FCC, IC and ISED Test Report

Detnet South Africa (Pty) Ltd
DGPS tagger, Model: CE4
DGPS Commander, Model: CE4

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

Prepared for: Detnet South Africa (Pty) Ltd
Block 1B, Founders Hill Office Park
Centenary Road
Modderfontein P O Box 10
1645
South Africa

FCC ID: 2ARNH-18462290 & 2ARNH-18362211
IC: 24476-18462290 & 24476-18362211

COMMERCIAL-IN-CONFIDENCE

Document 75949717-01 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
John Laydon	General Manager	Authorised Signatory	17 February 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, ICES-003 and ISEDC RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Callum Smith	17 February 2021	C Smith

FCC Accreditation
217472 Bearley Test Laboratory

Industry Canada Accreditation
2932E Bearley Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B: 2018, ICES-003 Issue 6: 2016 and ISEDC RSS-GEN: Issue 5 (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	17 February 2021

Table 1

1.2 Introduction

Applicant	Detnet South Africa (Pty) Ltd
Manufacturer	Detnet South Africa (Pty) Ltd
Model Number(s)	CE4
Serial Number(s)	183000010 and 18400000C
Hardware Version(s)	V6
Software Version(s)	45232
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2018, ICES-003 Issue 6: 2016 ISEDC RSS-GEN: Issue 5 (2018)
Order Number Date	4500432723 05-August-2020
Date of Receipt of EUT	18-January-2021
Start of Test	22-January-2021
Finish of Test	22-January-2021
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, ICES-003 and ISEDC RSS-GEN is shown below.

Section	Specification Clause			Test Description	Modification State	Result	Comments/Base Standard
	FCC	ICES	ISEDC				
Configuration and Mode: Battery Powered - Idle with GPS/DGPS Receiver operational							
2.1	15.109	3.2	7.1	Radiated Disturbance	0	Pass	ANSI C63.4: 2014

Table 2

1.4 Declaration of Build Status

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	Blasting control of electronic detonators
Manufacturer:	DetNet South Africa Pty (Ltd)
Model:	DGPS CE4 Commander
Part Number:	18400000C
Hardware Version:	V6
Software Version:	45232
FCC ID of the product under test – see guidance here	2ARNH-18462290
IC ID of the product under test – see guidance here	24476-18462290

Table 3

Intentional Radiators

Technology	RF	WiFi	NFC			
Frequency Range (MHz to MHz)	902-928	2412-2457	13.553-13.567			
Conducted Declared Output Power (dBm)	27	18	6			
Antenna Gain (dBi)	0	2.1	2.1			
Supported Bandwidth(s) (MHz) (e.g 1 MHz, 20 MHz, 40 MHz)	50	22				
Modulation Scheme(s) (e.g GFSK, QPSK etc)	GFSK	BPSK, QPSK, 16QAM, 64QAM	Point to point communication			
ITU Emission Designator (see guidance here)	900MF1D	2G4G1D	13M5D1D			
Bottom Frequency (MHz)	902.26	2412	-			
Middle Frequency (MHz)	914.74	2437	13.56			
Top Frequency (MHz)	927.74	2457	-			

Table 4

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

Name: Suzette Menezes
Position held: Approvals Manager
Date: 2020-08-14

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	Blasting control of electronic detonators
Manufacturer:	DetNet South Africa Pty (Ltd)
Model:	DGPS CE4 Tagger
Part Number:	183000010
Hardware Version:	V6
Software Version:	45232
FCC ID of the product under test – see guidance here	2ARNH-18362211
IC ID of the product under test – see guidance here	24476-18362211

Intentional Radiators

Technology	RF	WiFi	NFC			
Frequency Range (MHz to MHz)	902-928	2412-2457	13.553-13.567			
Conducted Declared Output Power (dBm)	27	18	6			
Antenna Gain (dBi)	0	2.1	2.1			
Supported Bandwidth(s) (MHz) (e.g 1 MHz, 20 MHz, 40 MHz)	50	22				
Modulation Scheme(s) (e.g GFSK, QPSK etc)	GFSK	BPSK, QPSK, 16QAM, 64QAM	Point to point communication			
ITU Emission Designator (see guidance here)	900MF1D	2G4G1D	13M5D1D			
Bottom Frequency (MHz)	902.26	2412	-			
Middle Frequency (MHz)	914.74	2437	13.56			
Top Frequency (MHz)	927.74	2457	-			

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

Name: Suzette Menezes
Position held: Approvals Manager
Date: 2020-08-14

1.5 Product Information

1.5.1 Technical Description

The Equipment under test (EUT) was a DetNet South Africa Pty (Ltd), DGPS CE4 Commander and a DGPS CE4 Tagger.

The primary function of the EUT is to be used as a Blasting control for electronic detonators.

Figure 1 – Front View - DGPS Tagger

Figure 2 – Rear View - DGPS Tagger

Figure 3 - Front View - DGPS Commander

Figure 4 - Rear View - DGPS Commander

1.5.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
Commander-External Antenna	3m	RF	Coax	Yes

Table 5

1.5.3 Test Configuration

Configuration	Description
Battery Powered	Units tested separately, both connected to external antenna and powered by internal battery at 3.7V DC.

Table 6

1.5.4 Modes of Operation

Mode	Description
Idle with GPS/DGPS Receiver operational	Tagger-Functional Tagger Software. GPS Receiver powered, Wifi powered yet idle unless access point created. RF is powered and in receive mode. Commander- Power on Commander. All RF elements powered yet in an idle state.

Table 7

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: Tagger CE4, Serial Number: 183000010			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: Commander CE4, Serial Number: 18400000C			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 8

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: Battery Powered - Idle with GPS/DGPS Receiver operational		
Radiated Disturbance	Callum Smith	UKAS

Table 9

Office Address:

Snitterfield Road
Bearley
Stratford-upon-Avon
Warwickshire
CV37 0EX
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
ISEDC RSS-GEN Clause 7.1

2.1.2 Equipment Under Test and Modification State

Tagger CE4, S/N: 183000010 - Modification State 0
Commander CE4, S/N: 18400000C - Modification State 0

2.1.3 Date of Test

22-January-2021

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

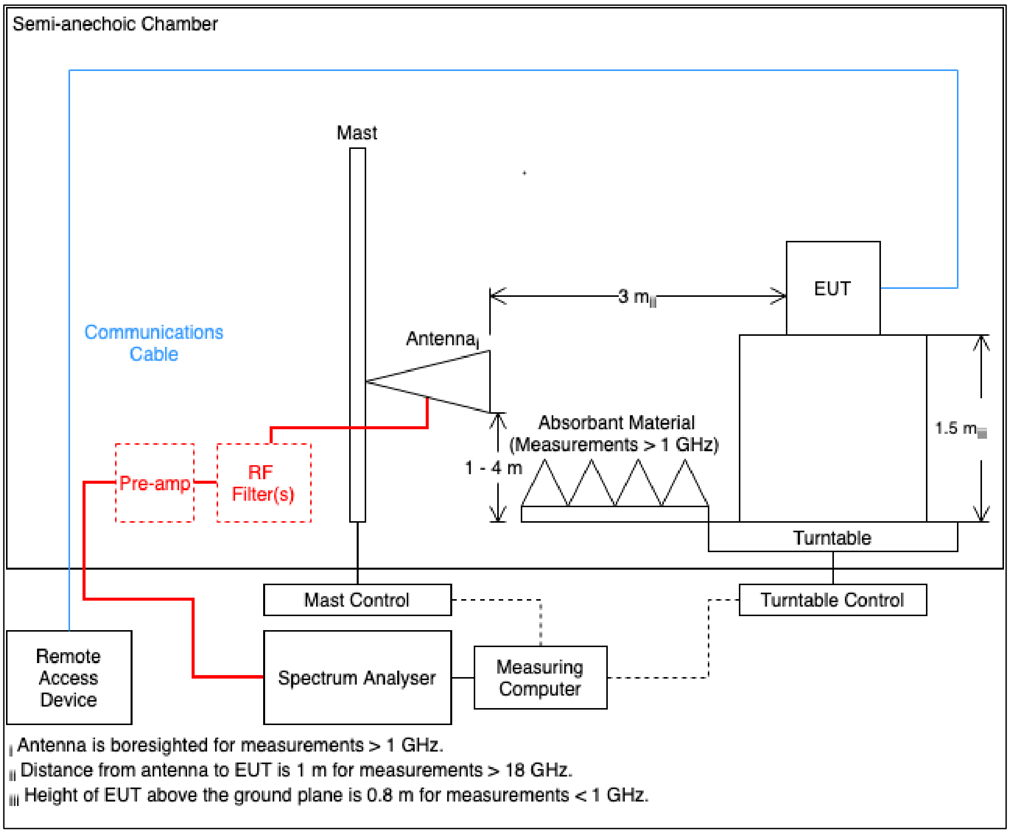

Figure 5

2.1.7 Environmental Conditions

Ambient Temperature	17.4 - 18.3 °C
Relative Humidity	42.3 - 46.8 %

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 10

Note: - Radiated emissions were measured in a 3 metre chamber and the results were then extrapolated to show a 10 metre measurement using an inverse proportionality factor of 20dB per decade.

2.1.9 Test Results (Tagger)

Results for Configuration and Mode: Tagger - Battery Powered - Idle with GPS/DGPS Receiver operational.

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: 2457 MHz
Which necessitates an upper frequency test limit of: 13 GHz

The Tagger is handheld, body-worn, or ceiling-mounted equipment and has therefore been tested in three different orientations in accordance with ANSI C63.4, Clause 6.3.2.1.

Frequency Range of Test: 30 MHz to 1 GHz- Tagger X Axis

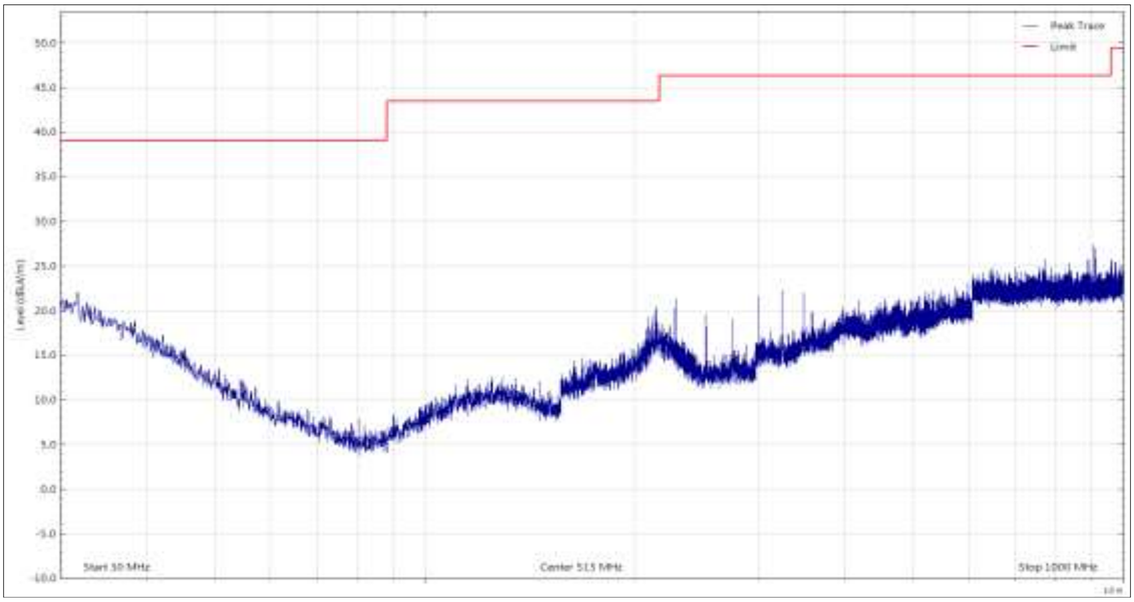

Figure 6 - 30 MHz to 1 GHz - Tagger, Quasi-Peak, Vertical - X Orientation

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

*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: 30 MHz to 1 GHz- Tagger X Axis

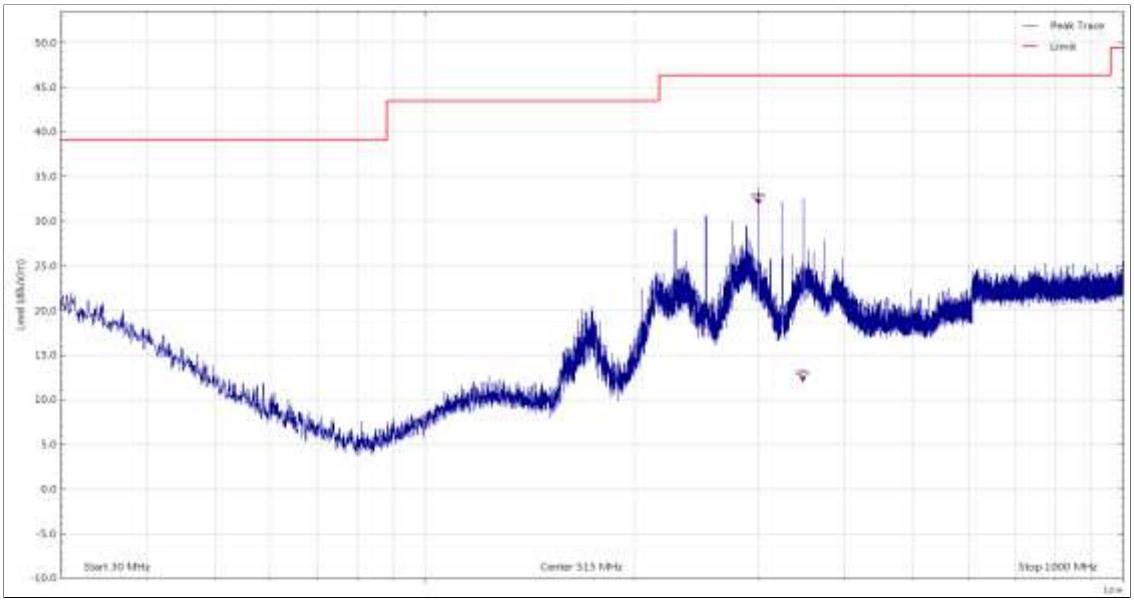

Figure 7 - 30 MHz to 1 GHz - Tagger, Quasi-Peak, Horizontal - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
300.006	31.6	46.4	-14.8	Q-Peak	178	122	Horizontal	X
347.645	11.81	46.4	-34.59	Q-Peak	38	387	Horizontal	X

No other 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- Tagger X Axis – Peak Detector

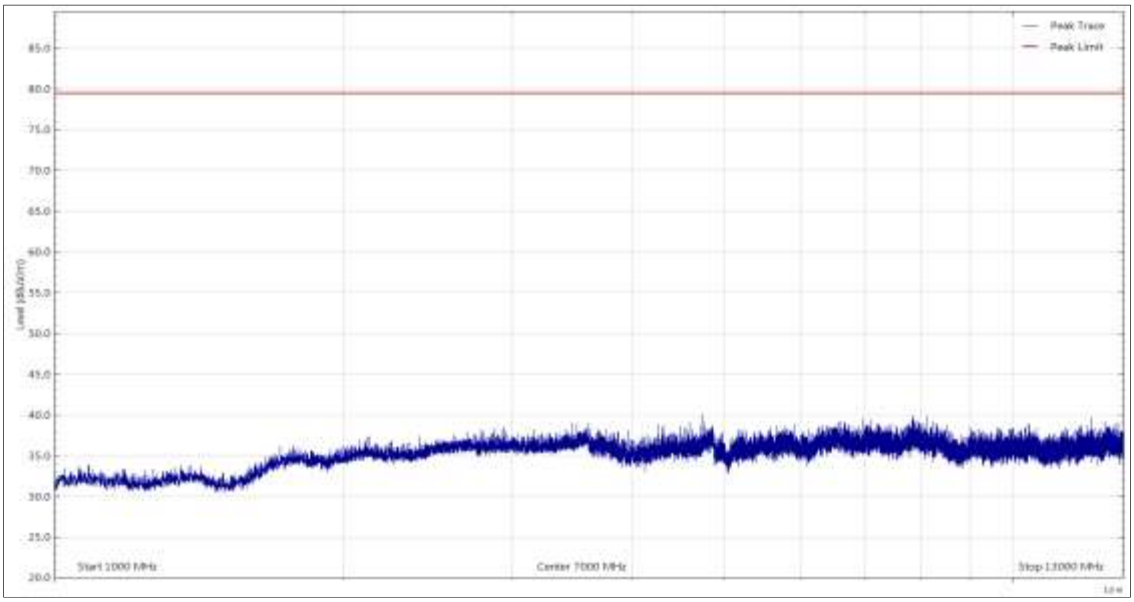

Figure 8 - 1 GHz to 13 GHz - Peak, Vertical - X Orientation

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

*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- Tagger X Axis – Peak Detector

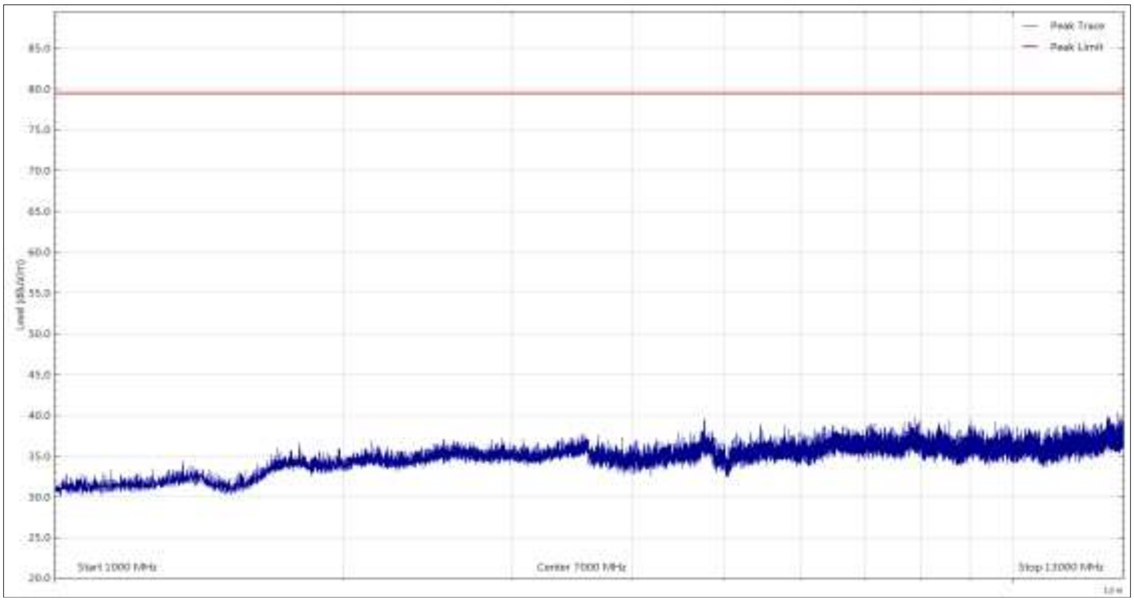

Figure 9 - 1 GHz to 13 GHz - Peak, Horizontal - X Orientation

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

*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- Tagger X Axis - CISPR Average Detector

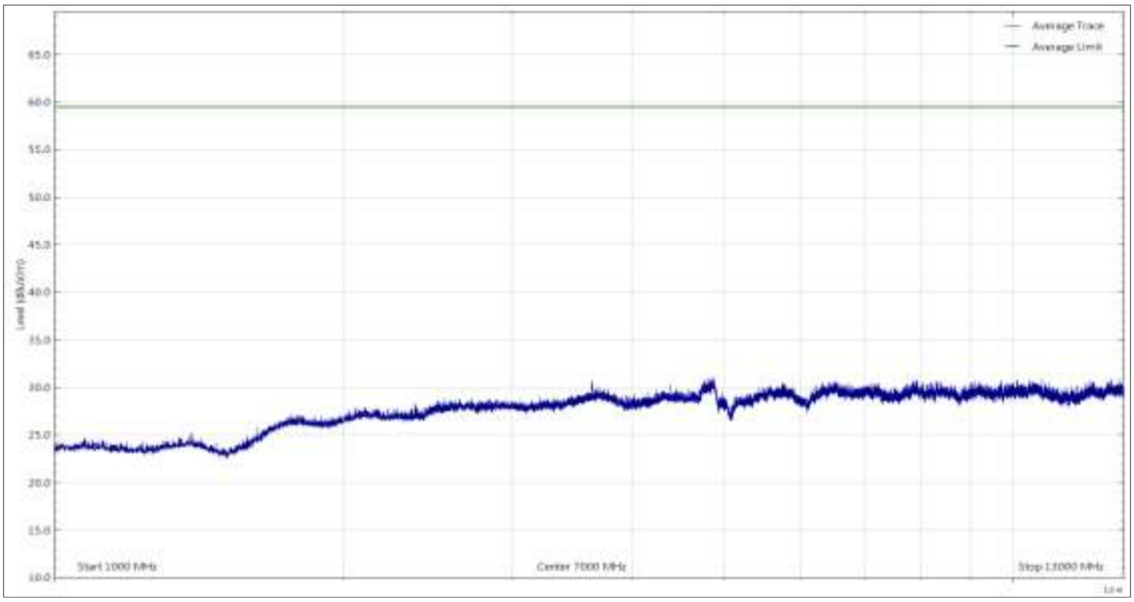

Figure 10 -1GHz to 13 GHz - CISPR Average, Vertical - X Orientation

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

*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- Tagger X Axis - CISPR Average Detector

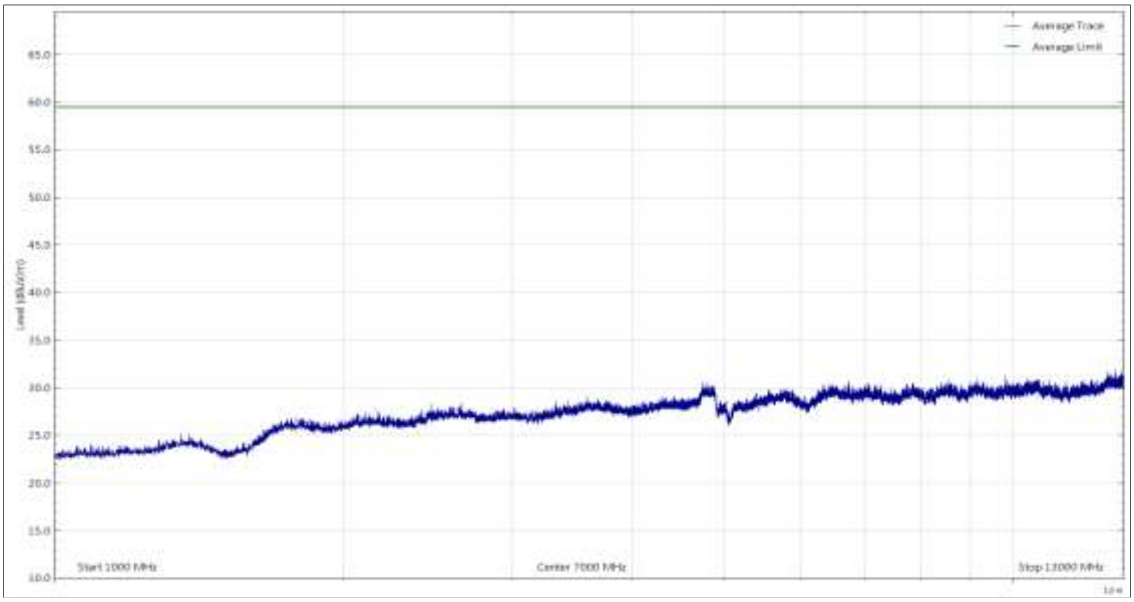

Figure 11 - 1 GHz to 13 GHz - CISPR Average, Horizontal - X Orientation

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

*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: 30 MHz to 13 GHz- Tagger Y Axis

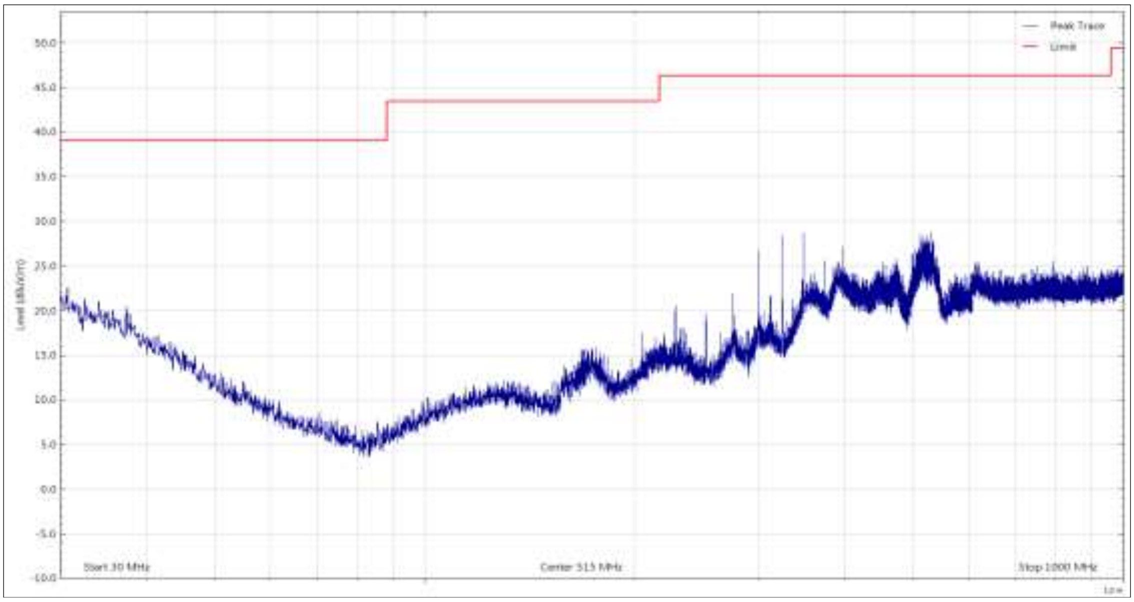

Figure 12 - 30 MHz to 1 GHz - Tagger, Quasi-Peak, Vertical - Y Orientation

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

*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: 30 MHz to 1 GHz- Tagger Y Axis

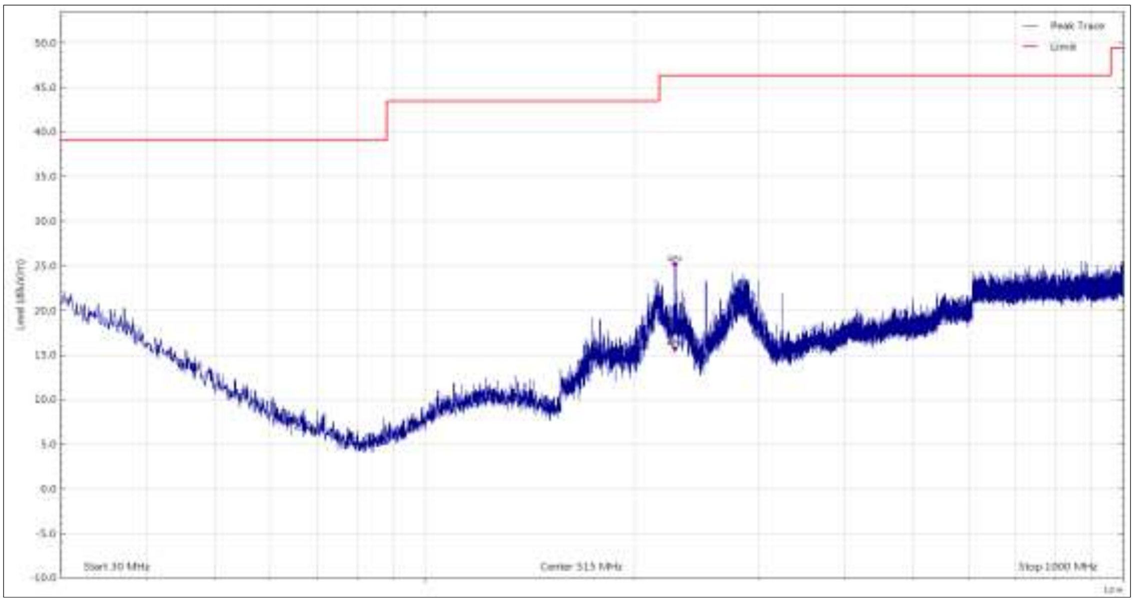

Figure 13 - 30 MHz to 1 GHz - Tagger, Quasi-Peak, Horizontal - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
300.024	31.88	46.4	-14.52	Q-Peak	95	100	Horizontal	Y
348.035	31.55	46.4	-14.85	Q-Peak	176	100	Horizontal	Y

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- Tagger Y Axis - Peak Detector

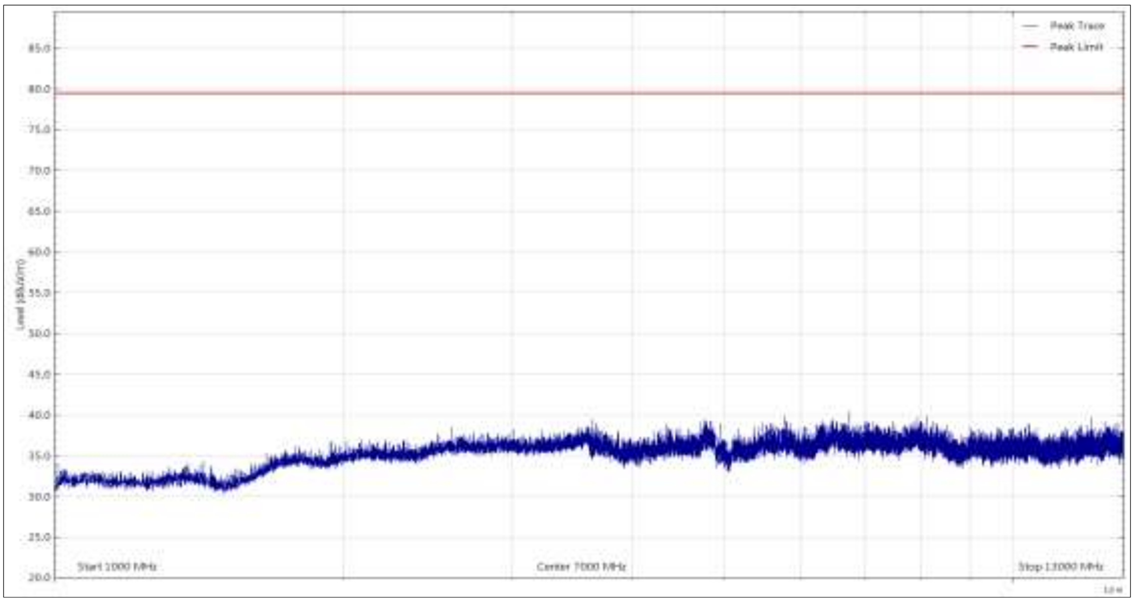

Figure 14 - 1 GHz to 13 GHz - Tagger, Peak, Vertical - Y Orientation

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

*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- Tagger Y Axis - Peak Detector

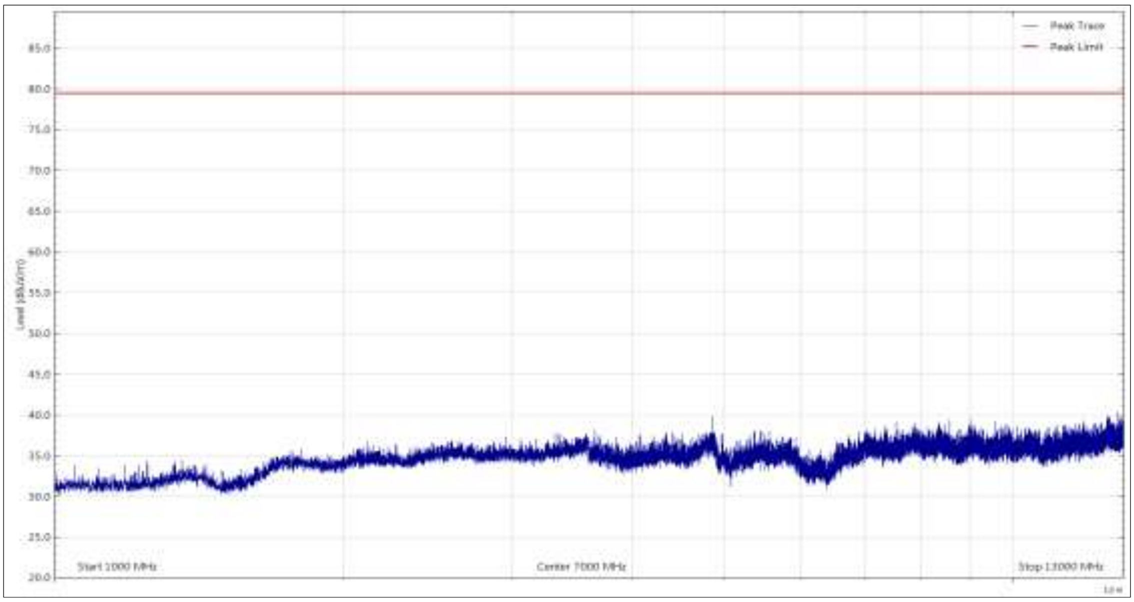

Figure 15 - 1 GHz to 13 GHz - Tagger, Peak, Horizontal - Y Orientation

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

*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 - Tagger Y Axis - CISPR Average Detector

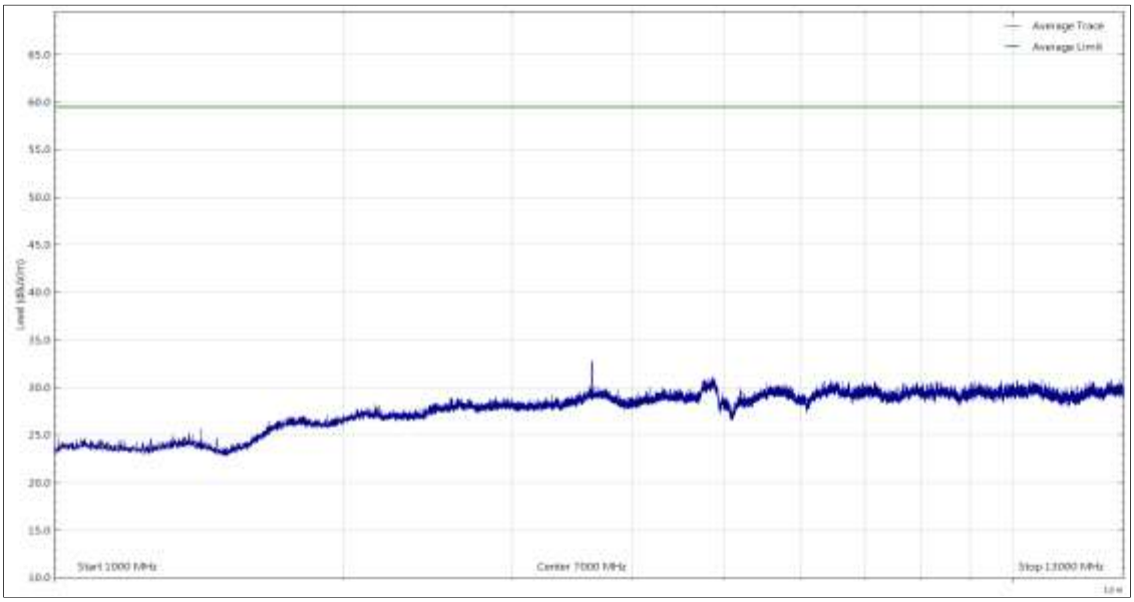

Figure 16 - 1 GHz to 13 GHz - Tagger, CISPR Average, Vertical - Y Orientation

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

*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 - Tagger Y Axis - CISPR Average Detector

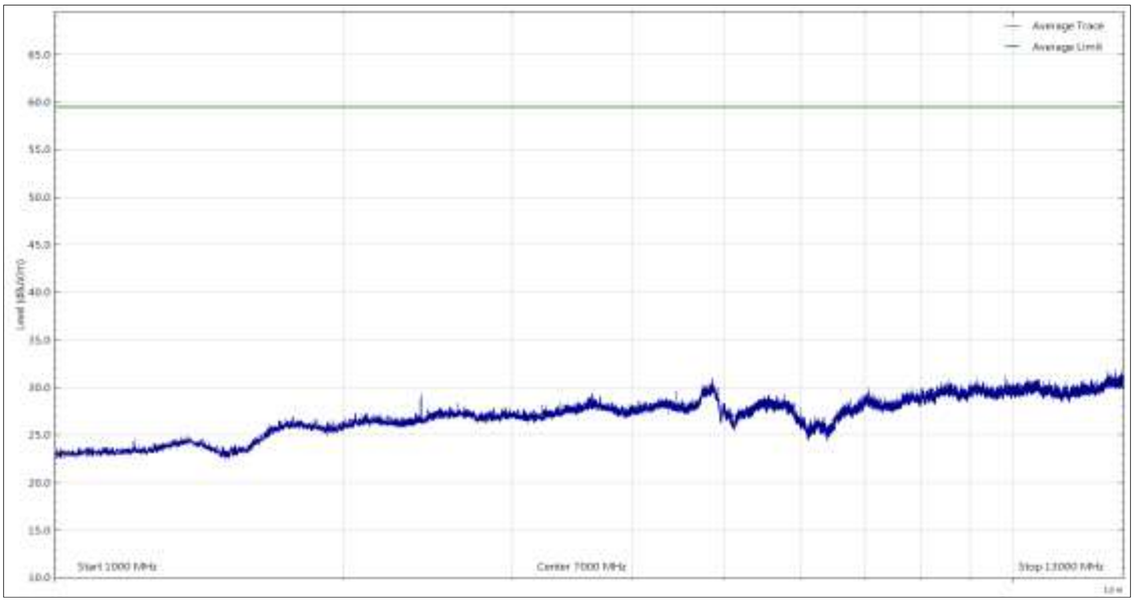

Figure 17 - 1 GHz to 13 GHz - Tagger, CISPR Average, Horizontal - Y Orientation

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

*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: 30 MHz to 1 GHz- Tagger Z Axis

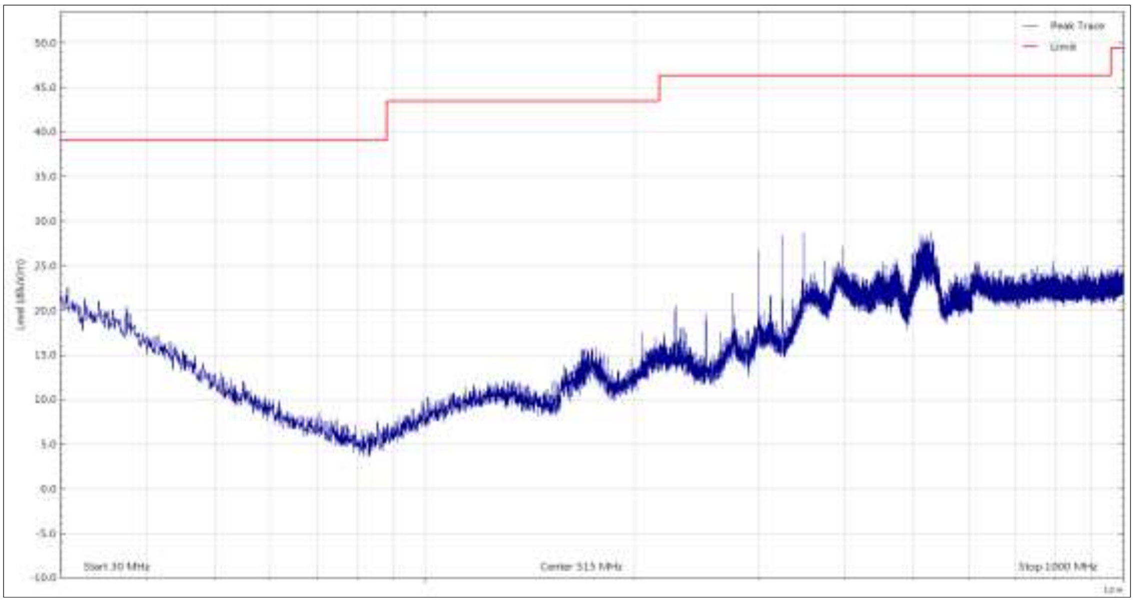

Figure 18 - 30 MHz to 1 GHz - Tagger, Quasi-Peak, Vertical - Z Orientation

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

*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: 30 MHz to 1 GHz- Tagger Z Axis

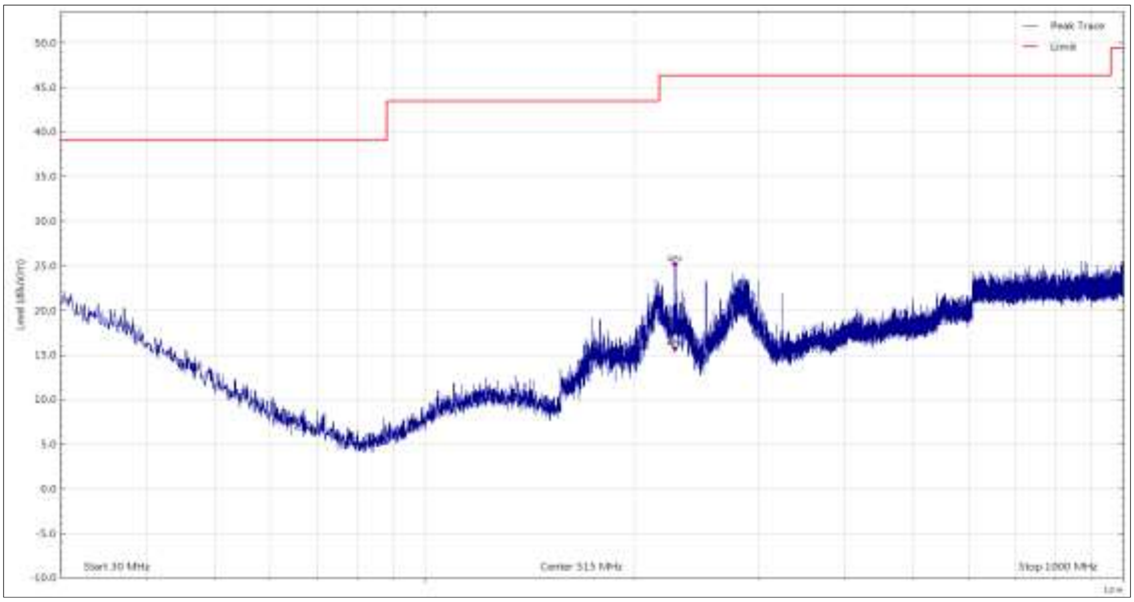

Figure 19 - 30 MHz to 1 GHz - Tagger, Quasi-Peak, Horizontal - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
227.968	24.53	46.4	-21.87	Q-Peak	360	109	Horizontal	Z
228.052	15.13	46.4	-31.27	Q-Peak	107	148	Horizontal	Z

No other 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- Tagger Z Axis - Peak Detector

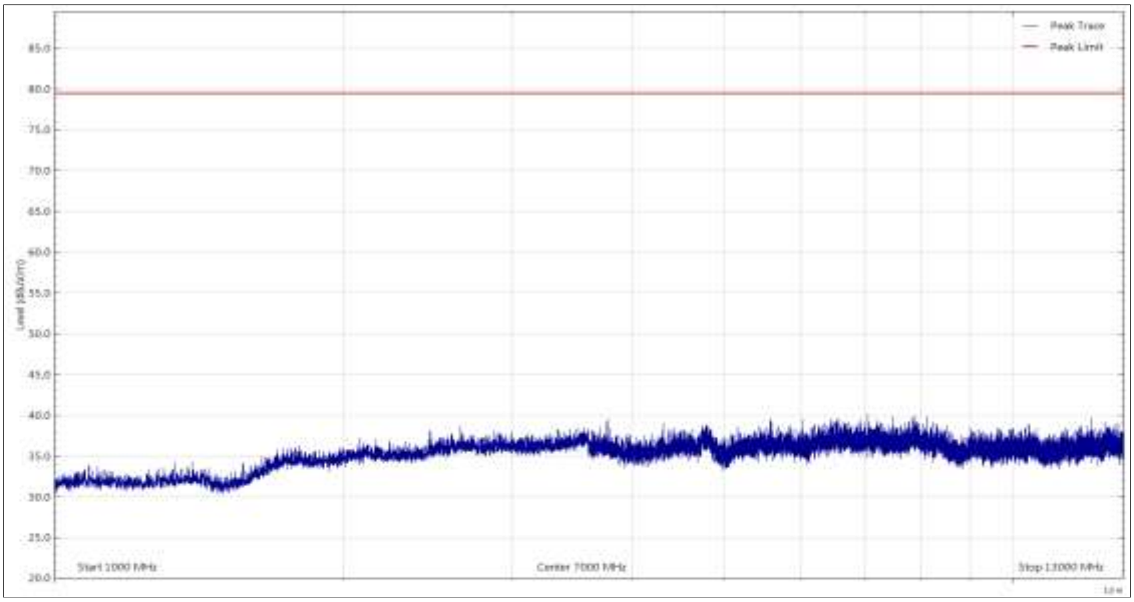

Figure 20 - 1 GHz to 13 GHz - Tagger, Peak, Vertical - Z Orientation

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

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- Tagger Z Axis - Peak Detector

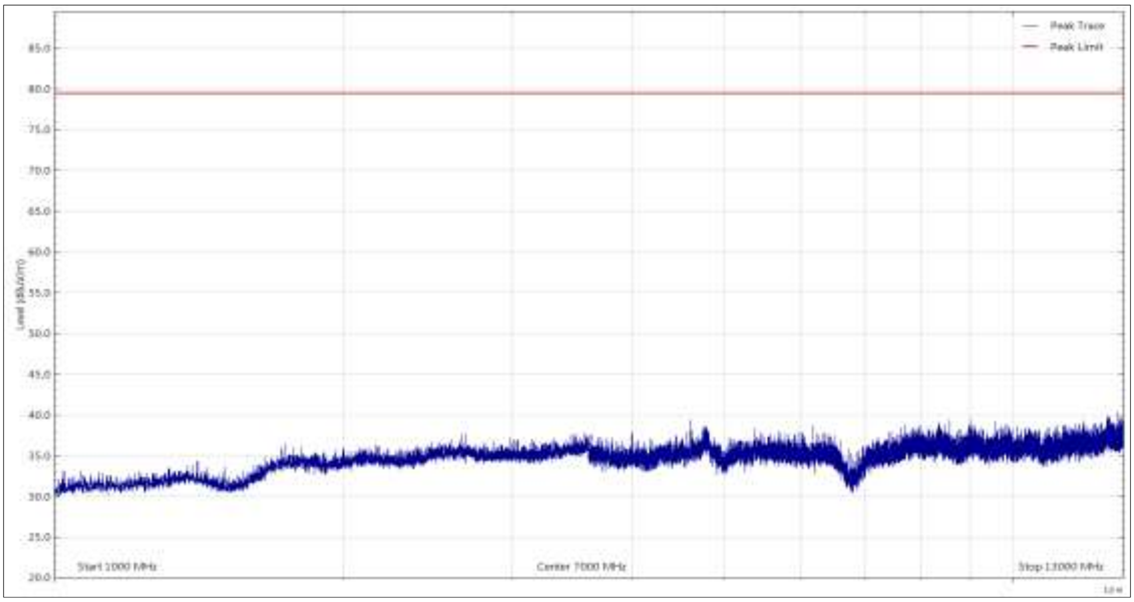

Figure 21 - 1 GHz to 13 GHz - Tagger, Peak, Horizontal - Z Orientation

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

*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- Tagger Z Axis - CISPR Average Detector

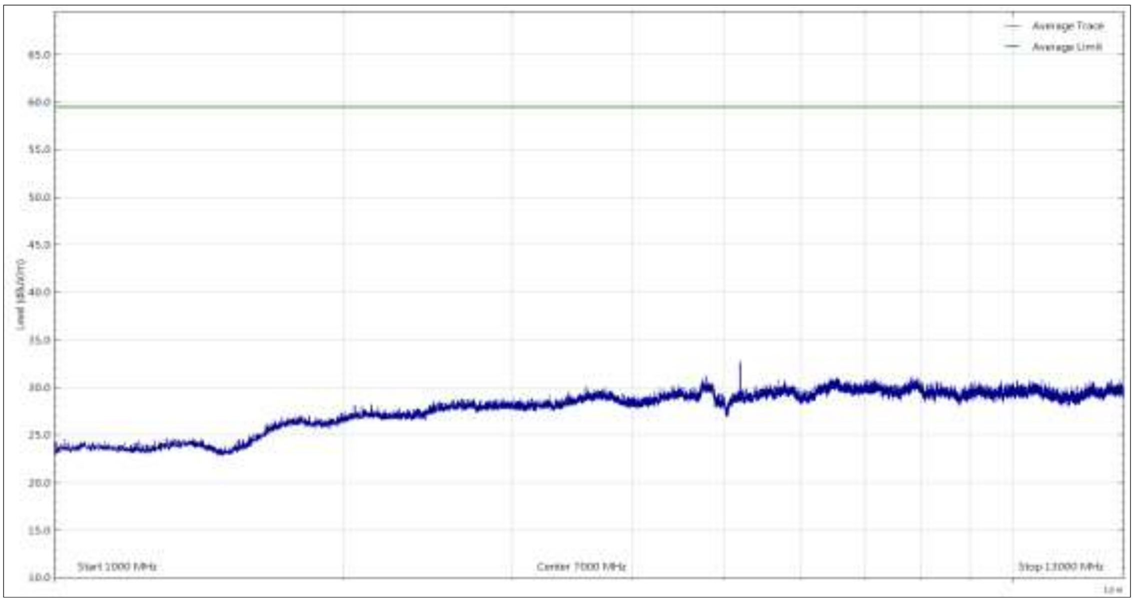

Figure 22 - 1 GHz to 13 GHz - CISPR Average, Vertical - Z Orientation

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

*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- Tagger Z Axis - CISPR Average Detector

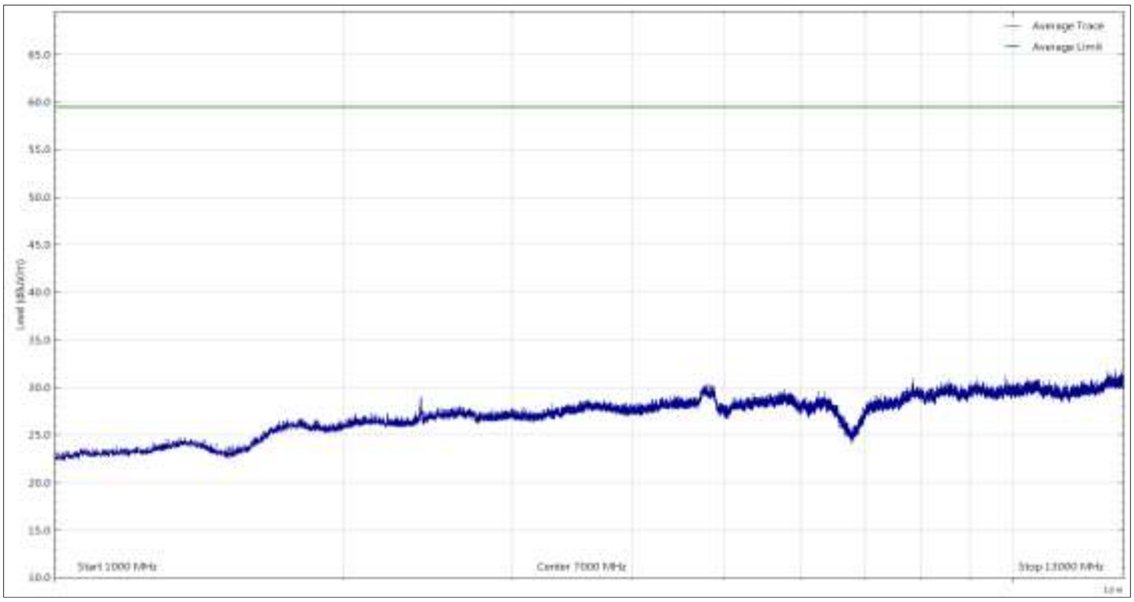

Figure 23 - 1 GHz to 13 GHz - CISPR Average, Horizontal - Z Orientation

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

*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.

2.1.10 Test Results (Commander)

Results for Configuration and Mode: Commander-Battery Powered - Idle with GPS/DGPS Receiver operational.

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: 2457 MHz
Which necessitates an upper frequency test limit of: 13 GHz
Measurement were performed at a 3m distance.

The Customer has stated that the commander will only be operated in a fixed upright position. For this reason, a single orientation will be tested.

Frequency Range of Test: 30 MHz to 13 GHz- Commander-Single Orientation

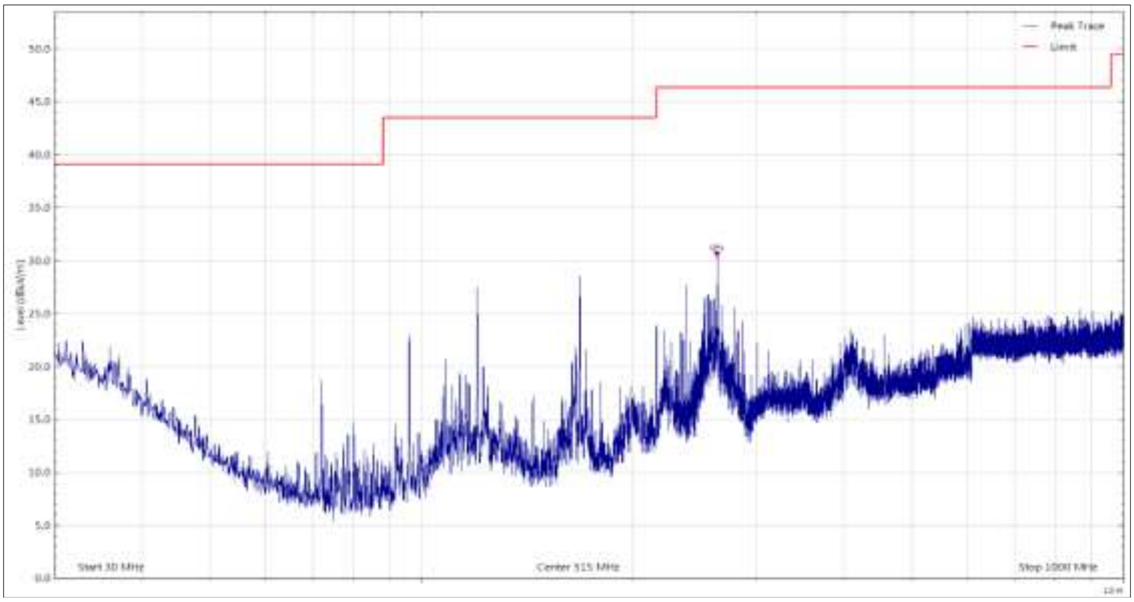

Figure 24 - 30 MHz to 1 GHz-Commander (Single Orientation), Quasi-Peak, Vertical - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
264.015	30.16	46.4	-16.24	Q-Peak	116	104	Vertical	-

No other 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: 30 MHz to 13 GHz- Commander-Single Orientation

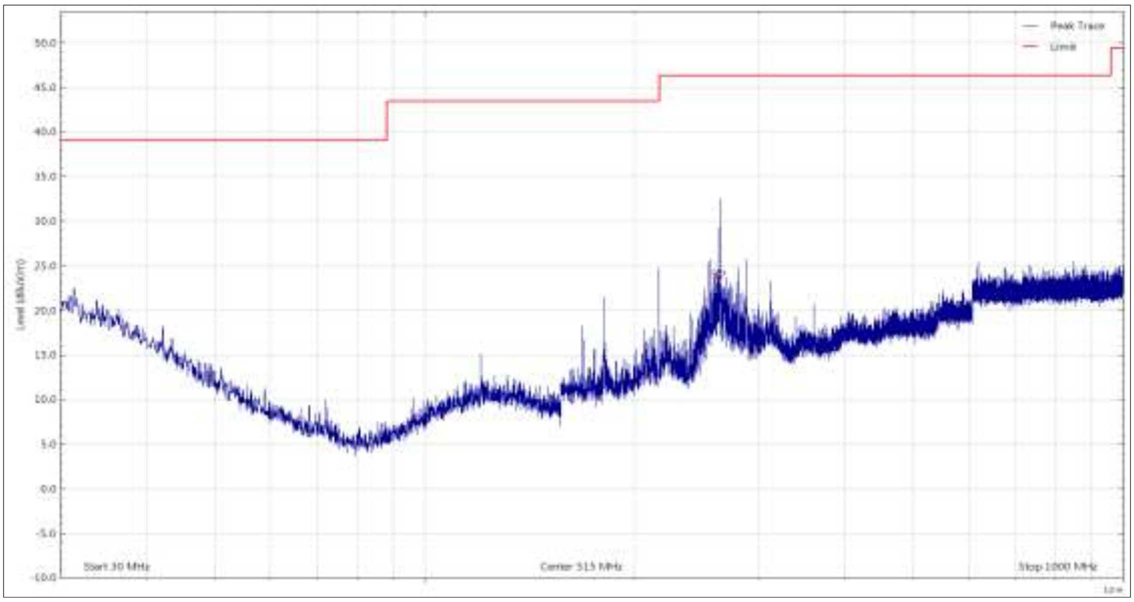

Figure 25 - 30 MHz to 1 GHz- Quasi-Peak, Horizontal - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
264.025	22.97	46.4	-23.43	Q-Peak	285	364	Horizontal	-

Table 13

No other 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 - Commander-Single Orientation - Peak Detector

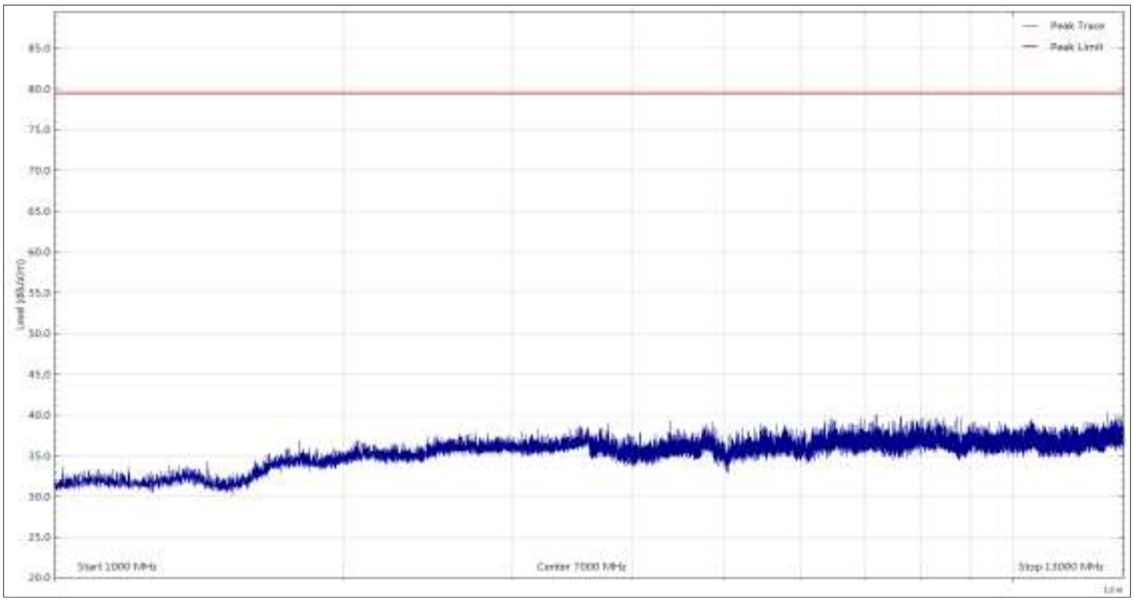

Figure 26 - 1 GHz to 13 GHz - Peak, Vertical

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

*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 - Commander-Single Orientation - Peak Detector

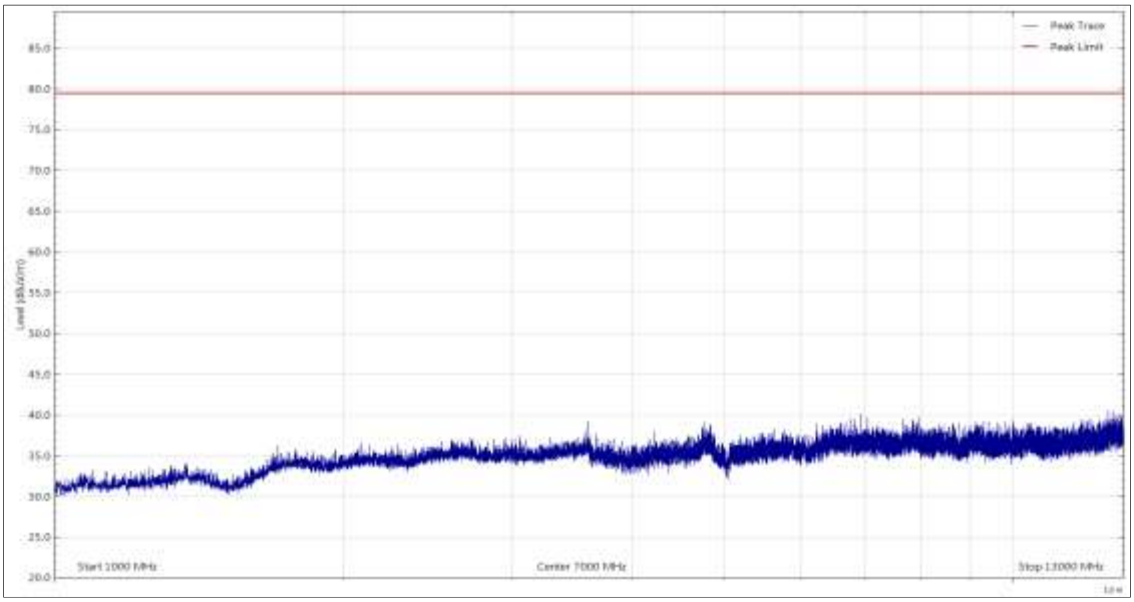

Figure 27 - 1 GHz to 13 GHz- Peak, Horizontal

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

*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 - Commander-Single Orientation - CISPR Average Detector

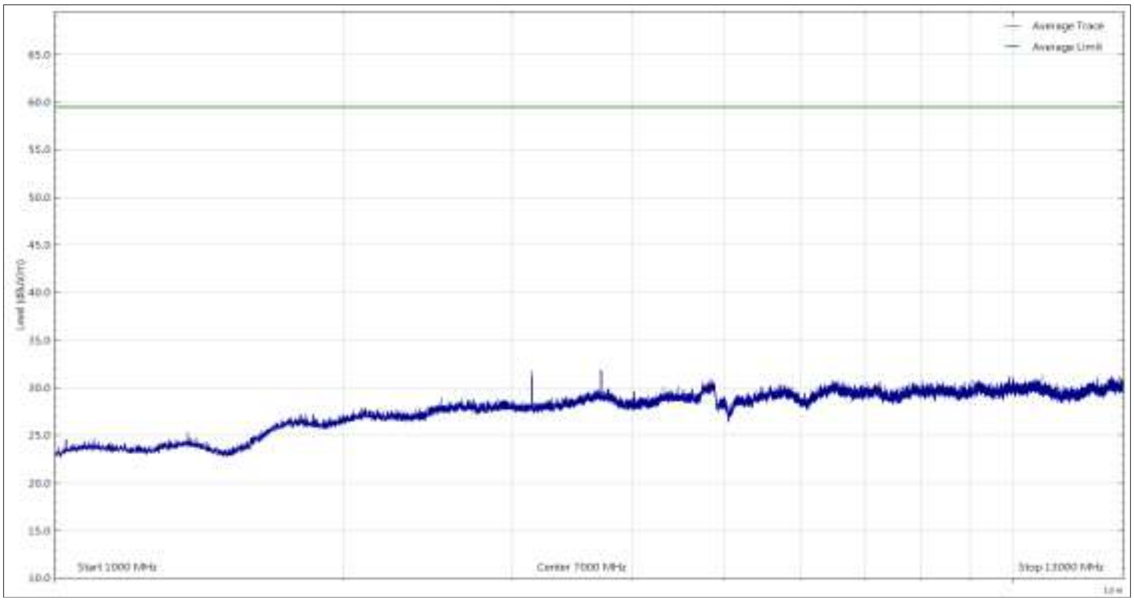

Figure 28 - 1 GHz to 13 GHz - CISPR Average, Vertical

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

*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 - Commander-Single Orientation - CISPR Average Detector

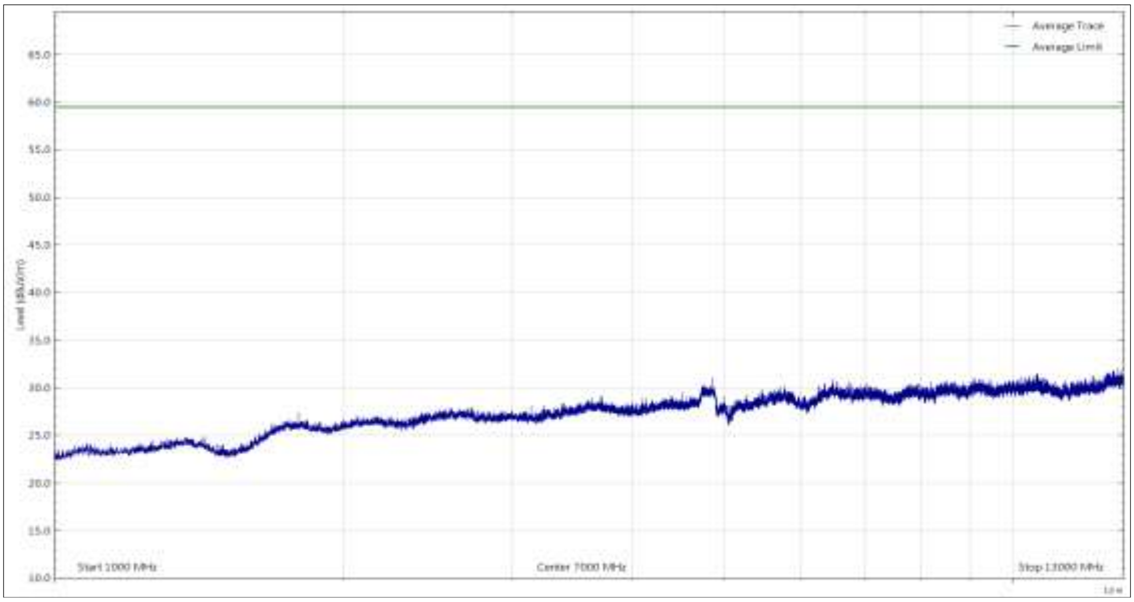

Figure 29 - 1 GHz to 13 GHz- CISPR Average, Horizontal

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

*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 30 - Test Setup - 30 MHz to 1 GHz -Tagger

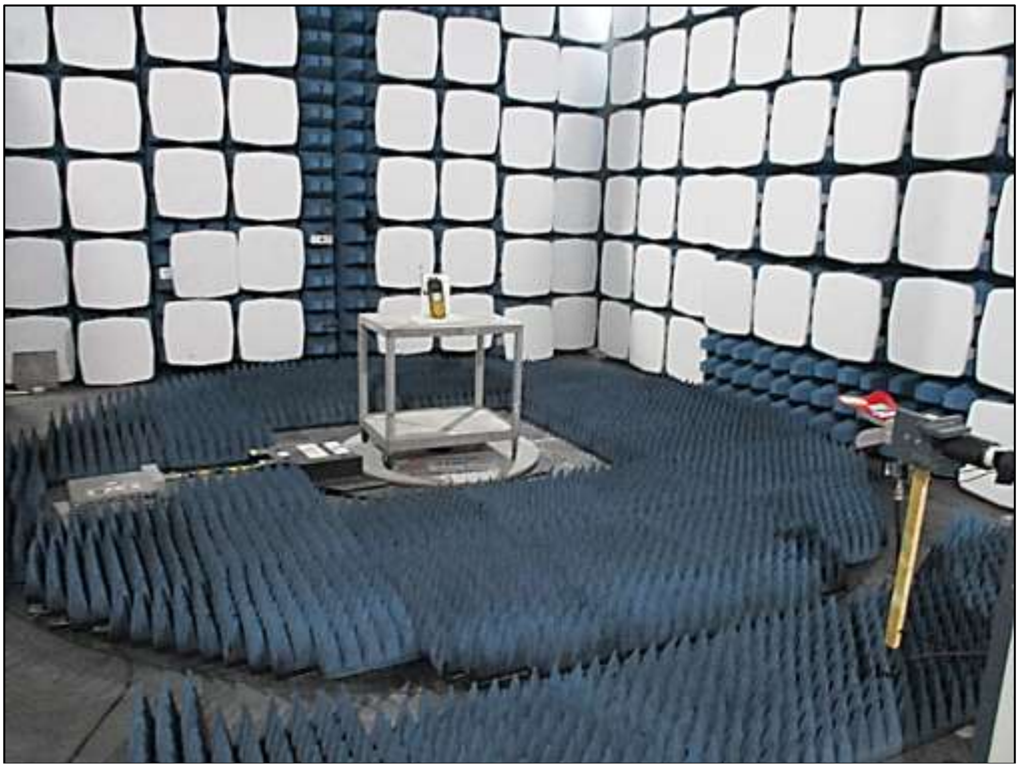

Figure 31 - Test Setup - 1 GHz to 13 GHz -Tagger

Figure 32 - Test Setup - 30 MHz to 1 GHz -Commander

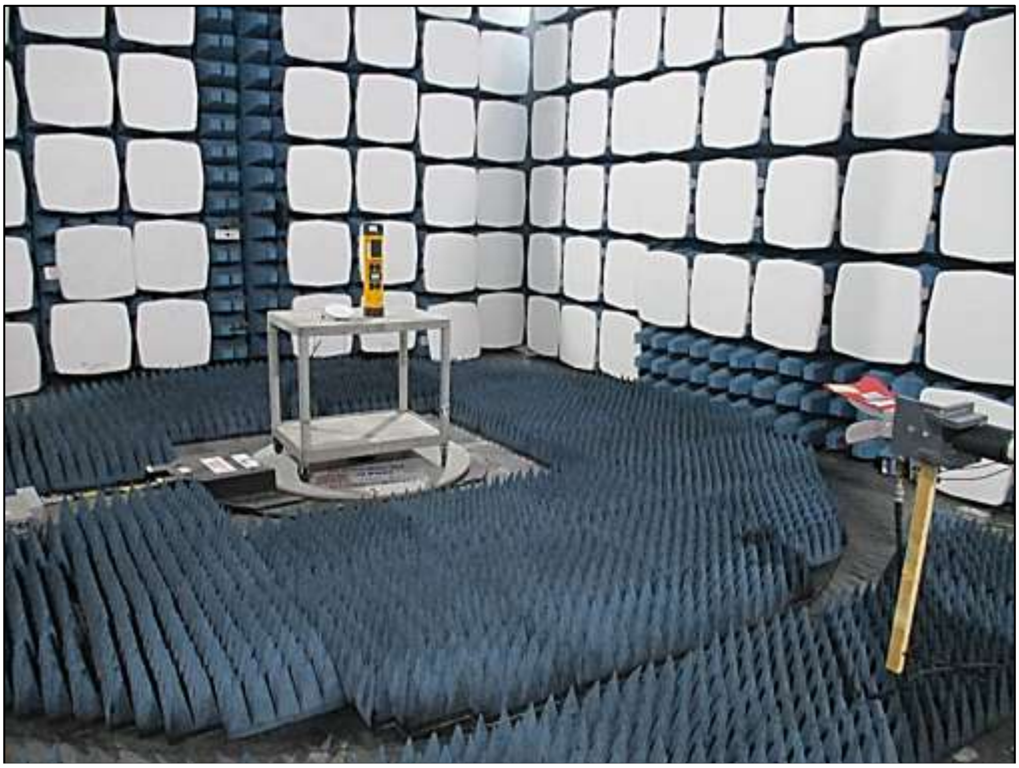

Figure 33 - Test Setup - 1 GHz to 13 GHz -Commander

2.1.11 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
Hygromer	Rotronic	A2	1698	12	18-Nov-2021
Power Supply Unit	Farnell	H60-25	1709	-	TU
Bilog Antenna	Schaffner	CBL6143	1858	24	10-Nov-2022
EMI Test Receiver	Rohde & Schwarz	ESIB26	2028	12	14-Aug-2021
EMC 3m Semi Anechoic Chamber	Rainford	Hybrid	4160	36	16-Dec-2021
7m N-Type Cable	Teledyne Storm	SA90-195-7MTR	4168	12	10-Mar-2021
1-8 GHz Amplifier	Wright Technologies	APS04-0085	4674	12	18-Aug-2021
8-18 GHz Amplifier	Wright Technologies	APS04-0086	4675	12	18-Aug-2021
EMC Mast controller	Innco Systems	Controller CO3000	4728	-	TU
1 - 18GHz DRG Horn	ETS-Lindgren	3117	4737	24	28-Jul-2021
EMI Receiver	Keysight Technologies	N9038A MXE	4974	12	11-Feb-2021
EmX Emissions Software	TUV SUD	V2.1.0	5125	-	Software
Cable (18GHz N Type 3m)	Rosenberger	LU7-036-3000	5163	12	10-Dec-2021
Turntable Controller	Maturo	Maturo NCD	5275	-	TU
4dB Attenuator	Pasternack	PE7047-4	5647	24	10-Nov-2022

Table 14

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 15

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.