

FCC/ISED Test Report

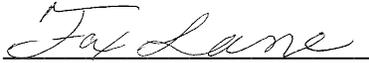
Prepared for: Garmin International, Inc.

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

Product: A04968

Test Report No: R20240627-00-E2 **Rev:** A

Approved by:


Fox Lane
EMC Test Engineer

DATE: December 19, 2024

Total Pages: 88

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REVISION PAGE

Rev. No.	Date	Description
0	5 December 2024	Issued by FLane Prepared by FLane
A	6 December 2024	Corrected Power measurement – FL



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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 3

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 3 Section 5.4(d)	Peak output power	Pass
FCC Part 15.247(a)(2) RSS-247 Issue 3 Section 5.2 (a)	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 3 Section 5.5, RSS-Gen Issue 5, Section 8.9	Transmitter Radiated Emissions	Pass
FCC Part 15.247(e) RSS-247 Issue 3 Section 5.2 (b)	Power Spectral Density	Pass
FCC Part 15.209, 15.247(d) RSS-247 Issue 3 Section 5.5	Band Edge Measurement	Pass
FCC Part 15.207 RSS-Gen Issue 5, Section 8.8	Conducted Emissions	N/A*

*DC Battery Powered Device



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2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

Summary and Operating Condition:

EUT	A04968
FCC ID	IPH-04968
IC ID	1792A-04968
EUT Received	7 August 2024
EUT Tested	25 September 2024- 11 November 2024
Serial No.	200183 (Radiated Sample) (Lab Assigned Serial Number) 200177 (Conducted Sample) (Lab Assigned Serial Number)
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	External Battery Pack, 32VDC Pack

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	MCS0/MCS7

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 Technician	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.



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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
Com-Power LISN, Single Phase	LI-220C	20070017	July 17, 2023	July 17, 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, 2025
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	June 5, 2023	June 5, 2025
RF Cable (antenna to 10m chamber bulkhead)*	FSCM 64639	01E3872	June 5, 2023	June 5, 2025
RF Cable (10m chamber bulkhead to control room bulkhead)*	FSCM 64639	01E3874	June 5, 2023	June 5, 2025
RF Cable (control room bulkhead to test receiver)*	FSCM 64639	01F1206	June 5, 2023	June 5, 2025
N connector bulkhead (10m chamber)*	PE9128	NCEEBH1	June 5, 2023	June 5, 2025
N connector bulkhead (control room)*	PE9128	NCEEBH2	June 5, 2023	June 5, 2025
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.

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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.

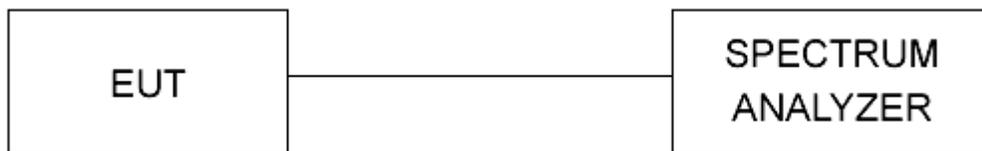


Figure 1 - Bandwidth Measurements Test Setup

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.

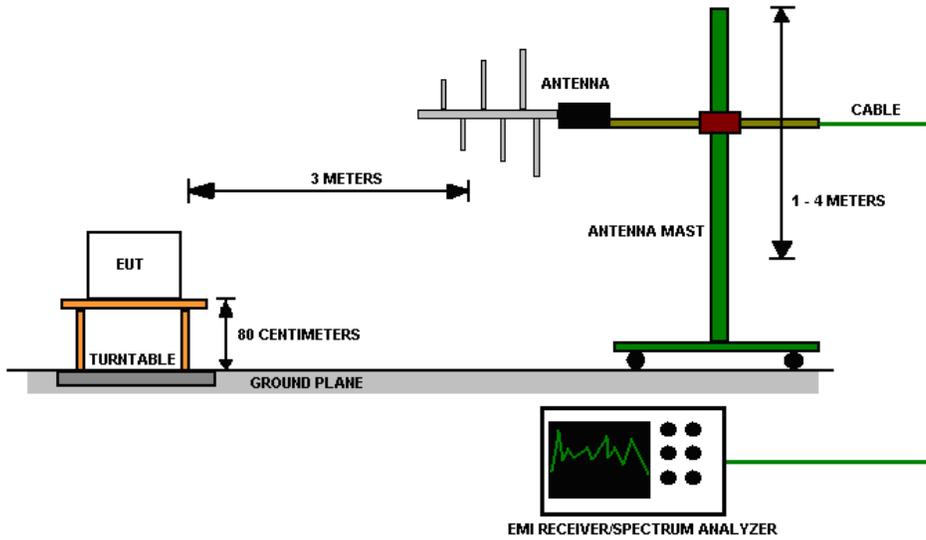


Figure 2 - Radiated Emissions Test Setup

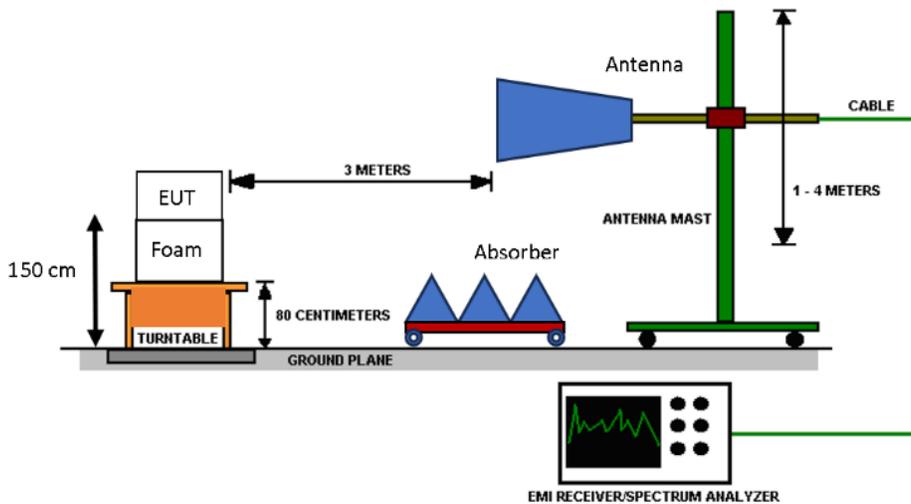


Figure 3 - Radiated Emissions Test Setup, >1GHz



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4.0 RESULTS

DTS Radio Measurements Low Data Rate					
CHANNEL	Transmitter	Occupied Bandwidth (kHz)	6 dB Bandwidth (kHz)	PSD (dBm)	RESULT
Low	802.11b	13771	9090	4.17	PASS
Mid	802.11b	13904	9080	4.64	PASS
High	802.11b	13764	9080	-3.32	PASS
Low	802.11g	16781	15690	-10.44	PASS
Mid	802.11g	17127	15520	-4.87	PASS
High	802.11g	16755	15700	-8.2	PASS
Low	802.11n	17773	16290	-9.95	PASS
Mid	802.11n	18063	15720	-6.02	PASS
High	802.11n	17794	16190	-10.71	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 (dB μ V)	Relative Fundamental (dB μ V)	Delta (dB)	Min Delta (dB)	Result
Low	802.11b	2400.00	23.869	61.49	37.62	30.00	PASS
Low	802.11g	2400.00	21.627	55.257	33.63	30.00	PASS
Low	802.11n	2400.00	21.882	55.276	33.39	30.00	PASS
High	802.11b	2483.50	16.449	64.189	47.74	30.00	PASS
High	802.11g	2483.50	15.956	57.296	41.34	30.00	PASS
High	802.11n	2483.50	15.255	57.933	42.68	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	55.765	Peak	73.98	18.22	PASS
Low	802.11g	2390.00	66.191	Peak	73.98	7.79	PASS
Low	802.11n	2390.00	68.098	Peak	73.98	5.88	PASS
High	802.11b	2483.50	55.937	Peak	73.98	18.04	PASS
High	802.11g	2483.50	63.375	Peak	73.98	10.61	PASS
High	802.11n	2483.50	68.256	Peak	73.98	5.72	PASS

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



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Average Restricted Band-Edge, Low 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	44.675	0.961	45.64	Peak	53.98	8.34	PASS
Low	802.11g	2390.00	47.633	0.969	48.60	Peak	53.98	5.38	PASS
Low	802.11n	2390.00	49.051	0.885	49.94	Peak	53.98	4.04	PASS
High	802.11b	2483.50	44.568	0.961	45.53	Peak	53.98	8.45	PASS
High	802.11g	2483.50	47.553	0.969	48.52	Peak	53.98	5.46	PASS
High	802.11n	2483.50	49.179	0.885	50.06	Peak	53.98	3.92	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 average

DTS Power Measurements, Low Data Rate

CHANNEL	Mode	Raw Average Output Power (dBm)	DCCF (For Power)	Corrected Average Output Power (dBm)	PEAK OUTPUT POWER (mW)	RESULT
Low	802.11b	15.830	0.173	16.003	39.836	PASS
Mid	802.11b	15.870	0.173	16.043	40.205	PASS
High	802.11b	15.050	0.173	15.223	33.287	PASS
Low	802.11g	12.710	0.137	12.847	19.261	PASS
Mid	802.11g	15.740	0.137	15.877	38.697	PASS
High	802.11g	13.060	0.137	13.197	20.877	PASS
Low	802.11n	11.370	0.531	11.901	15.490	PASS
Mid	802.11n	15.150	0.531	15.681	36.988	PASS
High	802.11n	12.170	0.531	12.701	18.623	PASS

Corrected Average Output Power = Raw Average output power + DCCF



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DTS Radio Measurements, High Data Rate					
CHANNEL	Transmitter	Occupied Bandwidth (kHz)	6 dB Bandwidth (kHz)	PSD (dBm)	RESULT
Low	802.11b	13414	9114	-4.269	PASS
Mid	802.11b	13436	8748	-4.083	PASS
High	802.11b	13360	8967	-4.737	PASS
Low	802.11g	16458	16340	-11.922	PASS
Mid	802.11g	16599	16420	-5.782	PASS
High	802.11g	16529	16090	-11.746	PASS
Low	802.11n	17663	16650	-11.532	PASS
Mid	802.11n	17725	17180	-6.931	PASS
High	802.11n	17664	17270	-12.334	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 (dB μ V)	Relative Fundamental (dB μ V)	Delta (dB)	Min Delta (dB)	Result
Low	802.11b	2400.00	22.516	61.407	38.89	30.00	PASS
Low	802.11g	2400.00	19.57	55.457	35.89	30.00	PASS
Low	802.11n	2400.00	18.858	55.355	36.50	30.00	PASS
High	802.11b	2483.50	15.938	64.352	48.41	30.00	PASS
High	802.11g	2483.50	16.297	58.156	41.86	30.00	PASS
High	802.11n	2483.50	15.638	58.082	42.44	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	56.102	Peak	73.98	17.88	PASS
Low	802.11g	2390.00	64.775	Peak	73.98	9.21	PASS
Low	802.11n	2390.00	65.625	Peak	73.98	8.36	PASS
High	802.11b	2483.50	55.597	Peak	73.98	18.38	PASS
High	802.11g	2483.50	65.601	Peak	73.98	8.38	PASS
High	802.11n	2483.50	64.667	Peak	73.98	9.31	PASS

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



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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	44.329	0.954	45.28	Peak	53.98	8.70	PASS
Low	802.11g	2390.00	46.392	3.557	49.95	Peak	53.98	4.03	PASS
Low	802.11n	2390.00	45.924	5.352	51.28	Peak	53.98	2.70	PASS
High	802.11b	2483.50	44.413	0.954	45.37	Peak	53.98	8.61	PASS
High	802.11g	2483.50	48.039	3.557	51.60	Peak	53.98	2.38	PASS
High	802.11n	2483.50	47.849	5.352	53.20	Peak	53.98	0.78	PASS

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

DTS Power Measurements, High Data Rate

CHANNEL	Mode	Raw Average Output Power (dBm)	DCCF (For Power)	Corrected Average Output Power (dBm)	PEAK OUTPUT POWER (mW)	RESULT
Low	802.11b	15.270	0.477	15.747	37.557	PASS
Mid	802.11b	14.550	0.477	15.027	31.819	PASS
High	802.11b	15.470	0.477	15.947	39.327	PASS
Low	802.11g	11.030	1.778	12.808	19.091	PASS
Mid	802.11g	13.280	1.778	15.058	32.050	PASS
High	802.11g	11.300	1.778	13.078	20.316	PASS
Low	802.11n	9.780	2.676	12.456	17.604	PASS
Mid	802.11n	13.230	2.676	15.906	38.959	PASS
High	802.11n	10.040	2.676	12.716	18.690	PASS

Corrected Average Output Power = Raw Average output power + DCCF



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4.1 OUTPUT POWER

Test Method:

Power measurements were performed using ANSI C63.10, Section 11.9.2.2.2.

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:

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 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.



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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

Test Method:

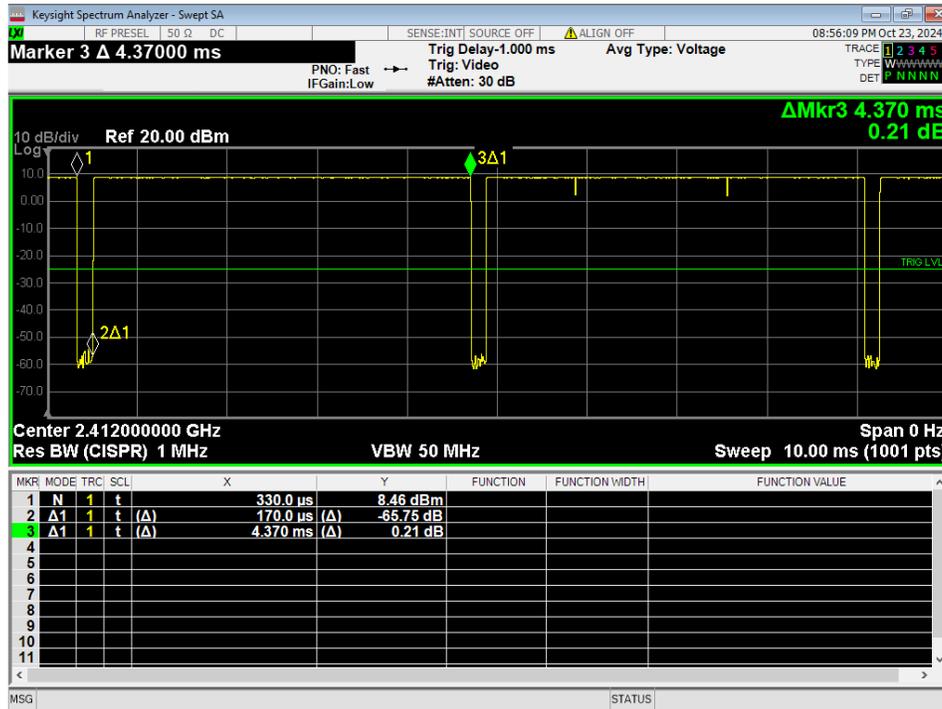


Figure 4 – Duty Cycle, 802.11b 1MB

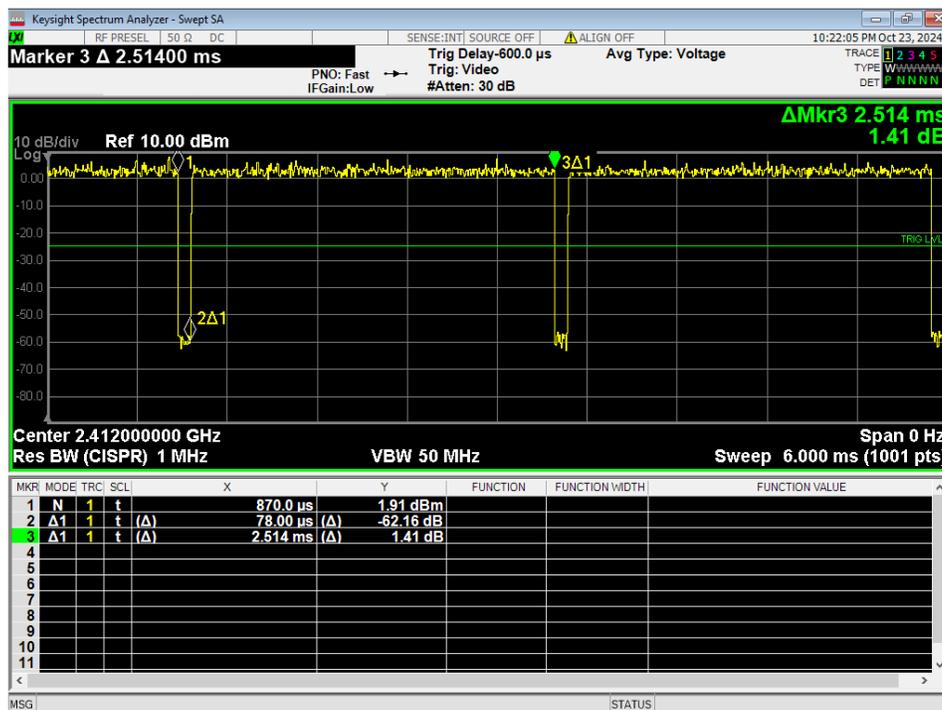


Figure 5 – Duty Cycle, 802.11G 6MB

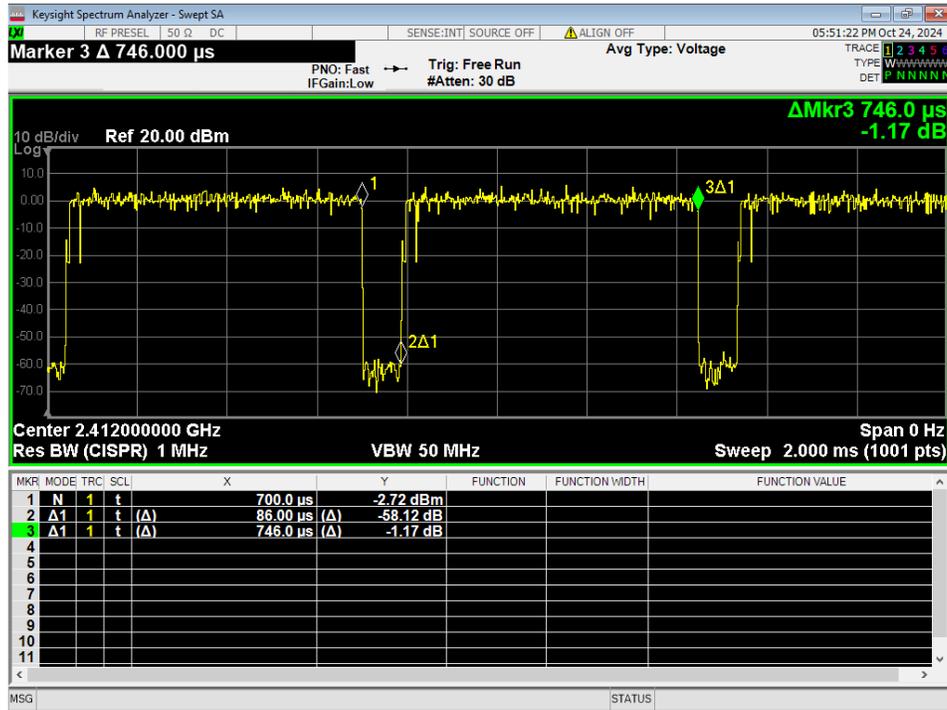


Figure 6 – Duty Cycle, 802.11N MCS0

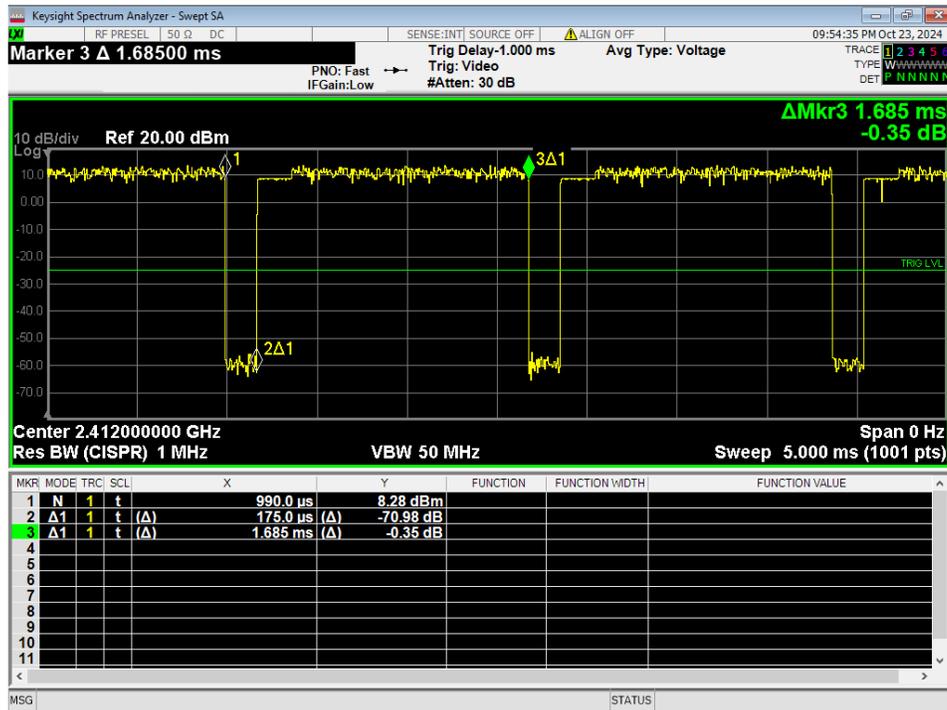


Figure 7 – Duty Cycle, 802.11b 11MB

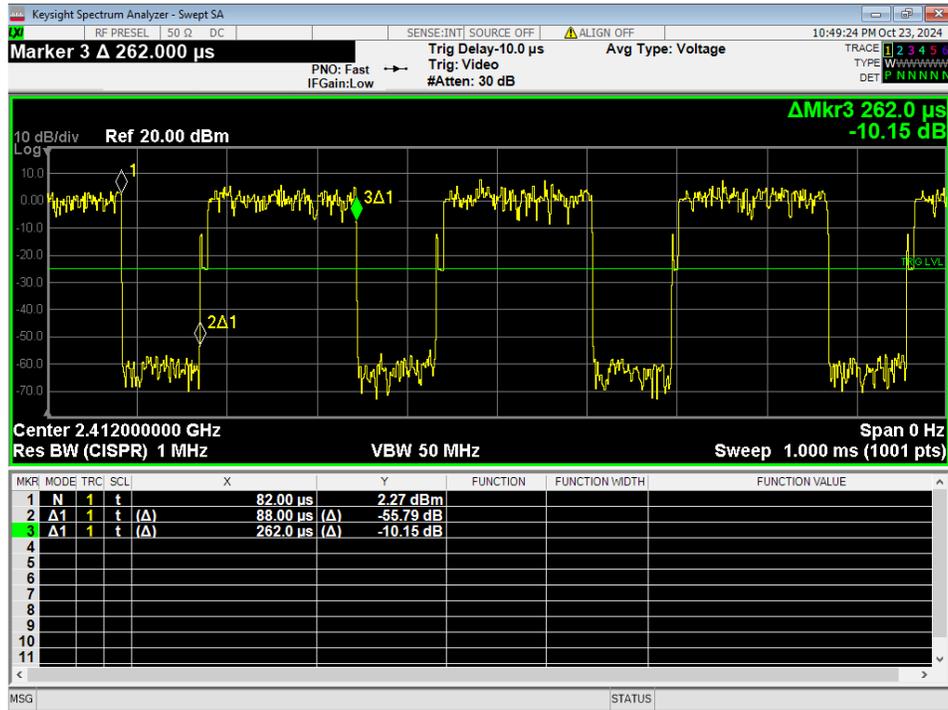


Figure 8 – Duty Cycle, 802.11G 54MB

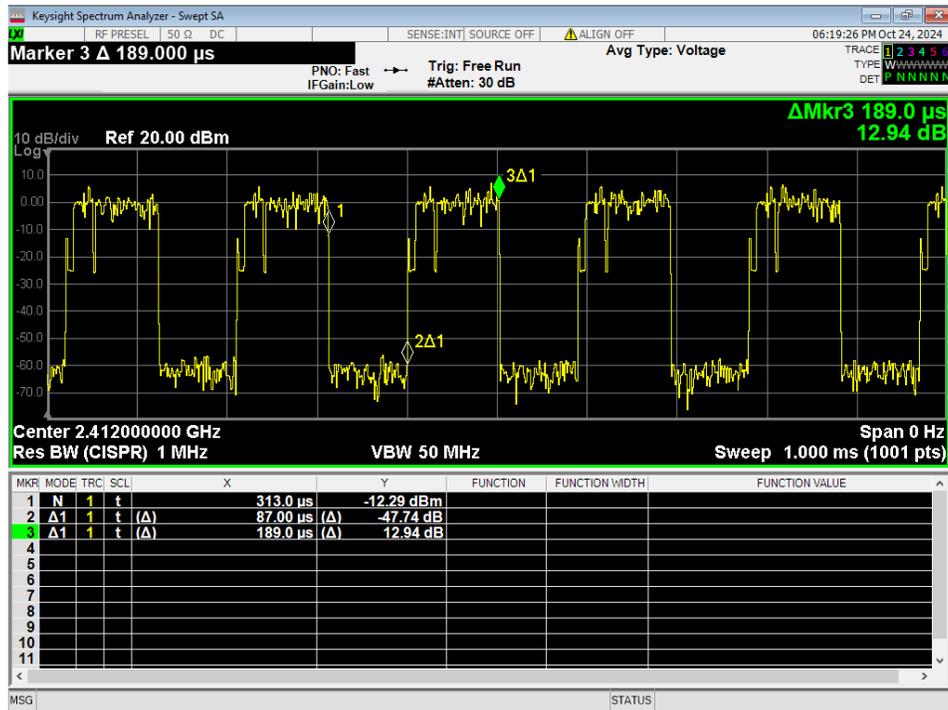


Figure 9 – Duty Cycle, 802.11N MCS7

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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:	0.961	
Duty cycle correction factor (for emissions) for GMSK 1MB:		0.346dB
Duty Cycle correction factor (for power) for GMSK 1MB:		0.173dB
Duty cycle for Wi-Fi G 6MB:	0.969	
Duty cycle correction factor (for emissions) for GMSK 2MB:		0.274dB
Duty Cycle correction factor (for power) for GMSK 1MB:		0.137dB
Duty cycle for Wi-Fi N MCS0:	0.885	
Duty cycle correction factor (for emissions) for GMSK 2MB:		1.061dB
Duty Cycle correction factor (for power) for GMSK 1MB:		0.531dB
Duty cycle for Wi-Fi B 11MB:	0.896	
Duty cycle correction factor (for emissions) for GMSK 2MB:		0.954dB
Duty Cycle correction factor (for power) for GMSK 1MB:		0.477dB
Duty cycle for Wi-Fi G 54MB:	0.664	
Duty cycle correction factor (for emissions) for GMSK 2MB:		3.557dB
Duty Cycle correction factor (for power) for GMSK 1MB:		1.778dB
Duty cycle for Wi-Fi N MCS7:	0.540	
Duty cycle correction factor (for emissions) for GMSK 2MB:		5.352dB
Duty Cycle correction factor (for power) for GMSK 1MB:		2.676dB

4.4 RADIATED EMISSIONS

Test Method:

ANSI C63.10-2013, 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 (μV/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 * Emission level (μV/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.



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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:

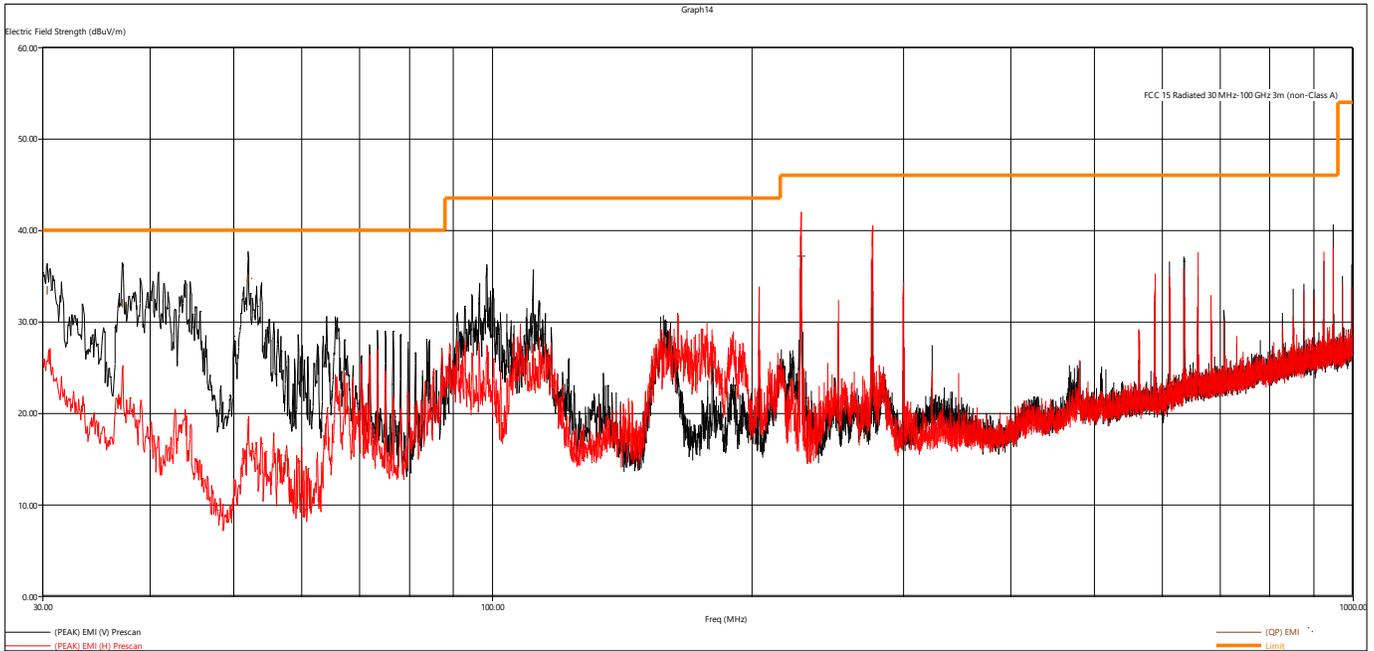


Figure 10 - Radiated Emissions Plot, Receive

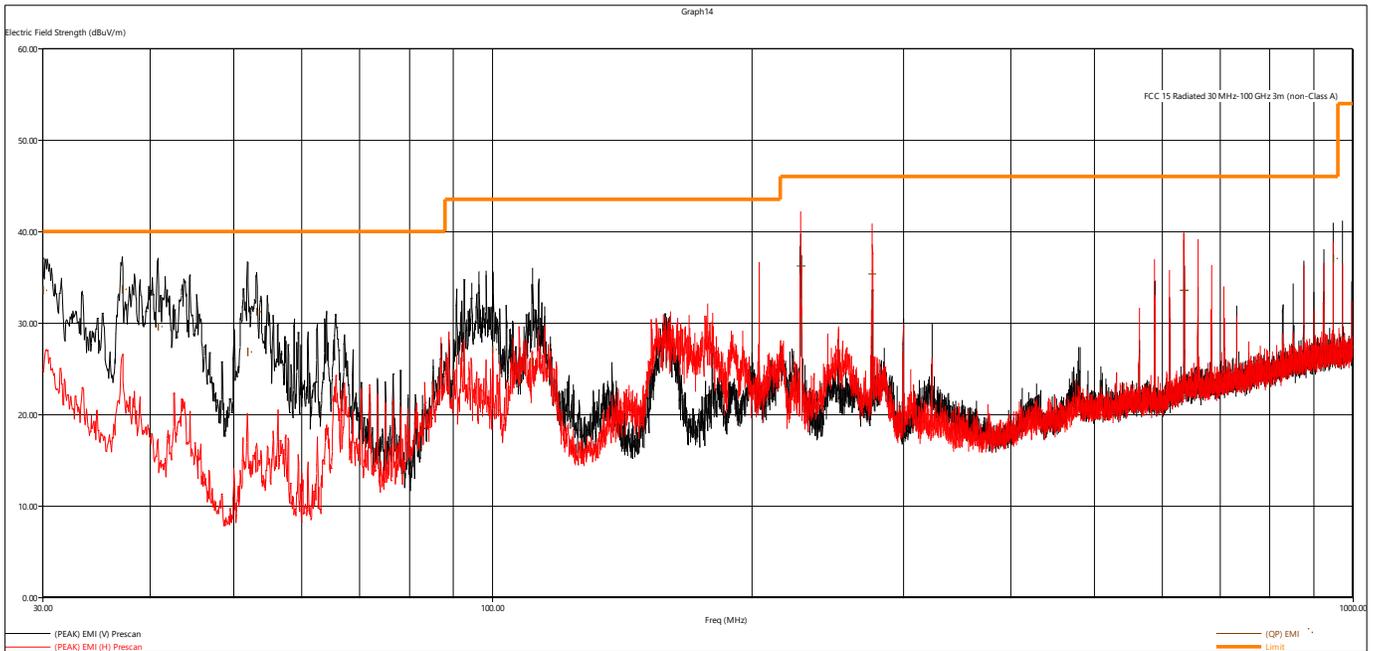


Figure 11 - Radiated Emissions Plot, 802.11b 1MB

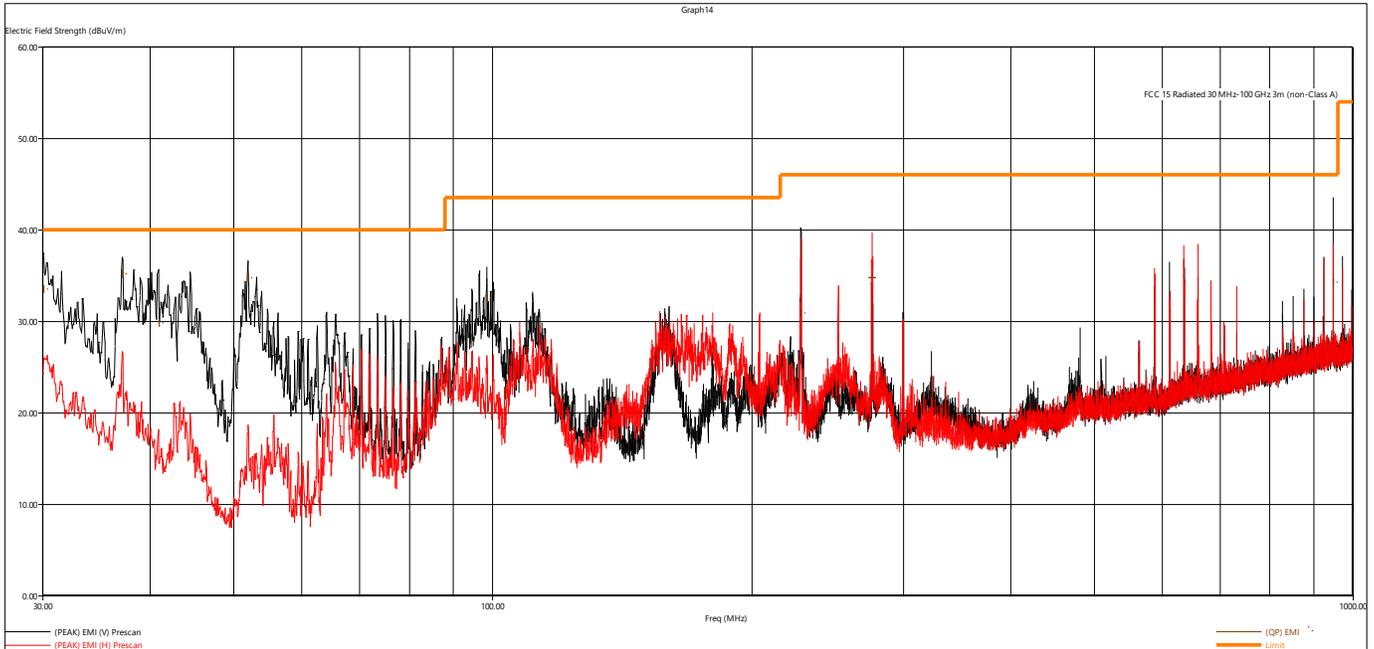


Figure 12 - Radiated Emissions Plot, 802.11b 11MB

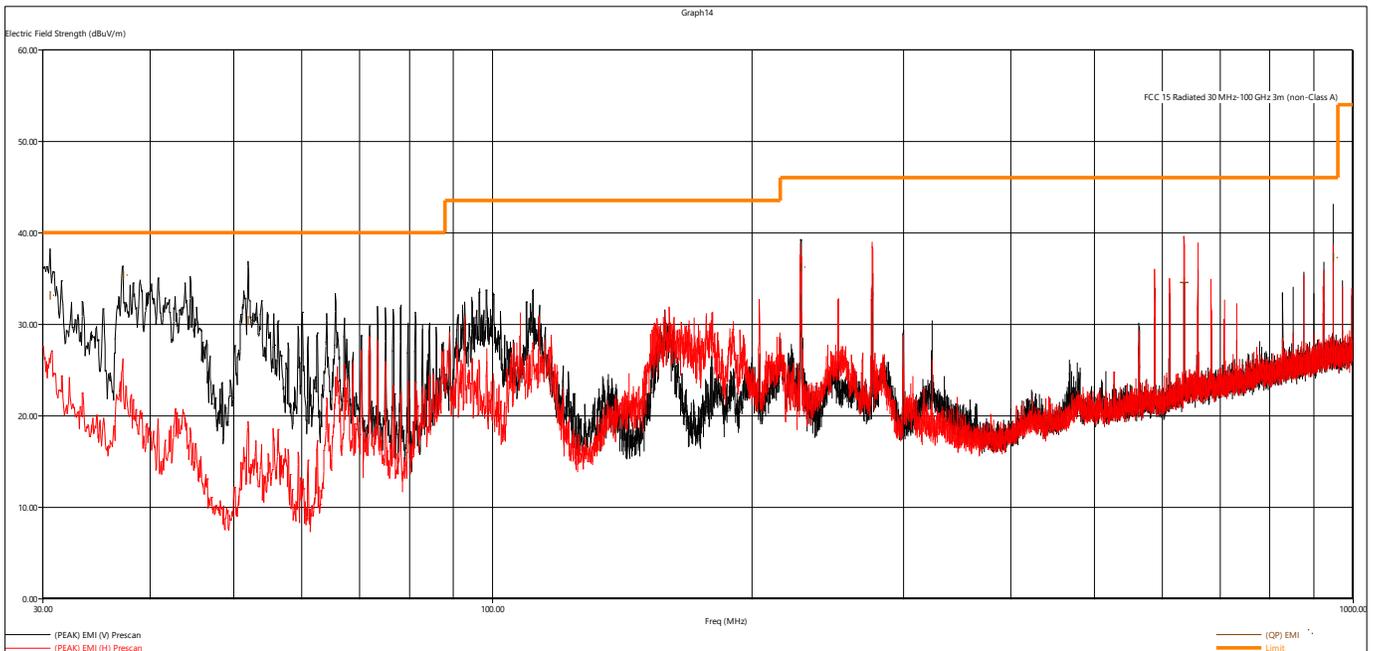


Figure 13 - Radiated Emissions Plot, 802.11g 6MB

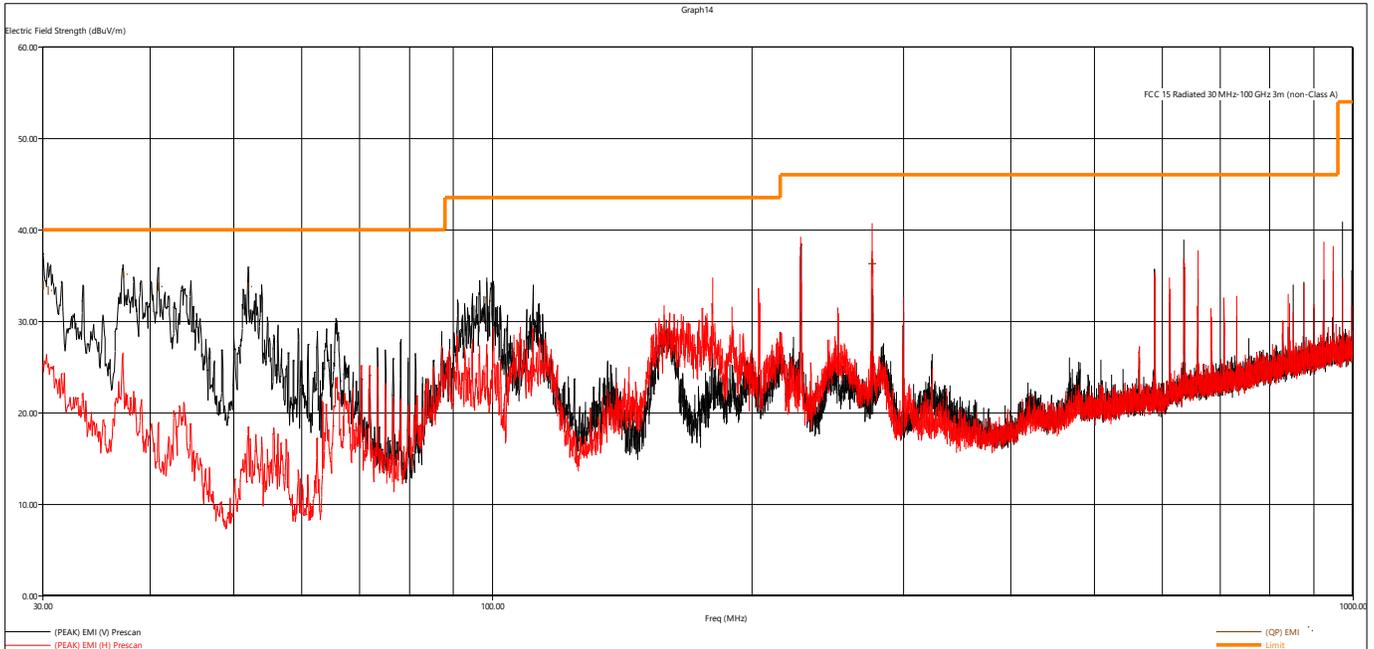


Figure 14 - Radiated Emissions Plot, 802.11g 54MB

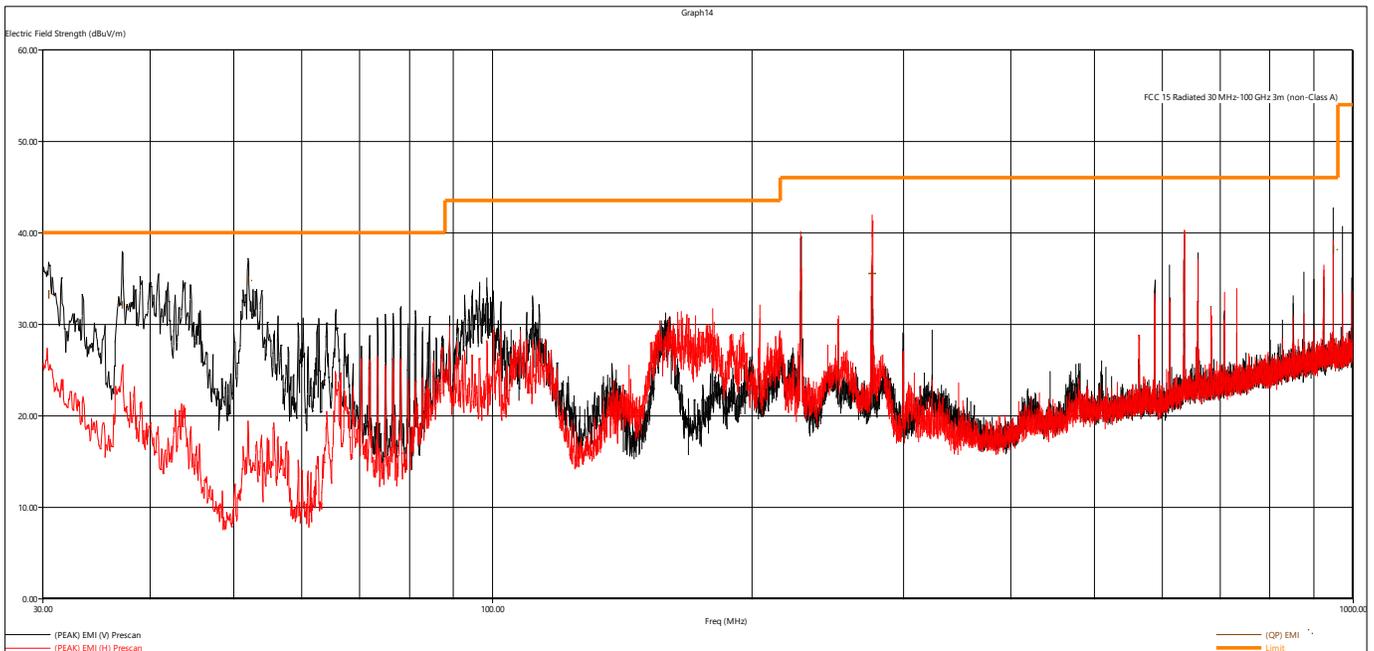


Figure 15 - Radiated Emissions Plot, 802.11n MCS0

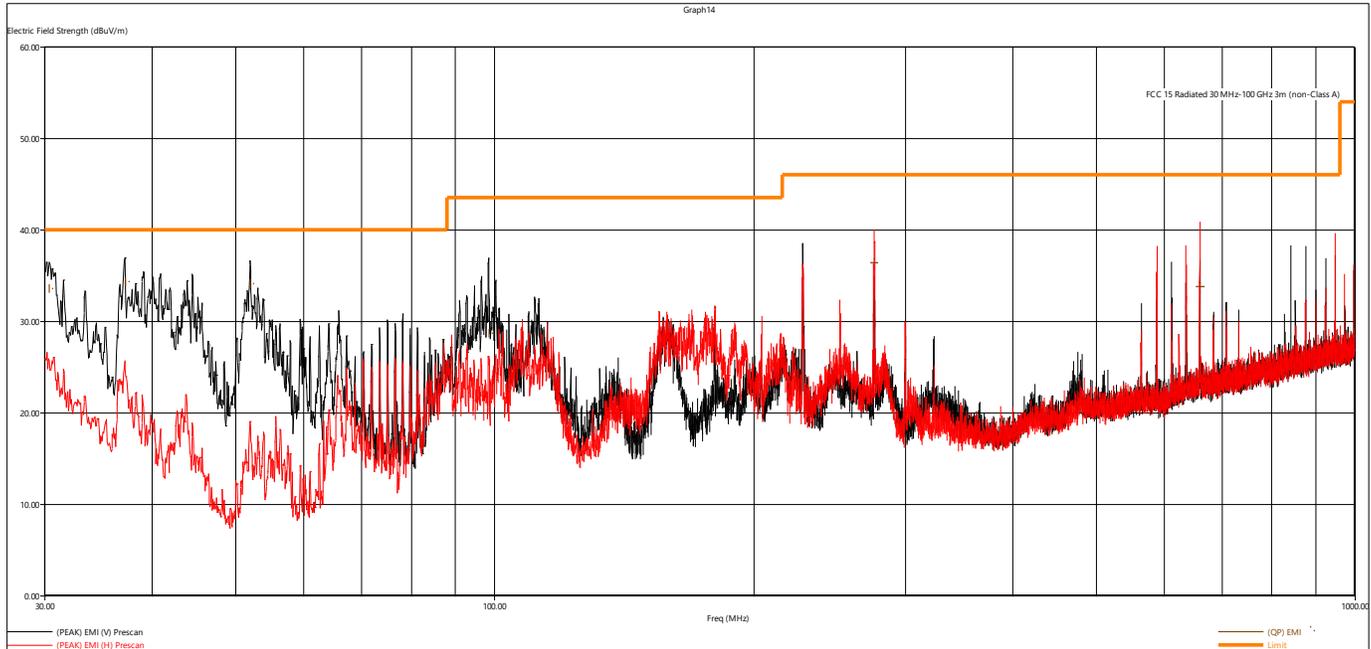


Figure 16 - Radiated Emissions Plot, 802.11n MCS7

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. The other emission levels were very low against the limit.
4. Margin value = Limit value – Emission level

Quasi-Peak Measurements, 802.11x							
Frequency	Level	Limit	Margin	Height	Angle	Pol	Modulation
MHz	dBμV/m	dBμV/m	dB	cm.	deg.		
227.904480	36.18	46.02	9.84	150.38	91.50	H	B 1MB
276.157200	35.31	46.02	10.71	218.98	75.00	H	B 1MB
636.169200	33.55	46.02	12.47	204.35	3.25	H	B 1MB
30.097804	33.51	40.00	6.49	130.02	358.25	V	B 1MB
37.028400	33.63	40.00	6.37	106.74	9.25	V	B 1MB
40.701600	29.52	40.00	10.48	150.26	298.75	V	B 1MB
51.705840	26.83	40.00	13.17	158.74	342.50	V	B 1MB
53.175120	31.18	40.00	8.82	129.67	175.75	V	B 1MB
100.048800	27.01	43.52	16.51	119.52	258.75	V	B 1MB
111.126720	25.63	43.52	17.89	201.07	298.50	V	B 1MB
947.821680	36.94	46.02	9.08	104.71	229.75	V	B 1MB
275.848560	34.69	46.02	11.33	173.79	67.50	H	B 11MB
30.159063	33.47	40.00	6.53	110.08	81.25	V	B 11MB
37.120080	35.12	40.00	4.88	106.02	280.00	V	B 11MB
40.912560	29.76	40.00	10.24	113.19	111.75	V	B 11MB
51.953040	34.70	40.00	5.30	105.01	168.00	V	B 11MB
98.330640	32.43	43.52	11.09	110.74	81.25	V	B 11MB



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228.321600	30.89	46.02	15.13	165.31	340.75	V	B 11MB
947.851440	34.25	46.02	11.77	110.56	234.25	V	B 11MB
635.986800	34.49	46.02	11.53	218.38	1.75	H	G 6MB
30.410640	33.07	40.00	6.93	111.70	57.00	V	G 6MB
37.120320	35.30	40.00	4.70	108.11	269.00	V	G 6MB
52.044000	30.42	40.00	9.58	129.13	185.25	V	G 6MB
228.207120	36.13	46.02	9.89	127.34	357.50	V	G 6MB
947.844720	37.22	46.02	8.80	105.55	229.75	V	G 6MB
276.059520	36.21	46.02	9.81	166.20	70.25	H	G 54MB
30.025636	33.82	40.00	6.18	122.32	61.25	V	G 54MB
30.436080	33.25	40.00	6.75	113.97	78.00	V	G 54MB
37.151280	35.11	40.00	4.89	115.94	335.25	V	G 54MB
40.838160	33.76	40.00	6.24	125.37	301.50	V	G 54MB
51.966240	33.77	40.00	6.23	173.67	153.50	V	G 54MB
98.421840	32.16	43.52	11.36	116.71	131.75	V	G 54MB
276.130320	35.48	46.02	10.54	239.64	78.75	H	N MCS0
30.431520	33.20	40.00	6.80	113.85	195.75	V	N MCS0
37.013520	32.05	40.00	7.95	105.97	248.50	V	N MCS0
51.978720	34.66	40.00	5.34	174.68	170.25	V	N MCS0
948.170640	38.06	46.02	7.96	106.56	226.00	V	N MCS0
276.029760	36.36	46.02	9.66	167.28	73.00	H	N MCS7
659.734560	33.72	46.02	12.30	202.02	360.00	H	N MCS7
30.406560	33.53	40.00	6.47	105.31	17.25	V	N MCS7
37.172880	34.31	40.00	5.69	111.64	258.25	V	N MCS7
52.010880	34.06	40.00	5.94	103.28	180.75	V	N MCS7
98.286240	28.56	43.52	14.96	132.17	-0.25	V	N MCS7
228.111600	37.10	46.02	8.92	134.38	83.00	H	Receive
30.591600	33.36	40.00	6.64	108.59	27.50	V	Receive
37.220160	31.93	40.00	8.07	106.44	301.25	V	Receive
51.904080	34.71	40.00	5.29	130.08	197.25	V	Receive

All other measurements were found to be at least 6 dB below the limit. Worst case emissions are reported.



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Peak Measurements, 802.11x								
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Modulation
MHz	dB μ V/m	dB μ V/m	dB	cm.	deg.			
4823.964000	51.73	73.98	22.25	160.65	329.75	V	Low	Wifi B 1MB
4874.034000	52.28	73.98	21.7	143.16	304.25	V	Mid	Wifi B 1MB
4924.024000	50.16	73.98	23.82	201.55	330	V	High	Wifi B 1MB
4823.874000	51.7	73.98	22.28	319.46	330.5	V	Low	Wifi B 11MB
4874.352000	49.21	73.98	24.77	144	302.25	V	Mid	Wifi B 11MB
4924.102000	50.15	73.98	23.83	190.5	329.75	V	High	Wifi B 11MB
4828.876000	46.63	73.98	27.35	310.74	333	V	Low	Wifi G 6MB
4870.230000	47.63	73.98	26.35	228.53	328.25	V	Mid	Wifi G 6MB
4926.730000	45.67	73.98	28.31	207.94	331	V	High	Wifi G 6MB
4824.192000	47.25	73.98	26.73	201.49	8.25	V	Low	Wifi G 54MB
4872.528000	51.48	73.98	22.5	185.13	48.75	V	Mid	Wifi G 54MB
4923.046000	46.4	73.98	27.58	252.29	2.25	H	High	Wifi G 54MB
4824.856000	42.94	73.98	31.04	253.97	326.5	H	Low	Wifi N MCS0
4874.262000	51.64	73.98	22.34	162.56	47.75	V	Mid	Wifi N MCS0
4926.286000	43.76	73.98	30.22	218.26	79.75	V	High	Wifi N MCS0
4825.022000	46.6	73.98	27.38	552.17	94.75	V	Low	Wifi N MCS7
4874.270000	51.42	73.98	22.56	162.74	47.25	V	Mid	Wifi N MCS7
4922.926000	47.34	73.98	26.64	200.29	82.75	V	High	Wifi N MCS7

The EUT was maximized on all 3 orthogonal axes. The worst-case is shown in the plot and table above. All other measurements were found to be at least 6 dB Below the limit.



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Average Measurements, 802.11x										
Freq.	Peak Level	DCCF	Average Level	Limit	Margin	Height	Angle	Pol	Channel	Modulation
MHz	dB μ V/m	dB	dB μ V/m	dB μ V/m	dB	cm.	deg.			
4823.964000	51.73	0.346	51.38	53.98	2.60	160.65	329.75	V	Low	Wifi B 1MB
4874.034000	52.28	0.346	51.93	53.98	2.05	143.16	304.25	V	Mid	Wifi B 1MB
4924.024000	50.16	0.346	49.81	53.98	4.17	201.55	330.00	V	High	Wifi B 1MB
4823.874000	51.7	0.274	51.43	53.98	2.55	319.46	330.50	V	Low	Wifi B 11MB
4874.352000	49.21	0.274	48.94	53.98	5.04	144.00	302.25	V	Mid	Wifi B 11MB
4924.102000	50.15	0.274	49.88	53.98	4.10	190.50	329.75	V	High	Wifi B 11MB
4828.876000	46.63	1.061	45.57	53.98	8.41	310.74	333.00	V	Low	Wifi G 6MB
4870.230000	47.63	1.061	46.57	53.98	7.41	228.53	328.25	V	Mid	Wifi G 6MB
4926.730000	45.67	1.061	44.61	53.98	9.37	207.94	331.00	V	High	Wifi G 6MB
4824.192000	47.25	0.954	46.30	53.98	7.68	201.49	8.25	V	Low	Wifi G 54MB
4872.528000	51.48	0.954	50.53	53.98	3.45	185.13	48.75	V	Mid	Wifi G 54MB
4923.046000	46.4	0.954	45.45	53.98	8.53	252.29	2.25	H	High	Wifi G 54MB
4824.856000	42.94	3.557	39.38	53.98	14.60	253.97	326.50	H	Low	Wifi N MCS0
4874.262000	51.64	3.557	48.08	53.98	5.90	162.56	47.75	V	Mid	Wifi N MCS0
4926.286000	43.76	3.557	40.20	53.98	13.78	218.26	79.75	V	High	Wifi N MCS0
4825.022000	46.6	5.352	41.25	53.98	12.73	552.17	94.75	V	Low	Wifi N MCS7
4874.270000	51.42	5.352	46.07	53.98	7.91	162.74	47.25	V	Mid	Wifi N MCS7
4922.926000	47.34	5.352	41.99	53.98	11.99	200.29	82.75	V	High	Wifi N MCS7

Average Level = Peak level - DCCF

The EUT was maximized on all 3 orthogonal axes. The worst-case is shown in the plot and table above.
 All other measurements were found to be at least 6 dB Below the limit.



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4.5 CONDUCTED SPURIOUS EMISSIONS

Test Method:

ANSI C63.10-2013, 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.

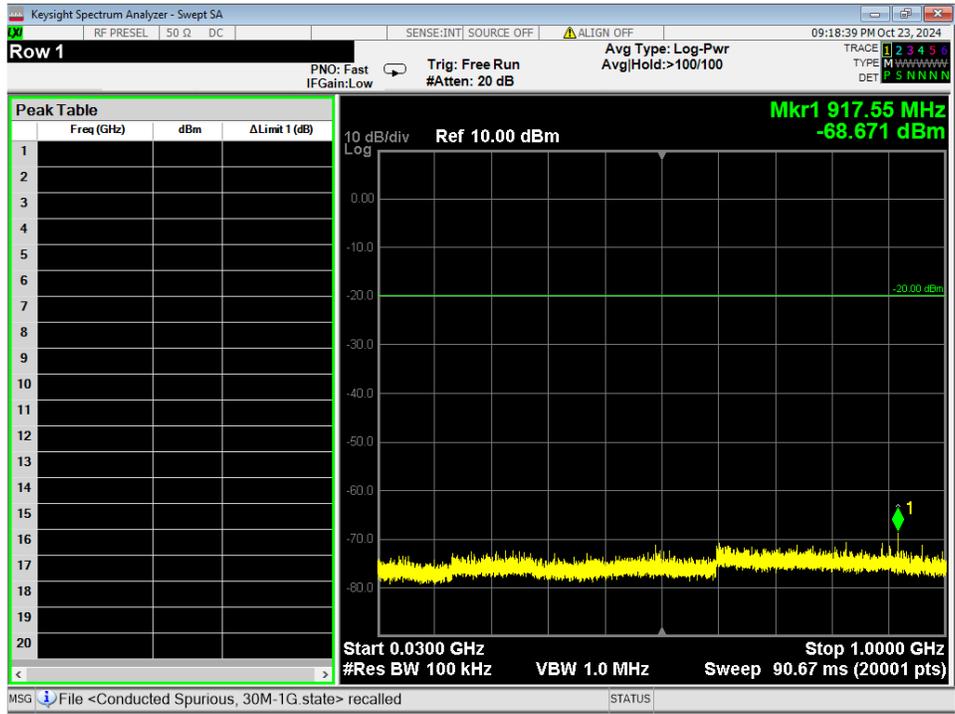


Figure 17 - Radiated Emissions Plot, WIFI 802.11b, 30M – 1G, Low

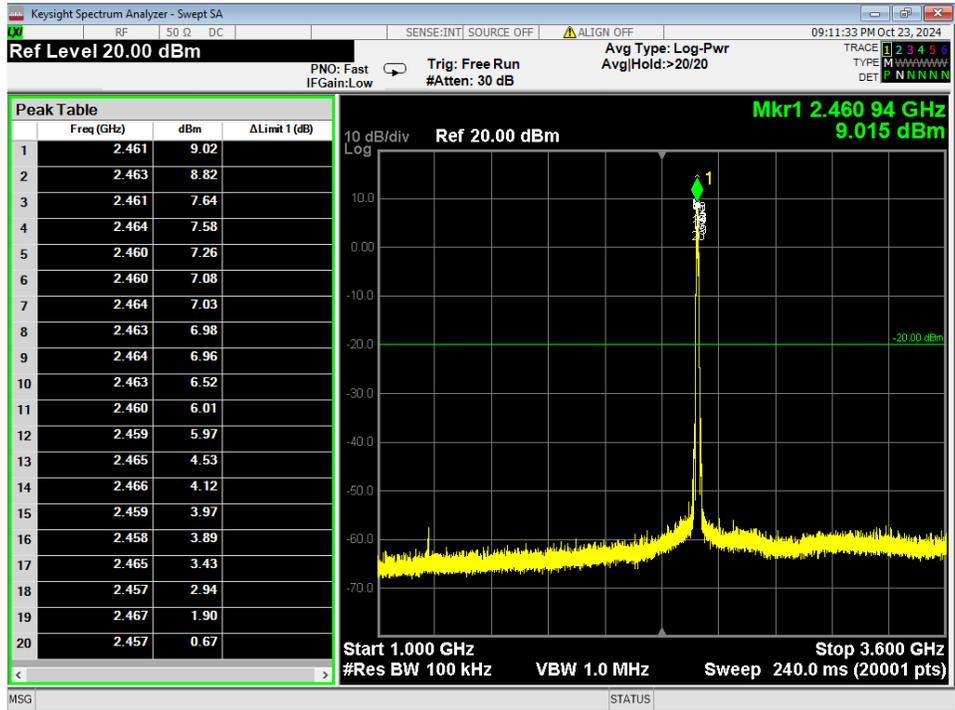


Figure 18 - Radiated Emissions Plot, WIFI 802.11b, 1G – 3.6G, Low

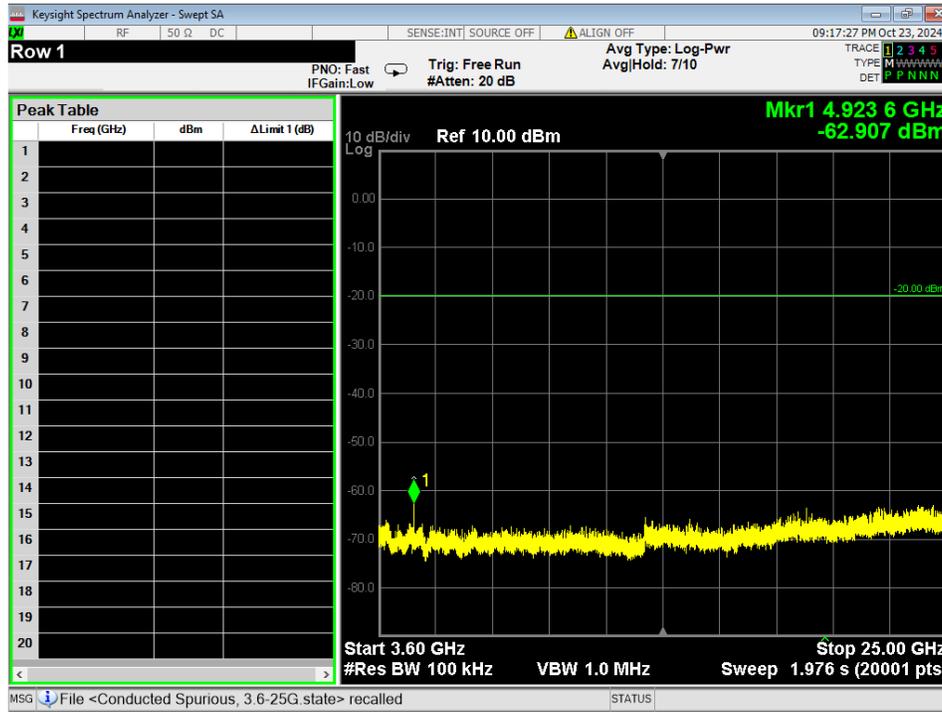


Figure 19 - Radiated Emissions Plot, WIFI 802.11b, 3.6G – 25G, Low

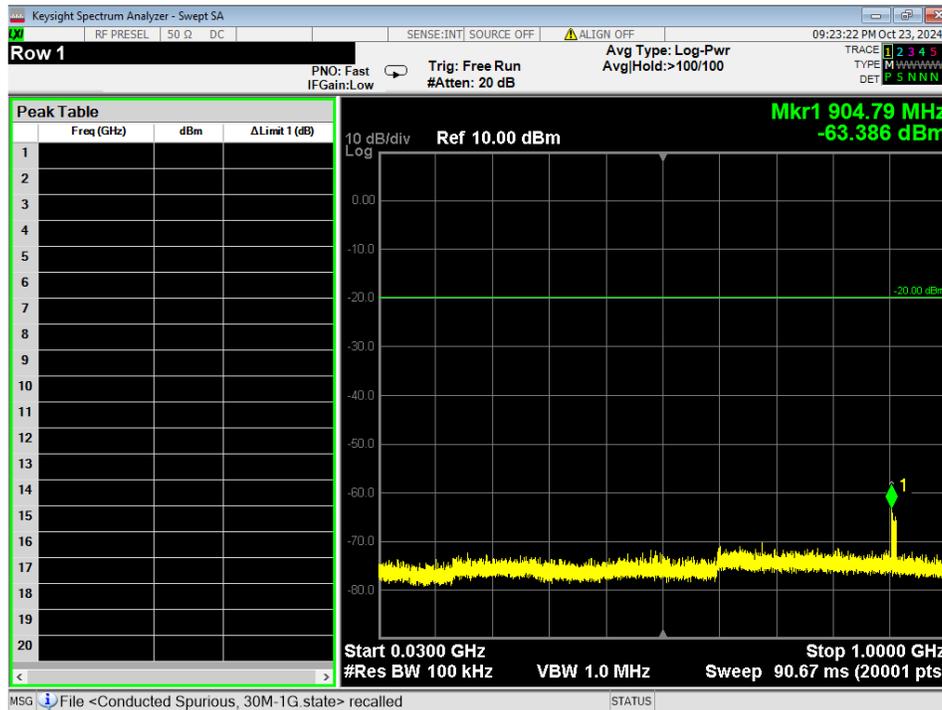


Figure 20 - Radiated Emissions Plot, WIFI 802.11g, 30M – 1G, Low

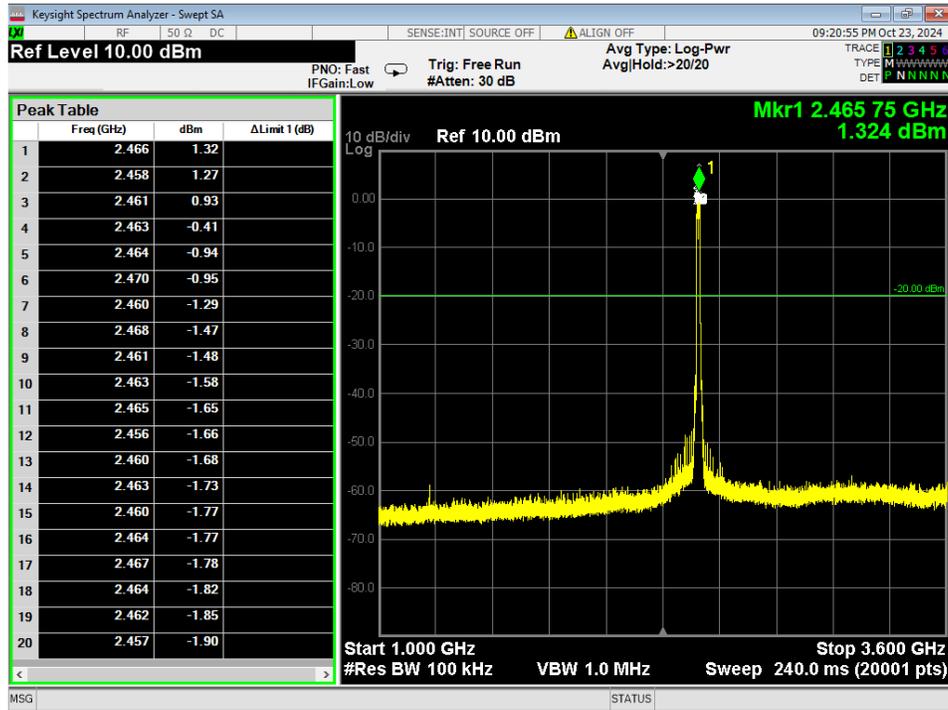


Figure 21 - Radiated Emissions Plot, WIFI 802.11g, 1G – 3.6G, Low

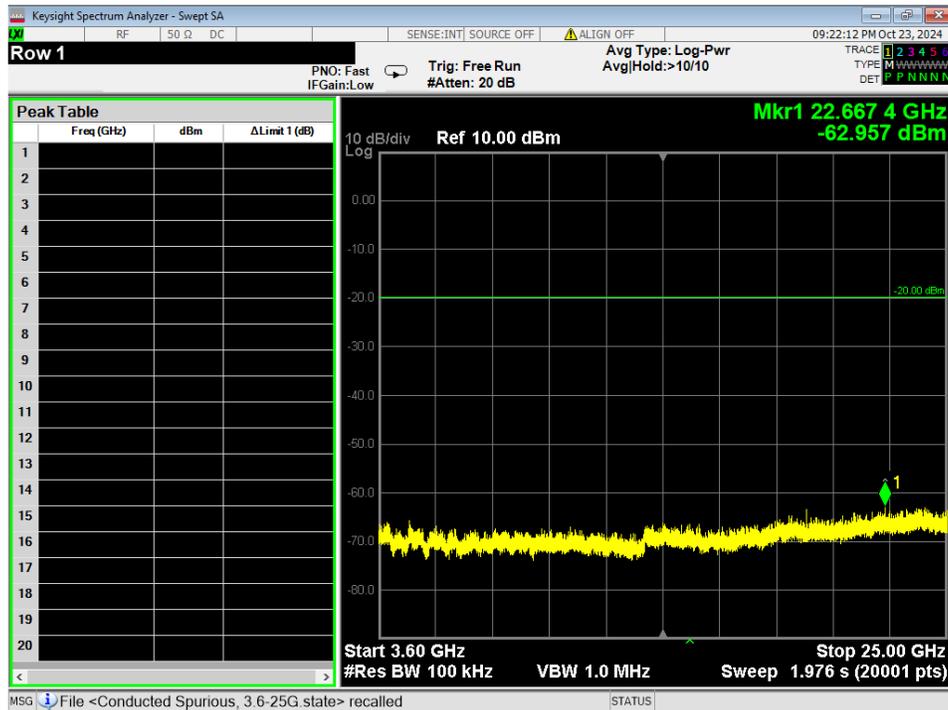


Figure 22 - Radiated Emissions Plot, WIFI 802.11g, 3.6G – 25G, Low

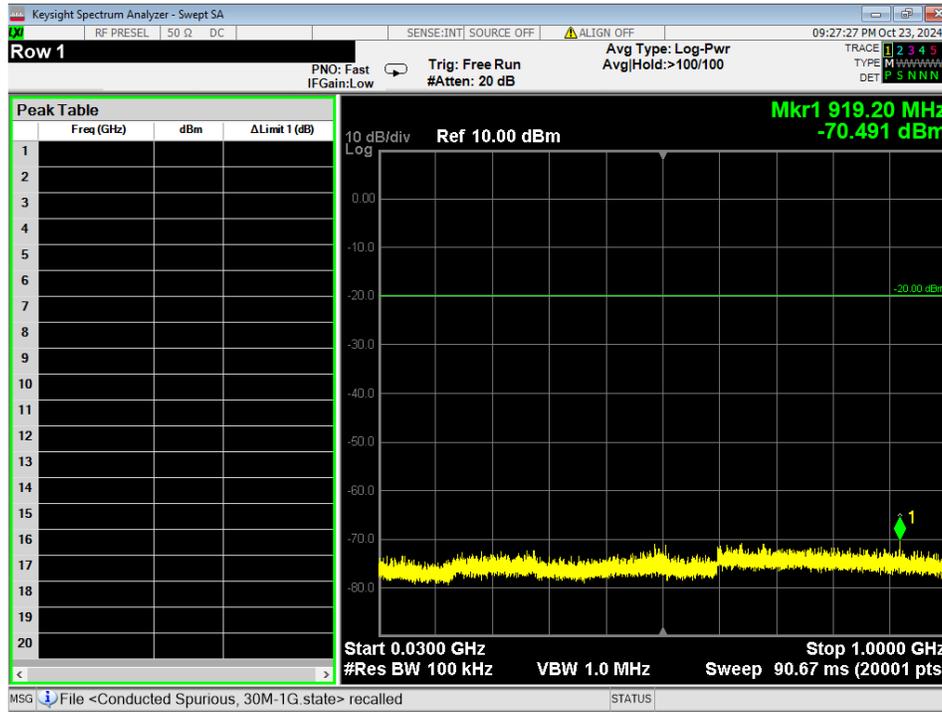


Figure 23 - Radiated Emissions Plot, WIFI 802.11n, 30M – 1G, Low

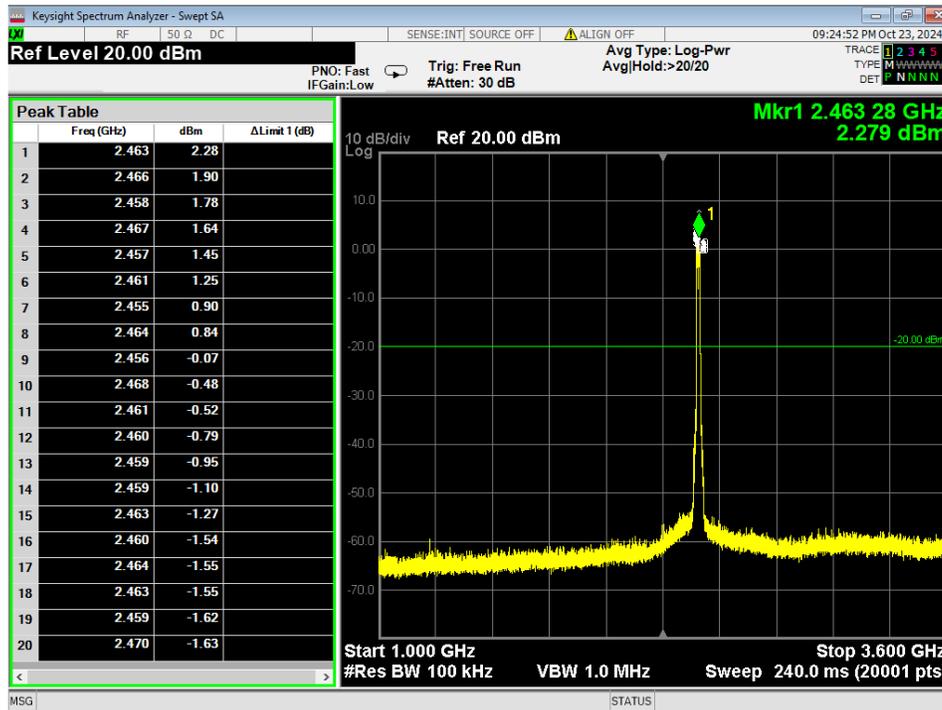


Figure 24 - Radiated Emissions Plot, WIFI 802.11n, 1G – 3.6G, Low

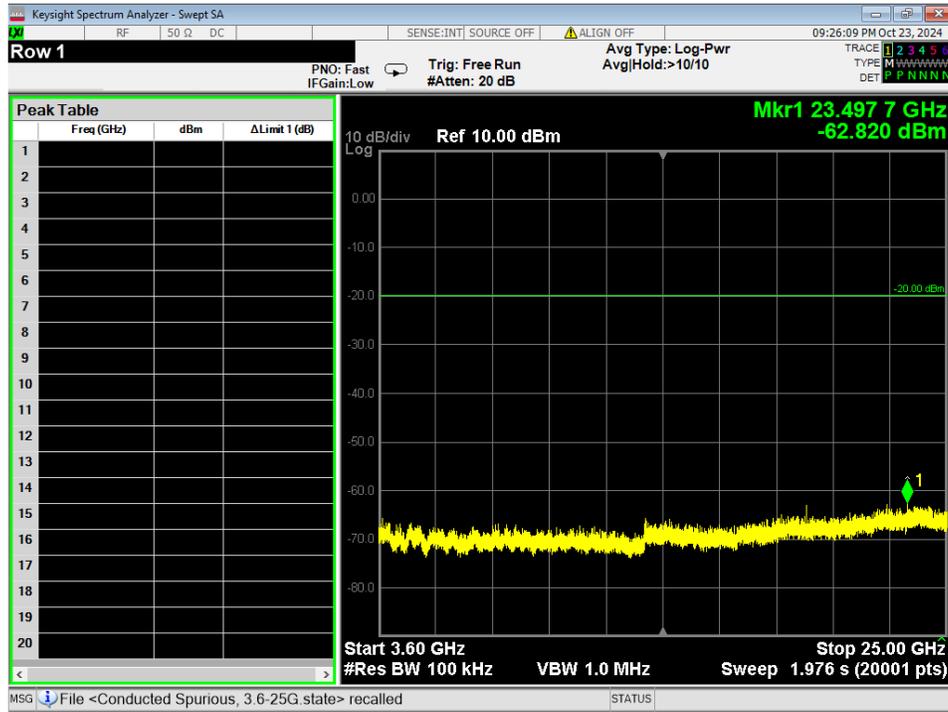


Figure 25 - Radiated Emissions Plot, WIFI 802.11n, 3.6G – 25G, Low



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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.



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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.



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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.

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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 dB μ V 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 dB μ V/m.

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

The 48.1 dB μ V/m value can be mathematically converted to its corresponding level in μ V/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;

$$EIRP \text{ (Watts)} = [\text{Field Strength (V/m)} \times \text{antenna distance (m)}]^2 / 30$$

$$\text{Power (watts)} = 10^{[\text{Power (dBm)}]/10} / 1000$$

$$\text{Voltage (dB}\mu\text{V)} = \text{Power (dBm)} + 107 \text{ (for } 50\Omega \text{ measurement systems)}$$

$$\text{Field Strength (V/m)} = 10^{[\text{Field Strength (dB}\mu\text{V/m)} / 20] / 10^6}$$

$$\text{Gain} = 1 \text{ (numeric gain for isotropic radiator)}$$

$$\text{Conversion from 3m field strength to EIRP (d=3):}$$

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

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

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



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APPENDIX B – MEASUREMENT UNCERTAINTY

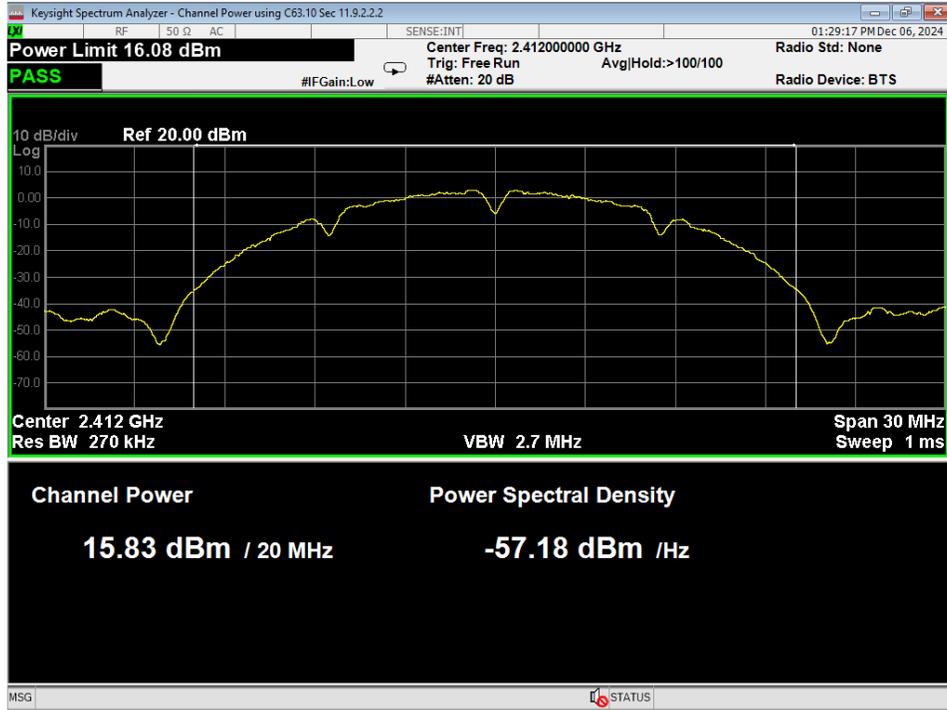
NCEE Labs does not add uncertainty to

Where relevant, the following measurement uncertainty levels have been for tests performed in this test report:

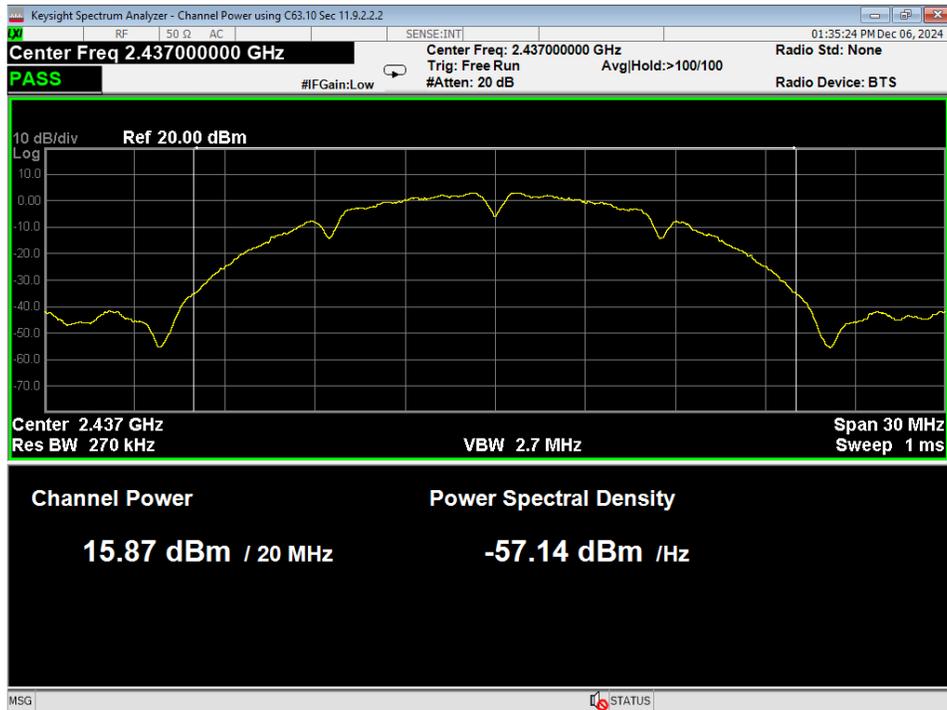
Test	Frequency Range	Uncertainty Value (dB)
Radiated Emissions, 3m	30MHz - 1GHz	±4.31
Radiated Emissions, 3m	1GHz - 18GHz	±5.08
Emissions limits, conducted	30MHz – 18GHz	±3.03

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

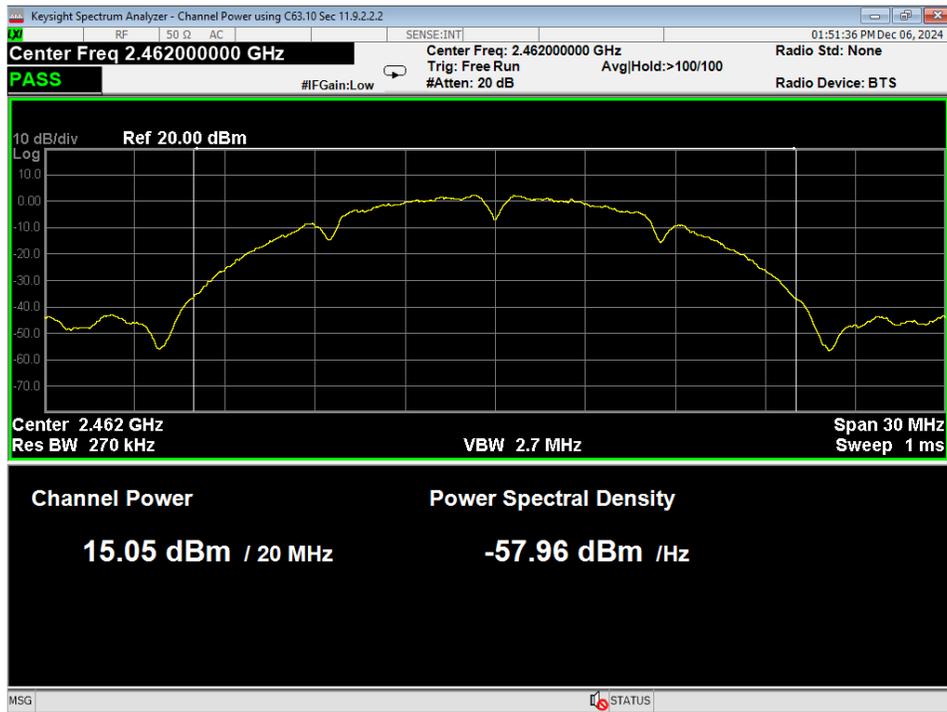
APPENDIX C – GRAPHS AND TABLES



01 Average Power, Low, Wifi B, Low Data Rate



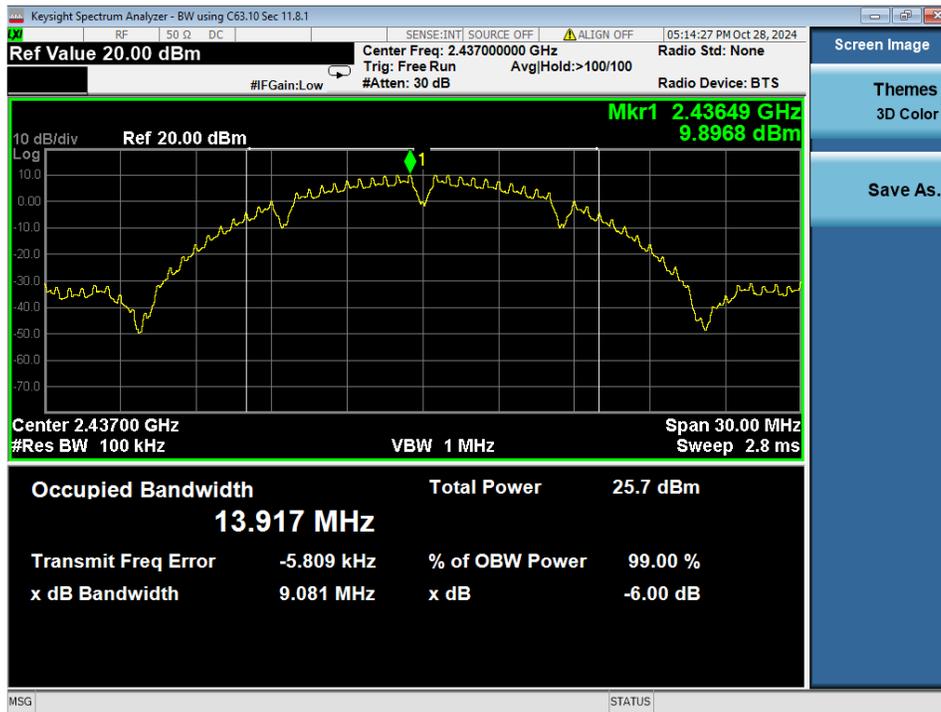
02 Average Power, Mid, Wifi B, Low Data Rate



03 Average Power, High, Wifi B, Low Data Rate



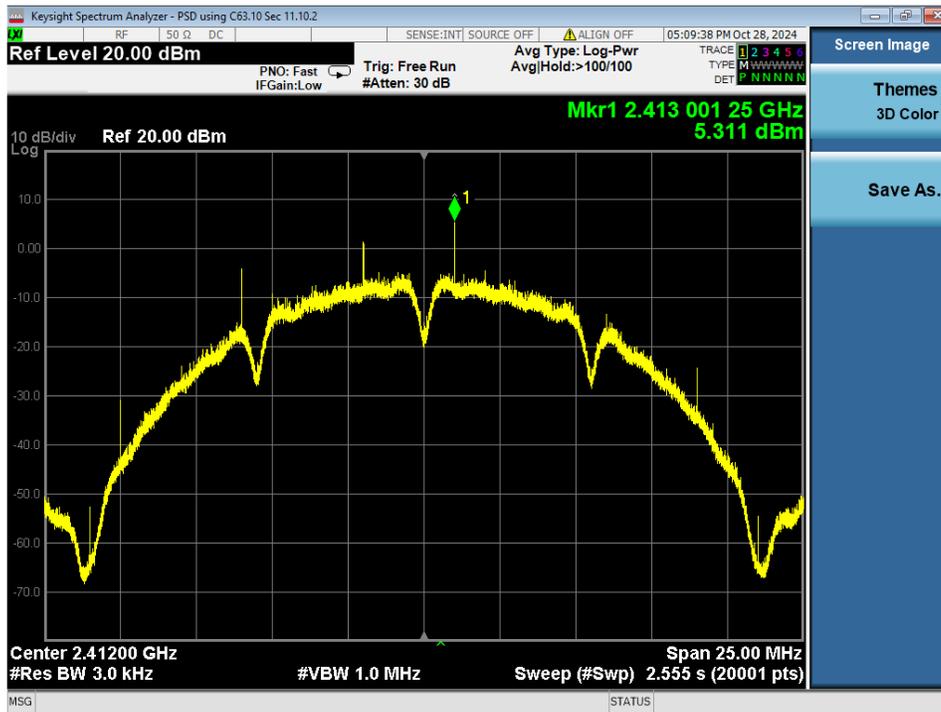
04 6dB Bandwidth, Low, Wifi B, Low Data Rate



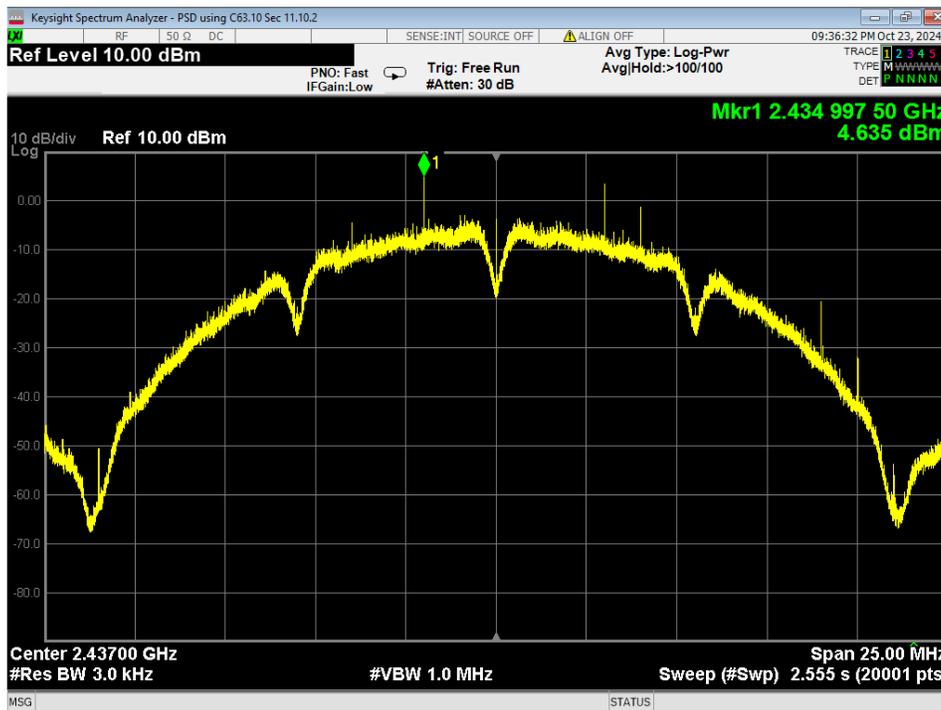
05 6dB Bandwidth, Mid, Wifi B, Low Data Rate



06 6dB Bandwidth, High, Wifi B, Low Data Rate



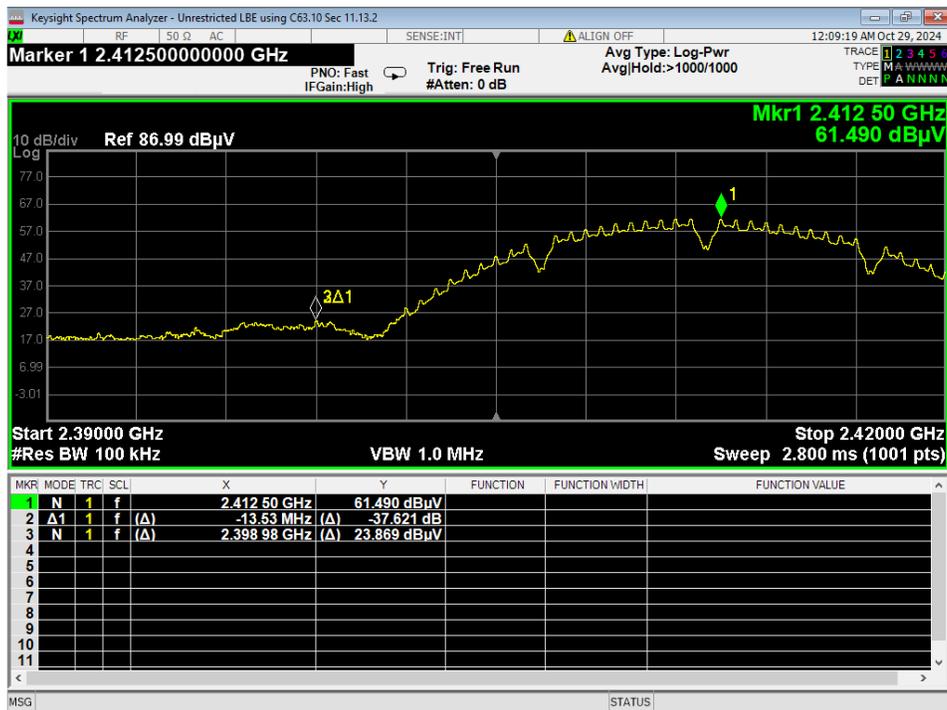
07 PSD, Low, Wifi B, Low Data Rate



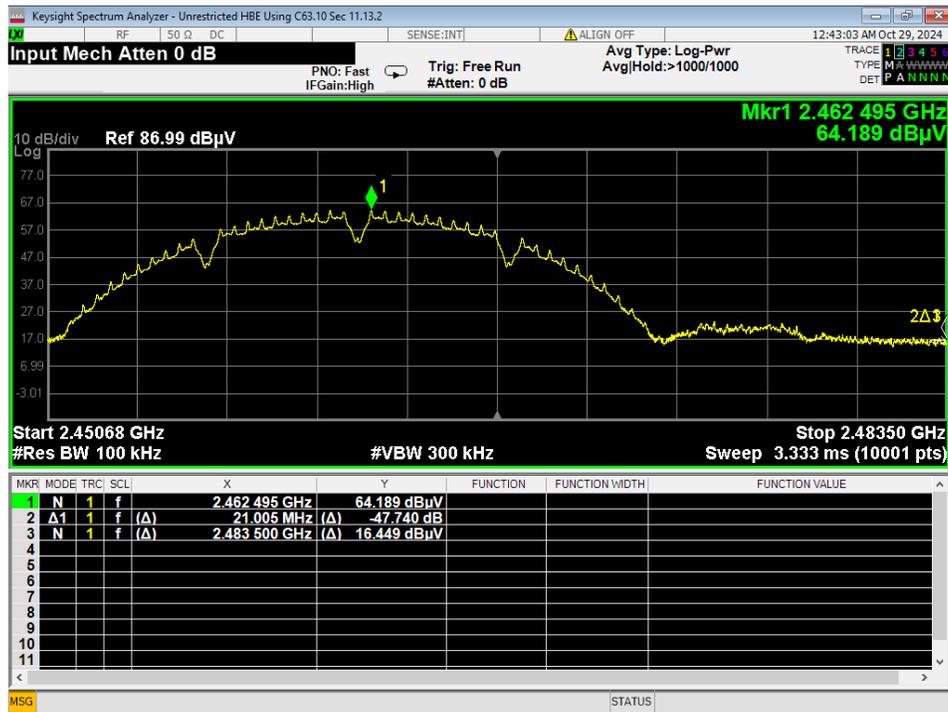
08 PSD, Mid, Wifi B, Low Data Rate



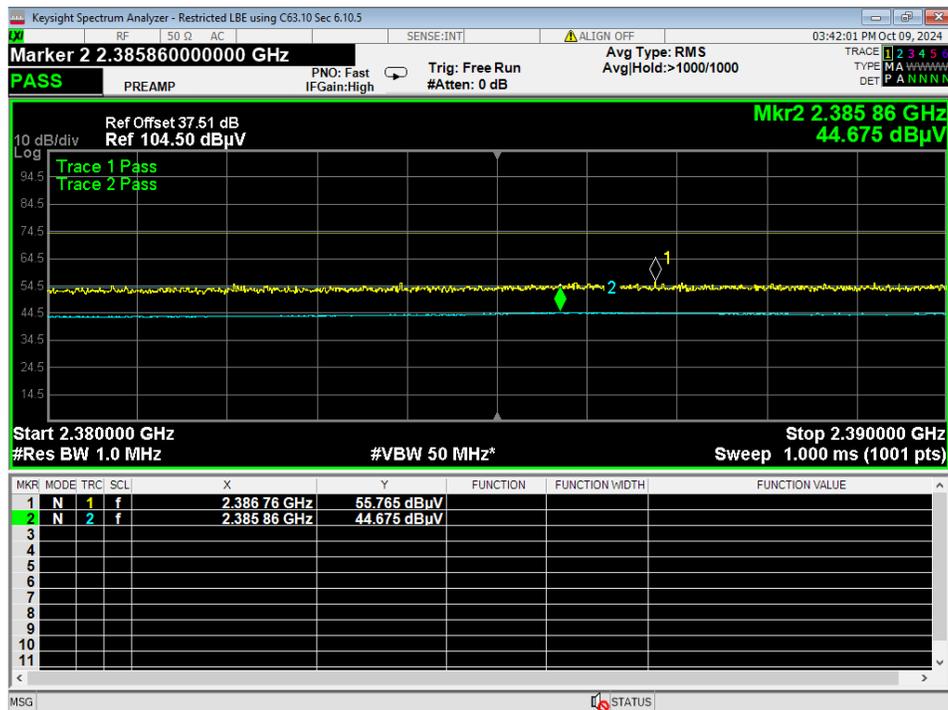
09 PSD, High, Wifi B, Low Data Rate



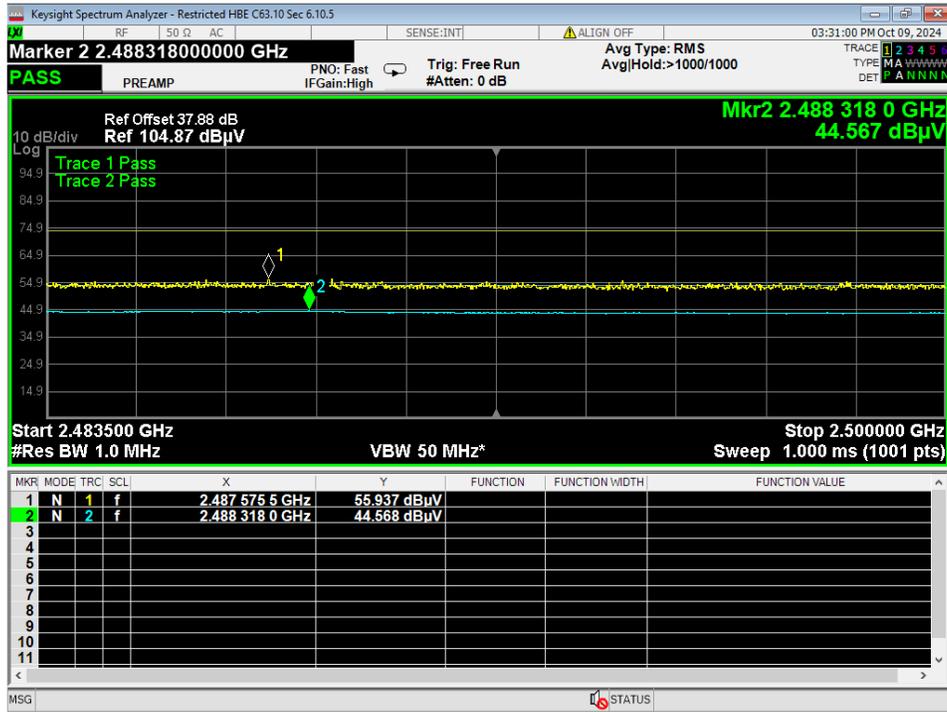
10 Lower Bandedge, Unrestricted, Wifi B, Low Data Rate



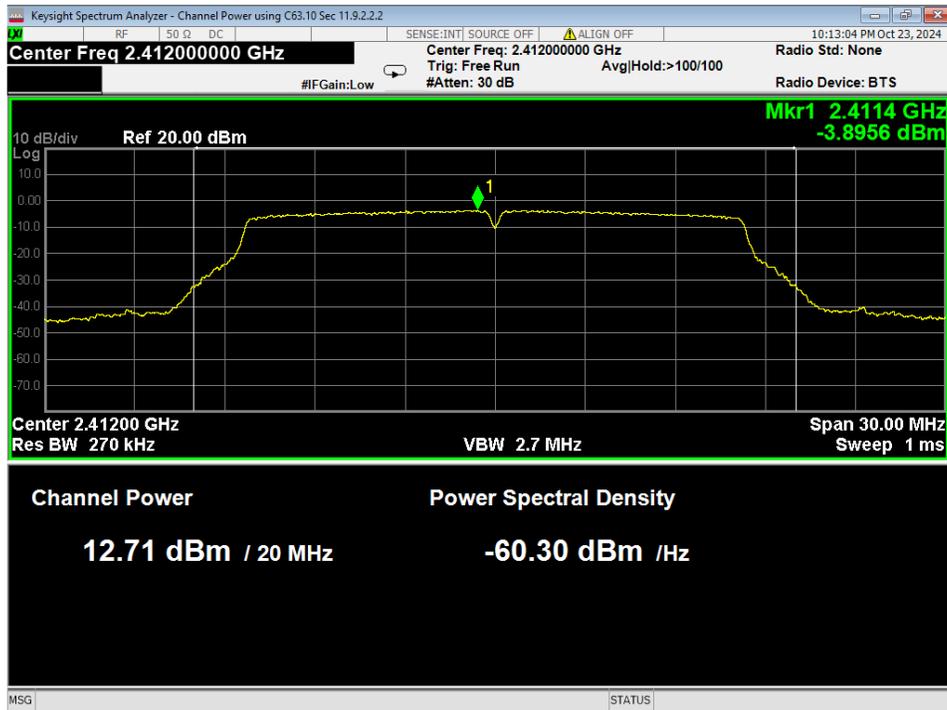
11 Higher Bandedge, Unrestricted, Wifi B, Low Data Rate



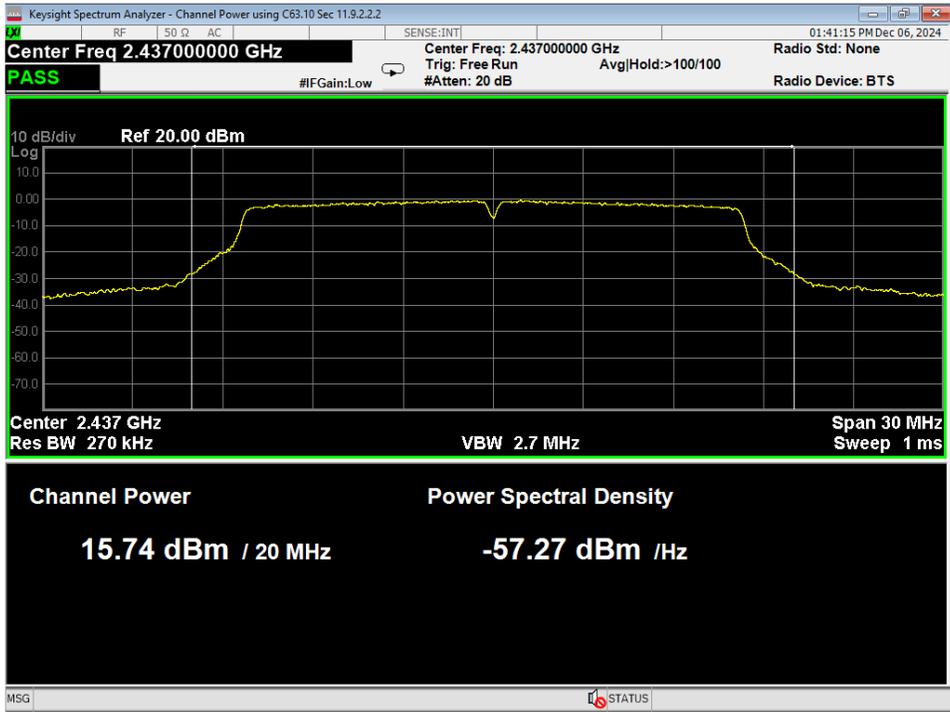
12 Lower Bandedge, Restricted, Wifi B, Low Data Rate



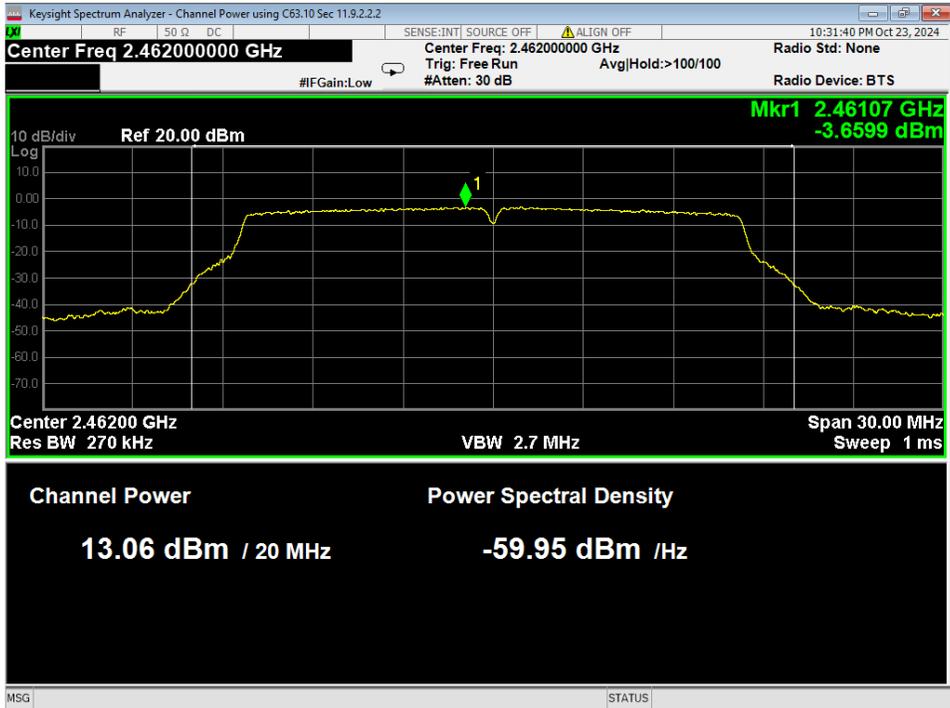
13 Higher Bandedge, Restricted, Wifi B, Low Data Rate



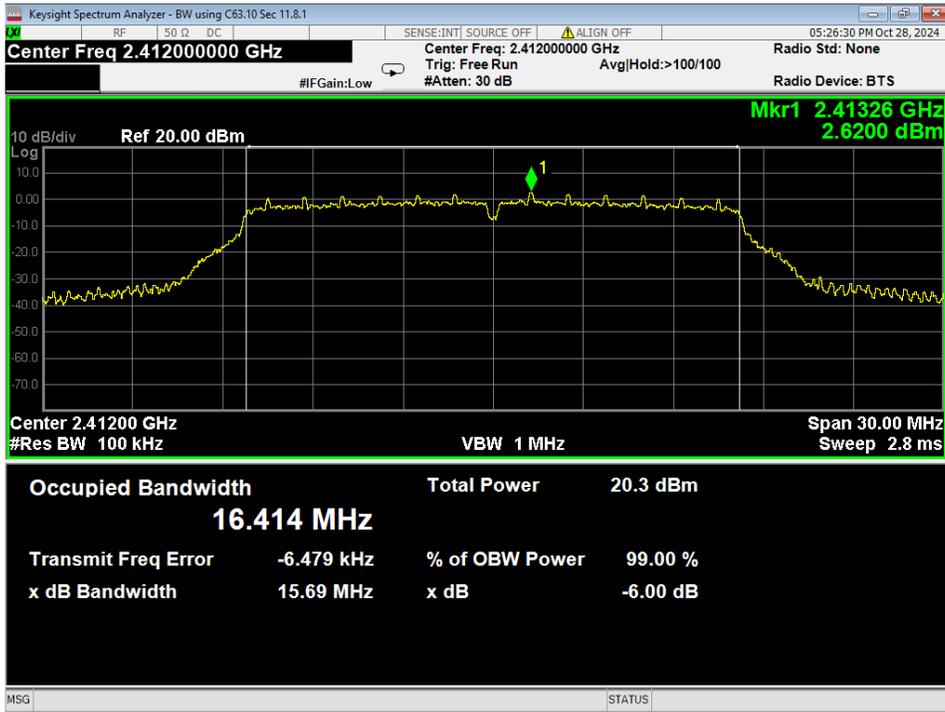
14 Average Power, Low, Wifi G, Low Data Rate



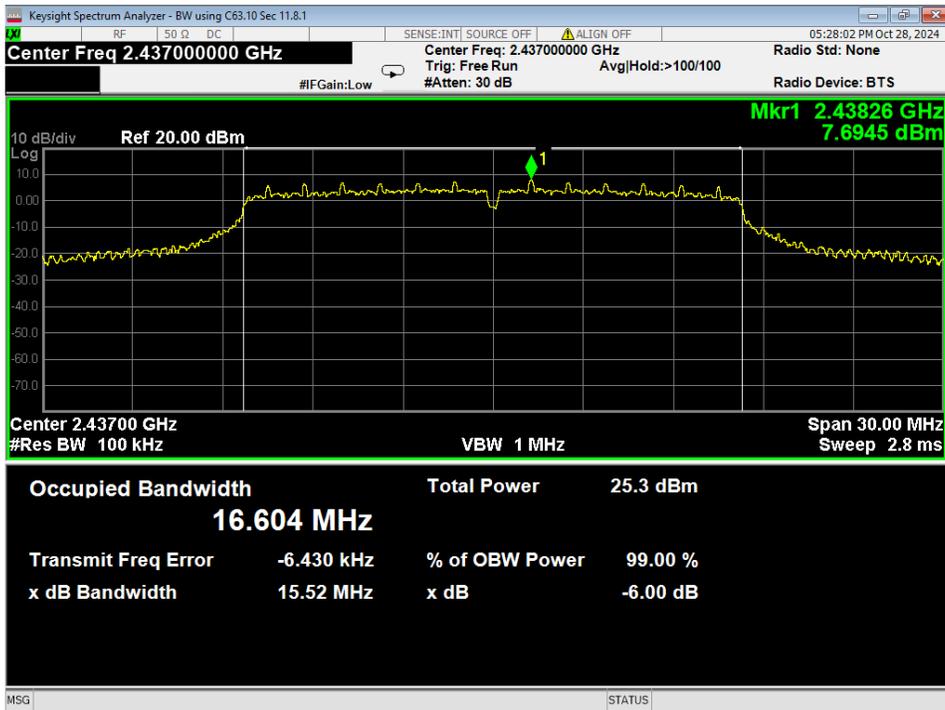
15 Average Power, Mid, Wifi G, Low Data Rate



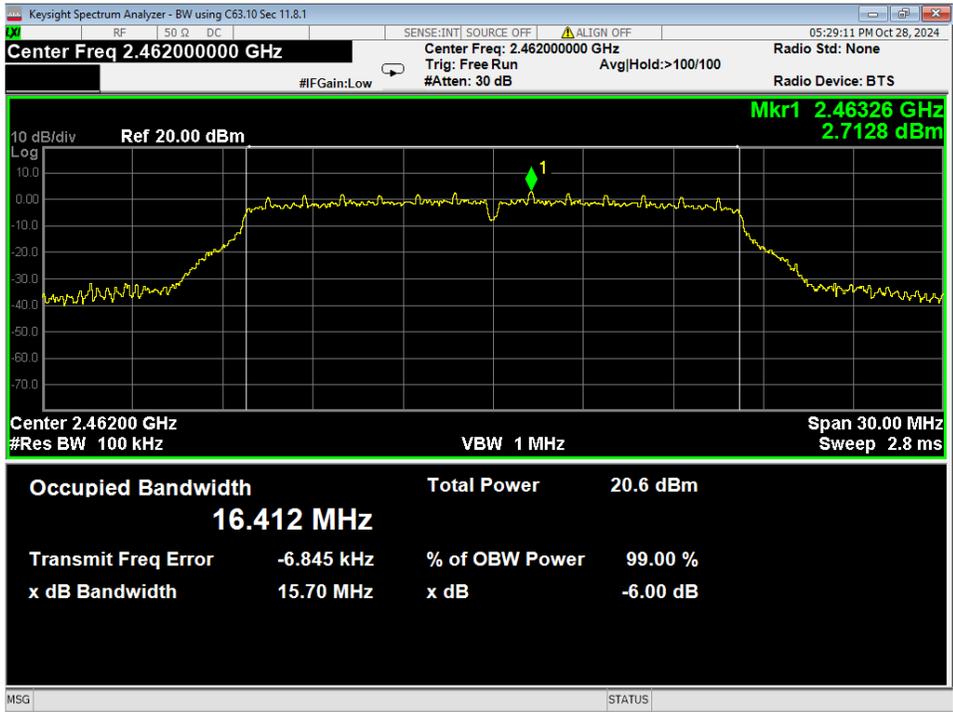
16 Average Power, High, Wifi G, Low Data Rate



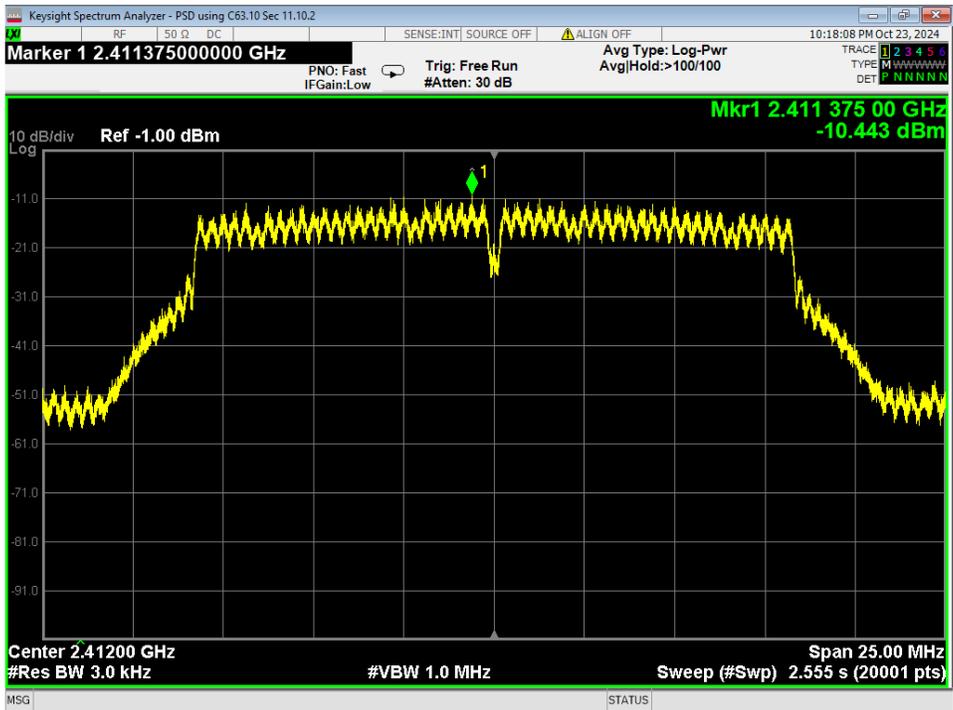
17 6dB Bandwidth, Low, Wifi G, Low Data Rate



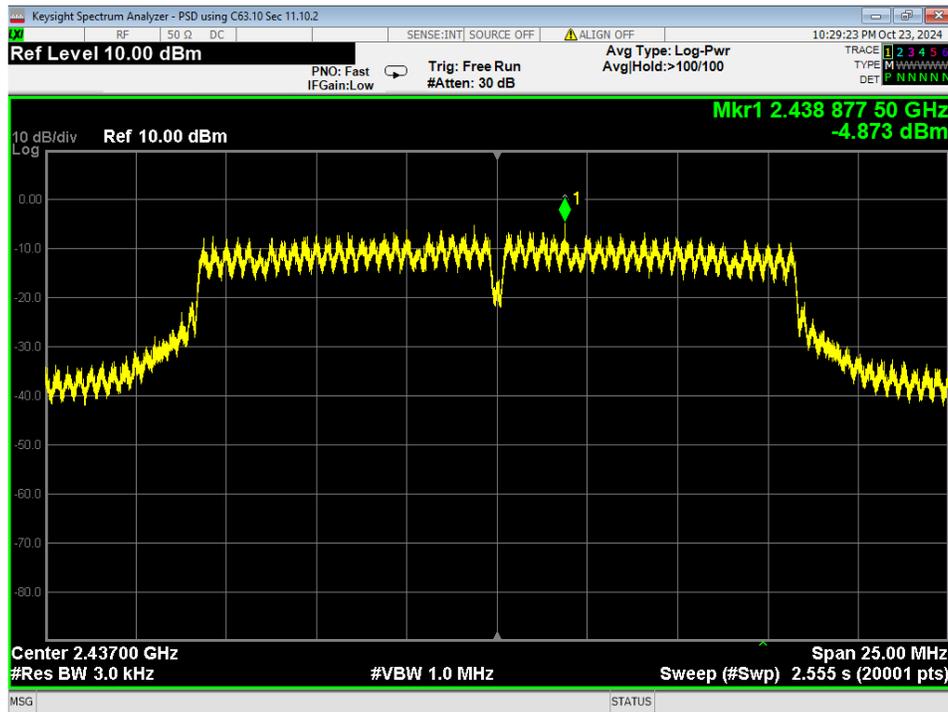
18 6dB Bandwidth, Mid, Wifi G, Low Data Rate



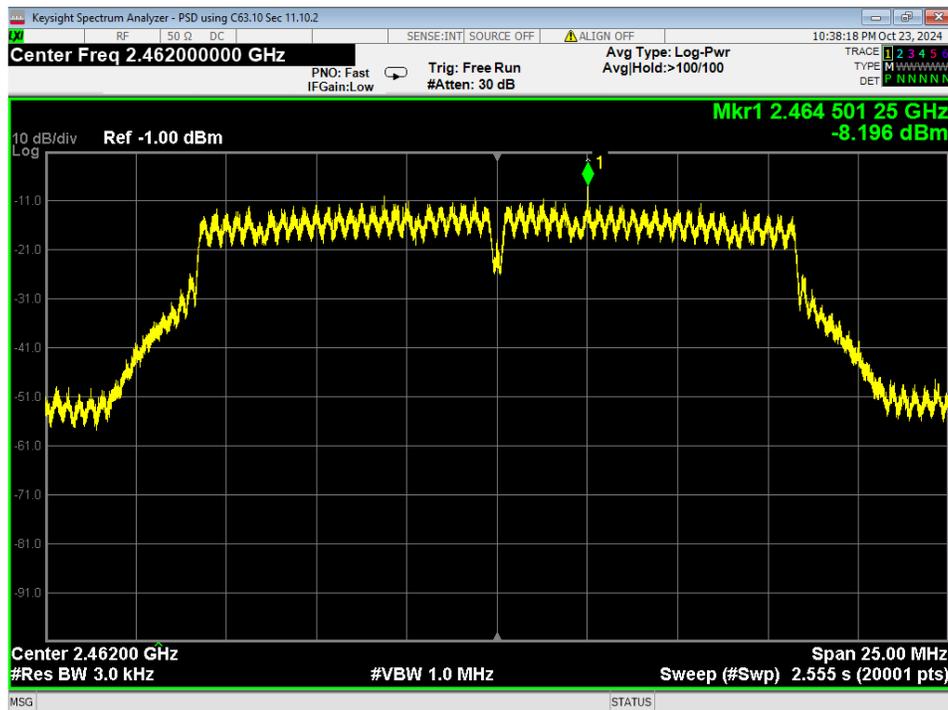
19 6dB Bandwidth, High, Wifi G, Low Data Rate



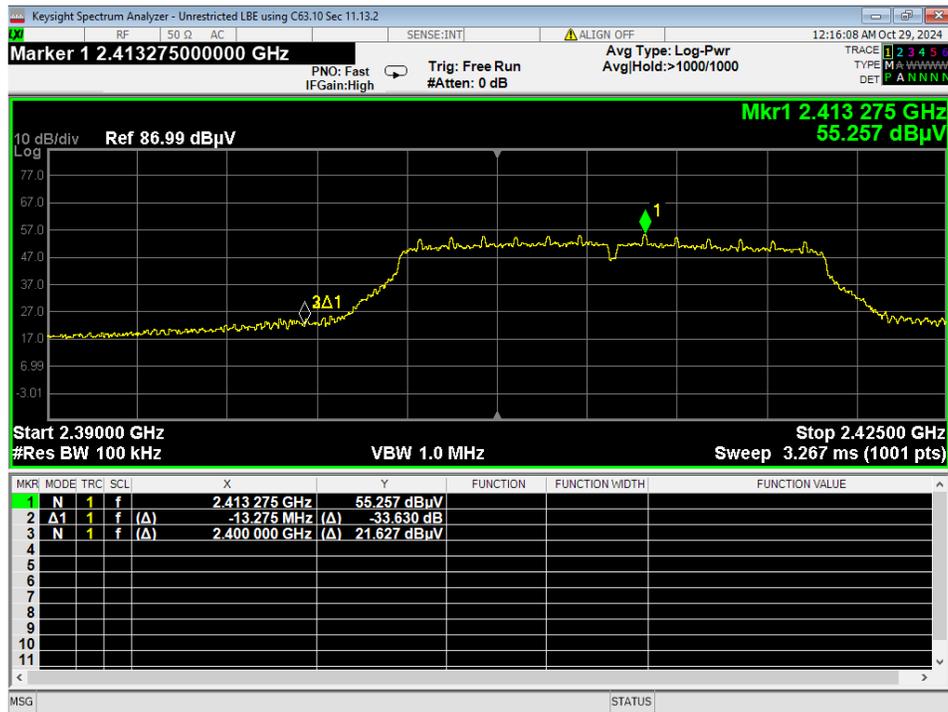
20 PSD, Low, Wifi G, Low Data Rate



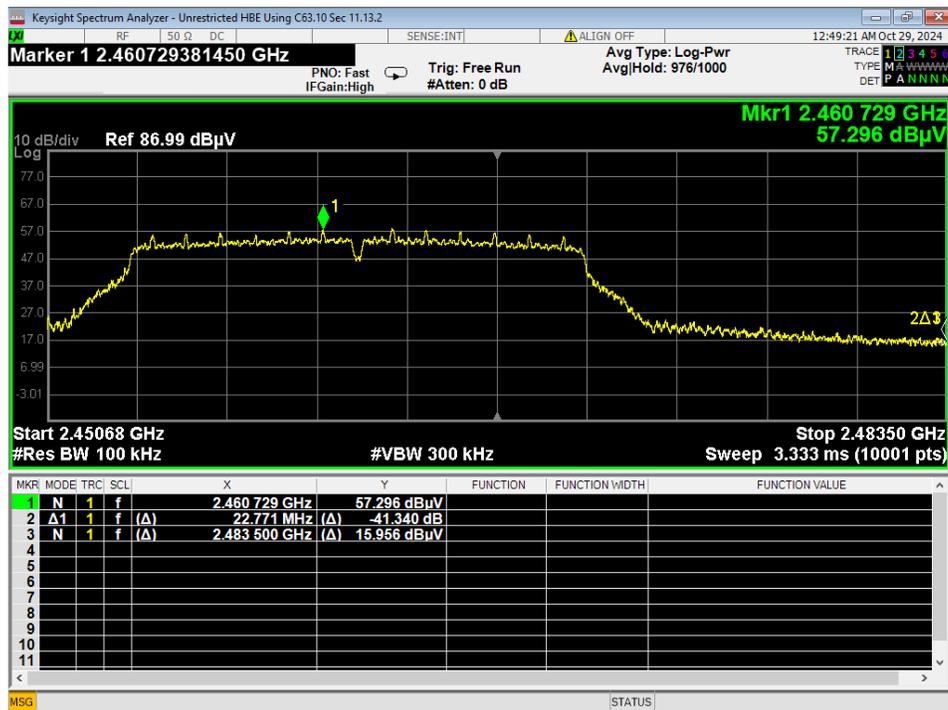
21 PSD, Mid, Wifi G, Low Data Rate



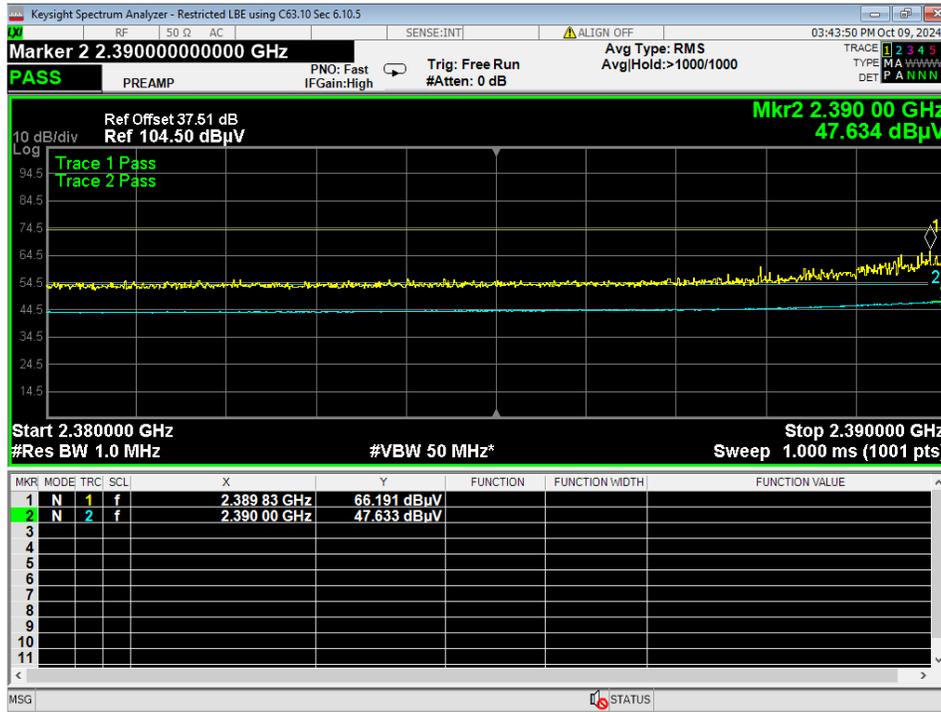
22 PSD, High, Wifi G, Low Data Rate



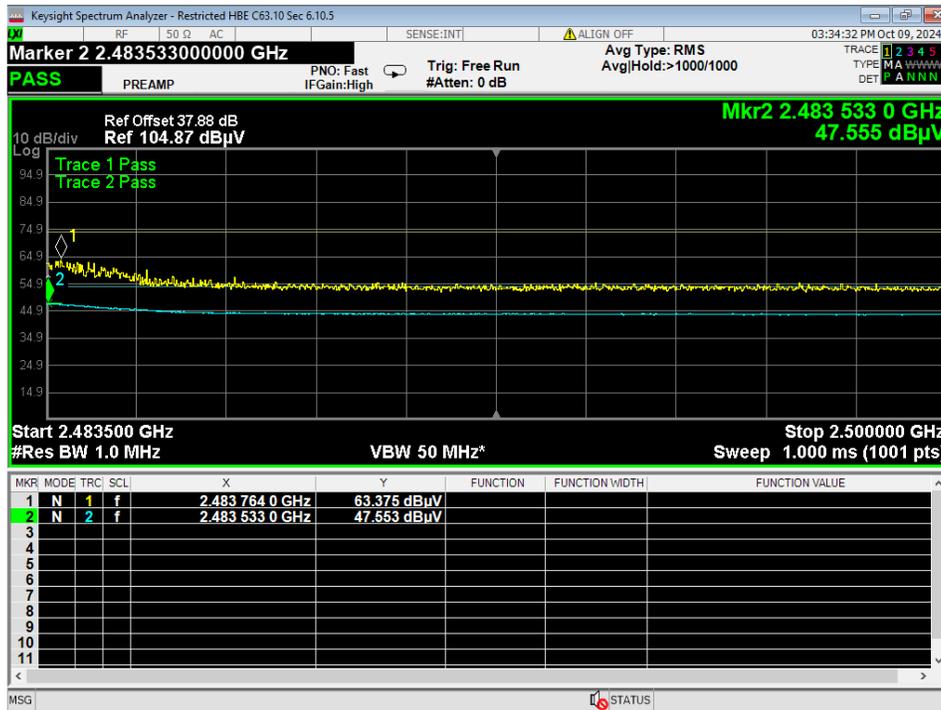
23 Lower Bandedge, Unrestricted, Wifi G, Low Data Rate



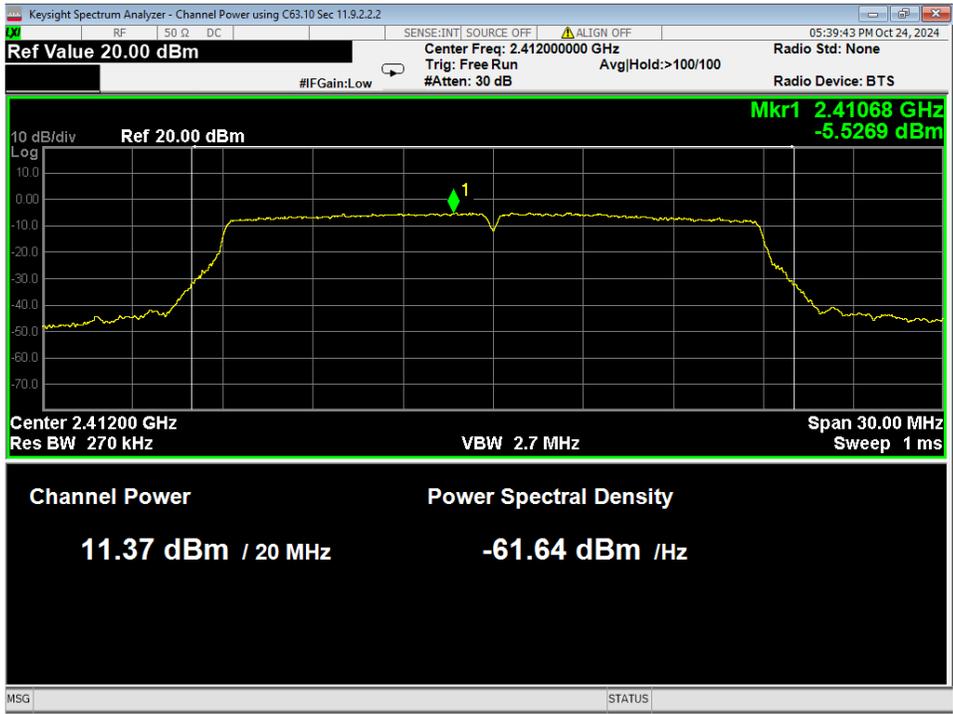
24 Higher Bandedge, Unrestricted, Wifi G, Low Data Rate



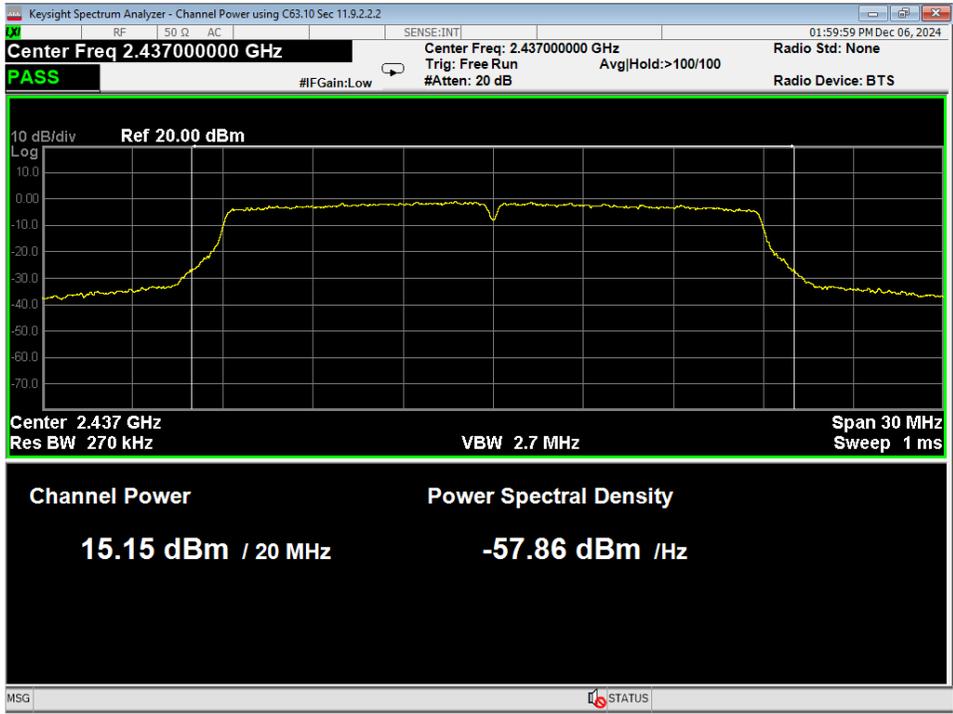
25 Lower Bandedge, Restricted, Wifi G, Low Data Rate



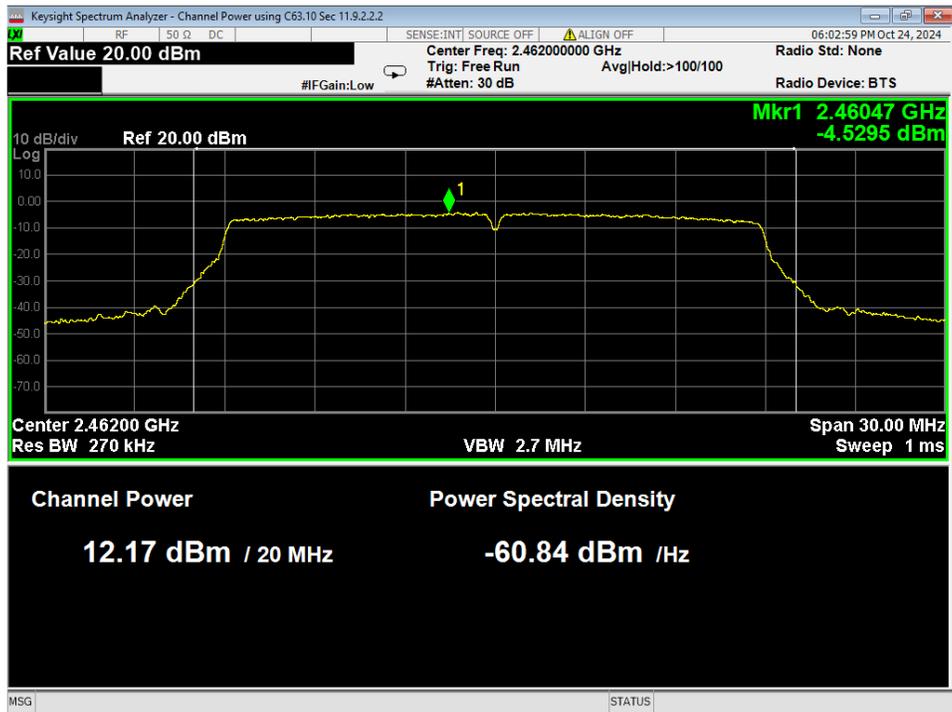
26 Higher Bandedge, Restricted, Wifi G, Low Data Rate



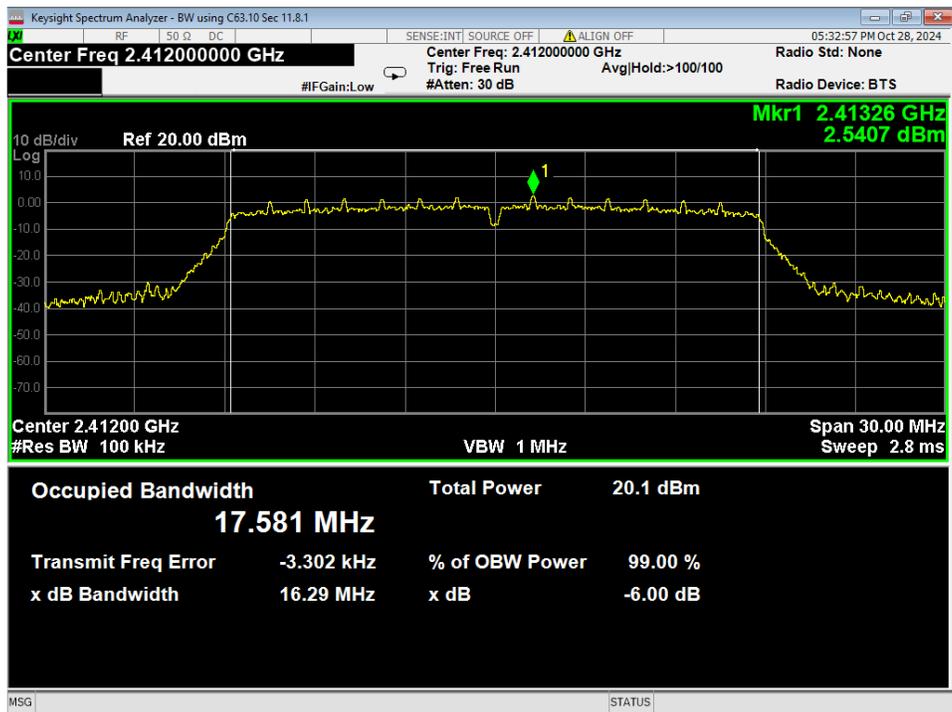
27 Average Power, Low, Wifi N, Low Data Rate



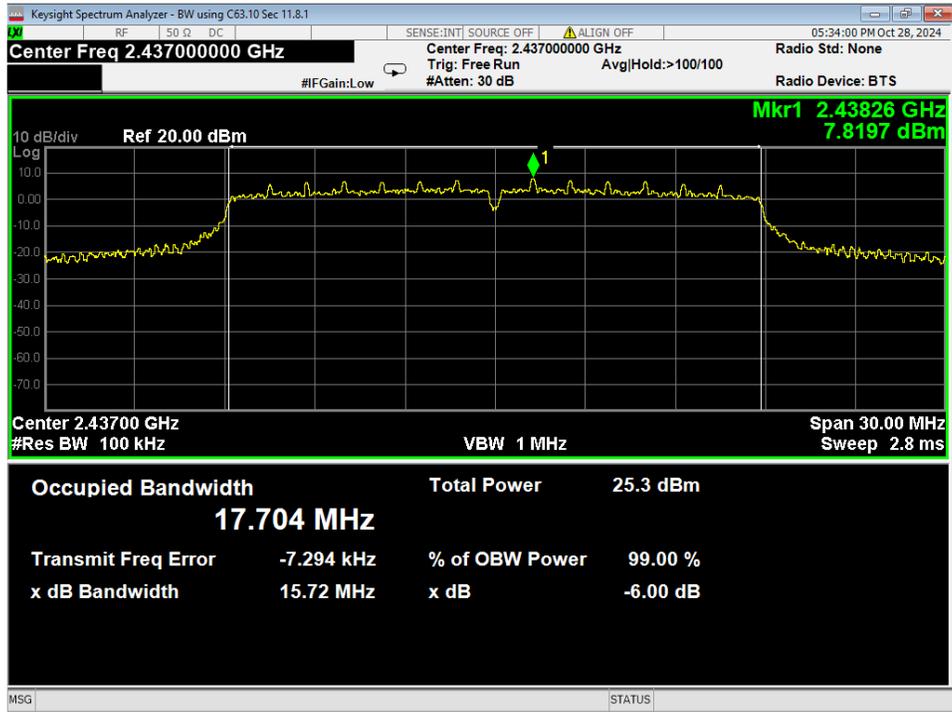
28 Average Power, Mid, Wifi N, Low Data Rate



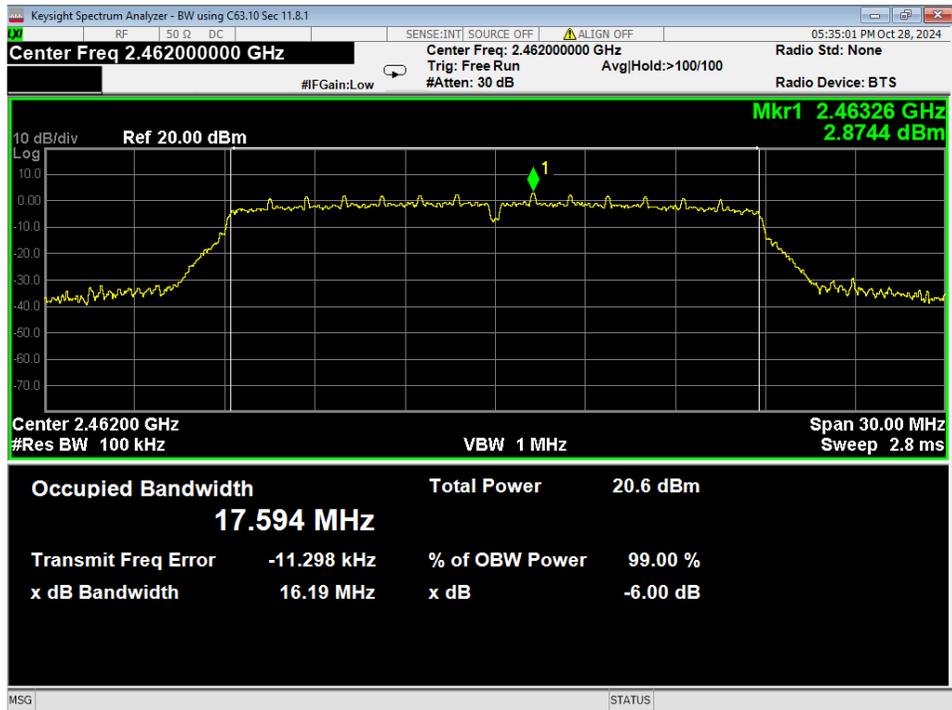
29 Average Power, High, Wifi N, Low Data Rate



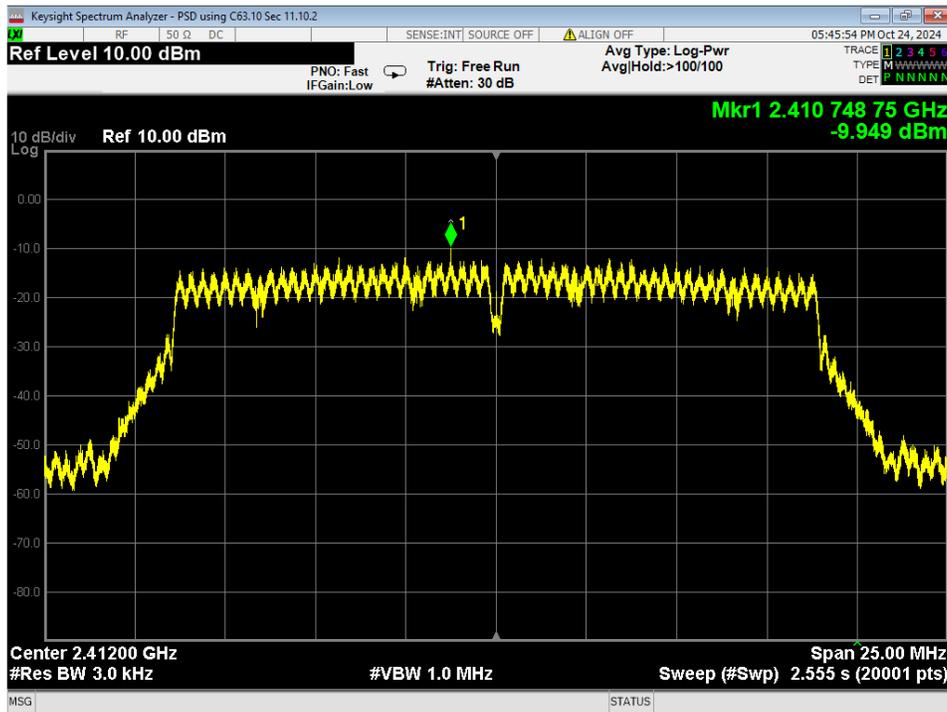
30 6dB Bandwidth, Low, Wifi N, Low Data Rate



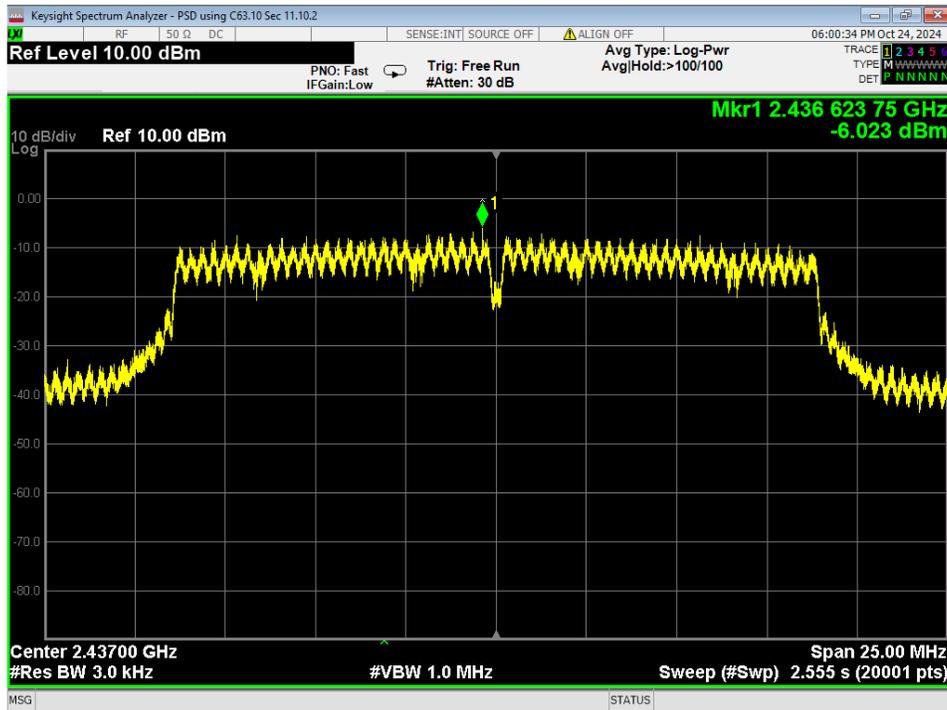
31 6dB Bandwidth, Mid, Wifi N, Low Data Rate



32 6dB Bandwidth, High, Wifi N, Low Data Rate



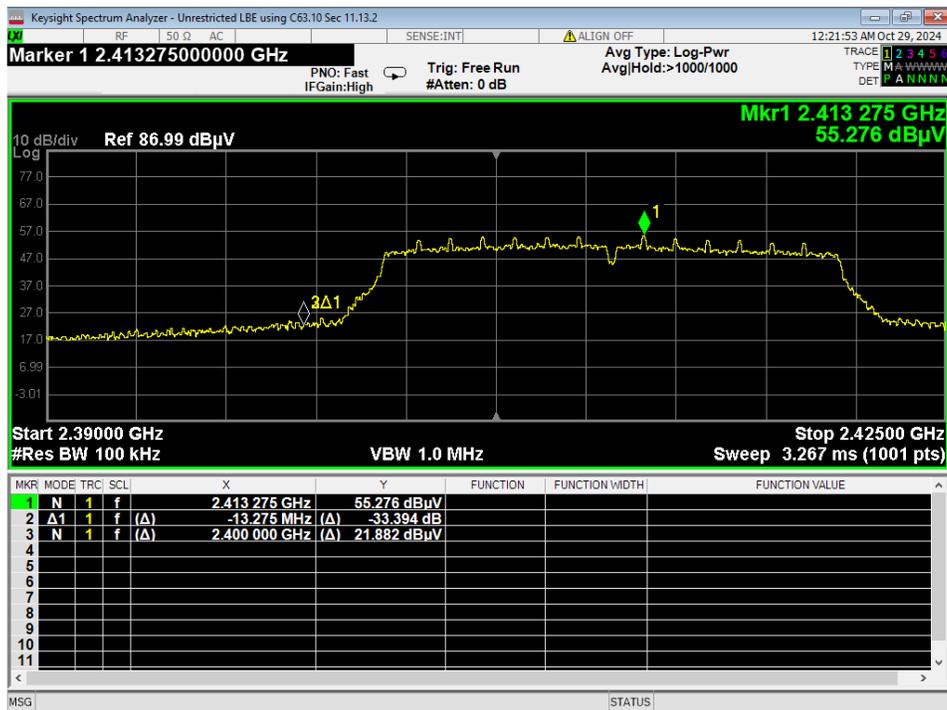
33 PSD, Low, Wifi N, Low Data Rate



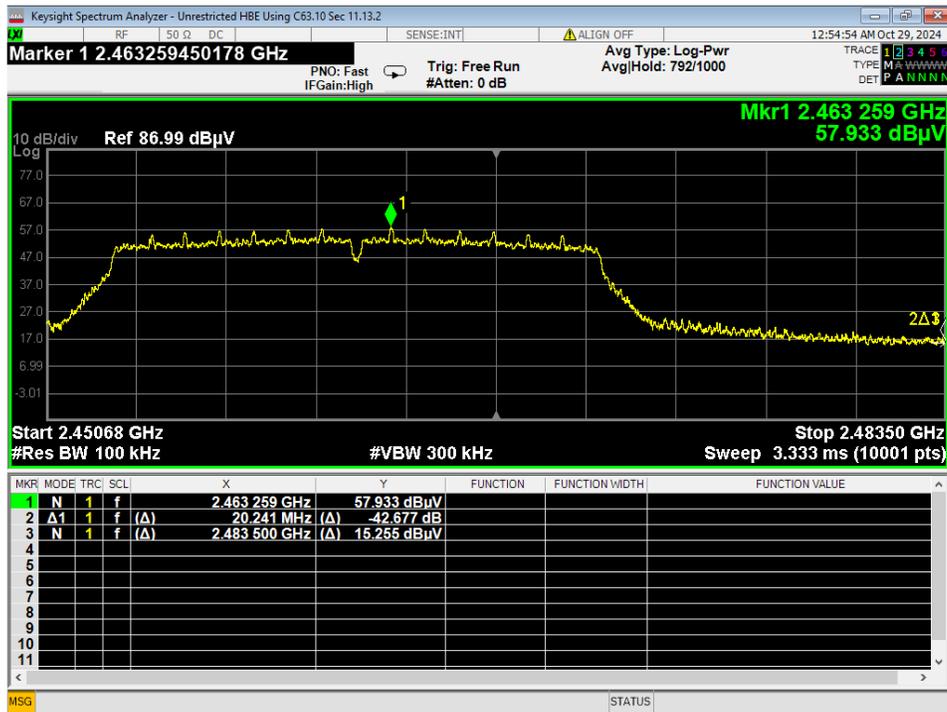
34 PSD, Mid, Wifi N, Low Data Rate



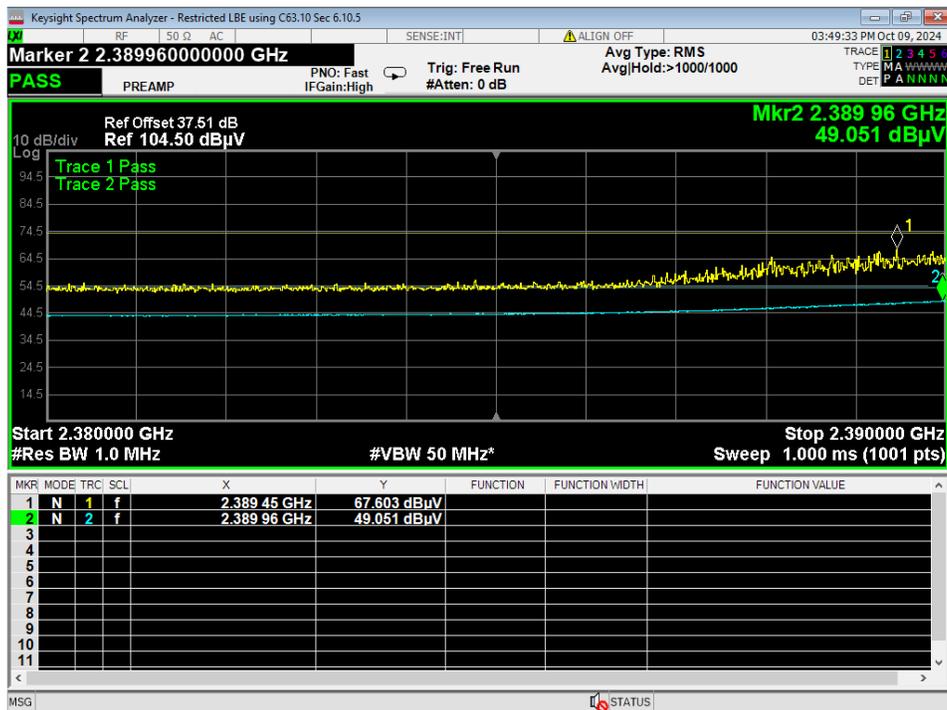
35 PSD, High, Wifi N, Low Data Rate



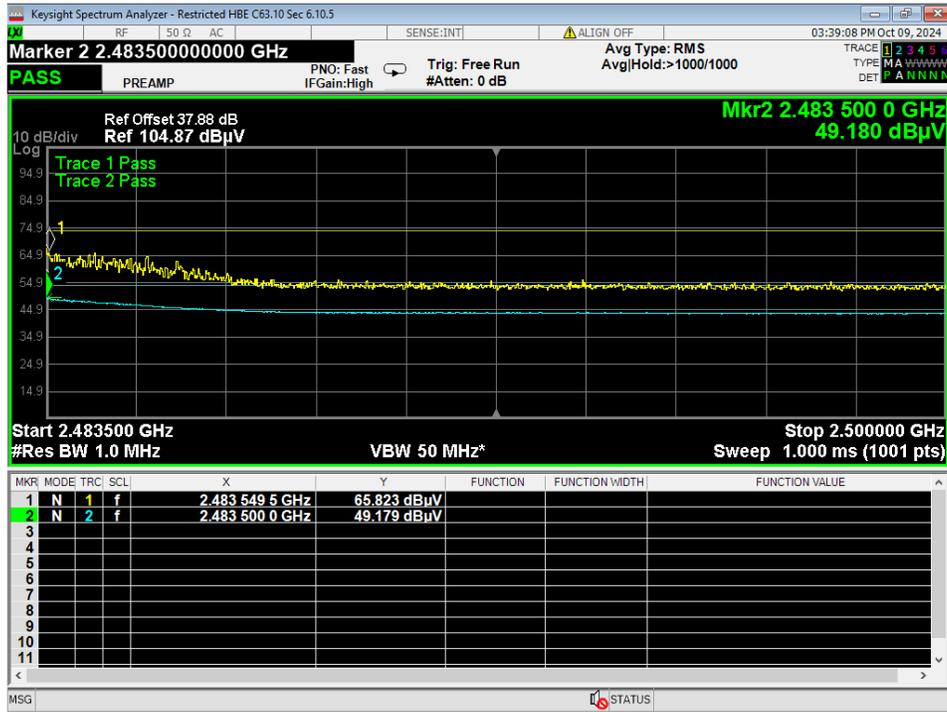
36 Lower Bandedge, Unrestricted, Wifi N, Low Data Rate



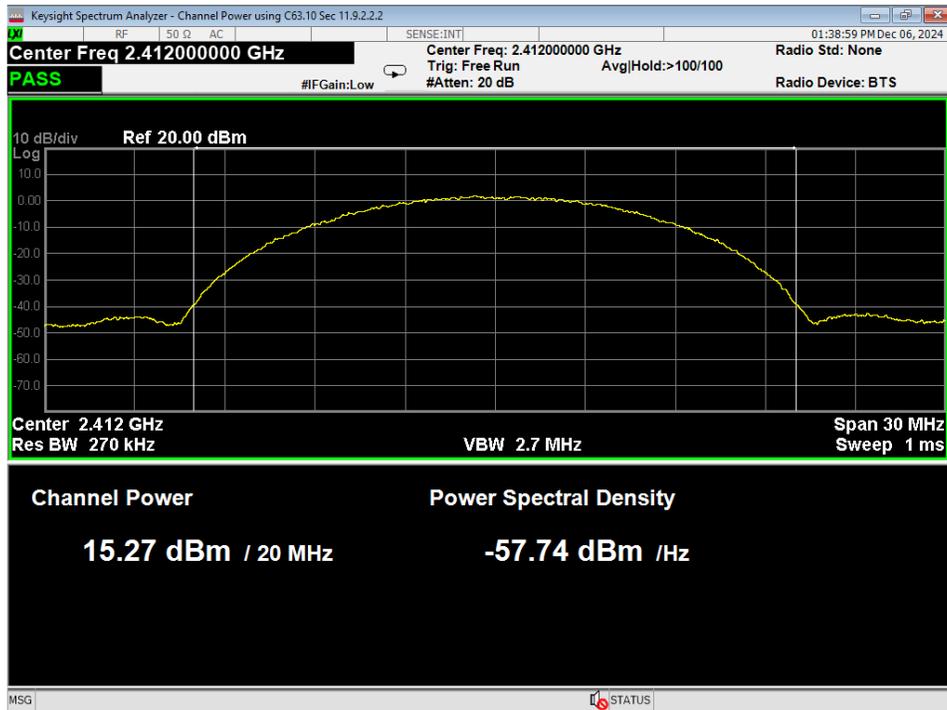
37 Higher Bandedge, Unrestricted, Wifi N, Low Data Rate



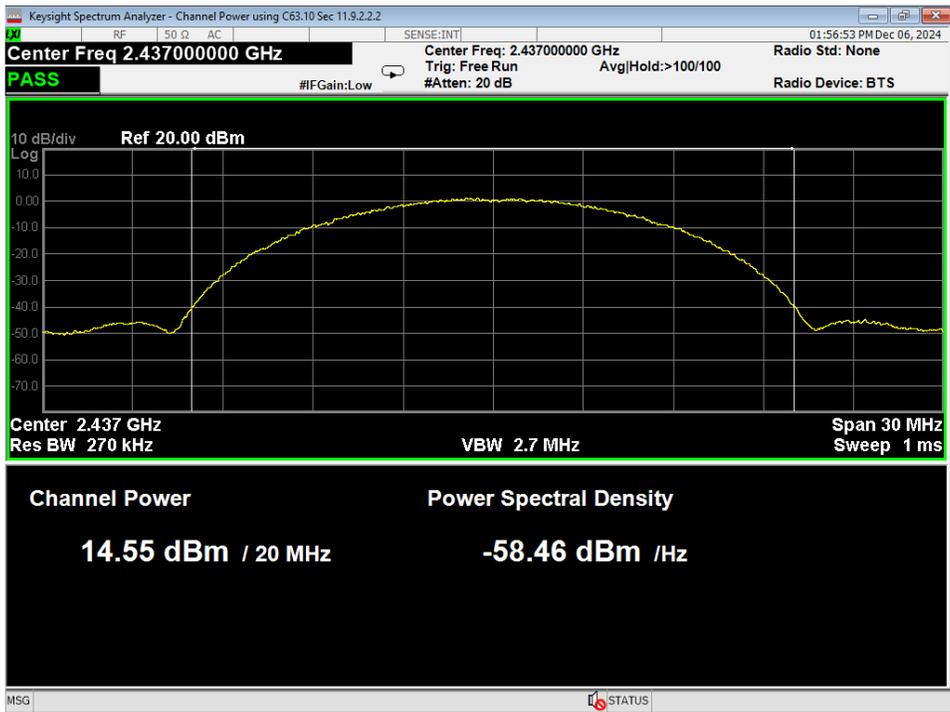
38 Lower Bandedge, Restricted, Wifi N, Low Data Rate



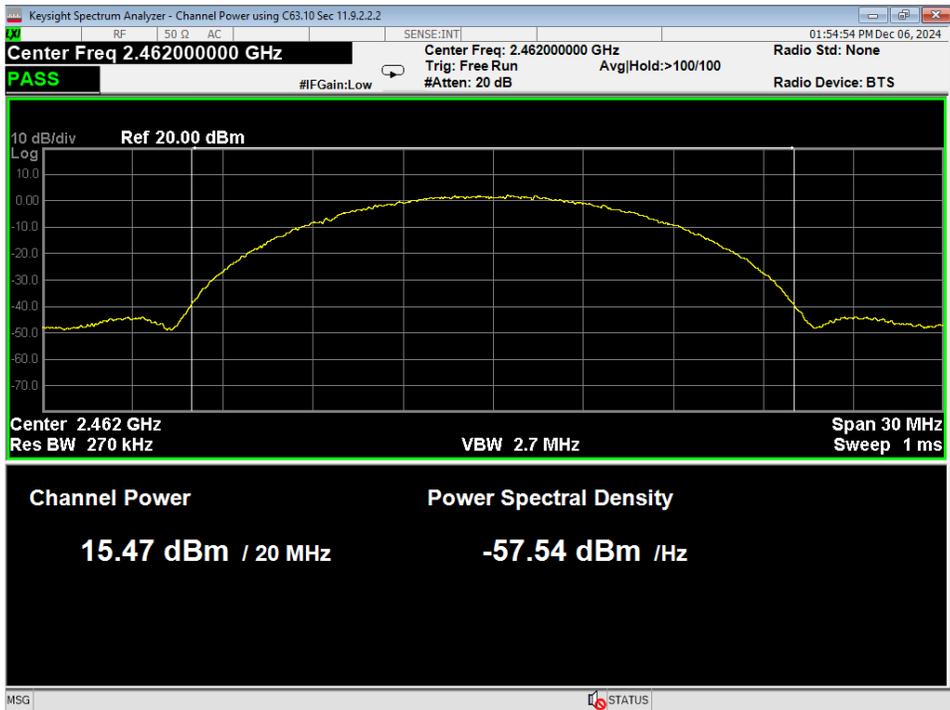
39 Higher Bandedge, Restricted, Wifi N, Low Data Rate



40 Average Power, Low, Wifi B, High Data Rate



41 Average Power, Mid, Wifi B, High Data Rate



42 Average Power, High, Wifi B, High Data Rate



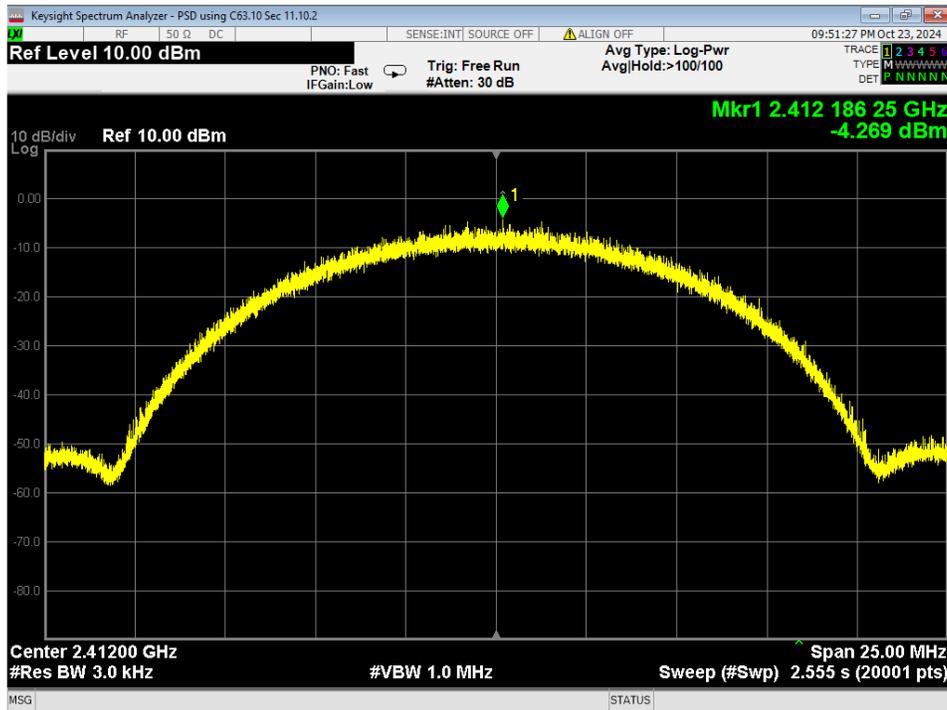
43 6dB Bandwidth, Low, Wifi B, High Data Rate



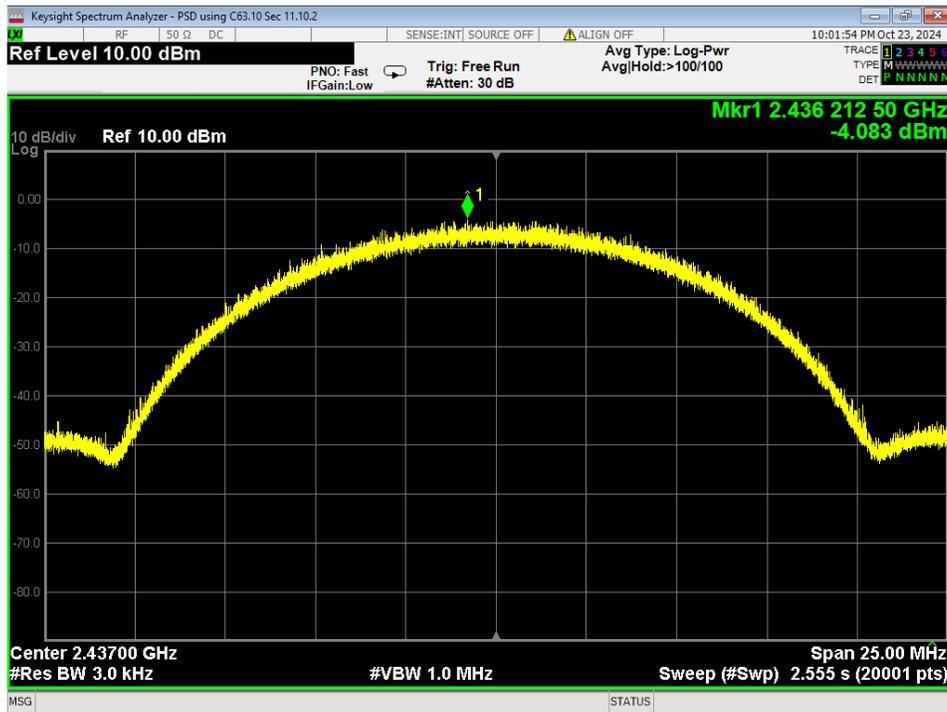
44 6dB Bandwidth, Mid, Wifi B, High Data Rate



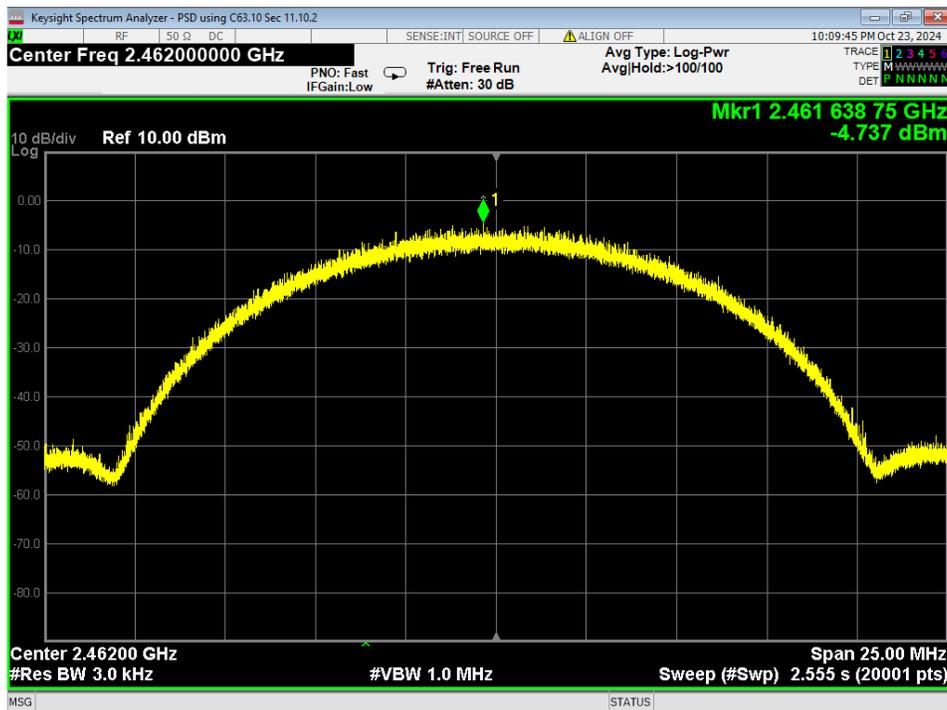
45 6dB Bandwidth, High, Wifi B, High Data Rate



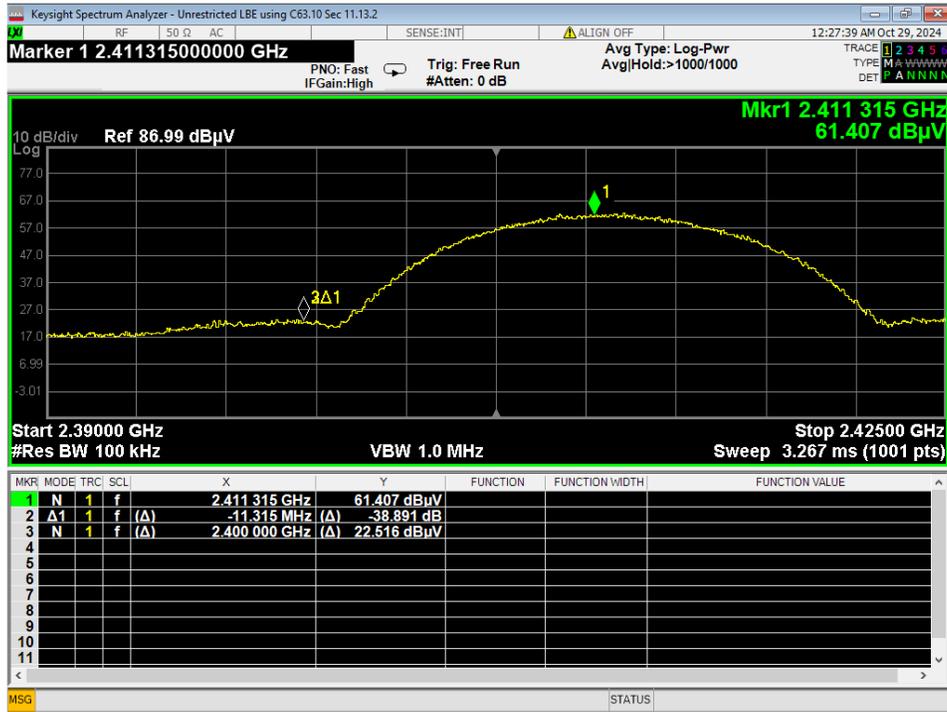
46 PSD, Low, Wifi B, High Data Rate



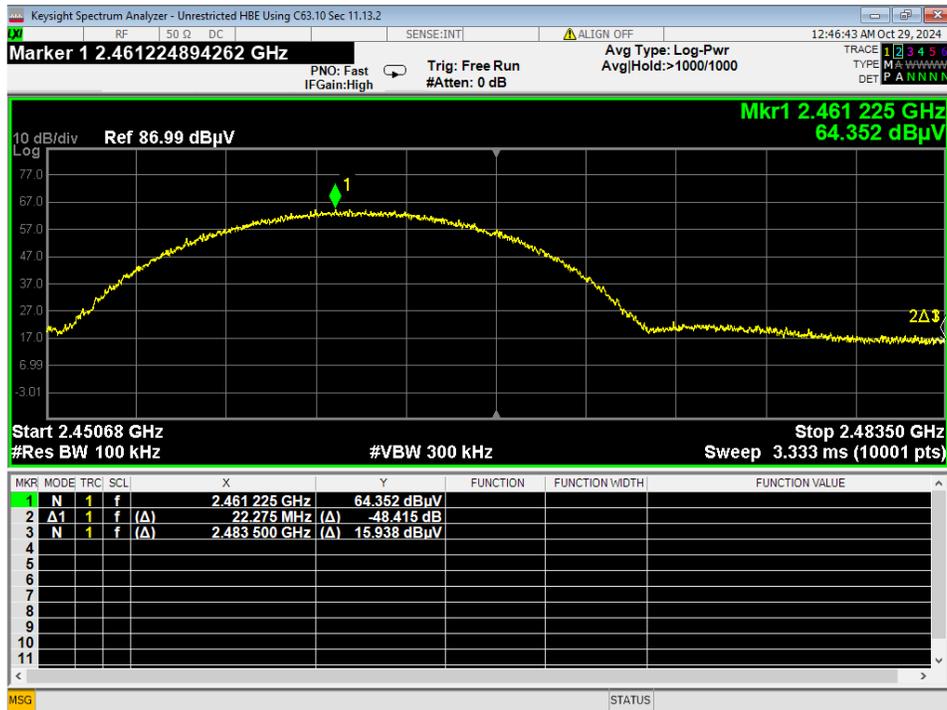
47 PSD, Mid, Wifi B, High Data Rate



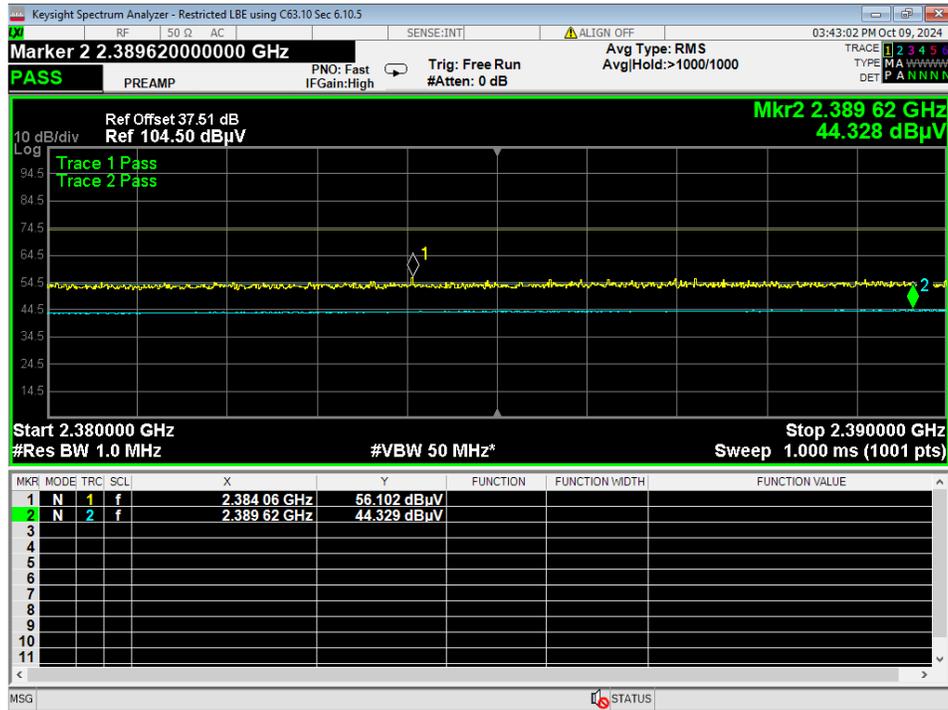
48 PSD, High, Wifi B, High Data Rate



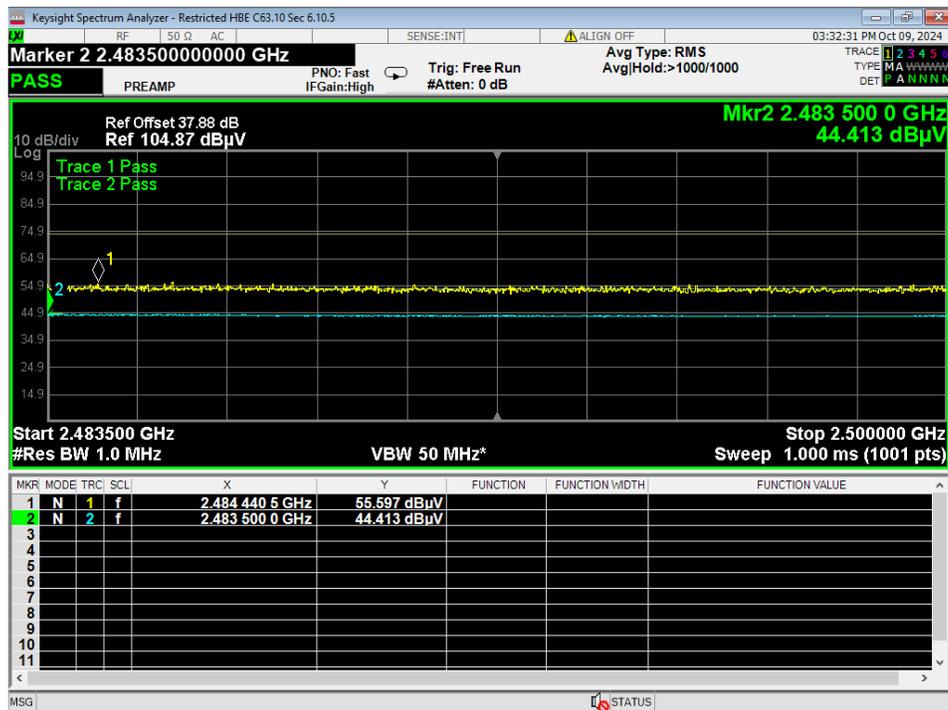
49 Lower Bandedge, Unrestricted, Wifi B, High Data Rate



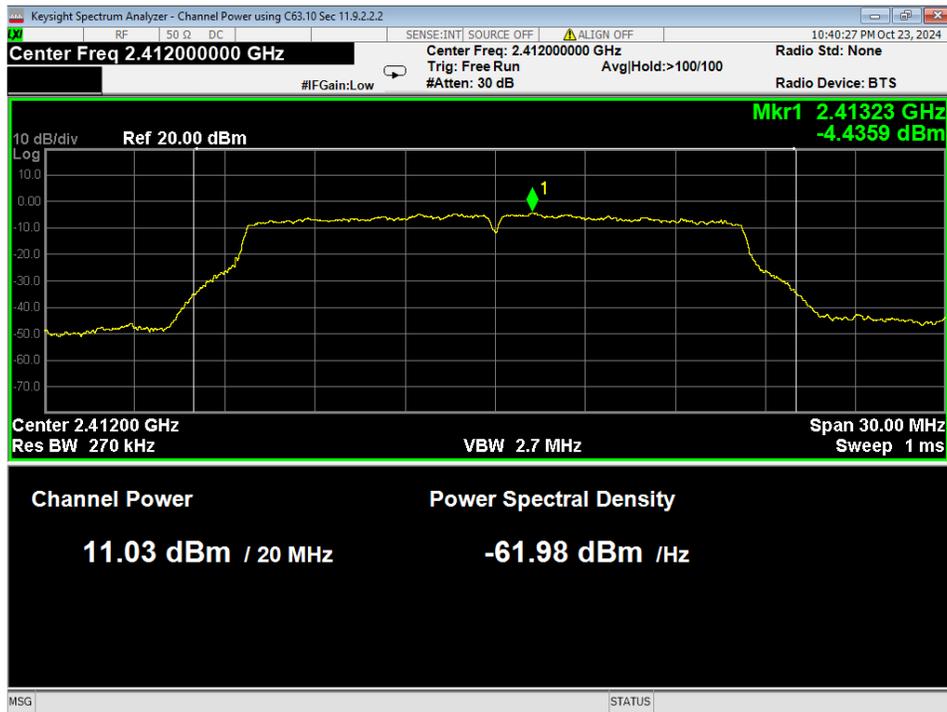
50 Higher Bandedge, Unrestricted, Wifi B, High Data Rate



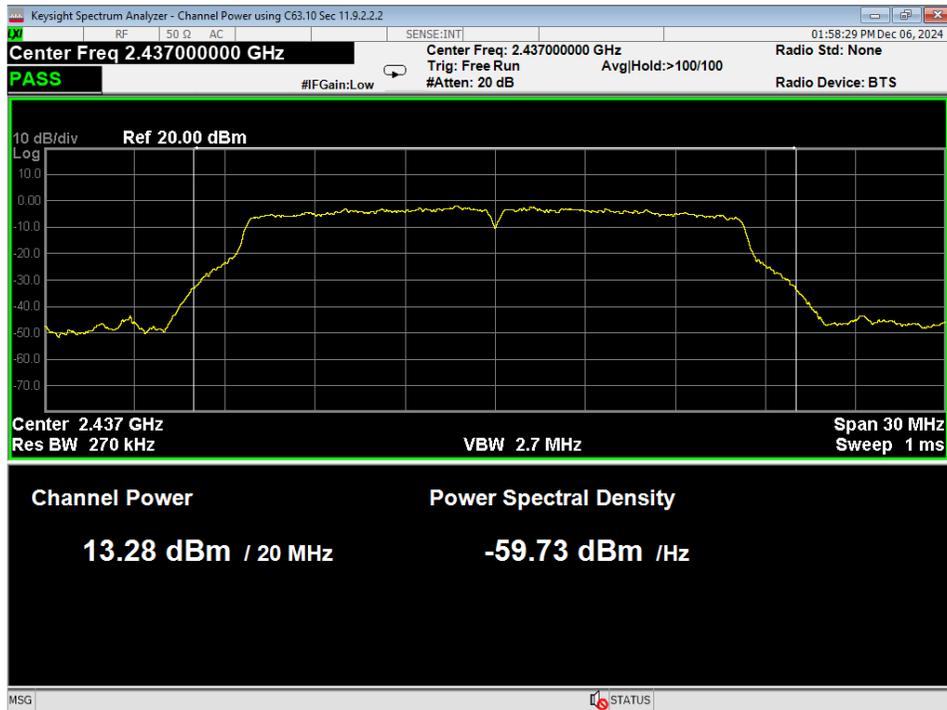
51 Lower Bandedge, Restricted, Wifi B, High Data Rate



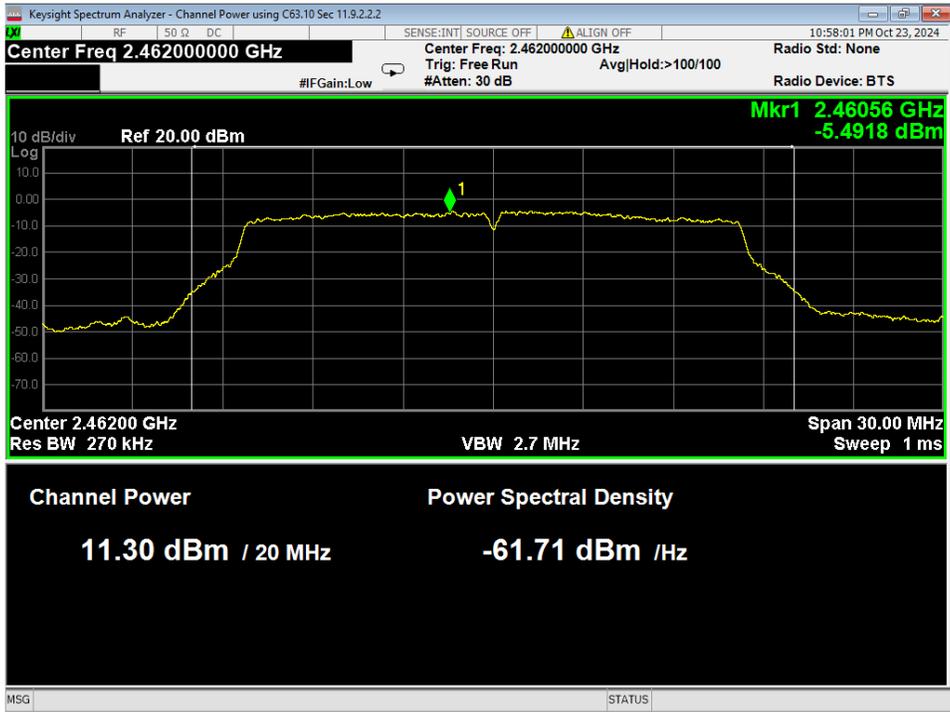
52 Higher Bandedge, Restricted, Wifi B, High Data Rate



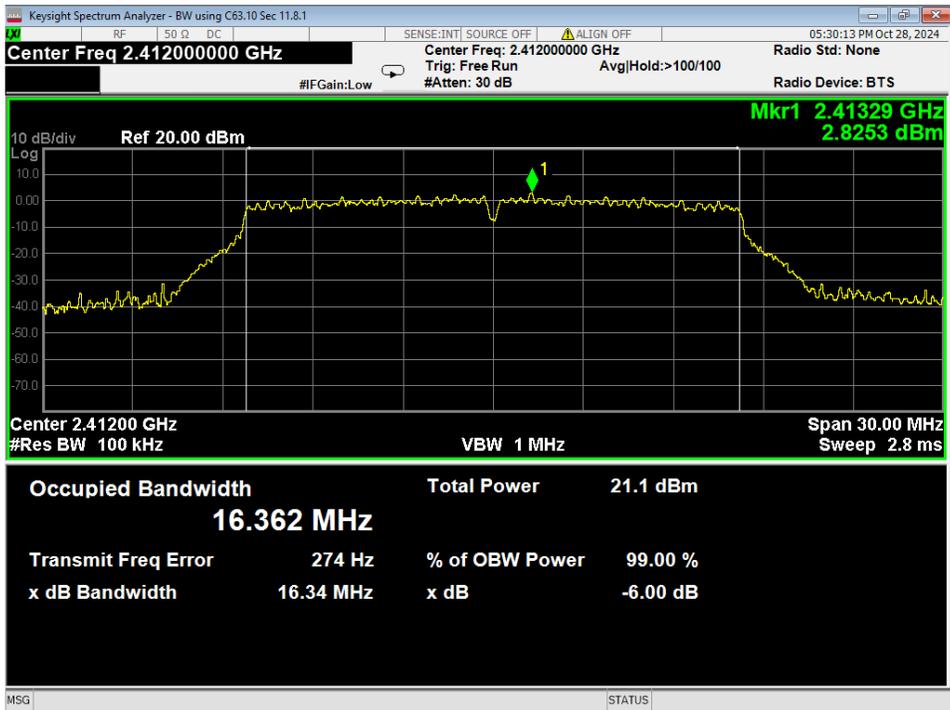
53 Average Power, Low, Wifi G, High Data Rate



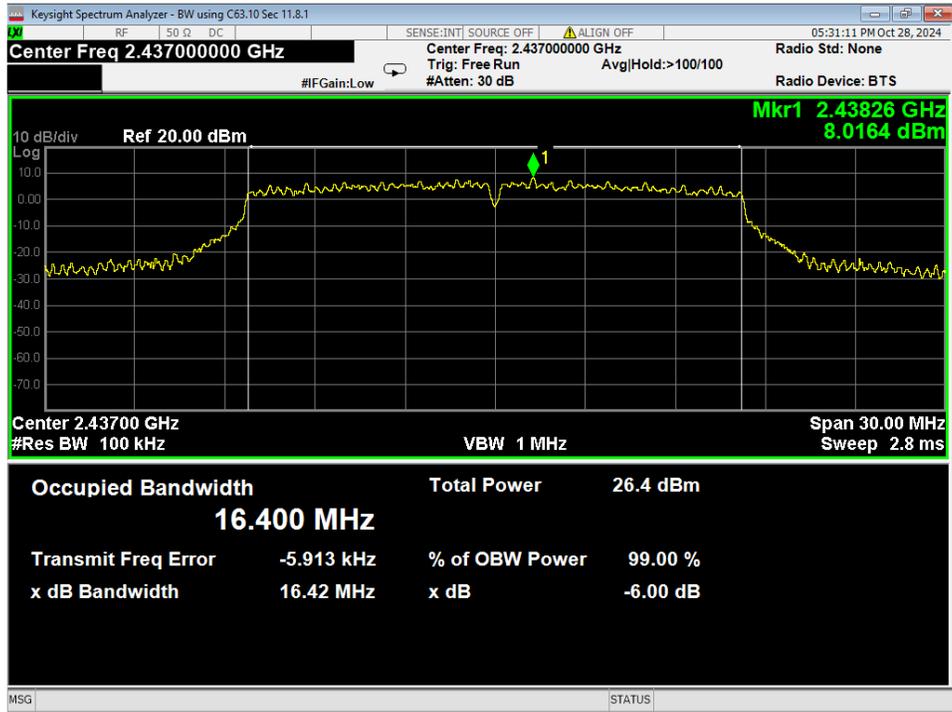
54 Average Power, Mid, Wifi G, High Data Rate



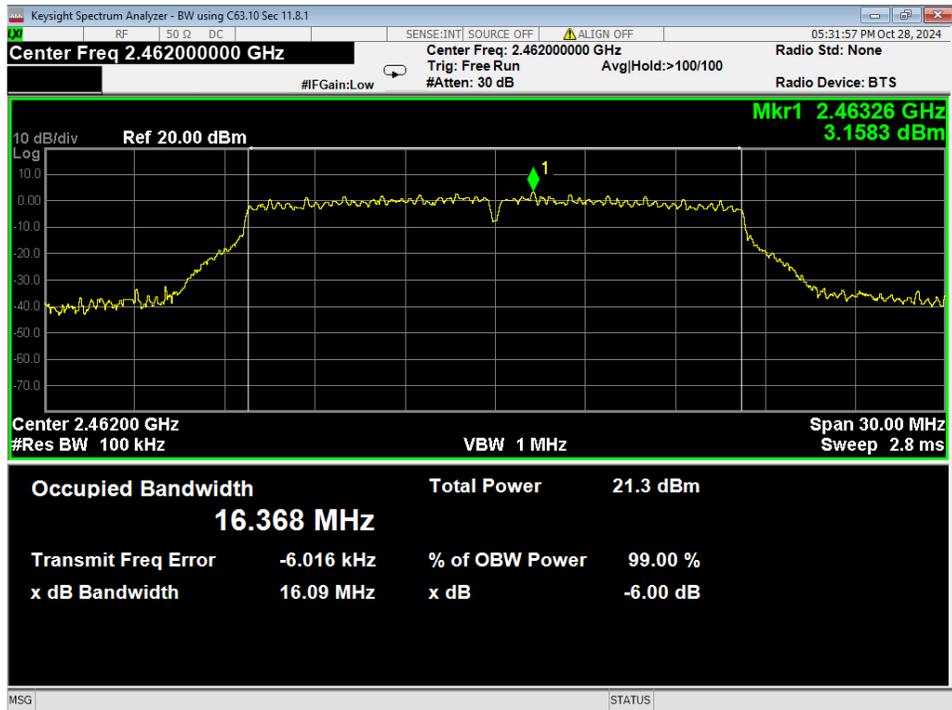
55 Average Power, High, Wifi G, High Data Rate



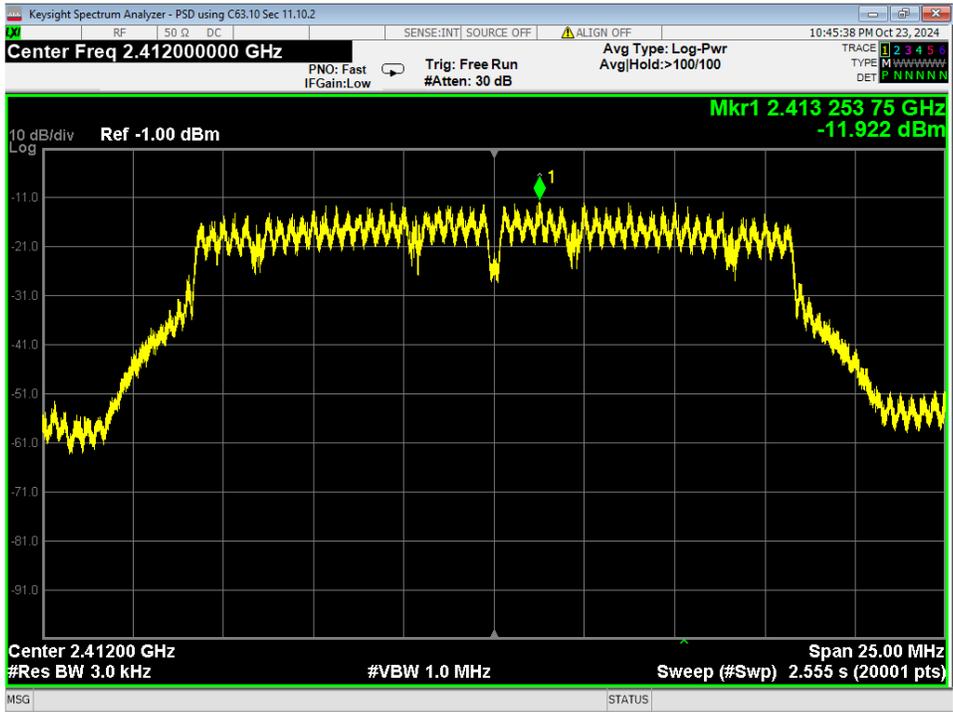
56 6dB Bandwidth, Low, Wifi G, High Data Rate



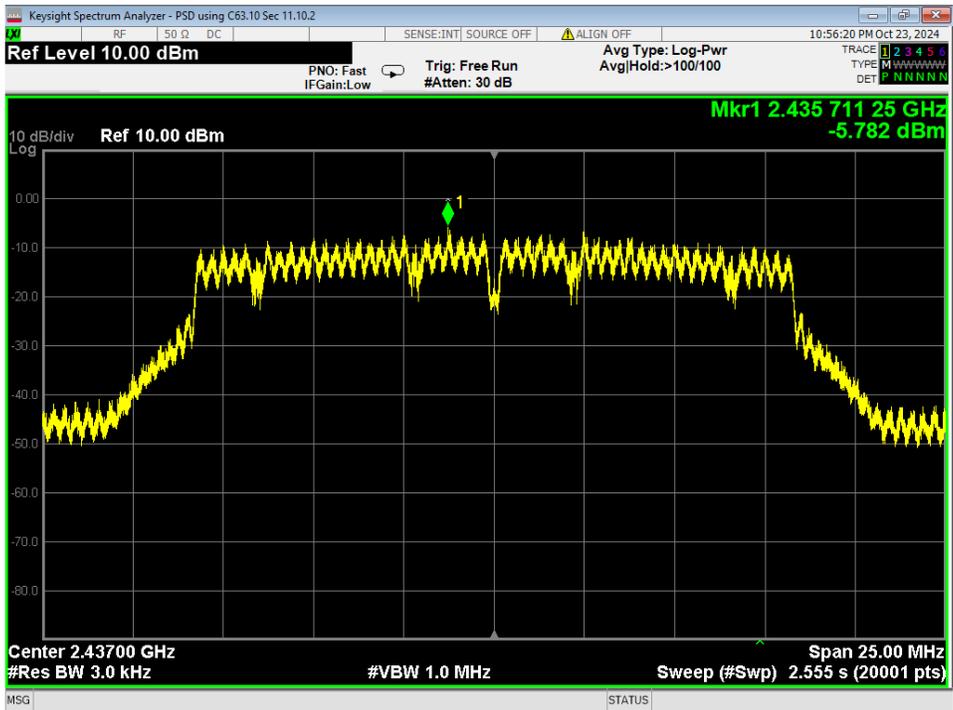
57 6dB Bandwidth, Mid, Wifi G, High Data Rate



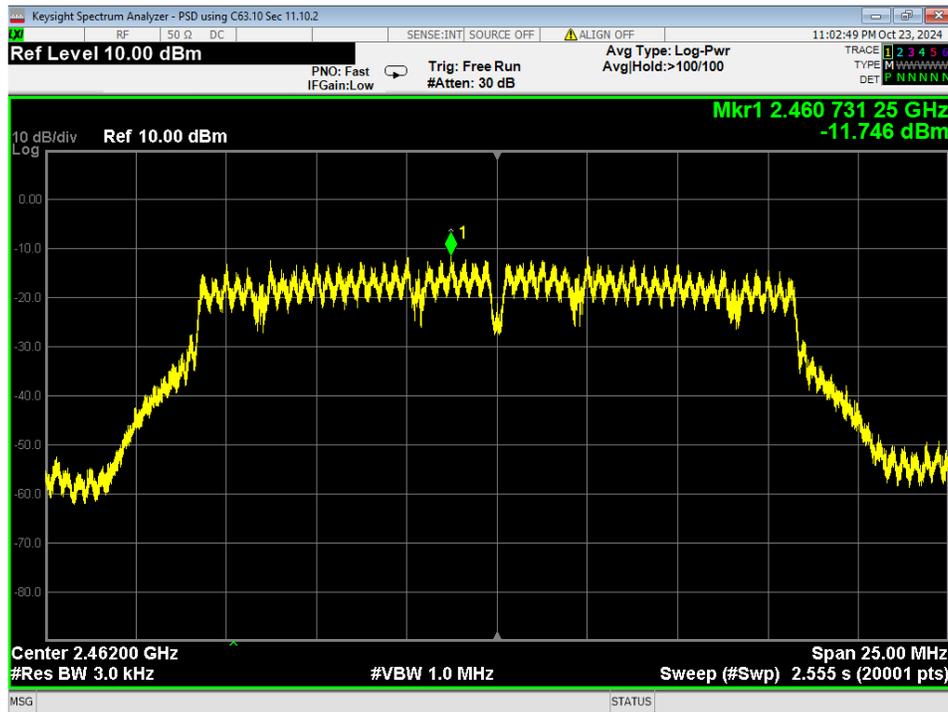
58 6dB Bandwidth, High, Wifi G, High Data Rate



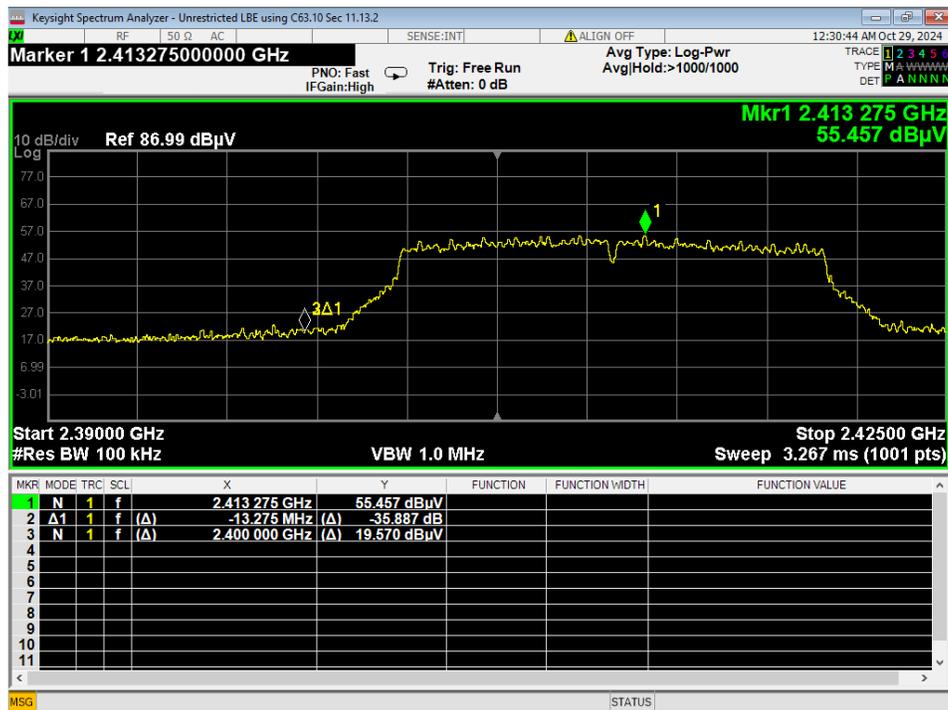
59 PSD, Low, Wifi G, High Data Rate



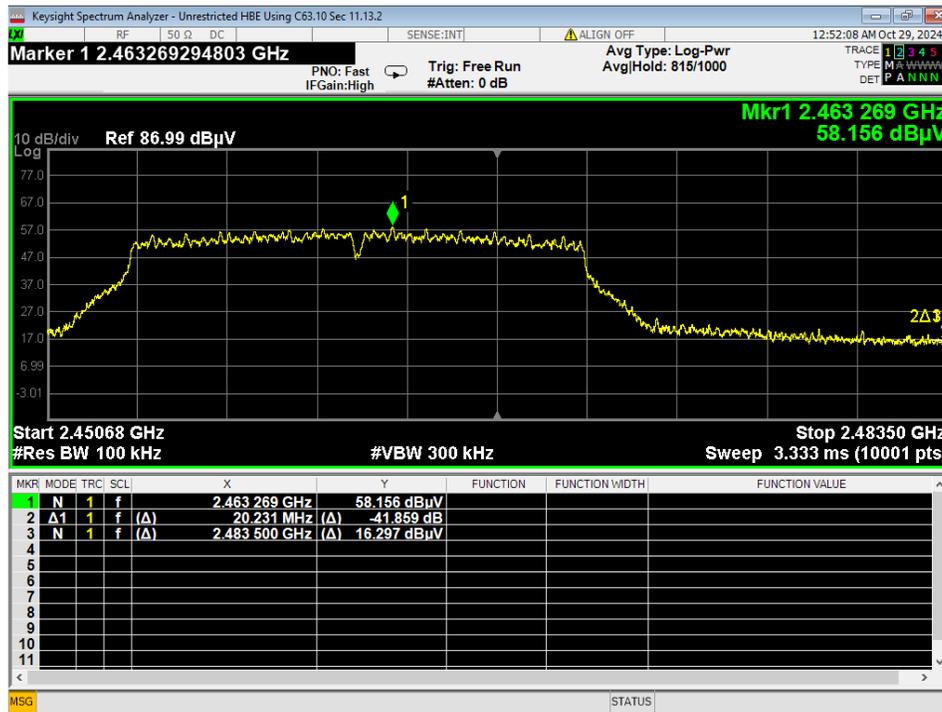
60 PSD, Mid, Wifi G, High Data Rate



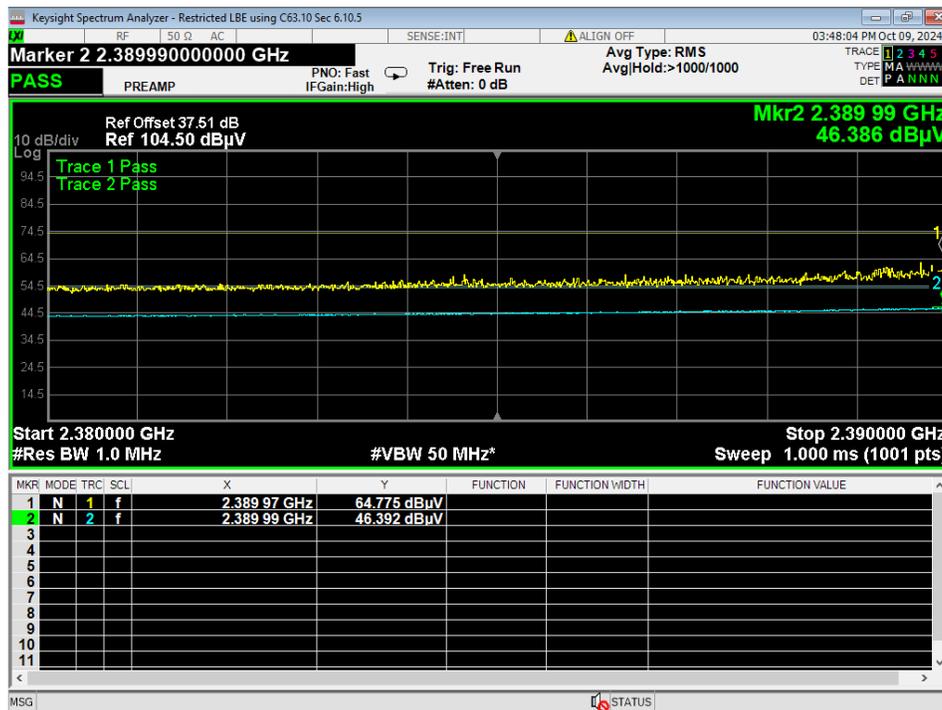
61 PSD, High, Wifi G, High Data Rate



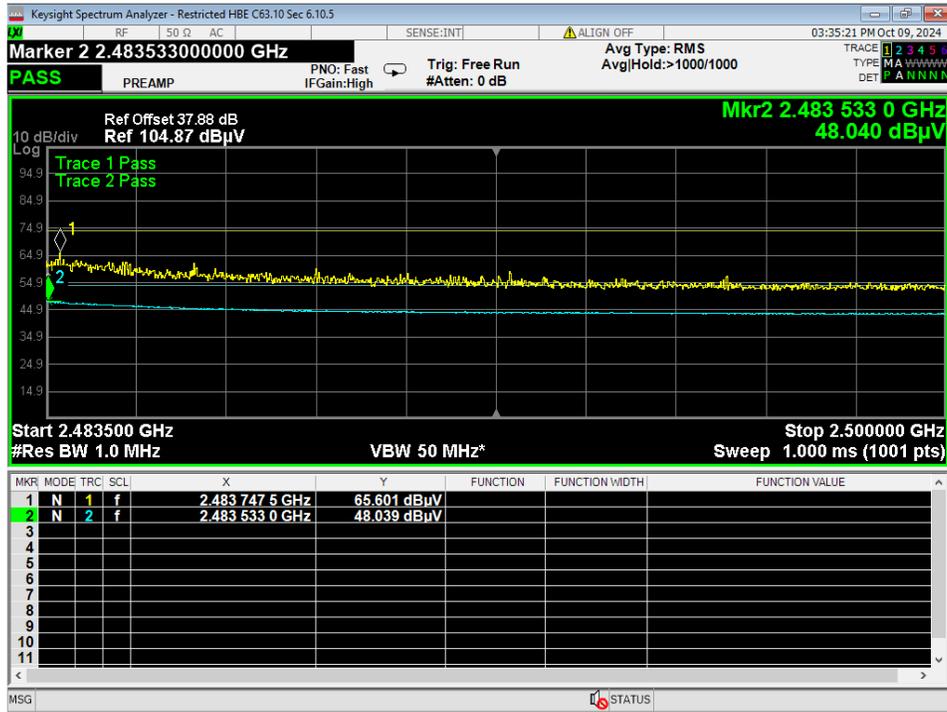
62 Lower Bandedge, Unrestricted, Wifi G, High Data Rate



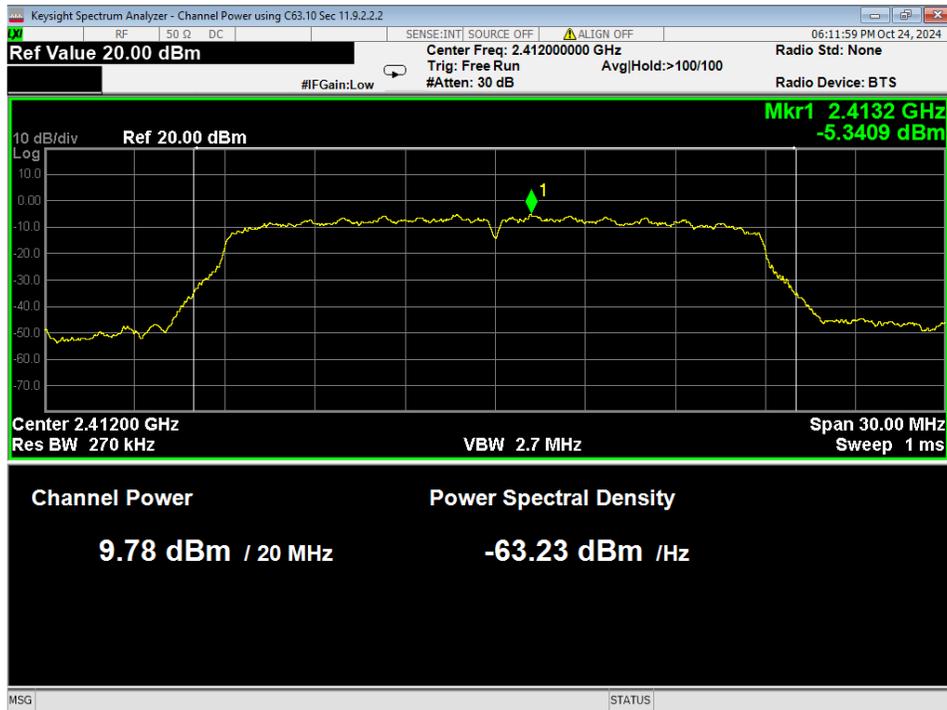
63 Higher Bandedge, Unrestricted, Wifi G, High Data Rate



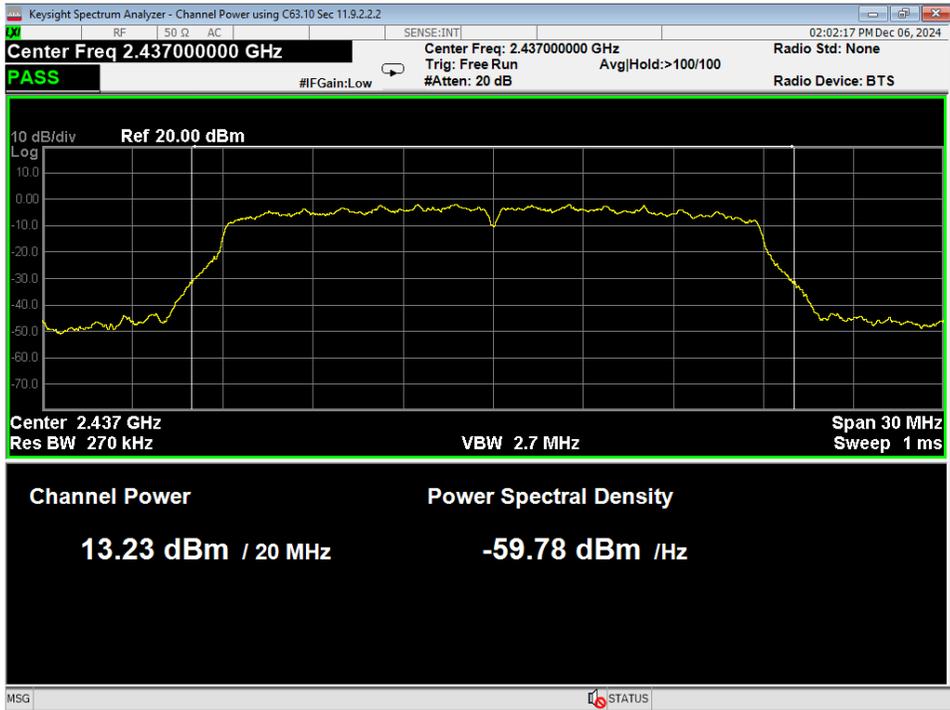
64 Lower Bandedge, Restricted, Wifi G, High Data Rate



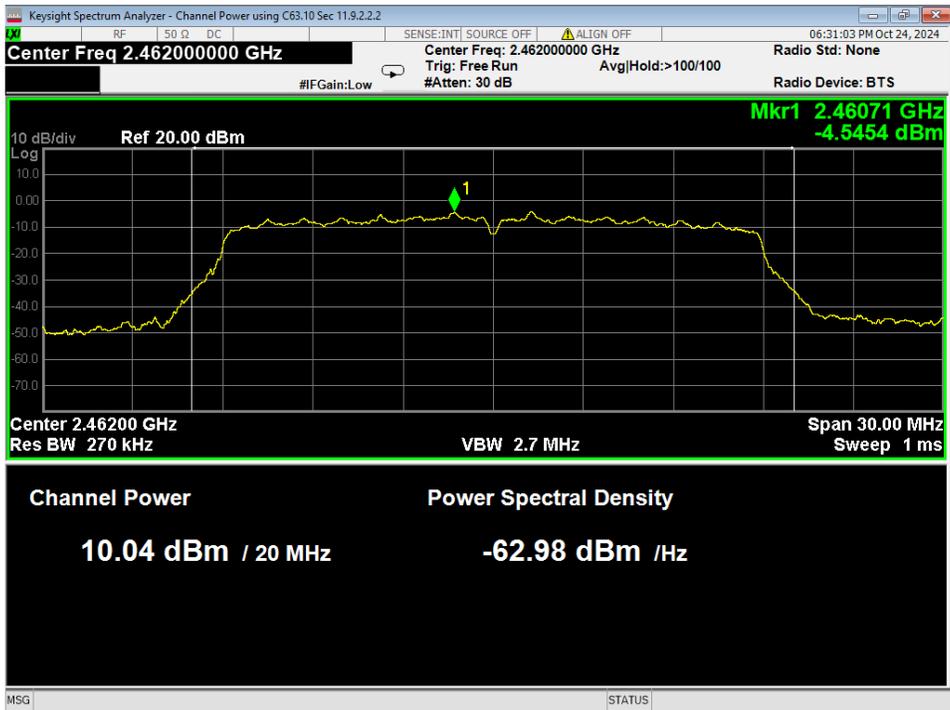
65 Higher Bandedge, Restricted, Wifi G, High Data Rate



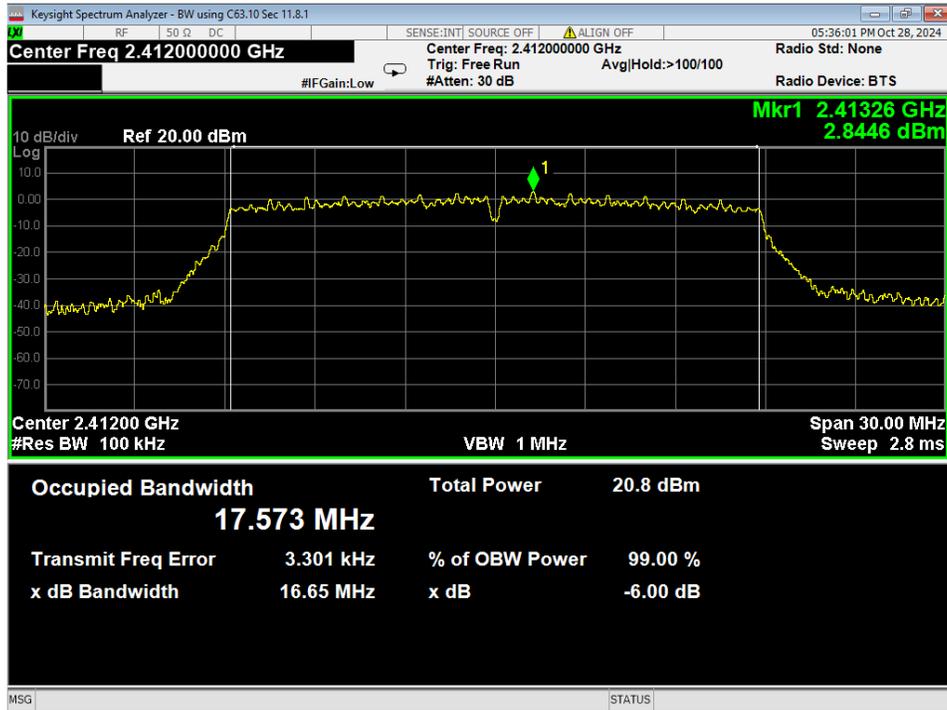
66 Average Power, Low, Wifi N, High Data Rate



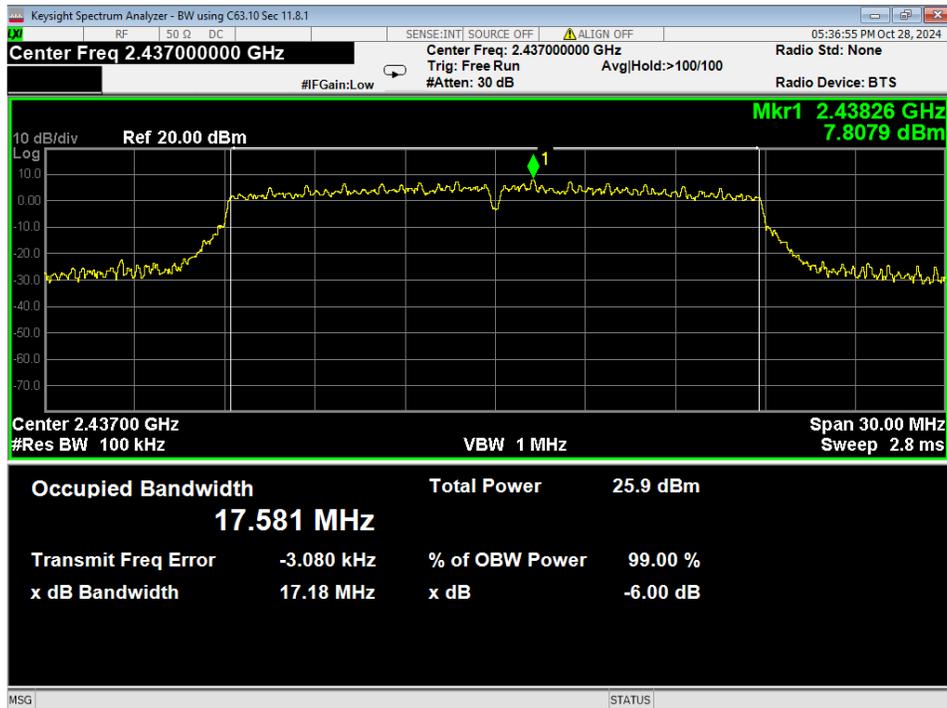
67 Average Power, Mid, Wifi N, High Data Rate



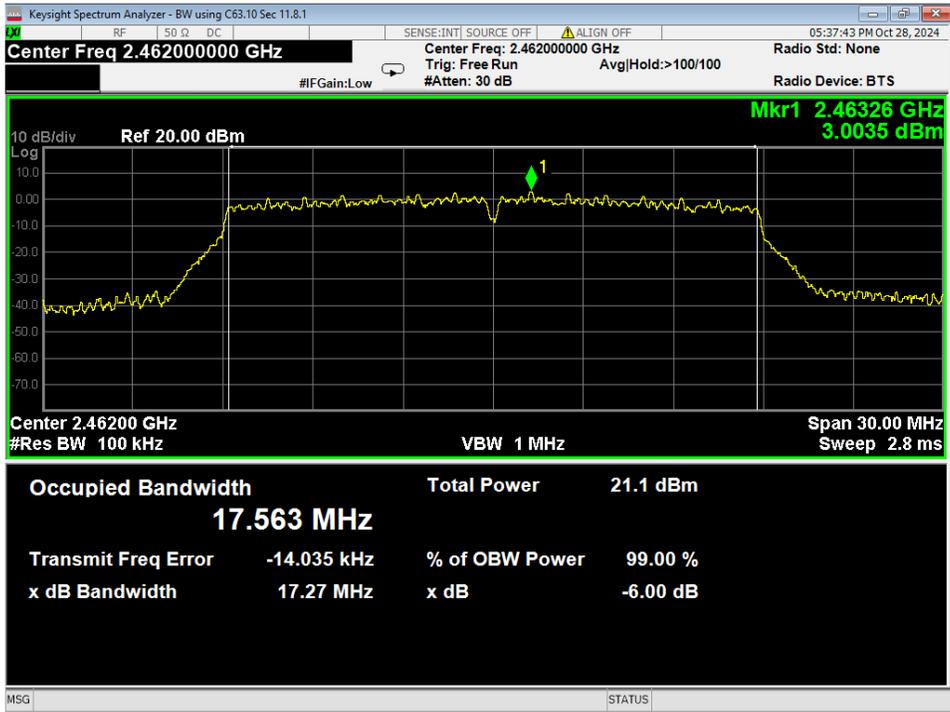
68 Average Power, High, Wifi N, High Data Rate



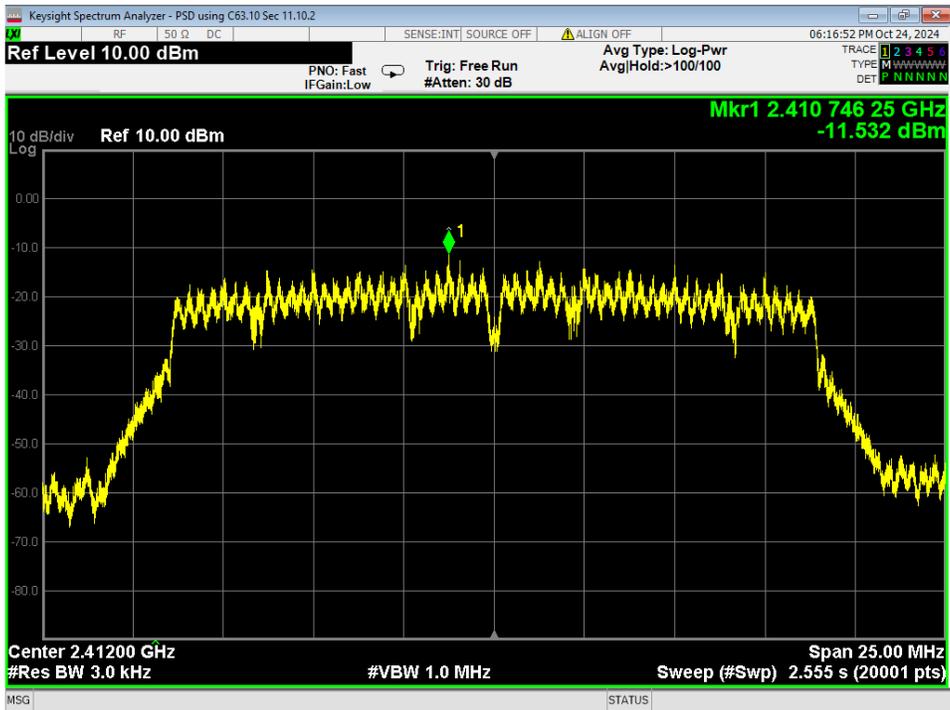
69 6dB Bandwidth, Low, Wifi N, High Data Rate



70 6dB Bandwidth, Mid, Wifi N, High Data Rate



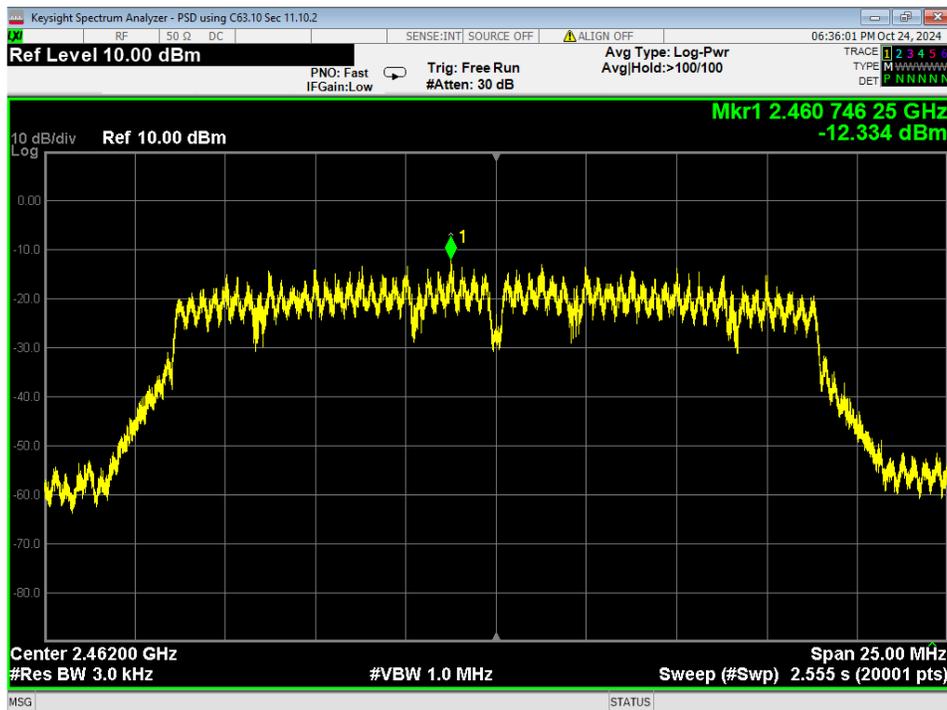
71 6dB Bandwidth, High, Wifi N, High Data Rate



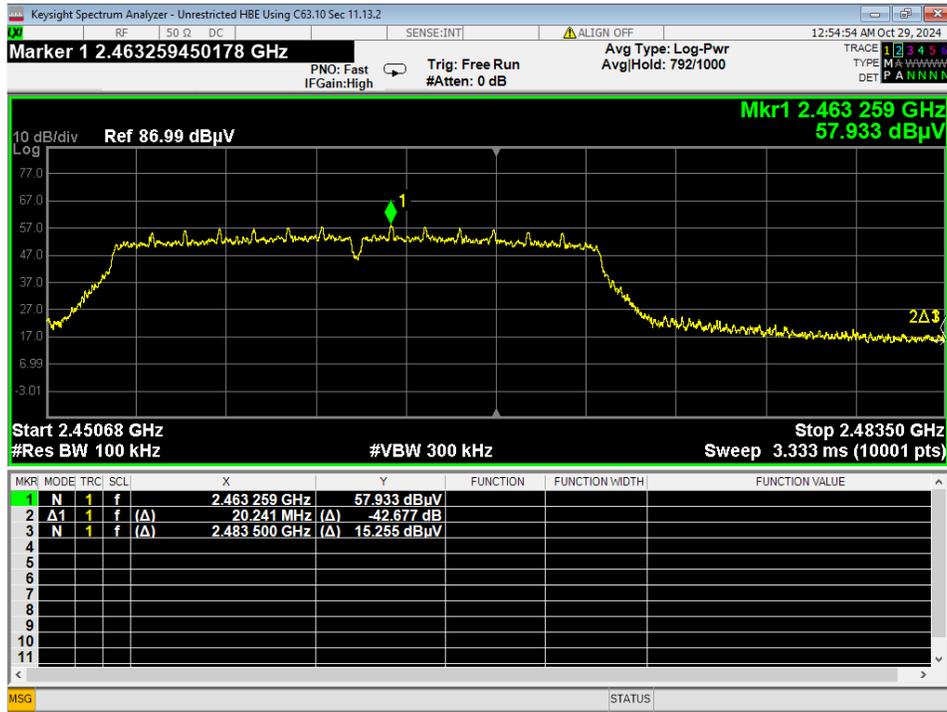
72 PSD, Low, Wifi N, High Data Rate



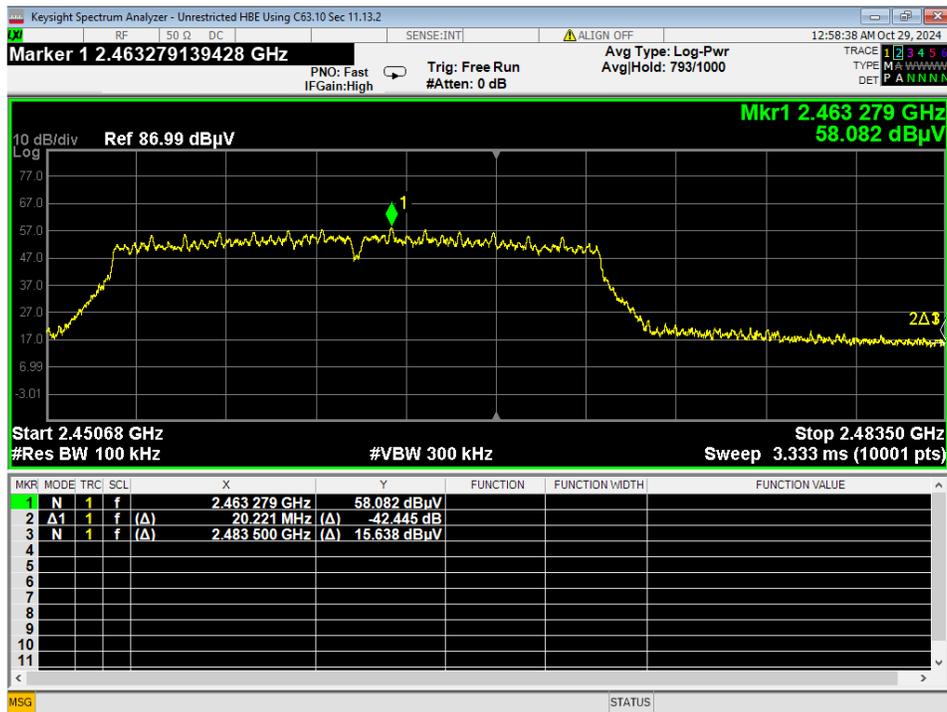
73 PSD, Mid, Wifi N, High Data Rate



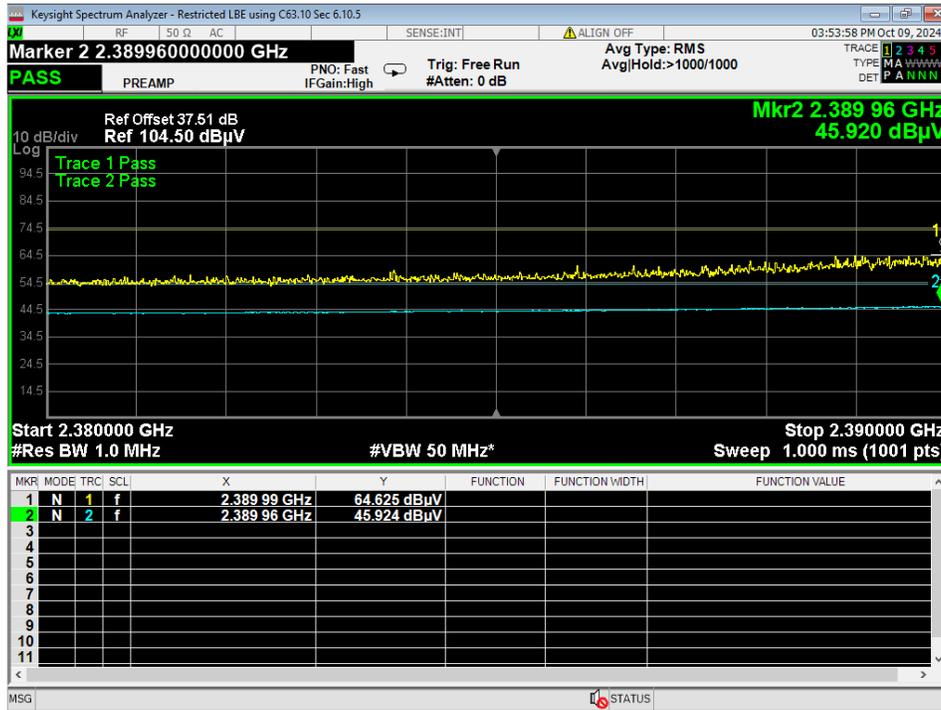
74 PSD, High, Wifi N, High Data Rate



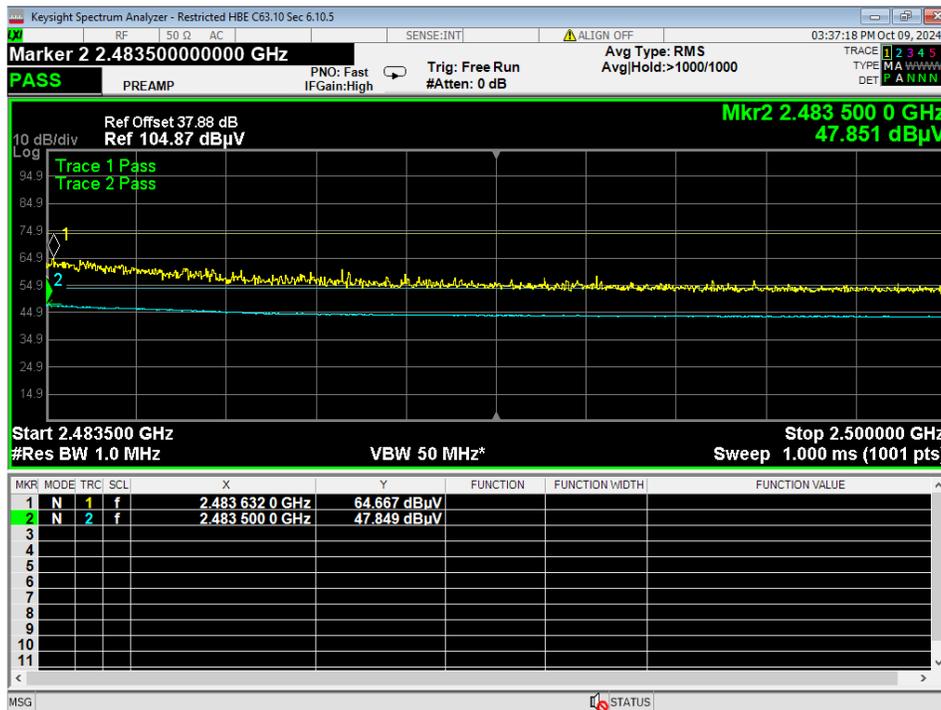
75 Lower Bandedge, Unrestricted, Wifi N, High Data Rate



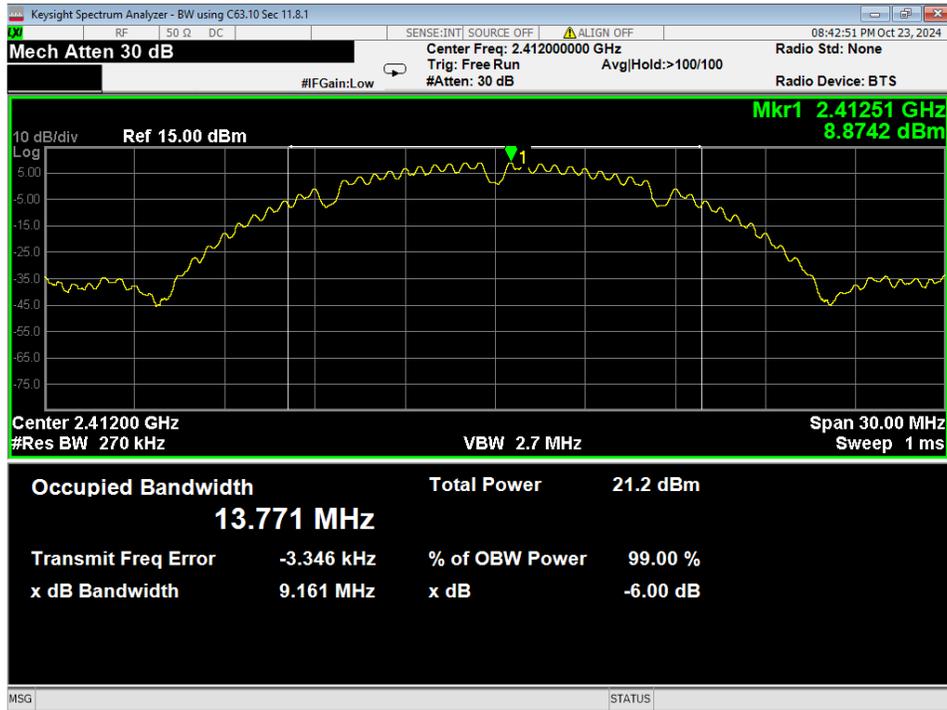
76 Higher Bandedge, Unrestricted, Wifi N, High Data Rate



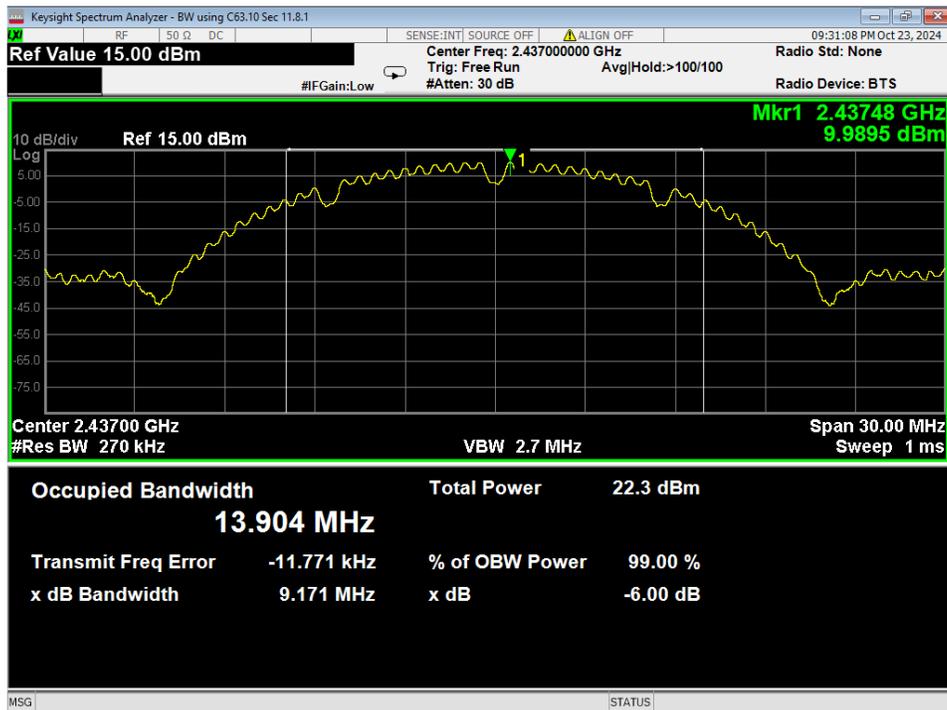
77 Lower Bandedge, Restricted, Wifi N, High Data Rate



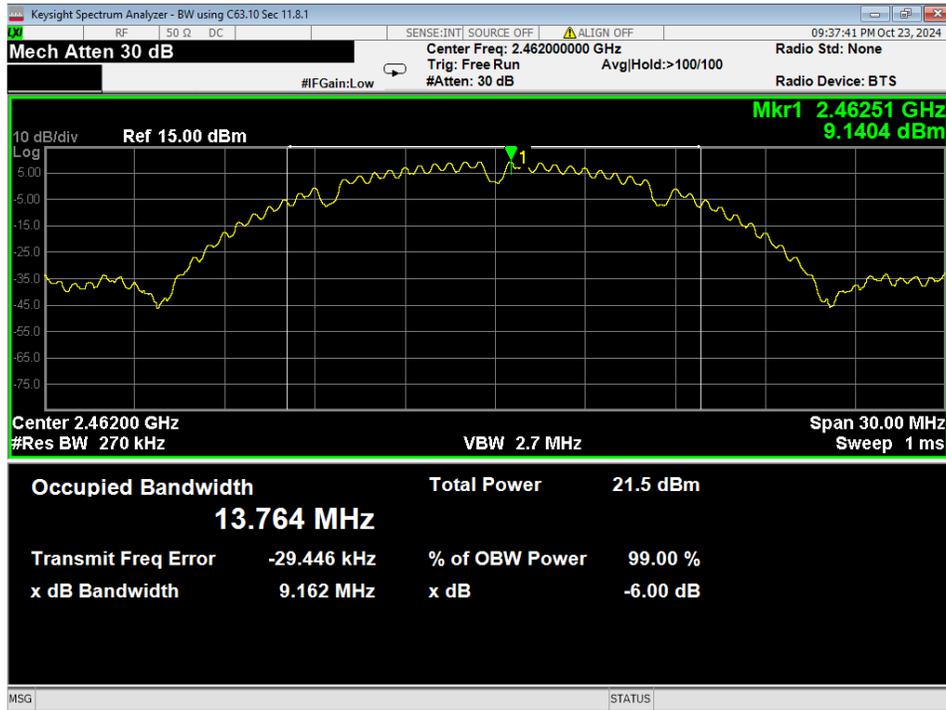
78 Higher Bandedge, Restricted, Wifi N, High Data Rate



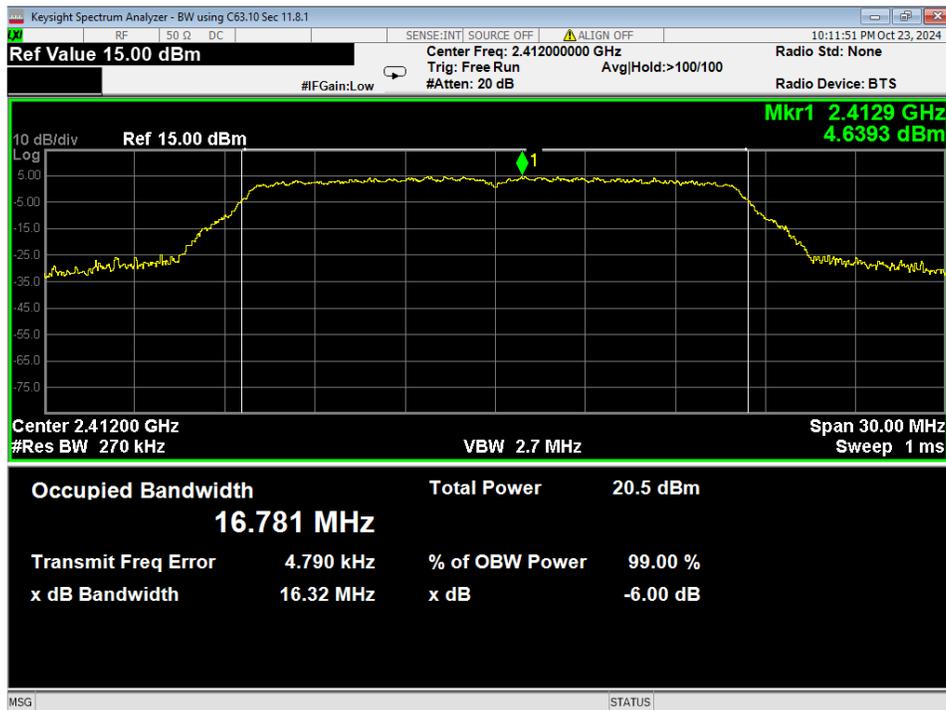
79 Occupied Bandwidth, Low, Wifi B, Low Data Rate



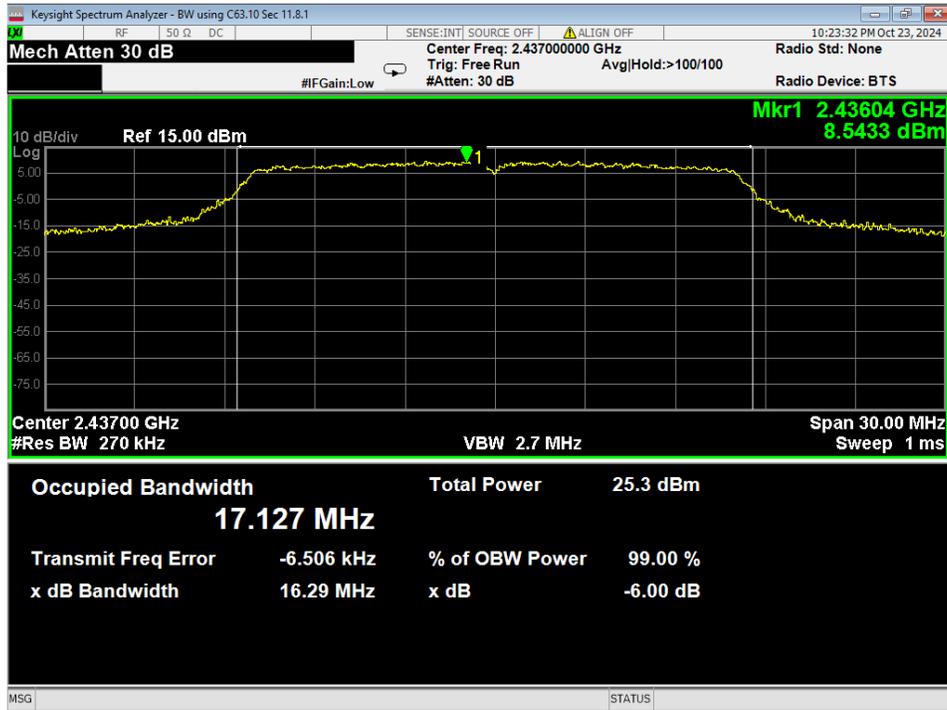
80 Occupied Bandwidth, Mid, Wifi B, Low Data Rate



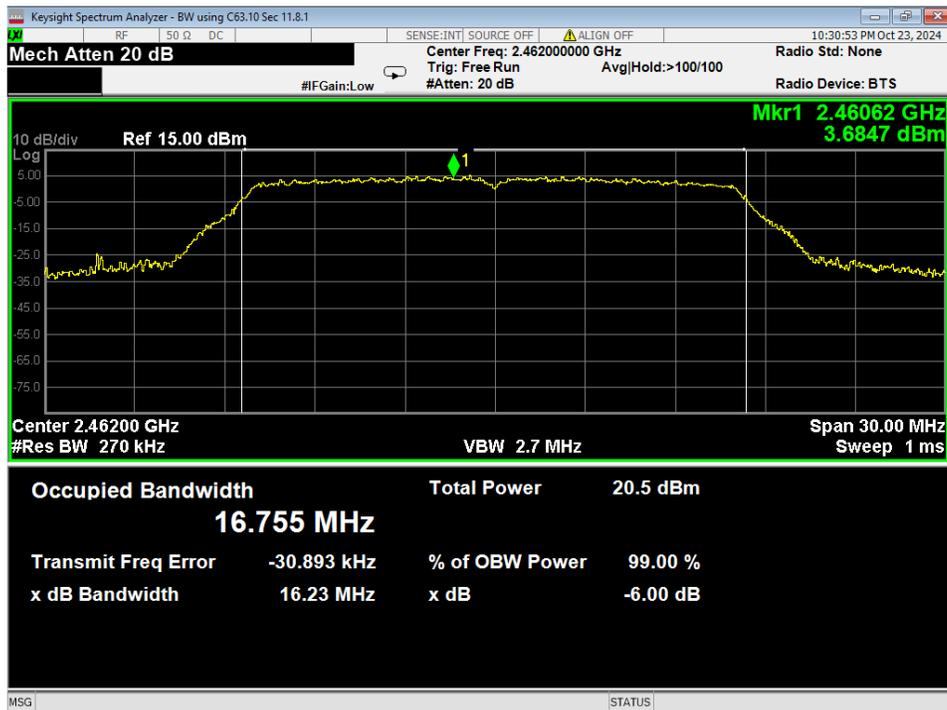
81 Occupied Bandwidth, High, Wifi B, Low Data Rate



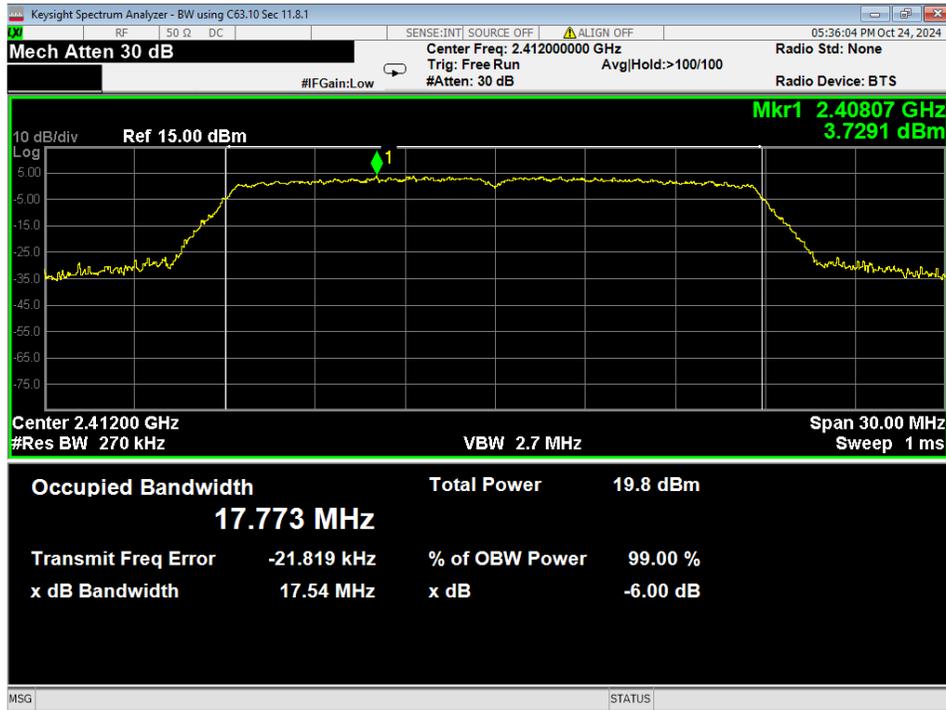
82 Occupied Bandwidth, Low, Wifi G, Low Data Rate



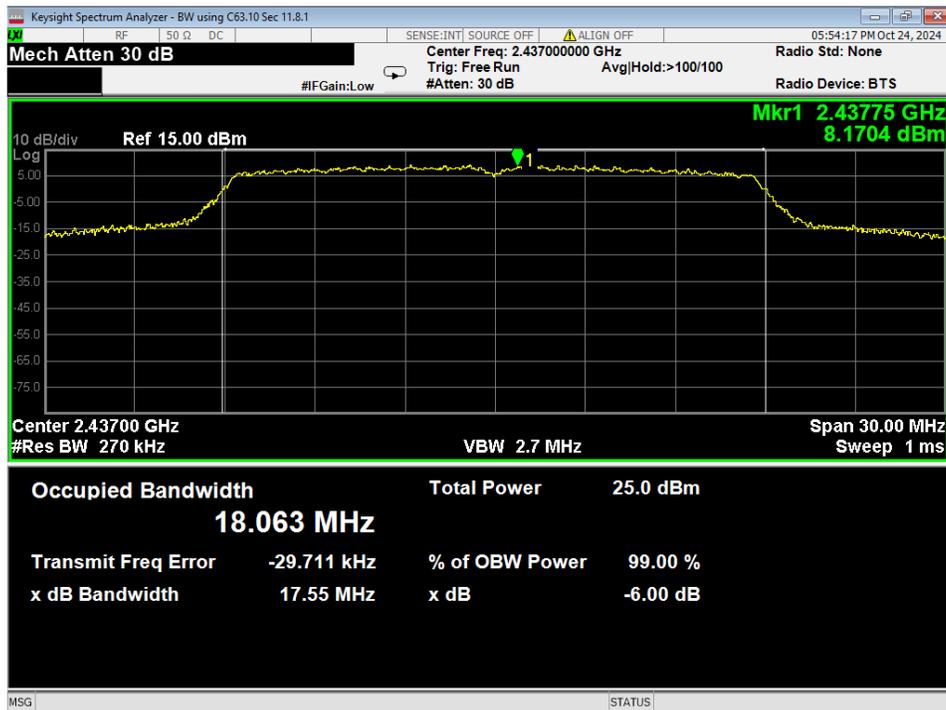
83 Occupied Bandwidth, Mid, Wifi G, Low Data Rate



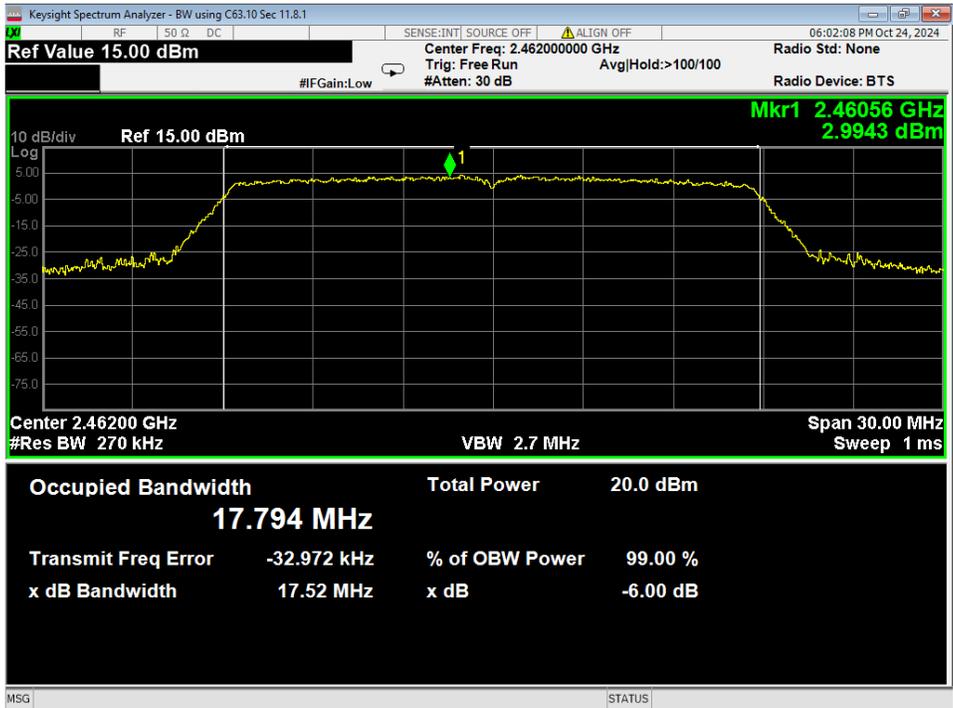
84 Occupied Bandwidth, High, Wifi G, Low Data Rate



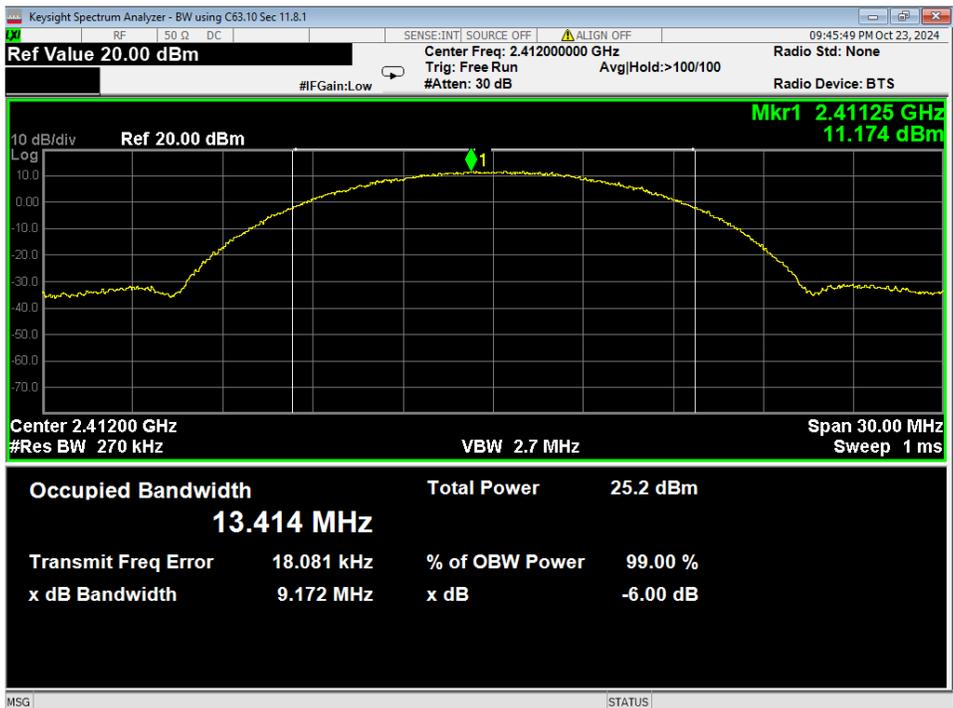
85 Occupied Bandwidth, Low, Wifi N, Low Data Rate



86 Occupied Bandwidth, Mid, Wifi N, Low Data Rate



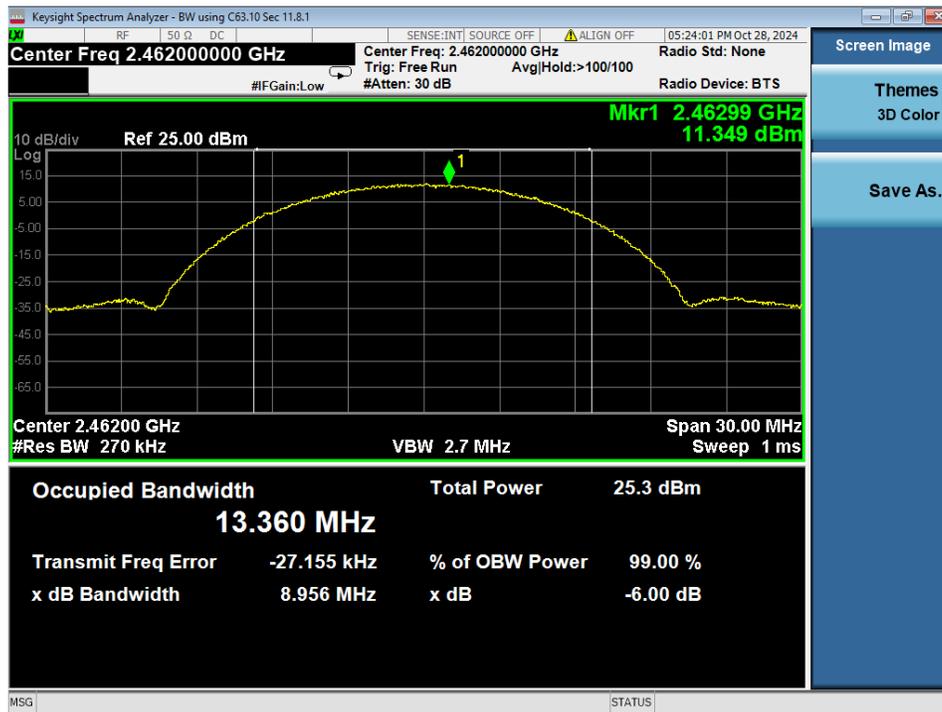
87 Occupied Bandwidth, High, Wifi N, Low Data Rate



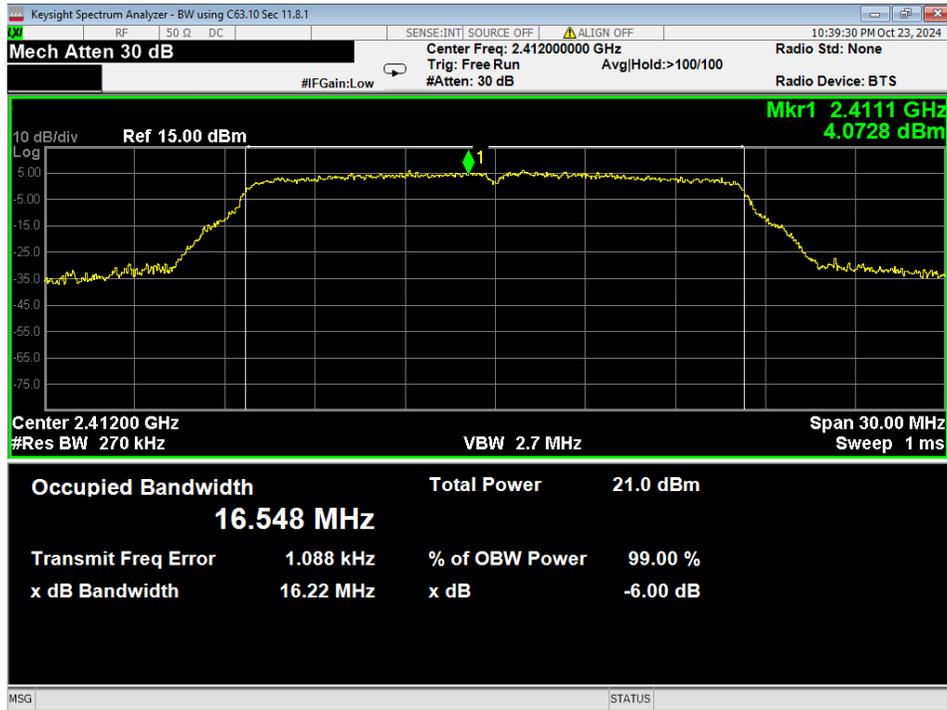
88 Occupied Bandwidth, Low, Wifi B, High Data Rate



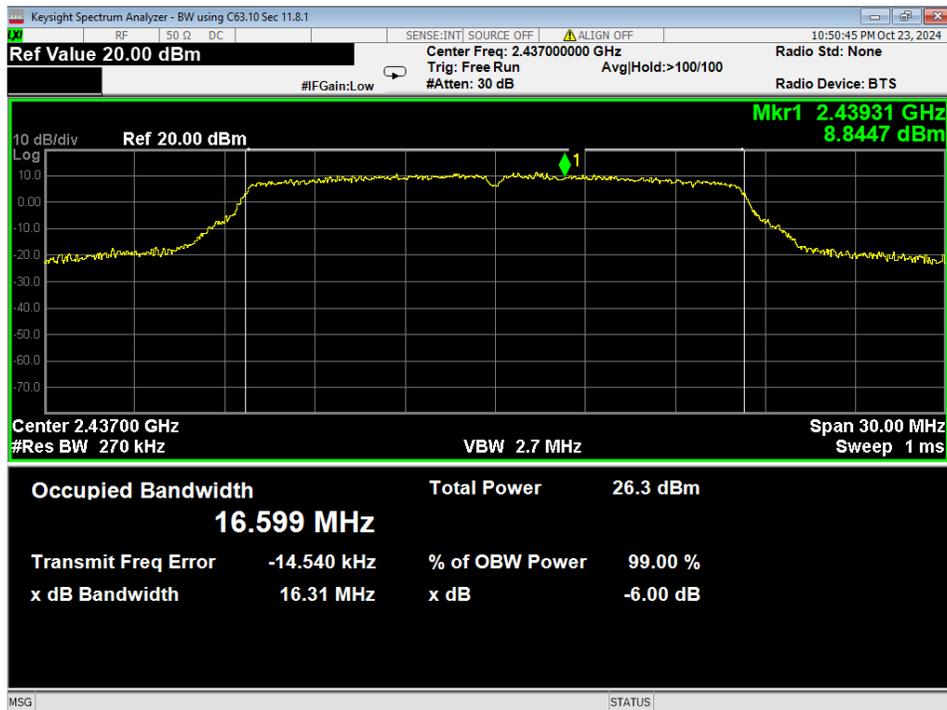
89 Occupied Bandwidth, Mid, Wifi B, High Data Rate



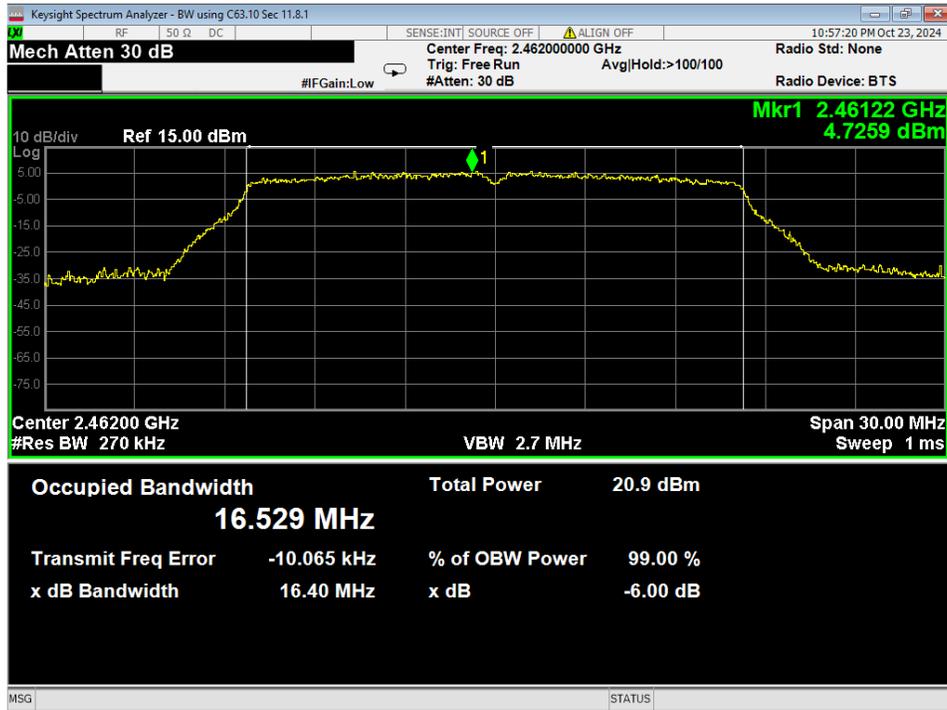
90 Occupied Bandwidth, High, Wifi B, High Data Rate



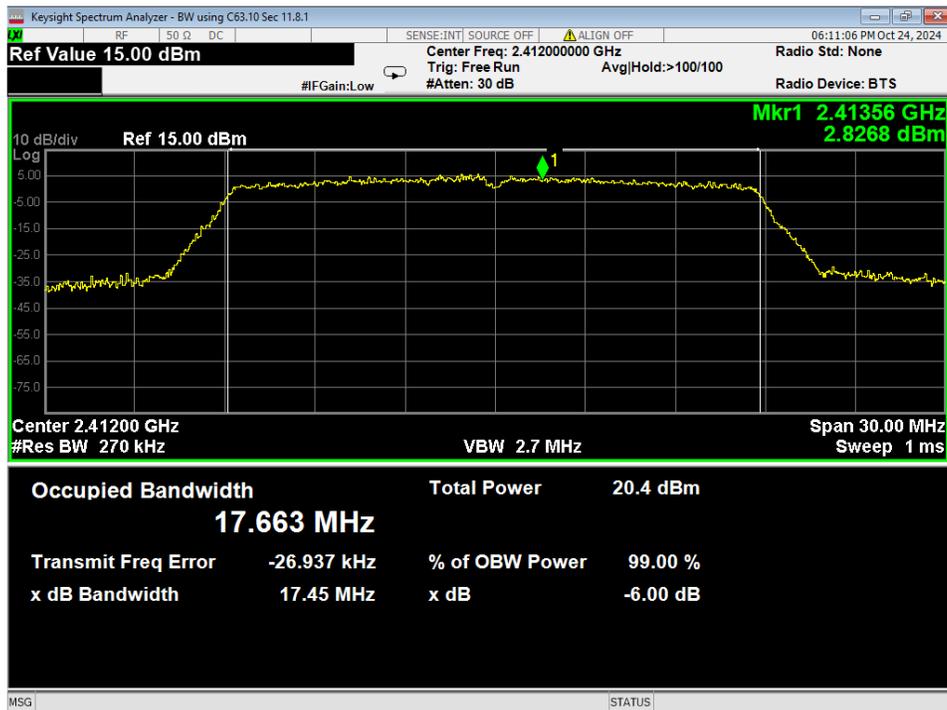
91 Occupied Bandwidth, Low, Wifi G, High Data Rate



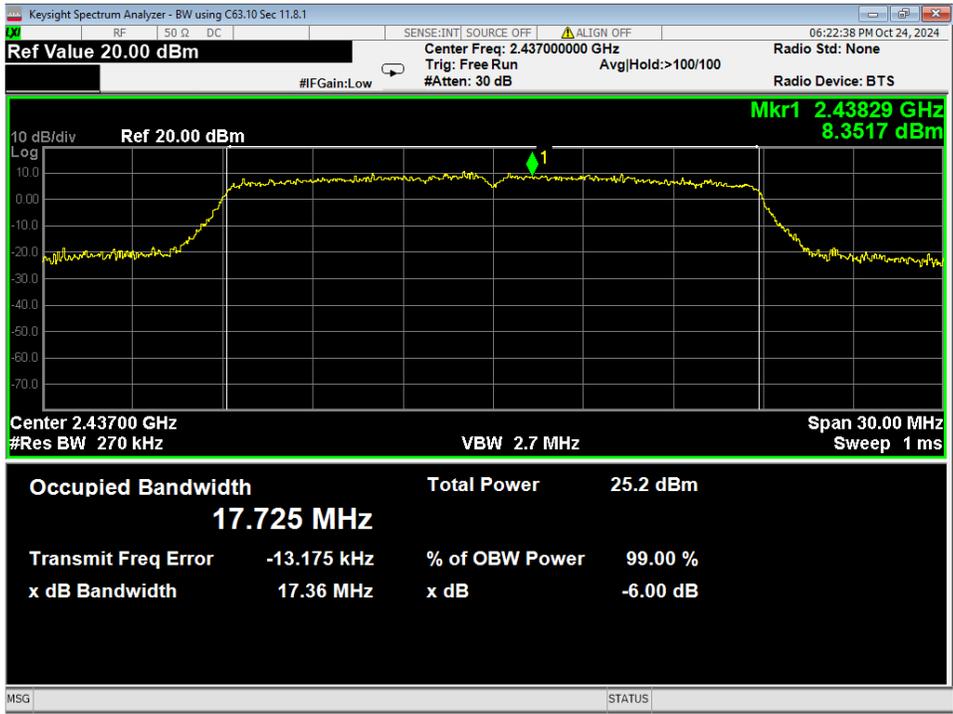
92 Occupied Bandwidth, Mid, Wifi G, High Data Rate



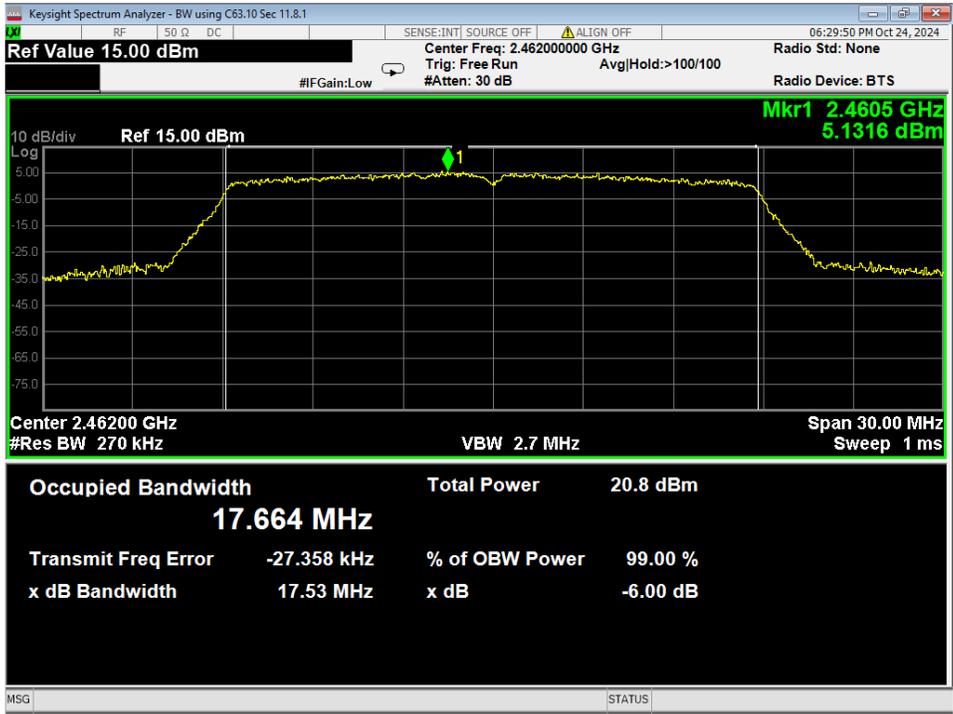
93 Occupied Bandwidth, High, Wifi G, High Data Rate



94 Occupied Bandwidth, Low, Wifi N, High Data Rate



95 Occupied Bandwidth, Mid, Wifi N, High Data Rate



96 Occupied Bandwidth, High, Wifi N, High Data Rate



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Rev

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Prepared for:

Garmin International, Inc.

REPORT END