

FCC and ISCED Test Report

Sepura Limited

TETRA Mobile Radio, Model: SCG2221 Standard

In accordance with FCC 47 CFR Part 15C, ISCED
RSS-247 and ISCED RSS-GEN
(Bluetooth and Bluetooth Low Energy)

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



Add value.
Inspire trust.

FCC ID: XX6SCG2221M

IC: 8739A-SCG2221M

COMMERCIAL-IN-CONFIDENCE

Document 75957883-04 Issue 01

SIGNATURE

| NAME | JOB TITLE | RESPONSIBLE FOR | ISSUE DATE |
|----------------|-----------------|----------------------|-------------|
| Steve Marshall | Senior Engineer | Authorised Signatory | 17 May 2023 |

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, ISCED RSS-247 and ISCED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

| RESPONSIBLE FOR | NAME | DATE | SIGNATURE |
|-----------------|---------------------|-------------|-----------|
| Testing | Pier-Angelo Lorusso | 17 May 2023 | |

FCC Accreditation

90987 Octagon House, Fareham Test Laboratory

ISCED 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: 2021, ISCED RSS-247: Issue 2 (02-2017) and ISCED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021) for the tests detailed in section 1.3.



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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.tuvsud.com/en

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



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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 | 17-May-2023 |

Table 1

1.2 Introduction

| | |
|-------------------------------|--|
| Applicant | Sepura Limited |
| Manufacturer | Sepura Limited |
| Model Number(s) | SCG2221 Standard |
| Serial Number(s) | 1PR002250GPB2N7 |
| Hardware Version(s) | 7 |
| Software Version(s) | 1807 004 10138 |
| Number of Samples Tested | 1 |
| Test Specification/Issue/Date | FCC 47 CFR Part 15C: 2021 ISED RSS-247: Issue 2 (02-2017) ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021) |
| Order Number | PLC-PO025039-1 |
| Date | 20-February-2023 |
| Date of Receipt of EUT | 24-March-2023 |
| Start of Test | 26-April-2023 |
| Finish of Test | 27-April-2023 |
| Name of Engineer(s) | Pier-Angelo Lorusso |
| Related Document(s) | ANSI C63.10 (2020) ANSI C63.10 (2013) 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 15C, ISED RSS-247 and ISED RSS-GEN is shown below.

| Section | Specification Clause | | | Test Description | Result | Comments/Base Standard |
|--|-----------------------|-------------|--------------|-----------------------------|--------|--|
| | Part 15C | RSS-247 | RSS-GEN | | | |
| Configuration and Mode: Bluetooth | | | | | | |
| 2.1 | 15.209 and 15.247 (d) | 3.3 and 5.5 | 6.13 and 8.9 | Spurious Radiated Emissions | Pass | Limited spot checks based on worst-case results over a frequency range of 30MHz to 5GHz. |
| Configuration and Mode: Bluetooth Low Energy | | | | | | |
| 2.1 | 15.209 and 15.247 (d) | 3.3 and 5.5 | 6.13 and 8.9 | Spurious Radiated Emissions | Pass | Limited spot checks based on worst-case results over a frequency range of 30MHz to 5GHz. |

Table 2



A brief summary of the tests carried out in document 75948283-02 Issue 04 is shown below.

| Section | Specification Clause | | | Test Description | Result | Comments/Base Standard |
|---|-----------------------|---------|---------|--|--------|------------------------|
| | Part 15C | RSS-247 | RSS-GEN | | | |
| Configuration and Mode: Vehicle RSM - Bluetooth | | | | | | |
| 2.1 | 15.247 (b) | 5.4 | 6.12 | Maximum Conducted Output Power | Pass | ANSI C63.10 (2013) |
| 2.2 | 15.247 (a)(1) | 5.1 | - | Frequency Hopping Systems - Number of Hopping Channels | Pass | ANSI C63.10 (2013) |
| 2.3 | 15.247 (d) | 5.5 | - | Authorised Band Edges | Pass | ANSI C63.10 (2013) |
| 2.4 | 15.247 (a)(1) | 5.1 | - | Frequency Hopping Systems - Channel Separation | Pass | ANSI C63.10 (2013) |
| 2.5 | 15.247 (a)(1) | 5.1 | - | Frequency Hopping Systems - 20 dB Bandwidth | Pass | ANSI C63.10 (2013) |
| 2.6 | 15.205 | - | 8.10 | Restricted Band Edges | Pass | ANSI C63.10 (2013) |
| 2.7 | 15.247 (d) and 15.205 | 5.5 | 6.13 | Spurious Radiated Emissions | Pass | ANSI C63.10 (2013) |
| 2.8 | 15.247 (a)(1) | 5.1 | - | Frequency Hopping Systems – Average Time of Occupancy | Pass | ANSI C63.10 (2013) |

Table 3



A brief summary of the tests carried out in document 75948283-03 Issue 04 is shown below.

| Section | Specification Clause | | | Test Description | Result | Comments/Base Standard |
|--|--------------------------|---------|---------|--------------------------------|--------|------------------------|
| | Part 15C | RSS-247 | RSS-GEN | | | |
| Configuration and Mode: Vehicle RSM - Bluetooth Low Energy | | | | | | |
| 2.1 | 15.247 (e) | 5.2 | 6.12 | Power Spectral Density | Pass | ANSI C63.10 (2013) |
| 2.2 | 15.247 (a)(2) | 5.2 | 6.7 | Emission Bandwidth | Pass | ANSI C63.10 (2013) |
| 2.3 | 15.247 (d) | 5.5 | - | Authorised Band Edges | Pass | ANSI C63.10 (2013) |
| 2.4 | 15.205 | - | 8.10 | Restricted Band Edges | Pass | ANSI C63.10 (2013) |
| 2.5 | 15.247 (d) and 15.205 | 5.5 | 6.13 | Spurious Radiated Emissions | Pass | ANSI C63.10 (2013) |
| 2.6 | 15.247 (b) | 5.4 | 6.12 | Maximum Conducted Output Power | Pass | ANSI C63.10 (2013) |

Table 4



1.4 Donor Product Introduction

Conducted test results on the 2.4 GHz WLAN/Bluetooth interface are covered by FCC ID XX6SCG2229M and ISED ID 8739A-SCG2229ME. Both the SCG2229 and SCG2221 use the same part for the Bluetooth/WLAN interface on the same PCB, which is supplied by the same voltage and uses the same software. There are no differences in the WLAN/Bluetooth functionality between the SCG2229 and SCG2221. Therefore, there can be no difference in the conducted results expected from both SCG22 radios. As the PCBs for the TETRA modules in SCG2221 and SCG2229 are different it is, however, necessary to consider radiated emissions.

Sepura Limited take all responsibility for the validity of the test data for conducted results being applicable to both SCG2229 and SCG2221.

1.5 Donor Product Differences

The SCG2229 and SCG2221 share common software and hardware for the WLAN/Bluetooth interface. The WLAN/Bluetooth interface is on a separate PCB to the TETRA interface, and this allows the WLAN/Bluetooth interface to be used across multiple platforms. The TETRA PCB and interface is different between the SCG2229 and SCG2221; the band for SCG2229 is 380-470 MHz and the band for SCG2221 is 136-174 MHz. The following table gives details of the differences between the different FCC and ISED IDs:

| FCC ID | ISED ID | TETRA Band (MHz) | TETRA PCB | WLAN/Bluetooth PCB | Expansion Board PCB |
|-------------|-----------------|------------------|-----------|--------------------|---------------------|
| XX6SCG2221X | 8739A-SCG2221X | 136-174 | VHF | N/A | N/A |
| XX6SCG2229X | 8739A-SCG2229X | 380-470 | UHF | N/A | N/A |
| XX6SCG2221M | 8739A-SCG2221M | 136-174 | VHF | 1LV Module | N/A |
| XX6SCG2229M | 8739A-SCG2229M | 380-470 | UHF | 1LV Module | N/A |
| XX6SCG2221M | 8739A-SCG2221ME | 136-174 | VHF | 1LV Module | Yes |
| XX6SCG2229M | 8739A-SCG2229ME | 380-470 | UHF | 1LV Module | Yes |

Table 5



1.6 Application Form

Equipment Description

| | | | |
|--|--|---|--------------------------------|
| Technical Description: <i>(Please provide a brief description of the intended use of the equipment including the technologies the product supports)</i> | | The SCG2221 is a TETRA mobile radio in the SCG22 series of radios, operating in the VHF band, with TETRA operating frequencies 136-174 MHz. The SCG2221 supports GNSS, Bluetooth, Bluetooth LE, WLAN at 2.4 GHz and a range of accessories and ancillary equipment. The SCG2221 may be installed in a vehicle or in a desk mount unit. | |
| Manufacturer: | | Sepura Limited | |
| Model: | | SCG2221 Standard | |
| Part Number: | | 1-8A*60-0**** | |
| Hardware Version: | | 7 | |
| Software Version: | | 1807 004 10138 | |
| FCC ID of the product under test – see guidance here | | XX6SCG2221M | |
| IC ID of the product under test – see guidance here | | 8739A-SCG2221M | |
| Device Category | Mobile <input checked="" type="checkbox"/> | Portable <input type="checkbox"/> | Fixed <input type="checkbox"/> |
| Equipment is fitted with an Audio Low Pass Filter | | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> |

Table 6

Intentional Radiators

| Technology | TETRA | Bluetooth | WLAN 802.11b | WLAN 802.11g | WLAN 802.11n | BLE |
|---|----------------------|-------------------------------|----------------------|--------------------------------------|--------------------------------|----------------------|
| Frequency Range (MHz to MHz) | 136-174 | 2402-2480 | 2412-2462 | 2412-2462 | 2412-2462 | 2402-2480 |
| Conducted Declared Output Power (dBm) | 40 | 8 | 17 | 17 | 17 | 7.5 |
| Antenna Gain (dBi) | No antenna supplied. | No antenna supplied. | No antenna supplied. | No antenna supplied. | No antenna supplied. | No antenna supplied. |
| Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz) | 0.025 | 1 | 20 | 20 | 20 | 2 |
| Modulation Scheme(s) (e.g. GFSK, QPSK etc) | $\pi/4$ DQPSK | GFSK / $\pi/4$ -DPSK / 8-DPSK | CCK / DBPSK / DQPSK | OFDM (BPSK / QPSK / 16-QAM / 64-QAM) | BPSK / QPSK / 16-QAM / 64-QAM) | GFSK |
| ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices) | 20K0DXW | 1M01F1D 1M01G1D | 19M7G1D | 19M7G1D | 19M7D1D | 1M81F1D |
| Bottom Frequency (MHz) | 136 | 2402 | 2412 | 2412 | 2412 | 2402 |
| Middle Frequency (MHz) | 155 | 2441 | 2437 | 2437 | 2437 | 2441 |
| Top Frequency (MHz) | 174 | 2480 | 2462 | 2462 | 2462 | 2480 |

Table 7



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 8

AC Power Source

| | | |
|---|--|----|
| AC supply frequency: | | Hz |
| Voltage | | V |
| Max current: | | A |
| Single Phase <input type="checkbox"/> Three Phase <input checked="" type="checkbox"/> | | |

Table 9

DC Power Source

| | | |
|------------------------|------|---|
| Nominal voltage: | 13.6 | V |
| Extreme upper voltage: | 15.6 | V |
| Extreme lower voltage: | 10.8 | V |
| Max current: | 4 | A |

Table 10

Battery Power Source

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

Table 11

Charging

| | |
|--|--|
| Can the EUT transmit whilst being charged Unit does not charge | Yes <input type="checkbox"/> No <input type="checkbox"/> |
|--|--|

Table 12

Temperature

| | | |
|----------------------|-----|----|
| Minimum temperature: | -20 | °C |
| Maximum temperature: | 55 | °C |

Table 13



Cable Loss

| | | |
|--|-----|----|
| Adapter Cable Loss (Conducted sample) | N/A | dB |
|--|-----|----|

Table 14

Antenna Characteristics

| | | | | | |
|---|-------|--|-----------------|----|-----|
| Antenna connector <input checked="" type="checkbox"/> | | | State impedance | 50 | Ohm |
| Temporary antenna connector <input type="checkbox"/> | | | State impedance | | Ohm |
| Integral antenna <input type="checkbox"/> | Type: | | Gain | | dBi |
| External antenna <input type="checkbox"/> | Type: | | Gain | | dBi |
| <p>For external antenna only:</p> <p>Standard Antenna Jack <input type="checkbox"/> If yes, describe how user is prohibited from changing antenna (if not professional installed):</p> <p>Equipment is only ever professionally installed <input checked="" type="checkbox"/></p> <p>Non-standard Antenna Jack <input type="checkbox"/></p> <p>All part 15 applications will need to show how the antenna gain was derived either from a manufacturer data sheet or a measurement. Where the gain of the antenna is inherently accounted for as a result of the measurement, such as field strength measurements on a part 15.249 or 15.231 device, so the gain does not necessarily need to be verified. However, enough information regarding the construction of the antenna shall be provided. Such information maybe photographs, length of wire antenna etc.</p> <p>Antenna Gains are from https://uk.rs-online.com/web/p/wifi-antennas/7985368 and https://www.panorama-antennas.com/site/Mobile-Radio/PMR-Antennas/AFQNT-VAR</p> | | | | | |

Table 15

Ancillaries (if applicable)

| | | | |
|---------------|---|--------------------|------------------|
| Manufacturer: | Panorama Antennas | Part Number: | AFQNT-H5 |
| Model: | TETRA antenna | Country of Origin: | UK |
| Manufacturer: | Microchip | Part Number: | RN-SMA-4 |
| Model: | WLAN Antenna | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-00063 |
| Model: | GNSS Antenna | Country of Origin: | UK |
| Manufacturer: | Sepura | Part Number: | 300-02012 rev001 |
| Model: | Extended SCG Loudspeaker / IO USB Host lead | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-02010 |
| Model: | SCG Power/ignition Lead | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-00069 |
| Model: | Mobile Remote Cable 5.0M | Country of Origin: | Unknown |



| | | | |
|---------------|--------------------------------------|--------------------|-----------|
| Manufacturer: | Sepura | Part Number: | 300-00670 |
| Model: | HBC Interface and Hands-free Box | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-00079 |
| Model: | Remote Microphone And Switch Set | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-00292 |
| Model: | Remote Microphone (Handsfree Kit) 3m | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-01801 |
| Model: | Handset Based Console (HBC3) | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-00062 |
| Model: | Fist microphone | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-01808 |
| Model: | SCC3 (colour console) | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-01961 |
| Model: | CC VAC RSM (Long Cable) | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-00719 |
| Model: | Loudspeaker | Country of Origin: | Unknown |
| Manufacturer: | Sepura | Part Number: | 300-02009 |
| Model: | USB Data/Programming Lead | Country of Origin: | UK |
| Manufacturer: | Sepura | Part Number: | 300-02012 |
| Model: | SCG Loudspeaker / IO USB Host lead | Country of Origin: | UK |
| Manufacturer: | Sepura | Part Number: | 300-00784 |
| Model: | AMPS attachments | Country of Origin: | UK |
| Manufacturer: | Sepura | Part Number: | 300-00068 |
| Model: | Mobile Remote Cable 3.0M | Country of Origin: | UK |

Table 16

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

Name: Chris Beecham

Position held: Conformance Engineer

Date: 21/03/2023



1.7 Product Information

1.7.1 Technical Description

The SCG2221 is a TETRA mobile radio in the SCG22 series of radios, operating in the VHF band, with TETRA operating frequencies 136-174 MHz.

The SCG2221 supports GNSS, Bluetooth, Bluetooth LE, WLAN at 2.4 GHz and a range of accessories and ancillary equipment.

The SCG2221 may be installed in a vehicle or in a desk mount unit.

1.8 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.9 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: SCG2221 Standard, Serial Number: 1PR002250GPB2N7 | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |

Table 17

1.10 Test Location

TÜV SÜD conducted the following tests at our Octagon House Test Laboratory.

| Test Name | Name of Engineer(s) | Accreditation |
|--|---------------------|---------------|
| Configuration and Mode: Bluetooth | | |
| Spurious Radiated Emissions | Pier-Angelo Lorusso | UKAS |
| Configuration and Mode: Bluetooth Low Energy | | |
| Spurious Radiated Emissions | Pier-Angelo Lorusso | UKAS |

Table 18

Office Address:

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



2 Test Details

2.1 Spurious Radiated Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.209 and 15.247 (d)
ISED RSS-247, Clause 3.3 and 5.5
ISED RSS-GEN, Clause 6.13 and 8.9

2.1.2 Equipment Under Test and Modification State

SCG2221 Standard, S/N: 1PR002250GPB2N7 - Modification State 0

2.1.3 Date of Test

26-April-2023 to 27-April-2023

2.1.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.3, 6.5 and 6.6.

Measurements were only performed as requested by the manufacturer, full re-testing is not required, and some limited spot checks were performed. Spot checks were based on worst-case results and over a frequency range of 30MHz to 5GHz.

For frequencies > 1 GHz, plots for average measurements were taken in accordance with ANSI C63.10, clause 11.12.2.5.2.

The EUT was placed on the non-conducting platform in a manner typical of a normal installation. As the EUT was considered fixed and therefore reasonable to be used in single plane, pre-scans were performed with the EUT orientated in X plane with reference to the ground plane.

Ports on the EUT were terminated with loads as described in ANSI C63.4 clause 6.2.4. For EUT's with multiple connectors of the same type.

The plots shown are the characterisation of the EUT. The limits on the plots represent the most stringent case for restricted bands, (74/54 dBuV/m) when compared to 20 dBc outside restricted bands. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBμV/m to μV/m:
 $10^{(\text{Field Strength in dB}\mu\text{V/m}/20)}$

Where formal measurements have been necessary, the results have been presented in the emissions table.

2.1.5 Example Test Setup Diagram

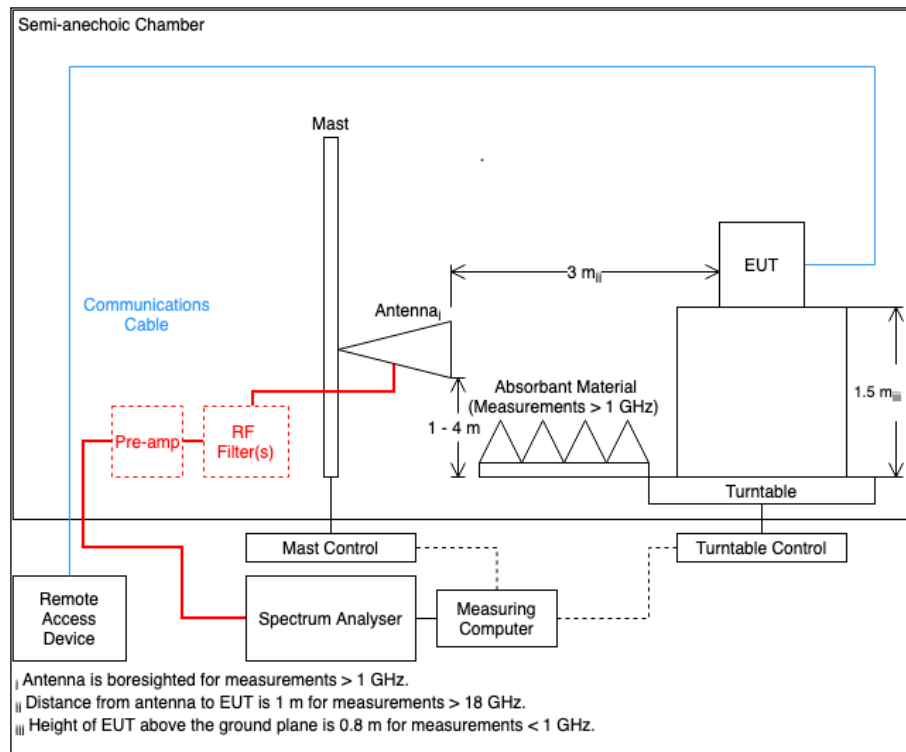


Figure 1

2.1.6 Environmental Conditions

| | |
|---------------------|----------------|
| Ambient Temperature | 20.8 - 21.8 °C |
| Relative Humidity | 32.4 - 36.8 % |



2.1.7 Test Results

Bluetooth

| Frequency (MHz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|
| 239.999 | 36.62 | 46.02 | -9.40 | Q-Peak | 17 | 100 | Vertical |
| 240.021 | 39.69 | 46.02 | -6.33 | Q-Peak | 345 | 120 | Horizontal |
| 299.952 | 36.42 | 46.02 | -9.60 | Q-Peak | 117 | 110 | Horizontal |

Table 19 - 2442 MHz (CH40), DH5, 30 MHz to 5 GHz

No other emissions found within 6 dB of the limit.

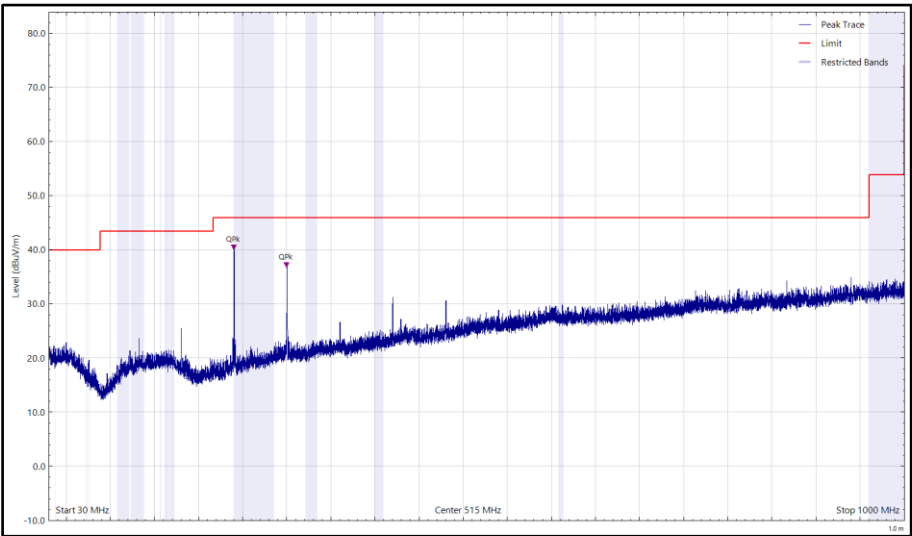


Figure 2 - 2442 MHz (CH40), DH5, 30 MHz to 1 GHz, Horizontal (Peak)

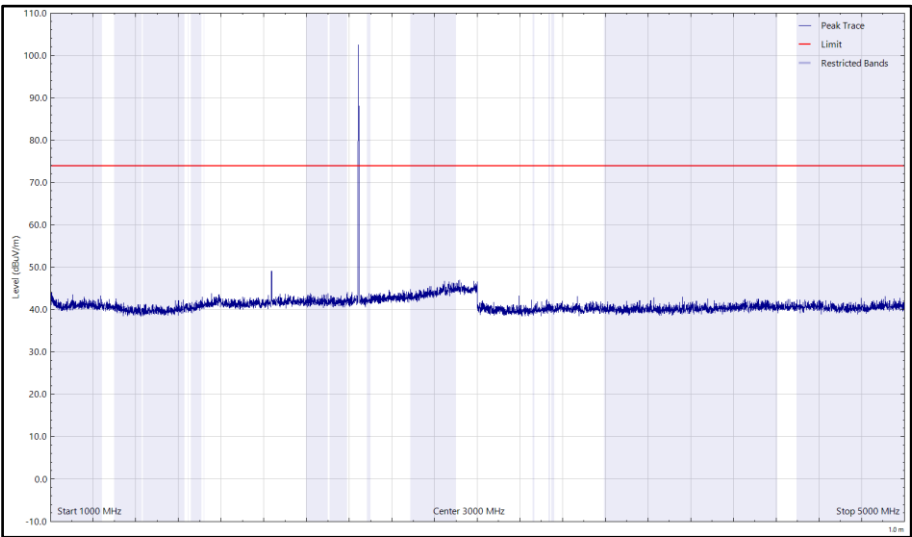


Figure 3 - 2442 MHz (CH40), DH5, 1 GHz to 5 GHz, Horizontal (Peak)

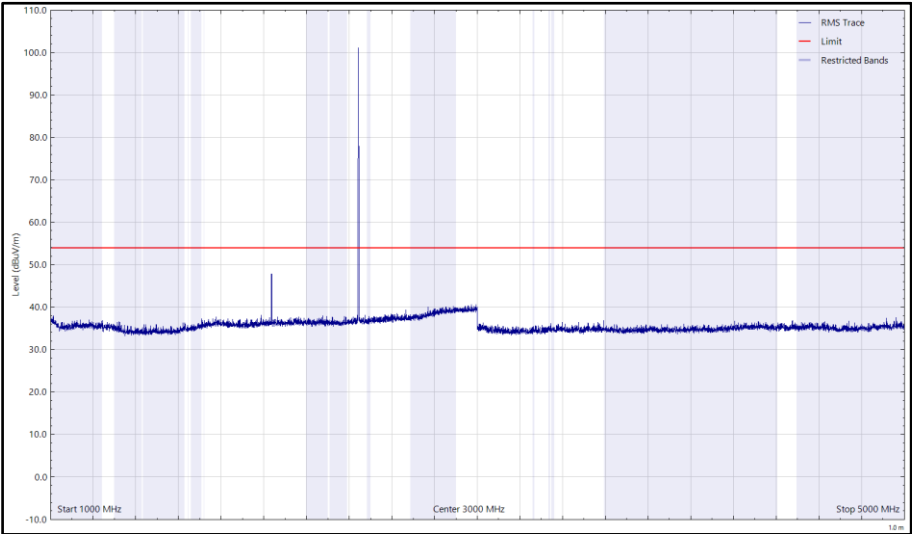


Figure 4 - 2442 MHz (CH40), DH5, 1 GHz to 5 GHz, Horizontal (rms)

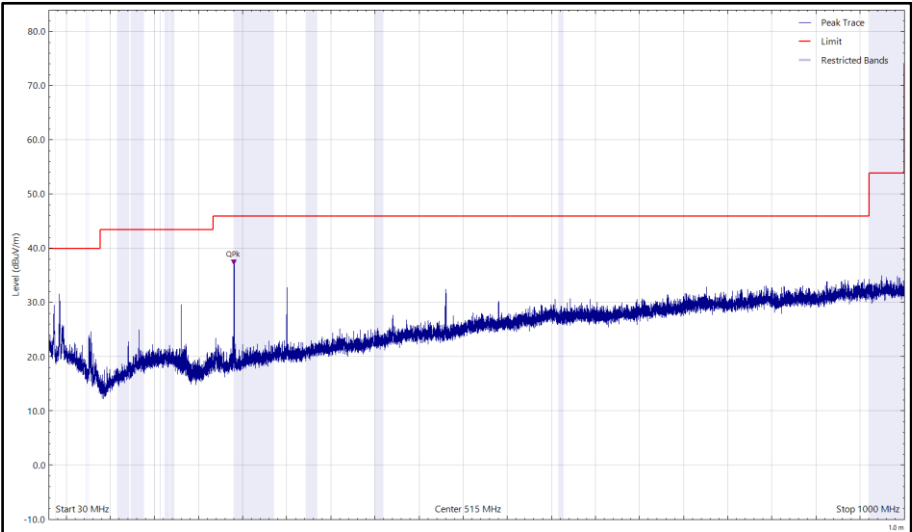


Figure 5 - 2442 MHz (CH40), DH5, 30 MHz to 1 GHz, Vertical (Peak)

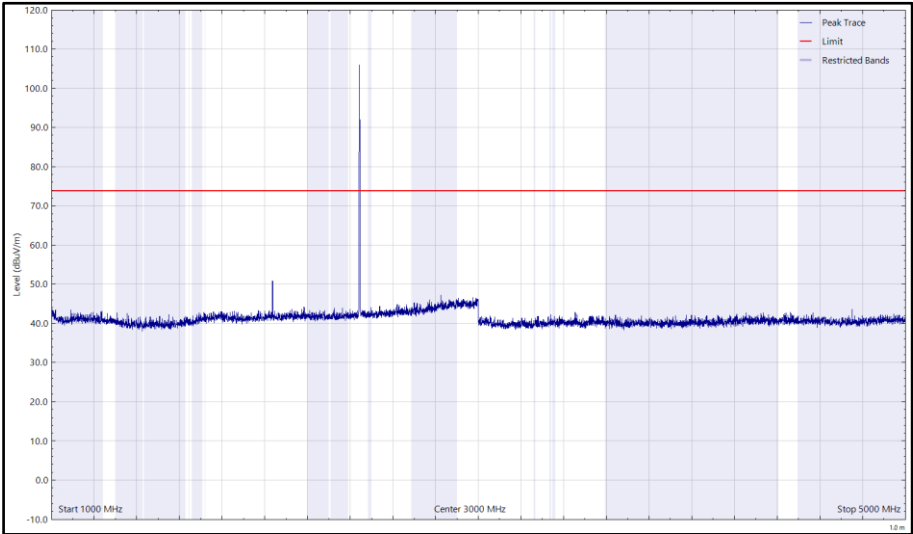


Figure 6 - 2442 MHz (CH40), DH5, 1 GHz to 5 GHz, Vertical (Peak)

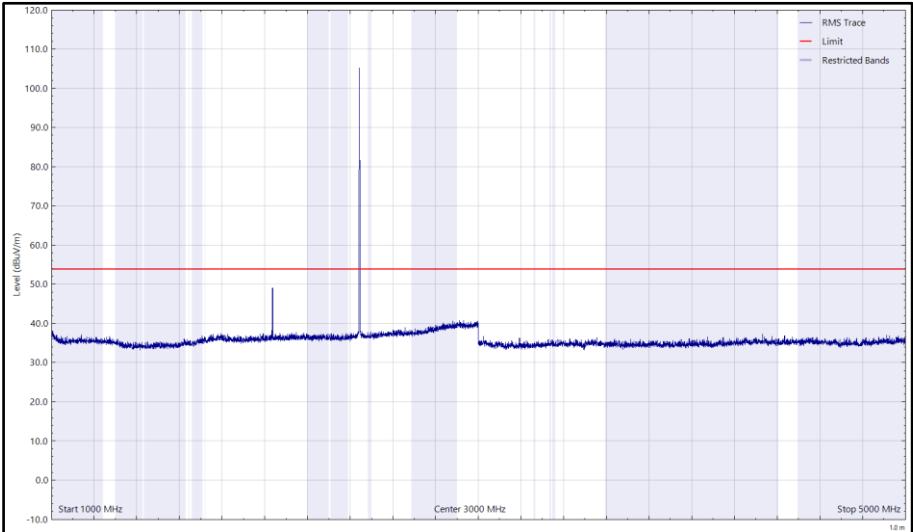


Figure 7 - 2442 MHz (CH40), DH5, 1 GHz to 5 GHz, Vertical (rms)

Bluetooth Low Energy

| Frequency (MHz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|
| 240.018 | 39.73 | 46.02 | -6.29 | Q-Peak | 344 | 126 | Horizontal |

Table 20 - 2480 MHz (CH39), LE1M, 30 MHz to 5 GHz

No other emissions found within 6 dB of the limit.

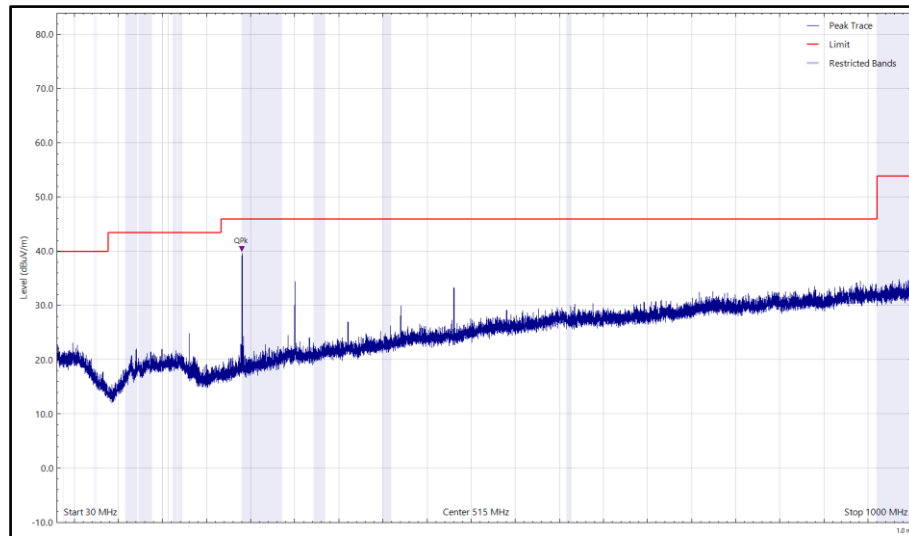


Figure 8 - 2480 MHz (CH39), LE1M, 30 MHz to 1 GHz, Horizontal (Peak)

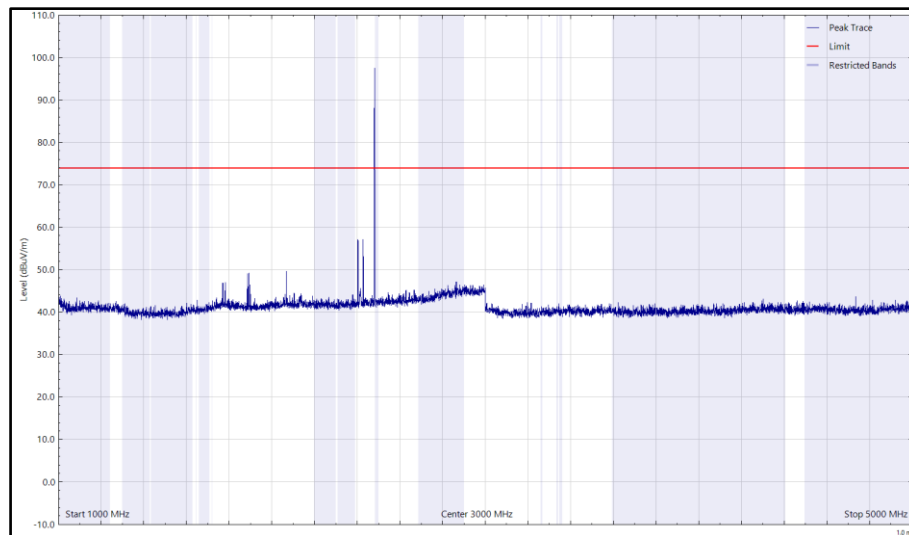


Figure 9 - 2480 MHz (CH39), LE1M, 1 GHz to 5 GHz, Horizontal (Peak)

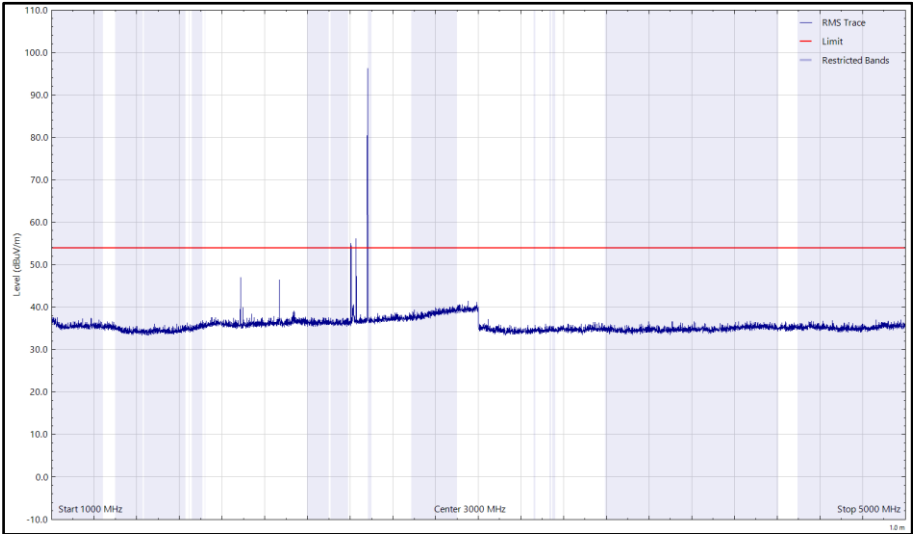


Figure 10 - 2480 MHz (CH39), LE1M, 1 GHz to 5 GHz, Horizontal (rms)

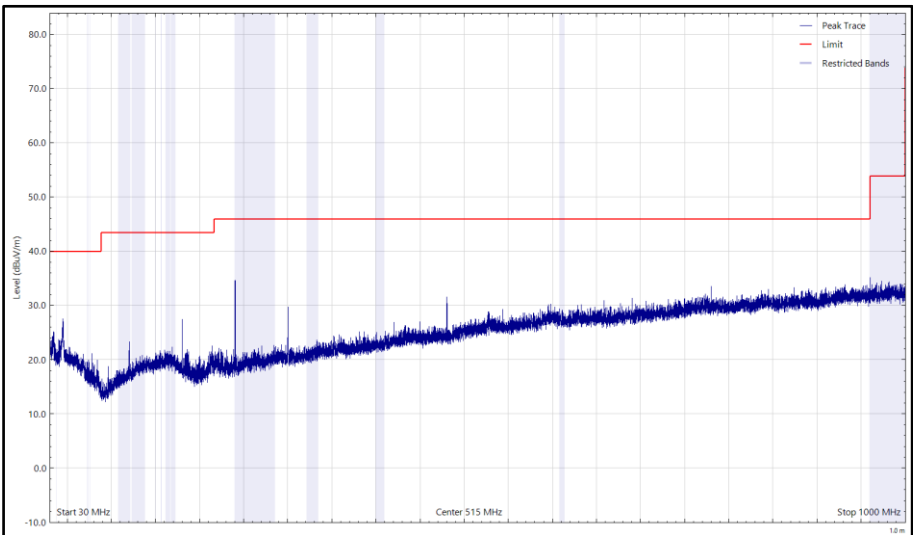


Figure 11 - 2480 MHz (CH39), LE1M, 30 MHz to 1 GHz, Vertical (Peak)

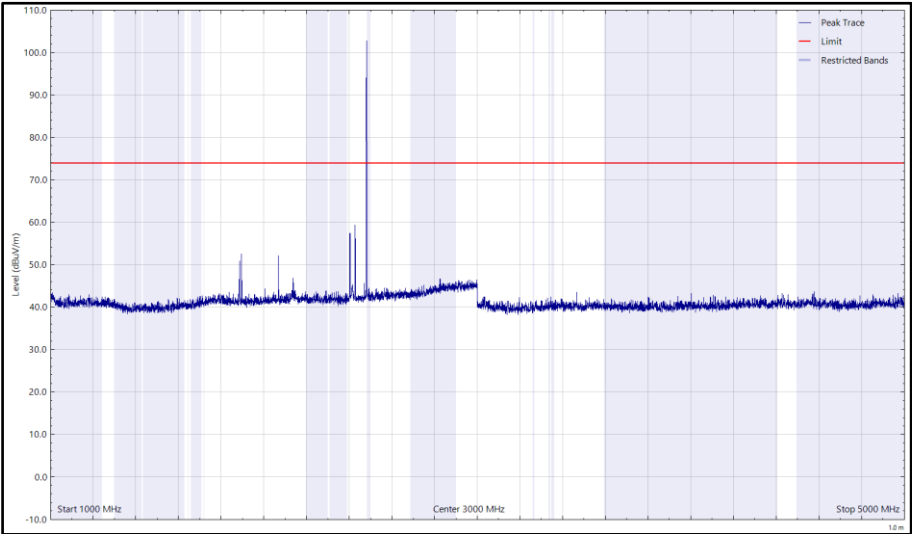


Figure 12 - 2480 MHz (CH39), LE1M, 1 GHz to 5 GHz, Vertical (Peak)

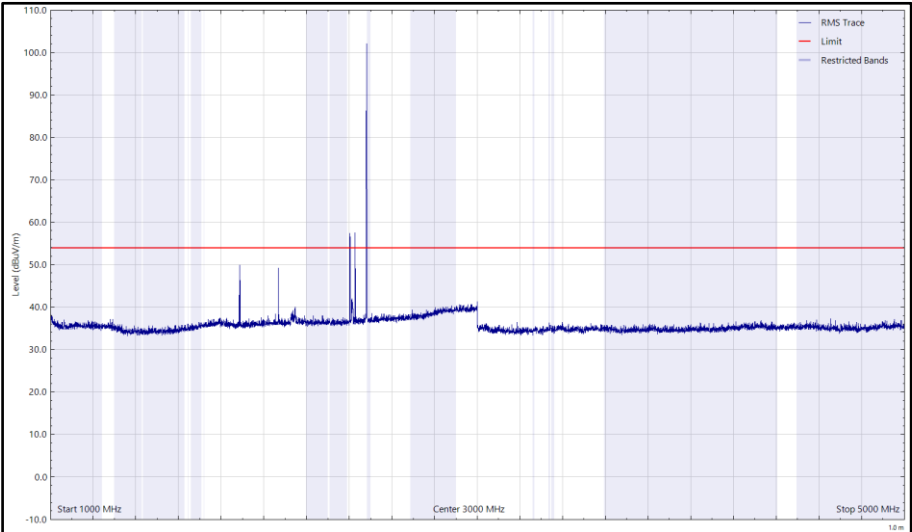


Figure 13 - 2480 MHz (CH39), LE1M, 1 GHz to 5 GHz, Vertical (rms)



FCC 47 CFR Part 15, Limit Clause 15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

ISED RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in RSS-GEN, clause 8.10, must also comply with the radiated emission limits specified in RSS-GEN clause 8.9.



2.1.8 Test Location and Test Equipment Used

This test was carried out in RF Chamber 11.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Expires |
|-------------------------------------|----------------------|--|-------|-----------------------------|---------------------|
| Hygrometer | Rotronic | A1 | 2138 | 12 | 28-Sep-2023 |
| Band Reject Filter - 2.4585 GHz | Wainwright | WRCGV14-2423.5-2433.5-2483.5-2493.5-50SS | 5068 | 12 | 07-Nov-2023 |
| EMI Test Receiver | Rohde & Schwarz | ESW44 | 5084 | 12 | 17-May-2023 |
| Emissions Software | TUV SUD | EmX V3.1.11 | 5125 | - | Software |
| Screened Room (11) | Rainford | Rainford | 5136 | 36 | 24-Nov-2024 |
| Mast | Maturo | TAM 4.0-P | 5158 | - | TU |
| Mast and Turntable Controller | Maturo | Maturo NCD | 5159 | - | TU |
| Turntable | Maturo | TT 15WF | 5160 | - | TU |
| Antenna (DRG 1-10.5GHz) | Schwarzbeck | BBHA9120B | 5215 | 12 | 28-May-2023 |
| Pre Amp 1 - 26.5 GHz | Agilent Technologies | 8449B | 5445 | 12 | 12-May-2023 |
| Cable (SMA to SMA 1m) | Junkosha | MWX221-01000AMSAMS/A | 5513 | 12 | 14-Apr-2024 |
| Cable (SMA to SMA 1m) | Junkosha | MWX221-01000AMSAMS/A | 5516 | 12 | 23-Oct-2023 |
| 2m SMA Cable | Junkosha | MWX221-02000AMSAMS/A | 5518 | 12 | 14-Apr-2024 |
| Cable (N-Type to N-Type, 8 m) | Junkosha | MWX221-08000NMSNMS/B | 5522 | 12 | 14-Apr-2024 |
| 3 GHz High pass Filter | Wainwright | WHKX12-2580-3000-18000-80SS | 5547 | 12 | 11-May-2023 |
| TRILOG Super Broadband Test Antenna | Schwarzbeck | VULB 9168 | 5942 | 24 | 03-Feb-2024 |
| Attenuator 4dB | Pasternack | PE7074-4 | 6202 | 24 | 16-Jul-2024 |

Table 21

TU - Traceability Unscheduled

3 Photographs

3.1 Test Setup Photographs

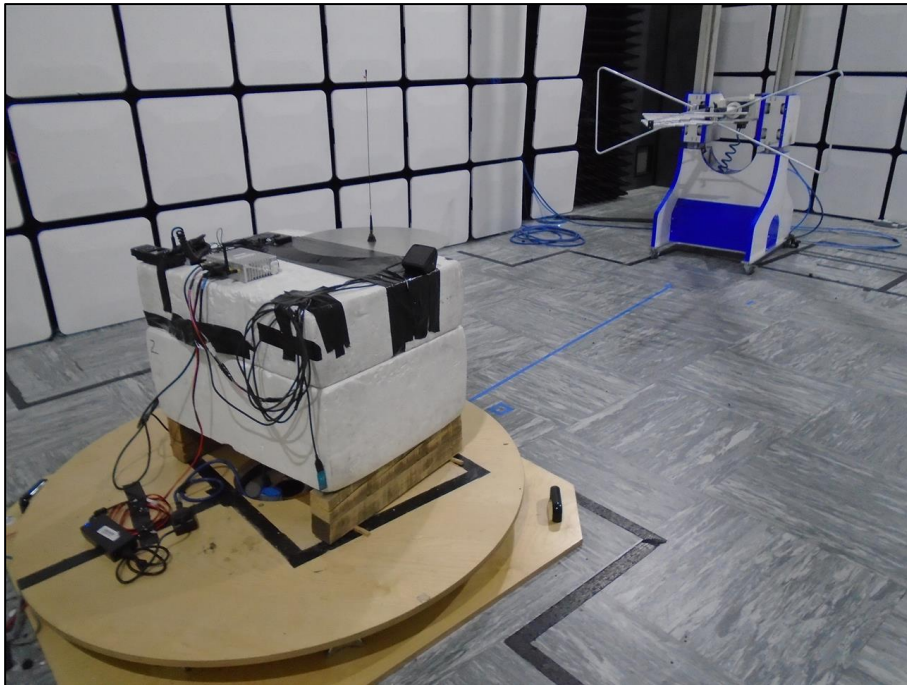


Figure 14 - Test Setup, Bluetooth - 30 MHz to 1 GHz

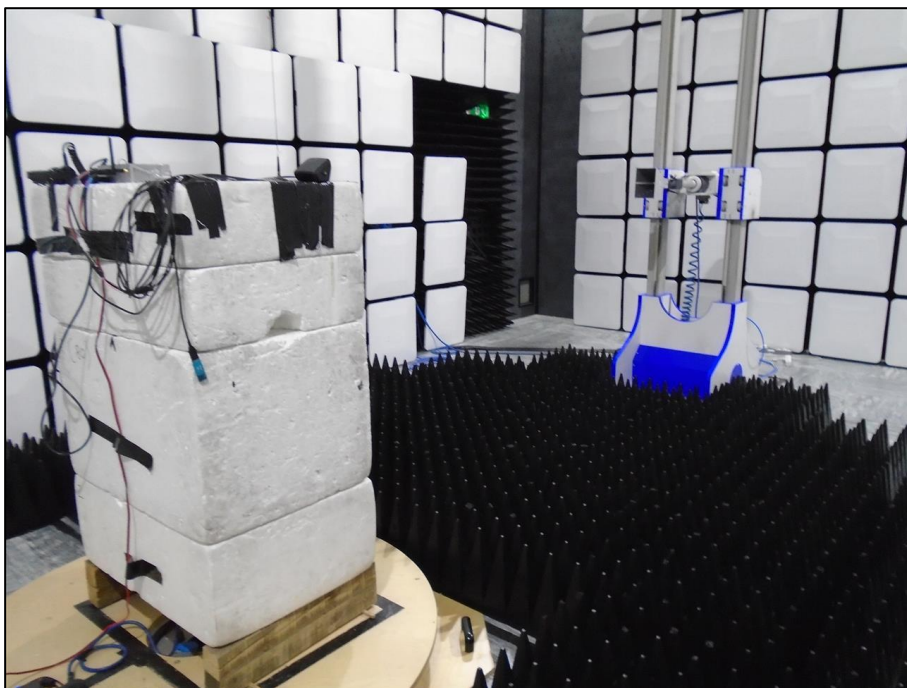


Figure 15 - Test Setup, Bluetooth - 1 GHz to 5 GHz

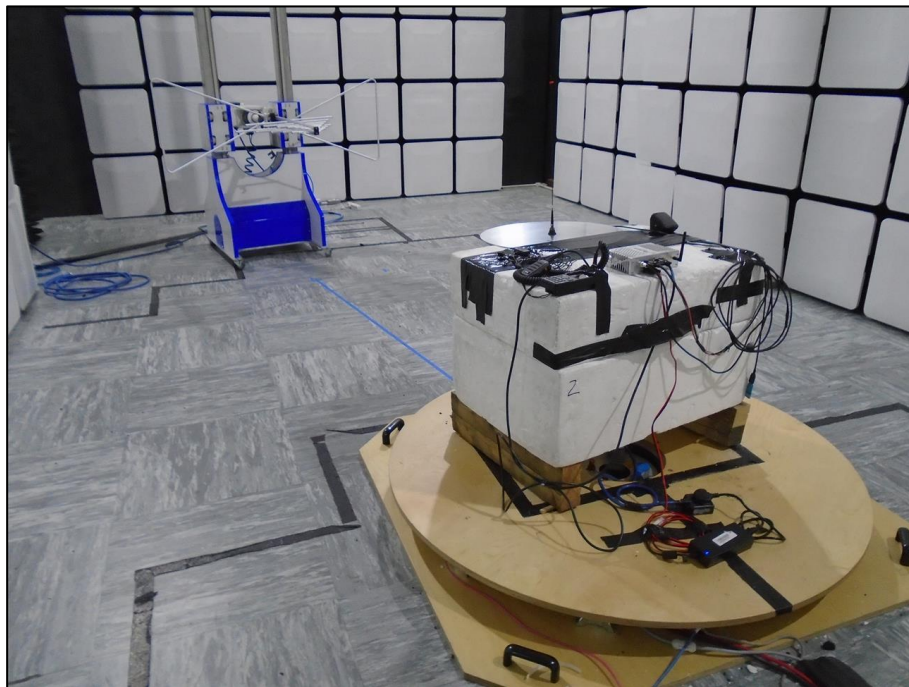


Figure 16 - Test Setup, Bluetooth Low Energy - 30 MHz to 1 GHz

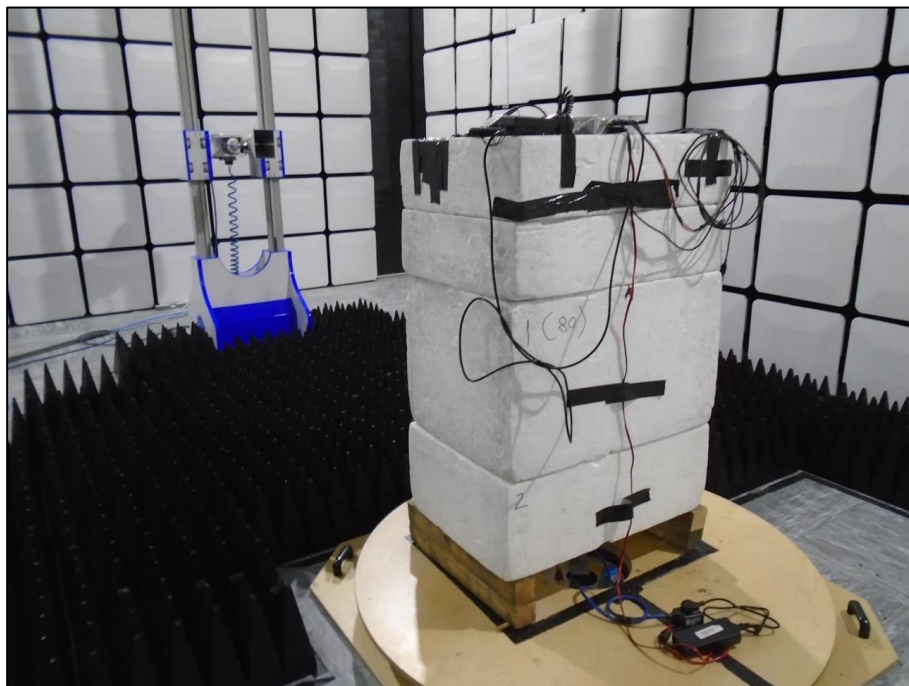


Figure 17 - Test Setup, Bluetooth Low Energy - 1 GHz to 5 GHz



4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

| Test Name | Measurement Uncertainty |
|-----------------------------|--|
| Spurious Radiated Emissions | 30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB |

Table 22

Measurement Uncertainty Decision Rule – Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2021, Clause 4.4.3 (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.