



**Engineering Test Report No. 2300379-01 Rev. A**

Report Date	July 31, 2023	
Manufacturer Name	Molex Sensorcon, LLC	
Manufacturer Address	307 Cayuga Rd, Suite 100 Cheektowaga, NY 14225	
Test Item Name Model No.	Handheld Gas Detector PRO-CO-1000	
Date Received	July 17, 2023	
Test Dates	July 17 & 18, 2023	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 Innovation, Science, and Economic Development Canada, RSS-247	
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515	FCC Reg. Number: 269750 IC Reg. Number: 2987A CAB Identifier: US0107
Signature		
Tested by	Tylar Jozefczyk	
Signature		
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	C000683492	

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## 1. Report Revision History

Revision	Date	Description
–	01 AUG 2023	Initial Release of Engineering Test Report No. 2300379-01
A	5 JAN 2024 By Rick King	<ul style="list-style-type: none"><li>– Throughout report: Changed Engineering Test Report No. 2300379-01 to Engineering Test Report No. 2300379-01 Rev. A</li><li>– Throughout report: Updated the manufacturer from Molex Sensorcon to Molex Sensorcon, LLC.</li></ul>

## 2. Introduction

### 2.1. Scope of Tests

This document presents the results of a series of RF emissions tests that were performed on the Molex Sensorcon, LLC Handheld Gas Detector (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was manufactured and submitted for testing by Molex Sensorcon, LLC located in Cheektowaga, NY.

### 2.2. Purpose

The test series was performed to determine if the EUT meets the RF emission requirements of the FCC “Code of Federal Regulations” Title 47, Part 15, Subpart C, §15.247 for a Digital Modulation intentional radiator operating within the 2400 – 2483.5MHz band.

The test series was also performed to determine if the EUT meets the RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification RSS-Gen and RSS-247 for a Digital Modulation intentional radiator operating within the 2400 – 2483.5MHz band.

Testing was performed in accordance with ANSI C63.10-2013.

### 2.3. Identification of the EUT

The EUT was identified as follows and used throughout the test series:

EUT Identification	
Product Description	Handheld Gas Detector
Model/Part No.	PRO-CO-1000
Serial No.	N/A (test module)
Size of EUT	3.5” x 1.9” x 0.9”
Software/Firmware Version	1.0.0
Device Type	Digitally Modulated Transmission Device
Band of Operation	2400 – 2483.5MHz
Modulation Type	Bluetooth
Antenna Type	Chip
Rated Output Power	0.00037W (-4.26dBm)
6dB Bandwidth	694.3kHz
Occupied Bandwidth (99% CBW)	1.056MHz
Emission Classification	F1D

## 3. Power Input

The EUT was powered by 3.6VDC from an internal Tadiran lithium battery.

## 4. Grounding

The EUT was not connected to ground.

## 5. Support Equipment

The EUT was submitted for testing along with the following support equipment:

Description	Model #	S/N
Laptop	Zbook G7	---
Module Programmer	SLWSTK6101D	---

## 6. Interconnect Leads

No interconnect leads were used during the tests.

## 7. Modifications Made to the EUT

No modifications were made to the EUT during the testing.

## 8. Mode of Operation

The EUT was energized and was programmed to transmit in the following mode:

Mode	Description
BLE (Power Setting = 0dBm)	- 2402MHz - 2440MHz - 2480MHz

## 9. Test Specifications

The tests were performed to selected portions of, and in accordance with, the following test specifications.

- Federal Communications Commission "Code of Federal Regulations", Title 47, Chapter I, Subchapter A, Part 15, Subpart B – "Unintentional Radiators"
- Federal Communications Commission "Code of Federal Regulations", Title 47, Chapter I, Subchapter A, Part 15, Subpart C – "Intentional Radiators"
- ANSI C63.4-2014 – "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
- ANSI C63.10-2013 – "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
- KDB 558074 D01v05r02 (April 2, 2019) – "Guidance For Compliance Measurements On Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 of the FCC Rules"
- Radio Standard Specification RSS-Gen Issue 5, Amendment 2 (February 2021) – "General Requirements for Compliance of Radio Apparatus"
- Radio Standard Specification RSS-247 Issue 2, February 2017 – "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices"

## 10. Test Plan

No test plan was provided. Instructions were provided by personnel from Molex Sensorcon, LLC and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247, Innovation, Science, and Economic Development Canada, RSS-247, ANSI C63.10-2013, and ANSI C63.4-2014 specifications.

## 11. Deviations, Additions to, or Exclusions from Test Specifications

There were no deviations, additions to, or exclusions from the test specifications during this test series.

## 12. Laboratory Conditions

The ambient parameters of the laboratory during testing were as follows:

Ambient Parameters	Value
Temperature	24.1°C
Relative Humidity	42%
Atmospheric Pressure	1015.5mb

### 13. Summary

The following EMC tests were performed and the results are shown below:

Test Description	Requirements	Test Method	Results
6dB Bandwidth	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Conforms
Occupied Bandwidth (99%)	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Conforms
Effective Isotropic Radiated Power (EIRP)	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Conforms
Case Spurious Radiated Emissions	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Conforms
Band-Edge Compliance	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Conforms
Power Spectral Density	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Conforms

### 14. Sample Calculations

For Radiated Emissions:

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external preamplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

$$\text{Formula 1: FS (dB}\mu\text{V/m)} = \text{MTR (dB}\mu\text{V)} + \text{AF (dB/m)} + \text{CF (dB)} + (-\text{PA (dB)}) + \text{DC (dB)}$$

To convert the Field Strength dB $\mu$ V/m term to  $\mu$ V/m, the dB $\mu$ V/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in  $\mu$ V/m terms.

$$\text{Formula 2: FS (}\mu\text{V/m)} = \text{AntiLog} [(\text{FS (dB}\mu\text{V/m)})/20]$$

### 15. Statement of Conformity

The Molex Sensorcon, LLC Handheld Gas Detector (Model No. PRO-CO-1000) did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247.

### 16. Certification

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247 test specifications. The data presented in this test report pertains to the EUT as received by the customer on the test date specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

17. Photographs of EUT







## 18. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW0	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G	PL2926/0646	20GHZ-26.5GHZ	9/21/2022	9/21/2023
APW14	PREAMPLIFIER	PLANAR	PE2-35-120-5R0-10-12-SFF	PL22671	1-20GHZ	9/21/2022	9/21/2023
CDZ3	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
GSE2	SIGNAL GENERATOR (40GHZ)	ROHDE & SCHWARZ	SMB100A	183293	100KHZ-40GHZ	1/26/2023	1/26/2024
NHG0	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NWQ1	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	5/26/2022	5/26/2024
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	4/27/2022	4/27/2024
R29F	3M ANECHOIC CHAMBER NSA	EMC TEST SYSTEMS	3M ANECHOIC		30MHZ-18GHZ	6/12/2023	6/12/2024
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	4/10/2023	4/10/2024
SES0	24VDC POWER SUPPLY	P-TRANS	FS-32024-1M	001	18-27VDC	NOTE 1	
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	

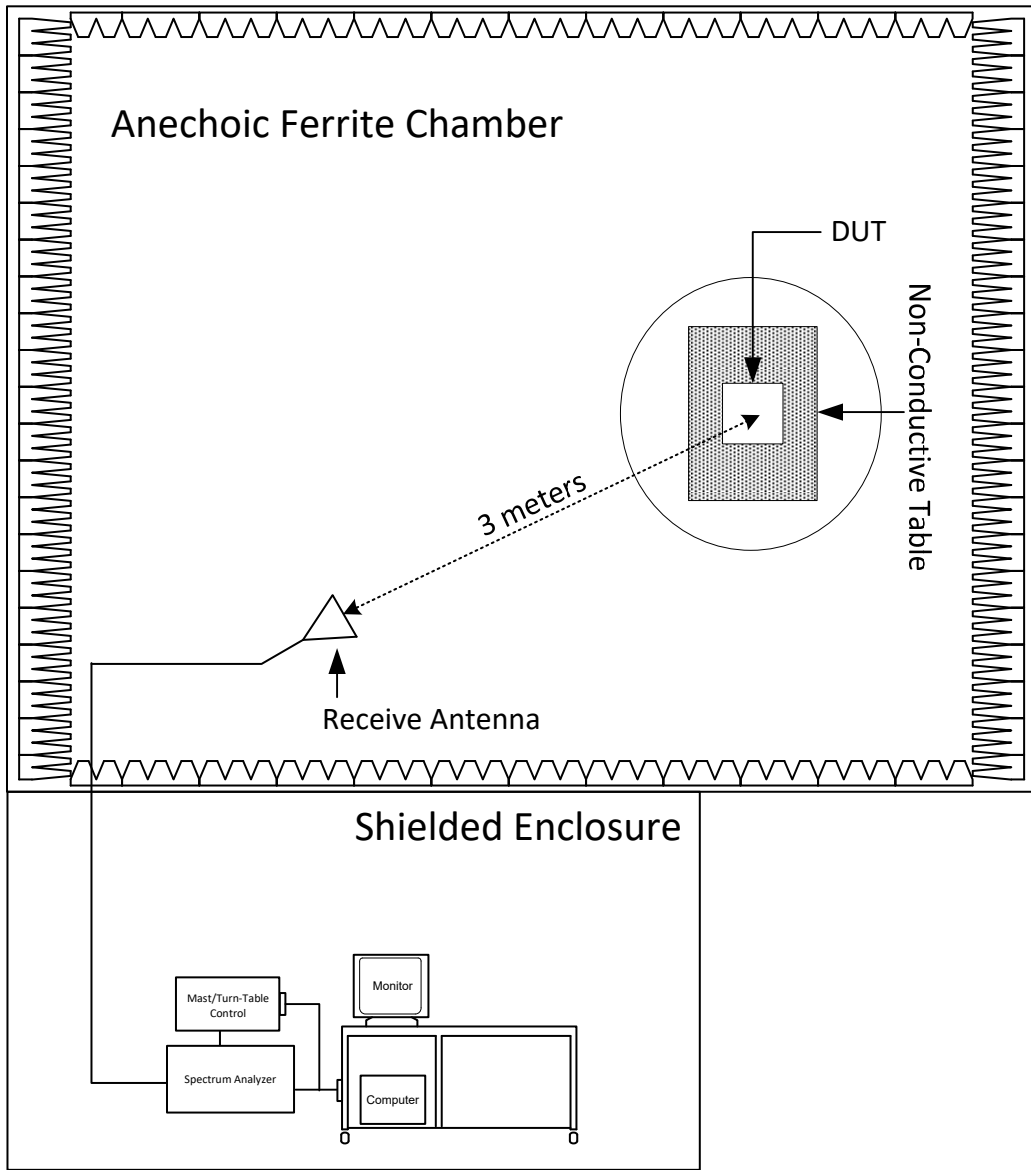
N/A: Not Applicable

I/O: Initial Only

CNR: Calibration Not Required

NOTE 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

### 19. Block Diagram of Test Setup



Radiated Measurements Test Setup

20. 6dB Bandwidth

EUT Information	
Manufacturer	Molex Sensorcon, LLC
Product	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE

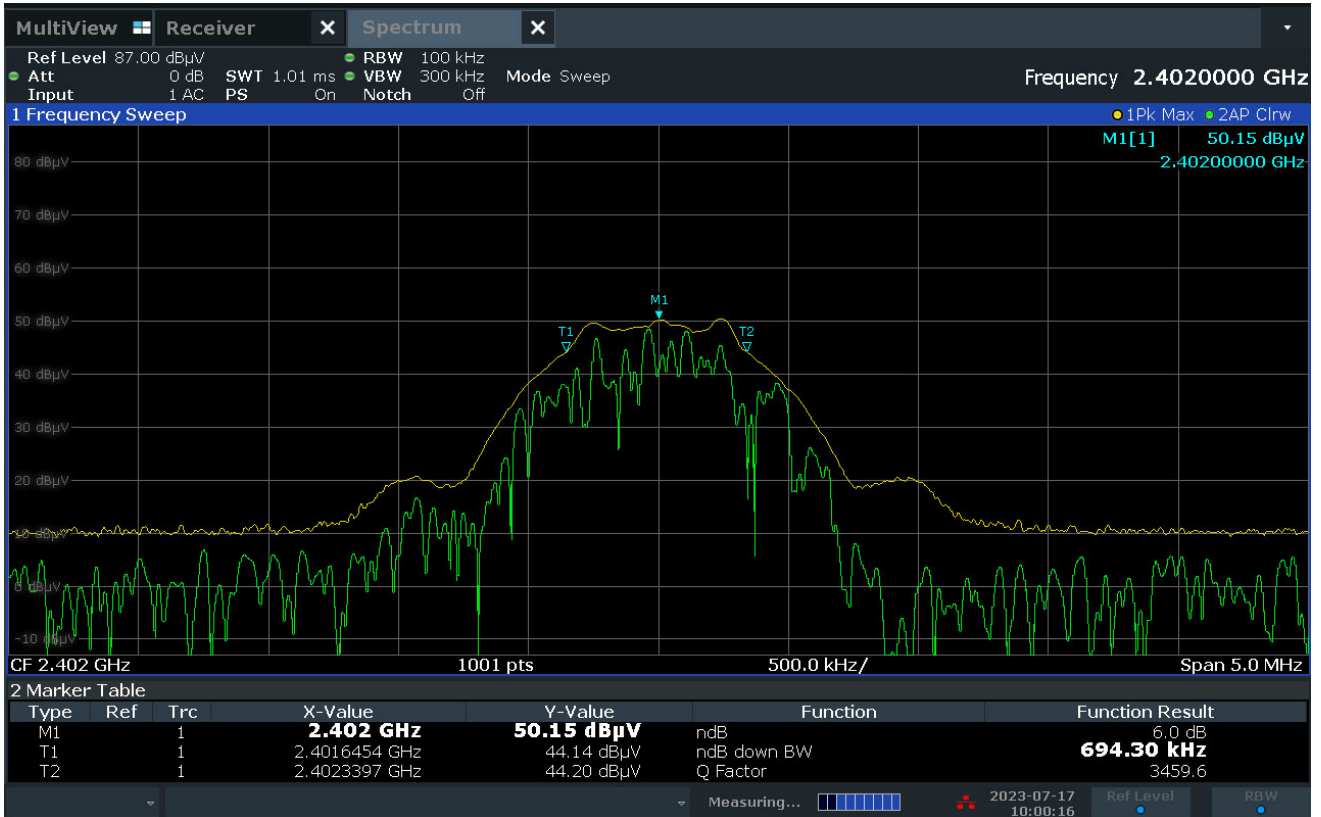
Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	R29F
Type of Antennas Used	Above 1GHz: Double-ridged waveguide (or equivalent)
Notes	

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1

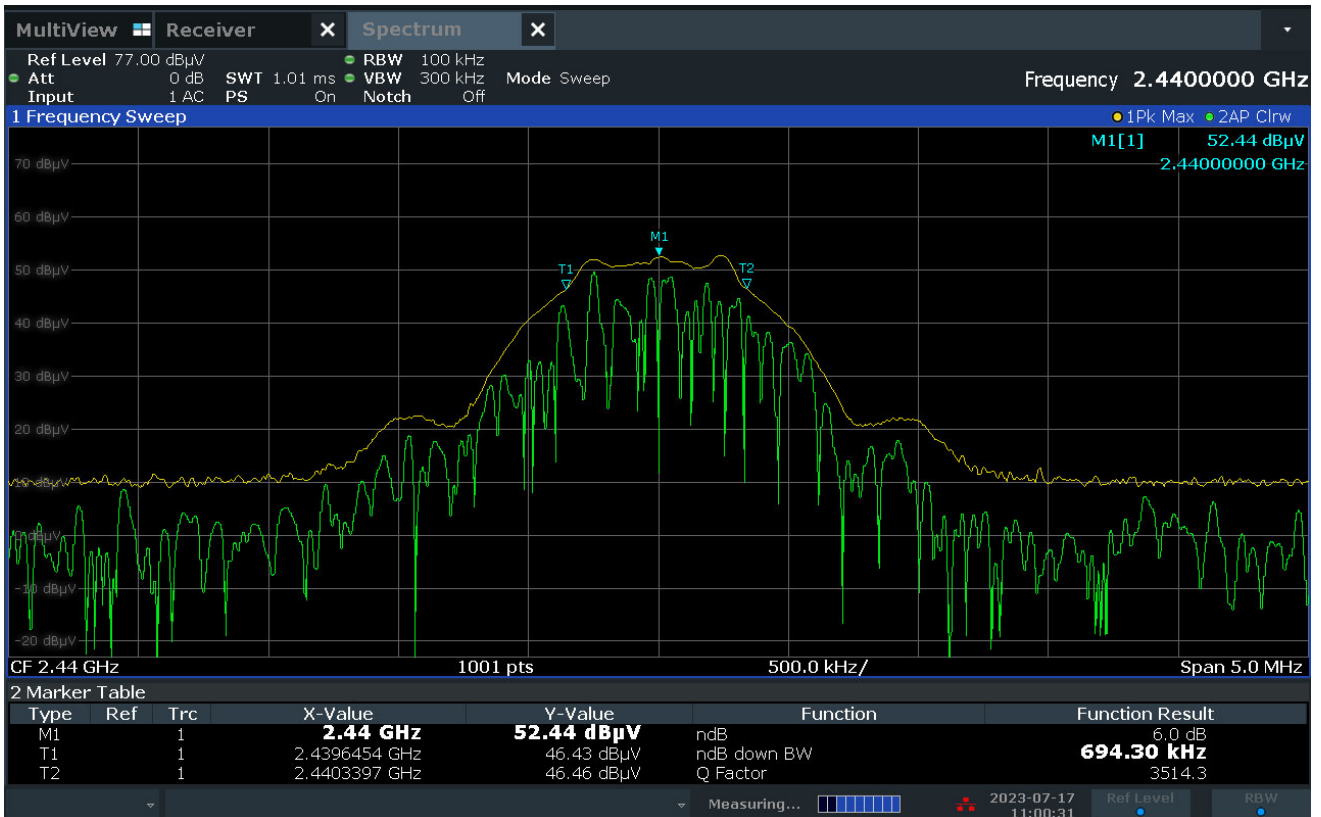
Requirements
Systems using digital modulation techniques shall have a minimum 6dB bandwidth of 500kHz

Procedure
<p>The EUT was setup inside the chamber. The EUT was allowed to transmit continuously.</p> <p>The transmit channel was set separately to low, middle, and high channels. The resolution bandwidth (RBW) was set to 100kHz, the video bandwidth (VBW) was set to the same as or 3 times greater than the RBW, and the span was set to 3 times the RBW.</p> <p>The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was then screenshot and saved.</p>

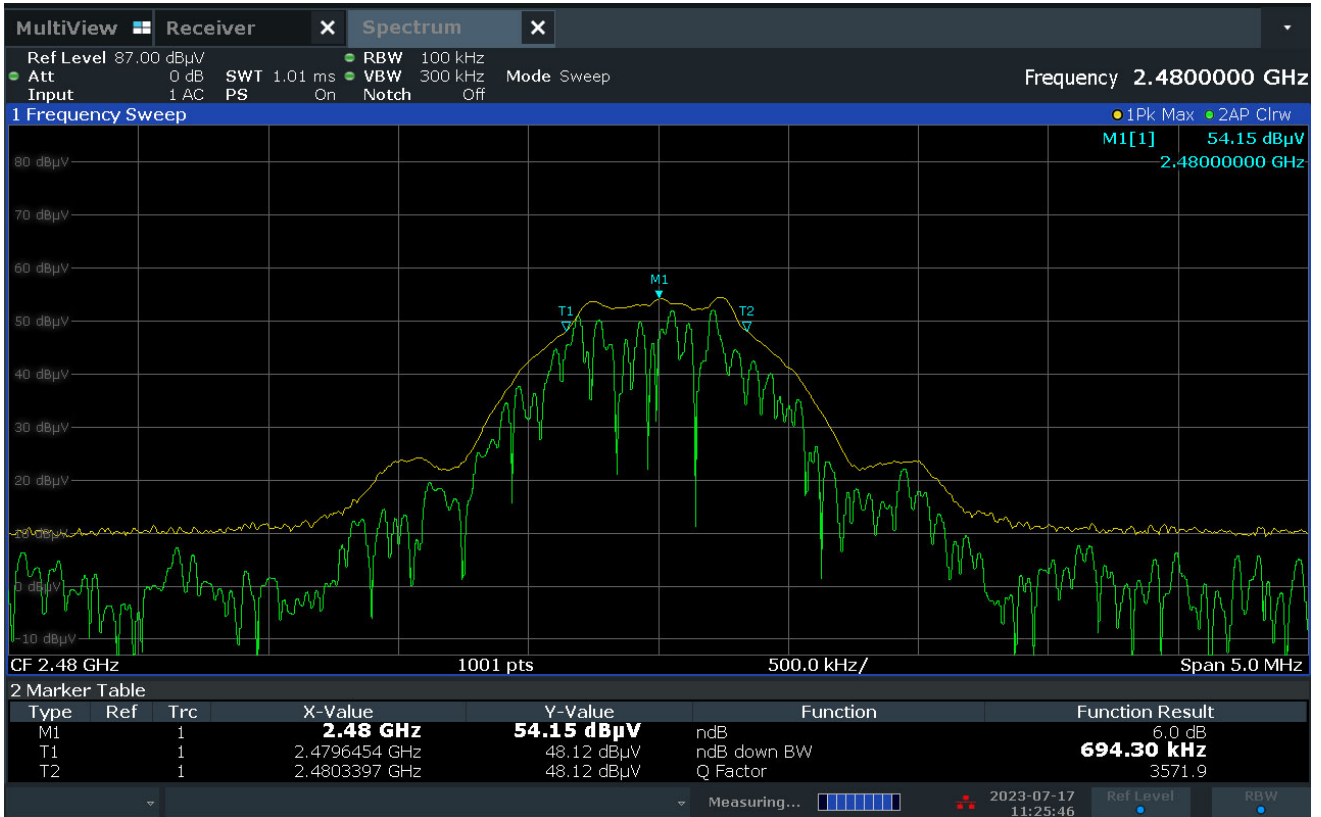
Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2402MHZ
Result	6dB BW = 694.3kHz
Notes	



Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2440MHz
Result	6dB BW = 694.3kHz
Notes	



Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2480MHz
Result	6dB BW = 694.3kHz
Notes	



21. Occupied Bandwidth (99%)

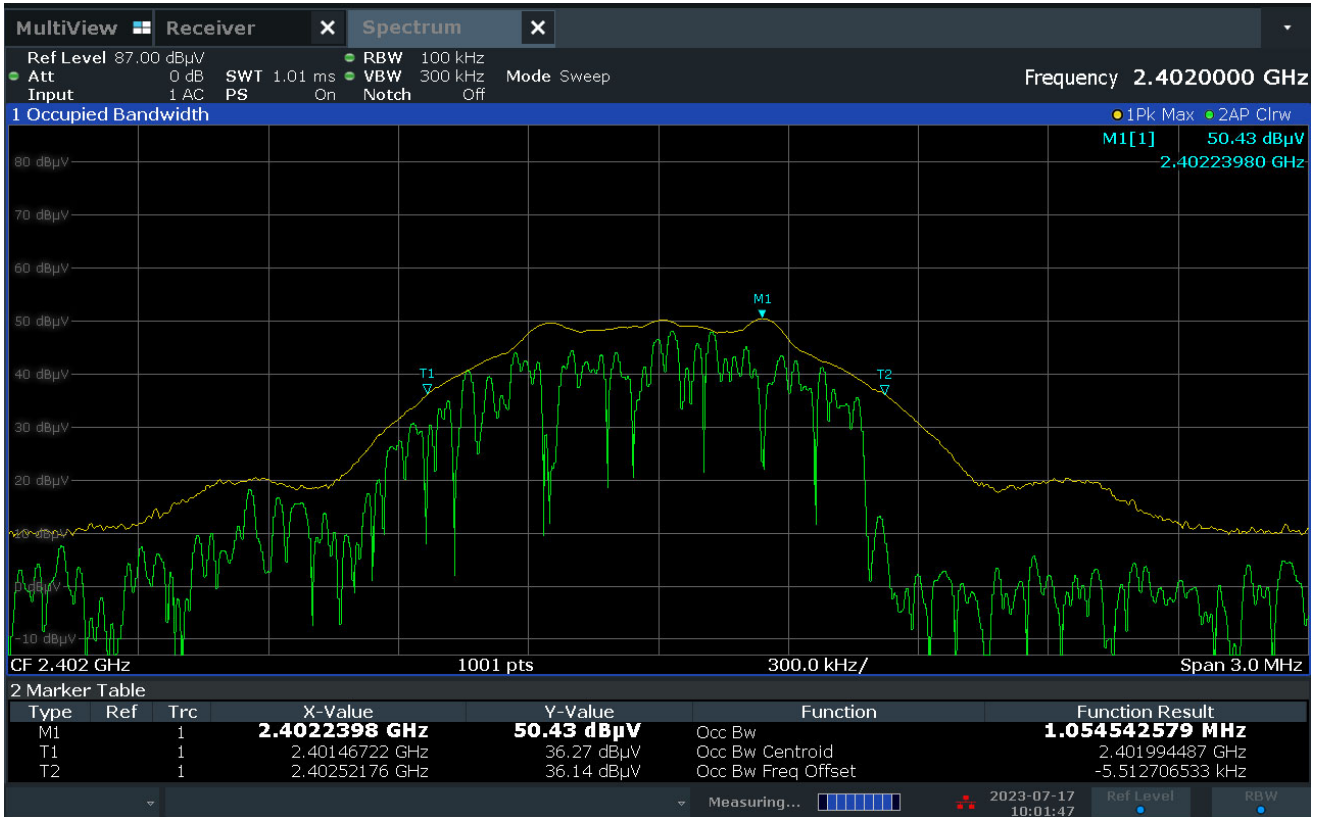
EUT Information	
Manufacturer	Molex Sensorcon, LLC
Product	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	R29F
Type of Antennas Used	Above 1GHz: Double-ridged waveguide (or equivalent)
Notes	

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1

Procedure
<p>The EUT was setup inside the chamber. The EUT was allowed to transmit continuously. The transmit channel was set separately to low, middle, and high channels. The resolution bandwidth (RBW) was set to 1% to 5% of the actual occupied / x dB bandwidth, the video bandwidth (VBW) was set 3 times greater than the RBW, and the span was set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency.</p> <p>The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility.</p>

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2402MHz
Result	OBW = 1.054MHz
Notes	





Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2440MHz
Result	OBW = 1.056MHz
Notes	



Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2480MHz
Result	OBW = 1.056MHz
Notes	



22. Effective Isotropic Radiated Power (EIRP)

EUT Information	
Manufacturer	Molex Sensorcon, LLC
Product	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	R29F
Type of Antennas Used	Above 1GHz: Double-ridged waveguide (or equivalent)
Notes	

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1

Requirements
The output power shall not exceed 4W (36dBm).

Procedure
<p>The EUT was placed on the non-conductive stand and set to transmit. A double ridged waveguide antenna was placed at a test distance of 3 meters from the EUT. The resolution bandwidth (RBW) of the spectrum analyzer was set to greater than the 6dB bandwidth. The EUT was maximized for worst case emissions (or maximum output power) at the measuring antenna. The maximum meter reading was recorded. The peak power output was measured for the low, middle, and high channels.</p> <p>The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, a dipole antenna (double ridged waveguide antenna for all measurements above 1GHz) was then set in place of the EUT and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was then corrected to compensate for cable loss (and antenna gain for all measurements above 1GHz), as required. The peak power output was calculated for low, middle, and high hopping frequencies.</p>

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Result	Max EIRP = 0.00037W (-4.26dBm)
Notes	

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBμV)	Matched Sig Gen Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2402.00	H	44.43	-22.36	5.33	2.75	-19.78	36.00	-55.78
	V	51.98	-10.59	5.33	2.75	-8.01	36.00	-44.01
2440.00	H	49.88	-13.49	5.22	2.77	-11.05	36.00	-47.05
	V	54.16	-8.49	5.22	2.77	-6.05	36.00	-42.05
2480.00	H	52.84	-9.02	5.15	2.80	-6.67	36.00	-42.67
	V	56.36	-6.61	5.15	2.80	-4.26	36.00	-40.26

23. Case Spurious Radiated Emissions

EUT Information	
Manufacturer	Molex Sensorcon, LLC
Product	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	R29F
Type of Antennas Used	1 – 18GHz: Double-Ridged Waveguide (or equivalent) Above 18GHz: Horn (or equivalent)
Notes	N/A

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3

**Procedure**

Radiated measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

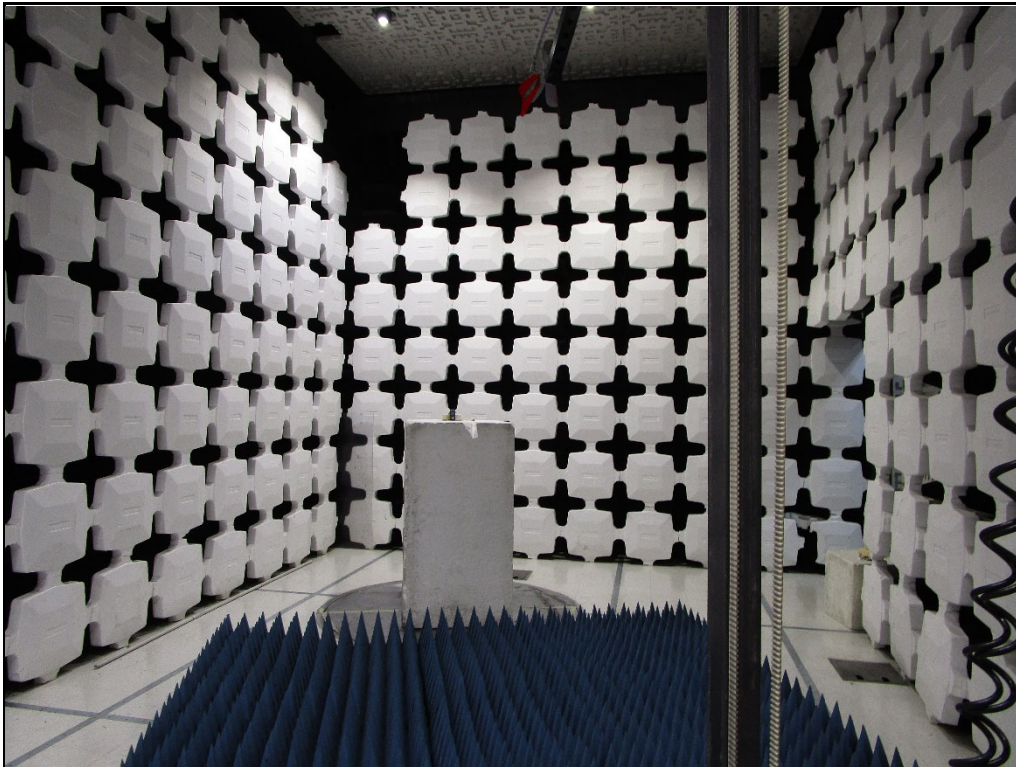
Preliminary radiated emissions tests were performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3-meter distance from the EUT. The entire frequency range from 30MHz to 25GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 25GHz.

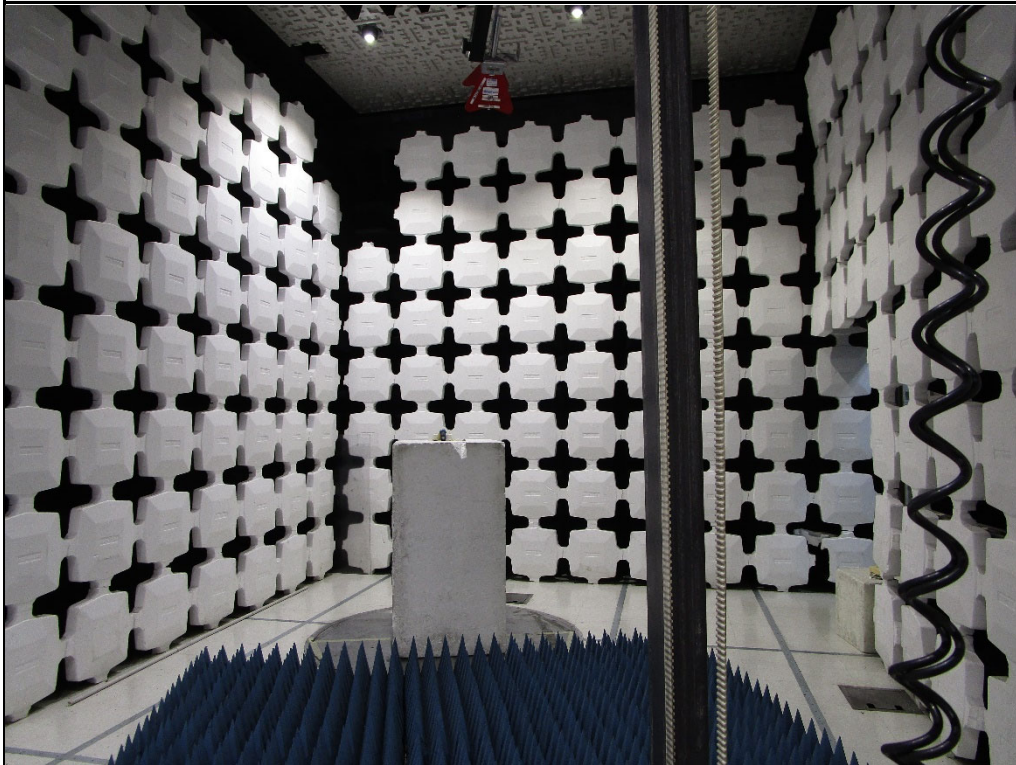
- 1) For all harmonics not in the restricted bands, the following procedure was used:
  - a) The field strength of the fundamental was measured using a double ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a 1.5-meter-high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
  - b) The field strengths of all of the harmonics not in the restricted band were then measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a 1.5-meter-high non-conductive stand. A peak detector with a resolution bandwidth of 100kHz was used on the spectrum analyzer.
  - c) To ensure that maximum or worst-case emission levels at the fundamental and harmonics were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions:
    - i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
    - ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
    - iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
  - d) All harmonics not in the restricted bands must be at least 20dB levels measured at the fundamental. However, attenuation below the general limits specified in §15.209(a) is not required.
- 2) For all emissions in the restricted bands, the following procedure was used:
  - a) The field strengths of all emissions below 1GHz were measured using a bi-log antenna. The bi-log antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on an 80cm high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
  - b) The field strengths of all emissions above 1GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a 1.5-meter-high non-conductive stand. A peak detector with a resolution bandwidth of 1MHz was used on the spectrum analyzer.
  - c) To ensure that maximum or worst-case emission levels were measured, the following steps were taken when taking all measurements:
    - i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
    - ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
    - iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
  - d) For all radiated emissions measurements below 1GHz, if the peak reading is below the limits listed

in §15.209(a), no further measurements are required. If, however, the peak readings exceed the limits listed in §15.209(a), then the emissions are remeasured using a quasi-peak detector.

- e) For all radiated emissions measurements above 1GHz, the peak readings must comply with the §15.35(b) limits. §15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1GHz must be no greater than 20dB above the limits specified in §15.209(a).
- f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average detector. An average reading was taken.

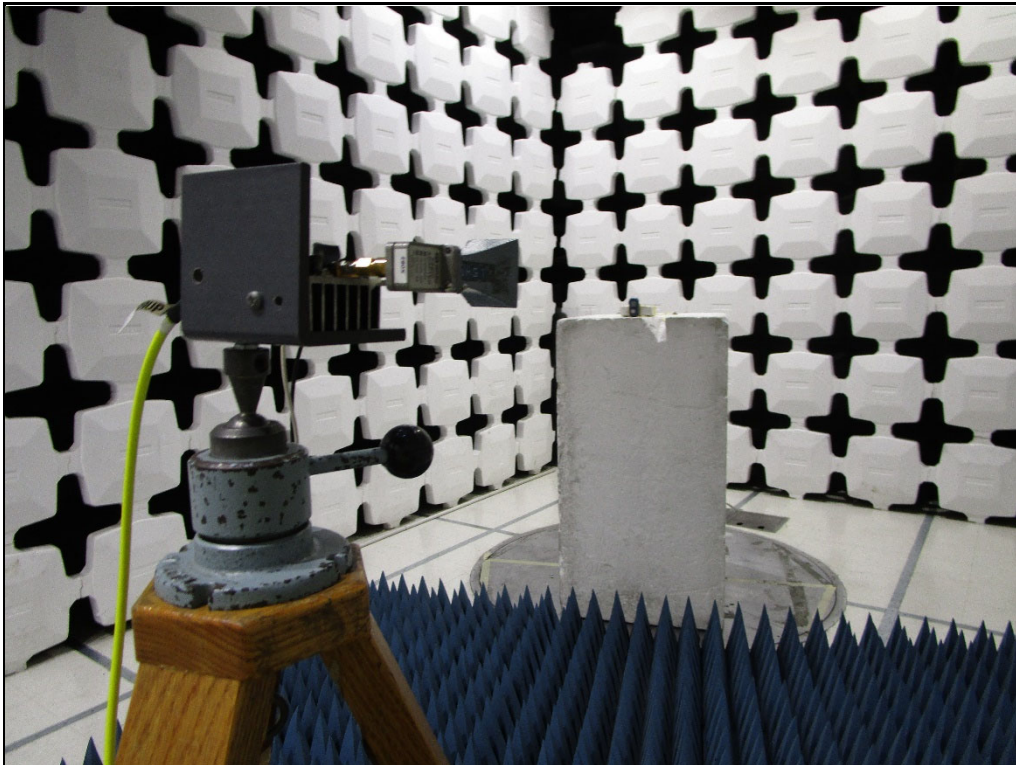


Test Setup for Spurious Radiated Emissions, 1 – 18GHz – Antenna Polarization Horizontal

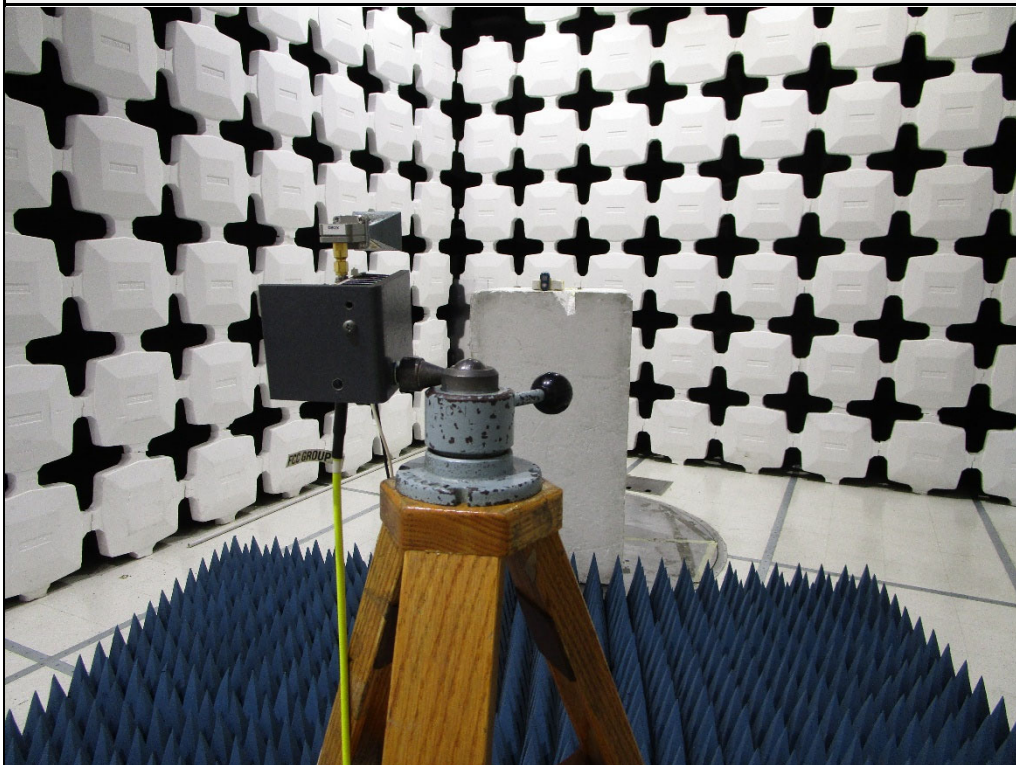


Test Setup for Spurious Radiated Emissions, 1 – 18GHz – Antenna Polarization Vertical





Test Setup for Spurious Radiated Emissions, Above 18GHz – Antenna Polarization Horizontal



Test Setup for Spurious Radiated Emissions, Above 18GHz – Antenna Polarization Vertical

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2402MHz
Notes	Peak Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBμV/m)	Peak Total at 3m (μV/m)	Peak Limit at 3m (μV/m)	Margin (dBm)
4804.00	H	48.62	Ambient	4.82	34.31	-39.71	48.04	252.35	5000.00	-25.94
	V	48.74	Ambient	4.82	34.31	-39.71	48.16	255.86	5000.00	-25.82
12010.00	H	49.18	Ambient	6.87	38.83	-39.00	55.87	621.86	5000.00	-18.11
	V	48.60	Ambient	6.87	38.83	-39.00	55.29	581.69	5000.00	-18.69
19216.00	H	29.59	Ambient	2.21	40.38	-28.22	43.95	157.65	5000.00	-30.03
	V	29.89	Ambient	2.21	40.38	-28.22	44.25	163.19	5000.00	-29.73

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2402MHz
Notes	Average Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dB $\mu$ V)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dB $\mu$ V/m)	Average Total at 3m ( $\mu$ V/m)	Average Limit at 3m ( $\mu$ V/m)	Margin (dB)
4804.00	H	32.94	Ambient	4.82	34.31	-39.71	0.00	32.36	41.50	500.00	-21.62
	V	33.00	Ambient	4.82	34.31	-39.71	0.00	32.42	41.78	500.00	-21.56
12010.00	H	33.45	Ambient	6.87	38.83	-39.00	0.00	40.14	101.67	500.00	-13.84
	V	33.62	Ambient	6.87	38.83	-39.00	0.00	40.31	103.68	500.00	-13.67
19216.00	H	14.59	Ambient	2.21	40.38	-28.22	0.00	28.95	28.03	500.00	-25.03
	V	14.57	Ambient	2.21	40.38	-28.22	0.00	28.93	27.97	500.00	-25.05

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2402MHz
Notes	Peak Measurements in Non-Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBμV/m)	Peak Total at 3m (μV/m)	Peak Limit at 3m (μV/m)	Margin (dBm)
2402.00	H	47.37		3.38	32.57	0.00	83.33	14669.11		
	V	50.54		3.38	32.57	0.00	86.50	21130.21		
7206.00	H	37.33	Ambient	5.89	36.29	-39.66	39.85	98.27	2113.02	-26.65
	V	37.18	Ambient	5.89	36.29	-39.66	39.70	96.59	2113.02	-26.80
9608.00	H	39.45	0.00	6.27	37.14	-39.30	43.55	150.56	2113.02	-22.94
	V	37.91	Ambient	6.27	37.14	-39.30	42.01	126.09	2113.02	-24.48
14412.00	H	38.27	Ambient	7.43	39.42	-38.58	46.54	212.29	2113.02	-19.96
	V	37.72	Ambient	7.43	39.42	-38.58	45.99	199.26	2113.02	-20.51
16814.00	H	36.29	Ambient	7.72	42.24	-37.37	48.88	277.85	2113.02	-17.62
	V	36.24	Ambient	7.72	42.24	-37.37	48.83	276.26	2113.02	-17.67
21618.00	H	20.23	Ambient	2.25	40.56	-28.49	34.54	53.35	2113.02	-31.96
	V	20.10	Ambient	2.25	40.56	-28.49	34.41	52.56	2113.02	-32.09
24020.00	H	20.15	Ambient	2.24	40.62	-29.27	33.74	48.66	2113.02	-32.75
	V	19.74	Ambient	2.24	40.62	-29.27	33.33	46.42	2113.02	-33.16

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2440MHz
Notes	Peak Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBμV/m)	Peak Total at 3m (μV/m)	Peak Limit at 3m (μV/m)	Margin (dBm)
4880.00	H	48.56		5.01	34.20	-39.62	48.15	255.54	5000.00	-25.83
	V	48.71		5.01	34.20	-39.62	48.30	259.99	5000.00	-25.68
7320.00	H	48.24	Ambient	5.84	36.27	-39.62	50.73	343.87	5000.00	-23.25
	V	48.50	Ambient	5.84	36.27	-39.62	50.99	354.32	5000.00	-22.99
12200.00	H	47.77	Ambient	7.25	38.85	-38.89	54.99	561.42	5000.00	-18.99
	V	47.65	Ambient	7.25	38.85	-38.89	54.87	553.71	5000.00	-19.11
19520.00	H	28.65	Ambient	2.22	40.39	-27.76	43.50	149.65	5000.00	-30.48
	V	28.71	Ambient	2.22	40.39	-27.76	43.56	150.69	5000.00	-30.42

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2440MHz
Notes	Average Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dB $\mu$ V)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dB $\mu$ V/m)	Average Total at 3m ( $\mu$ V/m)	Average Limit at 3m ( $\mu$ V/m)	Margin (dB)
4880.00	H	33.91		5.01	34.20	-39.62	0.00	33.50	47.31	500.00	-20.48
	V	33.41		5.01	34.20	-39.62	0.00	33.00	44.66	500.00	-20.98
7320.00	H	32.76	Ambient	5.84	36.27	-39.62	0.00	35.25	57.86	500.00	-18.73
	V	32.74	Ambient	5.84	36.27	-39.62	0.00	35.23	57.73	500.00	-18.75
12200.00	H	32.73	Ambient	7.25	38.85	-38.89	0.00	39.95	99.38	500.00	-14.03
	V	32.58	Ambient	7.25	38.85	-38.89	0.00	39.80	97.68	500.00	-14.18
19520.00	H	13.68	Ambient	2.22	40.39	-27.76	0.00	28.53	26.70	500.00	-25.45
	V	13.80	Ambient	2.22	40.39	-27.76	0.00	28.65	27.08	500.00	-25.33

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2440MHz
Notes	Peak Measurements in Non-Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBμV/m)	Peak Total at 3m (μV/m)	Peak Limit at 3m (μV/m)	Margin (dBm)
2440.00	H	47.81		3.39	32.63	0.00	83.83	15542.32		
	V	52.78		3.39	32.63	0.00	88.80	27543.30		
9760.00	H	37.66		6.37	37.22	-39.27	41.98	125.60	2754.33	-26.82
	V	36.38	Ambient	6.37	37.22	-39.27	40.70	108.39	2754.33	-28.10
14640.00	H	37.74	Ambient	7.32	39.51	-38.62	45.95	198.34	2754.33	-22.85
	V	38.16	Ambient	7.32	39.51	-38.62	46.37	208.16	2754.33	-22.43
17080.00	H	36.83	Ambient	7.64	42.43	-37.37	49.54	299.77	2754.33	-19.26
	V	36.28	Ambient	7.64	42.43	-37.37	48.99	281.38	2754.33	-19.81
21960.00	H	20.73	Ambient	2.20	40.58	-28.88	34.63	53.92	2754.33	-34.17
	V	21.31	Ambient	2.20	40.58	-28.88	35.21	57.64	2754.33	-33.59
24400.00	H	20.03	Ambient	2.22	40.63	-29.29	33.60	47.84	2754.33	-35.20
	V	20.52	Ambient	2.22	40.63	-29.29	34.09	50.62	2754.33	-34.71

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2480MHz
Notes	Peak Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBμV/m)	Peak Total at 3m (μV/m)	Peak Limit at 3m (μV/m)	Margin (dBm)
4960.00	H	48.77		5.21	34.14	-39.65	48.48	265.35	5000.00	-25.50
	V	48.83		5.21	34.14	-39.65	48.54	267.19	5000.00	-25.44
7440.00	H	48.25	Ambient	5.90	36.31	-39.56	50.90	350.77	5000.00	-23.08
	V	47.72	Ambient	5.90	36.31	-39.56	50.37	330.01	5000.00	-23.61
12400.00	H	48.09	Ambient	7.29	38.89	-38.76	55.50	595.82	5000.00	-18.48
	V	47.67	Ambient	7.29	38.89	-38.76	55.08	567.69	5000.00	-18.90
19840.00	H	29.38	Ambient	2.23	40.40	-28.04	43.98	158.05	5000.00	-30.00
	V	29.73	Ambient	2.23	40.40	-28.04	44.33	164.55	5000.00	-29.65
22320.00	H	30.27	Ambient	2.23	40.59	-28.84	44.24	163.00	5000.00	-29.74
	V	30.26	Ambient	2.23	40.59	-28.84	44.23	162.81	5000.00	-29.75



Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2480MHz
Notes	Average Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBμV/m)	Average Total at 3m (μV/m)	Average Limit at 3m (μV/m)	Margin (dB)
4960.00	H	34.80		5.21	34.14	-39.65	0.00	34.51	53.13	500.00	-19.47
	V	33.85		5.21	34.14	-39.65	0.00	33.56	47.62	500.00	-20.42
7440.00	H	32.69	Ambient	5.90	36.31	-39.56	0.00	35.34	58.48	500.00	-18.64
	V	32.67	Ambient	5.90	36.31	-39.56	0.00	35.32	58.35	500.00	-18.66
12400.00	H	32.45	Ambient	7.29	38.89	-38.76	0.00	39.86	98.43	500.00	-14.12
	V	32.48	Ambient	7.29	38.89	-38.76	0.00	39.89	98.77	500.00	-14.09
19840.00	H	14.62	Ambient	2.23	40.40	-28.04	0.00	29.22	28.89	500.00	-24.76
	V	14.66	Ambient	2.23	40.40	-28.04	0.00	29.26	29.03	500.00	-24.72
22320.00	H	15.39	Ambient	2.23	40.59	-28.84	0.00	29.36	29.39	500.00	-24.62
	V	15.40	Ambient	2.23	40.59	-28.84	0.00	29.37	29.42	500.00	-24.61

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2480MHz
Notes	Peak Measurements in Non-Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBμV/m)	Peak Total at 3m (μV/m)	Peak Limit at 3m (μV/m)	Margin (dBm)
2480.00	H	51.53		3.40	32.71	0.00	87.64	24088.19		
	V	54.90		3.40	32.71	0.00	91.01	35506.20		
9920.00	H	37.85		6.46	37.17	-39.23	42.25	129.54	3550.62	-28.76
	V	37.05	Ambient	6.46	37.17	-39.23	41.45	118.14	3550.62	-29.56
14880.00	H	37.07	Ambient	7.40	39.87	-38.54	45.80	194.94	3550.62	-25.21
	V	37.28	Ambient	7.40	39.87	-38.54	46.01	199.71	3550.62	-25.00
17360.00	H	37.15	Ambient	7.65	42.50	-37.42	49.87	311.67	3550.62	-21.13
	V	37.29	Ambient	7.65	42.50	-37.42	50.01	316.73	3550.62	-20.99
24800.00	H	21.63	Ambient	2.21	40.64	-29.32	35.16	57.26	3550.62	-35.85
	V	21.72	Ambient	2.21	40.64	-29.32	35.25	57.86	3550.62	-35.76

## 24. Band-Edge Compliance

EUT Information	
Manufacturer	Molex Sensorcon, LLC
Product	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE

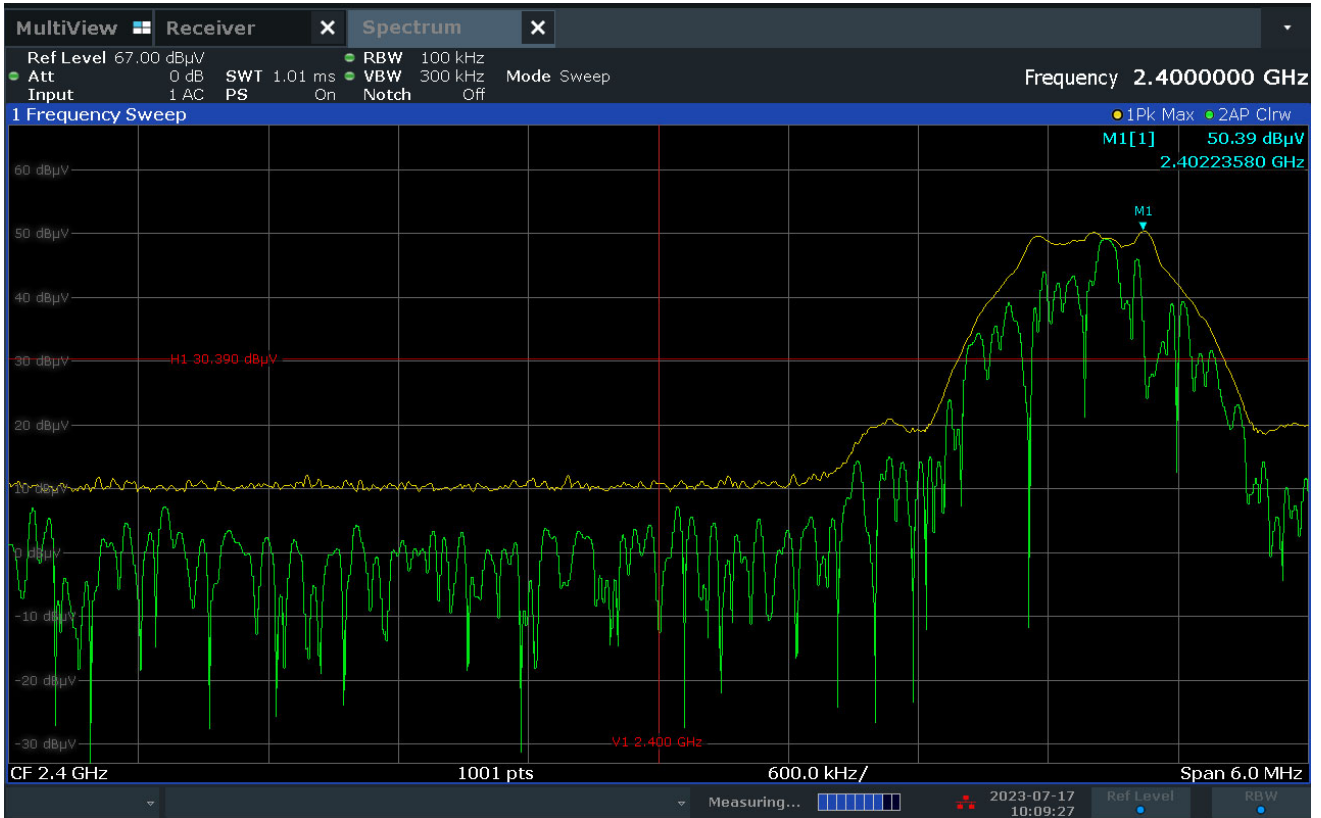
Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	R29F
Type of Antennas Used	Above 1GHz: Double-Ridged Waveguide (or equivalent)
Notes	None

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1

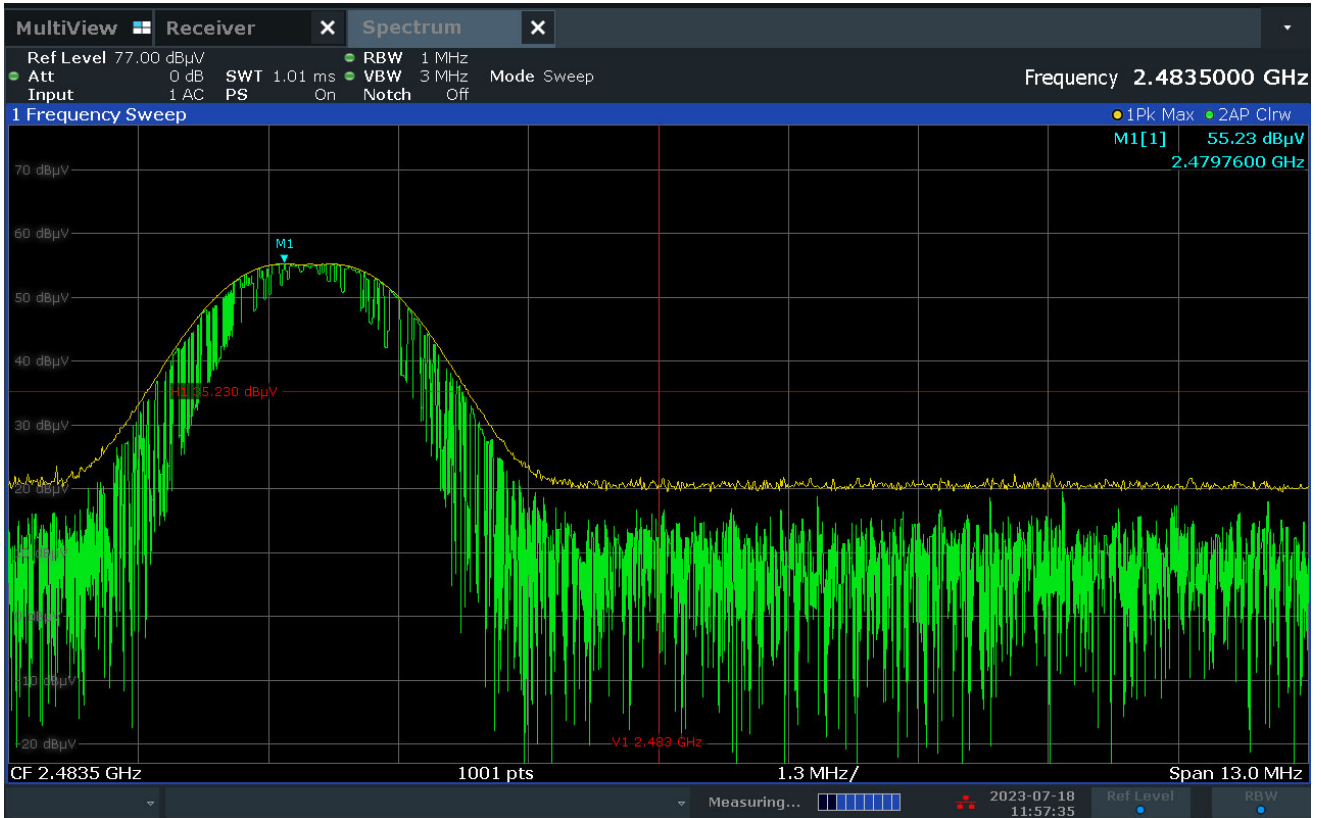
Procedure
<p>1) Low Band Edge:</p> <ul style="list-style-type: none"> <li>a) The EUT was setup inside the test chamber on a non-conductive stand and a broadband measuring antenna was placed at a test distance of 3 meters from the EUT.</li> <li>b) The EUT was set to transmit continuously at the channel closest to the low band-edge.</li> <li>c) The EUT was maximized for worst case emissions at the measuring antenna and the maximum meter reading was recorded.</li> <li>d) To determine the band edge compliance, the following spectrum analyzer settings were used: <ul style="list-style-type: none"> <li>o Center Frequency = 2400MHz (low band-edge frequency).</li> <li>o Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.</li> <li>o Resolution Bandwidth (RBW) = <math>\geq 1\%</math> of the span.</li> <li>o 'Max-Hold' function was engaged.</li> </ul> </li> <li>e) The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.</li> <li>f) The marker was set on the peak of the in-band emissions. A display line was placed 20dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB down display line. (All emissions to the left of the center frequency (band-edge) must be below the display line.)</li> <li>g) The analyzer's display was then screenshot and saved.</li> </ul> <p>2) High Band Edge:</p> <ul style="list-style-type: none"> <li>a) The EUT was setup inside the test chamber on a non-conductive stand and set to transmit continuously at the channel closest to the high band-edge.</li> </ul>

- b) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT. The antenna was connected to the input of a spectrum analyzer.
- c) The center frequency of the analyzer was set to the high band edge (2483.5MHz).
- d) The Resolution Bandwidth was set to 1MHz.
- e) To ensure that the maximum or worst-case emission level was measured, the following steps were taken:
  - o The EUT was rotated so that all of its sides were exposed to the receiving antenna.
  - o Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
  - o The EUT was rotated so that all of its sides were exposed to the receiving antenna.
  - o The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.
  - o The highest measured peak reading and the highest measured average reading were recorded.

Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2402MHz
Notes	Low Band Edge



Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2480MHz
Notes	High Band Edge



Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2480MHz
Notes	High Band Edge – Peak and Average Measurements

Freq (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBμV/m)	Peak Total at 3m (μV/m)	Peak Limit at 3m (μV/m)	Margin (dBm)
2483.50	H	21.22		3.40	32.72	0.00	57.33	735.71	5000.00	-16.65
	V	21.76		3.40	32.72	0.00	57.87	782.90	5000.00	-16.11

Freq (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBμV/m)	Average Total at 3m (μV/m)	Average Limit at 3m (μV/m)	Margin (dB)
2483.50	H	7.07		3.40	32.72	0.00	0.00	43.18	144.28	500.00	-10.80
	V	7.26		3.40	32.72	0.00	0.00	43.37	147.47	500.00	-10.61

25. Power Spectral Density

EUT Information	
Manufacturer	Molex Sensorcon, LLC
Product	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	R29F
Type of Antennas Used	Above 1GHz: Double-Ridged Waveguide (or equivalent)
Notes	N/A

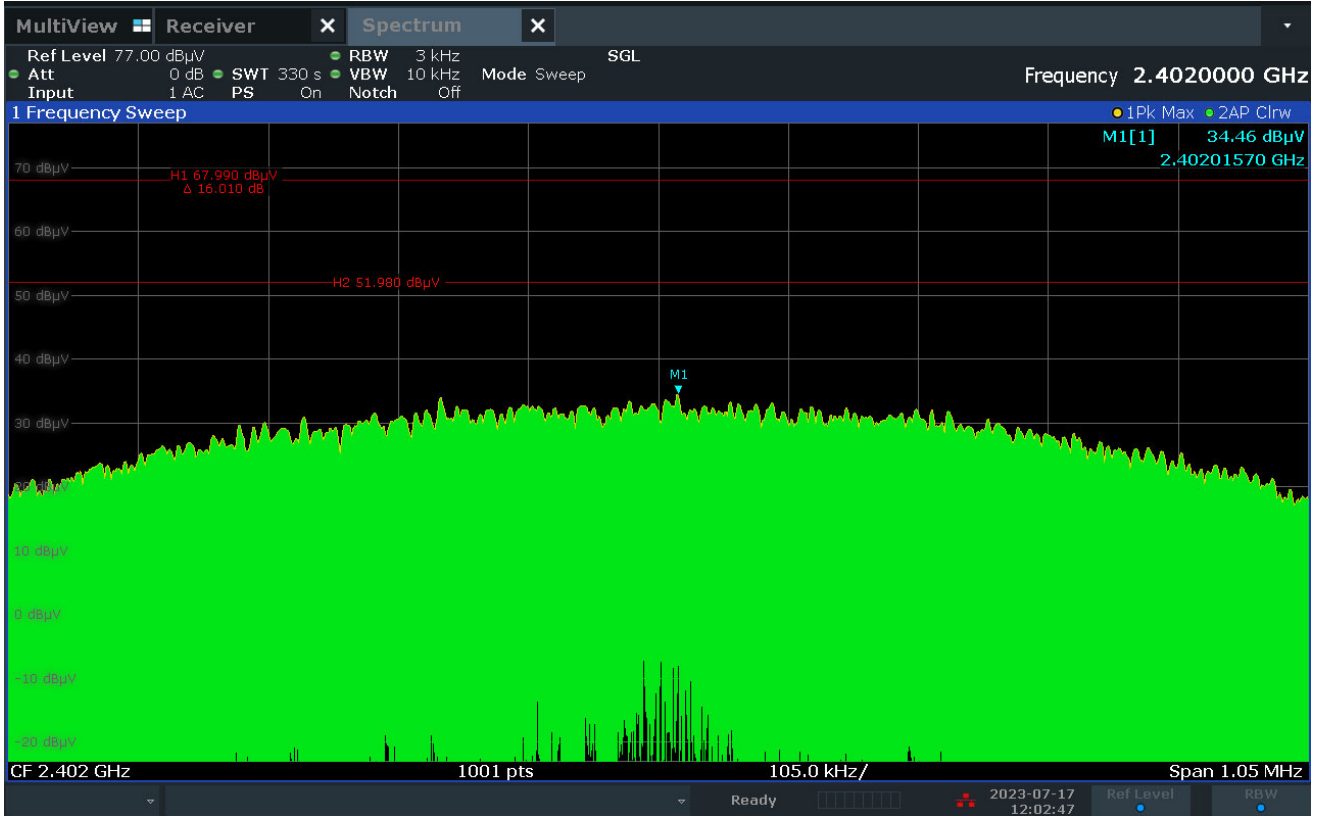
Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1

Requirement
The power spectral density from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

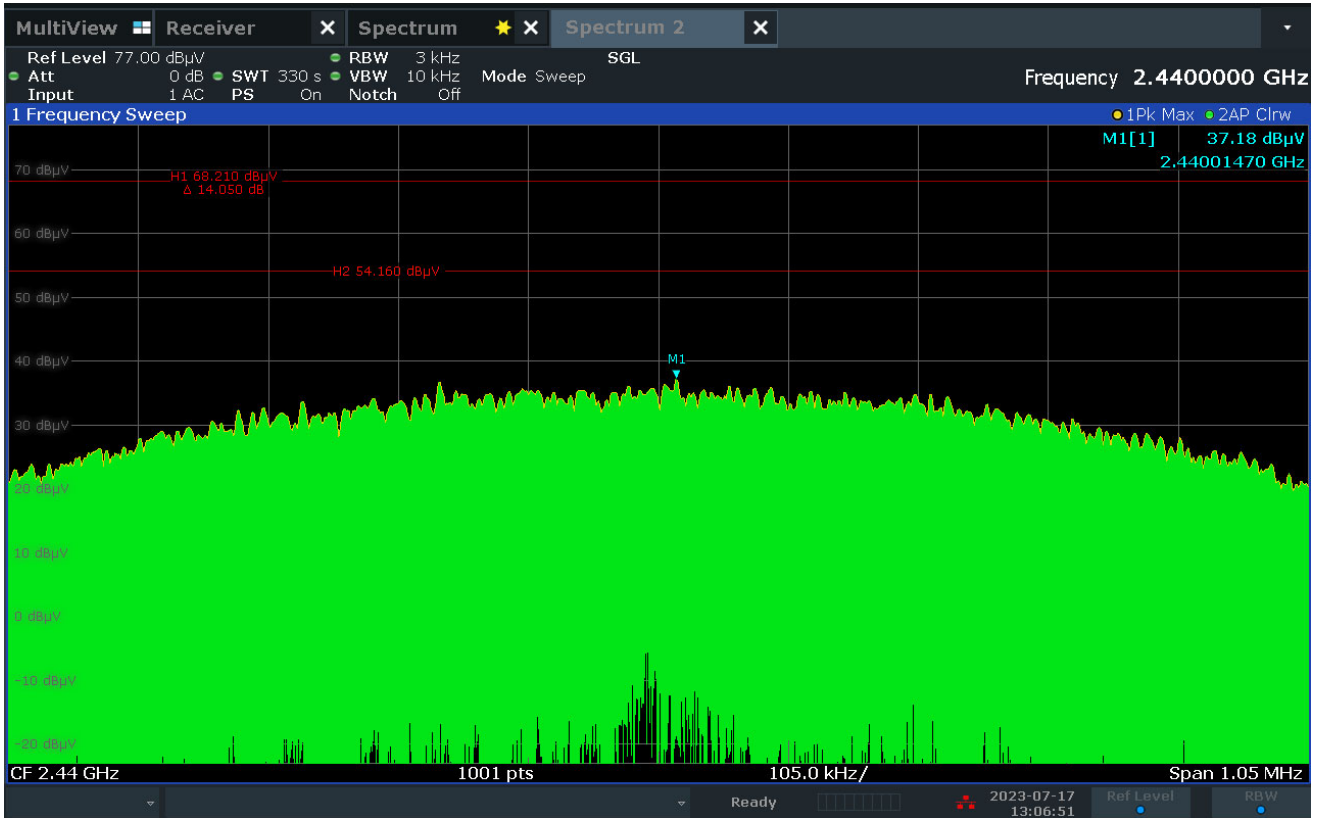
Procedure
<ol style="list-style-type: none"> <li>1) The EUT was set up inside the test chamber on a non-conductive stand and set to transmit. A broadband measuring antenna was placed near the EUT.</li> <li>2) To determine the power spectral density, the following spectrum analyzer settings were used:               <ul style="list-style-type: none"> <li>- Center Frequency = Transmit Frequency</li> <li>- Span = 1.5 × the DTS (6dB) bandwidth</li> <li>- Resolution Bandwidth (RBW) = &gt; DTS (6dB) bandwidth</li> <li>- Sweep time = Auto</li> <li>- Detector = Peak</li> <li>- Trace Function = Max-Hold</li> </ul> </li> <li>3) The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. A display line was then placed on the corresponding +8dBm level.</li> <li>4) To determine the power spectral density, the following spectrum analyzer settings were used:               <ul style="list-style-type: none"> <li>- Center Frequency = Transmit Frequency</li> <li>- Span = 1.5× the DTS (6dB) bandwidth</li> <li>- Resolution Bandwidth (RBW) = 3kHz ≤ RBW ≤ 100kHz</li> <li>- Sweep time = Auto</li> <li>- Detector = Peak</li> <li>- Trace Function = Max-Hold</li> </ul> </li> <li>5) The display line was then placed on the corresponding +8dBm level.</li> <li>6) The receiver display was then screenshot and saved.</li> </ol>



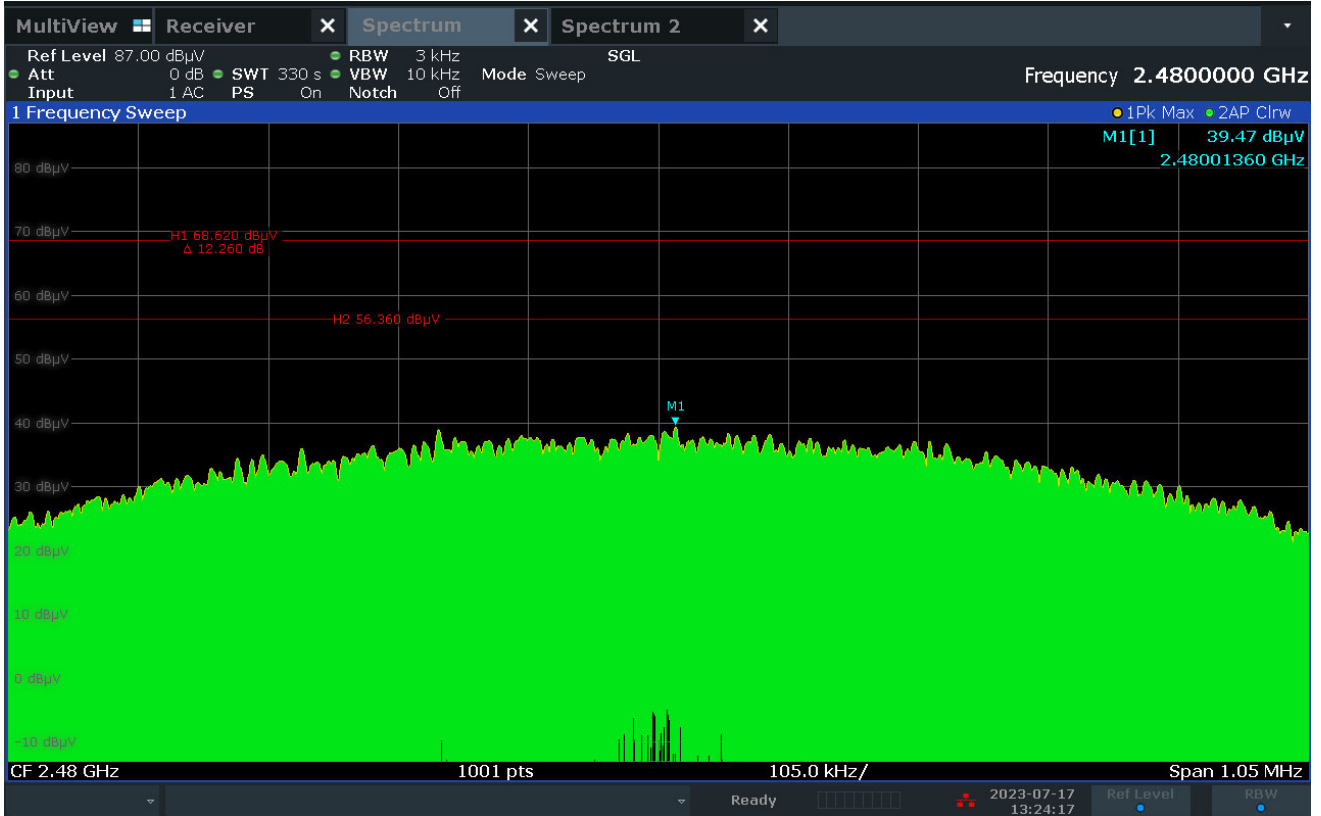
Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2402MHz
Notes	



Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2440MHz
Notes	



Test Details	
Manufacturer	Molex Sensorcon, LLC
EUT	Handheld Gas Detector
Model No.	PRO-CO-1000
Serial No.	N/A
Mode	BLE
Frequency Tested	2480MHz
Notes	



## 26. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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Website: [www.elitetest.com](http://www.elitetest.com)

## ELECTRICAL

Valid To: August 31, 2023

Certificate Number: 1786.01

In recognition of the successful completion of the A2LA Accreditation Program evaluation process, accreditation is granted to this laboratory to perform the following automotive electromagnetic compatibility and other electrical tests:

**Test Technology:****Test Method(s) <sup>1</sup>:*****Transient Immunity***

ISO 7637-2 (including emissions); ISO 7637-3;  
ISO 16750-2:2012, Sections 4.6.3 and 4.6.4;  
CS-11979, Section 6.4; CS.00054, Section 5.9;  
EMC-CS-2009.1 (CI220); FMC1278 (CI220, CI221, CI222);  
GMW 3097, Section 3.5; SAE J1113-11; SAE J1113-12;  
ECE Regulation 10.06 Annex 10

***Electrostatic Discharge (ESD)***

ISO 10605 (2001, 2008);  
CS-11979 Section 7.0; CS.00054, Section 5.10;  
EMC-CS-2009.1 (CI 280); FMC1278 (CI280); SAE J1113-13;  
GMW 3097 Section 3.6

***Conducted Emissions***

CISPR 25 (2002, 2008), Sections 6.2 and 6.3;  
CISPR 25 (2016), Sections 6.3 and 6.4;  
CS-11979, Section 5.1; CS.00054, Sections 5.6.1 and 5.6.2;  
GMW 3097, Section 3.3.2;  
EMC-CS-2009.1 (CE 420); FMC1278 (CE420, CE421)

***Radiated Emissions Anechoic***

CISPR 25 (2002, 2008), Section 6.4;  
CISPR 25 (2016), Section 6.5;  
CS-11979, Section 5.3; CS.00054, Section 5.6.3;  
GMW 3097, Section 3.3.1;  
EMC-CS-2009.1 (RE 310); FMC1278 (RE310);

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<u>Test Technology:</u>	<u>Test Method(s) <sup>1</sup>:</u>
<i>Vehicle Radiated Emissions</i>	CISPR 12; CISPR 36; ICES-002; ECE Regulation 10.06 Annex 5
<i>Bulk Current Injection (BCI)</i>	ISO 11452-4; CS-11979, Section 6.1; CS.00054, Section 5.8.1; GMW 3097, Section 3.4.1; SAE J1113-4; EMC-CS-2009.1 (RI112); FMC1278 (RI112); ECE Regulation 10.06 Annex 9
<i>Radiated Immunity Anechoic (Including Radar Pulse)</i>	ISO 11452-2; ISO 11452-5; CS-11979, Section 6.2; CS.00054, Section 5.8.2; GMW 3097, Section 3.4.2; EMC-CS-2009.1 (RI114); FMC1278 (RI114); SAE J1113-21; ECE Regulation 10.06 Annex 9
<i>Radiated Immunity Magnetic Field</i>	ISO 11452-8
<i>Radiated Immunity Reverb</i>	ISO/IEC 61000-4-21; GMW 3097, Section 3.4.3; EMC-CS-2009.1 (RI114); FMC1278 (RI114); ISO 11452-11
<i>Radiated Immunity (Portable Transmitters)</i>	ISO 11452-9; EMC-CS-2009.1 (RI115); FMC1278 (RI115)
<i>Vehicle Radiated Immunity (ALSE)</i>	ISO 11451-2; ECE Regulation 10.06 Annex 6
<i>Vehicle Product Specific EMC Standards</i>	EN 14982; EN ISO 13309; ISO 13766; EN 50498; EC Regulation No. 2015/208; EN 55012
<i>Electrical Loads</i>	ISO 16750-2
<b>Emissions</b> Radiated and Conducted (3m Semi-anechoic chamber, up to 40 GHz)	47 CFR, FCC Part 15 B (using ANSI C63.4:2014); 47 CFR, FCC Part 18 (using FCC MP-5:1986); ICES-001; ICES-003; ICES-005; IEC/CISPR 11, Ed. 4.1 (2004-06); AS/NZS CISPR 11 (2004); IEC/CISPR 11 Ed 5 (2009-05) + A1 (2010); KN 11 (2008-5) with RRL Notice No. 2008-3 (May 20, 2008); CISPR 11; EN 55011; KS C 9811; CNS 13803 (1997, 2003); CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1; CISPR 16-2-1 (2008); CISPR 16-2-1; KS C 9814-1; KN 14-1; IEC/CISPR 22 (1997); EN 55022 (1998) + A1(2000); EN 55022 (1998) + A1(2000) + A2(2003); EN 55022 (2006); IEC/CISPR 22 (2008-09); AS/NZS CISPR 22 (2004); AS/NZS CISPR 22, 3rd Edition (2006); KN 22 (up to 6 GHz); CNS 13438 (up to 6 GHz); VCCI V-3 (up to 6 GHz); CISPR 32; EN 55032; KS C 9832; KN 32; ECE Regulation 10.06 Annex 7 (Broadband); ECE Regulation 10.06 Annex 8 (Narrowband); ECE Regulation 10.06 Annex 14 (Conducted)

<u>Test Technology:</u>	<u>Test Method(s) <sup>1</sup>:</u>
<b>Emissions (cont'd)</b>	
Cellular Radiated Spurious Emissions	ETSI TS 151 010-1 GSM; 3GPP TS 51.010-1, Sec 12; ETSI TS 134 124 UMTS; 3GPP TS 34.124; ETSI TS 136 124 LTE; E-UTRA; 3GPP TS 36.124
Current Harmonics	IEC 61000-3-2; IEC 61000-3-12; EN 61000-3-2; KN 61000-3-2; KS C 9610-3-2; ECE Regulation 10.06 Annex 11
Flicker and Fluctuations	IEC 61000-3-3; IEC 61000-3-11; EN 61000-3-3; KN 61000-3-3; KS C 9610-3-3; ECE Regulation 10.06 Annex 12
<b>Immunity</b>	
Electrostatic Discharge	IEC 61000-4-2, Ed. 1.2 (2001); IEC 61000-4-2 (1995) + A1(1998) + A2(2000); EN 61000-4-2 (1995); EN 61000-4-2 (2009-05); KN 61000-4-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-2; EN 61000-4-2; KN 61000-4-2; KS C 9610-4-2; IEEE C37.90.3 2001
Radiated Immunity	IEC 61000-4-3 (1995) + A1(1998) + A2(2000); IEC 61000-4-3, Ed. 3.0 (2006-02); IEC 61000-4-3, Ed. 3.2 (2010); KN 61000-4-3 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-3; EN 61000-4-3; KN 61000-4-3; KS C 9610-4-3; IEEE C37.90.2 2004
Electrical Fast Transient/Burst	IEC 61000-4-4, Ed. 2.0 (2004-07); IEC 61000-4-4, Ed. 2.1 (2011); IEC 61000-4-4 (1995) + A1(2000) + A2(2001); KN 61000-4-4 (2008-5); RRL Notice No. 2008-5 (May 20, 2008); IEC 61000-4-4; EN 61000-4-4; KN 61000-4-4; KS C 9610-4-4; ECE Regulation 10.06 Annex 15
Surge	IEC 61000-4-5 (1995) + A1(2000); IEC 61000-4-5, Ed 1.1 (2005-11); EN 61000-4-5 (1995) + A1(2001); KN 61000-4-5 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-5; EN 61000-4-5; KN 61000-4-5; KS C 9610-4-5; IEEE C37.90.1 2012; IEEE STD C62.41.2 2002; ECE Regulation 10.06 Annex 16

**Test Technology:**

**Test Method(s) <sup>1</sup>:**

**Immunity (cont'd)**

Conducted Immunity

IEC 61000-4-6 (1996) + A1(2000);  
IEC 61000-4-6, Ed 2.0 (2006-05);  
IEC 61000-4-6 Ed. 3.0 (2008);  
KN 61000-4-6 (2008-5);  
RRL Notice No. 2008-4 (May 20, 2008);  
EN 61000-4-6 (1996) + A1(2001); IEC 61000-4-6;  
EN 61000-4-6; KN 61000-4-6; KS C 9610-4-6

Power Frequency Magnetic Field  
Immunity (*Down to 3 A/m*)

IEC 61000-4-8 (1993) + A1(2000); IEC 61000-4-8 (2009);  
EN 61000-4-8 (1994) + A1(2000);  
KN 61000-4-8 (2008-5);  
RRL Notice No. 2008-4 (May 20, 2008);  
IEC 61000-4-8; EN 61000-4-8; KN 61000-4-8; KS C 9610-4-8

Voltage Dips, Short Interrupts, and Line  
Voltage Variations

IEC 61000-4-11, Ed. 2 (2004-03);  
KN 61000-4-11 (2008-5);  
RRL Notice No. 2008-4 (May 20, 2008);  
IEC 61000-4-11; EN 61000-4-11; KN 61000-4-11;  
KS C 9610-4-11

Ring Wave

IEC 61000-4-12, Ed. 2 (2006-09);  
EN 61000-4-12:2006;  
IEC 61000-4-12; EN 61000-4-12; KN 61000-4-12;  
IEEE STD C62.41.2 2002

Generic and Product Specific EMC  
Standards

IEC/EN 61000-6-1; AS/NZS 61000-6-1; KN 61000-6-1;  
KS C 9610-6-1; IEC/EN 61000-6-2; AS/NZS 61000-6-2;  
KN 61000-6-2; KS C 9610-6-2; IEC/EN 61000-6-3;  
AS/NZS 61000-6-3; KN 61000-6-3; KS C 9610-6-3;  
IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4;  
KS C 9610-6-4; EN 50130-4; EN 61326-1; EN 50121-3-2;  
EN 12895; EN 50270; EN 50491-1; EN 50491-2; EN 50491-3;  
EN 55015; EN 60730-1; EN 60945; IEC 60533;  
EN 61326-2-6; EN 61800-3; IEC/CISPR 14-2; EN 55014-2;  
AS/NZS CISPR 14.2; KN 14-2; KS C 9814-2;  
IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24;  
IEC/CISPR 35; AS/NZS CISPR 35; EN 55035; KN 35;  
KS C 9835; IEC 60601-1-2; JIS T0601-1-2

***TxRx EMC Requirements***

EN 301 489-1; EN 301 489-3; EN 301 489-9;  
EN 301 489-17; EN 301 489-19; EN 301 489-20

**Test Technology:**

**Test Method(s) <sup>1</sup>:**

*European Radio Test Standards*

ETSI EN 300 086-1; ETSI EN 300 086-2;  
 ETSI EN 300 113-1; ETSI EN 300 113-2;  
 ETSI EN 300 220-1; ETSI EN 300 220-2;  
 ETSI EN 300 220-3-1; ETSI EN 300 220-3-2;  
 ETSI EN 300 330-1; ETSI EN 300 330-2;  
 ETSI EN 300 440-1; ETSI EN 300 440-2;  
 ETSI EN 300 422-1; ETSI EN 300 422-2;  
 ETSI EN 300 328; ETSI EN 301 893;  
 ETSI EN 301 511; ETSI EN 301 908-1;  
 ETSI EN 908-2; ETSI EN 908-13;  
 ETSI EN 303 413; ETSI EN 302 502;  
 EN 303 340; EN 303 345-2; EN 303 345-3; EN 303 345-4

*Canadian Radio Tests*

RSS-102 measurement (RF Exposure Evaluation);  
 RSS-102 measurement (Nerve Stimulation);  
 SPR-002; RSS-111; RSS-112; RSS-117; RSS-119; RSS-123;  
 RSS-125; RSS-127; RSS-130; RSS-131; RSS-132; RSS-133;  
 RSS-134; RSS-135; RSS-137; RSS-139; RSS-140; RSS-141;  
 RSS-142; RSS-170; RSS-181; RSS-182; RSS-191; RSS-192;  
 RSS-194; RSS-195; RSS-196; RSS-197; RSS-199; RSS-210;  
 RSS-211; RSS-213; RSS-215; RSS-216; RSS-220; RSS-222;  
 RSS-236; RSS-238; RSS-243; RSS-244; RSS-247; RSS-248;  
 RSS-251; RSS-252; RSS-287; RSS-288; RSS-310; RSS-GEN

*Mexico Radio Tests*

IFT-008-2015; NOM-208-SCFI-2016

*Japan Radio Tests*

Radio Law No. 131, Ordinance of MPT No. 37, 1981,  
 MIC Notification No. 88:2004, Table No. 22-11;  
 ARIB STD-T66, Regulation 18

*Taiwan Radio Tests*

LP-0002 (July 15, 2020)

*Australia/New Zealand Radio Tests*

AS/NZS 4268; Radiocommunications (Short Range Devices)  
 Standard (2014)

*Hong Kong Radio Tests*

HKCA 1039 Issue 6; HKCA 1042; HKCA 1033 Issue 7;  
 HKCA 1061; HKCA 1008; HKCA 1043; HKCA 1057;  
 HKCA 1073

*Korean Radio Test Standards*

KN 301 489-1; KN 301 489-3; KN 301 489-9;  
 KN 301 489-17; KN 301 489-52; KS X 3124; KS X 3125;  
 KS X 3130; KS X 3126; KS X 3129

*Vietnam Radio Test Standards*

QCVN 47:2015/BTTTT; QCVN 54:2020/BTTTT;  
 QCVN 55:2011/BTTTT; QCVN 65:2013/BTTTT;  
 QCVN 73:2013/BTTTT; QCVN 74:2020/BTTTT;  
 QCVN 112:2017/BTTTT; QCVN 117:2020/BTTTT

*Vietnam EMC Test Standards*

QCVN 18:2014/BTTTT; QCVN 86:2019/BTTTT;  
 QCVN 96:2015/BTTTT; QCVN 118:2018/BTTTT



**Test Technology:**

**Test Method(s) <sup>1</sup>:**

*Unlicensed Radio Frequency Devices  
(3 Meter Semi-Anechoic Room)*

47 CFR FCC Part 15C, 15D, 15E, 15F, 15G, 15H  
(using ANSI C63.10:2013, ANSI C63.17:2013 and  
FCC KDB 905462 D02 (v02))

*Licensed Radio Service Equipment*

47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87,  
90, 95, 96, 97, 101 (using ANSI/TIA-603-E,  
TIA-102.CAAA-E, ANSI C63.26:2015)

*OIA (Over the Air) Performance*

GSM, GPRS, EGPRS  
UMTS (W-CDMA)  
LTE including CAT M1  
A-GPS for UMTS/GSM  
LTS A-GPS, A-GLONASS,  
SIB8/SIB16  
Large Device/Laptop/Tablet Testing  
Integrated Device Testing  
WiFi 802.11 a/b/g/n/a

CTIA Test Plan for Wireless Device Over-the-Air  
Performance (Method for Measurement for Radiated Power  
and Receiver Performance) V3.8.2;  
CTIA Test Plan for RF Performance Evaluation of WiFi  
Mobile Converged Devices V2.1.0

**Electrical Measurements and  
Simulation**

**AC Voltage / Current**

(1mV to 5kV) 60 Hz  
(0.1V to 250V) up to 500 MHz  
(1µA to 150A) 60 Hz

FAA AC 150/5345-10H

FAA AC 150/5345-43J

FAA AC 150/5345-44K

**DC Voltage / Current**

(1mV to 15-kV) / (1µA to 10A)

FAA AC 150/5345-46E

FAA AC 150/5345-47C

**Power Factor / Efficiency / Crest Factor**

(Power to 30kW)

FAA EB 67D

**Resistance**

(1mΩ to 4000MΩ)

**Surge**

(Up to 10 kV / 5 kA) (Combination  
Wave and Ring Wave)

**On the following products and materials:**

Telecommunications Terminal Equipment (TTE), Radio Equipment, Network Equipment, Information Technology Equipment (ITE), Automotive Electronic Equipment, Automotive Hybrid Electronic Devices, Maritime Navigation and Radio Communication Equipment and Systems, Vehicles, Boats and Internal Combustion Engine Driven Devices, Automotive, Aviation, and General Lighting Products, Medical Electrical Equipment, Motors, Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment, Household Appliances, Electric Tools, Low-voltage Switchgear and Control gear, Programmable Controllers, Electrical Equipment for Measurement, Control and Laboratory Use, Base Materials, Power and Data Transmission Cables and Connectors

<sup>1</sup> When the date, edition, version, etc. is not identified in the scope of accreditation, laboratories may use the version that immediately precedes the current version for a period of one year from the date of publication of the standard measurement method, per part C., Section 1 of A2LA R101 - General Requirements- Accreditation of ISO-IEC 17025 Laboratories.

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1<sup>2</sup>

<b>Rule Subpart/Technology</b>	<b>Test Method</b>	<b>Maximum Frequency (MHz)</b>
<u>Unintentional Radiators</u> Part 15B	ANSI C63.4:2014	40000
<u>Industrial, Scientific, and Medical Equipment</u> Part 18	FCC MP-5 (February 1986)	40000
<u>Intentional Radiators</u> Part 15C	ANSI C63.10:2013	40000
<u>Unlicensed Personal Communication Systems Devices</u> Part 15D	ANSI C63.17:2013	40000
<u>U-NII without DFS Intentional Radiators</u> Part 15E	ANSI C63.10:2013	40000
<u>U-NII with DFS Intentional Radiators</u> Part 15E	FCC KDB 905462 D02 (v02)	40000
<u>UWB Intentional Radiators</u> Part 15F	ANSI C63.10:2013	40000
<u>BPL Intentional Radiators</u> Part 15G	ANSI C63.10:2013	40000
<u>White Space Device Intentional Radiators</u> Part 15H	ANSI C63.10:2013	40000
<u>Commercial Mobile Services (FCC Licensed Radio Service Equipment)</u> Parts 22 (cellular), 24, 25 (below 3 GHz), and 27	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
<u>General Mobile Radio Services (FCC Licensed Radio Service Equipment)</u> Parts 22 (non-cellular), 90 (below 3 GHz), 95, 97, and 101 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
<u>Citizens Broadband Radio Services (FCC Licensed Radio Service Equipment)</u> Part 96	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1<sup>2</sup>

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
<u>Maritime and Aviation Radio Services</u> Parts 80 and 87	ANSI/TIA-603-E; ANSI C63.26:2015	40000
<u>Microwave and Millimeter Bands Radio Services</u> Parts 25, 30, 74, 90 (above 3 GHz), 97 (above 3 GHz), and 101	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
<u>Broadcast Radio Services</u> Parts 73 and 74 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
<u>Signal Boosters</u> Part 20 (Wideband Consumer Signal Boosters, Provider-specific signal boosters, and Industrial Signal Boosters) Section 90.219	ANSI C63.26:2015	40000

<sup>2</sup> Accreditation does not imply acceptance to the FCC equipment authorization program. Please see the FCC website (<https://apps.fcc.gov/oetcf/eas/>) for a listing of FCC approved laboratories.



## Accredited Laboratory

A2LA has accredited

### ELITE ELECTRONIC ENGINEERING INC.

Downers Grove, IL

for technical competence in the field of

### Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 19<sup>th</sup> day of May 2021.



Mr. Trace McInturf, Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 1786.01  
Valid to August 31, 2023  
Revised June 7, 2023

*For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.*