

TEST REPORT

Test Report No. : UL-RPT-RP13754225-2716A

| Customer | : | VEGA Grieshaber KG |
|------------------|---|--|
| Model No. | : | VEGAPULS 6X |
| FCC ID | : | O6QPS6XW |
| Technology | : | Level Probing Radar |
| Test Standard(s) | : | FCC Parts 15.209(a) & 15.256(f)(g)(h) |
| Test Laboratory | : | UL International (UK) Ltd, Basingstoke, Hampshire, RG24 8AH, United Kingdom |

- 1. This test report shall not be reproduced except in full, without the written approval of UL International (UK) Ltd.
- 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 1.0.

Date of Issue:

23 February 2022

Checked by:

- WELDERS

Sarah Williams RF Operations Leader, Radio Laboratory

Company Signatory:

Ulle

Ben Mercer Lead Project Engineer, Radio Laboratory



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UL International (UK) LTD

Customer Information

| Company Name: | VEGA Grieshaber KG | |
|---------------|--|--|
| Address: | Am Hohenstein 113 D-77761 Schiltach | |
| | Germany | |

Report Revision History

| Version Number | Issue Date | Revision Details | Revised By |
|-------------------|------------|------------------|----------------|
| 1.0 | 23/02/2022 | Initial Version | Sarah Williams |

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1 Attestation of Test Results

1.1 Description of EUT

The equipment under test was a radar sensor for the continuous level measurement of liquids.

1.2 General Information

| Specification Reference: | 47CFR15.256 | |
|--------------------------|--|--|
| Specification Title: | Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Section 15.256 | |
| Specification Reference: | 47CFR15.209 | |
| Specification Title: | Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Sections 15.209 | |
| 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: | 04 January 2022 to 21 February 2022 | |

1.3 Summary of Test Results

| FCC Reference (47CFR) | Measurement | Result |
|--|--|--------|
| Part 15.35(c) | Transmitter Duty Cycle | |
| Part 15.256(f) | Transmitter Fundamental Emission Bandwidth | |
| Part 15.256(g) Transmitter Maximum Peak EIRP | | 0 |
| Part 15.256(g) | (g) Transmitter Maximum Average EIRP | |
| Part 15.256(h) & 15.209(a) | Transmitter Unwanted Emissions | |
| Key to Results | | |
| I = Complied | bly | |

Note(s):

1. The measurement was performed to assist in the calculation of the maximum average EIRP level.

1.4 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.

2 Summary of Testing

2.1 Facilities and Accreditation

The test site and measurement facilities used to collect data are located at Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom. The following table identifies which facilities were utilised for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| Site 1 | х |
|---------|---|
| Site 2 | - |
| Site 17 | х |

UL International (UK) Ltd is accredited by the United Kingdom Accreditation Service (UKAS). UKAS is one of the signatories to the International Laboratory Accreditation Co-operation (ILAC) Arrangement for the mutual recognition of test reports. The tests reported herein have been performed in accordance with its terms of accreditation.

2.2 Methods and Procedures

| Reference: | ANSI C63.10-2013 | |
|------------|--|--|
| Title: | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices | |
| Reference: | KDB 890966 D01 Level Probing Radar v01r01 September 10, 2014 | |
| Title: | Measurement Procedure for Level Probing Radars | |

2.3 Calibration and Uncertainty

Measuring Instrument Calibration

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.

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 |
|--------------------------------|-------------------|-------------------------|---------------------------|
| Duty Cycle | 75 GHz to 85 GHz | 95% | ±1.14 % |
| Fundamental Emission Bandwidth | 75 GHz to 85 GHz | 95% | ±4.59 % |
| Maximum Peak EIRP | 75 GHz to 85 GHz | 95% | ±5.12 dB |
| Maximum Average EIRP | 75 GHz to 85 GHz | 95% | ±5.12 dB |
| Radiated Emissions | 9 kHz to 30 MHz | 95% | ±5.32 dB |
| Radiated Emissions | 30 MHz to 1 GHz | 95% | ±3.30 dB |
| Radiated Emissions | 1 GHz to 40 GHz | 95% | ±2.94 dB |
| 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.

VERSION 1.0

2.4 Test and Measurement Equipment

Test Equipment Used for Transmitter Bandwidth, Duty Cycle and EIRP Tests

| Asset No. | Instrument | Manufacturer | Type No. | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|--------------|------------------|-----------------|----------|------------|-------------------------|------------------------------|
| M2038 | Thermohygrometer | Testo | 608-H1 | 45124919 | 09 Dec 2022 | 12 |
| M1832 | Signal Analyser | Keysight | N9010A | MY53470303 | 06 Mar 2022 | 24 |
| G0614 | Signal Generator | Rohde & Schwarz | SMB100A | 177687 | 30 Jun 2023 | 36 |
| M2064 | Downconverter | Virginia Diodes | WR12SAX | SAX 325 | 17 Feb 2022 | 24 |
| A3194 | Attenuator | AtlanTecRF | AS8167 | J510060687 | Calibrated before use | - |

Test Equipment Used for Transmitter Radiated Emissions Tests

| Asset No. | Instrument | Manufacturer | Туре 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 |
| A3167 | Pre-Amplifier | Com-Power | PAM-103 | 18020010 | 20 Oct 2022 | 12 |
| A2148 | Attenuator | AtlanTecRF | AN18-06 | 090202-06 | Calibrated before use | - |
| A2948 | Pre-Amplifier | Com-Power | PAM-118A | 551087 | 20 Oct 2022 | 12 |
| A2889 | Antenna | Schwarzbeck | BBHA 9120 B | 653 | 26 Oct 2022 | 12 |
| A2892 | Antenna | Schwarzbeck | BBHA 9170 | 9170-727 | 02 Nov 2022 | 12 |
| M2041 | Thermohygrometer | Testo | 608-H1 | 45119912 | 09 Dec 2022 | 12 |
| M1832 | Signal Analyzer | Keysight | N9010A | MY53470303 | 09 May 2022 | 12 |
| A2963 | Antenna | Link Microtek | AM19HA-ULV1 | 14929 | 04 Feb 2023 | 12 |
| A3212 | Low Pass Filter | Sage Millimeter | SWF-50354340- 22-L1 | B10754-01 | Calibrated before use | - |
| M1621 | Harmonic Mixer | Keysight | 11970U | 3003A01631 | 27 May 2024 | 36 |
| M2066 | Downconverter | Virginia Diodes | WR6.5SAX | SAX 392 | 17 Feb 2022 | 24 |
| M2067 | Downconverter | Virginia Diodes | WR4.3SAX | SAX 391 | 17 Feb 2022 | 24 |
| M2069 | Downconverter | Virginia Diodes | WR15.0 SAX | SAX 394 | 17 Feb 2022 | 24 |
| M2065 | Downconverter | Virginia Diodes | WR10SAX | SAX 393 | 17 Feb 2022 | 24 |
| A2967 | Antenna | Link Microtek | AM10HA-ULV1 | 14933 | 04 Feb 2023 | 12 |
| A2964 | Antenna | Link Microtek | AM15HA-ULV1 | 14930 | 04 Feb 2023 | 12 |
| M2040 | Thermohygrometer | Testo | 608-H1 | 45124934 | 09 Dec 2022 | 12 |
| K0001 | 3m RSE Chamber | Rainford EMC | N/A | N/A | 06 Sep 2022 | 12 |
| M2044 | Test Receiver | Rohde & Schwarz | ESU26 | 100122 | 29 Apr 2022 | 12 |
| A553 | Antenna | Chase | CBL6111A | 1593 | 23 Nov 2022 | 12 |
| A3154 | Pre-Amplifier | Com-Power | PAM-103 | 18020012 | 24 Aug 2022 | 12 |
| A3165 | Loop Antenna | ETS-Lindgren | 6502 | 00224383 | 12 Oct 2022 | 12 |

<u>3 Equipment Under Test (EUT)</u>

3.1 Identification of Equipment Under Test (EUT)

| Brand Name: | VEGAPULS |
|----------------------------|-------------|
| Model No.: | VEGAPULS 6X |
| Test Sample Serial Number: | 55822749 |
| Hardware Version: | 1.0.0 |
| Software Version: | 1.00.00 |
| FCC ID: | O6QPS6XW |

3.2 Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.3 Additional Information Related to Testing

| Technology Tested: | Level Probing Radar | | |
|---------------------------------|---|--|--------|
| Type of Unit: | Transceiver | | |
| Modulation: | FMCW | | |
| Power Supply Requirement(s): | Nominal 24.0 VDC | | |
| Maximum Conducted Output Power: | 2.9 dBm | | |
| Transmit Frequency Range: | 75 GHz to 85 GHz | | |
| Transmit Channels Tested: | Channel Bandwidth Channel Frequency (GHz) (GHz) | | |
| | 2 79.500 | | 79.500 |
| | 4 80.000 | | 80.000 |
| | 8 80.000 | | |

3.4 Description of Available Antennas

The radio utilizes various external antennas, with the following maximum gains:

| Model Number | Туре | Frequency Range (MHz) | Antenna Gain (dBi) |
|----------------|--|--------------------------|-----------------------|
| VEGAZW-6-74539 | Thread with Integrated Horn Antenna | 75000 to 85000 | 25.3 |
| VEGAZW-6-74538 | Flange with Lens Antenna | 75000 to 85000 | 30.7 |

3.5 Description of Test Setup

Support Equipment

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

| Description: | Waveguide Adapter |
|-----------------------|-------------------|
| Brand Name: | MI-WAVE |
| Model Name or Number: | 284E-102/387 |
| Serial Number: | 2051 |
| | |
| Description: | Round Nose Pliers |
| Brand Name: | Belzer |
| Model Name or Number: | 2464-A19 |
| Serial Number: | 2051 |
| | |
| Description: | DC Power Supply |
| Brand Name: | ISO-Tech |
| Model Name or Number: | IPS2302A |
| Serial Number: | 504E005G2 |
| | |
| Description: | DC Power Supply |
| Brand Name: | Tenma |
| Model Name or Number: | 72-10480 |
| Serial Number: | 08250099280 |

Operating Modes

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

• Transmitting at maximum power on each supported chirp bandwidth with FMCW modulation.

Configuration and Peripherals

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

- The EUT was configured using the built-in user interface. The chirp bandwidth was set by varying the maximum measurement distance setting.
- The EUT was powered via a 24 VDC bench power supply connected to a 120 VAC 60 Hz mains supply.
- The customer supplied a waveguide adapter to transition from the proprietary connector to rectangular waveguide. The adapter loss is considered negligible and has therefore not been included in path loss calculations.
- The customer requested for conducted measurements to be performed for test efficiency and accuracy purposes.
- Radiated Transmitter Unwanted Emissions were performed with the EUT in the position that produced worst case with respect to emission. No accessories/peripherals were employed during test as there were no ports on the EUT to populate.
- Radiated Transmitter Unwanted Emissions were performed with the EUT transmitting an 8 GHz chirp bandwidth, as preliminary investigation showed this to be the worst case with respect to emissions.
- The EUT can be supplied with a range of antennas. Testing was performed on the highest gain antenna of each type.

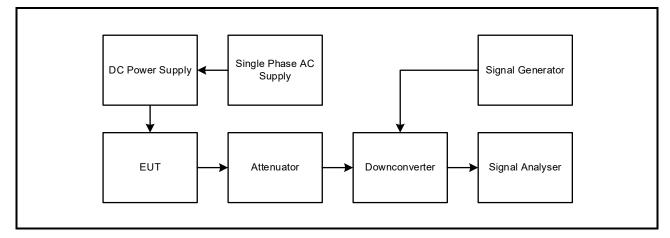
VERSION 1.0

ISSUE DATE: 23 FEBRUARY 2022

Test Setup Diagrams

Conducted Tests:

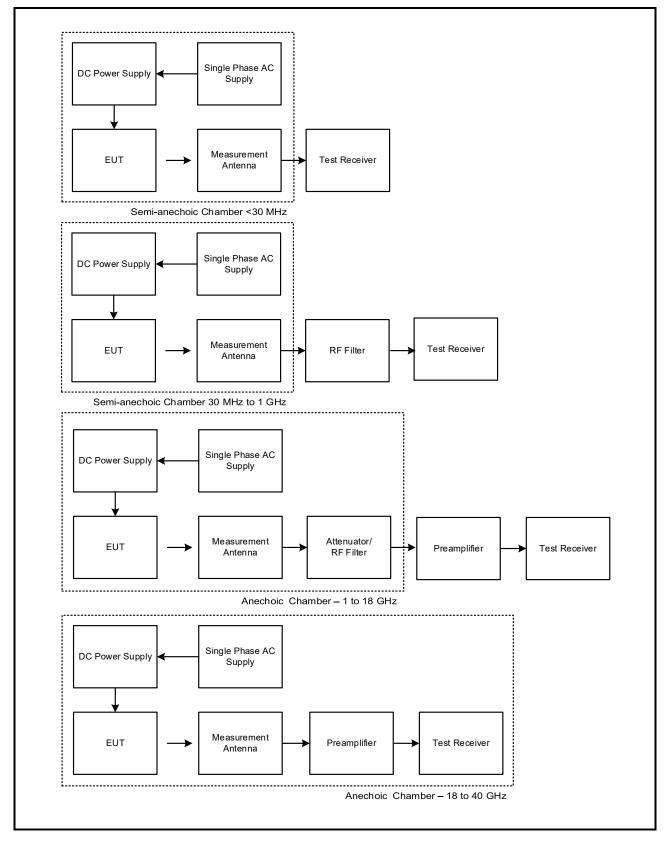
Test Setup for Transmitter Bandwidth, Duty Cycle and EIRP



Test Setup Diagrams (continued)

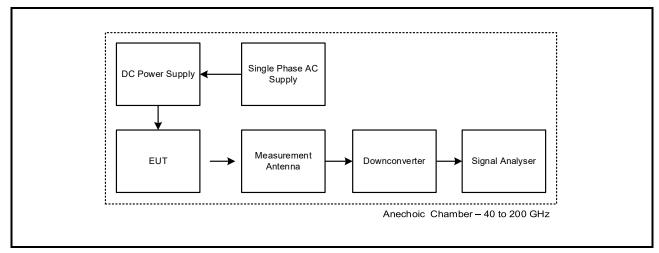
Radiated Tests:

Test Setup for Transmitter Radiated Emissions



Test Setup Diagrams (continued)

Test Setup for Transmitter Radiated Emissions (continued)



4 Antenna Port Test Results

4.1 Transmitter Duty Cycle

Test Summary:

| Test Engineer: | Ben Mercer | Test Dates: | 04 February 2022 & 21 February 2022 |
|----------------------------|------------|-------------|-------------------------------------|
| Test Sample Serial Number: | 55822749 | | |

| FCC Reference: | Part 15.35(c) |
|-------------------|--------------------------|
| Test Method Used: | ANSI C63.10 Section 11.6 |

Environmental Conditions:

| Temperature (°C): | 21 to 23 |
|------------------------|----------|
| Relative Humidity (%): | 39 to 42 |

Note(s):

1. In order to assist with the measurement of the Maximum Average EIRP, measurements were made of the duty cycle. The transmitter duty cycle was measured using a signal analyser in the time domain.

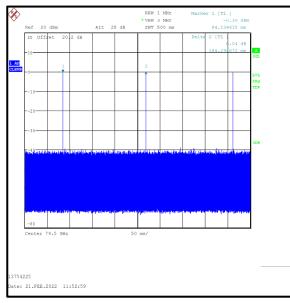
2. The customer has declared duty cycle of 170 ms to 200 ms, depending on voltage supply conditions.

3. The customer has declared a sweep time (T_S) of 2 ms.

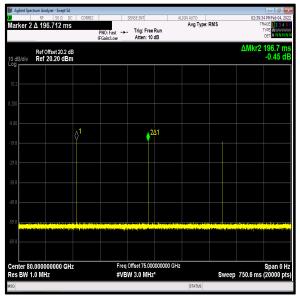
Transmitter Duty Cycle (continued)

Results:

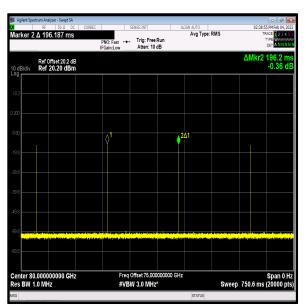
| Channel Bandwidth (GHz) | Duty Cycle (ms) |
|----------------------------|--------------------|
| 2 | 184.295 |
| 4 | 196.200 |
| 8 | 196.700 |







8 GHz



4 GHz

4.2 Transmitter Fundamental Emission Bandwidth

Test Summary:

| Test Engineer: | Ben Mercer | Test Dates: | 04 February 2022 & 07 February 2022 |
|----------------------------|------------|-------------|-------------------------------------|
| Test Sample Serial Number: | 55822749 | | |

| FCC Reference: | Part 15.256(f) |
|-------------------|--|
| Test Method Used: | KDB 890966 Section D & ANSI C63.10 Section 6.9.2 |

Environmental Conditions:

| Temperature (°C): | 20 to 21 |
|------------------------|----------|
| Relative Humidity (%): | 36 to 42 |

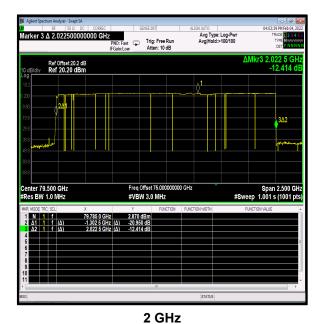
Note(s):

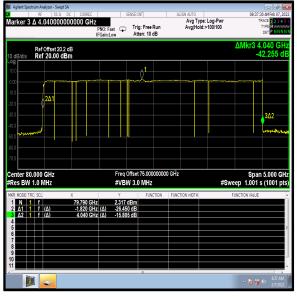
- 1. The signal analyser resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz. A peak detector was used, with Max Hold trace mode, and with sweep time set to ensure coincidence with the FMCW signal. The emission bandwidth was measured at 10 dB down from the peak of the signal.
- 2. The downconverter was connected to the antenna port on the EUT using suitable attenuation and waveguide.

Transmitter Fundamental Emission Bandwidth (continued)

Results:

| Channel Bandwidth (GHz) | 10 dB Bandwidth (GHz) | Limit (MHz) | Margin (GHz) | Result |
|----------------------------|--------------------------|----------------|-----------------|----------|
| 2 | 2.023 | ≥50 | 1.973 | Complied |
| 4 | 4.040 | ≥50 | 3.990 | Complied |
| 8 | 8.040 | ≥50 | 7.990 | Complied |





4 GHz



8 GHz

4.3 Transmitter Maximum Peak EIRP

Test Summary:

| Test Engineer: | Ben Mercer | Test Date: | 04 February 2022 |
|----------------------------|------------|------------|------------------|
| Test Sample Serial Number: | 55822749 | | |

| FCC Reference: | Part 15.256(g) |
|-------------------|----------------------|
| Test Method Used: | KDB 890996 Section F |

Environmental Conditions:

| Temperature (°C): | 21 |
|------------------------|----|
| Relative Humidity (%): | 42 |

Note(s):

- 1. The signal analyser resolution bandwidth was set to 1 MHz and video bandwidth of 3 MHz. A peak detector was used, with Max Hold trace mode, and a sweep time set to ensure coincidence with the FMCW signal. A marker was placed at the peak of the signal and the results recorded in the tables below.
- 2. The 50 MHz correction factor was not applied since the EUT uses FMCW modulation and the instantaneous signal is narrowband, with full power in a 3 MHz bandwidth.
- 3. The Downconverter was connected to the antenna port on the EUT using suitable attenuation and waveguide. An RF level offset was entered on the signal analyser to compensate for the loss of the attenuator and waveguide.
- 4. The conducted power was added to the declared antenna gain to obtain the EIRP.

Results: VEGAZW-6-74539

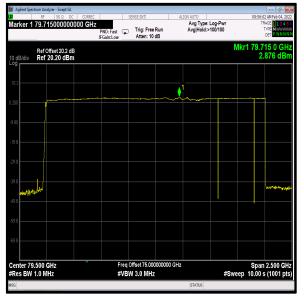
| Channel Bandwidth (GHz) | Conducted Peak Power (dBm/1 MHz) | Declared Antenna Gain (dBi) | EIRP (dBm/1 MHz) | EIRP Limit (dBm/ 50 MHz) | Margin (dB) | Result |
|-------------------------------|--|--------------------------------------|---------------------|--------------------------------|----------------|----------|
| 2 | 2.9 | 25.3 | 28.2 | 34.0 | 5.8 | Complied |
| 4 | 2.2 | 25.3 | 27.5 | 34.0 | 6.5 | Complied |
| 8 | 1.4 | 25.3 | 26.7 | 34.0 | 7.3 | Complied |

Results: VEGAZW-6-74538

| Channel Bandwidth (GHz) | Conducted Peak Power (dBm/1 MHz) | Declared Antenna Gain (dBi) | EIRP (dBm/1 MHz) | EIRP Limit (dBm/ 50 MHz) | Margin (dB) | Result |
|-------------------------------|--|--------------------------------------|---------------------|--------------------------------|----------------|----------|
| 2 | 2.9 | 30.7 | 33.6 | 34.0 | 0.4 | Complied |
| 4 | 2.2 | 30.7 | 32.9 | 34.0 | 1.1 | Complied |
| 8 | 1.4 | 30.7 | 32.1 | 34.0 | 1.9 | Complied |

Transmitter Maximum Peak EIRP (continued)

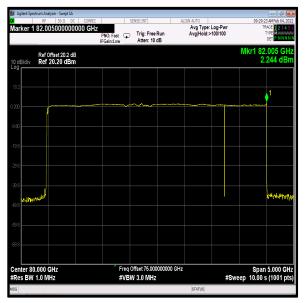
Conducted Results







8 GHz



4 GHz

4.4 Transmitter Maximum Average EIRP

Test Summary:

| Test Engineer: | Ben Mercer | Test Date: | 04 February 2022 |
|----------------------------|------------|------------|------------------|
| Test Sample Serial Number: | 55822749 | | |

| FCC Reference: | Part 15.256(g) |
|-------------------|----------------------|
| Test Method Used: | KDB 890996 Section F |

Environmental Conditions:

| Temperature (°C): | 21 |
|------------------------|----|
| Relative Humidity (%): | 42 |

Note(s):

1. A calculated average factor was subtracted from the peak EIRP level to obtain the average EIRP. The average factor was calculated as follows:

Average Factor = $10Log((T_s/\Delta F)/Cycle Time)$

Where:

Ts is the signal sweep time in seconds

 ΔF is the signal sweep frequency span in MHz

Cycle Time is the total time for a complete cycle of the signal including retrace and any other latency times

The minimum declared cycle time of 170 ms and sweep time of 2 ms have been used in the calculations as this represents the worst case.

- 2 GHz Bandwidth Average Factor = 10Log((2/2000)/170) = -52.3 dB
- 4 GHz Bandwidth Average Factor = 10Log((2/4000)/170) = -55.3 dB
- 8 GHz Bandwidth Average Factor = 10Log((2/8000)/170) = -58.3 dB

Channel Average Average EIRP Limit Peak EIRP Margin Bandwidth Factor EIRP Result (dBm/MHz) (dBm/MHz) (dB) (dBm/MHz) (GHz) (dB) 2 -52.3 21.1 Complied 28.2 -24.1 -3.0 4 27.5 -55.3 -27.8 -3.0 24.8 Complied 8 -31.6 28.6 Complied 26.7 -58.3 -3.0

Results: VEGAZW-6-74539

Results: VEGAZW-6-74538

| Channel Bandwidth (GHz) | Peak EIRP (dBm/MHz) | Average Factor (dB) | Average EIRP (dBm/MHz) | EIRP Limit (dBm/MHz) | Margin (dB) | Result |
|-------------------------------|------------------------|---------------------------|------------------------------|-------------------------|----------------|----------|
| 2 | 33.6 | -52.3 | -18.7 | -3.0 | 15.7 | Complied |
| 4 | 32.9 | -55.3 | -22.4 | -3.0 | 19.4 | Complied |
| 8 | 32.1 | -58.3 | -26.2 | -3.0 | 23.2 | Complied |

5 Radiated Test Results

5.1 Transmitter Radiated Emissions <1 GHz

Test Summary:

| Test Engineers: | Nick Tye & Vi Van | Test Dates: | 04 January 2022 & 19 January 2022 |
|----------------------------|----------------------|-------------|--------------------------------------|
| Test Sample Serial Number: | 55822749 | | |

| FCC Reference: Part 15.256(h) & 15.209(a) | | | |
|---|-------------------|--|--|
| Test Method Used:KDB 890966 Section G & ANSI C63.10 Sections 6.3, 6.4 and 6 | | | |
| Frequency Range | 9 kHz to 1000 MHz | | |

Environmental Conditions:

| Temperature (°C): | 20 to 22 |
|------------------------|----------|
| Relative Humidity (%): | 39 to 40 |

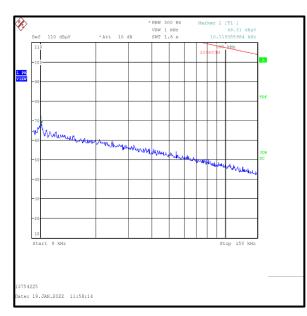
Note(s):

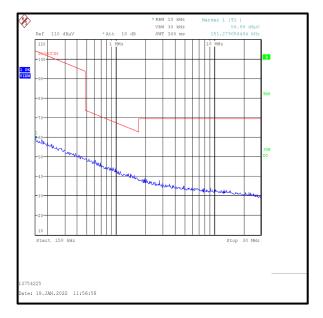
- 1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
- 2. All emissions shown on the pre-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system.
- 3. Measurements below 1 GHz were performed in semi-anechoic chambers (Asset Numbers K0001 & K0017) 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. Between 30 MHz and 1 GHz, maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
- 4. Pre-scans were performed and markers placed on the highest measured levels. The test receiver was configured as follows: For 9 kHz to 150 kHz, the resolution bandwidth was set to 300 Hz and video bandwidth 1 kHz. A peak detector was used and trace mode was Max Hold. For 150 kHz to 30 MHz, the resolution bandwidth was set to 10 kHz and video bandwidth 30 kHz, trace mode was Max Hold. For 30 MHz to 1 GHz, the resolution bandwidth was set to 120 kHz and video bandwidth 500 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
- 5. Pre-scans were performed with each antenna. Emission frequencies and amplitudes did not vary between antennas, therefore final measurements were performed on the Thread with Integrated Horn Antenna.
- 6. Final measurements were performed on the marker frequencies and the results entered into the table below. The test receiver resolution bandwidth was set to 120 kHz, using a CISPR quasi-peak detector and span wide enough to see the whole emission.

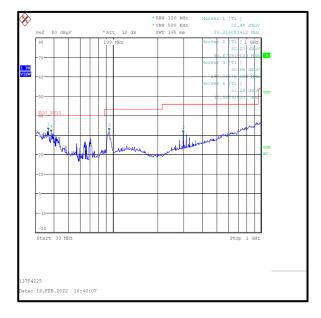
Transmitter Radiated Emissions (continued)

Results: Quasi-Peak

| Frequency (MHz) | Antenna Polarity | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|--------------------|---------------------|-------------------|-------------------|----------------|----------|
| 35.3 | Vertical | 24.2 | 40.0 | 15.8 | Complied |
| 38.9 | Vertical | 22.4 | 40.0 | 17.6 | Complied |
| 280.0 | Horizontal | 29.4 | 47.0 | 17.6 | Complied |
| 296.0 | Horizontal | 31.9 | 47.0 | 15.1 | Complied |
| 312.0 | Horizontal | 29.3 | 47.0 | 17.7 | Complied |







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

5.2 Transmitter Radiated Emissions >1 GHz

Test Summary:

| Test Engineer: | Vi Van | Test Dates: | 05 January 2022 to 13 January 2022 |
|----------------------------|----------|-------------|---------------------------------------|
| Test Sample Serial Number: | 55822749 | | |

| FCC Reference: | Part 15.256(h) & 15.209(a) |
|-------------------|---|
| Test Method Used: | KDB 890966 Section G & ANSI C63.10 Sections 6.3 and 6.6 |
| Frequency Range | 1 GHz to 200 GHz |

Environmental Conditions:

| Temperature (°C): | 21 to 24 |
|------------------------|----------|
| Relative Humidity (%): | 31 to 39 |

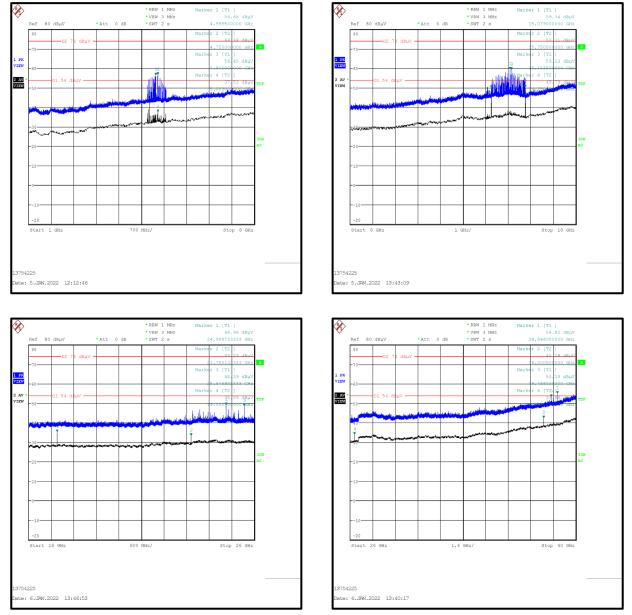
Note(s):

- 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-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system.
- 3. In accordance with Part 15.256(I)(5), the Part 15.35(b) & (c) provisions that require emissions to be averaged over a 100 ms period and that limit the peak power to 20 dB above the average limit have not been applied.
- 4. Pre-scans above 1 GHz were performed in fully anechoic chambers (Asset Numbers K0002 & K0017) 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.
- 5. Final measurements between 1 GHz and 40 GHz were performed in a fully anechoic chamber (Asset Number K0017) 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.
- 6. Measurements above 40 GHz were performed in accordance with ANSI C63.10 Clause 9.12. Exploratory scans were performed in both azimuth and elevation with the analyser sweep time set to auto. Pre-scans were repeated at the maximised orientation using a long sweep time to minimise the impact of mixing products.
- 7. Measurement distances above 40 GHz were determined according to ANSI C63.10 Clause 9.8. Measurement distances were reduced until 6 dB noise floor clearance was achieved:

40-50 GHz – 0.5 metres 50-75 GHz – 1.0 metres 75-110 GHz – 1.0 metres 110-170 GHz – 0.5 metres 170-200 GHz – 0.5 metres

Transmitter Radiated Emissions (continued)

| esults: VEGAZW-6-74539 / Average | | | | | | | |
|----------------------------------|---------------------|-------------------|-------------------|----------------|----------|--|--|
| Frequency (MHz) | Antenna Polarity | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result | | |
| 4686.306 | Vertical | 39.7 | 54.0 | 14.3 | Complied | | |
| 5250.714 | Vertical | 37.9 | 54.0 | 16.1 | Complied | | |
| 14250.020 | Vertical | 44.4 | 54.0 | 9.6 | Complied | | |
| 38000.196 | Vertical | 43.7 | 54.0 | 10.3 | Complied | | |
| 74906.500 | Vertical | 45.8 | 54.0 | 8.2 | Complied | | |
| 85681.500 | Vertical | 48.4 | 54.0 | 5.6 | Complied | | |
| 100102.500 | Vertical | 48.3 | 54.0 | 5.7 | Complied | | |



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

Transmitter Radiated Emissions (continued)

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| <u>s</u> | PNC fast 🧊 Tidg: Free Run FGatcrilgh | | Mkr2 49.502 5 GHz | | PND: Fast 🖵 Tridge Fi FGeintligh Attack | 048 | o Mkr1 50.39 |
| Ref 015el 253 dB Ref 01.00 dByV | | | 47.222 dBµV | 10 dBklv Ref 80.00 dBpV | | | 42.45 |
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| 1 74.9064968833229 GHz | | instal Biog Typer Volge Anglister 17 | 1-1-2-56 192019-21 7-76 (2011) 7-76 (2011) | 60) Biggergenninger-lægt k | 127400 | jonal | 059 7 59 9 |
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Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)

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| Ref 80.00 dBpV | | | Mkr1 100.102 5 GHz 48.270 dBµV | 10 dBidir Ref 80.00 dBpV | | | | |
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Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

VERSION 1.0

Transmitter Radiated Emissions (continued)

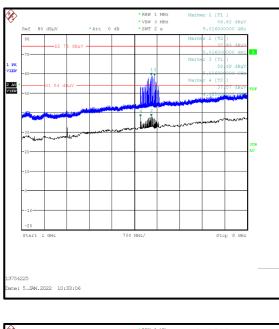


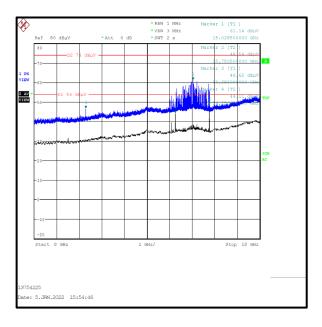
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

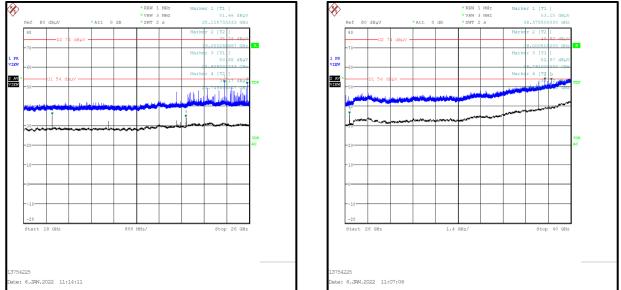
Transmitter Radiated Emissions (continued)

| Frequency (MHz) | Antenna Polarity | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|--------------------|---------------------|-------------------|-------------------|----------------|----------|
| 4750.159 | Vertical | 47.9 | 54.0 | 6.1 | Complied |
| 14250.028 | Vertical | 46.3 | 54.0 | 7.7 | Complied |
| 15750.184 | Vertical | 40.7 | 54.0 | 13.3 | Complied |
| 37999.963 | Vertical | 44.6 | 54.0 | 9.4 | Complied |
| 48147.851 | Vertical | 47.1 | 54.0 | 6.9 | Complied |
| 74994.000 | Vertical | 46.6 | 54.0 | 7.4 | Complied |
| 85727.500 | Vertical | 47.6 | 54.0 | 6.4 | Complied |
| 101440.100 | Vertical | 46.6 | 54.0 | 7.4 | Complied |

Results: VEGAZW-6-74538 / Average

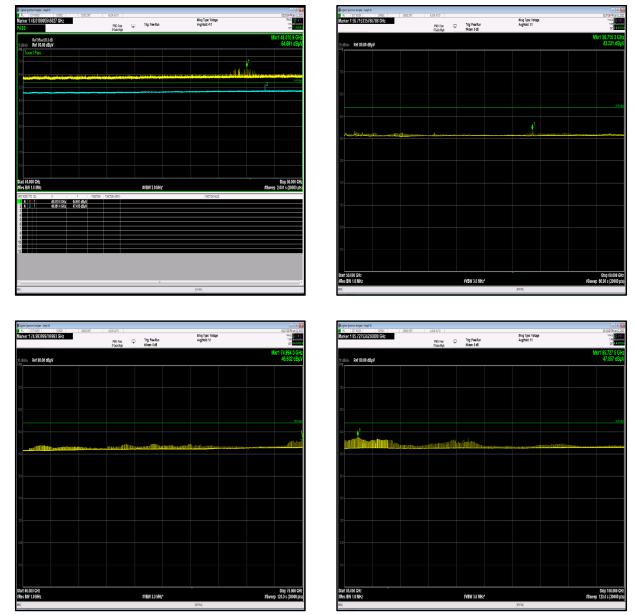






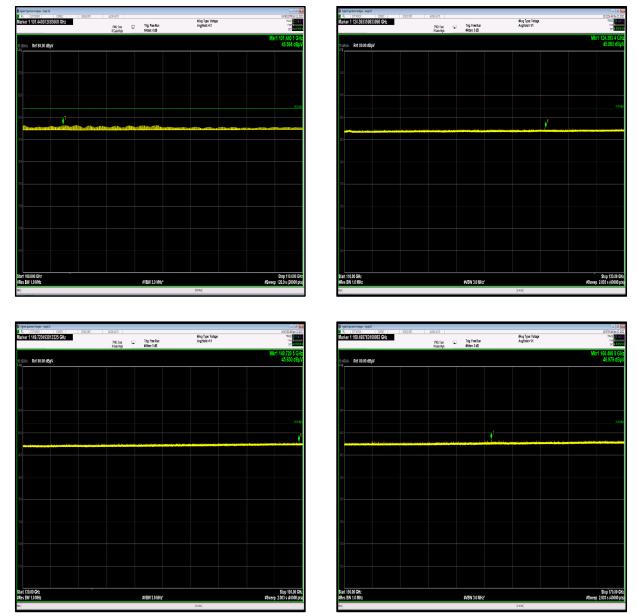
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



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

Transmitter Radiated Emissions (continued)



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

TEST REPORT

Transmitter Radiated Emissions (continued)



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

--- END OF REPORT ---