

FCC/ISED Test Report

Prepared for: Garmin International, Inc.

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

Product: A03992

Test Report No: R20200220-21-E1C

Approved by:



Nic S. Johnson, NCE

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iNARTE Certified EMC Engineer #EMC-003337-NE

DATE: 8 January 2021

Total Pages: 49

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REVISION PAGE

Rev. No.	Date	Description
0	20 March 2020	Original – NJohnson Prepared by KVepuri/CFarrington
A	13 November 2020	Updated calibration table. Includes NCEE Labs report R20200220-21-E1 and its amendment in full. -NJ
B	15 December 2020	Updated Band-Edge Measurements and test equipment table -KV/FL
C	8 January 2021	Measured duty cycle and calculated duty cycle correction factor. DCCF was applied to peak band edge measurements to calculate average value. -NJ



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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 section (Please see the checked box below for the rule part used):

FCC Part 15.249 ☑

The EUT has been tested according to the following specifications:

- (1) US Code of Federal Regulations, Title 47, Part 15
- (2) ISSED RSS-Gen, Issue 5
- (3) ISSED RSS-210, Issue 10

SUMMARY			
Requirement	Test Type and Limit	Result	Remark
FCC 15.203	Unique Antenna Requirement	Pass	PCB Antenna
FCC 15.35 RSS-Gen, 6.10	Duty cycle of pulsed emissions	N/A	Not required
NA	Maximum Peak Output Power	N/A	Informational Purpose Only
NA	Minimum Bandwidth	N/A	Informational Purpose Only
FCC 15.209 RSS-Gen, 7.1	Receiver Radiated Emissions	Pass	Meets the requirement of the limit.
FCC 15.209 RSS-Gen, 8.9 RSS-210 A1.2 FCC 15.249(a)	Transmitter Radiated Emissions	Pass	Meets the requirement of the limit.
FCC 15.209, 15.205, 15.249(d) RSS-Gen, 8.9 RSS-210, 5.5	Band Edge Measurement	Pass	Meets the requirement of the limit.
FCC 15.207 RSS-Gen. 8.8	Conducted AC Emissions	Pass	Meets the requirement of the limit.



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2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

Summary and Operating Condition:

EUT	A03992
EUT Received	13 January 2020
EUT Tested	9 March 2020- 15 December 2020
Serial No.	3319808296 (conducted antenna port measurements); 3319808343 (radiated measurements);
Operating Band	2400 – 2483.5 MHz
Device Type	☒ GMSK ☒ GFSK ☐ BT BR ☐ BT EDR 2MB ☐ BT EDR 3MB ☐ 802.11x ☒ NFC
Power Supply / Voltage	Internal Battery/ 5VDC Charger: Garmin (Phi Hong) MN: PSAF10R-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 Bluetooth Transmissions:

Channel	Frequency
Low	2402 MHz
Mid	2440/2441 MHz
High	2480 MHz

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 frequency and designations.

2.3 DESCRIPTION OF SUPPORT UNITS

None

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



3.2 TEST PERSONNEL

No.	PERSONNEL	TITLE	ROLE
1	Nic Johnson	Technical Manager	Review/editing
2	Karthik Vepuri	Test Engineer	Testing and report
3	Caleb Farrington	Test Engineer	Testing and report
4	Fox Lane	Test Technician	Testing and report
5	April Inamura	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	N9038A	MY59050109	23 Apr 2019	23 Apr 2021
Keysight EXA Signal Analyzer	N9010A	MY56070862	14 Dec 2018	14 Dec 2020**
SunAR RF Motion	JB1	A091418	March 6, 2020	March 6, 2021
EMCO Horn Antenna	3115	6415	March 16, 2020	March 16, 2022
EMCO Horn Antenna	3116	2576	March 9, 2020	March 9, 2022
Rohde & Schwarz LISN	ESH3-Z5	836679/010	August 13, 2020	August 13, 2021
Rohde & Schwarz Preamplifier**	TS-PR18	3545700803	April 14, 2020	April 14, 2022
Trilithic High Pass Filter*	6HC330	23042	April 14, 2020	April 14, 2022
MiniCircuits High Pass Filter*	VHF-1320+	15542	April 14, 2020	April 14, 2022
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	April 14, 2020	April 14, 2022
RF Cable (10m chamber bulkhead to control room bulkhead)*	FSCM 64639	01E3874	April 14, 2020	April 14, 2022
RF Cable (control room bulkhead to test receiver)*	FSCM 64639	01F1206	April 14, 2020	April 14, 2022
N connector bulkhead (10m chamber)*	PE9128	NCEEBH1	April 14, 2020	April 14, 2022
N connector bulkhead (control room)*	PE9128	NCEEBH2	April 14, 2020	April 14, 2022

*Internal Characterization ** Extended Cal

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:

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.

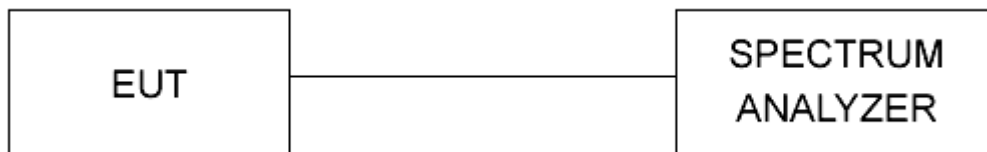


Figure 1 - Bandwidth Measurements Test Setup

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.

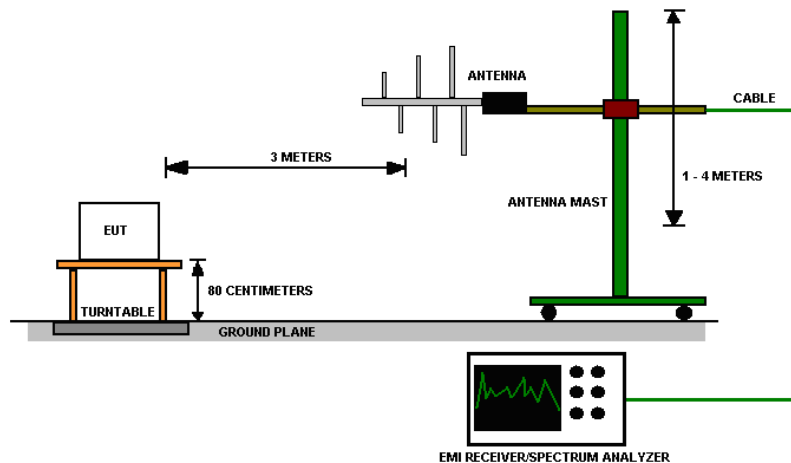


Figure 2 - Radiated Emissions Test Setup



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4.0 RESULTS



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4.1 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 15.249 Device:

For Informational Purposes only

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 the Appendix C.
2. All the measurements were found to be compliant.



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4.3 DUTY CYCLE

Test Method: ANSI C63.10-2013, Section 7.5

Duty cycle was declared by the manufacturer to be 47.5% and is source-based.

Duty cycle correction factor (DCCF) in dB = $20\log(0.454) = -6.47$ dB

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

NOTE:

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



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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.
- h. Emissions were investigated with both the GMSK GFSK radios transmitting simultaneously with the NFC radio to detect any potential intermodulation products. No additional emissions were found within the labs measurement sensitivity as a result of the simultaneous transmissions.

Test setup:

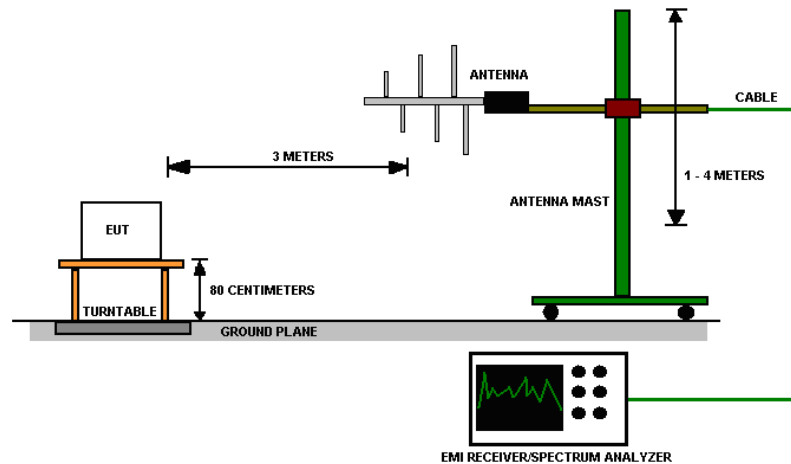


Figure 3 - Radiated Emissions Test Setup

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:

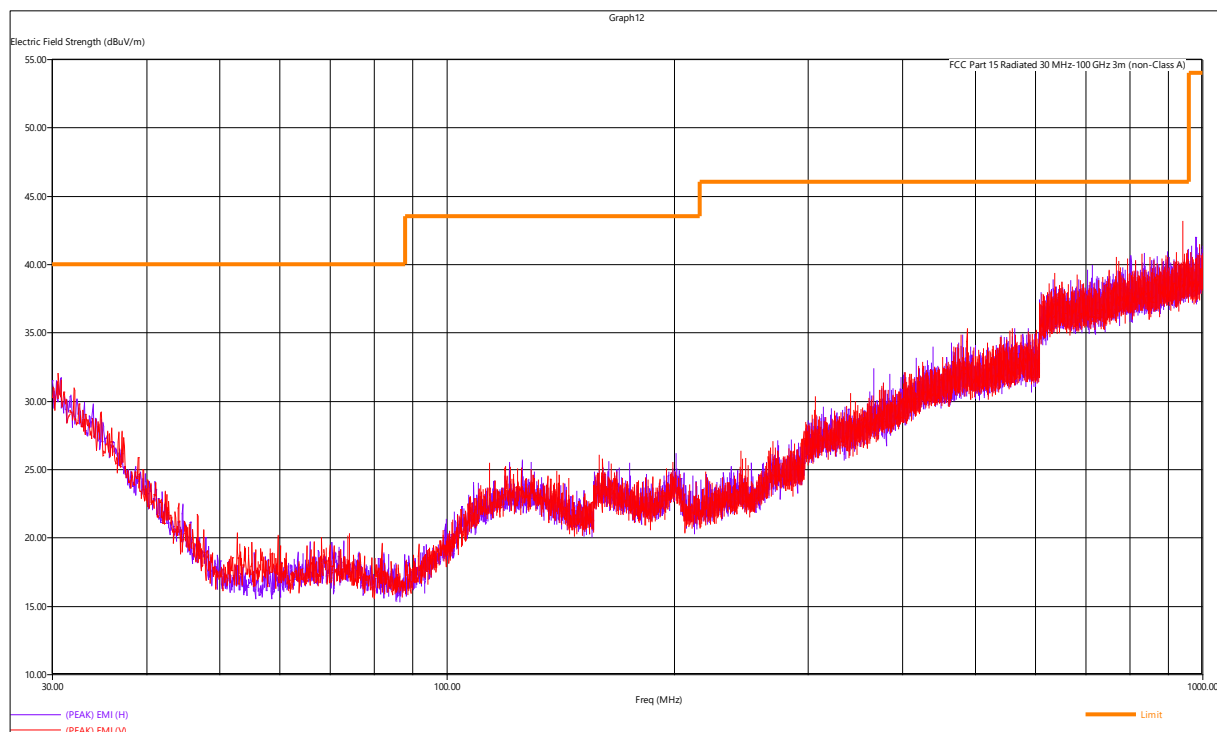


Figure 4 - Radiated Emissions Plot, Receive, GMSK

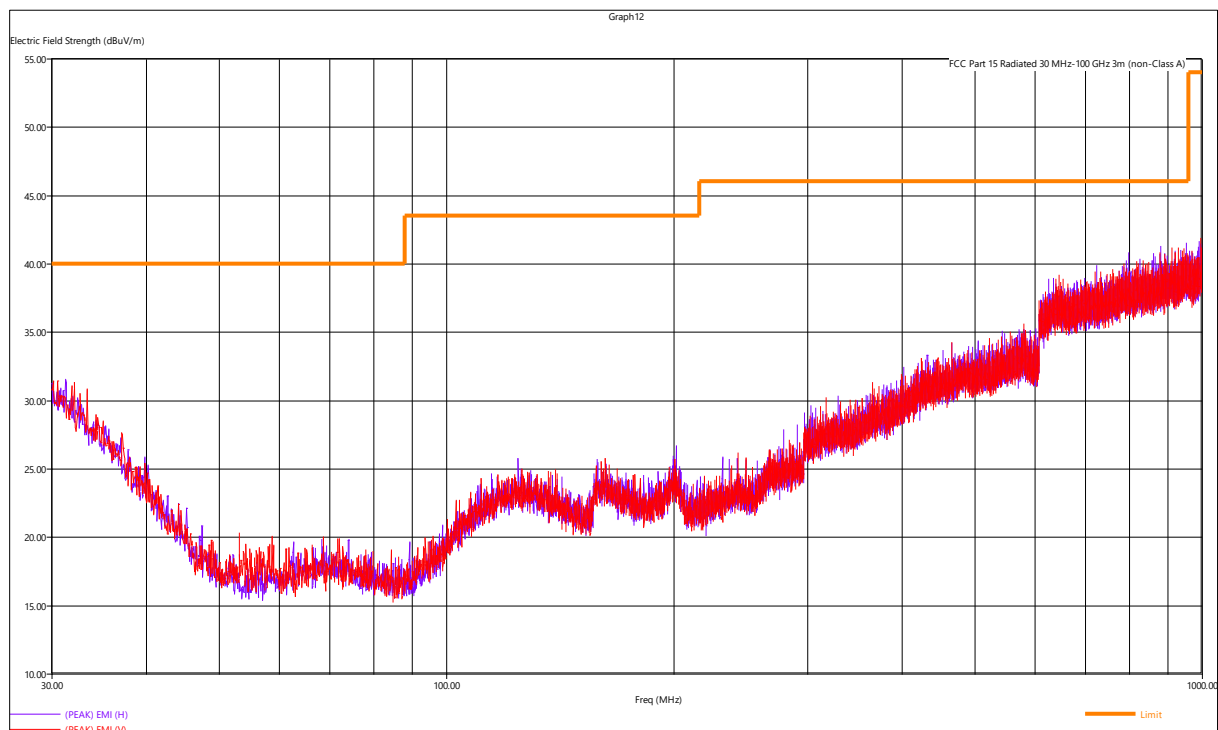


Figure 5 - Radiated Emissions Plot, Low Channel, GMSK

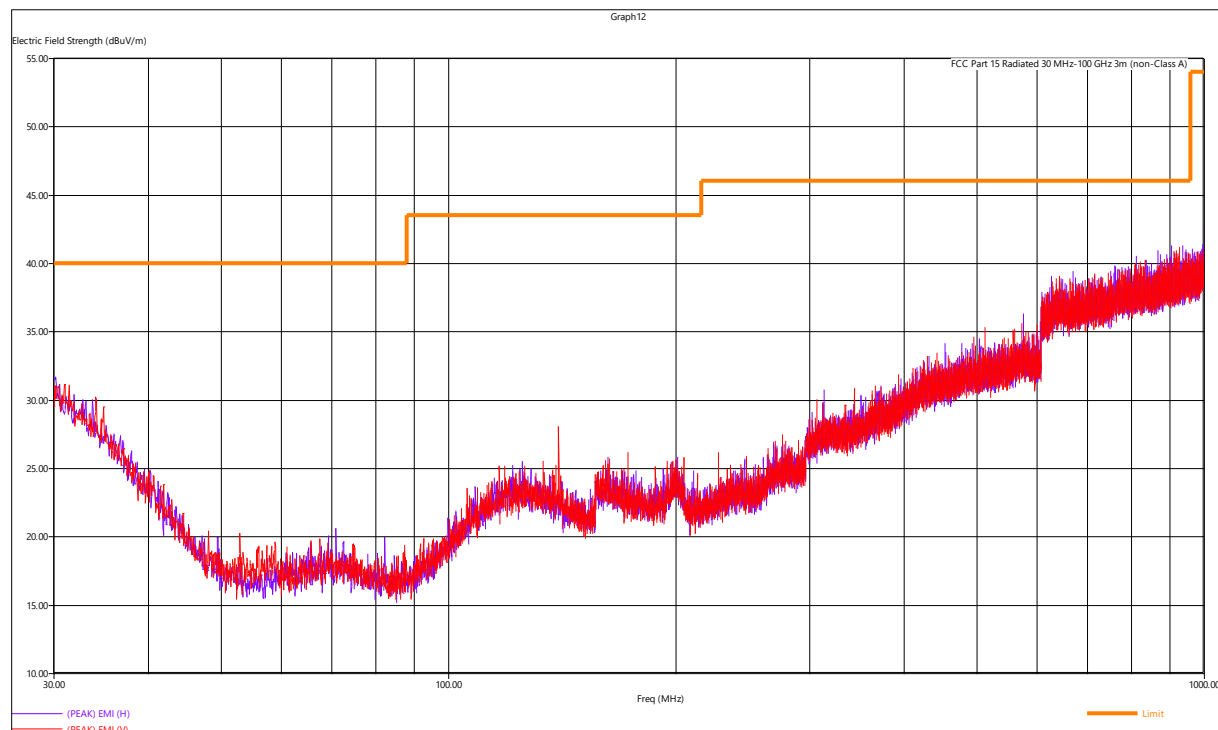


Figure 6 - Radiated Emissions Plot, Mid Channel, GMSK

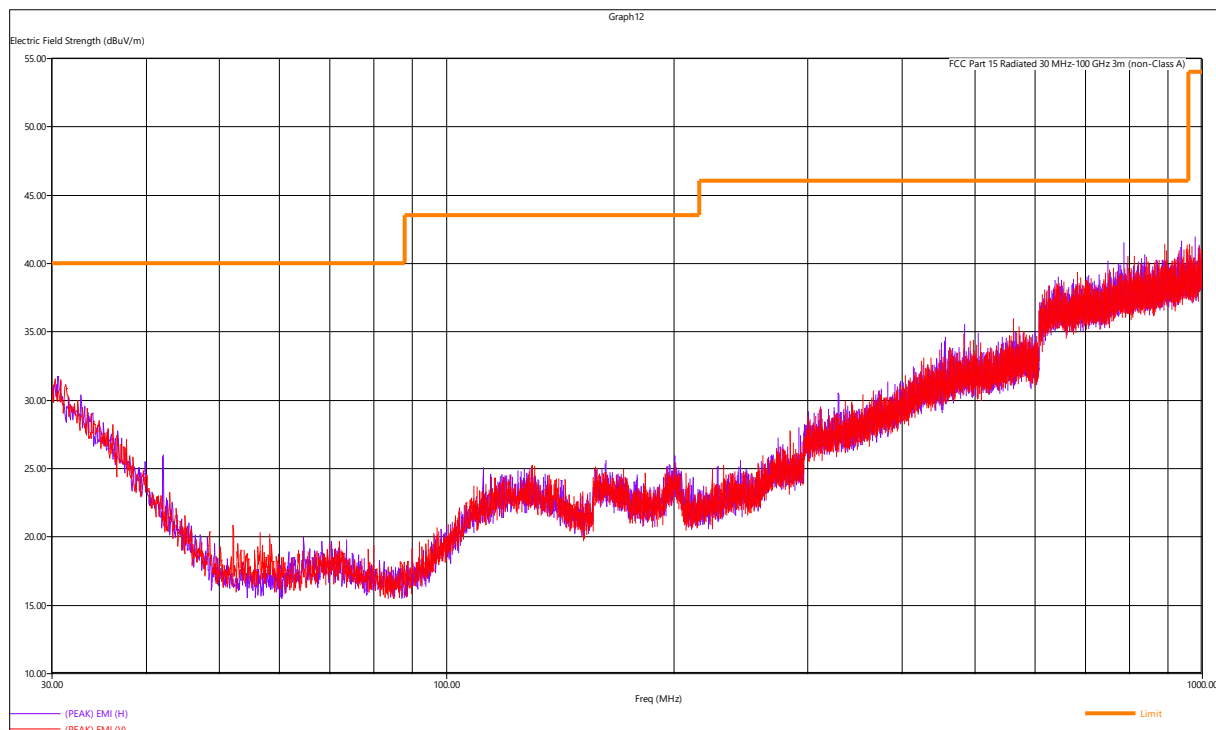


Figure 7 - Radiated Emissions Plot, High Channel, GMSK

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

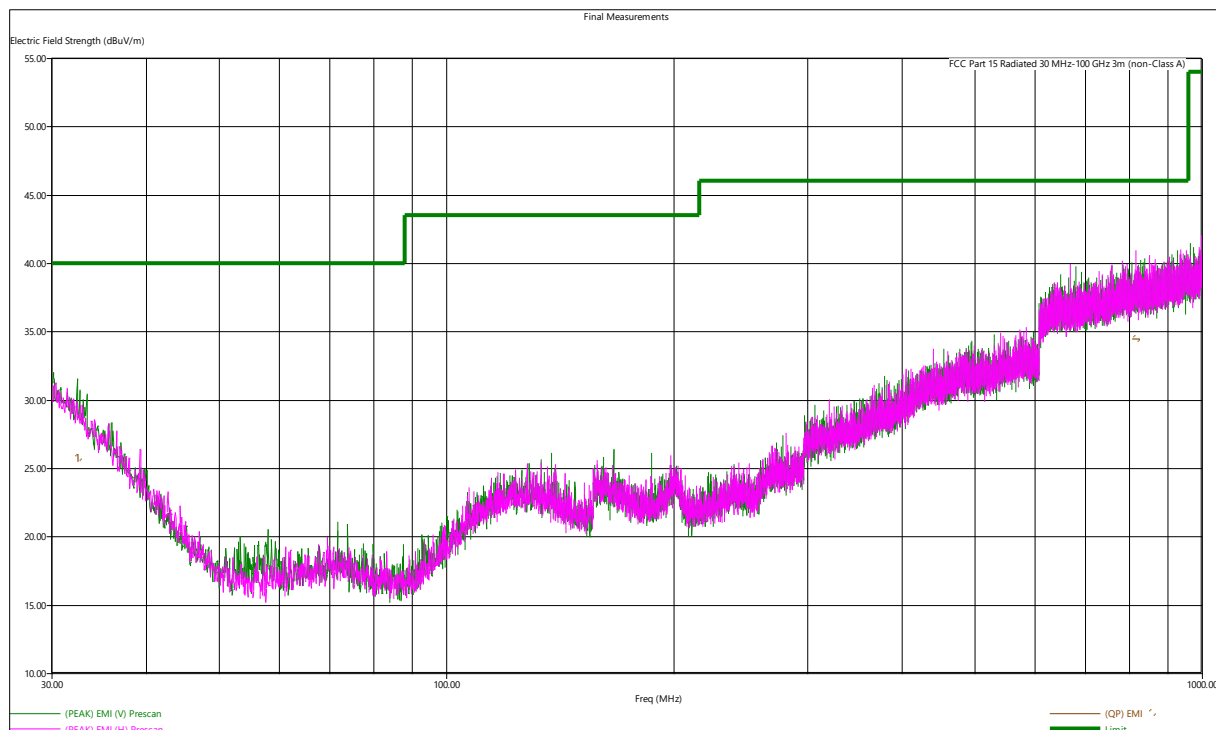


Figure 8 - Radiated Emissions Plot, Low Channel, GFSK

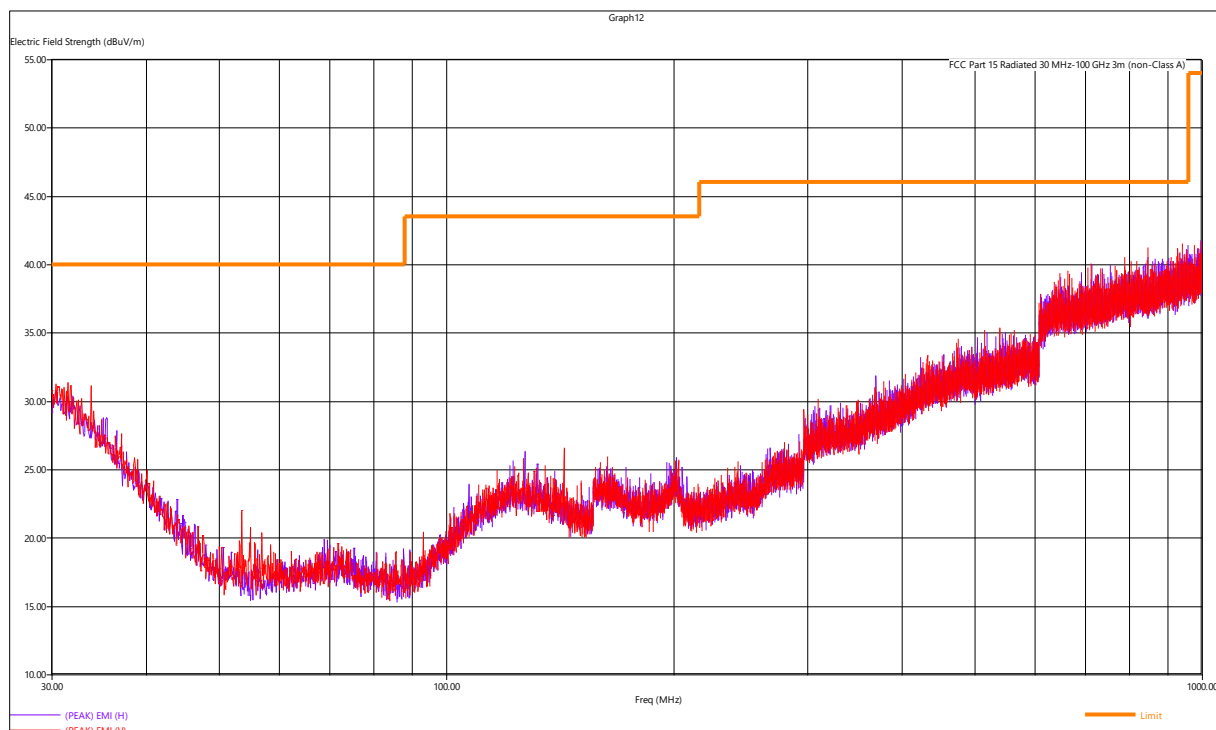


Figure 9 - Radiated Emissions Plot, Mid Channel, GFSK

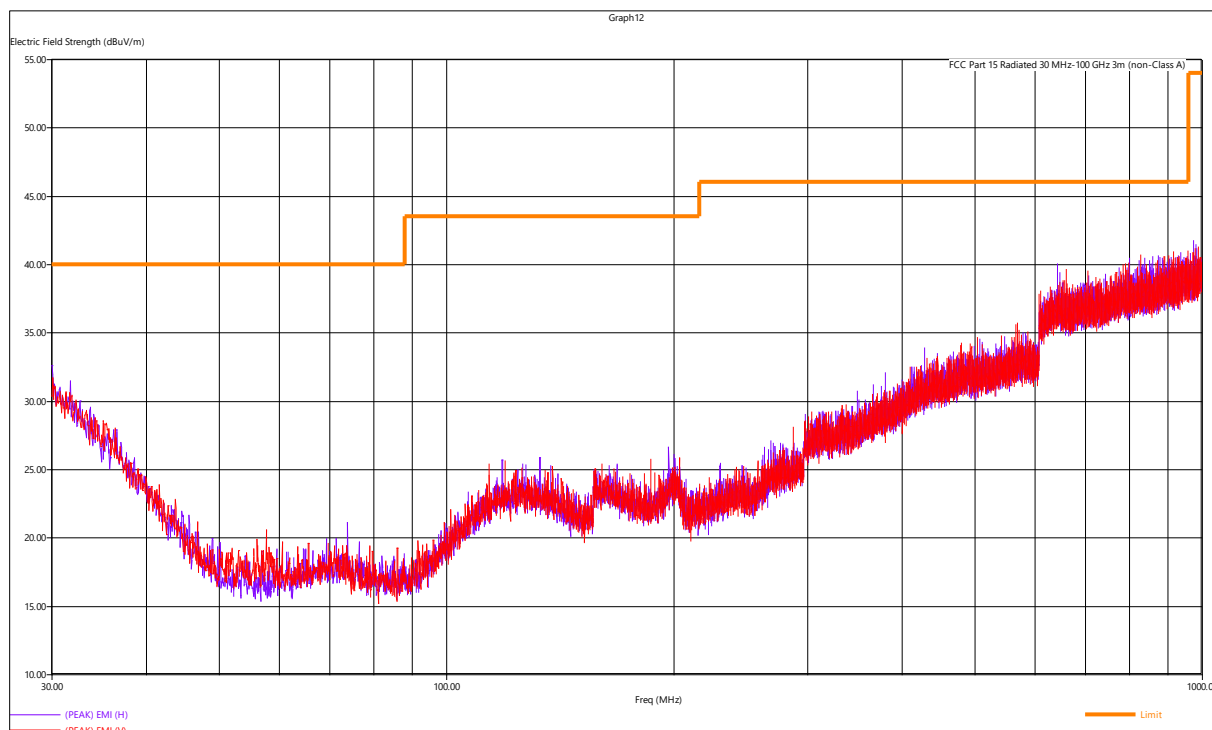


Figure 10 - Radiated Emissions Plot, High Channel, GFSK

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

Quasi-Peak Measurements, GMSK-GFSK								
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Modulation
MHz	dBμV/m	dBμV/m	dB	cm.	deg.			
817.32	34.44	46.02	11.58	193	343	H	low	GFSK
32.4	25.71	40	14.29	120	181	V	low	GFSK

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



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Peak Measurements, GMSK-GFSK								
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Modulation
MHz	dBμV/m	dBμV/m	dB	cm.	deg.			
2402.000000	92.11	94.00	1.89	204	169	H	Low	GMSK
2440.000000	93.06	94.00	0.94	195	171	H	Mid	GMSK
2480.000000	91.84	94.00	2.16	184	172	H	High	GMSK
2402.000000	93.67	94.00	0.33	202	165	H	Low	GFSK
2441.000000	92.21	94.00	1.79	199	176.00	H	Mid	GFSK
2480.000000	91.82	94.00	2.18	184	177.00	H	High	GFSK

Peak measurements were compared to average limits to show compliance with both peak and average requirements.



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4.5 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 15.249 Device:

For emissions outside of the allowed band of operation, the emission level needs to be 50dB under the maximum fundamental field strength. However, if the emissions fall within one of the restricted bands from 15.205 the field strength levels need to be under that of the limits in 15.209.

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. If the device falls under FCC Part 15.249 (Details can be found in summary of test results), compliance is shown in the unrestricted band edges by showing minimum delta of 50 dB between peak and the band edge.
4. 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.

Unrestricted Peak Band-Edge							
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Highest out of band level (dBuV/m @ 3m)	Measurement Type	Limit (dBuV/m @ 3m)	Margin	Result
Low	GMSK	2400.00	58.38	Peak	73.98	15.60	PASS
Low	GFSK	2400.00	56.45	Peak	73.98	17.53	PASS
High	GMSK	2483.50	51.79	Peak	73.98	22.19	PASS
High	GFSK	2483.50	51.56	Peak	73.98	22.42	PASS

*Limit shown is the peak limit from FCC Part 15.209

Unrestricted Average Band-Edge							
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Highest out of band level (dBuV/m @ 3m)	Measurement Type	Limit (dBuV/m @ 3m)	Margin	Result
Low	GMSK	2400.00	51.91	AVG	53.98	2.07	PASS
Low	GFSK	2400.00	49.98	AVG	53.98	4.00	PASS
High	GMSK	2483.50	45.32	AVG	53.98	8.66	PASS
High	GFSK	2483.50	45.09	AVG	53.98	8.89	PASS

*Limit shown is the average limit from FCC Part 15.209

Peak Restricted Band-Edge							
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Highest out of band level (dBuV/m @ 3m)	Measurement Type	Limit (dBuV/m @ 3m)	Margin	Result
Low	GMSK	2390.00	51.00	Peak	73.98	22.98	PASS
Low	GFSK	2390.00	50.96	Peak	73.98	23.02	PASS
High	GMSK	2483.50	55.01	Peak	73.98	18.97	PASS
High	GFSK	2483.50	52.10	Peak	73.98	21.88	PASS

*Limit shown is the peak limit from FCC Part 15.209

Average Restricted Band-Edge							
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Highest out of band level (dBuV/m @ 3m)	Measurement Type	Limit (dBuV/m @ 3m)	Margin	Result
Low	GMSK	2390.00	44.53	AVG	53.98	9.45	PASS
Low	GFSK	2390.00	44.49	AVG	53.98	9.49	PASS
High	GMSK	2483.50	48.54	AVG	53.98	5.44	PASS
High	GFSK	2483.50	45.63	AVG	53.98	8.35	PASS

*Limit shown is the average limit from FCC Part 15.209

Average value = peak value + duty cycle correction (-6.86). See Section 4.3 for details.



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Corrections used for above table			
CHANNEL	Band edge type	Band edge /Measurement Frequency (MHz)	Corrections
Low	Unrestricted	2400.00	Cable Loss= 5.96 dB; Antenna Factor = 28.38 dB
Low	Restricted	2390.00	Cable Loss= 5.96 dB; Antenna Factor = 28.389 dB
High	Unrestricted	2483.50	Cable Loss= 5.98 dB; Antenna Factor = 28.39 dB
High	Restricted	2483.50	Cable Loss= 5.98 dB; Antenna Factor = 28.39 dB

4.6 CONDUCTED AC MAINS EMISSIONS

Test Method: ANSI C63.10-2013, Section(s) 6.2

Limits for conducted emissions measurements:

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

Notes:

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

Test Procedures:

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

Deviation from the test standard:

No deviation

EUT operating conditions:

Details can be found in section 2.1 of this report.

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Test Results:

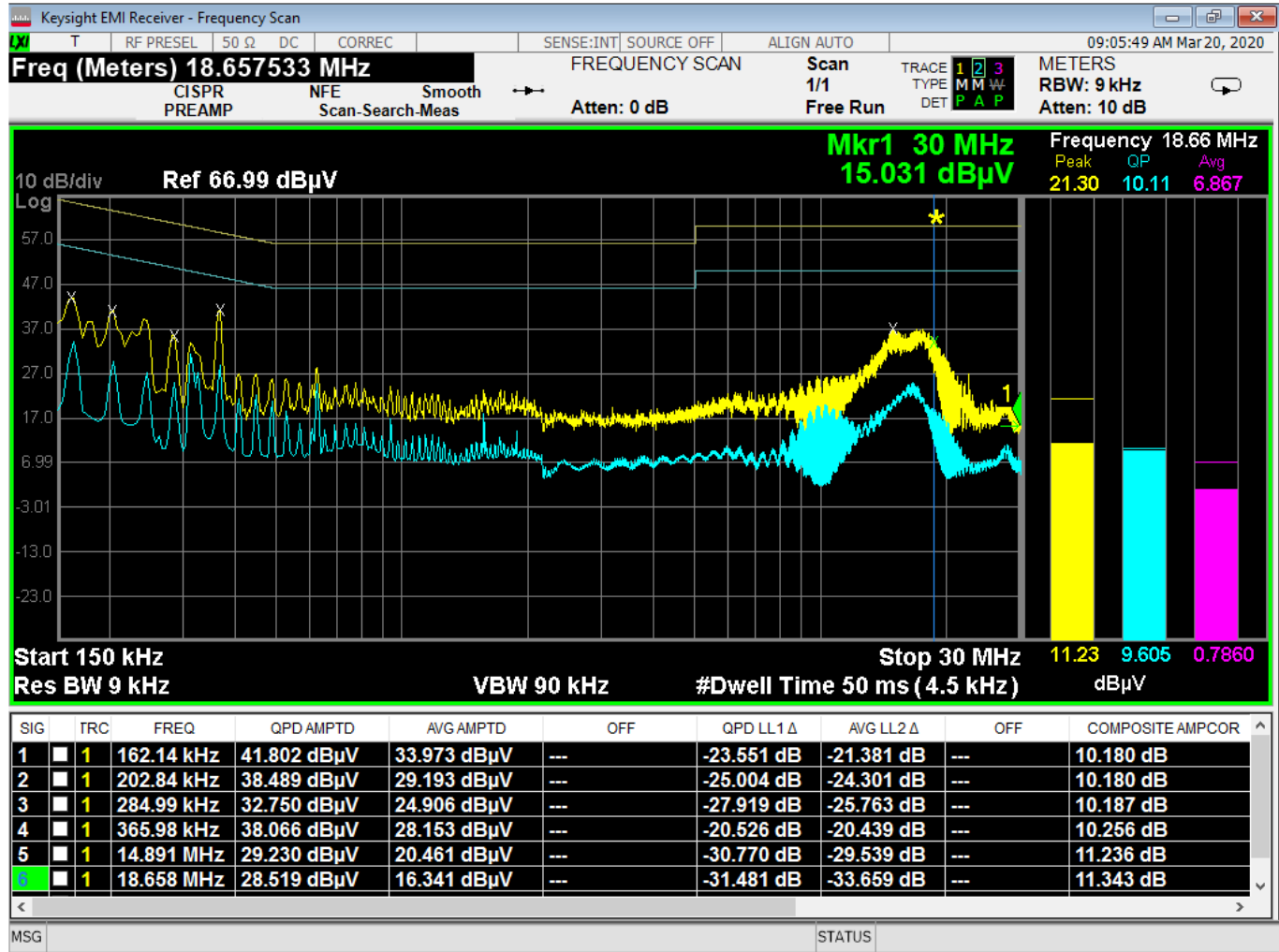


Figure 11 - Conducted Emissions Plot, Line

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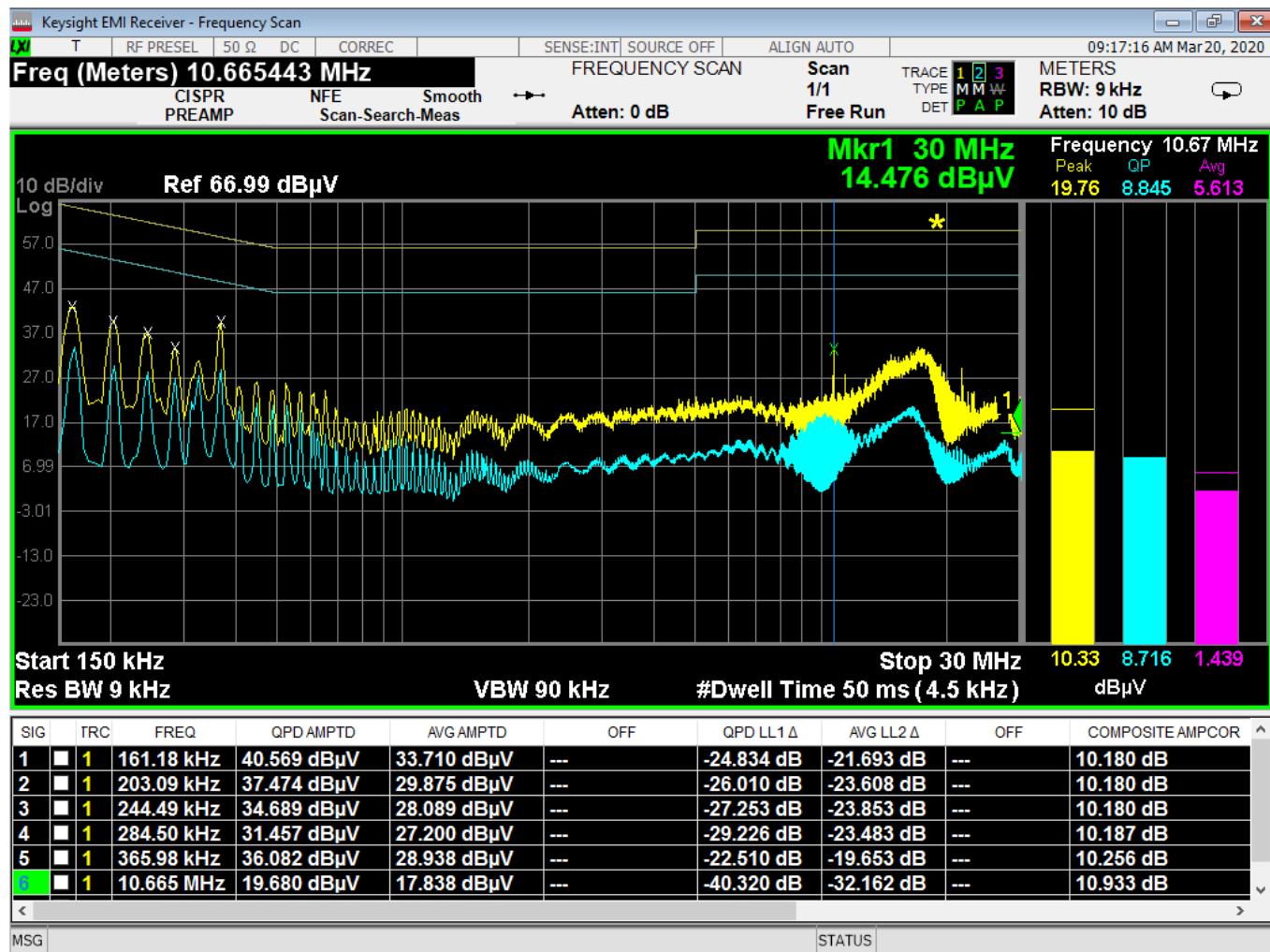


Figure 12 - Conducted Emissions Plot, Neutral



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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 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.



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EIRP Calculations

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

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

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

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

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

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

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

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

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

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



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APPENDIX B – MEASUREMENT UNCERTAINTY

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

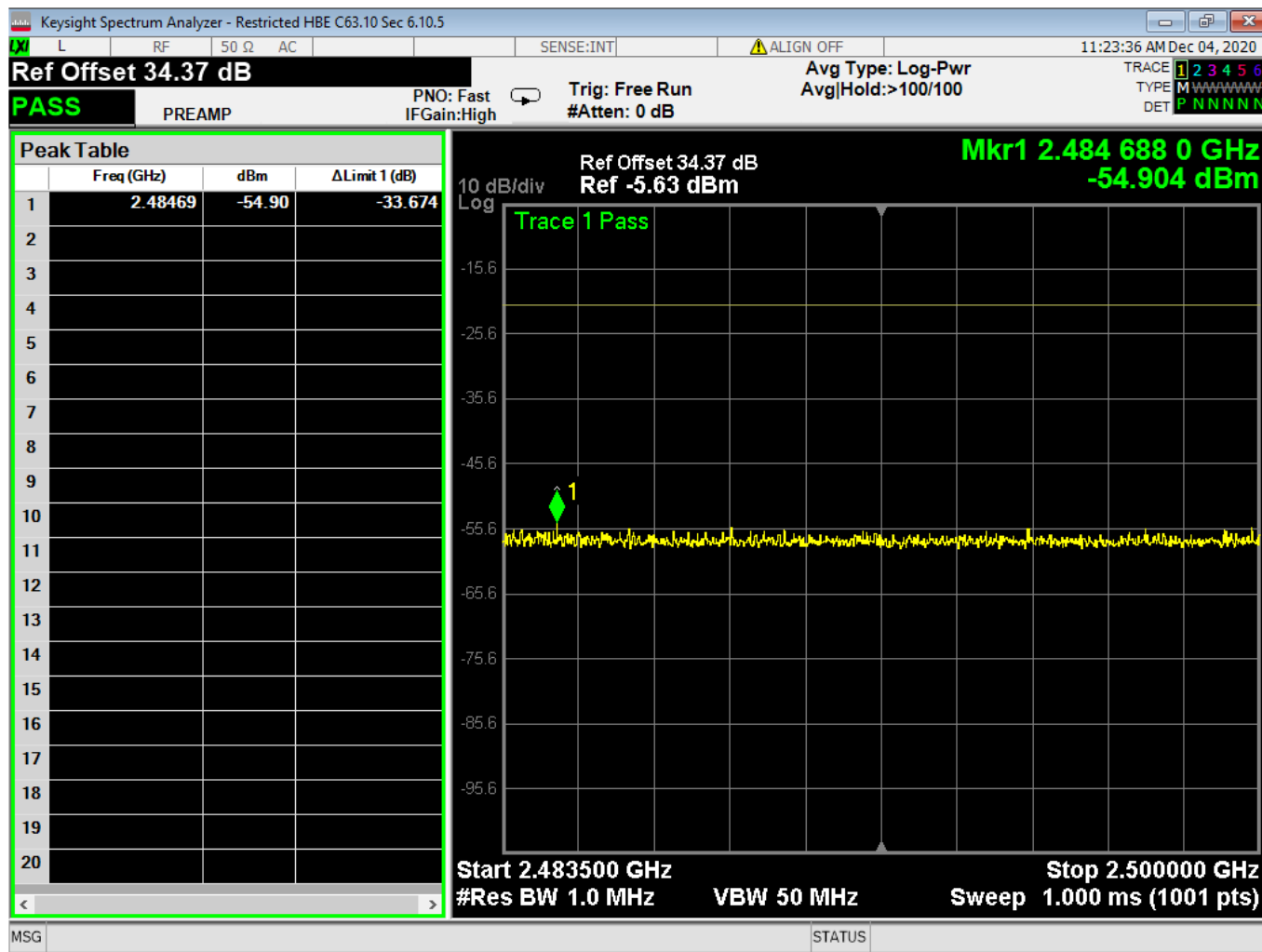
Test	Frequency Range	Uncertainty Value (dB)
Radiated Emissions, 3m	30MHz - 1GHz	3.82
Radiated Emissions, 3m	1GHz - 18GHz	4.44
Emissions limits, conducted	30MHz – 18GHz	±3.30 dB

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



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APPENDIX C – GRAPHS AND TABLES

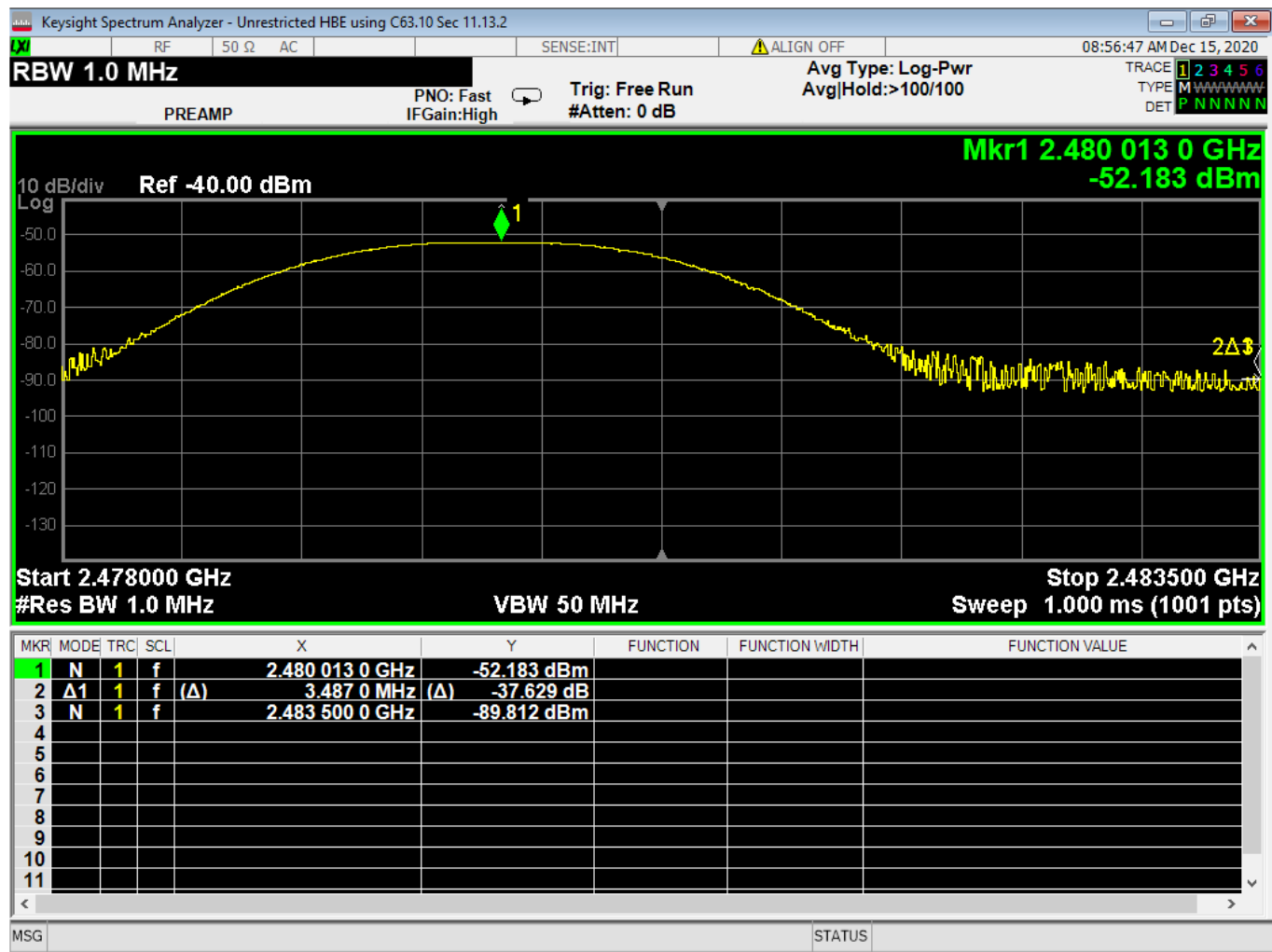


GFSK High Band-Edge restricted

Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.

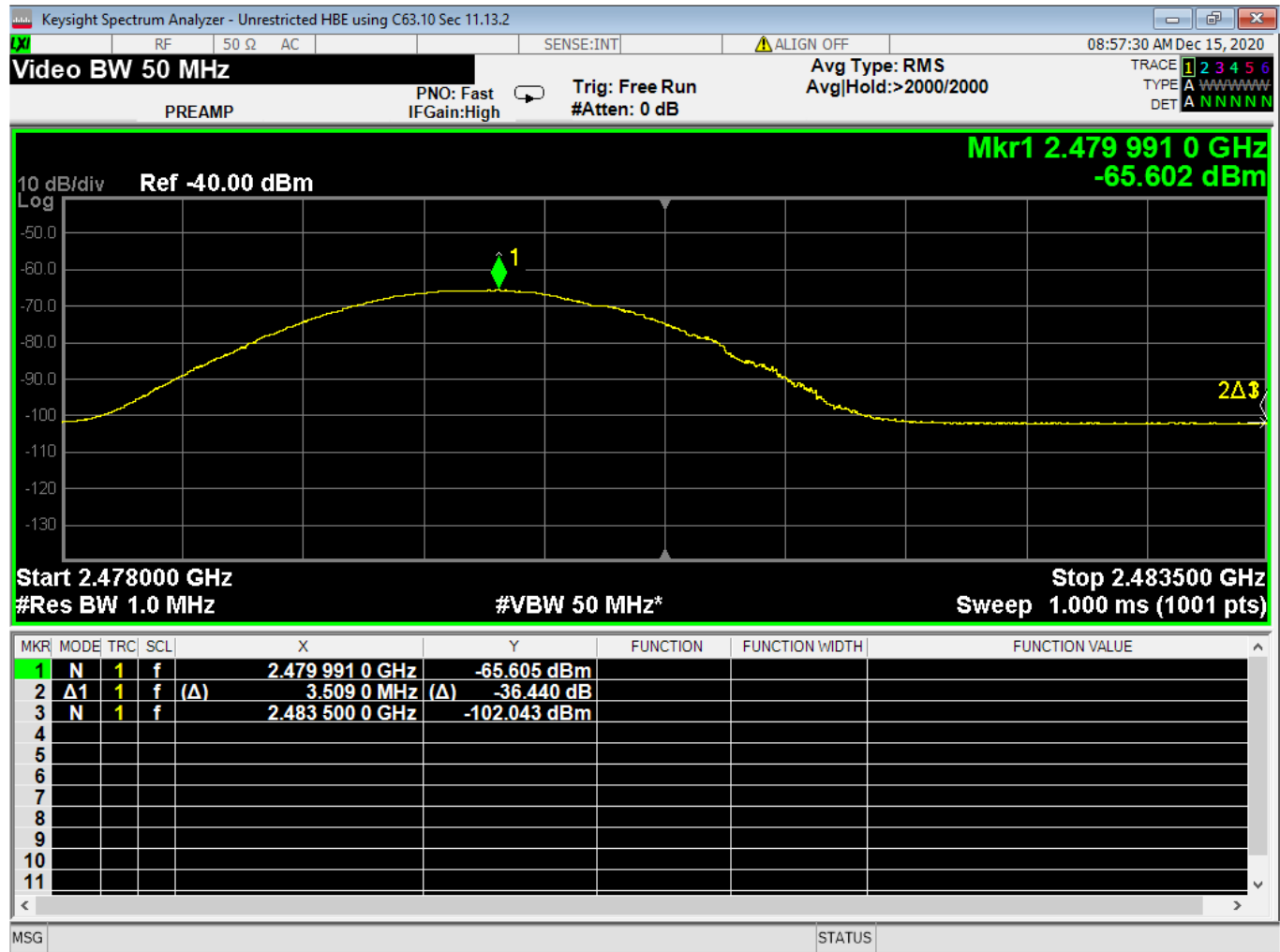


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GFSK High Band-Edge unrestricted

Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.



GFSK High Band-Edge unrestricted Average

Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.

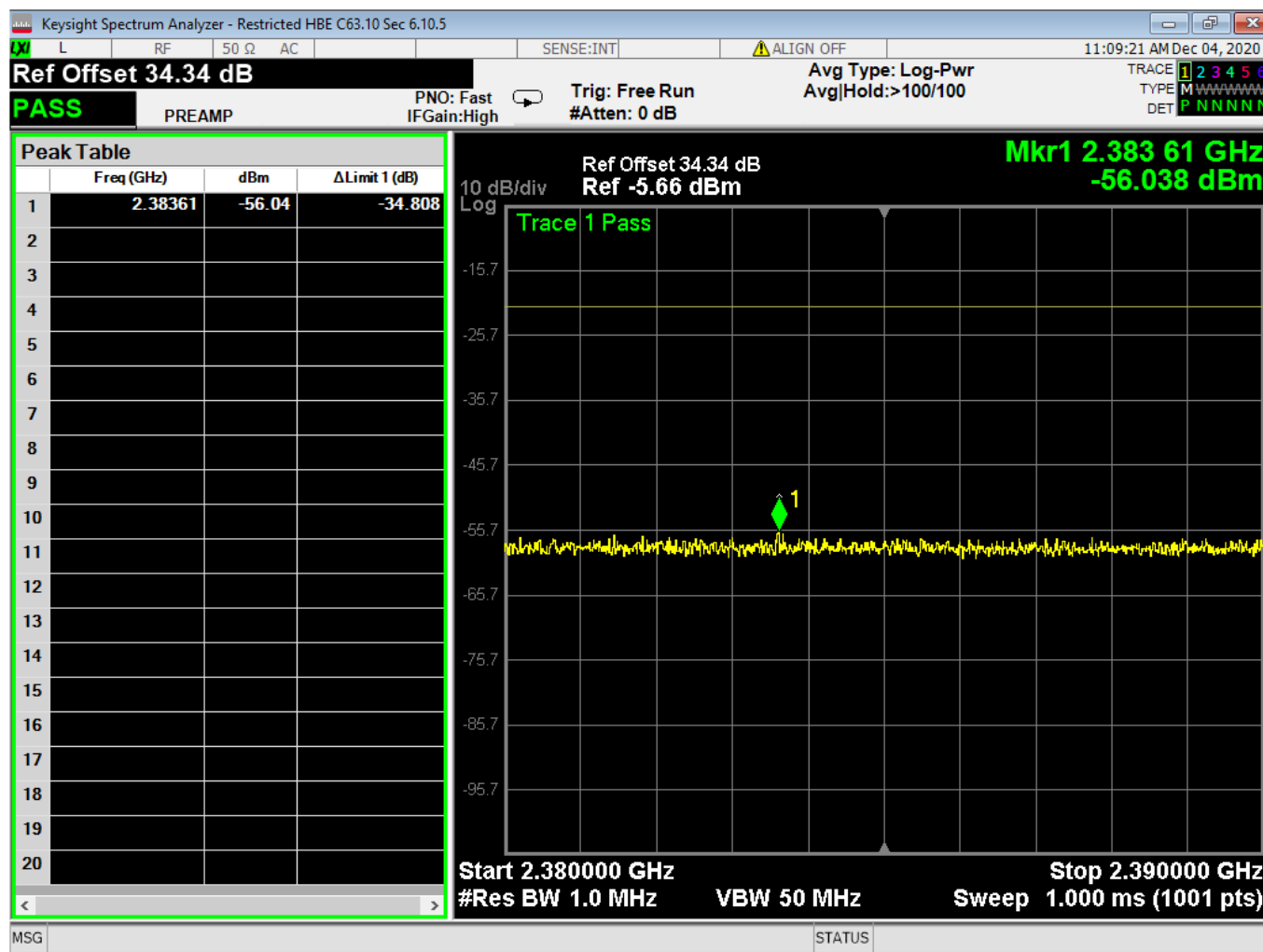


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GFSK Low Band-Edge restricted

Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.

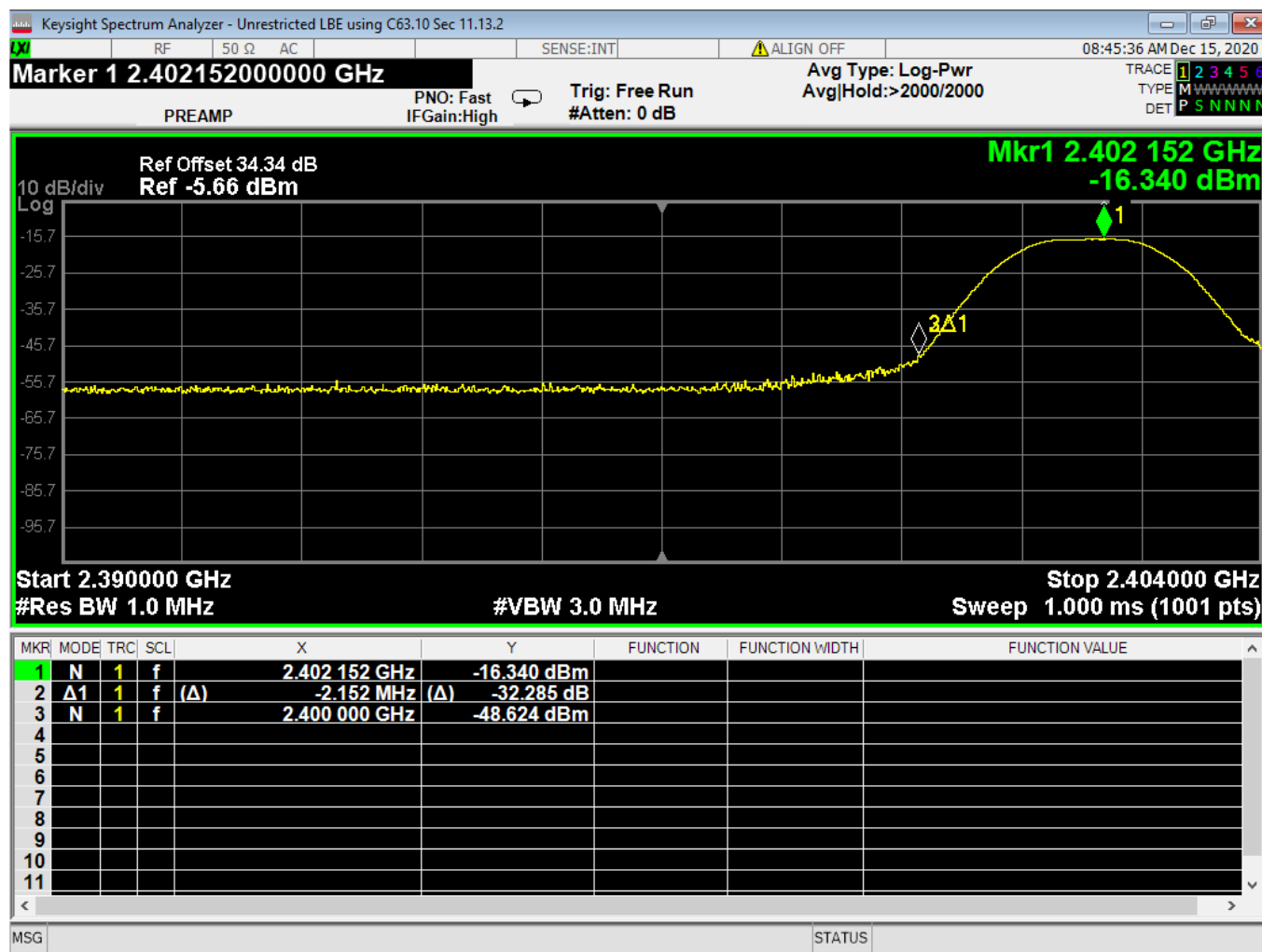


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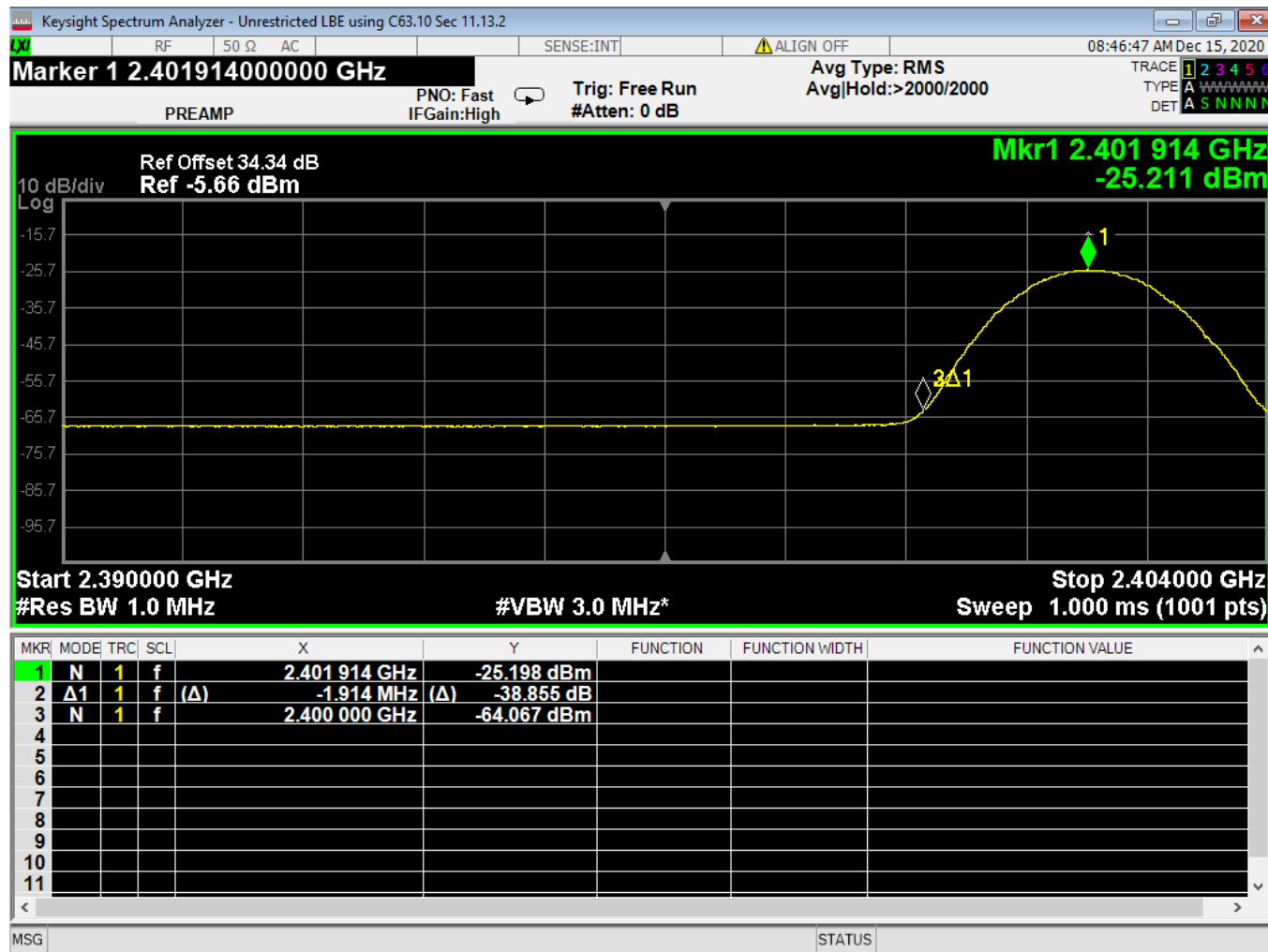
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GMSK Low Band-Edge Unrestricted

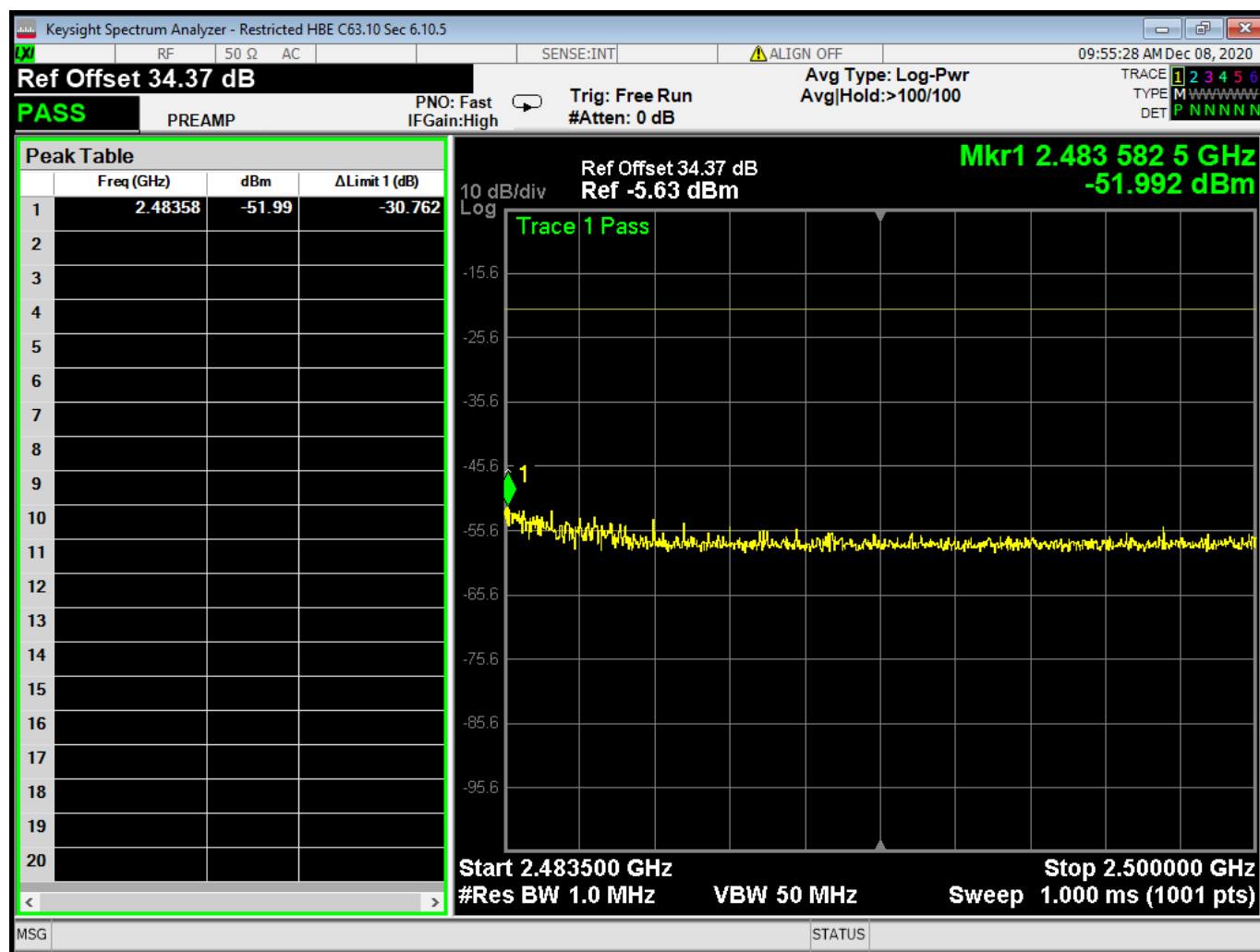
Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.



GMSK Low Band-Edge Unrestricted Average

Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.

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GMSK High Band-Edge restricted

Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.

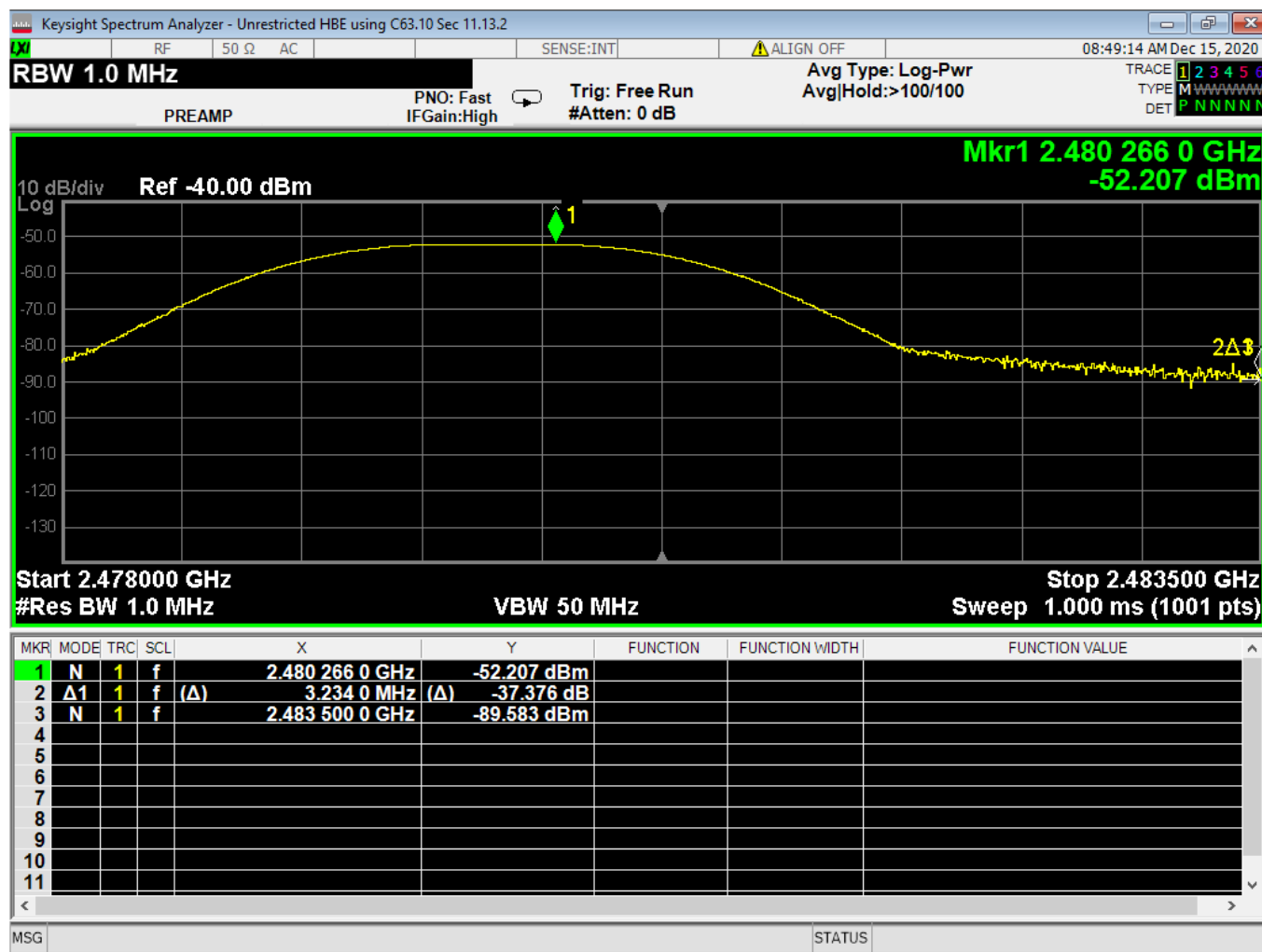


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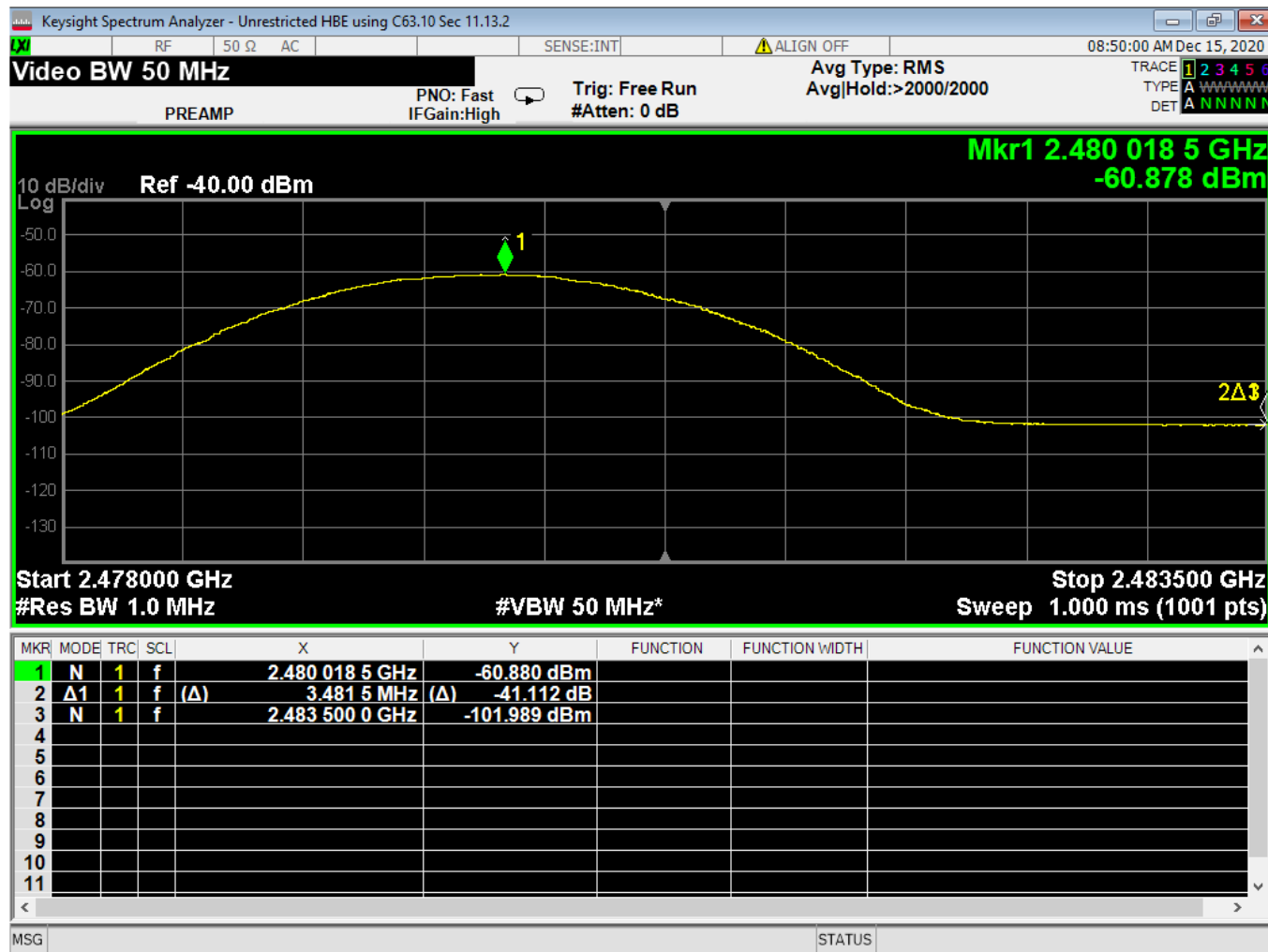
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GMSK High Band-Edge Unrestricted

Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.



GMSK High Band-Edge Unrestricted Average

Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.

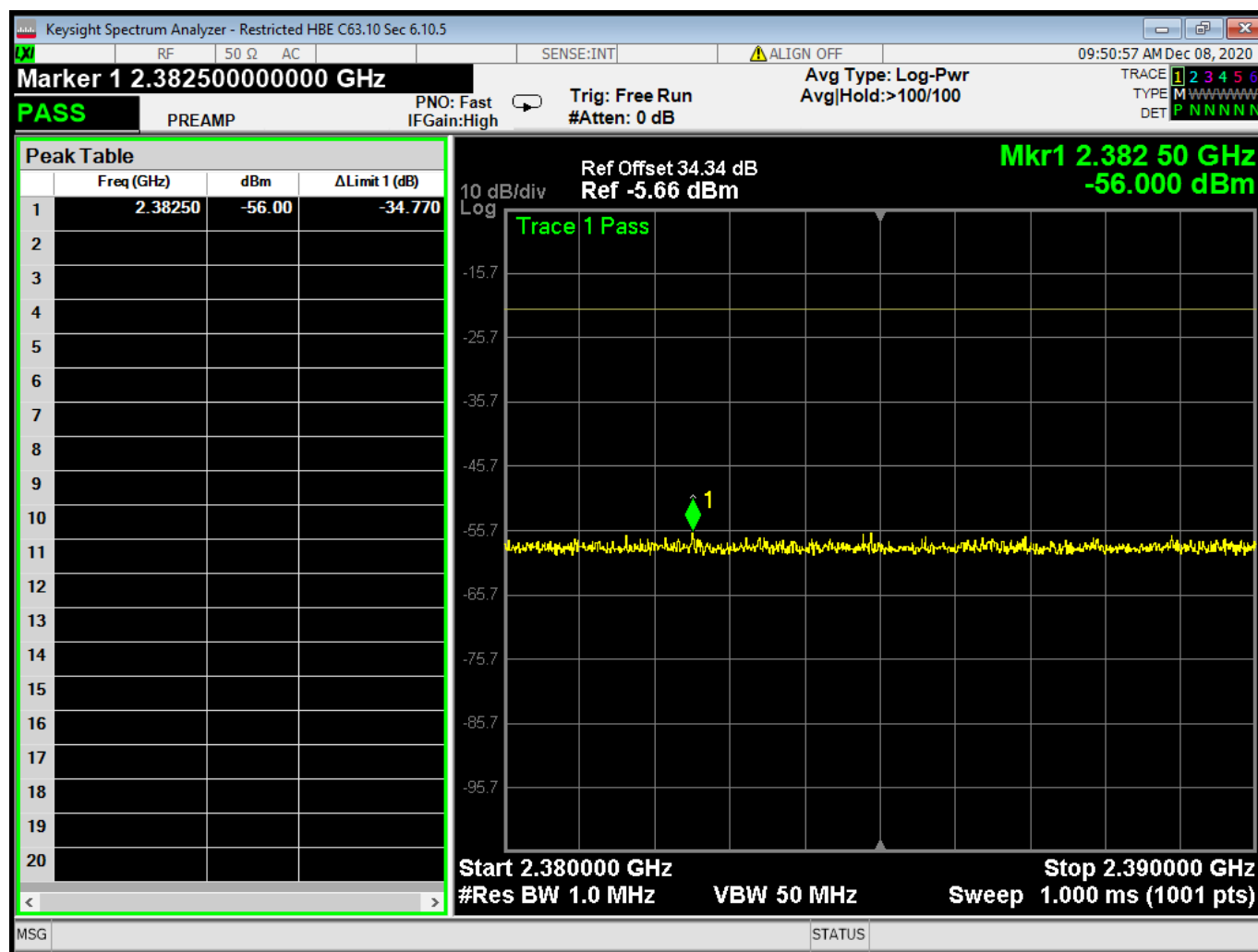


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GMSK Low Band-Edge restricted

Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.

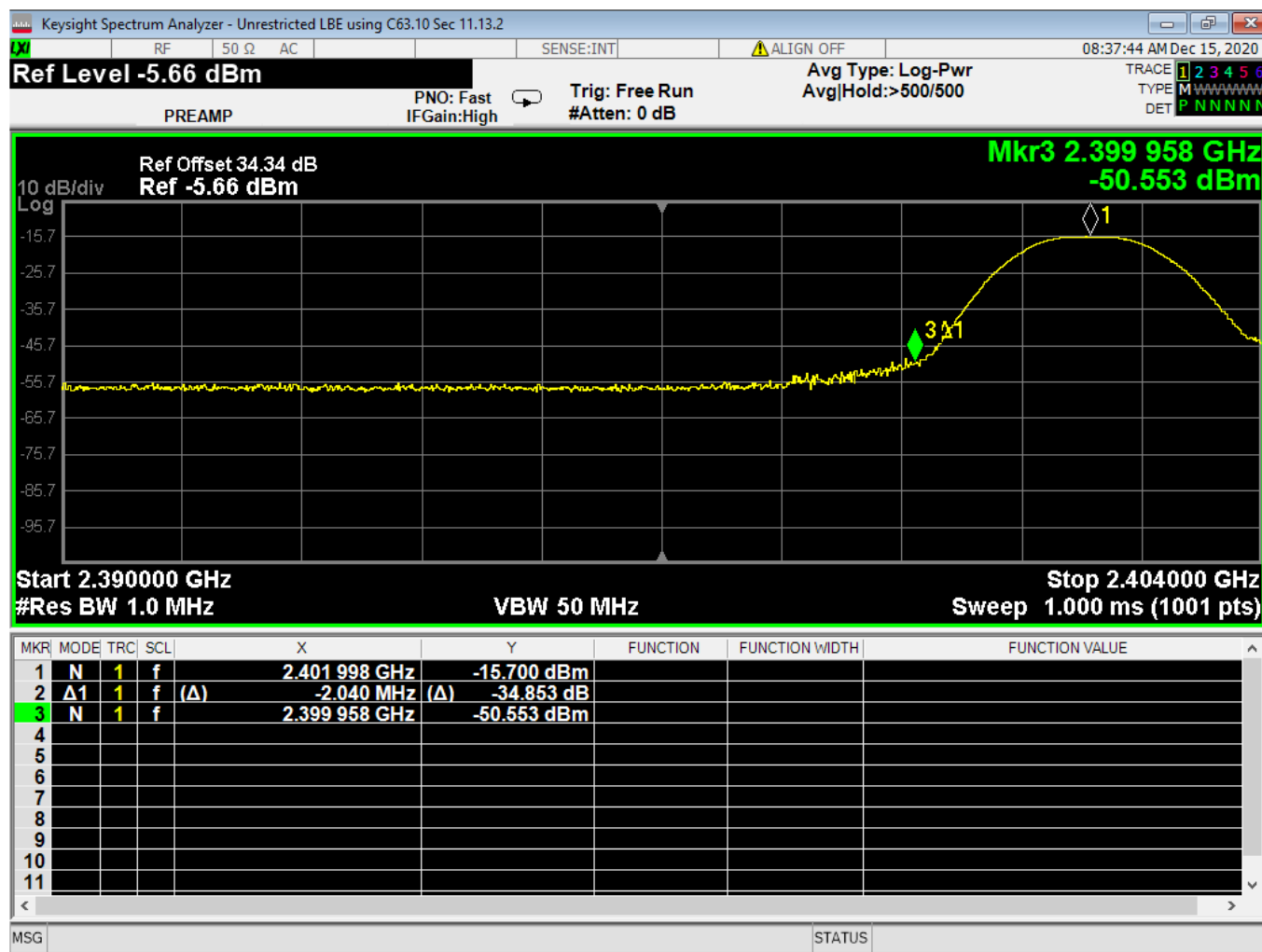


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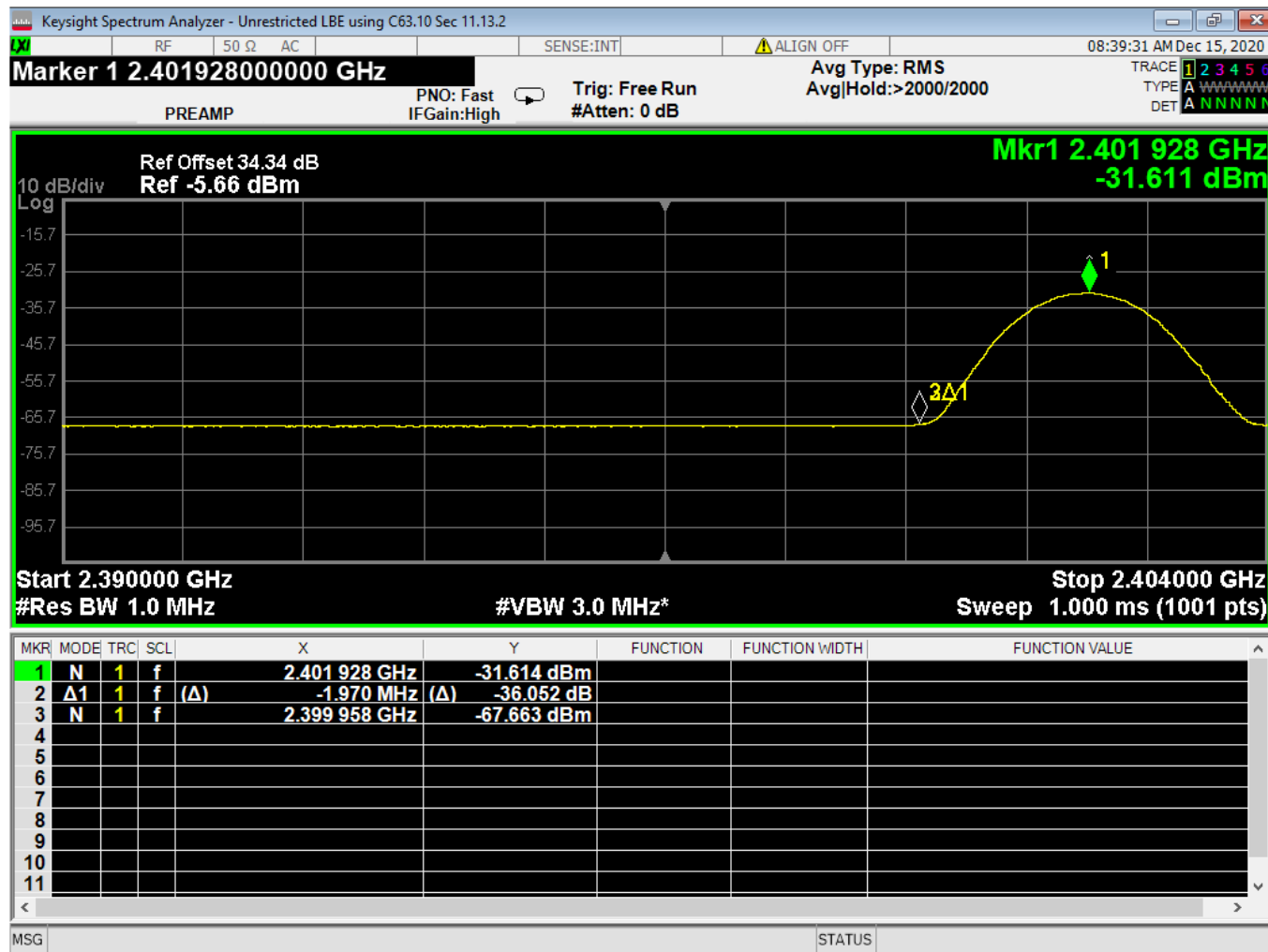
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GFSK Low Band-Edge Unrestricted

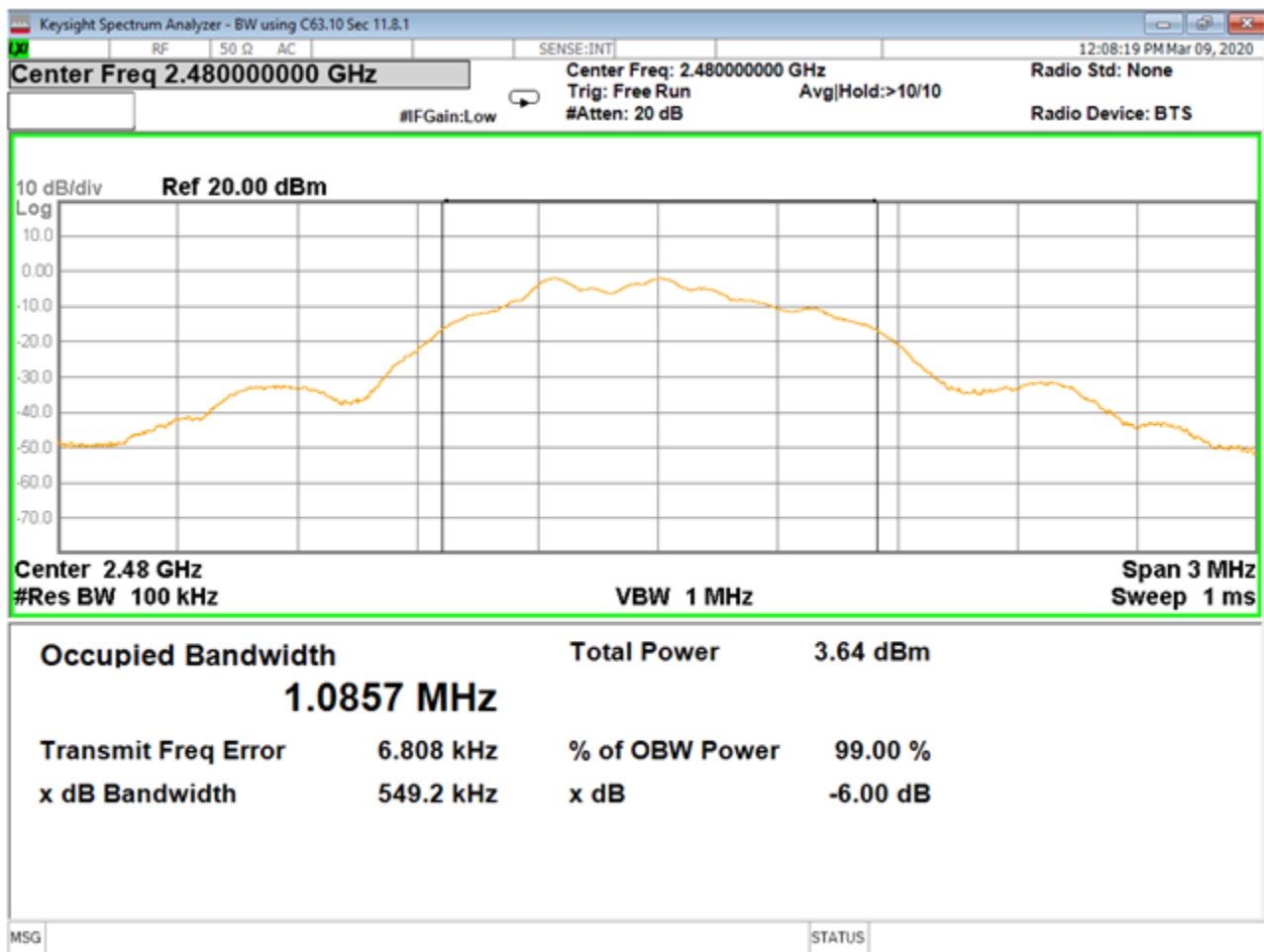
Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.



GFSK Low Band-Edge Unrestricted Average

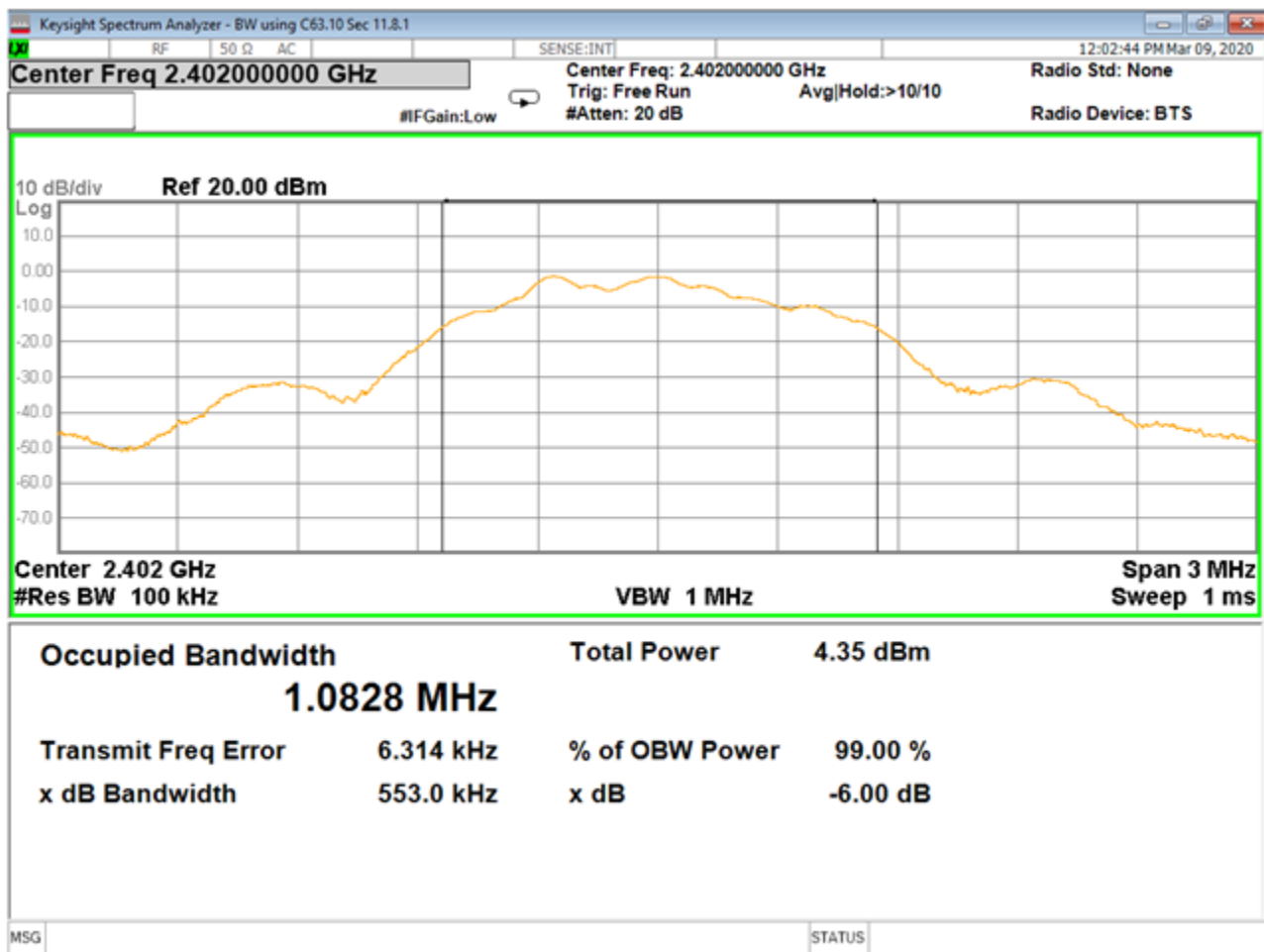
Compliance to part 15.209 limits is shown. Refer to section 4.5 of this report for a detailed table. Corrections are included in the plot and they are listed in section 4.5 of this report.

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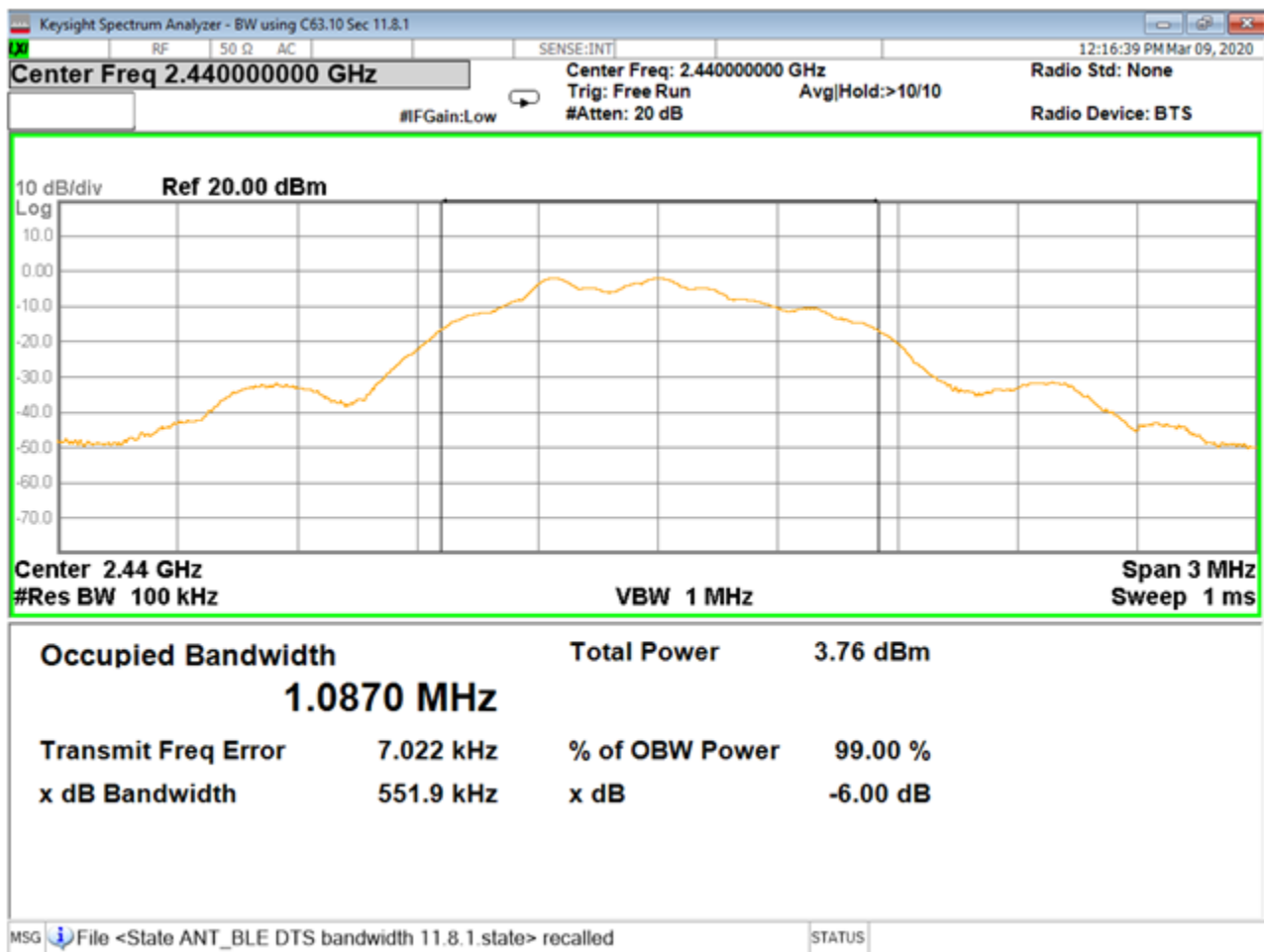
GMSK OBW high

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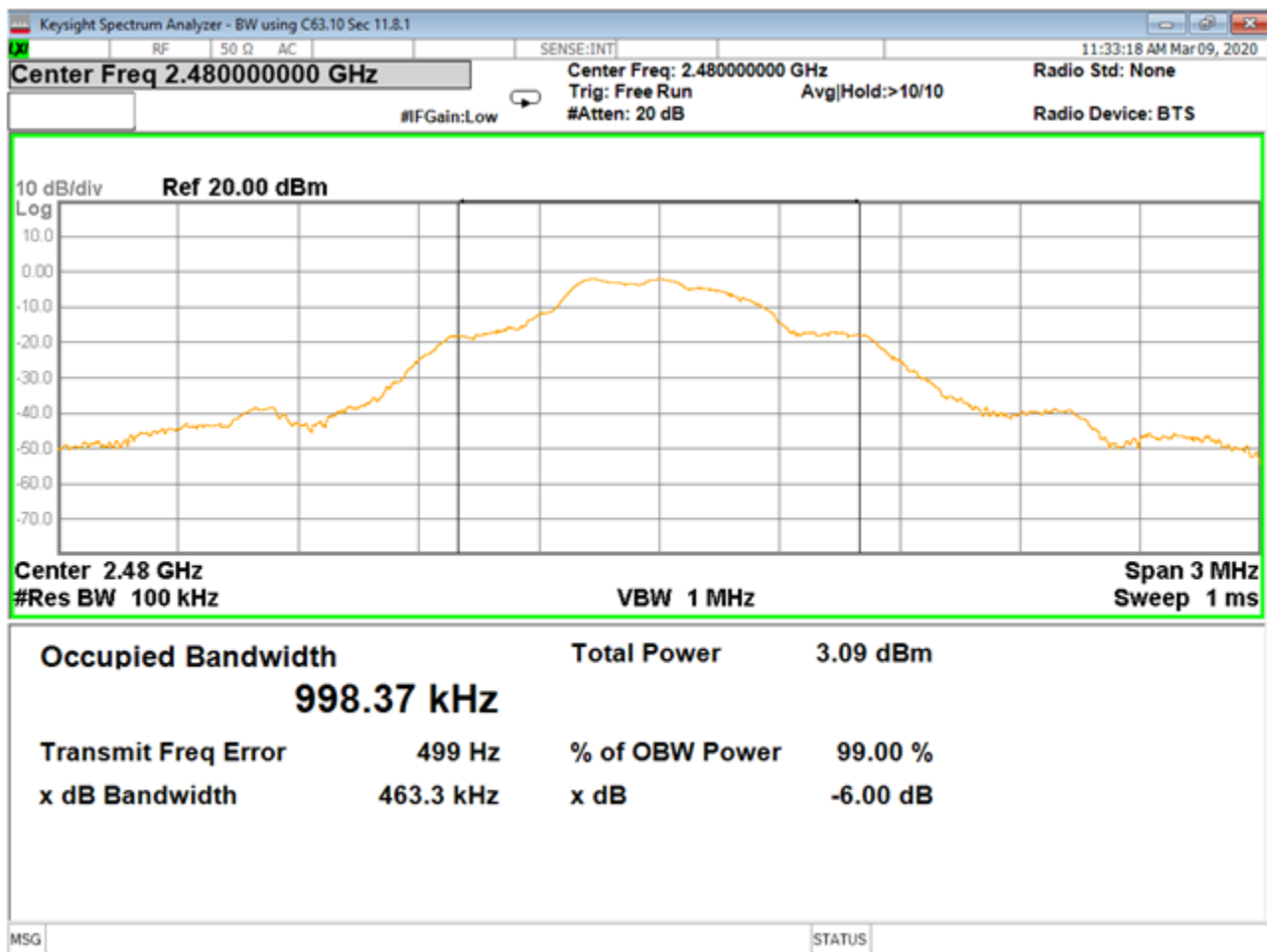
GMSK OBW low

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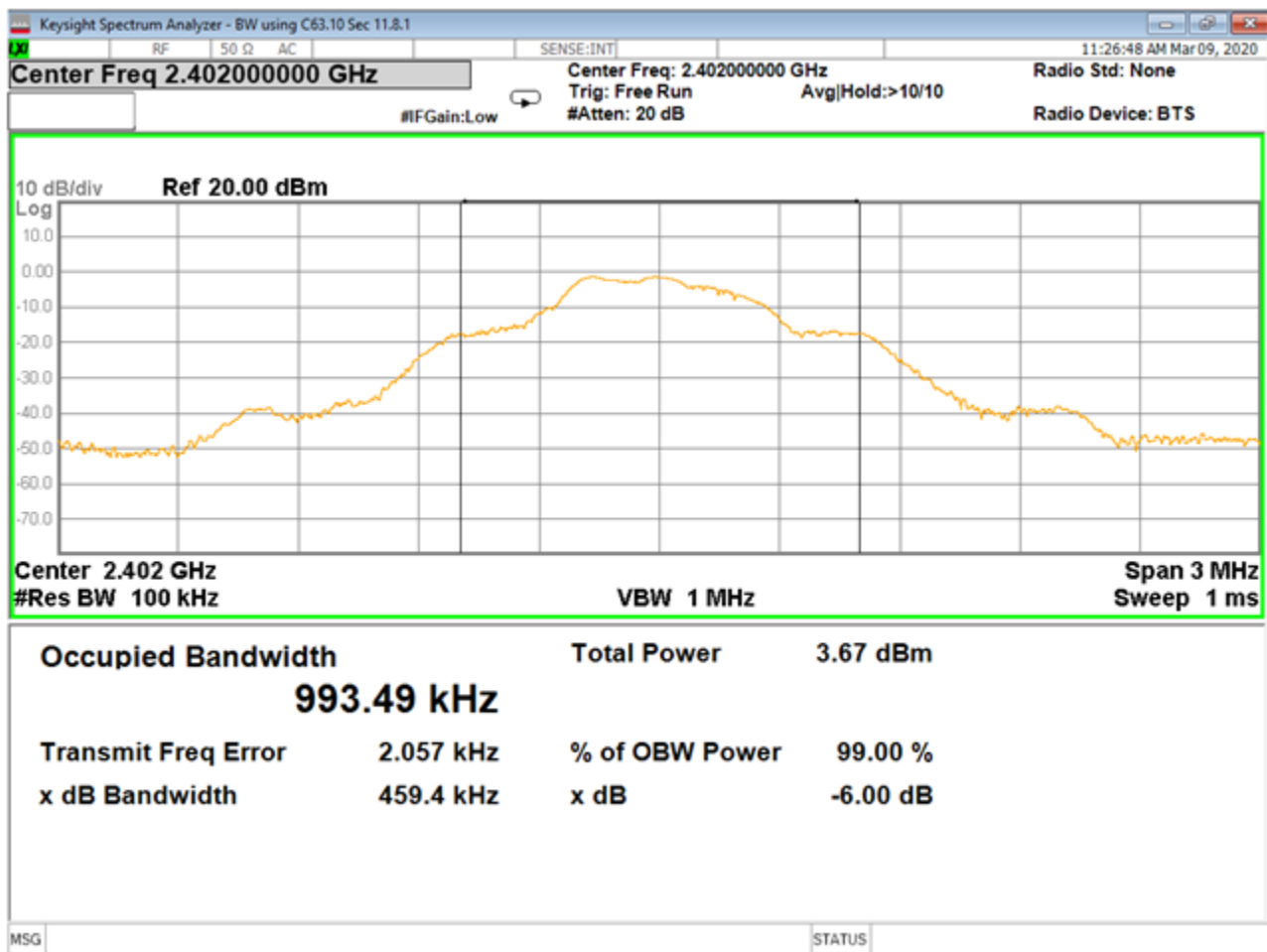


GMSK OBW mid

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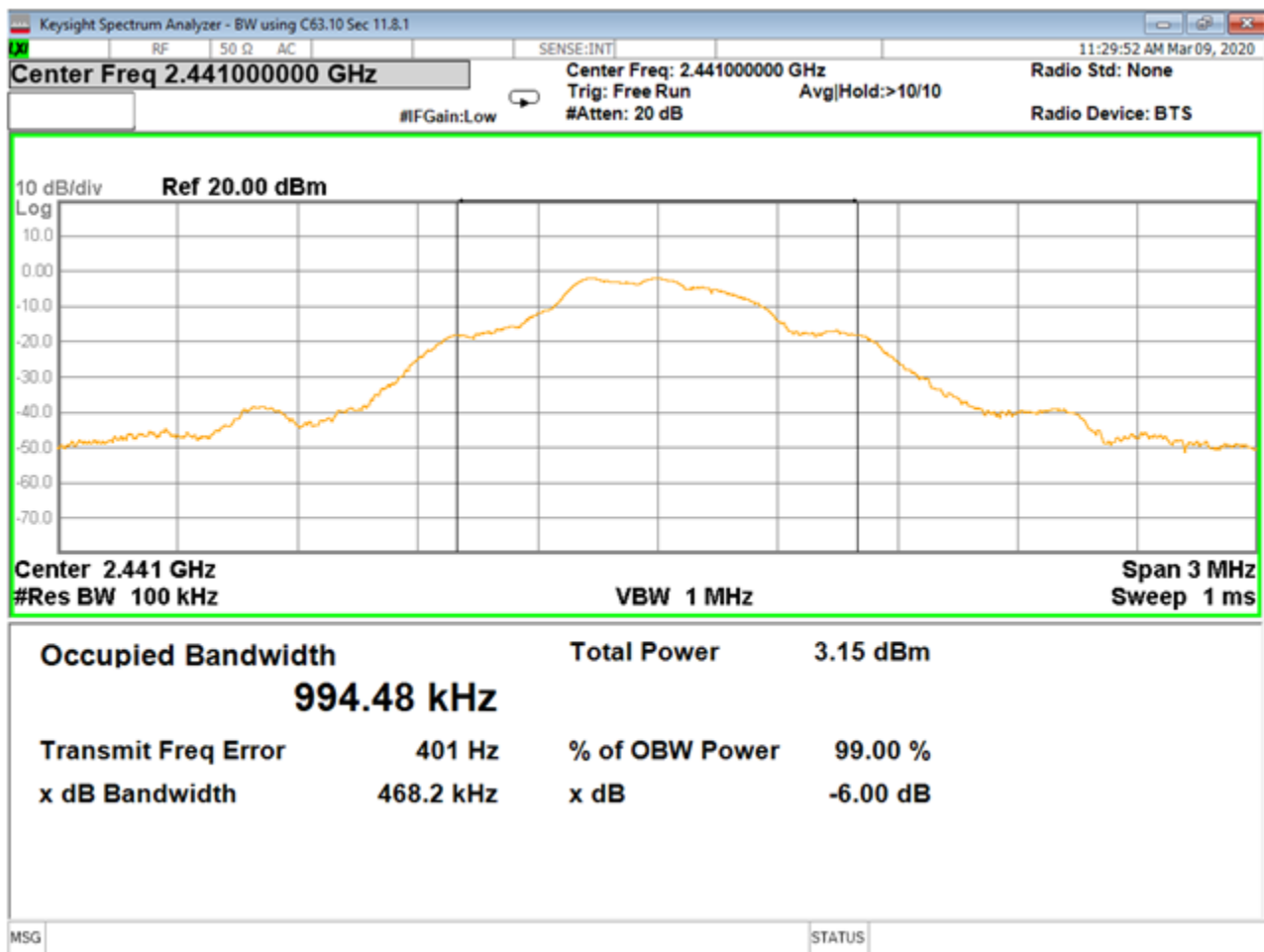


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GFSK OBW low

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GFSK OBW Mid



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