# 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

Add value.
Inspire trust.

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

FCC ID: XX6SCG2229X IC: IC: 8739A-SCG2229

## COMMERCIAL-IN-CONFIDENCE

Document 75954235-01 Issue 01

| SIGNATURE | | | |
|---|---|---|---|
| AS Lawson. | | | |
| **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.



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

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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<br>ICES-003 Issue 7: 2020 |
| Order Number<br>Date | PLC-PO021186-1<br>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:<br>*(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:<br>380 - 430 MHz<br>AFB-UT:<br>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) | π/4 DQPSK | GFSK | GFSK<br>π/4 DQPSK<br>8DPSK | 802.11b: CCK, DBPSK, DQPSK<br>802.11g: BPSK, QPSK, 16QAM, 64QAM | BPSK, QPSK, 16QAM, 64QAM | BPSK, QPSK, 16QAM, 64QAM |
| ITU Emission Designator (see guidance here) | 22K0DXW<br>20K0DXW | 1M81F1D | 1M01F1D<br>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 | The EUT was powered by 12 V DC<br>The EUT was populated with: -<br>One SCC3 local console connected to the rear of the EUT, connected to EUT's serial port.<br>One 300-00719 loudspeaker in 300-02012 cable connected to EUT's serial port.<br>One Kingston 100 G3 USB stick in 300-02012 cable connected to EUT's serial port.<br>One SCG power ignition lead 300-02010 connected by serial port.<br>One 50 Ohm load<br>One vehicle roof antenna connected to the EUT's BNC port for TETRA and EUT's SMC port for GPS. |

**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:

Quasi-Peak level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = Quasi-Peak level (dBµV/m) - Limit (dBµV/m)

Above 1 GHz:

CISPR Average level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = CISPR Average level (dBµV/m) - Limit (dBµV/m)

Peak level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = Peak level (dBµV/m) - Limit (dBµV/m)

### 2.1.6 Example Test Setup Diagram

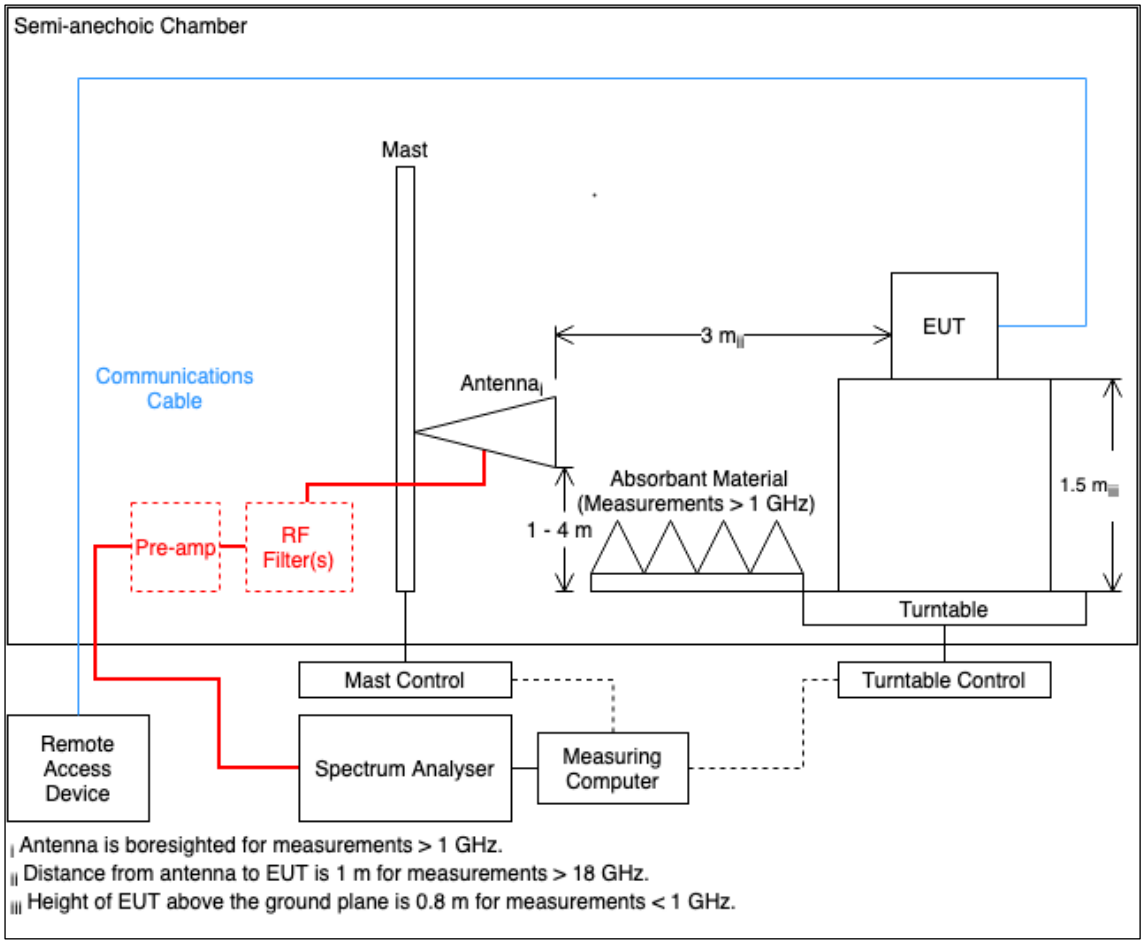


**Figure 1**

### 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 (µV/m) | Test Limit (dBµV/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:**<br>Note 1. A Quasi-Peak detector is to be used for measurements below 1 GHz.<br>Note 2. A CISPR Average detector is to be used for measurements above 1 GHz.<br>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

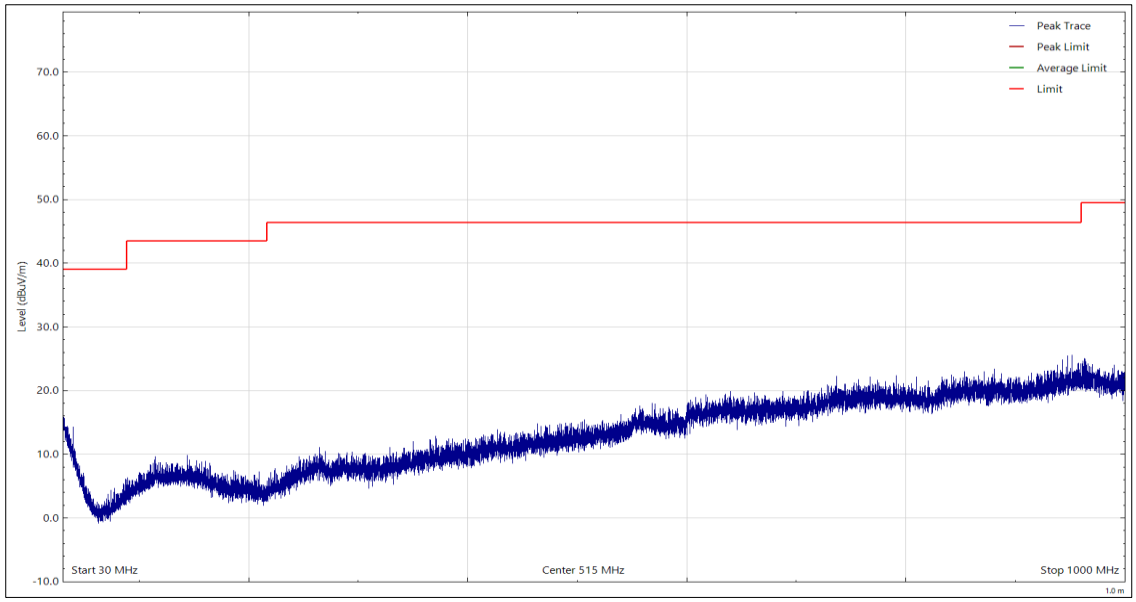


**Figure 2 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal**

| 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.

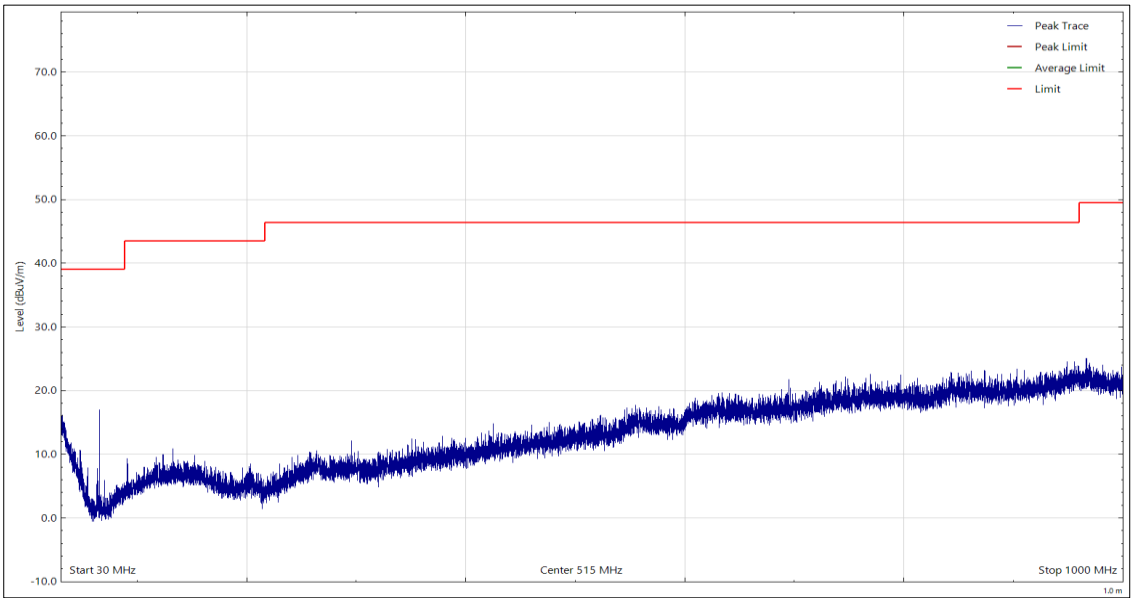


**Figure 3 - 30 MHz to 1 GHz, Quasi-Peak, Vertical**

| 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.

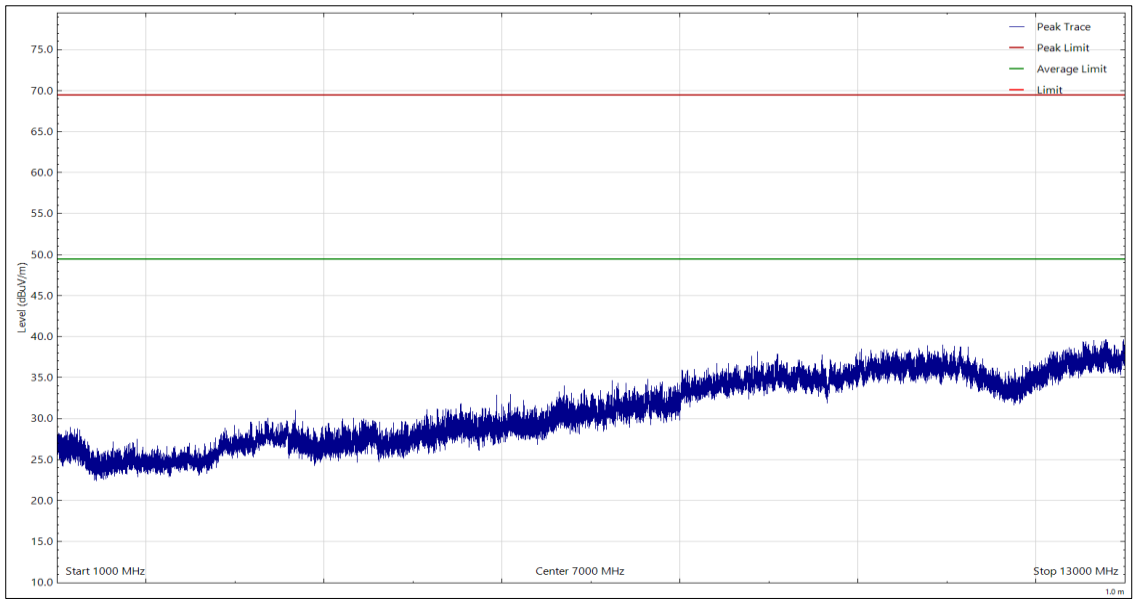


**Figure 4 - 1 GHz to 13 GHz, Peak and CISPR Average, Horizontal**

| 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.

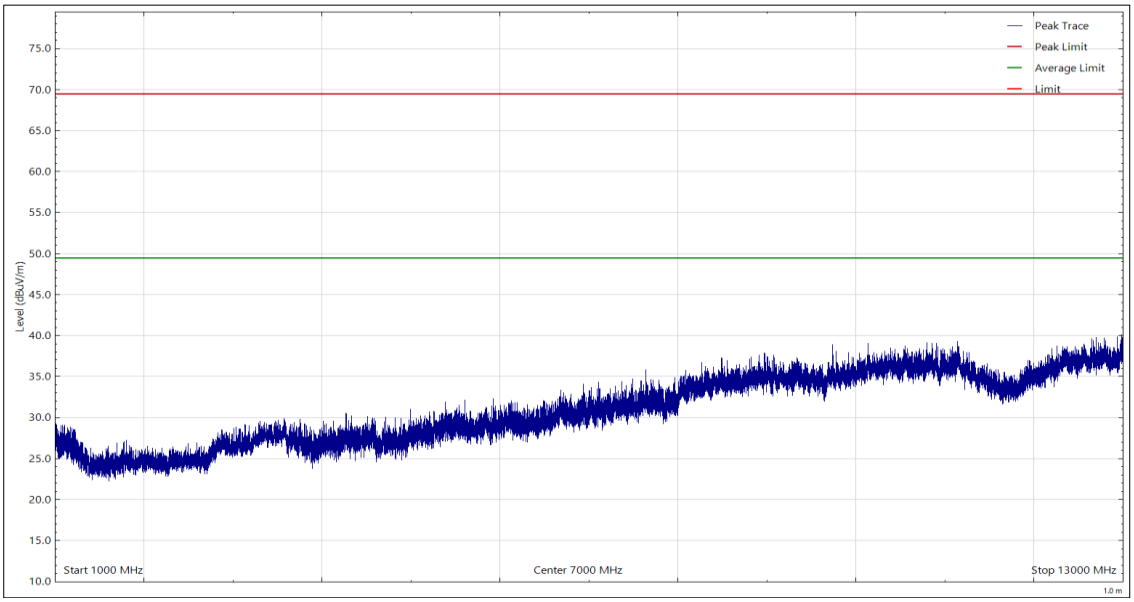


**Figure 5 - 1 GHz to 13 GHz, Peak and CISPR Average, Vertical**

| 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<br>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.