

FCC Test Report

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

In accordance with FCC 47 CFR Part 27 and
FCC 47 CFR Part 2 (4G - LTE Cat M1)

Prepared for: ASH Wireless Electronics Ltd
Shaftesbury Avenue
Southampton
SO17 1SB
United Kingdom



Add value.
Inspire trust.

FCC ID: 2AUOD-FFAPCATM1US

COMMERCIAL-IN-CONFIDENCE

Document 75952455-04 Issue 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Steve Marshall	Senior Engineer	Authorised Signatory	28 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 27 and FCC 47 CFR Part 2. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Graeme Lawler	28 July 2021	

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 27: 2019 and FCC 47 CFR Part 2: 2019 for the tests detailed in section 1.3.



DISCLAIMER AND COPYRIGHT

This non-binding report has been prepared by TÜV SÜD with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD. No part of this document may be reproduced without the prior written approval of TÜV SÜD. © 2021 TÜV SÜD. This report relates only to the actual item/items tested.

ACCREDITATION

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation. Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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

TÜV SÜD 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	2
1.1	Report Modification Record.....	2
1.2	Introduction.....	2
1.3	Brief Summary of Results	3
1.4	Application Form	4
1.5	Product Information	6
1.6	Deviations from the Standard.....	6
1.7	EUT Modification Record	6
1.8	Test Location	6
2	Test Details	7
2.1	Radiated Spurious Emissions	7
3	Measurement Uncertainty	13



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	28-July-2021

Table 1

1.2 Introduction

Applicant	ASH Wireless Electronics Ltd
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: bugle_cc_v1.1_interim_fcc_test_release
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 27: 2019 FCC 47 CFR Part 2: 2019
Order Number	PO-002158
Date	08-June-2021
Date of Receipt of EUT	12-July-2021
Start of Test	18-July-2021
Finish of Test	18-July-2021
Name of Engineer(s)	Graeme Lawler
Related Document(s)	ANSI C63.26: 2015 KDB 996369 D04 Module Integration Guide v02



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 27 and FCC 47 CFR Part 2 is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 27	Part 2			
Configuration and Mode: LTE FDD Band 12					
2.1	27.53	2.1053	Radiated Spurious Emissions	Pass	Emission measurements as per KDB 996369 D04, clause 3.4 only. ANSI C63.26: 2015.

Table 2



1.4 Application Form

Equipment Description

Technical Description: <i>(Please provide a brief description of the intended use of the equipment including the technologies the product supports)</i>	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: bugle_cc_v1.1_interim_fcc_test_release	
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) <input checked="" type="checkbox"/>	
Class B Digital Device (Use in residential environment only) <input type="checkbox"/>	

Battery Power Source

Voltage:	3.6	V
End-point voltage:	3.2	V (Point at which the battery will terminate)
Alkaline <input type="checkbox"/> Leclanche <input type="checkbox"/> Lithium <input type="checkbox"/> Nickel Cadmium <input type="checkbox"/> Lead Acid* <input type="checkbox"/> *(Vehicle regulated)		
Other <input checked="" type="checkbox"/>	Please detail:	Lithium thionyl chloride primary cell

Charging

Can the EUT transmit whilst being charged	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
---	---

Temperature

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

Cable Loss

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

Antenna Characteristics

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

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

Remote flood level monitoring equipment using ultrasonic measurement technique and cellular communications.

1.5.2 EUT Configuration and Rationale for Radiated Spurious Emissions

The EUT was placed on the non-conducting platform in a manner typical of a normal installation.

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
1	Customer supplied a new PCB with updated software version: "bugle_cc_v1.1_interim_fcc_test_release (extra bands enabled)" for testing against LTE Bands.	Graeme Lawler	18-July-2021

Table 3

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: LTE FDD Band 12		
Radiated Spurious Emissions	Graeme Lawler	UKAS

Table 4

Office Address:

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



2 Test Details

2.1 Radiated Spurious Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.53
FCC 47 CFR Part 2, Clause 2.1053

2.1.2 Equipment Under Test and Modification State

Unit A Prime, S/N: Not Serialised (Storix-ID FAR-585302-01) - Modification State 1

2.1.3 Date of Test

18-July-2021

2.1.4 Test Method

A preliminary profile of the Radiated Spurious Emissions was obtained up to the 5th harmonic by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber.

Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Testing was performed in accordance with ANSI C63.26, Clause 5.5.

Prescans and final measurements were performed using the direct field strength method.

Field strength measurements were performed and then converted to Equivalent Power Measurements in accordance with ANSI C63.26, Clause 5.2.7 equation c)

Example calculation

$E \text{ (dBuV/m)} + 20\log(d) - 104.8 = \text{EIRP (dBm)}$ where (d) is the measurement distance.

$82.2 + 20\log(3) - 104.8 = \text{EIRP (dBm)}$

$-13.0 = \text{EIRP (dBm)}$

2.1.5 Example Test Setup Diagram

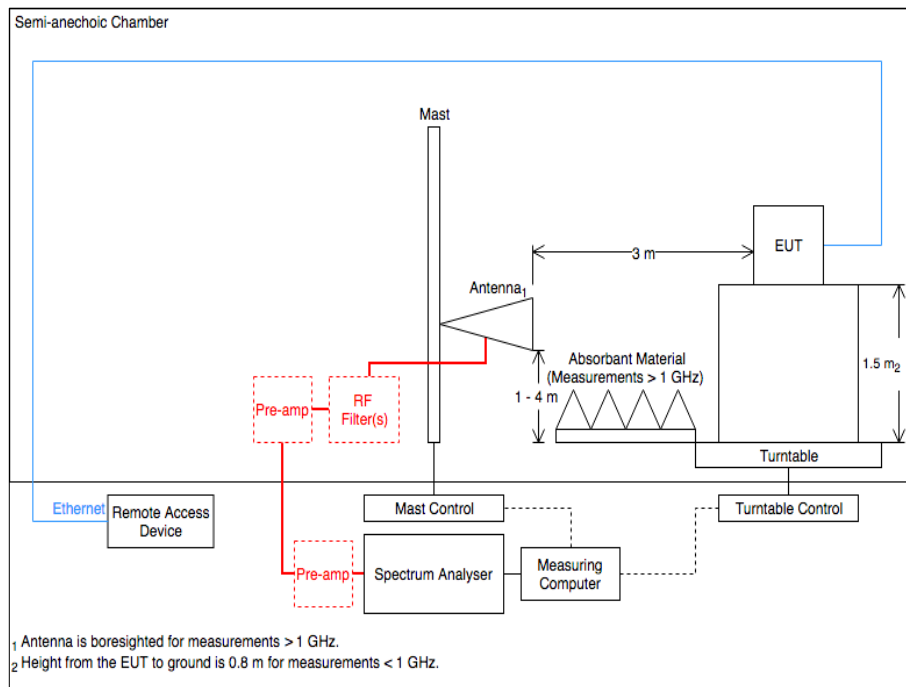


Figure 1

2.1.6 Environmental Conditions

Ambient Temperature 20.7 °C
Relative Humidity 66.8 %



2.1.7 Test Results

LTE FDD Band 12

Frequency (MHz)	Level (dBm)	Angle	Height	Polarisation	Orientation
*					

Table 5 - Radiated Emissions Results

*No emissions were detected within 10 dB of the limit.

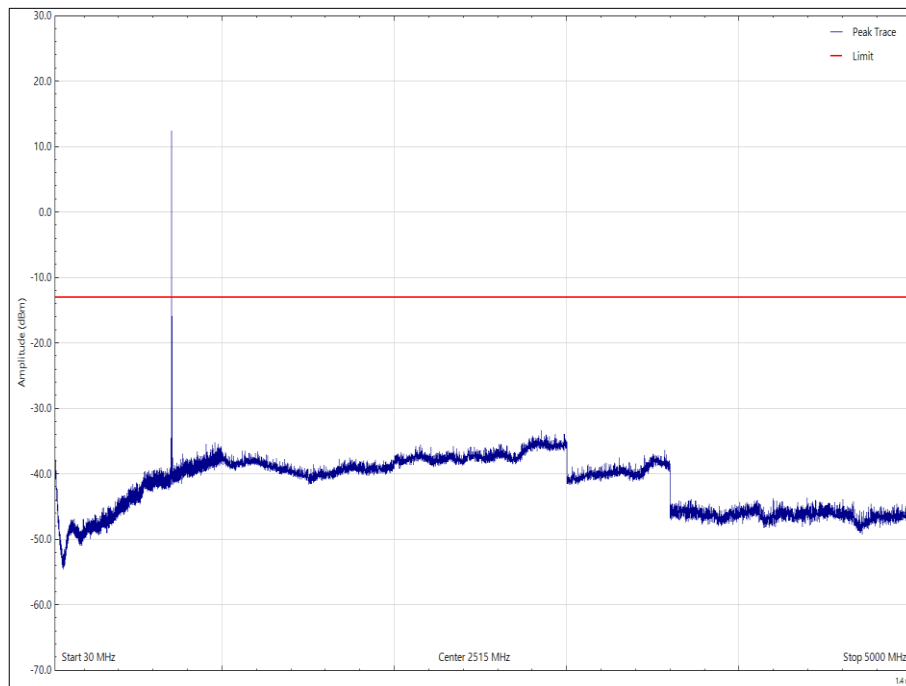


Figure 2 - 30 MHz to 5 GHz, Horizontal

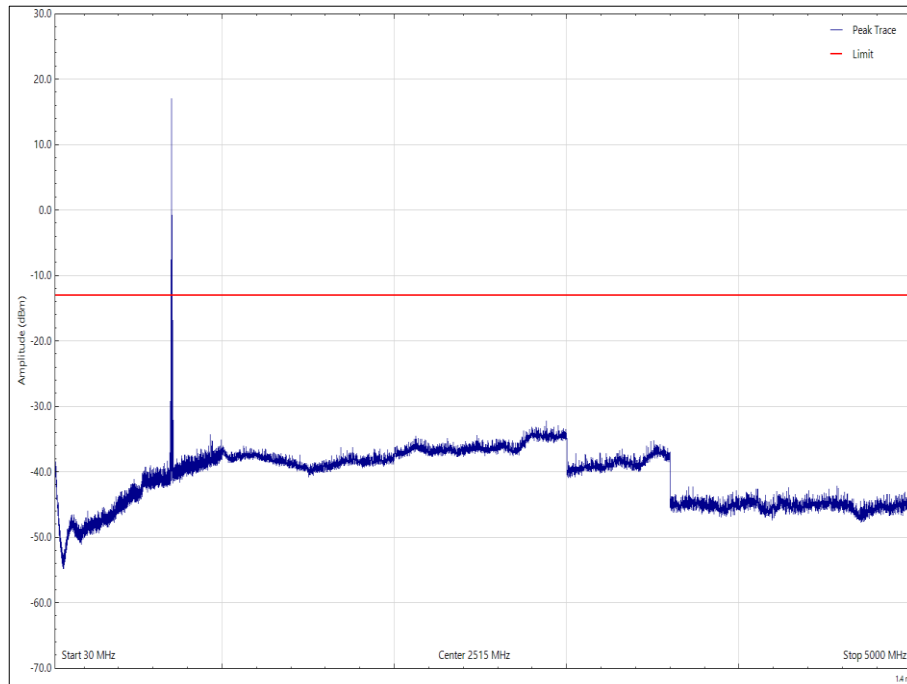


Figure 3 - 30 MHz to 5 GHz, Vertical

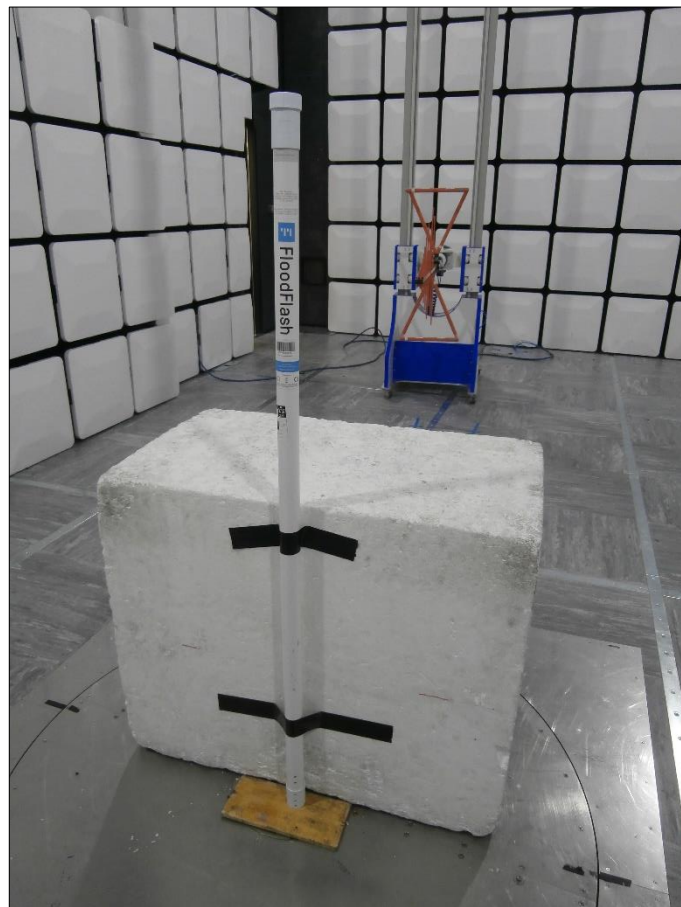


Figure 4 - Test Setup - 30 MHz to 1 GHz



Figure 5 - Test Setup - 1 GHz to 5 GHz

FCC 47 CFR Part 27, Limit Clause 27.53

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.



2.1.8 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
Antenna with permanent attenuator (Bilog)	Schaffner	CBL6143	287	24	14-Oct-2022
Comb Generator	Schaffner	RSG1000	3034	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	18-Mar-2022
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	10-Feb-2022
EmX Emissions Software	TUV SUD	V2.1.10 V.V2.1.10	5125	-	N/A - Software
3.5 mm 2m Cable	Junkosha	MWX221-02000DMS	5428	12	15-Oct-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	31-Mar-2022
3 GHz High pass Filter	Wainwright	WHKX12-2580-3000-18000-80SS	5548	12	7-May-2022
Broadband Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	22-Sep-2021
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
3m Semi Anechoic Chamber	MVG	EMC-3	5621	36	11-Aug-2023
Cable Assembly - 18GHz 8m	Junkosha	MWX221-08000NMSNMS/B	5732	6	5-Aug-2021

Table 6

TU – Traceability Unscheduled



3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Radiated Spurious Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 7

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.