FCC and ISED Test Report

Jotron AS
Model: Tron 40VDR AIS

In accordance with FCC 47 CFR Part 15B, ICES-003 and ISED RSS-GEN

Prepared for: Jotron AS
Ringdalskogen 8,
3270 Larvik,
Norway

FCC ID: VRV40VDRAIS IC: 2131A-40VDRAIS

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Document 75950873-03 Issue 02

SIGNATURE			
A J Lawson.			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Andy Lawson	Chief Engineer - EMC	Authorised Signatory	24 January 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 and ISED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Graeme Lawler	24 January 2022	G. Lawler.

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: 2019, ICES-003: Issue 7: 2020 and ISED RSS-GEN: Issue 5 and A1 (2019-03) for the tests detailed in section 1.3.

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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	11 January 2022
2	Second Issue to remove Manufacturer Declared Variant (Tron 40AIS)	24 January 2022

Table 1

1.2 Introduction

Applicant	Jotron AS
Manufacturer	Jotron AS
Model Number(s)	Tron 40VDR AIS
Serial Number(s)	00041
Hardware Version(s)	Rev: 2020
Software Version(s)	Rev 1.2
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2019 ICES-003: Issue 7: 2020 ISED RSS-GEN: Issue 5 and A1 (2019-03)
Order Number Date	P42335 22-December-2020
Date of Receipt of EUT	23-February-2021
Start of Test	08-June-2021
Finish of Test	08-June-2021
Name of Engineer(s)	Graeme Lawler
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 and ISED RSS-GEN is shown below.

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	Part 15B	ICES-003	RSS-GEN			
Configuration and Mode: Battery Powered - Idle Mode and VDR						
2.1	15.109	3.2	7.1	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2

1.4 Declaration of Build Status

MAIN EUT			
MANUFACTURING DESCRIPTION	COSPAS-SARSAT 406 MHz Satellite Emergency Position-Indication Radio Beacon		
MANUFACTURER	Jotron AS		
MODEL	Tron 40VDR AIS		
PART NUMBER	103171		
HARDWARE VERSION	Rev: 2020		
SOFTWARE VERSION	Rev 1.2		
PSU VOLTAGE/FREQUENCY/CURRENT	7.2 V / 18 Ah		
HIGHEST INTERNALLY GENERATED FREQUENCY	406.031 MHz		
FCC ID (if applicable)	VRV40VDRAIS		
INDUSTRY CANADA ID (if applicable)	2131A-40VDRAIS		
TECHNICAL DESCRIPTION (a brief technical description of the intended use and operation)	The Tron 40VDR AIS is an Emergency Location Transmitter with built-in 406 MHz Cospas-Sarsat, AIS-SART and 121.5 MHz Homing transmitters. It is used to assist in the locating and recovery of individuals that are in imminent danger.		
COUNTRY OF ORIGIN	Lithuania		
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	406.031 MHz, 161.975 - 162.025 MHz, 121.5 MHz		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	1575.42 MHz (GPS/GALILEO) 1598.0625-1609.3125 MHz (GLONASS)		
INTERMEDIATE FREQUENCIES	-		
EMISSION DESIGNATOR(S): https://fccid.io/Emissions-Designator/	16K0G1D (406.031 MHz) 16K0GXW (162 MHz) 3K20A3X (121.5 MHz)		
MODULATION TYPES: (i.e. GMSK, QPSK)	Phase modulation 1.1 rad (406 MHz) GMSK/FM (162 MHz) AM Homing (121.5 MHz)		
OUTPUT POWER (W or dBm)	37 dBm (406 MHz) >30 dBm (162 MHz) 17 dBm (121.5 MHz)		
SEPARATE BATTERY/POWER SUPPLY (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
PSU VOLTAGE/FREQUENCY/CURRENT			
COUNTRY OF ORIGIN			
MODULES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
POWER			
FCC ID			
INDUSTRY CANADA ID			
EMISSION DESIGNATOR			
DHSS/FHSS/COMBINED OR OTHER			
COUNTRY OF ORIGIN			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
SERIAL NUMBER			
COUNTRY OF ORIGIN			

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

Name: Frank Løke
Position held: Certification Manager
Date: 2021-07-01

1.5 Product Information

1.5.1 Technical Description

The Equipment under test (EUT) was a Jotron Tron 40VDR AIS

The primary function of the EUT is as an Emergency Position Indication Radio Beacon (EPIRB) within capsule. The capsule contained a VDR unit.

Additionally, the EUT has the functionality for Automatic Identification System (AIS), GNSS Rx (GPS/Galileo/Glonass) Transmitting 406 MHz, 121.5 MHz Homer, RLS and a Voyage Data Recorder (VDR) storage module.

1.5.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
PoE Cable	< 3 m	DC Power to VDR unit.	RJ45 with DC Power.	Yes

Table 3

1.5.3 Test Configuration

Configuration	Description
Battery Powered	The EUT was powered by its internal battery.

Table 4

1.5.4 Modes of Operation

Mode	Description
Idle Mode	The EUT position switch was in the un-armed position. The VDR was powered and active.

Table 5

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: Tron 40VDR AIS, Serial Number: 00041			
0	As supplied by the customer	Not Applicable	Not Applicable
1	GNSS LED changed to blink before or after 406MHz to reduce noise on modulation	Manufacturer at TUV SUD site	31-March 2021
2	Addition of a LDO (Low Dropout Regulator) to the TCXO, to reduce the noise coming from the power supply. A resistor of 0 ohm (added to the design for current measurement) was replaced by the three-legged regulator.	Manufacturer	27-April 2021
3	SW update to reduce image AIS frequencies. Parameter in the synthesizer was adjusted to reduce the signal level from the clock.	Manufacturer	21-May 2021

Note: sample repair was carried out on 25-May-2021 to resolve an issue with low power output.

Table 6

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: Battery Powered - Idle Mode and VDR		
Radiated Disturbance	Graeme Lawler	UKAS

Table 7

Office Address:

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

2 Test Details

2.1 Radiated Disturbance

2.1.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.109
ICES-003, Clause 3.2
ISED RSS-GEN, Clause 7.1

2.1.2 Equipment Under Test and Modification State

Tron 40VDR AIS, S/N: 00041 - Modification State 3

2.1.3 Date of Test

08-June-2021

2.1.4 Test Method

The EUT was set up on a non-conductive table 0.8 m above a reference ground plane insulated support 0.1 m above a ground reference 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

2.1.5 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)

2.1.6 Example Test Setup Diagram

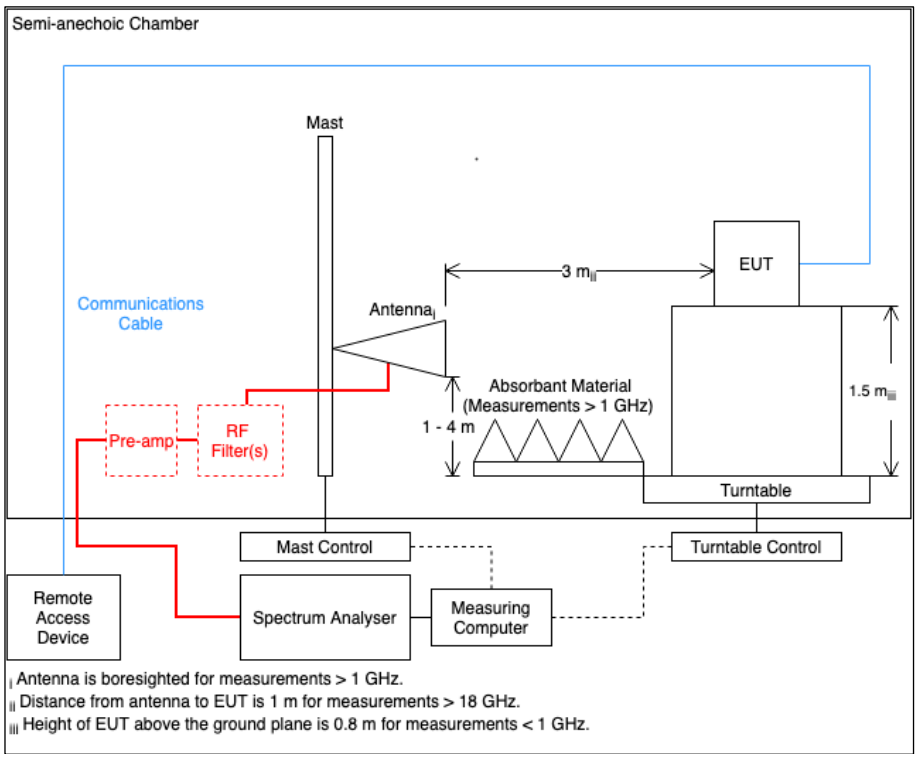

Figure 1

2.1.7 Environmental Conditions

Ambient Temperature	20.1 °C
Relative Humidity	53.2 %

2.1.8 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 8

2.1.9 Test Results

Results for Configuration and Mode: Battery Powered - Idle Mode and VDR.

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: 406.031 MHz
Which necessitates an upper frequency test limit of: 2 GHz

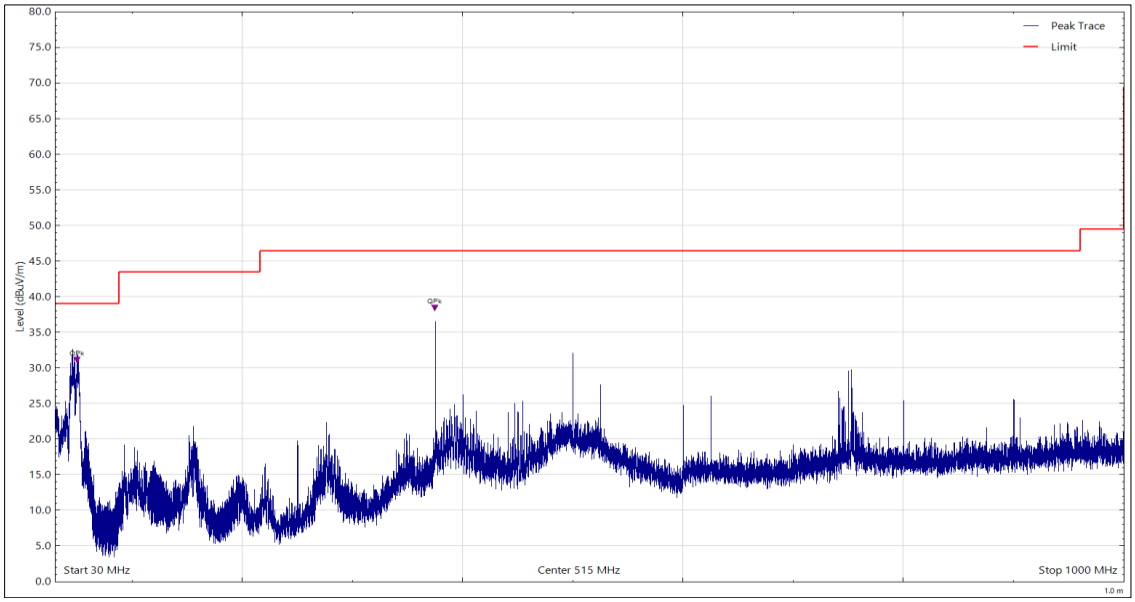

Figure 2 - 30 MHz to 1 GHz, Quasi-Peak, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
50.419	30.5	39.1	-8.6	Q-Peak	158	100	Vertical
375.018	37.8	46.4	-8.7	Q-Peak	157	118	Vertical

Table 9

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.

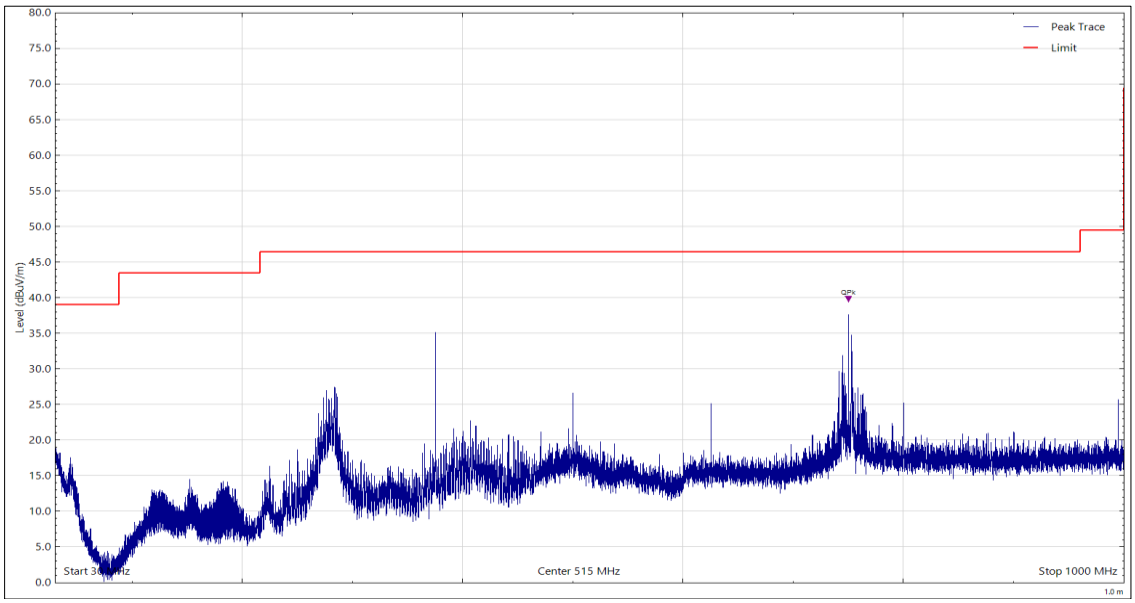

Figure 3 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
749.966	39.2	46.4	-7.3	Q-Peak	350	100	Horizontal

Table 10

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.

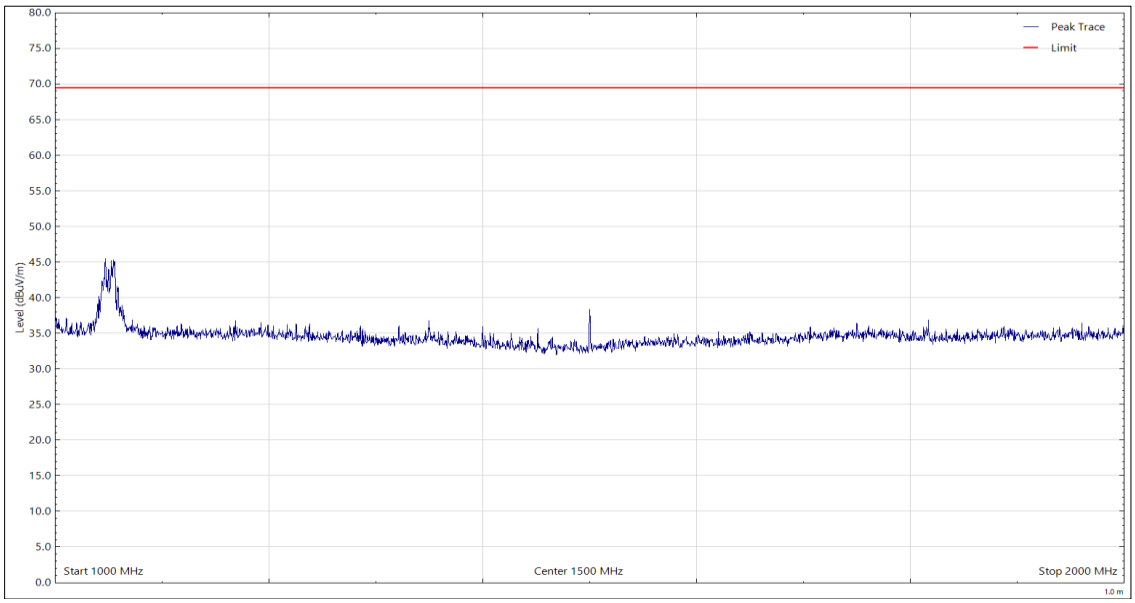

Figure 4 - 1 GHz to 2 GHz, Peak, Vertical

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

Table 11

*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.

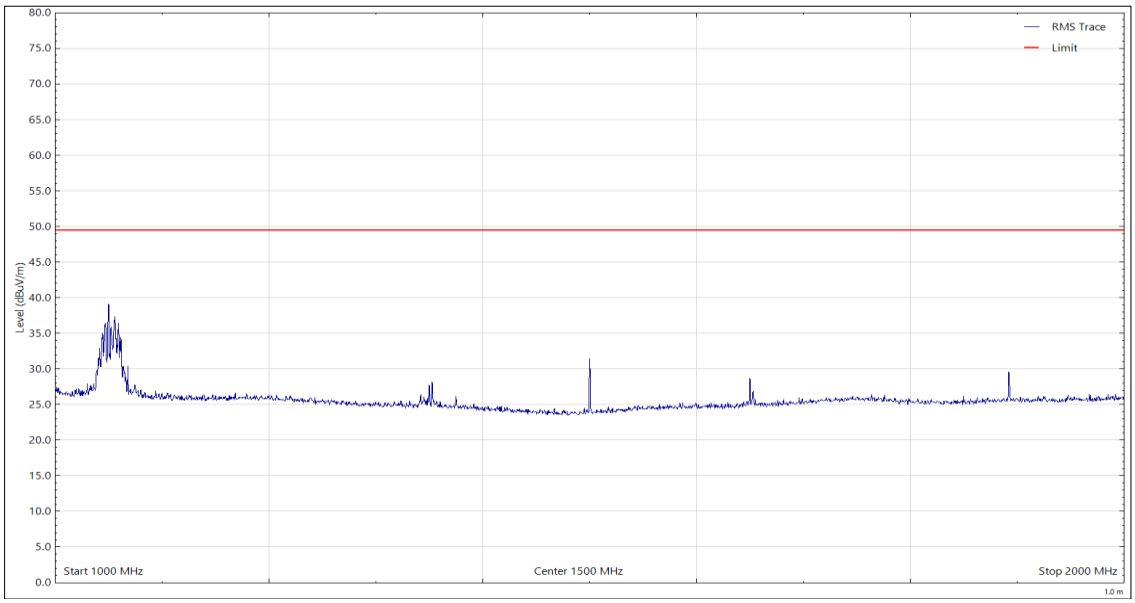

Figure 5 - 1 GHz to 2 GHz, CISPR Average, Vertical

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

Table 12

*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.

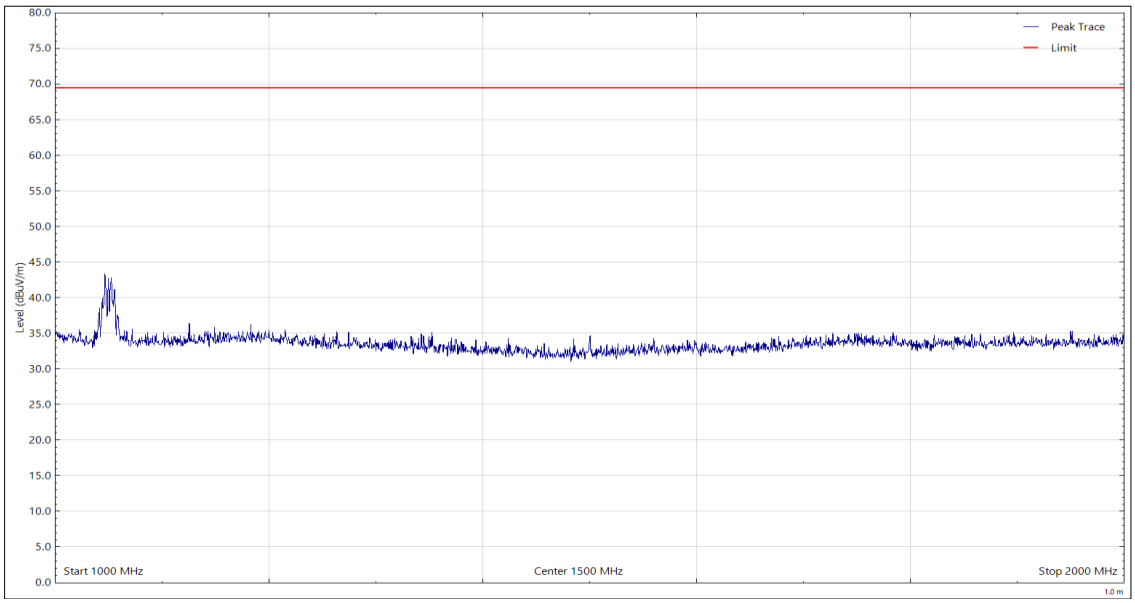

Figure 6 - 1 GHz to 2 GHz, Peak, Horizontal

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

Table 13

*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.

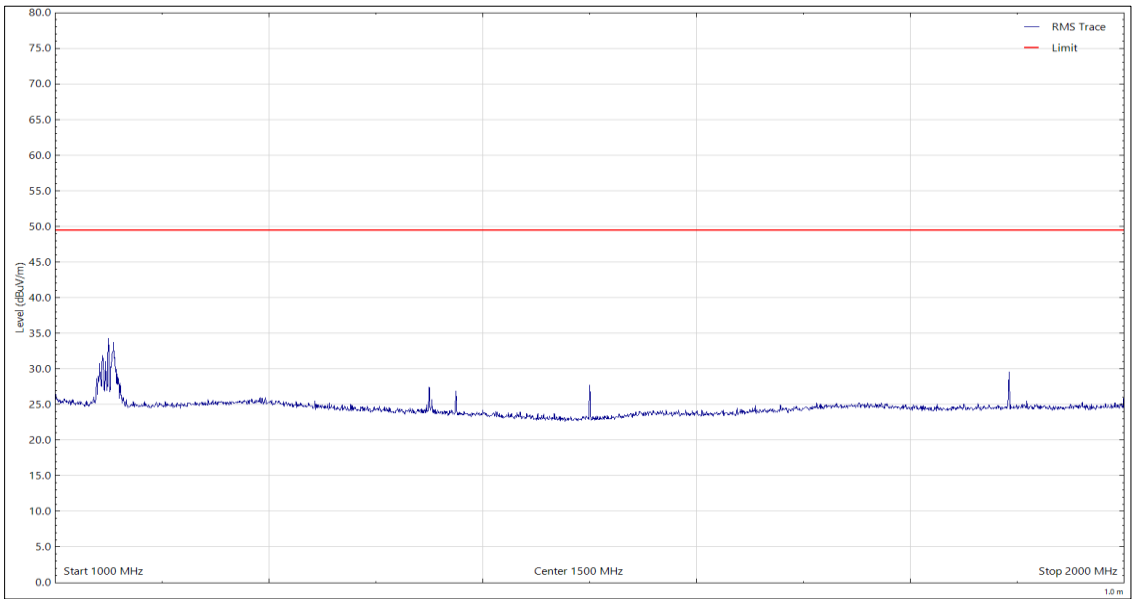

Figure 7 - 1 GHz to 2 GHz, CISPR Average, Horizontal

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

Table 14

*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.

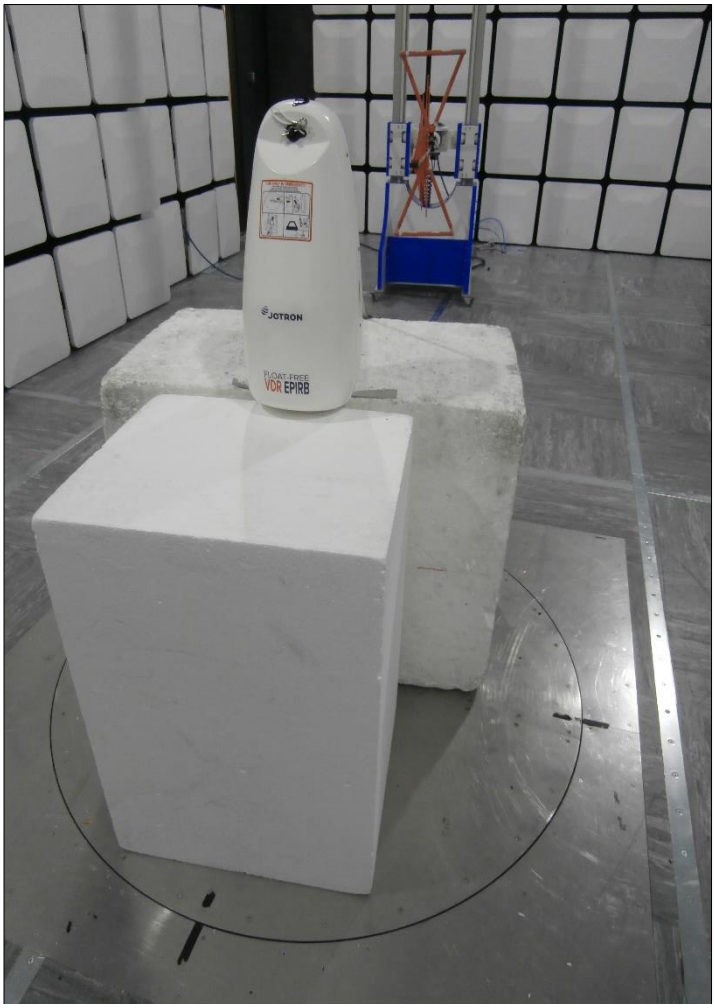

Figure 8 - Test Setup - 30 MHz to 1 GHz

Figure 9 - Test Setup - 1 GHz to 2 GHz

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
3m Semi Anechoic Chamber	MVG	EMC-3	5621	36	11-Aug-2023
EmX Emissions Software	TUV SUD	V2.1.8	5125	-	Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	18-Mar-2022
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast TAM 4.0-P	Maturo Gmbh	TAM 4.0-P	5613	-	TU
Turntable	Maturo Gmbh	Turntable 1.5 SI-2t	5614	-	TU
Cable 2.92m	Junkosha	MWX241/B	5411	12	22-Jun-2021
3.5 mm 2m Cable	Junkosha	MWX221-02000DMS	5428	12	15-Oct-2021
Cable Assembly - 18GHz 8m	Junkosha	MWX221-08000NMSNMS/B	5732	6	05-Aug-2021
Preamplifier (30dB 1GHz to 18GHz)	Schwarzbeck	BBV 9718 C	5350	12	21-Sep-2021
Antenna with permanent attenuator (Bilog)	Schaffner	CBL6143	287	24	14-Oct-2022
Broadband Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	22-Sep-2021

Table 15

TU - Traceability Unscheduled

3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	14-Oct-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	31-Mar-2022
Hygrometer	Rotronic	A1	2138	12	01-Jul-2021
Beacon Tester	WS Technologies	BT100S	4790	24	22-Sep-2018
8 Meter Cable	Teledyne	PR90-088-8MTR	5208	12	03-Sep-2021
Comb Generator	Schaffner	RSG1000	3034	-	TU
Tester (Beacon)	WS Technologies	BT200-1100Y	5395	12	07-May-2021
8 Meter Cable	Teledyne	PR90-088-8MTR	5450	6	08-Mar-2022

Table 16

TU – Traceability Unscheduled

4 Incident Reports

No incidents reports were raised.

5 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Radiated Disturbance	30 MHz to 1 GHz, Bilog Antenna, ±5.2 dB 1 GHz to 40 GHz, Horn Antenna, ±6.3 dB

Table 17

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.