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.C.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 and 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 Date	PO-002158 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: *(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 and 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 3M00GD 5M00GD 10M0GD 15M0GD 20M0GD	1M40GD 3M00GD 5M00GD 10M0GD 15M0GD 20M0GD	1M40GD 3M00GD 5M00GD 10M0GD	1M40GD 3M00GD 5M00GD 10M0GD	5M00GD 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) ☒ 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: Standard Antenna Jack ☐ If yes, describe how user is prohibited from changing antenna (if not professional installed): Equipment is only ever professionally installed ☐ 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

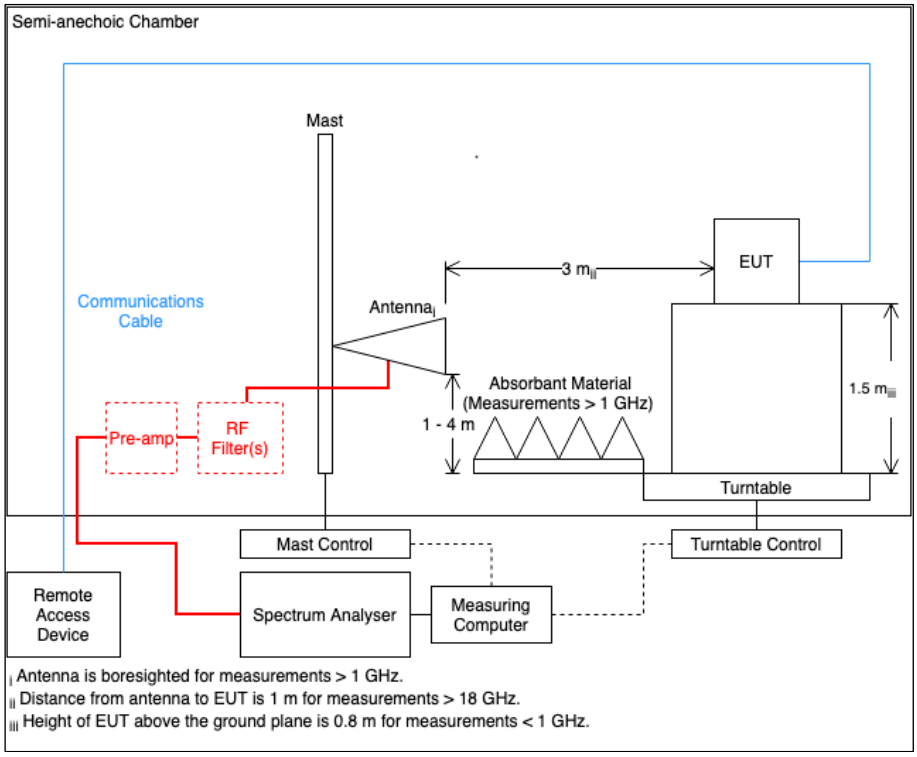

Figure 1

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: 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.

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

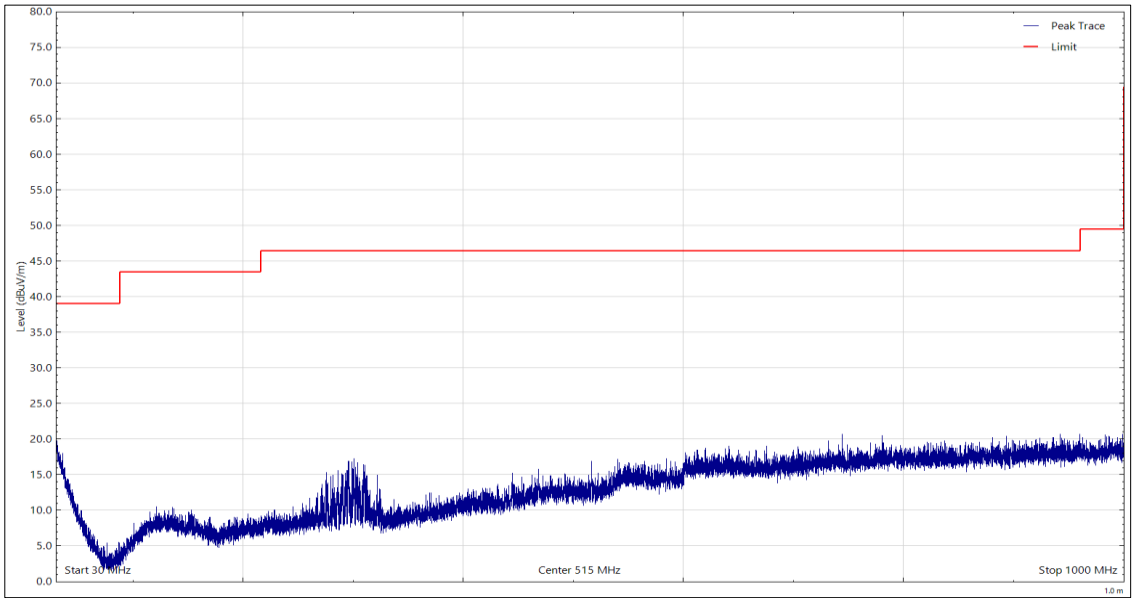

Figure 2 - 30 MHz to 1 GHz, Quasi-Peak, Vertical

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.

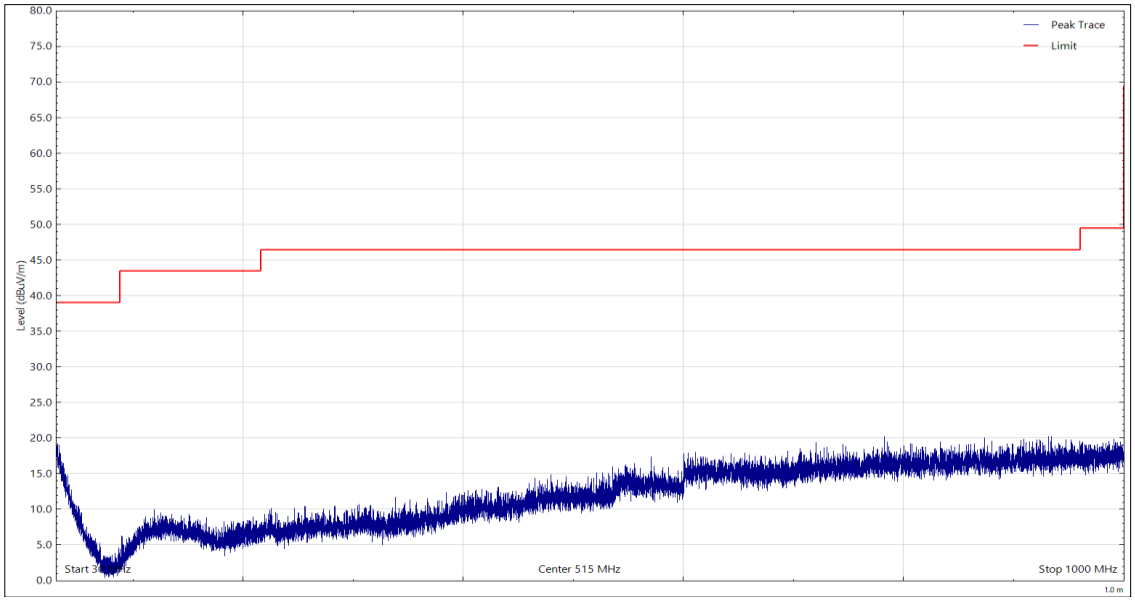

Figure 3 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal

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.

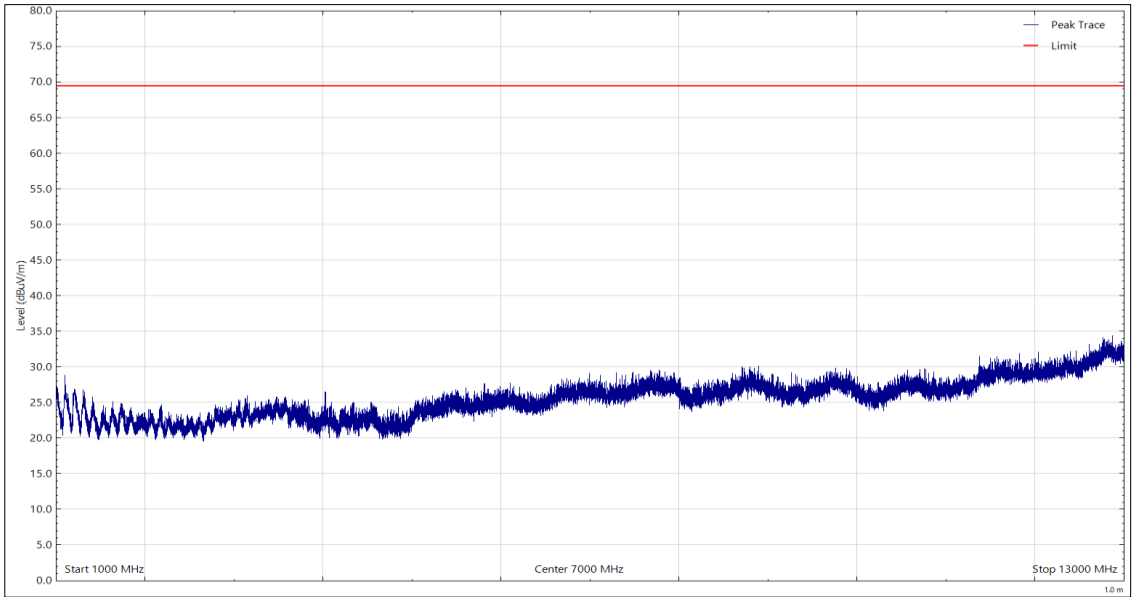

Figure 4 - 1 GHz to 13 GHz, Peak, Vertical

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.

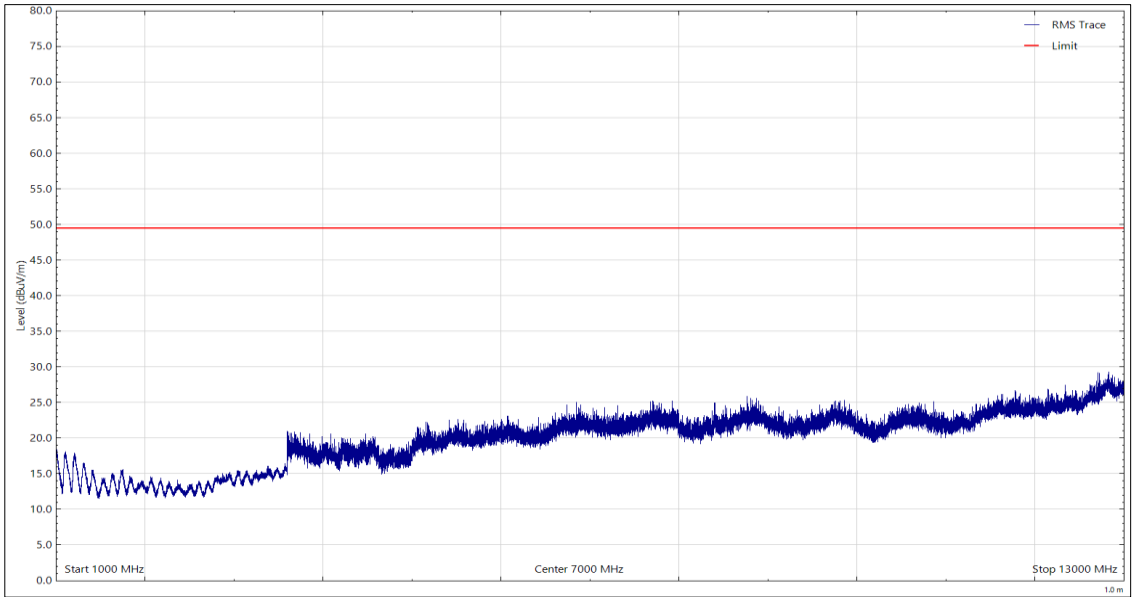

Figure 5 - 1 GHz to 13 GHz, CISPR Average, Vertical

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.

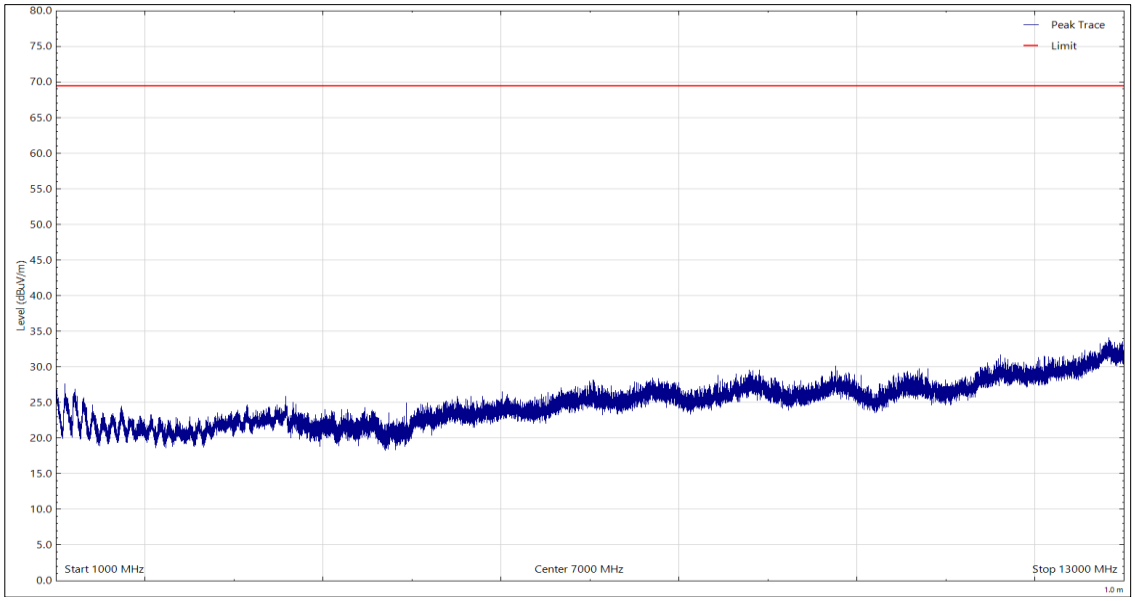

Figure 6 - 1 GHz to 13 GHz, Peak, Horizontal

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.

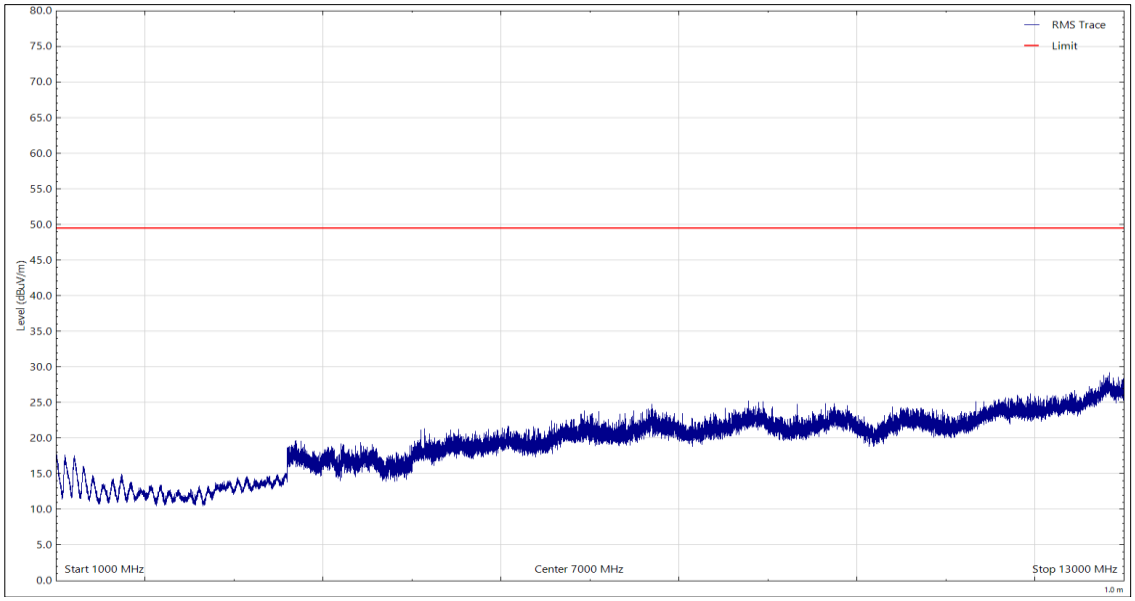

Figure 7 - 1 GHz to 13 GHz, CISPR Average, Horizontal

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.

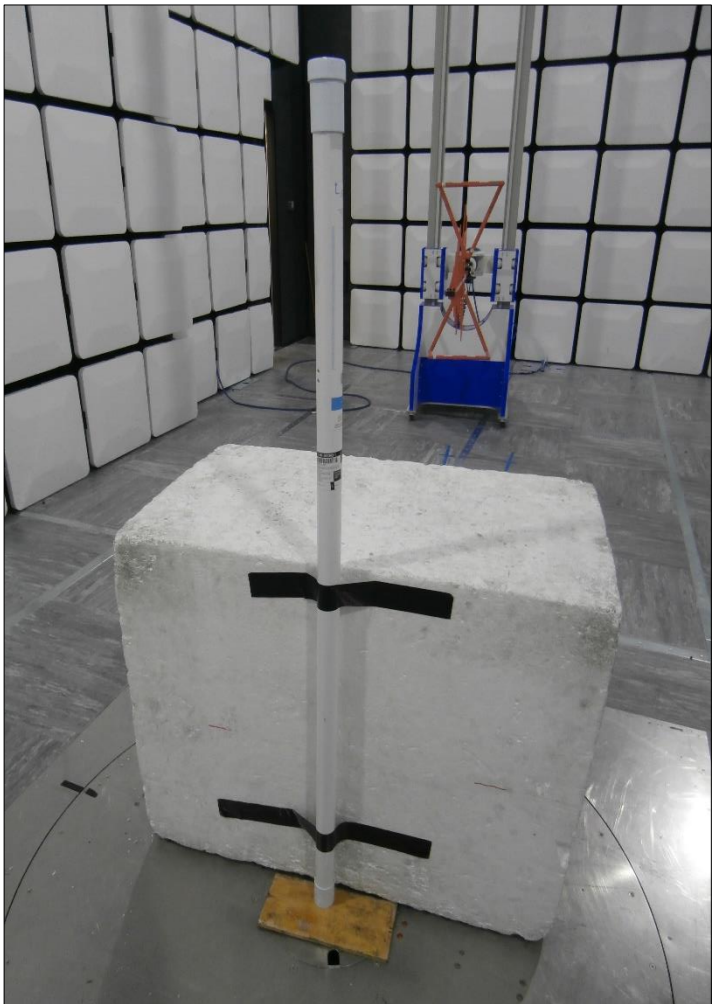

Figure 8 - Test Setup - 30 MHz to 1 GHz

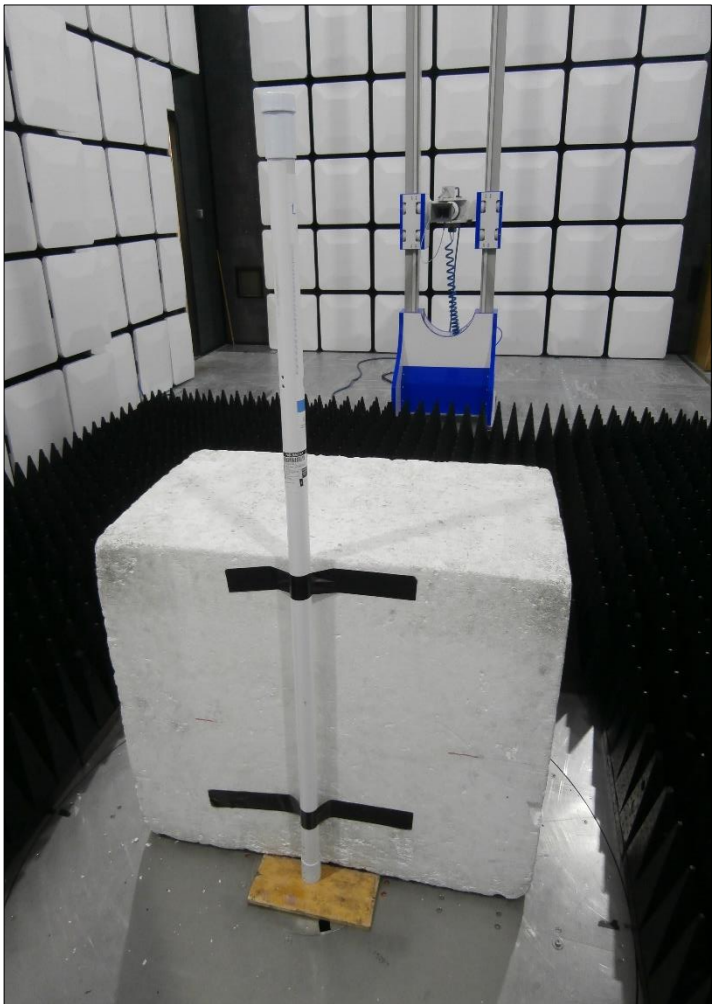

Figure 9 - Test Setup - 1 GHz to 13 GHz

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 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.