

# FCC Test Report

MiX Telematics International (Pty) Ltd  
Telematics Unit, Model: MiX 46MC-4G-B

In accordance with FCC CFR 47 Part 15C,  
FCC CFR 47 Part 22 and FCC CFR 47 Part 24

Prepared for: MiX Telematics Europe Ltd  
Cherry Orchard North  
Kembrey Business Park  
Swindon  
Wiltshire  
SN2 8UH  
United Kingdom



Add value.  
Inspire trust.

FCC ID: 2AFMS-4XMCXG

## COMMERCIAL-IN-CONFIDENCE

Document 75948420-05 Issue 01

### SIGNATURE

| NAME            | JOB TITLE       | RESPONSIBLE FOR      | ISSUE DATE  |
|-----------------|-----------------|----------------------|-------------|
| Stephen Marshal | Senior Engineer | Authorised Signatory | 05 May 2020 |

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 CFR 47 Part 15C, FCC CFR 47 Part 22 and FCC CFR 47 Part 24. The sample tested was found to comply with the requirements defined in the applied rules.

| RESPONSIBLE FOR | NAME          | DATE        | SIGNATURE |
|-----------------|---------------|-------------|-----------|
| Testing         | Graeme Lawler | 05 May 2020 |           |

FCC Accreditation  
90987 Octagon House, Fareham Test Laboratory

### EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC CFR 47 Part 15C: 2019, FCC CFR 47 Part 22: 2019 and FCC CFR 47 Part 24: 2019 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           | 05 May 2020   |

**Table 1**

### 1.2 Introduction

|                                  |                                                                                  |
|----------------------------------|----------------------------------------------------------------------------------|
| Applicant                        | MiX Telematics Europe Ltd                                                        |
| Manufacturer                     | MiX Telematics International (Pty) Ltd                                           |
| Model Number(s)                  | MiX 46MC-4G-B                                                                    |
| Manufacturer Declared Variant(s) | MiX 46MC-4G                                                                      |
| Serial Number(s)                 | 52000102                                                                         |
| Hardware Version(s)              | 1                                                                                |
| Software Version(s)              | 4.8                                                                              |
| Number of Samples Tested         | 1                                                                                |
| Test Specification/Issue/Date    | FCC CFR 47 Part 15: 2019<br>FCC CFR 47 Part 22: 2019<br>FCC CFR 47 Part 24: 2019 |
| Order Number                     | P0093369                                                                         |
| Date                             | 20-February-2020                                                                 |
| Date of Receipt of EUT           | 02-March-2020                                                                    |
| Start of Test                    | 18-March-2020                                                                    |
| Finish of Test                   | 22-March-2020                                                                    |
| Name of Engineer(s)              | Graeme Lawler                                                                    |
| Related Document(s)              | ANSI C63.26: 2015                                                                |



### 1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15C, FCC CFR 47 Part 22, FCC CFR 47 Part 24 and FCC CFR 47 Part 27 is shown below.

| Section                                                                      | Specification Clause  |            |            |           | Test Description                                        | Result | Comments/Base Standard |
|------------------------------------------------------------------------------|-----------------------|------------|------------|-----------|---------------------------------------------------------|--------|------------------------|
|                                                                              | Part 15C              | Part 22    | Part 24    | Part 27   |                                                         |        |                        |
| Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 2  |                       |            |            |           |                                                         |        |                        |
| 2.1                                                                          | 15.247 (d) and 15.205 |            | 24.238 (a) | -         | Radiated Spurious Emissions (Simultaneous Transmission) | Pass   | ANSI C63.26: 2015      |
| Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 4  |                       |            |            |           |                                                         |        |                        |
| 2.1                                                                          | 15.247 (d) and 15.205 | -          | -          | 27.53 (h) | Radiated Spurious Emissions (Simultaneous Transmission) | Pass   | ANSI C63.26: 2015      |
| Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 5  |                       |            |            |           |                                                         |        |                        |
| 2.1                                                                          | 15.247 (d) and 15.205 | 22.917 (a) |            | -         | Radiated Spurious Emissions (Simultaneous Transmission) | Pass   | ANSI C63.26: 2015      |
| Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 12 |                       |            |            |           |                                                         |        |                        |
| 2.1                                                                          | 15.247 (d) and 15.205 | -          | -          | 27.53 (g) | Radiated Spurious Emissions (Simultaneous Transmission) | Pass   | ANSI C63.26: 2015      |

**Table 2**



## 1.4 Application Form

### Equipment Description

|                                                                                                     |                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Technical Description:<br>(Please provide a brief description of the intended use of the equipment) | The MiX 46MC-4G is a fleet product that incorporates the latest market trends. It consists mainly of an on-board computer, an LTE CAT M1 modem with 2G fall-back, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives and 434 / 915 MHz short range transceiver. |
| Manufacturer:                                                                                       | MiX Telematics International (Pty) Ltd.                                                                                                                                                                                                                                                                   |
| Model:                                                                                              | MiX 46MC-4G; MiX 46MC-4G-B                                                                                                                                                                                                                                                                                |
| Part Number:                                                                                        | 440FT0194; 440FT0195                                                                                                                                                                                                                                                                                      |
| Hardware Version:                                                                                   | 1                                                                                                                                                                                                                                                                                                         |
| Software Version:                                                                                   | 4.8                                                                                                                                                                                                                                                                                                       |
| FCC ID (if applicable)                                                                              | 2AFMS-4XMCXG                                                                                                                                                                                                                                                                                              |
| IC (if applicable)                                                                                  |                                                                                                                                                                                                                                                                                                           |

### Intentional Radiators

| Technology                            | LTE Band 12     | LTE Band 13     | LTE Band 5      | LTE Band 4      | LTE Band 3      | LTE Band 2      | SRD915  | SRD2400   |
|---------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------|-----------|
| Frequency Band (MHz)                  | 699-716         | 777-787         | 824-849         | 1710-1755       | 1710-1785       | 1880-1910       | 902-928 | 2400-2480 |
| Conducted Declared Output Power (dBm) | 23              | 23              | 23              | 23              | 23              | 23              | 20      | 7         |
| Antenna Gain (dBi)                    | 0.76            | 1.39            | 0.21            | 1.46            | 1.46            | 2.07            | 0       | 1.4       |
| Supported Bandwidth(s) (MHz)          | 1.4             | 1.4             | 1.4             | 1.4             | 1.4             | 1.4             | 0.025   | 1         |
| Modulation Scheme(s)                  | QPSK/<br>16-QAM | QPSK/<br>16-QAM | QPSK/<br>16-QAM | QPSK/<br>16-QAM | QPSK/<br>16-QAM | QPSK/<br>16-QAM | 2FSK    | GFSK      |
| ITU Emission Designator               | 1M40W7D         | 1M40W7D         | 1M40W7D         | 1M40W7D         | 1M40W7D         | 1M40W7D         | 38K4F7D | 1M00G7D   |
| Bottom Frequency (MHz)                | 699             | 777             | 824             | 1710            | 1710            | 1850            | 902     | 2402      |
| Middle Frequency (MHz)                | 707.5           | 782             | 836.5           | 1747.5          | 1747.5          | 1880            | 915     | 2440      |
| Top Frequency (MHz)                   | 716             | 787             | 849             | 1755            | 1785            | 1910            | 928     | 2480      |

### 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               | 699 MHz  |
| Class A Digital Device (Use in commercial, industrial or business environment) <input type="checkbox"/> |          |
| Class B Digital Device (Use in residential environment only) <input checked="" type="checkbox"/>        |          |



### AC Power Source

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

### DC Power Source

|                        |                                            |   |
|------------------------|--------------------------------------------|---|
| Nominal voltage:       | 13.8/27.6 V DC                             | V |
| Extreme upper voltage: | 32                                         | V |
| Extreme lower voltage: | 10.5                                       | V |
| Max current:           | 2A typical; 4.5A absolute max (7.5A Fused) | A |

### Battery Power Source

|                                                                                                                                                                                                                   |     |                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------------------------------|
| Voltage:                                                                                                                                                                                                          | 3.2 | V                                             |
| End-point voltage:                                                                                                                                                                                                | 3.2 | V (Point at which the battery will terminate) |
| Alkaline <input type="checkbox"/> Leclanche <input checked="" type="checkbox"/> Lithium <input type="checkbox"/> Nickel Cadmium <input type="checkbox"/> Lead Acid* <input type="checkbox"/> *(Vehicle regulated) |     |                                               |
| Other <input type="checkbox"/> Please detail:                                                                                                                                                                     |     |                                               |

### Charging

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

### Temperature

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

### Antenna Characteristics

|                                                                                                                                                                                                                                                                                                                                     |       |                              |                 |                    |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------|-----------------|--------------------|-----|
| Antenna connector <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                               |       |                              | State impedance | 50                 | Ohm |
| Temporary antenna connector <input type="checkbox"/>                                                                                                                                                                                                                                                                                |       |                              | State impedance |                    | Ohm |
| Integral antenna <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                | Type: | LTE<br>BLE<br>SRD915<br>GNSS | Gain            | 3<br>1.4<br>0<br>4 | dBi |
| External antenna <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                | Type: | GNSS                         | Gain            | 4                  | dBi |
| For external antenna only:<br>Standard Antenna Jack <input checked="" type="checkbox"/> If yes, describe how user is prohibited from changing antenna (if not professional installed):<br>Equipment is only ever professionally installed <input checked="" type="checkbox"/><br>Non-standard Antenna Jack <input type="checkbox"/> |       |                              |                 |                    |     |



Ancillaries (if applicable)

|               |                                   |                    |              |
|---------------|-----------------------------------|--------------------|--------------|
| Manufacturer: | MiX Telematics                    | Part Number:       | 440FT0033    |
| Model:        | Main Harness MP10                 | Country of Origin: | South Africa |
| Manufacturer: | MiX Telematics                    | Part Number:       | 440FT0032    |
| Model:        | Code Plug Harness with Socket CP4 | Country of Origin: | South Africa |
| Manufacturer: | MiX Telematics                    | Part Number:       | 440FT0931    |
| Model:        | Serial Harness SR1                | Country of Origin: | South Africa |
| Manufacturer: | RF Design                         | Part Number:       | 440FT0933    |
| Model:        | External GNSS Antenna PA2         | Country of Origin: | South Africa |

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

|                |                    |
|----------------|--------------------|
| Name:          | Ben van der Merwe  |
| Position held: | Senior RF Engineer |
| Date:          | 29 April 2020      |



### 1.5 Manufacturer's Declared Variant(s)

The following product variants (with part numbers) are available:

| Part ID   | Official Name | Description                                                                                                                      |
|-----------|---------------|----------------------------------------------------------------------------------------------------------------------------------|
| 440FT0194 | MiX 46MC-4G   | MiX 4000 LTE with 2G fall back (Model 46MC-4G) Electronic Unit; with Magix 434MHz and 915MHz support.                            |
| 440FT0195 | MiX 46MC-4G-B | MiX 4000 LTE with 2G fall back (Model 46MC-4G-B) Electronic Unit with Battery (plugged in) with Magix 434MHz and 915MHz support. |

The variants MiX 46MC-4G and MiX 46MC-4G-B, present the same electrical, physical and electro mechanics characteristics, the same PCB (440AWZ124), layout and components.

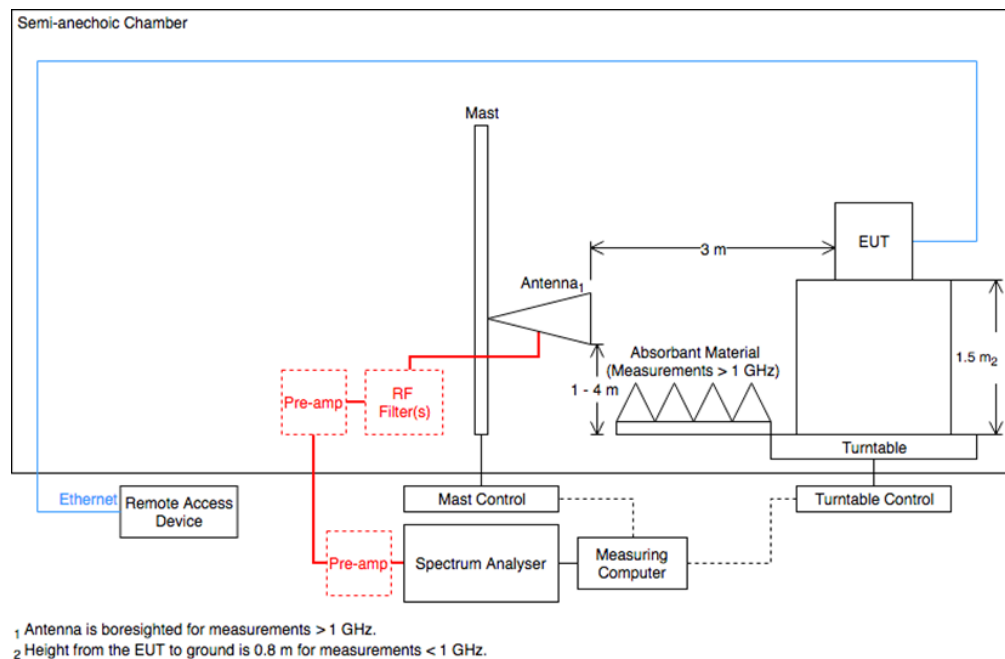
The only difference between them is that the model MiX 46MC-4G-B has an internal backup battery, allowing the device to work after the disconnection of the vehicle's battery.

## 1.6 Product Information

### 1.6.1 Technical Description

The MiX 46MC-4G is a fleet product that incorporates the latest market trends. It consists mainly of an on-board computer, an LTE CAT M1 modem with 2G fallback, a GNSS, an accelerometer, Bluetooth Low Energy, I/O, 2 x CAN, 2 x RS232, 4 x positive drives and 434 / 915 MHz short range transceiver.

### 1.6.2 Test Setup Diagram(s)



### Table 3

### 1.6.3 EUT Configuration and Rationale for Radiated Spurious Emissions

The EUT was placed on a non-conducting platform in a manner typical of a normal installation. The EUT would be fitted in multiple planes, pre-scans were performed with the EUT orientated in X, Y and Z planes with reference to the ground plane.

Ports on the EUT were terminated with loads as described in ANSI C63.4 clause 6.2.4

## 1.7 Deviations from the Standard

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

## 1.8 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: MiX 46MC-4G-B, Serial Number: 52000102 |                                                 |                        |                          |
| 0                                             | As supplied by the customer                     | Not Applicable         | Not Applicable           |

Table 4



## 1.9 Test Location

TÜV SÜD conducted the following tests at our Fareham Test Laboratory.

| Test Name                                                                    | Name of Engineer(s) | Accreditation |
|------------------------------------------------------------------------------|---------------------|---------------|
| Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 2  |                     |               |
| Radiated Spurious Emissions (Simultaneous Transmission)                      | Graeme Lawler       | UKAS          |
| Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 4  |                     |               |
| Radiated Spurious Emissions (Simultaneous Transmission)                      | Graeme Lawler       | UKAS          |
| Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 5  |                     |               |
| Radiated Spurious Emissions (Simultaneous Transmission)                      | Graeme Lawler       | UKAS          |
| Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 12 |                     |               |
| Radiated Spurious Emissions (Simultaneous Transmission)                      | Graeme Lawler       | UKAS          |

**Table 5**

Office Address:

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



## 2 Test Details

### 2.1 Radiated Spurious Emissions (Simultaneous Transmission)

#### 2.1.1 Specification Reference

FCC CFR 47 Part, Clause 15.247 (d) and 15.205  
FCC CFR 47 Part, Clause 22.917 (a)  
FCC CFR 47 Part, Clause 24.238 (a)  
FCC CFR 47 Part, Clause 27.53 (g)  
FCC CFR 47 Part, Clause 27.53 (h)

#### 2.1.2 Equipment Under Test and Modification State

MiX 46MC-4G-B, S/N: 52000102 - Modification State 0

#### 2.1.3 Date of Test

18-March-2020 to 22-March-2020

#### 2.1.4 Test Method

Testing was performed in accordance with ANSI C63.26, clause 5.5.

Prescans and final measurements were performed using the direct field strength method.

A preliminary profile of the Spurious Radiated Emissions was obtained up to the 10th harmonic by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

The Regulatory limit of -13dBm / MHz has been converted to a field strength limit in accordance with ANSI C63.26 clause 5.2.7 equation c)

Example calculation

$E \text{ (dBuV/m)} = \text{EIRP (dBm)} - 20\log(d) + 104.8$  where (d) is the measurement distance.

$E \text{ (dBuV/m)} = -13 - 20\log(3) + 104.8$

$E \text{ (dBuV/m)} = 82.26$

#### 2.1.5 Environmental Conditions

Ambient Temperature 18.0 - 19.9 °C

Relative Humidity 29.1 - 48.1 %

## 2.1.6 Test Results

### Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 2

The EUT was configured for simultaneous transmission in the following mode of operation:

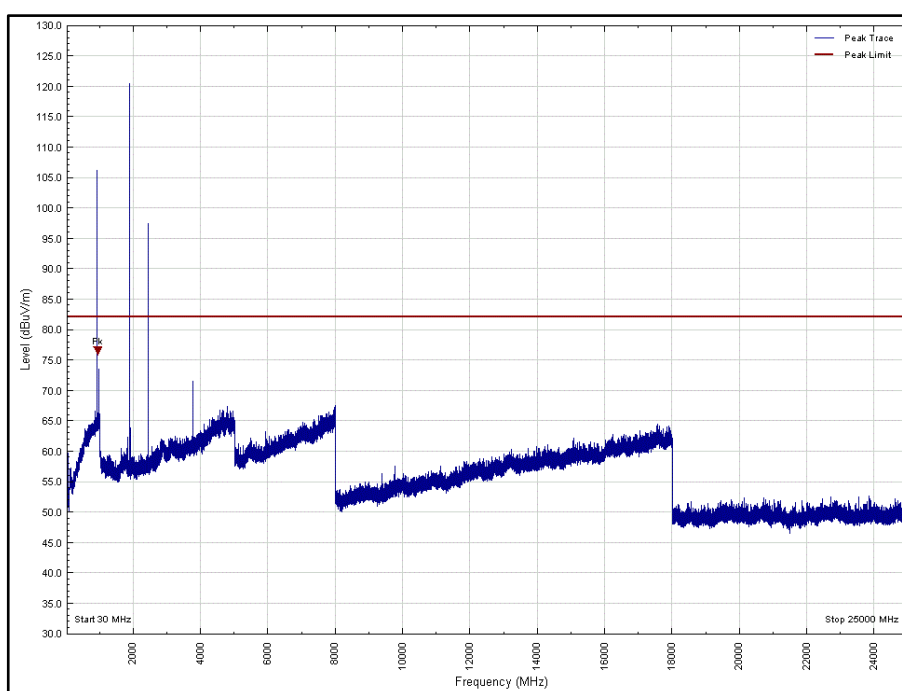
| Technology           | Frequency Band (MHz) | Channel Frequency (MHz) |
|----------------------|----------------------|-------------------------|
| Short Range Device   | 902 to 928           | 915.0                   |
| Bluetooth Low Energy | 2400 to 2483.5       | 2440.0                  |
| LTE FDD Band 2       | 1850 to 1910         | 1880.0                  |

**Table 6 - Modes of Operation**

| Frequency (MHz) | Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------------|----------------------|-------------|----------|-----------|-------------|--------------|-------------|
| 965.500         | 75.40                | 82.26                | 6.86        | Peak     | 55        | 117         | Vertical     | X           |

**Table 7 - 30 MHz to 25 GHz Emissions Results**

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



**Figure 1 - 30 MHz to 25 GHz, Vertical, X Orientation**



| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 965.463         | 74.49          | 82.26          | 7.77        | Peak     | 218       | 198         | Horizontal   | X           |

Table 8 - 30 MHz to 25 GHz Emissions Results

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

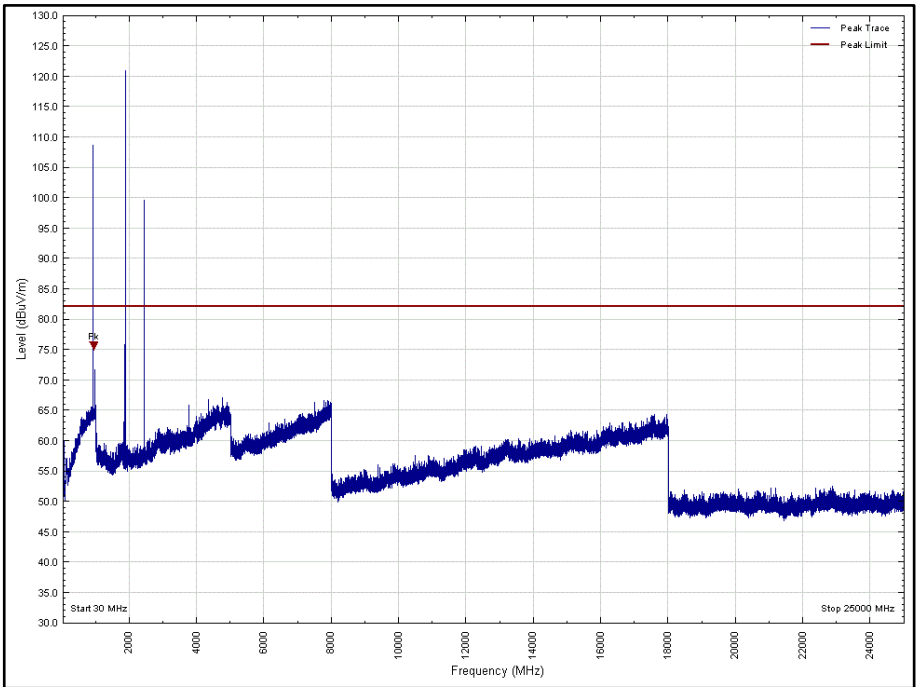


Figure 2 - 30 MHz to 25 GHz, Horizontal, X Orientation



| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 965.416         | 75.59          | 82.26          | 6.67        | Peak     | 166       | 104         | Vertical     | Y           |

Table 9 - 30 MHz to 25 GHz Emissions Results

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

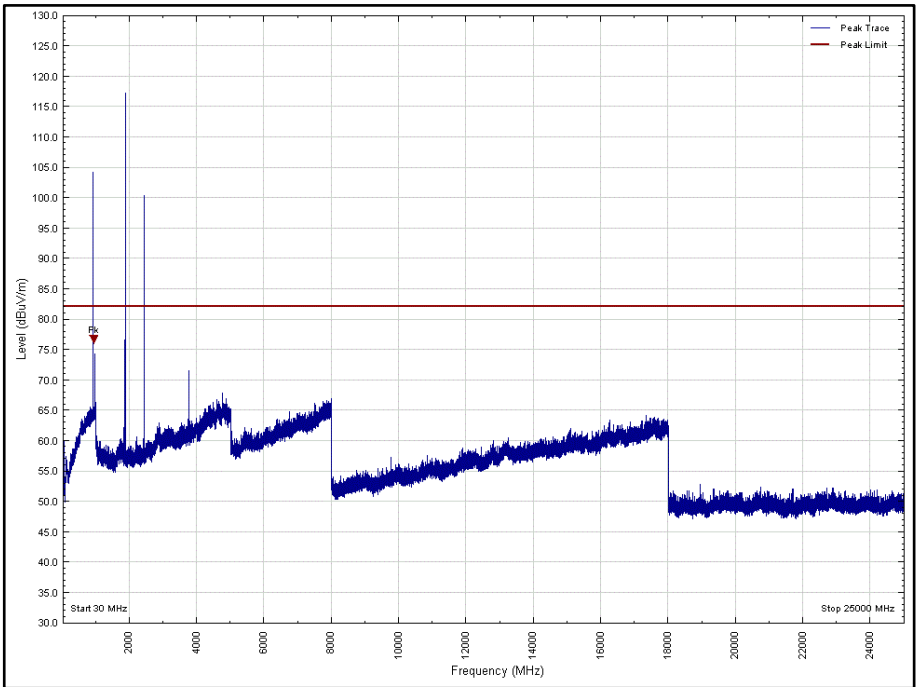


Figure 3 - 30 MHz to 25 GHz, Vertical, Y Orientation



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

Table 10 - 30 MHz to 25 GHz Emissions Results

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

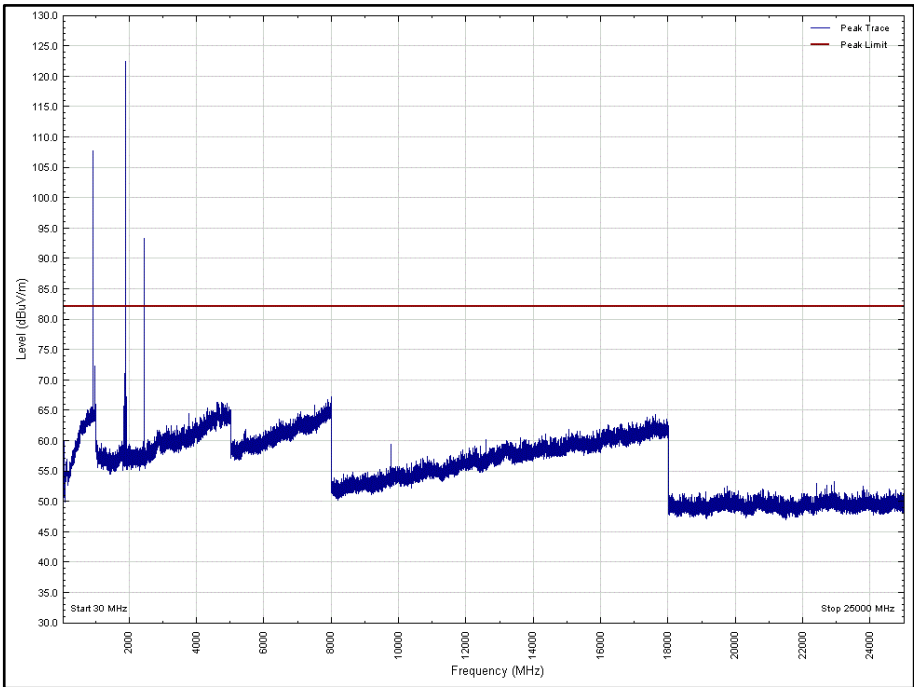


Figure 4 - 30 MHz to 25 GHz, Horizontal, Y Orientation



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

Table 11 - 30 MHz to 25 GHz Emissions Results

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

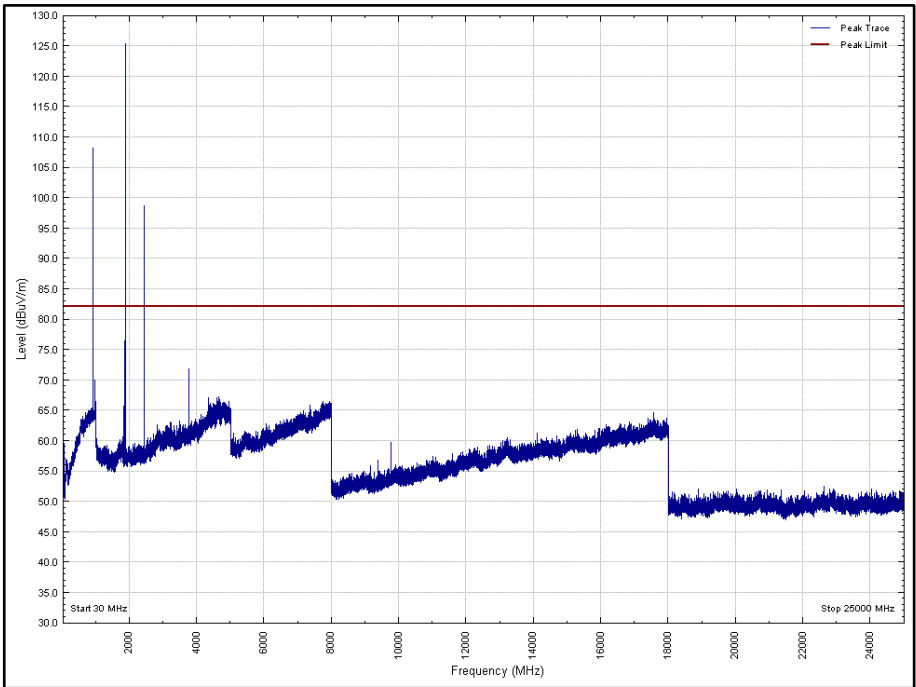


Figure 5 - 30 MHz to 25 GHz, Vertical, Z Orientation



| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 965.500         | 74.25          | 82.26          | 8.01        | Peak     | 118       | 192         | Horizontal   | Z           |

Table 12 - 30 MHz to 25 GHz Emissions Results

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

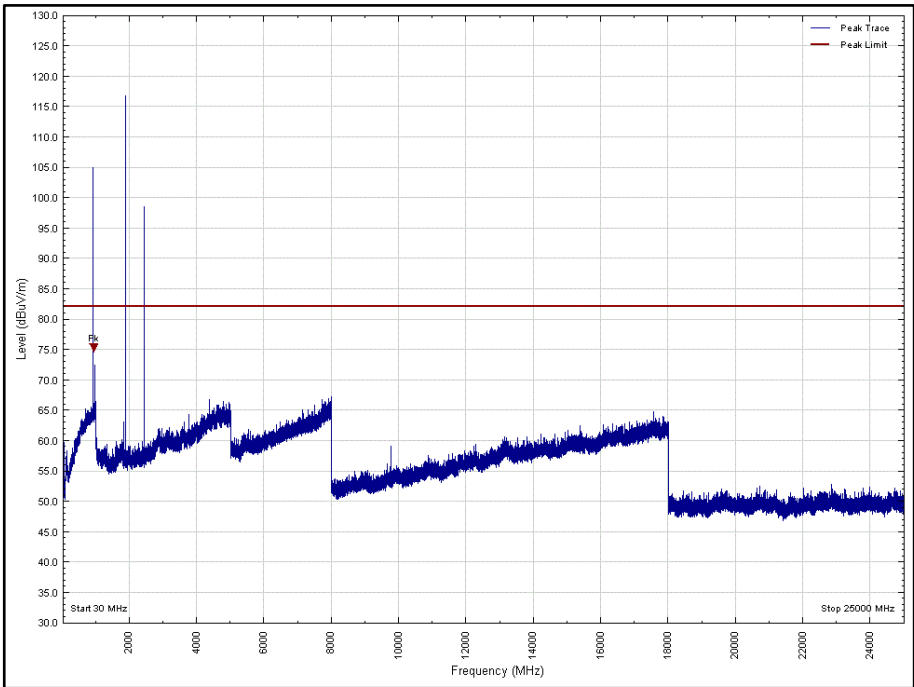


Figure 6 - 30 MHz to 25 GHz, Horizontal, Z Orientation

### Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 4

The EUT was configured for simultaneous transmission in the following mode of operation:

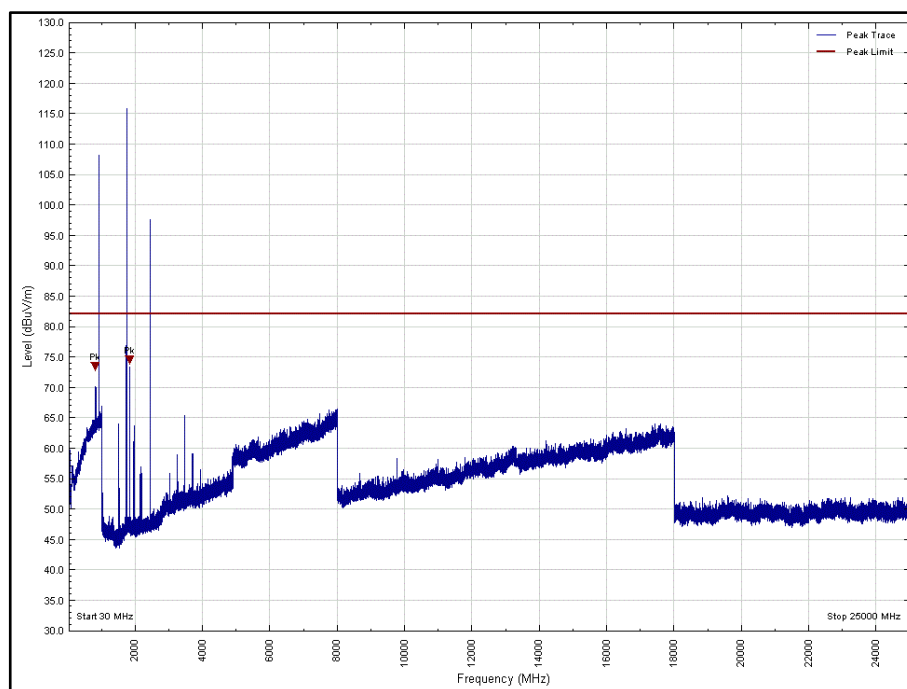
| Technology           | Frequency Band (MHz) | Channel Frequency (MHz) |
|----------------------|----------------------|-------------------------|
| Short Range Device   | 902 to 928           | 915.0                   |
| Bluetooth Low Energy | 2400 to 2483.5       | 2440.0                  |
| LTE FDD Band 4       | 1710 to 1755         | 1732.5                  |

**Table 13 - Modes of Operation**

| Frequency (MHz) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 817.237         | 72.38          | 82.26          | 9.88        | Peak     | 180       | 283         | Vertical     | X           |
| 1830.078        | 73.48          | 82.26          | 8.78        | Peak     | 96        | 160         | Vertical     | X           |

**Table 14 - 30 MHz to 25 GHz Emissions Results**

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



**Figure 7 - 30 MHz to 25 GHz, Vertical, X Orientation**



| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 817.347         | 73.84          | 82.26          | 8.42        | Peak     | 105       | 100         | Horizontal   | X           |
| 1830.012        | 73.00          | 82.26          | 9.26        | Peak     | 339       | 329         | Horizontal   | X           |

Table 15 - 30 MHz to 25 GHz Emissions Results

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

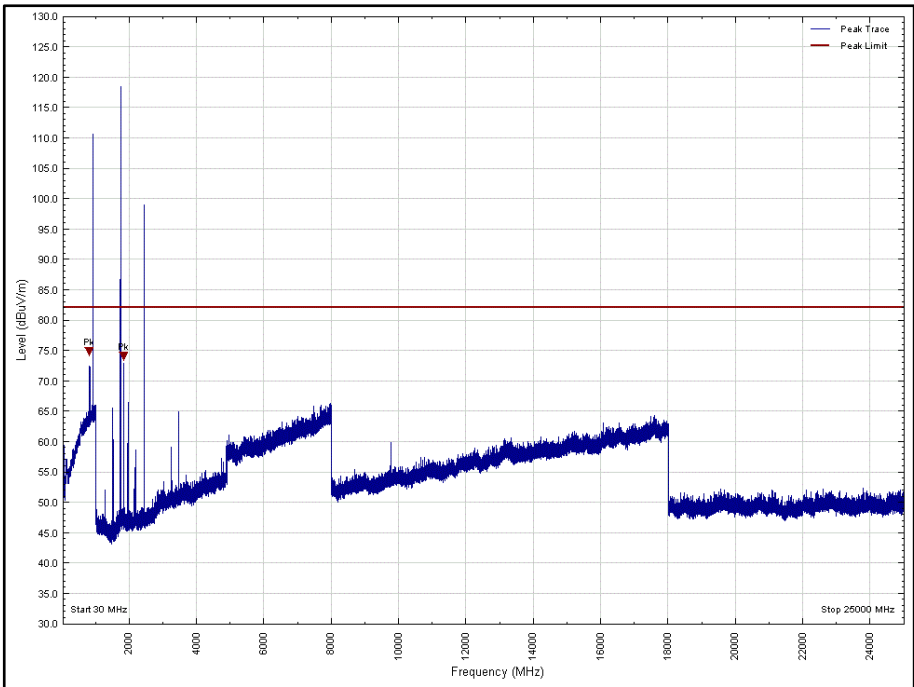


Figure 8 - 30 MHz to 25 GHz, Horizontal, X Orientation



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

Table 16 - 30 MHz to 25 GHz Emissions Results

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

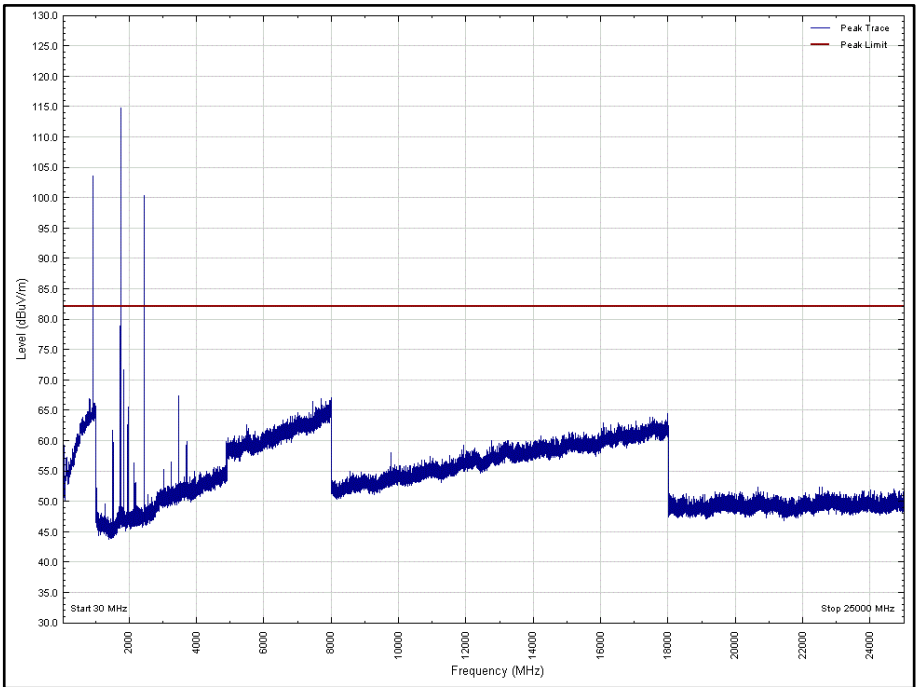


Figure 9 - 30 MHz to 25 GHz, Vertical, Y Orientation



| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 817.374         | 74.29          | 82.26          | 7.97        | Peak     | 255       | 100         | Horizontal   | Y           |

Table 17 - 30 MHz to 25 GHz Emissions Results

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

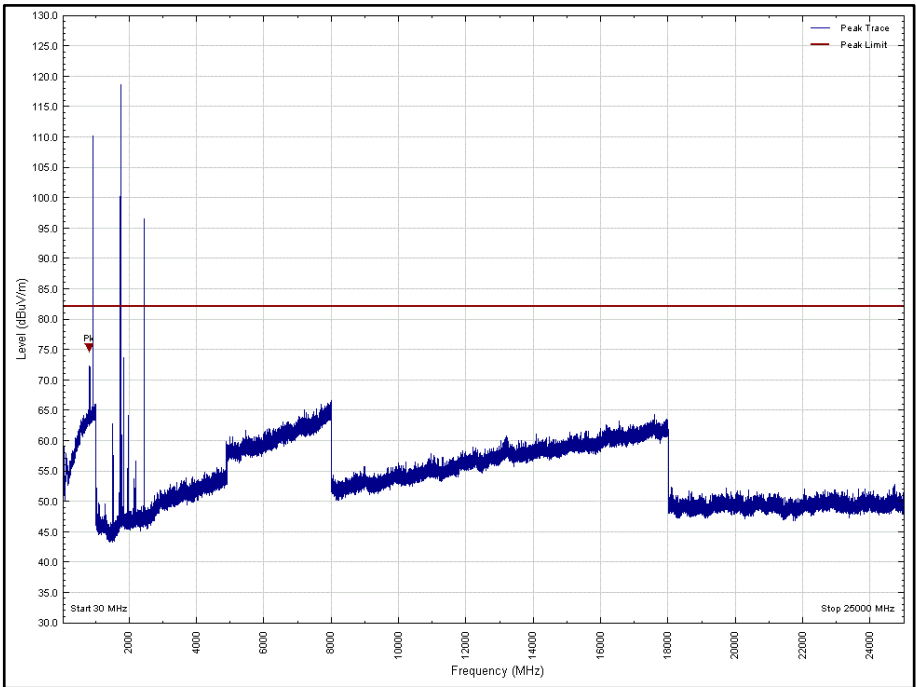


Figure 10 - 30 MHz to 25 GHz, Horizontal, Y Orientation



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

Table 18 - 30 MHz to 25 GHz Emissions Results

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

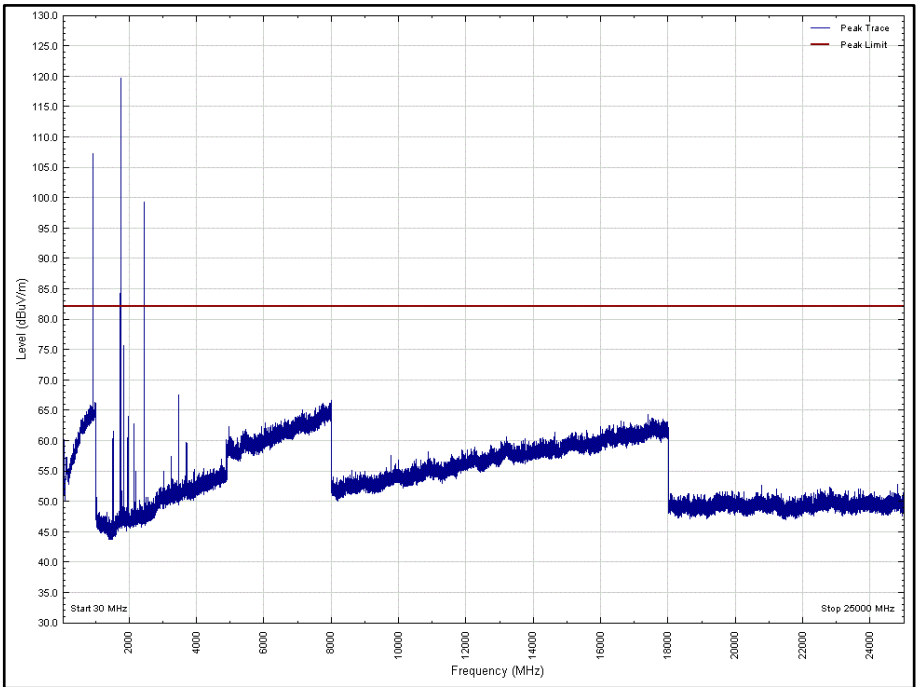


Figure 11 - 30 MHz to 25 GHz, Vertical, Z Orientation



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

Table 19 - 30 MHz to 25 GHz Emissions Results

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

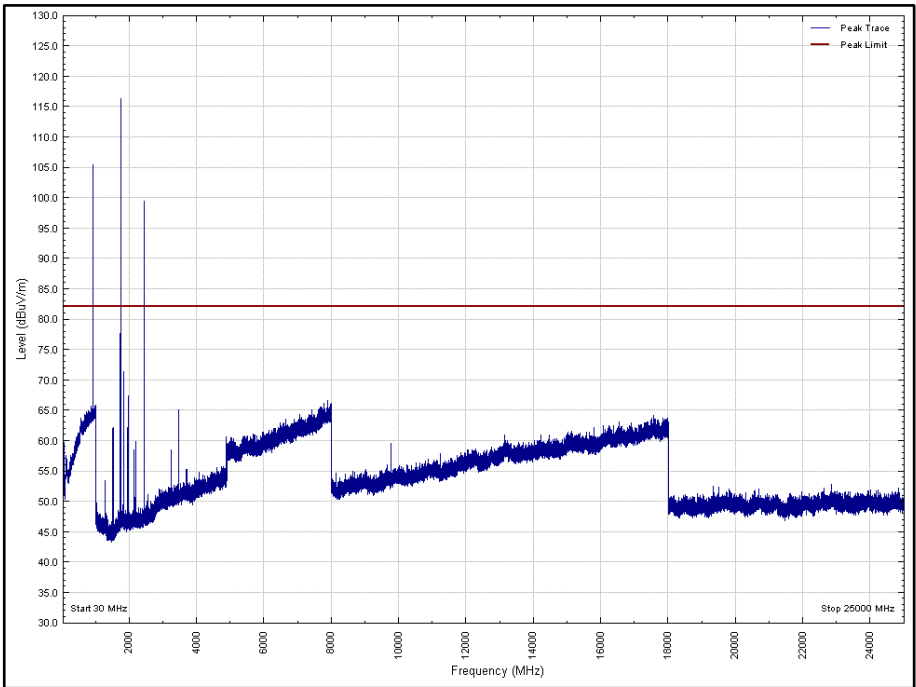


Figure 12 - 30 MHz to 25 GHz, Horizontal, Z Orientation



Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 5

The EUT was configured for simultaneous transmission in the following mode of operation:

| Technology           | Frequency Band (MHz) | Channel Frequency (MHz) |
|----------------------|----------------------|-------------------------|
| Short Range Device   | 902 to 928           | 915.0                   |
| Bluetooth Low Energy | 2400 to 2483.5       | 2440.0                  |
| LTE FDD Band and 5   | 824 to 849           | 836.5                   |

Table 20 - Modes of Operation

| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 757.626         | 76.74          | 82.26          | 5.52        | Peak     | 22        | 191         | Vertical     | X           |

Table 21 - 30 MHz to 25 GHz Emissions Results

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

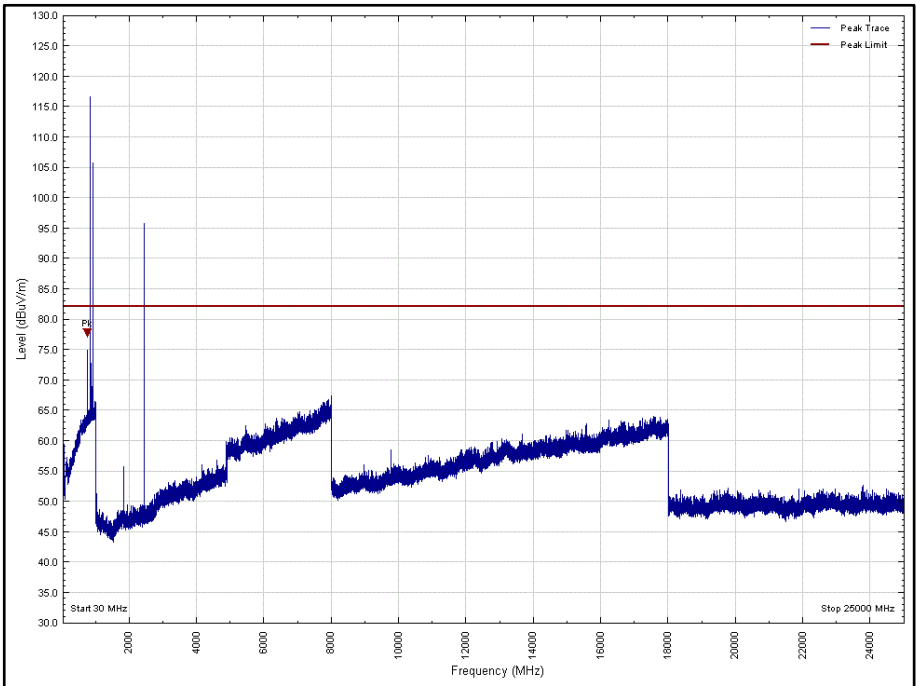


Figure 13 - 30 MHz to 25 GHz, Vertical, X Orientation



| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 758.26          | 79.05          | 82.26          | 3.21        | Peak     | 222       | 271         | Horizontal   | X           |

Table 22 - 30 MHz to 25 GHz Emissions Results

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

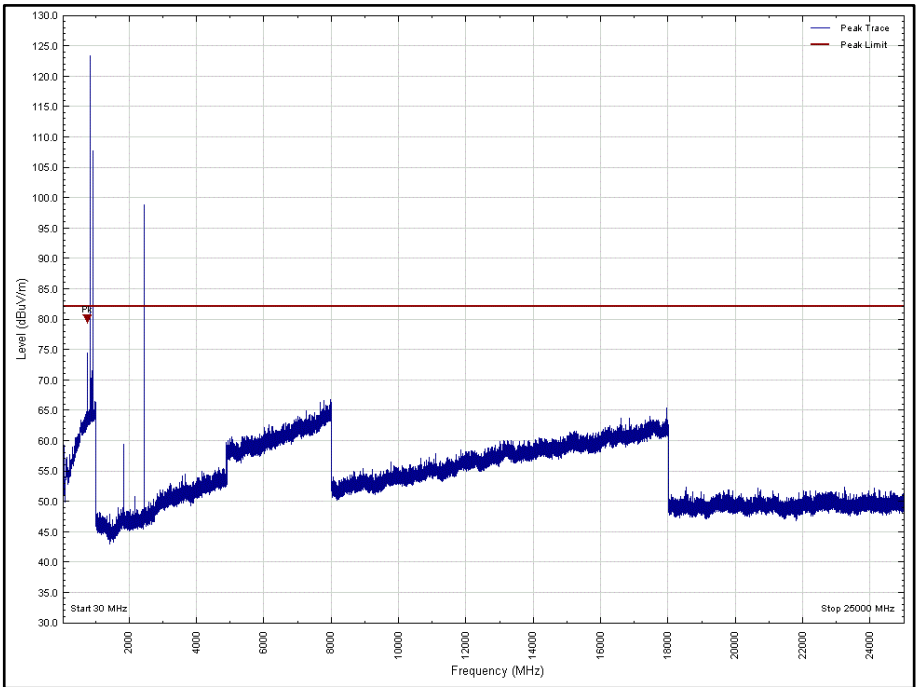


Figure 14 - 30 MHz to 25 GHz, Horizontal, X Orientation



| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 758.505         | 77.73          | 82.26          | 4.53        | Peak     | 186       | 386         | Vertical     | Y           |

Table 23 - 30 MHz to 25 GHz Emissions Results

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

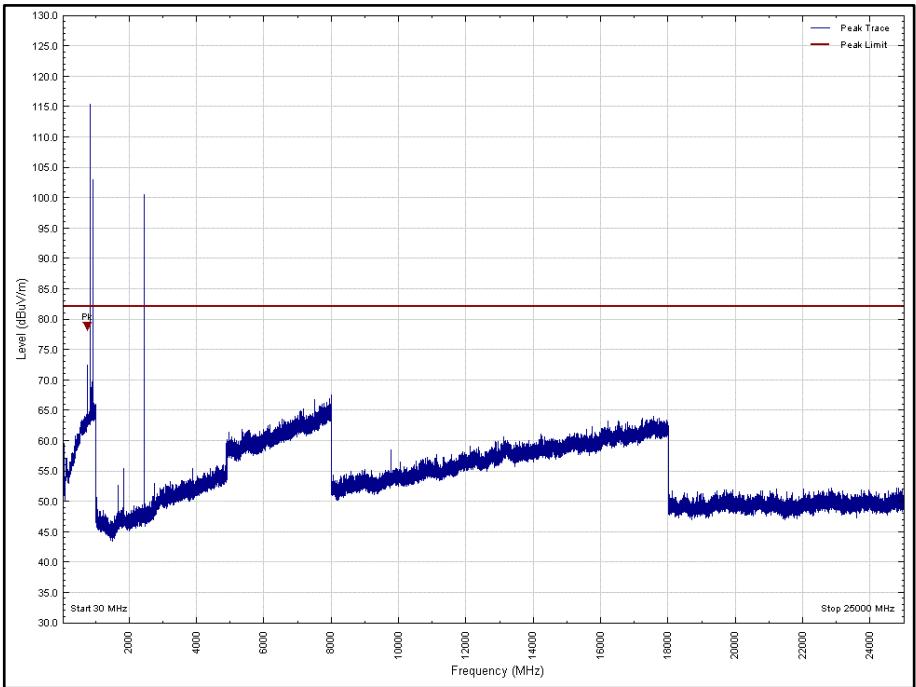


Figure 15 - 30 MHz to 25 GHz, Vertical, Y Orientation



| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 758.368         | 78.53          | 82.26          | 3.73        | Peak     | 329       | 115         | Horizontal   | Y           |

Table 24 - 30 MHz to 25 GHz Emissions Results

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

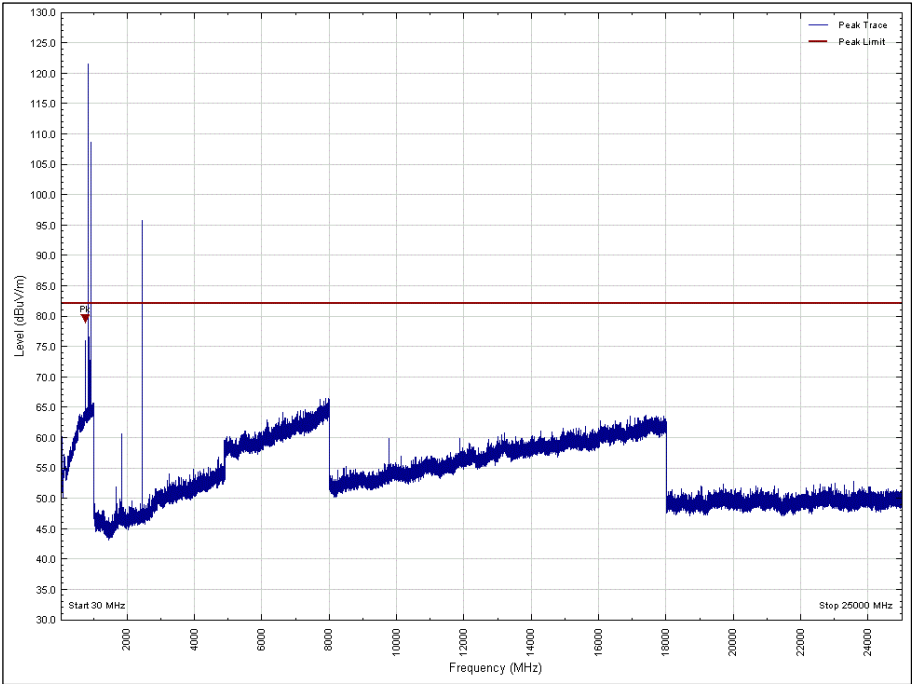


Figure 16 - 30 MHz to 25 GHz, Horizontal, Y Orientation



| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 758.421         | 75.80          | 82.26          | 6.46        | Peak     | 358       | 100         | Vertical     | Z           |

Table 25 - 30 MHz to 25 GHz Emissions Results

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

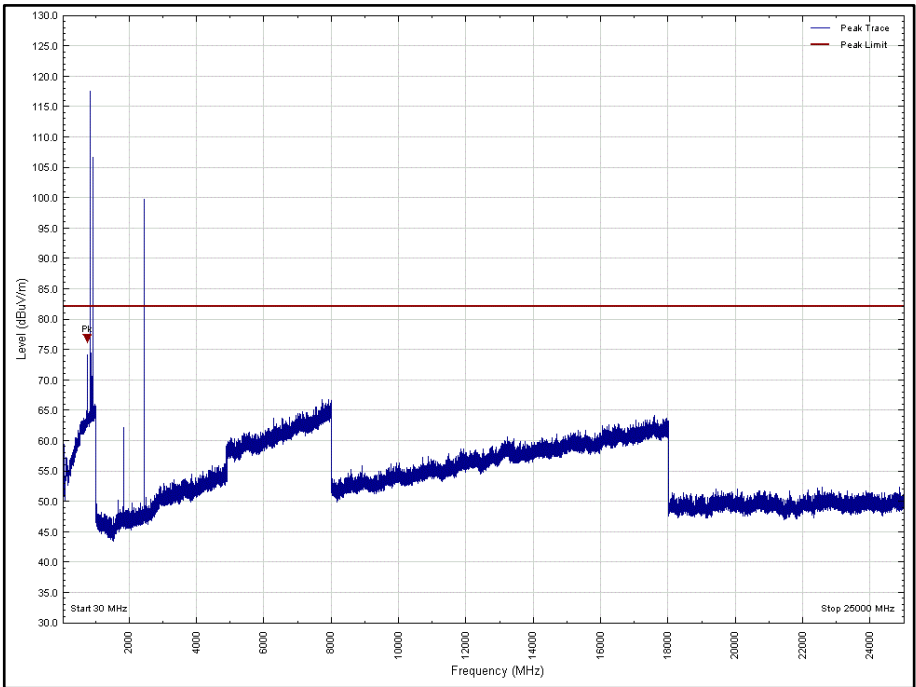


Figure 17 - 30 MHz to 25 GHz, Vertical, Z Orientation



| Frequency (MHz) | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Detector | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|----------------|----------------|-------------|----------|-----------|-------------|--------------|-------------|
| 758.526         | 79.09          | 82.26          | 3.17        | Peak     | 191       | 278         | Horizontal   | Z           |

Table 26 - 30 MHz to 25 GHz Emissions Results

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

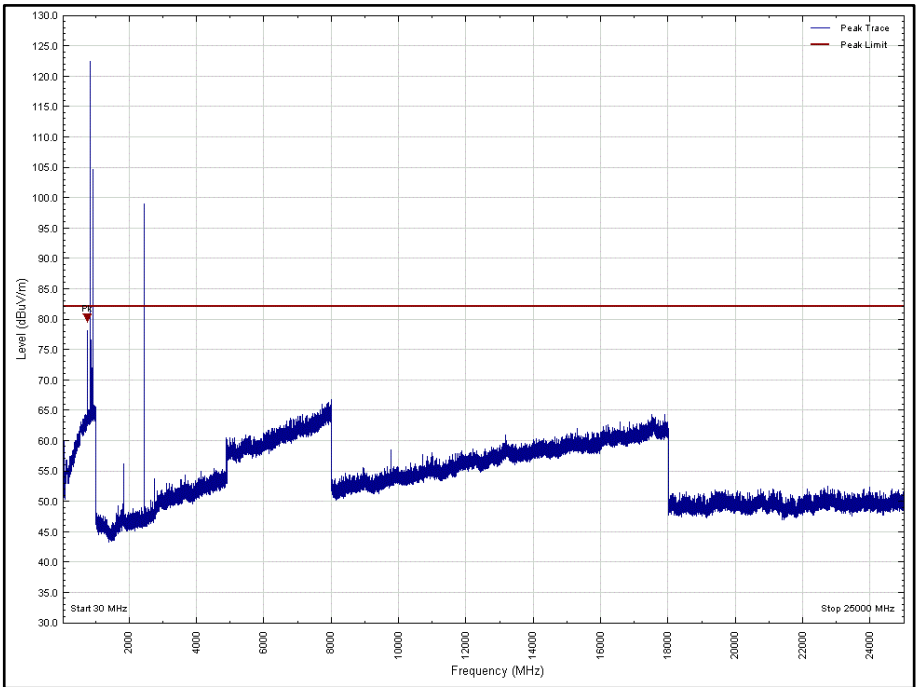


Figure 18 - 30 MHz to 25 GHz, Horizontal, Z Orientation



Bluetooth Low Energy + 915 MHz SRD + LTE FDD Band 12

The EUT was configured for simultaneous transmission in the following mode of operation:

| Technology           | Frequency Band (MHz) | Channel Frequency (MHz) |
|----------------------|----------------------|-------------------------|
| Short Range Device   | 902 to 928           | 915.0                   |
| Bluetooth Low Energy | 2400 to 2483.5       | 2440.0                  |
| LTE FDD Band and 12  | 699 to 716           | 707.5                   |

Table 27 - Modes of Operation

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

Table 28 - 30 MHz to 25 GHz Emissions Results

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

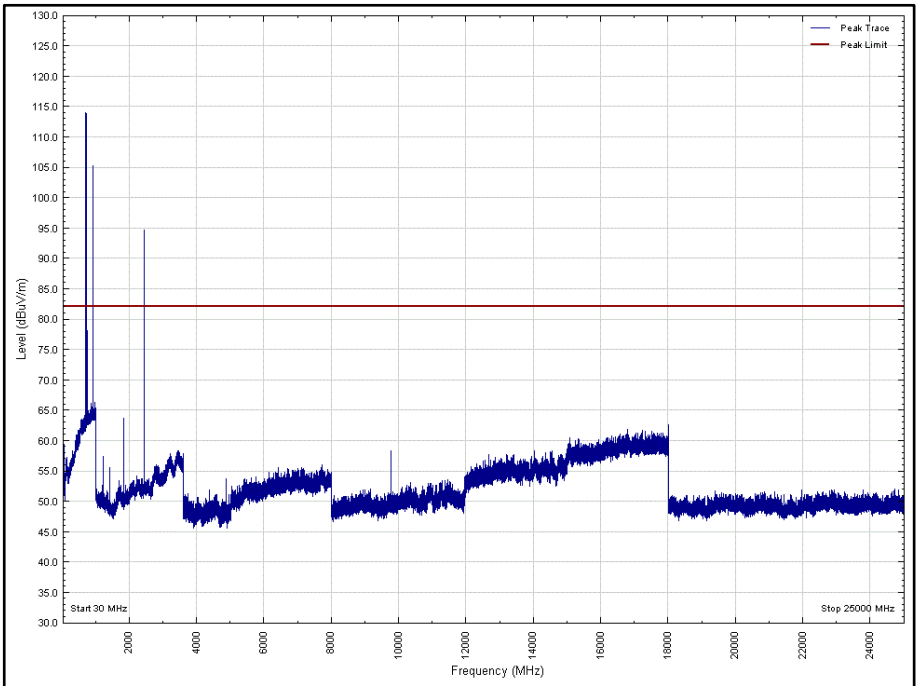


Figure 19 - 30 MHz to 25 GHz, Vertical, X Orientation



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

Table 29 - 30 MHz to 25 GHz Emissions Results

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

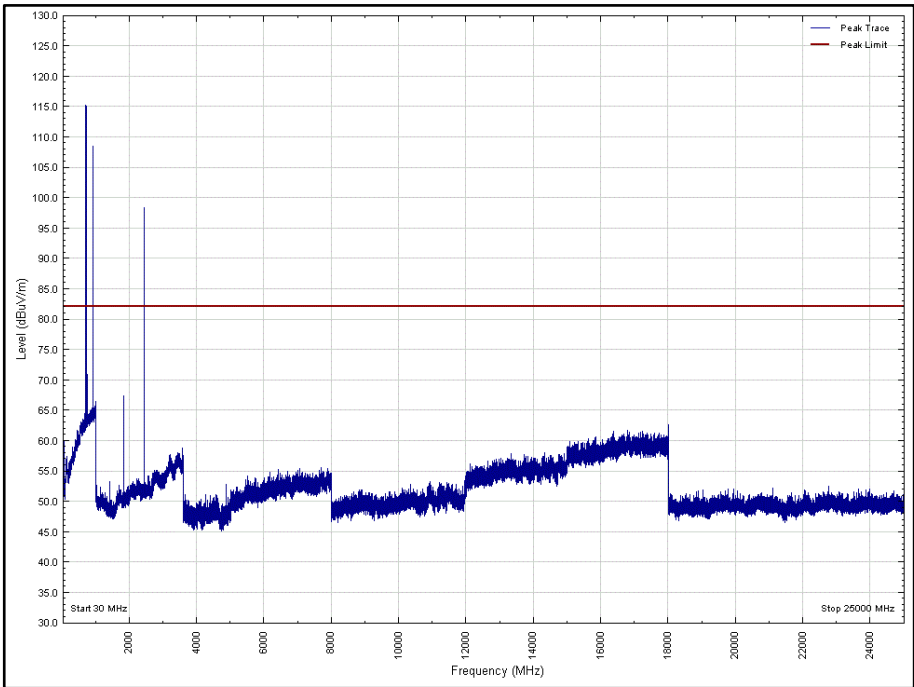


Figure 20 - 30 MHz to 25 GHz, Horizontal, X Orientation



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

Table 30 - 30 MHz to 25 GHz Emissions Results

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

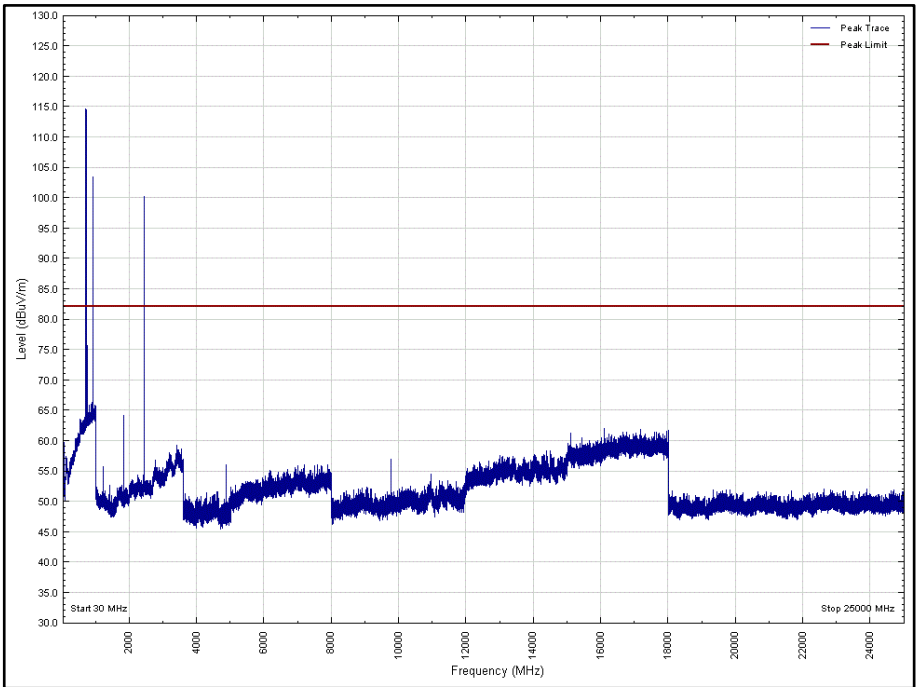


Figure 21 - 30 MHz to 25 GHz, Vertical, Y Orientation



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

Table 31 - 30 MHz to 25 GHz Emissions Results

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

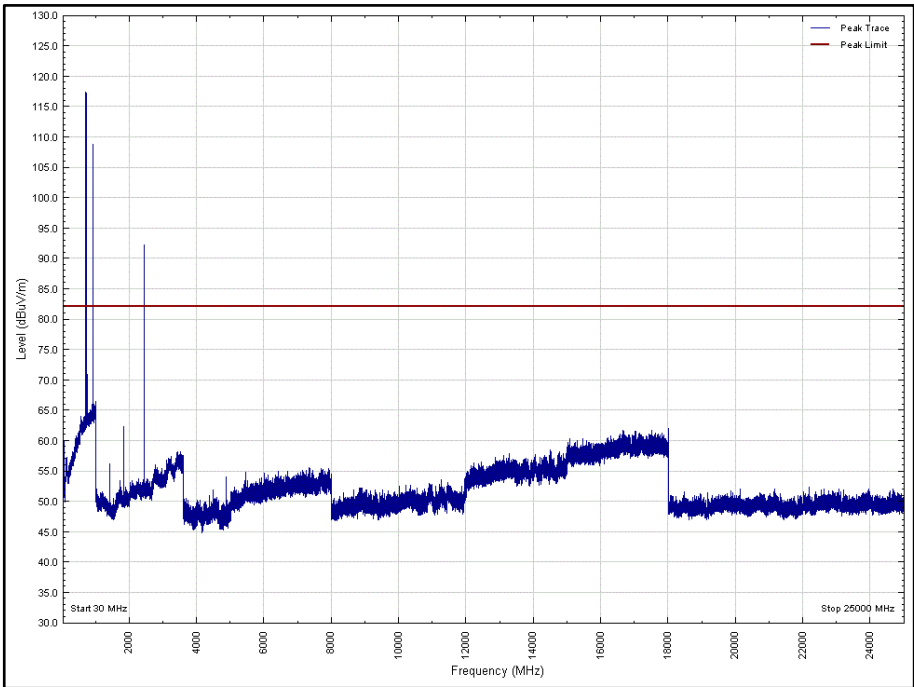


Figure 22 - 30 MHz to 25 GHz, Horizontal, Y Orientation



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

Table 32 - 30 MHz to 25 GHz Emissions Results

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

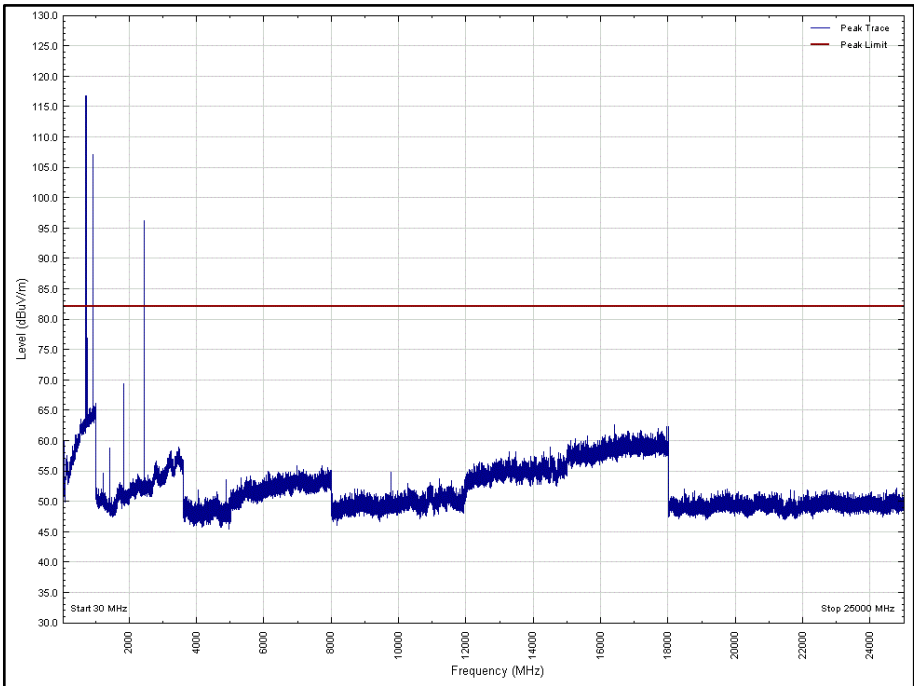


Figure 23 - 30 MHz to 25 GHz, Vertical, Z Orientation



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

Table 33 - 30 MHz to 25 GHz Emissions Results

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

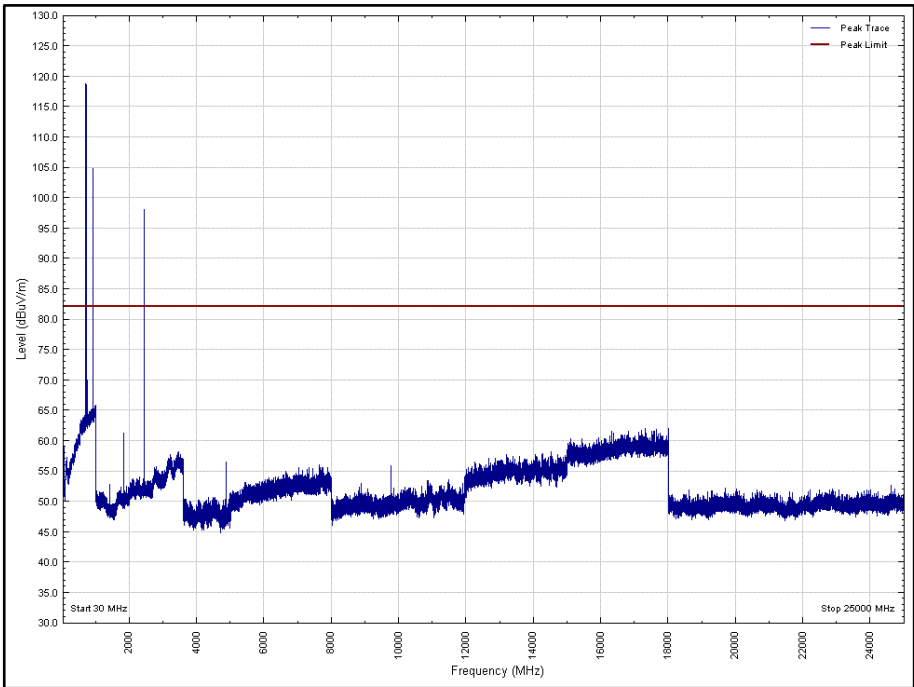
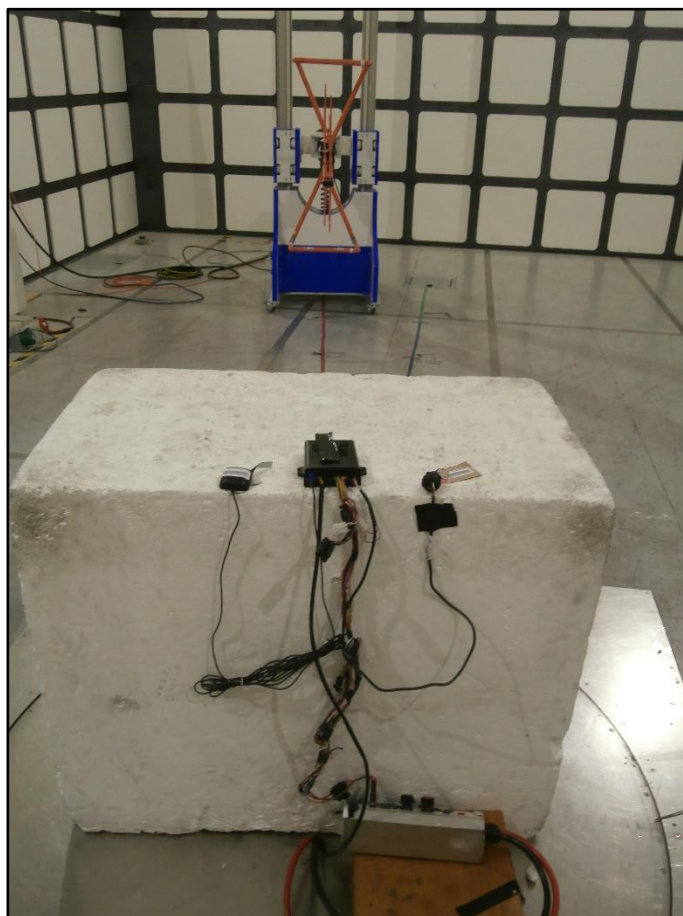
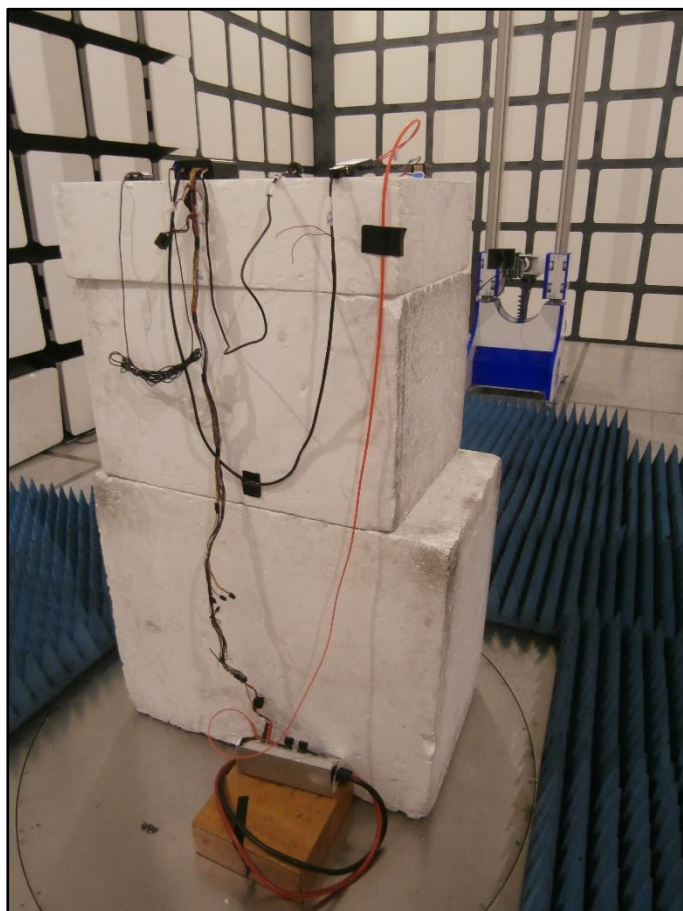


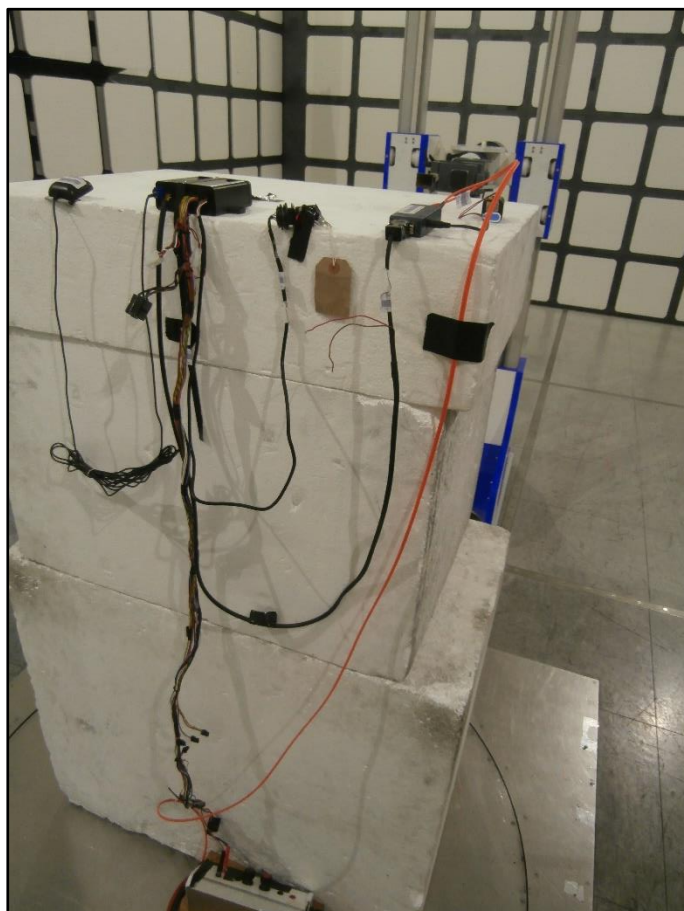
Figure 24 - 30 MHz to 25 GHz, Horizontal, Z Orientation



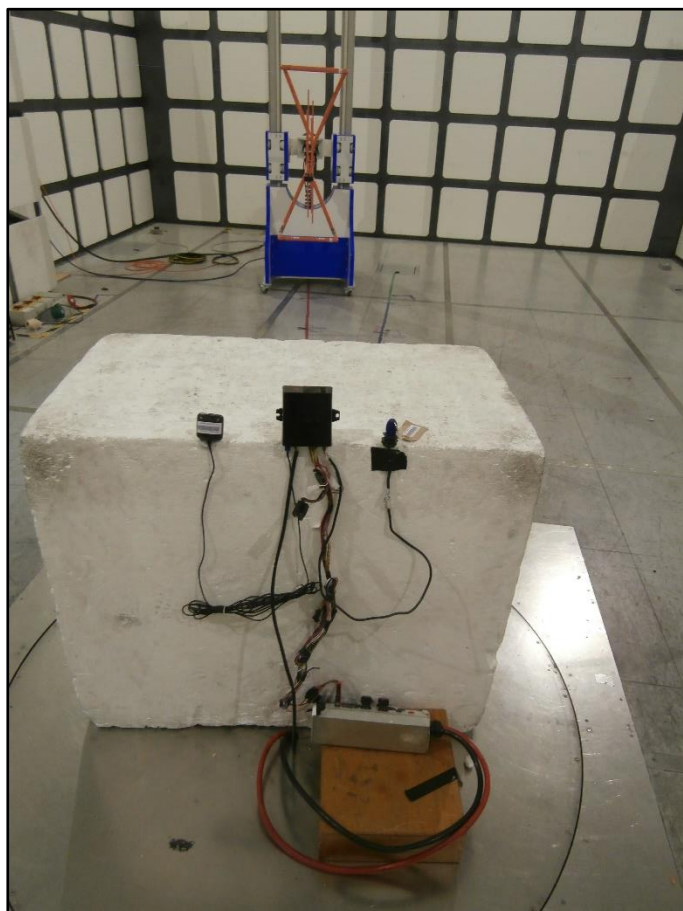
**Figure 25 – Test Setup – 30 MHz to 1 GHz, X Orientation**



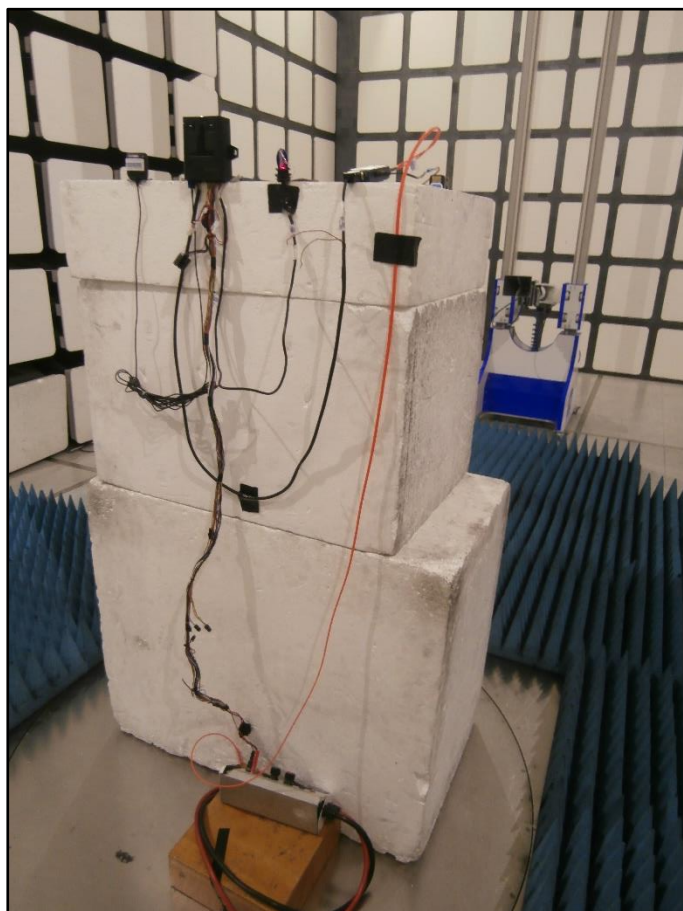
**Figure 26 – Test Setup – 1 GHz to 18 GHz, X Orientation**



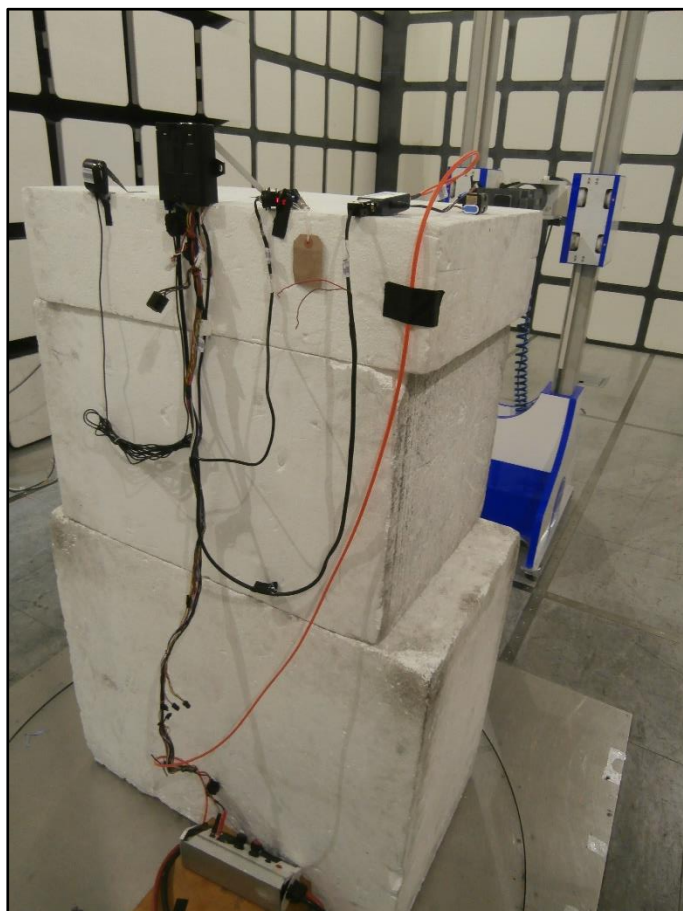
**Figure 27 – Test Setup – 18 GHz to 25 GHz, X Orientation**



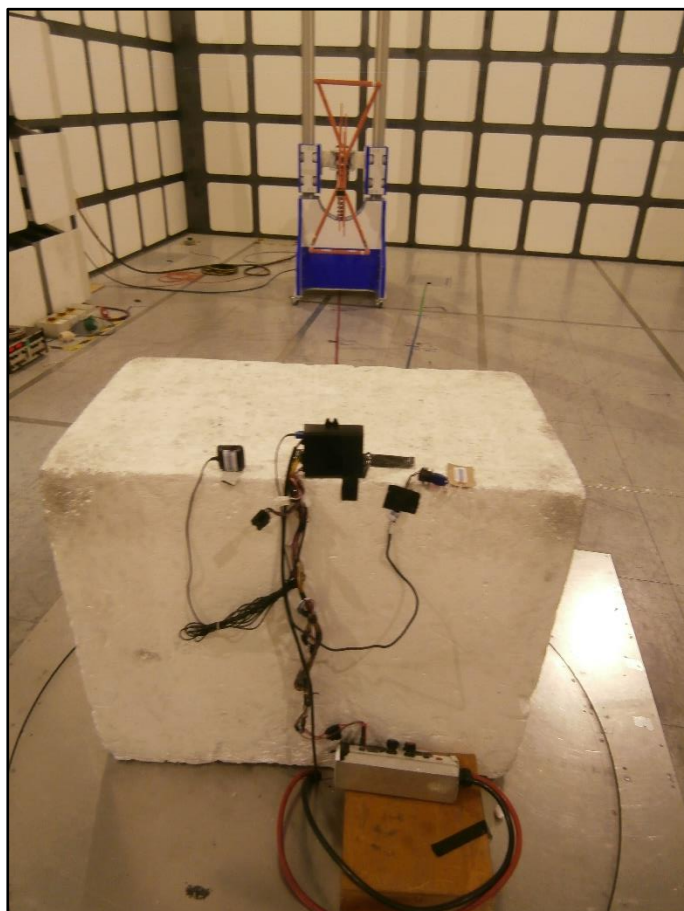
**Figure 28 – Test Setup – 30 MHz to 1 GHz, Y Orientation**



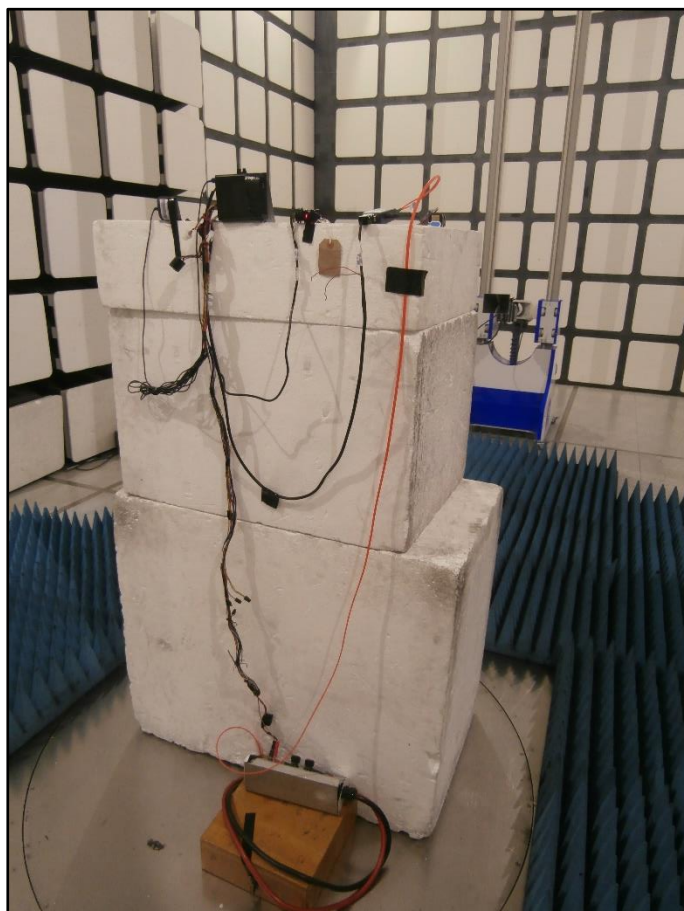
**Figure 29 – Test Setup – 1 GHz to 18 GHz, Y Orientation**



**Figure 30 – Test Setup – 18 GHz to 25 GHz, Y Orientation**



**Figure 31 – Test Setup – 30 MHz to 1 GHz, Z Orientation**



**Figure 32 – Test Setup – 1 GHz to 18 GHz, Z Orientation**

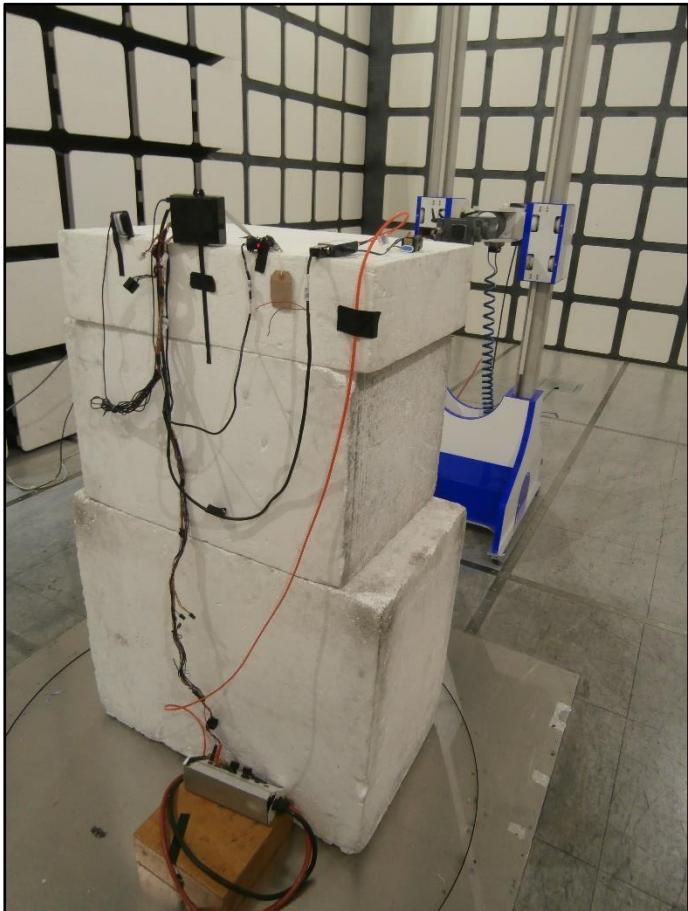


Figure 33 – Test Setup – 18 GHz to 25 GHz, Z Orientation

FCC 47 CFR Parts 15.247(d), 15.205, 22.917(a), 24.238(a), 27.53 (h) and 27.53 (g)

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                                |
|-----------------------------------------------------|--------------------------------------|
| Part 22.917 (a), 24.238(a), 27.53 (g) and 27.53 (h) | -13 dBm (EIRP) / 82.26 dBμV/m at 3m. |

Table 34 - Limit Table



## 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 |
|-------------------------------------------|-----------------------|--------------------|-------|-----------------------------|-----------------|
| Antenna 18-40GHz (Double Ridge Guide)     | Link Microtek Ltd     | AM180HA-K-TU2      | 230   | 24                          | 02-May-2020     |
| 18GHz - 40GHz Pre-Amplifier               | Phase One             | PSO4-0087          | 1534  | 12                          | 18-Feb-2021     |
| Screened Room (5)                         | Rainford              | Rainford           | 1545  | 36                          | 23-Jan-2021     |
| Turntable Controller                      | Inn-Co GmbH           | CO 1000            | 1606  | -                           | TU              |
| DC Power Supply                           | Hewlett Packard       | 6269B              | 1909  | -                           | TU              |
| Antenna with permanent attenuator (Bilog) | Chase                 | CBL6143            | 2904  | 24                          | 30-Sep-2021     |
| Comb Generator                            | Schaffner             | RSG1000            | 3034  | -                           | TU              |
| EMI Test Receiver                         | Rohde & Schwarz       | ESU40              | 3506  | 12                          | 03-Jan-2021     |
| '2.92mm' - '2.92mm' RF Cable (2m)         | Rhophase              | KPS-1503-2000-KPS  | 3695  | 12                          | 11-Jun-2020     |
| Cable 1503 2M 2.92(P)m 2.92(P)m           | Rhophase              | KPS-1503A-2000-KPS | 4293  | 12                          | 08-Nov-2020     |
| Cable (Yellow, Rx, Km-Km 2m)              | Scott Cables          | KPS-1501-2000-KPS  | 4527  | 6                           | 09-Jun-2020     |
| Mast Controller                           | Maturo GmbH           | NCD                | 4810  | -                           | TU              |
| Tilt Antenna Mast                         | Maturo GmbH           | TAM 4.0-P          | 4811  | -                           | TU              |
| Double Ridge Broadband Horn Antenna       | Schwarzbeck           | BBHA 9120 B        | 4848  | 12                          | 10-Mar-2021     |
| Hygrometer                                | Rotronic              | HP21               | 4989  | 12                          | 02-May-2020     |
| EmX Emissions Software                    | TUV SUD               | EmX V.V1.5.8       | 5125  | -                           | Software        |
| 8 Meter Cable                             | Teledyne              | PR90-088-8MTR      | 5212  | 12                          | 30-Aug-2020     |
| Cellular Signalling Box                   | Keysight Technologies | UXM                | 5267  | 12                          | 05-Mar-2021     |
| Antenna (DRG Horn 7.5-18GHz)              | Schwarzbeck           | HWRD750            | 5348  | 12                          | 04-Sep-2020     |
| EMI Test Receiver                         | Rohde & Schwarz       | ESW44              | 5527  | 12                          | Class 1 (Ext)   |

**Table 35**



### 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: $\pm 5.2$ dB<br>1 GHz to 40 GHz: $\pm 6.3$ dB |

**Table 36**

#### 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.