




TEST REPORT


Test Report No. : UL-RPT-RP10690672JD04A V2.0

Manufacturer : 3D Sound Lab
Model No. : 3DSLH01
FCC ID : 2AEBV-3DSLH01
Technology : *Bluetooth* – Low Energy
Test Standard(s) : FCC Parts 15.207, 15.209(a) & 15.247

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2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions

Date of Issue: 28 May 2015

Checked by: 
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1. Customer Information








| | |
|----------------------|---|
| Company Name: | 3D Sound Labs |
| Address: | 130 rue de Lourmel 75015 Paris France |

2. Summary of Testing

2.1. General Information

| | |
|---------------------------------|---|
| Specification Reference: | 47CFR15.247 |
| Specification Title: | Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247 |
| Specification Reference: | 47CFR15.207 and 47CFR15.209 |
| Specification Title: | Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209 |
| Site Registration: | 209735 |
| Location of Testing: | UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom |
| Test Dates: | 03 March 2015 to 26 May 2015 |

2.2. Summary of Test Results

| FCC Reference (47CFR) | Measurement | Result |
|--|--|---|
| Part 15.207 | Transmitter AC Conducted Emissions |  |
| Part 15.247(a)(2) | Transmitter Minimum 6 dB Bandwidth |  |
| Part 15.247(e) | Transmitter Power Spectral Density | Note 1 |
| Part 15.247(b)(3) | Transmitter Maximum Peak Output Power |  |
| Part 15.247(d)/15.209(a) | Transmitter Radiated Emissions |  |
| Part 15.247(d)/15.209(a) | Transmitter Band Edge Radiated Emissions |  |
| Key to Results  = Complied  = Did not comply | | |

Note(s):

1. In accordance with FCC KDB 558074 Section 10.1, PSD is not required if the maximum conducted output power is less than the PSD limit of 8 dBm / 3 kHz. The PSD level is therefore deemed to be equal to the measured total output power.

2.3. Methods and Procedures

| | |
|-------------------|---|
| Reference: | ANSI C63.4 (2009) |
| Title: | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| Reference: | ANSI C63.10 (2009) |
| Title: | American National Standard for Testing Unlicensed Wireless Devices |
| Reference: | KDB 558074 D01 v03r02 June 5, 2014 |
| Title: | Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 |

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

| | |
|----------------------------|---|
| Brand Name: | 3D Sound Labs |
| Model Name or Number: | 3DSLH01 |
| Test Sample Serial Number: | P PROD 13 (<i>Radiated sample #1</i>) |
| Hardware Version Number: | 3.4 |
| Software Version Number: | direct_test_mode-0.0.1, firmware-02.01.02 |
| FCC ID: | 2AEBV-3DSLH01 |

| | |
|----------------------------|---|
| Brand Name: | 3D Sound Labs |
| Model Name or Number: | 3DSLH01 |
| Test Sample Serial Number: | P PROD 24 (<i>Radiated sample #2</i>) |
| Hardware Version Number: | 3.4 |
| Software Version Number: | direct_test_mode-0.0.2 |
| FCC ID: | 2AEBV-3DSLH01 |

| | |
|----------------------------|--|
| Brand Name: | 3D Sound Labs |
| Model Name or Number: | 3DSLH01 |
| Test Sample Serial Number: | P PROD 14 (<i>Conducted sample with RF port</i>) |
| Hardware Version Number: | 3.4 |
| Software Version Number: | direct_test_mode-0.0.2 |
| FCC ID: | 2AEBV-3DSLH01 |

3.2. Description of EUT

The equipment under test was Wireless headphones with a *Bluetooth* Low Energy motion sensor module.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

| | | | |
|---------------------------------|--|----------------|-------------------------|
| Technology Tested: | Bluetooth Low Energy (Digital Transmission System) | | |
| Type of Unit: | Transceiver | | |
| Channel Spacing: | 2 MHz | | |
| Modulation: | GFSK | | |
| Data Rate: | 1 Mbps | | |
| Power Supply Requirement(s): | Nominal | 3.7 VDC | |
| Maximum Conducted Output Power: | 4.7 dBm | | |
| Antenna Gain: | 1.7 dBi | | |
| Transmit Frequency Range: | 2402 MHz to 2480 MHz | | |
| Transmit Channels Tested: | Channel ID | Channel Number | Channel Frequency (MHz) |
| | Bottom | 0 | 2402 |
| | Middle | 19 | 2440 |
| | Top | 39 | 2480 |

3.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

| | |
|------------------------------|---------------|
| Description: | Laptop PC |
| Brand Name: | Dell |
| Model Name or Number: | Latitude D260 |
| Serial Number: | 00052 |

| | |
|------------------------------|-----------------------|
| Description: | CSR development board |
| Brand Name: | CSR |
| Model Name or Number: | N117270 |
| Serial Number: | 10089A0018 |

| | |
|------------------------------|----------------------|
| Description: | USB Micro-B cable |
| Brand Name: | Not marked or stated |
| Model Name or Number: | Not marked or stated |
| Serial Number: | Not marked or stated |

| | |
|------------------------------|----------------------|
| Description: | USB mini-B cable |
| Brand Name: | Not marked or stated |
| Model Name or Number: | Not marked or stated |
| Serial Number: | Not marked or stated |

| | |
|------------------------------|-----------------------------|
| Description: | USB serial convertor cables |
| Brand Name: | Not marked or stated |
| Model Name or Number: | Not marked or stated |
| Serial Number: | Not marked or stated |

| | |
|------------------------------|---|
| Description: | 2m RS232 9 pin female to 9 pin female cable |
| Brand Name: | Not marked or stated |
| Model Name or Number: | Not marked or stated |
| Serial Number: | Not marked or stated |

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Transmitting at maximum power in *Bluetooth* LE mode with modulation, maximum possible data length available and Pseudorandom Bit Sequence 9.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- The EUT was controlled with a test laptop and a third party test software application using commands supplied by the customer. Channels, packet lengths and other settings were then set using this software application as required.
- The EUT was powered by a USB cable which was connected to a laptop PC.
- The EUT conducted sample was used for 6 dB bandwidth and maximum peak output power.
- The EUT radiated sample #1 was used radiated spurious emissions tests below 1 GHz.
- The EUT radiated sample #2 was used for AC Conducted emissions and radiated tests above 1 GHz.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainty* for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

| | | | |
|----------------------------|-------------|------------|---------------|
| Test Engineer: | David Doyle | Test Date: | 21 April 2015 |
| Test Sample Serial Number: | P PROD 24 | | |

| | |
|-------------------|---|
| FCC Reference: | Part 15.207 |
| Test Method Used: | As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4 |

Environmental Conditions:

| | |
|------------------------|----|
| Temperature (°C): | 24 |
| Relative Humidity (%): | 31 |

Results: Live / Quasi Peak

| Frequency (MHz) | Line | Level (dBμV) | Limit (dBμV) | Margin (dB) | Result |
|-----------------|------|--------------|--------------|-------------|----------|
| 0.330 | Live | 34.4 | 59.5 | 25.1 | Complied |
| 0.483 | Live | 32.8 | 56.3 | 23.5 | Complied |
| 1.455 | Live | 32.0 | 56.0 | 24.0 | Complied |
| 3.876 | Live | 34.5 | 56.0 | 21.5 | Complied |
| 4.520 | Live | 32.6 | 56.0 | 23.4 | Complied |
| 11.697 | Live | 33.7 | 60.0 | 26.3 | Complied |

Results: Live / Average

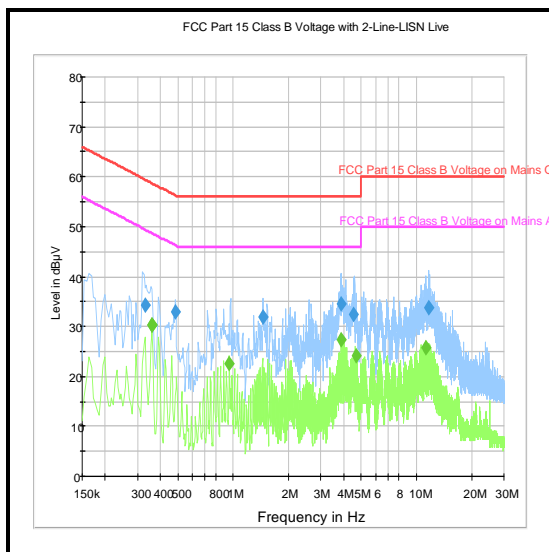
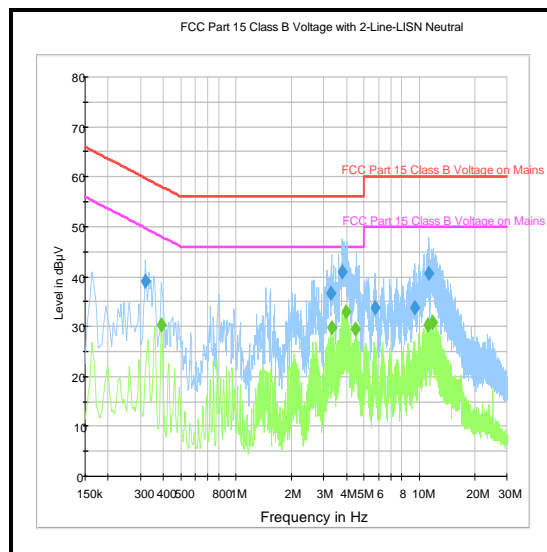
| Frequency (MHz) | Line | Level (dBμV) | Limit (dBμV) | Margin (dB) | Result |
|-----------------|------|--------------|--------------|-------------|----------|
| 0.362 | Live | 30.2 | 48.7 | 18.5 | Complied |
| 0.951 | Live | 22.7 | 46.0 | 23.3 | Complied |
| 3.872 | Live | 27.3 | 46.0 | 18.7 | Complied |
| 4.659 | Live | 24.2 | 46.0 | 21.8 | Complied |
| 11.252 | Live | 25.8 | 50.0 | 24.2 | Complied |

Transmitter AC Conducted Spurious Emissions (continued)**Results: Neutral / Quasi Peak**

| Frequency (MHz) | Line | Level (dBμV) | Limit (dBμV) | Margin (dB) | Result |
|-----------------|---------|--------------|--------------|-------------|----------|
| 0.321 | Neutral | 39.2 | 59.7 | 20.5 | Complied |
| 3.305 | Neutral | 36.6 | 56.0 | 19.4 | Complied |
| 3.795 | Neutral | 40.8 | 56.0 | 15.2 | Complied |
| 5.735 | Neutral | 33.6 | 60.0 | 26.4 | Complied |
| 9.429 | Neutral | 33.8 | 60.0 | 26.2 | Complied |
| 11.216 | Neutral | 40.6 | 60.0 | 19.4 | Complied |

Results: Neutral / Average

| Frequency (MHz) | Line | Level (dBμV) | Limit (dBμV) | Margin (dB) | Result |
|-----------------|---------|--------------|--------------|-------------|----------|
| 0.393 | Neutral | 30.3 | 48.0 | 17.7 | Complied |
| 3.314 | Neutral | 29.7 | 46.0 | 16.3 | Complied |
| 3.971 | Neutral | 33.1 | 46.0 | 12.9 | Complied |
| 4.461 | Neutral | 29.4 | 46.0 | 16.6 | Complied |
| 11.153 | Neutral | 30.4 | 50.0 | 19.6 | Complied |
| 11.742 | Neutral | 30.9 | 50.0 | 19.1 | Complied |

Transmitter AC Conducted Spurious Emissions (continued)**Live****Neutral**

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Equipment Used:

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|-----------|------------------|-----------------|------------|------------|----------------------|------------------------|
| A067 | LISN | Rohde & Schwarz | ESH3-Z5 | 890603/002 | 14 Aug 2015 | 12 |
| A1830 | Pulse Limiter | Rohde & Schwarz | ESH3-Z2 | 100668 | 02 Mar 2016 | 12 |
| M1263 | Test Receiver | Rohde & Schwarz | ESIB7 | 100265 | 14 Oct 2016 | 12 |
| M1625 | Thermohygrometer | JM Handelspunkt | 30.5015.06 | N/A | 07 Jan 2016 | 12 |

5.2.2. Transmitter Minimum 6 dB Bandwidth**Test Summary:**

| | | | |
|-----------------------------------|-------------|-------------------|---------------|
| Test Engineer: | David Doyle | Test Date: | 16 April 2015 |
| Test Sample Serial Number: | P PROD 14 | | |

| | |
|--------------------------|--|
| FCC Reference: | Part 15.247(a)(2) |
| Test Method Used: | As detailed in FCC KDB 558074 Section 8.1 Option 1 |

Environmental Conditions:

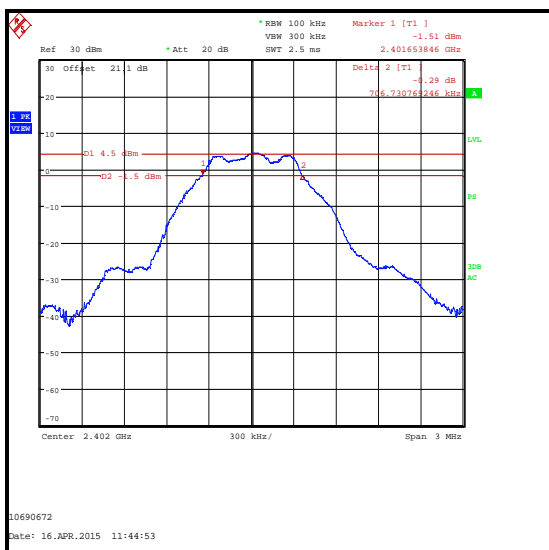
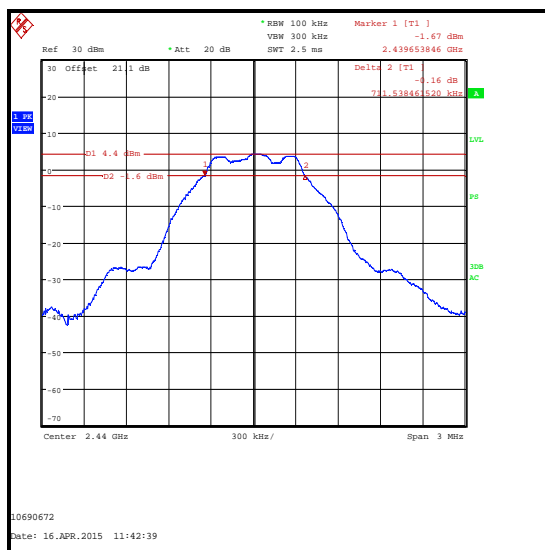
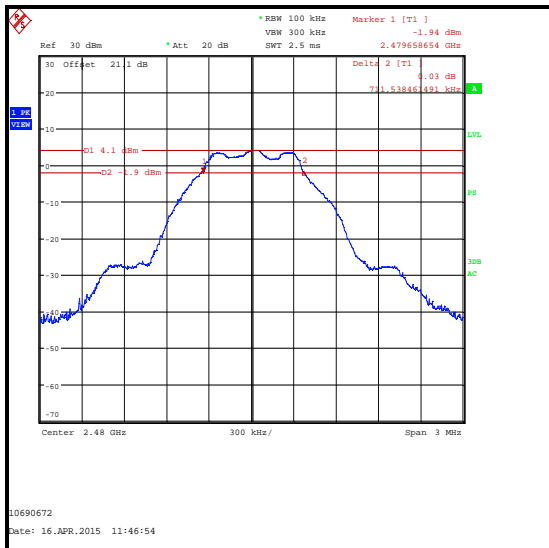
| | |
|-------------------------------|----|
| Temperature (°C): | 27 |
| Relative Humidity (%): | 31 |

Note(s):

1. 6 dB DTS bandwidth tests were performed using a signal analyser in accordance with FCC KDB 558074 Section 8.1 Option 1 measurement procedure.
2. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

Results:

| Channel | 6 dB Bandwidth (kHz) | Limit (kHz) | Margin (kHz) | Result |
|----------------|-----------------------------|--------------------|---------------------|---------------|
| Bottom | 706.731 | ≥500 | 206.731 | Complied |
| Middle | 711.538 | ≥500 | 211.538 | Complied |
| Top | 711.538 | ≥500 | 211.538 | Complied |

Transmitter Minimum 6 dB Bandwidth (continued)**Results:****Bottom Channel****Middle Channel****Top Channel**

Transmitter Minimum 6 dB Bandwidth (continued)**Test Equipment Used:**

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|-----------|--------------------|-----------------|------------|------------|-----------------------|------------------------|
| M1785 | Thermohygrometer | JM Handelspunkt | 30.5015.13 | Not stated | 24 Apr 2015 | 12 |
| M1630 | Signal Analyser | Rohde & Schwarz | ESU40 | 100233 | 20 Feb 2016 | 12 |
| A2526 | Attenuator | AtlanTecRF | AN18W5-20 | 832828#1 | Calibrated before use | - |
| S0557 | DC Power Supply | TTI | EL303R | 395819 | Calibrated before use | - |
| M1251 | Digital Multimeter | Fluke | 175 | 89170179 | 19 May 2015 | 12 |
| M260 | Signal Generator | Hewlett Packard | SMP02 | 829076/008 | 24 Apr 2015 | 12 |
| M199 | Power Meter | Rohde & Schwarz | NRVS | 827023/075 | 08 Apr 2016 | 24 |
| M1267 | Power Sensor | Rohde & Schwarz | NRV-Z52 | 100155 | 23 Apr 2016 | 24 |

5.2.3. Transmitter Maximum Peak Output Power**Test Summary:**

| | | | |
|-----------------------------------|-------------|-------------------|---------------|
| Test Engineer: | David Doyle | Test Date: | 16 April 2015 |
| Test Sample Serial Number: | P PROD 14 | | |

| | |
|--------------------------|---|
| FCC Reference: | Part 15.247(b)(3) |
| Test Method Used: | As detailed in FCC KDB 558074 Section 9.1.1 |

Environmental Conditions:

| | |
|-------------------------------|----|
| Temperature (°C): | 27 |
| Relative Humidity (%): | 31 |

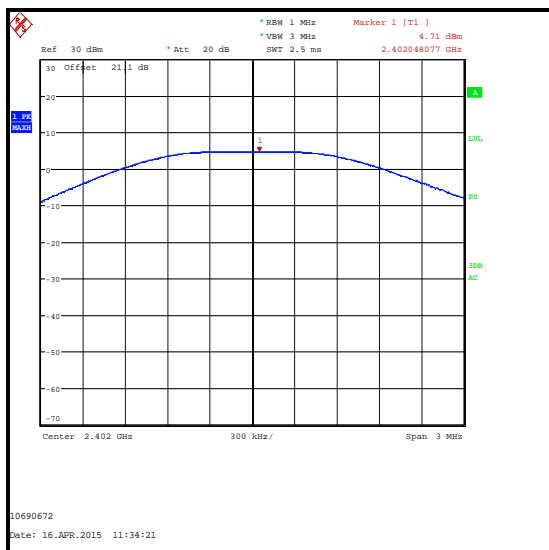
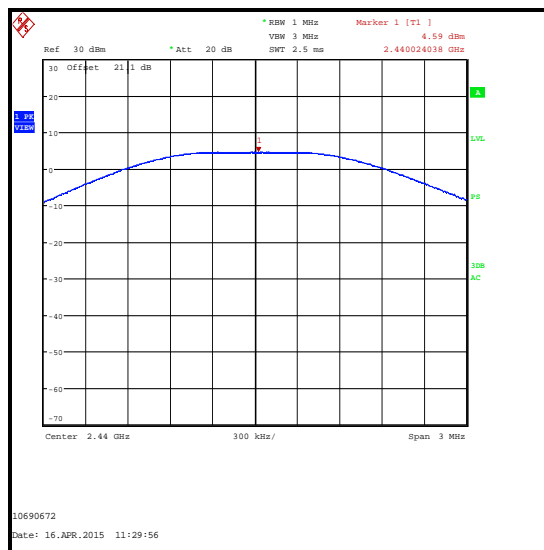
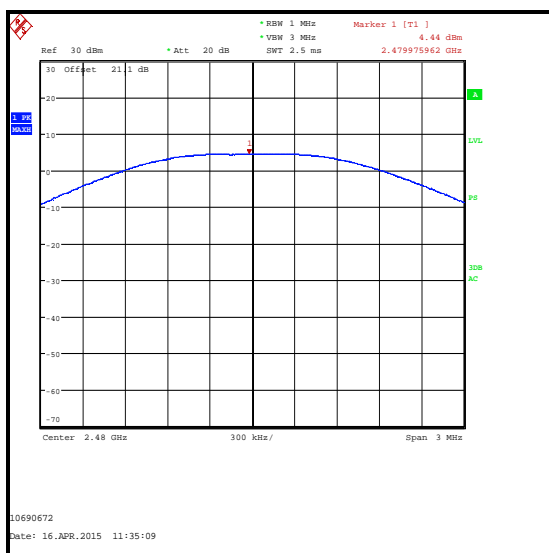
Note(s):

1. Conducted power tests were performed using a signal analyser in accordance with FCC KDB 558074 Section 9.1.1 with the RBW > *DTS bandwidth* procedure. A resolution bandwidth of 1 MHz was used and the video bandwidth was set to 3 MHz.
2. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the signal analyser to compensate for the loss of the attenuator and RF cable.
3. The conducted peak power was added to the declared antenna gain to obtain the EIRP.

Results:

| Channel | Conducted Peak Power (dBm) | Conducted Peak Power Limit (dBm) | Margin (dB) | Result |
|---------|----------------------------|----------------------------------|-------------|----------|
| Bottom | 4.7 | 30.0 | 25.3 | Complied |
| Middle | 4.6 | 30.0 | 25.4 | Complied |
| Top | 4.4 | 30.0 | 25.6 | Complied |

| Channel | Conducted Peak Power (dBm) | Declared Antenna Gain (dBi) | EIRP (dBm) | De Facto EIRP Limit (dBm) | Margin (dB) | Result |
|---------|----------------------------|-----------------------------|------------|---------------------------|-------------|----------|
| Bottom | 4.7 | 1.7 | 6.4 | 36.0 | 29.6 | Complied |
| Middle | 4.6 | 1.7 | 6.3 | 36.0 | 29.7 | Complied |
| Top | 4.4 | 1.7 | 6.1 | 36.0 | 29.9 | Complied |

Transmitter Maximum Peak Output Power (continued)**Bottom Channel****Middle Channel****Top Channel**

Transmitter Maximum Peak Output Power (continued)**Test Equipment Used:**

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|------------------|--------------------|---------------------|-----------------|-------------------|-----------------------------|-------------------------------|
| M1785 | Thermohygrometer | JM Handelspunkt | 30.5015.13 | Not stated | 24 Apr 2015 | 12 |
| M1630 | Signal Analyser | Rohde & Schwarz | ESU40 | 100233 | 20 Feb 2016 | 12 |
| A2526 | Attenuator | AtlanTecRF | AN18W5-20 | 832828#1 | Calibrated before use | - |
| S0557 | DC Power Supply | TTI | EL303R | 395819 | Calibrated before use | - |
| M1251 | Digital Multimeter | Fluke | 175 | 89170179 | 19 May 2015 | 12 |
| M260 | Signal Generator | Hewlett Packard | SMP02 | 829076/008 | 24 Apr 2015 | 12 |
| M199 | Power Meter | Rohde & Schwarz | NRVS | 827023/075 | 08 Apr 2016 | 24 |
| M1267 | Power Sensor | Rohde & Schwarz | NRV-Z52 | 100155 | 23 Apr 2016 | 24 |

5.2.4. Transmitter Radiated Emissions**Test Summary:**

| | | | |
|-----------------------------------|----------------|-------------------|---------------|
| Test Engineer: | Andrew Edwards | Test Date: | 03 March 2015 |
| Test Sample Serial Number: | P PROD 13 | | |

| | |
|--------------------------|--|
| FCC Reference: | Parts 15.247(d) & 15.209(a) |
| Test Method Used: | As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4 |
| Frequency Range | 30 MHz to 1000 MHz |

Environmental Conditions:

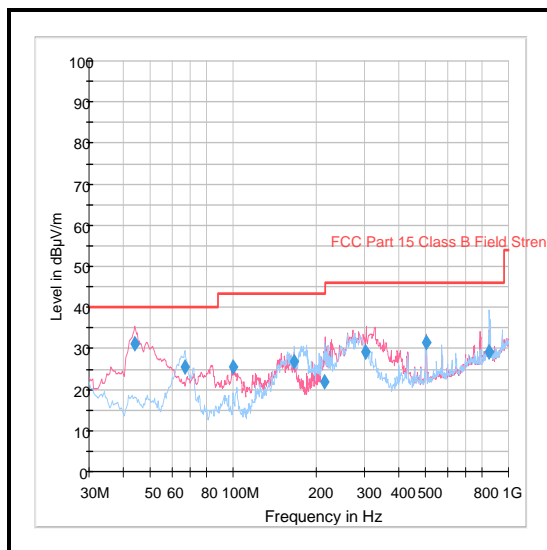
| | |
|-------------------------------|----|
| Temperature (°C): | 22 |
| Relative Humidity (%): | 35 |

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The preliminary scans showed similar emission levels below 1 GHz for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the middle channel only.
3. All other emissions shown on the pre-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system.
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Results: Middle Channel

| Frequency (MHz) | Antenna Polarity | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|------------------------|-------------------------|-----------------------|-----------------------|--------------------|---------------|
| 166.028 | Horizontal | 26.9 | 43.5 | 16.6 | Complied |

Transmitter Radiated Emissions (continued)

Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.

Test Equipment Used:

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|-----------|------------------|-----------------|------------|-------------|----------------------|------------------------|
| M1624 | Thermohygrometer | JM Handelspunkt | 30.5015.10 | None stated | 07 Jan 2016 | 12 |
| K0001 | 5m RSE Chamber | Rainford EMC | N/A | N/A | 26 Mar 2015 | 12 |
| G054 | Amplifier | Sonoma | 310N | 230801 | 04 Mar 2015 | 3 |
| M1124 | Test Receiver | Rohde & Schwarz | ESIB26 | 100046K | 06 Oct 2015 | 12 |
| A490 | Antenna | Chase | CBL6111A | 1590 | 29 Apr 2015 | 12 |
| A1834 | Attenuator | Hewlett Packard | 8491B | 10444 | 05 Mar 2016 | 12 |

Transmitter Radiated Emissions (continued)**Test Summary:**

| | | | |
|-----------------------------------|-------------|--------------------|----------------------------------|
| Test Engineer: | David Doyle | Test Dates: | 17 April 2015 & 20 April 2015 |
| Test Sample Serial Number: | P PROD 24 | | |

| | |
|--------------------------|--|
| FCC Reference: | Parts 15.247(d) & 15.209(a) |
| Test Method Used: | As detailed in FCC KDB 558074 Sections 11 & 12 referencing ANSI C63.10 Sections 6.3 and 6.6 and ANSI C63.4 |
| Frequency Range | 1 GHz to 25 GHz |

Environmental Conditions:

| | |
|-------------------------------|----------|
| Temperature (°C): | 23 to 24 |
| Relative Humidity (%): | 26 to 31 |

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. The emission shown on the 1 GHz to 4 GHz plot is the EUT fundamental.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.
6. *Emissions in restricted bands: In accordance with ANSI C63.10 Section 6.6.4.2 Note 1, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
7. Emissions in non-restricted bands: The reference level for the emission in the non-restricted band was established by following KDB 558074 Section 11.2 procedure.

Transmitter Radiated Emissions (continued)**Results: Peak / Bottom Channel**

| Frequency (MHz) | Antenna Polarity | Peak Level (dB μ V/m) | Average Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|---------------------------|------------------------------|-------------|----------|
| 4804.064 | Vertical | 45.0 | 54.0* | 9.0 | Complied |

Results: Peak / Middle Channel

| Frequency (MHz) | Antenna Polarity | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|----------------------|----------------------|-------------|----------|
| 2499.439 | Vertical | 58.9 | 74.0 | 15.1 | Complied |
| 4880.657 | Vertical | 46.6 | 54.0* | 7.4 | Complied |
| 7319.415 | Vertical | 51.1 | 54.0* | 2.9 | Complied |

Results: Average / Middle Channel

| Frequency (MHz) | Antenna Polarity | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|----------------------|----------------------|-------------|----------|
| 2499.487 | Vertical | 52.5 | 54.0 | 1.5 | Complied |

Results: Peak / Top Channel

| Frequency (MHz) | Antenna Polarity | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|----------------------|----------------------|-------------|----------|
| 2499.327 | Vertical | 55.1 | 74.0 | 18.9 | Complied |
| 4960.064 | Vertical | 36.6 | 54.0* | 17.4 | Complied |
| 7440.042 | Vertical | 51.2 | 54.0* | 2.8 | Complied |

Results: Average / Top Channel

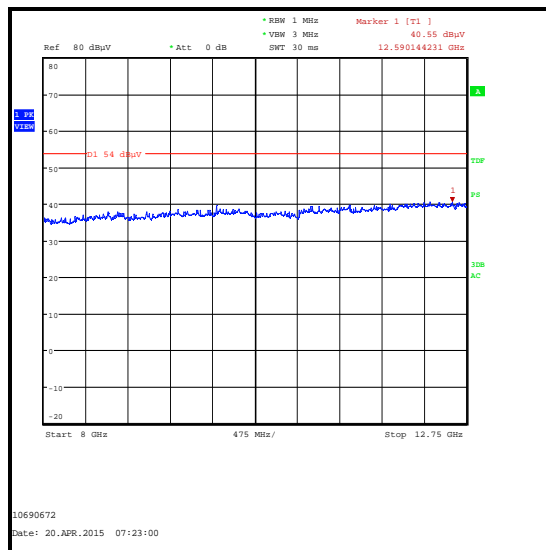
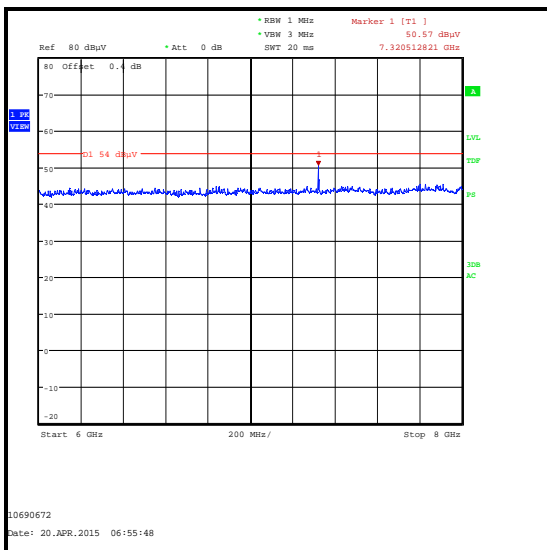
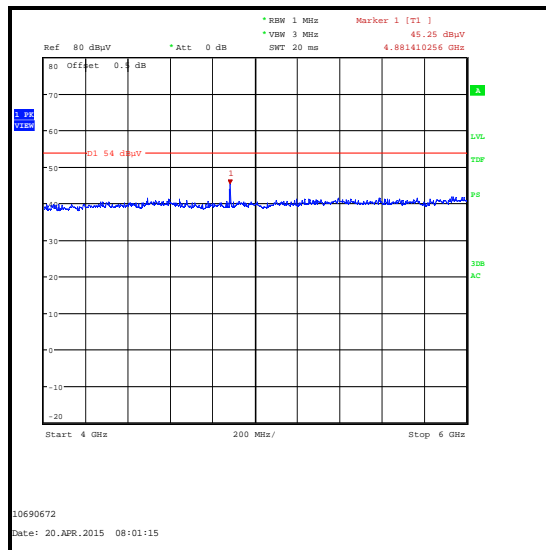
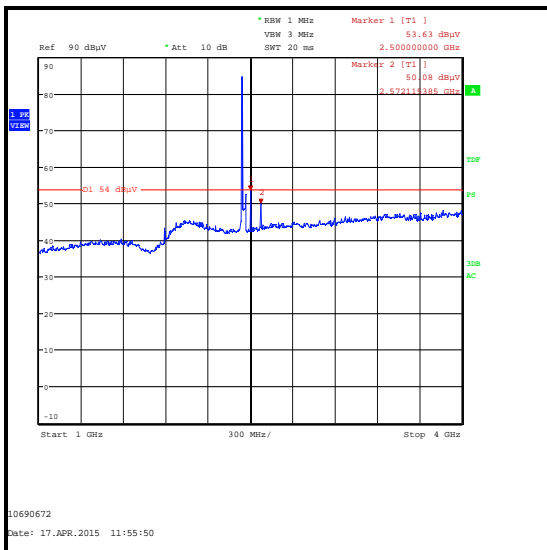
| Frequency (MHz) | Antenna Polarity | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|----------------------|----------------------|-------------|----------|
| 2499.327 | Vertical | 53.9 | 54.0 | 0.1 | Complied |

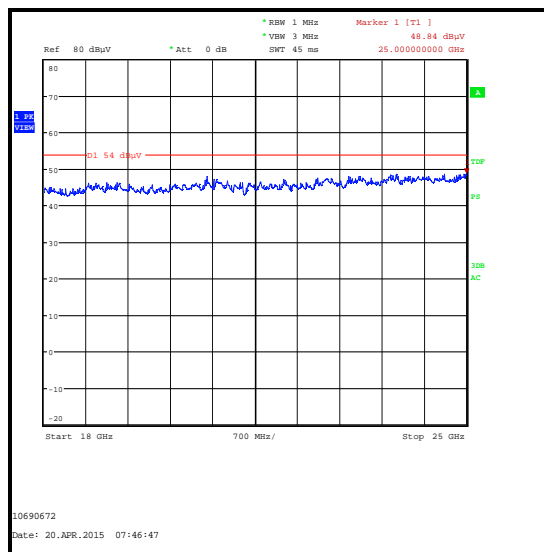
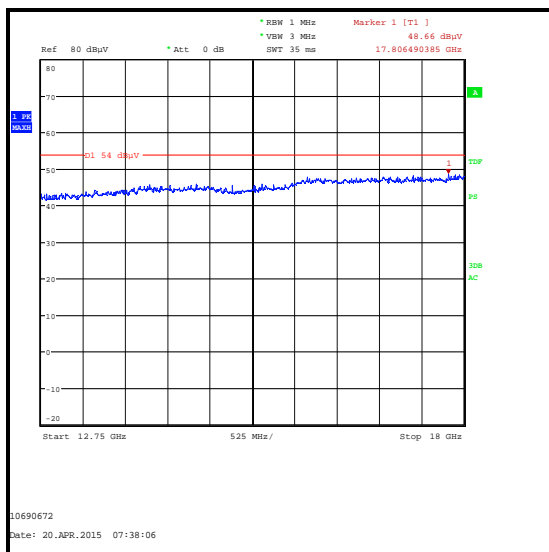
Results: Non-restricted Band / Bottom Channel

| Frequency (MHz) | Antenna Polarity | Level (dB μ V/m) | -20 dBc Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|----------------------|------------------------------|-------------|----------|
| 7206.111 | Vertical | 51.0 | 59.1 | 8.1 | Complied |

Results: Non-restricted Band / Middle Channel

| Frequency (MHz) | Antenna Polarity | Level (dB μ V/m) | -20 dBc Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|----------------------|------------------------------|-------------|----------|
| 2570.770 | Vertical | 44.4 | 65.5 | 21.1 | Complied |

Transmitter Radiated Emissions (continued)

Transmitter Radiated Emissions (continued)

Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Equipment Used:

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|-----------|------------------|-----------------|------------|------------|-----------------------|------------------------|
| M1782 | Thermohygrometer | JM Handelpunkt | 30.5015.10 | Not stated | 24 Apr 2015 | 12 |
| K0002 | 3m RSE Chamber | Rainford EMC | N/A | N/A | 30 Apr 2015 | 12 |
| M1874 | Test Receiver | Rohde & Schwarz | ESU26 | 100553 | 13 May 2015 | 12 |
| A1534 | Pre Amplifier | Hewlett Packard | 8449B | 3008A00405 | 21 Dec 2015 | 12 |
| A1818 | Antenna | EMCO | 3115 | 00075692 | 20 Dec 2015 | 12 |
| A253 | Antenna | Flann Microwave | 12240-20 | 128 | 20 Dec 2014 | 12 |
| A254 | Antenna | Flann Microwave | 14240-20 | 139 | 20 Dec 2014 | 12 |
| A255 | Antenna | Flann Microwave | 16240-20 | 519 | 20 Dec 2014 | 12 |
| A256 | Antenna | Flann Microwave | 18240-20 | 400 | 20 Dec 2014 | 12 |
| A436 | Antenna | Flann Microwave | 20240-20 | 330 | 21 Dec 2014 | 12 |
| A1975 | High Pass Filter | AtlanTecRF | AFH-0300 | 09042410 | Calibrated before use | - |
| M260 | Signal Generator | Hewlett Packard | SMP02 | 829076/008 | 24 Apr 2015 | 12 |
| M199 | Power Meter | Rohde & Schwarz | NRVS | 827023/075 | 08 Apr 2016 | 24 |
| M1267 | Power Sensor | Rohde & Schwarz | NRV-Z52 | 100155 | 23 Apr 2016 | 24 |

5.2.5. Transmitter Band Edge Radiated Emissions**Test Summary:**

| | | | |
|-----------------------------------|-------------|-------------------|-------------|
| Test Engineer: | David Doyle | Test Date: | 26 May 2015 |
| Test Sample Serial Number: | P PROD 13 | | |

| | |
|--------------------------|--|
| FCC Reference: | Parts 15.247(d) & 15.209(a) |
| Test Method Used: | As detailed in ANSI C63.10 Section 6.9.2 & KDB 558074 Section 11 |

Environmental Conditions:

| | |
|-------------------------------|----|
| Temperature (°C): | 23 |
| Relative Humidity (%): | 37 |

Note(s):

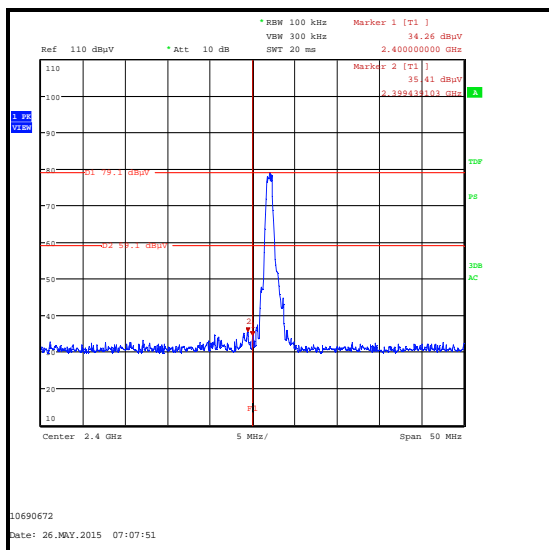
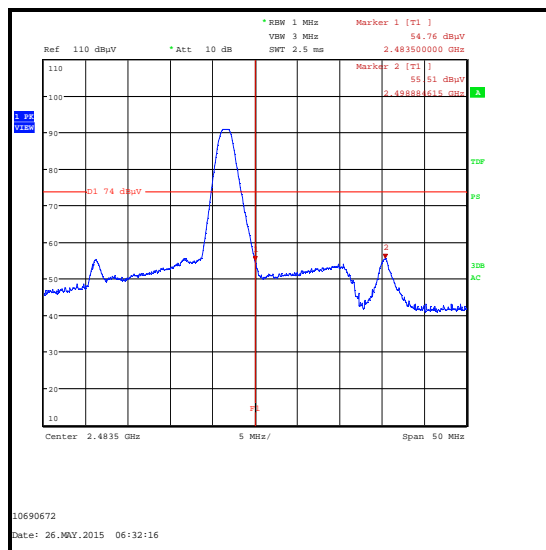
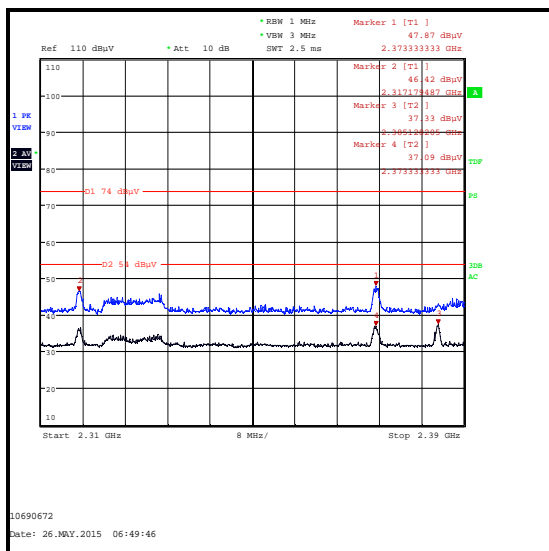
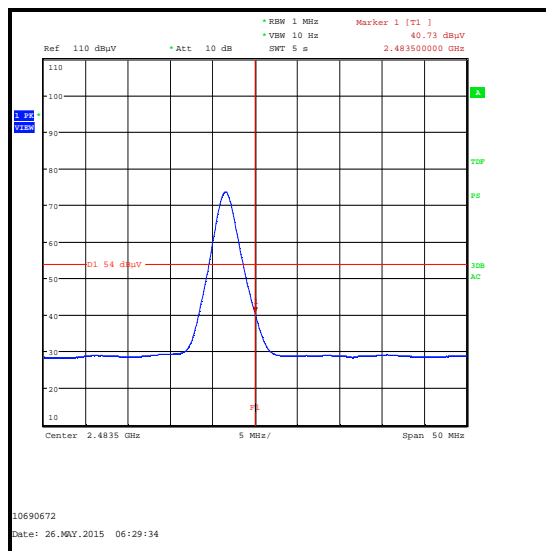
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The maximum peak conducted output power was previously measured. In accordance with FCC KDB 558074 Section 11.1(a), the lower band edge measurement was performed with a peak detector and the -20 dBc limit applied.
3. There is a restricted band 10 MHz below the lower band edge. The test receiver was set up as follows: the RBW set to 1 MHz, the VBW set to 3 MHz, with the sweep time set to auto couple. Peak and average measurements were performed with their respective detectors. Markers were placed on the highest point on each trace.
4. * -20 dBc limit.

Results: Peak

| Frequency (MHz) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Result |
|-----------------|----------------|----------------|-------------|----------|
| 2373.333 | 47.9 | 74.0 | 26.1 | Complied |
| 2399.439 | 35.4 | 59.1* | 23.7 | Complied |
| 2400 | 34.3 | 59.1* | 24.8 | Complied |
| 2483.5 | 54.8 | 74.0 | 19.2 | Complied |
| 2498.885 | 55.5 | 74.0 | 18.5 | Complied |

Results: Average

| Frequency (MHz) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Result |
|-----------------|----------------|----------------|-------------|----------|
| 2385.128 | 37.3 | 54.0 | 16.7 | Complied |
| 2483.5 | 40.7 | 54.0 | 13.3 | Complied |

Transmitter Band Edge Radiated Emissions (continued)**Lower Band Edge Peak Measurement****Upper Band Edge Peak Measurement****2310 MHz to 2390 MHz Restricted Band Plot****Upper Band Edge Average Measurement****Test Equipment Used:**

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|-----------|------------------|-----------------|------------|-------------|----------------------|------------------------|
| M1656 | Thermohygrometer | JM Handelspunkt | 30.5015.13 | None stated | 23 Apr 2016 | 12 |
| K0002 | 3m RSE Chamber | Rainford EMC | N/A | N/A | 01 May 2016 | 12 |
| M1874 | Test Receiver | Rohde & Schwarz | ESU26 | 100553 | 13 Jun 2015 | 12 |
| A1534 | Pre Amplifier | Hewlett Packard | 8449B | 3008A00405 | 21 Dec 2015 | 12 |
| A1818 | Antenna | EMCO | 3115 | 00075692 | 20 Dec 2015 | 12 |

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value measured (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

| Measurement Type | Range | Confidence Level (%) | Calculated Uncertainty |
|-------------------------------------|-----------------------|-----------------------------|-------------------------------|
| AC Conducted Spurious Emissions | 0.15 MHz to 30 MHz | 95% | ±4.69 dB |
| Conducted Maximum Peak Output Power | 2.4 GHz to 2.4835 GHz | 95% | ±1.13 dB |
| Minimum 6 dB Bandwidth | 2.4 GHz to 2.4835 GHz | 95% | ±3.92 % |
| Radiated Spurious Emissions | 30 MHz to 1 GHz | 95% | ±5.65 dB |
| Radiated Spurious Emissions | 1 GHz to 26.5 GHz | 95% | ±2.94 dB |

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

7. Report Revision History

| Version Number | Revision Details | | |
|----------------|------------------|--------|----------------------|
| | Page No(s) | Clause | Details |
| 1.0 | - | - | Initial Version |
| 2.0 | - | - | Model number updated |

--- END OF REPORT ---