FCC and ISED Test Report

XYZ Reality Ltd
Controller, Model: Atom Controller

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

Prepared for: XYZ Reality Ltd
Unit G0, G02, 338-346
Goswell Road
Angel
Clerkenwell
EC1V 7LQ
UNITED KINGDOM

Add value.
Inspire trust.

FCC ID: 2A3C5XYZ2202 IC: 28181-XYZ222

COMMERCIAL-IN-CONFIDENCE

Document 75954477-02 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Andy Lawson	Chief Engineer, EMC	Authorised Signatory	14 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. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Matthew Dawkins	14 April 2022	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISED Accreditation
12669A Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B and ICES-003: 2020 and Issue 7: 2020 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 2022

Table 1

1.2 Introduction

Applicant	XYZ Reality Ltd
Manufacturer	XYZ Reality Ltd
Model Number(s)	Atom Controller
Serial Number(s)	220012
Hardware Version(s)	N/A
Software Version(s)	N/A
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2020 and ICES-003: Issue 7: 2020
Order Number	XYZ0265
Date	07-February-2022
Date of Receipt of EUT	25-February-2022
Start of Test	14-March-2022
Finish of Test	14-March-2022
Name of Engineer(s)	Matthew Dawkins
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 and ICES-003 is shown below.

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

Table 2

1.4 Declaration of Build Status

MAIN EUT			
MANUFACTURING DESCRIPTION	Handheld device for interacting with augmented reality		
MANUFACTURER	XYZ Reality Ltd		
MODEL	Atom Controller		
PART NUMBER	XYZ-22-02		
HARDWARE VERSION	N/A		
SOFTWARE VERSION	N/A		
PSU VOLTAGE/FREQUENCY/CURRENT	Internal (removeable), Li Ion Battery 7.4V		
HIGHEST INTERNALLY GENERATED FREQUENCY	24 MHz		
FCC ID (if applicable)	2A3C5XYZ2202		
INDUSTRY CANADA ID (if applicable)	28181-XYZ222		
TECHNICAL DESCRIPTION (a brief technical description of the intended use and operation)	Handheld device for interacting with Atom Hard Hat and Atom Tracking Beacons.		
COUNTRY OF ORIGIN	United Kingdom		
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	2402-2480		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	2402-2480		
INTERMEDIATE FREQUENCIES			
EMISSION DESIGNATOR(S): https://fccid.io/Emissions-Designator/	1M00F1D		
MODULATION TYPES: (i.e. GMSK, QPSK)	GFSK, DQPSK		
OUTPUT POWER (W or dBm)	0 dBm		
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	7.4V		
COUNTRY OF ORIGIN	United Kingdom		
MODULES (if applicable)			
MANUFACTURING DESCRIPTION	nRF52832		
MANUFACTURER	NORDIC Semiconductor		
TYPE	WLAN 2.4 GHz		
POWER	0 dBm		
EMISSION DESIGNATOR	1M00F1D		
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION	Atom Hard Hat	Atom Tracking Beacon	Atom Charging Station
MANUFACTURER	XYZ Reality Ltd	XYZ Reality Ltd	XYZ Reality Ltd
TYPE			
PART NUMBER	XYZ-12-01	XYZ-52-01	XYZ-42-01
SERIAL NUMBER	N/A	N/A	N/A
COUNTRY OF ORIGIN	United Kingdom	United Kingdom	United Kingdom

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

Name: Dave Williams
Position held: Director of Engineering, DitroniX Ltd
Date: 31 January 2022

1.5 Product Information

1.5.1 Technical Description

The Equipment under test (EUT) was a XYZ Reality Ltd, Atom Controller.

The primary function of the EUT is as a handheld device for interacting with the Atom Hard Hat and Atom Tracking Beacon.

Figure 1 – General View

Figure 2 – Rear View

1.5.2 Test Configuration

Configuration	Description
Battery Powered	The EUT was powered by its internal battery. No external Connections to the EUT were made.

Table 3

1.5.3 Modes of Operation

Mode	Description
Idle	The hand controller was powered on with all transmitters disabled.

Table 4

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: Atom Controller, Serial Number: 220012			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 5

1.8 Test Location

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

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: Battery Powered - Idle		
Radiated Disturbance	Matthew Dawkins	UKAS

Table 6

Office Address:

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

2 Test Details

2.1 Radiated Disturbance

2.1.1 Specification Reference

FCC 47 CFR Part 15B and ICES-003, Clause 15.109 and 3.2

2.1.2 Equipment Under Test and Modification State

Atom Controller, S/N: 220012 - Modification State 0

2.1.3 Date of Test

14-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

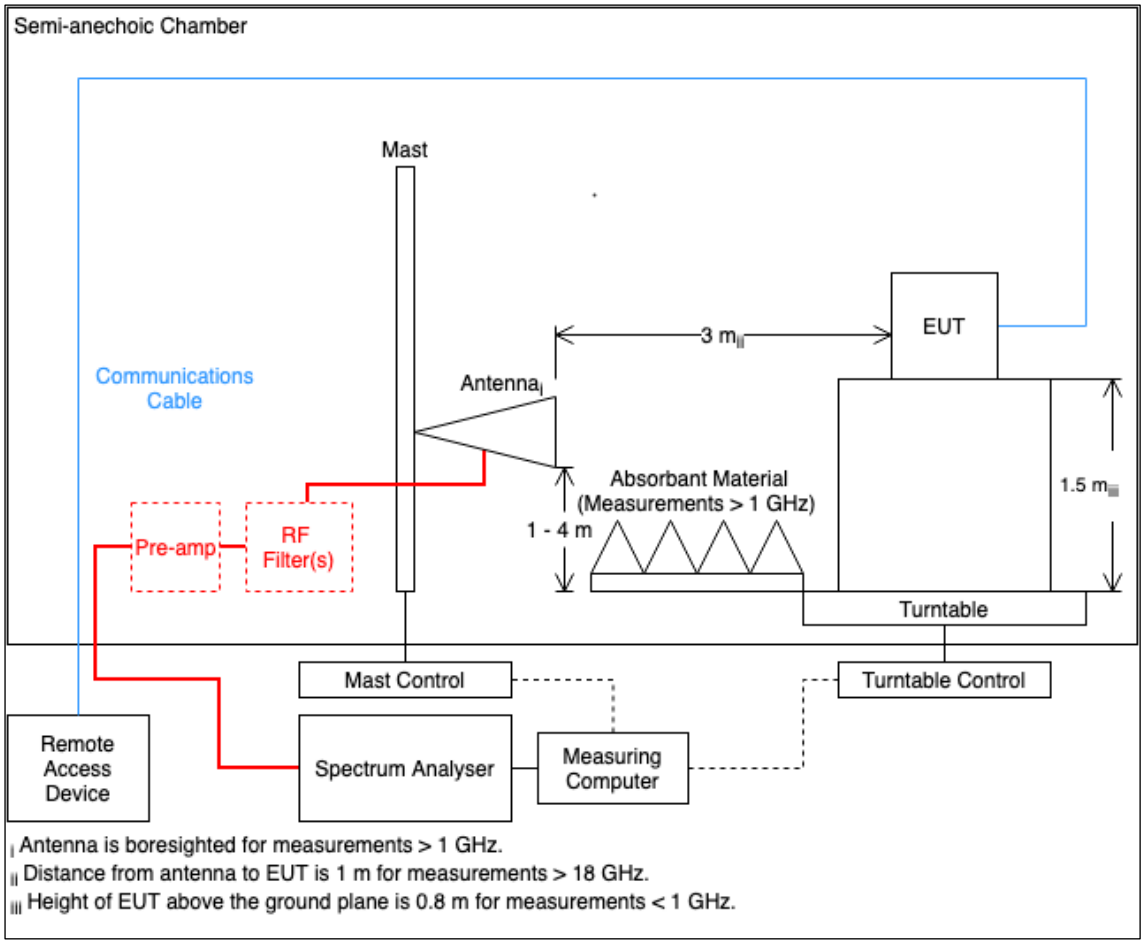

Figure 3

2.1.7 Environmental Conditions

Ambient Temperature	21.2 °C
Relative Humidity	39.3 %

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 7

2.1.9 Test Results

Results for Configuration and Mode: Battery Powered - Idle.

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: 2.4 GHz
Which necessitates an upper frequency test limit of: 18 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.

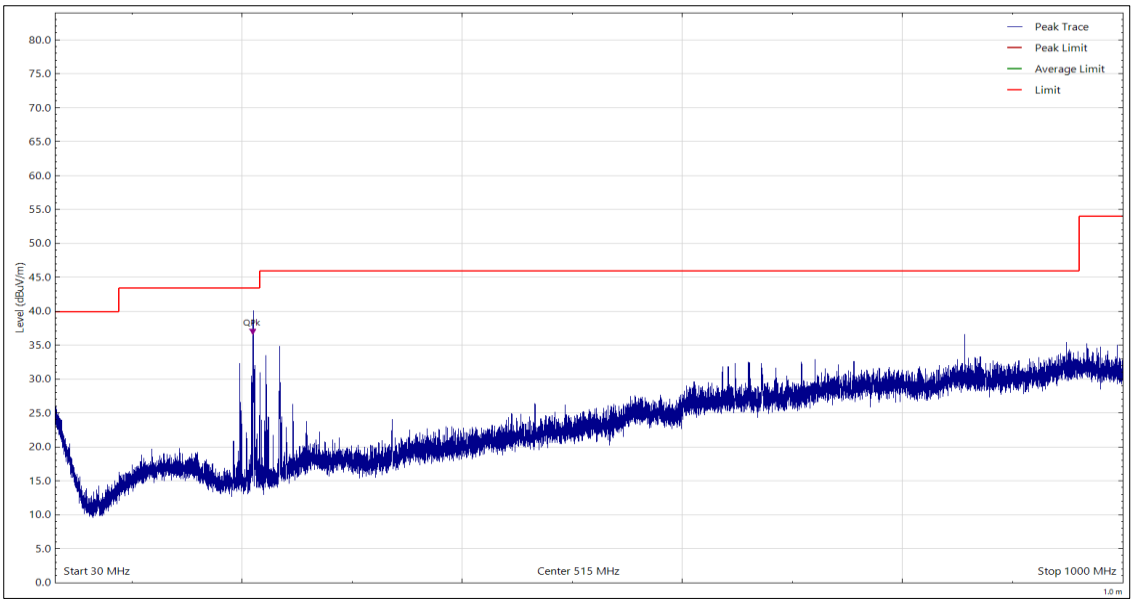

Figure 4- 30 MHz to 1 GHz, Quasi-Peak, Horizontal - X Orientation

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
209.954	36.3	43.5	-7.2	Q-Peak	0	158	Horizontal

Table 8

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.

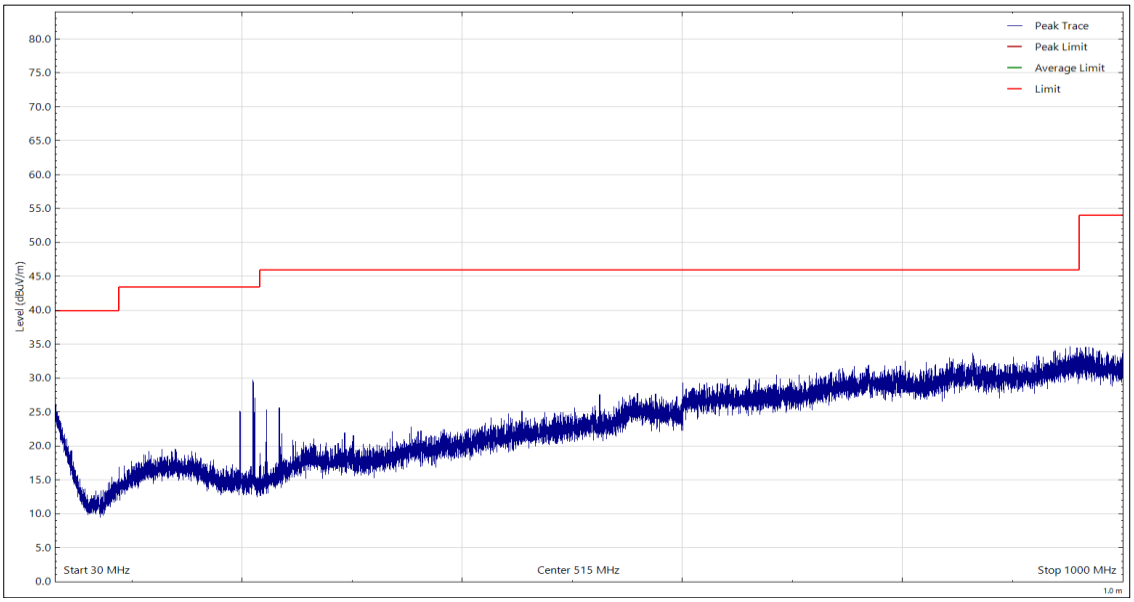

Figure 5- 30 MHz to 1 GHz, Quasi-Peak, Vertical - X Orientation

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

Table 9

*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.

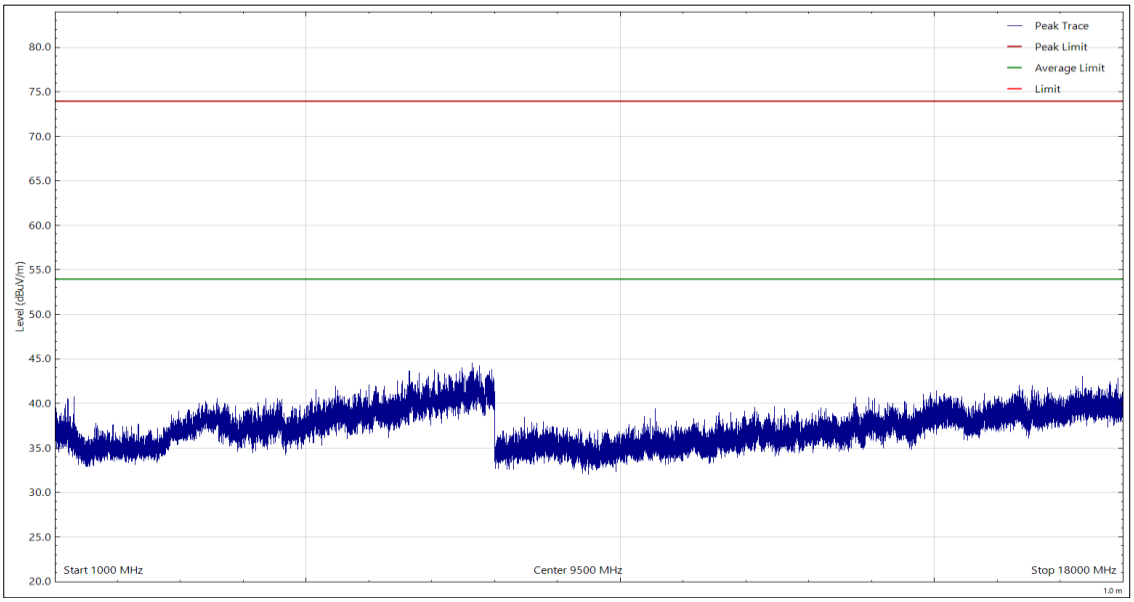

Figure 6 - 1 GHz to 18 GHz, Peak & CISPR Average, Horizontal - X Orientation

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

Table 10

*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.

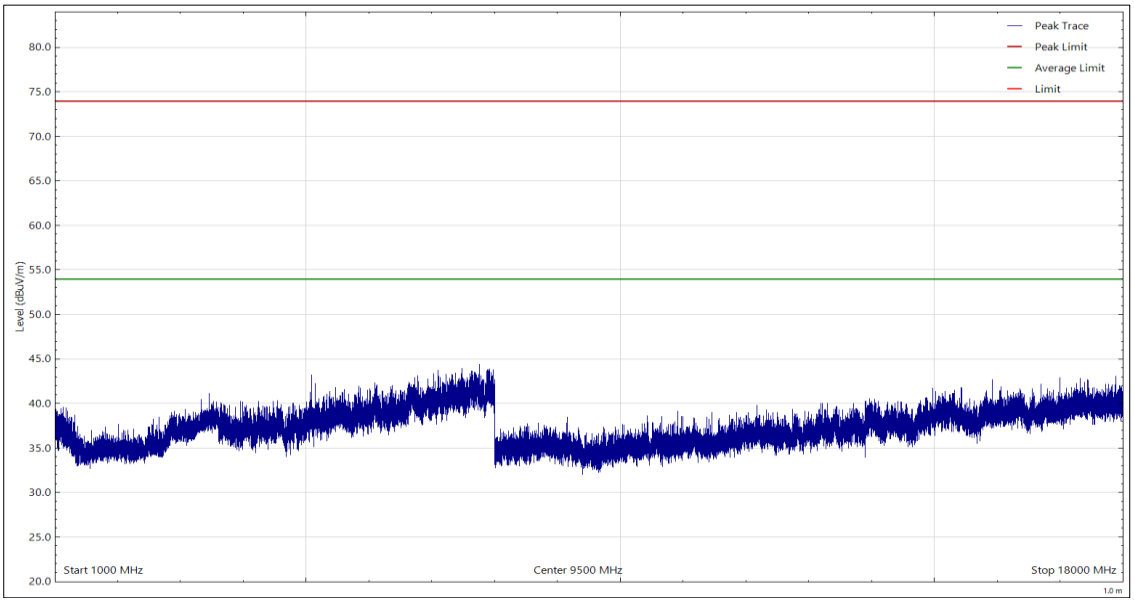

Figure 7 - 1 GHz to 18 GHz, Peak & CISPR Average, Vertical - X Orientation

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

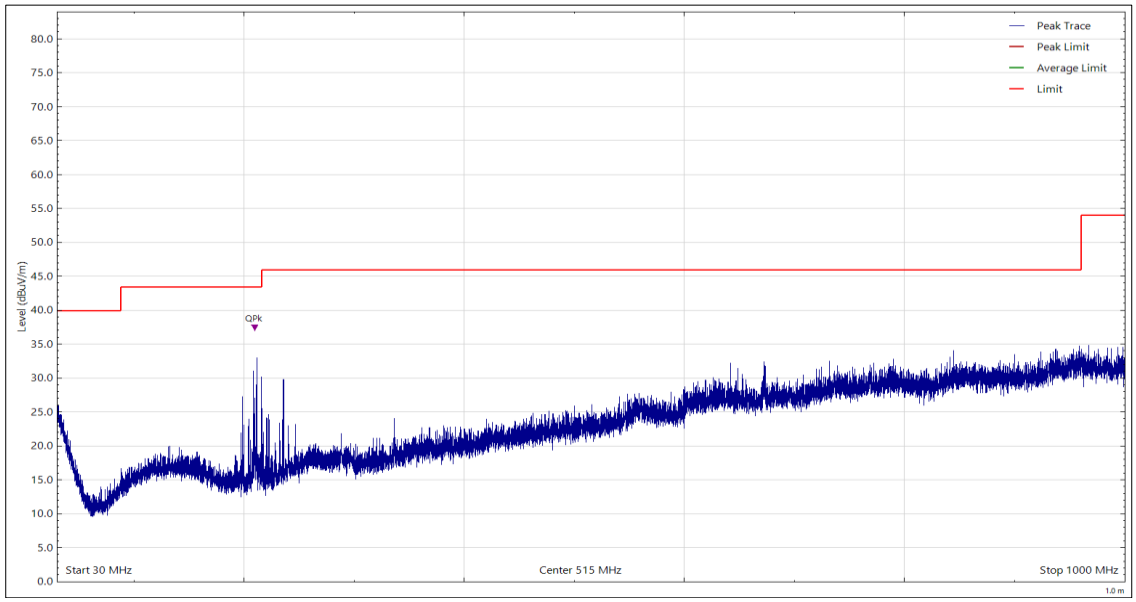

Figure 8 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal - Y Orientation

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
209.926	36.8	43.5	-6.7	Q-Peak	76	161	Horizontal

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.

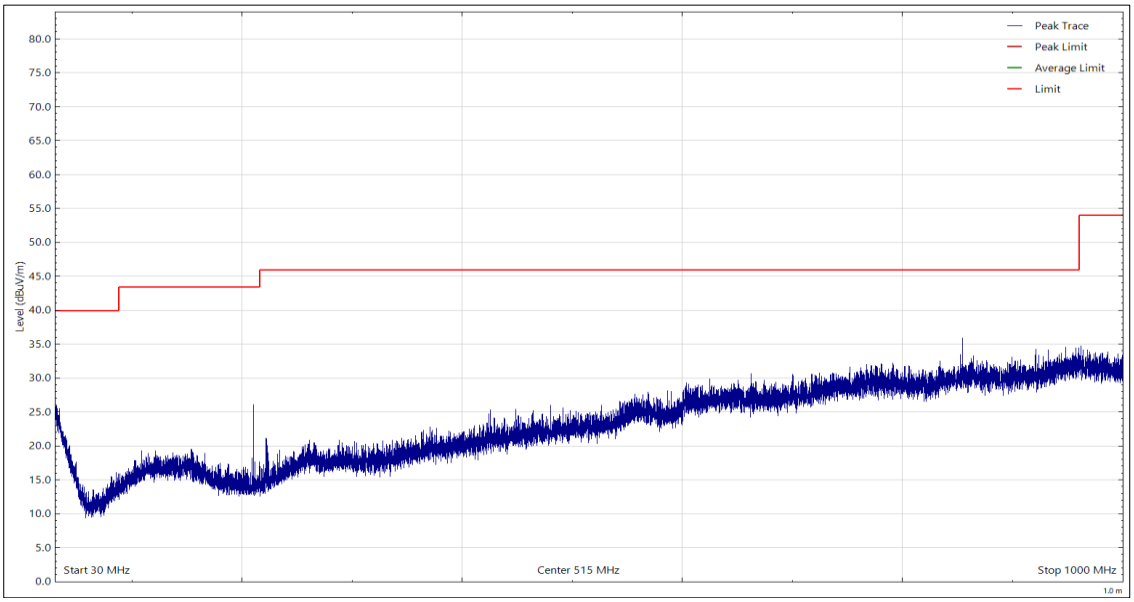

Figure 9 - 30 MHz to 1 GHz, Quasi-Peak, Vertical - Y Orientation

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

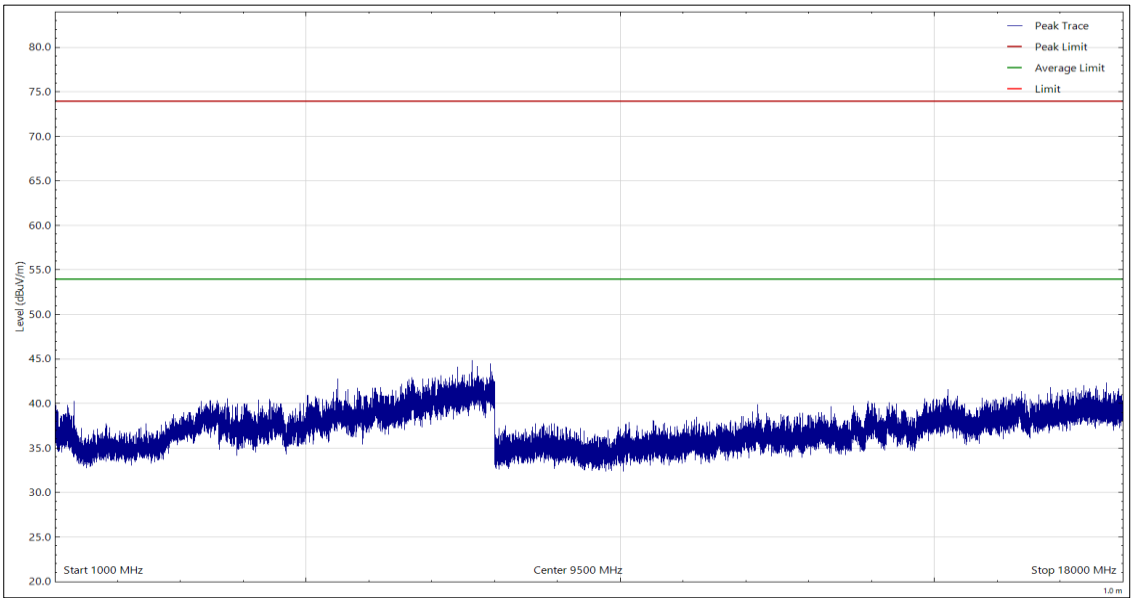

Figure 10 - 1 GHz to 18 GHz, Peak & CISPR Average, Horizontal - Y Orientation

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

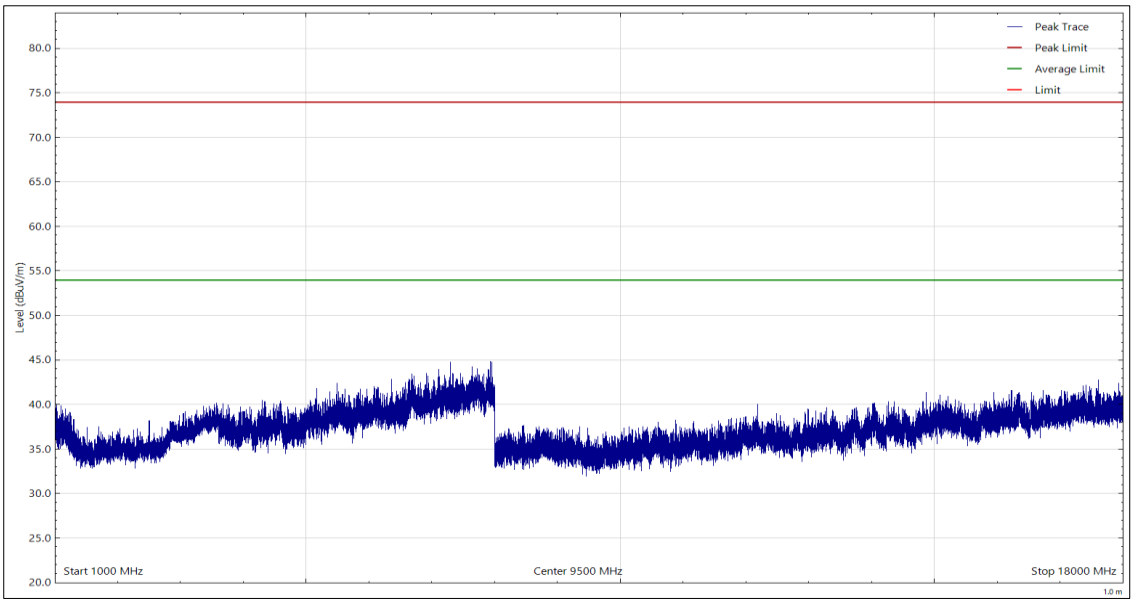

Figure 11 - 1 GHz to 18 GHz, Peak & CISPR Average, Vertical - Y Orientation

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

Table 15

*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.

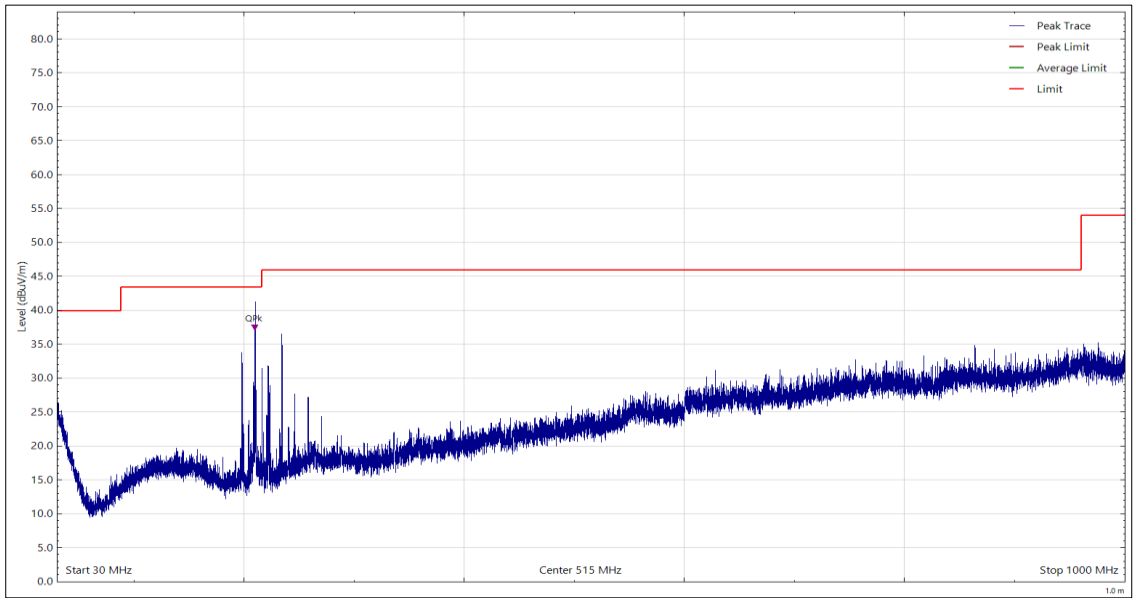

Figure 12 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal - Z Orientation

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
209.937	36.7	43.5	-6.8	Q-Peak	81	100	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.

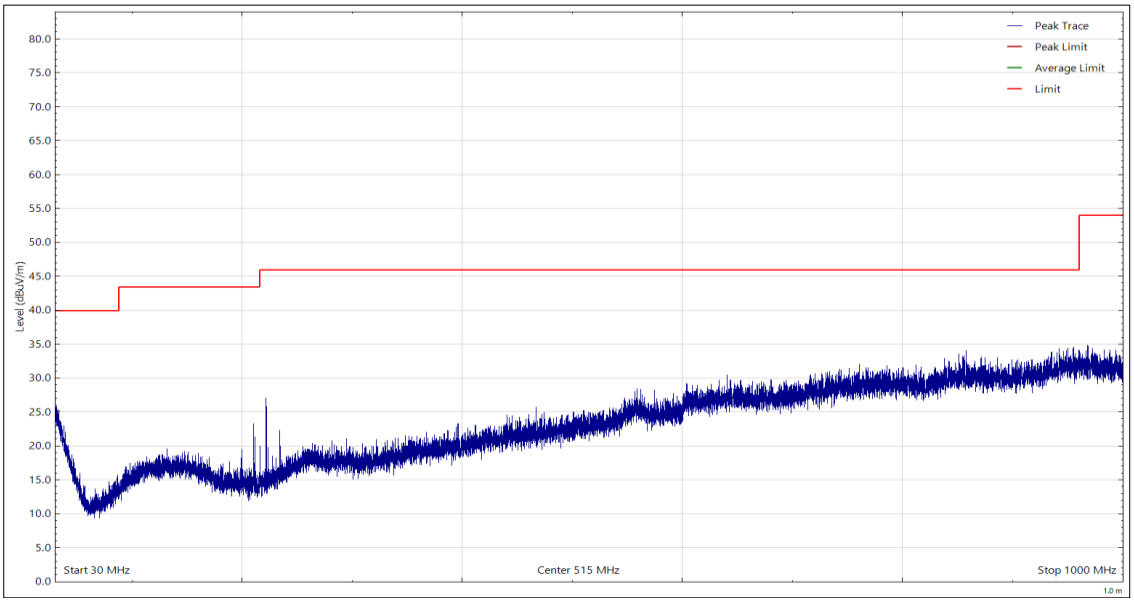

Figure 13 - 30 MHz to 1 GHz, Quasi-Peak, Vertical - Z Orientation

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

Table 17

*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.

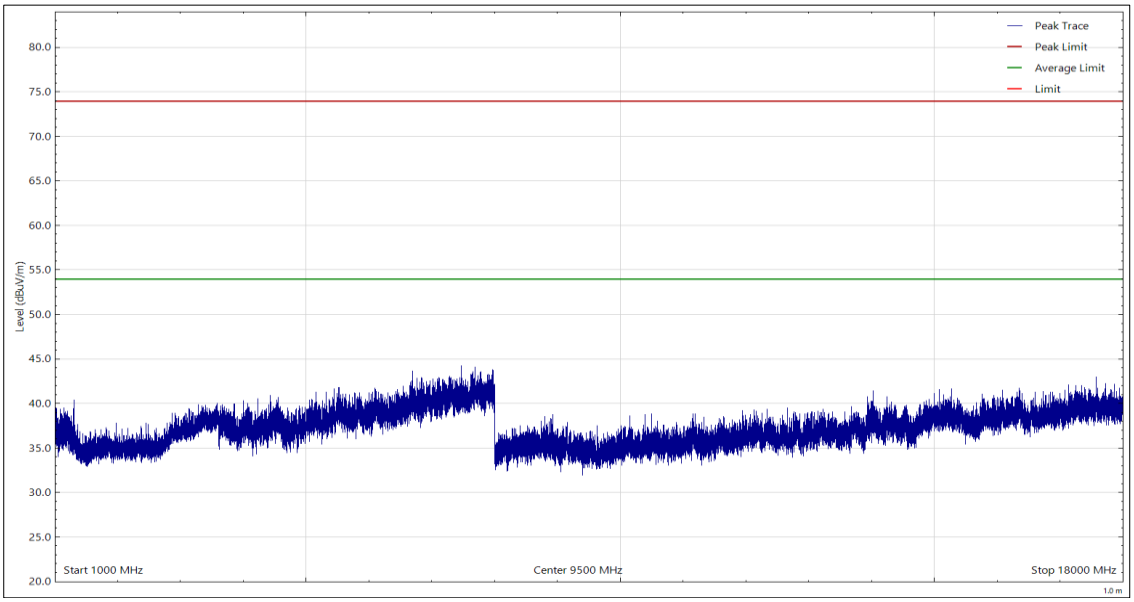

Figure 14 - 1 GHz to 18 GHz, Peak & CISPR Average, Horizontal - Z Orientation

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

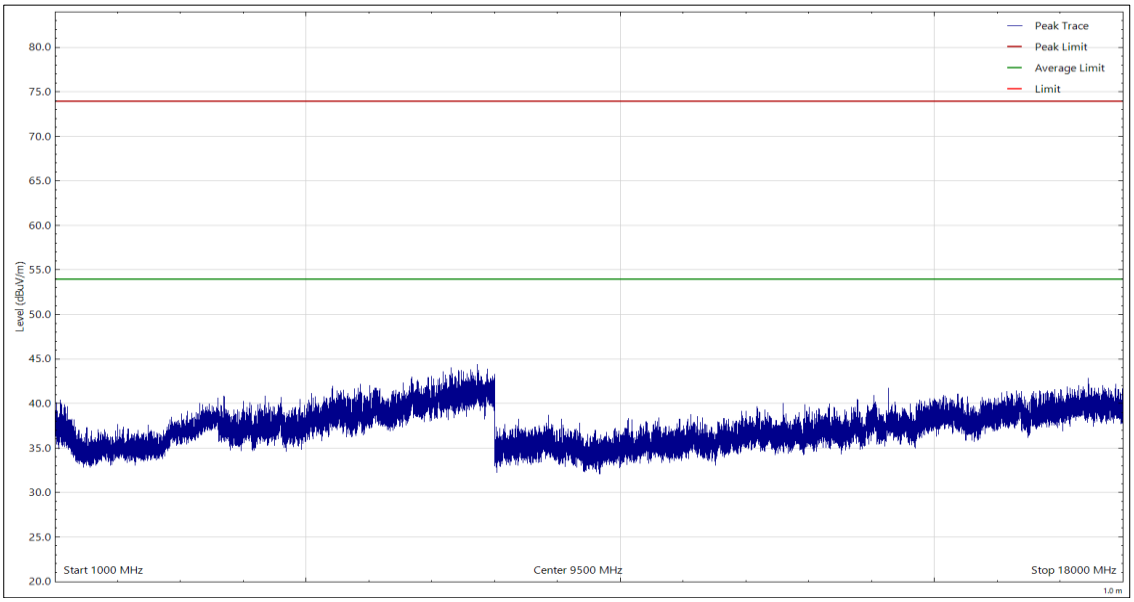

Figure 15 - 1 GHz to 18 GHz, Peak & CISPR Average, Vertical - Z Orientation

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/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 16- Test Setup - Below 1 GHz - X Orientation

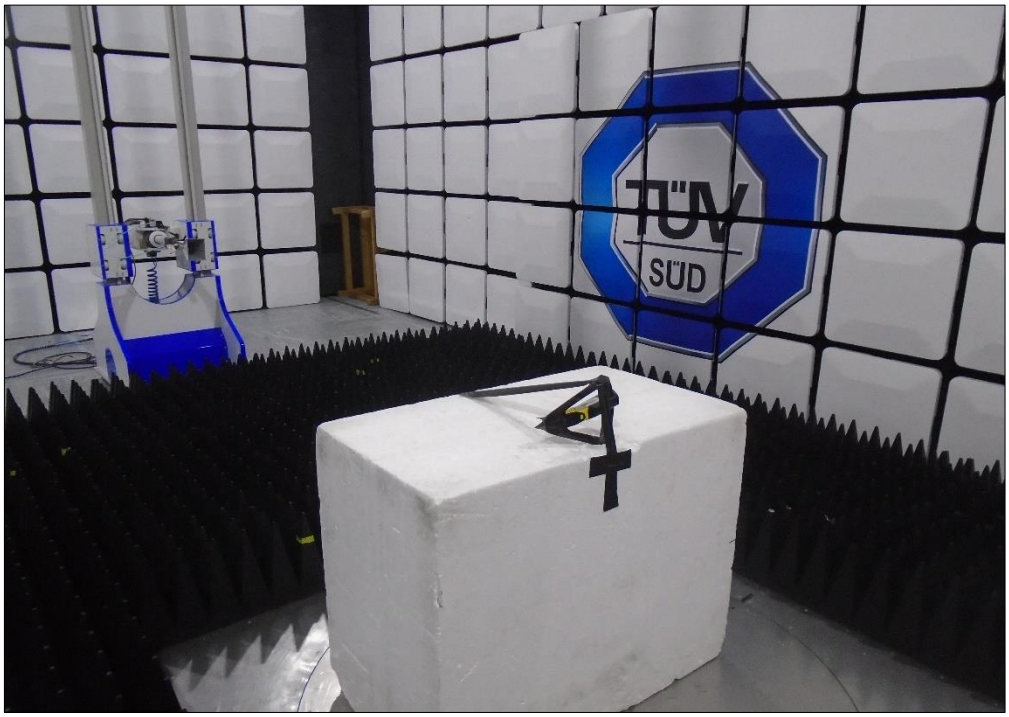

Figure 17 - Test Setup - Above 1 GHz - X Orientation

Figure 18 - Test Setup - Below 1 GHz - Y Orientation

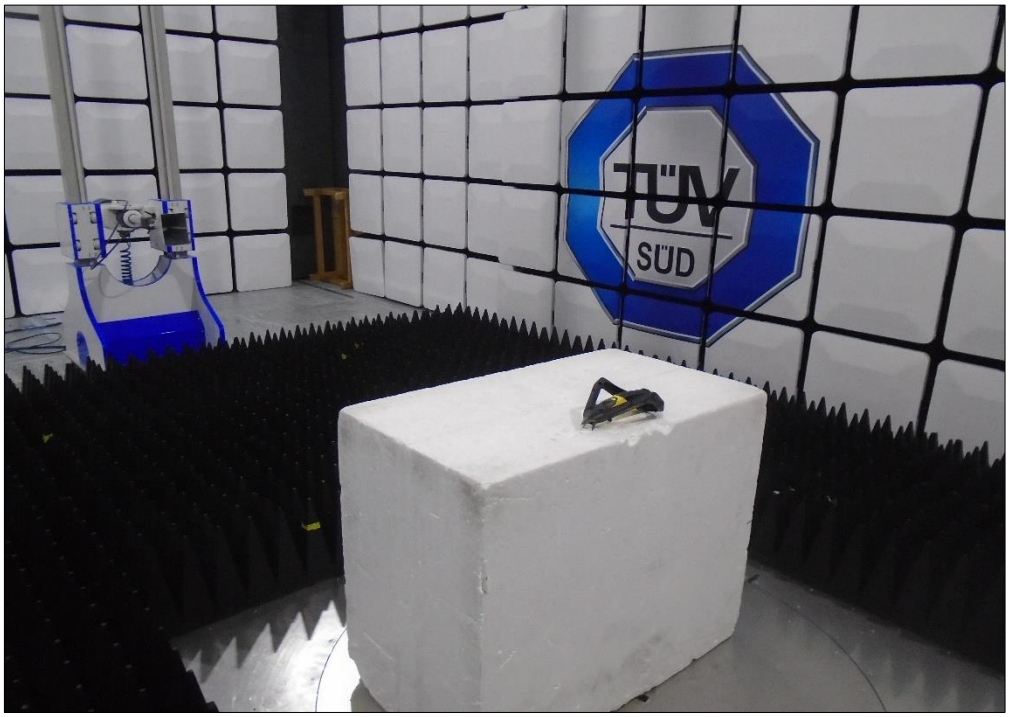

Figure 19 - Test Setup - Above 1 GHz - Y Orientation

Figure 20 - Test Setup - Below 1 GHz - Z Orientation

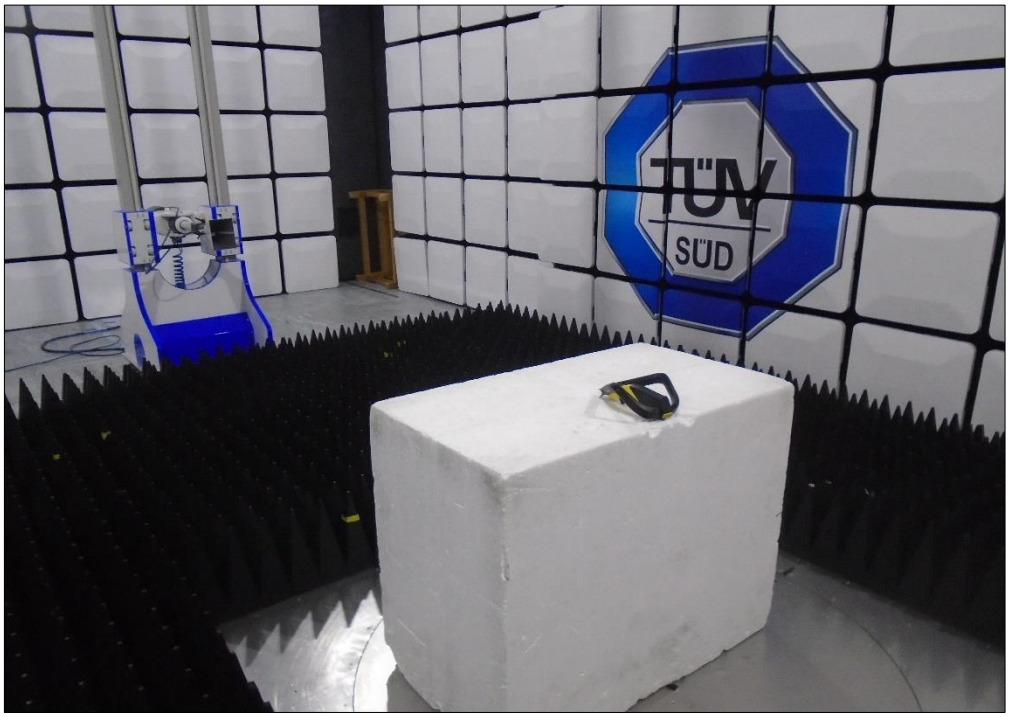

Figure 21 - Test Setup - Above 1 GHz - Z Orientation

2.1.10 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Screened Room (12)	MVG	EMC-3	5621	36	11-Aug-2023
Emissions Software	TUV SUD	EmX V2.1.11	5125	-	Software
Test Receiver	Rohde & Schwarz	ESU40	3506	12	18-Mar-2022
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	5613	-	TU
Cable (N-Type to N-Type, 1 m)	Rosenberger	LU7-036-1000	5031	12	23-Jul-2022
2 Metre SMA Type Cable	Rhophase	3PS-1801A-2000-3PS	4113	12	27-Jan-2023
Cable (N-Type to N-Type, 8 m)	Teledyne	PR90-088-8MTR	5450	6	08-Mar-2022
Pre-Amplifier (8 GHz to 18 GHz)	Phase One	PS04-0086	1533	12	21-Feb-2023
Pre-Amplifier (1 GHz to 18 GHz)	Schwarzbeck	BBV 9718 C	5350	12	22-Sep-2022
Antenna (Bi-Log, 30 MHz to 1 GHz)	Teseq	CBL6111D	5615	24	16-Oct-2022
Antenna (DRG, 1 GHz to 10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	15-Oct-2022
Antenna (DRG, 7.5 GHz to 18 GHz)	Schwarzbeck	HWRD750	5610	12	15-Oct-2022

Table 20

TU - Traceability Unscheduled

3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5471	12	07-Apr-2022

Table 21

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 22

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.