

Report on the FCC and ISED Testing of:

Sepura Ltd

Portable TETRA Handset. Model: SC2124

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

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

FCC ID: XX6SC2124

IC: 8739A-SC2124



Add value.
Inspire trust.

COMMERCIAL-IN-CONFIDENCE

Document Number: 75944487-01 | Issue: 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Simon Bennett	Chief Engineer	Authorised Signatory	23 July 2019

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, ISED RSS-GEN and ICES-003. The sample tested was found to comply with the requirements defined in the applied rules.

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Graeme Lawler	Test Engineer	Testing	23 July 2019
Jay Balendrarajah	Test Engineer	Testing	23 July 2019

FCC Accreditation

90987 Octagon House, Fareham Test Laboratory

ISED Accreditation

IC2932B-1 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 (10-1-2018), ISED RSS-GEN Issue 5 (2018-04) and ICES-003 Issue 6 (2016-01).



DISCLAIMER AND COPYRIGHT

This non-binding report has been prepared by TÜV SÜD with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD. No part of this document may be reproduced without the prior written approval of TÜV SÜD. © 2019 TÜV SÜD. This report relates only to the actual item/items tested.

ACCREDITATION

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation. Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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

TÜV SÜD 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 Summary2**

1.1 Report Modification Record.....2

1.2 Introduction.....2

1.3 Brief Summary of Results3

1.4 Application Form4

1.5 Product Information6

1.6 Deviations from the Standard.....8

1.7 EUT Modification Record8

1.8 Test Location8

2 **Test Details9**

2.1 Conducted Disturbance at Mains Terminals9

2.2 Radiated Disturbance 12

3 **Photographs 17**

3.1 Test Setup Photographs 17

4 **Measurement Uncertainty 20**



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	23 July 2019

Table 1

1.2 Introduction

Applicant	Sepura Ltd
Manufacturer	Sepura Ltd
Model Number(s)	SC2124
Serial Number(s)	Radio 2B – 2PS001845GM55XT
Hardware Version(s)	Production
Software Version(s)	Radio 2B - 1754 006 07366 (boot) 1754 006 07367 (kernel)
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2018 ISED RSS-GEN: Issue 05 (2018-04) ICES-003: Issue 06 (2016-01)
Order Number	PLC-PO011393-1
Date	07-December-2018
Date of Receipt of EUT	18-March-2019
Start of Test	31-March-2019
Finish of Test	16-June-2019
Name of Engineer(s)	Graeme Lawler
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, ISED RSS-GEN and ICES-003 is shown below.

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	Part 15B	RSS-GEN	ICES-003			
Configuration and Mode: High Capacity Battery - Battery Charging, TETRA and BLE in Idle/Rx Mode and GNSS operating.						
2.1	15.107	7.2	6.1	Conducted Disturbance at Mains Terminals	Pass	ANSI C63.4: 2014
2.2	15.109	7.3	6.2	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2



1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	SC2124 Radio 2B – 2PS001845GM55XT
Part Number	N/A
Hardware Version	Production
Software Version	Radio 2B - 1754 006 07366 (boot), 1754 006 07367 (kernel)
FCC ID (if applicable)	XX6SC2124
ISED 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	25kHz	π /4DQPS K	22K0DXW	403	436.5	470
TETRA	403-470	34	>-1	22kHz	π /4DQPS K	20K0DXW	403	436.5	470
Bluetooth	2402-2480	7.382	2.5	1.0	8PSK, DQPSK, GFSK	1M00F1D	2402	2441	2480

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	
Lowest frequency generated or used in the device or on which the device operates or tunes	
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
	110V/60Hz		
External DC	Nominal Voltage		Maximum Current
	7.4 V DC		2A
Battery	Nominal Voltage		Battery Operating End Point Voltage
	7.4 V DC		6.2 V 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: 30/1/2019

1.5 Product Information

1.5.1 Technical Description

Portable TETRA Radio for use by the emergency services etc.

1.5.2 Test Setup Diagram(s)

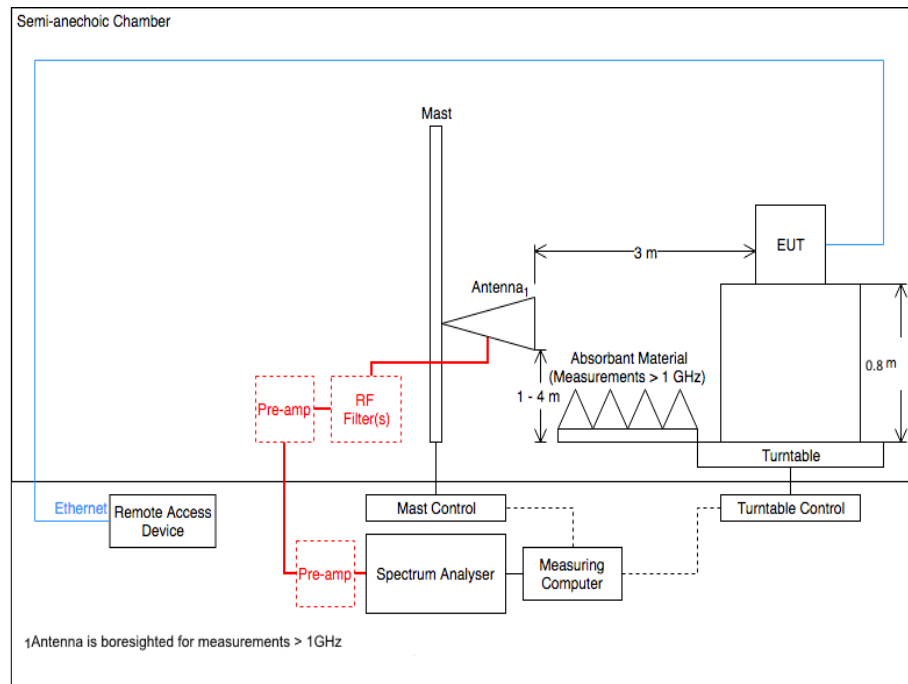


Figure 1 - Radiated Emissions

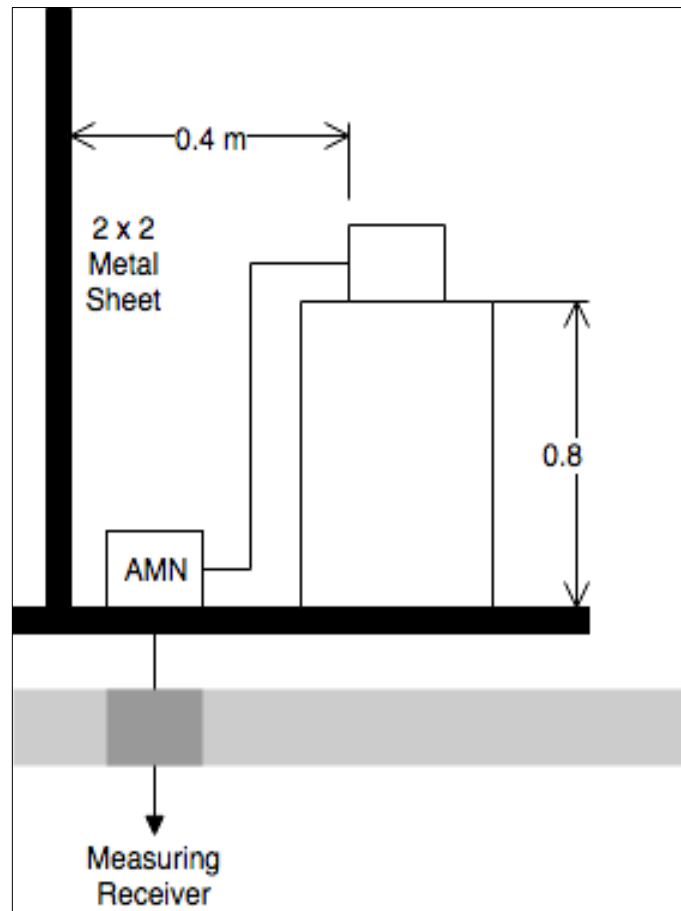


Figure 2 - AC Line Conducted Emissions

1.5.3 EUT Configuration and Rationale for Radiated Spurious Emissions

The EUT was placed on the non-conducting platform in a manner typical of a normal installation. For an EUT which could reasonably 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.



1.6 Deviations from the Standard

No deviations were made 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
Serial Number: Radio 2B – 2PS001845GM55XT			
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: High Capacity Battery - Battery Charging, BLE and TETRA in Idle/Rx Mode and GNSS operating.		
Conducted Disturbance at Mains Terminals	Graeme Lawler	UKAS
Radiated Disturbance	Jay Balendrarajah	UKAS

Table 4

Office Address:

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



2 Test Details

2.1 Conducted Disturbance at Mains Terminals

2.1.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.107
ISED RSS-GEN, Clause 7.2
ICES-003 Clause 6.1

2.1.2 Equipment Under Test and Modification State

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

2.1.3 Date of Test

31-March-2019

2.1.4 Test Method

The EUT was placed on a non-conductive table 0.8m above a reference ground plane and 0.4m away from a vertical coupling plane.

All power was connected to the EUT through an Artificial Mains Network (AMN). Conducted disturbance voltage measurements on mains lines were made at the output of the AMN. The AMN was placed 0.8m from the boundary of the EUT and bonded to the reference ground plane.

2.1.5 Environmental Conditions

Ambient Temperature	17.9 °C
Relative Humidity	44.4 %



2.1.6 Test Results

Results for Configuration and Mode: High Capacity Battery - Battery Charging, BLE and TETRA Idle / Rx and GNSS operating.

Testing was performed in accordance with Class A limits.

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Line Under Test: AC Mains Neutral

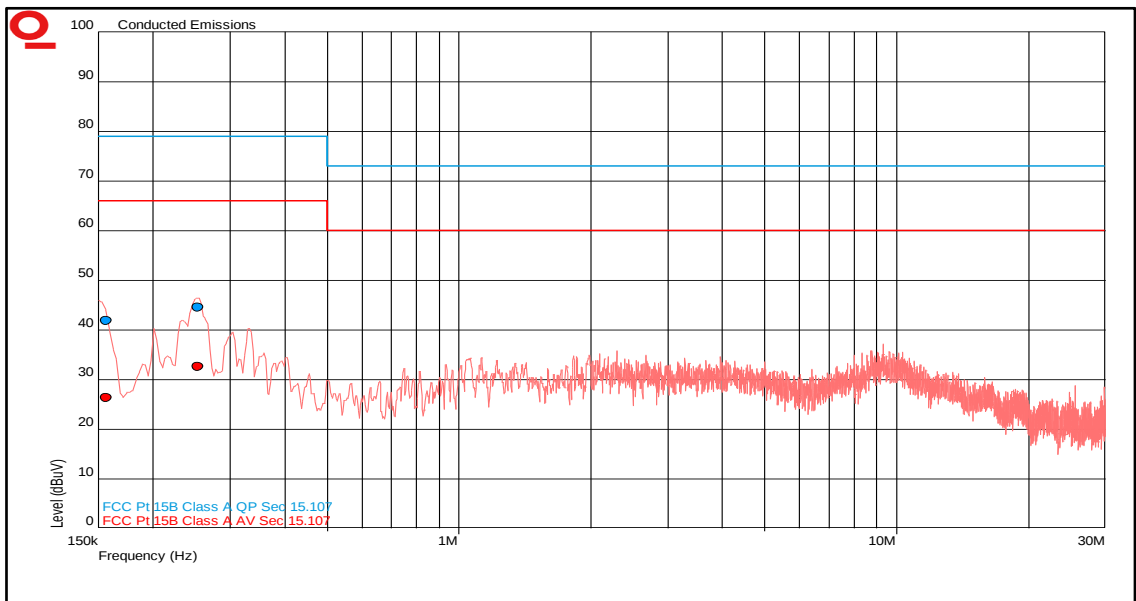


Figure 3 - Graphical Results - AC Mains Neutral

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dB)
0.156	41.9	79.0	-37.1	26.3	66.0	-39.7
0.254	44.5	79.0	-34.5	32.7	66.0	-33.3

Table 5

Line Under Test: AC Mains Live

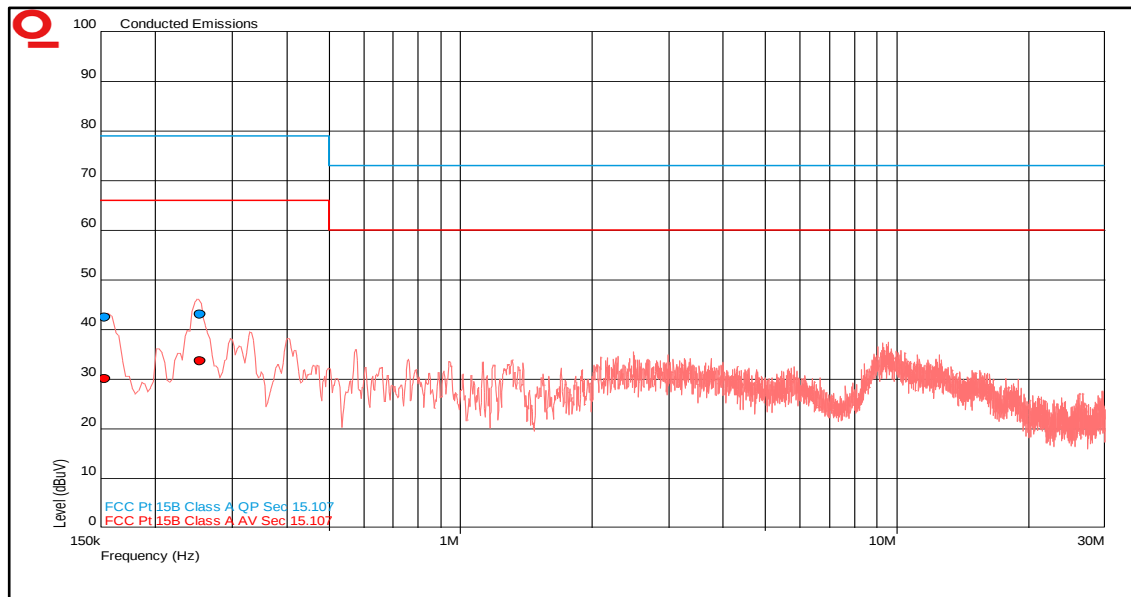


Figure 4 - Graphical Results - AC Mains Live

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.154	42.4	79.0	-36.6	30.1	66.0	-35.9
0.253	43.0	79.0	-36.0	33.7	66.0	-32.3

Table 6

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
Transient Limiter	Hewlett Packard	11947A	15	12	26-Jul-2019
LISN	Rohde & Schwarz	ESH3-Z5	1390	12	20-Nov-2019
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Hygrometer	Rotronic	A1	2677	12	20-Feb-2020
Compliance 5 Emissions	Teseq	V5.26.51	3275	-	Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	17-Dec-2019
8 Meter Cable	Teledyne	PR90-088-8MTR	5212	6	28-Jul-2019

Table 7



2.2 Radiated Disturbance

2.2.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.109
ISED RSS-GEN, Clause 7.3
ICES-003 Clause 6.2

2.2.2 Equipment Under Test and Modification State

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

2.2.3 Date of Test

16-June-2019

2.2.4 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive table 0.8m above a reference ground plane.

A pre-scan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarisation using a peak detector; measurements were taken at a 3m distance. Using the pre-scan list of the highest emissions detected, their bearing and associated antenna polarisation, the EUT was then formally measured using a Quasi-Peak, Peak, Average detector as appropriate. The readings were maximised by adjusting the antenna height, polarisation and turntable azimuth, in accordance with the specification.

2.2.5 Environmental Conditions

Ambient Temperature	17.9 °C
Relative Humidity	44.4 %

2.2.6 Test Results

Results for Configuration and Mode: High Capacity Battery - Battery Charging, TETRA and BLE Idle/Rx and GNSS operating.

Testing was performed in accordance with Class A limits.

Detailed results are shown below.

Highest frequency generated or used within the EUT: 2.480 GHz
Which necessitates an upper frequency test limit of: 13 GHz

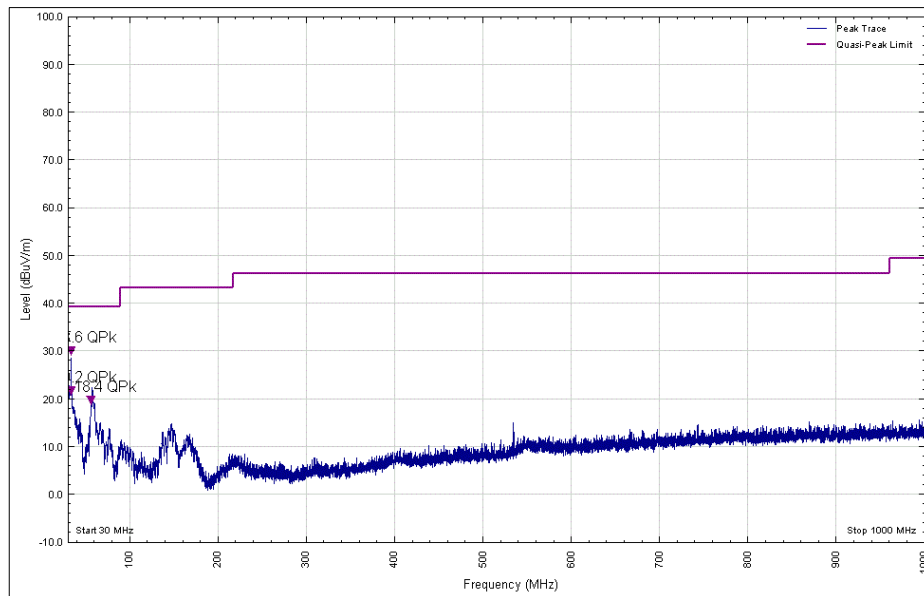


Figure 5 - Graphical Results - 30 MHz to 1 GHz - Vertical Polarity

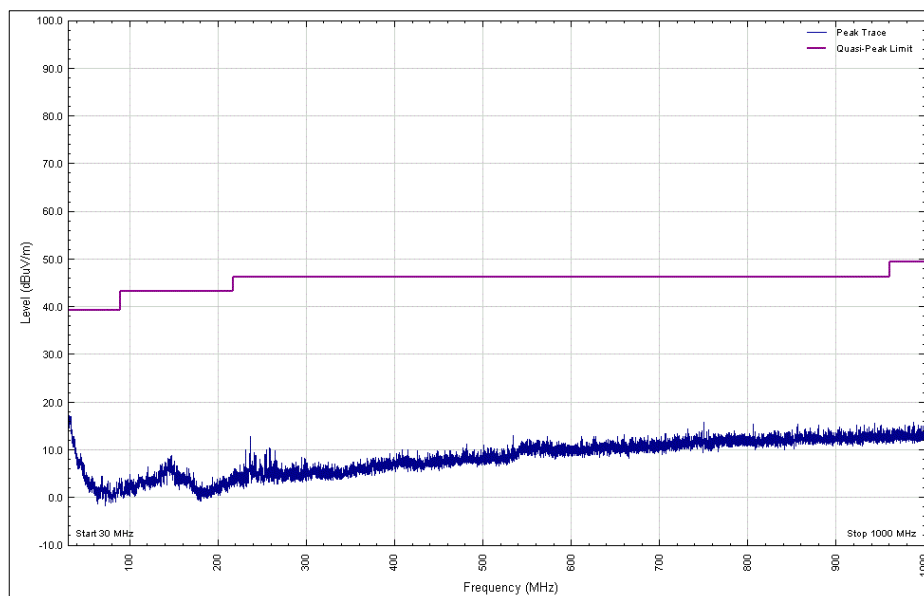


Figure 6 - Graphical Results - 30 MHz to 1 GHz - Horizontal Polarity

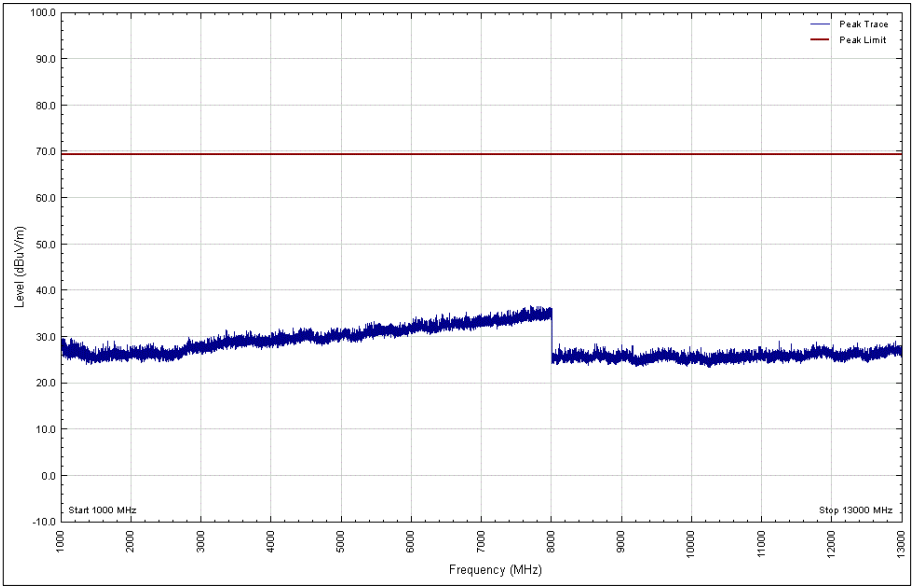


Figure 7 - Graphical Results - 1 GHz to 13 GHz – Peak Vertical Polarity

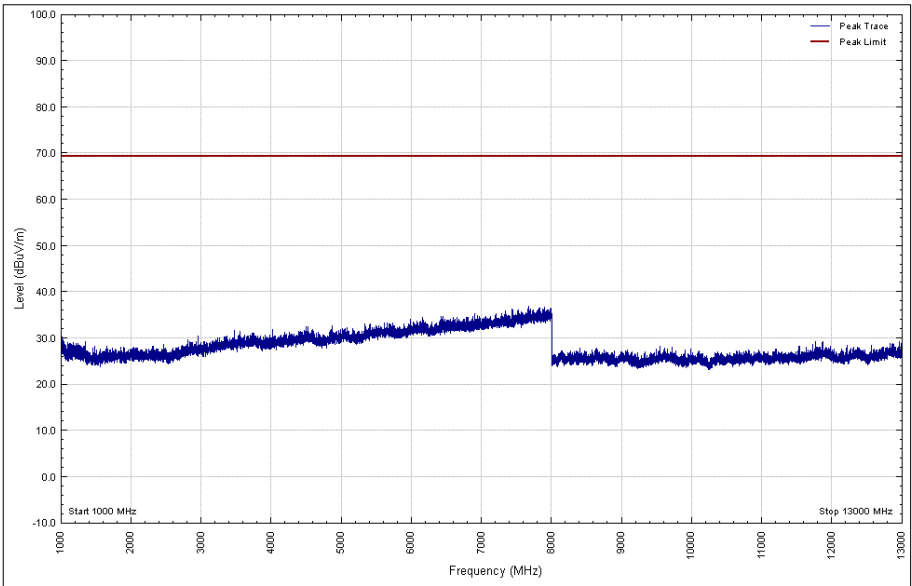


Figure 8 - Graphical Results - 1 GHz to 13 GHz – Average Vertical Polarity

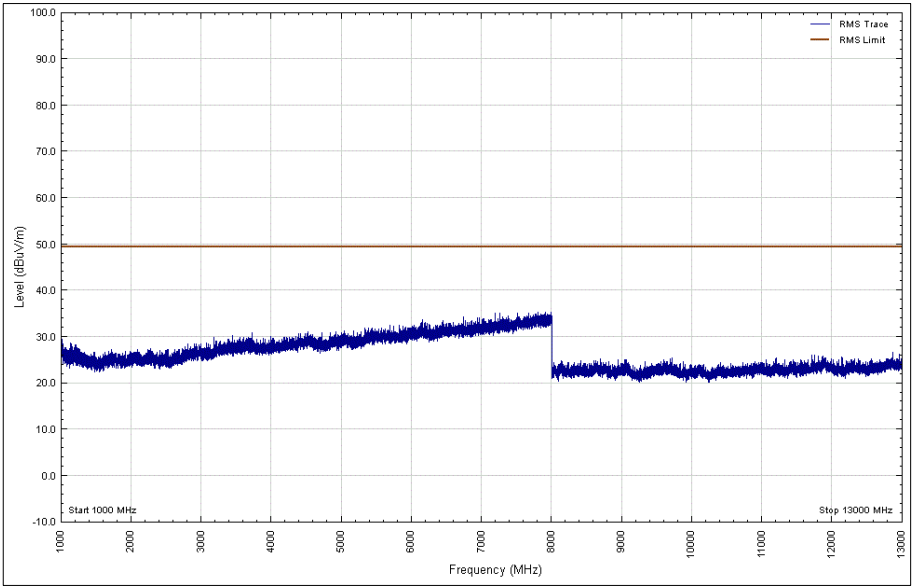


Figure 9 - Graphical Results - 1 GHz to 13 GHz – Peak Horizontal Polarity

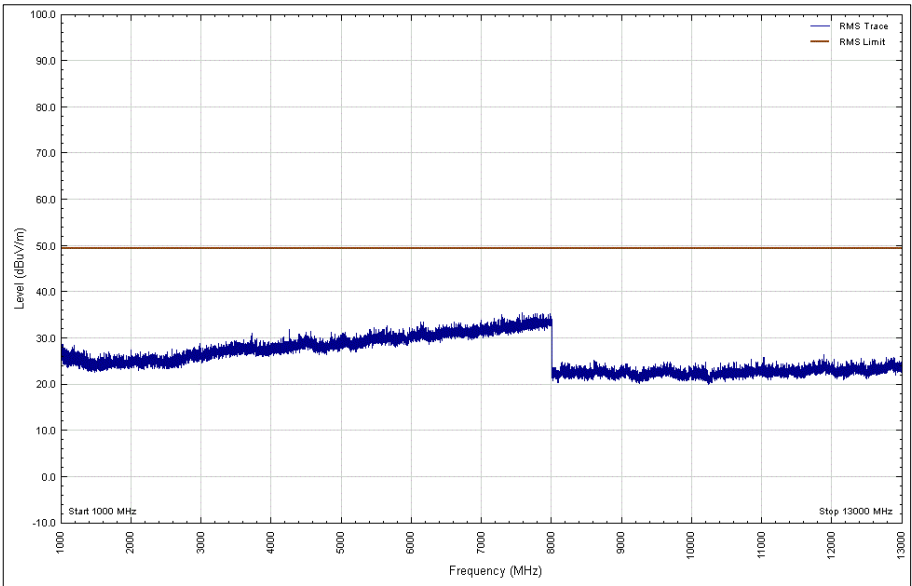


Figure 10 - Graphical Results - 1 GHz to 13 GHz – Average Horizontal Polarity

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dB)		Angle (°)	Height (m)	Polarisation	EUT Orientation
	Peak	Average	Peak	Average	Peak	Average				
*										

Table 8

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



2.2.7 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
8 - 18 GHz pre amp	Wright Technologies	PS06-0061	4971	12	07-Dec-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
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
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

Table 9

TU - Traceability Unscheduled

3 Photographs

3.1 Test Setup Photographs

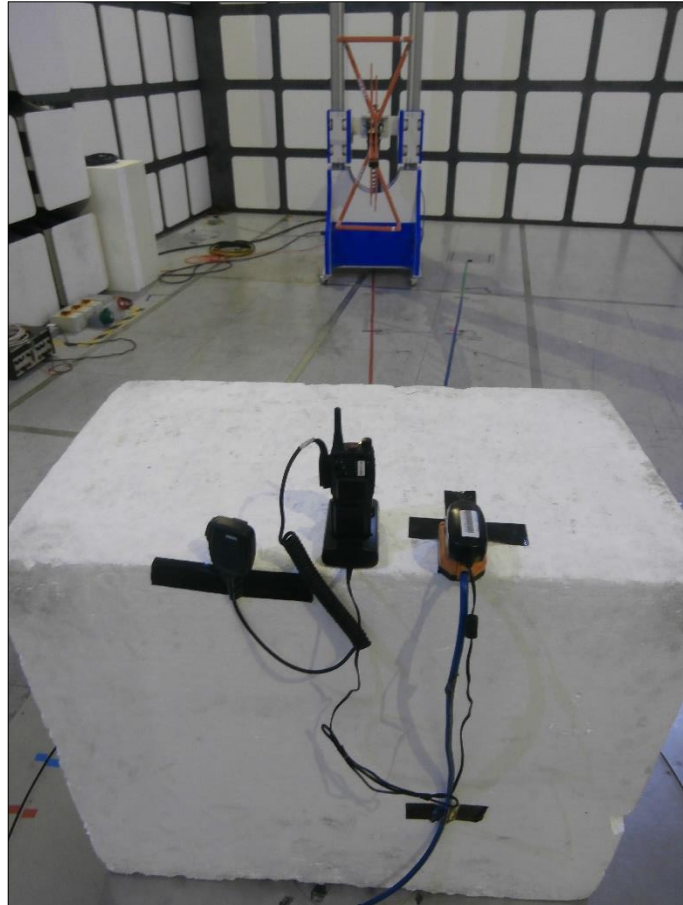


Figure 11 - Radiated Emissions 30 MHz to 1 GHz

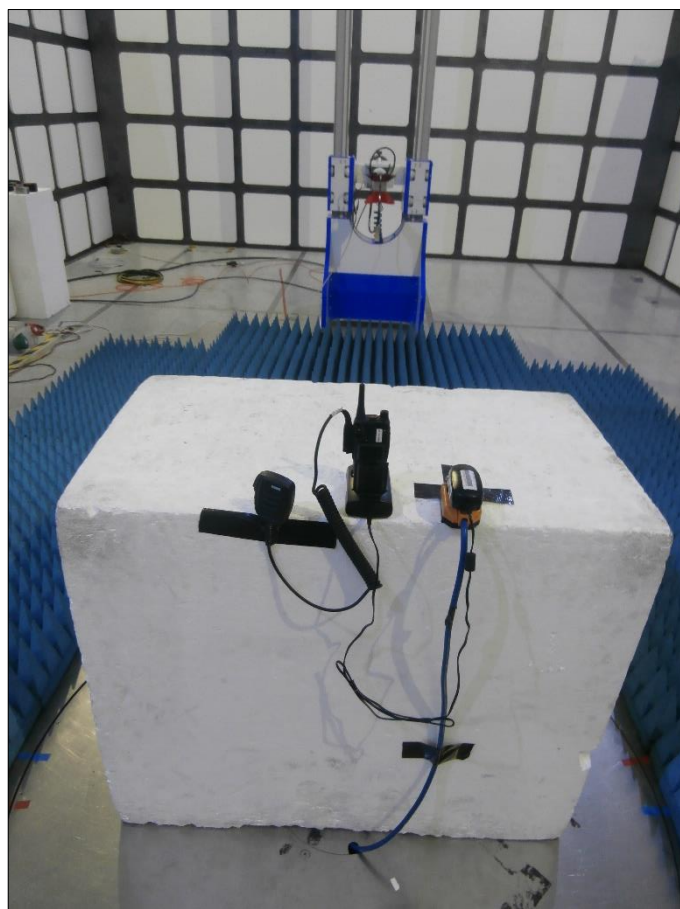


Figure 12 - Radiated Emissions 1 GHz to 13 GHz

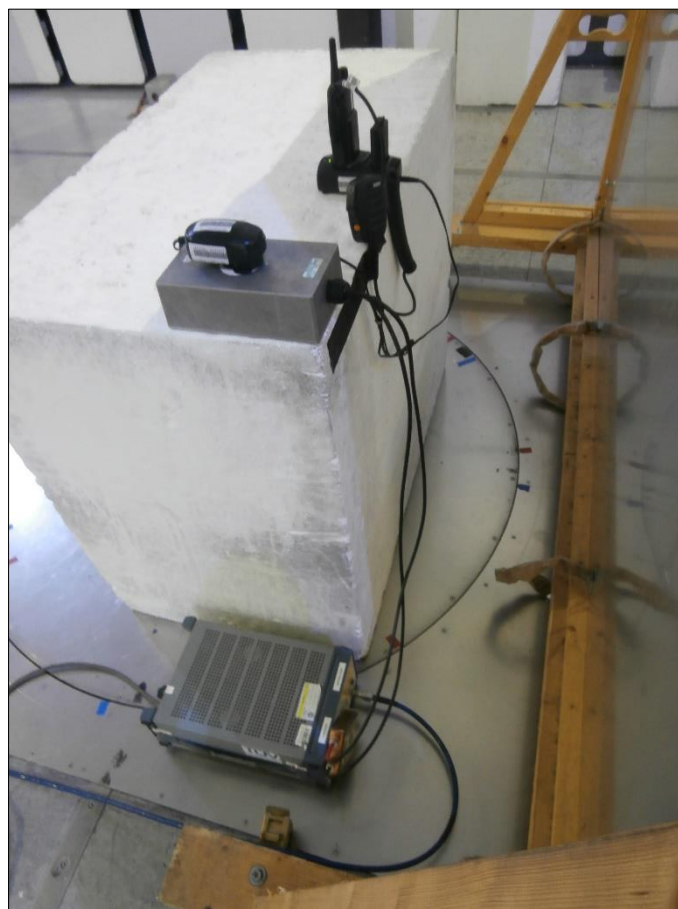


Figure 13 - AC Line Conducted Emissions



4 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
Conducted Disturbance at Mains Terminals	150 kHz to 30 MHz, LISN, ± 3.7 dB

Table 10