FCC and ISED Test Report

PervasID
Flow Ranger, Model: FR 9380 (8-port FCC)

In accordance with FCC 47 CFR Part 15B and ICES-003 (RFiD)

Prepared for: PervasID
St John's Inovation Centre
Cowley Road
Cambridge
CB4 OWS
UNITED KINGDOM

Add value.
Inspire trust.

FCC ID: 2AQQWFR9380 IC: 24482-FR9380

COMMERCIAL-IN-CONFIDENCE

Document 75954042-01 Issue 01

SIGNATURE			
AJ Lawson.			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Andy Lawson	Chief Engineer, EMC	Authorised Signatory	29 June 2022

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

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15B and ICES-003. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Matthew Dawkins	29 June 2022	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISED Accreditation
12669A Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B and ICES-003: 2020 and Issue 7: 2020 for the tests detailed in section 1.3.

TÜV SÜD
is a trading name of TUV SUD Ltd
Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TUV SUD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuvsud.com/en

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire PO15 5RL
United Kingdom

Contents

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	29 June 2022

Table 1

1.2 Introduction

Applicant	PervasID
Manufacturer	PervasID
Model Number(s)	FR 9380 (8-port FCC)
Serial Number(s)	10510422-0074
Hardware Version(s)	V6.4 P0.3 (serial no: 10510422-0074)
Software Version(s)	Reader software – 3_1_0_EX4; R2000 firmware – 3_1_0_EX3; DB firmware – 1_0_1_EX2, Bootloader 512d8e3
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B and ICES-003: 2020 and Issue 7: 2020
Order Number Date	PO-0519 08-December-2021
Date of Receipt of EUT	04-February-2022
Start of Test	23-March-2022
Finish of Test	23-March-2022
Name of Engineer(s)	Matthew Dawkins
Related Document(s)	ANSI C63.4: 2014

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15B and ICES-003 is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: AC Powered - Idle				
2.1	15.107 and 3.1	Conducted Disturbance at Mains Terminals	Pass	ANSI C63.4: 2014
2.2	15.109 and 3.2	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2

1.4 Declaration of Build Status

MAIN EUT	
MANUFACTURING DESCRIPTION	UHF RFID Distributed Antenna System
MANUFACTURER	PervasID Ltd
MODEL	FR 9380 (8-port FCC)
PART NUMBER	N/A
HARDWARE VERSION	V6.4 P0.3 (serial no: 10510422-0074)
SOFTWARE VERSION	Reader software – 3_1_0_EX4; R2000 firmware – 3_1_0_EX3; DB firmware – 1_0_1_EX2, Bootloader 512d8e3
PSU VOLTAGE/FREQUENCY/CURRENT	24Vdc, 4A
HIGHEST INTERNALLY GENERATED FREQUENCY	927.25MHz
FCC ID (if applicable)	2AQQWFR9380
INDUSTRY CANADA ID (if applicable)	24482-FR9380
TECHNICAL DESCRIPTION (a brief technical description of the intended use and operation)	UHF RFID Distributed Antenna System - intended use detection and monitoring of UHF RFID tags
COUNTRY OF ORIGIN	UK
RF CHARACTERISTICS (if applicable)	
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	902.75MHz - 927.25 MHz
RECEIVER FREQUENCY OPERATING RANGE (MHz)	902.75MHz - 927.25 MHz
INTERMEDIATE FREQUENCIES	Direct conversion
EMISSION DESIGNATOR(S): https://fccid.io/Emissions-Designator/	TBD
MODULATION TYPES: (i.e. GMSK, QPSK)	PR-ASK
OUTPUT POWER (W or dBm)	33dBm (interrogator), 33dBm (suppressor)
SEPARATE BATTERY/POWER SUPPLY (if applicable)	
MANUFACTURING DESCRIPTION	AC/DC Power Supply
PART NUMBER	E.g. XP Power AEJ100PS24
PSU VOLTAGE/FREQUENCY/CURRENT	100 to 264 VAC, 47 – 63Hz, ≥92W
MODULES (if applicable)	
ANCILLARIES (if applicable)	

Table 3

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

Name: Andy Bell
Position held: VP Engineering
Date: 04-Feb-2022

1.5 Product Information

1.5.1 Technical Description

The Equipment under test (EUT) was a UHF RFID Distributed Antenna System - intended use detection and monitoring of UHF RFID tags.

The primary function of the EUT is to detect and monitor stock item movements within a warehousing or similar environment using allocated UHF RFID Tags.

Figure 1 – General View

Figure 2 – Rear View

1.5.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
Configuration and Mode: AC Powered - Idle				
AC Power	1 m	115 V 60 Hz Mains Power	AC to DC power adapter	No
Ethernet	8 m	Data Transfer	Ethernet	Yes

Table 4

1.5.3 Test Configuration

Configuration	Description
AC Powered	The EUT was powered from a 115 V 60 Hz AC power supply. The EUT had 50 Ω terminations on all 8 of the R-TNC input / output ports. A client supplied laptop outside of the test area was connected to the EUTs ethernet port.

Table 5

1.5.4 Modes of Operation

Mode	Description
Idle	The EUT was powered and operating but not reading any tags.

Table 6

1.6 Deviations from the Standard

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

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.

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
Model: FR 9380 (8-port FCC), Serial Number: 10510422-0074			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 7

1.8 Test Location

TÜV SÜD conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: AC Powered - Idle		
Conducted Disturbance at Mains Terminals	Matthew Dawkins	UKAS
Radiated Disturbance	Matthew Dawkins	UKAS

Table 8

Office Address:

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Conducted Disturbance at Mains Terminals

2.1.1 Specification Reference

FCC 47 CFR Part 15B and ICES-003, Clause 15.107 and 3.1

2.1.2 Equipment Under Test and Modification State

FR 9380 (8-port FCC), S/N: 10510422-0074 - Modification State 0

2.1.3 Date of Test

23-March-2022

2.1.4 Test Method

The EUT was setup according to ANSI C63.4, clause 5.2.

The EUT was placed on a non-conductive table 0.8 m above a reference ground plane. A vertical coupling plane was placed 0.4 m from the EUT boundary.

A Line Impedance Stabilisation Network (LISN) was directly bonded to the ground-plane. The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN was 0.8 m.

Interconnecting cables that hanged closer than 0.4 m to the ground plane were folded back and forth in the centre forming a bundle 0.3 m to 0.4 m long.

Input and output cables were terminated with equipment or loads representative of real usage conditions.

The EUT was configured to give the highest level of emissions within reason of a typical installation as described by the manufacturer.

2.1.5 Example Calculation

Quasi-Peak level (dBµV) = Receiver level (dBµV) + Correction Factor (dB)
Margin (dB) = Quasi-Peak level (dBµV) - Limit (dBµV)

CISPR Average level (dBµV) = Receiver level (dBµV) + Correction Factor (dB)
Margin (dB) = CISPR Average level (dBµV) - Limit (dBµV)

2.1.6 Example Test Setup Diagram

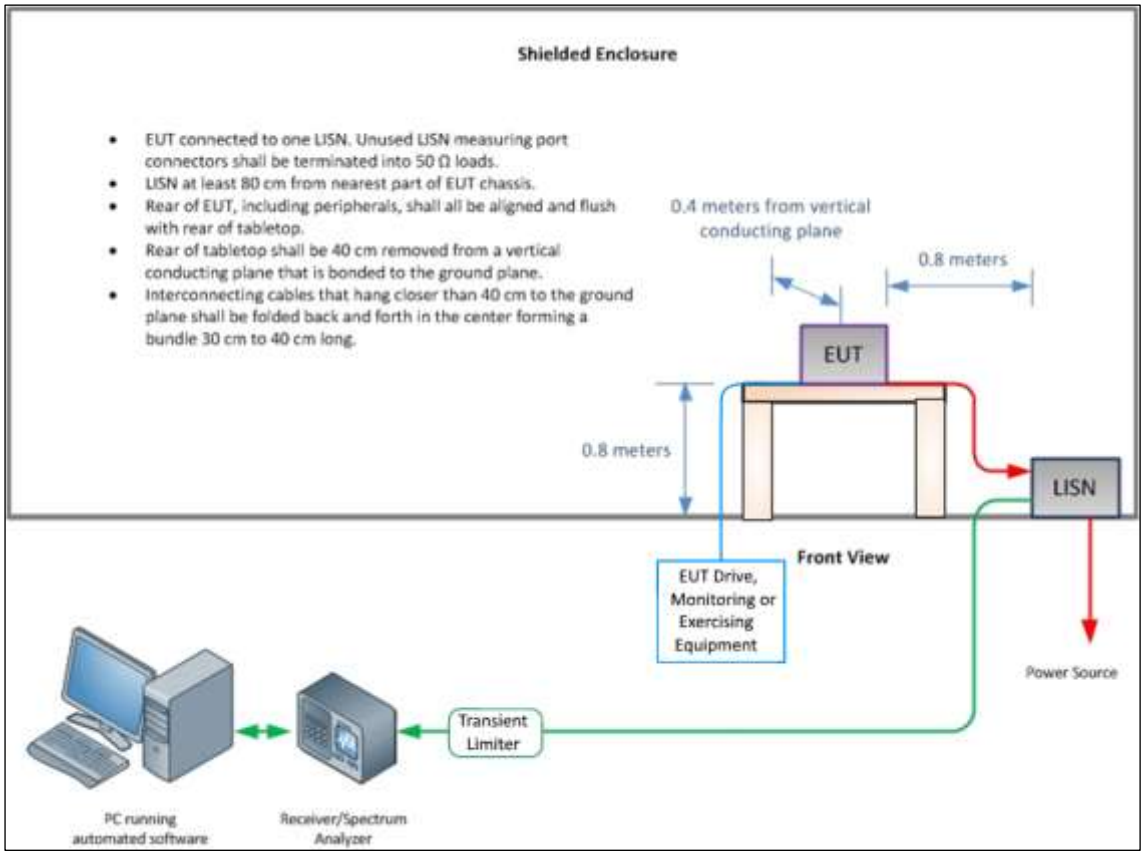

Figure 3

2.1.7 Environmental Conditions

Ambient Temperature	20.5 °C
Relative Humidity	42.8 %

2.1.8 Specification Limits

Required Specification Limits - Class A			
Line Under Test	Frequency Range (MHz)	Quasi-Peak Test Limit (dBµV)	CISPR Average Test Limit (dBµV)
AC Power Port	0.15 to 0.5	79	66
	0.5 to 30	73	60
Supplementary information: None			

Table 9

2.1.9 Test Results

Results for Configuration and Mode: AC Powered - Idle.

This test was performed to the requirements of the Class A limits.

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

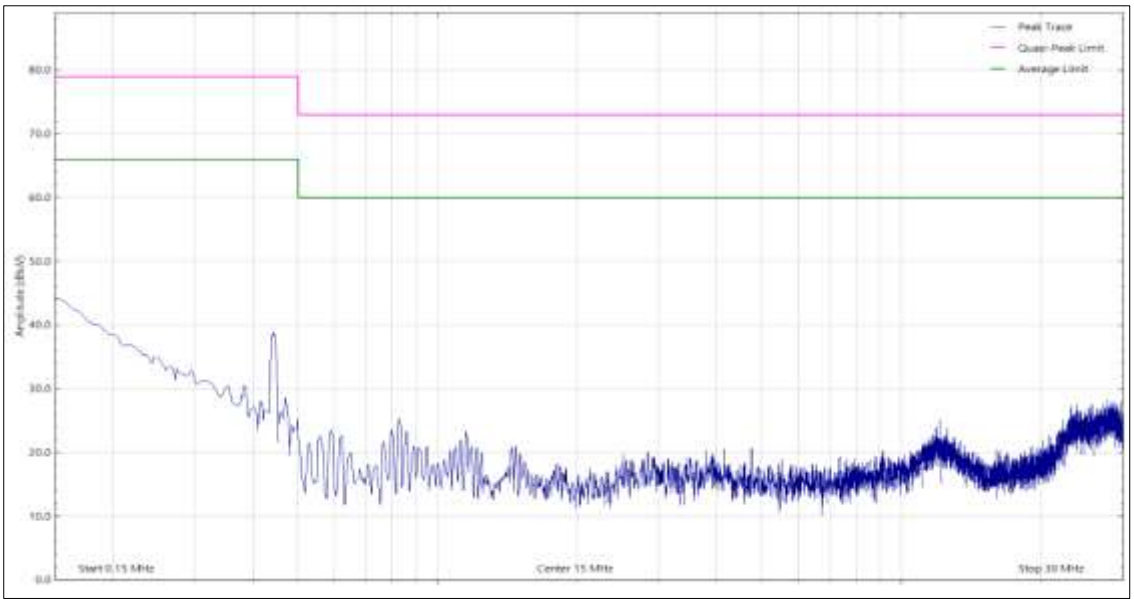

Figure 4 - Graphical Results - Live Line

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 10

* No final measurements were made as a peak emissions seen above the measurement system noise floor during the pre-scan were greater than 6 dB below the CISPR Average test limit.

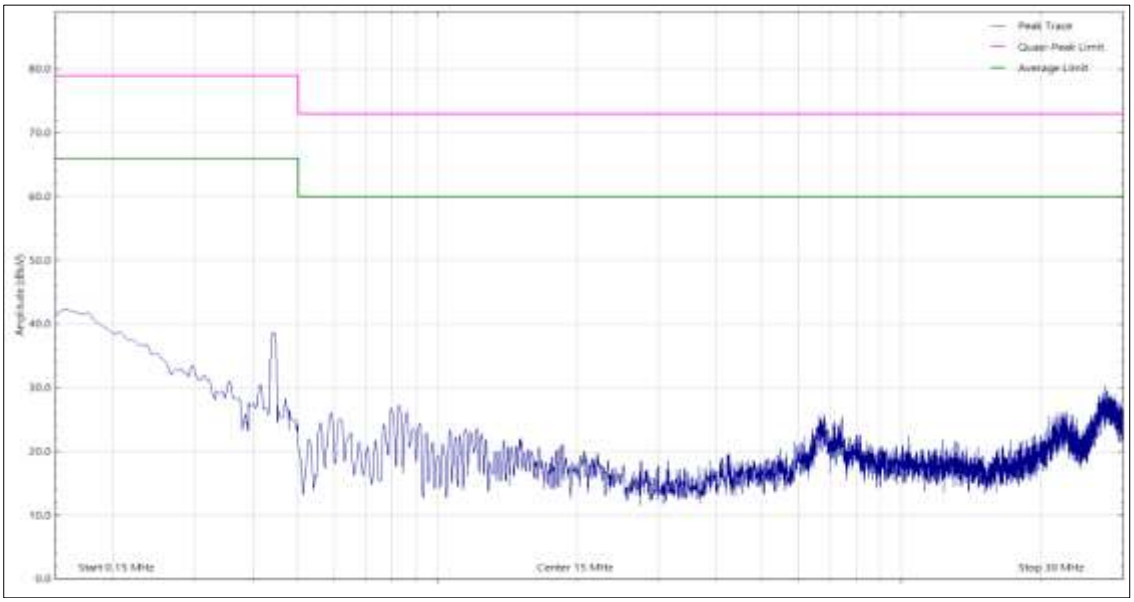

Figure 5 - Graphical Results - Neutral Line

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 11

* No final measurements were made as a peak emissions seen above the measurement system noise floor during the pre-scan were greater than 6 dB below the CISPR Average test limit.

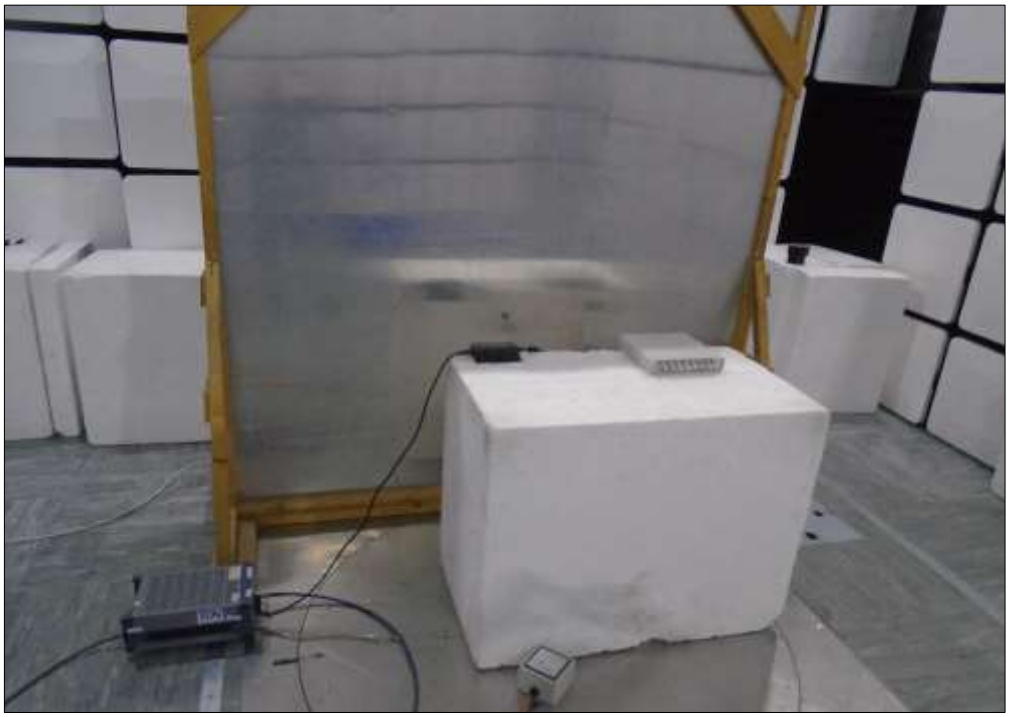

Figure 6 - Test Setup

2.1.10 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Screened Room (12)	MVG	EMC-3	5621	36	11-Aug-2023
Emissions Software	TUV SUD	EmX V2.1.11	5125	-	N/A - Software
EMI Test Receiver	Rohde & Schwarz	ESW44	5912	12	17-Feb-2023
Transient Limiter	Hewlett Packard	11947A	2378	12	13-Oct-2022
2 Metre SMA Type Cable	Rhophase	3PS-1801A-2000-3PS	4113	12	27-Jan-2023
Cable (N-Type to N-Type, 8 m)	Teledyne	PR90-088-8MTR	5450	6	01-Apr-2022
LISN	Rohde & Schwarz	ESH3-Z5	1390	12	31-Jan-2023

Table 12

2.2 Radiated Disturbance

2.2.1 Specification Reference

FCC 47 CFR Part 15B and ICES-003, Clause 15.109 and 3.2

2.2.2 Equipment Under Test and Modification State

FR 9380 (8-port FCC), S/N: 10510422-0074 - Modification State 0

2.2.3 Date of Test

23-March-2022

2.2.4 Test Method

The EUT was set up on a non-conductive table 0.8 m above a reference ground plane within a semi-anechoic chamber on a remotely controlled turntable.

A pre-scan of the EUT emissions profile using a peak detector was made at a 3 m antenna distance whilst varying the antenna-to-EUT azimuth and polarisation.

For an EUT which could reasonable be used in multiple planes, pre-scans were performed with the EUT orientated in X, Y and Z planes with reference to the ground plane.

Using a list of the highest emissions detected during the pre-scan along with their bearing and associated antenna polarisation, the EUT was then formally measured using a Quasi-Peak, Peak or CISPR Average detector as appropriate.

The readings were maximised by adjusting the antenna height, polarisation and turntable azimuth, in accordance with the specification.

2.2.5 Example Calculation

Below 1 GHz:

Quasi-Peak level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = Quasi-Peak level (dBµV/m) - Limit (dBµV/m)

Above 1 GHz:

CISPR Average level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = CISPR Average level (dBµV/m) - Limit (dBµV/m)

Peak level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = Peak level (dBµV/m) - Limit (dBµV/m)

2.2.6 Example Test Setup Diagram

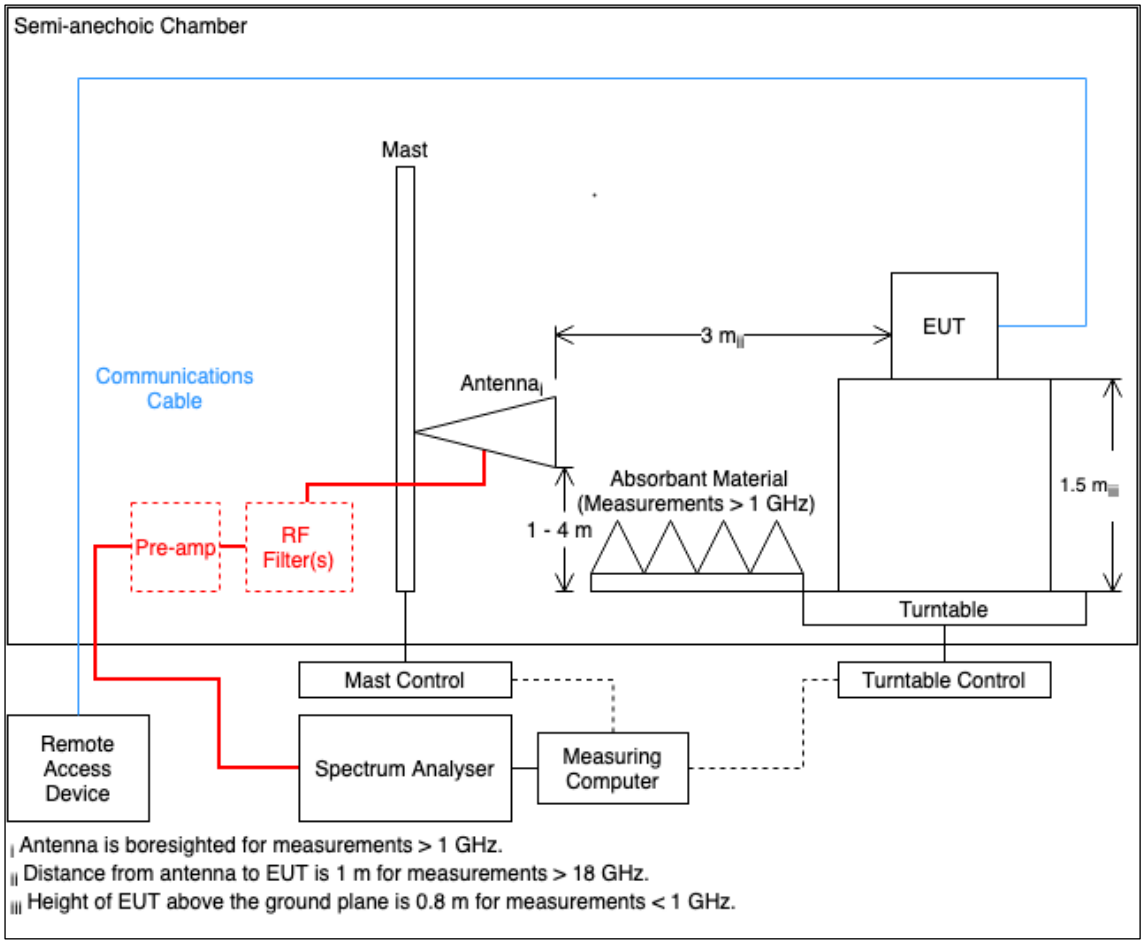

Figure 7

2.2.7 Environmental Conditions

Ambient Temperature	21.5 °C
Relative Humidity	41.2 %

2.2.8 Specification Limits

Required Specification Limits, Field Strength - Class A Test Limit at a 10 m Measurement Distance		
Frequency Range (MHz)	Test Limit (µV/m)	Test Limit (dBµV/m)
30 to 88	90	39.1
88 to 216	150	43.5
216 to 960	210	46.4
Above 960	300	49.5
Supplementary information: Note 1. A Quasi-Peak detector is to be used for measurements below 1 GHz. Note 2. A CISPR Average detector is to be used for measurements above 1 GHz. Note 3. The Peak test limit above 1 GHz is 20 dB higher than the CISPR Average test limit.		

Table 13

2.2.9 Test Results

Results for Configuration and Mode: AC Powered - Idle.

This test was performed to the requirements of the Class A limits.

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Highest frequency generated or used within the EUT: 927.25 MHz
Which necessitates an upper frequency test limit of: 8 GHz

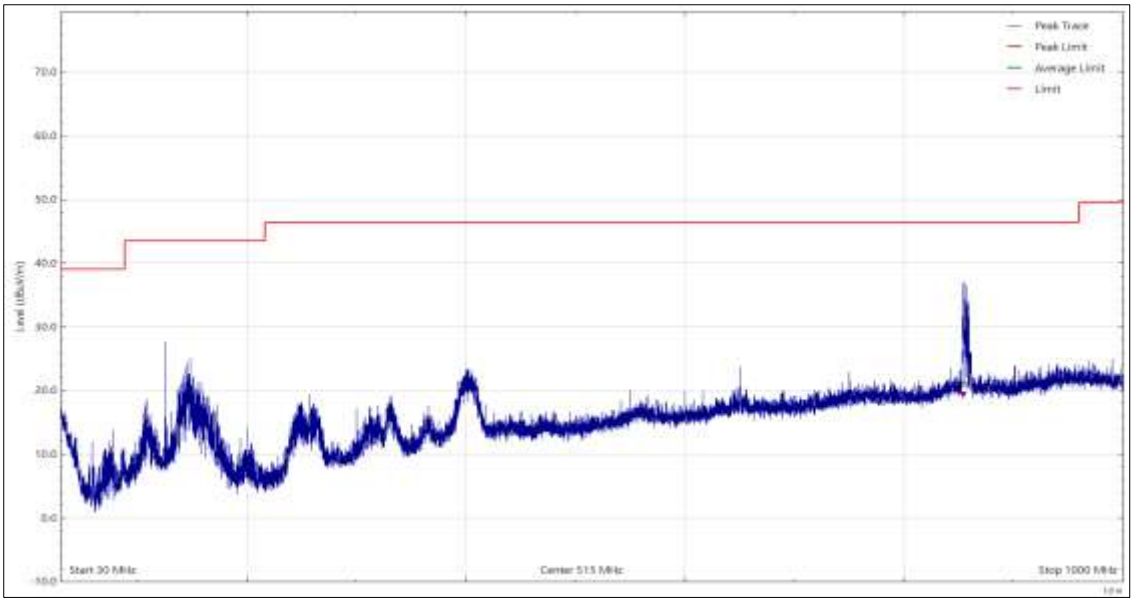

Figure 8 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
854.423	18.6	46.4	-27.8	Q-Peak	280	100	Horizontal

Table 14

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

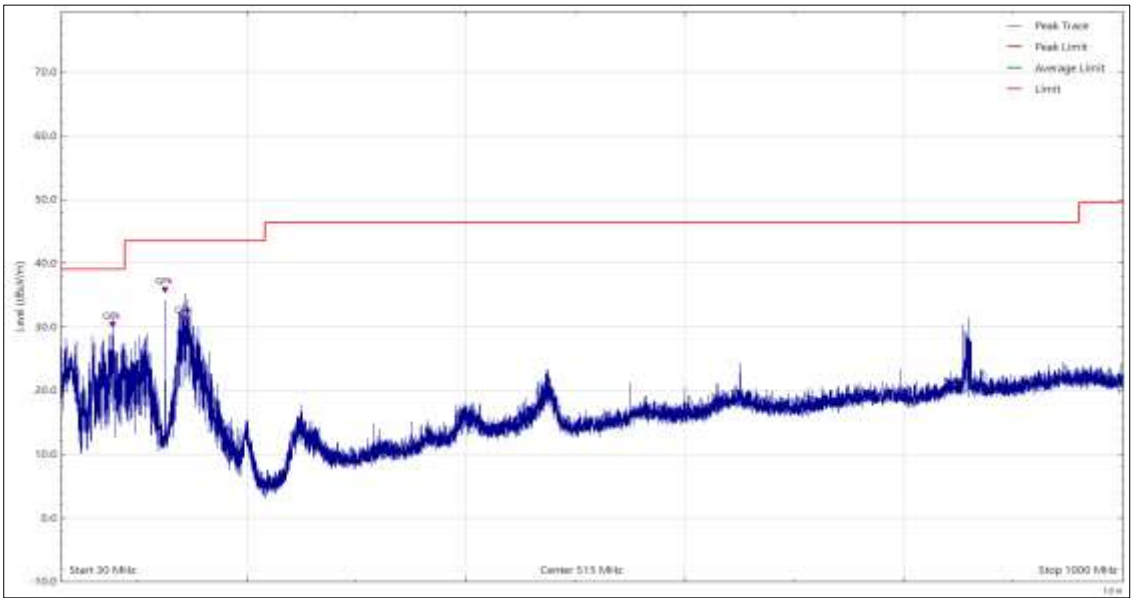

Figure 9 - 30 MHz to 1 GHz, Quasi-Peak, Vertical

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
77.203	29.6	39.1	-9.5	Q-Peak	18	100	Vertical
125.018	35.1	43.5	-8.4	Q-Peak	108	100	Vertical
143.319	30.5	43.5	-13.0	Q-Peak	119	100	Vertical

Table 15

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

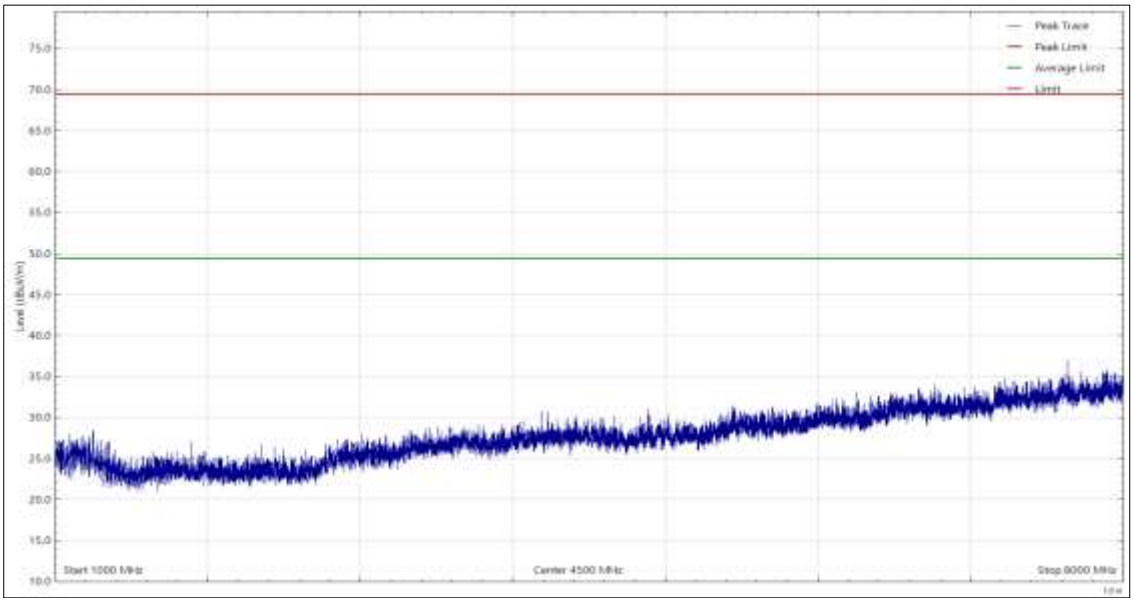

Figure 10 - 1 GHz to 8 GHz, Peak & CISPR Average, Horizontal

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 16

*No final measurements were made as all peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

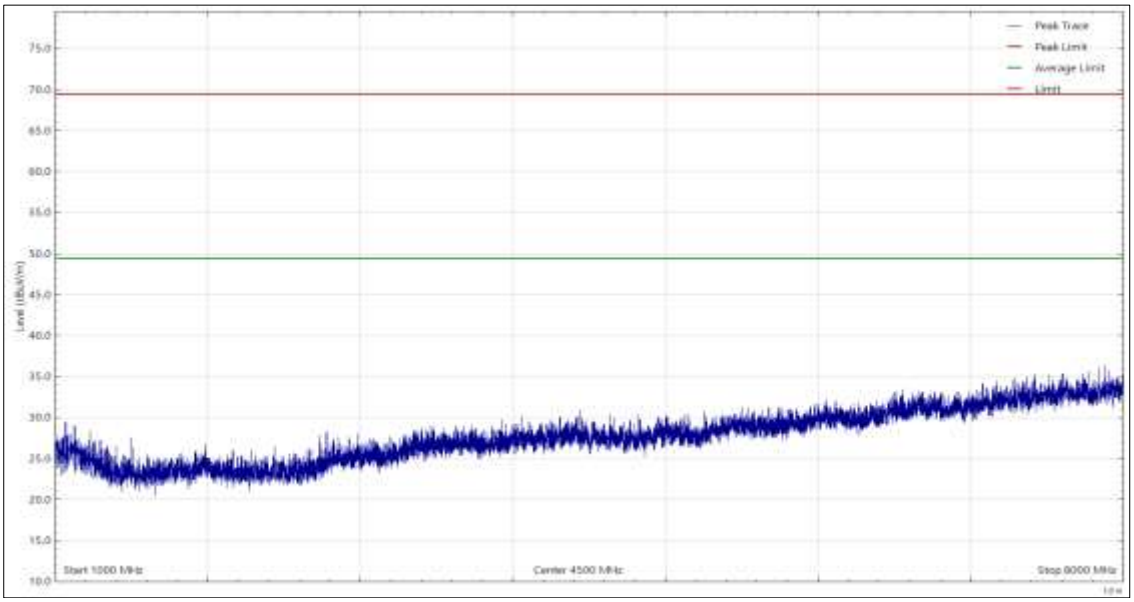

Figure 11 - 1 GHz to 8 GHz, Peak & CISPR Average, Vertical

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 17

*No final measurements were made as all peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

Figure 12 - Test Setup - Below 1 GHz

Figure 13 - Test Setup - Above 1 GHz

2.2.10 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Screened Room (12)	MVG	EMC-3	5621	36	11-Aug-2023
Emissions Software	TUV SUD	EmX V2.1.11	5125	-	Software
EMI Test Receiver	Rohde & Schwarz	ESW44	5912	12	17-Feb-2023
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	5613	-	TU
2 Metre SMA Type Cable	Rhophase	3PS-1801A-2000-3PS	4113	12	27-Jan-2023
Cable (N-Type to N-Type, 1 m)	Rosenberger	LU7-036-1000	5031	12	23-Jul-2022
Cable (N-Type to N-Type, 8 m)	Teledyne	PR90-088-8MTR	5450	6	01-Apr-2022
Pre-Amplifier (1 GHz to 18 GHz)	Schwarzbeck	BBV 9718 C	5350	12	22-Sep-2022
Antenna (Bi-Log, 30 MHz to 1 GHz)	Teseq	CBL6111D	5615	24	16-Oct-2022
Antenna (DRG, 1 GHz to 10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	15-Oct-2022

Table 18

TU - Traceability Unscheduled

3 Incident Reports

No incidents reports were raised.

4 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Conducted Disturbance at Mains Terminals	150 kHz to 30 MHz, LISN, ±3.7 dB
Radiated Disturbance	30 MHz to 1 GHz, Bilog Antenna, ±5.2 dB 1 GHz to 40 GHz, Horn Antenna, ±6.3 dB

Table 19

Worst case error for both Time and Frequency measurement 12 parts in 10^6.

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2007, Clause 4.4.3 and 4.5.1. (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.