

Report on the Testing of the
InVue Security Products Inc.
InVue LIVE One POD Sensor with
integrated InVue module LBAA0QB1SJ

In accordance with:
FCC 47 CFR part 15.247
ISED RSS-247 Issue 2, February 2017

Prepared for: InVue Security Products Inc.
9201 Baybrook Lane
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Kirby Munroe	Wireless / EMC Technical and Certification Manager, NA TUV SUD America Inc.	Authorized Signatory	2/21/2022

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FCC Accreditation Designation Number US1233
FCC Test Site Registration Number 967699
Innovation, Science, and Economic Development Canada Lab Code 23932

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with the standards listed above.



A2LA Cert. No. 2955.09

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Table 1.1-1 – Modification Record

Issue	Description of Change	Date of Issue
0	First Issue	2/21/2022

1.2 Introduction

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations Section 15.247 and Innovation Science and Economic Development Canada's Radio Standards Specification RSS-247 for the tests documented herein to support a Permissive Change for the combination InVue Live OnePOD Sensor and Murata module LBAA0QB1SJ-295 to account for a new SMT antenna (Molex, Ceramic, (PN:2081420001).

Applicant	Eric Brutke
Manufacturer	Invue Security Products Inc
Applicant's Email Address	EricBrutke@invue.com
Host Model Name	InVue Live OnePod Sensor
Host Model Number(s)	OPSNSR
Module Model Name	InVue
Module Model Number(s)	LBAA0QB1SJ
Serial Number(s)	N/A
Host FCC ID	N/A
Host ISED Certification Number	N/A
Hardware Version(s)	0
Software Version(s)	N/A
Number of Samples Tested	1
Test Specification/Issue/Date	US Code of Federal Regulation (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2021 ISED Canada Radio Standards Specification: RSS-247 – Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices, Issue 2, February 2017.
Order Number	72168019



Date of Receipt of EUT	2021-July-19
Start of Test	2021-August-18
Finish of Test	2021-August-18
Related Document(s)	ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Device. FCC OET KDB 558074 D01 15.247 Meas Guidance v05r02: 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, April 2, 2019 US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2021. ISED Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 5, Amendment 1 (March 2019), Amendment 2 (February 2021)

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC Part 15.247 and ISED Canada's RSS-247 is shown below.

Table 1.3-1: Test Result Summary

Test Parameter	Test Plan (Yes/No)	Test Result	FCC 47 CFR Rule Part	ISED Canada's RSS	Test Report Page No
Antenna Requirement	Yes	Pass	15.203, 15.204	-----	10
Carrier Frequency Separation	No	Not Tested	15.247(a)(1)	RSS-247 5.1(b)	-----
Number of Hopping Channels	No	Not Tested	15.247(a)(1)(i)	RSS-247 5.1(c)	-----
Channel Dwell Time	No	Not Tested	15.247(a)(1)(i)	RSS-247 5.1(c)	-----
20 dB Bandwidth	No	Not Tested	15.247(a)(1)(i)	RSS-247 5.1(c)	-----
99% Bandwidth	No	Not Tested	-----	RSS-GEN 6.7	-----
Peak Output Power	No	Not Tested	15.247(b)(2)	RSS-247 5.4(a)	-----
Band-Edge Compliance of RF Conducted Emissions	No	Not Tested	15.247(d)	RSS-247 5.5	-----
RF Conducted Spurious Emissions	No	Not Tested	15.247(d)	RSS-247 5.5	-----
Radiated Spurious Emissions into Restricted Frequency Bands	Yes	Pass	15.205, 15.209	RSS-GEN 8.9, 8.10	11
Power Spectral Density	No	Not Tested	15.247(e)	RSS-247 5.2(b)	-----
Power Line Conducted Emissions	No	Not Tested	15.207	RSS-GEN 8.8	-----
Duty Cycle	No	-----			-----

1.4 Product Information

1.4.1 Technical Description

The LIVE ONEPOD host product provides a system for retailers to protect their electronic devices from theft while still enabling the customer a means to demo and handle the product. The system is comprised of two parts, a Stand and a Sensor. The Sensor is mounted to the top of the Stand and it communicates with the Stand with a customized 2-Wire Cable. The Sensor holds the displayed electronic device. The Stand mounts or bolts to the Table. The protected device, with the Sensor, is displayed on a Stand. This Stand provides power to the Sensor and charges the electronic device while the Sensor is docked. The integrated module details are provided in table 1.4-1. Below are images of the system and integrated module.

Table 1.4-1 – Wireless Module Technical Information

Detail	Description
Module FCC ID	2AFR8-LB1SJ
Module ISED ID	23313-LB1SJ
Host Transceiver Model #	InVue Live OnePOD Sensor
Modulation Format	LoRa (125kHz)
Frequency Range	902.3 MHz – 914.9 MHz
Antenna Type / Description:	PCB antenna / 1.8 dBi Gain

A full description and detailed product specification details are available from the manufacturer.



Figure 1.4.1-1 –Views of the Host

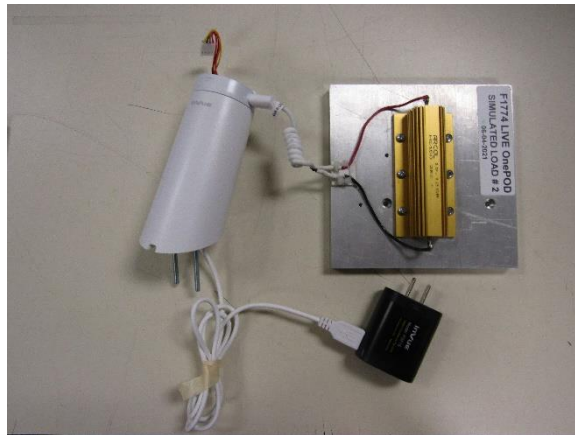


Figure 1.4.1-2 –Views of the Host with Dummy load

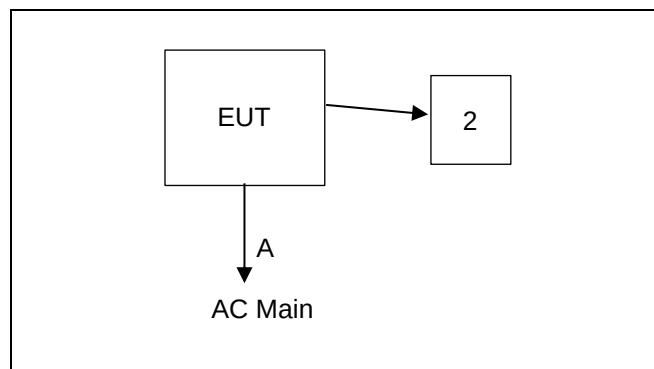


Figure 1.4.1-3: Test Setup Block Diagram

Table 1.4.1-1 – Cable Descriptions

Item	Cable/Port	Description
A	USB	Power Cable

Table 1.4.1-2 – Support Equipment Descriptions

Item	Make/Model	Description
1	Lenovo	Laptop used for configuring wireless module
2	Simulated Load	EUT connected to load while performing testing.

1.4.2 Modes of Operation

The tested mode of operation was:

The EUT was placed in transmit mode using the radios applicable low, mid, and high channels.

Mode of Operation	Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)	Mode	Data Rates Supported	Classification
1	902.3 – 914.9	64	200	LoRa	SF10	Hybrid

Transmit settings:

Power setting during test: 21 dBm

The module only operates in hybrid mode as identified below for the combination host / module for this application.

1.4.3 Monitoring of Performance

For radiated emissions, the EUT was evaluated in three orthogonal orientations. The worst-case orientation was Y-position. See test setup photos for more information. The EUT was programmed to generate a continuously modulated signal on each channel evaluated.

Worst case mode for all parameters measured listed below:

Test case	Modulation / Data rate	Tested Frequency (MHz)
Radiated spurious emissions	LoRa / SF10	902.3, 908.7, 914.9

1.5 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.6 EUT Modification Record

The table below details modifications made to the EUT during the test program. The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	Initial State		

The equipment was tested as provided without any modifications.

1.7 Test Location

TÜV SÜD conducted the following tests at our Alpharetta, GA test laboratory.

Test Name	Name of Engineer(s)	Accreditation
Radiated Spurious Emissions into Restricted Frequency Bands	Paul Villarreal	A2LA

Office address:
TÜV SÜD America
5945 Cabot Parkway, Suite 100
Alpharetta, GA 30005, USA

2 Test Details

2.1 Antenna Requirement

2.1.1 Specification Reference

FCC Section: 15.203

2.1.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state “0”, as noted in §1.6.

2.1.3 Date of Test

8/18/2021

2.1.4 Test Method

N/A

2.1.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.1.6 Test Results

The EUT utilizes PCB antenna with peak gain 1.8 dBi which is mounted on the bottom side of the printed circuit board, therefore satisfying the requirements of Section 15.203.

2.2 Radiated Spurious Emissions into Restricted Frequency Bands

2.2.1 Specification Reference

FCC Sections: 15.205, 15.209.
ISED Canada: RSS-GEN 8.9, 8.10

2.2.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state "0", as noted in §1.6.

2.2.3 Date of Test

8/18/2021

2.2.4 Test Method

Radiated emissions tests were made over the frequency range of 9 kHz to 10 GHz, 10 times the highest fundamental frequency of 900 MHz. Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in Section 15.209.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 150 kHz, quasi-peak measurements were made using a resolution bandwidth RBW of 300 Hz and a video bandwidth VBW of 1 kHz and frequencies between 150 kHz and 30MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 10 kHz and a video bandwidth VBW of 30 kHz. For frequencies between 30 MHz and 1000 MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 100 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak and average measurements were made with RBW of 1 MHz and VBW of 3 MHz.

2.2.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.2.6 Test Results

Test Summary: EUT was set to transmit mode.

Test Results: Pass

See data below for detailed results.

Table 2.2.6-1: Radiated Spurious Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
LCH										
2706.9	45.80	38.00	H	5.82	51.62	43.82	74.0	54.0	22.4	10.2
2706.9	46.20	37.30	V	5.82	52.02	43.12	74.0	54.0	22.0	10.9
3609.2	48.00	42.40	H	7.43	55.43	49.83	74.0	54.0	18.6	4.2
3609.2	47.20	41.10	V	7.43	54.63	48.53	74.0	54.0	19.4	5.5
MCH										
2726.1	46.10	38.30	H	5.87	51.97	44.17	74.0	54.0	22.0	9.8
2726.1	45.90	37.80	V	5.87	51.77	43.67	74.0	54.0	22.2	10.3
3634.8	47.30	41.30	H	7.48	54.78	48.78	74.0	54.0	19.2	5.2
3634.8	46.60	40.10	V	7.48	54.08	47.58	74.0	54.0	19.9	6.4
HCH										
2744.7	45.20	37.10	H	5.91	51.11	43.01	74.0	54.0	22.9	11.0
2744.7	46.50	39.20	V	5.91	52.41	45.11	74.0	54.0	21.6	8.9
3659.6	47.40	41.10	H	7.53	54.93	48.63	74.0	54.0	19.1	5.4
3659.6	46.50	39.80	V	7.53	54.03	47.33	74.0	54.0	20.0	6.7

Sample Calculations

$$R_c = R_u + CF_T$$

Where:

- CF_T = Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
- R_u = Uncorrected Reading
- R_c = Corrected Level
- AF = Antenna Factor
- CA = Cable Attenuation
- AG = Amplifier Gain
- DC = Duty Cycle Correction Factor

Example Calculation: Peak

Corrected Level: $48 + 7.43 = 55.43 \text{ dB}\mu\text{V/m}$

Margin: $74 \text{ dB}\mu\text{V/m} - 55.43 \text{ dB}\mu\text{V/m} = 18.6 \text{ dB}$

Example Calculation: Average

Corrected Level: $42.40 + 7.43 + 0 = 49.83 \text{ dB}\mu\text{V/m}$

Margin: $54 \text{ dB}\mu\text{V/m} - 49.83 \text{ dB}\mu\text{V/m} = 4.2 \text{ dB}$

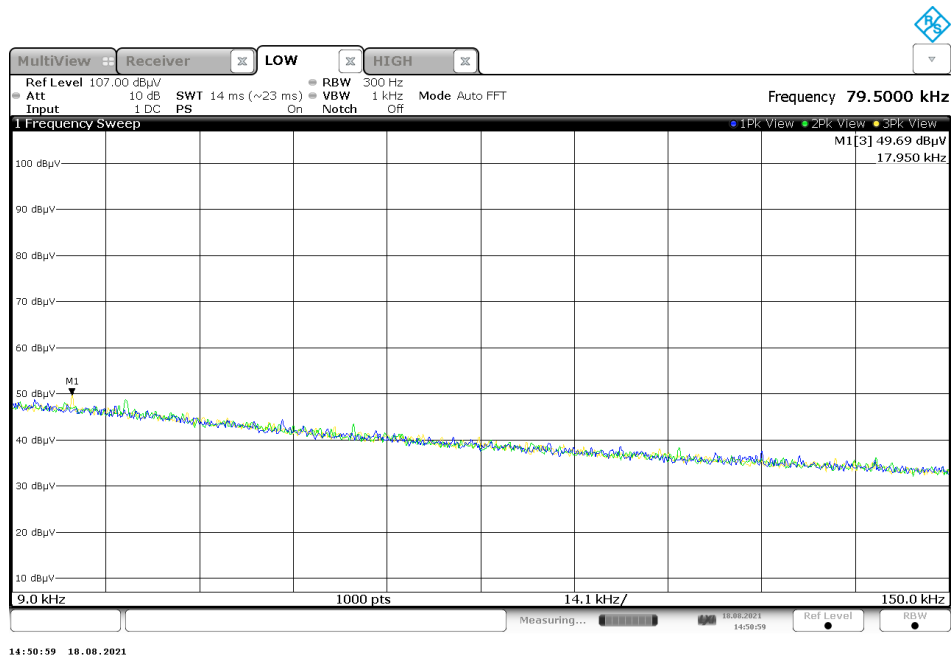


Figure 1: Reference plot for Radiated Spurious Emissions – 9 kHz – 150 kHz

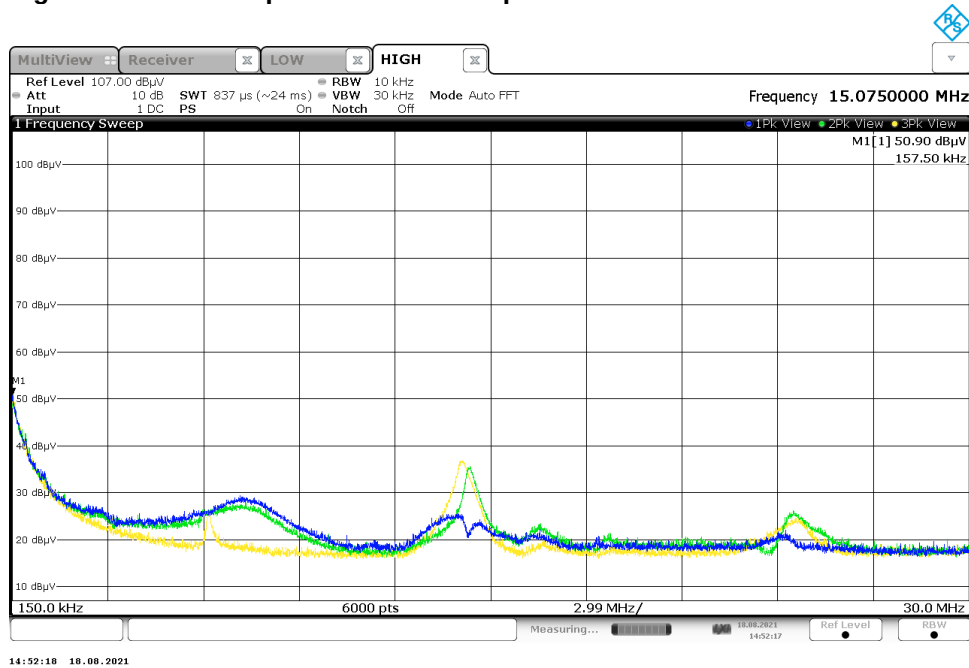


Figure 2: Reference plot for Radiated Spurious Emissions– 150 kHz – 300 kHz
Note: Emissions above the noise floor are ambient not associated with the EUT.

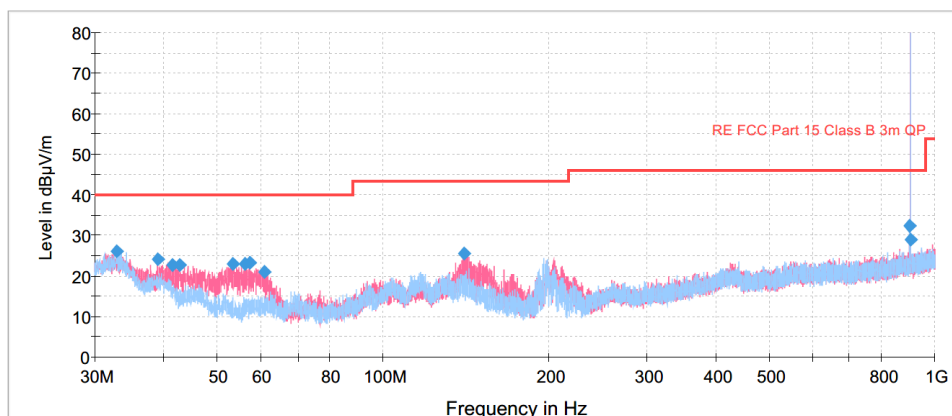


Figure 3: Reference plot for Radiated Spurious Emissions – 30 MHz – 1 GHz

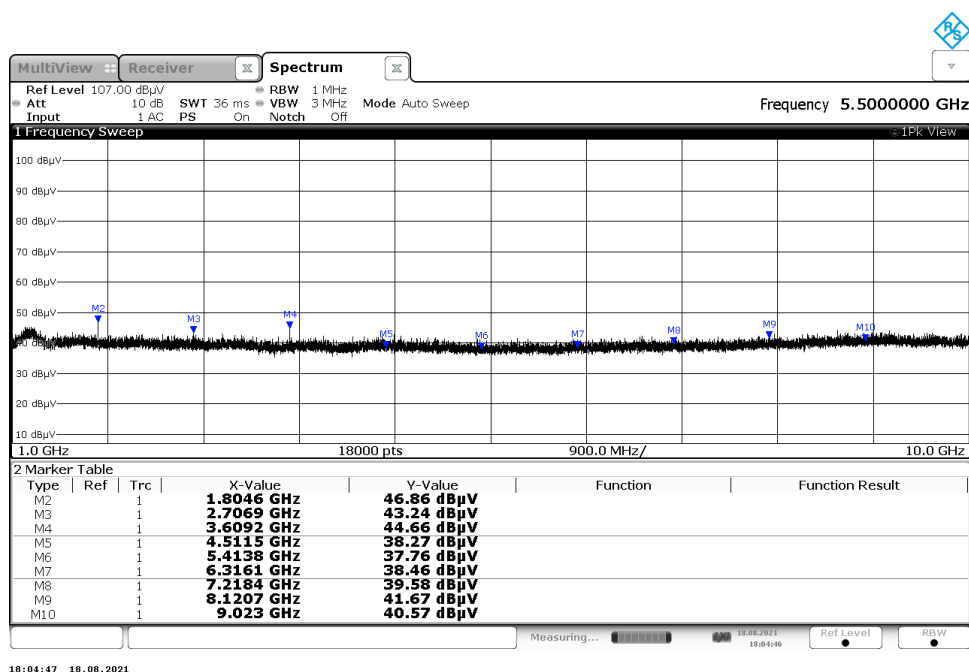


Figure 4: Reference plot for Radiated Spurious Emissions – 1 GHz – 10 GHz

2.3 Test Equipment Used

Table 2.3-1 –Equipment List

AssetID	Manufacturer	Model	Equipment Type	Serial Number	Last Calibration Date	Calibration Due Date
628	EMCO	6502	Active Loop Antenna 10kHz-30MHz	9407-2877	6/8/2021	6/8/2023
3161	Teseq	CBL 6112D	Bilog Antenna 30MHz- 1GHz	51323	3/19/2021	3/19/2022
857	ETS Lindgren	3117	Horn Antenna 1-18GHz	153608	11/12/2019	11/12/2021
22	Hewlett Packard	8449B	High Frequency Pre- Amp	3008A00526	11/19/2020	11/19/2021
213	TEC	PA 102	Amplifier	44927	7/30/2021	7/30/2022
337	Hewlett Packard	H1G513G1	Microwave Bandpass filter	282706	6/9/2021	6/9/2022
654	Micro-Tronics	BRC50722	Band Reject Filter	-10	6/9/2021	6/9/2022
882	Rohde & Schwarz	ESW44	Test Receiver	101961	6/24/2021	6/24/2022
836	ETS Lindgren	N/A	SAC Cable set	N/A	5/11/2021	5/11/2022

N/A – Not Applicable

3 Diagram of Test Set-ups

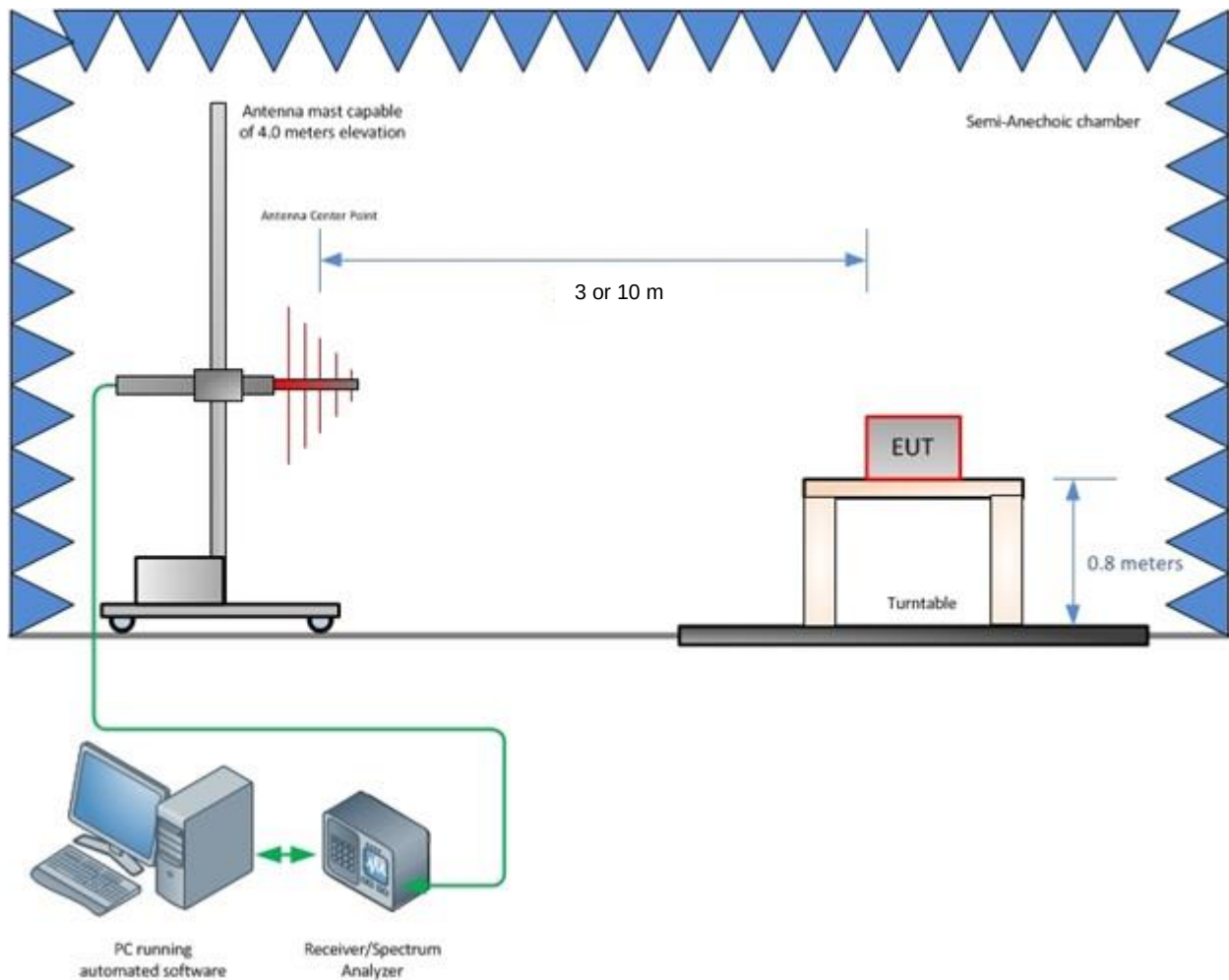


Figure 3-1 – Radiated Emissions Test Setup up to 1 GHz

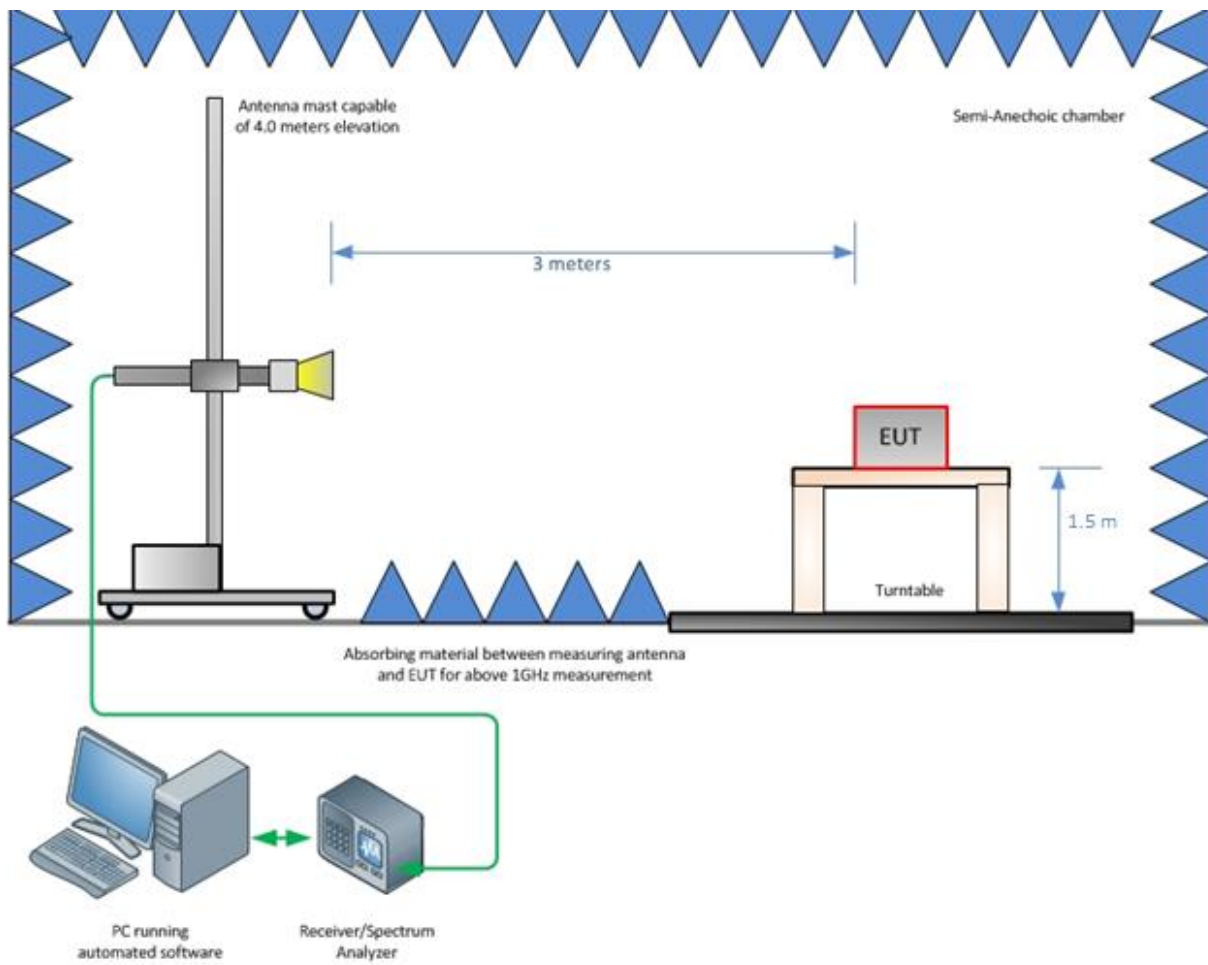


Figure 3-2 – Radiated Emissions Test Setup above 1 GHz

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STATEMENT OF MEASUREMENT UNCERTAINTY

The expanded laboratory measurement uncertainty figures (U_{Lab}) provided below correspond to an expansion factor (coverage factor) $k = 1.96$ which provide confidence levels of 95%.

Table 4-1: Estimation of Measurement Uncertainty

Parameter	U_{lab}
Radiated Emissions ≤ 1 GHz	± 5.814 dB
Radiated Emissions > 1 GHz	± 4.318 dB
Temperature	± 0.860 °C
Radio Frequency	$\pm 2.832 \times 10^{-8}$

TEST EQUIPMENT

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated to meet test method standard requirements and/or manufacturer's specifications