FCC and ISED Test Report

MiX Telematics International (Pty) Ltd
Telematics Unit, Model: MiX 4401-B

In accordance with FCC 47 CFR Part 15B and ICES-003 and ISED RSS-GEN

Prepared for: MiX Telematics International (Pty) Ltd
Blaauwklip Office Park 2
Cnr Strand & Webersvalley Roads
Stellenbosch
South Africa

FCC ID: 2AFMS-4401XG IC: N/A

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Document 75951936-08 Issue 02

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
John Laydon	General Manager	Authorised Signatory	07 April 2022

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 ICES-003 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	William Mayo	07 April 2022	
Testing	Lewis Hoe	07 April 2022	
Supervisor	John Laydon	07 April 2022	

FCC Accreditation
330364 Bearley Test Laboratory

ISED Accreditation
12669A Bearley Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B 2020, ICES-003 Issue 7: 2020 and ISED RSS-GEN: 2 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	09 November 2021
2	Second Issue - Test Mix 4401-B (55000201) due to the replacement of the existing Bluetooth Integrated Circuit.	07 April 2022

Table 1

1.2 Introduction

Applicant	MiX Telematics International (Pty) Ltd
Manufacturer	MiX Telematics International (Pty) Ltd
Model Number(s)	MiX 4401-B
Declared Variant(s)	MiX 4401
Serial Number(s)	55000102 & 55000201
Hardware Version(s)	1 & 3
Software Version(s)	4.10 and 4.12.x
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2020 ICES-003: Issue 7: 2020 ISED RSS-GEN: Issue 5 and A1 (2019-03)
Order Number Date	P0094917 P0096141 13-April-2021 22-November-2021
Date of Receipt of EUT	05-October-2021 & 03-March-2022
Start of Test	05-October-2021 & 15-March-2022
Finish of Test	05-October-2021 & 15-March-2022
Name of Engineer(s)	William Mayo (Supervised by John Laydon) Lewis Hoe (Supervised by John Laydon)
Related Document(s)	ANSI C63.4: 2014

Manufacturer's declared variants: Models MiX 4401-B (P/N: U0073MT) and MiX 4401 (P/N: U0071MT), present the same electrical, physical and electro mechanics characteristics, the same PCB, layout and components. The only difference between them is that the model MiX 4401-B has an internal backup battery plugged in, allowing the device to work after the disconnection of the vehicle´s battery. The functionality and purposes of the products are exactly the same.

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15B and ICES-003 and ISED RSS-GEN is shown below.

Section	Specification Clause			Test Description	Modification State	Result	Comments/Base Standard
	FCC	ICES	ISEDC				
Configuration and Mode: DC Powered - Transmitters Idle and GNSS receiver active							
2.2	15.109	3.2	7.1	Radiated Disturbance	0	Pass	ANSI C63.4: 2014

Table 2

1.4 Declaration of Build Status – MiX 4401-B (55000102)

MAIN EUT	
MANUFACTURING DESCRIPTION	Vehicle Tracking / Fleet Management
MANUFACTURER	MiX Telematics International (Pty) Ltd.
MODEL	MiX 4401 MiX 4401-B
PART NUMBER	U0071MT U0073MT
HARDWARE VERSION	1
SOFTWARE VERSION	4.10
PSU VOLTAGE/FREQUENCY/CURRENT	12/24 V DC; 2 A typical; 4.5 A absolute max; (7.5 A fuse)
HIGHEST INTERNALLY GENERATED FREQUENCY	2.690 MHz
FCC ID (if applicable)	2AFMS-4401XG
INDUSTRY CANADA ID (if applicable)	-
TECHNICAL DESCRIPTION (a brief technical description of the intended use and operation)	The MiX 4000 series is a range of fleet products that incorporates the latest market trends. It consists mainly of an on-board computer, a modem, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives, and an optional 434 / 915 MHz short range transceiver. The range consists of variants with a LTE CAT M1 cellular module Quectel BG96. All the variants make use of the same PCB, the only difference is the modem to be populated and all the modems have the same foot print.
COUNTRY OF ORIGIN	South Africa
RF CHARACTERISTICS (if applicable)	
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	434, 902-928MHz, 2400-2480MHz, LTE BANDS [1, 2, 3, 4, 5, 8, 12, 13, 19, 20, 28] [1] 1920-1980, [2]1850-1910, [3]1710-1785, [4]1710-1755, [5]824-849, [8]880-915, [12]699-716, [13] 777-787, [18] 815-830, [19] 830-845, [20]830-845, [28] 703-748 2G fall-back: GSM 850 MHz (824 – 849 MHz) E-GSM 900 MHz (880 - 915 MHz) DCS 1800 MHz (1710 - 1785 MHz) PCS 1900 MHz (1850 – 1910 MHz)
RECEIVER FREQUENCY OPERATING RANGE (MHz)	434, 902-928MHz, 2400-2480MHz, LTE BANDS [1, 2, 3, 4, 5, 8, 12, 13, 19, 20, 28] [1] 2110-2170, [2]1930-1990, [3]1805-1880, [4]2110-2155, [5]869-894, [8]925-960, [12]729-746, [13] 746-756, [18] 860-875, [19] 875-890, [20]875-890, [28] 758-803 2G fall-back: GSM 850 MHz (869 - 894 MHz) E-GSM 900 MHz (925 - 960 MHz) DCS 1800 MHz (1805 - 1880 MHz) PCS 1900 MHz (1930 – 1990 MHz)
INTERMEDIATE FREQUENCIES	Unknown
EMISSION DESIGNATOR(S): https://fccid.io/Emissions-Designator/	SRD434/915 F1D, BLE F1D, LTE 246KGXW, 249KG7W, 1M12G7D, 1M05W7D http://183.82.99.162:8000/Quectel/NB-IOT%20Module/BG96/05%20Certificate/Quectel_BG96_FCC_Certificate.pdf
MODULATION TYPES: (i.e. GMSK, QPSK)	2FSK for SRD434/915,GFSK for BLE, LTE SC-FDMA/OFDMA.16QAM 2G: GMSK/8-PSK
OUTPUT POWER (W or dBm)	SRD 915 <20dBm, SRD 434 < 10 dBm, BLE <7dBm, LTE Class 3 (23dBm) 2G GMSK: Class 1 (30 dBm) for DCS/PCS bands 2G 8-PSK: Class E2 (27 dBm) for GSM/E-GSM bands Class E2 (26 dBm) for DCS/PCS bands

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	BG96	ZOE-M8Q	Cc2564B
MANUFACTURER	Quectel	UBLOX	Texas Instruments
TYPE	LTE CAT M1 with 2G fall-back	GNSS	Bluetooth BLE
POWER	LTE: 0.722W @3.8V 2G: 2W	0.5 W @ 3.6 V (max)	0.016 W
FCC ID	XMR201707BG96	-	-
INDUSTRY CANADA ID	10224A-201707BG96	-	-
EMISSION DESIGNATOR	246KGXW, 249KG7W, 1M12G7D, 1M05W7D	-	F1D
DHSS/FHSS/COMBINED OR OTHER	Other	N/A	Other
COUNTRY OF ORIGIN	China	Switzerland	Northern America
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: 6 October 2021

1.5 Declaration of Build Status – MiX 4401-B (55000201)

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	The MiX 4000 series is a range of fleet products that incorporates the latest market trends. It consists mainly of an on-board computer, a modem, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives, and an optional 434 / 915 MHz short range transceiver. The range consists of variants with a LTE CAT M1 cellular module Quectel BG96. Models MiX 4401-B and MiX 4401, present the same electrical, physical and electro mechanics characteristics, the same PCB, layout and components. The only difference between them is that the "-B" variant has an internal backup battery plugged in, allowing the device to work after the disconnection of the vehicle´s battery. The functionality and purposes of the products are exactly the same.
Manufacturer:	MiX Telematics International (Pty) Ltd.
Model:	MiX 4401 MiX 4401-B
Part Number:	U0071MT U0073MT
Hardware Version:	3
Software Version:	4.12.x
FCC ID of the product under test – see guidance here	2AFMS-4401XG
IC ID of the product under test – see guidance here	-

Intentional Radiators

Technology	LTE Band 2	LTE Band 3	LTE Band 4	LTE Band 5	LTE Band 12	LTE Band 13
Frequency Range (MHz to MHz)	1850-1910	1710-1785	1710-1755	824-849	699-716	777-787
Conducted Declared Output Power (dBm)	23	23	23	23	23	23
Antenna Gain (dBi)	2.07	1.46	1.46	0.21	0.76	1.39
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	1.4	1.4	1.4	1.4	1.4	1.4
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	QPSK/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	1M40W7D	1M40W7D	1M40W7D	1M40W7D	1M40W7D	1M40W7D
Bottom Frequency (MHz)	1850	1710	1710	824	699	777
Middle Frequency (MHz)	1880	1747.5	1747.5	836.5	707.5	782
Top Frequency (MHz)	1910	1785	1755	849	716	787

Technology	SRD915	SRD434	SRD2400
Frequency Band (MHz)	902-928	434.3 ± 0.01	2400-2480
Conducted Declared Output Power (dBm)	20	10	4
Antenna Gain (dBi)	0	0	1.4
Supported Bandwidth(s) (MHz)	0.025	0.025	1
Modulation Scheme(s)	2FSK	2FSK	GFSK
ITU Emission Designator	38K4F7D	38K4F7D	1M00G7D
Bottom Frequency (MHz)	902	434.31	2402
Middle Frequency (MHz)	915	434.3	2440
Top Frequency (MHz)	928	434.29	2480

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	2690 MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	699MHz
Class A Digital Device (Use in commercial, industrial or business environment) ☐ Class B Digital Device (Use in residential environment only) ☒	

AC Power Source

AC supply frequency:	N/A	Hz
Voltage	N/A	V
Max current:	N/A	A
Single Phase ☐ Three Phase ☐		

DC Power Source

Nominal voltage:	13.8/27.6	V
Extreme upper voltage:	32	V
Extreme lower voltage:	10.5	V
Max current:	2A typical ; 4.5A absolute max (7.5A Fused)	A

Battery Power Source

Voltage:	3.2	V
End-point voltage:	2.7	V *(Point at which the battery will terminate)*
Alkaline ☐ Leclanche ☐ Lithium ☒ Nickel Cadmium ☐ Lead Acid* ☐ **(Vehicle regulated)*		
Other ☐ Please detail:		

Charging

Can the EUT transmit whilst being charged	Yes ☒ No ☐

Temperature

Minimum temperature:	-20	°C
Maximum temperature:	60	°C

Cable Loss

Adapter Cable Loss (Conducted sample)		dB

Antenna Characteristics

Antenna connector ☒			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☒	Type:	LTE BLE SRD915 GNSS	Gain	3 1.4 0 4	dBi
External antenna ☐	Type:	GNSS	Gain	4	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:	MiX Telematics	Part Number:	440FT0930 440FT0623
Model:	Code Plug Harness with Socket CP2, Code Plug Socket	Country of Origin:	South Africa
Manufacturer:	MiX Telematics	Part Number:	440FT0033
Model:	Power (MP10)	Country of Origin:	South Africa
Manufacturer:	MiX Telematics	Part Number:	440FT0931
Model:	Serial Harness SR1	Country of Origin:	South Africa
Manufacturer:	RF Design	Part Number:	440FT0933
Model:	External GNSS Antenna PA2	Country of Origin:	South Africa

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

Name: Ben van der Merwe
Position held: Senior Engineer
Date: 3 March 2022

1.6 Product Information

1.6.1 Technical Description

The Equipment under test (EUT) was a was a Mix Telematics international (Pty) Limited, Mix-4401-B Vehicle Tracking and Fleet Management Module.

The MiX 4000 series is a range of fleet products that incorporates the latest market trends. It consists mainly of an on-board computer, a modem, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives, and an optional 434 / 915 MHz short range transceiver.

The range consists of variants with a LTE CAT M1 cellular module Quectel BG96. Models MiX 4401-B and MiX 4401, present the same electrical, physical and electro mechanics characteristics, the same PCB, layout and components. The only difference between them is that the “-B” variant has an internal backup battery plugged in, allowing the device to work after the disconnection of the vehicle´s battery. The functionality and purposes of the products are exactly the same.

Figure 1 – MiX 4401-B (55000102) Front view

Figure 2 – MiX 4401-B (55000102) Rear view

Figure 3 – MiX 4401-B (55000102) Ratings Plate

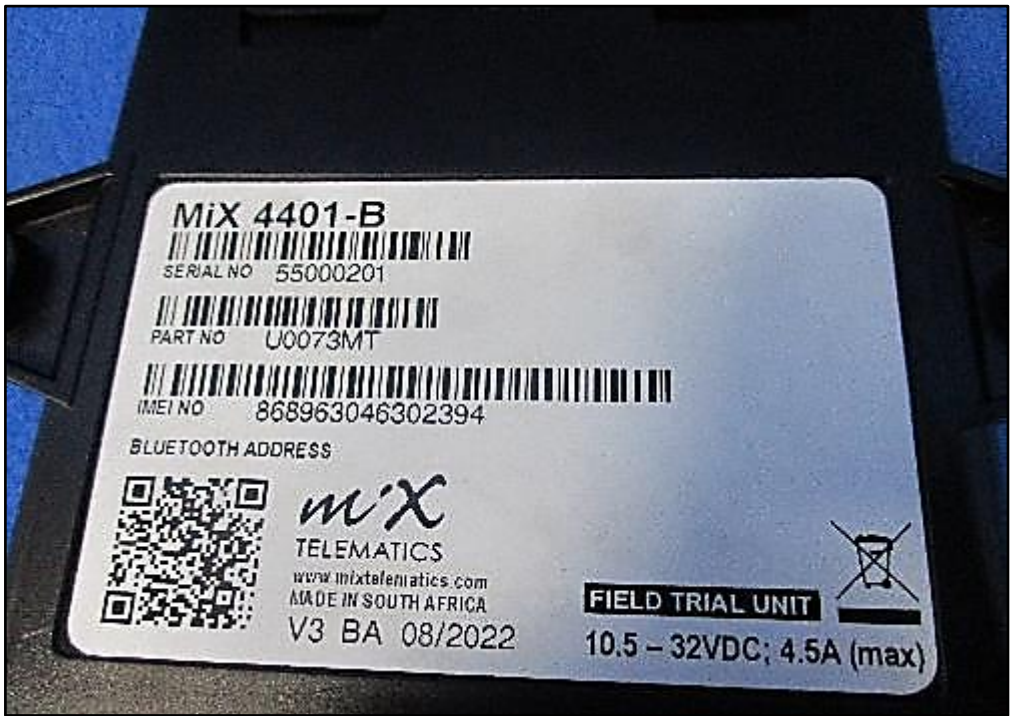

Figure 4 – MiX 4401-B (55000201) Ratings Plate

1.6.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Screened
Configuration and Mode: DC Powered, idle and GNSS Receiver mode			
Power	2 m	Power	No
Communication	2 m	Communication	No
I/O Port	1m	I/O Port	No

Table 3

1.6.3 Test Configuration

Configuration	Description
12 Vdc Powered	Powered from a 12 Vdc supply. It consists mainly of an on-board computer, a modem, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives, and an optional 434 / 915 MHz short range transceiver.

Table 4

1.6.4 Modes of Operation

Mode	Description
DC Powered - Idle and GNSS Receiver	Transmitters placed into Receive Mode (Idle) GNSS Transmitter Active

Table 5

1.7 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.8 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 4401-B, Serial Number: 55000102 & 55000201			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 6

1.9 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 - Transmitters Idle and GNSS receiver active		
Radiated Disturbance	William Mayo (Supervised by John Laydon)	UKAS
Radiated Disturbance	Lewis Hoe (Supervised by John Laydon)	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
ICES-003, Clause 3.2
ISED RSS-GEN, Clause 7.1

2.1.2 Equipment Under Test and Modification State

MiX 4401-B, S/N: 55000102 - Modification State 0
MiX 4401-B, S/N: 55000201 – Modification State 0

2.1.3 Date of Test

05-October-2021 & 15-March-2022

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

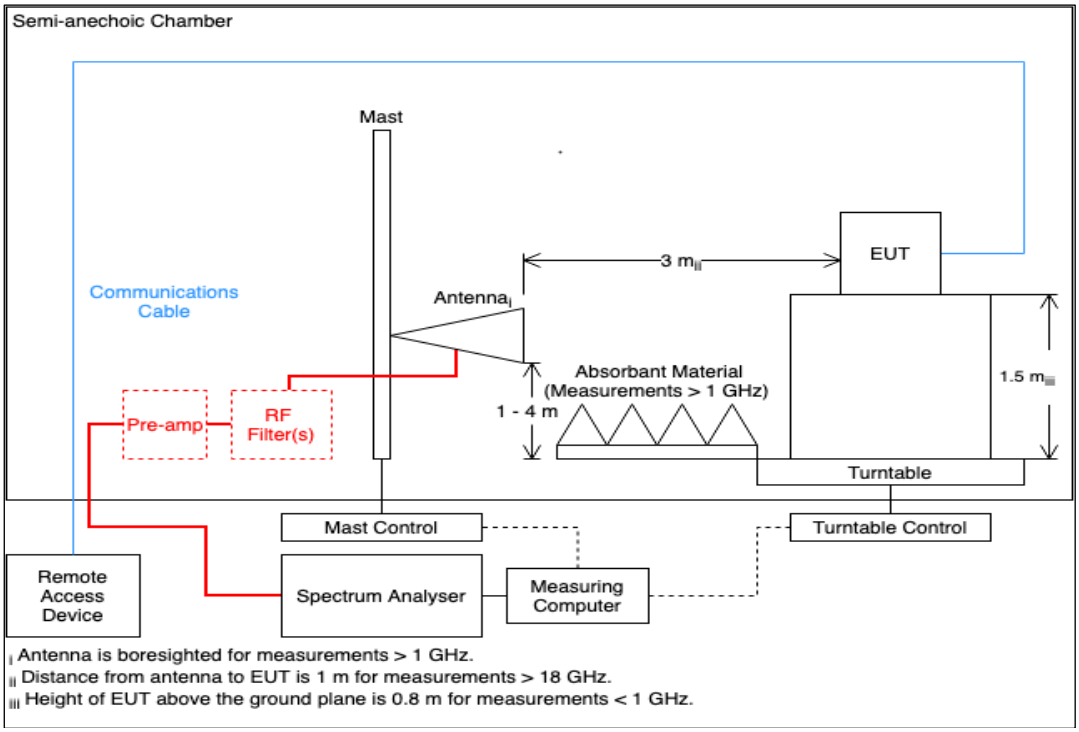

Figure 5

2.1.7 Environmental Conditions

Ambient Temperature	17.6 °C / 15.2 °C
Relative Humidity	61.4 % / 45.5 %

2.1.8 Specification Limits

Required Specification Limits, Field Strength - Class B Test Limit at a 3 m Measurement Distance		
Frequency Range (MHz)	Test Limit (µV/m)	Test Limit (dBµV/m)
30 to 88	100	40.0
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0
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: MiX 4401-B (55000102) DC Powered - Transmitters Idle and GNSS receiver active.

This test was performed to the requirements of 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: 12.4 GHz

Frequency Range of Test: 30 MHz to 1 GHz

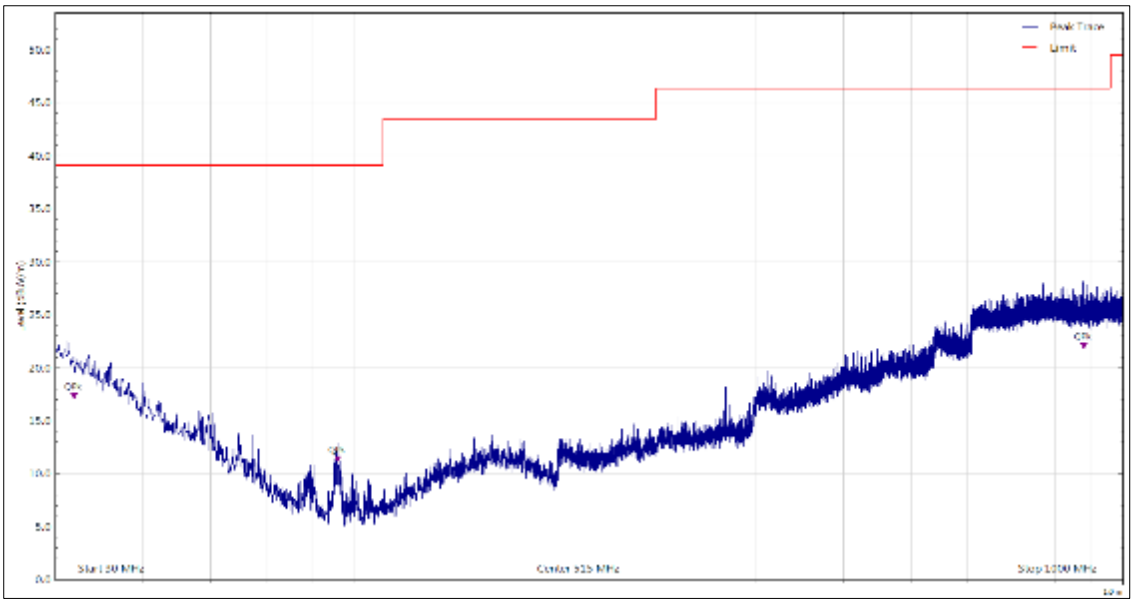

Figure 6 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
31.964	17.0	39.1	-22.1	Q-Peak	290	120	Horizontal
76.007	11.0	39.1	-28.1	Q-Peak	331	248	Horizontal
880.275	21.7	46.4	-24.7	Q-Peak	108	252	Horizontal

Table 9

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

Frequency Range of Test: 30 MHz to 1 GHz

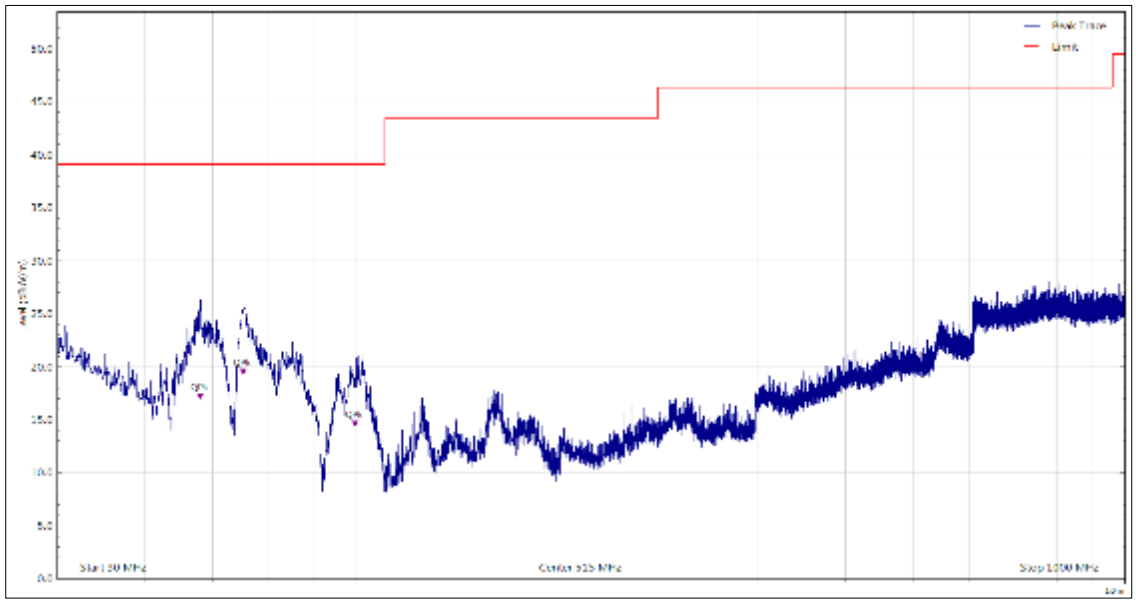

Figure 7 - 30 MHz to 1 GHz, Quasi-Peak, Vertical

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
48.020	16.8	39.1	-22.3	Q-Peak	195	214	Vertical
55.375	19.1	39.1	-20.0	Q-Peak	223	114	Vertical
79.815	14.2	39.1	-24.9	Q-Peak	159	113	Vertical

Table 10

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

Frequency Range of Test: 1 GHz to 13 GHz - Peak Detector

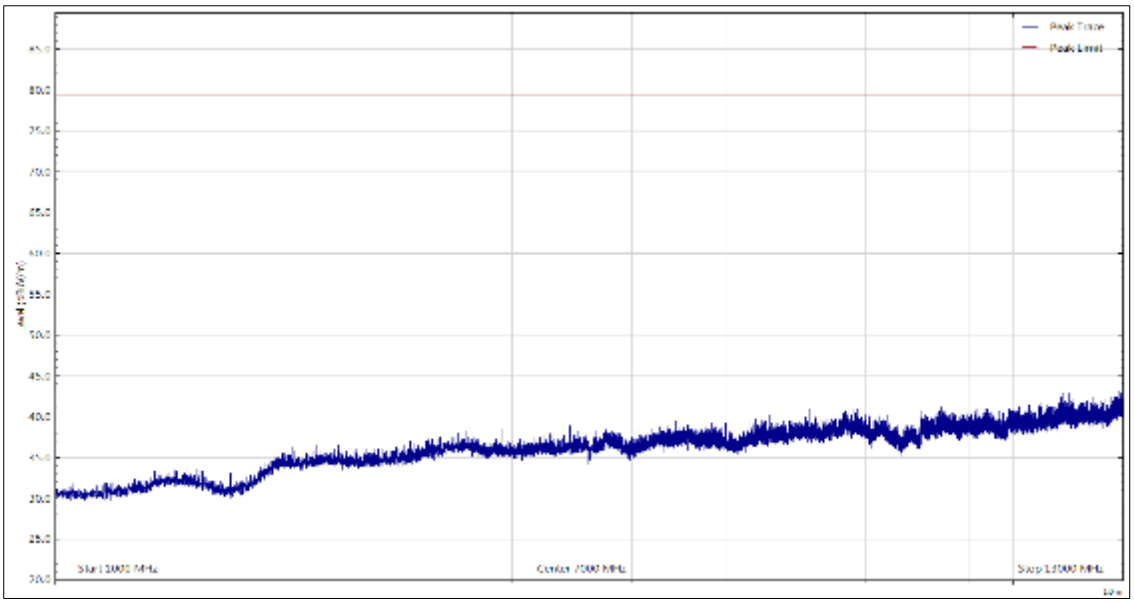

Figure 8 - 1 GHz to 13 GHz, Peak, Horizontal

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/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.

Frequency Range of Test: 1 GHz to 13 GHz - Peak Detector

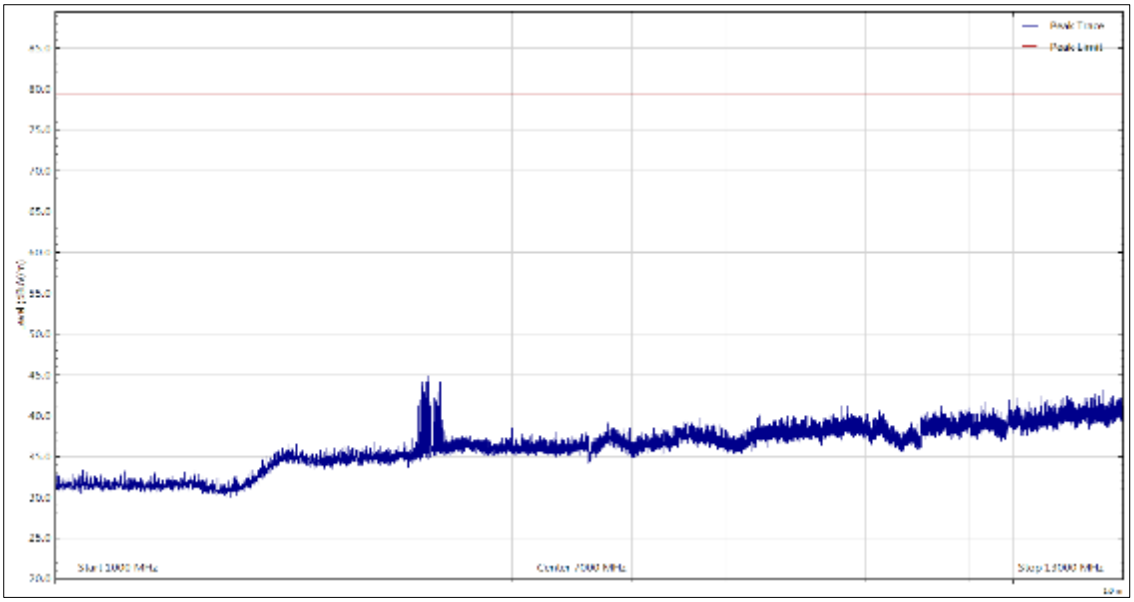

Figure 9 - 1 GHz to 13 GHz, Peak, Vertical

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/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.

Frequency Range of Test: 1 GHz to 13 GHz - CISPR Average Detector

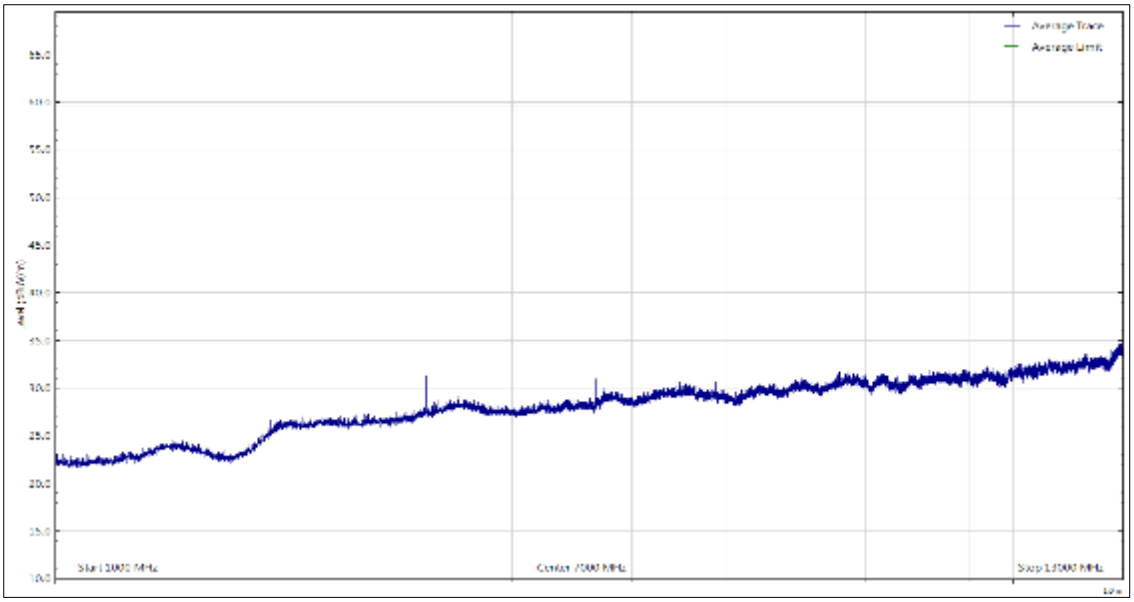

Figure 10 - 1 GHz to 13 GHz, CISPR Average, Horizontal

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/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.

Frequency Range of Test: 1 GHz to 13 GHz - CISPR Average Detector

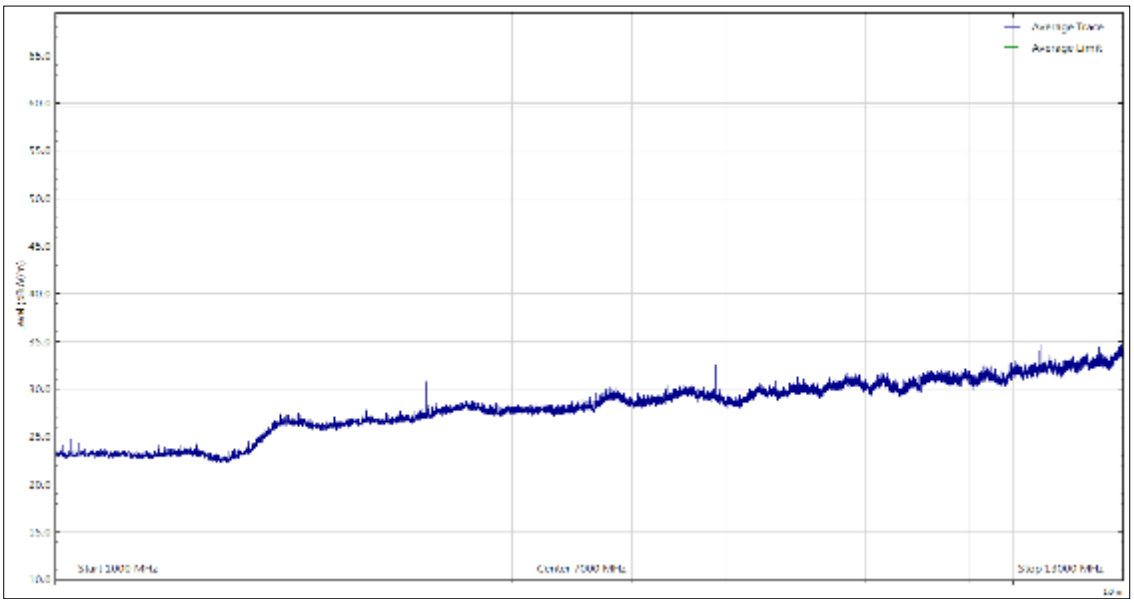

Figure 11 - 1 GHz to 13 GHz, CISPR Average, Vertical

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/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.

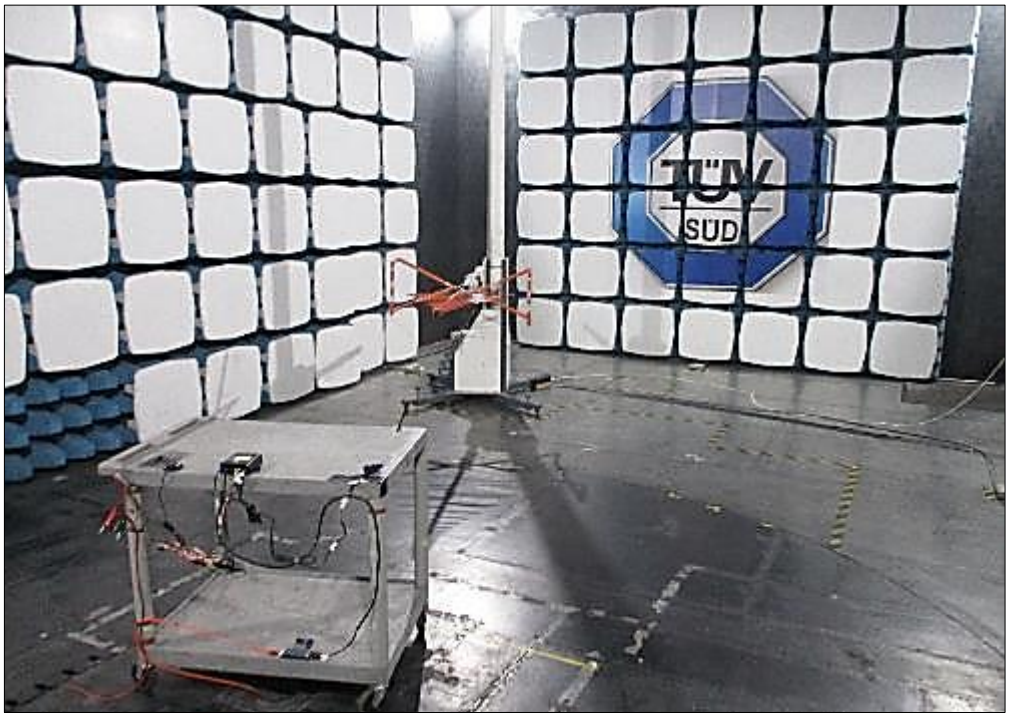

Figure 12 - Test Setup - 30 MHz to 1 GHz

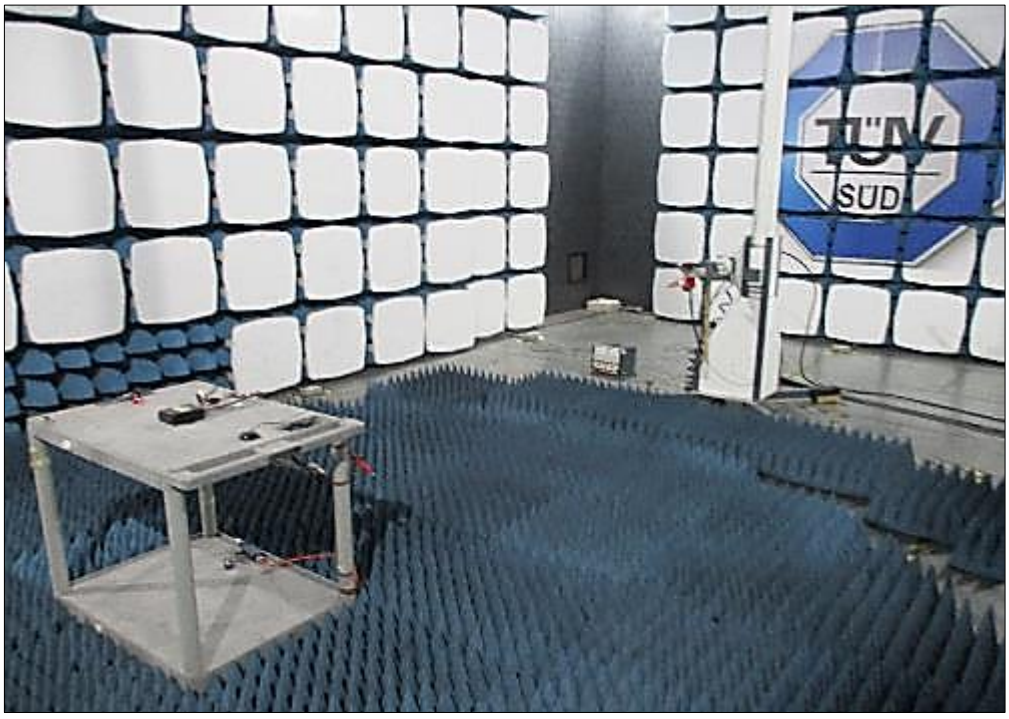

Figure 13 - Test Setup - 1 GHz to 13 GHz

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 Expires
Bilog Antenna	Schaffner	CBL6143	1858	24	10-Nov-2022
1-8 GHz Amplifier	Wright Technologies	APS04-0085	4674	12	18-Aug-2022
EMC Mast controller	Innco Systems	Controller CO3000	4728	-	TU
1 - 18GHz DRG Horn	ETS-Lindgren	3117	4737	24	13-Aug-2023
EMI Receiver	Keysight Technologies	N9038A MXE	4974	12	27-Jan-2022
EmX Emissions Software	TUV SUD	V2.1.11	5125	-	Software
Turntable Controller	Maturo	Maturo NCD	5275	-	TU
4dB Attenuator	Pasternack	PE7047-4	5647	24	10-Nov-2022

Table 15

TU – Traceability Unscheduled

2.1.11 Test Results

Results for Configuration and Mode: MiX 4401-B (55000201) DC Powered - Idle with GNSS operational.

This test was performed to the requirements of 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: 2690 MHz
Which necessitates an upper frequency test limit of: 13 GHz

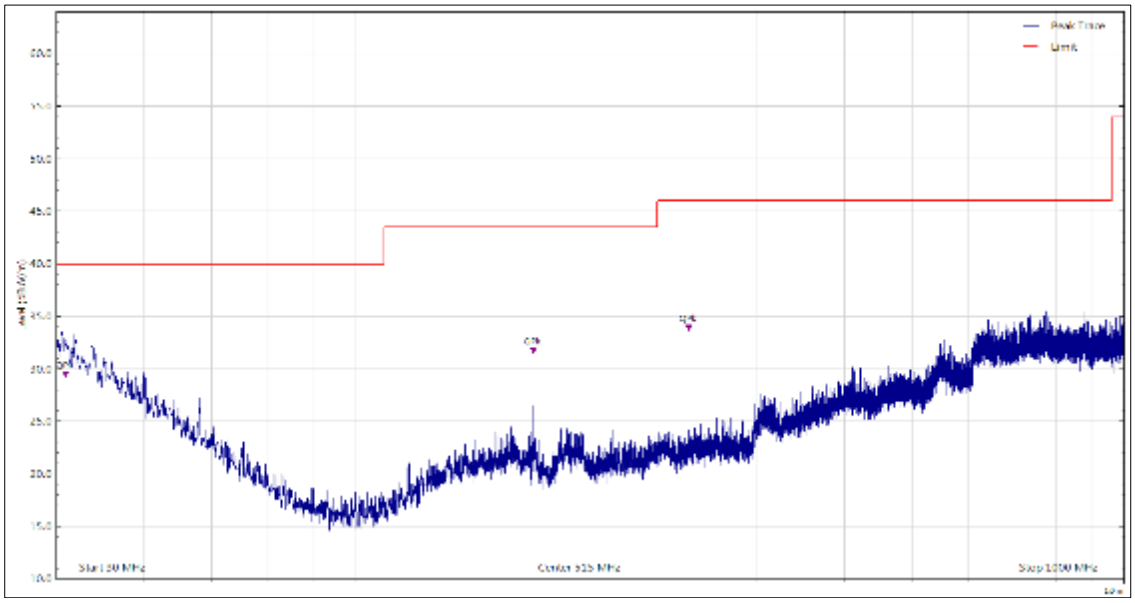

Figure 14 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
30.976	29.1	40.0	-10.9	Q-Peak	350	392	Horizontal
144.017	31.3	43.5	-12.2	Q-Peak	185	273	Horizontal
240.018	33.5	46.0	-12.5	Q-Peak	169	143	Horizontal

Table 16

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

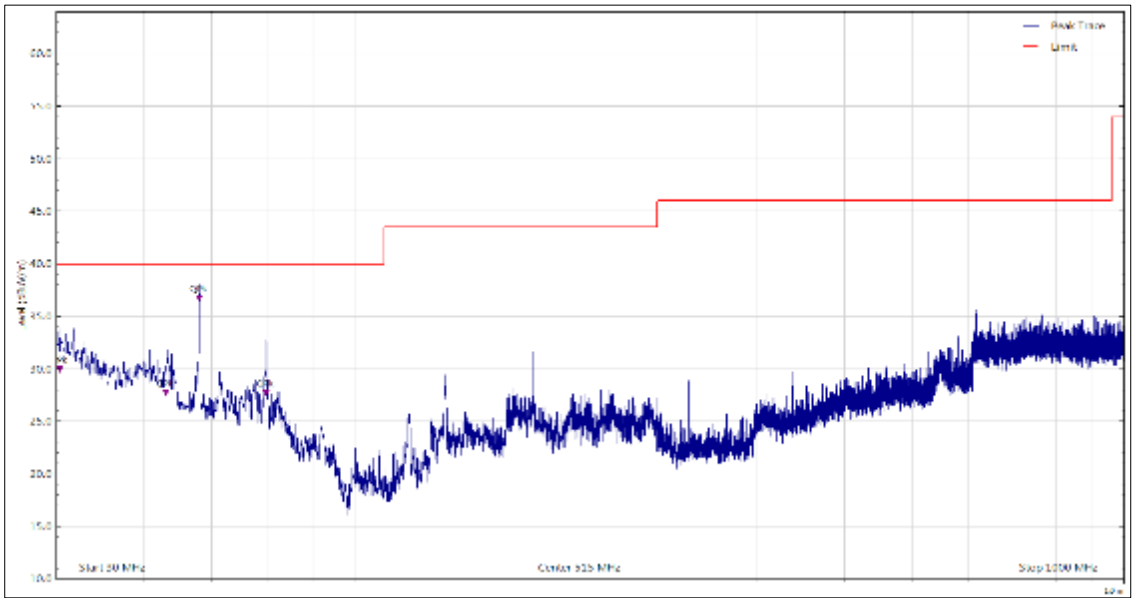

Figure 15 - 30 MHz to 1 GHz, Quasi-Peak, Vertical

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
30.410	29.6	40.0	-10.5	Q-Peak	256	117	Vertical
43.051	27.3	40.0	-12.8	Q-Peak	79	107	Vertical
48.015	36.3	40.0	-3.7	Q-Peak	195	100	Vertical
59.827	27.3	40.0	-12.8	Q-Peak	95	101	Vertical

Table 17

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

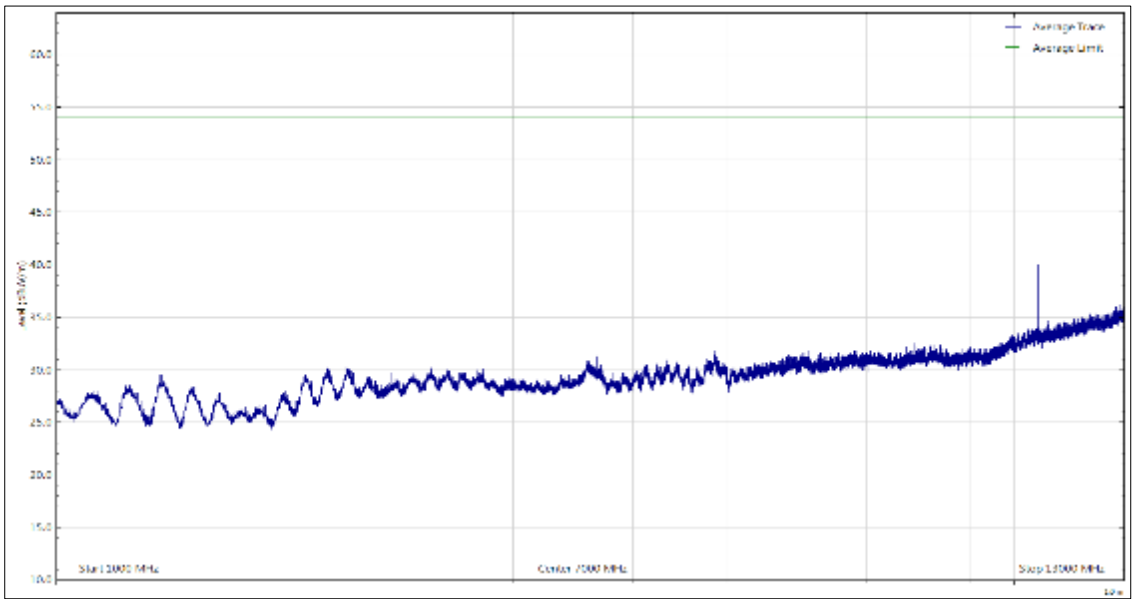

Figure 16 - 1 GHz to 13 GHz, Peak, Horizontal

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

Table 18

*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.

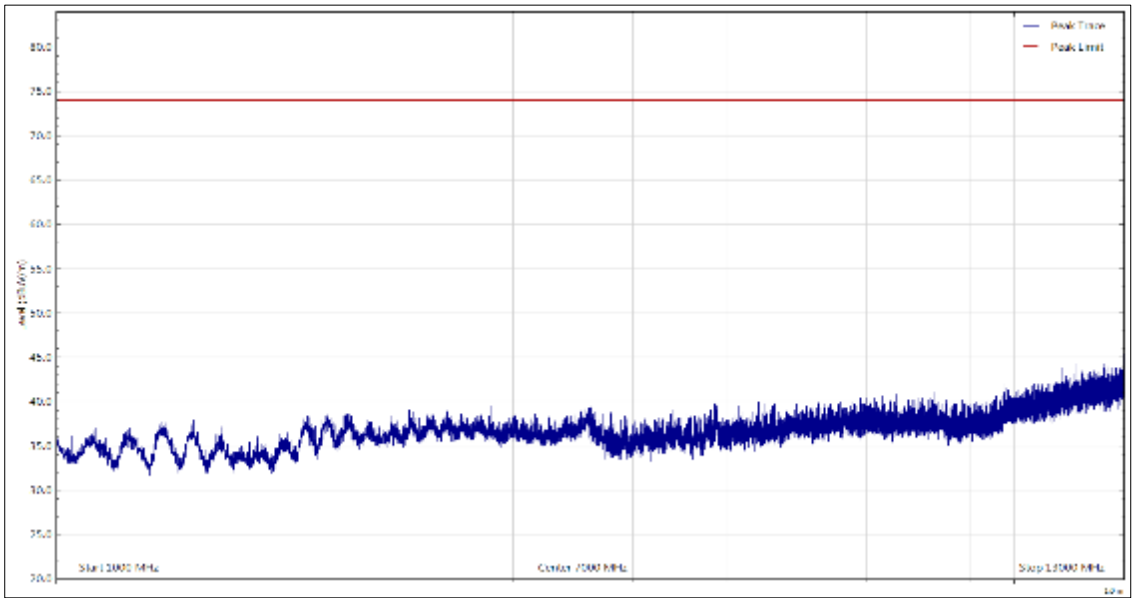

Figure 17 - 1 GHz to 13 GHz, Peak, Vertical

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

Table 19

*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.

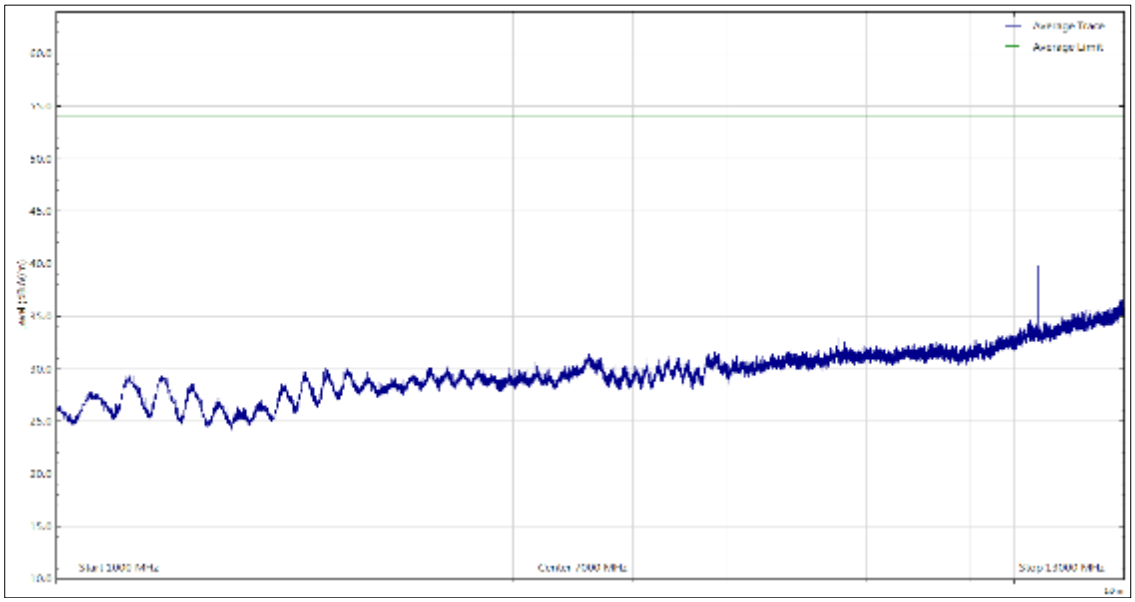

Figure 18 - 1 GHz to 13 GHz, CISPR Average, Horizontal

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

Table 20

*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.

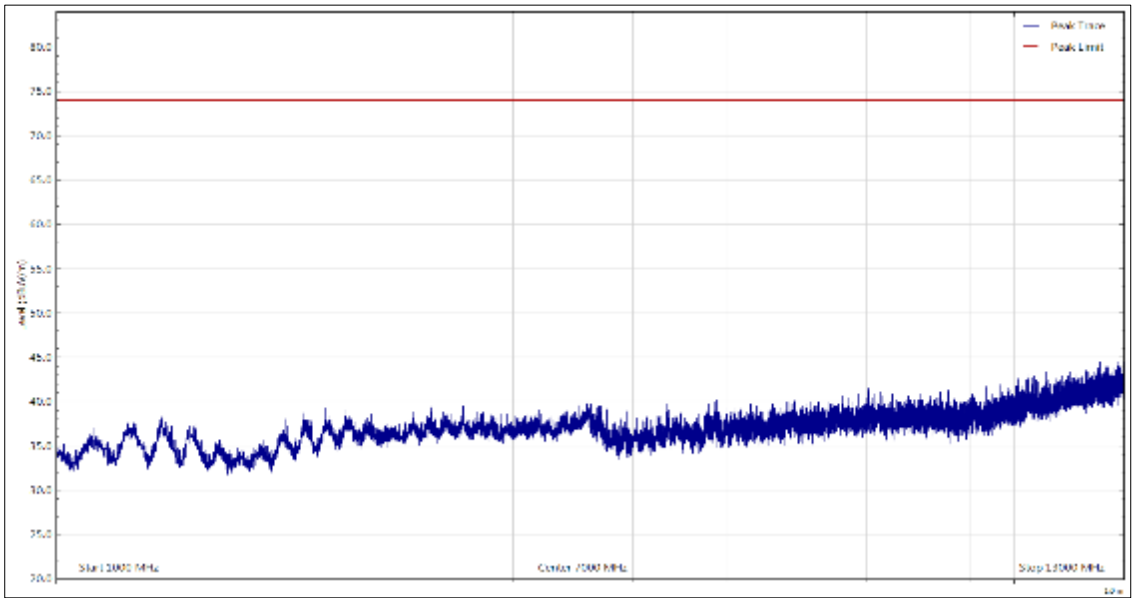

Figure 19 - 1 GHz to 13 GHz, CISPR Average, Vertical

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

Table 21

*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.

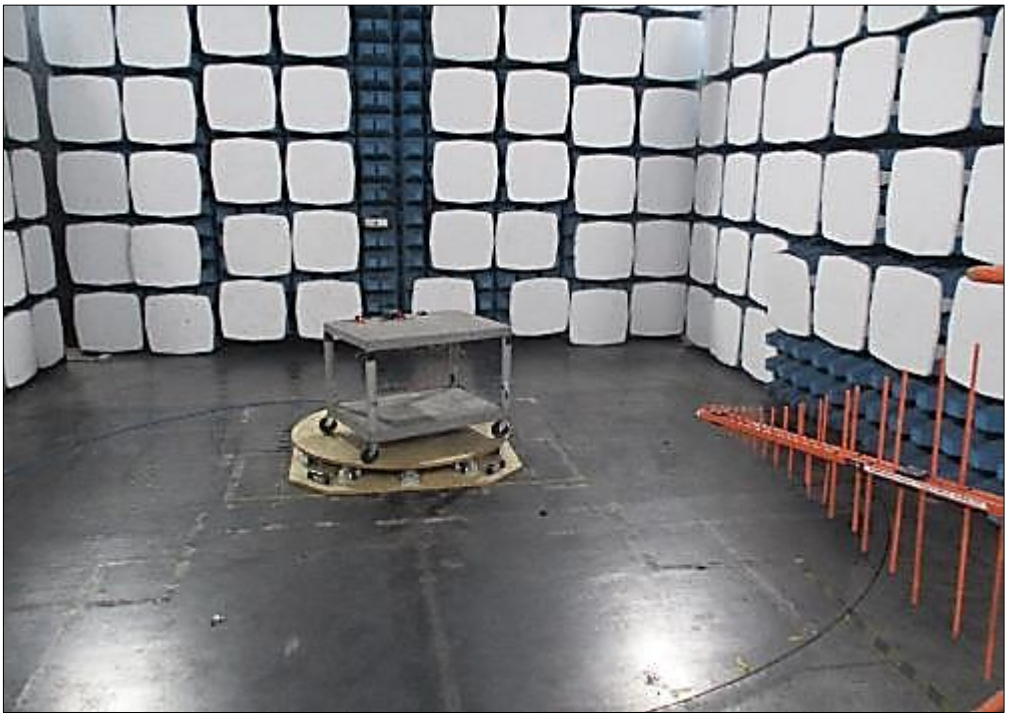

Figure 20 - Test Setup - 30 MHz to 1 GHz

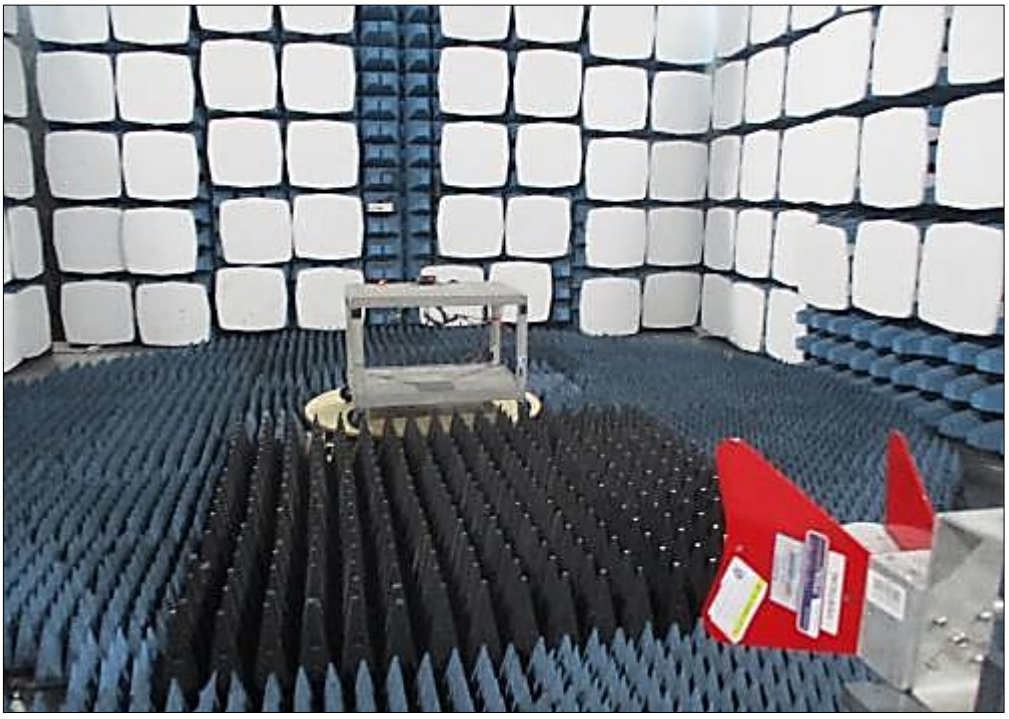

Figure 21 - Test Setup - 1 GHz to 13 GHz

2.1.12 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 Expires
Antenna (Bilog, 30 MHz to 3 GHz)	Schaffner	CBL6143	1858	24	10-Nov-2022
Pre-Amplifier (1 GHz to 8 GHz)	Wright Technologies	APS04-0085	4674	12	18-Aug-2022
Mast controller	Innco Systems	Controller CO3000	4728	-	TU
Antenna (Double Ridge Guide, 1 GHz to 18 GHz)	ETS-Lindgren	3117	4737	24	11-Mar-2024
Test Receiver	Keysight Technologies	N9038A MXE	4974	12	22-Feb-2023
Emissions Software	TUV SUD	EmX V2.1.11	5125	-	Software
Turntable Controller	Maturo	Maturo NCD	5275	-	TU
Attenuator (4 dB, 2 W)	Pasternack	PE7047-4	5647	24	10-Nov-2022
Turntable	Maturo	TT 1.2WF Turntable Model TT1.2WF 1011 3110.01	5780	-	TU
Broadband Pre-Amplifier (0.5 - 18 GHz)	Schwarzbeck	BBV 9718 D	5882	12	01-Mar-2023

Table 22

TU - Traceability Unscheduled

3 Test Equipment Information

3.1 General Test Equipment Used (2021)

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Scientific Ambient Monitor	Testo	622	5698	12	17-Feb-2022
7m N-Type Cable	Teledyne Storm	SA90-195-7MTR	4168	6	19-Oct-2021
Cable (18GHz N Type 3m)	Rosenberger	LU7-036-3000	5163	12	10-Dec-2021
Power Supply	Farnell	LT30-2	1673	-	TU

Table 23

3.2 General Test Equipment Used (2022)

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Screened Room (1)	Rainford	Hybrid	4160	36	11-Jan-2025
Cable (N-Type to N-Type, 7 m)	Teledyne Storm	SA90-195-7MTR	4168	6	21-Apr-2022
Cable (N-Type to N-Type, 3 m)	Rosenberger	LU7-036-3000	5163	12	13-Dec-2022
Cable (18GHz SMA 1m)	Rosenberger	LU7-071-1000	5164	12	13-Dec-2022

Table 24

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 25

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. (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard. Risk:

The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.