FCC Test Report

Report No.: AGC02390220301FE05

FCC ID	:	2ABRU-WF3135
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	BDE Dual-Band WiFi Network Processor Module
BRAND NAME	:	BDE
MODEL NAME	:	BDE-WF3135A, BDE-WF3135AU, BDE-WF3135N
APPLICANT	:	Guangzhou BDE Technology Inc.
DATE OF ISSUE	:	Jul. 26, 2022
STANDARD(S) **TEST PROCEDURE(S)**	:	FCC Part 15.247
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jul. 26, 2022	Valid	Initial Release

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1. VERIFICATION OF CONFORMITY

Applicant	Guangzhou BDE Technology Inc.
Address	B2-403, Chuangyi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
manufacturer	Guangzhou BDE Technology Inc.
Address	B2-403, Chuangyi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Factory	Guangzhou BDE Technology Inc.
Address	B2-403, Chuangyi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Product Designation	BDE Dual-Band WiFi Network Processor Module
Brand Name	BDE
Test Model	BDE-WF3135A
Series Model	BDE-WF3135AU, BDE-WF3135N
Declaration of Difference	BDE-WF3135A has a PCB antenna integrated, while BDE-WF3135AU has an U.FL connector on board which can be connected to an external antenna, and BDE-WF3135N has no antenna included but can be connected to an external antenna through the application PCB, otherwise, they are the same.
Date of test	Jun. 13, 2022 to Jul. 22, 2022
Deviation	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BGN/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Prepared By	Alan Duan (Project Engineer)	Jul. 22, 2022
Reviewed By	Calvin Liu (Reviewer)	Jul. 26, 2022
Approved By	Max Zhang (Authorized Officer)	Jul. 26, 2022

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as “BDE Dual-Band WiFi Network Processor Module”. It is designed by way of utilizing the DSSS and OFDM technology to achieve the system operation.

A major technical description of EUT is described as following

Equipment Type	WLAN 2.4G
Frequency Band	2400MHz ~ 2483.5MHz
Operation Frequency	2412MHz ~ 2462MHz
Output Power (Average)	IEEE 802.11b:13.97dBm; IEEE 802.11g:13.83dBm; IEEE 802.11n(HT20):13.02dBm
Output Power (Peak)	IEEE 802.11b:14.72dBm; IEEE 802.11g:19.49dBm; IEEE 802.11n(HT20):18.39dBm
Modulation	802.11b:DQPSK, DBPSK, CCK 802.11g/n: 64-QAM, 16-QAM, QPSK, BPSK
Data Rate	802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps
Number of channels	11
Hardware Version	1.2
Software Version	4.11
Antenna Designation	Refer to Chapter 2.10 of the report. (Comply with requirements of the FCC part 15.203)
Antenna Gain	Refer to Chapter 2.9 of the report.
Power Supply	DC 3.3V

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
2400~2483.5MHZ	1	2412 MHZ
	2	2417 MHZ
	3	2422 MHZ
	4	2427 MHZ
	5	2432 MHZ
	6	2437 MHZ
	7	2442 MHZ
	8	2447 MHZ
	9	2452 MHZ
	10	2457 MHZ
	11	2462 MHZ

Note: For 20MHZ bandwidth system use Channel 1 to Channel 11.

2.3. IEEE 802.11N MODULATION SCHEME

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Data rate(Mbps)	
									800nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0
6	1	64-QAM	3/4	6	312	648	234	489	58.5	121.5
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	Guard interval

2.4. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2ABRU-WF3135** filing to comply with the FCC Part 15 requirements.

2.5. TEST METHODOLOGY

KDB 558074 D01 15.247 Meas Guidance v05: Guidance for compliance measurements on Digital transmissio n system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules
ANSI C63.10:2013: American National Standard for Testing Unlicensed Wireless Devices

2.6. SPECIAL ACCESSORIES

Refer to section 5.2.

2.7. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.8. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

2.9. DESCRIPTION OF AVAILABLE ANTENNAS

Model No.: BDE-WF3135A

Bluetooth Dedicated Antenna		
Antenna Type	Frequency Band (MHz)	Max Peak Gain (dBi)
PCB antenna	2400 ~ 2483.5	2.5

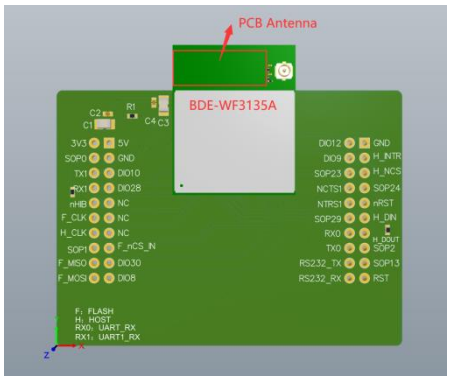
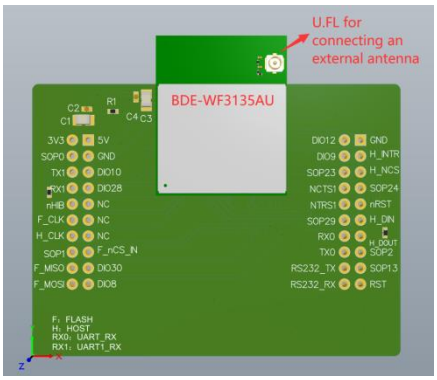
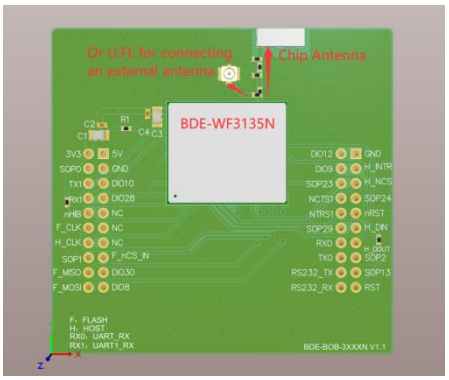
Model No.: BDE-WF3135AU

Bluetooth Dedicated Antenna		
Antenna Type	Frequency Band (MHz)	Max Peak Gain (dBi)
Whip antenna	2400 ~ 2483.5	6.0

Model No.: BDE-WF3135N

Bluetooth Internal Antenna		
Antenna Type	Frequency Band (MHz)	Max Peak Gain (dBi)
Ceramic Antenna	2400 ~ 2483.5	1.0
Whip antenna	2400 ~ 2483.5	6.0

2.10. DESCRIPTION OF ANTENNA RF PORT

Antenna RF Port			
--	WIFI (BDE-WF3135A)	WIFI (BDE-WF3135AU)	WIFI (BDE-WF3135N)
Software Control Port	PCB	U.FL	Chip+ U.FL
			

Note：The above BDE-WF3135A U.FL port is only provided for RF test, and the attenuation is 0 dBm

3. MEASUREMENT UNCERTAINTY

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%.

Item	Measurement Uncertainty
Uncertainty of Conducted Emission for AC Port	U_c = ±3.1 dB
Uncertainty of Radiated Emission below 1GHz	U_c = ±4.0 dB
Uncertainty of Radiated Emission above 1GHz	U_c = ±4.8 dB
Uncertainty of total RF power, conducted	U_c = ±0.8 dB
Uncertainty of RF power density, conducted	U_c = ±2.6 dB
Uncertainty of spurious emissions, conducted	U_c = ±2 %
Uncertainty of Occupied Channel Bandwidth	U_c = ±2 %

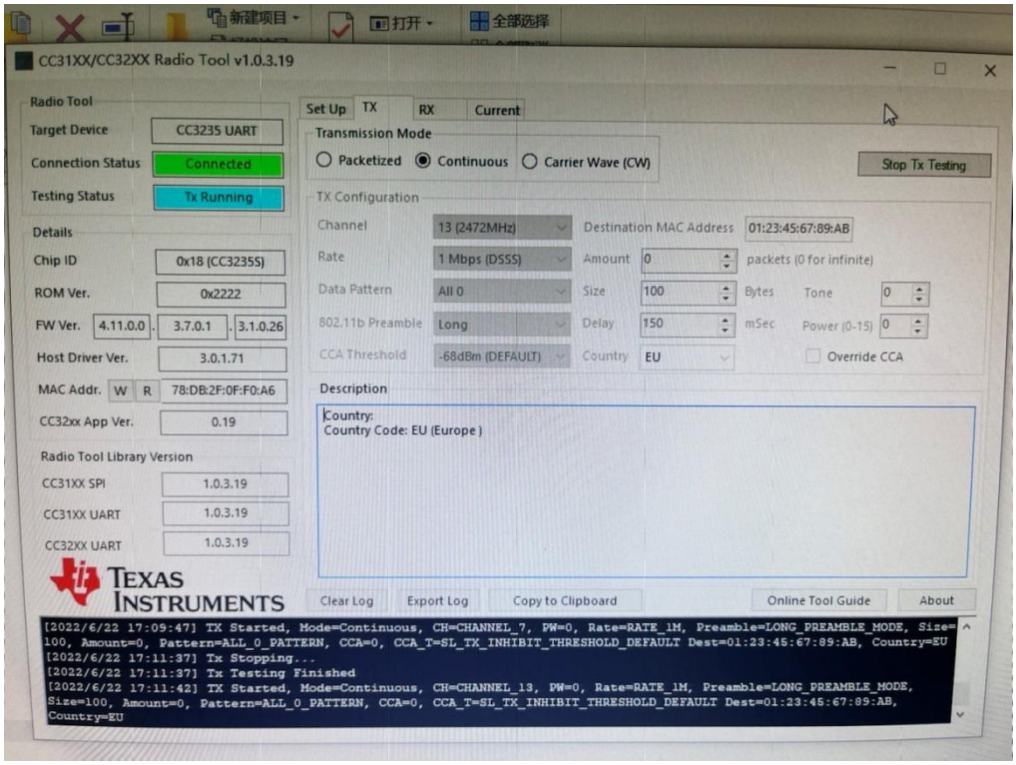
4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel transmitting (TX)
2	Middle channel transmitting (TX)
3	High channel transmitting (TX)
Note: Transmit by 802.11b with Date rate (1/2/5.5/11) Transmit by 802.11g with Date rate (6/9/12/18/24/36/48/54) Transmit by 802.11n (20MHz) with Date rate (6.5/13/19.5/26/39/52/58.5/65) The test channel for 20MHZ bandwidth system is channel 1, 6 and 11.	

Note:

1. The EUT has been set to operate continuously on the lowest, middle and highest operation frequency Individually, and the EUT is operating at its maximum duty cycle>or equal 98%
2. All modes under which configure applicable have been tested and the worst mode test data recording in the test report, if no other mode data.

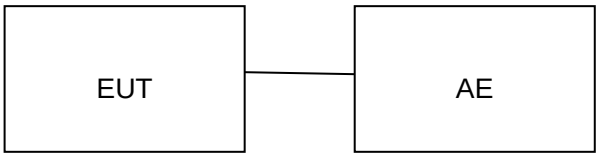
Software Setting



5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Configure:



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	BDE Dual-Band WiFi Network Processor Module	BDE-WF3135A	2ABRU-WF3135	EUT
2	PC	Nbl-WAQ9R	--	AE
3	PC adapter	HW-200200CP1	--	AE
4	Control	J5K-NPC	--	AE

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247(b)(3)	Output Power	Compliant
§15.247(a)(2)	6 dB Bandwidth	Compliant
§15.247	Conducted Spurious Emission	Compliant
§15.247(e)	Maximum Conducted Output Power Spectral Density	Compliant
§15.209	Radiated Emission	Compliant
§15.247(d)	Band Edges	Compliant
§15.207	Line Conduction Emission	Compliant

6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Mar. 28, 2022	Mar. 27, 2023
LISN	R&S	ESH2-Z5	100086	Jun. 08, 2022	Jun. 07, 2023
Test software	R&S	ES-K1(Ver.V1.71)	N/A	N/A	N/A

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Mar. 28, 2022	Mar. 27, 2023
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Nov. 17, 2021	Nov. 16, 2022
Power sensor	Aglient	U2021XA	MY54110007	Mar. 04, 2022	Mar. 03, 2023
2.4GHz Fliter	Micro-tronics	087	N/A	Mar. 22, 2022	Mar. 21, 2024
Attenuator	Weinachel Corp	58-30-33	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Oct. 31, 2021	Oct. 30, 2023
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	00034609	Mar. 12, 2022	Mar. 21, 2024
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Apr. 23, 2021	Apr. 22, 2023
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
ANTENNA	SCHWARZBECK	VULB9168	D69250	Jan. 08, 2020	Jan. 07, 2023
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

7. OUTPUT POWER

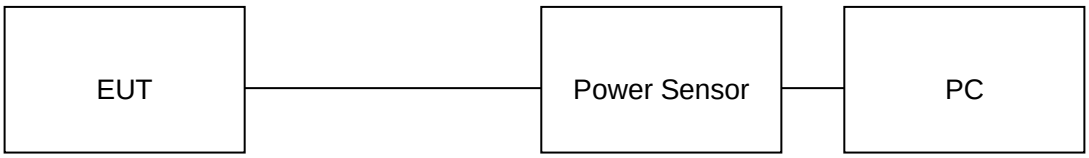
7.1. MEASUREMENT PROCEDURE

For average power test:

1. Connect EUT RF output port to power sensor through an RF attenuator.
2. Connect the power sensor to the PC.
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Record the maximum power from the software.

Note：The EUT was tested according to ANSI C63.10 (2013) for compliance to FCC 47CFR 15.247 requirements.

7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



7.3. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power					
Test Mode	Test Channel (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
802.11b	2412	13.97	14.72	⩽30	Pass
	2437	13.85	14.69	⩽30	Pass
	2462	13.93	14.62	⩽30	Pass
802.11g	2412	10.15	15.54	⩽30	Pass
	2437	13.83	19.49	⩽30	Pass
	2462	10.12	15.58	⩽30	Pass
802.11n20	2412	9.35	14.90	⩽30	Pass
	2437	13.02	18.39	⩽30	Pass
	2462	9.77	15.23	⩽30	Pass

8. BANDWIDTH

8.1. MEASUREMENT PROCEDURE

6dB bandwidth:

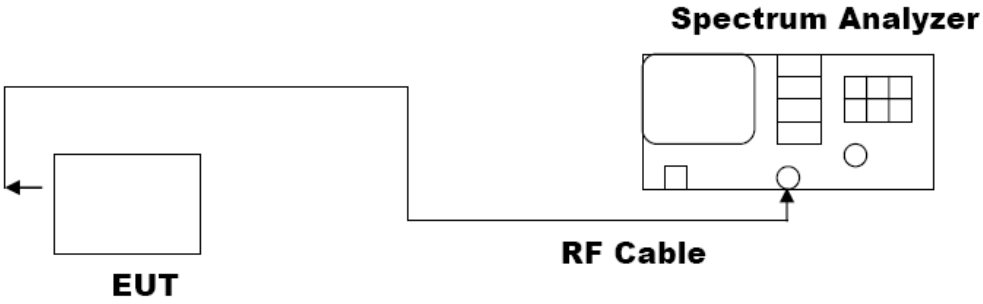
1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 kHz, VBW≥3×RBW.
4. Set SPA Trace 1 Max hold, then View.

Occupied bandwidth:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel
   The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

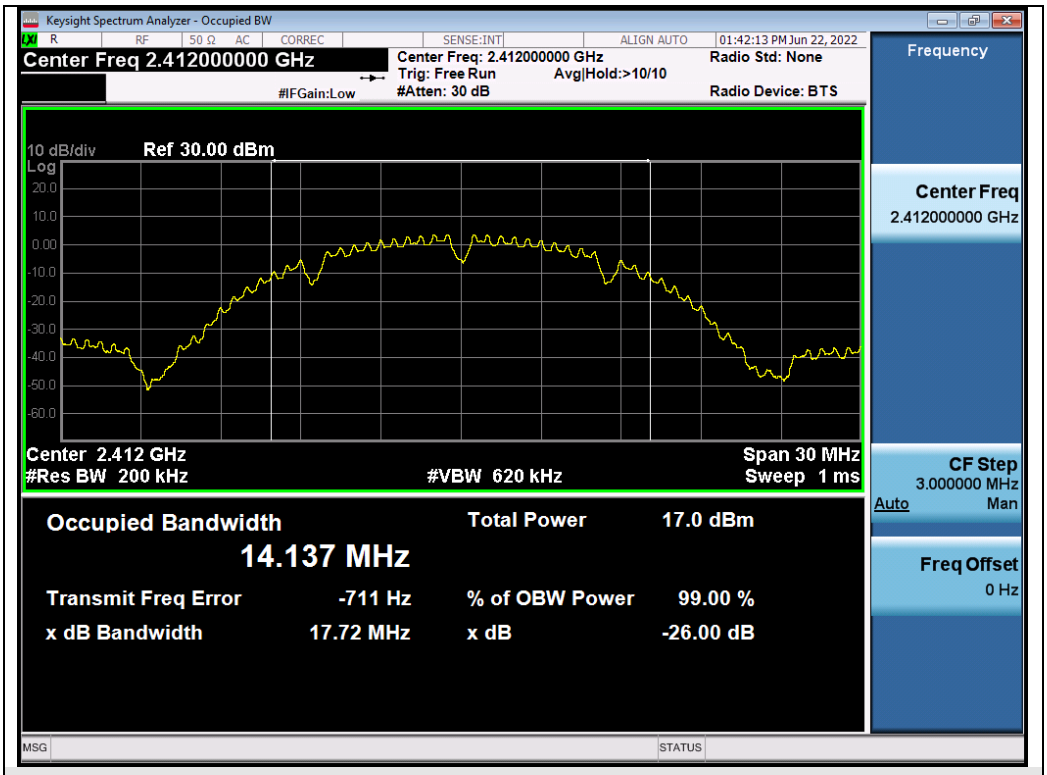
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



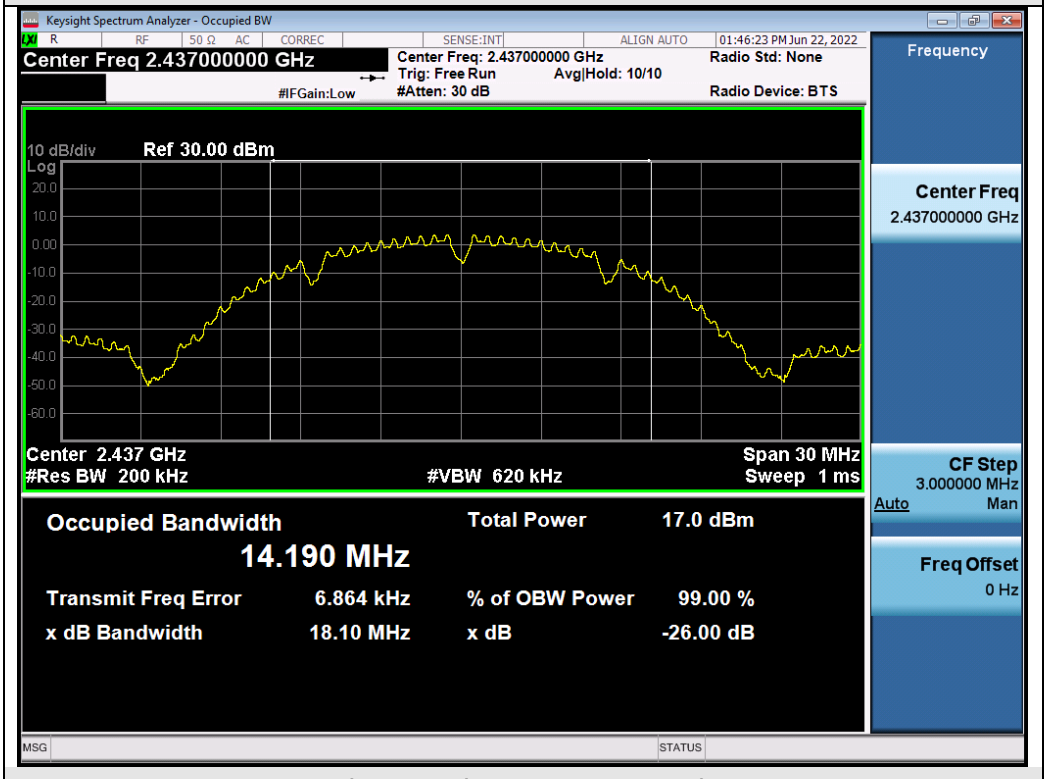
8.3. LIMITS AND MEASUREMENT RESULTS

Test Data of Occupied Bandwidth and DTS Bandwidth					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-6dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
802.11b	2412	14.137	10.01	≥0.5	Pass
	2437	14.190	10.01	≥0.5	Pass
	2462	14.125	9.545	≥0.5	Pass
802.11g	2412	16.345	15.10	≥0.5	Pass
	2437	17.483	15.11	≥0.5	Pass
	2462	16.362	15.10	≥0.5	Pass
802.11n20	2412	17.434	15.10	≥0.5	Pass
	2437	17.773	15.10	≥0.5	Pass
	2462	17.466	15.10	≥0.5	Pass

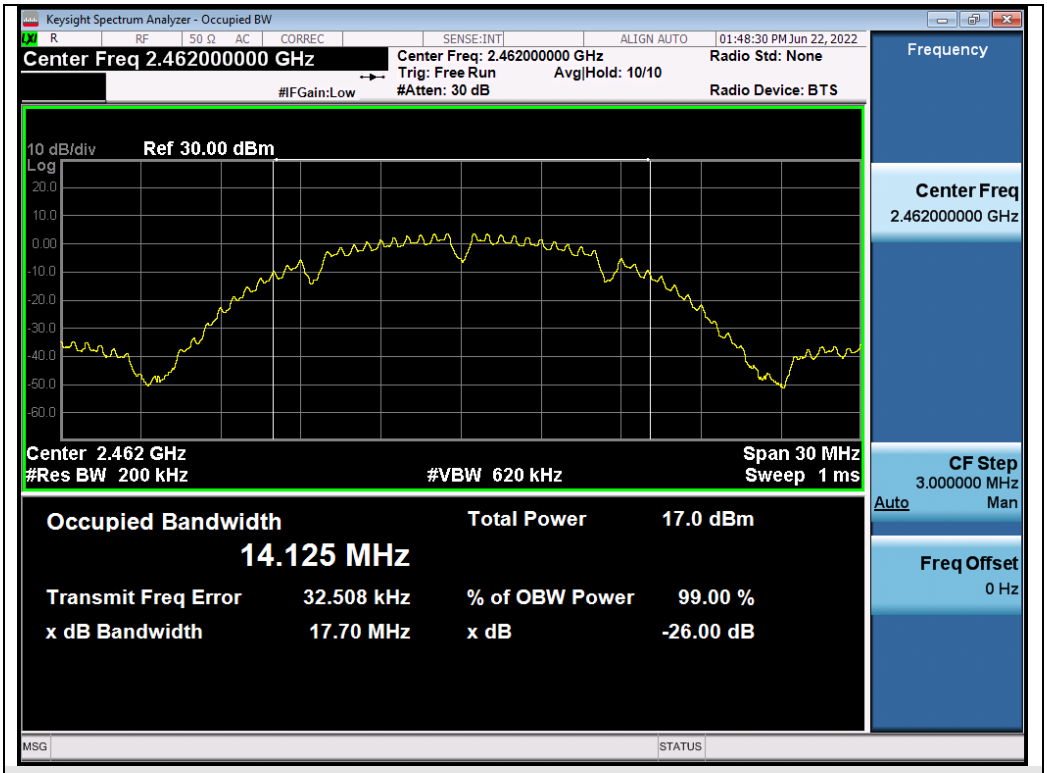
Test Graphs of Occupied Bandwidth



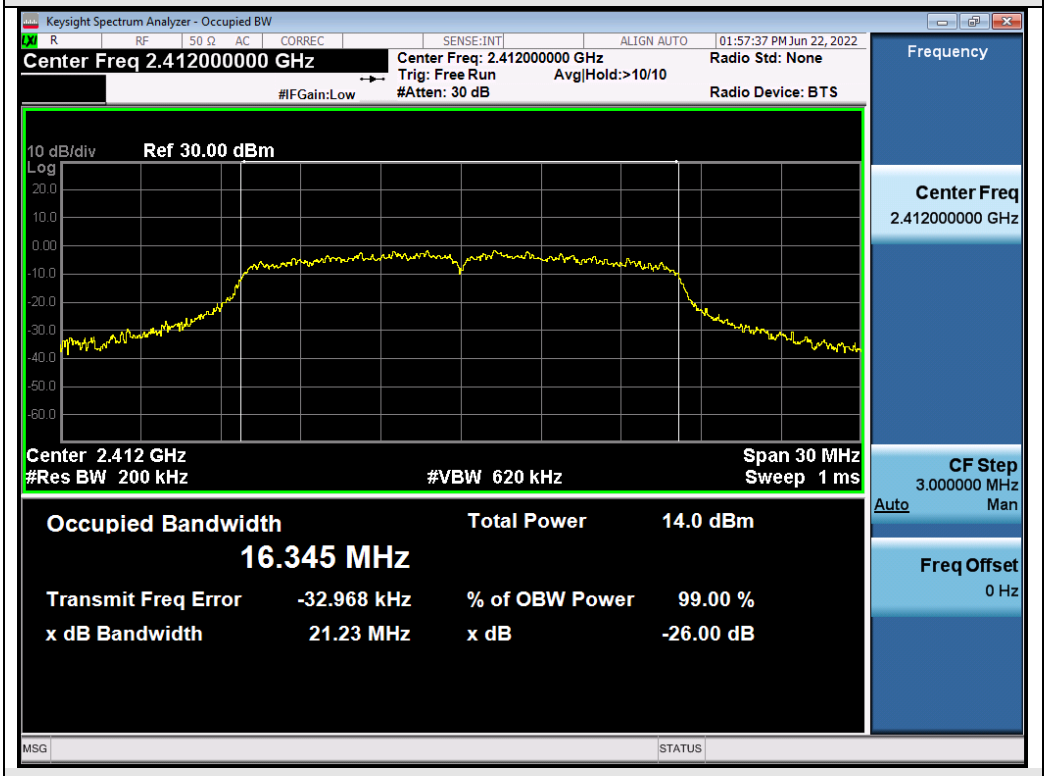
Test_Graph_802.11b_ANT1_2412_1Mbps_OBW



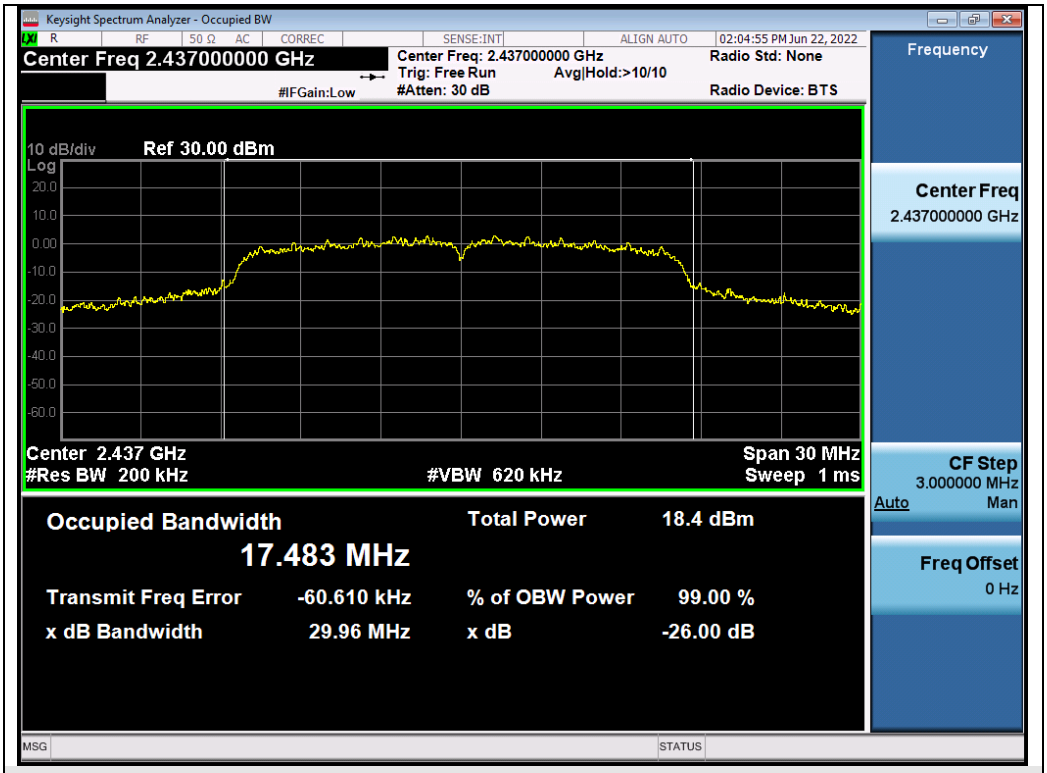
Test_Graph_802.11b_ANT1_2437_1Mbps_OBW



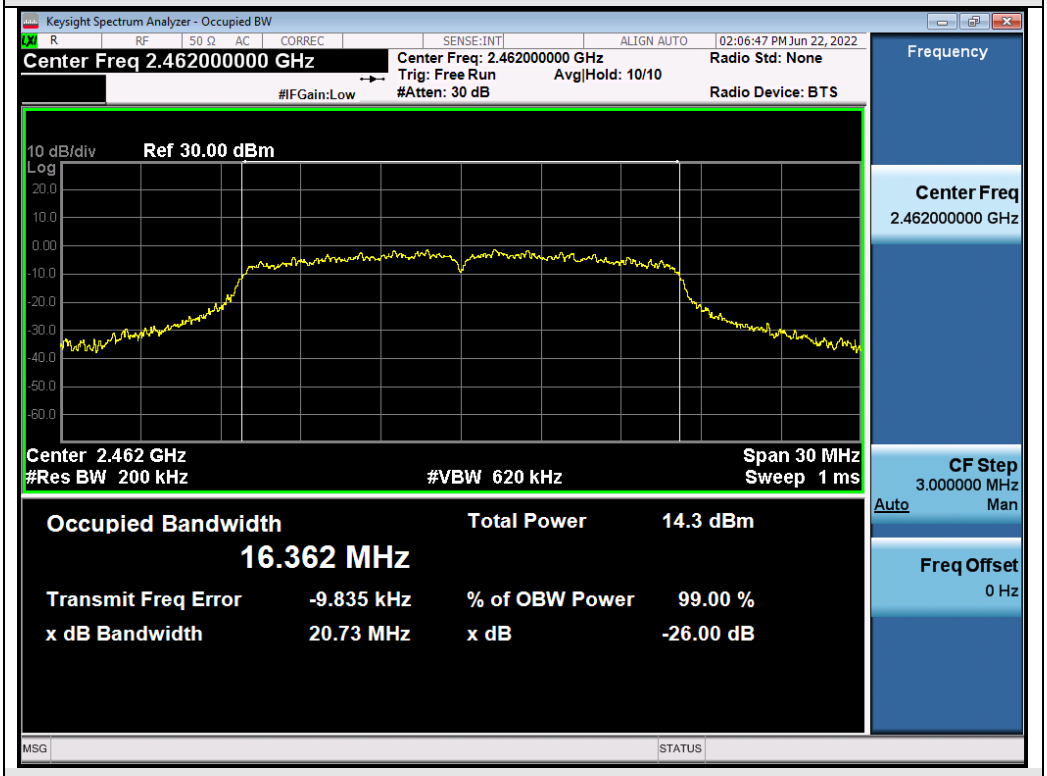
Test_Graph_802.11b_ANT1_2462_1Mbps_OBW



Test_Graph_802.11g_ANT1_2412_6Mbps_OBW

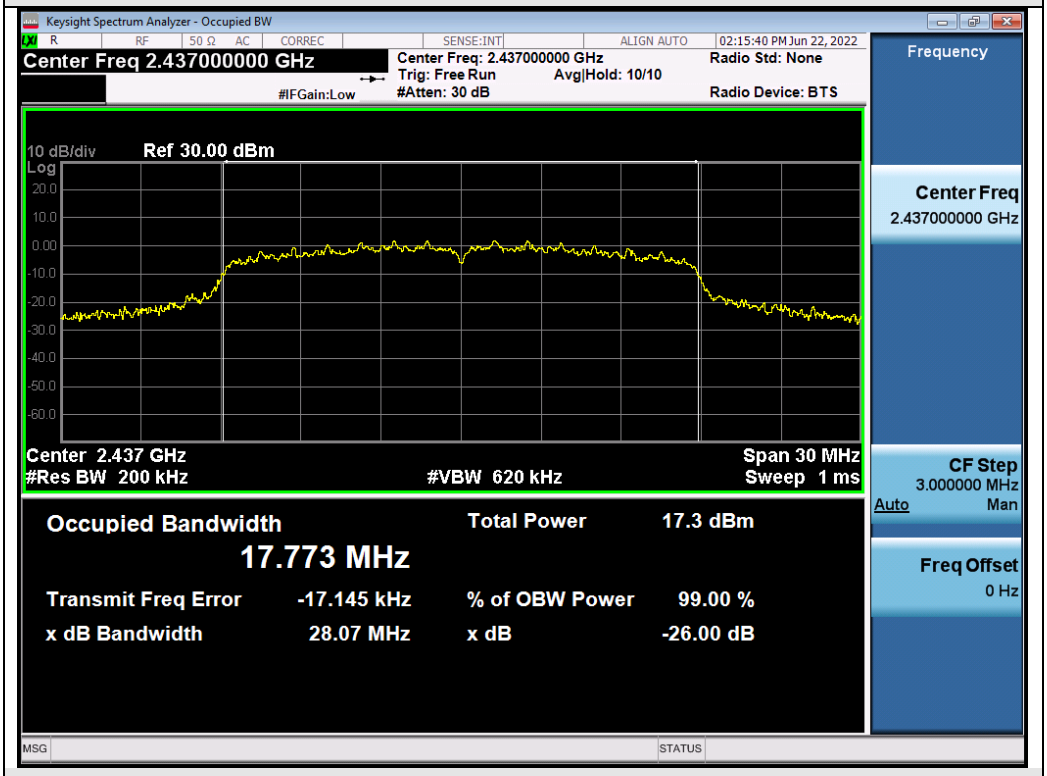


Test_Graph_802.11g_ANT1_2437_6Mbps_OBW



Test_Graph_802.11g_ANT1_2462_6Mbps_OBW

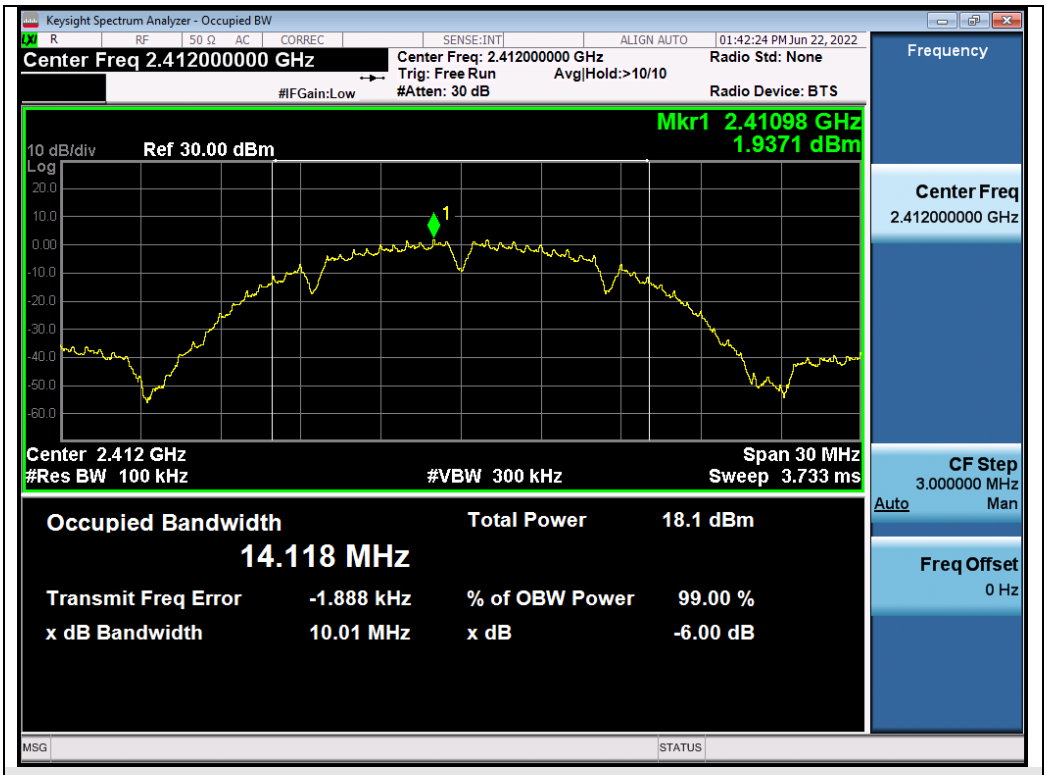
Test_Graph_802.11n20_ANT1_2412_MCS0_OBW



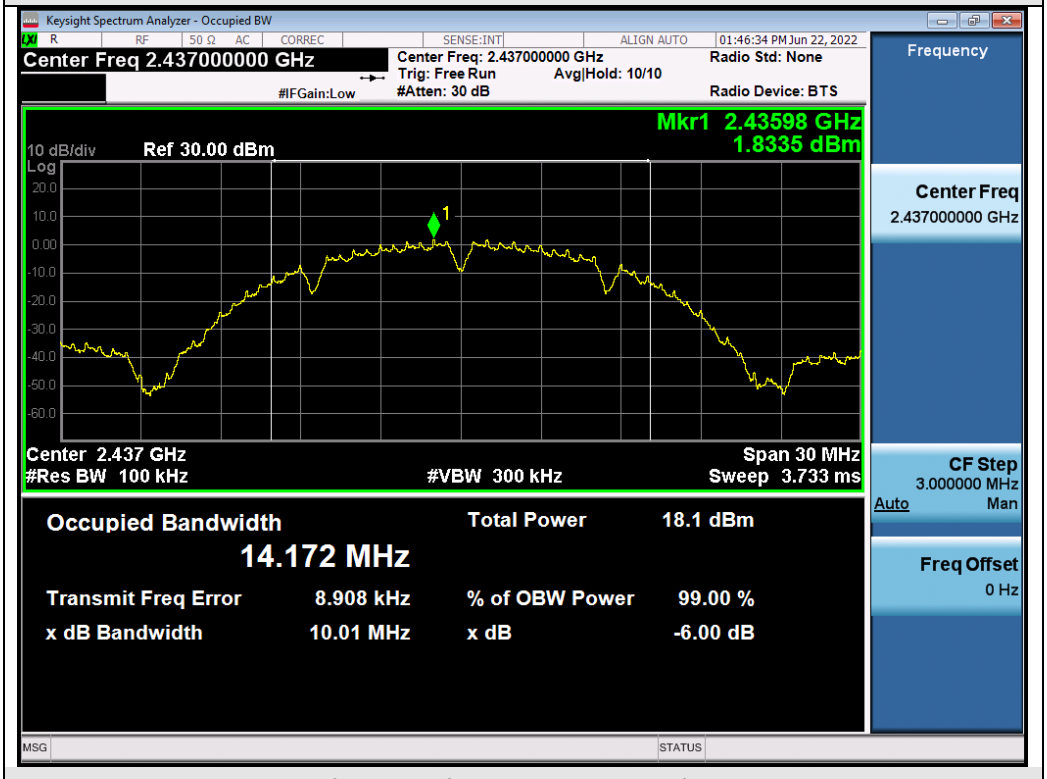
Test_Graph_802.11n20_ANT1_2437_MCS0_OBW

Test_Graph_802.11n20_ANT1_2462_MCS0_OBW

Test Graphs of DTS Bandwidth

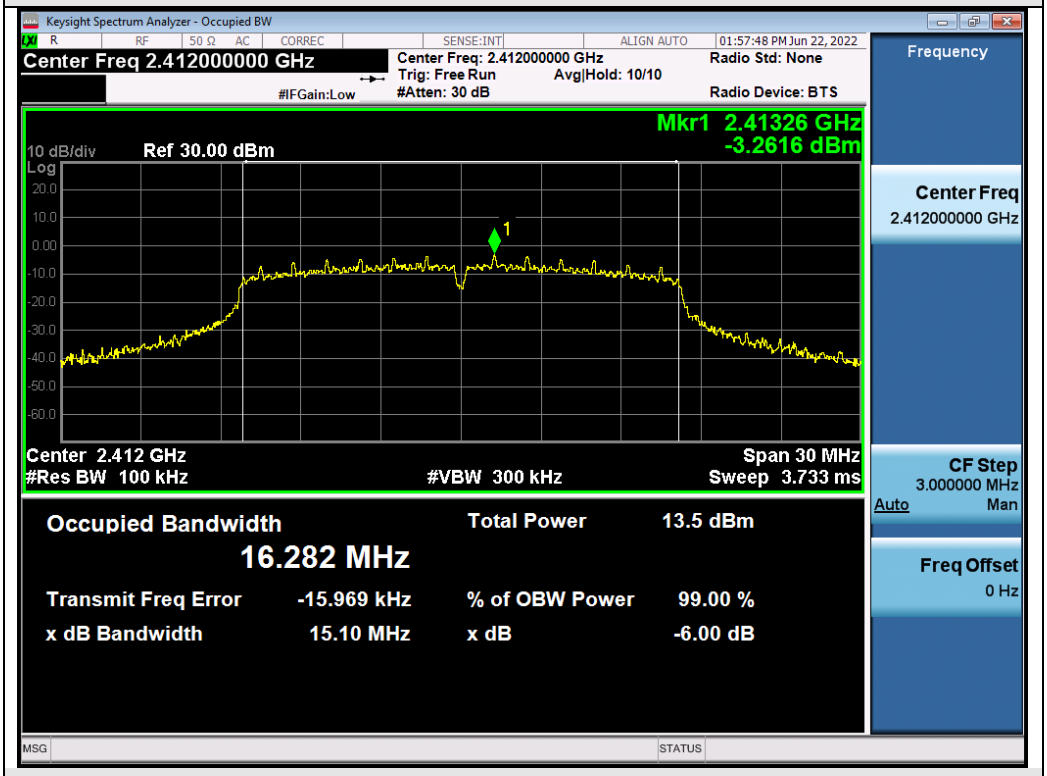


Test_Graph_802.11b_ANT1_2412_1Mbps_DTSBW



Test_Graph_802.11b_ANT1_2437_1Mbps_DTSBW

Test_Graph_802.11b_ANT1_2462_1Mbps_DTSBW



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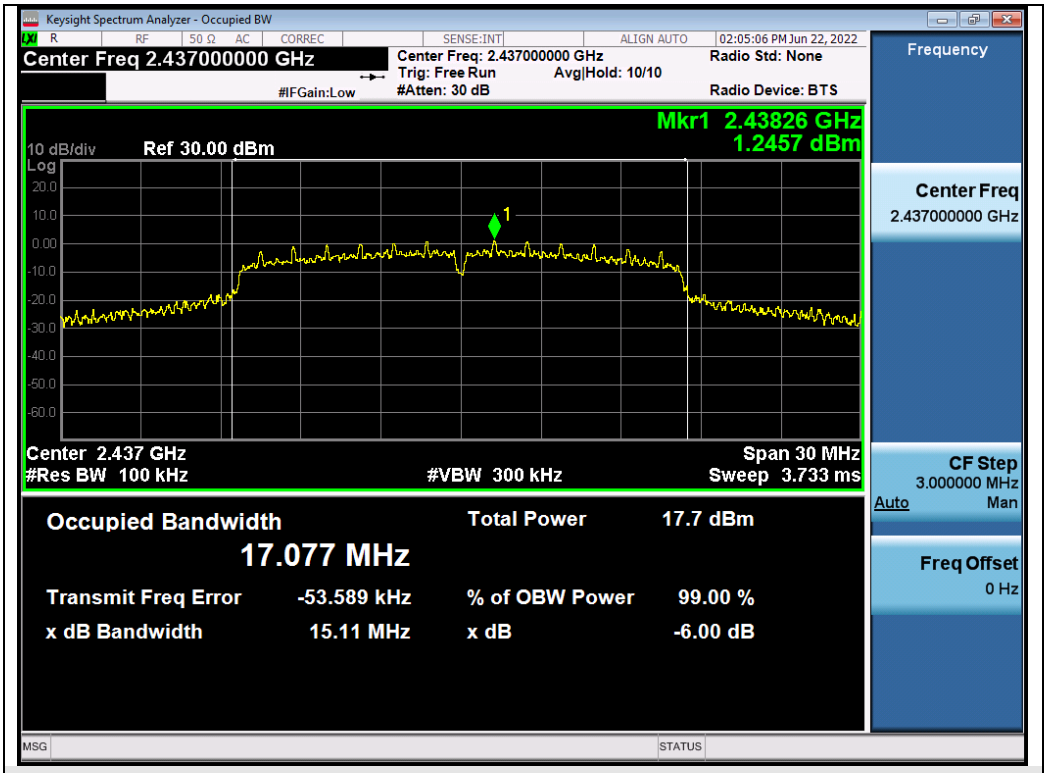
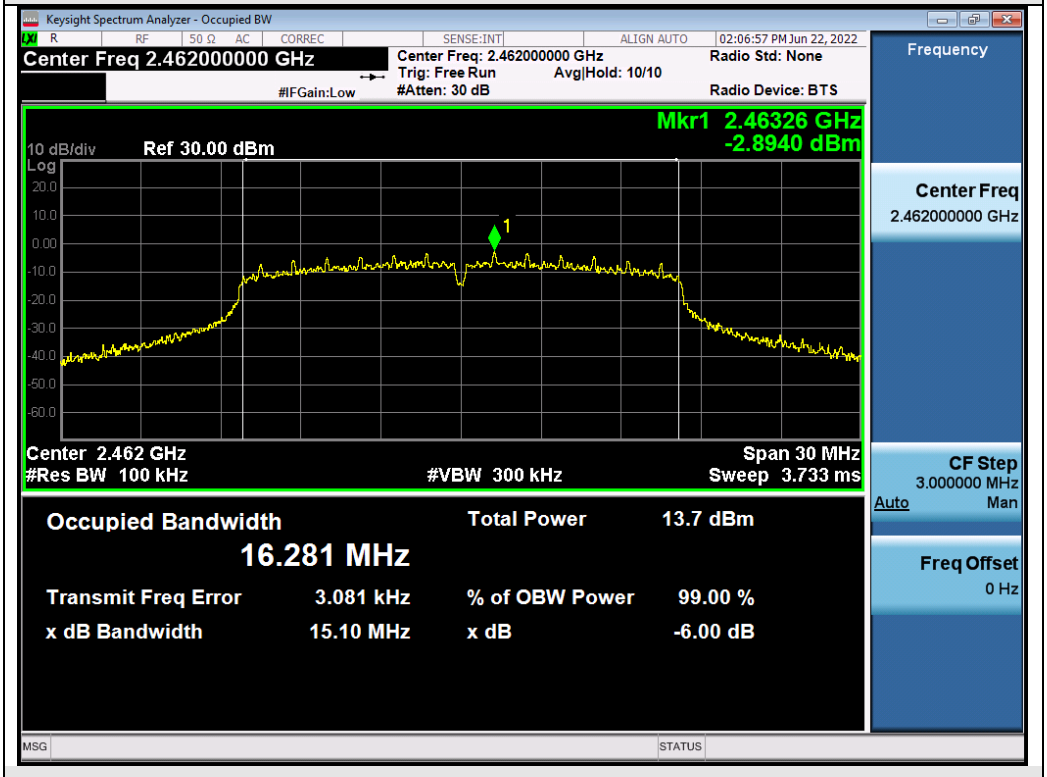
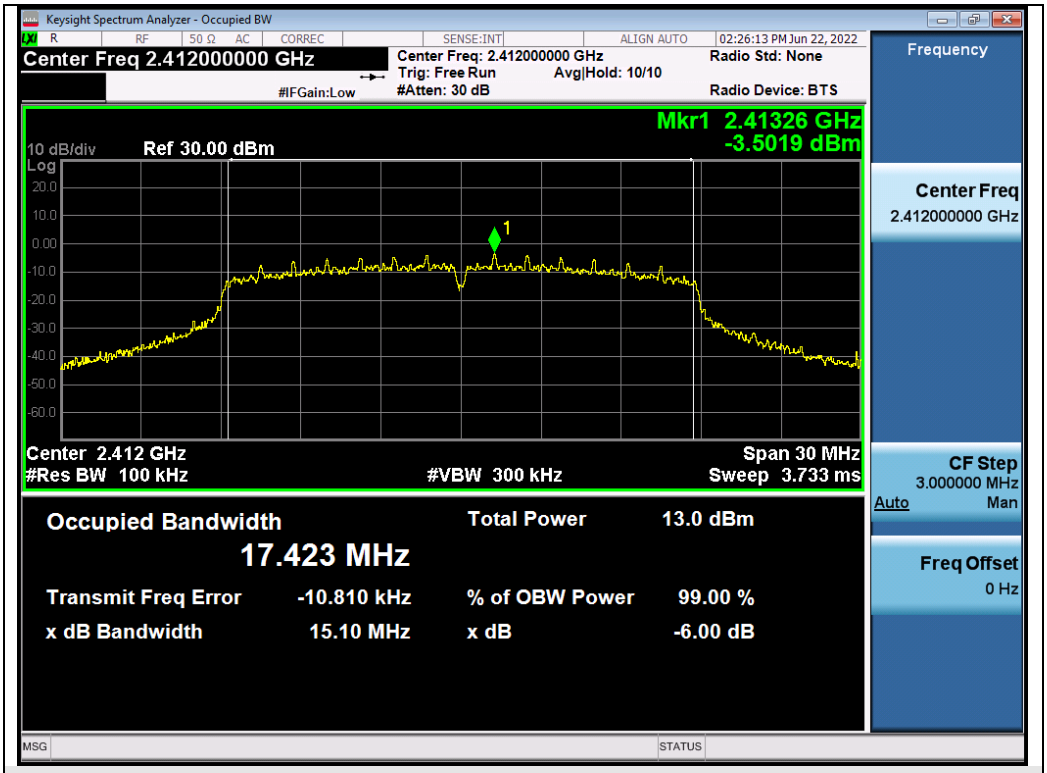


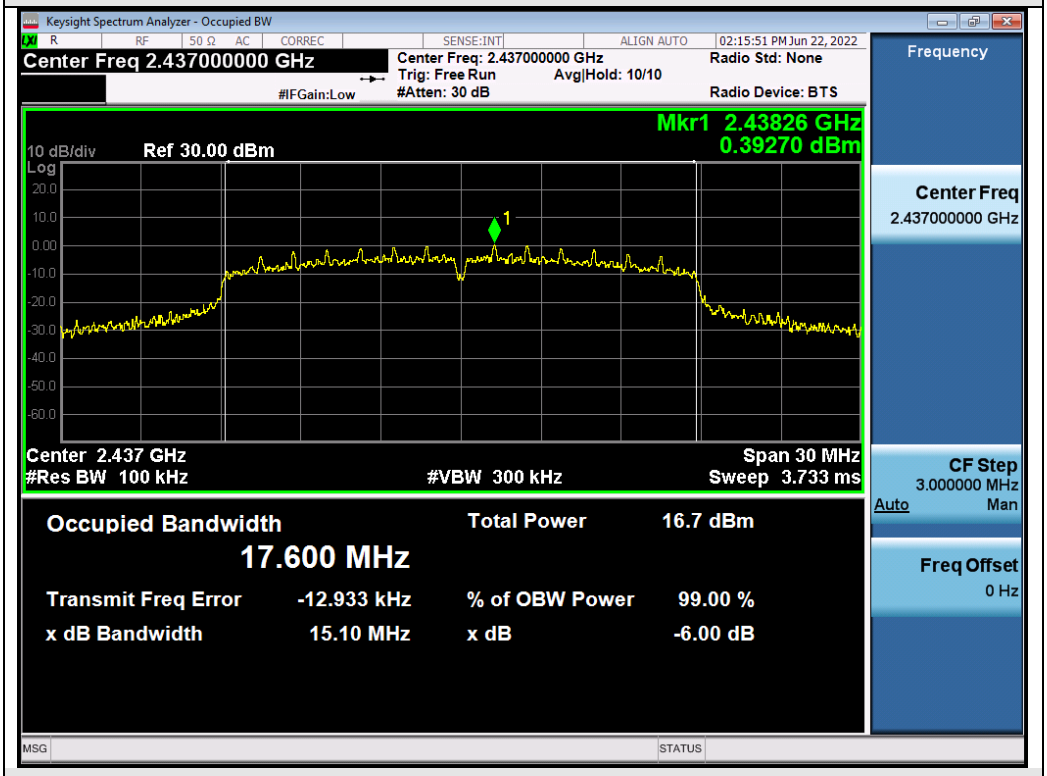
Test_Graph_802.11g_ANT1_2437_6Mbps_DTSBW



Test_Graph_802.11g_ANT1_2462_6Mbps_DTSBW



Test_Graph_802.11n20_ANT1_2412_MCS0_DTSBW



Test_Graph_802.11n20_ANT1_2437_MCS0_DTSBW

Test_Graph_802.11n20_ANT1_2462_MCS0_DTSBW

9. CONDUCTED SPURIOUS EMISSION

9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 (2013) for compliance to FCC 47CFR 15.247 requirements. Owing to satisfy the requirements of the number of measurement points, we set the RBW=1MHz, VBW＞RBW, scan up through 10th harmonic, and consider the tested results as the worst case, if the tested results conform to the requirement, we can deem that the real tested results(set the RBW=100KHz, VBW＞RBW) are conform to the requirement.

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2.

9.3. MEASUREMENT EQUIPMENT USEDJN

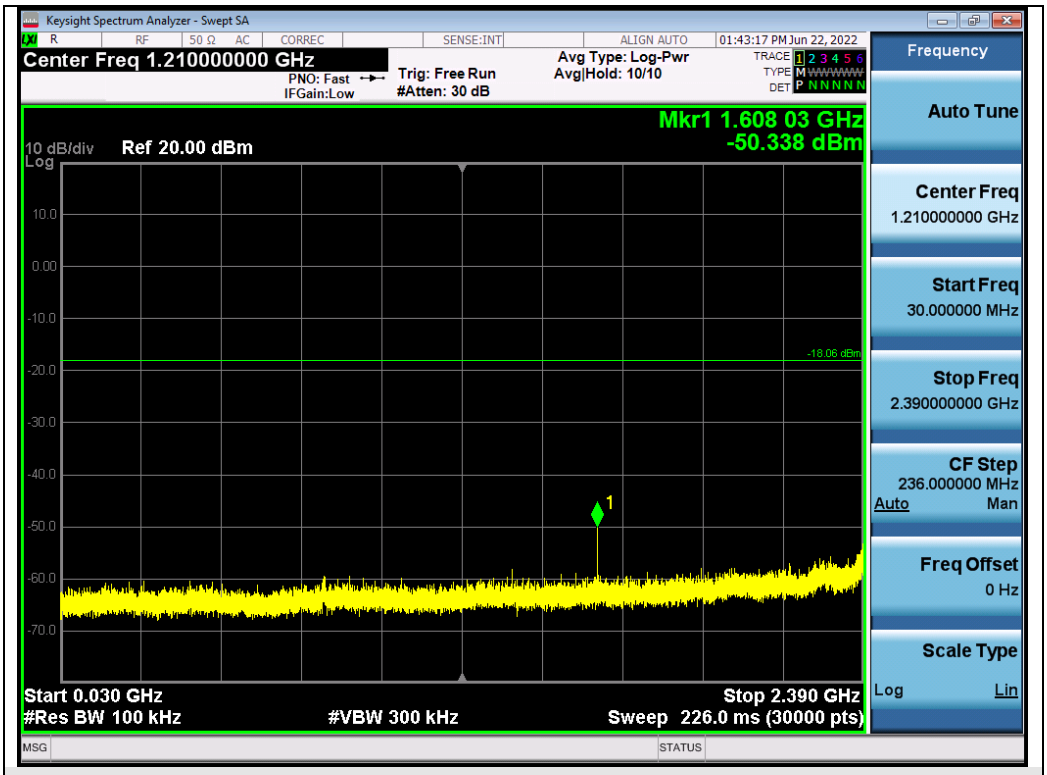
The same as described in section 6.

9.4. LIMITS AND MEASUREMENT RESULT

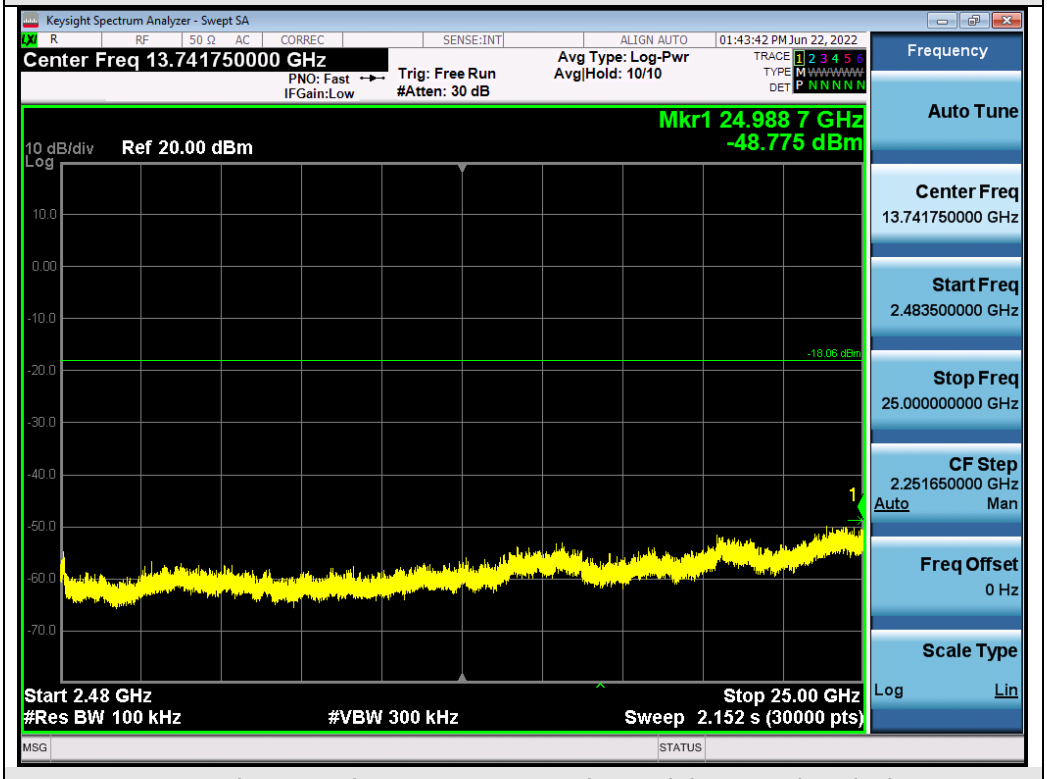
LIMITS AND MEASUREMENT RESULT		
Applicable Limits	**Measurement Result**	
	Test Data	**Criteria**
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS
	At least -20dBc than the limit Specified on the TOP Channel	PASS

Note: The limits reference level is according to the test plot of -6dB bandwidth.

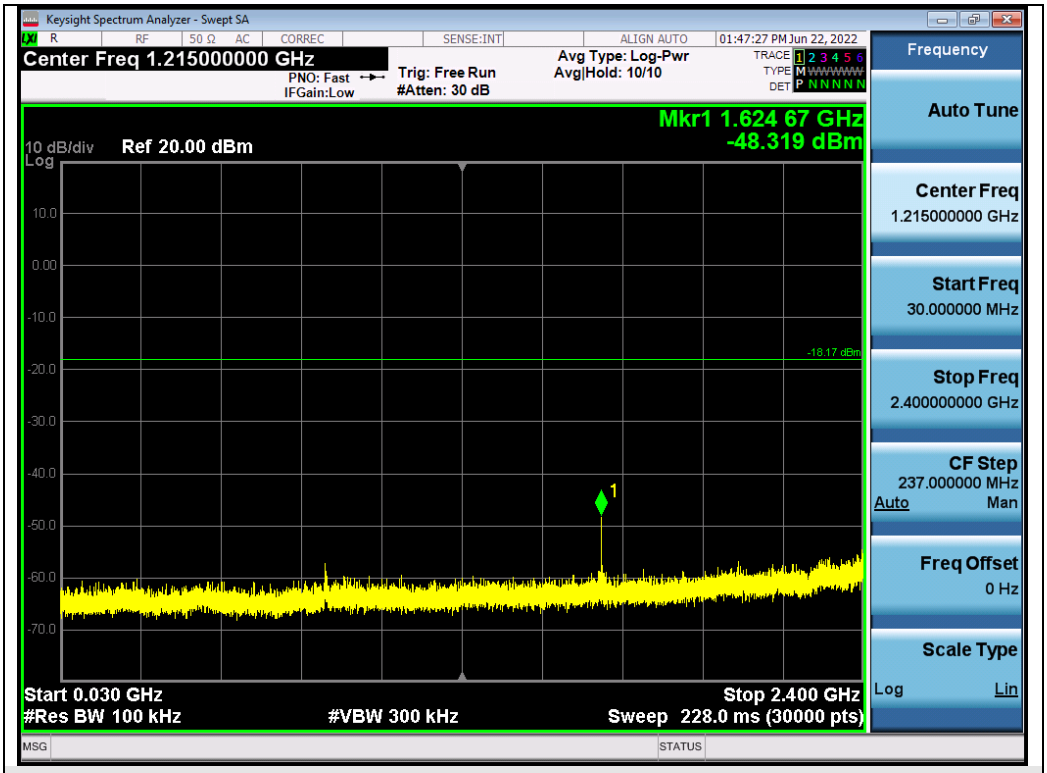
Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands



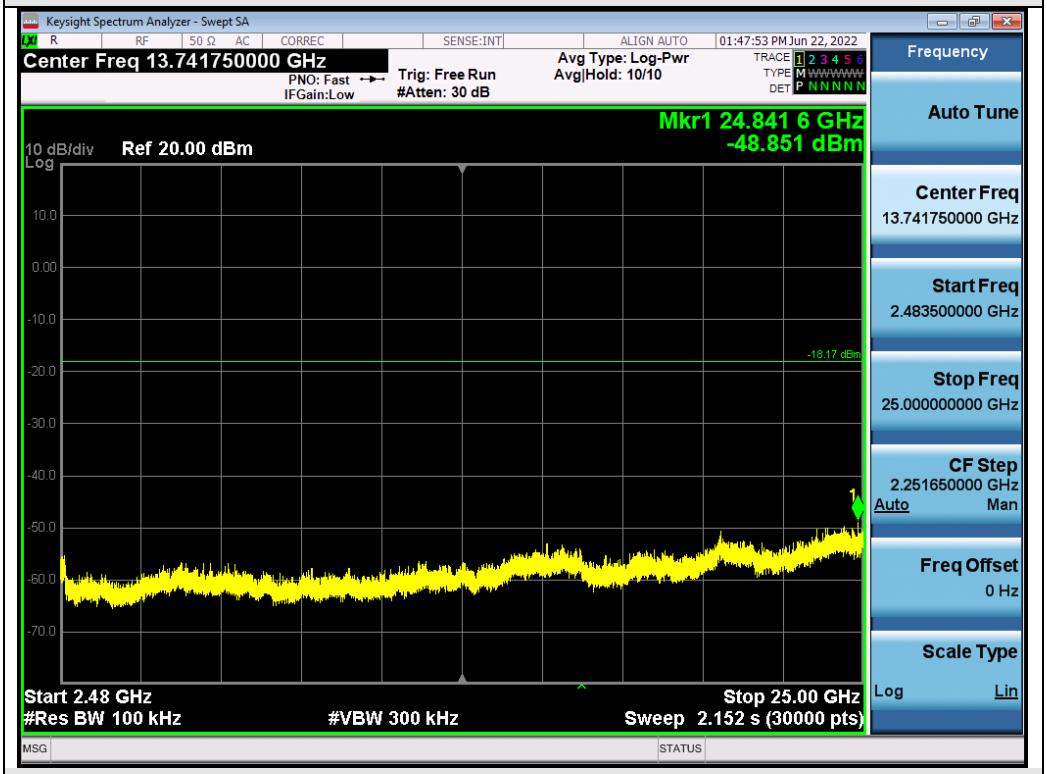
Test_Graph_802.11b_ANT1_2412_1Mbps_Lower Band Emissions



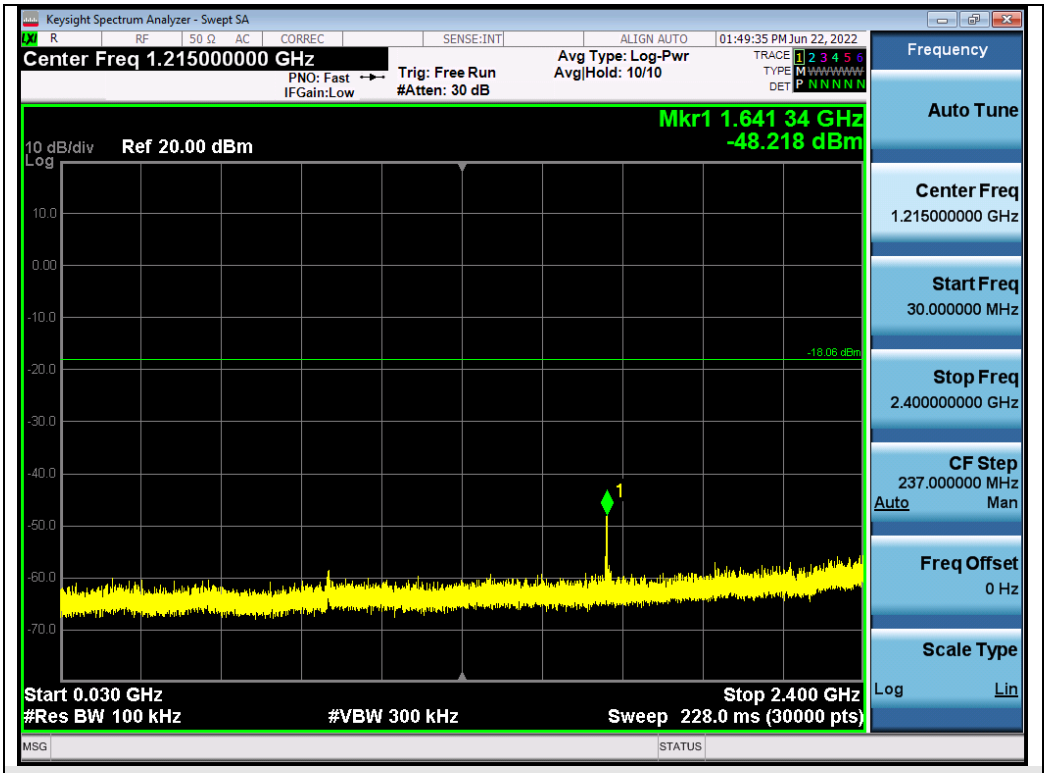
Test_Graph_802.11b_ANT1_2412_1Mbps_Higher Band Emissions



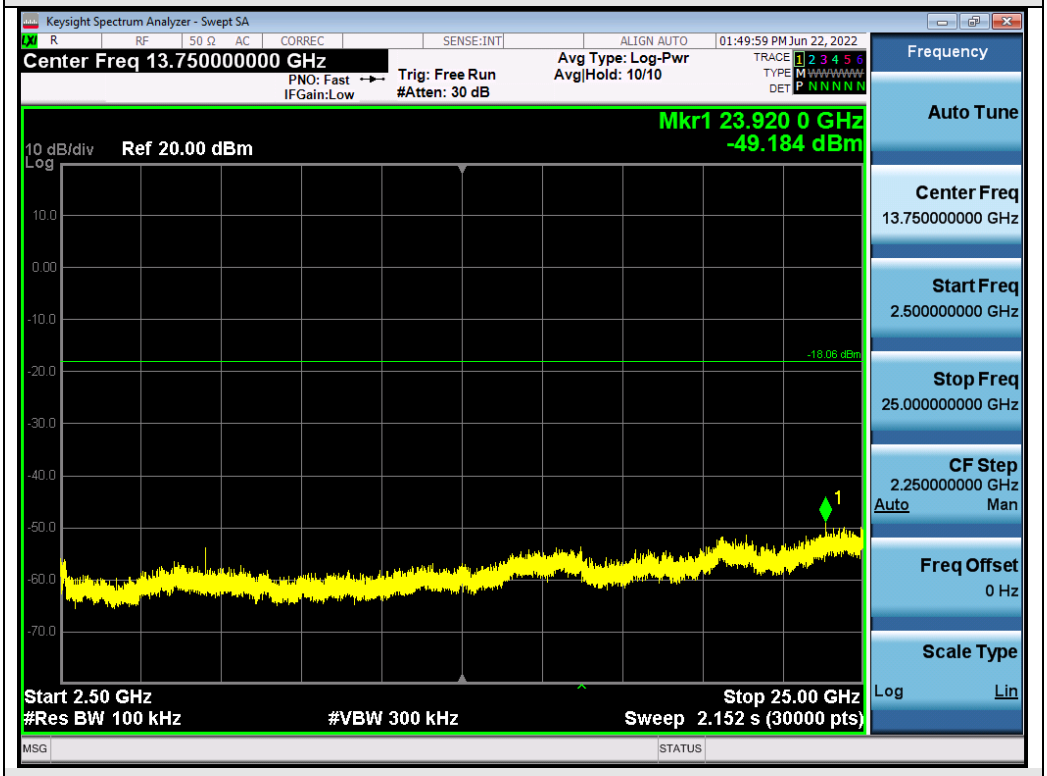
Test_Graph_802.11b_ANT1_2437_1Mbps_Lower Band Emissions



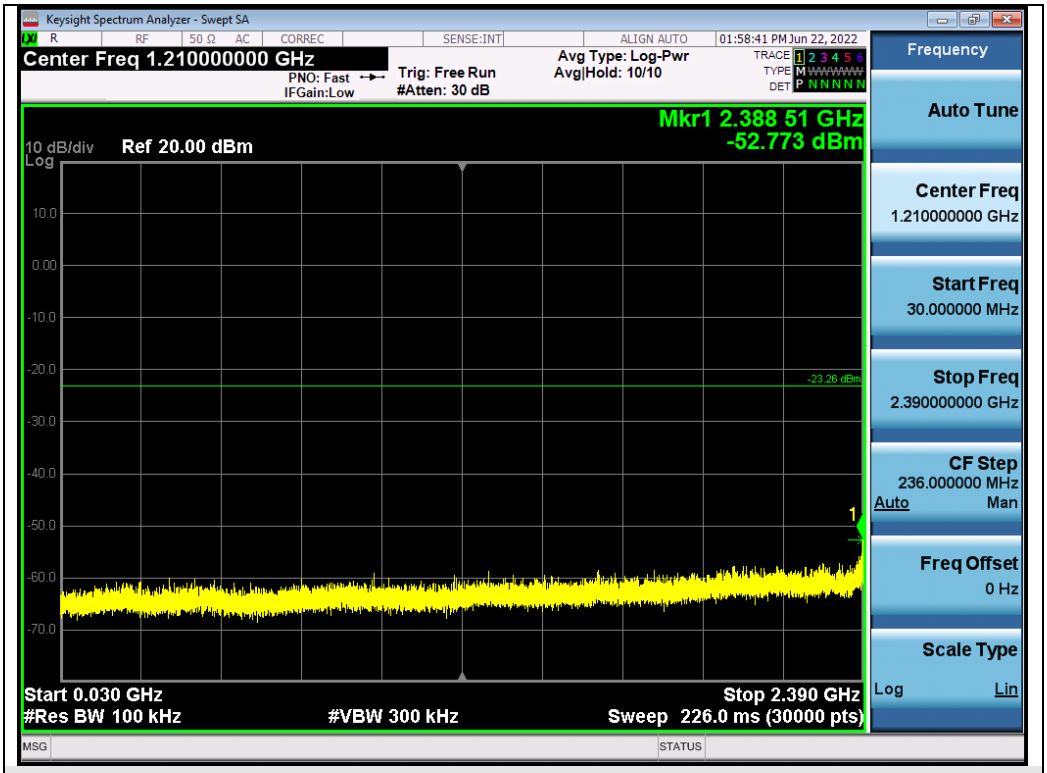
Test_Graph_802.11b_ANT1_2437_1Mbps_Higher Band Emissions



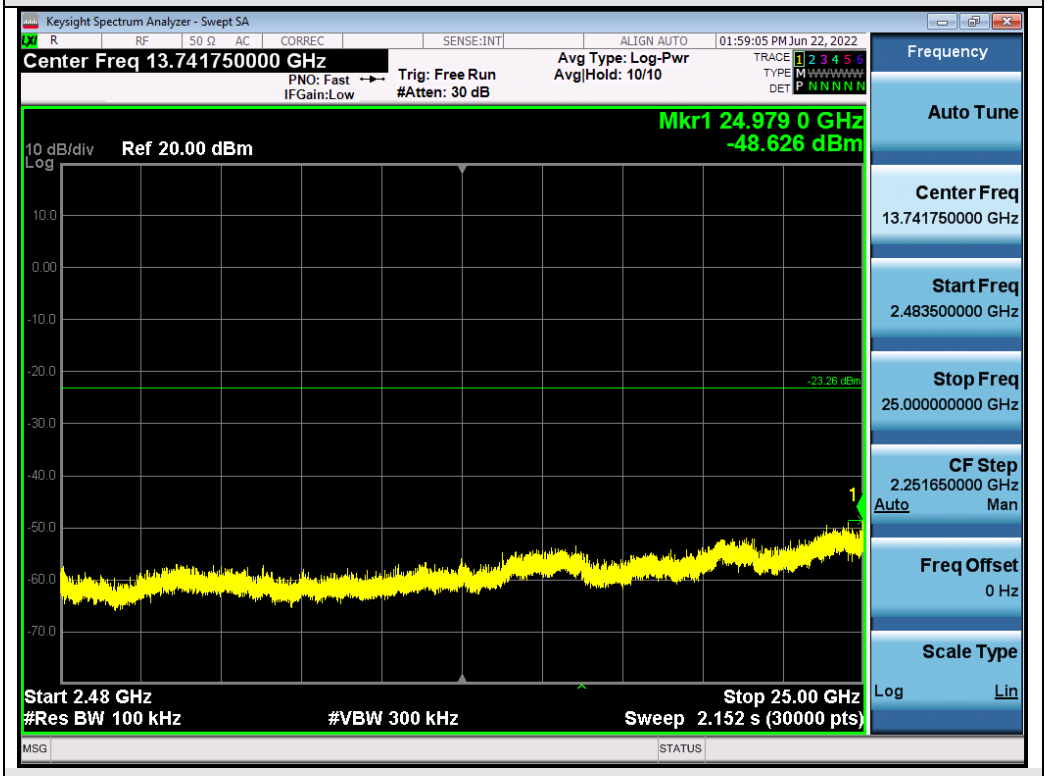
Test_Graph_802.11b_ANT1_2462_1Mbps_Lower Band Emissions



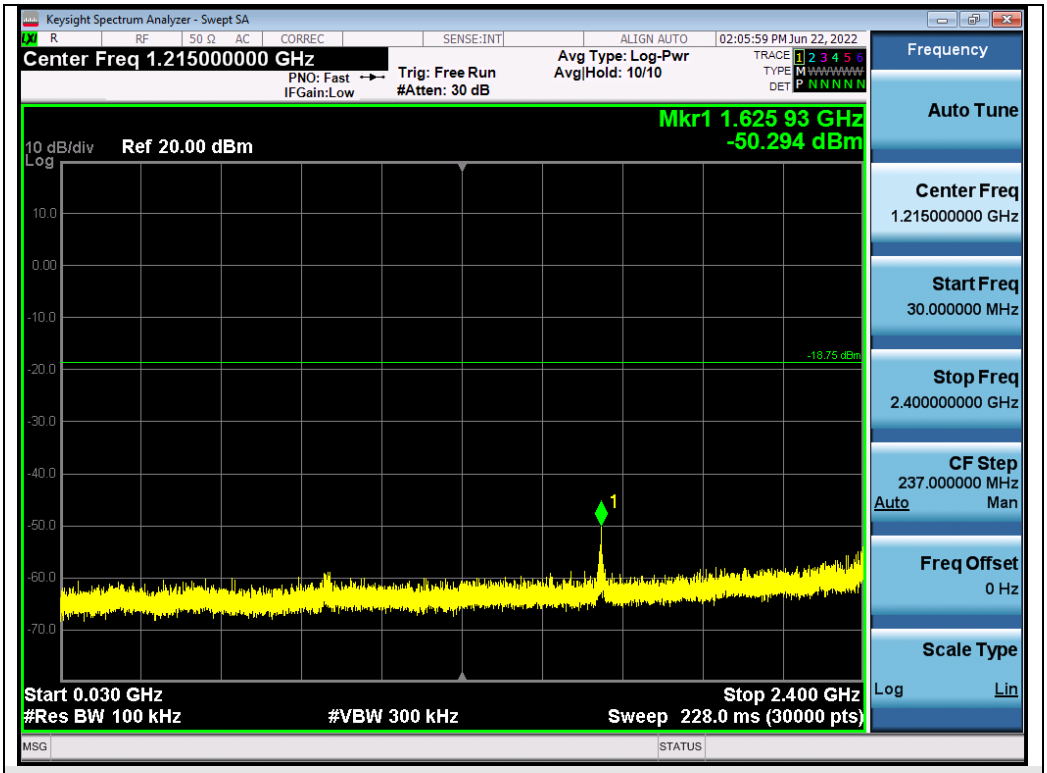
Test_Graph_802.11b_ANT1_2462_1Mbps_Higher Band Emissions



Test_Graph_802.11g_ANT1_2412_6Mbps_Lower Band Emissions

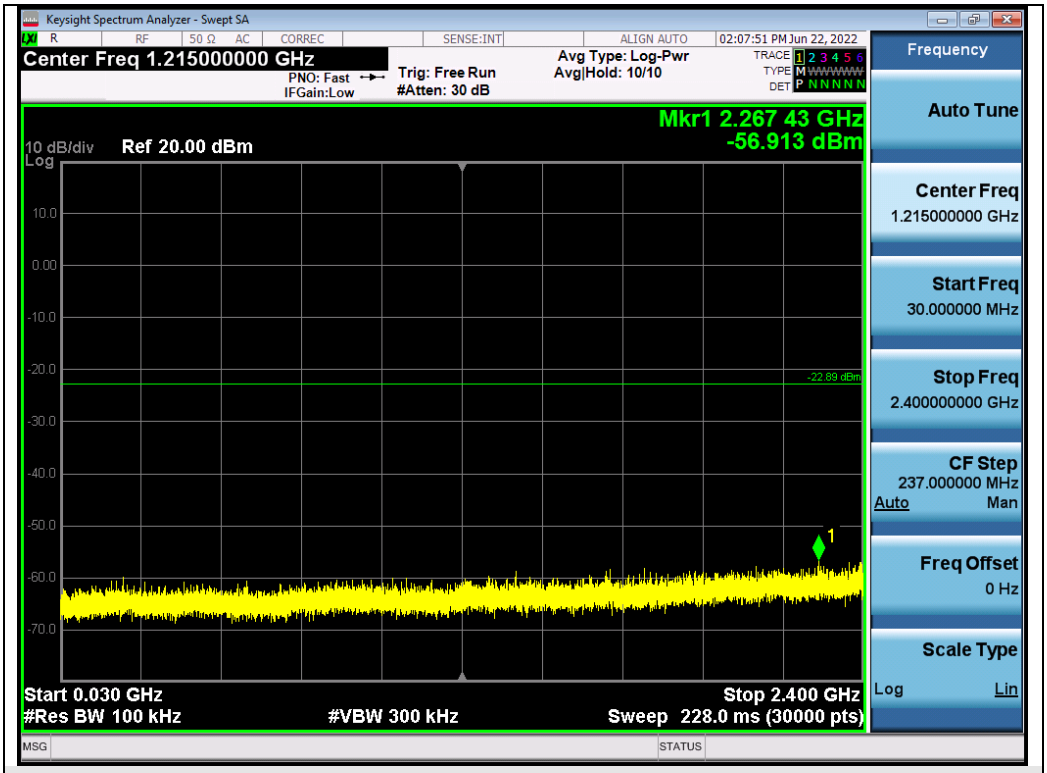


Test_Graph_802.11g_ANT1_2412_6Mbps_Higher Band Emissions

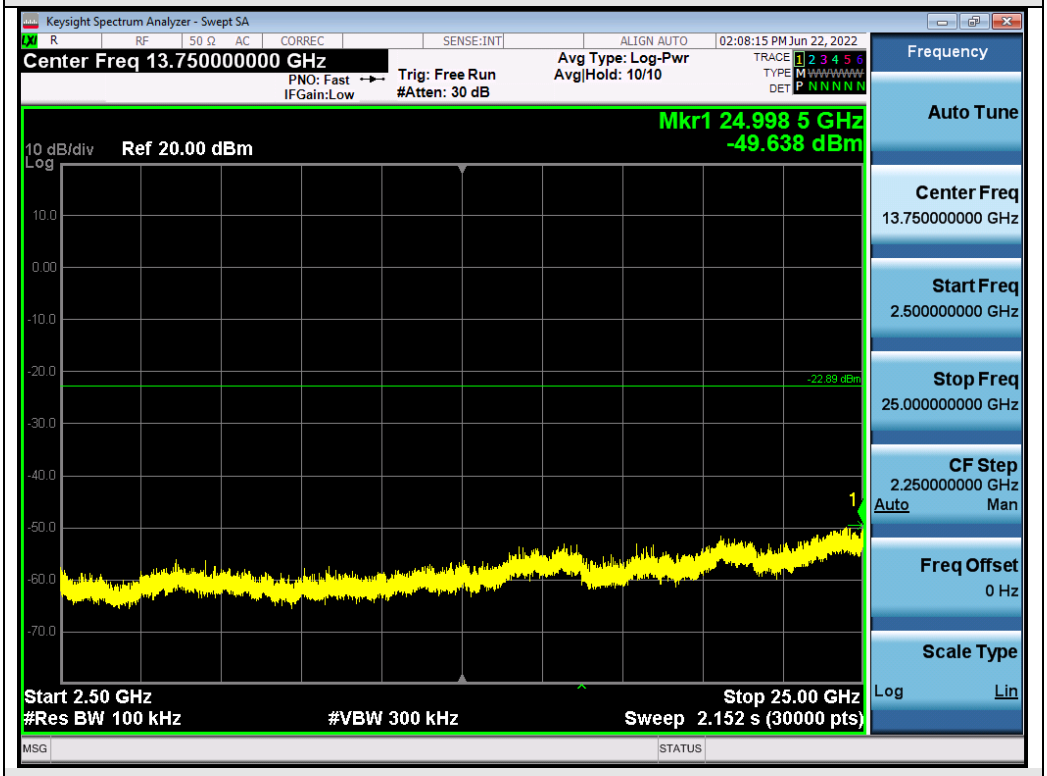


Test_Graph_802.11g_ANT1_2437_6Mbps_Lower Band Emissions

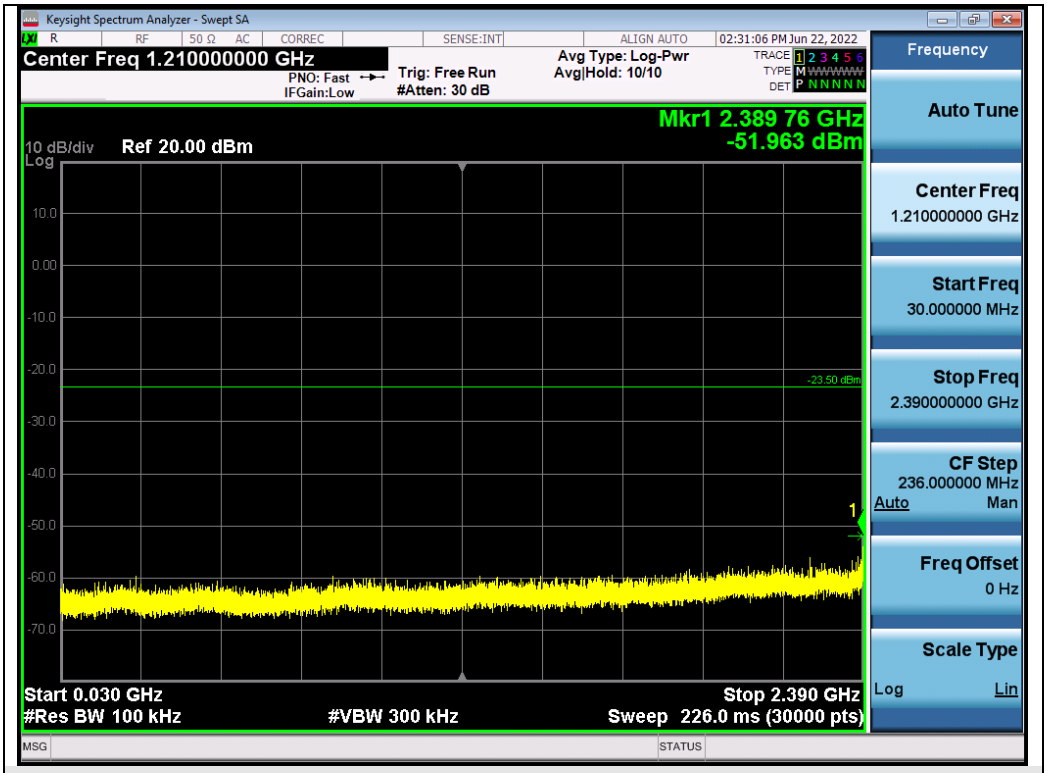
Test_Graph_802.11g_ANT1_2437_6Mbps_Higher Band Emissions



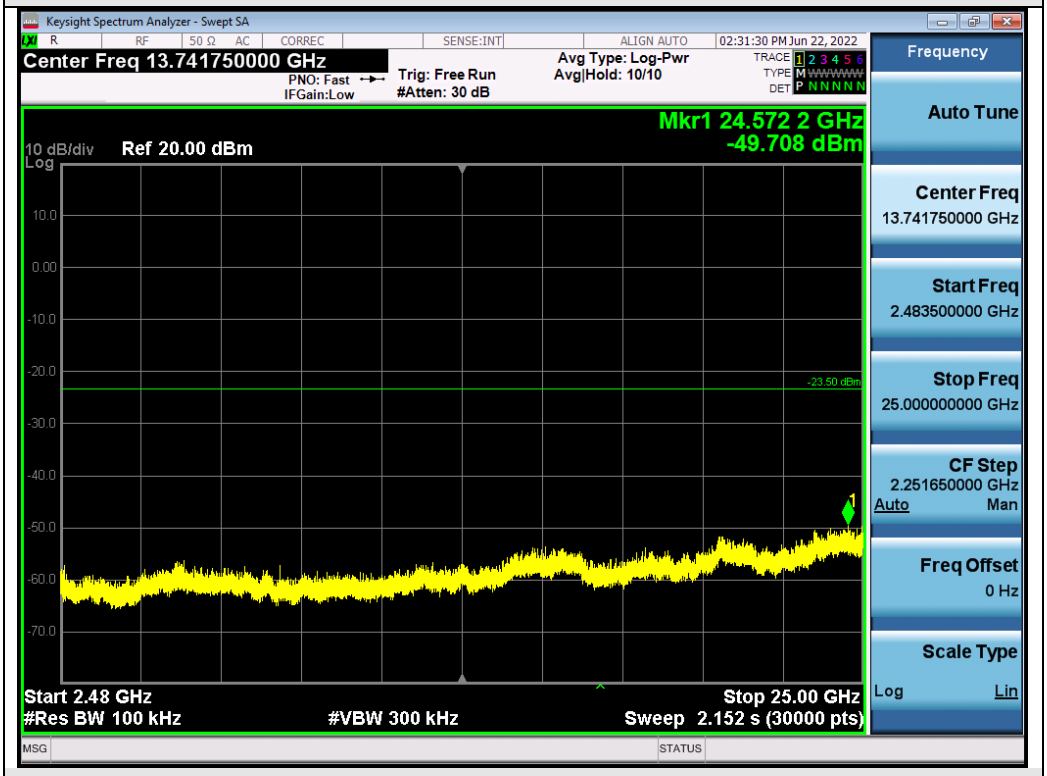
Test_Graph_802.11g_ANT1_2462_6Mbps_Lower Band Emissions



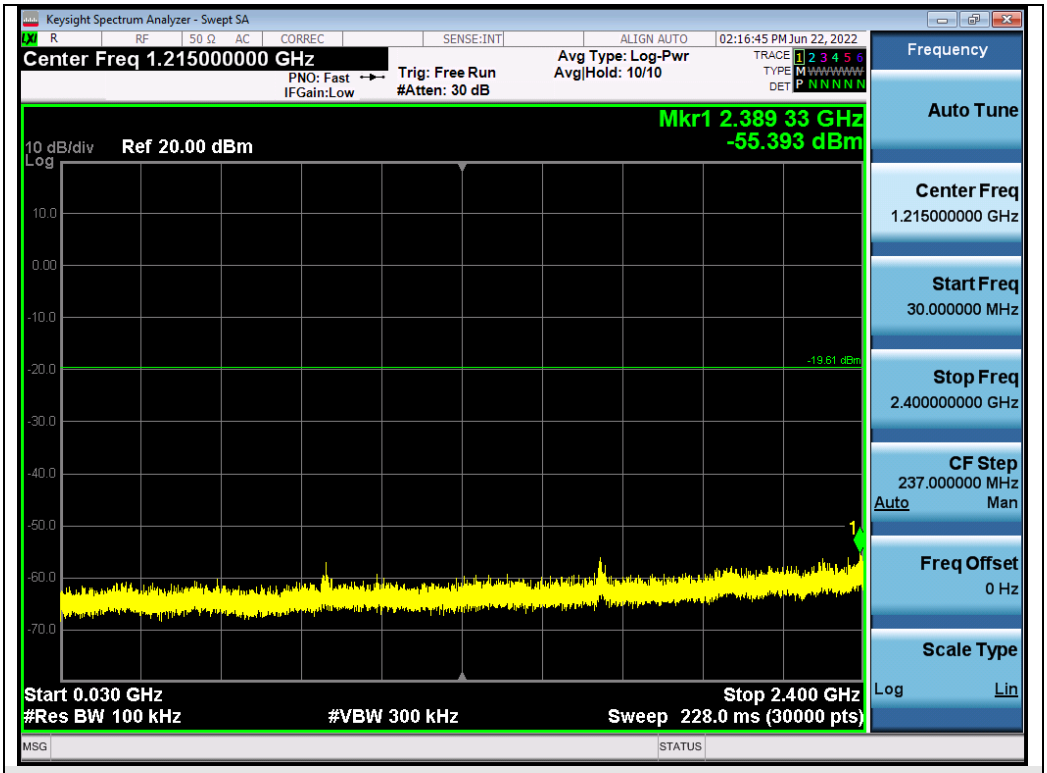
Test_Graph_802.11g_ANT1_2462_6Mbps_Higher Band Emissions



Test_Graph_802.11n20_ANT1_2412_MCS0_Lower Band Emissions

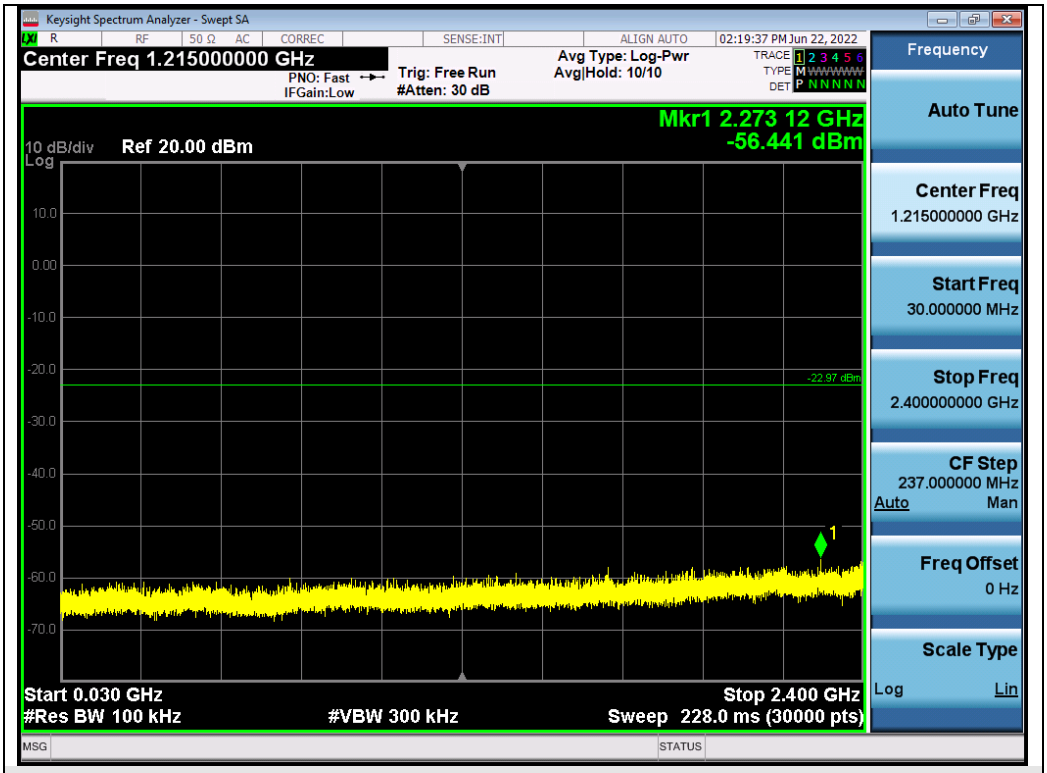


Test_Graph_802.11n20_ANT1_2412_MCS0_Higher Band Emissions

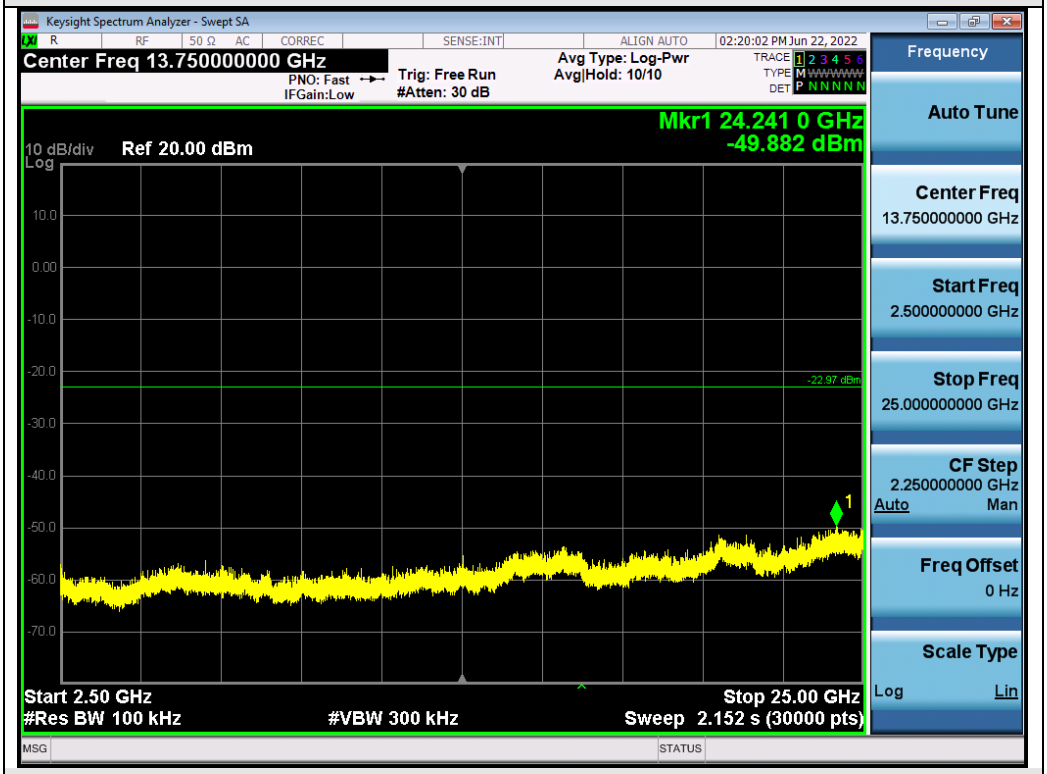


Test_Graph_802.11n20_ANT1_2437_MCS0_Lower Band Emissions

Test_Graph_802.11n20_ANT1_2437_MCS0_Higher Band Emissions



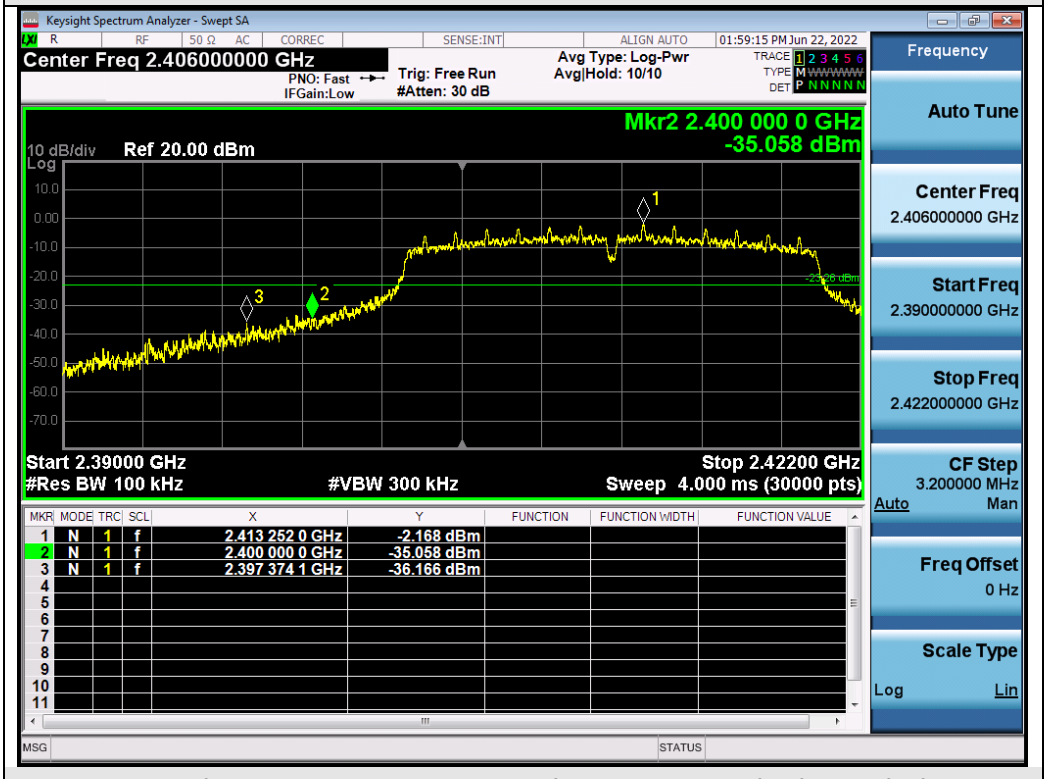
Test_Graph_802.11n20_ANT1_2462_MCS0_Lower Band Emissions



Test_Graph_802.11n20_ANT1_2462_MCS0_Higher Band Emissions

Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands

Test_Graph_802.11b_ANT1_2412_1Mbps_Lower Band Edge Emissions



Test_Graph_802.11g_ANT1_2412_6Mbps_Lower Band Edge Emissions

Test_Graph_802.11n20_ANT1_2412_MCS0_Lower Band Edge Emissions

Note: Emissions from 2483.5-2500MHz which fall in the restricted bands had been considered with the radiated emission limits specified.

10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

10.1 MEASUREMENT PROCEDURE

(1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator

(2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.

(3). Set SPA Trace 1 Max hold, then View.

Note: The method of PKPSD in the ANSI C63.10 (2013) item 11.10 was used in this testing.

10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer to Section 8.2.

10.3 MEASUREMENT EQUIPMENT USED

Refer to Section 6.

10.4 LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power Spectral Density					
Test Mode	Test Channel (MHz)	Power density (dBm/20kHz)	Power density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail
802.11b	2412	-3.492	-11.731	≤8	Pass
	2437	-3.504	-11.743	≤8	Pass
	2462	-3.453	-11.692	≤8	Pass
802.11g	2412	-8.295	-16.534	≤8	Pass
	2437	-4.603	-12.842	≤8	Pass
	2462	-9.347	-17.586	≤8	Pass
802.11n20	2412	-9.057	-17.296	≤8	Pass
	2437	-5.415	-13.654	≤8	Pass
	2462	-9.176	-17.415	≤8	Pass

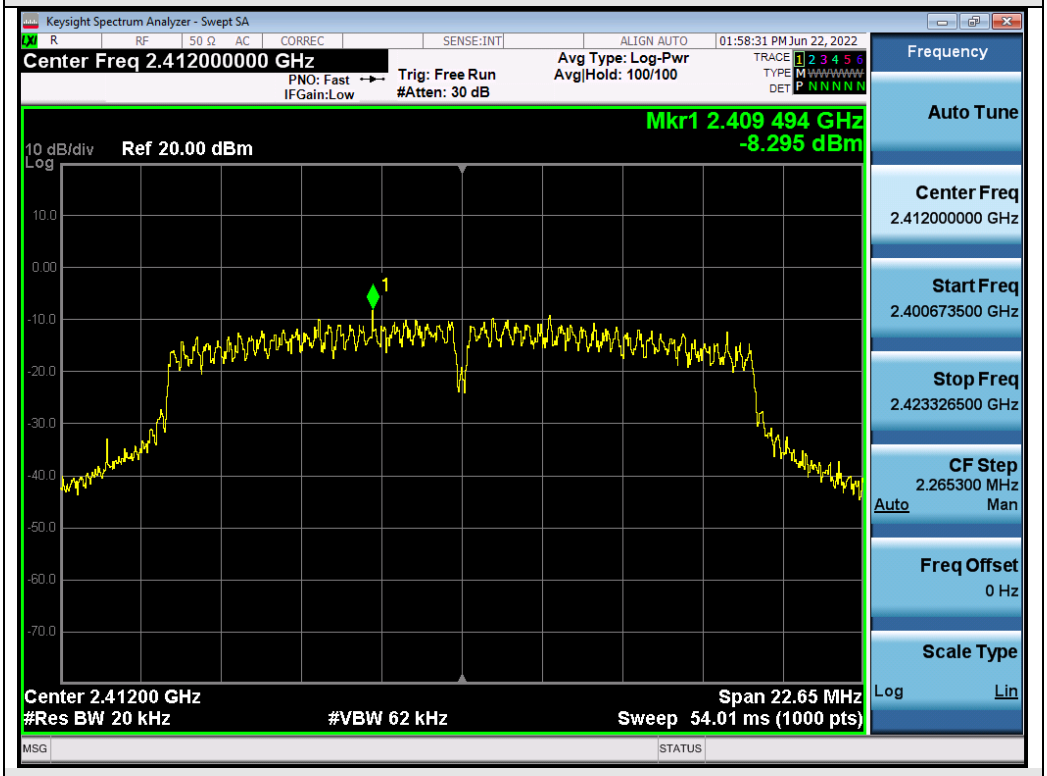
Note: Power density(dBm/3kHz) = Power density(dBm/20kHz) – 10*log(20/3).

Test Graphs of Conducted Output Power Spectral Density

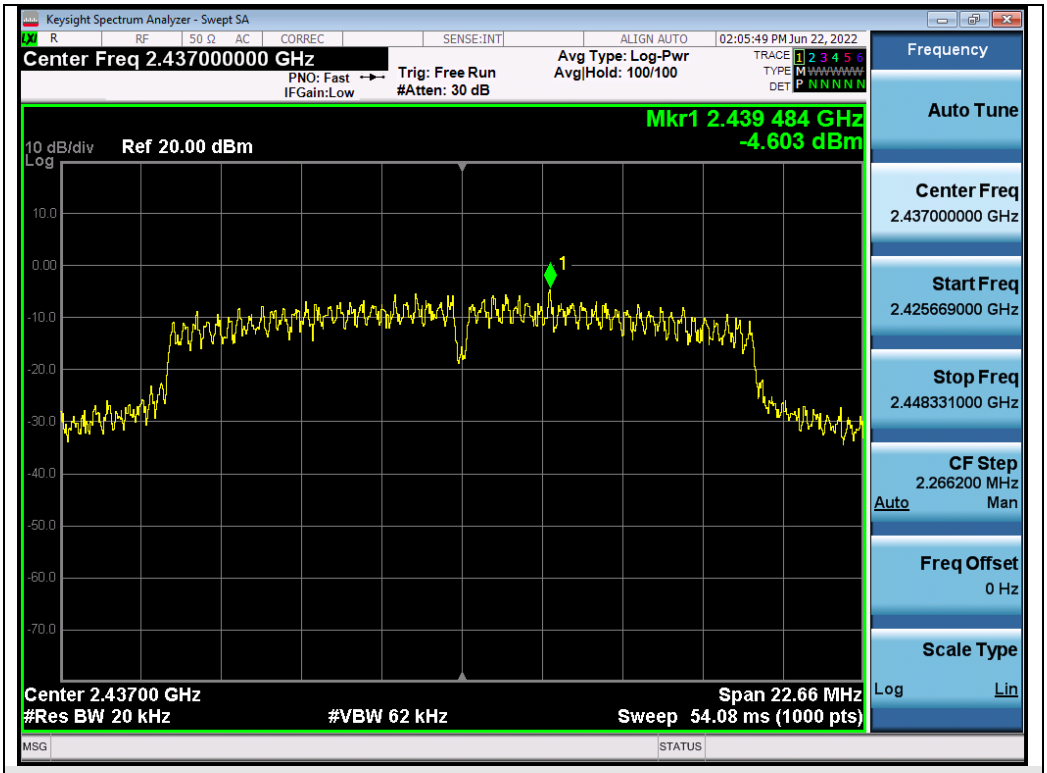
Test_Graph_802.11b_ANT1_2412_1Mbps_PSD

Test_Graph_802.11b_ANT1_2437_1Mbps_PSD

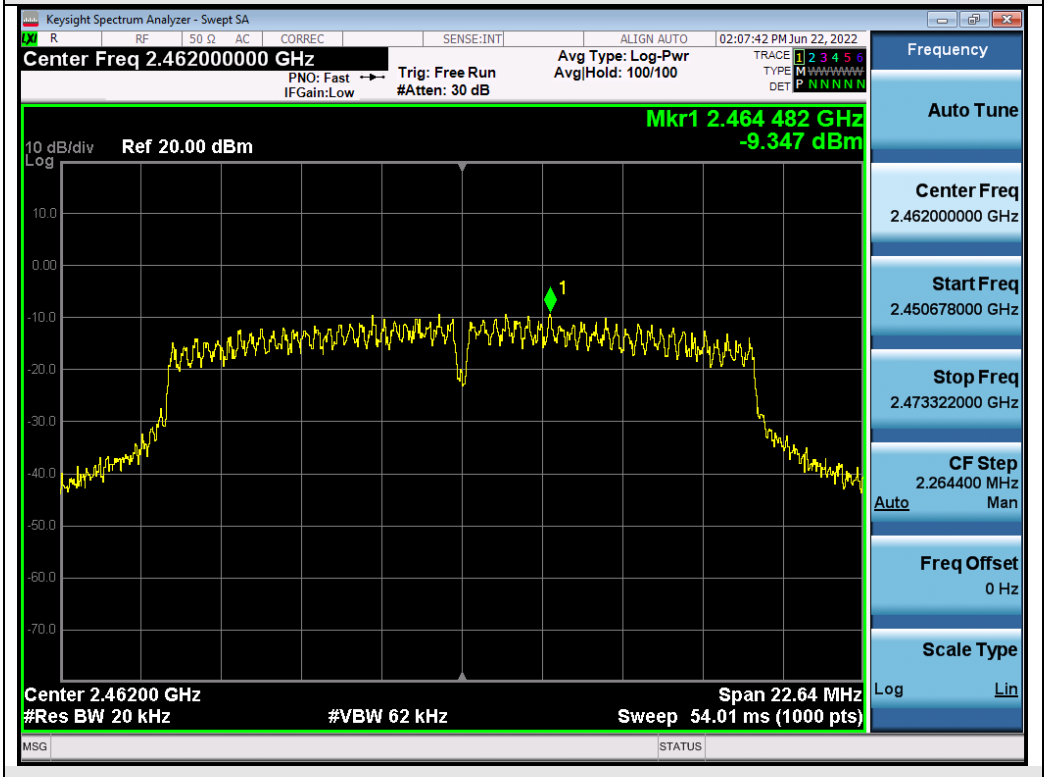
Test_Graph_802.11b_ANT1_2462_1Mbps_PSD



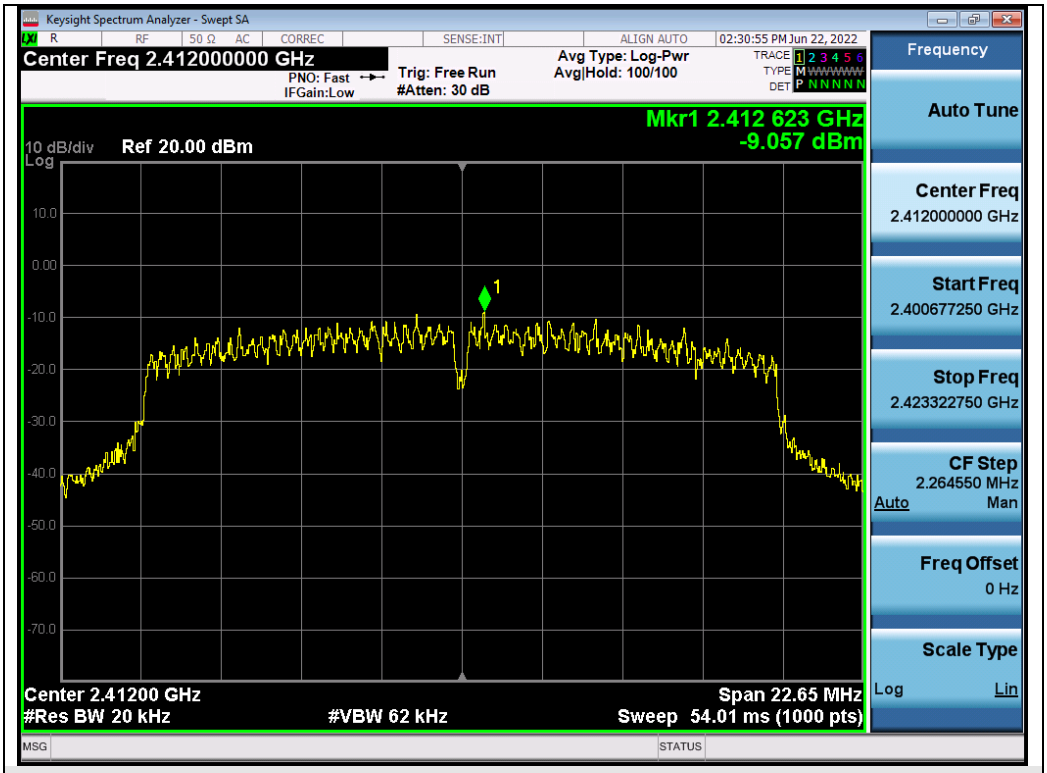
Test_Graph_802.11g_ANT1_2412_6Mbps_PSD



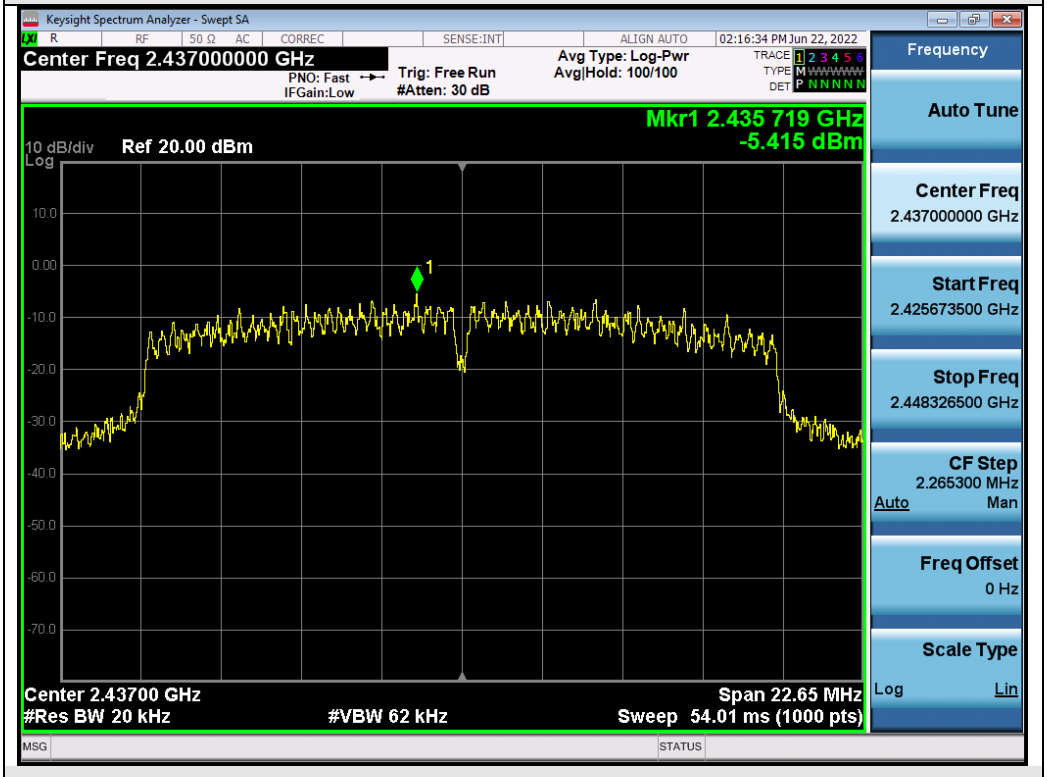
Test_Graph_802.11g_ANT1_2437_6Mbps_PSD



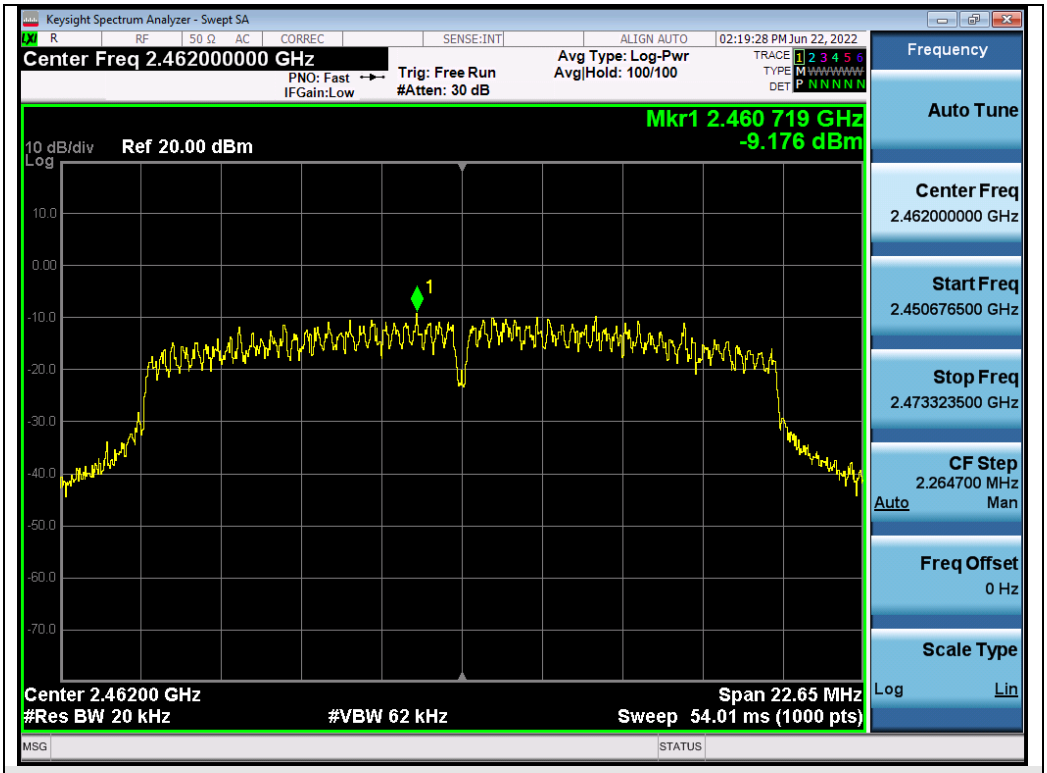
Test_Graph_802.11g_ANT1_2462_6Mbps_PSD



Test_Graph_802.11n20_ANT1_2412_MCS0_PSD



Test_Graph_802.11n20_ANT1_2437_MCS0_PSD



Test_Graph_802.11n20_ANT1_2462_MCS0_PSD

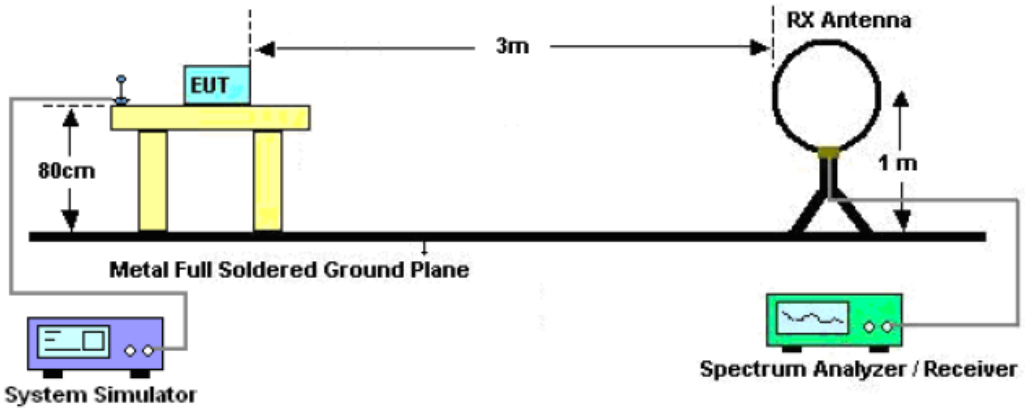
11. RADIATED EMISSION

11.1. MEASUREMENT PROCEDURE

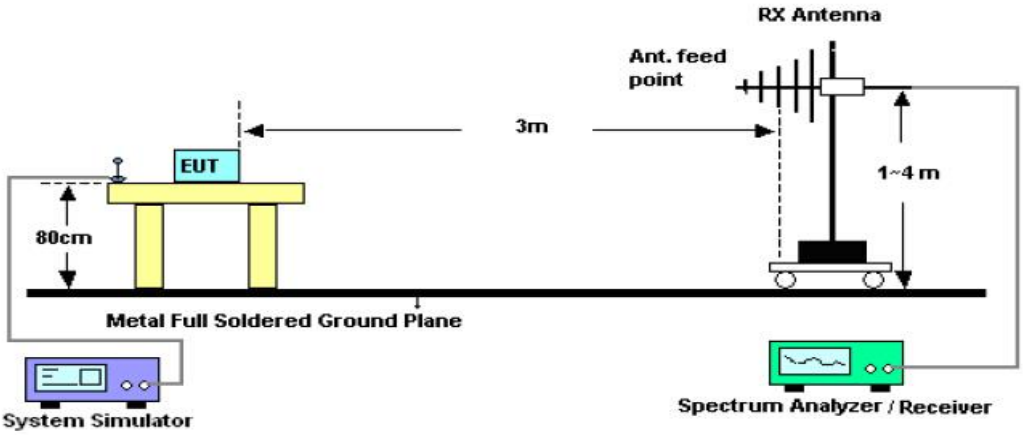
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

11.2. TEST SETUP

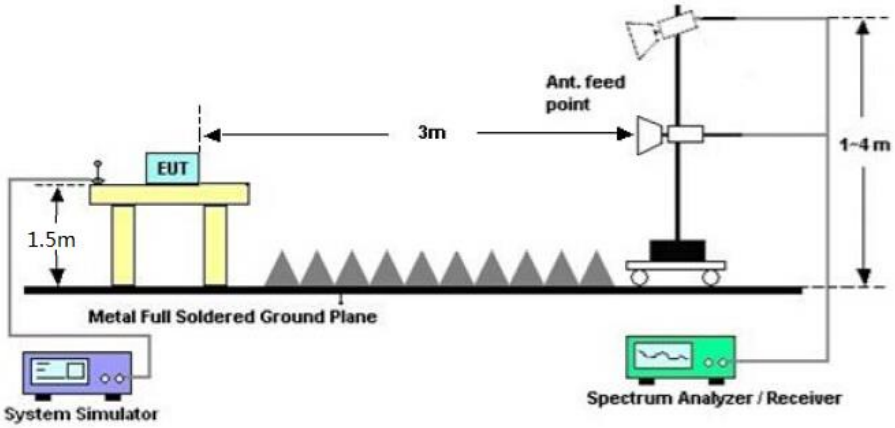
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



11.3. LIMITS AND MEASUREMENT RESULT

15.209(a) Limit in the below table has to be followed

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested for restricted band radiated emission,
the test records reported below are the worst result compared to other modes.

11.4. TEST RESULT

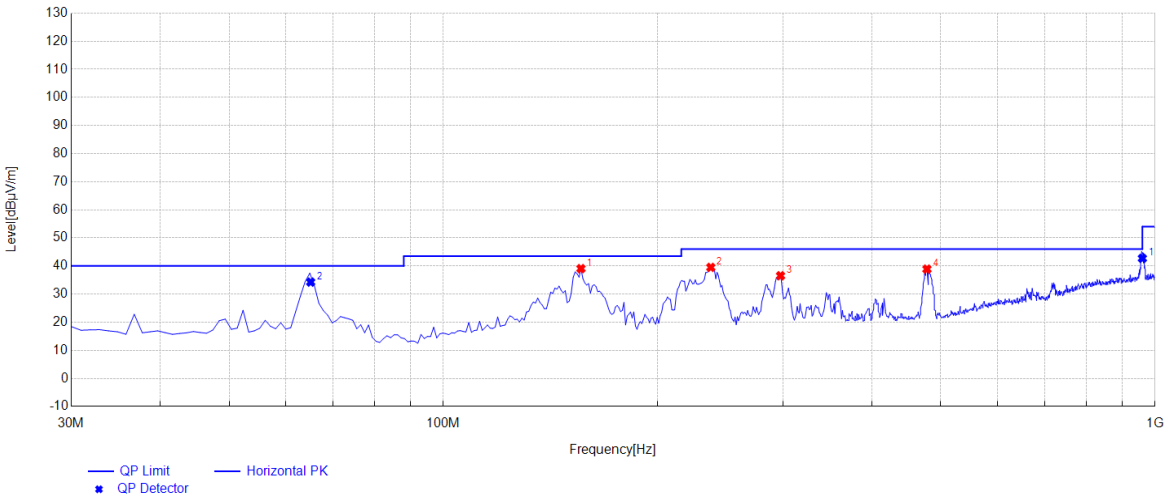
Radiated emission below 30MHz

The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

Radiated emission from 30MHz to 1000MHz

Antenna 1

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25℃	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHz	Antenna	Horizontal



Peak data list

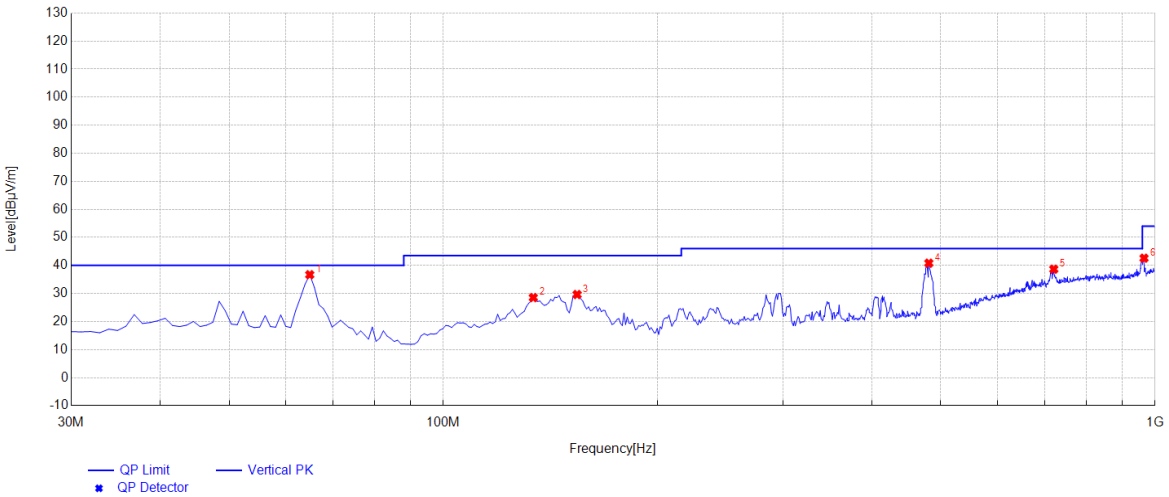
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	156.1	39.06	15.51	43.50	4.44	100	85	Horizontal
2	237.58	39.50	13.35	46.00	6.50	100	50	Horizontal
3	297.72	36.52	14.88	46.00	9.48	100	38	Horizontal
4	478.14	38.88	17.75	46.00	7.12	100	105	Horizontal

QP data list

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	959.8763	31.53	42.71	46.00	3.29	100	54	Horizontal
2	65.1096	10.09	34.27	40.00	5.73	100	40	Horizontal

RESULT: PASS

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHz	Antenna	Vertical

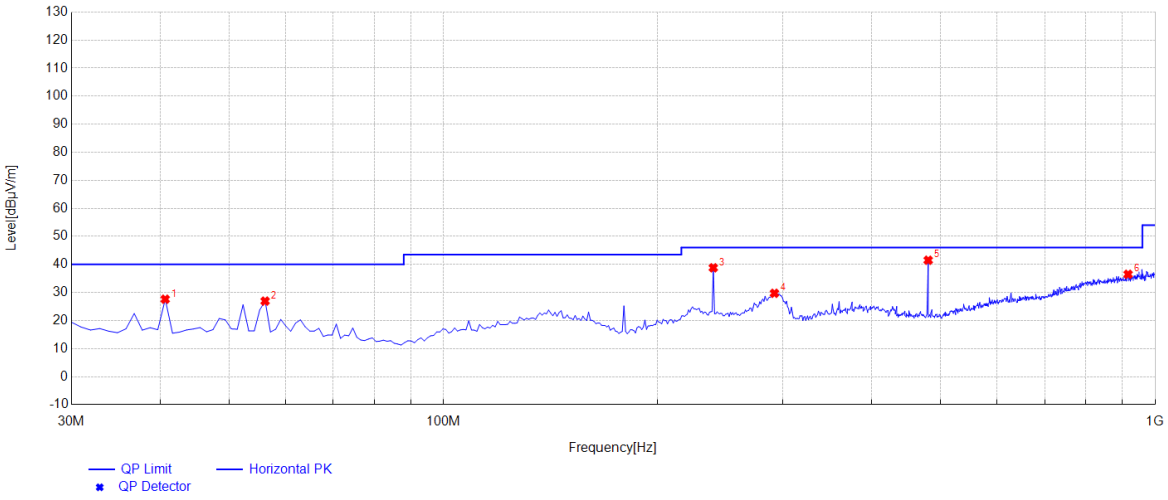


NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	64.92	36.69	10.09	40.00	3.31	100	112	Vertical
2	133.79	28.53	18.49	43.50	14.97	100	2	Vertical
3	154.16	29.63	16.38	43.50	13.87	100	308	Vertical
4	481.05	40.81	18.60	46.00	5.19	100	42	Vertical
5	720.64	38.66	29.55	46.00	7.34	100	57	Vertical
6	965.08	42.59	33.22	54.00	11.41	100	42	Vertical

RESULT: PASS

Antenna 2

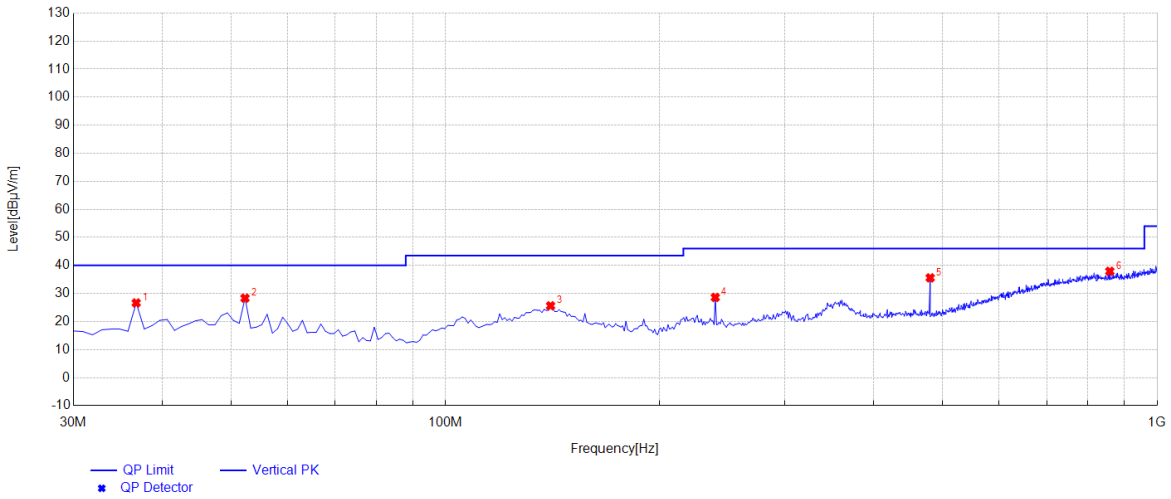
EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHz	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	40.67	27.60	10.79	40.00	12.40	100	200	Horizontal
2	56.19	26.93	11.20	40.00	13.07	100	354	Horizontal
3	239.52	38.80	13.59	46.00	7.20	100	187	Horizontal
4	291.9	29.71	15.35	46.00	16.29	100	340	Horizontal
5	480.08	41.50	17.78	46.00	4.50	100	351	Horizontal
6	916.58	36.48	30.85	46.00	9.52	100	311	Horizontal

RESULT: PASS

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHz	Antenna	Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.79	26.64	10.73	40.00	13.36	100	1	Vertical
2	52.31	28.33	11.49	40.00	11.67	100	16	Vertical
3	140.58	25.61	19.74	43.50	17.89	100	249	Vertical
4	239.52	28.60	13.64	46.00	17.40	100	127	Vertical
5	480.08	35.57	18.58	46.00	10.43	100	139	Vertical
6	858.38	37.92	31.61	46.00	8.08	100	352	Vertical

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The “Factor” value can be calculated automatically by software of measurement system.

3. All test modes had been pre-tested. The 802.11b at low channel is the worst case and recorded in the report.

Radiated emission above 1GHz

Antenna 1:

EUT	BDE Dual-Band WiFi Network Processor Module	**Model Name**	BDE-WF3135A
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHz	**Antenna**	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4824.000	56.13	0.08	56.21	74	-17.79	peak
4824.000	45.98	0.08	46.06	54	-7.94	AVG
7236.000	50.25	2.21	52.46	74	-21.54	peak
7236.000	41.63	2.21	43.84	54	-10.16	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Dual-Band WiFi Network Processor Module	**Model Name**	BDE-WF3135A
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHz	**Antenna**	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4824.000	55.13	0.08	55.21	74	-18.79	peak
4824.000	46.28	0.08	46.36	54	-7.64	AVG
7236.000	51.06	2.21	53.27	74	-20.73	peak
7236.000	41.37	2.21	43.58	54	-10.42	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2437MHz	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4874.000	56.39	0.14	56.53	74	-17.47	peak
4874.000	46.38	0.14	46.52	54	-7.48	AVG
7311.000	51.26	2.36	53.62	74	-20.38	peak
7311.000	41.27	2.36	43.63	54	-10.37	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2437MHz	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4874.000	56.39	0.14	56.53	74	-17.47	peak
4874.000	46.28	0.14	46.42	54	-7.58	AVG
7311.000	50.29	2.36	52.65	74	-21.35	peak
7311.000	40.27	2.36	42.63	54	-11.37	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2462MHz	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4924.000	55.93	0.22	56.15	74	-17.85	peak
4924.000	46.38	0.22	46.6	54	-7.4	AVG
7386.000	50.27	2.64	52.91	74	-21.09	peak
7386.000	41.16	2.64	43.8	54	-10.2	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2462MHz	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4924.000	56.39	0.22	56.61	74	-17.39	peak
4924.000	46.37	0.22	46.59	54	-7.41	AVG
7386.000	51.27	2.64	53.91	74	-20.09	peak
7386.000	42.19	2.64	44.83	54	-9.17	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Antenna 2:

EUT	BDE Dual-Band WiFi Network Processor Module	**Model Name**	BDE-WF3135A
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHz	**Antenna**	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4824.000	55.32	0.08	55.4	74	-18.6	peak
4824.000	46.97	0.08	47.05	54	-6.95	AVG
7236.000	50.14	2.21	52.35	74	-21.65	peak
7236.000	41.37	2.21	43.58	54	-10.42	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Dual-Band WiFi Network Processor Module	**Model Name**	BDE-WF3135A
Temperature	25°C	**Relative Humidity**	58%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHz	**Antenna**	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4824.000	54.28	0.08	54.36	74	-19.64	peak
4824.000	45.37	0.08	45.45	54	-8.55	AVG
7236.000	51.08	2.21	53.29	74	-20.71	peak
7236.000	42.19	2.21	44.4	54	-9.6	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2437MHz	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4874.000	57.42	0.14	57.56	74	-16.44	peak
4874.000	46.38	0.14	46.52	54	-7.48	AVG
7311.000	51.24	2.36	53.6	74	-20.4	peak
7311.000	41.37	2.36	43.73	54	-10.27	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2437MHz	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4874.000	57.42	0.14	57.56	74	-16.44	peak
4874.000	46.97	0.14	47.11	54	-6.89	AVG
7311.000	50.14	2.36	52.5	74	-21.5	peak
7311.000	41.06	2.36	43.42	54	-10.58	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2462MHz	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4924.000	55.28	0.22	55.5	74	-18.5	peak
4924.000	46.97	0.22	47.19	54	-6.81	AVG
7386.000	50.15	2.64	52.79	74	-21.21	peak
7386.000	40.37	2.64	43.01	54	-10.99	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2462MHz	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4924.000	56.84	0.22	57.06	74	-16.94	peak
4924.000	47.12	0.22	47.34	54	-6.66	AVG
7386.000	51.05	2.64	53.69	74	-20.31	peak
7386.000	42.34	2.64	44.98	54	-9.02	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Note:

The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.

Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

The “Factor” value can be calculated automatically by software of measurement system.

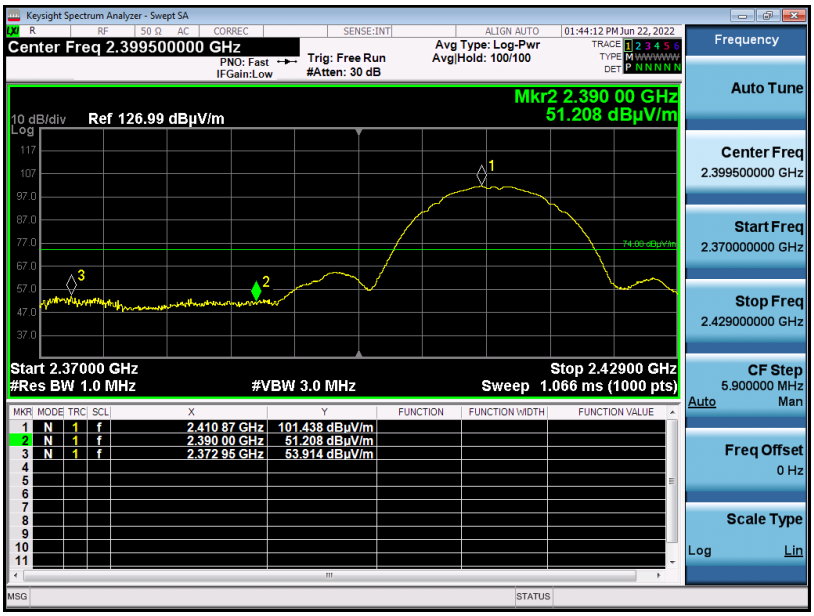
All test modes had been pre-tested. The 802.11b mode is the worst case and recorded in the report.

Test result for band edge emission at restricted bands

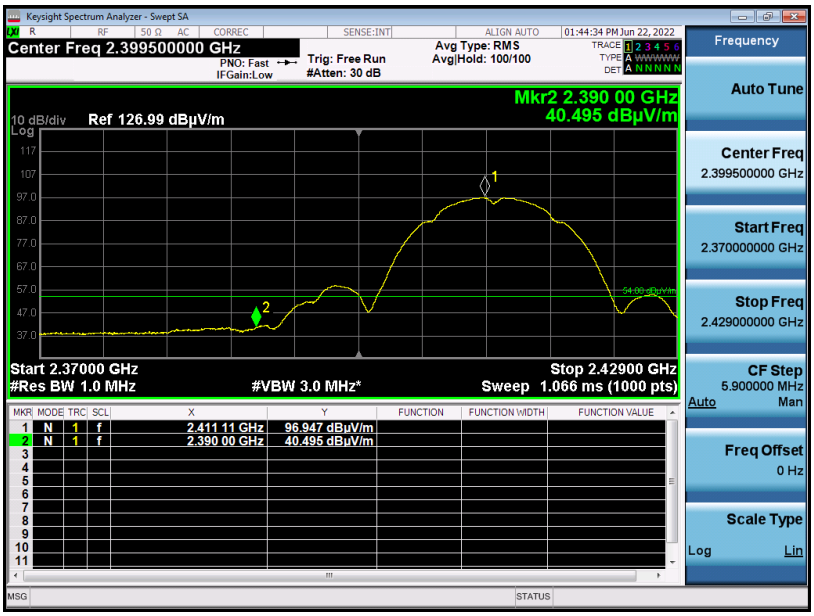
Antenna 1

EUT	BDE Dual-Band WiFi Network Processor Module	**Model Name**	BDE-WF3135A
Temperature	25°C	**Relative Humidity**	60%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	802.11b with data rate 1 2412MHz	**Antenna**	Horizontal

Test Graph for Peak Measurement



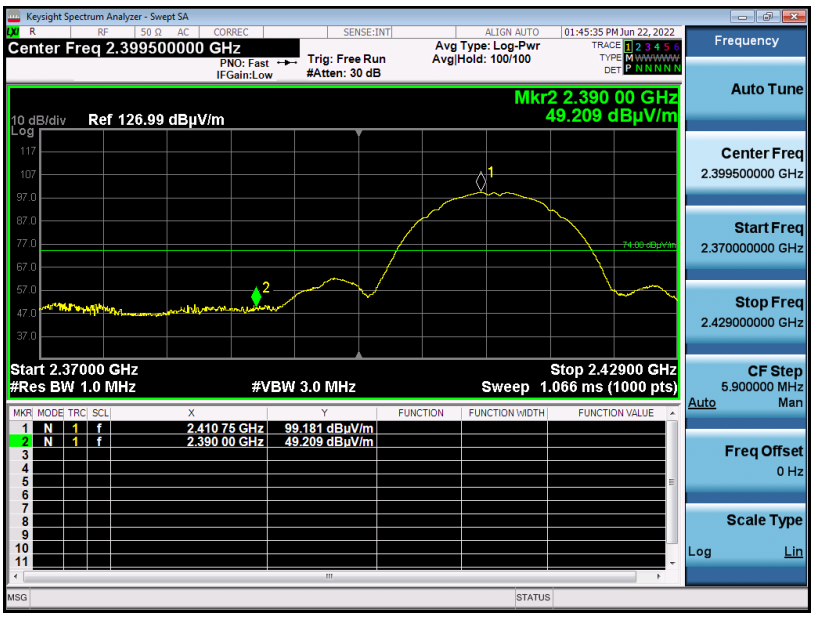
Test Graph for Average Measurement



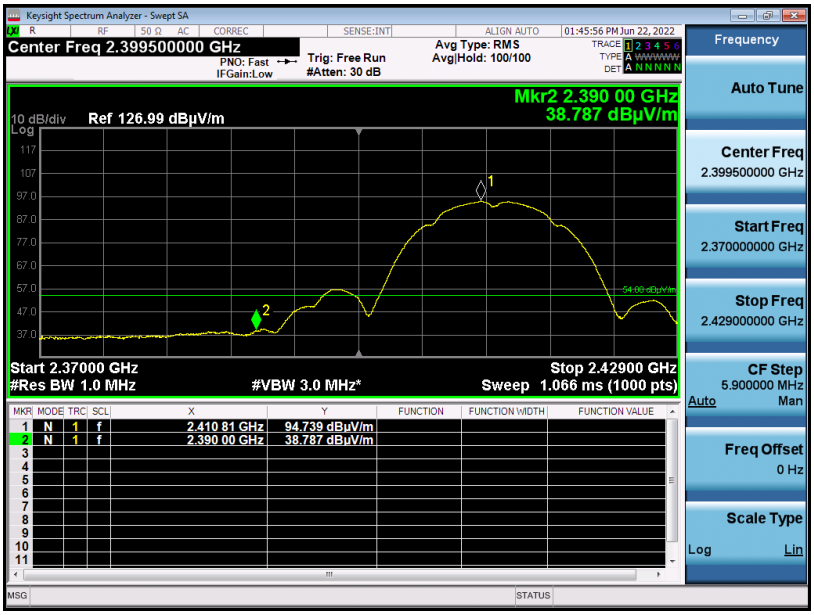
RESULT: PASS

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25℃	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with data rate 1 2412MHz	Antenna	Vertical

Test Graph for Peak Measurement



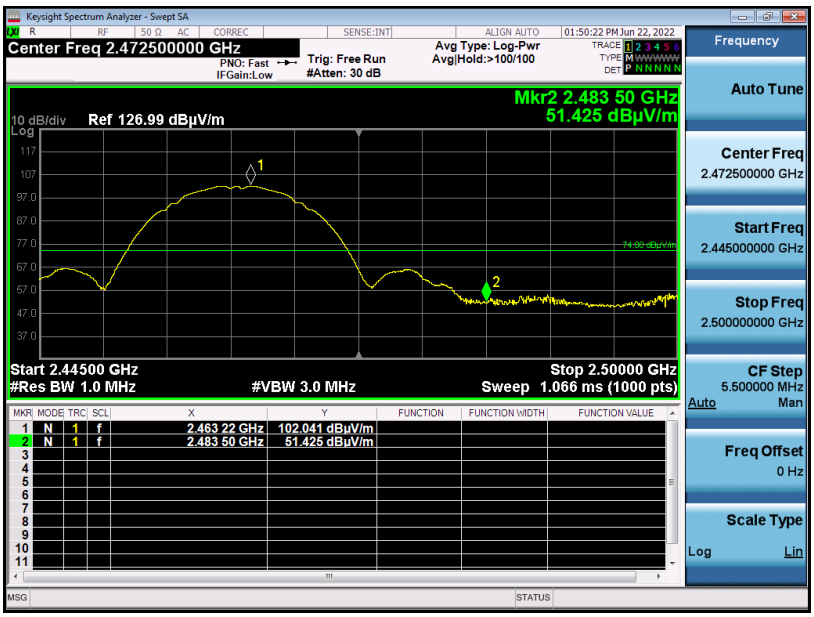
Test Graph for Average Measurement



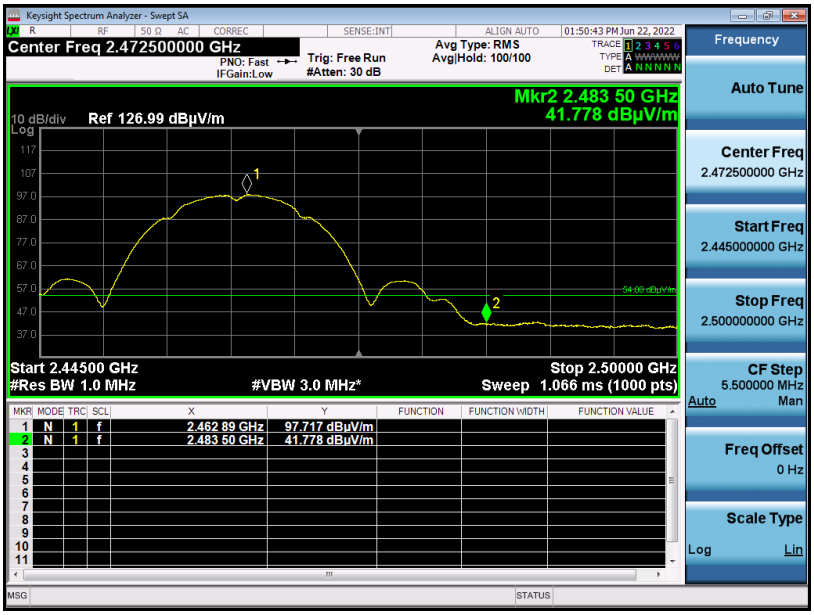
RESULT: PASS

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25℃	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with data rate 1 2462MHz	Antenna	Horizontal

Test Graph for Peak Measurement



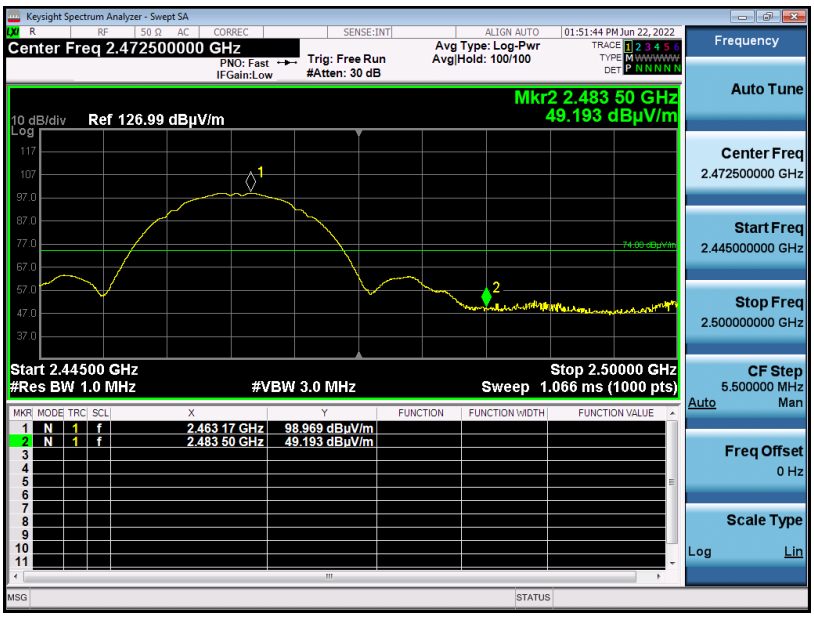
Test Graph for Average Measurement



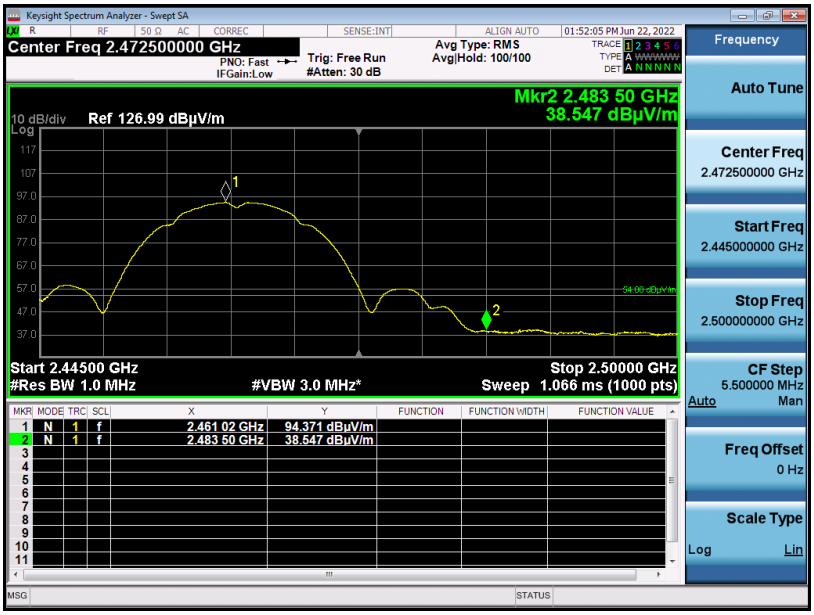
RESULT: PASS

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25℃	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with data rate 1 2462MHz	Antenna	Vertical

Test Graph for Peak Measurement



Test Graph for Average Measurement

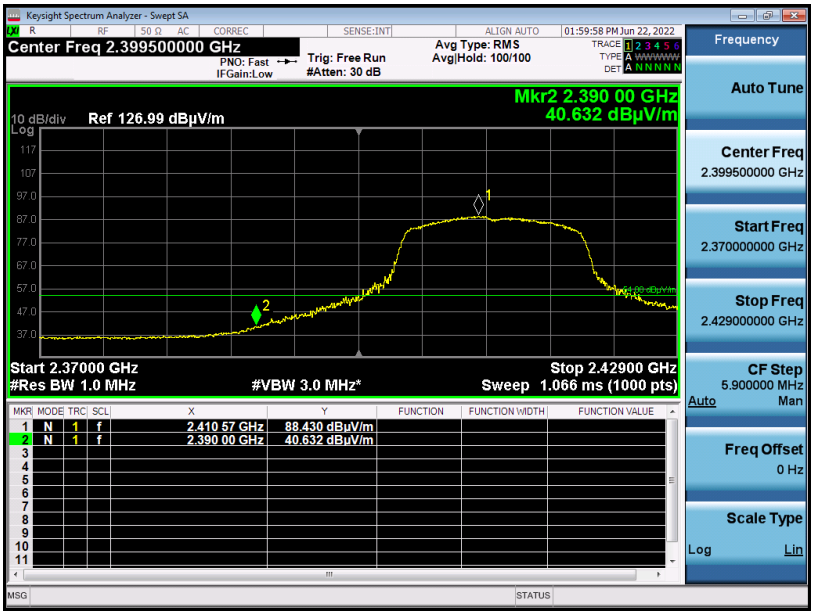


RESULT: PASS

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11g with data rate 6 2412MHz	Antenna	Horizontal

Test Graph for Peak Measurement

Test Graph for Average Measurement

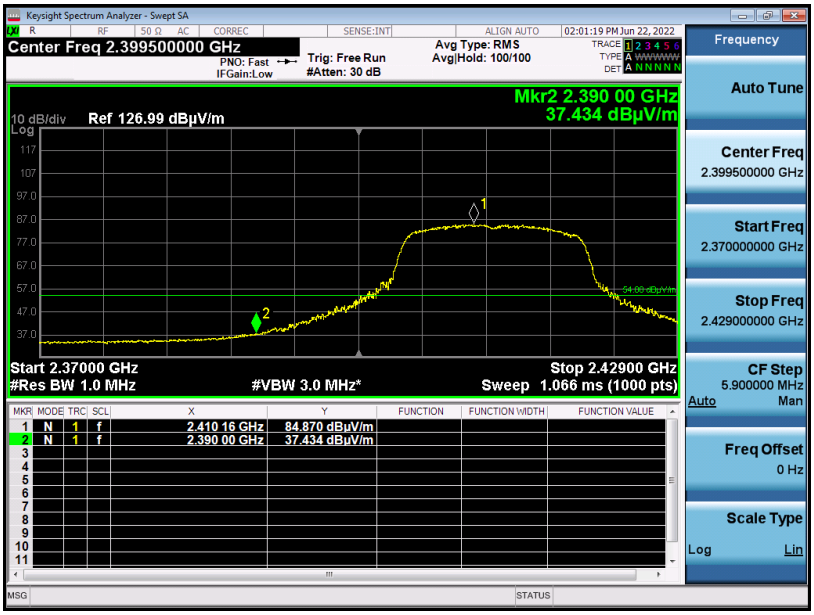


RESULT: PASS

EUT	BDE Dual-Band WiFi Network Processor Module	Model Name	BDE-WF3135A
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11g with data rate 6 2412MHz	Antenna	Vertical

Test Graph for Peak Measurement

Test Graph for Average Measurement



RESULT: PASS