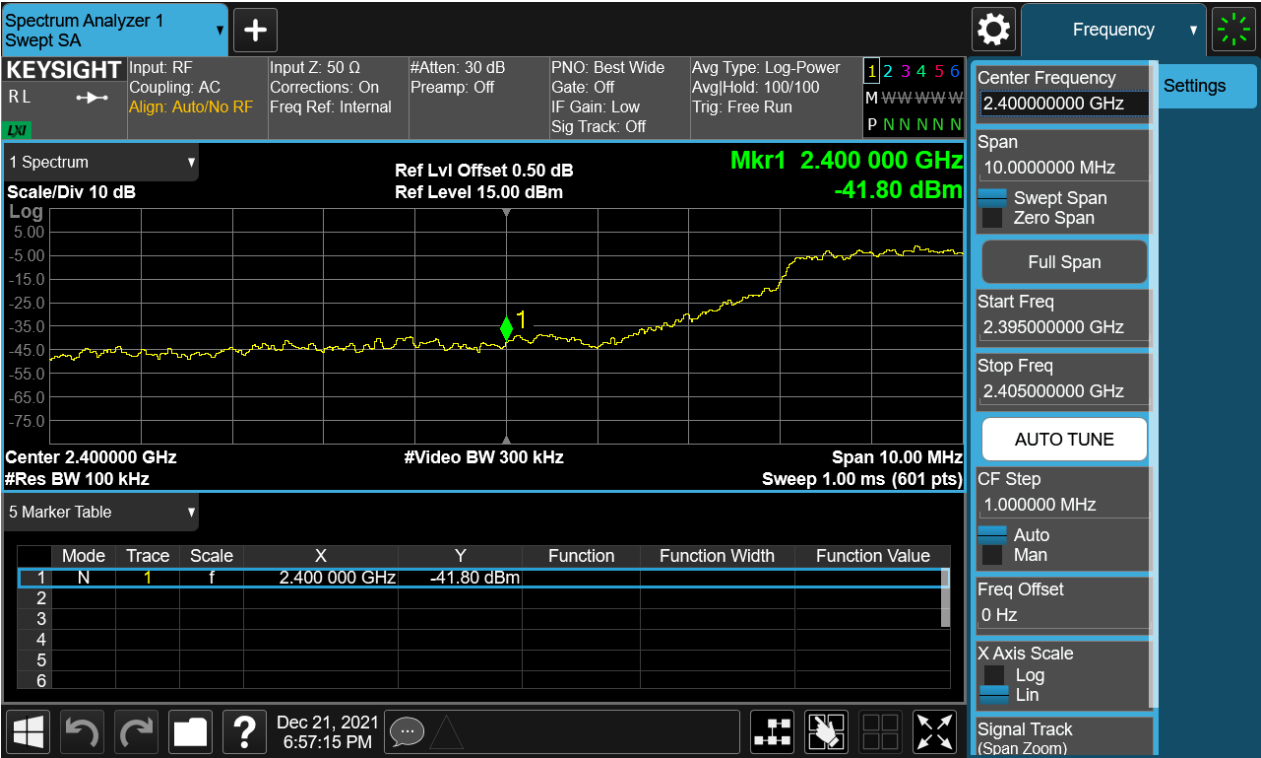
Date: 2022-01-24

Page 36 of 50

Figure 25: Conducted Spurious Emission & Authorized-band band-edge, 802.11n(HT20), 2412MHz Carrier Level



Band Edge



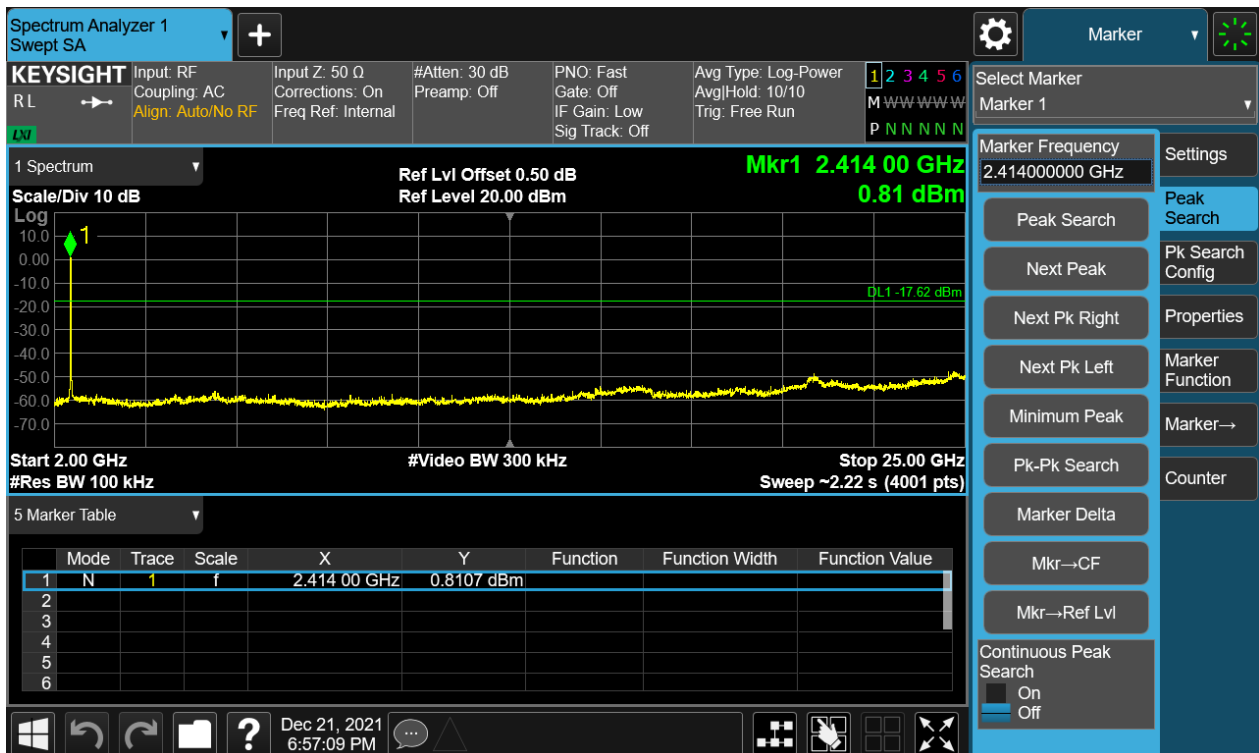
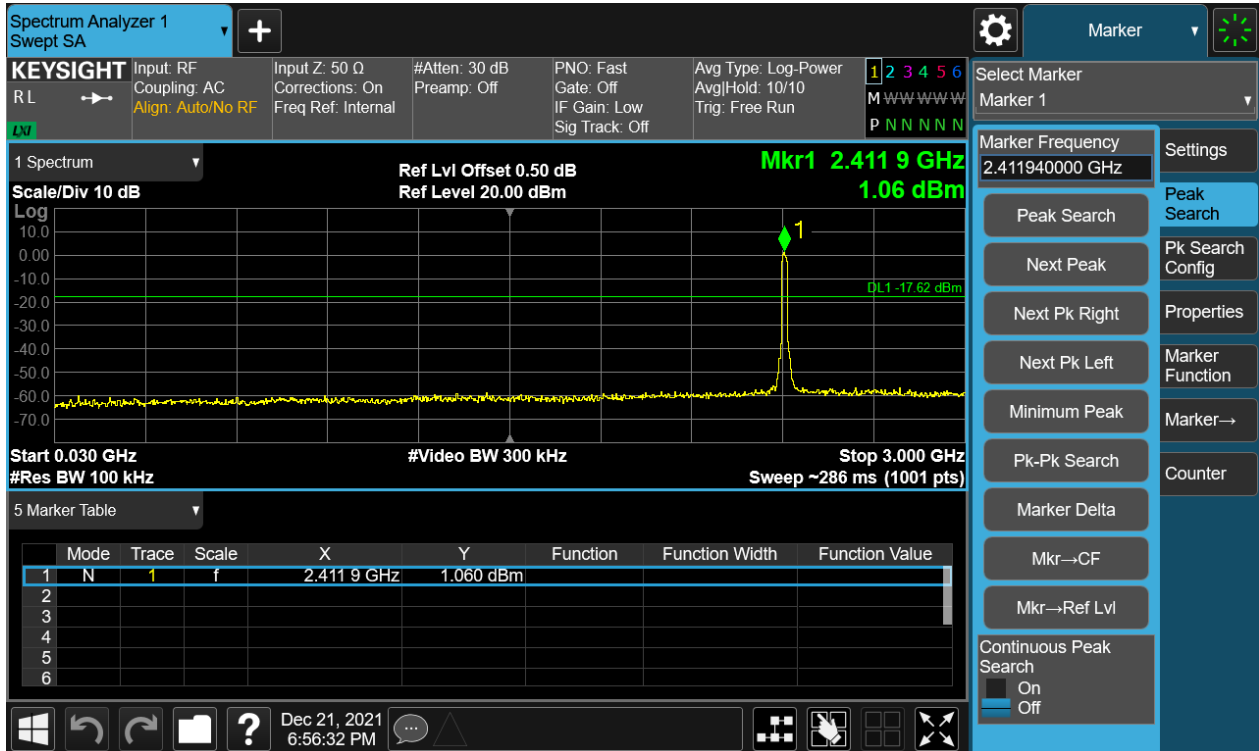
TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 37 of 50

Conducted spurious emissions 30MHz-25GHz



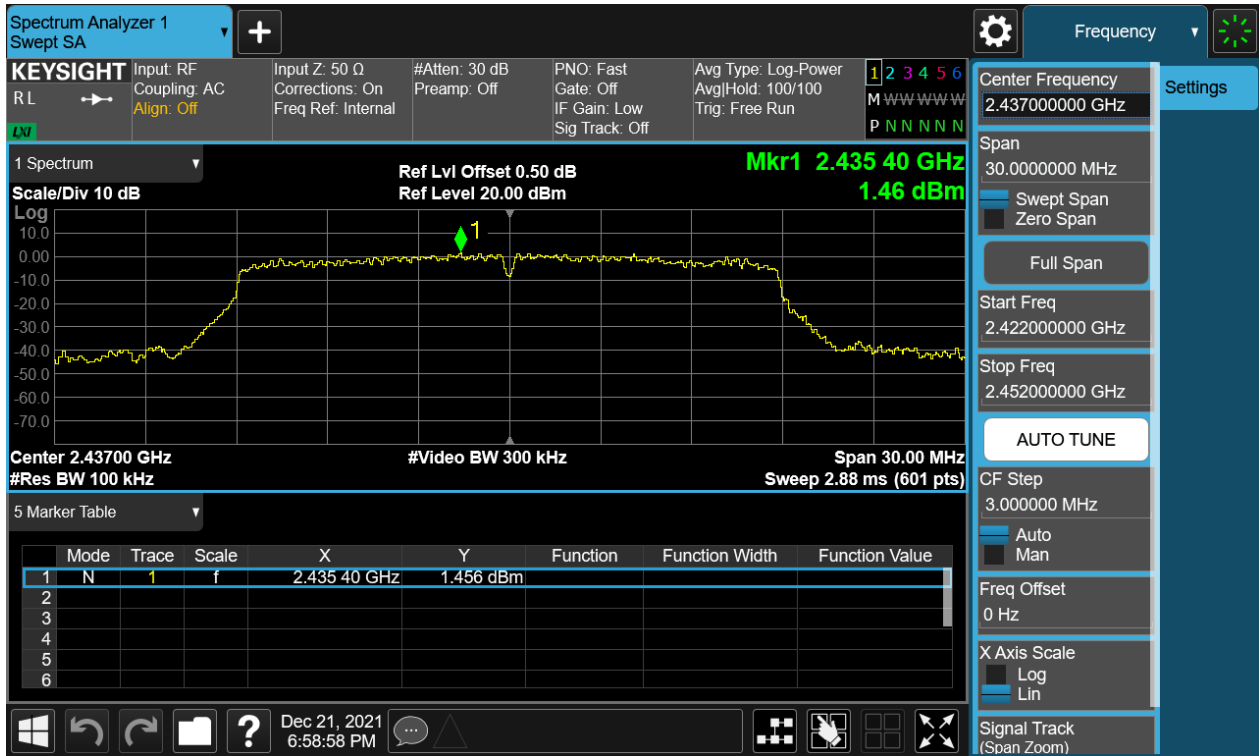
TEST REPORT

Report No.: SHE21120050-02AE

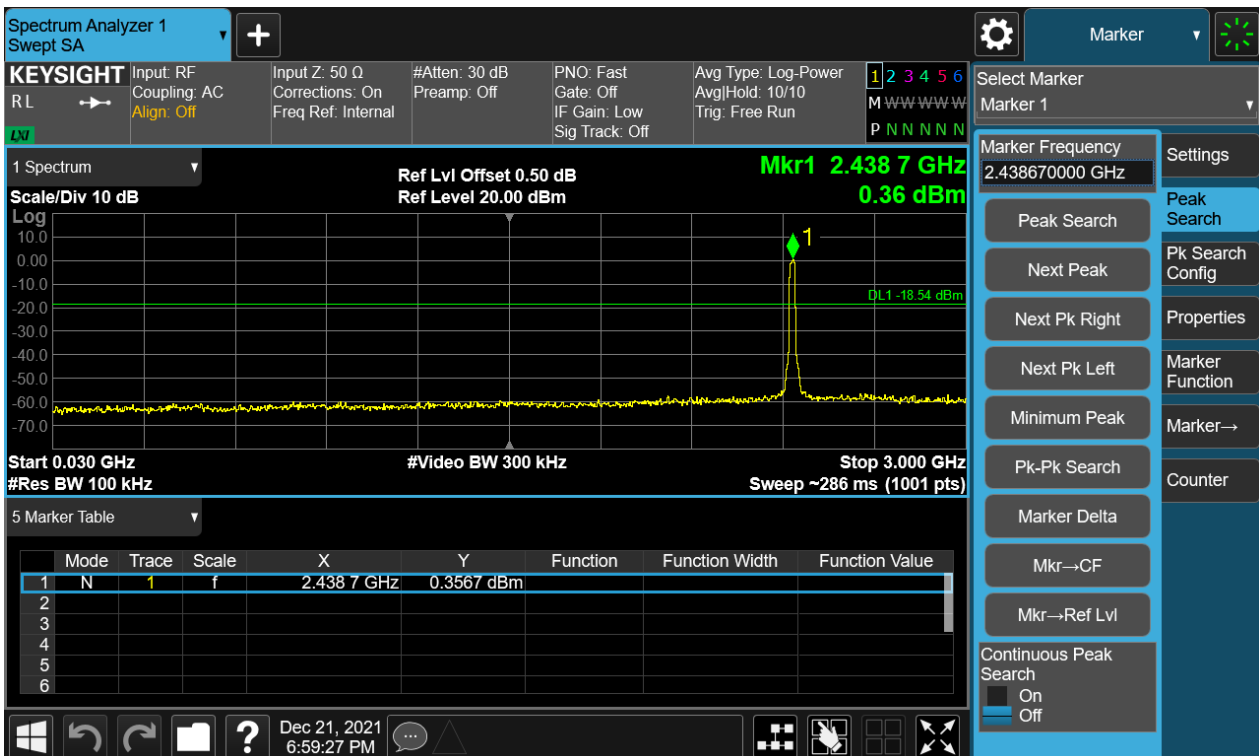
Date: 2022-01-24

Page 38 of 50

Figure 26: Conducted Spurious Emission & Authorized-band band-edge, 802.11n(HT20), 2437MHz Carrier Level



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 39 of 50

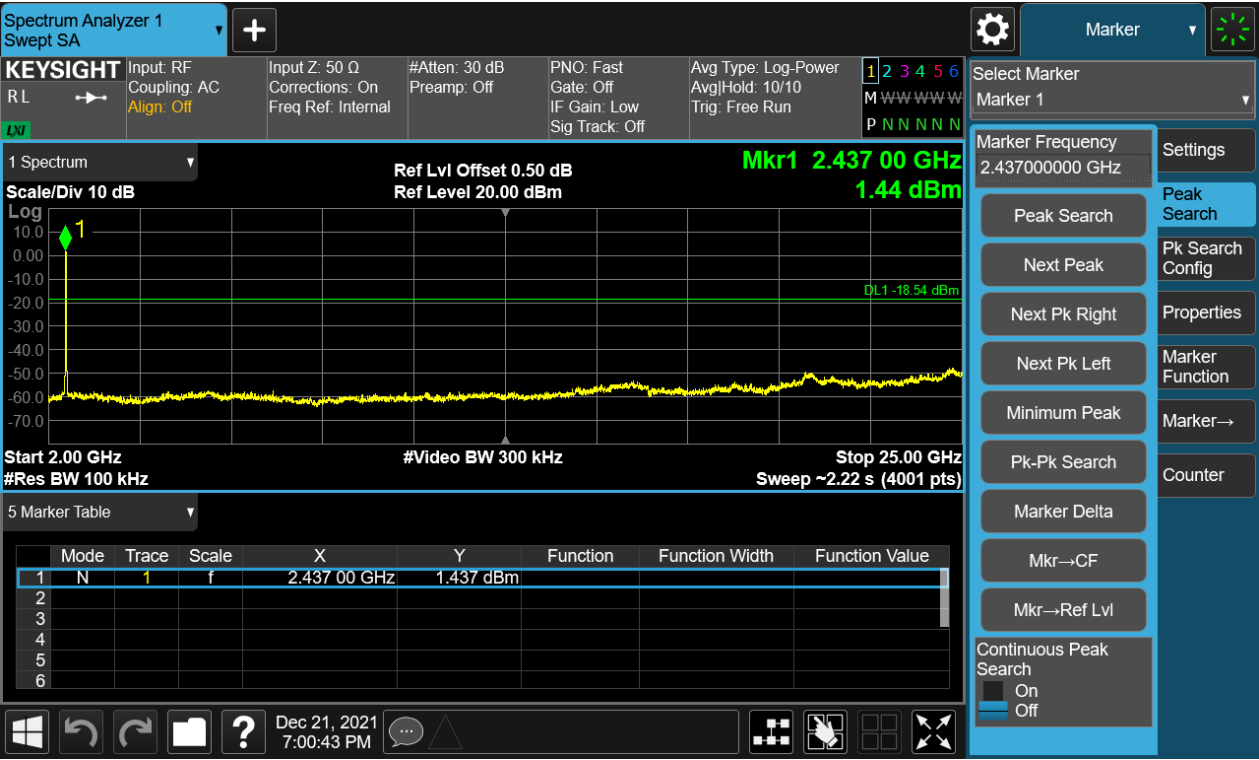
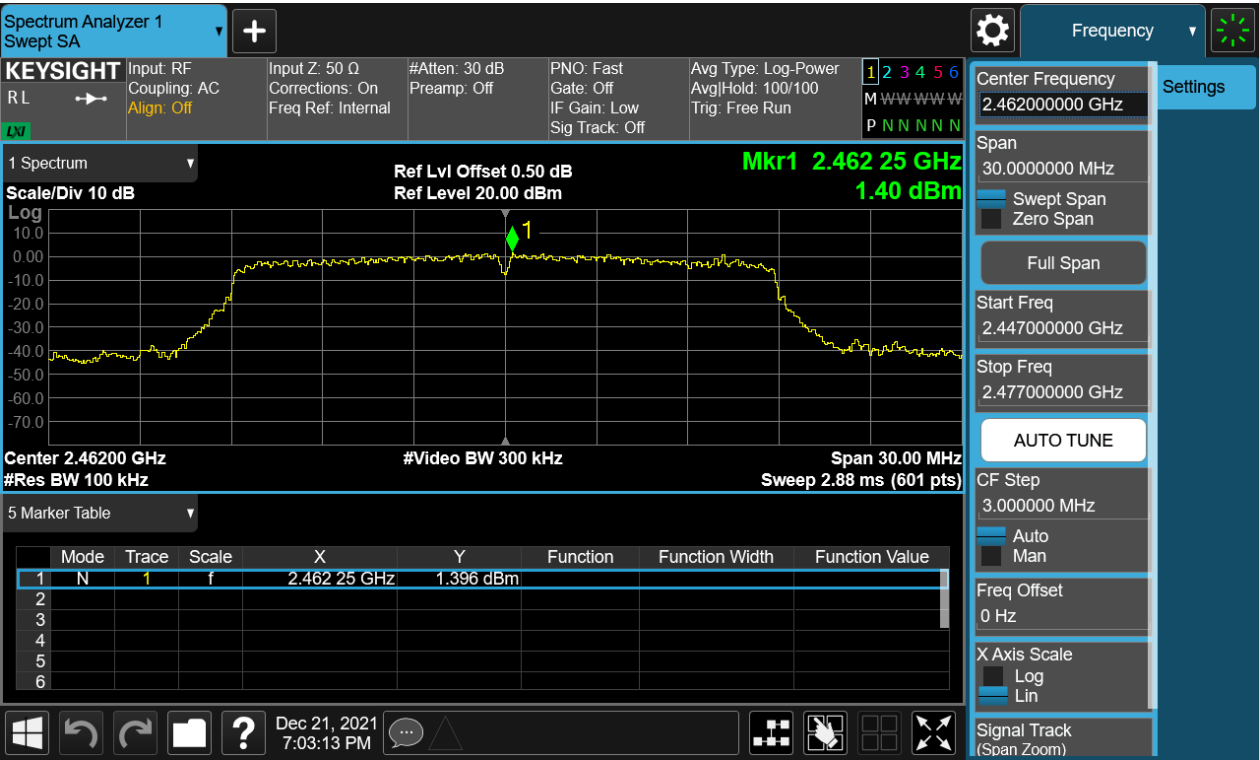


Figure 27: Conducted Spurious Emission & Authorized-band band-edge, 802.11n(HT20), 2462MHz Carrier Level



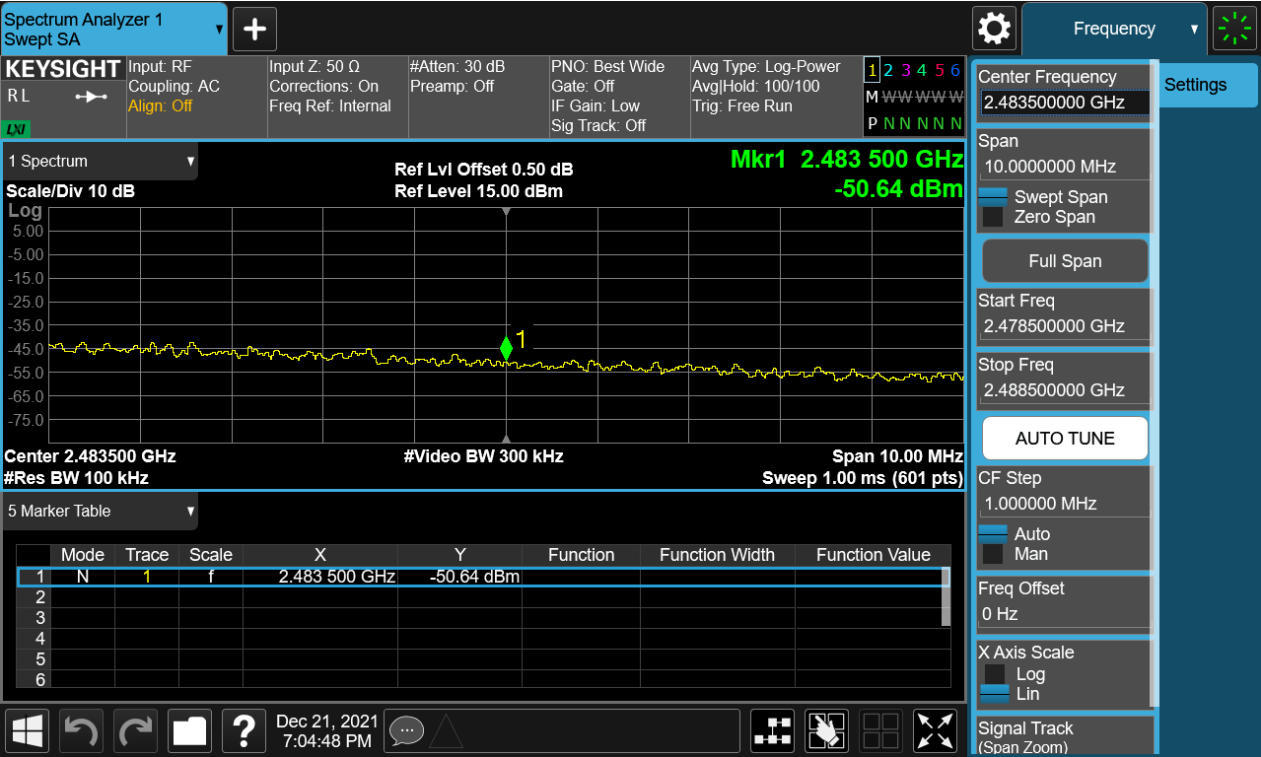
TEST REPORT

Report No.: SHE21120050-02AE

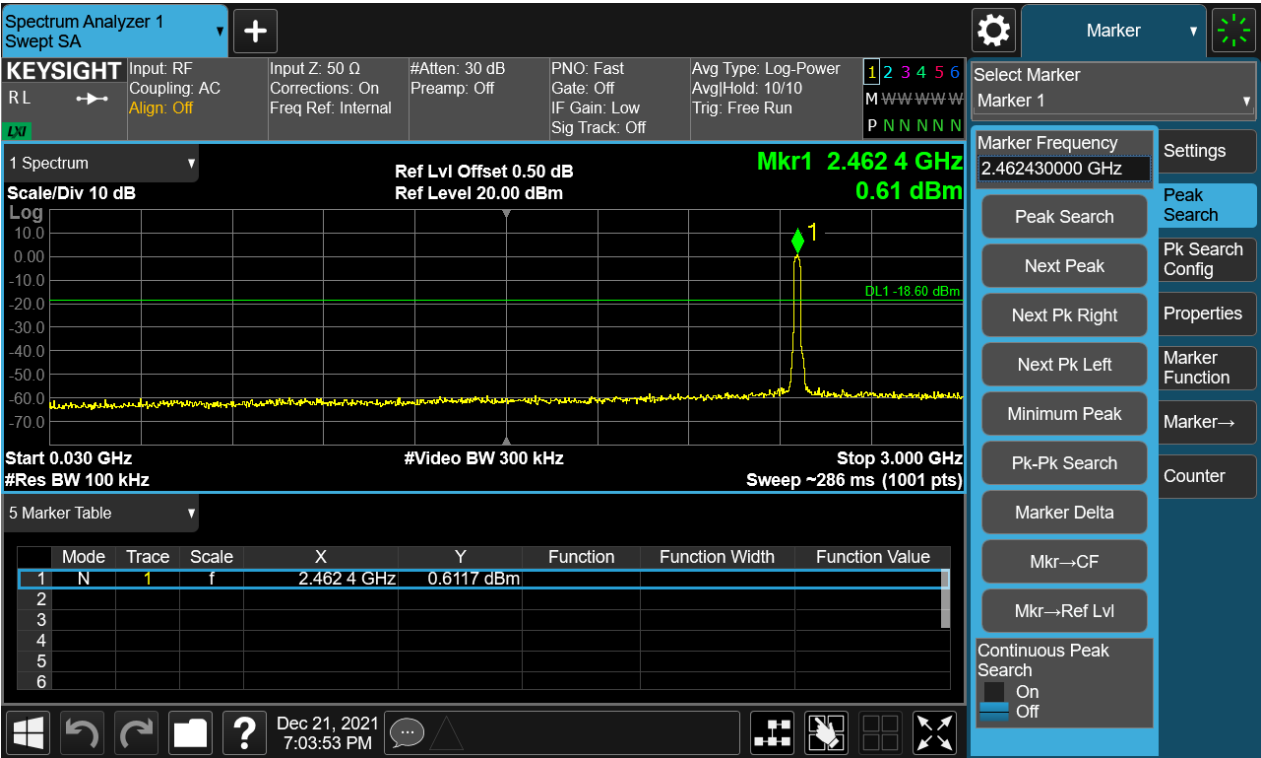
Date: 2022-01-24

Page 40 of 50

Band Edge



Conducted spurious emissions 30MHz-25GHz

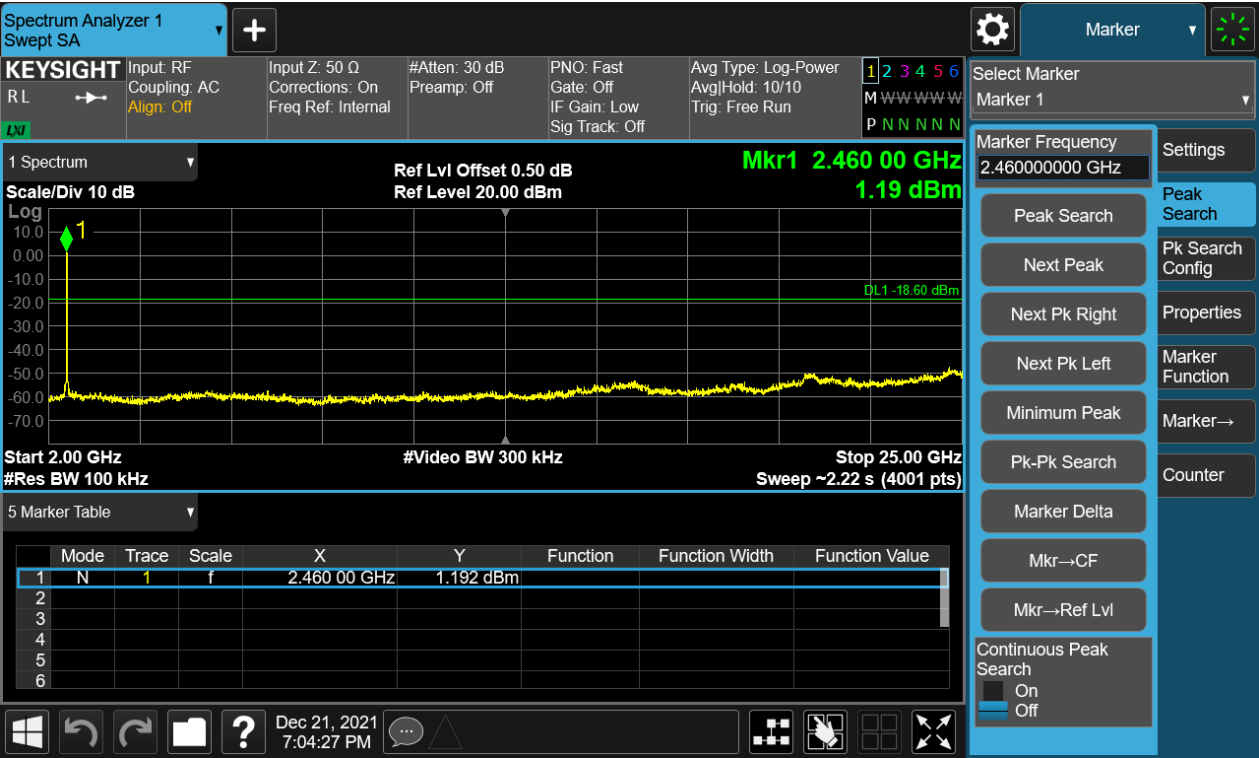


TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 41 of 50



TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 42 of 50

4.1.6 Radiated Spurious Emission

RESULT:

PASS

Test standard	: FCC Part 15.247(d), 15.205, 15.209
Requirement	: ANSI C63.10-2013, KDB 558074
Kind of test site	: 3m Semi-Anechoic Chamber

Test setup

Test Channel	: Low/Middle/High
Operation Mode	: A
Ambient temperature	: 16.8°C
Relative humidity	: 42%

Notes

Test plots please refer to the annex document "SHE21120050-02AE DATA WIFI 2.4GHz-TX EXHIBIT A OF X-C13SM-0 Model and SHE21120050-02AE DATA WIFI 2.4GHz-TX EXHIBIT A OF X-C13SM-1 Model".

1. For 9 kHz ~ 30 MHz, the amplitude of spurious emissions that are attenuated by more than 20dB below the permissible. The value has no need to be reported.
2. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.
3. The EUT is working in the Normal link mode below 1 GHz.
4. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement -X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 43 of 50

4.1.7 Band Edge (Restricted-band band-edge)

RESULT:

PASS

Test standard	: FCC Part 15.247(d), 15.205, 15.209
Requirement	: ANSI C63.10-2013, KDB 558074
Kind of test site	: 3m Semi-Anechoic Chamber

Test setup

Test Channel	: Low/Middle/High
Operation Mode	: A.1
Ambient temperature	: 16.3°C
Relative humidity	: 49%

Notes:

1. Test plots please refer to the annex document "SHE21120050-02A DATA WIFI 2.4GHz-TX EXHIBIT A OF X-C13SM-0 Model and SHE21120050-02A DATA WIFI 2.4GHz-TX EXHIBIT OF X-C13SM-1 Model".
2. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 44 of 50

4.2 Mains Emissions

4.2.1 Conducted Emission on AC Mains

RESULT:

PASS

Test standard	: FCC Part 15.207(a)
Requirement	: ANSI C63.10-2013
Kind of test site	: Shielded room

Test setup

Input Voltage	: DC 5V by pc (which received AC 120V 60Hz)
Operation Mode	: A
Earthing	: Not Connected
Ambient temperature	: 23°C
Relative humidity	: 51%

For details refer to following test plot.

TEST REPORT

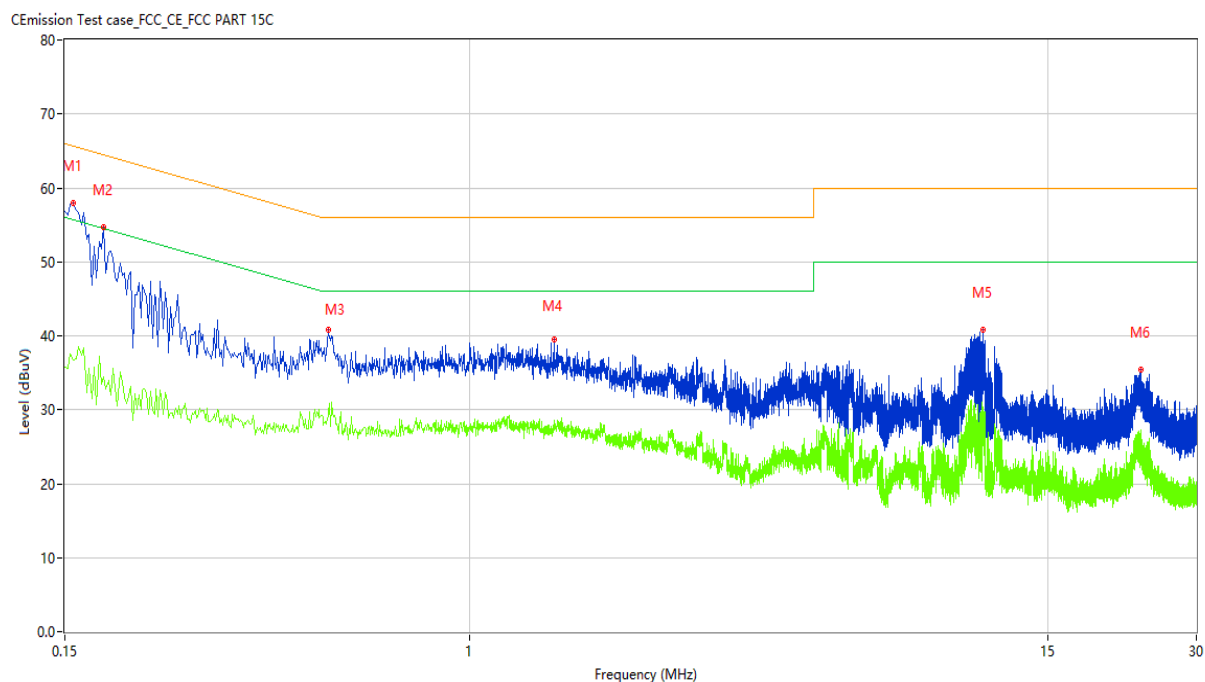
Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 45 of 50

Note: The all configurations were tested respectively, but only the worst configuration shown here.

Figure 28: Conducted Emission on AC Mains, L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.156	59.59	10.26	65.67	-6.08	Peak	L	Pass
1*	0.156	54.37	10.26	65.67	-11.30	QP	L	Pass
1**	0.156	36.67	10.26	55.67	-19.00	AV	L	Pass
2	0.180	55.34	10.24	64.49	-9.15	Peak	L	Pass
2*	0.180	50.25	10.24	64.49	-14.24	QP	L	Pass
2**	0.180	34.43	10.24	54.49	-20.06	AV	L	Pass
3	0.514	38.87	10.29	56.00	-17.13	Peak	L	Pass
3*	0.514	34.22	10.29	56.00	-21.78	QP	L	Pass
3**	0.514	29.24	10.29	46.00	-16.76	AV	L	Pass
4	1.482	35.67	10.18	56.00	-20.33	Peak	L	Pass
4*	1.482	30.02	10.18	56.00	-25.98	QP	L	Pass
4**	1.482	27.32	10.18	46.00	-18.68	AV	L	Pass
5	11.024	40.28	10.39	60.00	-19.72	Peak	L	Pass
5*	11.024	33.26	10.39	60.00	-26.74	QP	L	Pass
5**	11.024	30.39	10.39	50.00	-19.61	AV	L	Pass
6	23.152	34.76	11.00	60.00	-25.24	Peak	L	Pass
6*	23.152	29.08	11.00	60.00	-30.92	QP	L	Pass
6**	23.152	27.29	11.00	50.00	-22.71	AV	L	Pass

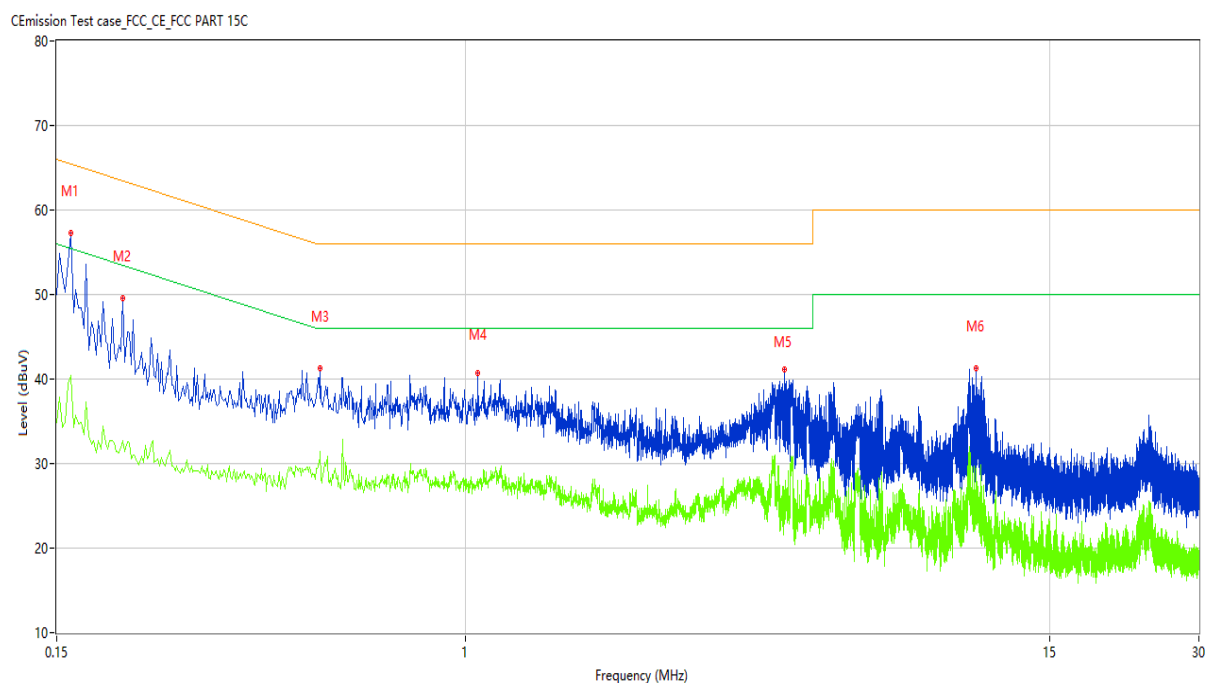
TEST REPORT

Report No.: SHE21120050-02AE

Date: 2022-01-24

Page 46 of 50

Figure 29: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.160	59.91	10.26	65.46	-5.55	Peak	N	Pass
1*	0.160	55.79	10.26	65.46	-9.67	QP	N	Pass
1**	0.160	40.45	10.26	55.46	-15.01	AV	N	Pass
2	0.204	52.13	10.23	63.45	-11.32	Peak	N	Pass
2*	0.204	46.21	10.23	63.45	-17.24	QP	N	Pass
2**	0.204	32.78	10.23	53.45	-20.67	AV	N	Pass
3	0.510	41.15	10.29	56.00	-14.85	Peak	N	Pass
3*	0.510	37.92	10.29	56.00	-18.08	QP	N	Pass
3**	0.510	31.41	10.29	46.00	-14.59	AV	N	Pass
4	1.058	37.77	10.20	56.00	-18.23	Peak	N	Pass
4*	1.058	32.94	10.20	56.00	-23.06	QP	N	Pass
4**	1.058	27.49	10.20	46.00	-18.51	AV	N	Pass
5	4.390	41.81	10.22	56.00	-14.19	Peak	N	Pass
5*	4.390	37.16	10.22	56.00	-18.84	QP	N	Pass
5**	4.390	26.86	10.22	46.00	-19.14	AV	N	Pass
6	10.678	43.64	10.38	60.00	-16.36	Peak	N	Pass
6*	10.678	37.48	10.38	60.00	-22.52	QP	N	Pass
6**	10.678	29.48	10.38	50.00	-20.52	AV	N	Pass