FCC and ISEDC Test Report

Sepura Ltd
Portable TETRA Handset, Model: SC2124

In accordance with FCC 47 CFR Part 15, FCC 47 CFR Part 90, ISEDC RSS-247 and Industry Canada RSS-119

Add value.
Inspire trust.

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

FCC ID: XX6SC2124 IC: 8739A-SC2124

COMMERCIAL-IN-CONFIDENCE

Document 75944487-05 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Stephen Marshall	Senior Engineer	Authorised Signatory	06 March 2020

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 15, FCC 47 CFR Part 90, ISEDC RSS-247 and Industry Canada RSS-119 The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSI2.4 GHz Bluetooth Low Energy FOR	NAME	DATE	SIGNATURE
Testing	Graeme Lawler	**06 March 2020**	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISEDC 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 15: 2018, FCC 47 CFR Part 90: 2018, ISEDC RSS-247: Issue 2 (02-2017) and Industry Canada RSS-119: Issue 12 (05-2015) for the tests detailed in section 1.3.

TÜV SÜD
is a trading name of TUV SUD Ltd
Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TUV SUD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuv-sud.co.uk

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

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	06 March 2020

Table 1

1.2 Introduction

Applicant	Sepura Ltd
Manufacturer	Sepura Ltd
Model Number(s)	SC2124
Serial Number(s)	2PS001845GM55XT and 1PR001909GM18R8
Hardware Version(s)	Production
Software Version(s)	1) 1754 006 07367 2) 2001 684 07367
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 15: 2018 FCC 47 CFR Part 90: 2018 ISEDC RSS-247: Issue 2 (02-2017) Industry Canada RSS-119: Issue 12 (05-2015)
Order Number Date	PLC-PO011393-1 07-December-2018
Date of Receipt of EUT	18-March-2019 and 15-August-2019
Start of Test	26-March-2019
Finish of Test	17-February-2020
Name of Engineer(s)	Graeme Lawler
Related Document(s)	ANSI C63.26: 2015

1.3 Brief Summary of Results

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

Section	Specification Clause				Test Description	Result	Comments/Base Standard
	Part 15	Part 90	RSS-247	RSS-119			
Configuration and Mode: TETRA 450 MHz to 470 MHz + 2.4 GHz Bluetooth Low Energy - Simultaneous Transmission							
2.1	15.247 (d) and 15.205	90.210	5.5	5.8	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	
Configuration and Mode: TETRA 403 MHz to 430 MHz + 2.4 GHz Bluetooth Low Energy - Simultaneous Transmission							
2.1	15.247 (d) and 15.205	90.210	5.5	5.8	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	
Configuration and Mode: TETRA Mid Tx channel 450 MHz to 470 MHz + 2.4 GHz Wi-Fi Mid Tx Channel 802.11b, 11 Mbps - Simultaneous Transmission							
2.1	15.247 (d) and15.205)	90.210	5.5	5.8	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	

Table 2

1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	SC2124
Part Number	N/A
Hardware Version	Production
Software Version	1) 1754 006 07367 2) 2001 684 07367
FCC ID (if applicable)	XX6SC2124
Industry Canada ID (if applicable)	8739A-SC2124
Technical Description (Please provide a brief description of the intended use of the equipment)	Portable TETRA Radio for use by the emergency services etc.

INTENTIONAL RADIATORS									
Technology	Frequency Band (MHz)	Conducted Declared Output Power (dBm)	Antenna Gain (dBi)	Supported Bandwidth(s) (MHz)	Modulation Scheme(s)	ITU Emission Designator	Test Channels (MHz)		
							Bottom	Middle	Top
TETRA	403-470	34	>-1	25 kHz	π/4DQPSK	22K0DXW	403	436.5	470
TETRA	403-470	34	>-1	22 kHz	π/4DQPSK	20K0DXW	403	436.5	470
Bluetooth (Low Energy)	2402-2480	7.382	2.5	1.0	GFSK	1M00F1D	2402	2441	2480
WLAN	2412-2462	20	2.5	20/40	DSSS OFDM	14M8WDX 17M8WDX 36M0WDX	2412	2437	2462

UN-INTENTIONAL RADIATOR	
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) ☐	

Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
External DC	Nominal Voltage	Maximum Current	
	7.4V DC	2A	
Battery	Nominal Voltage	Battery Operating End Point Voltage	
	7.4V DC	6.2V DC	
Can EUT transmit whilst being charged?		Yes ☒ No ☐	

EXTREME CONDITIONS					
Maximum temperature	65	°C	Minimum temperature	-30	°C

Ancillaries
Please list all ancillaries which will be used with the device.
Remote speaker microphone, leather cases, pocket clips, earpieces

ANTENNA CHARACTERISTICS						
☐	Antenna connector			State impedance		Ohm
☒	Temporary antenna connector			State impedance	50	Ohm
☒	Integral antenna	Type	Bluetooth			
☐	External antenna	Type				

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

Name: Chris Beecham

Position held: Conformance Engineer Date: 03/03/2020

1.5 Product Information

1.5.1 Technical Description

Portable TETRA Radio for use by the emergency services etc.

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: SC2124, Serial Number: 2PS000055XT			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: SC2124, Serial Number: GEMUVP2-08			
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 450 MHz to 470 MHz + 2.4 GHz Bluetooth Low Energy - Simultaneous Transmission		
Radiated Spurious Emissions (Simultaneous Transmission)	Graeme Lawler	UKAS
Configuration and Mode: TETRA 403 MHz to 430 MHz + 2.4 GHz Bluetooth Low Energy - Simultaneous Transmission		
Radiated Spurious Emissions (Simultaneous Transmission)	Graeme Lawler	UKAS
Configuration and Mode: TETRA Mid Tx channel 450 MHz to 470 MHz + 2.4 GHz Wi-Fi Mid Tx Channel 802.11b, 11 Mbps - Simultaneous Transmission		
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 47 CFR Part 15, Clause 15.247 (d) and 15.205
FCC 47 CFR Part 90, Clause 90.210
ISEDC RSS-247, Clause 5.5
Industry Canada RSS-119, Clause 5.8

2.1.2 Equipment Under Test and Modification State

SC2124, S/N: 2PS001845GM55XT - Modification State 0
SC2124, S/N: 1PR001909GM18R8 - Modification State 0

2.1.3 Date of Test

26-March-2019 to 17-February-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.

The limit line on the prescan plots was calculated from equation c) in clause 5.2.7.

For testing above 18 GHz the measurement distance was reduced to 1 m.

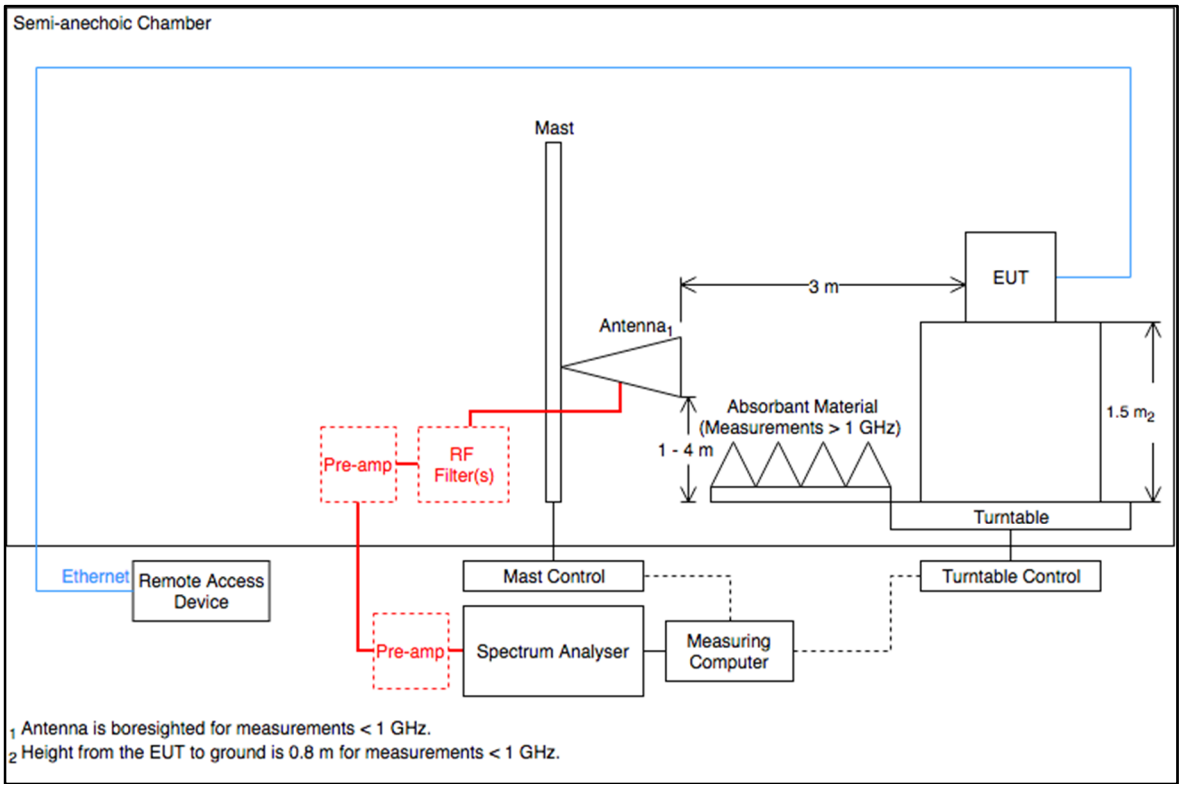

Figure 1 - Setup Diagram

2.1.5 Environmental Conditions

Ambient Temperature 19.9 - 20.6 °C
Relative Humidity 31.5 - 34.1 %

2.1.6 Test Results

TETRA 450 MHz to 470 MHz + 2.4 GHz Bluetooth Low Energy - Simultaneous Transmission

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

Technology	Frequency Band (MHz)	Channel Frequency (MHz)
Tetra	450 to 470	460.025
Bluetooth Low Energy	2400 to 2483.5	2440

Table 5 - Modes of Operation

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

Table 6 – 30 MHz to 25 GHz Emissions Results

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

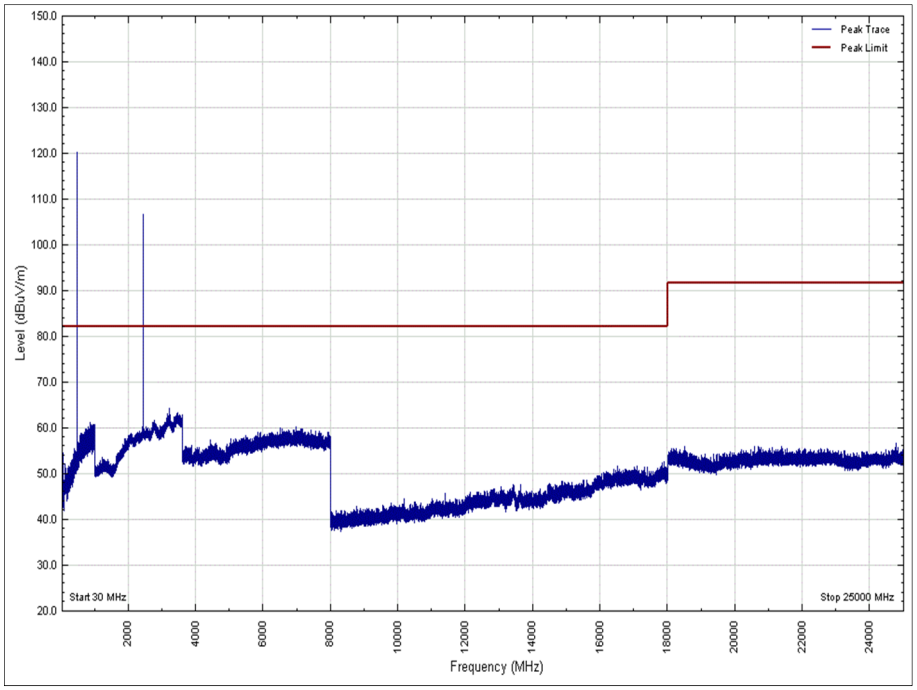

Figure 2 - 30 MHz to 25 GHz - X Orientation – Vertical

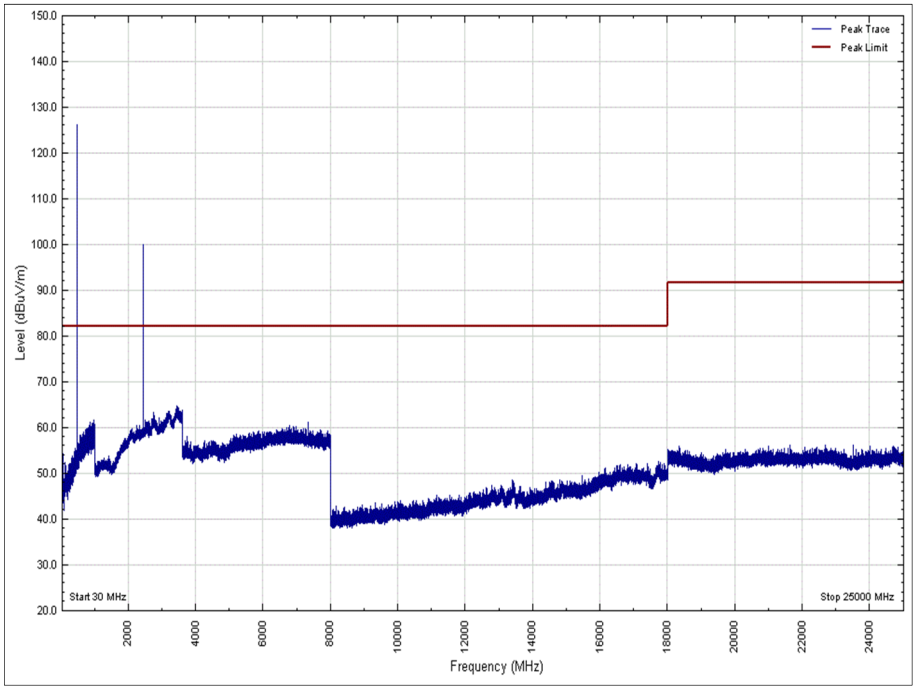

Figure 3 - 30 MHz to 25 GHz - X Orientation - Horizontal

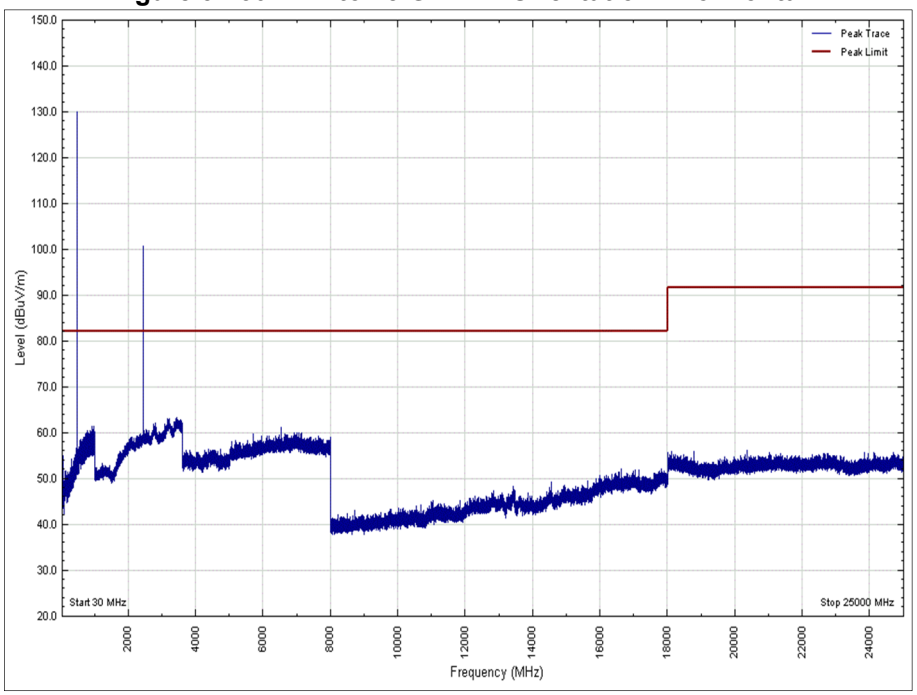

Figure 4 - 30 MHz to 25 GHz - Y Orientation – Vertical

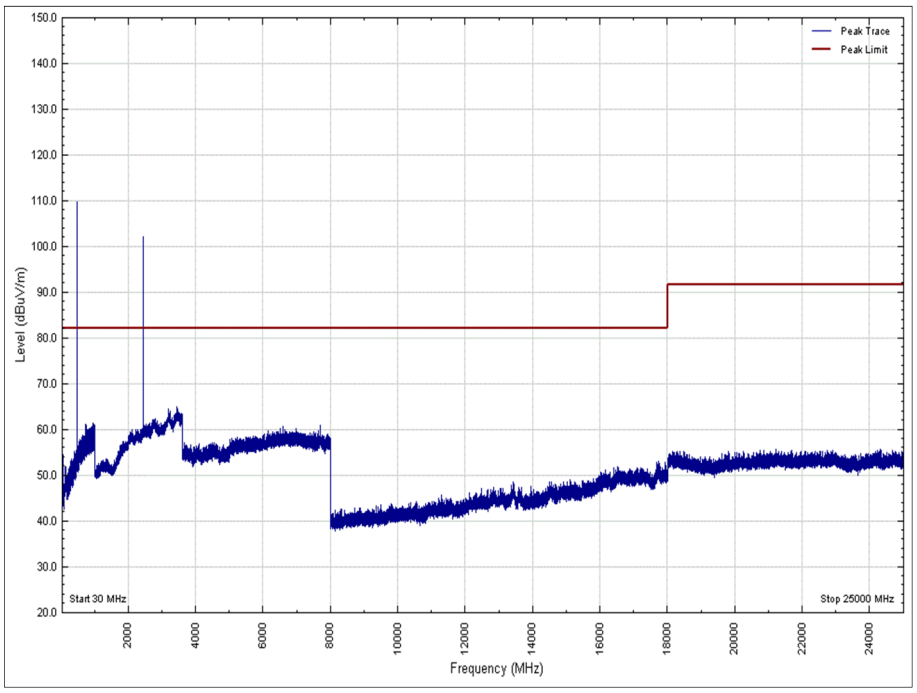

Figure 5 - 30 MHz to 25 GHz - Y Orientation – Horizontal

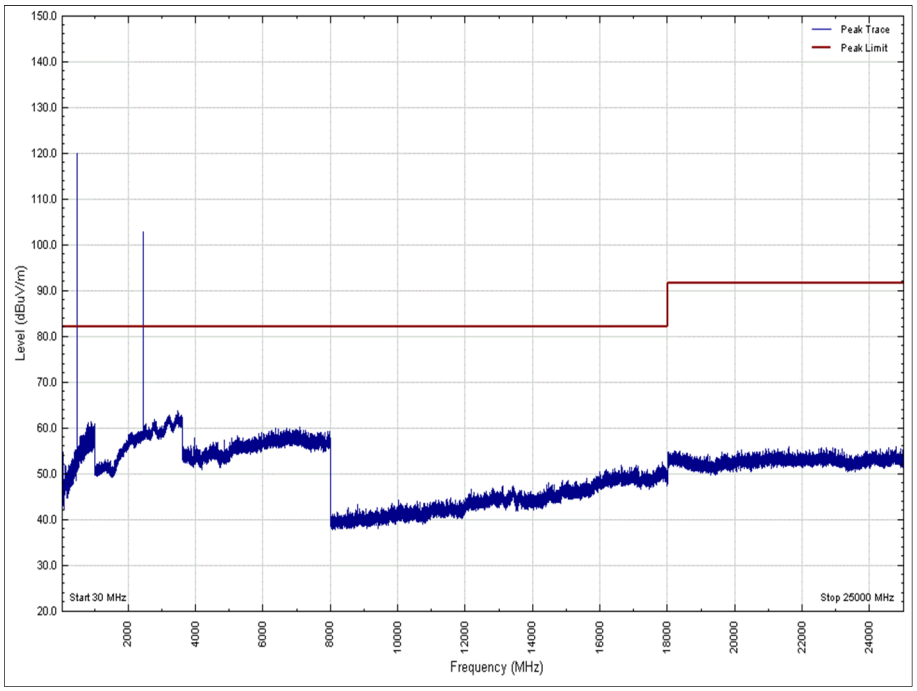

Figure 6 - 30 MHz to 25 GHz - Z Orientation – Vertical

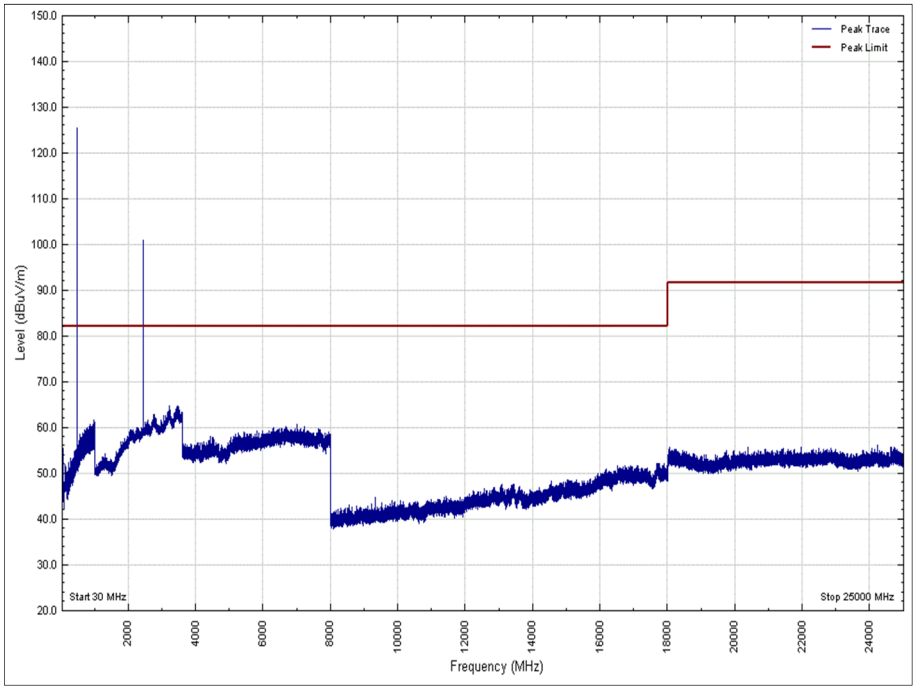

Figure 7 - 30 MHz to 25 GHz - Z Orientation - Horizontal

TETRA 403 MHz to 430 MHz + 2.4 GHz Bluetooth Low Energy - Simultaneous Transmission

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

Technology	Frequency Band (MHz)	Channel Frequency (MHz)
Tetra	403 to 430	418.050
Bluetooth Low Energy	2400 to 2483.5	2440

Table 7 - Modes of Operation

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

Table 8 - 1 GHz to 25 GHz Emissions Results

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

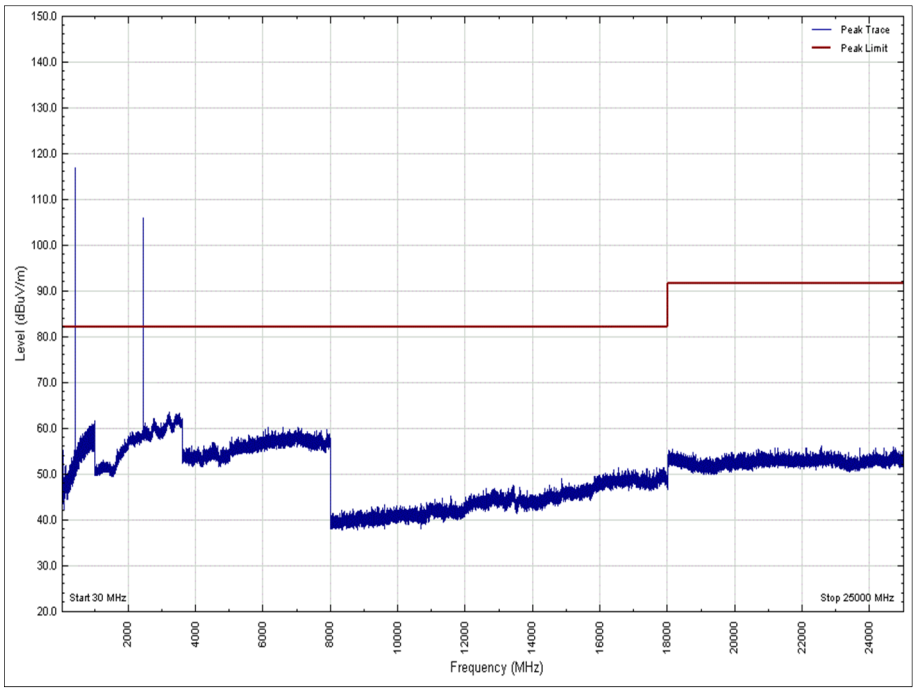

Figure 8 - 30 MHz to 25 GHz - X Orientation – Vertical

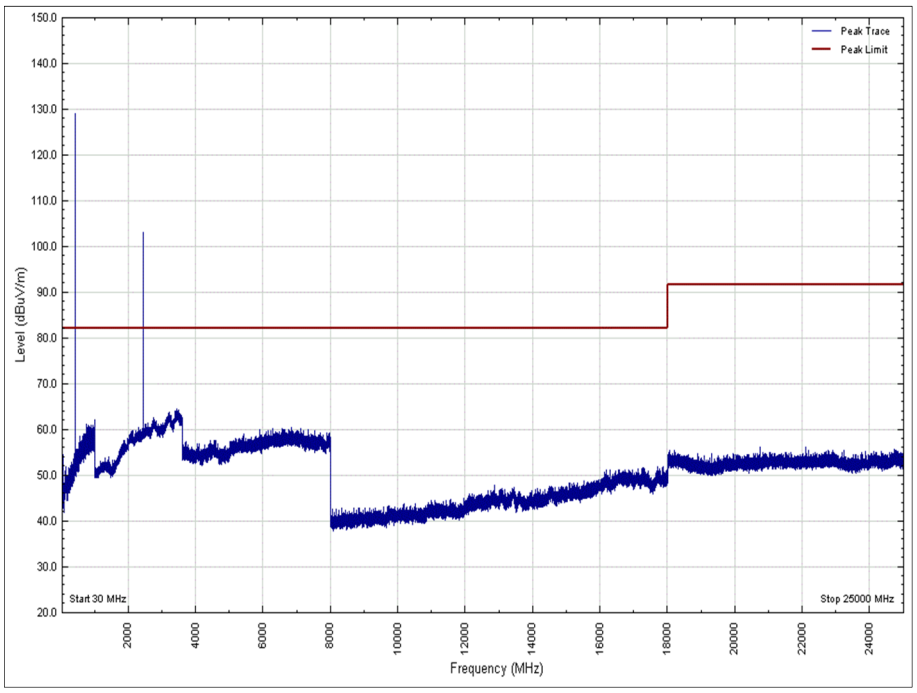

Figure 9 - 30 MHz to 25 GHz - X Orientation – Horizontal

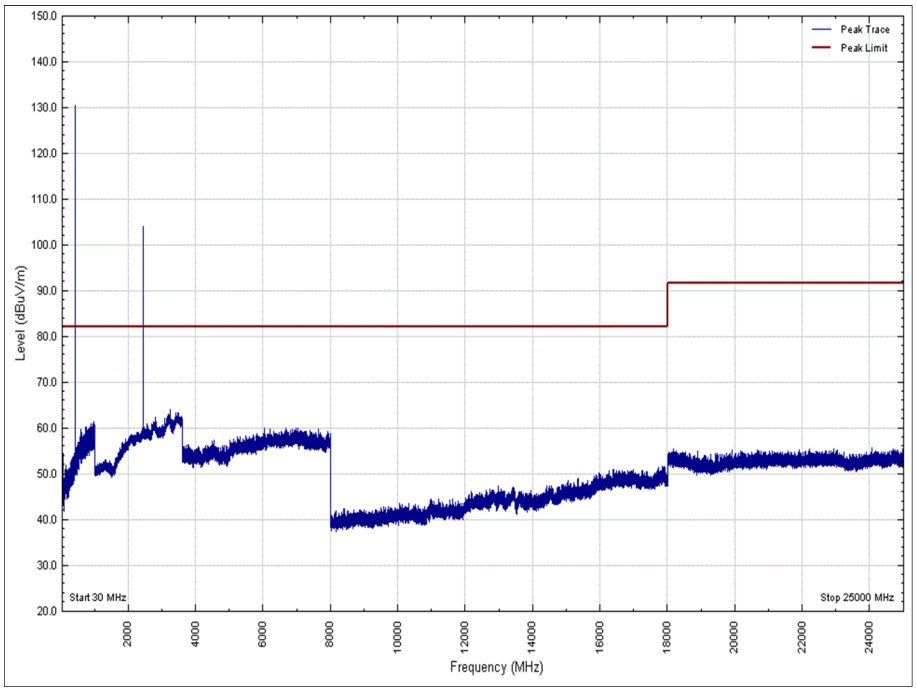

Figure 10 - 30 MHz to 25 GHz - Y Orientation – Vertical

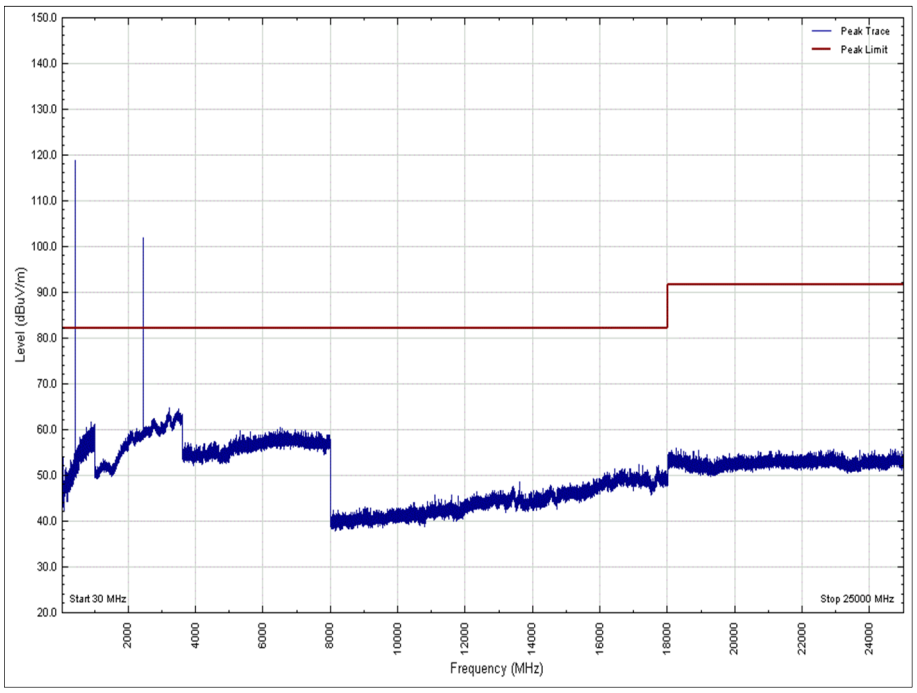

Figure 11 - 30 MHz to 25 GHz - Y Orientation – Horizontal

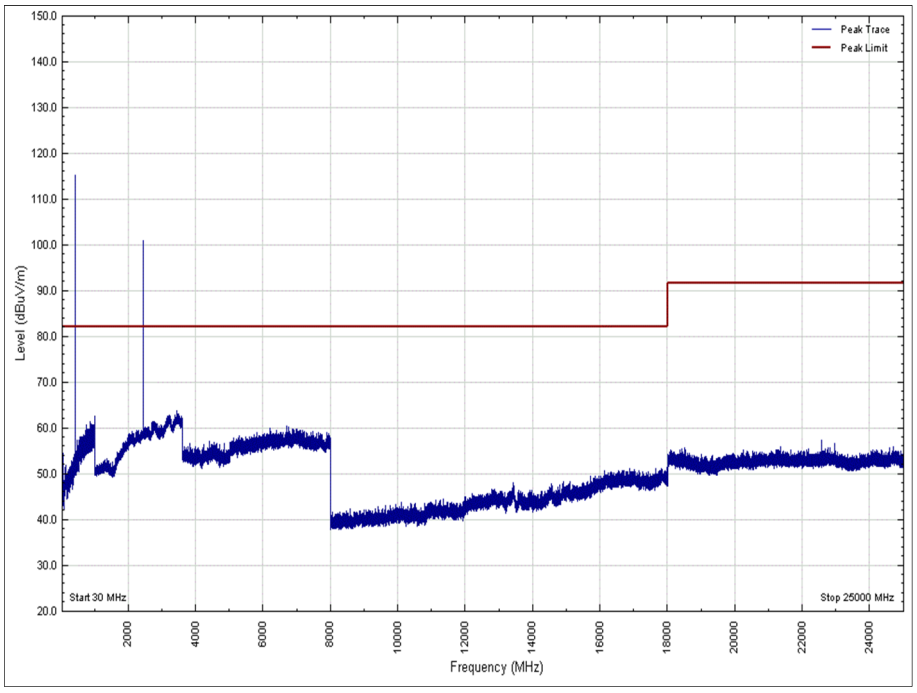

Figure 12 - 30 MHz to 25 GHz - Z Orientation – Vertical

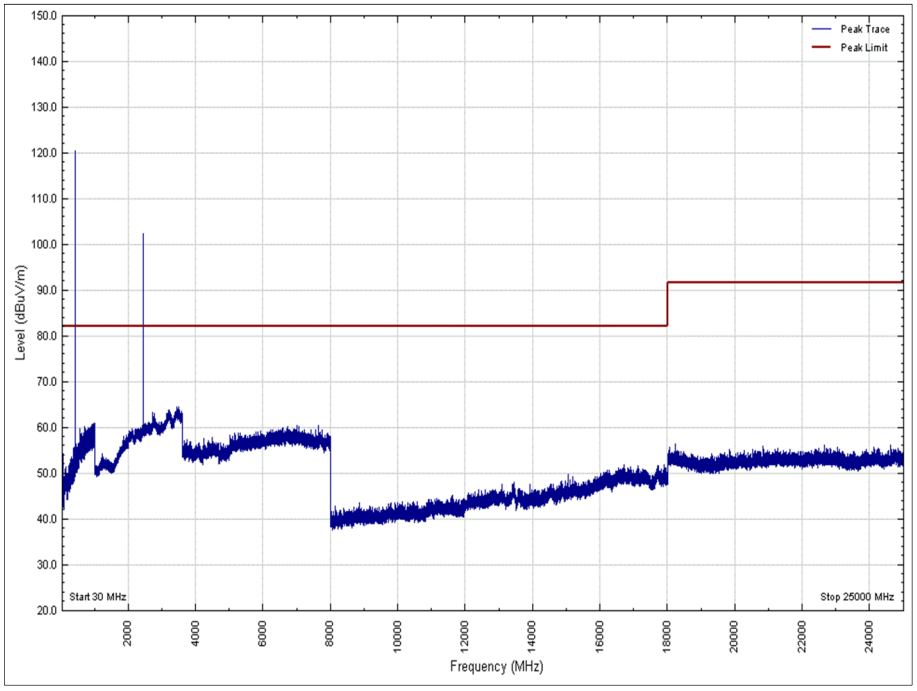

Figure 13 - 30 MHz to 25 GHz - Z Orientation - Horizontal

TETRA Mid Tx channel 450 MHz to 470 MHz + 2.4 GHz Wi-Fi Mid Tx Channel 802.11b and 11 Mbps - Simultaneous Transmission

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

Technology	Frequency Band (MHz)	Channel Frequency (MHz)
802.11b	2400 to 2483.5	2437
Tetra	450 to 470	450.025

Table 9 - Modes of Operation

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

Table 10 - 1 GHz to 25 GHz Emissions Results

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

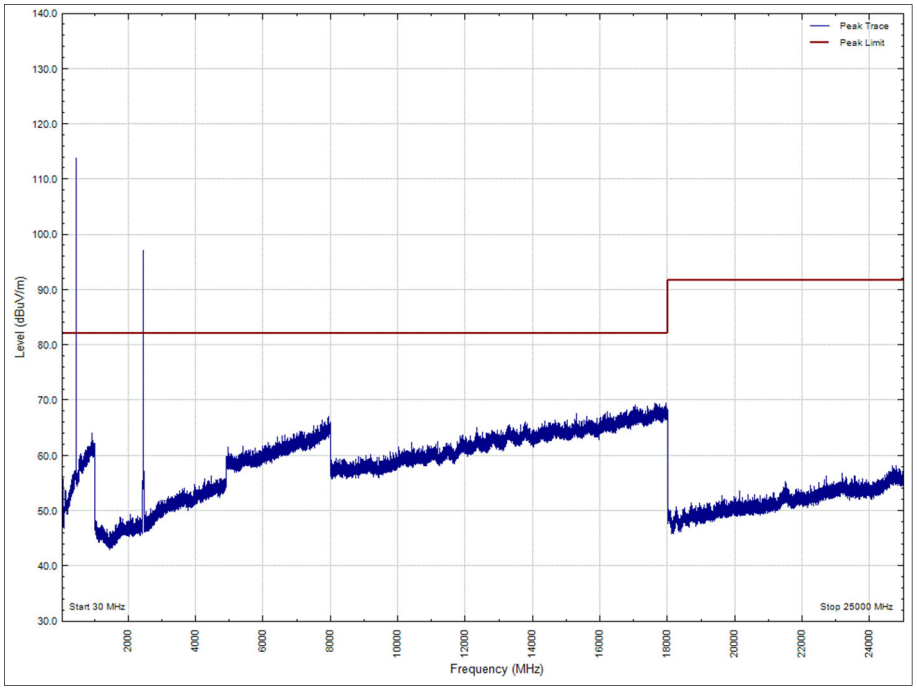

Figure 14 - 30 MHz to 25 GHz - X Orientation - Vertical

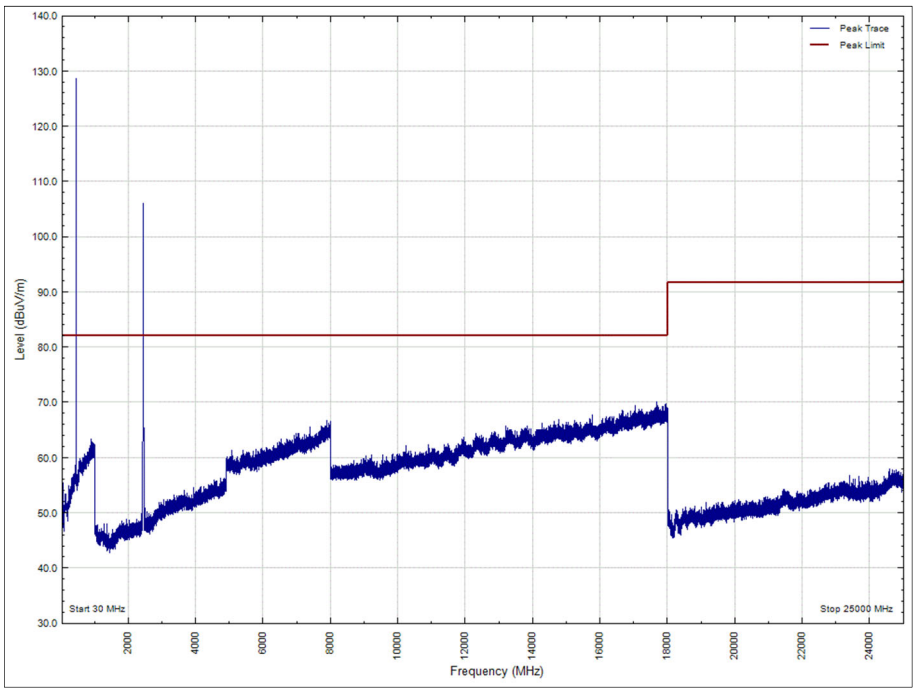

Figure 15 - 30 MHz to 25 GHz - X Orientation – Horizontal

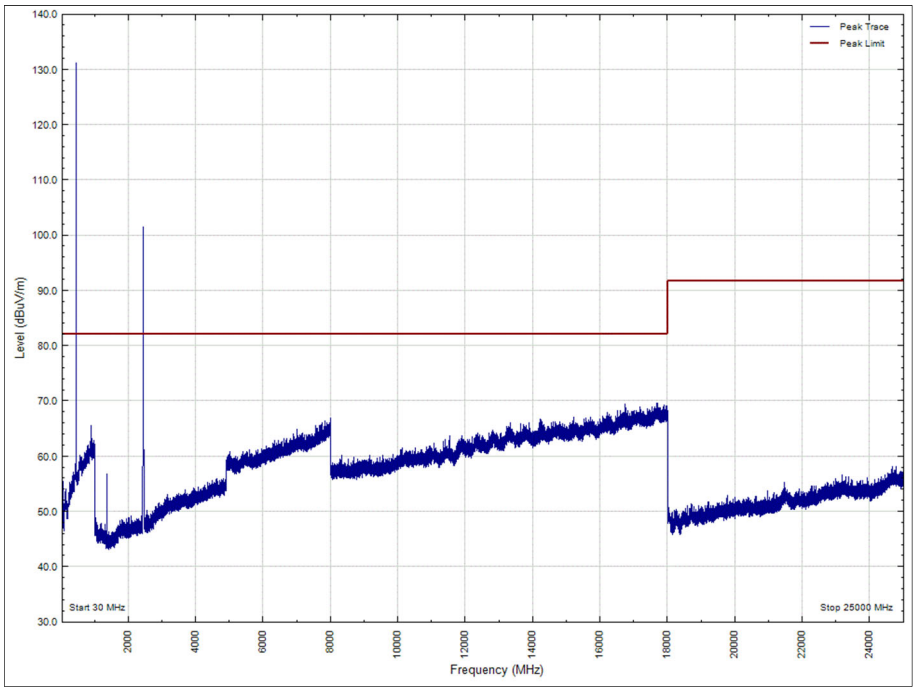

Figure 16 - 30 MHz to 25 GHz - Y Orientation - Vertical

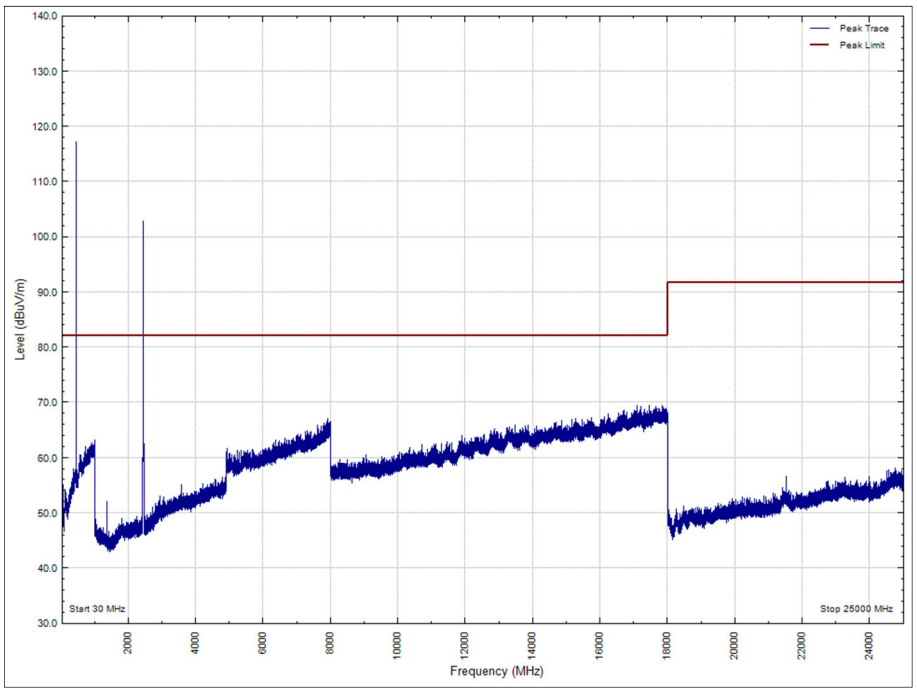

Figure 17 - 30 MHz to 25 GHz - Y Orientation – Horizontal

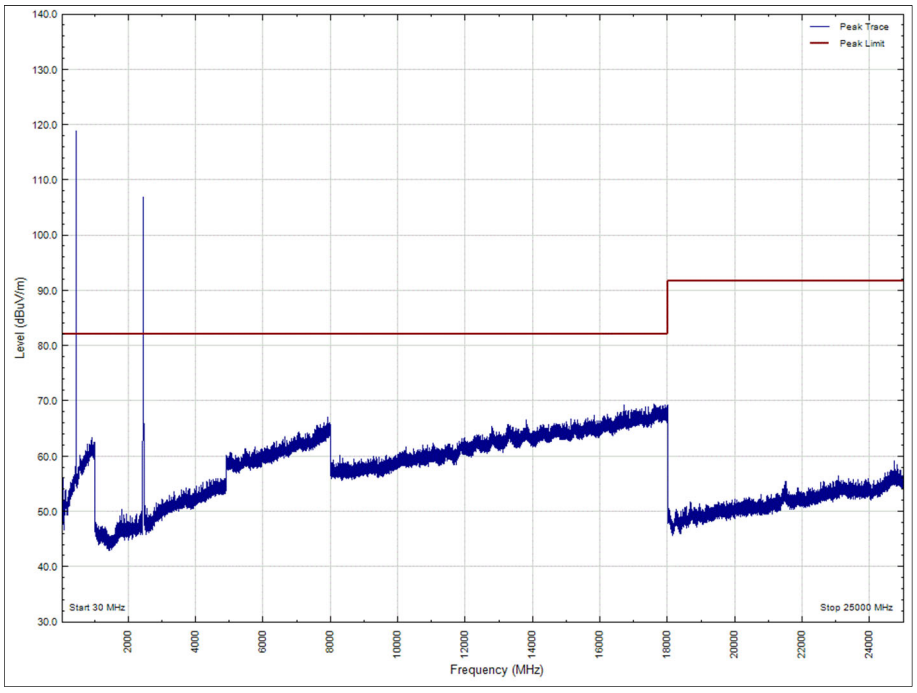

Figure 18 - 30 MHz to 25 GHz - Z Orientation - Vertical

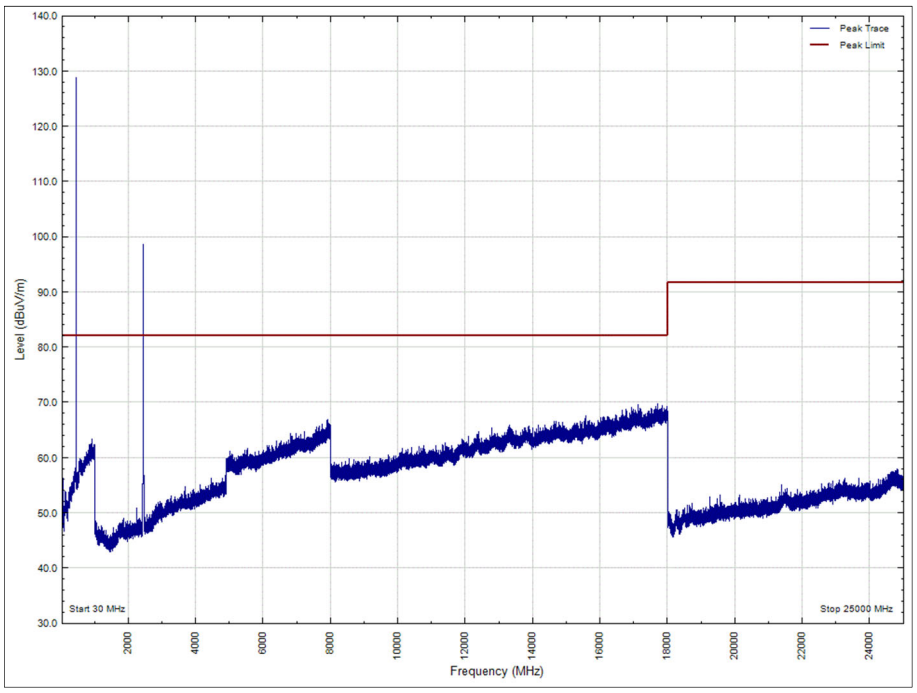

Figure 19 - 30 MHz to 25 GHz - Z Orientation - Horizontal

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:

Rule Part	Limit
90.210	-13 dBm (EIRP) / 82.2 dBuV/m at 3 m and -13 dBm (EIRP) / 91.7 dBuV/m at 1 m

Table 11 - Limit Table

2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

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	02-May-2020
Precision 'N' Termination (Female)	Maury	2510B6	488	12	26-Feb-2020
Filter (High Pass)	Lorch	SHP7-7000-SR	566	12	10-May-2019*
Pre-Amplifier	Phase One	PS04-0086	1533	12	08-Feb-2020*
18GHz - 40GHz Pre-Amplifier	Phase One	PSO4-0087	1534	12	05-Feb-2020*
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygrometer	Rotronic	HYGROPALM 1	2338	12	15-Nov-2019*
Antenna with permanent attenuator (Bilog)	Chase	CBL6143	2904	24	08-Aug-2019*
Antenna with permanent attenuator (Bilog)	Chase	CBL6143	2904	24	30-Sep-2021
Comb Generator	Schaffner	RSG1000	3034	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	17-Dec-2019*
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	26-Oct-2019*
Cable 1503 2M 2.92(P)m 2.92(P)m	Rhophase	KPS-1503A-2000-KPS	4293	12	08-Nov-2020
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	26-Apr-2019*
Cable (Yellow, Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4527	6	09-Jun-2020*
Cable (Rx, SMAm-SMAm 0.5m)	Scott Cables	SLSLL18-SMSM-00.50M	4528	6	26-Apr-2019*
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	01-Mar-2019*
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	05-Mar-2020
1 - 18GHz DRG Antenna	ETS-Lindgren	3117	4738	12	05-Mar-2020
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	11-Mar-2020
4dB Attenuator	Pasternack	PE7047-4	4935	24	28-Nov-2019*
4dB Attenuator	Pasternack	PE7047-4	4935	24	30-Sep-2021*
8 - 18 GHz pre amp	Wright Technologies	PS06-0061	4971	12	07-Dec-2019*
8 - 18 GHz pre amp	Wright Technologies	PS06-0061	4971	12	23-Jan-2021*

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Hygrometer	Rotronic	HP21	4989	12	26-Apr-2019*
Hygrometer	Rotronic	HP21	4989	12	02-May-2020*
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5093	12	04-Oct-2019*
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5095	12	04-Oct-2019*
Cable (18 GHz)	Rosenberger	LU7-071-1000	5104	12	05-Oct-2019*
Cable (18 GHz)	Rosenberger	LU7-071-2000	5107	12	05-Oct-2019*
EmX Emissions Software	TUV SUD	EmX	5125	-	Software
1.5m 40GHz RF Cable	Scott Cables	KPS-1501-2000-KPS	5126	6	26-Apr-2019*
Screened Room (11)	Rainford	Rainford	5136	36	01-Nov-2021
Mast	Maturo	TAM 4.0-P	5158	-	TU
Mast and Turntable Controller	Maturo	Maturo NCD	5159	-	TU
Turntable	Maturo	TT 15WF	5160	-	TU
8 Meter Cable	Teledyne	PR90-088-8MTR	5212	12	30-Aug-2020
Horn Antenna (1-10GHz)	Schwarzbeck	BBHA 9120 B	5215	12	11-Mar-2020
DRG Horn Antenna (7.5-18GHz)	Schwarzbeck	HWRD750	5216	12	11-Mar-2020
Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	5217	12	09-Apr-2020
Preamplifier (30dB 18-40GHz)	Schwarzbeck	BBV 9721	5218	12	09-Apr-2020
3 GHz High pass filter	Wainwright	WHKX12-2580-3000-18000-80SS	5220	12	15-Feb-2020
Antenna (DRG Horn 7.5-18GHz)	Schwarzbeck	HWRD750	5348	12	04-Sep-2020
EMI Test Receiver	Rohde & Schwarz	ESW44	5382	12	08-Oct-2020

Table 12

TU - Traceability Unscheduled

*Note: Testing was performed over multiple dates therefore it may appear that some items calibration expiry date was before the completion of testing, however TUV SUD can confirm that all testing was performed with equipment holding a valid calibration at the time the equipment was used.

3 Photographs

3.1 Test Setup Photographs

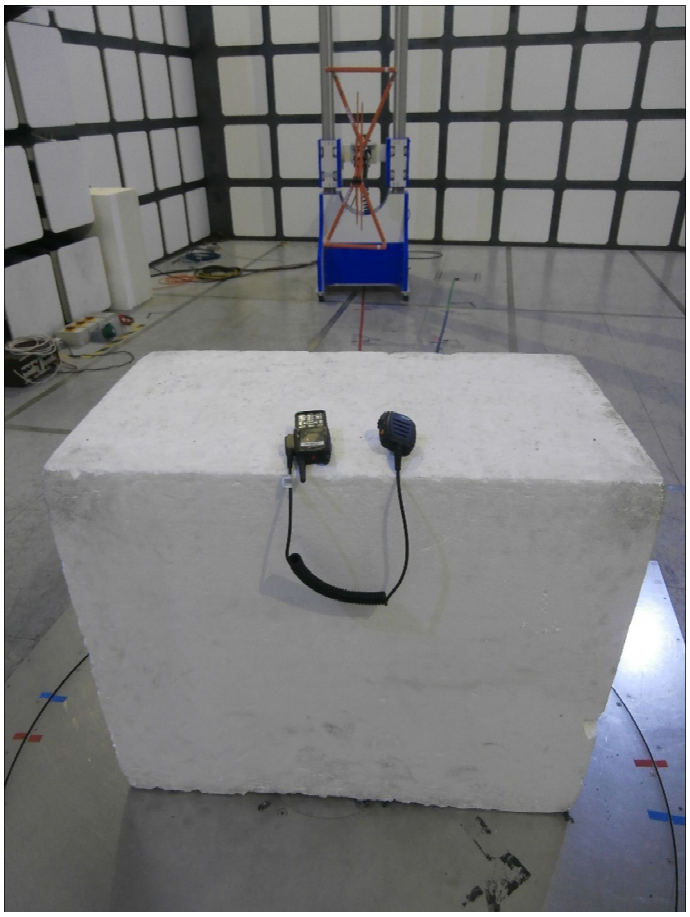

Figure 20 - 30 MHz to 1 GHz - X Orientation

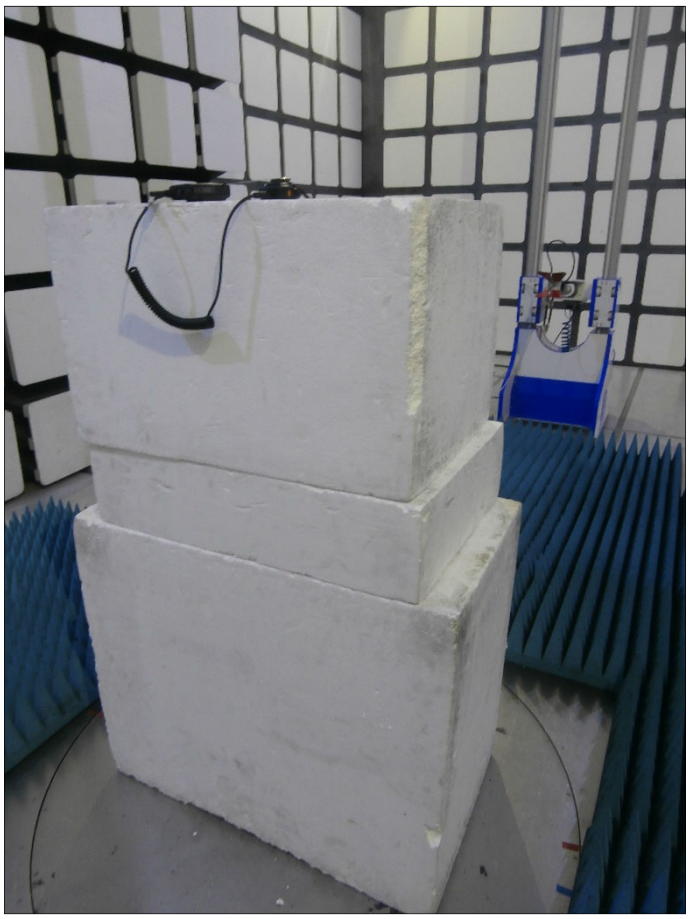

Figure 21 - 1 GHz to 18 GHz - X Orientation