TEST REPORT

Applicant	:	AiRISTA Flow, Inc.
Address of Applicant	:	1966 Greenspring Drive, Suite 125 Timonium, Maryland 21093.
Product Name	:	BLE Beaconing Gateway UNIT
Brand Name	:	AiRISTA Flow
Model Name	:	BGU.C
Sample Acquisition Method	:	Sent by Client
Sample No.	:	E24030088-01#03 E24030088-01#02
FCC ID	:	TA7-BGU
Standards	:	FCC CFR47 Part 15, Subpart C
Date of Receipt	:	2024-03-27
Date of Test	:	2024-03-28~ 2024-05-07
Date of Issue	:	2024-05-07

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 (Erik Yang) Reviewed by: Jennifer zhou (Jennifer Zhou) Approved by: Echo Mu (Authorized signatory: Echo Mu)

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1 General Information

1.1 Testing Laboratory

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

1.2 Details of Application

Applicant Company Name	AiRISTA Flow, Inc.
Address	1966 Greenspring Drive, Suite 125 Timonium, Maryland 21093.
Contact Person	Patrick Jenkins
Telephone	(443) 212-4251
Email	Patrick.Jenkins@Airista.com
Manufacturer Company Name	AiRISTA Flow, Inc.
Address	1966 Greenspring Drive, Suite 125 Timonium, Maryland 21093.
Factory Company Name	AiRISTA Flow, Inc.
Address	1966 Greenspring Drive, Suite 125 Timonium, Maryland 21093.

1.3 Details of EUT

Product Name	BLE Beaconing Gateway UNIT
Brand Name	AiRISTA Flow
Test Model Name	BGU.C
FCC ID	TA7-BGU
Mode of Operation	WLAN 802.11b/g/n(HT20/40)
Conducted (average) output power	IEEE 802.11b: 17.74dBm IEEE 802.11g: 16.21dBm IEEE 802.11n(20): 15.55dBm IEEE 802.11n(40): 15.01dBm
Frequency Range	2400MHz ~ 2483.5MHz
Channel Separation	5 MHz
Number of channels	11
Modulation Type	802.11b: DSSS(CCK, DQPSK, DBPSK) 802.11g/n(20M/40M): OFDM(64QAM, 16QAM, QPSK, BPSK)
Antenna Type	PCB Antenna
Antenna Gain	0.43dBi
Extreme Temperature Range	0℃~ +50℃

Test Voltage	Input(POE): DC 37-57V Input(USB): DC 5V 1A
Hardware Version	1.0
Software Version	1000.2338
RF power setting in TEST SW	802.11b: AmebaD_mptool_2V2_TX Power Index_105 802.11g: AmebaD_mptool_2V2_ TX Power Index_86 802.11n(HT20): AmebaD_mptool_2V2_ TX Power Index_87 802.11n(HT40): AmebaD_mptool_2V2_ TX Power Index_80

Note:

1. *The above information was declared by the manufacture.*
2. *For more details, please refer to the User's manual of the EUT.*

Channel List

Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2.412GHz	5	2.432GHz	9	2.452GHz
2	2.417GHz	6	2.437GHz	10	2.457GHz
3	2.422GHz	7	2.442GHz	11	2.462GHz
4	2.427GHz	8	2.447GHz		

Note:

For 20MHz bandwidth system use Channel 1 to Channel 11

For 40MHz bandwidth system use Channel 3 to Channel 9

1.4 Test Methodology

47 CFR Part 15, Subpart C	Telecommunication-Radio Frequency Devices-Intentional Radiators
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
Maximum conducted (average) output power	FCC Part 15.247(b)(3)	PASS
6dB Bandwidth	FCC Part 15.247(a)(2)	PASS
Maximum conducted output power spectral density	FCC Part 15.247(e)	PASS
Conducted Spurious Emission & Authorized-band band-edge	FCC Part 15.247(d)	PASS
Radiated 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

2 Test Condition

2.1 Environmental conditions

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

2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Keysight	N9020B	MY59260184	2023-07-27	2024-07-26
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2023-06-08	2024-06-07
Signal Generator	Rohde & Schwarz	SMR27	100184	2023-07-27	2024-07-26
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2023-06-08	2024-06-07
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2023-06-08	2024-06-07
V-network	SCHWARZBECK	NSLK 8127	8127-902	2023-06-07	2024-06-06
Attenuator	SCHWARZBECK	VTSD 9561-FN	/	2023-06-06	2024-06-05
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2023-03-22	2025-03-21
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2023-06-13	2025-06-12
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2023-06-09	2024-06-08
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2023-06-18	2025-06-17
Broadband Preamplifier	SCHWARZBECK	BBV 9718	346	2023-06-08	2024-06-07
EMC chamber 9*6*6(L*W*H)	CHANGNING	966	N/A	2023-06-09	2024-06-08
Shielded Enclosure 8*5*4(L*W*H)	CHANGNING	854	N/A	2023-06-09	2025-06-08
Test Software	BL	BL410_E	Version:1.0.0.117	N/A	N/A
Test Software	BL	BL410_R	Version:2.1.1.409	N/A	N/A

2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI. The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95.45%.

Parameter		Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	9KHz – 30MHz	± 3.42 dB
	30 MHz – 1GHz	± 5.01 dB
	> 1GHz	± 5.21 dB
Conducted Emission on AC Mains	150kHz-30MHz	± 2.68 dB
Occupied Channel Bandwidth		±5 %
Maximum Conducted Output Power		±0.64 dB
Maximum Conducted Output Power Spectral Density		±1.18 dB

3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software (AmebaD_mptool_2V2) was control EUT work in continuous transmitting 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

For 802.11n(HT40)

Channel	Frequency
The lowest channel (CH3)	2422MHz
The middle channel (CH6)	2437MHz
The highest channel (CH9)	2452MHz

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	5.5Mbps
802.11g	18Mbps
802.11n(20M)	MCS4
802.11n(40M)	MCS4

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

3.2 Special Accessories and Auxiliary Equipment

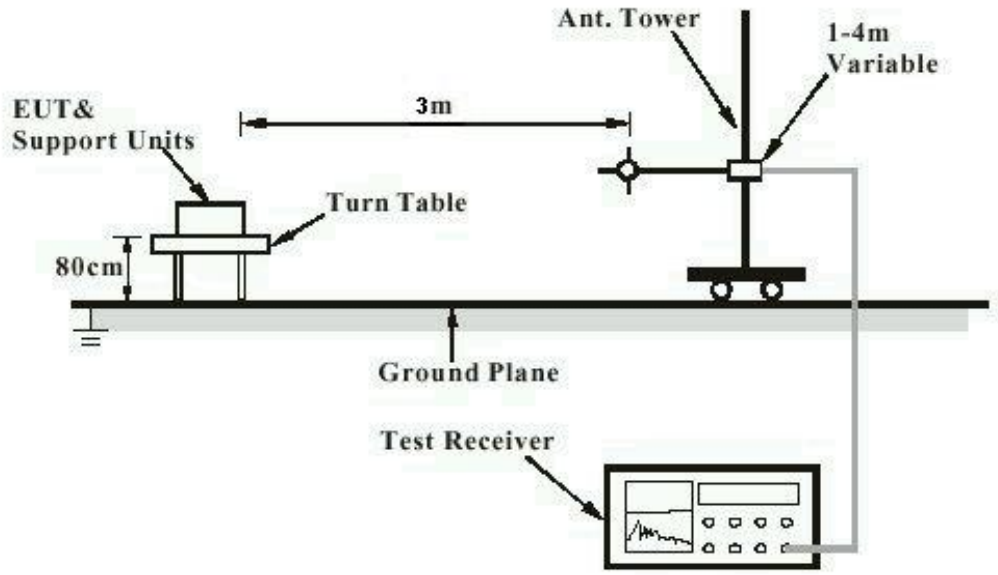
Description	Manufacturer	Model Name	Serial No.
Laptop	Lenovo	TP00083A	PF-0PRDGN
POE Switch	MERCURY	MSG05CP	1242079001044
Adapter	UGREEN	CD112	50714
USB Cable	N/A	N/A	1.00m Unshielded

3.3 Support Software

Description	Manufacturer	Software Name
Software	N/A	AmebaD_mptool_2V2

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

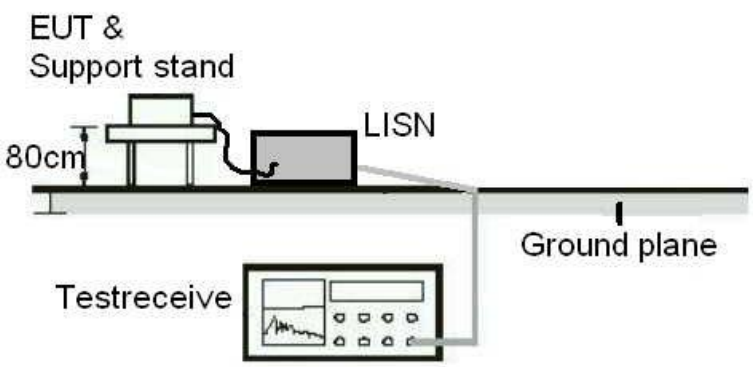
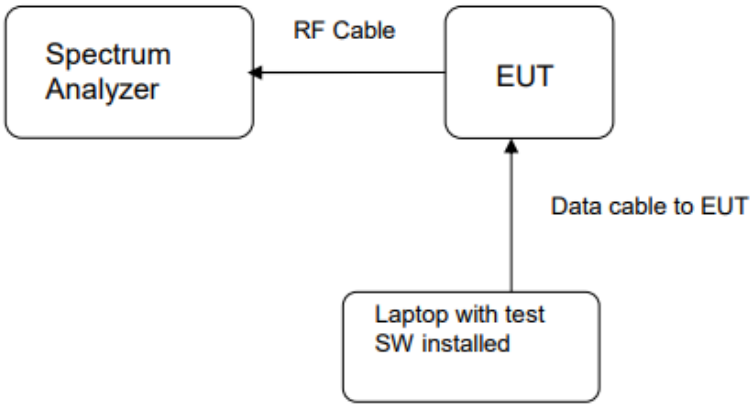


Diagram of Measurement Equipment Configuration for Transmitter Measurement



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	:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. In addition, If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 0.43dBi. The antenna is a PCB antenna with no possibility of replacement with a non-approved antenna by the end-user.
The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
Therefore, the EUT is considered to comply with this provision.

4.1.2 Maximum conducted (average) output power

RESULT: **PASS**

Test standard : FCC Part 15.247(b)(3)
Requirement : ANSI C63.10-2013, Clause 11.9.2
KDB 558074 D01 v05r02, Clause 8.3.2
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 23.9°C~24.8°C
Relative humidity : 46%~49%

Table 1: Maximum conducted (average) output power

Test Mode	Duty Cycle (%)	Test Channel (MHz)	Maximum conducted (average) output power		Limit (W)
			(dBm)	(mW)	
802.11b	100	2412	17.06	50.82	≤1
		2437	17.47	55.85	
		2462	17.74	59.43	
802.11g	100	2412	14.02	25.23	
		2437	13.97	24.95	
		2462	12.66	18.45	
802.11n(HT20)	100	2412	14.32	27.04	
		2437	14.36	27.29	
		2462	13.49	22.34	
802.11n(HT40)	100	2422	12.46	17.62	
		2437	12.41	17.42	
		2452	13.02	20.04	

Notes:

1. Add [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

4.1.3 6dB Bandwidth

RESULT: **PASS**

Test standard : FCC Part 15.247(a)(2)
Requirement : ANSI C63.10-2013, Clause 11.8.1
KDB 558074 D01 v05r02, Clause 8.2
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 23.9°C~24.8°C
Relative humidity : 46%~49%

Table 2: 6dB Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Applicable Limit (MHz)
802.11b	2412	10.12	14.541	≥0.5
	2437	10.16	14.660	
	2462	9.98	14.642	
802.11g	2412	16.51	16.781	
	2437	16.52	16.783	
	2462	15.12	16.166	
802.11n(HT20)	2412	17.74	17.877	
	2437	17.75	17.867	
	2462	15.72	17.440	
802.11n(HT40)	2422	36.43	35.967	
	2437	36.36	35.986	
	2452	36.05	35.965	

Figure 1: 6dB Bandwidth, 802.11b, 2412MHz

Figure 2: 6dB Bandwidth, 802.11b, 2437MHz

Figure 3: 6dB Bandwidth, 802.11b, 2462MHz

Figure 4: 6dB Bandwidth, 802.11g, 2412MHz

Figure 5: 6dB Bandwidth, 802.11g, 2437MHz

Figure 6: 6dB Bandwidth, 802.11g, 2462MHz

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

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

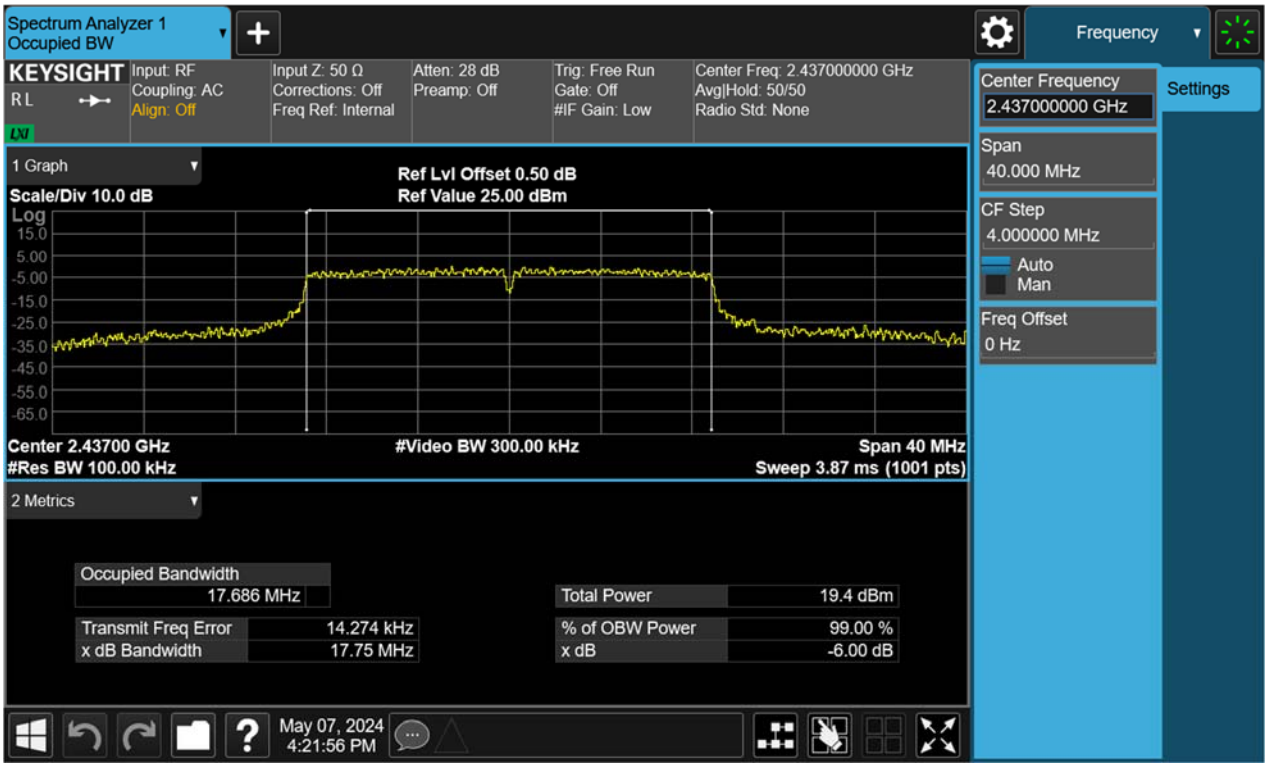


Figure 9: 6dB Bandwidth, 802.11n(HT20), 2462MHz

Figure 10: 6dB Bandwidth, 802.11n(HT40), 2422MHz

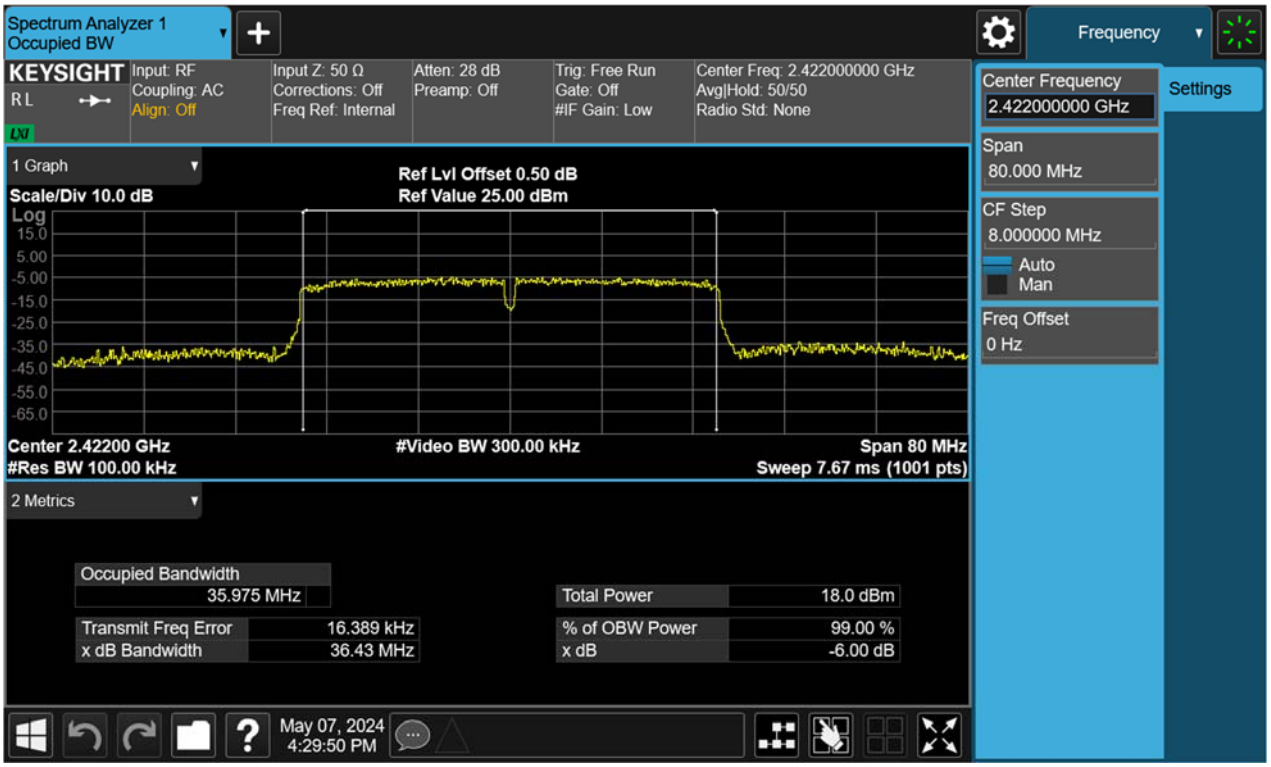
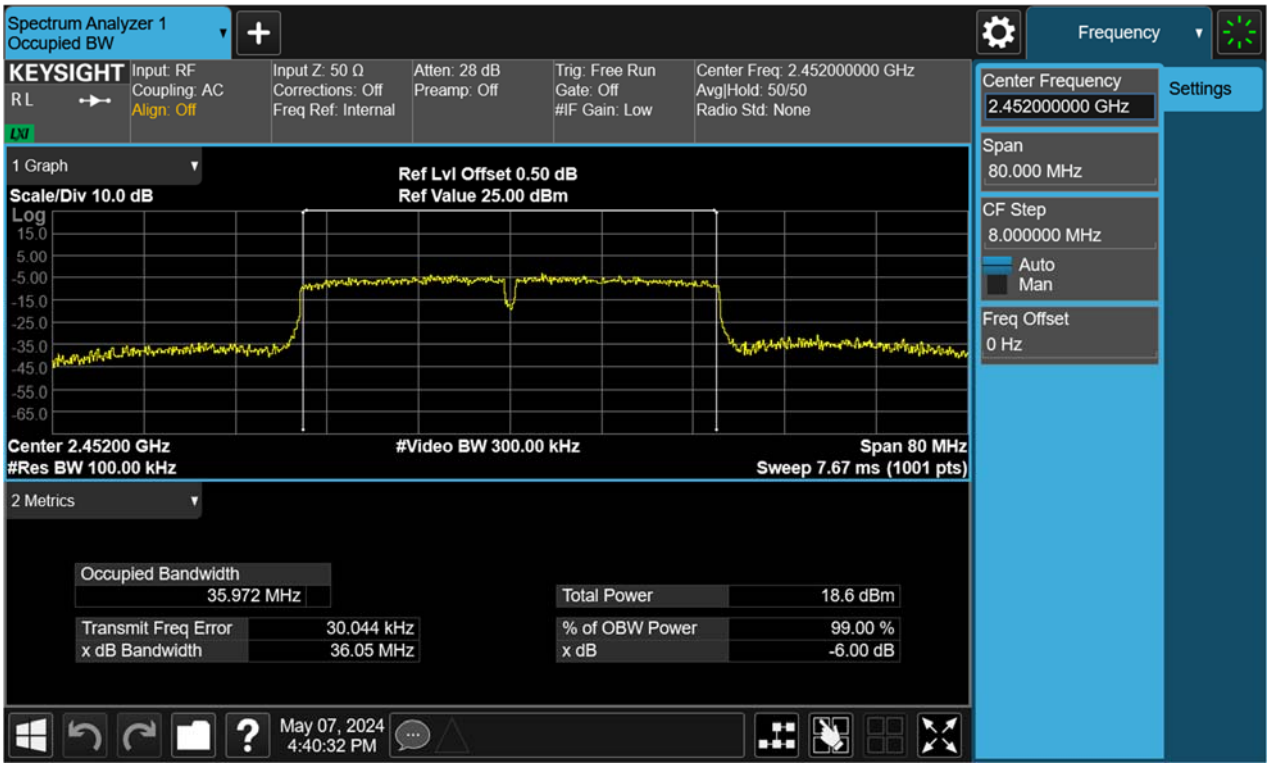


Figure 11: 6dB Bandwidth, 802.11n(HT40), 2437MHz

Figure 12: 6dB Bandwidth, 802.11n(HT40), 2452MHz



4.1.4 Maximum conducted output power spectral density

RESULT: **PASS**

Test standard : FCC Part 15.247(e)
Requirement : ANSI C63.10-2013, Clause 11.10.4
KDB 558074 D01 v05r02, Clause 8.4
Kind of test site : Shielded room

Test setup
Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 23.9°C~24.8°C
Relative humidity : 46%~49%

Table 3: Maximum (average) conducted output power spectral density

Test Mode	Test Channel (MHz)	Maximum (average) conducted output power spectral density (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	2412	-15.00	≤8
	2437	-14.74	
	2462	-14.56	
802.11g	2412	-21.62	
	2437	-21.57	
	2462	-21.85	
802.11n(HT20)	2412	-21.45	
	2437	-21.45	
	2462	-21.47	
802.11n(HT40)	2422	-26.68	
	2437	-26.57	
	2452	-25.98	

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

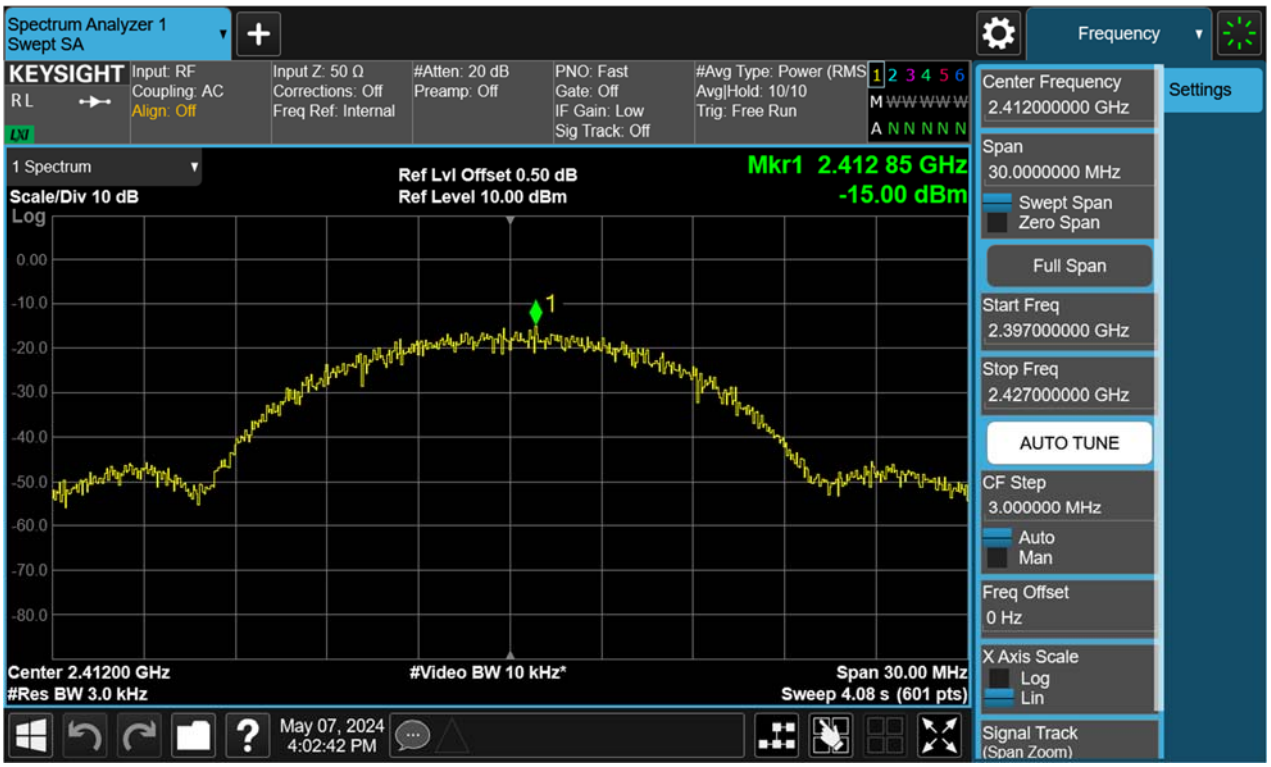


Figure 14: Power Spectral Density, 802.11b, 2437MHz

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

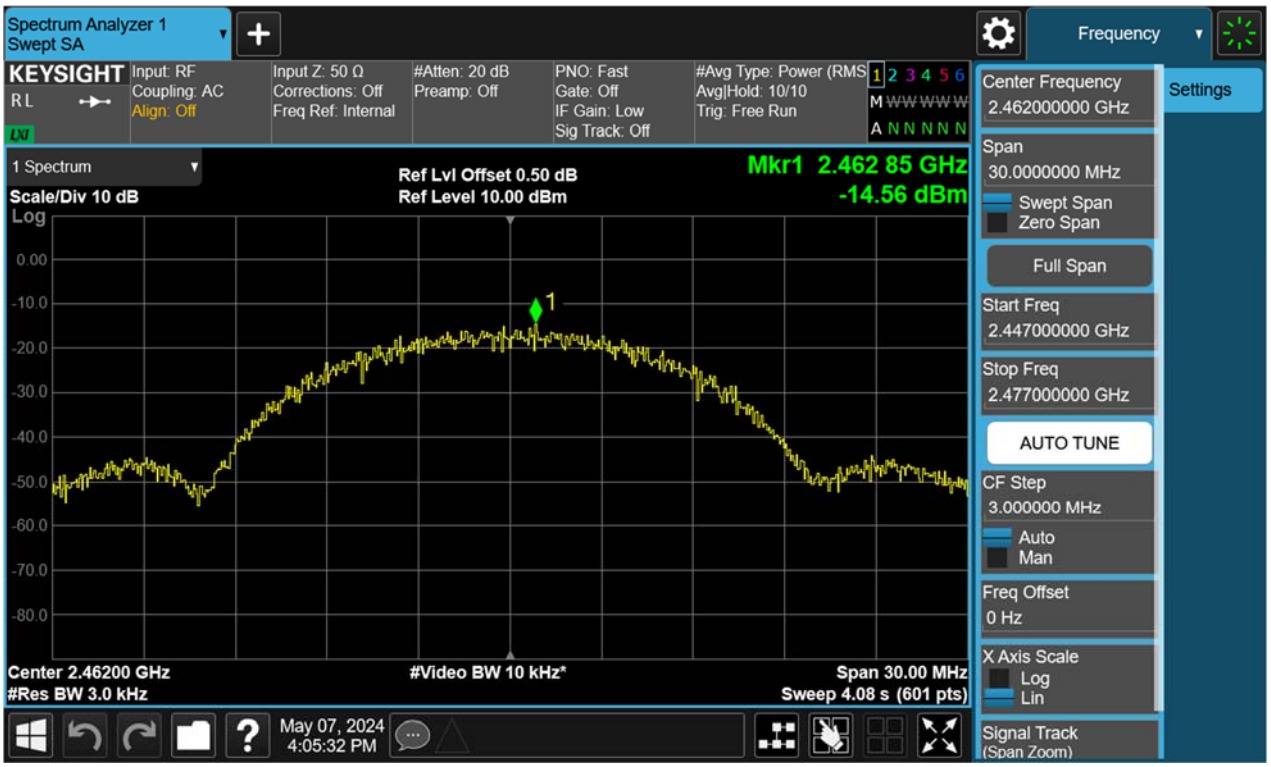


Figure 16: Power Spectral Density, 802.11g, 2412MHz

Figure 17: Power Spectral Density, 802.11g, 2437MHz

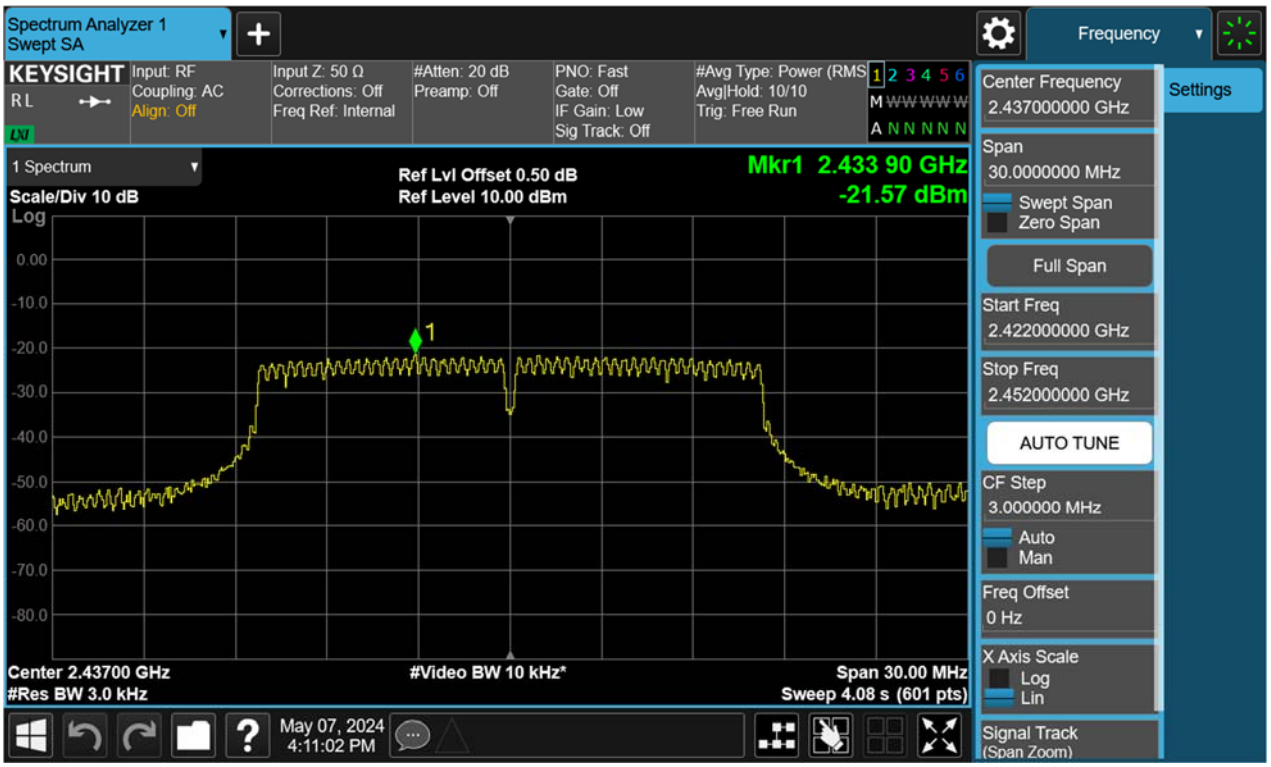


Figure 18: Power Spectral Density, 802.11g, 2462MHz

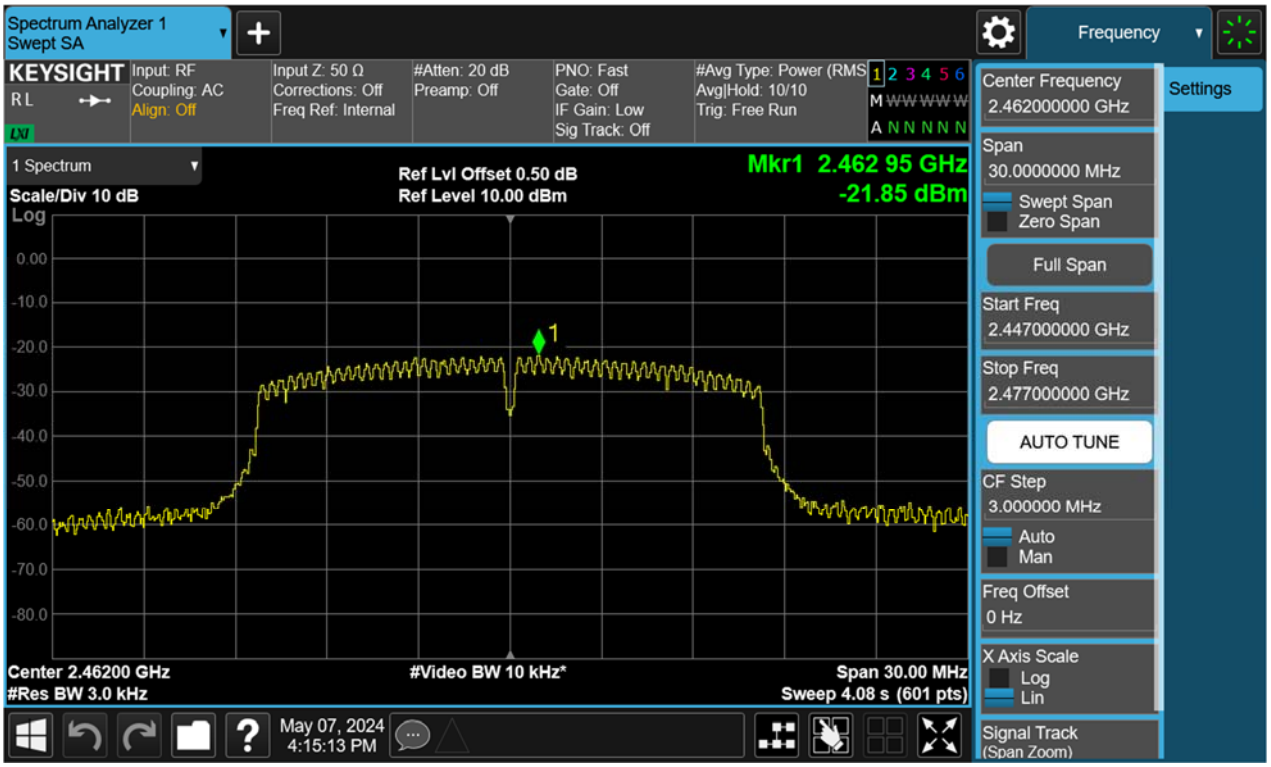


Figure 19: Power Spectral Density, 802.11n(HT20), 2412MHz

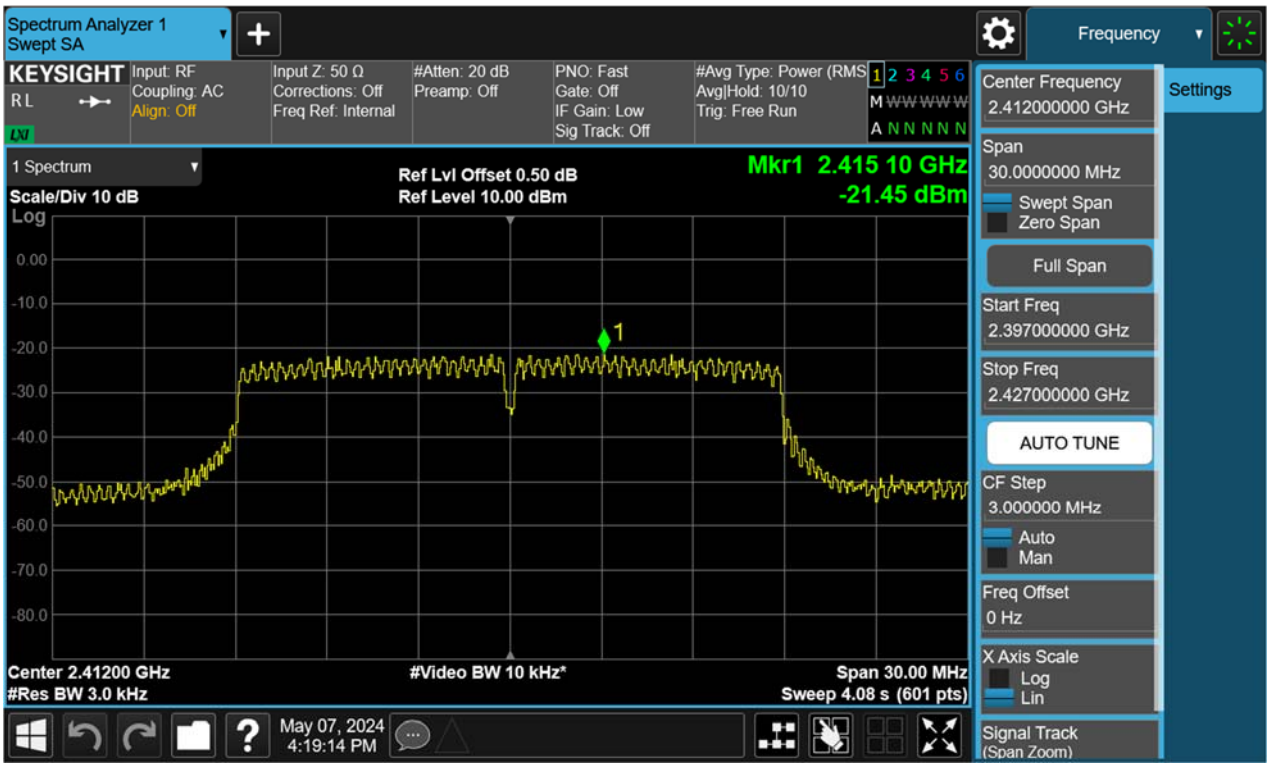


Figure 20: Power Spectral Density, 802.11n(HT20), 2437MHz

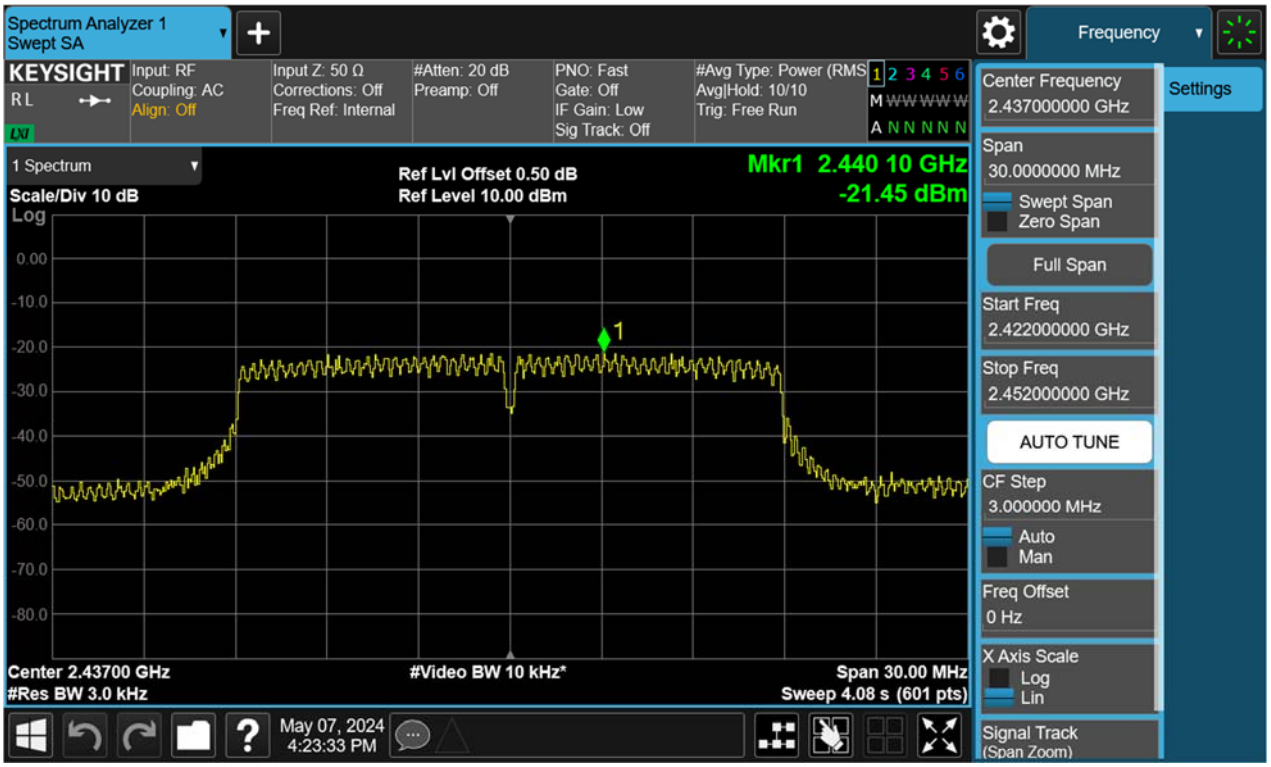


Figure 21: Power Spectral Density, 802.11n(HT20), 2462MHz

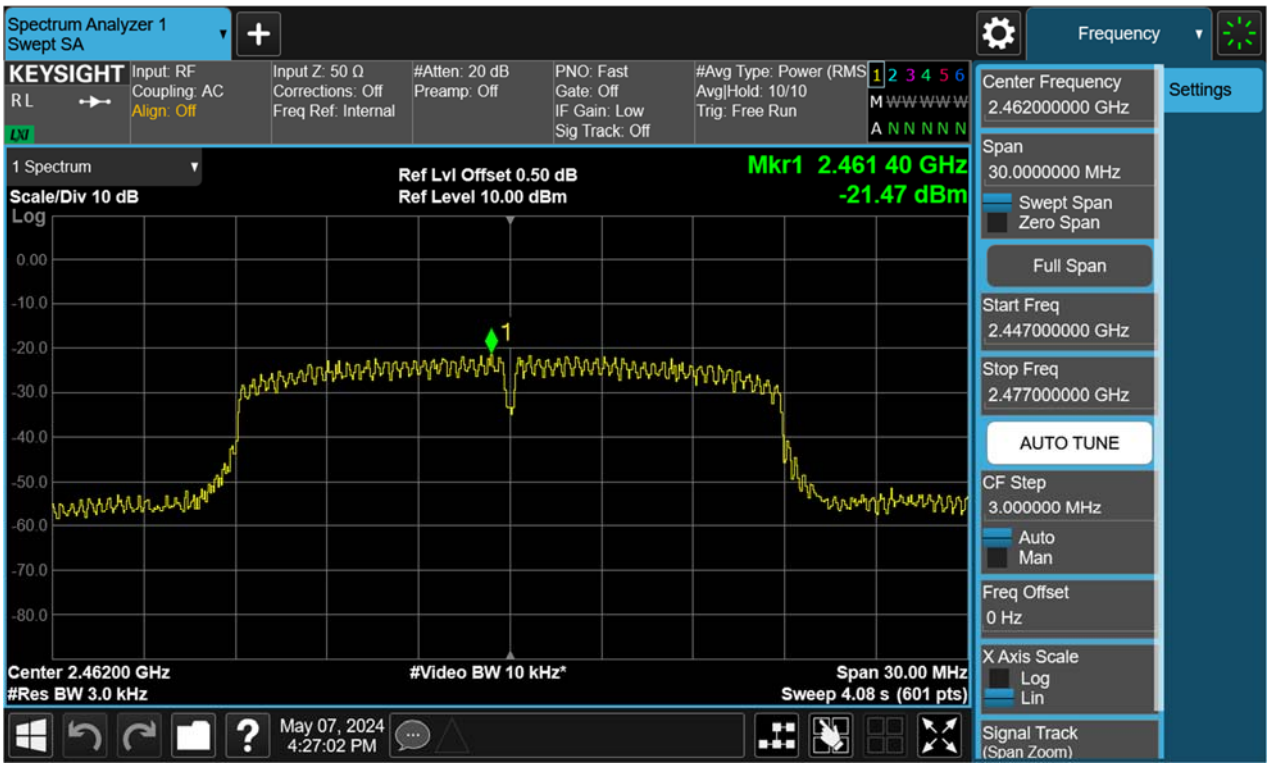


Figure 22: Power Spectral Density, 802.11n(HT40), 2422MHz

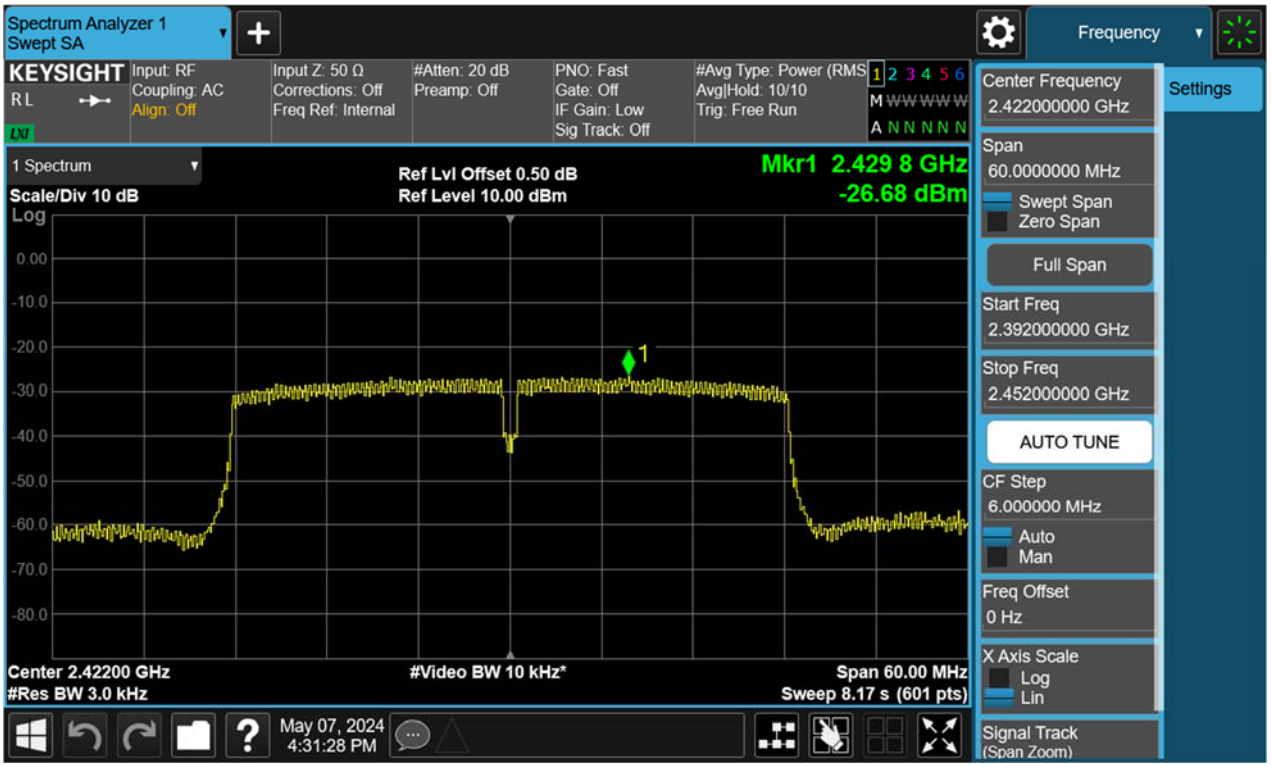


Figure 23: Power Spectral Density, 802.11n(HT40), 2437MHz

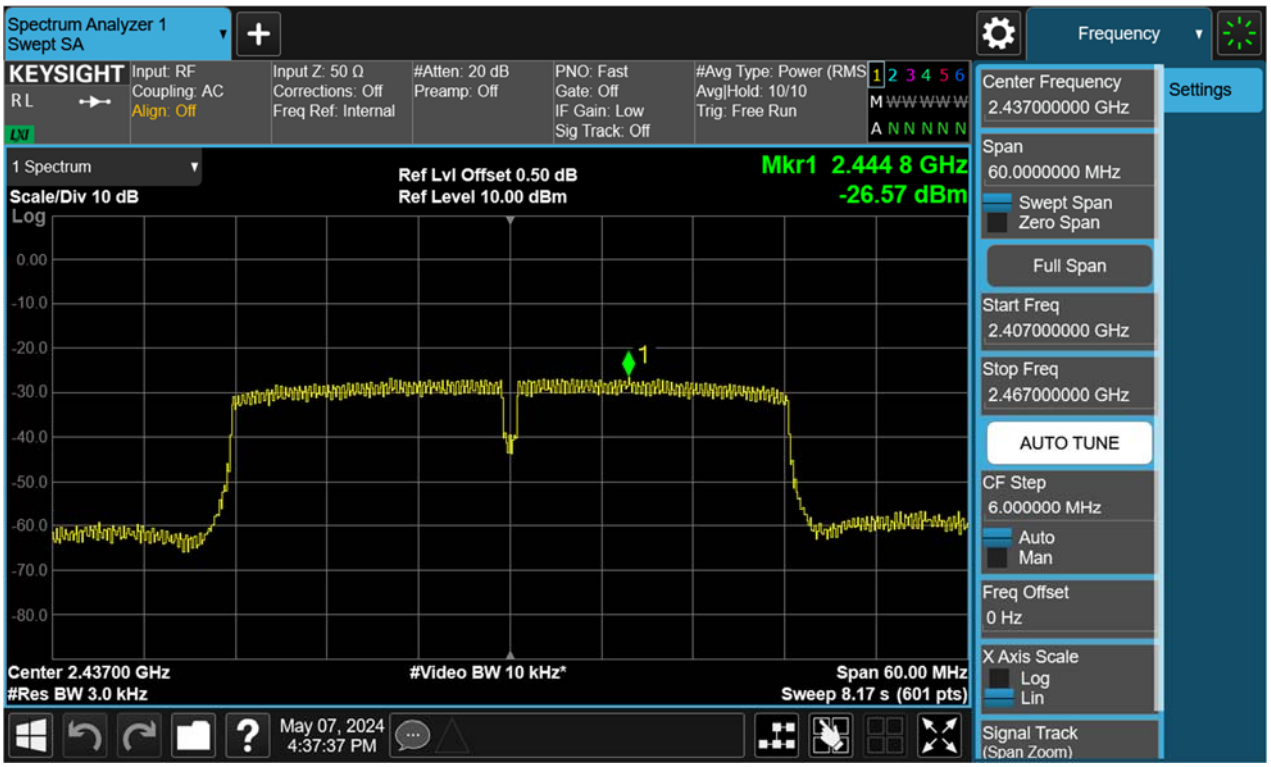
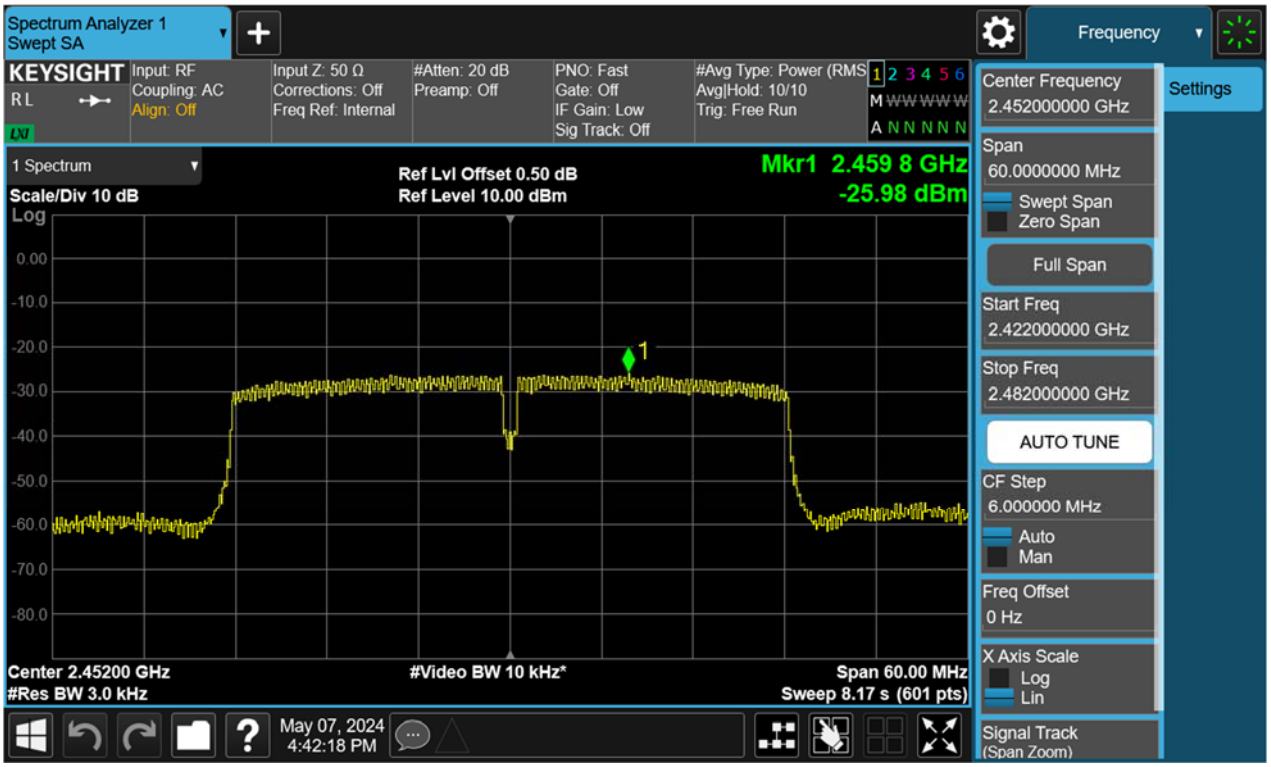


Figure 24: Power Spectral Density, 802.11n(HT40), 2452MHz



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, Clause 11.11.1(b) KDB 558074 D01 v05r02, Clause 8.5
Kind of test site	:	Shielded room

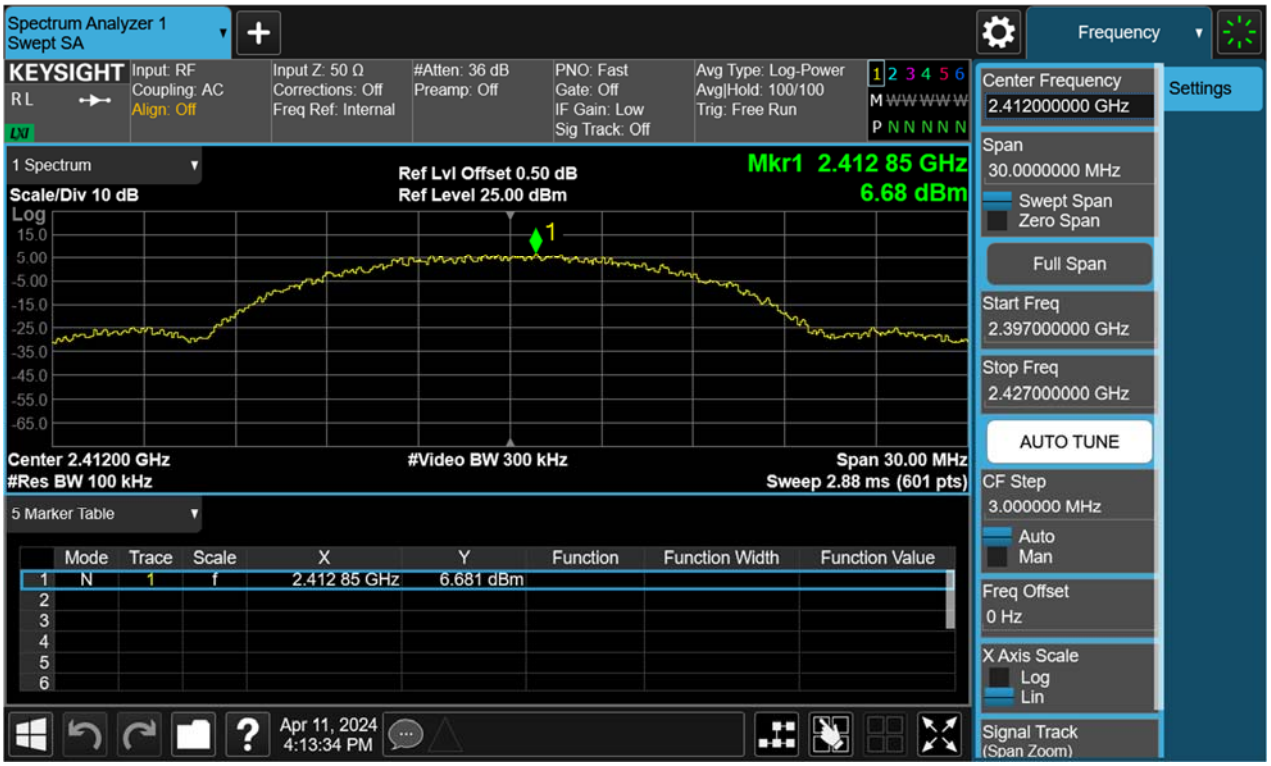
Test setup

Test Channel	:	Low/Middle/High for spurious, Low/High for Band Edge
Operation Mode	:	A.1.a
Ambient temperature	:	23.9°C~24.8°C
Relative humidity	:	46%~49%

For details refer to following test plot.

Figure 25: Conducted Spurious Emission & Authorized-band band-edge, 802.11b, 2412MHz

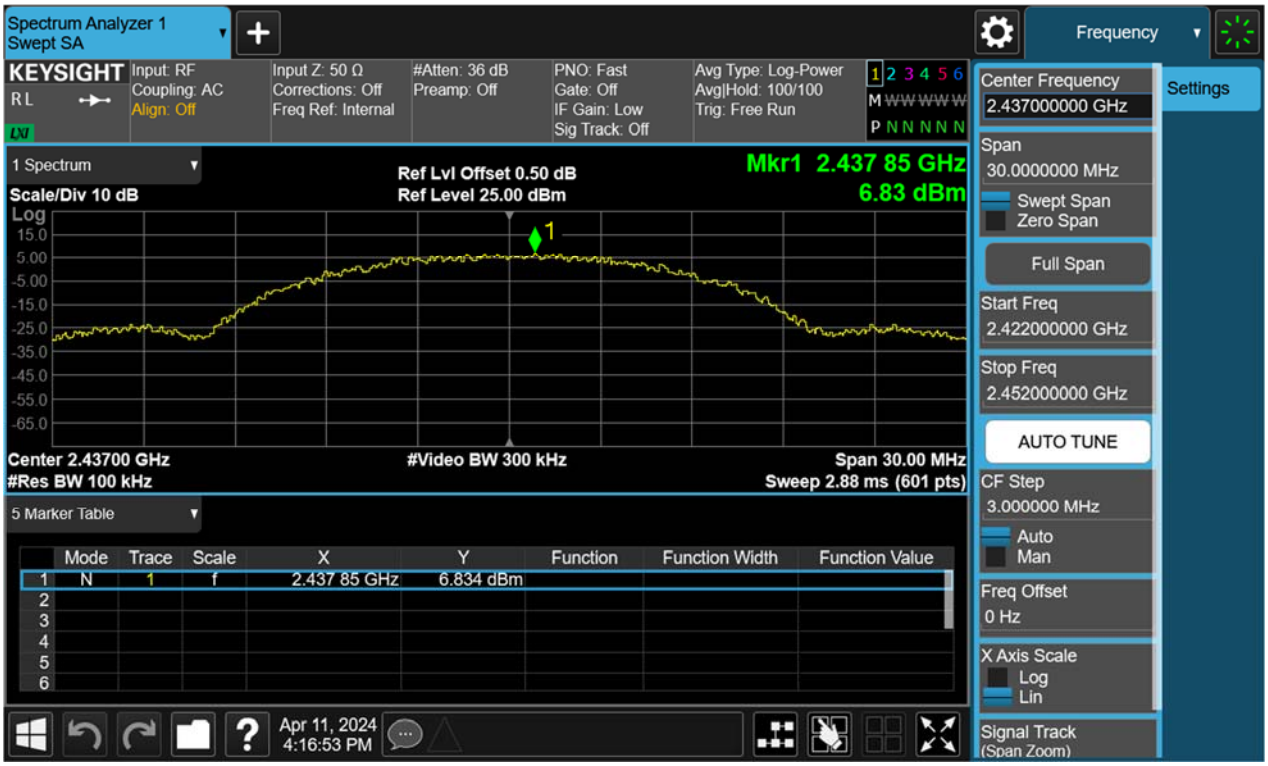
Carrier Level



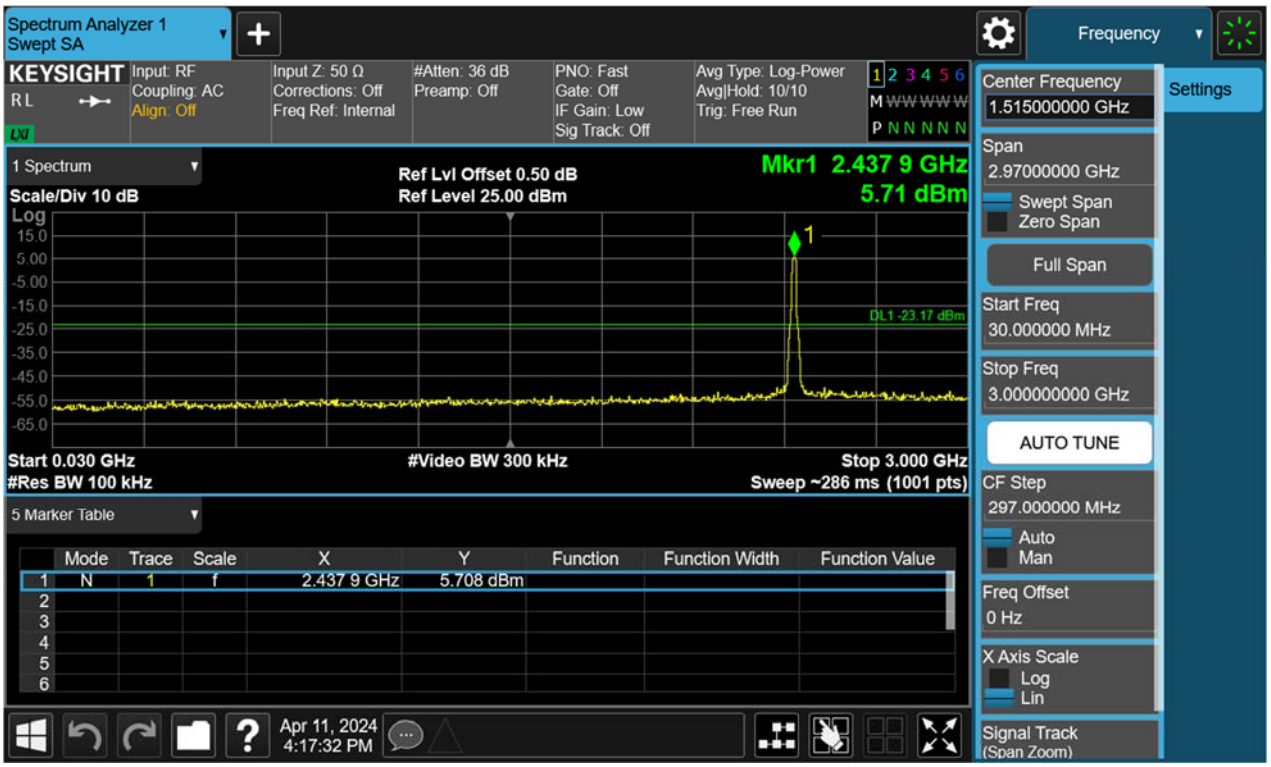
Band Edge

Conducted spurious emissions 30MHz-25GHz

Figure 26: Conducted Spurious Emission & Authorized-band band-edge, 802.11b, 2437MHz Carrier Level



Conducted spurious emissions 30MHz-25GHz



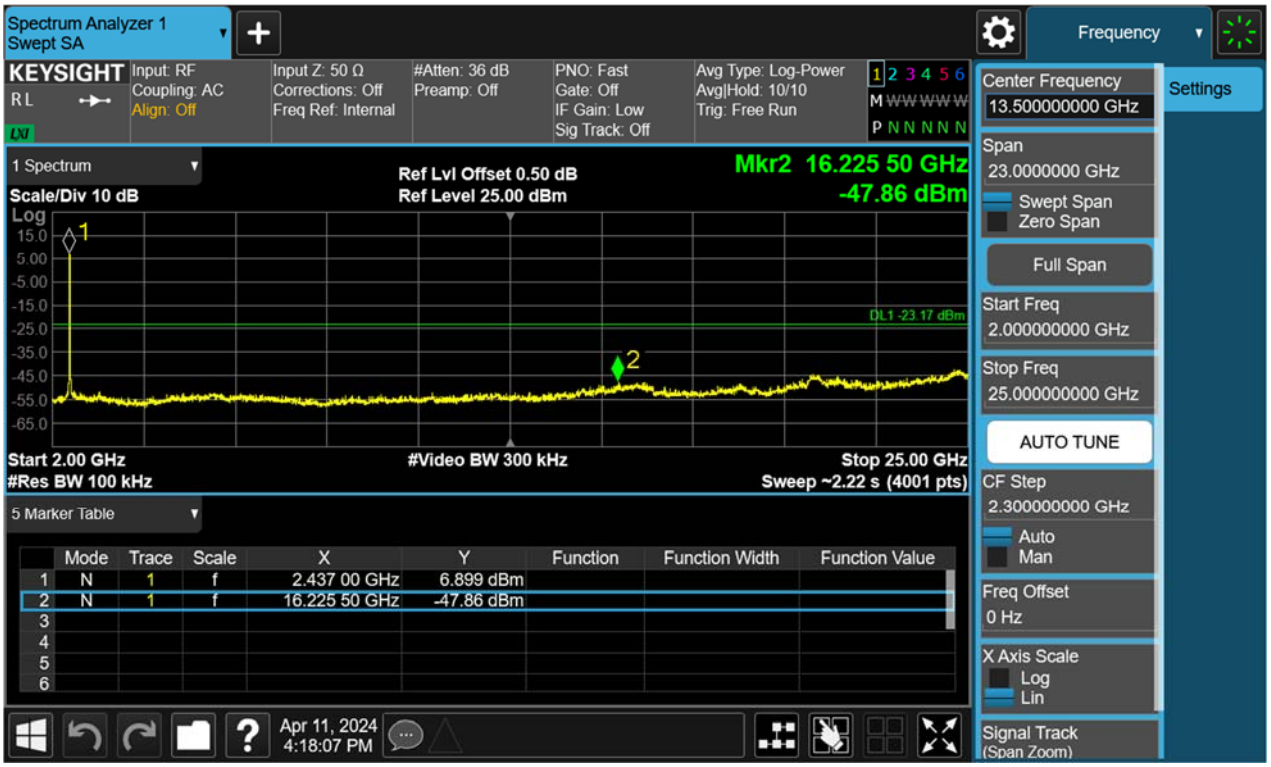
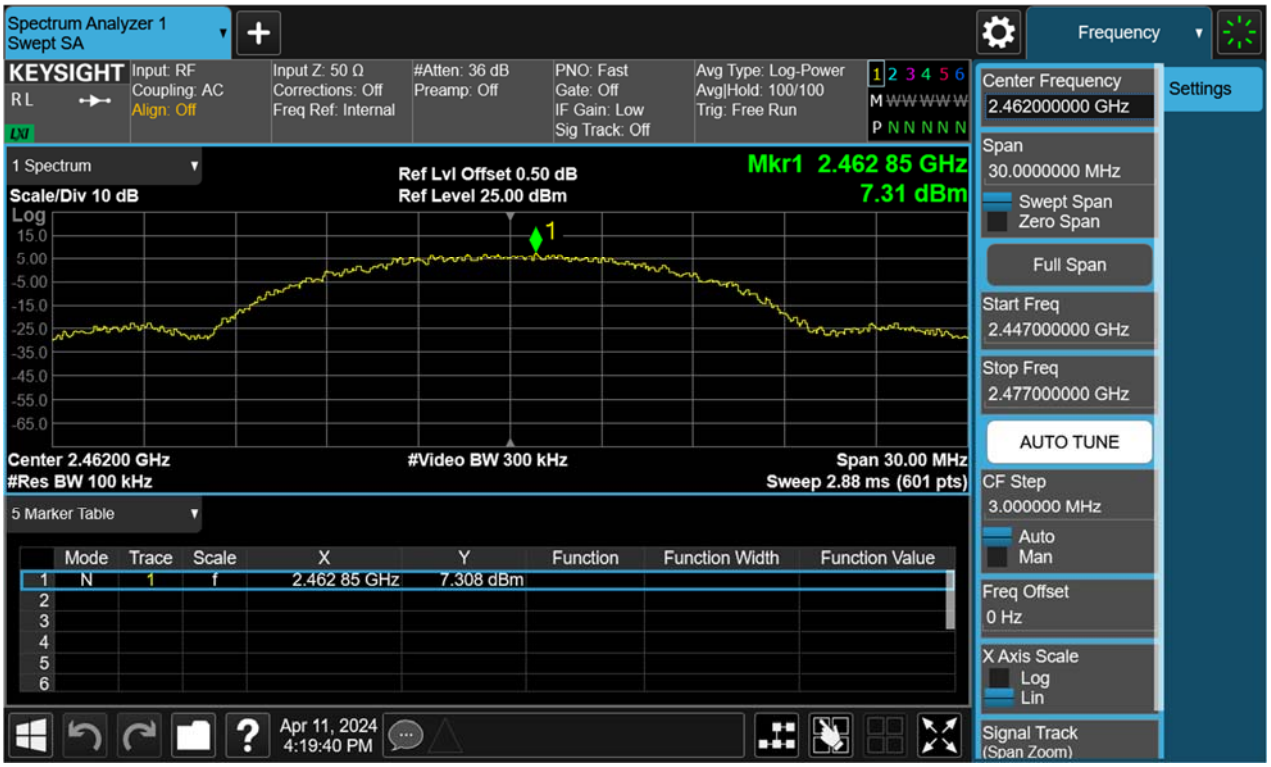


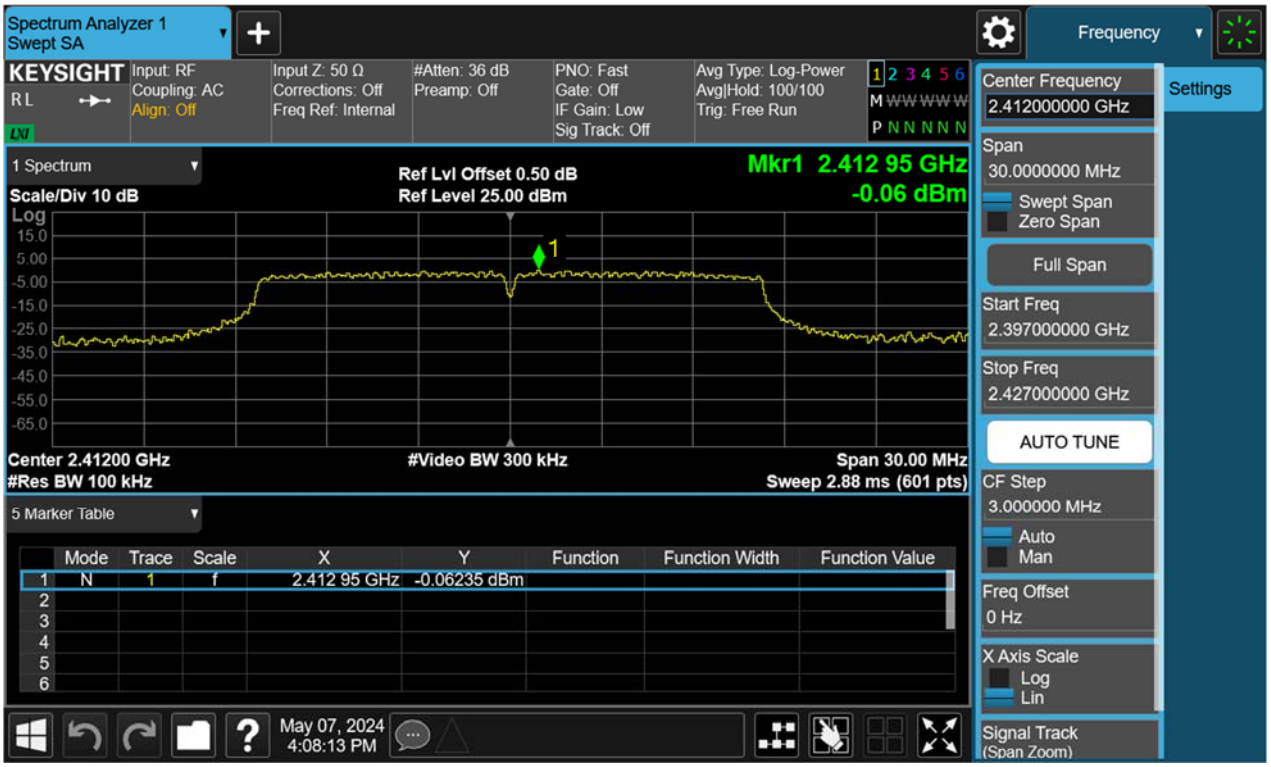
Figure 27: Conducted Spurious Emission & Authorized-band band-edge, 802.11b, 2462MHz Carrier Level



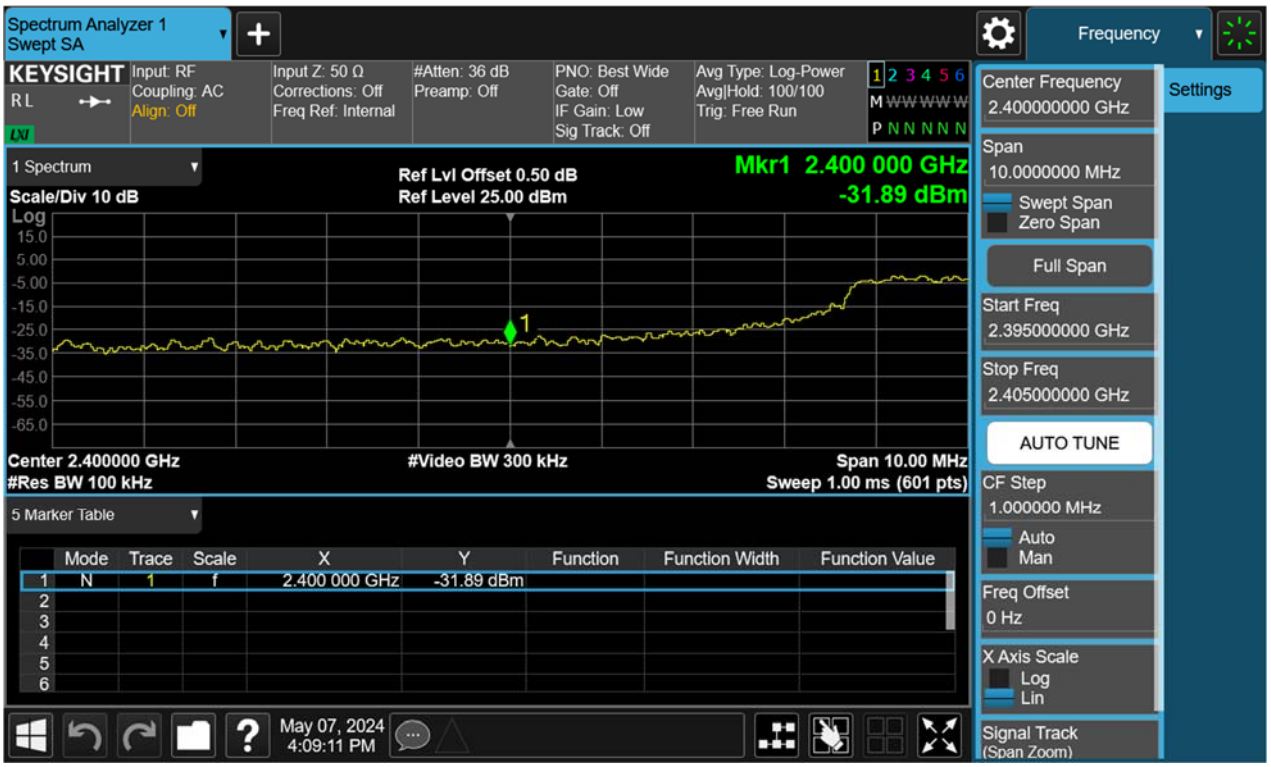
Band Edge

Conducted spurious emissions 30MHz-25GHz

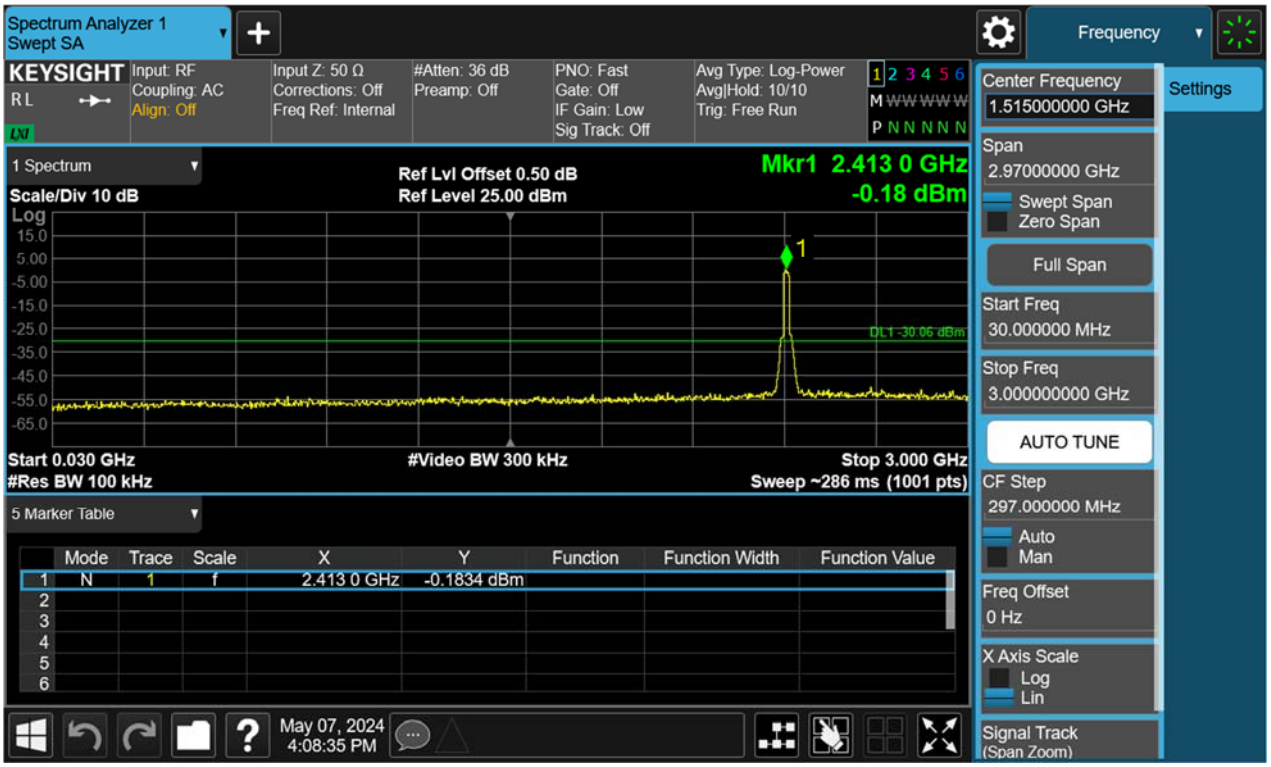
Figure 28: Conducted Spurious Emission & Authorized-band band-edge, 802.11g, 2412MHz Carrier Level



Band Edge



Conducted spurious emissions 30MHz-25GHz



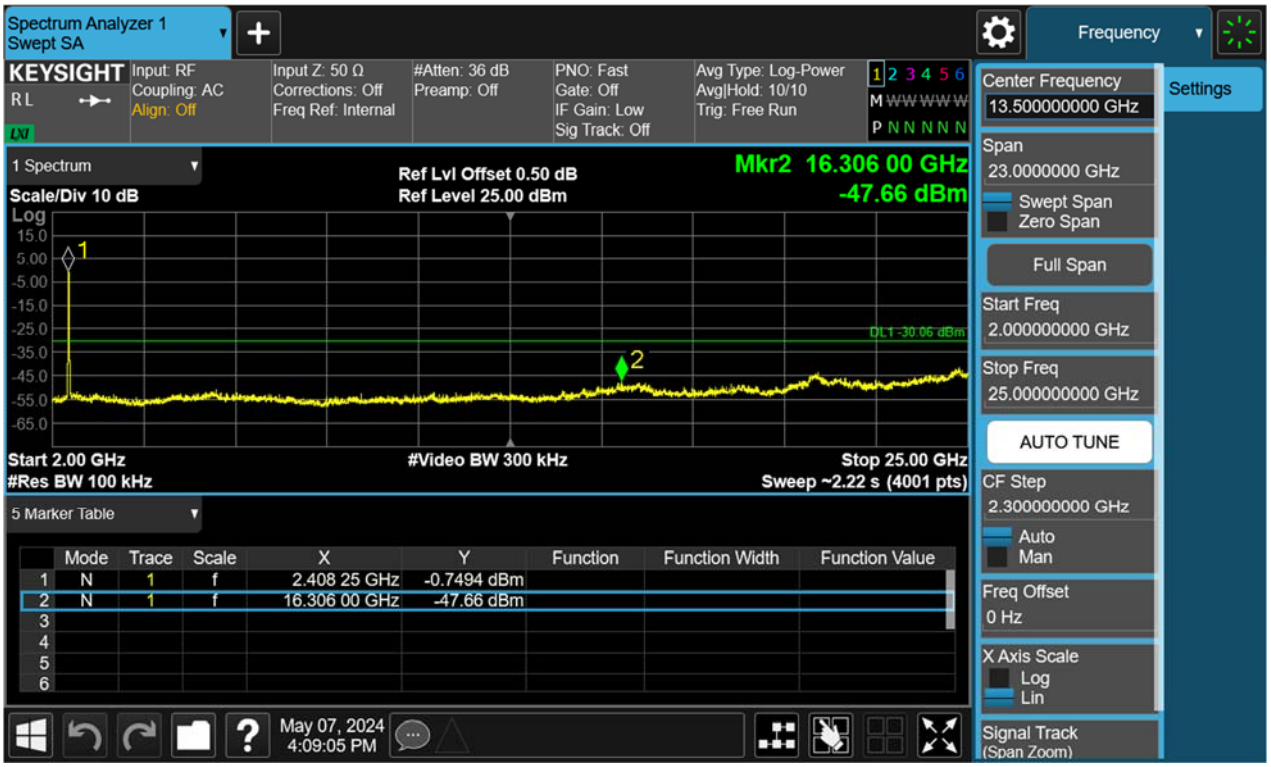
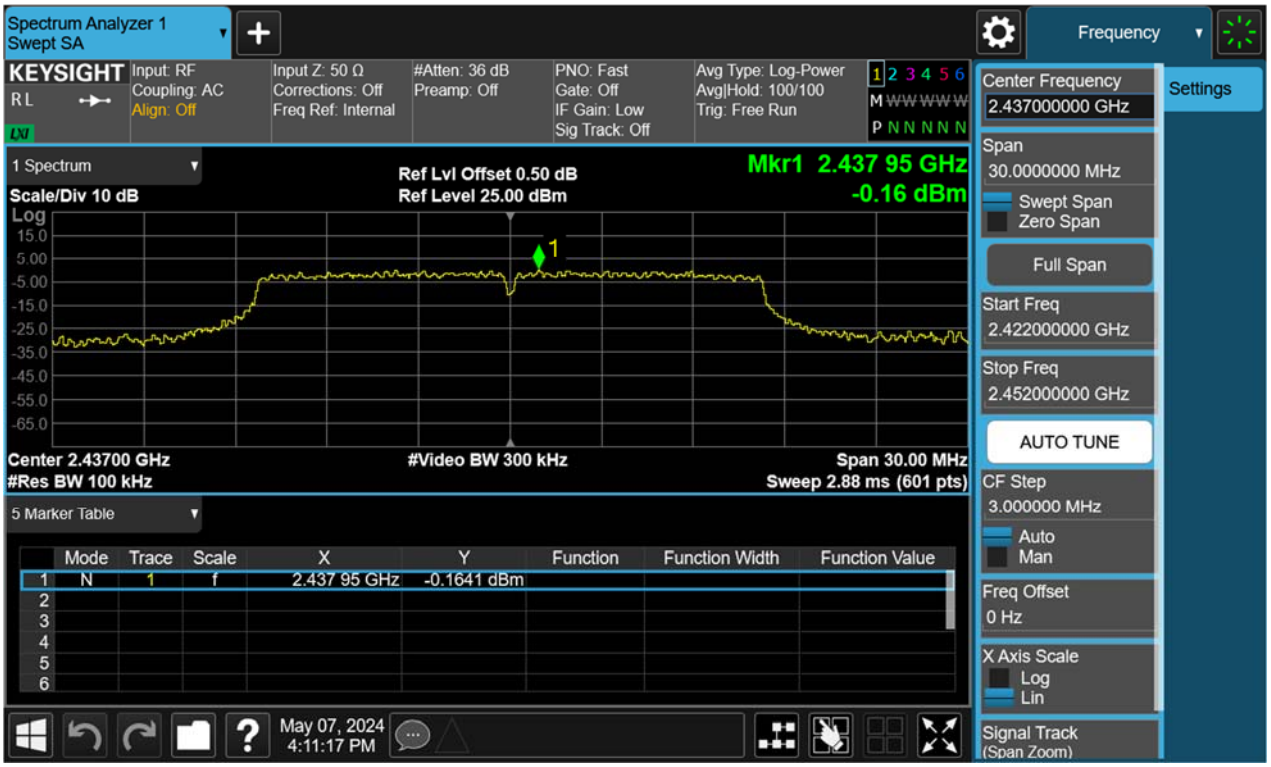



Figure 29: Conducted Spurious Emission & Authorized-band band-edge, 802.11g, 2437MHz Carrier Level