# FCC Test Report

## ASH Wireless Electronics Ltd
## Remote Flood Level Monitoring Device, Model: Unit A Prime

## In accordance with FCC 47 CFR Part 15B

Prepared for: FloodFlash Limited
Shaftesbury Avenue
Southampton
SO17 1SB
United Kingdom

FCC ID: 2AUOD-FFAPCATM1US

## COMMERCIAL-IN-CONFIDENCE

Document 75952455-01 Issue 01

| SIGNATURE | | | |
|---|---|---|---|
| AJ Lawson. | | | |
| **NAME** | **JOB TITLE** | **RESPONSIBLE FOR** | **ISSUE DATE** |
| Andy Lawson | Senior Engineer | Authorised Signatory | 30 July 2021 |

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. The sample tested was found to comply with the requirements defined in the applied rules.

| RESPONSIBLE FOR | NAME | DATE | SIGNATURE |
|---|---|---|---|
| Testing | Graeme Lawler | 30 July 2021 | G. Lawler. |

FCC Accreditation
90987 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 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 | 30 July 2021 |

**Table 1**

## 1.2 Introduction

| | |
|---|---|
| Applicant | FloodFlash Limited |
| Manufacturer | ASH Wireless Electronics Ltd |
| Model Number(s) | Unit A Prime |
| Serial Number(s) | Not Serialised (Storix-ID FAR-585302-01) |
| Hardware Version(s) | B |
| Software Version(s) | SAMD21 microcontroller: \branches\tkt_284_fcc_test\target_mc.hex<br>and<br>LPC1768 microcontroller: AC44-S2001_Bugle_CC_v1.0.hex |
| Number of Samples Tested | 1 |
| Test Specification/Issue/Date | FCC 47 CFR Part 15B: 2019 |
| Order Number<br>Date | PO-002158<br>08-June-2021 |
| Date of Receipt of EUT | 12-July-2021 |
| Start of Test | 12-July-2021 |
| Finish of Test | 12-July-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 is shown below.

| Section | Specification Clause | Test Description | Result | Comments/Base Standard |
|---|---|---|---|---|
| Configuration and Mode: Battery Powered - Idle | | | | |
| 2.1 | 15.109 | Radiated Disturbance | Pass | ANSI C63.4: 2014 |

**Table 2**

## 1.4 Application Form

### Equipment Description

| | |
|---|---|
| Technical Description:<br>*(Please provide a brief description of the intended use of the equipment including the technologies the product supports)* | Remote flood level monitoring equipment using ultrasonic measurement technique and cellular communications. |
| Manufacturer: | Floodflash Ltd. |
| Model: | Unit A Prime |
| Part Number: | FF-GA-002 |
| Hardware Version: | B |
| Software Version: | SAMD21 microcontroller: \branches\tkt_284_fcc_test\target_mc.hex<br>and<br>LPC1768 microcontroller: AC44-S2001_Bugle_CC_v1.0.hex |
| FCC ID of the product under test – see guidance here | 2AUOD-FFAPCATM1US |
| IC ID of the product under test – see guidance here | Not Applicable |

### Intentional Radiators

| Technology | GSM 850 | GSM 1900 | LTE Cat M1 Band 2 | LTE Cat M1 Band 4 | LTE Cat M1 Band 5 | LTE Cat M1 Band 12 | LTE Cat M1 Band 13 |
|---|---|---|---|---|---|---|---|
| Frequency Range (MHz to MHz) | 824.2 - 848.8 | 1850.2 – 1909.8 | 1850 - 1910 | 1710-1755 | 824-849 | 699 - 716 | 777-787 |
| Conducted Declared Output Power (dBm) | 33 | 30 | 24 | 24 | 24 | 24 | 24 |
| Antenna Gain (dBi) | 1.2 | 4.1 | 4.1 | 4.1 | 1.2 | 1.2 | 1.2 |
| Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz) | 0.2 | 0.2 | 1.4, 3, 5, 10, 15, 20 | 1.4, 3, 5, 10, 15, 20 | 1.4, 3, 5, 10 | 1.4, 3, 5, 10 | 5, 10 |
| Modulation Scheme(s) (e.g. GFSK, QPSK etc) | GMSK | GMSK | QPSK, 16QAM | QPSK, 16QAM | QPSK, 16QAM | QPSK, 16QAM | QPSK, 16QAM |
| ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices) | 200KGD | 200KGD | 1M40GD<br>3M00GD<br>5M00GD<br>10M0GD<br>15M0GD<br>20M0GD | 1M40GD<br>3M00GD<br>5M00GD<br>10M0GD<br>15M0GD<br>20M0GD | 1M40GD<br>3M00GD<br>5M00GD<br>10M0GD | 1M40GD<br>3M00GD<br>5M00GD<br>10M0GD | 5M00GD<br>10M0GD |
| Bottom Frequency (MHz) | 824.2 | 1850.2 | 1850.7 | 1710.7 | 824.7 | 699.7 | 779.5 |
| Middle Frequency (MHz) | 836.6 | 1880.0 | 1880.0 | 1747.5 | 836.5 | 707.5 | 782.0 |
| Top Frequency (MHz) | 848.8 | 1909.8 | 1909.3 | 1754.3 | 848.3 | 716.3 | 784.5 |

## Un-intentional Radiators

| | |
|---|---|
| Highest frequency generated or used in the device or on which the device operates or tunes | 2155 MHz |
| Lowest frequency generated or used in the device or on which the device operates or tunes | 40 kHz |
| Class A Digital Device (Use in commercial, industrial or business environment) ☒<br>Class B Digital Device (Use in residential environment only) ☐ | |

## Battery Power Source

| | | |
|---|---|---|
| Voltage: | 3.6 | V |
| End-point voltage: | 3.2 | V *(Point at which the battery will terminate)* |
| Alkaline ☐ Leclanche ☐ Lithium ☐ Nickel Cadmium ☐ Lead Acid* ☐ **(Vehicle regulated)* | | |
| Other ☒ Please detail: | Lithium thionyl chloride primary cell | |

## Charging

| | |
|---|---|
| Can the EUT transmit whilst being charged | Yes ☐ No ☒ |

## Temperature

| | | |
|---|---|---|
| Minimum temperature: | -40 | °C |
| Maximum temperature: | +40 | °C |

## Cable Loss

| | | |
|---|---|---|
| Adapter Cable Loss (Conducted sample) | No cables | dB |

## Antenna Characteristics

| | | | | | |
|---|---|---|---|---|---|
| Antenna connector ☐ | | | State impedance | | Ohm |
| Temporary antenna connector ☐ | | | State impedance | | Ohm |
| Integral antenna ☒ | Type: | 2JE18 | Gain | 4.1 | dBi |
| External antenna ☐ | Type: | | Gain | | dBi |
| For external antenna only:<br>Standard Antenna Jack ☐ If yes, describe how user is prohibited from changing antenna (if not professional installed):<br>Equipment is only ever professionally installed ☐<br>Non-standard Antenna Jack ☐ | | | | | |

## Ancillaries (if applicable)

| | | | |
|---|---|---|---|
| Manufacturer: | | Part Number: | |
| Model: | | Country of Origin: | |

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

Name: Richard Clifford-Smith
Position held: Chief Hardware Engineer
Date: 21 July 2021

## 1.5 Product Information

### 1.5.1 Technical Description

The equipment under test (EUT) was a remote flood level monitoring equipment that utilises ultrasonic measurement technique and cellular communications.

### 1.5.2 EUT Port/Cable Identification

| Port | Max Cable Length specified | Usage | Type | Screened |
|---|---|---|---|---|
| - | - | - | - | - |

**Table 3**

NOTE: The equipment under test does not have any external ports.

### 1.5.3 Test Configuration

| Configuration | Description |
|---|---|
| Battery Powered | The EUT was powered from its internal battery. |

**Table 4**

### 1.5.4 Modes of Operation

| Mode | Description |
|---|---|
| Idle | The SIM card for cellular communications was removed to disable transmissions from the cellular radio. All other processes were active. The EUT emits an audible sound to confirm operation. |

**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: Unit A Prime, Serial Number: Not Serialised (Storix-ID FAR-585302-01) | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |

**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 | | |
| 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

### 2.1.2 Equipment Under Test and Modification State

Unit A Prime, S/N: Not Serialised (Storix-ID FAR-585302-01) - Modification State 0

### 2.1.3 Date of Test

12-July-2021

### 2.1.4 Test Method

The EUT was set up on a non-conductive 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

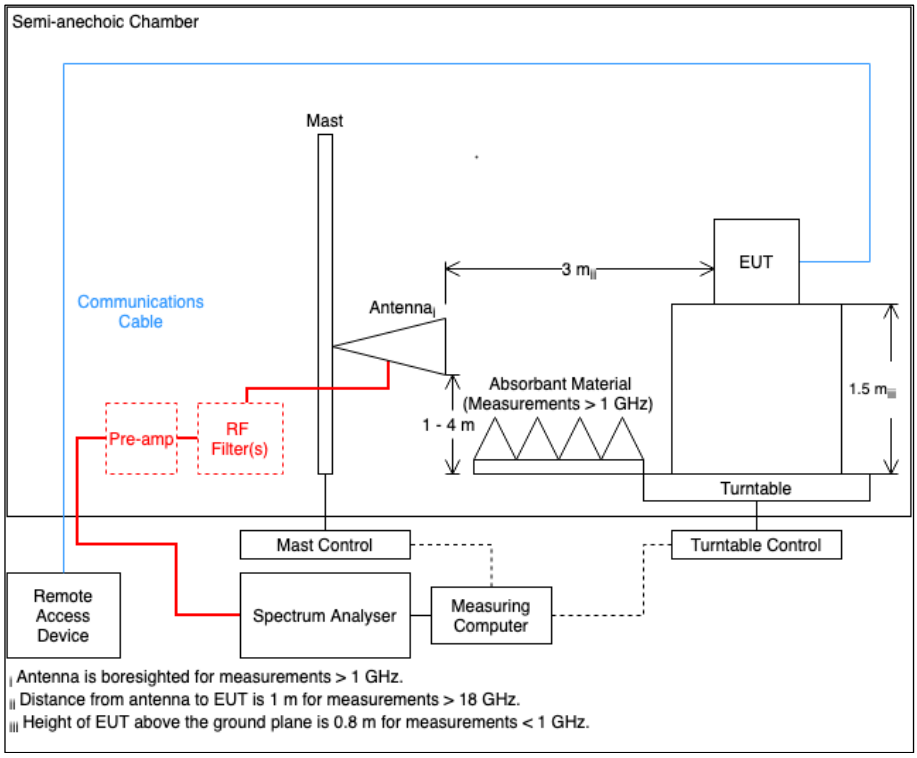


**Figure 1**

### 2.1.7 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 19.8 °C |
| Relative Humidity | 73.6 % |

### 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.**

**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: 2155 MHz
Which necessitates an upper frequency test limit of: 10.775 GHz

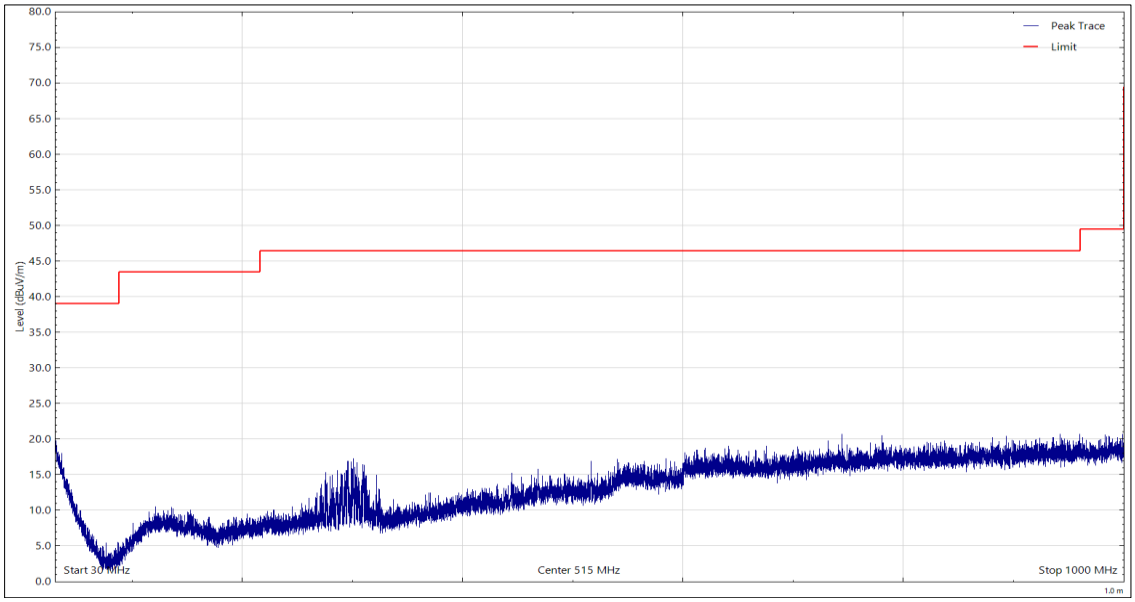


**Figure 2 - 30 MHz to 1 GHz, Quasi-Peak, Vertical**

| 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.

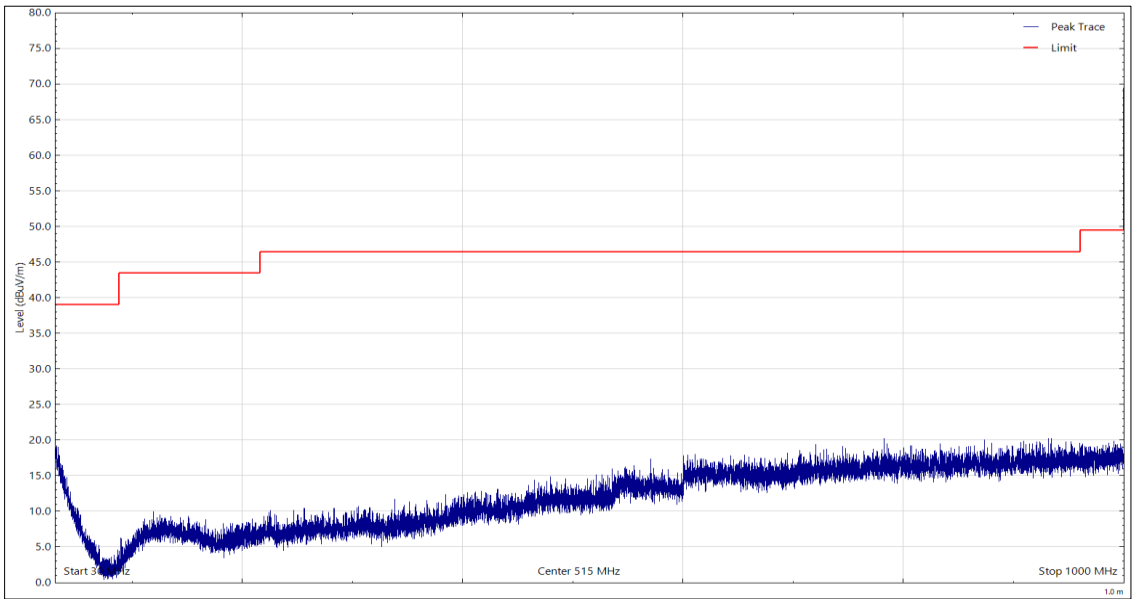


**Figure 3 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal**

| 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.

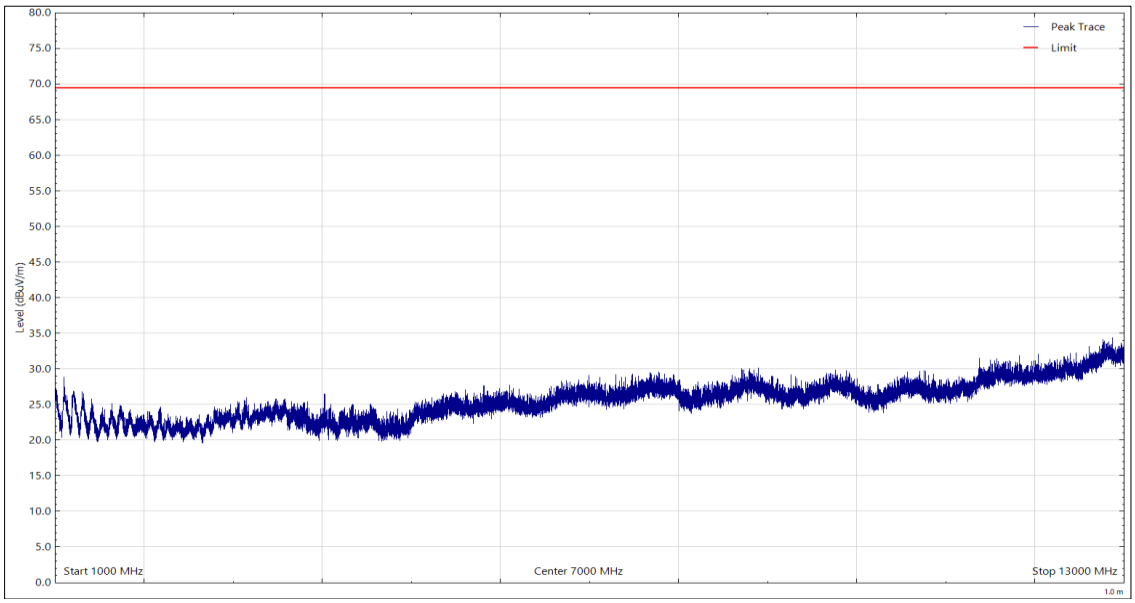


**Figure 4 - 1 GHz to 13 GHz, Peak, Vertical**

| 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.

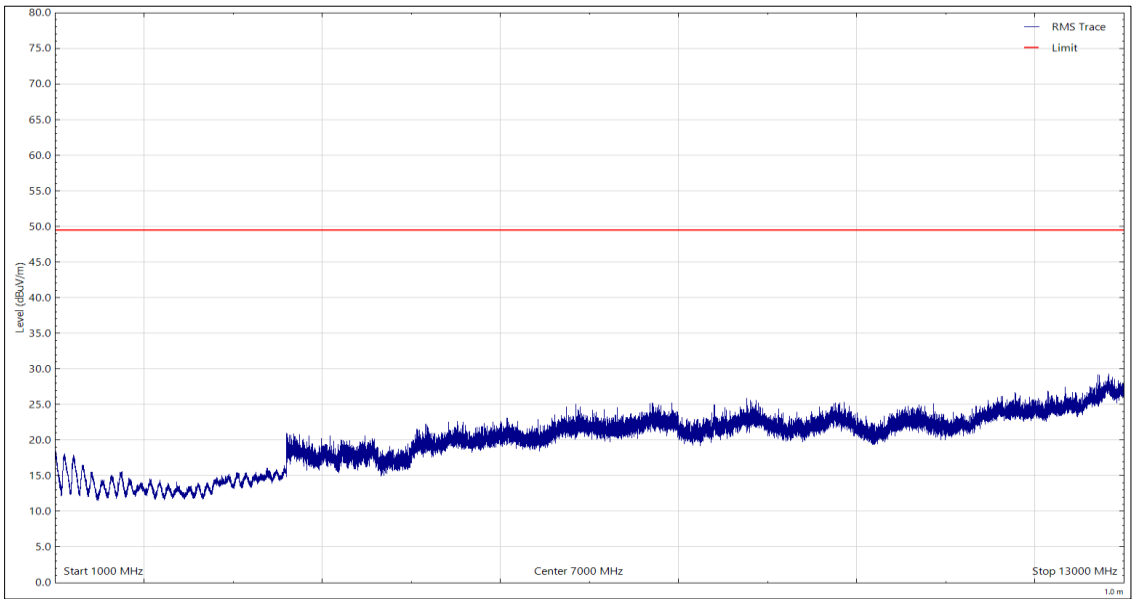


**Figure 5 - 1 GHz to 13 GHz, CISPR Average, Vertical**

| 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.

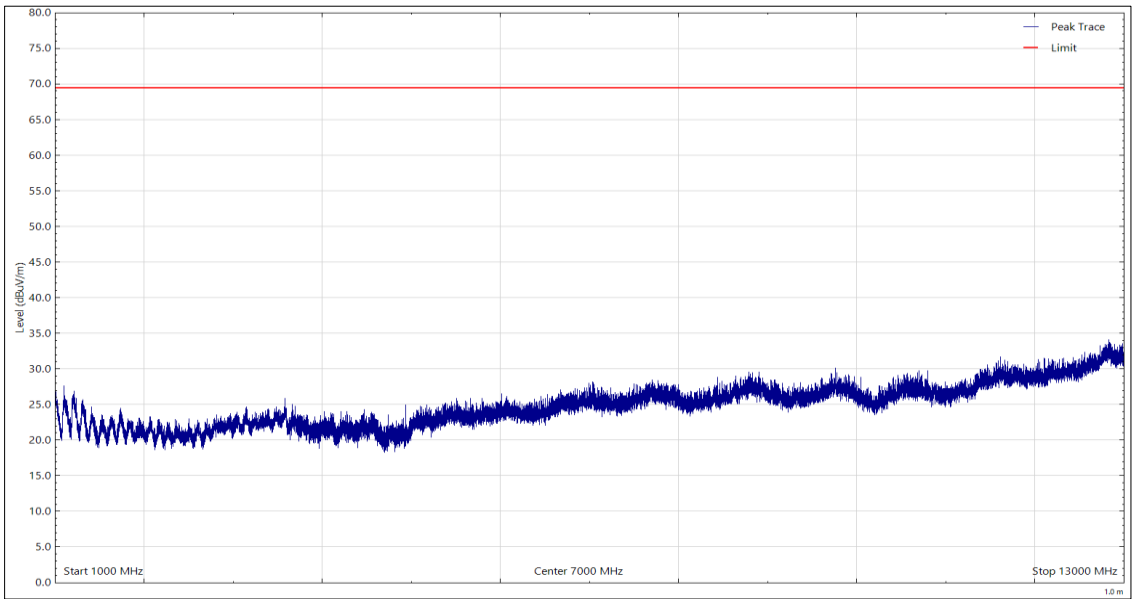


**Figure 6 - 1 GHz to 13 GHz, Peak, Horizontal**

| 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.

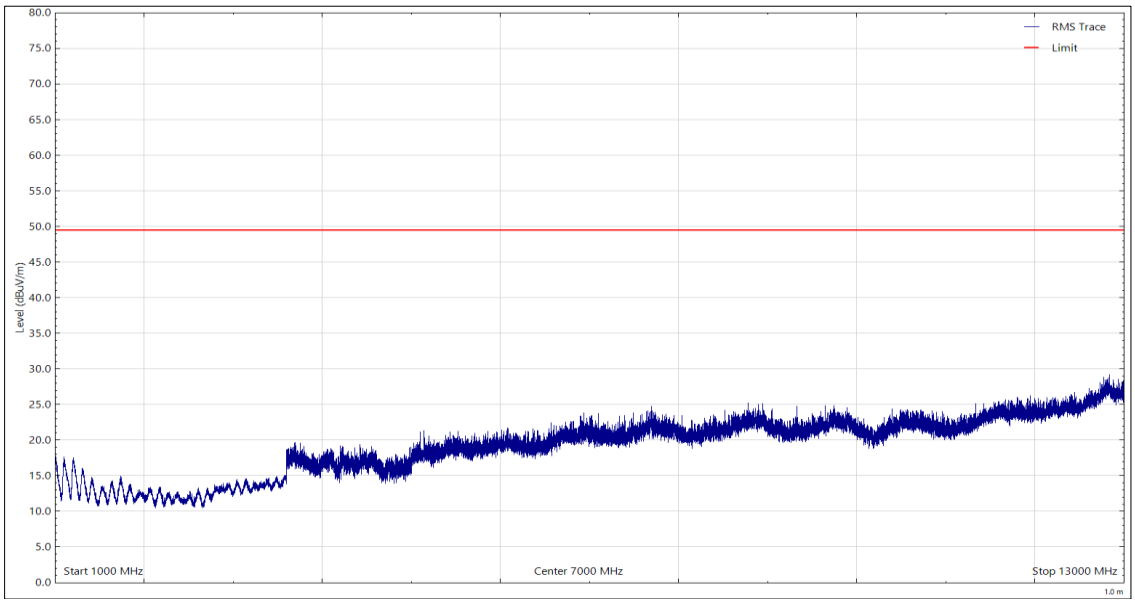


**Figure 7 - 1 GHz to 13 GHz, CISPR Average, Horizontal**

| 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.

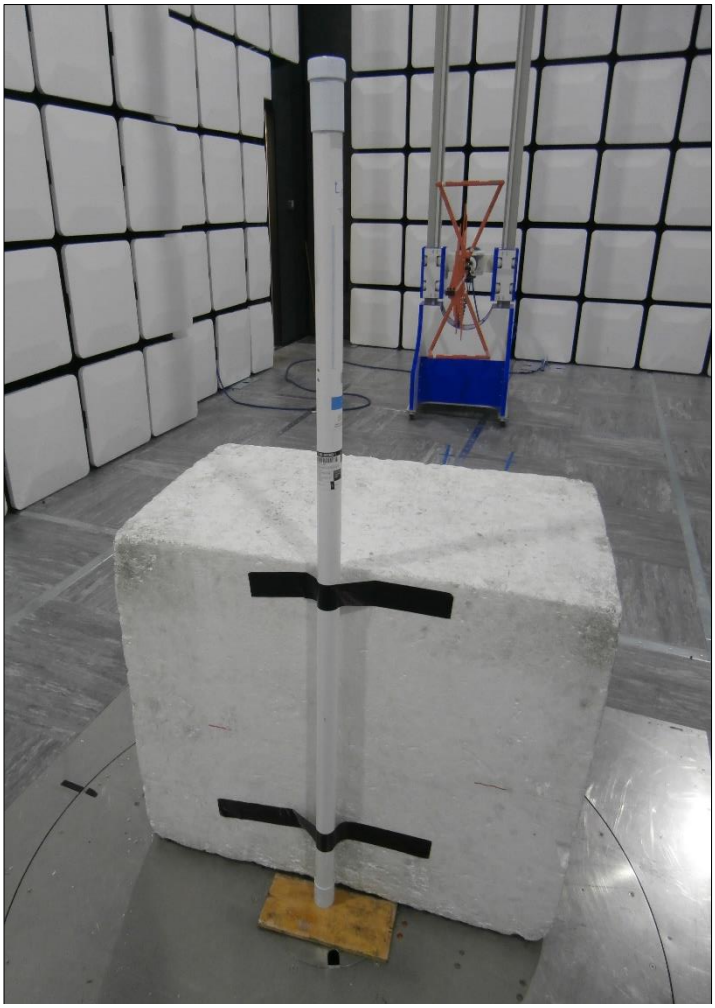

**Figure 8 - Test Setup - 30 MHz to 1 GHz**

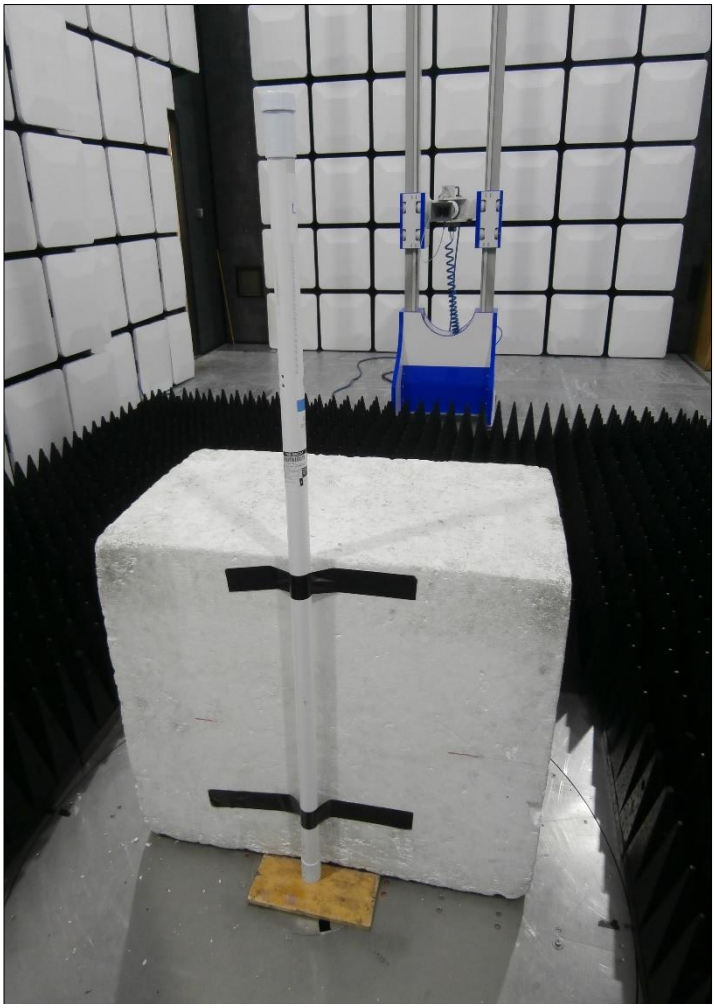

**Figure 9 - Test Setup - 1 GHz to 13 GHz**

### 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 | V2.1.10 | 5125 | - | Software |
| EMI Test Receiver | Rohde & Schwarz | ESU40 | 3506 | 12 | 18-Mar-2022 |
| 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 |
| Turntable & Mast Controller | Maturo Gmbh | NCD/498/2799.01 | 5612 | - | TU |
| Cable (18 GHz) | Rosenberger | LU7-036-1000 | 5031 | 12 | 22-Jul-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 |
| DRG Horn Antenna (7.5-18GHz) | Schwarzbeck | HWRD750 | 5610 | 12 | 22-Sep-2021 |
| 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 | 5481 | 12 | 31-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<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.