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

11/05/2025

OnAsset Intelligence
8407 Sterling St. Irving
TX 75063
USA

Dear Shawn Key,

Enclosed is the EMC Wireless test report for compliance testing of the OnAsset Intelligence Sentinel 200 as tested to the requirements of FCC 15.247 and RSS-247 Issue 4 for Intentional Radiators. This test report pertains specifically to the LoRa transmitter onboard which operates in the 915MHz 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: WIRA135442-FCC-IC-LoRa_R2

LoRa Test Report

for the

OnAsset Intelligence
Sentinel 200

Tested under
FCC 15.247 and RSS-247 Issue 4
For Intentional Radiators

Veer Patel, EMC/Wireless Test 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
∅	September 16, 2025	Initial Issue.
1	10/23/2025	TCB Reviewer Comments
2	11/05/2025	TCB Reviewer 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**ertz
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ertz
kPa	**k**ilo**pa**scal
kV	**k**ilovolt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**micro**henry
µ	**micro**farad
µs	**micro**seconds
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 Sentinel 200, with the requirements of FCC 15.247 and RSS-247 Issue 4. OnAsset Intelligence should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Sentinel 200, 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 4, in accordance with OnAsset Intelligence purchase order number 8642. 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 4 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	**NA**[1]
Title 47 of the CFR, Part 15 §15.247(a)(1)	RSS-247 (6.2.2.1)	20dB Occupied Bandwidth	**Compliant**
---	RSS-GEN(6.7)	99% Occupied Bandwidth	**Compliant**
Title 47 of the CFR, Part 15 §15.247 (a, 1, i)	RSS-247(6.2.2.1)	Number of Hopping Channels	**Compliant**
Title 47 of the CFR, Part 15 §15.247 (a, 1, i)	RSS-247(6.2.2.1)	Channel Separation	**Compliant**
Title 47 of the CFR, Part 15 §15.247 (a, 1, i)	RSS-247(6.2.2.1)	Hopping Channel Dwell Time	**Compliant**
Title 47 of the CFR, Part 15 §15.247(b)	RSS-247(6.3.1)	Peak Power Spectral Density	**Compliant**
Title 47 of the CFR, Part 15 §15.247(e)	RSS-247(6.3.2)	Peak Power Output	**Compliant**
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	RSS-247 (6.6)	Radiated Spurious Emissions Requirements	**Compliant**
Title 47 of the CFR, Part 15 §15.247(d)	RSS-247 (6.6)	RF Conducted Spurious Emissions Requirements	**Compliant**

Table 1. Executive Summary

[1] This test is not applicable since the test sample is battery powered with no connection to AC mains.

II. Equipment Configuration

A. Overview

Eurofins MET Labs was contracted by OnAsset Intelligence to perform testing on the Sentinel 200, under OnAsset Intelligence's purchase order number 8642.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Sentinel 200.

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

Product Name:	Sentinel 200	
Model(s) Tested:	Sentinel 200	
Sample Number:	25321-4	
FCCID:	2ARLF-200	
ICID:	24446-200	
Equipment Specifications:	Primary Power:	3VDC TO 3.6VDC
	Type of Modulations:	GFSK
	Equipment Code:	DTS / FHSS (Hybrid System)
	Peak RF Output Power:	9.96dBm
	EUT Frequency Ranges:	902.3 – 927.7MHz
	Antenna Gain[2]:	0.5 dBi
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:	Bryan Taylor, Veer Patel	
Report Date(s):	11/05/2025	

Table 2. EUT Summary Table

[2] The antenna gain information was provided by OnAsset Intelligence and may affect compliance.

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 4	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-GEN, Issue 5	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

The Sentinel 200 is an internal battery powered LoRa and BLE beacon with sensors intended for asset tracking and monitoring. It can be used to identify location area and save sensor information for later download.

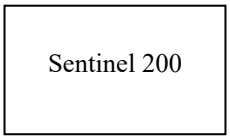


Figure 1. Block Diagram of Test Configuration

F. Equipment Configuration

The EUT was set up as outlined in Figure 1 above. Software commands were sent to the test sample to control the transmitter via the Silicon Laboratories standalone NCP commander tool.

G. Support Equipment

The Sentinel 200 was tested in a stand-alone configuration. No support equipment was used during the evaluation.

H. Ports and Cabling Information

The Sentinel 200 was tested in a stand-alone configuration. No cables were connected during the evaluation.

I. Mode of Operation

Software commands were sent to the test sample to control the transmitter via the Silicon Laboratories standalone NCP commander tool.

Transmit Band	Modulation	Channel Frequencies Tested	Test Tool Power Setting[3]
902 – 928MHz	Chirp Spread Spectrum	902.3MHz / 915MHz / 927.4MHz	19dBm

Table 5. 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 OnAsset Intelligence upon completion of testing.

[3] Note, the test tool power setting does not necessarily correspond to a power in dBm or Watts.

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.

Test Results: The EUT as tested is compliant the criteria of §15.203. The TX antenna is permanently attached to the unit and is not accessible by the end user.

Test Engineer(s): Bryan Taylor

Test Date(s): 07/02/2025

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): 8/20/2025

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 rang between two points, one above and the other blow 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): 8/20/2025

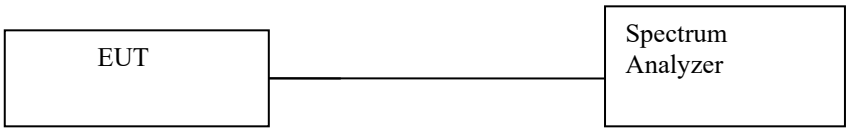
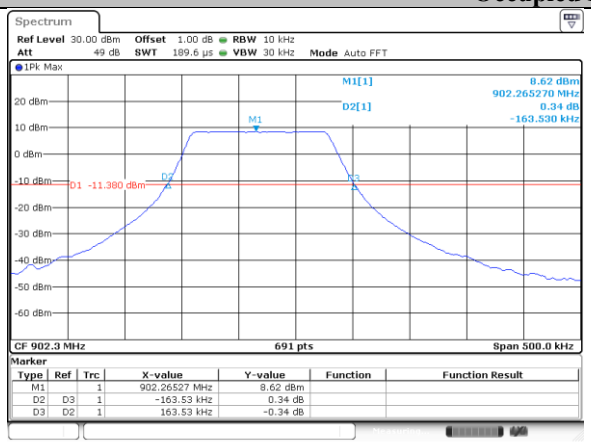


Figure 2. Block Diagram, Occupied Bandwidth Test Setup

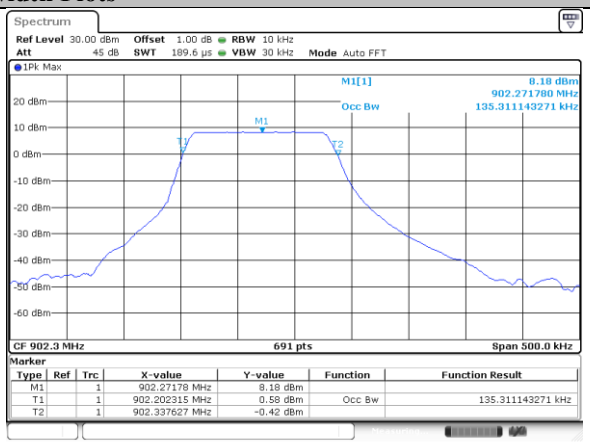
Channel	Frequency (MHz)	20dB Bandwidth	20dB Bandwidth Limit (Maximum)	99% Bandwidth	Result
Low	902.3MHz	163.5kHz	0.25 MHz	135.3kHz	Pass
Middle	915MHz	164.2kHz	0.25 MHz	138.2kHz	Pass
High	927.4MHz	164.9kHz	0.25 MHz	137.5kHz	Pass

Table 6. 99% and 20 dB Occupied Bandwidth, Test Results

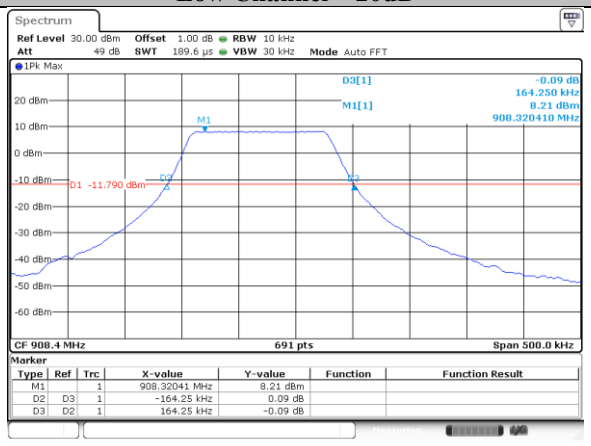
Occupied Bandwidth Plots



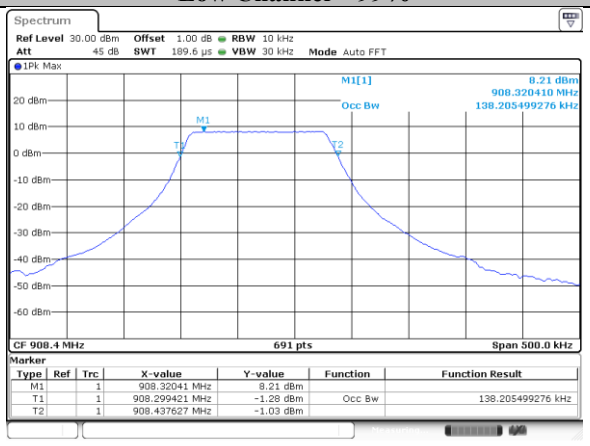
Low Channel – 20dB



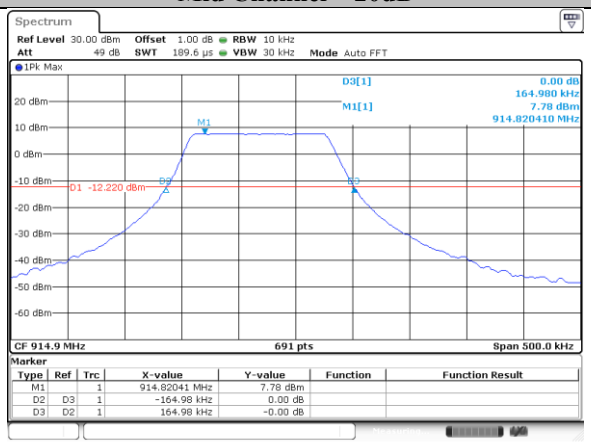
Low Channel – 99%



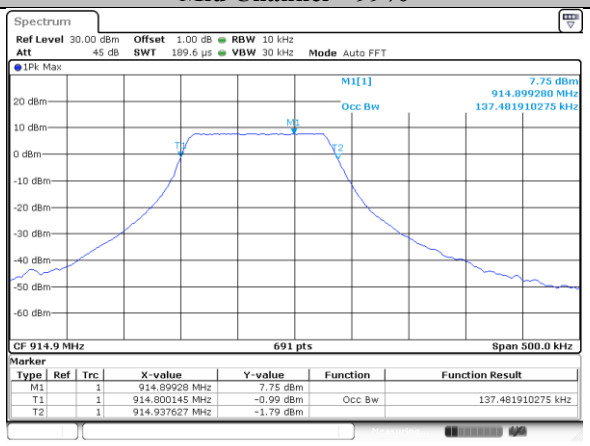
Mid Channel – 20dB



Mid Channel – 99%



High Channel – 20dB



High Channel – 99%

Figure 3. 20dB and 99% Bandwidth Plots

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 164.98kHz.

Parameter	Measured Value	Limit	Result
Number Of Hopping Channels	64	50 (minimum)	Pass
Hopping Channel Separation	200kHz	164.98kHz (minimum)	Pass
Number of Hops in 20S	1	---	---
Hopping Channel Dwell Time	366.8mS (within a 20S period)	400mS (within a 20S period)	Pass

Figure 4. Hopping Channel Results

Test Engineer(s): Veet Patel

Test Date(s): 8/20/2025

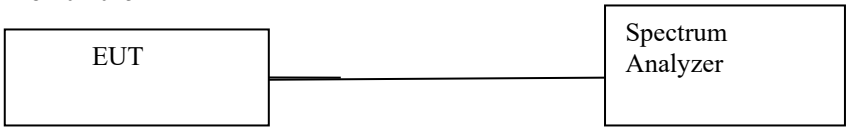
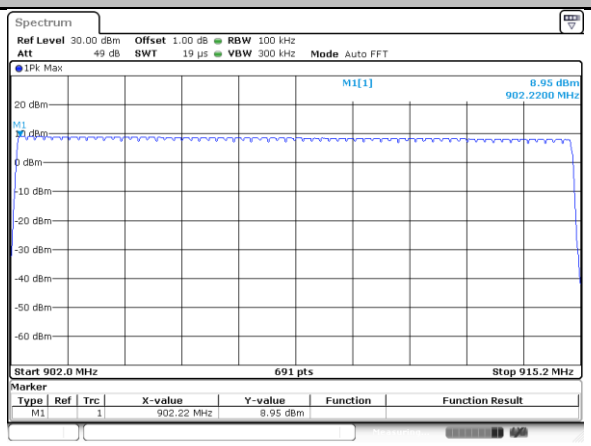
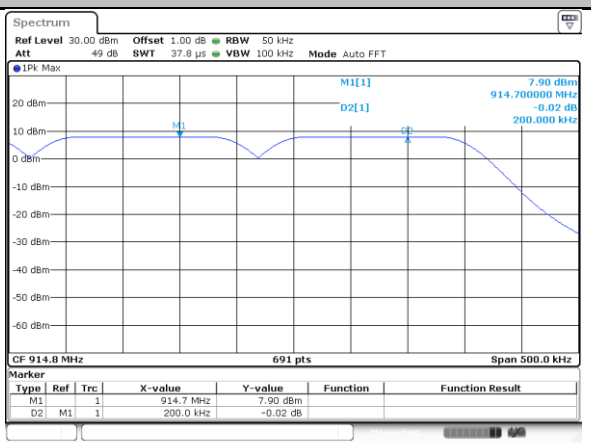


Figure 5. Hopping Channel Test Setup

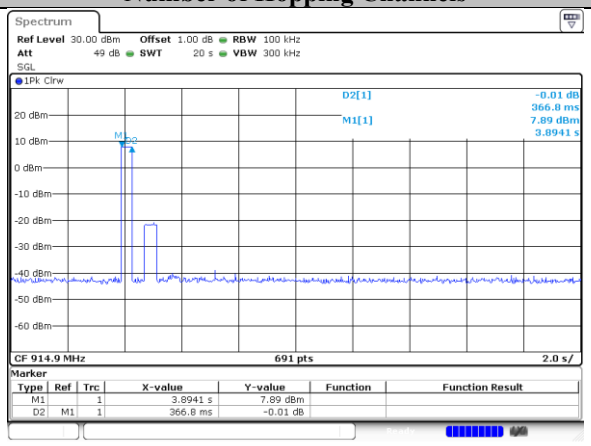
Hopping Channel Plots



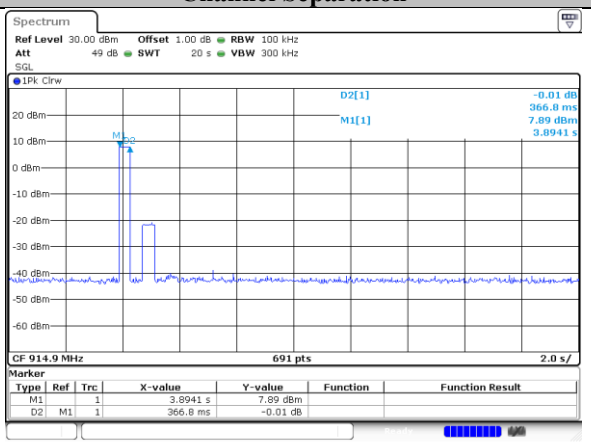
Number of Hopping Channels



Channel Separation



On Time of a Single Hop



Number of Hops in a 20 Second Period

Figure 6. Hopping Channel Plots

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 **Error! Reference source not found.**, 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 RSS-247 (5.4).

Test Engineer(s): Veet Patel

Test Date(s): 6/30/2025

Figure 7. Peak Power Output Test Setup

Peak Power Output Test Results

Channel	Frequency (MHz)	Peak Conducted Power (dBm)	Peak Power Limit (dBm)	Result
Low	902.3MHz	9.96	30	Pass
Middle	915MHz	9.23	30	Pass
High	927.4MHz	8.47	30	Pass

Table 7. Peak Power Output, Test Results

Channel	Frequency (MHz)	Peak Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Peak Power Limit (dBm)	Result
Low	902.3MHz	9.96	0.5	10.46	36	Pass
Middle	915MHz	9.23	0.5	9.73	36	Pass
High	927.4MHz	8.47	0.5	8.97	36	Pass

Table 8. RSS-247 EIRP, Test Results

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(e) Peak Power Spectral Density

Test Requirements: **§15.247(e):** For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure: 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 between 3kHz and 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.

The analyzer settings are shown in the following table:

RBW:	3kHz	Detector:	Peak	Reference Level:	30dBm
VBW:	10kHz	Sweep Time:	Auto	Internal Attenuation:	49dB

Figure 8. Analyzer Settings During Measurement

Test Results: The EUT was compliant with the peak power spectral density limits of **§ 15.247 (e)**.

Test Engineer: Veer Patel

Test Date: 06/30/2025

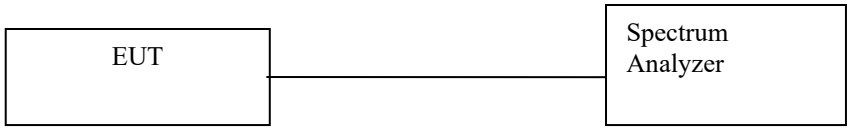


Figure 9. Block Diagram, Peak Power Spectral Density Test Setup

Data Rate	Channel	Frequency (MHz)	Peak Power Spectral Density (dBm / 3kHz)	Peak Power Spectral Density Limit (dBm / 3kHz)	Result
1Mbps	Low	902.3MHz	7.56	8	Pass
	Middle	915MHz	6.55	8	Pass
	High	927.4MHz	5.64	8	Pass

Table 9. Peak Power Spectral Density, Test Results

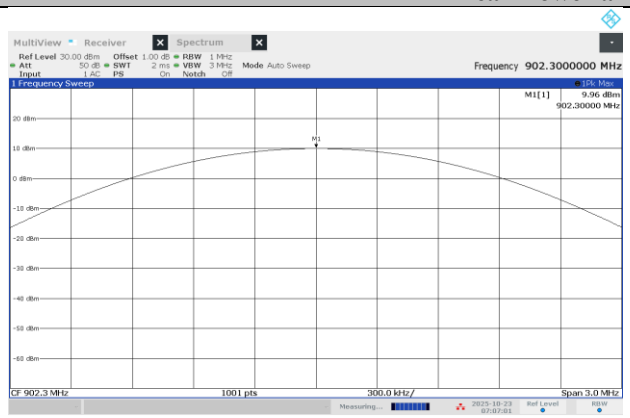
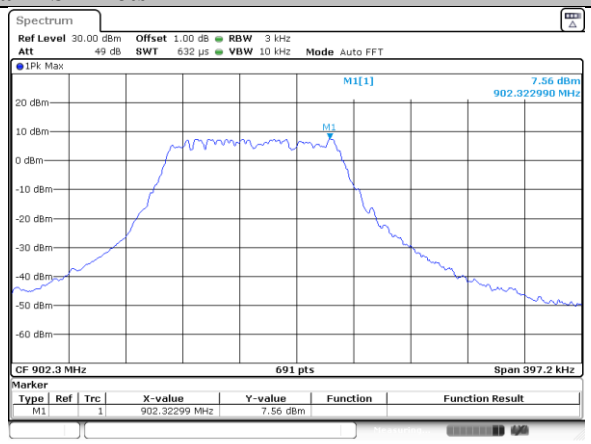
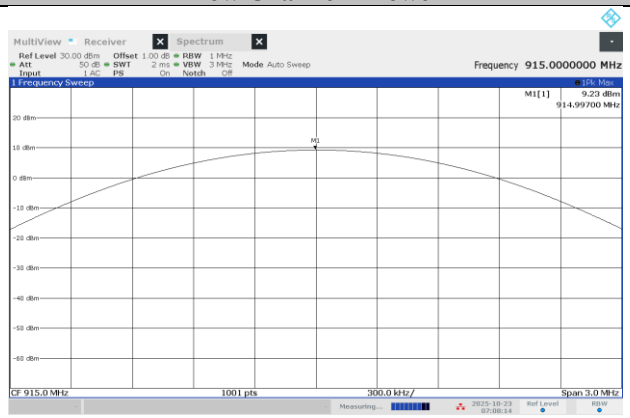
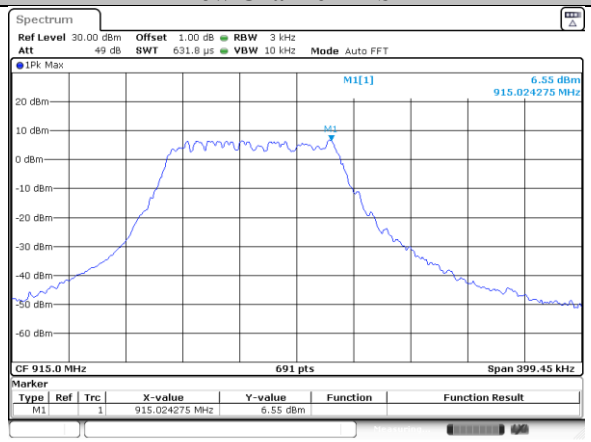
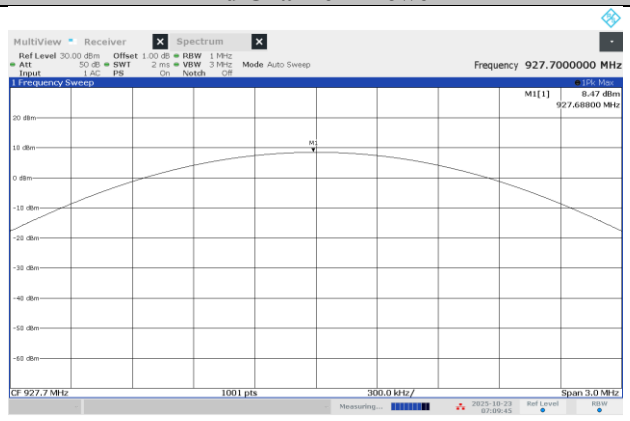
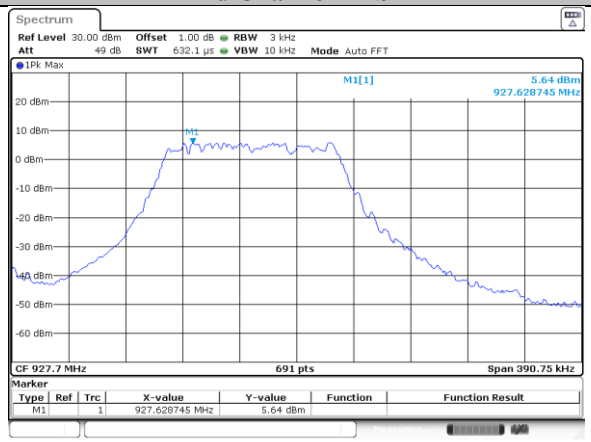
Peak Power and Peak PSD Plots	
	
Low Channel – Power	**Low Channel – PSD**
	
Mid Channel – Power	**Mid Channel – PSD**
	
High Channel – Power	**High Channel – PSD**

Figure 10. Peak Power and Peak PSD Plots

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:	49dB

Figure 11. 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): 06/30/2025

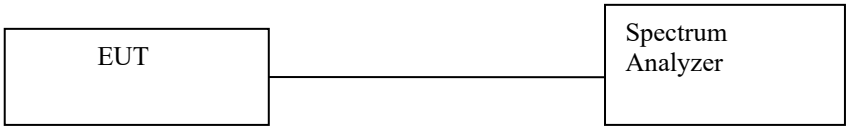


Figure 12. Block Diagram, Conducted Spurious Emissions Test Setup

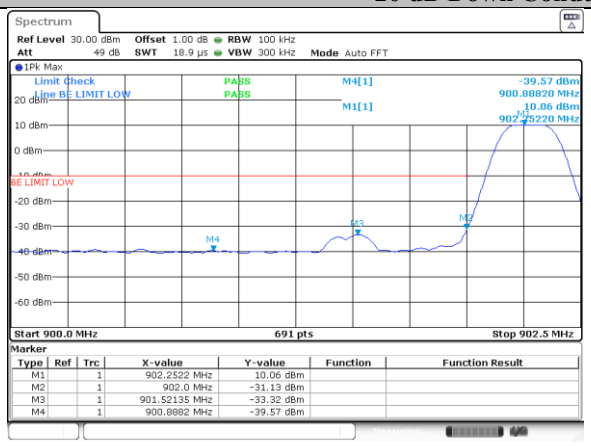
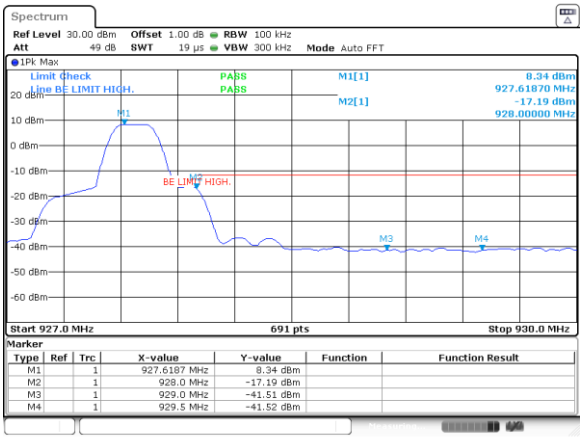
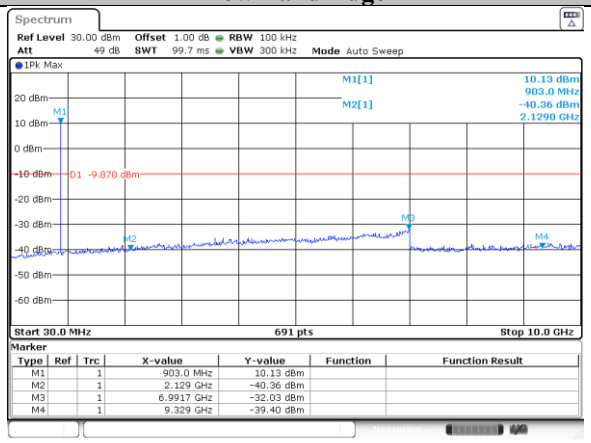
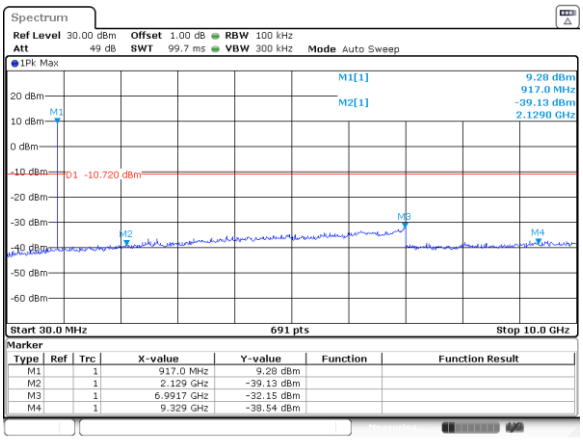
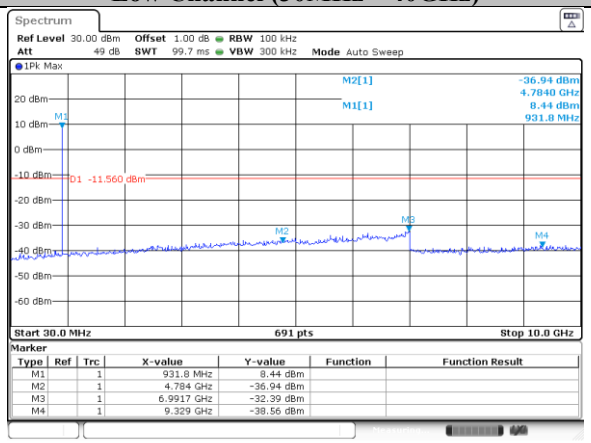
20 dB Down Conducted Spurious Emissions	
	
Low Band Edge	High Band Edge
	
Low Channel (30MHz – 40GHz)	Mid Channel (30MHz – 40GHz)
	
High Channel (30MHz – 40GHz)	Intentionally Blank

Figure 13. 20dB Down Conducted Spurious Emissions

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) Radiated Spurious Emissions Requirements and Band Edge

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 10. 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 11.

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 11. 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.

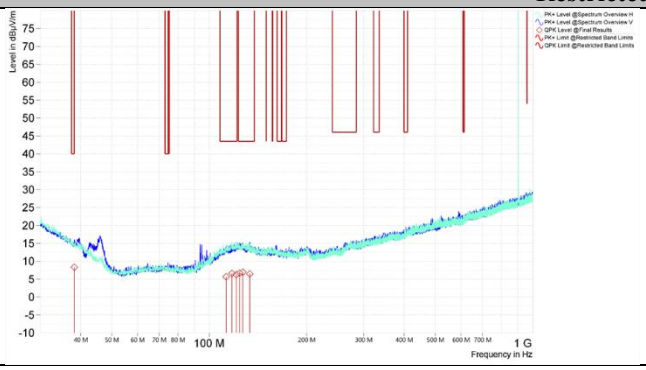
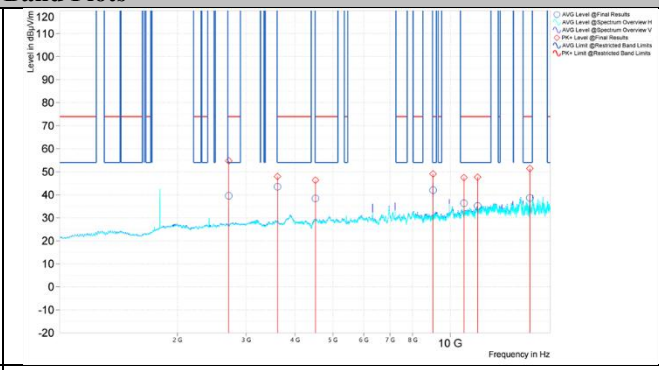
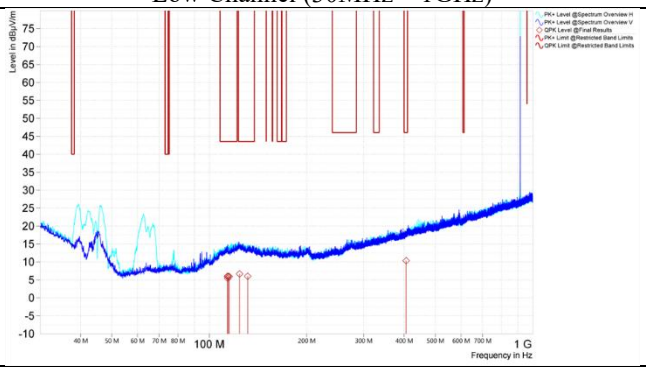
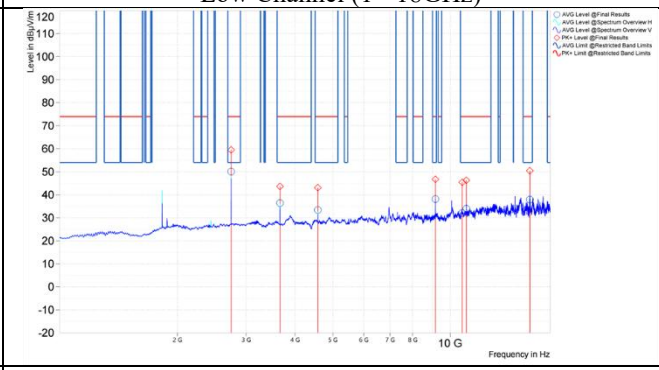
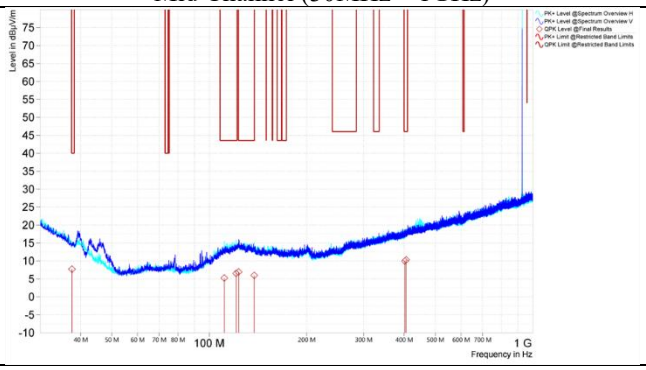
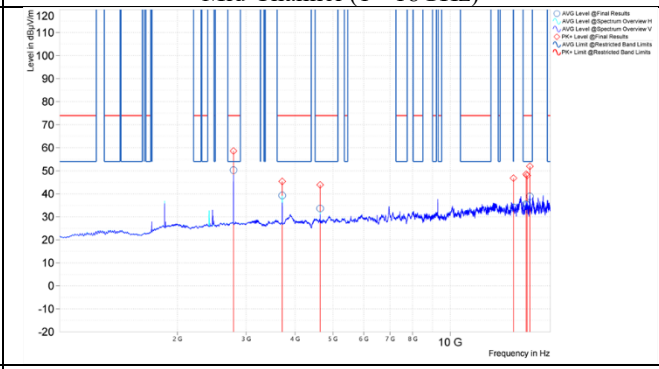
Radiated measurements below 30MHz were performed in a semi-anechoic chamber that has been correlated to an open area site.

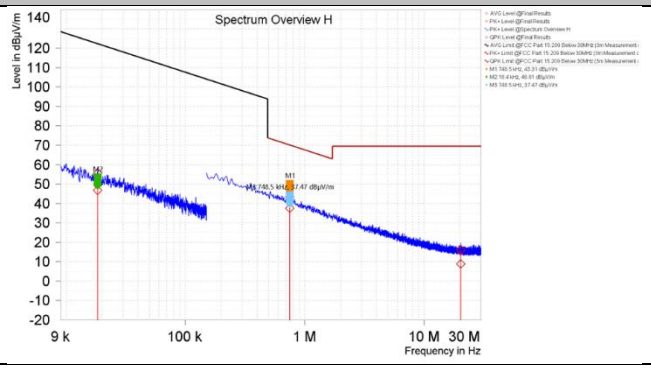
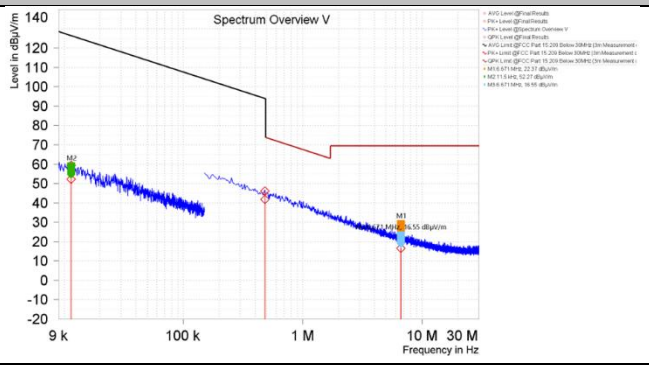
Test Software: TILE Version 7.4.2.5 (Manufactured by ETS Lindgren) and ELEKTRA Version 4.61 (Manufactured by Rohde&Schwarz) was utilized to perform these measurements.

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

Test Engineer(s): Veer Patel

Test Date(s): 7/10/2025 – 7/18/2025

Restricted Band Plots	
	
Low Channel (30MHz – 1GHz)	Low Channel (1 - 18GHz)
	
Mid Channel (30MHz – 1GHz)	Mid Channel (1 - 18GHz)
	
High Channel (30MHz – 1GHz)	High Channel (1 - 18GHz)

Restricted Band Plots	
	
9kHz – 30MHz (Coaxial Loop)	9kHz – 30MHz (Coplanar Loop)

Frequency [MHz]	Peak Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
0.012	59.39	126.37	66.98	18.22	V	105	1.00	0.200	Pass
0.018	55.67	122.29	66.62	14.98	H	90.5	1.00	0.200	Pass
0.483	46.05	93.92	47.87	11.32	V	108.9	1.00	9.000	Pass
0.749	43.31	70.12	26.81	11.46	H	151.7	1.00	9.000	Pass
6.671	22.37	69.50	47.13	11.01	V	165.1	1.00	9.000	Pass
20.306	16.11	69.50	53.39	10.16	H	73.2	1.00	9.000	Pass

Figure 14. Worst Case Cabinet Radiation, 9kHz - 30MHz

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
38.250	8.33	40.00	31.67	-6.55	V	121.5	4	120.000	Pass
112.740	5.64	43.52	37.88	-7.55	V	67.7	3.47	120.000	Pass
117.420	6.59	43.52	36.93	-6.59	H	269.9	3.32	120.000	Pass
121.140	6.27	43.52	37.25	-6.64	V	89.9	1.45	120.000	Pass
124.170	6.71	43.52	36.81	-6.16	V	283.8	2.56	120.000	Pass
126.990	6.92	43.52	36.60	-6.25	H	190.2	3.06	120.000	Pass
133.410	6.44	43.52	37.08	-6.72	V	83.1	3.72	120.000	Pass

Figure 15. Radiated Spurious, 30MHz - 1GHz, Low

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
113.820	5.97	43.52	37.55	-7.04	H	221.6	2.02	120.000	Pass
114.030	5.45	43.52	38.07	-7.52	V	255.7	3.75	120.000	Pass
114.180	5.98	43.52	37.54	-7.00	H	199.5	3.75	120.000	Pass
115.140	5.95	43.52	37.57	-6.88	H	269	2.64	120.000	Pass
123.990	6.68	43.52	36.84	-6.26	H	269.4	1.28	120.000	Pass
131.430	6.03	43.52	37.49	-6.83	V	30	2.43	120.000	Pass
405.930	10.35	46.02	35.67	-2.60	H	149.9	3.58	120.000	Pass

Figure 16. Radiated Spurious, 30MHz - 1GHz, Mid

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
37.620	7.72	40.00	32.28	-5.76	H	212.1	2.93	120.000	Pass
111.240	5.27	43.52	38.25	-7.49	H	39.5	2.98	120.000	Pass
120.990	6.52	43.52	37.00	-6.27	H	103.2	3.49	120.000	Pass
123.210	6.93	43.52	36.59	-6.24	V	225.2	4	120.000	Pass
137.670	5.97	43.52	37.55	-7.05	H	315	3.22	120.000	Pass
402.480	9.98	46.02	36.04	-2.76	V	177.7	1.68	120.000	Pass
406.140	10.31	46.02	35.71	-2.59	H	169.7	3.76	120.000	Pass

Figure 17. Radiated Spurious, 30MHz - 1GHz, High

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
2,707.000	54.69	74.00	19.31	39.56	54.00	14.44	-2.71	H	4.3	2.9	Pass
3,609.000	47.94	74.00	26.06	43.45	54.00	10.55	-2.43	H	344.8	3.14	Pass
4,511.000	46.30	74.00	27.70	38.41	54.00	15.59	-3.12	H	299.1	3.5	Pass
9,022.500	49.08	74.00	24.92	41.98	54.00	12.02	-4.64	V	0.2	3.34	Pass
10,827.500	47.48	74.00	26.52	36.32	54.00	17.68	-2.12	V	310.7	3.5	Pass
11,729.500	47.64	74.00	26.36	35.13	54.00	18.87	-1.22	V	319.4	3.29	Pass
15,965.000	51.37	74.00	22.63	38.65	54.00	15.35	-0.87	H	0	2.38	Pass

Figure 18. Radiated Spurious, 1GHz to 18GHz, Low

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
2,745.000	59.52	74.00	14.48	50.10	54.00	3.90	-2.74	H	16	3.5	Pass
3,660.000	43.62	74.00	30.38	36.40	54.00	17.60	-3.66	H	0	2.5	Pass
4,575.000	43.05	74.00	30.95	33.36	54.00	20.64	-3.79	H	341.6	3.15	Pass
9,149.500	46.70	74.00	27.30	38.14	54.00	15.86	-3.90	V	198.5	3.34	Pass
10,719.500	45.39	74.00	28.61	32.13	54.00	21.87	-1.05	V	88.8	1.36	Pass
10,980.000	46.29	74.00	27.71	33.94	54.00	20.06	-2.15	V	346.2	3.5	Pass
15,962.500	50.43	74.00	23.57	37.92	54.00	16.08	-0.83	V	40.1	3.35	Pass

Figure 19. Radiated Spurious, 1GHz to 18GHz, Mid

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
2,783.000	58.56	74.00	15.44	50.23	54.00	3.77	-2.84	V	74.3	2.44	Pass
3,710.500	45.38	74.00	28.62	39.26	54.00	14.74	-4.00	H	317.6	2.97	Pass
4,638.000	43.87	74.00	30.13	33.59	54.00	20.41	-4.27	H	317.6	3.15	Pass
14,493.000	46.76	74.00	27.24	34.07	54.00	19.93	-0.04	V	124.1	3.39	Pass
15,626.500	48.48	74.00	25.52	35.48	54.00	18.52	0.54	V	188.6	1.26	Pass
15,711.500	47.89	74.00	26.11	35.27	54.00	18.73	1.00	V	7	2.39	Pass
15,964.000	51.90	74.00	22.10	38.87	54.00	15.13	-0.85	H	165.7	1	Pass

Figure 20. Radiated Spurious, 1GHz to 18GHz, High

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.

Asset #	Description	Manufacturer	Model	Last Cal Date	Cal Due Date
1A1250	Receiver	Rohde & Schwarz	ESW44	03/28/2025	03/28/2026
1A1234	FSV Signal Analyzer	Rohde & Schwarz	FSV 40	03/13/2025	03/13/2026
1A1176	Active Loop Antenna (9KHz-30MHz)	ETS-Lindgren	6502	08/22/2024	08/22/2026
1A1050	Bi-Log Antenna	Schaffner	CBL-6112D	03/05/2024	03/05/2026
1A1183	Double Ridged Waveguide Antenna	ETS Lindgren	3117	02/20/2024	02/20/2026
1A1161	Horn Antenna (18GHz – 40GHz)	ETS Lindgren	3116C	08/01/2024	08/01/2026
1A1088	Preamplifier	Rohde & Schwarz	TS-PR1	See Note	
1A1044	Generator	Com-Power	CG-520	See Note	
1A1073	Multi Device Controller	ETS	2090	See Note	
1A1074	System Controller	Panasonic	WV-CU101	See Note	
1A1080	Multi-Device	ETS	2090	See Note	
1A1180	Preamplifier	Miteq	AMF-7D-01001800-22-10P	See Note	

Table 12. Test Equipment Table

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

End of Report