APPLIED TEST LAB INC.

FCC15.247, RSS-247 Issue 3 TEST REPORT

DTS (2400-2483.5 MHz)

Limits Applied: FCC 15.247, RSS-247 Issue 3

Report#: B002E029-51

Manufacturer: Blackline Safety

Model: EX8N-01-NA2

Serial Number: 3589400206

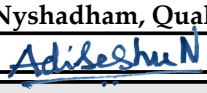
EUT Received Date: 2024-09-09

Test Start Date: 2024-09-09

Test Completion Date: 2024-11-04

Test Result: PASS

Report Issue Date: 2024-11-14

Tested by	Approved by:
Chi Gieng, Test specialist	Adiseshu Nyshadham, Quality Prime
	

Report Issued to	Report Issued by
Blackline Safety Unit 100, 803 24 Avenue SE Calgary, AB Canada, T2G 1P5	Applied Test Lab Inc. Unit 4174-3961 52 Ave NE Calgary, AB, T3J 0J8

Report Revision History

Rev	Description of Change	Date
Draft01	Initial	2024-11-05
Release	Title Pg and Pg 4,5, 7, 8, 22, 23	2024-11-05
Release 2	Title Pg and Pg 41-54 added	2024-11-14

This report contains **127** pages

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1.0 General

1.1 Purpose

The purpose of this report is to document conformance with RSS-247 Issue 3(DTS), FCC 15.247 and to detail the results of testing performed on the sample Model: **EX8N-01-NA2** manufactured by **Blackline Safety**. The test sample was received in good condition. Testing began **2024-09-09** on and was completed on **2024-11-04**.

1.2 Relevant Standards and References

One or more of the following standards were used to evaluate the EUT:

1. **ANSI C63.4-2014:** American National Standard for Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9 kHz to 40 GHz
2. **CFR Title 47 FCC Part 15** - Radio Frequency Devices, Subpart B – Unintentional Radiators.
3. **CFR Title 47 FCC Part 15** - Radio Frequency Devices, Subpart C – Intentional Radiators.
   - 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz
4. **RSS-Gen: Issue 5 2018-04:** General Requirement for Compliance of Radio Apparatus
5. **RSS-247 Issue 3 2023-08**– Digital Transmission System(DTSs), Frequency Hopping System(FHSs) and Licence - Exempt Local Area Network(LE-LAN) Devices
6. **ICES-003 Issue 7 2020-10**– Information Technology Equipment(Including Digital Apparatus) – Limits and Methods of Measurement
7. **ANSI C63.10-2013**, "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
8. **FCC KDB 558074** D01 DTS Meas Guidance v05, "GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247"

1.3 Performance Requirement

The EUT is marketed as **FCC 15.247, RSS-247 Issue 3** equipment and must comply with the **FCC 15.247, RSS-247 Issue 3 (DTS)** emission limits and requirements.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increase emission levels should be checked and verified to ensure continuous compliance has been maintained (i.e., printed circuit board layout changes, changes to filter performance, power supply changes, I/O cable and interface changes, critical component changes etc.)

1.4 Measurement Uncertainty

Test Case	Uncertainty
AC Line Conducted Emissions	± 1.50 dB
20dB Bandwidth	±10 kHz
Radiated Spurious Emissions	± 3.44 dB
Radio Frequency	±1x10-6
RF output power-conducted	±1.482 dB
Rower Spectral Density - conducted	±1.482 dB
Temperature	±2 °C
Humidity	±5%

The measurement uncertainties are evaluated for tests performed on the EUT as specified in CISPR 16-4-2.

The measurement uncertainties reported above relates to the measurement setups and procedures.
It does not take into account EUT performance variations from sample to sample.

1.5 Test Results Summary

Test Type	Basic Standard	Result
Antenna Requirement	FCC 47 CFR Part 15.203 IC RSS-Gen Issue 5 Section 7.1.2	PASS
RF Peak Power Output	FCC Title 47 CFR Part 15: Subpart C-15.247(b)(1) RSS-247 Issue 3	PASS
Radiated Spurious Emissions	FCC Subpart C 15.205, 15.209, 15.247 RSS-247-Issue 3, RSS-Gen Issue 5	PASS
20 dB Bandwidth	FCC Subpart C 15.247 RSS-247-Issue 3, RSS-Gen Issue 5	PASS
99% Bandwidth	RSS-247-Issue 3, RSS-Gen Issue 5	PASS
Out-of-Band Emissions (Band edge)	FCC Title 47 CFR Part 15: Subpart C-15.247(d) RSS-247-Issue 3	PASS
Channel Separation	FCC Title 47 CFR Part 15: Subpart C-15.247(a)(1) RSS-247-Issue 3	PASS
Number of Hopping Channels	FCC Title 47 CFR Part 15: Subpart C-15.247 RSS-247-Issue 3	PASS
Dwell Time and Time Occupancy Per Frequency	FCC Title 47 CFR Part 15: Subpart C-15.247(a)(1)(iii) RSS-247-Issue 3	PASS
Unintentional Radiated Emissions	FCC Title 47 CFR Part 15: Subpart B -15.109 ICES-003 Issue 7	PASS
AC Mains Conducted Emissions	FCC Title 47 CFR Part 15: Subpart B -15.109 ICES-003 Issue 7	PASS
Frequency Stability	FCC Title 47 CFR Part 2.1055, Part 15: Subpart C-15.215(c) RSS-GEN Issue 5(8.8)	PASS

NP=ATL was not contracted to perform the test.

1.6 Test Facility Information

Name	Applied Test Lab Inc.		
Address	Unit 4174-3961 52nd Avenue NE, Calgary, Alberta, T3J 0J8, Canada		
Telephone	403 590 8701	**Fax**	403 590 8570
Email	emctesting@appliedtestlab.com	**Website**	www.appliedtestlab.com
FCC Registration	209928	**IC Recognition**	10988A

1.7 Client Information

Name	**Blackline Safety**		
Address	Unit 100, 803 24 Avenue SE ǀ Calgary, AB T2G 1P5		
Telephone	403-451-0327	**Website**	www.blacklinesafety.com
Contact Name	Scott Jacobsen	**Contact Email**	sjacobsen@blacklinesafety.com

2.0 Test Sample Information

The **EX8N-01-NA2** was only operated and exercised in the mode(s) and configuration(s) described in this report. All inputs and outputs to and from support equipment associated with the **EX8N-01-NA2** were provided or simulated under the direction and responsibility of **Blackline Safety**. A description of these signals and their provision is included in Appendix A.

2.1 Equipment Under Test (EUT)

Product Description	EXO8 is a cloud-connected area monitor that bundles industry leading gas detection with automated compliance and business analytics tools. For the first time ever, the days of manually collecting data from the field, reviewing spreadsheets and compiling reports are behind you. EXO8 solves the challenges of continuous toxic and combustible gas monitoring for sites, facilities and fence lines. Automating long-term area monitoring and connected safety for streamlined efficiency, EXO8 allows teams to focus on their work at and. In the event of a safety incident or gas exposure, monitoring personnel can see what has happened and communicate with workers directly via text messaging or an optional two-way voice calling feature through their EXO.
Manufacturer	**Blackline Safety Corp.**
Trade Name	EXO 8
Model Number	**EX8N-01-NA2**
Serial Number	**3589400206**
Model discrepancy/ Variations	None
FCC ID	W77EXO8
IC ID	8255A-EXO8
Power Supply and Requirements	LiFePO4 Rechargeable Battery 114 Ah 3.0-3.6V, nominal 3.4VDC
Firmware Version	4.0.0.0000000006
Software Version	N/A
Antenna Type and Gain	Ceramic Chip Antenna, 2.2dBi(peak), 1.9dBi(Band edges)
Operation Frequency Range	2400MHz – 2483.5MHz
Modulation type(s)	GFSK, QPSK, 8-PSK
Number of TX Chains	1
Product Manufacturing Status	☐Production Unit ☒Pre-Production Unit

2.2 Support Equipment and Details

☐**Applicable**

Manufacturer	Description	Model No.	Serial Number	Other Info
XP Power		VERO05US120-JA	N/A	

2.3 I/O Ports and Details

☐**Applicable**

Port Type	Description	Filter Info	Shielding Info	Other Info
Power port	Power	N/A	Unshielded	
Signal port	communication	N/A	Unshielded	

2.4 I/O Cable Descriptions

☐**Applicable**

Cable Description	Length (m)	Port From	Port To	Cable Type	Remarks
Power cable	1.5	EUT	Power outlet	Power	
Signal cable	3	EUT	Termination		

3.0 Test Facilities

Laboratory Location

The radiated and conducted emission test sites are located at the following address:

Applied Test Lab,
Unit 4174, 3961-52 Ave N.E., Calgary, AB T3J 0J8

Laboratory Accreditation/Recognitions/Certifications

The Semi-Anechoic Chamber Test Site and Conducted Emission Site have been fully described, submitted to, and accepted by the FCC and Industry Canada for testing Interference by information technology equipment. In addition, ATL has implemented an interim in-house quality system which is based on the ISO 17025 standard and is actively pursuing to achieve its accreditation. The following certification numbers have been issued in recognition of the certifications:

FCC Registration Number: **209928**
Industry Canada Lab Code: **IC 10988A**

Country	Agency	Accreditation/Certification	LOGO
USA	FCC	3 (m) Semi-Anechoic Chamber to perform FCC Part 15/18 measurements	
Canada	Industry Canada	3 (m) Semi-Anechoic Chamber to perform ICES-004 and RSS measurements	Industry Canada Industrie Canada

Note: Unless otherwise specified, ATL performs the tests using standard test methods to evaluate the EUT for compliance to the defined International standards. However, the report is not to be used to claim compliance, certification or endorsement by FCC or Industry Canada or any other government agency unless specifically submitted to such agency for such purpose.

3.1 Semi-Anechoic Chamber Test Site Description

The Semi-Anechoic Chamber Test Site consists of a 6.24 x 9.144 x 5.79 (m) shielded enclosure. The chamber is lined with SAMWAH Ferrite Grid Absorber, model number SN-20. The ferrite tile grid is 100 x 100x 6.7 (mm) thick and weighs approximately 200 (grams). These tiles are mounted on steel panels and installed directly on the inner walls of the chamber. Inner side Wall is lined by 600H Foam Absorber with White Cap. Chamber is illuminated by set of 12 LED Bulbs.

The turntable is 198 (cm) in diameter and is located 160 (cm) from the back wall of the chamber. The chamber is grounded via Utility Ground installed at the side of the back East wall, it is bound to the Chamber ground Stud using 1/2" copper braided cable.

The turntable is all aluminum, flush mounted table installed in an all steel frame. The table is remotely operated from the control area located outside the Semi Anechoic Chamber. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

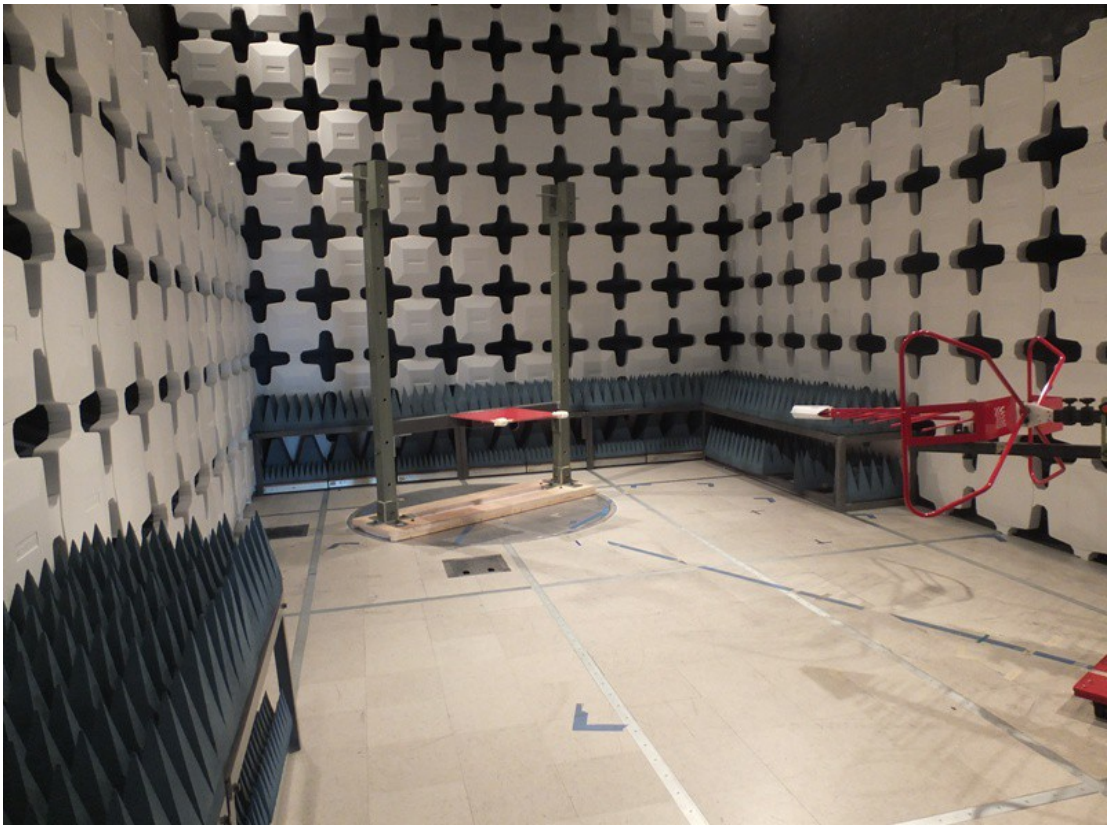

Figure 3.1 - Test Facility (Setup for 30MHz - 1000MHz)

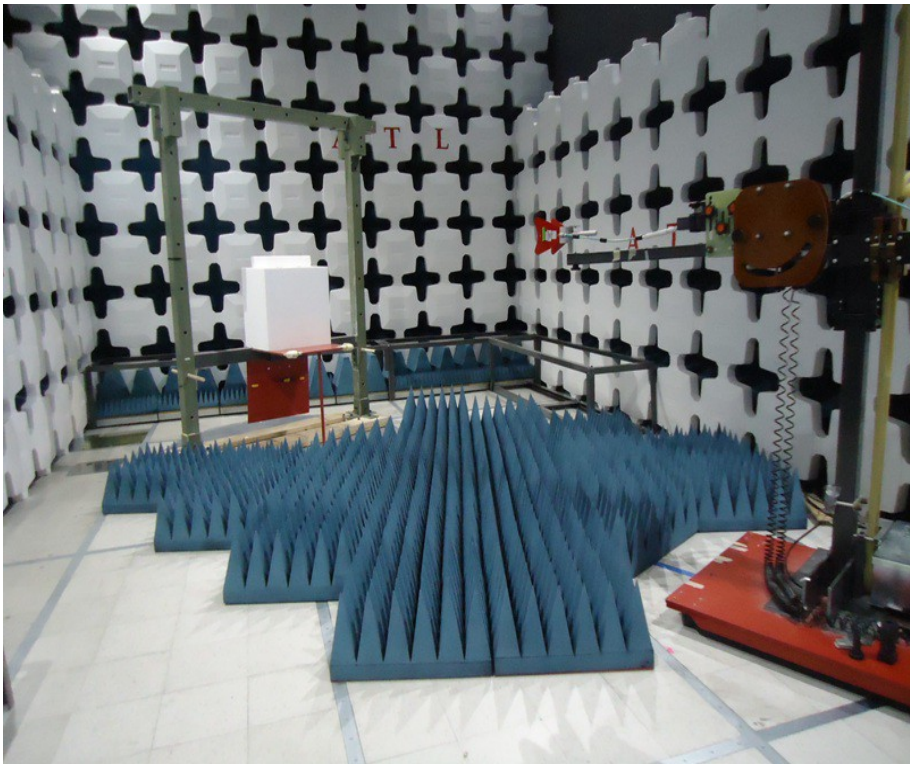

Figure 3.2 - Test Facility (Setup for 1GHz – 18GHz)

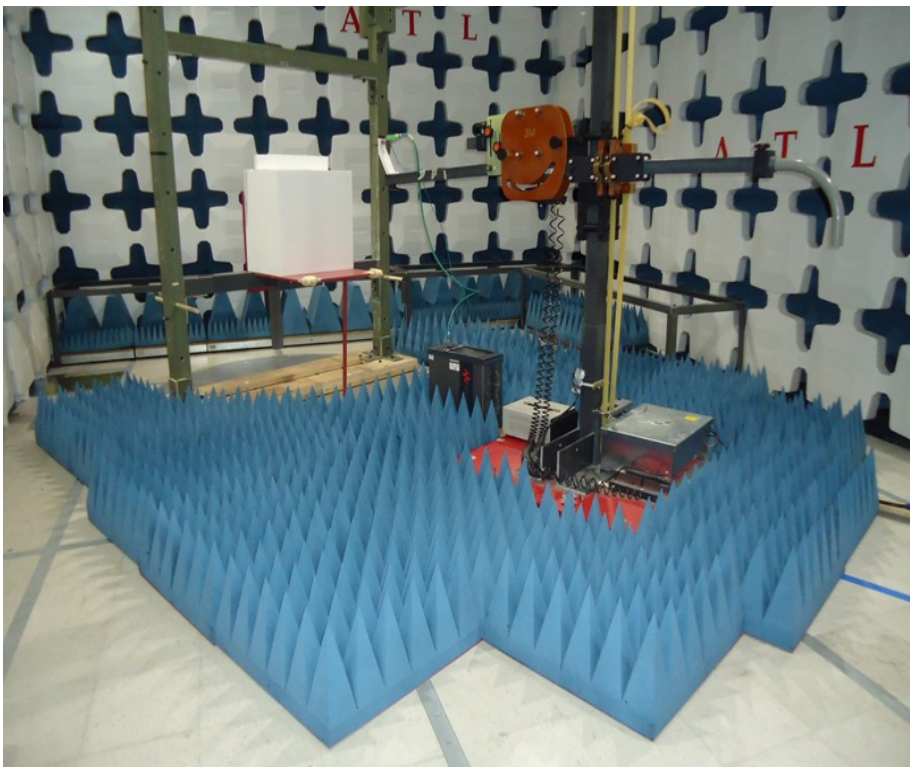

Figure 3.3 - Test Facility (Setup for 18GHz - 26GHz)

3.2 A diagram of the Semi-Anechoic Chamber Test Site

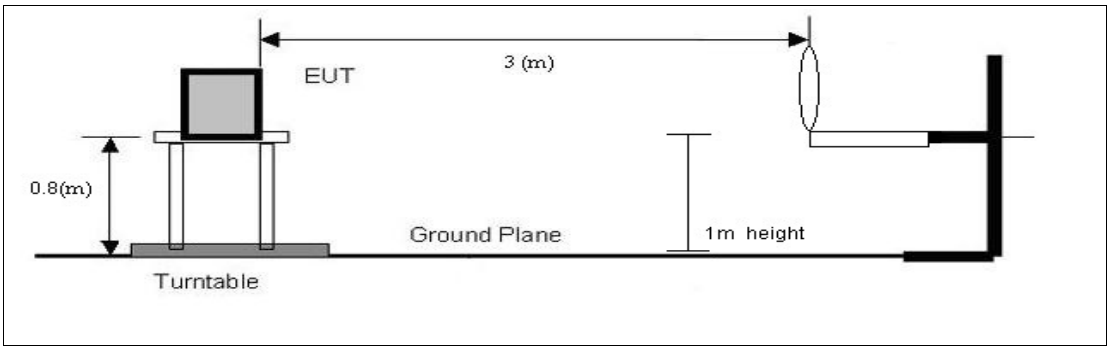

Figure 3.4 - Semi- Anechoic chamber diagram(0.009MHz - 30MHz)

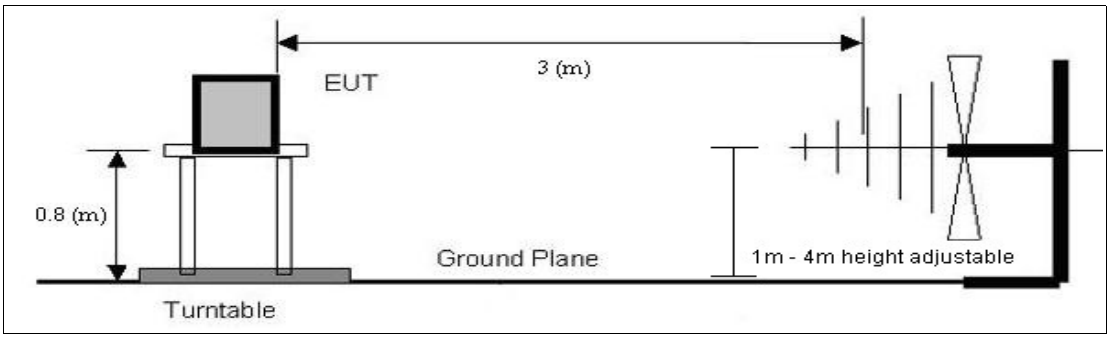

Figure 3.5 - Semi- Anechoic chamber diagram(30MHz - 1000MHz)

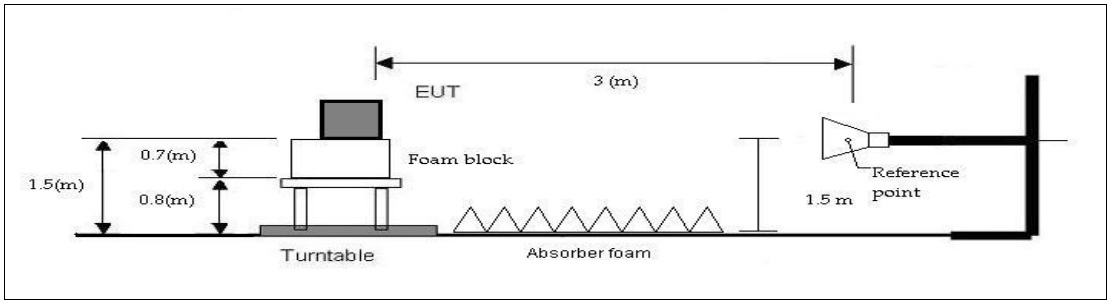

Figure 3.6 - Semi- Anechoic chamber diagram(1GHz – 18GHz)

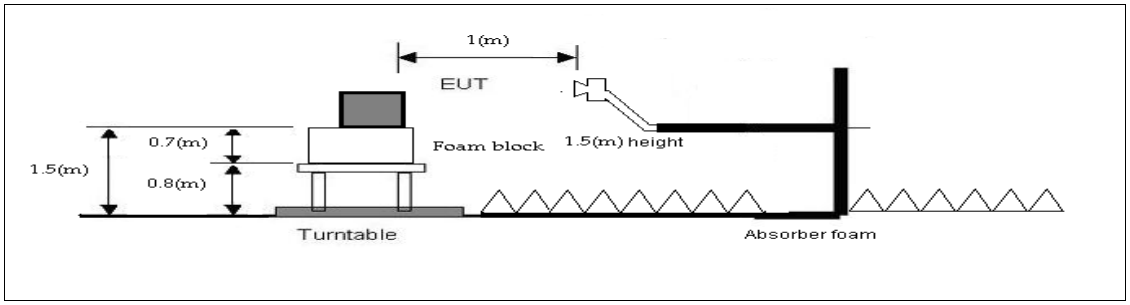

Figure 3.7 - Semi- Anechoic chamber diagram(18GHz – 26GHz)

3.3 Test Equipment List

Table 3.1 - Test Equipment used

Description	Manufacturer	Model Number	Serial Number	Next Cal
Bi-Log antenna	CHASE	CBL6111B	2261	May 1, 2027
Double Ridged Horn	ETS Lindgren	3117	143095	October 17, 2025
Spectrum Analyzer	Hewlett Packard	Hp8593EM	3639A00172	October 01, 2026
EMI Receiver & RF filter section	Hewlett Packard	8546A, 85460A	3448A00267, 3448A00245	October 7, 2027
MXA Signal Analyzer	Keysight	N9020A	MY48011091	January 15, 2025
Standard Gain Horn Antenna (18G-26G)	ETS Lindgren	3160-09	130132	NCR
LISN	Com-Power	LI-215A	191933	October 15, 2027
Transient Limiiter	Com-Power	LIT-930	531577	PV
Cable	Micro Coax UTIFLEX	UFB293C	303	PV
Cable	Micro Coax UTIFLEX	UFB311A	SFC220863	PV
Cable	Micro Coax UTIFLEX	UFA210B-0-0120-50250	96G1557	PV
Turntable	ETS Lindgren	2187	NA	NCR
Antenna Bore-sight Mast	ETS Lindgren	2071B	136243	NCR
Multi Device Controller	ETS Lindgren	ETS 2090	148017	NCR
3 Meter chamber	ETS Lindgren	FACT 3-2.0	N/A	November 11, 2026
LNA	MITEQ	AMF-7D-01001800-22-10P	1782797	PV
DC power supply	Instek	PC-3030	9503310	PV
Test SW	DVT Solutions Inc	REDvtAtlV3p42.exe - (20240331)		

NCR: No Calibration required.
PV:Periodic Verification

4.0 Test Setup Description

4.1 EUT System Block Diagram and Support Equipment

☒**Applicable**

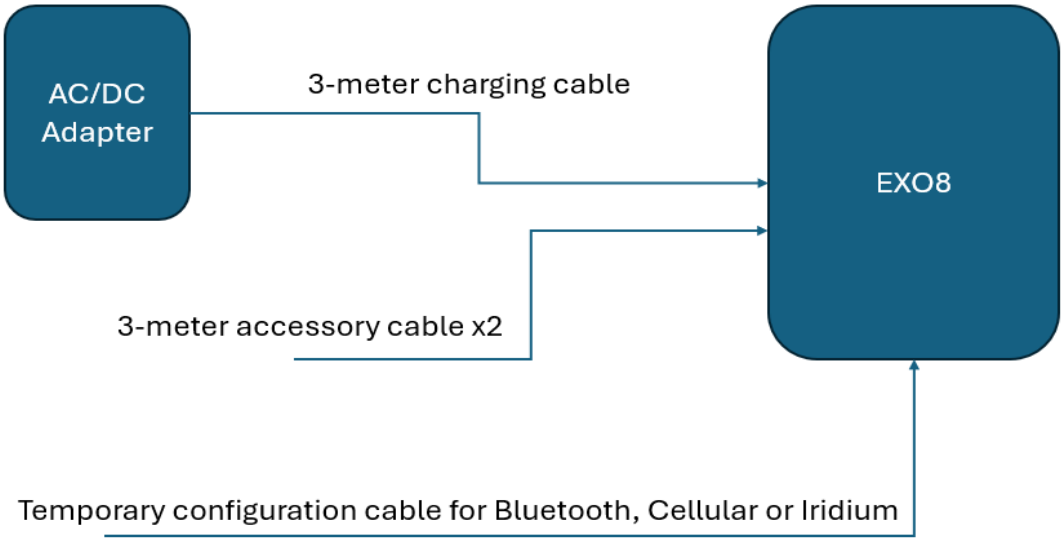

Figure 4.1 – System Block Diagram

5.0 Test Methodology

5.1 Method of measurement of Radiated Spurious Emissions

Below 30MHz：

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the test antenna (loop antenna). The test antenna is positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop is adjusted to 1 m above the ground. Additional tests are performed by placing the the loop antenna plane positioned horizontally at the specified distance from the EUT.

Above 30MHz：

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the test antenna. The maximal emission value is acquired by adjusting the antenna height, polarization and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarization Vertical (V) and Horizontal (H).

As per FCC 15C, section 15.225

a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 μV/m (84 dBμV/m) at 30 m.
b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 μV/m (50.5 dBμV/m) at 30 m.
c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 μV/m (40.5 dBμV/m) at 30 m.
d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209. The limits are shown below in Table 5.2:

As per RSS-247-Issue 3, RSS-Gen Issue 5, FCC Subpart C 15.205, 15.209 & 15.247

According to FCC Part15.205, the level of any transmitter spurious emission in Restricted bands shown in the following table shall not exceed the level of the emission specified in the Table 5.2

According to FCC Part15.205, Restricted bands

Table 5.1: FCC 15. 205 – Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4

8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	>38.6
13.36-13.41			

Table 5.2: FCC 15. 209 and Clause 8.9 of RSS-Gen. – Radiated Emission limits**.**

Frequency (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	67 – 20 x Log 10(F)	300
0.490 – 1.705	24000/F(kHz)	87 – 20 x Log 10(F)	30
1.705 – 30	30	29.5	30
30 – 88	100	40	3
88 – 216	150	43.5	3
216 – 960	200	46.0	3
Above 960	500	54.0	3

FCC Part15.247 (d) 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)).

Testing Setup/Configuration

Unless otherwise indicated, the following configuration steps are used for the equipment setup: The cable(s) were routed consistent with the typical application and installation instructions provided with the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cable(s) was investigated to find the configuration that produced maximum emissions. Cable(s) were of the type and length as specified in the individual requirements. The length(s) of cable(s) that produced maximum emissions was selected.

The equipment under test(EUT) was set up in a manner that is represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was measured with a spectrum analyzer or receiver using the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown below. The corrected data

was then compared to the applicable emission limits. Preliminary and final measurements were performed in order to ensure that all emissions from the EUT were detected and maximized.

Correction Factors and sample calculation

The highest emission reading from spectrum analyzer was converted using correction factors as shown (Analyzer/Receiver) in the formula. For radiated emissions in dBuV/m, the spectrum analyzer reading in dBuV was corrected by using the following formula. This corrected reading was then compared to the applicable specification limit and the results are presented in the margin column. The margin was calculated based on subtracting the specification limit value from the corrected measurement data; a positive margin represents a measurement exceeding the specification limit, while a negative margin represents a measurement less the the specification limit.

Corrected Reading (dBuV/m) = Analyzer/Receiver Reading(dBuV) + Correction Factor(dB/m)
Correction Factor (dB/m) = Cable Loss(dB) + Antenna Factor(dB/m)-((Preamplifier Gain)(dB))
Margin (dB) = Corrected Reading(dBuV/m) - Applicable Limit(dBuV/m)

Test Instrumentation and Analyzer settings

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10dB per division were used.

Measuring equipment bandwidth setting per frequency range			
Test	Start	Stop	Band width setting
Conducted Emissions	150kHz	30MHz	9kHz
Radiated Emissions	9kHz	150kHz	200Hz
Radiated Emissions	150kHz	30MHz	9kHz
Radiated Emissions	30MHz	1000MHz	120kHz
Radiated Emissions	1000MHz	>1GHz	1MHz

Spectrum Analyzer / Receiver Detector Functions

The notes that accompany the measurements contained in the emissions tables indicate the type of the detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the “positive peak” detector mode. Whenever a “quasi-peak” or “average” reading was recorded, the measurement was annotated with a “QP or an “AVG” on appropriate rows of the data sheets. In case where quasi-peak or average limits were employed and exits for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference.

5.2 Antenna Requirements

Test Standard: FCC 47 CFR Part 15.203 and IC RSS-Gen Issue 6 Section 7.1.2

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited." … "the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

5.3 RF Peak Power Output

Test Standard: FCC Title 47 CFR Part 15: Subpart C - 15.247 (b)(1), RSS-247 Issue 3
Test Method: ANSI C63.10:2013, section11.9.2

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels the maximum peak conducted output power of the intentional radiator shall not exceed 1 watt.
AVGSA-1

The EUT's hopping function should be disabled and placed in continuous selected channel transmitting mode. Use the spectrum analyzer settings as per sec 11.9.2.2.2. After the trace is stabilized.

Compute power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with band limits set equal to the OBW band edges.

5.4 Method of measurement of 20dB Bandwidth

Test Standard: RSS-247-Issue 3, RSS-Gen Issue 5; FCC Subpart C §15.247
Test Method: ANSI C63.10:2013, section 6.9.2

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in 15.217 through 15.257 and in Subpart E of Part 15, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

According to 15.247(a)(1)(iii), for frequency hopping systems operating in the 2400 MHZ-2483.5 MHz no limit was assigned for 20 dB Band width.

The EUT's hopping function should be disabled and placed in continuous selected channel transmitting mode.

Use the spectrum analyzer settings as per sec 6.9.2. After the trace is stabilized follow the method specified in sec 6.9.2 and use marker delta method to determine the 20 dB bandwidth.

5.5 Method of measurement of 99% Bandwidth

Test Standard: RSS-247-Issue 3, RSS-Gen Issue 5
Test Method: ANSI C63.10:2013, section 6.9.3

The Occupied Channel Bandwidth is the bandwidth that contains 99 % of the power of the signal. The bandwidth shall fall completely within the frequency range specified by the standard.

The EUT's hopping function should be disabled and placed in continuous selected channel transmitting mode. Use the spectrum analyzer settings as per sec 6.9.3. After the trace is stabilized follow the method specified in sec 6.9.3 and use marker delta method to determine the 99% bandwidth.

5.6 Out of Band Emissions (Band Edge)

Test Standard: RSS-247-Issue 3, FCC Title 47 CFR Part 15: Subpart C - 15.247 (d)
Test Method: ANSI C63.10:2013, section 6.10.4

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20dB.

The EUT's hopping function should be disabled and placed in continuous selected channel transmitting mode. Use the spectrum analyzer settings as per sec 6.10.4. After the trace is stabilized follow the method specified in sec 6.10.4 and use marker delta method to determine the Out of band emissions.

The EUT's hopping function should be enabled. Use the spectrum analyzer settings as per sec 6.10.4. After the trace is stabilized follow the method specified in sec 6.10.4 and use marker delta method to determine the Out of band emissions in hopping mode

5.7 Channel Separation

Test Standard: FCC Title 47 CFR Part 15: Subpart C - 15.247(a)(1), RSS-247-Issue 3
Test Method: ANSI C63.10:2013, section 7.8.2

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

The EUT's hopping function should be enabled. Use the spectrum analyzer settings as per sec 7.8.2. After the trace is stabilized the marker-delta function was used to determine the separation between the peaks of the adjacent channels.

5.8 Number of Hopping Channels

Test Standard: FCC Title 47 CFR Part 15: Subpart C - 15.247, RSS-247-Issue 3
Test Method: ANSI C63.10:2013, section 7.8.3

The EUT's hopping function should be enabled. Use the spectrum analyzer settings as per sec 7.8.3. Let the trace be stabilized.

It might be necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels.

5.9 Dwell Time and Time of Occupancy Per Frequency

Test Standard: FCC Title 47 CFR Part 15: Subpart C - 15.247 (a)(1)(iii), RSS-247-Issue 3
Test Method: ANSI C63.10:2013, section 7.8.4

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

The EUT's hopping function should be enabled. Use the spectrum analyzer settings as per sec 7.8.4. After the trace is stabilized the marker-delta function was used to determine transmit time per hop.

Measurement is repeated using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time should be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

5.10 Method of measurement of Frequency Stability

Test Standard: FCC Title 47 CFR Part 2.1055, Part 15: Subpart C-15.215(c), RSS-GEN Issue 5(8.8))
Test Method: ANSI C63.10:2013, section 6.8

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a

temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10o centigrade through the range. A period of time sufficient (approximately 30minutes) to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

Test Procedure
Frequency Stability vs. Temperature: The equipment under test was connected to PC and is powered by an external AC programmable power supply. An active loop antenna was connected to a Spectrum Analyzer to measure the magnetic field strength . The EUT and the Active Loop Antenna was placed inside the temperature chamber.

The temperature of the chamber is adjusted from 50 degrees to -20 degrees C in steps of 10 degrees C. After the temperature is stabilized for approximately 30 minutes at every step, the frequency output was recorded from the Spectrum Analyzer after at 0m, 2m, 5m, 10m, and the temperature chamber temperature is recorded

Frequency Stability vs. Voltage: Using an external AC/DC programmable or adjustable power supply source the voltage was set to 115% of the nominal value or highest value of the voltage range, which ever is lower. The temperature of the chamber is adjusted to 20 degrees C. After the temperature is stabilized for approximately 30 minutes, the frequency output was recorded from the Spectrum Analyzer after at 0m, 2m, 5m, 10m, and the temperature chamber temperature is recorded.

Using an external A/DC programmable or adjustable power supply source the voltage was set to 85% of the nominal value or lowest value of the voltage range, which ever is higher. The temperature of the chamber is adjusted to 20 degrees C. After the temperature is stabilized for approximately 30 minutes, the frequency output was recorded from the Spectrum Analyzer after at 0m, 2m, 5m, 10m, and the temperature chamber temperature is recorded.

5.11 AC Mains Conducted Emissions

Test Standard: FCC Title 47 CFR Part 15: Subpart B - 15.109, ICES-003 Issue 7
Test Method: ANSI C63.4:2014

Conducted Emission Limits FCC/**ICES-003**

Class A: An ITE meeting the conditions for Class A operation shall comply with the Class A conducted limits set out in Table 5.3. ☐**Applicable**

Table 5.3 - Class A Conducted Emission Limits (FCC and ICES-003)

Emission Type	Frequency Range (MHz)	FCC/ICES-003 (dBuV)	
		Quasi-peak	Average
Conducted Emission	0.15 - 0.5	79	66
	0.5 - 30	73	60

Class B: An ITE meeting the conditions for Class B operation shall comply with the Class B conducted limits set out in Table 5.4. ☒**Applicable**

Table 5.4 - Class B Conducted Emission Limits (FCC and ICES-003)

Emission Type	Frequency Range (MHz)	FCC/ICES-003 (dBuV)	
		Quasi-peak	Average
Conducted Emission	0.15 - 0.5	66 linear to 56	56 linear to 46
	0.5 - 5	56	46
	5 - 30	60	50

5.12 Unintentional Radiated Emissions

Test Standard: FCC Title 47 CFR Part 15: Subpart B - 15.109, ICES-003 Issue 7
Test Method: ANSI C63.4:2014

Radiated emission from an ITE shall be measured from the lowest frequency generated, or used, in the device or 30 (MHz), whichever is higher, up to the frequency determined in accordance with Table 5.5

Table 5.5 - Frequency Range of Measurement

Highest Frequency Generated or Used in Device	Upper Frequency of Radiated Measurement
Below 1.705 MHz	No radiated testing required
1.705 MHz - 108 MHz	1000 (MHz)
108 MHz - 500 MHz	2000 (MHz)
500 MHz - 1000 MHz	5000 (MHz)
Above 1000M Hz	5th harmonic of the highest frequency or 40000 (MHz), whichever is lower.

Class A: An ITE meeting the conditions for Class A operation defined in Section 1.3 shall comply with the Class A radiated limits set out in Table 5.6 determined at a distance of 3 (m).

☒**Applicable**

Table 5.6 - Class A Radiated Emission Limits(FCC & ICES-003)

Emission Type	Frequency Range (MHz)	FCC @ 3 (m) (dBuV/m)		ICES-003 @ 3 (m) (dBuV/m)	
		Quasi-peak	Average	Quasi-peak	Average
Radiated Emission	30 - 88	49.54	-	49.46	-
	88 - 216	53.98	-	53.96	-
	216 - 960	56.90	-	56.86	-
	960 - 1000	60	-	59.96	-
	Above 1000	-	60	-	59.96

Class B: An ITE that does not meeting the conditions for Class A operation shall comply with the Class B radiated limits set out in Table 5.7 determined at a distance of 3 (m).

☐**Applicable**

Table 5.7 - Class B Radiated Emission Limits (FCC & ICES-003)

Emission Type	Frequency Range (MHz)	FCC @ 3 (m) (dBuV/m)		ICES-003 @ 3 (m) (dBuV/m)	
		Quasi-peak	Average	Quasi-peak	Average
Radiated Emission	30 - 88	40	-	40	-
	88 - 216	43.52	-	43.5	-
	216 - 960	46.02	-	46	-
	960 - 1000	53.98	-	54	-
	Above 1000	-	53.98	-	54

6.0 Test Results

6.1 Antenna Requirement

☒**Applicable**

Table 6.1.1 - Antenna Requirement Test Setup Information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.203, IC RSS Gen Issue 6 section 7.1.2**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS/LIMIT APPLIED:**	**FCC 15.247, RSS-247 Issue 3**
TEST REFERENCE:	FCC 47 CFR Part 15.203 and IC RSS-Gen Issue 6 Section 7.1.2		
REQUIREMENT	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.		
REMARK	A permanently attached antenna was used which is not replaceable.		
RESULTS:	**PASS**		

6.2 RF Peak Power Output

☒**Applicable**

Table 6.2.1 – RF Peak Output Power information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3588000037**	**CLASS:**	
TEMPERATURE:	23°C	**HUMIDITY:**	26%
TESTED BY:	Adiseshu Nyshadham	**DATE OF TEST:**	2024-10-28
TESTREFERENCE:	FCC Title 47 CFR Part 15: Subpart C – 15.247(b)(1), RSS-247 Issue 3		
TEST VOLTAGE:	3.0V ,3.4V ,3.6V		
SETUP:	As per ANSI C63.10:2013, sec 11.9.2		
FREQUENCY RANGE	2400-2483.5 MHz		
FREQUENCY TESTED:	2402 MHz, 2441 MHz, 2480 MHz		
FIRMWARE POWER SETTING	11 dBm		
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE	GFSK, DH1, QPSK, DH2 8-PSK, DH3		
ANTENNA TYPE/GAIN	Ceramic Chip Antenna, 2.2dBi(peak), 1.9dBi(Band edges)		
DUTY CYCLE	NA		
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

Table 6.2.2 – Test Data Summary – Output Power with Voltage Variations					
Frequency (MHz)	**Mode**	**3VDC (dBm)**	**3.4VDC (dBm)**	**3.6VDC (dBm)**	**Max Deviation from 3.4VDC (dB)**
2402	Bluetooth, GFSK	9.15	8.95	8.95	-0.20
2441	Bluetooth, GFSK	10.15	10.15	10.25	-0.10
2480	Bluetooth, GFSK	10.55	10.45	10.75	-0.30

Table 6.2.3 – Antenna Conducted Output Power Measurement

Frequency (MHz)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV)	Corrected Reading (dBm) dBm = dBuV-107.0	RSS-247 5.4 Limit (dBm)	Margin (dB)
2402	114.5	1.45	115.95	8.95	30	-21.05
2441	115.7	1.45	117.15	10.15	30	-19.85
2480	116	1.45	117.45	10.45	30	-19.55
Note: The correction factor is the insertion loss of the 90cm coaxial RF cable that was a temporary antenna port for conducted measurements. Worse case insertion loss value used.						

Table 6.2.4 – Maximum Power Output Summary For all Modes – RF Conducted Measurement				
Frequency	**Mode**	**Measured (dBm)**	**Limit (dBm)**	**Result**
2402	Bluetooth, GFSK	8.95	30	PASS
2441	Bluetooth, GFSK	10.15	30	PASS
2480	Bluetooth, GFSK	10.45	30	PASS
2402	Bluetooth, QPSK	5.85	30	PASS
2441	Bluetooth, QPSK	7.35	30	PASS
2480	Bluetooth, QPSK	7.45	30	PASS
2402	Bluetooth, 8-PSK	5.55	30	PASS
2441	Bluetooth, 8-PSK	7.05	30	PASS
2480	Bluetooth, 8-PSK	7.85	30	PASS

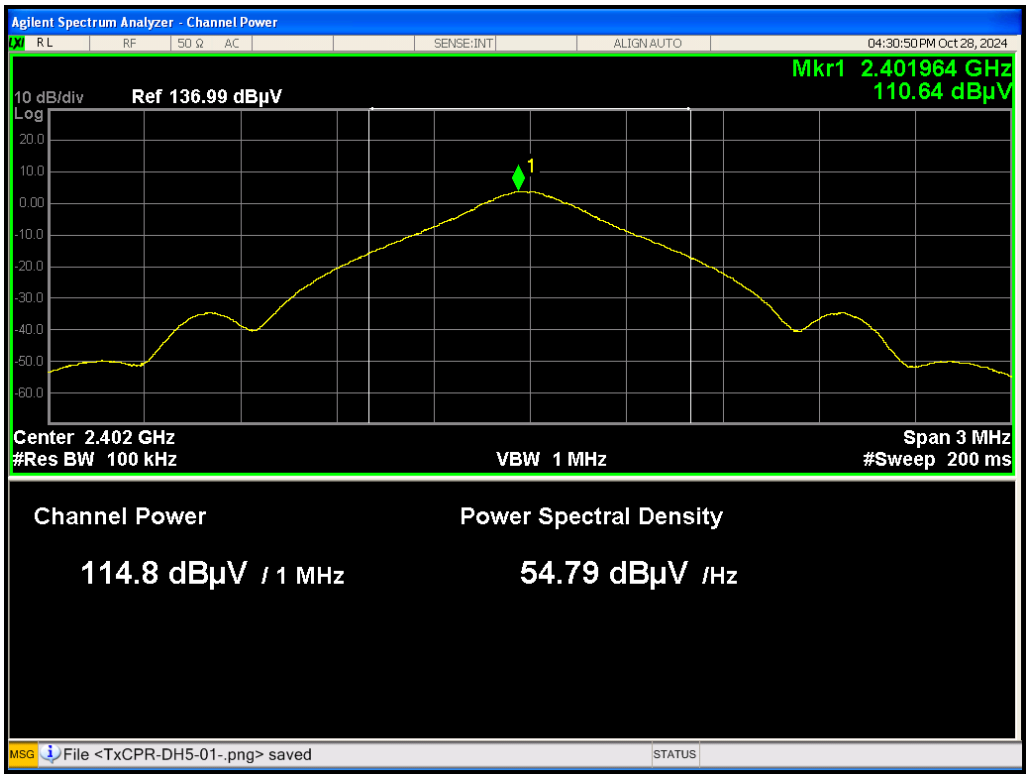

Figure 6.2.1 – Antenna Conducted Out Put Power Channel 1, GFSK Data.

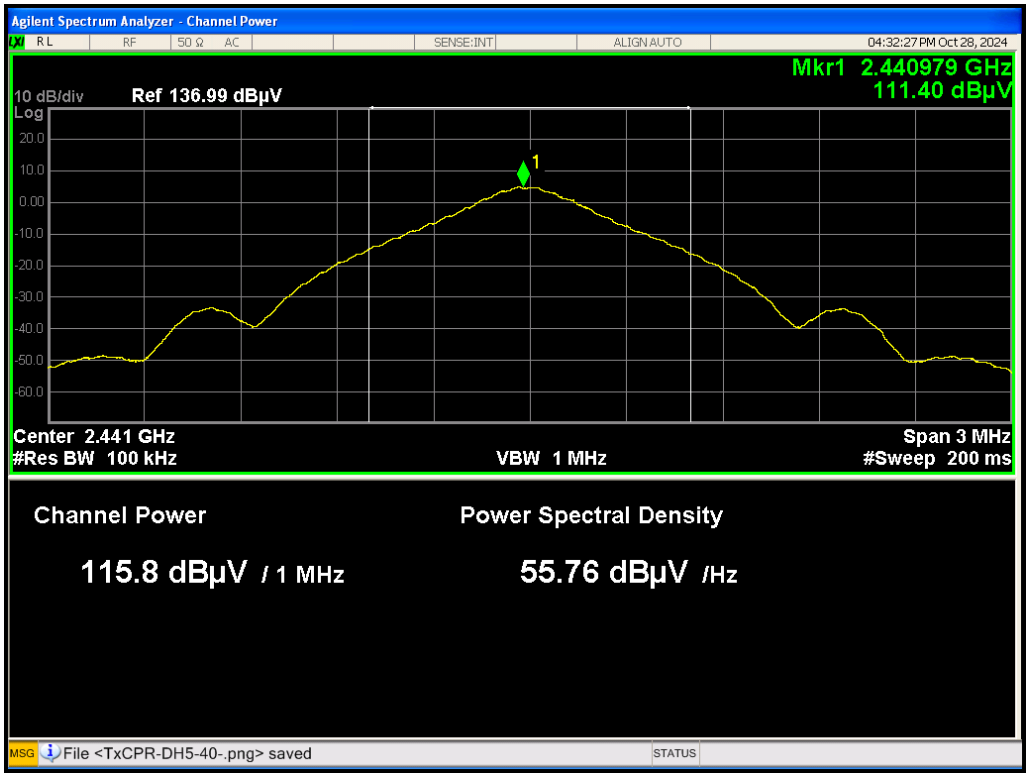

Figure 6.2.2 - Antenna Conducted Out Put Power Channel 40, GFSK Data.

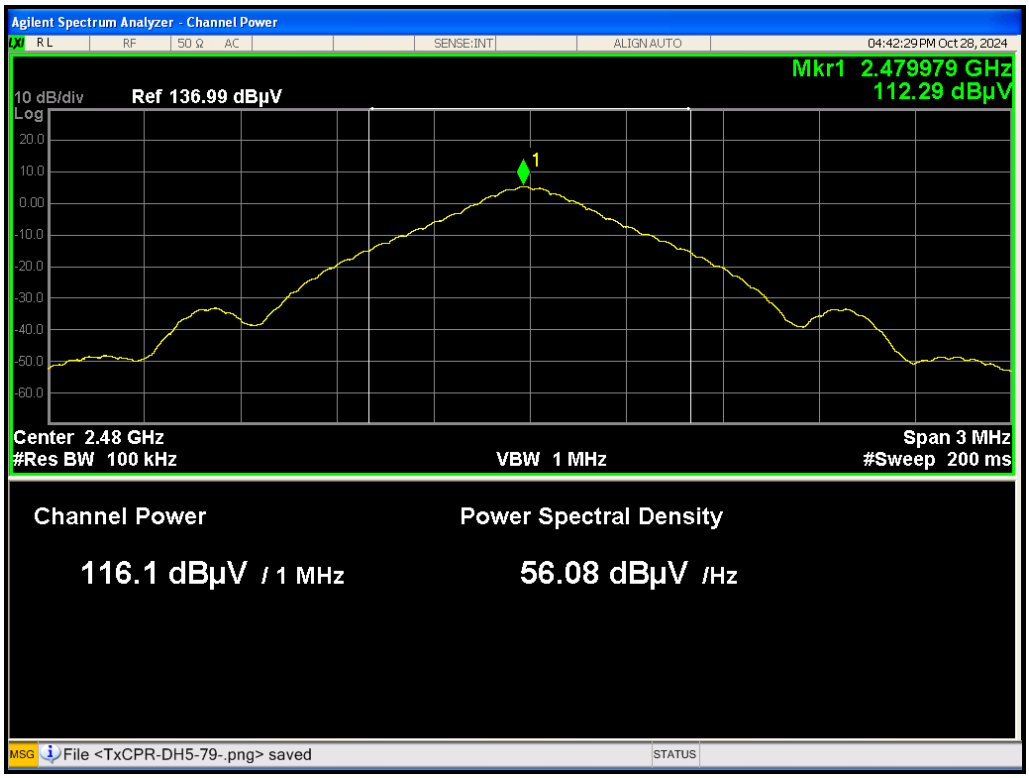

Figure 6.2.3 – Antenna Conducted Out Put Power Channel 79, GFSK Data.

6.3 Radiated Spurious Emissions

☒**Applicable**

Table 6.3.1 – Radiated Spurious Emission Test Setup Information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS:**	
TEMPERATURE:	23-25°C	**HUMIDITY:**	23-25%
TESTED BY:	Chi Gieng	**DATE OF TEST:**	2024-10-07 to 2024-11-13
TESTREFERENCE:	FCC Subpart C 15.205, 15.209, 15.247, RSS-247-Issue 3, RSS-Gen Issue 5		
TEST VOLTAGE:	120VAC, range		
SETUP:	ANSI C63.4-2014		
FREQUENCY RANGE	30M-26.5 GHz		
FREQUENCY TESTED:	2402MHz, 2441 MHz, 2480 MHz		
FIRMWARE POWER SETTING	11 dBm		
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE	GFSK, DH1, QPSK, DH2 8-PSK, DH3		
ANTENNA TYPE/GAIN	Ceramic Chip Antenna, 2.2dBi(peak), 1.9dBi(Band edges)		
DUTY CYCLE	N/A		
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

Radiated Spurious Emissions Data
8-PSK, CH2402

Table 6.3.2a - Radiated Emission - **Horizontal** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
84.025	172.5	400	10.35	16.25	26.6	40	-13.4
31.575	195	100	0.91	25.1	26.01	40	-13.99

Table 6.3.2b - Radiated Emission - **Vertical** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
95.225	285	100	18.32	17.71	36.03	43.52	-7.49
54.1	330	100	14.73	15.21	29.94	40	-10.06

Table 6.3.2c - Radiated Emission - **Horizontal** Polarization AVG

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
4804	255	150	59.25	-17.87	41.38	53.98	-12.6
7206	45	150	60.16	-17.72	42.44	53.98	-11.54

Table 6.3.2d - Radiated Emission - **Vertical** Polarization AVG

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
4804	330	150	58.58	-18.01	40.57	53.98	-13.41
7206	300	150	57.2	-17.76	39.44	53.98	-14.54

Note: The emissions with peak detector were measured and found to meet Quasi-peak/average limits. Only Quasi-peak/Average detector measurements were shown in the above tables. Emissions below 10dB were not reported.

Radiated Spurious Emissions Data
8-PSK, CH2441

Table 6.3.3a - Radiated Emission - **Horizontal** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
84	82.5	300	12.9	16.24	29.14	40	-10.86
31.15	172.5	200	2.14	25.35	27.49	40	-12.51

Table 6.3.3b - Radiated Emission - **Vertical** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
54.175	150	100	17.23	15.18	32.41	40	-7.59
84.025	82.5	300	14.16	16.25	30.41	40	-9.59

Table 6.3.3c - Radiated Emission - **Horizontal** Polarization AVG

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
4882	270	150	57.92	-17.03	40.89	53.98	-13.09
7323	345	150	57.16	-16.82	39.2	53.98	-14.78

Table 6.3.3d - Radiated Emission - **Vertical** Polarization AVG

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
4882	315	150	59.00	-17.96	41.04	53.98	-12.94
7323	195	150	58.83	-16.96	41.87	53.98	-12.11

Note: The emissions with peak detector were measured and found to meet Quasi-peak/average limits. Only Quasi-peak/Average detector measurements were shown in the above tables. Emissions below 10dB were not reported.

Radiated Spurious Emissions Data
8-PSK, CH2480

Table 6.3.4a - Radiated Emission - **Horizontal** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
30.85	330	200	1.38	25.49	26.87	40	-13.13
84	262.5	300	10.56	16.24	26.8	40	-13.2

Table 6.3.4b - Radiated Emission - **Vertical** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
72.8	262.5	100	17.58	14.28	31.86	40	-8.14
53.7	330	100	16.42	15.37	31.79	40	-8.21
84	262.5	100	15.24	16.24	31.48	40	-8.52

Table 6.3.4c - Radiated Emission - **Horizontal** Polarization AVG

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
4960	270	150	58.68	-17.69	40.99	53.98	-12.99
7440	300	150	59.25	-18.06	41.19	53.98	-12.79

Table 6.3.4d - Radiated Emission - **Vertical** Polarization AVG

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
4960	195	150	59.98	-17.89	42.09	53.98	-11.89
7440	180	150	56.97	-18.06	38.91	53.98	-15.07

Note: The emissions with peak detector were measured and found to meet Quasi-peak/average limits. Only Quasi-peak/Average detector measurements were shown in the above tables. Emissions below 10dB were not reported.

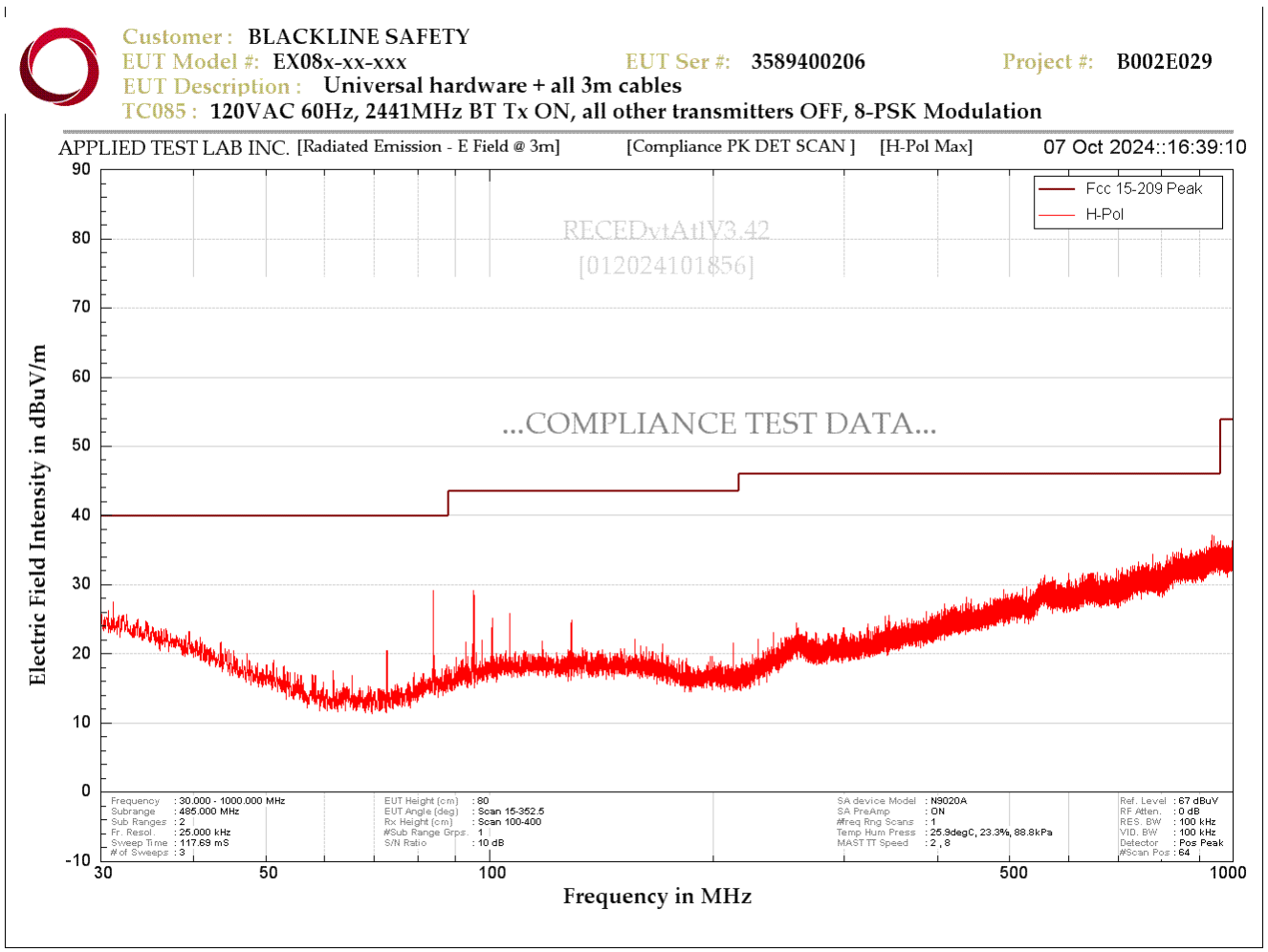

Figure 6.3.1a - Radiated Spurious Emission data(Middle channel, 8-PSK) -H-Pol-(30MHz - 1000MHz)

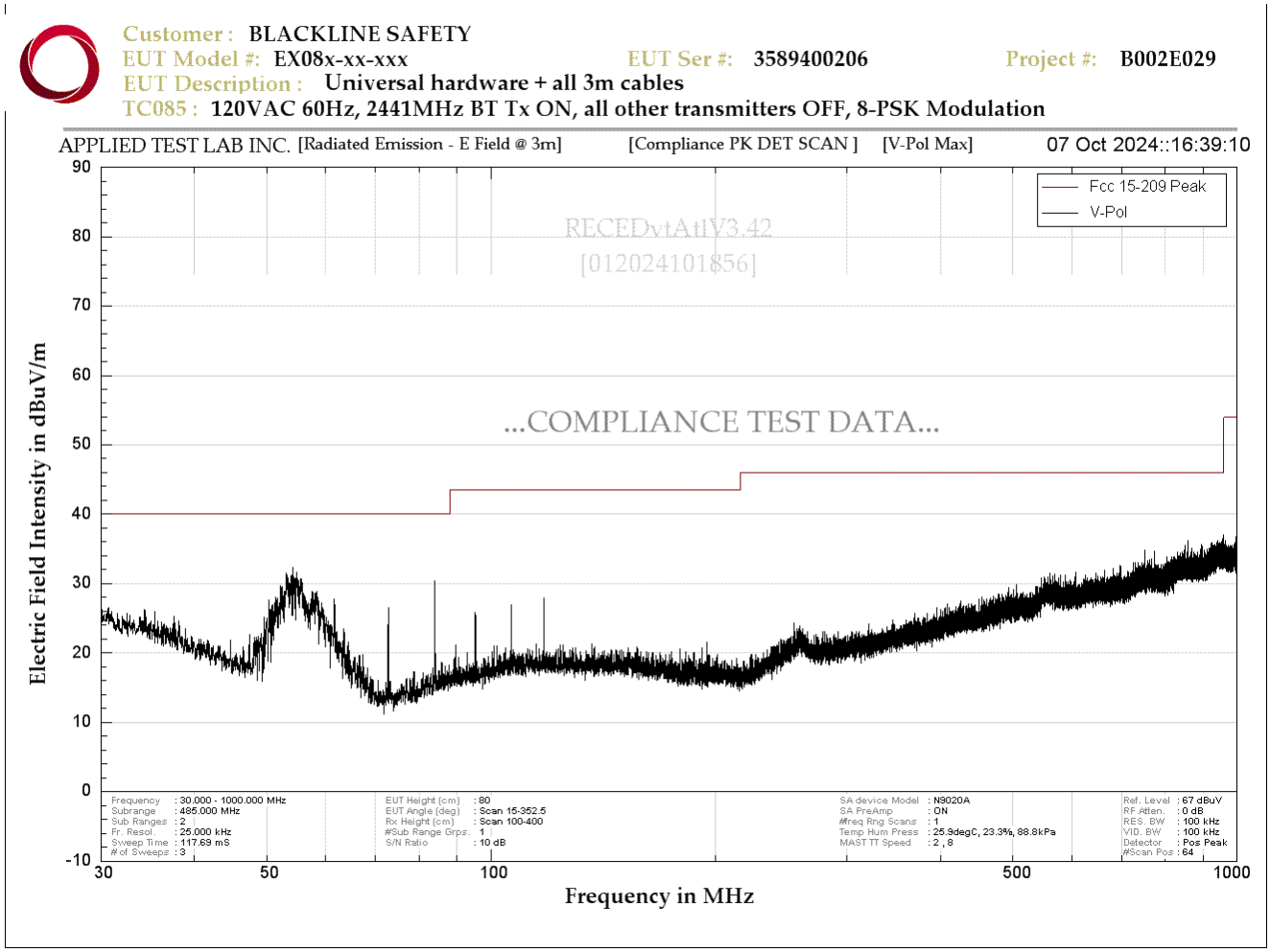

Figure 6.3.1b - Radiated Spurious Emission data(Middle channel, 8-PSK) – V-pol-(30MHz - 1000MHz)

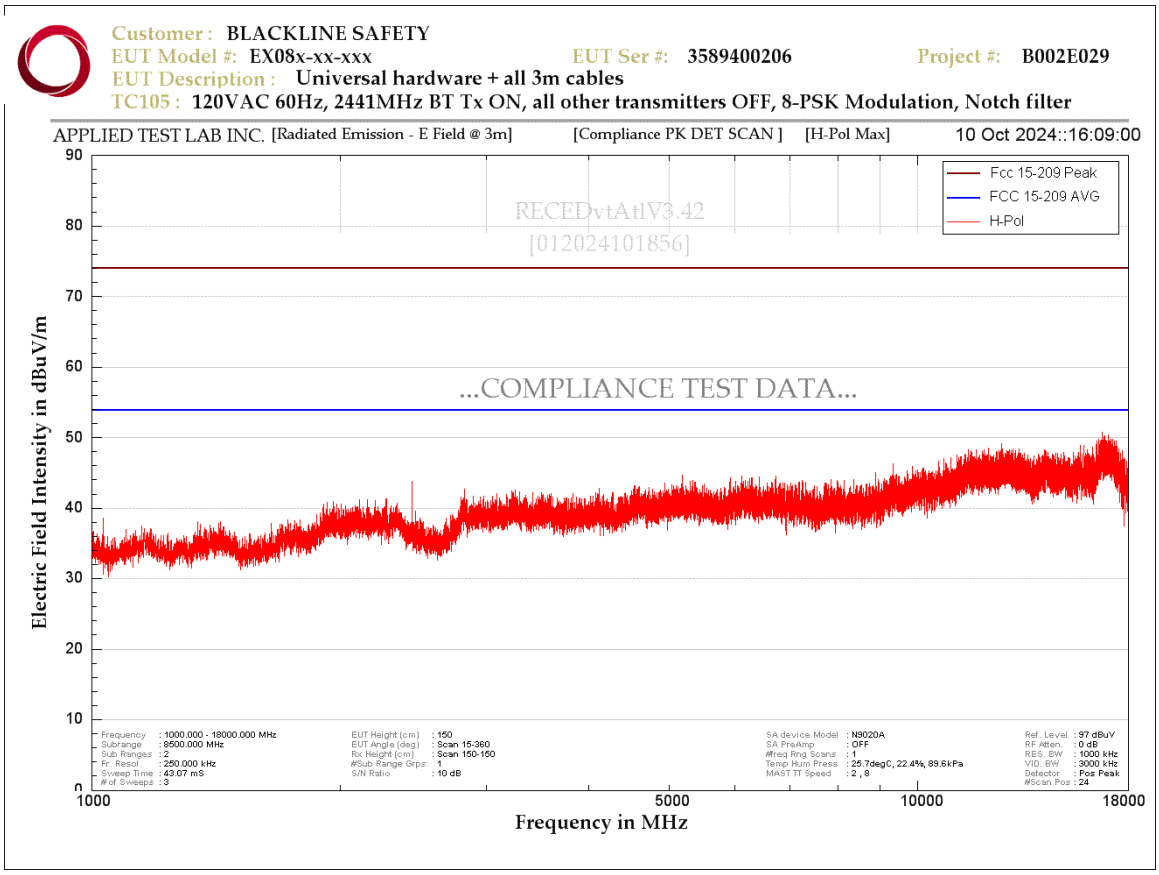

Figure 6.3.1c - Radiated Spurious Emission data(Middle channel, 8-PSK) -H-Pol-(1GHz – 18GHz)

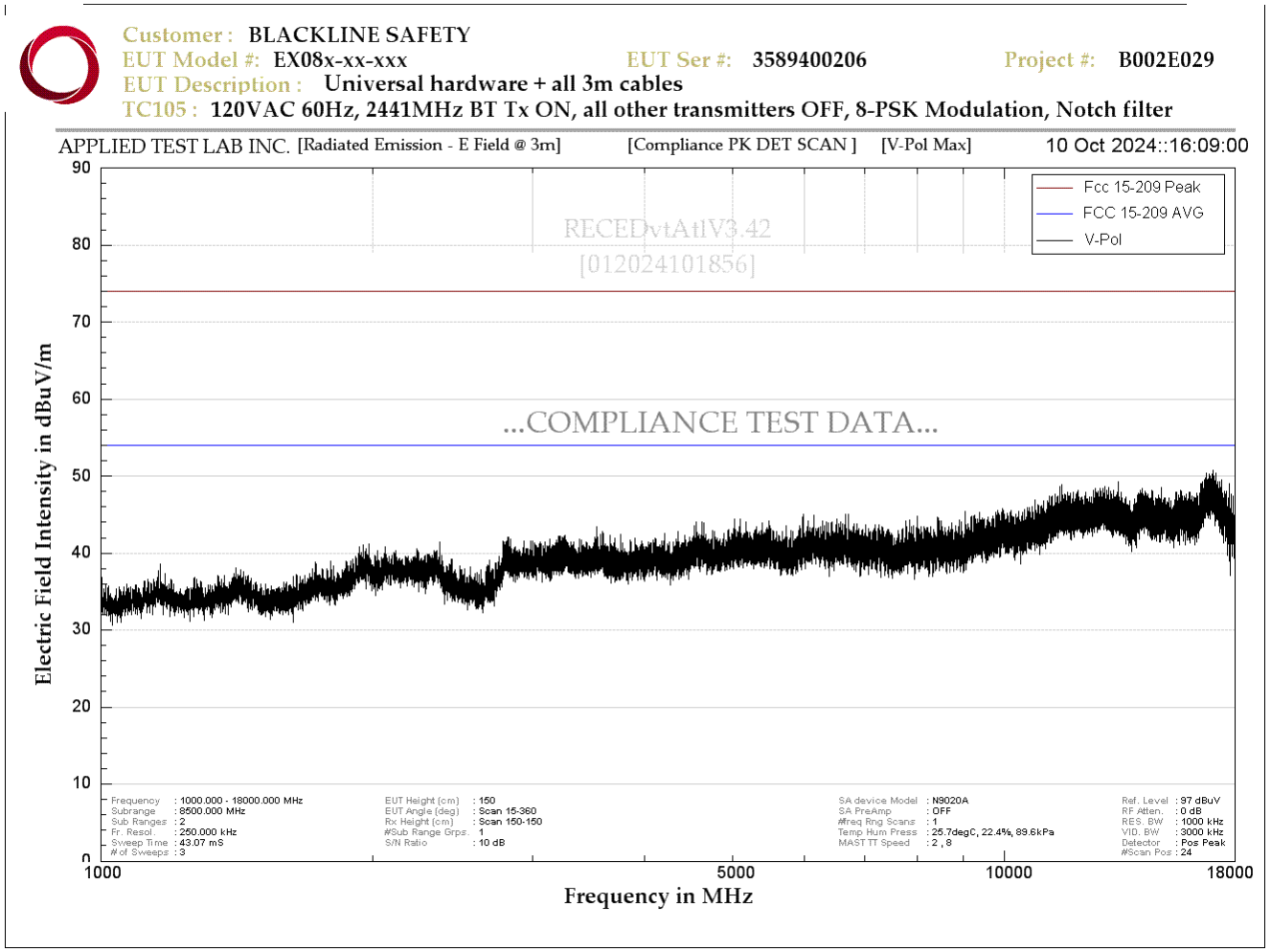

Figure 6. 3.1d - Radiated Spurious Emission data(Middle channel, 8-PSK) – V-pol-(1GHz - 18GHz)

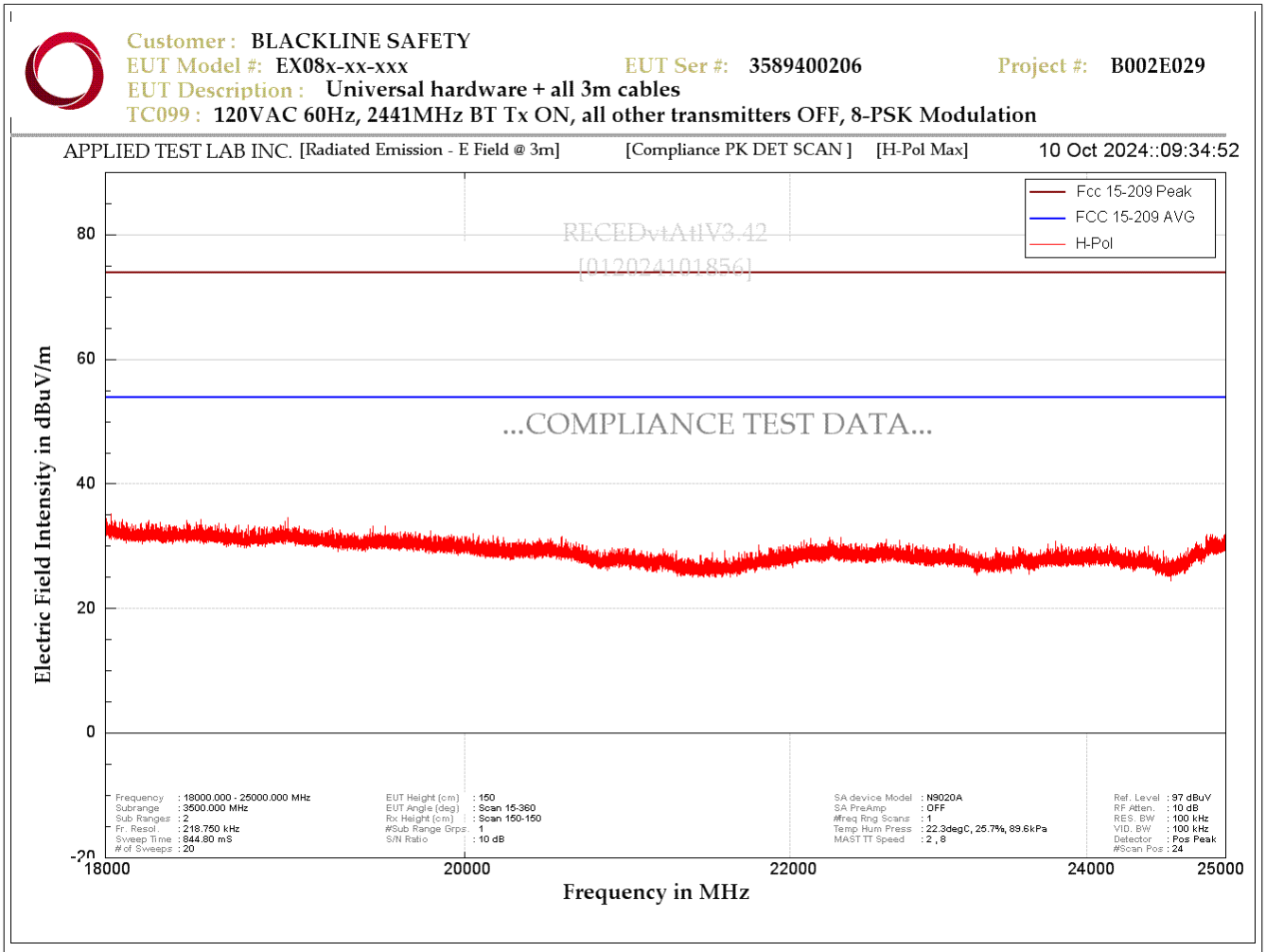

Figure 6. 3.1e - Radiated Spurious Emission data(Middle channel, 8-PSK) -H-Pol-(18GHz - 25GHz)

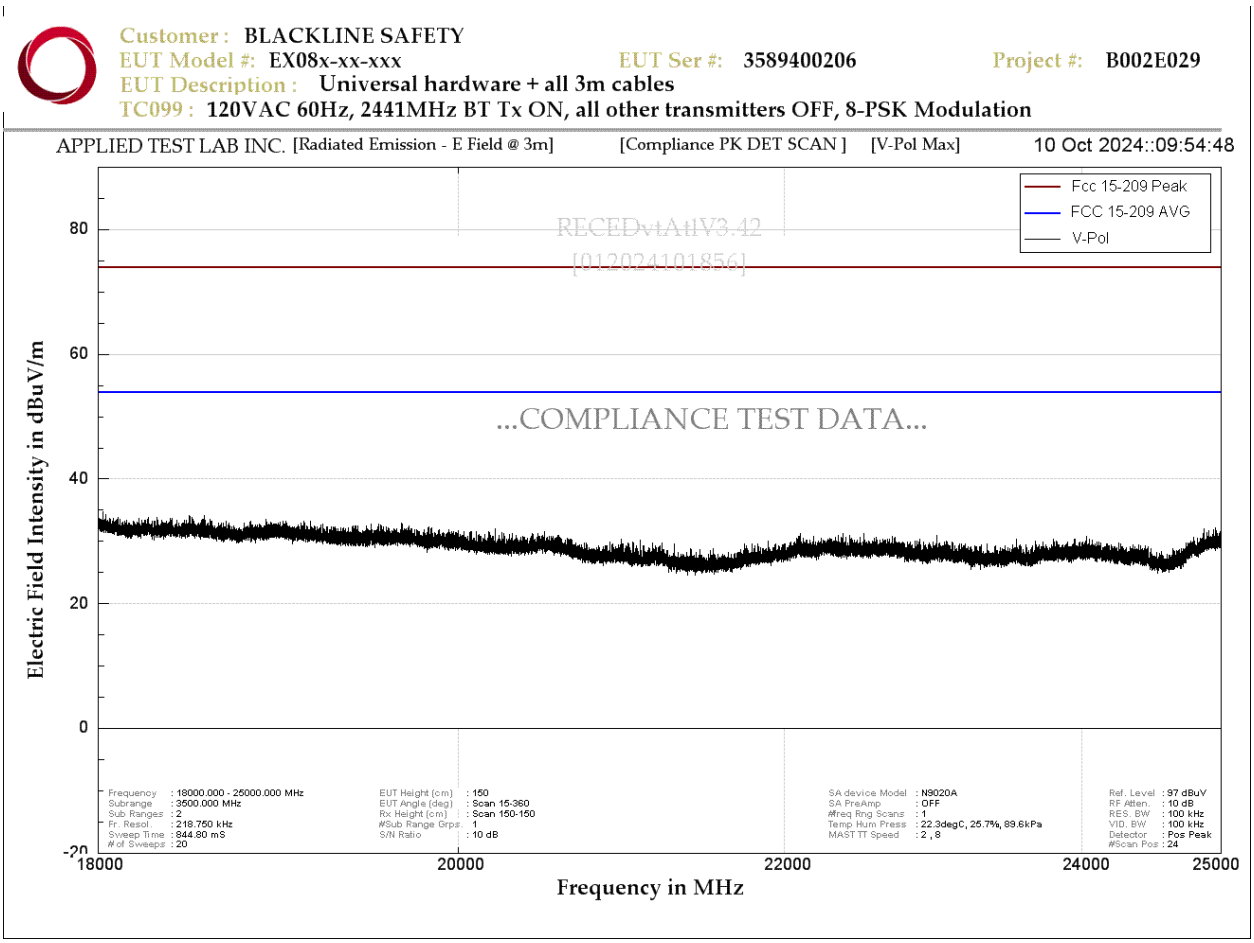

Figure 6. 3.1f - Radiated Spurious Emission data(Middle channel, 8-PSK) – V-pol-(18GHz - 25GHz)

Table 6.3.5a - Radiated Emission - **Horizontal** Polarization AVG RSS-247 5.5

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
GFSK							
4804	330	150	45.87	-20.77	25.10	53.98	-28.88
7206	330	150	44.29	-17.78	26.51	53.98	-27.47
4882	330	150	45.42	-20.41	25.01	53.98	-28.97
7323	330	150	43.48	-17.73	25.75	53.98	-28.23
4960	330	150	45.22	-20.4	24.82	53.98	-29.16
7440	330	150	43.5	-17.59	25.91	53.98	-28.07
QPSK							
4804	330	150	45.74	-20.77	24.97	53.98	-29.01
7206	330	150	43.48	-17.78	25.70	53.98	-28.28
4882	330	150	45.34	-20.41	24.93	53.98	-29.05
7323	330	150	43.2	-17.73	25.47	53.98	-28.51
4960	330	150	45.11	-20.4	24.71	53.98	-29.27
7440	330	150	43.39	-17.59	25.80	53.98	-28.18
8-PSK							
4804	255	150	59.25	-17.87	41.38	53.98	-12.6
7206	7206	150	60.16	-17.72	42.44	53.98	-11.54
4882	4882	150	57.92	4882	40.89	53.98	-13.09
7323	7323	150	57.16	-16.82	39.2	53.98	-14.78
4960	4960	150	58.68	-17.69	40.99	53.98	-12.99
7440	7440	150	59.25	-18.06	41.19	53.98	-12.79

Table 6.3.6 - Radiated Emission - **Vertical** Polarization AVG RSS-247 5.5

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
GFSK							
4804	330	150	57.51	-20.77	36.74	53.98	-17.24
7206	330	150	55.55	-17.78	37.77	53.98	-16.21
4882	330	150	55.56	-20.41	35.15	53.98	-18.83
7323	330	150	56	-17.73	38.27	53.98	-15.71
4960	330	150	56.13	-20.4	35.73	53.98	-18.25
7440	330	150	54.47	-17.59	36.88	53.98	-17.10
QPSK							
4804	330	150	57.07	-20.77	36.30	53.98	-17.68
7206	330	150	54.37	-17.78	36.59	53.98	-17.39
4882	330	150	57.1	-20.41	36.69	53.98	-17.29
7323	330	150	55.91	-17.73	38.18	53.98	-15.80
4960	330	150	56.23	-20.4	35.83	53.98	-18.15
7440	330	150	54.45	-17.59	36.86	53.98	-17.12
8-PSK							
4804	330	150	58.58	-18.01	40.57	53.98	-13.41
7206	300	150	57.2	-17.76	39.44	53.98	-14.54
4882	315	150	59	-17.96	41.04	53.98	-12.94
7323	195	150	58.83	-16.96	41.87	53.98	-12.11
4960	195	150	59.98	-17.89	42.09	53.98	-11.89
7440	180	150	56.97	-18.06	38.91	53.98	-15.07

Note: The emissions with peak detector were measured and found to meet average limits.

Radio Collocation Data
8-PSK, CH2441 Cell modem Tx On 699MHz 24dBm 1616MHz 2W pulse 90ms

Table 6.3.10a - Radiated Emission - **Horizontal** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
32.431	146	383	-2.5	24.69	22.19	40	-17.81

Table 6.3.10b - Radiated Emission - **Vertical** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
95.2403	199	136	16.99	17.71	34.7	43.52	-8.82

Note: 84 and 917 MHz emissions are verified to be not related to spurious emissions from radios

Table 6.3.10c - Radiated Emission - **Horizontal** Polarization AVG

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
3232	75	150	64.94	-20.72	44.22	54	-9.78
4848	360	150	58.47	-18.2	40.27	54	-13.73
6464	195	150	57.23	-16.95	40.28	54	-13.72
8080	285	150	59.37	-16.74	42.63	54	-11.37
9696	225	150	58.42	-14.96	43.46	54	-10.54

Table 6.3.10d - Radiated Emission - **Vertical** Polarization AVG

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
3232	312.6	218.4	51.6	-20.93	30.67	54	-23.33
4848	195	150	66.88	-18.37	48.51	54	-5.49
6464	135	150	56.02	-16.95	39.07	54	-14.93
8080	165	150	59.96	-16.75	43.21	54	-10.79
9696	131.1	266.2	48.92	-14.94	33.98	54	-20.02
11312	187.8	293.2	47.89	-12.4	35.59	54	-18.41

Note: The emissions with peak detector were measured and found to meet average limits. Peak/Average detector measurements were shown in the above tables.

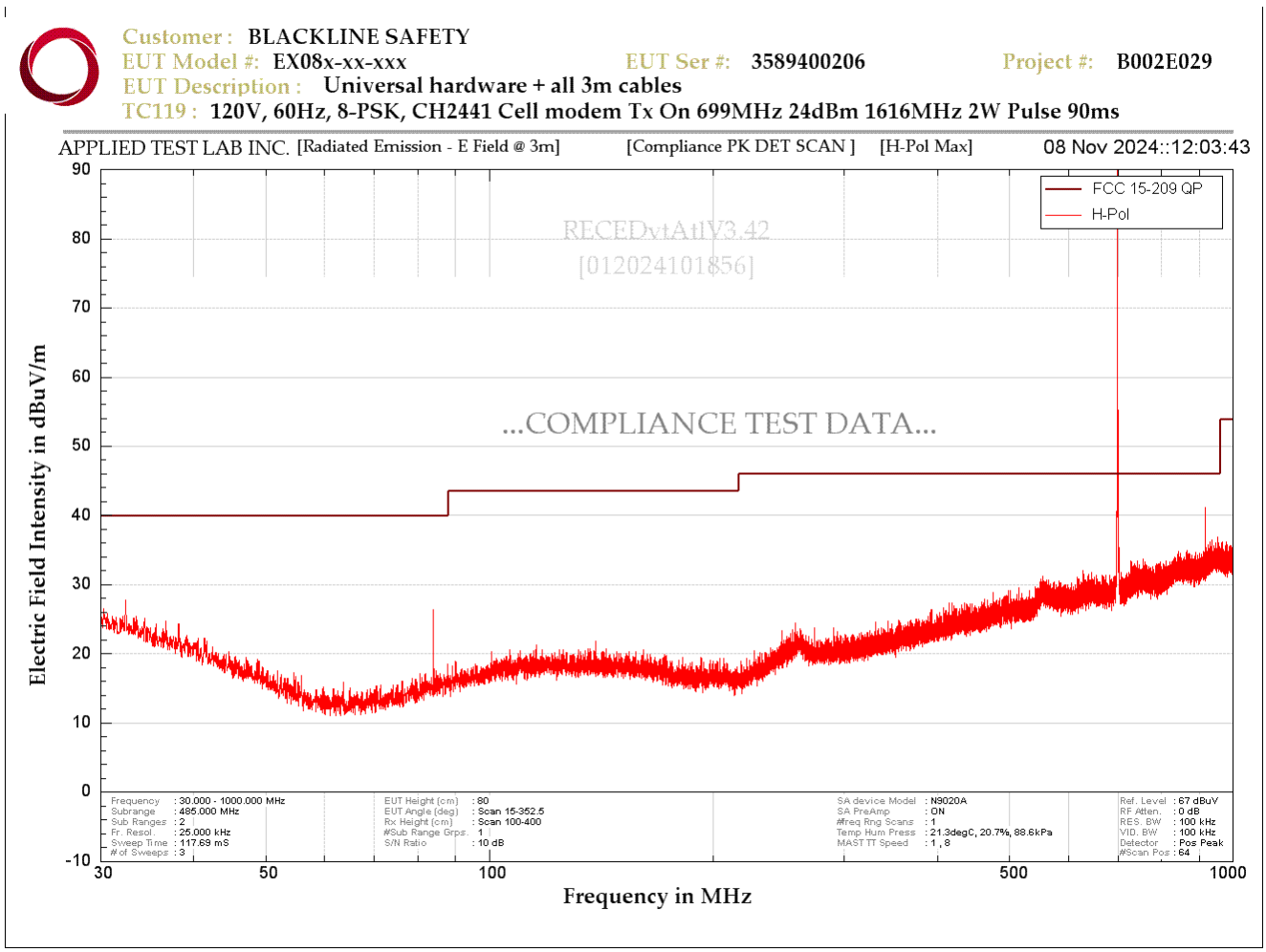

Figure 6.3.5a - Radiated Spurious Emission data(Middle channel, 8-PSK) -H-Pol-(30MHz – 1000MHz)

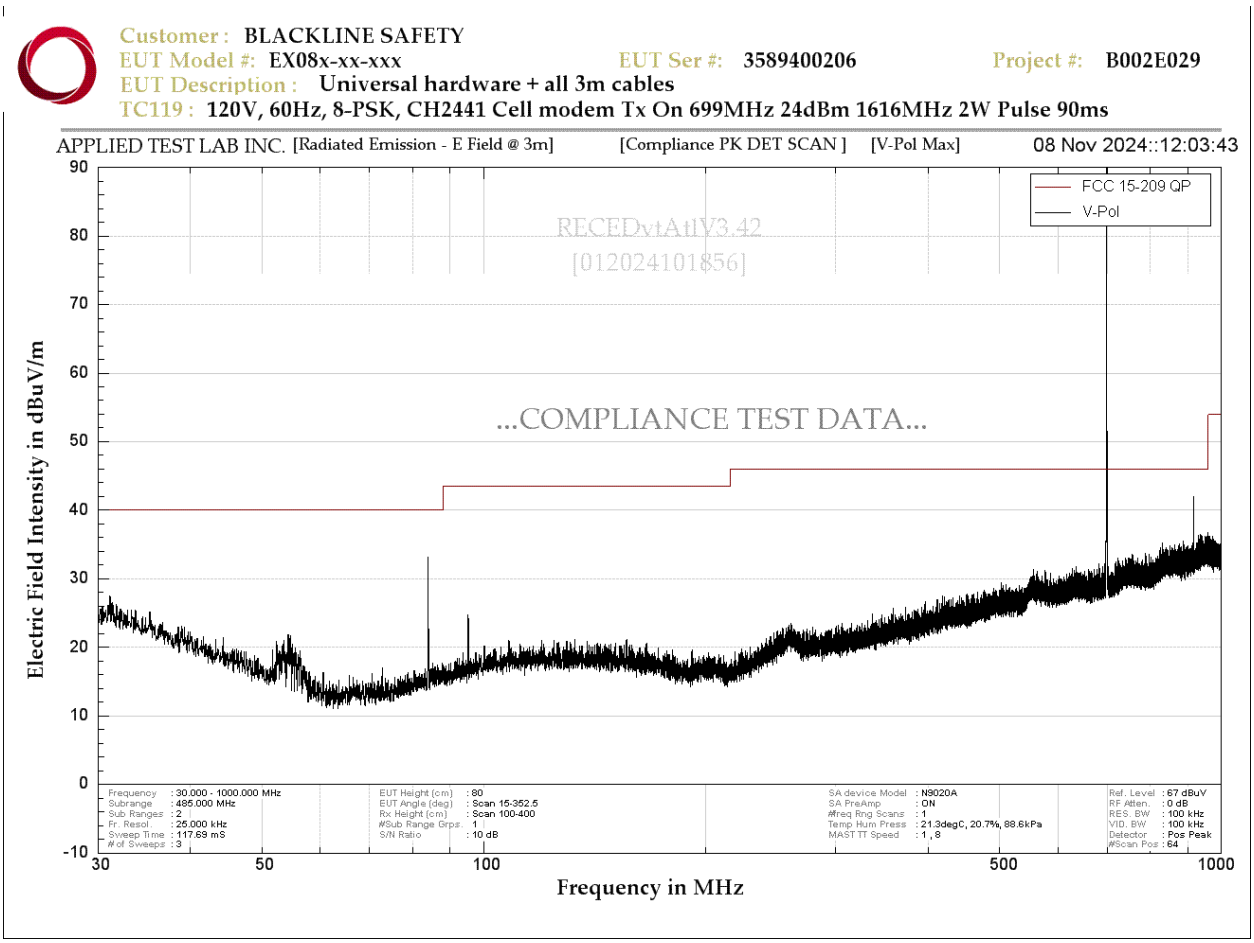

Figure 6.3.5b - Radiated Spurious Emission data(Middle channel, 8-PSK) – V-pol-(30MHz - 1000MHz)

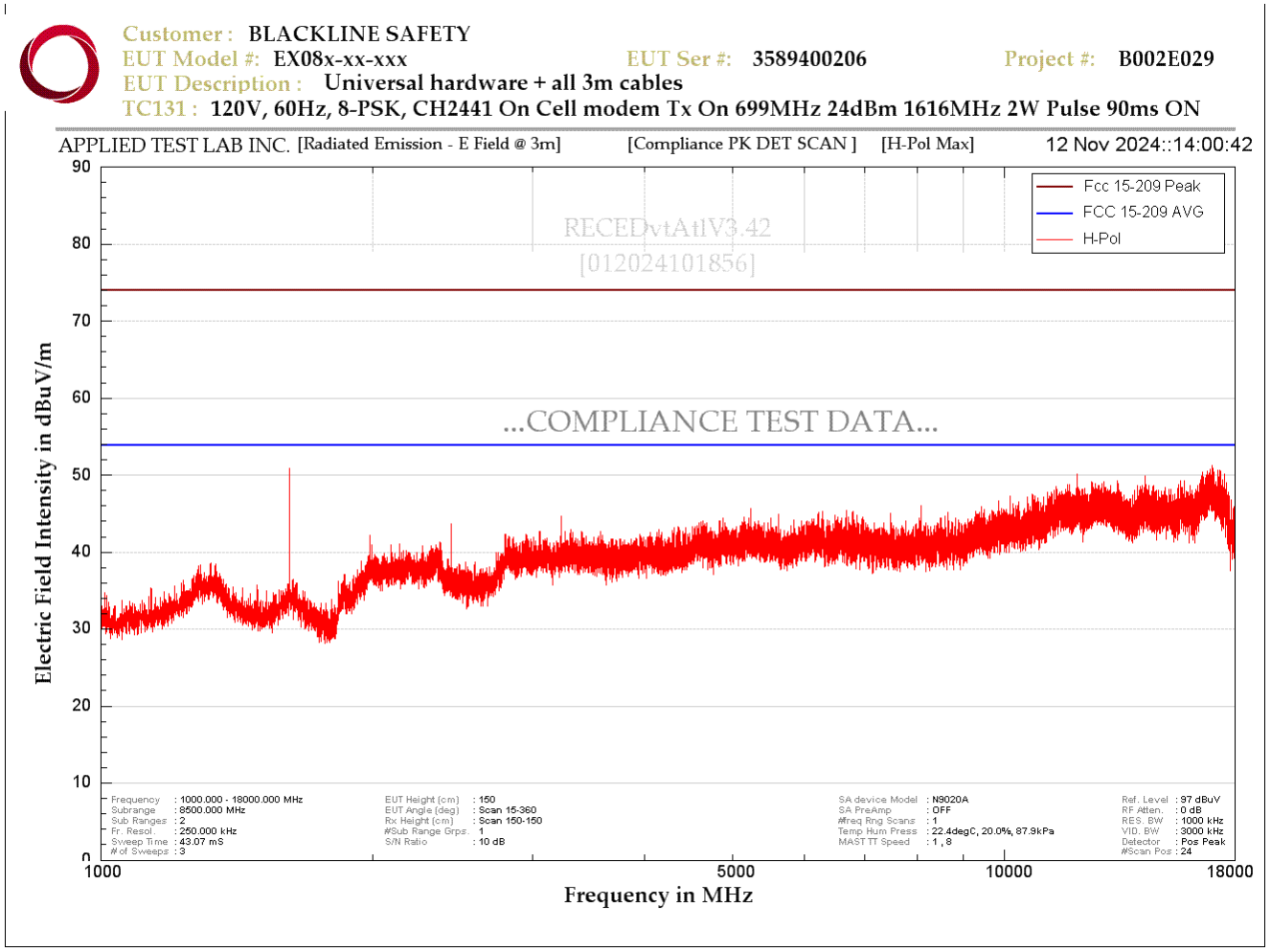

Figure 6.3.5c - Radiated Spurious Emission data(Middle channel, 8-PSK) -H-Pol-(1GHz – 18GHz)

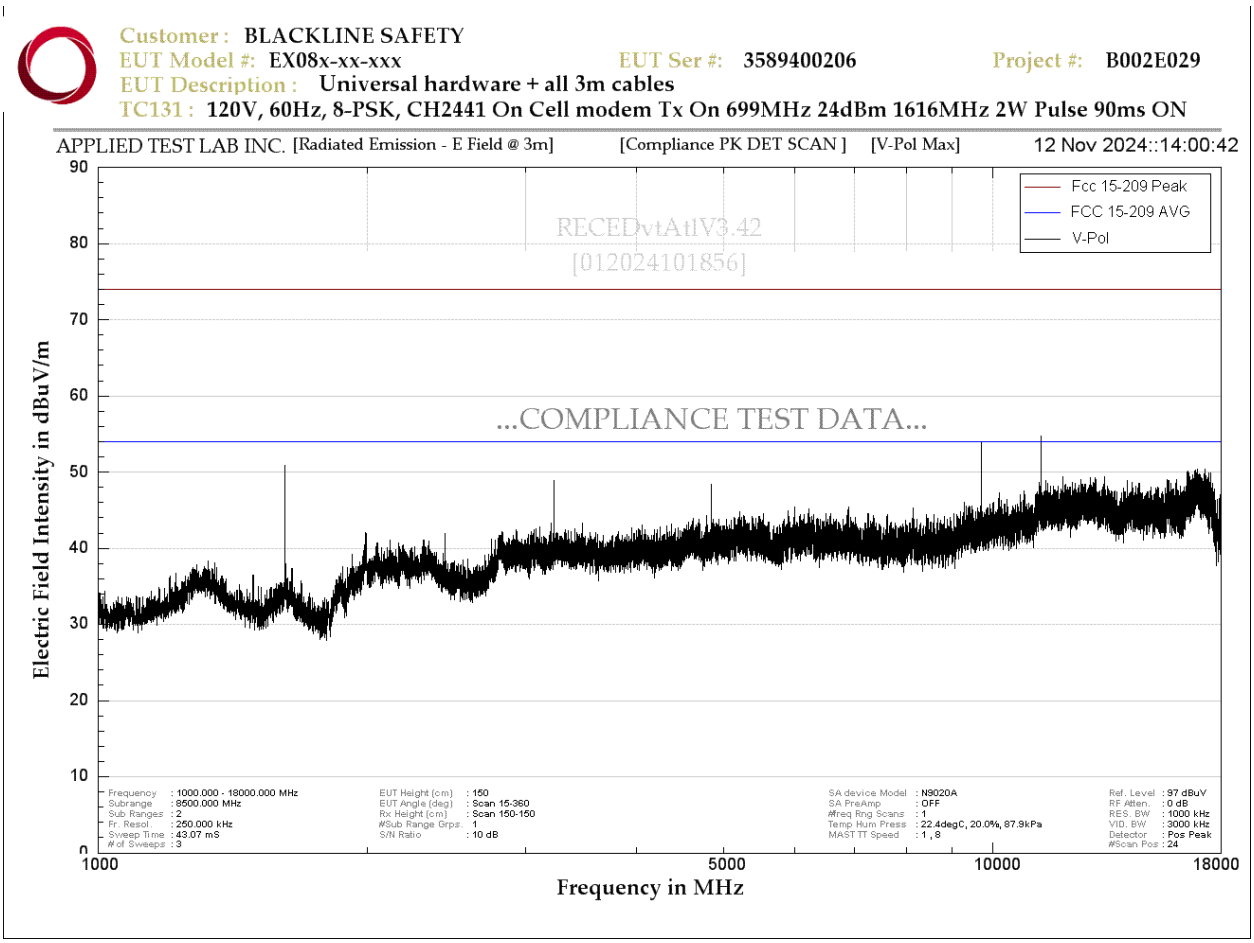

Figure 6.3.5d - Radiated Spurious Emission data(Middle channel, 8-PSK) – V-pol-(1GHz - 18GHz)

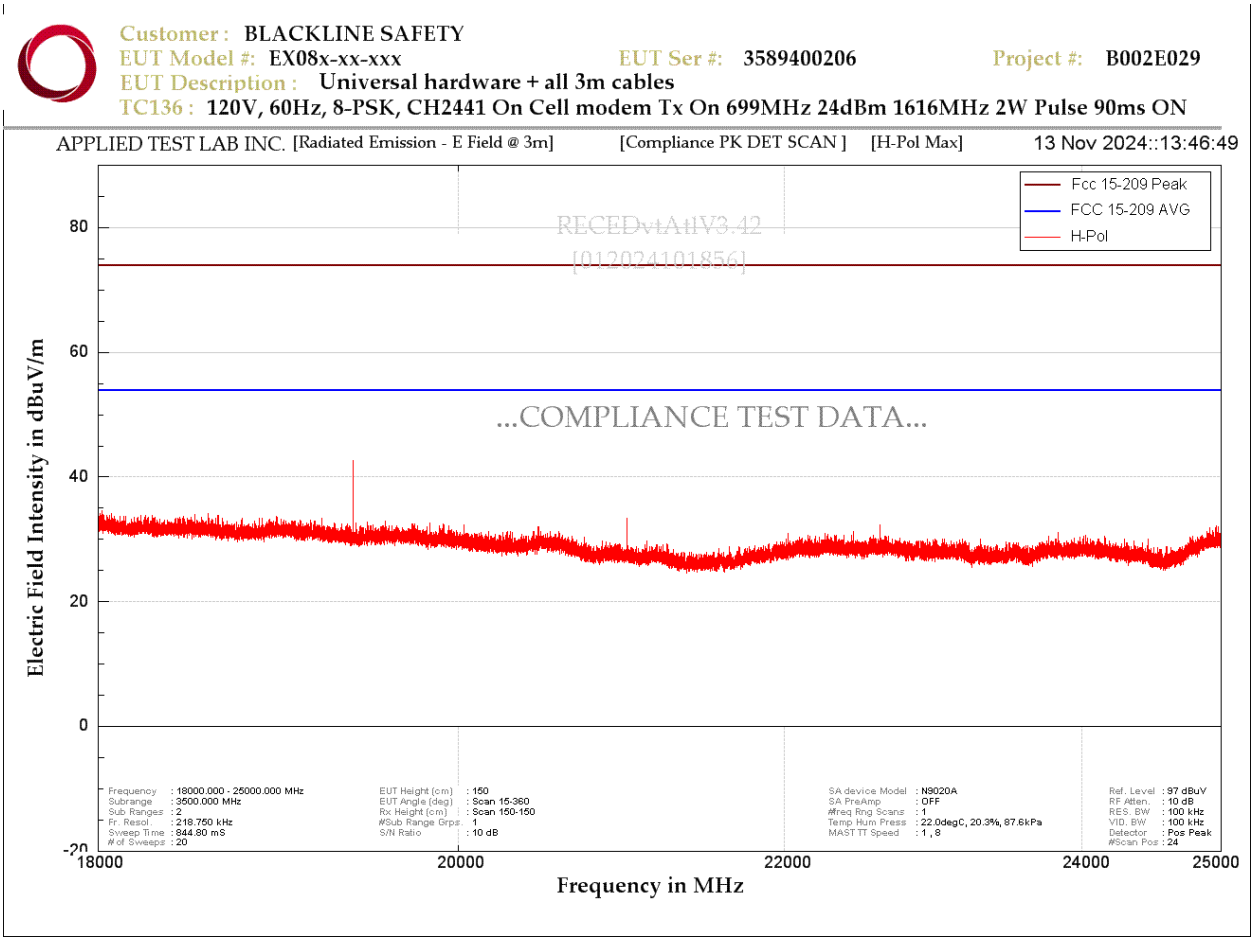

Figure 6.3.5e - Radiated Spurious Emission data(Middle channel, 8-PSK) -H-Pol-(18GHz – 26GHz)

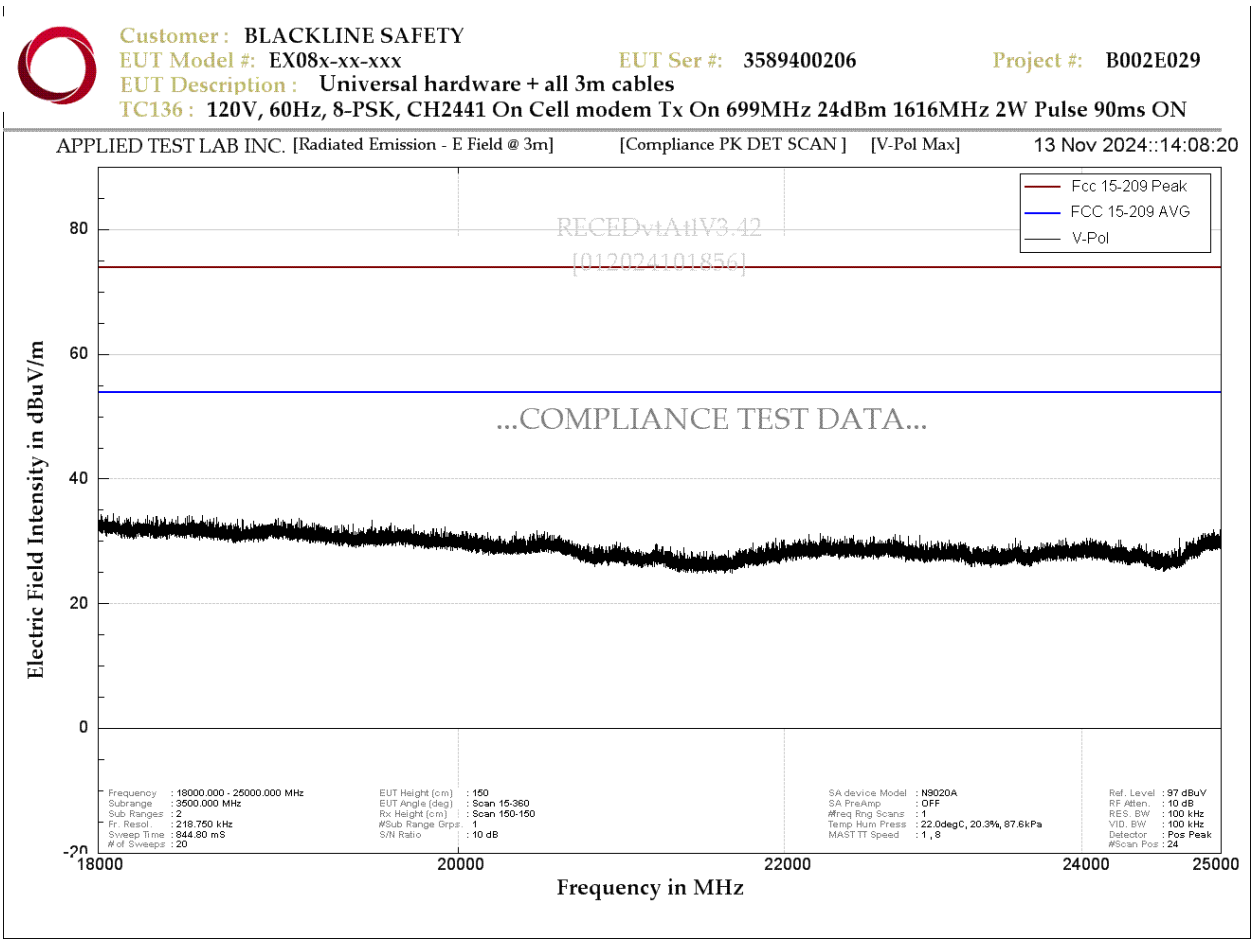

Figure 6.3.5f - Radiated Spurious Emission data(Middle channel, 8-PSK) – V-pol-(18GHz - 26GHz)

Radio Collocation Data
8-PSK, CH2441 Cell modem Tx On 824MHz 24dBm 1616MHz 2W pulse 90ms

Table 6.3.10a - Radiated Emission - **Horizontal** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
							0

Table 6.3.10b - Radiated Emission - **Vertical** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
95.2518	15	132.20	16.10	17.71	33.81	43.52	-9.71

Note: 84 and 917 MHz emissions are verified to be not related to spurious emissions from radios

Table 6.3.10c - Radiated Emission - **Horizontal** Polarization AVG

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
3232	292.5	354	51.83	-20.72	31.11	54	-22.89
4848	165	150	61.51	-18.2	43.31	54	-10.69
6464	120	150	56.85	-16.95	39.9	54	-14.10
8080	135	150	57.67	-16.74	40.93	54	-13.07
9696	150	150	57.71	-14.96	42.74	54	-11.26

Table 6.3.10d - Radiated Emission - **Vertical** Polarization AVG

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	RSS-247 5.5 Limit (dBuV/m)	Margin (dB)
3230.861	60	196.9	51.73	-20.93	30.80	54	-23.20
4849.843	271.1	308.5	49.41	-18.39	31.02	54	-22.98
8080	150	150	62.02	-16.74	45.28	54	-8.72
9696	210	150	61.51	-14.96	46.55	54	-7.45
11312.25	141.7	373.2	48.02	-12.4	35.62	54	-18.38

Note: The emissions with peak detector were measured and found to meet average limits. Peak/Average detector measurements were shown in the above tables.

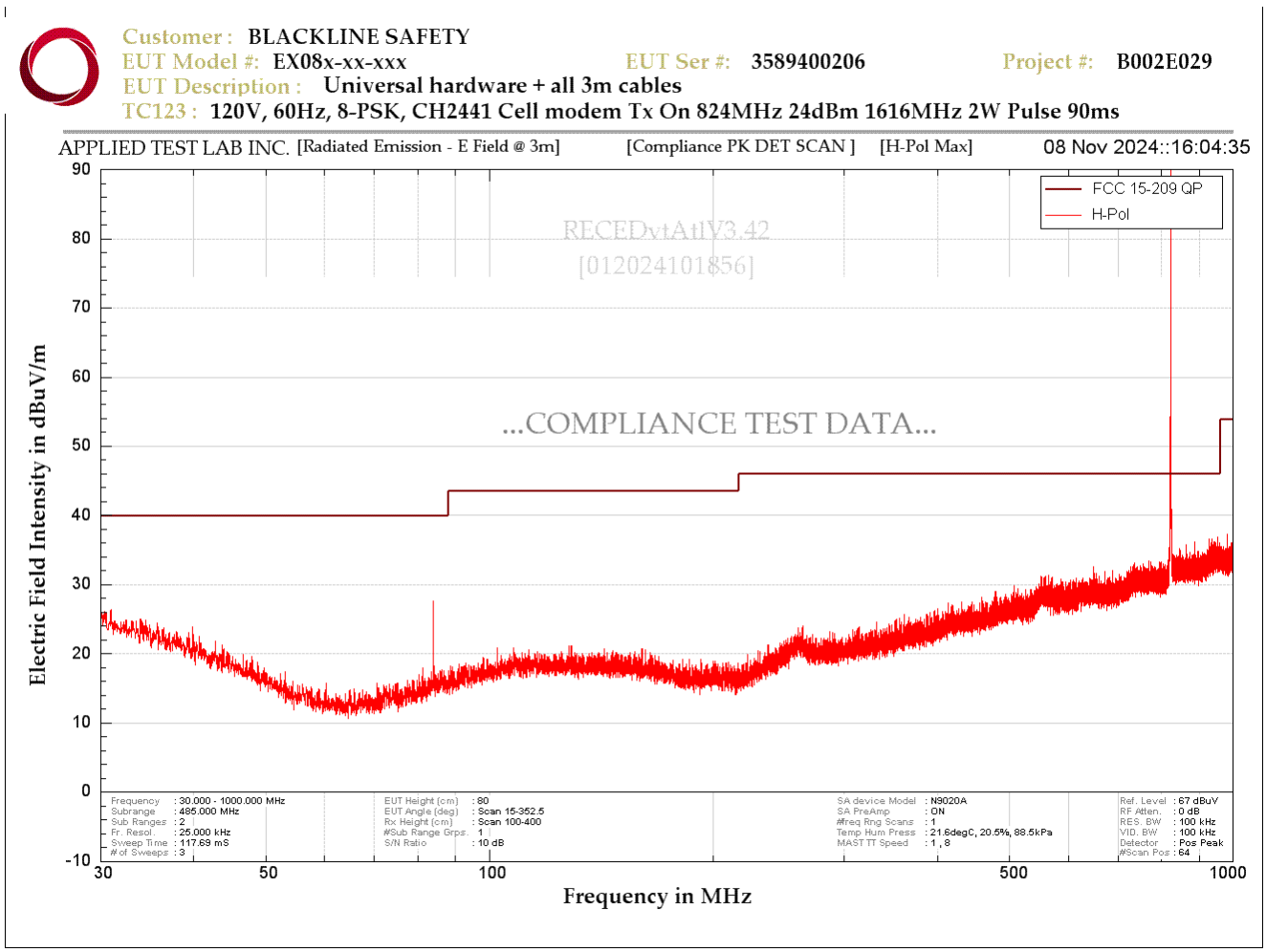

Figure 6.3.5a - Radiated Spurious Emission data(Middle channel, 8-PSK) -H-Pol-(30MHz – 1000MHz)

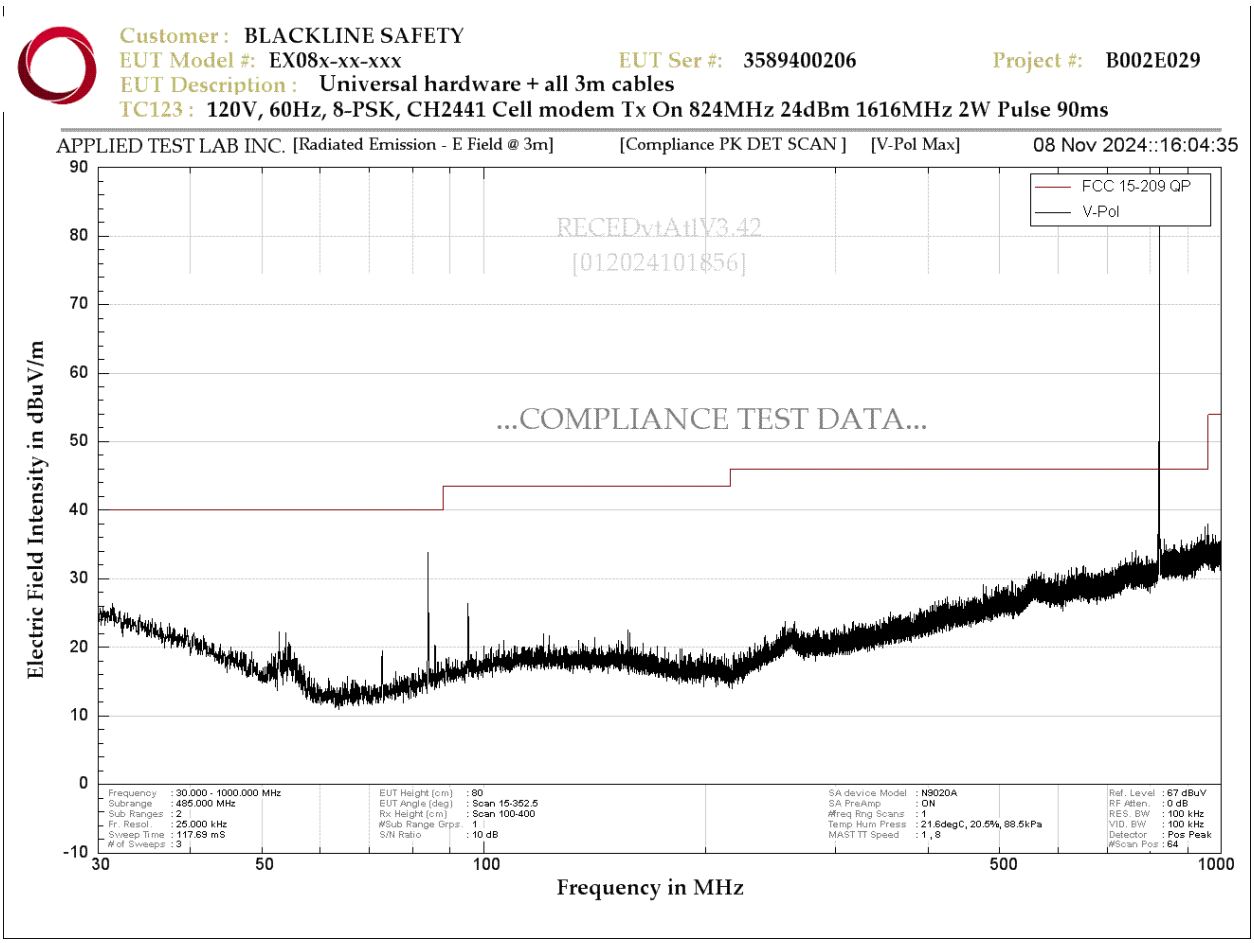

Figure 6.3.5b - Radiated Spurious Emission data(Middle channel, 8-PSK) – V-pol-(30MHz - 1000MHz)

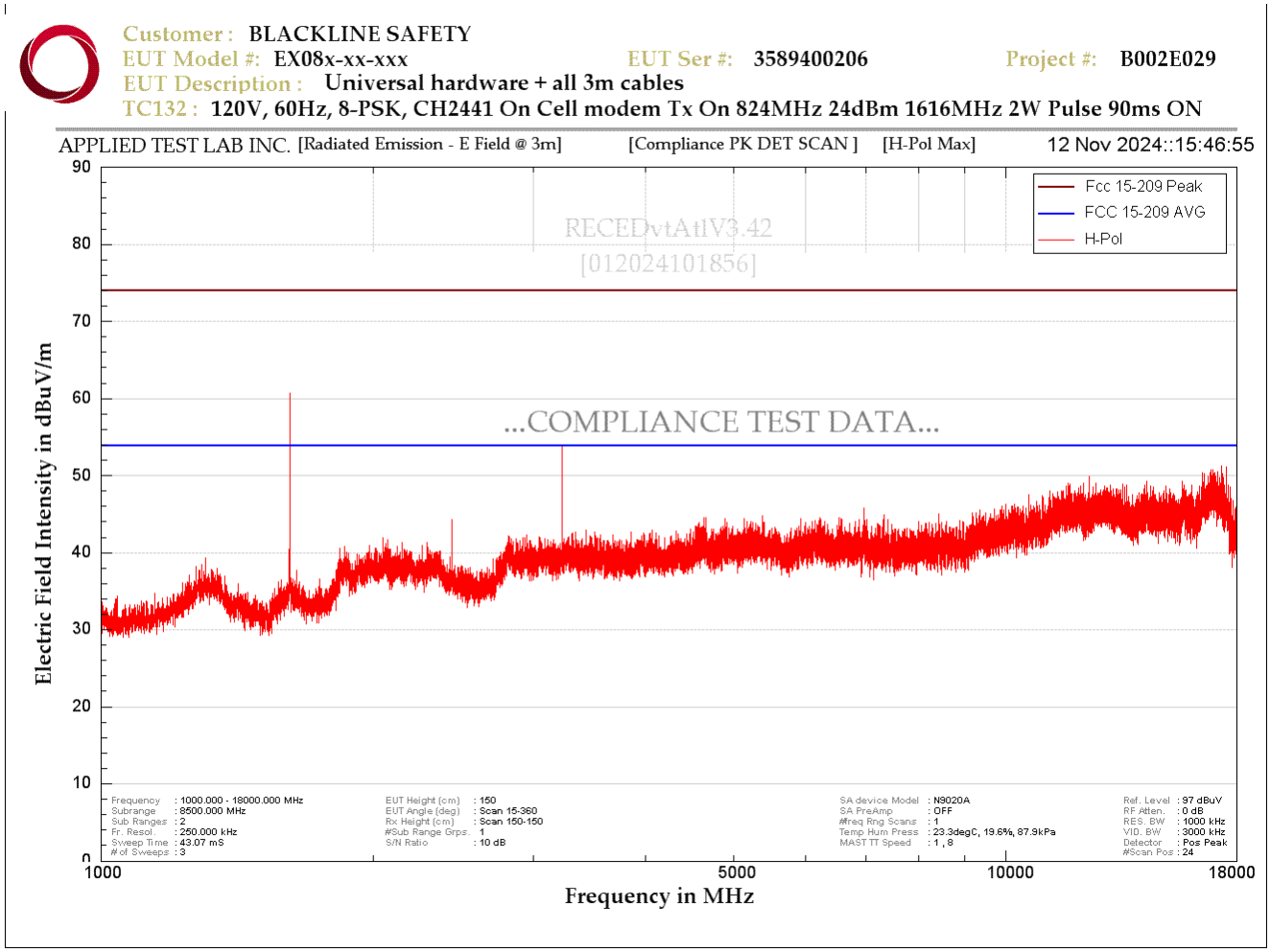

Figure 6.3.5c - Radiated Spurious Emission data(Middle channel, 8-PSK) -H-Pol-(1GHz – 18GHz)

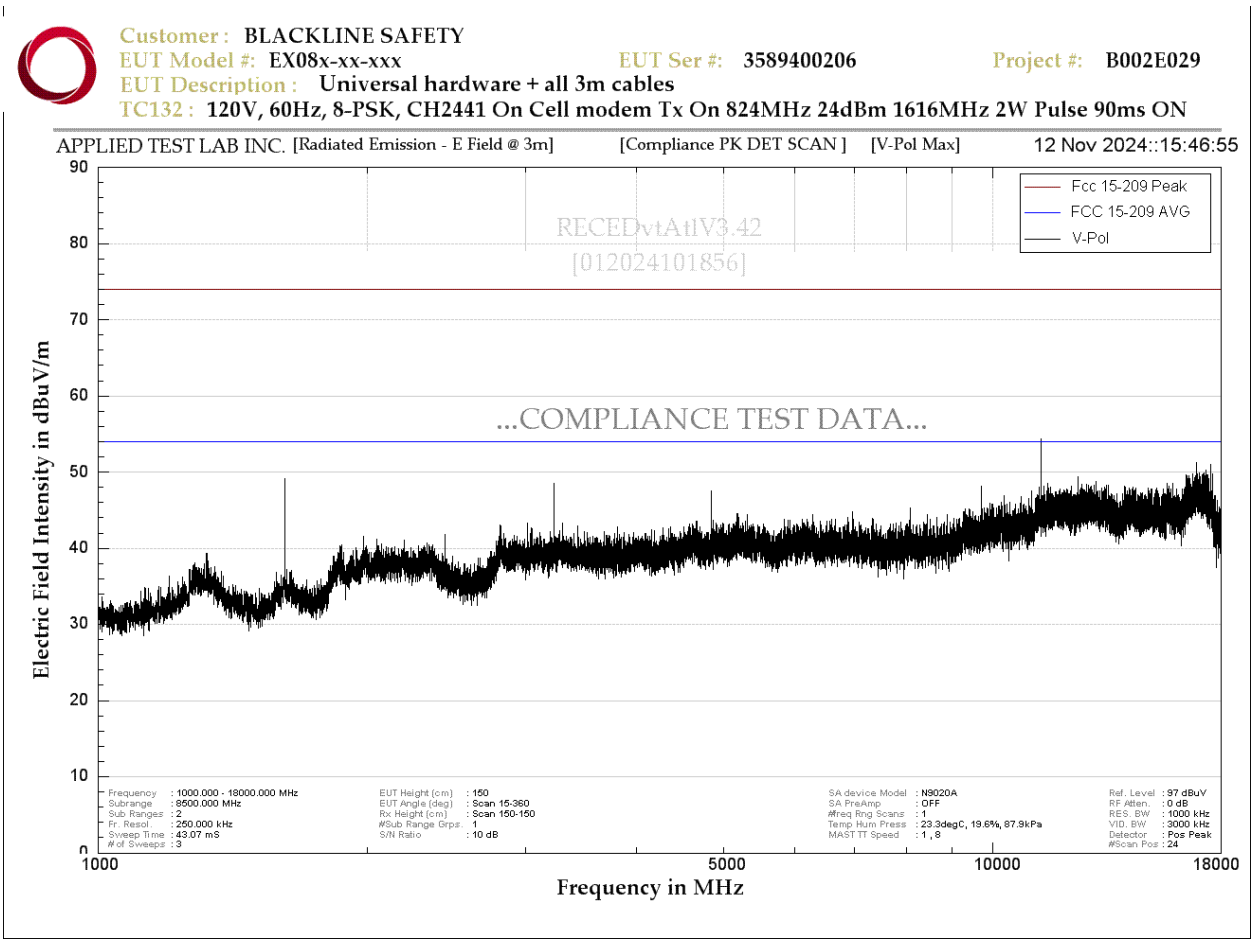

Figure 6.3.5d - Radiated Spurious Emission data(Middle channel, 8-PSK) – V-pol-(1GHz - 18GHz)

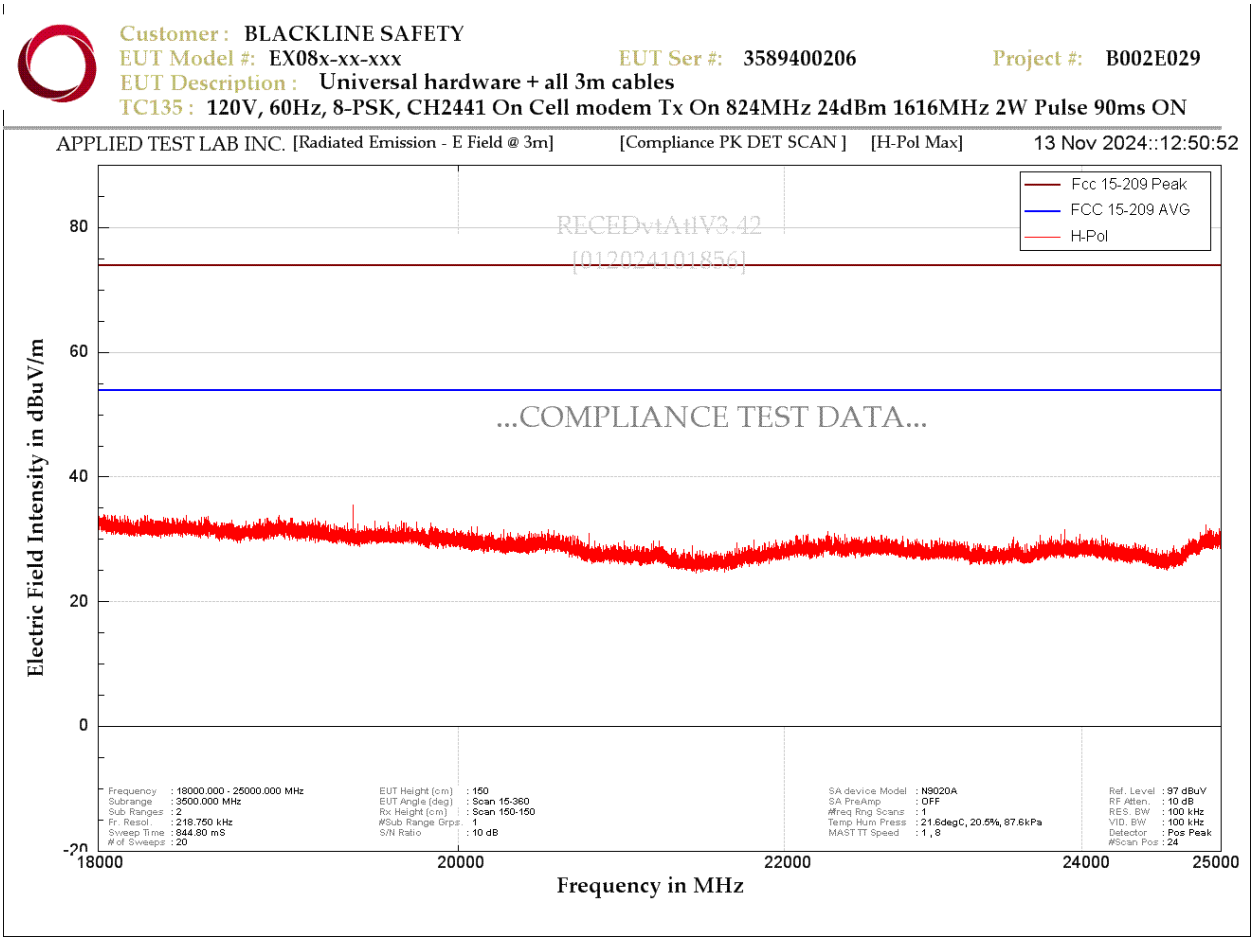

Figure 6.3.5e - Radiated Spurious Emission data(Middle channel, 8-PSK) -H-Pol-(18GHz – 26GHz)

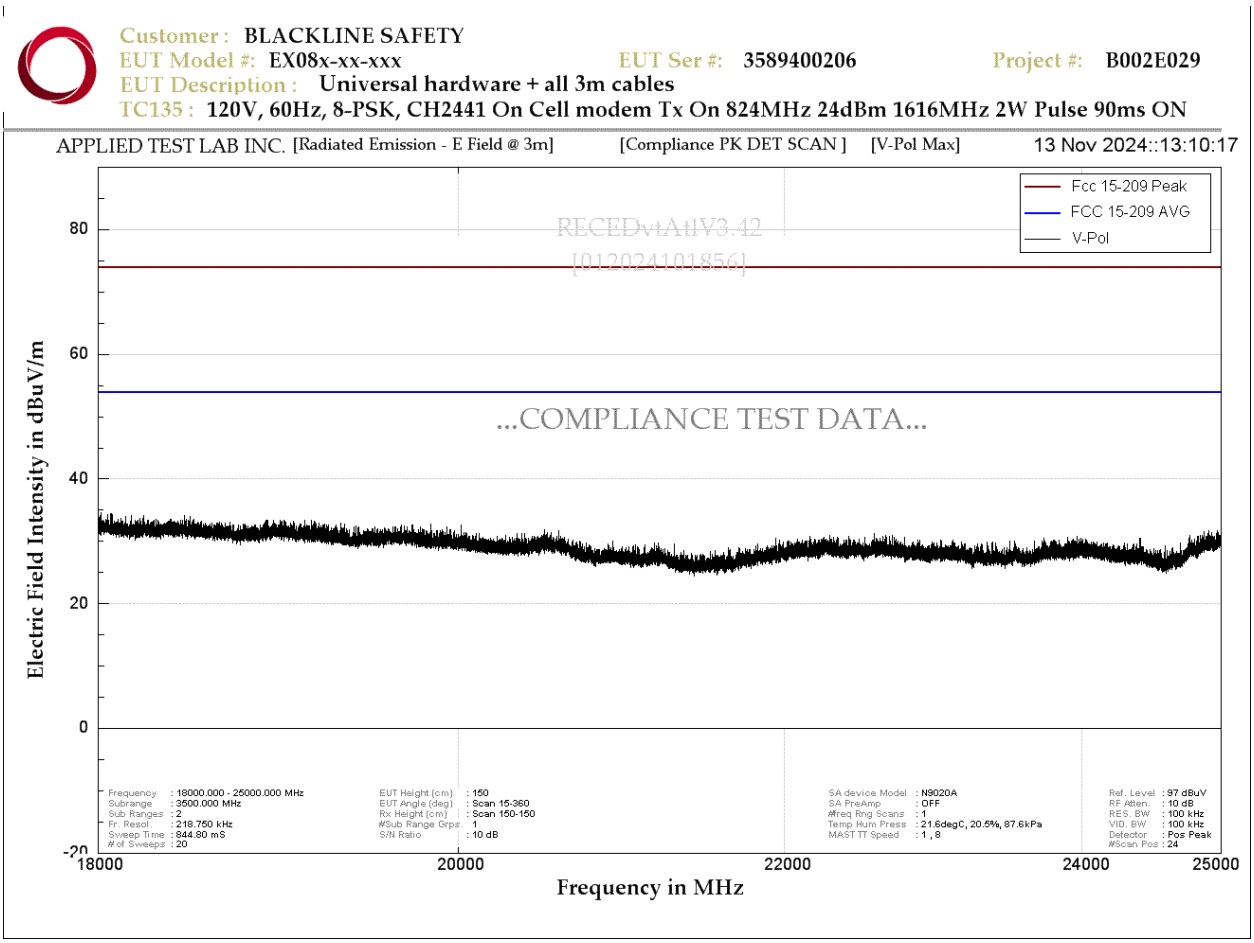

Figure 6.3.5f - Radiated Spurious Emission data(Middle channel, 8-PSK) – V-pol-(18GHz - 26GHz)

6.4 20dB Bandwidth

☒**Applicable**

Table 6.4.1 – 20dB Bandwidth Test Setup Information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS:**	
TEMPERATURE:	23°C	**HUMIDITY:**	26%
TESTED BY:	Adiseshu Nyshadham	**DATE OF TEST:**	2024-10-29
TESTREFERENCE:	FCC Subpart C 15.247, RSS-247-Issue 3, RSS-Gen Issue 5		
TEST VOLTAGE:	3.4V		
SETUP:	As per ANSI C63.10:2013, sec 6.9.2		
FREQUENCY RANGE	2400-2483.5 MHz		
FREQUENCY TESTED:	2402 MHz, 2441 MHz, 2480 MHz		
FIRMWARE POWER SETTING	11 dBm		
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE	GFSK, DH1, QPSK, DH2 8-PSK, DH3		
ANTENNA TYPE/GAIN	Ceramic Chip Antenna, 2.2dBi(peak), 1.9dBi(Band edges)		
DUTY CYCLE	N/A		
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

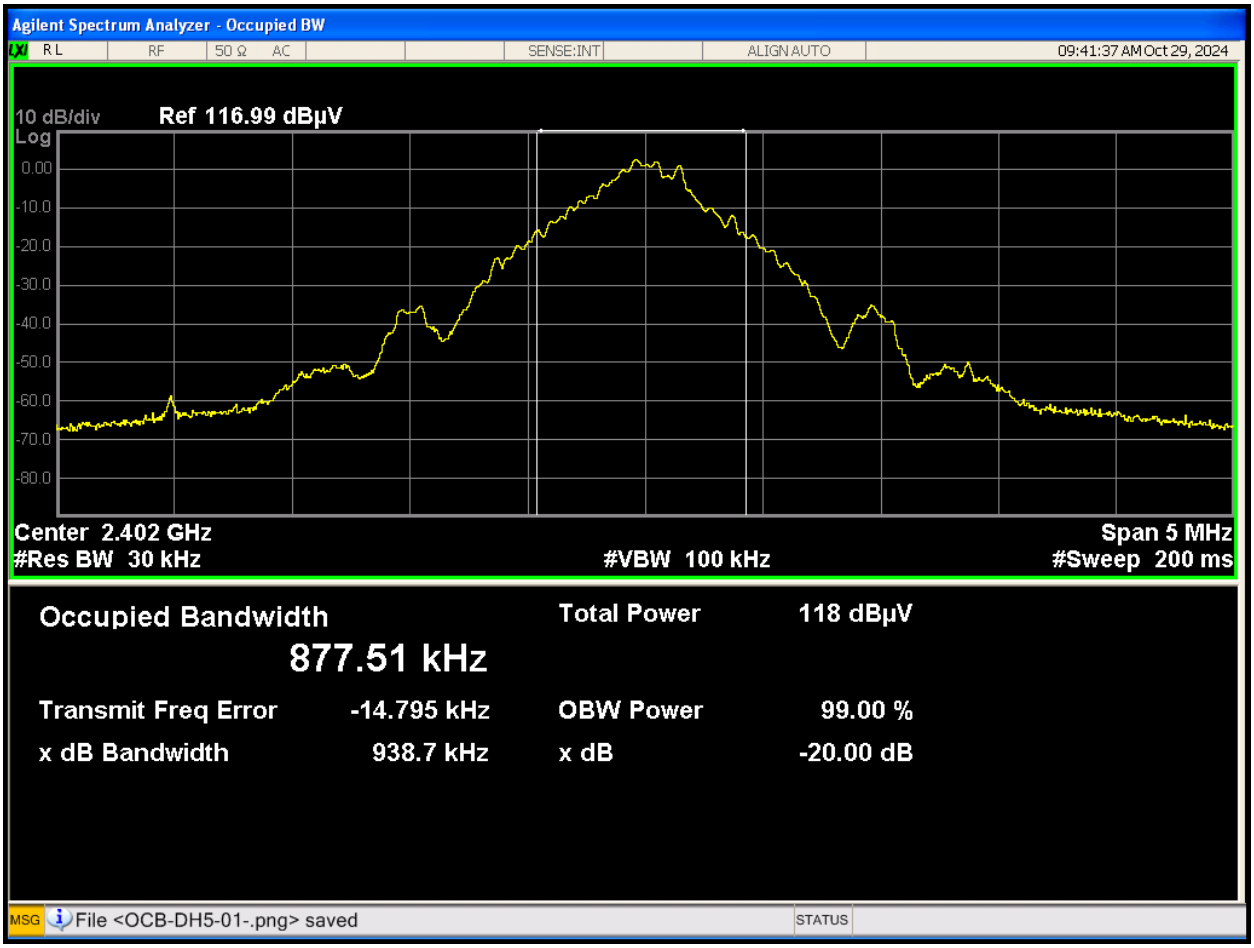

Figure 6.4.1 - 20dB Bandwidth data plot, channel 2402 MHz, GFSK

Mode	Channel #	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Remarks
GFSK	1	2402	938.7	N/A	PASS

Note:N/A-Not Applicable

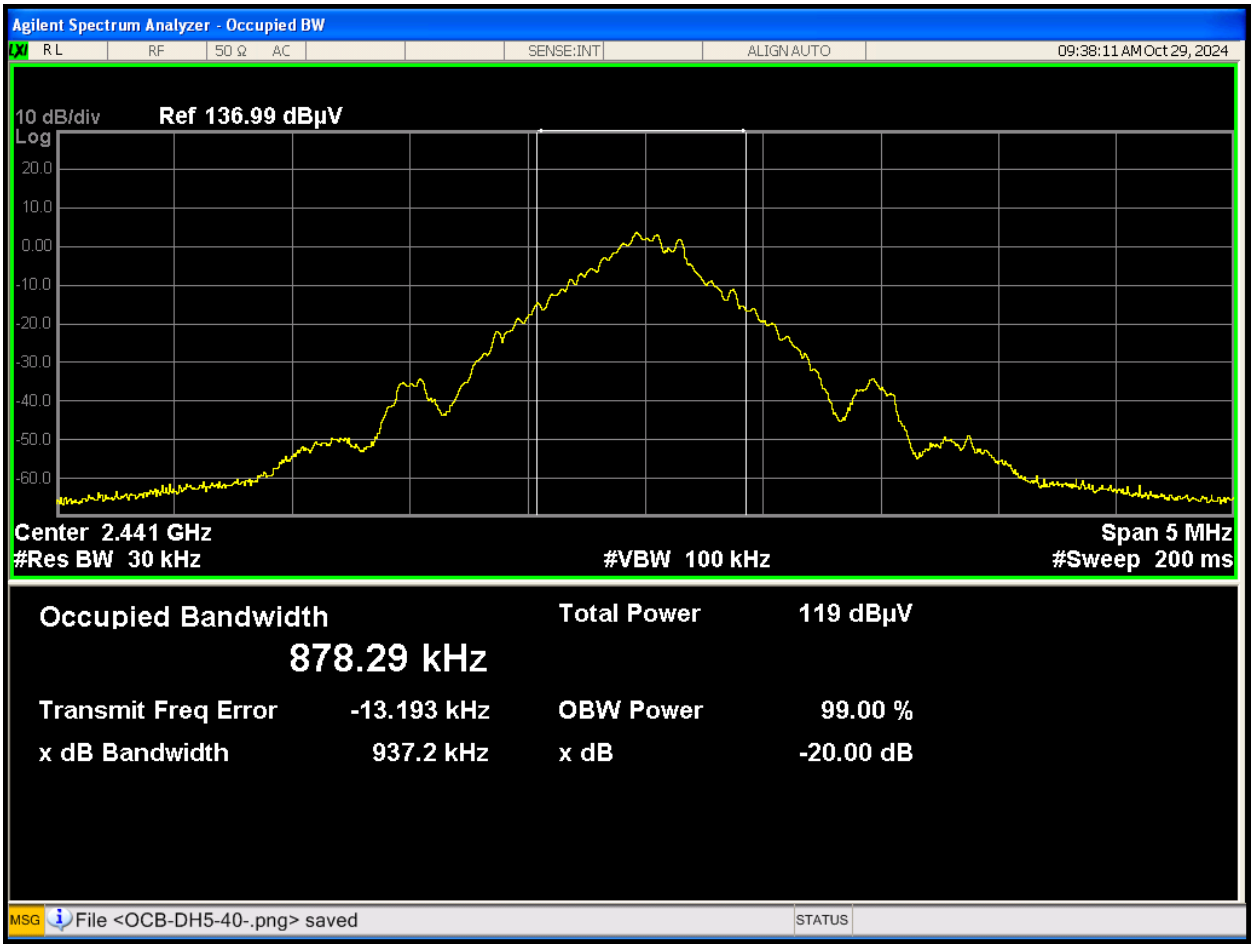

Figure 6.4.2 - 20dB Bandwidth data plot, channel 2441 MH**z, GFSK**

Mode	Channel #	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Remarks
GFSK	40	2441	937.2	N/A	PASS

Note:N/A-Not Applicable

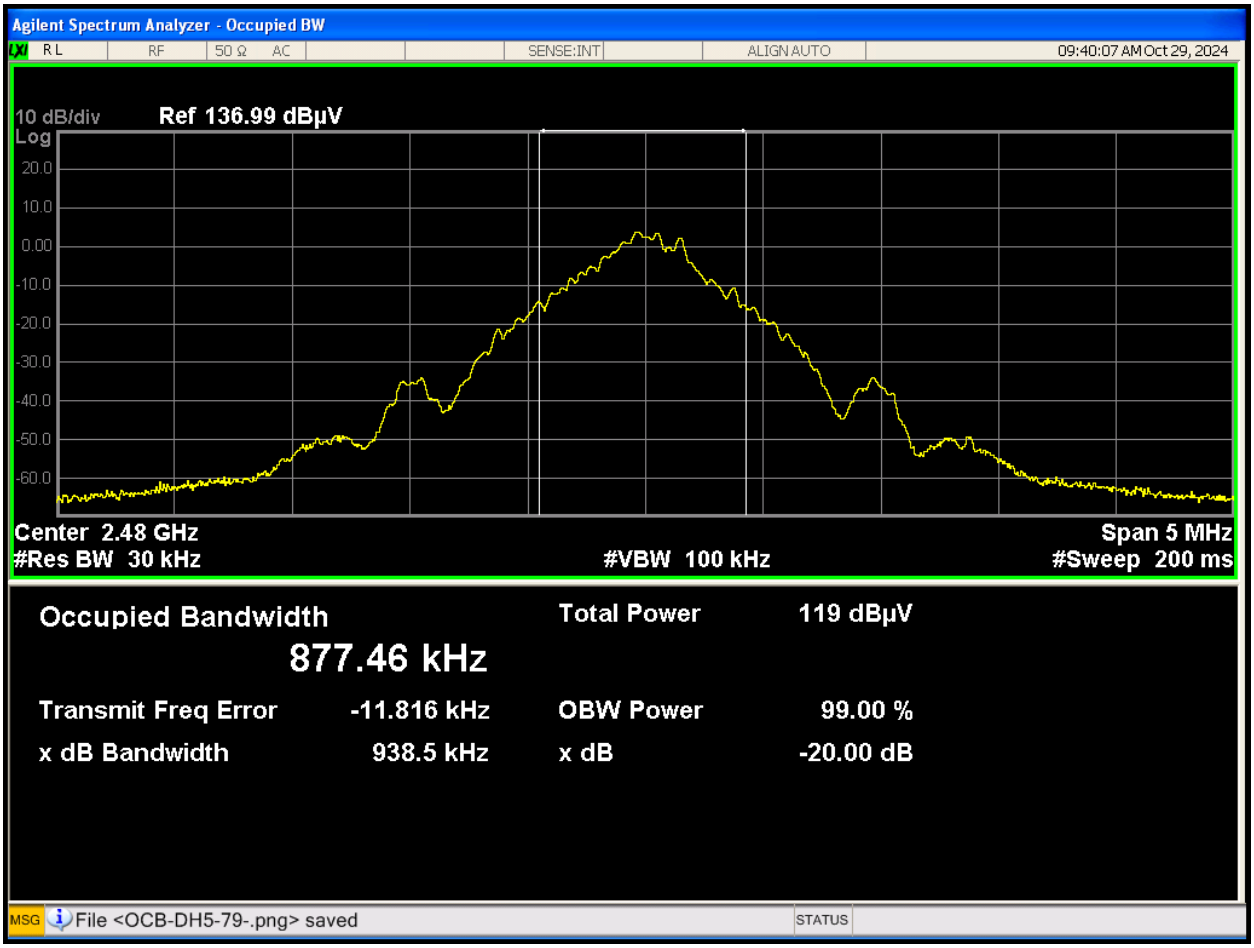

Figure 6.4.3 - 20dB Bandwidth data plot, channel 2480 MHz, GFSK

Mode	Channel #	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Remarks
GFSK	79	2480	938.5	N/A	PASS

Note:N/A-Not Applicable

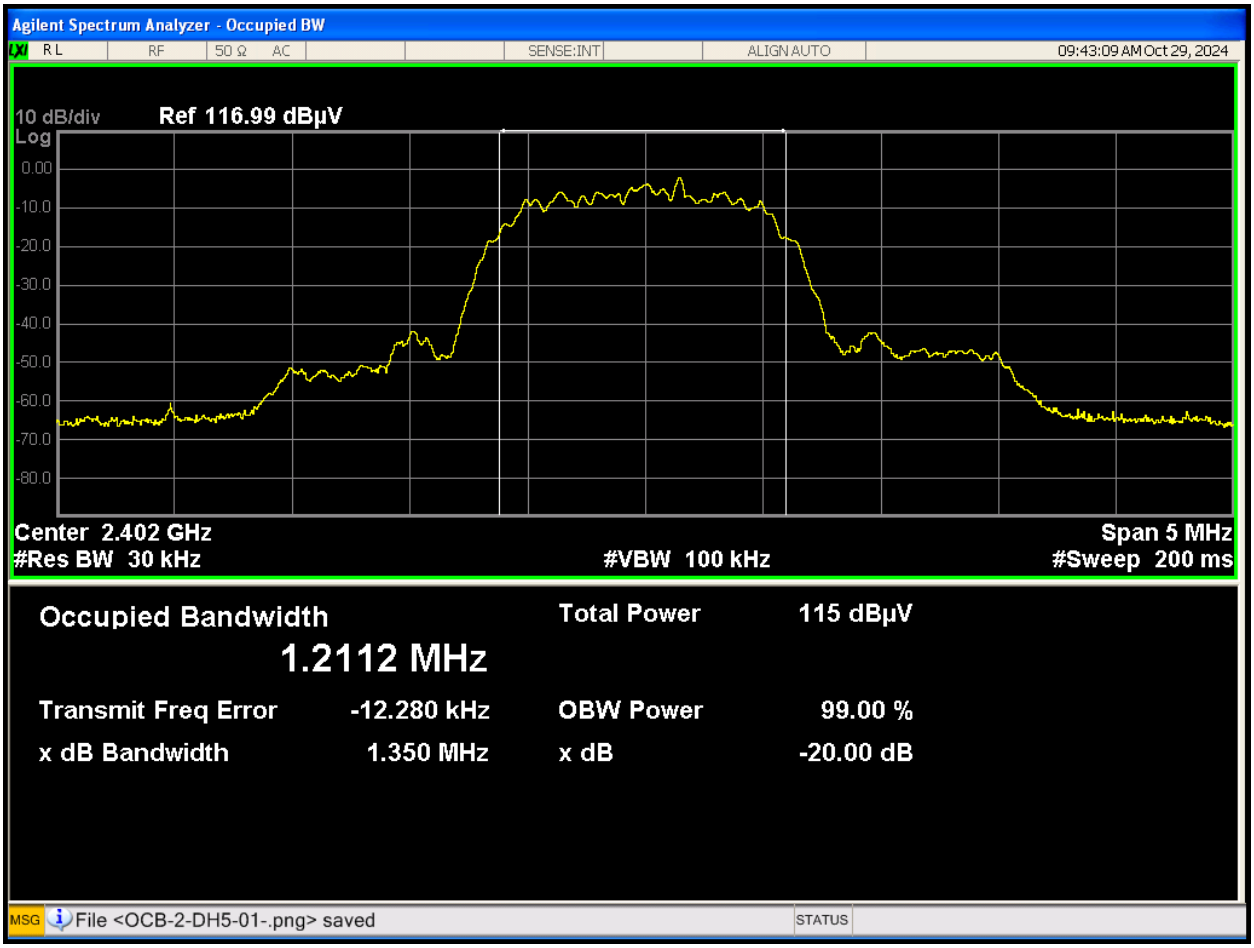

Figure 6.4.4 - 20dB Bandwidth data plot, channel 2402 MHz, QPSK

Mode	Channel #	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Remarks
QPSK	1	2402	1350.0	N/A	PASS

Note:N/A-Not Applicable

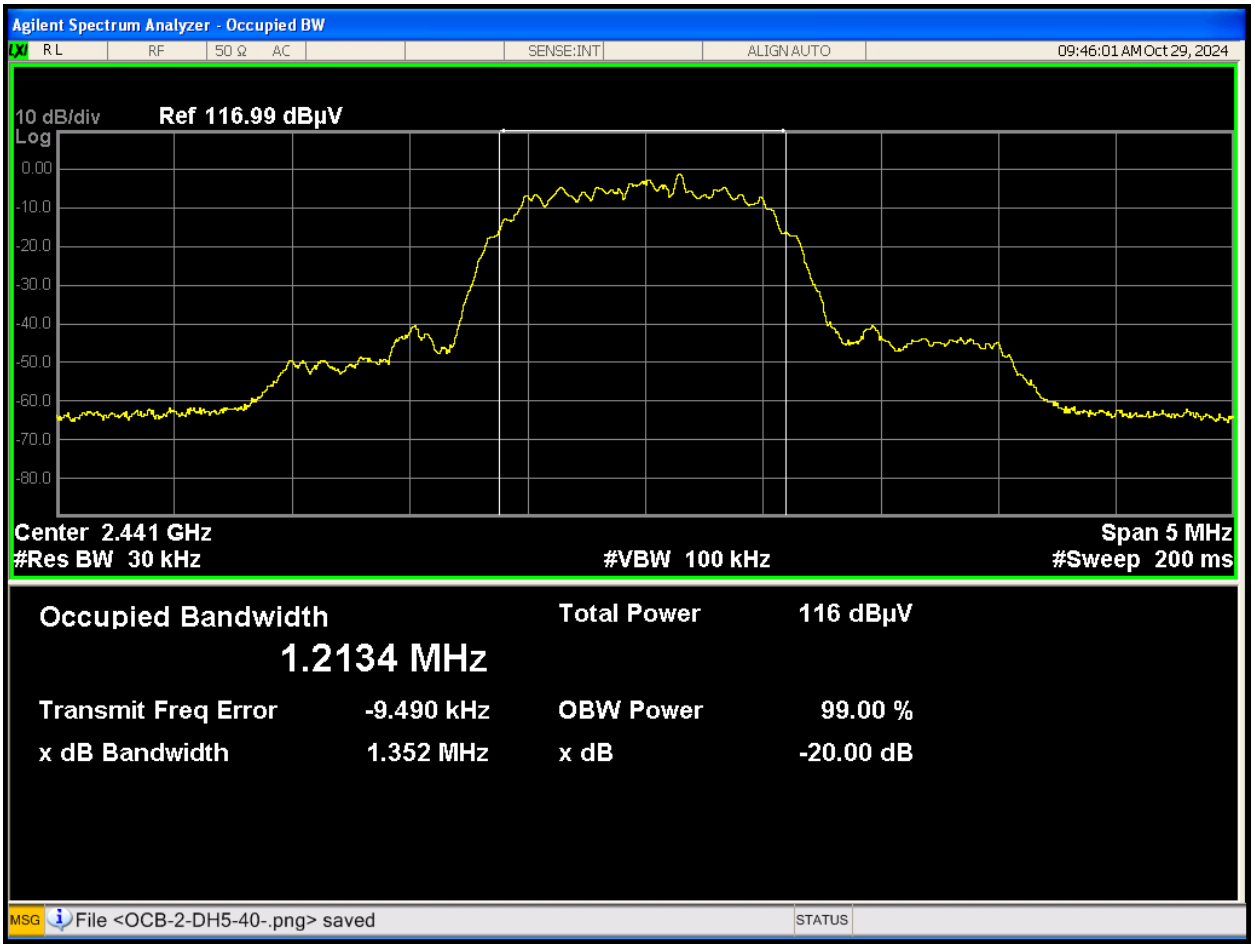

Figure 6.4.5 - 20dB Bandwidth data plot, channel 2441 MHz, QPSK

Mode	Channel #	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Remarks
QPSK	40	2441	1352.0	N/A	PASS

Note:N/A-Not Applicable

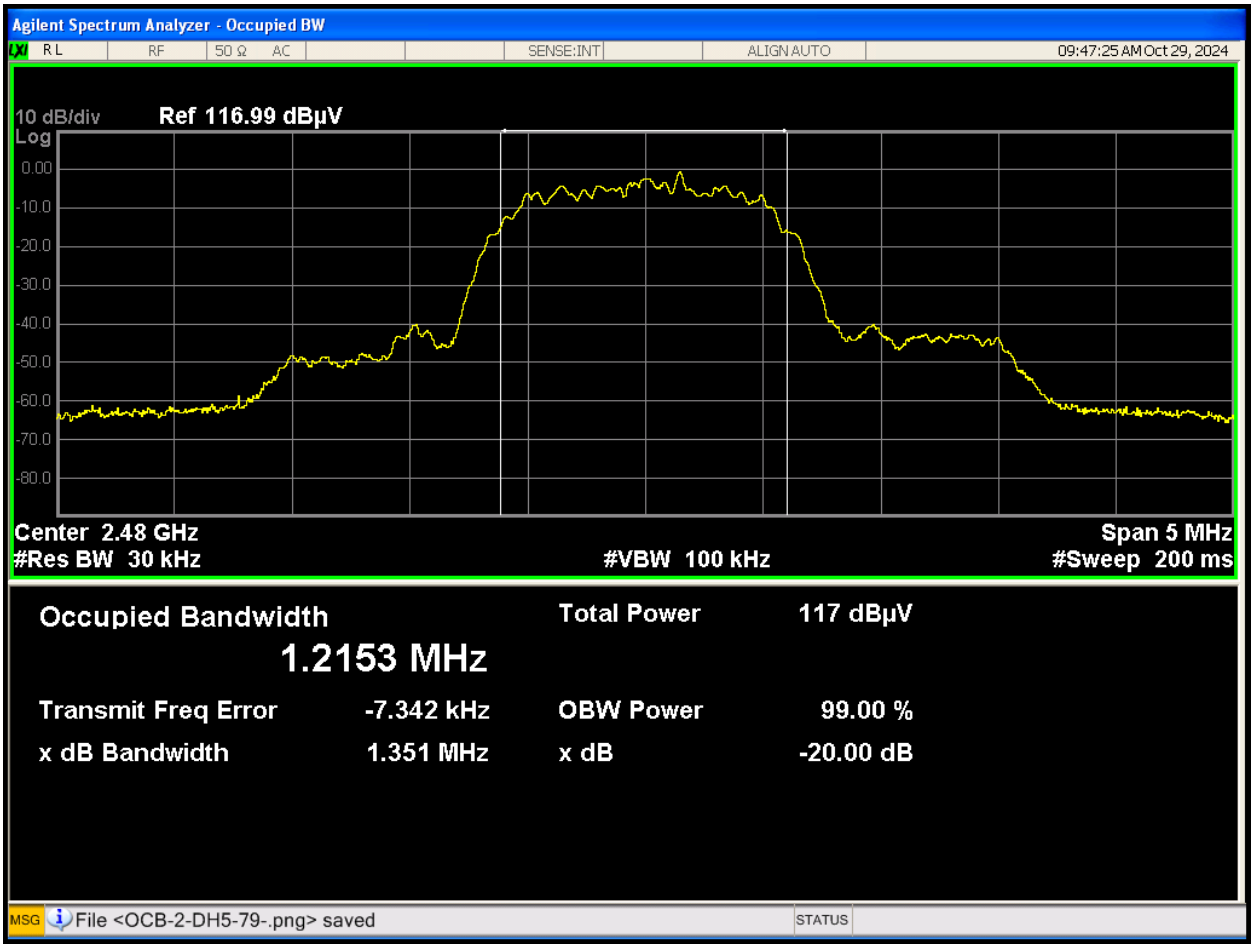

Figure 6.4.6 - 20dB Bandwidth data plot, channel 2480 MHz, QPSK

Mode	Channel #	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Remarks
QPSK	79	2480	1351.0	N/A	PASS

Note:N/A-Not Applicable

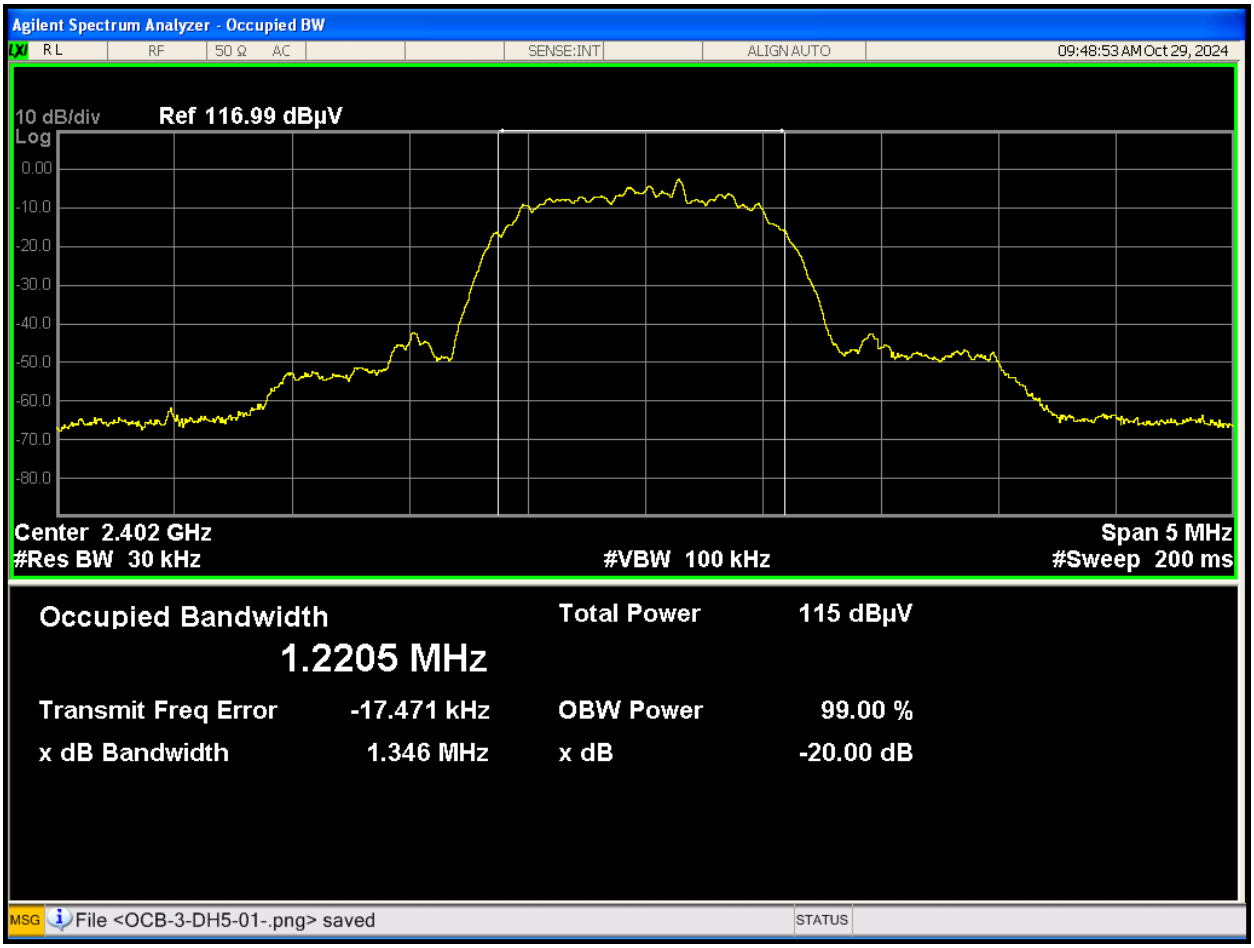

Figure 6.4.7 - 20dB Bandwidth data plot, channel 2402 MHz, 8-PSK

Mode	Channel #	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Remarks
8-PSK	1	2402	1346.0	N/A	PASS

Note:N/A-Not Applicable

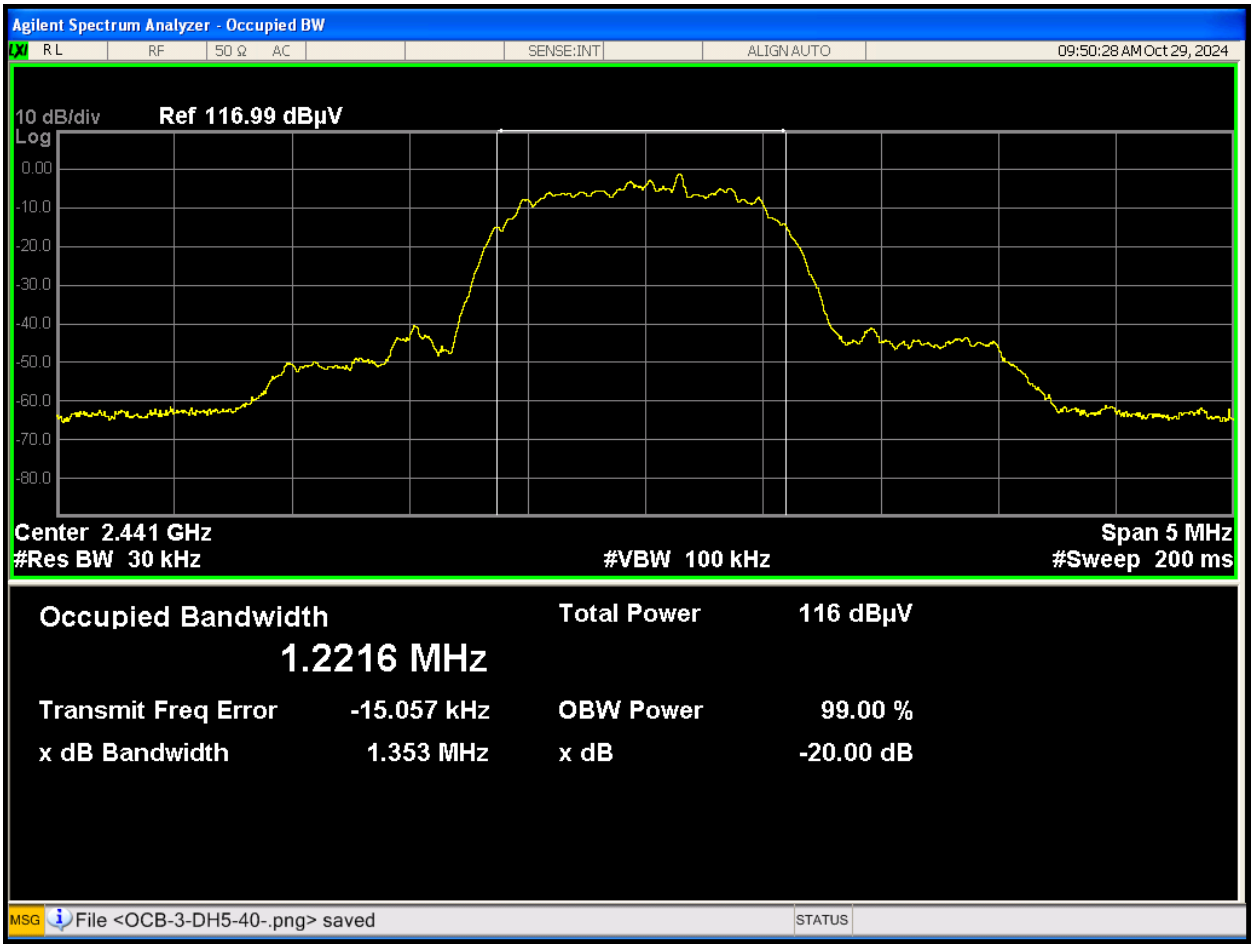

Figure 6.4.8 - 20dB Bandwidth data plot, channel 2441 MHz, 8-PSK

Mode	Channel #	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Remarks
8-PSK	40	2441	1353.0	N/A	PASS

Note:N/A-Not Applicable

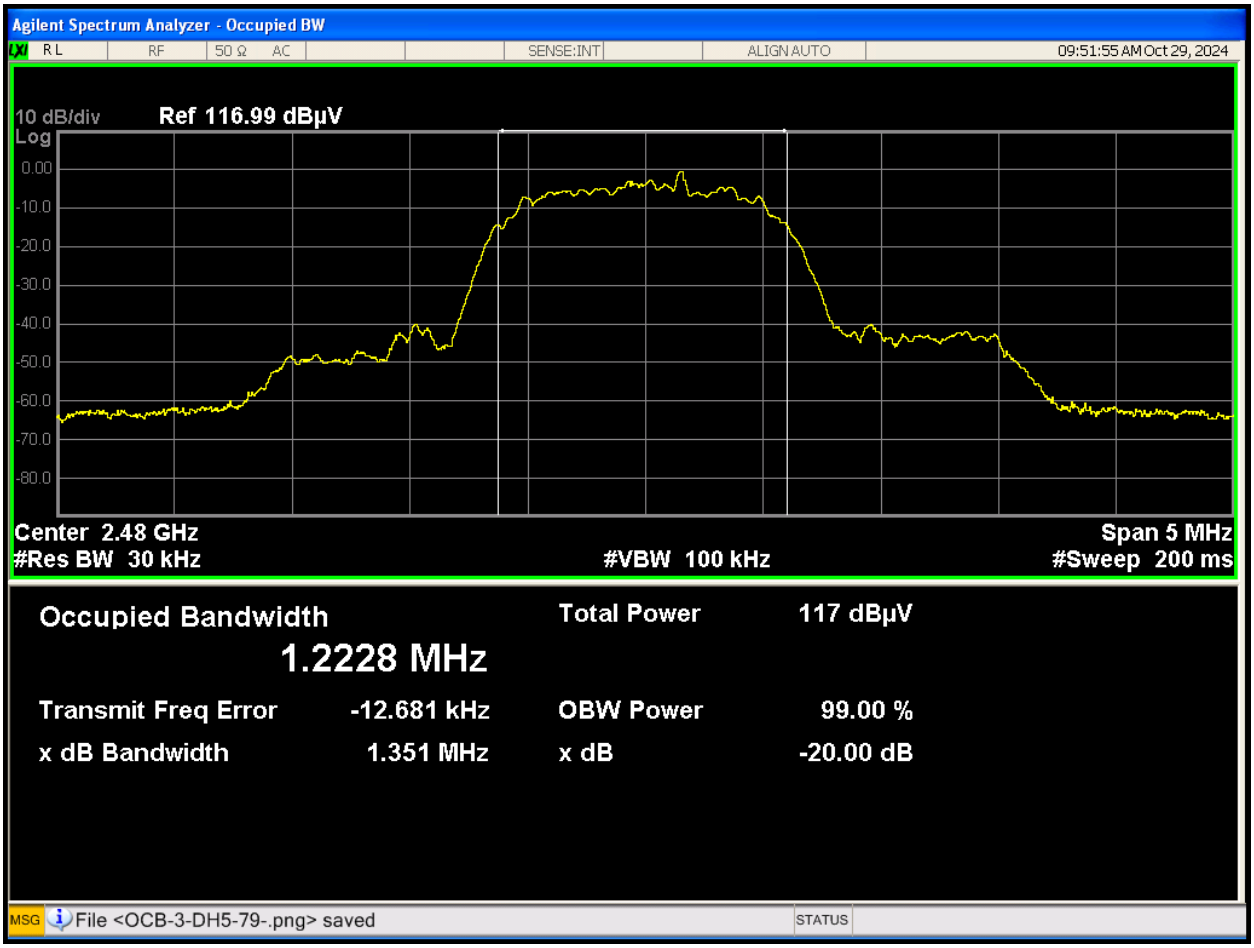

Figure 6.4.9 - 20dB Bandwidth data plot, channel 2480 MHz, 8-PSK

Mode	Channel #	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Remarks
8-PSK	79	2480	1351.0	N/A	PASS

Note:N/A-Not Applicable

6.5 99% Bandwidth

☒**Applicable**

Table 6.5.1 – 99% Bandwidth Test Setup Information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS:**	
TEMPERATURE:	23°C	**HUMIDITY:**	26%
TESTED BY:	Adiseshu Nyshadham	**DATE OF TEST:**	2024-10-29
TESTREFERENCE:	RSS-247-Issue 3, RSS-Gen Issue 5		
TEST VOLTAGE:	3.4V		
SETUP:	As per ANSI C63.10:2013, sec 6.9.3		
FREQUENCY RANGE	2400-2483.5 MHz		
FREQUENCY TESTED:	2402 MHz, 2441 MHz, 2480 MHz		
FIRMWARE POWER SETTING	11 dBm		
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE	GFSK, DH1, QPSK, DH2 8-PSK, DH3		
ANTENNA TYPE/GAIN	Ceramic Chip Antenna, 2.2dBi(peak), 1.9dBi(Band edges)		
DUTY CYCLE	N/A		
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

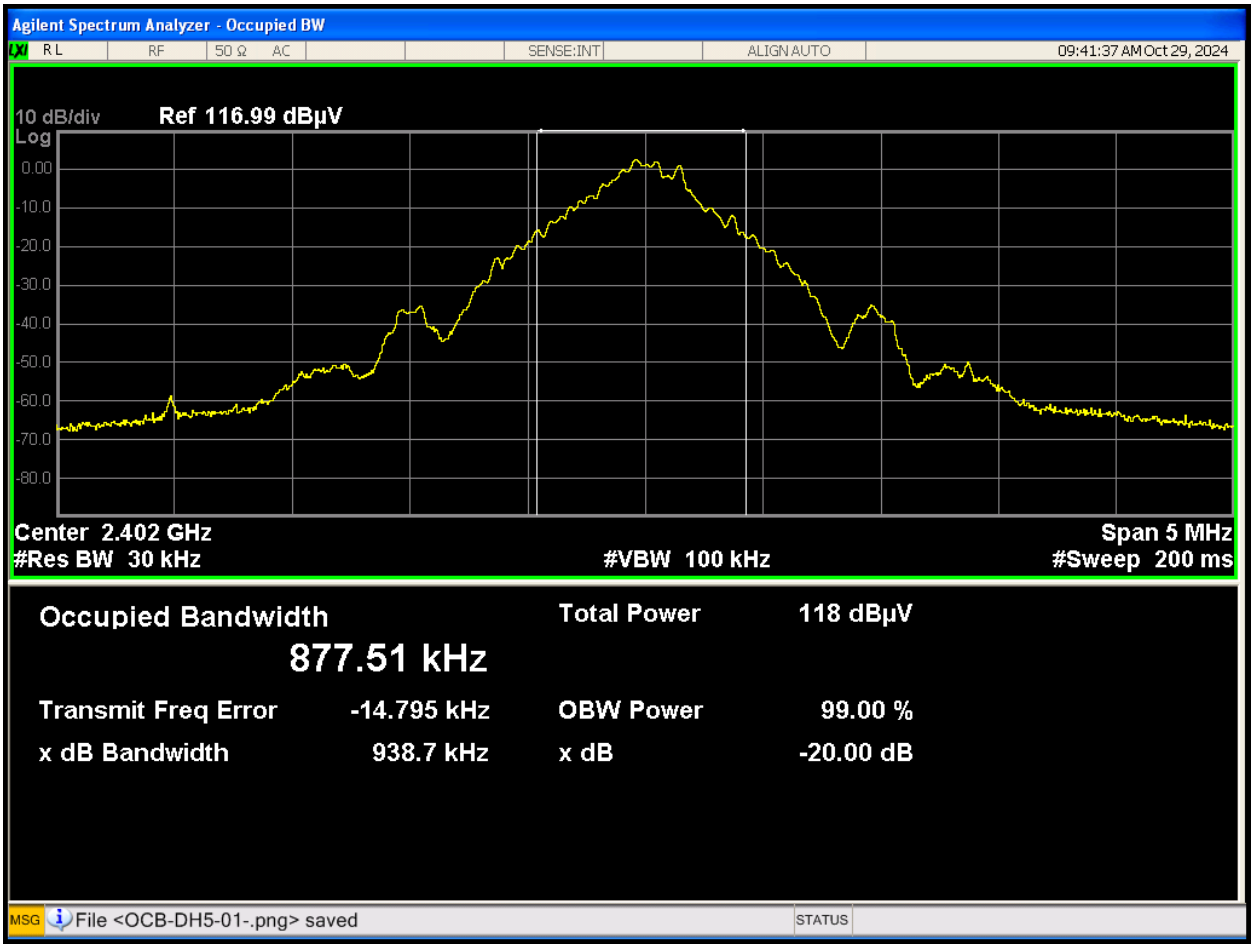

Figure 6.5.1 - 99% Bandwidth data plot, channel 2402 MHz, GFSK

Mode	Channel #	Channel Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Remarks
GFSK	1	2402	877.51	N/A	PASS

Note:N/A-Not Applicable

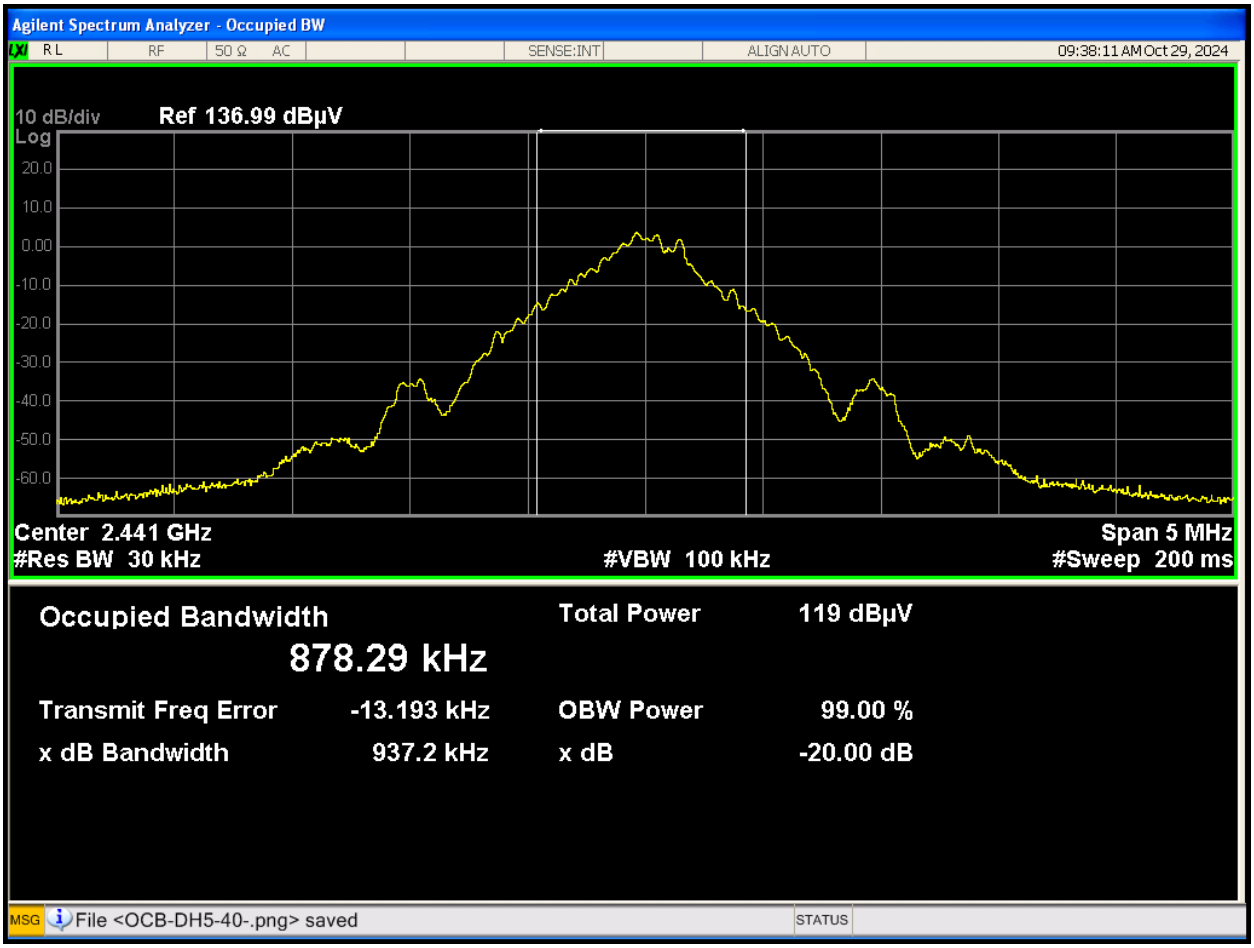

Figure 6.5.2 - 99% Bandwidth data plot, channel 2441 MHz, GFSK

Mode	Channel #	Channel Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Remarks
GFSK	40	2441	878.29	N/A	PASS

Note:N/A-Not Applicable

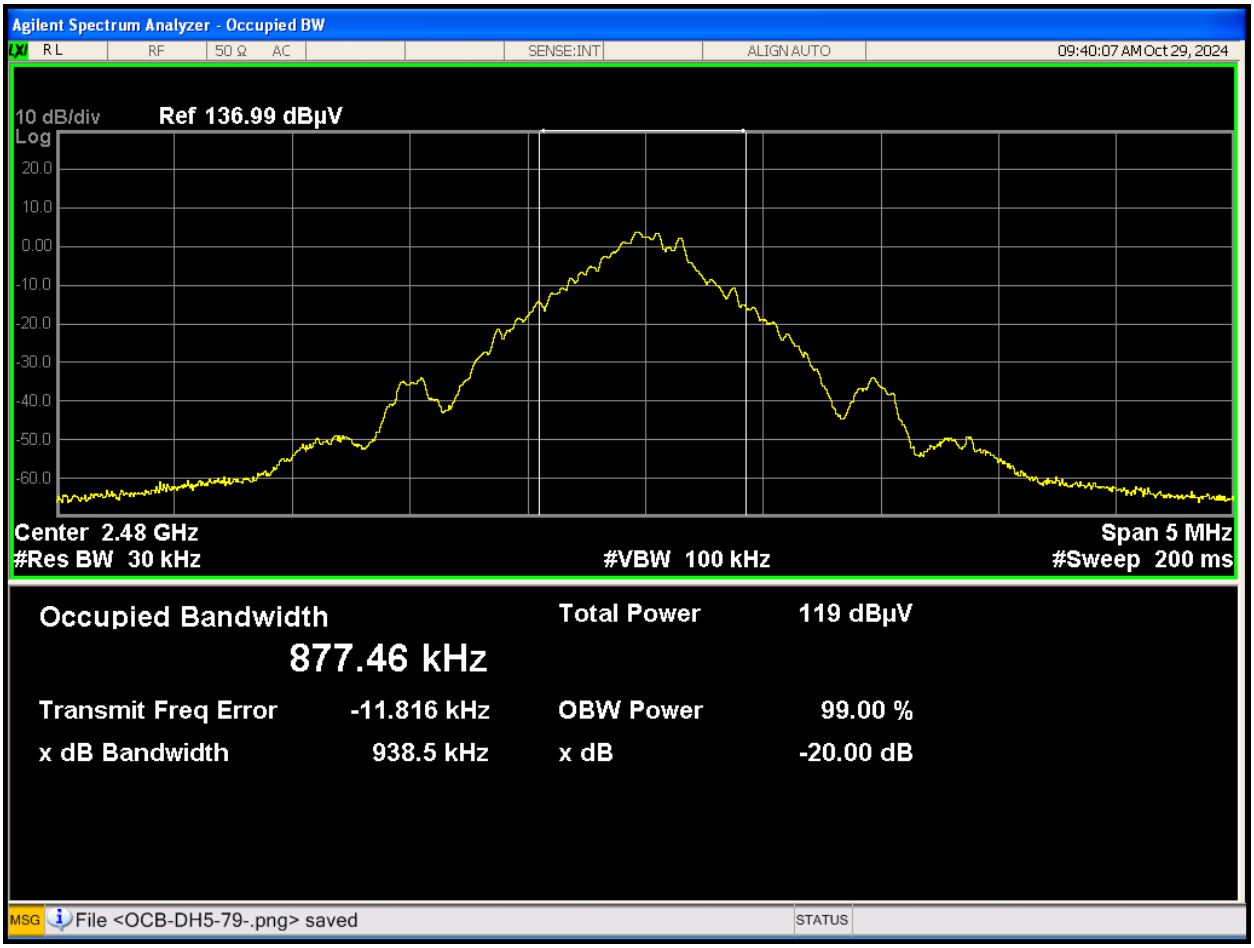

Figure 6.5.3 - 99% Bandwidth data plot, channel 2480 MHz, GFSK

Mode	Channel #	Channel Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Remarks
GFSK	79	2480	877.46	N/A	PASS

Note:N/A-Not Applicable

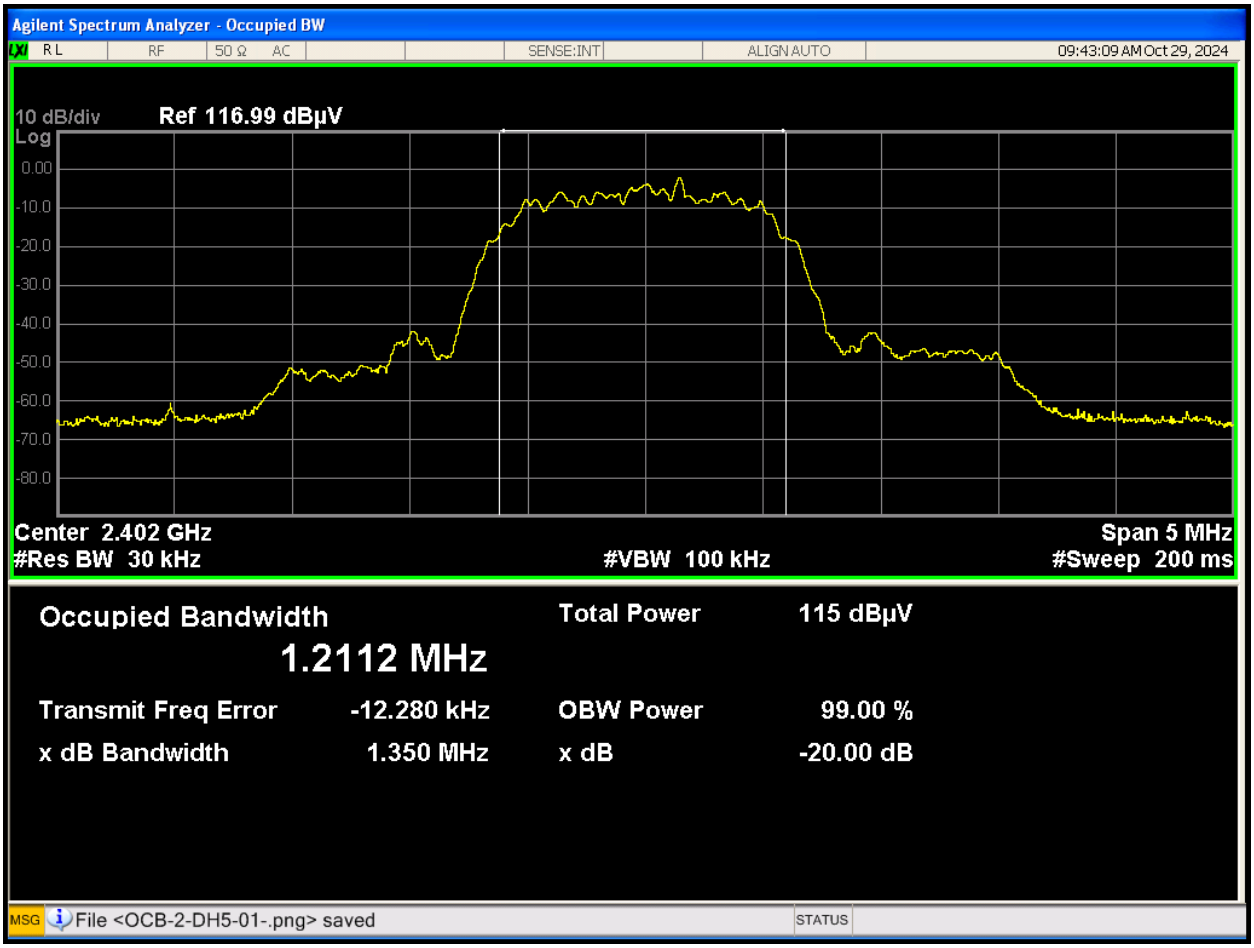

Figure 6.5.4 - 99% Bandwidth data plot, channel 2402 MHz, QPSK

Mode	Channel #	Channel Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Remarks
QPSK	1	2402	1211.2	N/A	PASS

Note:N/A-Not Applicable

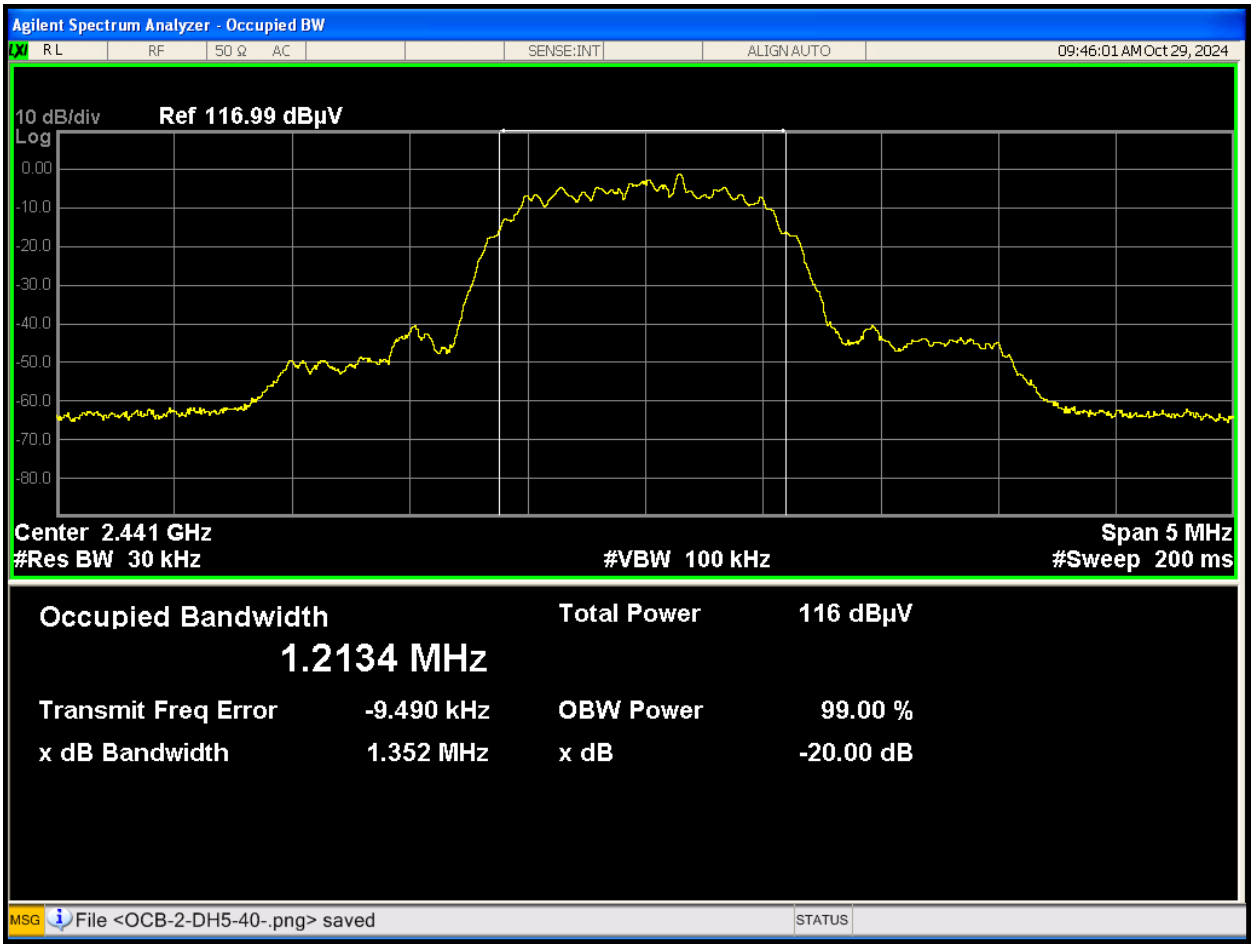

Figure 6.5.5 - 99% Bandwidth data plot, channel 2441 MHz, QPSK

Mode	Channel #	Channel Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Remarks
QPSK	40	2441	1213.4	N/A	PASS

Note: N/A-Not Applicable

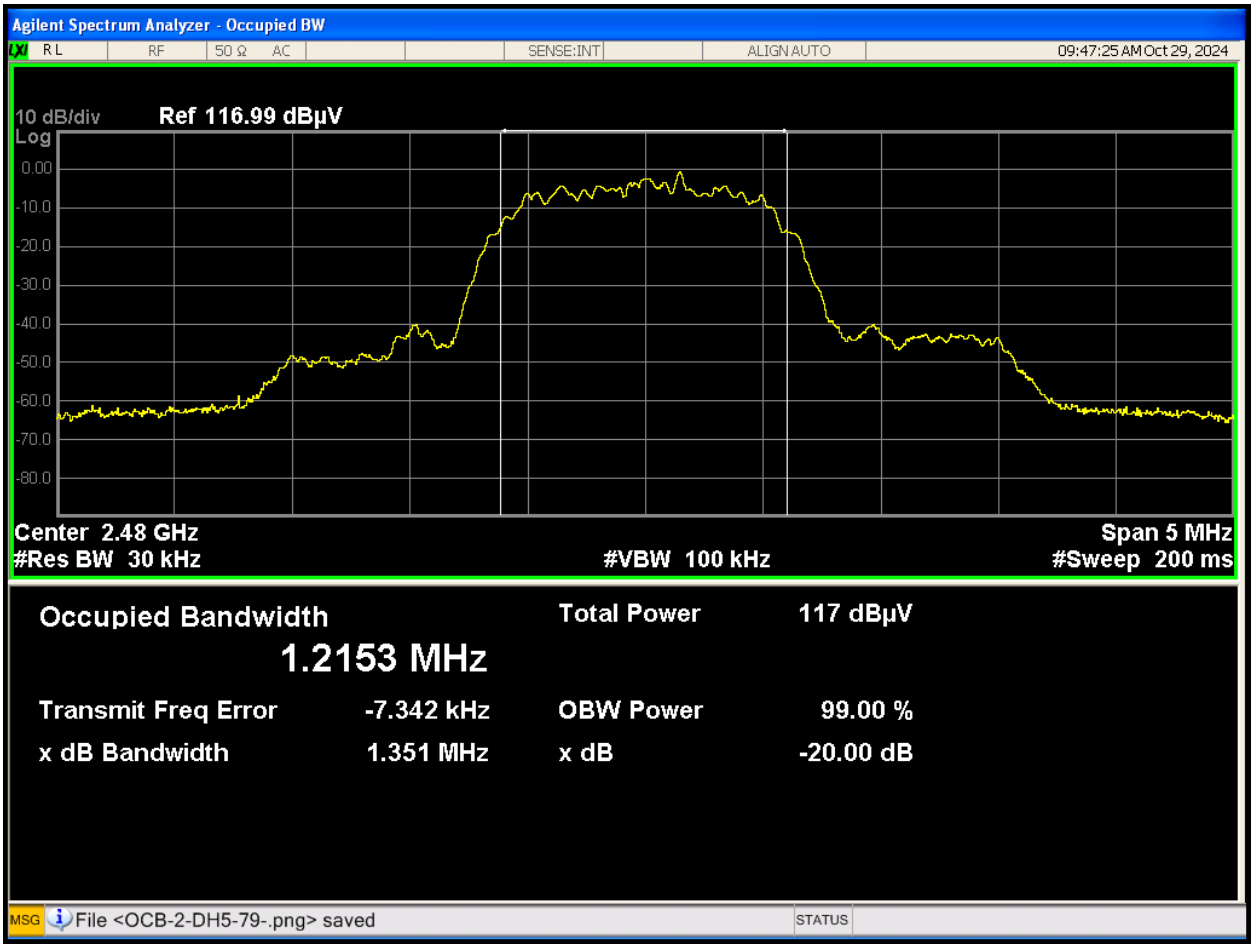

Figure 6.5.6 - 99% Bandwidth data plot, channel 2480 MHz, QPSK

Mode	Channel #	Channel Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Remarks
QPSK	79	2480	1215.3	N/A	PASS

Note: N/A-Not Applicable

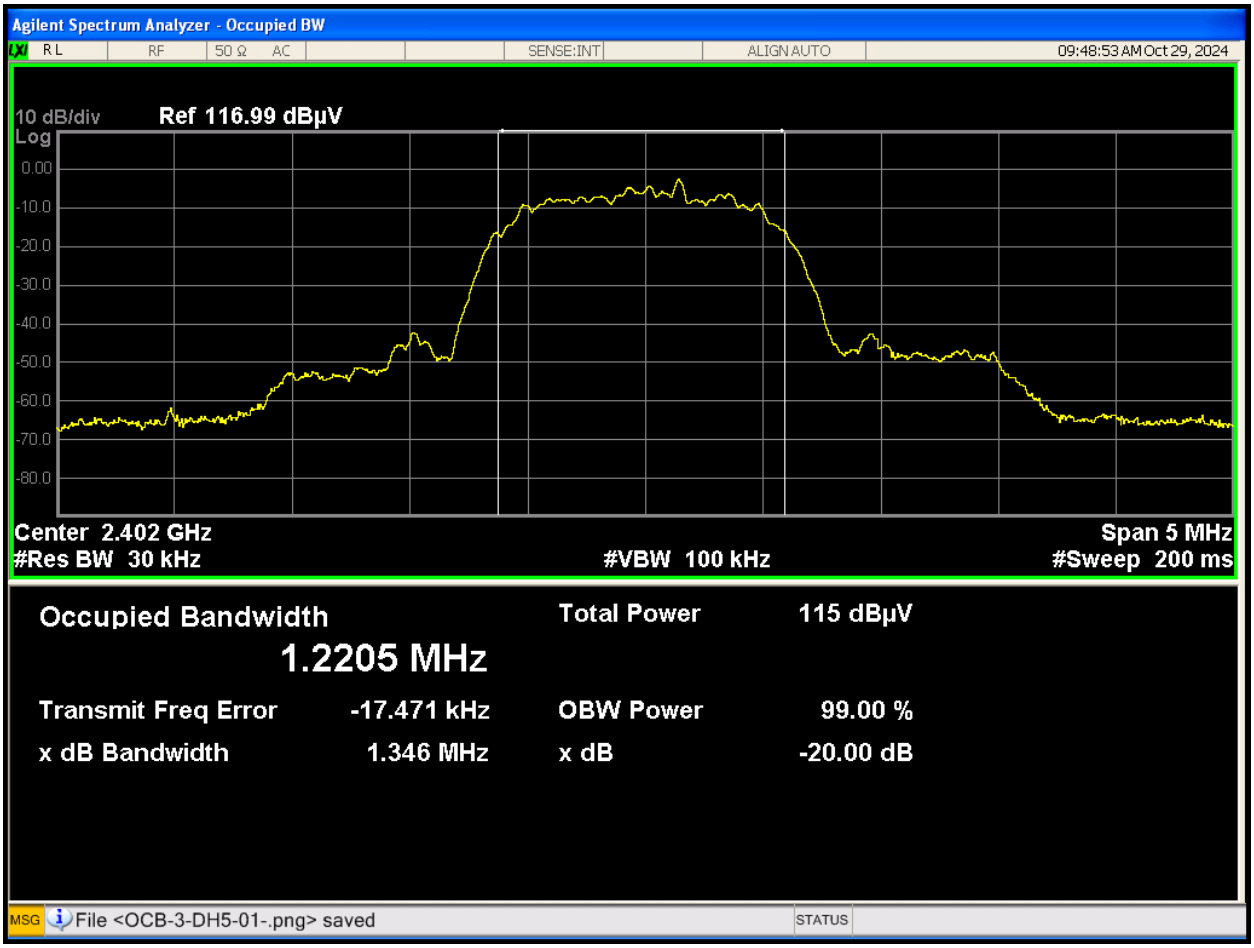

Figure 6.5.7 - 99% Bandwidth data plot, channel 2402 MHz, 8-PSK

Mode	Channel #	Channel Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Remarks
8-PSK	1	2402	1220.5	N/A	PASS

Note: N/A-Not Applicable

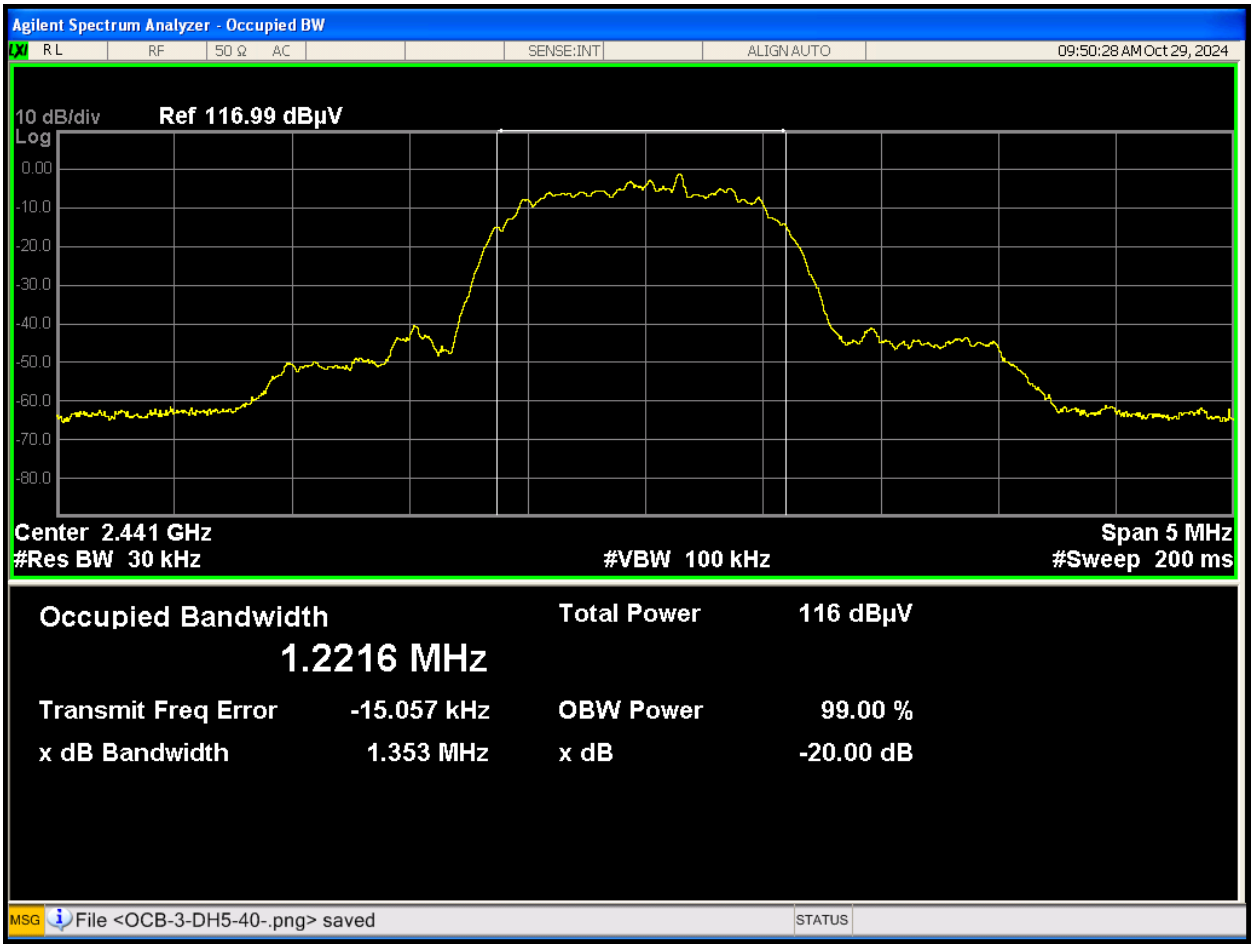

Figure 6.5.8 - 99% Bandwidth data plot, channel 2441 MHz, 8-PSK

Mode	Channel #	Channel Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Remarks
8-PSK	40	2441	1221.6	N/A	PASS

Note: N/A-Not Applicable

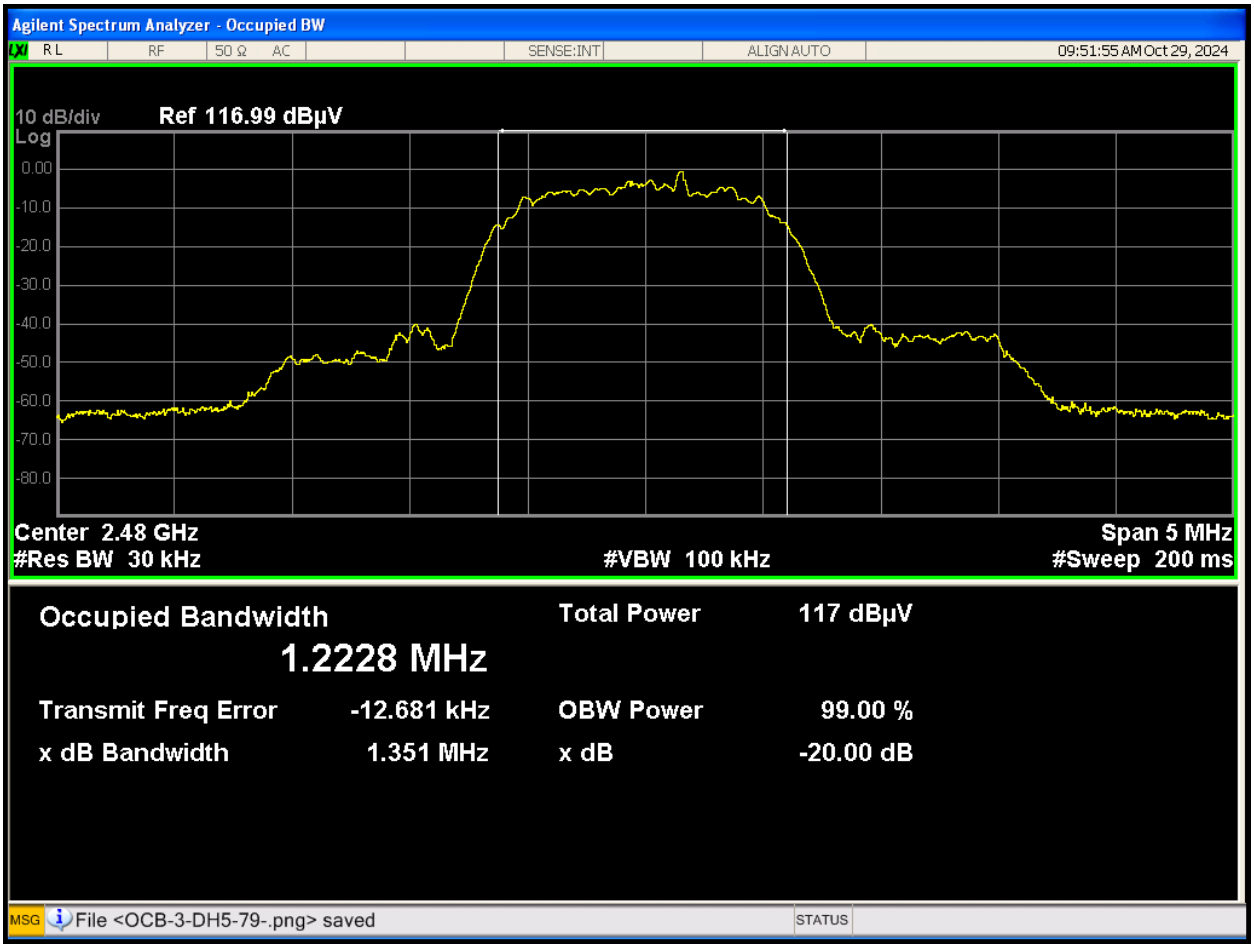

Figure 6.5.9 - 99% Bandwidth data plot, channel 2480 MHz, 8-PSK

Mode	Channel #	Channel Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Remarks
8-PSK	79	2480	1222.8	N/A	PASS

Note: N/A-Not Applicable

6.6 Out of Band Emissions(Band Edge)

☒**Applicable**

Table 6.6.1 – Out-of-Band Emission Test Setup Information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS:**	
TEMPERATURE:	23°C	**HUMIDITY:**	26%
TESTED BY:	Adiseshu Nyshadham	**DATE OF TEST:**	2024-10-29
TESTREFERENCE:	FCC Title 47 CFR Part 15: Subpart C-15.247(d), RSS-247-Issue 3		
TEST VOLTAGE:	3.4V		
SETUP:	As per ANSI C63.10:2013, sec 6.9.3		
FREQUENCY RANGE	2400-2483.5 MHz		
FREQUENCY TESTED:	2402 MHz, 2441 MHz, 2480 MHz		
FIRMWARE POWER SETTING	11 dBm		
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE	GFSK, DH1, QPSK, DH2 8-PSK, DH3		
ANTENNA TYPE/GAIN	Ceramic Chip Antenna, 2.2dBi(peak), 1.9dBi(Band edges)		
DUTY CYCLE	N/A		
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

Table 6.6.2 – Conducted Band Edge Summary

Frequency (MHz)	Measurement (dBuV)	In Band Level (dBuV)	Band Edge Marker Delta level(dB)	Limit (dB)	Margin (dB)	Detector	Result
GFSK							
2400	61.30	115.72	-54.42	-20	-34.42	Peak	PASS
2483.5	56.17	115.49	-59.32	-20	-39.32	Peak	PASS
2400	58.49	115.51	-57.02	-20	-37.02	AVG	PASS
2483.5	56.17	115.45	-55.85	-20	-35.85	AVG	PASS
Frequency (MHz)	**Measurement (dBuV)**	**In Band Level (dBuV)**	**Band Edge Marker Delta level(dB)**	**Limit (dB)**	**Margin (dB)**	**Detector**	**Result**
QPSK							
2400	58.25	115.07	-56.76	-20	-36.76	Peak	PASS
2483.5	54.81	116.04	-61.23	-20	-41.23	Peak	PASS
2400	58.28	111.90	-58.31	-20	-38.31	AVG	PASS
2483.5	52.53	114.83	-63.45	-20	-43.45	AVG	PASS
Frequency (MHz)	**Measurement (dBuV)**	**In Band Level (dBuV)**	**Band Edge Marker Delta level(dB)**	**Limit (dB)**	**Margin (dB)**	**Detector**	**Result**
8-PSK							
2400	61.64	114.88	-53.24	-20	-33.24	Peak	PASS
2483.5	55.86	116.07	-60.21	-20	-40.21	Peak	PASS
2400	53.48	114.57	56.09	-20	76.09	AVG	PASS
2483.5	52.96	115.82	-62.86	-20	-42.86	AVG	PASS

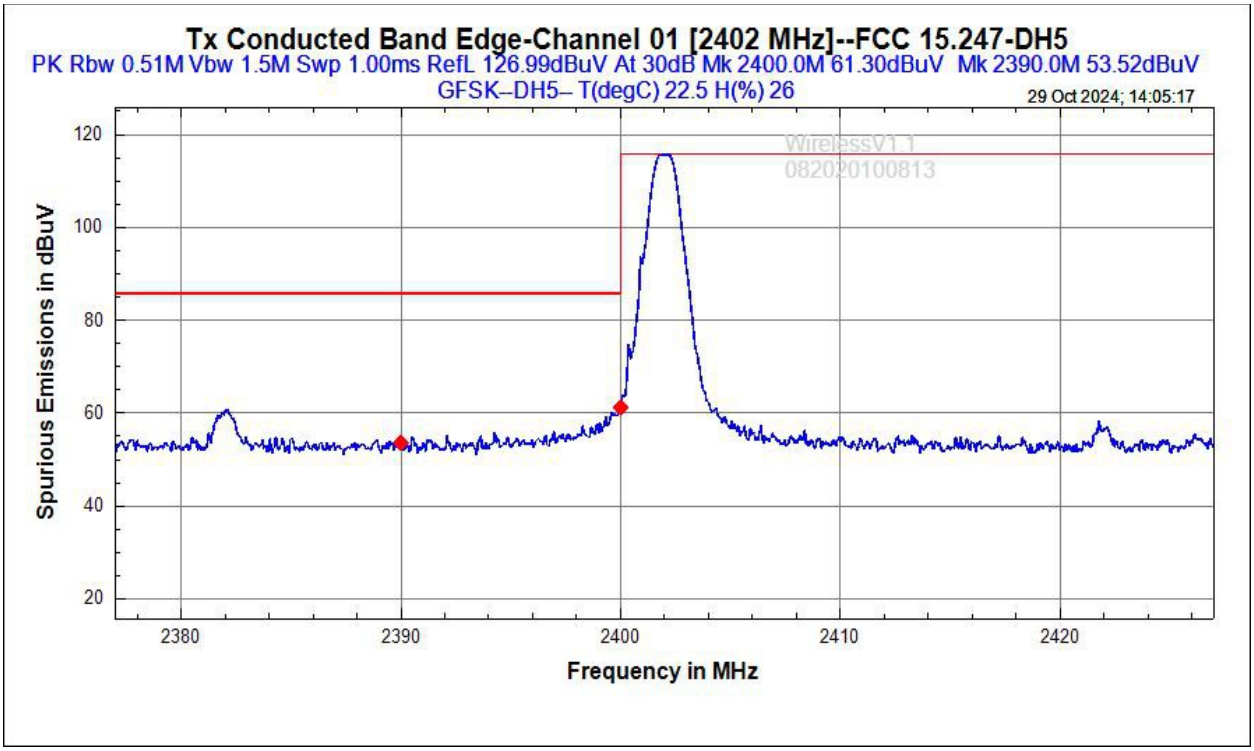

Figure 6.6.1a – Conducted Band Edge data (GFSK Peak)

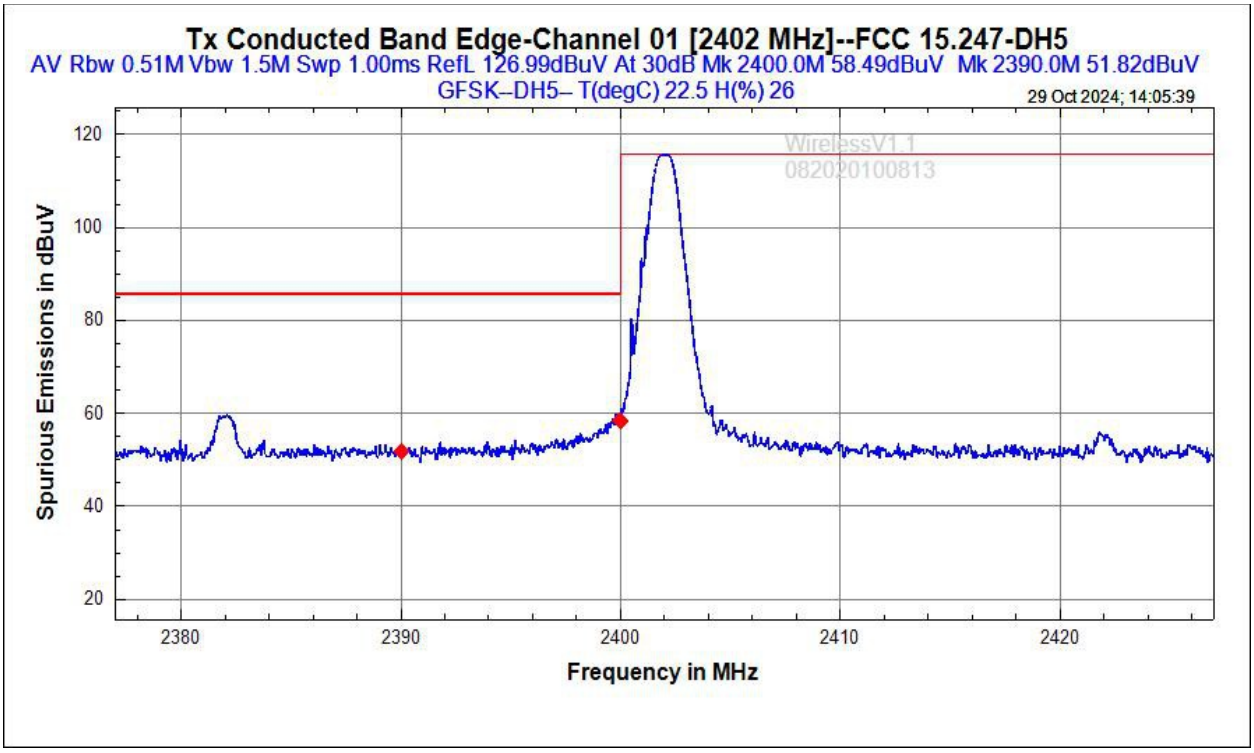

Figure 6.6.1b – Conducted Band Edge data (GFSK AVG)

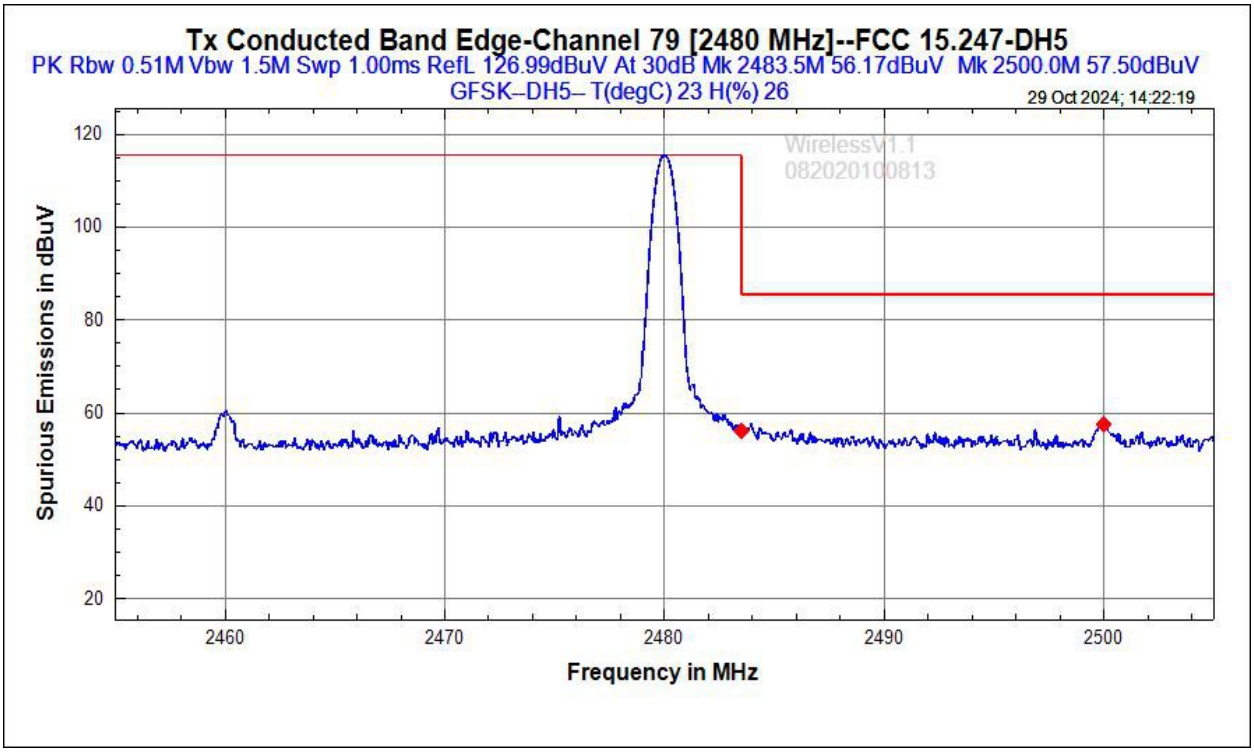

Figure 6.6.1c – Conducted Band Edge data (GFSK Peak)

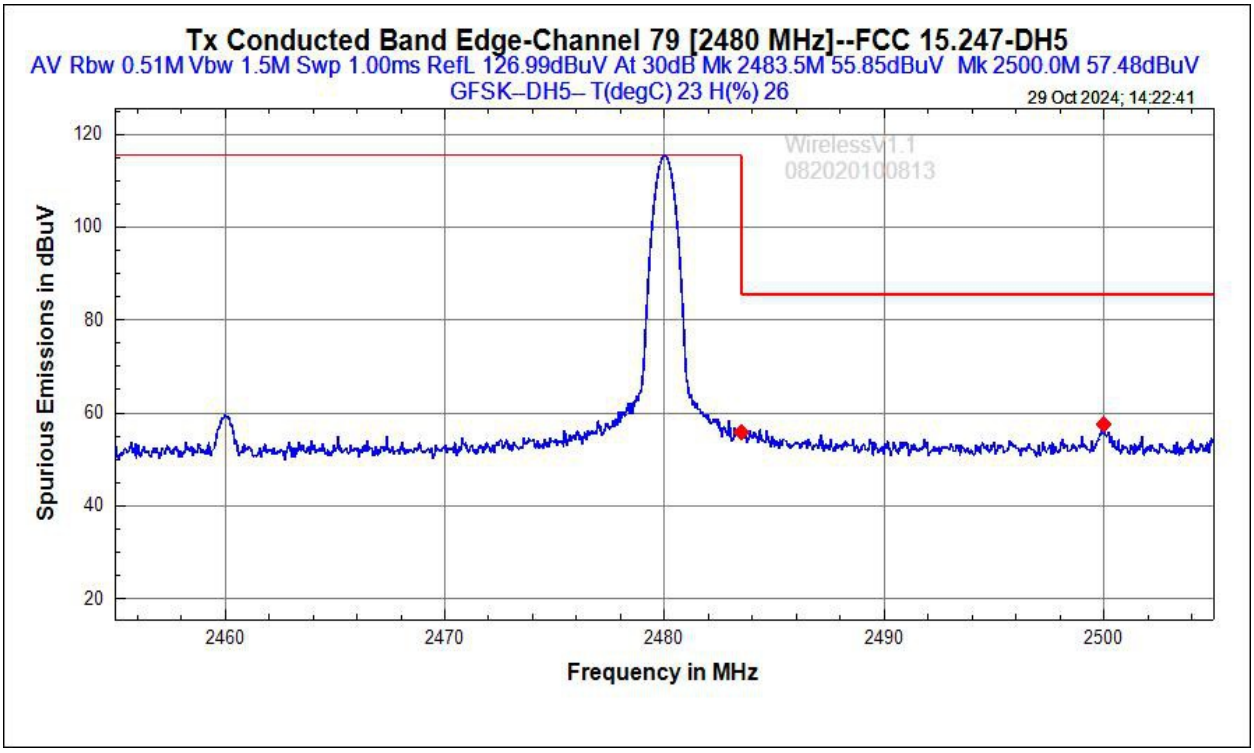

Figure 6.6.1d – Conducted Band Edge data (GFSK AVG)

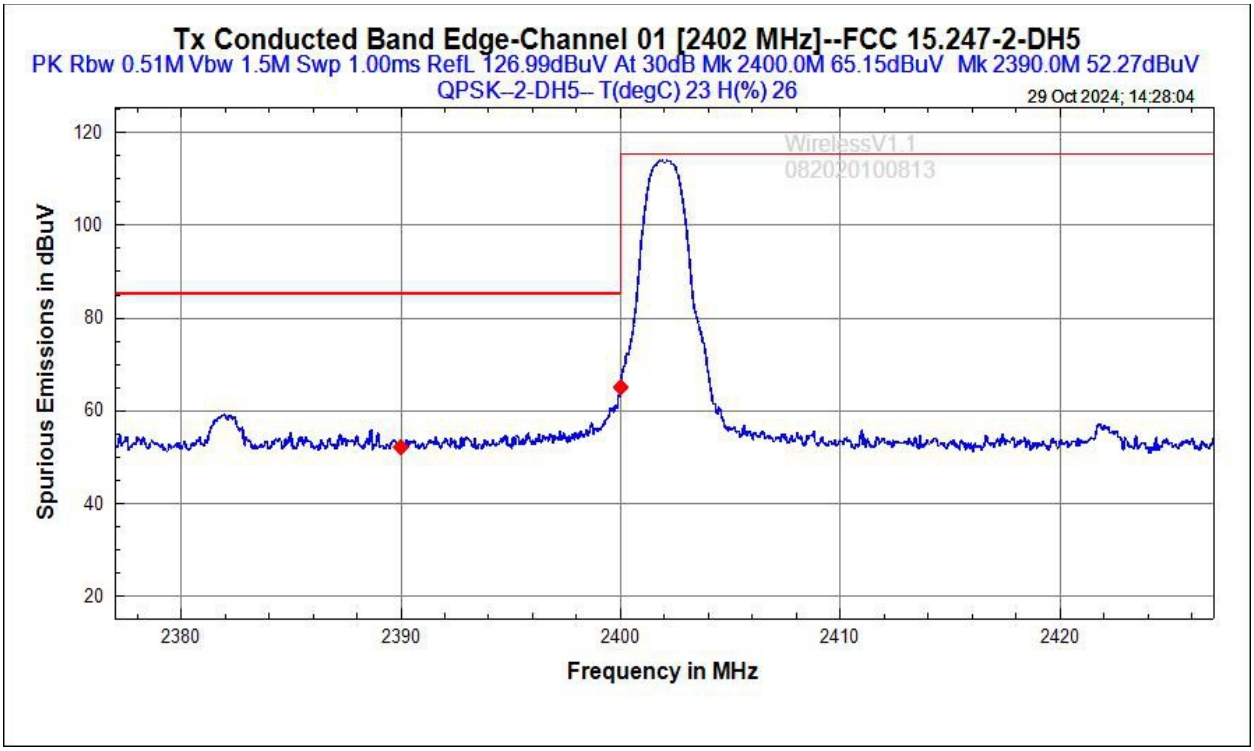

Figure 6.6.2a – Conducted Band Edge data (QPSK Peak)

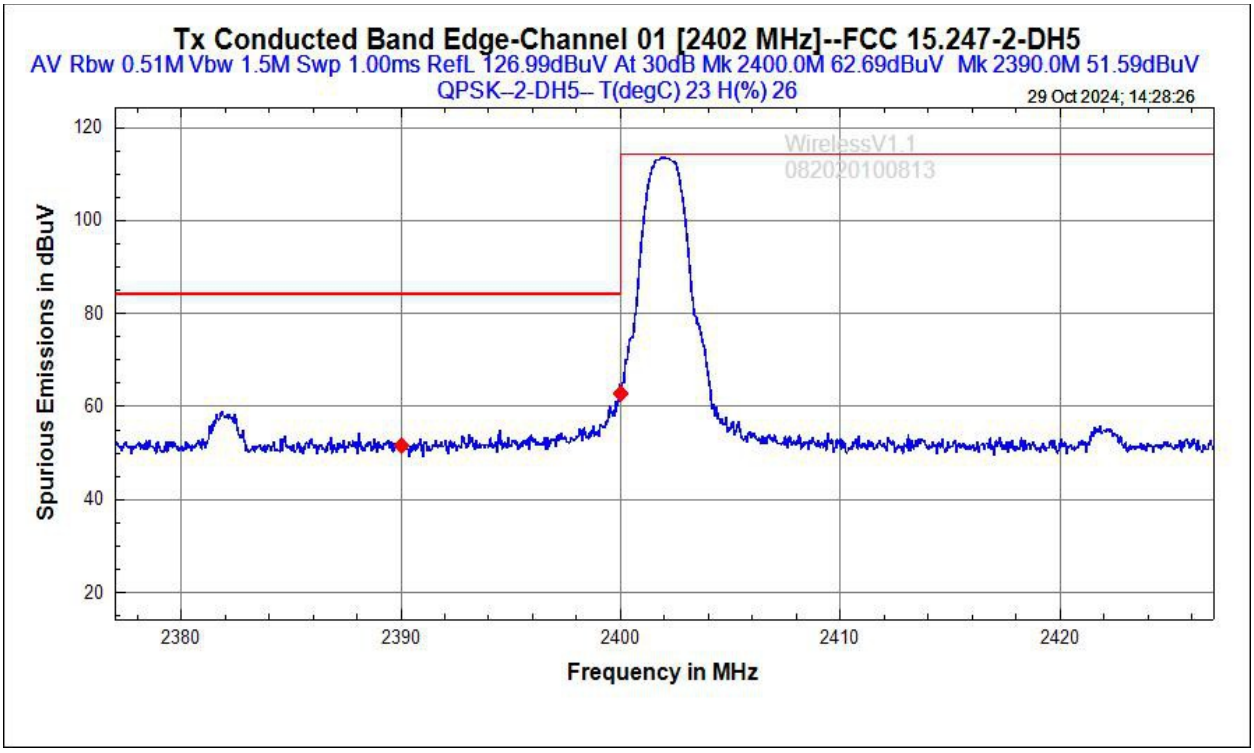

Figure 6.6.2b. – Conducted Band Edge data (QPSK AVG)

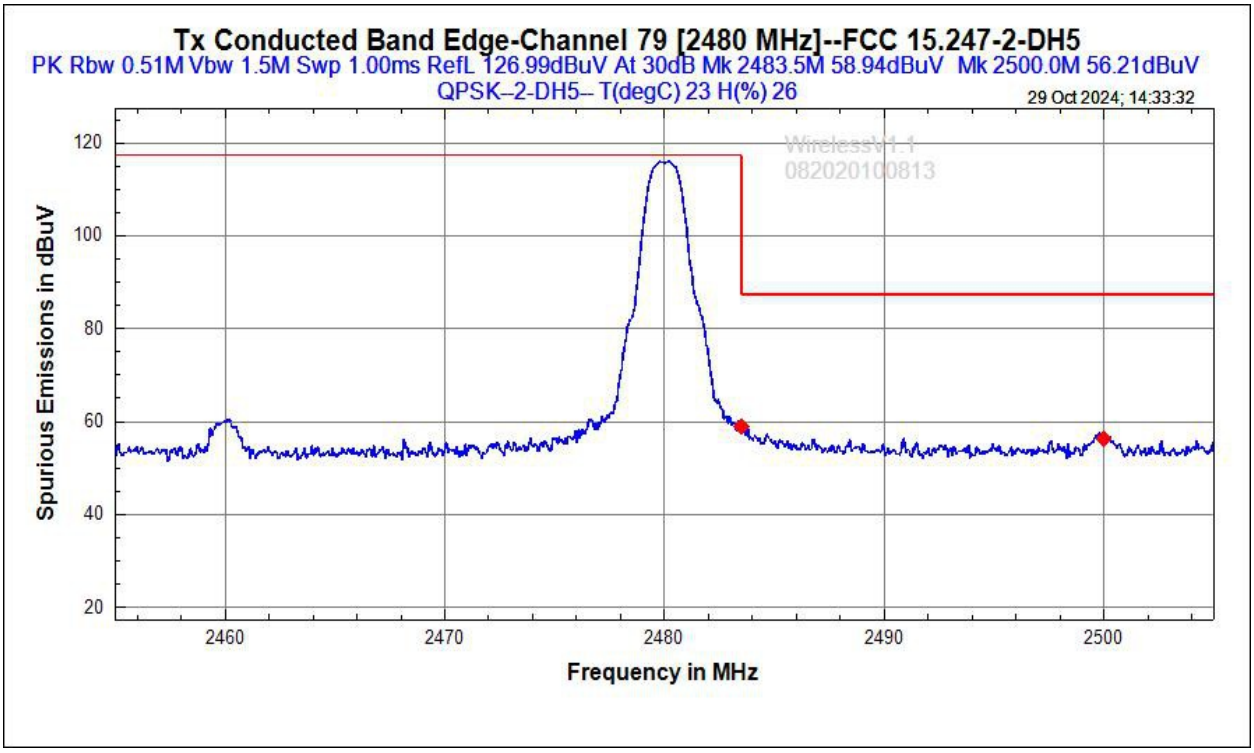

Figure 6.6.2c – Conducted Band Edge data (QPSK Peak)

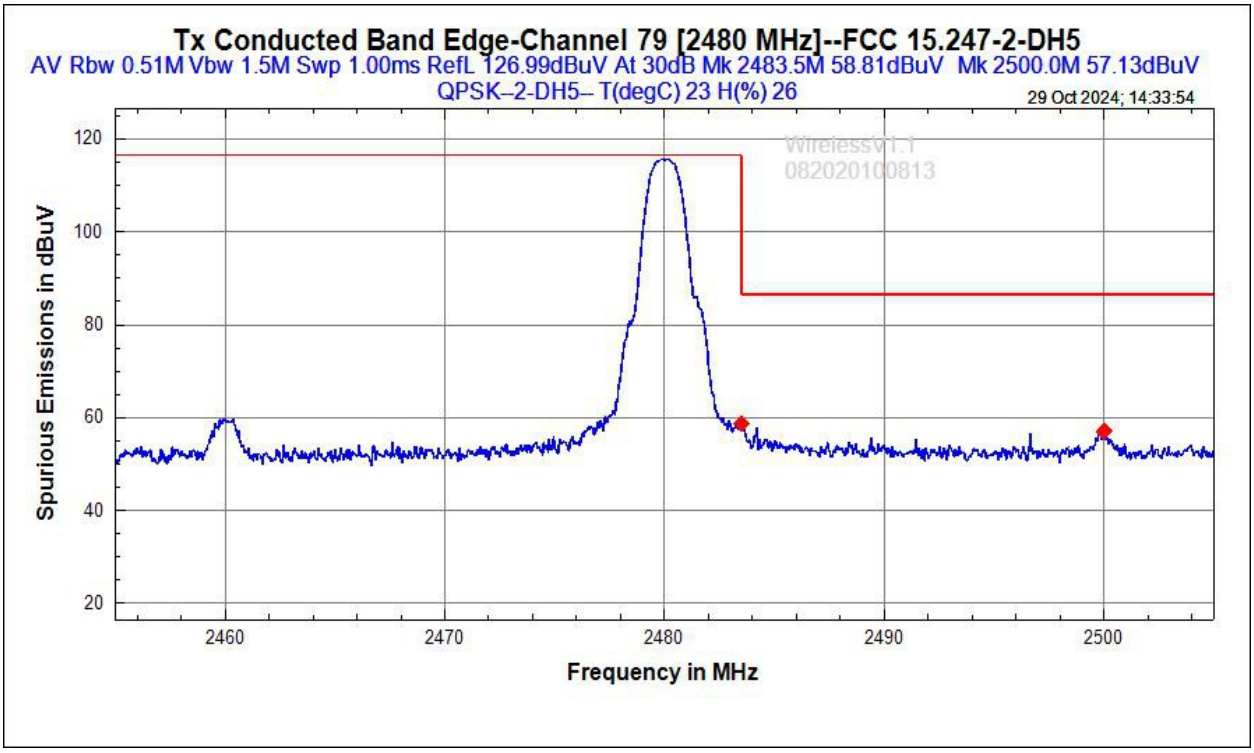

Figure 6.6.2d. – Conducted Band Edge data (QPSK AVG)

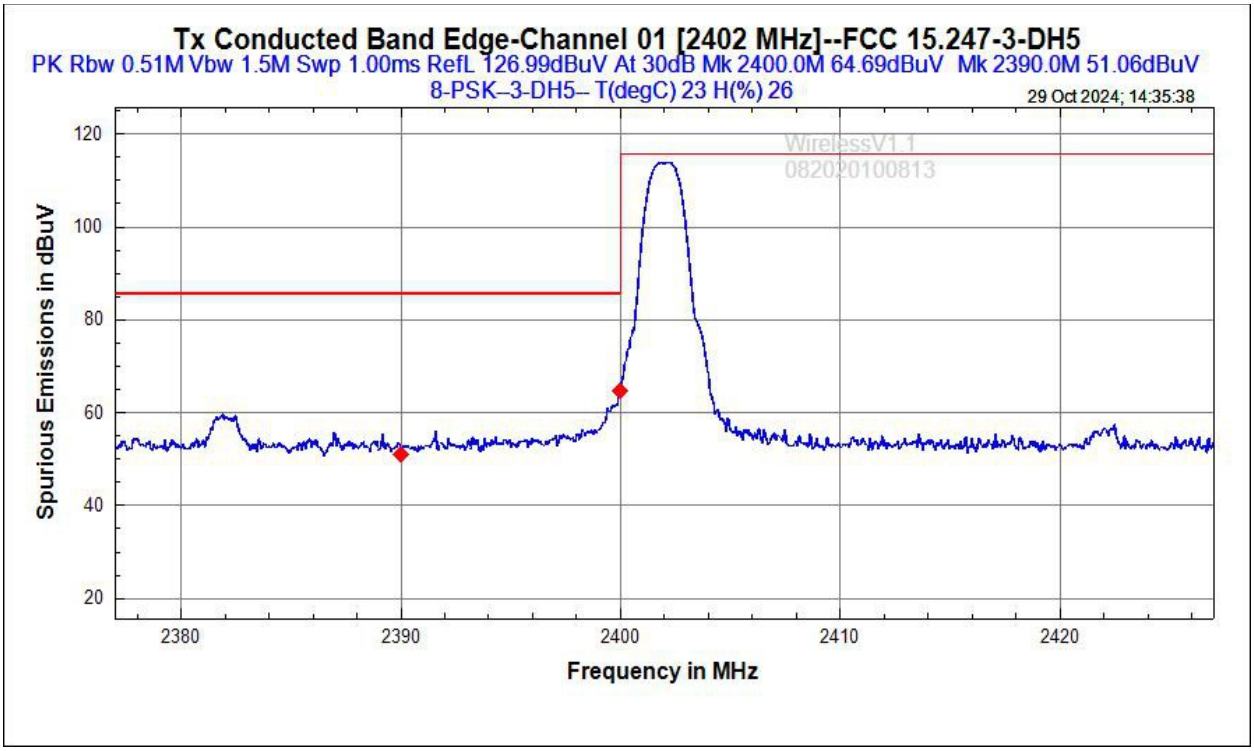

Figure 6.6.3a – Conducted Band Edge data (8-PSK Peak)

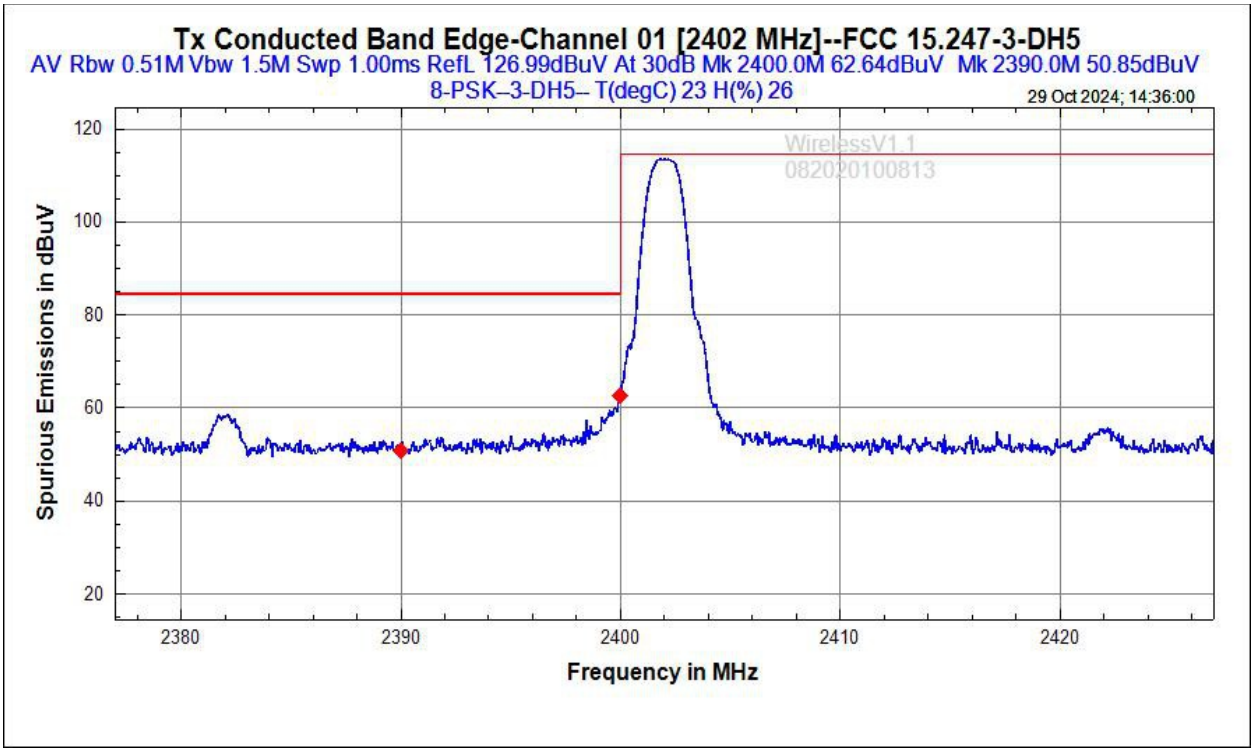

Figure 6.6.3b. – Conducted Band Edge data (8-PSK AVG)

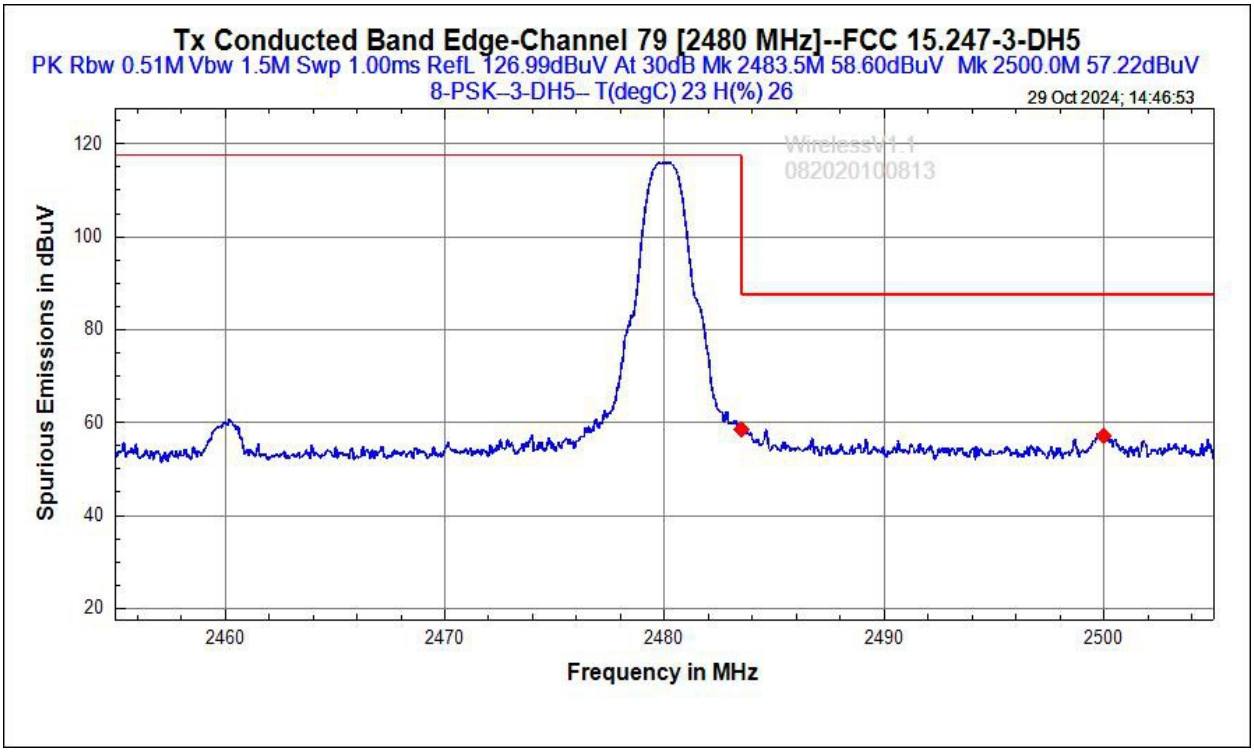

Figure 6.6.3c – Conducted Band Edge data (8-PSK Peak)

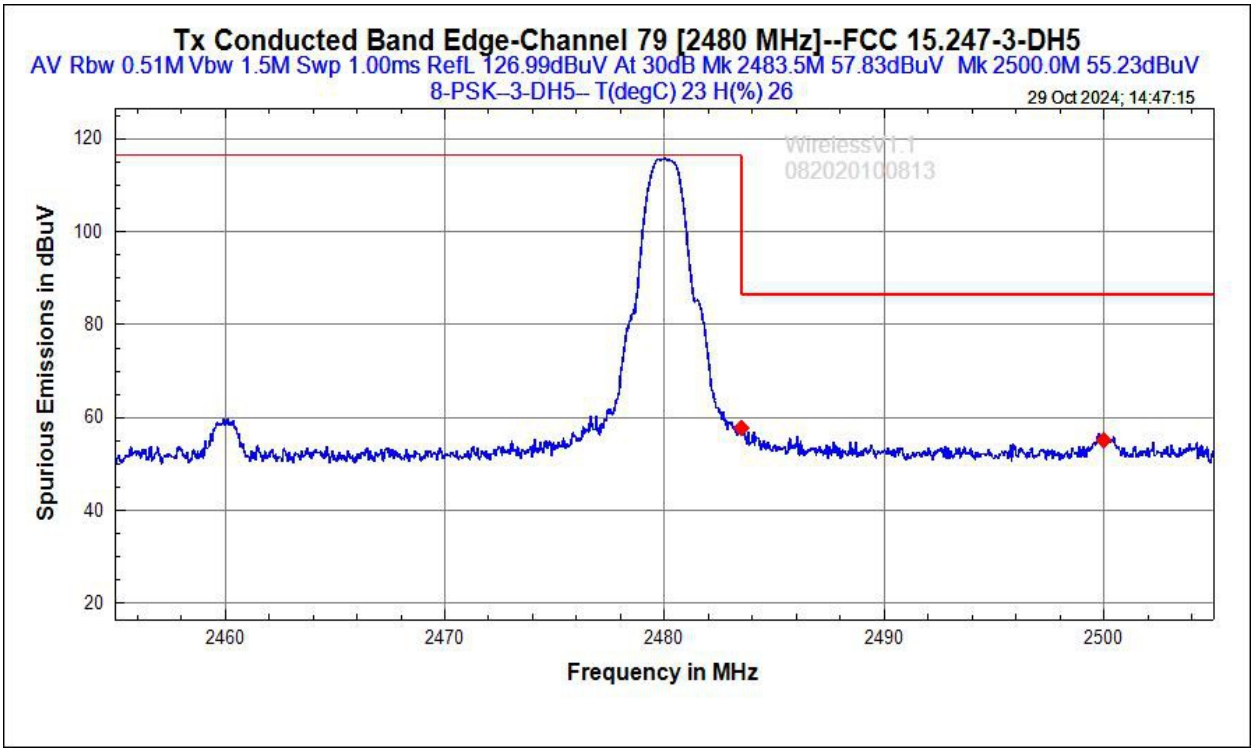

Figure 6.6.3d. – Conducted Band Edge data (8-PSK AVG)

Table 6.6.3 – Conducted Band Edge Summary-Hopping mode

Frequency (MHz)	Measurement (dBuV)	In Band Level (dBuV)	Band Edge Marker Delta level(dB)	Limit (dB)	Margin (dB)	Detector	Result
GFSK							
2400	56.51	116.52	-60.01	-20	-40.01	Peak	PASS
2483.5	54.33	117.43	-63.1	-20	-43.1	Peak	PASS
2400	57.30	116.05	-58.75	-20	-38.75	AVG	PASS
2483.5	51.35	117.39	-66.04	-20	-46.04	AVG	PASS
Frequency (MHz)	**Measurement (dBuV)**	**In Band Level (dBuV)**	**Band Edge Marker Delta level(dB)**	**Limit (dB)**	**Margin (dB)**	**Detector**	**Result**
QPSK							
2400	58.28	115.07	-56.79	-20	-36.79	Peak	PASS
2483.5	54.81	116.04	-61.23	-20	-41.23	Peak	PASS
2400	56.18	111.90	-55.72	-20	-35.72	AVG	PASS
2483.5	52.53	114.83	-62.3	-20	-42.3	AVG	PASS
Frequency (MHz)	**Measurement (dBuV)**	**In Band Level (dBuV)**	**Band Edge Marker Delta level(dB)**	**Limit (dB)**	**Margin (dB)**	**Detector**	**Result**
8-PSK							
2400	61.64	114.88	-53.24	-20	-33.24	Peak	PASS
2483.5	55.86	116.07	-60.21	-20	-40.21	Peak	PASS
2400	58.48	114.57	-56.09	-20	-36.09	AVG	PASS
2483.5	52.96	115.82	-62.86	-20	-42.86	AVG	PASS

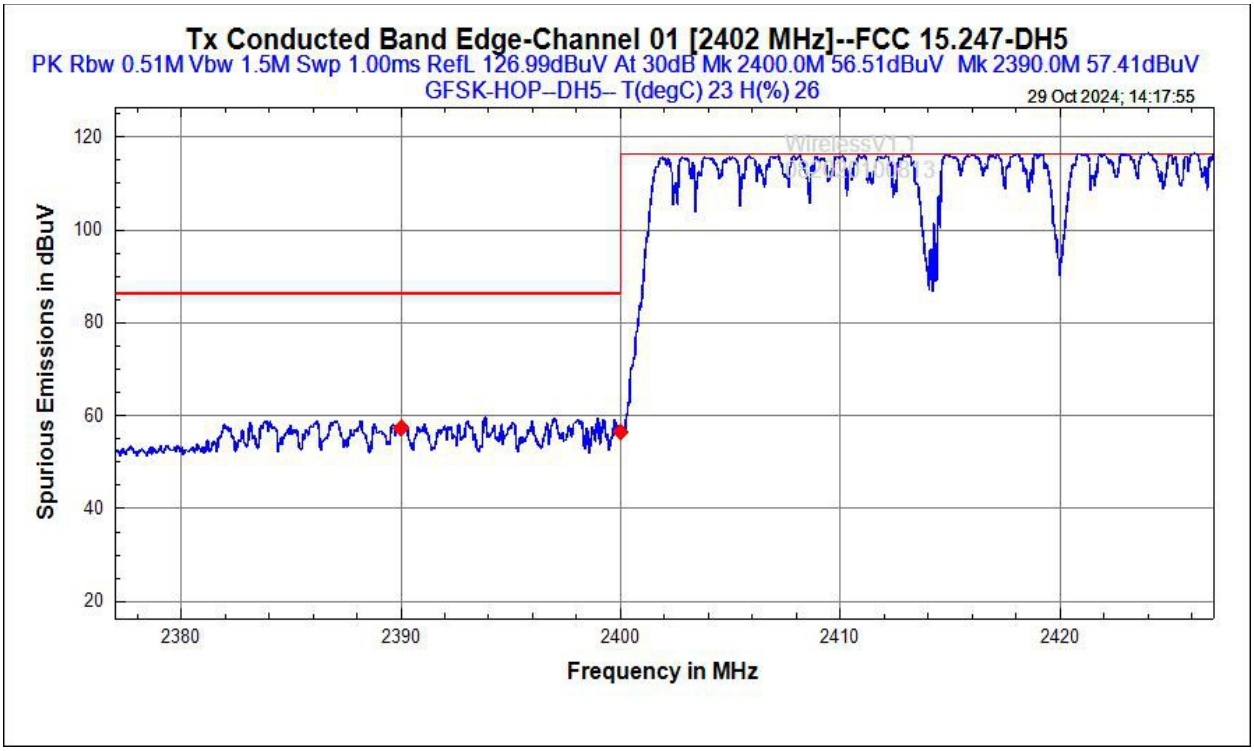

Figure 6.6.4a– Conducted Band Edge data (GFSK Peak)

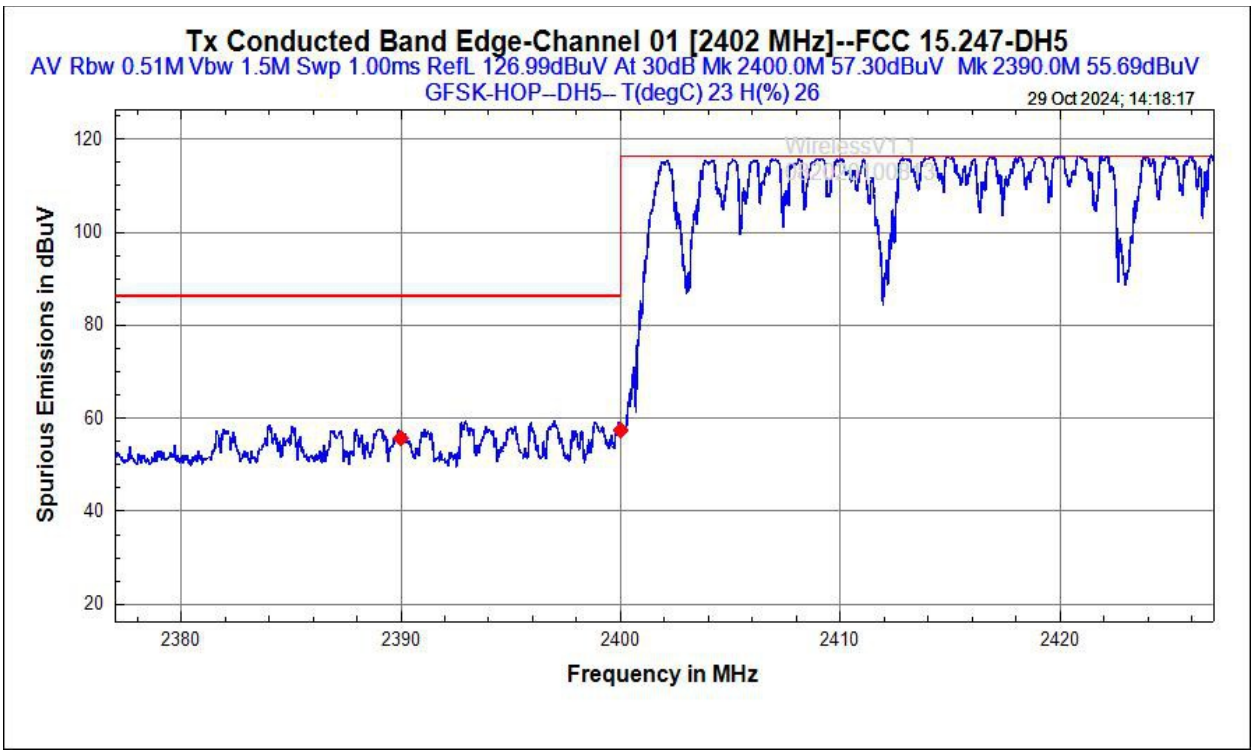

Figure 6.6.4b – Conducted Band Edge data (GFSK AVG)

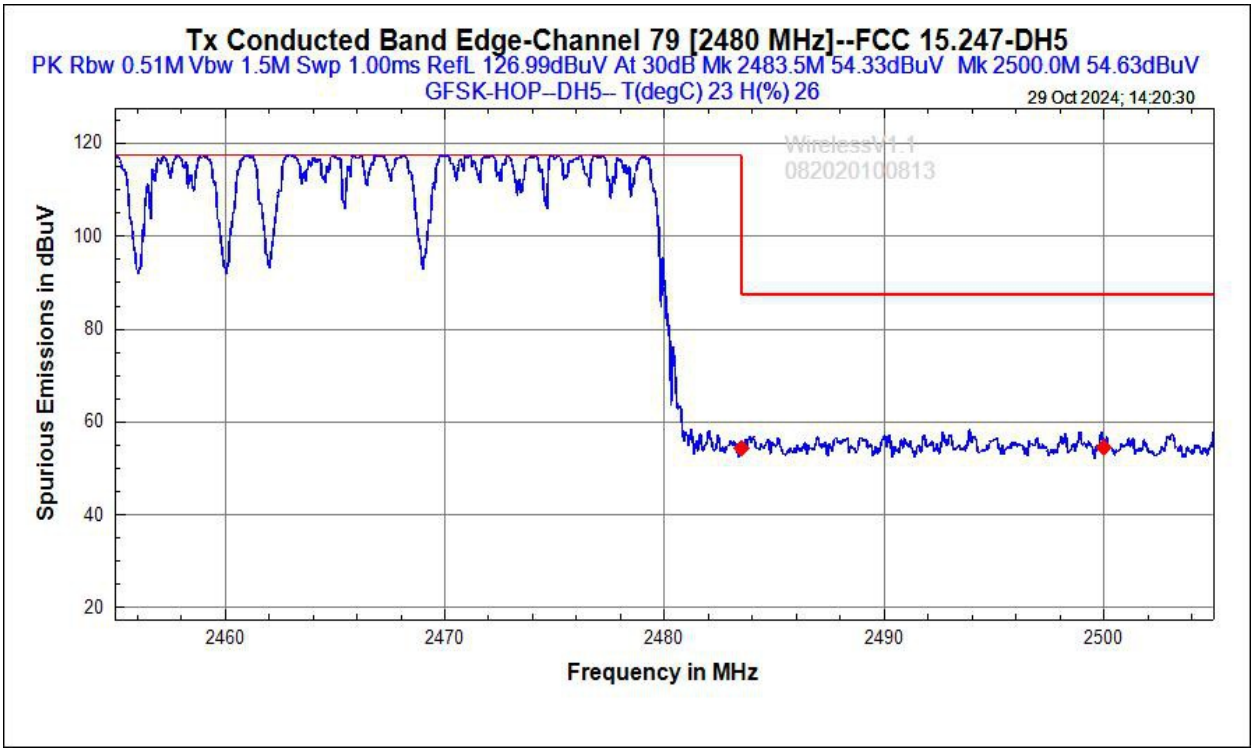

Figure 6.6.4c– Conducted Band Edge data (GFSK Peak)

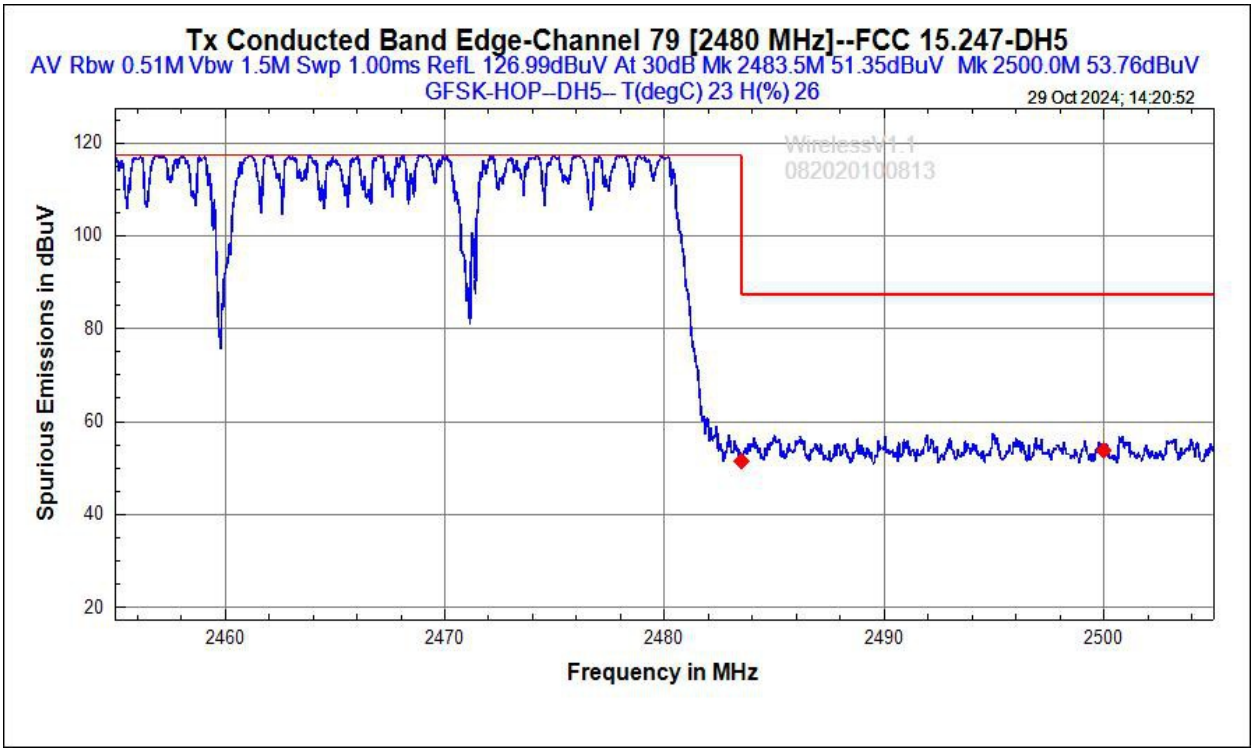

Figure 6.6.4d. – Conducted Band Edge data (GFSK AVG)

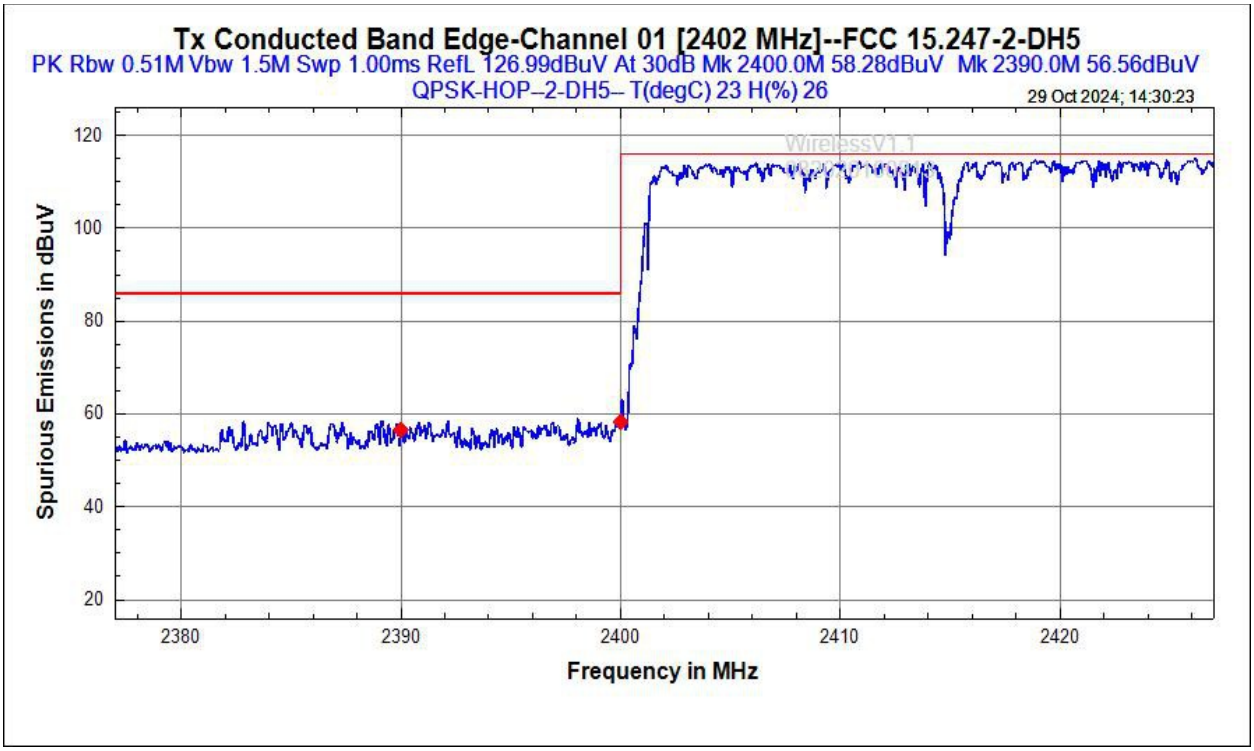

Figure 6.6.5a – Conducted Band Edge data (QPSK Peak)

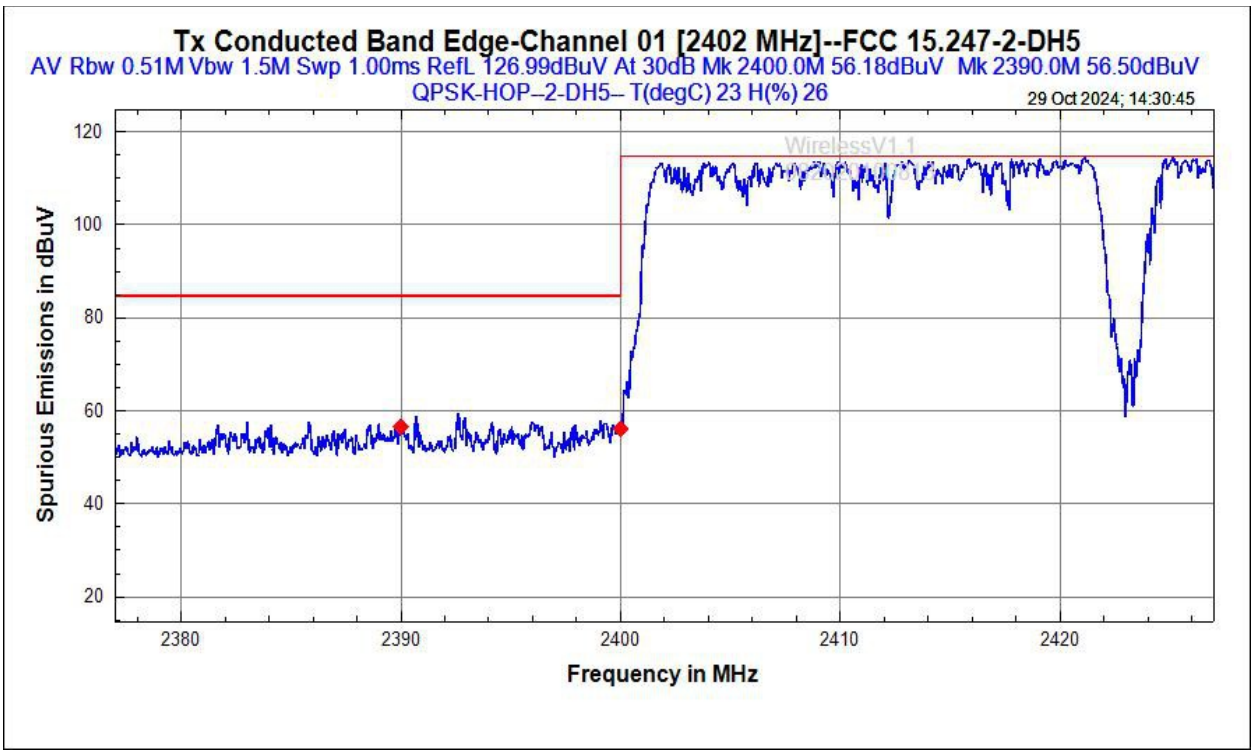

Figure 6.6.5b – Conducted Band Edge data (QPSK AVG)

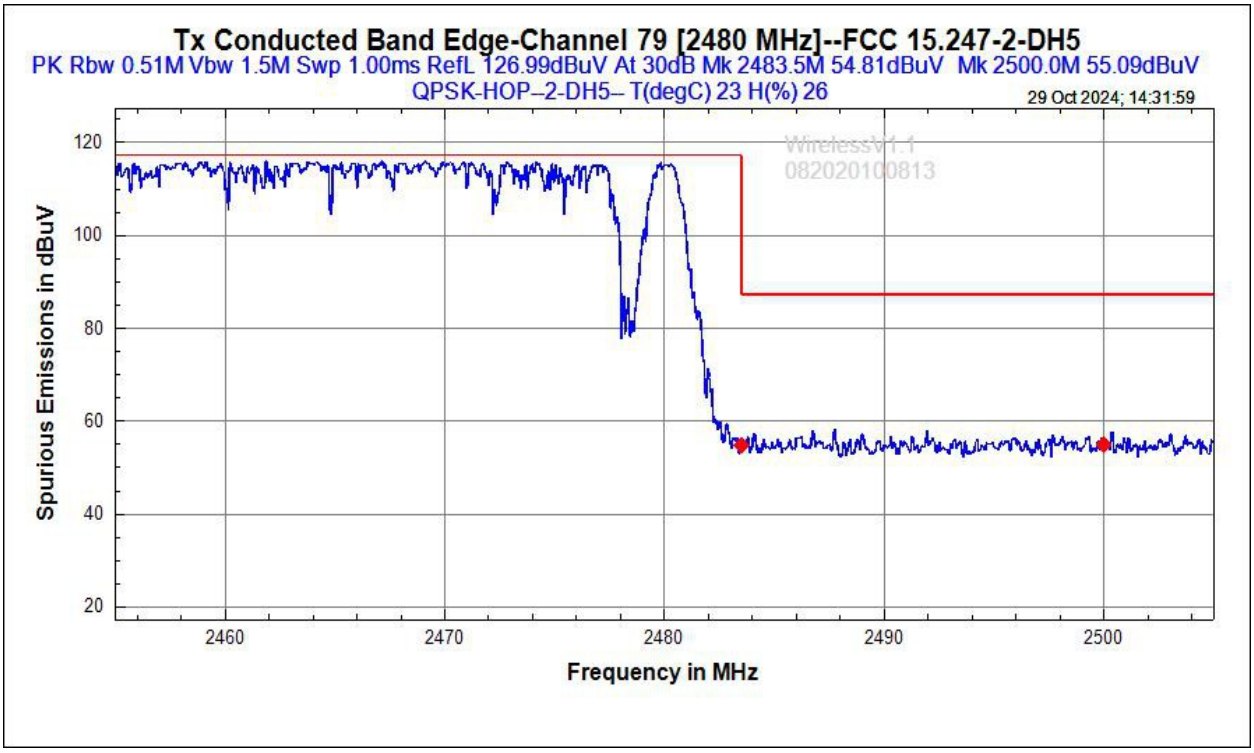

Figure 6.6.5c – Conducted Band Edge data (QPSK Peak)

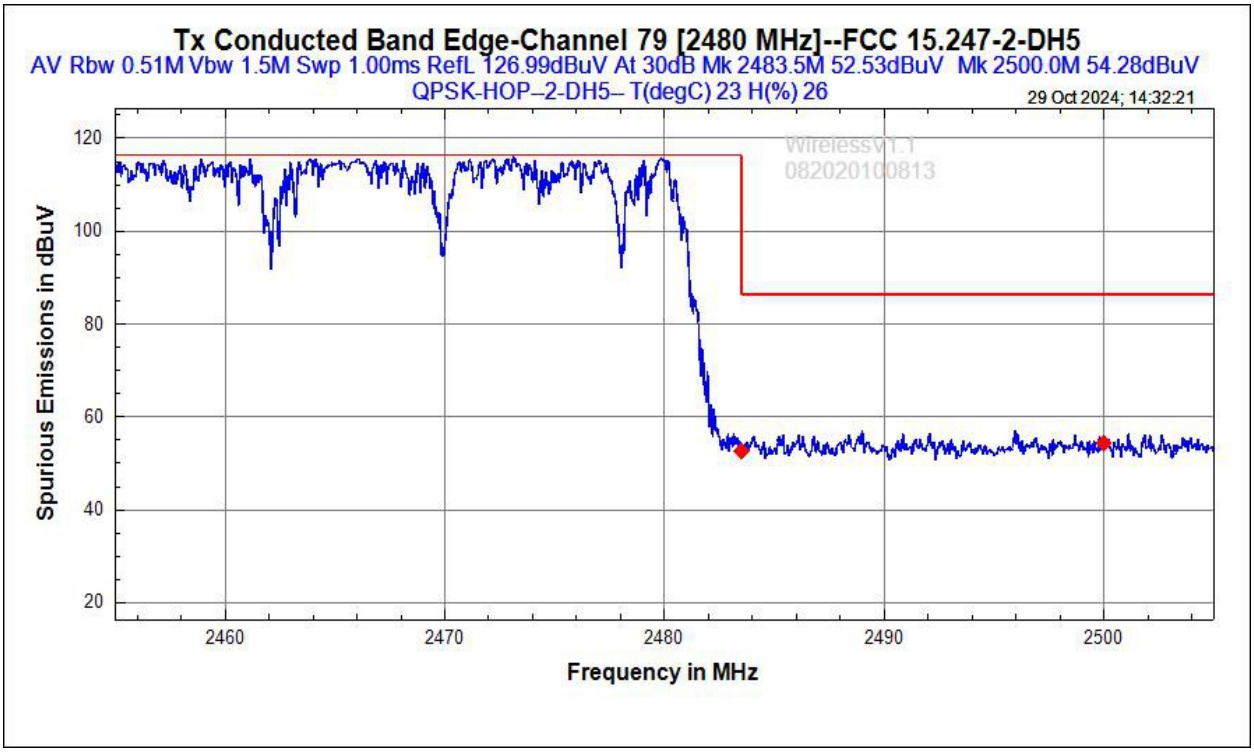

Figure 6.6.5d – Conducted Band Edge data (QPSK AVG)

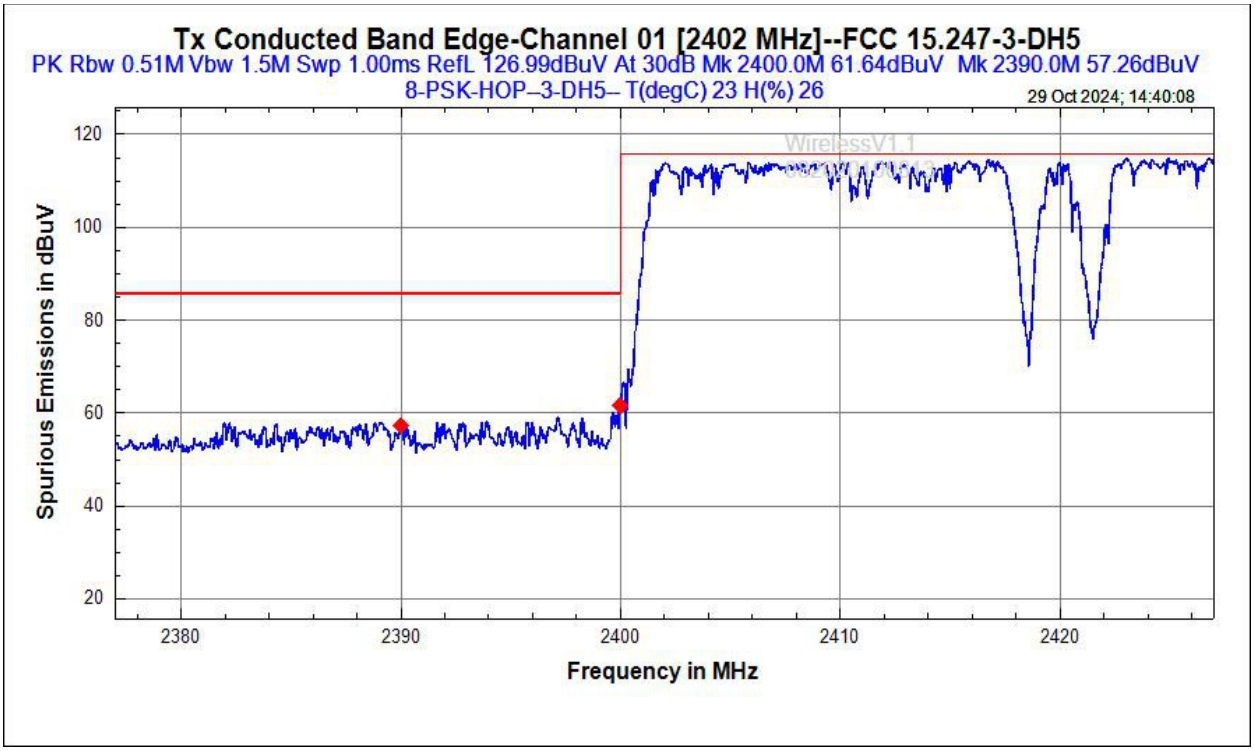

Figure 6.6.6a – Conducted Band Edge data (8-PSK Peak)

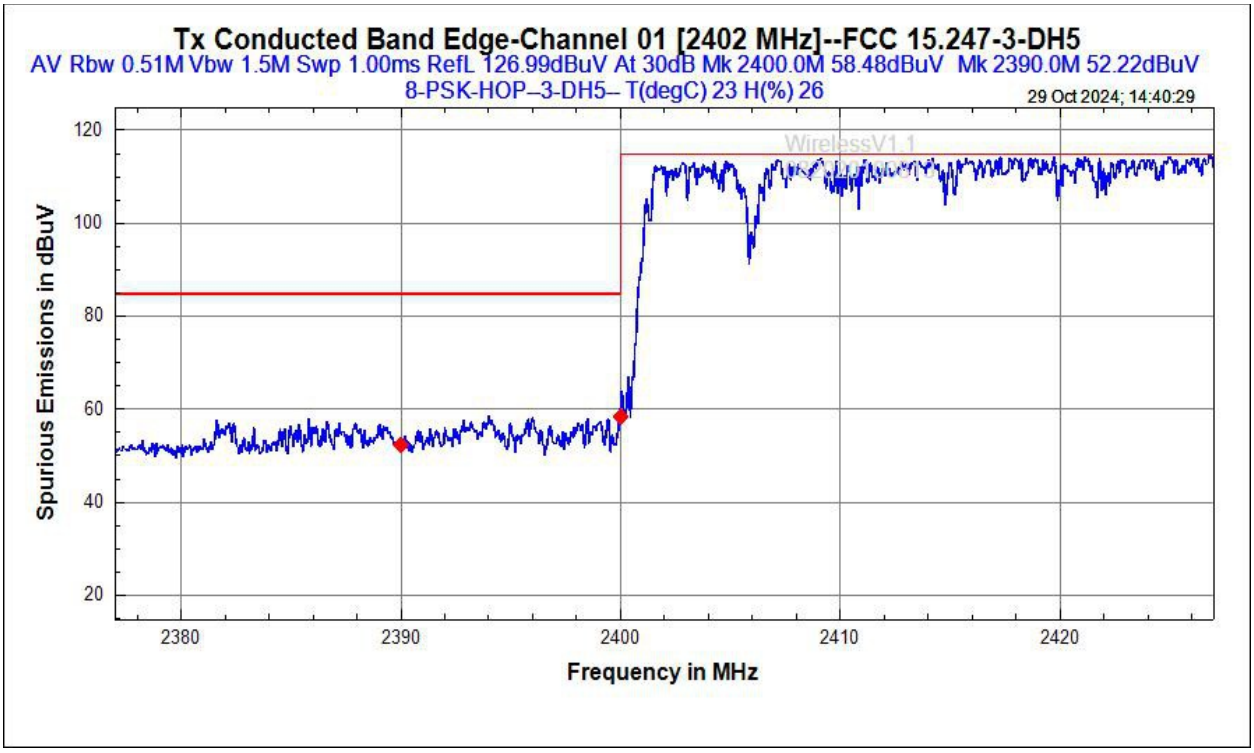

Figure 6.6.6b – Conducted Band Edge data (8-PSK AVG)

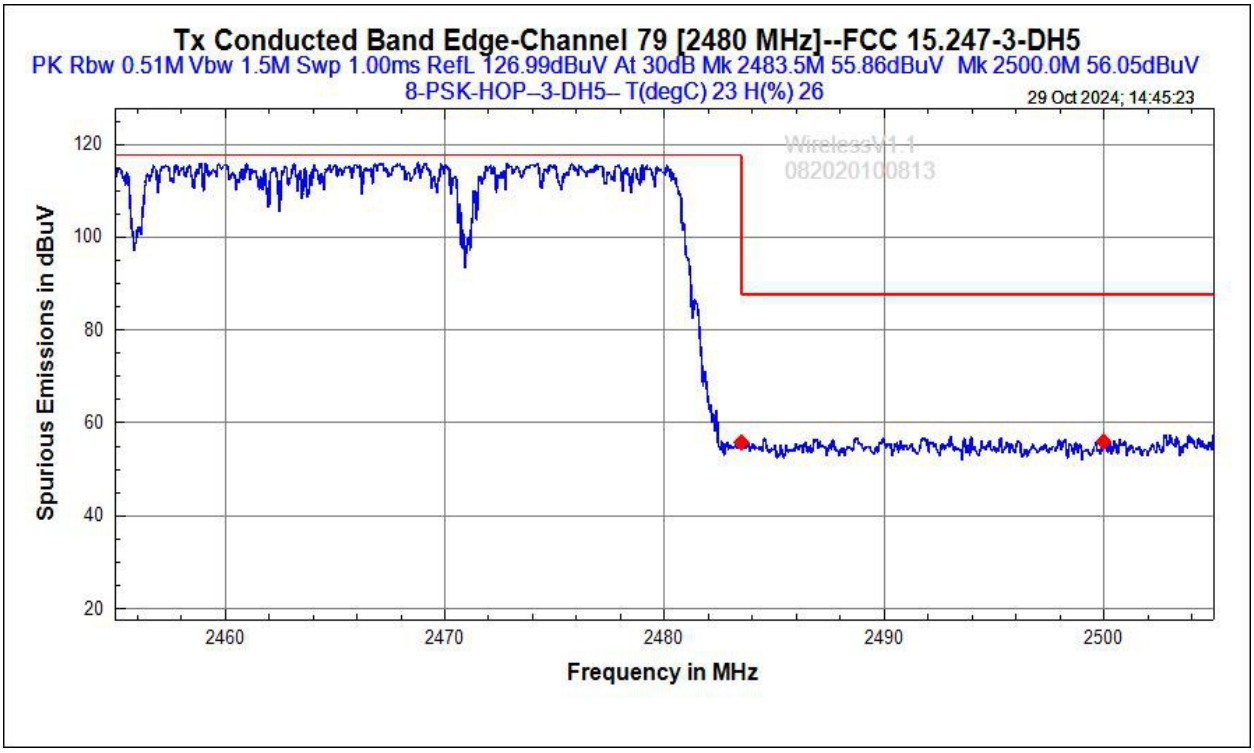

Figure 6.6.6c – Conducted Band Edge data (8-PSK Peak)

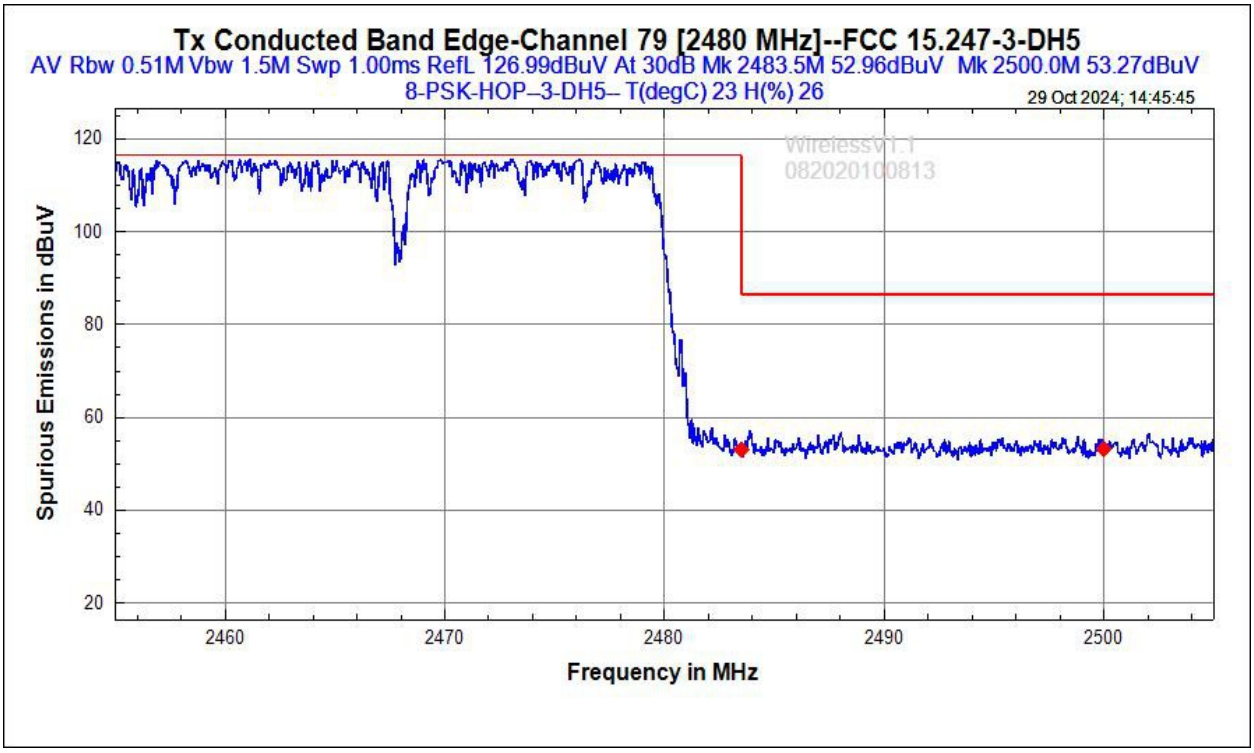

Figure 6.6.6d – Conducted Band Edge data (8-PSK AVG)

6.7 Channel Separation

☒**Applicable**

Table 6.7.1 – Channel Separation Test Setup Information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS:**	
TEMPERATURE:	23.5°C	**HUMIDITY:**	27%
TESTED BY:	Adiseshu Nyshadham	**DATE OF TEST:**	2024-10-30
TESTREFERENCE:	FCC Title 47 CFR Part 15: Subpart C-15.247(a)(1), RSS-247-Issue 3		
TEST VOLTAGE:	3.4V		
SETUP:	As per ANSI C63.10:2013, sec 7.8.2		
FREQUENCY RANGE	2400-2483.5 MHz		
FREQUENCY TESTED:	2402 MHz, 2441 MHz, 2480 MHz		
FIRMWARE POWER SETTING	11 dBm		
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE	GFSK, DH1, QPSK, DH2 8-PSK, DH3		
ANTENNA TYPE/GAIN	Ceramic Chip Antenna, 2.2dBi(peak), 1.9dBi(Band edges)		
DUTY CYCLE	N/A		
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

Table 6.7.2 – Channel Separation summary

Mode	Number of Channels	Left marker (MHz)	dBuV	Δ Marker (MHz)	Δ dBuV
GFSK	2	2402.142	115.731	0.996	0.036
QPSK	2	2401.854	112.932	1.018	0.004
8-PSK	2	2401.948	112.977	0.992	0.052

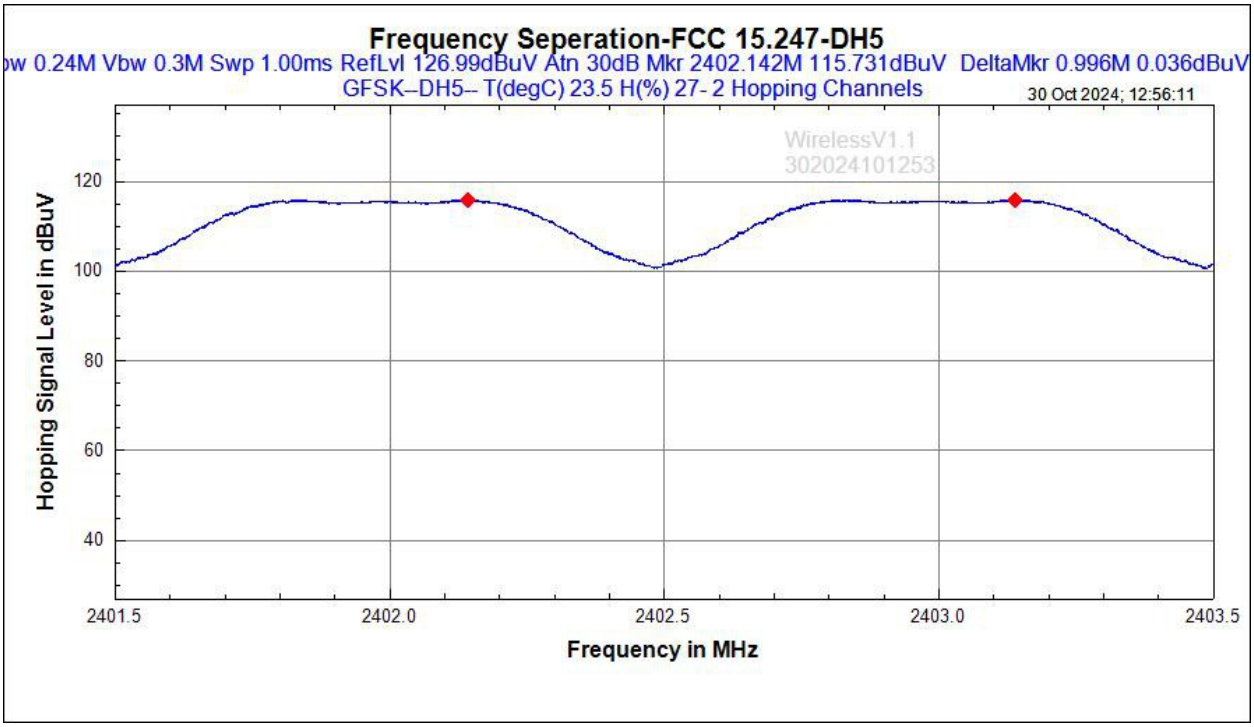

Figure 6.7.1a – Channel Separation, GFSK

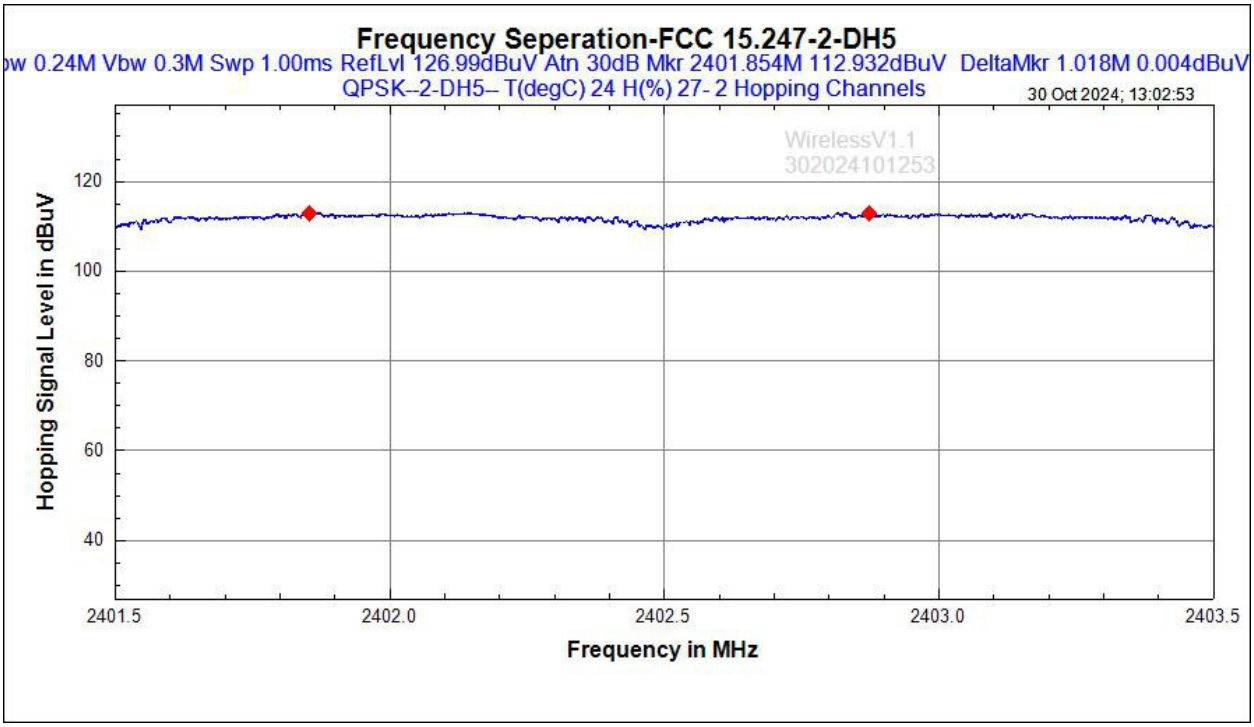

Figure 6.7.1b – Channel Separation, QPSK

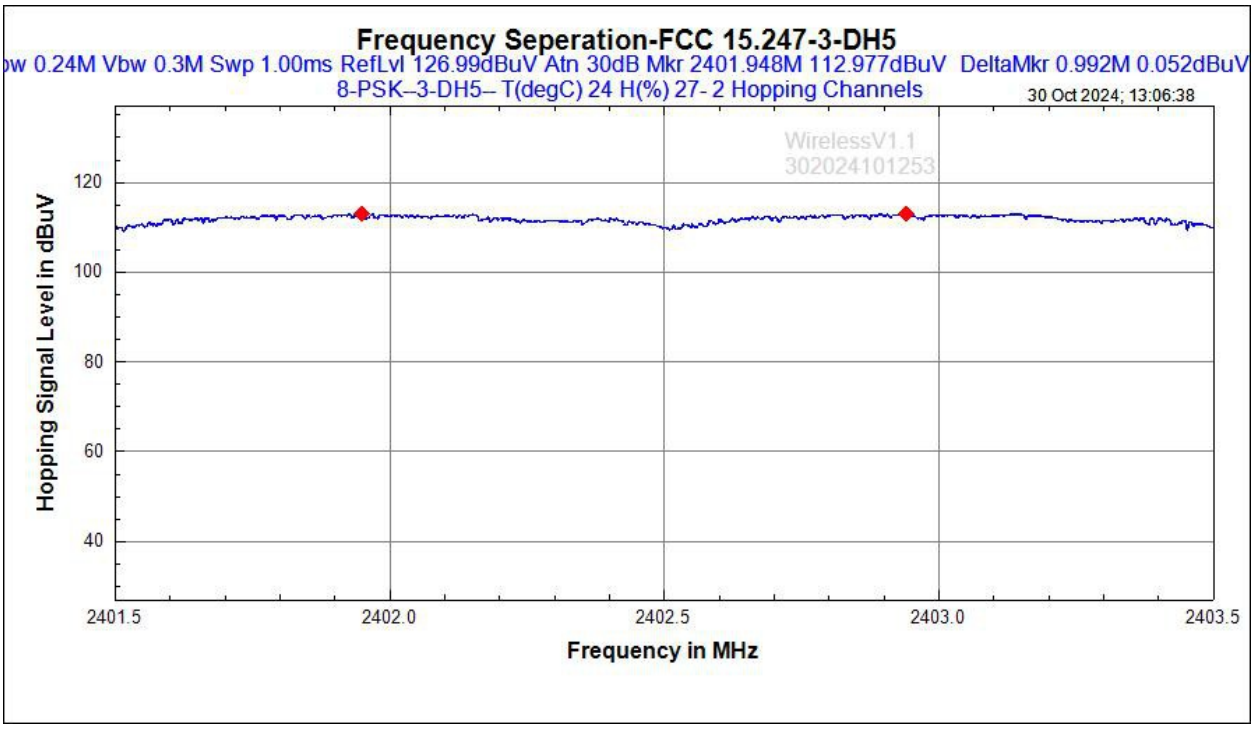

Figure 6.7.1c – Channel Separation, 8-PSK

6.8 Number of Hopping Channels

☒**Applicable**

Table 6.8.1 – Number of hopping channels Test Setup Information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS:**	
TEMPERATURE:	24°C	**HUMIDITY:**	27%
TESTED BY:	Adiseshu Nyshadham	**DATE OF TEST:**	2024-10-30
TESTREFERENCE:	FCC Title 47 CFR Part 15: Subpart C-15.247, RSS-247-Issue 3		
TEST VOLTAGE:	3.4V		
SETUP:	As per ANSI C63.10:2013, sec 7.8.3		
FREQUENCY RANGE	2400-2483.5 MHz		
FREQUENCY TESTED:	2402 MHz, 2441 MHz, 2480 MHz		
FIRMWARE POWER SETTING	11 dBm		
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE	GFSK, DH1, QPSK, DH2 8-PSK, DH3		
ANTENNA TYPE/GAIN	Ceramic Chip Antenna, 2.2dBi(peak), 1.9dBi(Band edges)		
DUTY CYCLE	N/A		
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

Table 6.8.2 – Number of Hopping Channels Summary

Mode	Number of Hopping (Channels)	Figure Reference	Limits (Channels)	PASS/FAIL
GFSK	79	6.8.1a	> =15	PASS
QPSK	20+20+20+19=79	6.8.2a-6.8.2d	>=15	PASS
8-PSK	20+20+20+19=79	6.8.3a-6.8.3d	>=15	PASS

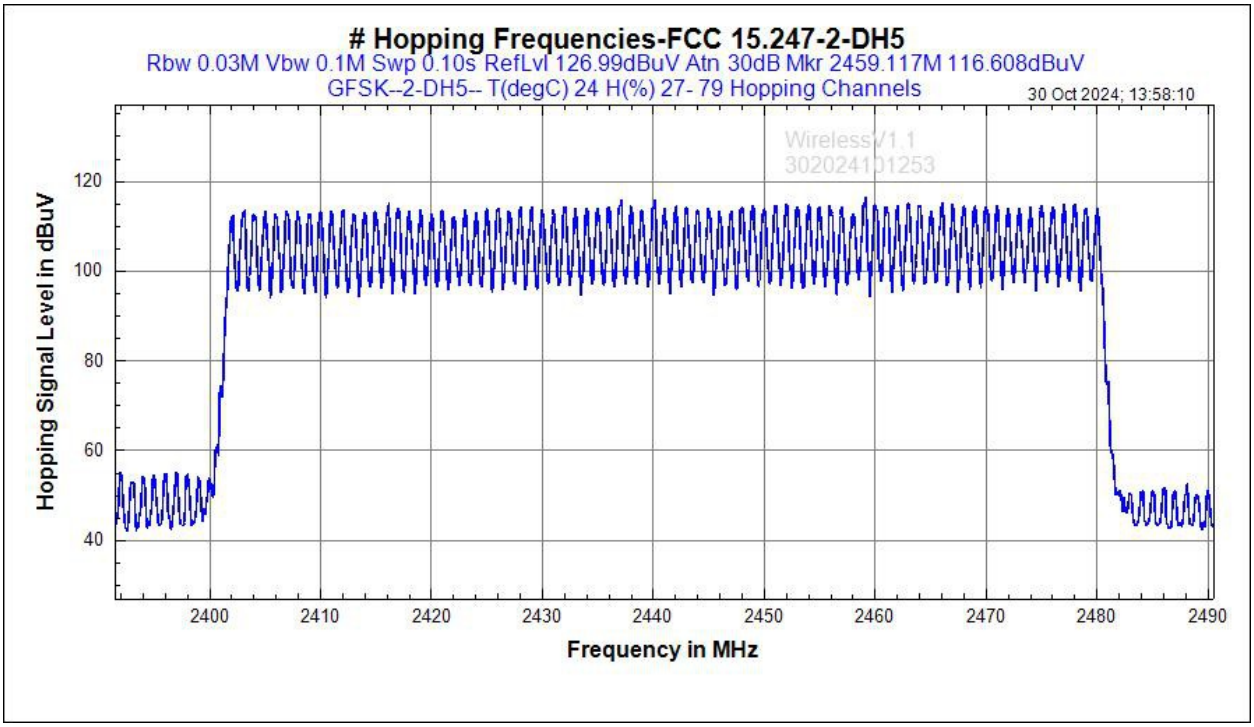

Figure 6.8.1a – Number of hopping channel, GFSK

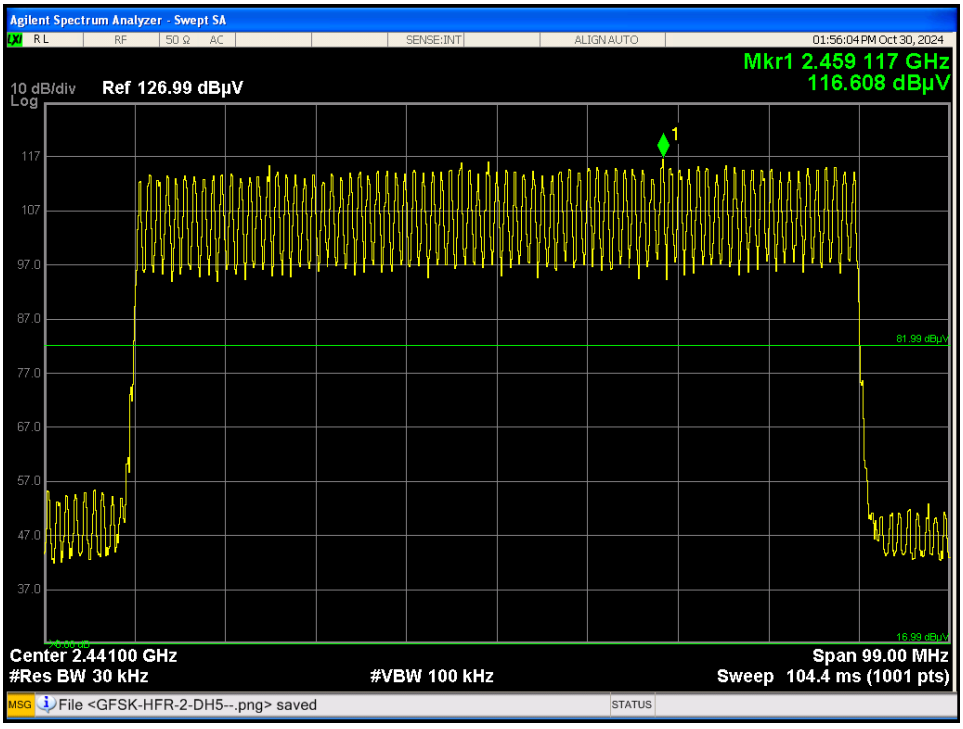

Figure 6.8.1a – Number of hopping channel, GFSK

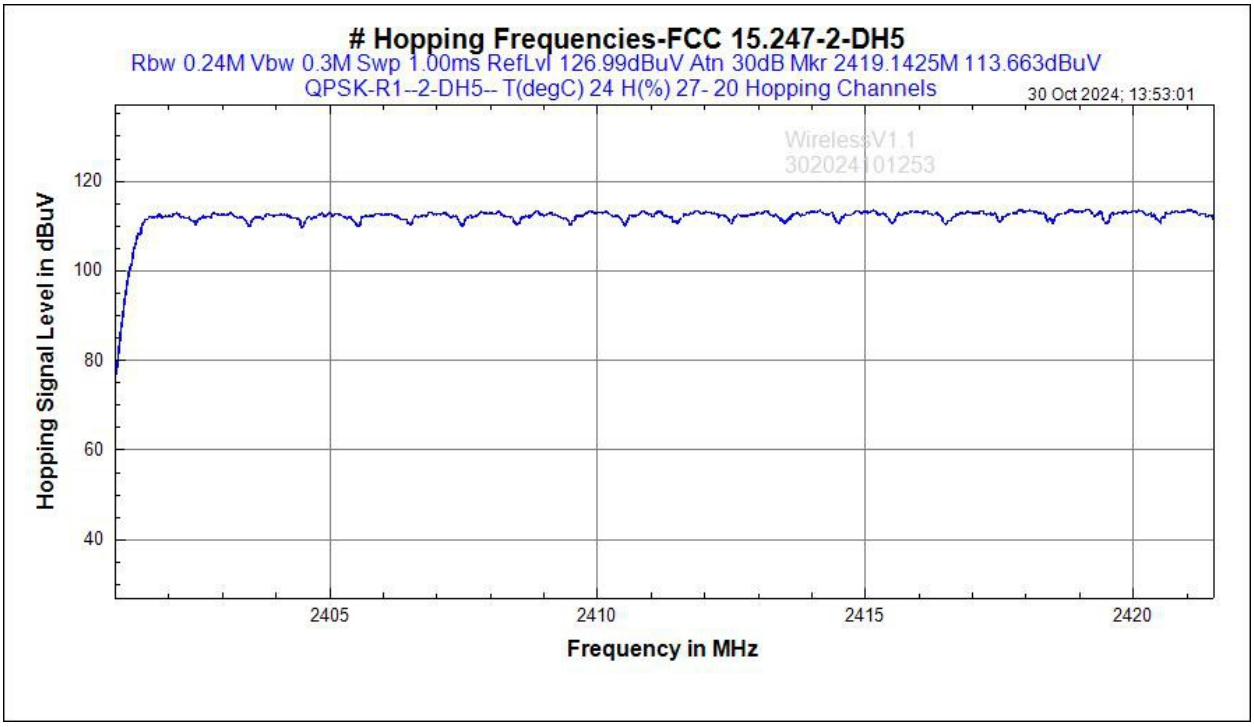

Figure 6.8.2a – Number of hopping, QPSK

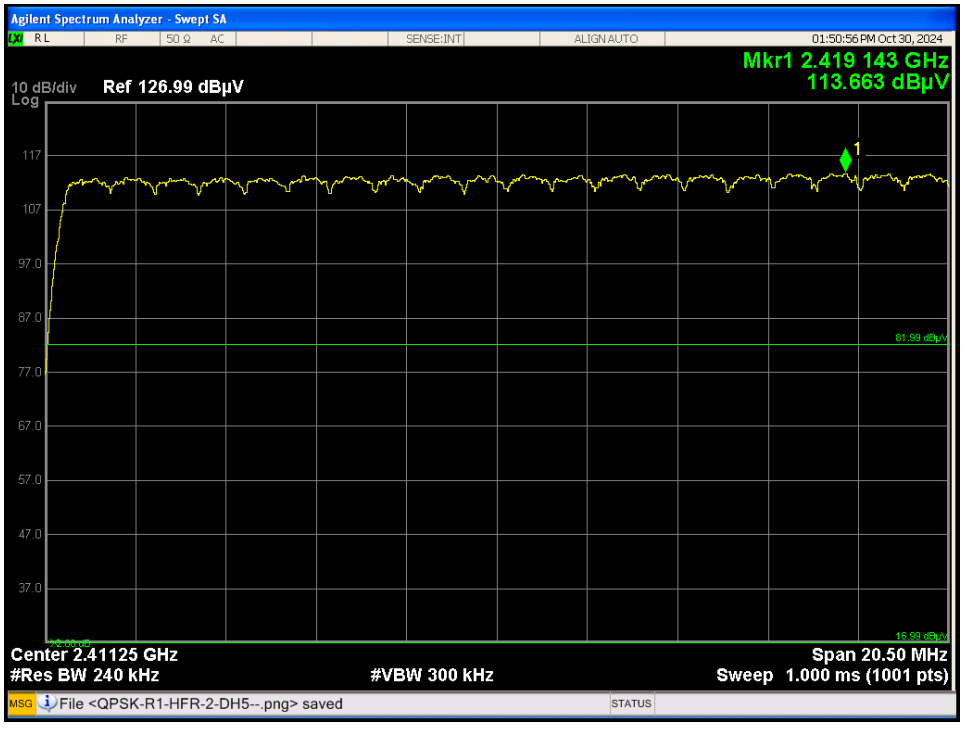

Figure 6.8.2a – Number of hopping, QPSK

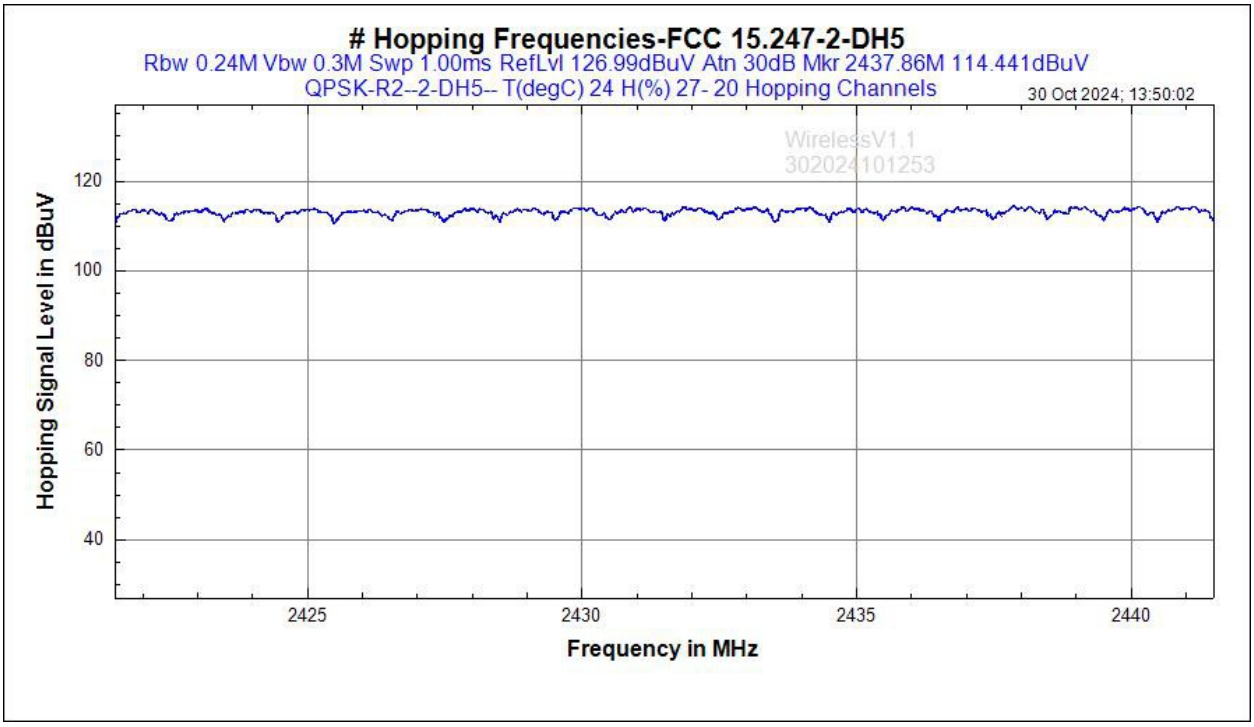

Figure 6.8.2b – Number of hopping, QPSK

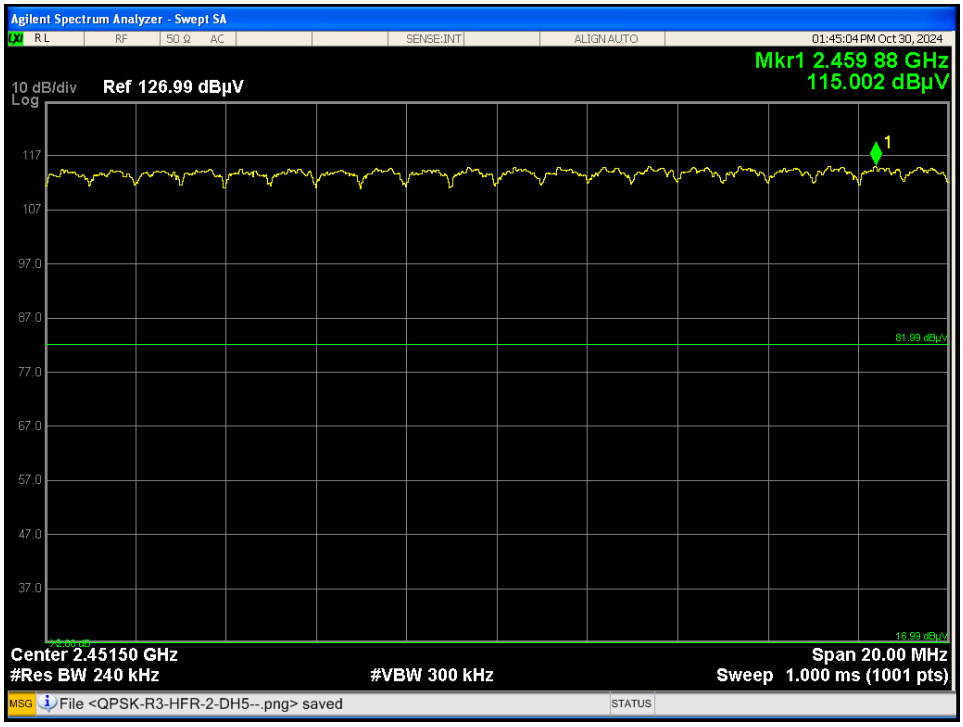

Figure 6.8.2b – Number of hopping, QPSK

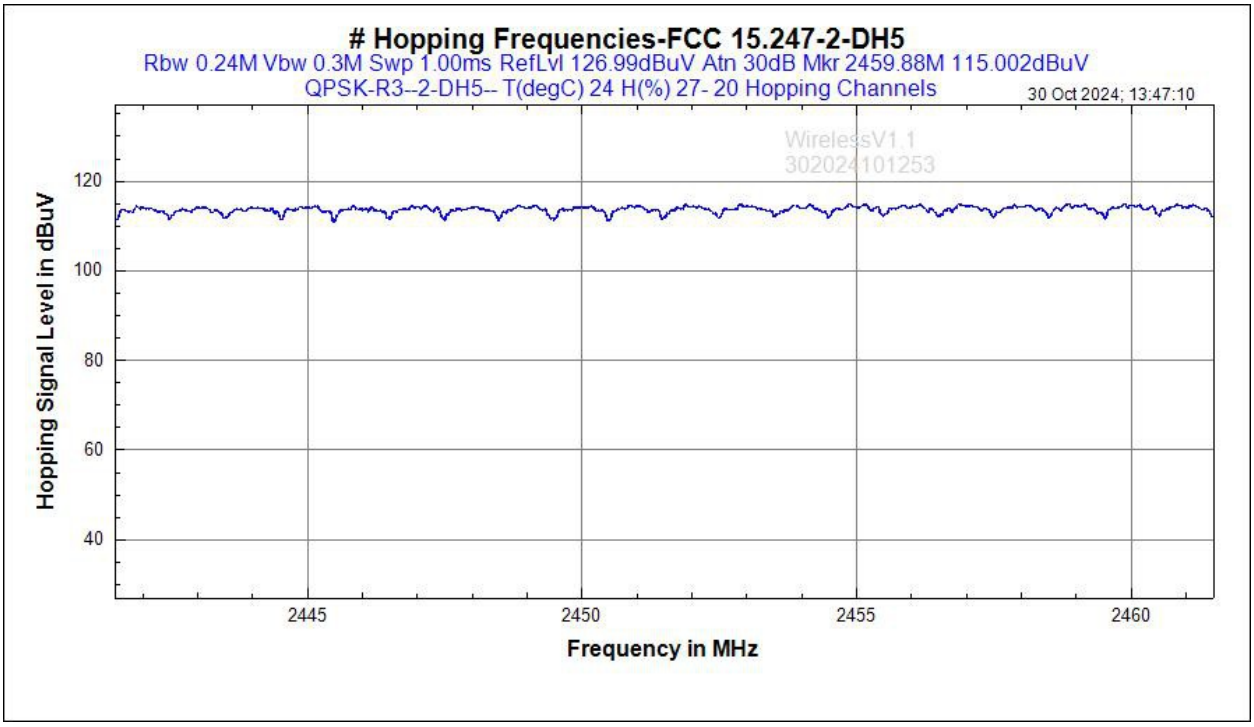

Figure 6.8.2c – Number of hopping, QPSK

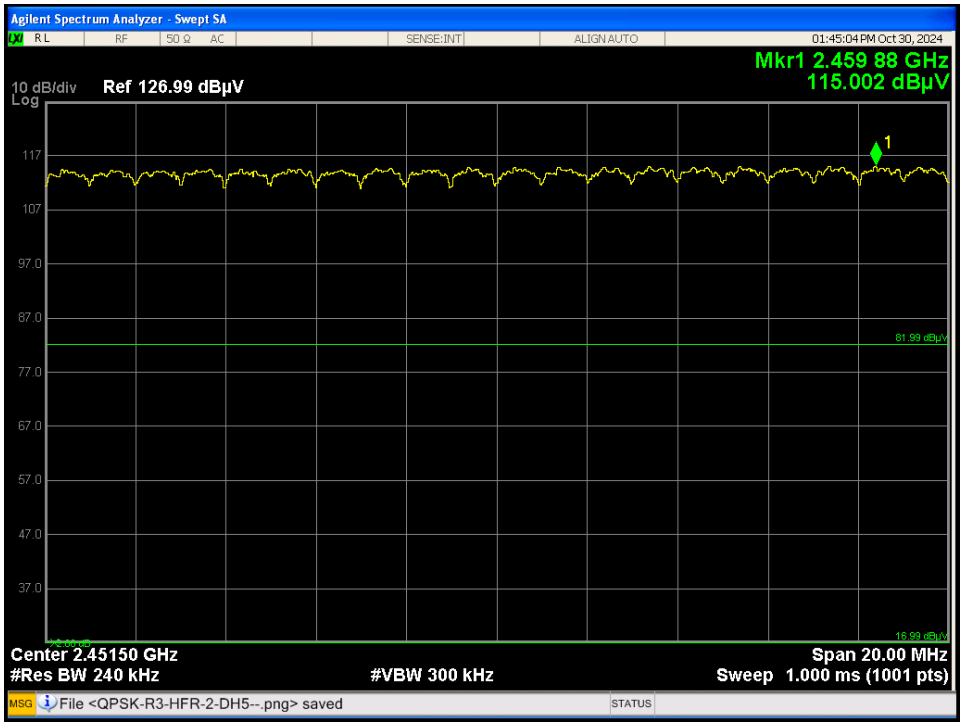

Figure 6.8.2c – Number of hopping, QPSK

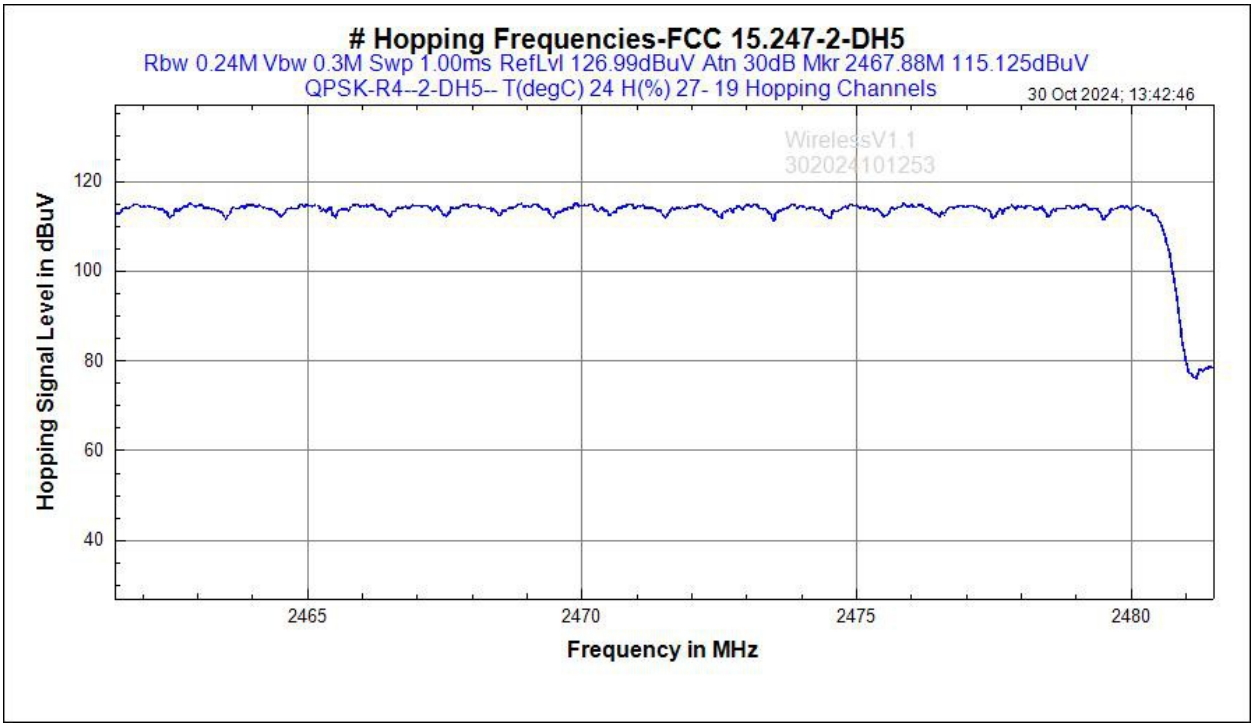

Figure 6.8.2d – Number of hopping, QPSK

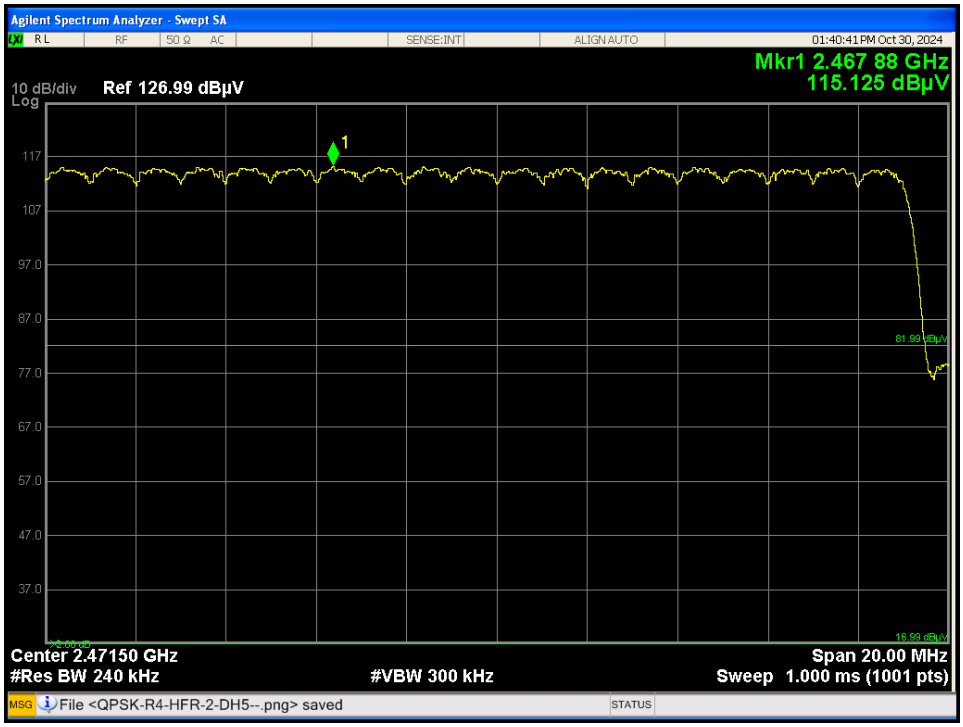

Figure 6.8.2d – Number of hopping, QPSK

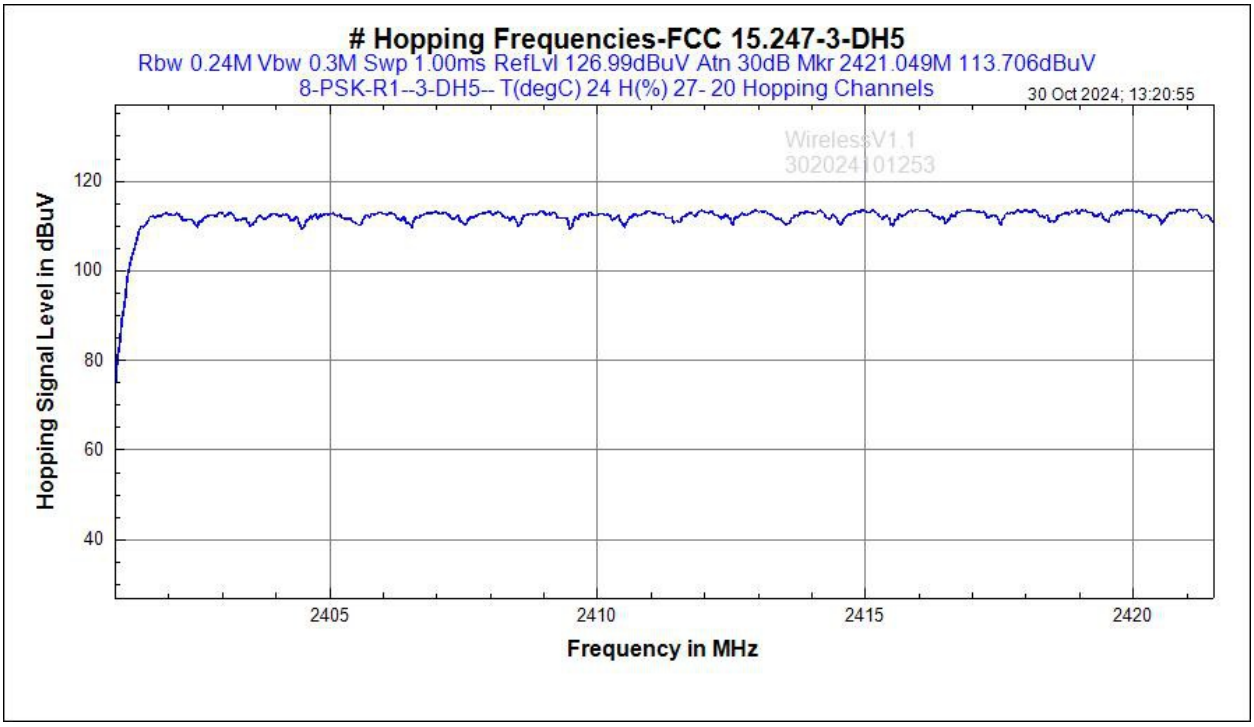

Figure 6.8.3a – Number of hopping, 8-PSK

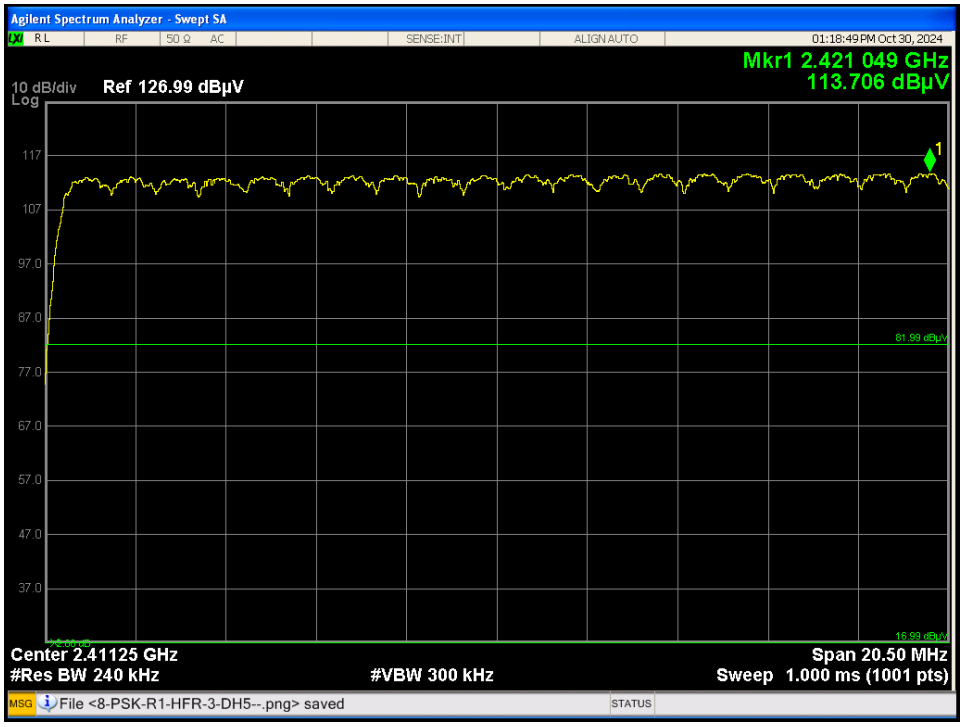

Figure 6.8.3a – Number of hopping, 8-PSK

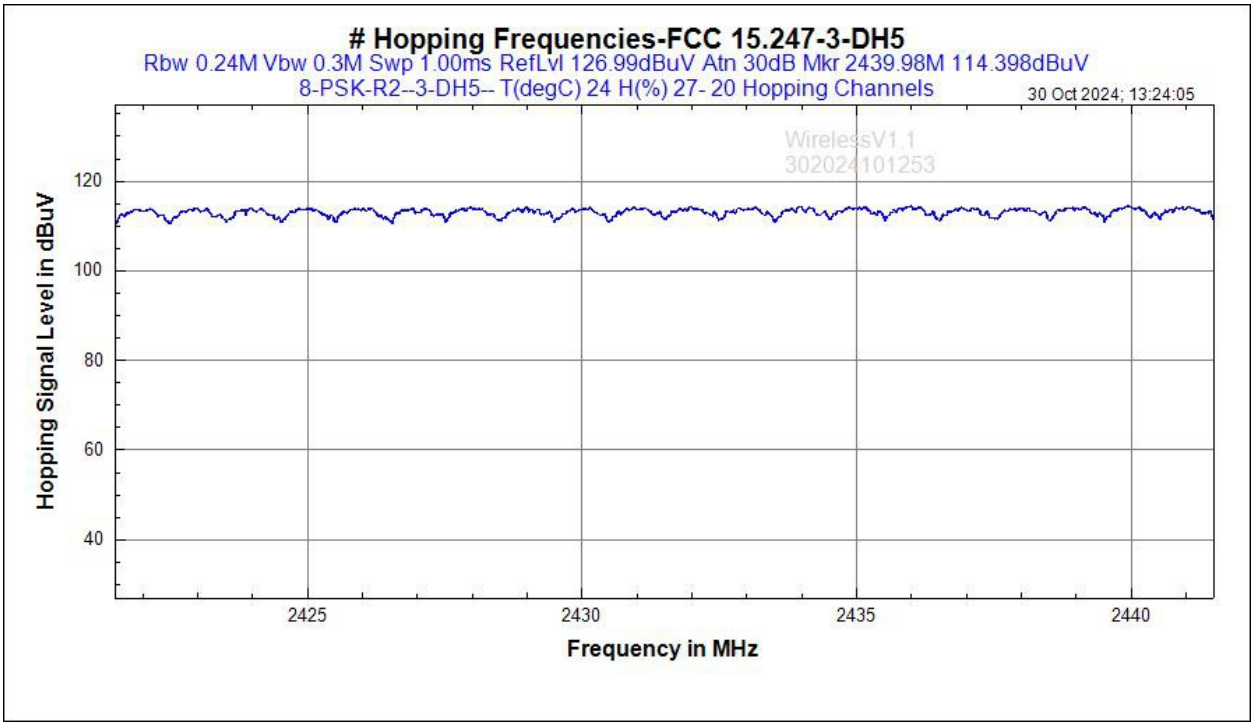

Figure 6.8.3b – Number of hopping, 8-PSK

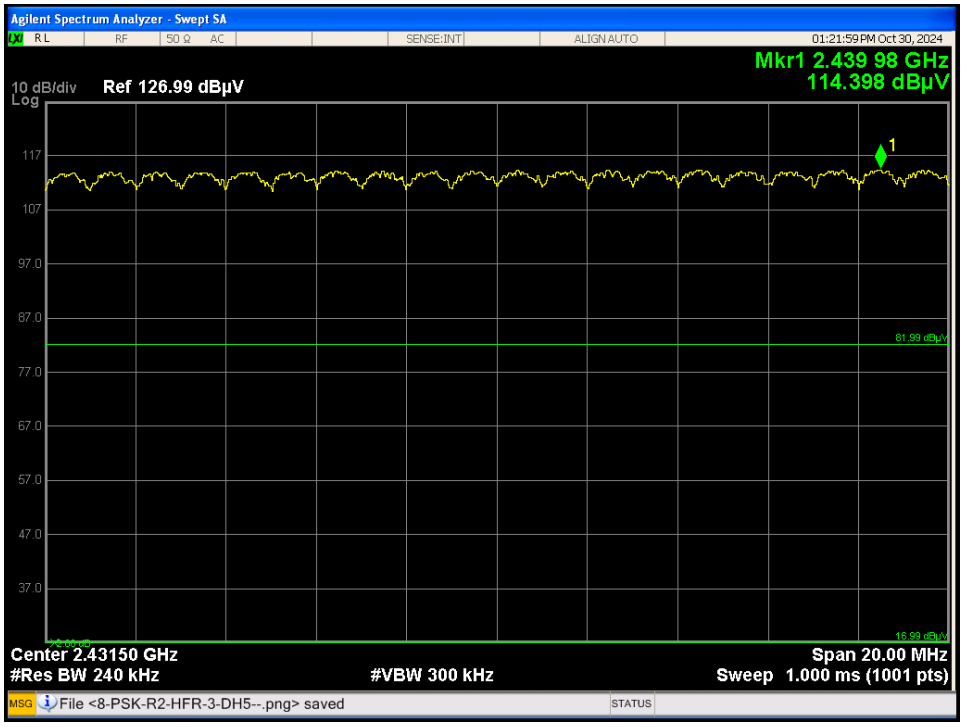

Figure 6.8.3b – Number of hopping, 8-PSK

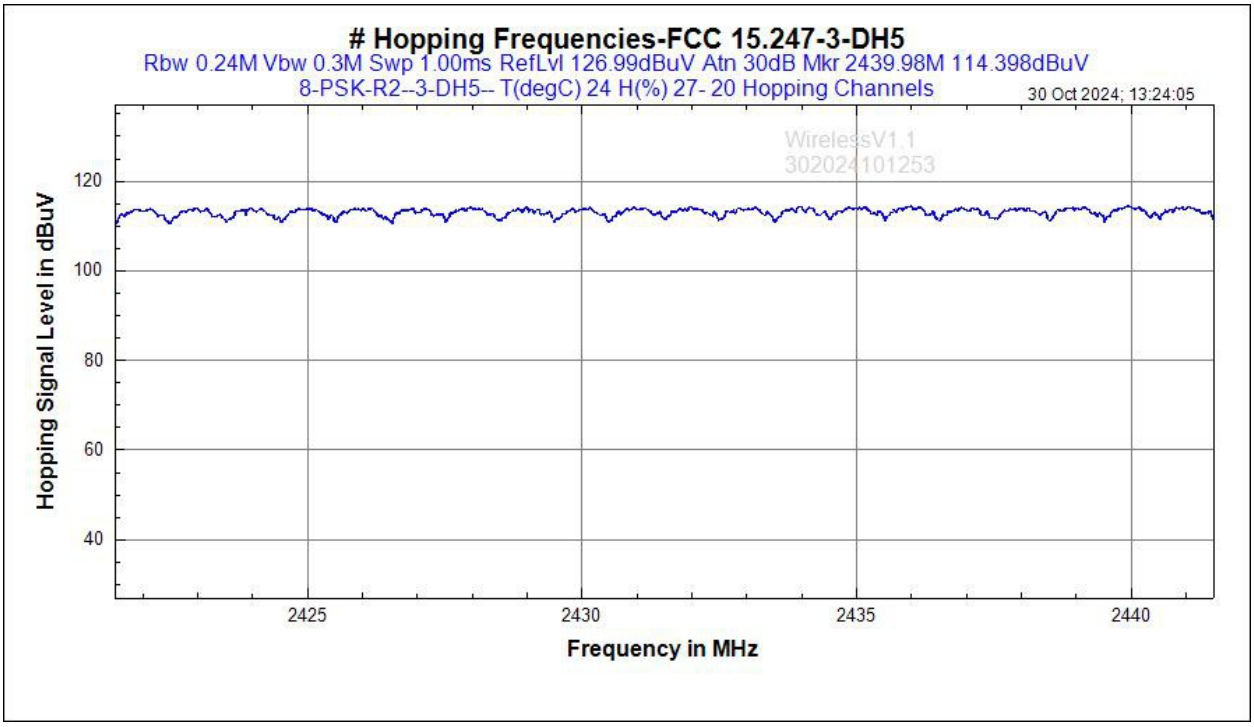

Figure 6.8.3c – Number of hopping, 8-PSK

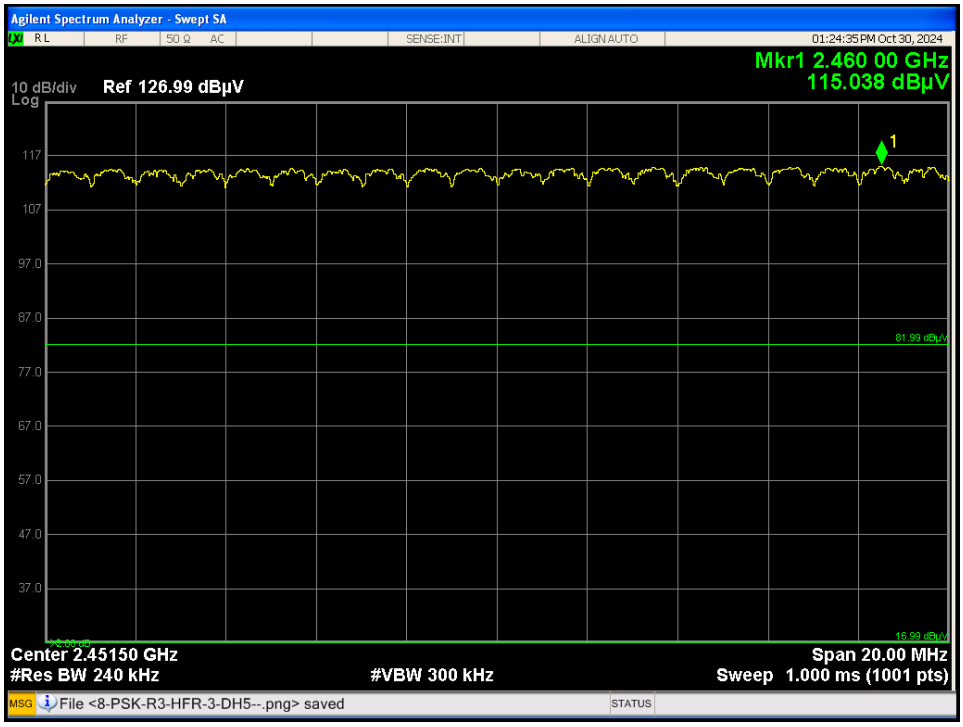

Figure 6.8.3c – Number of hopping, 8-PSK

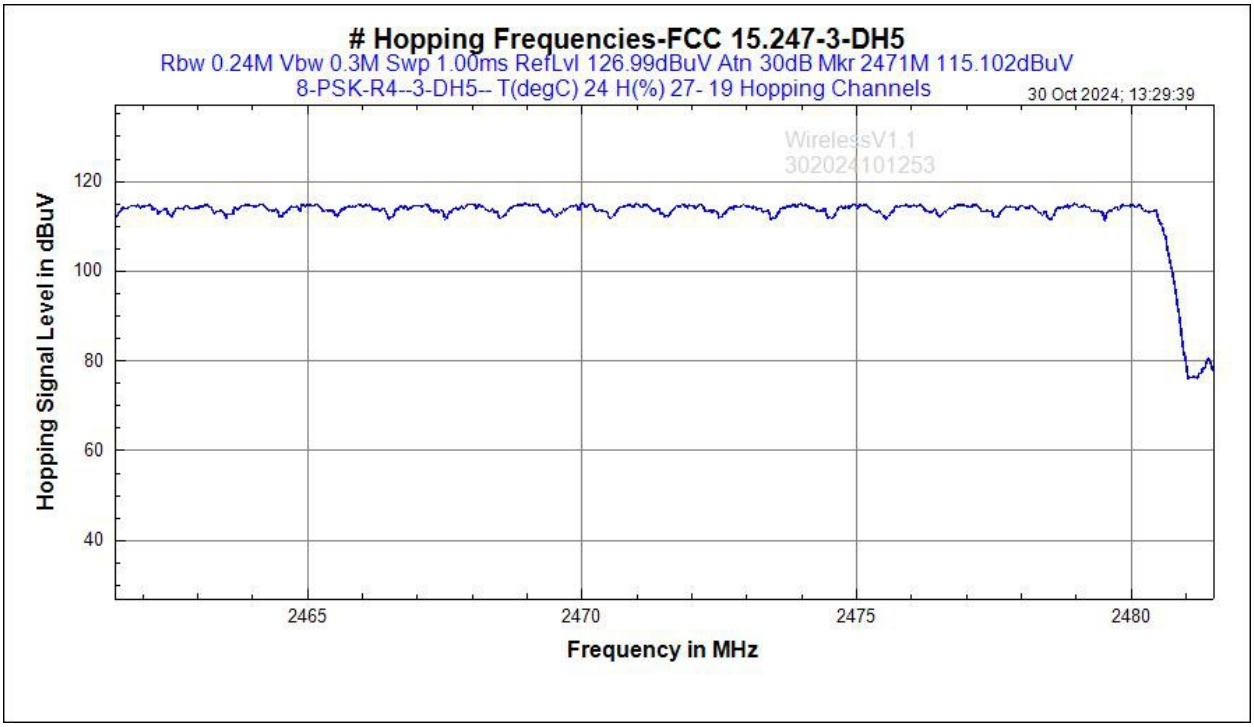

Figure 6.8.3d – Number of hopping, 8-PSK

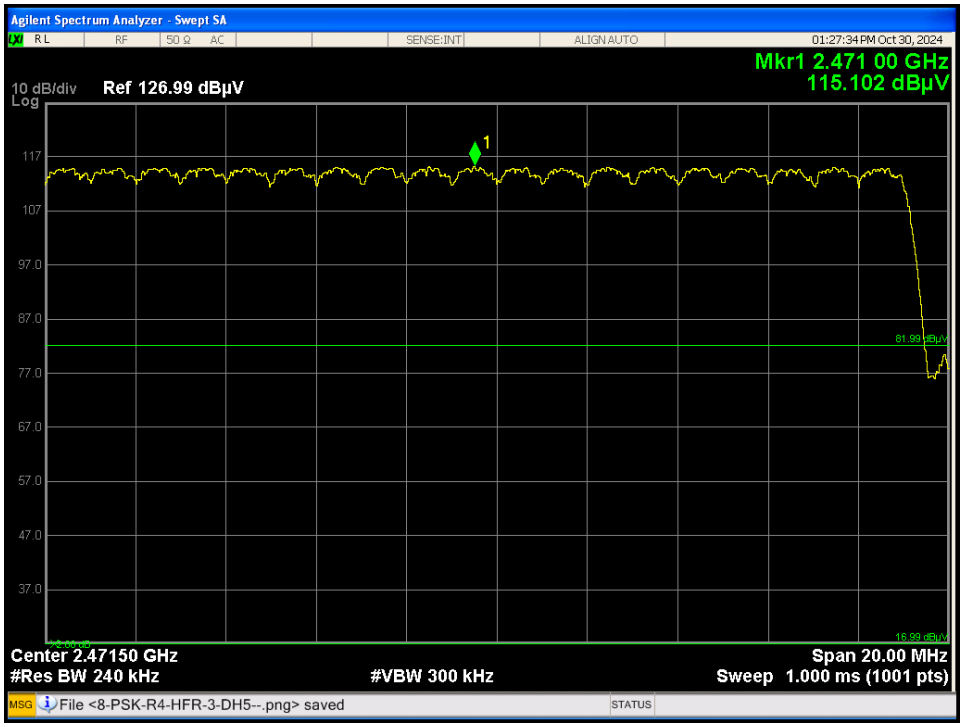

Figure 6.8.3d – Number of hopping, 8-PSK

6.9 Dwell Time and Time Occupancy Per Frequency

☒**Applicable**

Table 6.9.1 – Dwell time and Time Occupancy Per Frequency Test Setup Information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS:**	
TEMPERATURE:	23.5°C	**HUMIDITY:**	25%
TESTED BY:	Adiseshu Nyshadham	**DATE OF TEST:**	2024-10-29
TESTREFERENCE:	FCC Title 47 CFR Part 15: Subpart C-15.247(a)(1)(iii), RSS-247-Issue 3		
TEST VOLTAGE:	3.4V		
SETUP:	As per ANSI C63.10:2013, sec 7.8.4		
FREQUENCY RANGE	2400-2483.5 MHz		
FREQUENCY TESTED:	2402 MHz, 2441 MHz, 2480 MHz		
FIRMWARE POWER SETTING	11 dBm		
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE	GFSK, DH1, QPSK, DH2 8-PSK, DH3		
ANTENNA TYPE/GAIN	Ceramic Chip Antenna, 2.2dBi(peak), 1.9dBi(Band edges)		
DUTY CYCLE	N/A		
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

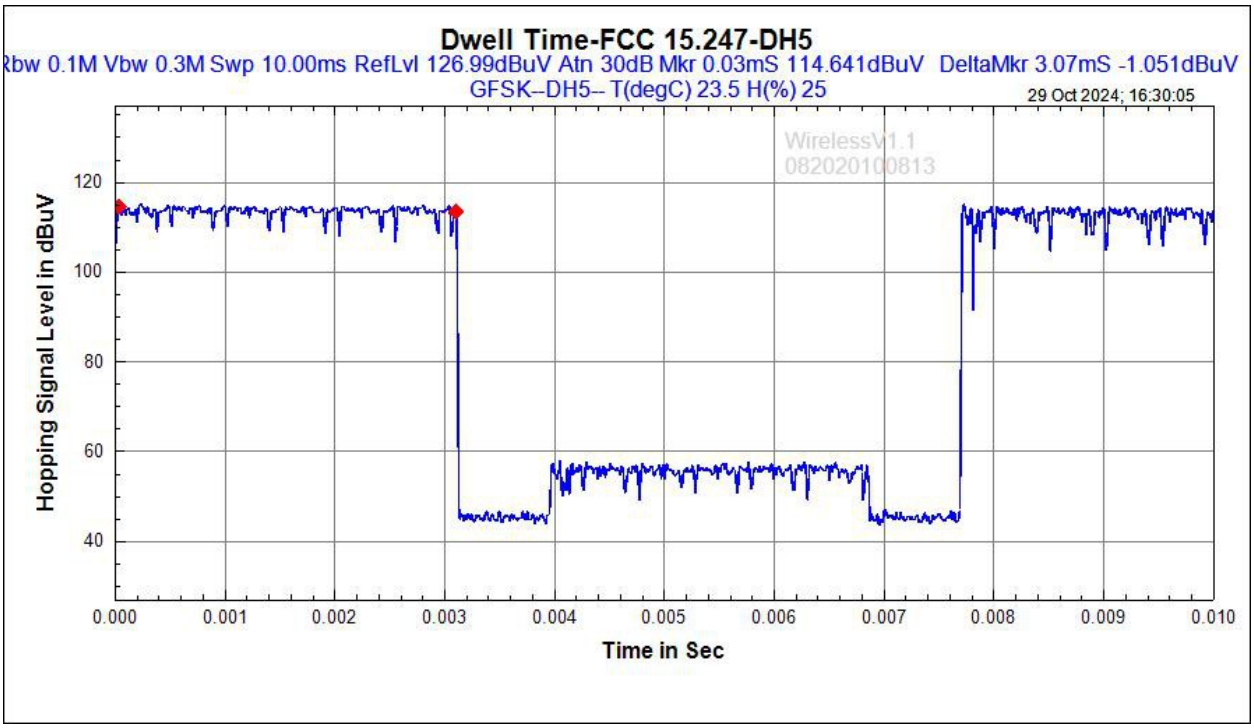

Figure 6.9.1a**:** Dwell Time and Time Occupancy Per Frequency(GFSK) is 288 mS

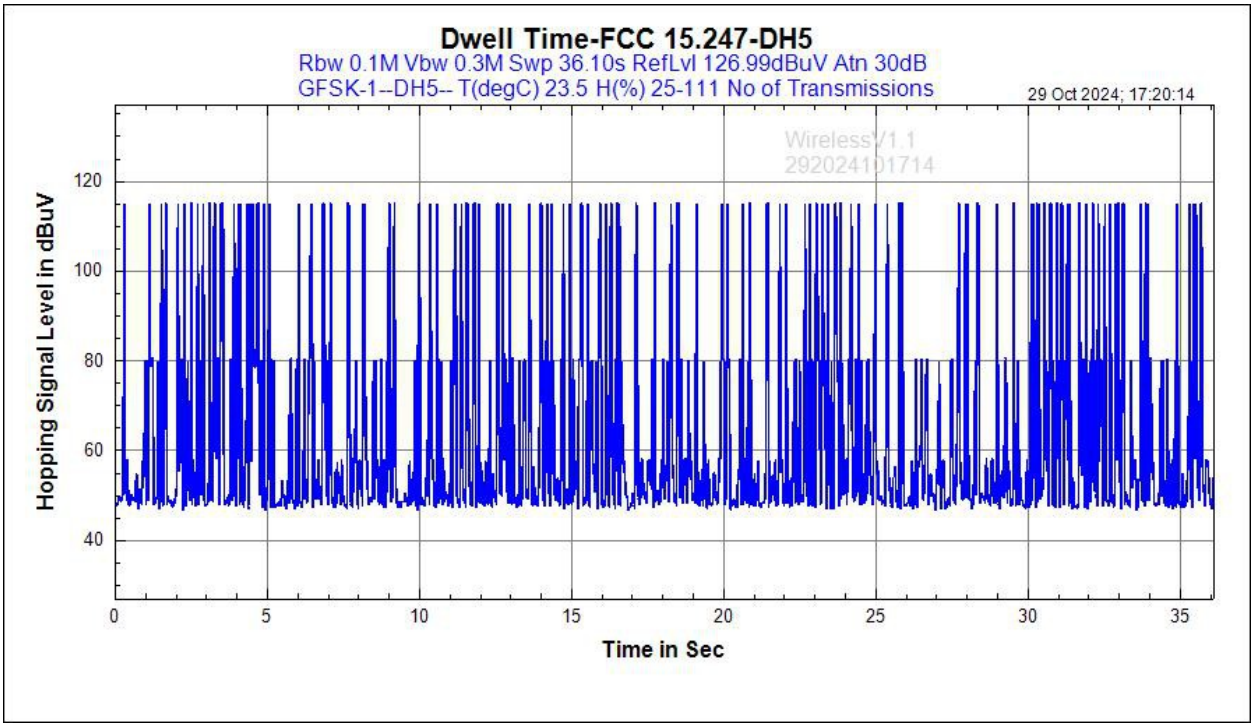

Figure 6.9.1b.: Pulse numbers in 36.1 seconds: 93 (GFSK)

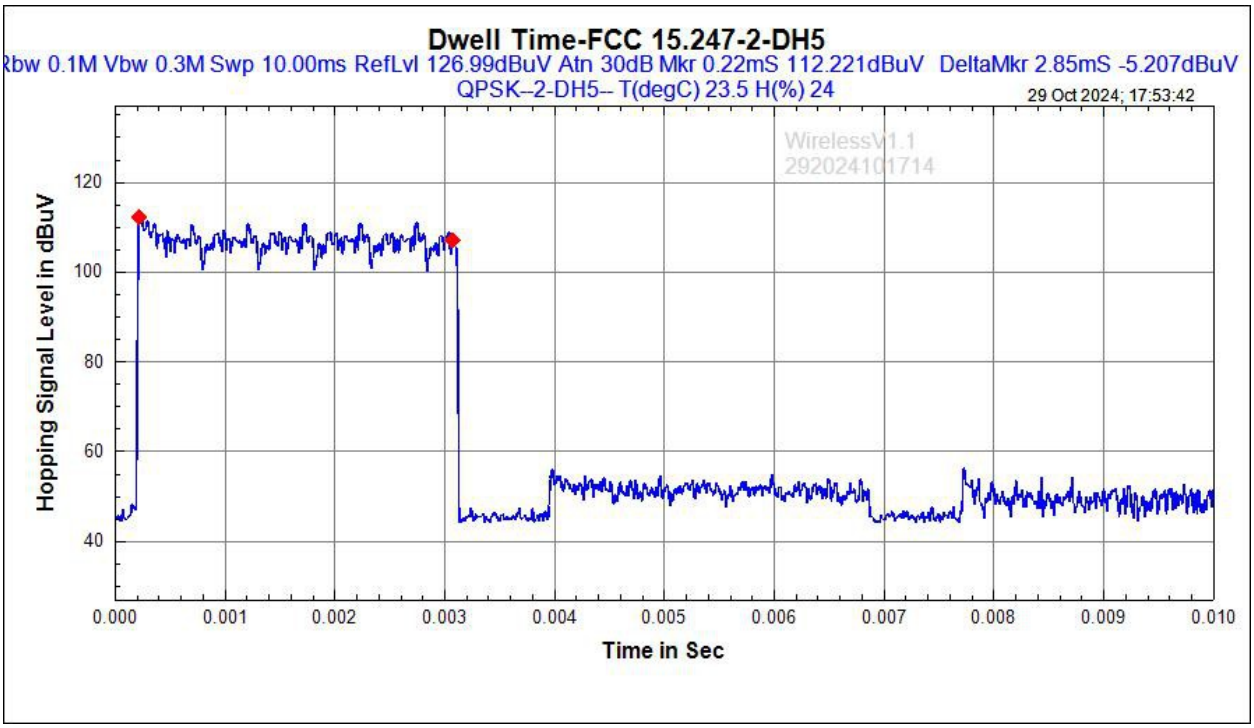

Figure 6.9.2a.**:** Dwell Time and Time Occupancy Per Frequency(QPSK) is 289 mS

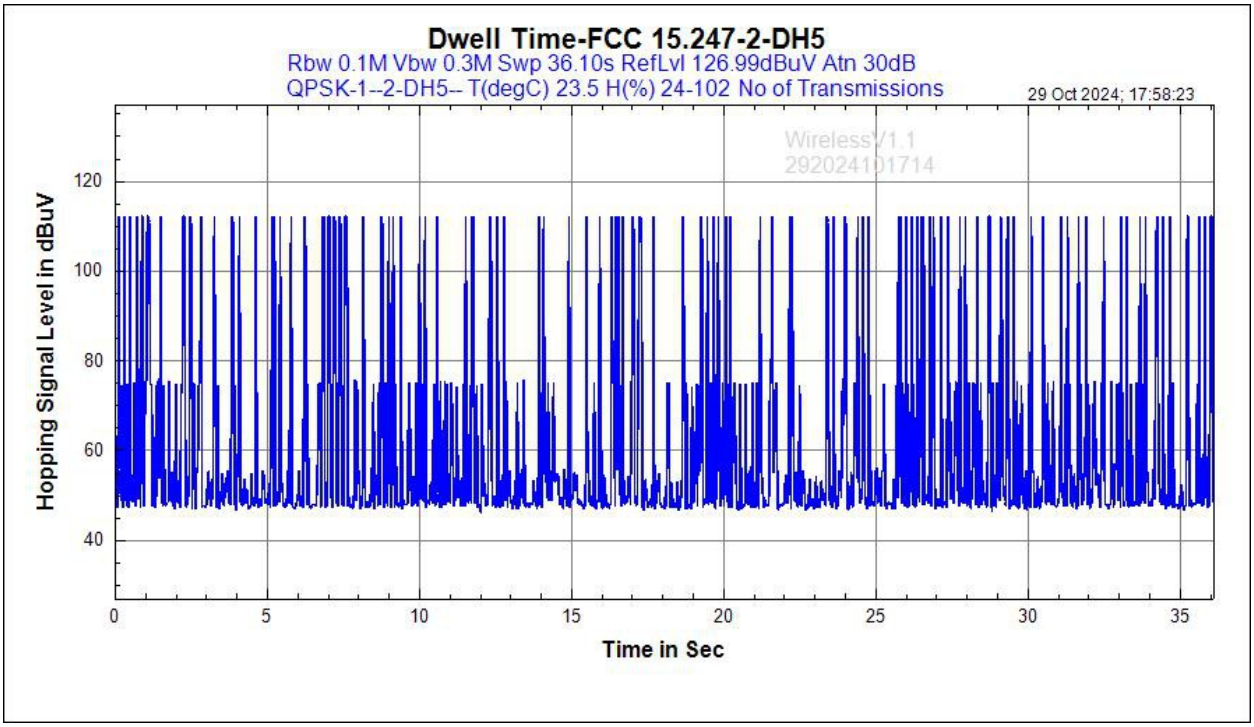

Figure 6.9.2b.: Pulse numbers in 36.1 seconds: 109 (QPSK)

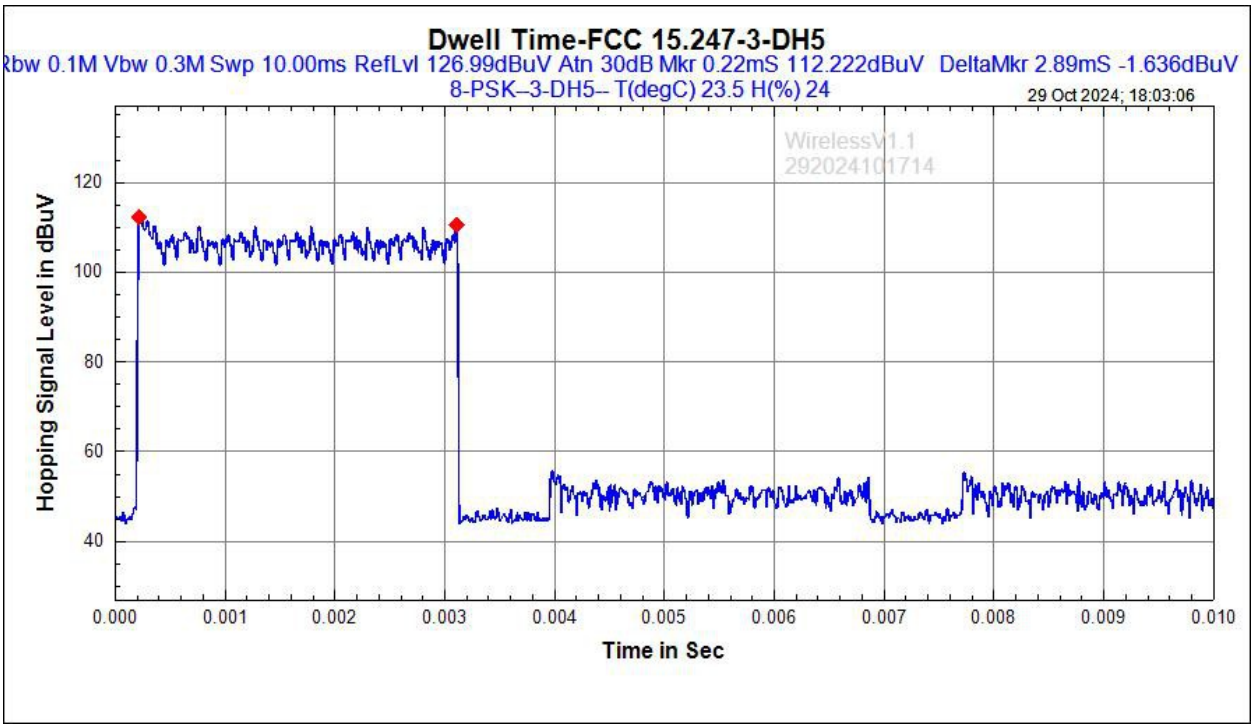

Figure 6.9.3a**:** Dwell Time and Time Occupancy Per Frequency(8-PSK) is 289 mS

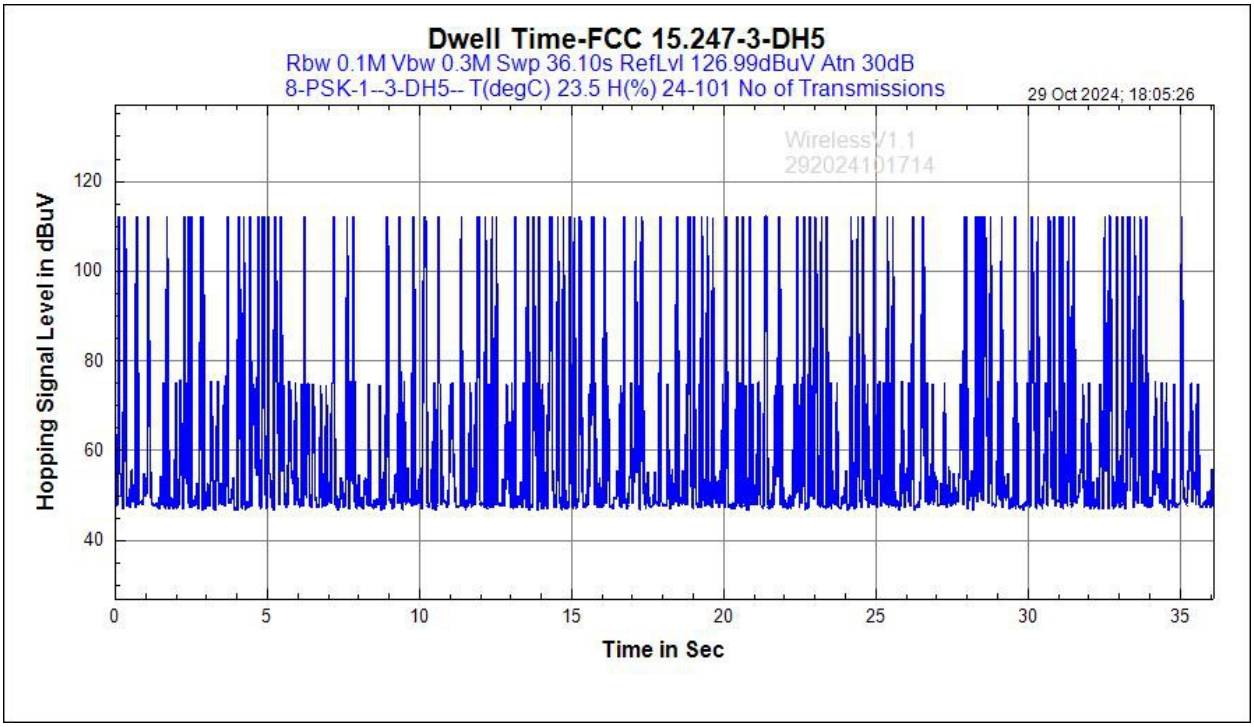

Figure 6.9.3b.: Pulse numbers in 36.1 seconds: 98 (8-PSK)

6.10 Unintentional Radiated Emissions

☒**Applicable**

Table 6.10.1 – Unintentional Radiated Emissions Test Setup Information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS:**	
TEMPERATURE:	24.2°C	**HUMIDITY:**	23.4%
TESTED BY:	Chi Gieng	**DATE OF TEST:**	2024-10-11
TESTREFERENCE:	FCC Title 47 CFR Part 15: Subpart B -15.109, ICES-003 Issue 7		
TEST VOLTAGE:	120VAC, Range xxx		
SETUP:	As per ANSI C63.4:2014		
FREQUENCY RANGE	30MHz to 6000MHz		
FREQUENCY TESTED:	Digital Emissions		
FIRMWARE POWER SETTING			
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE			
ANTENNA TYPE/GAIN			
DUTY CYCLE			
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

Table 6.10.2a - Radiated Emission - **Horizontal** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height(cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	FCC Limit (dBuV/m)	Margin (dB)
							0
							0

Table 6. 10.2b - Radiated Emission - **Vertical** Polarization Quasi-peak

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height(cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	FCC Limit (dBuV/m)	Margin (dB)

Note: The emissions with peak detector were measured and found to meet quasi-peak limits. Only quasi-peak detector measurements were shown in the above tables. Emissions below 10dB were not reported.

Table 6. 10.3a - Radiated Emission - **Horizontal** Polarization Quasi-peak ICES-003

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	ICES-003 Limit (dBuV/m)	Margin (dB)
							0
							0
							0
							0
							0
							0

Table 6. 10.3b- Radiated Emission - **Vertical** Polarization Quasi-peak ICES-003

Frequency (MHz)	Azimuth Angle (deg)	Antenna Height (cm)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV/m)	ICES-003 Limit (dBuV/m)	Margin (dB)
							0
							0
							0
							0
							0
							0

Note: The emissions with peak detector were measured and found to meet quasi-peak limits. Only quasi-peak detector measurements were shown in the above tables. Emissions below 10dB were not reported.

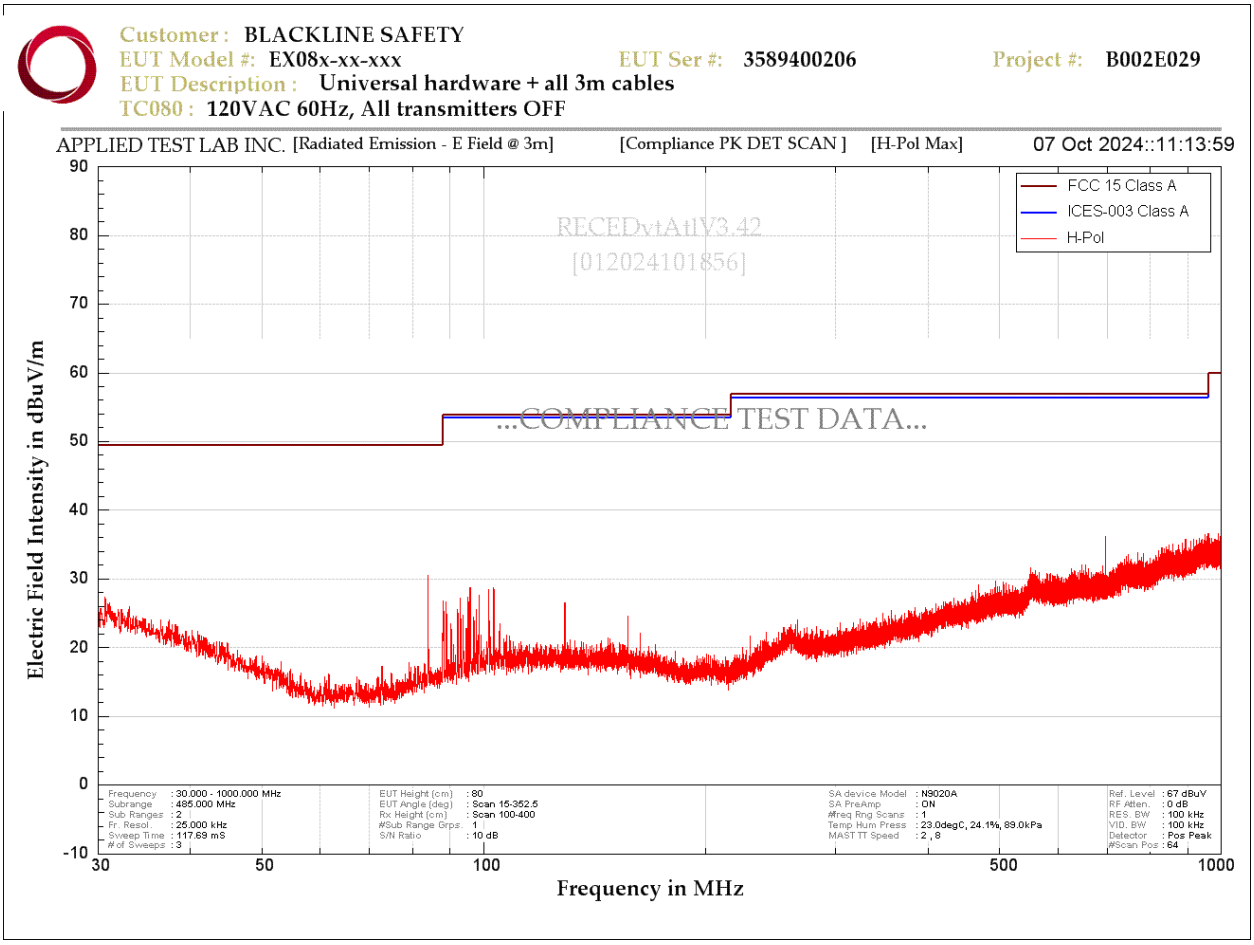

Figure 6.10.1a - Radiated Emission (FCC and ICES-003) - Scan Horizontal Polarization (30MHz – 1000MHz)

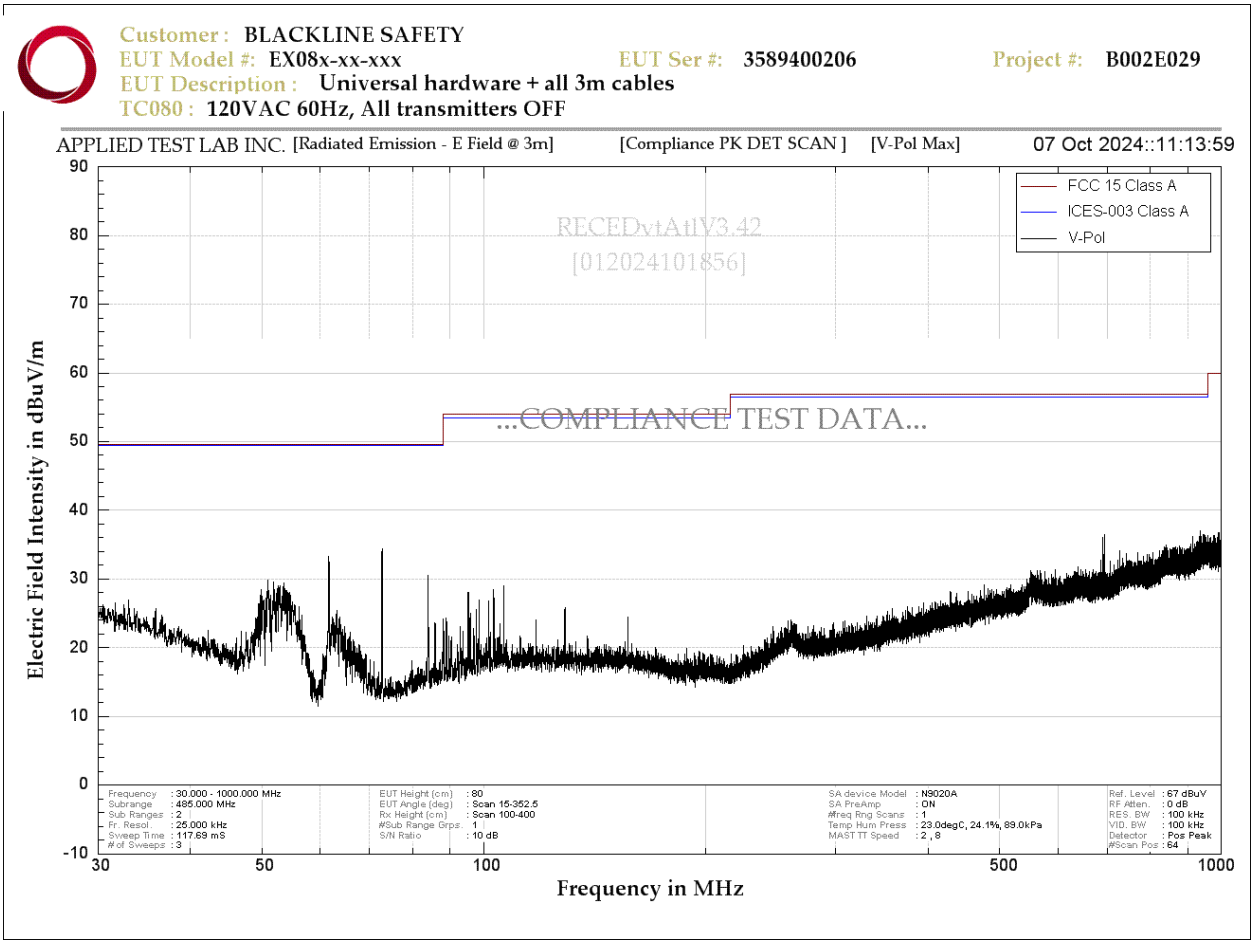

Figure 6.10.1b. - Radiated Emission (FCC and ICES-003) - Scan Vertical Polarization (30MHz – 1000MHz)

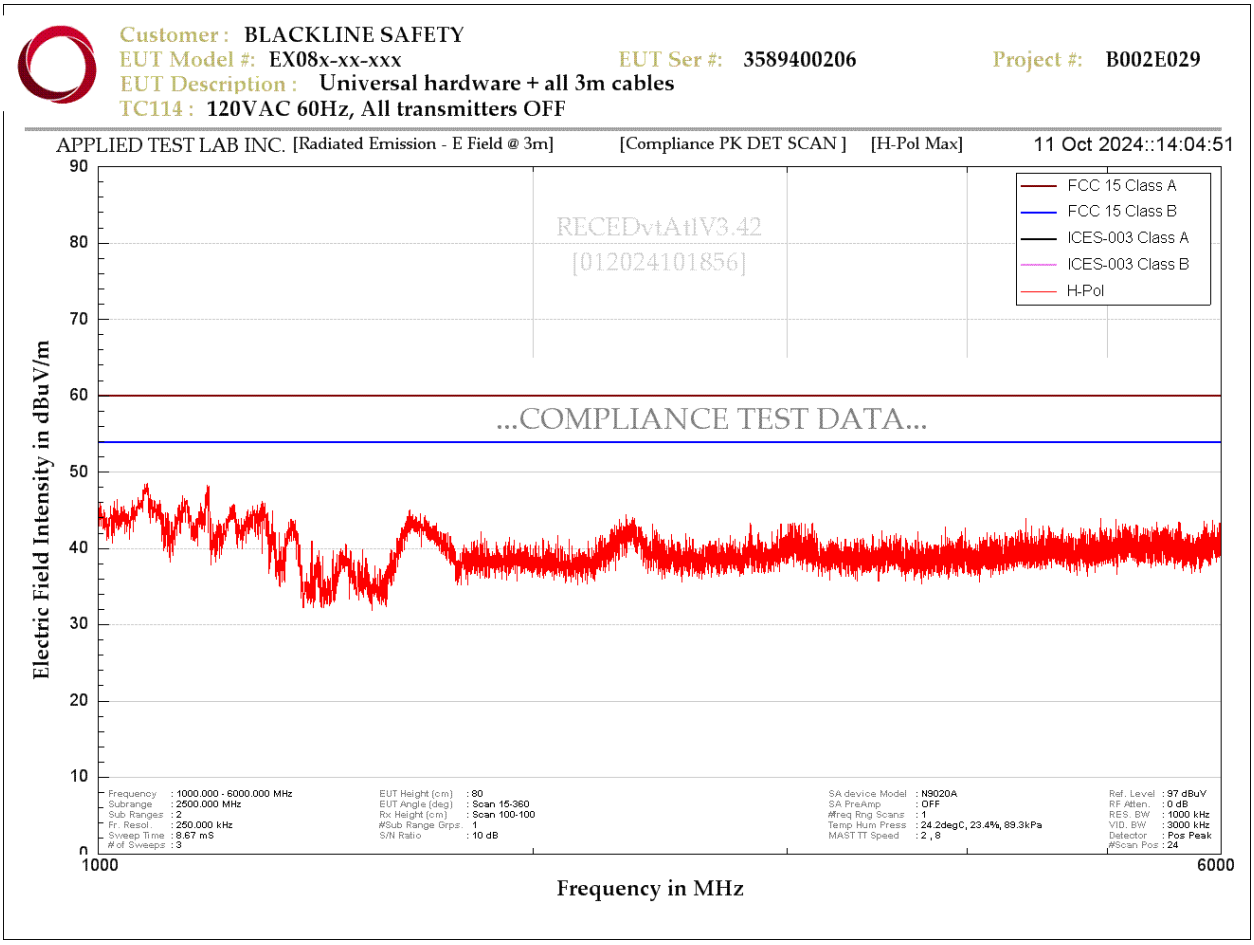

Figure 6.10.2a. - Radiated Emission (FCC and ICES-003 - Scan Horizontal Polarization (1GHz – 6GHz)

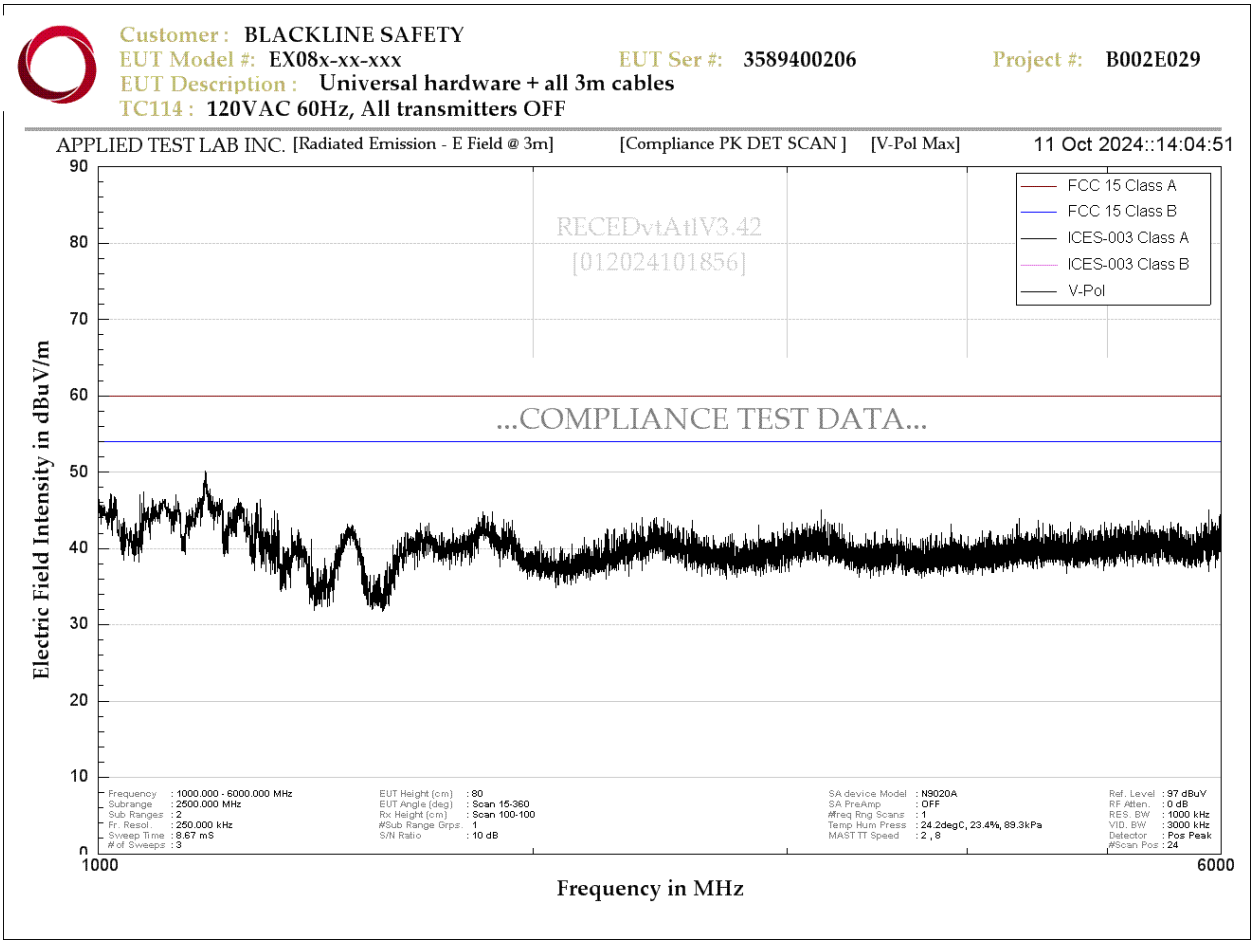

Figure 6.10.2b. - Radiated Emission (FCC and ICES-003) - Scan Vertical Polarization (1GHz – 6GHz)

6.11 AC Main Conducted Emission(0.15MHz - 30MHz)

☒**Applicable**

Table 6.11.1 – AC Main conducted Emissions Test Setup Information (RSS-247)

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS:**	
TEMPERATURE:	23.5°C	**HUMIDITY:**	23%
TESTED BY:	Chi Gieng	**DATE OF TEST:**	2024-10-15
TESTREFERENCE:	FCC Title 47 CFR Part 15: Subpart B -15.109, ICES-003 Issue 7		
TEST VOLTAGE:	120V AC, Range xxx		
SETUP:	As per ANSI C63.4:2014		
FREQUENCY RANGE	150kHz-30MHz		
FREQUENCY TESTED:	Digital Emissions		
FIRMWARE POWER SETTING			
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE			
ANTENNA TYPE/GAIN			
DUTY CYCLE			
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

Table 6.11.2a - Conducted Emission Line 1 **– AVG** FCC/ICES

Emission Type	Frequency (MHz)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV)	FCC/ICES AVG Limit (dBuV)	FCC Margin (dB)
Conducted Emission						

Table 6.11.2b - Conducted Emission Line 2 **– AVG** FCC/ICES

Emission Type	Frequency (MHz)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV)	FCC/ICES AVG Limit (dBuV)	FCC Margin (dB)
Conducted Emission						

Table 6.11.3a - Conducted Emission Line 1 **– Quasi-peak** FCC/ICES

Emission Type	Frequency (MHz)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV)	FCC/ICES Quasi-peak Limit (dBuV)	Margin (dB)
Conducted Emission						

Table 6.11.3b - Conducted Emission Line 2 **– Quasi-peak** FCC/ICES

Emission Type	Frequency (MHz)	Measured Reading (dBuV)	Correction Factor (dB)	Corrected Reading (dBuV)	FCC/ICES Quasi-peak Limit (dBuV)	Margin (dB)
Conducted Emission						

Note: The emissions with peak detector were measured and found to meet quasi-peak and average limits. Only quasi-peak and average detector measurements were shown in the above tables. Emissions below 10dB were not reported.

☐**Applicable**

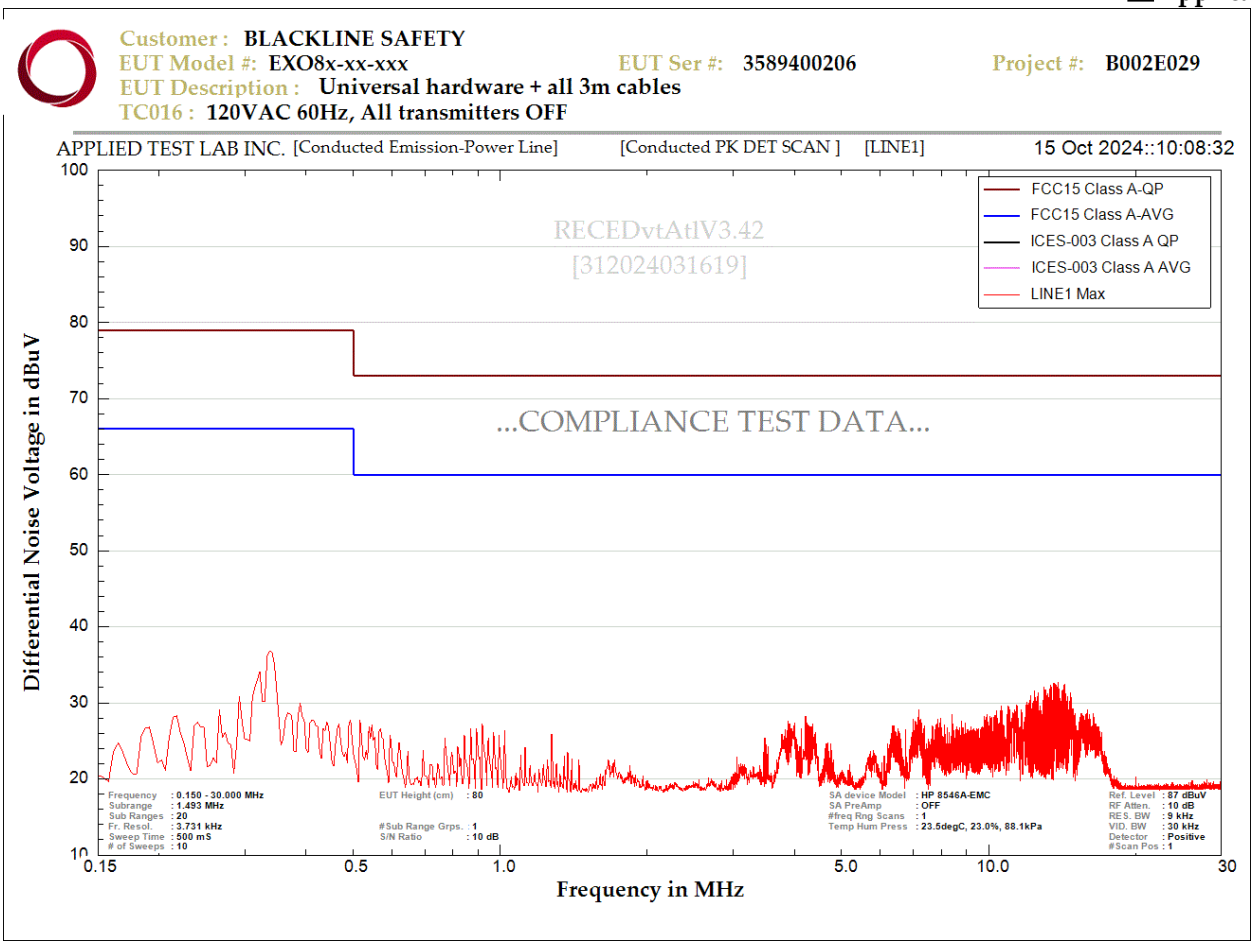

Figure 6.11.1a - Conducted Emission Scan Line 1 (Line L)

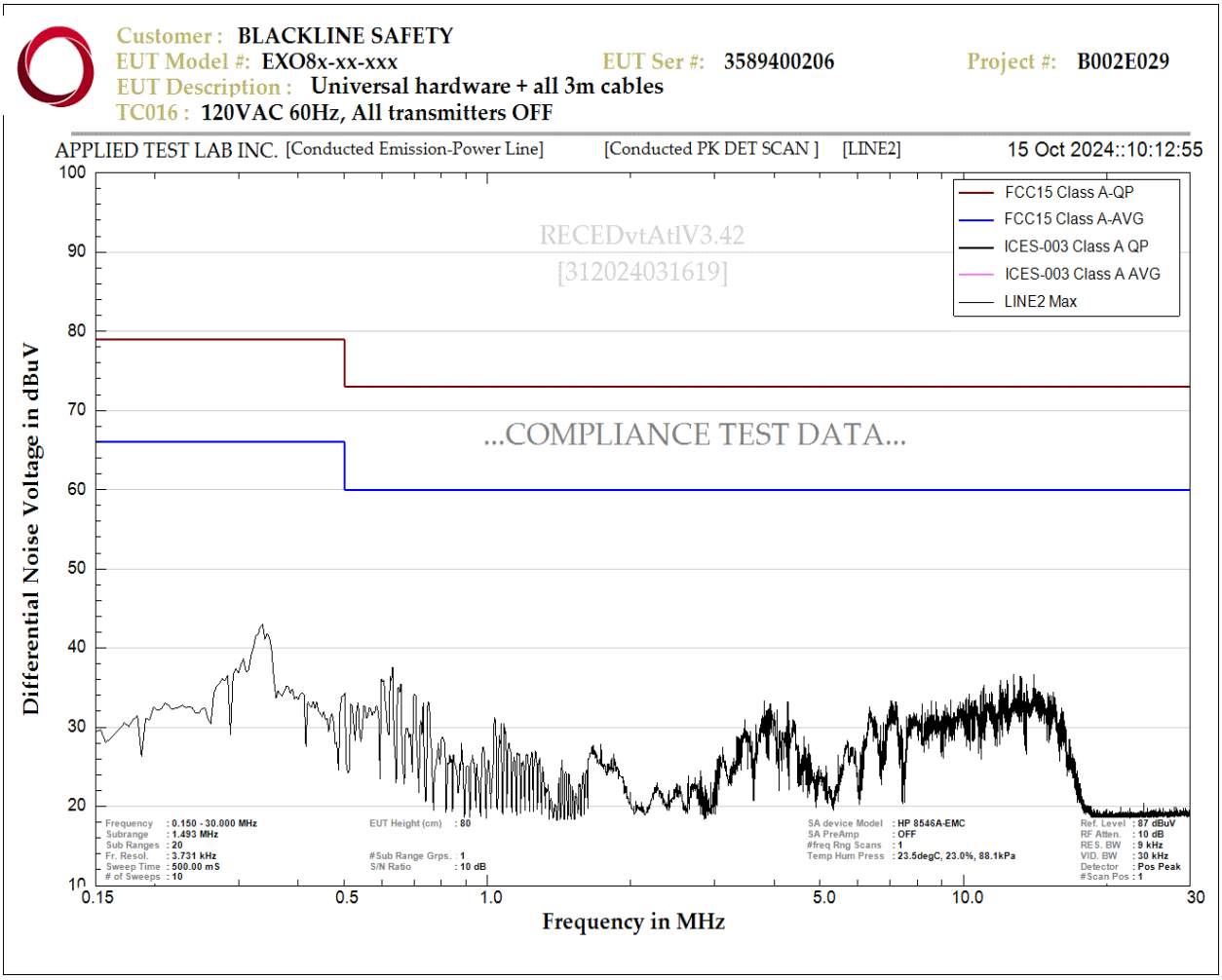

Figure 6.11.1b - Conducted Emission Scan Line 2 (Line N)

6.12 Frequency Stability

☒**Applicable**

Table 6.12.1 – Frequency stability Test Setup Information

CLIENT:	**Blackline Safety**	**TEST STANDARD:**	**FCC 15.247, RSS-247 Issue 3**
MODEL NUMBER:	**EX8N-01-NA2**	**PRODUCT:**	**EX8N-01-NA2**
SERIAL NUMBER:	**3589400206**	**CLASS:**	
TEMPERATURE:	20°C	**HUMIDITY:**	23%
TESTED BY:	Adiseshu Nyshadham	**DATE OF TEST:**	2024-11-02 to 2024-11-03
TESTREFERENCE:	FCC Title 47 CFR Part 2.1055, Part 15: Subpart C-15.215(c), RSS-GEN Issue 5(8.8)		
TEST VOLTAGE:	3.0V, 3.4V, 3.6V		
SETUP:	As per ANSI C63.10:2013, sec 6.8		
FREQUENCY RANGE	2400-2483.5 MHz		
FREQUENCY TESTED:	2402 MHz, 2441 MHz, 2480 MHz		
FIRMWARE POWER SETTING	11 dBm		
EUT FIRMWARE	4.0.0.0000000006		
MODULATION/DATA RATE	GFSK, DH1, QPSK, DH2 8-PSK, DH3		
ANTENNA TYPE/GAIN	Ceramic Chip Antenna, 2.2dBi(peak), 1.9dBi(Band edges)		
DUTY CYCLE	NA		
DECISION RULE	Decision rule support document: ☒Data obtained ☐Video ☐Email conversation ☐inherent in the requested specification standard ☐other		
RESULTS:	**PASS**		

Table 6.12.2a – Frequency over a temperature variation of -20 degree to +50 degrees C (CH#1 2402MHz)

Power Supply	Temperature (°C)	Measured Frequency (MHz)	Frequency Error	FCC 15C Limit
3.4VDC	50	2401.981340	-0.001049%	+/- 0.01%
	40	2401.981250	-0.000983%	+/- 0.01%
	30	2401.985670	-0.000859%	+/- 0.01%
	20	2401.993250	-0.000723%	+/- 0.01%
	10	2401.998080	-0.000638%	+/- 0.01%
	0	2402.001160	-0.000616%	+/- 0.01%
	-10	2402.001760	-0.000694%	+/- 0.01%
	-20	2401.998390	-0.000986%	+/- 0.01%

Table 6.12.2b– Variation in the primary voltage from EUT limit's minimum and maximum of the rated supply voltage at 20 degree C

Power Supply	Temperature (°C)	Measured Frequency (MHz)	Frequency Error	FCC 15C, Section 15.225 Limit
3VDC(Min)	20	2401.983340	-0.000694%	+/- 0.01%
3.6VDC(Max)	20	2401.982130	-0.000744%	+/- 0.01%

Table 6.12.3a – Frequency over a temperature variation of -20 degree to +50 degrees C (CH#40 2441MHz)

Power Supply	Temperature (℃)	Measured Frequency (MHz)	Frequency Error	FCC 15C, Section 15.225 Limit
3.4VDC	50	2440.976900	-0.000946%	+/- 0.01%
	40	2440.978600	-0.000877%	+/- 0.01%
	30	2440.981650	-0.000752%	+/- 0.01%
	20	2440.984730	-0.000626%	+/- 0.01%
	10	2440.986990	-0.000533%	+/- 0.01%
	0	2440.987010	-0.000532%	+/- 0.01%
	-10	2440.983500	-0.000676%	+/- 0.01%
	-20	2440.974880	-0.001029%	+/- 0.01%

Table 6. 12.3b– Variation in the primary voltage from EUT limit's minimum and maximum of the rated supply voltage at 20 degree C

Power Supply	Temperature (℃)	Measured Frequency (MHz)	Frequency Error	FCC 15C, Section 15.225 Limit
3VDC(Min)	20	2440.984790	-0.000623%	+/- 0.01%
3.6VDC(Max)	20	2440.984420	-0.000638%	+/- 0.01%

Table 6.12.4a – Frequency over a temperature variation of -20 degree to +50 degrees C (CH#79 2480MHz)

Power Supply	Temperature (℃)	Measured Frequency (MHz)	Frequency Error	FCC 15C, Section 15.225 Limit
3.4VDC	50	2479.978800	-0.000855%	+/- 0.01%
	40	2479.980800	-0.000774%	+/- 0.01%
	30	2479.983860	-0.000651%	+/- 0.01%
	20	2479.989220	-0.000435%	+/- 0.01%
	10	2479.989220	-0.000435%	+/- 0.01%
	0	2479.988960	-0.000445%	+/- 0.01%
	-10	2479.985120	-0.000600%	+/- 0.01%
	-20	2479.976010	-0.000967%	+/- 0.01%

Table 6. 12.4b– Variation in the primary voltage from EUT limit's minimum and maximum of the rated supply voltage at 20 degree C

Power Supply	Temperature (℃)	Measured Frequency (MHz)	Frequency Error	FCC 15C, Section 15.225 Limit
3VDC(Min)	20	2479.986810	-0.000532%	+/- 0.01%
3.6VDC(Max)	20	2479.986670	-0.000538%	+/- 0.01%

7.0 Appendix A – Test Sample Description

(From Data Provided by the Customer)

EUT Information

Description

EXO8 is a cloud-connected area monitor that bundles industry leading gas detection with automated compliance and business analytics tools. For the first time ever, the days of manually collecting data from the field, reviewing spreadsheets and compiling reports are behind you.

EXO8 solves the challenges of continuous toxic and combustible gas monitoring for sites, facilities and fence lines. Automating long-term area monitoring and connected safety for streamlined efficiency, EXO8 allows teams to focus on their work at hand.

In the event of a safety incident or gas exposure, monitoring personnel can see what has happened and communicate with workers directly via text messaging or an optional two-way voice calling feature through their EXO.

Model Number Decoder

EXab-cc-dde
Where
a = Series
8 - 8th
9 - 9th
A - 10th

b = Type
N = Non-Gamma
G = Gamma

cc = SIM Card
01 - Telenor SIM
02 - Etisalat SIM

dd = Region
NA - North America
EU - Europe/UK
AZ - Australia/New Zealand
UA - UAE

EXO8 hardware is global in that one cellular radio module, LARA-R6001D, and one global multiband antenna are used for all regional variants. The Bluetooth radio, GNSS receiver, and Iridium satellite modem and all associated antennas are also common across variants. The only differences among regional variants are regulatory labelling, networking URLs, and SIM cards. Therefore, EMC and Wireless test results for one regional variant are representative of all units, provided the AC voltage and frequency for the AC/DC power

adapter is correct for the region during testing. For example, testing performed on either EX8N-01-NA2 or EX8N-01-EU2 is representative for the performance of both model variants provided the unit is tested at both 120V/60 Hz and 240V/50 Hz.

Unit Submitted for Testing
Manufacturer: Blackline Safety Corp.
Trade Name: EXO8
Model Number: EX8N-01-NA2
Serial Number: 3589400206
Firmware Version: 4.0.0.0000000006
SW Version: N/A

8.0 Appendix B – List of Abbreviations and Acronyms

Industrial, scientific and medical (ISM) applications (of radio frequency energy)
operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications

ISM equipment and appliances
equipment or appliances designed to generate and/or use locally radio-frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications and information technology and other applications covered by other CISPR publications

Electromagnetic radiation

1. phenomenon by which energy in the form of electromagnetic waves emanates from a source into space
2. energy transferred through space in the form of electromagnetic waves

Boundary of the equipment under test
imaginary straight line periphery describing a simple geometric configuration encompassing the equipment under test. All interconnecting cables are included within this boundary

Electro-discharge machining (EDM) equipment
all the necessary units for the spark erosion process including the machine tool, the generator, control circuits, the working fluid container and integral devices

Spark erosion
removal of material in a dielectric working fluid by electro-discharges, which are separated in time and randomly distributed in space, between two electrically conductive electrodes (the tool electrode and the work piece electrode), and where the energy in the discharge is controlled

Arc welding equipment
equipment for applying current and voltage and having the required characteristics suitable for arc welding and allied processes

Equipment for resistance welding and allied processes
all equipment associated with carrying out the processes of resistance welding or allied processes consisting of e.g. power source, electrodes, tooling and associated control equipment, which may be a separate unit or part of a complex machine

Low voltage LV
a set of voltage levels used for the distribution of electricity and whose upper limit is generally accepted to be 1 000 V a.c.

End of document