



TEST REPORT


Test Report No. : UL-RPT-RP14002621-716A

Manufacturer : Cambium Networks Ltd
Model No. : 60 GHz cnWave V3000
FCC ID : QWP-60V3000
Test Standard(s) : FCC Parts 15.209, 15.215 & 15.255

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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 testing.

Date of Issue: 11 August 2022

Checked by: 
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Lead Project Engineer, Radio Laboratory

Company Signatory: 
Sarah Williams
Operations Leader, Radio Laboratory



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1. Customer Information








| | |
|----------------------|---|
| Company Name: | Cambium Networks Ltd |
| Address: | Unit B2 Linhay Business Park Eastern Road Ashburton Devon TQ13 7UP United Kingdom |

2. Summary of Testing

2.1. General Information

| | |
|---------------------------------|---|
| Specification Reference: | 47CFR15.255 |
| Specification Title: | Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Radio Frequency Devices) – Section 15.255 |
| Specification Reference: | 47CFR15.209 and 47CFR15.215 |
| Specification Title: | Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.209 & 15.215 |
| Site Registration: | 685609 |
| Lab. Designation No.: | UK2011 |
| Location of Testing: | Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom |
| Test Dates: | 16 March 2022 to 17 June 2022 |

2.2. Summary of Test Results

| FCC Reference (47CFR) | Measurement | Result |
|---|--------------------------------|---|
| Part 15.255(c)(1)(ii) | Transmitter EIRP |  |
| Part 15.255(e) | Transmitter Peak Output Power |  |
| Part 15.255(e)(1) | Transmitter 6 dB Bandwidth |  |
| Part 15.215(c) | Transmitter 20 dB Bandwidth |  |
| Part 15.255(d) / 15.209 | Transmitter Spurious Emissions |  |
| Key to Results | | |
|  = Complied  = Did not comply | | |

2.3. Methods and Procedures

| | |
|-------------------|---|
| Reference: | ANSI C63.10-2013 |
| Title: | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |

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: | Cambium Networks |
| Model Name or Number: | 60 GHz cnWave V3000 |
| Test Sample Serial Number: | V5XF026Q7XSF |
| Hardware Version: | P9 |
| Software Version: | Image: 1.2.1 B25, DM Tools: 3.9.0.3 |
| Firmware Version: | 10.11.0.89 |
| FCC ID: | QWP-60V3000 |

3.2. Description of EUT

The equipment under test was a point-to-point / point-to-multipoint high gain client node operating in the 57-71 GHz band.

3.3. Modifications Incorporated in the EUT

The EUT was returned to the customer on 26/05/22 due to fluctuating emission levels. This was traced to the baseband RF cable which was replaced and the EUT returned to UL on 15/06/22. No other modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

| | | | |
|----------------------------------|---|------------------------|--------------------------------|
| Category of Equipment: | Transceiver | | |
| Channel Spacing: | 4.32 GHz | | |
| Modulation Type: | BPSK, QPSK & 16QAM | | |
| Antenna Type: | Integrated Patch & Parabolic Reflector | | |
| Antenna Gain: | 20.1 dBi (patch) 20.4 dB (reflector) Combined: 40.5 dBi | | |
| Transmit Frequency Range: | 57 GHz to 66 GHz | | |
| Transmit Channels Tested: | Channel ID | Channel No. | Channel Frequency (GHz) |
| | Bottom | 9 | 59.400 |
| | Middle | 10 | 61.560 |
| | Top | 11 | 63.720 |
| Power Supply Requirement: | Nominal | 56 VDC via 120 VAC PoE | |

3.5 EUT Settings

| Channel | Sector | TPC | Notch |
|----------------|---------------|------------|--------------|
| 9 | 32 | 1 | - |
| 10 | 32 | 4 | - |
| 11 | 32 | 4 | - |

3.6. Support Equipment

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

| | |
|------------------------------|------------------|
| Description: | PoE |
| Brand Name: | Cambium Networks |
| Model Name or Number: | N000900L017A |
| Serial Number: | 1745005333 |

| | |
|------------------------------|--------------|
| Description: | Test Laptop |
| Brand Name: | HP EliteBook |
| Model Name or Number: | NH121UC#ABU |
| Serial Number: | 2CE00223BK |

| | |
|------------------------------|--|
| Description: | Ethernet Cables. Quantity 3. Length 1 m / 3 m / 10 m |
| Brand Name: | RS Pro |
| 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 with BPSK MCS5 modulation, which was found to be the worst-case mode after preliminary investigation.
- Operating on bottom, middle and top channels with a 4.32 GHz channel bandwidth.
- Transmitting at maximum output power with beamforming locked to sector 32 (straight ahead), which was found to be the direction of highest EIRP during preliminary investigation.

4.2. Configuration and Peripherals

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

- A laptop PC with Qualcomm DMTools and QRCT software was used to configure the EUT during the testing. Telnet commands were used to set the channel and modulation. The laptop was connected to the EUT via Ethernet.
- The EUT was powered by a PoE supply connected to 120 VAC mains.
- Due to the large dimensions of the 20 dB reflector, the far field measurement distance is in excess of 60 m. For in-band tests, the reflector was removed to expose the smaller 20.1 dBi patch, allowing measurements to be made in the far field at 3 m. The 20 dB reflector gain was added to the measured results. An enquiry was made to the FCC OET and this method was deemed acceptable.
- Transmitter radiated spurious emissions tests were performed with the 20 dB reflector fitted. All measurements were performed in the far field of the measurement antenna.

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 Uncertainties* 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 EIRP

Test Summary:

| | | | |
|-----------------------------------|---------------|-------------------|---------------|
| Test Engineer: | Patrick Jones | Test Date: | 22 April 2022 |
| Test Sample Serial Number: | V5XF026Q7XSF | | |

| | |
|--------------------------|--------------------------|
| FCC Reference: | Part 15.255(c)(1)(ii) |
| Test Method Used: | ANSI C63.10 Section 9.11 |

Environmental Conditions:

| | |
|-------------------------------|----|
| Temperature (°C): | 23 |
| Relative Humidity (%): | 38 |

Note(s):

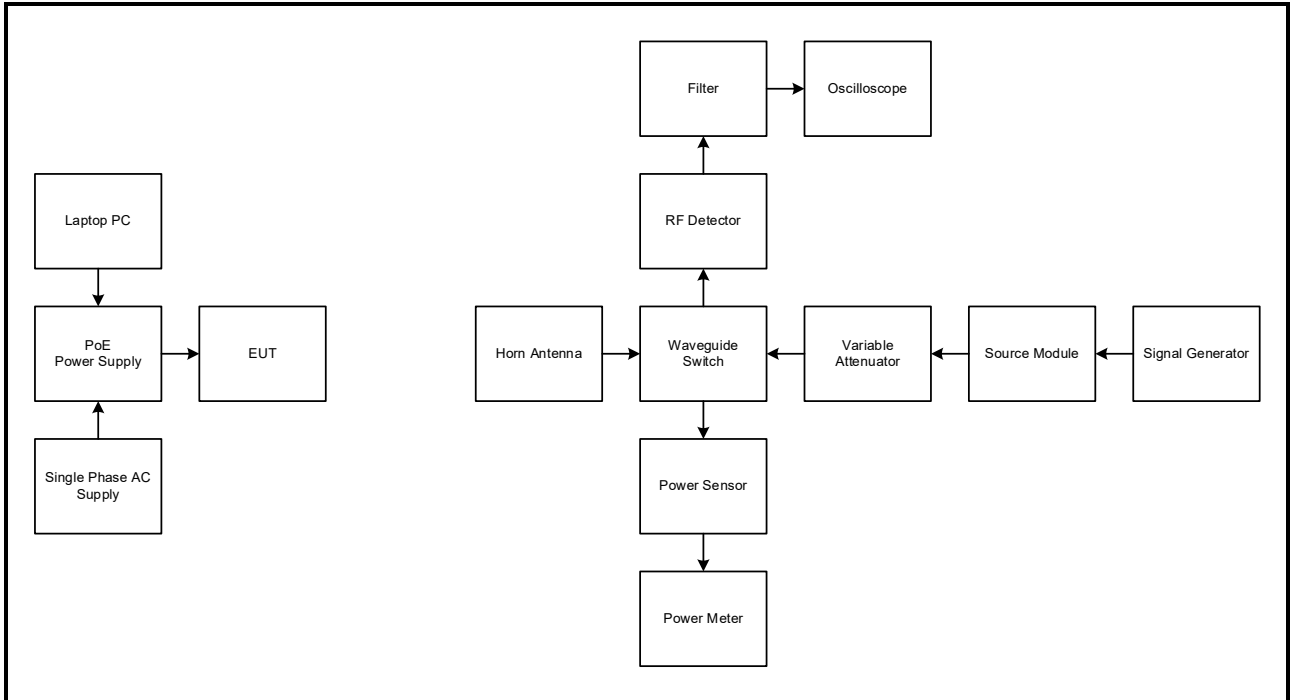
1. The measurement antenna was connected to an RF detector via a 4-way waveguide switch. A CW signal generator and wideband thermocouple power sensor were connected to the remaining two ports.
2. The RF detector was connected to the 50 Ω input of a digital storage oscilloscope via a 10 MHz low pass filter.
3. The EUT peak and average voltages were measured on the oscilloscope. The waveguide switch was then rotated to connect the signal generator to the RF detector, and the signal generator output was adjusted to match the previously measured voltages. The waveguide switch was then rotated to connect the signal generator output to the thermocouple power sensor, and the signal generator output power was measured.
4. The substituted levels recorded below include the calibrated path loss of the waveguide switch.
5. In accordance with Part 15.255(c)(1)(ii), the peak and average EIRP limits shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The combined gain of the patch antenna and reflector is 40.5 dBi. The limit reduction was calculated as follows:

$$2 \times (51 \text{ dBi} - 40.5 \text{ dBi}) = 21 \text{ dB}$$

$$\begin{aligned} \text{Peak EIRP Limit: } & 85 \text{ dBm} - 21 \text{ dB} = 64 \text{ dBm} \\ \text{Average EIRP Limit: } & 82 \text{ dBm} - 21 \text{ dB} = 61 \text{ dBm} \end{aligned}$$

Transmitter EIRP (continued)

Test setup:



Transmitter EIRP (continued)**Results: Bottom Channel / Peak**

| Frequency (GHz) | Level (V) | Substituted EIRP Level (dBm) | Reflector Gain (dB) | Corrected EIRP Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------|------------------------------|---------------------|----------------------------|-------------|-------------|----------|
| 59.400 | 0.241 | 29.5 | 20.4 | 49.9 | 64.0 | 14.1 | Complied |

Results: Bottom Channel / Average

| Frequency (GHz) | Level (V) | Substituted EIRP Level (dBm) | Reflector Gain (dB) | Corrected EIRP Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------|------------------------------|---------------------|----------------------------|-------------|-------------|----------|
| 59.400 | 0.139 | 25.6 | 20.4 | 46.0 | 61.0 | 15.0 | Complied |

Results: Middle Channel / Peak

| Frequency (GHz) | Level (V) | Substituted EIRP Level (dBm) | Reflector Gain (dB) | Corrected EIRP Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------|------------------------------|---------------------|----------------------------|-------------|-------------|----------|
| 61.560 | 0.458 | 32.2 | 20.4 | 52.6 | 64.0 | 11.4 | Complied |

Results: Middle Channel / Average

| Frequency (GHz) | Level (V) | Substituted EIRP Level (dBm) | Reflector Gain (dB) | Corrected EIRP Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------|------------------------------|---------------------|----------------------------|-------------|-------------|----------|
| 61.560 | 0.376 | 31.5 | 20.4 | 51.9 | 61.0 | 9.1 | Complied |

Results: Top Channel / Peak

| Frequency (GHz) | Level (V) | Substituted EIRP Level (dBm) | Reflector Gain (dB) | Corrected EIRP Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------|------------------------------|---------------------|----------------------------|-------------|-------------|----------|
| 63.720 | 0.354 | 31.4 | 20.4 | 51.8 | 64.0 | 12.2 | Complied |

Results: Top Channel / Average

| Frequency (GHz) | Level (V) | Substituted EIRP Level (dBm) | Reflector Gain (dB) | Corrected EIRP Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------|------------------------------|---------------------|----------------------------|-------------|-------------|----------|
| 63.720 | 0.261 | 30.0 | 20.4 | 50.4 | 61.0 | 10.6 | Complied |

Transmitter EIRP (continued)**Test Equipment Used:**

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|------------------|------------------------|---------------------|--------------------|-------------------|-----------------------------|-------------------------------|
| M2041 | Thermohygrometer | Testo | 608-H1 | 45119912 | 09 Dec 2022 | 12 |
| M2070 | Oscilloscope | Keysight | DSOX2024A | MY59125508 | 22 Feb 2024 | 24 |
| A3233 | Waveguide RF Detector | Sage Millimeter | SFD-503753-15SF-P1 | 18199-01 | Calibrated before use | - |
| A3235 | Waveguide Switch | Flann | 25333-2 | 215753 | Calibrated before use | - |
| M281 | Power Meter | Hewlett Packard | E4418A | GB37170210-01 | 19 May 2022 | 12 |
| M291 | Waveguide Power Sensor | Hewlett Packard | V8486A | US39010039 | 30 Nov 2022 | 24 |
| M1252 | Signal Generator | Hewlett Packard | 83640A | 3119A00489 | 04 Feb 2024 | 24 |
| G094 | Source Module | Hewlett Packard | 83557A | 2948A00475 | Calibrated before use | - |
| A2964 | Horn Antenna | Link Microtek | AM15HA-ULV1 | 14930 | 04 Feb 2023 | 12 |
| A3251 | Video Amplifier | Femto | HVA-200M-40B | 05-01-354 | Calibrated before use | - |
| A3252 | Low Pass Filter | Mini-Circuits | BLP-10.7+ | YUU54901833 | Calibrated before use | - |

5.2.2. Transmitter Peak Conducted Output Power

Test Summary:

| | | | |
|-----------------------------------|---------------|-------------------|---------------|
| Test Engineer: | Patrick Jones | Test Date: | 22 April 2022 |
| Test Sample Serial Number: | V5XF026Q7XSF | | |

| | |
|--------------------------|--------------------------|
| FCC Reference: | Part 15.255(e) |
| Test Method Used: | ANSI C63.10 Section 9.11 |

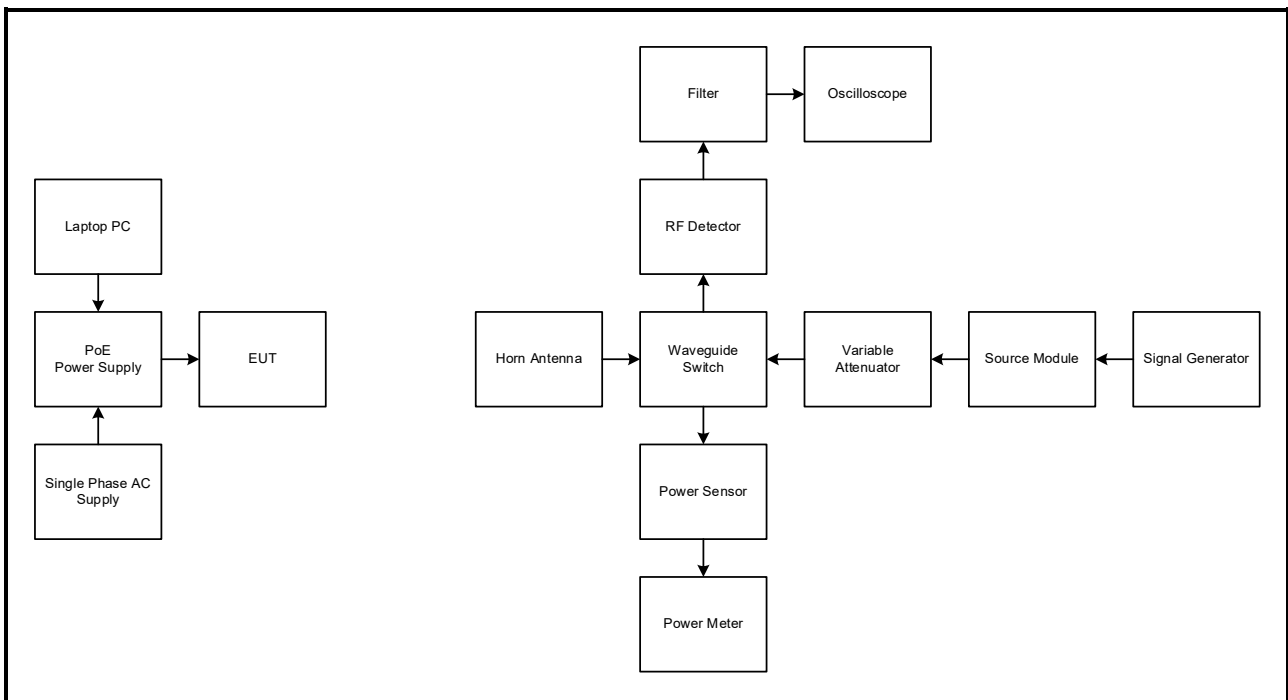
Environmental Conditions:

| | |
|-------------------------------|----|
| Temperature (°C): | 23 |
| Relative Humidity (%): | 38 |

Note(s):

1. The measurement antenna was connected to an RF detector via a 4-way waveguide switch. A CW signal generator and wideband thermocouple power sensor were connected to the remaining two ports.
2. The RF detector was connected to the 50 Ω input of a digital storage oscilloscope via a 10 MHz low pass filter.
3. The EUT peak and average voltages were measured on the oscilloscope. The waveguide switch was then rotated to connect the signal generator to the RF detector, and the signal generator output was adjusted to match the previously measured voltages. The waveguide switch was then rotated to connect the signal generator output to the thermocouple power sensor, and the signal generator output power was measured.
4. The stated antenna gain was subtracted from the measured EIRP to obtain the conducted power.
5. The substituted levels recorded below include the calibrated path loss of the waveguide switch.

Test setup:



Transmitter Peak Conducted Output Power (continued)**Results: Bottom Channel**

| EIRP Level (dBm) | Antenna Gain (dBi) | Conducted Level (dBm) | Conducted Level (mW) | Limit (mW) | Margin (mW) | Result |
|------------------|--------------------|-----------------------|----------------------|------------|-------------|----------|
| 49.9 | 40.5 | 9.4 | 8.7 | 500 | 491.3 | Complied |

Results: Middle Channel

| EIRP Level (dBm) | Antenna Gain (dBi) | Conducted Level (dBm) | Conducted Level (mW) | Limit (mW) | Margin (mW) | Result |
|------------------|--------------------|-----------------------|----------------------|------------|-------------|----------|
| 52.6 | 40.5 | 12.1 | 16.2 | 500 | 483.8 | Complied |

Results: Top Channel

| EIRP Level (dBm) | Antenna Gain (dBi) | Conducted Level (dBm) | Conducted Level (mW) | Limit (mW) | Margin (mW) | Result |
|------------------|--------------------|-----------------------|----------------------|------------|-------------|----------|
| 51.8 | 40.5 | 11.3 | 13.5 | 500 | 486.5 | Complied |

Test Equipment Used:

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|-----------|------------------------|-----------------|--------------------|---------------|-----------------------|------------------------|
| M2041 | Thermohygrometer | Testo | 608-H1 | 45119912 | 09 Dec 2022 | 12 |
| M2070 | Oscilloscope | Keysight | DSOX2024A | MY59125508 | 22 Feb 2024 | 24 |
| A3233 | Waveguide RF Detector | Sage Millimeter | SFD-503753-15SF-P1 | 18199-01 | Calibrated before use | - |
| A3235 | Waveguide Switch | Flann | 25333-2 | 215753 | Calibrated before use | - |
| M281 | Power Meter | Hewlett Packard | E4418A | GB37170210-01 | 19 May 2022 | 12 |
| M291 | Waveguide Power Sensor | Hewlett Packard | V8486A | US39010039 | 30 Nov 2022 | 24 |
| M1252 | Signal Generator | Hewlett Packard | 83640A | 3119A00489 | 04 Feb 2024 | 24 |
| G094 | Source Module | Hewlett Packard | 83557A | 2948A00475 | Calibrated before use | - |
| A2964 | Horn Antenna | Link Microtek | AM15HA-JLV1 | 14930 | 04 Feb 2023 | 12 |
| A3251 | Video Amplifier | Femto | HVA-200M-40B | 05-01-354 | Calibrated before use | - |
| A3252 | Low Pass Filter | Mini-Circuits | BLP-10.7+ | YUU54901833 | Calibrated before use | - |

5.2.3. Transmitter 6 dB Bandwidth

Test Summary:

| | | | |
|-----------------------------------|---------------|-------------------|---------------|
| Test Engineer: | Patrick Jones | Test Date: | 20 April 2022 |
| Test Sample Serial Number: | V5XF026Q7XSF | | |

| | |
|--------------------------|-------------------------|
| FCC Reference: | Part 15.255(e)(1) |
| Test Method Used: | ANSI C63.10 Section 9.3 |

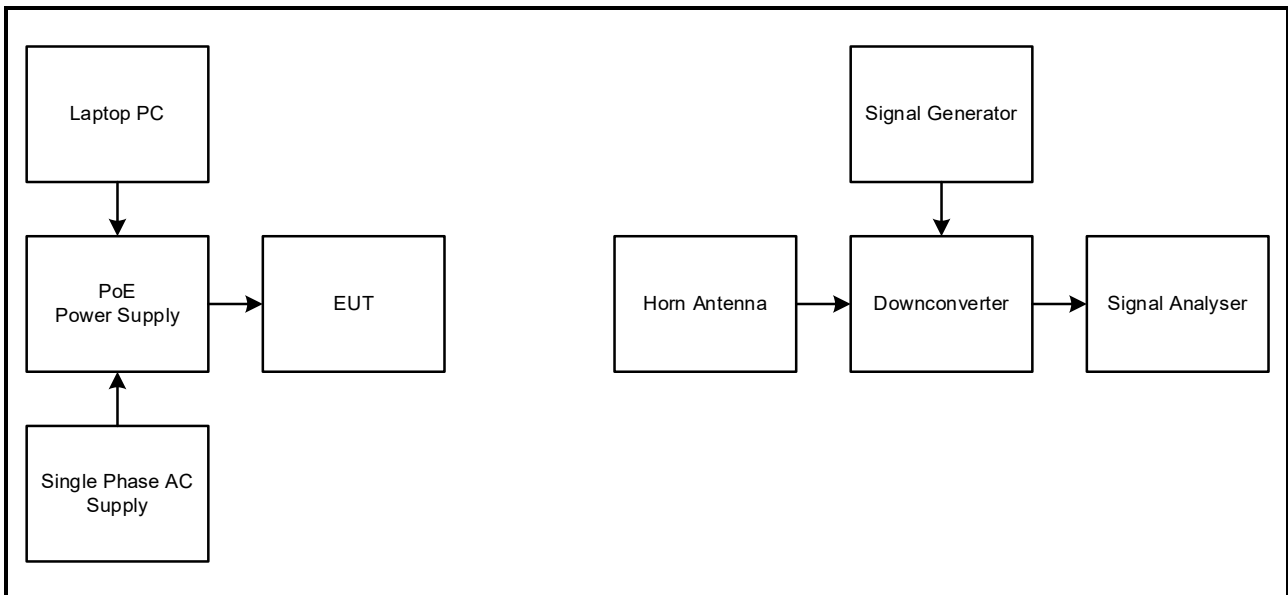
Environmental Conditions:

| | |
|-------------------------------|----|
| Temperature (°C): | 22 |
| Relative Humidity (%): | 40 |

Note(s):

1. The analyser span was set to between two and three times the emission bandwidth. The RBW was set to 100 kHz, and the VBW was set to three times the RBW. The marker delta function was used to measure 6 dB down from the peak on both sides of the emission. The resulting frequency delta between the two markers was recorded as the emission bandwidth.

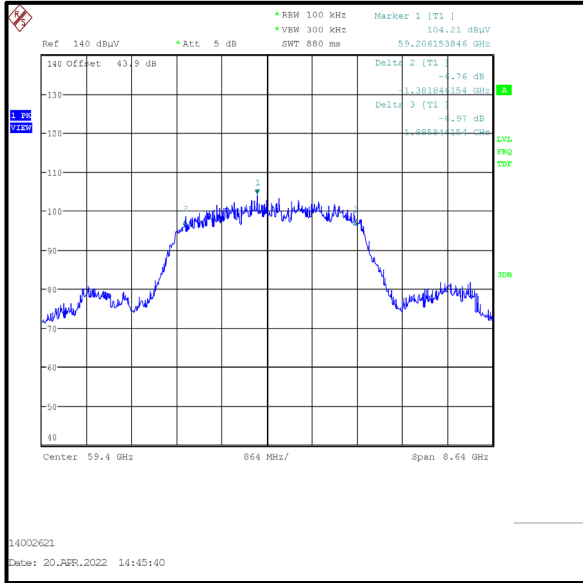
Test setup:



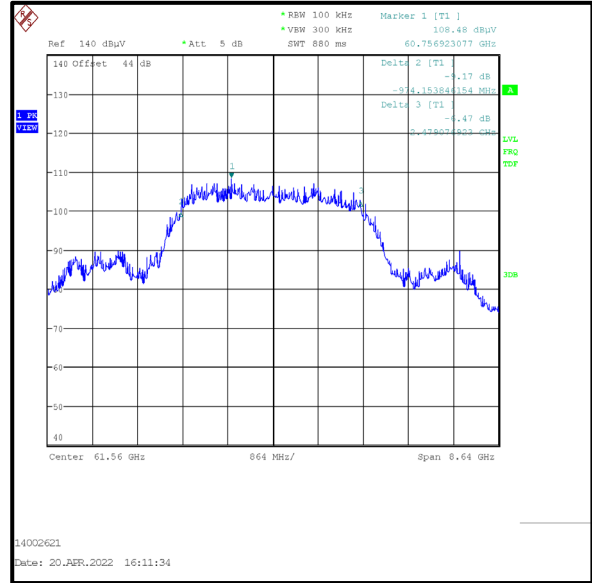
Transmitter 6 dB Bandwidth (continued)

Results:

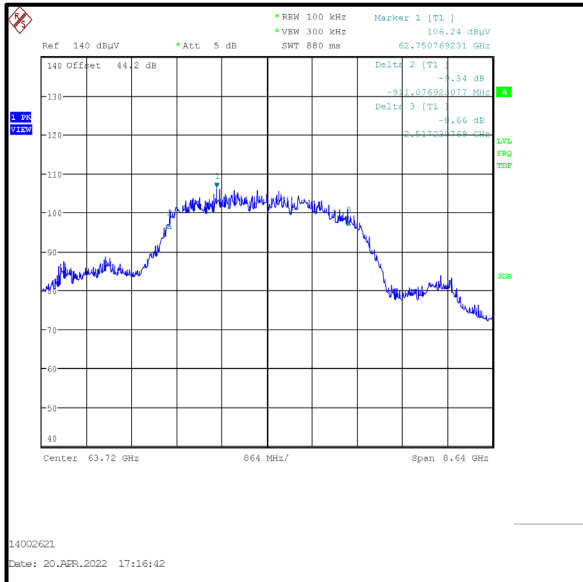
| Channel | RBW (kHz) | VBW (kHz) | Emission Bandwidth (MHz) |
|---------|-----------|-----------|--------------------------|
| Bottom | 100 | 300 | 3267.692 |
| Middle | 100 | 300 | 3453.231 |
| Top | 100 | 300 | 3428.308 |



Bottom Channel



Middle Channel



Top Channel

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

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|------------------|-------------------|---------------------|-----------------|-------------------|-----------------------------|-------------------------------|
| M2003 | Thermohygrometer | Testo | 608-H1 | 45046641 | 09 Dec 2022 | 12 |
| M1995 | Test Receiver | Rohde & Schwarz | ESU40 | 100428 | 12 Oct 2022 | 12 |
| M2069 | Downconverter | Virginia Diodes | WR15SAX | SAX 394 | 09 Jul 2023 | 24 |
| M1252 | Signal Generator | Hewlett Packard | 83640A | 3119A00489 | 04 Feb 2024 | 24 |
| A2964 | Horn Antenna | Link Microtek | AM15HA-ULV1 | 14930 | 04 Feb 2023 | 12 |

5.2.4. Transmitter 20 dB Bandwidth

Test Summary:

| | | | |
|-----------------------------------|---------------|-------------------|---------------|
| Test Engineer: | Patrick Jones | Test Date: | 20 April 2022 |
| Test Sample Serial Number: | V5XF026Q7XSF | | |

| | |
|--------------------------|---------------------------|
| FCC Reference: | Part 15.215(c) |
| Test Method Used: | ANSI C63.10 Section 6.9.2 |

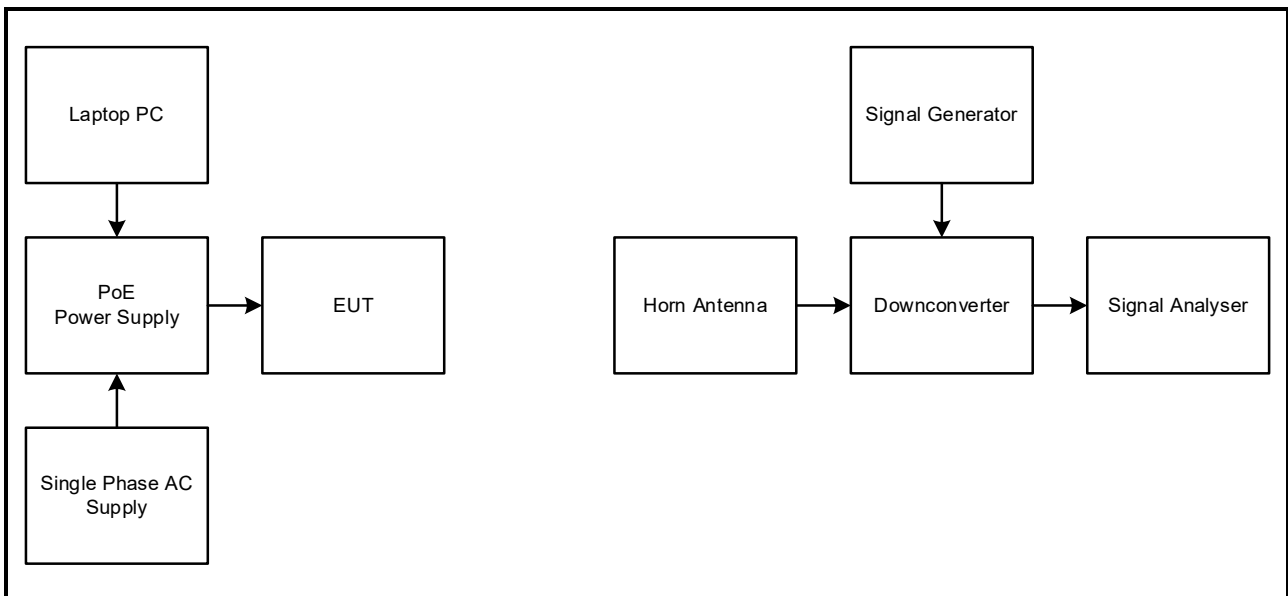
Environmental Conditions:

| | |
|-------------------------------|----|
| Temperature (°C): | 22 |
| Relative Humidity (%): | 40 |

Note(s):

1. The signal analyser resolution bandwidth was set to 1 MHz and the video bandwidth to 3 MHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The span was set to 5 GHz. The marker delta function was used to measure 20 dB down from the peak on both sides of the emission. The resulting frequency delta between the two markers was recorded as the 20 dB bandwidth.

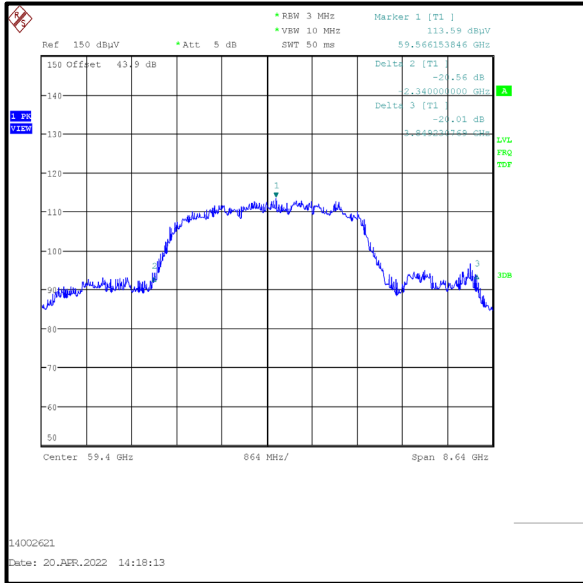
Test setup:



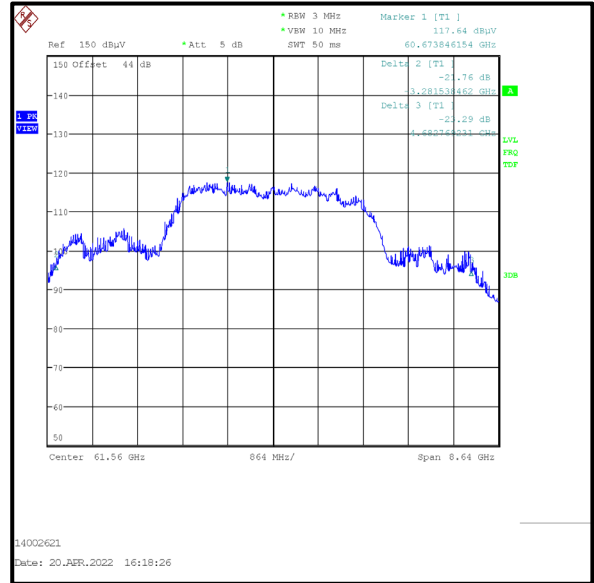
Transmitter 20 dB Bandwidth (continued)

Results:

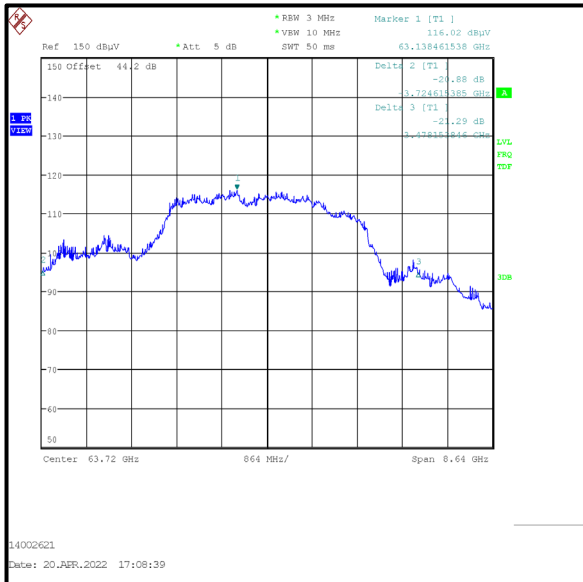
| Channel | 20 dB Bandwidth (MHz) |
|---------|-----------------------|
| Bottom | 6189.231 |
| Middle | 7964.307 |
| Top | 7202.769 |



Bottom Channel



Middle Channel



Top Channel

Transmitter 20 dB Bandwidth (continued)**Test Equipment Used:**

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|------------------|-------------------|---------------------|-----------------|-------------------|-----------------------------|-------------------------------|
| M2003 | Thermohygrometer | Testo | 608-H1 | 45046641 | 09 Dec 2022 | 12 |
| M1995 | Test Receiver | Rohde & Schwarz | ESU40 | 100428 | 12 Oct 2022 | 12 |
| M2069 | Downconverter | Virginia Diodes | WR15SAX | SAX 394 | 09 Jul 2023 | 24 |
| M1252 | Signal Generator | Hewlett Packard | 83640A | 3119A00489 | 04 Feb 2024 | 24 |
| A2964 | Horn Antenna | Link Microtek | AM15HA-ULV1 | 14930 | 04 Feb 2023 | 12 |

5.2.5. Transmitter Radiated Spurious Emissions**Test Summary:**

| | | | |
|------------------------------------|----------------------------------|--------------------|------------------------------|
| Test Engineers: | Patrick Jones & Nick Raptopoulos | Test Dates: | 16 March 2022 & 17 June 2022 |
| Test Sample Serial Numbers: | V5XF026Q7XSF | | |

| | |
|--------------------------|--|
| FCC Reference: | Part 15.255(d) / 15.209 |
| Test Method Used: | ANSI C63.10 Sections 6.3, 6.6, 9.8, 9.9, 9.12 & 9.13 |
| Frequency Range: | 1 to 8 GHz, 110 to 140 GHz |

Environmental Conditions:

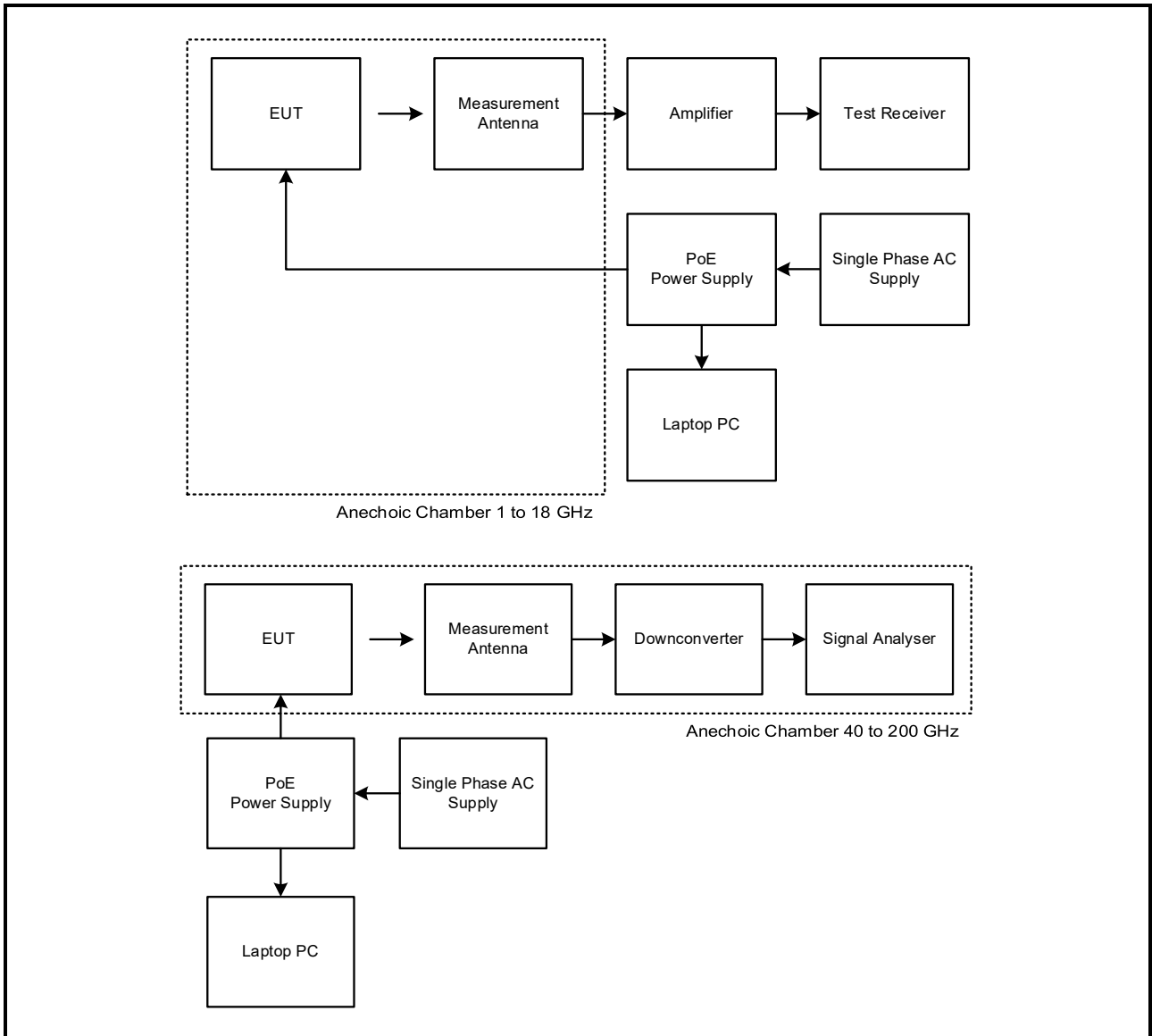
| | |
|-------------------------------|----------|
| Temperature (°C): | 24 to 25 |
| Relative Humidity (%): | 39 to 44 |

Note(s):

1. Full range spurious emissions testing was performed using a 2.16 GHz channel bandwidth under test report UL-RPT-RP13194254-1916A V2.0. Testing in this report has been reduced to known emission frequencies from the 2.16 GHz testing. The emission previously seen at approximately 15 GHz was not present.
2. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
3. 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 1.5 m 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.
4. Part 15.255(d)(3) defines a power density limit of 90 pW/cm² at 3 metres for spurious emissions between 40 GHz and 200 GHz. This was converted to a field strength limit of 85.31 dBuV/m using the equations provided in section 9.6 of ANSI C63.10.
5. Measurements distances above 40 GHz were determined using the procedure defined in section 9.8 of ANSI C63.10. Measurements were made at the following distances:
110 GHz to 170 GHz – 1 metre
6. Where measurements were performed at a distance other than that specified by the limit, a correction factor was calculated using the equation provided in section 9.4 of ANSI C63.10. This correction factor was included in the transducer factor entered on the signal analyser.

Transmitter Radiated Spurious Emissions (continued)

Test setup:



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

| Frequency (MHz) | Antenna Polarity | Peak Level (dB μ V/m) | Peak Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|---------------------------|---------------------------|-------------|----------|
| 7425.192 | Horizontal | 53.8 | 74.0 | 20.2 | Complied |

Results: Bottom Channel / Average

| Frequency (MHz) | Antenna Polarity | Average Level (dB μ V/m) | Average Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|------------------------------|------------------------------|-------------|----------|
| 7424.968 | Horizontal | 48.1 | 54.0 | 5.9 | Complied |
| 117039.170 | Horizontal | 68.2 | 85.3 | 17.1 | Complied |
| 120559.130 | Horizontal | 72.4 | 85.3 | 12.9 | Complied |

Results: Middle Channel / Peak

| Frequency (MHz) | Antenna Polarity | Peak Level (dB μ V/m) | Peak Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|---------------------------|---------------------------|-------------|----------|
| 7695.000 | Horizontal | 54.4 | 74.0 | 19.6 | Complied |

Results: Middle Channel / Average

| Frequency (MHz) | Antenna Polarity | Average Level (dB μ V/m) | Average Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|------------------------------|------------------------------|-------------|----------|
| 7695.048 | Horizontal | 48.2 | 54.0 | 5.8 | Complied |
| 121359.140 | Horizontal | 72.3 | 85.3 | 13.0 | Complied |
| 124879.140 | Horizontal | 71.8 | 85.3 | 13.5 | Complied |

Results: Top Channel / Peak

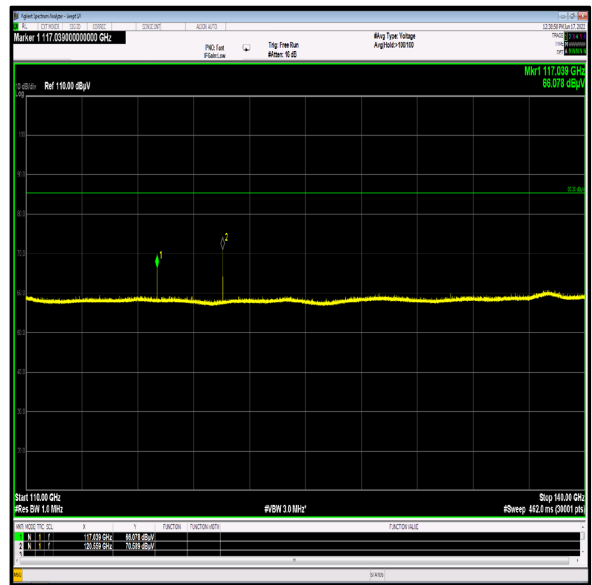
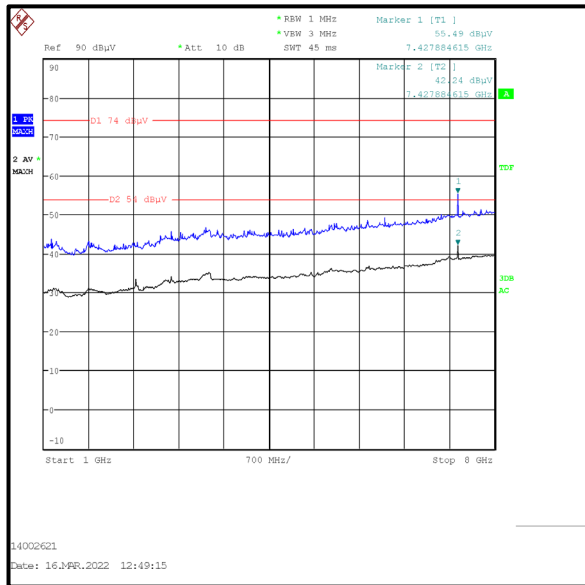
| Frequency (MHz) | Antenna Polarity | Peak Level (dB μ V/m) | Peak Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|---------------------------|---------------------------|-------------|----------|
| 7964.750 | Horizontal | 57.1 | 74.0 | 16.9 | Complied |

Results: Top Channel / Average

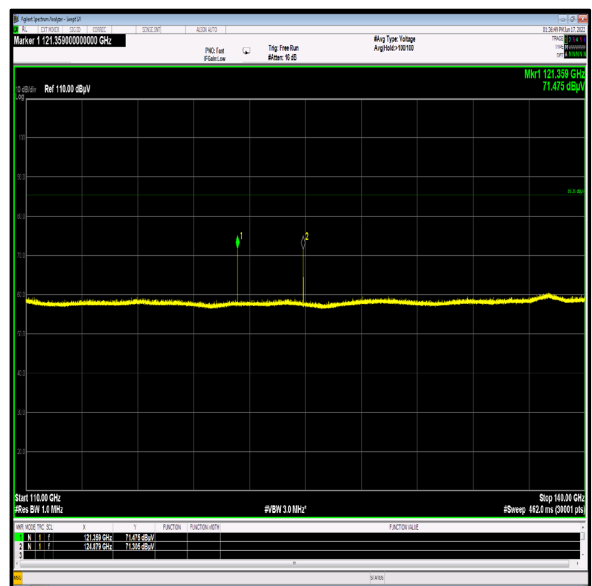
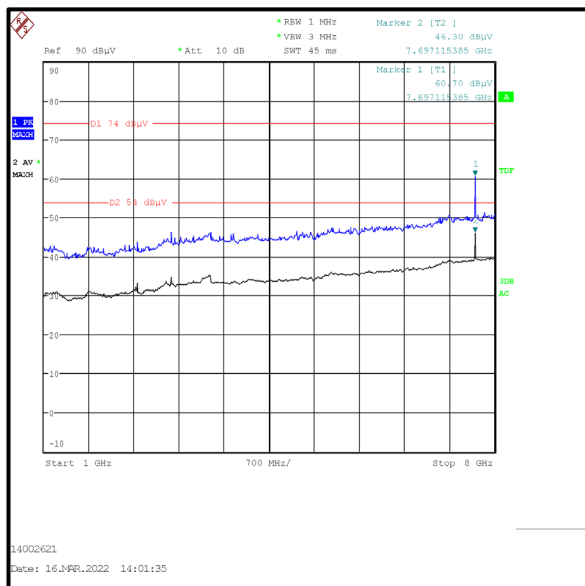
| Frequency (MHz) | Antenna Polarity | Average Level (dB μ V/m) | Average Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|------------------------------|------------------------------|-------------|----------|
| 7964.942 | Horizontal | 53.2 | 54.0 | 0.8 | Complied |
| 125679.130 | Horizontal | 71.5 | 85.3 | 13.8 | Complied |
| 129199.110 | Horizontal | 72.9 | 85.3 | 12.4 | Complied |

Transmitter Radiated Spurious Emissions (continued)

Bottom Channel



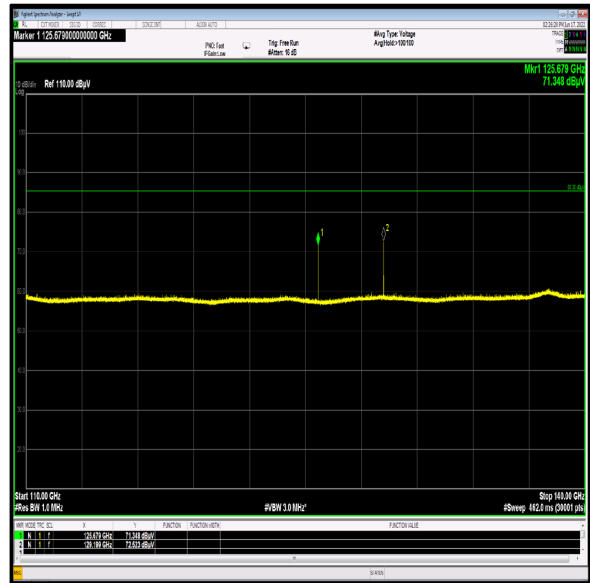
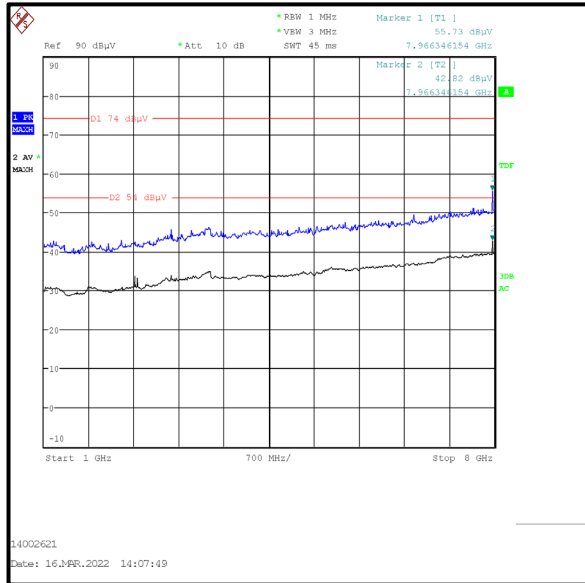
Middle Channel



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

Transmitter Radiated Spurious Emissions (continued)

Top Channel



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

Transmitter Radiated Spurious Emissions (continued)**Test Equipment Used:**

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|------------------|-------------------|---------------------|-----------------|-------------------|-----------------------------|-------------------------------|
| M2003 | Thermohygrometer | Testo | 608-H1 | 45046641 | 09 Dec 2022 | 12 |
| K0017 | 3m RSE Chamber | Rainford EMC | N/A | N/A | 26 Oct 2022 | 12 |
| M1995 | Test Receiver | Rohde & Schwarz | ESU40 | 100428 | 12 Oct 2022 | 12 |
| A2863 | Pre-Amplifier | Keysight | 8449B | 3008A02100 | 21 Oct 2022 | 12 |
| A2889 | Antenna | Schwarzbeck | BBHA 9120 B | 00653 | 26 Oct 2022 | 12 |
| M1832 | Signal Analyser | Keysight | N9010A | MY53470303 | 18 May 2024 | 24 |
| M2066 | Downconverter | Virginia Diodes | WR6.5SAX | SAX 392 | 31 May 2024 | 24 |
| A2968 | Horn Antenna | Link Microtek | AM7HA-ULV1 | 14934 | 04 Feb 2023 | 12 |

6 Measurement Uncertainty & Decision Rule

Overview

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 of the measurand (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.

Decision Rule

The decision rule applied is based upon the accuracy method criteria. The measurement uncertainty is met and the result is considered in conformance with the requirement criteria if the observed value is within the prescribed limit.

Measurement Uncertainty

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 |
|--------------------------------|-------------------|-----------------------------|-------------------------------|
| Transmitter EIRP | 57 to 71 GHz | 95% | ± 2.70 dB |
| Transmitter Peak Output Power | 57 to 71 GHz | 95% | ± 2.70 dB |
| Transmitter 6 dB Bandwidth | 57 to 71 GHz | 95% | ±4.59 % |
| Transmitter 20 dB Bandwidth | 57 to 71 GHz | 95% | ±4.59 % |
| Transmitter Radiated Emissions | 1 GHz to 40 GHz | 95% | ±3.16 dB |
| Transmitter Radiated Emissions | 40 GHz to 200 GHz | 95% | ±5.12 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 | 6 | 3.1 | Firmware version corrected |

--- END OF REPORT ---