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FCC/ISED Test Report

Prepared for: **Garmin International, Inc.**

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

Product: **C04112**

Test Report No: **R20220122-21-E5B**

Approved by:

Nic Johnson, NCE
Techncial Manager,
iNARTE Certified EMC Engineer #EMC-003337-NE

DATE: **June 24, 2022**

Total Pages: **57**

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REVISION PAGE

Rev. No.	Date	Description
0	6 June 2022	Original – KVepuri Prepared by FLane, KVepuri
A	23 June 2022	Added comment to Sec 4.0 and 4.1 - FL
B	24 June 2022	Signed and approved - NJ

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1.0 SUMMARY OF TEST RESULTS

The intention of this report is to determine, if the EUT can be qualified as Class II permissive change (FCC ID: IPH-A04112). The manufacturer made modifications to the EUT that qualify for a C2PC. Manufacturer has declared that the changes would not change conducted measurements. So, only the measurements that would be affected due to these changes are investigated in this report. The measurements that can be done in conducted manner are ignored as they won't be affected due to these changes. The worst-case measurements were reported in this report. Summary of test results presented in this report correspond to the following section(s):

FCC Part 15.247 ☒

The EUT has been tested according to the following specifications:

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

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 2 Section 5.4(d)	Peak output power	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 2 Section 5.5, RSS-Gen Issue 5, Section 8.9	Transmitter Radiated Emissions	Pass
FCC Part 15.209, 15.247(d) RSS-247 Issue 2 Section 5.5	Band Edge Measurement	Pass

2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

Summary and Operating Condition:

EUT	C04112
EUT Received	25 February 2022
EUT Tested	1 March 2022- 26 May 2022
Serial No.	3400415111 (Conducted Unit) 3412218493 (Radiated Unit)
Operating Band	2400 – 2483.5 MHz
Device Type	☐ GMSK ☐ GFSK ☐ BT BR ☐ BT EDR 2MB ☐ BT EDR 3MB ☒ 802.11x
Power Supply / Voltage	Internal Battery/ 5VDC Charger: Garmin (Phi Hong) MN: PSAI10R-050Q (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:

For 802.11x Transmissions:

Channel	Frequency
Low	2412 MHz
Mid	2437 MHz
High	2462 MHz

Data Rate		
Modulation	**Low**	**High**
802.11b	1Mb	11Mb
802.11g	6Mb	54Mb
802.11n	MCS0	MCS7

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 frequency 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-1
NCC CAB Identification No:	US0177

Environmental conditions varied slightly throughout the tests:
Relative humidity of 35 ± 4%
Temperature of 22 ± 3° Celsius

3.2 TEST PERSONNEL

No.	PERSONNEL	TITLE	ROLE
1	Nic Johnson	Technical Manager	Review/editing
2	Fox Lane	Test Engineer	Testing and report
3	Karthik Vepuri	Test Engineer	Review / Testing
4	Blake Winter	Test Engineer	Testing
5	Grace Larsen	Test Engineer	Testing

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

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 21, 2021	July 21, 2023
Keysight MXE Signal Analyzer (26.5GHz)***	N9038A	MY56400083	May 5, 2020	May 5, 2023
Keysight EXA Signal Analyzer**	N9010A	MY56070862	July 20, 2021	July 20, 2023
SunAR RF Motion	JB1	A091418	July 27, 2021	July 27, 2022
EMCO Horn Antenna**	3115	6416	July 28, 2021	July 28, 2023
Rohde & Schwarz Preamplifier*	TS-PR18	3545700803	March 21, 2022	March 21, 2024
Agilent Preamp*	87405A	3950M00669	March 21, 2022	March 21, 2024
Trilithic High Pass Filter*	6HC330	23042	March 21, 2022	March 21, 2024
TDK Emissions Lab Software	V11.25	700307	NA	NA
RF Cable (preamplifier to antenna)*	MFR-57500	01-07-002	April 14, 2020	April 14, 2022
RF Cable (antenna to 10m chamber bulkhead)*	FSCM 64639	01E3872	September 24, 2021	September 24, 2023
RF Cable (10m chamber bulkhead to control room bulkhead)*	FSCM 64639	01E3864	September 24, 2021	September 24, 2023
RF Cable (control room bulkhead to test receiver)*	FSCM 64639	01F1206	September 24, 2021	September 24, 2023
N connector bulkhead (10m chamber)*	PE9128	NCEEBH1	September 24, 2021	September 24, 2023
N connector bulkhead (control room)*	PE9128	NCEEBH2	September 24, 2021	September 24, 2023

*Internal Characterization

**2 Year Cal Cycle

***3 Year Cal Cycle

Notes:

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

3.4 GENERAL TEST PROCEDURE AND SETUP FOR RADIO MEASUREMNTS

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 the 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.

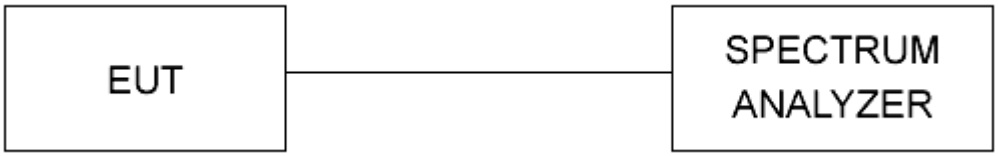


Figure 1 - Bandwidth Measurements Test Setup

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 the 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.

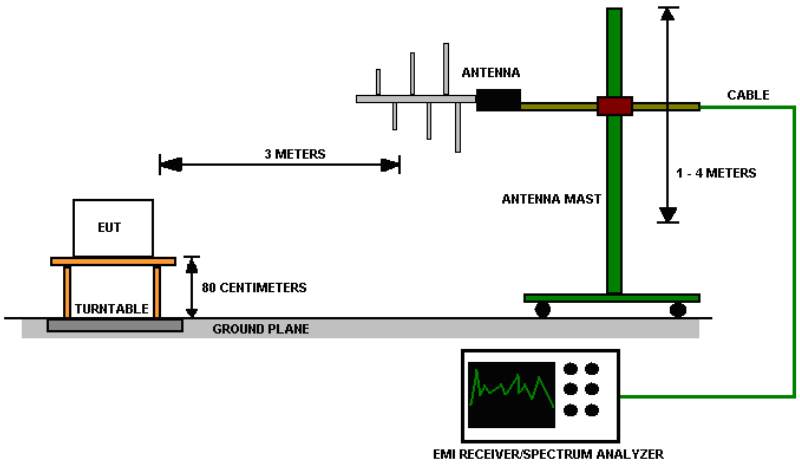


Figure 2 - Radiated Emissions Test Setup

4.0 RESULTS

DTS Radio Measurements					
CHANNEL	**Modulation**	**Data Rate**	**PEAK OUTPUT POWER (dBm)**	**PEAK OUTPUT POWER (mW)**	**RESULT**
Low	802.11b	1MB	16.12	40.93	PASS
Mid	802.11b	1MB	17.90	61.66	PASS
High	802.11b	1MB	17.89	61.52	PASS
Low	802.11g	6MB	16.20	41.69	PASS
Mid	802.11g	6MB	22.29	169.43	PASS
High	802.11g	6MB	15.68	36.98	PASS
Low	802.11n	MCS0	15.20	33.11	PASS
Mid	802.11n	MCS0	21.71	148.25	PASS
High	802.11n	MCS0	15.29	33.81	PASS
Low	802.11b	11MB	19.51	89.33	PASS
Mid	802.11b	11MB	21.38	137.40	PASS
High	802.11b	11MB	21.27	133.97	PASS
Low	802.11g	54MB	17.03	50.47	PASS
Mid	802.11g	54MB	19.95	98.86	PASS
High	802.11g	54MB	16.62	45.92	PASS
Low	802.11n	MCS7	16.30	42.66	PASS
Mid	802.11n	MCS7	16.48	44.46	PASS
High	802.11n	MCS7	16.86	48.53	PASS
Peak Output Power Limit = 30dBm / 1000mW; Results were all within measurement tolerance when compared with IPH-A04112.					

Peak Restricted Band-Edge, Low Data Rate							
CHANNEL	**Mode**	**Band edge /Measurement Frequency (MHz)**	**Highest out of band level (dBuV/m @ 3m)**	**Measurement Type**	**Limit (dBuV/m @ 3m)**	**Margin**	**Result**
Low	802.11 b	2390.00	62.92	Peak	73.98	11.07	PASS
Low	802.11 g	2390.00	66.87	Peak	73.98	7.11	PASS
Low	802.11 n	2390.00	68.78	Peak	73.98	5.20	PASS
High	802.11 b	2483.50	61.91	Peak	73.98	12.07	PASS
High	802.11 g	2483.50	60.87	Peak	73.98	13.11	PASS
High	802.11 n	2483.50	61.90	Peak	73.98	12.08	PASS
*Limit shown is the peak limit taken from FCC Part 15.209							
Average Restricted Band-Edge, Low Data Rate							
CHANNEL	**Mode**	**Band edge /Measurement Frequency (MHz)**	**Highest out of band level (dBuV/m @ 3m)**	**Measurement Type**	**Limit (dBuV/m @ 3m)**	**Margin**	**Result**
Low	802.11 b	2390.00	52.49	Average	53.98	1.49	PASS
Low	802.11 g	2390.00	52.06	Average	53.98	1.92	PASS
Low	802.11 n	2390.00	52.57	Average	53.98	1.41	PASS
High	802.11 b	2483.50	50.22	Average	53.98	3.76	PASS
High	802.11 g	2483.50	47.77	Average	53.98	6.21	PASS
High	802.11 n	2483.50	47.57	Average	53.98	6.41	PASS
*Limit shown is the average limit taken from FCC Part 15.209							

Peak Restricted Band-Edge, High Data Rate							
CHANNEL	**Mode**	**Band edge /Measurement Frequency (MHz)**	**Highest out of band level (dBuV/m @ 3m)**	**Measurement Type**	**Limit (dBuV/m @ 3m)**	**Margin**	**Result**
Low	802.11 b	2390.00	62.03	Peak	73.98	11.95	PASS
Low	802.11 g	2390.00	69.42	Peak	73.98	4.57	PASS
Low	802.11 n	2390.00	70.59	Peak	73.98	3.39	PASS
High	802.11 b	2483.50	61.91	Peak	73.98	12.07	PASS
High	802.11 g	2483.50	71.21	Peak	73.98	2.77	PASS
High	802.11 n	2483.50	72.28	Peak	73.98	1.70	PASS
*Limit shown is the peak limit taken from FCC Part 15.209							
Average Restricted Band-Edge, High Data Rate							
CHANNEL	**Mode**	**Band edge /Measurement Frequency (MHz)**	**Highest out of band level (dBuV/m @ 3m)**	**Measurement Type**	**Limit (dBuV/m @ 3m)**	**Margin**	**Result**
Low	802.11 b	2390.00	51.84	Average	53.98	2.14	PASS
Low	802.11 g	2390.00	53.48	Average	53.98	0.50	PASS
Low	802.11 n	2390.00	53.69	Average	53.98	0.29	PASS
High	802.11 b	2483.50	50.24	Average	53.98	3.74	PASS
High	802.11 g	2483.50	51.46	Average	53.98	2.52	PASS
High	802.11 n	2483.50	51.15	Average	53.98	2.83	PASS
*Limit shown is the average limit taken from FCC Part 15.209							

4.1 OUTPUT POWER

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 allowed peak 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 the Appendix C.
2. All the measurements were found to be compliant.
3. Results were all within measurement tolerance.

4.2 DUTY CYCLE

Test Method:

All Modulations/Transmitters in this report had a duty cycle of >98%

4.3 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.
4. The EUT was tested for spurious emissions while running off of battery power and external USB power. The worse-case emissions were produced while running off of USB power, so results from this mode are presented.

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.

Test setup:

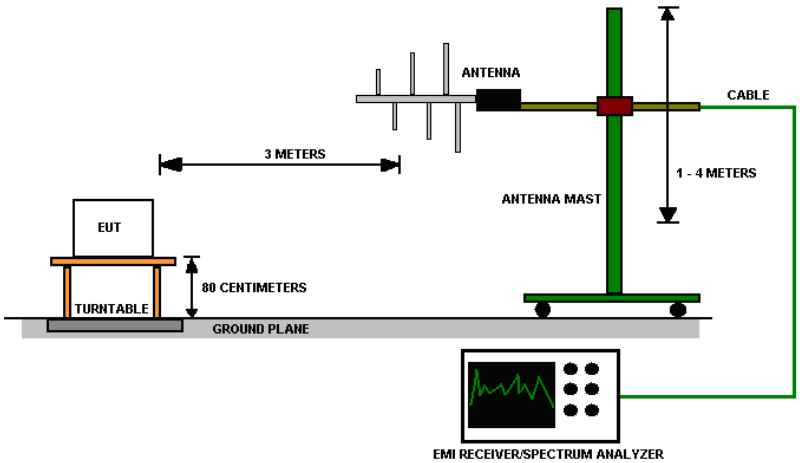


Figure 3 - Radiated Emissions Test Setup

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:

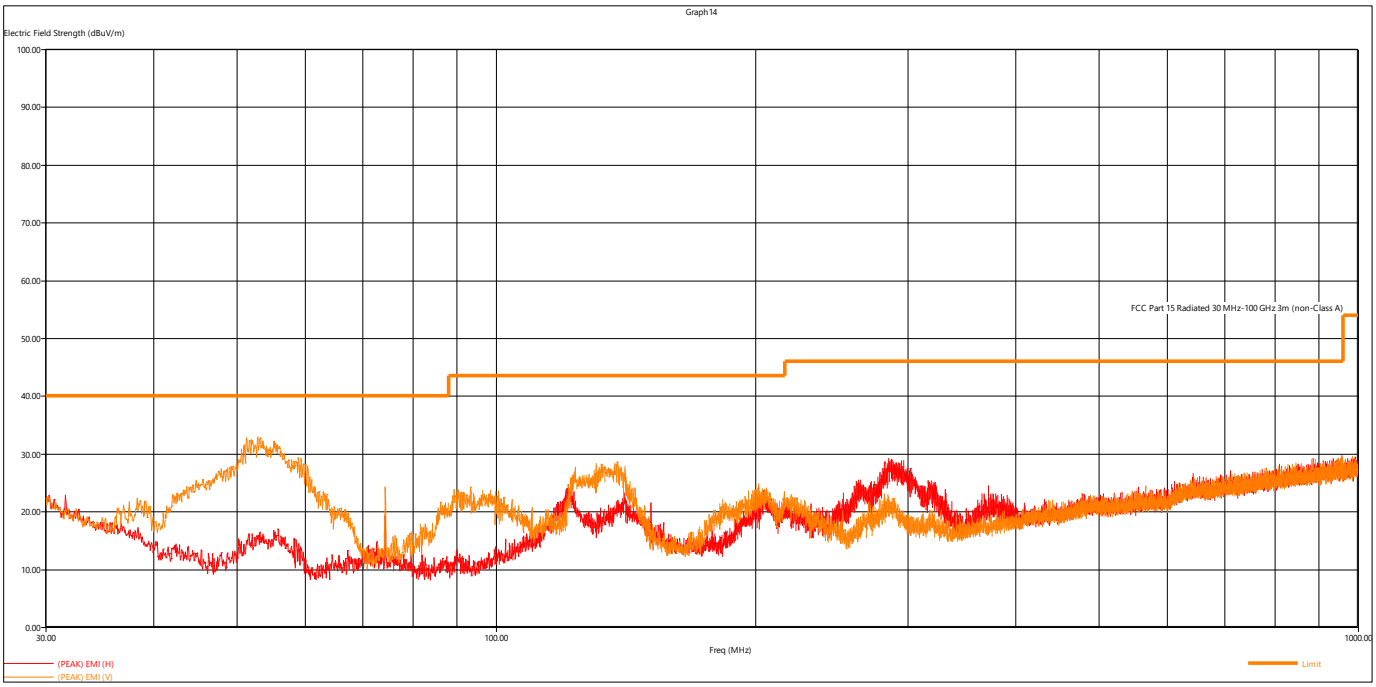


Figure 4 - Radiated Emissions Plot, Receive

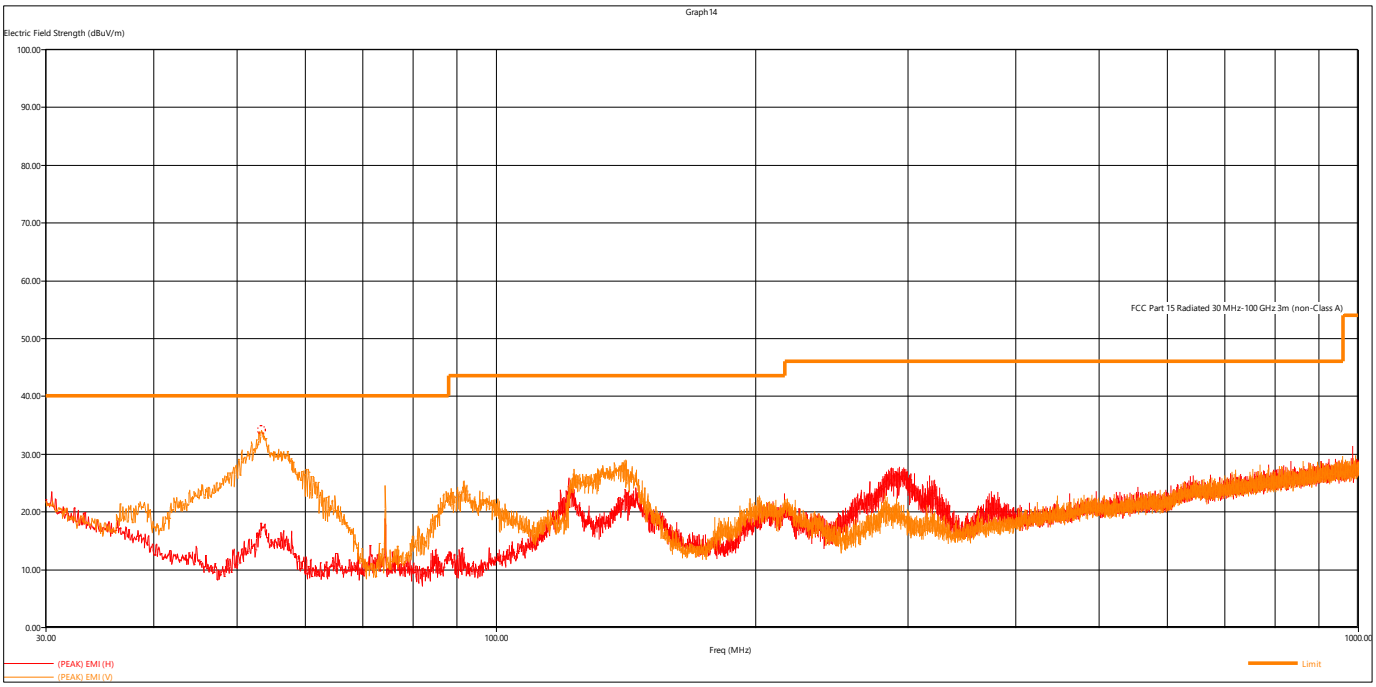


Figure 5 - Radiated Emissions Plot, 802.11b, Low Data Rate

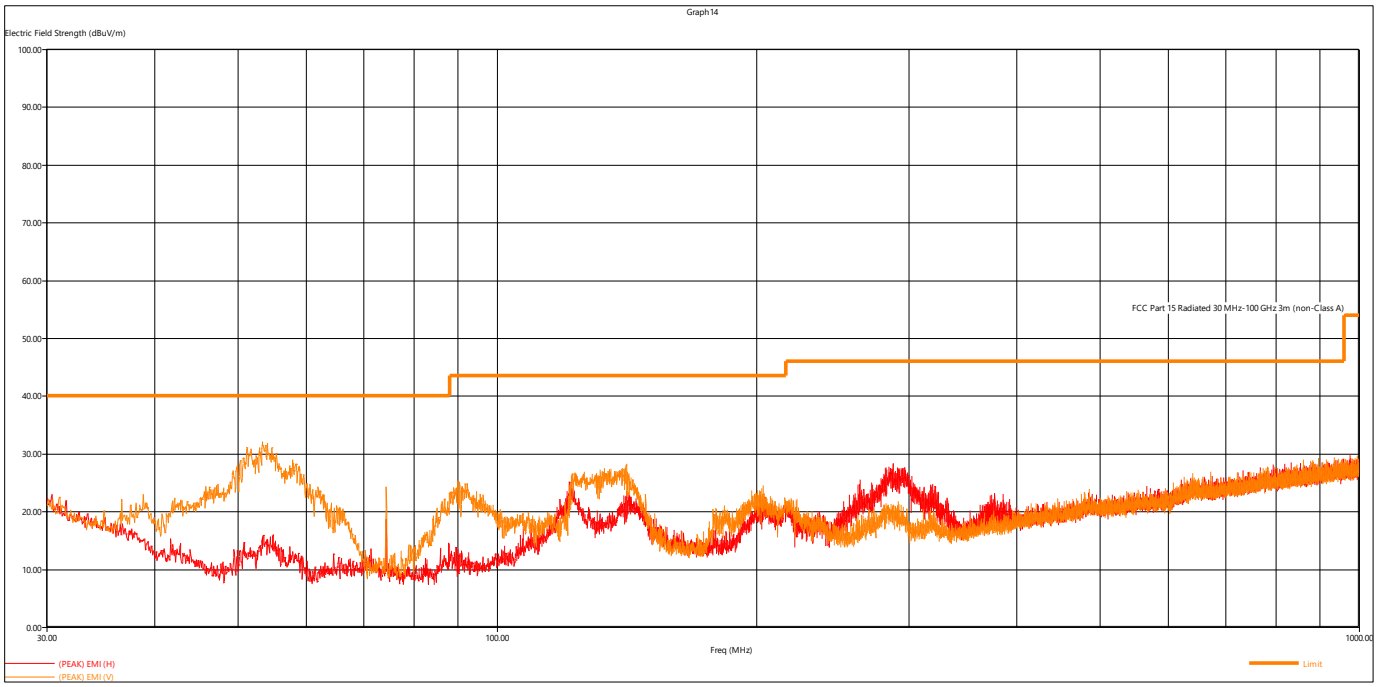


Figure 6 - Radiated Emissions Plot, 802.11g, Low Data Rate, Low Ch

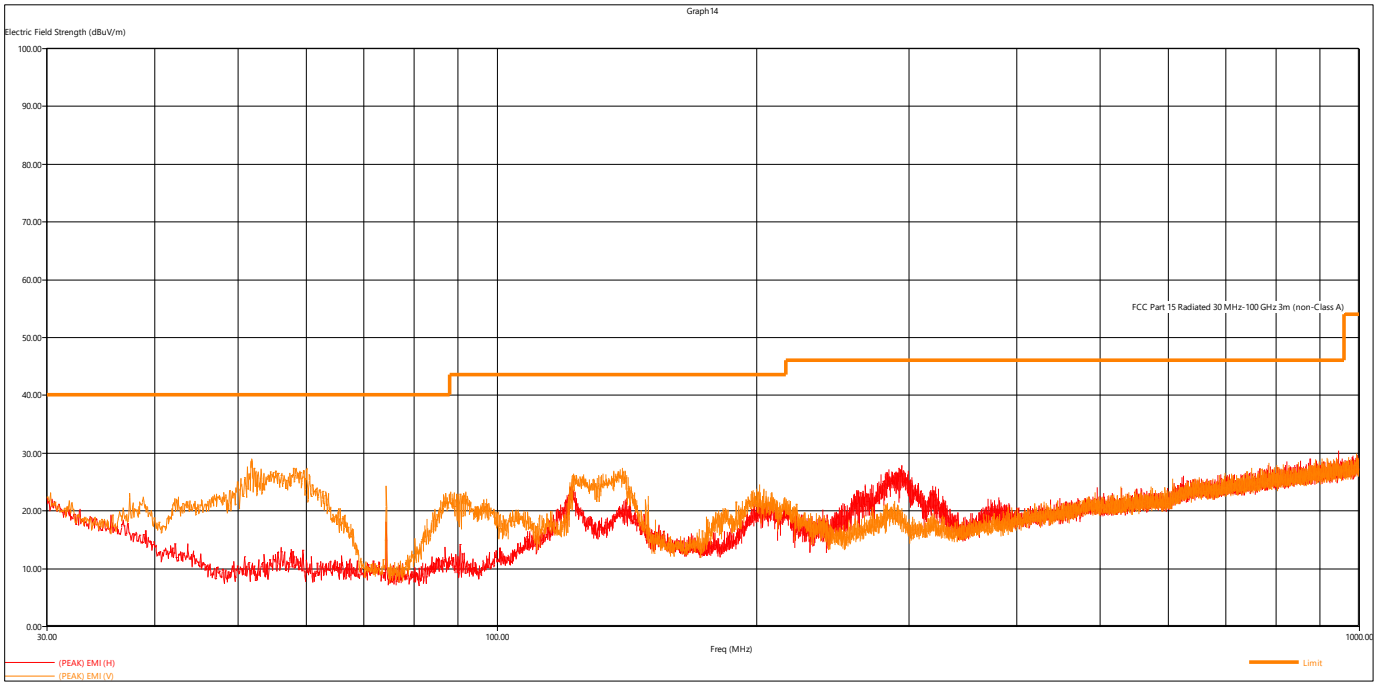


Figure 7 - Radiated Emissions Plot, 802.11n, Low Data Rate, Low Ch

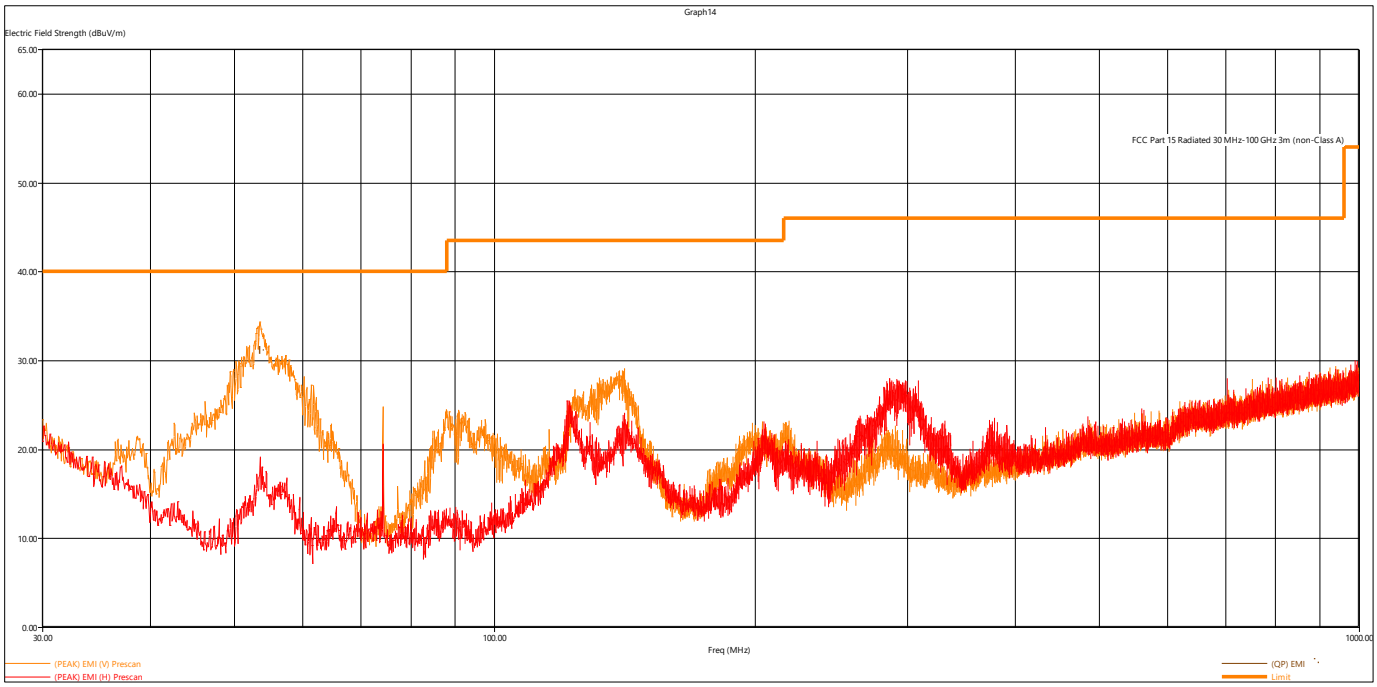


Figure 8 - Radiated Emissions Plot, 802.11b, High Data Rate, Low Ch

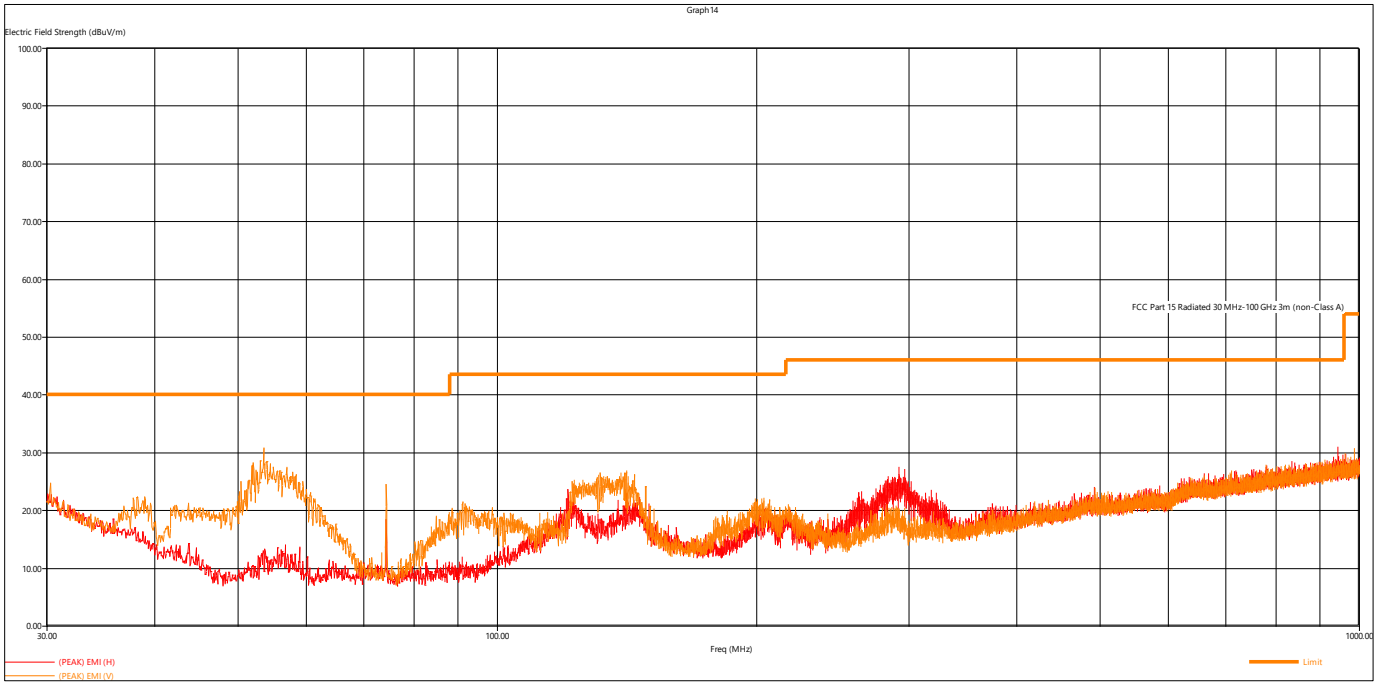


Figure 9 - Radiated Emissions Plot, 802.11g, High Data Rate, Low Ch

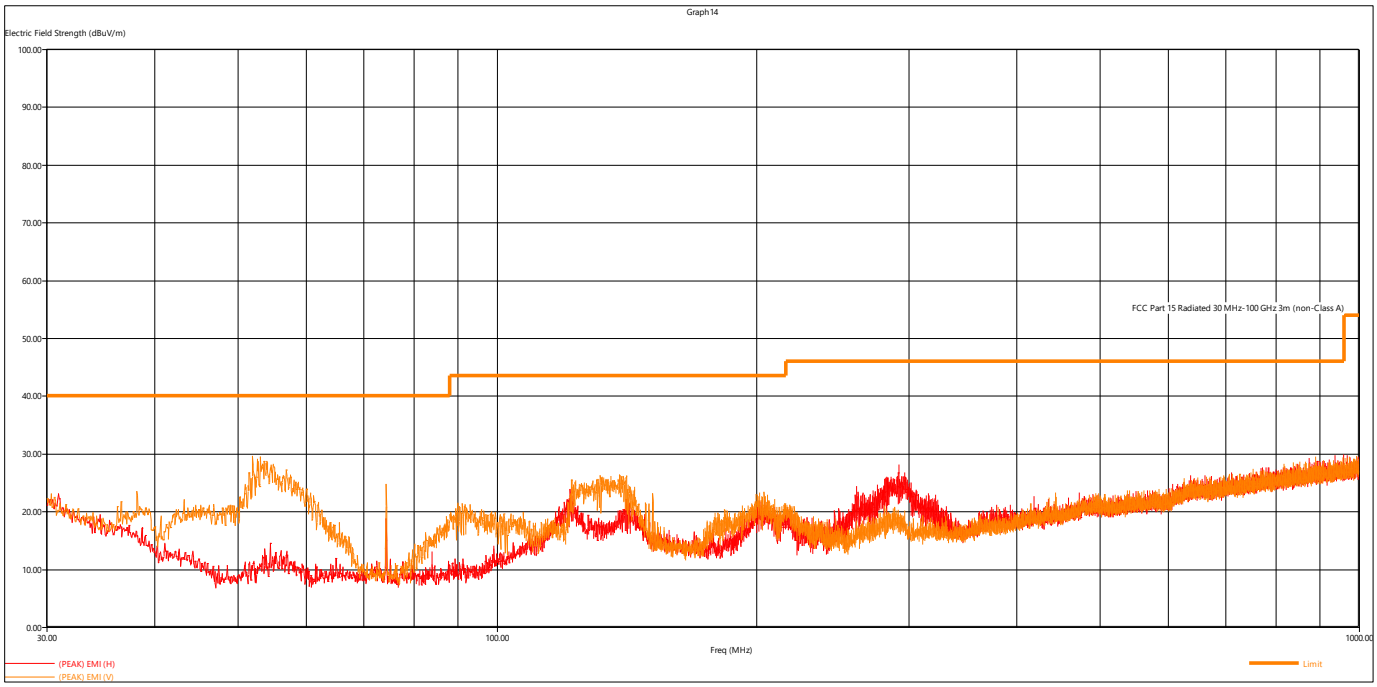


Figure 10 - Radiated Emissions Plot, 802.11n, High Data Rate, Low Ch

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 = Emission level – Limit value

Peak Measurements, 802.11x									
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Modulation	Data Rate
MHz	dBµV/m	dBµV/m	dB	cm.	deg.				
2411.074	103.72	NA	NA	133	183	H	Low	802.11b	1MHz
2436.108	105.62	NA	NA	116	197	H	Mid	802.11b	1MHz
2461.164	103.37	NA	NA	164	180	H	High	802.11b	1MHz
7309.52	58.53	73.98	15.45	110	360	V	Mid	802.11b	1MHz
2411.156	108.08	NA	NA	129	183	H	Low	802.11b	11MHz
2436.414	109.43	NA	NA	115	197	H	Mid	802.11b	11MHz
2460.984	107.16	NA	NA	126	181	H	High	802.11b	11MHz
7309.132	59.48	73.98	14.5	177	16	V	Mid	802.11b	11MHz
2413.626	100.18	NA	NA	130	182	H	Low	802.11g	6MHz
2434.88	108.08	NA	NA	114	197	H	Mid	802.11g	6MHz
2463.002	99.33	NA	NA	132	178	H	High	802.11g	6MHz
7314.71	63.13	73.98	10.85	100	360	V	Mid	802.11g	6MHz
2415.468	101.6	NA	NA	133	181	H	Low	802.11g	54MHz
2438.388	104.22	NA	NA	255	195	H	Mid	802.11g	54MHz
2463.44	98.73	NA	NA	256	97	V	High	802.11g	54MHz
7313.638	58.45	73.98	15.53	212	8	V	Mid	802.11g	54MHz
2419.286	98.48	NA	NA	125	183	H	Low	802.11n	MCS0
2439.514	108.37	NA	NA	112	192	H	Mid	802.11n	MCS0
2462.23	99.36	NA	NA	119	179	H	High	802.11n	MCS0
7310.732	59.59	73.98	14.39	263	25	V	Mid	802.11n	MCS0
2419.798	101.06	NA	NA	139	181	H	Low	802.11n	MCS7
2438.432	104.47	NA	NA	117	200	H	Mid	802.11n	MCS7
2458.484	90.78	NA	NA	124	179	H	High	802.11n	MCS7

The EUT was maximized in all 3 orthogonal axes. The worst-case is shown in the plot and table above.
All other emissions found to be at least 6dB below the limit line. System Noise floor was at least 6 dB below the limit line throughout the test range.

Average Measurements, 802.11x									
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Modulation	Data Rate
MHz	dBµV/m	dBµV/m	dB	cm.	deg.				
2411.074	100.87	NA	NA	133	183	H	Low	802.11b	1MHz
2436.108	102.9	NA	NA	116	197	H	Mid	802.11b	1MHz
2461.164	100.65	NA	NA	164	180	H	High	802.11b	1MHz
7309.52	53.18	53.98	0.80	110	360	V	Mid	802.11b	1MHz
2411.156	100.11	NA	NA	129	183	H	Low	802.11b	11MHz
2436.414	101.94	NA	NA	115	197	H	Mid	802.11b	11MHz
2460.984	99.77	NA	NA	126	181	H	High	802.11b	11MHz
7309.132	47.73	53.98	6.25	177	16	V	Mid	802.11b	11MHz
2413.626	90.98	NA	NA	130	182	H	Low	802.11g	6MHz
2434.88	98.67	NA	NA	114	197	H	Mid	802.11g	6MHz
2463.002	90.43	NA	NA	132	178	H	High	802.11g	6MHz
7314.71	48.73	53.98	5.25	100	360	V	Mid	802.11g	6MHz
2415.468	91.35	NA	NA	133	181	H	Low	802.11g	54MHz
2438.388	94.35	NA	NA	255	195	H	Mid	802.11g	54MHz
2463.44	88.94	NA	NA	256	97	V	High	802.11g	54MHz
7313.638	44.07	53.98	9.91	212	8	V	Mid	802.11g	54MHz
2419.286	89.22	NA	NA	125	183	H	Low	802.11n	MCS0
2439.514	97.92	NA	NA	112	192	H	Mid	802.11n	MCS0
2462.23	88.94	NA	NA	119	179	H	High	802.11n	MCS0
7310.732	46.03	53.98	7.95	263	25	V	Mid	802.11n	MCS0
2419.798	90.28	NA	NA	139	181	H	Low	802.11n	MCS7
2438.432	93.61	NA	NA	117	200	H	Mid	802.11n	MCS7
2458.484	101.51	NA	NA	124	179	H	High	802.11n	MCS7

The EUT was maximized in all 3 orthogonal axes. The worst-case is shown in the plot and table above.
All other emissions found to be at least 6dB below the limit line. System Noise floor was at least 6 dB below the limit line throughout the test range.

4.4 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 the 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 to the general limit defined in Part 15.209. The limit shown in the graph accounts for the antenna gain of the device.

APPENDIX A: SAMPLE CALCULATION

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and 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 dBμV/m

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

Level in μV/m = Common Antilogarithm [(48.1 dBμV/m)/20]= 254.1 μV/m

AV is calculated by the taking the 20*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 (Watts) = [Field Strength (V/m) x antenna distance (m)]^2 / 30

Power (watts) = 10^[Power (dBm)/10] / 1000

Voltage (dBµV) = Power (dBm) + 107 (for 50Ω measurement systems)

Field Strength (V/m) = 10^[Field Strength (dBµV/m) / 20] / 10^6

Gain = 1 (numeric gain for isotropic radiator)

Conversion from 3m field strength to EIRP (d=3):

EIRP = [FS(V/m) x d^2]/30 = FS [0.3] for d = 3

EIRP(dBm) = FS(dBµV/m) – 10(log 10^9)+ 10log[0.3] = FS(dBµV/m) - 95.23

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

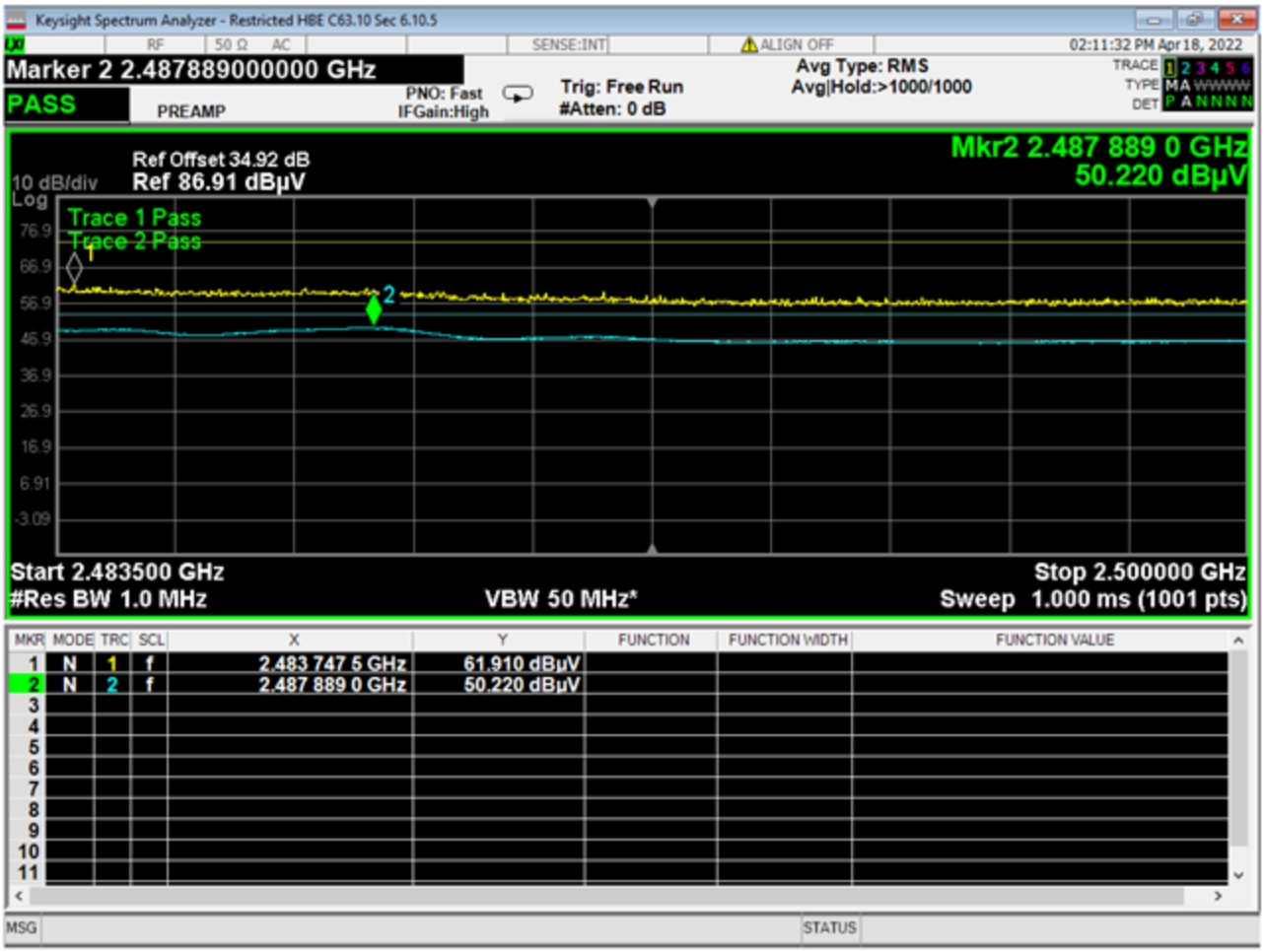
APPENDIX B – MEASUREMENT UNCERTAINTY

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

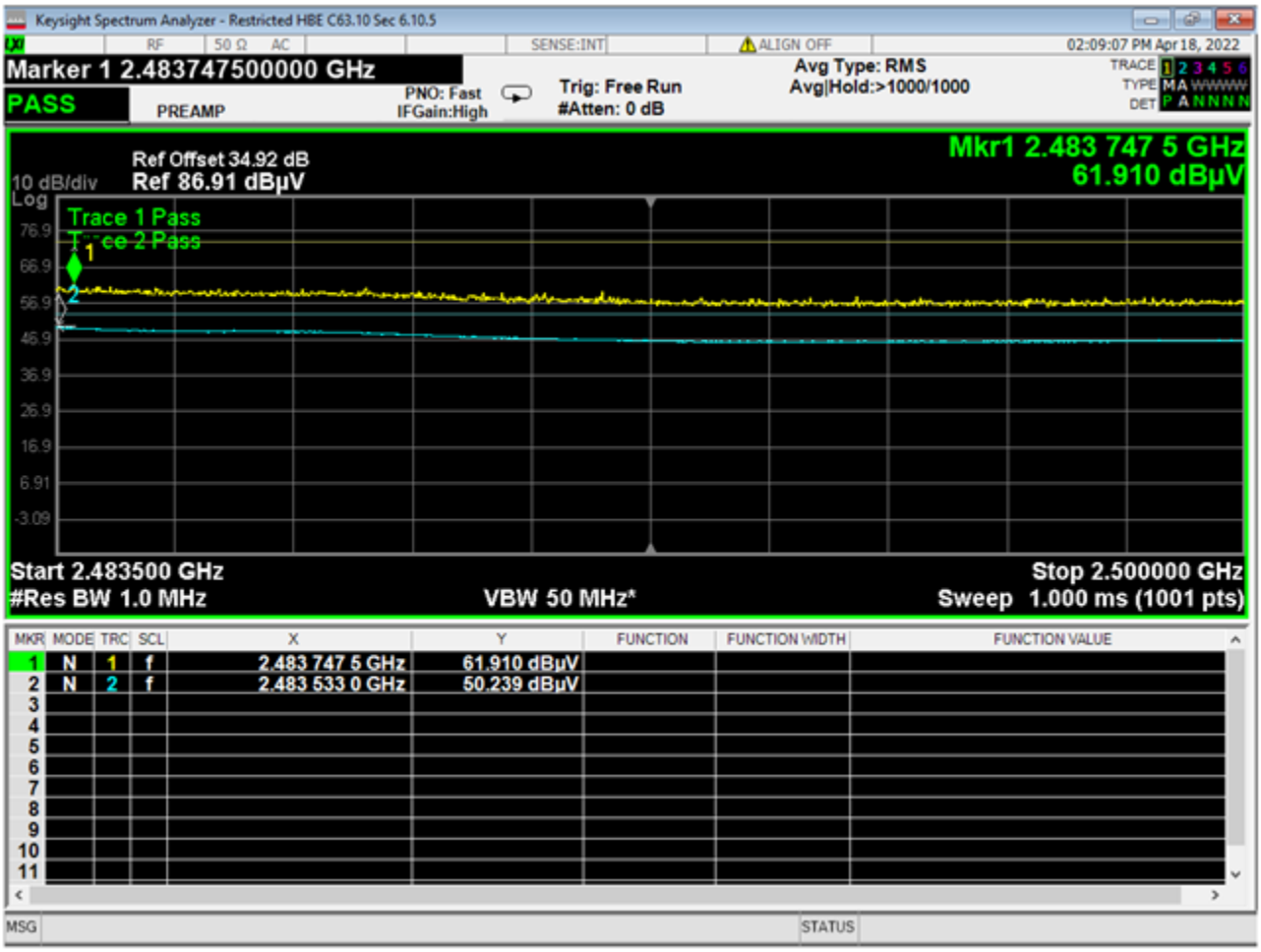
Test	Frequency Range	Uncertainty Value (dB)
Radiated Emissions, 3m	30MHz - 1GHz	±4.31
Radiated Emissions, 3m	1GHz - 18GHz	±5.08
Emissions limits, conducted	30MHz – 18GHz	±3.03

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

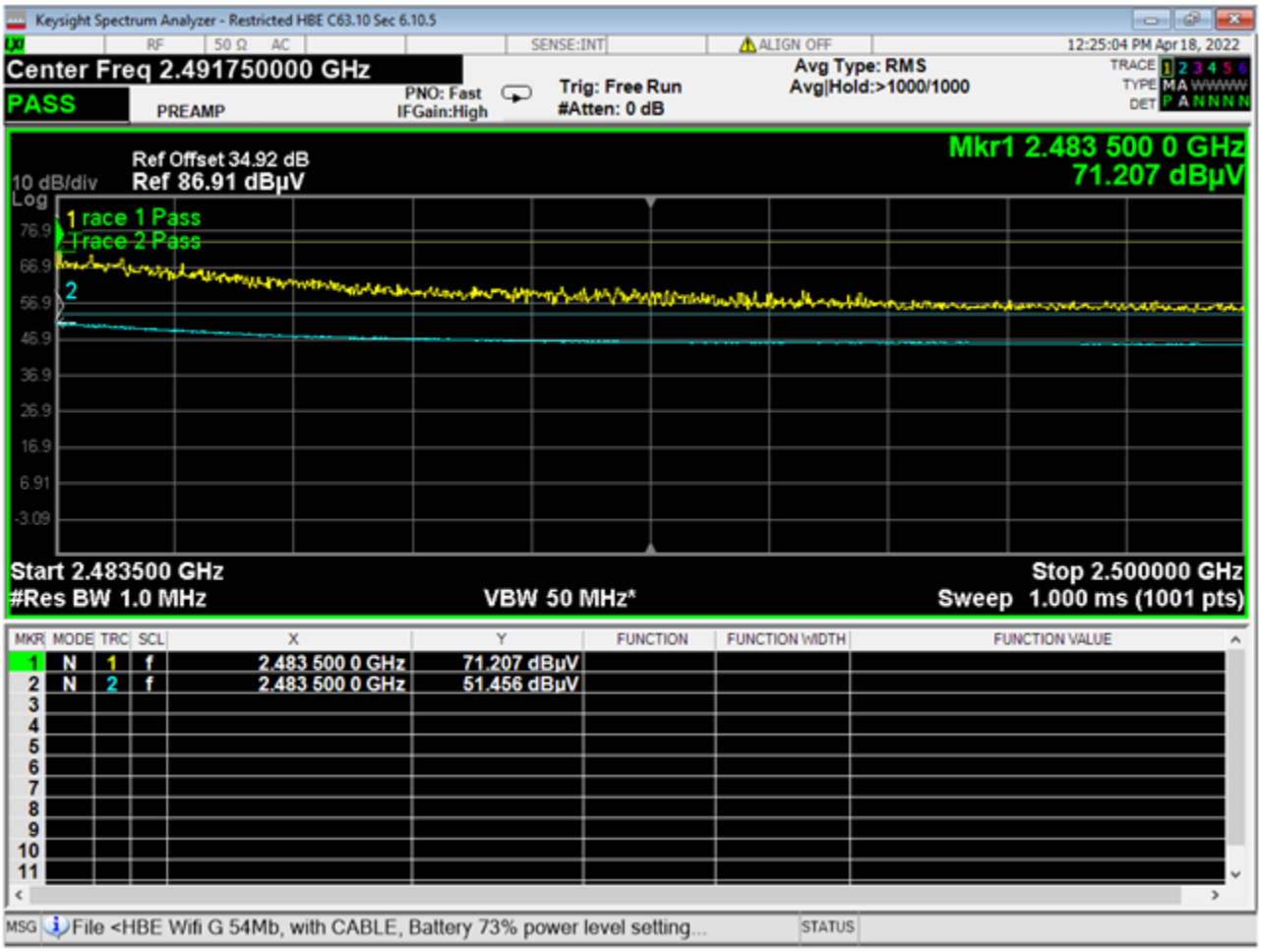
APPENDIX C – GRAPHS AND TABLES



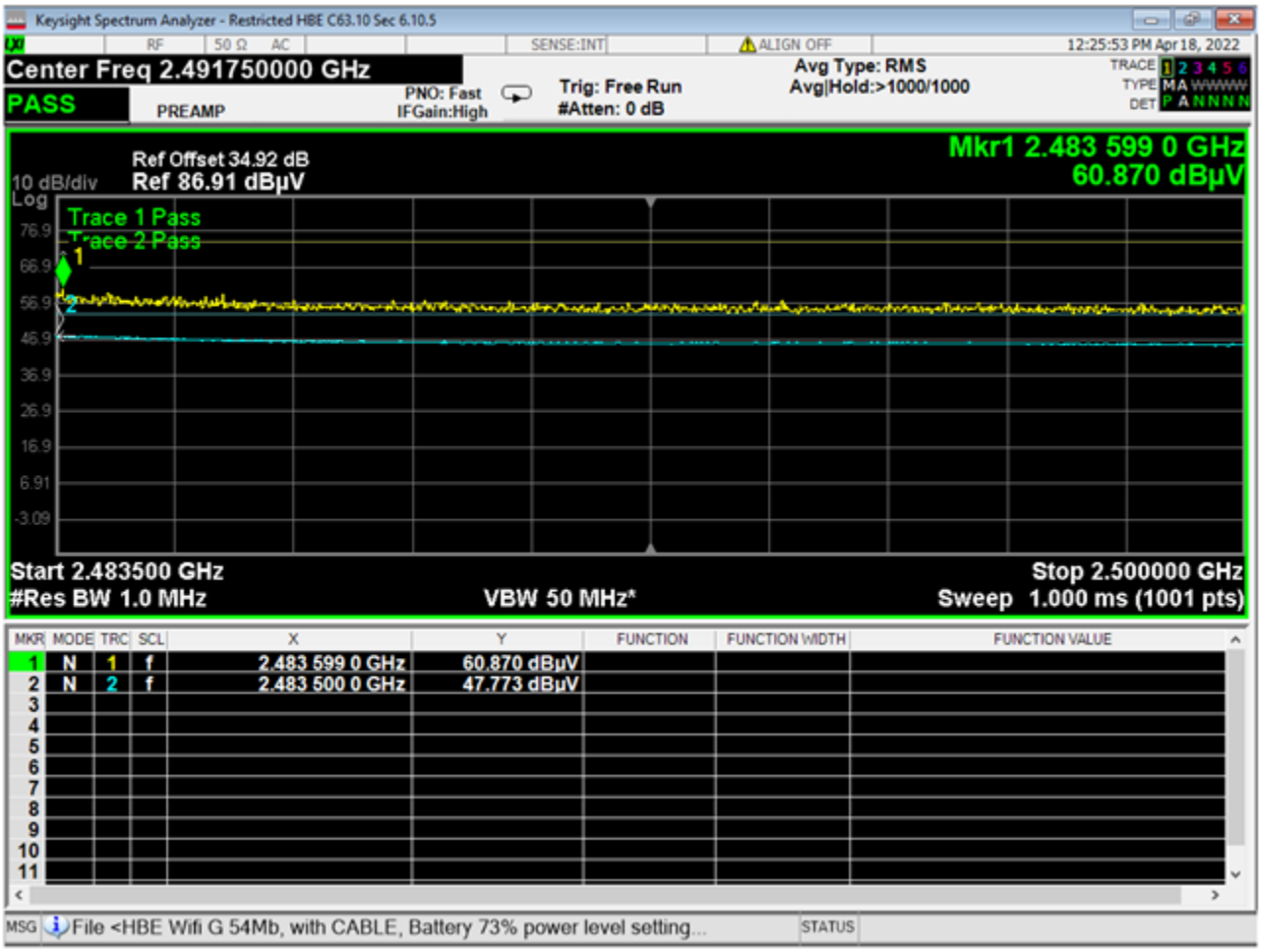
HBE Restricted, Wifi B 1 Mbps



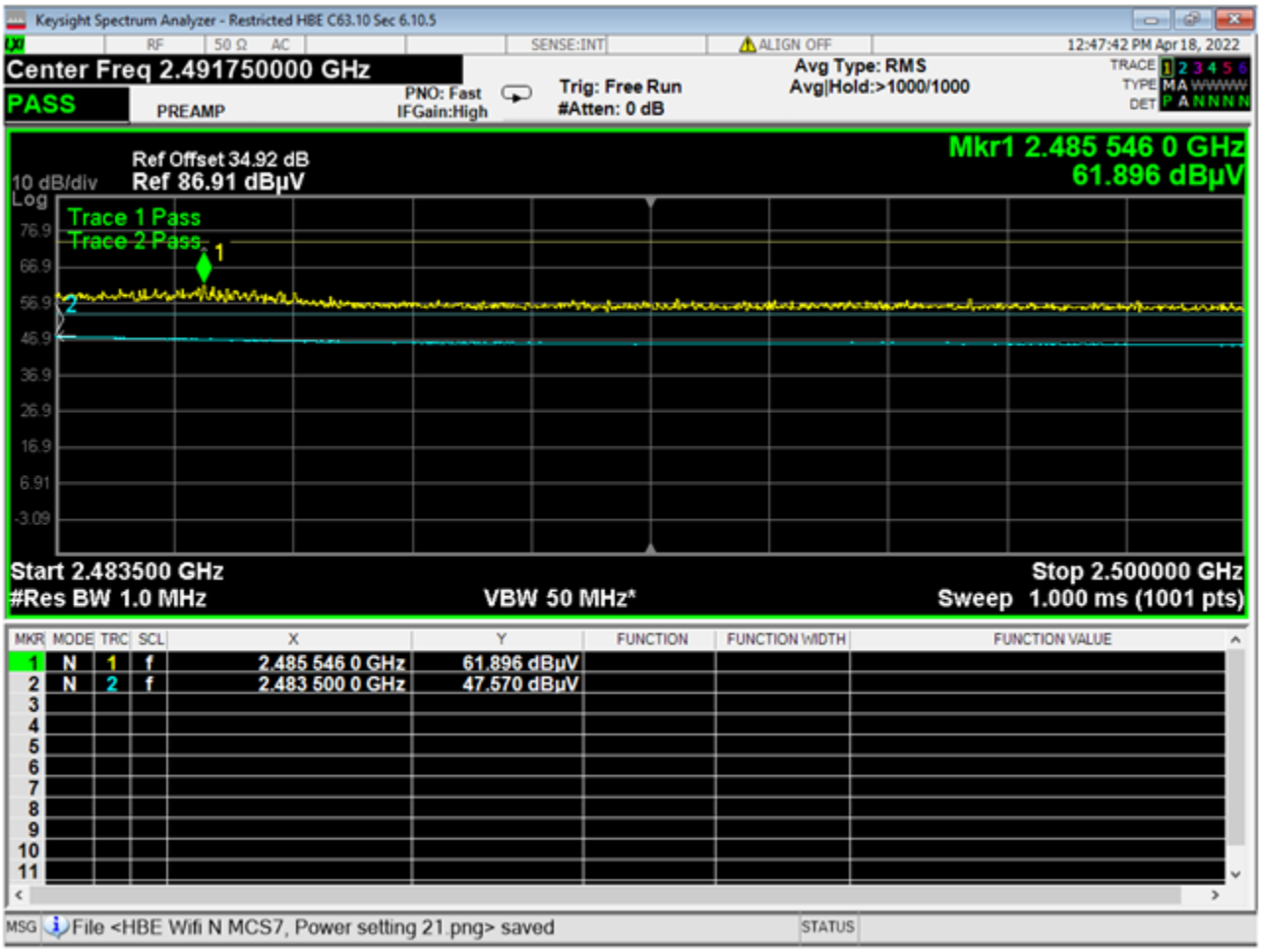
HBE Restricted, Wifi B 11 Mbps



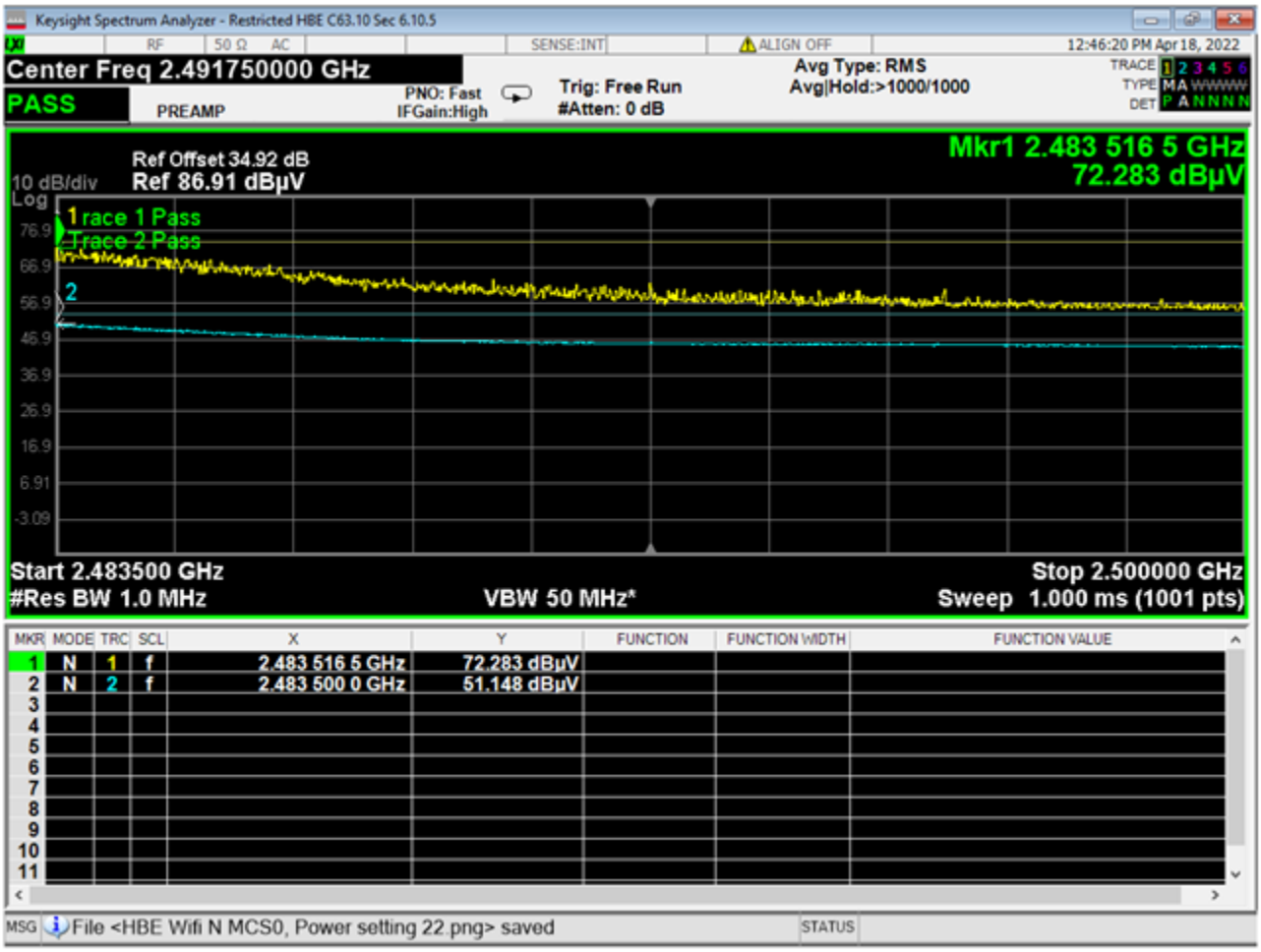
HBE Restricted, Wifi G 54Mb



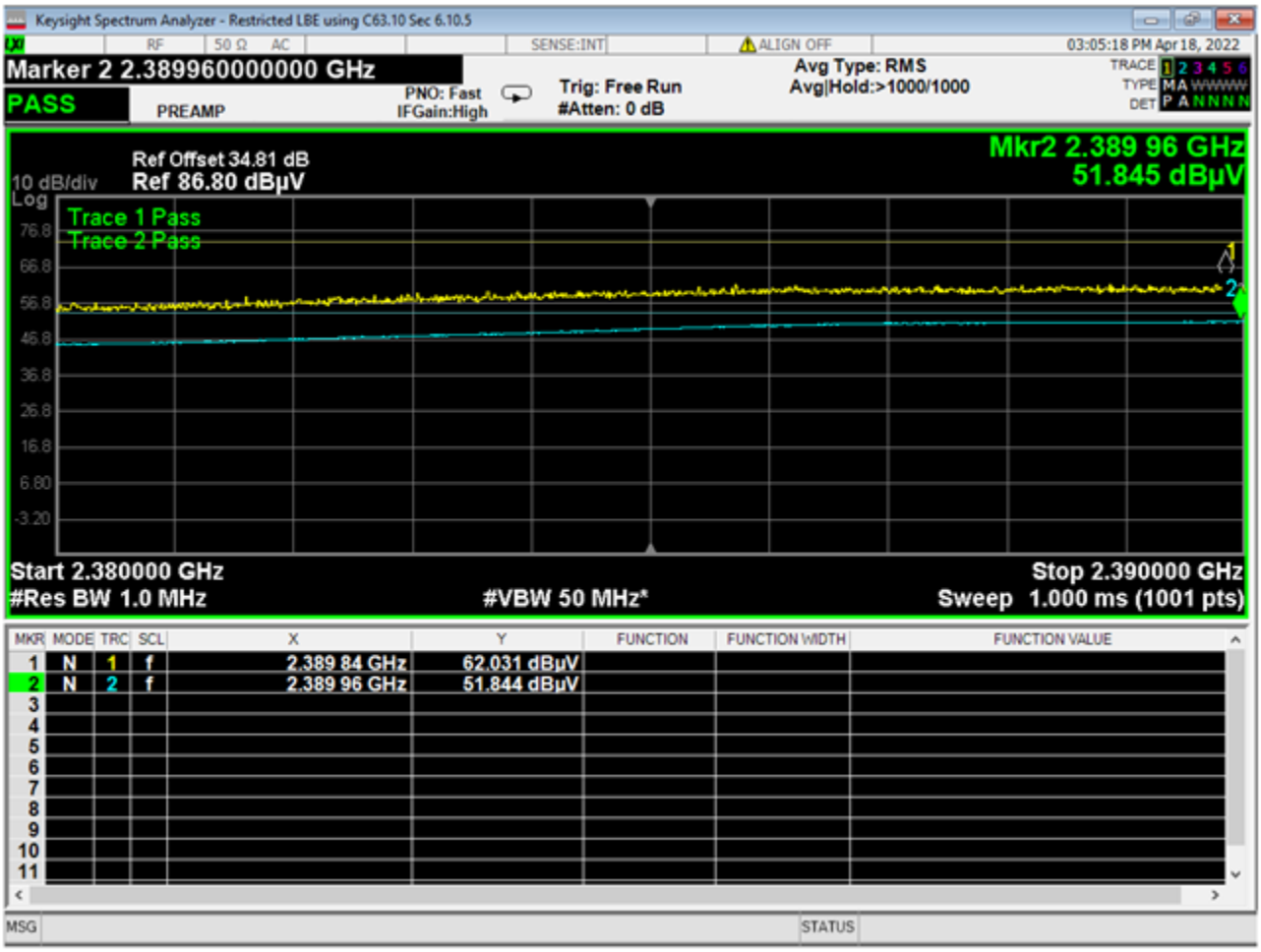
HBE Restricted, Wifi G 6Mb



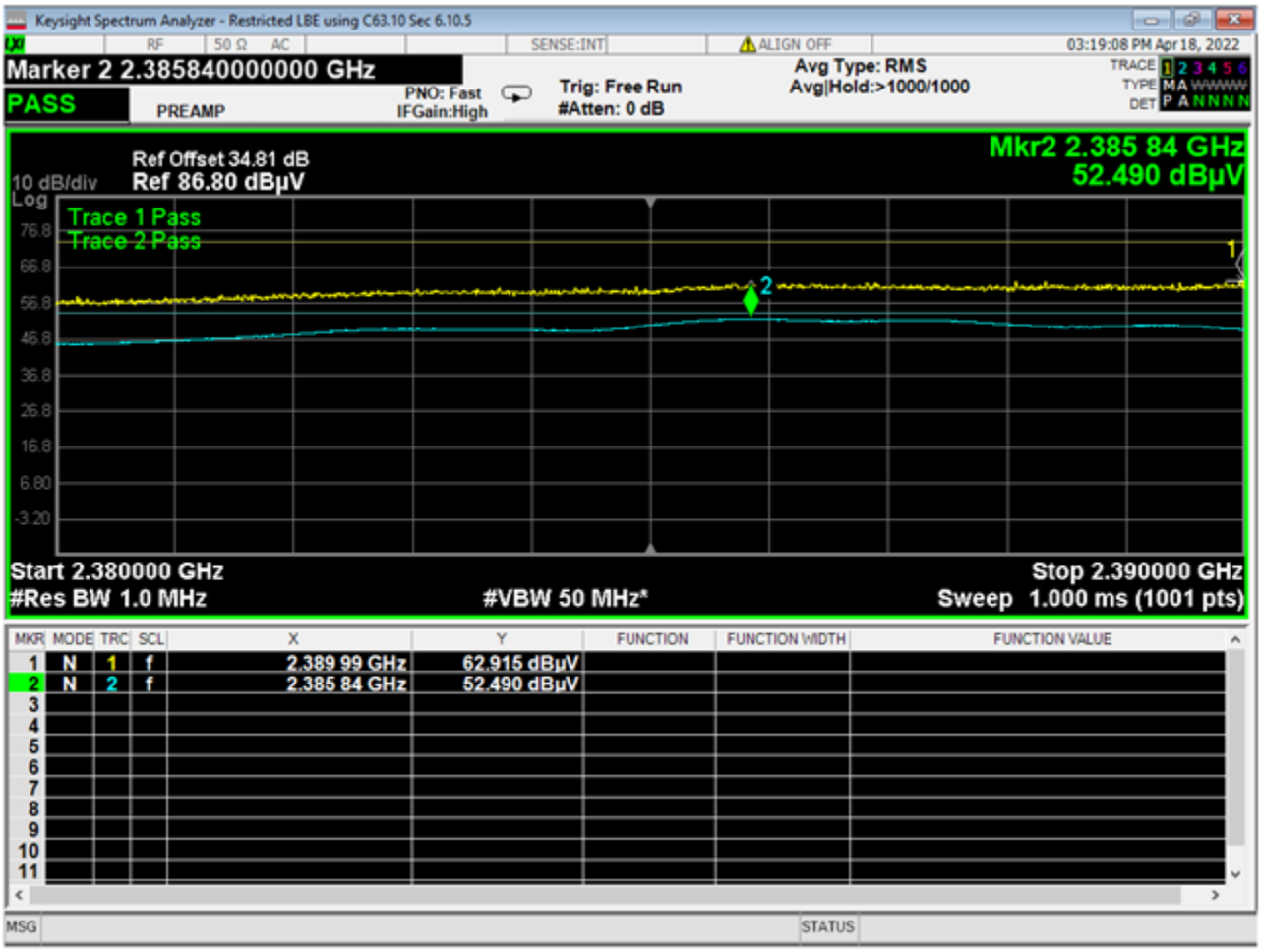
HBE Restricted, Wifi N MCS0



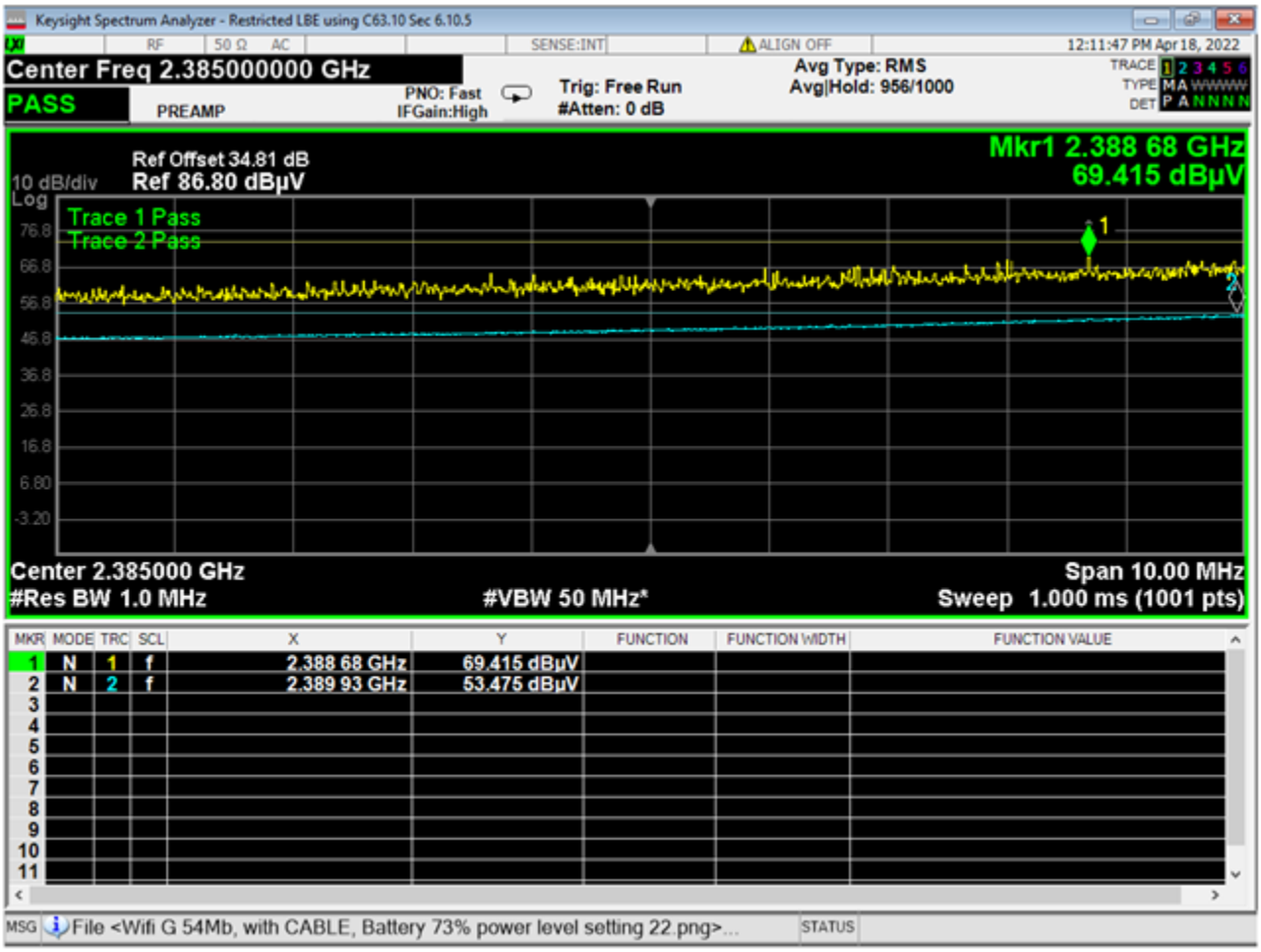
HBE Restricted, Wifi N MCS7



LBE Restricted, Wifi B 11MHz



LBE Restricted, Wifi B 1MHz



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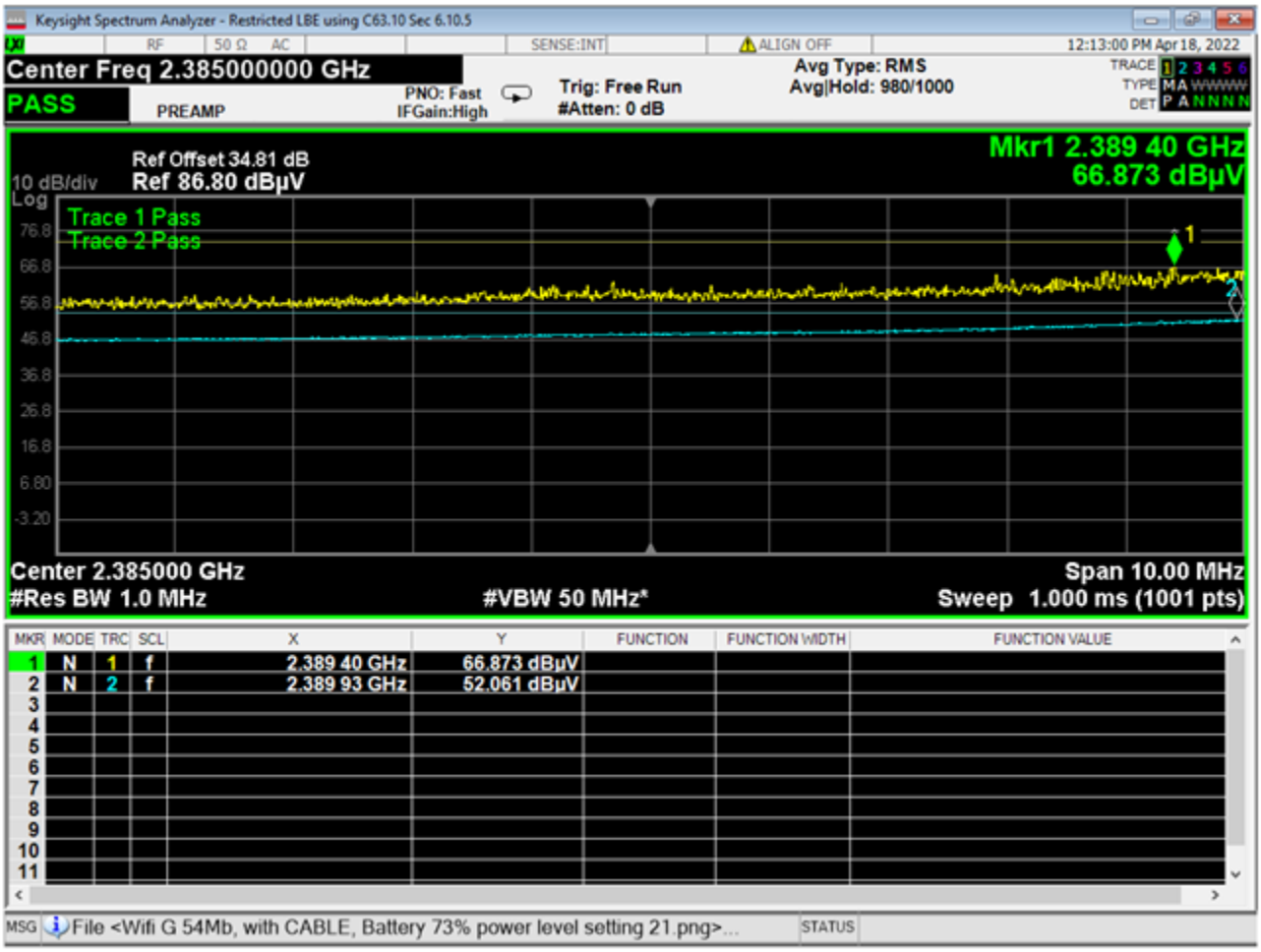

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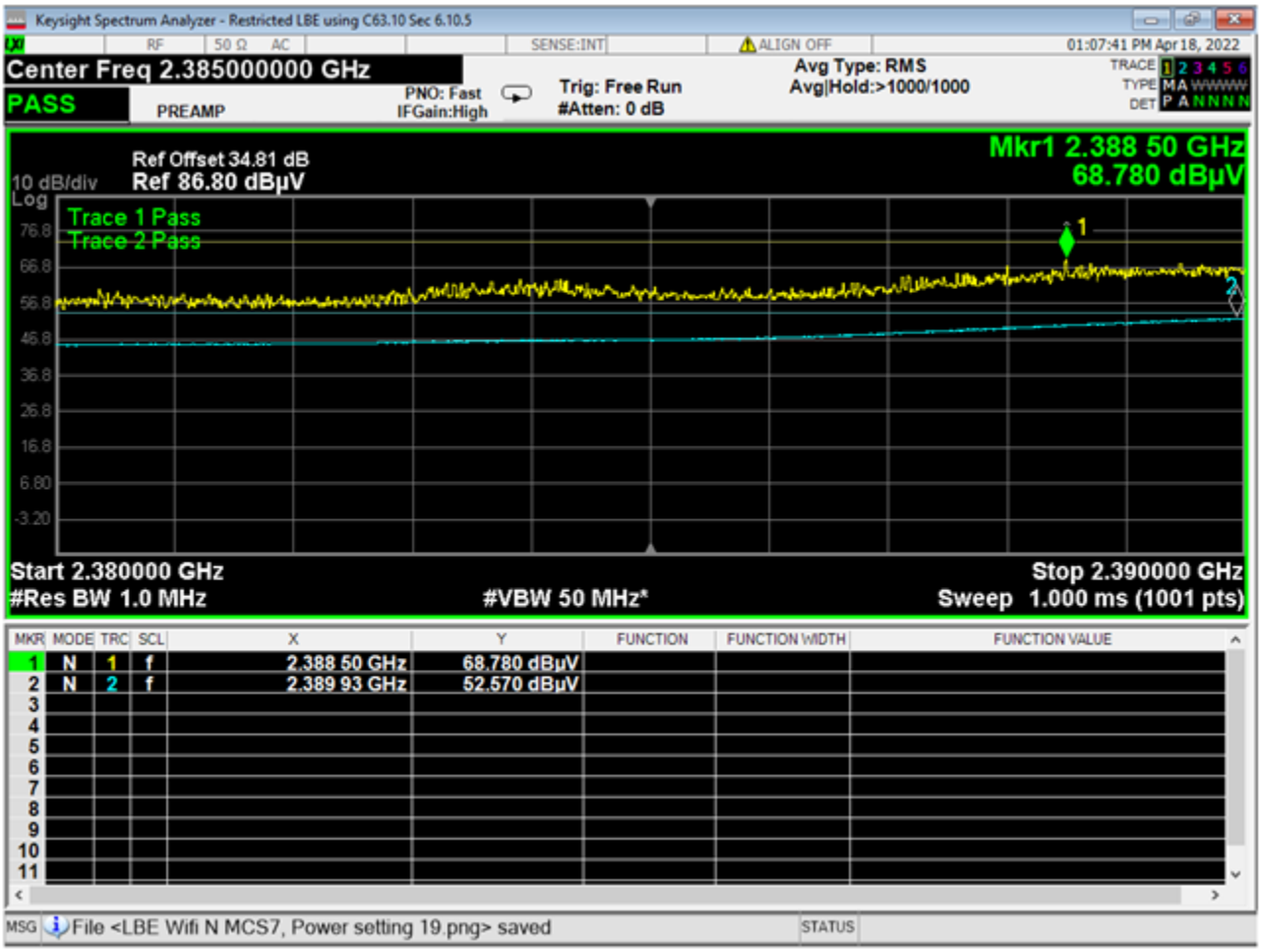

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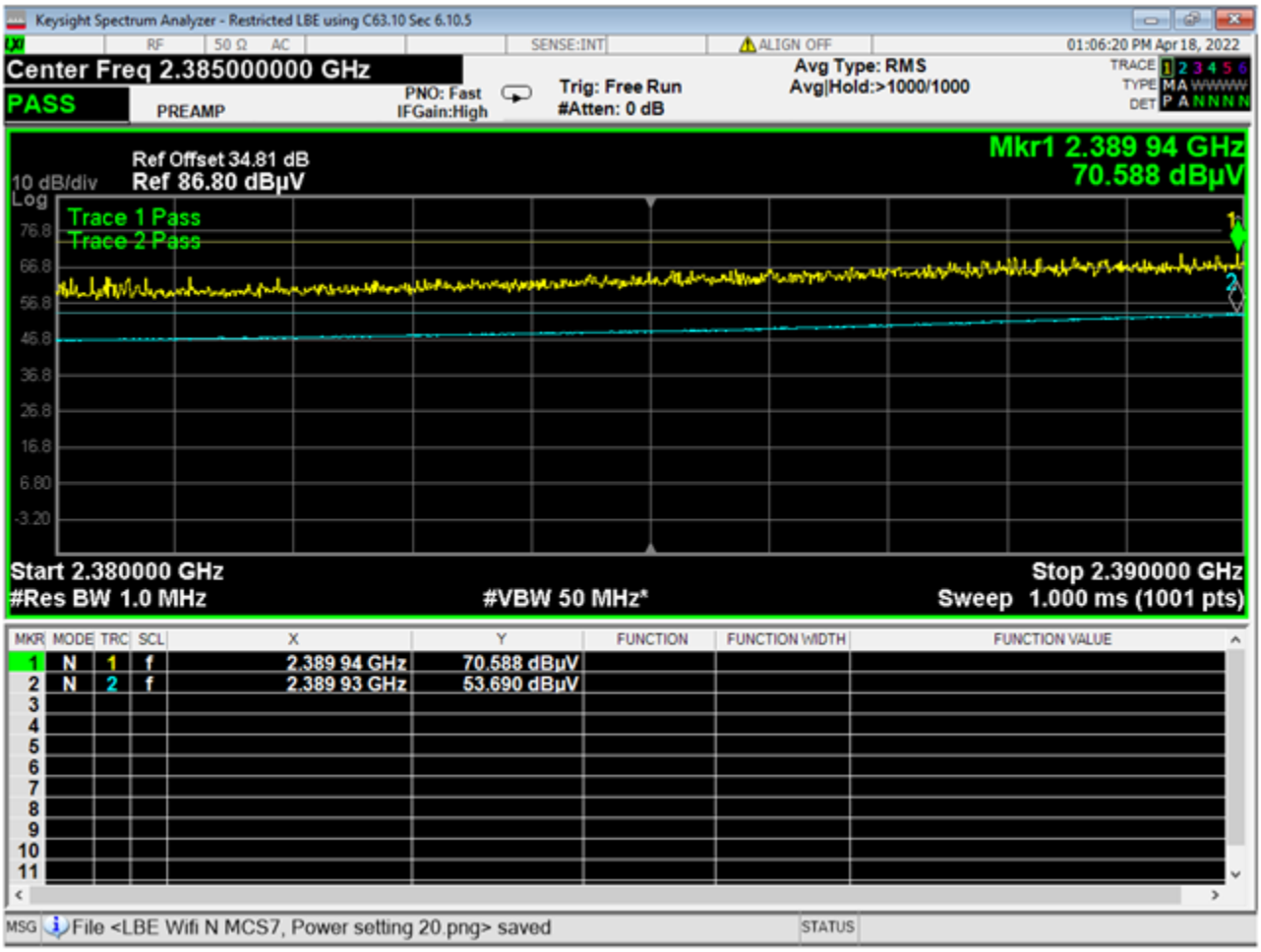
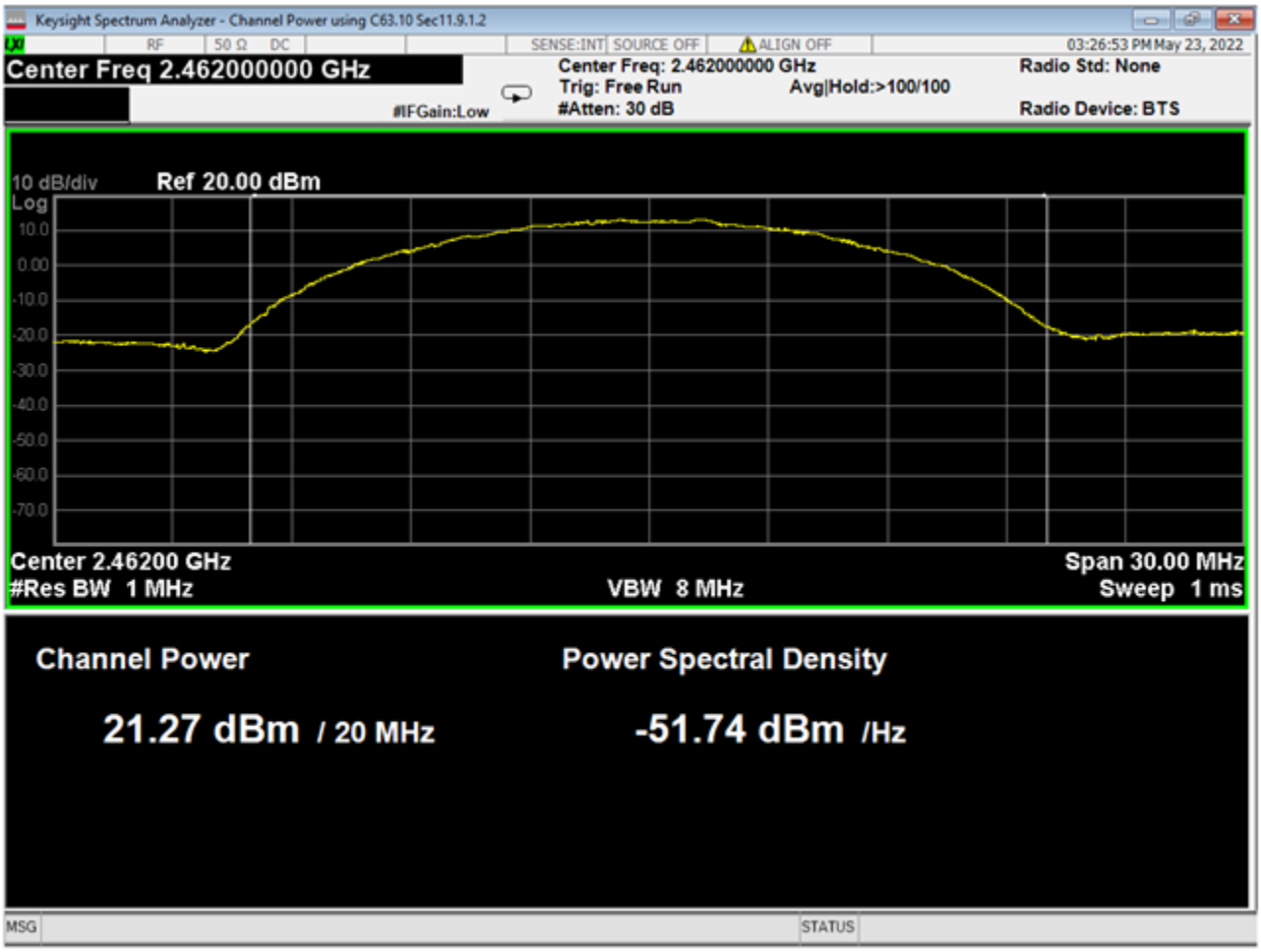
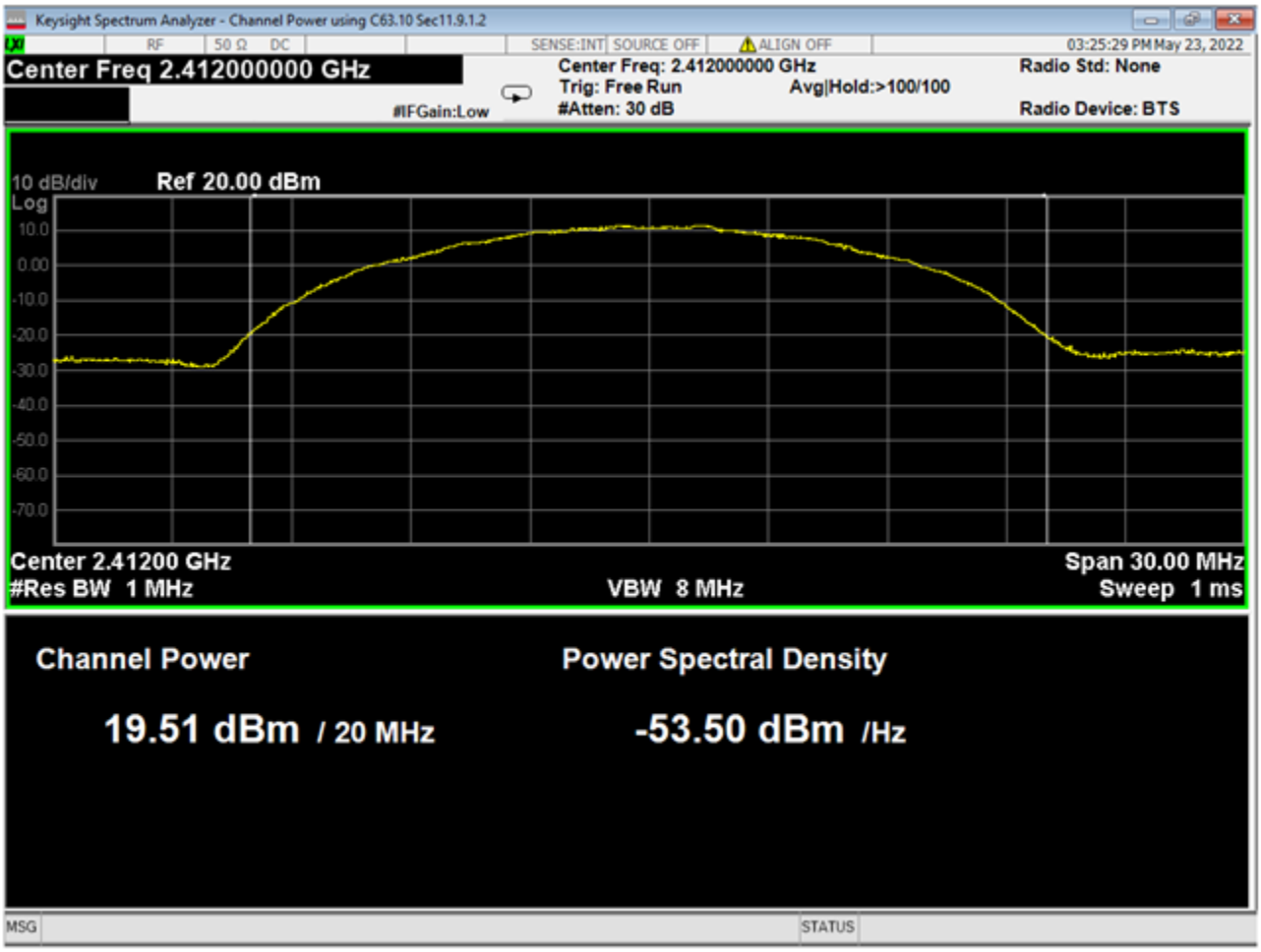


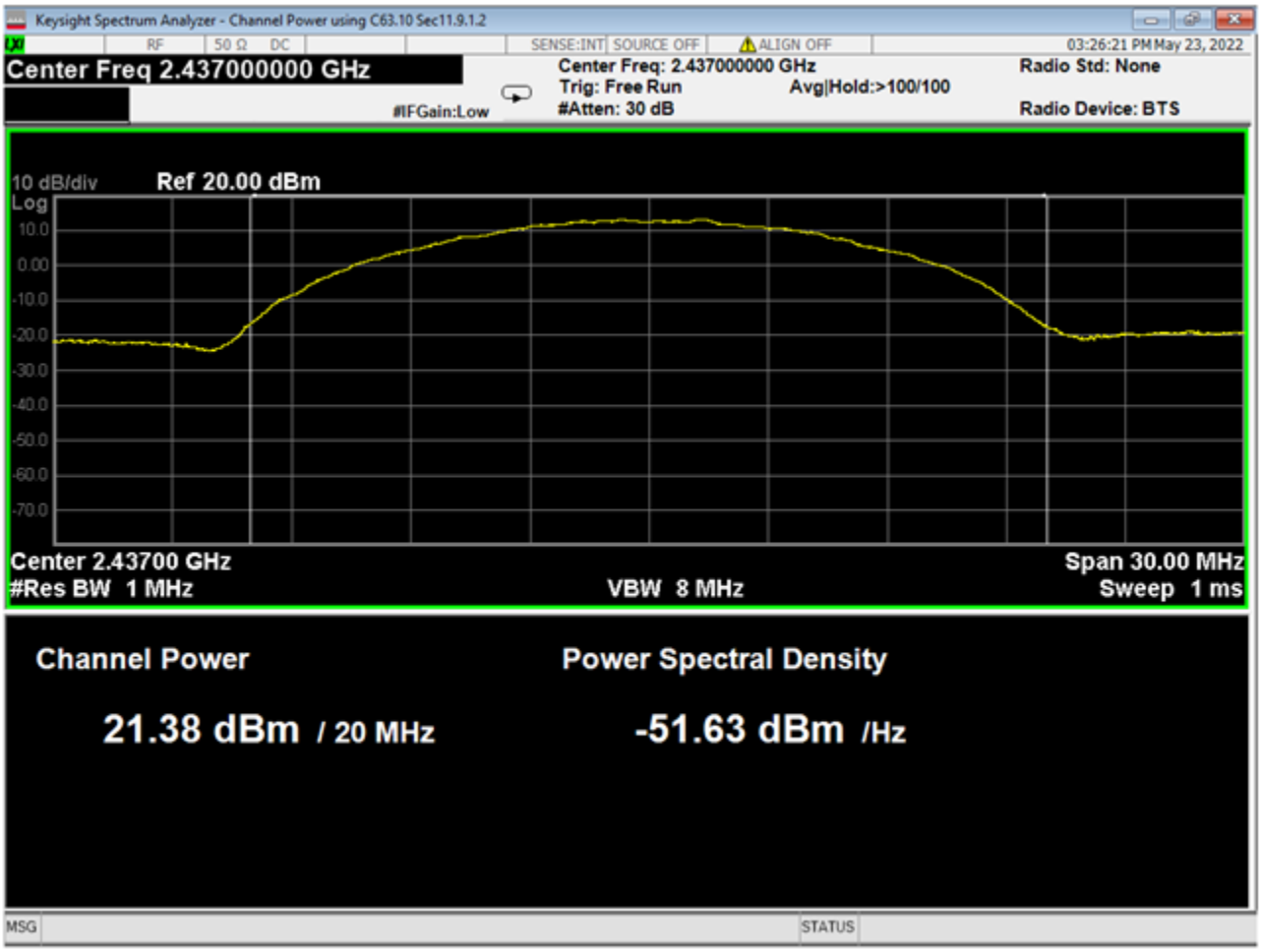
LBE Restricted, Wifi N MCS7



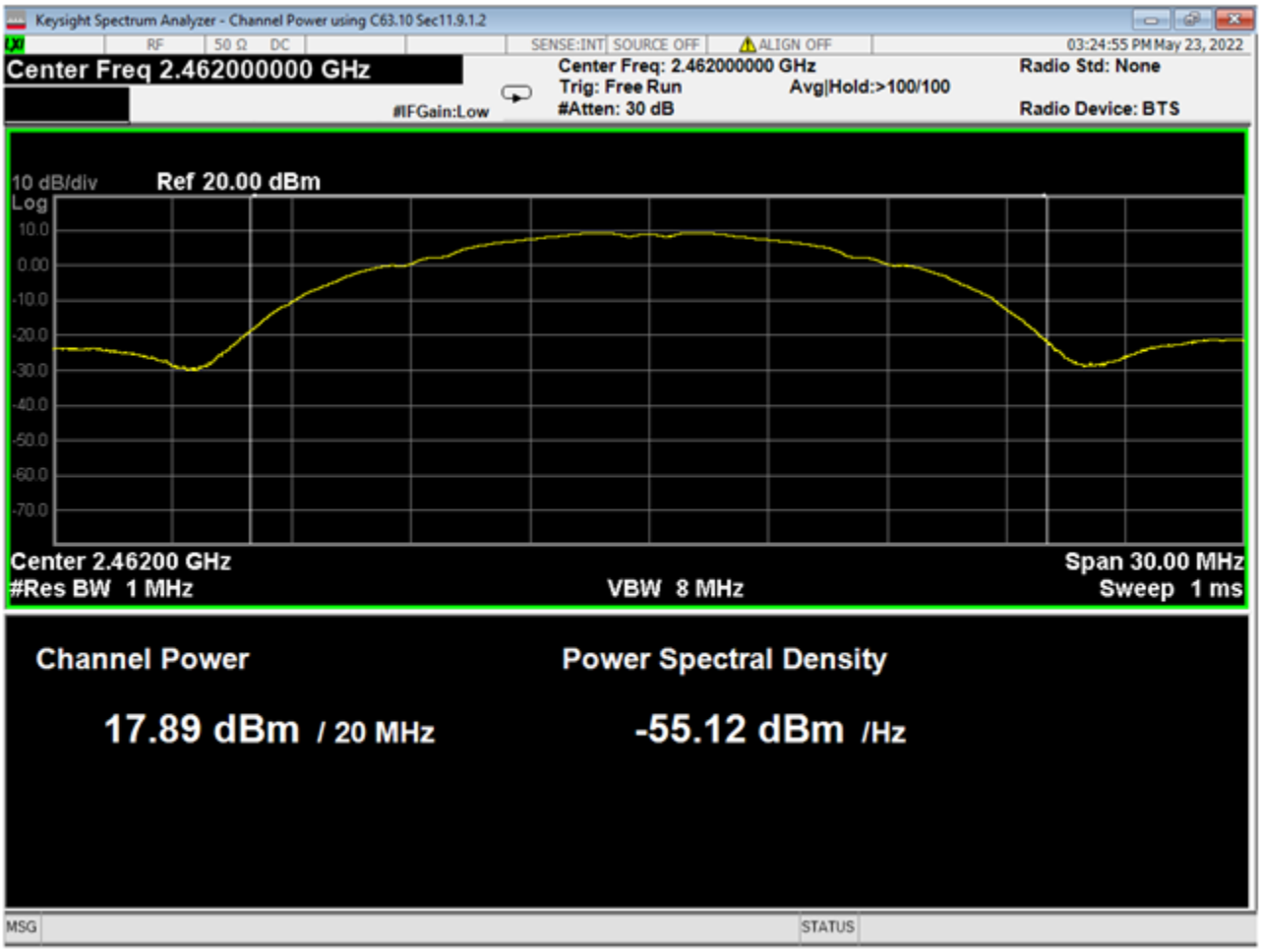
Wifi B 11MB, High



Wifi B 11MB, Low



Wifi B 11MB, Mid



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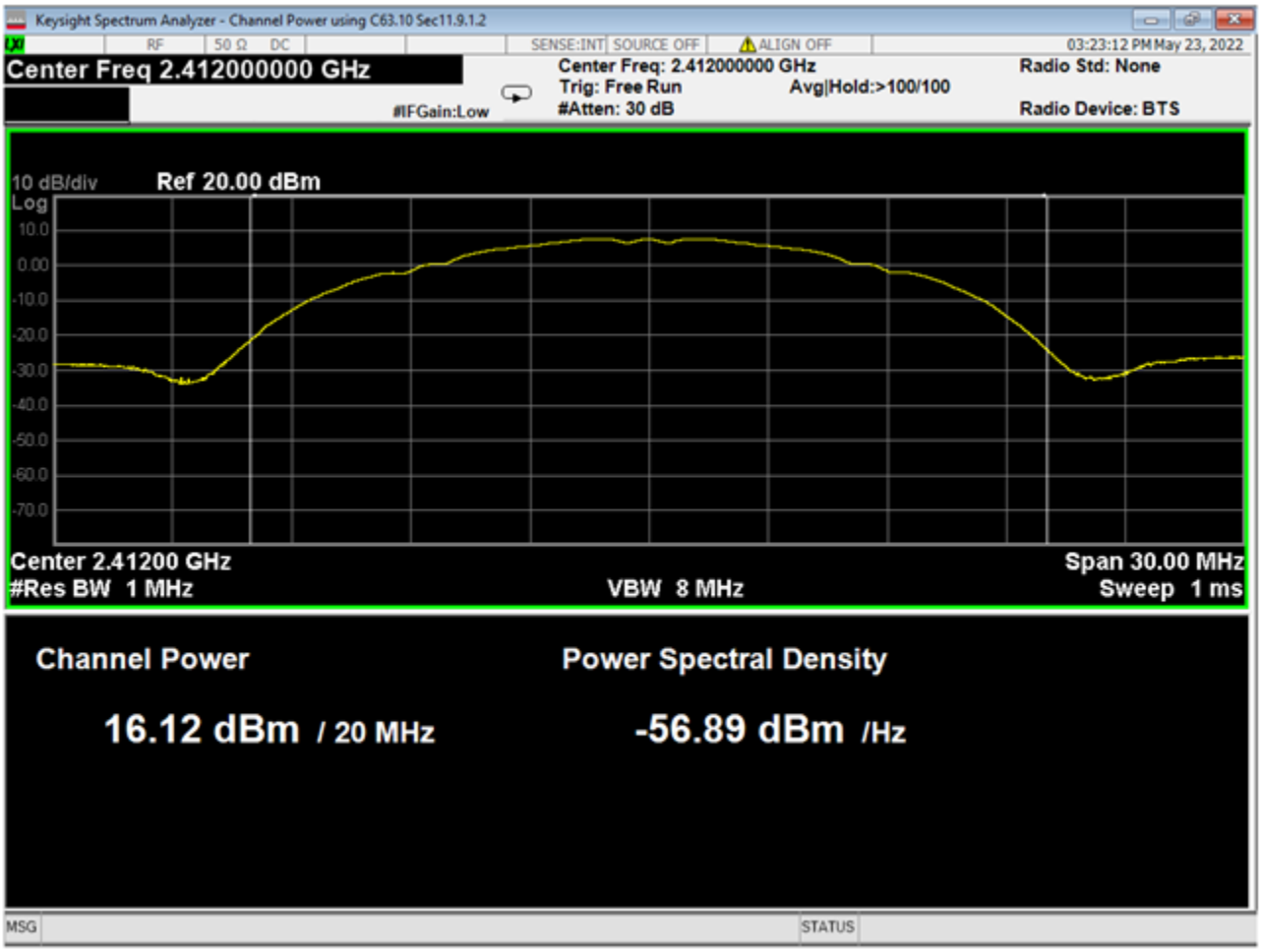

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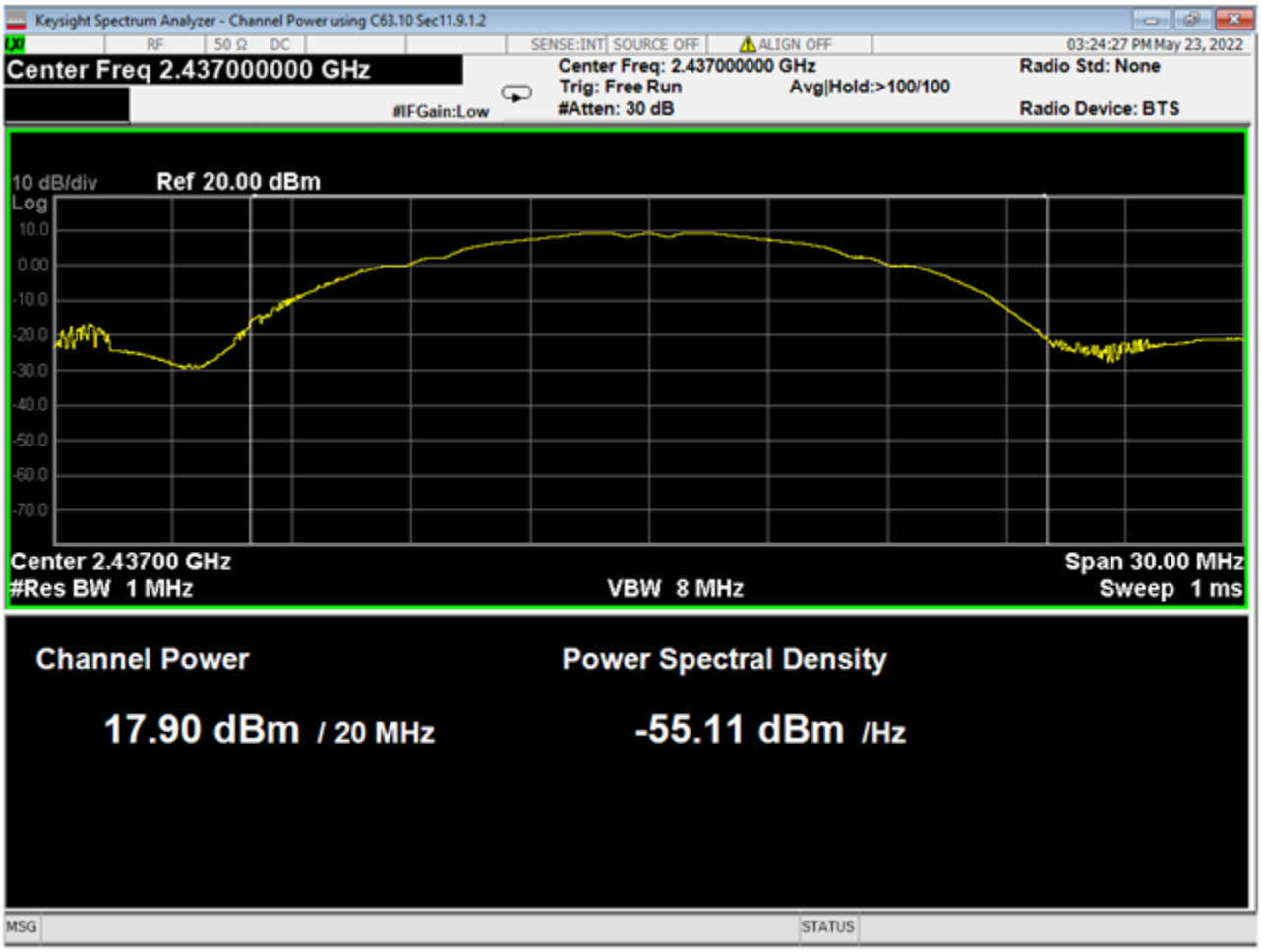

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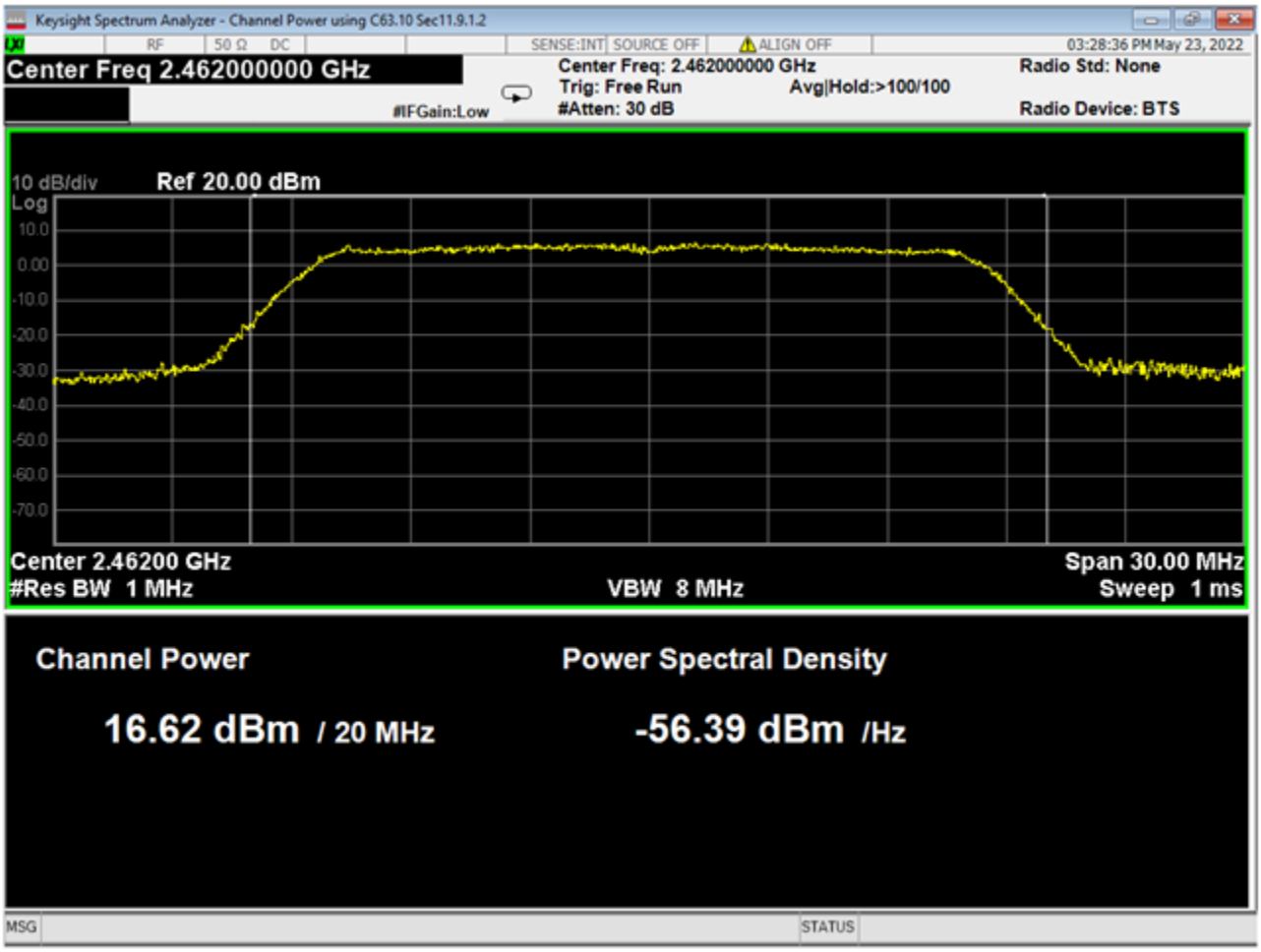

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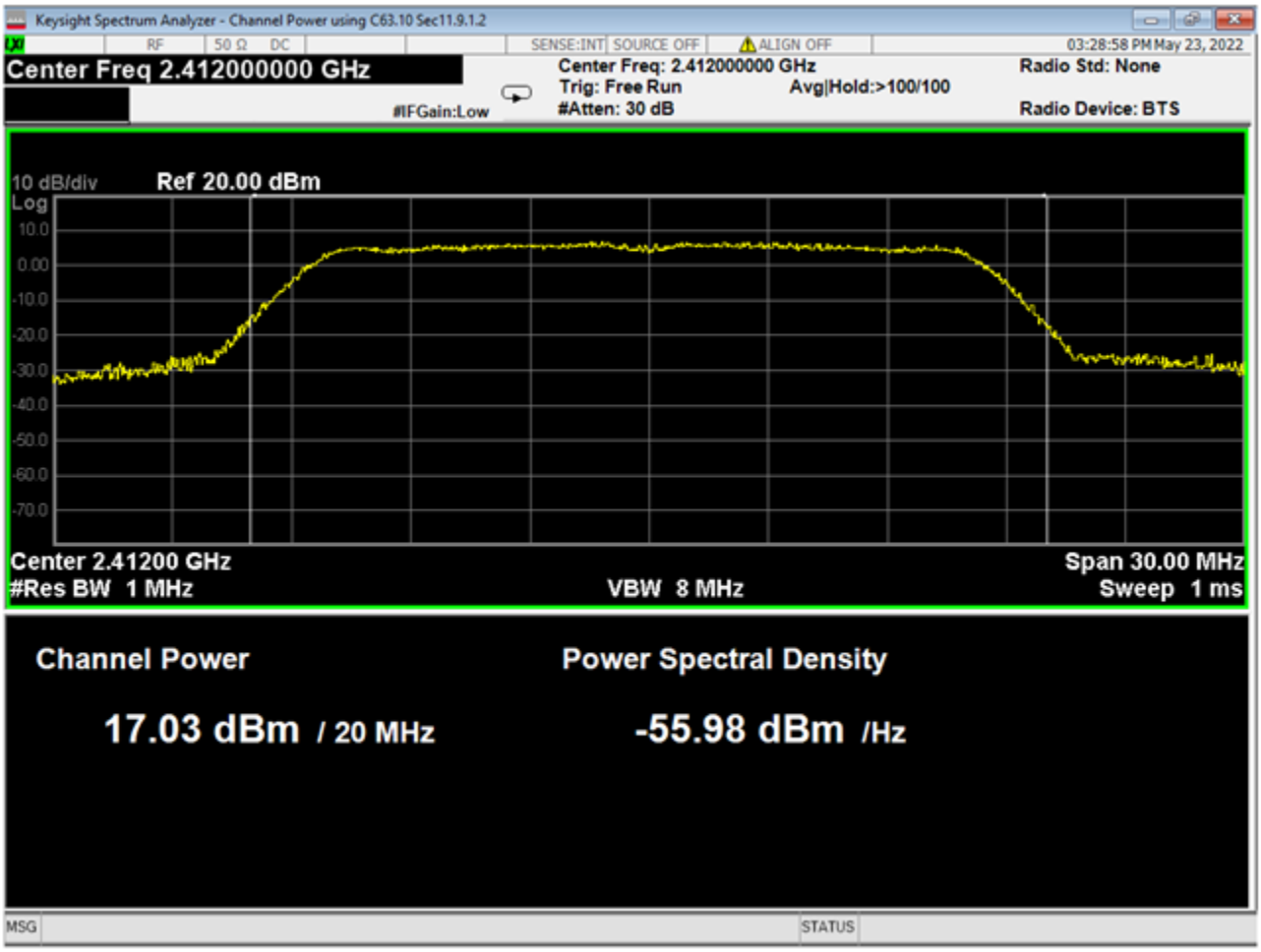

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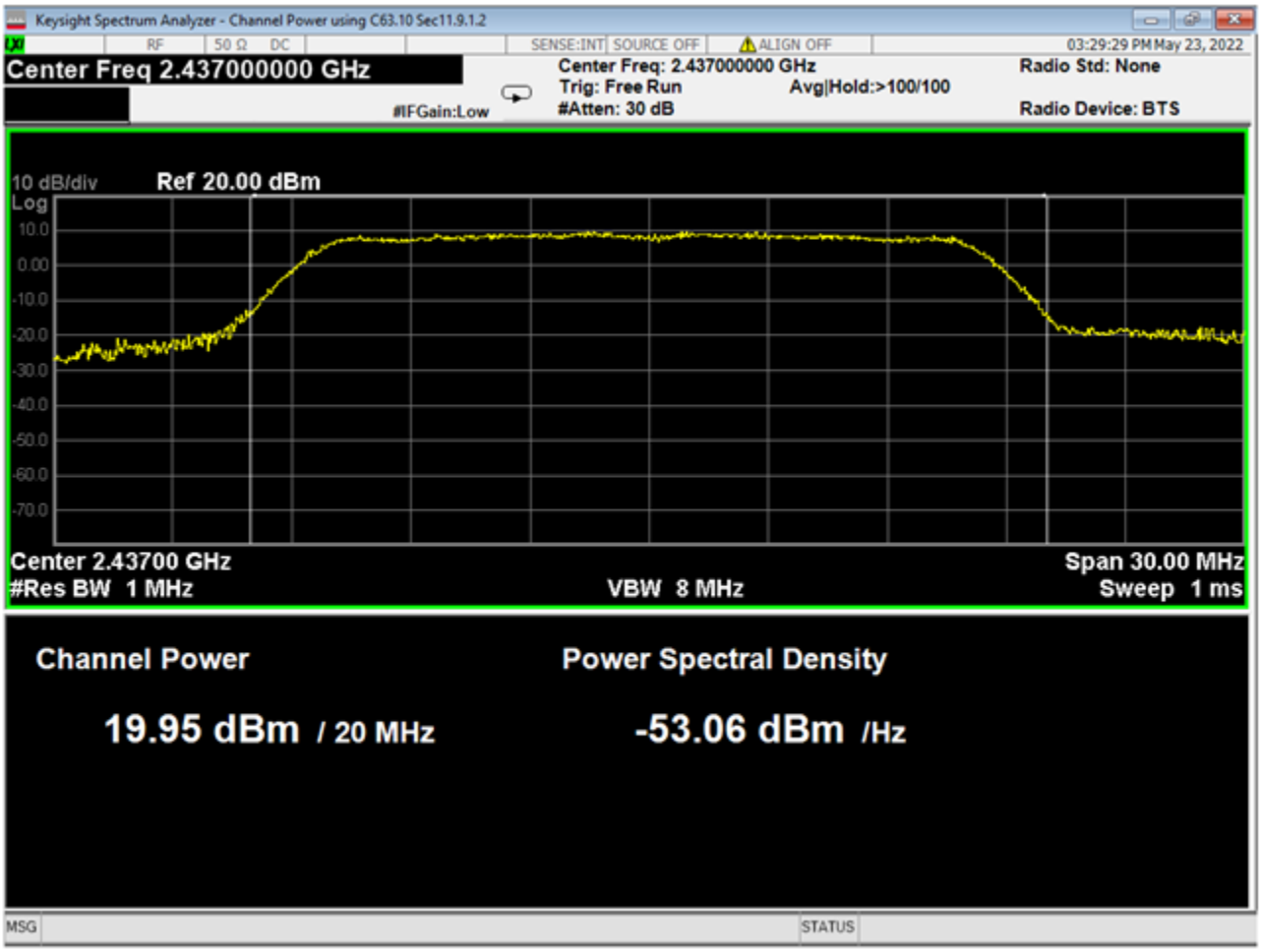

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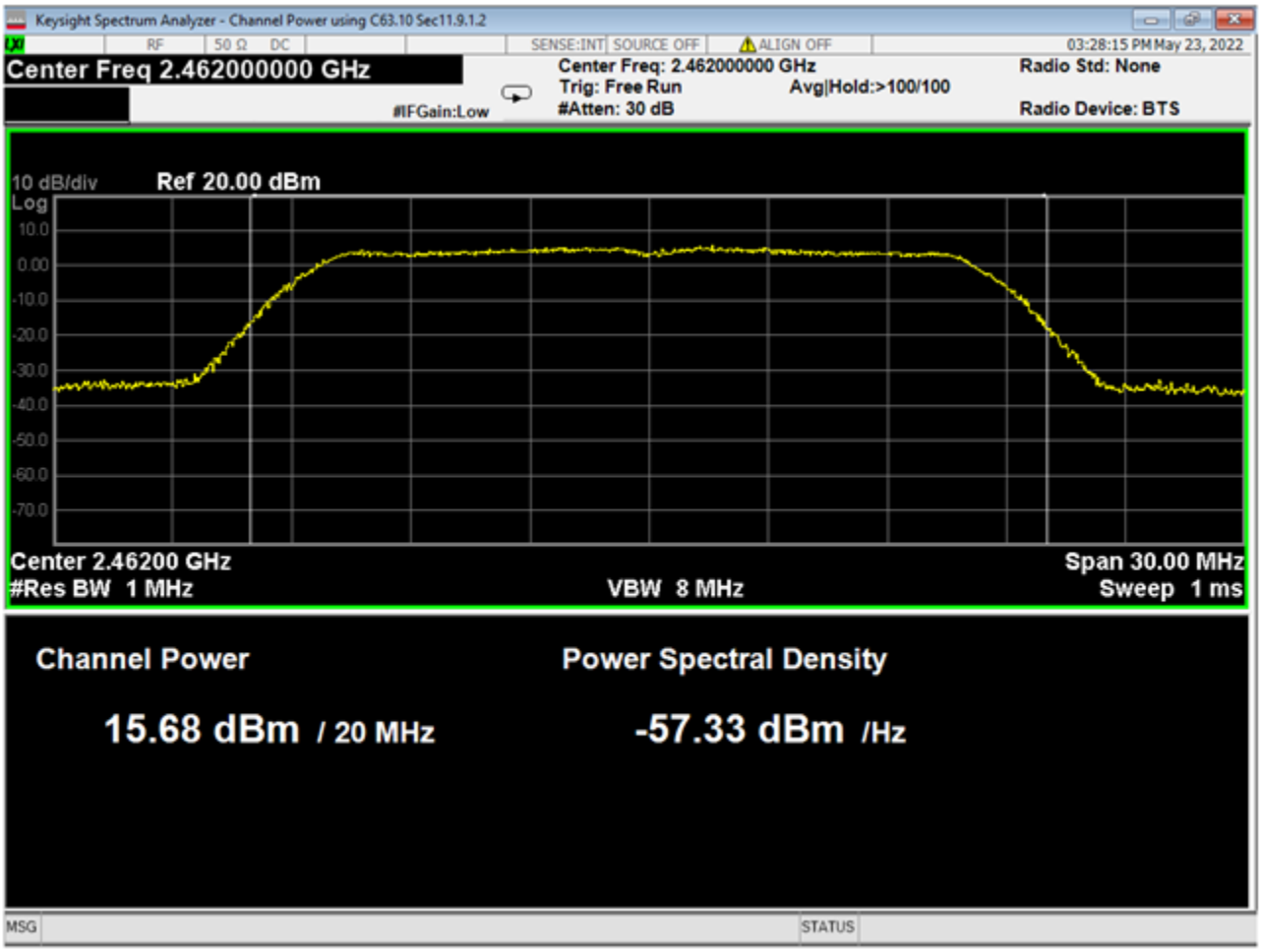

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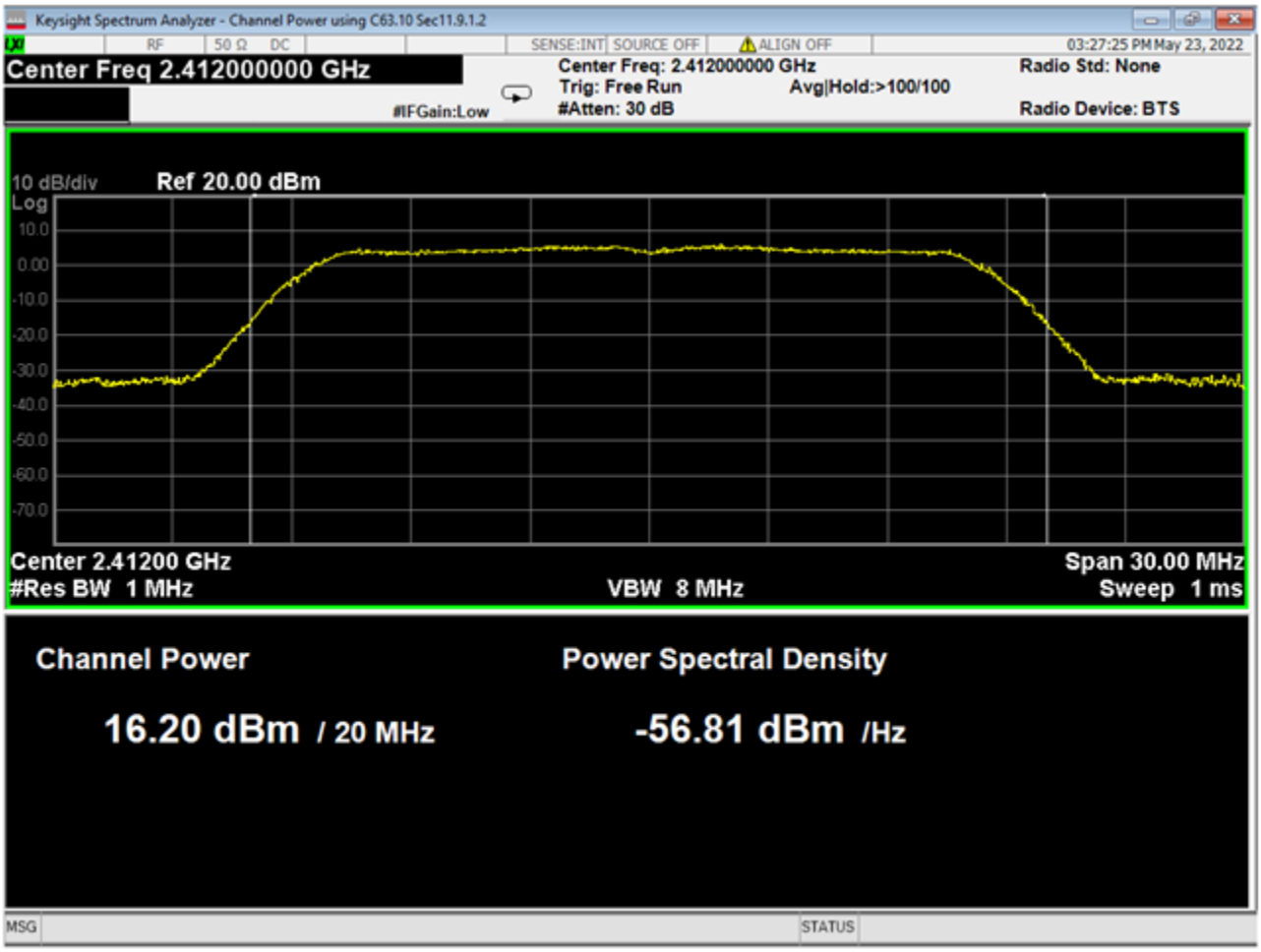

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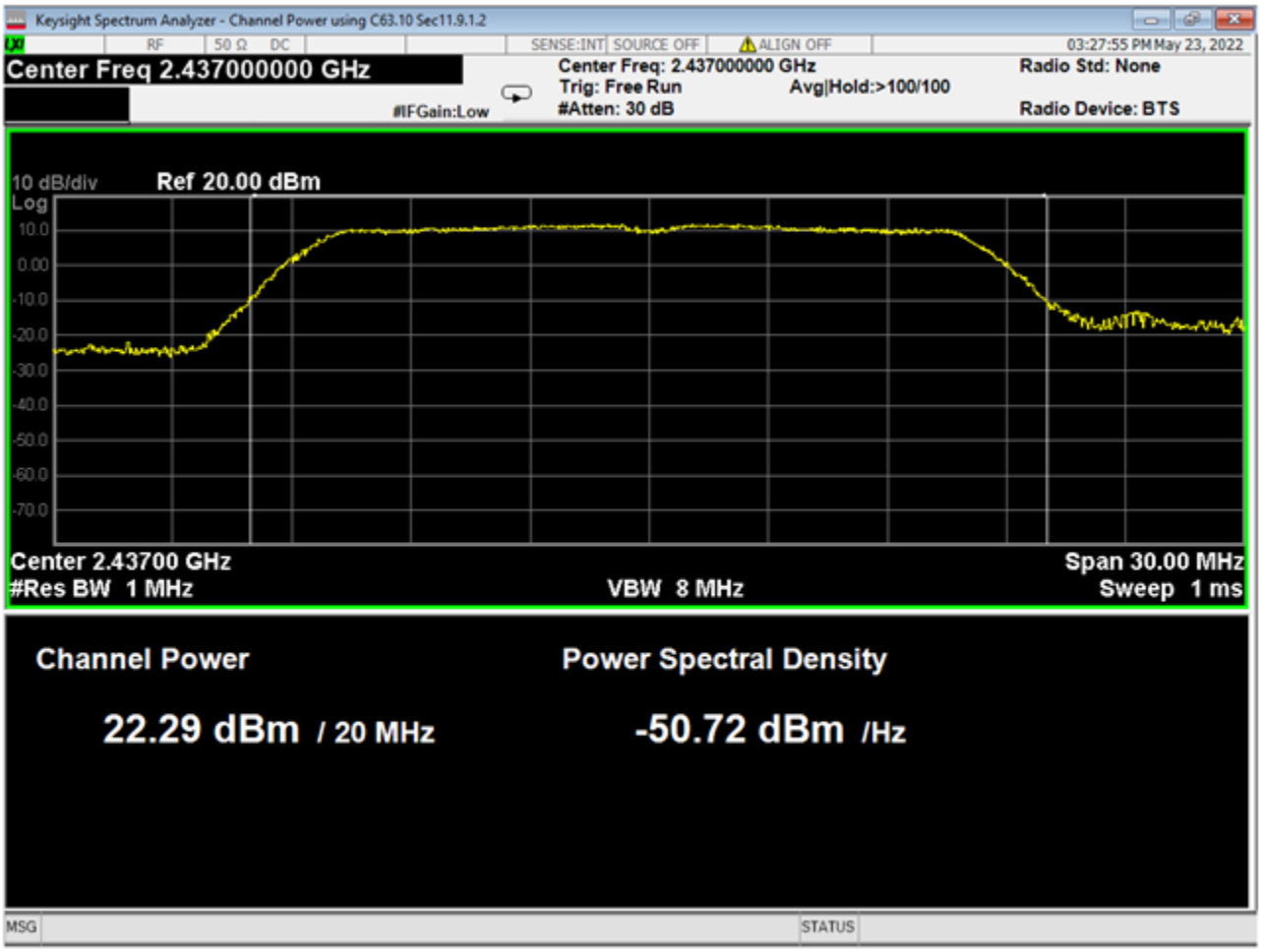

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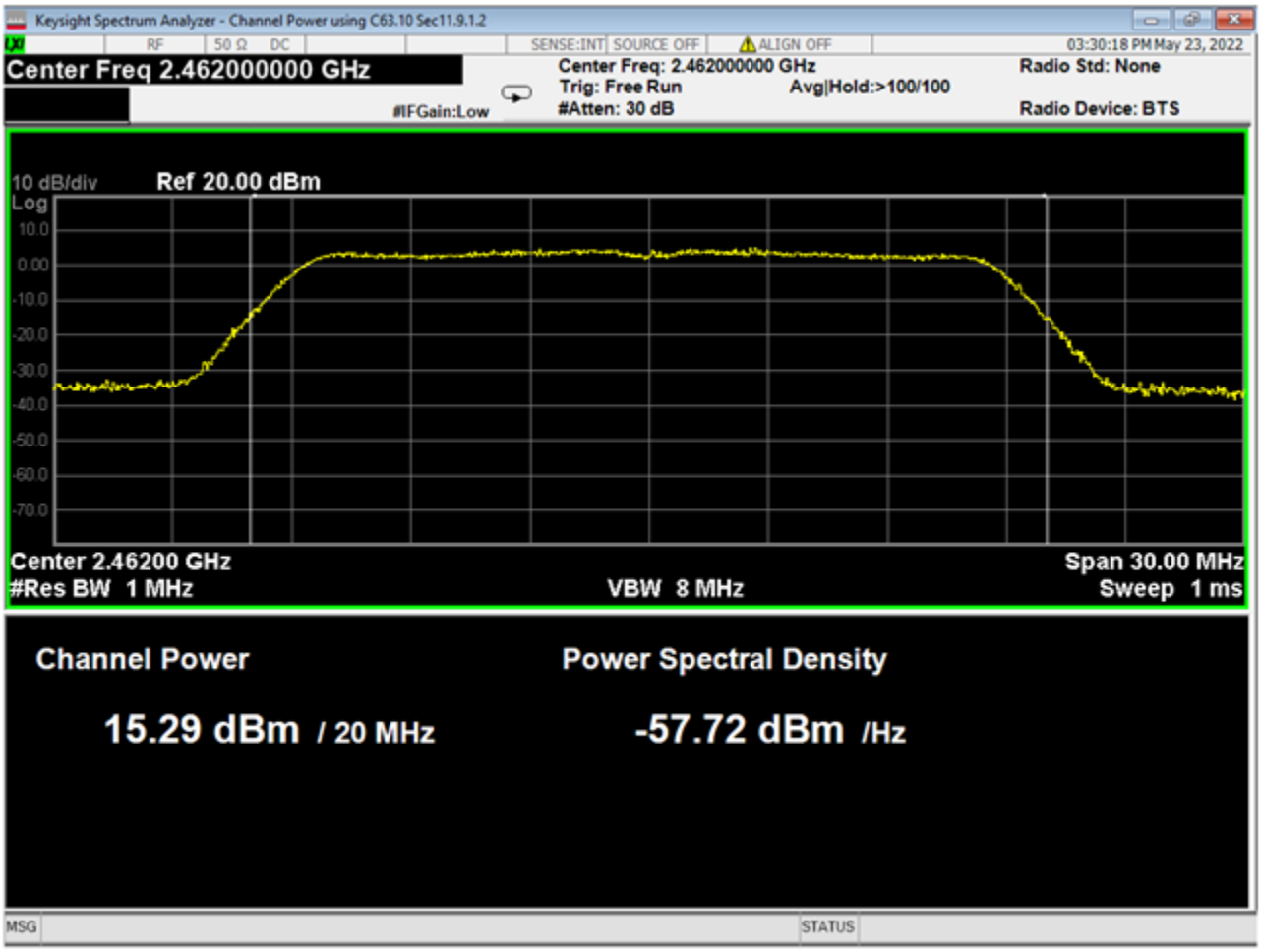

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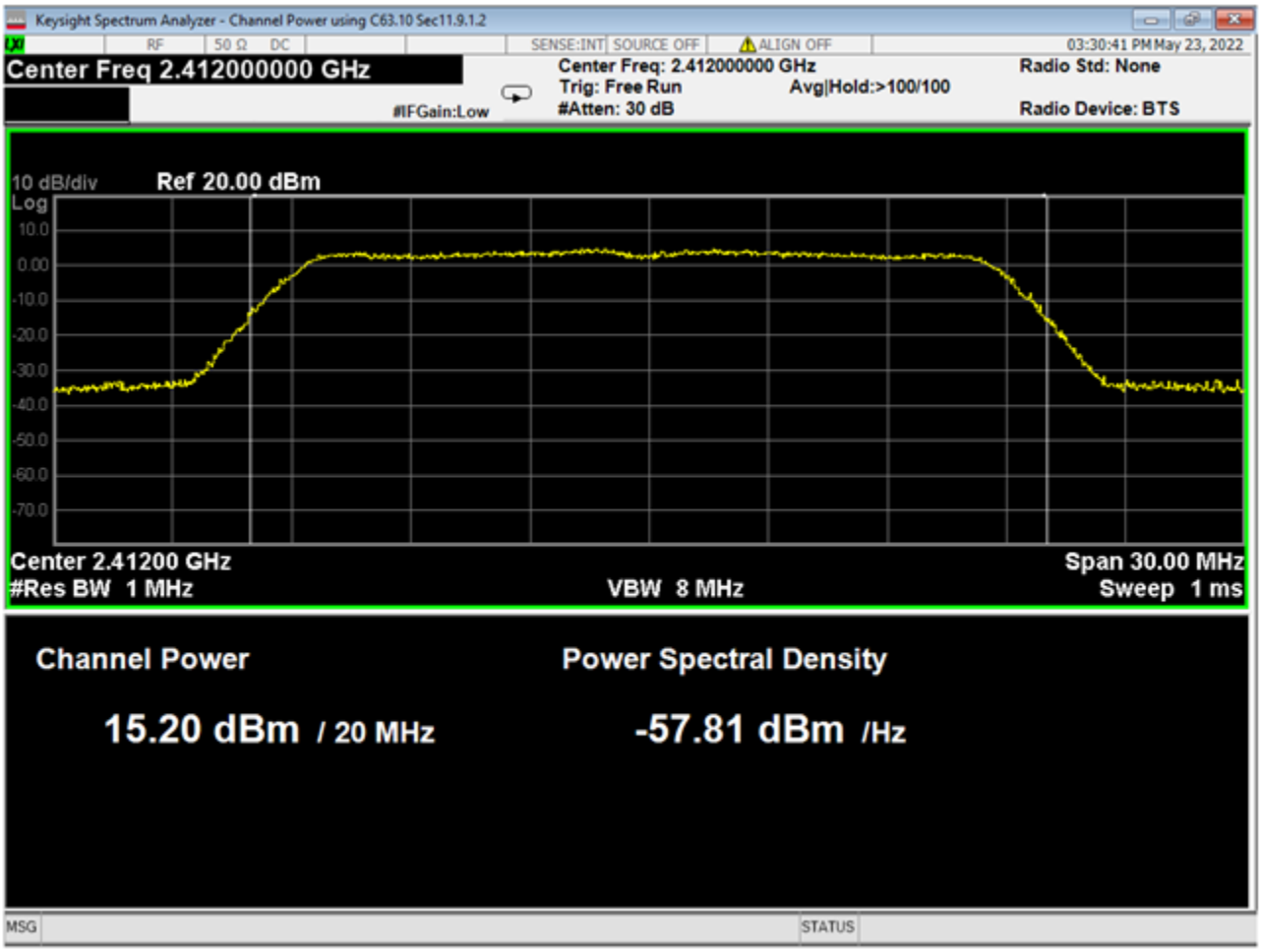

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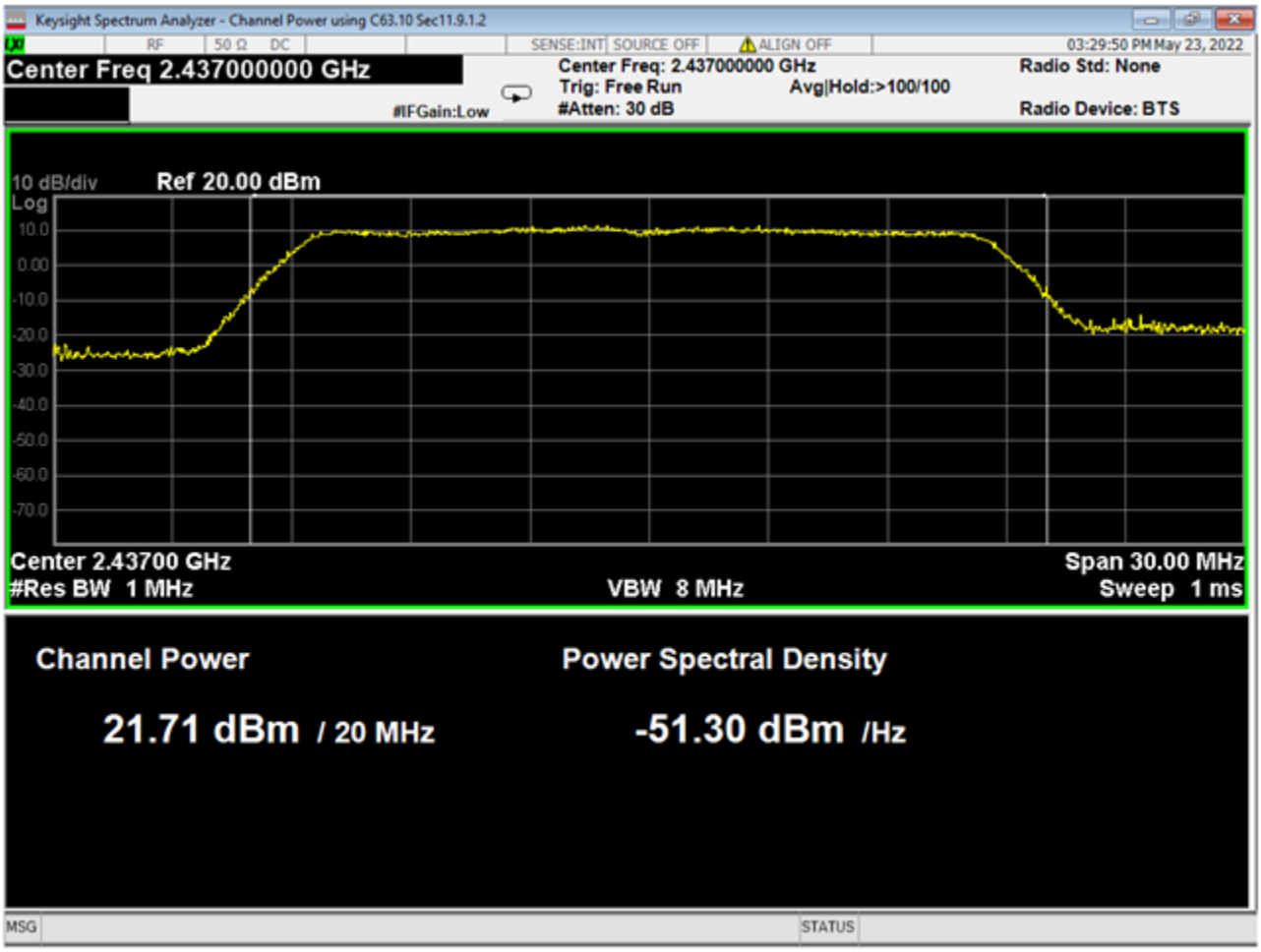

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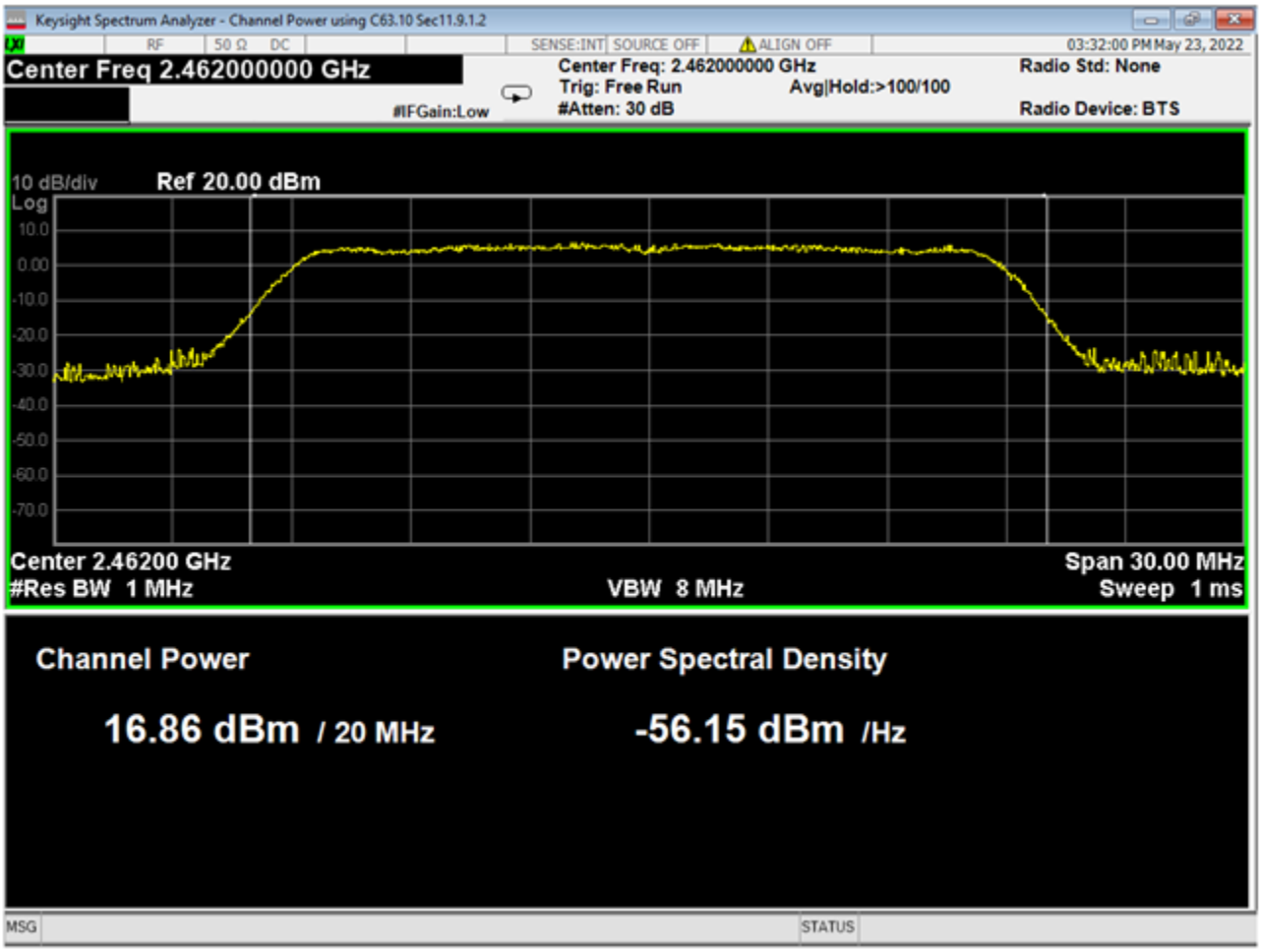

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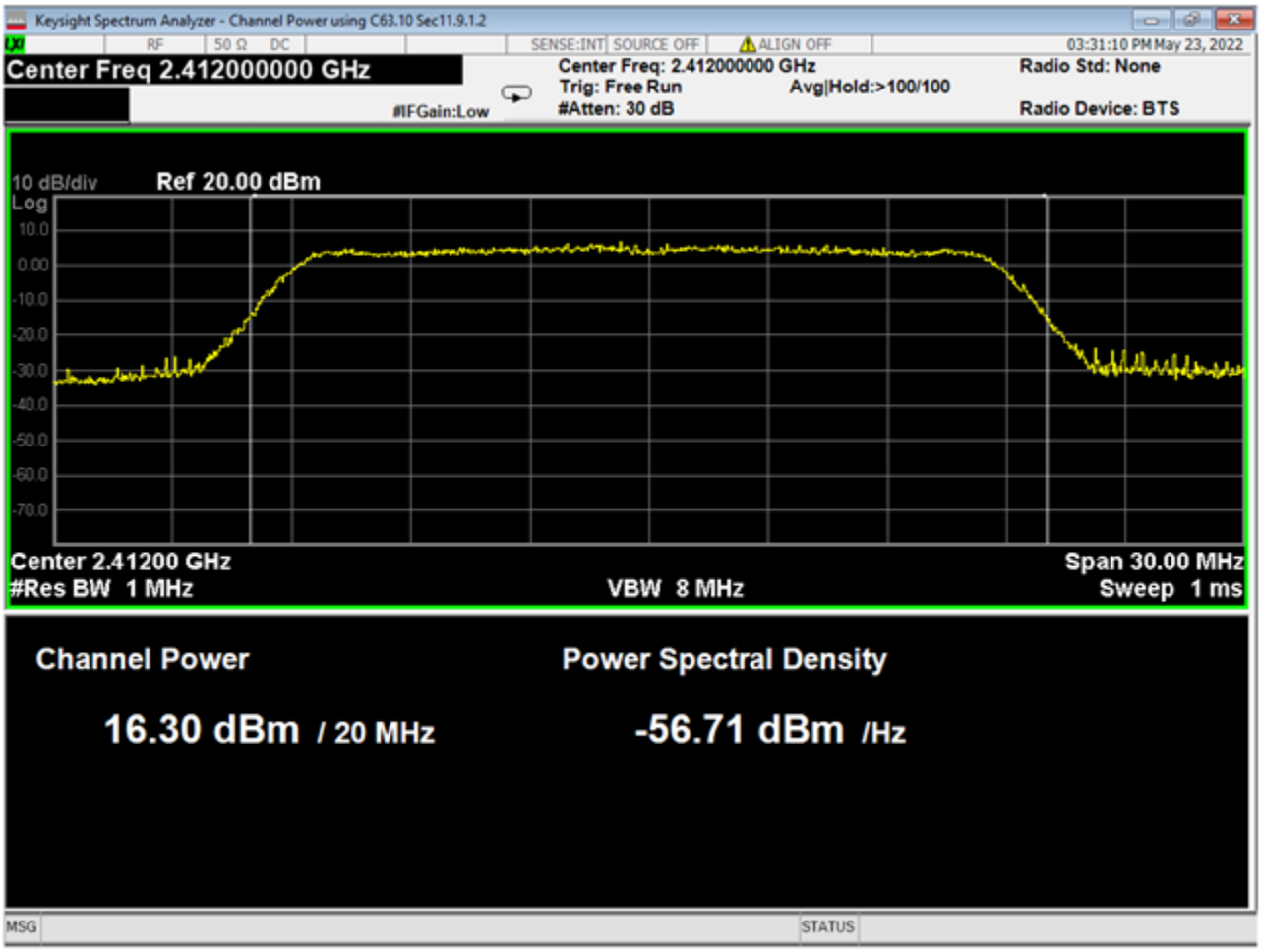

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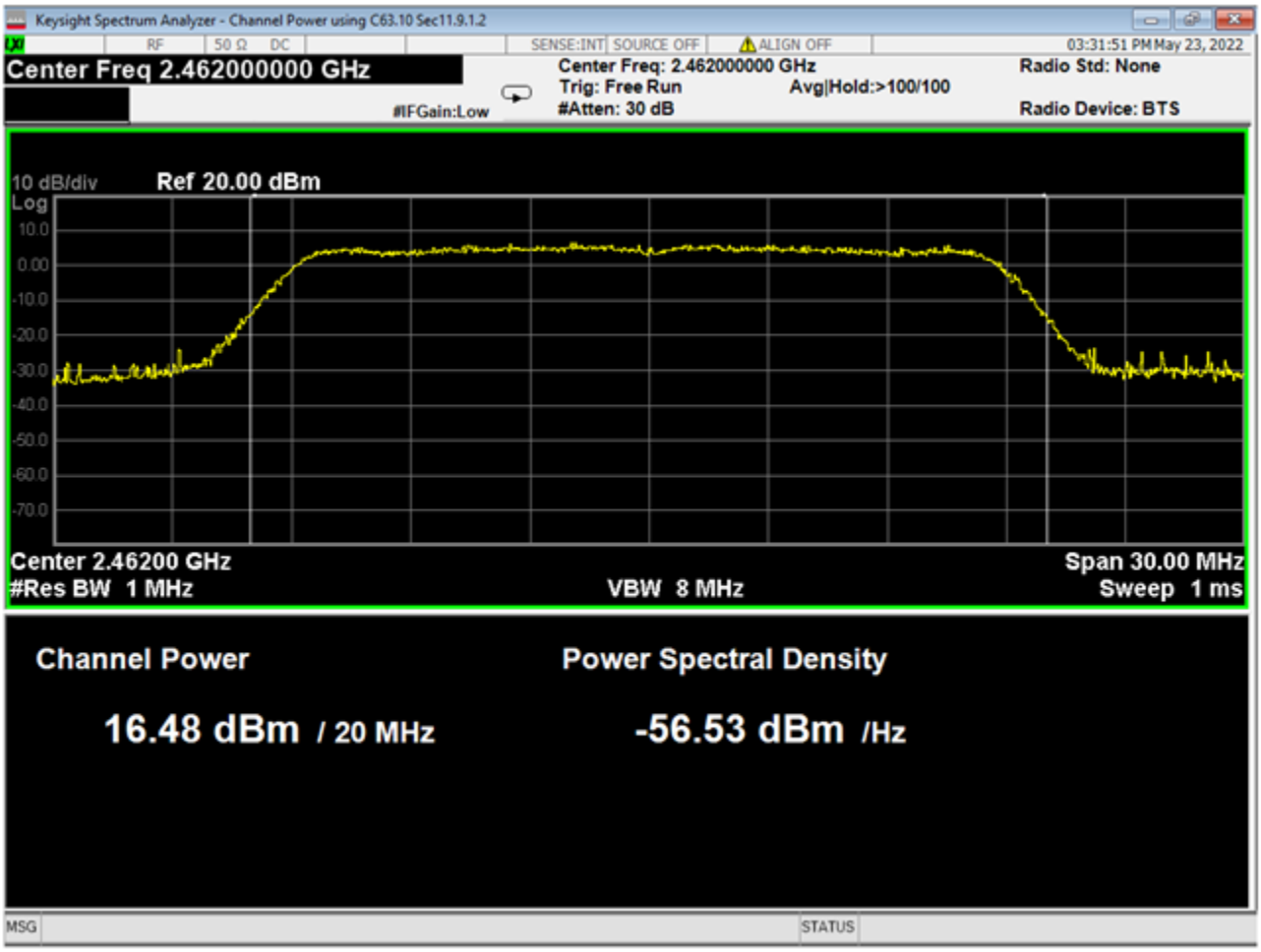

Wifi N MCS7, Mid

REPORT END