

FCC and ISED Test Report

Sepura Ltd

Tetra Radio, Model: SCG2229 Variant 1-89*50-0****

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

Prepared for: Sepura Ltd
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Add value.
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FCC ID: XX6SCG2229X

IC: IC: 8739A-SCG2229

COMMERCIAL-IN-CONFIDENCE

Document 75954235-01 Issue 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Andy Lawson	Chief Engineer, EMC	Authorised Signatory	26 January 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	26 January 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: 2020 and ICES-003 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	26 January 2022

Table 1

1.2 Introduction

Applicant	Sepura Ltd
Manufacturer	Sepura Ltd
Model Number(s)	SCG2229 Variant 1-89*50-0****
Serial Number(s)	1PR002041GPP6QB
Hardware Version(s)	Production
Software Version(s)	2001-840-10137
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2020 ICES-003 Issue 7: 2020
Order Number	PLC-PO021186-1
Date	17-December-2021
Date of Receipt of EUT	10-January-2022
Start of Test	10-January-2022
Finish of Test	11-January-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: DC Powered - Idle				
2.1	15.109 and 3.2	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2



1.4 Declaration of Build Status

Equipment Description

Technical Description: (Please provide a brief description of the intended use of the equipment including the technologies the product supports)	TETRA mobile radio for use within cars, trucks, mobile and fixed control rooms, motorcycles, boats and trains with GPS function.
Manufacturer:	Sepura
Model:	SCG2229
Part Number:	SCG2229
Hardware Version:	Production
Software Version:	2001 840 10137
FCC ID of the product under test – see guidance here	XX6SCG2229X
IC ID of the product under test – see guidance here	8739A-SCG2229

Table 3

Intentional Radiators

Technology	TETRA	Bluetooth LE	Bluetooth Classic / EDR	Wi-Fi 802.11b, g	Wi-Fi 802.11n 20	Wi-Fi 802.11n 40
Frequency Range (MHz to MHz)	380 - 470 MHz	2402 - 2480 MHz	2402 - 2480 MHz	2412 - 2462 MHz	2412 - 2462 MHz	2422 - 2452 MHz
Conducted Declared Output Power (dBm)	40	7.4	7.382	16.5	16.5	16.5
Antenna Gain (dBi)	7	2	2	2	2	2
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	AFB-TET: 380 - 430 MHz AFB-UT: 406 - 472 MHz	Element 3: 2200-2700	Element 3: 2200-2700	Element 3: 2200-2700	Element 3: 2200-2700	Element 3: 2200-2700
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	$\pi/4$ DQPSK	GFSK	GFSK $\pi/4$ DQPSK 8DPSK	802.11b: CCK, DBPSK, DQPSK 802.11g: BPSK, QPSK, 16QAM, 64QAM	BPSK, QPSK, 16QAM, 64QAM	BPSK, QPSK, 16QAM, 64QAM
ITU Emission Designator (see guidance here)	22K0DXW 20K0DXW	1M81F1D	1M01F1D 1M01G1D	19M7G1D	19M7D1D	36M8D1D
Bottom Frequency (MHz)	380 MHz	2402 MHz	2402 MHz	2412 MHz	2412 MHz	2422 MHz
Middle Frequency (MHz)	425 MHz	2441 MHz	2441 MHz	2437 MHz	2437 MHz	2437 MHz
Top Frequency (MHz)	470 MHz	2480 MHz	2480 MHz	2462 MHz	2462 MHz	2452 MHz

Table 4



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

Name:	Chris Beecham
Position held:	Conformance Engineer
Date:	10 January 2022

1.5 Product Information

1.5.1 Technical Description

The Equipment Under Test (EUT) was a TETRA mobile radio for use within cars, trucks, mobile and fixed control rooms, motorcycles, boats and trains with GPS function.

A full description and detailed product specification details are available from the manufacturer.



Figure 1 – Front View



Figure 2 – Rear View

1.5.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
GPS Antenna Port	≤ 30 m	Connection to GPS Antenna	Data	No
TETRA Antenna Port	≤ 30 m	Connection to TETRA Antenna	Data	No
USB Port	≤ 5 m	Connection to USB	Data	No
SCC3 / HBC3 Port	≤ 30 m	Connection to SCC3 / HBC3 Port	Data	No
IO Cable	≤ 8 m	Data	Data	No
Loudspeaker	≤ 6 m	Audio	Audio	No

Table 5



1.5.3 Test Configuration

Configuration	Description
DC Powered	<p>The EUT was powered by 12 V DC</p> <p>The EUT was populated with: -</p> <p>One SCC3 local console connected to the rear of the EUT, connected to EUT's serial port.</p> <p>One 300-00719 loudspeaker in 300-02012 cable connected to EUT's serial port.</p> <p>One Kingston 100 G3 USB stick in 300-02012 cable connected to EUT's serial port.</p> <p>One SCG power ignition lead 300-02010 connected by serial port.</p> <p>One 50 Ohm load</p> <p>One vehicle roof antenna connected to the EUT's BNC port for TETRA and EUT's SMC port for GPS.</p>

Table 6

1.5.4 Modes of Operation

Mode	Description
Idle	The EUT was powered with all transmitters configured to idle. GPS was set to receive. TETRA was set to receive at 425 MHz

Table 7

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: SCG2229 Variant 1-89*50-0****, Serial Number: 1PR002041GPP6QB			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 8



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: DC Powered - Idle		
Radiated Disturbance	Matthew Dawkins	UKAS

Table 9

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, Clause 15.109 and ICES-003, Clause 3.2

2.1.2 Equipment Under Test and Modification State

SCG2229 Variant 1-89*50-0****, S/N: 1PR002041GPP6QB - Modification State 0

2.1.3 Date of Test

10-January-2022 to 11-January-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.

Pre-scans were performed with the EUT orientated in a single 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:

$$\begin{aligned}\text{Quasi-Peak level (dB}\mu\text{V/m)} &= \text{Receiver level (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} \\ \text{Margin (dB)} &= \text{Quasi-Peak level (dB}\mu\text{V/m)} - \text{Limit (dB}\mu\text{V/m)}\end{aligned}$$

Above 1 GHz:

$$\begin{aligned}\text{CISPR Average level (dB}\mu\text{V/m)} &= \text{Receiver level (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} \\ \text{Margin (dB)} &= \text{CISPR Average level (dB}\mu\text{V/m)} - \text{Limit (dB}\mu\text{V/m)}\end{aligned}$$

$$\begin{aligned}\text{Peak level (dB}\mu\text{V/m)} &= \text{Receiver level (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} \\ \text{Margin (dB)} &= \text{Peak level (dB}\mu\text{V/m)} - \text{Limit (dB}\mu\text{V/m)}\end{aligned}$$

2.1.6 Example Test Setup Diagram

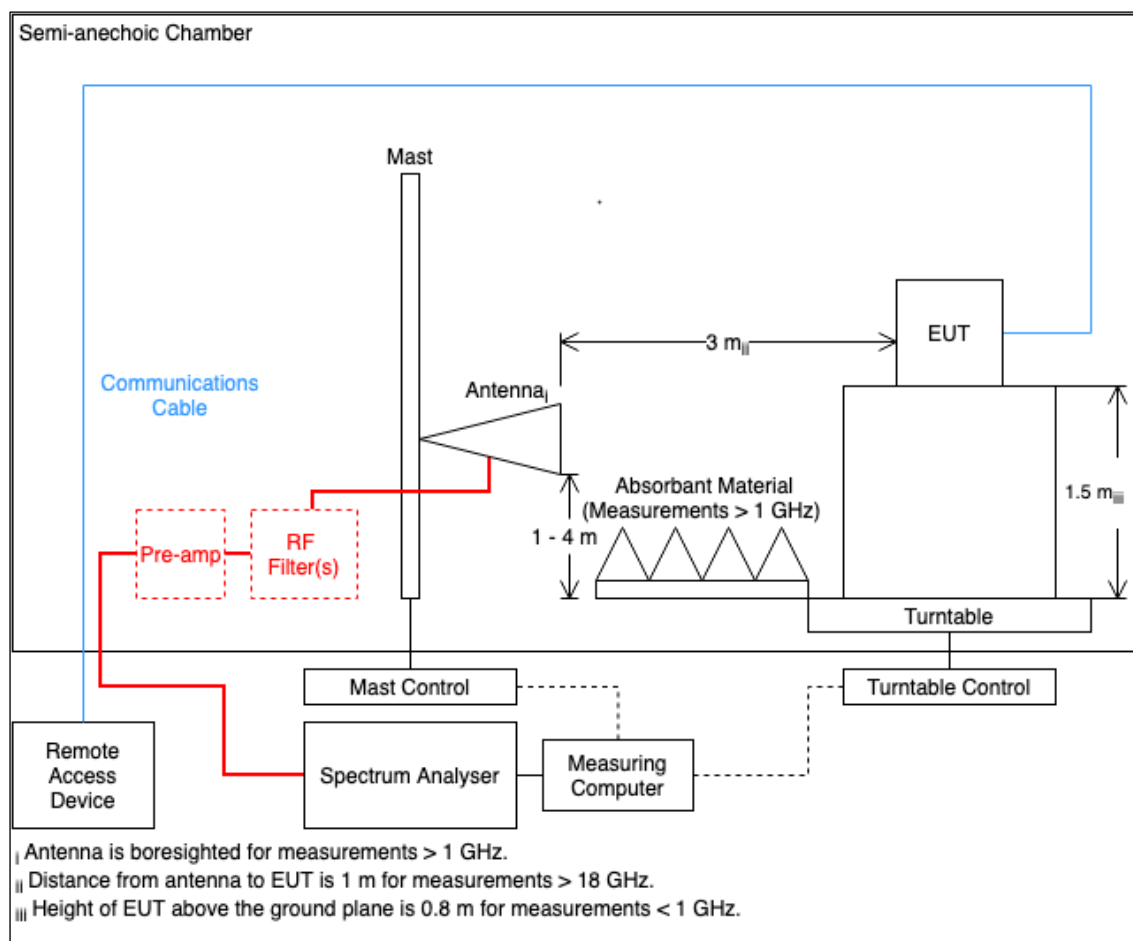


Figure 1

2.1.7 Environmental Conditions

Ambient Temperature	21.2 °C
Relative Humidity	43.8 %



2.1.8 Specification Limits

Required Specification Limits, Field Strength - Class A Test Limit at a 10 m Measurement Distance		
Frequency Range (MHz)	Test Limit ($\mu\text{V/m}$)	Test Limit (dB $\mu\text{V/m}$)
30 to 88	90	39.1
88 to 216	150	43.5
216 to 960	210	46.4
Above 960	300	49.5
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 10

2.1.9 Test Results

Results for Configuration and Mode: DC Powered - Idle.

This test was performed to the requirements of the Class A limits.

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

Detailed results are shown below.

Highest frequency generated or used within the EUT: 2480 MHz

Which necessitates an upper frequency test limit of: 13 GHz

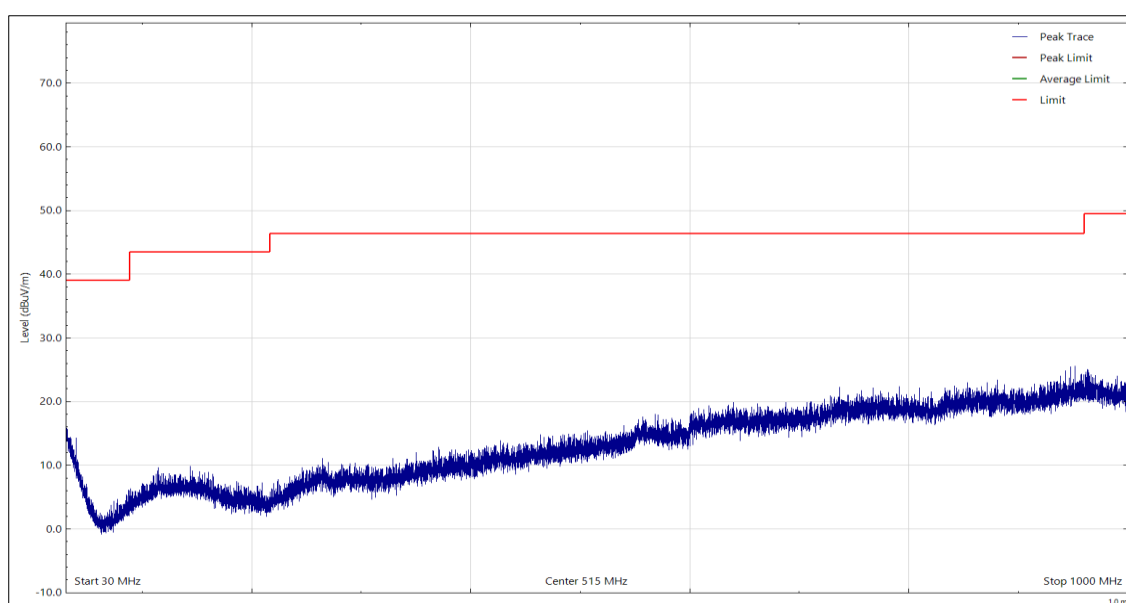


Figure 2 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal

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

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.

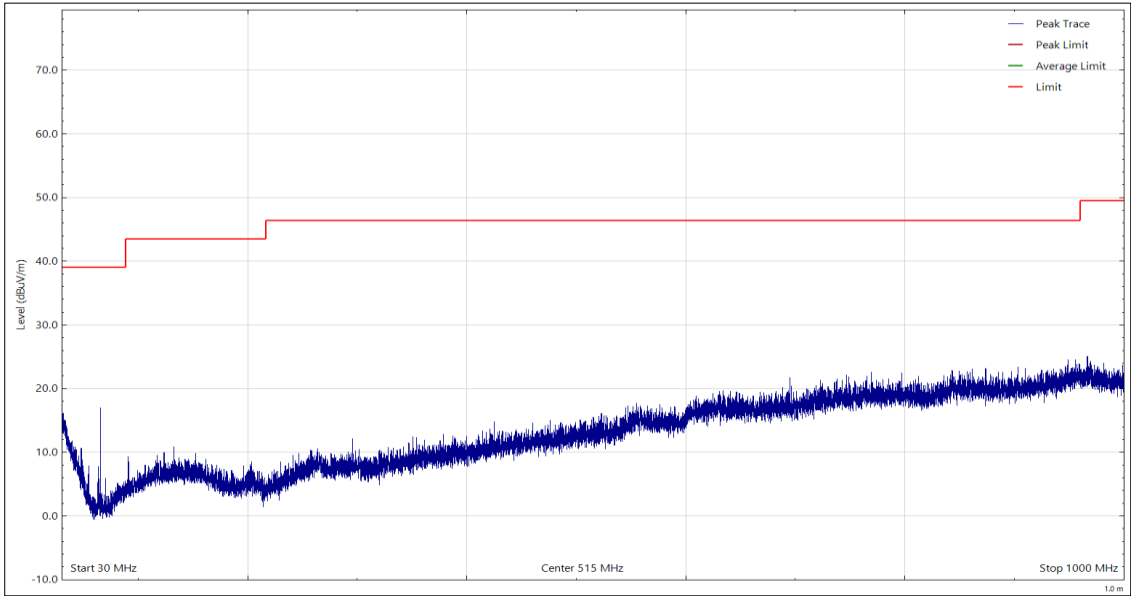


Figure 3 - 30 MHz to 1 GHz, Quasi-Peak, Vertical

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

Table 12

*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.

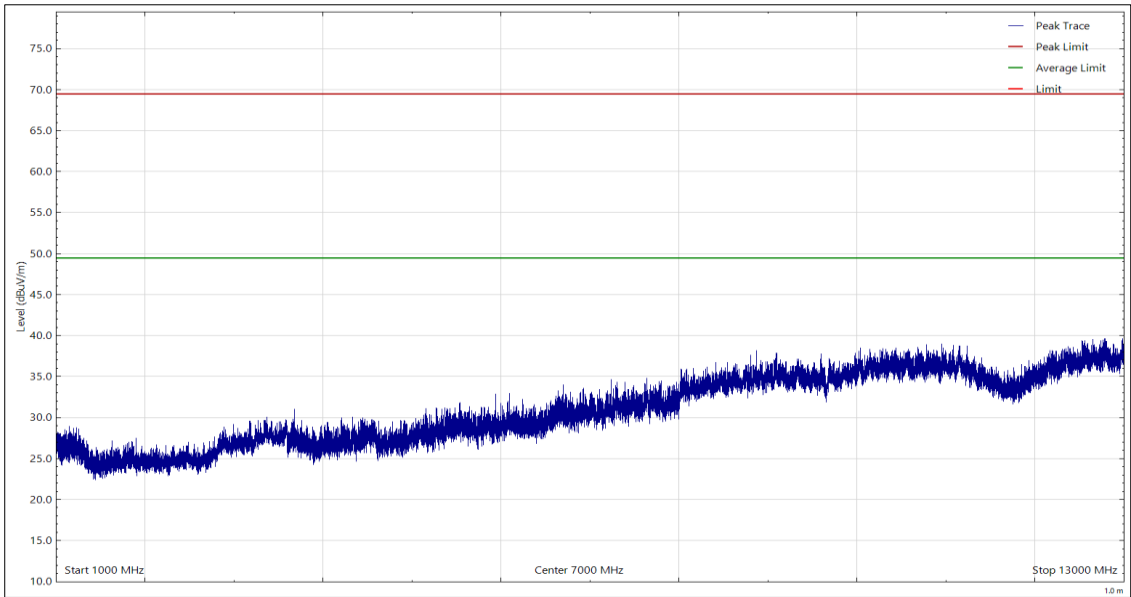


Figure 4 - 1 GHz to 13 GHz, Peak and CISPR Average, Horizontal

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

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.

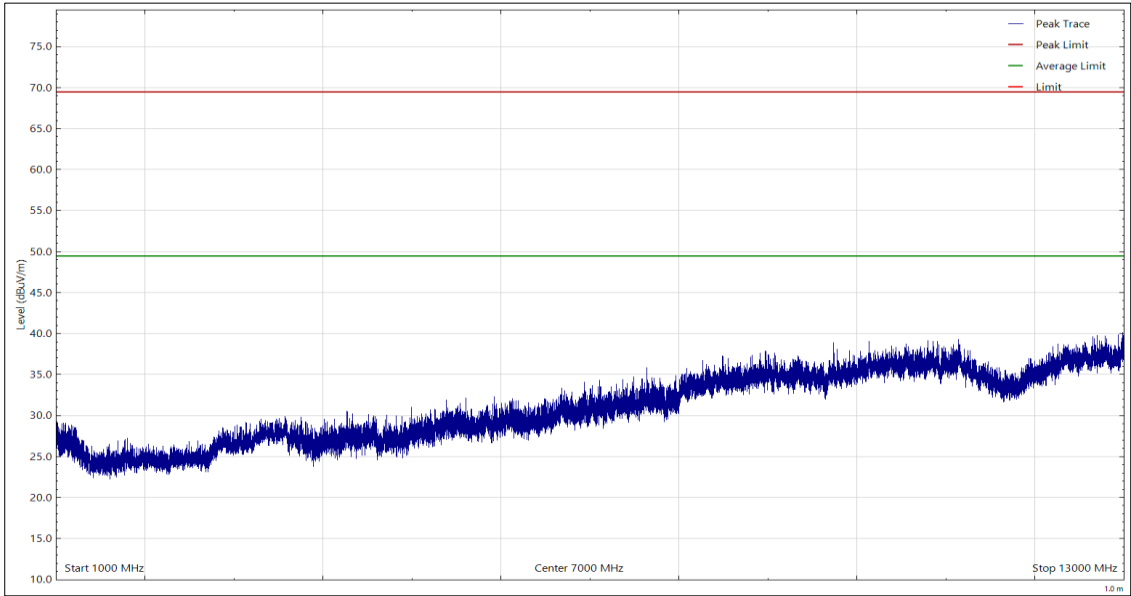


Figure 5 - 1 GHz to 13 GHz, Peak and CISPR Average, Vertical

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

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 6 - Test Setup - Below 1 GHz

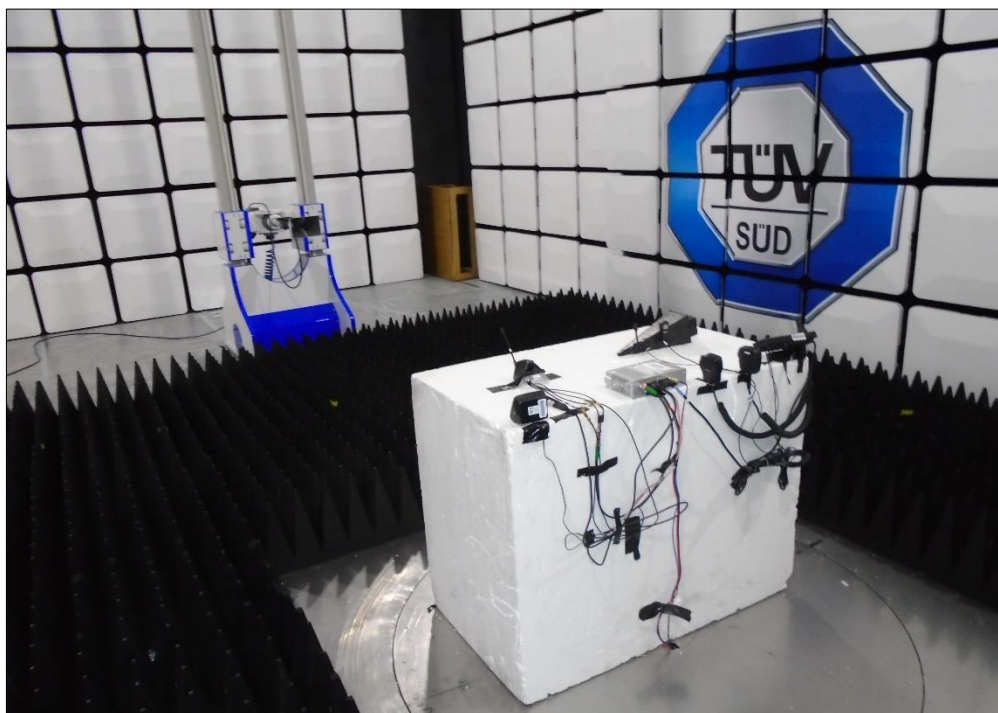


Figure 7 - Test Setup - Above 1 GHz



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 (K-Type to K-Type, 2 m)	Scott Cables	KPS-1501-2000-KPS	4526	6	06-Mar-2022
Cable (N-Type to N-Type, 1 m)	Rosenberger	LU7-036-1000	5031	12	23-Jul-2022
Cable (N-Type to N-Type, 8 m)	Teledyne	PR90-088-8MTR	5450	6	08-Mar-2022
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 15

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	5473	12	01-Apr-2022

Table 16



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 17

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.