FCC Test Report:

MiX Telematics International (Pty) Ltd
Telematics Unit, Model: MiX 44MC-3G-B

In accordance with FCC 47 CFR Part 15B

Prepared for: Mix Telematics Europe Ltd
Cherry Orchard North
Kembrey Park
Swindon
SN2 8UH
United Kingdom

FCC ID: 2AFMS-44MC3G

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COMMERCIAL-IN-CONFIDENCE

Document Number: 75947039-02 | Issue: 02

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
John Laydon	General Manager	Authorised Signatory	13 December 2019

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	Callum Smith	13 December 2019	

FCC Accreditation
217472 Bearley Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B: 2018 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	22 November 2019
2	To remove references to ICES-003 and include FCC ID	13 December 2019

Table 1

1.2 Introduction

Applicant	Mix Telematics Europe Ltd
Manufacturer	MiX Telematics International (Pty) Ltd
Model Number(s)	MiX 44MC-3G-B
Serial Number(s)	51000125
Hardware Version(s)	1
Software Version(s)	4.4.7
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2018
Order Number Date	P0092481 13-September-2019
Date of Receipt of EUT	21-October-2019
Start of Test	21-October-2019
Finish of Test	21-October-2019
Name of Engineer(s)	Callum Smith
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: DC Powered - idle and GNSS Receiver				
2.1	15.109	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2

1.4 Declaration of Build Status

MAIN EUT	
MANUFACTURING DESCRIPTION	Vehicle Tracking Fleet Management
MANUFACTURER	MiX Telematics International (Pty) Ltd
MODEL NAME/NUMBER	MiX 44MC-3G; MiX 44MC-3G-B
PART NUMBER	U0032MT; U0034MT
SERIAL NUMBER	MiX44MC-3G-B 51000126 Conducted Sample MiX44MC-3G-B 51000125 STD Test Sample Primary Test Unit Chamber A MiX44MC-3G-B 51000129 STD Test Sample MiX44MC-3G-B 51000104 STD Test Sample Primary Test Unit Chamber B/Backup for A MiX44MC-3G 51000103 STD Test Sample Battery Less Example
HARDWARE VERSION	1
SOFTWARE VERSION	4.4.7
PSU VOLTAGE/FREQUENCY/CURRENT	12v / 24v, < 2A (7.5A Fused)
HIGHEST INTERNALLY GENERATED / USED FREQUENCY	2480MHz
FCC ID (if applicable)	2AFMS-44MC3G
INDUSTRY CANADA ID (if applicable)	
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The MiX 4000 is a fleet product that incorporates the latest market trends. It consists mainly of an on-board computer, a 3G modem, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives and 434MHz / 915MHz short range transceiver.
COUNTRY OF ORIGIN	South Africa
RF CHARACTERISTICS (if applicable)	
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	3G UTMS/HSPA: [MHz] Bands I, II, VIII, V, XVIIII 1922.4-977.6; 1852.4-1907.6; 882.4-912.6; 826.4-846.6; 832.4-842.6 2G GSM/EGSM/DCS/PCS: [MHz] 824.2-848.8; 880.2-914.8; 1710.2-1784.8; 1850.2-1909.8 SRD434MHz: 434.3 SRD915MHz: 902-928 BLE: 2400-2480
RECEIVER FREQUENCY OPERATING RANGE (MHz)	3G UTMS/HSPA: [MHz] Bands I, II, VIII, V, XVIIII 2110-2170; 1930-1990; 925-960; 869-894; 875-890 2G GSM/EGSM/DCS/PCS: [MHz] 869.2-893.8; 925.2-959.8; 1805.2-1879.8; 1930.2-1989.8 SRD434MHz: 434.3 SRD915MHz: 902-928 BLE: 2400-2480
INTERMEDIATE FREQUENCIES	unknown
EMISSION DESIGNATOR(S): **(i.e. G1D, GXW)**	SRD434 ;SRD915 F1D; BLE F1D; 2G/3G G7D
MODULATION TYPES: **(i.e. GMSK, QPSK)**	2FSK for SRD,GFSK for BLE
OUTPUT POWER (W or dBm)	SRD434 < 10dBm; SRD 915 <20dBm; BLE <7dBm, 3G 24dBm; 2G 33dBm
SEPARATE BATTERY/POWER SUPPLY (if applicable)	
MANUFACTURING DESCRIPTION	Uniross Rechargeable batteries
MANUFACTURER	Guangzhou Great Power Energy&Technology Co., Ltd.
TYPE	Rechargeable Li-ion batteries
PART NUMBER	IFR655060Fe
PSU VOLTAGE/FREQUENCY/CURRENT	3.2 V / DC/ 1600 mAh, 5.12 Wh
COUNTRY OF ORIGIN	China

MODULES (if applicable)			
MANUFACTURING DESCRIPTION		SARA-U201-03B	
MANUFACTURER		UBLOX	
TYPE		UTMS/HSPA	
POWER		2 W @ 4.4V	
FCC ID		XPY1CGM5NNN	
INDUSTRY CANADA ID		8595A-1CGM5NNN	
EMISSION DESIGNATOR		G7W	
DHSS/FHSS/COMBINED OR OTHER		other Switzerland	
COUNTRY OF ORIGIN			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION	GNSS ANTENNA		
MANUFACTURER	RF Design		
TYPE	ACTIVE PATCH		
PART NUMBER	GNS-AF50002-3VDT		
SERIAL NUMBER	N/A		
COUNTRY OF ORIGIN	South Africa		

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

Name: B van der Merwe Position held: Senior RF Engineer
Date: 21 October 2019

1.5 Product Information

1.5.1 Technical Description

The primary function of the EUT is to be a Vehicle Tracking Fleet Management.

Figure 1 - General View

Figure 2 - Rear View

Figure 3 - Rating Plate

1.5.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
Configuration and Mode: DC Powered, idle and GNSS Receiver mode				
Power	2000 mm	Power	N/A	No
GPS Active Patch	5000 mm	Communication	N/A	No
Codeplug serial cable	1000 mm 1500 mm	I/O Port	N/A	No

Table 3

1.5.3 Test Configuration

Configuration	Description
DC Powered	Powered by 24 V DC.

Table 4

1.5.4 Modes of Operation

Mode	Description
Idle and GNSS Receiver	EUT connected and communication with test systems and software. Relevant transmitters set to receiver mode.

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: MiX 44MC-3G-B: Serial Number: 51000125			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 6

1.8 Test Location

TÜV SÜD conducted the following tests at our Bearley Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: DC Powered - Idle and GNSS Receiver		
Radiated Disturbance	Callum Smith	UKAS

Table 7

Office Address:

Snitterfield Road
Bearley
Warwickshire
CV37 OEX
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

MiX 44MC-3G-B, S/N: 51000125 - Modification State 0

2.1.3 Date of Test

21-October-2019

2.1.4 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive table 0.8m above a reference ground plane.

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.

A pre-scan of the EUT emissions profile was made at a 3m distance while varying the antenna-to-EUT azimuth and polarisation using a peak detector.

Using a list of the highest emissions detected during the pre-scan along with their bearing and associated antenna polarisation, the EUT was 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)
Margin (dB) = Limit (dBµV/m) – Quasi-Peak level (dBµV/m)

Above 1 GHz:

CISPR Average level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB)
Margin (dB) = Limit (dBµV/m) – CISPR Average level (dBµV/m)

Peak level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB)
Margin (dB) = Limit (dBµV/m) – Peak level (dBµV/m)

2.1.6 Example Test Setup Diagram

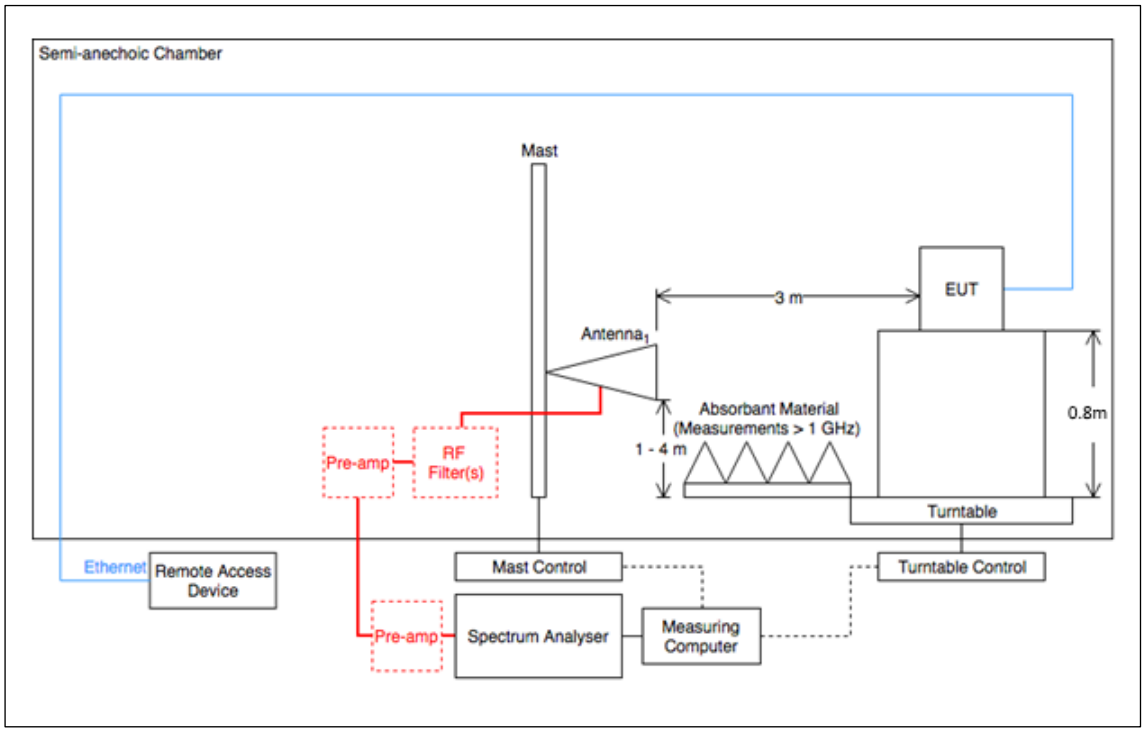

Figure 4 - Radiated Disturbance Example Test Setup

2.1.7 Environmental Conditions

Ambient Temperature	16.0 °C
Relative Humidity	53.0 %

2.1.8 Specification Limits

Required Specification Limits, Field Strength (Class B @ 3m)		
Frequency Range (MHz)	(µV/m)	(dBµV/m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54
Supplementary information: Quasi-peak detector to be used for measurements below 1 GHz CISPR Average detector to be used for measurements above 1 GHz 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: DC Powered - idle and GNSS Receiver.

The test was performed in accordance with the Class B limits.

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Highest frequency generated or used within the EUT: 2480 MHz
Which necessitates an upper frequency test limit of: 18 GHz

Frequency Range of Test: 30 MHz to 1 GHz

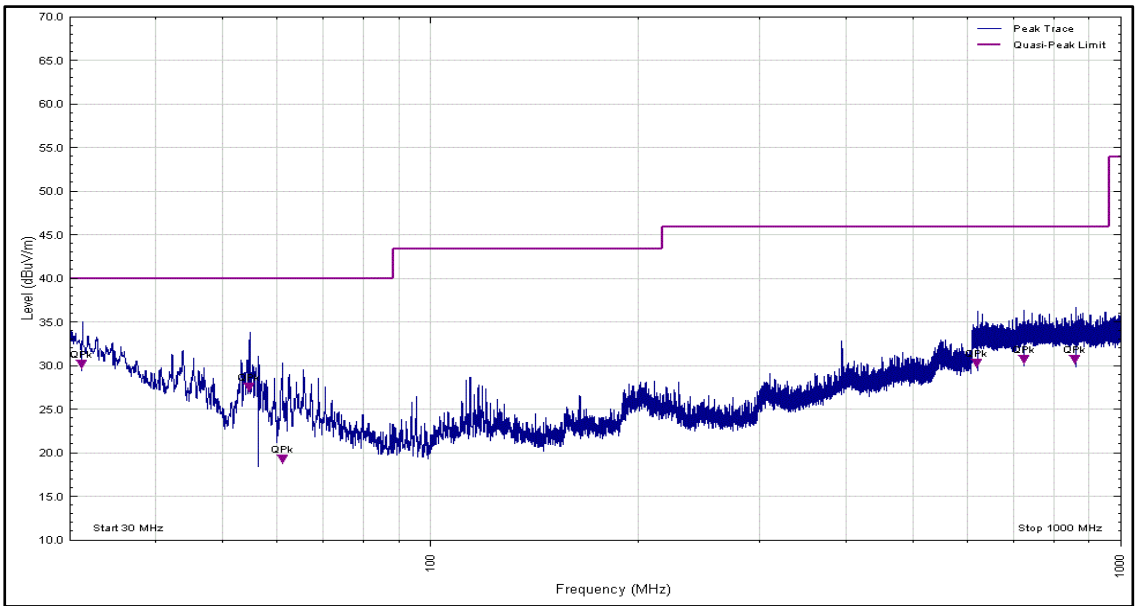

Figure 5 - Graphical Results - Vertical Polarity

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
31.254	29.4	40.0	-10.6	Q-Peak	327	271	Vertical
54.657	26.8	40.0	-13.2	Q-Peak	52	110	Vertical
61.053	18.5	40.0	-21.5	Q-Peak	52	360	Vertical
618.615	29.5	47.0	-17.5	Q-Peak	52	321	Vertical
724.256	29.9	47.0	-17.1	Q-Peak	321	119	Vertical
858.259	29.9	47.0	-17.1	Q-Peak	84	140	Vertical

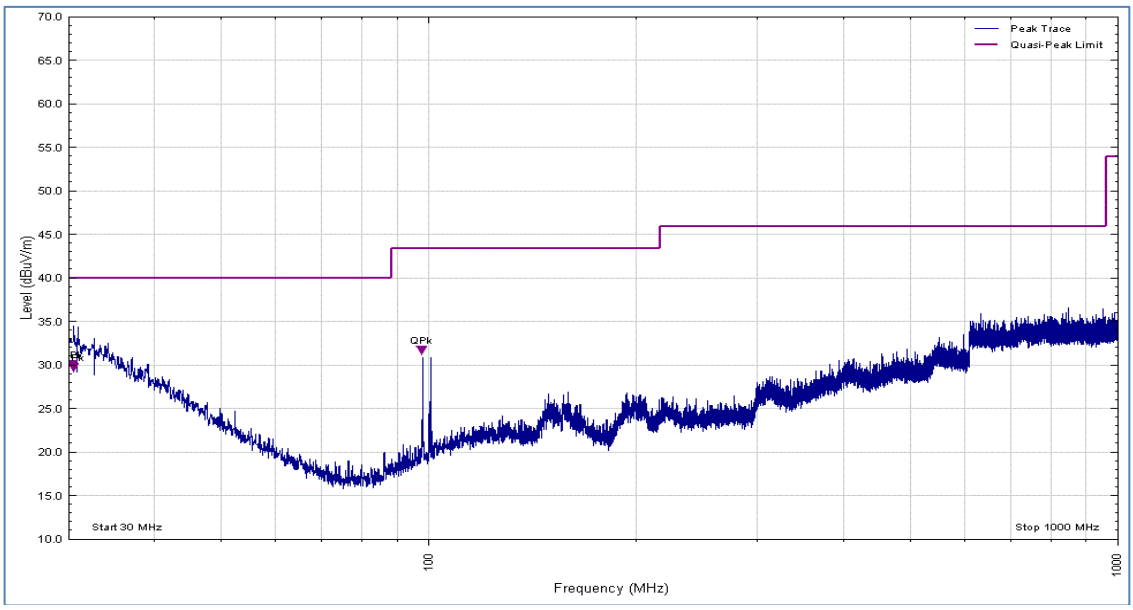

Figure 6 - Graphical Results - Horizontal Polarity

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
30.462	29.2	40.0	-10.8	Q-Peak	94	304	Horizontal
30.483	28.9	40.0	-11.1	Q-Peak	95	100	Horizontal
97.869	31.0	43.5	-12.5	Q-Peak	139	212	Horizontal
97.908	30.9	43.5	-12.6	Q-Peak	214	172	Horizontal

Table 9

Frequency Range of Test: 1 GHz to 6 GHz

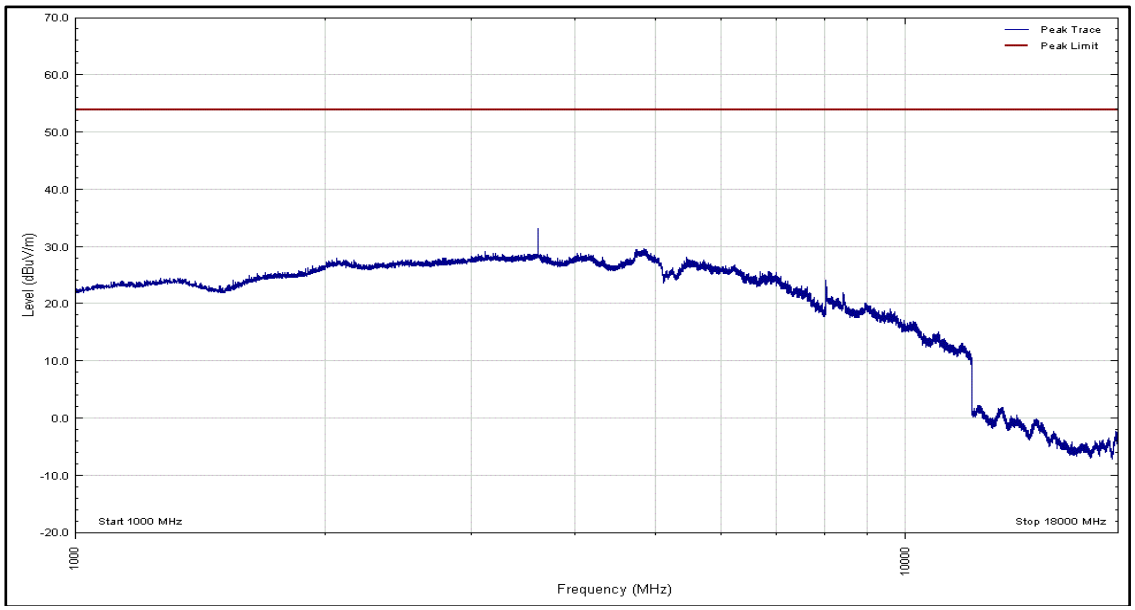

Figure 7 - Graphical Results - Vertical Polarity

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
8010.208	6.3	54.0	-47.7	Peak	334	121	Vertical
13008.202	-7.2	54.0	-61.2	Peak	0	278	Vertical

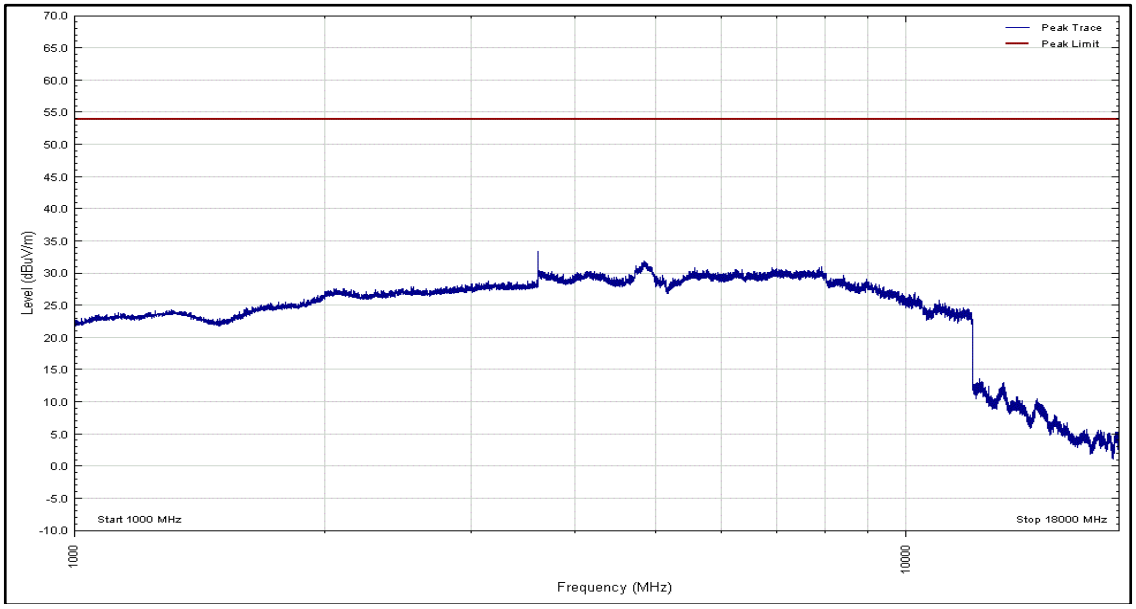

Figure 8 - Graphical Results - Horizontal Polarity

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
1111.234	20.1	54.0	-33.9	Peak	151	164	Horizontal
2182.370	23.2	54.0	-30.8	Peak	0	110	Horizontal
3199.761	24.9	54.0	-29.1	Peak	1	296	Horizontal
3601.477	22.7	54.0	-31.3	Peak	17	394	Horizontal
4834.778	23.0	54.0	-31.0	Peak	82	392	Horizontal
8388.986	5.1	54.0	-48.9	Peak	125	389	Horizontal
13036.549	14.2	54.0	-39.8	Peak	2	244	Horizontal

Table 10

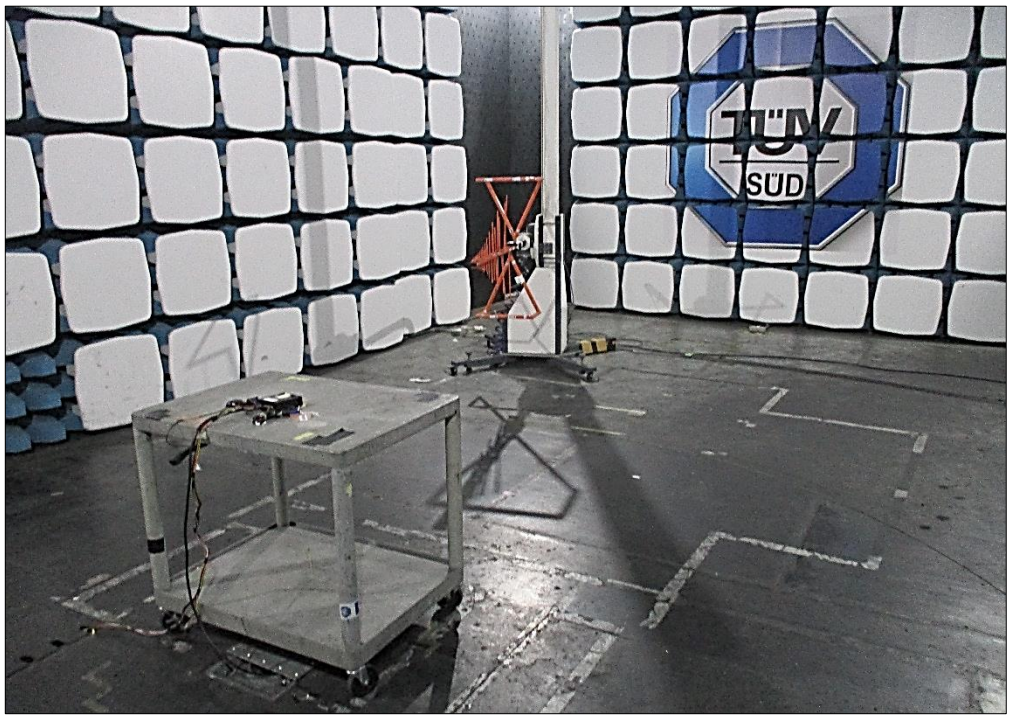

Figure 9 - Test Setup - Below 1 GHz

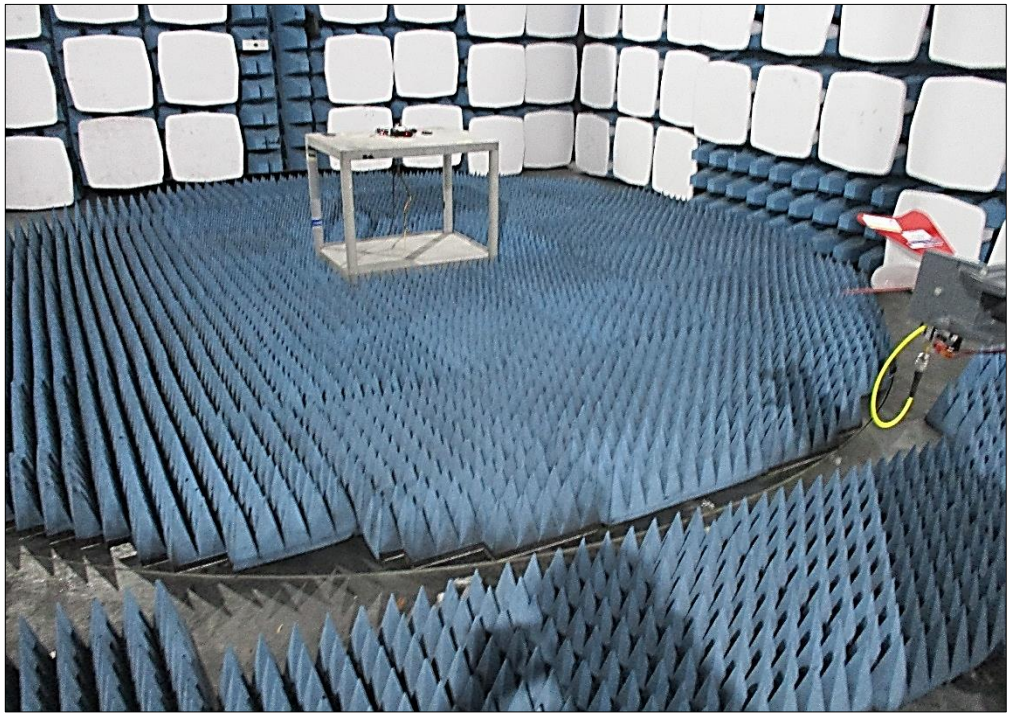

Figure 10 - Test Setup - Above 1 GHz

2.1.10 Test Location and Test Equipment Used

This test was carried out in Bearley EMC Chamber 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Power Supply	Farnell	LT30-2	1673	-	TU
Power Supply Unit	Farnell	H60-25	1709	-	TU
Bilog Antenna	Schaffner	CBL6143	1858	24	11-Apr-2021
EMI Test Receiver	Rohde & Schwarz	ESIB26	3763	12	15-Aug-2020
EMC 3m Semi Anechoic Chamber	Rainford	Hybrid	4160	36	16-Dec-2021
1-8 GHz Amplifier	Wright Technologies	APS04-0085	4674	12	12-Aug-2020
8-18 GHz Amplifier	Wright Technologies	APS04-0086	4675	12	12-Aug-2020
EMC Mast controller	Innco Systems	CONTROLLER CO3000	4728	-	TU
Cable (N-N, 10m)	Teledyne Storm	PR90-088-393.7	4733	12	01-Mar-2020
1 - 18GHz DRG Horn	ETS-Lindgren	3117	4737	24	28-Jul-2021
4dB Attenuator	Pasternack	7047-4	4933	12	11-Apr-2020
4 metre N-N type cable	Suhner	4 metre Enviroflex RG214/U	4950	12	29-Mar-2020
Cable (18GHz N Type 3m)	Rosenberger	LU7-036-3000	5163	12	12-Dec-2019
Emissions Cable 10m	Unknown	C-NPNP-2301-10MEB	5302	12	12-Jul-2020
EmX Emissions Software	TUV SUD	EmX V.V1.4.8.3	5125	-	Software
Turntable Controller	Maturo	Maturo NCD	5275	-	TU

Table 11

TU – Traceability Unscheduled

3 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 12

Worst case error for both Time and Frequency measurement 12 parts in 10^6.
All measurement uncertainties have been calculated using CISPR guidelines.

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.