# 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
Charlotte, North Carolina 28277

America

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## COMMERCIAL-IN-CONFIDENCE

Document Number: AT72168019.1P0

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| **Kirby Munroe** | **Wireless / EMC Technical and Certification Manager, NA**<br>**TUV SUD America Inc.** | **Authorized Signatory** | 2/21/2022 |

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD America, Inc. document control rules.

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<br>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.<br>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<br>US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2021.<br>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 Stands 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.

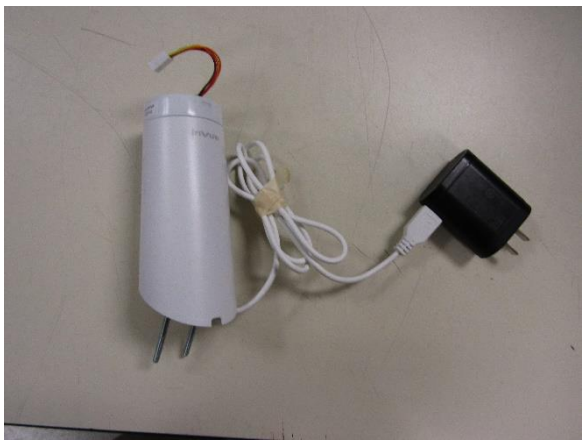

**Figure 1.4.1-1 –Views of the Host**

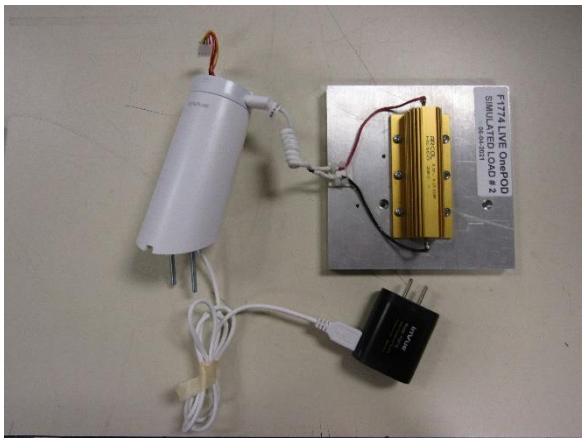


**Figure 1.4.1-2 –Views of the Host with Dummy load**

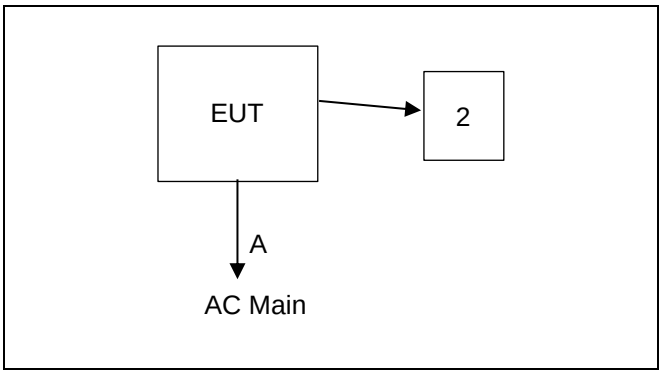


**Figure 1.4.1-3: Test Setup Block Diagram**

**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 | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | 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 dBµV/m
Margin: 74 dBµV/m – 55.43dBµV/m = 18.6 dB

**Example Calculation: Average**
Corrected Level: 42.40 + 7.43 + 0 = 49.83 dBµV/m
Margin: 54 dBµV/m – 49.83dBµV/m = 4.2 dB

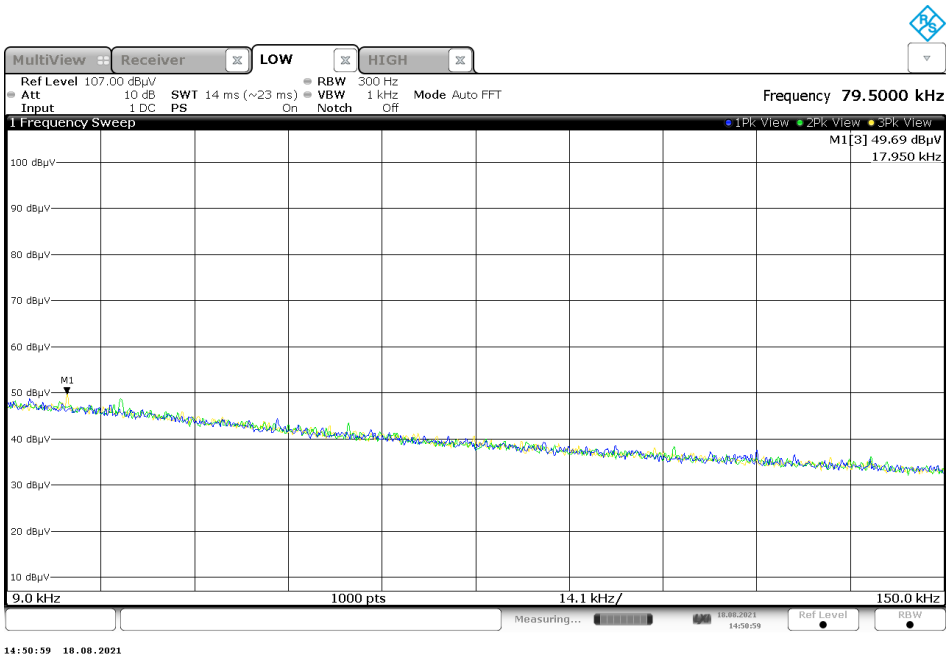


**Figure 1: Reference plot for Radiated Spurious Emissions – 9 kHz – 150 kHz**

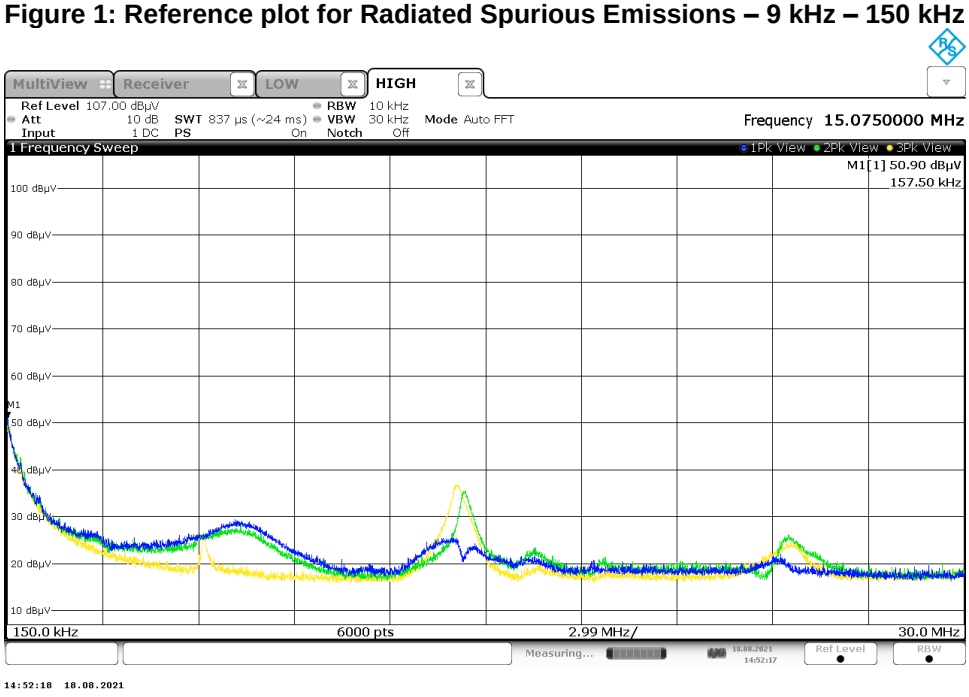


**Figure 2: Reference plot for Radiated Spurious Emissions– 150 kHz – 300 kHz**

Note: Emissions above the noise floor are ambient not associated with the EUT.

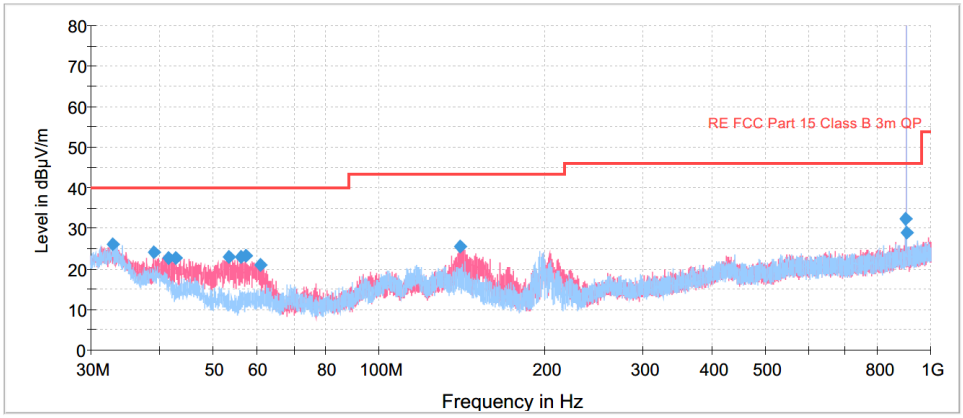


**Figure 3: Reference plot for Radiated Spurious Emissions – 30 MHz – 1 GHz**

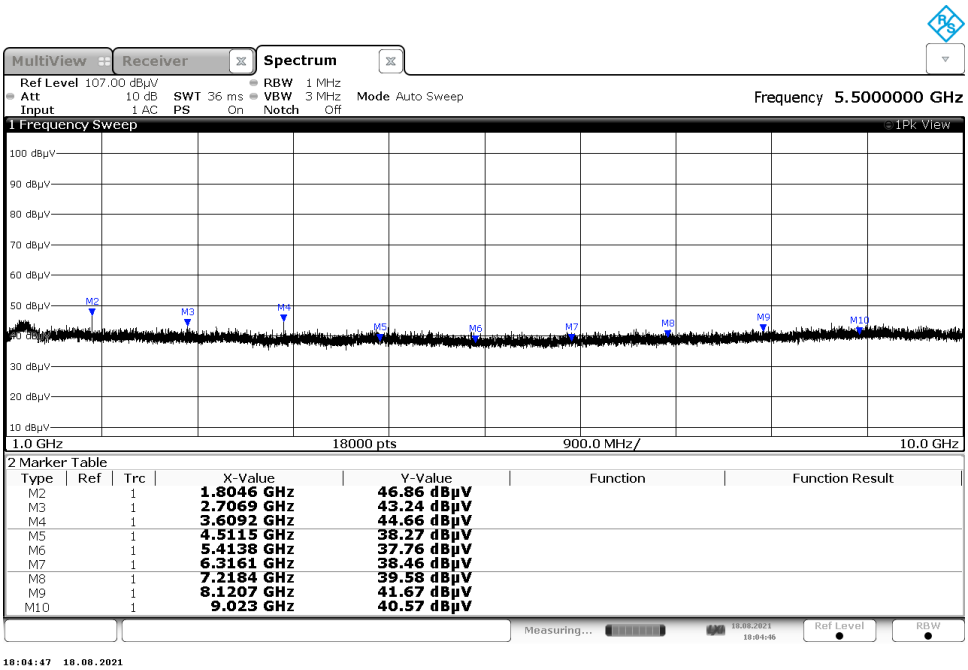


**Figure 4: Reference plot for Radiated Spurious Emissions – 1 GHz – 10 GHz**

## 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

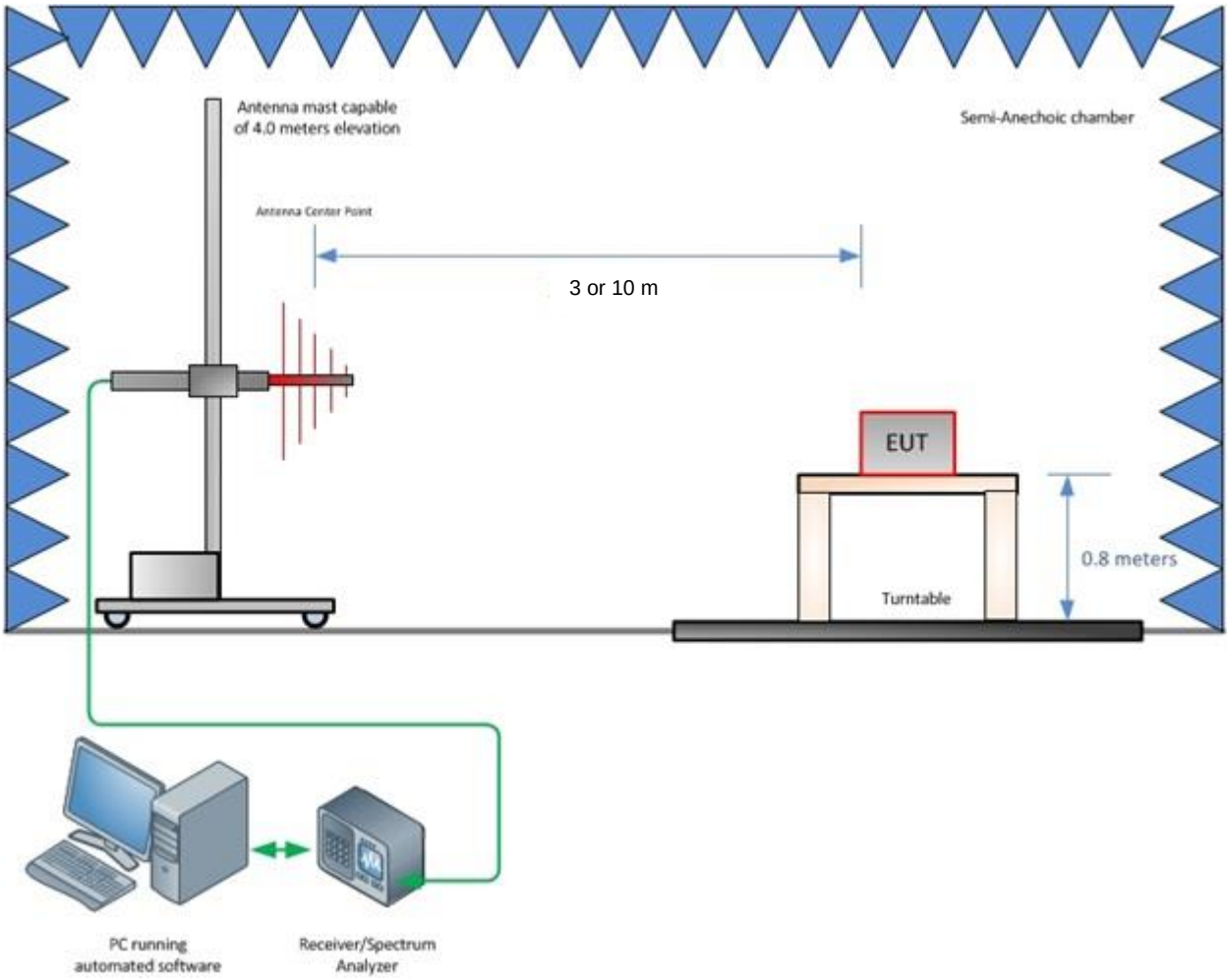


**Figure 3-1 – Radiated Emissions Test Setup up to 1 GHz**

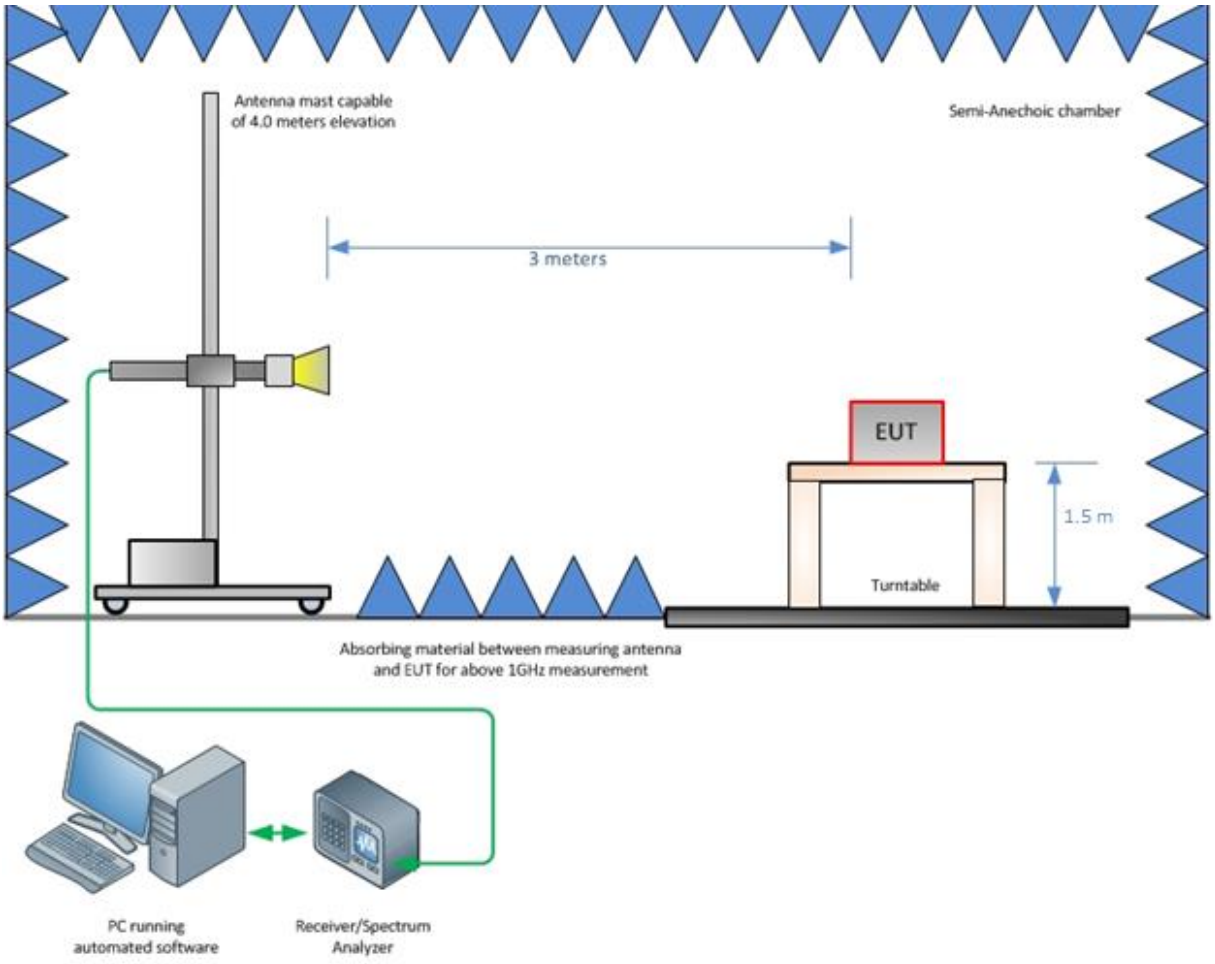


**Figure 3-2 – Radiated Emissions Test Setup above 1 GHz**

# 4 Accreditation, Disclaimers and Copyright

TÜV SÜD America Inc.'s reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV SÜD America, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America, Inc.'s issued reports.

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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 | ± 2.832 x $10^{-8}$ |

**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