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HEADQUARTERS: 914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230 • PHONE (410) 354-3300 • FAX (410) 354-3313

06/23/2025

BiPOM Electronics, Inc
9788 Clarewood Dr.
Ste:306
Houston, Texas 77036
USA

Dear Oguz Murtezaoglu,

Enclosed is the EMC Wireless test report for compliance testing of the BiPOM Electronics, Inc WB-L-U-2 and WB-L-W-2 as tested to the requirements of FCC 15.247 and RSS-247 Issue 3 for Intentional Radiators. This test report pertains specifically to the Long Range(LoRa) transmitter onboard which operates in the 902MHz to 928MHz band.

Thank you for using the services of Eurofins MET Labs. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
EUROFINS MET LABS

Nancy LaBrecque
Documentation Department

Reference: WIRA135219_FCC_FHSS_Report_R2

915 MHz ISM
Test Report

for the

BiPOM Electronics, Inc
WB-L-U-2 and WB-L-W-2

Tested under
FCC 15.247 and RSS-247 Issue 3
For Intentional Radiators

Veer Patel, Wireless Engineer
Electromagnetic Compatibility Lab

Nancy LaBrecque
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Part 15.247 under normal use and maintenance.

Matthew Hinojosa
EMC Manager, Austin Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	May 20, 2025	Initial Issue.
1	6/10/2025	TCB Review Comments
2	06/23/2025	TCB Review Comments

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the WB-L-U-2 and WB-L-W-2, with the requirements of FCC 15.247 and RSS-247 Issue 3. BiPOM Electronics, Inc should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the WB-L-U-2 and WB-L-W-2, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC 15.247 and RSS-247 Issue 3, in accordance with BiPOM Electronics, Inc purchase order number 6021. All tests were conducted using measurement procedures ANSI C63.4-2014 and ANSI C63.10-2013.

FCC Reference 47 CFR Part 15.247:2005	IC Reference RSS-247 Issue 3 RSS-GEN Issue 5	Description	Compliance
Title 47 of the CFR, Part 15 §15.203	---	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	RSS-GEN(8.8)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(2)	RSS-247 (5.2)	6dB Occupied Bandwidth	Compliant
---	RSS-GEN(6.7)	99% Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	RSS-247(5.4)	Peak Power Output	Compliant
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	RSS-GEN (6.13), (8.9), & (8.10)	Radiated Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-247(5.5)	RF Conducted Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	RSS-247(5.2)	Peak Power Spectral Density	N/A

Table 1. Executive Summary

II. Equipment Configuration

A. Overview

Eurofins MET Labs was contracted by BiPOM Electronics, Inc to perform testing on the WB-L-U-2 and WB-L-W-2, under BiPOM Electronics, Inc's purchase order number 6021.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the WB-L-U-2 and WB-L-W-2.

The results obtained relate only to the item(s) tested.

Product Name:	WB-L-U-2 and WB-L-W-2	
Model(s) Tested:	WB-L-U-2 and WB-L-W-2	
FCCID:	2BCAS-BIPOM-WBL	
ICID:	33805-BIPOMWBL	
Equipment Specifications:	Primary Power:	3.3VDC
	Type of Modulations:	LoRaWAN
	Equipment Code:	FHSS
	Peak RF Output Power:	22dBm
	EUT Frequency Ranges:	902MHz to 928 MHz
	Antenna Gain[1]:	2JW1115-C952B: Dipole Antenna: 3.3dBi
		2JF0415P-010MC137: Flex PCB Antenna: 3.6dBi
		SI328100009: Coil (Wire) Antenna: -0.3dBi
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Veer Patel	
Report Date(s):	May 20, 2025	

Table 2. EUT Summary Table

[1] The antenna gain information was provided by BiPOM Electronics, Inc and may affect compliance. The WB-L-U-2 and WB-L-W-2 were evaluated with three antenna types as indicated.

B. References

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
RSS-247, Issue 3, August 2023	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-GEN, Issue 5, March 2019	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Table 3. References

C. Test Site

All testing was performed at Eurofins MET Labs, 13501 McCallen Pass, Austin, TX 78753. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

ISED Lab Info:
CAB Identifier: US0004
Company Number: 2043D

FCC Lab Info:
Designation Number: US1127

D. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
Occupied Bandwidth Measurements	±4.52 Hz	2	95%
Conducted Power Measurements	±2.74 dB	2	95%
Power Spectral Density Measurements	±2.74 dB	2	95%
Conducted Spurious Emissions	±2.80 dB	2	95%
Conducted Emissions (Mains)	±2.97 dB	2	95%
Radiated Spurious Emissions (9kHz – 1GHz)	±2.95 dB	2	95%
Radiated Spurious Emissions (1GHz - 40GHz)	±3.54 dB	2	95%

Table 4. Uncertainty Calculations Summary

E. Description of Test Sample

LoRaWAN module based on ST Micro's STM32WL5MOCH6 chip with integrated microcontroller and radio circuit for building LoRaWAN end node and sensor products.

There are 3 antenna variants for the tests:

1- Part number WB-L-U-2 with u.FL connector that allows connecting:
a) Flex antenna part number 2JF0415P-010MC137 from 2J Antennas or similar type of flex antenna
b) Dipole stub antenna part number 2JW1115-C943B from 2J Antennas or similar type of dipole stub antenna

2- Part number WB-L-W-2 with coil (wire) antenna that is soldered to the specimen. Antenna part number is SI328100009 from 2J Antennas

Figure 1. Block Diagram of Test Configuration

F. Equipment Configuration

The EUT was set up as outlined in Figure 1 above. The laptop computer was used to send test commands to force the transmitters to operate in the appropriate test mode. The EUT was powered from the laptop computer during configuration and from a stand-alone battery pack during actual testing.

G. Support Equipment

Ref. ID	Name/Description	Manufacturer	Model Number	Customer Supplied Calibration Data
1.5V AA batteries	Amazon Basics	ALK AA20FFP-U	Not applicable	Not applicable
AA battery holder	Shutao	B0CZ3PC511	Not applicable	Not applicable

Table 5. Support Equipment

H. Ports and Cabling Information

Ref. Id	Port Name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
Mini USB	Mini USB to USB A Cable	No	1	1	No	Battery pack for power	Mini USB

Table 6. Ports and Cabling Information

I. Mode of Operation

Using WillowBee Tester firmware, the module can exercise all of its radio functionality:

1- Continuous Wave (CW) that transmits continuously at the selected ISM frequency without modulation
2- Continuous Modulation (CM) that transmits continuously at the selected ISM frequency with LoRaWAN modulation
3- Frequency hopping: This mode sweeps various frequencies while LoRaWAN modulation is in effect. Bandwidth, transmit power, spreading factor (SF) and center frequency (range of frequencies for hopping) can be specified.

Transmit Band	Modulation	Channel Frequencies Tested	Test Tool Power Setting
915MHz to 928MHz	LoRaWAN	902.3MHz/908.7MHz/914.9MHz	22dBm

Table 7. Test Channels Utilized

J. Method of Monitoring EUT Operation

A spectrum analyzer was used to confirm proper transmitter operation.

K. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

L. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to BiPOM Electronics, Inc upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

Test Requirement: **§ 15.203:** An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

a.) Antenna must be permanently attached to the unit.

b.) Antenna must use a unique type of connector to attach to the EUT.

c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT as tested is compliant the criteria of §15.203. The TX antenna is either permanently attached to the unit (in the case of the coil antenna) or it uses a unique antenna connector on the module (in the case of the version with an antenna connector).

Test Engineer(s): Veer Patel

Test Date(s): 03/26/2025

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(a)(1) 20 dB Bandwidth

Test Requirements: **§ 15.247(a)(1):** Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.
(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz

Test Procedure: The transmitter was on and transmitting at the highest output power. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately 1% of the total emission bandwidth, and the VBW > RBW. The 20 dB Bandwidth was measured and recorded. The measurements were performed on the low, mid and high channels.

Test Results The EUT was compliant with § 15.247 (a)(1).

The 20 dB Bandwidth was determined from the plots on the following pages.

Test Engineer(s): Veer Patel

Test Date(s): 03/26/2025

Electromagnetic Compatibility Criteria for Intentional Radiators

RSS-GEN (6.7) 99% Bandwidth

Test Requirements: The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

Test Procedure: The transmitter was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth, and the VBW > RBW. The 99% Bandwidth was measured and recorded.

Test Results The 99% Bandwidth determined from the plots on the following pages.

Test Engineer(s): Veer Patel

Test Date(s): 03/31/2025

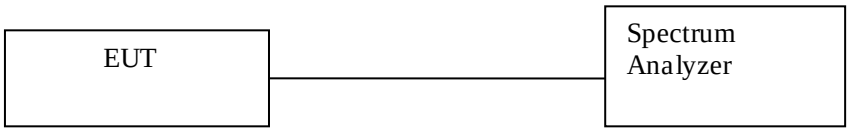
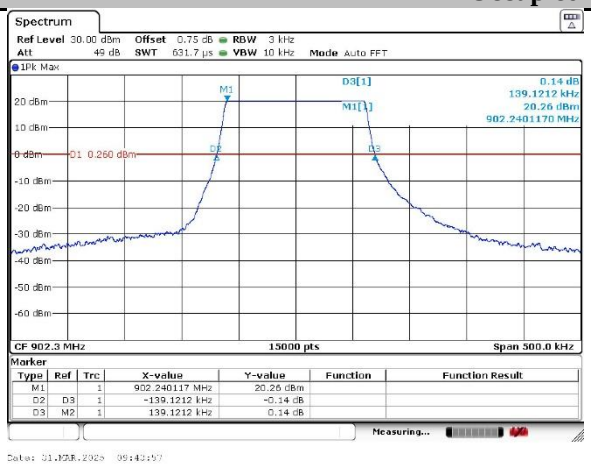


Figure 2. Block Diagram, Occupied Bandwidth Test Setup

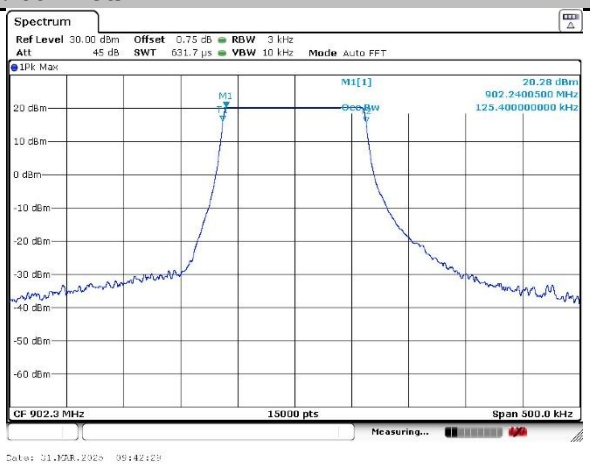
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	20dB Bandwidth Limit (MHz)	99% Bandwidth (MHz)	Result
Low	902.3	0.1391212	0.250	0.1254	Pass
Middle	908.7	0.1391212	0.250	0.1254333	Pass
High	914.9	0.1391212	0.250	0.1256334	Pass

Table 8. 99% and 20 dB Occupied Bandwidth, Test Results

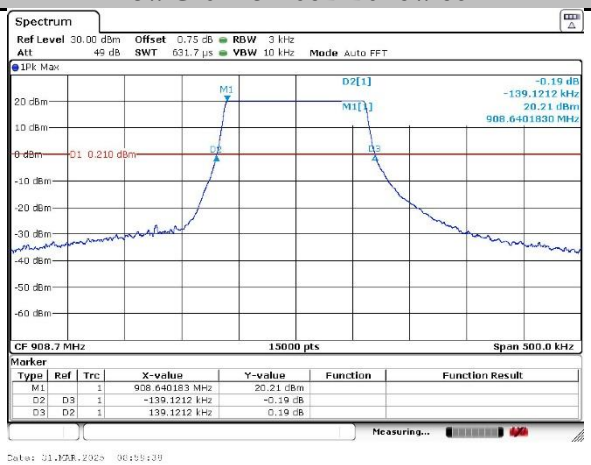
Occupied Bandwidth Plots



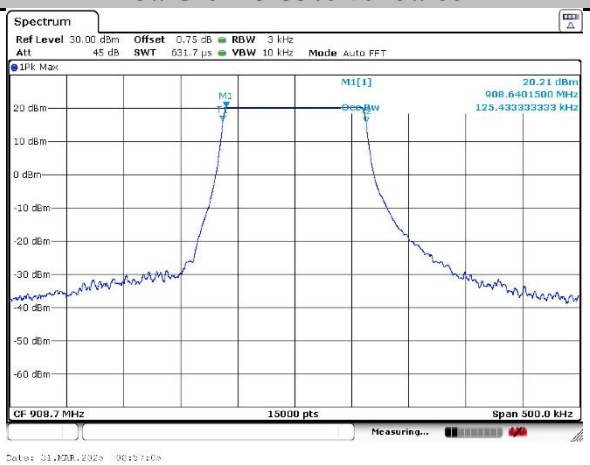
Low Channel 20dB Bandwidth



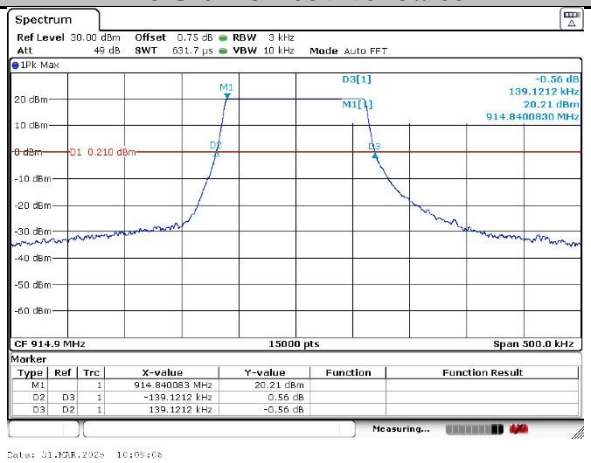
Low Channel 99% Bandwidth



Mid Channel 20dB Bandwidth



Mid Channel 99% Bandwidth



High Channel 20dB Bandwidth

High Channel 99% Bandwidth

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output

Test Requirements: For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section

§15.247(c): if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the Table 2. EUT Summary Table, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§ RSS-247 Peak Power Output and EIRP

Test Requirements: **§RSS-247 (5.4.a):** For FHSs operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W and the e.i.r.p. shall not exceed 1 W if the hopset uses less than 50 hopping channels.

Test Procedure: The transmitter was connected to a calibrated spectrum analyzer. The analyzer reference level was offset by cable loss connecting to the test sample. The peak power was measured at the low, mid and high channels of each band at the maximum power level.

Test Results: The EUT was compliant with the Peak Power Output limits of **§15.247(b)** and the EIRP limits from RSS-247.

Test Engineer(s): Veer Patel

Test Date(s): 03/26/2025

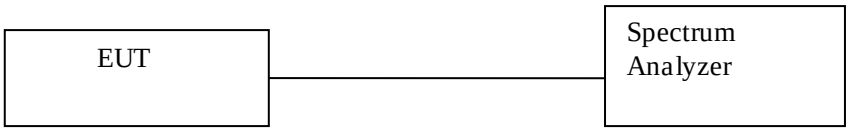


Figure 3. Peak Power Output Test Setup

Peak Power Output Test Results

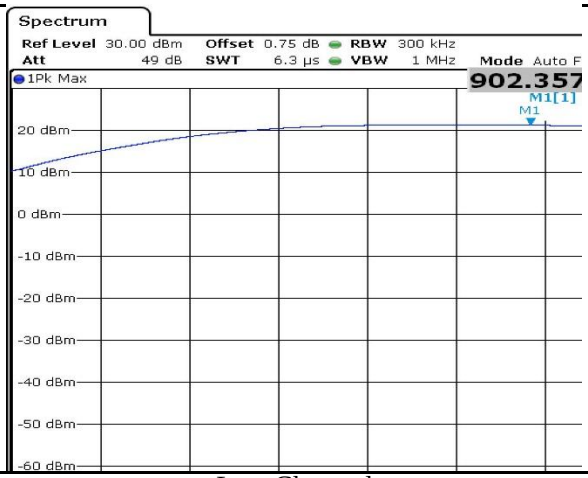
Channel	Frequency (MHz)	Peak Conducted Power (dBm)	Peak Power Limit (dBm)	Result
Low	902.3	21.21	30	Pass
Middle	908.7	21.00	30	Pass
High	914.9	21.00	30	Pass

Table 9. Peak Power Output, Test Results

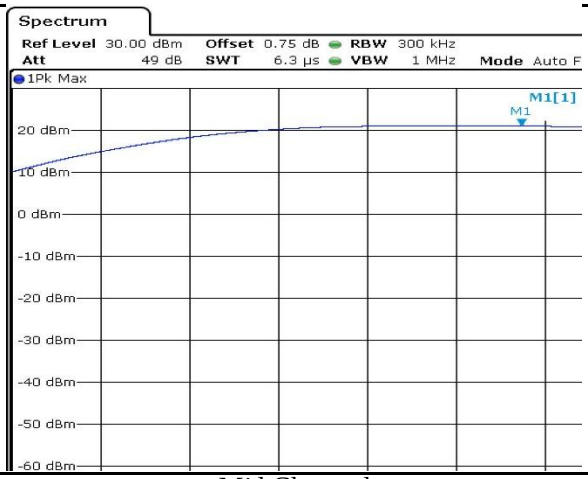
Channel	Frequency (MHz)	Peak Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
Low	902.3	21.21	3.6	24.81	36	Pass
Middle	908.7	21	3.6	24.6	36	Pass
High	914.9	21	3.6	24.6	36	Pass

Table 10. Peak Power and EIRP, Test Results

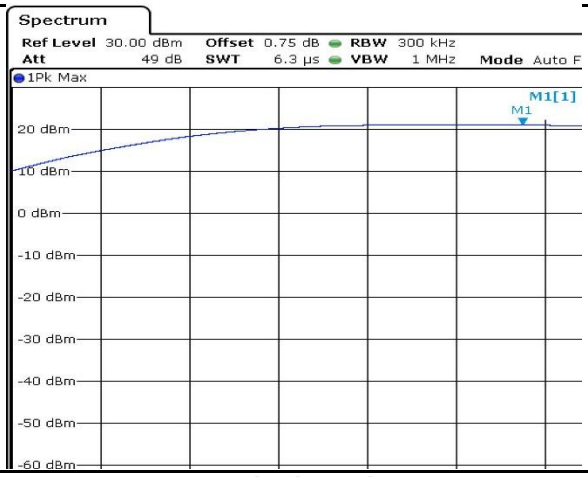
Peak Power Plots



Low Channel



Mid Channel



High Channel

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) RF Conducted Spurious Emissions Requirements

Test Requirement: **15.247(d)** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Test Procedure: For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level. The RBW was set to 100 kHz. The VBW was set to 3x the RBW. The spectrum analyzer was set to an auto sweep time and a peak detector was used. Measurements were carried out at the low, mid and high channels.

See following pages for detailed test results with RF Conducted Spurious Emissions.

The analyzer settings are shown in the following table:

RBW:	100kHz	Detector:	Peak	Reference Level:	30dBm
VBW:	300kHz	Sweep Time:	Auto	Internal Attenuation:	50dB

Figure 4. Analyzer Settings During Measurement

Test Results: The EUT was compliant with the Conducted Spurious Emission limits of **§15.247(d)**.

Test Engineer(s): Veer Patel

Test Date(s): 03/28/2025, 03/31/2025

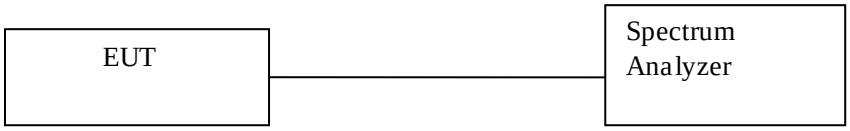
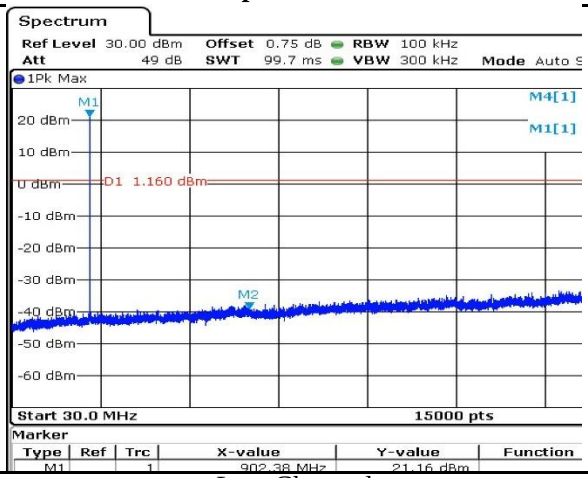
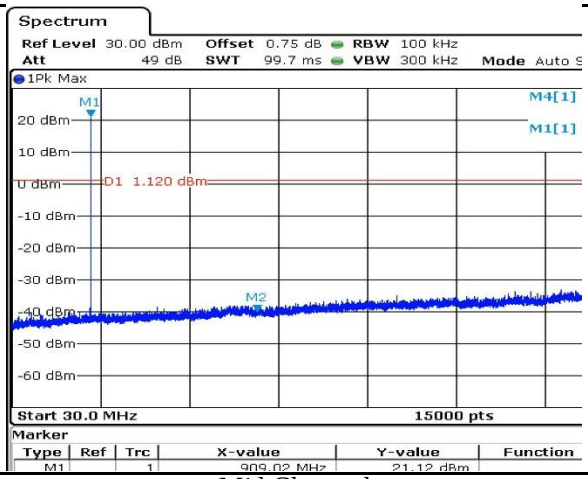


Figure 5. Block Diagram, Conducted Spurious Emissions Test Setup

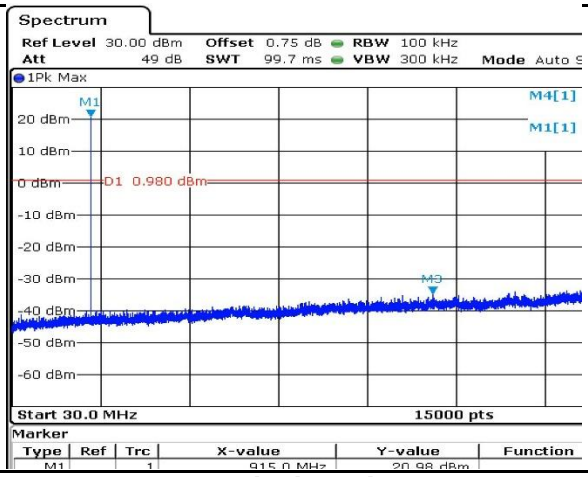
-20dB Down Spurious Emission Plots



Low Channel

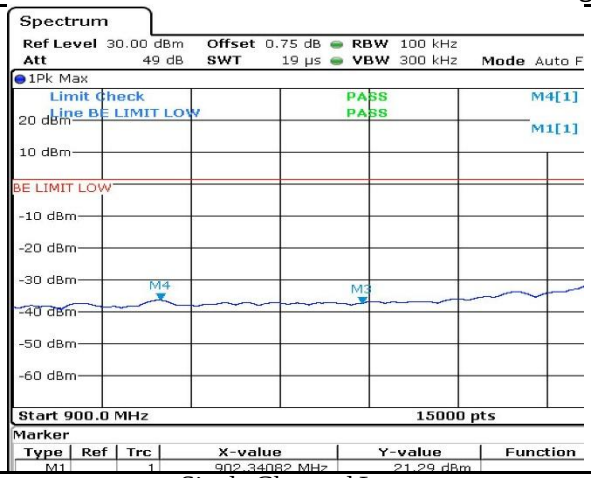


Mid Channel

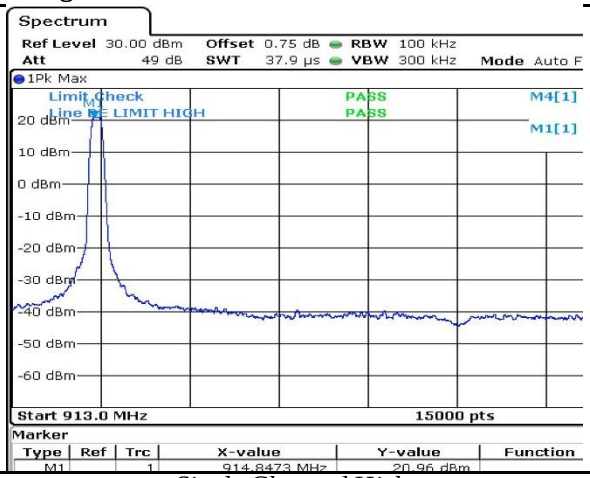


High Channel

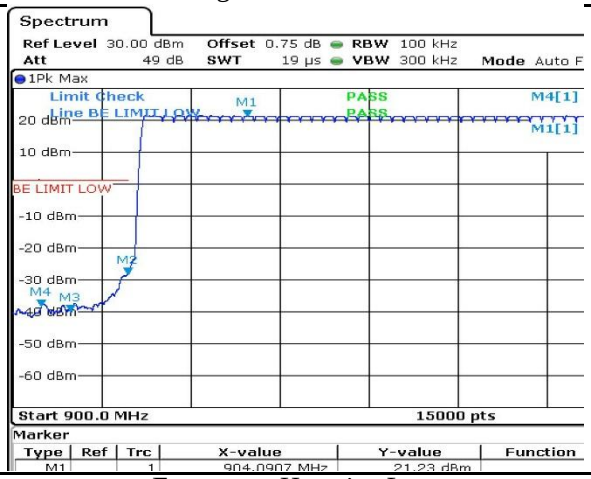
Low and High Band Edge Plots



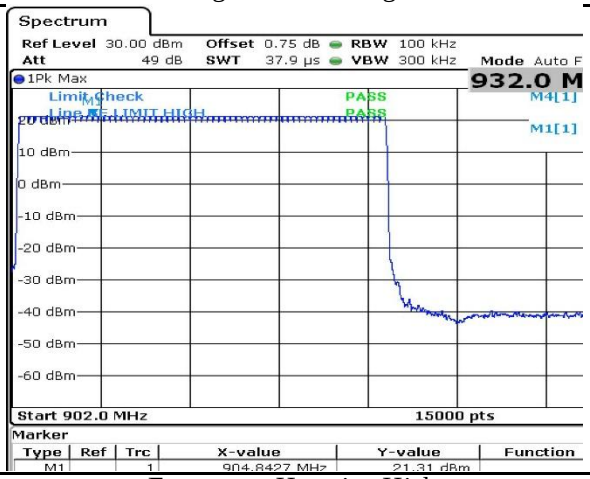
Single Channel Low



Single Channel High



Frequency Hopping Low



Frequency Hopping High

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) Radiated Spurious Emissions Requirements

Test Requirements: **§15.247(d); §15.205:** Emissions outside the frequency band.

§15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

§15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110----------	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505----------	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905----------	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128----------	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775----------	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775----------	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218----------	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825----------	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225----------	123–138	2200–2300	14.47–14.5
8.291–8.294----------	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366----------	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675----------	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475----------	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293----------	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025----------	240–285	3345.8–3358 36.	43–36.5
12.57675–12.57725----------	322–335.4	3600–4400	([2])

Table 11. Restricted Bands of Operation

[1] Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.

[2] Above 38.6

Test Requirement(s): **§ 15.209 (a):** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 12.

Frequency (MHz)	§ 15.209(a),Radiated Emission Limits (dBµV) @ 3m
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

Table 12. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

Test Procedures: The radiated methodology referenced in ANSI C63.10: 2013 Section 11.12.1 was utilized in order to assess the unwanted emissions in the restricted bands.

A radiated scan was performed with the antenna of proper impedance installed. The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes if multiple mounting orientations are supported. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line.

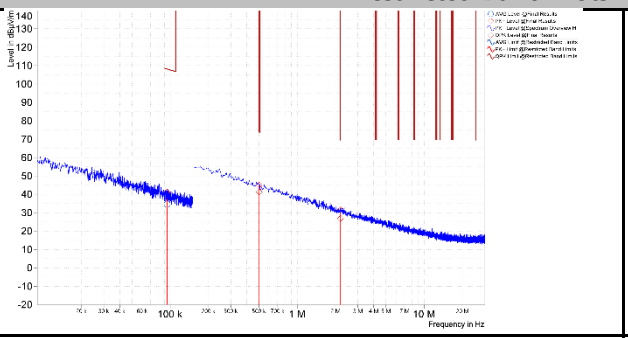
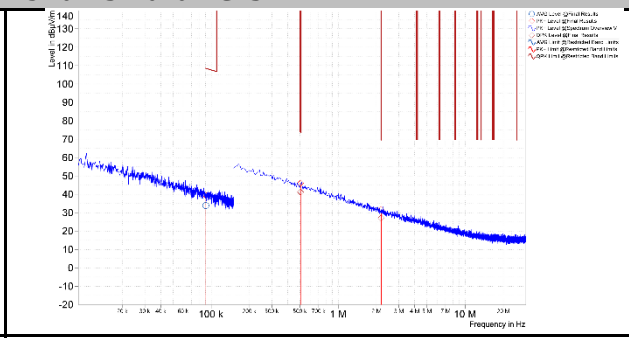
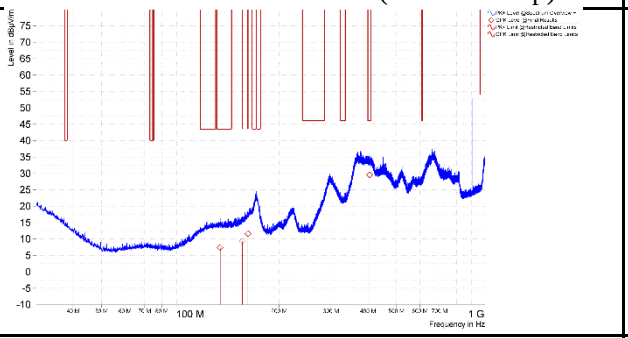
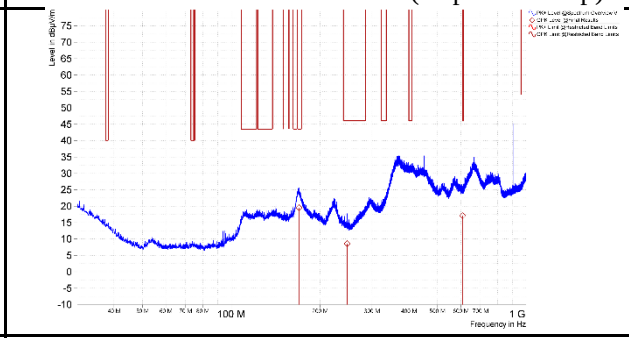
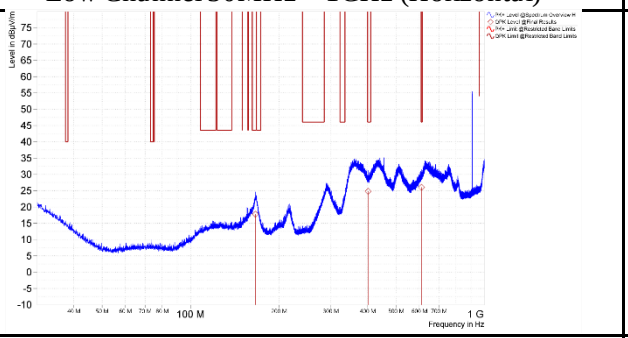
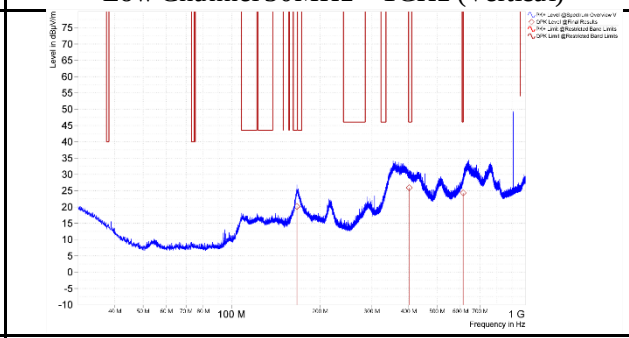
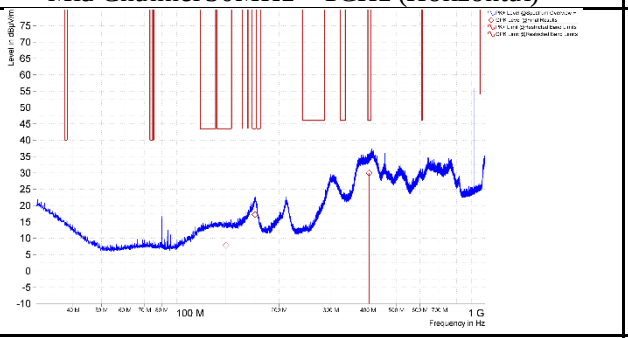
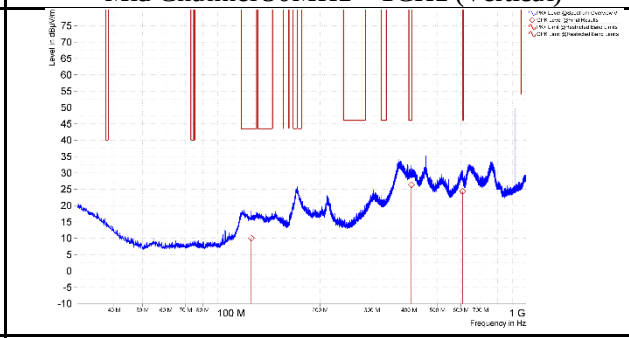
Radiated measurements below 30MHz were performed in a semi-anechoic chamber that has been correlated to an open area site.

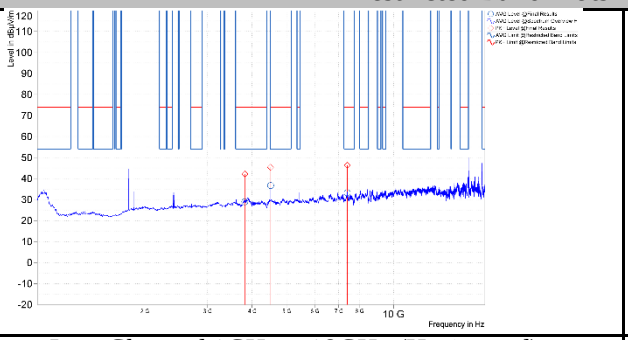
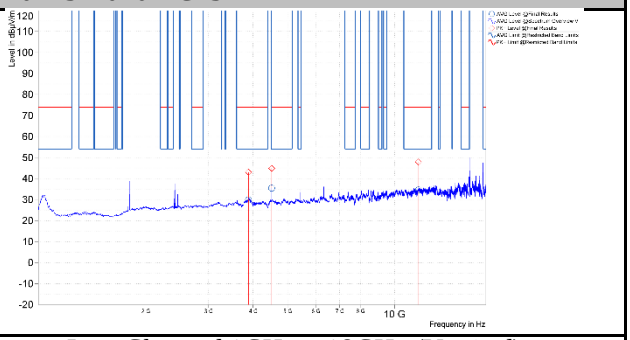
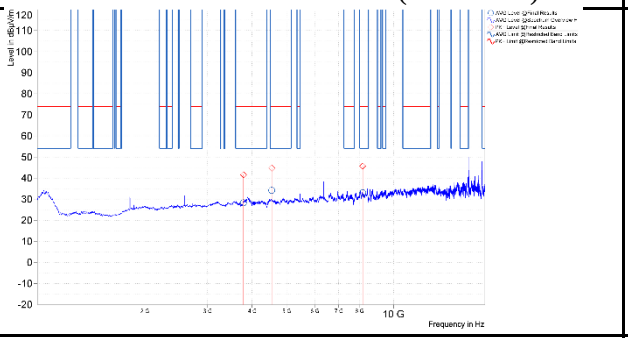
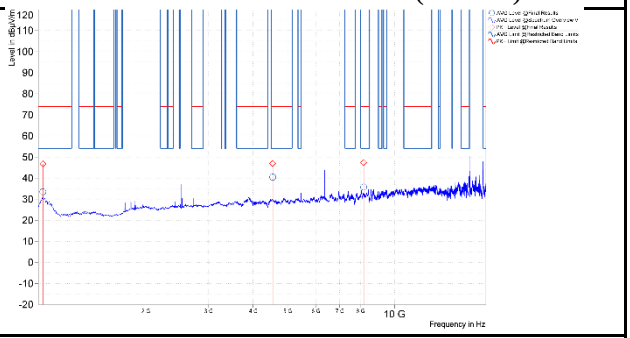
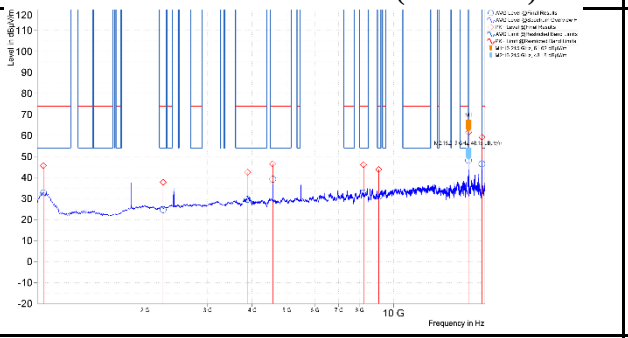
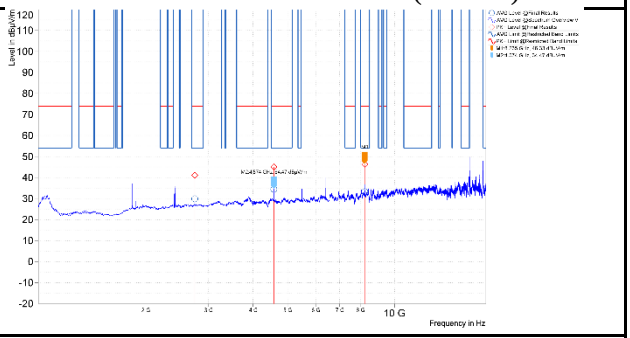
Test Software: ELEKTRA Version 4.61 (Manufactured by Rohde&Schwarz) was utilized to perform these measurements.

Test Results: The EUT was compliant with the Radiated Spurious Emission limits of **§ 15.247(d)**.

Test Engineer(s): An Dang/Veer Patel

Test Date(s): 03/28/2025 – 04/01/2025

Restricted Band Plots - 2JF0415P-010MC137	
	
Mid Channel 9kHz – 30MHz (Coaxial Loop)	Mid Channel 9kHz – 30MHz (Coplanar Loop)
	
Low Channel 30MHz – 1GHz (Horizontal)	Low Channel 30MHz – 1GHz (Vertical)
	
Mid Channel 30MHz – 1GHz (Horizontal)	Mid Channel 30MHz – 1GHz (Vertical)
	
High Channel 30MHz – 1GHz (Horizontal)	High Channel 30MHz – 1GHz (Vertical)

Restricted Band Plots - 2JF0415P-010MC137	
	
Low Channel 1GHz – 18GHz (Horizontal)	Low Channel 1GHz – 18GHz (Vertical)
	
Mid Channel 1GHz – 18GHz (Horizontal)	Mid Channel 1GHz – 18GHz (Vertical)
	
High Channel 1GHz – 18GHz (Horizontal)	High Channel 1GHz – 18GHz (Vertical)

Worst Case Cabinet Spurious Emissions

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
0.091	39.51	108.47	68.96	11.73	V	298	1	0.200	Pass
0.094	41.06	108.12	67.05	11.54	H	255.8	1	0.200	Pass
0.501	44.98	73.69	28.71	11.27	H	226.2	1	9.000	Pass
0.506	46.10	73.62	27.52	11.31	V	65.6	1	9.000	Pass
2.180	31.77	69.54	37.77	11.69	V	231.5	1	9.000	Pass
2.189	31.40	69.54	38.14	11.69	H	60.3	1	9.000	Pass

Figure 6. Worst Case Cabinet Radiation, 9kHz - 30MHz 2JF0415P-010MC137

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
126.300	7.38	43.52	36.14	-6.25	H	277.2	3.69	120.000	Pass
150.000	9.26	43.52	34.26	-7.61	H	307.3	3.97	120.000	Pass
156.840	11.68	43.52	31.84	-7.61	H	293.6	3.81	120.000	Pass
169.620	19.54	43.52	23.98	-8.26	V	103.1	1.17	120.000	Pass
247.110	8.57	46.02	37.45	-7.47	V	106.6	1.1	120.000	Pass
405.150	29.55	46.02	16.47	-2.70	H	268.2	2.69	120.000	Pass
609.360	17.04	46.02	28.98	1.35	V	106.4	1.36	120.000	Pass

Figure 7. Worst Case Cabinet Radiation, 30MHz - 1GHz (Low Channel) 2JF0415P-010MC137

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
166.170	17.75	43.52	25.77	-7.96	H	75.5	3.25	120.000	Pass
166.740	20.16	43.52	23.36	-8.26	V	135	1.38	120.000	Pass
401.580	24.80	46.02	21.22	-2.92	H	261	2.06	120.000	Pass
402.150	25.89	46.02	20.13	-2.77	V	162.8	3.88	120.000	Pass
610.230	26.05	46.02	19.97	1.16	H	129.5	1.6	120.000	Pass
613.410	24.30	46.02	21.72	1.46	V	46.7	1.02	120.000	Pass

Figure 8. Worst Case Cabinet Radiation, 30MHz - 1GHz (Mid Channel) 2JF0415P-010MC137

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
116.820	10.07	43.52	33.45	-7.41	V	231.3	1.21	120.000	Pass
132.300	7.77	43.52	35.75	-6.55	H	261.1	3.99	120.000	Pass
165.840	17.23	43.52	26.29	-7.95	H	105.1	3.01	120.000	Pass
403.650	30.01	46.02	16.01	-2.78	H	102.8	1.62	120.000	Pass
407.730	26.33	46.02	19.69	-2.39	V	96.2	0.99	120.000	Pass
609.330	24.30	46.02	21.72	1.35	V	125	2.77	120.000	Pass

Figure 9. Worst Case Cabinet Radiation, 30MHz - 1GHz (High Channel) 2JF0415P-010MC137

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Result
3,817.000	42.19	74.00	31.81	28.90	54.00	25.10	-2.36	H	153.3	1.38	Pass
3,883.500	43.09	74.00	30.91	29.84	54.00	24.16	-1.68	V	287.7	2.84	Pass
4,511.500	45.41	74.00	28.59	36.66	54.00	17.34	-3.13	H	295	1.57	Pass
4,511.500	44.92	74.00	29.08	35.44	54.00	18.56	-3.13	V	162.7	3.33	Pass
7,402.500	46.19	74.00	27.81	33.25	54.00	20.75	-2.49	H	65.3	1.33	Pass
11,663.500	47.89	74.00	26.11	34.56	54.00	19.44	-1.10	V	111.3	3.63	Pass

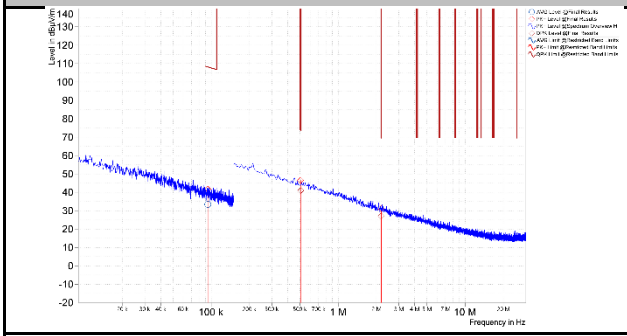
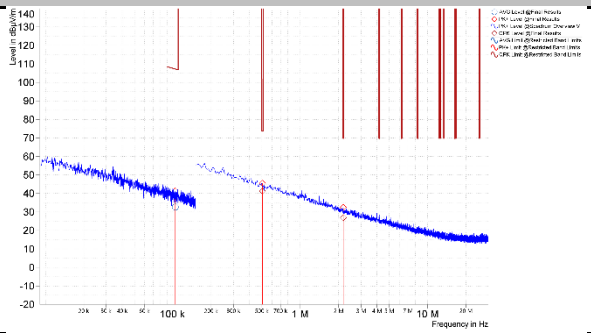
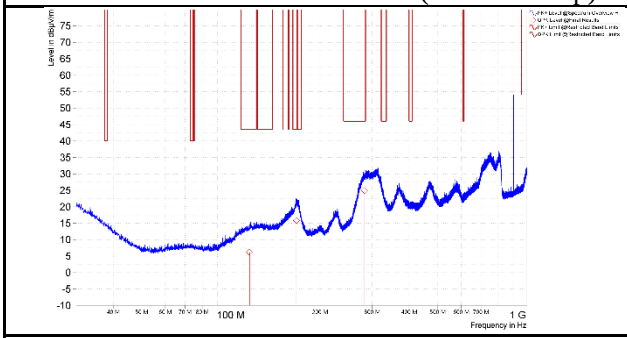
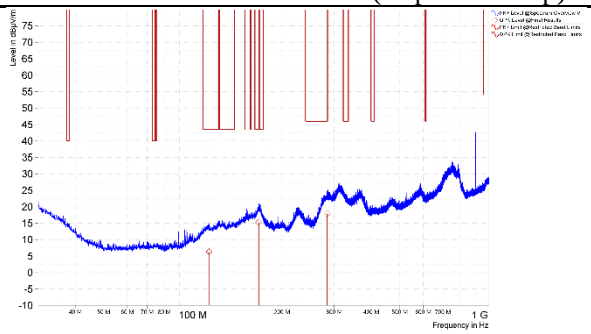
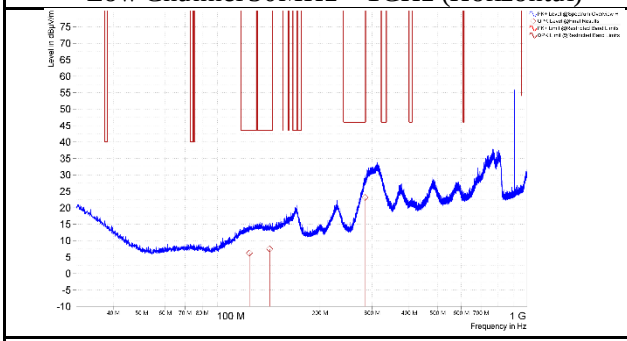
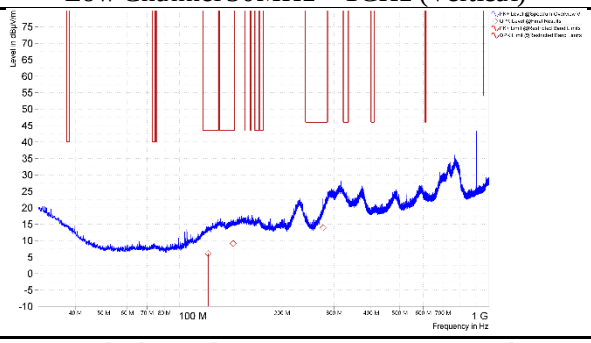
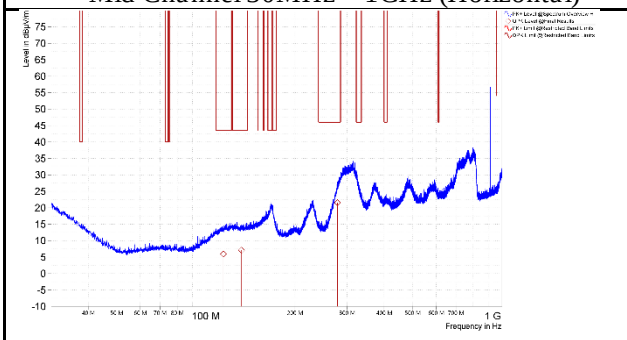
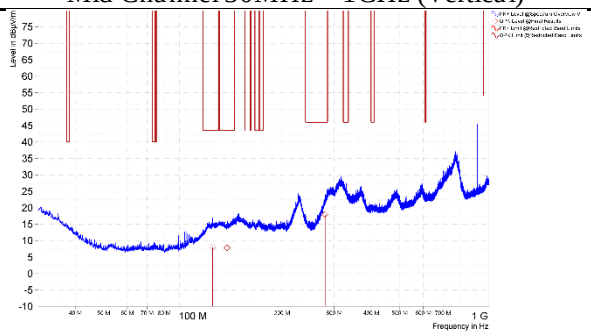
Figure 10. Worst Case Cabinet Radiation, 1GHz - 18GHz (Low Channel) 2JF0415P-010MC137

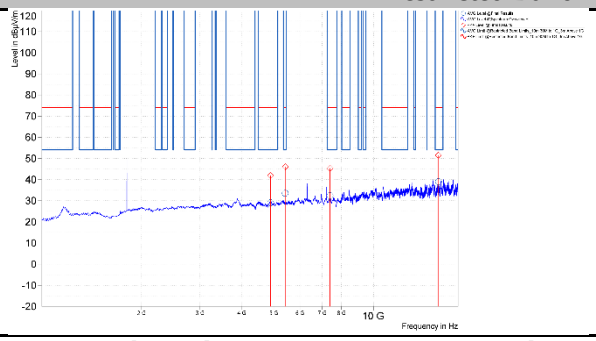
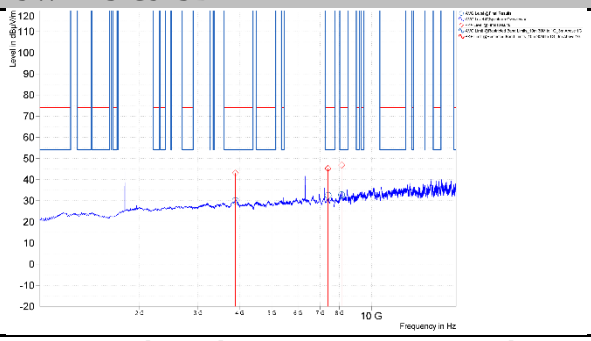
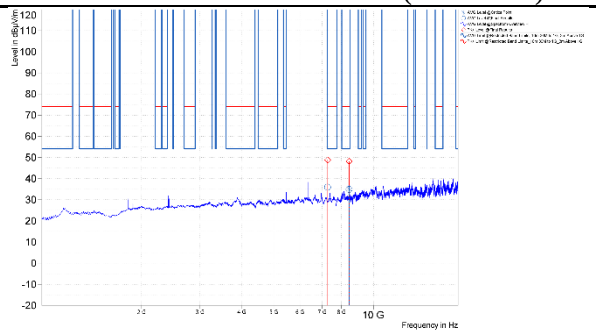
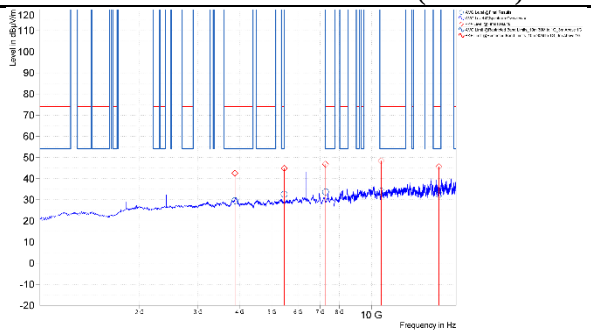
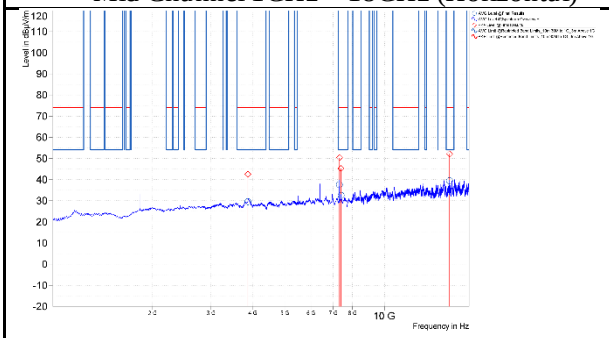
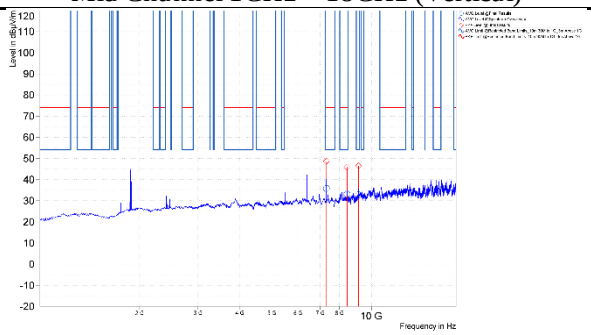
Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Result
1,028.000	46.71	74.00	27.29	33.52	54.00	20.48	-0.56	V	191.7	1	Pass
3,785.000	41.57	74.00	32.43	28.28	54.00	25.72	-2.79	H	334.8	1.59	Pass
4,543.500	44.66	74.00	29.34	34.18	54.00	19.82	-3.44	H	201.6	3.51	Pass
4,543.500	46.95	74.00	27.05	40.44	54.00	13.56	-3.44	V	209.6	2.37	Pass
8,178.000	47.39	74.00	26.61	35.70	54.00	18.30	-3.20	V	20.1	3.19	Pass
8,179.000	45.73	74.00	28.27	33.06	54.00	20.94	-3.17	H	263.9	3.93	Pass

Figure 11. Worst Case Cabinet Radiation, 1GHz - 18GHz (Mid Channel) 2JF0415P-010MC137

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Result
1,039.500	45.62	74.00	28.38	32.75	54.00	21.25	-0.61	H	185.9	1.5	Pass
2,252.500	37.74	74.00	36.26	24.73	54.00	29.27	-2.83	H	193.2	2.53	Pass
2,744.500	41.13	74.00	32.87	29.88	54.00	24.12	-2.74	V	155.6	2.15	Pass
3,881.000	42.56	74.00	31.44	29.63	54.00	24.37	-1.70	H	211.7	1.58	Pass
4,574.000	45.05	74.00	28.95	34.47	54.00	19.53	-3.78	V	199.4	3.8	Pass
4,574.500	46.51	74.00	27.49	39.19	54.00	14.81	-3.78	H	153.9	3.97	Pass
8,233.500	46.12	74.00	27.88	32.69	54.00	21.31	-3.14	H	5.8	3.42	Pass
8,234.500	46.33	74.00	27.67	33.26	54.00	20.74	-3.15	V	35.8	3.27	Pass
9,079.000	43.73	74.00	30.27	31.14	54.00	22.86	-4.45	H	255.4	1.45	Pass

Figure 12. Worst Case Cabinet Radiation, 1GHz - 18GHz (High Channel) 2JF0415P-010MC137

Restricted Band Plots - 2JW1115-C943B	
	
Mid Channel 9kHz – 30MHz (Coaxial Loop)	Mid Channel 9kHz – 30MHz (Coplanar Loop)
	
Low Channel 30MHz – 1GHz (Horizontal)	Low Channel 30MHz – 1GHz (Vertical)
	
Mid Channel 30MHz – 1GHz (Horizontal)	Mid Channel 30MHz – 1GHz (Vertical)
	
High Channel 30MHz – 1GHz (Horizontal)	High Channel 30MHz – 1GHz (Vertical)

Restricted Band Plots - 2JW1115-C943B	
	
Low Channel 1GHz – 18GHz (Horizontal)	Low Channel 1GHz – 18GHz (Vertical)
	
Mid Channel 1GHz – 18GHz (Horizontal)	Mid Channel 1GHz – 18GHz (Vertical)
	
High Channel 1GHz – 18GHz (Horizontal)	High Channel 1GHz – 18GHz (Vertical)

Worst Case Cabinet Spurious Emissions

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
0.094	41.66	108.14	66.48	11.55	H	128.8	1	0.200	Pass
0.105	41.36	107.22	65.87	11.32	V	298.8	1	0.200	Pass
0.506	46.53	73.62	27.09	11.31	H	199.4	1	9.000	Pass
0.506	45.44	73.62	28.17	11.31	V	315.1	1	9.000	Pass
2.180	31.21	69.54	38.33	11.69	H	249.5	1	9.000	Pass
2.180	32.45	69.54	37.09	11.69	V	175	1	9.000	Pass

Figure 13. Worst Case Cabinet Radiation, 9kHz - 30MHz 2JW1115-C943B

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
113.580	6.35	43.52	37.17	-7.52	V	57.1	1.92	120.000	Pass
115.650	6.21	43.52	37.31	-6.77	H	64.7	3.87	120.000	Pass
166.440	15.88	43.52	27.64	-7.96	H	279.5	2.98	120.000	Pass
166.980	15.30	43.52	28.22	-8.26	V	9.3	1.57	120.000	Pass
282.810	24.99	46.02	21.03	-5.93	H	89.1	3.93	120.000	Pass
284.190	17.92	46.02	28.10	-5.91	V	88.9	1.22	120.000	Pass

Figure 14. Worst Case Cabinet Radiation, 30MHz - 1GHz (Low Channel) 2JW1115-C943B

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
112.590	6.17	43.52	37.35	-7.57	V	242.5	2.17	120.000	Pass
115.500	6.26	43.52	37.26	-6.80	H	247.2	3.56	120.000	Pass
135.090	7.48	43.52	36.04	-6.81	H	95.9	3.69	120.000	Pass
136.740	9.11	43.52	34.41	-6.77	V	65.3	1.05	120.000	Pass
275.130	13.88	46.02	32.14	-5.90	V	150.4	3.78	120.000	Pass
283.380	23.12	46.02	22.90	-5.93	H	292.2	2.58	120.000	Pass

Figure 15. Worst Case Cabinet Radiation, 30MHz - 1GHz (Mid Channel) 2JW1115-C943B

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
114.540	5.92	43.52	37.60	-6.96	H	171.3	1.49	120.000	Pass
116.610	8.08	43.52	35.44	-7.44	V	303.3	1.04	120.000	Pass
130.350	7.80	43.52	35.72	-6.90	V	321.2	1.06	120.000	Pass
131.910	7.07	43.52	36.45	-6.52	H	89.9	2.37	120.000	Pass
278.400	21.54	46.02	24.48	-5.93	H	112.9	3.18	120.000	Pass
279.780	17.95	46.02	28.07	-6.04	V	158.3	4	120.000	Pass

Figure 16. Worst Case Cabinet Radiation, 30MHz - 1GHz (High Channel) 2JW1115-C943B

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Result
3,888.000	43.04	74.00	30.96	30.00	54.00	24.00	-1.63	V	153.3	3.5	Pass
4,893.500	41.82	74.00	32.18	29.06	54.00	24.94	-3.12	H	331.4	1.19	Pass
5,418.000	46.01	74.00	27.99	33.57	54.00	20.43	-4.26	H	188.4	2.86	Pass
7,398.000	45.43	74.00	28.57	32.39	54.00	21.61	-2.47	H	202.8	4.02	Pass
7,398.500	45.30	74.00	28.70	32.50	54.00	21.50	-2.47	V	213.7	1.35	Pass
8,126.500	46.87	74.00	27.13	32.81	54.00	21.19	-4.13	V	159.1	3.87	Pass
15,704.000	51.49	74.00	22.51	39.04	54.00	14.96	1.04	H	326.7	3.95	Pass

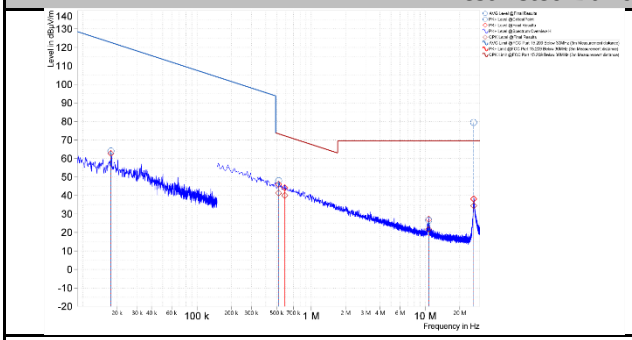
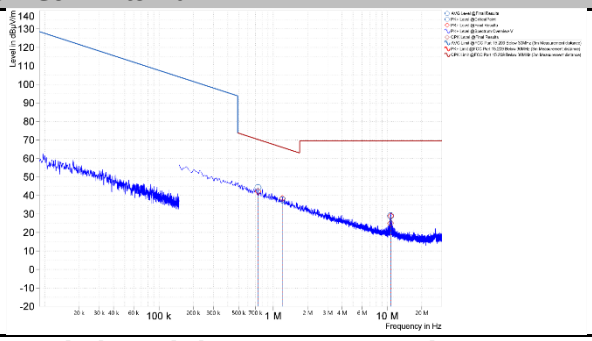
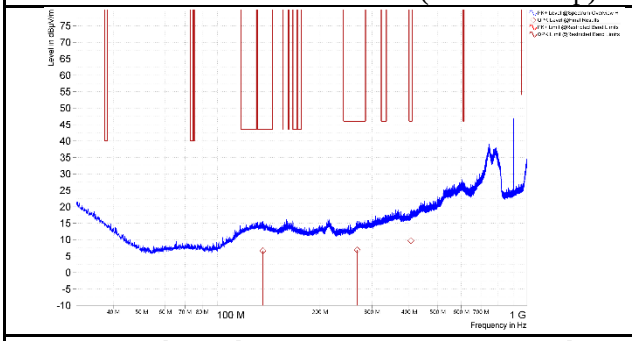
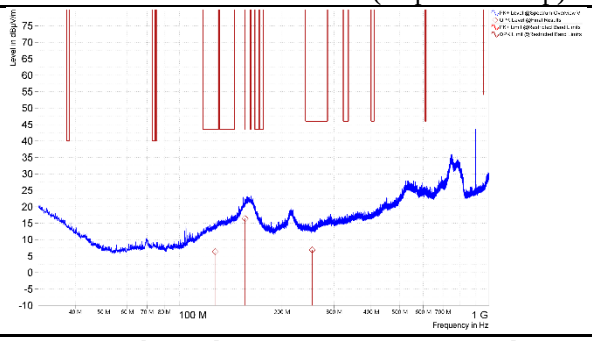
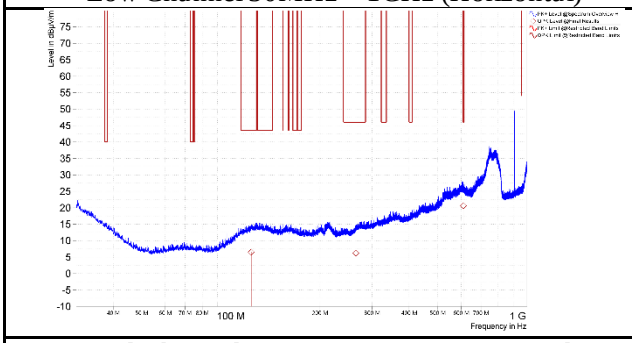
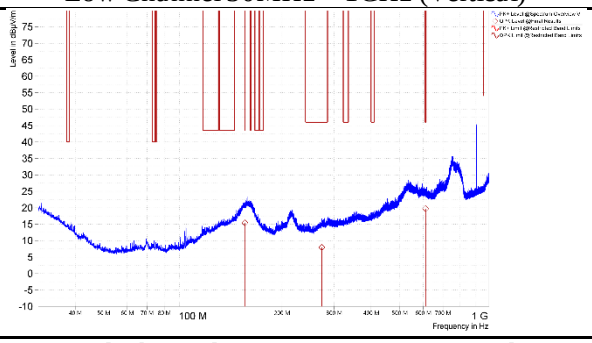
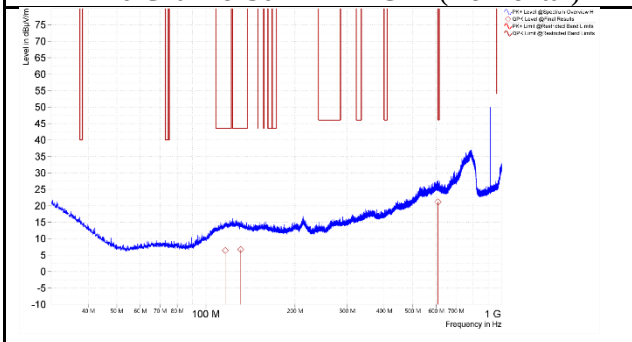
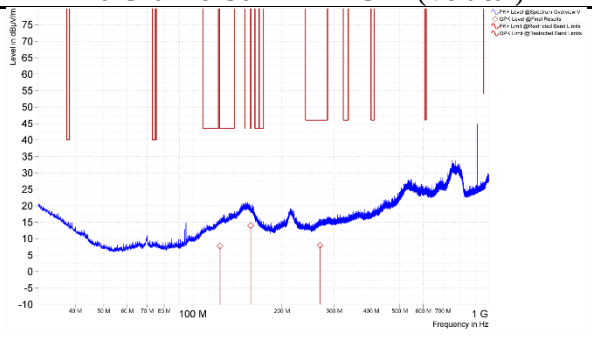
Figure 17. Worst Case Cabinet Radiation, 1GHz - 18GHz (Low Channel) 2JW1115-C943B

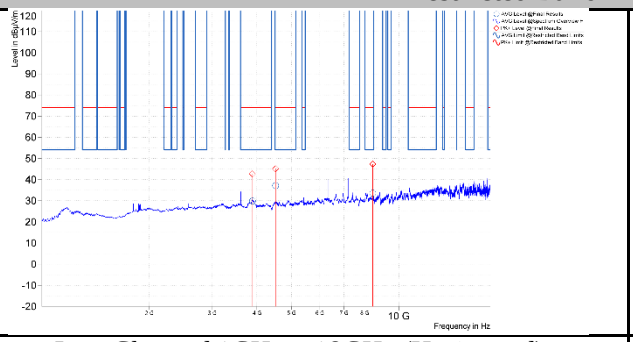
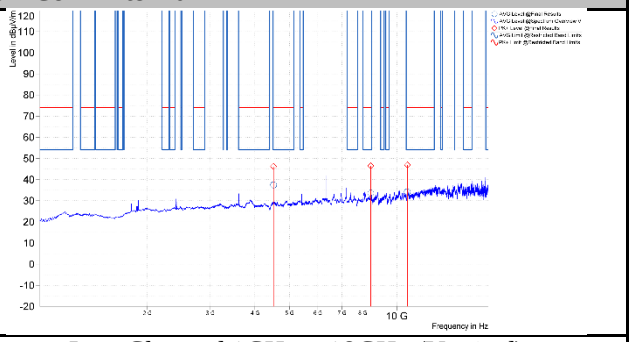
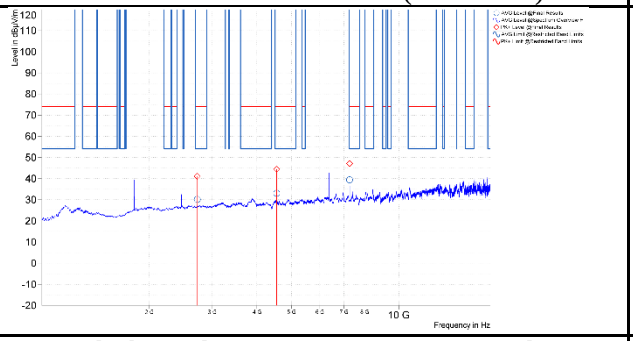
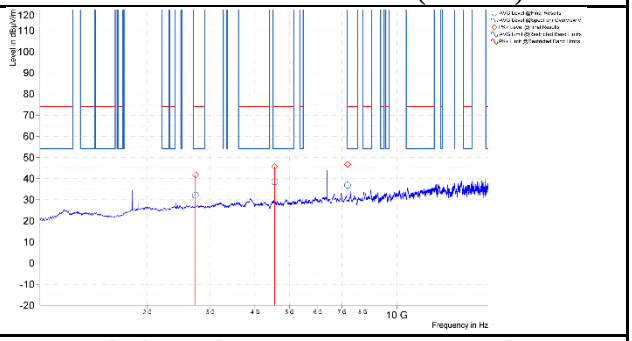
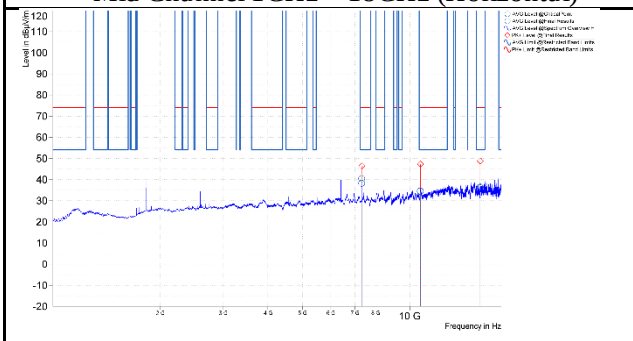
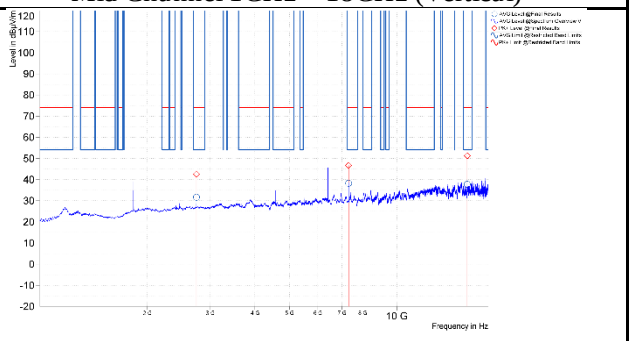
Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Result
3,878.500	42.54	74.00	31.46	29.56	54.00	24.44	-1.73	V	195.7	1.5	Pass
5,457.000	44.83	74.00	29.17	32.56	54.00	21.44	-4.17	V	149.3	3.5	Pass
7,275.000	48.86	74.00	25.14	35.95	54.00	18.05	-3.14	H	273.2	3.82	Pass
7,275.000	46.86	74.00	27.14	33.72	54.00	20.28	-3.14	V	300.3	4.01	Pass
8,440.500	48.21	74.00	25.79	34.91	54.00	19.09	-3.70	H	344.3	1.49	Pass
10,695.000	48.40	74.00	25.60	34.06	54.00	19.94	-0.80	V	182.8	1.57	Pass
15,964.000	45.53	74.00	28.47	32.53	54.00	21.47	-0.85	V	47.9	1.41	Pass

Figure 18. Worst Case Cabinet Radiation, 1GHz - 18GHz (Mid Channel) 2JW1115-C943B

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Result
3,876.500	42.48	74.00	31.52	29.53	54.00	24.47	-1.75	H	316.6	1.64	Pass
7,312.500	48.66	74.00	25.34	35.84	54.00	18.16	-2.83	V	315.4	4	Pass
7,313.500	50.38	74.00	23.62	37.58	54.00	16.42	-2.83	H	273.8	3.66	Pass
7,398.500	45.25	74.00	28.75	32.55	54.00	21.45	-2.47	H	336.5	3.87	Pass
8,440.500	45.85	74.00	28.15	33.12	54.00	20.88	-3.70	V	59.2	3.03	Pass
9,140.500	46.41	74.00	27.59	32.79	54.00	21.21	-3.99	V	306.2	4	Pass
15,703.500	52.16	74.00	21.84	39.49	54.00	14.51	1.04	H	75.6	1.18	Pass

Figure 19. Worst Case Cabinet Radiation, 1GHz - 18GHz (High Channel) 2JW1115-C943B

Restricted Band Plots – Coil Antenna	
	
Mid Channel 9kHz – 30MHz (Coaxial Loop)	Mid Channel 9kHz – 30MHz (Coplanar Loop)
	
Low Channel 30MHz – 1GHz (Horizontal)	Low Channel 30MHz – 1GHz (Vertical)
	
Mid Channel 30MHz – 1GHz (Horizontal)	Mid Channel 30MHz – 1GHz (Vertical)
	
High Channel 30MHz – 1GHz (Horizontal)	High Channel 30MHz – 1GHz (Vertical)

Restricted Band Plots – Coil Antenna	
	
Low Channel 1GHz – 18GHz (Horizontal)	Low Channel 1GHz – 18GHz (Vertical)
	
Mid Channel 1GHz – 18GHz (Horizontal)	Mid Channel 1GHz – 18GHz (Vertical)
	
High Channel 1GHz – 18GHz (Horizontal)	High Channel 1GHz – 18GHz (Vertical)

Worst Case Cabinet Spurious Emissions

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
0.195	54.49	101.80	47.31	11.34	H	176.9	1	9.000	Pass
0.560	44.28	72.65	28.37	11.42	H	224.4	1	9.000	Pass
0.942	40.45	68.12	27.67	11.64	V	0	1	9.000	Pass
1.280	38.29	65.46	27.17	11.71	H	354.4	1	9.000	Pass
2.225	32.66	69.50	36.84	11.68	V	313.2	1	9.000	Pass
4.542	26.21	69.50	43.29	11.59	H	6.6	1	9.000	Pass

Figure 20. Worst Case Cabinet Radiation, 9kHz - 30MHz Coil Antenna

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
119.250	6.34	43.52	37.18	-6.93	V	203	3.76	120.000	Pass
128.250	6.69	43.52	36.83	-6.35	H	279.8	2.2	120.000	Pass
150.000	16.41	43.52	27.11	-7.71	V	190.4	1.55	120.000	Pass
252.990	6.94	46.02	39.08	-7.37	V	322.9	1.14	120.000	Pass
267.450	6.83	46.02	39.19	-6.16	H	129.6	2.91	120.000	Pass
405.900	9.75	46.02	36.27	-2.61	H	223.2	3.75	120.000	Pass

Figure 21. Worst Case Cabinet Radiation, 30MHz - 1GHz (Low Channel) Coil Antenna

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
117.120	6.54	43.52	36.98	-6.59	H	360	1.1	120.000	Pass
150.030	15.38	43.52	28.14	-7.71	V	210.8	1.38	120.000	Pass
264.390	6.29	46.02	39.73	-6.42	H	194	1.11	120.000	Pass
272.760	7.94	46.02	38.08	-5.98	V	297.4	1.43	120.000	Pass
610.470	20.67	46.02	25.35	1.16	H	143	3.68	120.000	Pass
611.310	19.75	46.02	26.27	1.39	V	277.8	3.04	120.000	Pass

Figure 22. Worst Case Cabinet Radiation, 30MHz - 1GHz (Mid Channel) Coil Antenna

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
116.250	6.40	43.52	37.12	-6.67	H	276.3	2.5	120.000	Pass
123.450	7.75	43.52	35.77	-6.21	V	74.6	1.47	120.000	Pass
131.010	6.71	43.52	36.81	-6.43	H	225.8	3.89	120.000	Pass
156.780	13.99	43.52	29.53	-7.84	V	181.9	1.35	120.000	Pass
268.620	7.92	46.02	38.10	-6.10	V	318.6	1.11	120.000	Pass
608.190	21.17	46.02	24.85	1.04	H	142.3	3.94	120.000	Pass

Figure 23. Worst Case Cabinet Radiation, 30MHz - 1GHz (High Channel) Coil Antenna

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Result
3,889.500	42.71	74.00	31.29	29.83	54.00	24.17	-1.62	H	252.1	3.89	Pass
4,511.500	45.14	74.00	28.86	37.12	54.00	16.88	-3.13	H	296.7	2.5	Pass
4,511.500	46.21	74.00	27.79	37.47	54.00	16.53	-3.13	V	244.3	2.81	Pass
8,440.500	47.36	74.00	26.64	33.63	54.00	20.37	-3.70	H	44.9	1.49	Pass
8,440.500	46.46	74.00	27.54	33.59	54.00	20.41	-3.70	V	9.7	3.64	Pass
10,677.500	46.97	74.00	27.03	34.20	54.00	19.80	-0.89	V	152.9	3.65	Pass

Figure 24. Worst Case Cabinet Radiation, 1GHz – 18GHz (Low Channel) Coil Antenna

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Result
2,726.000	41.07	74.00	32.93	30.18	54.00	23.82	-2.72	H	179	2.97	Pass
2,726.000	41.79	74.00	32.21	32.13	54.00	21.87	-2.72	V	193.7	1.57	Pass
4,543.500	44.31	74.00	29.69	33.12	54.00	20.88	-3.44	H	267	1.5	Pass
4,543.500	45.58	74.00	28.42	38.50	54.00	15.50	-3.44	V	183.7	3.74	Pass
7,269.500	47.13	74.00	26.87	39.41	54.00	14.59	-3.21	H	224.7	3.99	Pass
7,270.000	46.72	74.00	27.28	36.94	54.00	17.06	-3.20	V	122.5	3.55	Pass

Figure 25. Worst Case Cabinet Radiation, 1GHz - 18GHz (Mid Channel) Coil Antenna

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Result
2,744.500	42.69	74.00	31.31	31.66	54.00	22.34	-2.74	V	161.4	2.83	Pass
7,319.000	46.42	74.00	27.58	38.27	54.00	15.73	-2.79	H	174.3	2.82	Pass
7,319.000	46.75	74.00	27.25	38.30	54.00	15.70	-2.79	V	152.5	3.24	Pass
10,679.500	47.34	74.00	26.66	34.39	54.00	19.61	-0.88	H	224.6	1.7	Pass
15,709.000	51.34	74.00	22.66	37.77	54.00	16.23	1.01	V	-0.1	3.35	Pass
15,709.500	48.86	74.00	25.14	36.12	54.00	17.88	1.01	H	118.7	1.49	Pass

Figure 26. Worst Case Cabinet Radiation, 1GHz - 18GHz (High Channel) Coil Antenna

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Number of Hopping Channels, Channel Dwell Time and Hopping Frequency Separation

Test Requirements: § 15.247(a, 1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test Requirements: **§RSS-247 (5.1):**

a. The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system's radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

b. FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W.

c. For FHSs in the band 902-928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz

Test Procedure: The transmitter was connected to a calibrated spectrum analyzer. The test sample was configured for its normal hopping sequence. A plot was captured showing the total number of hopping channels. Another plot was captured showing the channel separation. And finally, plots were captured showing the "on time" of a single hop as well as the number of hops in 20 seconds.

The total channel dwell time in a 20-second period was calculated by multiplying the number of hops in 20 seconds by the "on time" of a single hop.

Test Results: The EUT was compliant with hopping channel criteria from FCC part 15.247 and RSS-247 for a 20dB bandwidth of 139kHz.

Parameter	Measured Value	Limit	Result
Number Of Hopping Channels	64 Channels	At Least 50 Channels	Pass
Hopping Channel Separation	200kHz	At Least 139kHz	Pass
Hopping Channel Dwell Time	248.6mS	400mS	Pass

Figure 27. Hopping Channel Results

Test Engineer(s): Veet Patel

Test Date(s): 03/31/2025

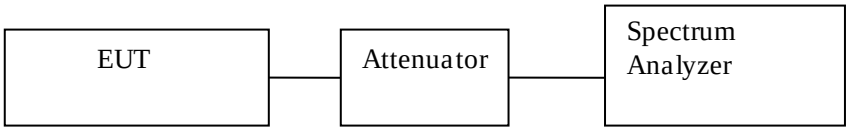
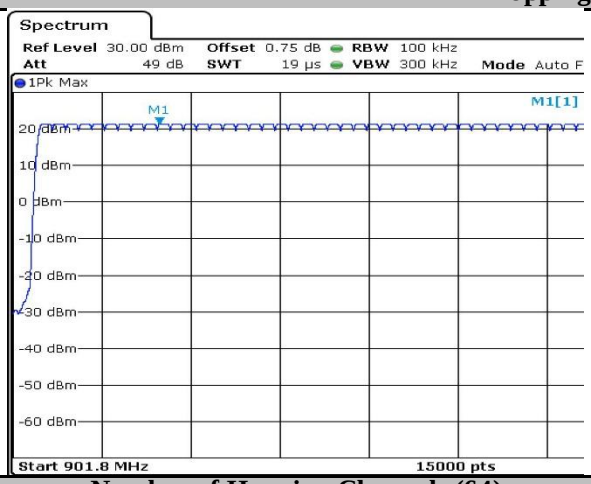
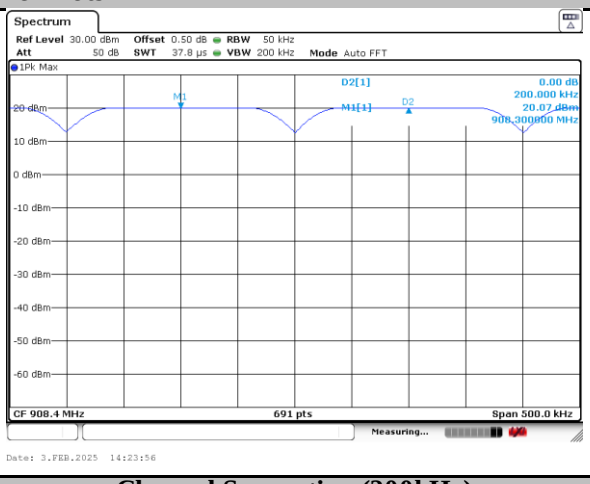


Figure 28. Hopping Channel Test Setup

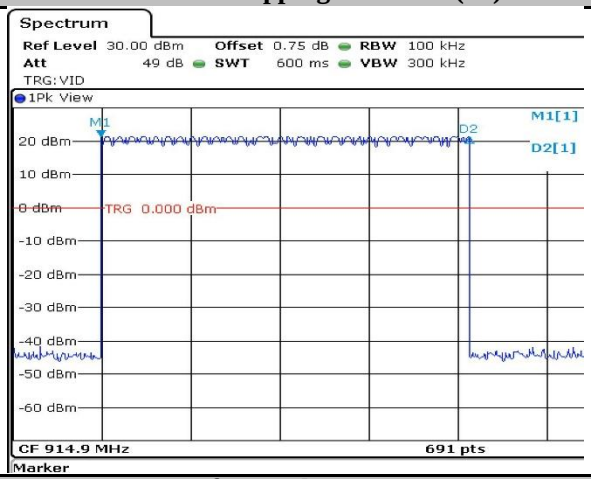
Hopping Channel Plots



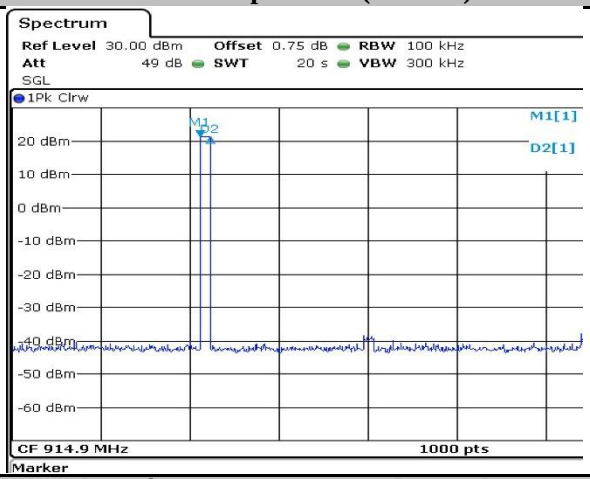
Number of Hopping Channels (64)



Channel Separation (200kHz)



On Time of a Single Hop (248.6mS)



Number of Hops in a 20 Second Period (One)

Figure 29. Hopping Channel Plots

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

MET Asset #	Nomenclature	Manufacturer	Model	Last Cal Date	Cal Due Date
1A1250	EMI Test Receiver	Rohde & Schwarz	ESW44	04/08/2024	04/08/2025
1A1088	Preamplifier	Rohde & Schwarz	TS-PR1	See Note	
1A1147	Bi-Log Antenna	Suno Sciences Corp	JB3	04/06/2023	04/06/2025
1A1259	Thermohygrometer with barometer	Traceable	6453	04/25/2024	04/25/2025
1A1176	Loop Antenna	ETS Lindgren	6502	08/22/2024	08/22/2026
1A1044	Generator	COM-Power Corp	CG- 520	See Note	
1A1073	Multi Device Controller	ETS EMCO	2090	See Note	
1A1180	Amplifier	Miteq	AMF-7D-01001800-22-10P	See Note	
1A1183	Double Ridged Waveguide Antenna	ETS Lindgren	3117	02/20/2024	02/20/2026
1A1161	18G – 40G Horn Antenna	ETS Lindgren	3116C-PA	08/01/2024	01/01/2026
1A1234	Spectrum Analyzer	Rohde & Schwarz	FSV 40	03/13/2025	03/13/2027
1A1099	Generator	COM-Power Corp	CGO 51000	See Note	
1A1080	Multi Device Controller	ETS EMCO	2090	See Note	
Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.					

Table 13. Test Equipment List

End of Report