

FCC/ISED Test Report

Prepared for: Fireboard Labs LLC

Address: 501 Charlotte St
Kansas City, MO 64106

EUT: FBXDC

FCC ID: 2A29A-FBXDC
IC ID: 27842-FBXDC
HVIN: FBXDC

Test Report No: R20260105-81-E1A

Approved by: 
Blake Winter
EMC Test Engineer
iNARTE EMC-50662-E

DATE: May 15, 2026

Total Pages: 37

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Report Number: R20260105-81-E1A

Rev

A

Prepared for: Fireboard Labs LLC

REVISION PAGE

Rev. No.	Date	Description
0	1 May 2026	Issued by BWinter Reviewed by FLane Prepared by BWinter
A	15 May 2026	Revision A – BWinter 1. Add FCC Grant Date on page 4. 2. Added additional comments regarding Radiated Emissions 30MHz-1GHz. 3. Deleted extraneous duty cycle statement. 4. Change RBW to 1kHz on OBW measurements. 5. Add plots for 1-18GHz radiated emissions.



Report Number: R20260105-81-E1A

Rev

A

Prepared for: Fireboard Labs LLC

CONTENTS

Revision Page	2
1.0 Summary of test results	4
2.0 EUT Description	5
2.1 Equipment under test	5
2.2 Description of test modes	6
2.3 Description of support units	6
3.0 Laboratory description	7
3.1 Laboratory description	7
3.2 Test personnel	7
3.3 Test equipment	8
4.0 Detailed results	9
4.1 Duty Cycle	10
4.2 Radiated emissions	11
4.3 Peak Output Power	22
4.4 Bandwidth	24
4.5 Bandedges	27
4.6 Carrier Frequency SepAration, Number of Hopping Channels, Time of occupancy	30
4.7 Conducted AC Mains Emissions	33
Appendix A: Sample Calculation	35
Appendix B – Measurement Uncertainty	36
REPORT END	37

	Report Number:	R20260105-81-E1A	Rev	A
	Prepared for:	Fireboard Labs LLC		

1.0 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

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

ANSI C63.10-2020 was used as a test method, with guidance from KBD 558074 D01 v05

SUMMARY			
Standard Section	Test Type and Limit	Result	Remark
FCC 15.203	Unique Antenna Requirement	Pass	Internal antenna
FCC 15.35 RSS-Gen, 6.10	Duty cycle of pulsed emissions	Informative only	The manufacturer states the duty cycle is <60%.
FCC 15.209 RSS-Gen, 7.1	Receiver Radiated Emissions	Pass	Meets the requirement of the limit.
FCC 15.247(a)(1)(i) RSS-247 Issue 4, 6.2.2.1	Maximum Bandwidth, Limit: Max. 250kHz	Pass	Meets the requirement of the limit.
FCC 15.247(b)(2) RSS-247 Issue 4, 6.2.2.2(b)	Maximum Peak Output Power, Limit: Max. 24 dBm	Pass	Meets the requirement of the limit.
FCC 15.209 RSS-Gen, 8.9 RSS-247 Issue 4, 6.6	Transmitter Radiated Emissions	Pass	Meets the requirement of the limit.
FCC 15.247(a) (1) (i) RSS-247 Issue 4, 6.2.2.1(c)	Frequency hopping system, Limit: Max. 0.4 Seconds in 20 Second Period	Pass	Meets the requirement of the limit.
FCC 15.209, 15.205 RSS-Gen, 8.9 RSS-247 Issue 4, 6.6	Band Edge Measurement, Limit: 20dB less than the peak value of fundamental frequency	Pass	Meets the requirement of the limit.
FCC 15.207 RSS-Gen. 8.8	Conducted AC Emissions	Pass	Meets the requirement of the limit.
KDB 996369 D04 Using ANSI C63.10-2020, Section 6.5, 6.6 FCC ID: 2AC7Z-ESPS3WROOM1	Transmitter Radiated Emissions: Intermodulation does not cause additional excessive Radiated Emissions*	Pass	Meets the requirement.

*Intermodulation products were evaluated between BLE/WiFi module - FCC ID 2AC7Z-ESPS3WROOM1, Grant Date 4/1/2020; IC ID 21098-ESPS3WROOM1, REL date 2024-09-01 - and 900 MHz radio, and it was found to be within permissible limits.

	Report Number:	R20260105-81-E1A	Rev	A
	Prepared for:	Fireboard Labs LLC		

2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

Summary

The Equipment Under Test (EUT) is an FBXDC PG Controller device manufactured by Fireboard Labs LLC. The device considered in this report operates in the 902 to 928 MHz band and has transmit and receive capabilities. The device in this report also contains BLE/WiFi module, FCC ID 2AC7Z-ESPS2WROOM1, IC ID 21098-ESPS3WROOM1, REL date 2024-09-01. The PG Controller consists of two printed circuit boards (PCB), a display, and a housing. The main PCB connects to the display and DC power supply. The main PCB supplies power to the Transmitter/Receiver PCB.

Manufacturer	Fireboard Labs LLC
EUT	FBXDC
EUT Tested	24 April 2026- 15 May 2026
Serial No.	NCEE 200297
Operating Band	902 – 928 MHz
Device Type	FHSS
Power Supply	12VDC output; 120V, 60Hz, AC input
Antenna	Internal

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



Report Number: R20260105-81-E1A

Rev

A

Prepared for: Fireboard Labs LLC

2.2 DESCRIPTION OF TEST MODES

The EUT operates on, and was tested at the frequencies below:

Channel	Frequency (MHz)
Low	912
Middle	915
High	918

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

This EUT was set to transmit in a worse-case scenario with modulation on. The manufacturer modified the unit to transmit continuously on the lowest, highest and one channel in the middle.

2.3 DESCRIPTION OF SUPPORT UNITS

None

	Report Number:	R20260105-81-E1A	Rev	A
	Prepared for:	Fireboard Labs LLC		

3.0 LABORATORY DESCRIPTION

3.1 LABORATORY DESCRIPTION

All testing was performed at the following Facility:

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

A2LA Certificate Number:	1953.01
FCC Accredited Test Site Designation No:	US1060
Industry Canada Test Site Registration No:	4294A
NCC CAB Identification No:	US0177
FCC Lab Registration Number:	134067

Environmental conditions varied slightly throughout the tests.



3.2 TEST PERSONNEL

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

Notes:

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

	Report Number:	R20260105-81-E1A	Rev	A
	Prepared for:	Fireboard Labs LLC		

3.3 TEST EQUIPMENT

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE DATE
Keysight MXE Signal Analyzer (26.5GHz)	N9038A	MY56400083	July 15, 2025	July 16, 2027
SunAR RF Motion	JB1	A082918-1	July 22, 2025	July 22, 2026
ETS EMCO Red Horn Antenna	3117	00274578	February 5, 2025	February 5, 2027
ETS Red Preamplifier (Orange)*	3115-PA	00218576	July 18, 2025	July 18, 2027
Trilithic High Pass Filter*	6HC330	23042	July 18, 2025	July 18, 2027
MiniCircuits High Pass Filter*	VHF-1320+	15542	July 18, 2025	July 18, 2027
ETS – Lindgren- VSWR on 10m Chamber	10m Semi-anechoic chamber- VSWR	4740 Discovery Drive	November 20, 2025	November 20, 2028
NCEE Labs-NSA on 10m Chamber*	10m Semi-anechoic chamber-NSA	NCEE-001	April 13, 2026	April 13, 2028
RF Cables (3m Ant. to Control room Bulkhead)	MFR-57500	1E3874	July 18, 2025	July 18, 2027
RF Cable (antenna to 10m chamber bulkhead)*	FSCM 64639	01E3872	July 18, 2025	July 18, 2027
RF Cable (10m chamber bulkhead to control room bulkhead)*	FSCM 64639	01E3874	July 18, 2025	July 18, 2027
RF Cable (control room bulkhead to test receiver)*	FSCM 64639	01F1206	July 18, 2025	July 18, 2027
N connector bulkhead (10m chamber)*	PE9128	NCEEBH1	July 18, 2025	July 18, 2027
N connector bulkhead (control room)*	PE9128	NCEEBH2	July 18, 2025	July 18, 2027
TDK Emissions Lab Software	V11.25	700307	NA	NA

*Internal Calibration

Notes:

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



Report Number:	R20260105-81-E1A	Rev	A
Prepared for:	Fireboard Labs LLC		

4.0 DETAILED RESULTS

Radio Measurements						
CHANNEL	Occupied Bandwidth (kHz)	20 dB Bandwidth (kHz)	Peak Output Field Strength (dBuV/m)	Peak EIRP (dBm)	Peak EIRP (mW)	RESULT
Low	20.98	22.07	109.02	13.79	23.93	Pass
Mid	20.79	21.71	108.78	13.55	22.65	Pass
High	20.89	22.05	108.89	13.66	23.23	Pass
20 dB Bandwidth Limit = 250 kHz max			Peak Output Power Limit = 30 dBm			

Unrestricted Band-Edge							
CHANNEL	Band edge /Measurement Frequency (MHz)	Relative Highest out of band level (dB)	Relative Fundamental (dB)	Measurement Type	Delta (dB)	Min Delta (dB)	Result
Low	902	46.19	109.01	Peak	62.82	20	Pass
High	928	44.19	108.63	Peak	64.44	20	Pass

Peak Vs Quasi-Peak Limit- Restricted Band-Edge						
CHANNEL	Band edge /Measurement Frequency (MHz)	Highest out of band level (dBuV/m @ 3m)	Measurement Type	Limit (dBuV/m @ 3m)*	Margin	Result
Low	608-614	30.99	Peak	46.02	15.03	Pass
High	960-1000	37.68	Peak	53.98	16.30	Pass
*Limit shown is the peak limit taken from FCC Part 15.209; Peak values are compared to quasi-peak limit to show compliance.						



Report Number:	R20260105-81-E1A	Rev	A
Prepared for:	Fireboard Labs LLC		

4.1 DUTY CYCLE

The manufacturer attests that the duty cycle is less than 39.6%: $DCCF = 20 * \log_{10}(0.396) = -8.05\text{dB}$.

4.2 RADIATED EMISSIONS

Test Method: ANSI C63.10-2020, Section 6.5, 6.6

Limits for radiated emissions measurements:

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

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

NOTE:

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



Report Number: R20260105-81-E1A

Rev

A

Prepared for: Fireboard Labs LLC

Test procedures:

- a. The EUT is placed on the top of a rotating table above the ground plane in a 10 meter semi-anechoic chamber. The table rotates 360 degrees to determine the position of the highest radiation. The table is 0.8m high for measurements from 30MHz-1Ghz and 1.5m for measurements from 1GHz and higher.
- b. The EUT is 3 meters away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height varies from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.
- d. For each suspected emission, the EUT is arranged to maximize its emissions and then the antenna height varies from 1 meter to 4 meters and the rotating table turns from 0 degrees to 360 degrees to find the maximum emission reading.
- e. The test-receiver system uses a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps is used for final measurements.
- f. If the emission level of the EUT in peak mode was 6dB lower than the limit specified, then testing stops and the peak values of the EUT are reported. Emissions that do not have 6 dB margin are re-tested individually with peak, quasi-peak, or average method as specified. The results are reported in a data sheet.
- g. The EUT is maximized in all 3 orthogonal positions. The results are presented for the axis that has the highest emissions.
- h. The orientation with the worst-case emissions is used for final measurements.
- i. Receive mode emissions do not exceed the measurement noise floor of the test laboratory.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.
2. The resolution bandwidth is 1 MHz for all measurements and at frequencies above 1GHz. A peak detector was used for all measurements above 1GHz. Measurements were made with an EMI Receiver.

Deviations from test standard:

No deviation.

Test setup:

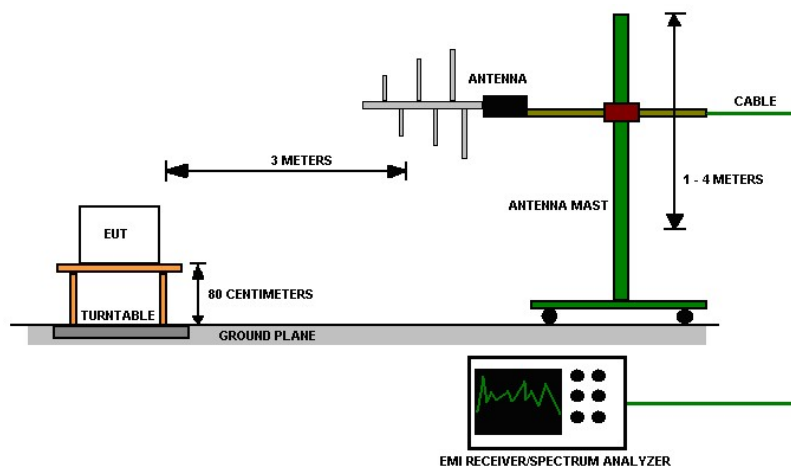


Figure 1 - Radiated Emissions Test Setup, 30MHz – 1GHz

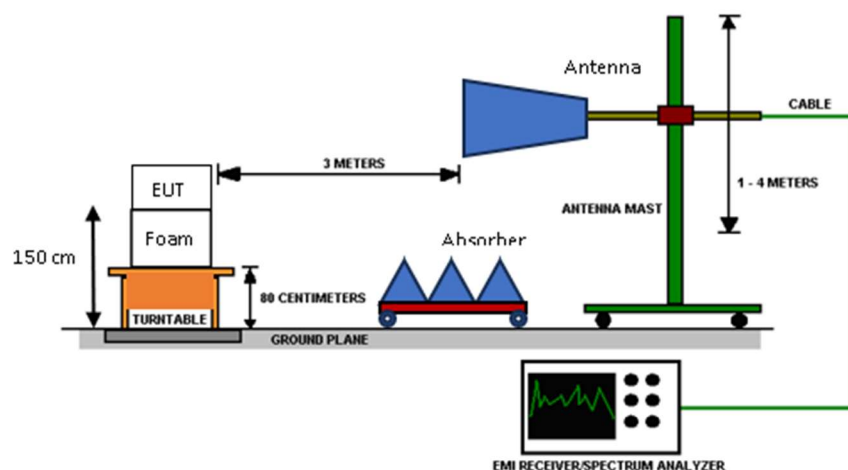


Figure 2 - Radiated Emissions Test Setup, 1GHz - 18GHz

EUT operating conditions

The EUT is powered by 12VDC output power supply that utilizes 120V, 60Hz AC input and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

Test results:

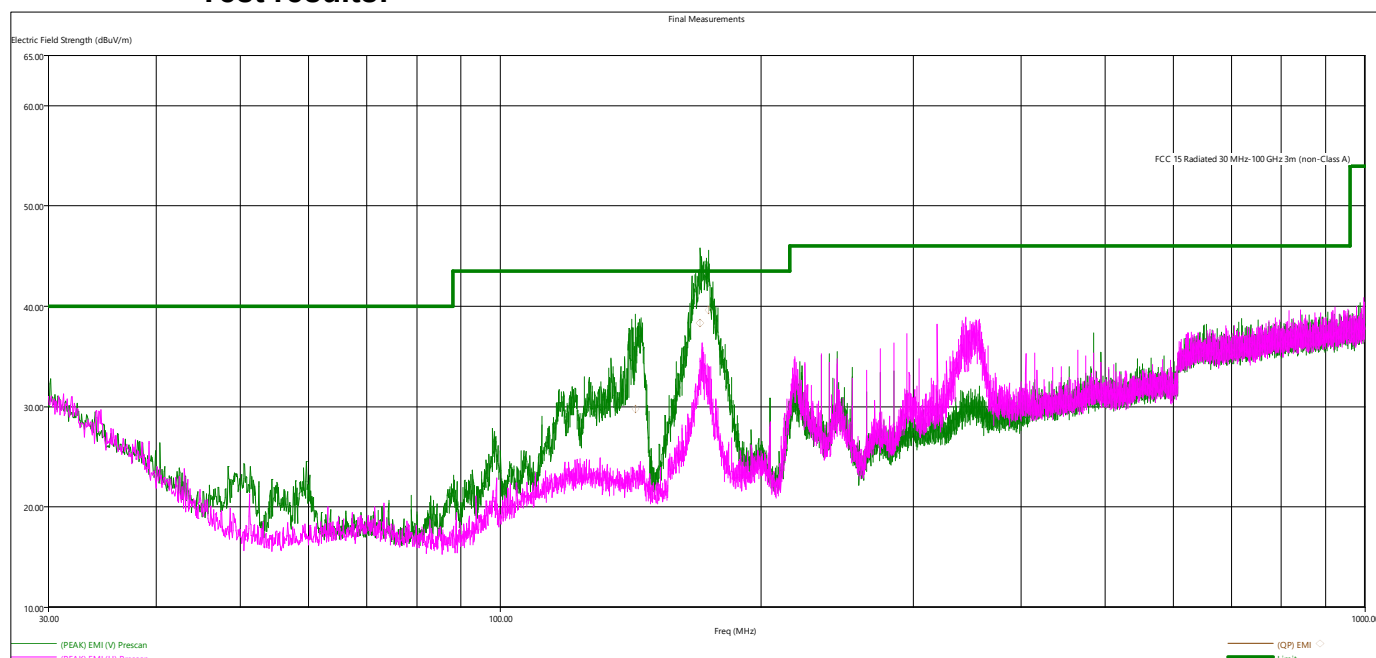


Figure 3 - Radiated Emissions Plot, Receive

Quasi-Peak Measurements, 30 MHz -1 GHz*							
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel
MHz	dBμV/m	dBμV/m	dB	cm.	deg.		
143.175840	29.81	43.52	13.71	156.25	226.00	V	Low
170.134800	38.37	43.52	5.15	139.89	248.25	V	Low
174.043440	39.63	43.52	3.89	107.17	226.50	V	Low

*Quasi-peak points recorded at the worst-case Peak points in the plot are shown in the table. Other points were evaluated separately.

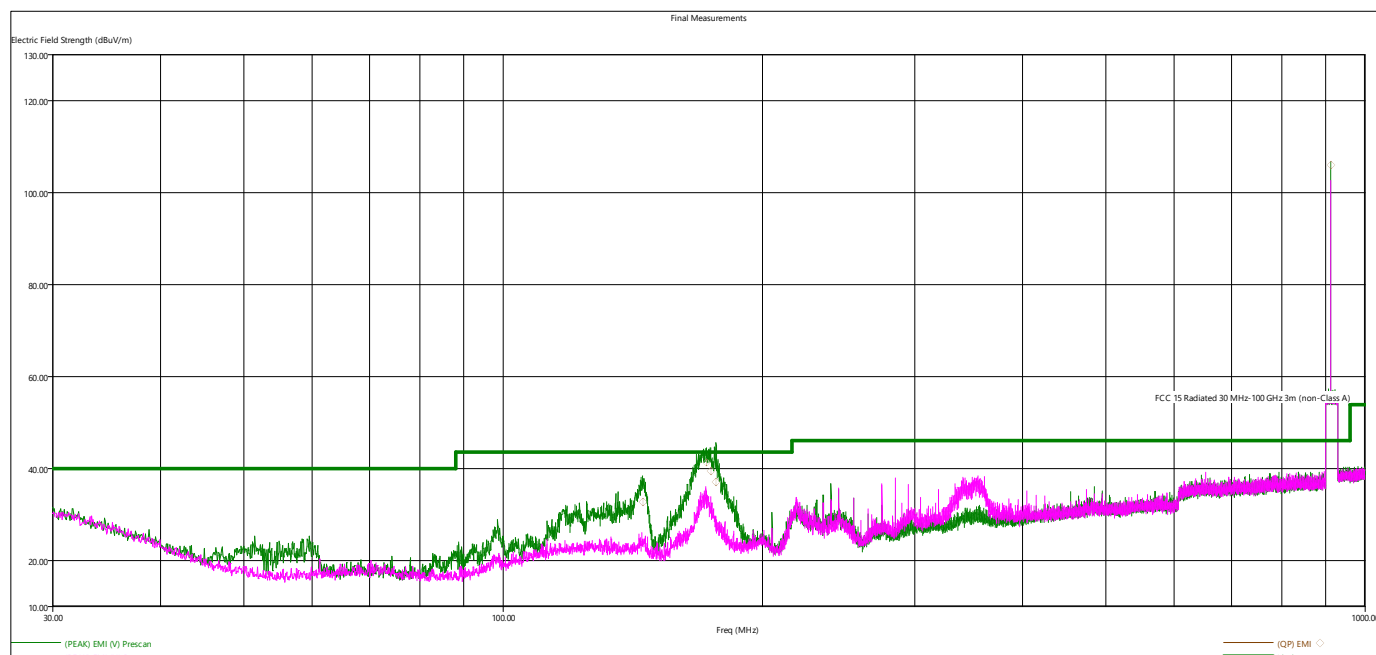


Figure 4 - Radiated Emissions Plot, Low Channel, 30M-1G

Quasi-Peak Measurements, 30 MHz -1 GHz							
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel
MHz	dBμV/m	dBμV/m	dB	cm.	deg.		
144.849600	32.82	43.52	10.70	117.50	150.00	V	Low
172.075920	41.47	43.52	2.05	108.85	265.00	V	Low
173.892240	39.58	43.52	3.94	113.62	255.25	V	Low
176.590320	37.24	43.52	6.28	110.82	232.25	V	Low
911.977200	106.02	46.02	-60.00	115.11	178.75	V	Low

*Quasi-peak points recorded at the worst-case Peak points in the plot are shown in the table. Other points were evaluated separately.

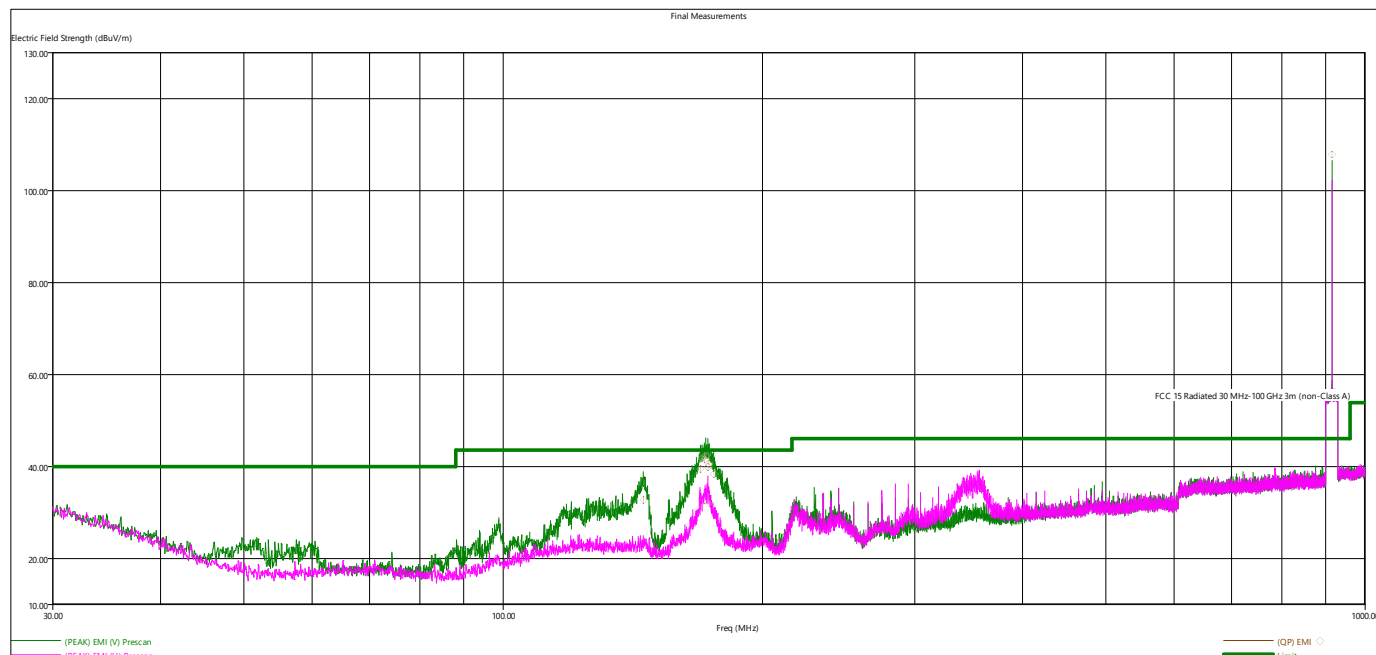


Figure 5 - Radiated Emissions Plot, Mid Channel, 30M-1G

Quasi-Peak Measurements, 30 MHz -1 GHz							
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel
MHz	dB μ V/m	dB μ V/m	dB	cm.	deg.		
172.652160	31.98	43.52	11.54	216.79	259.75	H	Low
145.434480	32.86	43.52	10.66	132.01	341.25	V	Low
169.302240	39.57	43.52	3.95	140.07	317.75	V	Low
169.843200	41.87	43.52	1.65	115.00	296.50	V	Low
171.195360	41.52	43.52	2.00	104.67	186.25	V	Low
171.834240	42.50	43.52	1.02	103.71	286.25	V	Low
172.829760	39.99	43.52	3.53	116.01	245.50	V	Low
173.612880	40.66	43.52	2.86	119.77	296.75	V	Low
175.398480	38.45	43.52	5.07	110.10	237.75	V	Low
915.084720	107.92	46.02	-61.90	115.23	183.00	V	Low

*Quasi-peak points recorded at the worst-case Peak points in the plot are shown in the table. Other points were evaluated separately.

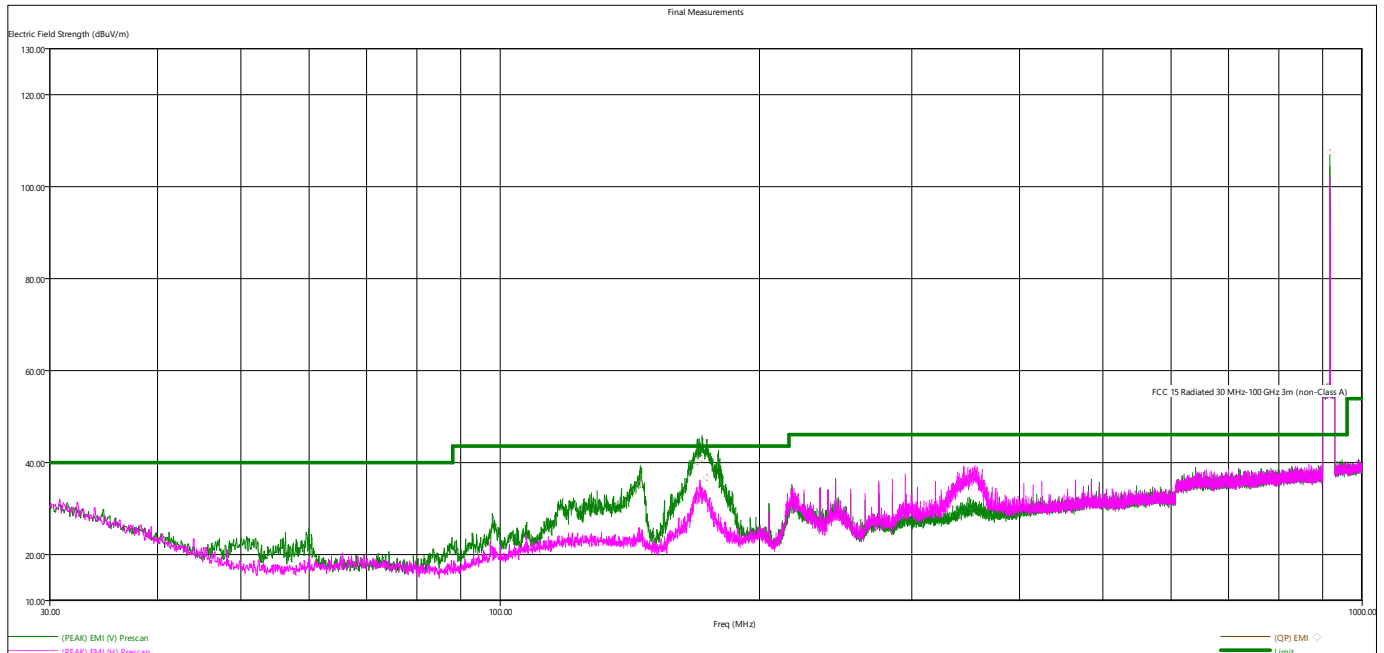


Figure 6 - Radiated Emissions Plot, High Channel, 30M-1G

Quasi-Peak Measurements, 30 MHz -1 GHz							
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel
MHz	dB μ V/m	dB μ V/m	dB	cm.	deg.		
145.306080	35.40	43.52	8.12	112.55	297.50	V	Low
169.321440	40.24	43.52	3.28	106.10	172.75	V	Low
171.480240	41.00	43.52	2.52	114.94	203.25	V	Low
173.398320	36.92	43.52	6.60	139.65	195.00	V	Low
918.017760	107.42	46.02	-61.40	113.20	181.25	V	Low

***Quasi-peak points recorded at the worst-case Peak points in the plot are shown in the table. Other points were evaluated separately.**

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Limit value - Emission level.
5. The EUT was measured in both the horizontal and vertical orientation. The polarization that produced the highest emissions was used for all testing.

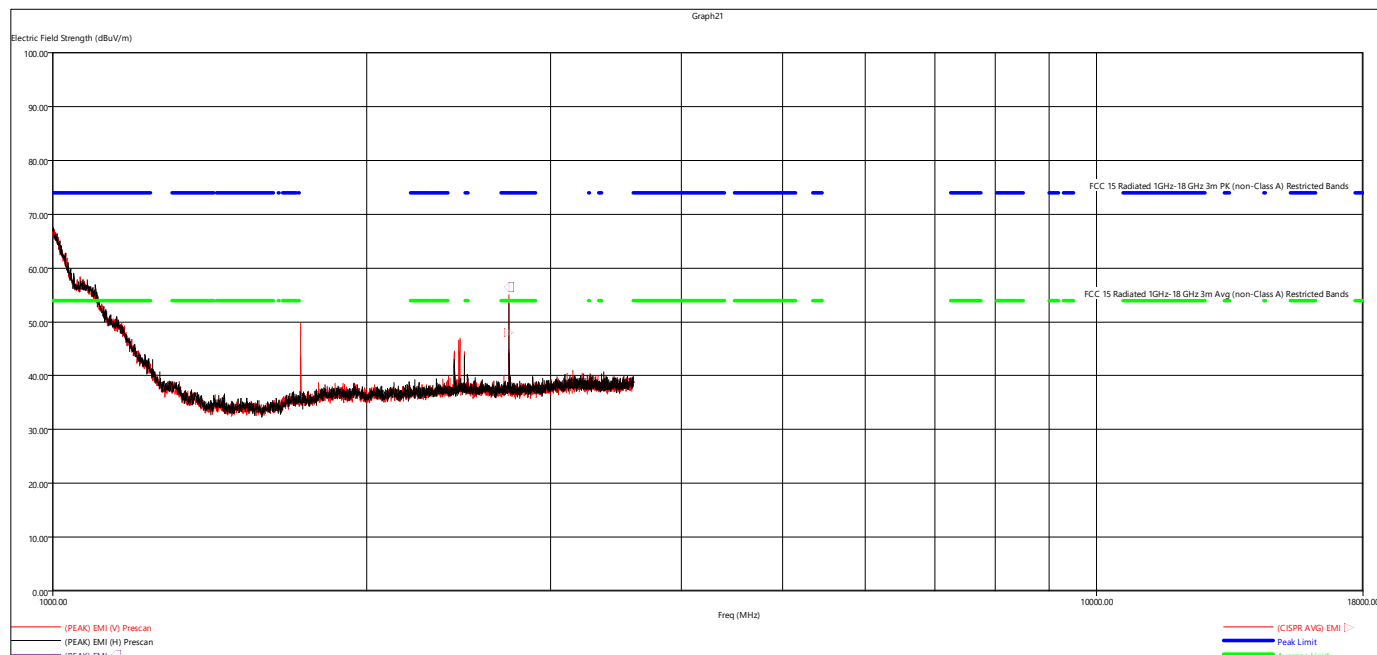


Figure 7 - Radiated Emissions Plot, Low Channel, 1GHz-3.6GHz

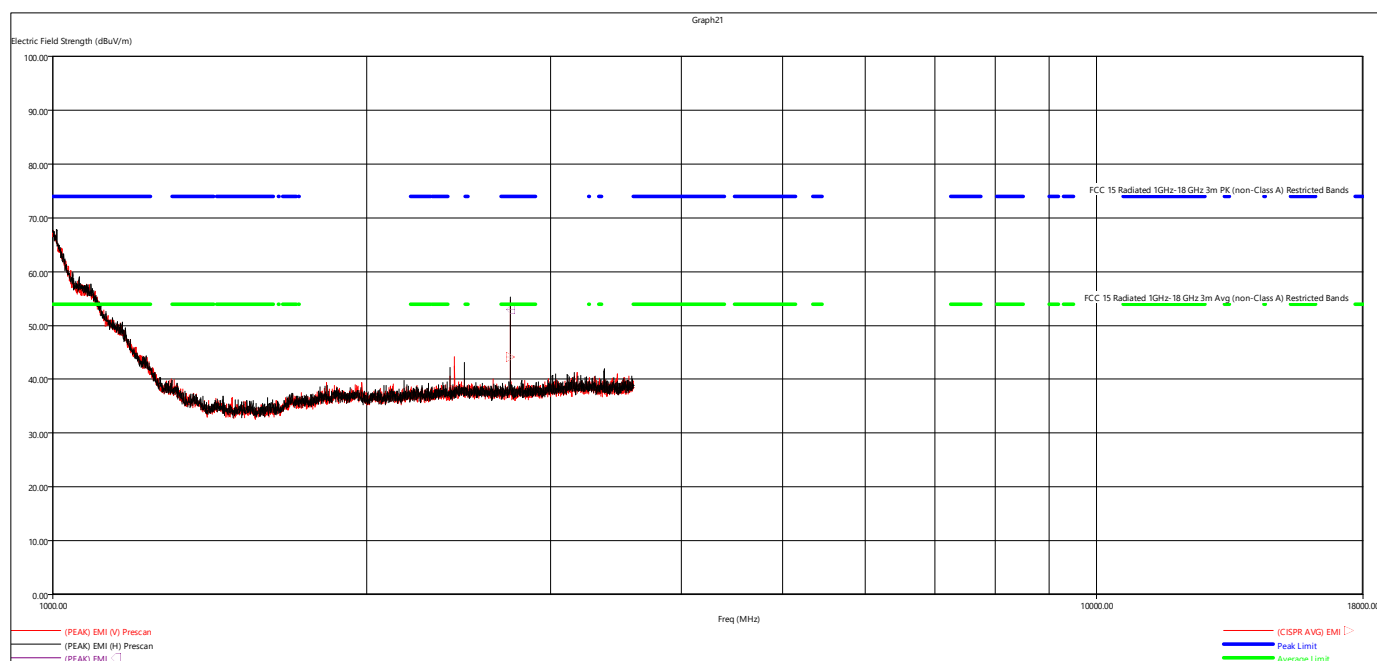


Figure 8 - Radiated Emissions Plot, Mid Channel, 1GHz-3.6GHz

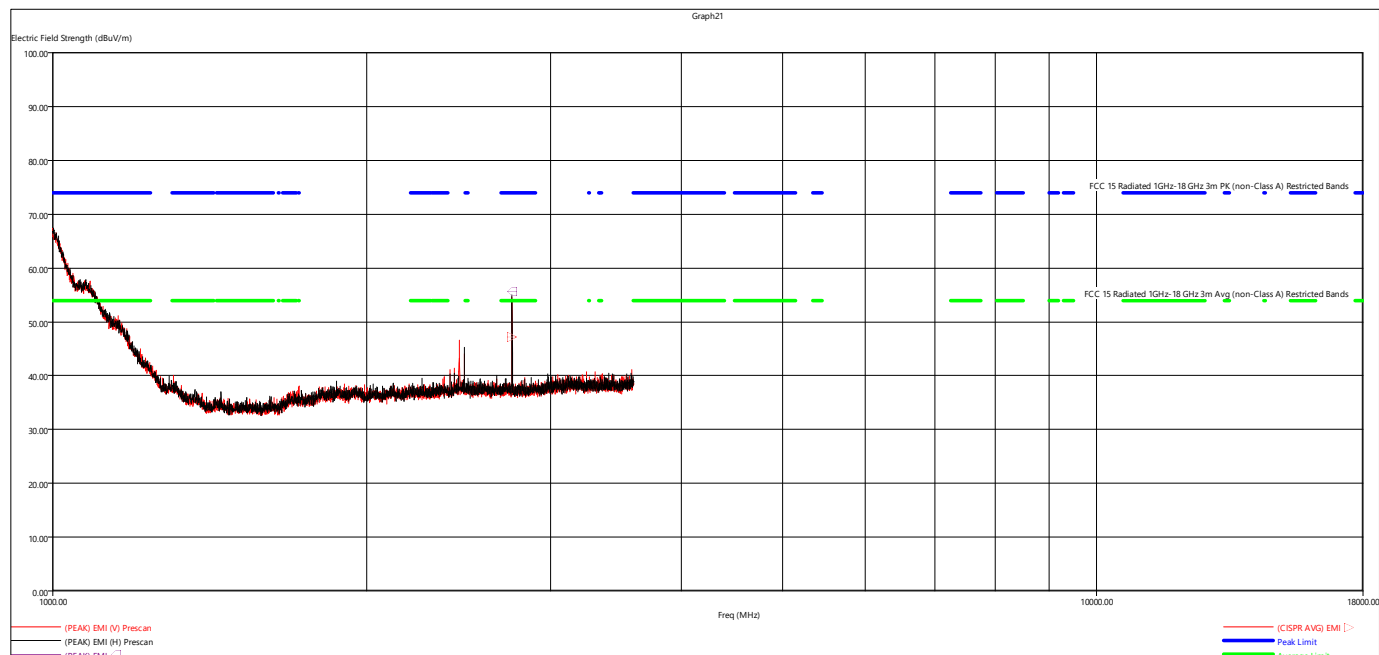


Figure 9 - Radiated Emissions Plot, High Channel, 1GHz-3.6GHz

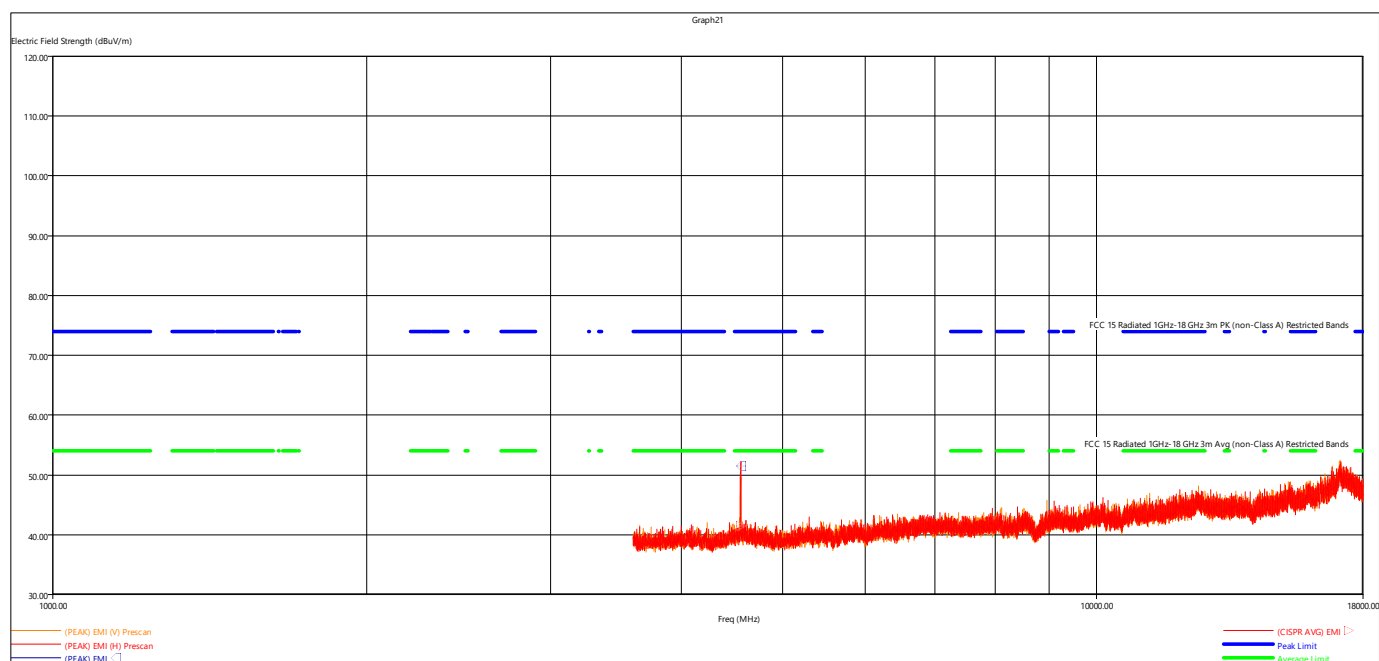


Figure 10 - Radiated Emissions Plot, Low Channel, 3.6GHz-18GHz

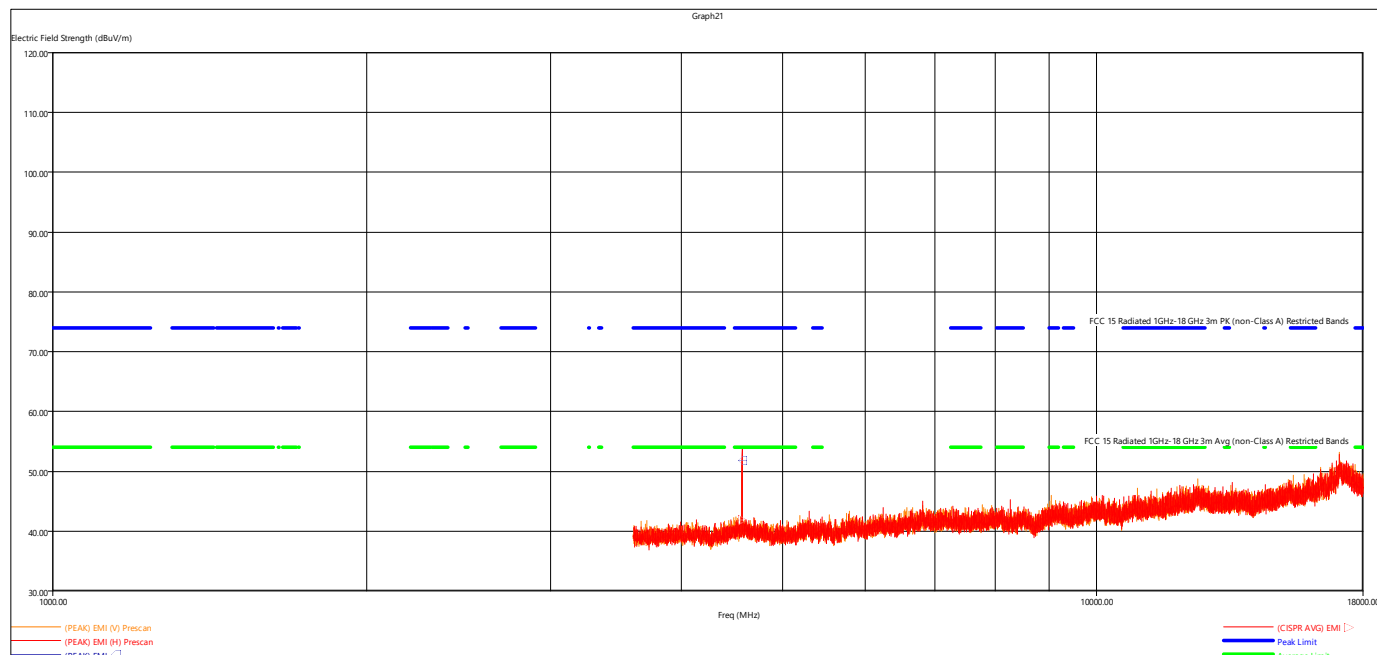


Figure 11 - Radiated Emissions Plot, Mid Channel, 3.6GHz-18GHz

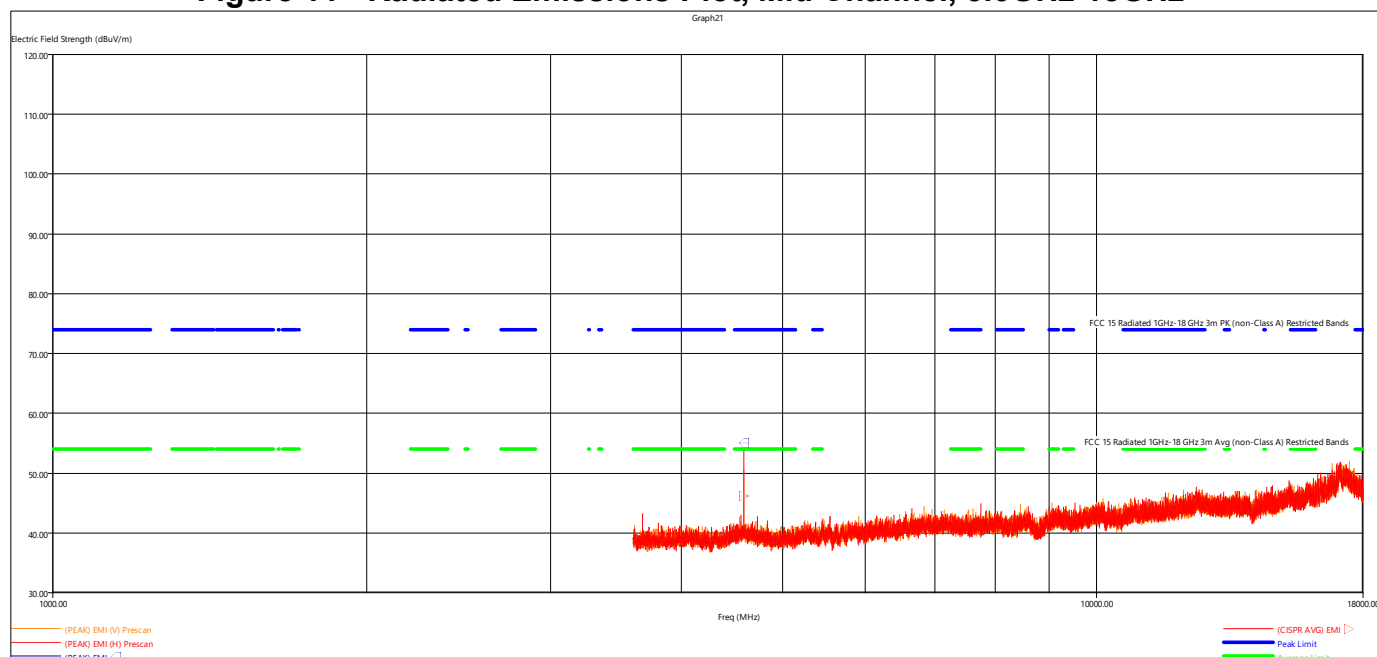


Figure 12 - Radiated Emissions Plot, High Channel, 3.6GHz-18GHz

Report Number:	R20260105-81-E1A	Rev	A
Prepared for:	Fireboard Labs LLC		

Peak Measurements, 1 GHz - 10 GHz							
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel
MHz	dBμV/m	dBμV/m	dB	cm.	deg.		
2736.39	56.43	73.98	17.55	215.00	167.00	V	Low
4560.566000	51.55	73.98	22.43	233.20	195.50	H	Low
2744.51	53.05	73.98	20.93	312.85	4.75	H	Mid
4574.276000	51.85	73.98	22.13	494.82	200.00	H	Mid
2754.14	55.65	73.98	18.33	411.43	13.25	H	High
4590.102000	55.12	73.98	18.86	175.29	197.75	H	High

*Unrestricted harmonics are at least 20dB below the fundamental peak.

Average Measurements, 1 GHz- 10 GHz								
Frequency	DCCF	Average Level**	Limit	Margin	Height	Angle	Pol	Channel
MHz	dB	dBμV/m	dBμV/m	dB	cm.	deg.		
2736.39	-8.05	48.38	53.98	5.60	215.00	167.00	V	Low
4560.566000	-8.05	43.50	53.98	10.48	233.20	195.50	H	Low
2744.51	-8.05	45.00	53.98	8.98	312.85	4.75	H	Low
4574.276000	-8.05	43.80	53.98	10.18	494.82	200.00	H	Low
2754.14	-8.05	47.60	53.98	6.38	411.43	13.25	H	Mid
4590.102000	-8.05	47.07	53.98	6.91	175.29	197.75	H	Mid

The EUT was maximized in all 3 orthogonal axes. The worst-case (z-axis) is shown in the table above.

*In unrestricted bands, harmonics are at least 20dB below fundamental levels.

**Average level is Peak Level + DCCF.

	Report Number:	R20260105-81-E1A	Rev	A
	Prepared for:	Fireboard Labs LLC		

4.3 PEAK OUTPUT POWER

Test Method: ANSI C63.10-2020, Section(s) 11.9.1.1

Limits of bandwidth measurements:

For an FHSS system with 50 channels or more, the output power is required to be less than 1000 mW or 30 dBm.

Maximum Effective Isotropic Radiated Power was calculated from the measured maximum field strength.

Test procedure: Radiated

Deviations from test standard:

No deviation.

Test setup:

See Section 4.2

EUT operating conditions:

The EUT was powered by 120V, 60Hz AC and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

Test results:

Refer to section 4.0 for the results table.

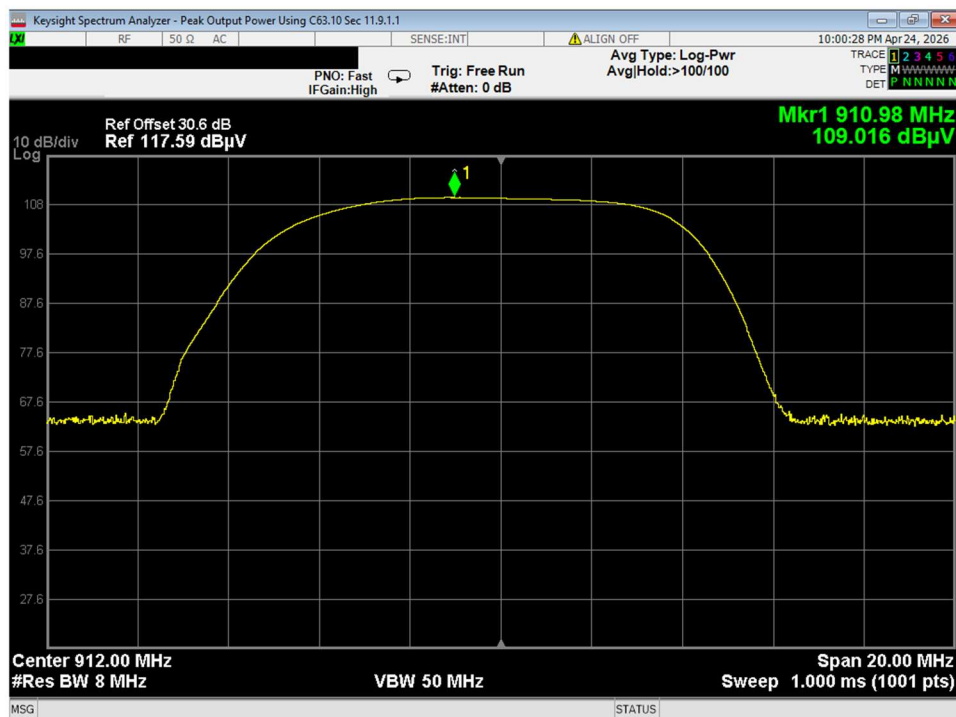


Figure 13 – Peak Field Strength, Low Channel.

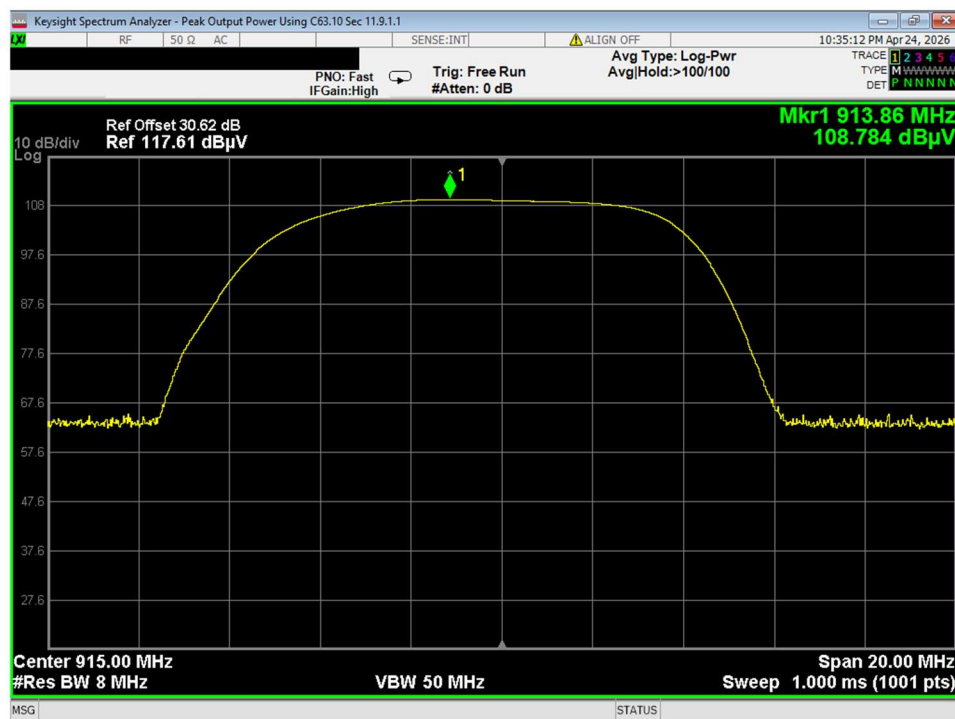


Figure 14 – Peak Field Strength, Mid Channel

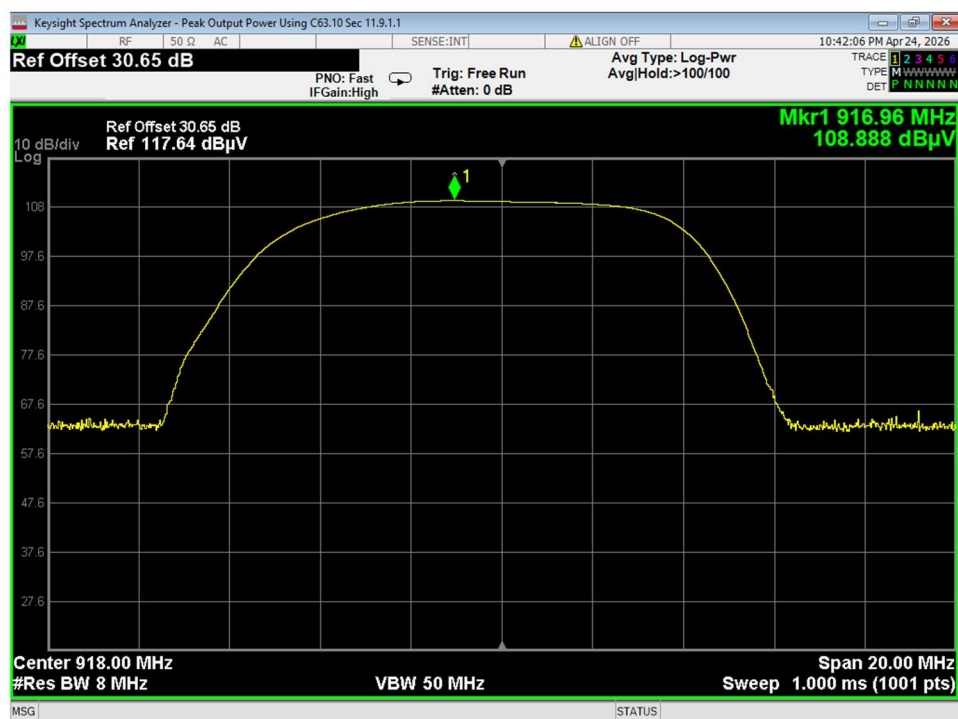


Figure 15 – Peak Field Strength, High Channel



Report Number: R20260105-81-E1A

Rev

A

Prepared for: Fireboard Labs LLC

4.4 BANDWIDTH

Test Method: ANSI C63.10-2020, Section(s) 6.9.2 (20 dB BW)
ANSI C63.10-2020, Section(s) 6.9.3 (99% BW)

Limits of bandwidth measurements:
From FCC Part 15.247 (1) (i) and RSS-247 5.1(c)

The maximum allowed 20 dB bandwidth of the hopping channel is 250 kHz.

Test procedures:
Bandwidth measurement was taken at a distance of 3m from the EUT. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1 kHz RBW.

The 20dB bandwidth is defined as the bandwidth of which is higher than peak power minus 20dB.

The 99% occupied bandwidth was measured using the test receiver's occupied bandwidth function.

Test setup:

All the measurements were done at 3m test distance while operating at low, mid, and high channels. See Section 4.3 for more details.

Deviations from test standard:
No deviation.

Test setup:

The transmitter radiated to the receiver at a distance of 3m.

EUT operating conditions:
The EUT was powered by 120V, 60Hz AC and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

Test results:

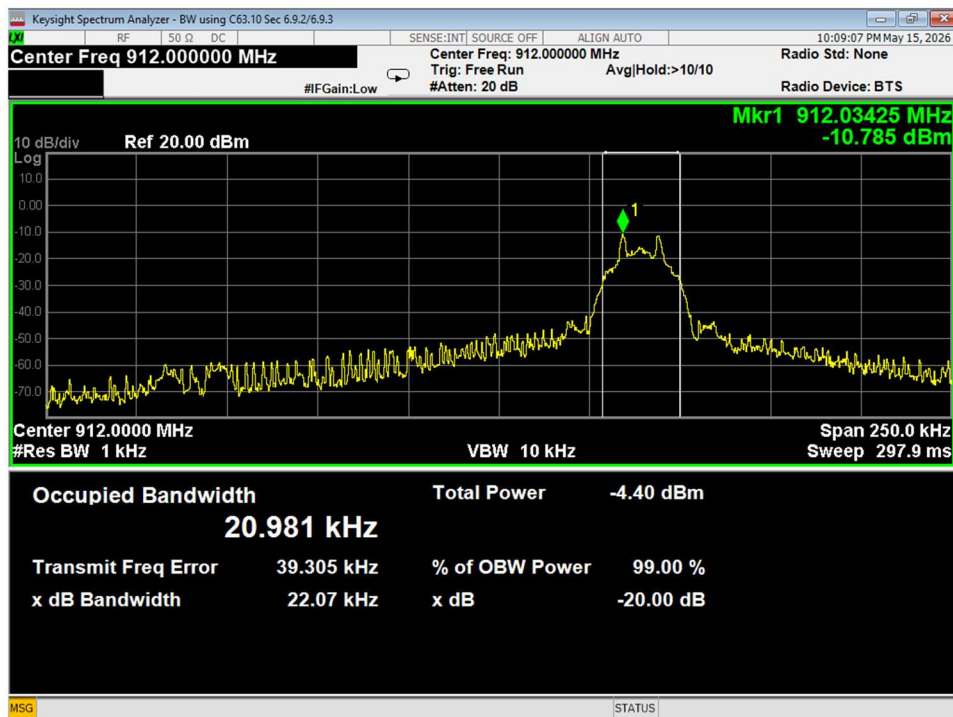


Figure 16 –Bandwidth, Low Channel

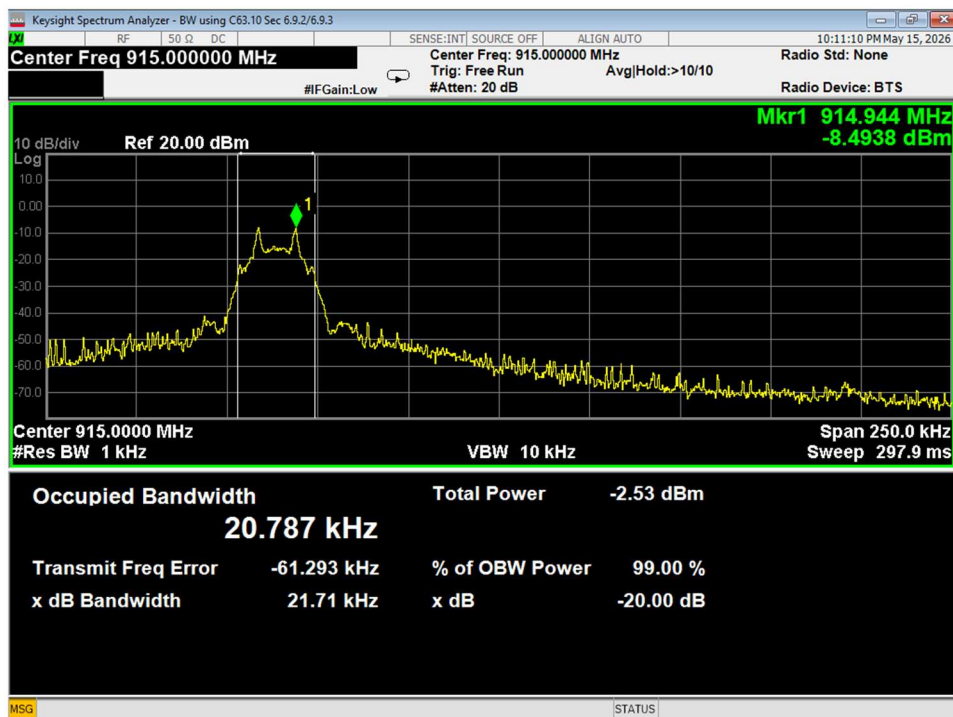


Figure 17 - Bandwidth, Mid Channel

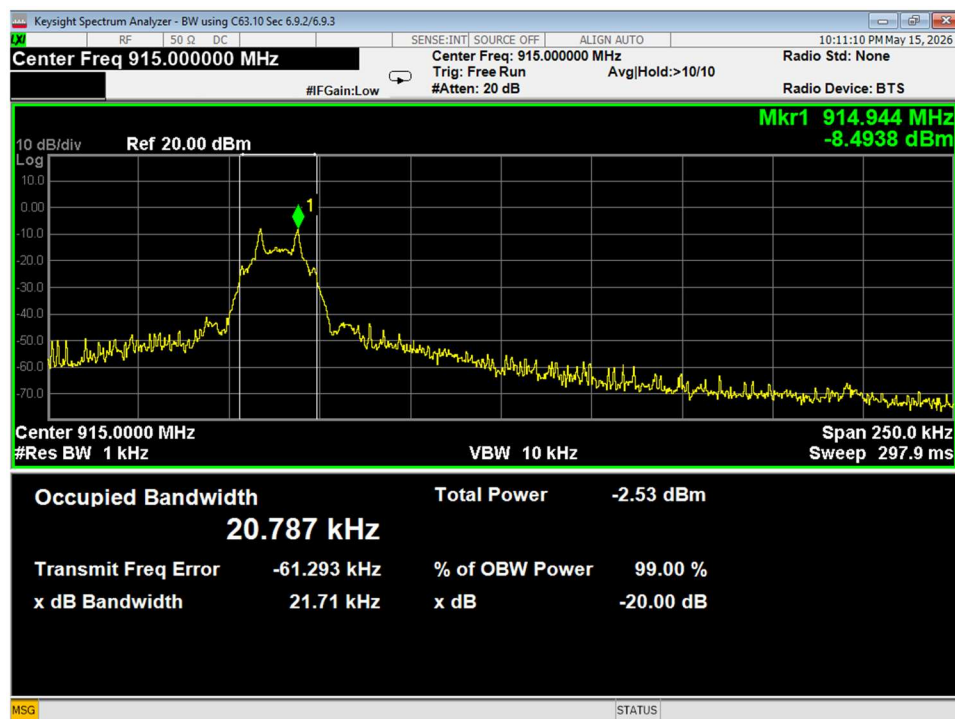


Figure 18 - Bandwidth, High Channel



Report Number: R20260105-81-E1A

Rev

A

Prepared for: Fireboard Labs LLC

4.5 BANDEDGES

Test Method: ANSI C63.10-2020, Section(s) 6.10.6

Limits of bandedge measurements:

For emissions outside of the allowed band of operation (902 – 928MHz), the emission level needs to be 20dB under the maximum fundamental field strength. However, if the emissions fall within one of the restricted bands from 15.205 the field strength levels need to be under that of the limits in 15.209.

Test procedures:

All measurements were taken at a distance of 3m from the EUT.

The EUT was maximized in all 3 orthogonal positions in a similar manner as described in Section 4.2.

Deviations from test standard:

No deviation.

Test setup:

All the measurements were done at 3m test distance while operating on the highest and lowest channel depending on which band edge was investigated.

EUT operating conditions:

The EUT was powered by 120V, 60Hz AC and set to transmit continuously on the lowest frequency channel and the highest frequency channel.

Test results:

Refer to section 4.0 for the results table.

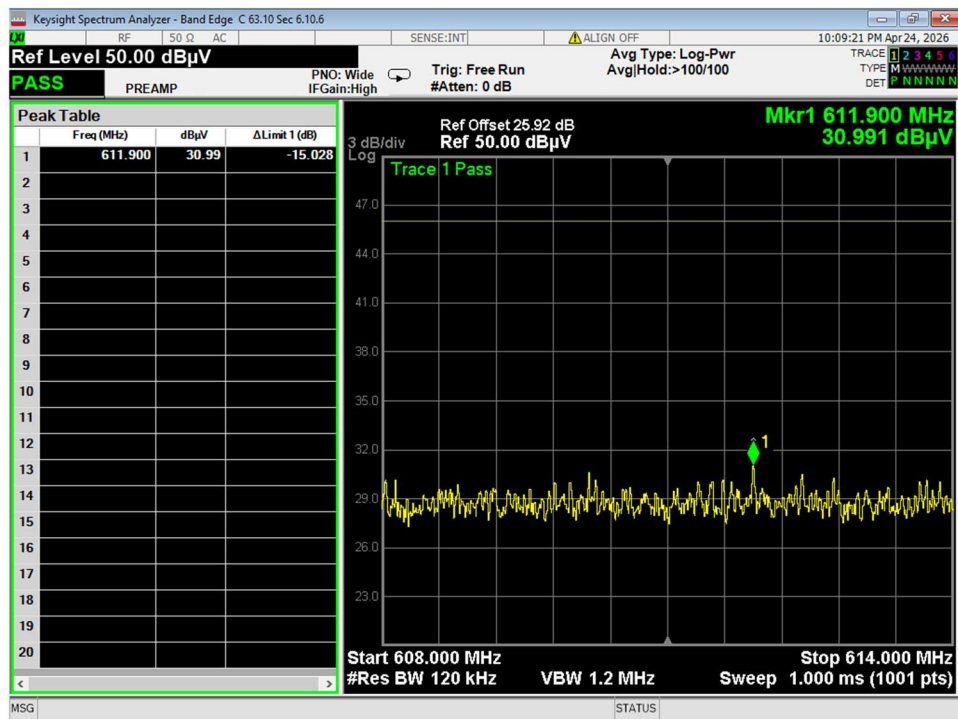


Figure 19 –Band-edge Measurement, Low Channel, Restricted Frequency

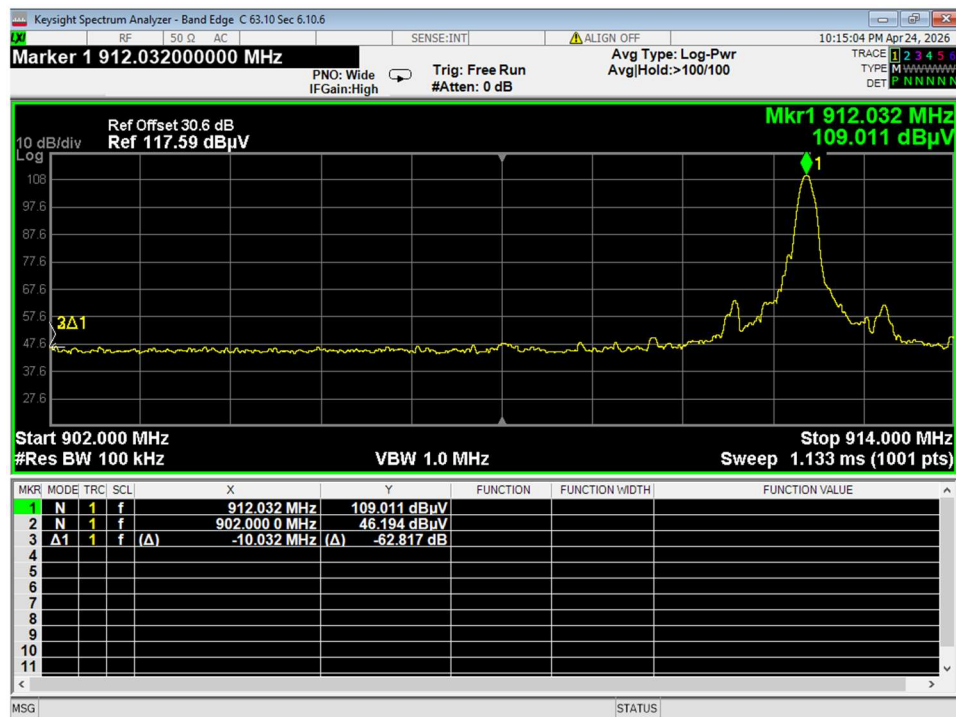


Figure 20 –Band-edge Measurement, Low Channel, Unrestricted Frequency

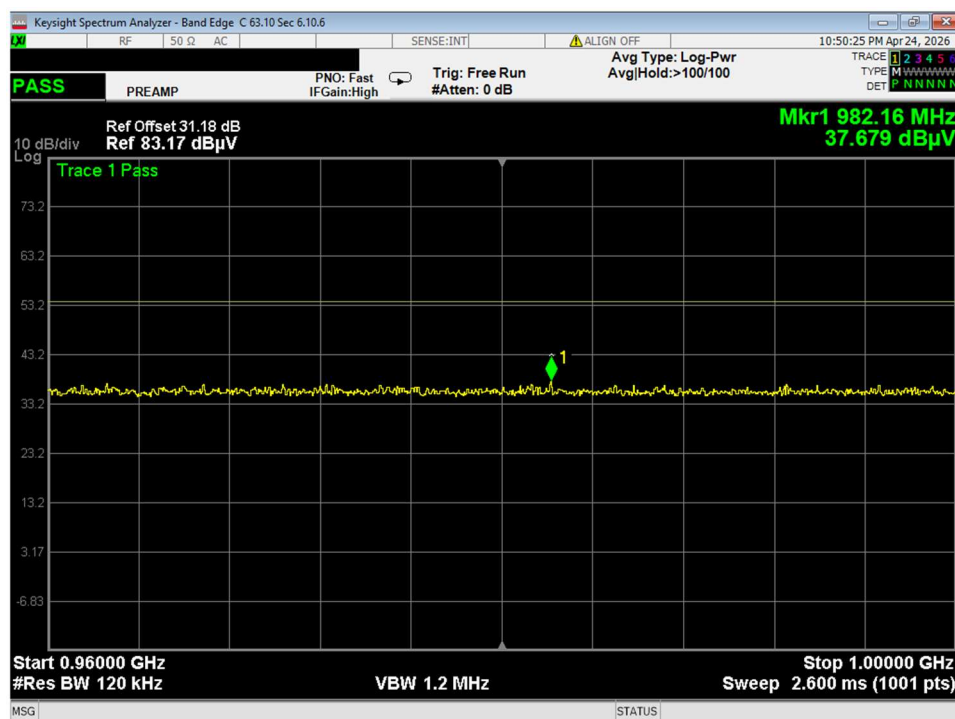


Figure 21 –Band-edge Measurement, High Channel, Restricted Frequency

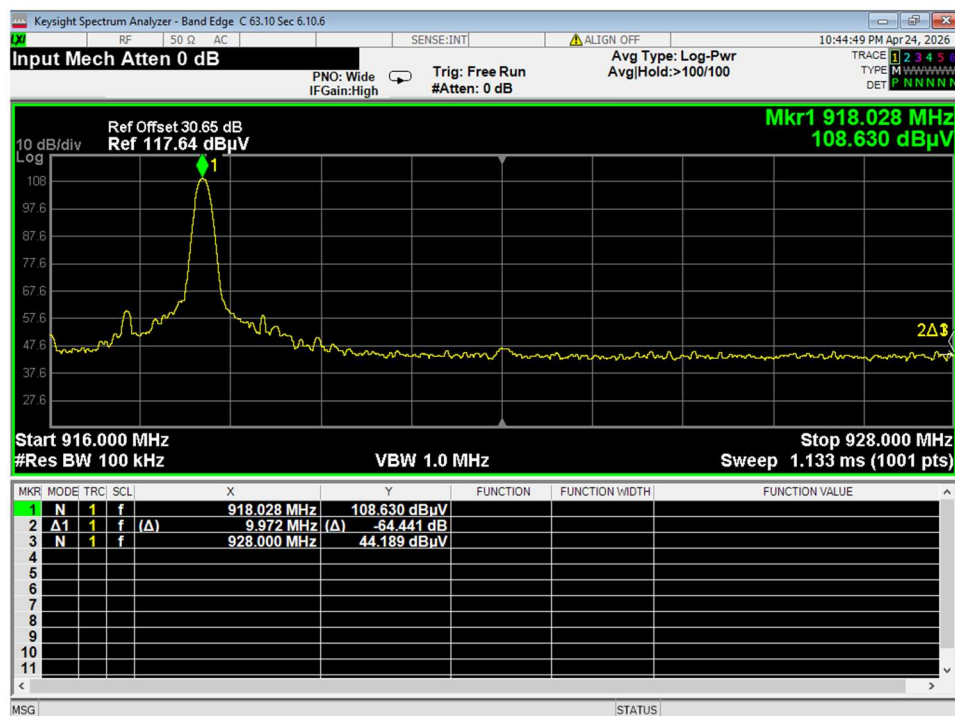


Figure 22 – Band-edge Measurement, High Channel, Unrestricted Frequency



Report Number:	R20260105-81-E1A	Rev	A
Prepared for:	Fireboard Labs LLC		

4.6 CARRIER FREQUENCY SEPARATION, NUMBER OF HOPPING CHANNELS, TIME OF OCCUPANCY

Test Method: ANSI C63.10-2020, Section 7.8.2, 7.8.3, 7.8.4

Limits for Time of Occupancy

Average time of occupancy on any frequency should not exceed 0.4 seconds within a 20 second period.

Test procedures:

The method from FCC DA 00-705

Test setup:

Radiated measurements.

EUT operating conditions:

The EUT was powered by a 12 VDC power supply that uses 120V, 60 Hz AC input and set to Hopping mode.

Test results:

On time recorded was 119ms in 20 seconds.

Time of Occupancy =
119ms < 400ms (15.247 Limit)

Total Hop Count =
61 Channels

Frequency Separation: the minimum frequency separation meets the requirements:
Separation: 99.8kHz (approximately)

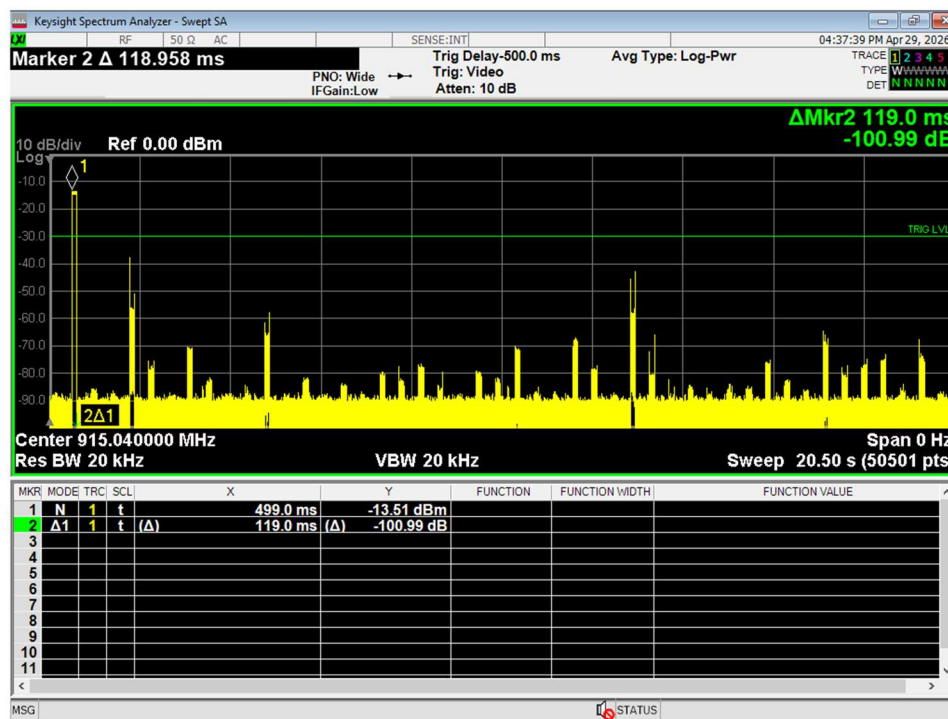


Figure 23 – On time, total duration

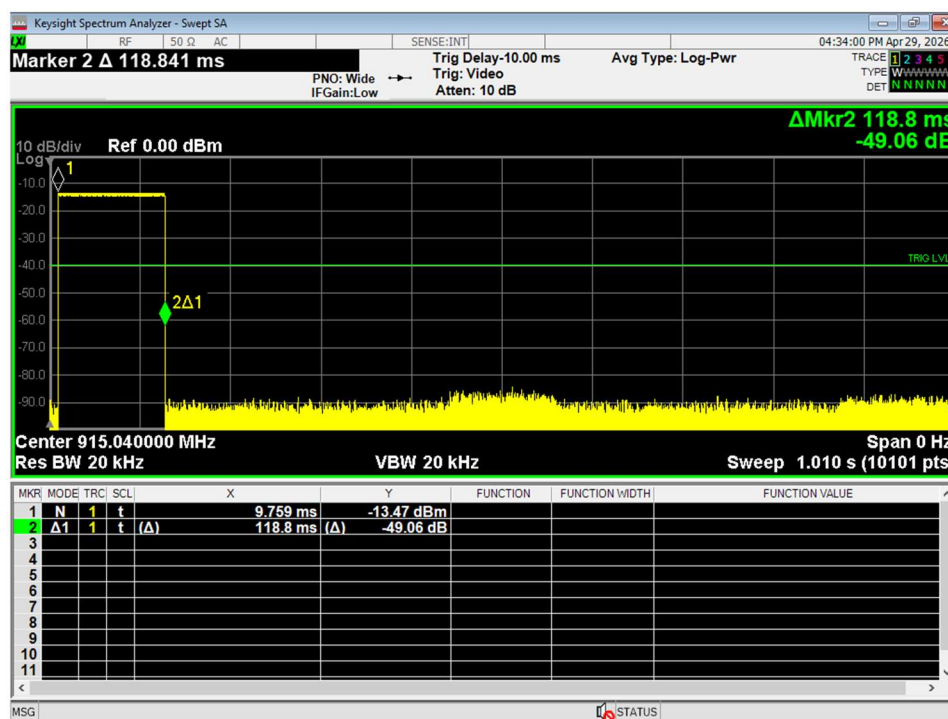


Figure 24 – On time, detail

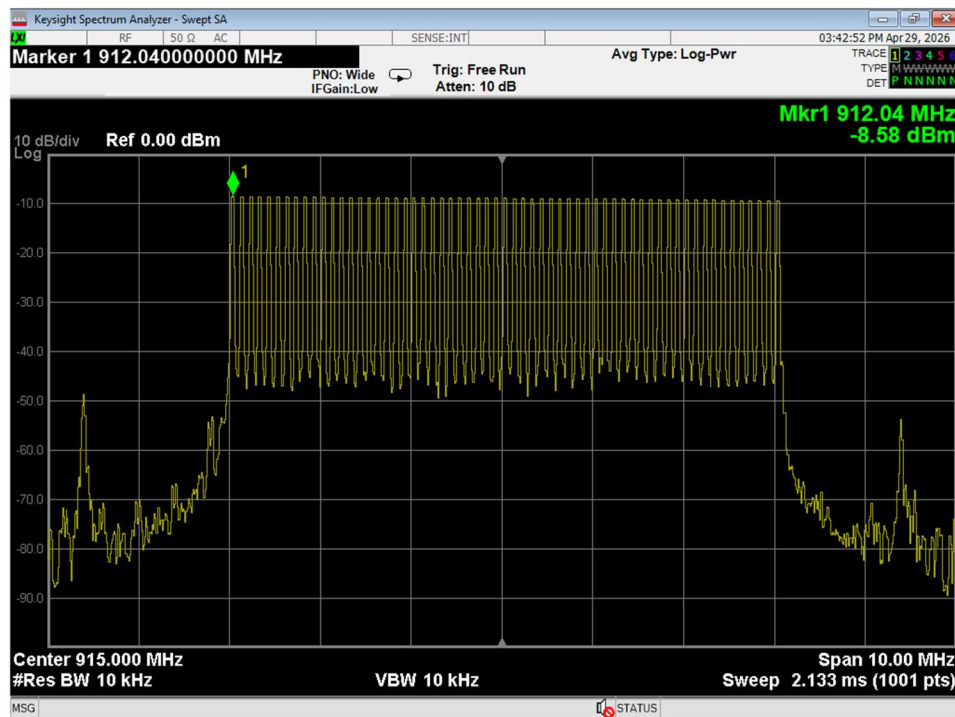


Figure 25 – Hop count, 61 hops



Figure 26 – Minimum Frequency Separation

4.7 CONDUCTED AC MAINS EMISSIONS

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

Limits for conducted emissions measurements:

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

Notes:

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

Test Procedures:

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

Deviation from the test standard:

No deviation

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test Results:

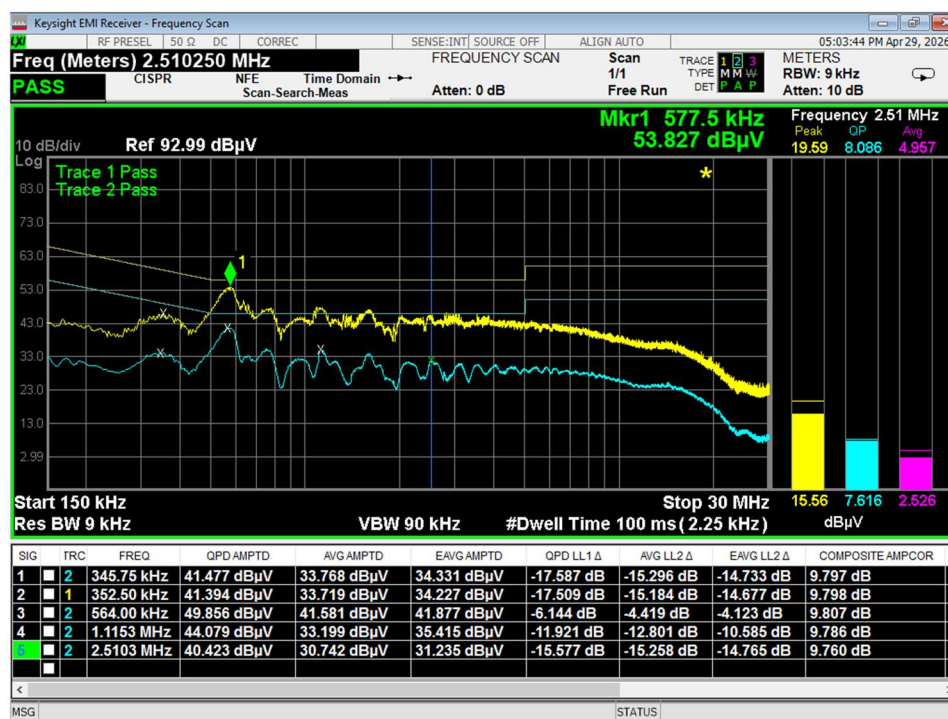


Figure 27 - Conducted Emissions, Line

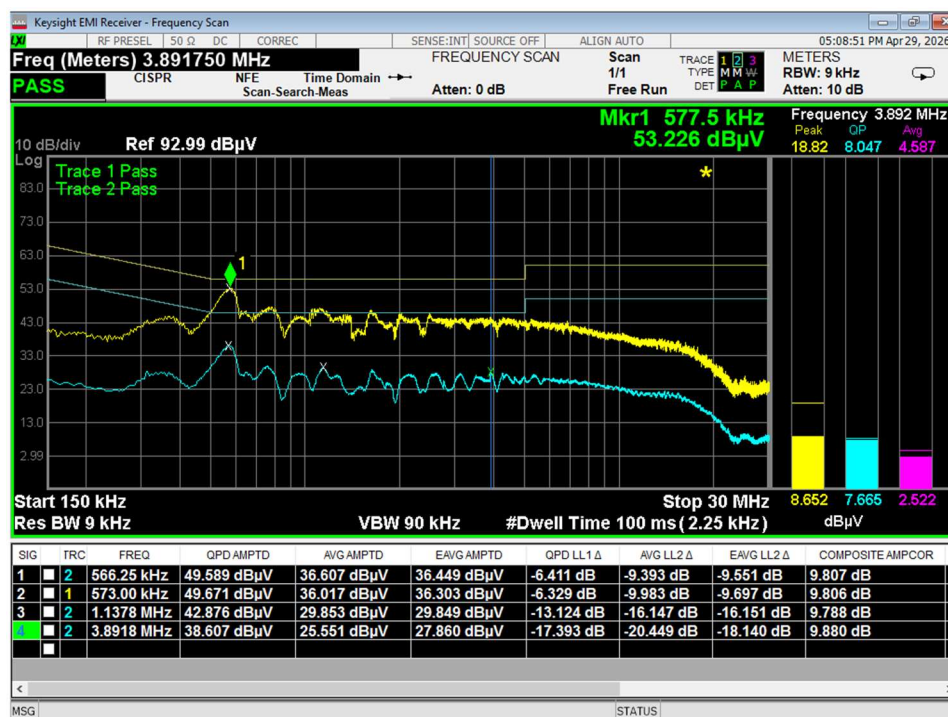


Figure 28 - Conducted Emissions, Neutral

	Report Number:	R20260105-81-E1A	Rev	A
	Prepared for:	Fireboard Labs LLC		

APPENDIX A: SAMPLE CALCULATION

Radiated Emissions

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

$$FS = R + AF - (-CF + AG)$$

where FS = Field Strength

R = Receiver Amplitude Receiver reading in dB μ V

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Preamplifier Amplifier Gain

Assume a receiver reading of 55.00 dB μ V is obtained. The Antenna Factor of 12.00 and a Cable Factor of 1.10 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.10 dB μ V/m.

$$FS = 55.00 + 12.00 - (-1.10 + 20.00) = 48.1 \text{ dB}\mu\text{V/m}$$

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

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

Conducted Emissions

Receiver readings are compared directly to the conducted emissions limits in decibels (dB) by adding the cable loss and LISN insertion loss to the receiver reading. The basic equations with a sample calculation is as follows;

$$FS = R + IL - (-CF)$$

where V = Conducted Emissions Voltage Measurement

R = Receiver reading in dB μ V

IL = LISN Insertion Loss

CF = Cable Attenuation Factor

	Report Number:	R20260105-81-E1A	Rev	A
	Prepared for:	Fireboard Labs LLC		

APPENDIX B – MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels apply to tests performed in this test report:

Test	Frequency Range	NCEE Labs Uncertainty Value (dB)	Maximum Uncertainty Values per CISPR 16-4-2:2011/A1:2018
AC Line Conducted Emissions	150kHz – 30MHz	3.03	3.4
Radiated Emissions, 3m	30MHz - 1GHz	4.50	5.3
Radiated Emissions, 3m	1GHz – 18GHz	4.49	5.2

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

NCEE Labs meets the maximum uncertainty requirements per CISPR 16-4-2:2011/A1:2018, and therefore does not require a minimum passing margin to state that an EUT is less than the field strength limits of the applicable CISPR, IEC or EN limit per CISPR 16-4-2:2011/A1:2018, Section 4.1.

NCEE Labs employs tilting when testing at 3m test distance. The maximum uncertainty associated with this method is used.

Maximum uncertainty values show the worst-case of all test distances used.



Report Number:	R20260105-81-E1A	Rev	A
Prepared for:	Fireboard Labs LLC		

REPORT END