

FCC and ISED Test Report

Sepura Ltd
TETRA Mobile Radio, Model: SC2128

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

Prepared for: Sepura Ltd
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United Kingdom



FCC ID: XX6SC2128

IC: 8739A-SC2128

COMMERCIAL-IN-CONFIDENCE

Document 75950098-06 Issue 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Steve Marshall	Senior Engineer	Authorised Signatory	16 April 2021

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C, FCC 47 CFR 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	16 April 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 47 CFR Part 15C: 2019, FCC 47 CFR Part 90: 2019, ISED RSS-247: Issue 2 (02-2017) and Industry Canada RSS-119: Issue 12 (05-2015) 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	16-April-2021

Table 1

1.2 Introduction

Applicant	Sepura Ltd
Manufacturer	Sepura Ltd
Model Number(s)	SC2128
Serial Number(s)	1PR002013GMJ3UC
Hardware Version(s)	Production
Software Version(s)	2001 797 07367
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2019 FCC 47 CFR Part 90: 2019 ISED RSS-247:Issue 2 (02-2017) Industry Canada RSS-119: Issue 12 (05-2015)
Order Number	PLC-PO017051-1
Date	23-September-2020
Date of Receipt of EUT	30-October-2020
Start of Test	06-April-2021
Finish of Test	06-April-2021
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 47 CFR Part 15C, FCC 47 CFR 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-119	RSS-247			
Configuration and Mode: 2.4 GHz WLAN and TETRA							
2.1	15.247 (d)	90.210	5.8	5.5	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	See note

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 SC21 hand-portable terminal is a TETRA enabled radio with Bluetooth and Wi-Fi capability
Manufacturer:	Sepura
Model:	SC2128
Part Number:	N/A
Hardware Version:	Production
Software Version:	2001 797 07367
FCC ID (if applicable)	XX6SC2128
IC ID (if applicable)	8739A-SC2128

Table 3

Intentional Radiators

Technology	TETRA	TETRA	BT Classic / EDR	BLE	Wi-Fi 802.11b, g	Wi-Fi 802.11n 20	Wi-Fi 802.11n 40
Frequency Band (MHz)	806 - 824	851 - 869	2402 - 2480	2402 - 2480	2412 - 2462	2412 - 2462	2412 - 2452
Conducted Declared Output Power (dBm)	34	34	7.382	7.4	16.5	16.5	16.5
Antenna Gain (dBi)	> 0	> 0	1.3	1.3	1.3	1.3	1.3
Supported Bandwidth(s) (MHz)	25 kHz	25 kHz	1	2	16.5 22	16.5	33
Modulation Scheme(s)	$\pi/4$ DQPSK	$\pi/4$ DQPSK	GFSK $\pi/4$ 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	22K0DXW	1M01F1D 1M01G1D	1M81F1D	19M7G1D	19M7D1 D	36M8D1D
Bottom Frequency (MHz)	806	851	2402	2402	2412	2412	2422
Middle Frequency (MHz)	815	860	2441	2441	2437	2437	2437
Top Frequency (MHz)	824	869	2480	2480	2462	2462	2452

Table 4

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) <input checked="" type="checkbox"/>	
Class B Digital Device (Use in residential environment only) <input type="checkbox"/>	

Table 5



DC Power Source

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

Table 6

Battery Power Source

Voltage:	7.4	V
End-point voltage:	6.2	V (Point at which the battery will terminate)
Alkaline <input type="checkbox"/> Leclanche <input type="checkbox"/> Lithium <input checked="" type="checkbox"/> Nickel Cadmium <input type="checkbox"/> Lead Acid* <input type="checkbox"/> *(Vehicle regulated)		
Other <input type="checkbox"/>	Please detail:	

Table 7

Charging

Can the EUT transmit whilst being charged	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
---	---

Table 8

Temperature

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

Table 9

Antenna Characteristics

Antenna connector <input checked="" type="checkbox"/> TETRA			State impedance	50	Ohm
Temporary antenna connector <input type="checkbox"/>			State impedance		Ohm
Integral antenna <input checked="" type="checkbox"/>	Type:	Chip	State impedance	50	Ohm
External antenna <input type="checkbox"/>	Type:		State impedance		dBI

Table 10



Ancillaries (if applicable)

Manufacturer:		Part Number:	
Model:		Country of Origin:	

Table 11

The SC2128 may be used with standard SC21 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 SC21 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: SC2128, Serial Number: 1PR002013GMJ3UC			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 12

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: 2.4 GHz WLAN and TETRA		
Radiated Spurious Emissions (Simultaneous Transmission)	Graeme Lawler	UKAS

Table 13

Office Address:

TÜV SÜD
Octagon House
Concorde Way
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 15C, Clause 15.247 (d) and 15.205
FCC 47 CFR Part 90, Clause 90.210
ISED RSS-119, Clause 5.8
ISED RSS-247, Clause 5.5

2.1.2 Equipment Under Test and Modification State

SC2128, S/N: 1PR002013GMJ3UC - Modification State 0

2.1.3 Date of Test

06-April-2021

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.

Testing was performed using a fully charged battery.

2.1.5 Example Test Setup Diagram

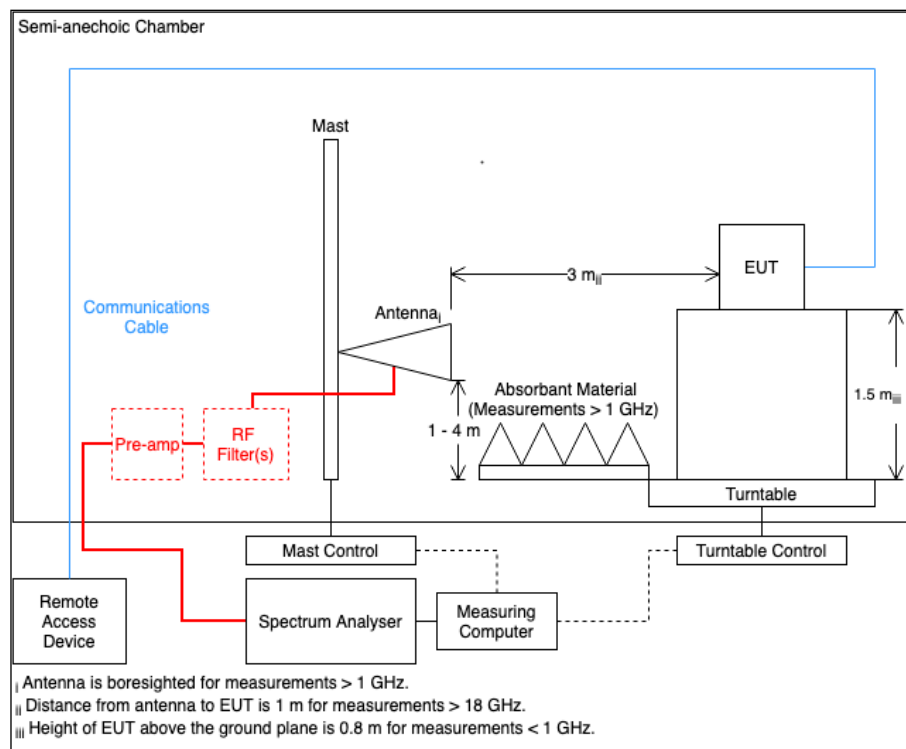


Figure 1



2.1.6 Environmental Conditions

Ambient Temperature 23.5 °C
Relative Humidity 28.7 %

2.1.7 Test Results

2.4 GHz WLAN and TETRA

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 14 - WLAN (802.11b - 1 Mbps), TETRA (Lower Sub-band)- Orientation: X, 2437 MHz and 816.5 MHz, 30 MHz to 25 GHz

*No emissions found within 6 dB of the limit.

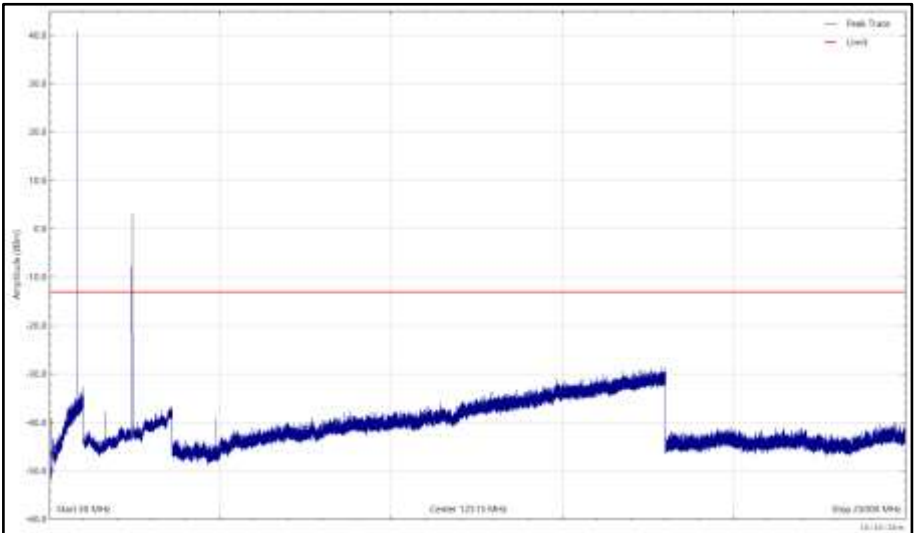


Figure 2 - WLAN (802.11b - 1 Mbps), TETRA (Lower Sub-band)- Orientation: X, 2437 MHz and 816.5 MHz, 30 MHz to 25 GHz, Horizontal (Peak)

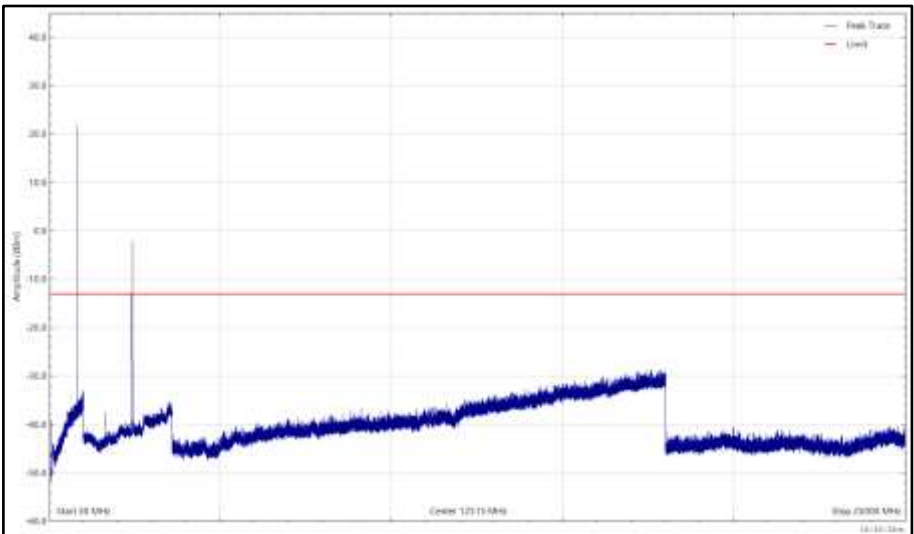


Figure 3 - WLAN (802.11b - 1 Mbps), TETRA (Lower Sub-band)- Orientation: X, 2437 MHz and 816.5 MHz, 30 MHz to 25 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 15 - WLAN (802.11b - 1 Mbps), TETRA (Lower Sub-band)- Orientation: Y, 2437 MHz and 816.5 MHz, 30 MHz to 25 GHz

*No emissions found within 6 dB of the limit.

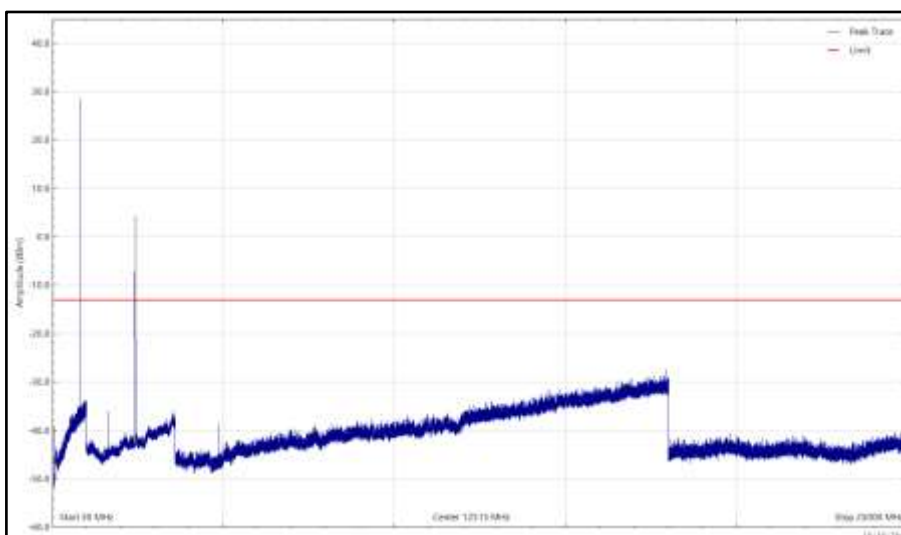


Figure 4 - WLAN (802.11b - 1 Mbps), TETRA (Lower Sub-band)- Orientation: Y, 2437 MHz and 816.5 MHz, 30 MHz to 25 GHz, Horizontal (Peak)

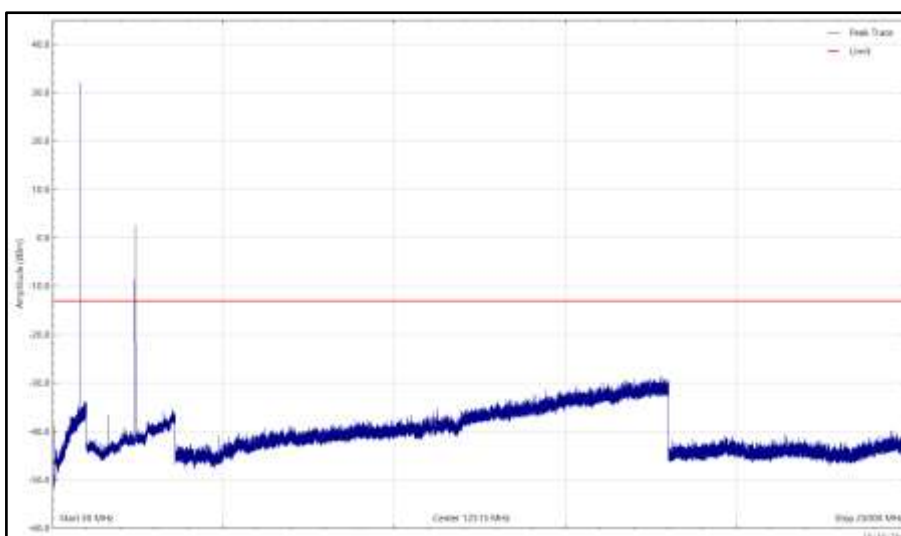


Figure 5 - WLAN (802.11b - 1 Mbps), TETRA (Lower Sub-band)- Orientation: Y, 2437 MHz and 816.5 MHz, 30 MHz to 25 GHz, Vertical (Peak)



Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 16 - WLAN (802.11b - 1 Mbps), TETRA (Lower Sub-band)- Orientation: Z, 2437 MHz and 816.5 MHz, 30 MHz to 25 GHz

*No emissions found within 6 dB of the limit.

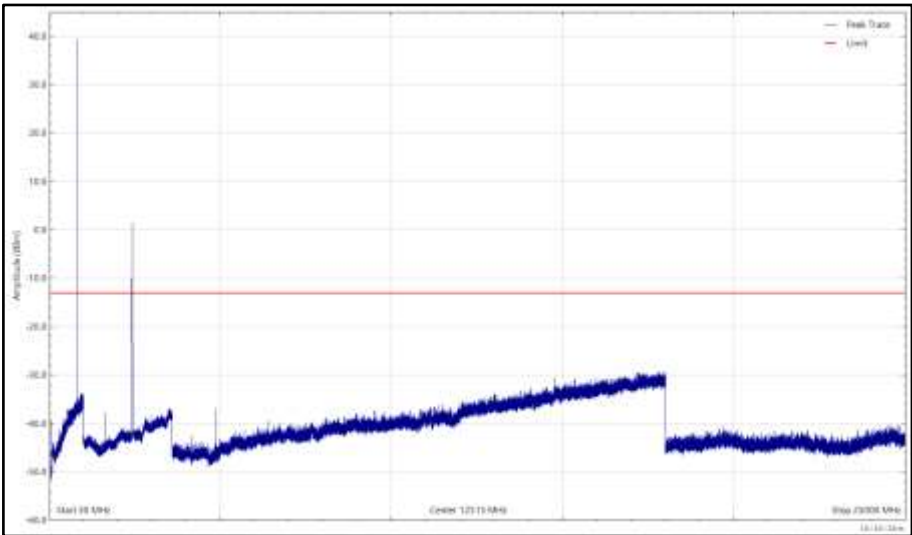


Figure 6 - WLAN (802.11b - 1 Mbps), TETRA (Lower Sub-band)- Orientation: Z, 2437 MHz and 816.5 MHz, 30 MHz to 25 GHz, Horizontal (Peak)

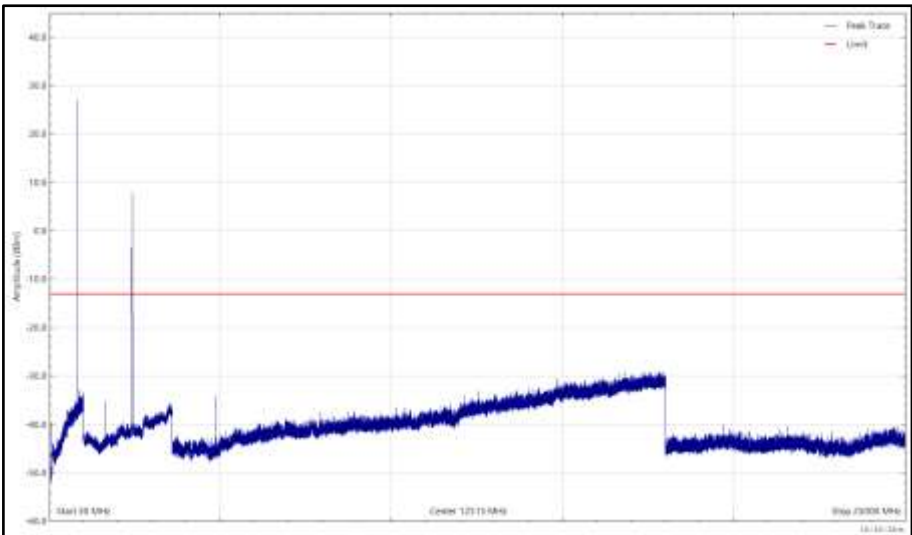


Figure 7 - WLAN (802.11b - 1 Mbps), TETRA (Lower Sub-band)- Orientation: Z, 2437 MHz and 816.5 MHz, 30 MHz to 25 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 17 - WLAN (802.11b - 1 Mbps), TETRA (Upper Sub-band)- Orientation: X, 2437 MHz and 861.5 MHz, 30 MHz to 25 GHz

*No emissions found within 6 dB of the limit.

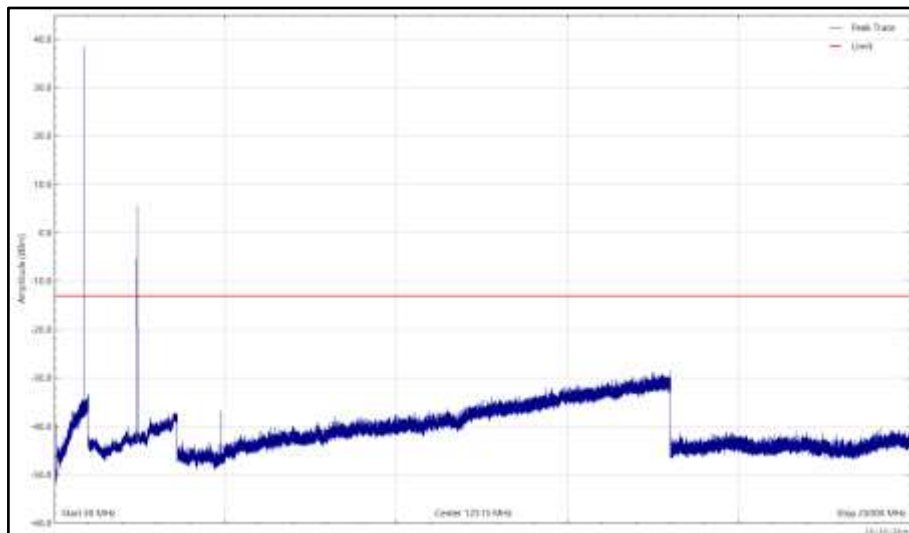


Figure 8 - WLAN (802.11b - 1 Mbps), TETRA (Upper Sub-band)- Orientation: X, 2437 MHz and 861.5 MHz, 30 MHz to 25 GHz, Horizontal (Peak)

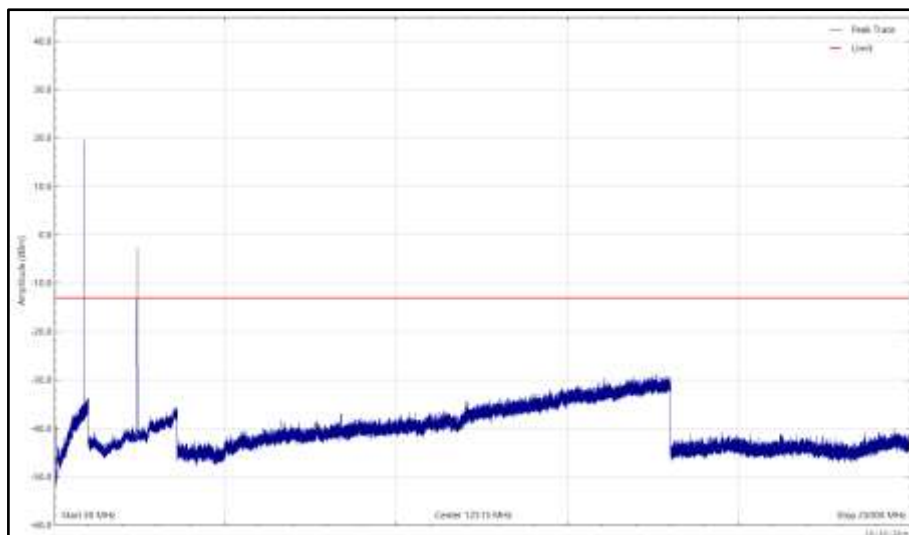


Figure 9 - WLAN (802.11b - 1 Mbps), TETRA (Upper Sub-band)- Orientation: X, 2437 MHz and 861.5 MHz, 30 MHz to 25 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 18 - WLAN (802.11b - 1 Mbps), TETRA (Upper Sub-band)- Orientation: Y, 2437 MHz and 861.5 MHz, 30 MHz to 25 GHz

*No emissions found within 6 dB of the limit.

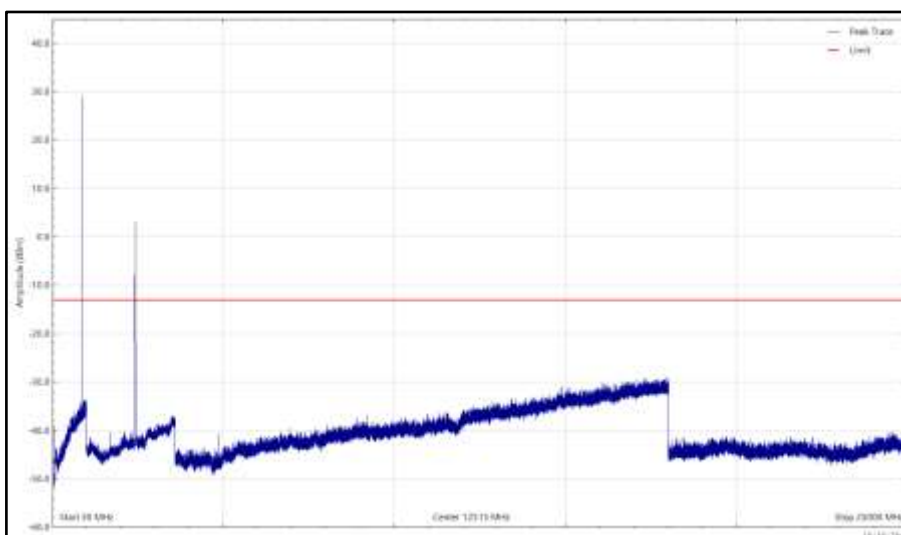


Figure 10 - WLAN (802.11b - 1 Mbps), TETRA (Upper Sub-band)- Orientation: Y, 2437 MHz and 861.5 MHz, 30 MHz to 25 GHz, Horizontal (Peak)

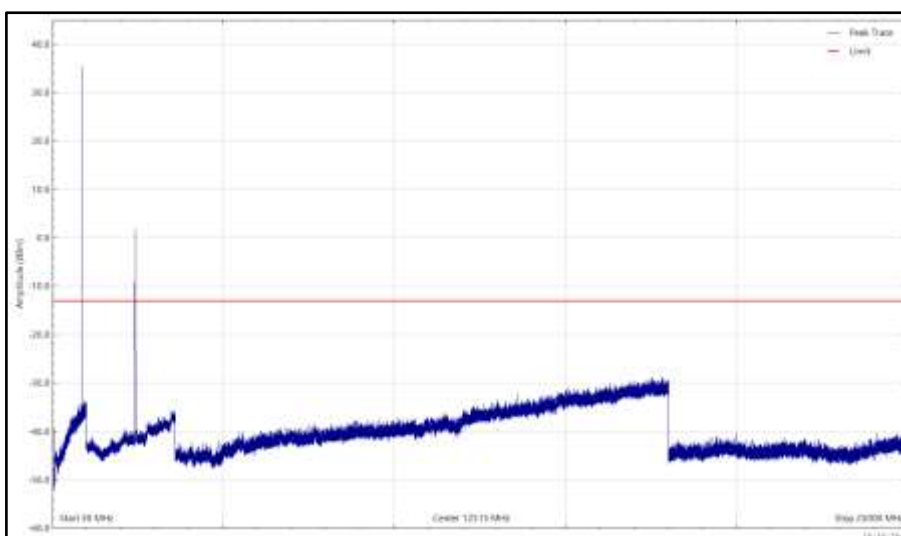


Figure 11 - WLAN (802.11b - 1 Mbps), TETRA (Upper Sub-band)- Orientation: Y, 2437 MHz and 861.5 MHz, 30 MHz to 25 GHz, Vertical (Peak)



Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 19 - WLAN (802.11b - 1 Mbps), TETRA (Upper Sub-band)- Orientation: Z, 2437 MHz and 861.5 MHz, 30 MHz to 25 GHz

*No emissions found within 6 dB of the limit.

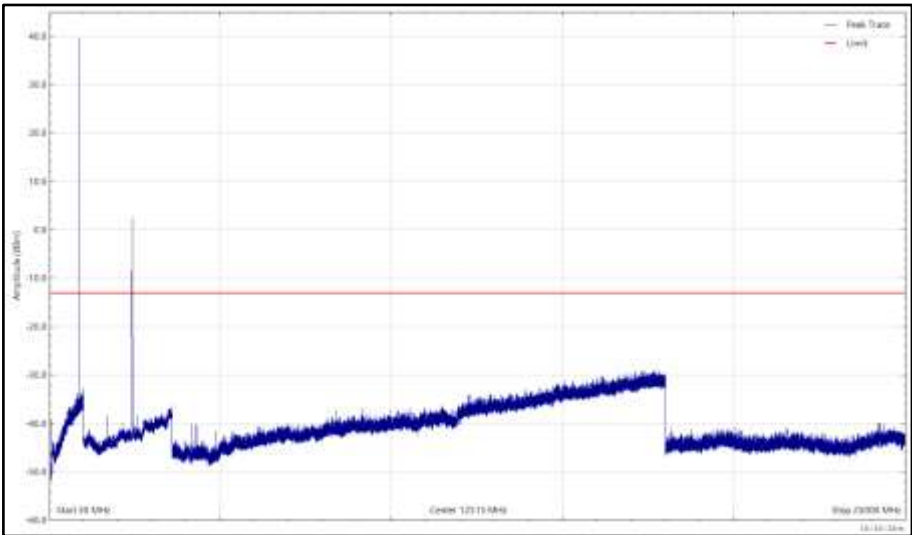


Figure 12 - WLAN (802.11b - 1 Mbps), TETRA (Upper Sub-band)- Orientation: Z, 2437 MHz and 861.5 MHz, 30 MHz to 25 GHz, Horizontal (Peak)

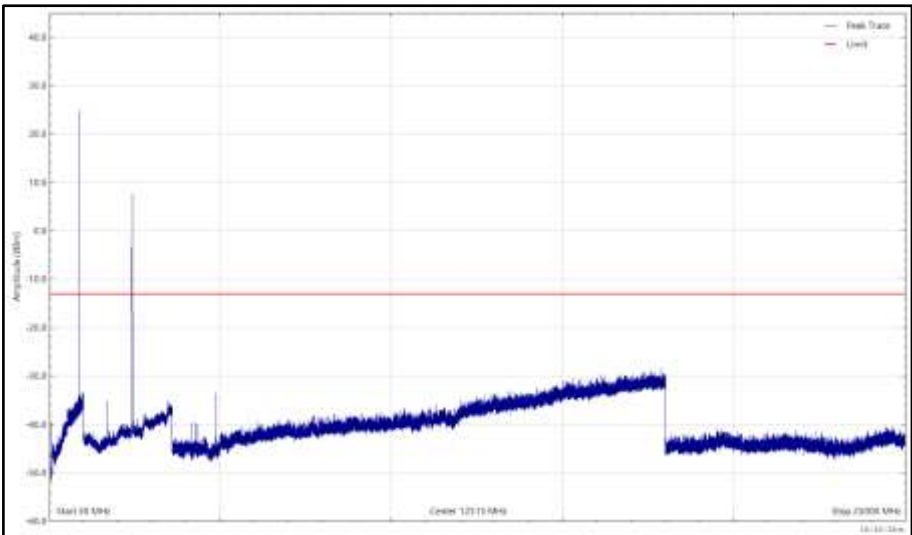


Figure 13 - WLAN (802.11b - 1 Mbps), TETRA (Upper Sub-band)- Orientation: Z, 2437 MHz and 861.5 MHz, 30 MHz to 25 GHz, Vertical (Peak)

FCC 47 CFR Parts 15.247(d), 15.209, 90.210

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
FCC 47 CFR Part 90.210	Attenuated by $43 + 10 \log_{10}(p)$ (-13 dBm)
RSS-119	Attenuated by $43 + 10 \log_{10}(p)$ (-13 dBm)

Table 20



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



2.1.8 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
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-2022
Hygrometer	Rotronic	A1	2138	12	01-Jul-2021
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	18-Mar-2022
Cable 1503 2M 2.92(P)m 2.92(P)m	Rhophase	KPS-1503A-2000-KPS	4293	12	16-Nov-2021
EmX Emissions Software	TUV SUD	V2.1.3	5125	-	Software
Cable 2.92m	Junkosha	MWX241/B	5411	12	22-Jun-2021
3.5 mm 2m Cable	Junkosha	MWX221-02000DMS	5428	12	15-Oct-2021
2 m K Type Cable	Junkosha	MWX241-02000KMSKMS/A	5523	12	09-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
Turntable	Maturo Gmbh	Turntable 1.5 SI-2t	5614	-	TU
3m Semi Anechoic Chamber	MVG	EMC-3	5621	36	11-Aug-2023
Cable Assembly - 18GHz 8m	Junkosha	MWX221-08000NMSNMS/B	5732	6	05-Aug-2021

Table 21

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 22

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.