

FCC and ISED Canada Testing of the

Intelligent Observation Inc.
Beacon

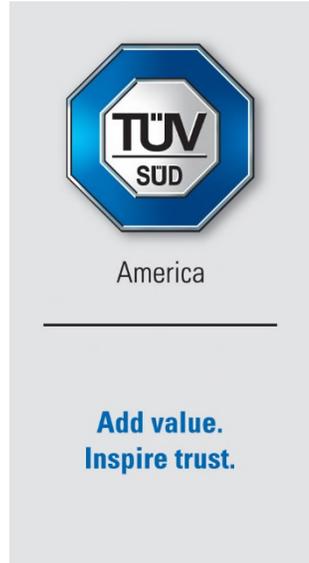
In accordance with FCC 47 CFR part 15.209 and
ISED Canada's Radio Standards Specifications
RSS-210

Prepared for: Intelligent Observation Inc.
1111 Brickell Ave
Miami, FL 33131

FCC ID: 2AXRM-IOBEACON
IC: N/A

COMMERCIAL-IN-CONFIDENCE

Document Number: TP72162883.200 | Version Number: 01



RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Authorized Signatory	Peter Walsh	2020 -October-14	
Testing	Thierry Jean-Charles	2020-October-14	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

FCC Accreditation
Designation Number US1063 Tampa, FL Test Laboratory

Innovation, Science, and Economic Development Canada
Accreditation
Site Number 2087A-2 Tampa, FL Test Laboratory

EXECUTIVE SUMMARY
Samples of this product were tested and found to be in compliance with 15.209. and ISED Canada's RSS-210.

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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.

Issue	Description of Change	Date of Issue
1	First Issue	2020-October-14

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 15.209 and Innovation Science and Economic Development Canada's Radio Standards Specification RSS-210 for the tests documented herein.



Applicant	Intelligent Observation Inc.
Manufacturer	Intelligent Observation Inc.
Applicant's Email Address	seth.freedman@intelobserve.com
Model Number(s)	Beacon
Serial Number(s)	20
FCC ID	2AXRM-IOBEACON
ISED Certification Number	N/A
Hardware Version(s)	C
Software Version(s)	19.1.1
Number of Samples Tested	1
Test Specification/Issue/Date	US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2020 Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-210 — Licence-Exempt Radio Apparatus: Category I Equipment, Issue 9, August 2016
Test Plan/Issue/Date	2020-July-24
Order Number	72162883
Date	2020-September-11
Date of Receipt of EUT	2020-September-17
Start of Test	2020-September-17
Finish of Test	2020-September-28
Name of Engineer(s)	Thierry Jean-Charles
Related Document(s)	ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2019. Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-GEN - General Requirements for Compliance of Radio Apparatus, Issue 5, Amendment 1, March 2019.



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC Part 15.209 and ISED Canada's RSS-210 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	-----	9
20 dB Bandwidth	Yes	Pass	15.215(c)	-----	10
99% Bandwidth	Yes	Pass	-----	RSS-GEN 6.6	12
Radiated Field Strength of Fundamental and Spurious Emissions	Yes	Pass	15.209	RSS-210 2.5	14
Power Line Conducted Emissions	No	-----	15.207	RSS-GEN 8.8	22



1.4 Product Information

1.4.1 Technical Description

The EUT was a beacon which consists of a 125 kHz RFID transceiver and a 2.4 GHz Wi-Fi + Bluetooth Low Energy (BLE) wireless module (FCC ID: 2AC7Z-ESP32WROVERB / IC: 21098-ESPWROVERB).

Technical Details

Mode of Operation: RFID
 Frequency Range: 125 kHz
 Number of Channels: 1
 Channel Separation: N/A
 Modulations: ASK
 Antenna Type/Gain: Coil
 Input Power: 3.7 VDC Battery

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

Table 1.4.1-1 – Cable Descriptions

Cable/Port	Description
N/A	The EUT is standalone only without any provisions for connection to auxiliary equipment

Table 1.4.1-2 – Support Equipment Descriptions

Make/Model	Description
N/A	The EUT is standalone only without any provisions for connection to auxiliary equipment



Declaration of Build Status

EQUIPMENT DESCRIPTION	
Model Name/Number	Beacon
Part Number	Comms
Hardware Version	C
Software Version	19.1.1
FCC ID (if applicable)	2AXRM-IOBEACON
ISED ID (if applicable)	
Technical Description (Please provide a brief description of the intended use of the equipment)	Broadcast metadata, serve as an IoT edge device

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	2.4 GHz
Lowest frequency generated or used in the device or on which the device operates or tunes	125 kHz
Class A Digital Device (Use in commercial, industrial or business environment) <input checked="" type="checkbox"/>	
Class B Digital Device (Use in residential environment only) <input type="checkbox"/>	

Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
	<input type="checkbox"/>	<input type="checkbox"/>	N/A
External DC	Nominal Voltage		Maximum Current
	N/A		N/A
Battery	Nominal Voltage		Battery Operating End Point Voltage
	3.7 V		2.75 V

EXTREME CONDITIONS			
Maximum temperature	+55	°C	Minimum temperature
			-10 °C

Ancillaries
Please list all ancillaries which will be used with the device.
Badge

I hereby declare that the information supplied is correct and complete.

Name: Geoff Turman
 Position held: Embedded Engineer
 Date: 9/14/2020



1.4.2 Modes of Operation

The EUT was evaluated for the 125 kHz RFID radio transmitting continuously.

1.4.3 Monitoring of Performance

The EUT was evaluated for radiated emissions in the orientation of typical installation.

The Bandwidth measurements were performed with a near field probe.

The EUT is abattery powered only without any provisions for connection to the AC mains. The EUT is exempted from the power line conducted emissions requirements.

1.4.4 Performance Criteria

The EUT was evaluated for the parameters listed below.

Table 1.4.4 -1: Performance Criteria

Parameter	Requirement
Antenna Requirement	FCC: Section 15.203. 15.204
20 dB Bandwidth	FCC: Section 15.215(c)
99% Bandwidth	ISED Canada: RSS-GEN 6.6
Radiated Field Strength of Fundamental and Spurious Emissions	FCC: Section 15.209; ISED Canada: RSS-210 2.5

1.5 Deviations from the Standard

The evaluation was performed without any deviations from the test standards.

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

The equipment was tested as provided without any modifications.



1.7 Test Location

TÜV SÜD Product Service conducted the following tests at our Tampa FL Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
AC Powered Operating		
Antenna Requirement	Thierry Jean-Charles	A2LA
20 dB Bandwidth	Thierry Jean-Charles	A2LA
99% Bandwidth	Thierry Jean-Charles	A2LA
Radiated Field Strength of Fundamental and Spurious Emissions	Thierry Jean-Charles	A2LA
Power Line Conducted Emissions	N/A	A2LA

Office Address:

TÜV SÜD America, Inc.
 5610 W. Sligh Ave, Suite 100
 Tampa, FL 33634
 USA



2 Test Details

2.1 Antenna Requirements

2.1.1 Specification Reference

FCC: Section 15.203, 15.204

2.1.2 Equipment Under Test and Modification State

SN: 20

2.1.3 Date of Test

9/25/2020

2.1.4 Test Method

N/A

2.1.5 Environmental Conditions

Ambient Temperature	N/A
Relative Humidity	N/A
Atmospheric Pressure	N/A

2.1.6 Test Results

Limit Clause FCC Sections: 15.203, 15,204

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The EUT uses a loop antenna that is integral to the PCB. The antenna is not removable nor replaceable. The EUT meets the requirements of FCC Section 15.203.

2.1.7 Test Location and Test Equipment Used

This test was carried out in TÜV SÜD America, Inc., 5610 W. Sligh Ave, Suite 100, Tampa, FL 33634, USA.

As this was a visual inspection, the no test equipment was used.



2.2 20 dB Bandwidth

2.2.1 Specification Reference

FCC: Section 15.215

2.2.2 Equipment Under Test and Modification State

SN: 20

2.2.3 Date of Test

2020-Sep-28

2.2.4 Test Method

The 20 dB bandwidth was measured in accordance with ANSI C63.10 Subclause 6.9.2. The spectrum analyzer span was set between two times and five times the OBW. The RBW of the spectrum analyzer was set to 1% to 5% of the OBW. The VBW was approximately three times RBW. A peak detector was used for the measurements.

2.2.5 Environmental Conditions

Ambient Temperature 27.6°C
 Relative Humidity 39 %
 Atmospheric Pressure 1010.8 mbar

2.2.6 Test Results

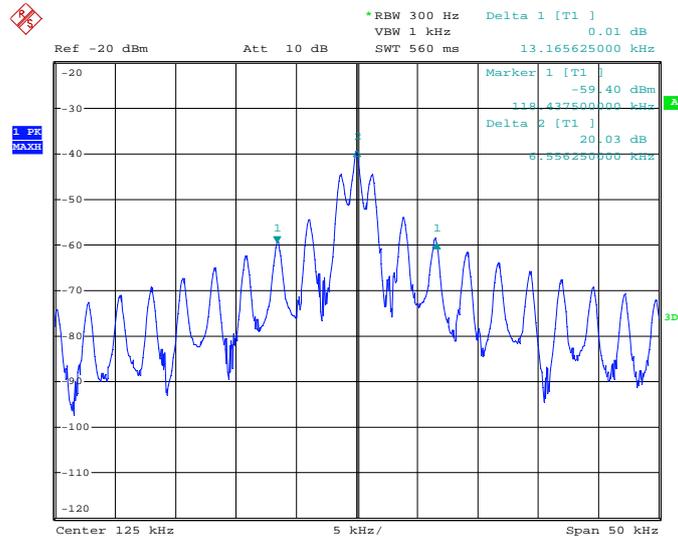
Battery Powered Operating

Limit Clause FCC Part 15.215

The intentional radiator must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated.

Table 2.2.6-1: 20 dB Bandwidth Test Results

Frequency (kHz)	20 dB Bandwidth (kHz)
125.0	13.1656



Date: 28.SEP.2020 18:20:31

Figure 2.2.6-1: 20 dB Bandwidth Test Results

2.2.7 Test Location and Test Equipment Used

This test was carried out in TÜV SÜD America, Inc., 5610 W. Sligh Ave, Suite 100, Tampa, FL 33634, USA.

Instrument	Manufacturer	Type No	TE No	Software / Firmware Revision	Calibration Period (months)	Calibration Due
E & H Near Field Probe Set	ETS Lindgren (EMCO)	7405	BEMC00079	N/A	N/A	NCR
Spectrum Analyzer	Rohde & Schwarz	FSP40	BEMC00283	4.50 SP5	24	04-Oct-2021
Attenuator 20dB, 2.9 mm-M/F, DC-40GHz 2 W	Aeroflex Inmet	40AH2W-20	BEMC02111	N/A	12	25-Jul-2021

TU - Traceability Unscheduled
 O/P MON - Traceability Unscheduled
 N/A - Not Applicable
 NCR – No Calibration Required



2.3 99% Bandwidth

2.3.1 Specification Reference

ISED Canada: RSS-GEN 6.7

2.3.2 Equipment Under Test and Modification State

SN: 20

2.3.3 Date of Test

2020-Sep-28

2.3.4 Test Method

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission. The RBW was set to 1% to 5% of the approximated bandwidth. The occupied 99% bandwidth was measured by using 99% bandwidth equipment function of the spectrum analyzer using a peak detector.

2.3.5 Environmental Conditions

Ambient Temperature 27.6°C
 Relative Humidity 39 %
 Atmospheric Pressure 1010.8 mbar

2.3.6 Test Results

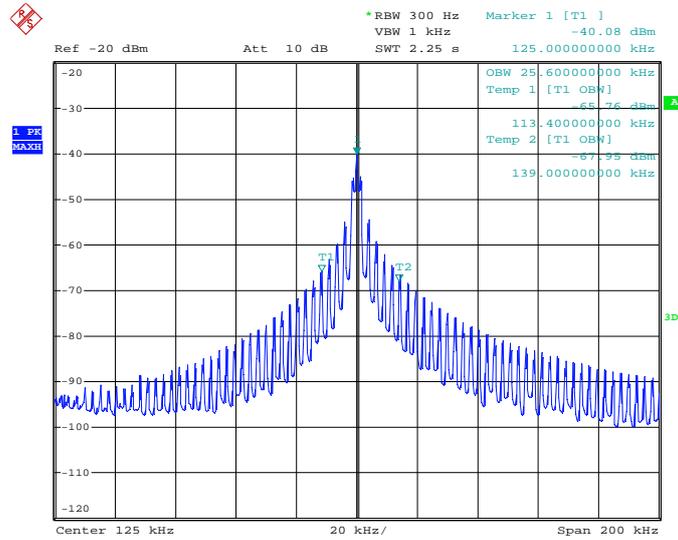
DC Powered Operating

Limit Clause ISED RSS-GEN 6.7

The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

Table 2.3.6-1: Occupied Bandwidth Test Results

Frequency (kHz)	99% Bandwidth (kHz)
125.0	25.6



Date: 28.SEP.2020 18:10:59

Figure 2.3.6-1: Occupied Bandwidth Test Results

2.3.7 Test Location and Test Equipment Used

This test was carried out in TÜV SÜD America, Inc., 5610 W. Sligh Ave, Suite 100, Tampa, FL 33634, USA.

Instrument	Manufacturer	Type No	TE No	Software / Firmware Revision	Calibration Period (months)	Calibration Due
E & H Near Field Probe Set	ETS Lindgren (EMCO)	7405	BEMC00079	N/A	N/A	NCR
Spectrum Analyzer	Rohde & Schwarz	FSP40	BEMC00283	4.50 SP5	24	04-Oct-2021
Attenuator 20dB, 2.9 mm-M/F, DC-40GHz 2 W	Aeroflex Inmet	40AH2W-20	BEMC02111	N/A	12	25-Jul-2021

TU - Traceability Unscheduled
 O/P MON - Traceability Unscheduled
 N/A - Not Applicable
 NCR – No Calibration Required



2.4 Radiated Field Strength and Spurious Emissions

2.4.1 Specification Reference

FCC Sections: 15.209;
ISED Canada: RSS-210 2.5

2.4.2 Equipment Under Test and Modification State

SN: 20

2.4.3 Date of Test

2020-Sep-28

2.4.4 Test Method

Radiated emissions tests were made over the frequency range of 9 kHz to 25 GHz, 10 times the highest fundamental frequency. 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.

For measurements below 30 MHz, the receive antenna height was set to 1 m and the EUT was rotated through 360 degrees. The resolution bandwidth was set to 200 Hz below 150 kHz and to 9 kHz above 150 kHz.

The spectrum analyzer's resolution and video bandwidths were set to 300 Hz and 1000 Hz respectively for frequencies below 150 kHz and 9 kHz and 30 kHz respectively for frequencies above 150 kHz and below 30 MHz. The fundamental levels were measured using a resolution bandwidth of 30 kHz which is greater than the measured emission bandwidth. For measurements in the frequency bands 9-90 kHz and 110-490 kHz, an average detector was used. When average measurements are specified, the peak emissions were also compared to a limit corresponding to 20 dB above the maximum permitted average limit according to Part 15.35. All other emissions were measured using a Quasi-peak detector. The final measurements were then corrected by antenna correction factors and cable loss for comparison to the limits.

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 1000 MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak measurements are made with RBW of 1 MHz and VBW of 3 MHz. Average measurements are performed in the linear scale using VBW of 30 Hz.



2.4.5 Distance Correction for Measurements below 30 MHz – FCC: Section 15.31

Radiated measurements were performed at a distance closer than 300 meters and 30m as required, according to Part 15.209. Therefore, a correction factor was applied to account for propagation loss at the specified distance. The propagation loss was determined by using the square of an inverse linear distance extrapolation factor (40dB/decade) according to 15.31. A sample calculation of the distance correction factor is shown below for limits expressed at a 300m measurement distance and a 30m measurement distance.

$$\begin{aligned} \text{Distance correction factor (300m Specified Test Distance)} &= 40 \cdot \text{Log} (\text{Test Distance}/300) \\ &= 40 \cdot \text{Log} (3/300) \\ &= - 80 \text{ dB} \end{aligned}$$

$$\begin{aligned} \text{Distance correction factor (30m Specified Test Distance)} &= 40 \cdot \text{Log} (\text{Test Distance}/30) \\ &= 40 \cdot \text{Log} (3/30) \\ &= - 40 \text{ dB} \end{aligned}$$

2.4.6 Duty Cycle Correction

The EUT was configured to transmit at 100% duty cycle during the evaluation. No duty Cycle Correction factor was applied to the average measurements.

2.4.7 Environmental Conditions

Ambient Temperature 27.5 °C
 Relative Humidity 40.5 %
 Atmospheric Pressure 1012.2 mbar

2.4.8 Test Results

DC Powered Operating

Limit Clause FCC Sections 15.209, ISED Canada: RSS-210 2.5

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.4090-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3



Table 2.4.8-1: TX Radiated Spurious Emissions

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
Low Channel										
Fundamental Frequency										
0.125	81.92	81.09	V	14.44	96.36	95.53	125.7	105.7	29.3	10.2
Spurious Emissions below 30 MHz										
0.375	55.37	55.00	V	14.34	69.71	69.34	116.1	96.1	46.4	26.8
0.625	-----	44.93	V	14.54	-----	59.47	-----	71.7	-----	12.2
0.875	-----	38.99	V	14.65	-----	53.64	-----	68.8	-----	15.2
1.125	-----	34.69	V	14.94	-----	49.63	-----	66.6	-----	17.0
1.375	-----	31.37	V	14.99	-----	46.36	-----	64.8	-----	18.4
1.625	-----	28.42	V	15.03	-----	43.45	-----	63.4	-----	19.9
1.875	-----	25.97	V	15.08	-----	41.05	-----	69.5	-----	28.5
2.125	-----	24.02	V	15.13	-----	39.15	-----	69.5	-----	30.3
2.375	-----	22.39	V	15.20	-----	37.59	-----	69.5	-----	31.9
2.625	-----	20.84	V	15.26	-----	36.10	-----	69.5	-----	33.4
Emissions above 30 MHz										
546.6	-----	4.67	V	27.06	-----	31.73	-----	46	-----	14.3
540.5	-----	5.13	V	26.58	-----	31.71	-----	46	-----	14.3

Notes:

- The emissions at 125 kHz and 375 kHz were measured with a peak and average detector. All the remaining measurements were performed using a quasi-peak detector.
- The emissions were performed at a test distance of 3 m.
- The EUT Fundamental emissions levels were measured using RBW = 30 kHz > 99% Bandwidth.

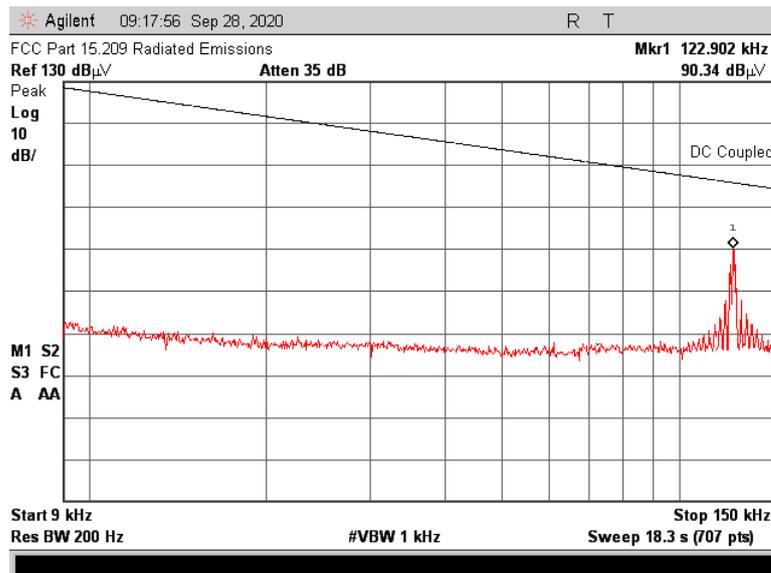




Figure 2.4.8-1 – Radiated Emissions Plot 9 kHz – 150 kHz

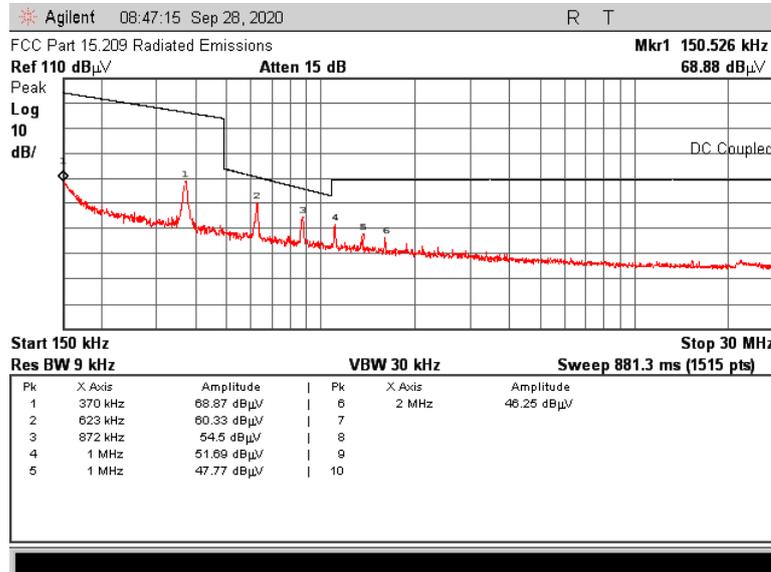


Figure 2.4.8-2 – Radiated Emissions Plot 150 kHz – 30 MHz

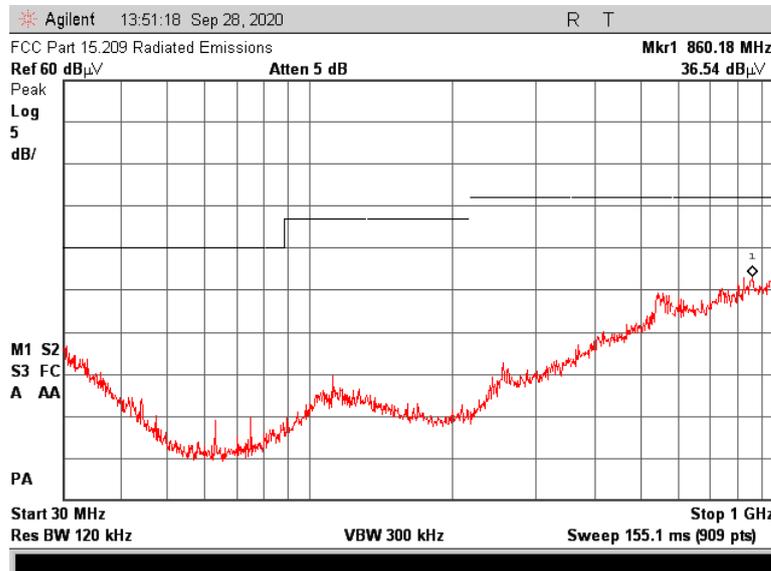


Figure 2.4.8-3 – Radiated Emissions Plot 30 MHz – 1 GHz - Horizontal Polarization

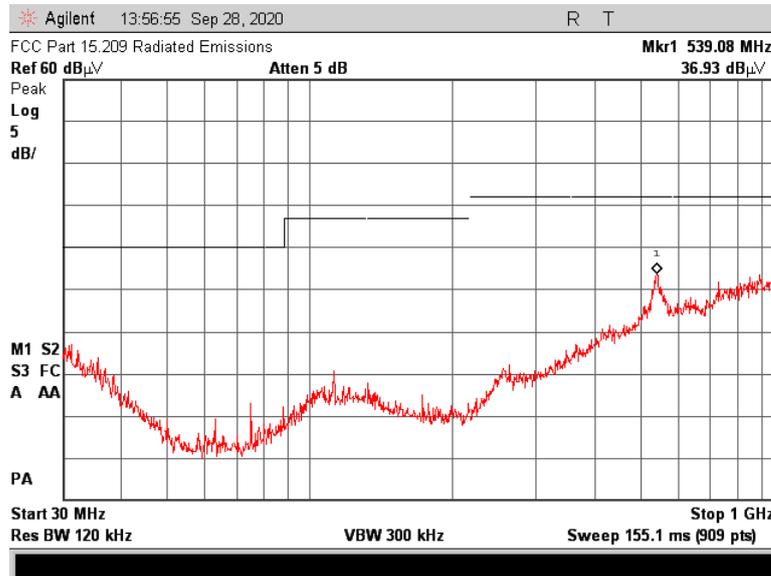


Figure 2.4.8-4 – Radiated Emissions Plot 30 MHz – 1 GHz - Vertical Polarization

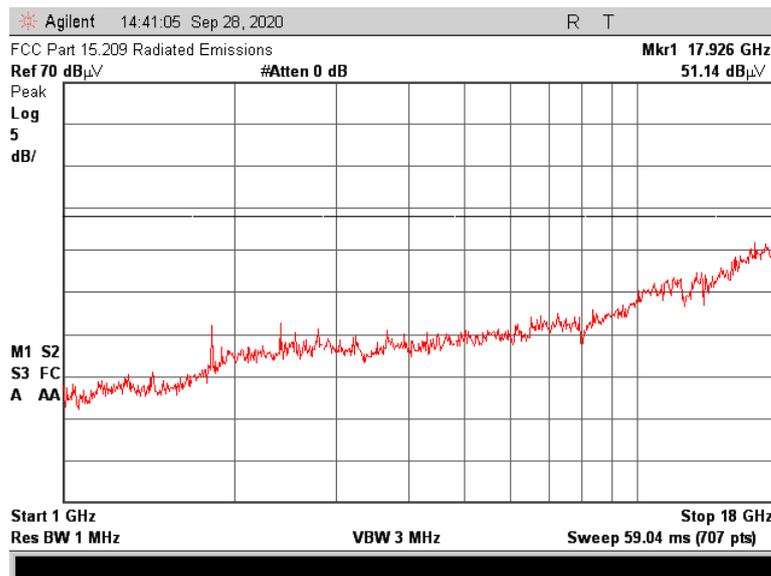


Figure 2.4.8-5 – Radiated Emissions Plot 1 GHz – 18 GHz - Horizontal Polarization

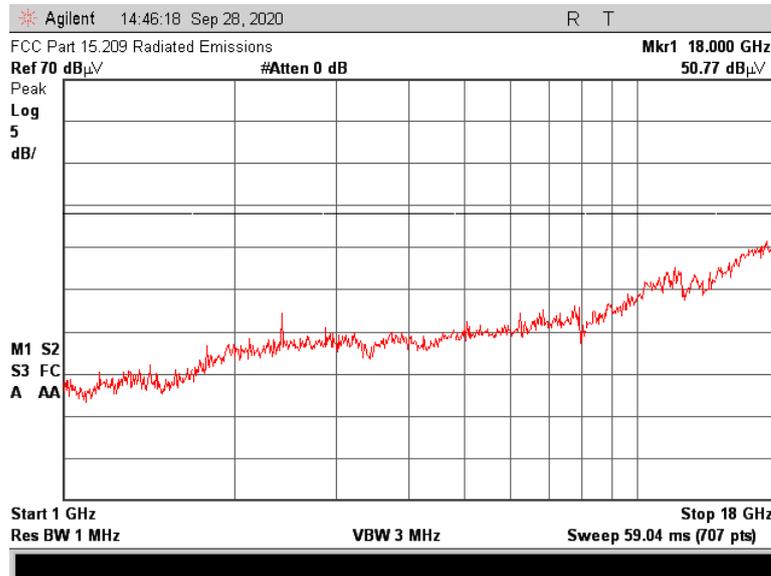


Figure 2.4.8-6 – Radiated Emissions Plot 1 GHz – 18 GHz - Vertical Polarization



Figure 2.4.8-7 – Radiated Emissions Plot 18 GHz – 26.5 GHz - Horizontal Polarization

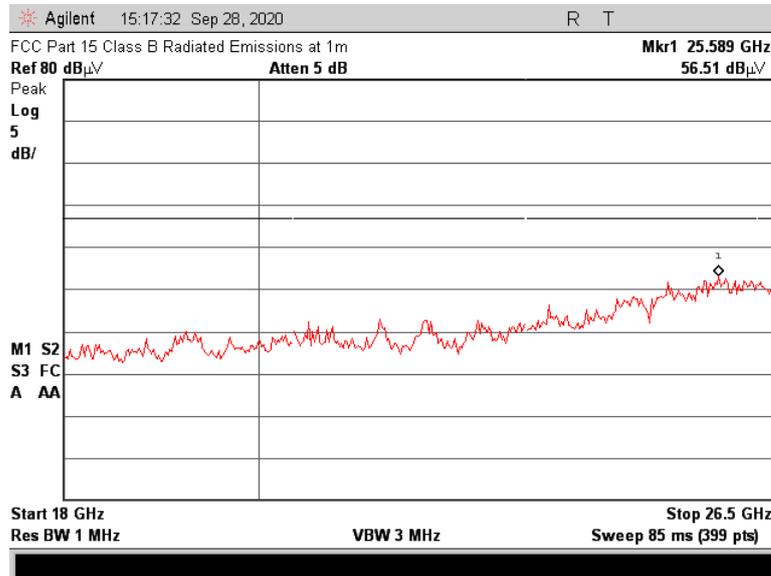


Figure 2.4.8-8 – Radiated Emissions Plot 18 GHz – 26.5 GHz - Vertical Polarization

2.4.9 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: $55.37 + 14.34 = 69.71$ dBµV/m
 Margin: 116.1 dBµV/m – 69.71 dBµV/m = 46.39 dB

Example Calculation: Average

Corrected Level: $55.0 + 14.34 - 0 = 69.34$ dBµV/m
 Margin: 96.1 dBµV/m – 69.34 dBµV/m = 26.76 dB



2.4.10 Test Location and Test Equipment Used

This test was carried out in TÜV SÜD America, Inc., 5610 W. Sligh Ave, Suite 100, Tampa, FL 33634, USA.

Instrument	Manufacturer	Type No	TE No	Software / Firmware Revision	Calibration Period (months)	Calibration Due
9kHz-26.5GHz EMC analyzer/HYZ	Agilent	E7405A	BEMC00523	A.14.06	24	27-Nov-2020
Tile Automation Software	ETS Lindgren	TILE4! - Version 4.2.A	BEMC02095	4.2A	N/A	NCR
BI LOG PERIODIC, ANTENNA	Schaffner	CBL6112B	TEMC00005	N/A	24	31-Oct-2021
Loop Antenna	Com Power	AL-130	TEMC00025	N/A	24	26-Sep-2021
Horn Antenna	Schwarzbeck	BBHA-9170	TEMC00029	N/A	60	23-Aug-2021
EMC Chamber	Panasheid	N/A	TEMC00031	N/A	36	28-Jan-2021
Double Ridge Guide Horn	ETS Lindgren	3117	TEMC00061	N/A	24	07-Feb-2022
18 GHz-40 GHz Microwave Preamplifier	COM-power	PAM-840A	TEMC00147	N/A	12	16-Mar-2021
PAM-118A	Com-Power Corporation	PAM-118A	TEMC00160	N/A	12	16-Mar-2021
A81-0303 18 GHz Cable Set	Teledyne Storm Products	A81-0303-360/96	TEMC00201	N/A	12	22-Apr-2021
1571AN 40 GHz Cable	IW Microwave	KPS-1571AN	TEMC00218	N/A	12	06-Jul-2021

TU - Traceability Unscheduled

O/P MON - Traceability Unscheduled

N/A - Not Applicable

NCR – No Calibration Required



2.5 Power Line Conducted Emissions

2.5.1 Specification Reference

FCC: Section 15.207
 ISED Canada; RSS-GEN 8.8

2.5.2 Equipment Under Test and Modification State

S/N: N/A

2.5.3 Date of Test

N/A

2.5.4 Test Method

ANSI C63.10 section 6.2 was the guiding document for this evaluation. Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

2.5.5 Environmental Conditions

Ambient Temperature N/A
 Relative Humidity N/A
 Atmospheric Pressure N/A

2.5.6 Test Results

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

The EUT is battery operated only without any provision for connection to AC Mains. The EUT is exempted from the power line conducted emissions evaluation.



3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Software / Firmware Revision	Calibration Period (months)	Calibration Due
E & H Near Field Probe Set	ETS Lindgren (EMCO)	7405	BEMC00079	N/A	N/A	NCR
Spectrum Analyzer	Rohde & Schwarz	FSP40	BEMC00283	4.50 SP5	24	04-Oct-2021
9kHz-26.5GHz EMC analyzer/HYZ	Agilent	E7405A	BEMC00523	A.14.06	24	27-Nov-2020
Tile Automation Software	ETS Lindgren	TILE4! - Version 4.2.A	BEMC02095	4.2A	N/A	NCR
Attenuator 20dB, 2.9 mm-M/F, DC-40GHz 2 W	Aeroflex Inmet	40AH2W-20	BEMC02111	N/A	12	25-Jul-2021
BI LOG PERIODIC, ANTENNA	Schaffner	CBL6112B	TEMC00005	N/A	24	31-Oct-2021
Loop Antenna	Com Power	AL-130	TEMC00025	N/A	24	26-Sep-2021
Horn Antenna	Schwarzbeck	BBHA-9170	TEMC00029	N/A	60	23-Aug-2021
EMC Chamber	Panasheid	N/A	TEMC00031	N/A	36	28-Jan-2021
Double Ridge Guide Horn	ETS Lindgren	3117	TEMC00061	N/A	24	07-Feb-2022
18 GHz-40 GHz Microwave Preamplifier	COM-power	PAM-840A	TEMC00147	N/A	12	16-Mar-2021
PAM-118A	Com-Power Corporation	PAM-118A	TEMC00160	N/A	12	16-Mar-2021
A81-0303 18 GHz Cable Set	Teledyne Storm Products	A81-0303-360/96	TEMC00201	N/A	12	22-Apr-2021
1571AN 40 GHz Cable	IW Microwave	KPS-1571AN	TEMC00218	N/A	12	06-Jul-2021

TU - Traceability Unscheduled

O/P MON - Traceability Unscheduled

N/A - Not Applicable

NCR – No Calibration Required

4 Diagram of Test Set-ups

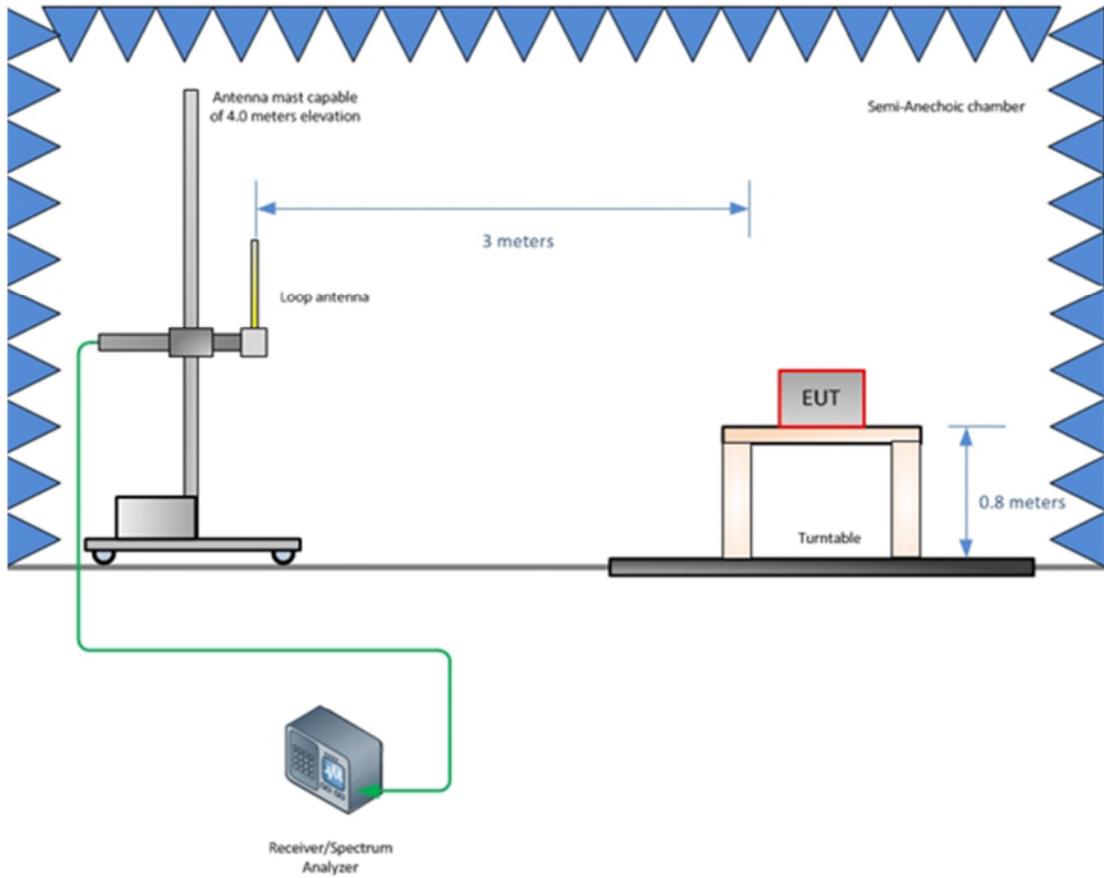


Figure 4-1 - Radiated Emissions Test Setup up to 30 MHz

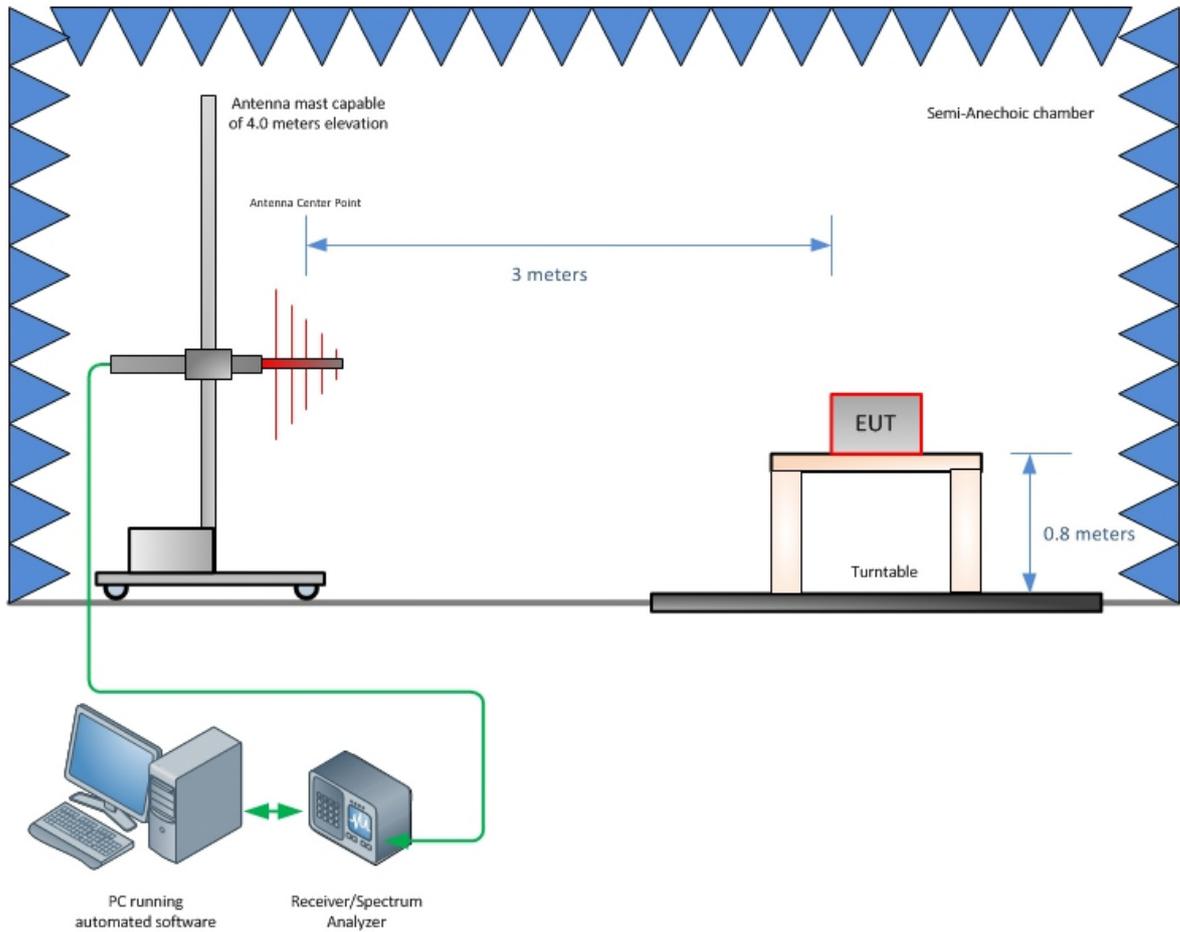


Figure 4-2 - Radiated Emissions Test Setup up to 1 GHz

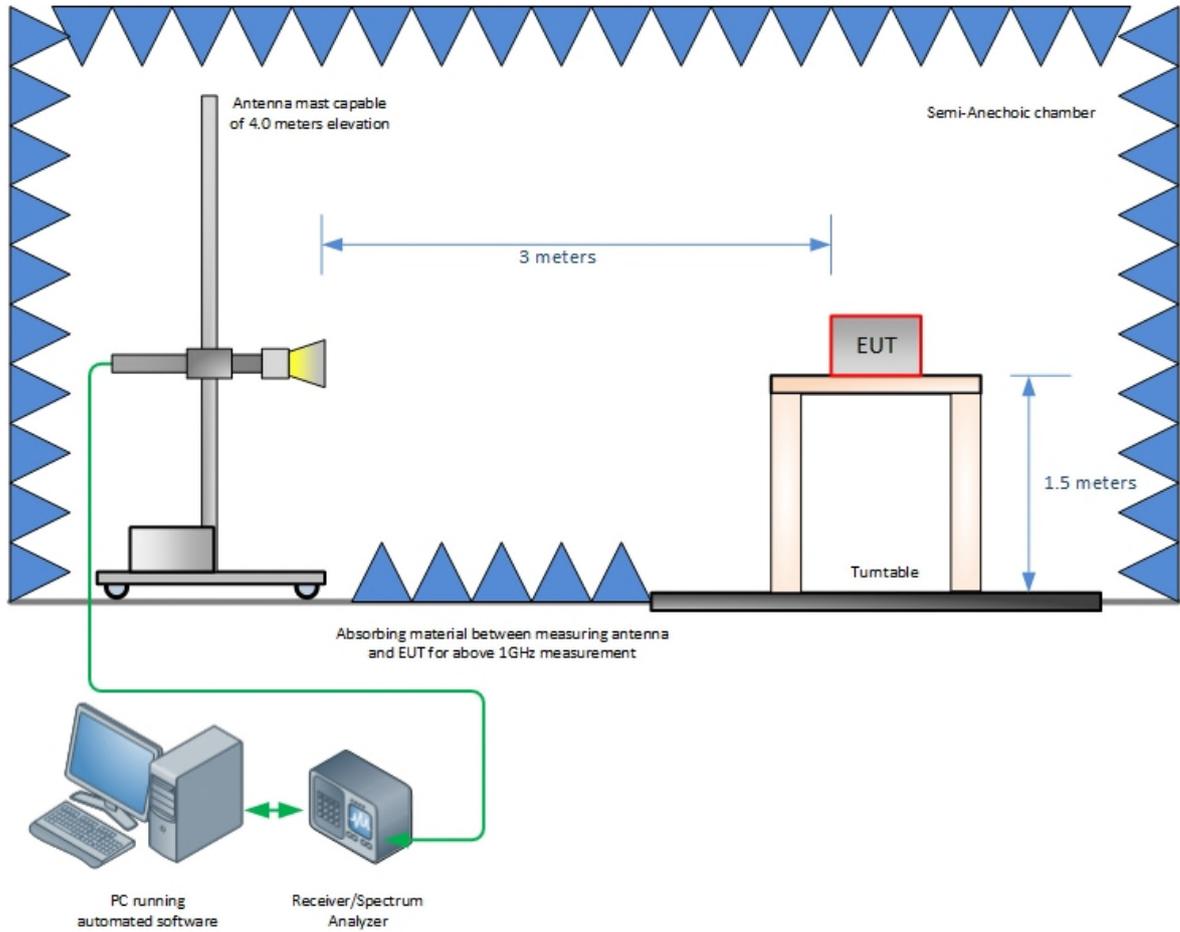


Figure 4-3 - Radiated Emissions Test Setup above 1 GHz

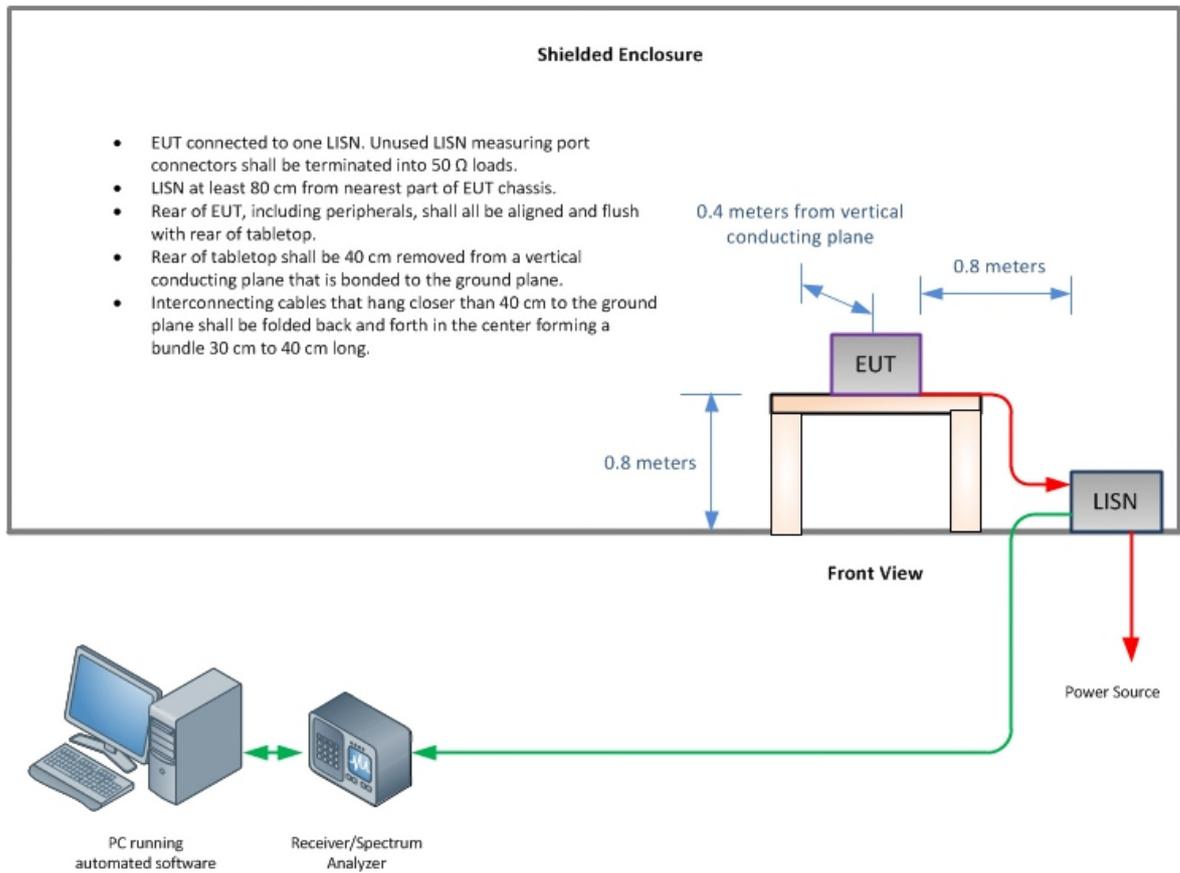


Figure 4-4 – Conducted Emissions Test Setup



5 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Table 5-1 - Values of U_{CISPR} and U_{Lab}

Measurement	U_{CISPR}	U_{Lab}
Conducted disturbance (mains port) (9 kHz – 150 kHz) (150 kHz – 30 MHz)	3.8 dB 3.4 dB	3.71 dB 3.31 dB
Conducted disturbance (telecom port) (150 kHz – 30 MHz 55 dB LCL) (150 kHz – 30 MHz 65 dB LCL) (150 kHz – 30 MHz 75 dB LCL)	5.0 dB 5.0 dB 5.0 dB	4.11 dB 4.50 dB 4.94 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1 000 MHz) (1 – 6 GHz) (6-18 GHz)	6.3 dB 5.2 dB 5.5 dB	5.85 dB 4.48 dB 4.48 dB

Notes:

U_{CISPR} resembles a value of measurement uncertainty for a specific test, which was determined by considering uncertainties associated with the quantities listed in CISPR 16-4-2:2011.



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