

FCC/ISED Test Report

Prepared for: Garmin International, Inc.

Address: 1200 E. 151st Street
Olathe, Kansas, 66062, USA

Product: A04828

Test Report No: R20250124-00-E2 **Rev:** B

Approved by: 
Fox Lane
EMC Test Engineer

DATE: July 28, 2025

Total Pages: 81

The Nebraska Center for Excellence in Electronics (NCEE) authorizes the above-named company to reproduce this report provided it is reproduced in its entirety for use by the company's employees only. Any use that a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. NCEE accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report applies only to the items tested.



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

REVISION PAGE

Rev. No.	Date	Description
0	11 July 2025	Issued by FLane Prepared by FLane, ESchmidt
A	22 July 2025	Added FVIN in Section 2.1, Added plots for 1-25GHz scans in Section 4.4 – ES
B	28 July 2025	Updated to new RSS-247 Issue 4



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

CONTENTS

Revision Page 2

1.0 Summary of test results.....4

2.0 EUT Description5

2.1 Equipment under test5

2.2 Description of test modes5

2.3 Description of support units.....5

3.0 Laboratory and General Test Description6

3.1 Laboratory description.....6

3.2 Test personnel.....6

3.3 Test equipment.....7

3.4 General Test Procedure and Setup for Radio Measuremnts.....8

4.0 Results10

4.1 Output Power14

4.2 Bandwidth.....15

4.3 Duty Cycle16

4.4 Radiated emissions.....20

4.5 Conducted Spurious Emissions29

4.6 Band edges35

4.7 Power Spectral Density.....36

4.8 Conducted AC Mains Emissions37

Appendix A: Sample Calculation42

Appendix B – Measurement Uncertainty43

Appendix C – Graphs and Tables44

REPORT END.....81

	Report Number:	R20250124-00-E2	Rev	B
	Prepared for:	Garmin International, Inc.		

1.0 SUMMARY OF TEST RESULTS

The worst-case measurements were reported in this report. Summary of test results presented in this report correspond to the following standards/section(s):

- (1) US Code of Federal Regulations, Title 47, Part 15
- (2) ISED RSS-Gen, Issue 5
- (3) ISED RSS-247, Issue 4

APPLIED STANDARDS AND REGULATIONS		
Standard Section	Test Type	Result
FCC Part 15.35 RSS Gen, Issue 5, Section 6.10	Duty Cycle	Pass
FCC Part 15.247(b)(3) RSS-247 Issue 4 Section 6.3	Peak output power	Pass
FCC Part 15.247(a)(2) RSS-247 Issue 4 Section 6.3	Bandwidth	Pass
FCC Part 15.209 RSS-Gen Issue 5, Section 7.3	Receiver Radiated Emissions	Pass
FCC Part 15.209 (restricted bands), 15.247 (unrestricted) RSS-247 Issue 4 Section 6.6, RSS-Gen Issue 5, Section 8.9	Transmitter Radiated Emissions	Pass
FCC Part 15.247(e) RSS-247 Issue 4 Section 6.3	Power Spectral Density	Pass
FCC Part 15.209, 15.247(d) RSS-247 Issue 4 Section 6.6	Band Edge Measurement	Pass
FCC Part 15.207 RSS-Gen Issue 5, Section 8.8	Conducted Emissions	Pass



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

Summary and Operating Condition:

EUT	A04828
FCC ID	IPH-04828
IC ID	1792A-04828
FVIN	1.01
EUT Received	8 May 2025
EUT Tested	8 May 2025- 6 June 2025
Serial No.	3489571855 (Radiated Sample) 3489571782 (Conducted Sample)
Operating Band	2400 – 2483.5 MHz
Device Type	<input type="checkbox"/> GMSK <input type="checkbox"/> GFSK <input type="checkbox"/> BT BR <input type="checkbox"/> BT EDR 2MB <input type="checkbox"/> BT EDR 3MB <input checked="" type="checkbox"/> 802.11x
Power Supply / Voltage	Internal Battery / 5VDC Charger: Garmin (Phi Hong) Model: PSAI05R-050Q GPN: 362-00118-00 (Representative Power Supply)

NOTE: For more detailed features description, please refer to the manufacturer's specifications or user's manual.

2.2 DESCRIPTION OF TEST MODES

The operating range of the EUT is dependent on the device type found in section 2.1:

Data Rates:

Modulation	Low/High Data rate
802.11b	1MB/11MB
802.11g	6MB/54MB
802.11n	6.5MB/72.2MB

For 802.11x Transmissions:

Channel	Frequency
Low	2412 MHz
Mid	2437 MHz
High	2462 MHz

These are the only representative channels tested in the frequency range according to FCC Part 15.31 and RSS-Gen Table A1. See the operational description for a list of all channel frequencies and designations.

2.3 DESCRIPTION OF SUPPORT UNITS

None

3.0 LABORATORY AND GENERAL TEST DESCRIPTION

3.1 LABORATORY DESCRIPTION

All testing was performed at the following Facility:

The Nebraska Center for Excellence in Electronics (NCEE Labs)
 4740 Discovery Drive
 Lincoln, NE 68521

A2LA Certificate Number:	1953.01
FCC Accredited Test Site Designation No:	US1060
Industry Canada Test Site Registration No:	4294A
NCC CAB Identification No:	US0177

Environmental conditions varied slightly throughout the tests:

Relative humidity of $35 \pm 4\%$
 Temperature of $22 \pm 3^\circ$ Celsius



3.2 TEST PERSONNEL

No.	PERSONNEL	TITLE	ROLE
1	Fox Lane	Test Engineer	Testing, Review, and Report
2	Blake Winter	Test Engineer	Testing
3	Ethan Schmidt	Test Engineer	Testing and Report

Notes:

All personnel are permanent staff members of NCEE Labs. No testing or review was sub-contracted or performed by sub-contracted personnel.



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

3.3 TEST EQUIPMENT

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE DATE
Keysight MXE Signal Analyzer (44GHz)	N9038A	MY59050109	July 17, 2024	July 18, 2026
Keysight MXE Signal Analyzer (26.5GHz)	N9038A	MY56400083	July 17, 2024	July 18, 2026
Keysight EXA Signal Analyzer	N9010A	MY56070862	July 18, 2023	July 17, 2025
SunAR RF Motion	JB1	A082918-1	July 17, 2024	July 17, 2025
EMCO Horn Antenna	3117	29616	June 12, 2024	June 12, 2025
EMCO Horn Antenna	3116	2576	July 31, 2023	July 30, 2025
Agilent Preamp*	87405A	3207A01475	May 2, 2024	May 2, 2026
ETS Red Preamplifier (Orange)*	3115-PA	00218576	January 22, 2024	January 22, 2026
Trilithic High Pass Filter*	6HC330	23042	June 5, 2023	June 5, 2026
Tektronix Average Power Meter	PSM3110	118674	July 17, 2024	July 18, 2026
ETS – Lindgren- VSWR on 10m Chamber	10m Semi-anechoic chamber-VSWR	4740 Discovery Drive	May 15, 2024	May 15, 2027
NCEE Labs-NSA on 10m Chamber*	10m Semi-anechoic chamber-NSA	NCEE-001	May 22, 2024	May 22, 2026
RF Cables (3m Ant. to Control room Bulkhead)	MFR-57500	1E3874	January 20, 2024	January 20, 2026
RF Cable (antenna to 10m chamber bulkhead)*	FSCM 64639	01E3872	January 21, 2024	January 21, 2026
RF Cable (10m chamber bulkhead to control room bulkhead)*	FSCM 64639	01E3874	January 21, 2024	January 21, 2026
RF Cable (control room bulkhead to test receiver)*	FSCM 64639	01F1206	January 21, 2024	January 21, 2026
N connector bulkhead (10m chamber)*	PE9128	NCEEBH1	January 21, 2024	January 21, 2026
N connector bulkhead (control room)*	PE9128	NCEEBH2	January 21, 2024	January 21, 2026
TDK Emissions Lab Software	V11.25	700307	NA	NA

*Internal Characterization

Notes:

All equipment is owned by NCEE Labs and stored permanently at NCEE Labs facilities.

Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

3.4 GENERAL TEST PROCEDURE AND SETUP FOR RADIO MEASUREMENTS

Measurement type presented in this report (Please see the checked box below):

Conducted

The conducted measurements were performed by connecting the output of the transmitter directly into a spectrum analyzer using an impedance matched cable and connector soldered to the EUT in place of the antenna. The information regarding resolution bandwidth, video bandwidth, span and the detector used can be found in the graphs provided in Appendix C. All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

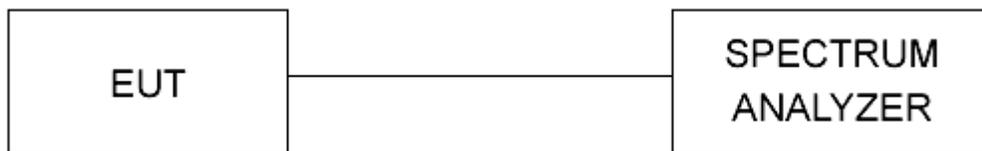


Figure 1 - Bandwidth Measurements Test Setup

Radiated ☒

All the radiated measurements were taken at a distance of 3m from the EUT. The information regarding resolution bandwidth, video bandwidth, span and the detector used can be found in the graphs provided in Appendix C. All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

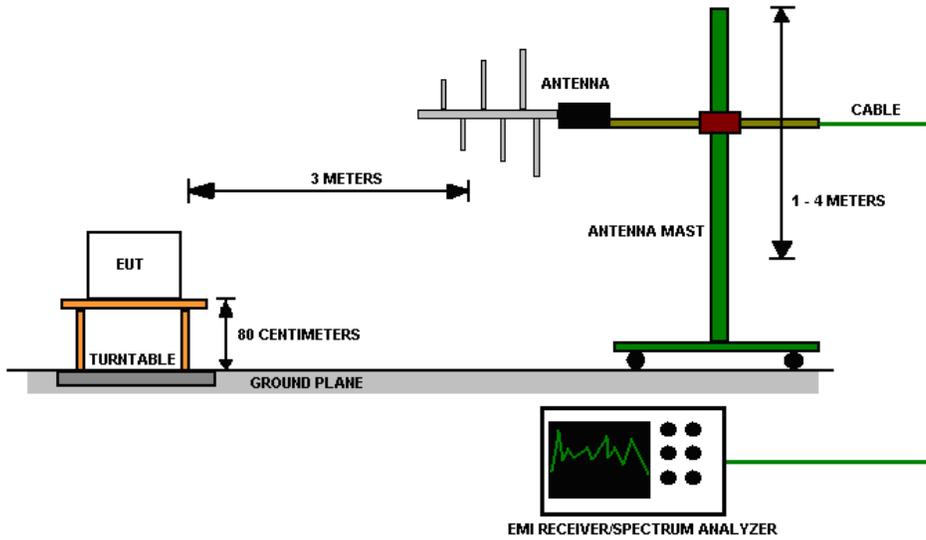


Figure 2 - Radiated Emissions Test Setup

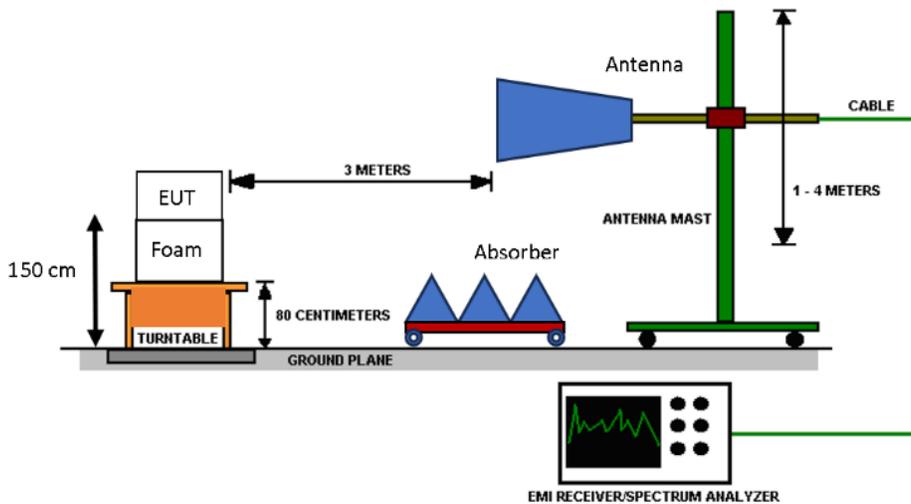


Figure 3 - Radiated Emissions Test Setup, >1GHz



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

4.0 RESULTS

DTS Radio Measurements Low Data Rate							
CHANNEL	Transmitter	Occupied Bandwidth (kHz)	6 dB Bandwidth (kHz)	PSD (dBm)	RESULT		
Low	802.11b	14142	8626	-5.905	PASS		
Mid	802.11b	14274	8963	-6.279	PASS		
High	802.11b	14529	9016	-5.891	PASS		
Low	802.11g	16558	16540	-9.085	PASS		
Mid	802.11g	16590	16530	-13.411	PASS		
High	802.11g	16553	16540	-10.036	PASS		
Low	802.11n	17602	17720	-10.947	PASS		
Mid	802.11n	17616	17740	-10.599	PASS		
High	802.11n	17599	17720	-12.107	PASS		
Occupied Bandwidth = N/A; 6 dB Bandwidth Limit = 500 kHz				PSD Limit = 8 dBm			
Unrestricted Band-Edge Low Data Rate							
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Relative Highest out of band level (dBm)	Relative Fundamental (dBm)	Delta (dB)	Min Delta (dB)	Result
Low	802.11b	2400.00	-28.193	9.253	37.45	30.00	PASS
Low	802.11g	2400.00	-30.463	7.392	37.86	30.00	PASS
Low	802.11n	2400.00	50.591	0.384	50.98	30.00	PASS
High	802.11b	2483.50	-45.889	10.269	56.16	30.00	PASS
High	802.11g	2483.50	-33.796	6.08	39.88	30.00	PASS
High	802.11n	2483.50	50.577	0.384	50.96	30.00	PASS
Radiated Peak Restricted Band-Edge Low Data Rate							
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Highest out of band level (dB μ V/m @ 3m)	Measurement Type	Limit (dB μ V/m @ 3m)	Margin	Result
Low	802.11b	2390.00	57.985	Peak	73.98	16.00	PASS
Low	802.11g	2390.00	67.551	Peak	73.98	6.43	PASS
Low	802.11n	2390.00	64.07	Peak	73.98	9.91	PASS
High	802.11b	2483.50	58.494	Peak	73.98	15.49	PASS
High	802.11g	2483.50	64.393	Peak	73.98	9.59	PASS
High	802.11n	2483.50	64.318	Peak	73.98	9.66	PASS
*Limit shown is the peak limit taken from FCC Part 15.209							



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

Average Restricted Band-Edge, Low Data Rate

Ch	Mode	Band edge /Measurement Frequency (MHz)	AVG Out of Band Level (dBuV/m @ 3m)	DCCF for Emissions (dB)	Corrected Out of band level (dBuV/m @ 3m)	Detector	Limit (dBuV/m @ 3m)	Margin	Result
Low	802.11b	2390.00	46.783	0.231	47.01	Average	53.98	6.97	PASS
Low	802.11g	2390.00	51.976	0.388	52.36	Average	53.98	1.62	PASS
Low	802.11n	2390.00	50.591	0.384	50.98	Average	53.98	3.00	PASS
High	802.11b	2483.50	48.065	0.231	48.30	Average	53.98	5.68	PASS
High	802.11g	2483.50	51.019	0.388	51.41	Average	53.98	2.57	PASS
High	802.11n	2483.50	50.577	0.384	50.96	Average	53.98	3.02	PASS

*Limit shown is the average limit taken from FCC Part 15.209 **Detector used was Avg, DCCF was added to Avg level to convert to true average

DTS Power Measurements, Low Data Rate (Power Meter)

CHANNEL	Mode	Raw Average Output Power (dBm)	DCCF (For Power)	Corrected Average Power (dBm)	Corrected Average Power (mW)	RESULT
Low	802.11b	17.956	0.115	18.071	64.140	PASS
Mid	802.11b	17.936	0.115	18.051	63.845	PASS
High	802.11b	18.200	0.115	18.315	67.847	PASS
Low	802.11g	16.304	0.194	16.498	44.648	PASS
Mid	802.11g	16.764	0.194	16.958	49.637	PASS
High	802.11g	15.042	0.194	15.236	33.389	PASS
Low	802.11n	14.588	0.192	14.780	30.062	PASS
Mid	802.11n	15.327	0.192	15.519	35.639	PASS
High	802.11n	13.910	0.192	14.102	25.717	PASS

Limit = 30dBm



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

DTS Radio Measurements, High Data Rate							
CHANNEL	Transmitter	Occupied Bandwidth (kHz)	6 dB Bandwidth (kHz)	PSD (dBm)	RESULT		
Low	802.11b	13657	8934	-3.796	PASS		
Mid	802.11b	13930	8889	-3.445	PASS		
High	802.11b	13989	8982	-3.16	PASS		
Low	802.11g	16497	16520	-12.695	PASS		
Mid	802.11g	16492	16530	-12.936	PASS		
High	802.11g	16495	16530	-12.907	PASS		
Low	802.11n	17523	17670	-16.65	PASS		
Mid	802.11n	17513	17620	-17.06	PASS		
High	802.11n	17539	17640	-16.536	PASS		
Occupied Bandwidth = N/A; 6 dB Bandwidth Limit =500 kHz				PSD Limit = 8 dBm			
Unrestricted Band-Edge, High Data Rate							
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Relative Highest out of band level (dBm)	Relative Fundamental (dBm)	Delta (dB)	Min Delta (dB)	Result
Low	802.11b	2400.00	-29.517	10.681	40.20	30.00	PASS
Low	802.11g	2400.00	-37.853	2.121	39.97	30.00	PASS
Low	802.11n	2400.00	45.639	3.466	49.10	30.00	PASS
High	802.11b	2483.50	-41.907	11.285	53.19	30.00	PASS
High	802.11g	2483.50	-41.92	2.171	44.09	30.00	PASS
High	802.11n	2483.50	47.246	3.466	50.71	30.00	PASS
Radiated Peak Restricted Band-Edge, High Data Rate							
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Highest out of band level (dB μ V/m @ 3m)	Measurement Type	Limit (dB μ V/m @ 3m)	Margin	Result
Low	802.11b	2390.00	58.112	Peak	73.98	15.87	PASS
Low	802.11g	2390.00	63.025	Peak	73.98	10.96	PASS
Low	802.11n	2390.00	60.315	Peak	73.98	13.67	PASS
High	802.11b	2483.50	59.162	Peak	73.98	14.82	PASS
High	802.11g	2483.50	62.53	Peak	73.98	11.45	PASS
High	802.11n	2483.50	61.01	Peak	73.98	12.97	PASS

*Limit shown is the peak limit taken from FCC Part 15.209



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

Average Restricted Band-Edge, High Data Rate

Ch	Mode	Band edge /Measurement Frequency (MHz)	Peak Out of Band Level (dBuV/m @ 3m)	DCCF for Emissions (dB)	Corrected Out of band level (dBuV/m @ 3m)	Detector	Limit (dBuV/m @ 3m)	Margin	Result
Low	802.11b	2390.00	46.378	1.668	48.05	Peak	53.98	5.93	PASS
Low	802.11g	2390.00	48.572	3.651	52.22	Peak	53.98	1.76	PASS
Low	802.11n	2390.00	45.639	3.466	49.10	Peak	53.98	4.88	PASS
High	802.11b	2483.50	47.217	1.668	48.88	Peak	53.98	5.10	PASS
High	802.11g	2483.50	49.384	3.651	53.04	Peak	53.98	0.94	PASS
High	802.11n	2483.50	47.246	3.466	50.71	Peak	53.98	3.27	PASS

*Limit shown is the average limit taken from FCC Part 15.209 **Detector used was Peak, DCCF was subtracted from Peak level to convert to average

DTS Power Measurements, High Data Rate (Power Meter)

CHANNEL	Mode	Raw Average Output Power (dBm)	DCCF (For Power)	Corrected Average Power (dBm)	Corrected Average Power (mW)	RESULT
Low	802.11b	16.293	0.834	17.127	51.605	PASS
Mid	802.11b	16.447	0.834	17.281	53.467	PASS
High	802.11b	17.916	0.834	18.750	74.987	PASS
Low	802.11g	11.626	1.826	13.452	22.139	PASS
Mid	802.11g	11.401	1.826	13.227	21.022	PASS
High	802.11g	11.469	1.826	13.295	21.353	PASS
Low	802.11n	8.777	1.733	10.510	11.245	PASS
Mid	802.11n	9.064	1.733	10.797	12.014	PASS
High	802.11n	8.617	1.733	10.350	10.839	PASS

Limit = 30dBm



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

4.1 OUTPUT POWER

Test Method:

Power measurements were performed using ANSI C63.10 Section 11.

Limits of power measurements:

For FCC Part 15.247 Device:

The maximum allowed output power is 30 dBm.

Test procedures:

Details can be found in section 3.4 of this report.

Deviations from test standard:

No deviation.

Test setup:

The device was directly connected to a calibrated average power meter.

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test results:

Pass

Comments:

1. All the output power plots can be found in Appendix C.
2. All the measurements were found to be compliant.
3. The measurements are listed in the tables in section 4.0.



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

4.2 BANDWIDTH

Test Method:

All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

Limits of bandwidth measurements:

For FCC Part 15.247 Device:

The 99% occupied bandwidth is for informational purposes only. The 6dB bandwidth of the signal must be greater than 500 kHz.

Test procedures:

Details can be found in section 3.4 of this report.

Deviations from test standard:

No deviation.

Test setup:

Test setup details can be found in section 3.4 of this report.

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test results:

Pass

Comments:

1. All the bandwidth plots can be found in Appendix C.
2. All the measurements were found to be compliant.
3. The measurements are listed in the tables in section 4.0.

4.3 DUTY CYCLE

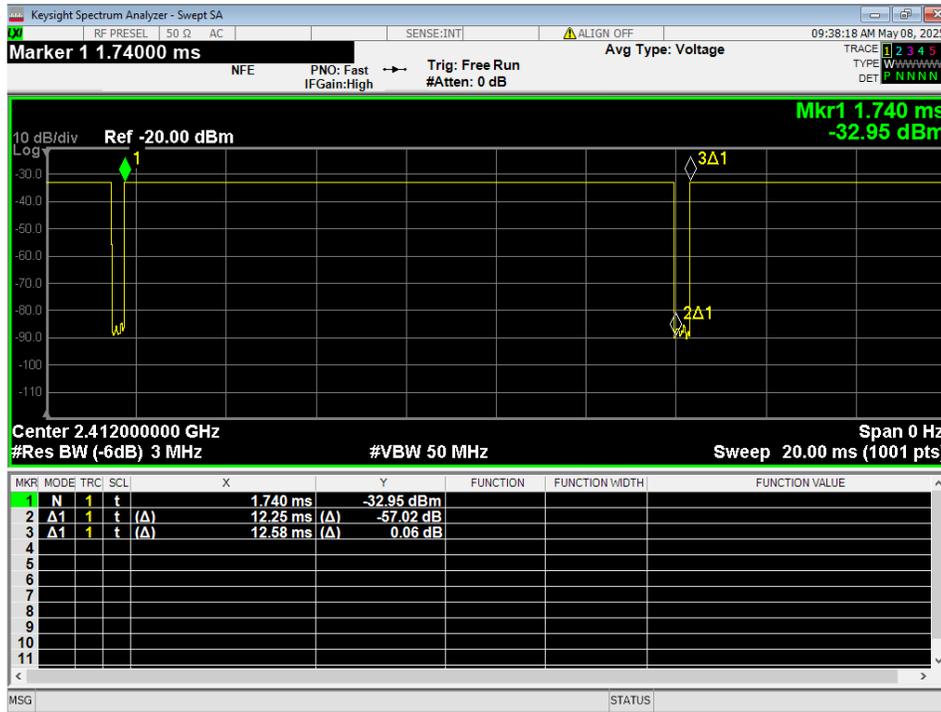


Figure 4 – Duty Cycle, 802.11b 1MB

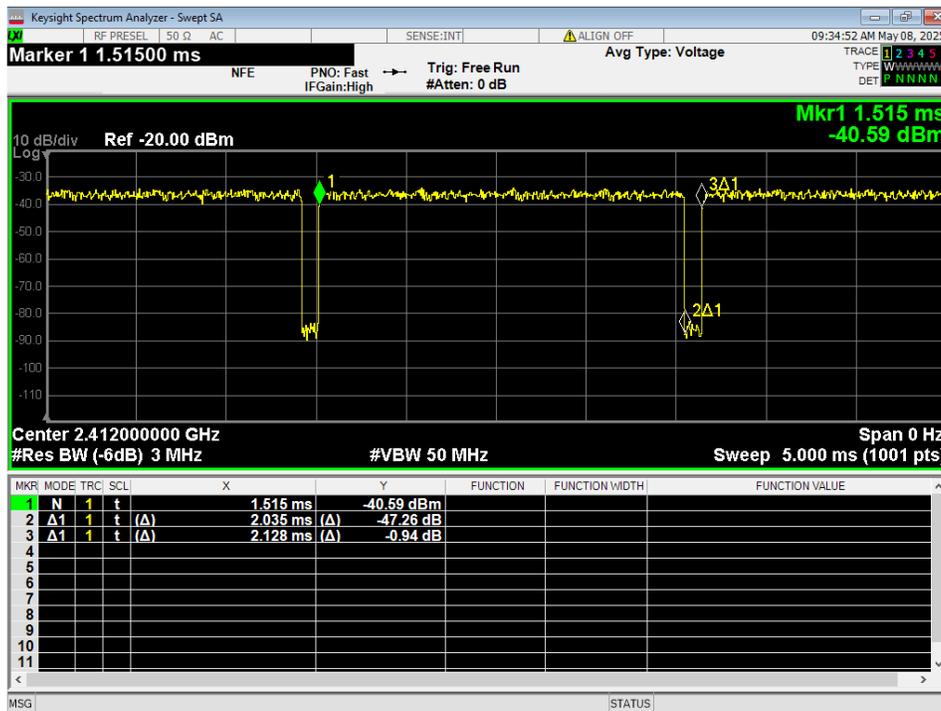


Figure 5 – Duty Cycle, 802.11G 6MB

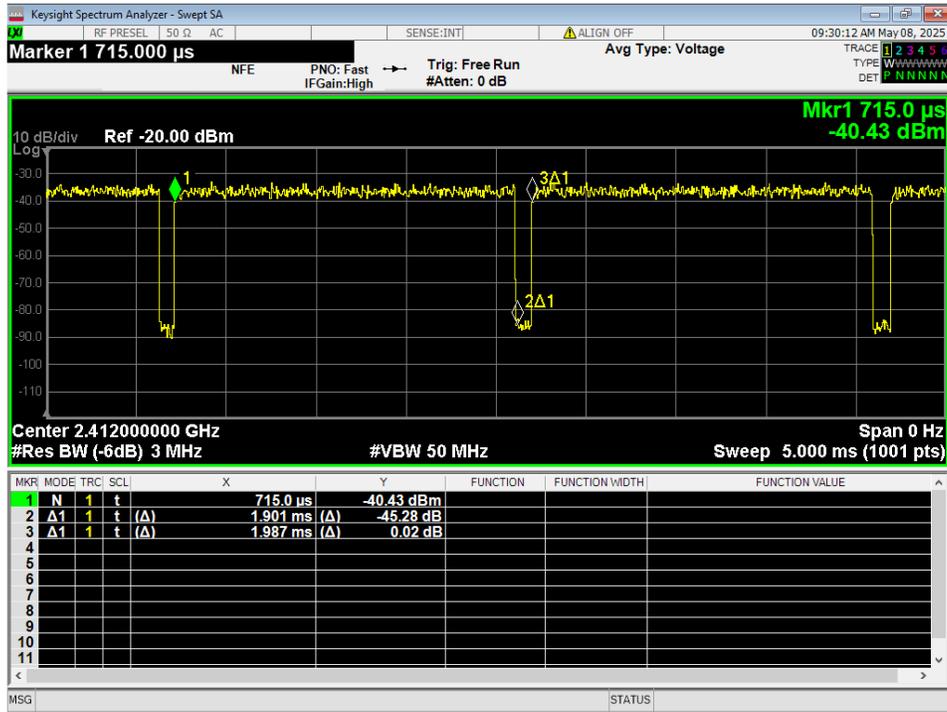


Figure 6 – Duty Cycle, 802.11N 6.5MB

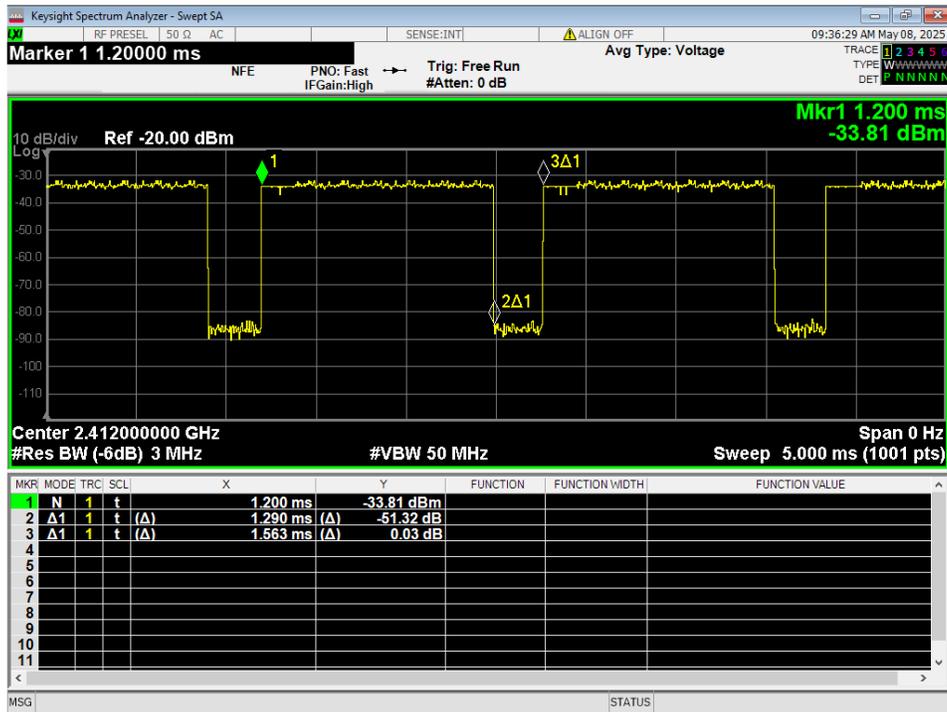


Figure 7 – Duty Cycle, 802.11b 11MB

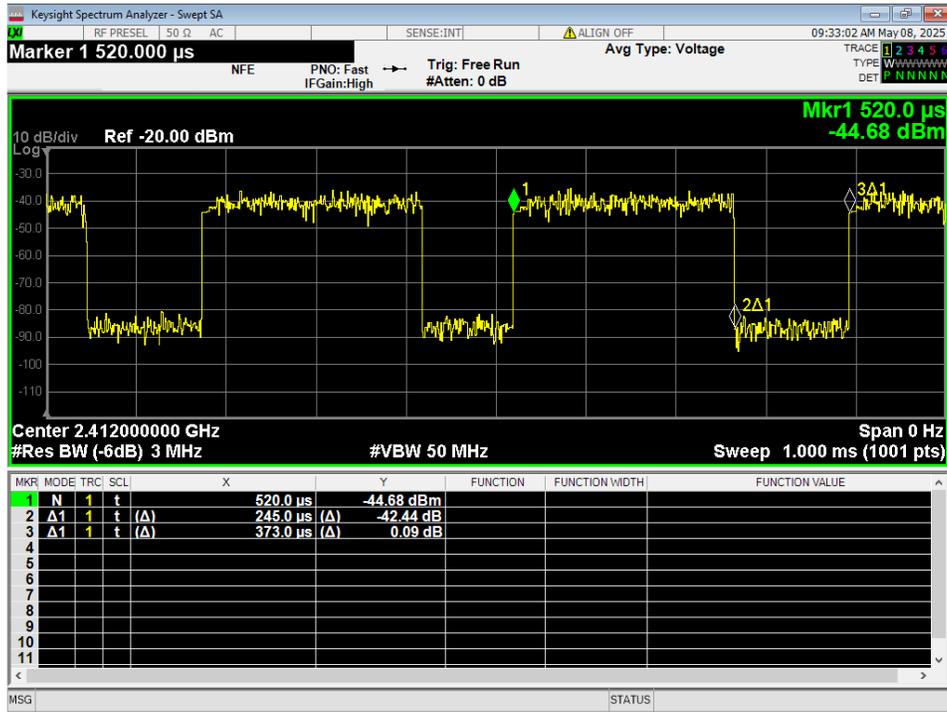


Figure 8 – Duty Cycle, 802.11G 54MB

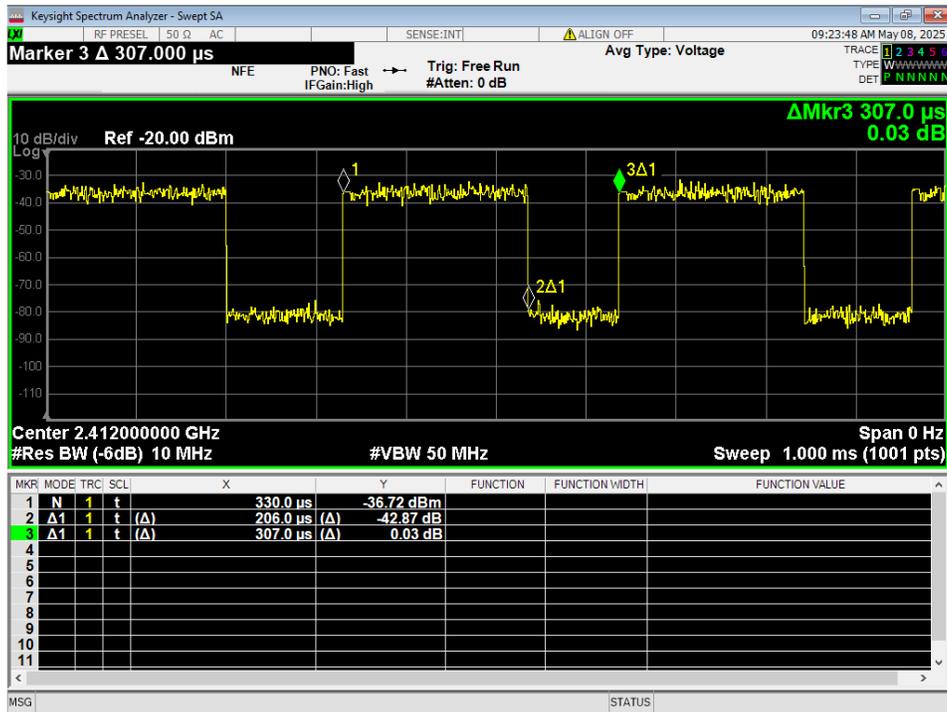


Figure 9 – Duty Cycle, 802.11N 72.2MB

	Report Number:	R20250124-00-E2	Rev	B
	Prepared for:	Garmin International, Inc.		

The following duty cycle and duty cycle correction factors (DCCF) were used where applicable.

Duty Cycle correction factor (for emissions) = $20 \cdot \log(\text{Duty cycle})$

Duty Cycle correction factor (for power) = $10 \cdot \log(\text{Duty Cycle})$

Duty cycle for Wi-Fi B 1MB: 0.974
Duty cycle correction factor (for emissions) for Wi-Fi B 1MB: 0.231dB
Duty Cycle correction factor (for power) for Wi-Fi B 1MB: 0.115dB

Duty cycle for Wi-Fi G 6MB: 0.956
Duty cycle correction factor (for emissions) for Wi-Fi G 6MB: 0.388dB
Duty Cycle correction factor (for power) for Wi-Fi G 6MB: 0.194dB

Duty cycle for Wi-Fi N 6.5MB: 0.957
Duty cycle correction factor (for emissions) for Wi-Fi N 6.5MB: 0.384dB
Duty Cycle correction factor (for power) for Wi-Fi N 6.5MB: 0.192dB

Duty cycle for Wi-Fi B 11MB: 0.825
Duty cycle correction factor (for emissions) for Wi-Fi B 11MB: 1.668 dB
Duty Cycle correction factor (for power) for Wi-Fi B 11MB: 0.834dB

Duty cycle for Wi-Fi G 54MB: 0.657
Duty cycle correction factor (for emissions) for Wi-Fi G 54MB: 3.651dB
Duty Cycle correction factor (for power) for Wi-Fi G 54MB: 1.826dB

Duty cycle for Wi-Fi N 72.2MB: 0.671
Duty cycle correction factor (for emissions) for Wi-Fi N 72.2MB: 3.466dB
Duty Cycle correction factor (for power) for Wi-Fi N 72.2MB: 1.733dB

4.4 RADIATED EMISSIONS

Test Method:

ANSI C63.10-2020, Section 6.5, 6.6

Limits for radiated emissions measurements:

Emissions radiated outside of the specified bands shall be applied to the limits in 15.209 as followed:

FREQUENCIES (MHz)	FIELD STRENGTH ($\mu\text{V/m}$)	MEASUREMENT DISTANCE (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = $20 * \log * \text{Emission level } (\mu\text{V/m})$.
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20dB under any condition of modulation.



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

Test procedures:

- a. The EUT was placed on the top of a rotating table above the ground plane in a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The table was 0.8m high for measurements from 30MHz-1Ghz and 1.5m for measurements from 1GHz and higher.

- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

- c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

- d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

- e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise, the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

- g. The EUT was maximized in all 3 orthogonal positions. The results are presented for the axis that had the highest emissions.

NOTE:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.

- 2. The resolution bandwidth 1 MHz for all measurements and at frequencies above 1GHz, A peak detector was used for all measurements above 1GHz. Measurements were made with an EMI Receiver.

Deviations from test standard:

No deviation.

EUT operating conditions

Details can be found in section 2.1 of this report.

Test results:

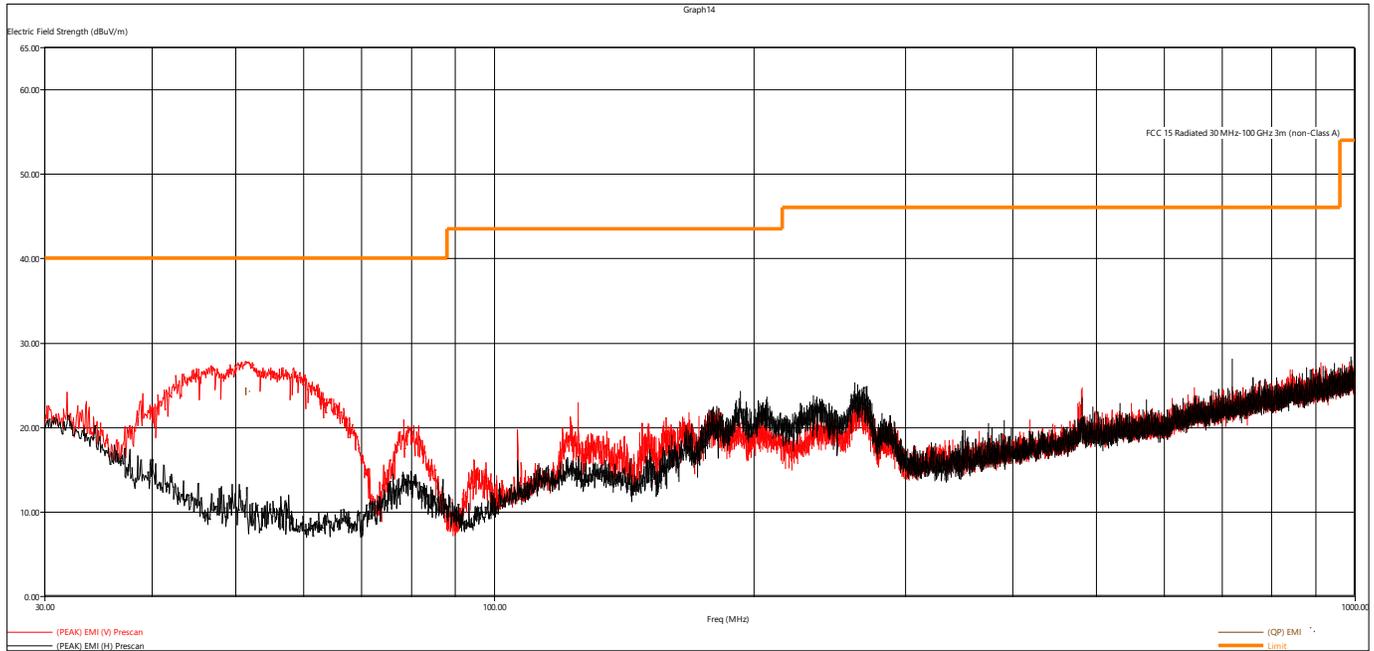


Figure 10 - Radiated Emissions Plot, Receive

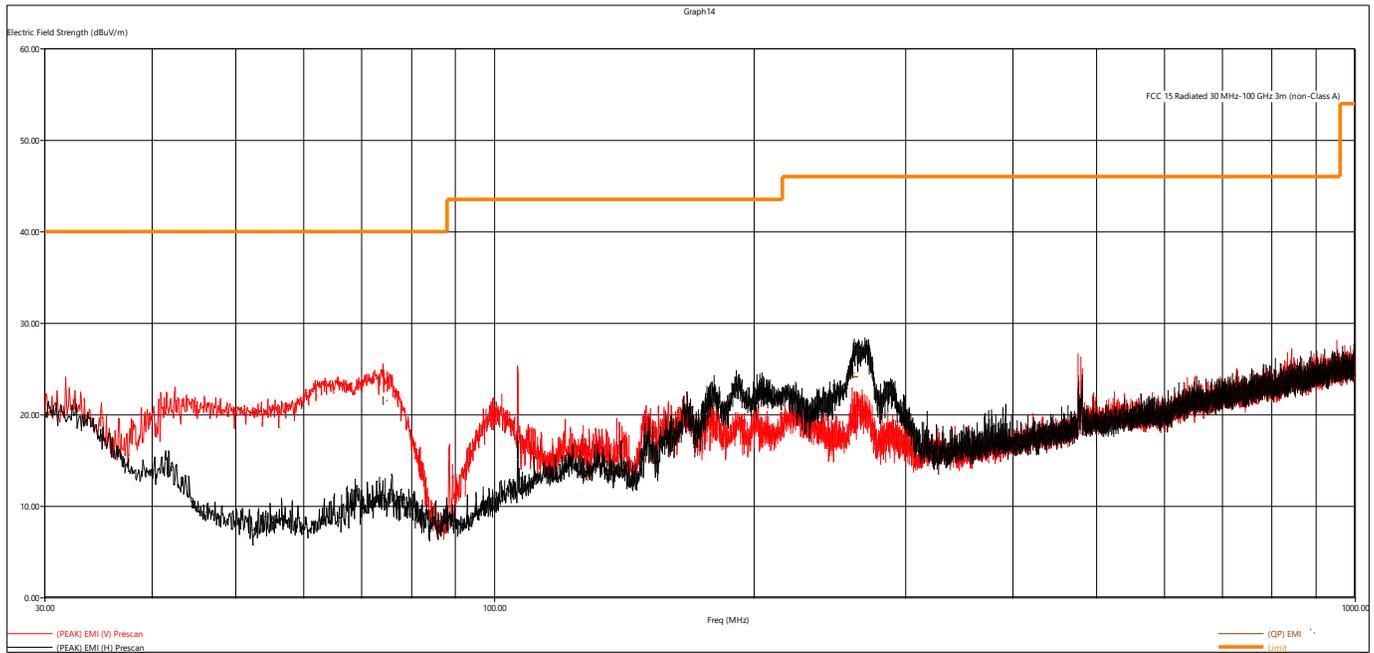


Figure 11 - Radiated Emissions Plot, 802.11b 1MB

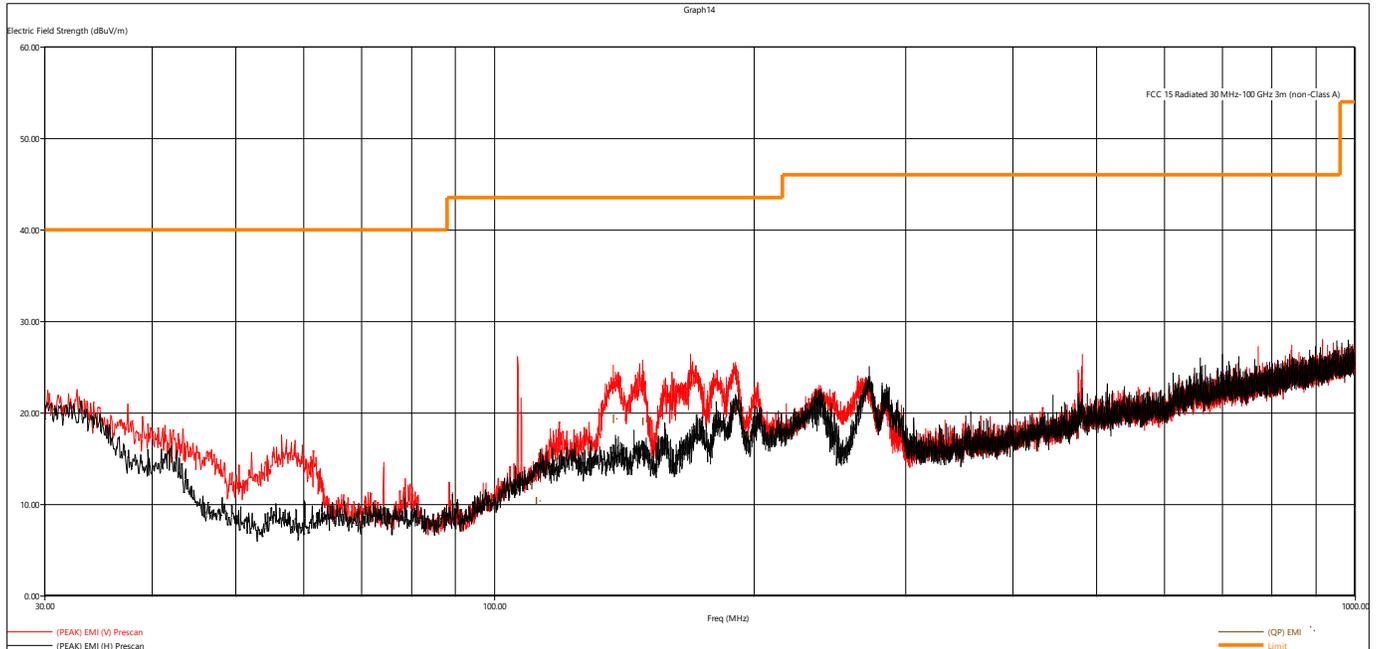


Figure 12 - Radiated Emissions Plot, 802.11b 11MB

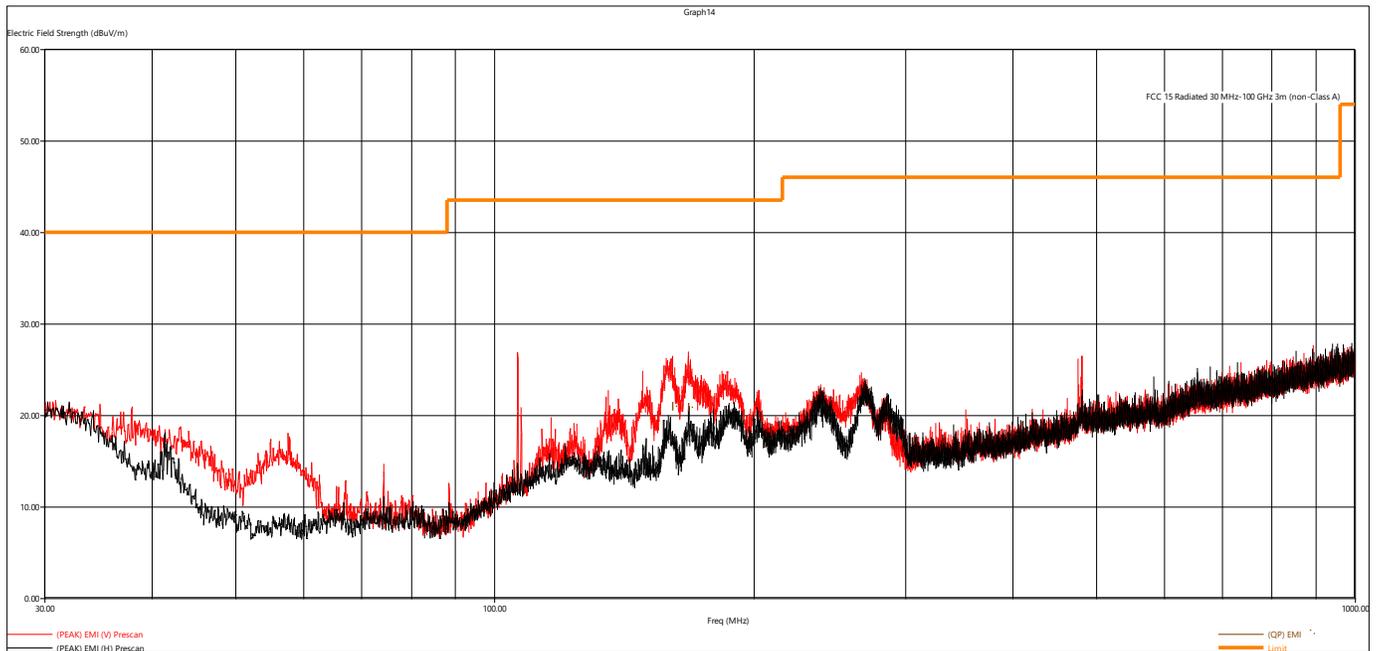


Figure 13 - Radiated Emissions Plot, 802.11g 6MB

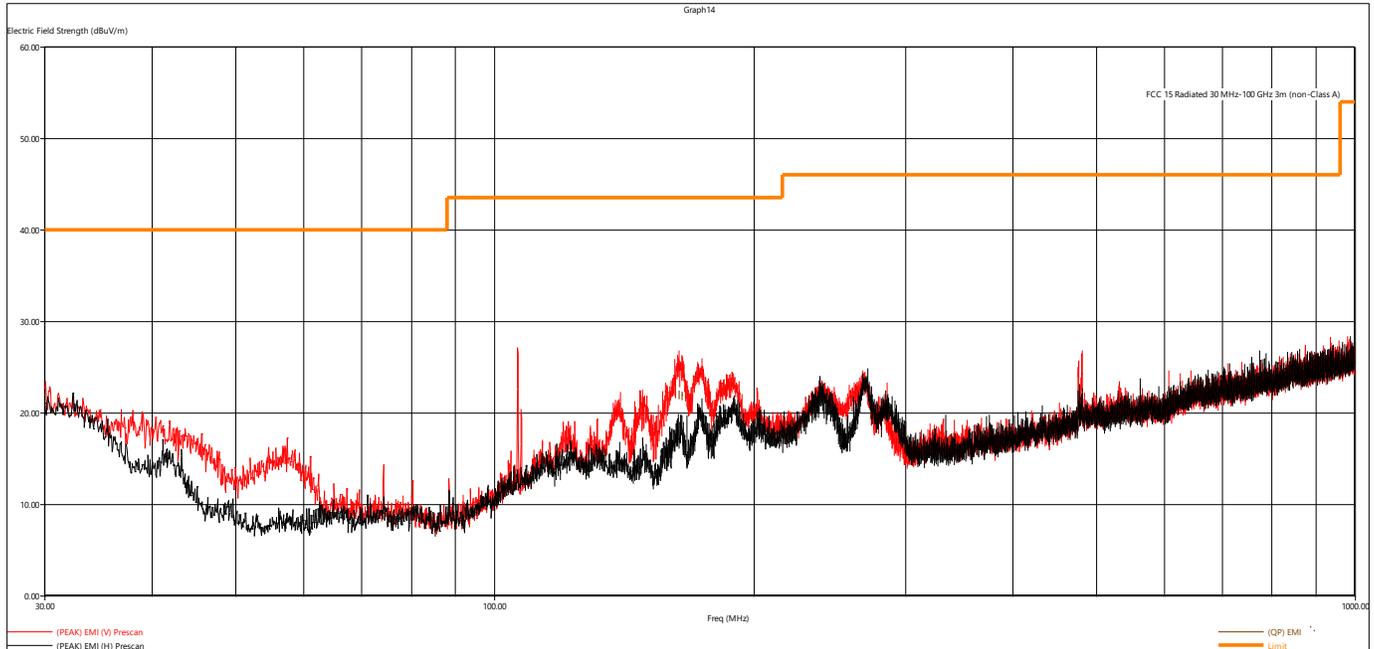


Figure 14 - Radiated Emissions Plot, 802.11g 54MB

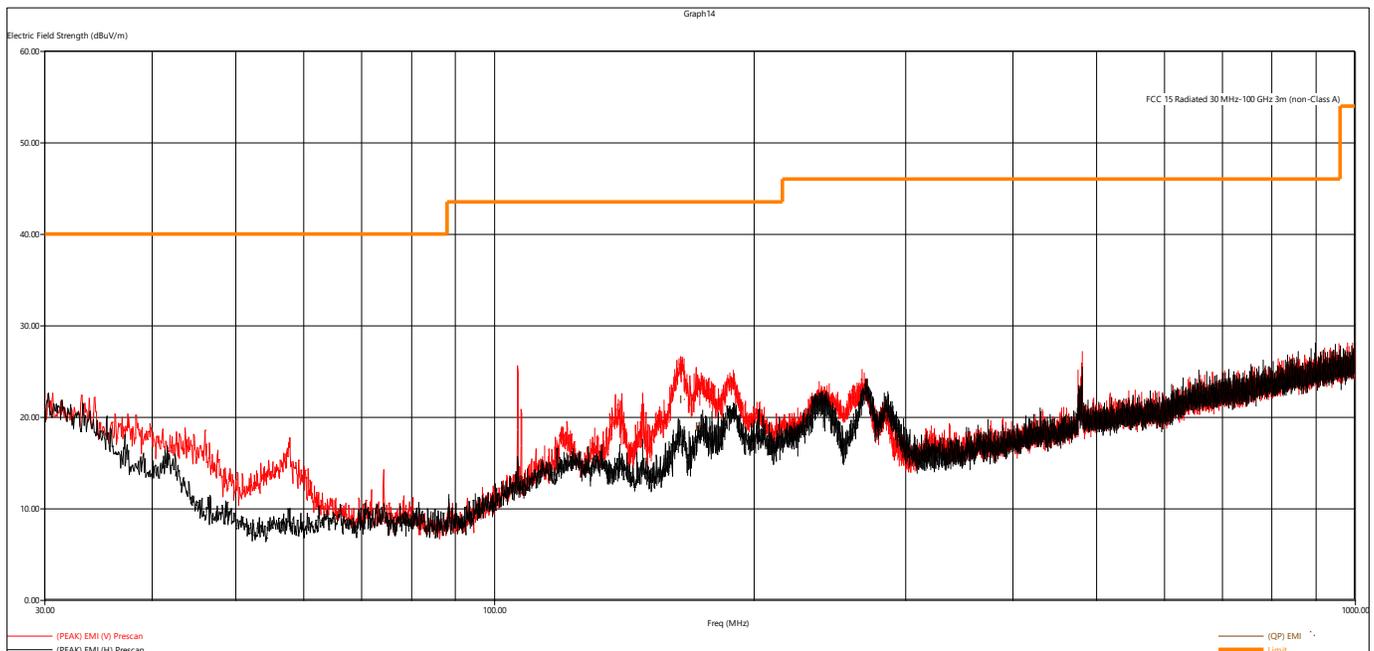


Figure 15 - Radiated Emissions Plot, 802.11n 6.5MB

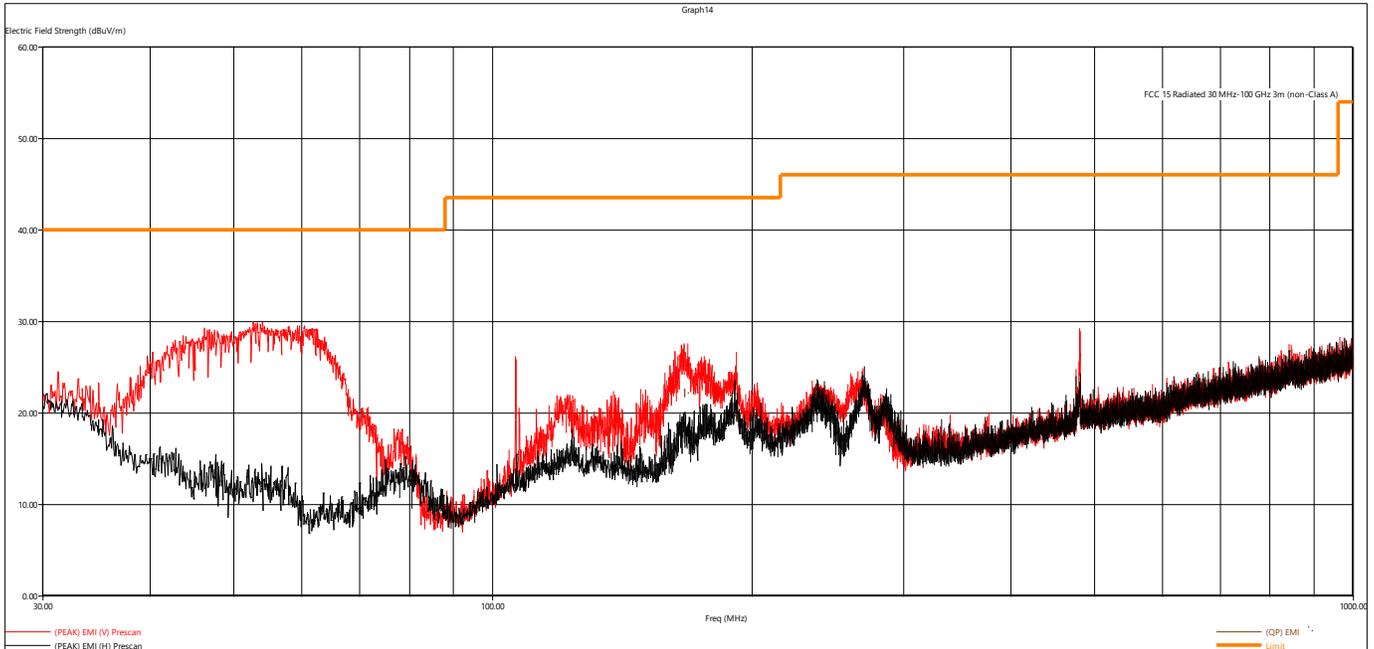


Figure 16 - Radiated Emissions Plot, 802.11n 72.2MB

Quasi-Peak Measurements, 802.11x							
Frequency	Level	Limit	Margin	Height	Angle	Pol	Modulation
MHz	dBuV/m	dBuV/m	dB	cm.	deg.		
51.349920	24.23	40.00	15.77	105.91	51.50	V	RX
261.564000	24.10	46.02	21.92	124.23	254.50	H	802.11b 1MB
74.213280	21.52	40.00	18.48	127.82	140.75	V	802.11b 1MB
137.187360	19.26	43.52	24.26	134.50	155.75	V	802.11b 11MB
148.427760	18.97	43.52	24.55	105.61	84.75	V	802.11b 11MB
168.847200	22.89	43.52	20.63	107.10	138.50	V	802.11b 11MB
190.461360	20.31	43.52	23.21	114.32	128.00	V	802.11b 11MB
160.731840	20.91	43.52	22.61	120.35	166.75	V	802.11g 6MB
167.812800	20.78	43.52	22.74	115.22	129.00	V	802.11g 6MB
163.659120	21.87	43.52	21.65	104.05	131.75	V	802.11g 54MB
165.006240	21.79	43.52	21.73	120.05	150.50	V	802.11g 54MB
164.069040	21.90	43.52	21.62	107.70	159.50	V	802.11n 6.5MB
171.335520	18.88	43.52	24.64	116.29	124.25	V	802.11n 6.5MB
166.541280	22.08	43.52	21.44	109.91	151.50	V	802.11n 72.2MB
191.869680	19.44	43.52	24.08	129.19	177.75	V	802.11n 72.2MB

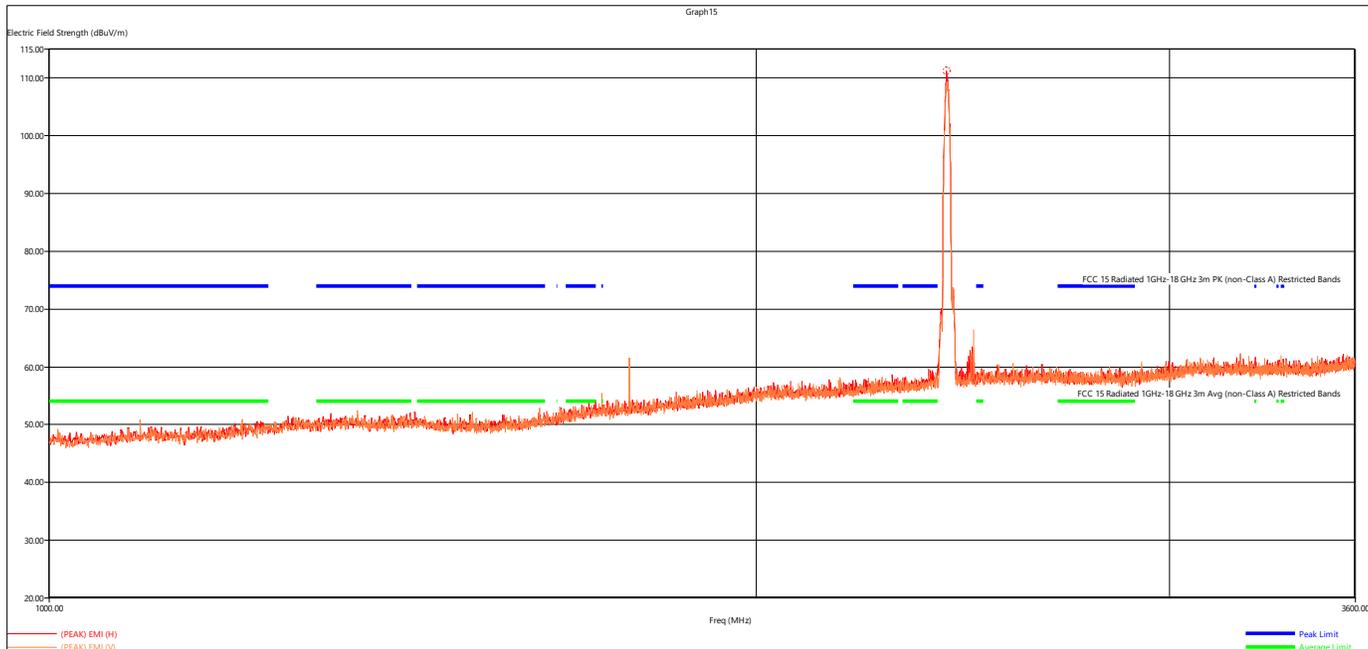


Figure 17 - Radiated Emissions Plot, 1-3.6GHz, 802.11b 11MB Low

Plot shows overages due to added attenuation to prevent receiver saturation; spurious emissions were investigated and found to be at least 6dB below applicable limits

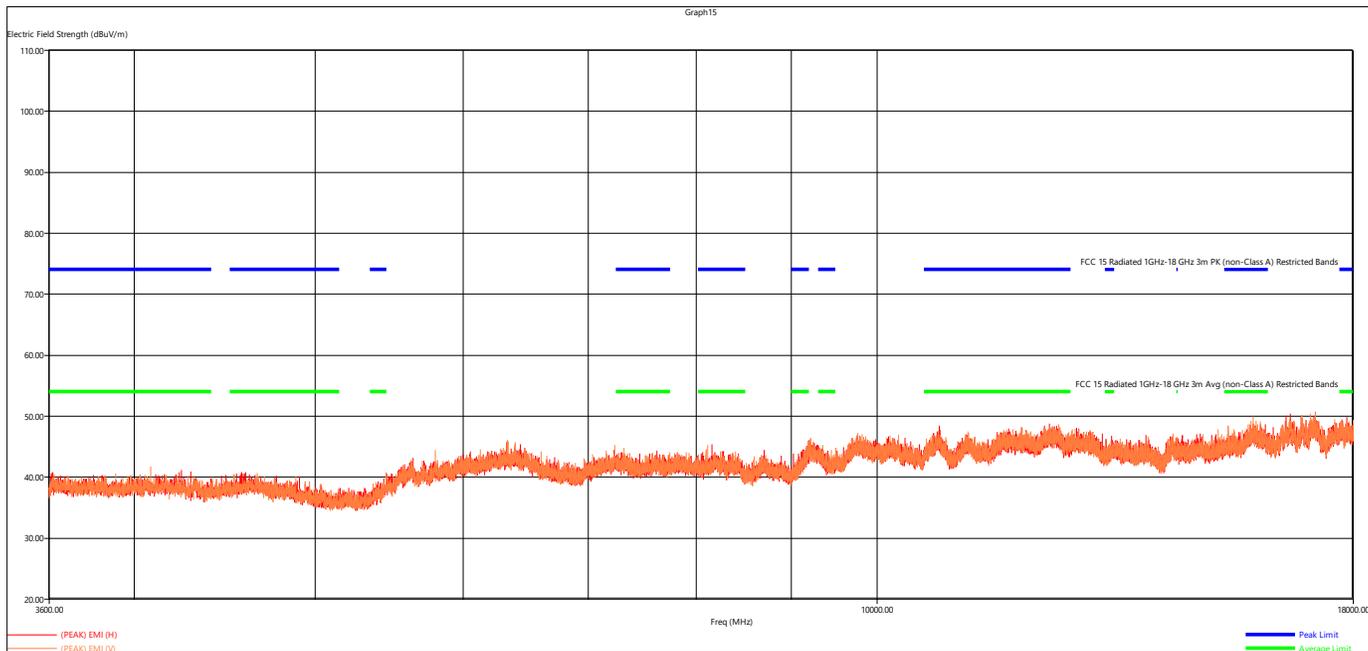


Figure 18 - Radiated Emissions Plot, 3.6-18GHz, 802.11b 11MB Low



Figure 19 – Radiated Emissions Plot, 18-21.5GHz, 802.11b 1MB Mid, 1m test distance

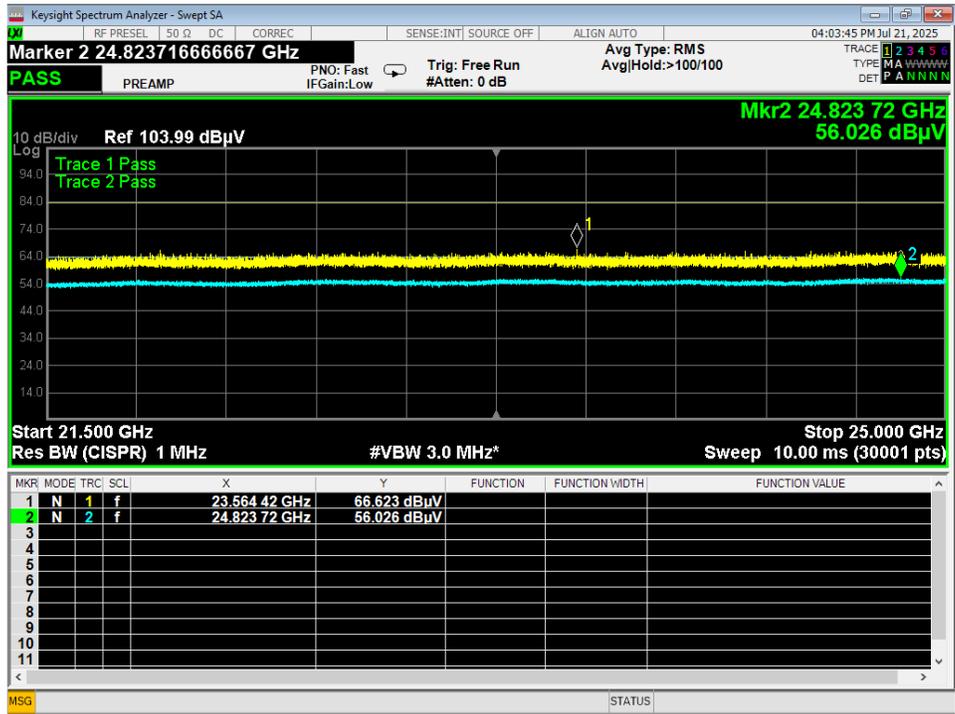


Figure 20 - Radiated Emissions Plot, 21.5-25GHz, 802.11b 1MB Mid, 1m test distance



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. Margin value = Limit value – Emission level
4. The worst-case plots from the 1-25GHz range are shown above. No measurements were found to be within 10dB of the applicable limits and therefore were not tabulated.



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

4.5 CONDUCTED SPURIOUS EMISSIONS

Test Method:

ANSI C63.10-2020, Section 6.7

Limits of spurious emissions:

From FCC Part 15.247:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated 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) (see § 15.205(c)).

Test procedures:

The highest emissions level was measured and recorded. All spurious measurements were evaluated to 30dB below the fundamental. More details can be found in section 3.4 of this report. The line shown in the plots is a reference line placed at -20dBm.

Deviations from test standard:

None.

Test setup:

Test setup details can be found in section 3.4 of this report.

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test results:

Data rates and channels were investigated and worst case was reported. No emissions exceeded the limits.

There was no distinguishable difference between low and high data rate for purposes of Conducted spurious.

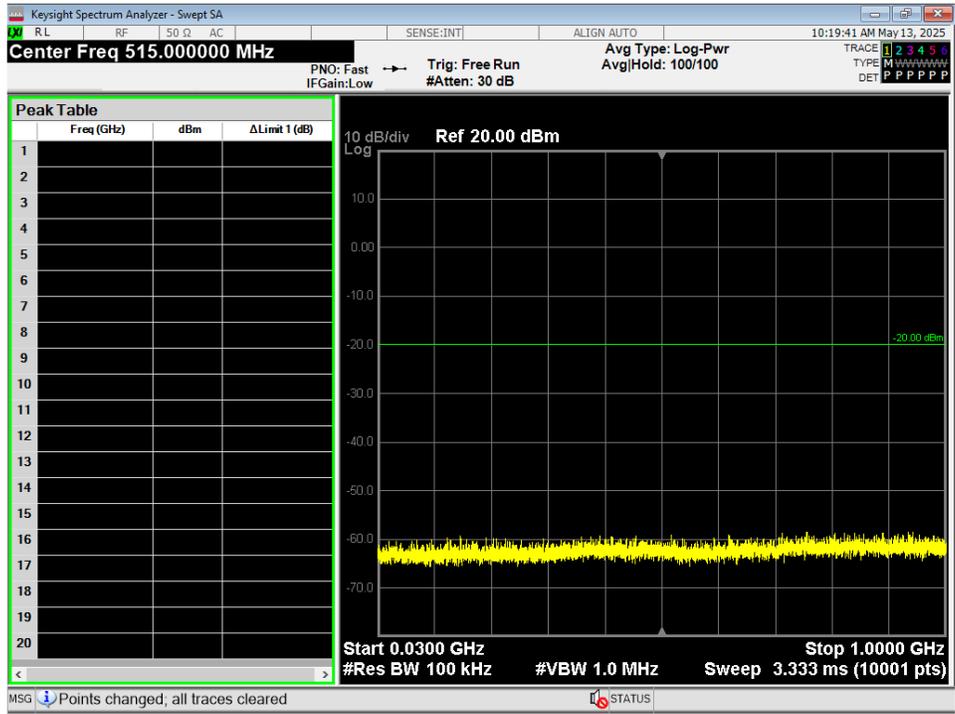


Figure 21 – Conducted Spurious Plot, WIFI 802.11b, 30M – 1G, Mid

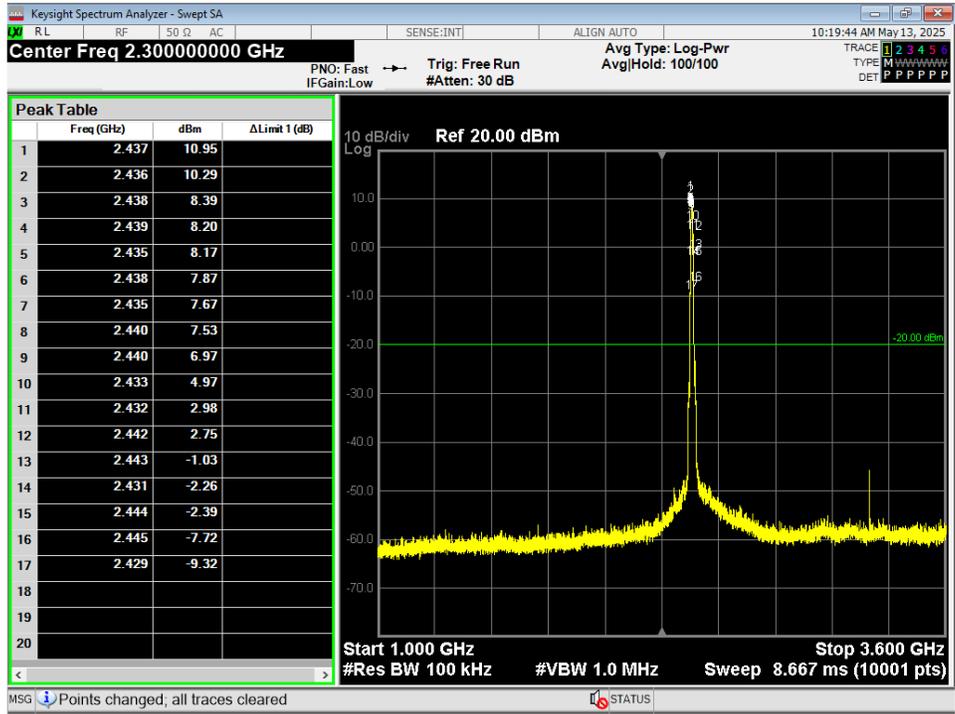


Figure 22 - Conducted Spurious Plot, WIFI 802.11b, 1G – 3.6G, Mid

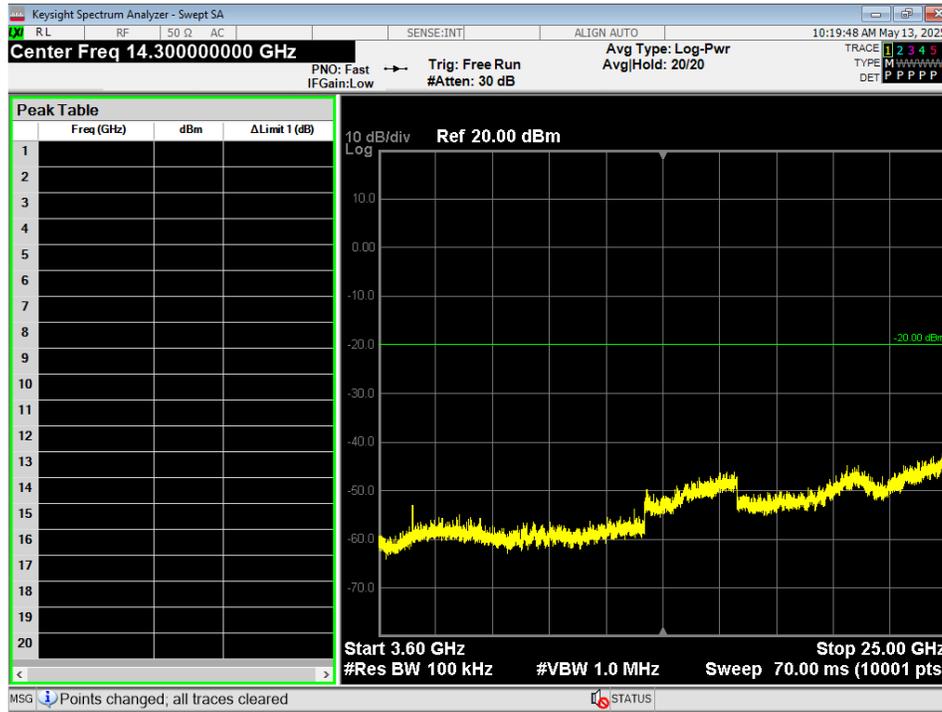


Figure 23 - Conducted Spurious Plot, WIFI 802.11b, 3.6G – 25G, Mid

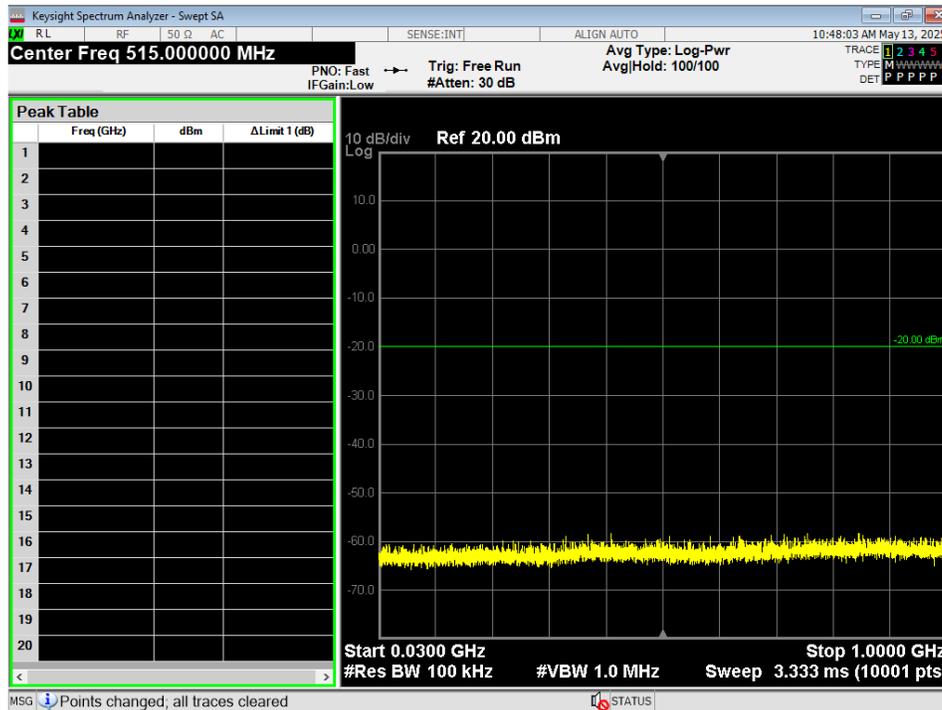


Figure 24 - Conducted Spurious Plot, WIFI 802.11g, 30M – 1G, Low

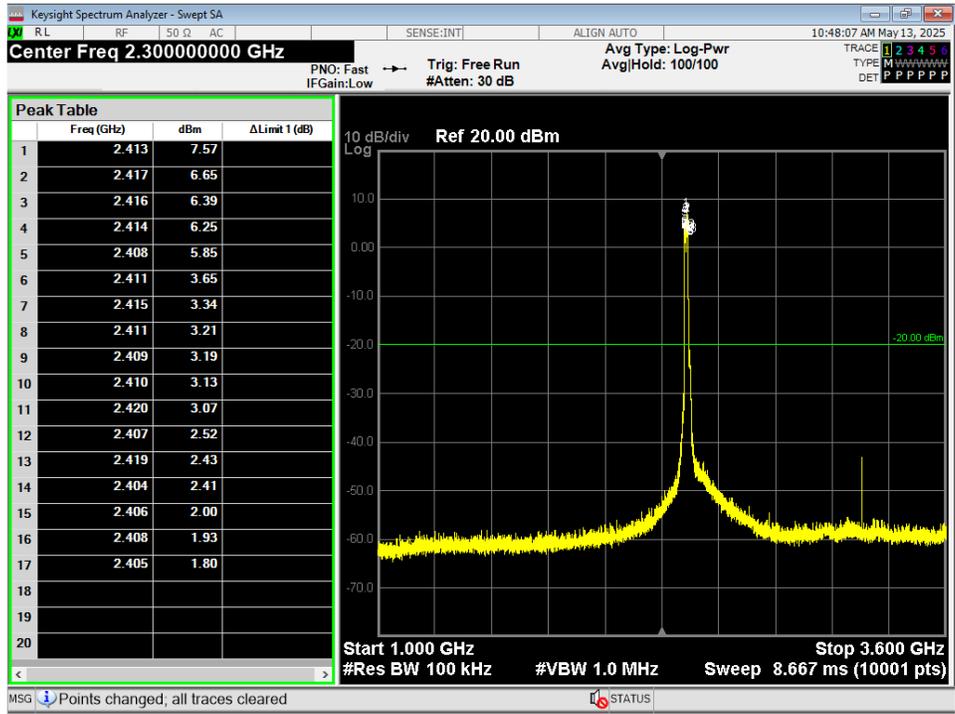


Figure 25 - Conducted Spurious Plot, WIFI 802.11g, 1G – 3.6G, Low

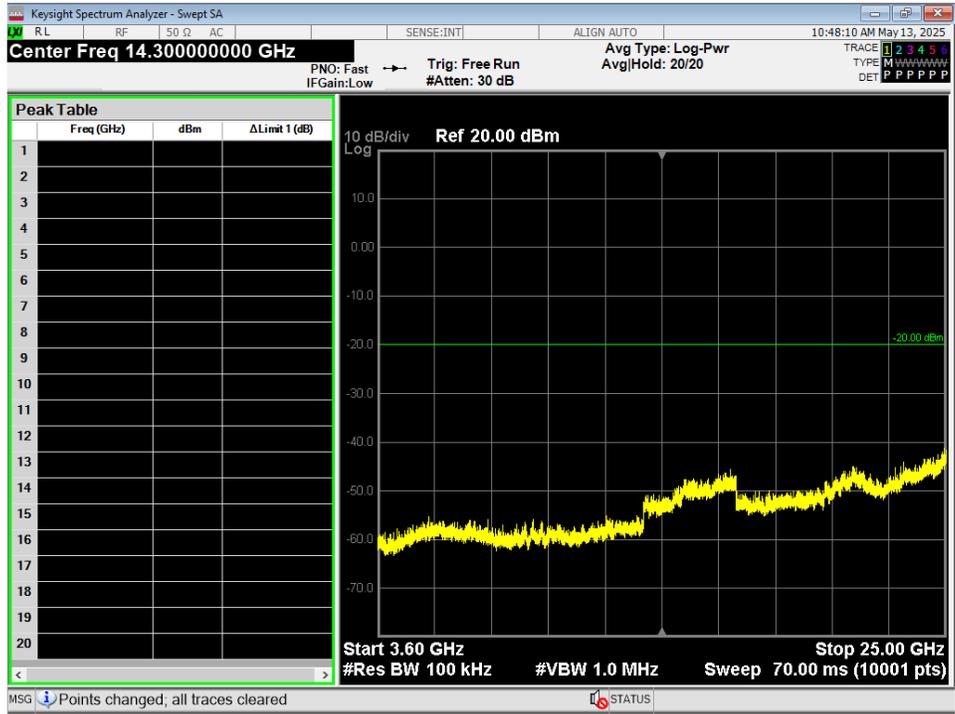


Figure 26 - Conducted Spurious Plot, WIFI 802.11g, 3.6G – 25G, Low

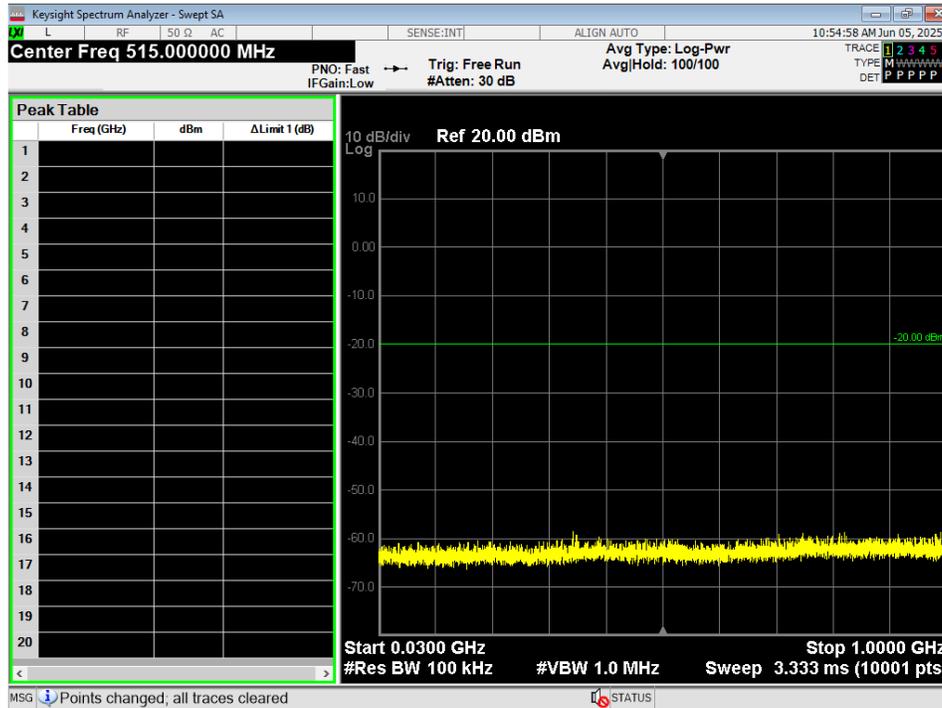


Figure 27 - Conducted Spurious Plot, WIFI 802.11n, 30M – 1G, Low

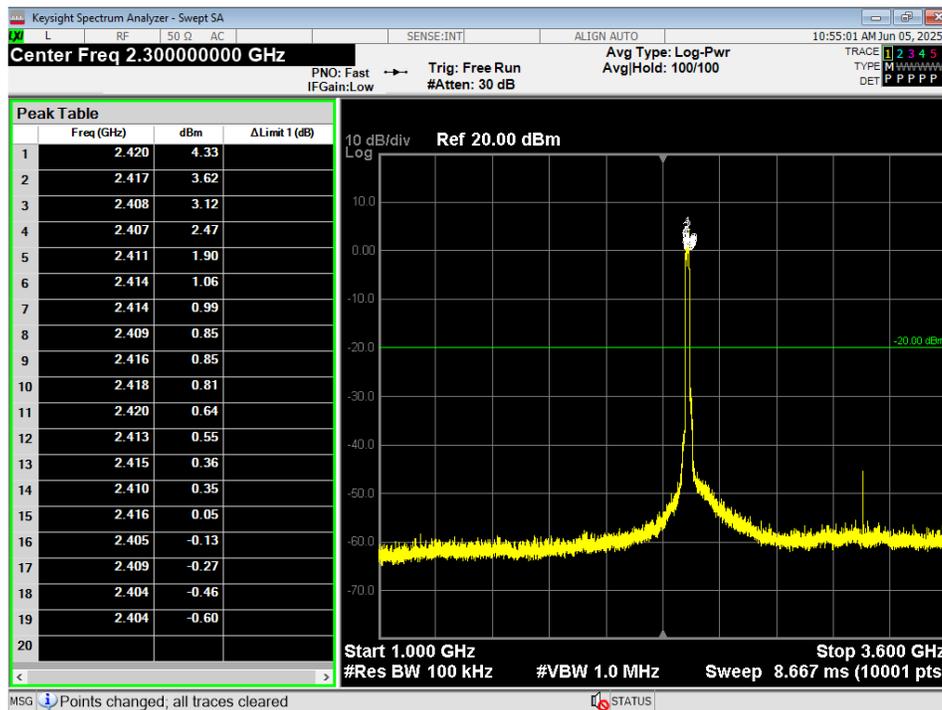


Figure 28 - Conducted Spurious Plot, WIFI 802.11n, 1G – 3.6G, Low

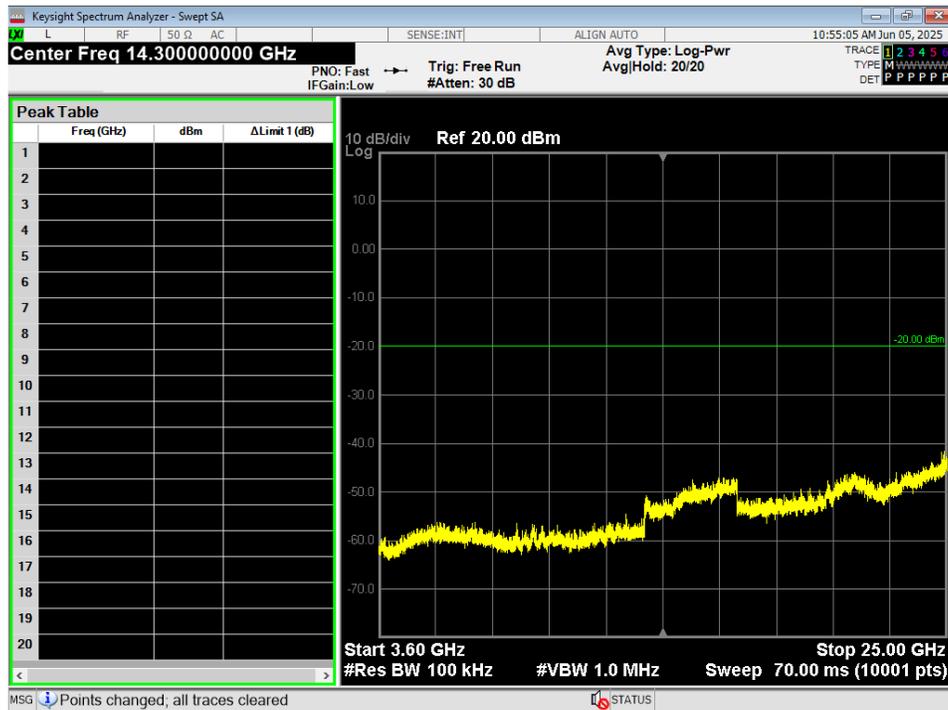


Figure 29 - Conducted Spurious Plot, WIFI 802.11n, 3.6G – 25G, Low



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

4.6 BAND EDGES

Test Method:

All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

Limits of band-edge measurements:

For FCC Part 15.247 Device:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated 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) (see §15.205(c)).

Test procedures:

The highest emissions level beyond the band-edge was measured and recorded. All band edge measurements were evaluated to the general limits in Part 15.209. More details can be found in section 3.4 of this report.

Deviations from test standard:

No deviation.

Test setup:

Test setup details can be found in section 3.4 of this report.

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test results:

Pass

Comments:

1. All the band edge plots can be found in Appendix C.
2. If the device falls under FCC Part 15.247 (Details can be found in summary of test results), compliance is shown in the unrestricted band edges by showing minimum delta of 20 dB between peak and the band edge.
3. The restricted band edge compliance is shown by comparing it to the general limit defined in Part 15.209. The limit shown in the graph accounts for the antenna gain of the device.



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

4.7 POWER SPECTRAL DENSITY

Test Method:

All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

Limits of power measurements:

For FCC Part 15.247 Device:

The maximum PSD allowed is 8 dBm.

Test procedures:

Details can be found in section 3.4 of this report.

Deviations from test standard:

No deviation.

Test setup:

Details can be found in section 3.4 of this report.

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test results:

Pass

Comments:

1. All the Power Spectral Density (PSD) plots can be found in Appendix C.
2. All the measurements were found to be compliant.
3. The measurements are listed in the tables in section 4.0.



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

4.8 CONDUCTED AC MAINS EMISSIONS

Test Method: ANSI C63.10-2020, Section(s) 6.2

Limits for conducted emissions measurements:

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Notes:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

Test Procedures:

- a. The EUT was placed 0.8m above a ground reference plane and 0.4 meters from the conducting wall of a shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provides 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference as well as the ground.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits are not reported.
- d. Results were compared to the 15.207 limits.

Deviation from the test standard:

No deviation

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test Results:

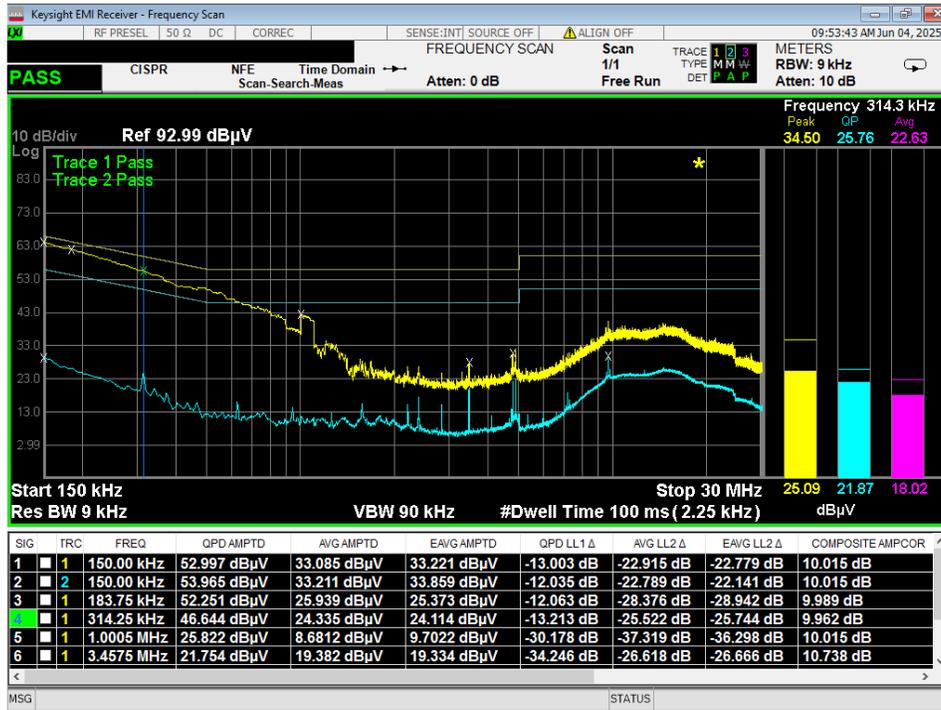


Figure 30 – Conducted Emissions Plot, charging on dock, TX, Line

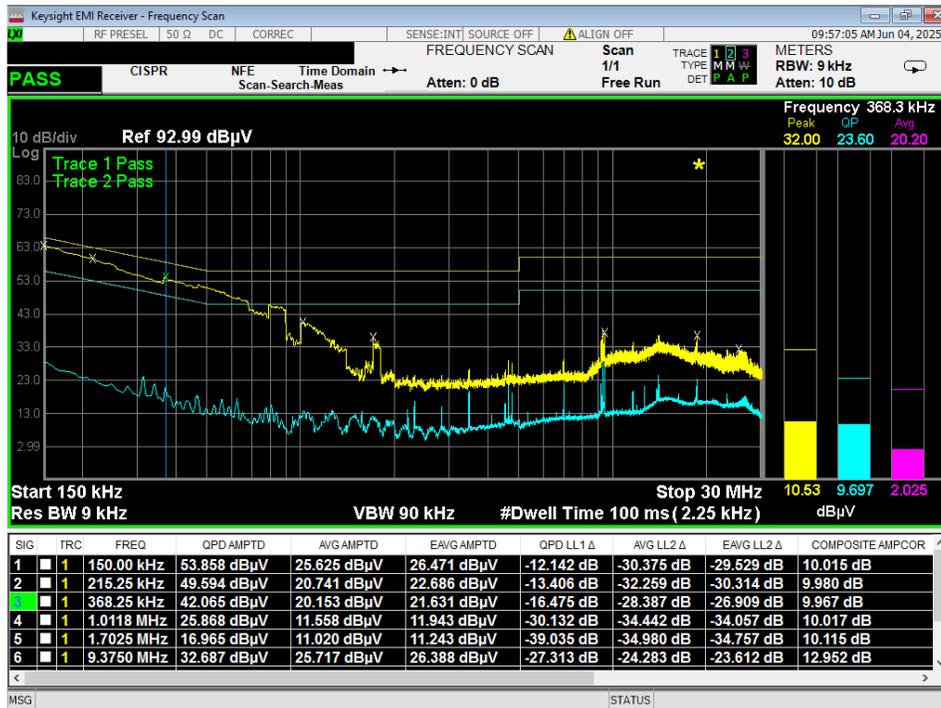


Figure 31 – Conducted Emissions Plot, charging on dock, TX, Neutral



Figure 32 – Conducted Emissions Plot, charging on dock, IDLE, Line

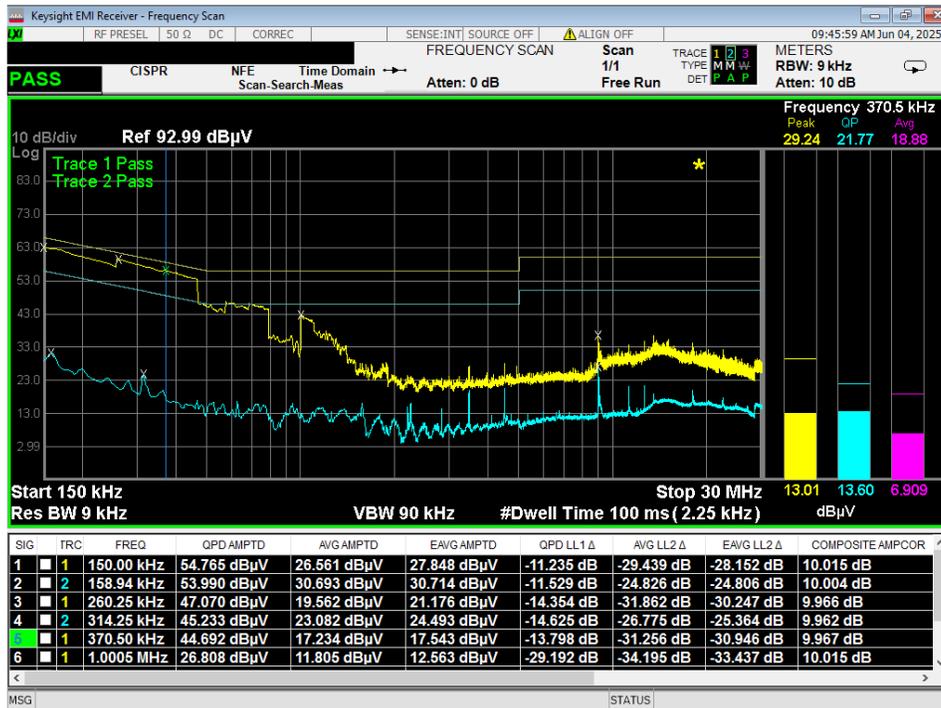


Figure 33 – Conducted Emissions Plot, charging on dock, IDLE, Neutral

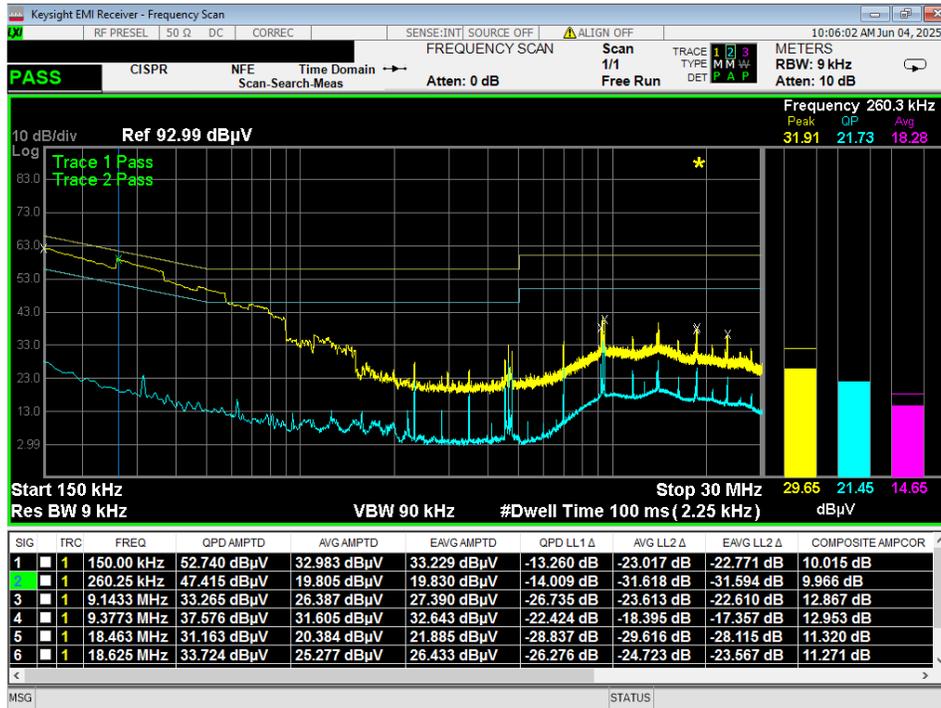


Figure 34 – Conducted Emissions Plot, charging via USB-C, TX, Line

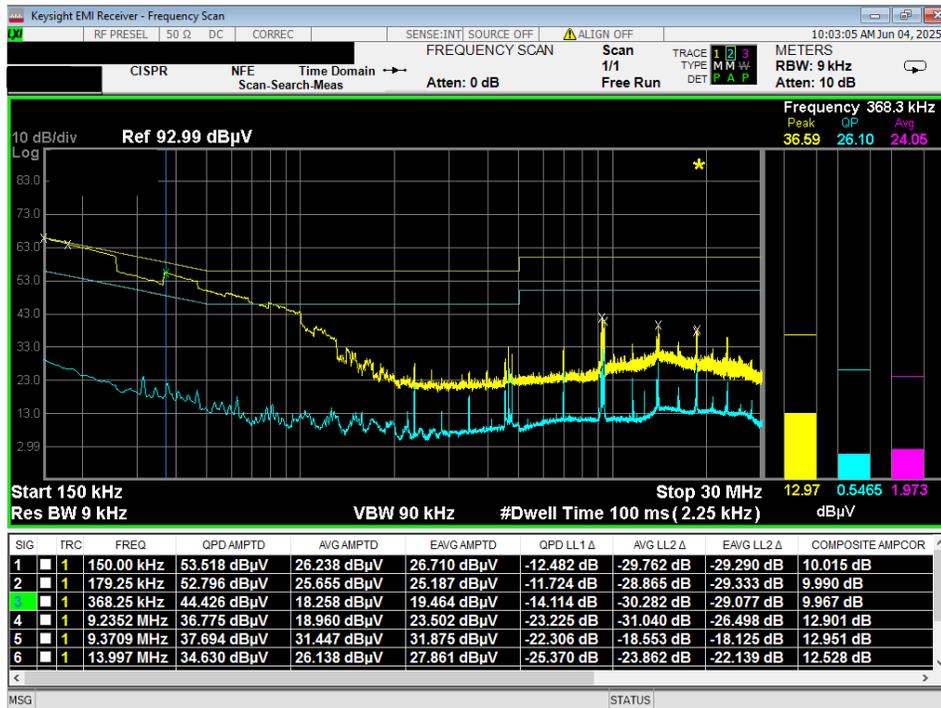


Figure 35 – Conducted Emissions Plot, charging via USB-C, TX, Neutral

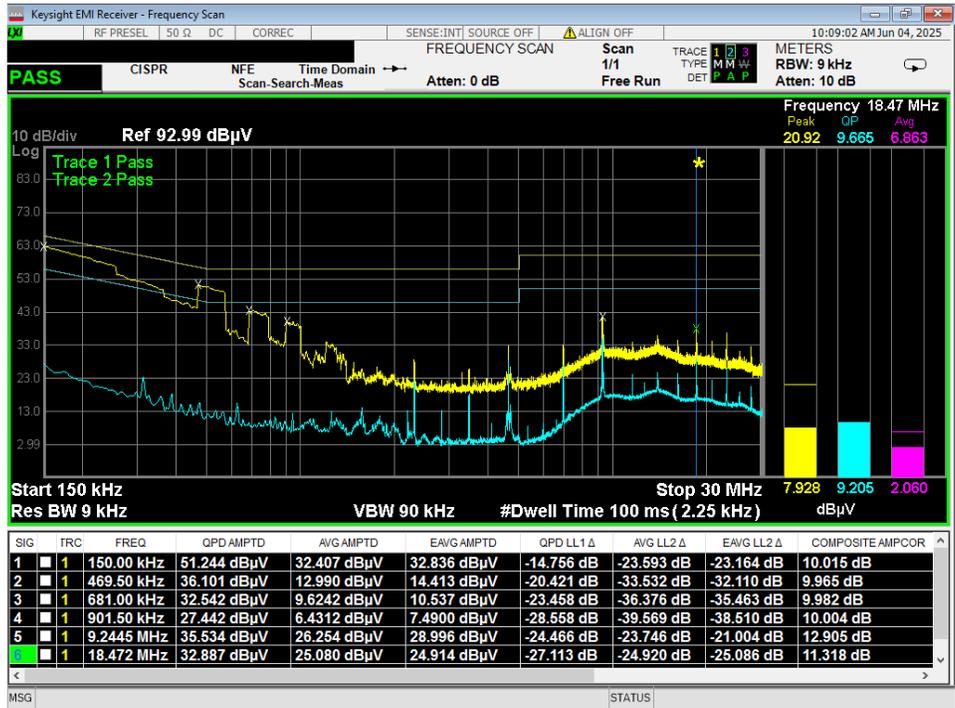


Figure 36 – Conducted Emissions Plot, charging via USB-C, IDLE, Line

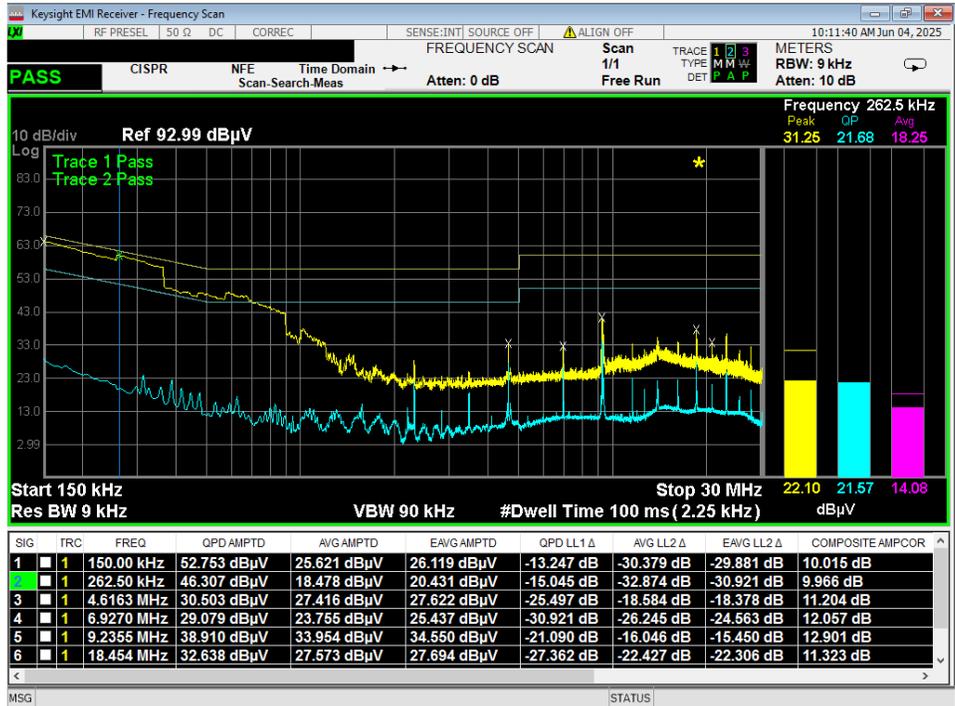


Figure 37 – Conducted Emissions Plot, charging via USB-C, IDLE, Neutral



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

APPENDIX A: SAMPLE CALCULATION

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF - (-CF + AG) + AV$$

- Where FS = Field Strength
- RA = Receiver Amplitude
- AF = Antenna Factor
- CF = Cable Attenuation Factor
- AG = Amplifier Gain
- AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dBμV is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dBμV/m.

$$FS = 55 + 12 - (-1.1 + 20) + 0 = 48.1 \text{ dB}\mu\text{V/m}$$

The 48.1 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(48.1 \text{ dB}\mu\text{V/m})/20] = 254.1 \mu\text{V/m}$$

AV is calculated by taking the $20 \cdot \log(T_{on}/100)$ where T_{on} is the maximum transmission time in any 100ms window.

EIRP Calculations

In cases where direct antenna port measurement is not possible or would be inaccurate, output power is measured in EIRP. The maximum field strength is measured at a specified distance and the EIRP is calculated using the following equation;

- $EIRP \text{ (Watts)} = [Field \text{ Strength (V/m)} \times \text{antenna distance (m)}]^2 / 30$
- $Power \text{ (watts)} = 10^{[Power \text{ (dBm)}/10]} / 1000$
- $Voltage \text{ (dB}\mu\text{V)} = Power \text{ (dBm)} + 107 \text{ (for } 50\Omega \text{ measurement systems)}$
- $Field \text{ Strength (V/m)} = 10^{[Field \text{ Strength (dB}\mu\text{V/m)} / 20]} / 10^6$
- $Gain = 1 \text{ (numeric gain for isotropic radiator)}$
- $Conversion \text{ from } 3m \text{ field strength to EIRP (d=3):}$

$$EIRP = [FS(V/m) \times d^2]/30 = FS [0.3] \quad \text{for } d = 3$$

$$EIRP(dBm) = FS(dB\mu V/m) - 10(\log 10^9) + 10\log[0.3] = FS(dB\mu V/m) - 95.23$$

10log(10^9) is the conversion from micro to milli



Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		

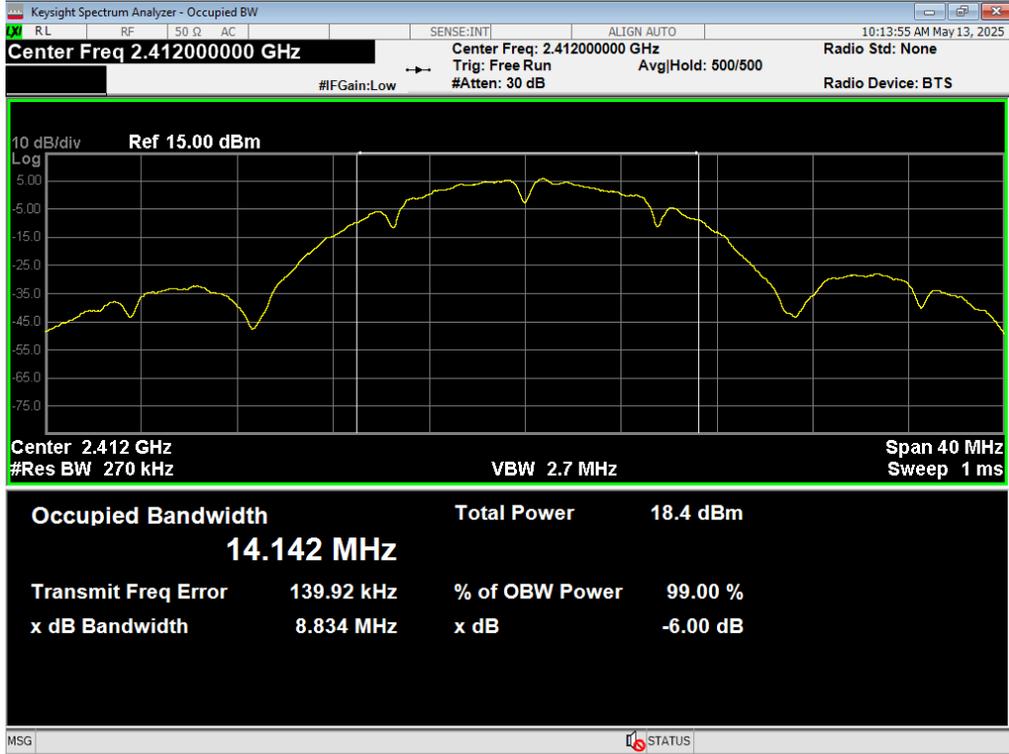
APPENDIX B – MEASUREMENT UNCERTAINTY

NCEE Labs does not add uncertainty levels to measurement levels
Where relevant, the following measurement uncertainty levels have been for tests performed in this test report:

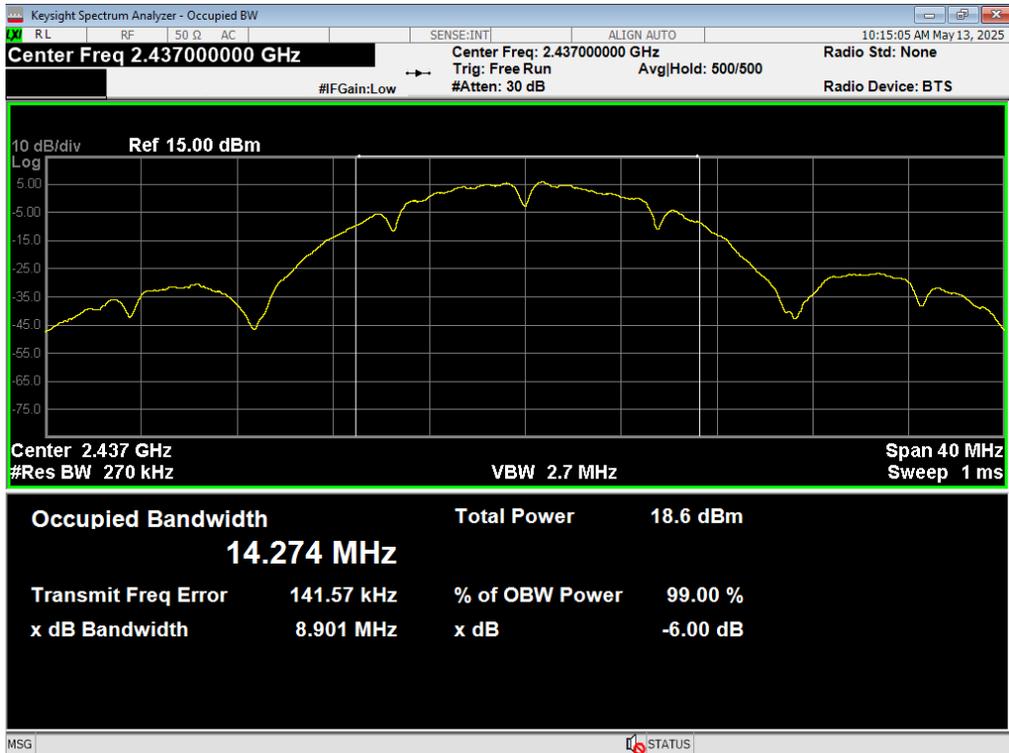
Test	Frequency Range	Uncertainty Value (dB)
Radiated Emissions, 3m	30MHz - 1GHz	±4.31
Radiated Emissions, 3m	1GHz - 18GHz	±5.08
Emissions limits, conducted	30MHz – 18GHz	±3.03

Expanded uncertainty values are calculated to a confidence level of 95%.

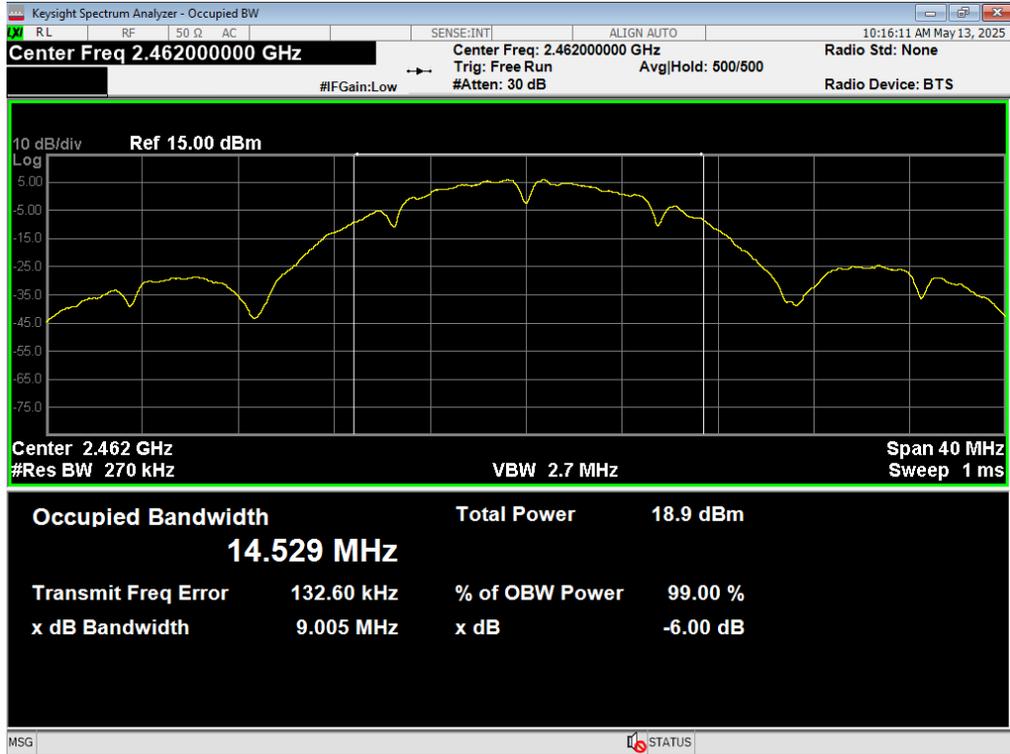
APPENDIX C – GRAPHS AND TABLES



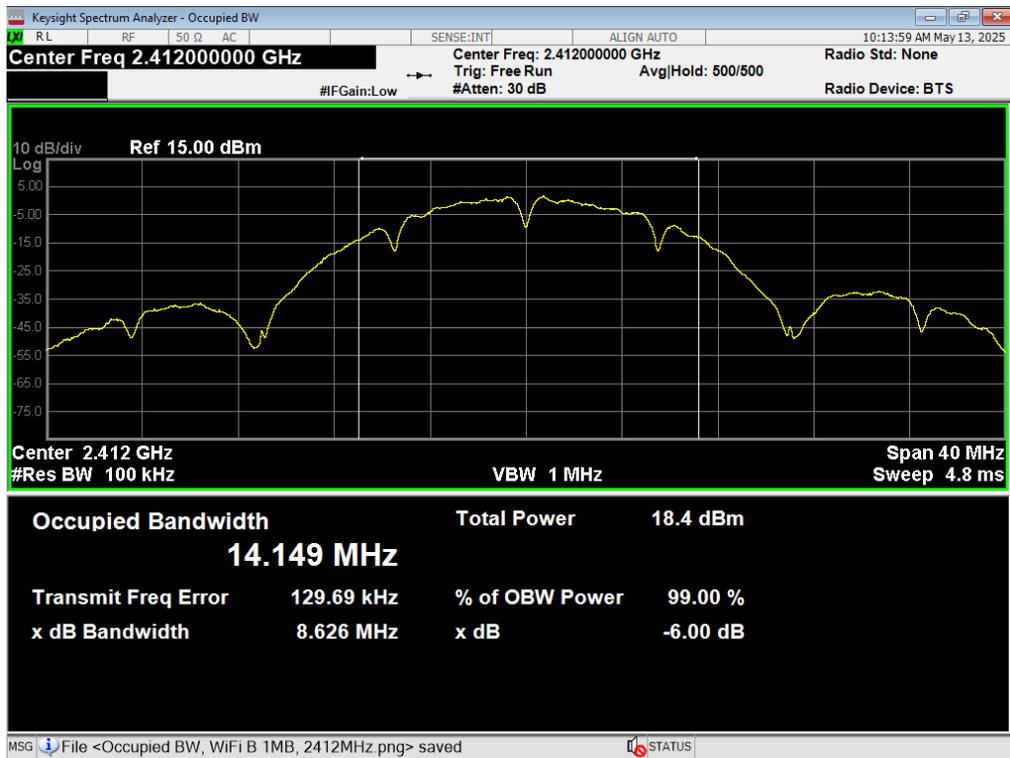
01 Occupied BW, WiFi B 1MB, 2412MHz



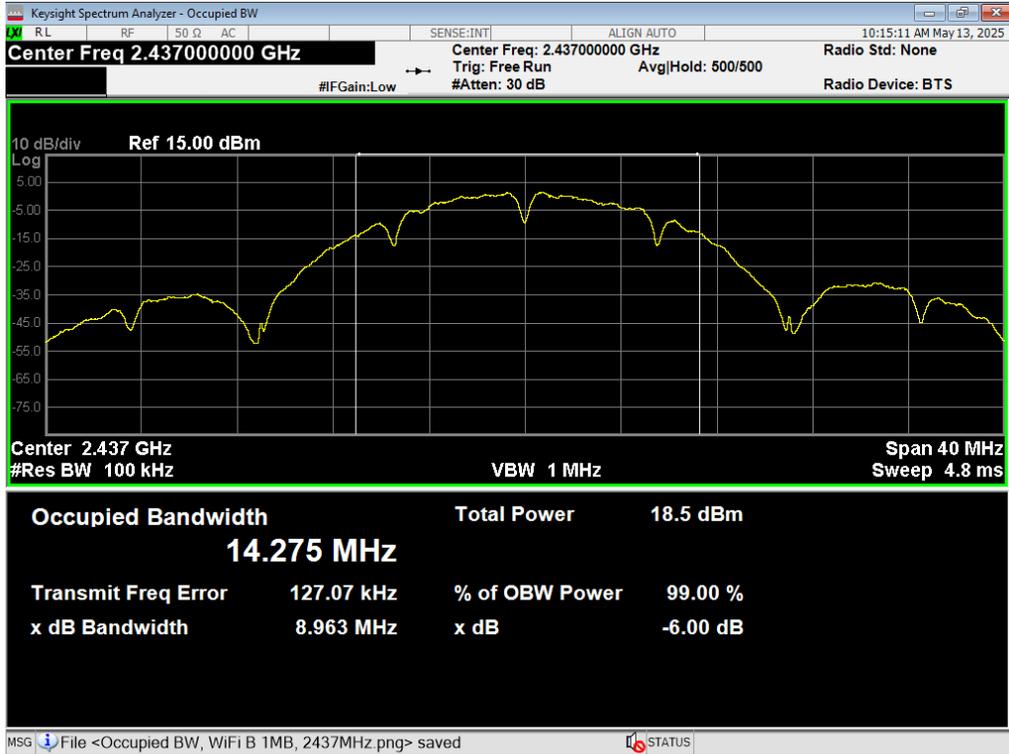
02 Occupied BW, WiFi B 1MB, 2437MHz



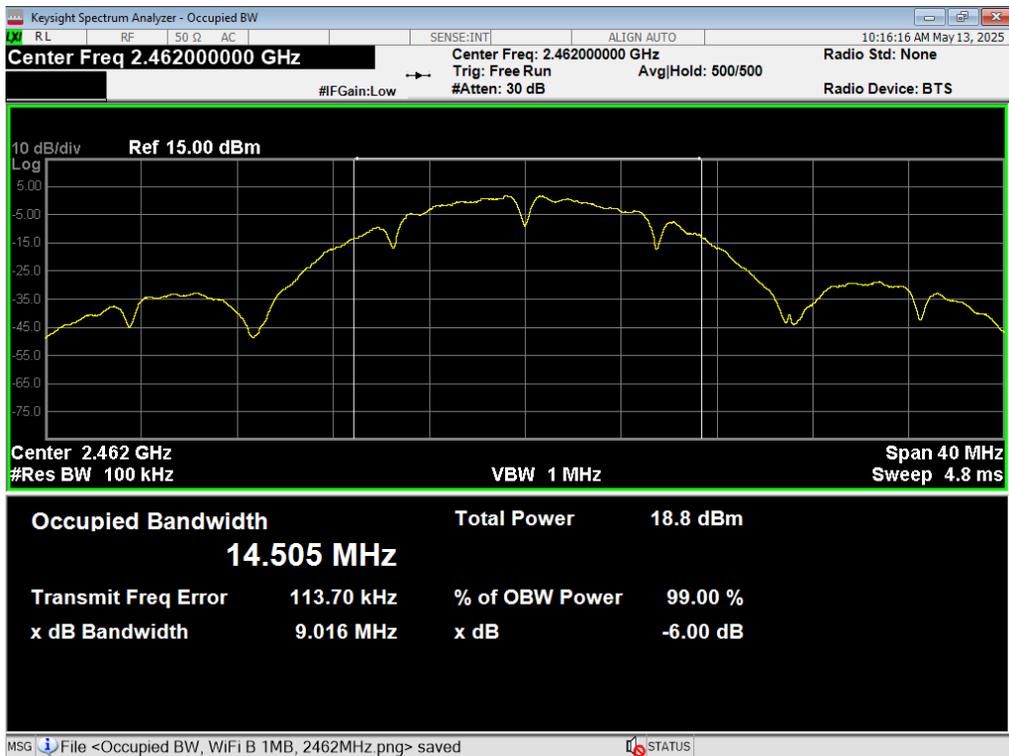
03 Occupied BW, WiFi B 1MB, 2462MHz



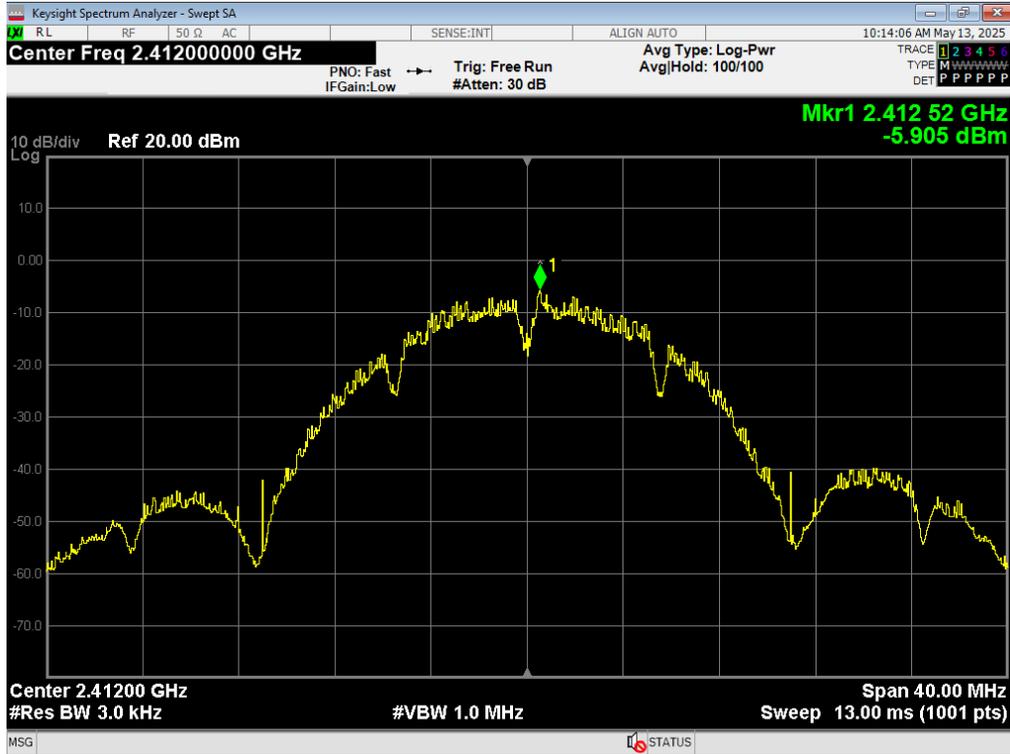
04 6dB BW, WiFi B 1MB, 2412MHz



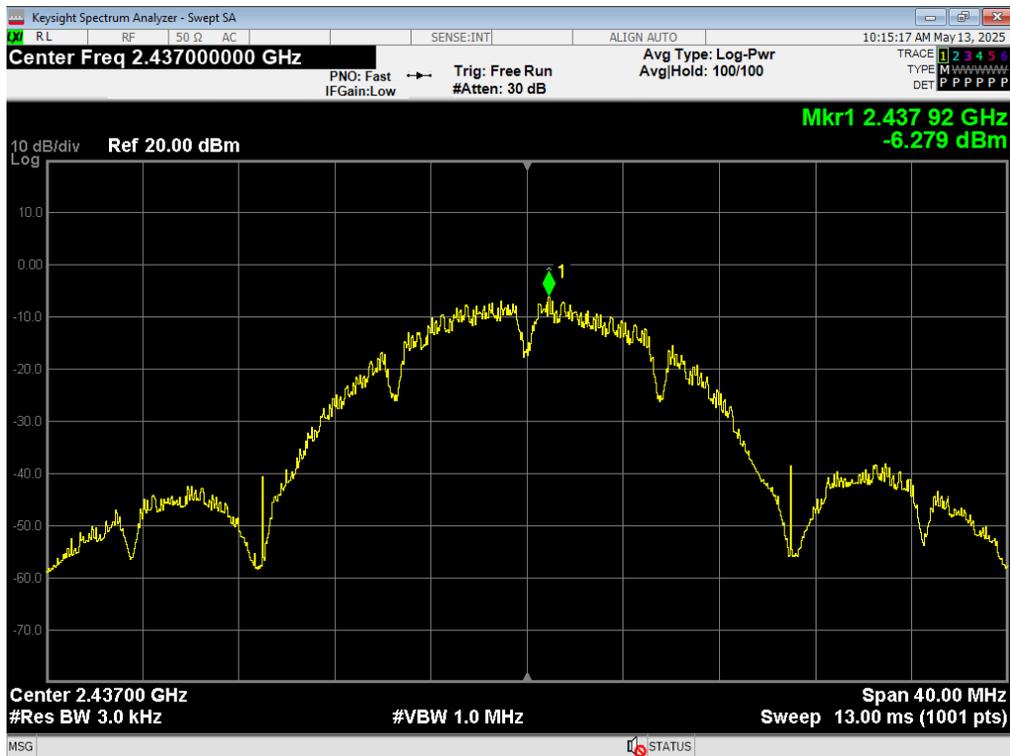
05 6dB BW, WiFi B 1MB, 2437MHz



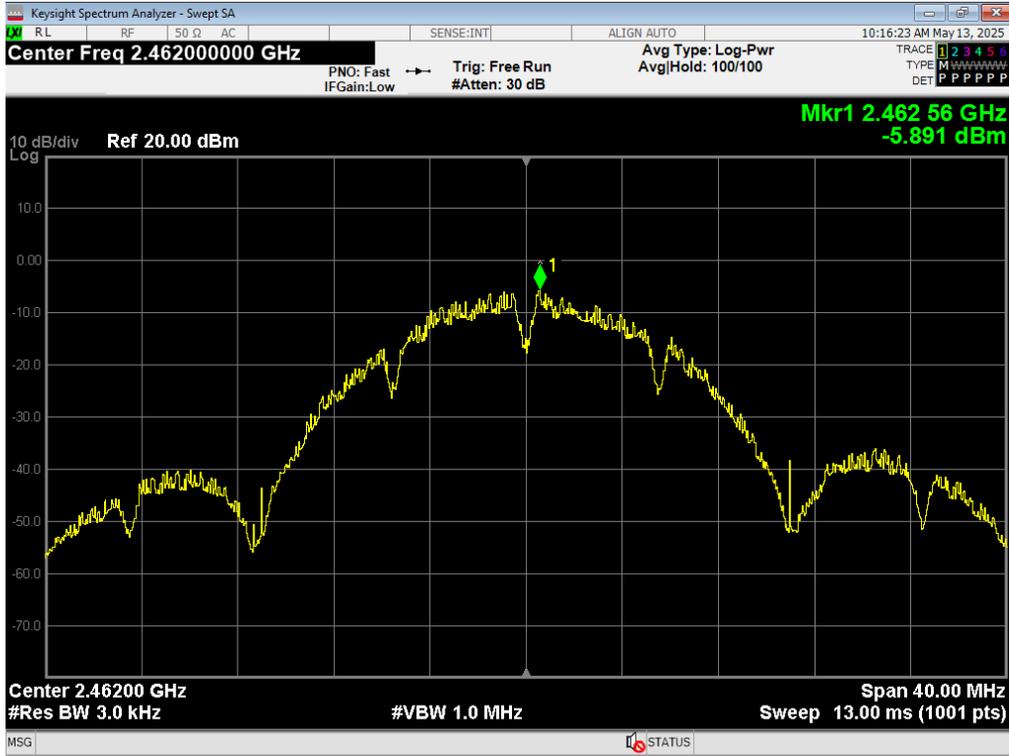
06 6dB BW, WiFi B 1MB, 2462MHz



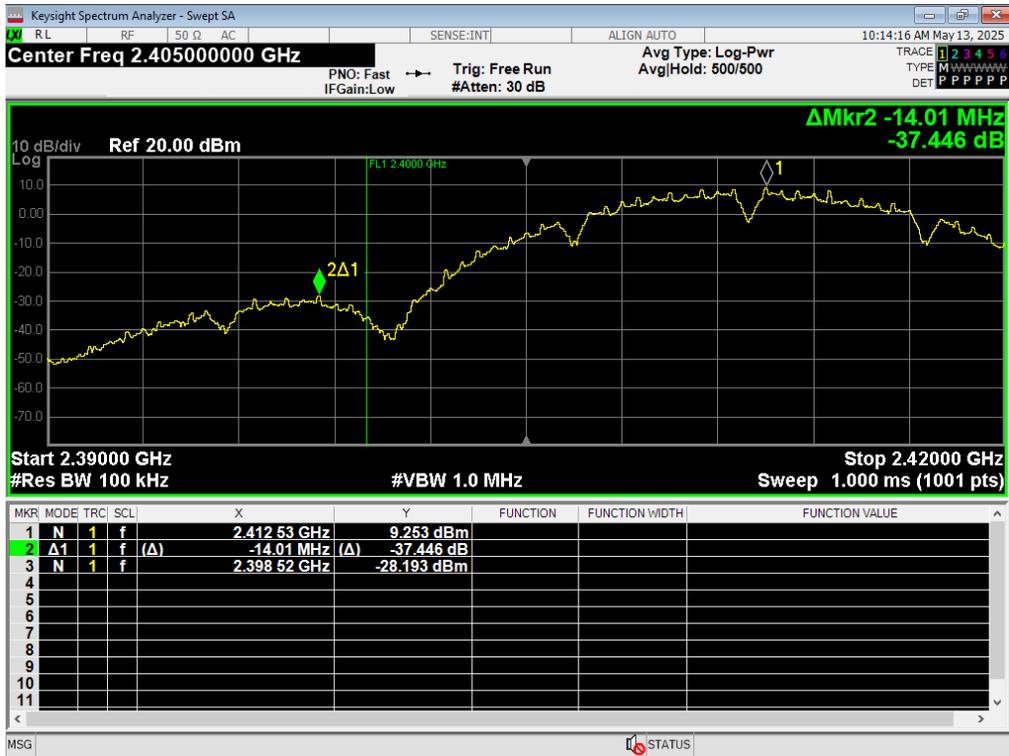
07 PSD, WiFi B 1MB, 2412MHz



08 PSD, WiFi B 1MB, 2437MHz



09 PSD, WiFi B 1MB, 2462MHz



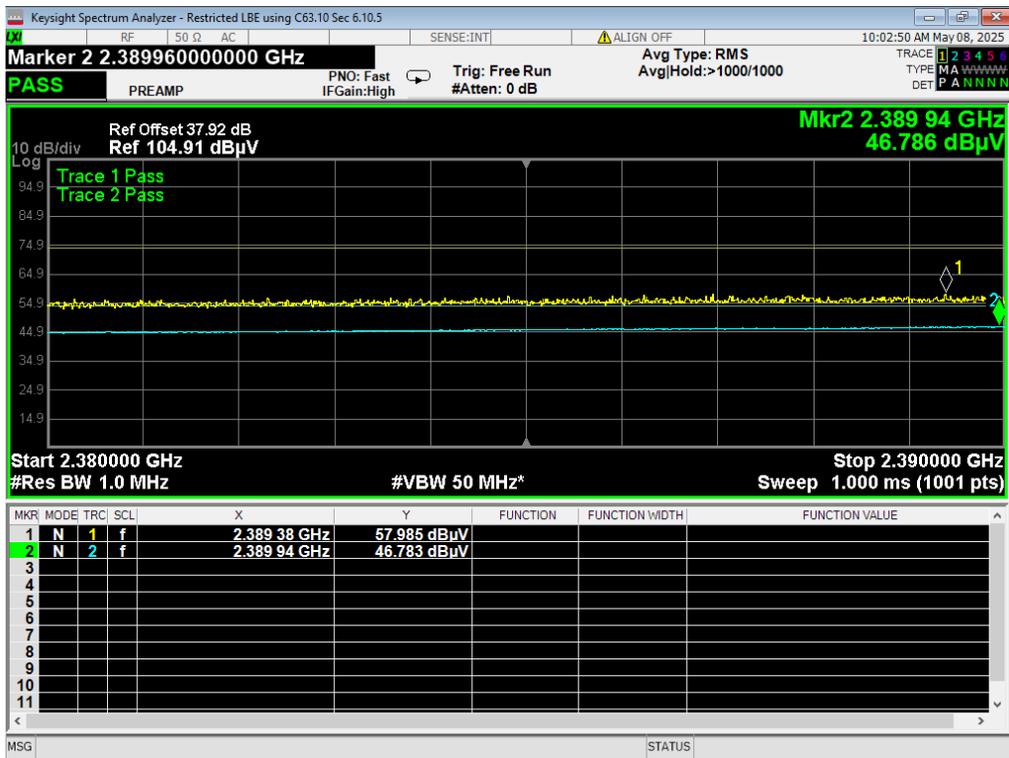
10 LBE Unrestricted, WiFi B 1MB



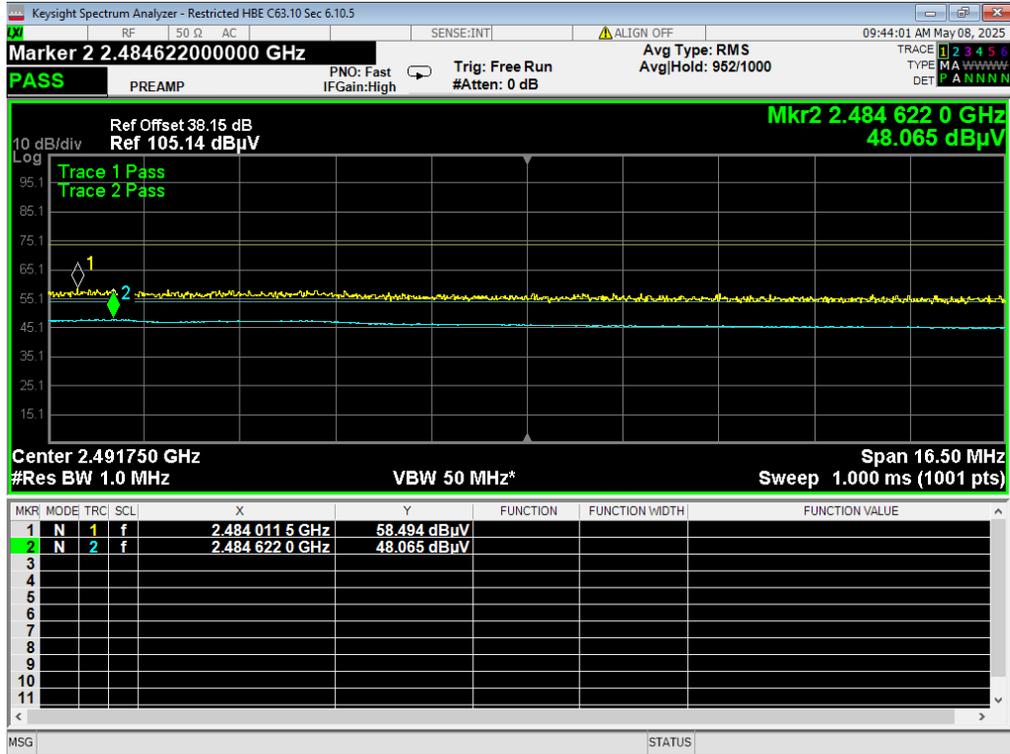
Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		



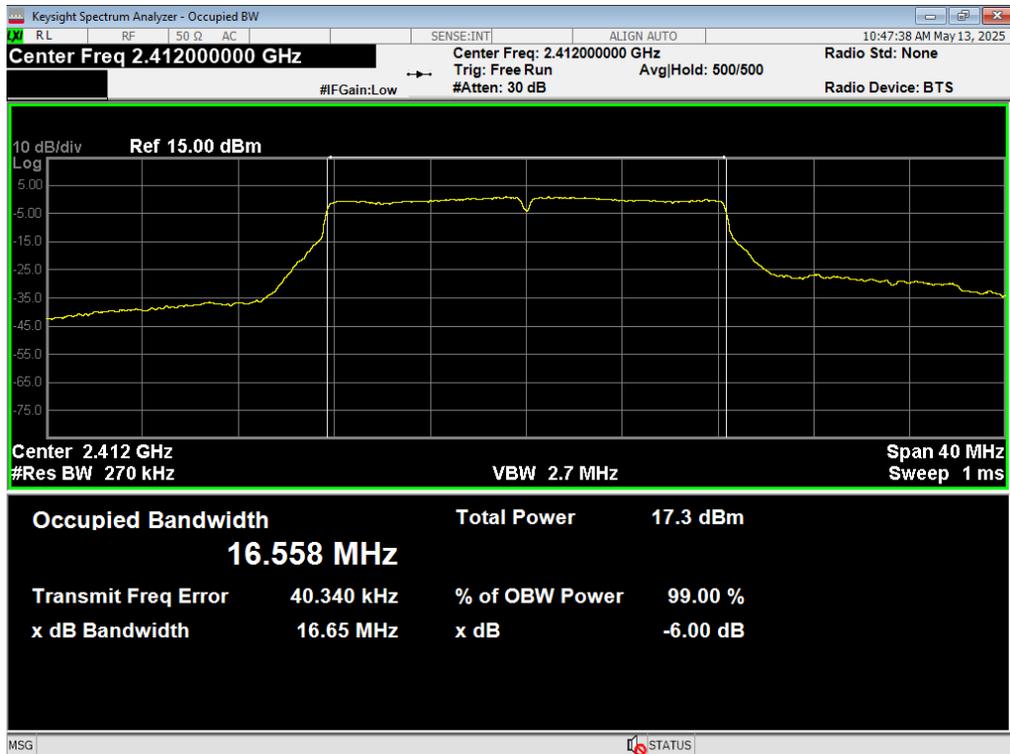
11 HBE Unrestricted, WiFi B 1MB



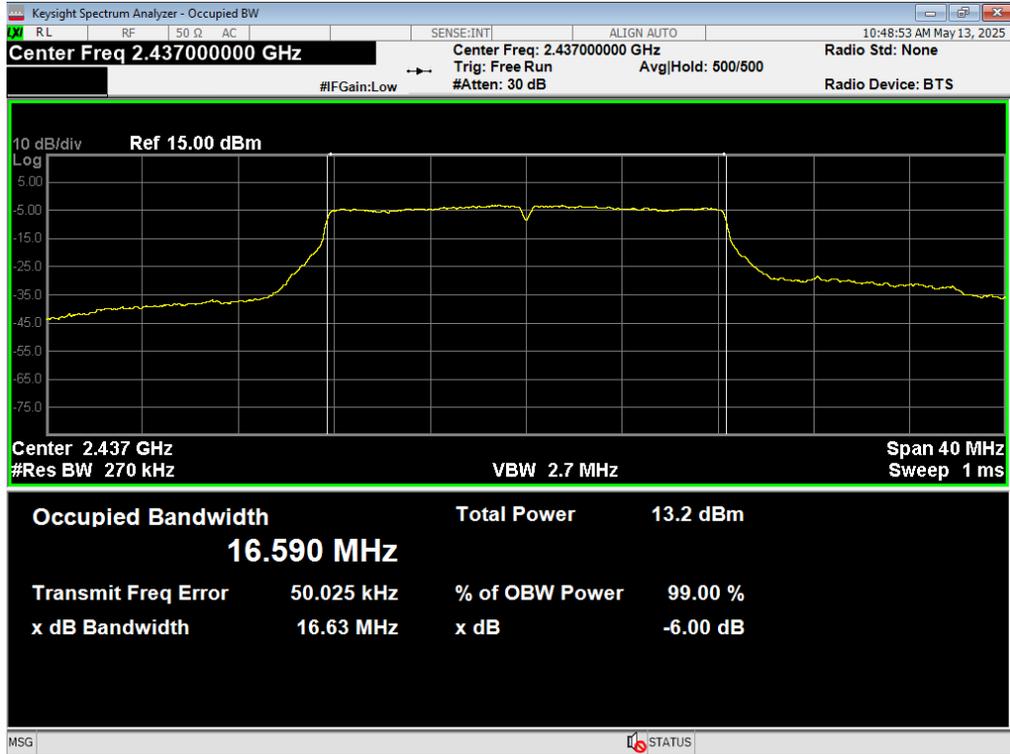
12 LBE Restricted, WiFi B 1MB



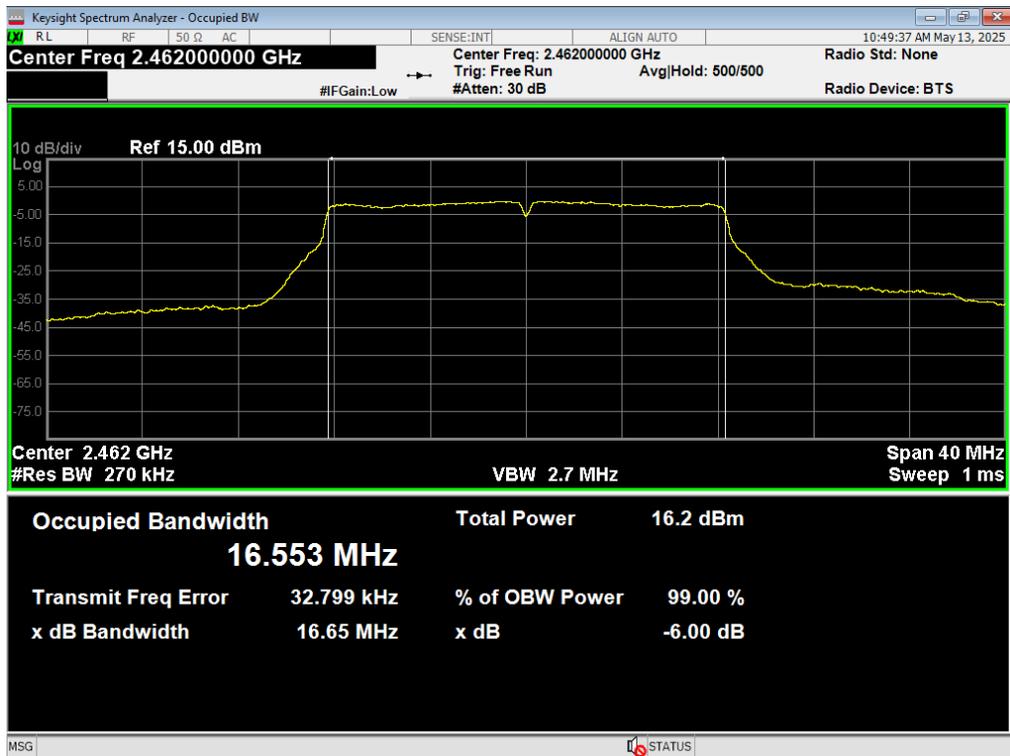
13 HBE Restricted, WiFi B 1MB, Ch11



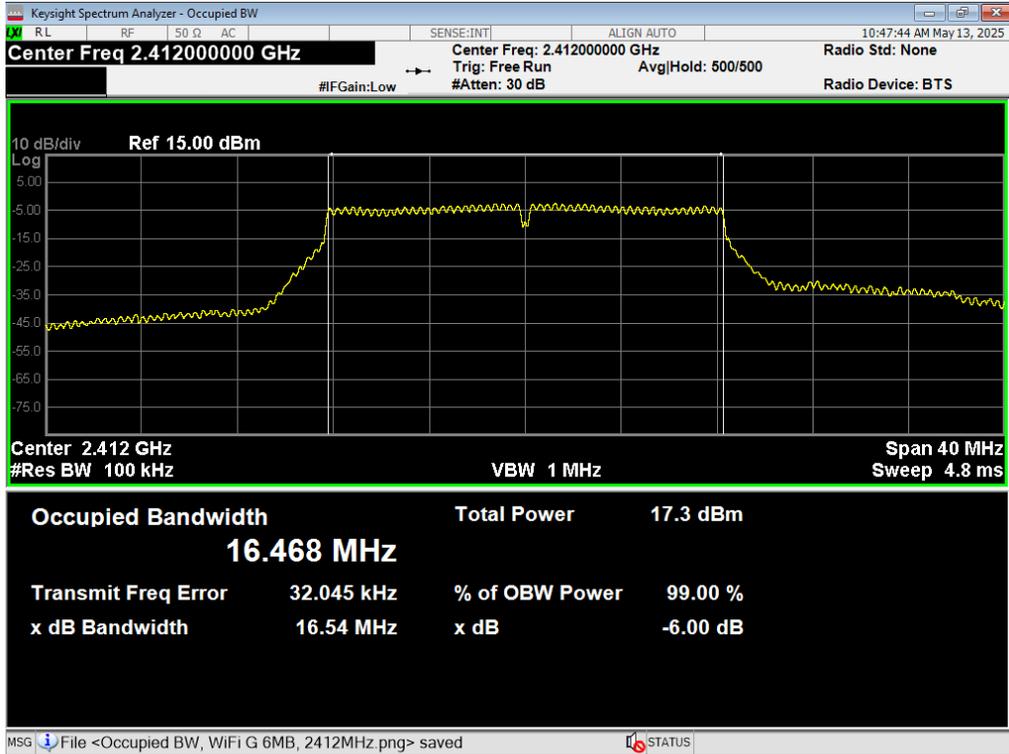
14 Occupied BW, WiFi G 6MB, 2412MHz



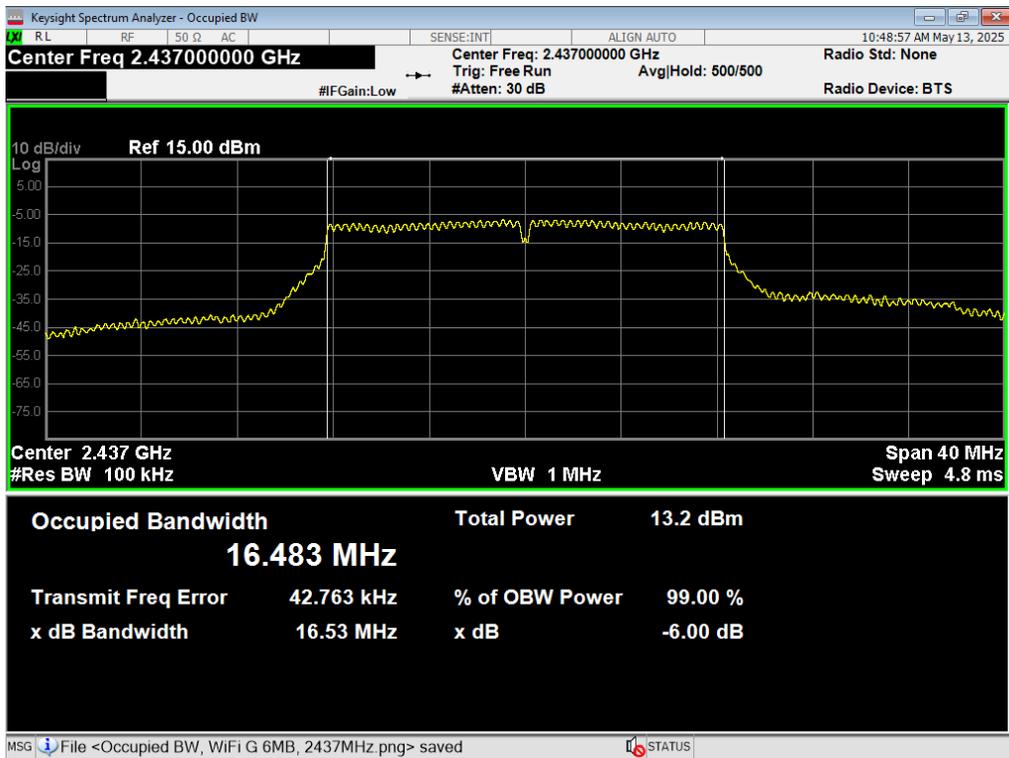
15 Occupied BW, WiFi G 6MB, 2437MHz



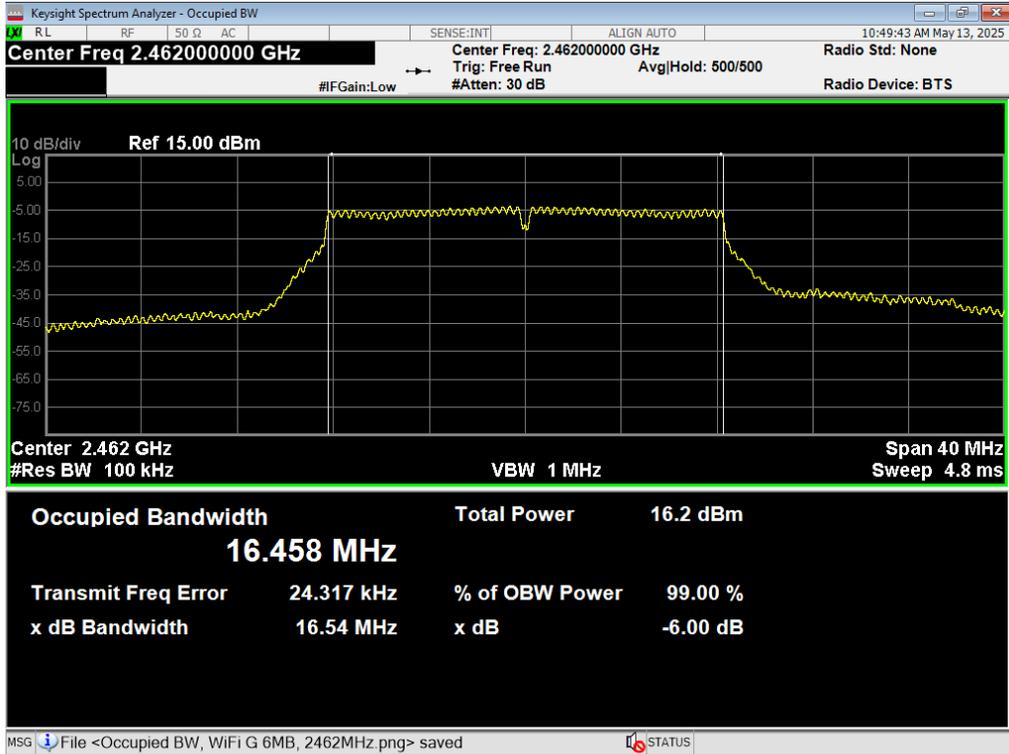
16 Occupied BW, WiFi G 6MB, 2462MHz



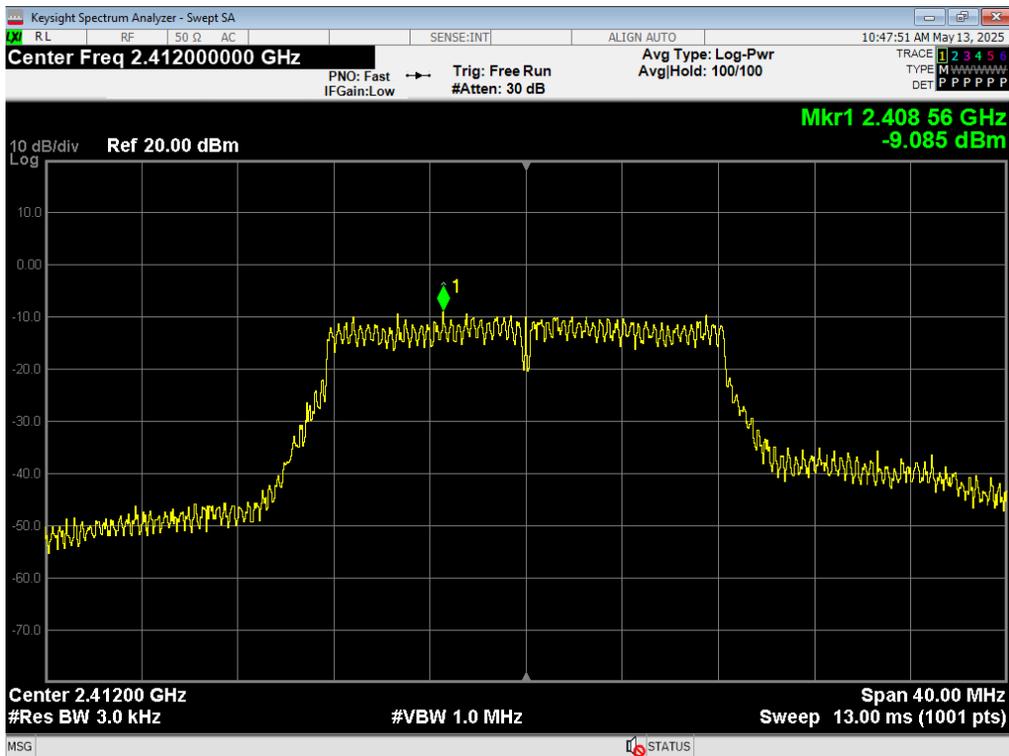
17 6dB BW, WiFi G 6MB, 2412MHz



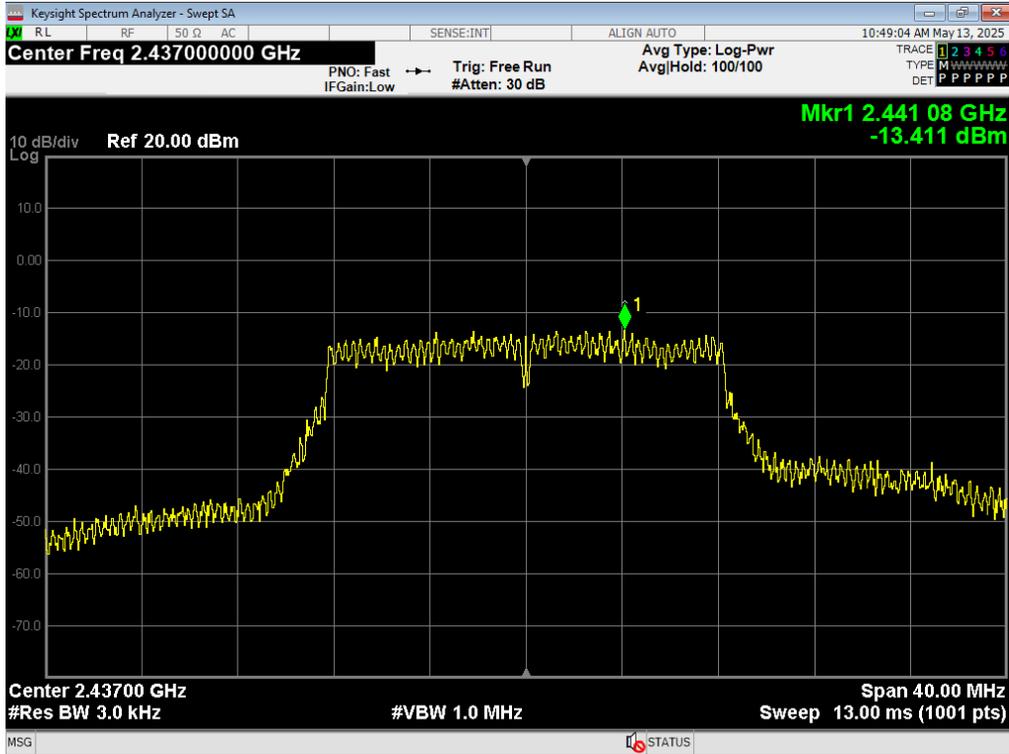
18 6dB BW, WiFi G 6MB, 2437MHz



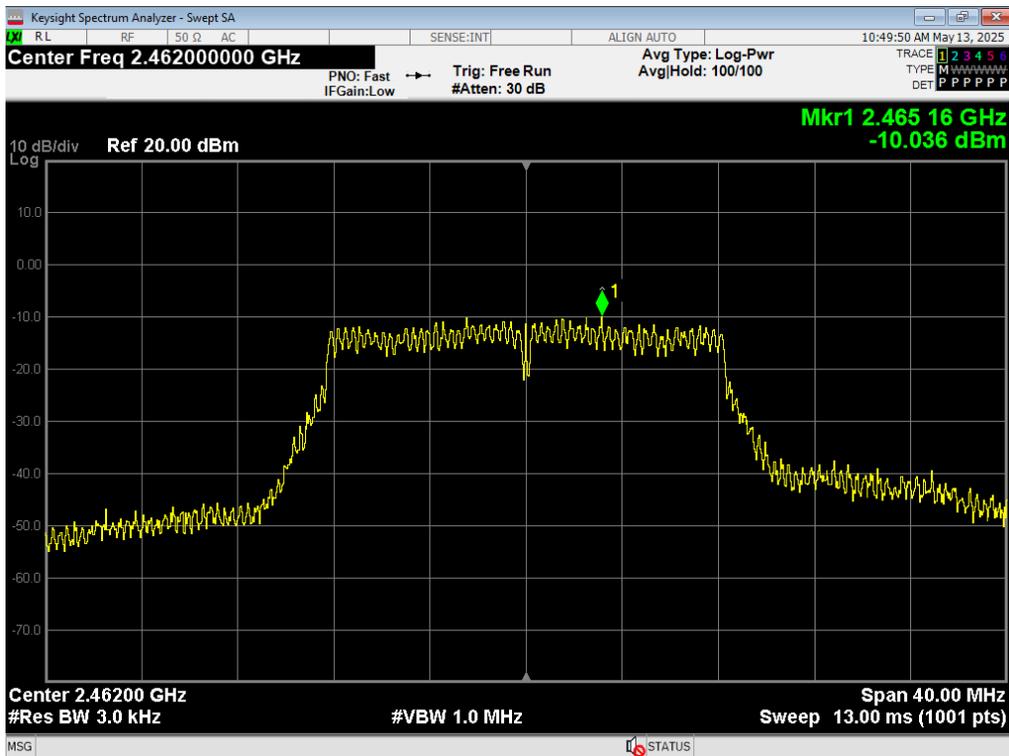
19 6dB BW, WiFi G 6MB, 2462MHz



20 PSD, WiFi G 6MB, 2412MHz



21 PSD, WiFi G 6MB, 2437MHz



22 PSD, WiFi G 6MB, 2462MHz



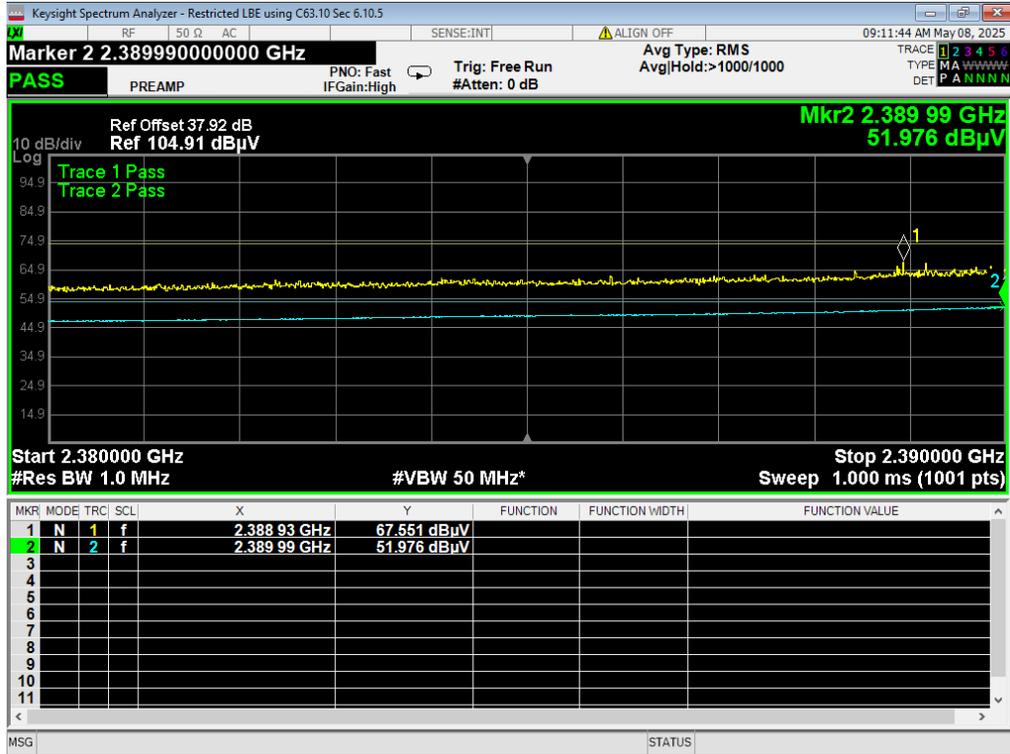
23 LBE Unrestricted, WiFi G 6MB



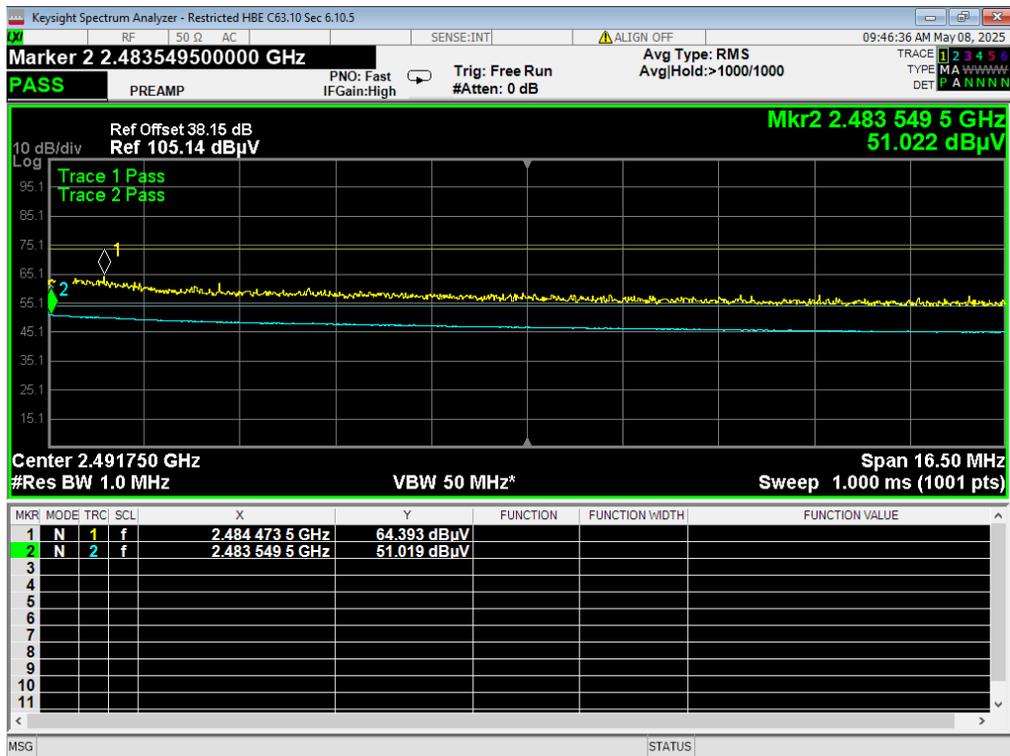
24 HBE Unrestricted, WiFi G 6MB



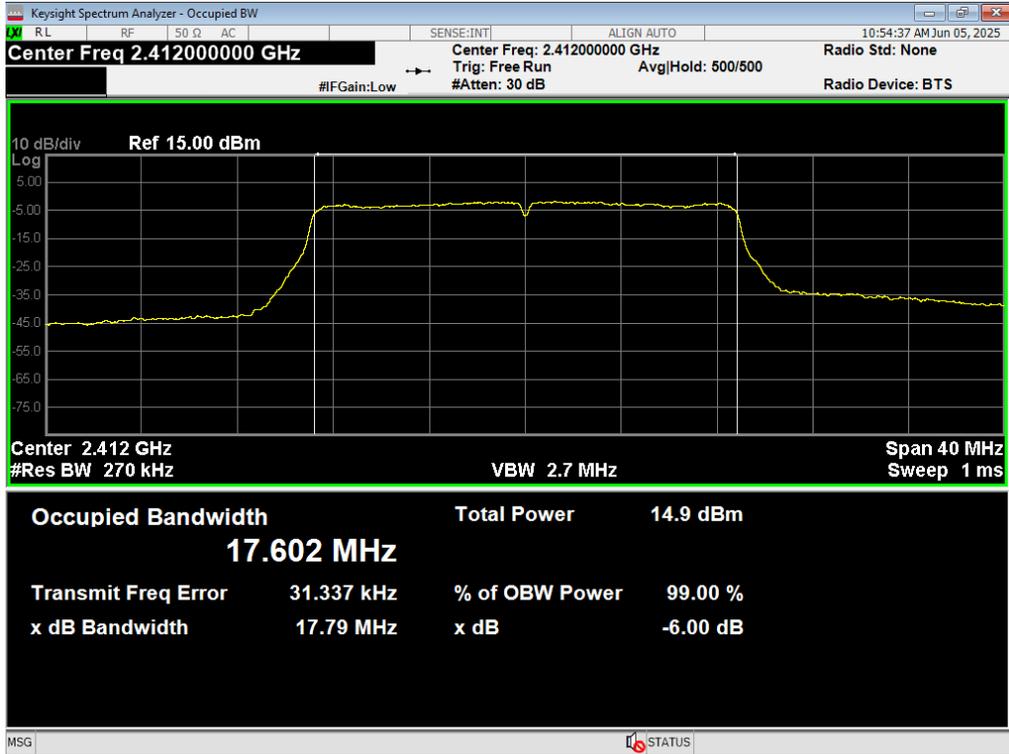
Report Number:	R20250124-00-E2	Rev	B
Prepared for:	Garmin International, Inc.		



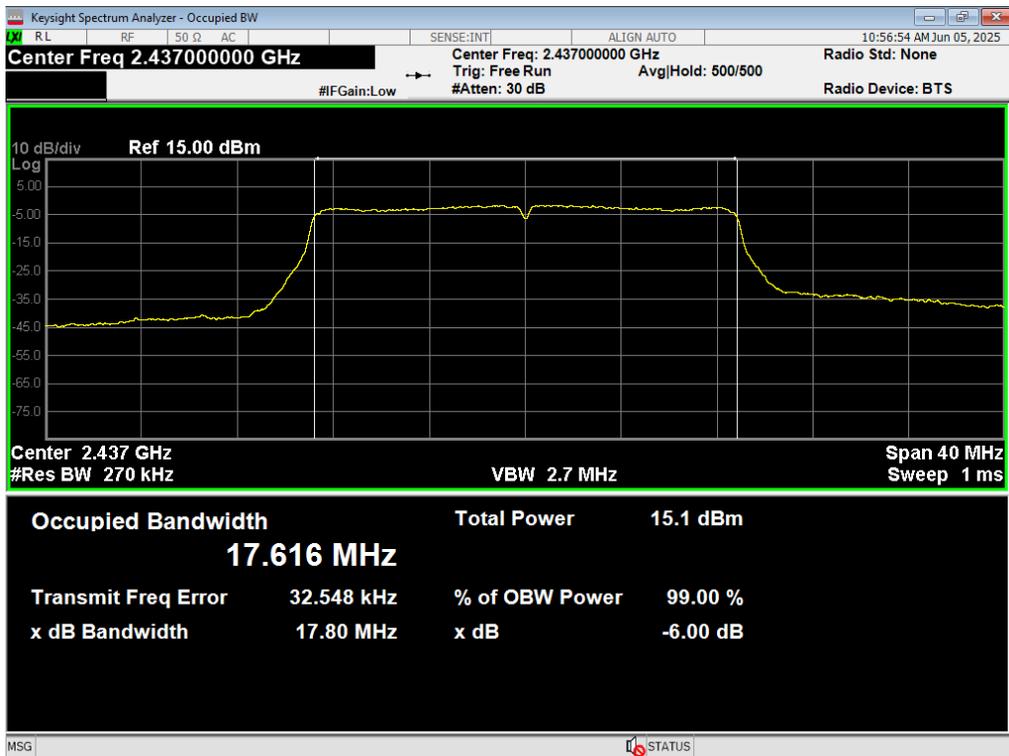
25 LBE Restricted, WiFi G 6MB



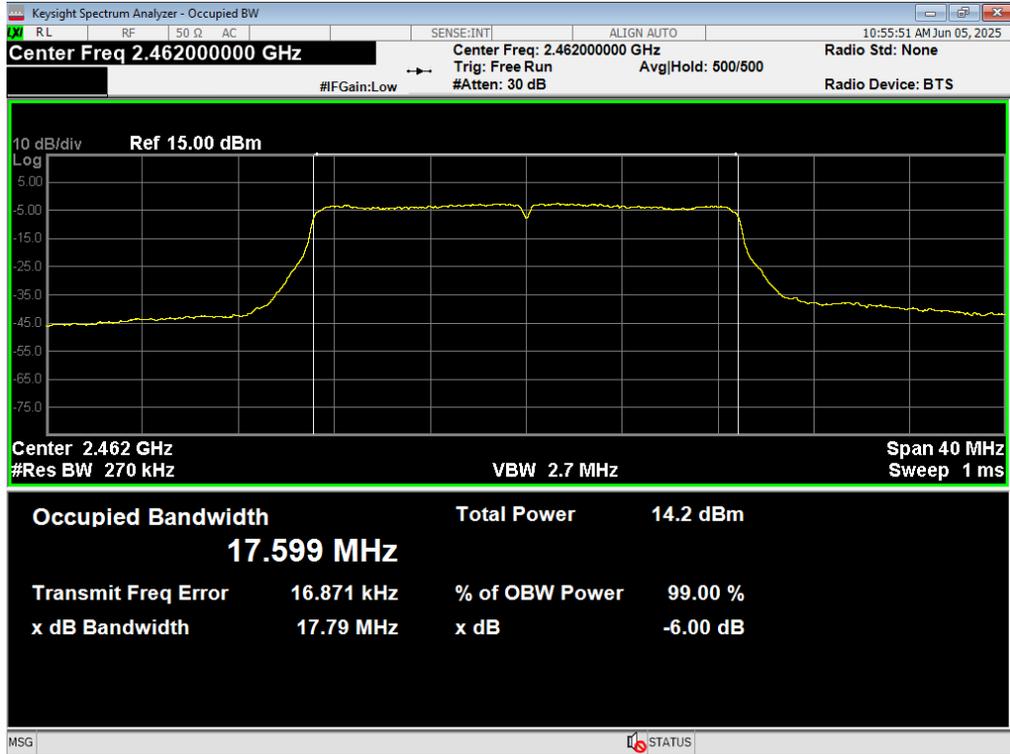
26 HBE Restricted, WiFi G 6MB, Ch11



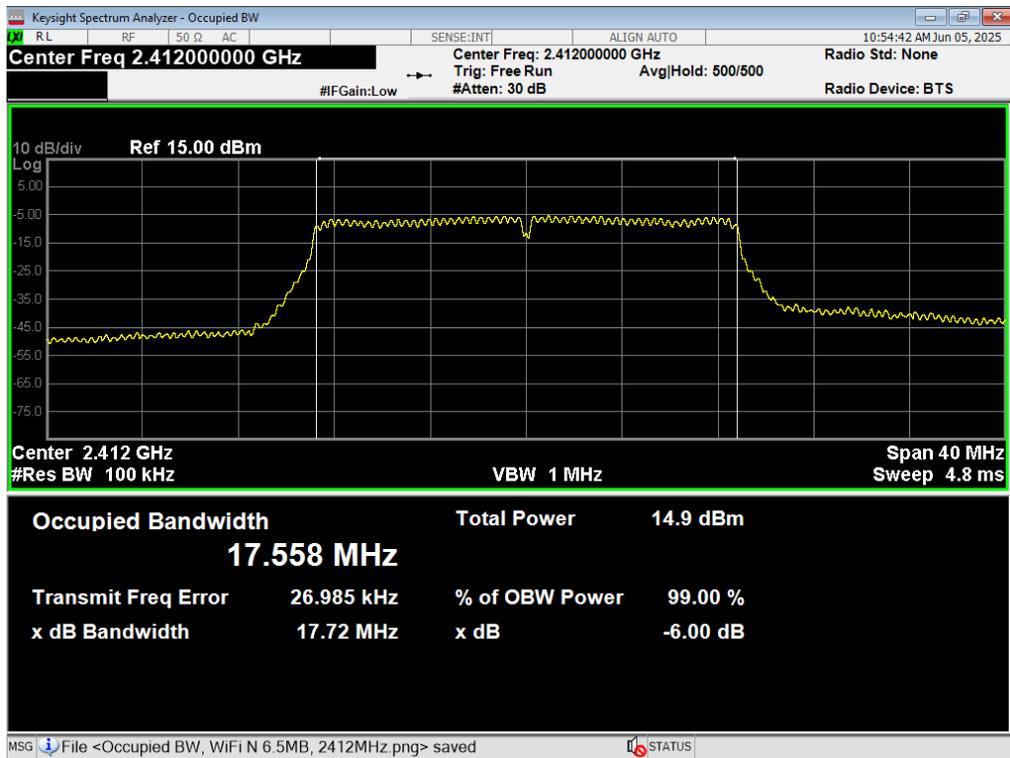
27 Occupied BW, WiFi N 6.5MB, 2412MHz



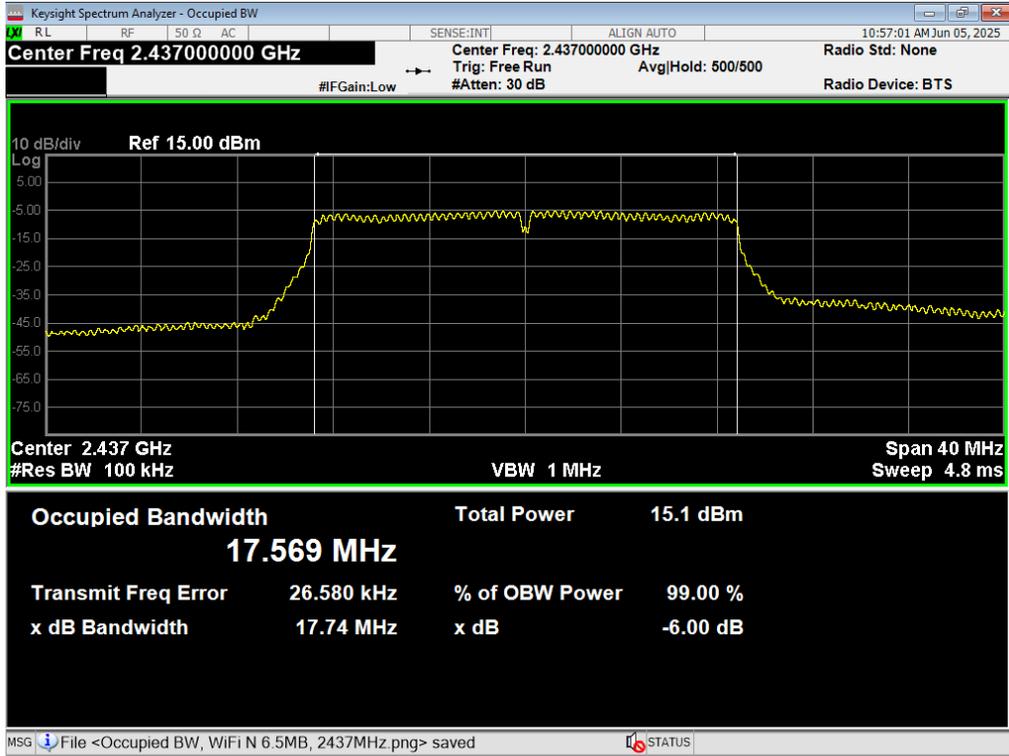
28 Occupied BW, WiFi N 6.5MB, 2437MHz



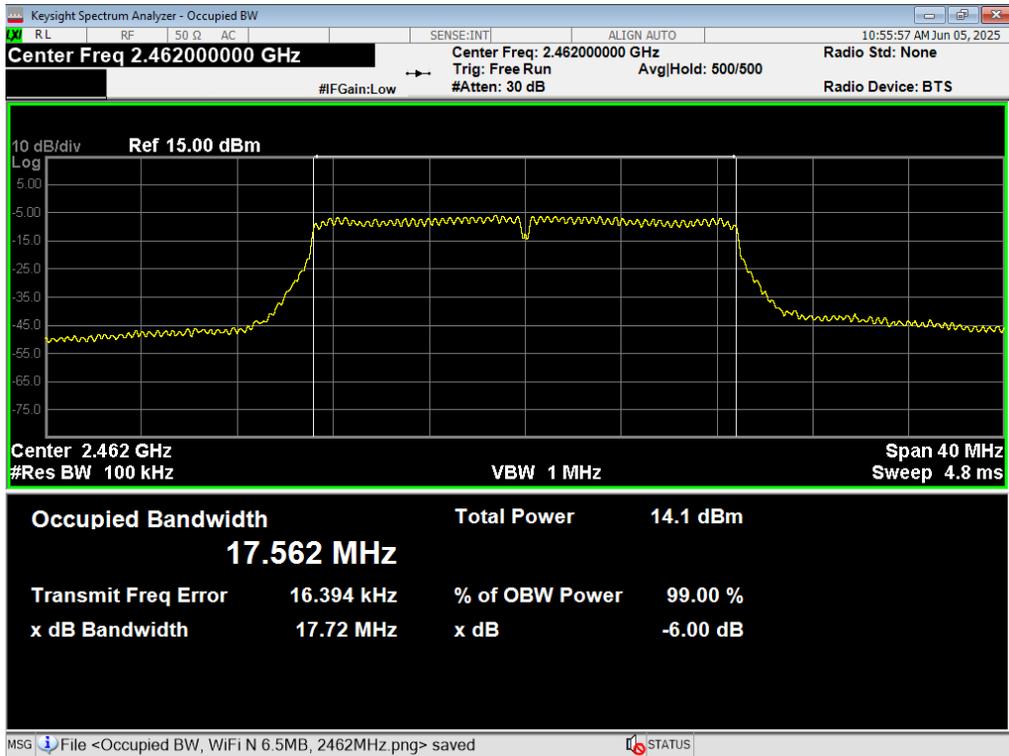
29 Occupied BW, WiFi N 6.5MB, 2462MHz



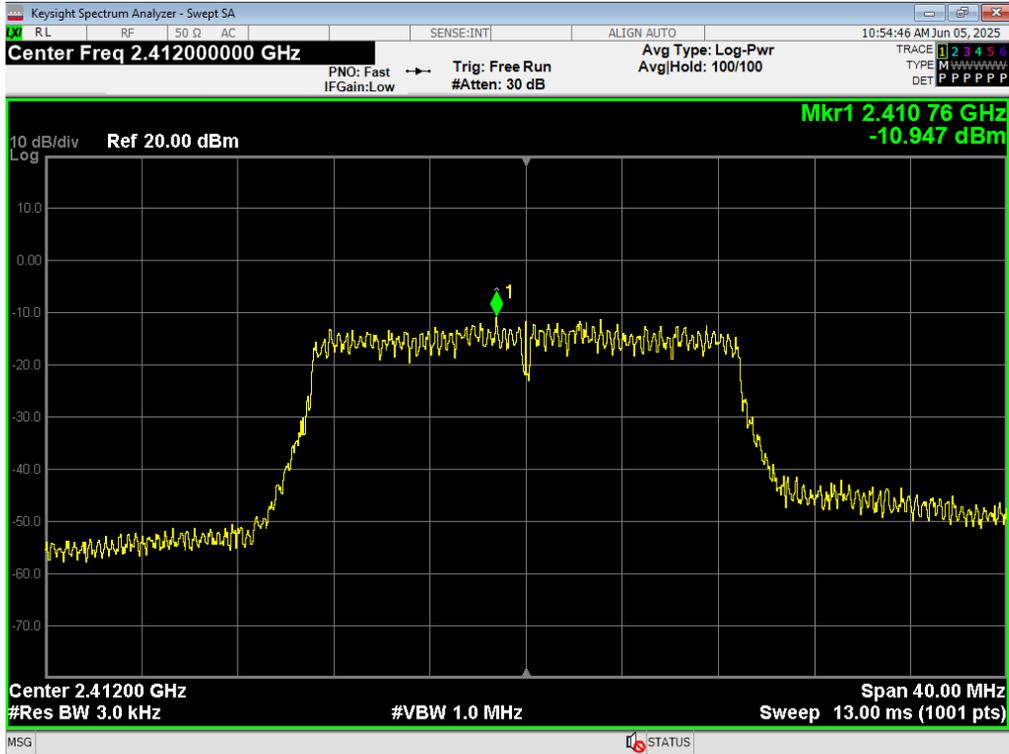
30 6dB BW, WiFi N 6.5MB, 2412MHz



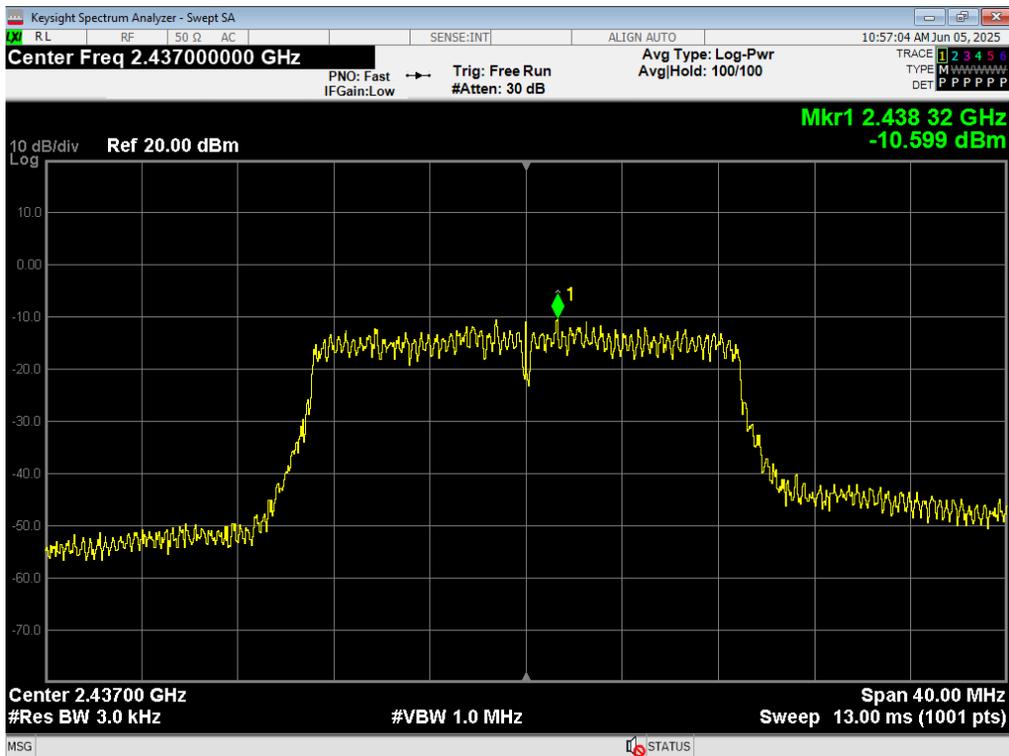
31 6dB BW, WiFi N 6.5MB, 2437MHz



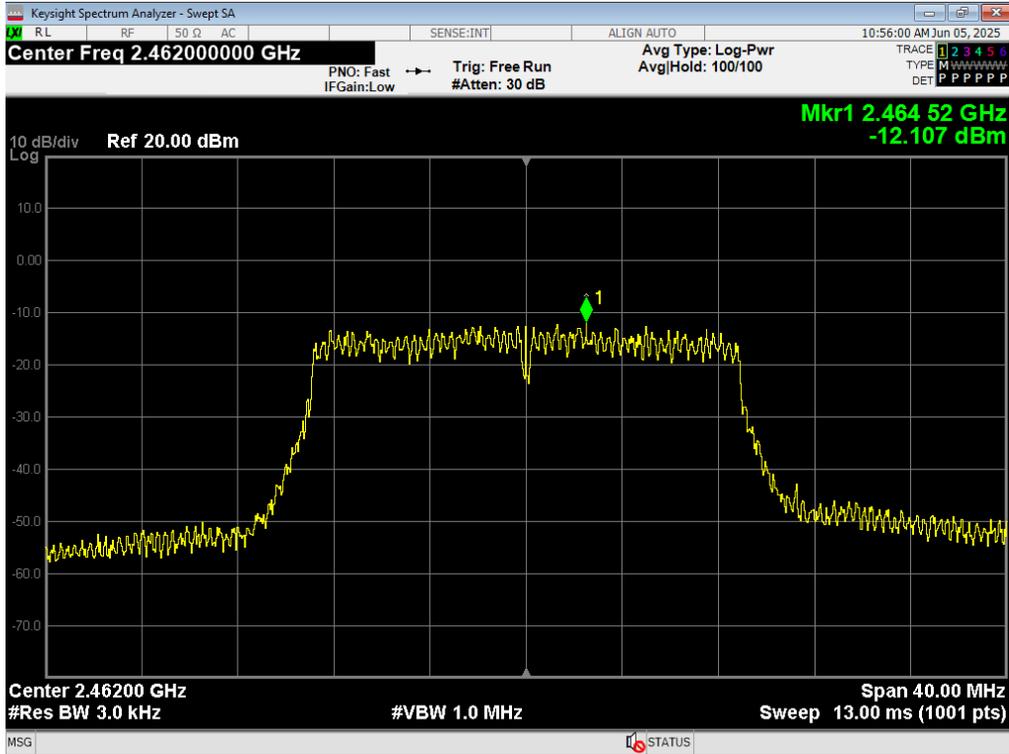
32 6dB BW, WiFi N 6.5MB, 2462MHz



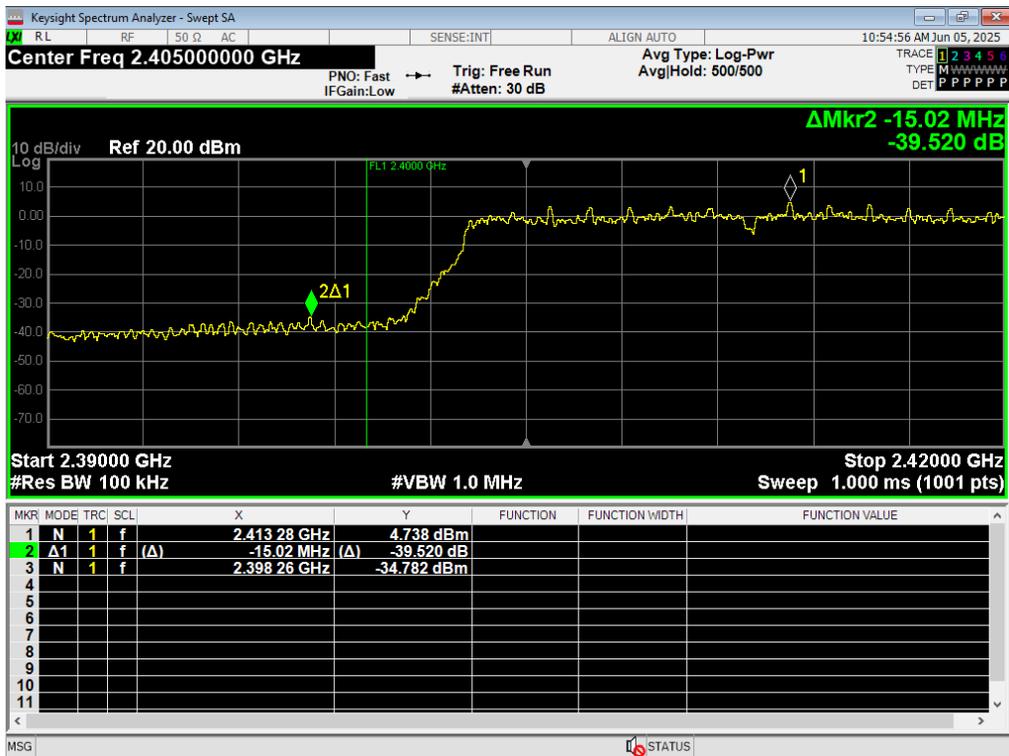
33 PSD, WiFi N 6.5MB, 2412MHz



34 PSD, WiFi N 6.5MB, 2437MHz



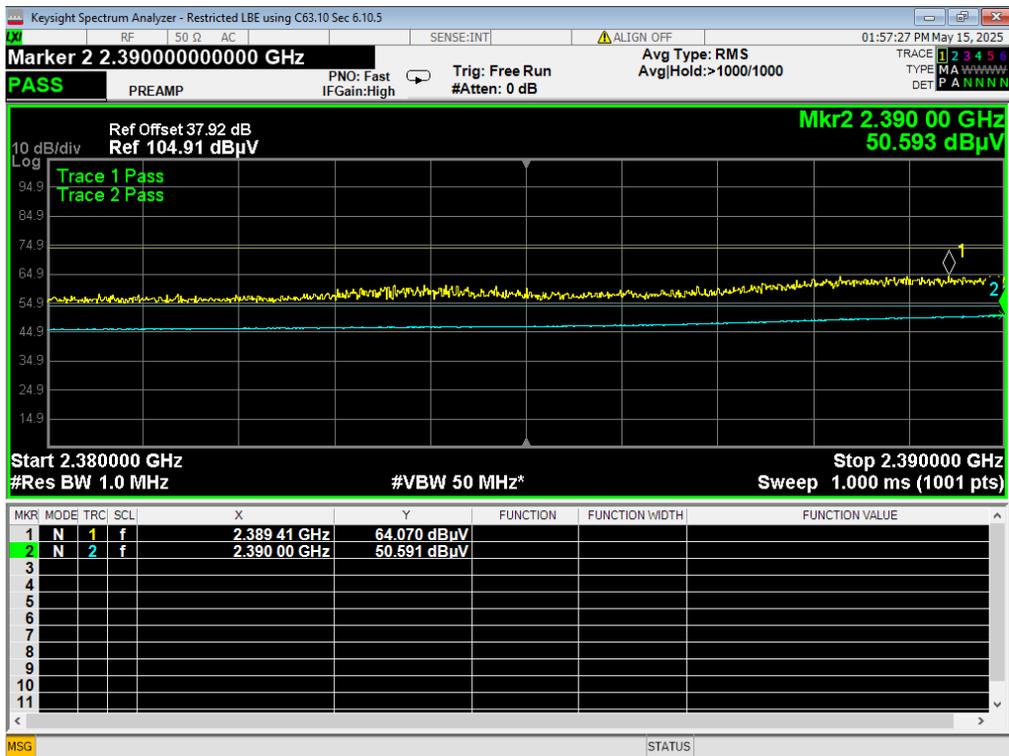
35 PSD, WiFi N 6.5MB, 2462MHz



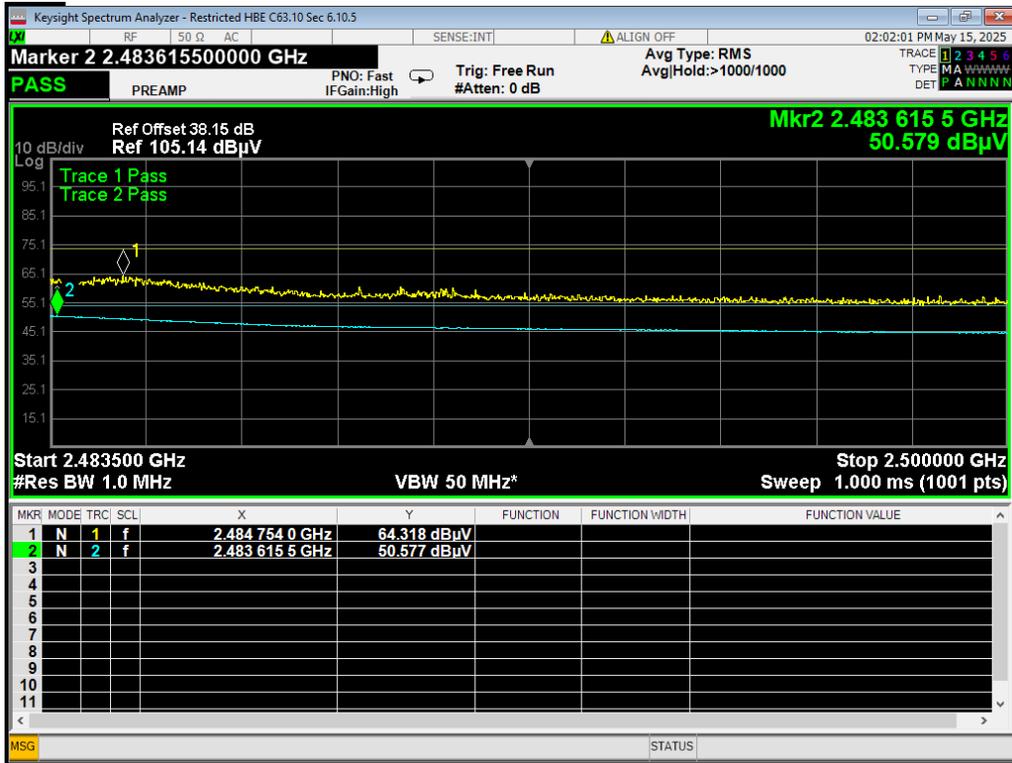
36 LBE Unrestricted, WiFi N 6.5MB



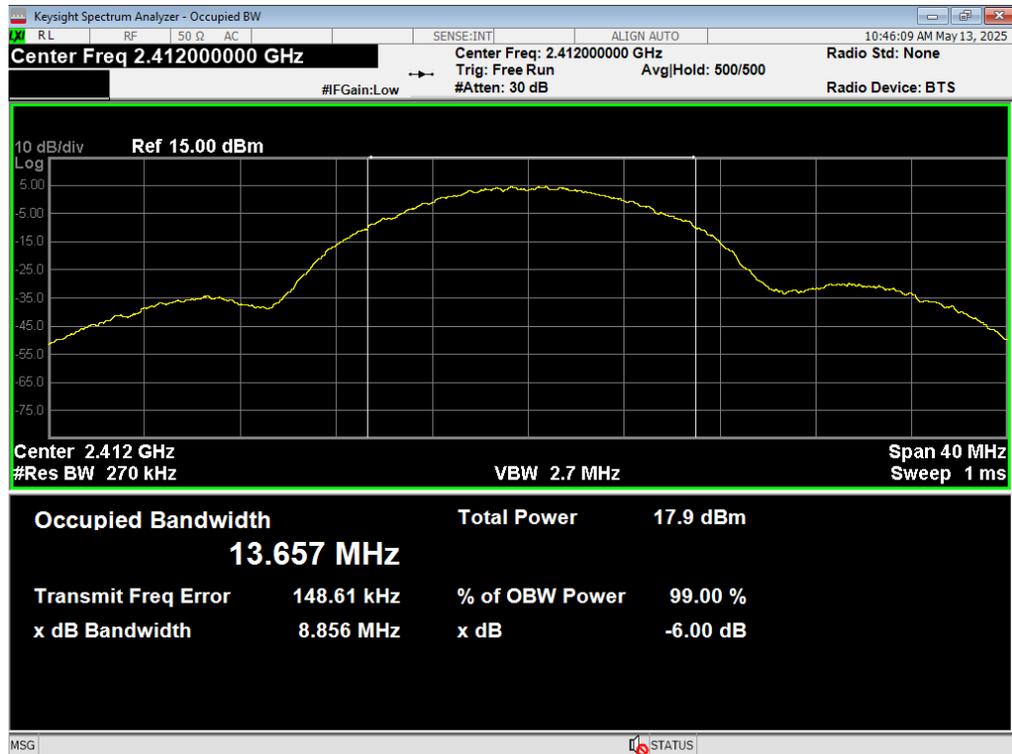
37 HBE Unrestricted, WiFi N 6.5MB



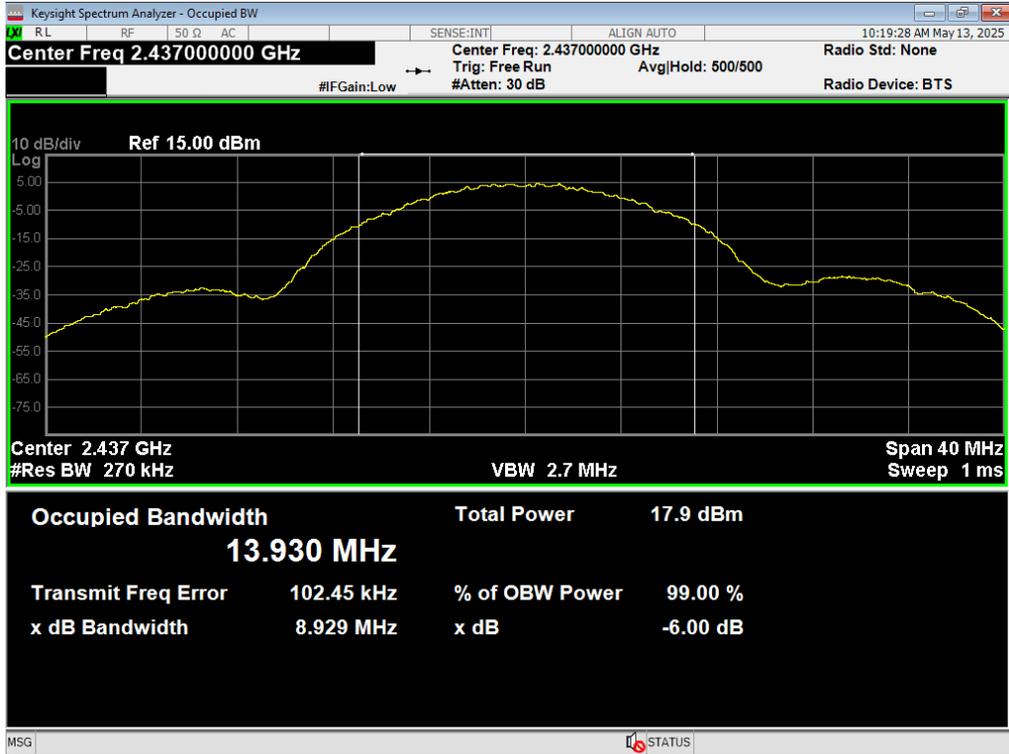
38 LBE Restricted, WiFi N 6.5MB



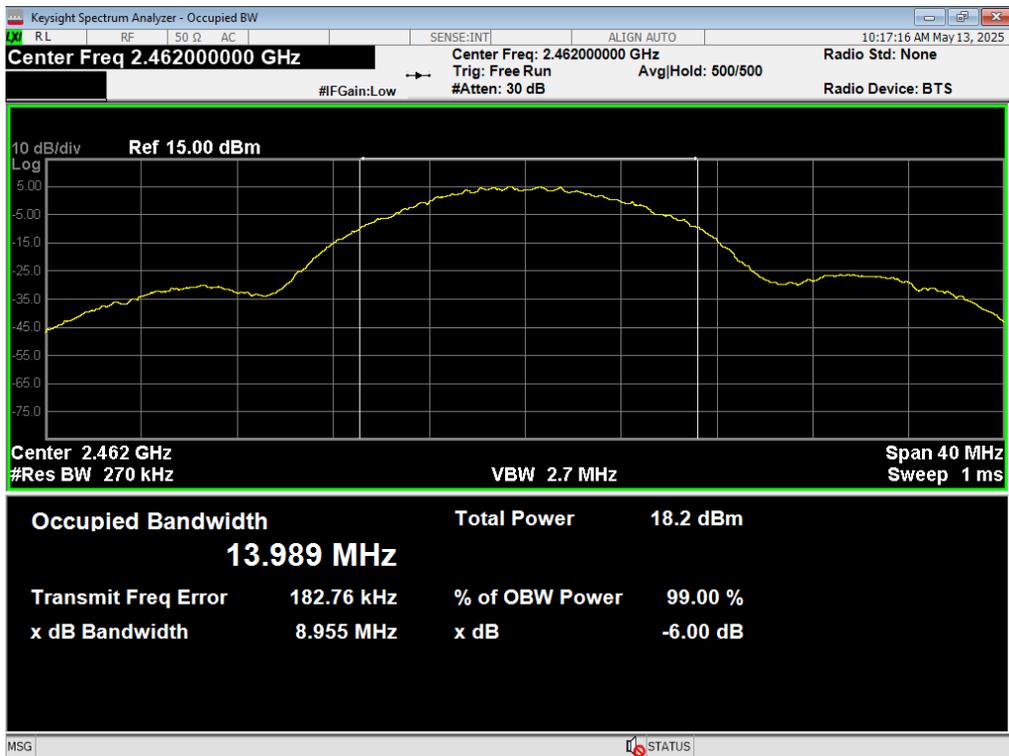
39 HBE Restricted, WiFi N 6.5MB



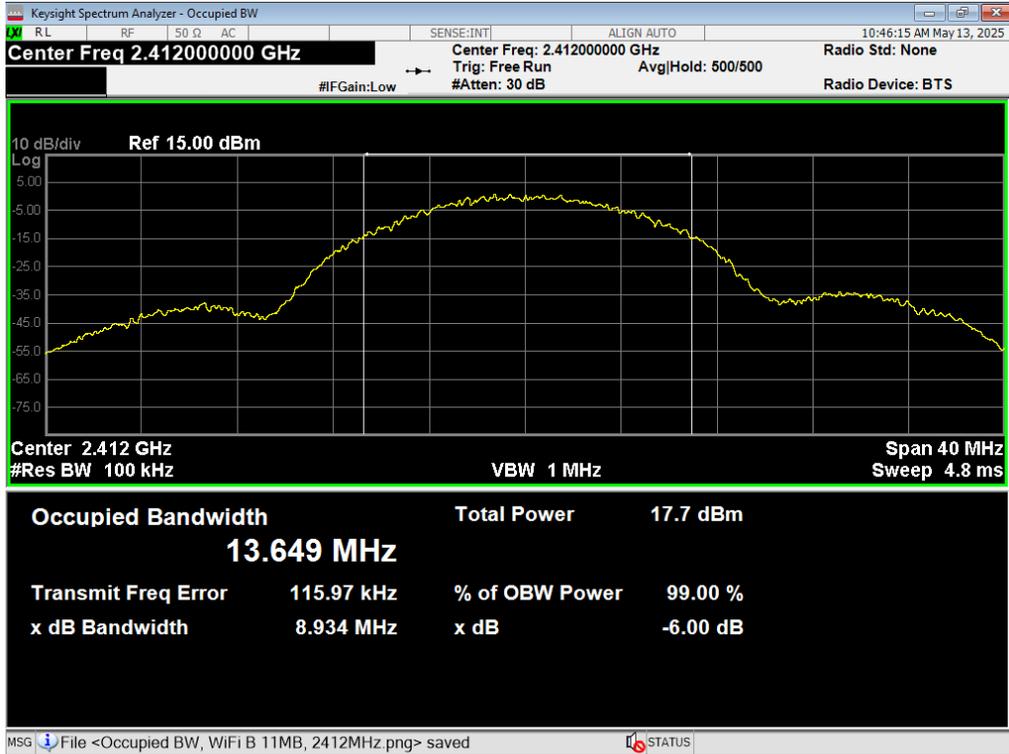
40 Occupied BW, WiFi B 11MB, 2412MHz



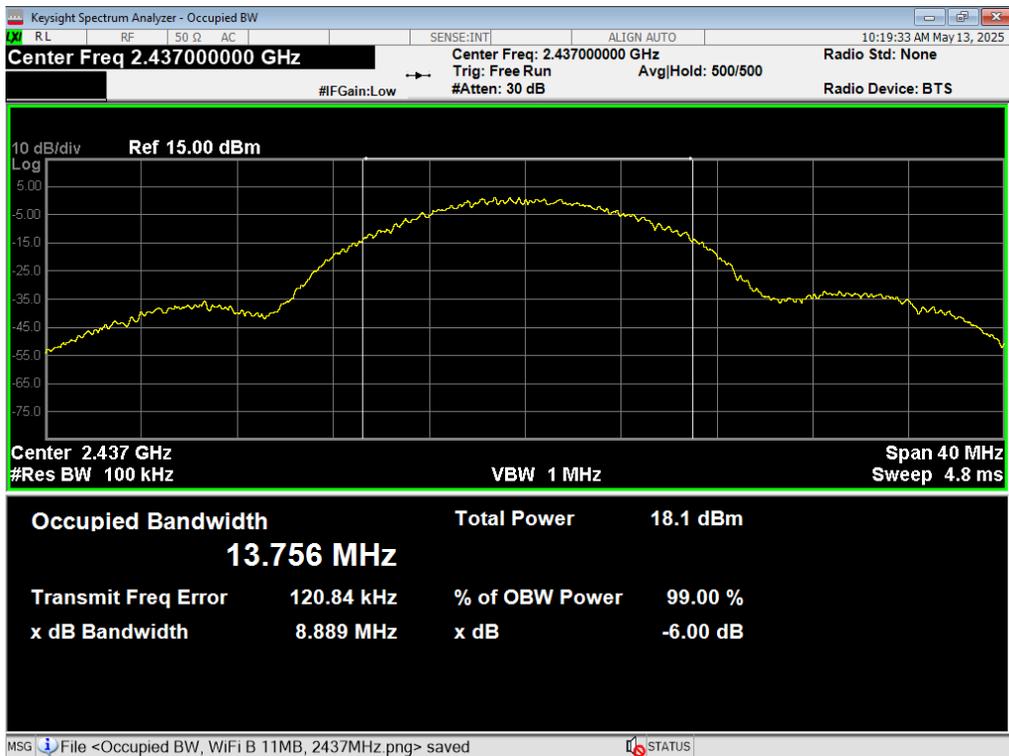
41 Occupied BW, WiFi B 11MB, 2437MHz



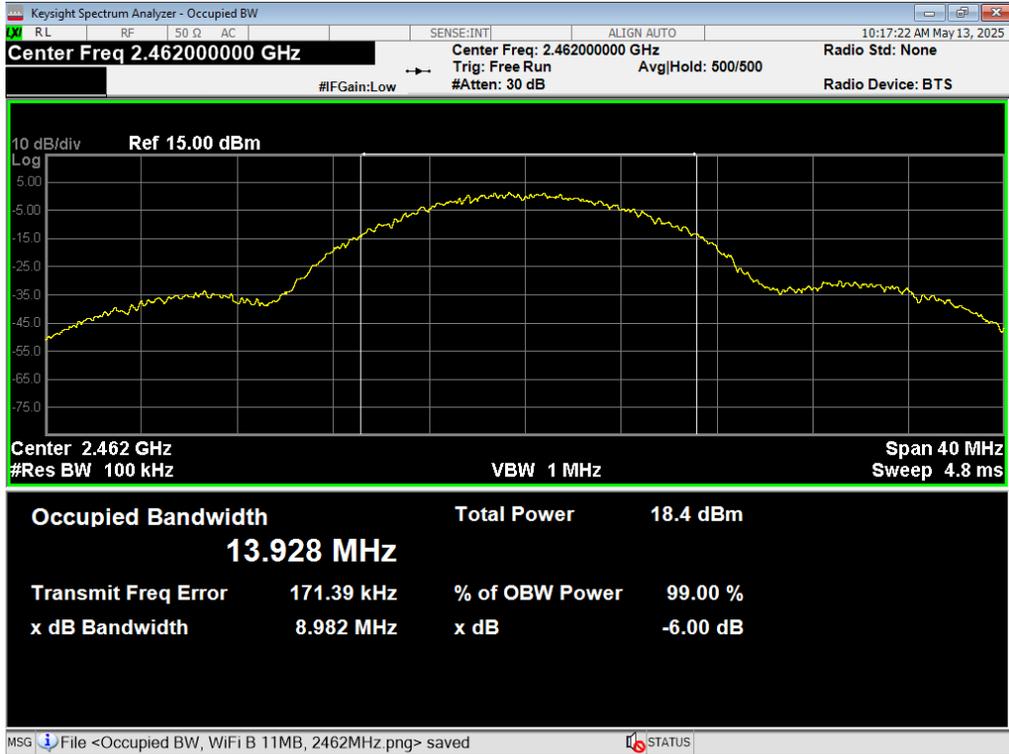
42 Occupied BW, WiFi B 11MB, 2462MHz



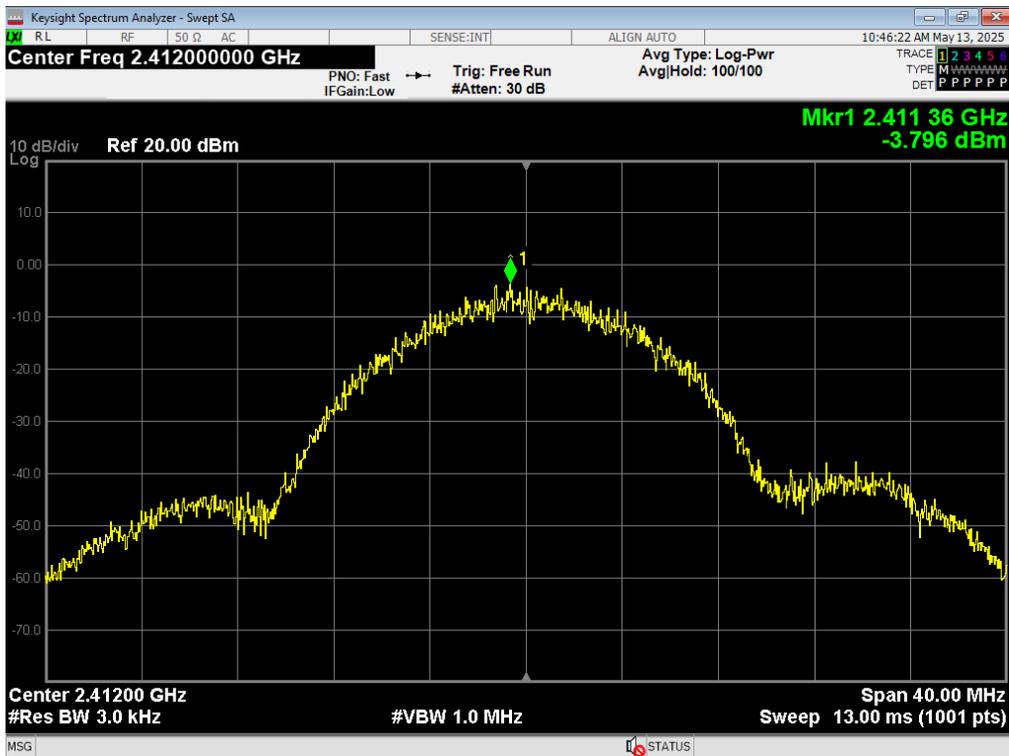
43 6dB BW, WiFi B 11MB, 2412MHz



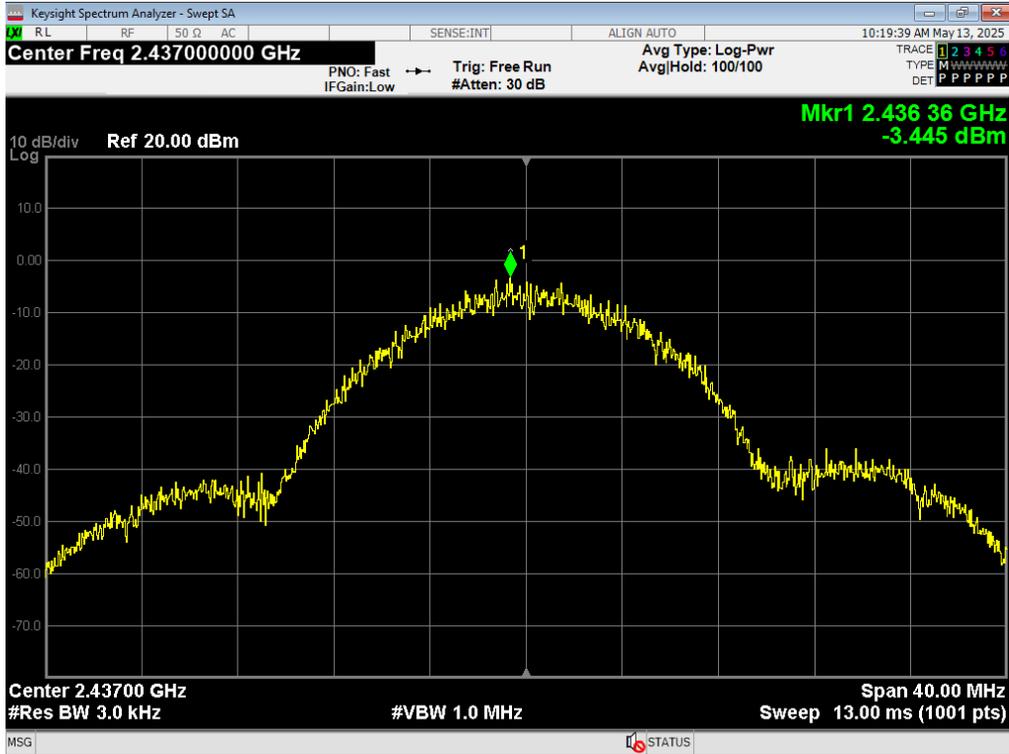
44 6dB BW, WiFi B 11MB, 2437MHz



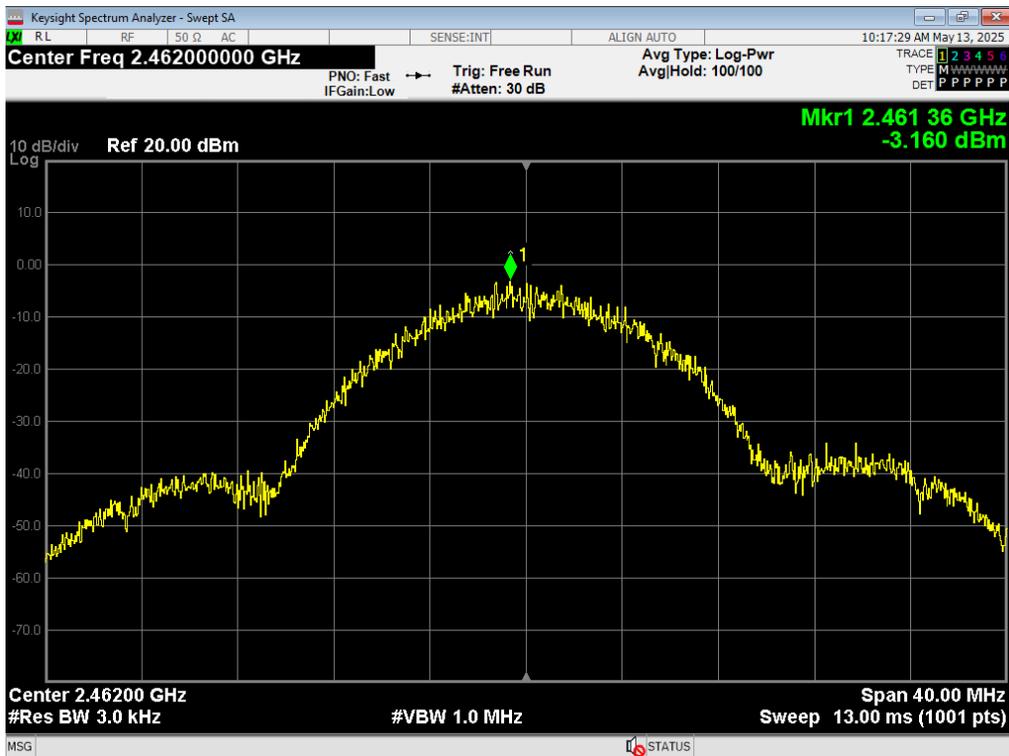
45 6dB BW, WiFi B 11MB, 2462MHz



46 PSD, WiFi B 11MB, 2412MHz



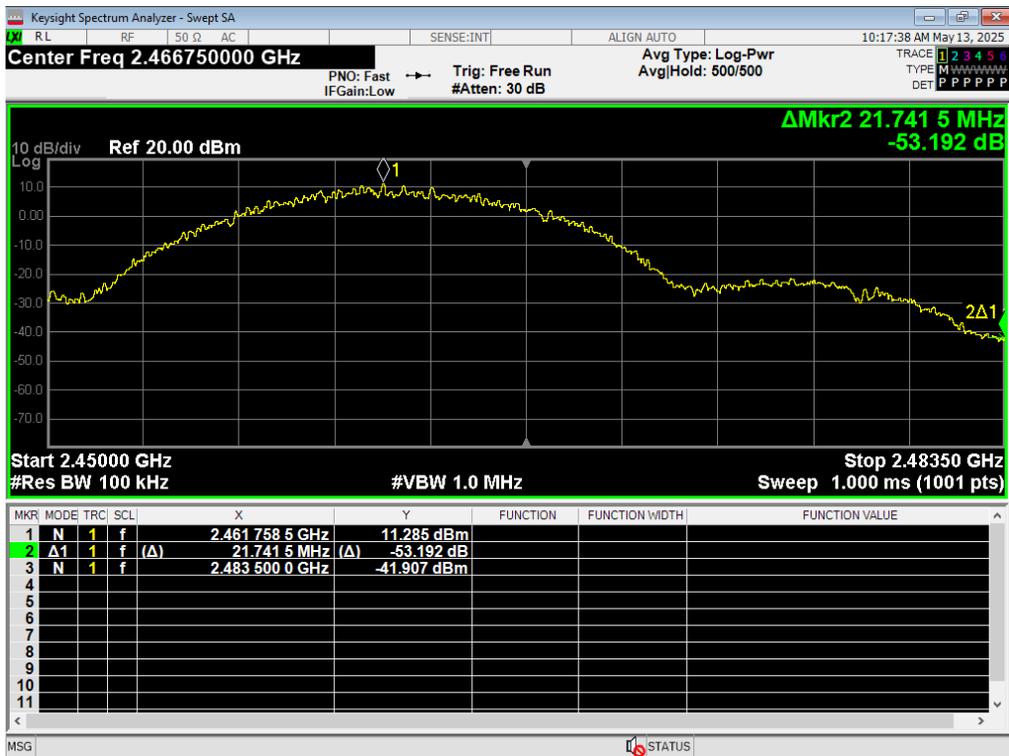
47 PSD, WiFi B 11MB, 2437MHz



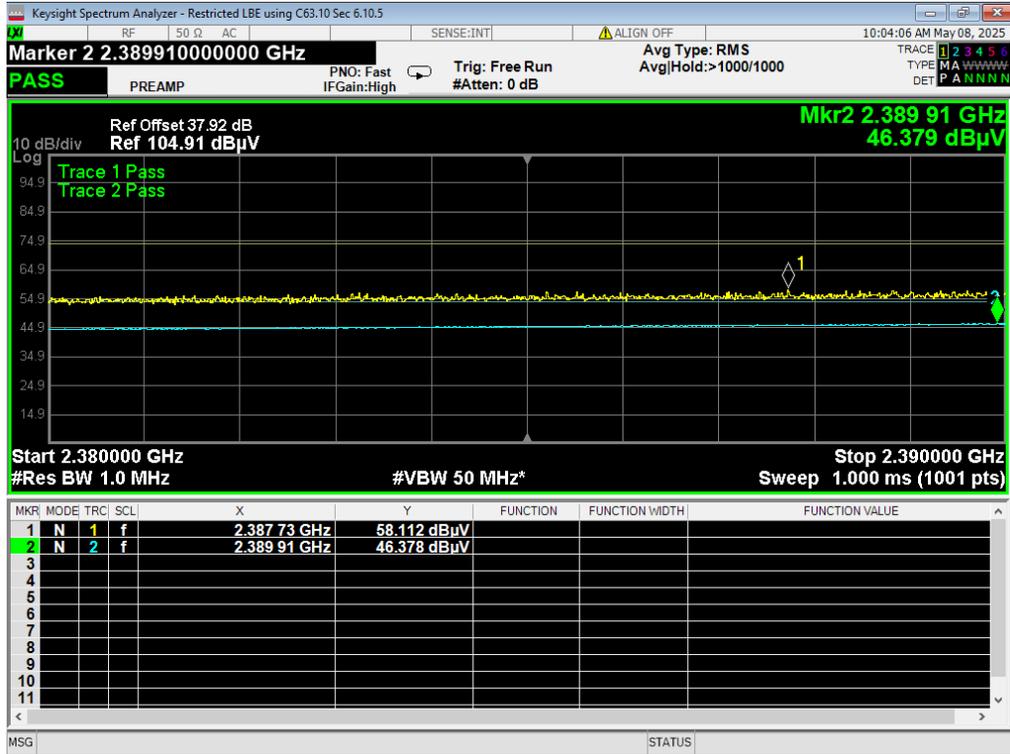
48 PSD, WiFi B 11MB, 2462MHz



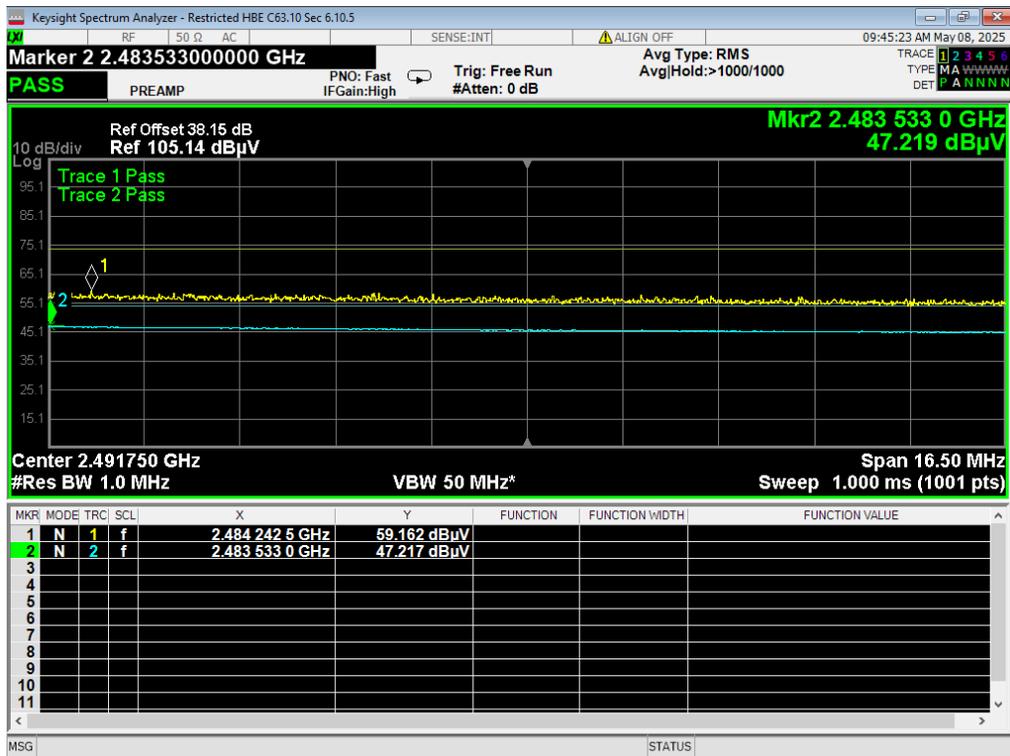
49 LBE Unrestricted, WiFi B 11MB



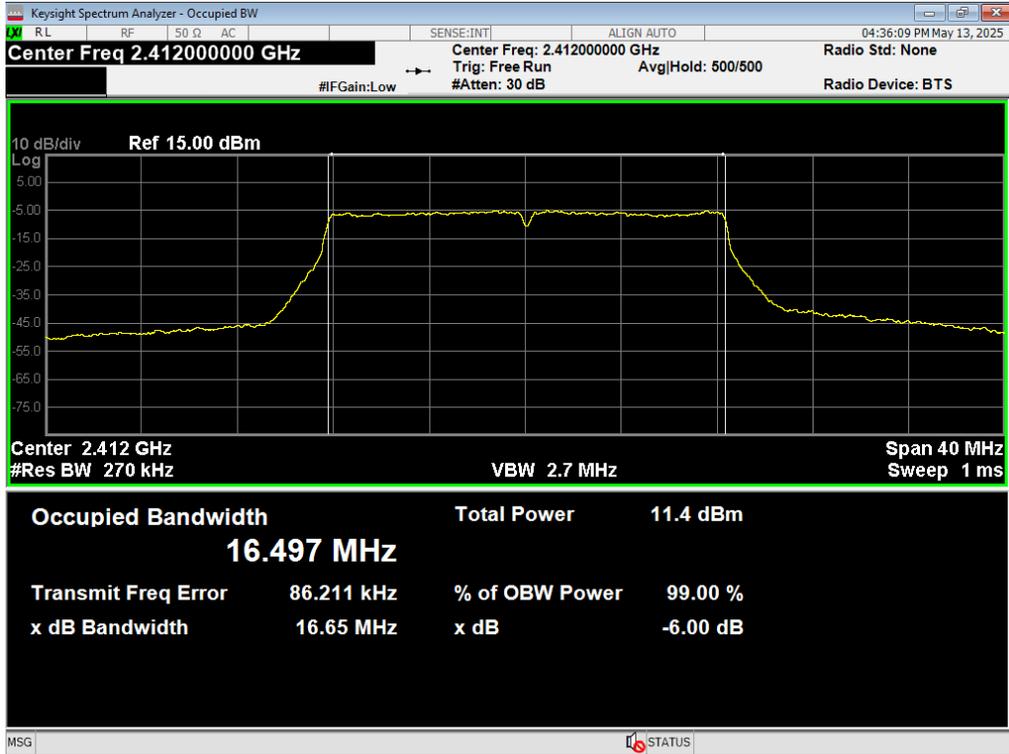
50 HBE Unrestricted, WiFi B 11MB



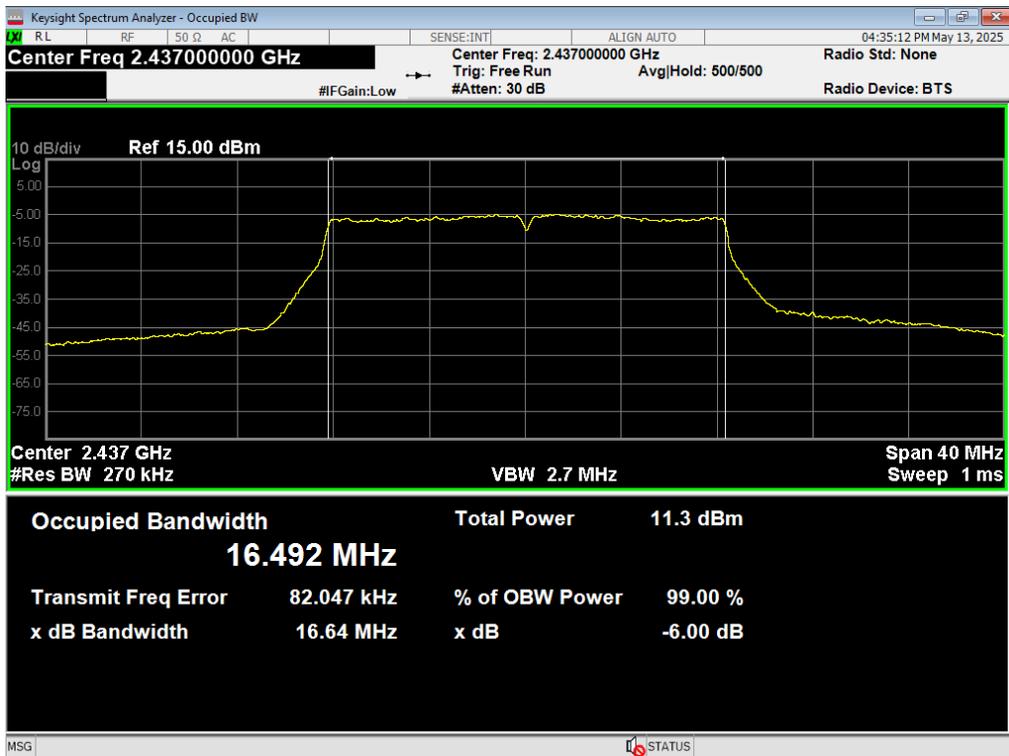
51 LBE Restricted, WiFi B 11MB



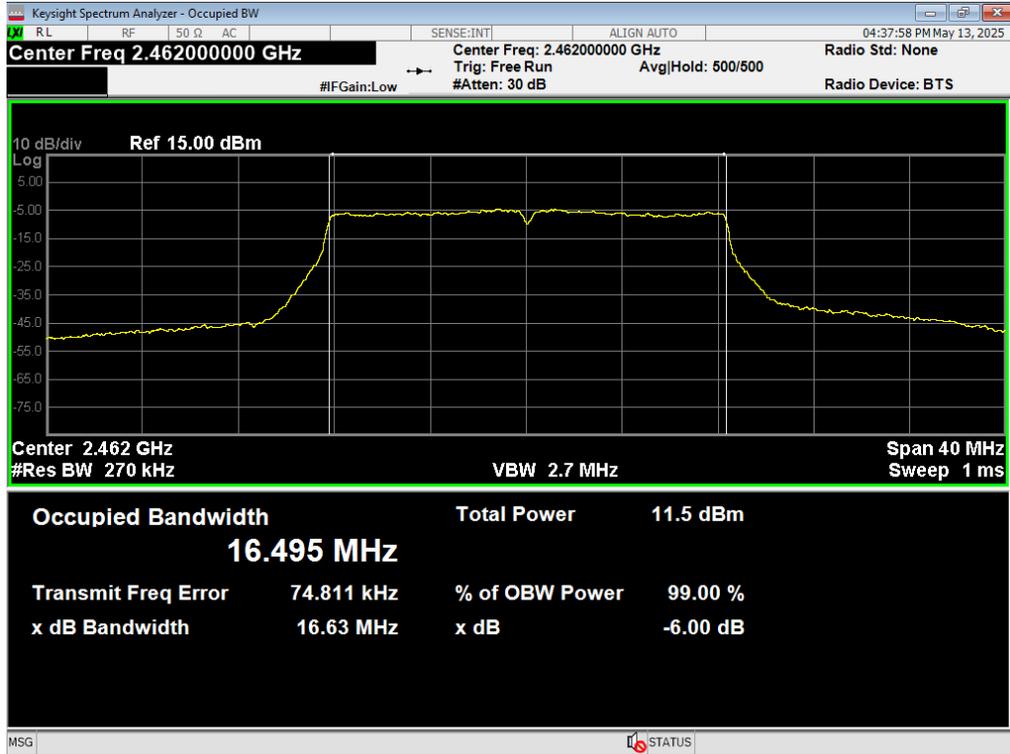
52 HBE Restricted, WiFi B 11MB, Ch11



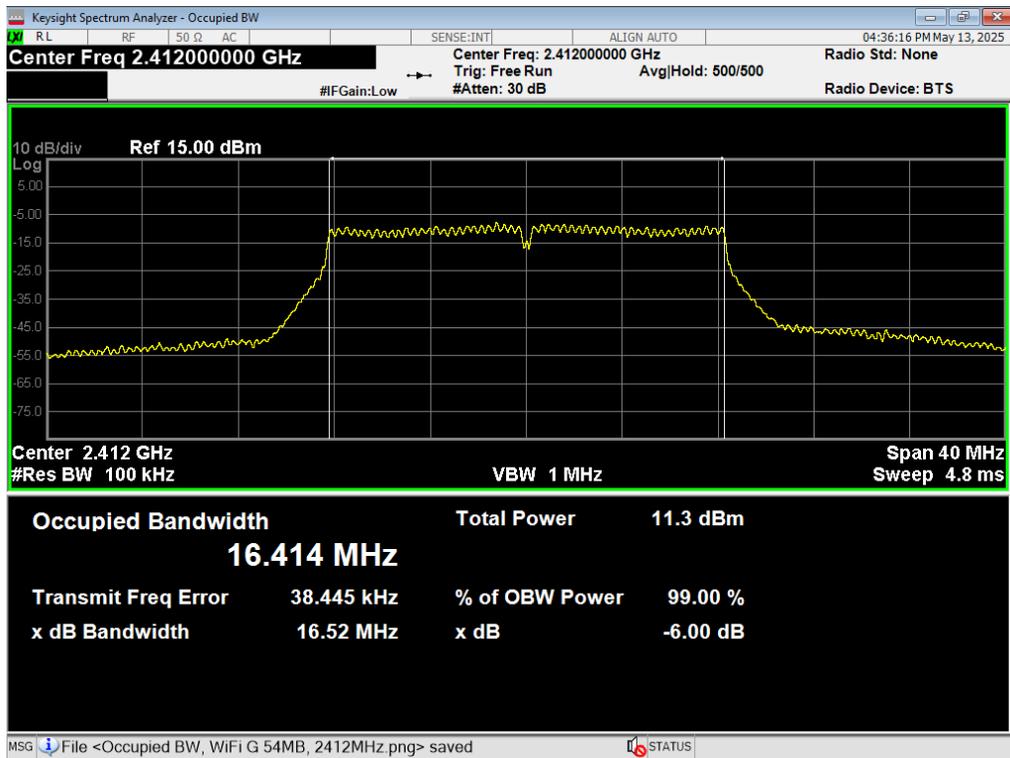
53 Occupied BW, WiFi G 54MB, 2412MHz



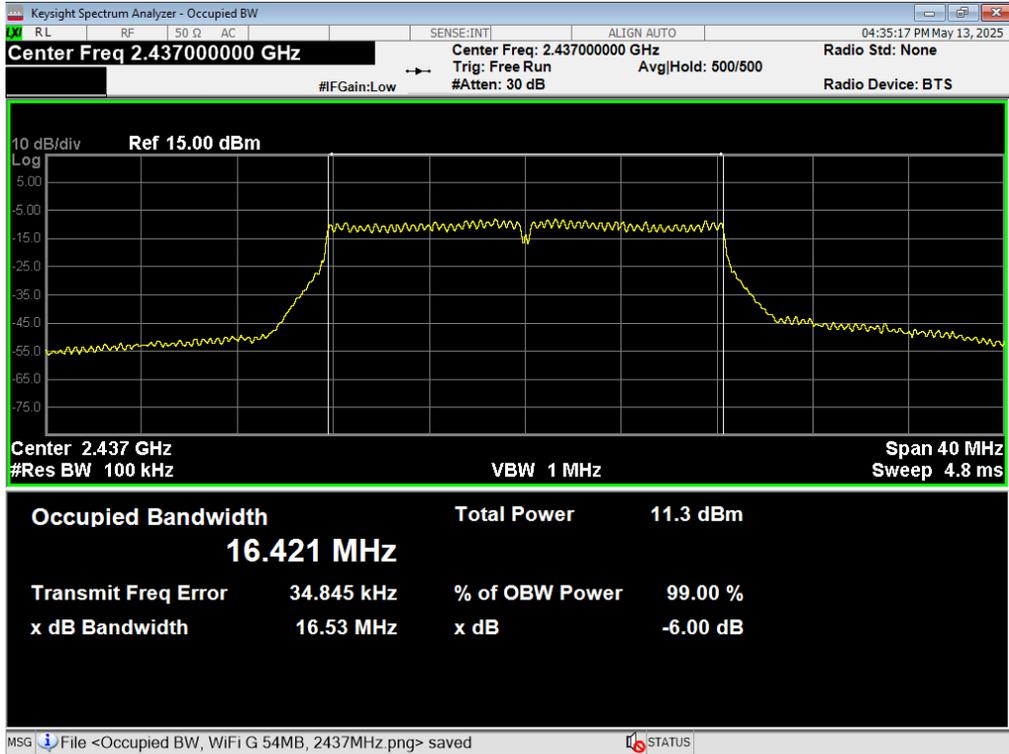
54 Occupied BW, WiFi G 54MB, 2437MHz



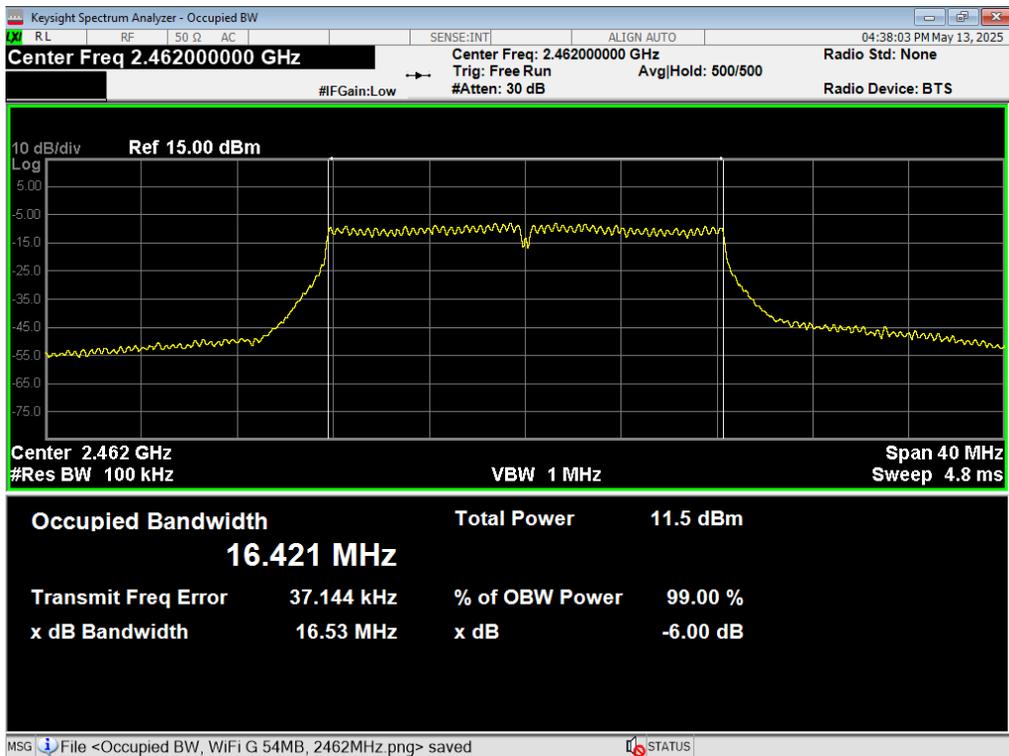
55 Occupied BW, WiFi G 54MB, 2462MHz



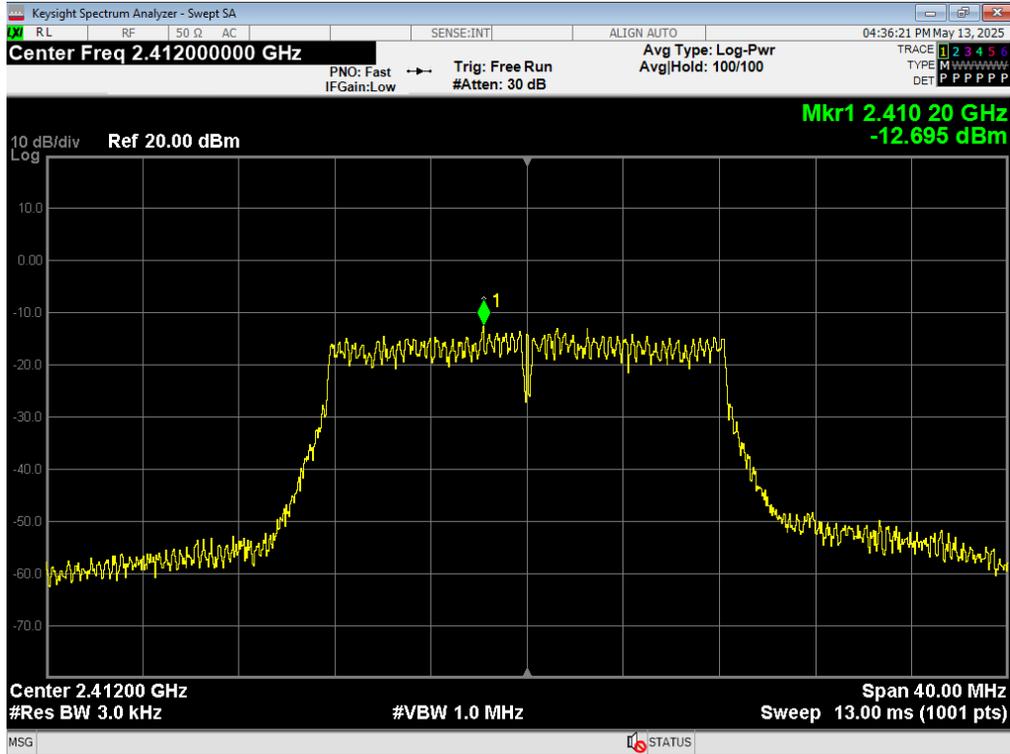
56 6dB BW, WiFi G 54MB, 2412MHz



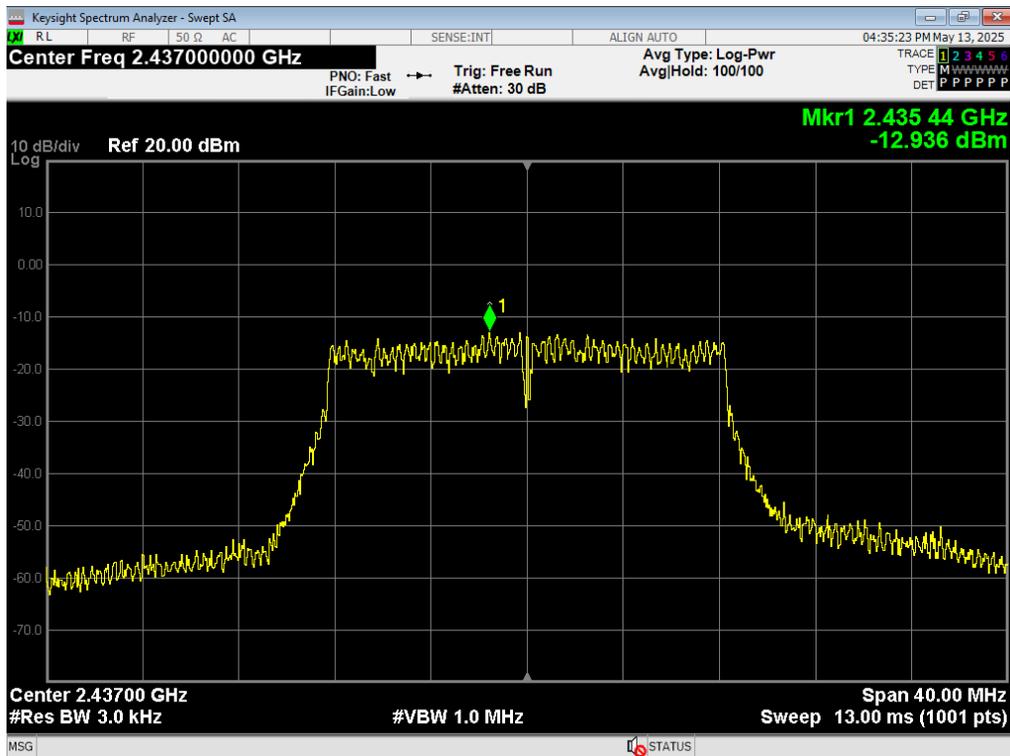
57 6dB BW, WiFi G 54MB, 2437MHz



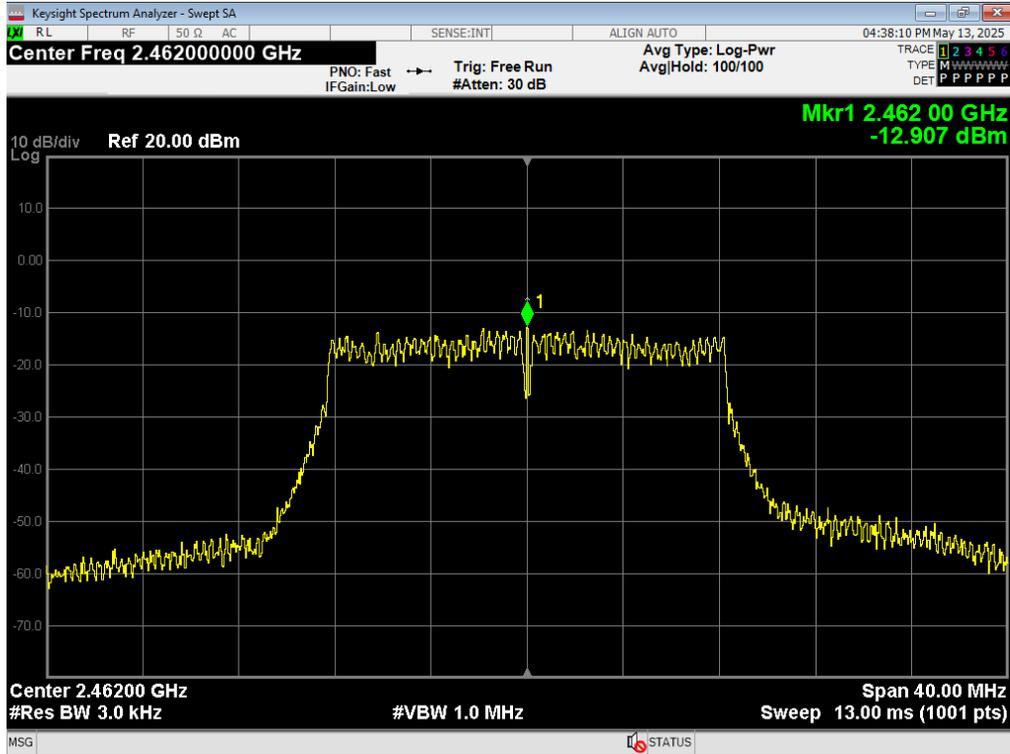
58 6dB BW, WiFi G 54MB, 2462MHz



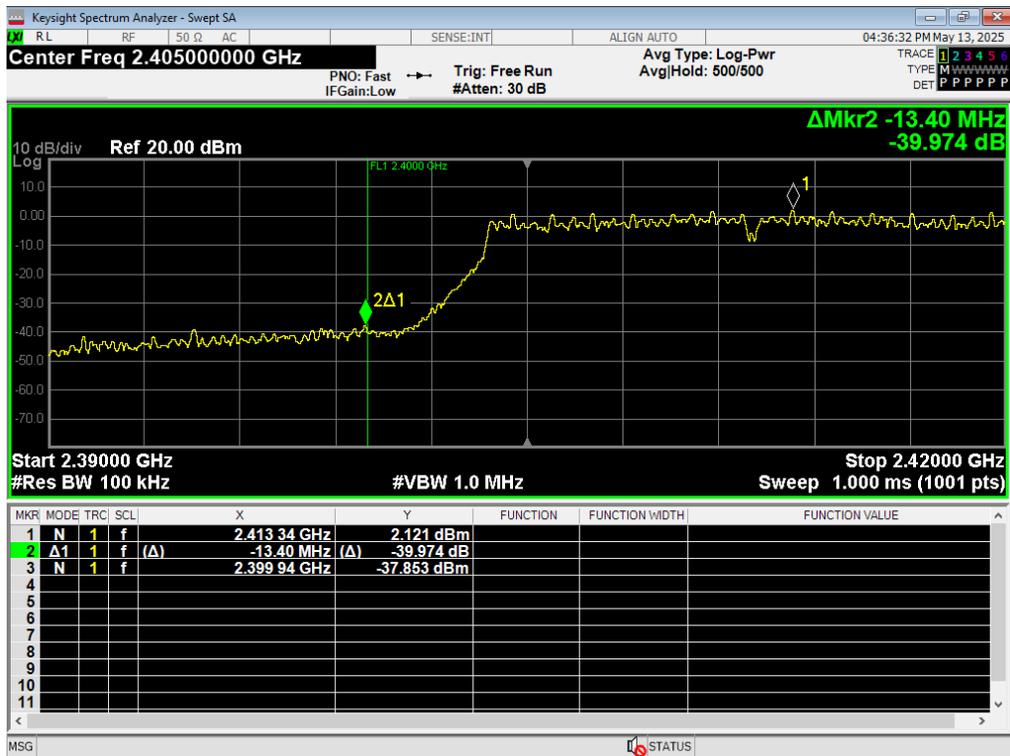
59 PSD, WiFi G 54MB, 2412MHz



60 PSD, WiFi G 54MB, 2437MHz



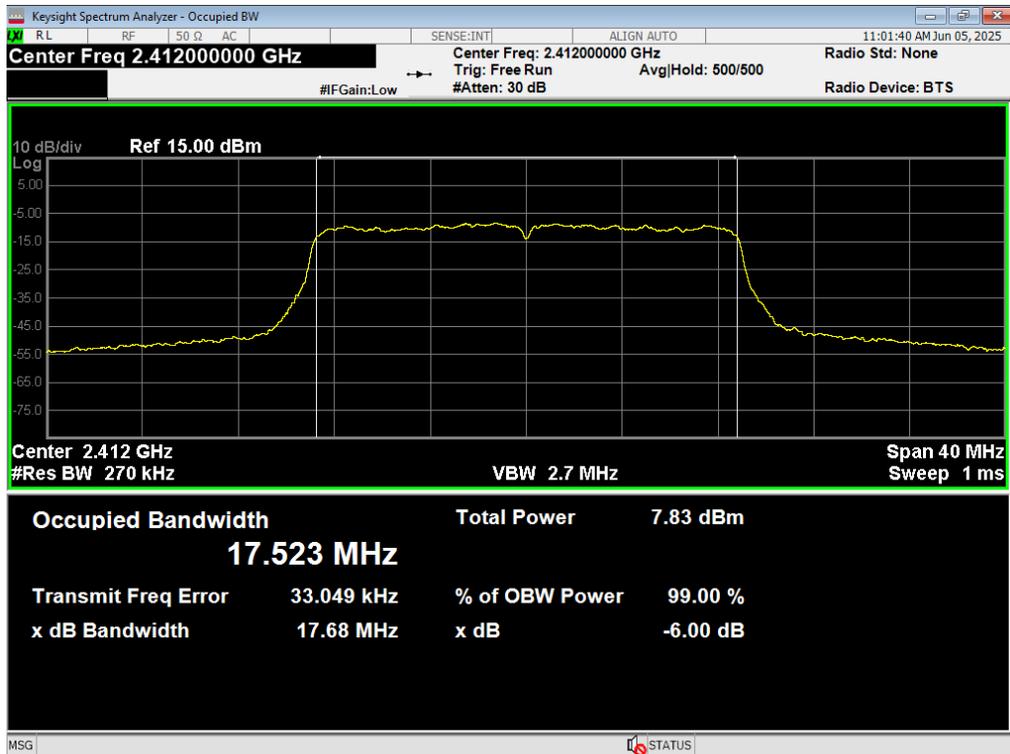
61 PSD, WiFi G 54MB, 2462MHz



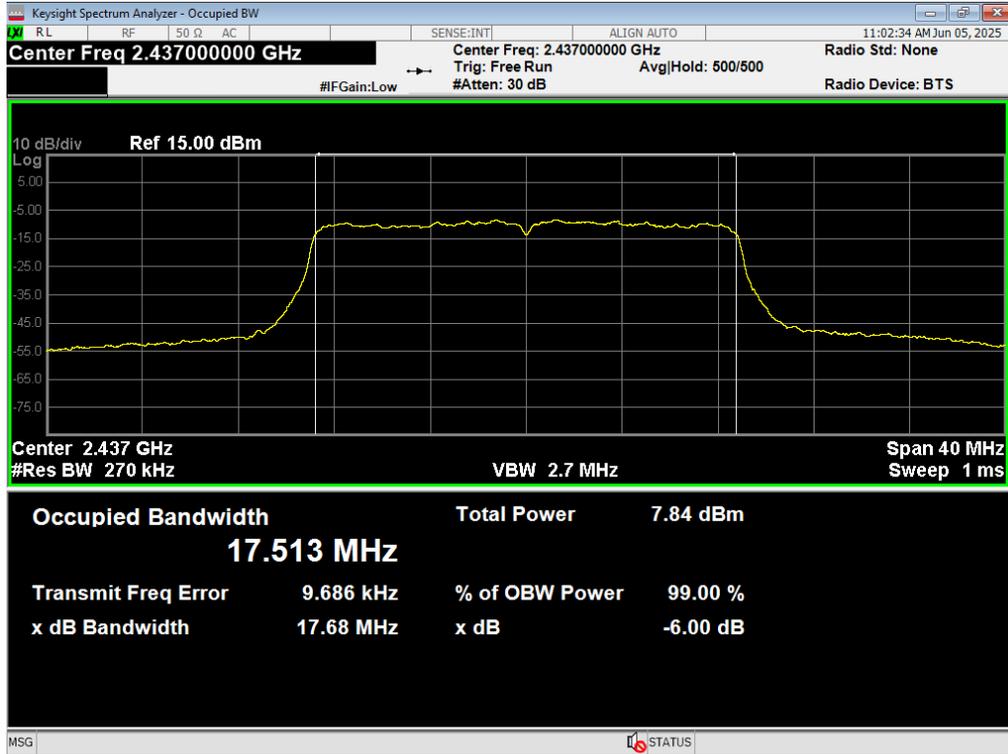
62 LBE Unrestricted, WiFi G 54MB



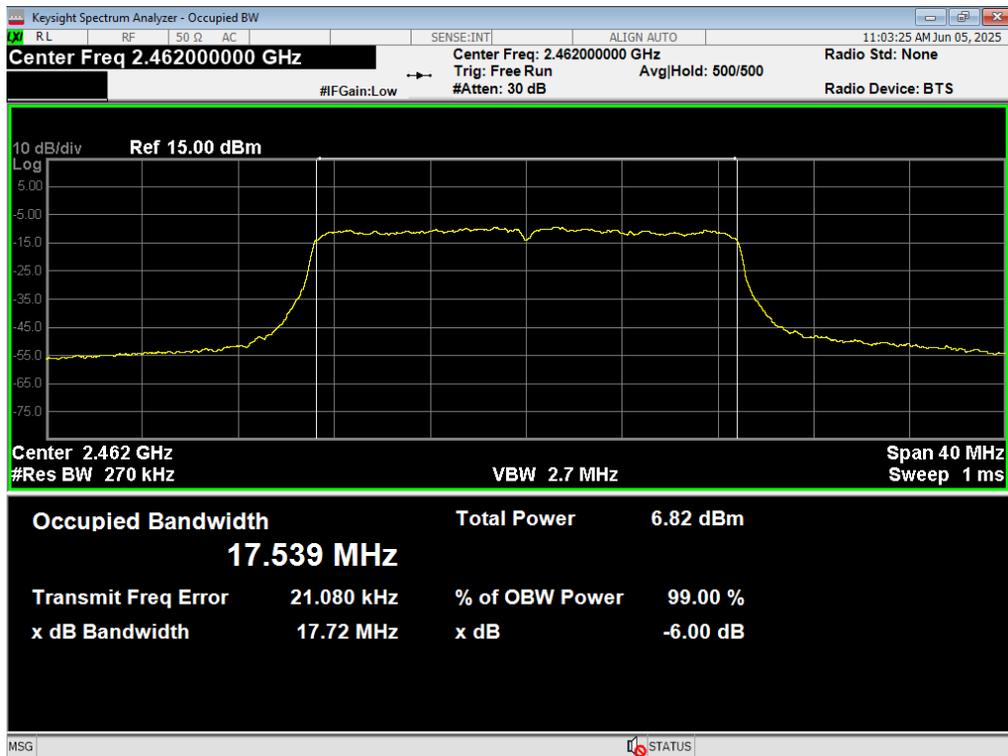
63 HBE Unrestricted, WiFi G 54MB



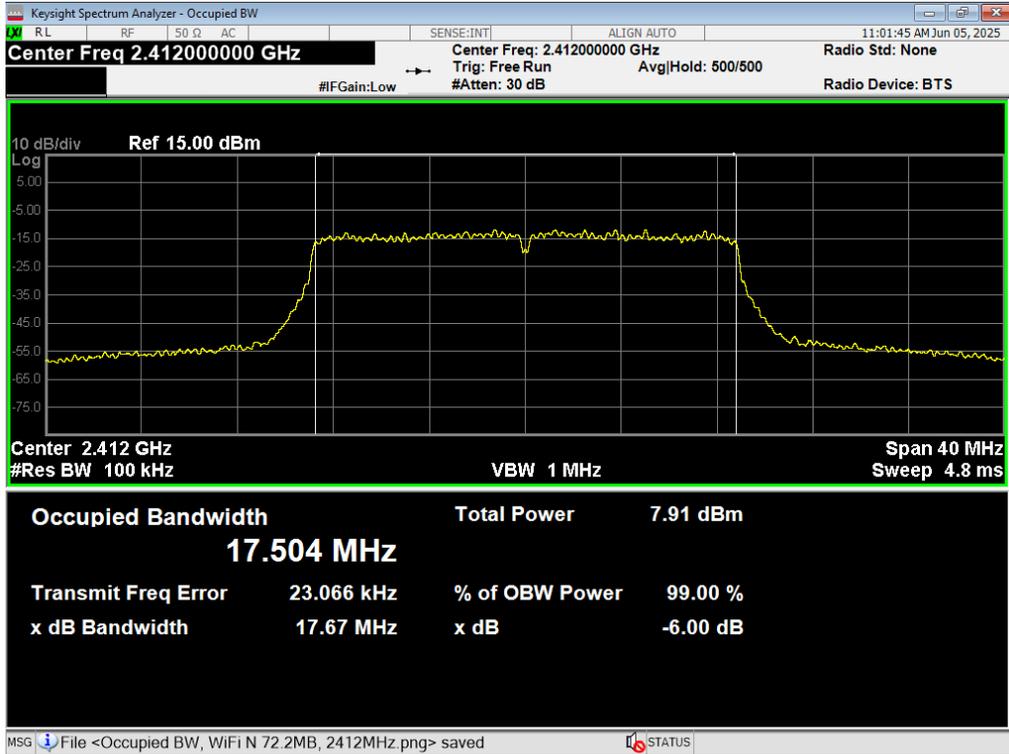
64 Occupied BW, WiFi N 72.2MB, 2412MHz



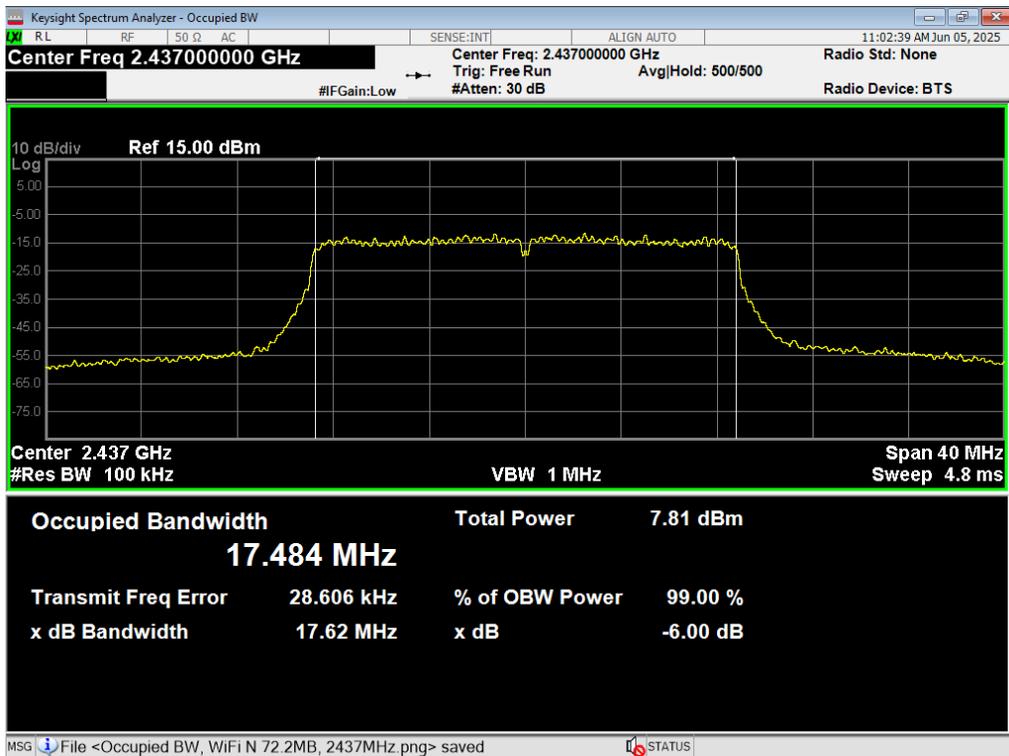
65 Occupied BW, WiFi N 72.2MB, 2437MHz



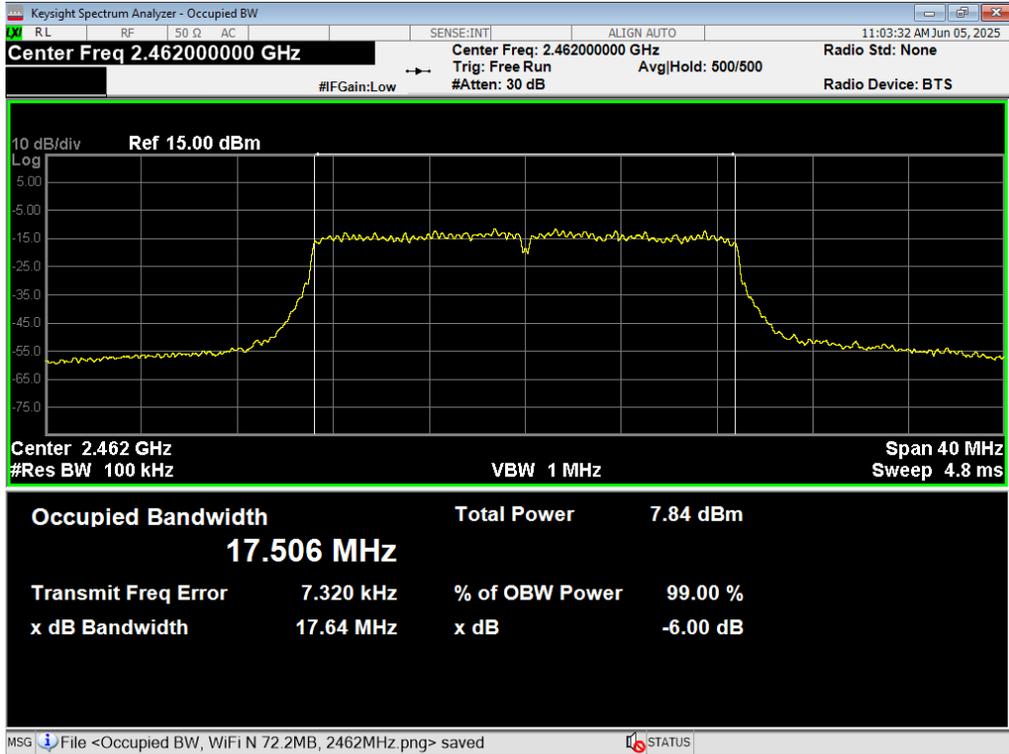
66 Occupied BW, WiFi N 72.2MB, 2462MHz



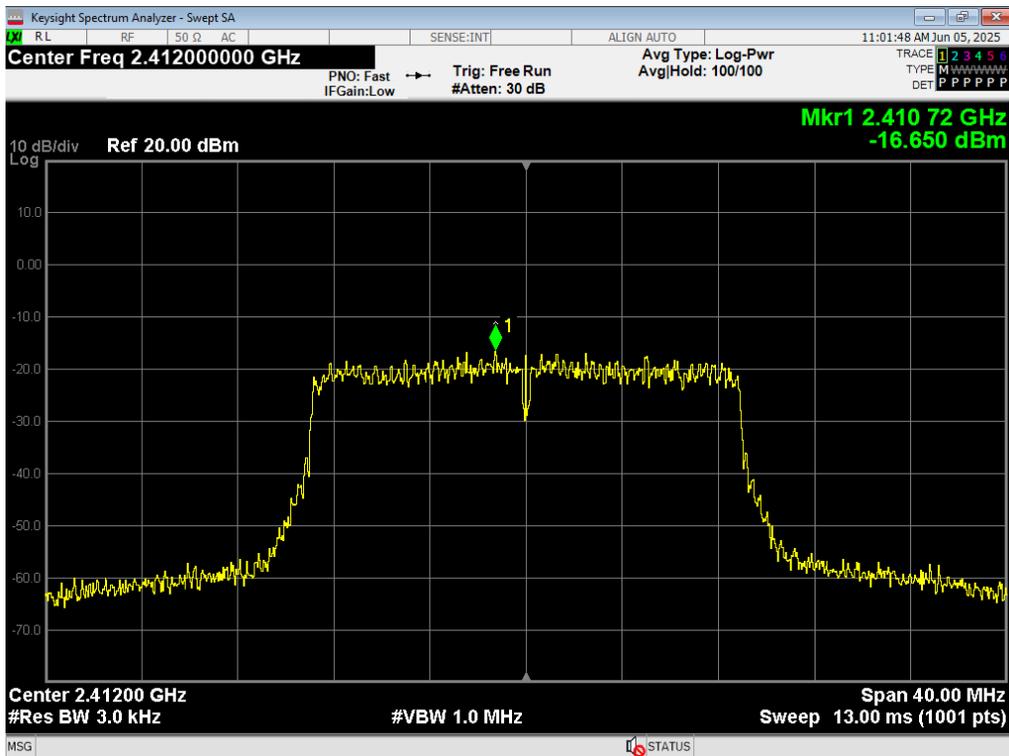
67 6dB BW, WiFi N 72.2MB, 2412MHz



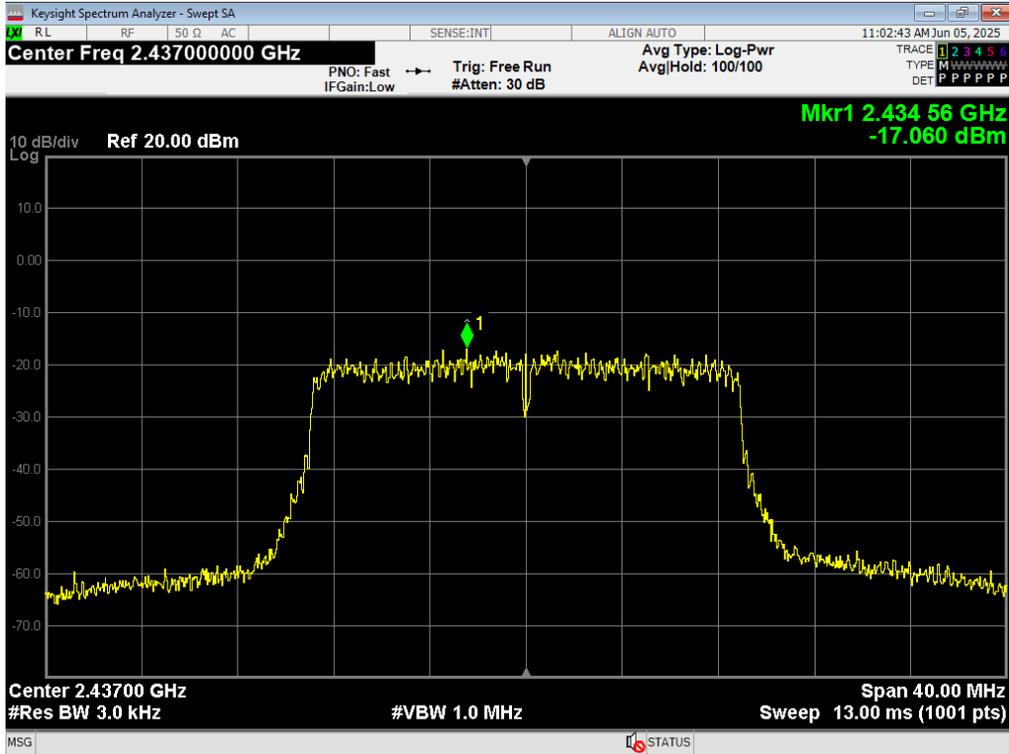
68 6dB BW, WiFi N 72.2MB, 2437MHz



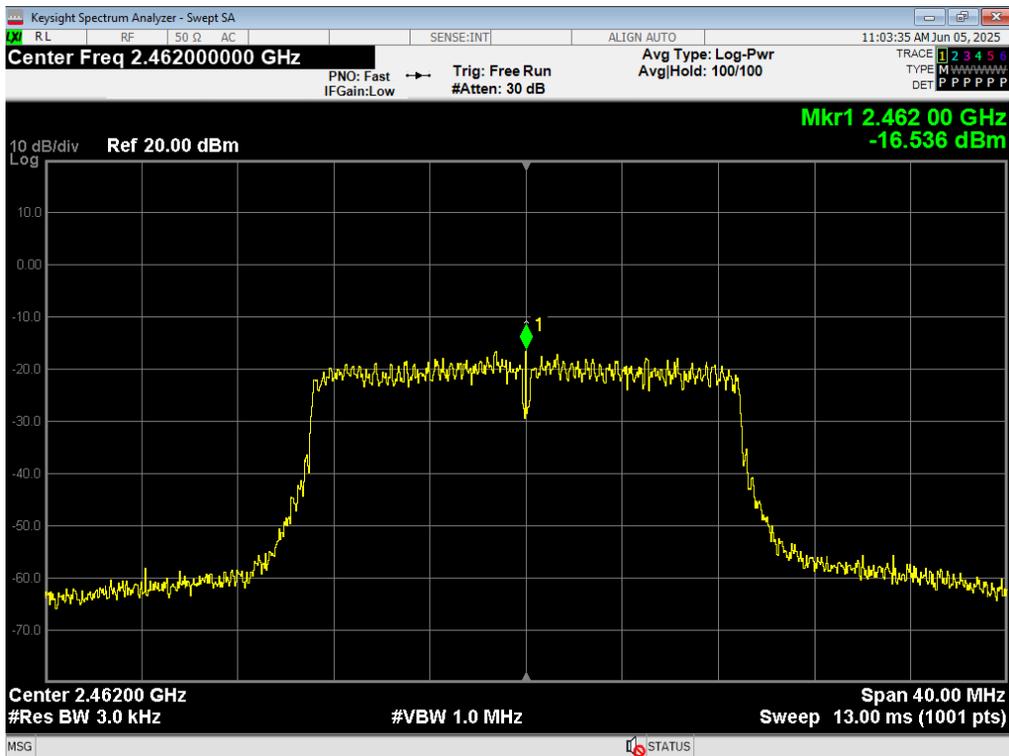
69 6dB BW, WiFi N 72.2MB, 2462MHz



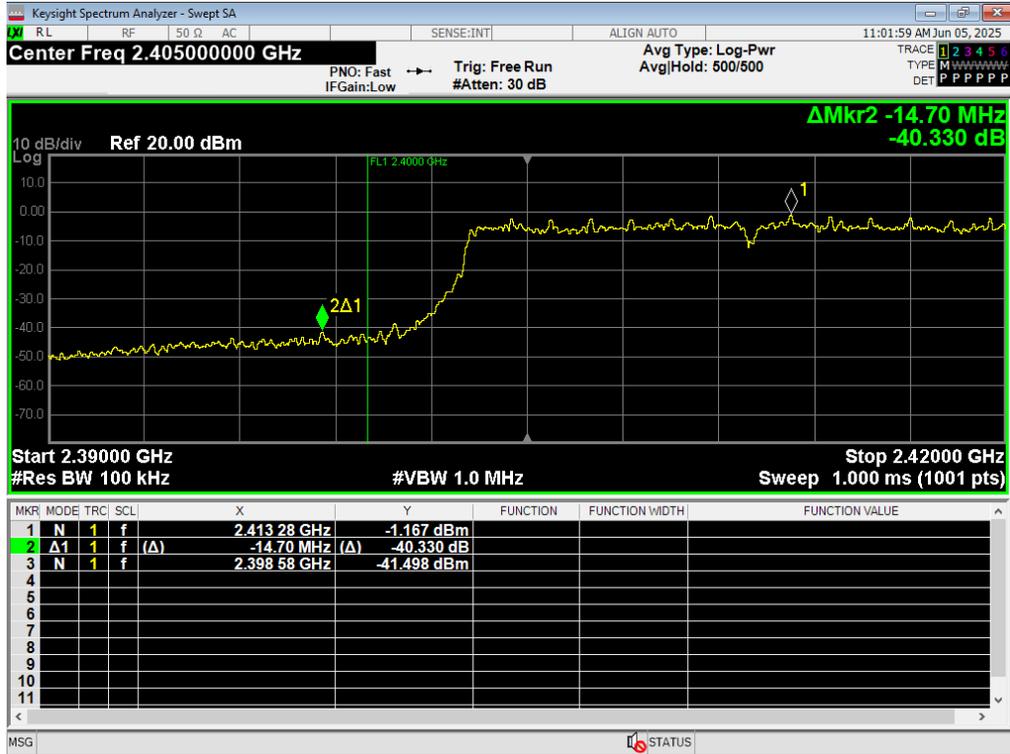
70 PSD, WiFi N 72.2MB, 2412MHz



71 PSD, WiFi N 72.2MB, 2437MHz



72 PSD, WiFi N 72.2MB, 2462MHz



73 LBE Unrestricted, WiFi N 72.2MB



74 HBE Unrestricted, WiFi N 72.2MB



Report Number:

R20250124-00-E2

Rev

B

Prepared for:

Garmin International, Inc.

REPORT END