RF Test Report

Standard(s): FCC Part 15 Subpart 15.247,
RSS-247 Issue 3:2023
Unlicensed Intentional Radiators

Issued To: Jamstack Inc
2580 Bur Oak Ave
Markham, ON L6B 1J5
Canada

Product Name: Guitar Speaker
Model: Jamstack 2
FCC ID: 2BBQE-JAMSTACK2
IC: 24396-JAMSTACK2

Report No. ML300393-RF01
Date of Issue: June 24, 2024

Report Prepared By:	**Reviewed By:**
Min Xie, Sr. EMC/RF Engineer	Amir Emami, Project Engineer

Megalab Group Inc. – 150 Addison Hall Circle, Aurora, Ontario, L4G 3X8, Canada
www.megalabinc.com – (905) 752-1925

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1. Revision History

Project No. & Revision	Report Date	Initials	Description
ML300393-RF00	June 5, 2024	MX	Initial Release
ML300393-RF01	June 24, 2024	MX	Updated client information.

NOTE:

- Latest reports marked as a revision replace any previous report and/or report revision issued under the same project number.

Summary of Test Results

1.1 Test Verdict

Unless otherwise stated, the test data and results in this test report relate only to the sample(s) tested.

Requirement		Test Type	Result	Remark
FCC	ISED			
15.203 15.247(b)(4)	RSS-247 5.4(d)	Antenna Gain and Requirement	Pass	Internal PCB antenna with U.FL/MHF1 cable assemble; Peak Gain: 3.20 dBi
15.247(a)(1)	RSS-247 5.1	Emission Bandwidth	Pass	--
15.247(a)(1)	RSS-247 5.1	Channel Carrier Frequency Separation	Pass	> (2/3)20 dB BW
15.247(a)(1)	RSS-247 5.1	Number of Hopping Channels	Pass	>15
15.247(a)(1)	RSS-247 5.1	Time of Occupancy (Dwell Time)	Pass	< 0.4 s In 0.4 x N_{ch} s
15.247(b)	RSS-247 5.4	Peak Conducted Output Power	Pass	< 0.125 Watt
15.247(d)	RSS-247 5.5	Spurious Conducted Out of Band Emissions	Pass	< 20dBc
15.247(d)/ 15.209	RSS-GEN 8.9 (Table 5 & 6)	Transmitter Spurious Radiated Emissions	Pass	---
15.205 15.209	RSS-GEN 8.10 (Table 7)	Lower and Upper Band Edges	Pass	Transmitter spurious radiated emissions which fall in the restricted bands
15.207	RSS-GEN (Table 4)	Power Line Conducted Emissions	N/A	--

1.1.1 Test Verdict Notes and Justifications

The DUT was mounted in three orthogonal axes. Worst case results are presented. See the Test Setup Photos for axis details.

Antenna details obtained from Antenna Manufacturer’s Datasheet. As per FCC 15.203, the antenna is internally mounted, uses a U.FL/MHF1 connector, and has less than 6dBi gain.

1.2 Test Standards

Standard	Description
47 CFR FCC Part 15 Subpart C	Code of Federal Regulations – Radio Frequency Devices, Intentional Radiators
FCC KDB 558074:2019	Digital Transmission Systems, measurements and procedures
RSS-247 Issue 3:2023	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-GEN Issue 5:2021	General Requirements for Compliance of Radio Apparatus
ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ISO 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories

1.3 Test Facility

All tests were performed at Megalab Group Inc., located at 150 Addison Hall Circle, Aurora, ON, L4G 3X8, Canada.
The 10-meter semi-anechoic chamber for radiated emission and radiated immunity is designed to handle weights of up to 10,000lb and has power capability of over 100A. The turntable is capable of supporting test devices or systems either floor standing or table top of up to 4 meters wide and 3m tall. Conducted emissions, unless otherwise specified, are performed on a 2.44m x 2.48m ground plane and using a 2.44m x 2.48m vertical ground plane if applicable.

1.3.1 Accreditations

This report does not indicate any product endorsement by any government, accreditation agency, or Megalab Group Inc. Megalab Group Inc. shall have no liability for any deductions, interpretations or generalizations drawn by the client or others from the issued reports. If any opinions or interpretations are expressed in this report, they are outside Megalab Group Inc.'s scope of accreditation and do not necessarily reflect the opinions of Megalab Group Inc., unless otherwise specified.

A2LA (Certificate #5179.02)

Megalab Group Inc. is accredited to ISO/IEC 17025:2017 by the American Association for Laboratory Accreditation (A2LA) with Testing Certificate #5179.02. The laboratories current scope of accreditation can be found as listed on A2LA's website.

ISED

Megalab Group Inc. is registered with and recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory.
Company Number: 28697

FCC

Megalab Group Inc. is registered with and recognized by the Federal Communications Commission (FCC) as an accredited testing laboratory.
Registration No. 200040

VCCI

The Semi-anechoic chamber of Megalab Group Inc. is registered with the Regulations for Voluntary Control Council for Interference (VCCI). Registration No.: R-20173, G-20174, C-20132, T-20133.

1.3.2 Measurement Uncertainty

As per ISO/IEC 17025 requirements, an evaluation of the measurement uncertainties associated with the emission test results should be included in the test report.

Where relevant, the following measurement uncertainty levels have been estimated for the tests performed on the DUT as specified in CISPR 16-4-2. The measurement uncertainties given below are based on a coverage factor k = 2 which yields approximately a 95% level of confidence for the near-normal distribution typical of most measurement results.

Measurement	Frequency Range	Uncertainty
Conducted Emissions at AC Mains Power Port	150kHz to 30MHz	2.27 dB
Radiated Emissions	30MHz to 1GHz	5.22 dB
	1GHz to 18GHz	4.76 dB

1.3.3 Sample Calculations

Conducted Emissions

Emission Level (dBµV) =	Read Level (dBµV)	+	LISN Factor (dB)	+	Attenuation Factor (dB)	+	Cable Loss (dB)
=	34.8	+	0.1	+	10.0	+	0.2
=	45.1						

Margin (dB) =	Limit (dBµV)	-	Emission Level (dBµV)
=	60.0	-	45.1
=	14.9		

Radiated Emissions

Emission Level (dBµV/m) =	Read Level (dBµV)	+	Antenna Factor (dB/m)	+	Cable Loss (dB)	-	Pre-Amp Gain (dB)
=	52.4	+	9.4	+	1.3	-	29.2
=	33.9						

Margin (dB) =	Limit (dBµV/m)	-	Emission Level (dBµV/m)
=	50.0	-	33.9
=	16.1		

1.3.4 Terms, Definitions and Abbreviations

AE	Auxiliary Equipment
DUT	Device Under Test
DTS	Digital Transmission System
EMC	Electro-Magnetic Compatibility
FHSS	Frequency Hopping Spread Spectrum
ISM	Industrial, Scientific and Medical
LISN	Line Impedance Stabilization Network
N/A	Not Applicable
NCR	No Calibration Required
RF	Radio Frequency
RBW	Resolution Bandwidth
VBW	Video Bandwidth

Auxiliary Equipment/Support Equipment
Equipment needed to exercise and/or monitor the operation of the DUT.

Artificial Mains Network
Network that provides a defined impedance to the DUT at radio frequencies, couples the disturbance voltage to the measuring receiver and decouples the test circuit from the supply mains.

Class A Equipment
Equipment suitable for use in all locations other than those allocated in residential environments and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

Class B Equipment
Equipment suitable for use in all locations, including in residential environments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

Device Under Test
Device or system being evaluated for compliance with the requirements of the Test Standards listed in this report.

Electro-Magnetic Compatibility
Ability of equipment or system to function satisfactorily in its EM environment without introducing intolerable electromagnetic disturbances to anything in that environment.

Electromagnetic Disturbance
Any electromagnetic phenomenon which may degrade the performance of a device, equipment or system.

2. General Information

2.1 Client Information

Company	Jamstack Inc
Address	2580 Bur Oak Ave Markham, ON L6B 1J5 Canada
Contact	Christopher Prendergast
Email	support@jamstack.io

2.2 Device Under Test (DUT)

2.2.1 DUT Information

DUT Name	Guitar Speaker
DUT Model(s)	Jamstack 2
Serial Number	Engineering Sample
Power Source (AC / DC / Battery)	AC and Battery
Input Voltage (V) or Range	100 – 240Vac
Frequency (Hz) or Range	50 – 60 Hz
Rated Current (A)	0.5 A
Mode(s) of Operation	Continuous transmission
Connectors Available on DUT	USB 3/RCA
DUT Dimensions (L x W x H)	20.32 cm x 6.35 cm x 6.35 cm
Transmitter Information	
FCC ID	2BBQE-JAMSTACK2
IC	24396-JAMSTACK2
Technology Used	FHSS/Skaa
Operating Frequency	2403.5 MHz to 2477.3MHz
Modulation Type	FSK
Number of Channels	49: uses a minimum of 15 channels for each transmission.
Antenna Manufacturer	Eleven Engineering
Antenna Model	AN0001-A0648 V1.2
Antenna Type	Inverted-F
Antenna Gain	3.2 dBi

Note: Above antenna information is provided by the client. The characteristics and gain are obtained from the Antenna Manufacturer’s Data Sheet.

2.2.2 DUT Description

The DUT is a Guitar Speaker with Skaa transceiver and Modularly certified BLE transceiver.

2.3 Test Setup of DUT

2.3.1 Configuration

The DUT was configured in a direct test mode with the following parameters

- For all the tests, the DUT was set to transmit continuously with 100% duty cycle
- Output Power setting: 00
- Channels:
    - 0 (low, 2403.5 MHz),
    - 24 (Mid, 2440.4 MHz),
    - 48 (High, 2477.3 MHz)
- Packet Type: Random

During all radiated emission measurements, the DUT was mounted in three orthogonal axes. See Test Setup Photos for axis details.

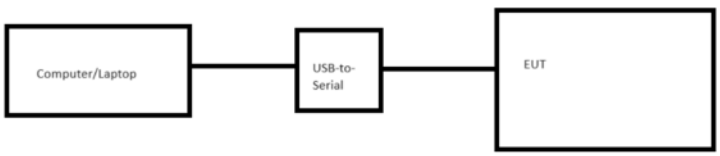

Figure 1 – Configuration Block Diagram

Description of I/O Cables			
Cable Function	**Length of Cable (m)**	**Shielded (Y/N)**	**Outdoor Use (Y/N)**
Audio (RCA)	0.5	N	N
USB 3	0.5	N	N

2.3.2 Support Equipment

Device	Manufacturer	Model	S/N
USB to serial adaptor	---	---	---

2.4 Modifications for Compliance

The following modifications were made to the device under test to achieve compliance:

- Updated firmware with proper modulation which lowers the 20 dB emission bandwidth.

3. Test Results

3.1 Emission Bandwidth

Test Date:	August 30, 2023	Initials:	MX
Temperature (°C)	23.5		
Relative Humidity (%)	50.6		
Barometric Pressure (kPa)	97.5		

During this test, the transmitter's 20 dB and 99% emission bandwidth will be examined and verify that the upper and lower frequency are always kept within the working frequency range band.

3.1.1 Limits

Systems using frequency hopping techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands with maximum allowable 20 dB bandwidth, specified in FCC 15.247 (a)(1) and RSS-247 Section 5.1, summarized below:

Frequency Band	Maximum 20 dB Bandwidth Limit
902–928 MHz	500 kHz
2400–2483.5 MHz	N/A*
5725–5850 MHz	1 MHz

*Note: FCC 15.247 and RSS-247 did not explicitly specify a maximum 20 dB bandwidth for FHSS operating in the 2400–2483.5 MHz band. The maximum 20 dB bandwidth is implicitly limited by the minimum number of hopping channels; i.e., the 20 dB bandwidth multiplied by minimum number of channels shall be within the 2400–2483.5 MHz band.

For 2400–2483.5 MHz band, the minimum number of channels specified is 15 channels. Thus, the maximum 20 dB bandwidth shall be less than 5.5 MHz (83.5 MHz/15).

99% bandwidth limit is not specified but is required for certification application.

3.1.2 Test Procedure

Tested according to ANSI C63.10 Section 6.9.2 for 20 dB bandwidth and Section 6.9.3 for 99% bandwidth.

For 20 dB Emission Bandwidth:

a) Set RBW in the range of 1% to 5% of the actual occupied bandwidth.
b) Set VBW ≥ [3 × RBW].
c) Span set to 2 to 5 times the occupied bandwidth.
d) Detector: Peak
e) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

For 99% Emission Bandwidth:

a) Set RBW in the range of 1% to 5% of the actual occupied bandwidth.
b) Set VBW ≥ [3 × RBW].
c) Span set to 1.5 to 5 times the occupied bandwidth.
d) Detector: Peak
e) Use the 99% power bandwidth function of the instrument to measure bandwidth.

3.1.3 Test Results

The DUT met the 20 dB requirement.

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	Test Result
Low	2403.5	2.27	Pass
Mid	2440.5	2.28	Pass
High	2477.3	2.26	Pass

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Test Result
Low	2403.5	2.45	Pass
Mid	2440.5	2.43	Pass
High	2477.3	2.43	Pass

Figure 2 – 20 dB Bandwidth - Low Channel

Figure 3 – 20 dB Bandwidth - Mid Channel

Figure 4 – 20 dB Bandwidth - High Channel

Figure 5 – 99% Bandwidth - Low Channel

Figure 6 – 99% Bandwidth - Mid Channel

Figure 7 – 99% Bandwidth - High Channel

3.1.4 Test Equipment List

Equipment ID	Description	Manufacturer	Model	Calibration Date	Calibration Due
EQ_EMC_58	EMI Receiver	Rohde & Schwarz	ESW 44	Feb 03, 2022	Feb 03, 2024
EQ_EMC_115	10dB Attenuator	Fairview Microwave	SA18E-10	NCR	NCR

3.2 Channel Carrier Frequency Separation

Test Date:	August 31, 2023	Initials:	MX
Temperature (°C)	23.0		
Relative Humidity (%)	45.5		
Barometric Pressure (kPa)	98.3		

During this test, the channel carrier frequency separation of the transmitter will be examined. This specification facilitates the prevention of data corruption while also indirectly limiting the power density of a transmitter which enable other transmitters to coexist in the same frequency band.

3.2.1 Limits

Systems using frequency hopping techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands with minimum allowable channel carrier frequency separation - Δf, specified in FCC 15.247 (a)(1) and RSS-247 Section 5.1, summarized below:

Frequency Band	Minimum Channel Separation	
	$P_{max\text{-}pk} \leq 1$ W	
902–928 MHz	$\Delta f \geq$ MAX {25 kHz, BW_{20dB}} $BW_{20dB} \leq$ 250 kHz	$\Delta f \geq$ MAX {25 kHz, BW_{20dB}} Provided: 250 kHz $\leq BW_{20dB} \leq$ 500 kHz $P_{max\text{-}pk} \leq 0.25$ W
2400–2483.5 MHz	$\Delta f \geq$ MAX {25 kHz, BW_{20dB}} Max. BW_{20dB} not specified	$\Delta f \geq$ [MAX {25 kHz, $\frac{2}{3}BW_{20dB}$} OR MAX {25 kHz, BW_{20dB}}] Provide: Max. BW_{20dB} not specified $P_{max\text{-}pk} \leq 0.125$ W
5725–5850 MHz	$\Delta f \geq$ MAX {25 kHz, BW_{20dB}} $BW_{20dB} \leq$ 1 MHz	

The DUT's operates in the 2400–2483.5 MHz band and its' maximum power is less than 0.125 W. The applicable limit is therefore, the larger of two-thirds of the 20 dB BW or 25 kHz. The system's highest 20 dB BW was measured to be 2.28 MHz and two-thirds of 2.28 MHz is 1.52 MHz. The minimum channel separation limit is 1.52 MHz.

3.2.2 Test Procedure

Tested according to ANSI C63.10 Section 7.8.2.

For Channel Carrier Frequency Separation

a) Set RBW approximately to 30% of the channel spacing; adjust as necessary to identify the center of each channel.
b) Set VBW ≥ RBW.
c) Detector: Peak
d) Span set to wide enough to capture at least two adjacent channels

3.2.3 Test Results

The DUT met the minimum channel separation limit. The channel separation is 1.58 MHz which is larger than 1.52 MHz. The EUT meets $P_{max\text{-}pk}$ (0.082 W) ≤ 0.125 W condition.

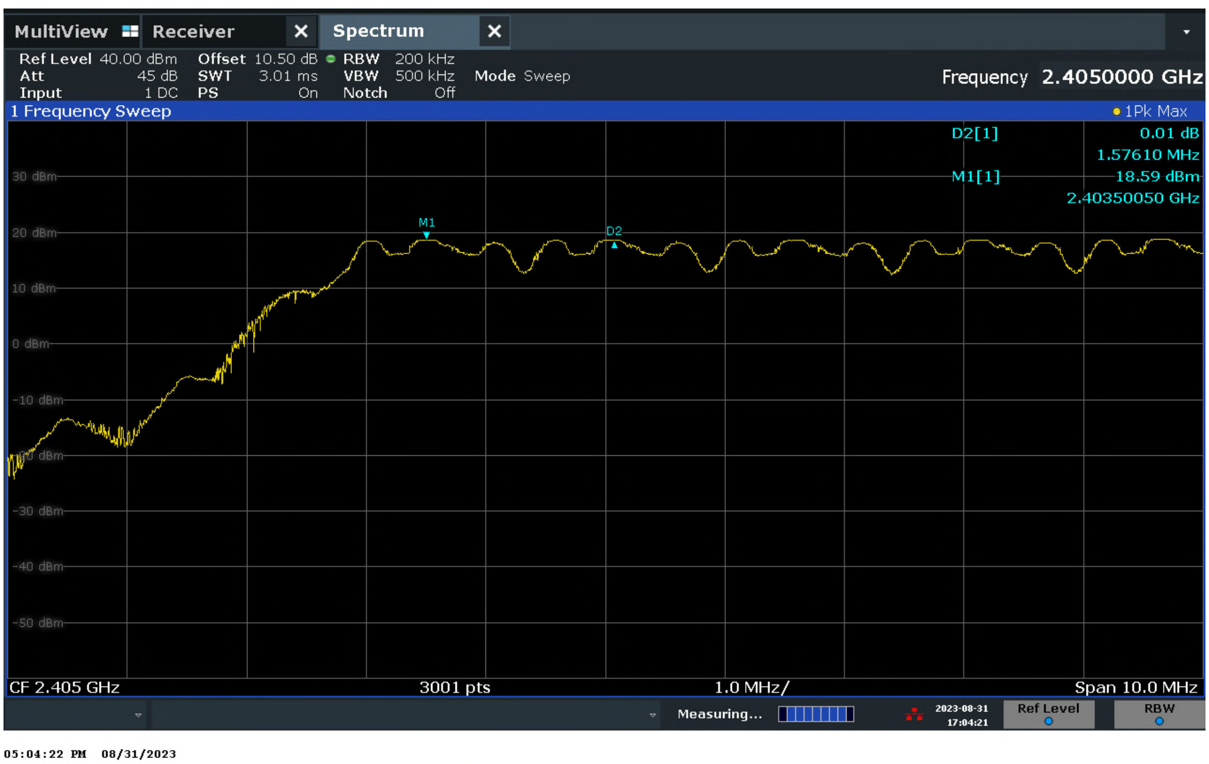

Figure 8 – Channel Separation

3.2.4 Test Equipment List

Equipment ID	Description	Manufacturer	Model	Calibration Date	Calibration Due
EQ_EMC_58	EMI Receiver	Rohde & Schwarz	ESW 44	Feb 03, 2022	Feb 03, 2024
EQ_EMC_115	10dB Attenuator	Fairview Microwave	SA18E-10	NCR	NCR

3.3 Number of Hopping Channels

Test Date:	August 31, 2023	Initials:	MX
Temperature (°C)	23.0		
Relative Humidity (%)	45.5		
Barometric Pressure (kPa)	98.3		

During this test, the Number of Hopping Channels of the transmitter will be examined. This specification limits the power density of a transmitter which enable other transmitters to coexist in the same frequency band.

3.3.1 Limits

Systems using frequency hopping techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands with minimum Number of Hopping Channels - N_{ch}, specified in FCC 15.247 (a)(1) and RSS-247 Section 5.1, summarized below:

Frequency Band	**Minimum Number of Hopping Channels**	
	$P_{max\text{-}pk} \leq 1$ W	
902–928 MHz	$N_{ch} \geq 50$	$25 \leq N_{ch} \leq 50$ Provided: $P_{max\text{-}pk} \leq 0.25$ W
2400–2483.5 MHz	$N_{ch} \geq 75$	$N_{ch} \geq 15$ Provided: $P_{max\text{-}pk} \leq 0.125$ W
5725–5850 MHz	$N_{ch} \geq 75$	

The DUT's operates in the 2400–2483.5 MHz band and its' maximum power is less than 0.125 W. The applicable limit is therefore, $N_{ch} \geq 15$.

3.3.2 Test Procedure

Tested according to ANSI C63.10 Section 7.8.3.

For Number of Hopping Channels

a) Set RBW less than 30% of the channel spacing or 20 dB bandwidth, whichever is smaller; adjust as necessary to identify each channel.
b) Set VBW ≥ RBW.
c) Detector: Peak
d) Span set to wide enough to capture the whole band; maybe necessary to divide the band into multiple spans if individual channels is not clearly seen.

3.3.3 Test Results

The DUT met the minimum number of channels requirement. The number of channels the device occupies is 49 channels.

Figure 9 – Number of Hopping Channels – Plot 1

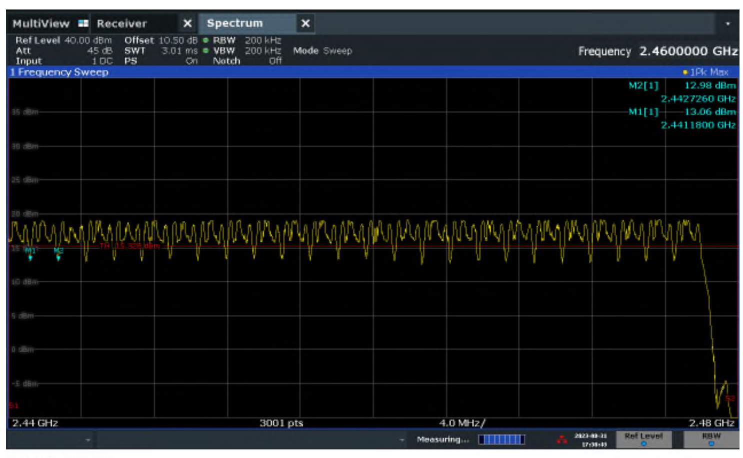

Figure 10 – Number of Hopping Channels – Plot 2

3.3.4 Test Equipment List

Equipment ID	Description	Manufacturer	Model	Calibration Date	Calibration Due
EQ_EMC_58	EMI Receiver	Rohde & Schwarz	ESW 44	Feb 03, 2022	Feb 03, 2024
EQ_EMC_115	10dB Attenuator	Fairview Microwave	SA18E-10	NCR	NCR

3.4 Time of Occupancy (Dwell Time)

Test Date:	August 31, 2023	Initials:	MX
Temperature (°C)	23.0		
Relative Humidity (%)	45.5		
Barometric Pressure (kPa)	98.3		

During this test, the Time of Occupancy for each channel of the transmitter will be examined. This specification limits the time a channel is occupied which enable other transmitter to coexist in the same frequency band.

3.4.1 Limits

Systems using frequency hopping techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands with maximum Time of Occupancy for each channel - t_{ch}, specified in FCC 15.247 (a)(1) and RSS-247 Section 5.1, summarized below:

Frequency Band	**Maximum Time of Occupancy**	
	$P_{max\text{-}pk} \leq 1$ W	
902–928 MHz	$BW_{20dB} \leq 250$ kHz $t_{ch} \leq 0.4$ s for $T = 20$ s	$t_{ch} \leq 0.4$ s for $T = 10$ s Provided: $P_{max\text{-}pk} \leq 0.25$ W 250 kHz $\leq BW_{20dB} \leq$ 500 kHz
2400–2483.5 MHz	$N_{ch} \geq 75$ $t_{ch} \leq 0.4$ s for $T = 0.4\ N_{ch}$ s	$t_{ch} \leq 0.4$ s for $T = 0.4\ N_{ch}$ s Privided: $P_{max\text{-}pk} \leq 0.125$ W $N_{ch} \geq 15$
5725–5850 MHz	$t_{ch} \leq 0.4$ s for $T = 30$ s	

The DUT's operates in the 2400–2483.5 MHz band and its' maximum power is less than 0.25 W. The applicable limit is therefore, $t_{ch} \leq 0.4$ s for $T = 0.4\ N_{ch}$ s.

3.4.2 Test Procedure

Tested according to ANSI C63.10 Section 7.8.4.

For Dwell Time per Hop

a) Set RBW less than channel spacing
b) Detector: Peak
c) Span: Zero span, centered on a hopping channel
d) Sweep: Single
e) Sweep Time: long enough to capture start and end of a transmission

For Number of Hop

a) Sweep Time: long enough to capture at least 2 hops
b) The number of hops within T is calculated from the number of hops on the channel divided by the Sweep Time multiplied by T

The Time of Occupancy is calculated by multiplying the dwell time per hop by the number of hops in T.

3.4.3 Test Results

The Observation time, T, is 0.4 second x 49 channels = 19.6 s.

There are 4 hops in 1 second. The number of hops per Observation time is (4/1) x 19.6 = 79 hops.

The DUT's dwell time per hop is 4.6 ms.

The DUT has an average occupancy t_{ch} of 79 x 4.6 ms = 363.4 ms (0.36 s) which is less than 0.4 s.

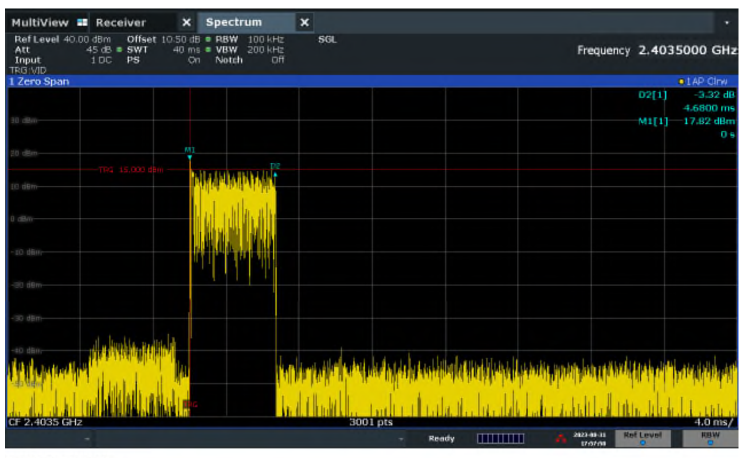

Figure 11 – Dwell Time per Hop

Figure 12 – Number of Hops per Sweep Time

3.4.4 Test Equipment List

Equipment ID	Description	Manufacturer	Model	Calibration Date	Calibration Due
EQ_EMC_58	EMI Receiver	Rohde & Schwarz	ESW 44	Feb 03, 2022	Feb 03, 2024
EQ_EMC_115	10dB Attenuator	Fairview Microwave	SA18E-10	NCR	NCR

3.5 Output Power

Test Date:	August 30, 2023	Initials:	MX
Temperature (°C)	23.5		
Relative Humidity (%)	50.6		
Barometric Pressure (kPa)	97.5		

3.5.1 Limits

Systems using frequency hopping techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands with maximum peak conducted power, specified in FCC 15.247 (b) and RSS-247 Section 5.4, summarized below:

Frequency Band	Maximum Peak Conducted Power	
902–928 MHz	$P_{max\text{-}pk} \leq 1$ W Provided: $N_{ch} \geq 50$	$P_{max\text{-}pk} \leq 0.25$ W Provided: $25 \leq N_{ch} \leq 50$
2400–2483.5 MHz	$P_{max\text{-}pk} \leq 1$ W Provided: $N_{ch} \geq 75$	$P_{max\text{-}pk} \leq 0.125$ W Provided: $N_{ch} \geq 15$
5725–5850 MHz	$P_{max\text{-}pk} \leq 1$ W Provided: $N_{ch} \geq 75$	

3.5.2 Test Procedure

Tested according to ANSI C63.10 Section 7.8.5.

For Peak Conducted Output Power

a) Set RBW > 20 dB emission bandwidth
b) Set VBW ≥ RBW
c) Detector: Peak
d) Span: Approximately 5 times 20 dB emission bandwidth
e) Trace: Max-hold

The RF output of the DUT was connected to the spectrum analyzer with sufficient attenuation in front and the total path loss was set as reference offset to correct the final reading.

3.5.3 Test Results

The EUT meets power limits of 0.125 W. The EUT meets N_{ch} (49) ≥ 15 condition.

Channel	Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)	Peak Power (W)	Limit (W)	Test Result
Low	2403.5	18.67	73.62	0.074	0.25	Pass
Mid	2440.5	18.96	78.70	0.079	0.25	Pass
High	2477.3	19.16	82.41	0.082	0.25	Pass

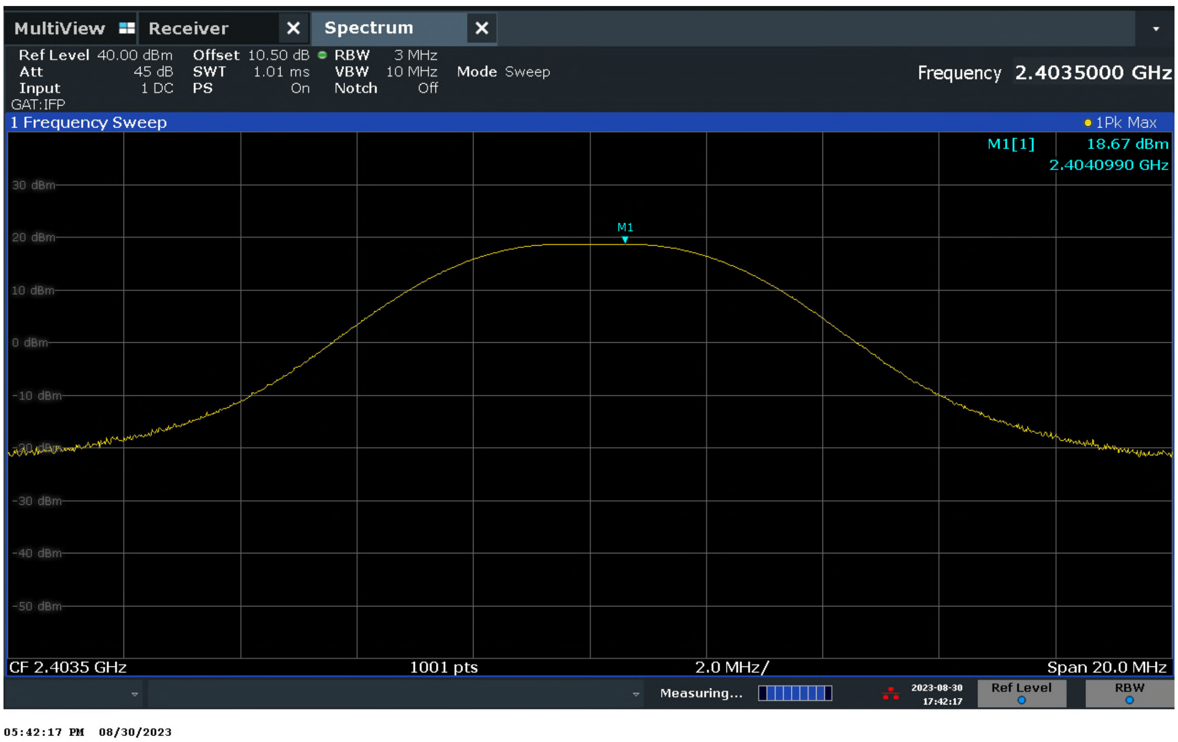

Figure 13 – Peak Power - Low Channel

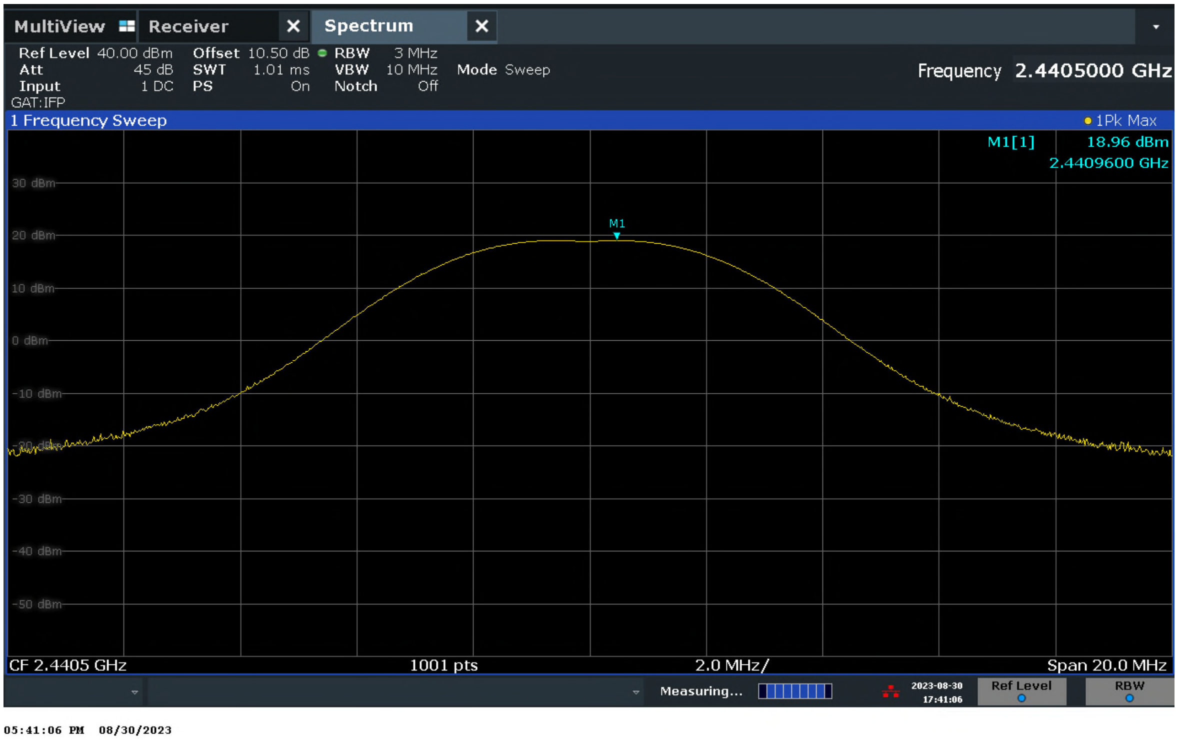

Figure 14 – Peak Power - Mid Channel

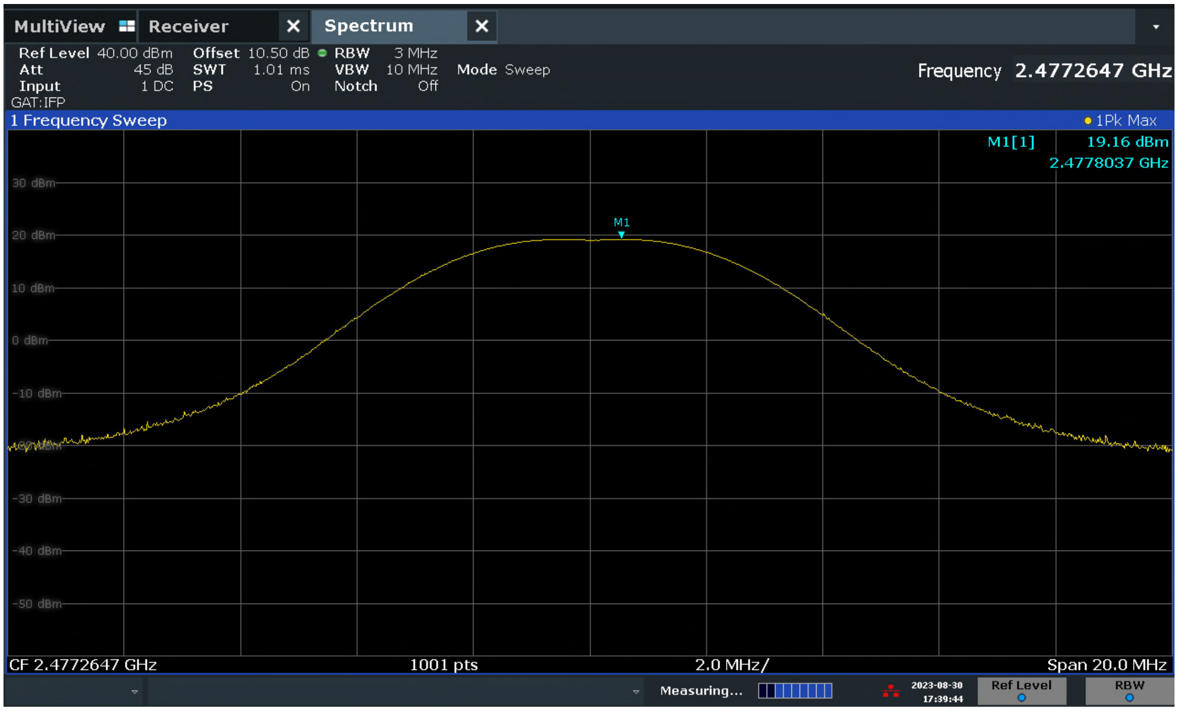

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Figure 15 – Peak Power - High Channel

3.5.4 Test Equipment List

Equipment ID	Description	Manufacturer	Model	Calibration Date	Calibration Due
EQ_EMC_58	EMI Receiver	Rohde & Schwarz	ESW 44	Feb 03, 2022	Feb 03, 2024
EQ_EMC_115	10dB Attenuator	Fairview Microwave	SA18E-10	NCR	NCR

3.6 Conducted Spurious Emissions (-20dBc)

Test Date:	August 30, 2023	Initials:	MX
Temperature (°C)	23.5		
Relative Humidity (%)	50.6		
Barometric Pressure (kPa)	97.5		

3.6.1 Limits

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 20dB 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 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, the attenuation required shall be 30dB instead of 20dB.

3.6.2 Test Procedure

Tested according to ANSI C63.10 Section 7.8.7

Conducted Band-edge testing is performed with hoping disabled and enabled.

For the reference level measurement:

a) Set RBW = 100kHz and VBW ≥ [3 × RBW].
b) Detector = Peak and Trace Mode = Max Hold.
c) Sweep = Auto Couple.
d) Span set to ≥1.5 20 dB emission bandwidth.
e) Use the peak marker function to determine the maximum level.

For the out of band emission measurement

a) Set the start and stop frequency to encompass the frequency range to be measured.
b) Set RBW = 100kHz and VBW ≥ [3 × RBW].
c) Detector = Peak and Trace Mode = Max Hold.
d) Sweep = Auto Couple.
e) Use the peak marker function to determine the maximum level.

The RF output of the DUT was connected to the spectrum analyzer with sufficient attenuation in front and the total path loss was set as reference offset to correct the final reading.

3.6.3 Test Results

The DUT met the 20dB below carrier requirement for out of band emissions.

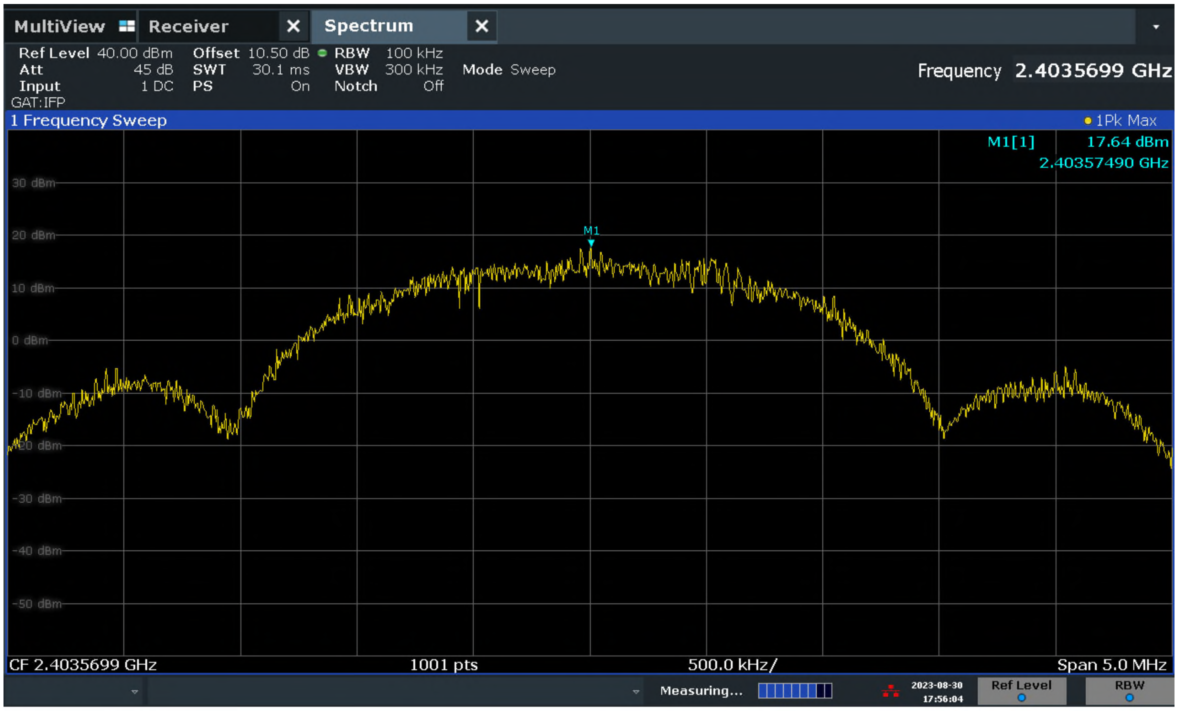

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Figure 16 – -20dBc Reference Level - Low Channel

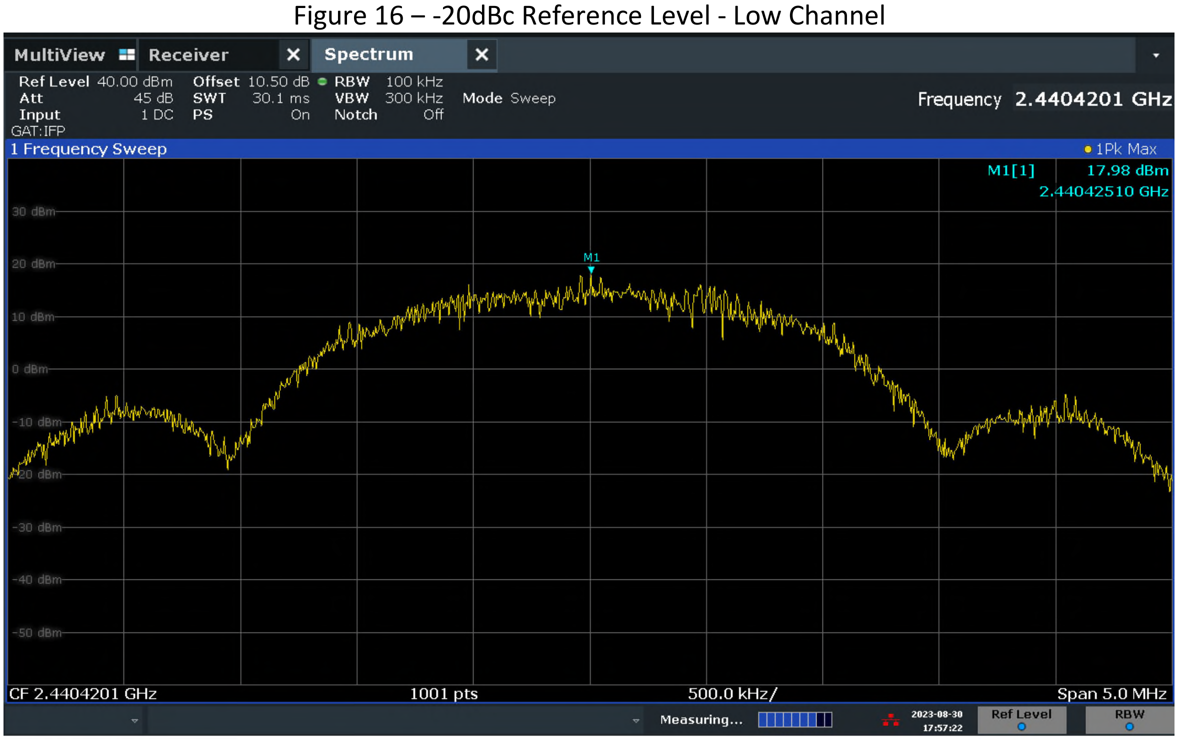

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Figure 17 – -20dBc Reference Level - Mid Channel

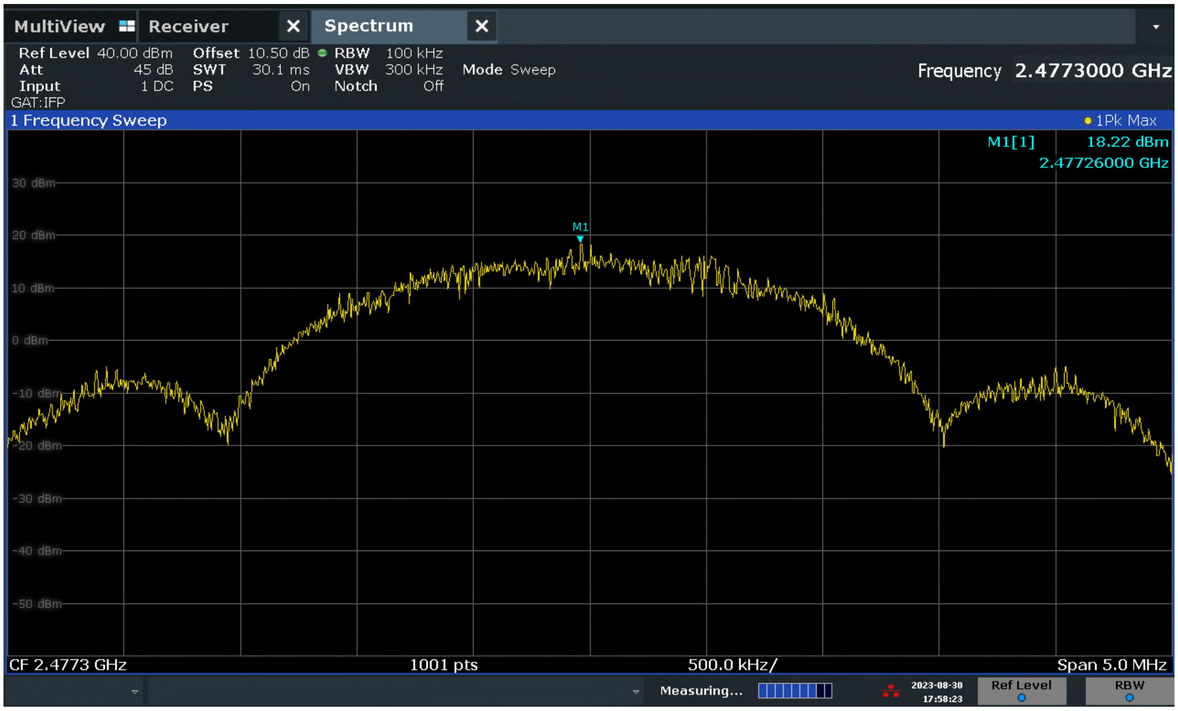

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Figure 18 – -20dBc Reference Level - High Channel

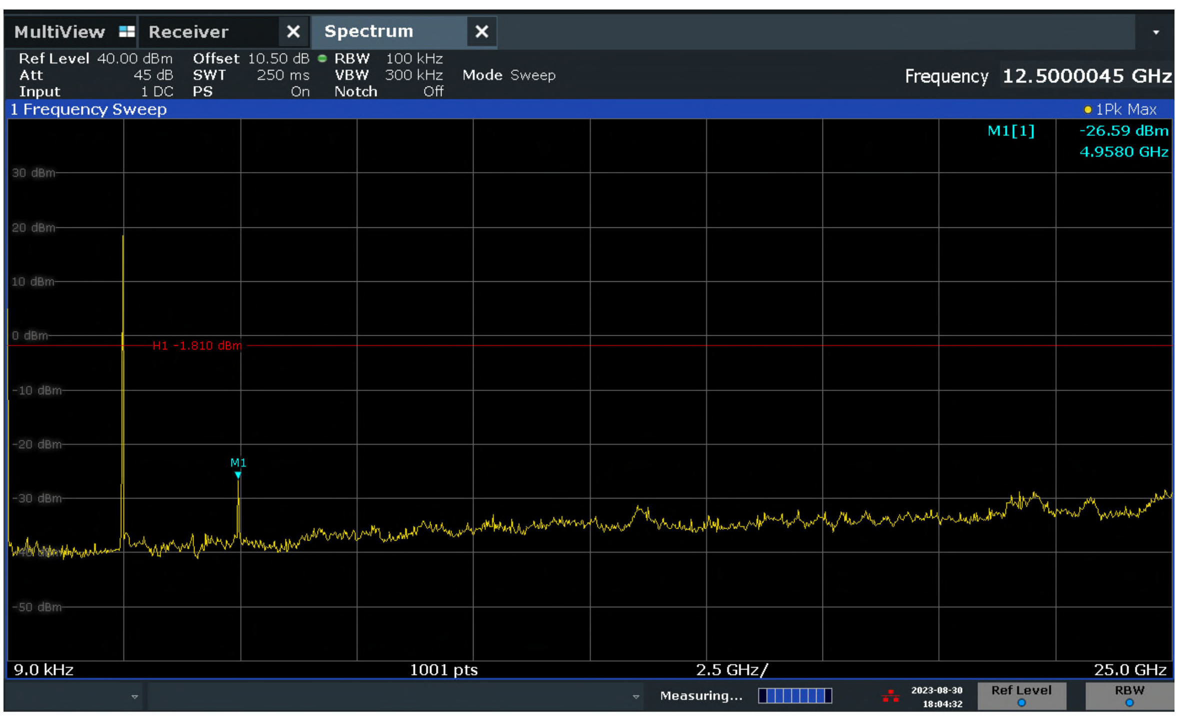

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Figure 19 – -20dBc with High Channel

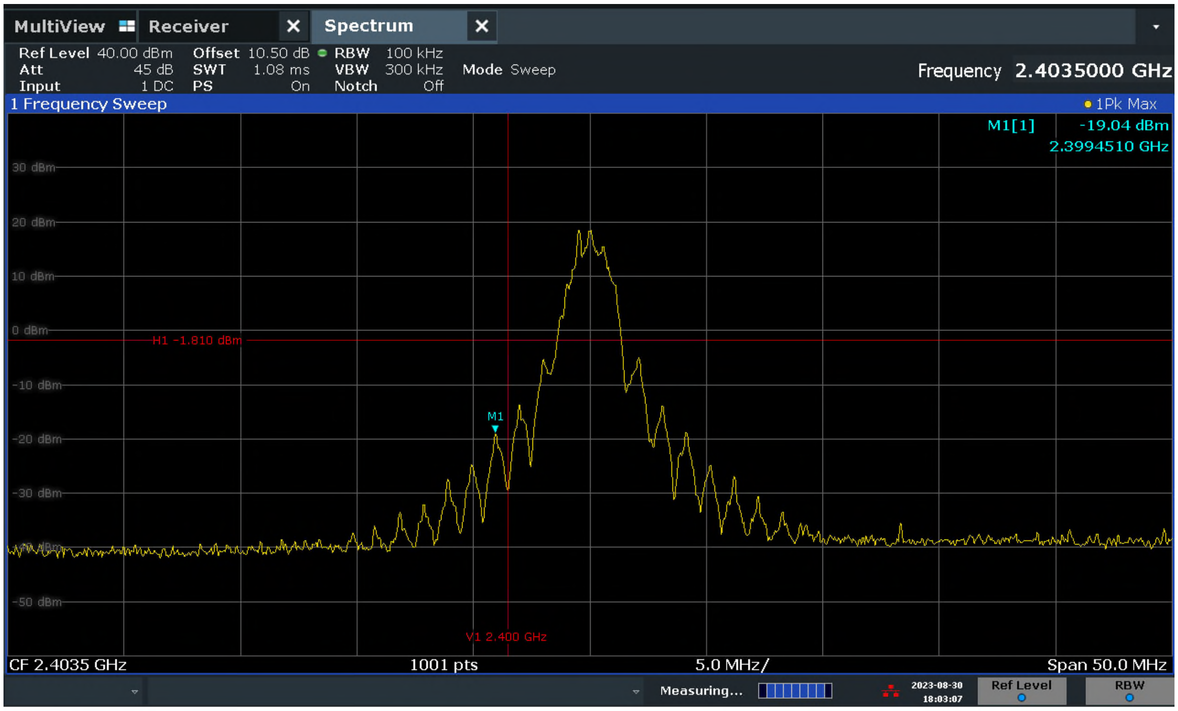

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Figure 20 – -20dBc Band Edge - Low Channel (Hoping Disabled)

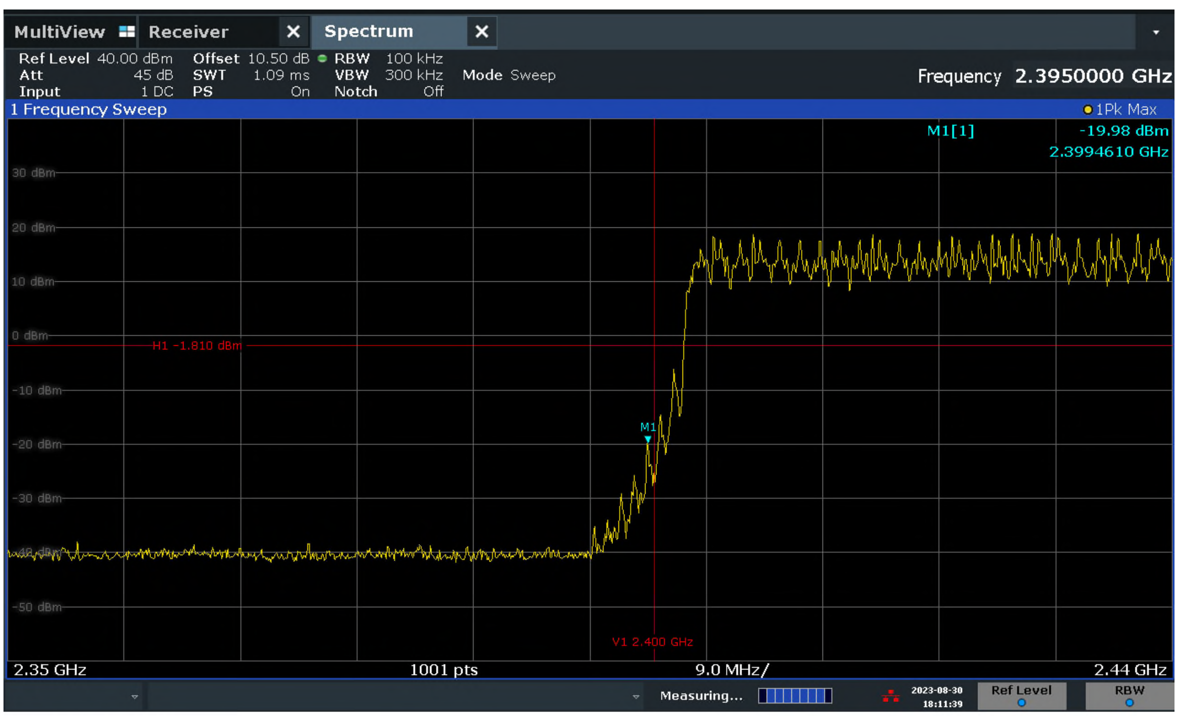

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Figure 21 – -20dBc Band Edge - Low Channel (Hoping Enabled)

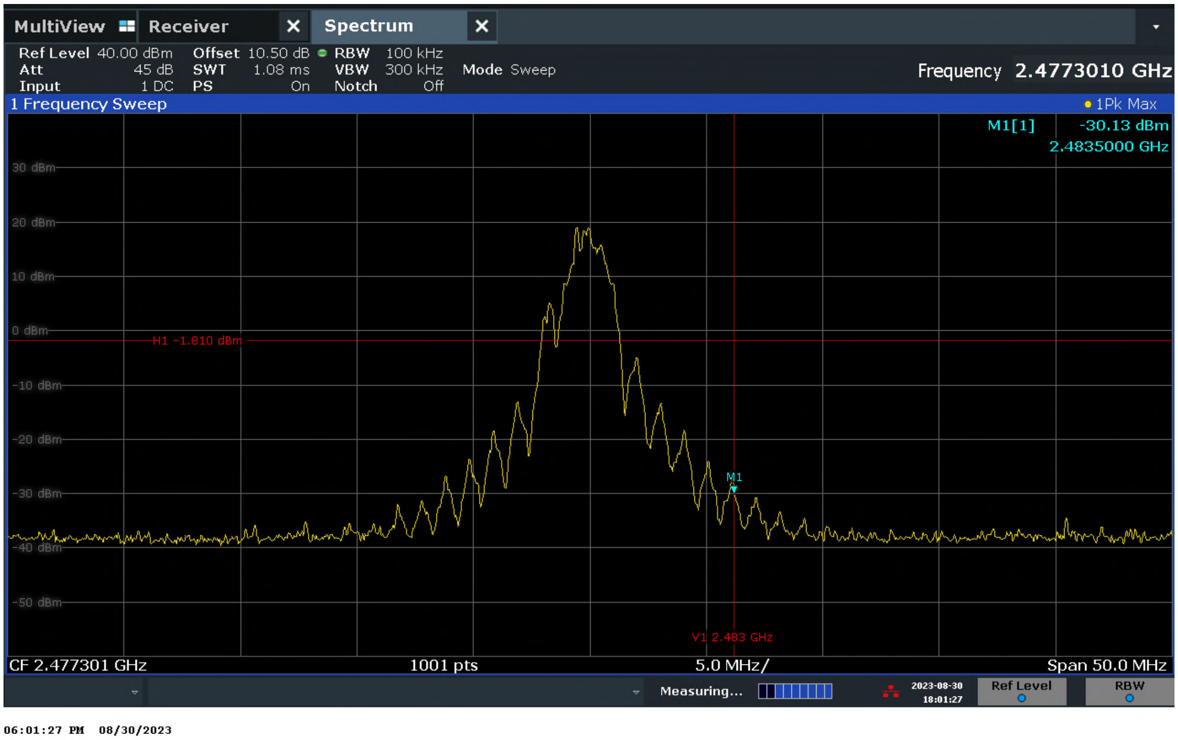


Figure 22 – -20dBc Band Edge - High Channel (Hoping Disabled)

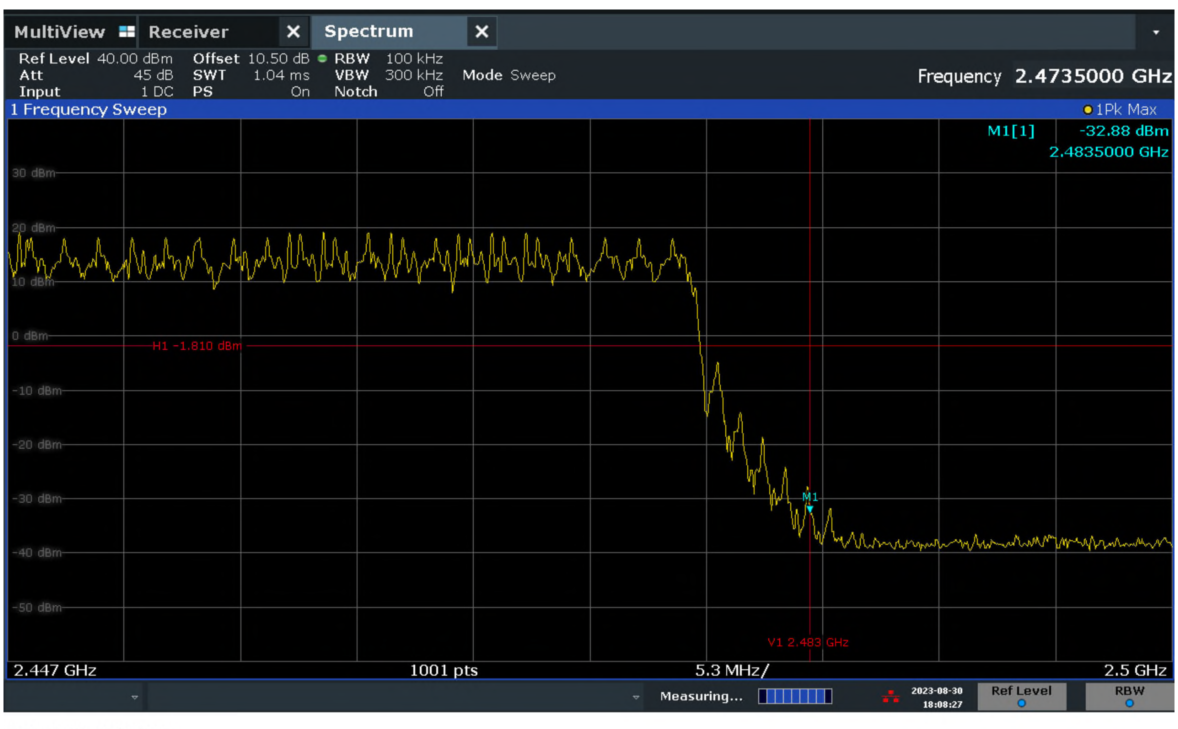


Figure 23 – -20dBc Band Edge - High Channel (Hoping Enabled)

3.6.4 Test Equipment List

Equipment ID	Description	Manufacturer	Model	Calibration Date	Calibration Due
EQ_EMC_58	EMI Receiver	Rohde & Schwarz	ESW 44	Feb 03, 2022	Feb 03, 2024
EQ_EMC_115	10dB Attenuator	Fairview Microwave	SA18E-10	NCR	NCR

3.7 Transmitter Spurious Radiated Emissions

Test Date:	August 30, 2023	Initials:	MX
Temperature (°C)	23.5		
Relative Humidity (%)	50.6		
Barometric Pressure (kPa)	97.5		

3.7.1 Limits

Any radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the general radiated emission limits specified in FCC 15.209(a). Other emissions shall be at least 20dB below the highest level of the intentional transmitter.

Base Standard(s): FCC Subpart C 15.209 and RSS-Gen Section 8.9.

Frequency Range (MHz)	Field Strength Limit		Field Strength at 3m (dBµV/m)	Detector Type / Measurement Bandwidth
	µV/m	Distance		
0.009 – 0.150	2400/F(kHz)	300	128.5 – 104.1	Quasi-Peak‡ / 200Hz
0.150 – 0.490	2400/F(kHz)	300	104.1 – 93.8	Quasi-Peak‡ / 9kHz
0.490 – 1.705	24000/F(kHz)	30	73.8 – 63.0	Quasi-Peak / 9kHz
1.705 – 30	30	30	69.5	Quasi-Peak / 9kHz
30 – 88	100	3	40.0	Quasi-Peak / 120kHz
88 – 216	150	3	43.5	Quasi-Peak / 120kHz
216 – 960	200	3	46.0	Quasi-Peak / 120kHz
960 – 1000	500	3	54.0	Quasi-Peak / 120kHz
Above 1000	500	3	54.0	Average / 1MHz
Above 1000	5000	3	74.0	Peak / 1MHz

‡The emission limits below 1GHz shown in the above table are based on measurements employing a CISPR Quasi-Peak detector except for the frequency bands 9-90 kHz and 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

As per ANSI C63.4 Section 4.2, if the Peak detector measurements do not exceed the Quasi-Peak limits, or Average limits where defined, then the DUT is considered to have passed the requirements.

3.7.2 Test Procedure

Tested according to ANSI C63.10 Section 6.3.

The device under test was setup inside a semi-anechoic chamber with remotely controlled turntable and antenna positioner at a 3m test distance. The DUT was placed on top of a 0.8m high non-conductive table above the reference ground plane for frequencies below 1GHz and 1.5m high for frequencies above 1GHz.

To determine the emission characteristics of the DUT, exploratory radiated emission scans were made while rotating the turntable 0° to 360° and using a Peak detector. The results were recorded in graphical form.

For each suspected emission, final measurements of the DUT radiated emissions with the Quasi-Peak, Average or Peak detector, as defined in the limit tables above, were made with the turntable azimuth rotated 0° to 360° and antenna height varied from 1m to 4m. The antenna was positioned to receive emissions in the vertical and horizontal polarizations such that the maximum radiated emission levels were detected.

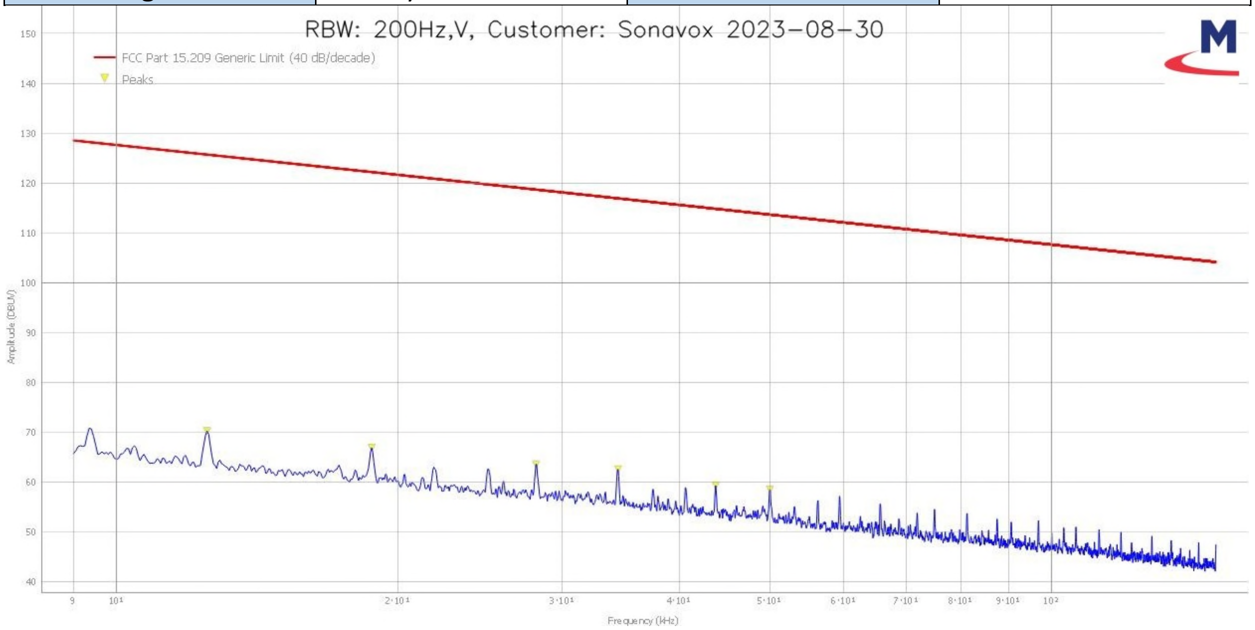
As per FCC Part 15.33(a), the DUT was scanned to the 10th harmonic of the highest fundamental frequency.

Peak output power for low, mid and high channels, each in three orthogonal axes, were verified. The worst case was used for the spurious emissions which was on the high channel and in the Y-axis.

Average emission of harmonics in restricted bands were corrected with a Duty Cycle Correction Factor of 20log(4.6%) = -26.7 dB. The dwell time for each hope is 4.6 ms and repetition time is 272 ms. Those the DUT is actively transmitting 4.6 ms in 100 ms. See section 4.4 for plots.

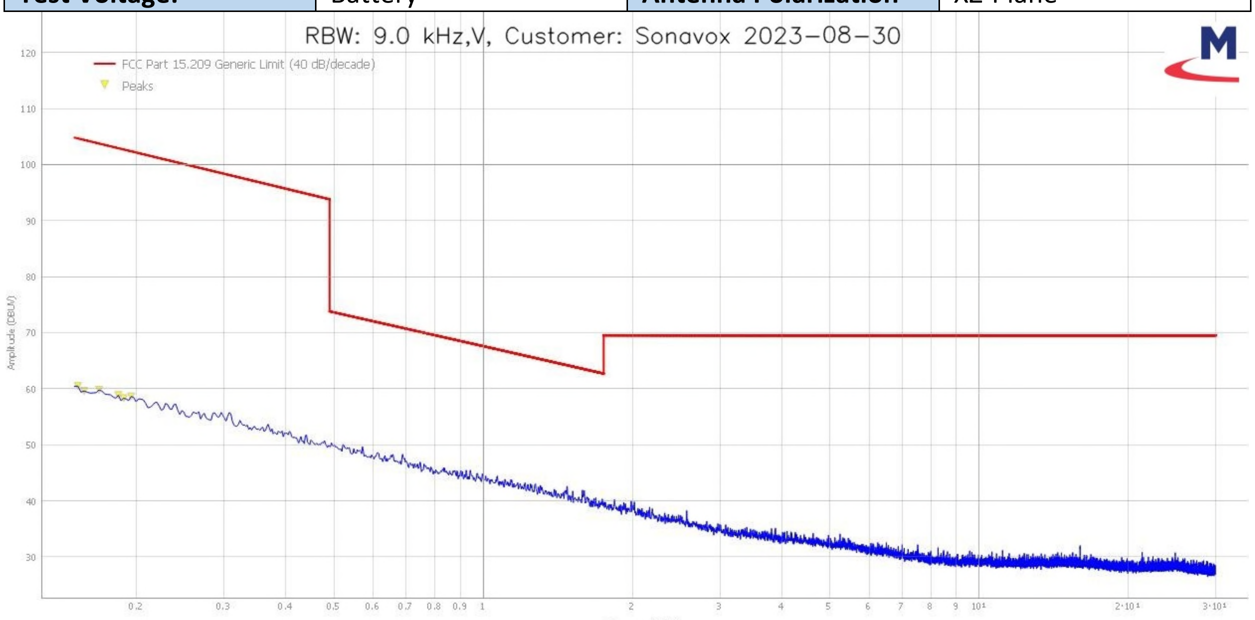
3.7.3 Test Results

Range:	9kHz to 150kHz	**Tx Frequency**	2403.5 MHz
Test Voltage:	Battery	**Antenna Polarization**	XZ-Plane



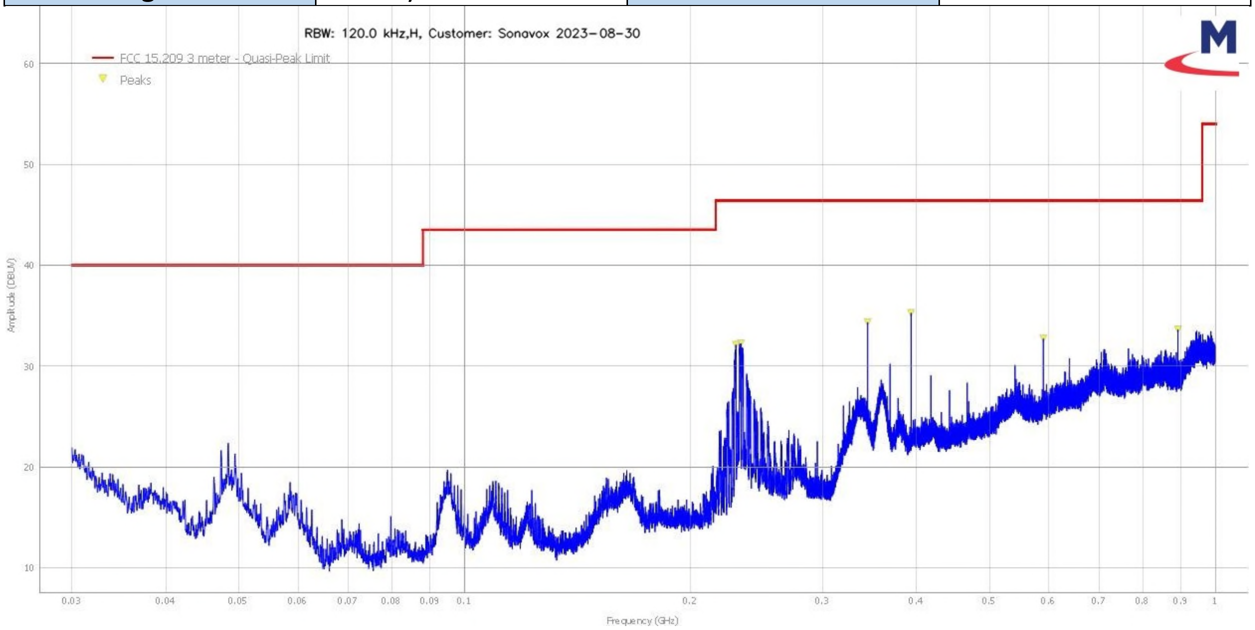
Remark: Peak Emission Plot

Range:	150kHz to 30MHz	**Tx Frequency**	High Channel
Test Voltage:	Battery	**Antenna Polarization**	XZ-Plane



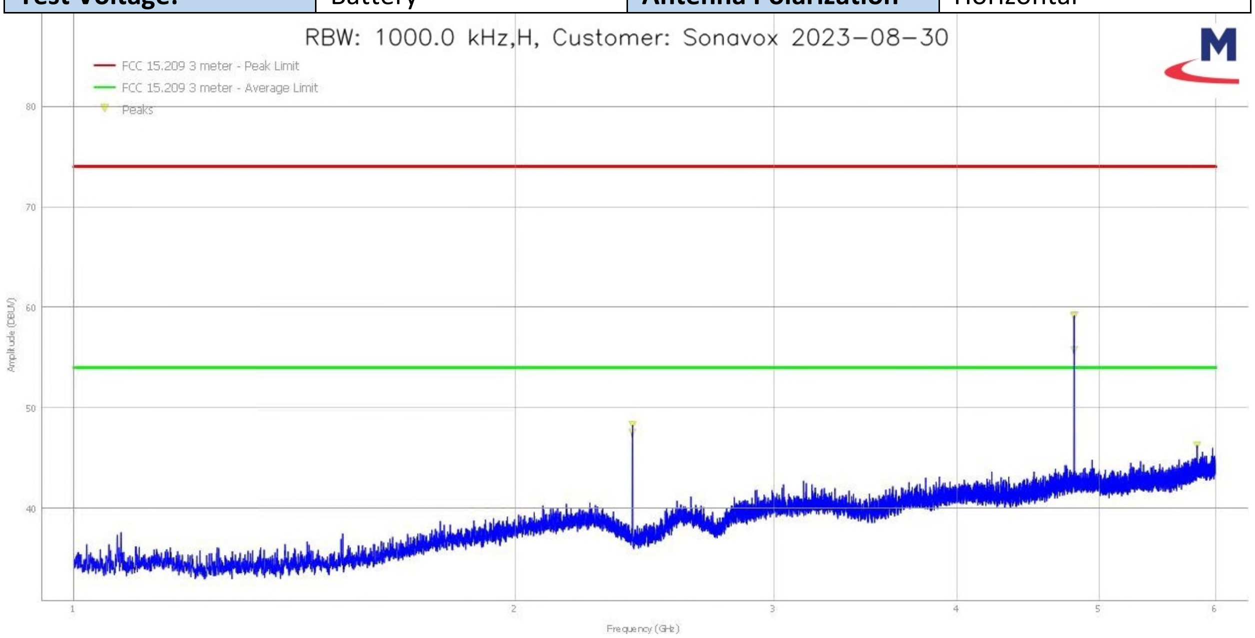
Remark: Peak Emission Plot

Range:	30MHz to 1GHz	**Tx Frequency**	2403.5 MHz
Test Voltage:	Battery	**Antenna Polarization**	Horizontal



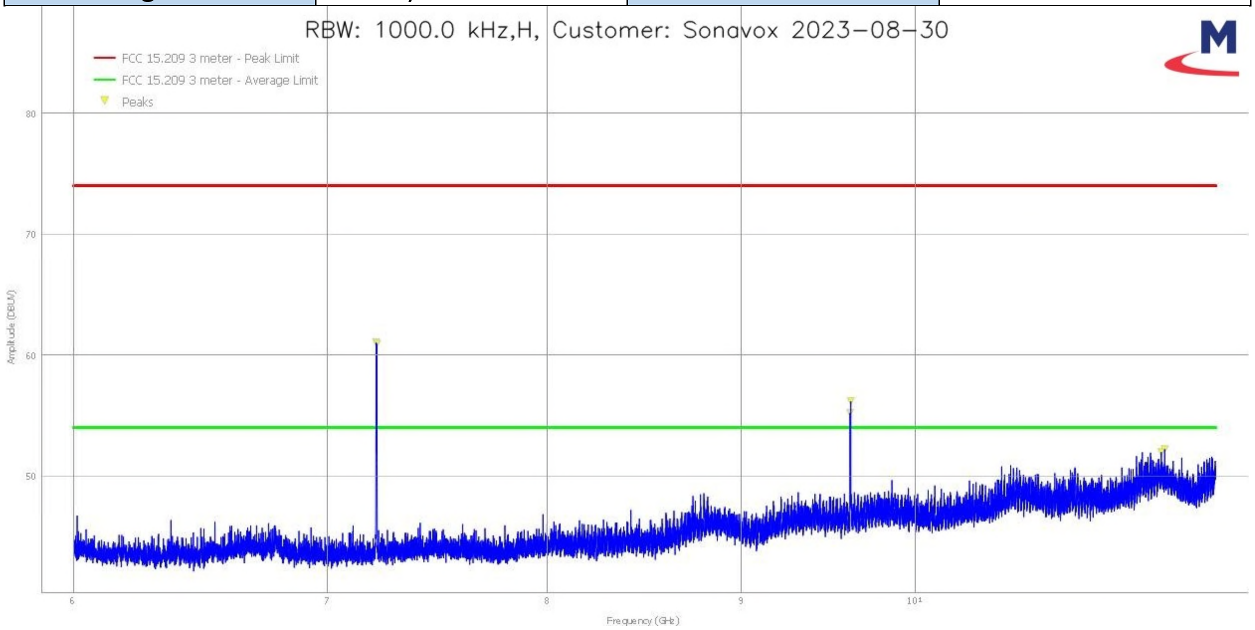
Remark: - Peak Emission Plot

Range:	1GHz to 6GHz	**Tx Frequency**	2403.5 MHz
Test Voltage:	Battery	**Antenna Polarization**	Horizontal



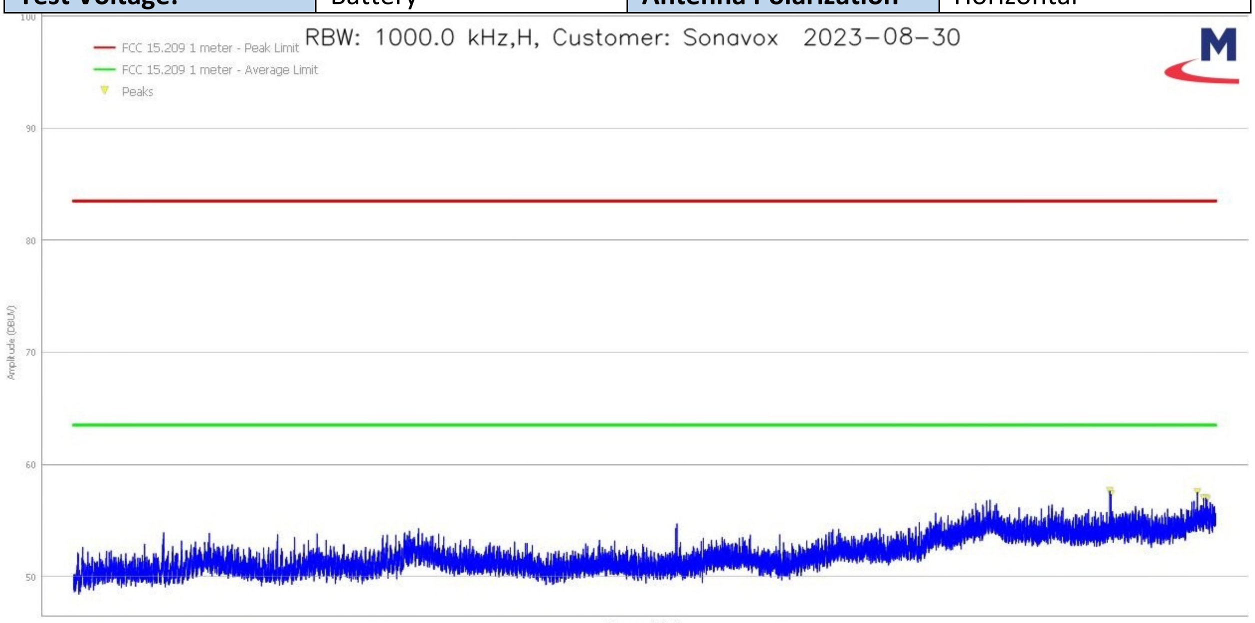
Remark: - Peak Emission Plot
- A Notch filter was used to filter out the fundamental

Range:	6GHz to 12GHz	Tx Frequency	2403.5 MHz
Test Voltage:	Battery	Antenna Polarization	Horizontal



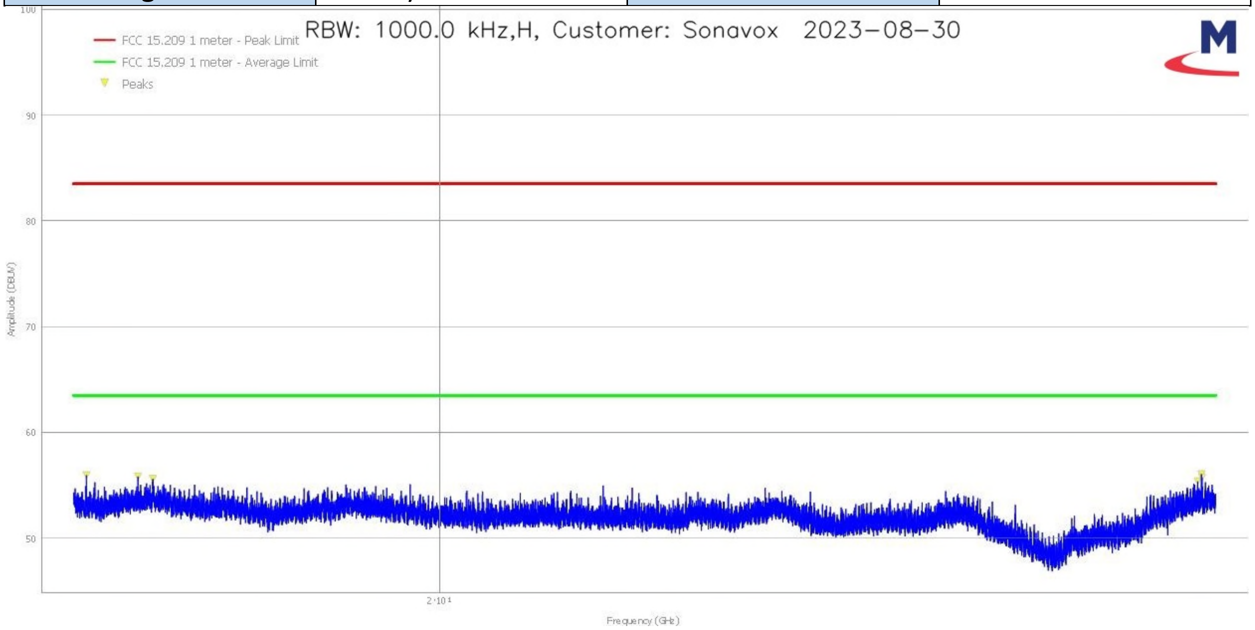
Remark: Peak Emission Plot

Range:	12GHz to 18GHz	Tx Frequency	2403.5 MHz
Test Voltage:	Battery	Antenna Polarization	Horizontal



Remark: Peak Emission Plot

Range:	18GHz to 25GHz	Tx Frequency	2403.5 MHz
Test Voltage:	Battery	Antenna Polarization	Horizontal

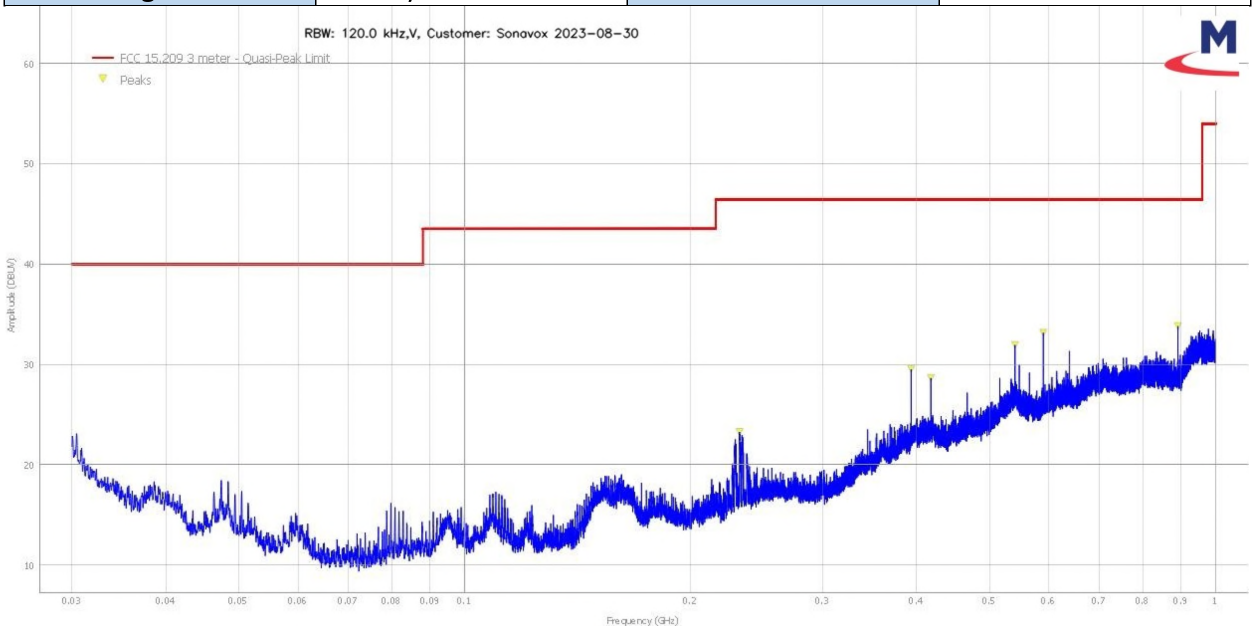


Remark: Peak Emission Plot

Horizontal Antenna Polarization							
Frequency (MHz)	Detector	Reading (dBµV)	Correction Factor (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Test Result
393.21	PEAK	39.9	-4.7	35.3	46.4	11.1	Pass
344.07	PEAK	41.1	-6.8	34.3	46.4	12.1	Pass
891.06	PEAK	31.4	2.2	33.6	46.4	12.8	Pass
589.83	PEAK	33.8	-1.1	32.7	46.4	13.7	Pass
233.28	PEAK	42.4	-10.2	32.2	46.4	14.2	Pass
229.77	PEAK	42.6	-10.5	32.1	46.4	14.3	Pass

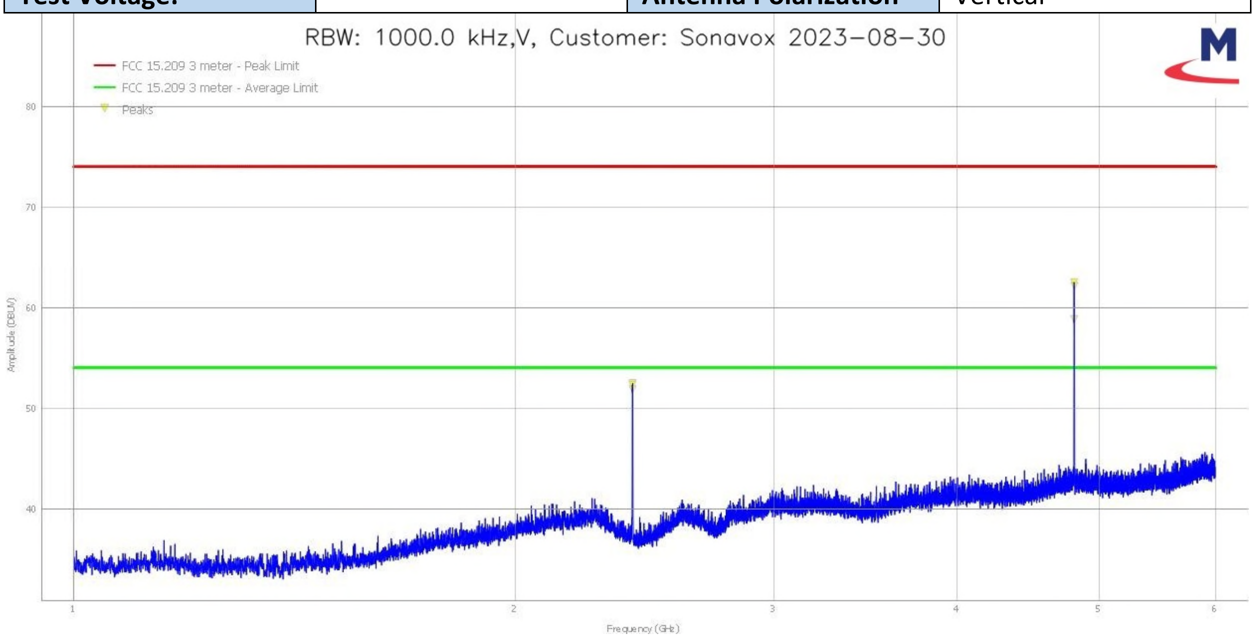
Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBµV)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dBµV/m)	Emission Limit (dBµV/m)	Margin (dB)	Result
Low Channel Y axis											
4807	Peak	Horz	62.1	34.5	7.4	0.0	-43.5	60.5	74.0	13.5	PASS
4807	Avg	Horz	24.5	34.5	7.4	0.0	-43.5	22.9	54.0	31.1	PASS
7210.5	Peak	Horz	62.0	35.9	8.9	0.0	-43.3	63.5	74.0	10.5	PASS
7210.5	Avg	Horz	25.3	35.9	8.9	0.0	-43.3	26.8	54.0	27.2	PASS
9614	Peak	Horz	52.6	37.3	10.4	0.0	-43.7	56.5	74.0	17.5	PASS
9614	Avg	Horz	15.4	37.3	10.4	0.0	-43.7	19.4	54.0	34.6	PASS
12017.5	Peak	Horz	47.3	39.1	12.0	0.0	-42.5	55.9	74.0	18.1	PASS
12017.5	Avg	Horz	35.9	39.1	12.0	0.0	-42.5	44.5	54.0	9.5	PASS
High Channel Y axis											
4954.64	Peak	Horz	64.7	34.5	7.5	0.0	-43.5	63.3	74.0	10.7	PASS
4954.64	Avg	Horz	28.7	34.5	7.5	0.0	-43.5	27.3	54.0	26.7	PASS
7431.96	Peak	Horz	64.5	35.9	9.0	0.0	-43.4	66.0	74.0	8.0	PASS
7431.96	Avg	Horz	27.2	35.9	9.0	0.0	-43.4	28.7	54.0	25.3	PASS
9909.28	Peak	Horz	54.9	37.6	10.5	0.0	-43.3	59.7	74.0	14.3	PASS
9909.28	Avg	Horz	17.4	37.6	10.5	0.0	-43.3	22.2	54.0	31.8	PASS
12386.6	Peak	Horz	41.1	39.3	12.1	0.0	-41.6	50.9	74.0	23.1	PASS
12386.6	Avg	Horz	30.0	39.3	12.1	0.0	-41.6	39.8	54.0	14.2	PASS

Range:	30MHz to 1GHz	**Tx Frequency**	2403.5 MHz
Test Voltage:	Battery	**Antenna Polarization**	Vertical



Remark: - Peak Emission Plot

Range:	1GHz to 6GHz	**Tx Frequency**	2403.5 MHz
Test Voltage:		**Antenna Polarization**	Vertical

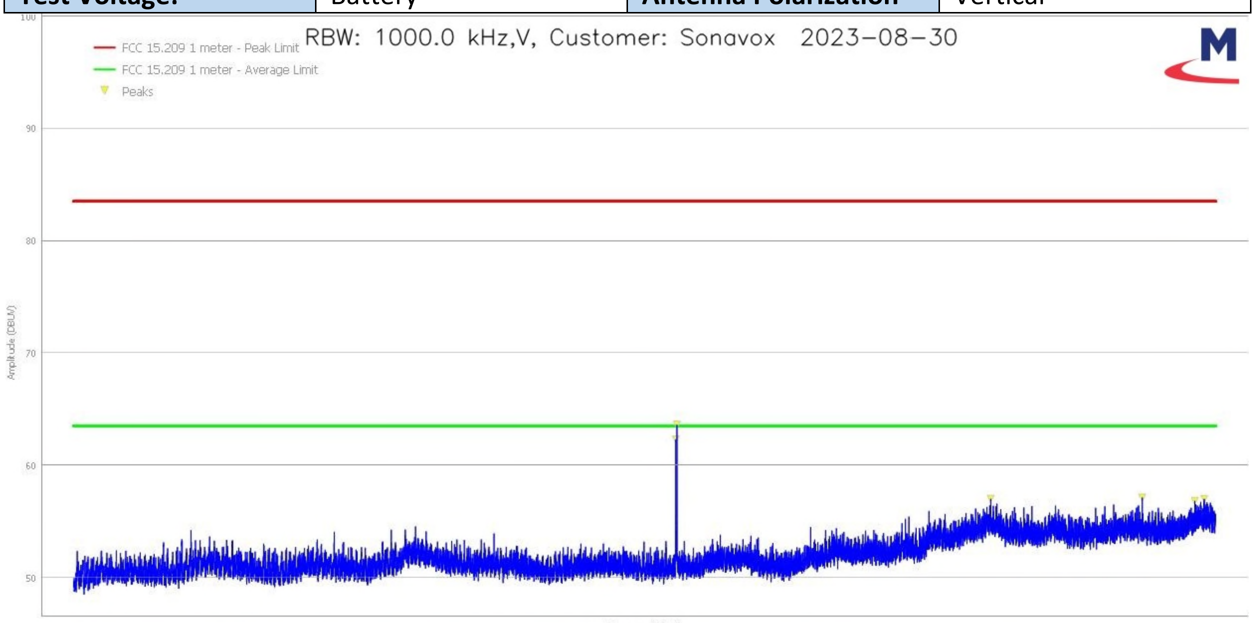


Remark: - Peak Emission Plot
- A Notch filter was used to filter out the fundamental

Range:	6GHz to 12GHz	**Tx Frequency**	2403.5 MHz
Test Voltage:	Battery	**Antenna Polarization**	Vertical

Remark: Peak Emission Plot

Range:	12GHz to 18GHz	**Tx Frequency**	
Test Voltage:	Battery	**Antenna Polarization**	Vertical



Remark: Peak Emission Plot

Range:	18GHz to 25GHz	Tx Frequency	2403.5 MHz
Test Voltage:	Battery	Antenna Polarization	Vertical

Remark: Peak Emission Plot

Vertical Antenna Polarization							
Frequency (MHz)	Detector	Reading (dBµV)	Correction Factor (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Test Result
891.06	PEAK	31.6	2.2	33.8	46.4	12.6	Pass
589.80	PEAK	34.2	-1.1	33.1	46.4	13.3	Pass
540.66	PEAK	32.4	-0.5	31.9	46.4	14.5	Pass
393.21	PEAK	34.2	-4.7	29.5	46.4	16.9	Pass
417.78	PEAK	32.6	-3.9	28.6	46.4	17.8	Pass
232.29	PEAK	33.5	-10.3	23.3	46.4	23.1	Pass
891.06	PEAK	31.6	2.2	33.8	46.4	12.6	Pass
589.80	PEAK	34.2	-1.1	33.1	46.4	13.3	Pass
14866.75	PEAK	52.6	11.0	63.6	83.5	19.9	Pass
14866.75	AVG	20.6	11.0	31.6	63.5	31.9	Pass

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBµV)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dBµV/m)	Emission Limit (dBµV/m)	Margin (dB)	Result
Low Channel Y axis											
4807	Peak	Vert	65.6	34.5	7.4	0.0	-43.5	64.0	74.0	10.0	PASS
4807	Avg	Vert	28.5	34.5	7.4	0.0	-43.5	26.9	54.0	27.1	PASS
7210.5	Peak	Vert	65.2	35.9	8.9	0.0	-43.3	66.7	74.0	7.3	PASS
7210.5	Avg	Vert	28.3	35.9	8.9	0.0	-43.3	29.8	54.0	24.2	PASS
9614	Peak	Vert	51.1	37.3	10.4	0.0	-43.7	55.1	74.0	18.9	PASS
9614	Avg	Vert	13.3	37.3	10.4	0.0	-43.7	17.2	54.0	36.8	PASS
12017.5	Peak	Vert	46.6	39.1	12.0	0.0	-42.5	55.3	74.0	18.7	PASS
12017.5	Avg	Vert	34.9	39.1	12.0	0.0	-42.5	43.5	54.0	10.5	PASS
High Channel Y axis											
4954.64	Peak	Vert	62.4	34.5	7.5	0.0	-43.5	61.0	74.0	13.0	PASS
4954.64	Avg	Vert	20.6	34.5	7.5	0.0	-43.5	19.1	54.0	34.9	PASS
7431.96	Peak	Vert	61.1	35.9	9.0	0.0	-43.4	62.7	74.0	11.3	PASS
7431.96	Avg	Vert	23.9	35.9	9.0	0.0	-43.4	25.4	54.0	28.6	PASS
9909.28	Peak	Vert	52.4	37.6	10.5	0.0	-43.3	57.2	74.0	16.8	PASS
9909.28	Avg	Vert	16.0	37.6	10.5	0.0	-43.3	20.7	54.0	33.3	PASS
12386.6	Peak	Vert	43.1	39.3	12.1	0.0	-41.6	52.9	74.0	21.1	PASS
12386.6	Avg	Vert	32.3	39.3	12.1	0.0	-41.6	42.1	54.0	11.9	PASS

Worst case position: Angle: 0 Deg
Height: 151 cm

See the Lower and Upper Band Edges Section for the harmonic measurements.

3.7.4 Test Equipment List

Equipment ID	Description	Manufacturer	Model	Calibration Date	Calibration Due
EQ_EMC_58	EMI Receiver	Rohde & Schwarz	ESW 44	Feb 03, 2022	Feb 03, 2024
EQ_EMC_48	Loop Antenna	Com-Power	AL-130R	May 4, 2022	May 4, 2024
EQ_EMC_59	BiLog Antenna	ETS Lindgren	3142E	Feb 27, 2022	Feb 27, 2024
EQ_EMC_60	Horn Antenna	ETS Lindgren	3117	Mar 11, 2022	Mar 11, 2024
EQ_EMC_56	Horn Antenna	A.H Systems	SAS-574	April 1, 2022	April 1, 2024
EQ_EMC_68	6dB Attenuator	Fairview Microwave	SA3NS-06	NCR	NCR
EQ_EMC_85	RF Cable <1GHz	Times Microwave	LMR-400	NCR	NCR
EQ_EMC_75	RF Cable >1GHz	MegaPhase	EMC2	NCR	NCR
EQ_EMC_89	Preamplifier 9kHz-1GHz	Teseq	LNA 6901	May 12, 2022	May 12, 2024
EQ_EMC_42	Preamplifier 1GHz-18GHz	Com-Power	PAM-118A	Mar 24, 2022	Mar 24, 2024
EQ_EMC_43	Preamplifier 18GHz-40GHz	Com-Power	PAM-840A	Mar 24, 2022	Mar 24, 2024
EQ_EMC_108	2400 - 2500MHz Notch Filter	Micro-Tronics	BRM50702	NCR	NCR
EQ_EMC_96	Emissions Software	Megalab Group	EMI V1.0	NCR	NCR

3.8 Radiated Band Edges

Test Date:	August 28, 2023	Initials:	MX
Temperature (°C)	24.4		
Relative Humidity (%)	45.6		
Barometric Pressure (kPa)	97.8		

3.8.1 Limits

Any radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the general radiated emission limits specified in FCC 15.209(a).

3.8.2 Test Procedure

Tested according to ANSI C63.10 Section 7.8.8.3

The device under test was setup inside a semi-anechoic chamber with remotely controlled turntable and antenna positioner at a 3m test distance. The DUT was placed on top of a 0.8m high non-conductive table above the reference ground plane for frequencies below 1GHz and 1.5m high for frequencies above 1GHz.

For both the lower and upper radiated band edges, the radiated emission was first maximized on the center frequency of the low and high channels with the turntable azimuth rotated 0° to 360° and antenna height varied from 1m to 4m. Once maximized, the start and stop frequency were adjusted to capture that channel's lower and upper band edges inside the restricted bands.

The antenna was positioned to receive emissions in the vertical and horizontal polarizations such that the maximum radiated emission levels were detected.

The radiated band edge measurements were made with the DUT in each of the three orthogonal axes.

3.8.3 Test Results

The DUT met the band edge requirements. Three orthogonal axes, were measured and the Plots Section below contains the maximum radiated emission levels captured on the spectrum analyzer at the band edges for the worst-case position which was in the Y-axis. The Final Measurements Section contains the final results with the correction factors added in.

3.8.3.1. Plots

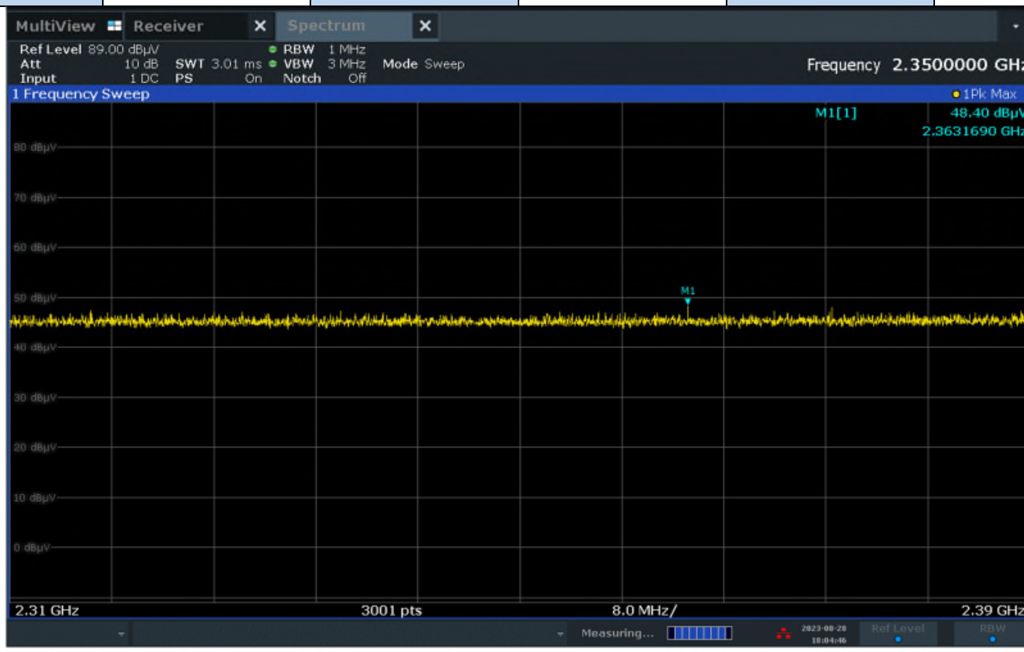
Tx Frequency	Low Channel	Antenna Polarization	Horizontal	Emission	Peak

05:56:40 PM 08/28/2023

Tx Frequency	Low Channel	Antenna Polarization	Horizontal	Emission	Average

05:57:28 PM 08/28/2023

Tx Frequency	Low Channel	**Antenna Polarization**	Vertical	**Emission**	Peak

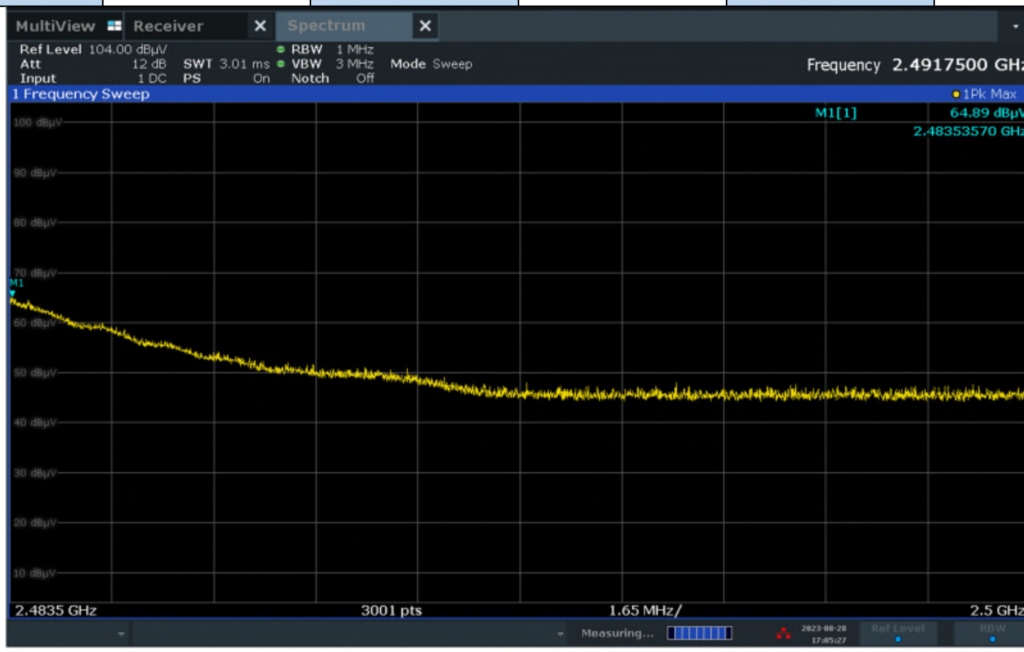


06:04:47 PM 08/28/2023

Tx Frequency	Low Channel	**Antenna Polarization**	Vertical	**Emission**	Average

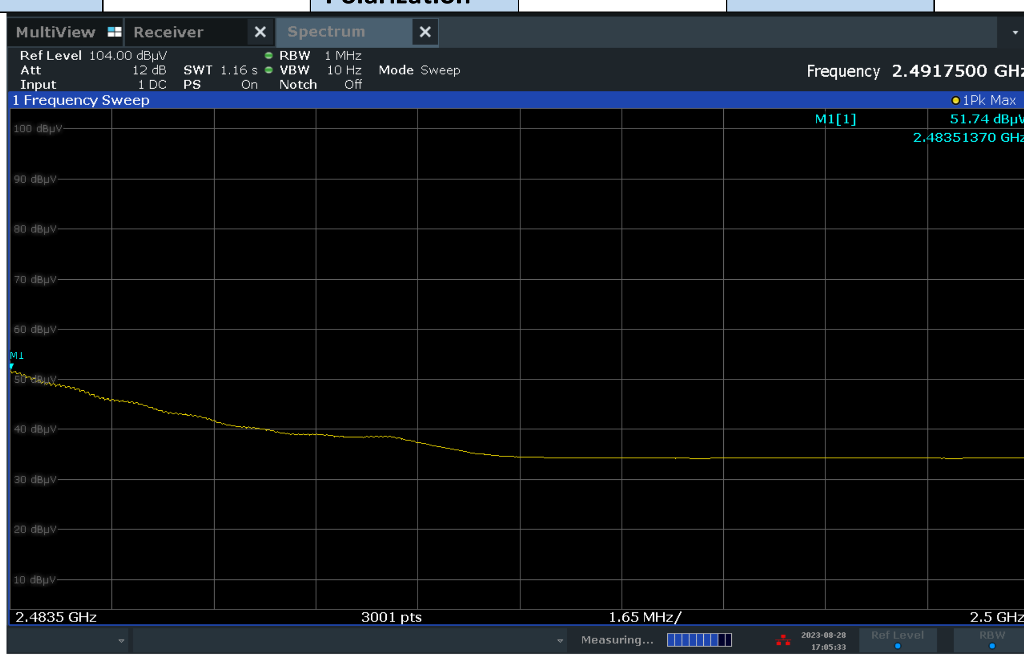
06:04:31 PM 08/28/2023

Tx Frequency	High Channel	Antenna Polarization	Horizontal	Emission	Peak



05:05:28 PM 08/28/2023

Tx Frequency	High Channel	Antenna Polarization	Horizontal	Emission	Average



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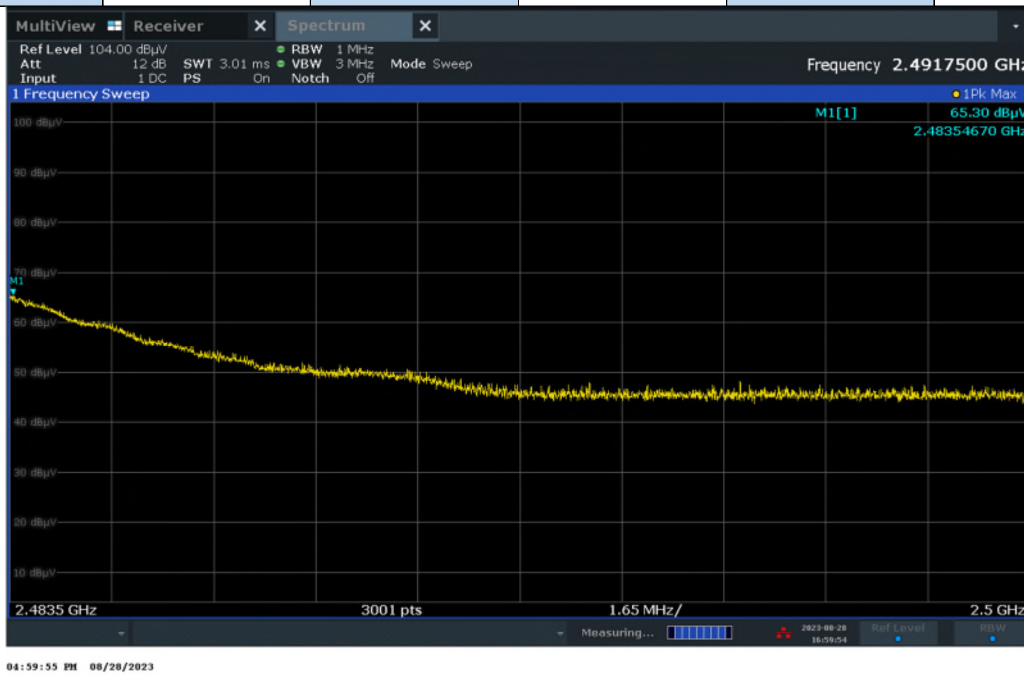
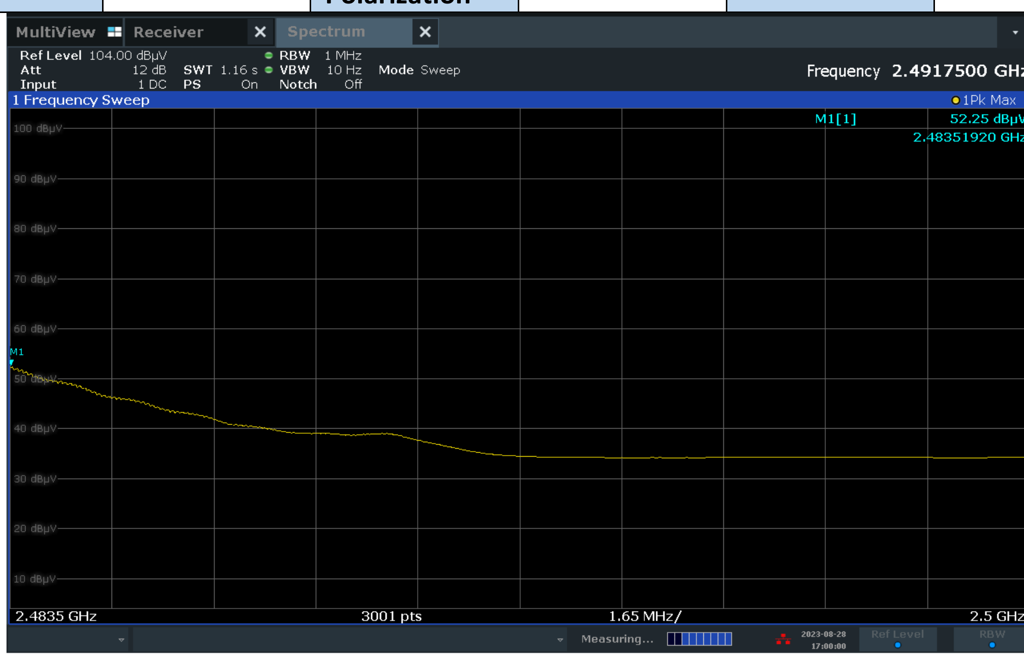
Tx Frequency	High Channel	Antenna Polarization	Vertical	Emission	Peak



Tx Frequency	High Channel	Antenna Polarization	Vertical	Emission	Average



3.8.3.2. Final Measurements

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBµV)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dBµV/m)	Emission Limit (dBµV/m)	Margin (dB)	Result
Low Channel Y axis											
2403.5	Peak	Horz	109.2	32.5	5.1	10.0	-43.1	113.7			PASS
2403.5	Avg	Horz	98.9	32.5	5.1	10.0	-43.1	103.3			PASS
2403.5	Peak	Vert	104.6	32.5	5.1	10.0	-43.1	109.0			PASS
2403.5	Avg	Vert	94.8	32.5	5.1	10.0	-43.1	99.3			PASS
2389.9	Peak	Horz	48.0	32.4	5.0	10.0	-43.1	52.4	74.0	21.6	PASS
2390	Avg	Horz	35.5	32.4	5.0	10.0	-43.1	39.9	54.0	14.1	PASS
2389.8	Peak	Vert	48.4	32.4	5.0	10.0	-43.1	52.8	74.0	21.2	PASS
2390	Avg	Vert	34.2	32.4	5.0	10.0	-43.1	38.6	54.0	15.4	PASS
2482.1	Peak	Horz	47.2	32.6	5.1	10.0	-43.1	51.8	74.0	22.2	PASS
2489.6	Avg	Horz	33.5	32.6	5.2	10.0	-43.2	38.1	54.0	15.9	PASS
2481.2	Peak	Vert	48.9	32.6	5.1	10.0	-43.1	53.5	74.0	20.5	PASS
2481.4	Avg	Vert	33.8	32.6	5.1	10.0	-43.1	38.4	54.0	15.6	PASS
High Channel Y axis											
2477.32	Peak	Horz	107.8	32.6	5.1	10.0	-43.1	112.4			PASS
2477.32	Avg	Horz	98.4	32.6	5.1	10.0	-43.1	103.0			PASS
2477.32	Peak	Vert	109.1	32.6	5.1	10.0	-43.1	113.7			PASS
2477.32	Avg	Vert	99.6	32.6	5.1	10.0	-43.1	104.2			PASS
2335	Peak	Horz	47.8	32.3	5.0	10.0	-42.9	52.2	74.0	21.8	PASS
2359.2	Avg	Horz	35.2	32.4	5.0	10.0	-43.0	39.6	54.0	14.4	PASS
2316	Peak	Vert	47.6	32.3	5.0	10.0	-42.9	51.9	74.0	22.1	PASS
2336.9	Avg	Vert	33.7	32.3	5.0	10.0	-42.9	38.1	54.0	15.9	PASS
2483.5	Peak	Horz	64.9	32.6	5.1	10.0	-43.1	69.5	74.0	4.5	PASS
2483.5	Avg	Horz	25.0	32.6	5.1	10.0	-43.1	29.6	54.0	24.4	PASS
2483.6	Peak	Vert	65.3	32.6	5.1	10.0	-43.1	69.9	74.0	4.1	PASS
2483.5	Avg	Vert	25.5	32.6	5.1	10.0	-43.1	30.1	54.0	23.9	PASS

Note: Average emissions for High Channel were corrected with a Duty Cycle Correction Factor of 20log(4.6%) = -26.7 dB. The dwell time for each hope is 4.6 ms and repetition time is 272 ms. Those the DUT is actively transmitting 4.6 ms in 100 ms. See section 4.4 for plots.

3.8.4 Test Equipment List

Equipment ID	Description	Manufacturer	Model	Calibration Date	Calibration Due
EQ_EMC_58	EMI Receiver	Rohde & Schwarz	ESW 44	Feb 03, 2022	Feb 03, 2024
EQ_EMC_60	Horn Antenna	ETS Lindgren	3117	Mar 11, 2022	Mar 11, 2024
EQ_EMC_75	RF Cable >1GHz	MegaPhase	EMC2	NCR	NCR
EQ_EMC_42	Preamplifier 1GHz-18GHz	Com-Power	PAM-118A	Mar 24, 2022	Mar 24, 2024

3.9 Power Line Conducted Emissions

Test Date:	August 11, 2023	Initials:	MX
Temperature (°C)	24.1		
Relative Humidity (%)	45.0		
Barometric Pressure (kPa)	97.3		

The conducted emission test is to measure radio-frequency (RF) signals and noise emitted from electrical and electronic devices in the frequency range of 150kHz to 30MHz.

3.9.1 Limits

Base Standard(s): FCC Subpart B 15.207 and RSS-GEN Section 8.8.

Frequency Range (MHz)	Coupling Device	Detector Type / Bandwidth	Limit (dBµV)
0.15 to 0.50	LISN	Quasi-Peak / 9kHz	66 to 56*
0.50 to 5			56
5 to 30			60
0.15 to 0.50	LISN	Average / 9kHz	56 to 46*
0.50 to 5			46
5 to 30			50

* Decreases linearly with the logarithm of the frequency

As per ANSI C63.4 Section 4.2, if the Peak or Quasi-Peak detector measurements do not exceed the Average limits, then the DUT is considered to have passed the requirements.

3.9.2 Test Procedure

Tested according to ANSI C63.10 Section 6.2.

Conducted emissions were measured on the DUT's power port via an Artificial Mains Network (AMN), also known as Line Impedance Stabilization Network (LISN), and maximum conducted emissions are checked on all the DUT's AC lines in the frequency range of 150kHz to 30MHz. The LISNs provide 50Ω/50µH of coupling impedance for the measuring receiver.

To determine the emission characteristics of the DUT, the conducted emission scans were made using a Peak detector and the results were recorded in graphical form.

For each suspected emission, final measurements of the DUT conducted emissions were made with the Quasi-Peak or Average detector as defined in the limits table above.

For Table-Top Equipment, the device under test is configured on a 0.8m high non-conductive table above the reference ground plane and 0.4m away from the vertical reference ground plane.

3.9.3 Setup Diagram

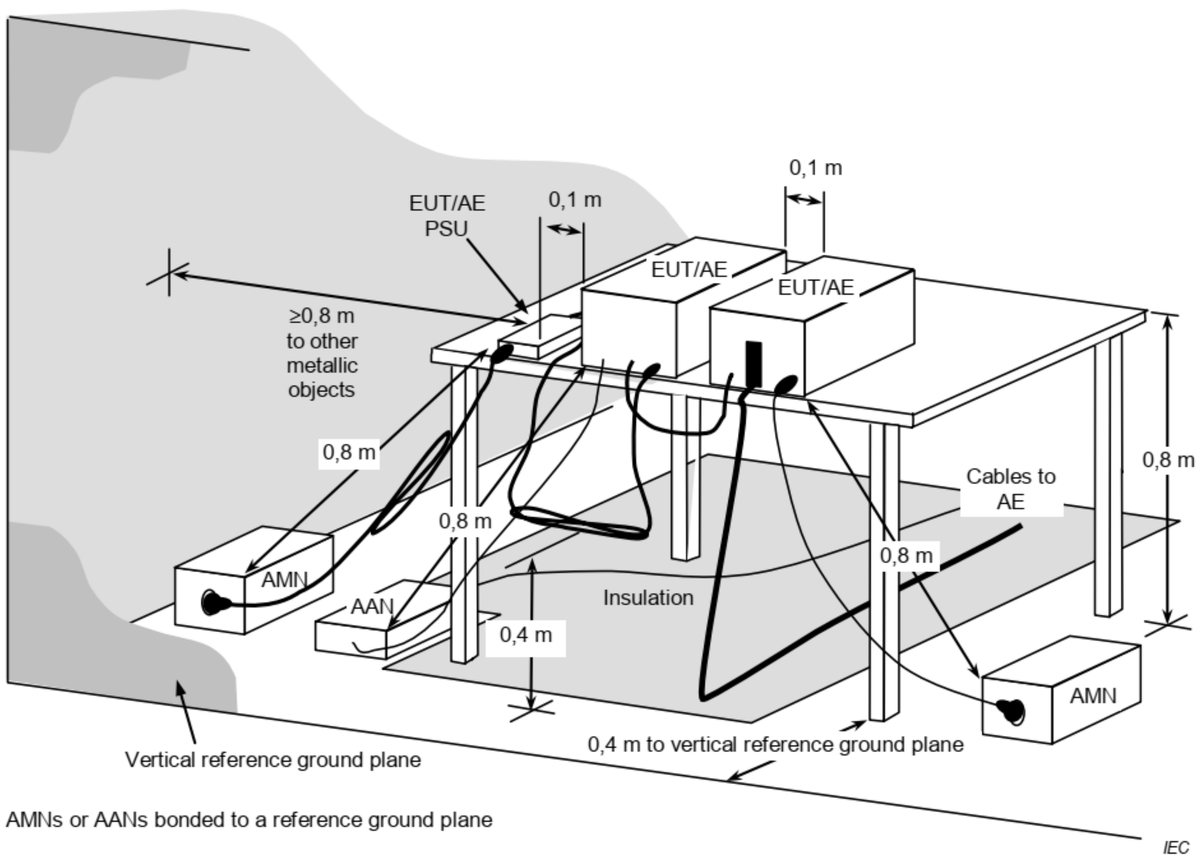


Figure 24 – Sample Measurement Arrangement for DUT

3.9.4 Test Results

Range:	150kHz to 30MHz	**DUT**	Jamstack 2
Test Voltage:	120Vac 60Hz	**Phase**	Line

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Remark: Quasi-Peak (yellow) and Average (green) Emission Plot

Range:	150kHz to 30MHz	**DUT**	Jamstack 2
Test Voltage:	120Vac 60Hz	**Phase**	Neutral

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Remark: Quasi-Peak (yellow) and Average (green) Emission Plot

3.9.5 Test Equipment List

Equipment ID	Description	Manufacturer	Model	Calibration Date	Calibration Due
EQ_EMC_58	EMI Receiver	Rohde & Schwarz	ESW 44	Feb 03, 2022	Feb 03, 2024
EQ_EMC_61	LISN	FCC	50/250-16-2-01	Mar 15, 2022	Mar 15, 2024
EQ_EMC_44	Transient Limiter (10dB)	Com-Power	LIT-930A	NCR	NCR
EQ_EMC_84	RF Cable	Times Microwave	LMR-400	NCR	NCR

---------- End of Test Report ----------