

Report on the FCC and IC Testing of:
Frontier Smart Technologies Limited
Minuet 2 Module, Model FS5352 and Minuet 2
Voice Reference Platform, Model FS6626
In accordance with FCC 47 CFR Part 15B and
ICES-003

Prepared for: Frontier Smart Technologies Limited
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UNITED KINGDOM



Add value.
Inspire trust.

FCC ID: YYX-FS5352 IC: 11458A-FS5352

COMMERCIAL-IN-CONFIDENCE

Document Number: 75946124-02 | Issue: 01

SIGNATURE

A handwritten signature of "Andy Lawson".

| NAME | JOB TITLE | RESPONSIBLE FOR | ISSUE DATE |
|-------------|-----------------|----------------------|-------------------|
| Andy Lawson | Senior Engineer | Authorised Signatory | 13 September 2019 |

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15B and ICES-003. The sample tested was found to comply with the requirements defined in the applied rules.

SIGNATURE

Two handwritten signatures, one for Francis Kane and one for Graeme Lawler, are placed side-by-side.

| NAME | JOB TITLE | RESPONSIBLE FOR | ISSUE DATE |
|---------------|---------------|-----------------|-------------------|
| Francis Kane | Test Engineer | Testing | 13 September 2019 |
| Graeme Lawler | Test Engineer | Testing | 13 September 2019 |

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B: 2018 and ICES-003: 2016 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 | 13 September 2019 |

Table 1

1.2 Introduction

| | |
|-------------------------------|---|
| Applicant | Frontier Smart Technologies Limited |
| Manufacturer | Frontier Smart Technologies Limited |
| Model Number(s) | Minuet 2 Module FS5352 Minuet 2 Voice Reference Platform FS6626 |
| Serial Number(s) | RAD113538 - Minuet 2 Module FS5352 RAD113525 - Minuet 2 Voice Reference Platform FS6626 RAD113253 - Minuet2 Module FS5352 RAD113409 - Minuet 2 Voice Reference Platform FS6626 |
| Hardware Version(s) | Minuet 2 Module: Rev4 Minuet 2 Voice Reference Platform: ES1 |
| Software Version(s) | NS2 |
| Number of Samples Tested | Two platforms with module installed |
| Test Specification/Issue/Date | FCC 47 CFR Part 15B: 2018 ICES-003: 2016 |
| Order Number | FS190532 |
| Date | 22-May-2019 |
| Date of Receipt of EUT | 17-June-2019 |
| Start of Test | 21-July-2019 |
| Finish of Test | 25-July-2019 |
| Name of Engineer(s) | Francis Kane and Graeme Lawler |
| Reference Standards | 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 |
|---|----------------------|----------|--|--------|------------------------|
| | Part 15B | ICES-003 | | | |
| Configuration and Mode: AC Powered - Receive Mode | | | | | |
| 2.1 | 15.107 | 6.1 | Conducted Disturbance at Mains Terminals | Pass | ANSI C63.4: 2014 |
| 2.2 | 15.109 | 6.2 | Radiated Disturbance | Pass | ANSI C63.4: 2014 |

Table 2



1.4 Application Form

Equipment Description

| | |
|--|--|
| Technical Description: <i>(Please provide a brief description of the intended use of the equipment)</i> | Minuet 2 is a module, which when installed in a consumer audio product enables high-quality audio streaming over Wi-Fi, Bluetooth, Ethernet and can be activated via voice commands. Where appropriate the Minuet 2 module is tested in the Minuet 2 Voice Reference Platform. |
| Manufacturer: | Frontier Smart Technologies Limited |
| Model: | Minuet 2 module (FS5352) |
| Part Number: | Minuet 2 module: HA-FS5352-xxxxxx (where xxxxxxx denotes the customer variant e.g. HA-FS5352-000001) |
| Hardware Version: | Minuet 2 module: Rev4 |
| Software Version: | NS2 |
| FCC ID (if applicable) | YYX-FS5352 |
| IC ID (if applicable) | 11458A-FS5352 |

Intentional Radiators

| Technology | Bluetooth | WLAN 2.4GHz | WLAN 5GHz |
|---------------------------------------|---------------------|----------------------------|--|
| Frequency Band (MHz) | 2400-2483.5 | 2402-2482 | 5150-5350, 5470-5825 |
| Conducted Declared Output Power (dBm) | 6.5 | 16.5 | 16.5 |
| Antenna Gain (dBi) | 2.3 | 2.3 | 2.2 (5150-5250) 3.5 (5250-5350 MHz) 4.6 (5470-5725 MHz) 3.1 (5725-5825 MHz) |
| Supported Bandwidth(s) (MHz) | 1, 2 | 20 | 20,40, 80 |
| Modulation Scheme(s) | GFSK, DQPSK, 8-DPSK | BPSK, QPSK, 16-QAM, 64-QAM | BPSK, QPSK, 16-QAM, 64-QAM |
| ITU Emission Designator | 1M00D, 2M00D | 20M00D | 20M00D, 40M00D, 80M00D |
| Bottom Frequency (MHz) | 2400 | 2412 | 5180 |
| Middle Frequency (MHz) | 2441 | 2437 | 5500 |
| Top Frequency (MHz) | 2480 | 2472 | 5825 |

Un-intentional Radiators

| | |
|--|-------------------------------------|
| Highest frequency generated or used in the device or on which the device operates or tunes | 5825 MHz |
| Lowest frequency generated or used in the device or on which the device operates or tunes | 2402 MHz |
| 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 checked="" type="checkbox"/> |



AC Power Source

| | |
|---|--------------------|
| AC supply frequency: 50 or 60 (Hz) | |
| 100 - 240 V | Max current: 0.8 A |
| Single Phase <input checked="" type="checkbox"/> Three Phase <input type="checkbox"/> | |

DC Power Source

| |
|-------------------------------|
| Nominal voltage: 5 V |
| Extreme upper voltage: 5.25 V |
| Extreme lower voltage: 4.75 V |
| Max current: 2 A |

Battery Power Source

| |
|--|
| Voltage: 11.1 V |
| End-point voltage: 8.1 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 checked="" type="checkbox"/> Please detail: Lithium-ion Polymer |

Charging

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

Temperature

| | |
|---------------------------|----------------------------|
| Minimum temperature: 0 °C | Maximum temperature: 70 °C |
|---------------------------|----------------------------|

Antenna Characteristics

| |
|--|
| Antenna connector <input checked="" type="checkbox"/> State impedance 50 Ohm |
| Temporary antenna connector <input type="checkbox"/> State impedance N/A Ohm |
| Integral antenna <input type="checkbox"/> Type N/A State impedance N/A Ohm |
| External antenna <input checked="" type="checkbox"/> Type PCB antenna State impedance 50 Ohm |

Ancillaries (if applicable)

| | |
|-------------------------|---------------------------|
| Manufacturer: Southstar | Part Number: N12-2128-R0A |
| Model: SW700M (SW750M) | Country of Origin: China |

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

Name: Abdul Wahed Dewan
Position held: Principal RF Engineer
Date: 29/08/2019



1.5 Product Information

1.5.1 Technical Description

The Equipment Under Test (EUT) was a Frontier Smart Technologies Limited, Minuet 2 Module (FS5352) and Minuet 2 Voice Reference Platform (FS6626).

The primary function of the EUT is to stream radio and music files in a variety of formats including AAC, AAC+, ALAC, MP3, WCISPR Average, WMA and FLAC over Wi-Fi, Bluetooth and Ethernet.

Additionally, the EUT has functionality to operate as an internet radio, wireless speaker or docking platform with full graphic display. Minuet 2 is a module, which when installed in a consumer audio product enables high-quality audio streaming over Wi-Fi, Bluetooth and Ethernet and can be activated via voice commands. Where appropriate the Minuet 2 module is tested in the Minuet 2 Voice Reference Platform.

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



Figure 1 - General View

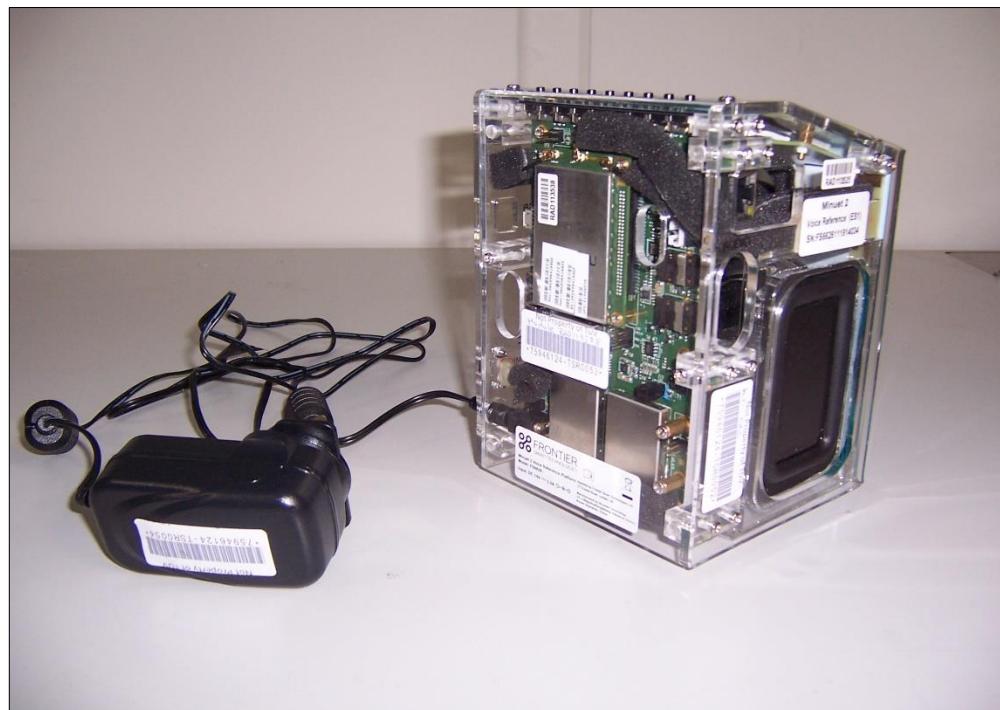


Figure 2 - Rear View



Figure 3 - Rating Plate



1.5.2 EUT Port/Cable Identification

| Port | Max Cable Length specified | Usage | Type | Screened |
|---|----------------------------|---|----------------------|----------|
| Configuration and Mode: AC Powered - Receive Mode | | | | |
| Wired Network Port | 3 meters | Data Transfer | Cat 5 Ethernet Cable | No |
| AC Power Port | 1.9 meter | 110 volt 60Hz AC to 14 volt DC Power Supply | Twin Pair | No |

Table 3

1.5.3 Test Configuration

| Configuration | Description |
|---------------|---|
| AC Powered | The EUT was powered from a 110 V 60 Hz AC supply. The EUTs Auxiliary output port was terminated into a tablet device. |

1.5.4 Modes of Operation

| Mode | Description |
|--------------|---|
| Receive Mode | EUT was powered and waiting to receive data stream. The EUTs 2.4 GHz and 5 GHz Wi-Fi was in receive mode. |

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 |
|--------------------------|---|------------------------|--------------------------|
| Serial Number: RAD113538 | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |
| Serial Number: RAD113525 | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |

Table 4



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: AC Powered - Receive Mode | | |
| Conducted Disturbance at Mains Terminals | Francis Kane | UKAS |
| Radiated Disturbance | Francis Kane and Graeme Lawler | UKAS |

Table 5

Office Address:

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



2 Test Details

2.1 Conducted Disturbance at Mains Terminals

2.1.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.107
ICES-003, Clause 6.1

2.1.2 Equipment Under Test and Modification State

Minuet 2 Voice Reference Platform (FS6626), S/N: RAD113525 - Modification State 0
Minuet 2 Module (FS5352), S/N: RAD113538 - Modification State 0

2.1.3 Date of Test

21-July-2019

2.1.4 Test Method

The EUT was setup according to ANSI C63.4, clause 5.2.

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

A Line Impedance Stabilisation Network (LISN) was directly bonded to the ground-plane. The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN was 0.8 m.

Interconnecting cables that hanged closer than 0.4 m to the ground plane were folded back and forth in the centre forming a bundle 0.3 m to 0.4 m long.

Input and output cables were terminated with equipment or loads representative of real usage conditions.

The EUT was configured to give the highest level of emissions within reason of a typical installation as described by the manufacturer.

2.1.5 Example Calculation

Quasi-Peak level (dB μ V) = Receiver level (dB μ V) + Correction Factor (dB)
Margin (dB) = Limit (dB μ V) – Quasi-Peak level (dB μ V)

CISPR Average level (dB μ V) = Receiver level (dB μ V) + Correction Factor (dB)
Margin (dB) = Limit (dB μ V) – CISPR Average level (dB μ V)

2.1.6 Example Test Setup Diagram

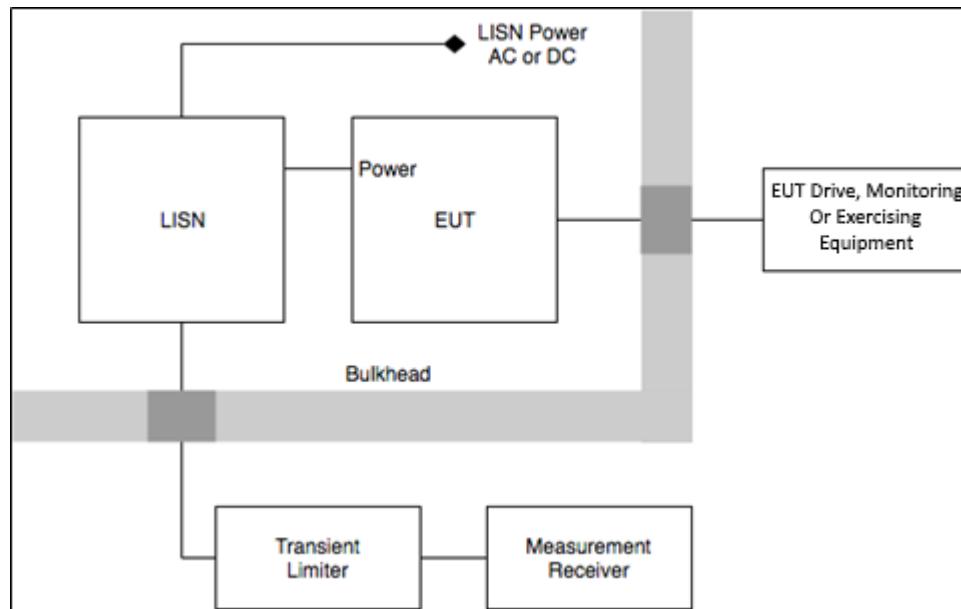


Figure 4 - Conducted Disturbance Example Test Setup

2.1.7 Environmental Conditions

Ambient Temperature 17.3 °C
Relative Humidity 76.5 %

2.1.8 Specification Limits

| Required Specification Limits (Class B) | | | |
|---|-----------------------|-------------------------|----------------------------|
| Line Under Test | Frequency Range (MHz) | Quasi-peak (dB μ V) | CISPR Average (dB μ V) |
| AC Power Port | 0.15 to 0.5 | 66 to 56* | 56 to 46* |
| | 0.5 to 5 | 56 | 46 |
| | 5 to 30 | 60 | 50 |

Supplementary information: *Decreases with the logarithm of the frequency.

Table 6

2.1.9 Test Results

Results for Configuration and Mode: AC Powered - Receive Mode.

The test was performed in accordance with the Class B limits.

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

Detailed results are shown below.

Line Under Test: Live Line

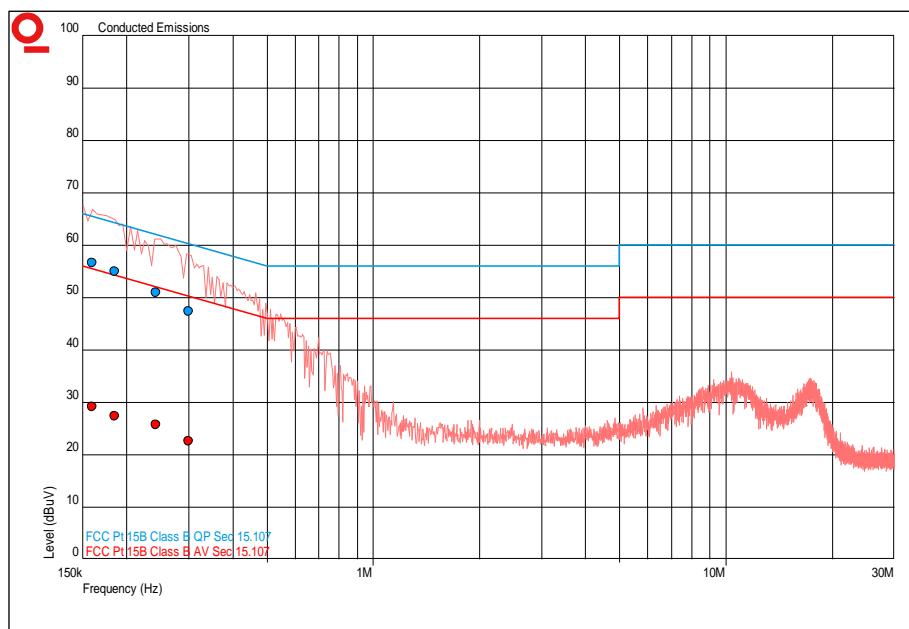


Figure 5 - Graphical Results – Live Line

| Frequency (MHz) | QP Level (dBμV) | QP Limit (dBμV) | QP Margin (dB) | CISPR Average Level (dBμV) | CISPR Average Limit (dBμV) | CISPR Average Margin (dB) |
|-----------------|-----------------|-----------------|----------------|----------------------------|----------------------------|---------------------------|
| 0.160 | 56.7 | 65.5 | -8.8 | 29.2 | 55.5 | -26.2 |
| 0.185 | 55.0 | 64.3 | -9.3 | 27.4 | 54.3 | -26.9 |
| 0.243 | 51.0 | 62.0 | -11.0 | 25.7 | 52.0 | -26.3 |
| 0.300 | 47.3 | 60.2 | -12.9 | 22.6 | 50.2 | -27.6 |

Table 7



Line Under Test: Neutral Line

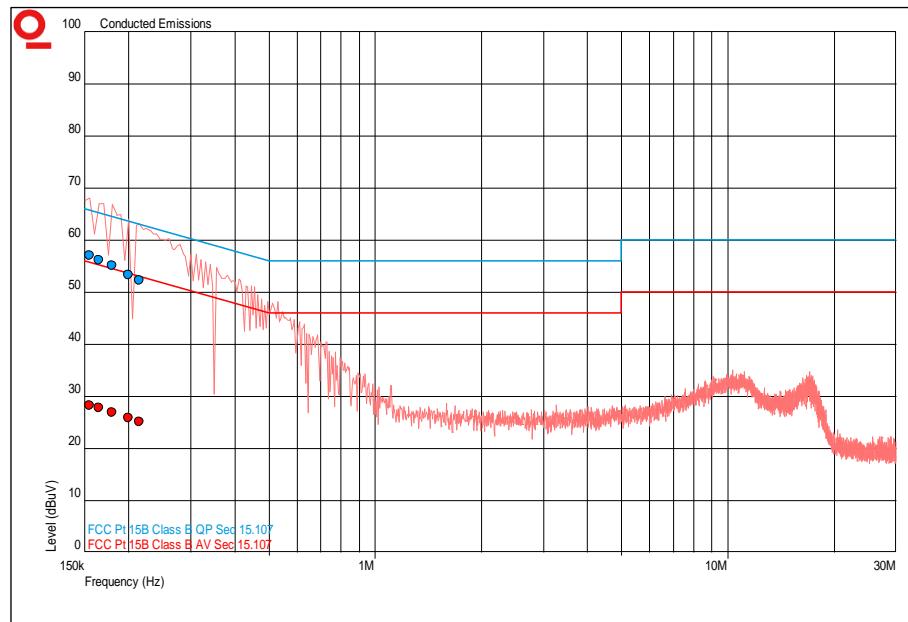


Figure 6 - Graphical Results – Neutral Line

| Frequency (MHz) | QP Level (dB μ V) | QP Limit (dB μ V) | QP Margin (dB) | CISPR Average Level (dB μ V) | CISPR Average Limit (dB μ V) | CISPR Average Margin (dB) |
|-----------------|-----------------------|-----------------------|----------------|----------------------------------|----------------------------------|---------------------------|
| 0.155 | 57.1 | 65.7 | -8.6 | 28.3 | 55.7 | -27.4 |
| 0.165 | 56.2 | 65.2 | -9.0 | 27.9 | 55.2 | -27.3 |
| 0.180 | 55.1 | 64.5 | -9.4 | 27.0 | 54.5 | -27.5 |
| 0.200 | 53.4 | 63.6 | -10.2 | 26.0 | 53.6 | -27.6 |
| 0.215 | 52.3 | 63.0 | -10.7 | 25.1 | 53.0 | -27.9 |

Table 8

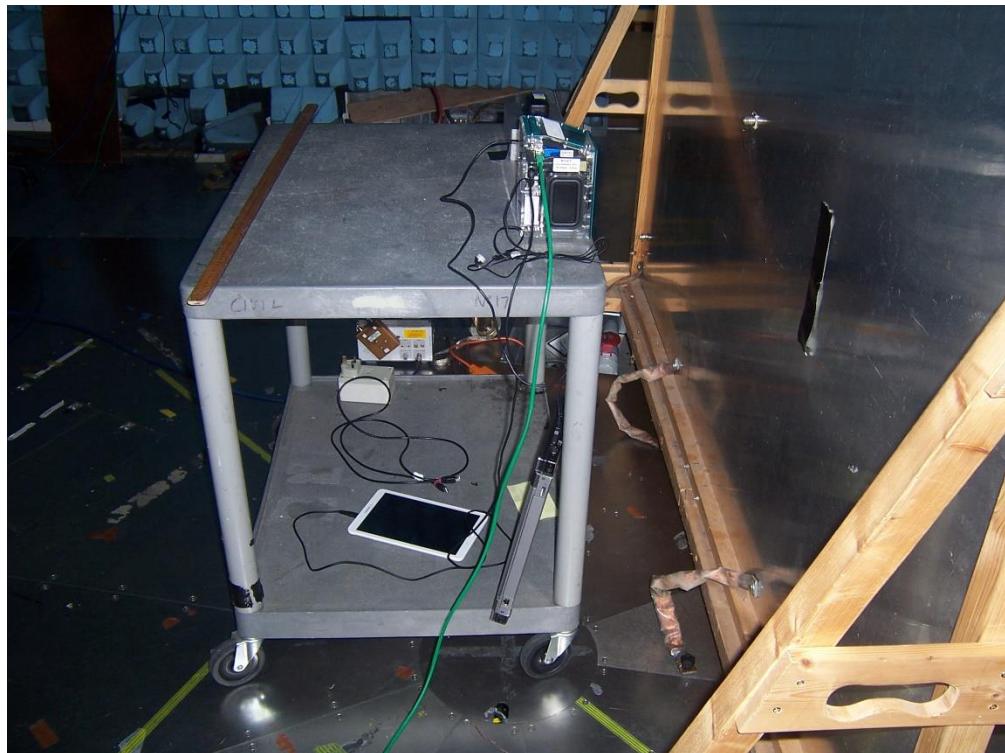


Figure 7 – Test Setup - Conducted Emissions

2.1.10 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 |
|------------------------|-----------------|----------|-------|-----------------------------|-----------------|
| Screened Room (5) | Rainford | Rainford | 1545 | 36 | 23-Jan-2021 |
| Compliance 5 Emissions | Teseq | V5.26.51 | 3275 | - | Software |
| EMI Test Receiver | Rohde & Schwarz | ESU40 | 3506 | 12 | 17-Dec-2019 |
| Transient Limiter | Hewlett Packard | 11947A | 15 | 12 | 26-Jul-2019 |
| LISN | Rohde & Schwarz | ESH3-Z5 | 1390 | 12 | 20-Nov-2019 |

Table 9



2.2 Radiated Disturbance

2.2.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.109
ICES-003, Clause 6.2

2.2.2 Equipment Under Test and Modification State

Minuet 2 Voice Reference Platform (FS6626), S/N: RAD113409 - Modification State 0
Minuet 2 Module (FS5352), S/N: RAD113253 - Modification State 0
Minuet 2 Voice Reference Platform (FS6626), S/N: RAD113525- Modification State 0
Minuet 2 Module (FS5352), S/N: RAD113538 - Modification State 0

2.2.3 Date of Test

25-July-2019

2.2.4 Test Method

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

For an EUT which could reasonable be used in multiple planes, pre-scans were performed with the EUT orientated in X, Y and Z planes with reference to the ground plane.

A pre-scan of the EUT emissions profile was made at a 3m distance while varying the antenna-to-EUT azimuth and polarisation using a peak detector.

Using a list of the highest emissions detected during the pre-scan along with their bearing and associated antenna polarisation, the EUT was 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.

2.2.5 Example Calculation

Below 1GHz:

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

Above 1GHz:

CISPR Average level (dB μ V/m) = Receiver level (dB μ V/m) + Correction Factor (dB)
Margin (dB) = Limit (dB μ V/m) – CISPR Average level (dB μ V/m)

Peak level (dB μ V/m) = Receiver level (dB μ V/m) + Correction Factor (dB)
Margin (dB) = Limit (dB μ V/m) – Peak level (dB μ V/m)

2.2.6 Example Test Setup Diagram

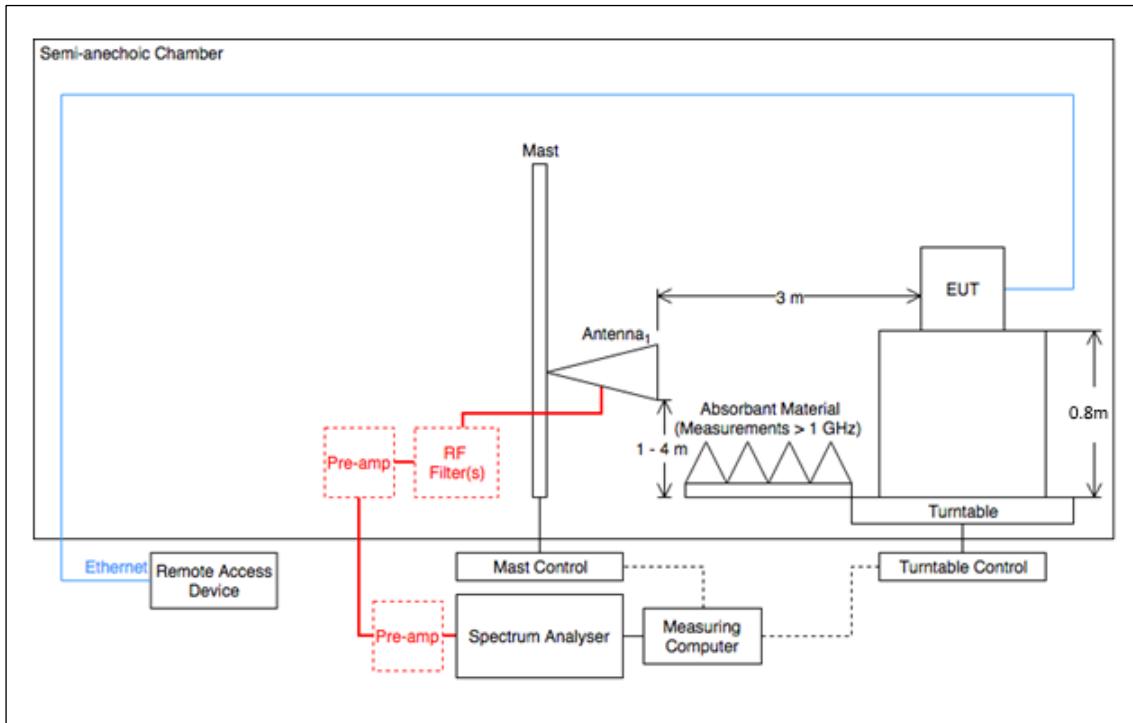


Figure 8 - Radiated Disturbance Example Test Setup

2.2.7 Environmental Conditions

Ambient Temperature 21.0 °C
Relative Humidity 57.0 %

2.2.8 Specification Limits

| Required Specification Limits, Field Strength (Class B @ 3m) | | |
|--|--------------|----------------|
| Frequency Range (MHz) | (μ V/m) | (dB μ V/m) |
| 30 to 88 | 100 | 40 |
| 88 to 216 | 150 | 43.5 |
| 216 to 960 | 200 | 46.0 |
| Above 960 | 500 | 54 |

Supplementary information:
Quasi-peak detector to be used for measurements below 1 GHz
CISPR Average detector to be used for measurements above 1 GHz
Peak test limit above 1 GHz is 20 dB higher than the CISPR Average test limit.

Table 10



2.2.9 Test Results

Results for Configuration and Mode: AC Powered - Receive Mode.

The test was performed in accordance with the Class B limits.

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

Detailed results are shown below.

Highest frequency generated or used within the EUT: 5.825 GHz
Which necessitates an upper frequency test limit of: 30 GHz

Frequency Range of Test: 30 MHz to 1 GHz - X Orientation

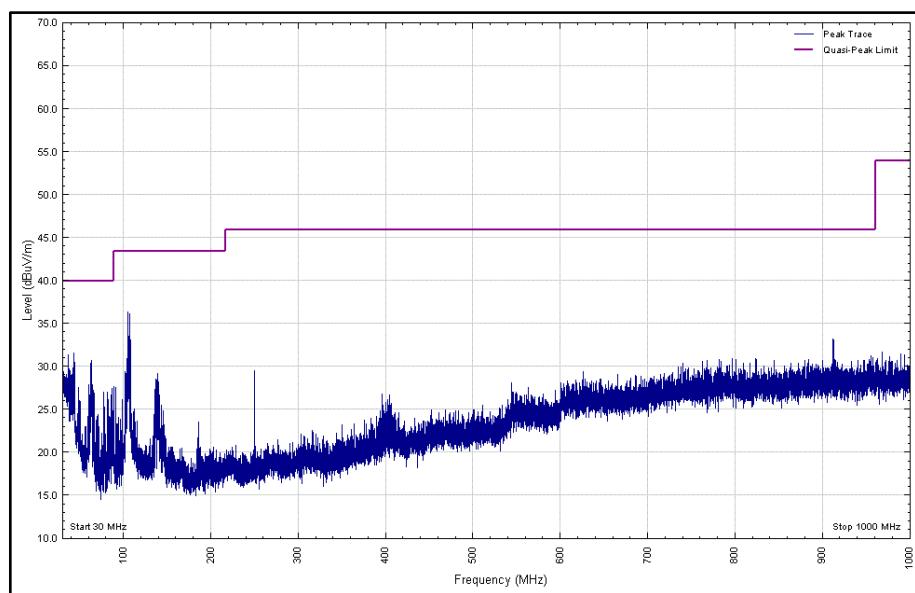


Figure 9 - Graphical Results - Vertical Polarity

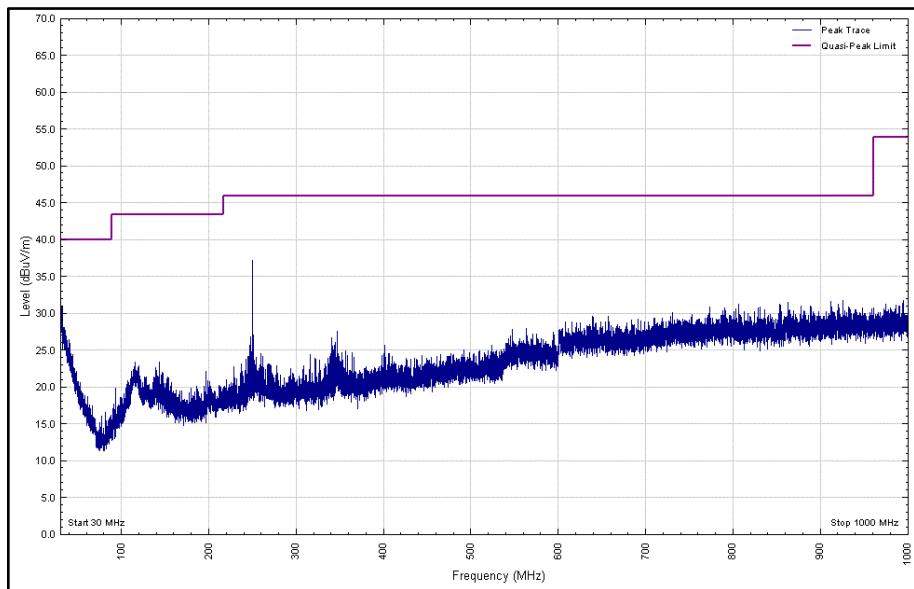


Figure 10 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 11

*No emissions were detected within 6 dB of the limit.

Frequency Range of Test: 30 MHz to 1 GHz - Y Orientation

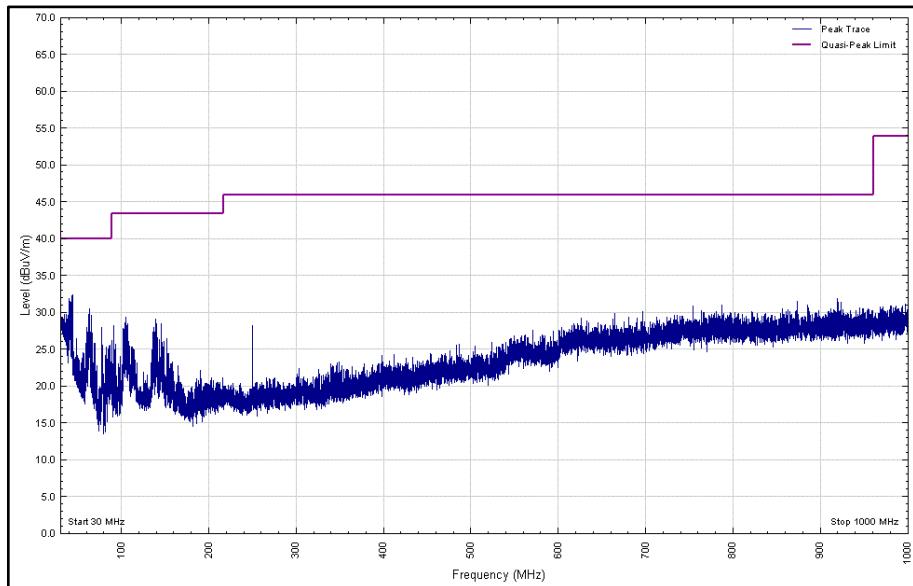


Figure 11 - Graphical Results - Vertical Polarity

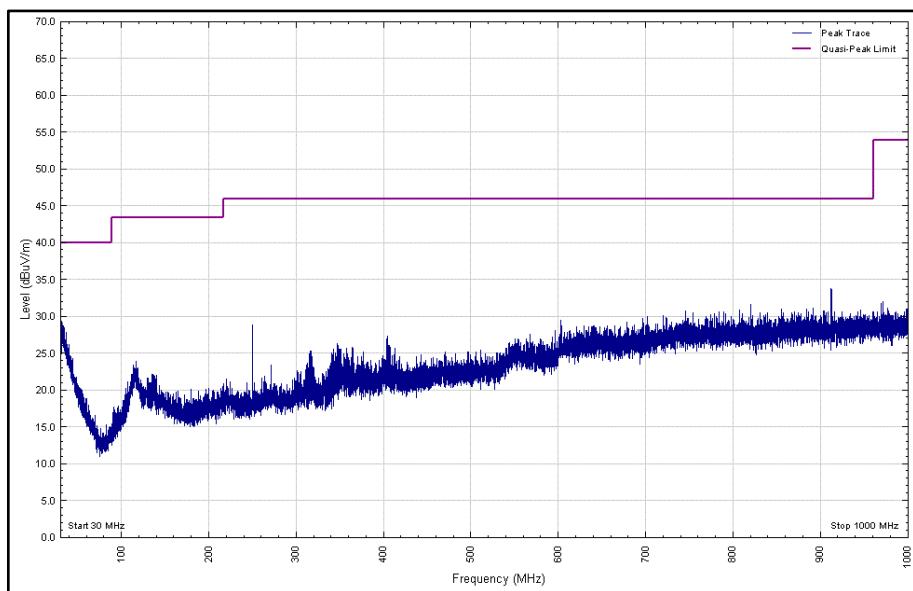


Figure 12 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 12

*No emissions were detected within 6 dB of the limit.

Frequency Range of Test: 30 MHz to 1 GHz - Z Orientation

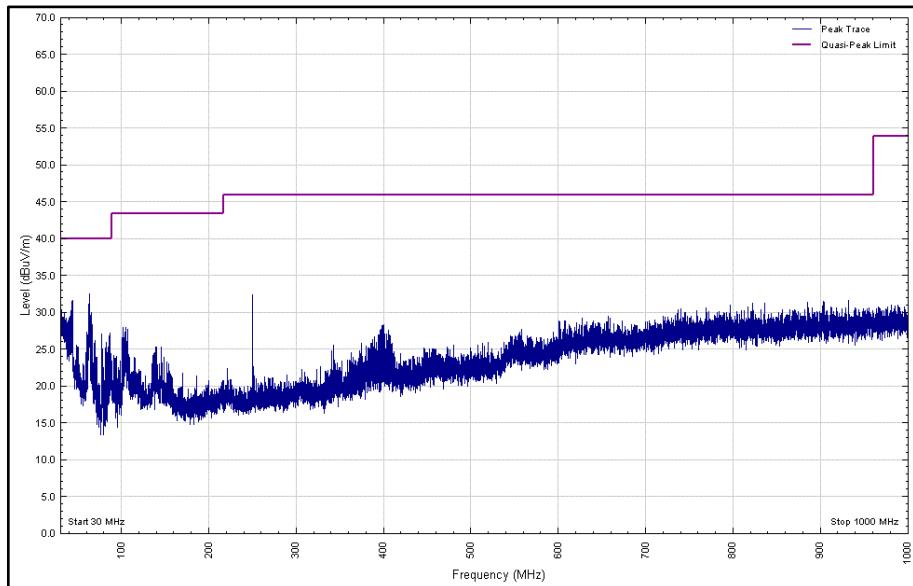


Figure 13 - Graphical Results - Vertical Polarity

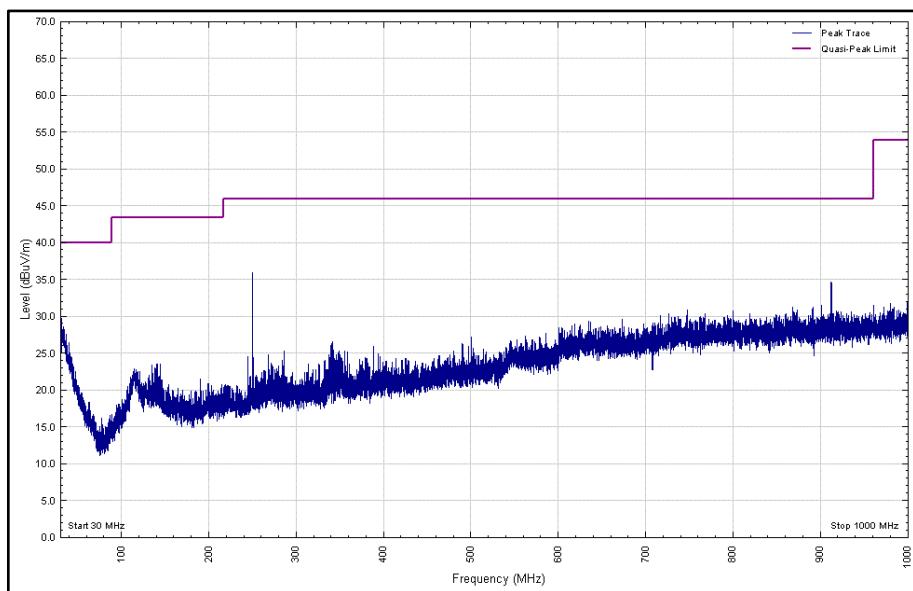


Figure 14 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 13

*No emissions were detected within 6 dB of the limit.

Frequency Range of Test: 1 GHz to 18 GHz - X Orientation CISPR Average

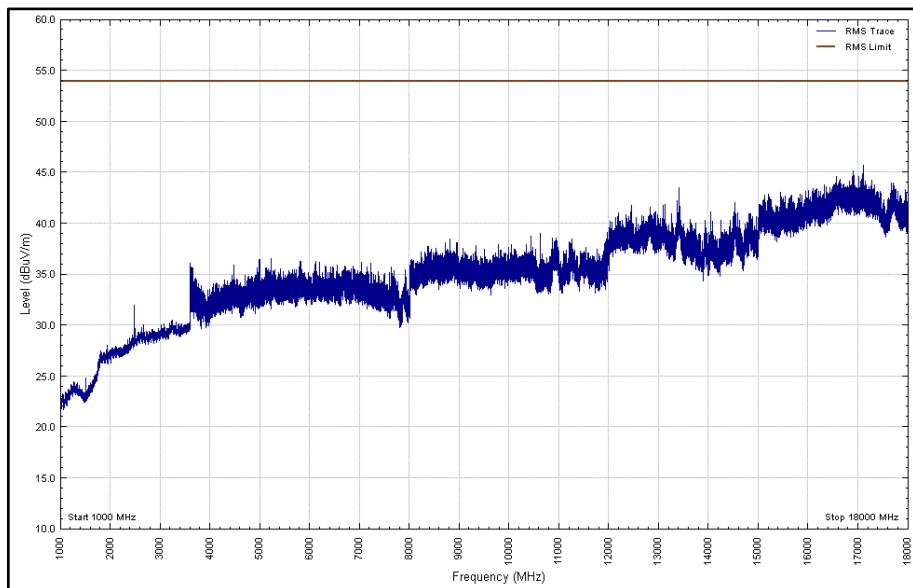


Figure 15 - Graphical Results - Vertical Polarity

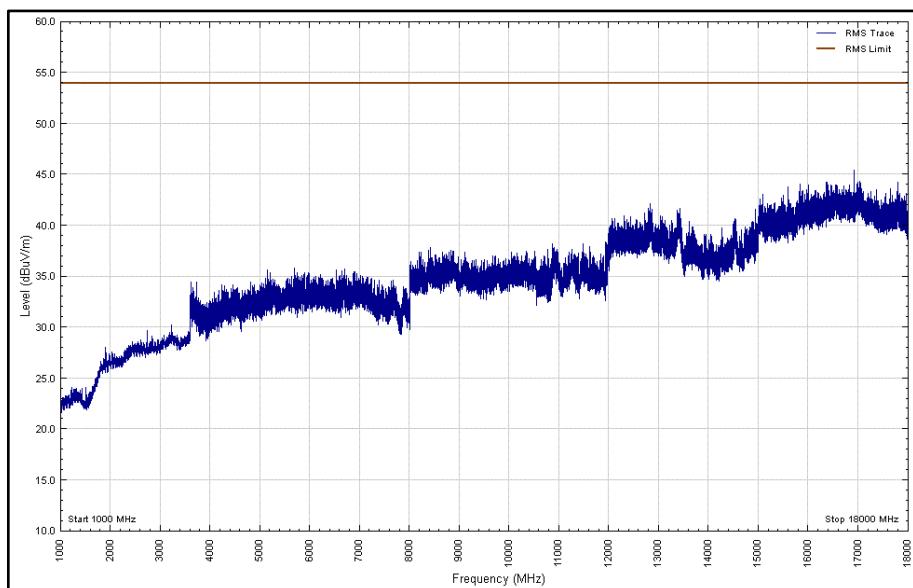


Figure 16 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 14

*No emissions were detected within 6 dB of the limit.

Frequency Range of Test: 1 GHz to 18 GHz - X Orientation Peak

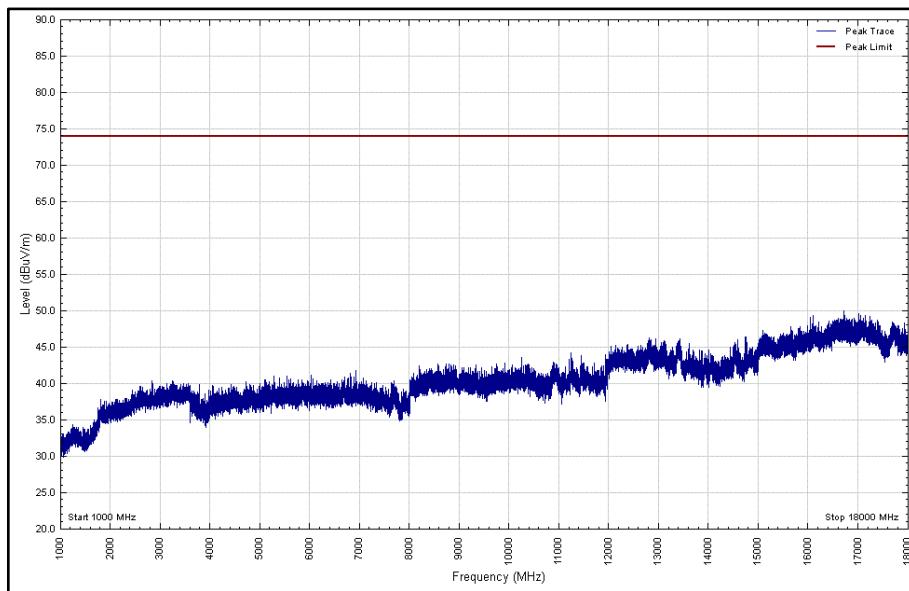


Figure 17 - Graphical Results - Vertical Polarity

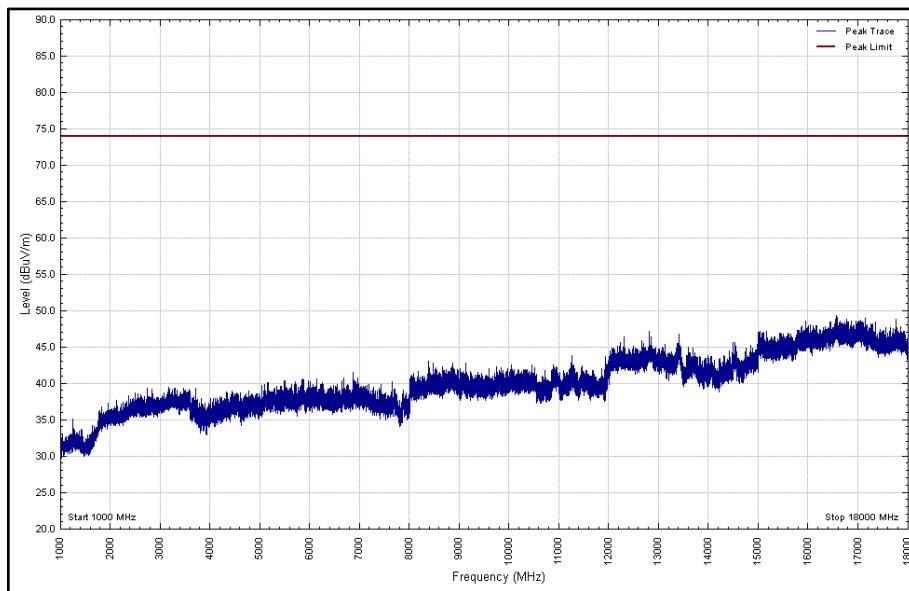


Figure 18 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 15

*No emissions were detected within 20 dB of the limit.

Frequency Range of Test: 1 GHz to 18 GHz - Y Orientation CISPR Average

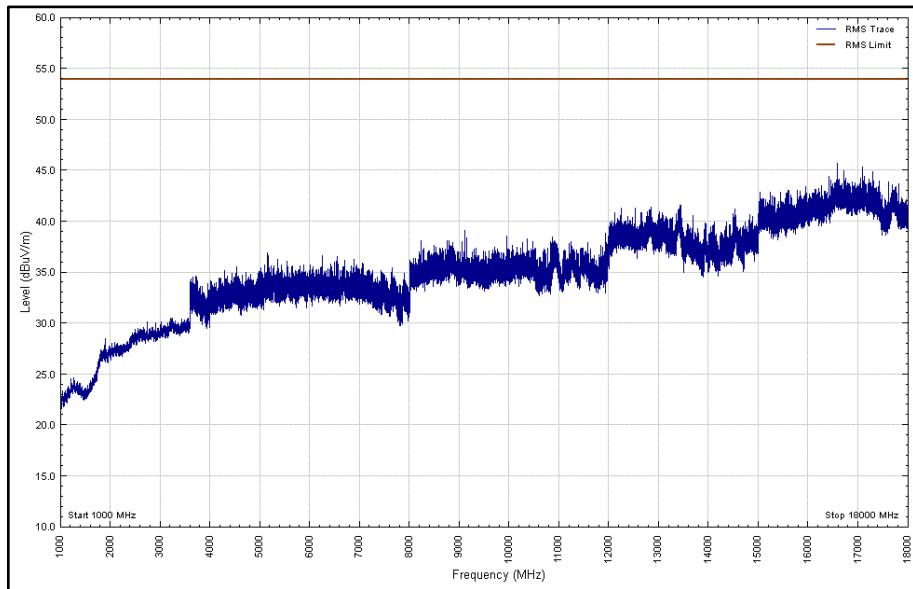


Figure 19 - Graphical Results - Vertical Polarity

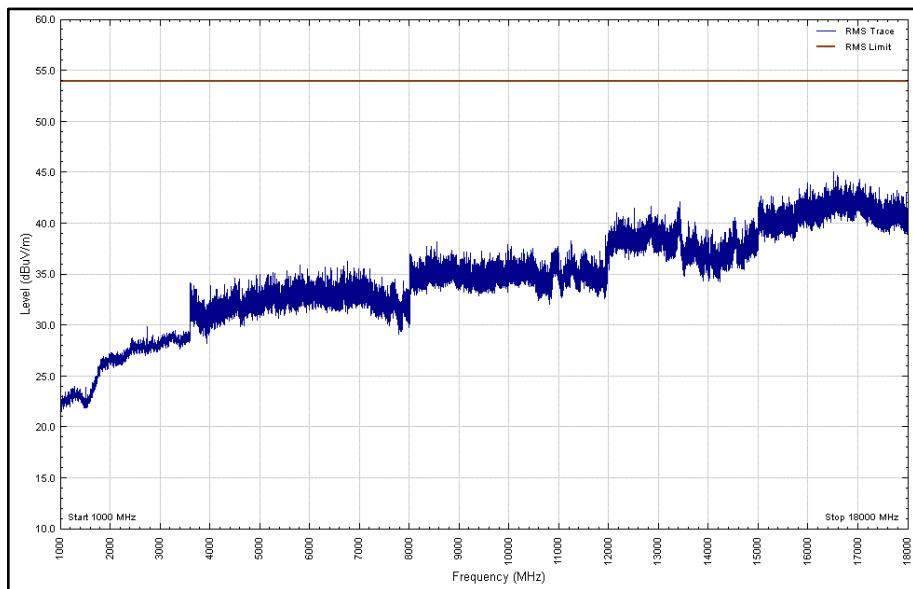


Figure 20 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 16

*No emissions were detected within 6 dB of the limit.

Frequency Range of Test: 1 GHz to 18 GHz - Y Orientation Peak

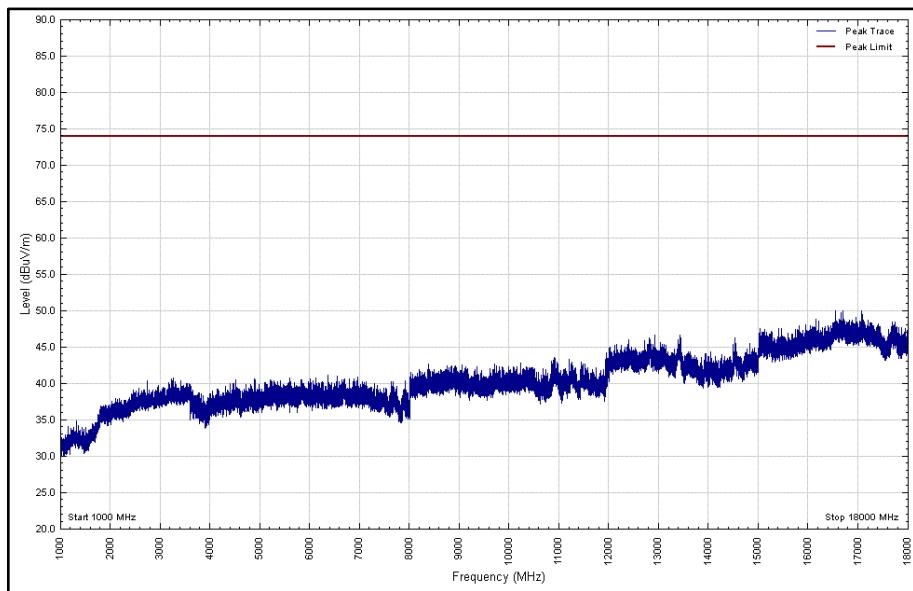


Figure 21 - Graphical Results - Vertical Polarity

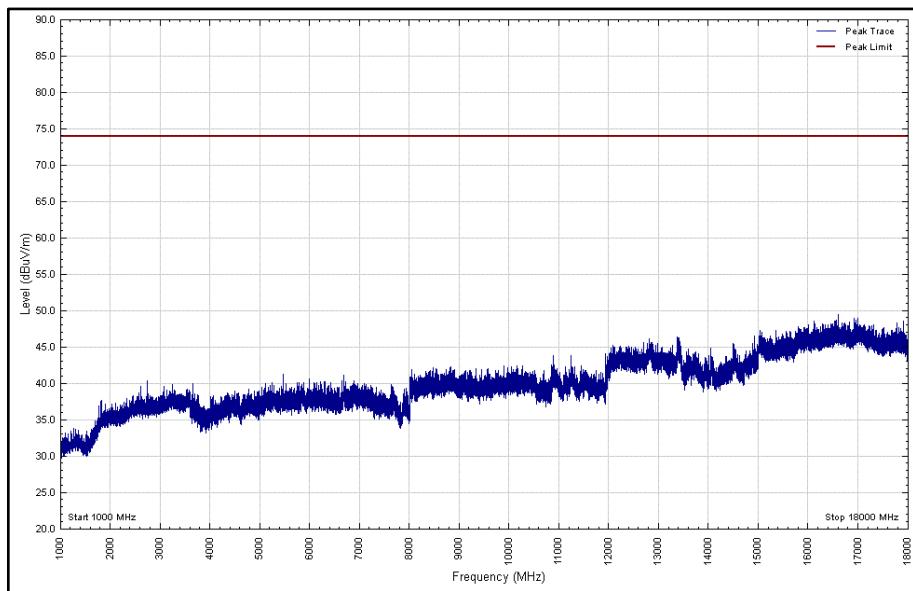


Figure 22 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 17

*No emissions were detected within 20 dB of the limit.

Frequency Range of Test: 1 GHz to 18 GHz - Z Orientation CISPR Average

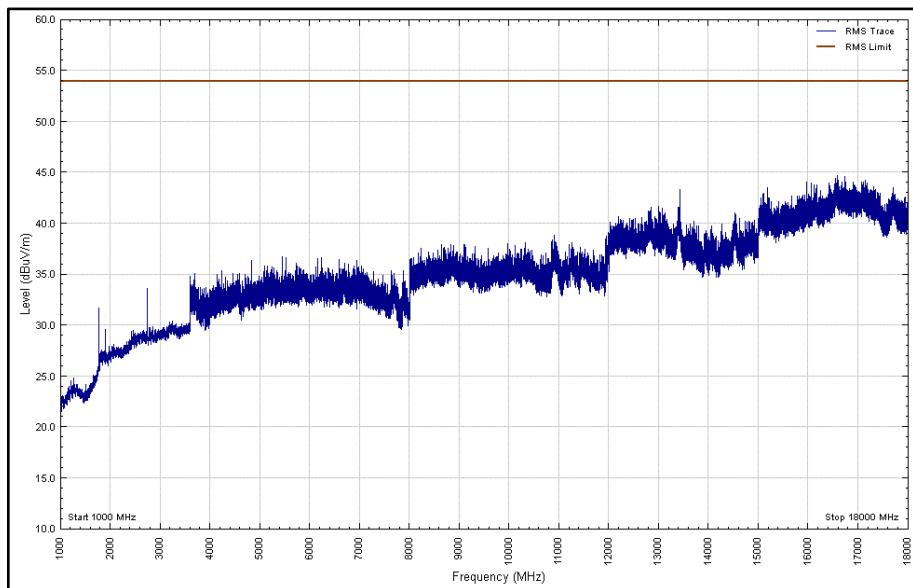


Figure 23 - Graphical Results - Vertical Polarity

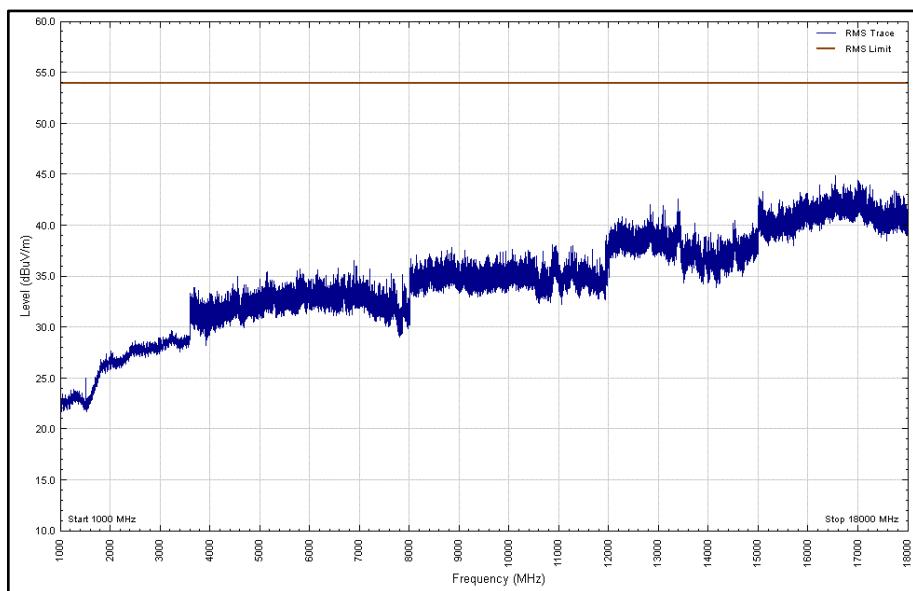


Figure 24 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 18

*No emissions were detected within 6 dB of the limit.

Frequency Range of Test: 1 GHz to 18 GHz - Z Orientation Peak

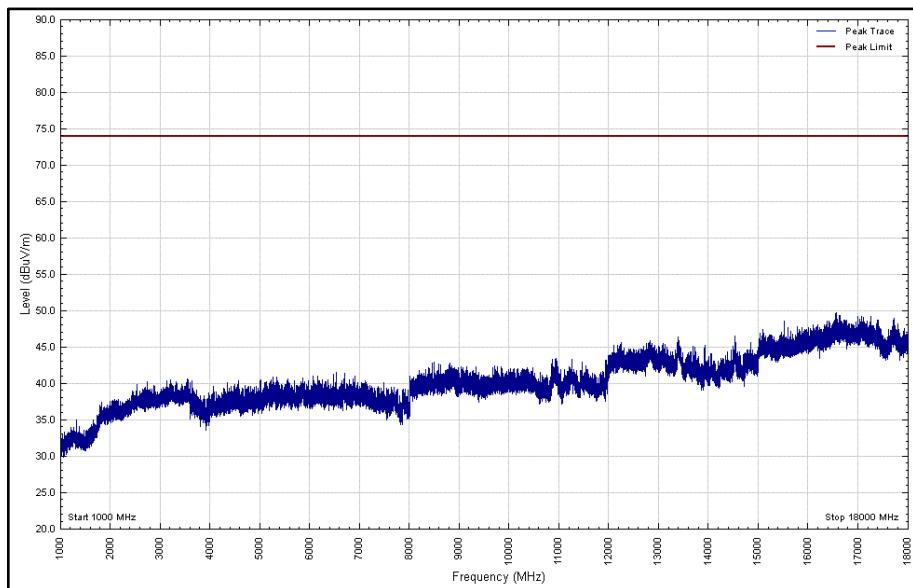


Figure 25 - Graphical Results - Vertical Polarity

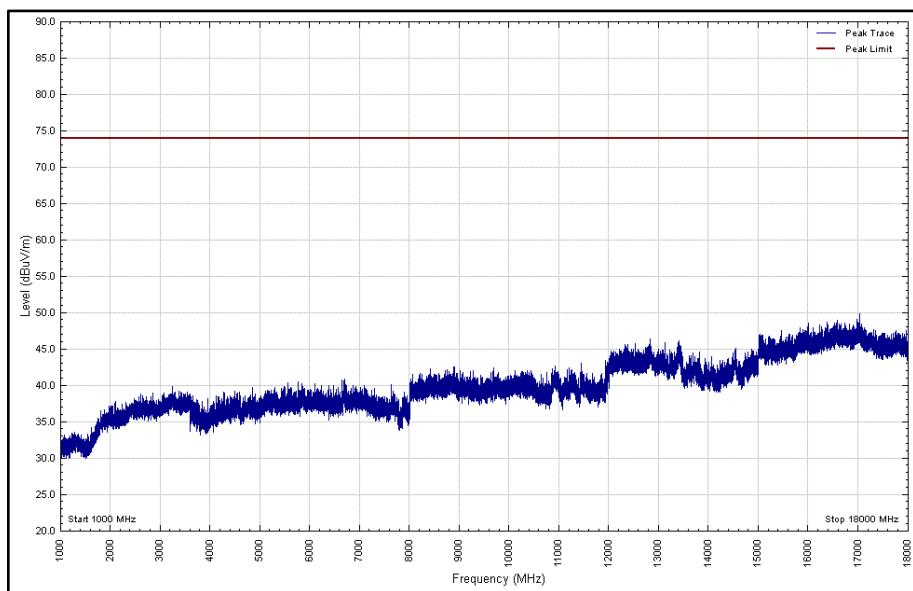


Figure 26 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 19

*No emissions were detected within 20 dB of the limit.



Frequency Range of Test: 18 GHz to 30 GHz – Multi-Orientation CISPR Average

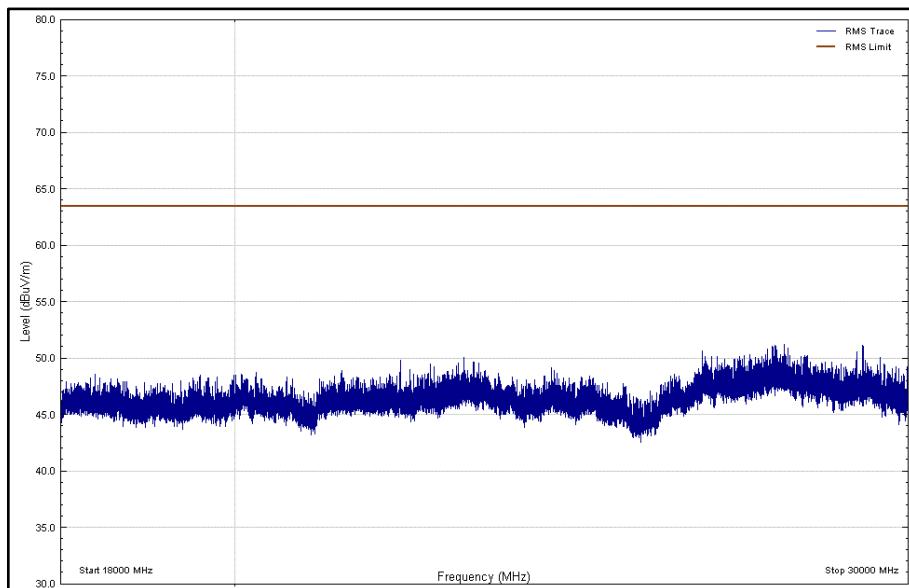


Figure 27 - Graphical Results - Vertical Polarity

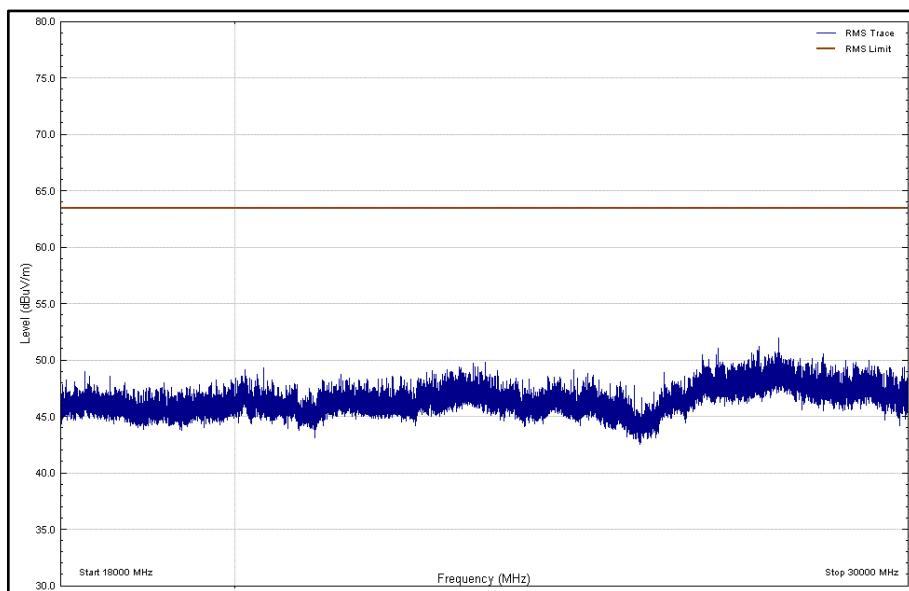


Figure 28 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 20

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

Frequency Range of Test: 18 GHz to 30 GHz – Multi-Orientation Peak

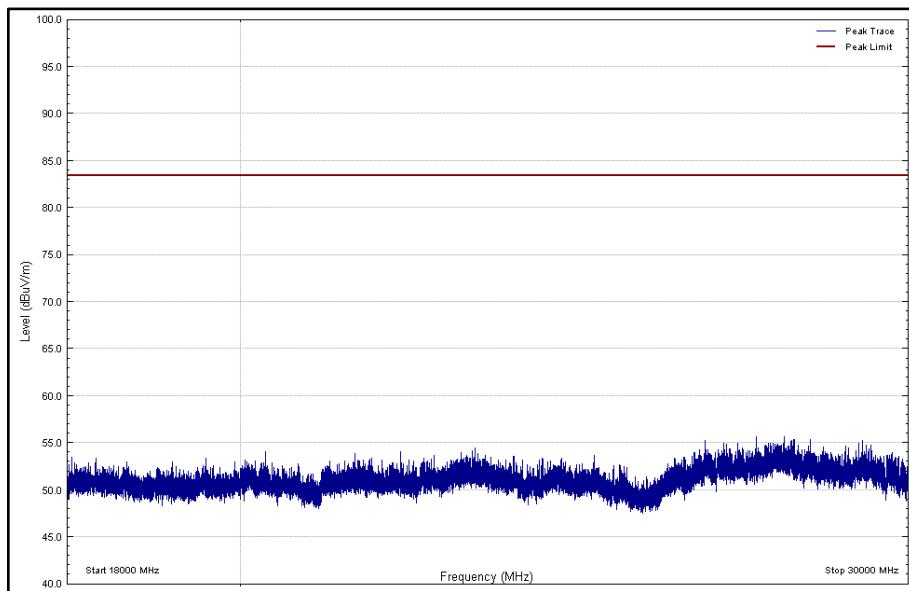


Figure 29 - Graphical Results - Vertical Polarity

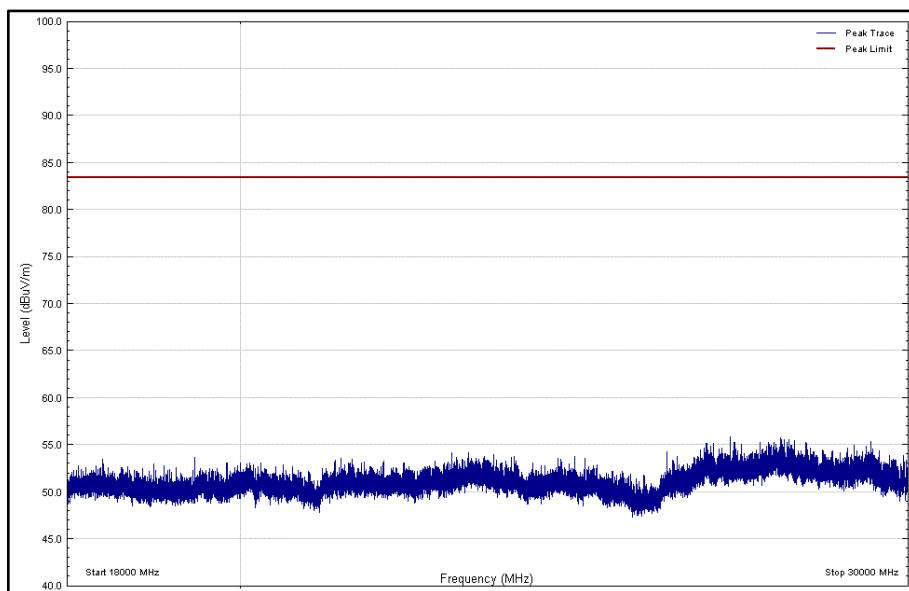


Figure 30 - Graphical Results - Horizontal Polarity

| Frequency (MHz) | Level | Limit | Margin | Detector | Unit | Angle (°) | Height (cm) | Polarisation | Orientation |
|-----------------|-------|-------|--------|----------|------|-----------|-------------|--------------|-------------|
| * | | | | | | | | | |

Table 21

*No emissions were detected within 20 dB of the limit.



Figure 31 – Test Setup - Radiated Emissions – 30 MHz to 1 GHz



Figure 32 – Test Setup - Radiated Emissions – 1 GHz to 18 GHz



Figure 33 – Test Setup - Radiated Emissions – 18 GHz to 30 GHz

2.2.10 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 |
|---|---------------------|-------------------------|-------|-----------------------------|-----------------|
| Screened Room (5) | Rainford | Rainford | 1545 | 36 | 23-Jan-2021 |
| EmX Software | TÜV SUD | EmX | 5125 | - | Software |
| EMI Test Receiver | Rohde & Schwarz | ESU40 | 3506 | 12 | 17-Dec-2019 |
| Turntable Controller | Inn-Co GmbH | CO 1000 | 1606 | - | TU |
| Mast Controller | Maturo GmbH | NCD | 4810 | - | TU |
| Tilt Antenna Mast | Maturo GmbH | TAM 4.0-P | 4811 | - | TU |
| Antenna with permanent attenuator (Bilog) | Chase | CBL6143 | 2904 | 24 | 08-Aug-2019 |
| 1GHz to 8GHz Low Noise Amplifier | Wright Technologies | APS04-0085 | 4365 | 12 | 25-Oct-2019 |
| 8GHz to 18GHz Low Noise Amplifier | Phase One | PS04-0086 | 1533 | 12 | 08-Feb-2020 |
| 18GHz - 40GHz Low Noise Amplifier | Phase One | PS04-0087 | 1534 | 12 | 05-Feb-2020 |
| Double Ridged Waveguide Horn Antenna | ETS-Lindgren | 3117 | 4722 | 12 | 05-Mar-2020 |
| Antenna 18-40GHz (Double Ridge Guide) | Link Microtek Ltd | AM180HA-K-TU2 | 230 | 24 | 02-May-2020 |
| Cable (Rx, Km-Km 2m) | Scott Cables | KPS-1501-2000-KPS | 4526 | 6 | 11-Dec-2019 |
| 4dB Attenuator | Pasternack | PE7047-4 | 4935 | 24 | 28-Nov-2019 |
| 8m N-Type RF Cable | Teledyne | PR90-088-8MTR | 5093 | 12 | 04-Oct-2019 |
| Cable (18 GHz) | Rosenberger | LU7-071-2000 | 5109 | 12 | 05-Oct-2019 |
| 1.5m 40GHz RF Cable | Scott Cables | KPS-1501-2000-KPS | 5127 | 6 | 11-Dec-2019 |
| WR90 / WG16 Waveguide Directional Coupler | Quasar | QCC 16SB-UBR-UBR-N-F-30 | 5145 | - | O/P Mon |

Table 22

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

3 Measurement Uncertainty

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

| Test Name | Measurement Uncertainty |
|--|---|
| Radiated Disturbance | 30 MHz to 1 GHz, Bilog Antenna, ± 5.2 dB 1 GHz to 40 GHz, Horn Antenna, ± 6.3 dB |
| Conducted Disturbance at Mains Terminals | 150 kHz to 30 MHz, LISN, ± 3.7 dB |

Table 23

Worst case error for both Time and Frequency measurement 12 parts in 10^6 .
All measurement uncertainties have been calculated using CISPR guidelines.