



TEST REPORT

Applicant: Hangzhou Ingscreen Technology Co., Ltd
Address of Applicant: Room 1006, building 6, 1324 Wenyi West Road, Yuhang District Hangzhou, China
Manufacturer/Factory: Hangzhou Ingscreen Technology Co., Ltd
Address of Manufacturer: Room 1006, building 6, 1324 Wenyi West Road, Yuhang District Hangzhou, China
Product Name: Interactive Flat Panel
Model No.: IS-6512, IS-5512, IS-7512, IS-8612, IS-9812, IS-11012, IS-5516, IS-6516, IS-7516, IS-8616, IS-9816, IS-11016, IS-5518, IS-6518, IS-7518, IS-8618, IS-9818, IS-11018
Trade Mark: 
FCC ID: 2A9WM-IS6512
Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of Test: Dec.28,2022- Jan.11, 2023
Date of report issued: Jan.31, 2023
Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Remark:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full without prior written permission of the company.

The report would be invalid without specific stamp of test institute and the signatures of compiler and approver

Prepared By

Shenzhen ETR Standard Technology Co., Ltd.

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Report Revision History		
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1. Test Summary

Test Item	Section	Result	Test by
Antenna requirement	FCC part 15.203/15.247 (c)	Pass	/
AC Power Line Conducted Emission	FCC part 15.207	Pass	Qiao Li
Conducted Peak Output Power	FCC part 15.247 (b)(3)	Pass	Yvan Fan
Channel Bandwidth	FCC part 15.247 (a)(2)	Pass	Yvan Fan
Power Spectral Density	FCC part 15.247 (e)	Pass	Yvan Fan
Band Edge	FCC part 15.247(d)	Pass	Yvan Fan
Spurious Emission	FCC part 15.205/15.209	Pass	Qiao Li

Remark: Test according to ANSI C63.10:2013

Pass: The EUT complies with the essential requirements in the standard.

Measurement Uncertainty

Test Item	Uncertainty Criterion	Measurement Uncertainty	Notes
Occupied Channel Bandwidth	±5%	±0.55%	(1)
RF output power, conducted	±1.5dB	±0.99dB	(1)
Power Spectral Density, conducted	±3dB	±0.61dB	(1)
Unwanted Emissions, conducted	±3dB	±0.64dB	(1)
AC Power Line Conducted Emission	±6dB	± 3.02 dB	(1)
Radiated emissions Below 1GHz	±6dB	±4.30 dB	(1)
Radiated emissions Above 1GHz	±6dB	±4.35 dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

2. General Information

2.1 General Description of EUT

Product Name:	Interactive Flat Panel
Model No.:	IS-6512,IS-5512, IS-7512,IS-8612,IS-9812,IS-11012,IS-5516,IS-6516, IS-7516,IS-8616,IS-9816,IS-11016,IS-5518,IS-6518,IS-7518,IS-8618, IS-9818,IS-11018
Test Model:	IS-6512
Difference of model(s)	All the model are the same circuit and RF module, except the product names and screen size are different.
Hardware version:	N/A
Software version:	N/A
Sample(s) Status	Engineer sample
Channel numbers:	802.11b/802.11g /802.11n(HT20): 11 802.11n(HT40):7
Channel separation:	5MHz
Modulation technology:	802.11b: Direct Sequence Spread Spectrum (DSSS) 802.11g/802.11n(H20)/802.11n(HT40): Orthogonal Frequency Division Multiplexing (OFDM)
Antenna Type:	External antenna
Antenna gain:	5.29dBi
Power supply:	AC 110-240V,50/60Hz

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	Frequency (MHz)	
	802.11b/802.11g/802.11n(HT20)	802.11n(HT40)
Lowest channel	2412MHz	2422MHz
Middle channel	2437MHz	2437MHz
Highest channel	2462MHz	2452MHz

2.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
<i>Remark: During the test, the dutycycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i>	

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:				
Pre-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.				
Mode	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)
Data rate	1Mbps	6Mbps	6.5Mbps	13Mbps

2.3 Description of Support Units

None.

2.4 Deviation from Standards

None.

2.5 Abnormalities from Standard Conditions

None.

2.6 Test Facility

Test laboratory:	Shenzhen ETR Standard Technology Co., Ltd.
CNAS Registration Number:	L11864
A2LA Certificate Number:	6640.01
FCC Designation Number:	CN1326
FCC Test Firm Registration:	183064

2.7 Test Location

All tests were performed at:	
Laboratory location:	No.103, No.10, Phase I, Zone 3, Xinxing Industrial Park, Xinhe, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	+86 755 85259392
Fax:	+86 755 27219460

2.8 Additional Instructions

Test Software	RtkWiFiTest-v1.8.1_20160613.apk
Power level setup	Default

3. Test Instruments list

Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	EMI Test Receiver	Rohde&schwarz	ESPI7	100605	2022.3.09	2023.3.08
2	EMI Test Receiver	Rohde&schwarz	ESCI3	102696	2022.3.09	2023.3.08
3	Broadband antenna	schwarabeck	VULB9168	1064	2022.3.11	2024.3.10
4	Horn antenna	schwarabeck	BBHA9120D	9120D-1145	2022.3.09	2023.3.08
5	amplifier	EMtrace	RP01A	50117	2022.3.09	2023.3.08
6	Artificial power network	schwarabeck	NSLK8127	8127483	2022.3.09	2023.3.08
	Artificial power network	ETS	3186/2NM	1132	2022.3.09	2023.3.08
7	10dB attenuator	HUBER+SUHNER	10dB	/	2022.3.09	2023.3.08
8	amplifier	Space-Dtronics	EWLAN0118 G-P40	19113001	2022.3.09	2023.3.08
9	Spectrum analyzer	KEYSIGHT	N9020A	MY55370280	2022.3.09	2023.3.08
10	Power detector box	MWRFtest	MW100-PSB	MW201020JYT	2022.11.09	2023.11.08

Note: the calibration interval of the above test instruments is 12 or 24 months and the calibrations are traceable to international system unit (SI).

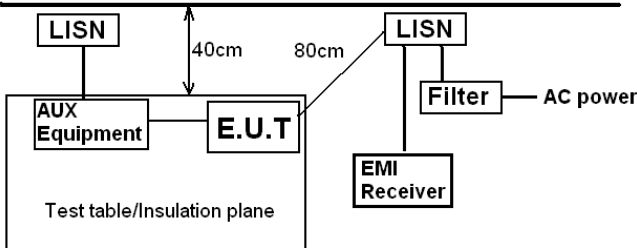
Software Name	Manufacturer	Model	Version
RF test software	MWRFtest	MTS 8310	V2.0.0.0
Conducted test software	EZ-EMC	Farad	Ver.EMC-CON 3A1.1
Radiated test software	EZ-EMC	Farad	Ver.FA-03A2 RE

4. Test results and Measurement Data

4.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c) , RSS-Gen §6.8
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, 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. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
EUT Antenna:	
<i>The antennas are External antenna, the best case gain of the antennas are 5.29 dBi, reference to the appendix II for details</i>	

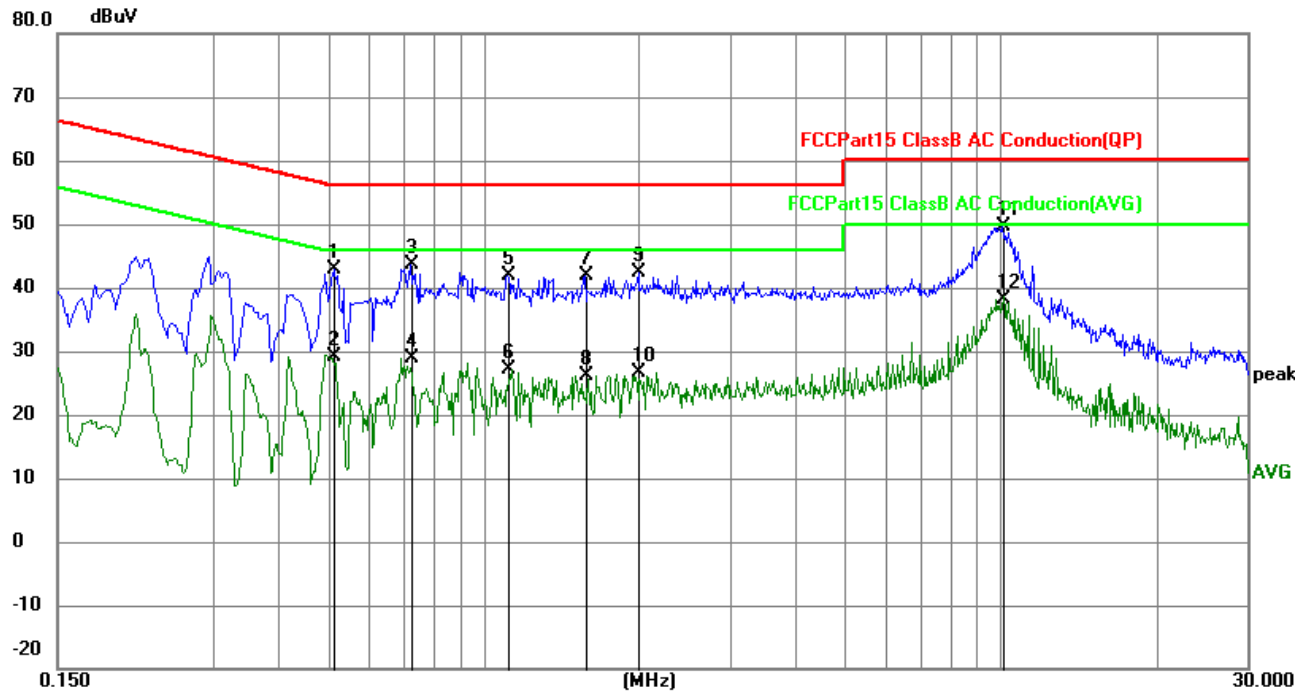
4.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207						
Test Method:	ANSI C63.10:2013						
Test Frequency Range:	150KHz to 30MHz						
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto						
Limit:	Frequency range (MHz)		Limit (dBuV)				
			Quasi-peak		Average		
	0.15-0.5		66 to 56*		56 to 46*		
	0.5-5		56		46		
	5-30		60		50		
* Decreases with the logarithm of the frequency.							
Test setup:	Reference Plane  Test table/Insulation plane <i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m						
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.						
Test Instruments:	Refer to section 3.0 for details						
Test mode:	Refer to section 2.2 for details						
Test environment:	Temp.:	22.7°C	Humid.:	30%	Press.:	1012mbar	
Test voltage:	AC 120V, 60Hz						
Test results:	Pass						

Remark: Both high voltage and low voltage have been tested, and the report only shows the worst case data with AC 120V/60Hz.

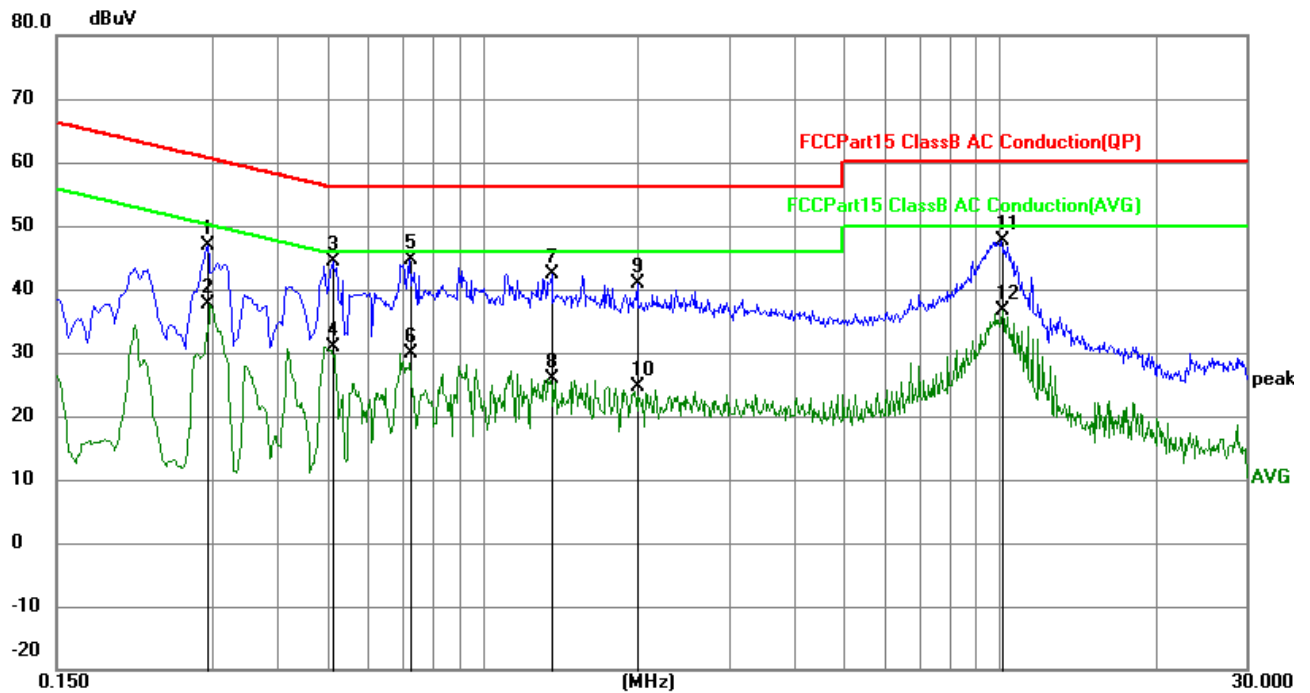
Measurement data

Line:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.5141	32.59	10.36	42.95	56.00	-13.05	QP
2	0.5141	18.69	10.36	29.05	46.00	-16.95	AVG
3	0.7258	33.37	10.33	43.70	56.00	-12.30	QP
4	0.7258	18.65	10.33	28.98	46.00	-17.02	AVG
5	1.1129	31.51	10.29	41.80	56.00	-14.20	QP
6	1.1129	16.91	10.29	27.20	46.00	-18.80	AVG
7	1.5764	31.52	10.30	41.82	56.00	-14.18	QP
8	1.5764	15.84	10.30	26.14	46.00	-19.86	AVG
9	1.9994	32.03	10.30	42.33	56.00	-13.67	QP
10	1.9994	16.22	10.30	26.52	46.00	-19.48	AVG
11	10.1219	39.20	10.40	49.60	60.00	-10.40	QP
12	10.1219	27.80	10.40	38.20	50.00	-11.80	AVG

Neutral:

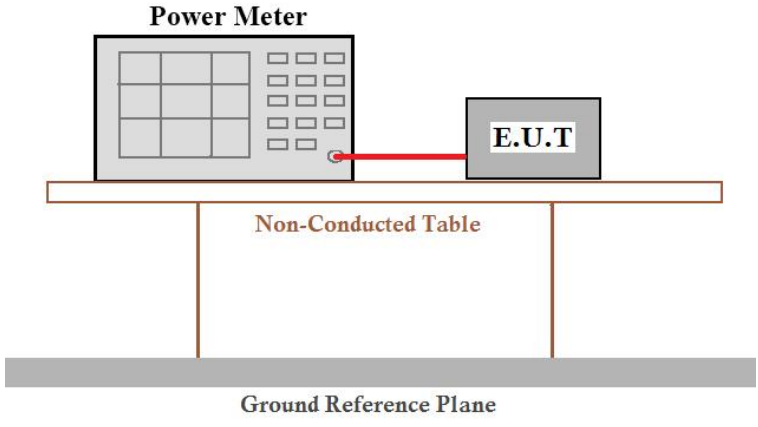


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2938	36.46	10.39	46.85	60.42	-13.57	QP
2	0.2938	27.17	10.39	37.56	50.42	-12.86	AVG
3	0.5141	34.09	10.36	44.45	56.00	-11.55	QP
4	0.5141	20.46	10.36	30.82	46.00	-15.18	AVG
5	0.7258	34.37	10.33	44.70	56.00	-11.30	QP
6	0.7258	19.65	10.33	29.98	46.00	-16.02	AVG
7	1.3604	32.17	10.29	42.46	56.00	-13.54	QP
8	1.3604	15.64	10.29	25.93	46.00	-20.07	AVG
9	1.9994	30.53	10.30	40.83	56.00	-15.17	QP
10	1.9994	14.22	10.30	24.52	46.00	-21.48	AVG
11	10.1219	37.20	10.40	47.60	60.00	-12.40	QP
12	10.1219	26.24	10.40	36.64	50.00	-13.36	AVG

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

4.3 Conducted Peak Output Power

Test Requirement :	FCC Part15 C Section 15.247 (b)(3)
Test Method :	KDB 558074 D01 15.247 Meas Guidance v05r02
Limit:	30dBm
Test setup:	 The diagram illustrates the test setup. A Power Meter and an E.U.T. (Equipment Under Test) are connected by a red cable. They are positioned on a Non-Conducted Table, which is elevated from a Ground Reference Plane by two vertical supports.
Test Instruments:	Refer to section 3.0 for details
Test mode:	Refer to section 2.2 for details
Test results:	Pass

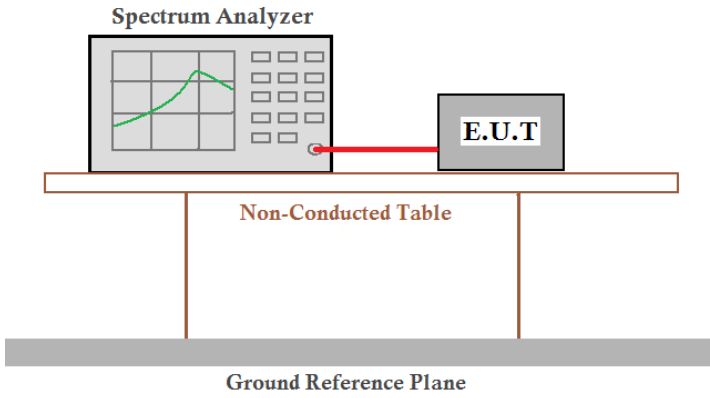
Measurement Data
(RTL8822CU Module)

Test CH	Peak Output Power (dBm)				Limit(dBm)	Result
	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)		
Lowest	13.93	14.34	13.92	12.78	30.00	Pass
Middle	13.77	14.27	13.64	12.61		
Highest	13.95	14.38	13.98	12.78		

(RTL8731BU Module)

Test CH	Peak Output Power (dBm)				Limit(dBm)	Result
	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)		
Lowest	14.04	14.69	14.66	13.48	30.00	Pass
Middle	13.93	14.62	14.56	13.16		
Highest	13.82	14.61	14.64	13.31		

4.4Channel Bandwidth

Test Requirement :	FCC Part15 C Section 15.247 (a)(2)
Test Method :	KDB 558074 D01 15.247 Meas Guidance v05r02
Limit:	>500KHz
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 3.0 for details
Test mode:	Refer to section 2.2 for details
Test results:	Pass

Measurement Data
(RTL8822CU Module)

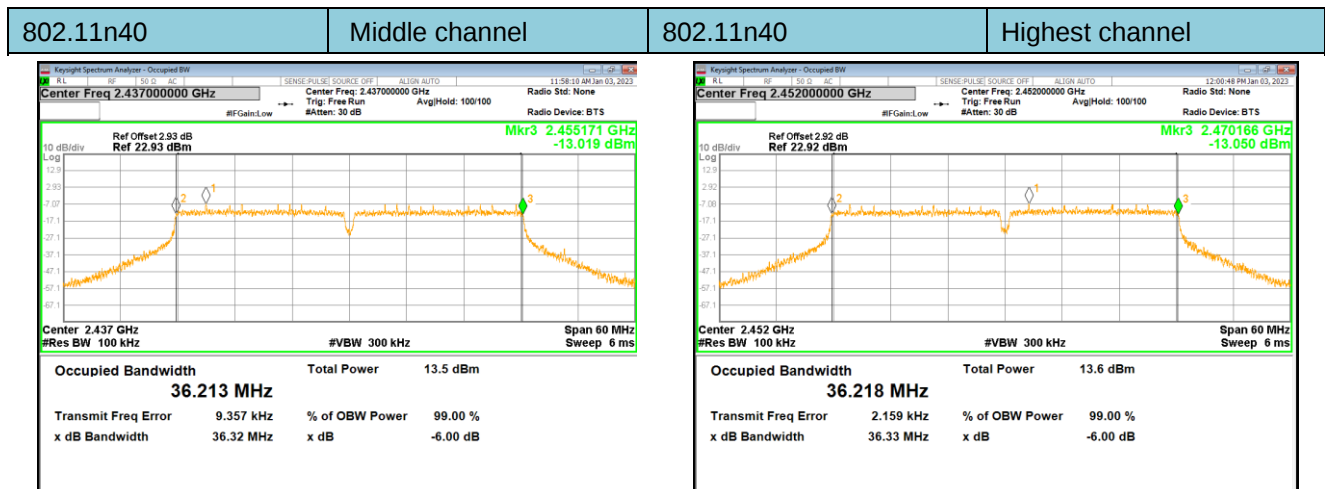
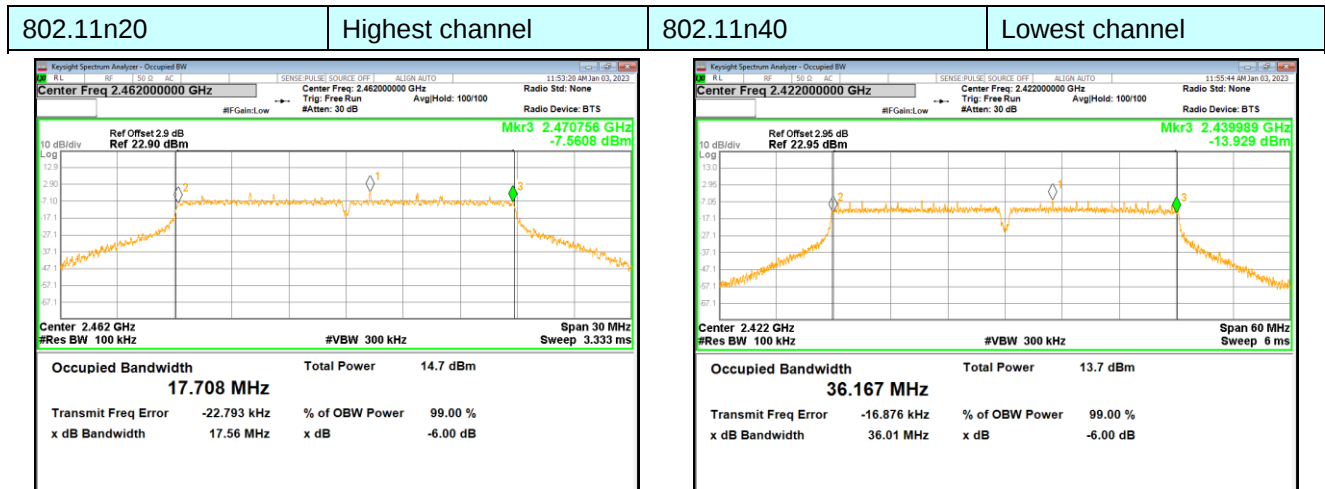
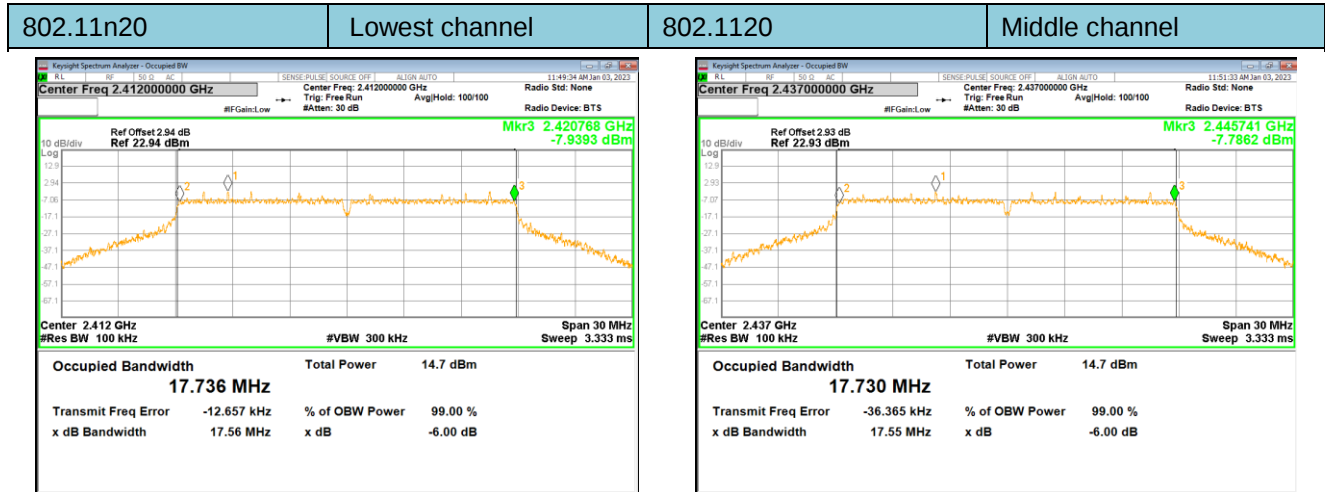
Test CH	Channel Bandwidth (MHz)				Limit(KHz)	Result
	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)		
Lowest	9.816	16.340	17.560	36.010	>500	Pass
Middle	9.560	16.050	17.550	36.320		
Highest	9.054	16.320	17.560	36.330		

(RTL8731BU Module)

Test CH	Channel Bandwidth (MHz)				Limit(KHz)	Result
	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)		
Lowest	9.073	16.322	17.579	36.266	>500	Pass
Middle	9.056	16.357	17.565	36.320		
Highest	10.018	16.306	17.557	36.306		

Test plot as follows:
(RTL8822CU Module)

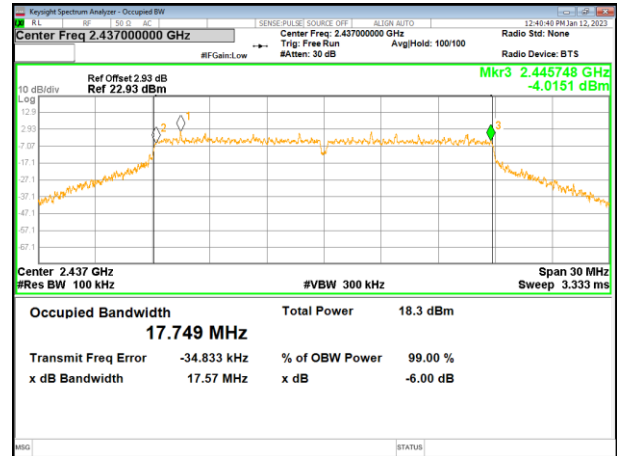
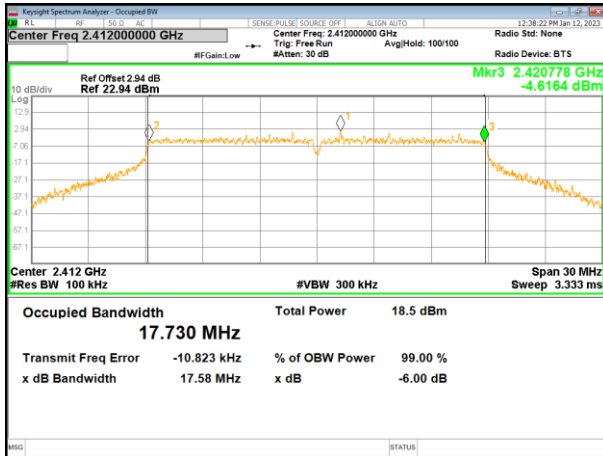




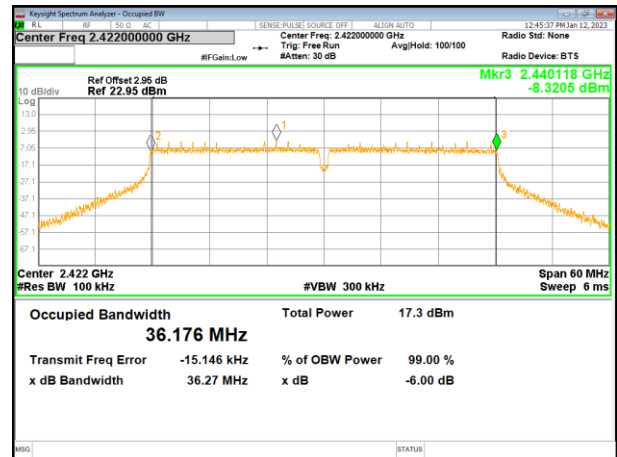
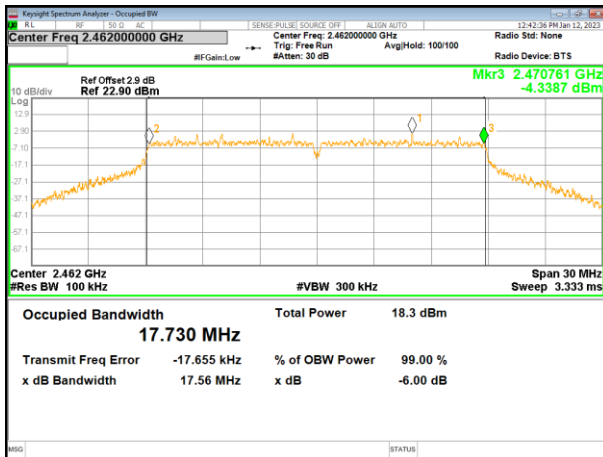
(RTL8731BU Module)



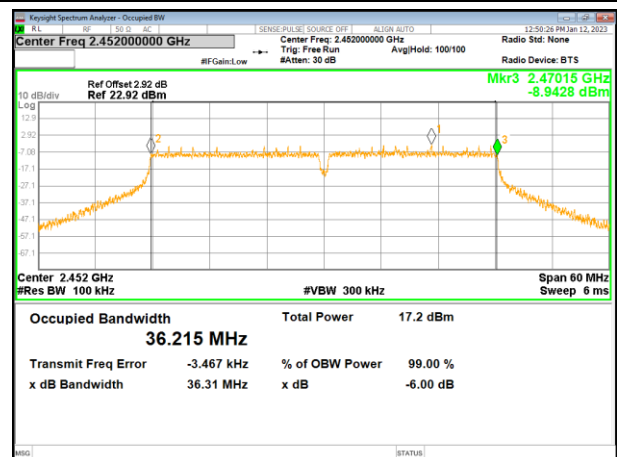
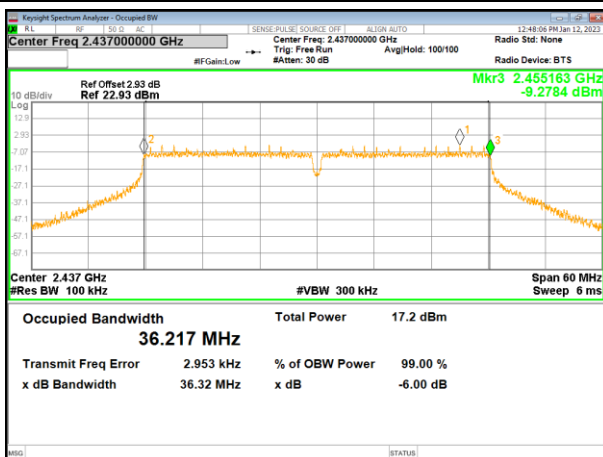
802.11n20	Lowest channel	802.1120	Middle channel
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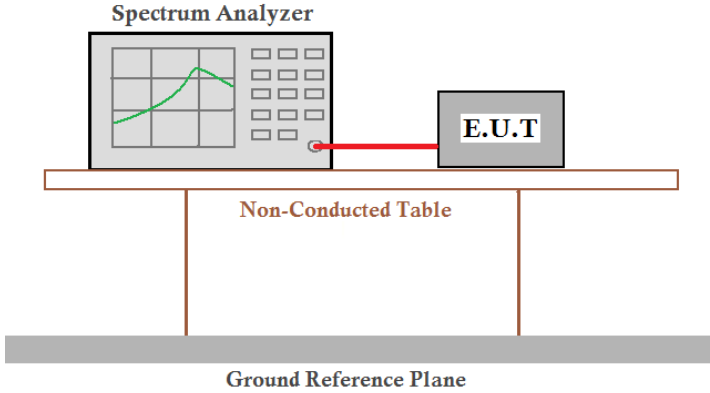
802.11n20	Highest channel	802.11n40	Lowest channel
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802.11n40	Middle channel	802.11n40	Highest channel
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4.5 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e), RSS-247 §5.2.b
Test Method:	KDB 558074 D01 15.247 Meas Guidance v05r02
Limit:	8dBm/3kHz
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 3.0 for details
Test mode:	Refer to section 2.2 for details
Test results:	Pass

Measurement Data

(RTL8822CU Module)

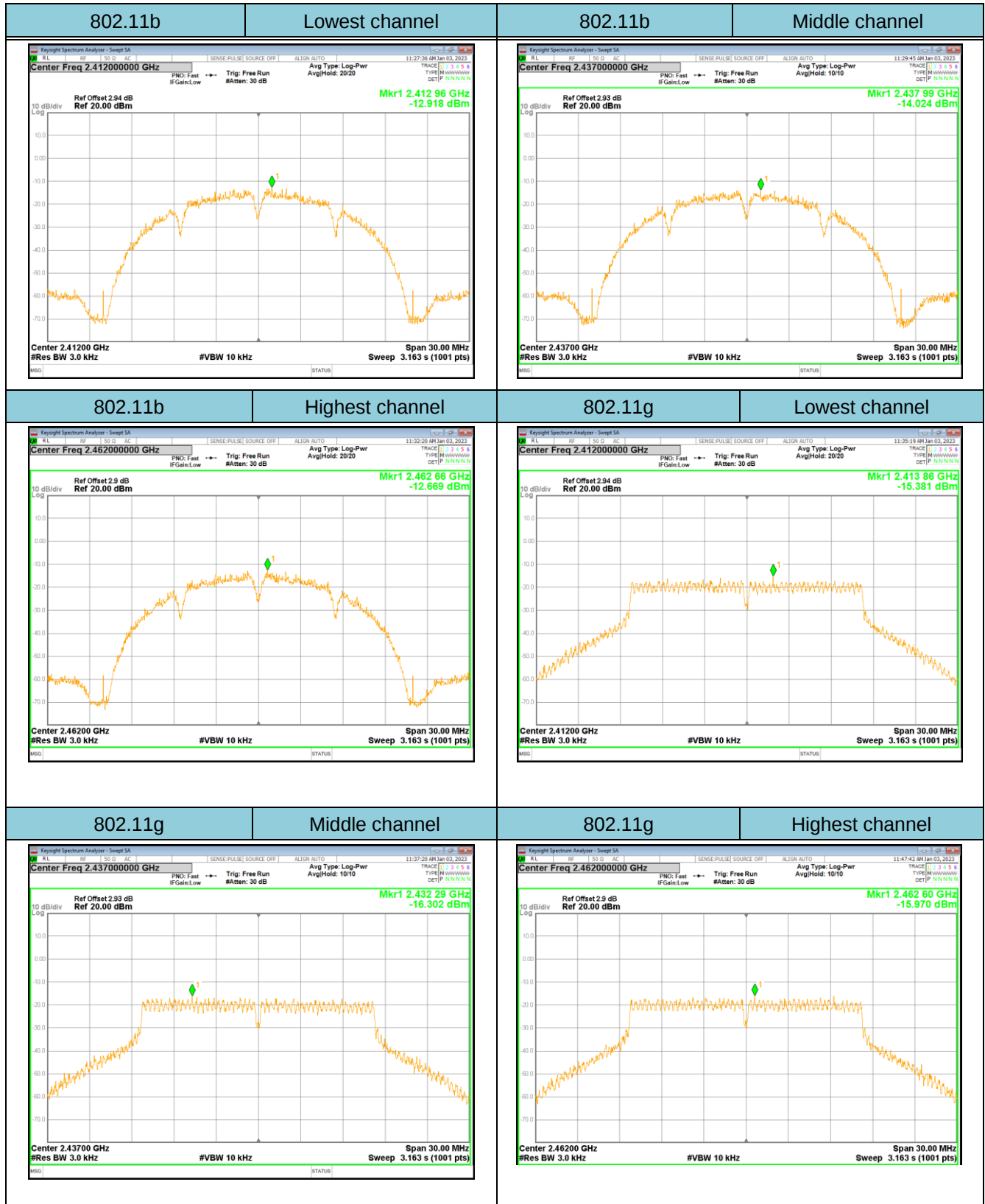
Test CH	Power Spectral Density (dBm/3kHz)				Limit (dBm/3kHz)	Result
	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)		
Lowest	-12.918	-15.381	-16.384	-20.633	8.00	Pass
Middle	-14.024	-16.302	-17.028	-21.035		
Highest	-12.669	-15.970	-15.905	-20.045		

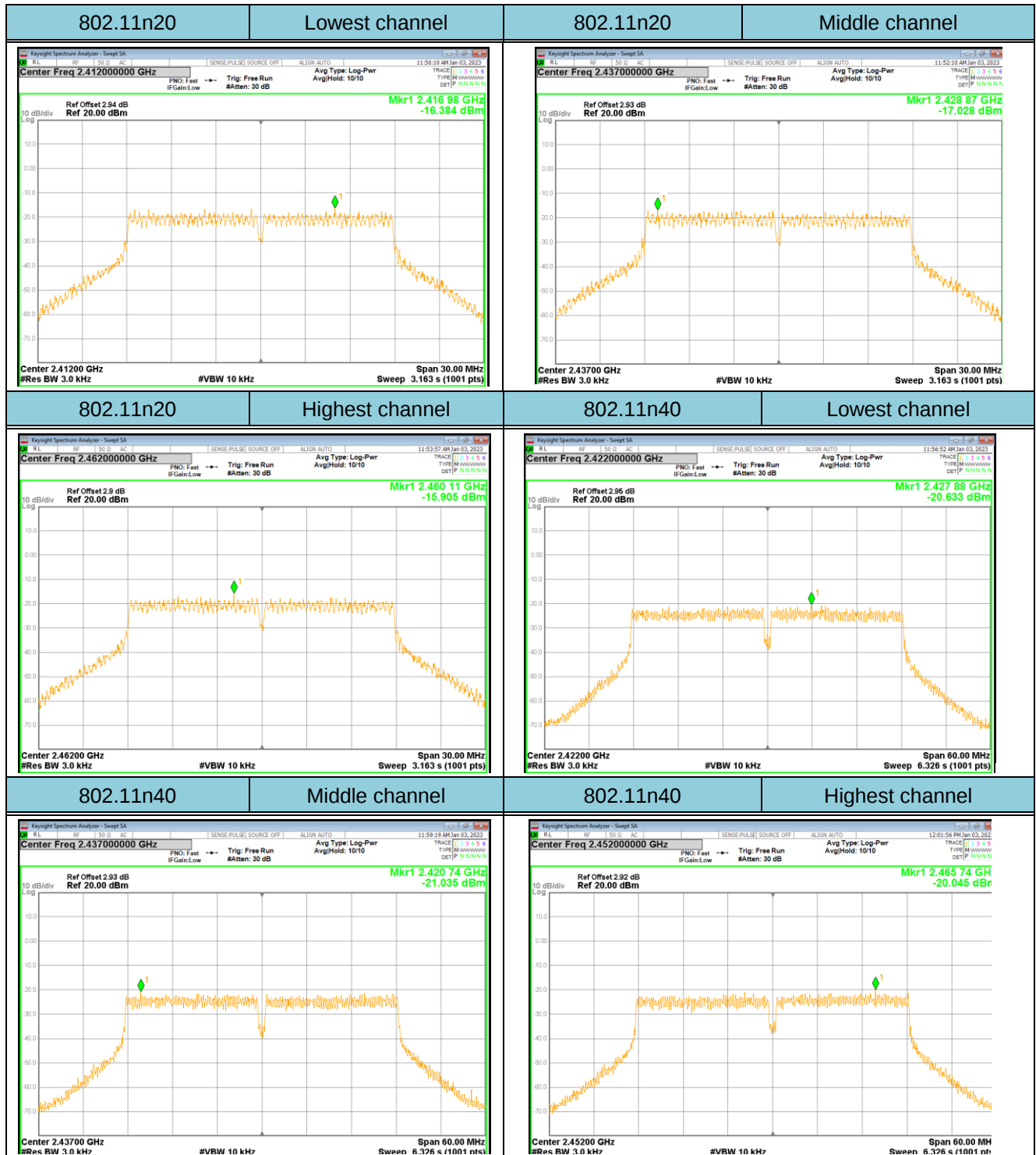
(RTL8731BU Module)

Test CH	Power Spectral Density (dBm/3kHz)				Limit (dBm/3kHz)	Result
	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)		
Lowest	-9.664	-12.370	-12.715	-16.972	8.00	Pass
Middle	-9.894	-12.648	-12.661	-17.660		
Highest	-9.928	-12.887	-12.955	-17.320		

Test plot as follows:

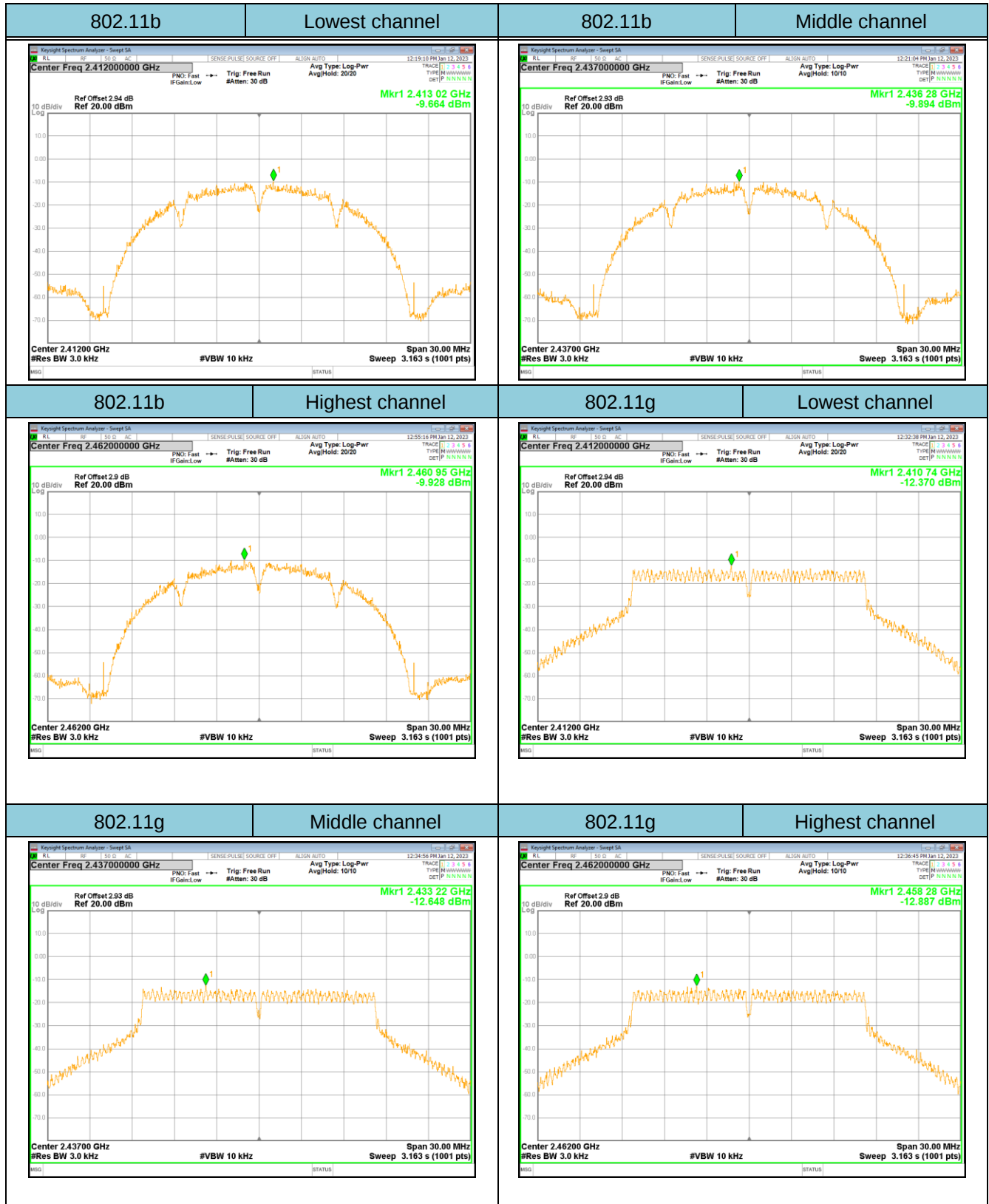
(RTL8822CU Module)

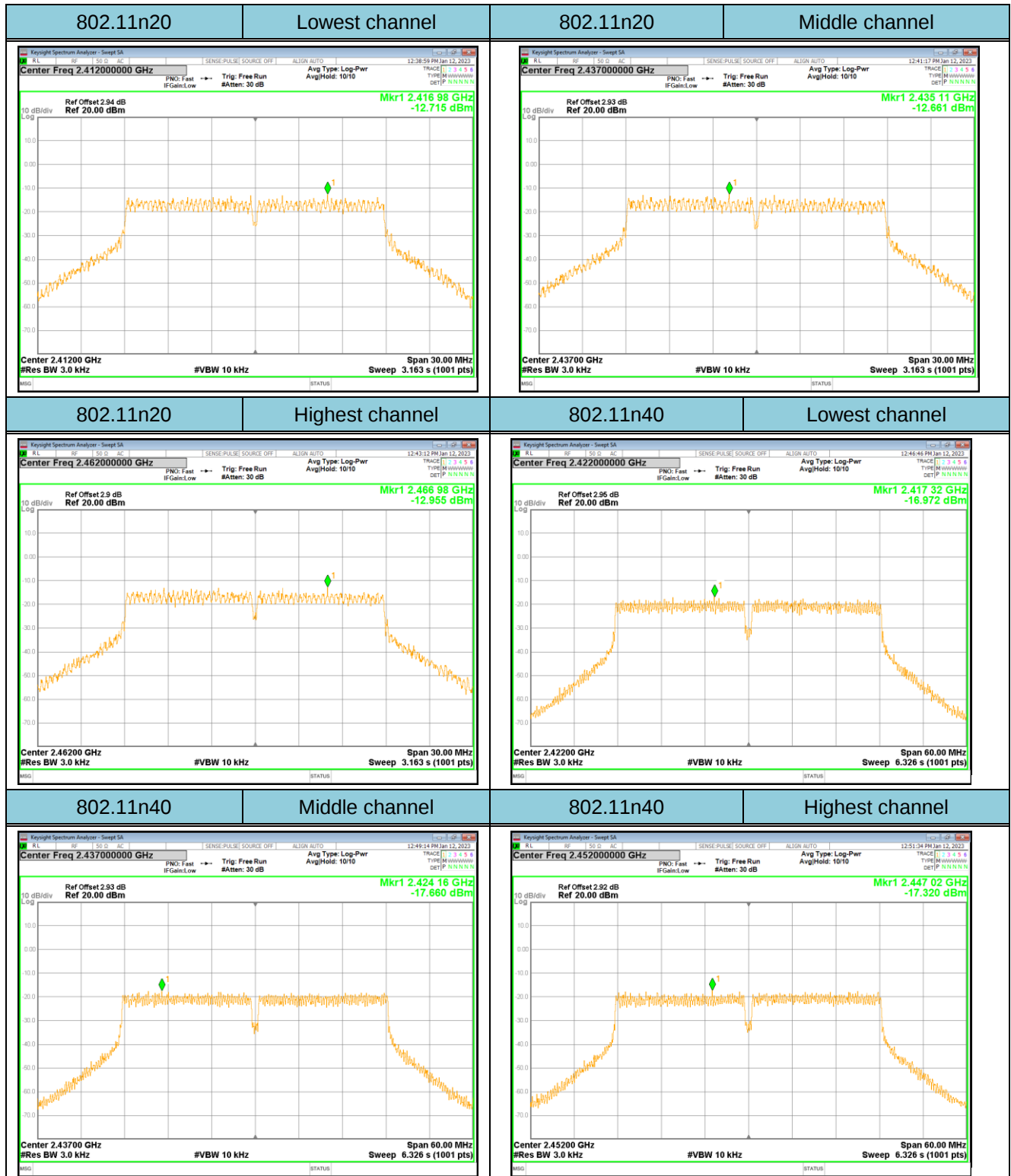




Test plot as follows:

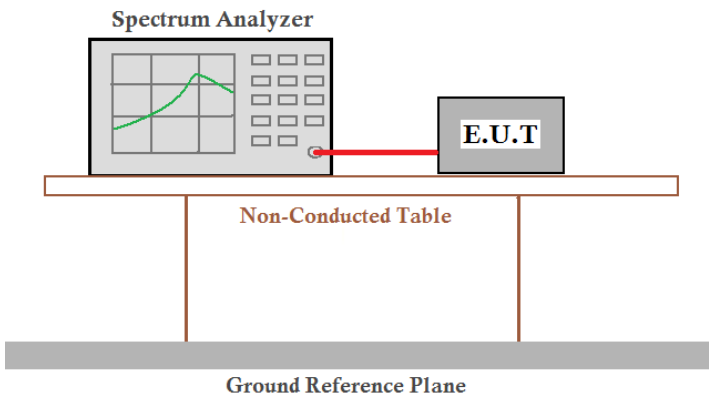
RTL8731BU Module





4.6 Band edges

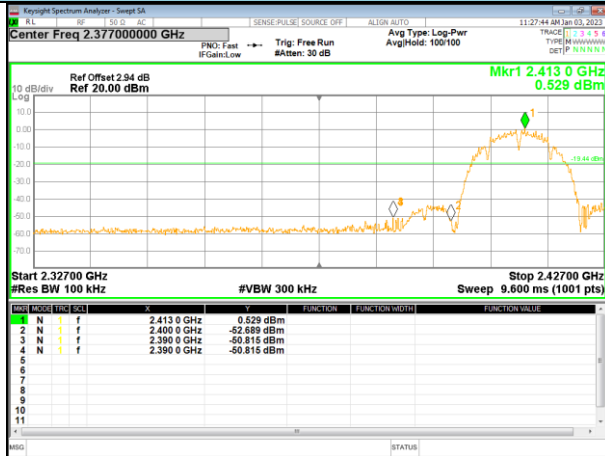
Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d), RSS-247 §5.2.b
Test Method:	KDB 558074 D01 15.247 Meas Guidance v05r02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 3.0 for details
Test mode:	Refer to section 2.2 for details
Test results:	Pass

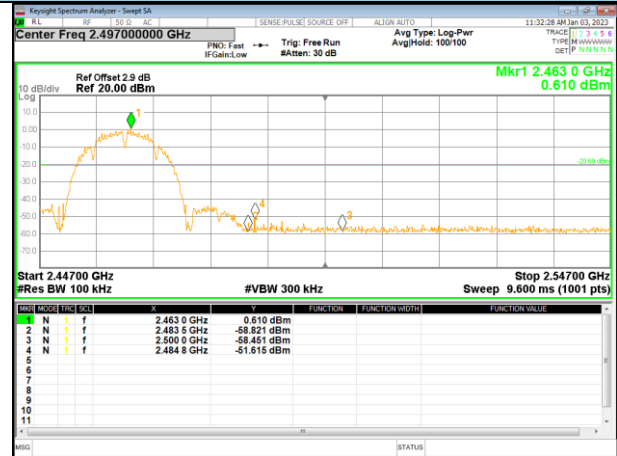
Test plot as follows: (RTL8822CU Module)

Test mode:

802.11b



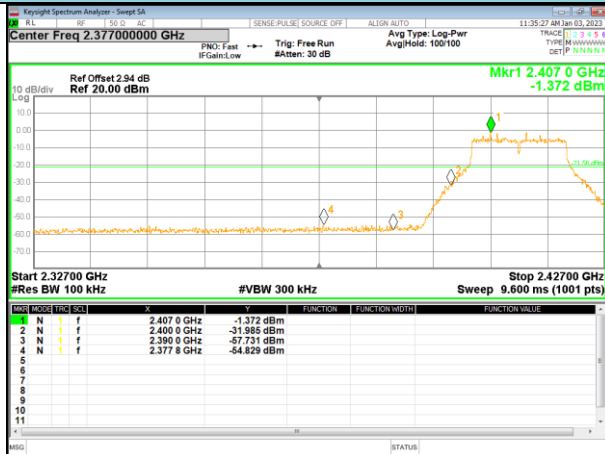
Lowest channel



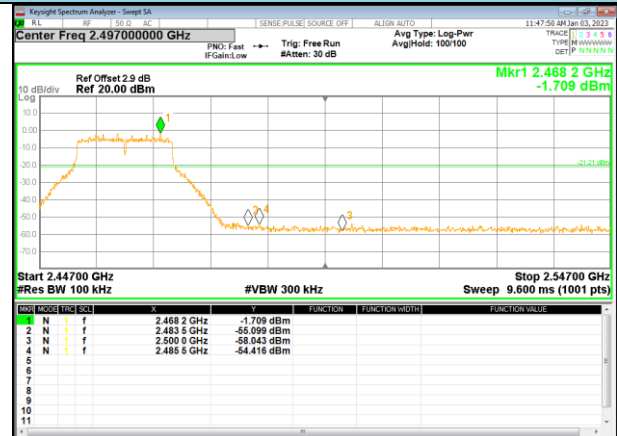
Highest channel

Test mode:

802.11g



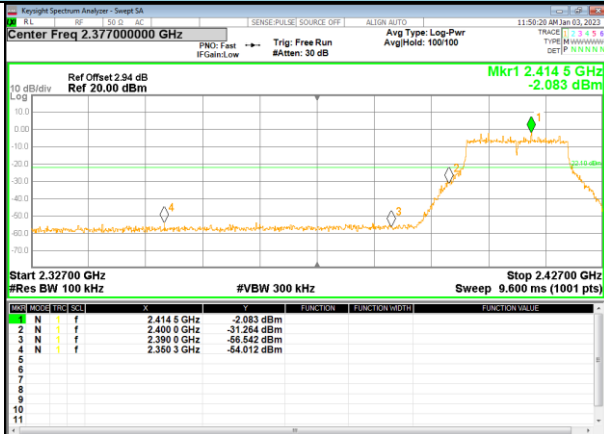
Lowest channel



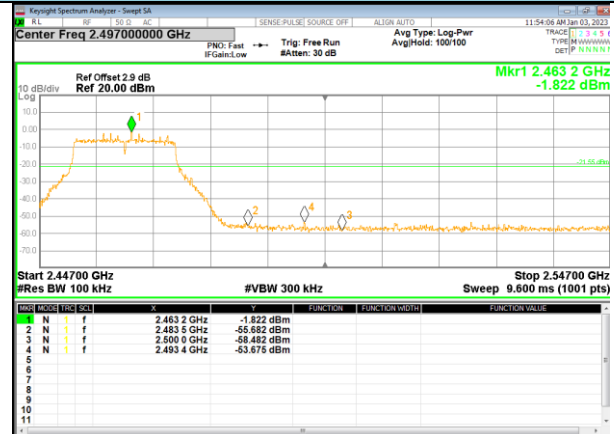
Highest channel

Test mode:

802.11n20



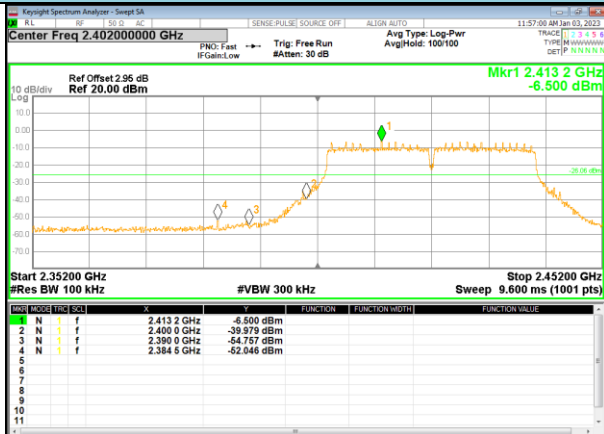
Lowest channel



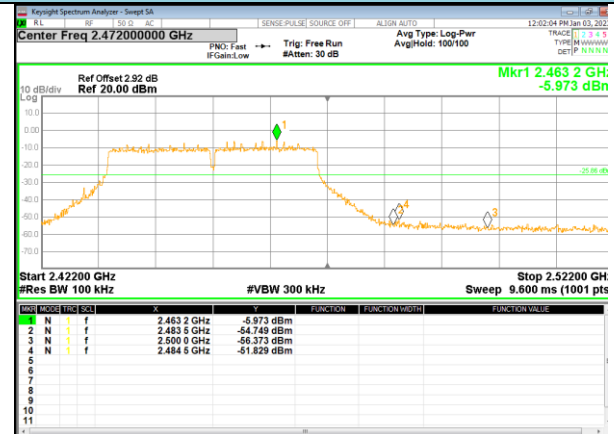
Highest channel

Test mode:

802.11n40



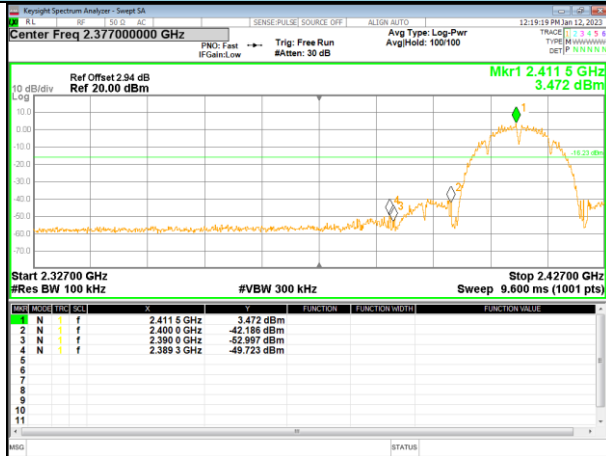
Lowest channel



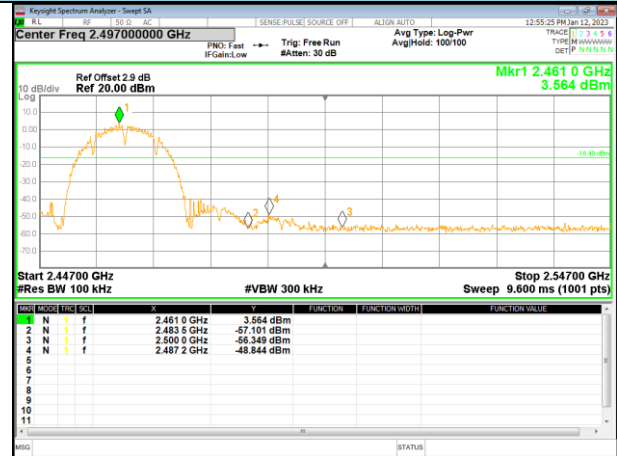
Highest channel

Test plot as follows: (RTL8731BU Module)

Test mode: 802.11b

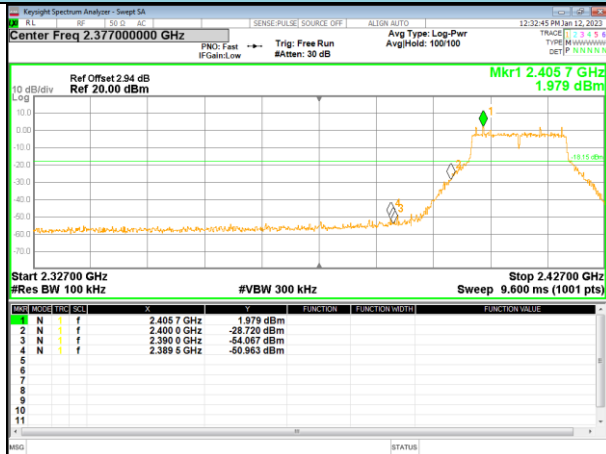


Lowest channel

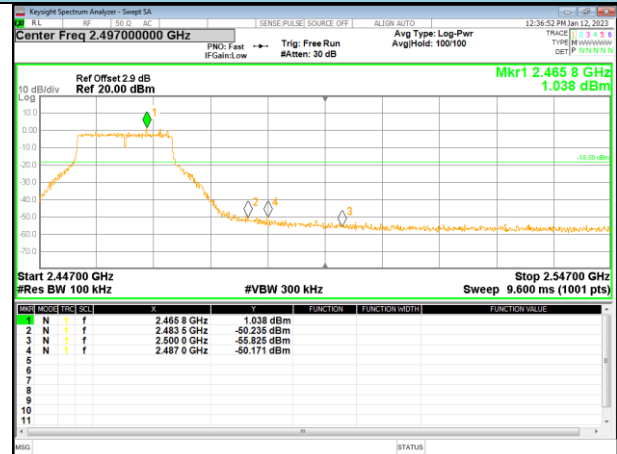


Highest channel

Test mode: 802.11g



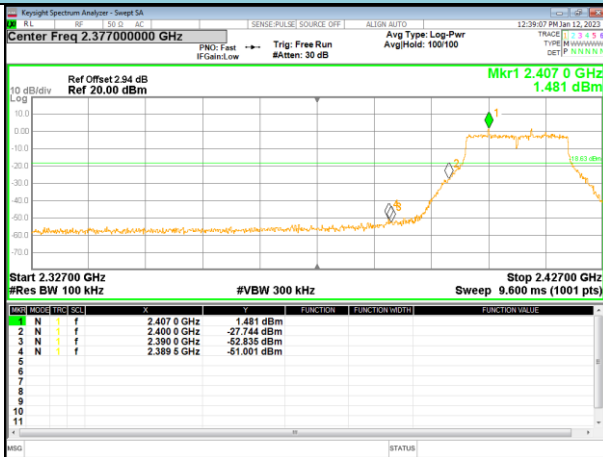
Lowest channel



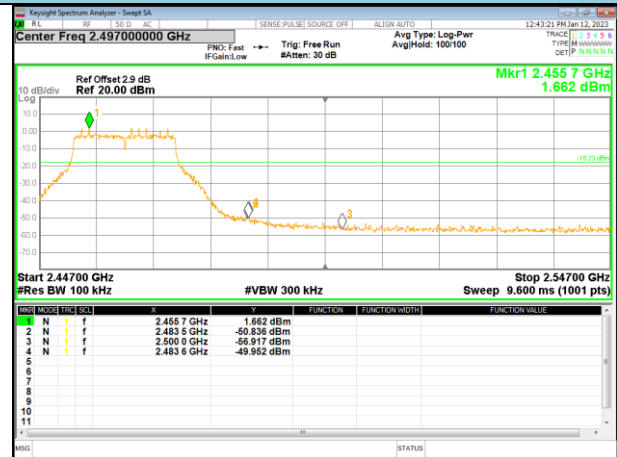
Highest channel

Test mode:

802.11n20



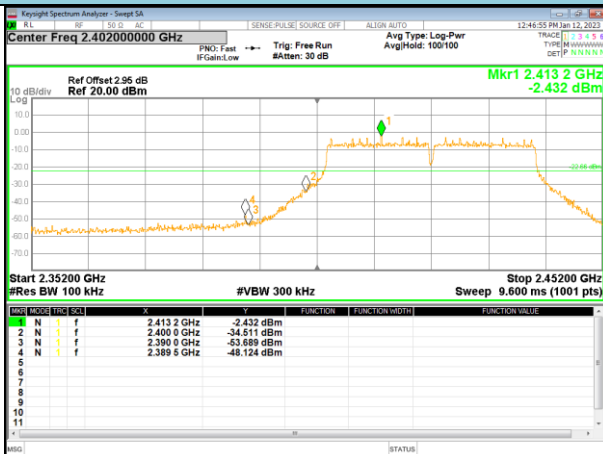
Lowest channel



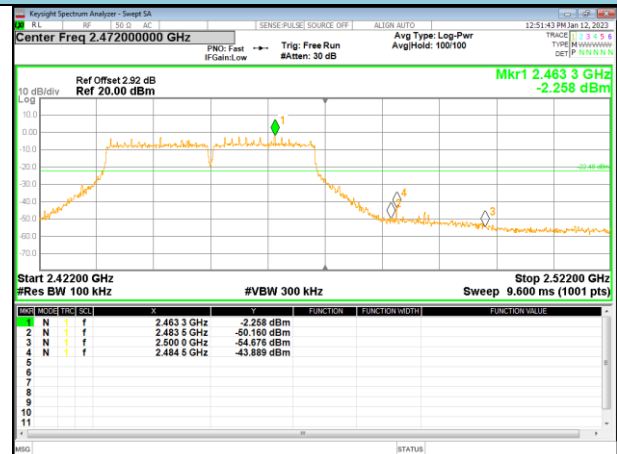
Highest channel

Test mode:

802.11n40



Lowest channel



Highest channel