FCC, IC and ISED Test Report

XYZ Reality Limited
ATOM Hard hat, Model: XYZ-13-01

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

Add value.
Inspire trust.

Prepared for: XYZ Reality Limited
Unit G0, G02, 338-346
Goswell Road
Angel
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UNITED KINGDOM

FCC ID: 2A3C5XYZ1301 IC: 28181-XYZ131

COMMERCIAL-IN-CONFIDENCE

Document 75957296-02 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
John Laydon	General Manager	Authorised Signatory	14 April 2023

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 ISED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Ravi Kishore Darshanam	14 April 2023	

FCC Accreditation	ISED Accreditation
330364 Bearley Test Laboratory	2932E Bearley Test Laboratory

EXECUTIVE SUMMARY
A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B: 2021, ICES-003 Issue 7: 2020 and ISEDC RSS-GEN: Issue 5 + A2 (2021-02) for the tests detailed in section 1.3.

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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	14 April 2023

Table 1

1.2 Introduction

Applicant	XYZ Reality Limited
Manufacturer	XYZ Reality Limited
Model Number(s)	XYZ-13-01
Serial Number(s)	130004
Hardware Version(s)	-
Software Version(s)	Windows Certification Build
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B:2021 ICES-003 Issue 7: 2020 ISED RSS-GEN: Issue 5 + A2 (2021-02)
Order Number	PO-XYZAM0356
Date	16-December-2022
Date of Receipt of EUT	01-March-2023
Start of Test	02-March-2023
Finish of Test	08-March-2023
Name of Engineer(s)	Ravi Kishore Darshanam
Related Document(s)	ANSI C63.4: 2014

Note: - This testing is specifically to address changes made to the Hard Hat due to obsolescence and modifications as below:
1. Kontron COMe-cWL6 i7-8665UE 16GB/1TB will be replaced with an AAEON COME T6 i7. Kontron COMecTL6 is a pre-certified COTS single board computer used in the AR Hard Hat. Due to supplier constraints, this change is needed to make this change to Aaeon.
2. Front Camera Xvisio XR80A42 is changing to Intel Realsense D450. Due to obsolescence we need to make this change.
3. Redesign of supporting PCBs inside the product (Mainboard PCB) to support the above changes along with optimising the design:
a. Power Management IC changes, b. NVM SSD Added to mainboard PCB and c. PCIE Clock Distribution added

1.3 Brief Summary of Results

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

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	FCC	ICES	ISEDC			
Configuration and Mode: Battery Powered - Idle						
2.1	15.109	3.2	7.1	Radiated Disturbance	Pass	ANSI C63.4: 2014
Configuration and Mode: Battery Powered - External Battery - Idle						
2.1	15.109	3.2	7.1	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2

1.4 Declaration of Build Status

MAIN EUT			
MANUFACTURING DESCRIPTION	Protective Hard Hat with integrated eye protection and augmented reality		
MANUFACTURER	XYZ Reality Ltd		
MODEL	Atom Hard Hat		
PART NUMBER	XYZ-13-01		
HARDWARE VERSION			
SOFTWARE VERSION	Windows Certification Build		
PSU VOLTAGE/FREQUENCY/CURRENT	Internal (removeable), Li Ion Battery 7.4V		
HIGHEST INTERNALLY GENERATED FREQUENCY	25 MHz		
FCC ID (if applicable)	2A3C5XYZ1301 (Contains FCC ID PD99260NG)		
INDUSTRY CANADA ID (if applicable)	28181-XYZ131 (Contains IC 1000M-9260NG)		
TECHNICAL DESCRIPTION (a brief technical description of the intended use and operation)	Protective hard Hat with integrated eye protection and augmented reality		
COUNTRY OF ORIGIN	United Kingdom		
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	2402-2480 2412-2472		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	2402-2480 2412-2472		
INTERMEDIATE FREQUENCIES			
EMISSION DESIGNATOR(S): https://fccid.io/Emissions-Designator/	1M00F1D, 20M3D1W, 40M3D1W		
MODULATION TYPES: (i.e. GMSK, QPSK)	GFSK, DQPSK, OFDM, OFDM-HT, CCK		
OUTPUT POWER (W or dBm)	FCC 20 dBm ± 1 dB ETSI 16 dBm ± 1 dB BT/BLE 12.0 dBm ± 2 dB		
SEPARATE BATTERY/POWER SUPPLY (if applicable)			
MANUFACTURING DESCRIPTION	Atom 7.4V Li iON Battery		
MANUFACTURER	XYZ Reality Ltd		
TYPE	Li Ion		
PART NUMBER	XYZ-32-01		
PSU VOLTAGE/FREQUENCY/CURRENT	7.2V		
COUNTRY OF ORIGIN	United Kingdom		
MODULES (if applicable)			
MANUFACTURING DESCRIPTION	M.2 module (AC-9260)	M.2 module (AC-9260)	nRF24LU1P
MANUFACTURER	Intel	Intel	Nordic Semi
TYPE	WLAN 2.4 GHz	BT classic/BLE	Proprietary 2.4 GHz
POWER	FCC 20 dBm ± 1 dB ETSI 16 dBm ± 1 dB	12.0 dBm ± 2 dB	0 dBm
FCC ID	PD99260NG	PD99260NG	
INDUSTRY CANADA ID	1000M-9260NG	1000M-9260NG	
EMISSION DESIGNATOR	20M3D1W / 40M3D1W	1M00F1D	1M00F1D
DHSS/FHSS/COMBINED OR OTHER			
COUNTRY OF ORIGIN			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION	Atom Controller	Atom Tracking Beacon	
MANUFACTURER	XYZ Reality Ltd	XYZ Reality Ltd	
TYPE			
PART NUMBER	XYZ-22-03	XYZ-53-01	
SERIAL NUMBER	N/A	N/A	
COUNTRY OF ORIGIN	United Kingdom	United Kingdom	

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

Authorised Named Person: Loek Janssen
Position held: Lead Hardware Engineer, XYZ Reality Ltd
Date: 1st March 2023

1.5 Product Information

1.5.1 Technical Description

The Equipment under test (EUT) was a XYZ reality, Atom hard hat system comprising of:

- Atom Hard Hat, Model: XYZ-13-01
- Controller, Model: XYZ-22-03
- Beacon, Model: XYZ-53-01

The EUT is Protective hard hat with integrated eye protection and augmented reality. Additionally, the EUT connects to the listed auxiliaries using Bluetooth and Wi-Fi.

Figure 1 - EUT General View

Figure 2 - Hat Front View

Figure 3 - Hat Rear View

Figure 4 - Hat RHS View

Figure 5 - Hat LHS View

Figure 6 - Hat Base View

Figure 7 - Controller Top View

Figure 8 - Controller Base View

Figure 9 - Beacon Front, RHS and Top View

Figure 10 - Beacon Rear, LHS and Base View

1.5.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
N/A	N/A	N/A	N/A	N/A

Table 3

1.5.3 Test Configuration

Configuration	Description
Battery Powered- Idle	EUT powered by internal batteries and connected to a Wi-Fi router. Shadow session of camera streaming with a full visual load running, monitored through the laptop. Remote video camera utilised to monitor the display of the EUT for any disturbances. i.e., display turning off.
Battery Powered - External Battery - Idle	EUT is powered by external battery, The EUT had one of its USB C cables connected to the external battery and the other cable connected to the USB-C Hub, Wi-Fi router connected to EUT. Shadow session of camera streaming with full visual load running, monitored through the laptop. Remote video camera utilised to monitor the display of the EUT for any disturbances. i.e., display turning off.

Table 4

1.5.4 Modes of Operation

Mode	Description
A single communications link + checking the display output of the Hard Hat.	• Running Camera with full load using XYZ internal batteries • Running Camera with full load using Zendure external battery

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: XYZ-13-01, Serial Number: 130004			
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: Battery Powered - Idle		
Radiated Disturbance	Ravi Kishore Darshanam	UKAS
Configuration and Mode: Battery Powered - External Battery - Idle		
Radiated Disturbance	Ravi Kishore Darshanam	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 15.107
ICES-003, Clause 3.1
ISED RSS-GEN Clause 7.1

2.1.2 Equipment Under Test and Modification State

XYZ-13-01, S/N: 130004 - Modification State 0

2.1.3 Date of Test

02-March-2023 to 08-March-2023

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.

The internal Pre-Amplifier was used for measurement from Frequency 1GHz - 3GHz and the external Pre-Amplifier was used for measurement from Frequency 3GHz - 13 GHz.

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

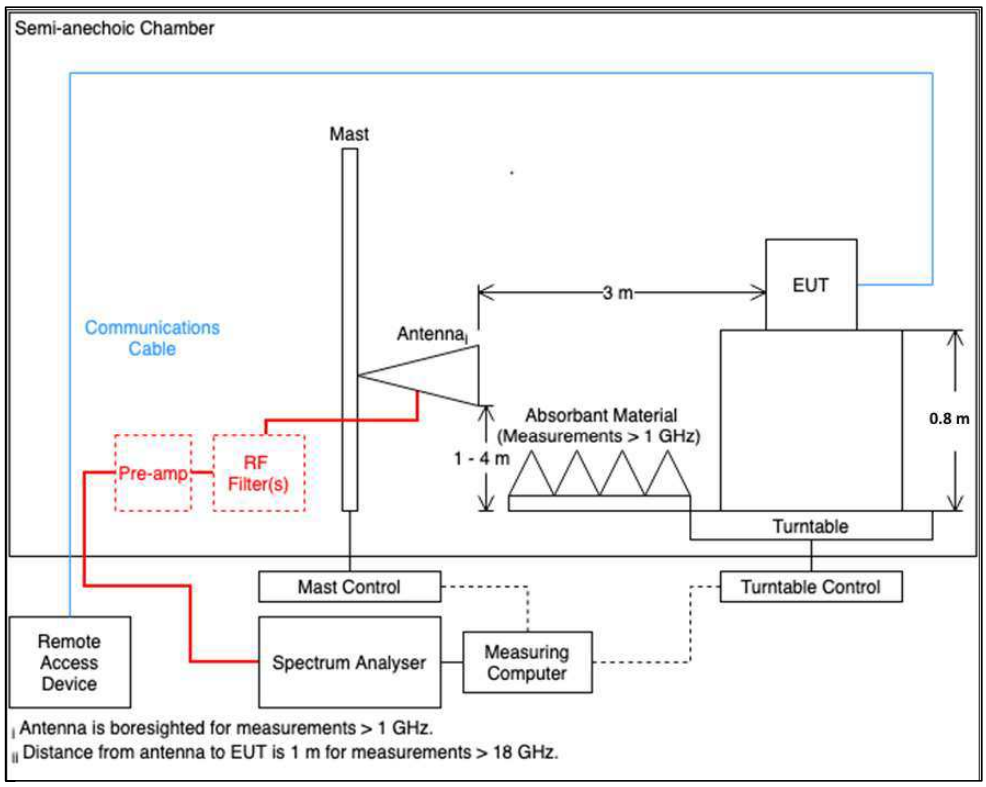

Figure 11 - Radiated Disturbance Example Test Setup

2.1.7 Environmental Conditions

Ambient Temperature	15.9 - 18.3 °C
Relative Humidity	35.8 - 36.7 %
Atmospheric Pressure	1006.0 - 1008.0 mbar

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

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

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: 2480MHz
Which necessitates an upper frequency test limit of: 13 GHz

The EUT 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.

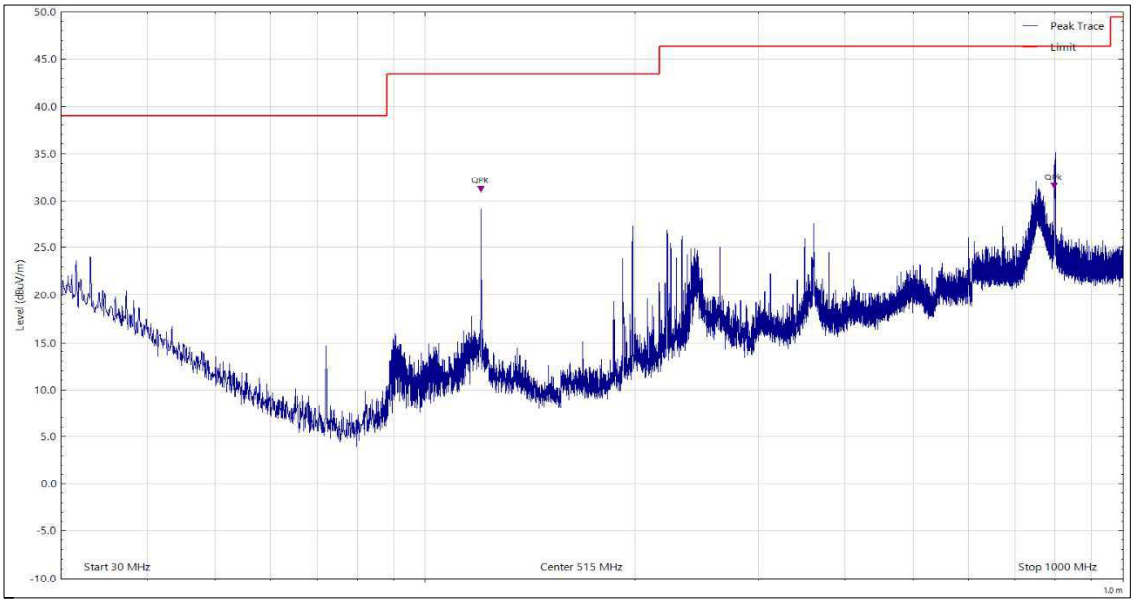

Figure 12 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
120.006	30.71	43.50	-12.79	Q-Peak	131	215	Horizontal	X
796.501	31.10	46.40	-15.30	Q-Peak	179	163	Horizontal	X

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.

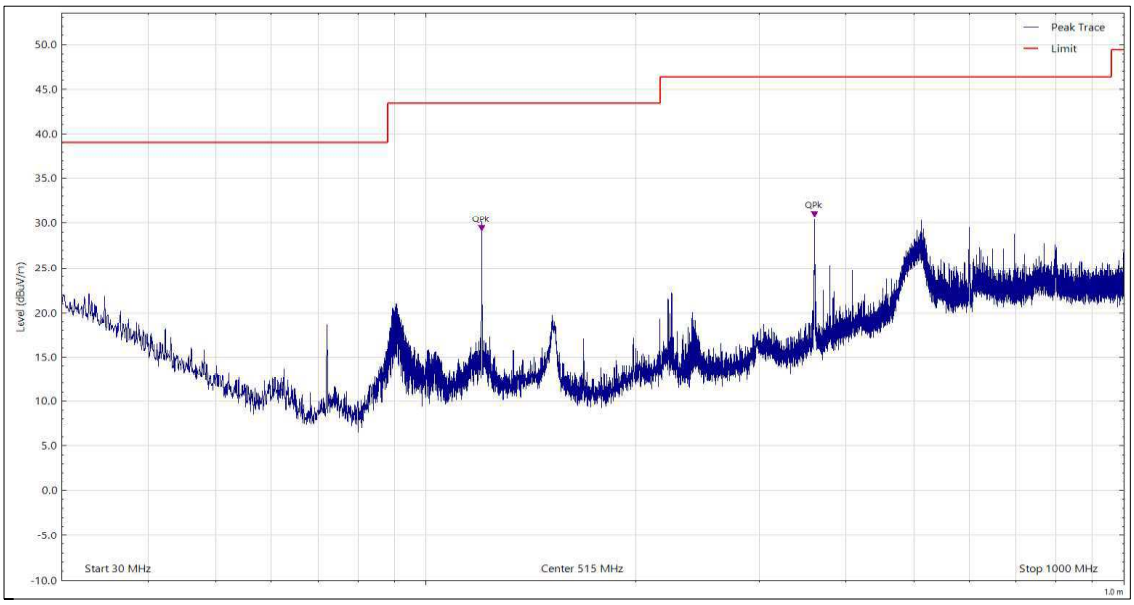

Figure 13 - 30 MHz to 1 GHz, Quasi-Peak, Vertical - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
120.012	28.93	43.50	-14.57	Q-Peak	33	117	Vertical	X
360.016	30.50	46.40	-15.90	Q-Peak	346	126	Vertical	X

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.

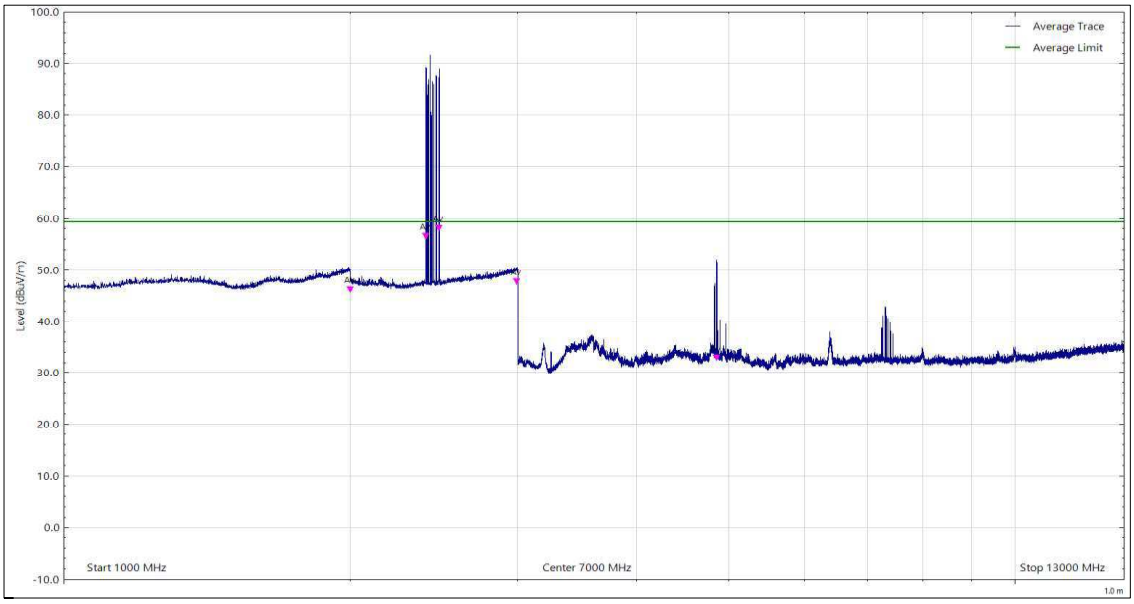

Figure 14 - 1 GHz to 13 GHz, CISPR Average, Horizontal - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2000.440	45.39	59.50	-14.11	CISPR Avg	188	204	Horizontal	X
2402.275	55.75	-	-	CISPR Avg	127	349	Horizontal	X
2480.105	57.21	-	-	CISPR Avg	95	296	Horizontal	X
2994.332	46.97	59.50	-12.53	CISPR Avg	168	210	Horizontal	X
4851.825	32.08	59.50	-27.42	CISPR Avg	211	110	Horizontal	X

Table 11

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.

The emissions seen at 2402.275 MHz and 2480.105MHz are intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

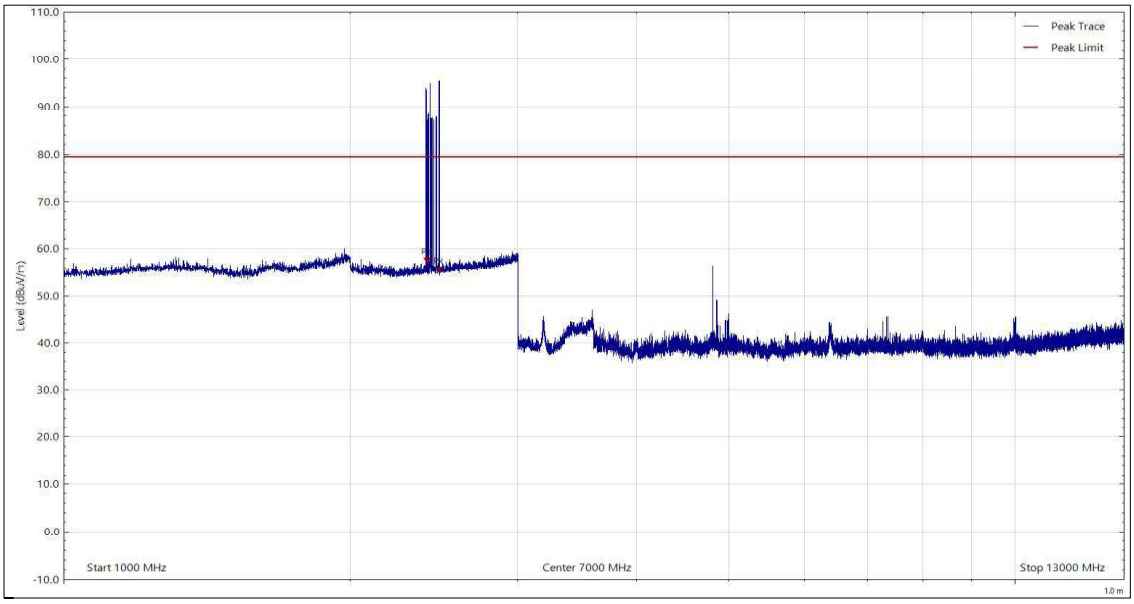

Figure 15 - 1 GHz to 13 GHz, Peak, Horizontal - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2409.610	56.54	-	-	Peak	184	131	Horizontal	X
2483.920	54.59	79.50	-24.91	Peak	63	302	Horizontal	X

Table 12

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.

The emission seen at 2409.610 MHz is an intentionally generated transmission from the EUT and are therefore not subject to the test limit.

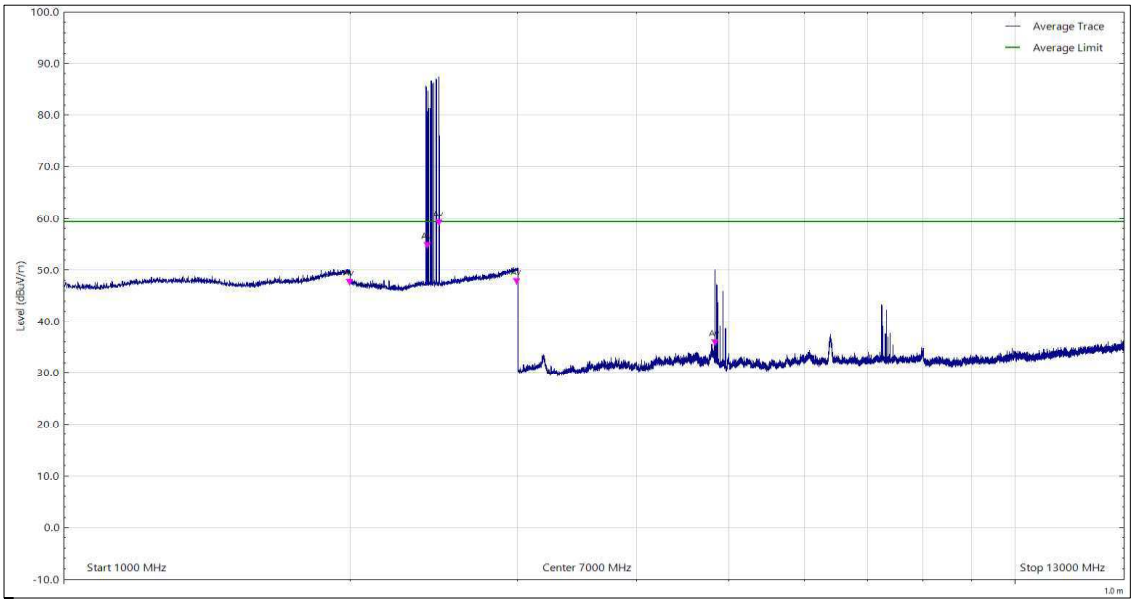

Figure 16 - 1 GHz to 13 GHz, CISPR Average, Vertical - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1998.215	46.76	59.50	-12.74	CISPR Avg	338	211	Vertical	X
2411.045	53.92	-	-	CISPR Avg	175	392	Vertical	X
2477.890	58.29	-	-	CISPR Avg	179	320	Vertical	X
2992.825	46.94	59.50	-12.56	CISPR Avg	194	351	Vertical	X
4833.965	35.00	59.50	-24.50	CISPR Avg	213	245	Vertical	X

Table 13

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.

The emissions seen at 2411.045 MHz and 2477.890 MHz are intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

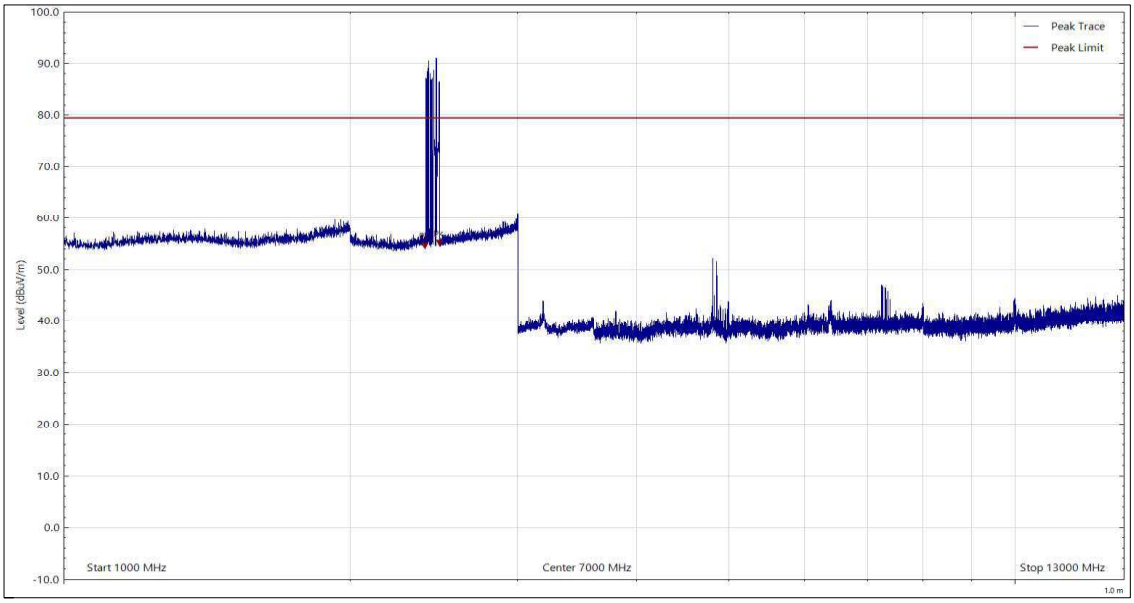

Figure 17 - 1 GHz to 13 GHz, Peak, Vertical - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2399.475	53.67	79.50	-25.83	Peak	0	388	Vertical	X
2483.930	54.19	79.50	-25.31	Peak	179	394	Vertical	X

Table 14

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.

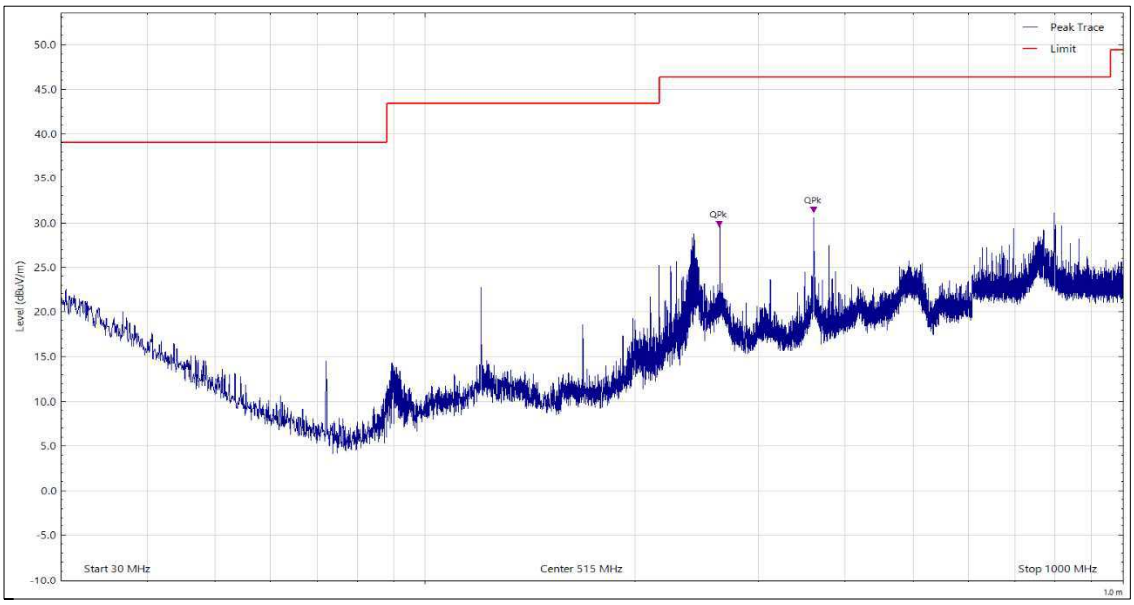

Figure 18 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
264.009	29.43	46.40	-16.97	Q-Peak	140	100	Horizontal	Y
360.003	30.99	46.40	-15.41	Q-Peak	227	100	Horizontal	Y

Table 15

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.

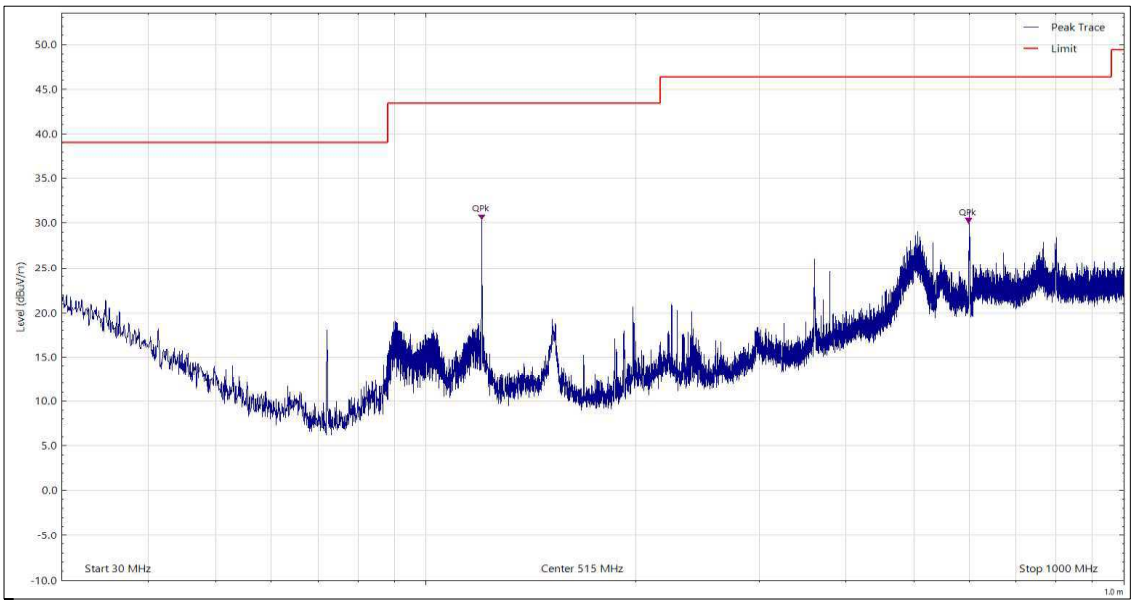

Figure 19 - 30 MHz to 1 GHz, Quasi-Peak, Vertical - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
120.012	30.15	43.50	-13.35	Q-Peak	78	110	Vertical	Y
599.902	29.75	46.40	-16.65	Q-Peak	181	100	Vertical	Y

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.

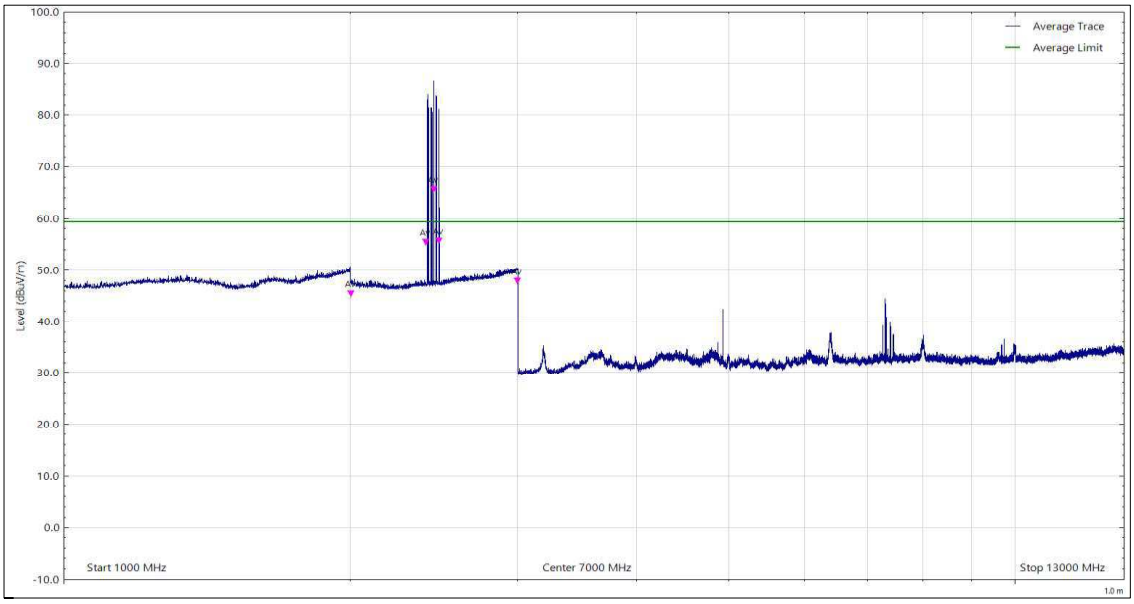

Figure 20 - 1 GHz to 13 GHz, CISPR Average, Horizontal - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2004.685	44.67	59.50	-14.83	CISPR Avg	273	334	Horizontal	Y
2402.250	54.60	-	-	CISPR Avg	0	248	Horizontal	Y
2446.955	64.80	-	-	CISPR Avg	10	324	Horizontal	Y
2479.740	54.84	-	-	CISPR Avg	0	368	Horizontal	Y
2998.846	46.99	59.50	-12.51	CISPR Avg	6	150	Horizontal	Y

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.

The emissions seen at 2402.250 MHz, 2446.955 MHz and 2479.740 MHz are intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

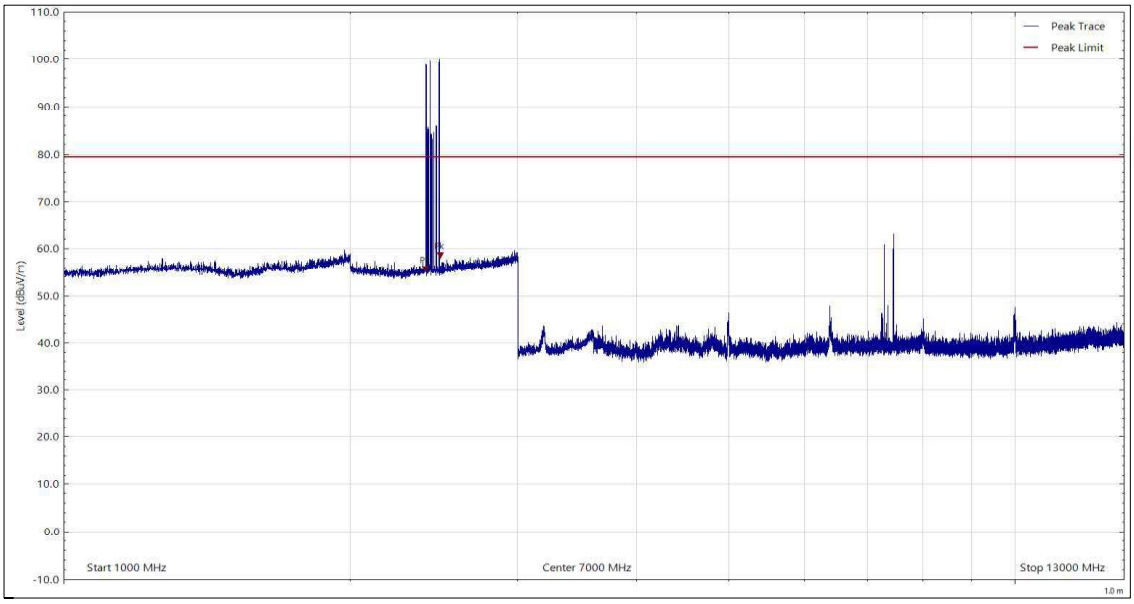

Figure 21 - 1 GHz to 13 GHz, Peak, Horizontal - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2401.330	54.68	79.50	-24.82	Peak	342	309	Horizontal	Y
2489.180	57.66	79.50	-21.84	Peak	339	277	Horizontal	Y

Table 18

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.

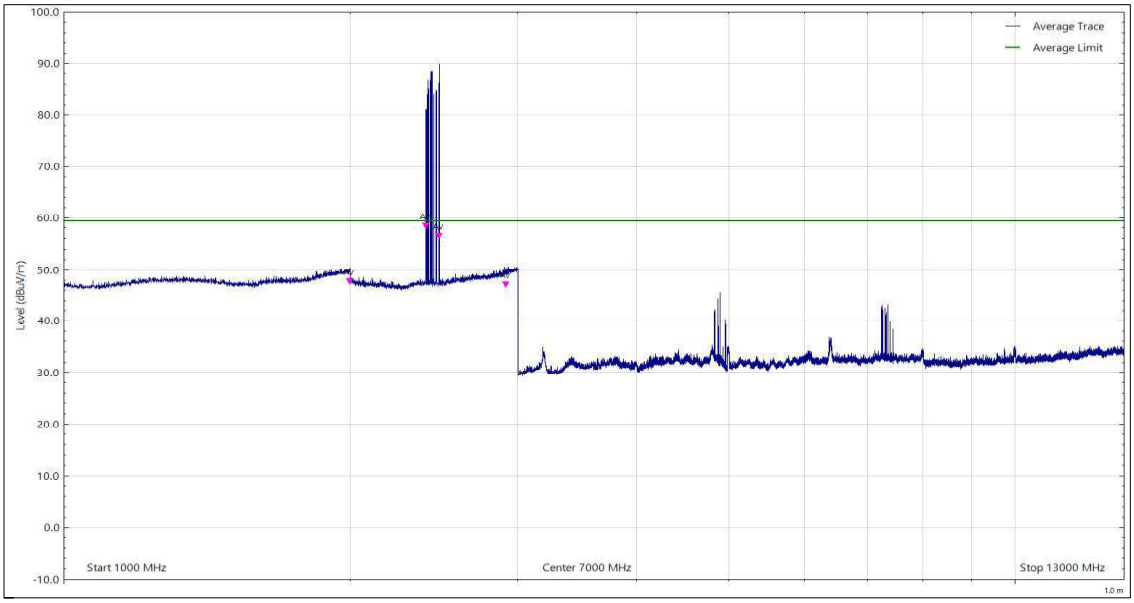

Figure 22 - 1 GHz to 13 GHz, CISPR Average, Vertical - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1996.875	46.89	59.50	-12.61	CISPR Avg	293	227	Vertical	Y
2401.695	57.46	59.50	-2.04	CISPR Avg	358	100	Vertical	Y
2479.685	55.56	-	-	CISPR Avg	274	383	Vertical	Y
2912.615	46.29	59.50	-13.21	CISPR Avg	30	100	Vertical	Y

Table 19

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.

The emission seen at 2479.685 MHz is an intentionally generated transmission from the EUT and are therefore not subject to the test limit.

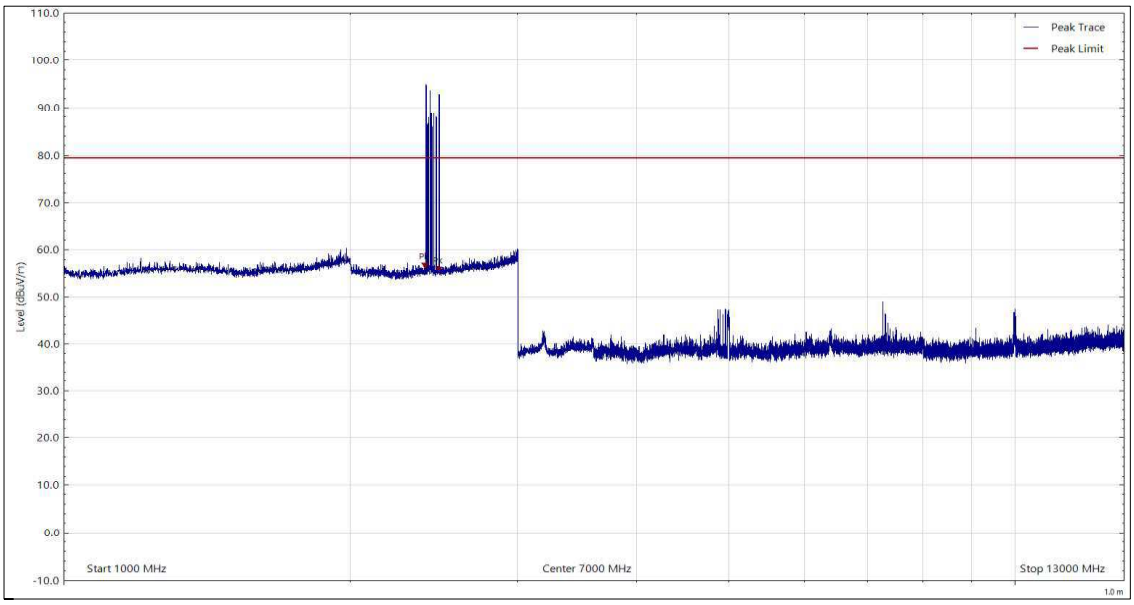

Figure 23 - 1 GHz to 13 GHz, Peak, Vertical - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2395.955	55.77	79.50	-23.73	Peak	350	100	Vertical	Y
2479.555	54.84	-	-	Peak	283	329	Vertical	Y

Table 20

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.

The emission seen at 2479.555 MHz is an intentionally generated transmission from the EUT and are therefore not subject to the test limit.

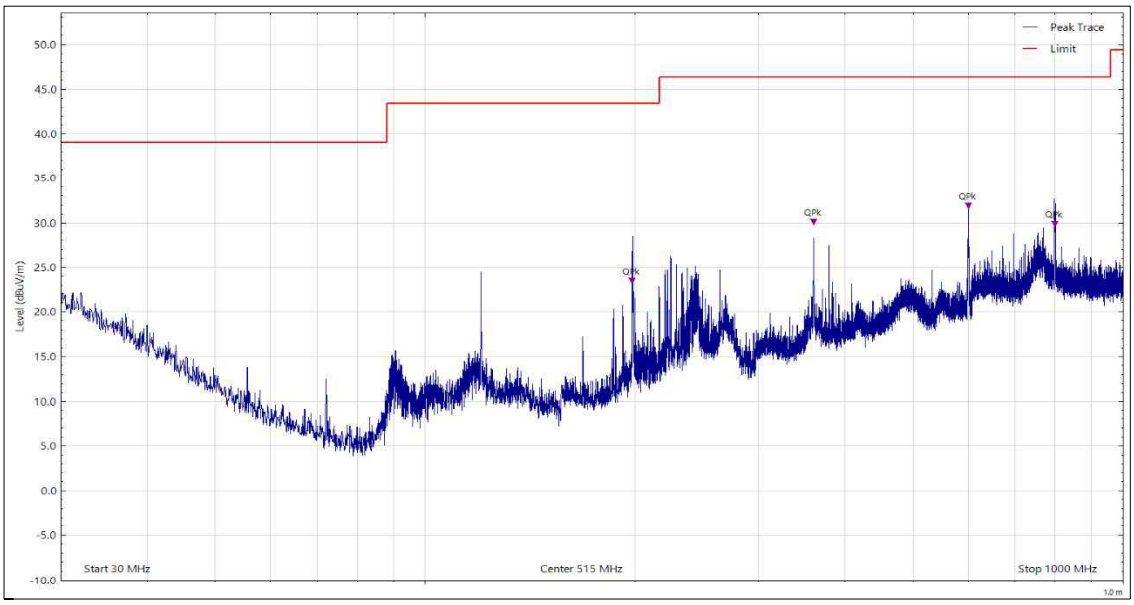

Figure 24 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
197.961	22.98	43.50	-20.52	Q-Peak	350	177	Horizontal	Z
360.016	29.61	46.40	-16.79	Q-Peak	50	245	Horizontal	Z
600.008	31.42	46.40	-14.98	Q-Peak	152	108	Horizontal	Z
799.821	29.41	46.40	-16.99	Q-Peak	19	110	Horizontal	Z

Table 21

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.

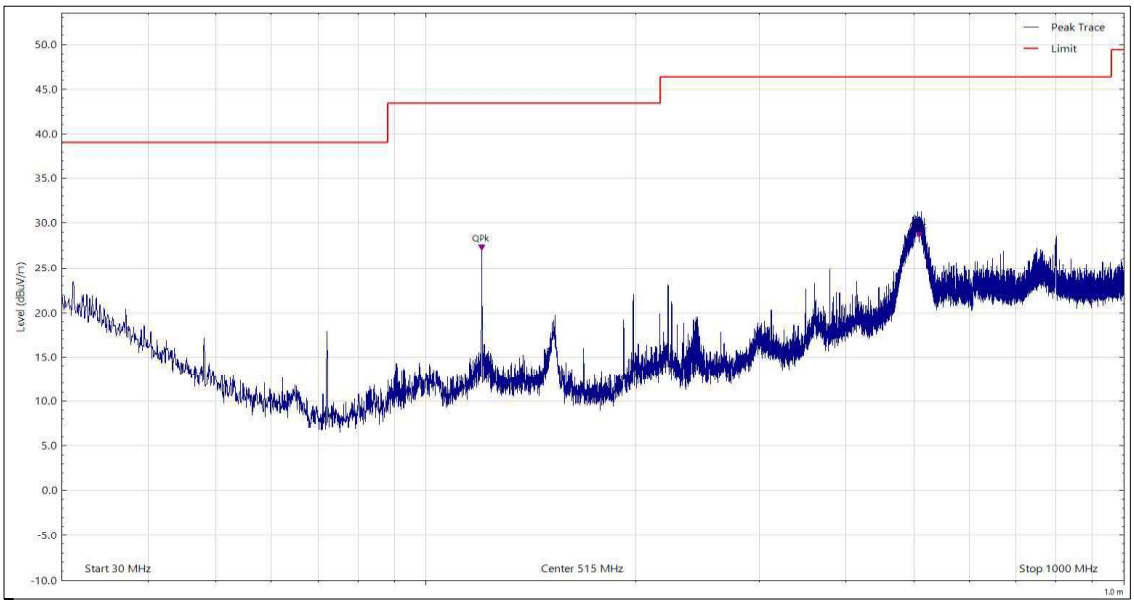

Figure 25 - 30 MHz to 1 GHz, Quasi-Peak, Vertical - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
120.006	26.75	43.50	-16.75	Q-Peak	312	114	Vertical	Z
509.285	28.14	46.40	-18.26	Q-Peak	358	123	Vertical	Z

Table 22

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.

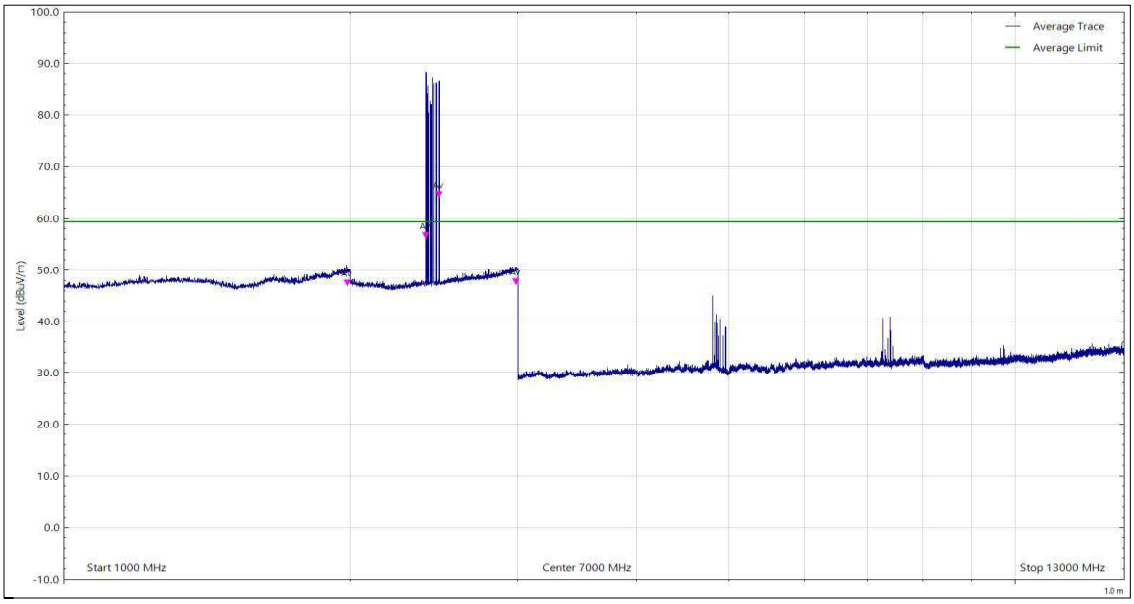

Figure 26 - 1 GHz to 13 GHz, CISPR Average, Horizontal - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1988.260	46.72	59.50	-12.78	CISPR Avg	277	163	Horizontal	Z
2401.750	55.84	59.50	-3.66	CISPR Avg	323	101	Horizontal	Z
2478.245	63.73	-	-	CISPR Avg	147	109	Horizontal	Z
2987.665	46.87	59.50	-12.63	CISPR Avg	12	110	Horizontal	Z

Table 23

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.

The emissions seen at 2478.245 MHz is an intentionally generated transmission from the EUT and are therefore not subject to the test limit.

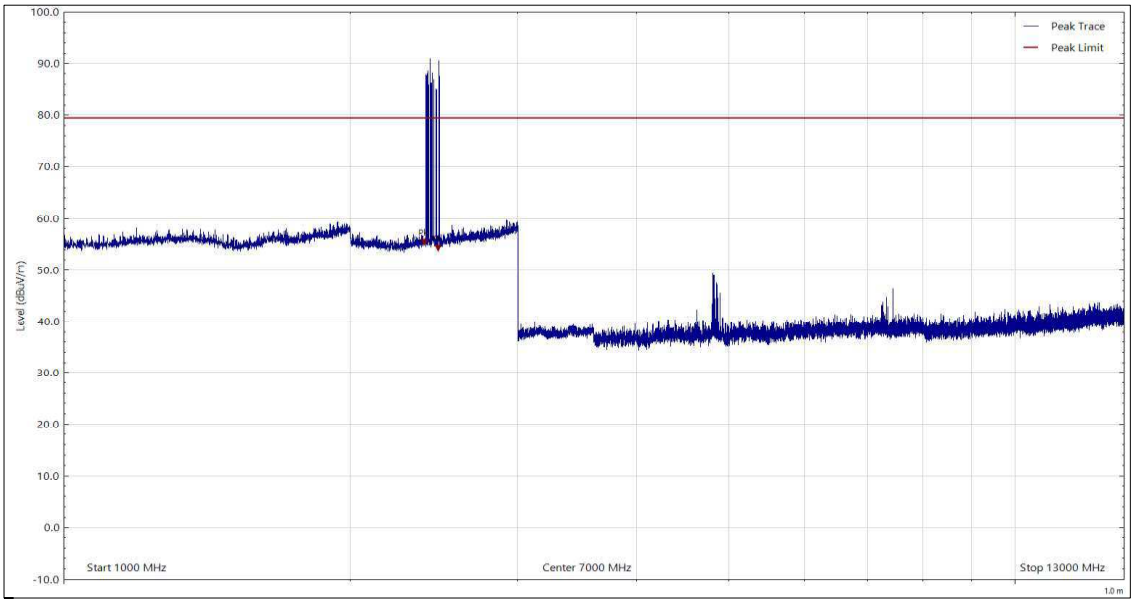

Figure 27 - 1 GHz to 13 GHz, Peak, Horizontal - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2394.185	54.56	79.50	-24.94	Peak	179	281	Horizontal	Z
2473.475	53.41	-	-	Peak	147	117	Horizontal	Z

Table 24

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.

The emission seen at 2473.475 MHz is an intentionally generated transmission from the EUT and are therefore not subject to the test limit.

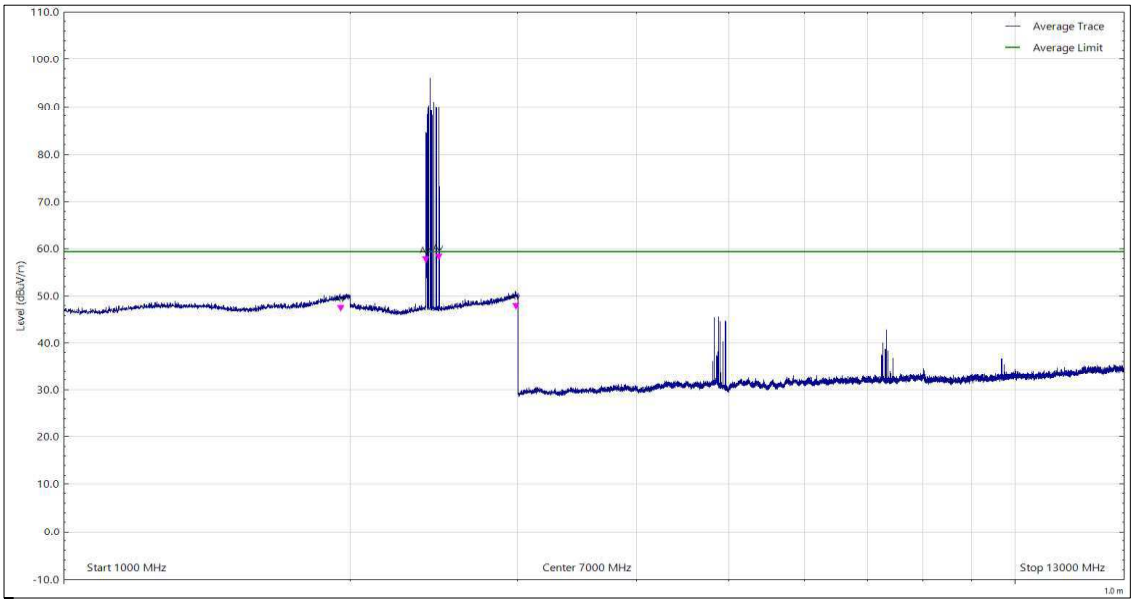

Figure 28 - 1 GHz to 13 GHz, CISPR Average, Vertical - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1954.555	46.52	59.50	-12.98	CISPR Avg	352	370	Vertical	Z
2401.755	56.87	59.50	-2.63	CISPR Avg	346	225	Vertical	Z
2479.780	57.40	-	-	CISPR Avg	346	108	Vertical	Z
2989.520	46.97	59.50	-12.53	CISPR Avg	80	332	Vertical	Z

Table 25

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.

The emission seen at 2479.780 MHz is an intentionally generated transmission from the EUT and are therefore not subject to the test limit.

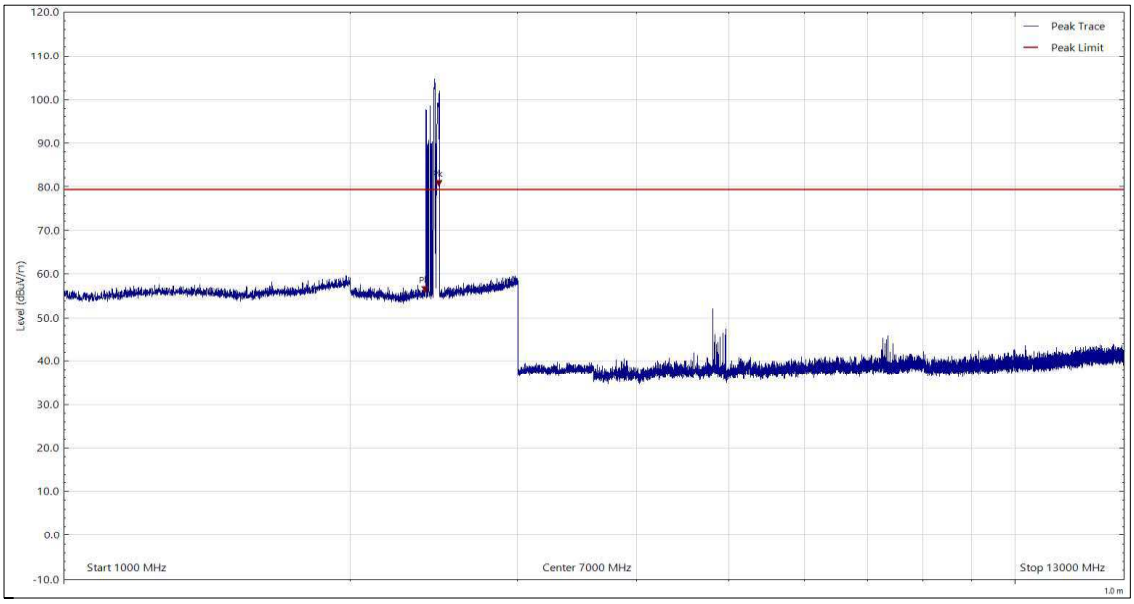

Figure 29 - 1 GHz to 13 GHz, Peak, Vertical - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2398.740	55.49	79.50	-24.01	Peak	345	148	Vertical	Z
2479.730	79.74	-	-	Peak	349	146	Vertical	Z

Table 26

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.

The emissions seen at 2479.730 MHz is intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

Figure 30 - Test Setup - 30 MHz to 1 GHz - X Orientation

Figure 31 - Test Setup - 1 GHz to 13 GHz- X Orientation

Figure 32 - Test Setup - 30 MHz to 1 GHz- Y Orientation

Figure 33 - Test Setup - 1 GHz to 13 GHz- Y Orientation

Figure 34 - Test Setup - 30 MHz to 1 GHz- Z Orientation

Figure 35 - Test Setup - 1 GHz to 13 GHz- Z Orientation

Results for Configuration and Mode: Battery Powered - External Battery - 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:
Which necessitates an upper frequency test limit of: 13 GHz

The EUT 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.

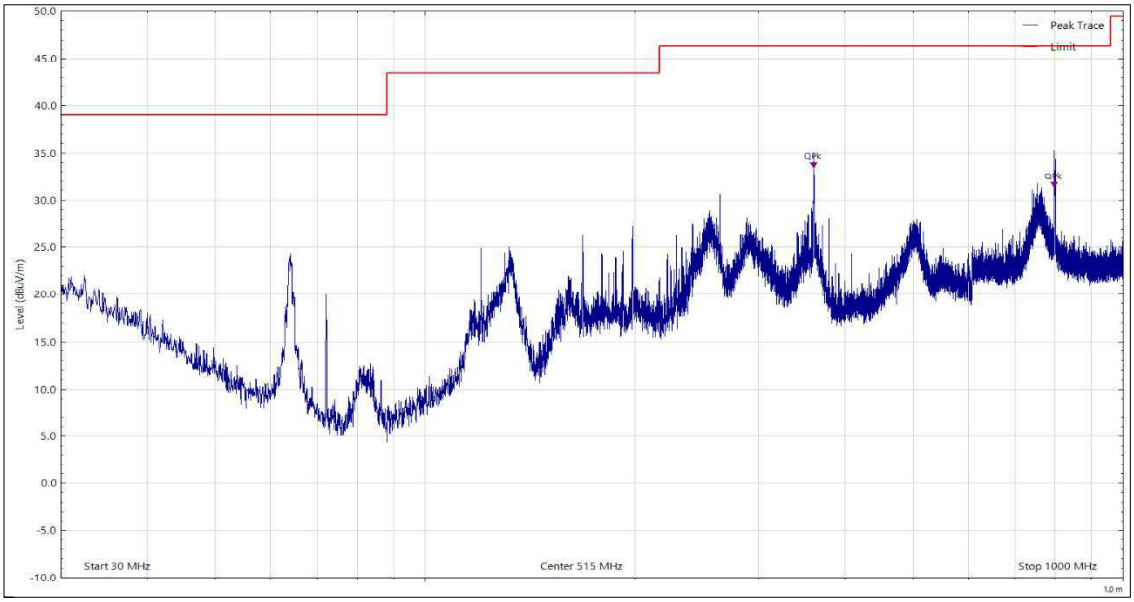

Figure 36 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
360.011	33.21	46.40	-13.19	Q-Peak	75	121	Horizontal	X
796.534	31.06	46.40	-15.34	Q-Peak	210	108	Horizontal	X

Table 27

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.

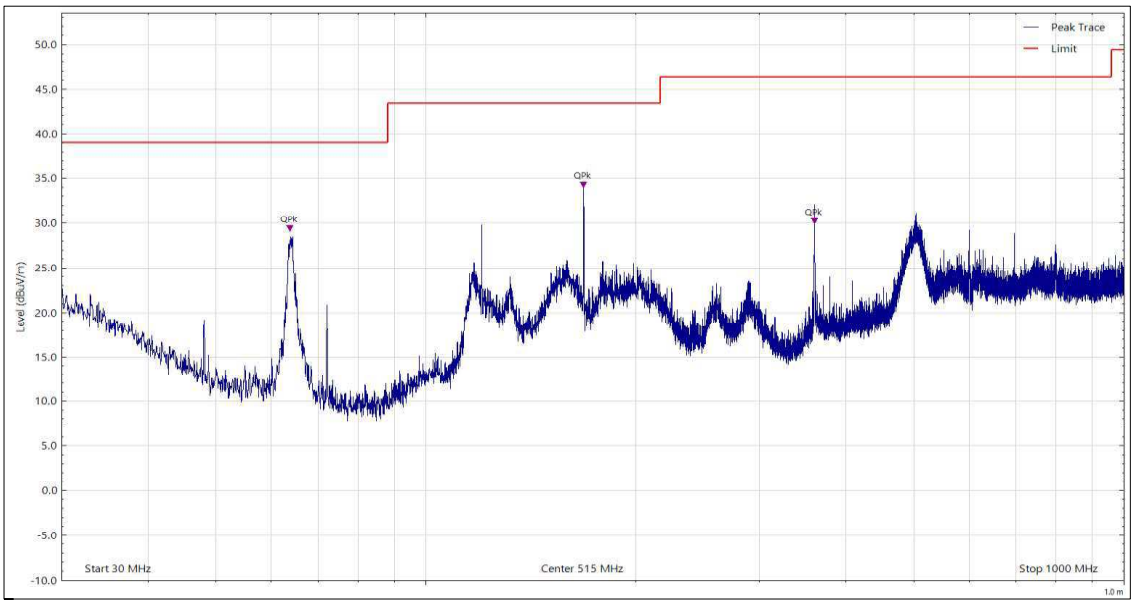

Figure 37 - 30 MHz to 1 GHz, Quasi-Peak, Vertical - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
63.831	28.92	39.10	-10.18	Q-Peak	74	100	Vertical	X
168.002	33.78	43.50	-9.72	Q-Peak	143	100	Vertical	X
360.038	29.71	46.40	-16.69	Q-Peak	7	100	Vertical	X

Table 28

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.

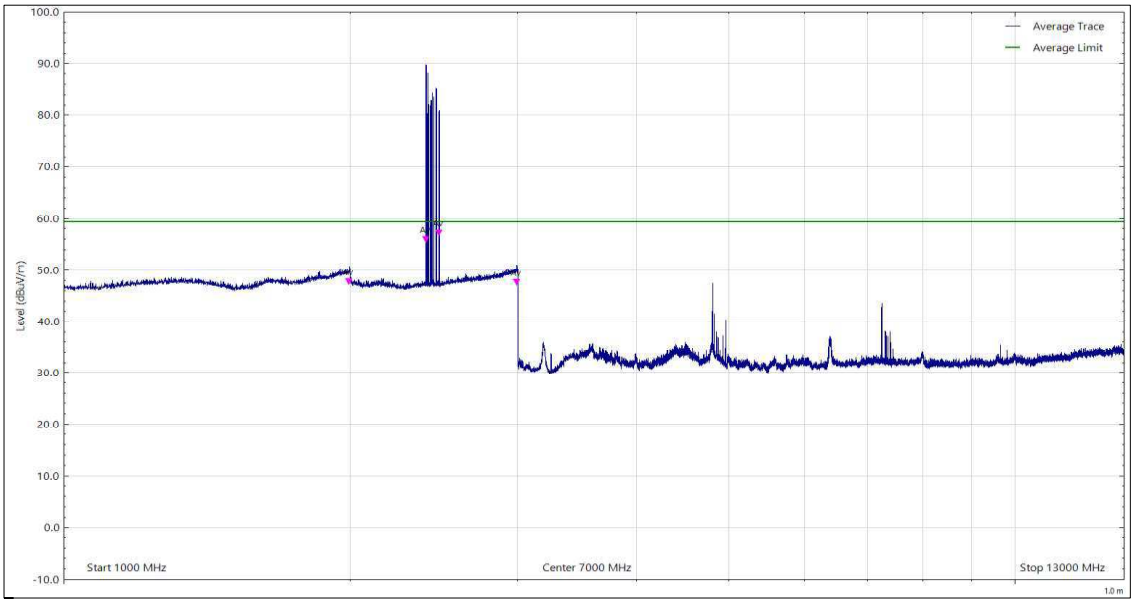

Figure 38 - 1 GHz to 13 GHz, CISPR Average, Horizontal - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1995.325	46.87	59.50	-12.63	CISPR Avg	-120	140	Horizontal	X
2402.185	55.11	-	-	CISPR Avg	60	149	Horizontal	X
2479.995	56.40	-	-	CISPR Avg	69	136	Horizontal	X
2993.936	46.80	59.50	-12.70	CISPR Avg	175	136	Horizontal	X

Table 29

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.

The emissions seen at between 2402.185 MHz and 2479.995 MHz are intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

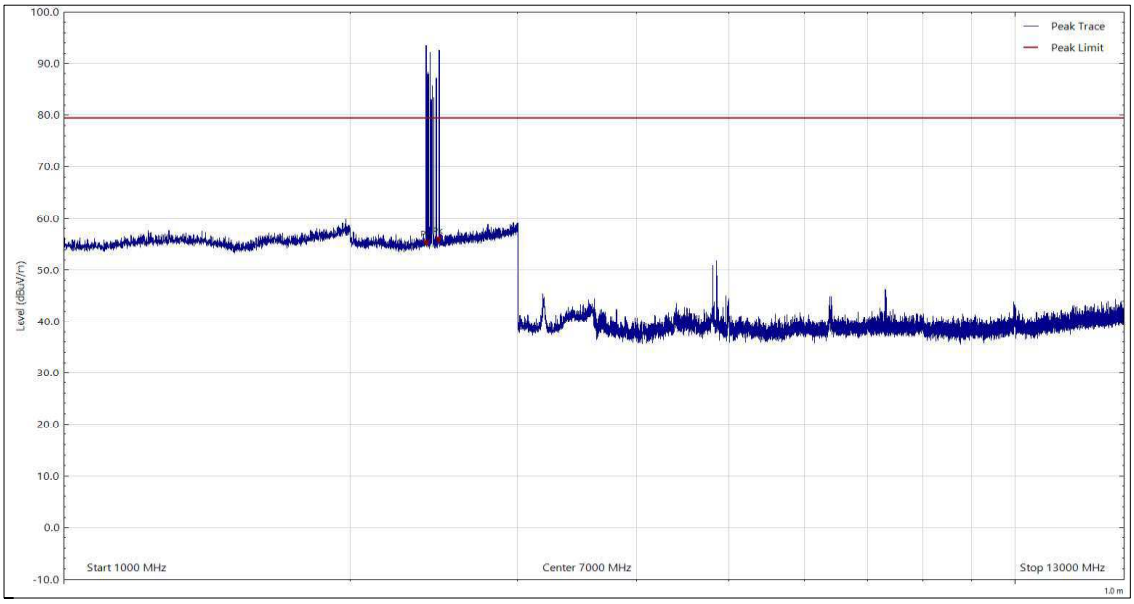

Figure 39 - 1 GHz to 13 GHz, Peak, Horizontal - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2404.905	54.39	-	-	Peak	117	150	Horizontal	X
2480.070	54.99	79.50	-24.51	Peak	107	116	Horizontal	X

Table 30

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.

The emissions seen at 2404.905 MHz is intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

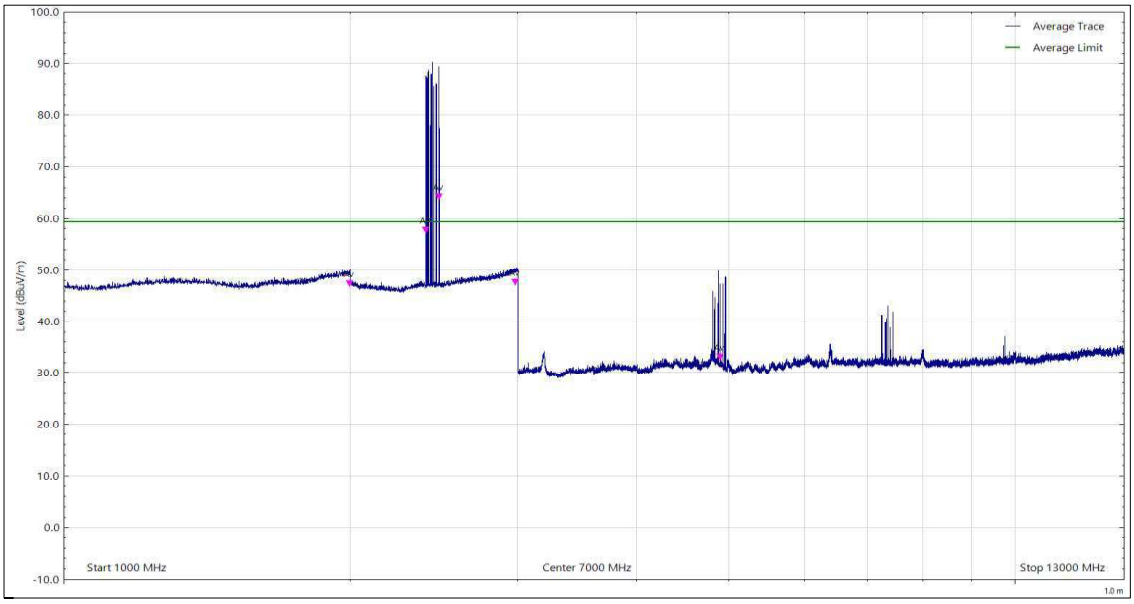

Figure 40 - 1 GHz to 13 GHz, CISPR Average, Vertical - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1998.110	46.55	59.50	-12.95	CISPR Avg	-18	130	Vertical	X
2401.800	56.87	59.50	-2.63	CISPR Avg	-136	149	Vertical	X
2477.900	63.38	-	-	CISPR Avg	-83	134	Vertical	X
2983.922	46.73	59.50	-12.77	CISPR Avg	145	139	Vertical	X
4894.085	32.23	59.50	-27.27	CISPR Avg	166	136	Vertical	X

Table 31

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.

The emissions seen at 2477.900 MHz is intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

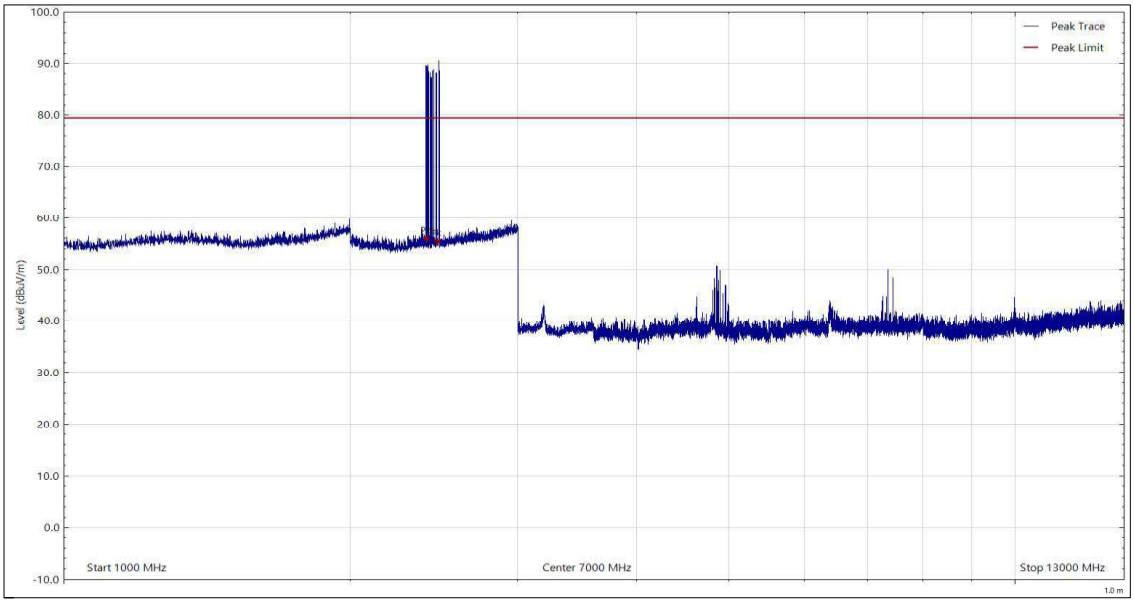

Figure 41 - 1 GHz to 13 GHz, Peak, Vertical - X Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2408.130	54.90	-	-	Peak	166	115	Vertical	X
2472.040	54.32	-	-	Peak	-83	100	Vertical	X

Table 32

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.

The emissions seen at 2408.130 MHz and 2472.040 MHz are intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

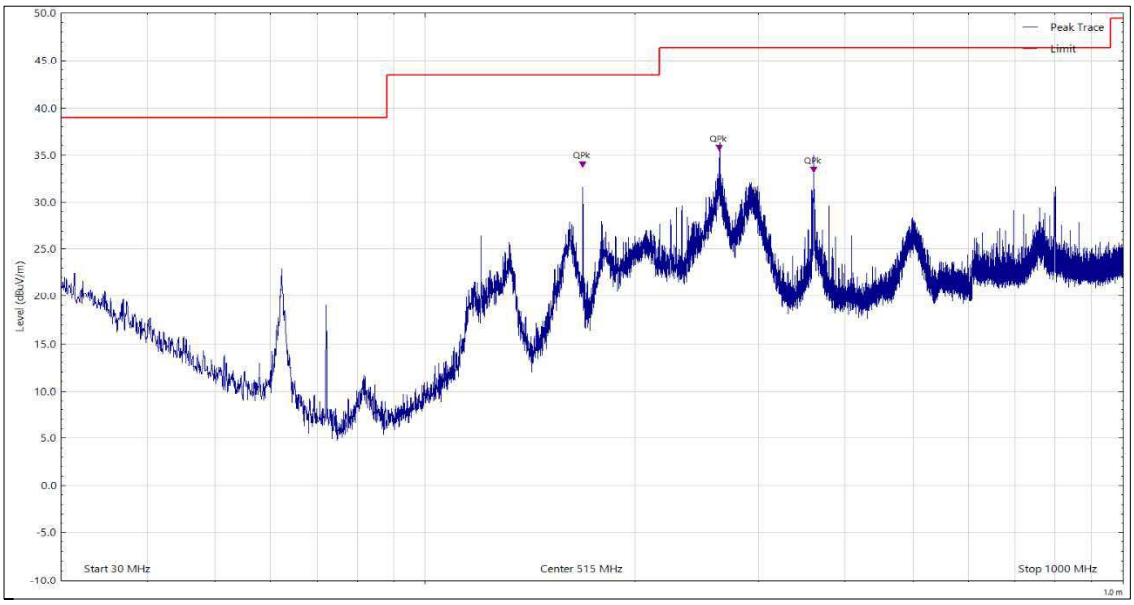

Figure 42 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
168.003	33.54	43.50	-9.96	Q-Peak	22	197	Horizontal	Y
263.992	35.27	46.40	-11.13	Q-Peak	234	100	Horizontal	Y
360.013	32.99	46.40	-13.41	Q-Peak	294	114	Horizontal	Y

Table 33

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.

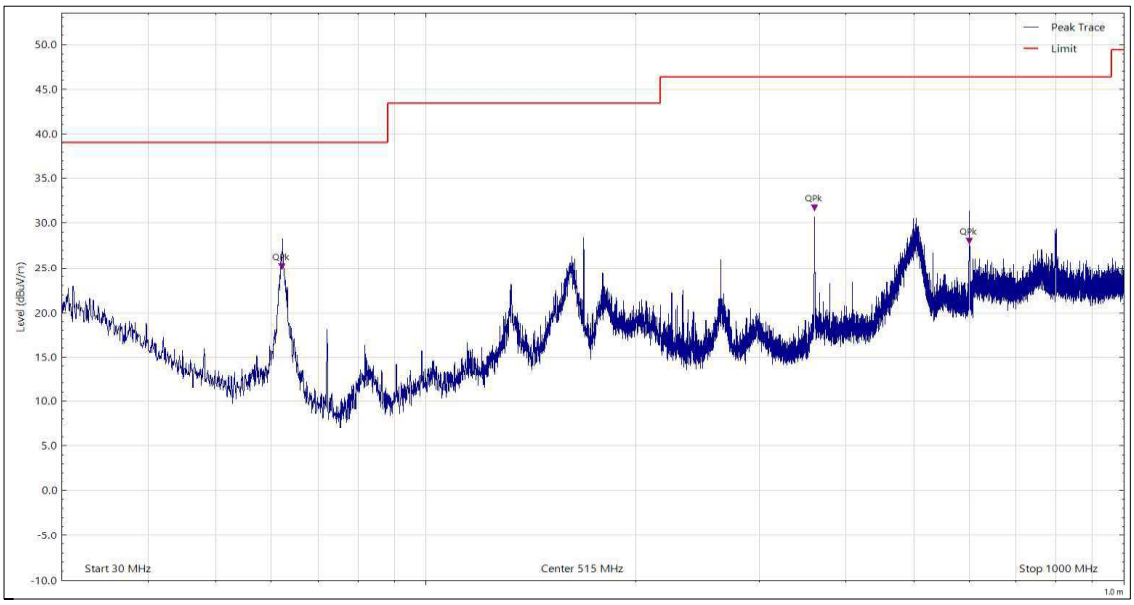

Figure 43 - 30 MHz to 1 GHz, Quasi-Peak, Vertical - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
62.192	24.69	39.10	-14.41	Q-Peak	94	100	Vertical	Y
360.000	31.30	46.40	-15.10	Q-Peak	234	147	Vertical	Y
600.065	27.51	46.40	-18.89	Q-Peak	201	186	Vertical	Y

Table 34

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.

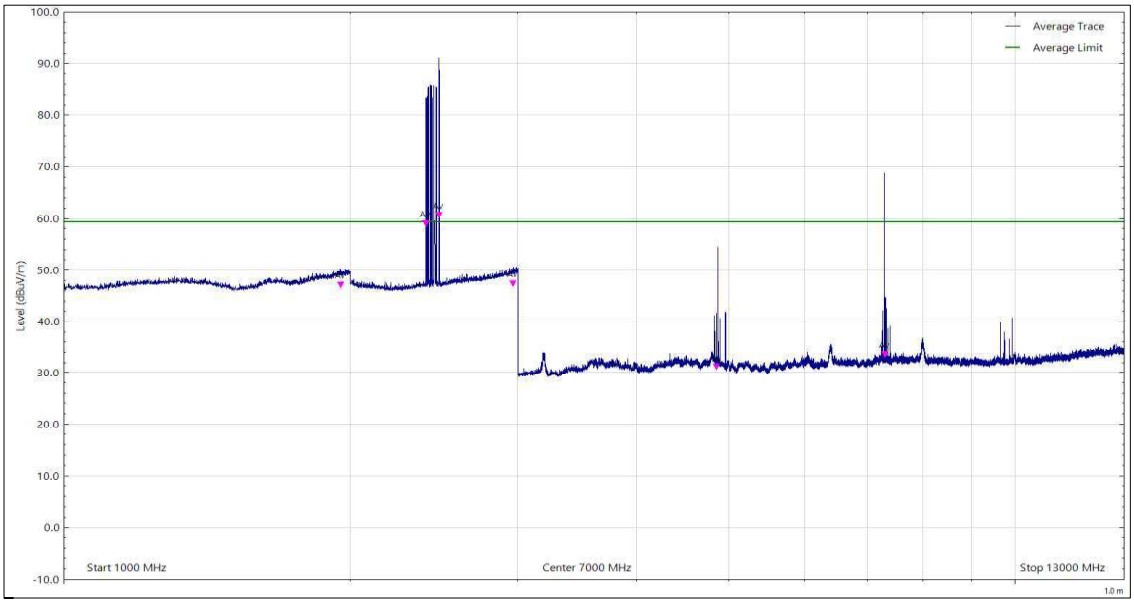

Figure 44 - 1 GHz to 13 GHz, CISPR Average, Horizontal - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1956.865	46.34	59.50	-13.16	CISPR Avg	-180	100	Horizontal	Y
2401.800	58.12	59.50	-1.38	CISPR Avg	-180	160	Horizontal	Y
2479.800	59.83	-	-	CISPR Avg	-177	148	Horizontal	Y
2967.005	46.59	59.50	-12.91	CISPR Avg	96	143	Horizontal	Y
4852.405	30.27	59.50	-29.23	CISPR Avg	-108	120	Horizontal	Y
7296.570	32.73	59.50	-26.77	CISPR Avg	-111	102	Horizontal	Y

Table 35

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.

The emissions seen at 2479.800 MHz is intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

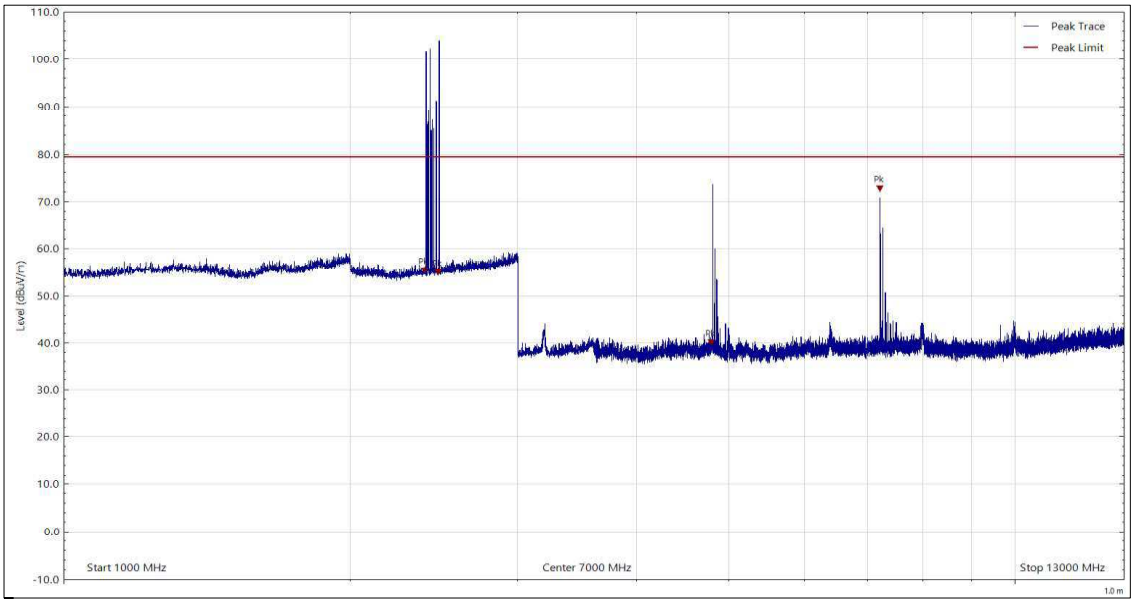

Figure 45 - 1 GHz to 13 GHz, Peak, Horizontal - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2393.855	54.44	79.50	-25.06	Peak	180	150	Horizontal	Y
2472.945	54.10	-	-	Peak	180	138	Horizontal	Y
4797.710	39.10	79.50	-40.40	Peak	-108	100	Horizontal	Y
7206.065	71.76	79.50	-7.74	Peak	155	114	Horizontal	Y

Table 36

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

The emissions seen at 2472.945 MHz is intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

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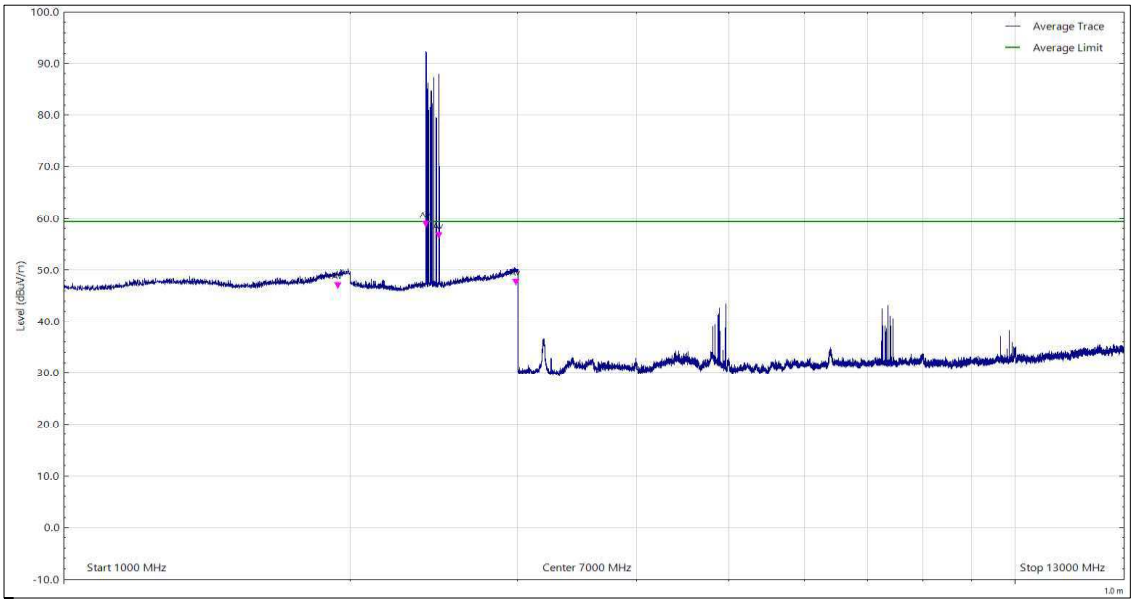

Figure 46 - 1 GHz to 13 GHz, CISPR Average, Vertical - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1942.655	46.16	59.50	-13.34	CISPR Avg	161	100	Vertical	Y
2401.700	58.03	59.50	-1.47	CISPR Avg	102	132	Vertical	Y
2480.140	55.84	59.50	-3.66	CISPR Avg	125	101	Vertical	Y
2985.735	46.76	59.50	-12.74	CISPR Avg	-148	121	Vertical	Y

Table 37

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.

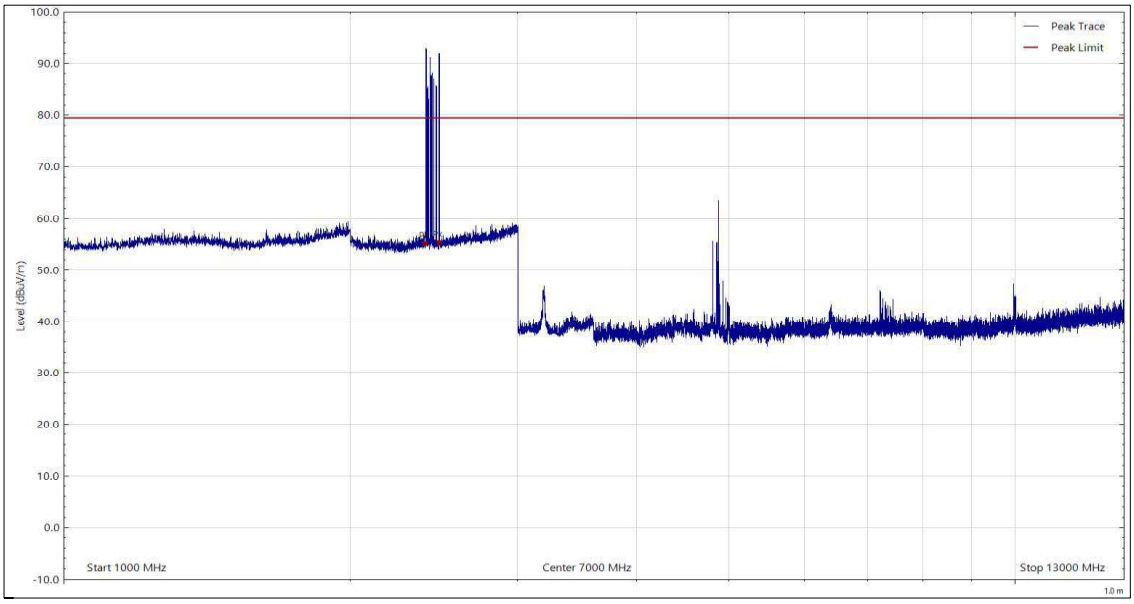

Figure 47 - 1 GHz to 13 GHz, Peak, Vertical - Y Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2397.140	54.13	79.50	-25.37	Peak	119	109	Vertical	Y
2480.490	54.27	79.50	-25.23	Peak	175	100	Vertical	Y

Table 38

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.

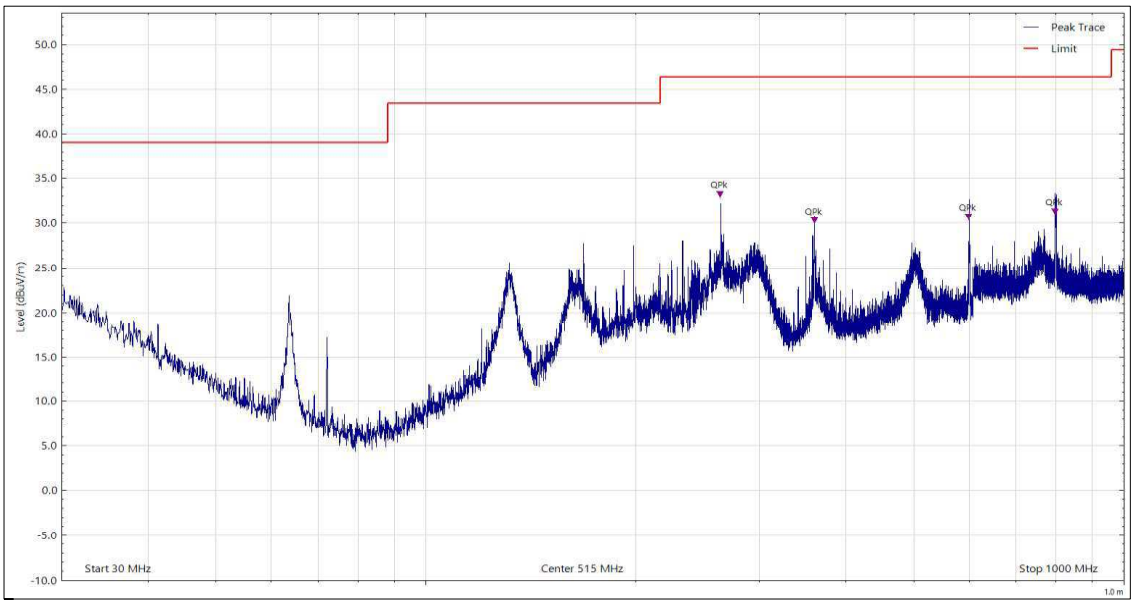

Figure 48 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
264.011	32.75	46.40	-13.65	Q-Peak	44	120	Horizontal	Z
360.011	29.80	46.40	-16.60	Q-Peak	86	100	Horizontal	Z
599.837	30.21	46.40	-16.19	Q-Peak	141	108	Horizontal	Z
796.840	30.85	46.40	-15.55	Q-Peak	17	115	Horizontal	Z

Table 39

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.

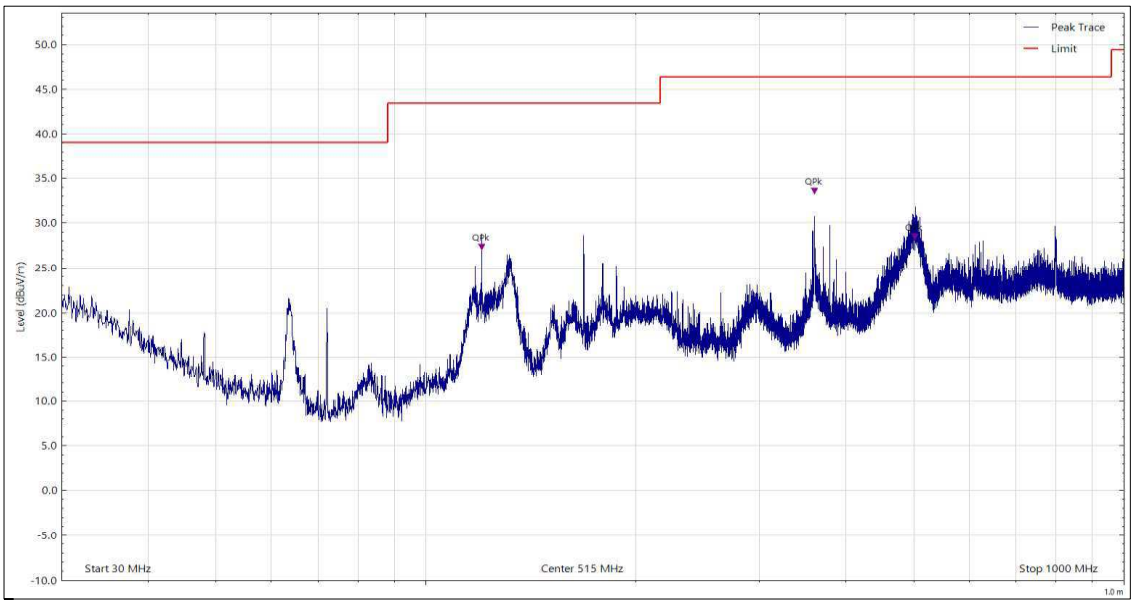

Figure 49 - 30 MHz to 1 GHz, Quasi-Peak, Vertical - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
120.016	26.81	43.50	-16.69	Q-Peak	269	100	Vertical	Z
360.032	33.13	46.40	-13.27	Q-Peak	312	138	Vertical	Z
501.564	27.92	46.40	-18.48	Q-Peak	316	112	Vertical	Z

Table 40

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.

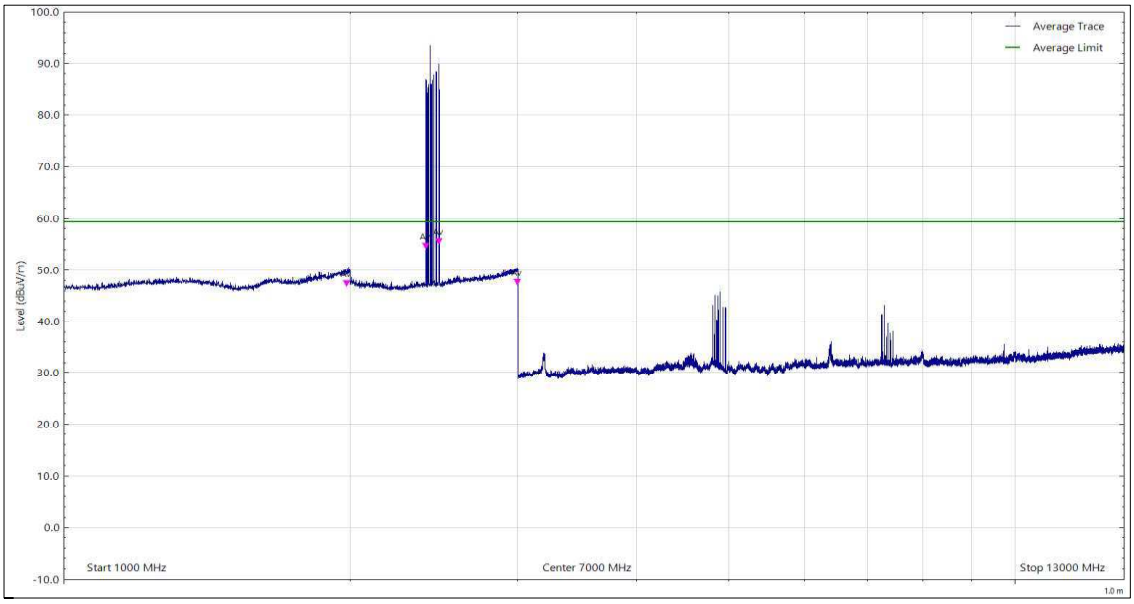

Figure 50 - 1 GHz to 13 GHz, CISPR Average, Horizontal - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1983.385	46.58	59.50	-12.92	CISPR Avg	173	100	Horizontal	Z
2402.220	53.84	-	-	CISPR Avg	-177	100	Horizontal	Z
2479.785	54.67	-	-	CISPR Avg	-134	100	Horizontal	Z
2998.003	46.81	59.50	-12.69	CISPR Avg	-95	102	Horizontal	Z

Table 41

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.

The emissions seen at 2402.220 MHz and 2479.785 MHz are intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

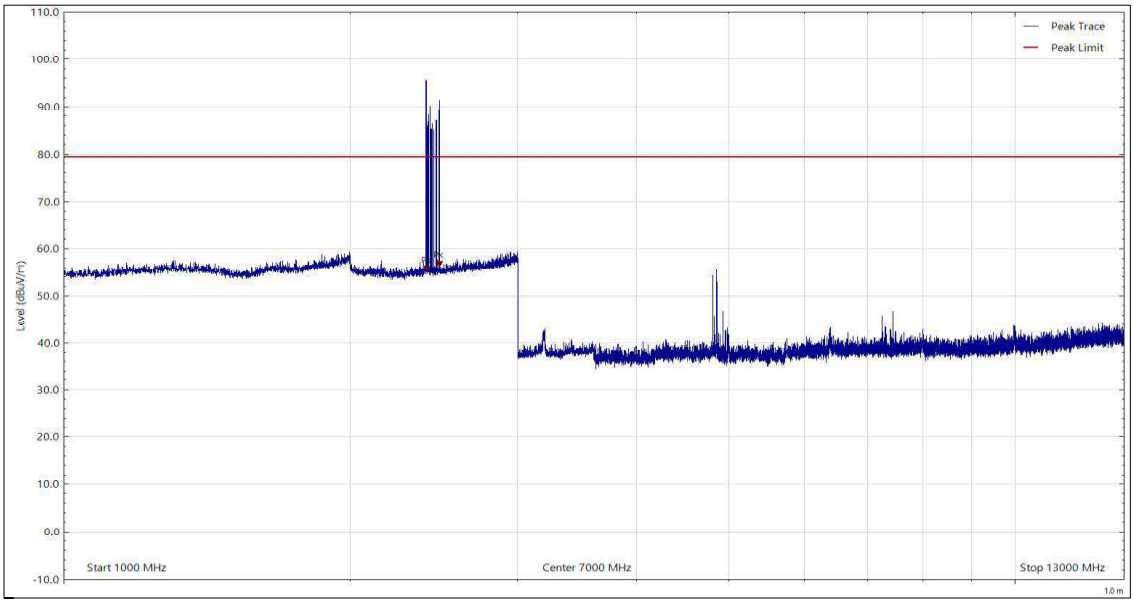

Figure 51 - 1 GHz to 13 GHz, Peak, Horizontal - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2411.090	54.67	-	-	Peak	100	156	Horizontal	Z
2484.220	55.91	79.50	-23.59	Peak	135	100	Horizontal	Z

Table 42

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.

The emissions seen at 2411.090 MHz is intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

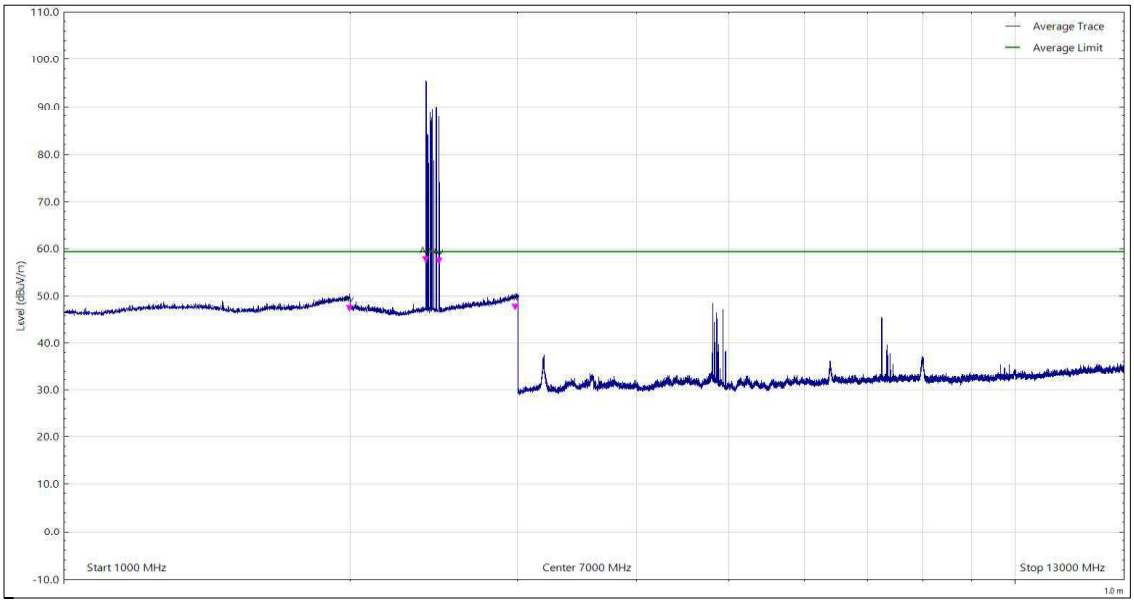

Figure 52 - 1 GHz to 13 GHz, CISPR Average, Vertical - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1996.750	46.48	59.50	-13.02	CISPR Avg	172	122	Vertical	Z
2401.785	56.82	59.50	-2.68	CISPR Avg	165	150	Vertical	Z
2479.715	56.50	-	-	CISPR Avg	160	149	Vertical	Z
2981.475	46.73	59.50	-12.77	CISPR Avg	70	138	Vertical	Z

Table 43

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.

The emissions seen at 2479.715 MHz is intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

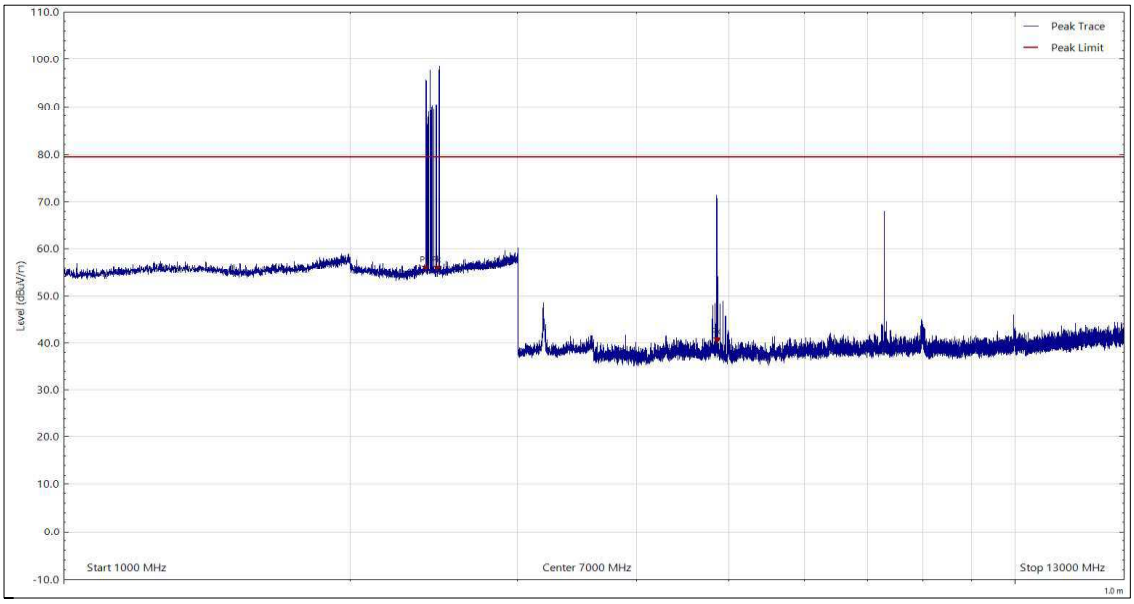

Figure 53 - 1 GHz to 13 GHz, Peak, Vertical - Z Orientation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2402.000	54.88	-	-	Peak	164	110	Vertical	Z
2470.305	54.83	-	-	Peak	165	152	Vertical	Z
4860.230	39.56	79.50	-39.94	Peak	167	100	Vertical	Z

Table 44

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.

The emissions seen at 2402 MHz and 2470.305 MHz are intentionally generated transmissions from the EUT and are therefore not subject to the test limit.

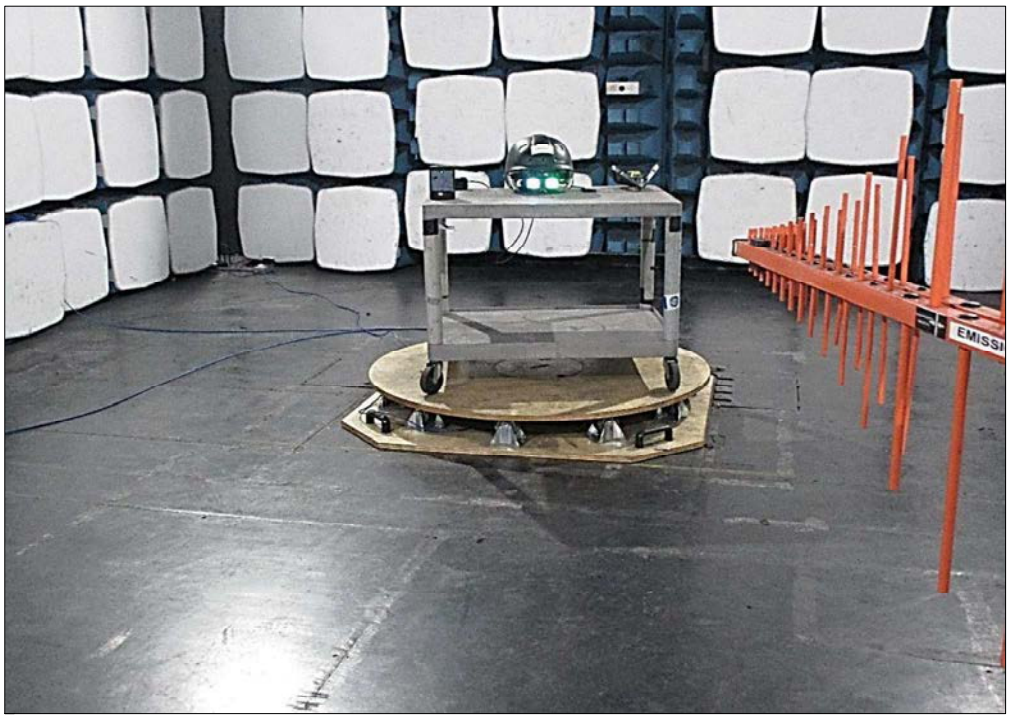

Figure 54 - Test Setup - 30 MHz to 1 GHz - X Orientation

Figure 55 - Test Setup - 1 GHz to 13 GHz - X Orientation

Figure 56 - Test Setup - 30 MHz to 1 GHz - Y Orientation

Figure 57 - Test Setup - 1 GHz to 13 GHz - Y Orientation

Figure 58 - Test Setup - 30 MHz to 1 GHz - Z Orientation

Figure 59 - Test Setup - 1 GHz to 18 GHz - Z Orientation

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
Antenna (Bilog, 30 MHz to 3 GHz)	Schaffner	CBL6143	1858	24	30-Apr-2023
Screened Room (1)	Rainford	Hybrid	4160	36	11-Jan-2025
Cable (N-Type to N-Type, 7 m)	Teledyne Storm	SA90-195-7MTR	4173	12	13-Apr-2023
Test Receiver	Keysight Technologies	N9038A MXE	4629	12	25-Jan-2024
Test Receiver	Keysight Technologies	N9038A MXE	4974	12	30-Jan-2024
Pre-Amplifier (1 GHz to 8 GHz)	Wright Technologies	APS04-0085	4674	12	19-Aug-2023
Pre-Amplifier (8 GHz to 18 GHz)	Wright Technologies	APS04-0086	4675	12	22-Aug-2023
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
Emissions Software	TUV SUD	EmX V3.1.10	5125	-	Software
Cable (N-Type to N-Type, 3 m)	Rosenberger	LU7-036-3000	5163	12	18-Dec-2023
Turntable Controller	Maturo	Maturo NCD	5275	-	TU

Table 45

TU - Traceability Unscheduled

3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Hygrometer	Rotronic	I-1000	2830	12	13-Oct-2023

Table 46

3.2 Customer Support Equipment

Instrument	Manufacturer	Type No	Serial Number	Calibration Period (months)	Calibration Due
Laptop	PW-00T1SL	L60	21AB-000NUK	N/A	-
8 Batteries	XYZ Reality	-	-	N/A	-
USB-C to HUB	Ugreen cable	80133	-	N/A	-
USB-C to Ethernet	Ugreen cable	-	-	N/A	-
USC-C Cable	Ugreen	-	-	N/A	-
Wi-Fi Router	TP-link	Archer C6	2229295009124	N/A	-
Battery power Pack	Zendure	ZDA8PDP	-	N/A	-

Table 47

4 Incident Reports

No incidents report was 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 48

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 115:2021, Clause 4.4.3 (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.