# FCC and ISED Test Report

## Jotron AS
## EPIRB, Model: Tron 40AIS

## In accordance with FCC 47 CFR Part 15B and ISED RSS-GEN

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

FCC ID: VRV40AIS IC: 2131A-40AIS

Add value.
Inspire trust.

## COMMERCIAL-IN-CONFIDENCE

Document 75951242-01 Issue 01

| SIGNATURE | | | |
|---|---|---|---|
| AJ Lawson. | | | |
| **NAME** | **JOB TITLE** | **RESPONSIBLE FOR** | **ISSUE DATE** |
| Andy Lawson | Chief Engineer - EMC | Authorised Signatory | |

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 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 | 12 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 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 | 12 January 2022 |

**Table 1**

## 1.2 Introduction

| | |
|---|---|
| Applicant | Jotron AS |
| Manufacturer | Jotron AS |
| Model Number(s) | Tron 40AIS |
| Serial Number(s) | 00023 |
| 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<br>ISED RSS-GEN: Issue 5 and A1 (2019-03) |
| Order Number<br>Date | P43169<br>11-February-2021 |
| Date of Receipt of EUT | 23-February-2021 |
| Start of Test | 04-May-2021 |
| Finish of Test | 04-May-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 ISED RSS-GEN is shown below.

| Section | Specification Clause | | Test Description | Result | Comments/Base Standard |
|---|---|---|---|---|---|
| | Part 15B | RSS-GEN | | | |
| Configuration and Mode: Battery Powered - Idle Mode | | | | | |
| 2.1 | 15.109 | 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 40AIS | | |
| PART NUMBER | 103181 | | |
| HARDWARE VERSION | Rev: 2020 | | |
| SOFTWARE VERSION | Rev 1.2 | | |
| PSU VOLTAGE/FREQUENCY/CURRENT | 7.2 V / 7.2 Ah | | |
| HIGHEST INTERNALLY GENERATED FREQUENCY | 406.031 MHz | | |
| FCC ID (if applicable) | VRV40AIS | | |
| INDUSTRY CANADA ID (if applicable) | 2131A-40AIS | | |
| TECHNICAL DESCRIPTION (a brief technical description of the intended use and operation) | The Tron 40AIS 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,<br>161.975 - 162.025 MHz,<br>121.5 MHz | | |
| RECEIVER FREQUENCY OPERATING RANGE (MHz) | 1575.42 MHz (GPS/GALILEO)<br>1598.0625-1609.3125 MHz (GLONASS) | | |
| INTERMEDIATE FREQUENCIES | - | | |
| EMISSION DESIGNATOR(S): https://fccid.io/Emissions-Designator/ | 16K0G1D (406.031 MHz)<br>16K0GXW (162 MHz)<br>3K20A3X (121.5 MHz) | | |
| MODULATION TYPES: (i.e. GMSK, QPSK) | Phase modulation 1.1 rad (406 MHz)<br>GMSK/FM (162 MHz)<br>AM Homing (121.5 MHz) | | |
| OUTPUT POWER (W or dBm) | 37 dBm (406 MHz)<br>>30 dBm (162 MHz)<br>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

JOTRON

## 1.5 Product Information

### 1.5.1 Technical Description

The Equipment under test (EUT) was a Jotron AS EPIRB, Model: Tron 40AIS.

The primary function of the EUT is as 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.

### 1.5.2 EUT Port/Cable Identification

| Port | Max Cable Length specified | Usage | Type | Screened |
|---|---|---|---|---|
| N/A | N/A | N/A | N/A | N/A |

**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. |

**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 40AIS, Serial Number: 00023 | | | |
| 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 |

**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 | | |
| 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
ISED RSS-GEN, Clause 7.1

### 2.1.2 Equipment Under Test and Modification State

Tron 40AIS, S/N: 00023 - Modification State 2

### 2.1.3 Date of Test

04-May-2021

### 2.1.4 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

### 2.1.5 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

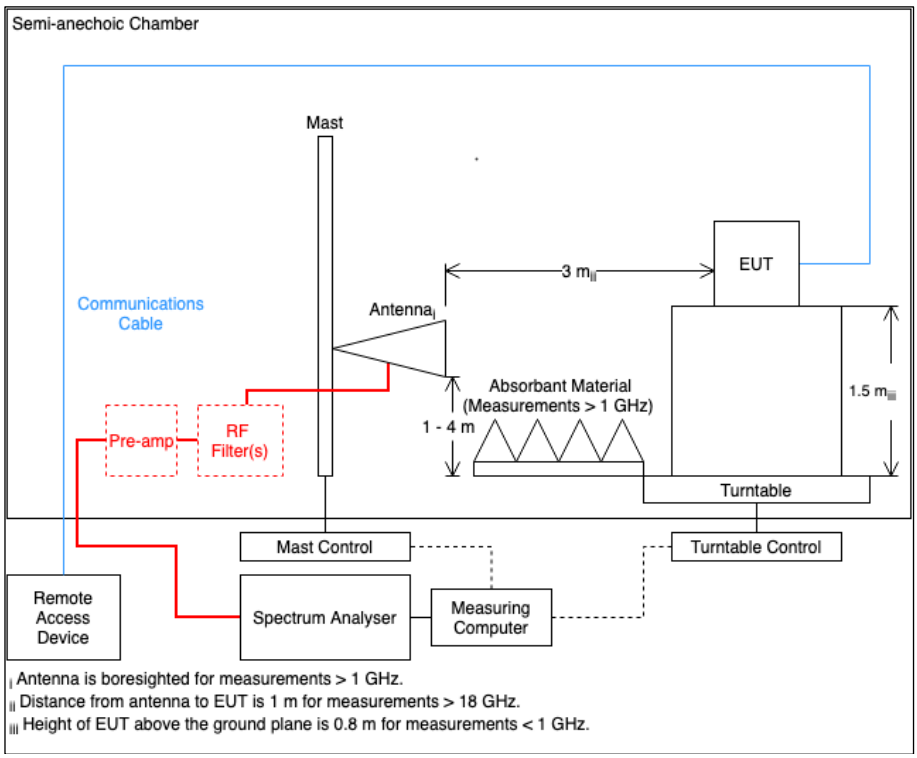


**Figure 1**

### 2.1.7 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 21.5 °C |
| Relative Humidity | 28.6 % |

### 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:**<br>Note 1. A Quasi-Peak detector is to be used for measurements below 1 GHz.<br>Note 2. A CISPR Average detector is to be used for measurements above 1 GHz.<br>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.**

**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

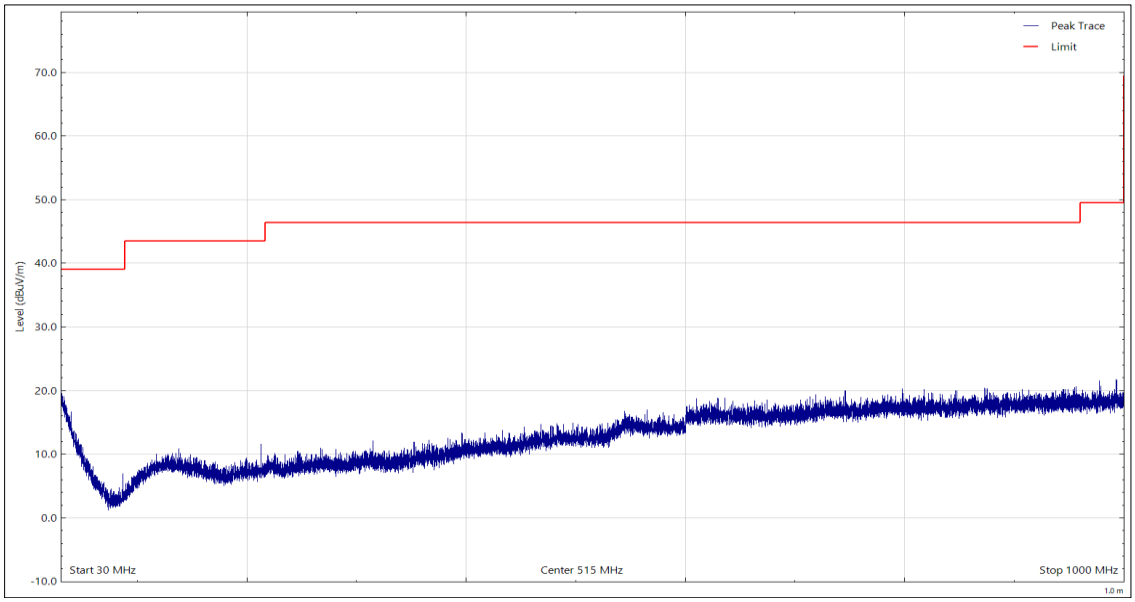


**Figure 2 - 30 MHz to 1 GHz, Quasi-Peak, Vertical**

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

**Table 9**

*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.

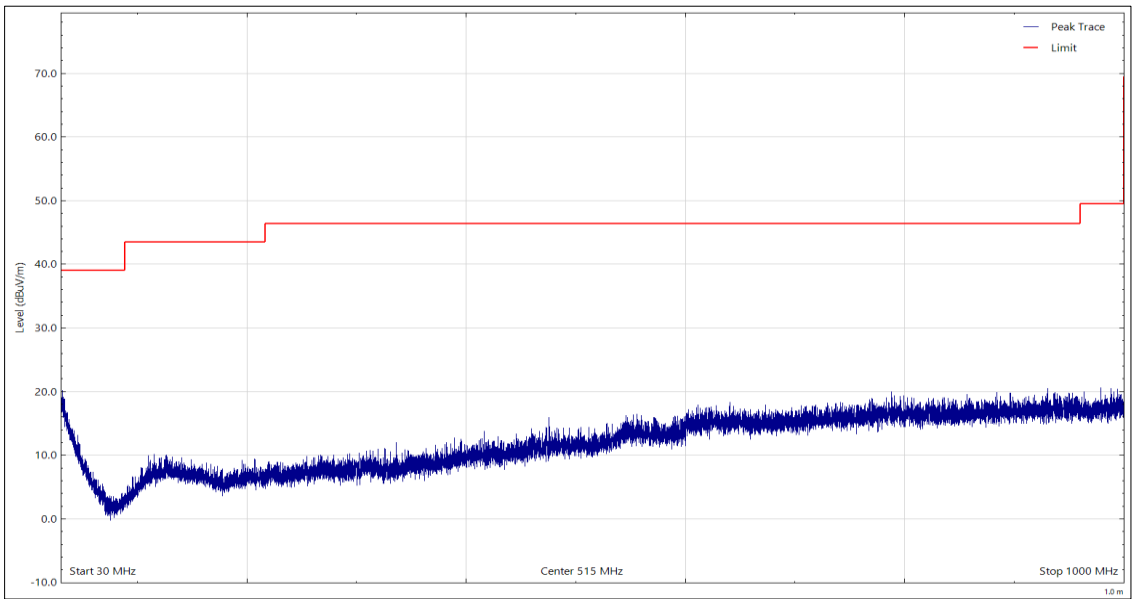


**Figure 3 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal**

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

**Table 10**

*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.

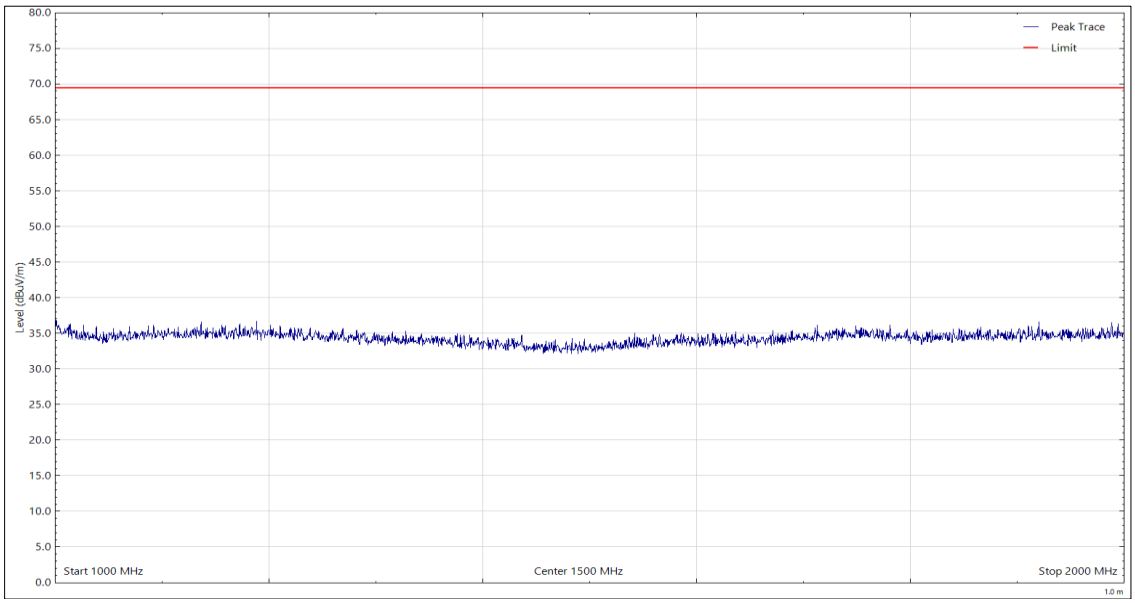


**Figure 4 - 1 GHz to 2 GHz, Peak, Vertical**

| 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.

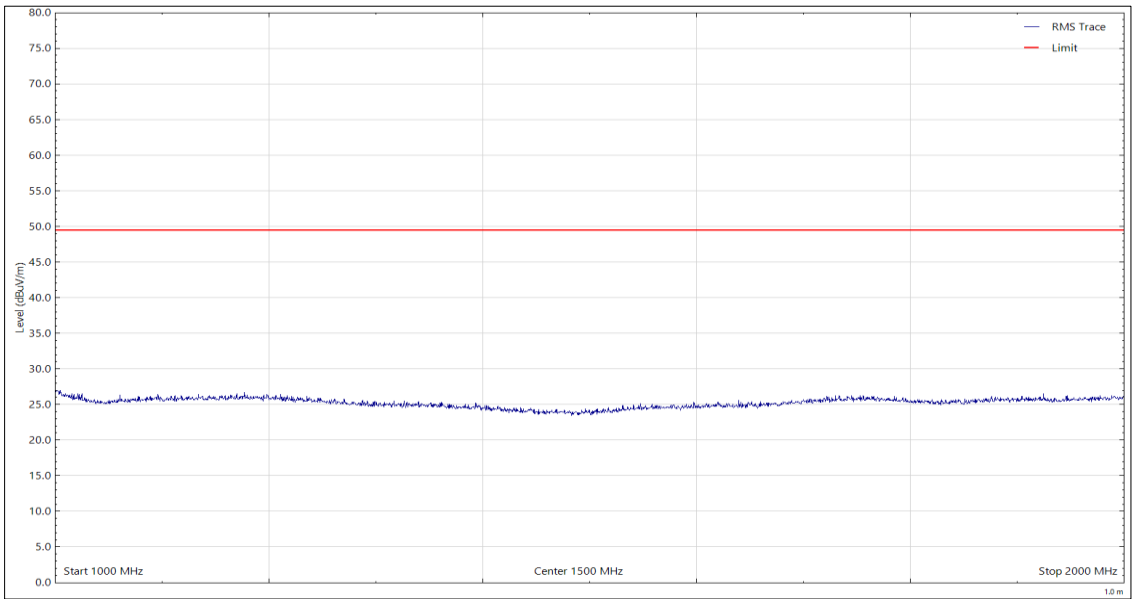


**Figure 5 - 1 GHz to 2 GHz, CISPR Average, Vertical**

| 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.

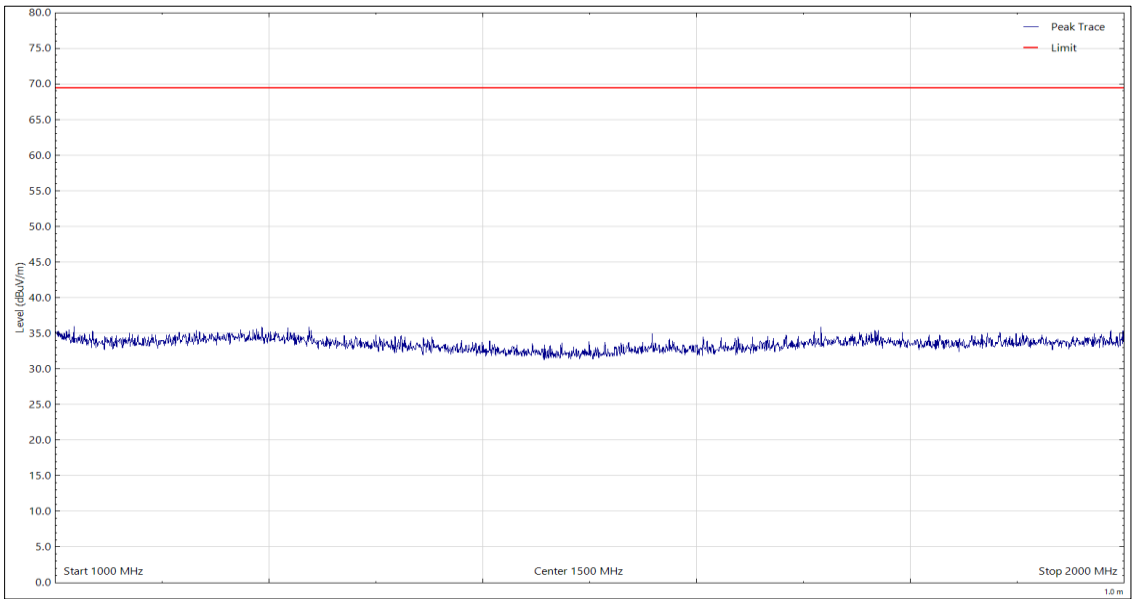


**Figure 6 - 1 GHz to 2 GHz, Peak, Horizontal**

| 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.

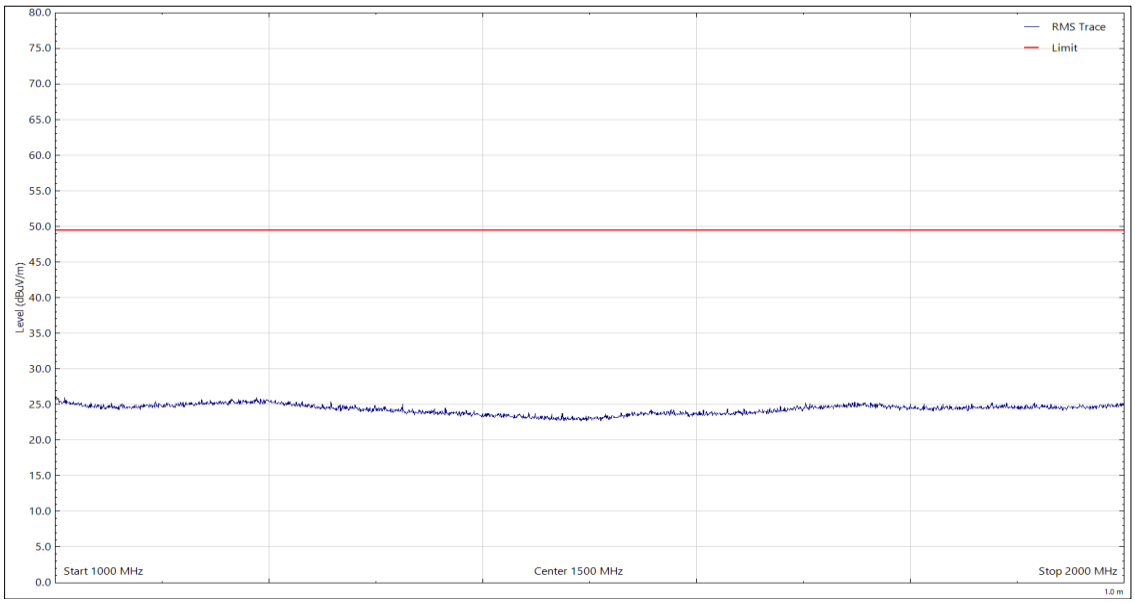


**Figure 7 - 1 GHz to 2 GHz, CISPR Average, Horizontal**

| 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.

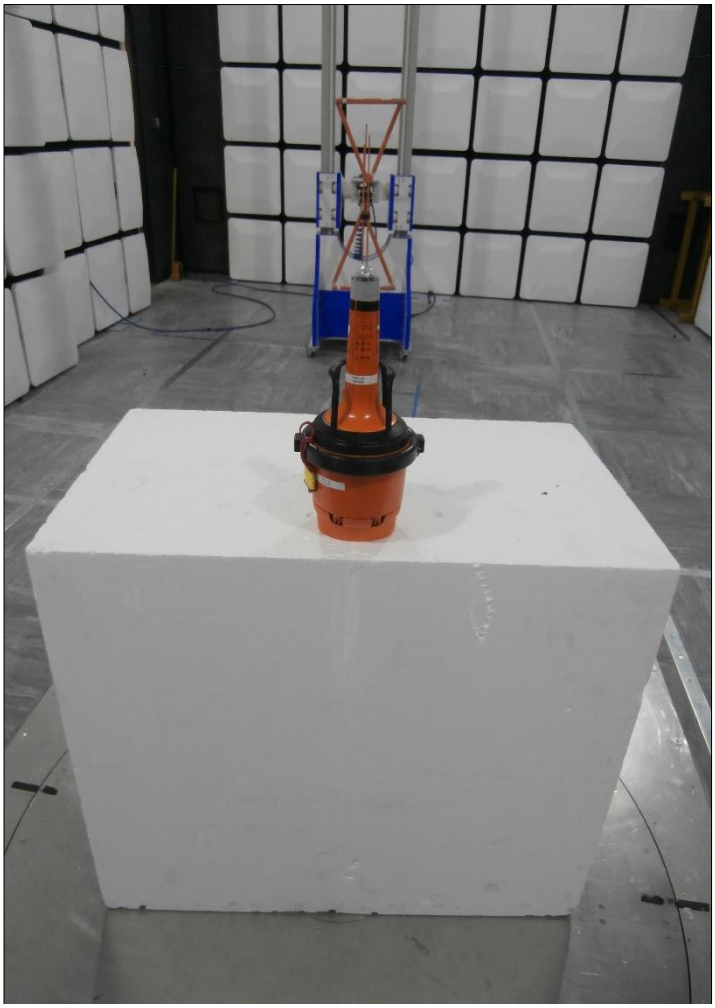

**Figure 8 - Test Setup - 30 MHz to 1 GHz**

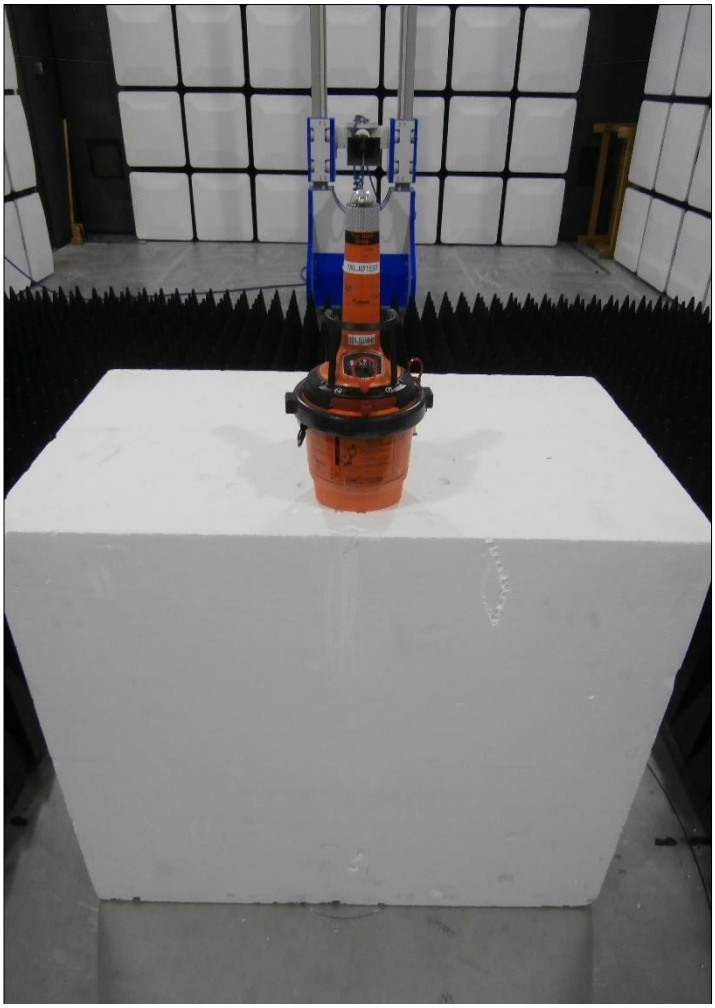

**Figure 9 - Test Setup - 1 GHz to 2 GHz**

### 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 | V2.1.6 | 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 Assembly - 18GHz 8m | Junkosha | MWX221-08000NMSNMS/B | 5732 | 6 | 05-Aug-2021 |
| 3.5 mm 2m Cable | Junkosha | MWX221-02000DMS | 5428 | 12 | 15-Oct-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 Due |
|---|---|---|---|---|---|
| Comb Generator | Schaffner | RSG1000 | 3034 | - | TU |
| Thermo-Hygro-Barometer | PCE Instruments | PCE-THB 40 | 5604 | 12 | 08-Sep-2021 |

**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<br>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.