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FCC/ISED Test Report

Prepared for:	**Fireboard Labs LLC**
Address:	**501 Charlotte St Kansas City, MO 64106**
EUT:	**FBWP**
FCC ID: IC ID:	**2A29A-FBWP24 27842-FBWP24**
Test Report No:	**R20240503-00-E2**
Approved by:	**Blake Winter EMC Test Engineer iNARTE EMC-50662-E**
DATE:	**August 26, 2024**
Total Pages:	**35**

ilac-MRA A2LA ACCREDITED
TESTING LABORATORY
CERTIFICATE NO. 1953.01

REVISION PAGE

Rev. No.	Date	Description
0	26 August 2024	Issued by BWinter Reviewed by KVepuri Prepared by BWinter

CONTENTS

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 2

ANSI C63.10-2013 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, 5.1(c)	Maximum Bandwidth, Limit: Max. 250kHz	Pass	Meets the requirement of the limit.
FCC 15.247(b)(1) RSS-247, 5.1	Maximum Peak Output Power, Limit: Max. 24 dBm	Pass	Meets the requirement of the limit.
FCC 15.209 RSS-Gen, 8.9 RSS-247, 5.5	Transmitter Radiated Emissions	Pass	Meets the requirement of the limit.
FCC 15.247(a) (1) (i) RSS-247, 5.1(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, 5.5	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.

2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

Summary
The Equipment Under Test (EUT) was a FBWP 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.

Manufacturer	Fireboard Labs LLC
EUT	FBWP
EUT Received	12 July 2024
EUT Tested	15 July 2024- 26 July 2024
Serial No.	A1, NCEE 011943 (for the majority of the radiated and radio measurements) A2, NCEE 011944 (for some harmonics and some radio measurements)
Operating Band	902 – 928 MHz
Device Type	FHSS
Power Supply	USB Power Supply, Fireboard AD568, SN NCEE 011887 (recharging only)
Antenna	Internal

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

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

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-1
NCC CAB Identification No:	US0177

Environmental conditions varied slightly throughout the tests.

3.2 TEST PERSONNEL

No.	PERSONNEL	TITLE	ROLE
1	Blake Winter	Test Engineer	Testing and Report
2	Karthik Vepuri	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.

3.3 TEST EQUIPMENT

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE DATE
Keysight MXE Signal Analyzer (44GHz)**	N9038A	MY59050109	July 17, 2024	July 17, 2026
Keysight MXE Signal Analyzer (26.5GHz)**	N9038A	MY56400083	July 17, 2024	July 17, 2026
SunAR RF Motion	JB1	A091418	May 16, 2024	May 16, 2025
ETS EMCO Red Horn Antenna	3115	00218576	February 21, 2024	February 21, 2025
ETS EMCO Amplifier*	3115-PA	00218576	January 22, 2024	January 22, 2026
Trilithic High Pass Filter*	6HC330	23042	June 5, 2023	June 5, 2025
ETS – Lindgren- VSWR on 10m Chamber***	10m Semi-anechoic chamber-VSWR	4740 Discovery Drive	May 7, 2024	May 7, 2027
NCEE Labs-NSA on 10m Chamber*	10m Semi-anechoic chamber-NSA	NCEE-001	June 18, 2024	June 18, 2026
TDK Emissions Lab Software	V11.25	700307	NA	NA
RF Cable (preamplifier to antenna)*	MFR-57500	90-195-040	June 5, 2023	June 5, 2025
RF Cable (antenna to 10m chamber bulkhead)*	FSCM 64639	01E3872	June 5, 2023	June 5, 2025
RF Cable (10m chamber bulkhead to control room bulkhead)*	FSCM 64639	01E3864	June 5, 2023	June 5, 2025
RF Cable (control room bulkhead to test receiver)*	FSCM 64639	01F1206	June 5, 2023	June 5, 2025
N connector bulkhead (10m chamber)*	PE9128	NCEEBH1	June 5, 2023	June 5, 2025
N connector bulkhead (control room)*	PE9128	NCEEBH2	June 5, 2023	June 5, 2025

*Internal Calibration
**2 year cal cycle
***4 year cal cycle

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

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	20.75	21.95	97.88	2.65	1.84	Pass
Mid	20.76	21.94	97.06	1.83	1.52	Pass
High	21.80	21.97	97.44	2.21	1.66	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	-93.35	-41.32	Peak	52.03	20	Pass
High	928	-91.85	-41.80	Peak	50.05	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	32.69	Peak	46.02	13.33	Pass
High	960-1000	38.05	Peak	53.98	15.93	Pass
*Limit shown is the peak limit taken from FCC Part 15.209; Peak values are compared to quasi-peak limit to show compliance.						

4.1 DUTY CYCLE

The manufacturer attests that the duty cycle is less than 60%: DCCF = 20 * log10(0.6) = -4.44dB.

4.2 RADIATED EMISSIONS

Test Method: ANSI C63.10:2013, Section 6.5, 6.6

Limits for radiated emissions measurements:

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

FREQUENCIES (MHz)	FIELD STRENGTH (μV/m)	MEASUREMENT DISTANCE (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

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

Test procedures:

a. The EUT was placed on the top of a rotating table above the ground plane in a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The table was 0.8m high for measurements form 30MHz-1Ghz and 1.5m for measurements from 1GHz and higher.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

f. If the emission level of the EUT in peak mode was 6dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 6 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. The EUT was maximized in all 3 orthogonal positions. The results are presented for the axis that had the highest emissions.

h. The orientation with the worst-case emissions was used for final measurements.

i. Receive mode emissions were tested and found to be within 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 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:

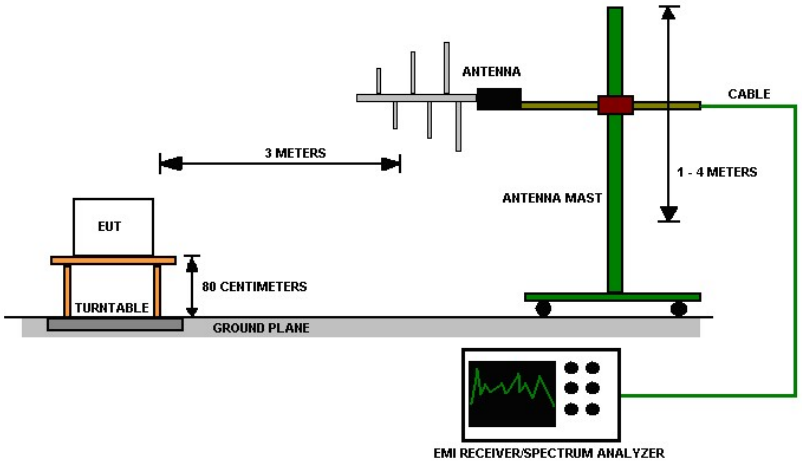

Figure 1 - Radiated Emissions Test Setup, 30MHz – 1GHz

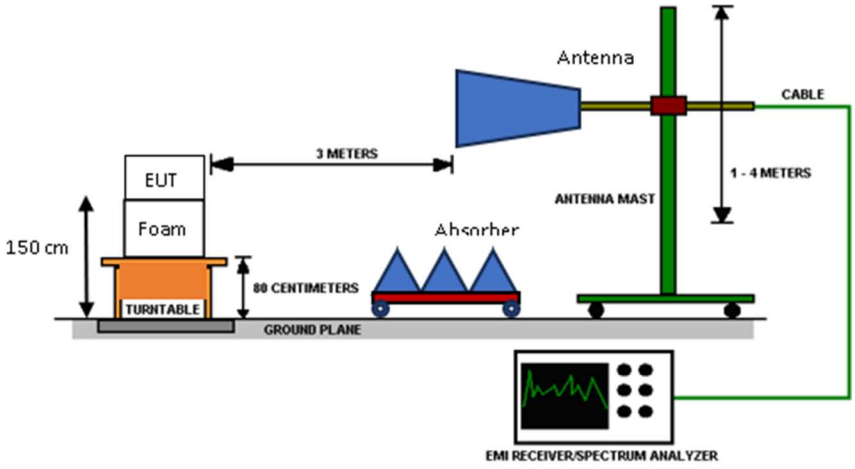

Figure 2 - Radiated Emissions Test Setup, 1GHz - 18GHz

EUT operating conditions
The EUT was powered by internal battery unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

Test results:

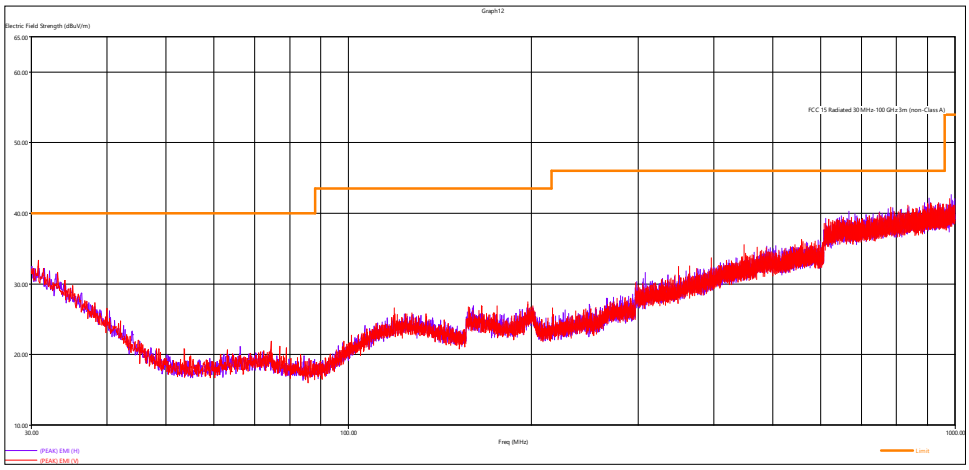

Figure 3 - Radiated Emissions Plot, Receive, A2 unit

No peak emissions were within 6dB of the limit, and the emissions from this plot are not tabulated.

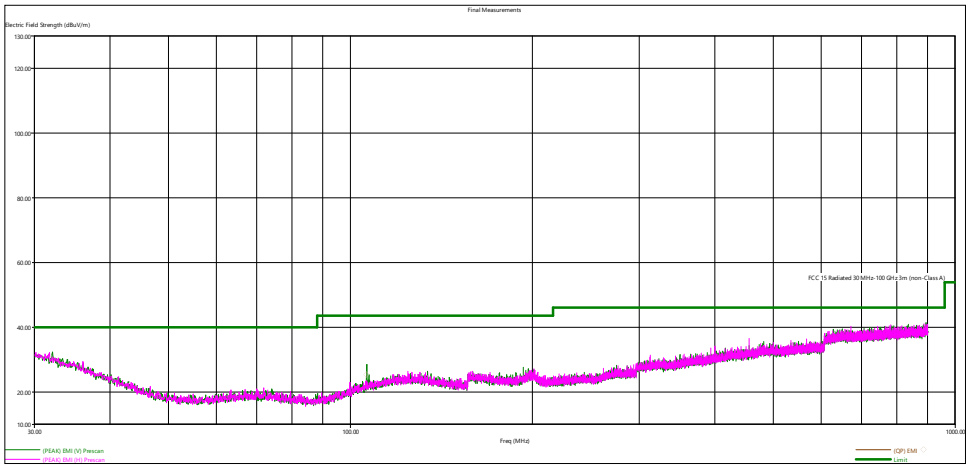

Figure 4 - Radiated Emissions Plot, Low Channel, 30M-900M, A1 unit

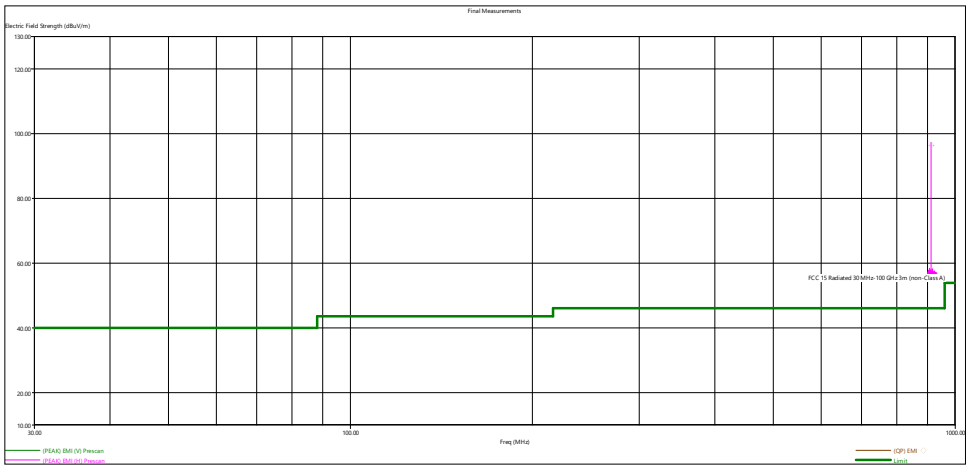

Figure 5 - Radiated Emissions Plot, Low Channel, 900M-930M, A1 unit

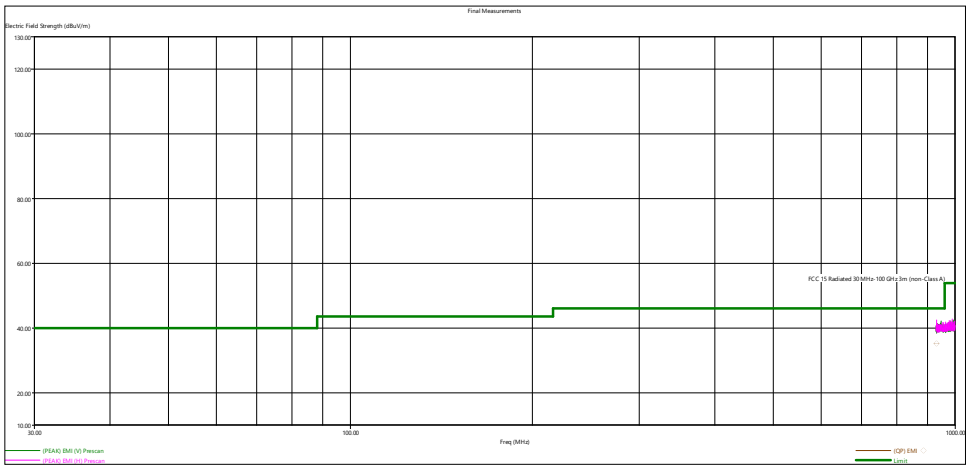

Figure 6 - Radiated Emissions Plot, Low Channel, 930M-1G, A2 unit

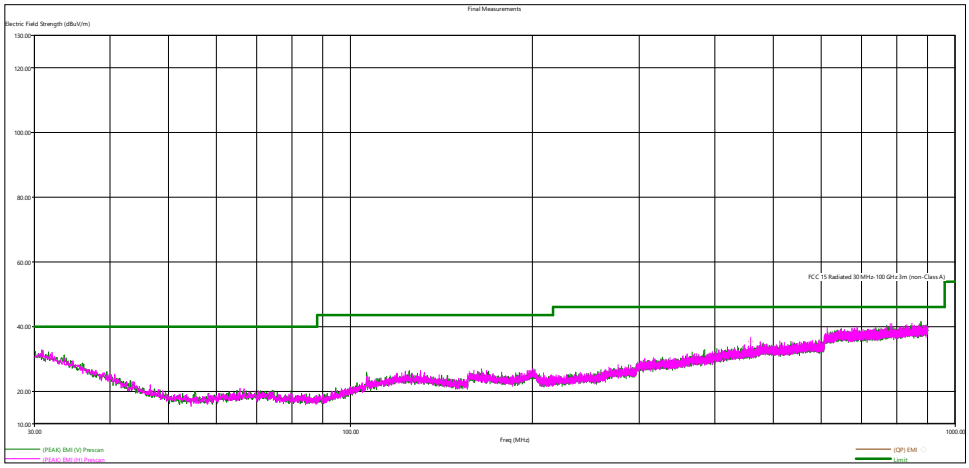

Figure 7 - Radiated Emissions Plot, Mid Channel, 30M-900M, A2 unit

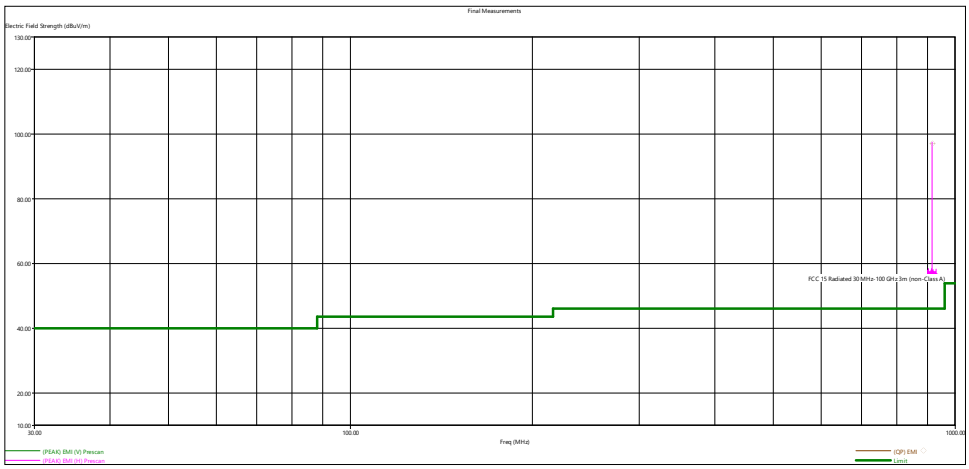

Figure 8 - Radiated Emissions Plot, Mid Channel, 900M-930M,A1 unit

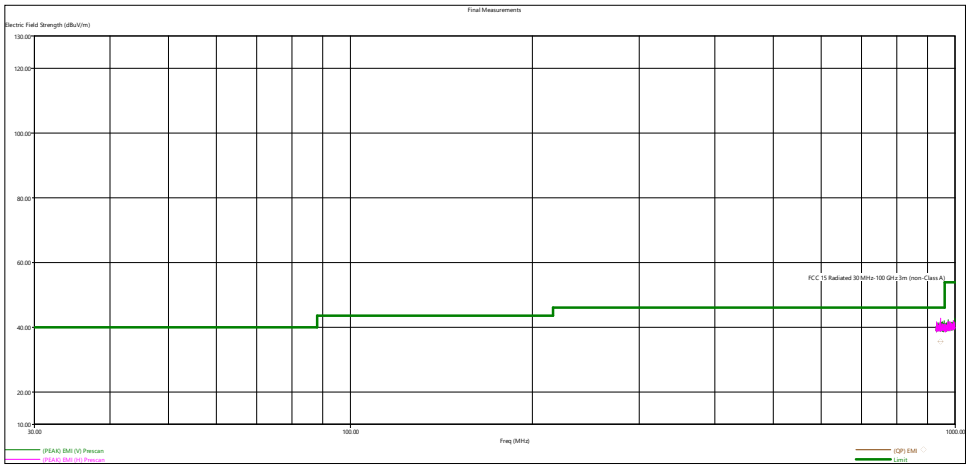

Figure 9 - Radiated Emissions Plot, Mid Channel, 930M-1G, A1 unit

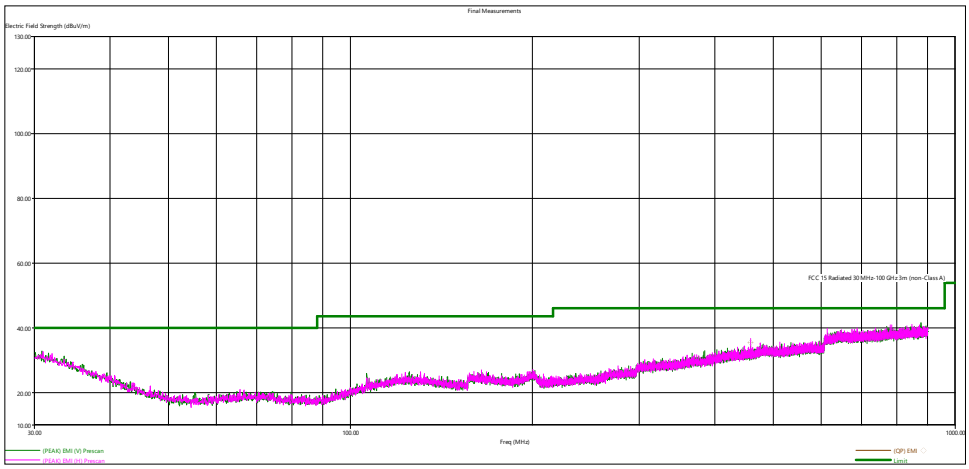

Figure 10 - Radiated Emissions Plot, High Channel, 30M-900M,A1 unit

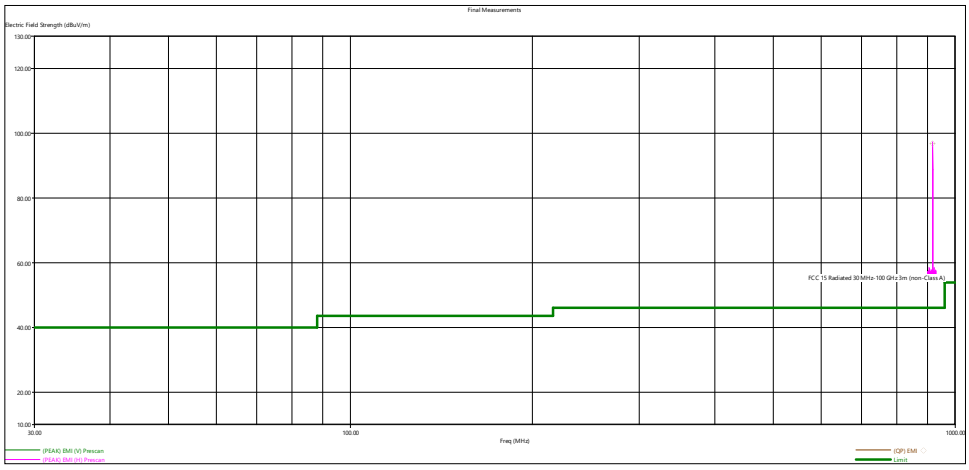

Figure 11 - Radiated Emissions Plot, High Channel, 900M-930M, A1 unit

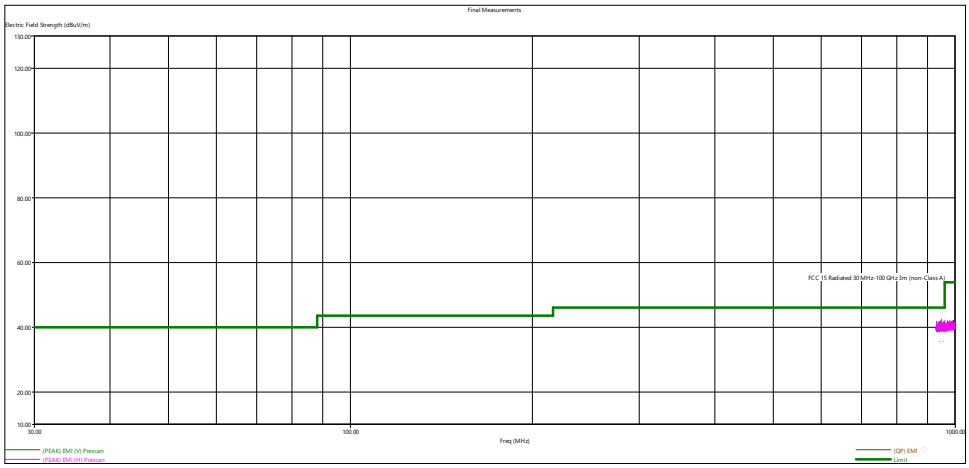

Figure 12 - Radiated Emissions Plot, High Channel, 930M-1G, A2 unit

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. It was found that the Horizontal position produced the highest emissions, and this orientation was used for all testing. See Annex A for test photos.

Quasi-Peak Measurements, 30 MHz -1 GHz*							
Frequency	**Level**	**Limit**	**Margin**	**Height**	**Angle**	**Pol**	**Channel**
MHz	**dBµV/m**	**dBµV/m**	**dB**	**cm.**	**deg.**		
106.246560	25.68	43.52	17.84	300.29	216.00	V	Low
912.069840	96.49	NA	NA	103.34	351.50	H	Low
930.841920	35.41	46.02	10.61	218.32	360.00	H	Low
457.456320	40.12	46.02	5.90	186.32	166.75	H	Mid
914.952960	97.11	NA	NA	103.52	352.00	H	Mid
946.141200	35.73	46.02	10.29	179.22	201.75	H	Mid
459.047760	35.68	46.02	10.34	188.53	156.50	H	High
918.055920	96.97	NA	NA	103.58	350.25	H	High
950.072160	35.62	46.02	10.40	348.11	238.75	H	High

*All other measurements found to be at least 6dB below the limit line.

Peak Measurements, 1 GHz - 10 GHz								
Frequency	Level	Limit	Margin	Height	Angle	Pol	EUT #	Channel
MHz	dBµV/m	dBµV/m	dB	cm.	deg.			
4573.504000	47.90	73.98	26.08	121.61	296.25	H	A1	RX
1824.090000	59.39	NA*	NA*	320.23	322.00	H	A1	Low
2736.980000	40.93	73.98	33.05	220.83	234.75	H	A1	Low
3648.316000	50.65	73.98	23.33	306.38	230.25	H	A2	Low
4560.304000	54.92	73.98	19.06	256.77	297.00	H	A1	Low
1829.940000	59.45	NA*	NA*	257.19	323.00	H	A1	Mid
3659.640000	51.85	73.98	22.13	211.08	235.25	H	A2	Mid
4575.252000	51.88	73.98	22.10	110.43	298.25	H	A1	Mid
1836.030000	52.87	NA*	NA*	316.35	221.25	H	A2	High
3672.316000	53.31	73.98	20.67	302.86	227.50	H	A2	High
4590.288000	56.92	73.98	17.06	148.46	295.75	H	A1	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	EUT #	Channel
MHz	dB	dBµV/m	dBµV/m	dB	cm.	deg.			
4573.504000	-4.44	43.46	53.98	10.52	121.61	296.25	H	A1	RX
1824.090000	-4.44	54.95	NA*	NA*	320.23	322.00	H	A1	Low
2736.980000	-4.44	36.49	53.98	17.49	220.83	234.75	H	A1	Low
3648.316000	-4.44	46.21	53.98	7.77	306.38	230.25	H	A2	Low
4560.304000	-4.44	50.48	53.98	3.5	256.77	297.00	H	A1	Low
1829.940000	-4.44	55.01	NA*	NA*	257.19	323.00	H	A1	Mid
3659.640000	-4.44	47.41	53.98	6.57	211.08	235.25	H	A2	Mid
4575.252000	-4.44	47.44	53.98	6.54	110.43	298.25	H	A1	Mid
1836.030000	-4.44	48.43	NA*	NA*	316.35	221.25	H	A2	High
3672.316000	-4.44	48.87	53.98	5.11	302.86	227.50	H	A2	High
4590.288000	-4.44	52.48	NA*	NA	148.46	295.75	H	A1	High

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.

4.3 PEAK OUTPUT POWER

Test Method: ANSI C63.10, Section(s) 11.9.2.2.2

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 an internal battery 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.

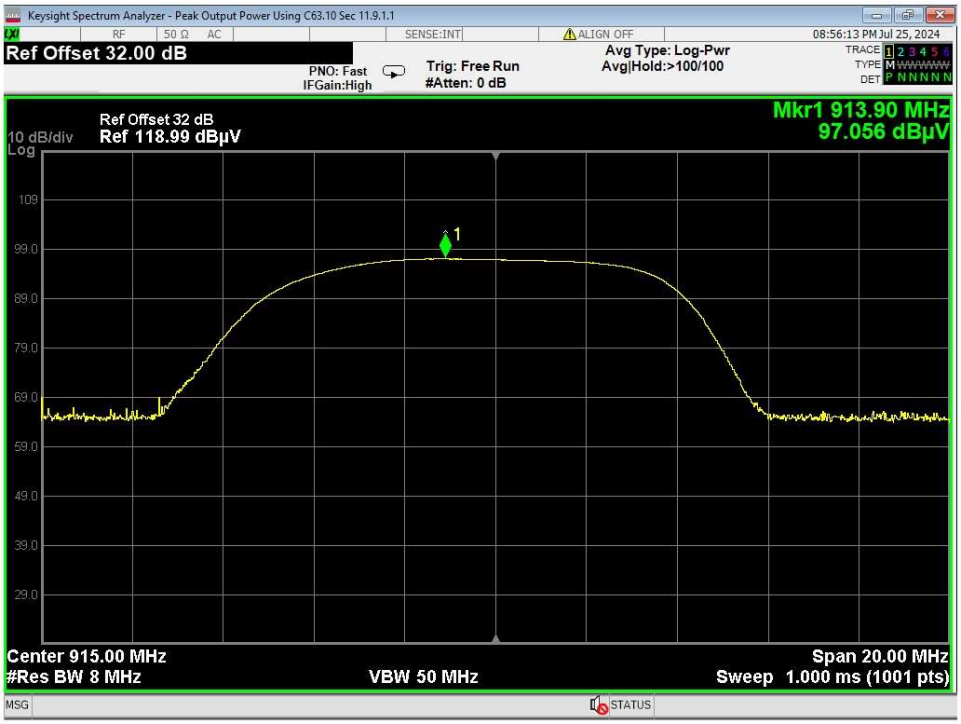

Figure 14 – Peak Field Strength, Mid Channel

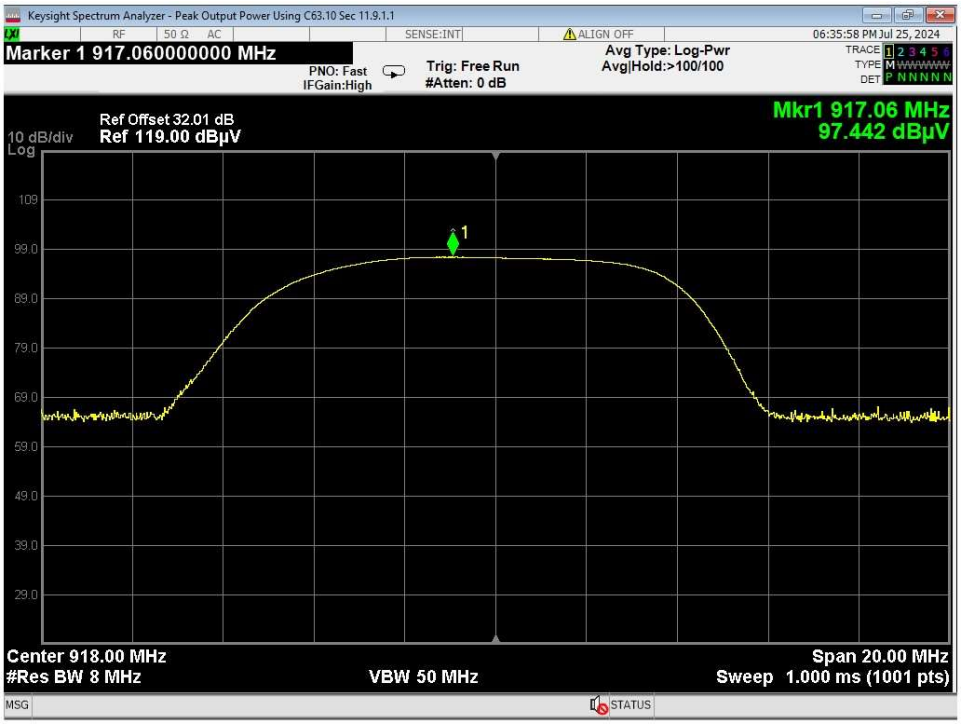

Figure 15 – Peak Field Strength, High Channel

4.4 BANDWIDTH

Test Method: ANSI C63.10, Section(s) 6.9.2 (20 dB BW)
ANSI C63.10, 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 through a distance of 3m.

EUT operating conditions:
The EUT was powered by an internal battery and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

Test results:

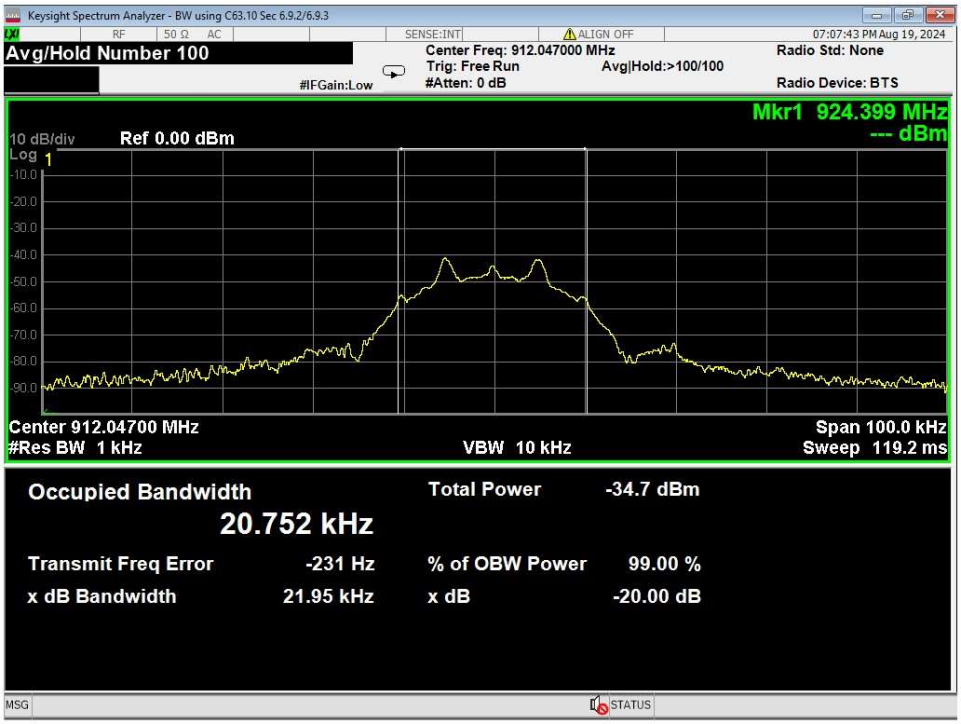

Figure 16 –Bandwidth, Low Channel

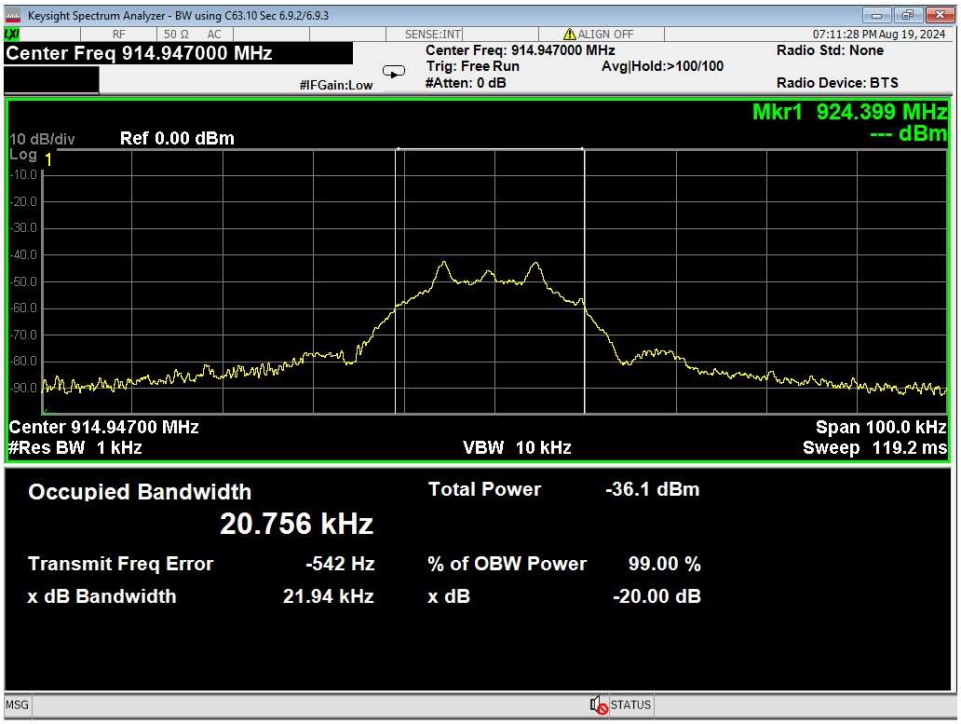

Figure 17 - Bandwidth, Mid Channel

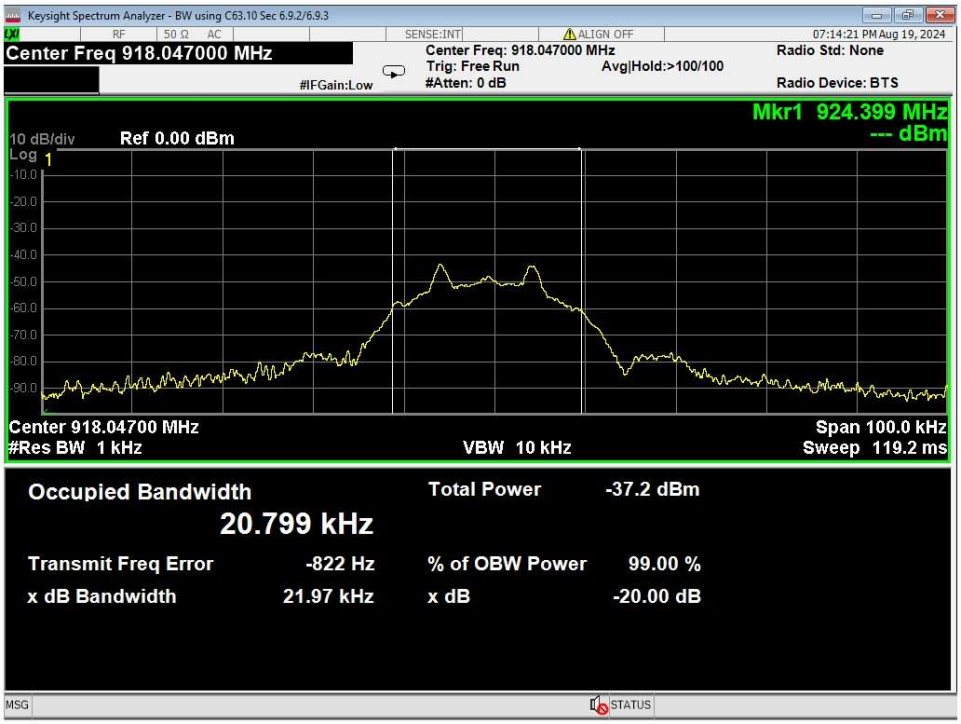

Figure 18 - Bandwidth, High Channel

4.5 BANDEDGES

Test Method: ANSI C63.10, 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 internal battery unless specified 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.

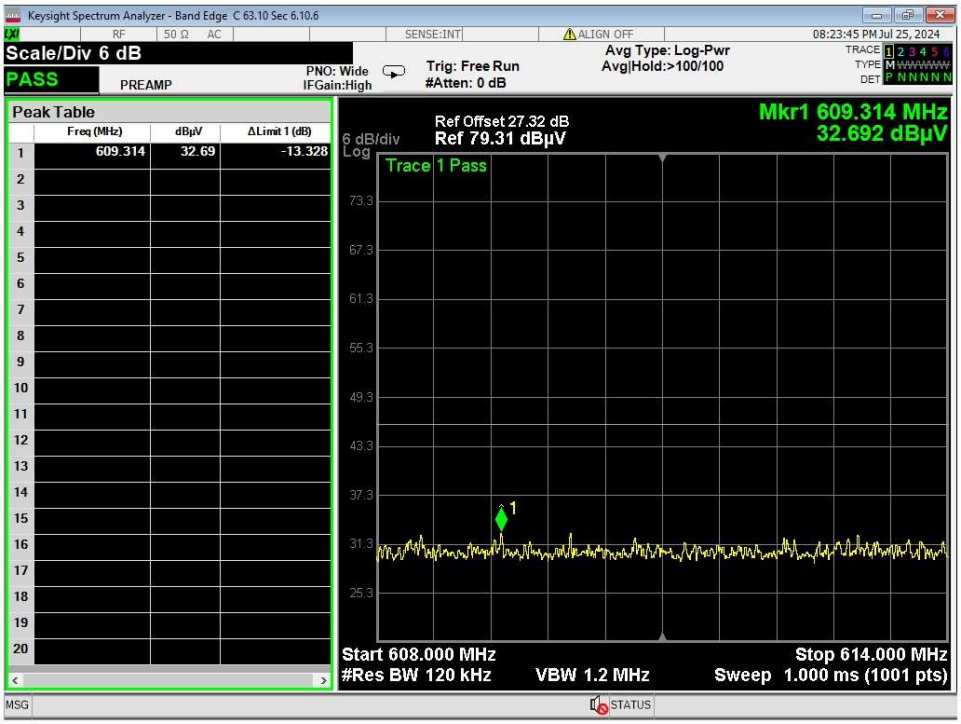

Figure 19 –Band-edge Measurement, Low Channel, Restricted Frequency

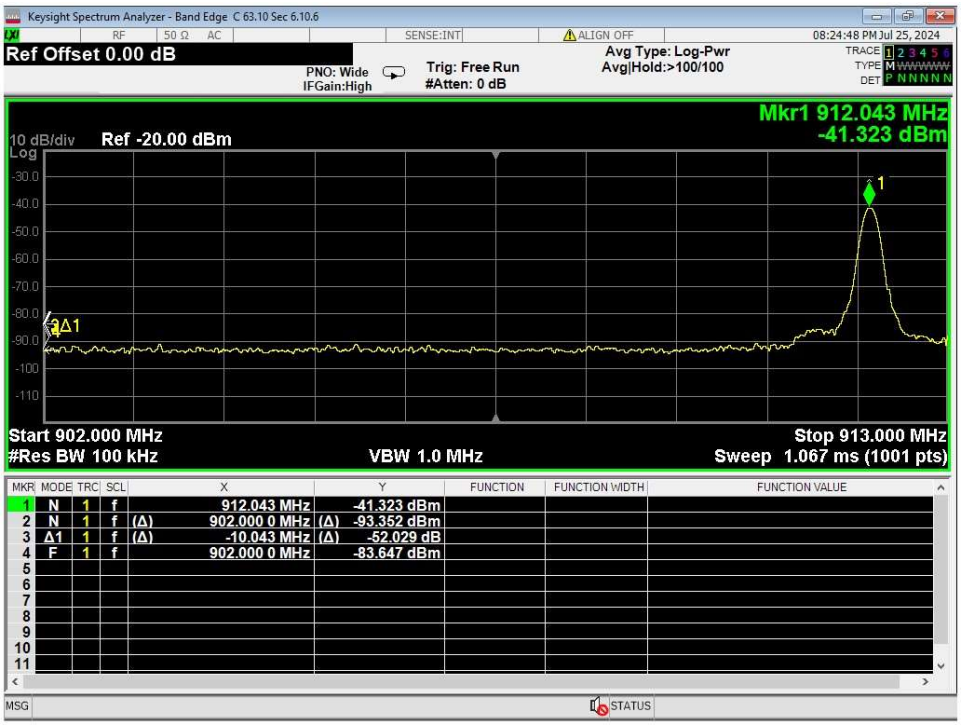

Figure 20 –Band-edge Measurement, Low Channel, Unrestricted Frequency

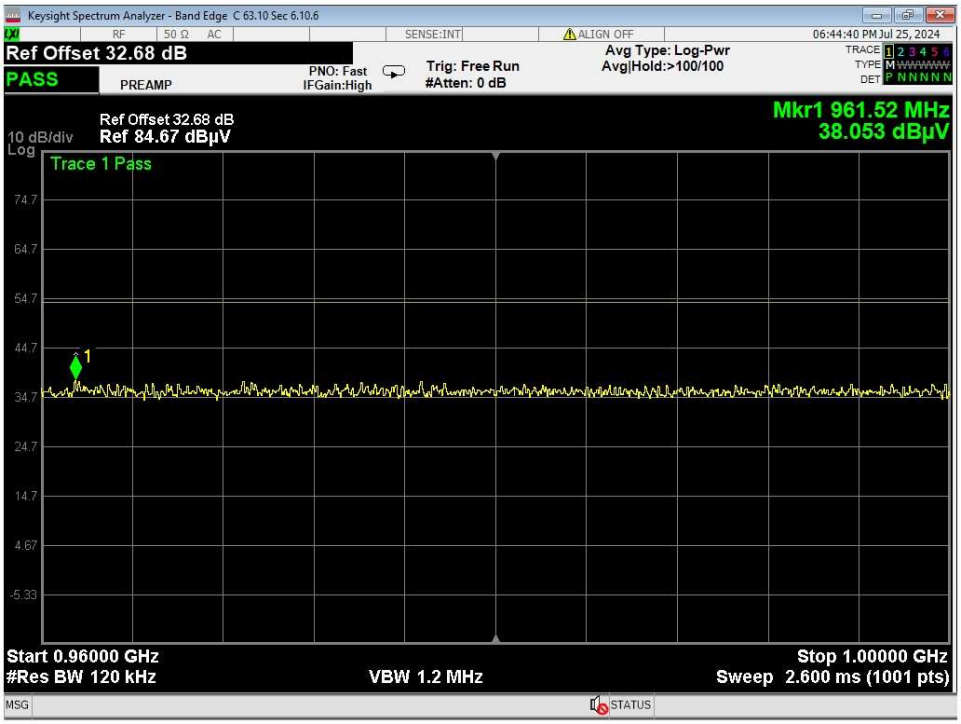

Figure 21 –Band-edge Measurement, High Channel, Restricted Frequency

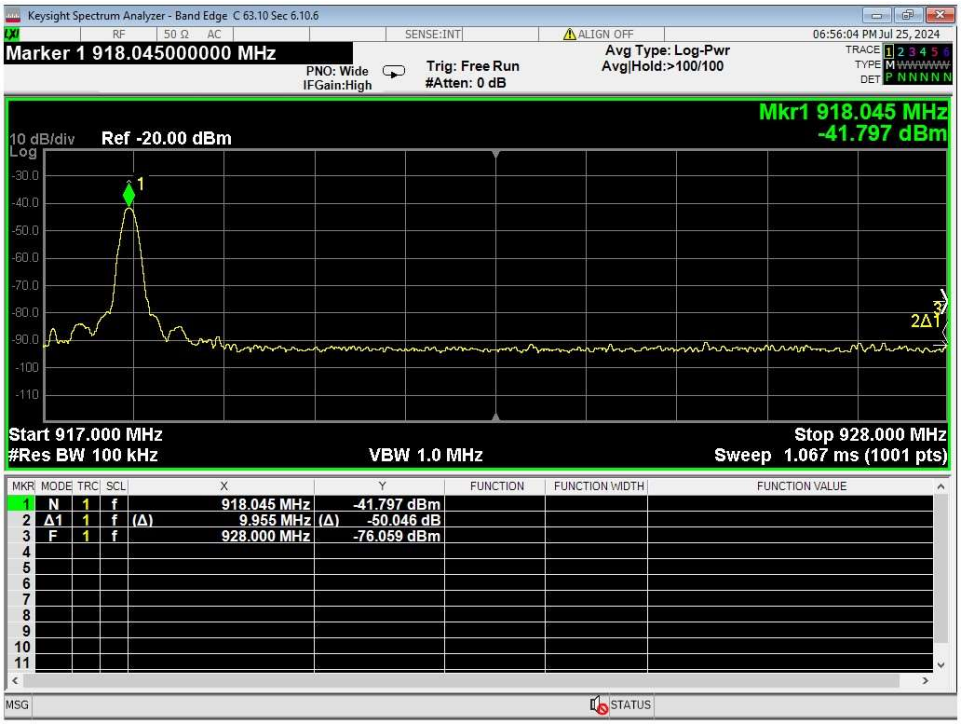

Figure 22 – Band-edge Measurement, High Channel, Unrestricted Frequency

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

Test Method: ANSI C63.10, 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 USB and set to Hopping mode.

Test results:

On time recorded was 120ms X 2 = 240ms.

Time of Occupancy =
240ms < 400ms (15.247 Limit)

Total Hop Count =
61 Channels

Frequency Separation: the minimum frequency separation meets the requirements:
Separation: 100kHz
20dB Bandwidth: 24.66kHz

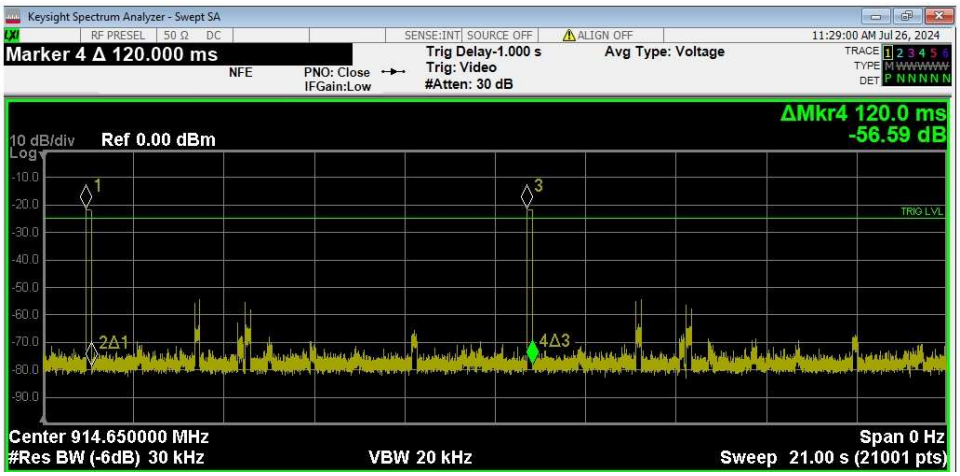

Figure 23 – On time, total duration

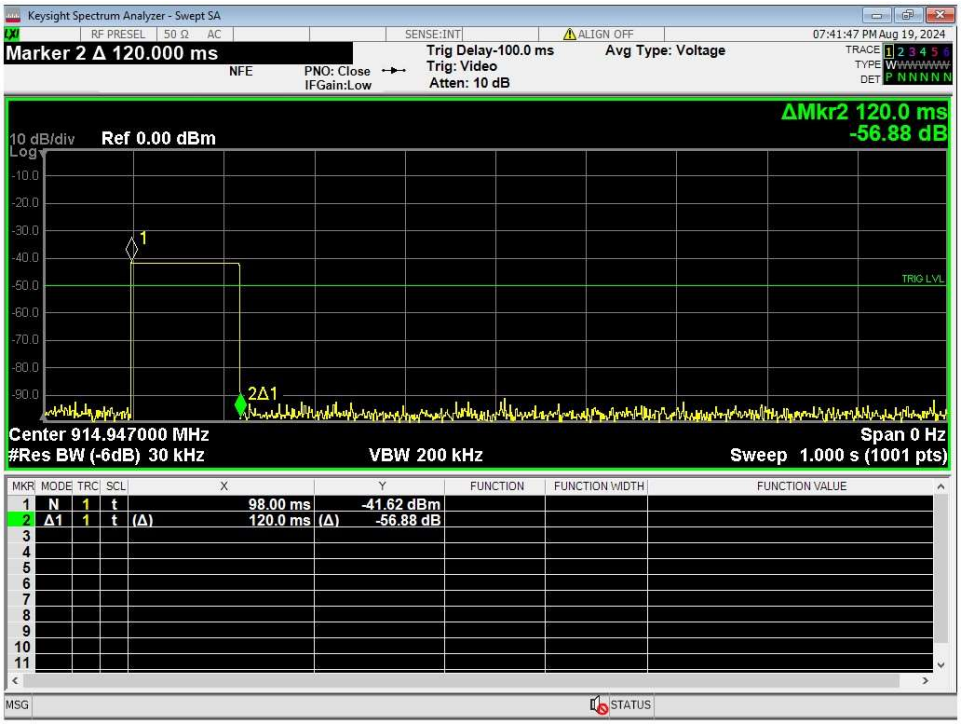

Figure 24 – On time, detail

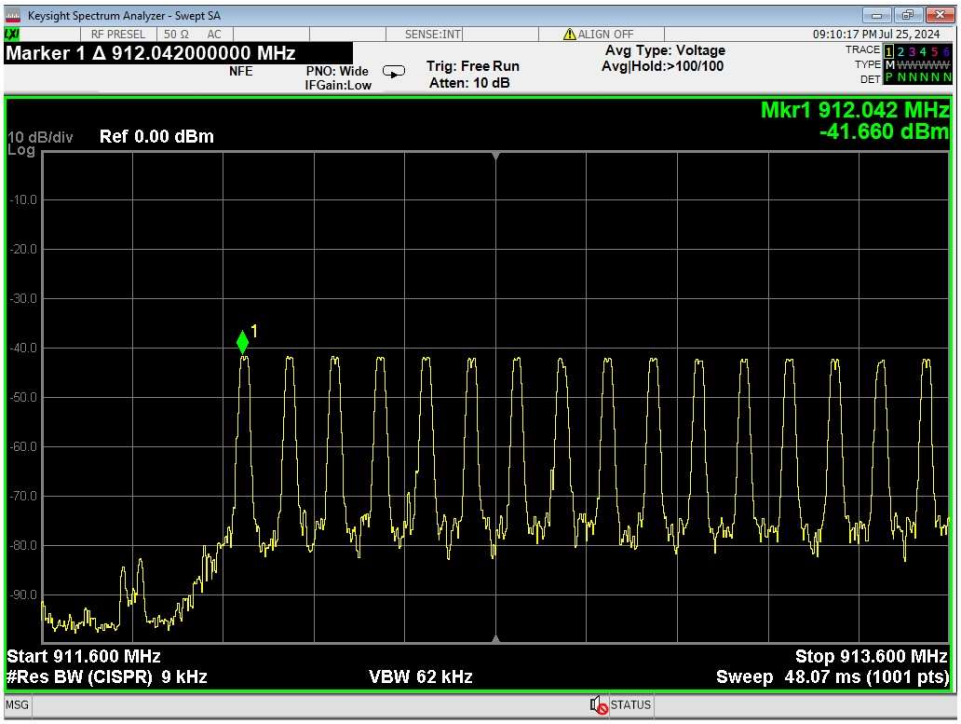

Figure 25 – Hop count, 911.6MHz to 913.6MHz

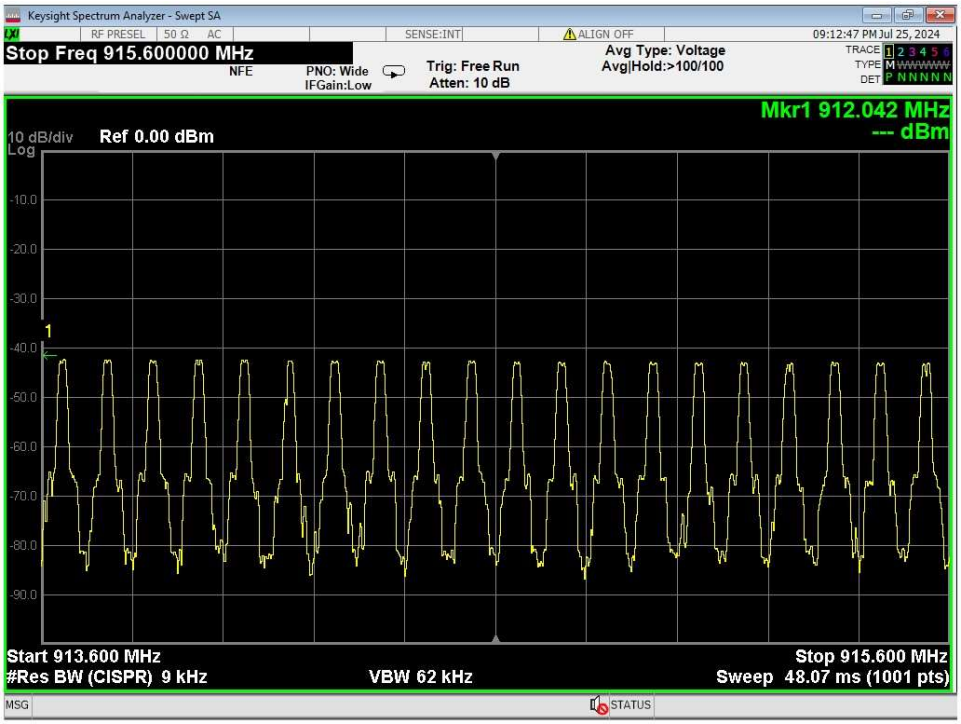

Figure 26 – Hop count, 913.6MHz to 915.6MHz

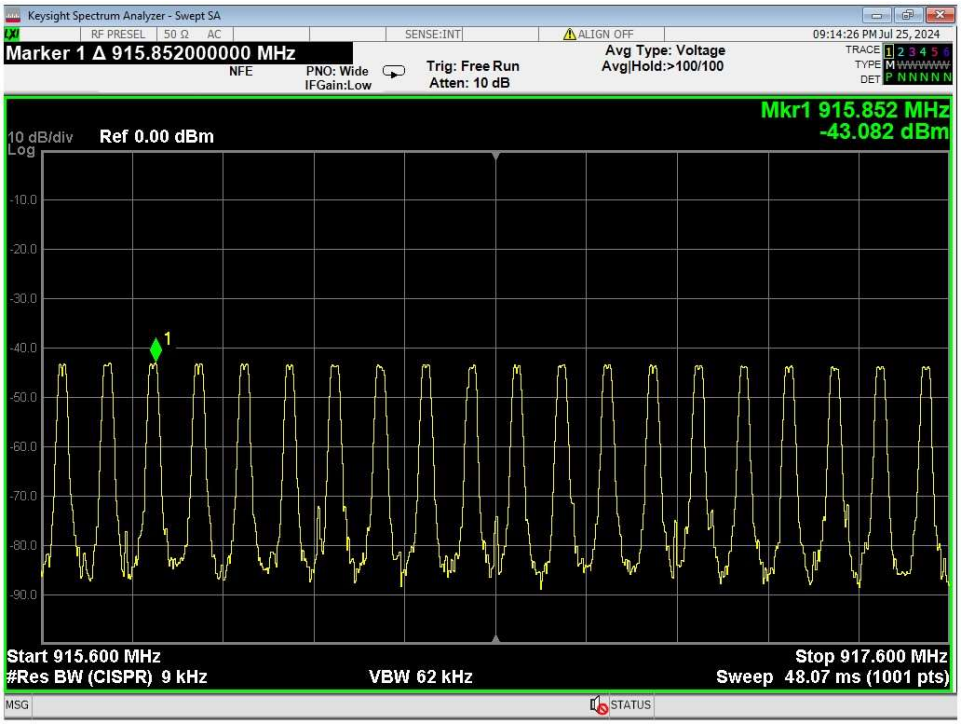

Figure 27 – Hop count, 915.6MHz to 917.6MHz

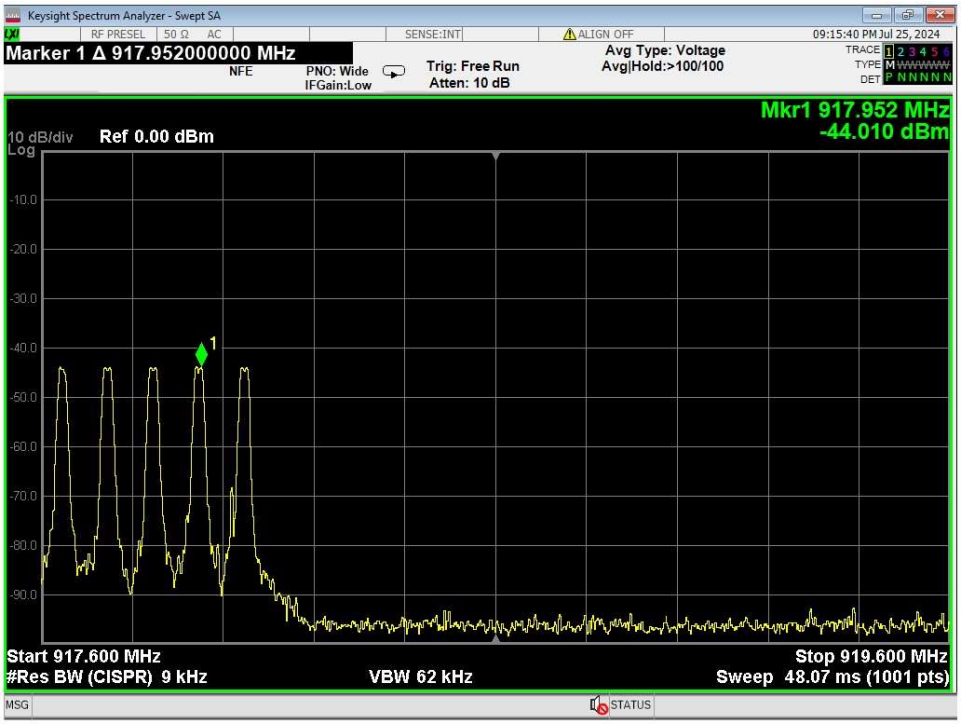

Figure 28 – Hop count, 917.6MHz to 919.6MHz

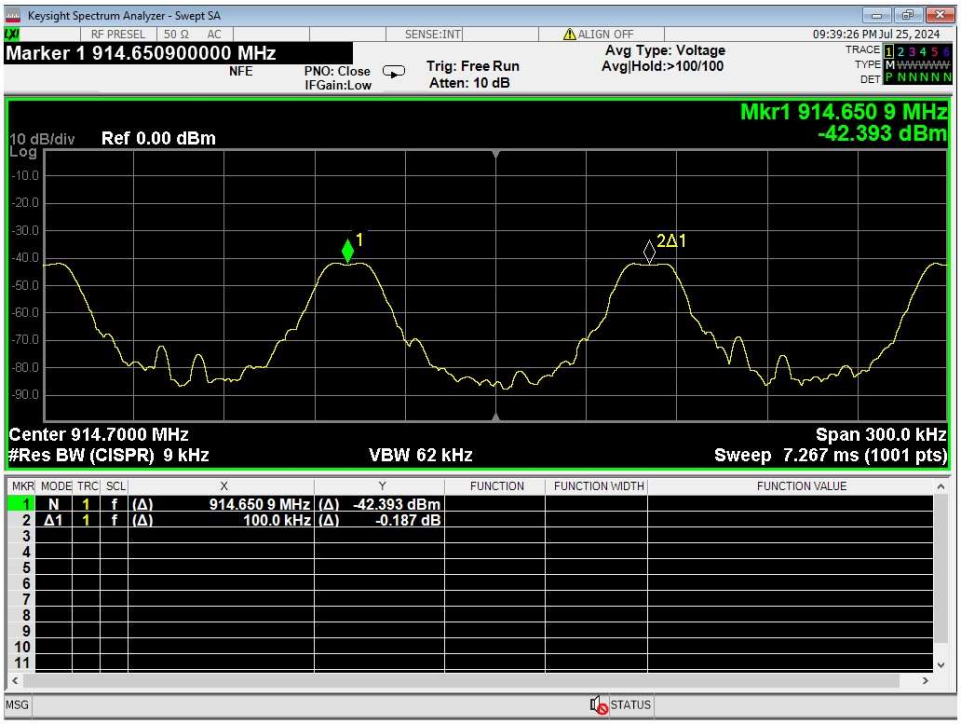

Figure 29 – Minimum Frequency Separation

4.7 CONDUCTED AC MAINS EMISSIONS

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

Limits for conducted emissions measurements:

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

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

Test Procedures:

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

Deviation from the test standard:
No deviation

EUT operating conditions:
Details can be found in section 2.1 of this report. USB power supply was used for AC Conducted Emissions.

Test Results:

Figure 30 - Conducted Emissions, Line

Figure 31 - Conducted Emissions, Neutral

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 dBµV

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Preamplifier Amplifier Gain

Assume a receiver reading of 55.00 dBµV 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 dBµV/m.

FS = 55.00 + 12.00 – (-1.10 + 20.00) = 48.1 dBµV/m

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

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

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 dBµV

IL = LISN Insertion Loss

CF = Cable Attenuation Factor

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	3.01	3.4
Radiated Emissions, 3m	30MHz - 1GHz	4.28	5.3
Radiated Emissions, 3m	1GHz – 6GHz	5.14	5.2
Radiated Emissions, 3m	6GHz – 18GHz	5.14	5.5

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 END