RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

Collocation Report

for

Model: Sentinel™ Gateway Node

Innovative Wireless Technologies, Inc.
1100 Main Street
Lynchburg, VA 24504
Tel: 434-316-5230

Result: Pass

April 17, 2025

Standards Referenced for this Report	
FCC Part 2: 2024	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
FCC Part 15: 2024	Radio Frequency Devices

Report Prepared by: Dan Baltzell

Document Number: 2024115COL

These tests are accredited under Rhein Tech Laboratories, Inc. ISO/IEC 17025 accreditation issued by ANAB. Refer to certificate and scope of accreditation AT-1445.

Table of Contents

Table of Figures

Table of Plots

Table of Tables

Table of Photographs

1 General Information

This collocation report for an FCC 15.209 device is prepared on behalf of Innovative Wireless Technologies, Inc., in accordance with the applicable Federal Communications Commission rules and regulations. The Equipment Under Test (EUT) was Model Sentinel™ Gateway Node.

1.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located in the rear lot of Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170.

1.2 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.

2 Test System Details

The test samples were received on August 26, 2024. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this testing, as applicable.

Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	Serial Number	Cable Description	RTL Bar Code
SENTINEL Gateway Node	Innovative Wireless Technologies, Inc.	FAP2213-011	G24140011	SP8-FAP2213-011	24416
Sector Antenna 17 dBi	Ventev/ TerraWave Solutions	T09170P1000690	N/A	N/A	24418
Yagi Antenna 11 dBi	ZDA Communications LLC	ZDADJ928-11YG	N/A	N/A	24420
Omni Antenna 6 dBi	Hana Wireless	HW-0D9-5-NF	N/A	N/A	24419
AC Adapter	FSP Group Inc.	FSP150-ABAN1	H00000012	N/A	24421

Table 2-2: Accessory Equipment

Part	Manufacturer	Model #	Serial Number	FCC ID	RTL Bar Code
Software	Innovative Wireless Technologies, Inc.	FCC Control v 1.0	N/A	N/A	N/A

2.1 Modifications

N/A

2.2 Configuration of Tested System

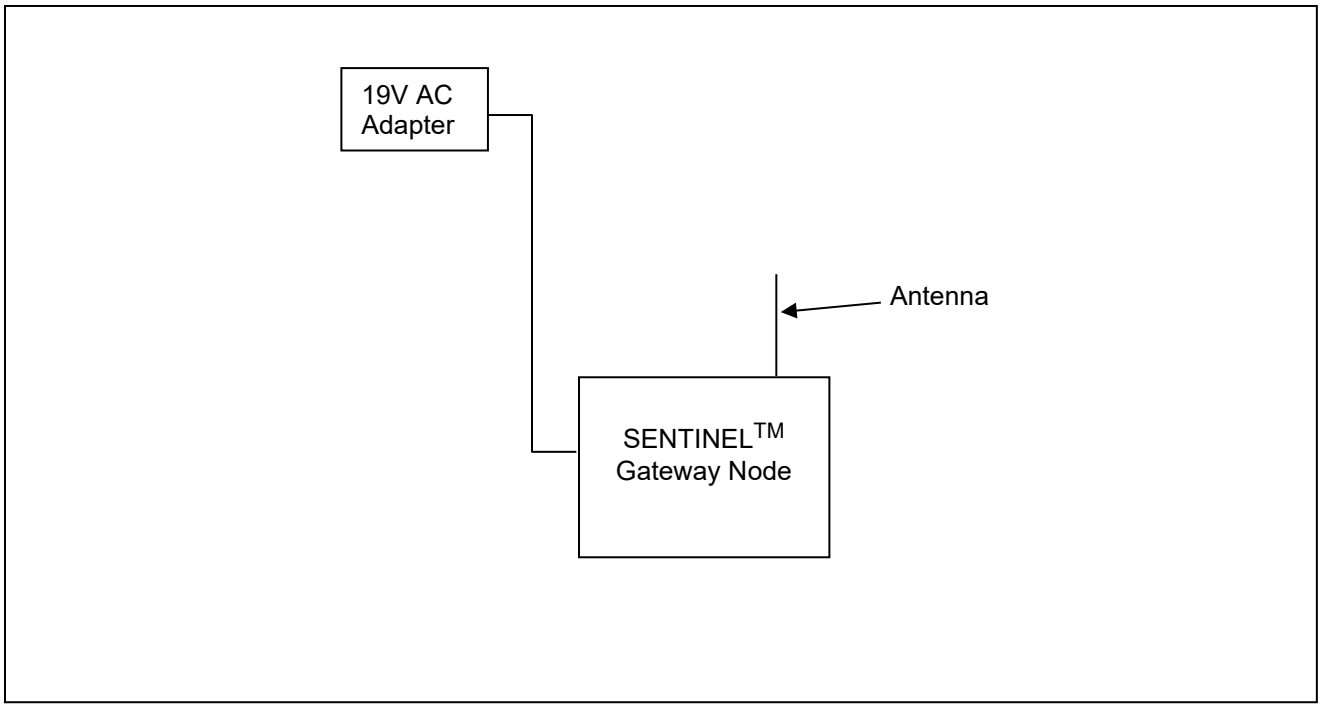


Figure 2-1: Configuration of Tested Equipment

3 Radiated Emissions – §15.209

3.1 Radiated Emissions Limits

Table 3-1: Radiated Emissions Limits

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
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.

3.2 Radiated Emissions Test Procedure

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 to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied to determine the effect on the EUT's emissions in terms of amplitude, direction, and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, to ensure that maximum emission amplitudes were achieved.

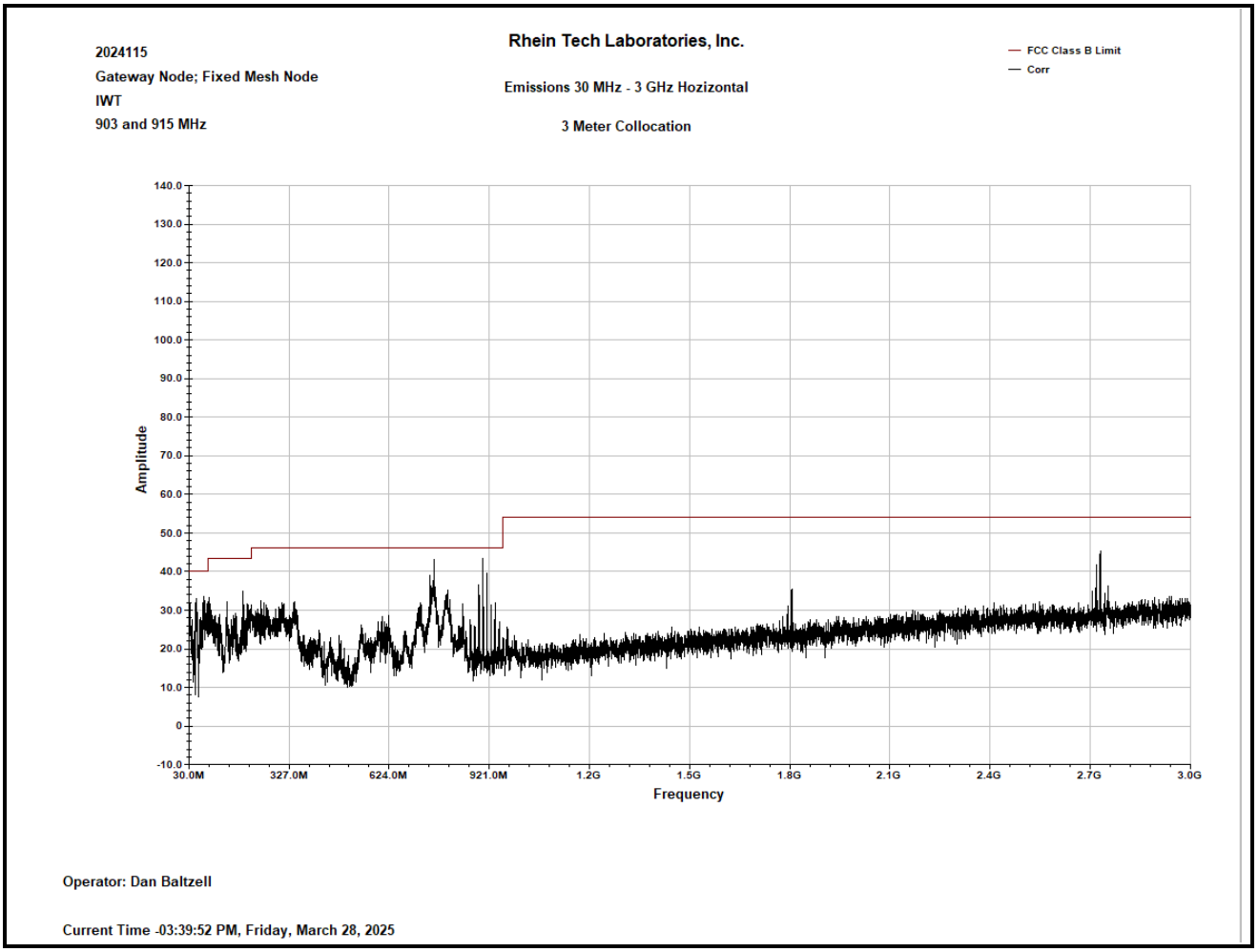
At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 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 3-2: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	05/10/2027
901669	ETS-Lindgren	3142E	Biconilog Antenna (30 MHz – 6000 MHz)	00166065	07/11/2027
901601	EMCO	5311	GTEM	1027	N/A
900878	Rhein Tech Laboratories	AM3-1197-0005	3-meter antenna mast, polarizing	Outdoor Range 1	Not Required
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 KHz – 6.5 GHz)	3325A00159	09/16/2027
900914	Hewlett Packard	8546OA	RF Filter Section, (100 kHz - 6.5 GHz)	3330A00107	09/16/2027
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required

3.3 Radiated Emissions Test Results

Plot 3-1: Collocation Scan; 903 and 915 MHz



Plot 3-2: Collocation Scan; 915 and 927 MHz

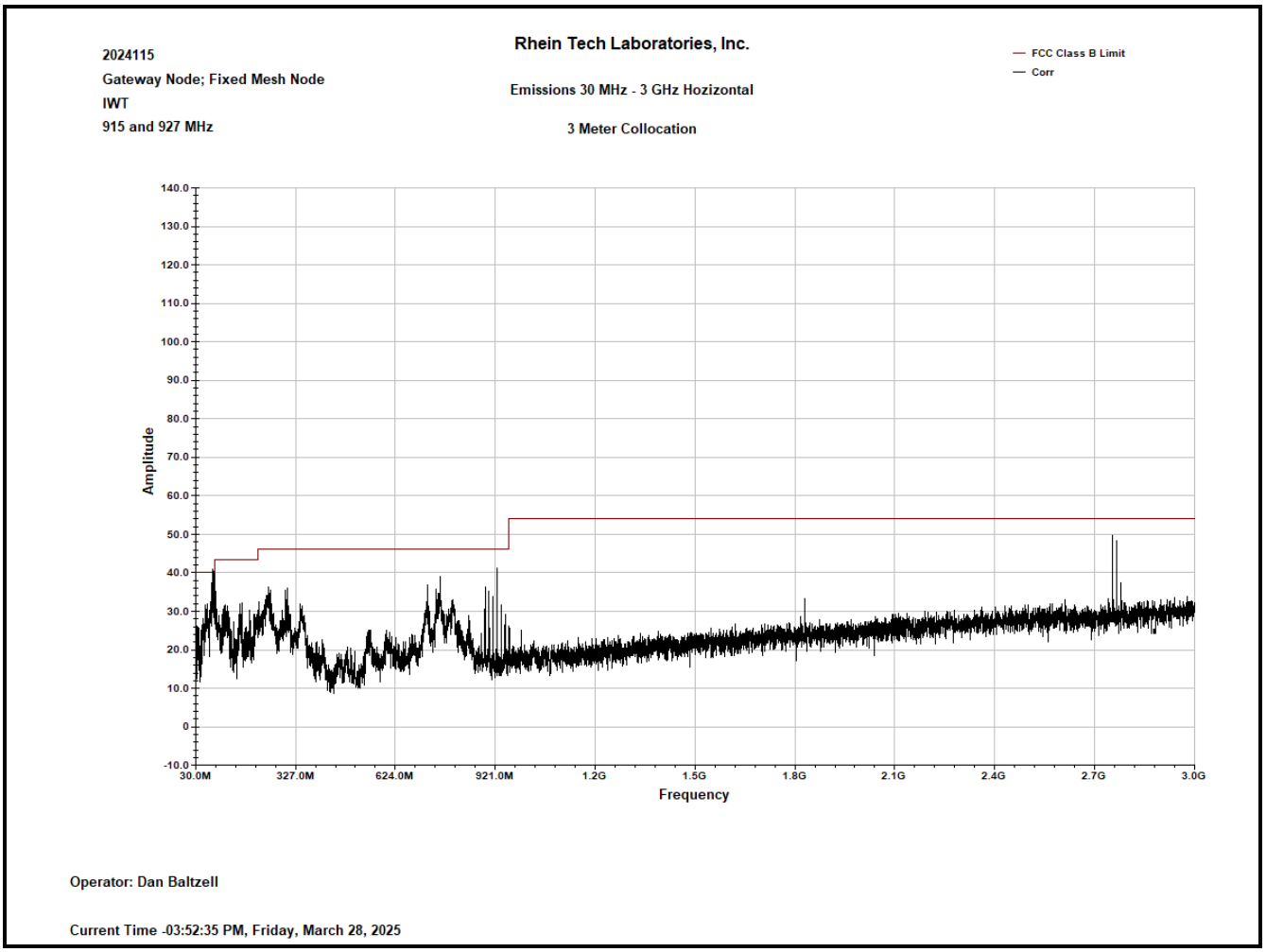


Table 3-3: Radiated Emissions – Sector Antenna, F1=903 and F2=915.0 (Quasi-Peak)

Emission Frequency (MHz)	Level Measured (dBuV)	Site Correction Factor (dB/m)	Corrected Emission Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Collocated Combination
927.000	63.20	4.8	68.0	88.2	-20.2	2F1-F2
890.488	73.3	3.3	76.6	88.2	-11.6	2F2-F1
939.000	42.8	5.4	48.2	88.2	-40.0	3F1-2F2
879.171	51.2	2.8	54.0	88.2	-34.2	3F2-2F1
951.000	36.1	5.7	41.8	88.2	-46.4	4F1-3F2
867.000	38.1	2.8	40.9	88.2	-47.3	4F2-3F1

Table 3-4: Radiated Emissions – Sector Antenna, F1=915 and F2=927.0 MHz (Quasi-Peak)

Emission Frequency (MHz)	Level Measured (dBuV)	Site Correction Factor (dB/m)	Corrected Emission Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Collocated Combination
939.138	72.0	5.4	77.4	88.2	-10.8	2F1-F2
902.525	73.4	3.6	77.0	88.2	-11.2	2F2-F1
951.088	45.9	5.7	51.6	88.2	-36.6	3F1-2F2
890.165	53.3	3.3	56.6	88.2	-31.6	3F2-2F1
963.000	35.9	5.5	41.4	54.0	-12.6	4F1-3F2
879.000	40.5	2.8	43.3	88.2	-44.9	4F2-3F1

Table 3-5: Radiated Emissions – Yagi Antenna, F1=903 and F2=915.0 (Quasi-Peak)

Emission Frequency (MHz)	Level Measured (dBuV)	Site Correction Factor (dB/m)	Corrected Emission Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Collocated Combination
927.000	72.0	4.8	76.8	88.2	-11.4	2F1-F2
890.488	65.2	3.3	68.5	88.2	-19.7	2F2-F1
939.000	46.3	5.4	51.6	88.2	-36.6	3F1-2F2
879.171	46.9	2.8	49.7	88.2	-38.5	3F2-2F1
951.000	29.9	5.7	35.6	88.2	-52.6	4F1-3F2
867.000	38.5	2.8	41.2	88.2	-47.0	4F2-3F1

Table 3-6: Radiated Emissions – Yagi Antenna, F1=915 and F2=927.0 MHz (Quasi-Peak)

Emission Frequency (MHz)	Level Measured (dBuV)	Site Correction Factor (dB/m)	Corrected Emission Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Collocated Combination
939.488	67.6	5.4	73.0	88.2	-15.2	2F1-F2
902.525	69.5	3.6	73.1	88.2	-15.1	2F2-F1
951.088	38.2	5.7	43.9	88.2	-44.3	3F1-2F2
890.165	48.7	3.3	52.0	88.2	-36.2	3F2-2F1
961.838	30.6	5.5	36.1	54.0	-17.9	4F1-3F2
879.000	33.2	2.8	36.0	88.2	-52.2	4F2-3F1

Table 3-7: Radiated Emissions – Omni Antenna, F1=903 and F2=915.0 (Quasi-Peak)

Emission Frequency (MHz)	Level Measured (dBuV)	Site Correction Factor (dB/m)	Corrected Emission Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Collocated Combination
927.151	71.7	4.8	76.5	88.2	-11.7	2F1-F2
891.513	65.0	3.3	68.3	88.2	-19.9	2F2-F1
939.800	51.6	5.4	57.0	88.2	-31.2	3F1-2F2
879.171	46.7	2.8	49.5	88.2	-38.7	3F2-2F1
950.825	35.7	5.7	41.4	88.2	-46.8	4F1-3F2
867.000	31.4	2.8	34.2	88.2	-54.0	4F2-3F1

Table 3-8: Radiated Emissions – Omni Antenna, F1=915 and F2=927.0 MHz (Quasi-Peak)

Emission Frequency (MHz)	Level Measured (dBuV)	Site Correction Factor (dB/m)	Corrected Emission Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Collocated Combination
939.488	71.0	5.4	76.4	88.2	-11.8	2F1-F2
902.525	68.9	3.6	72.5	88.2	-15.7	2F2-F1
951.088	46.3	5.7	52.0	88.2	-36.2	3F1-2F2
890.165	38.7	3.3	42.0	88.2	-46.2	3F2-2F1
961.838	36.4	5.5	41.9	54.0	-12.1	4F1-3F2
879.000	36.1	2.8	38.9	88.2	-49.3	4F2-3F1

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		March 28-31, 2025
EMC Test Engineer	Signature	Date of Test

4 Conclusion

The data in this Collocation Report shows that the Innovative Wireless Technologies, Inc. Model Sentinel Gateway Node complies with the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations.