



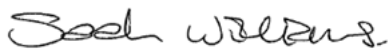
# TEST REPORT

**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:**   
Sarah Williams  
RF Operations Leader, Radio Laboratory

**Company Signatory:**   
Ben Mercer  
Lead Project Engineer, Radio Laboratory



---

**UL International (UK) LTD**

Unit 1-3 Horizon, Kingsland Business Park, Wade Road, Basingstoke, Hampshire, RG24 8AH, UK  
Telephone: +44 (0)1256 312000  
Facsimile: +44 (0)1256 312001

**Customer Information**

<b>Company Name:</b>	VEGA Grieshaber KG
<b>Address:</b>	Am Hohenstein 113 D-77761 Schiltach Germany

**Report Revision History**

<b>Version Number</b>	<b>Issue Date</b>	<b>Revision Details</b>	<b>Revised By</b>
1.0	23/02/2022	Initial Version	Sarah Williams

## **Table of Contents**

<b>Customer Information</b> .....	<b>2</b>
<b>Report Revision History</b> .....	<b>2</b>
<b>Table of Contents</b> .....	<b>3</b>
<b>1 Attestation of Test Results</b> .....	<b>4</b>
1.1 Description of EUT	4
1.2 General Information	4
1.3 Summary of Test Results	4
1.4 Deviations from the Test Specification	4
<b>2 Summary of Testing</b> .....	<b>5</b>
2.1 Facilities and Accreditation	5
2.2 Methods and Procedures	5
2.3 Calibration and Uncertainty	6
2.4 Test and Measurement Equipment	7
<b>3 Equipment Under Test (EUT)</b> .....	<b>8</b>
3.1 Identification of Equipment Under Test (EUT)	8
3.2 Modifications Incorporated in the EUT	8
3.3 Additional Information Related to Testing	8
3.4 Description of Available Antennas	8
3.5 Description of Test Setup	9
<b>4 Antenna Port Test Results</b> .....	<b>14</b>
4.1 Transmitter Duty Cycle	14
4.2 Transmitter Fundamental Emission Bandwidth	16
4.3 Transmitter Maximum Peak EIRP	18
4.4 Transmitter Maximum Average EIRP	20
<b>5 Radiated Test Results</b> .....	<b>21</b>
5.1 Transmitter Radiated Emissions <1 GHz	21
5.2 Transmitter Radiated Emissions >1 GHz	23

## 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

<b>Specification Reference:</b>	47CFR15.256
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Section 15.256
<b>Specification Reference:</b>	47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Sections 15.209
<b>Site Registration:</b>	685609
<b>Lab Designation No.:</b>	UK2011
<b>Location of Testing:</b>	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
<b>Test Dates:</b>	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	Note 1
Part 15.256(f)	Transmitter Fundamental Emission Bandwidth	
Part 15.256(g)	Transmitter Maximum Peak EIRP	
Part 15.256(g)	Transmitter Maximum Average EIRP	
Part 15.256(h) & 15.209(a)	Transmitter Unwanted Emissions	
<b>Key to Results</b>		
 = Complied  = Did not comply		

#### Note(s):

- 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	X
Site 2	-
Site 17	X

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**

<b>Reference:</b>	ANSI C63.10-2013
<b>Title:</b>	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
<b>Reference:</b>	KDB 890966 D01 Level Probing Radar v01r01 September 10, 2014
<b>Title:</b>	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”.

<b>Measurement Type</b>	<b>Range</b>	<b>Confidence Level (%)</b>	<b>Calculated Uncertainty</b>
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.

## 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	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
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

### **3 Equipment Under Test (EUT)**

#### **3.1 Identification of Equipment Under Test (EUT)**

<b>Brand Name:</b>	VEGAPULS
<b>Model No.:</b>	VEGAPULS 6X
<b>Test Sample Serial Number:</b>	55822749
<b>Hardware Version:</b>	1.0.0
<b>Software Version:</b>	1.00.00
<b>FCC ID:</b>	O6QPS6XW

#### **3.2 Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

#### **3.3 Additional Information Related to Testing**

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

#### **3.4 Description of Available Antennas**

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

<b>Model Number</b>	<b>Type</b>	<b>Frequency Range (MHz)</b>	<b>Antenna Gain (dBi)</b>
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:

<b>Description:</b>	Waveguide Adapter
<b>Brand Name:</b>	MI-WAVE
<b>Model Name or Number:</b>	284E-102/387
<b>Serial Number:</b>	2051

<b>Description:</b>	Round Nose Pliers
<b>Brand Name:</b>	Belzer
<b>Model Name or Number:</b>	2464-A19
<b>Serial Number:</b>	2051

<b>Description:</b>	DC Power Supply
<b>Brand Name:</b>	ISO-Tech
<b>Model Name or Number:</b>	IPS2302A
<b>Serial Number:</b>	504E005G2

<b>Description:</b>	DC Power Supply
<b>Brand Name:</b>	Tenma
<b>Model Name or Number:</b>	72-10480
<b>Serial Number:</b>	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**

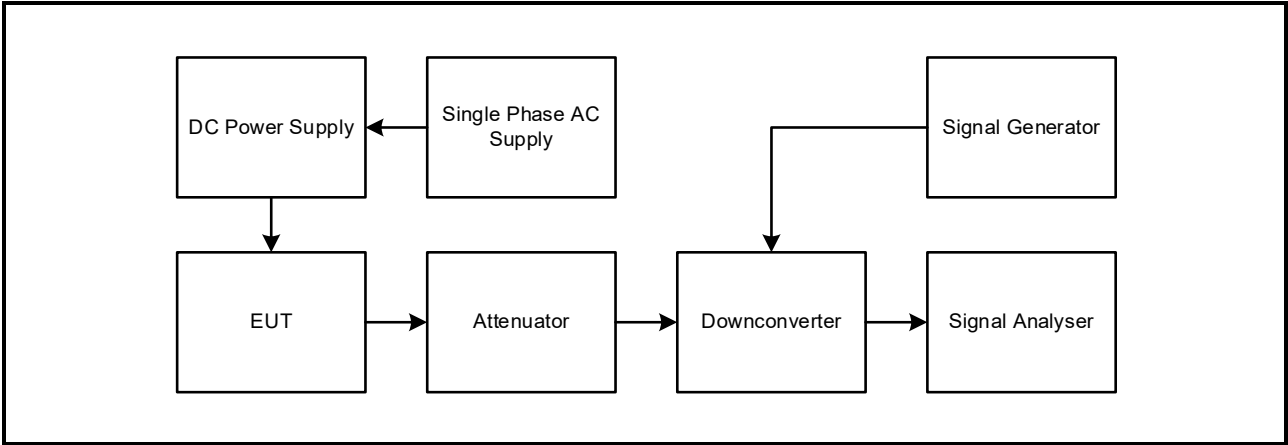
The EUT was tested in the following configuration(s):

- 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.

**Test Setup Diagrams**

**Conducted Tests:**

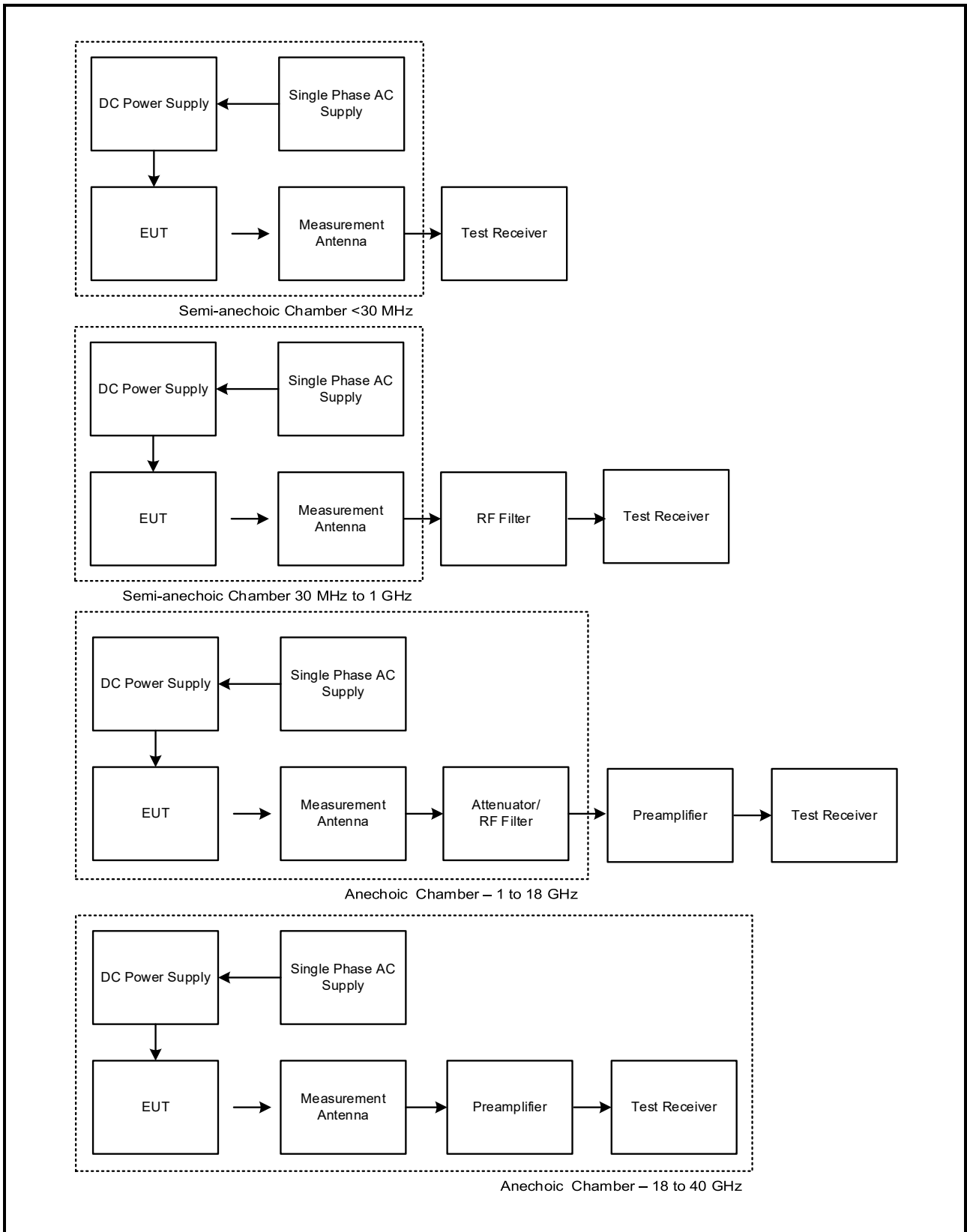
**Test Setup for Transmitter Bandwidth, Duty Cycle and EIRP**



**Test Setup Diagrams (continued)**

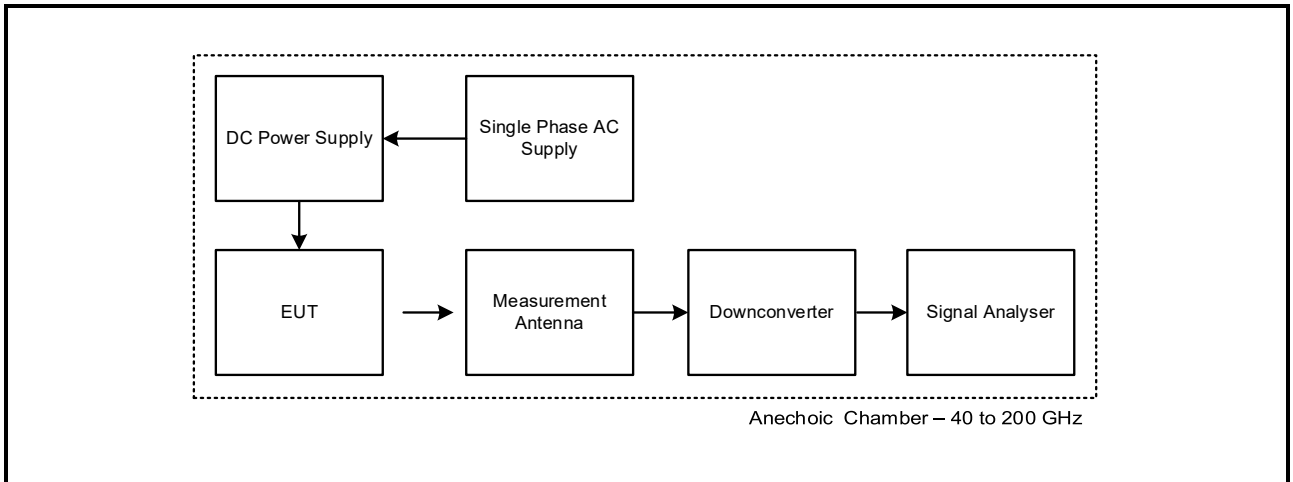
**Radiated Tests:**

**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:**

<b>Test Engineer:</b>	Ben Mercer	<b>Test Dates:</b>	04 February 2022 & 21 February 2022
<b>Test Sample Serial Number:</b>	55822749		

<b>FCC Reference:</b>	Part 15.35(c)
<b>Test Method Used:</b>	ANSI C63.10 Section 11.6

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	21 to 23
<b>Relative Humidity (%):</b>	39 to 42

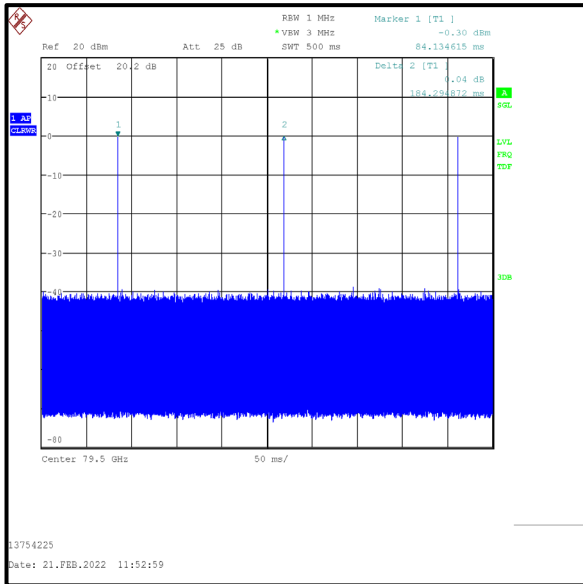
#### **Note(s):**

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.

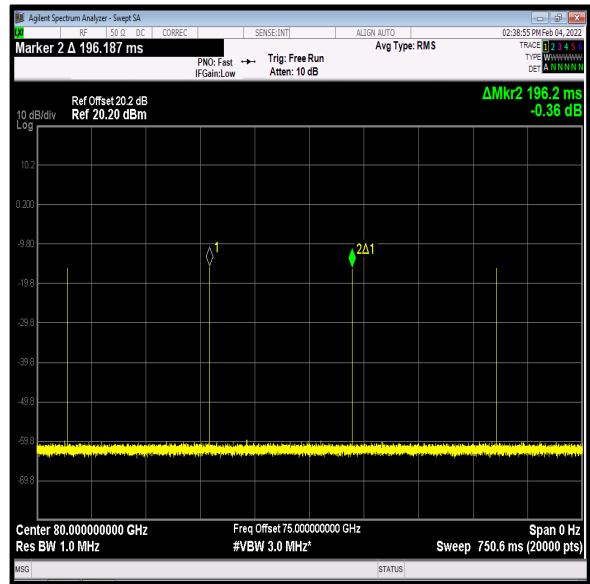
**Transmitter Duty Cycle (continued)**

**Results:**

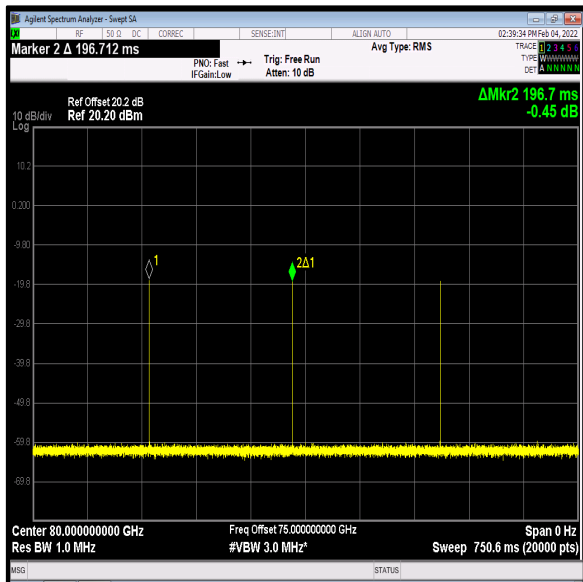
Channel Bandwidth (GHz)	Duty Cycle (ms)
2	184.295
4	196.200
8	196.700



**2 GHz**



**4 GHz**



**8 GHz**

## **4.2 Transmitter Fundamental Emission Bandwidth**

### **Test Summary:**

<b>Test Engineer:</b>	Ben Mercer	<b>Test Dates:</b>	04 February 2022 & 07 February 2022
<b>Test Sample Serial Number:</b>	55822749		

<b>FCC Reference:</b>	Part 15.256(f)
<b>Test Method Used:</b>	KDB 890966 Section D & ANSI C63.10 Section 6.9.2

### **Environmental Conditions:**

<b>Temperature (°C):</b>	20 to 21
<b>Relative Humidity (%):</b>	36 to 42

### **Note(s):**

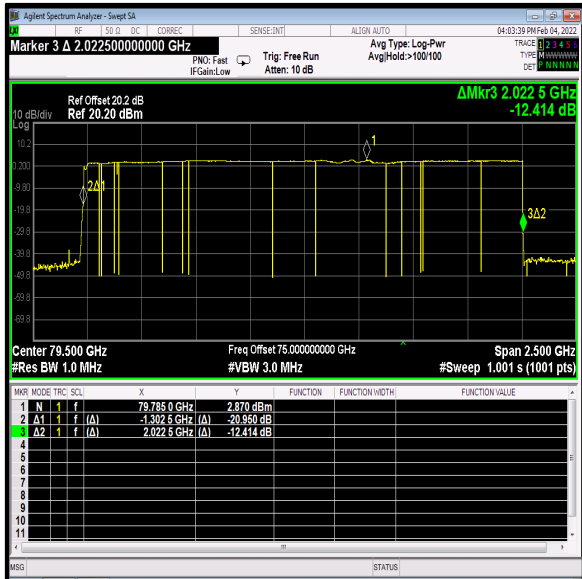
1. The signal analyser resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz. A peak detector was used, with Max Hold trace mode, and with sweep time set to ensure coincidence with the FMCW signal. The emission bandwidth was measured at 10 dB down from the peak of the signal.
2. The downconverter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



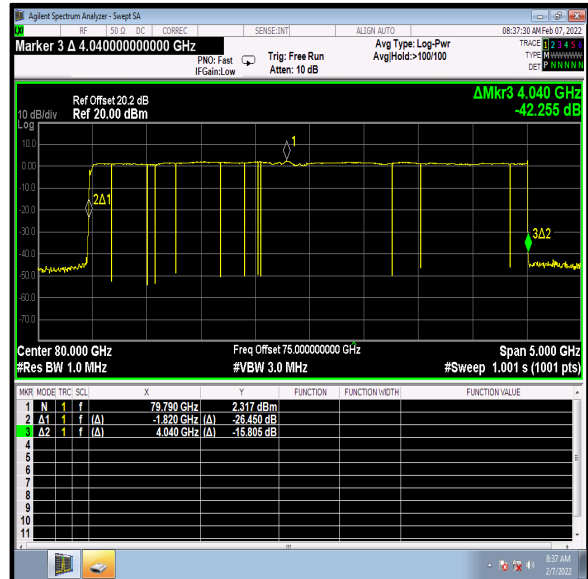
**Transmitter Fundamental Emission Bandwidth (continued)**

**Results:**

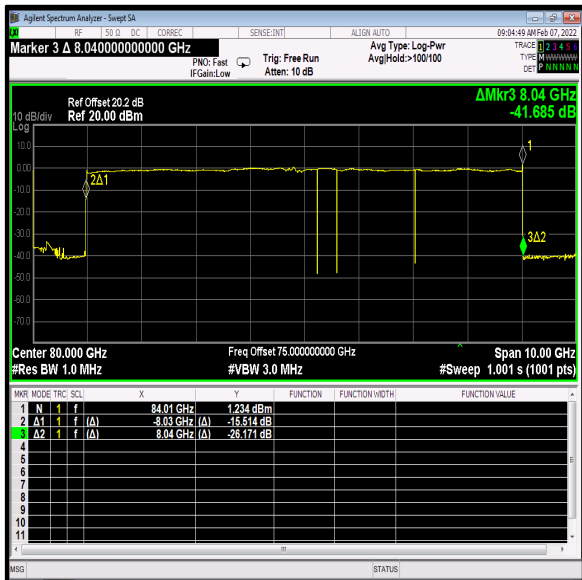
Channel Bandwidth (GHz)	10 dB Bandwidth (GHz)	Limit (MHz)	Margin (GHz)	Result
2	2.023	≥50	1.973	Complied
4	4.040	≥50	3.990	Complied
8	8.040	≥50	7.990	Complied



2 GHz



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

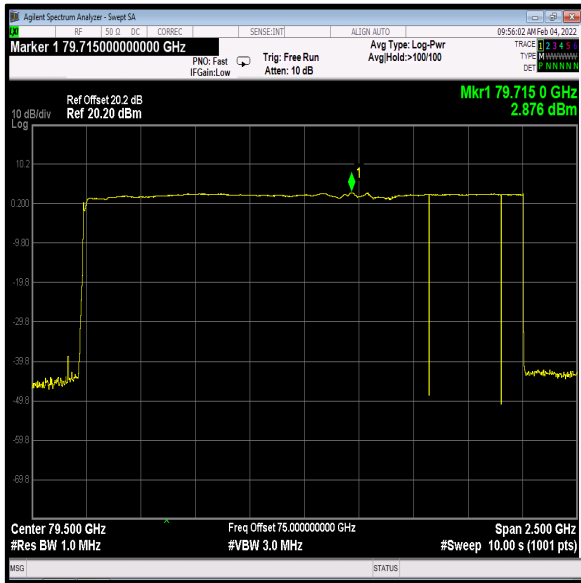
Channel Bandwidth (GHz)	Conducted Peak Power (dBm/1 MHz)	Declared Antenna Gain (dBi)	EIRP (dBm/1 MHz)	EIRP Limit (dBm/ 50 MHz)	Margin (dB)	Result
2	2.9	25.3	28.2	34.0	5.8	Complied
4	2.2	25.3	27.5	34.0	6.5	Complied
8	1.4	25.3	26.7	34.0	7.3	Complied

#### Results: VEGAZW-6-74538

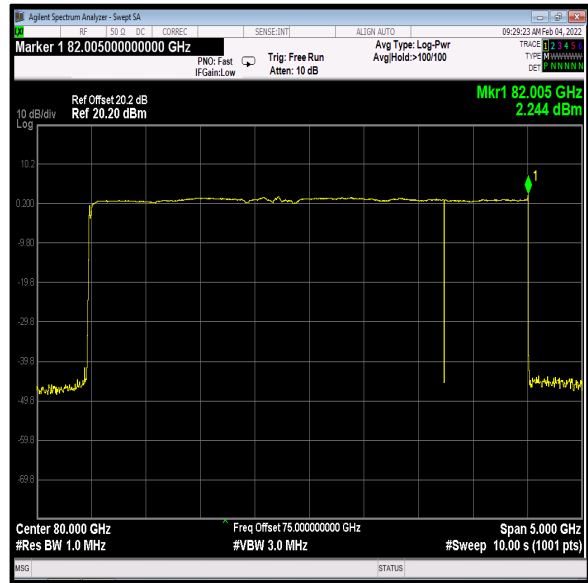
Channel Bandwidth (GHz)	Conducted Peak Power (dBm/1 MHz)	Declared Antenna Gain (dBi)	EIRP (dBm/1 MHz)	EIRP Limit (dBm/ 50 MHz)	Margin (dB)	Result
2	2.9	30.7	33.6	34.0	0.4	Complied
4	2.2	30.7	32.9	34.0	1.1	Complied
8	1.4	30.7	32.1	34.0	1.9	Complied

### Transmitter Maximum Peak EIRP (continued)

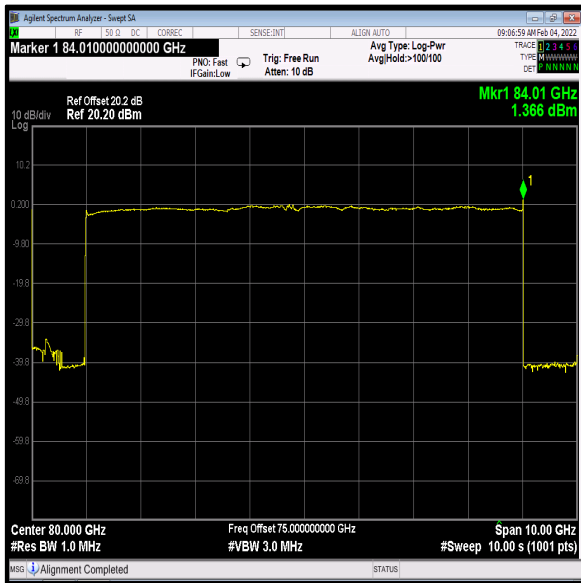
#### Conducted Results



2 GHz



4 GHz



8 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:

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

Where:

$T_s$  is the signal sweep time in seconds

$\Delta F$  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.

$$2 \text{ GHz Bandwidth Average Factor} = 10\text{Log}((2/2000)/170) = -52.3 \text{ dB}$$

$$4 \text{ GHz Bandwidth Average Factor} = 10\text{Log}((2/4000)/170) = -55.3 \text{ dB}$$

$$8 \text{ GHz Bandwidth Average Factor} = 10\text{Log}((2/8000)/170) = -58.3 \text{ dB}$$

##### Results: VEGAZW-6-74539

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

##### 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:**

<b>Test Engineers:</b>	Nick Tye & Vi Van	<b>Test Dates:</b>	04 January 2022 & 19 January 2022
<b>Test Sample Serial Number:</b>	55822749		

<b>FCC Reference:</b>	Part 15.256(h) & 15.209(a)
<b>Test Method Used:</b>	KDB 890966 Section G & ANSI C63.10 Sections 6.3, 6.4 and 6.5
<b>Frequency Range</b>	9 kHz to 1000 MHz

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	20 to 22
<b>Relative Humidity (%):</b>	39 to 40

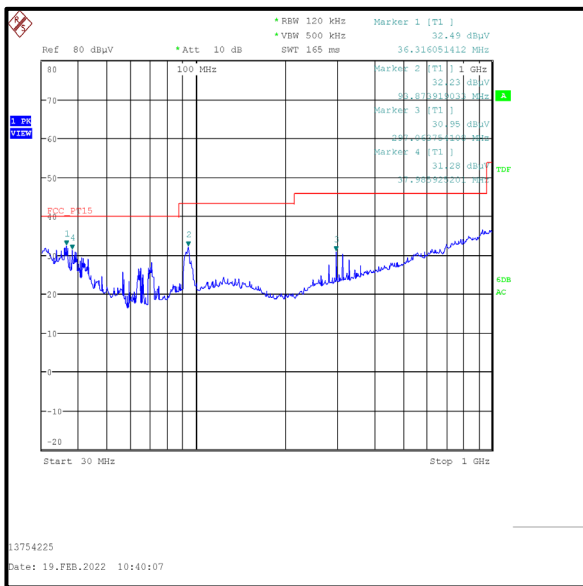
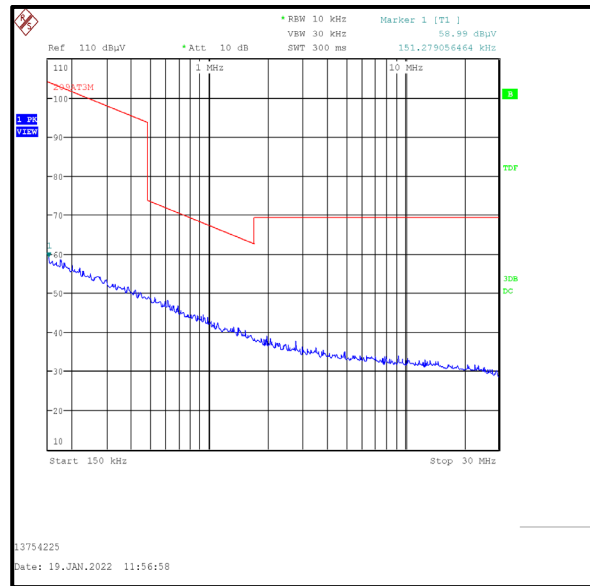
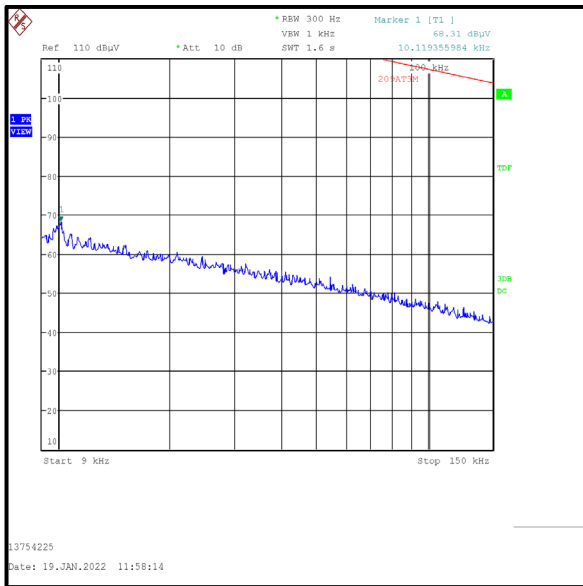
#### **Note(s):**

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 (dB $\mu$ V/m)	Limit (dB $\mu$ V/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:**

<b>Test Engineer:</b>	Vi Van	<b>Test Dates:</b>	05 January 2022 to 13 January 2022
<b>Test Sample Serial Number:</b>	55822749		

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

### **Environmental Conditions:**

<b>Temperature (°C):</b>	21 to 24
<b>Relative Humidity (%):</b>	31 to 39

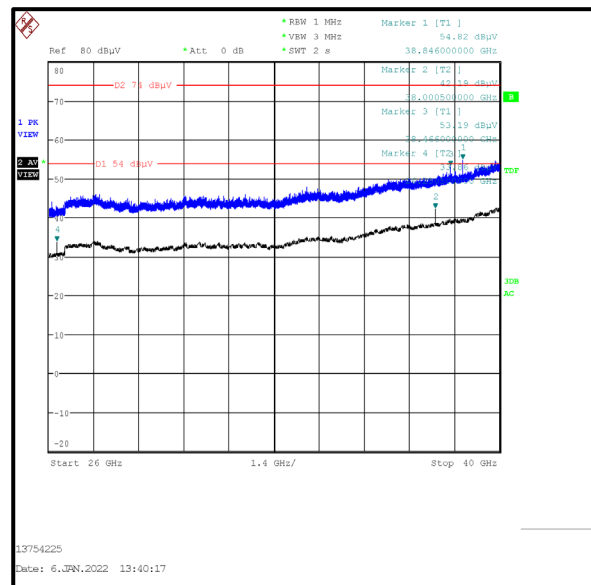
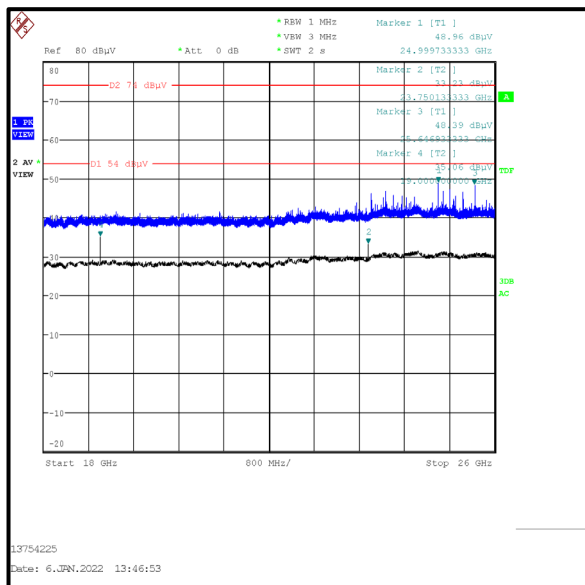
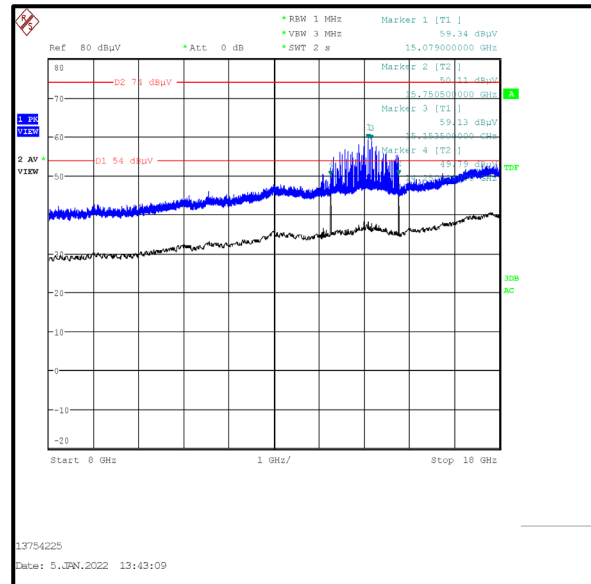
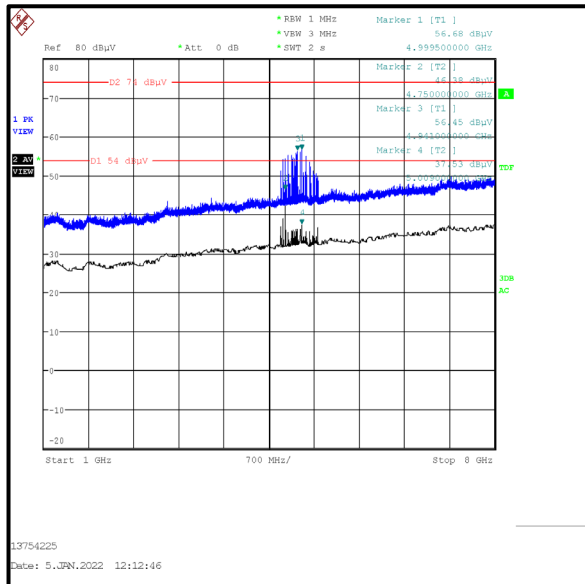
### **Note(s):**

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(l)(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)**

**Results: VEGAZW-6-74539 / Average**

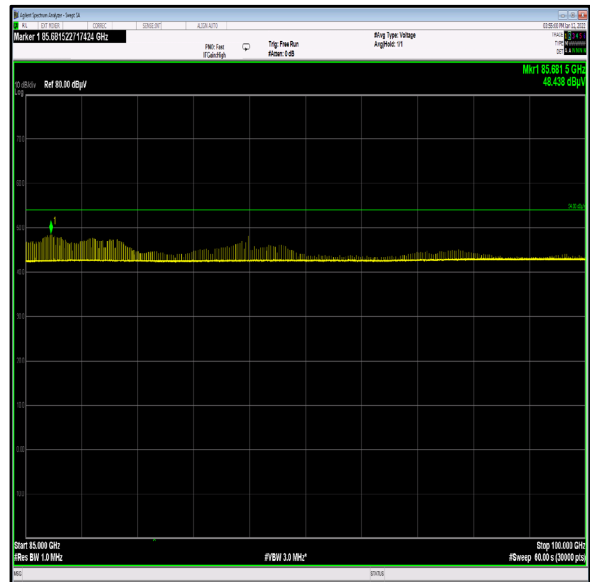
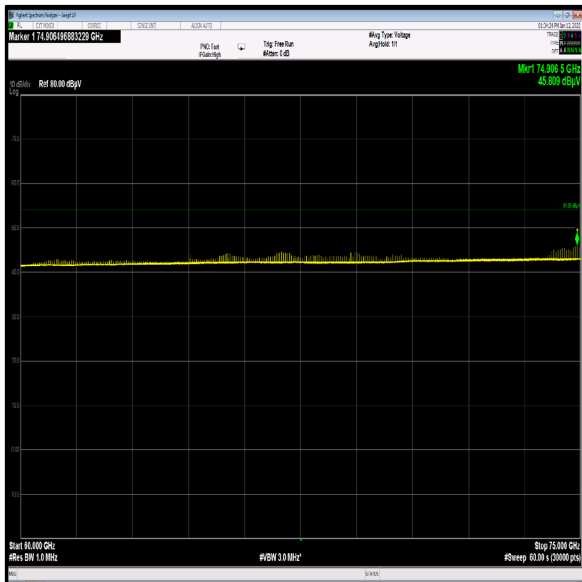
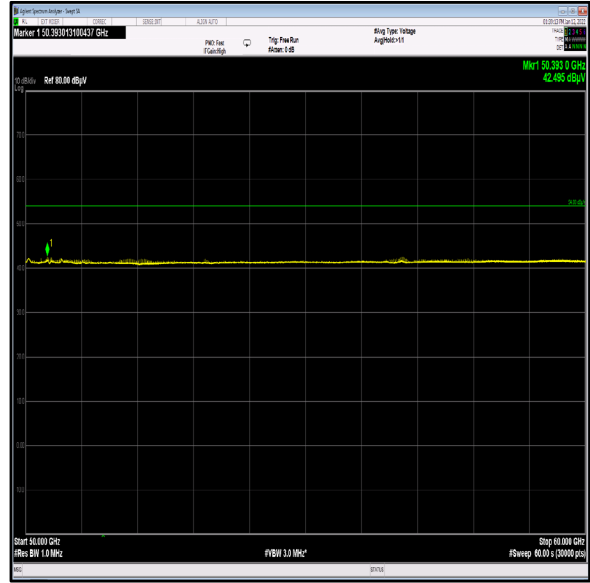
Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4686.306	Vertical	39.7	54.0	14.3	Complied
5250.714	Vertical	37.9	54.0	16.1	Complied
14250.020	Vertical	44.4	54.0	9.6	Complied
38000.196	Vertical	43.7	54.0	10.3	Complied
74906.500	Vertical	45.8	54.0	8.2	Complied
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.

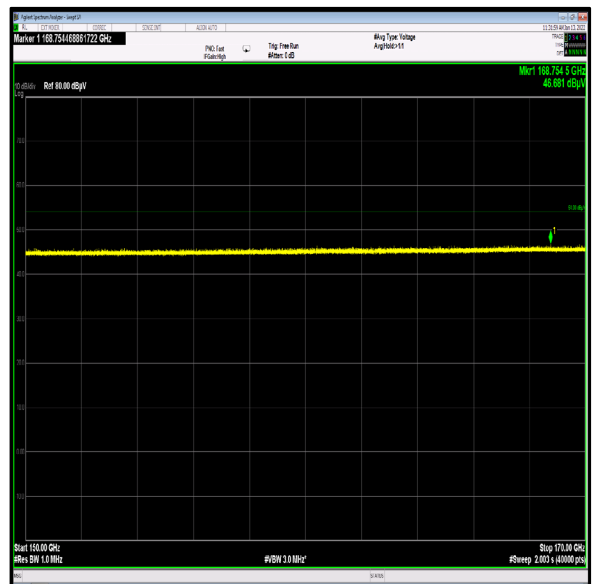
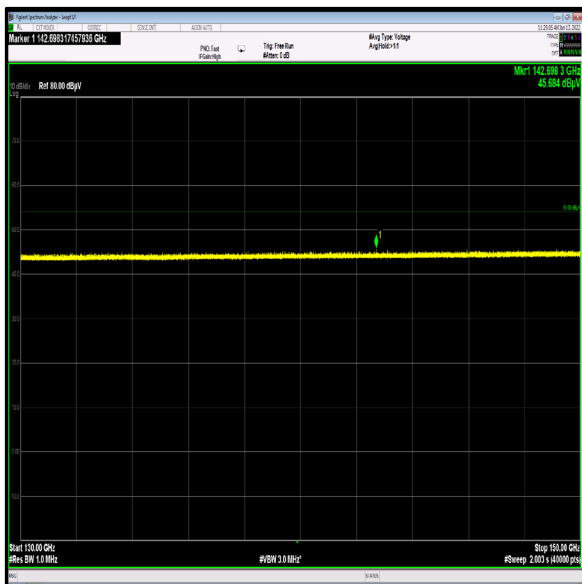
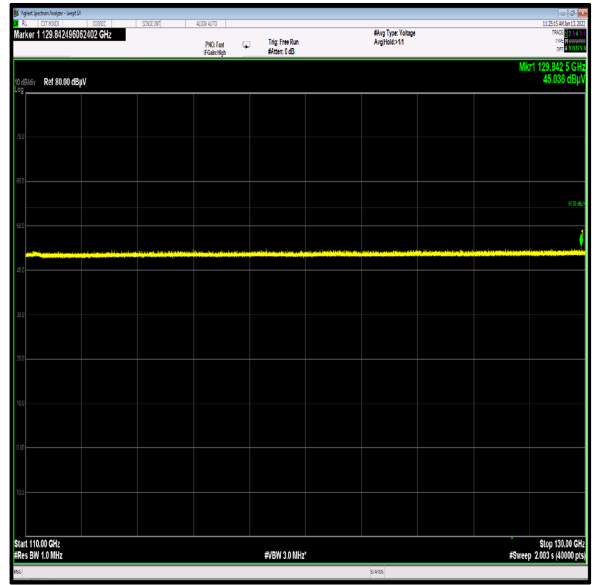
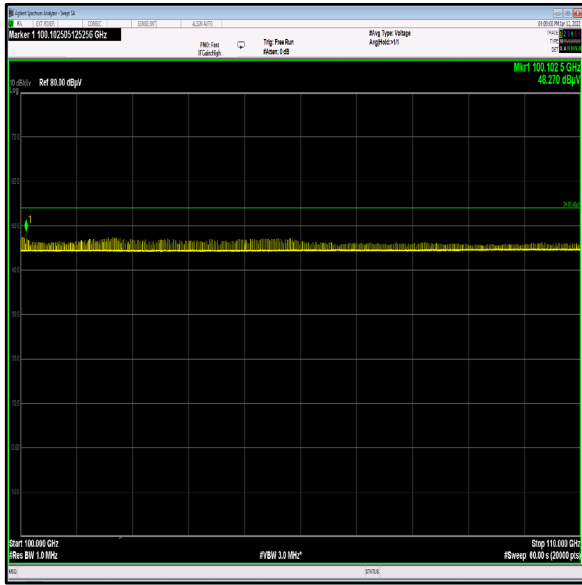


**Transmitter Radiated Emissions (continued)**



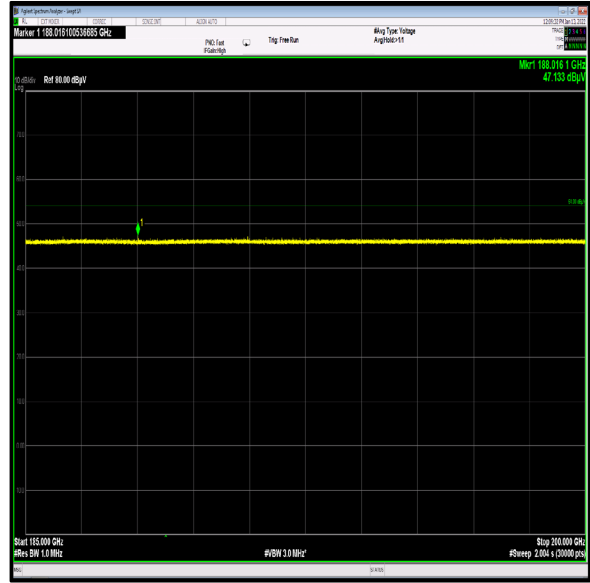
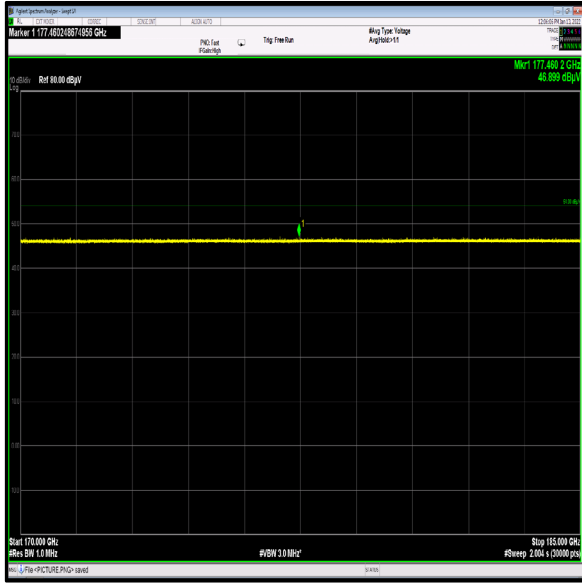
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

### 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)**

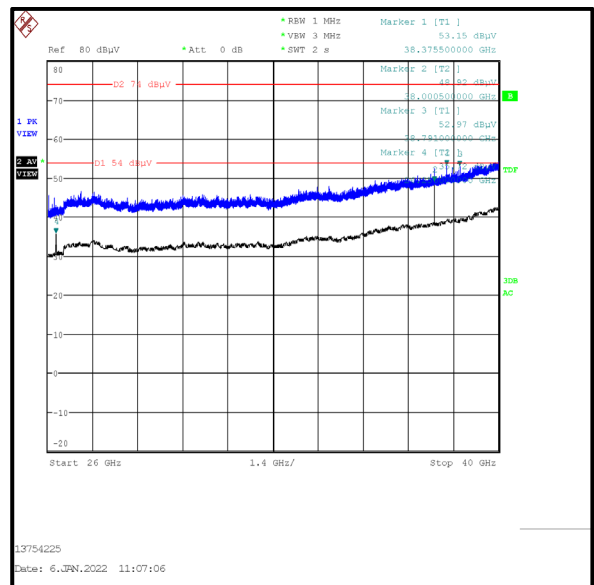
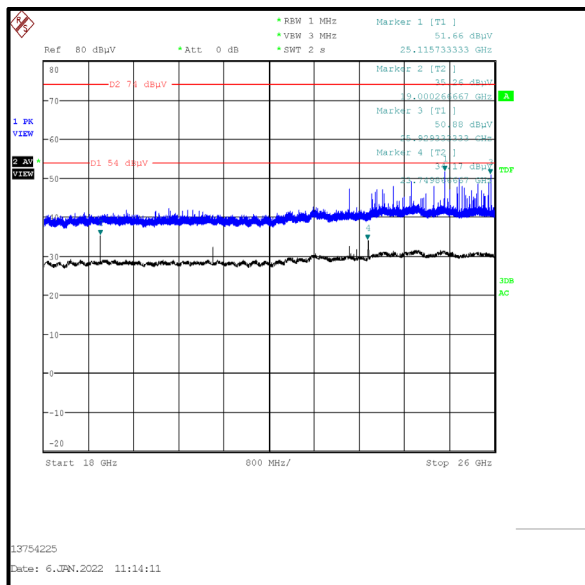
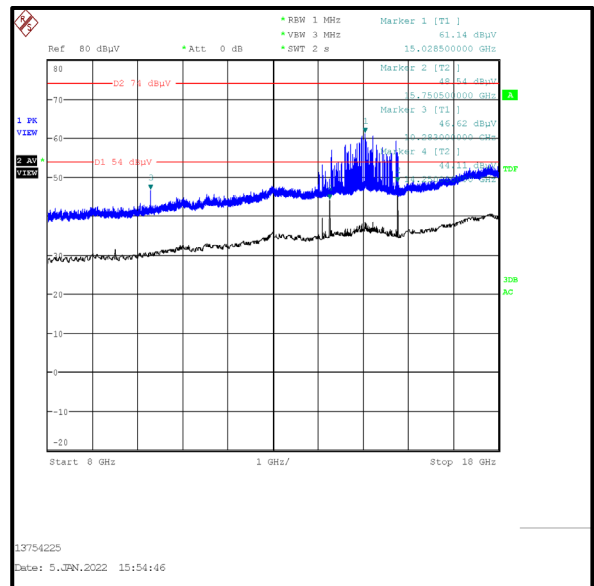
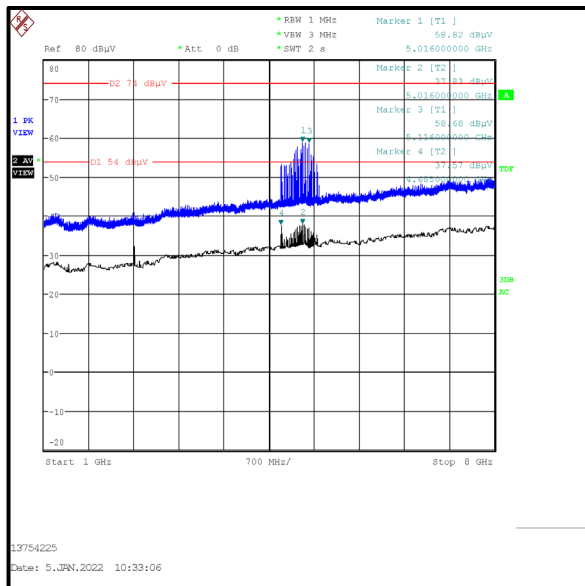


Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

**Transmitter Radiated Emissions (continued)**

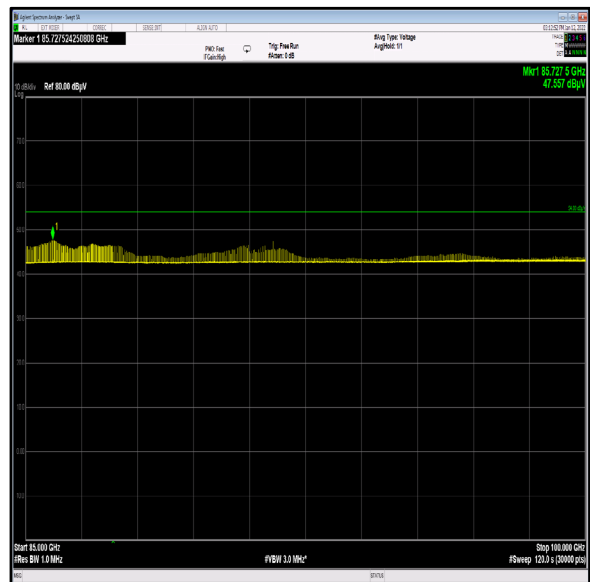
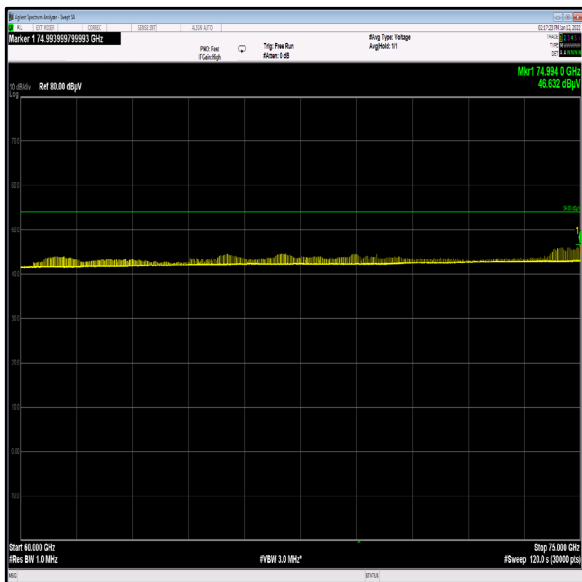
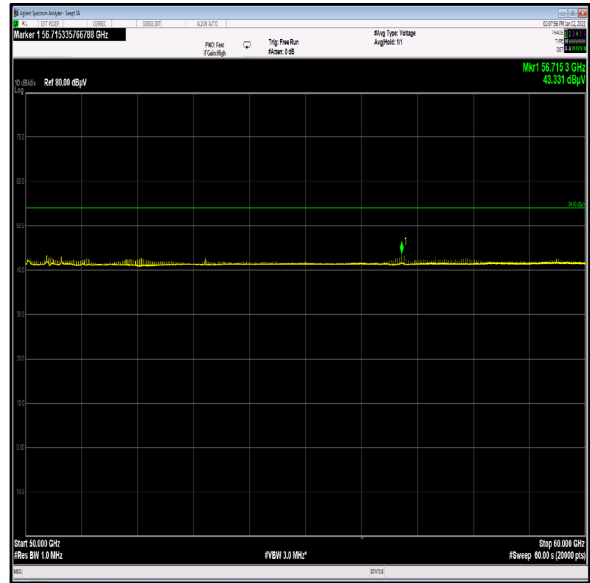
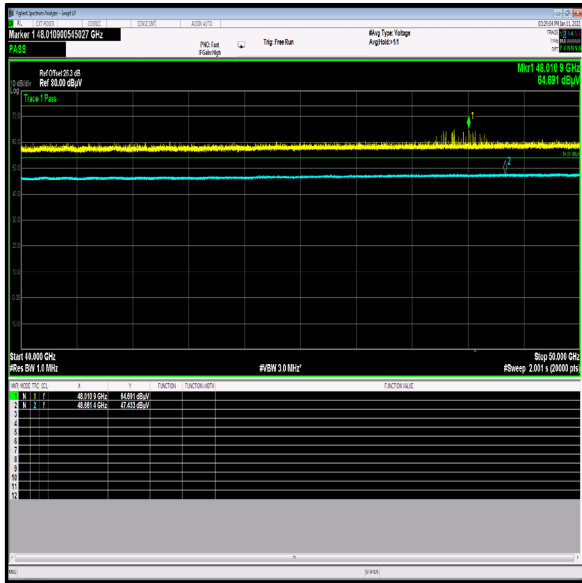
**Results: VEGAZW-6-74538 / Average**

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



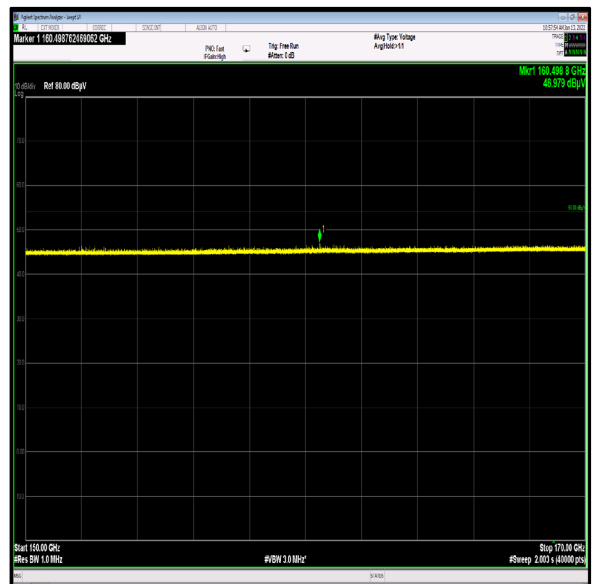
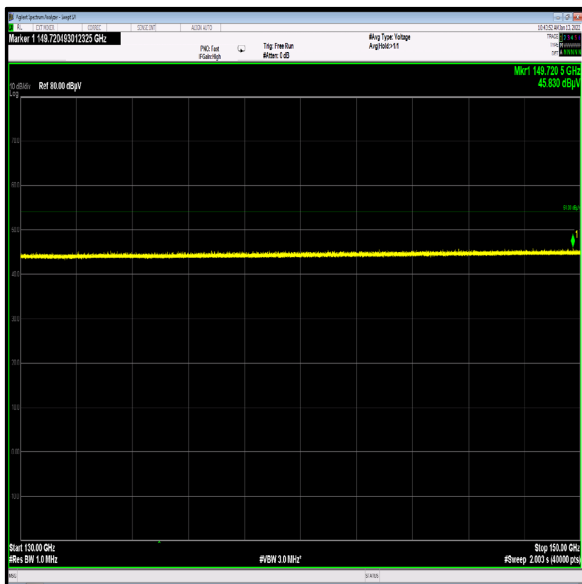
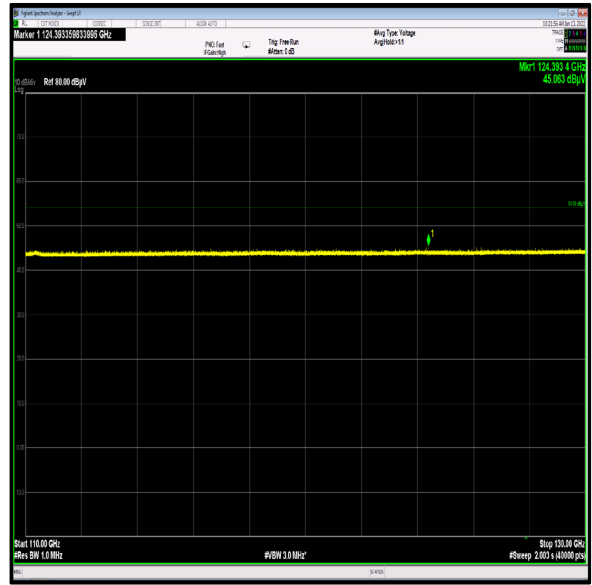
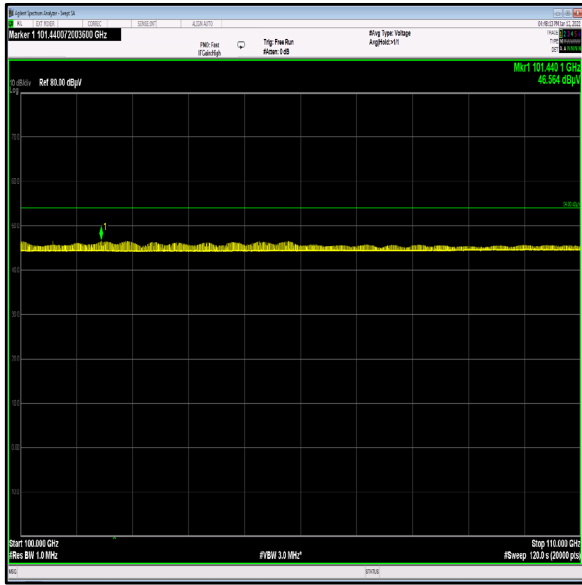
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

### Transmitter Radiated Emissions (continued)



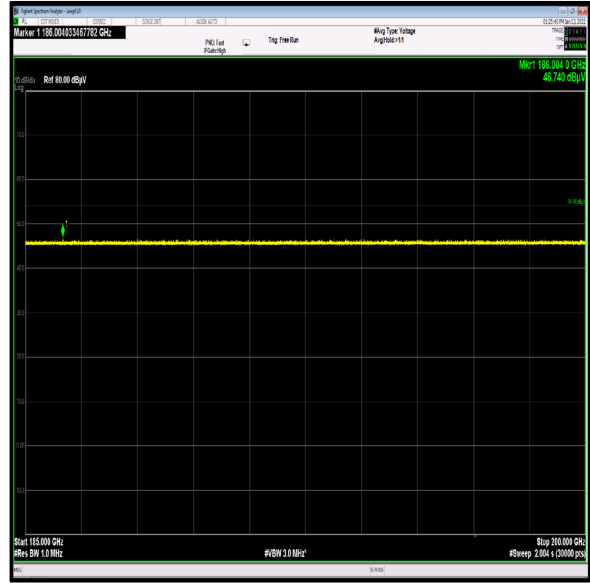
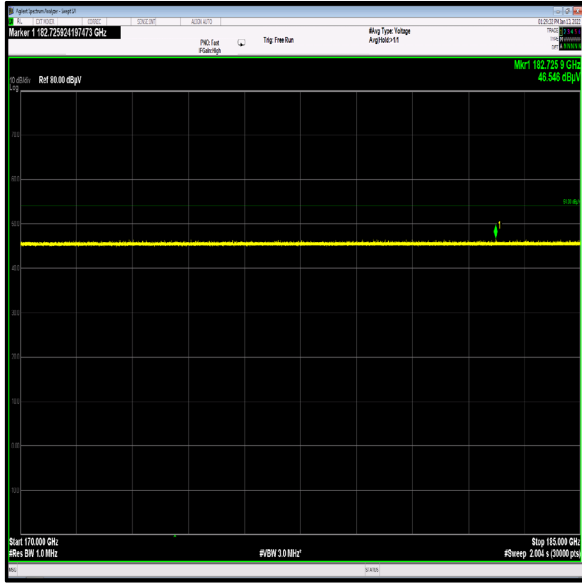
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

### Transmitter Radiated Emissions (continued)



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

**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 ---**