RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC Part 15.247 Certification Report

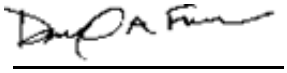
Test Lab:	Applicant:
Rhein Tech Laboratories, Inc. Phone: 703-689-0368 360 Herndon Parkway www.rheintech.com Suite 1400 Herndon, VA 20170	Innovative Wireless Technologies, Inc. (IWT) 1100 Main Street Tel: 434-316-5230 Lynchburg, VA 24504

FCC ID	SP8-FAP4913040	**Test Report Date**	May 16, 2025
Platform	N/A	**RTL Work Order Number**	2024109
Model(s)	WGM+/WGM/BMN	**RTL Quote Number**	QRTL24-109B
American National Standard Institute	ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
FCC Classification	DTS – Part 15 Digital Transmission System		
FCC Rule Part(s)	FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz (10-01-2016)		

Frequency Range (MHz)	**Output Power (W)***	**Frequency Tolerance**	**Emission Designator**
903 – 927	0.162	N/A	549KF1D

*Power is conducted maximum RMS

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, and ANSI C63.10.

Signature:  Date: May 16, 2025

Typed/Printed Name: Desmond A. Fraser Position: President

This report may not be reproduced, except in full, without the written approval of Rhein Tech Laboratories, Inc. and Innovative Wireless Technologies, Inc. The test results relate only to the item(s) tested. This report replaces Report R1.0.

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANAB. Refer to certificate and scope of accreditation AT-1445.

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1 General Information

1.1 Scope

Applicable Standards:

FCC Rules Part 15.247-2016: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

1.2 Description of EUT

Equipment Under Test	SENTINEL™ WGM+ (Wireless Gas Monitor+)
Model #	FAP4913-090
Power Supply	External Battery (8 VDC)
Modulation Type	2-FSK
Frequency Range	903 – 927 MHz
Antenna Types	Internal trace (1.5 dBi) IWT FAA9100-017 Yagi (11 dBi) IWT FAA9100-068 Omni (3 dBi)

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170.

1.4 Measurement Uncertainty

The measurement uncertainty complies with CISPR 16-4-2 limits and is not used to adjust measurements for compliance determination. Expanded uncertainty (U) for each scope, calculated per ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation, is provided in this RTL report. While this demonstrates RTL's commitment to transparency, compliance decisions are based solely on comparing measured values directly to the relevant standards' limits.

1.5 Related Submittal(s)/Grant(s)

This is an original application for certification for Innovative Wireless Technologies, Inc (IWT). SENTINEL™ Wireless Gas Monitor Plus (WGM+) under FCC ID: SP8-FAP4913040.

The certification request includes the other mechanical configurations of the wireless monitor base unit, namely the Wireless Gas Monitor (WGM) and the Battery Mesh Node (BMN).

The WGM+, WGM and BMN operate as nodes within a proprietary IWT wireless mesh network designed primarily for industrial wireless applications.

The WGM+, the WGM and the BMN transceivers are identical and use the same PCB assembly and components. The only RF distinction is the specific digital information each transmits and the other IWT network devices with which they communicate.

The WGM+ with external battery configuration was determined to be worst-case following spot-check testing of the WGM with internal batteries.

For additional information, refer to the Technical Operational Description submitted with this application.

1.6 Modifications

No modifications were required for compliance.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

Table 2-1: Frequencies Tested

Channel	Frequency
Low	903
Mid	915
High	927

2.2 Exercising the EUT

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with BMN/WGM FCC Testing Application software Version 07R00 to transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.247)

FCC Reference	C63.10 Procedure	Test	Pass/Fail or N/A
FCC 15.207	6.2	AC Power Conducted Emissions	N/A
FCC 15.209	6.5, 6.6	Radiated Emissions	Pass
FCC 15.247(b)	6.10	Maximum Peak Power Output	Pass
FCC 15.247(d)	6.7	Antenna Conducted Spurious Emissions	Pass
FCC 15.247(d)	6.9.2	Band Edge	Pass
FCC 15.247(a)(2)	6.9.1	6 dB Bandwidth	Pass
FCC 15.247(e)	6.11	Power Spectral Density	Pass

2.4 Test System Details

The test samples were received on November 12, 2024. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system are identified in the following tables.

Table 2-3: Equipment Under Test

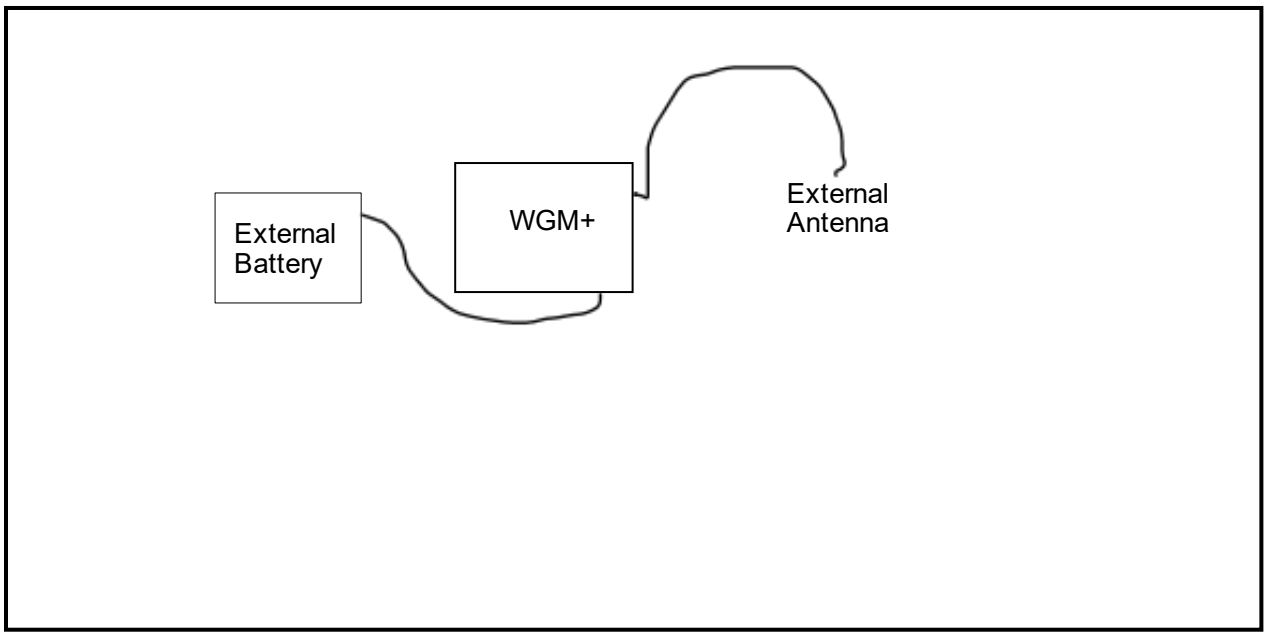
Part	Manufacturer	Model #	Serial Number	FCC ID	RTL Bar Code
Wireless Gas Monitor+ (WGM+)	IWT	FAP4913-090	SN2429001	SP8-FAP4913040	24449
External Battery	IWT	FAP9100-035	BMNBIS-24413030	N/A	24453
Internal Antenna 915 MHz ISM Band Flex Circuit (1.5 dBi)	Taoglas	FXP290.07.0100A	N/A	N/A	N/A
Omni Antenna (3 dBi) / Magnetic Mount	L-Com	HG2403U-NMO	N/A	N/A	24452
Yagi Antenna (11 dBi)	ZDA Communications US LLC	ZDADJ928-11YG	N/A	N/A`	24451

At the time of submission there was no inventory of the EUT FAP4913-090 variant. A discontinued single-bay WGM variant (FAP4913-130) with internal batteries, and additional regulatory certifications with specific gas sensors and a more complicated sensor interface cable, otherwise identical to the FAP4913-030, was modified to be electrically identical to the FAP4913-090.

The modified unit deviated from the FAP4913-090 production design only in labeling, color scheme of the button panel, and reflective tape color. The specific modifications of the FAP4913-130 to make it electrically identical to FAP4913-090 are detailed below.

- Receiver plate on bottom face modified to install external battery connector and associated cabling to main PCB.
- The gas module interface cable was replaced with the latest cost-reduced cable.
- The two cables to the internal battery compartments were disconnected from the main PCB.
- The FAP4913-090 is usually built without battery contacts in the battery compartment and with the battery doors epoxied permanently closed. The modified unit did not have the internal battery contacts removed or the battery doors glued shut. This should have no bearing on electrical performance since the contacts are not connected to any electrical circuitry.

2.5 Configuration of Tested System



3 Conducted Output Power – FCC 15.247(b)(3)

3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken using a Rhode & Schwarz spectrum analyzer.

Procedure: C63.10-2013 11.9.2 (Average)

Table 3-1: Conducted Output Power Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW50	Spectrum Analyzer	101021	05/30/2027

Table 3-2: Environmental Conditions

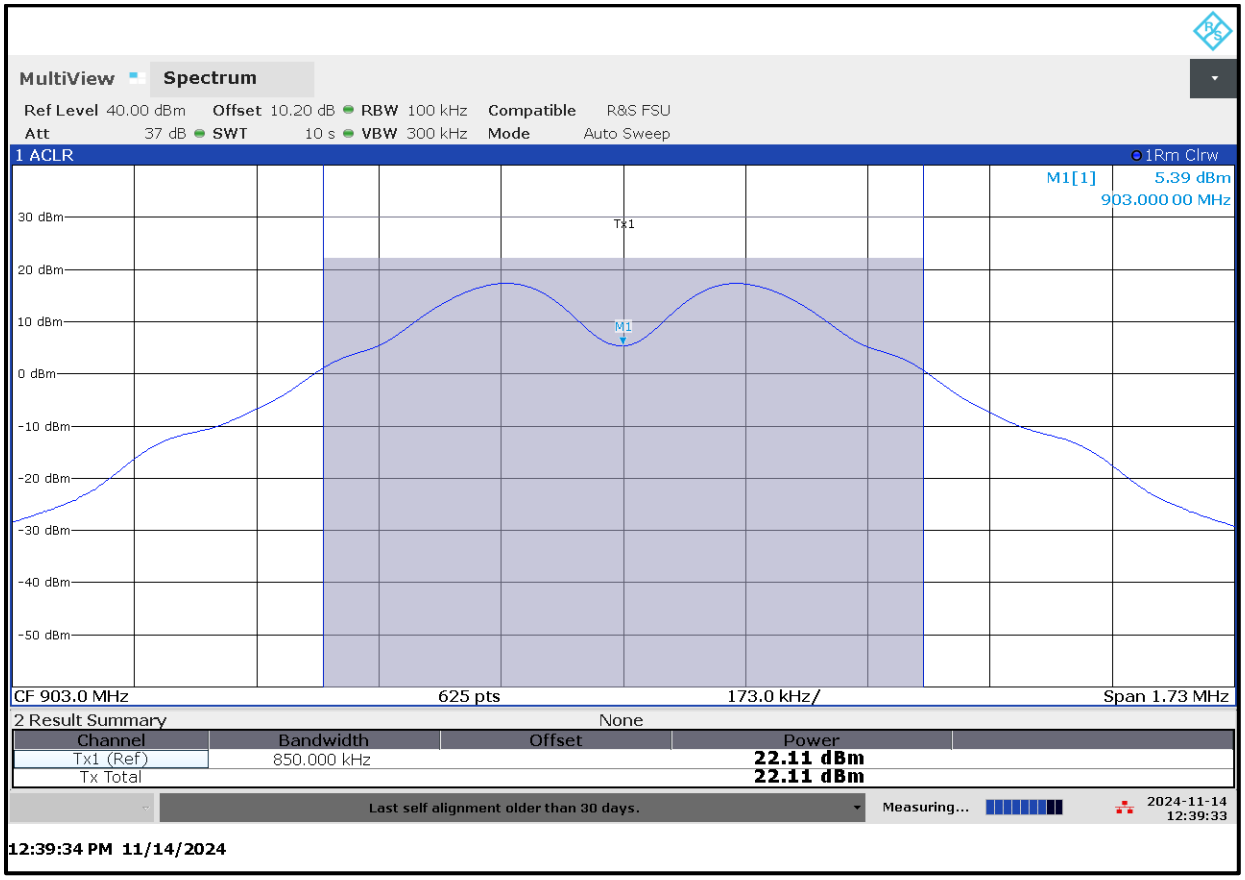
Date	Humidity (%)	Temperature (°C)	Pressure (kPa)
November 14, 2024	23	25.1	100.9

3.2 Average Conducted Output Power Test Data

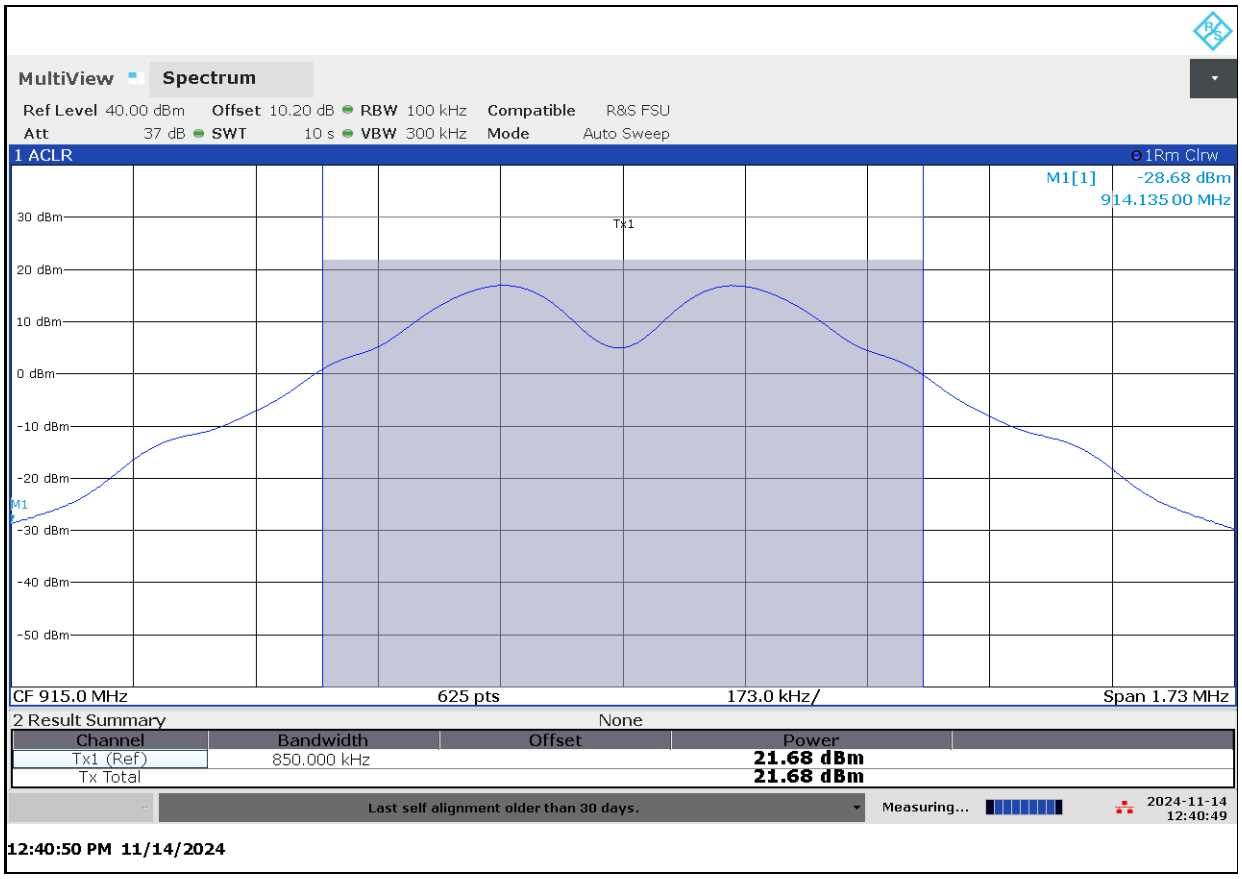
Table 3-3: Power Output Test Data

Frequency (MHz)	Average Conducted Power (dBm)
903	22.1
915	21.7
927	21.4

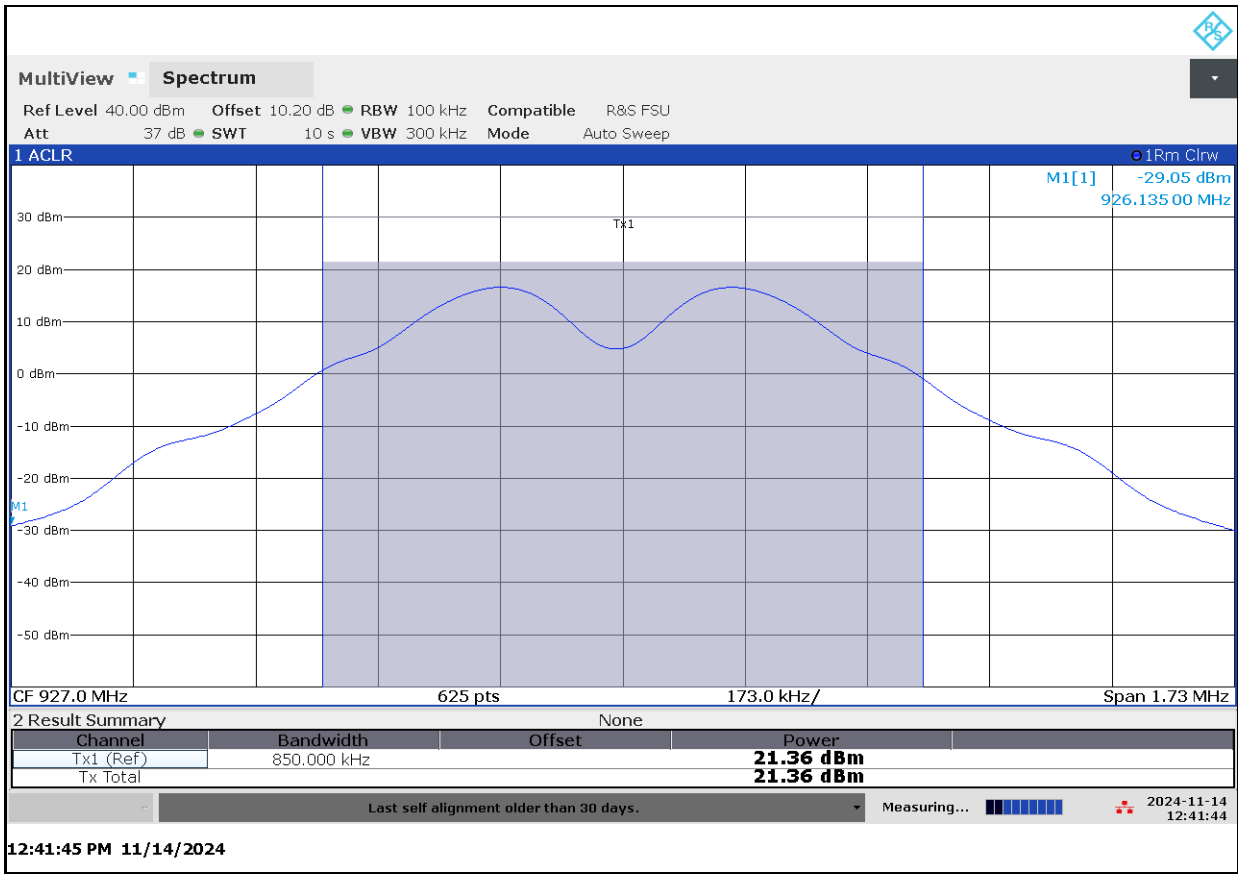
Plot 3-1: Average Conducted Output Power (903 MHz)



Plot 3-2: Average Conducted Output Power (915 MHz)



Plot 3-3: Average Conducted Output Power (927 MHz)



Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.5 dB

Results: Pass

Test Personnel:

Daniel W. Baltzell		November 14, 2024
Test Engineer	Signature	Date of Test

4 Band Edge Compliance of RF Conducted Emissions – FCC 15.247(d)

4.1 Band Edge Test Procedure

Procedure: C63.10-2013 11.13
The EUT was connected to the spectrum analyzer through suitable attenuation. The spectrum analyzer was set to the following:

Center Frequency:	Frequency of the emissions to be measured
Span:	5 MHz
RBW:	100 kHz
VBW:	3 x RBW
Detector:	Peak
Sweep:	Auto
Trace:	Max Hold

The trace was allowed to stabilize. The marker was set on the emission at the band edge.

Table 4-1: Band Edge Test Equipment

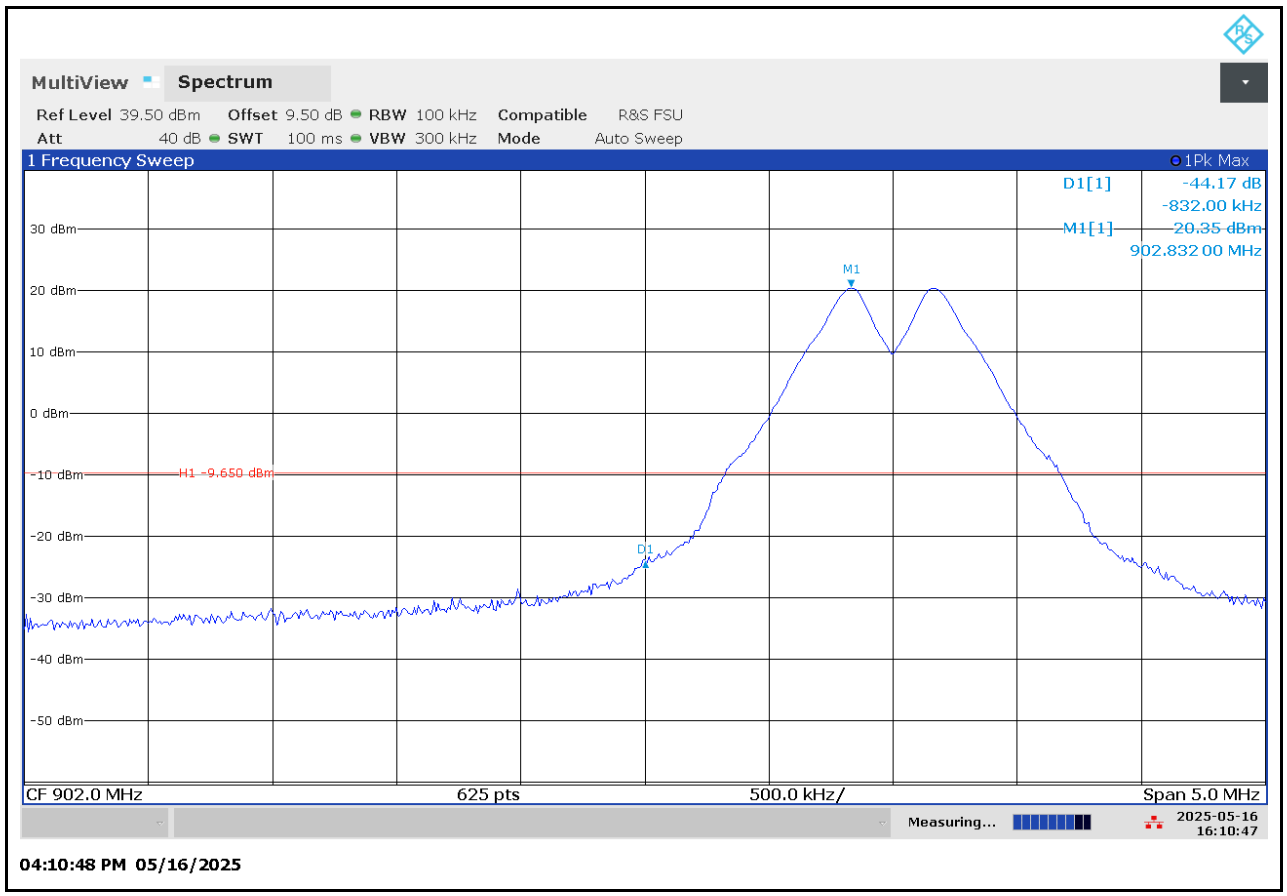
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW50	Spectrum Analyzer	101021	05/30/2027
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	12/02/2025

Table 4-2: Environmental Conditions

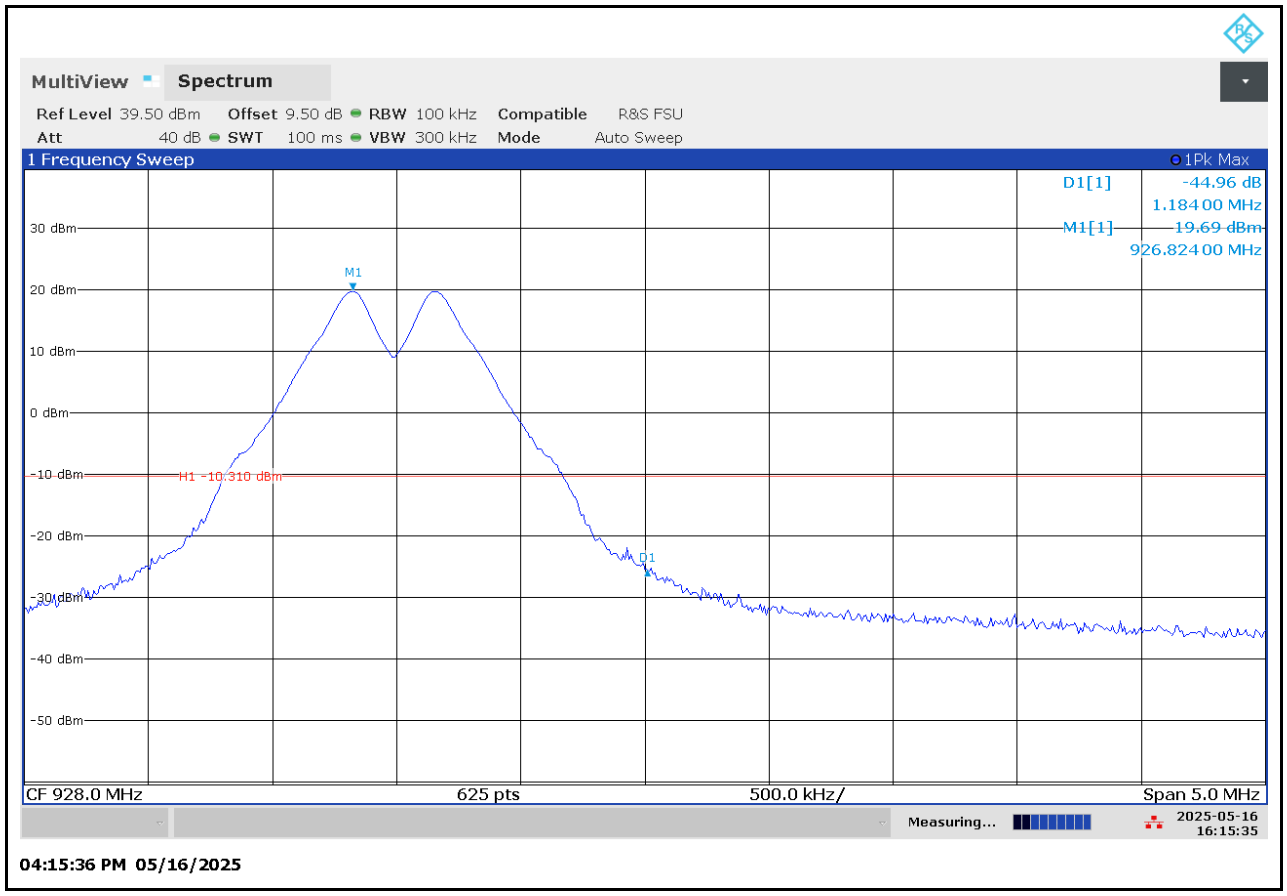
Date	Humidity (%)	Temperature (°C)	Pressure (kPa)
May 16, 2025	32	27.5	100.6

4.2 Test Results

Plot 4-1: Lower Band Edge (902 MHz Band Edge, 903 MHz Carrier) Peak



Plot 4-2: Upper Band Edge (928 MHz Band Edge, 927 MHz Carrier) Peak



Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.5 dB

Results: Pass

Test Personnel:

Daniel W. Baltzell		May 16, 2025
Test Engineer	Signature	Date of Test

5 Antenna Conducted Spurious Emissions – FCC 15.247(d)

5.1 Antenna Conducted Spurious Emissions Test Procedures

Procedure: C63.10-2013 11.12.2.

Antenna spurious emissions per FCC 15.247(d) were measured from the EUT antenna port using a 50-ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The modulated carrier was identified at the following frequencies: 903 MHz, 915 MHz and 927 MHz. The carrier to the 10th harmonic of the carrier frequency was investigated.

Table 5-1: Antenna Conducted Spurious Emissions Test Equipment

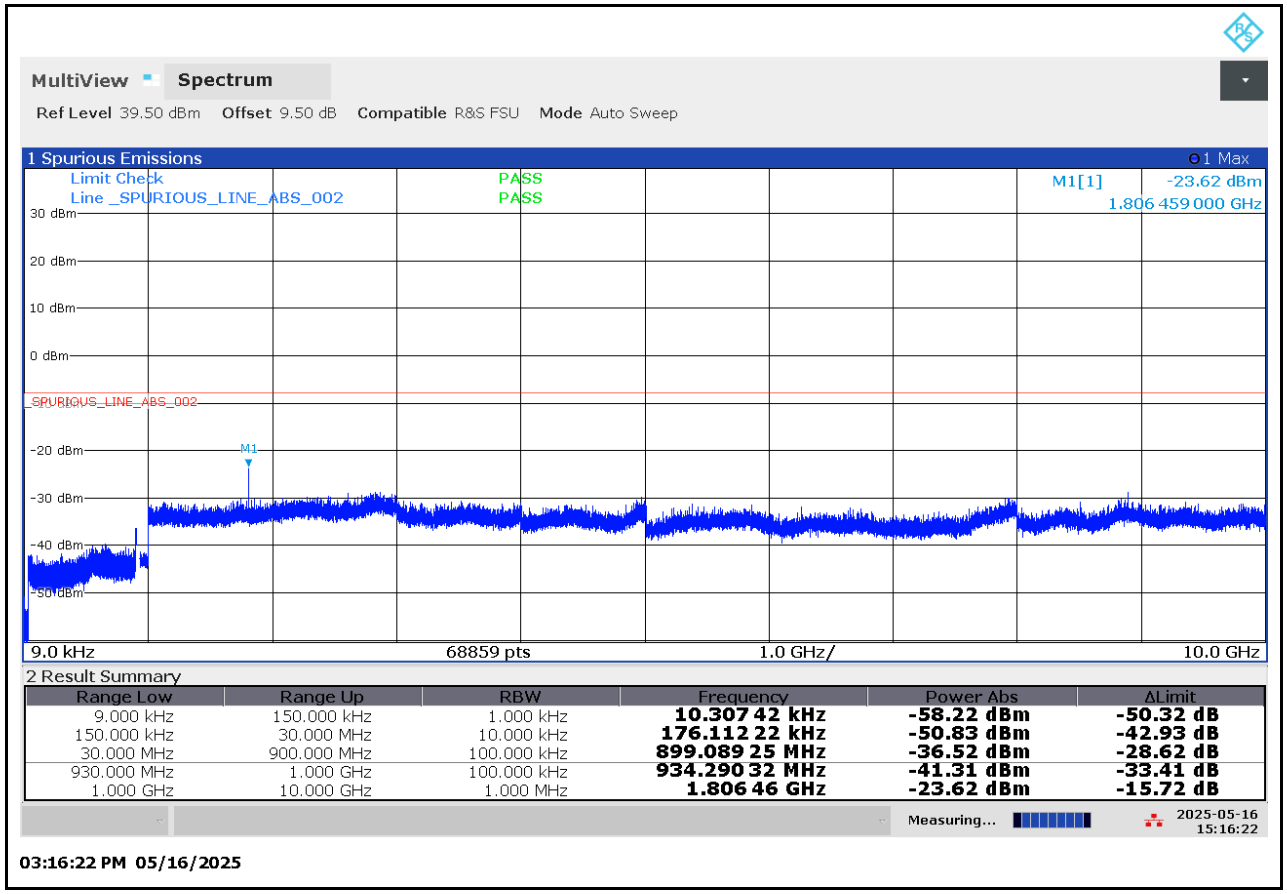
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW50	Spectrum Analyzer	101021	05/30/2027
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	12/2/2025

Table 5-2: Environmental Conditions

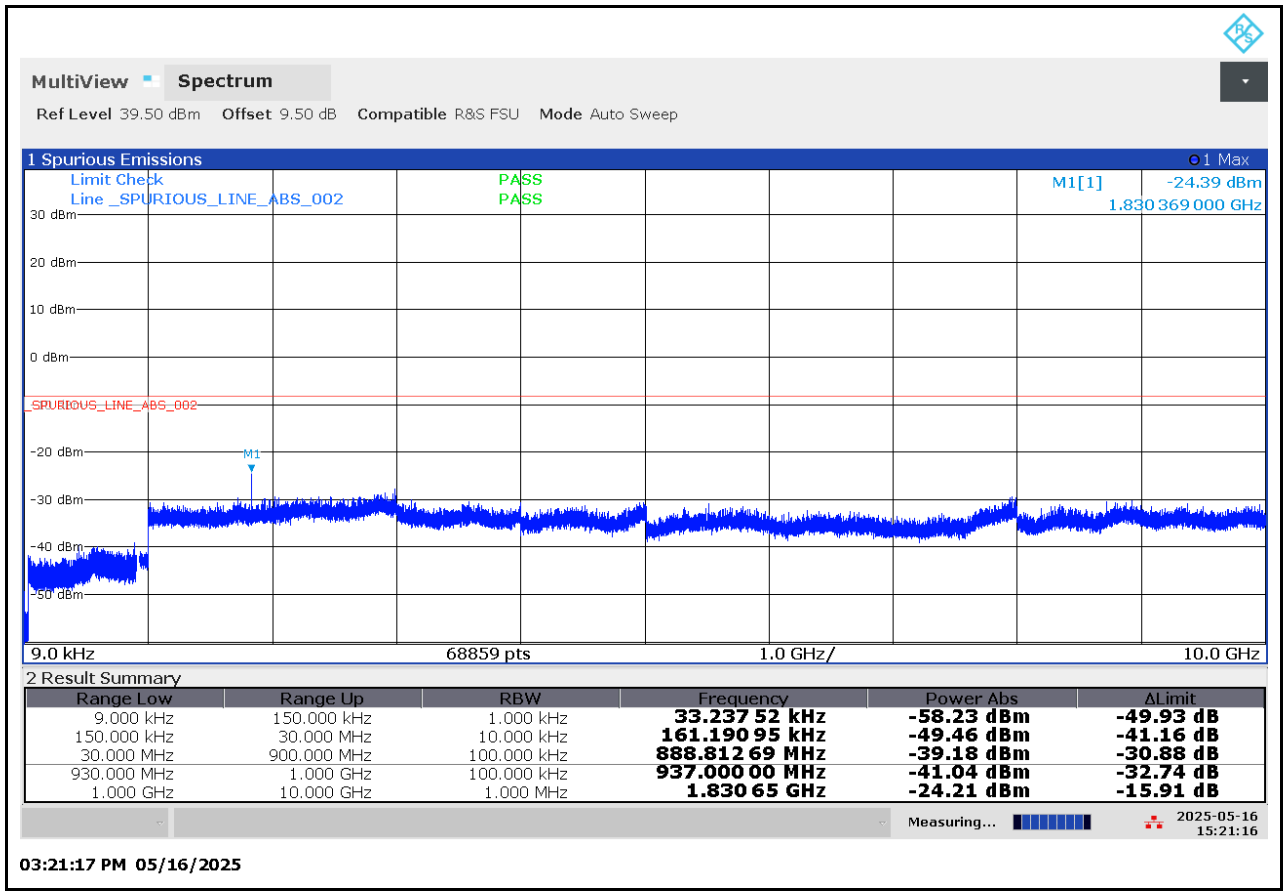
Date	Humidity (%)	Temperature (°C)	Pressure (kPa)
May 16, 2025	32	27.5	100.6

5.2 Antenna Conducted Spurious Emissions Test Results

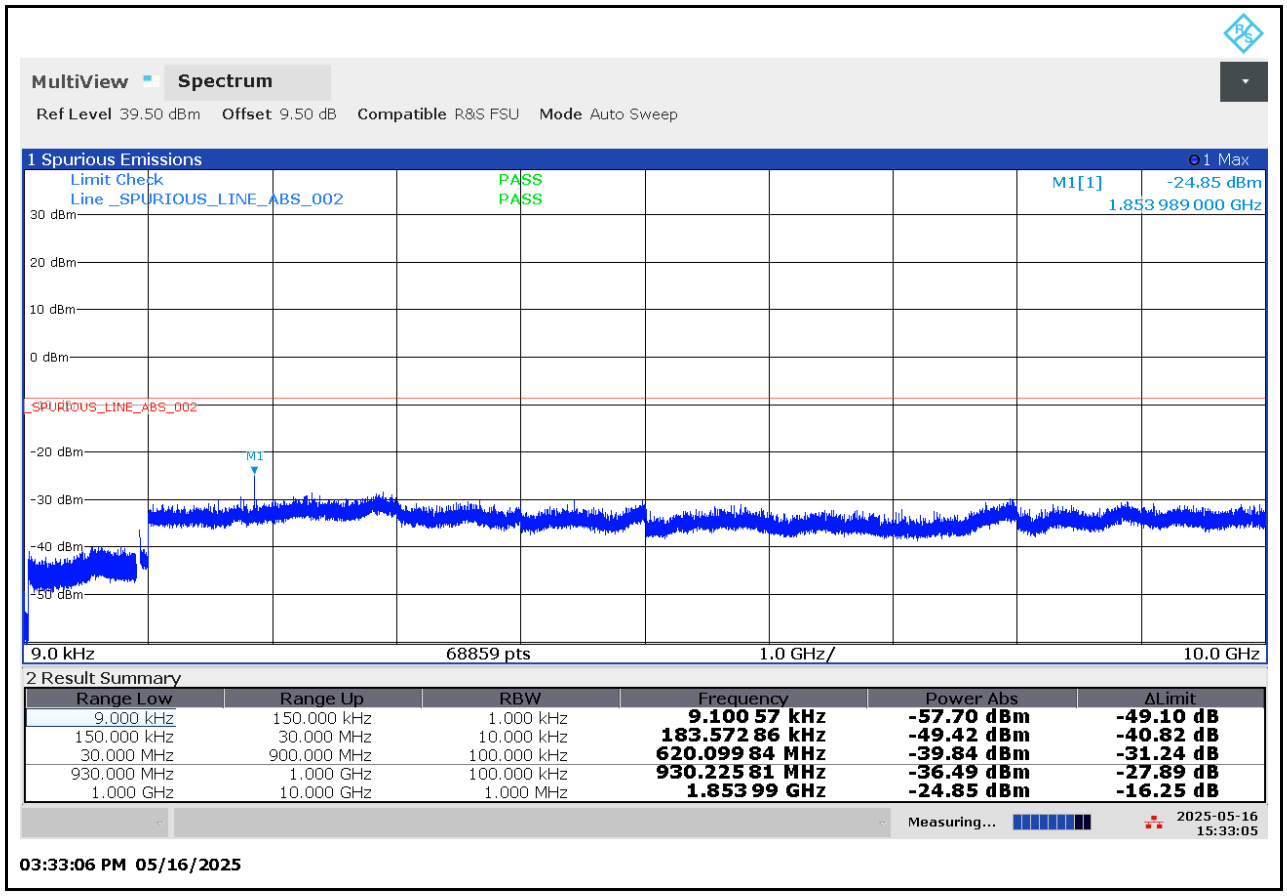
Plot 5-1: Antenna Conducted Spurious Emissions (903 MHz)



Plot 5-2: Antenna Conducted Spurious Emissions (915 MHz)



Plot 5-3: Antenna Conducted Spurious Emissions (927 MHz)



Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.5 dB

Results: Pass

Test Personnel:

Daniel W. Baltzell		May 16, 2025
Test Engineer	Signature	Date of Test

6 6 dB Bandwidth – FCC 15.247(a)(2)

6.1 Bandwidth Test Procedure

Procedure: C63.10-2013 11.8.

The minimum 6 dB bandwidths per FCC 15.247(a)(2) were measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The device was modulated. The minimum 6 dB bandwidths are presented below.

Table 6-1: 6 dB Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW50	Spectrum Analyzer	101021	05/30/2027

Table 6-2: Environmental Conditions

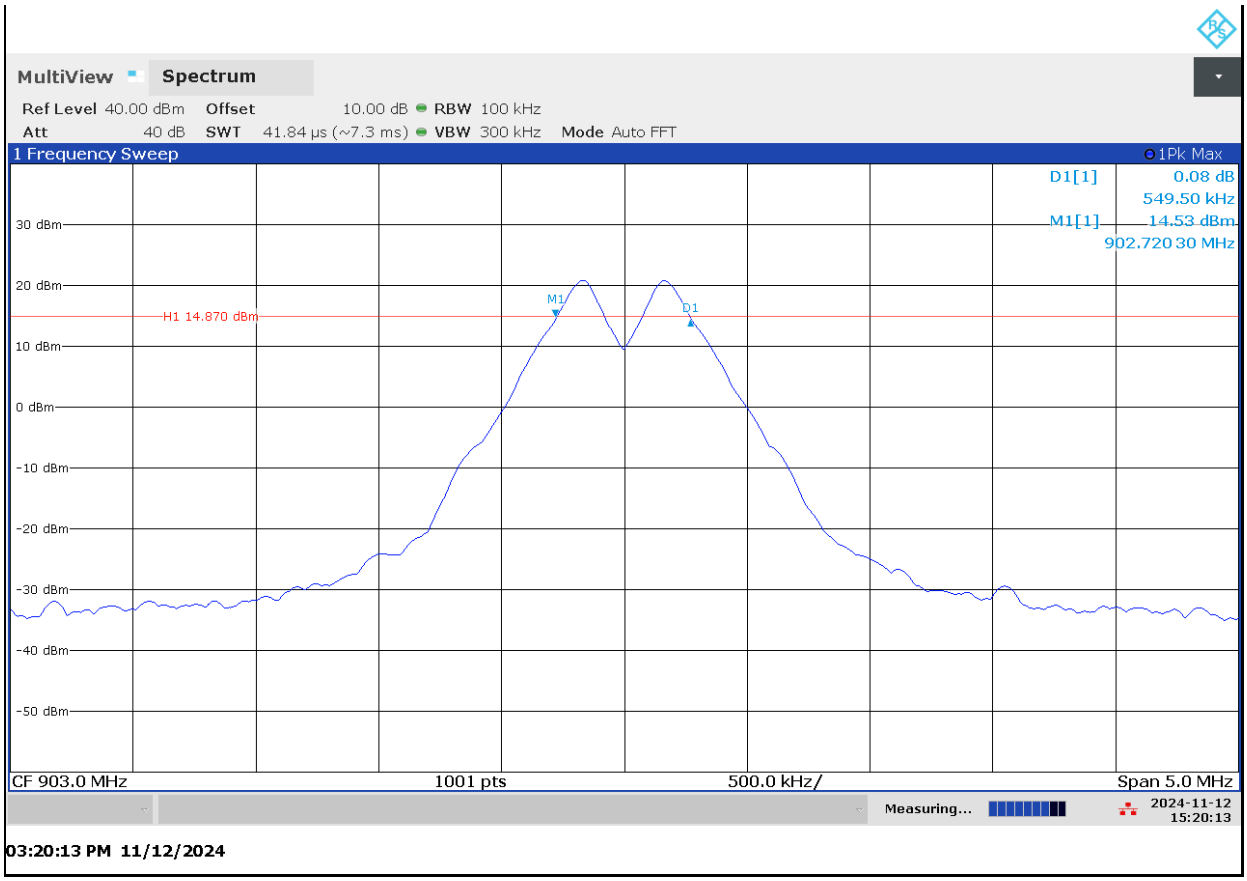
Date	Humidity (%)	Temperature (°C)	Pressure (kPa)
November 12, 2024	23	25.1	102.3

6.2 Bandwidth Test Results

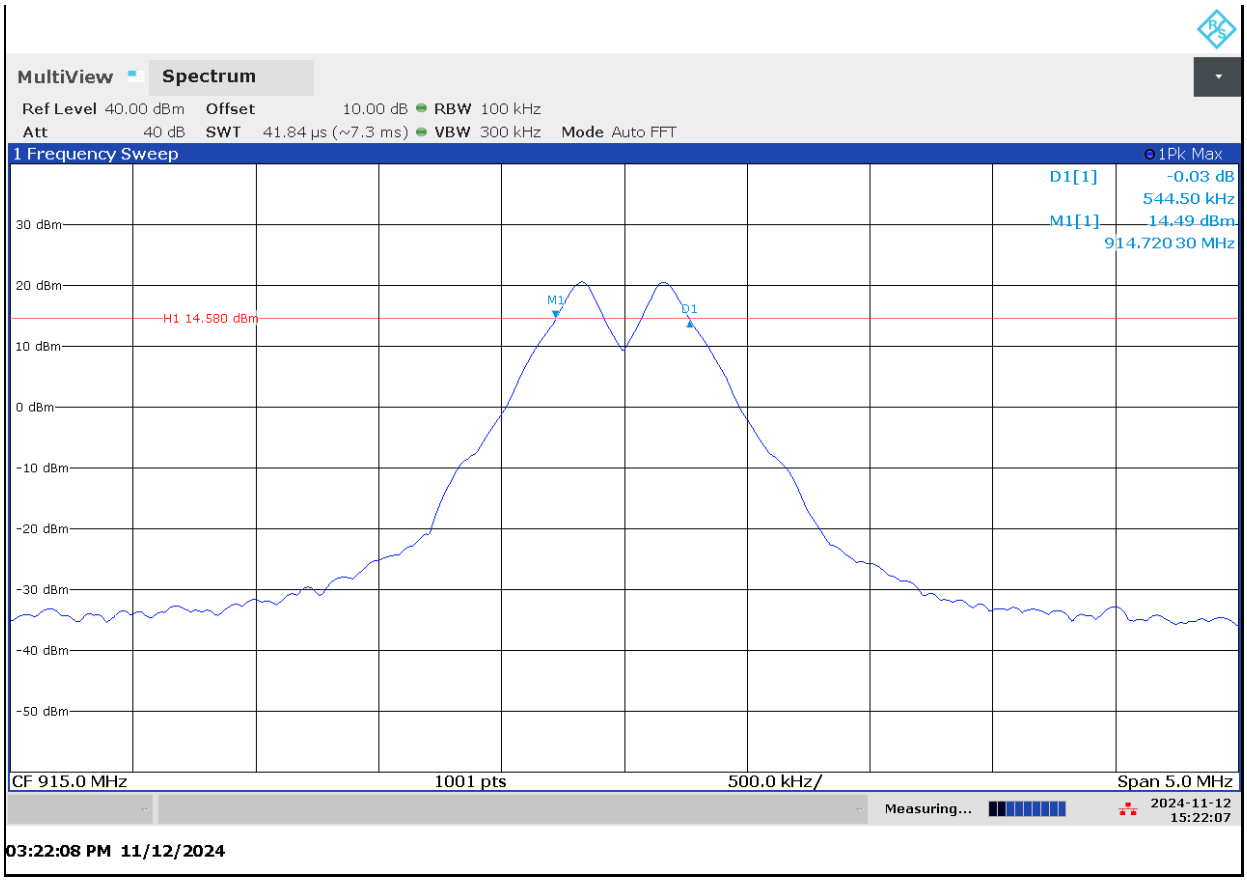
Table 6-3: 6 dB Bandwidth Test Data

Frequency (MHz)	Bandwidth (kHz)	Minimum Limit (kHz)	Pass/Fail
903	549.5	500	Pass
915	544.5	500	Pass
927	544.5	500	Pass

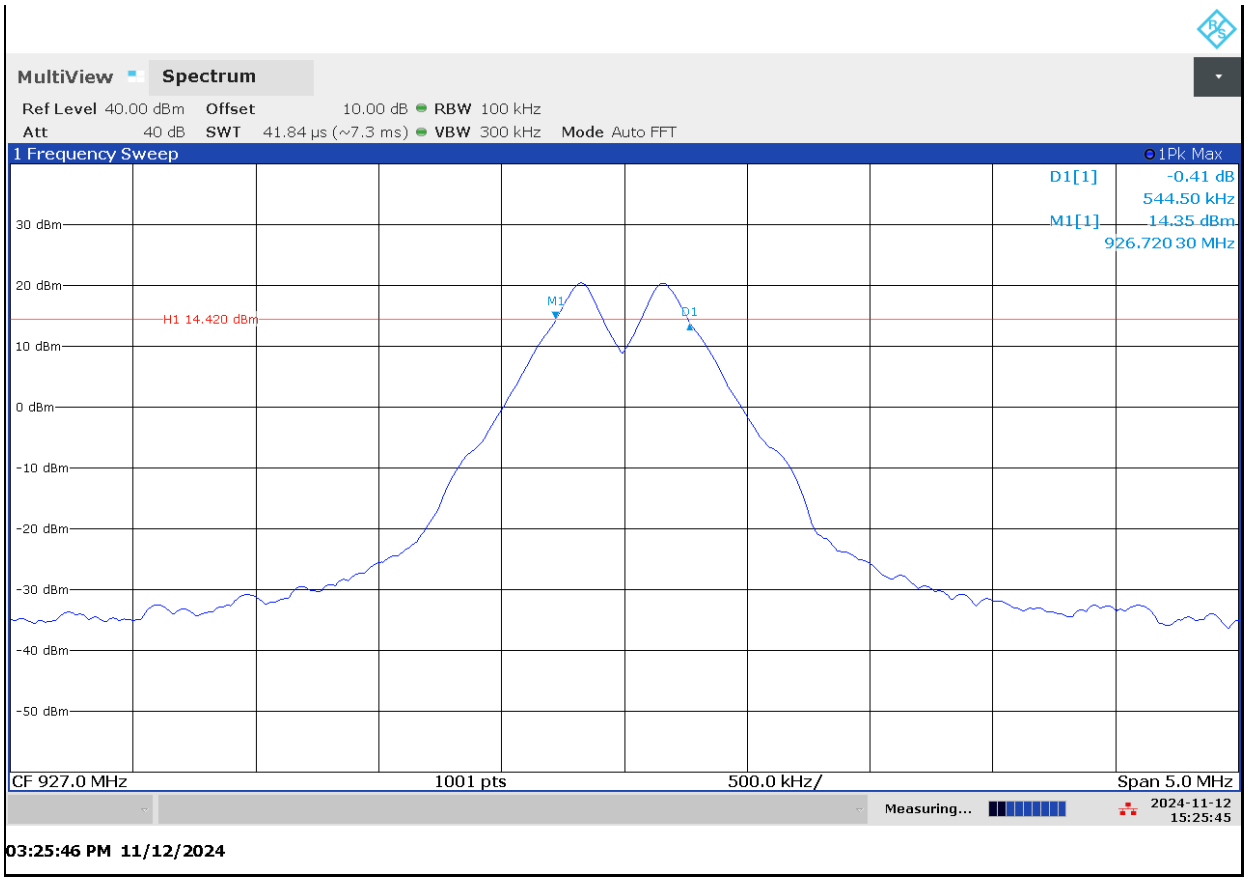
Plot 6-1: 6 dB Bandwidth – 903 MHz



Plot 6-2: 6 dB Bandwidth – 915 MHz



Plot 6-3: 6 dB Bandwidth – 927 MHz



Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.5 dB

Results: Pass

Test Personnel:

Daniel W. Baltzell		November 12, 2024
Test Engineer	Signature	Date of Test

7 Power Spectral Density – FCC 15.247(e)

7.1 Power Spectral Density Test Procedure

Procedure: C63.10-2013 11.10.3

The power spectral density per FCC 15.247(e) was measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 3 kHz and the video bandwidth set at 10 kHz. RMS trace averaging over 100 sweeps was used to resolve the spectral density for the modulated carriers at 903, 915 and 927 MHz. These levels are below the +8 dBm limit. See the power spectral density table and plots that follow.

Table 7-1: Power Spectral Density Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901773	Rohde & Schwarz	FSW50	Spectrum Analyzer	101021	05/30/2027

Table 7-2: Environmental Conditions

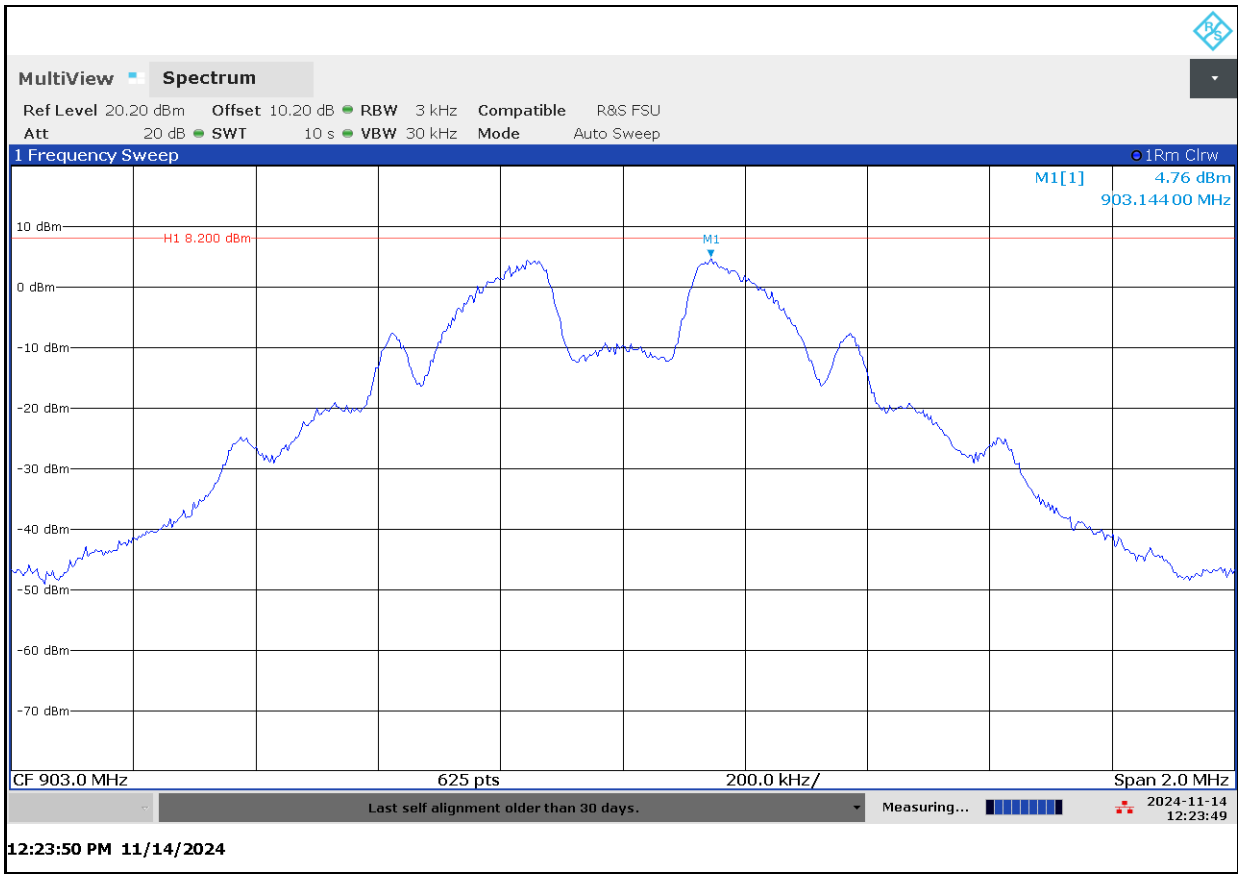
Date	Humidity (%)	Temperature (°C)	Pressure (kPa)
November 14, 2024	23	25.1	100.9

7.2 Power Spectral Density Test Data

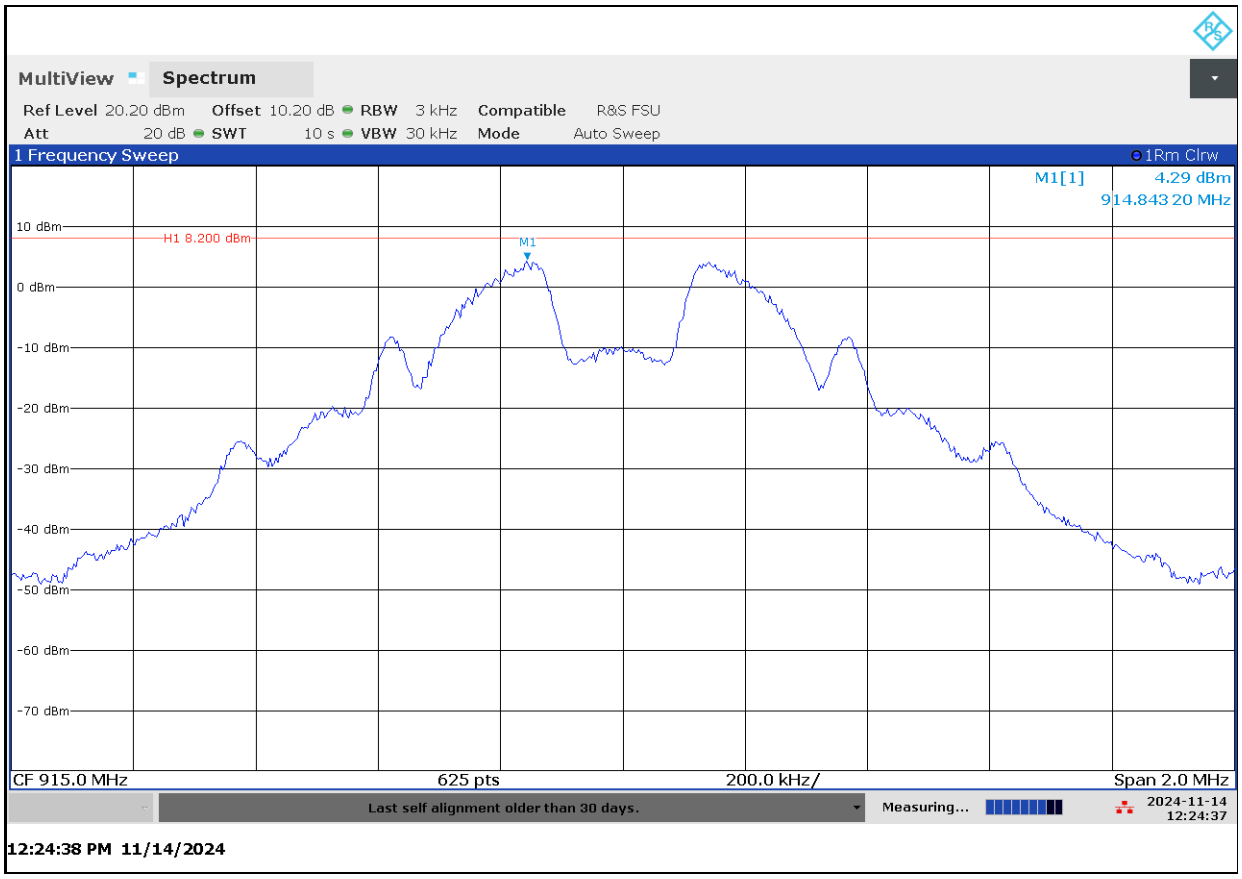
Table 7-3: Power Spectral Density Test Data

Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8 dBm	Pass/Fail
903	4.8	8	Pass
915	4.3	8	Pass
927	4.0	8	Pass

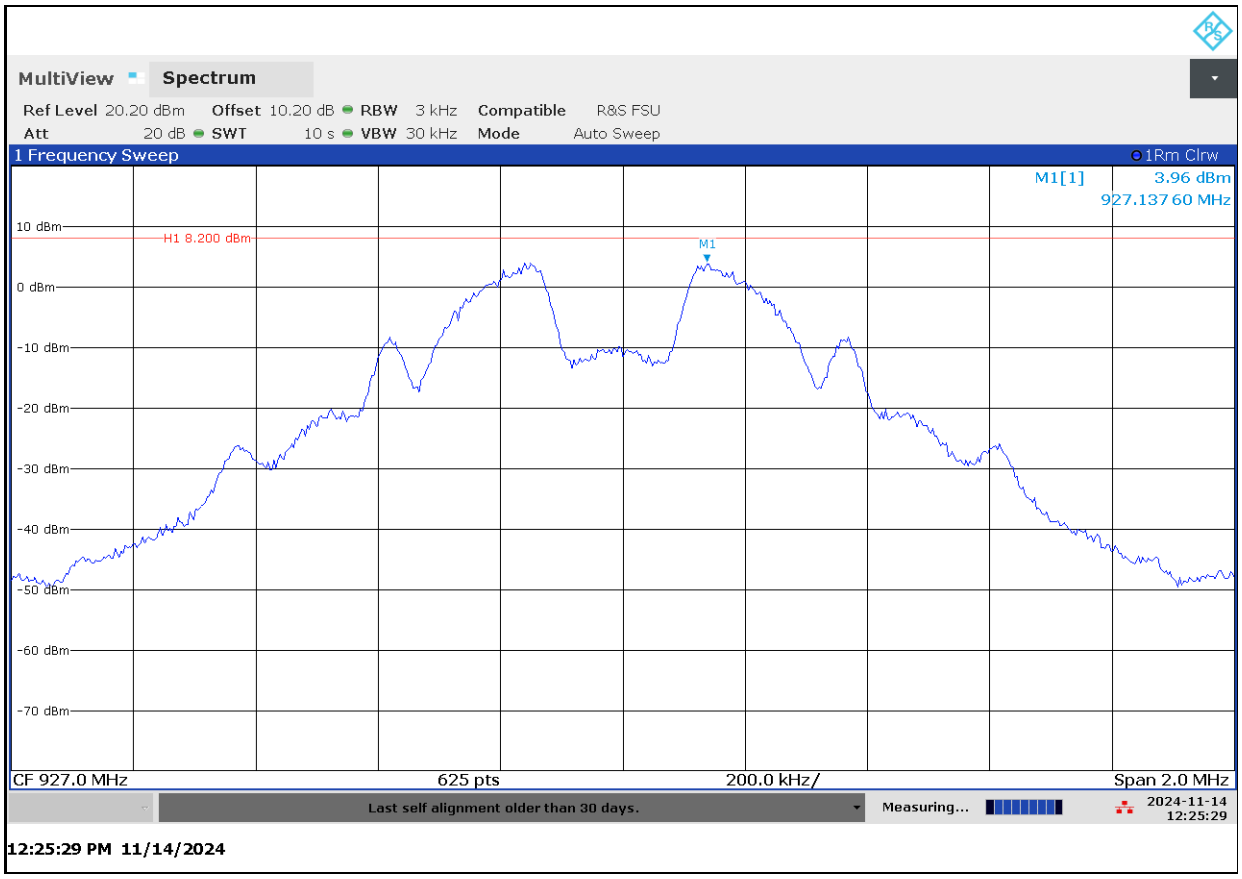
Plot 7-1: Power Spectral Density – 903 MHz



Plot 7-2: Power Spectral Density – 915 MHz



Plot 7-3: Power Spectral Density – 927 MHz



Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.5 dB

Results: Pass

Test Personnel:

Daniel W. Baltzell		November 14, 2024
Test Engineer	Signature	Date of Test

8 Conducted Emissions Measurement Limits – FCC 15.207

8.1 Limits of Conducted Emissions Measurement

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

8.2 Conducted Emissions Measurement Test Procedure

Procedure: C63.10-2009 6.2

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50-ohm / 50 micro Henry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

8.3 Conducted Line Emissions Test Data

N/A – EUT is battery operated.

9 Radiated Emissions – FCC 15.209

9.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	24000/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

9.2 Radiated Emissions Measurement Test Procedure

Procedure: C63.10-2013 11.12.1

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10^{th} harmonic of the highest fundamental transmitter frequency (9 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1,000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 9-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900878	Rhein Tech Laboratories, Inc.	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901792	Shireen	UF1-2.92	40 GHz 300" Cable	N/A	08/02/2025
901242	Rhein Tech Laboratories, Inc.	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2-4 GHz)	9804-1044	08/05/2025
900321	EMCO	3161-03	Horn Antennas (4–8.2 GHz)	9508-1020	08/05/2025
900323	EMCO	3160-7	Horn Antennas (8.2–12.4 GHz)	9605-1054	08/05/2025
901773	Rohde & Schwarz	FSW50	Spectrum Analyzer	101021	05/30/2027
901669	ETS-Lindgren	3142E	Biconilog Antenna (30 MHz–6000 MHz)	00166065	07/11/2025

9.3 Radiated Emissions Test Results

Table 9-2: Environmental Conditions

Date	Humidity (%)	Temperature (°C)	Pressure (kPa)
November 15, 2024	79	11.7	101.3
November 25, 2024	51	13.3	100.6

9.3.1 Radiated Emissions Harmonics/Spurious – Internal Antenna

Table 9-3: Peak Radiated Harmonics/Spurious – 903 MHz – Internal Antenna

Emission Frequency (MHz)	Peak Detector Level (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
2709.0	16.4	29.0	45.4	74.0	-28.6
3612.0	25.4	30.1	55.5	74.0	-18.5
4515.0	17.3	37.1	54.4	74.0	-19.6
5418.0	17.6	37.9	55.5	74.0	-18.5
8127.0	15.7	40.4	56.1	74.0	-17.9
9030.0	14.8	46.0	60.8	74.0	-13.2

Table 9-4: Average Radiated Harmonics/Spurious – 903 MHz – Internal Antenna

Emission Frequency (MHz)	Average Detector Level (dBuV)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2709.0	9.0	29.0	38.0	54.0	-16.0
3612.0	23.1	30.1	53.2	54.0	-0.8
4515.0	9.5	37.1	46.6	54.0	-7.4
5418.0	7.8	37.9	45.7	54.0	-8.3
8127.0	4.7	40.4	45.1	54.0	-8.9
9030.0	4.3	46.0	50.3	54.0	-3.7

Table 9-5: Peak Radiated Harmonics/Spurious – 915 MHz – Internal Antenna

Emission Frequency (MHz)	Peak Detector Level (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
2745.0	22.7	29.1	51.8	74.0	-22.2
3660.0	26.5	30.2	56.7	74.0	-17.3
4575.0	18.1	37.2	55.3	74.0	-18.7
7320.0	17.1	39.6	56.7	74.0	-17.3
8235.0	15.2	45.5	60.7	74.0	-13.3
9150.0	15.0	46.3	61.3	74.0	-12.7

Table 9-6: Average Radiated Harmonics/Spurious – 915 MHz – Internal Antenna

Emission Frequency (MHz)	Average Detector Level (dBuV)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2745.0	20.2	29.1	49.3	54.0	-4.7
3660.0	15.5	30.2	45.7	54.0	-8.3
4575.0	9.4	37.2	46.6	54.0	-7.4
7320.0	5.7	39.6	45.3	54.0	-8.7
8235.0	4.8	45.5	50.3	54.0	-3.7
9150.0	5.2	46.3	51.5	54.0	-2.5

Table 9-7: Peak Radiated Harmonics/Spurious – 927 MHz – Internal Antenna

Emission Frequency (MHz)	Peak Detector Level (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
2781.0	23.6	29.2	52.8	74.0	-21.2
3708.0	23.7	30.3	54.0	74.0	-20.0
4635.0	17.9	37.1	55.0	74.0	-19.0
7416.0	16.9	39.6	56.5	74.0	-17.5
8343.0	15.1	45.7	60.8	74.0	-13.2

Table 9-8: Average Radiated Harmonics/Spurious – 927 MHz – Internal Antenna

Emission Frequency (MHz)	Average Detector Level (dBuV)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2781.0	21.0	29.2	50.2	54.0	-3.8
3708.0	22.0	30.3	52.3	54.0	-1.7
4635.0	8.9	37.1	46.0	54.0	-8.0
7416.0	5.4	39.6	45.0	54.0	-9.0
8343.0	4.4	45.7	50.1	54.0	-3.9

9.3.2 Radiated Emissions Harmonics/Spurious – Yagi Antenna

Table 9-9: Peak Radiated Harmonics/Spurious – 903 MHz – Yagi Antenna

Emission Frequency (MHz)	Peak Detector Level (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
2709.0	16.5	29.0	45.5	74.0	-28.5
3612.0	25.1	30.1	55.2	74.0	-18.8
4515.0	18.4	37.1	55.5	74.0	-18.5
5418.0	17.3	37.9	55.2	74.0	-18.8
8127.0	16.6	40.4	57.0	74.0	-17.0
9030.0	15.0	46.0	61.0	74.0	-13.0

Table 9-10: Average Radiated Harmonics/Spurious – 903 MHz – Yagi Antenna

Emission Frequency (MHz)	Average Detector Level (dBuV)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2709.0	10.2	29.0	39.2	54.0	-14.8
3612.0	23.5	30.1	53.6	54.0	-0.4
4515.0	11.0	37.1	48.1	54.0	-5.9
5418.0	7.7	37.9	45.6	54.0	-8.4
8127.0	5.3	40.4	45.7	54.0	-8.3
9030.0	4.3	46.0	50.3	54.0	-3.7

Table 9-11: Peak Radiated Harmonics/Spurious – 915 MHz – Yagi Antenna

Emission Frequency (MHz)	Peak Detector Level (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
2745.0	20.0	29.1	49.1	74.0	-24.9
3660.0	24.6	30.2	54.8	74.0	-19.2
4575.0	18.1	37.2	55.3	74.0	-18.7
7320.0	17.1	39.6	56.7	74.0	-17.3
8235.0	16.6	45.5	62.1	74.0	-11.9
9150.0	16.7	46.3	63.0	74.0	-11.0

Table 9-12: Average Radiated Harmonics/Spurious – 915 MHz – Yagi Antenna

Emission Frequency (MHz)	Average Detector Level (dBuV)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2745.0	16.2	29.1	45.3	54.0	-8.7
3660.0	22.1	30.2	52.3	54.0	-1.7
4575.0	11.1	37.2	48.3	54.0	-5.7
7320.0	5.7	39.6	45.3	54.0	-8.7
8235.0	5.4	45.5	50.9	54.0	-3.1
9150.0	4.9	46.3	51.2	54.0	-2.8

Table 9-13: Peak Radiated Harmonics/Spurious – 927 MHz – Yagi Antenna

Emission Frequency (MHz)	Peak Detector Level (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
2781.0	17.0	29.2	46.2	74.0	-27.8
3708.0	21.7	30.3	52.0	74.0	-22.0
4635.0	19.6	37.1	56.7	74.0	-17.3
7416.0	16.3	39.6	55.9	74.0	-18.1
8343.0	15.4	45.7	61.1	74.0	-12.9

Table 9-14: Average Radiated Harmonics/Spurious – 927 MHz – Yagi Antenna

Emission Frequency (MHz)	Average Detector Level (dBuV)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2781.0	10.6	29.2	39.8	54.0	-14.2
3708.0	19.6	30.3	49.9	54.0	-4.1
4635.0	10.3	37.1	47.4	54.0	-6.6
7416.0	5.3	39.6	44.9	54.0	-9.1
8343.0	4.9	45.7	50.6	54.0	-3.4

9.3.3 Radiated Emissions Harmonics/Spurious – Omni Antenna

Table 9-15: Peak Radiated Harmonics/Spurious – 903 MHz – Omni Antenna

Emission Frequency (MHz)	Peak Detector Level (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
2709.0	25.2	29.0	54.2	74.0	-19.8
3612.0	23.8	30.1	53.9	74.0	-20.1
4515.0	18.1	37.1	55.2	74.0	-18.8
5418.0	18.1	37.9	56.0	74.0	-18.0
8127.0	17.0	40.4	57.4	74.0	-16.6
9030.0	14.7	46.0	60.7	74.0	-13.3

Table 9-16: Average Radiated Harmonics/Spurious – 903 MHz – Omni Antenna

Emission Frequency (MHz)	Average Detector Level (dBuV)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2709.0	22.7	29.0	51.7	54.0	-2.3
3612.0	20.6	30.1	50.7	54.0	-3.3
4515.0	10.3	37.1	47.4	54.0	-6.6
5418.0	8.4	37.9	46.3	54.0	-7.7
8127.0	5.3	40.4	45.7	54.0	-8.3
9030.0	4.1	46.0	50.1	54.0	-3.9

Table 9-17: Peak Radiated Harmonics/Spurious – 915 MHz – Omni Antenna

Emission Frequency (MHz)	Peak Detector Level (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
2745.0	22.9	29.1	52.0	74.0	-22.0
3660.0	23.6	30.2	53.8	74.0	-20.2
4575.0	18.0	37.2	55.2	74.0	-18.8
7320.0	17.1	39.6	56.7	74.0	-17.3
8235.0	15.2	45.5	60.7	74.0	-13.3
9150.0	15.4	46.3	61.7	74.0	-12.3

Table 9-18: Average Radiated Harmonics/Spurious – 915 MHz – Omni Antenna

Emission Frequency (MHz)	Average Detector Level (dBuV)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2745.0	20.0	29.1	49.1	54.0	-4.9
3660.0	20.1	30.2	50.3	54.0	-3.7
4575.0	12.5	37.2	49.7	54.0	-4.3
7320.0	6.2	39.6	45.8	54.0	-8.2
8235.0	5.3	45.5	50.8	54.0	-3.2
9150.0	4.5	46.3	50.8	54.0	-3.2

Table 9-19: Peak Radiated Harmonics/Spurious – 927 MHz – Omni Antenna

Emission Frequency (MHz)	Peak Detector Level (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
2781.0	17.3	29.2	46.5	74.0	-27.5
3708.0	21.2	30.3	51.5	74.0	-22.5
4635.0	18.8	37.1	55.9	74.0	-18.1
7416.0	15.3	39.6	54.9	74.0	-19.1
8343.0	15.2	45.7	60.9	74.0	-13.1

Table 9-20: Average Radiated Harmonics/Spurious – 927 MHz – Omni Antenna

Emission Frequency (MHz)	Average Detector Level (dBuV)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2781.0	11.0	29.2	40.2	54.0	-13.8
3708.0	18.9	30.3	49.2	54.0	-4.8
4635.0	9.5	37.1	46.3	54.0	-7.7
7416.0	5.0	39.6	44.6	54.0	-9.4
8343.0	4.6	45.7	50.3	54.0	-3.7

9.3.4 Radiated Emissions Unintentional

Table 9-21: Radiated Emissions Unintentional

Emission Frequency (MHz)	Quasi-Peak Detector Level (dBuV) (120 kHz RBW/ 500 kHz VBW)	Site Correction Factor (dB/m)	Quasi-Peak Emission Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Quasi-Peak Margin (dB)
40.576	16.4	16.1	32.5	40.0	-7.5
111.880	5.7	14.7	20.4	43.5	-23.1
289.130	16.5	21.0	37.5	46.0	-8.5
300.720	12.6	20.6	33.2	46.0	-12.8
451.760	2.2	24.7	26.9	46.0	-19.1
503.920	-3.9	25.9	22.0	46.0	-24.0
602.800	-4.8	21.4	16.6	46.0	-29.4
724.240	0.1	30.5	30.6	46.0	-15.4
683.494	-4.9	30.1	25.2	46.0	-20.8
902.244	-4.7	31.7	27.0	46.0	-19.0

Measurement uncertainty 30 MHz – 6 GHz = ±4.8 dB and from 6 GHz and above = ±5.2 dB:
This measurement uncertainty is expanded for a 95% confidence level received with a coverage factor k=2 for the entire frequency range.

Results: Pass

Test Personnel:

Daniel W. Baltzell		November 15 and 25, 2024
EMC Test Engineer	Signature	Dates of Test

10 Conclusion

The data in this measurement report shows the Innovative Wireless Technologies, Inc. Part # FAP4913-090, SENTINEL™ Wireless Gas Monitor+, FCC ID: SP8-FAP4913040, complies with the applicable requirements of Parts 2 and 15 of the FCC rules and regulations, as do the other mechanical configurations: SENTINEL™ Wireless Gas Monitor and the SENTINEL™ Battery Mesh Network.