FCC and ISED Test Report

Sepura Ltd
TETRA Mobile Radio, Model: SC2024

In accordance with FCC CFR 47 Part 15C, FCC CFR 47 Part 90, ISED RSS-247 and Industry Canada RSS-119 (Simultaneous Transmission)

Add value.
Inspire trust.

Prepared for: Sepura Ltd
9000 Cambridge Research Park
Beach Drive, Waterbeach, Cambridge
CB25 9TL, United Kingdom

FCC ID: XX6SC2024 IC: 8739A-SC2024

COMMERCIAL-IN-CONFIDENCE

Document 75950098-02 Issue 01

SIGNATURE			
			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	15 January 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 CFR 47 Part 15C, FCC CFR 47 Part 90, ISED RSS-247 and Industry Canada RSS-119. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Graeme Lawler	15 January 2021	

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 CFR 47 Part 15C: 2019, FCC CFR 47 Part 90: 2019, ISED RSS-247: Issue 2 (02-2017) and Industry Canada RSS-119: Issue 2 (05-2015) 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	15-Jan-2021

Table 1

1.2 Introduction

Applicant	Sepura Ltd
Manufacturer	Sepura Ltd
Model Number(s)	SC2024
Serial Number(s)	1PR002039GKP2KB
Hardware Version(s)	Production
Software Version(s)	2001 797 07367
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 15C: 2019 FCC CFR 47 Part 90: 2019 ISED RSS-247: Issue 2 (02-2017) Industry Canada RSS-119: Issue 2 (05-2015)
Order Number Date	PLC-PO017051-1 23-September-2020
Date of Receipt of EUT	30-October-2020
Start of Test	10-November-2020
Finish of Test	10-November-2020
Name of Engineer(s)	Graeme Lawler
Related Document(s)	ANSI C63.26: 2015 ANSI C63.10: 2013

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15C, FCC CFR 47 Part 90, ISED RSS-247 and Industry Canada RSS-119 is shown below.

Section	Specification Clause				Test Description	Result	Comments/Base Standard
	Part 15C	Part 90	RSS-247	RSS-119			
Configuration and Mode: TETRA (middle Tx channel) + 2.4 GHz Wi-Fi (middle Tx channel).							
2.1	15.247 (d)	90.210	5.5	5.8	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	ANSI C63.26: 2015 ANSI C63.10: 2013

Table 2

Note: The Bluetooth and WiFi cannot operate at the same time. For the purposes of simultaneous transmission assessment, 2.4 GHz WiFi was deemed as worst case.

1.4 Application Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment)*	The SC20 hand-portable terminal is a TETRA enabled radio with Bluetooth and Wi-Fi capability
Manufacturer:	Sepura
Model:	SC2024
Part Number:	N/A
Hardware Version:	Production
Software Version:	2001 797 07367
FCC ID (if applicable)	XX6SC2024
IC ID (if applicable)	8739A-SC2024

Intentional Radiators

Technology	TETRA	BT Classic / EDR	BLE	Wi-Fi 802.11b, g	Wi-Fi 802.11n 20	Wi-Fi 802.11n 40
Frequency Band (MHz)	403 – 470	2402 – 2480	2402 - 2480	2412 - 2462	2412 - 2462	2412 - 2452
Conducted Declared Output Power (dBm)	34	7.382	7.4	16.5	16.5	16.5
Antenna Gain (dBi)	> 0	2.5	2.5	2.5	2.5	2.5
Supported Bandwidth(s) (MHz)	25 kHz	1	2	16.5 22	16.5	33
Modulation Scheme(s)	π/4 DQPSK	GFSK π/4 DQPSK 8DPSK	GFSK	802.11b: CCK, DBPSK, DQPSK 802.11g: BPSK, QPSK, 16QAM, 64QAM	BPSK, QPSK, 16QAM, 64QAM	BPSK, QPSK, 16QAM, 64QAM
ITU Emission Designator	22K0DXW	1M01F1D 1M01G1D	1M81F1D	19M7G1D	19M7D1D	36M8D1D
Bottom Frequency (MHz)	403	2402	2402	2412	2412	2422
Middle Frequency (MHz)	436.5	2441	2441	2437	2437	2437
Top Frequency (MHz)	470	2480	2480	2462	2462	2452

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	2480 MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	32.768 kHz
Class A Digital Device (Use in commercial, industrial or business environment) ☒ Class B Digital Device (Use in residential environment only) ☐	

DC Power Source

Nominal voltage:	7.4	V
Extreme upper voltage:	7.4	V
Extreme lower voltage:	6.2	V
Max current:	2	A

Battery Power Source

Voltage:	7.4	V
End-point voltage:	6.2	V *(Point at which the battery will terminate)*
Alkaline ☐ Leclanche ☐ Lithium ☒ Nickel Cadmium ☐ Lead Acid* ☐ **(Vehicle regulated)*		
Other ☐ Please detail:		

Charging

Can the EUT transmit whilst being charged	Yes ☒ No ☐

Temperature

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

Antenna Characteristics

Antenna connector ☒ TETRA			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☒	Type:	PCB	State impedance	50	Ohm
External antenna ☐	Type:		State impedance		dBI

Ancillaries (if applicable)

Manufacturer:		Part Number:	
Model:		Country of Origin:	

The SC2024 may be used with standard SC20 accessories, batteries, chargers, belt clips, holsters, remote speaker and microphones, earpieces etc

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

Name: Chris Beecham
Position held: Conformance Engineer
Date: 30 October 2020

1.5 Product Information

1.5.1 Technical Description

The SC20 hand-portable terminal is a TETRA enabled radio with Bluetooth and Wi-Fi capability.

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: SC2024, Serial Number: 1PR002039GKP2KB			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

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: TETRA (middle Tx channel) + 2.4 GHz Wi-Fi (middle Tx channel).		
Radiated Spurious Emissions (Simultaneous Transmission)	Graeme Lawler	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Radiated Spurious Emissions (Simultaneous Transmission)

2.1.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (d)
FCC CFR 47 Part 90, Clause 90.210
ISED RSS-247, Clause 5.5
Industry Canada RSS-119, Clause 5.8

2.1.2 Equipment Under Test and Modification State

SC2024, S/N: 1PR002039GKP2KB - Modification State 0

2.1.3 Date of Test

10-November-2020

2.1.4 Test Method

Testing was performed in accordance with ANSI C63.26, clause 5.5.

Prescans were performed using the direct field strength method. Any emissions found within 10 dB of the specification limit were formally measured using the substitution method.

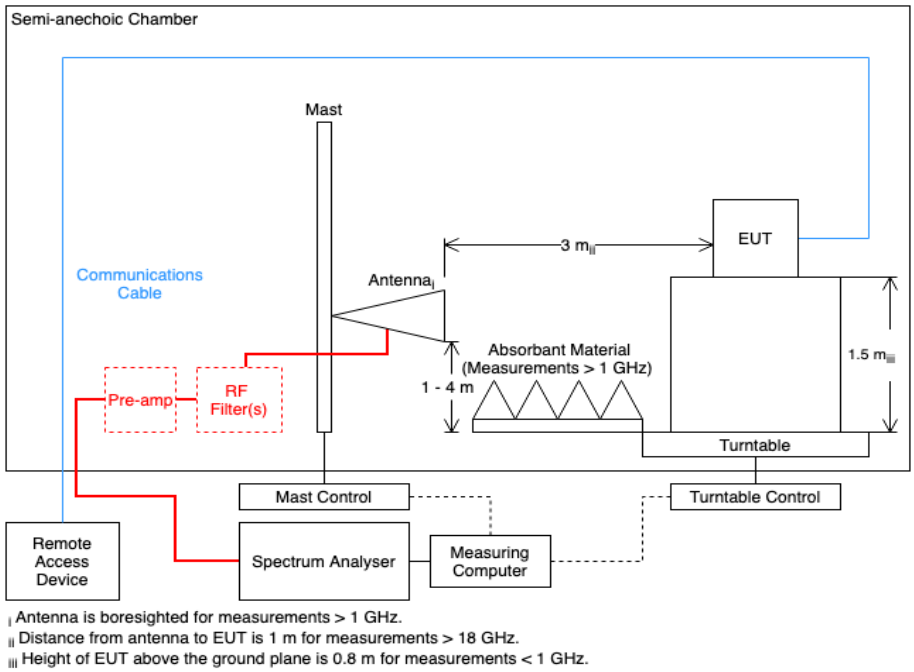

Figure 1

The EUT was placed on the non-conducting platform in a manner typical of a normal use. As the EUT 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.

Ports on the EUT were terminated with loads as described in ANSI C63.4 clause 6.2.4. Ancillary equipment and interconnecting cables were arranged to give worst case results.

2.1.5 Environmental Conditions

Ambient Temperature 21.6 °C
Relative Humidity 51.6 %

2.1.6 Test Results

TETRA (middle Tx channel) + 2.4 GHz Wi-Fi (middle Tx channel).

The EUT was configured for simultaneous transmission in the following mode of operation:

Technology	Frequency Band (MHz)	Channel Frequency (MHz)
802.11b	2400 MHz to 2483.5 MHz	2437
Tetra RSS Band of Operation	406 MHz to 430 MHz	418.050
Tetra FCC Band of Operation	450 MHz to 470 MHz	460.025

Table 5 - Modes of Operation

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

Table 6 - 30 MHz to 25 GHz – X Orientation (FCC)

* No emissions were detected within 10 dB of the limit.

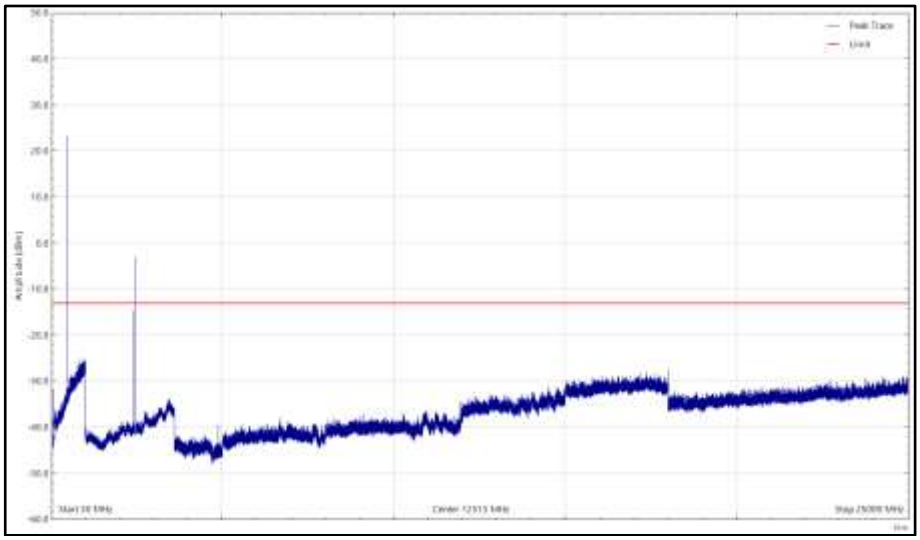

Figure 2 - 30 MHz to 25 GHz, Vertical – X Orientation (FCC)

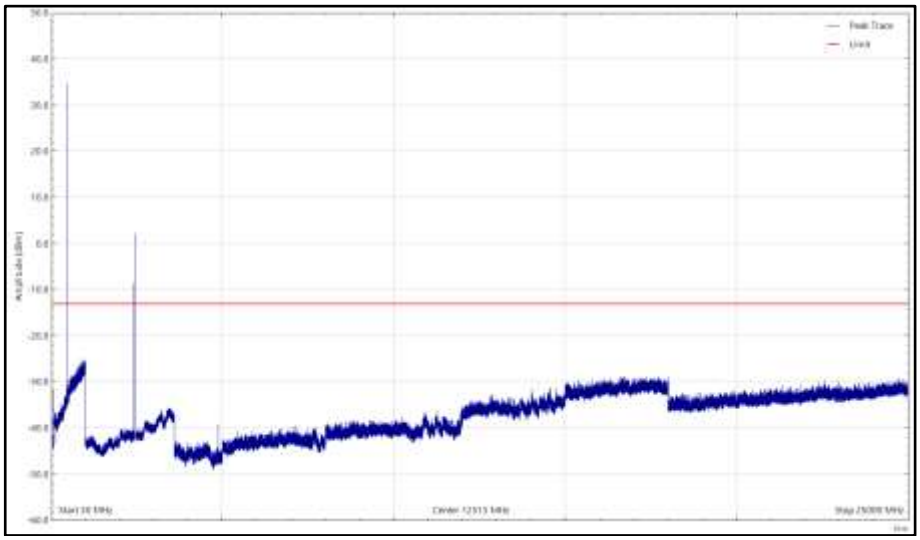

Figure 3 - 30 MHz to 25 GHz, Horizontal – X Orientation (FCC)

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

Table 7 - 30 MHz to 25 GHz – Y Orientation (FCC)

* No emissions were detected within 10 dB of the limit.

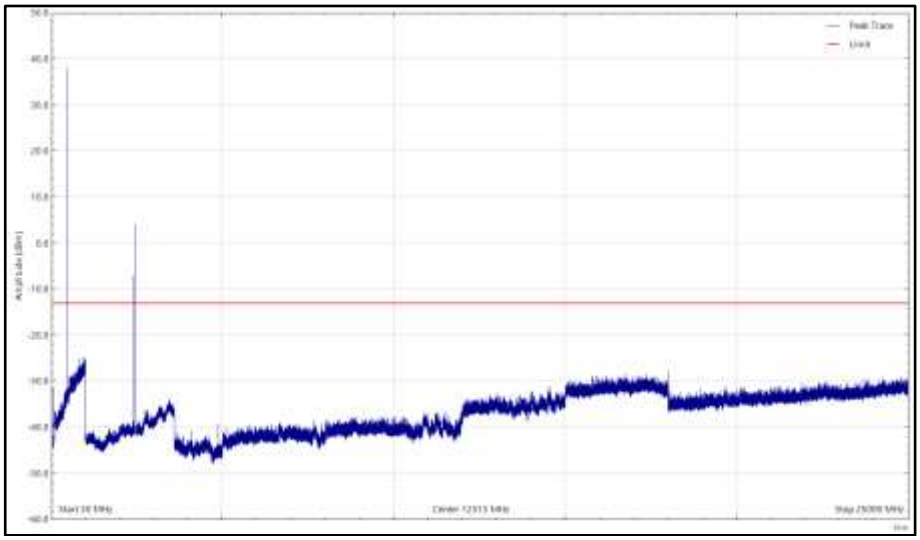

Figure 4 - 30 MHz to 25 GHz, Vertical – Y Orientation (FCC)

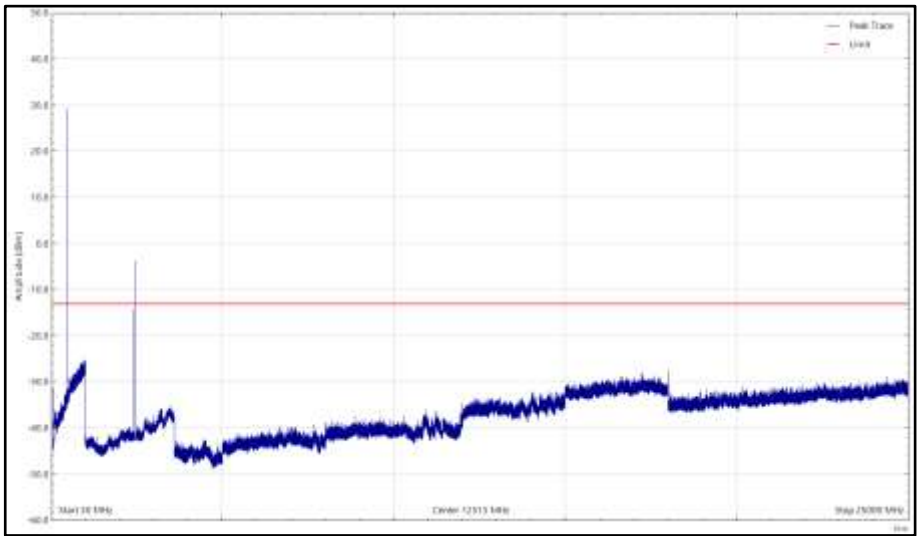

Figure 5 - 30 MHz to 25 GHz, Horizontal – Y Orientation (FCC)

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

Table 8 - 30 MHz to 25 GHz – Z Orientation (FCC)

* No emissions were detected within 10 dB of the limit.

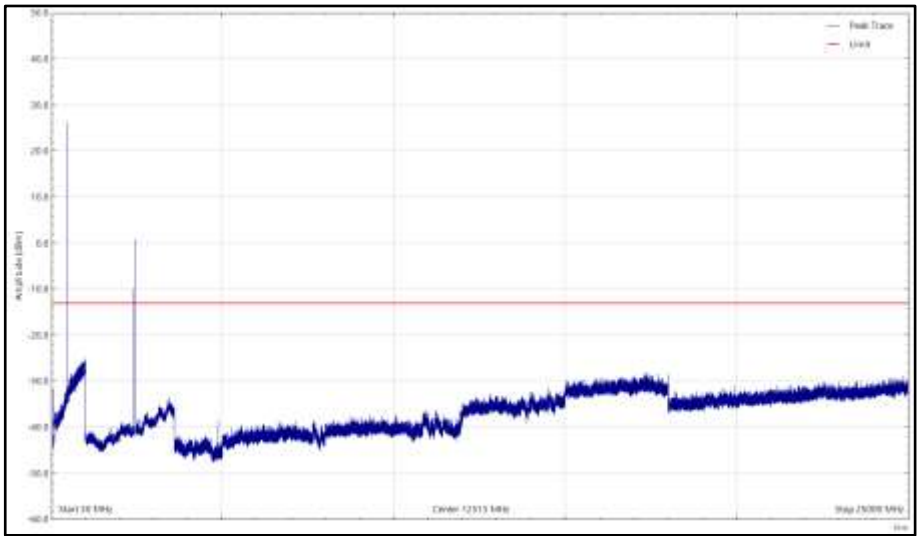

Figure 6 - 30 MHz to 25 GHz, Vertical – Z Orientation (FCC)

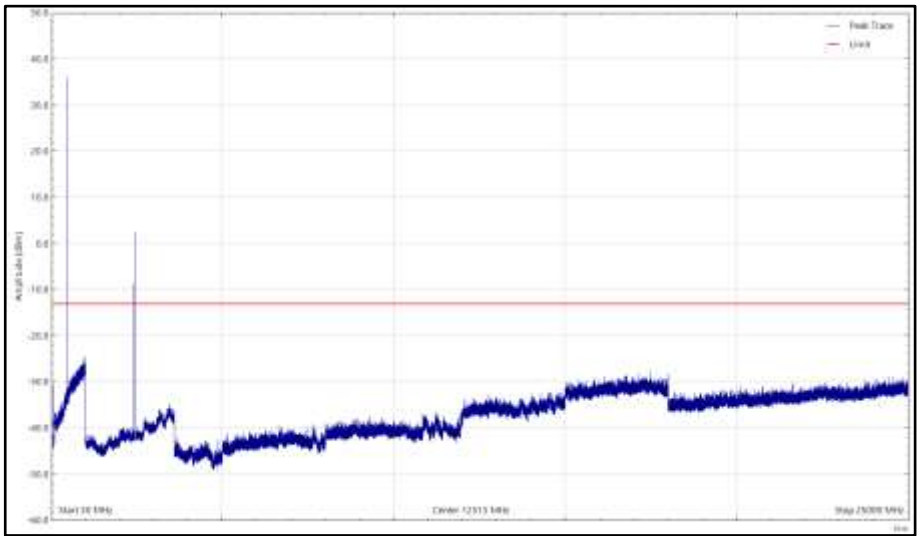

Figure 7 - 30 MHz to 25 GHz, Horizontal – Z Orientation (FCC)

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

Table 9 - 30 MHz to 25 GHz – X Orientation (ISED)

* No emissions were detected within 10 dB of the limit.

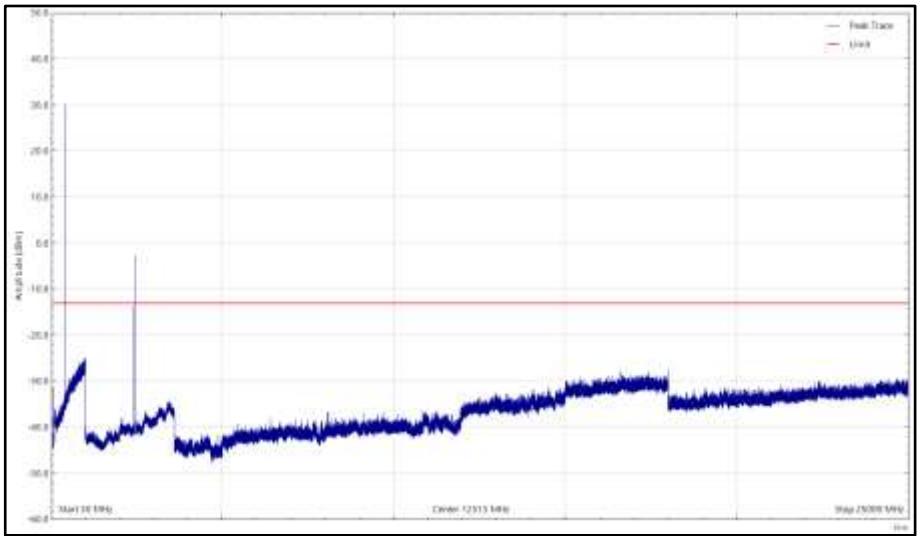

Figure 8 - 30 MHz to 25 GHz, Vertical – X Orientation (ISED)

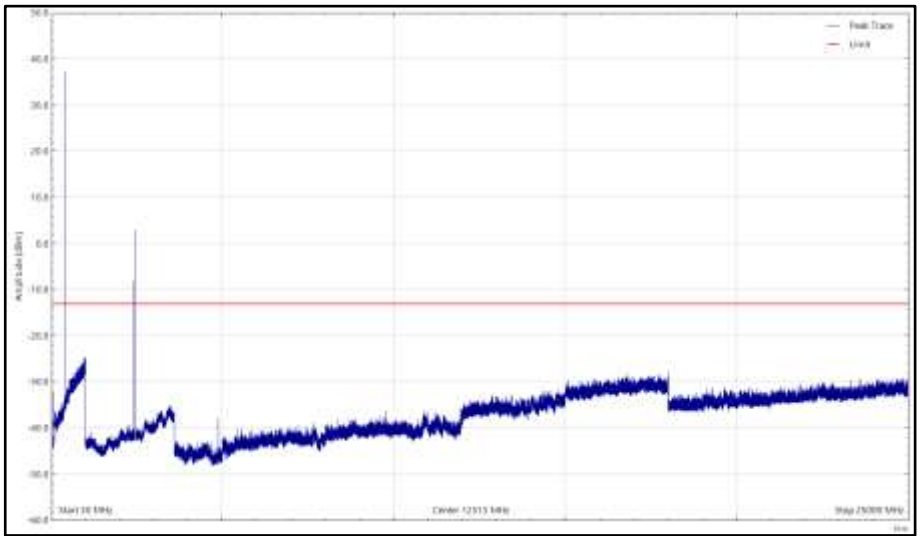

Figure 9 - 30 MHz to 25 GHz, Horizontal – X Orientation (ISED)

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

Table 10 - 30 MHz to 25 GHz – Y Orientation (ISED)

* No emissions were detected within 10 dB of the limit.

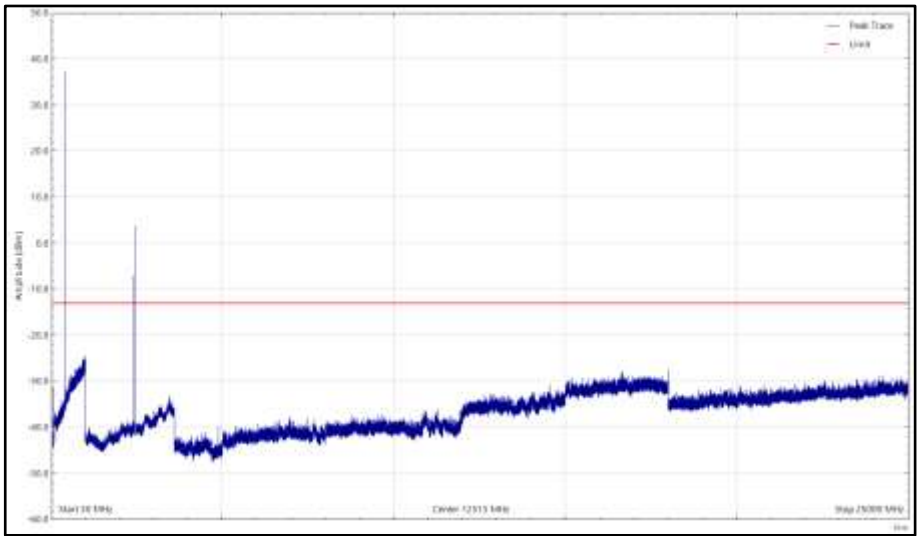

Figure 10 - 30 MHz to 25 GHz, Vertical – Y Orientation (ISED)

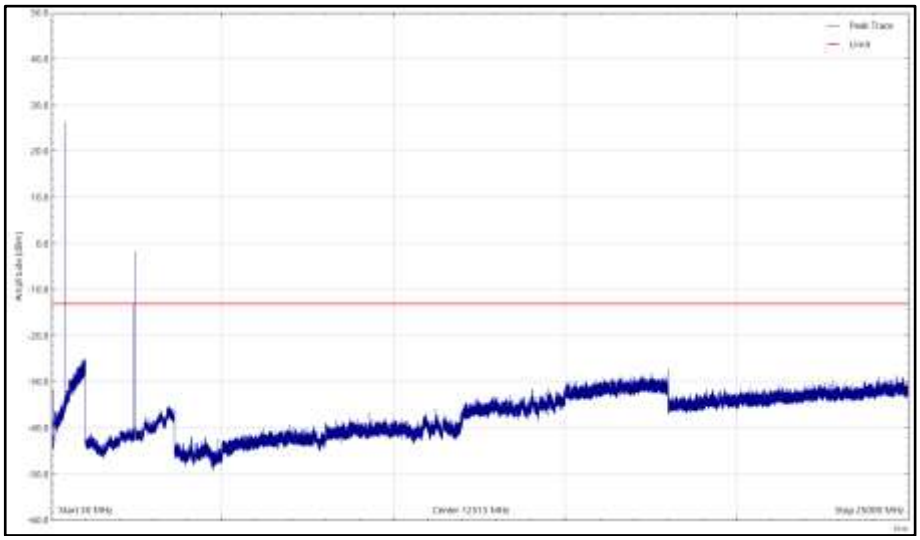

Figure 11 - 30 MHz to 25 GHz, Horizontal – Y Orientation (ISED)

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

Table 11 - 30 MHz to 25 GHz – Z Orientation (ISED)

* No emissions were detected within 10 dB of the limit.

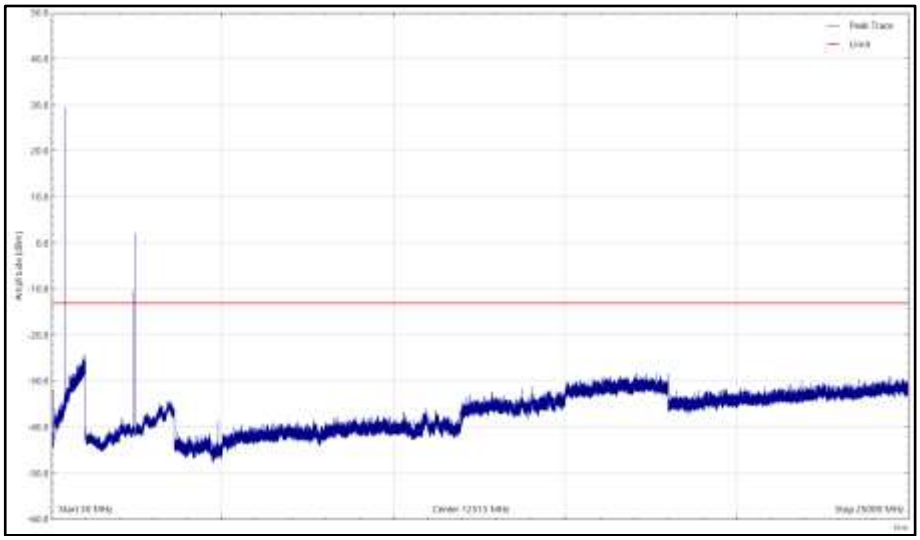

Figure 12 - 30 MHz to 25 GHz, Vertical – Z Orientation (ISED)

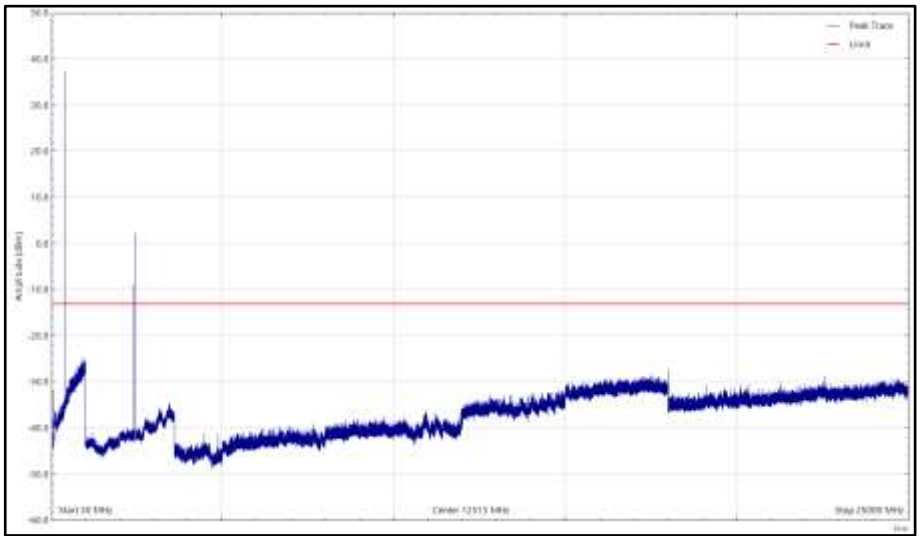

Figure 13 - 30 MHz to 25 GHz, Horizontal – Z Orientation (ISED)

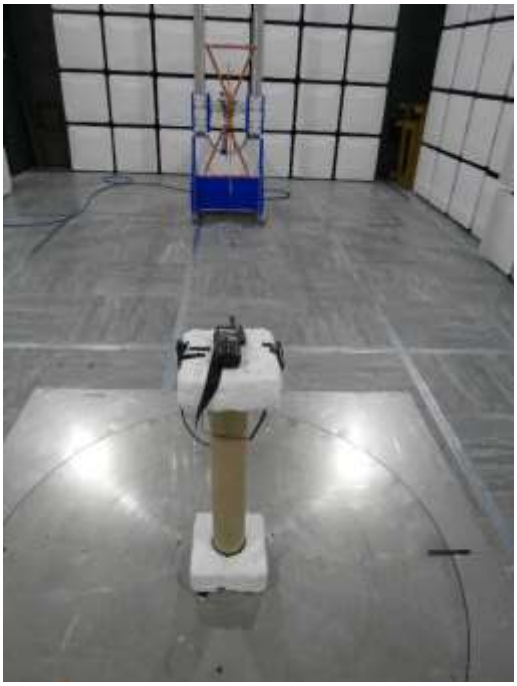

Figure 14 – Test Setup - 30 MHz to 1 GHz – X Orientation

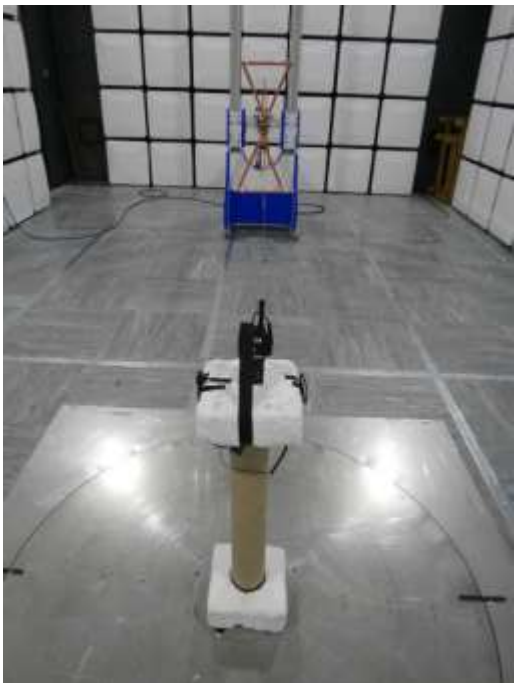

Figure 15 – Test Setup - 30 MHz to 1 GHz – Y Orientation

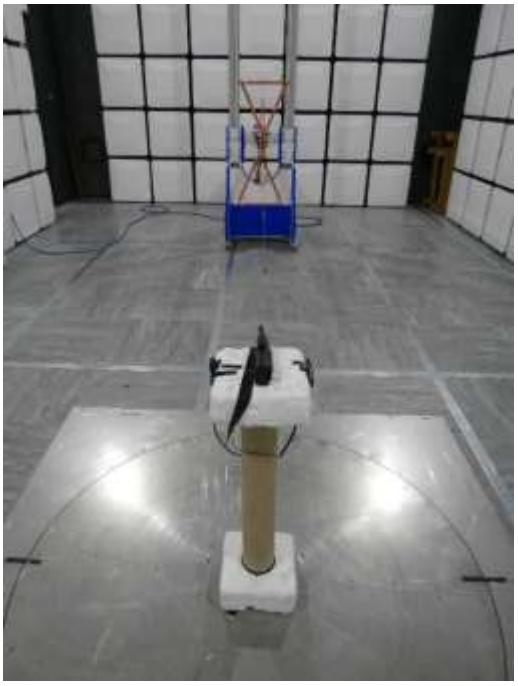

Figure 16 – Test Setup - 30 MHz to 1 GHz – Z Orientation

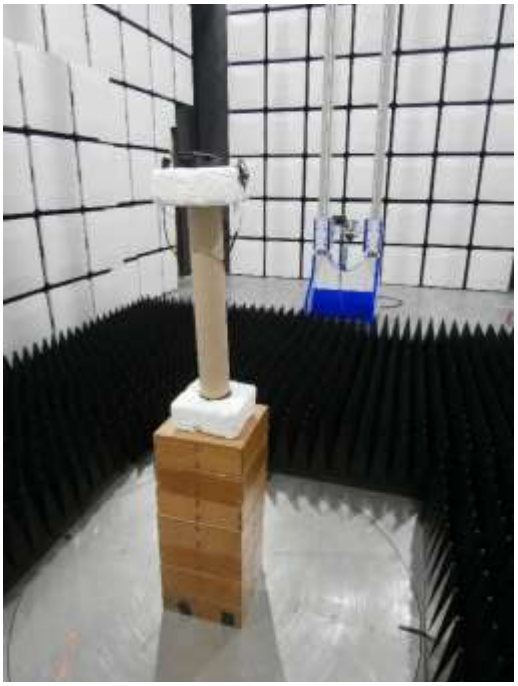

Figure 17 – Test Setup - 1 GHz to 18 GHz – X Orientation

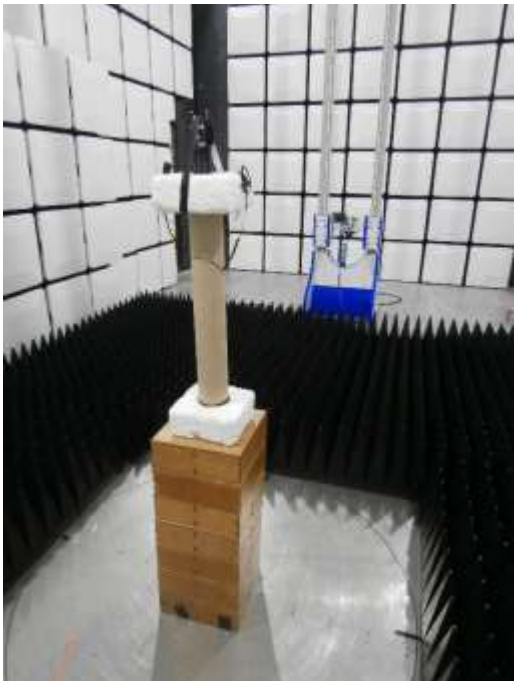

Figure 18 – Test Setup - 1 GHz to 18 GHz – Y Orientation

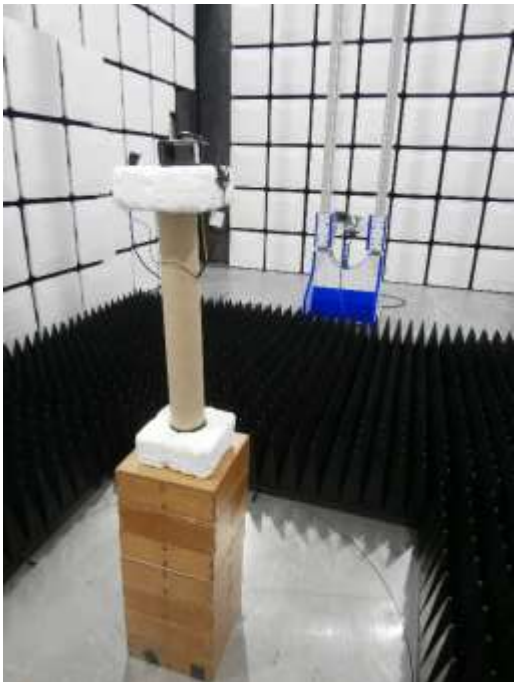

Figure 19 – Test Setup - 1 GHz to 18 GHz – Z Orientation

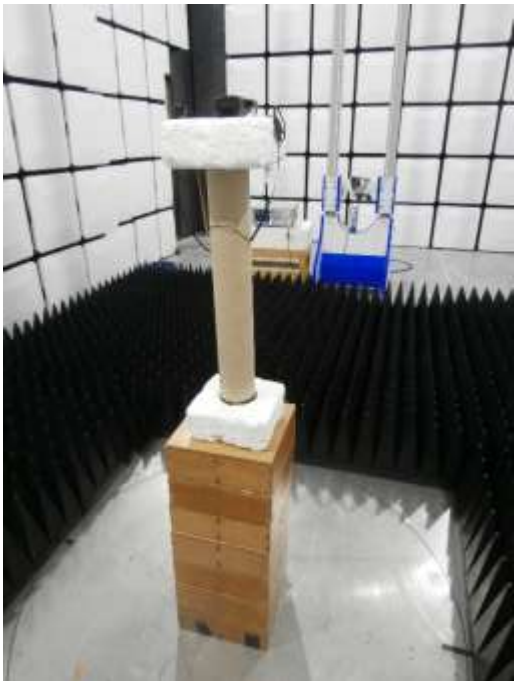

Figure 20 – Test Setup - 18 GHz to 25 GHz – X Orientation

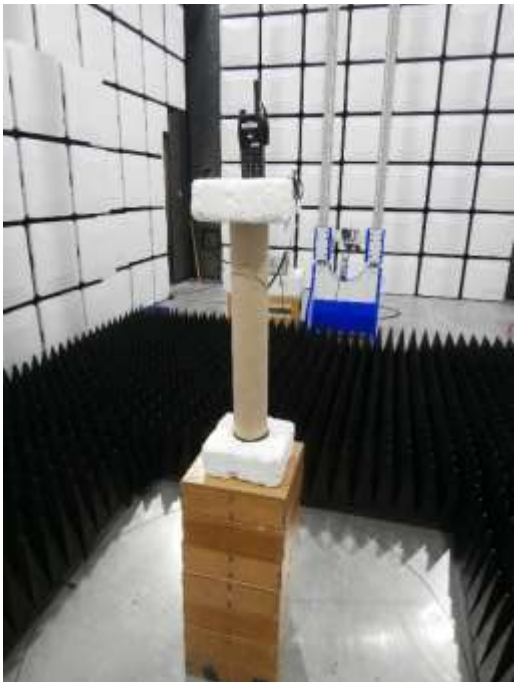

Figure 21 – Test Setup - 18 GHz to 25 GHz – Y Orientation

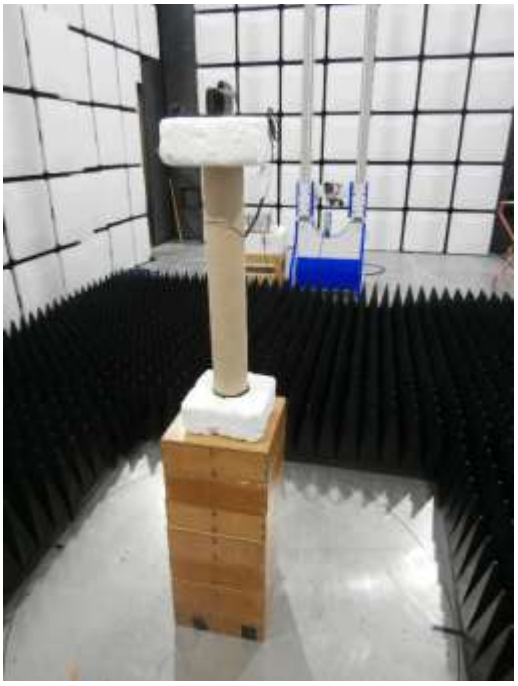

Figure 22 – Test Setup - 18 GHz to 25 GHz – Z Orientation

FCC and ISED Limit Clause

The least stringent limit from the applicable rule parts was used to determine compliance for Radiated Emissions testing of multiple transmission sources.

The least stringent applicable limit was:

Clause	Limit
Part 90.210	-13 dBm (EIRP) Emission Mask B
RSS-119	-13 dBm (EIRP) Emission Mask B

Table 12

2.1.7 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 Due
Antenna 18-40GHz (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	27-Jul-2022
Antenna with permanent attenuator (Bilog)	Schaffner	CBL6143	287	24	14-Oct-2022
18GHz - 40GHz Pre-Amplifier	Phase One	PSO4-0087	1534	12	18-Feb-2021
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	03-Jan-2021
Cable 1503 2M 2.92(P)m 2.92(P)m	Rhophase	KPS-1503A-2000-KPS	4293	12	16-Nov-2020
Cable (18 GHz)	Rosenberger	LU7-071-2000	5106	12	09-Dec-2020
EmX Emissions Software	TUV SUD	V2.0.1	5125	-	Software
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	16-Mar-2021
1m K-Type Cable	Junkosha	MWX241-01000KMSKMS/A	5511	12	03-Apr-2021
8m N-Type Cable	Junkosha	MWX221-08000NMSNMS/B	5520	12	24-Mar-2021
2 m K Type Cable	Junkosha	MWX241-02000KMSKMS/A	5523	12	03-Apr-2021
DRG Horn Antenna (7.5-18GHz)	Schwarzbeck	HWRD750	5610	12	22-Sep-2021
Broadband Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	22-Sep-2021
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast TAM 4.0-P	Maturo Gmbh	TAM 4.0-P	5613	-	TU
3m Semi Anechoic Chamber	MVG	EMC-3	5621	36	11-Aug-2023

Table 13

TU - Traceability Unscheduled

3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Radiated Spurious Emissions (Simultaneous Transmission)	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 14

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.