TEST REPORT

Test Report No. : UL-RPT-RP13754225-316A

Customer	:	VEGA Grieshaber KG
Model No.	:	VEGAPULS 6X
FCC ID	:	O6QPS6XW
Technology	:	VEGA Grieshaber KG
Test Standard(s)	:	FCC Parts 15.207, 15.209(a) & 15.256
Test Laboratory	:	UL International (UK) Ltd, Basingstoke, Hampshire, RG24 8AH, United Kingdom

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

Date of Issue: 13 January 2022

Checked by:

Sarah Williams
RF Operations Leader, Radio Laboratory

Company Signatory:

Ben Mercer
Lead Project Engineer, Radio Laboratory

5772

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	30/11/2021	Initial Version	Sarah Williams
2.0	13/01/2022	Added antenna requirements and admin updates requested by TCB	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:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Sections 15.207 and 15.209
Site Registration:	685609
Lab Designation No.:	UK2011
Location of Testing:	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	02 August 2021 to 12 October 2021

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(f)	Transmitter Frequency Stability	✓
Part 15.256(h) & 15.209(a)	Transmitter Unwanted Emissions	✓
Part 15.207	Transmitter AC Conducted Emissions	✓
Part 15.256(i)	Antenna Beamwidth	✓
Part 15.256(j)	Antenna Side Lobe Gain	✓

Key to Results

✓ = Complied ✗ = Did not comply

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	X
Site 2	X
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

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
Reference:	KDB 174176 D01 Line Conducted FAQs v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions

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
Frequency Stability	75 GHz to 85 GHz	95%	±4.59 %
Transmitter AC Conducted Emissions	0.15 MHz to 30 MHz	95%	±1.96 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	10 Dec 2021	12
M1832	Signal Analyser	Keysight	N9010A	MY53470303	06 Mar 2022	24
G0640	Signal Generator	Keysight	E8257D	US00000055	30 Jun 2023	24
M2064	Downconverter	Virginia Diodes	WR12SAX	SAX 325	17 Feb 2022	24
A3194	Attenuator	AtlanTecRF	AS8167	J510060687	Calibrated before use	-

Test Equipment Used for Transmitter Frequency Stability Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2038	Thermohygrometer	Testo	608-H1	45124919	10 Dec 2021	12
M1832	Signal Analyser	Keysight	N9010A	MY53470303	06 Mar 2022	24
G0640	Signal Generator	Keysight	E8257D	US00000055	30 Jun 2023	24
M2064	Downconverter	Virginia Diodes	WR12SAX	SAX 325	17 Feb 2022	24
A3194	Attenuator	AtlanTecRF	AS8167	J510060687	Calibrated before use	-
E0518	Environmental Chamber	TAS	LTCL 1200	24000107	Calibrated before use	-
M1642	Thermometer	Fluke	52II	18890119	21 May 2022	12

Test and Measurement Equipment (continued)

Test Equipment Used for Transmitter Radiated Emissions Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	10 Dec 2021	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
A3198	Loop Antenna	ETS Lindgren	6502	00221887	12 Aug 2022	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	26 Oct 2022	12
M2003	Thermohygrometer	Testo	608-H1	45046641	10 Dec 2021	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	19 May 2022	12
M2077	Test Receiver	Rohde & Schwarz	ESW44	102026	01 Feb 2022	12
A2948	Pre-Amplifier	Com-Power	PAM-118A	551087	20 Oct 2022	12
A2951	Pre-Amplifier	Com-Power	PAM-103	441141	25 Jan 2022	12
A3161	Antenna	Teseq	CBL6111D	50859	04 May 2022	12
A2943	Attenuator	AtlanTecRF	AN18W5-06	208147#2	01 Feb 2022	12
A3265	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-069	03 Nov 2022	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	02 Nov 2022	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	00653	26 Oct 2022	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	29 Oct 2022	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	18 Mar 2022	12
M2016	Thermohygrometer	Testo	608-H1	45046428	10 Dec 2021	12
M1794	Spectrum Analyser	Rohde & Schwarz	FSU26	100027	02 Mar 2022	12
G0614	Signal Generator	Rohde & Schwarz	SMB100A	177687	19 May 2023	36
M2064	Downconverter	Virginia Diodes	WR12SAX	SAX 325	17 Feb 2022	24
M2065	Downconverter	Virginia Diodes	WR10SAX	SAX 393	17 Feb 2022	24
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	WR15SAX	SAX 394	09 Jul 2023	24
M1621	Harmonic MIxer	Hewlett Packard	11970U	3003A01631	27 May 2024	36
A2963	Antenna	Link Microtek	AM19HA-ULV1	14929	31 Dec 2021	12
A2964	Antenna	Link Microtek	AM15HA-ULV1	14930	31 Dec 2021	12
A2965	Antenna	Link Microtek	AM12HA-ULV1	14931	31 Dec 2021	12
A2967	Antenna	Link Microtek	AM10HA-ULV1	14933	31 Dec 2021	12
A2968	Antenna	Link Microtek	AM7HA-ULV1	14934	31 Dec 2021	12
A2969	Antenna	Link Microtek	AM4HA-ULV1	14935	31 Dec 2021	12

Test and Measurement Equipment (continued)

Test Equipment Used for Transmitter AC Conducted Spurious Emissions:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2037	Thermohygrometer	Testo	608-H1	45124925	09 Dec 2021	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	82556/008	04 Aug 2022	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	21 Apr 2022	12
M1273	Test Receiver	Rohde & Schwarz	ESIB26	100275	14 Dec 2021	12

Test Measurement Software/Firmware Used:

Name	Version	Release Date
Rohde & Schwarz EMC32	6.30.0	2018

3 Equipment Under Test (EUT)

3.1 Identification of Equipment Under Test (EUT)

Brand Name:	VEGAPULS
Model No.:	VEGAPULS 6X
Test Sample Serial Number:	52284511 *(Conducted sample)*
Hardware Version:	1.0.0
Software Version:	1.00.00
FCC ID:	O6QPS6XW

Brand Name:	VEGAPULS
Model No.:	VEGAPULS 6X
Test Sample Serial Number:	52403535 *(Radiated sample)*
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:	-0.4 dBm	
Transmit Frequency Range:	75 GHz to 85 GHz	
Transmit Channels Tested:	**Channel Bandwidth (GHz)**	**Channel Frequency (GHz)**
	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:

Model Number	Type	Frequency Range (MHz)	Antenna Gain (dBi)
VEGAZW-6-74537	Plastic Horn Antenna	75000 to 85000	34.2
VEGAZW-6-74539	Thread with Integrated Horn Antenna	75000 to 85000	25.3
VEGAZW-6-74547	Flange with Encapsulated Antenna System	75000 to 85000	33.4
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:	240 Litre Tank
Brand Name:	Speidel
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

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

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

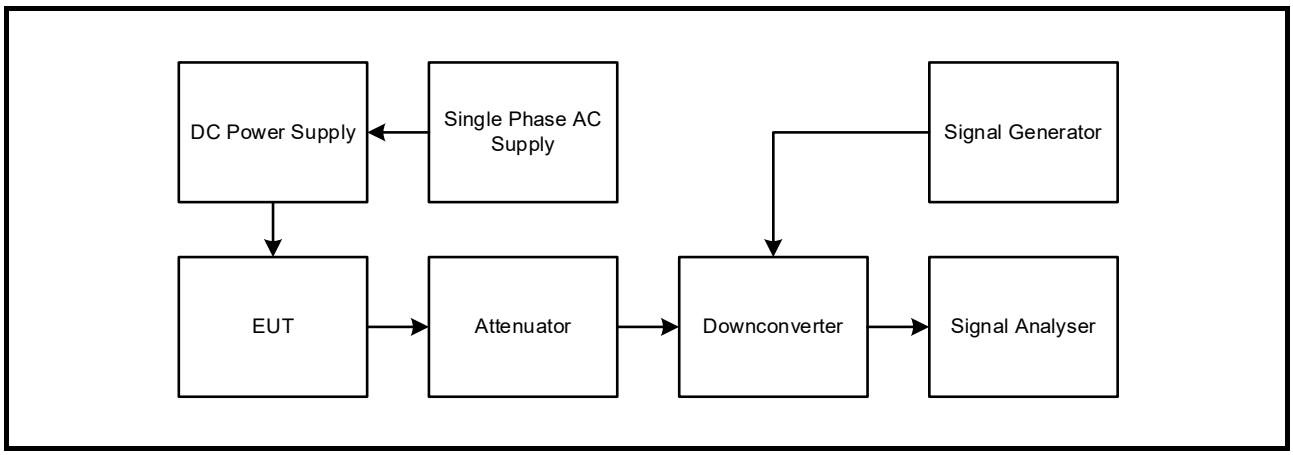
The EUT was tested in the following configuration(s):

- 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.
- AC Conducted Emissions tests were performed with the EUT installed in a representative metal tank. Installation within a representative tank was deemed to have no impact on conducted emissions compared to free space installation.

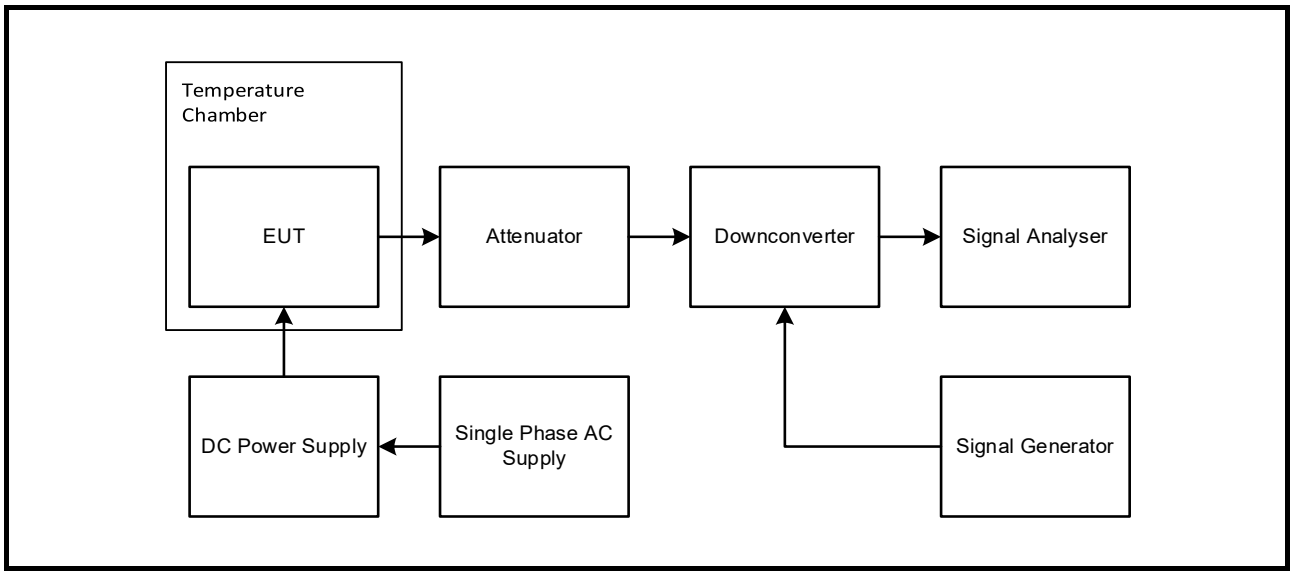
Test Setup Diagrams

Conducted Tests:

Test Setup for Transmitter Bandwidth, Duty Cycle and EIRP



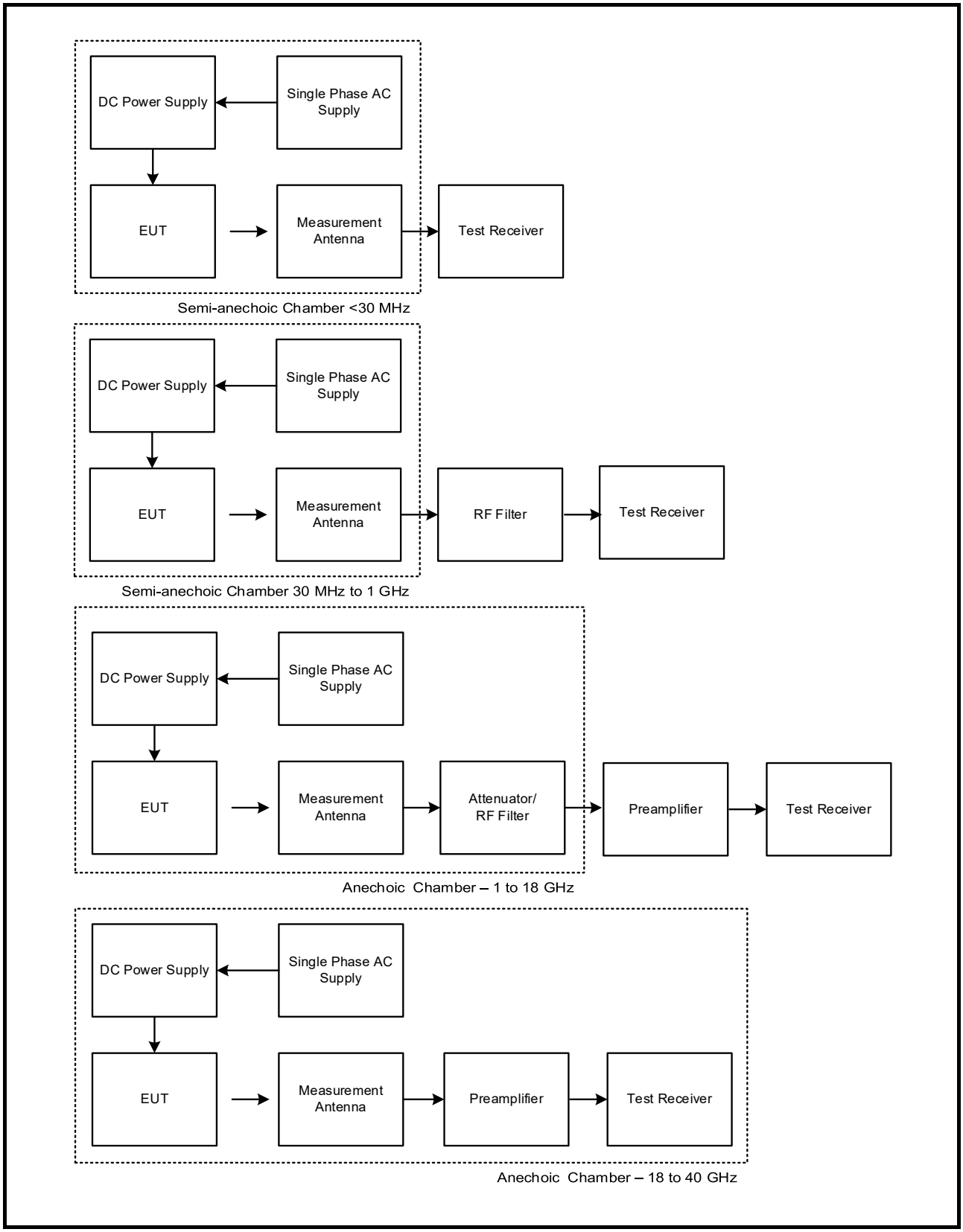
Test Setup for Transmitter Frequency Stability



Test Setup Diagrams (continued)

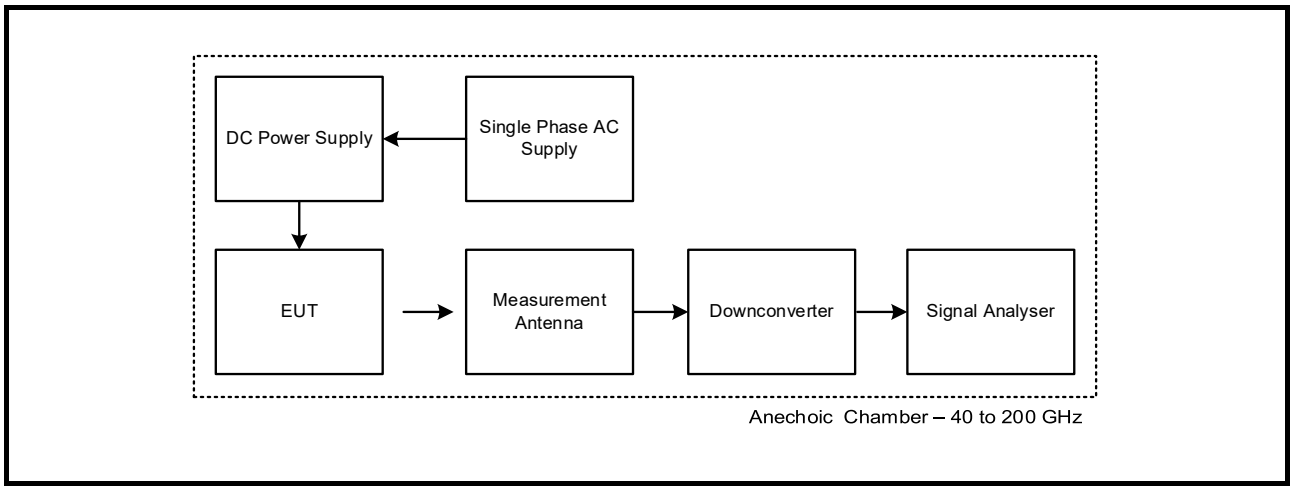
Radiated Tests:

Test Setup for Transmitter Radiated Emissions

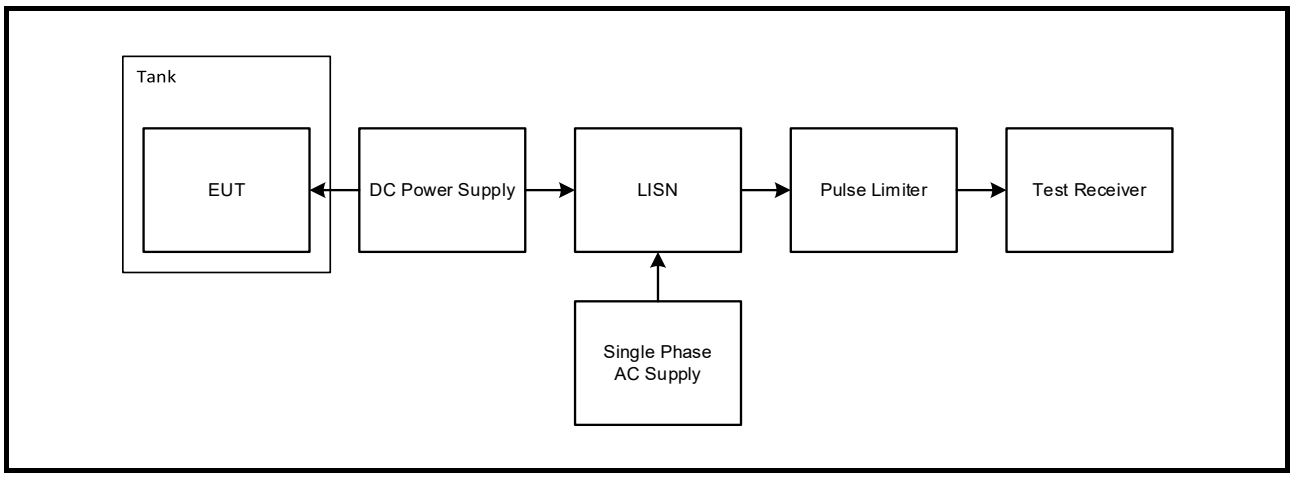


Test Setup Diagrams (continued)

Test Setup for Transmitter Radiated Emissions (continued)



Test Setup for Transmitter AC Conducted Spurious Emissions



4 Antenna Port Test Results

4.1 Transmitter Duty Cycle

Test Summary:

Test Engineer:	Ben Mercer	**Test Date:**	05 August 2021
Test Sample Serial Number:	52284511		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	45

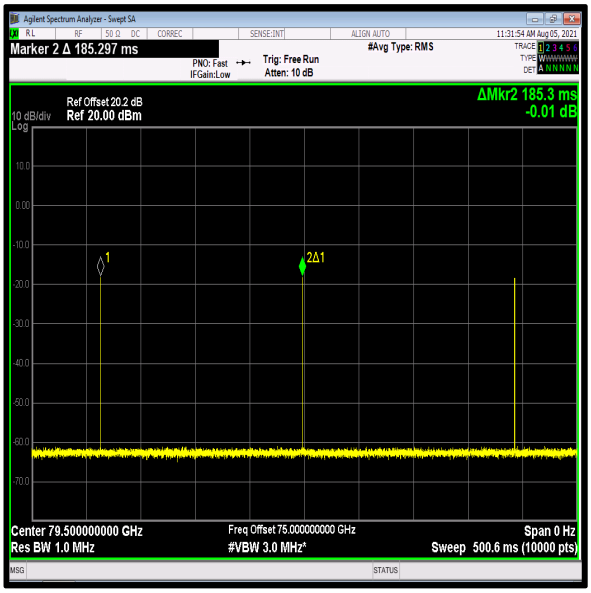
Note(s):

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.

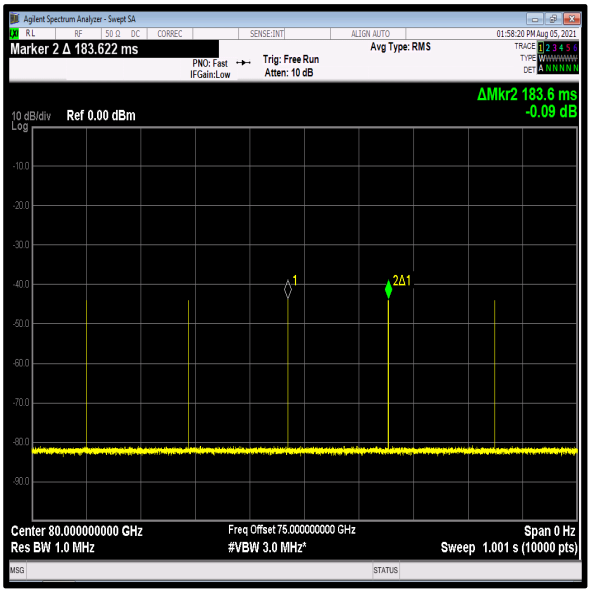
Transmitter Duty Cycle (continued)

Results:

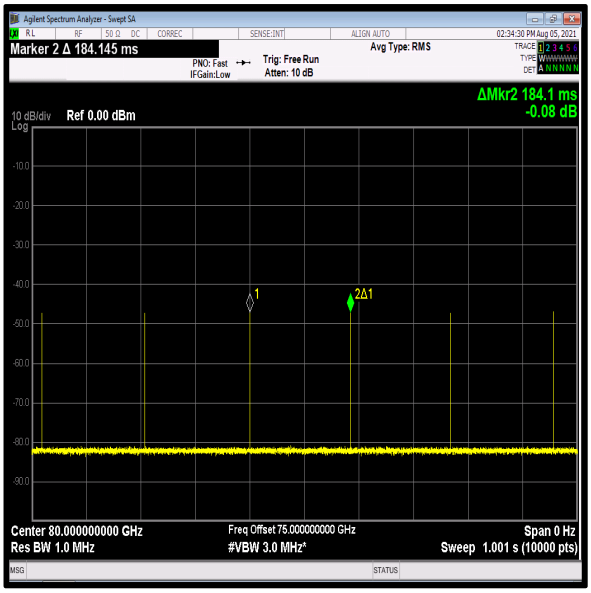
Channel Bandwidth (GHz)	Duty Cycle (ms)
2	185.300
4	183.600
8	184.100



2 GHz



4 GHz



8 GHz

4.2 Transmitter Fundamental Emission Bandwidth

Test Summary:

Test Engineer:	Ben Mercer	**Test Date:**	02 August 2021
Test Sample Serial Number:	52284511		

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

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	50

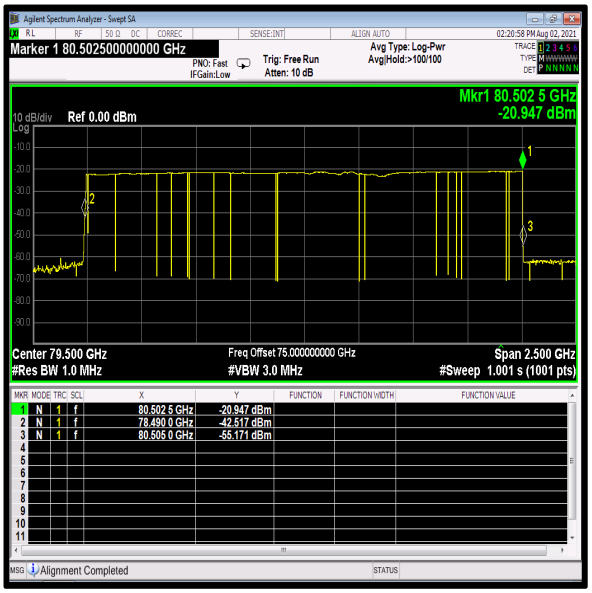
Note(s):

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.

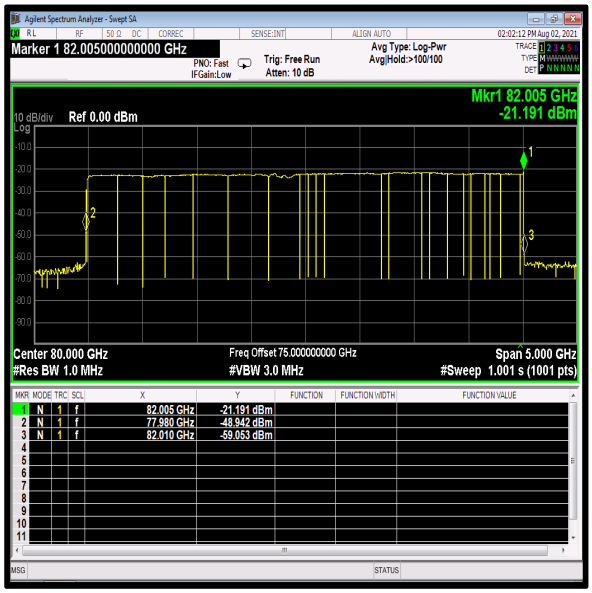
Transmitter Fundamental Emission Bandwidth (continued)

Results:

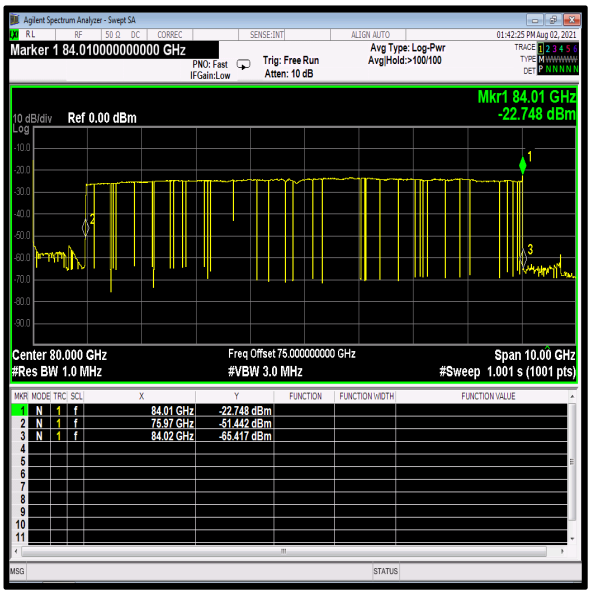
Channel Bandwidth (GHz)	10 dB Bandwidth (GHz)	Limit (MHz)	Margin (GHz)	Result
2	2.015	≥50	1.965	Complied
4	4.030	≥50	3.980	Complied
8	8.050	≥50	8.000	Complied



2 GHz



4 GHz



8 GHz

4.3 Transmitter Maximum Peak EIRP

Test Summary:

Test Engineer:	Ben Mercer	**Test Date:**	05 August 2021
Test Sample Serial Number:	52284511		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	45

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.

Transmitter Maximum Peak EIRP (continued)

Results: VEGAZW-6-74537

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	-0.4	34.2	33.8	34.0	0.2	Complied
4	-1.3	34.2	32.9	34.0	1.1	Complied
8	-2.4	34.2	31.8	34.0	2.2	Complied

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	-0.4	25.3	24.9	34.0	9.1	Complied
4	-1.3	25.3	24.0	34.0	10.0	Complied
8	-2.4	25.3	22.9	34.0	11.1	Complied

Results: VEGAZW-6-74547

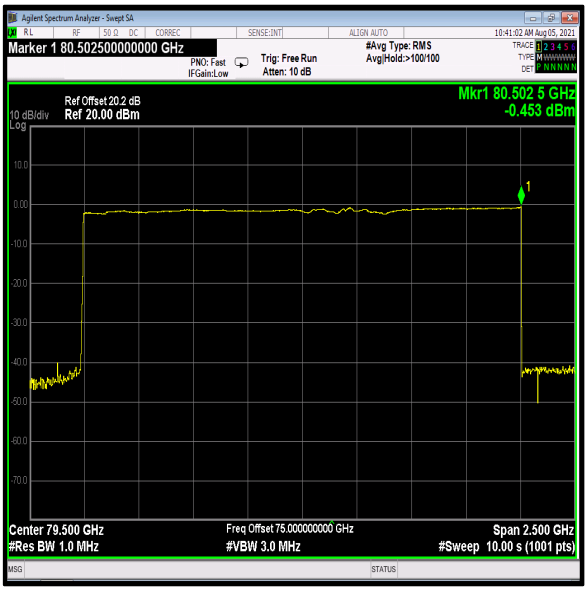
Channel Bandwidth (GHz)	Conducted Peak Power (dBm/1 MHz)	Declared Antenna Gain (dBi)	EIRP (dBm/1 MHz)	EIRP Limit (dBm/ 50 MHz)	Margin (dB)	Result
2	-0.4	33.4	33.0	34.0	1.0	Complied
4	-1.3	33.4	32.1	34.0	1.9	Complied
8	-2.4	33.4	31.0	34.0	3.0	Complied

Results: VEGAZW-6-74538

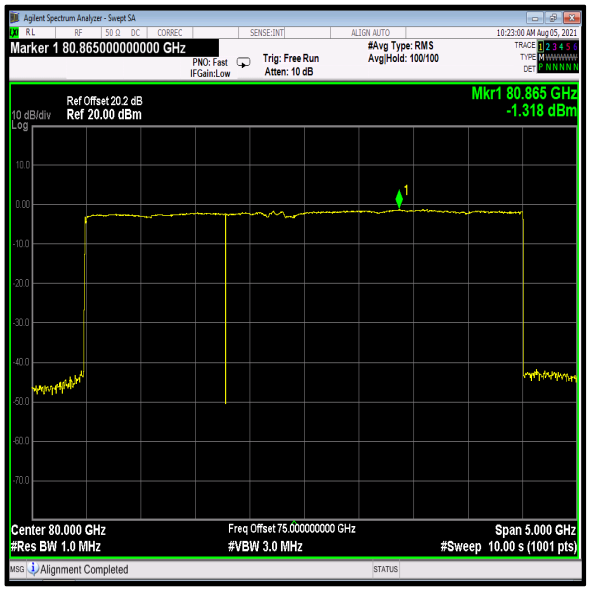
Channel Bandwidth (GHz)	Conducted Peak Power (dBm/1 MHz)	Declared Antenna Gain (dBi)	EIRP (dBm/1 MHz)	EIRP Limit (dBm/ 50 MHz)	Margin (dB)	Result
2	-0.4	30.7	30.3	34.0	3.7	Complied
4	-1.3	30.7	29.4	34.0	4.6	Complied
8	-2.4	30.7	28.3	34.0	5.7	Complied

Transmitter Maximum Peak EIRP (continued)

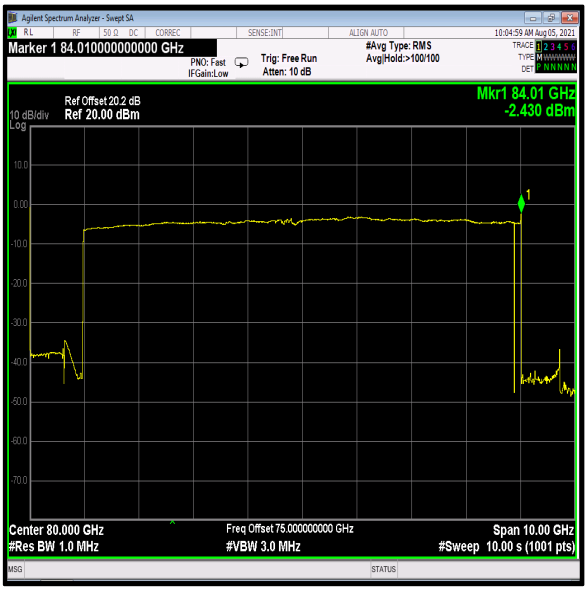
Conducted Results



2 GHz



4 GHz



8 GHz

4.4 Transmitter Maximum Average EIRP

Test Summary:

Test Engineer:	Ben Mercer	**Test Date:**	05 August 2021
Test Sample Serial Number:	52284511		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	45

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/ΔF)/Cycle Time)

   Where:

   T_S 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

Transmitter Maximum Average EIRP (continued)

Results: VEGAZW-6-74537

Channel Bandwidth (GHz)	Peak EIRP (dBm/MHz)	Average Factor (dB)	Average EIRP (dBm/MHz)	EIRP Limit (dBm/MHz)	Margin (dB)	Result
2	33.8	-52.3	-18.5	-3.0	15.5	Complied
4	32.9	-55.3	-22.4	-3.0	19.4	Complied
8	31.8	-58.3	-26.5	-3.0	23.5	Complied

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	24.9	-52.3	-27.4	-3.0	24.4	Complied
4	24.0	-55.3	-31.3	-3.0	28.3	Complied
8	22.9	-58.3	-35.4	-3.0	32.4	Complied

Results: VEGAZW-6-74547

Channel Bandwidth (GHz)	Peak EIRP (dBm/MHz)	Average Factor (dB)	Average EIRP (dBm/MHz)	EIRP Limit (dBm/MHz)	Margin (dB)	Result
2	33.0	-52.3	-19.3	-3.0	16.3	Complied
4	32.1	-55.3	-23.2	-3.0	20.2	Complied
8	31.0	-58.3	-27.3	-3.0	24.3	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	30.3	-52.3	-22.0	-3.0	19.0	Complied
4	29.4	-55.3	-25.9	-3.0	22.9	Complied
8	28.3	-58.3	-30.0	-3.0	27.0	Complied

4.5. Transmitter Frequency Stability (Temperature Variation)

Test Summary:

Test Engineers:	Saurabh Bhandari & Ben Mercer	**Test Date:**	03 September 2021
Test Sample Serial Number:	52284511		

FCC Reference:	Parts 15.256(f) & 2.1055
Test Method Used:	KDB 890966 Section H & ANSI C63.10 Section 6.8.1

Environmental Conditions:

Ambient Temperature (°C):	21
Ambient Relative Humidity (%):	58

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.
3. Temperature was monitored throughout the test using a calibrated digital thermometer.

Transmitter Frequency Stability (Temperature Variation) (continued)

Results: Lower Band Edge

Temperature (°C)	Measured Frequency (MHz)	Band Edge (MHz)	Margin (MHz)	Result
-30	75980.000	75000.000	980.000	Complied
-20	75980.000	75000.000	980.000	Complied
-10	75980.000	75000.000	980.000	Complied
0	75970.000	75000.000	970.000	Complied
10	75970.000	75000.000	970.000	Complied
20	75970.000	75000.000	970.000	Complied
30	75970.000	75000.000	970.000	Complied
40	75970.000	75000.000	970.000	Complied
50	75970.000	75000.000	970.000	Complied

Results: Upper Band Edge

Temperature (°C)	Measured Frequency (MHz)	Band Edge (MHz)	Margin (MHz)	Result
-30	84020.000	85000.000	980.000	Complied
-20	84020.000	85000.000	980.000	Complied
-10	84020.000	85000.000	980.000	Complied
0	84020.000	85000.000	980.000	Complied
10	84020.000	85000.000	980.000	Complied
20	84020.000	85000.000	980.000	Complied
30	84020.000	85000.000	980.000	Complied
40	84020.000	85000.000	980.000	Complied
50	84020.000	85000.000	980.000	Complied

4.6. Transmitter Frequency Stability (Voltage Variation)

Test Summary:

Test Engineers:	Saurabh Bhandari & Ben Mercer	**Test Date:**	03 September 2021
Test Sample Serial Number:	52284511		

FCC Reference:	Parts 15.256(f) & 2.1055
Test Method Used:	KDB 890966 Section H & ANSI C63.10 Section 6.8.2

Environmental Conditions:

Ambient Temperature (°C):	21
Ambient Relative Humidity (%):	58

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.
3. Voltage was monitored throughout the test using a calibrated digital voltmeter.

Results: Lower Band Edge

Voltage (VDC)	Measured Frequency (MHz)	Band Edge (MHz)	Margin (MHz)	Result
20.4	75970.000	75000.000	970.000	Complied
24.0	75970.000	75000.000	970.000	Complied
27.6	75970.000	75000.000	970.000	Complied

Results: Upper Band Edge

Voltage (VDC)	Measured Frequency (MHz)	Band Edge (MHz)	Margin (MHz)	Result
20.4	84020.000	85000.000	980.000	Complied
24.0	84020.000	85000.000	980.000	Complied
27.6	84020.000	85000.000	980.000	Complied

5 Radiated Test Results

5.1 Transmitter Radiated Emissions <1 GHz

Test Summary:

Test Engineer:	Mohamed Toubella	**Test Dates:**	08 August 2021 & 02 October 2021
Test Sample Serial Number:	52403535		

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 6.5
Frequency Range	9 kHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	24 to 27
Relative Humidity (%):	43

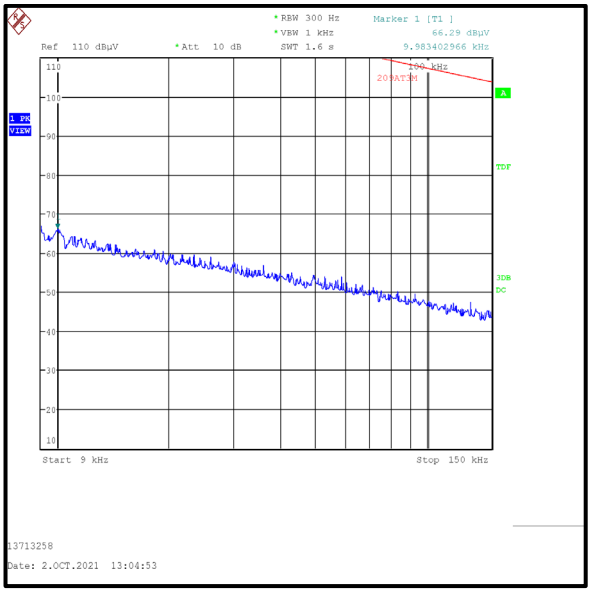
Note(s):

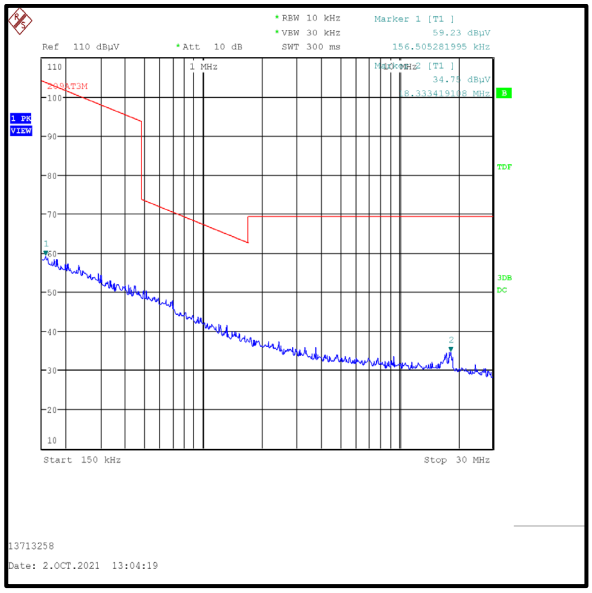
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system.
3. 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 Plastic 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.

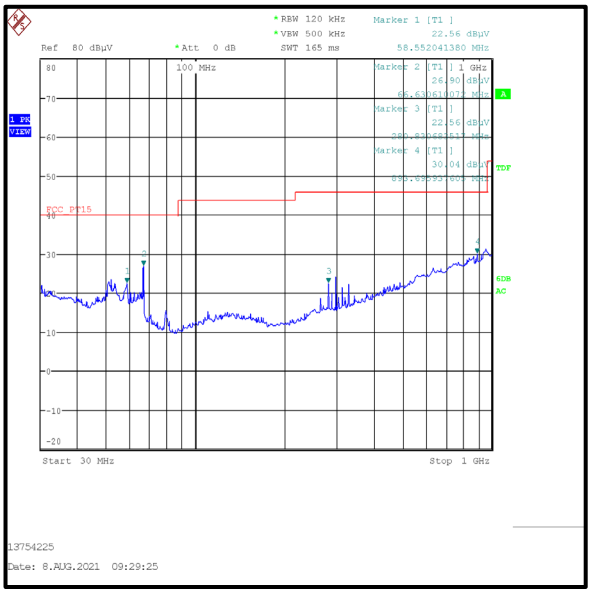
Transmitter Radiated Emissions (continued)

Results: Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
58.552	Horizontal	24.2	40.0	15.8	Complied
66.631	Horizontal	23.4	40.0	16.6	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 Engineers:	Mohamed Toubella, Vi Van, Saurabh Bhandari & Ben Mercer	**Test Dates:**	07 August 2021 to 12 October 2021
Test Sample Serial Number:	52403535		

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):	23 to 27
Relative Humidity (%):	36 to 56

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:

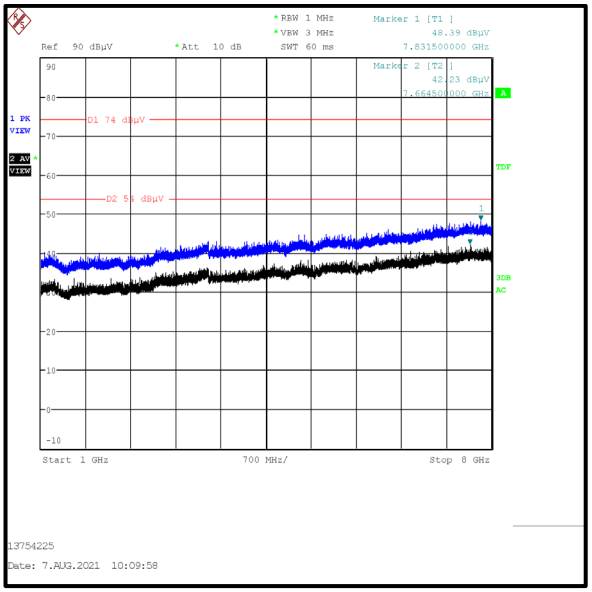
   40-50 GHz – 0.5 metres
   50-75 GHz – 1.0 metres
   75-110 GHz – 1.0 metres
   110-170 GHz – 0.5 metres
   170-200 GHz – 0.5 metres

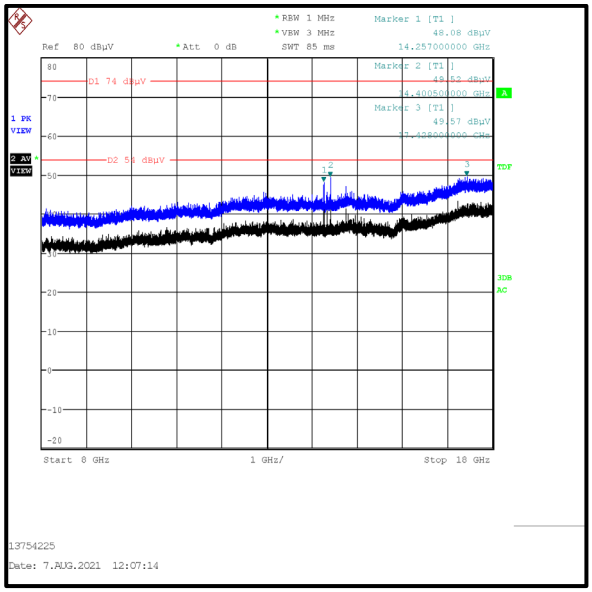
8. Pre-scans were performed up to 210 GHz, results are valid up to 200 GHz.

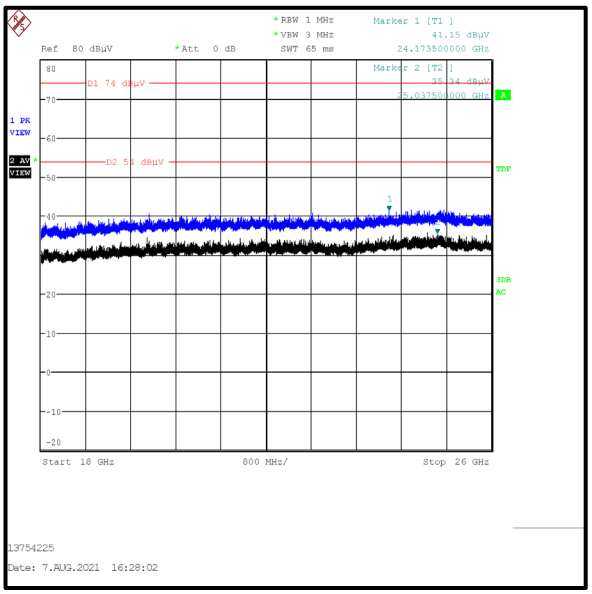
Transmitter Radiated Emissions (continued)

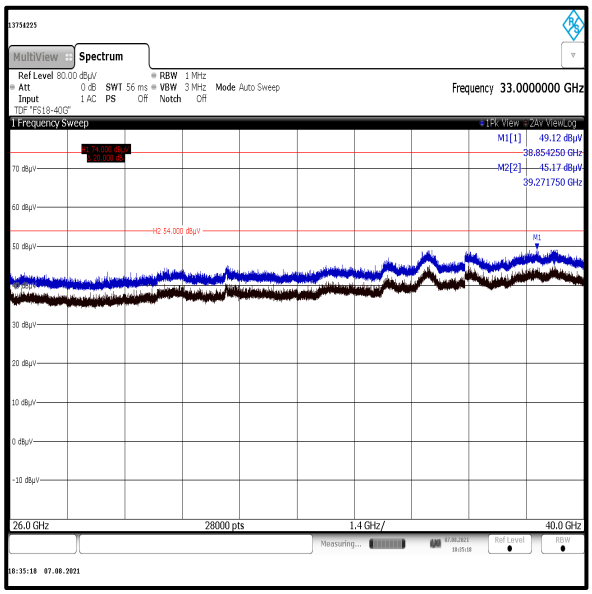
Results: VEGAZW-6-74537 / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
74463.141	Horizontal	46.1	54.0	7.9	Complied
85424.679	Horizontal	46.9	54.0	7.1	Complied



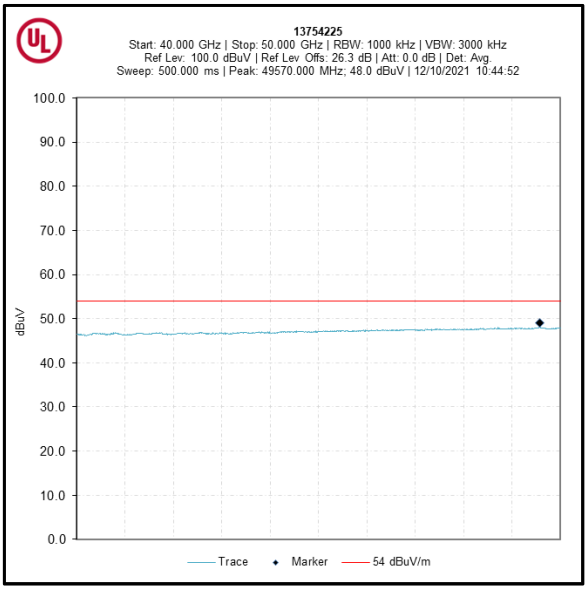


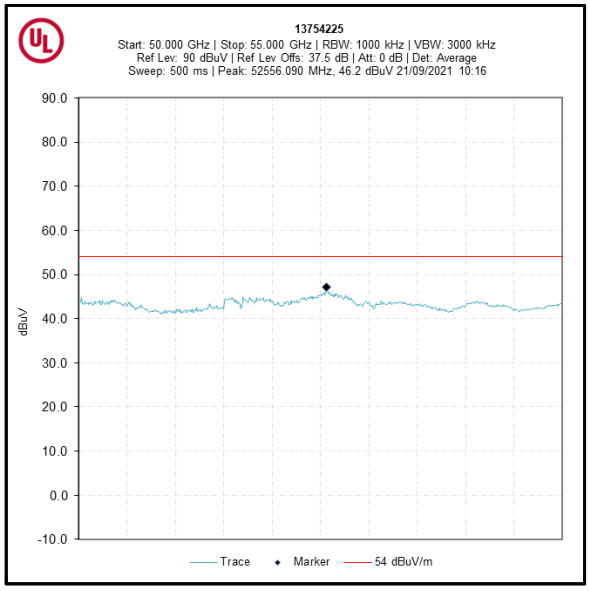


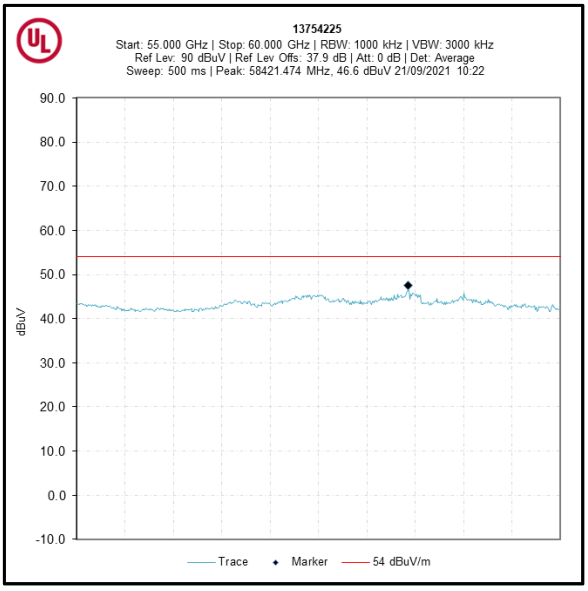


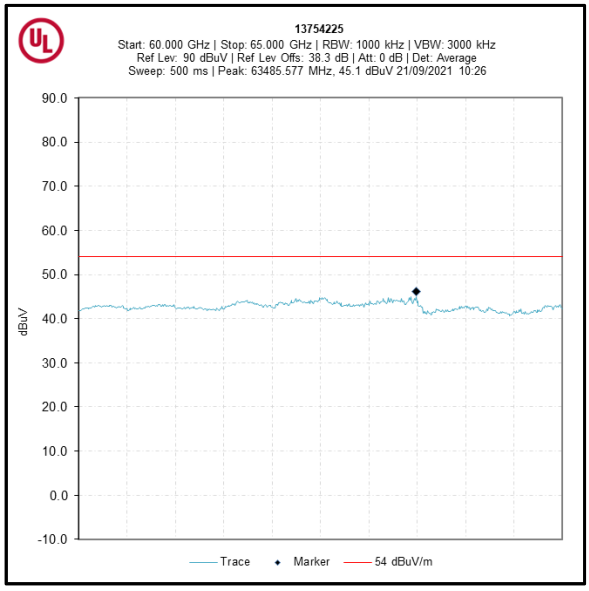
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



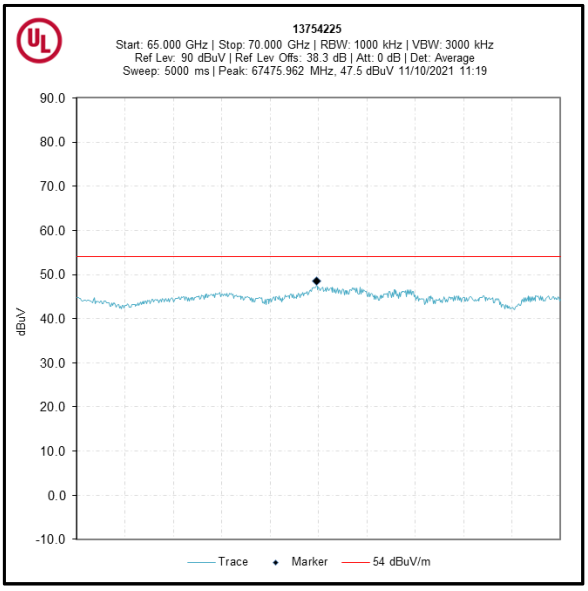


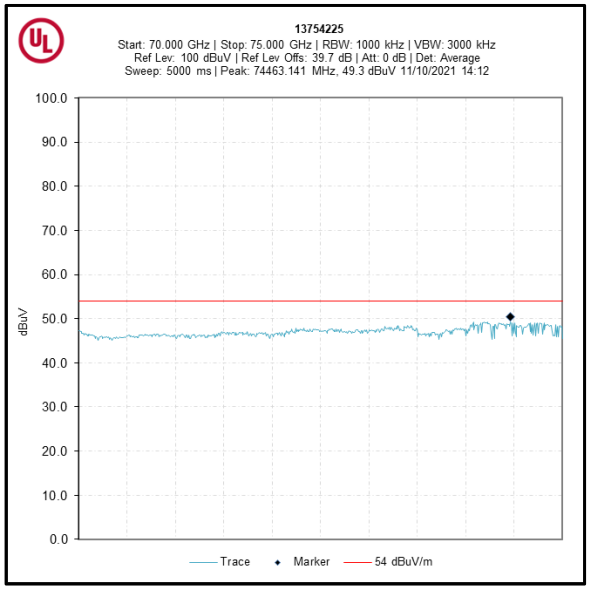


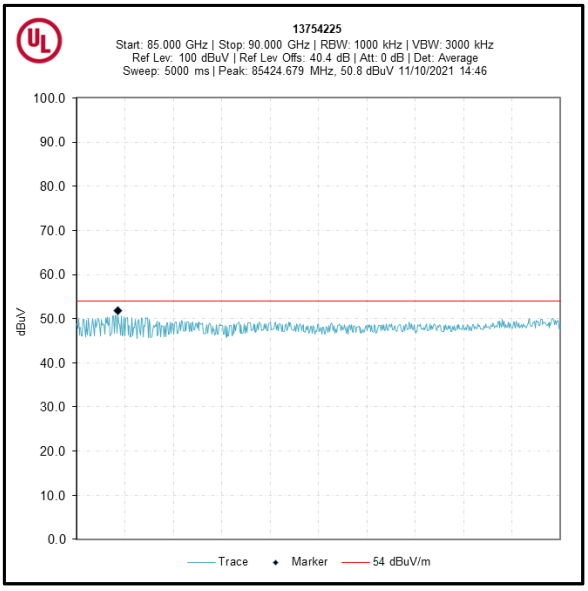


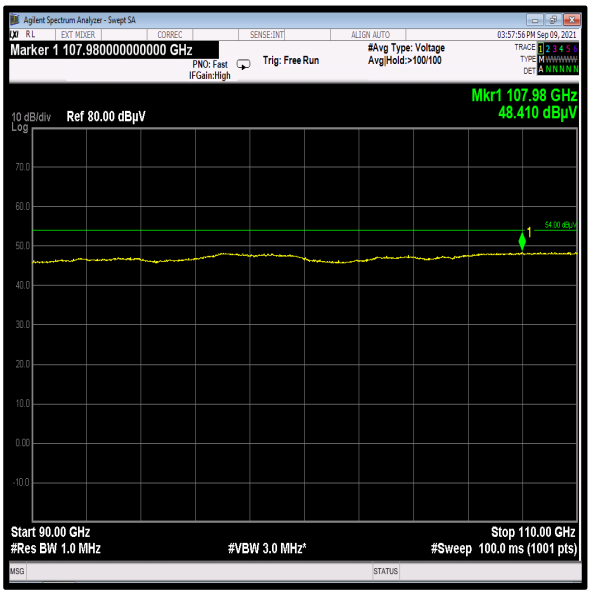
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



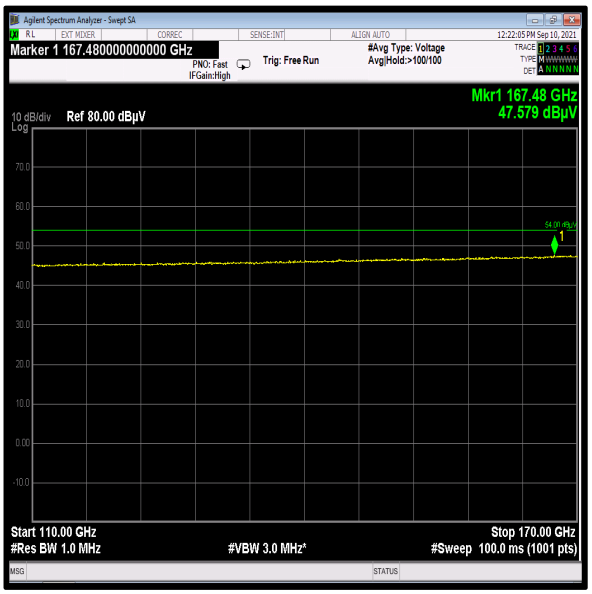


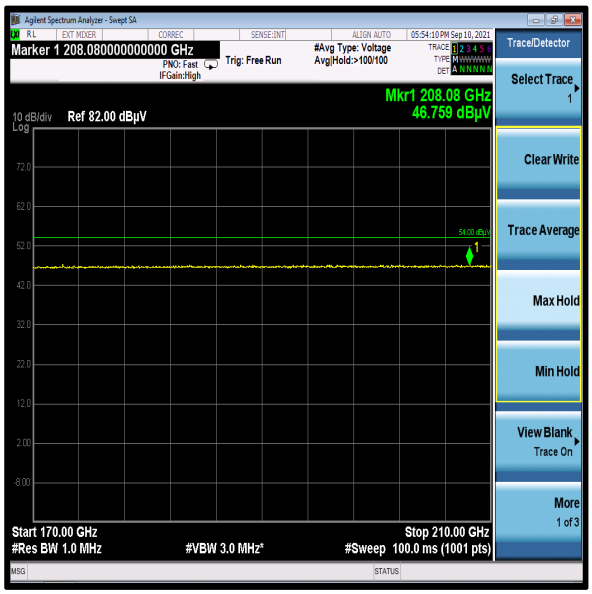




Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



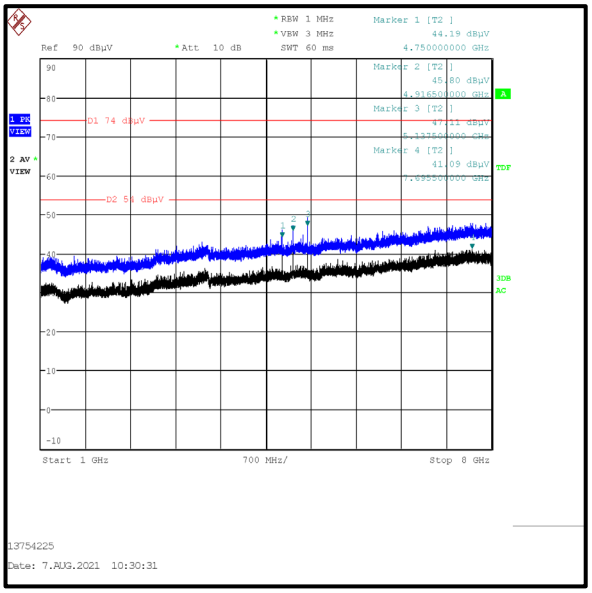


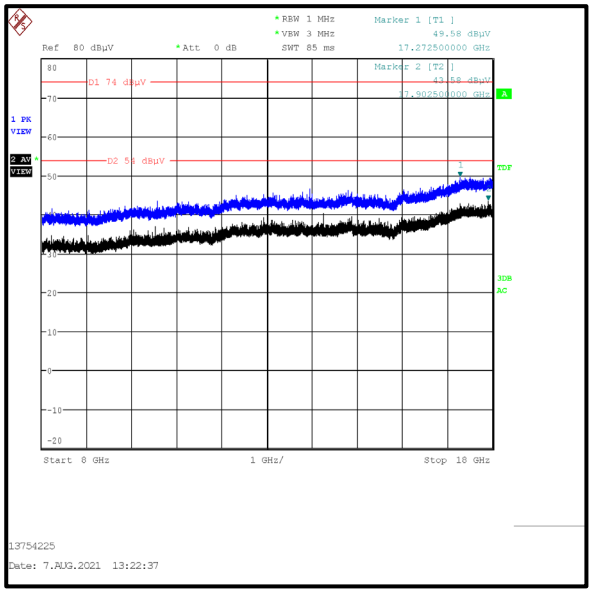
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

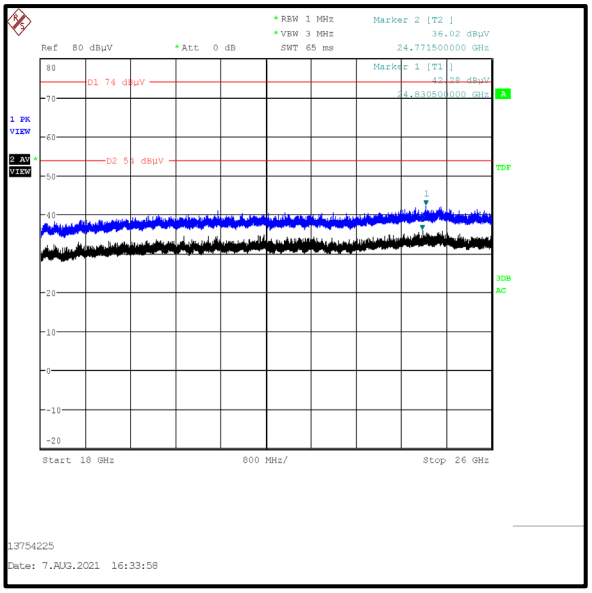
Transmitter Radiated Emissions (continued)

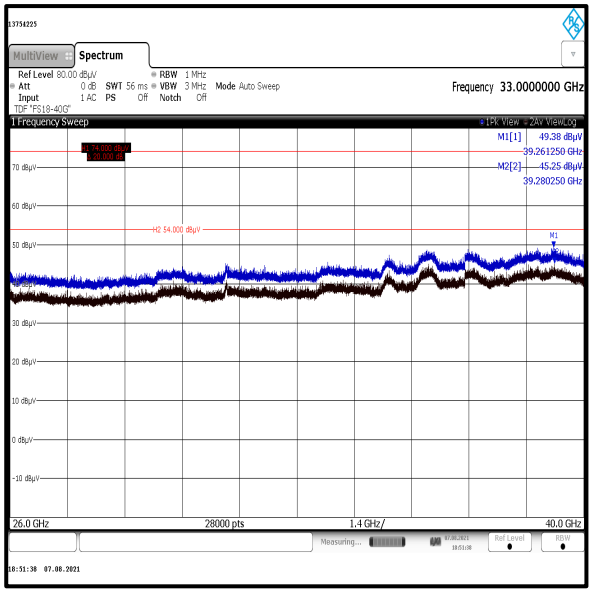
Results: VEGAZW-6-74539 / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
85424.619	Horizontal	46.7	54.0	7.3	Complied



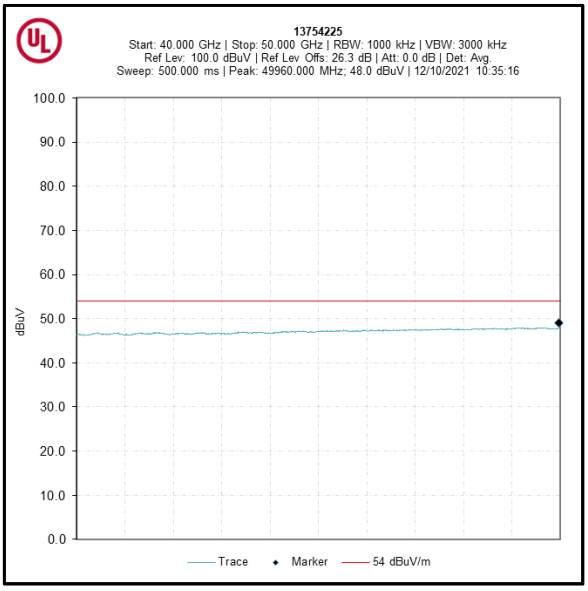


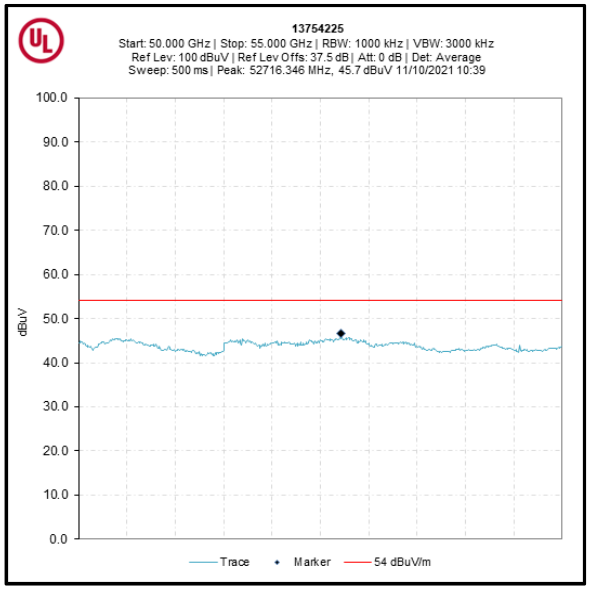


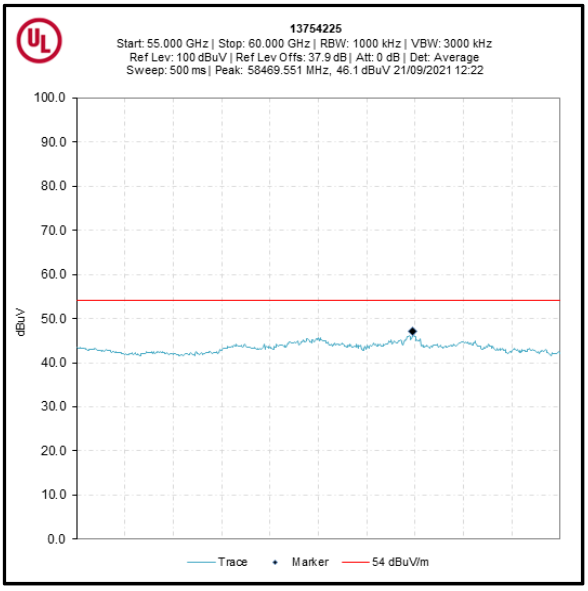


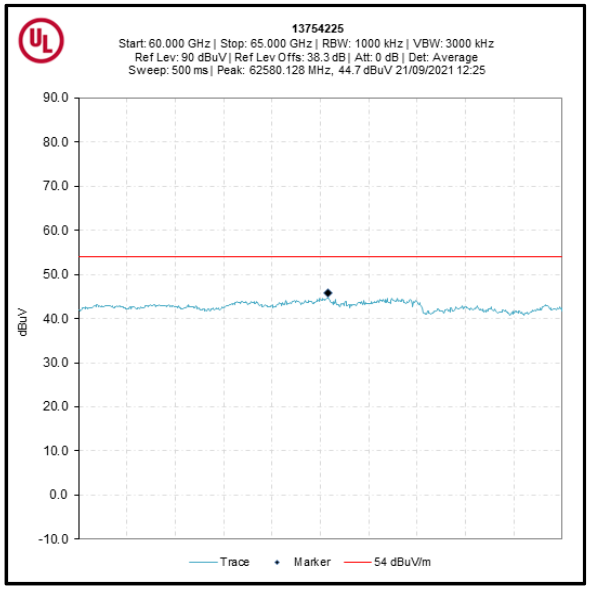
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



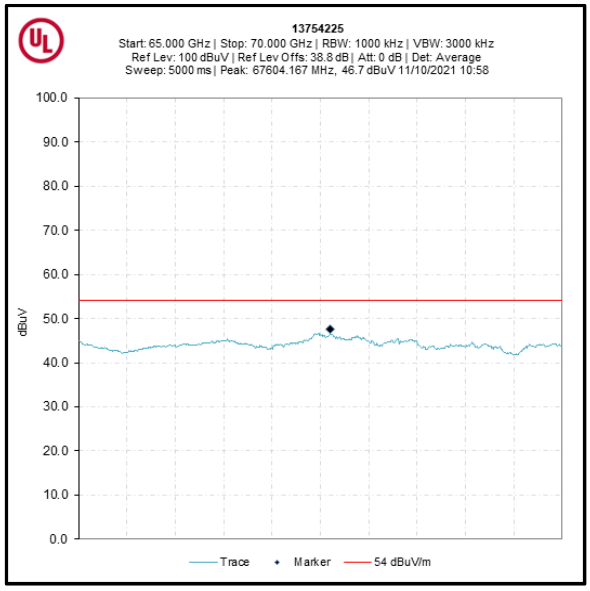


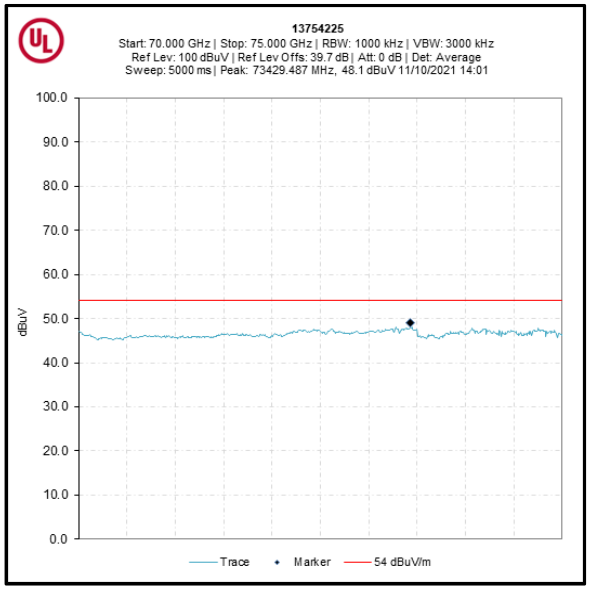


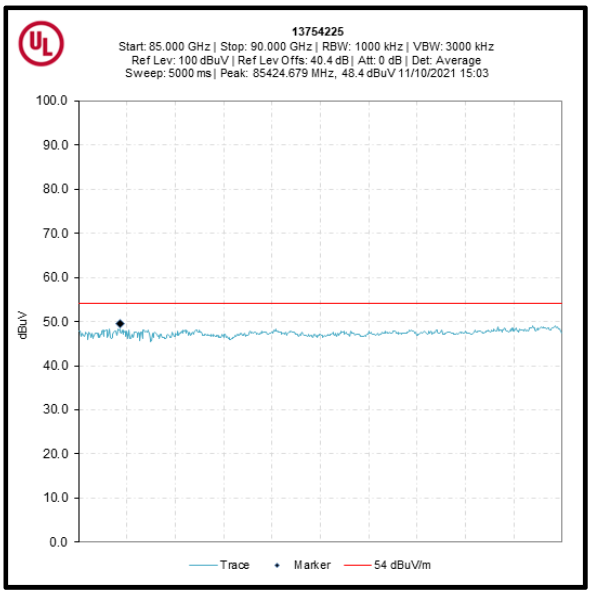


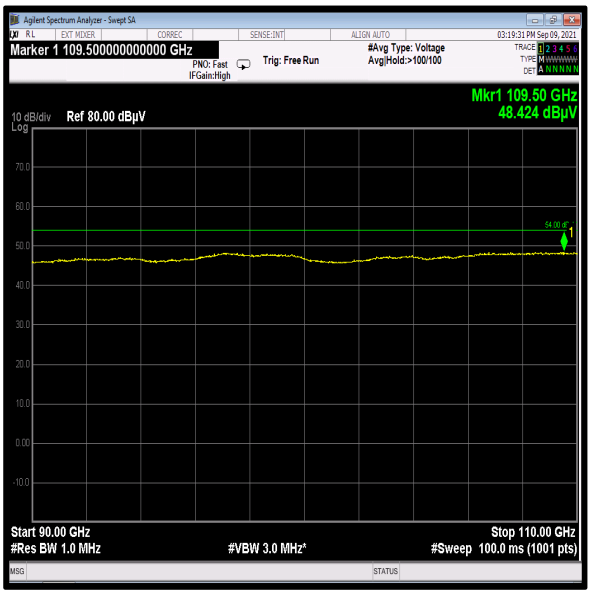
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



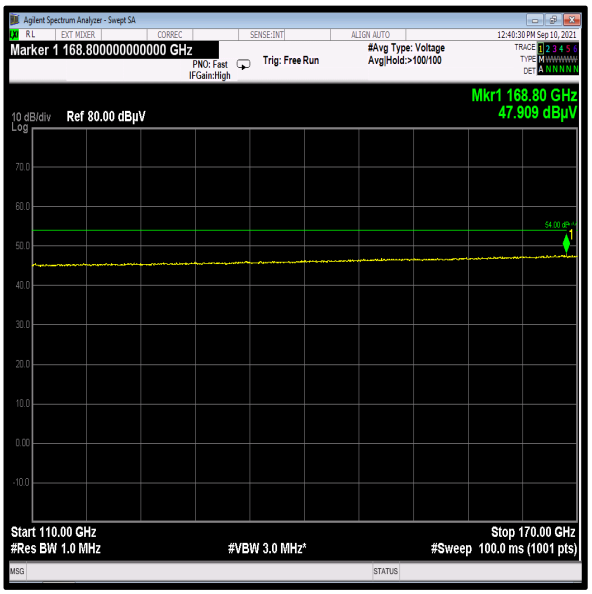


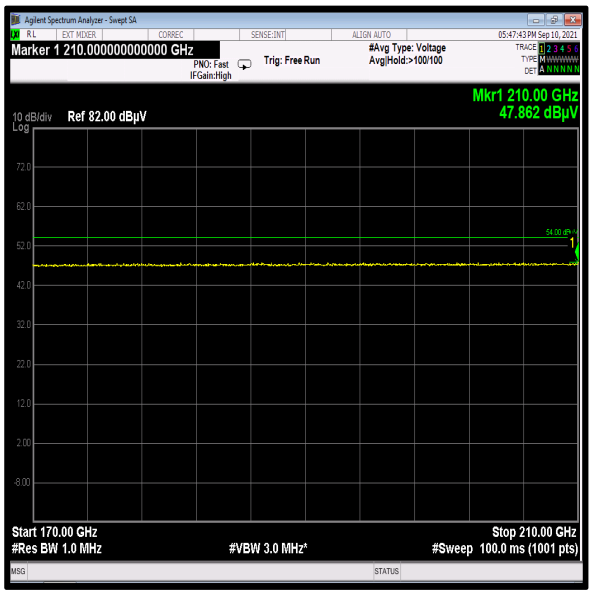




Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



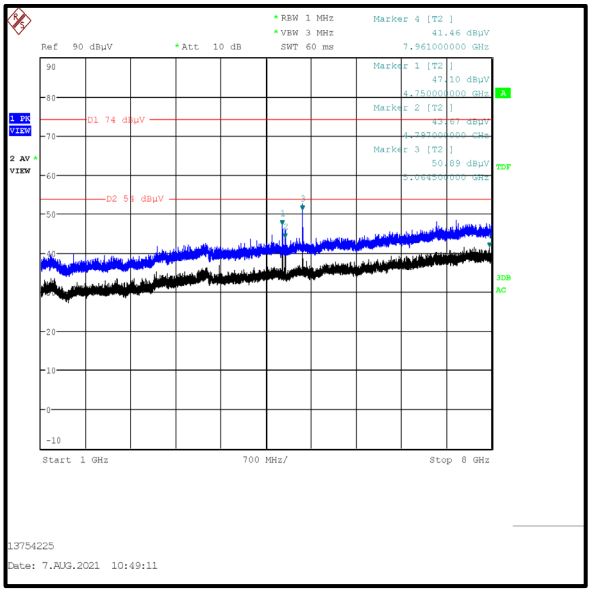


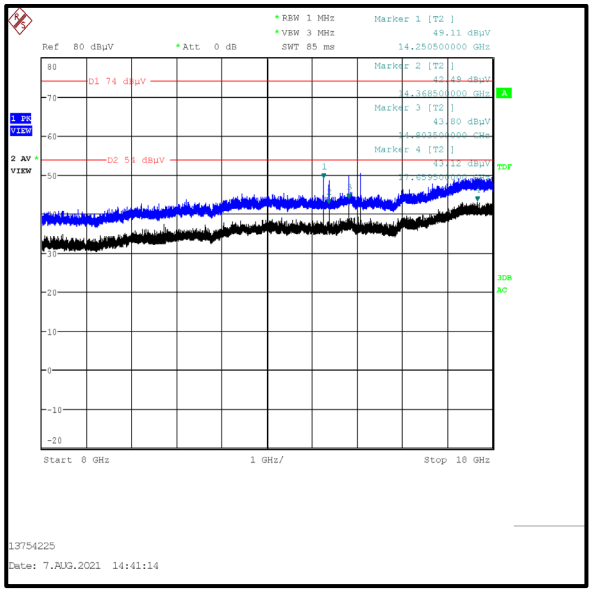
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

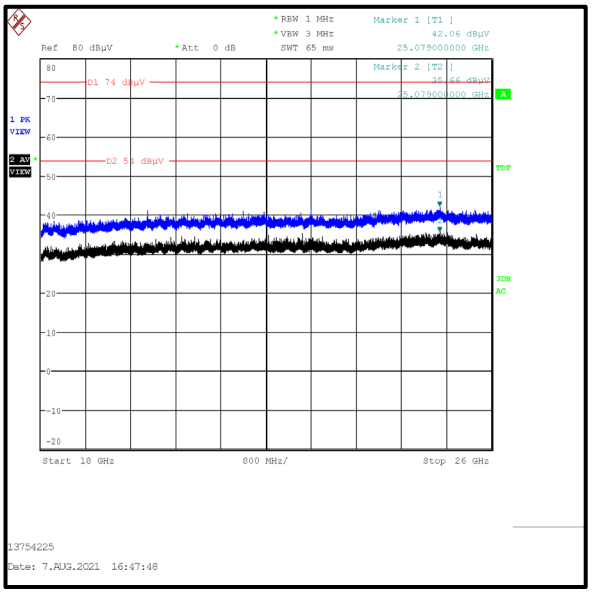
Transmitter Radiated Emissions (continued)

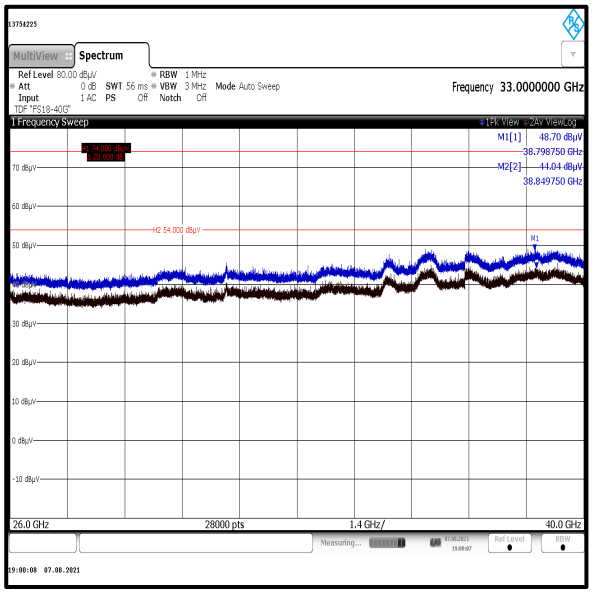
Results: VEGAZW-6-74547 / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
74703.341	Horizontal	46.5	54.0	7.5	Complied
85432.338	Horizontal	46.6	54.0	7.4	Complied



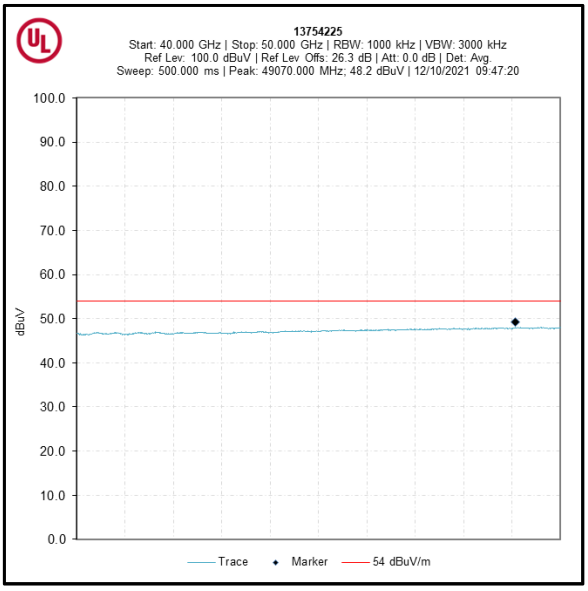


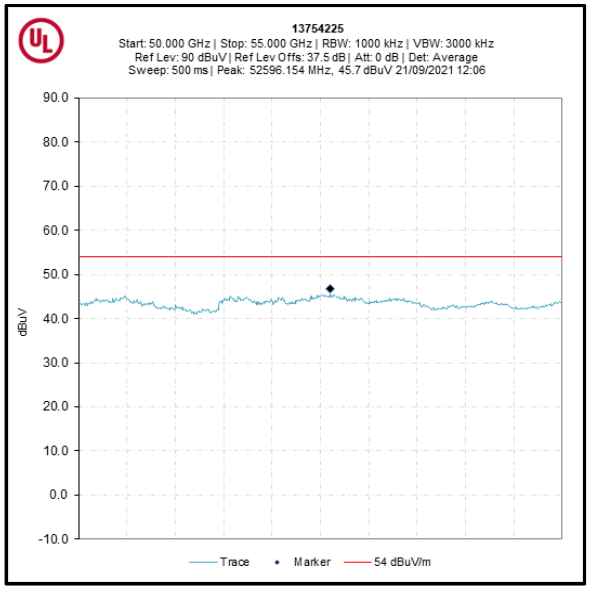


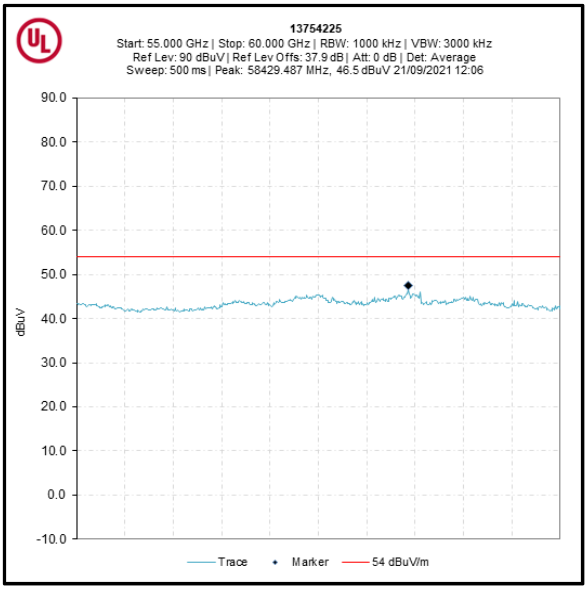


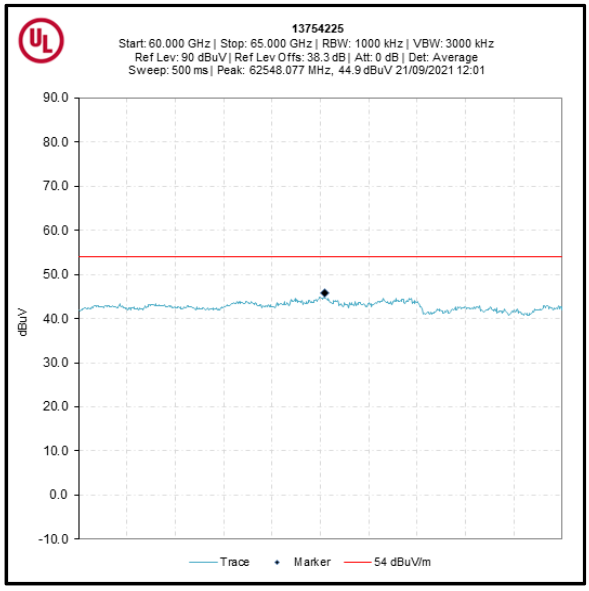
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



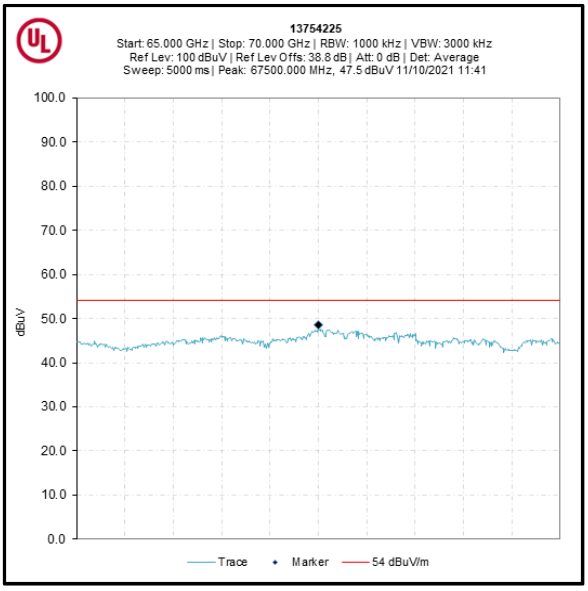


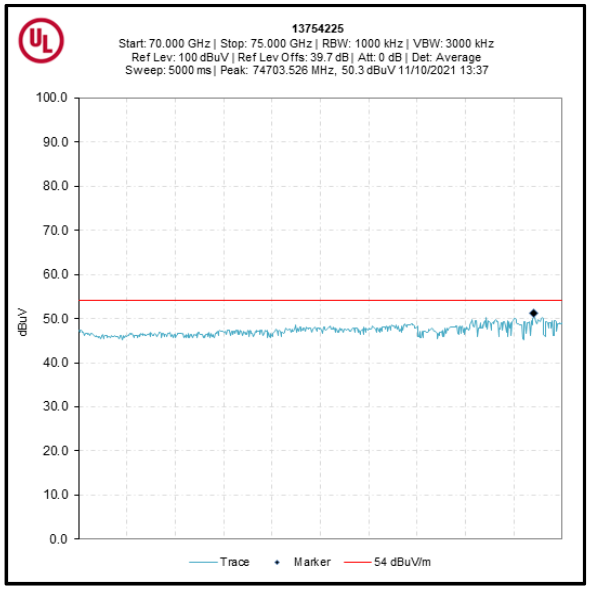


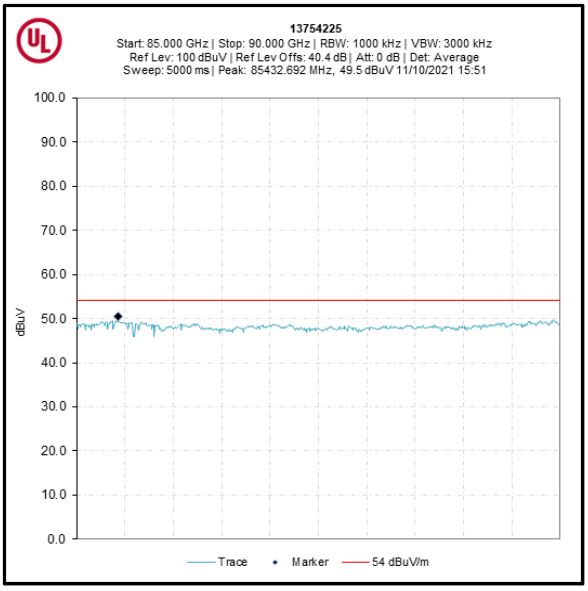


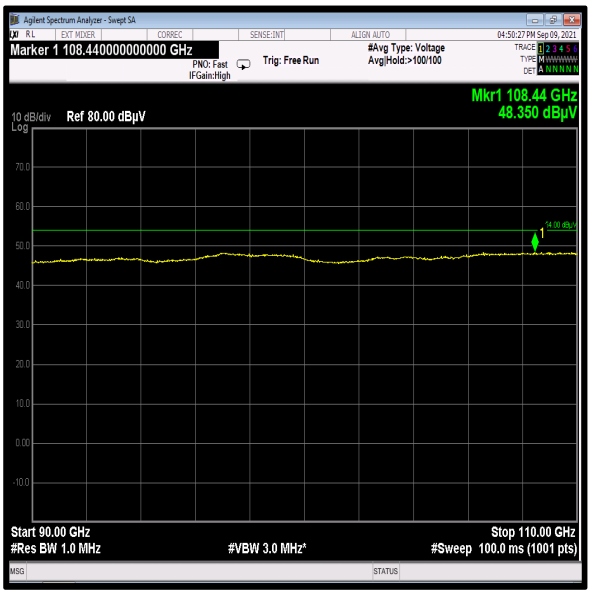
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



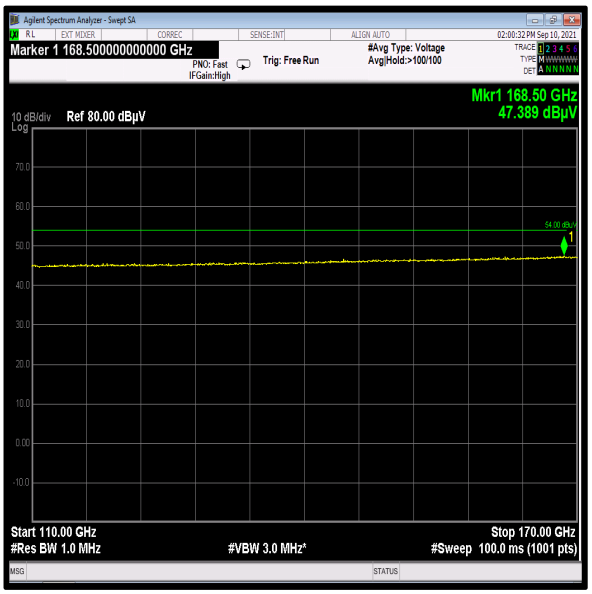


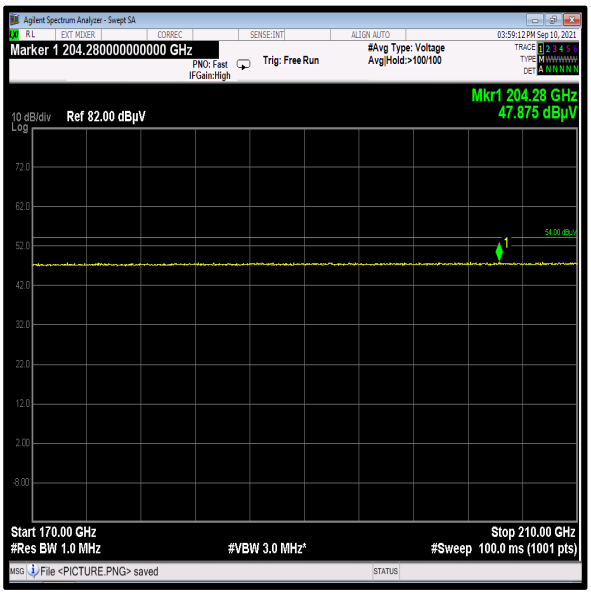




Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



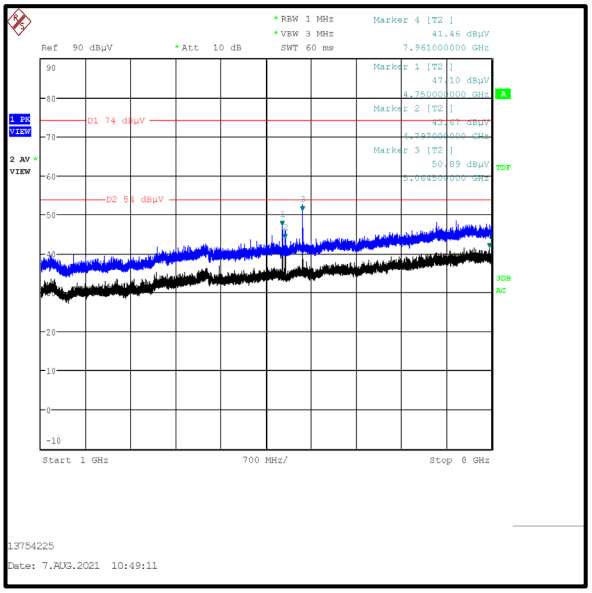


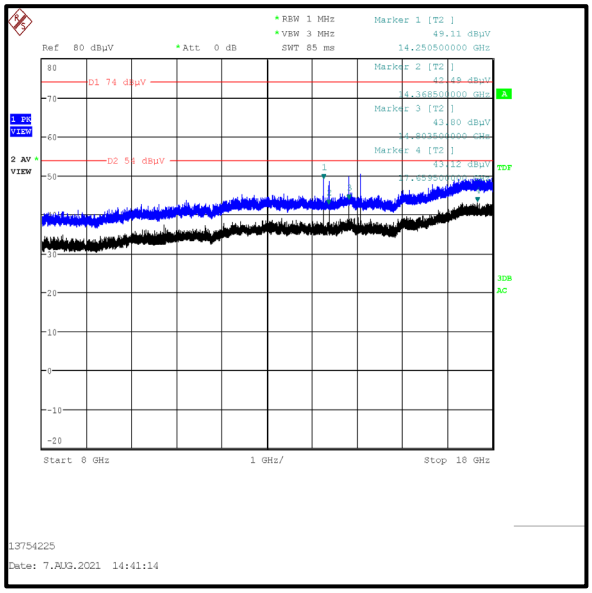
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

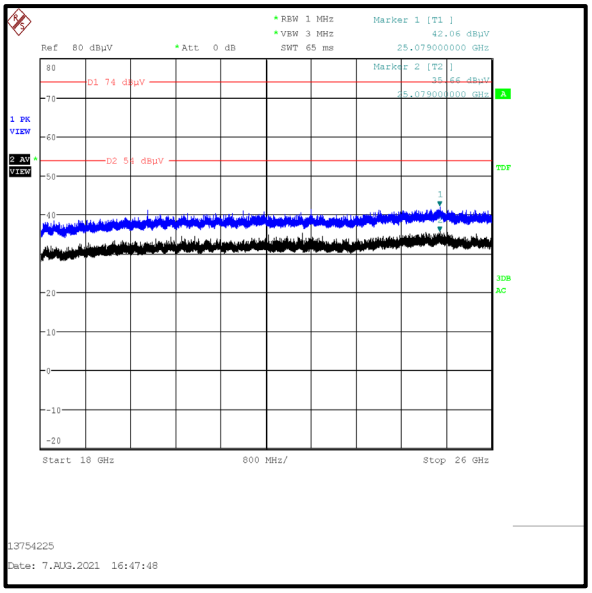
Transmitter Radiated Emissions (continued)

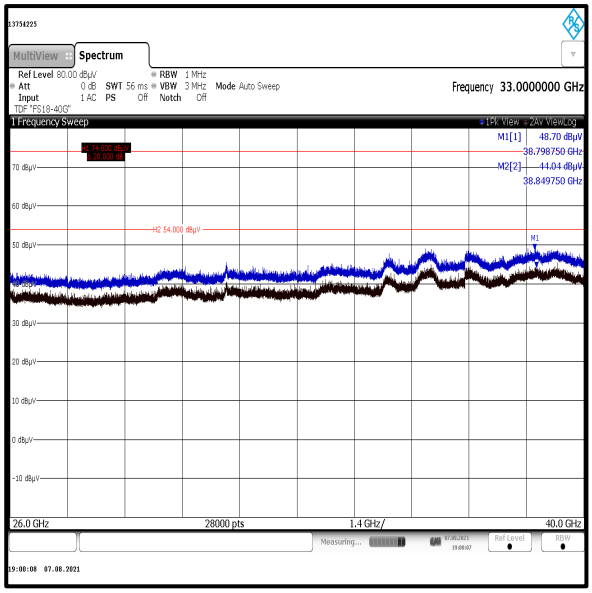
Results: VEGAZW-6-74538 / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
85664.921	Horizontal	46.1	54.0	7.9	Complied



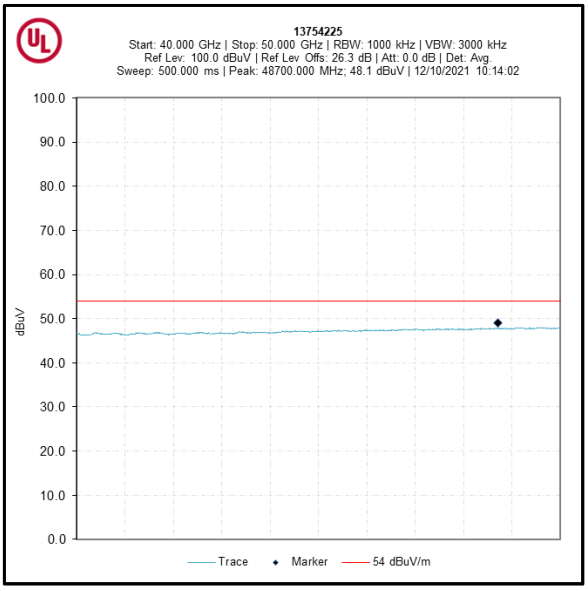


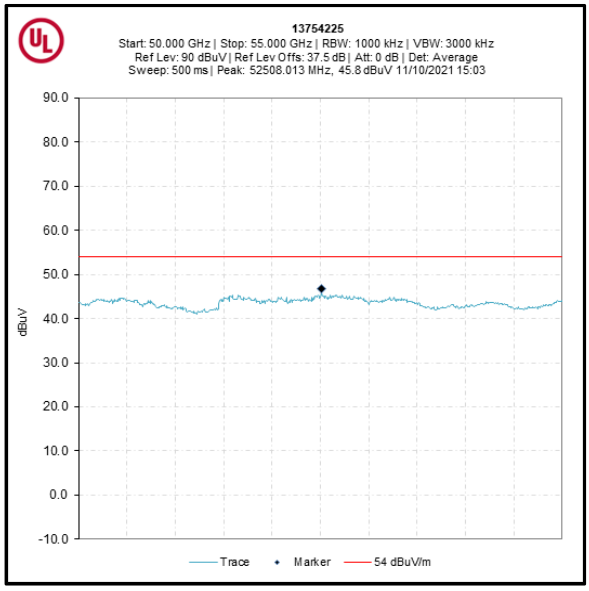


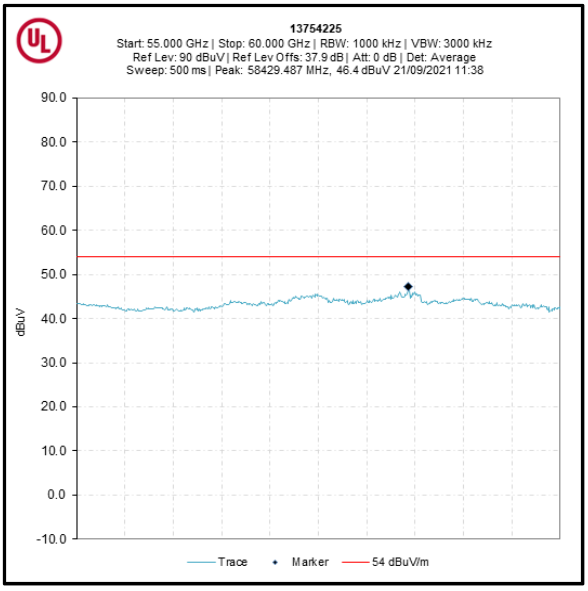


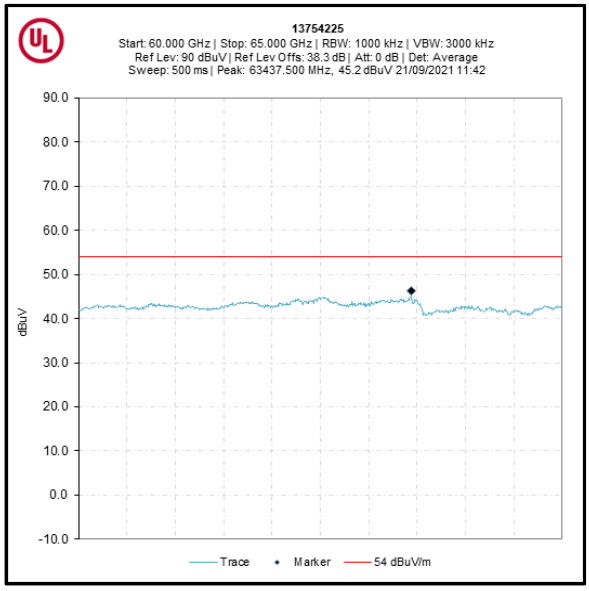
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



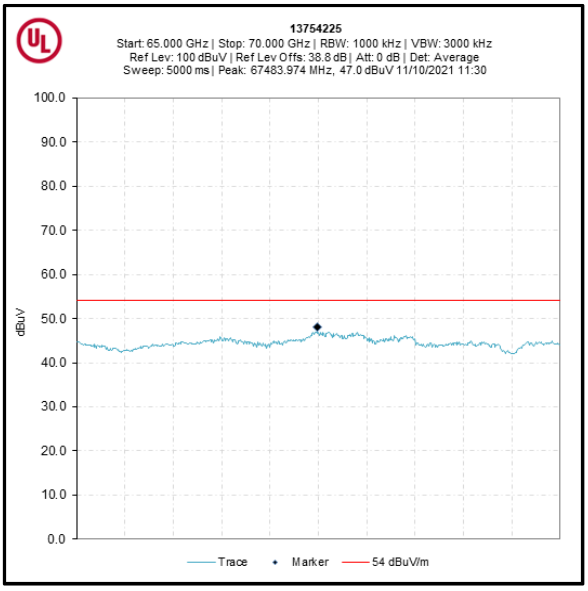


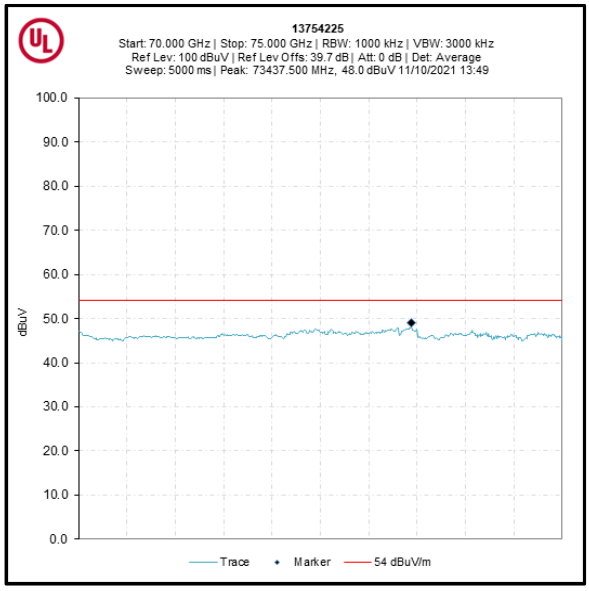


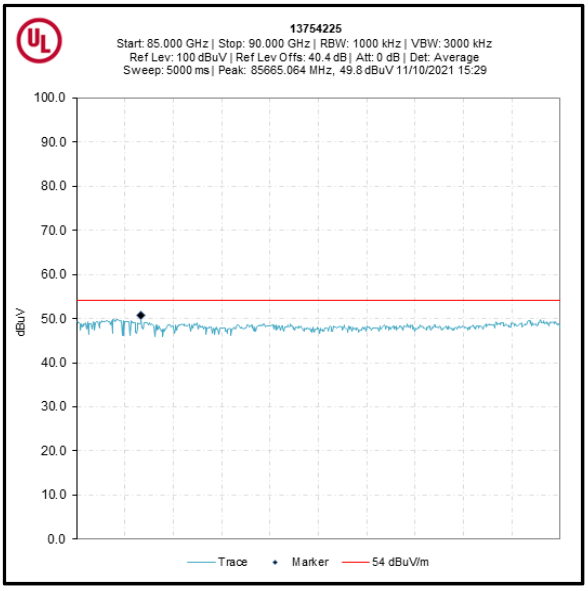


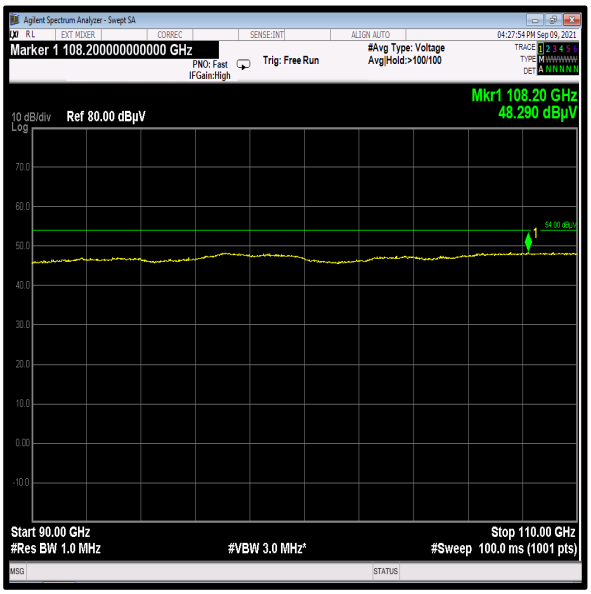
Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)



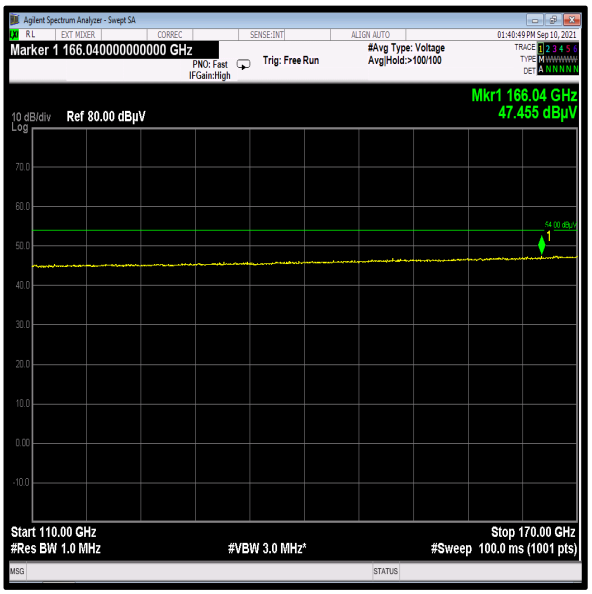


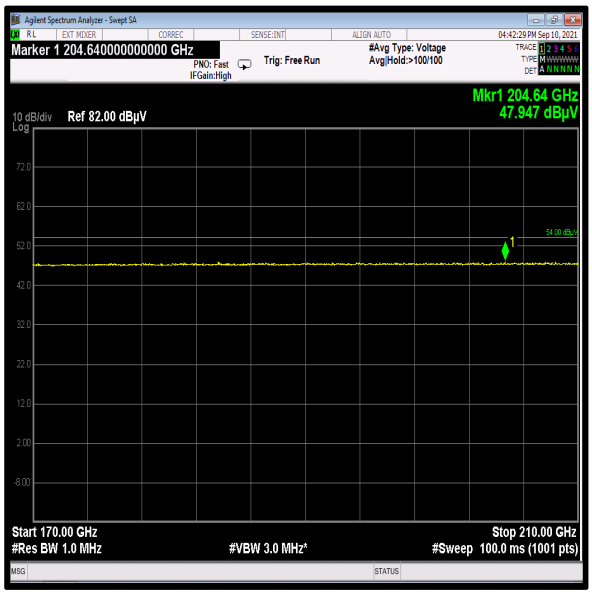




Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)





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

6 AC Power Line Conducted Emissions Test Results

6.1 Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineers:	Alison Johnston & Nick Raptopoulos	**Test Dates:**	04 October 2021 & 05 October 2021
Test Sample Serial Number:	52403535		

FCC Reference:	Part 15.207
Test Method Used:	ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	60

Note(s):

1. The EUT was connected to a 24 VDC bench power supply. The DC power supply was connected to 120 VAC 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests were performed with a 240 VAC 60 Hz single phase supply as this was within the voltage range marked on the power supply.
3. A pulse limiter was fitted between the LISN and the test receiver.
4. Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74537 / Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.159	Live	36.7	65.5	28.8	Complied
0.281	Live	21.4	60.8	39.4	Complied
3.561	Live	13.3	56.0	42.7	Complied
6.387	Live	17.5	60.0	42.5	Complied
12.003	Live	11.0	60.0	49.0	Complied
16.395	Live	20.5	60.0	39.5	Complied

Results: VEGAZW-6-74537 / Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.164	Live	15.9	55.3	39.4	Complied
0.254	Live	14.0	51.6	37.6	Complied
1.532	Live	8.0	46.0	38.0	Complied
11.999	Live	5.0	50.0	45.0	Complied
13.560	Live	42.0	50.0	8.0	Complied
16.229	Live	19.7	50.0	30.3	Complied

Results: VEGAZW-6-74537 / Neutral / Quasi Peak / 120 VAC 60 Hz

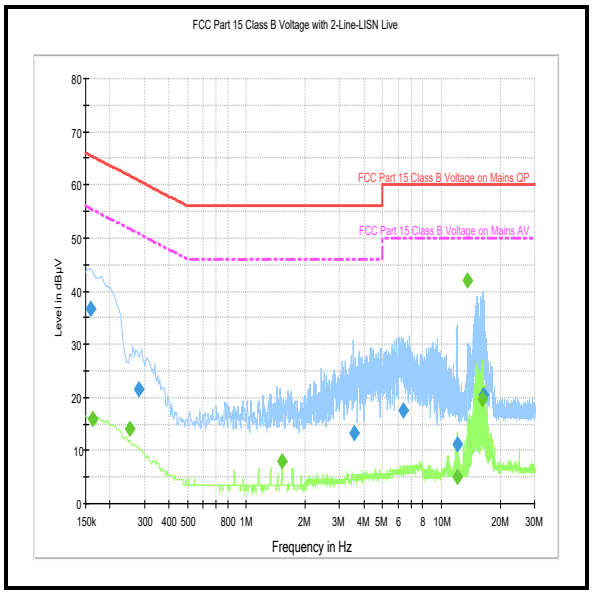
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.168	Neutral	35.3	65.1	29.8	Complied
0.285	Neutral	20.5	60.7	40.2	Complied
4.547	Neutral	14.6	56.0	41.4	Complied
6.252	Neutral	16.6	60.0	43.4	Complied
12.003	Neutral	10.9	60.0	49.1	Complied
16.319	Neutral	20.7	60.0	39.3	Complied

Results: VEGAZW-6-74537 / Neutral / Average / 120 VAC 60 Hz

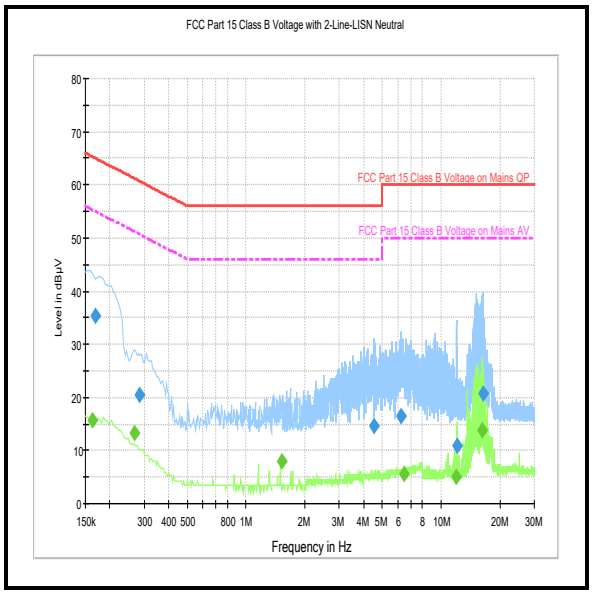
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.164	Neutral	15.7	55.3	39.6	Complied
0.267	Neutral	13.3	51.2	37.9	Complied
1.518	Neutral	8.0	46.0	38.0	Complied
6.450	Neutral	5.6	50.0	44.4	Complied
11.994	Neutral	4.9	50.0	45.1	Complied
16.233	Neutral	13.8	50.0	36.2	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74537 / 120 VAC 60 Hz



Live



Neutral

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

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74537 / Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.177	Live	22.3	64.6	42.3	Complied
1.518	Live	8.0	56.0	48.0	Complied
6.801	Live	16.0	60.0	44.0	Complied
11.999	Live	11.0	60.0	49.0	Complied
16.229	Live	24.3	60.0	35.7	Complied
28.275	Live	10.4	60.0	49.6	Complied

Results: VEGAZW-6-74537 / Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.182	Live	13.5	54.4	40.9	Complied
1.532	Live	12.1	46.0	33.9	Complied
11.999	Live	5.9	50.0	44.1	Complied
13.560	Live	19.2	50.0	30.8	Complied
16.175	Live	10.8	50.0	39.2	Complied
25.058	Live	16.1	50.0	33.9	Complied

Results: VEGAZW-6-74537 / Neutral / Quasi Peak / 240 VAC 60 Hz

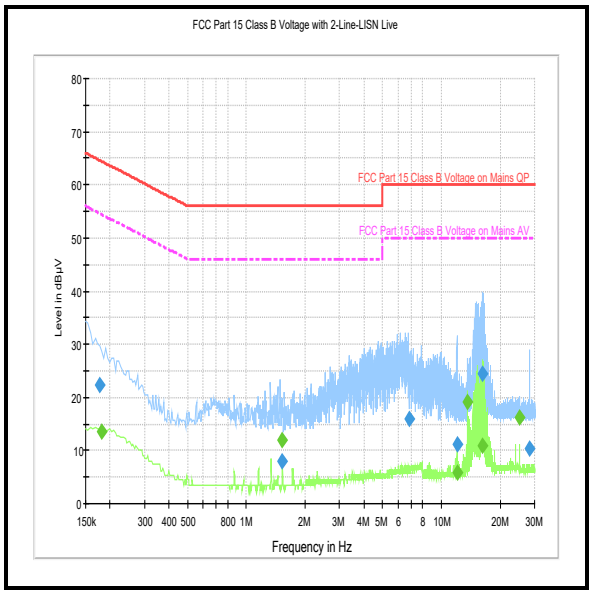
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.191	Neutral	20.8	64.0	43.2	Complied
3.345	Neutral	13.3	56.0	42.7	Complied
6.315	Neutral	17.4	60.0	42.6	Complied
11.999	Neutral	13.2	60.0	46.8	Complied
16.454	Neutral	20.1	60.0	39.9	Complied
24.257	Neutral	10.5	60.0	49.5	Complied

Results: VEGAZW-6-74537 / Neutral / Average / 240 VAC 60 Hz

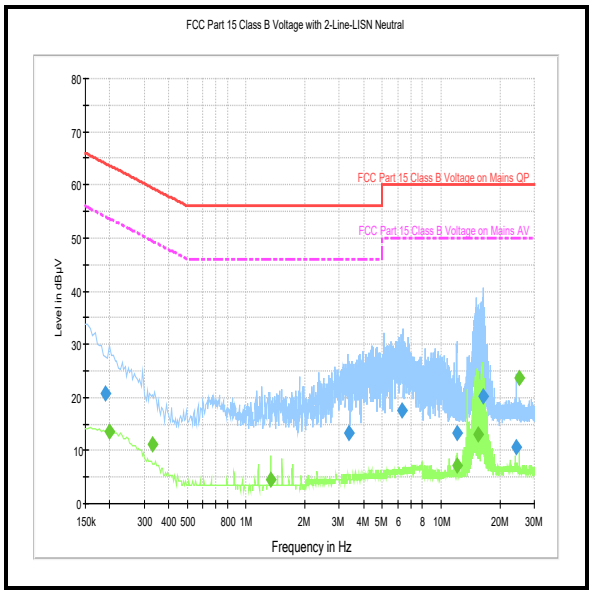
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.200	Neutral	13.5	53.6	40.1	Complied
0.330	Neutral	11.2	49.5	38.3	Complied
1.338	Neutral	4.5	46.0	41.5	Complied
11.999	Neutral	7.2	50.0	42.8	Complied
15.464	Neutral	13.0	50.0	37.0	Complied
25.058	Neutral	23.5	50.0	26.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74537 / 240 VAC 60 Hz



Live



Neutral

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

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74539 / Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.159	Live	36.9	65.5	28.6	Complied
4.088	Live	13.9	56.0	42.1	Complied
6.936	Live	15.5	60.0	44.5	Complied
11.999	Live	11.0	60.0	49.0	Complied
16.382	Live	20.8	60.0	39.2	Complied
22.349	Live	10.7	60.0	49.3	Complied

Results: VEGAZW-6-74539 / Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.200	Live	16.8	53.6	36.8	Complied
1.536	Live	7.4	46.0	38.6	Complied
7.967	Live	6.4	50.0	43.6	Complied
11.994	Live	5.0	50.0	45.0	Complied
16.391	Live	11.3	50.0	38.7	Complied
25.058	Live	12.2	50.0	37.8	Complied

Results: VEGAZW-6-74539 / Neutral / Quasi Peak / 120 VAC 60 Hz

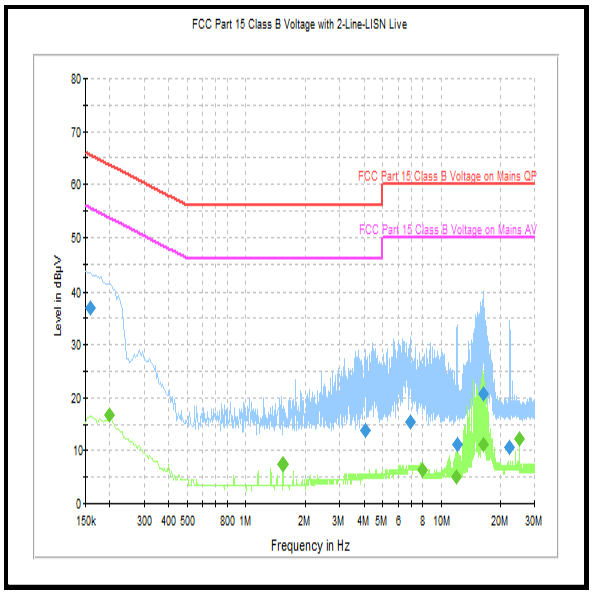
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.168	Neutral	36.6	65.1	28.5	Complied
0.299	Neutral	20.8	60.3	39.5	Complied
3.494	Neutral	12.9	56.0	43.1	Complied
5.928	Neutral	15.3	60.0	44.7	Complied
11.999	Neutral	12.2	60.0	47.8	Complied
16.395	Neutral	20.1	60.0	39.9	Complied

Results: VEGAZW-6-74539 / Neutral / Average / 120 VAC 60 Hz

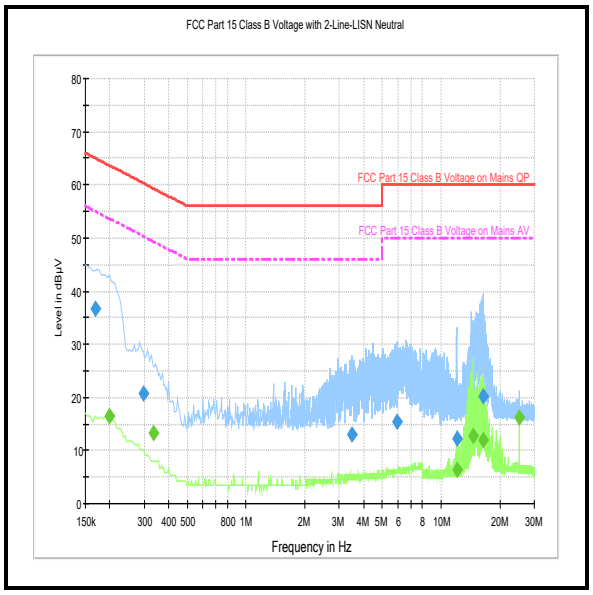
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.200	Neutral	16.6	53.6	37.0	Complied
0.335	Neutral	13.3	49.3	36.0	Complied
11.999	Neutral	6.5	50.0	43.5	Complied
14.595	Neutral	12.7	50.0	37.3	Complied
16.391	Neutral	12.0	50.0	38.0	Complied
25.058	Neutral	16.1	50.0	33.9	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74539 / 120 VAC 60 Hz



Live



Neutral

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

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74539 / Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.182	Live	21.6	64.4	42.8	Complied
4.029	Live	14.5	56.0	41.5	Complied
6.468	Live	17.3	60.0	42.7	Complied
11.999	Live	14.0	60.0	46.0	Complied
16.364	Live	20.1	60.0	39.9	Complied
25.058	Live	25.1	60.0	34.9	Complied

Results: VEGAZW-6-74539 / Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.200	Live	14.6	53.6	39.0	Complied
0.335	Live	11.6	49.3	37.7	Complied
4.551	Live	4.7	46.0	41.3	Complied
11.967	Live	6.6	50.0	43.4	Complied
14.316	Live	27.9	50.0	22.1	Complied
25.058	Live	24.6	50.0	25.4	Complied

Results: VEGAZW-6-74539 / Neutral / Quasi Peak / 240 VAC 60 Hz

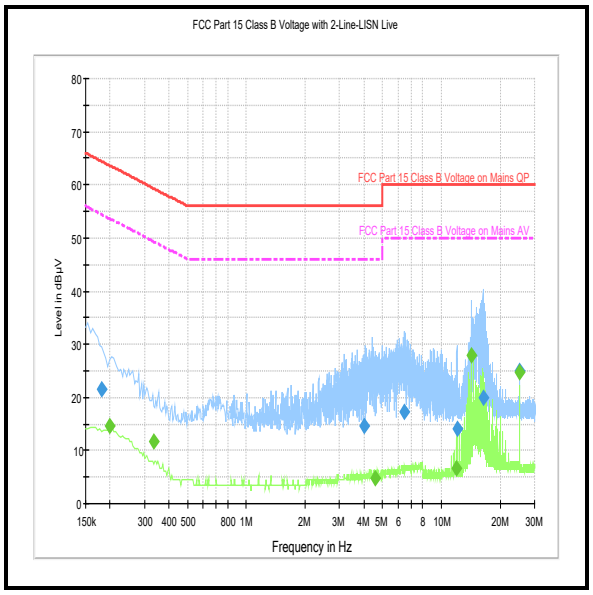
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.168	Neutral	23.9	65.1	41.2	Complied
2.616	Neutral	10.6	56.0	45.4	Complied
6.252	Neutral	17.2	60.0	42.8	Complied
11.999	Neutral	13.9	60.0	46.1	Complied
16.391	Neutral	19.5	60.0	40.5	Complied
25.058	Neutral	25.3	60.0	34.7	Complied

Results: VEGAZW-6-74539 / Neutral / Average / 240 VAC 60 Hz

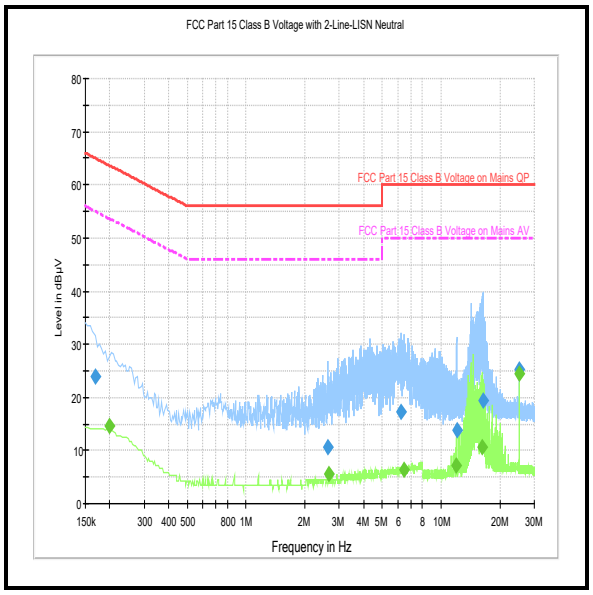
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.200	Neutral	14.6	53.6	39.0	Complied
2.6566	Neutral	5.5	46.0	40.5	Complied
6.450	Neutral	6.3	50.0	43.7	Complied
11.967	Neutral	7.2	50.0	42.8	Complied
16.305	Neutral	10.7	50.0	39.3	Complied
25.058	Neutral	24.5	50.0	25.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74539 / 240 VAC 60 Hz



Live



Neutral

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

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74547 / Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.155	Live	38.5	65.8	27.3	Complied
0.29	Live	22.4	60.7	38.3	Complied
4.120	Live	14.5	56.0	41.5	Complied
6.509	Live	16.7	60.0	43.3	Complied
11.999	Live	14.0	60.0	46.0	Complied
16.395	Live	19.9	60.0	40.1	Complied

Results: VEGAZW-6-74547 / Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.173	Live	16.2	54.8	38.6	Complied
0.285	Live	10.0	50.7	40.7	Complied
11.999	Live	8.5	50.0	41.5	Complied
16.179	Live	10.8	50.0	39.2	Complied
18.011	Live	12.2	50.0	37.8	Complied
25.058	Live	18.0	50.0	32.0	Complied

Results: VEGAZW-6-74547 / Neutral / Quasi Peak / 120 VAC 60 Hz

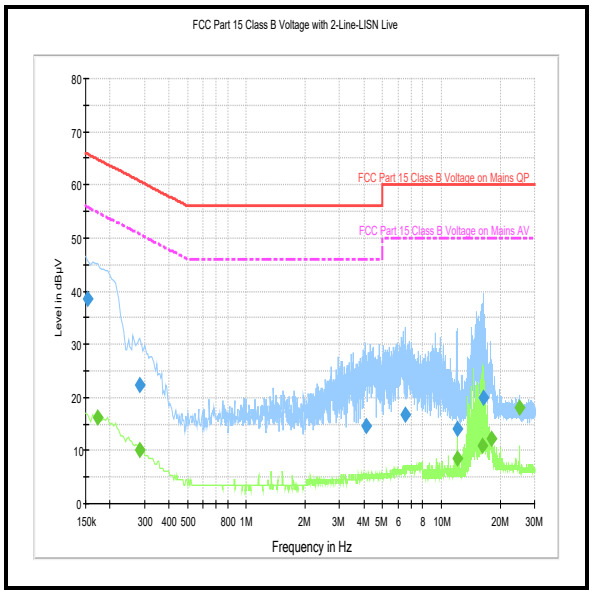
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.173	Neutral	37.3	64.8	27.5	Complied
4.263	Neutral	15.1	56.0	40.9	Complied
6.666	Neutral	16.6	60.0	43.4	Complied
11.999	Neutral	15.8	60.0	44.2	Complied
14.316	Neutral	34.9	60.0	25.1	Complied
21.359	Neutral	10.4	60.0	49.6	Complied

Results: VEGAZW-6-74547 / Neutral / Average / 120 VAC 60 Hz

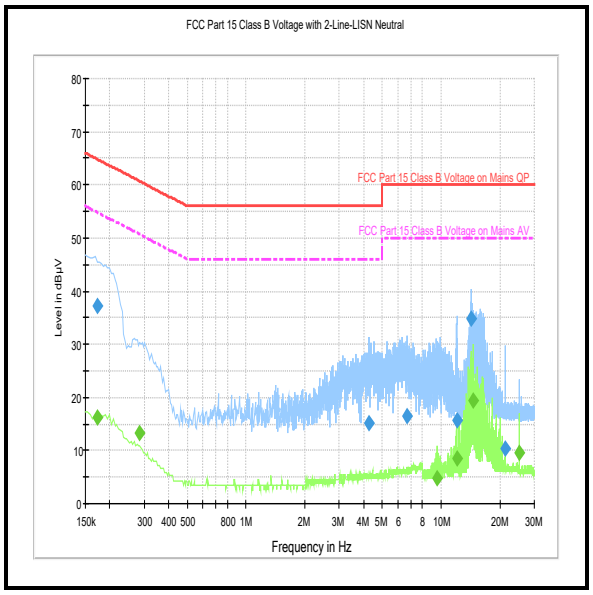
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.173	Neutral	16.2	54.8	38.6	Complied
0.285	Neutral	13.3	50.7	37.4	Complied
9.555	Neutral	4.9	50.0	45.1	Complied
12.003	Neutral	8.4	50.0	41.6	Complied
14.532	Neutral	19.4	50.0	30.6	Complied
25.058	Neutral	9.5	50.0	40.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74547 / 120 VAC 60 Hz



Live



Neutral

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

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74547 / Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.191	Live	26.4	64.0	37.6	Complied
0.942	Live	8.0	56.0	48.0	Complied
3.957	Live	14.8	56.0	41.2	Complied
6.059	Live	17.7	60.0	42.3	Complied
11.999	Live	11.0	60.0	49.0	Complied
16.458	Live	16.9	60.0	43.1	Complied

Results: VEGAZW-6-74547 / Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.168	Live	14.4	55.1	40.7	Complied
1.343	Live	11.3	46.0	34.7	Complied
3.876	Live	4.7	46.0	41.3	Complied
11.994	Live	5.0	50.0	45.0	Complied
16.449	Live	8.8	50.0	41.2	Complied
25.058	Live	12.2	50.0	37.8	Complied

Results: VEGAZW-6-74547 / Neutral / Quasi Peak / 240 VAC 60 Hz

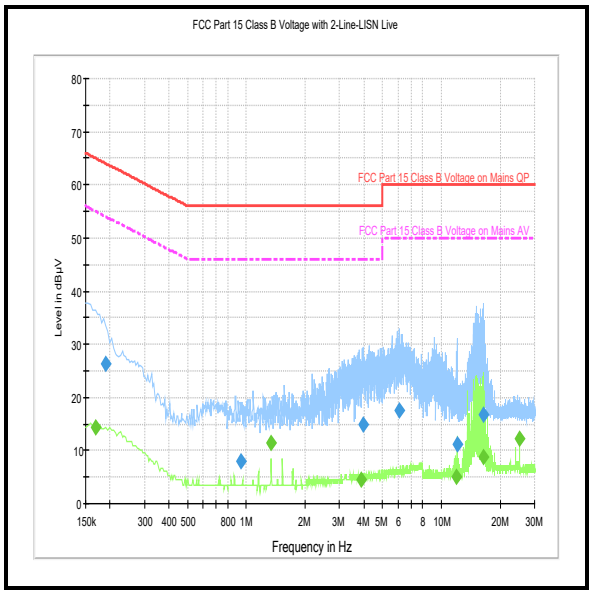
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.191	Neutral	25.8	64.0	38.2	Complied
2.949	Neutral	12.6	56.0	43.4	Complied
6.216	Neutral	17.2	60.0	42.8	Complied
12.003	Neutral	11.4	60.0	48.6	Complied
16.382	Neutral	18.4	60.0	41.6	Complied
21.822	Neutral	10.4	60.0	49.6	Complied

Results: VEGAZW-6-74547 / Neutral / Average / 240 VAC 60 Hz

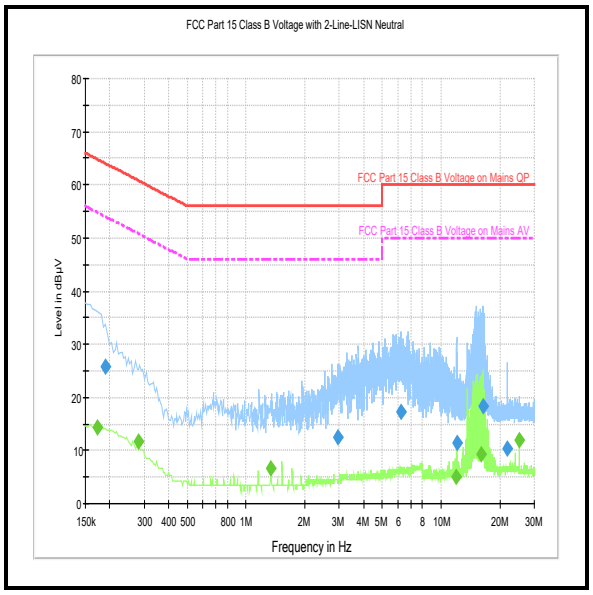
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.173	Neutral	14.4	54.8	40.4	Complied
0.281	Neutral	11.6	50.8	39.2	Complied
1.338	Neutral	6.8	46.0	39.2	Complied
11.994	Neutral	4.9	50.0	45.1	Complied
16.121	Neutral	9.2	50.0	40.8	Complied
25.058	Neutral	11.9	50.0	38.1	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74547 / 240 VAC 60 Hz



Live



Neutral

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

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74538 / Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.173	Live	37.1	64.8	27.7	Complied
0.299	Live	21.8	60.3	38.5	Complied
2.517	Live	11.0	56.0	45.0	Complied
6.171	Live	17.7	60.0	42.3	Complied
11.999	Live	11.5	60.0	48.5	Complied
16.382	Live	22.2	60.0	37.8	Complied

Results: VEGAZW-6-74538 / Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.177	Live	15.9	54.6	38.7	Complied
0.272	Live	10.8	51.1	40.3	Complied
1.532	Live	8.0	46.0	38.0	Complied
11.999	Live	5.9	50.0	44.1	Complied
16.229	Live	19.0	50.0	31.0	Complied
25.058	Live	12.6	50.0	37.4	Complied

Results: VEGAZW-6-74538 / Neutral / Quasi Peak / 120 VAC 60 Hz

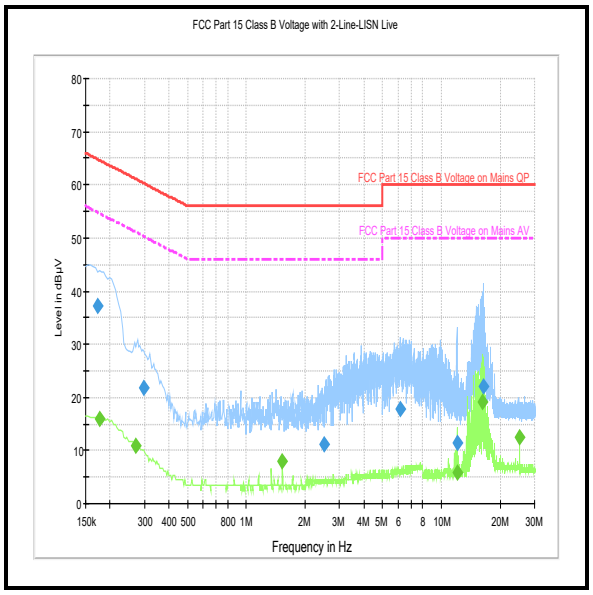
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.173	Neutral	36.9	64.8	27.9	Complied
0.272	Neutral	22.3	61.1	38.8	Complied
3.930	Neutral	14.8	56.0	41.2	Complied
6.639	Neutral	16.8	60.0	43.2	Complied
11.999	Neutral	11.4	60.0	48.6	Complied
16.382	Neutral	21.9	60.0	38.1	Complied

Results: VEGAZW-6-74538 / Neutral / Average / 120 VAC 60 Hz

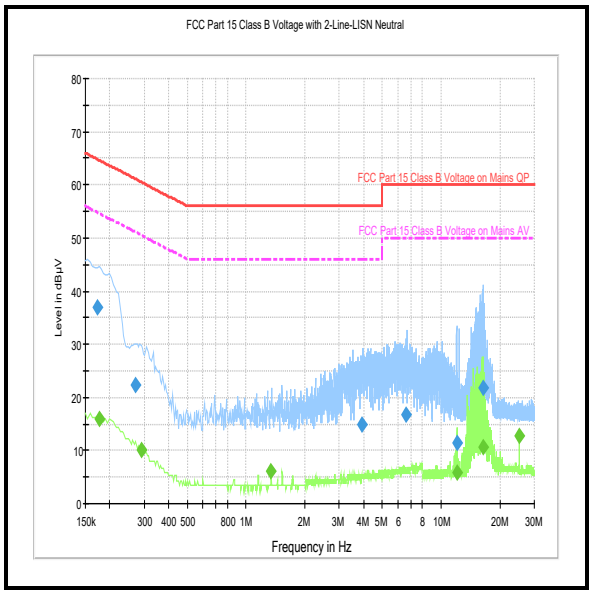
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.177	Neutral	15.9	54.6	38.7	Complied
0.290	Neutral	10.0	50.5	40.5	Complied
1.338	Neutral	6.1	46.0	39.9	Complied
11.999	Neutral	5.8	50.0	44.2	Complied
16.341	Neutral	10.7	50.0	39.3	Complied
25.058	Neutral	12.7	50.0	37.3	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74538 / 120 VAC 60 Hz



Live



Neutral

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

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74538 / Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.196	Live	20.7	63.8	43.1	Complied
3.309	Live	12.9	56.0	43.1	Complied
6.707	Live	16.4	60.0	43.6	Complied
11.994	Live	11.9	60.0	48.1	Complied
16.386	Live	21.0	60.0	39.0	Complied
25.058	Live	24.3	60.0	35.7	Complied

Results: VEGAZW-6-74538 / Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.204	Live	13.5	53.4	39.9	Complied
0.281	Live	11.6	50.8	39.2	Complied
3.386	Live	4.6	46.0	41.4	Complied
11.999	Live	6.6	50.0	43.4	Complied
16.445	Live	11.7	50.0	38.3	Complied
25.058	Live	23.6	50.0	26.4	Complied

Results: VEGAZW-6-74538 / Neutral / Quasi Peak / 240 VAC 60 Hz

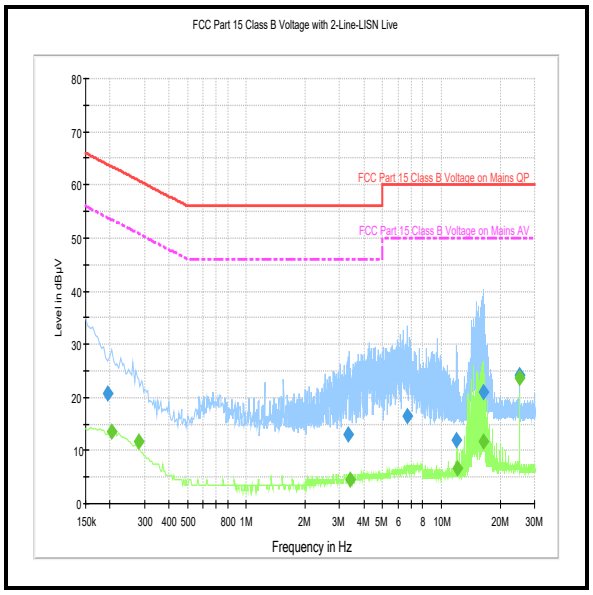
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.200	Neutral	20.5	63.6	43.1	Complied
0.672	Neutral	10.0	56.0	46.0	Complied
6.000	Neutral	17.0	60.0	43.0	Complied
10.014	Neutral	13.2	60.0	46.8	Complied
16.454	Neutral	20.8	60.0	39.2	Complied
25.058	Neutral	23.4	60.0	36.6	Complied

Results: VEGAZW-6-74538 / Neutral / Average / 240 VAC 60 Hz

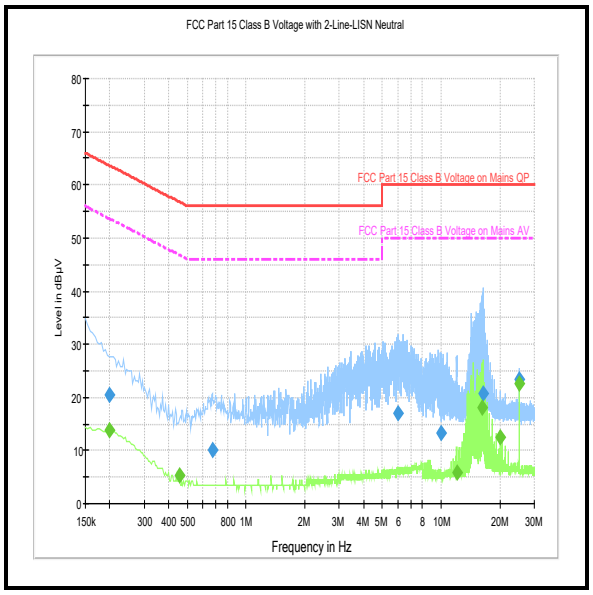
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.200	Neutral	13.8	53.6	39.8	Complied
0.456	Neutral	5.2	46.8	41.6	Complied
11.999	Neutral	5.8	50.0	44.2	Complied
16.233	Neutral	18.0	50.0	32.0	Complied
20.000	Neutral	12.4	50.0	37.6	Complied
25.058	Neutral	22.5	50.0	27.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: VEGAZW-6-74538 / 240 VAC 60 Hz



Live



Neutral

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

7 Antenna Requirements

7.1 Antenna Beamwidth

Test Summary:

FCC Reference:	Parts 15.256(i)
Test Method Used:	N/A

Note(s):

1. Antenna measurement data supplied by the manufacturer was compared against the limit defined in Part 15.256(i) to assess compliance.

Results: Lower Band Edge

Antenna	Measured 3 dB Beamwidth (°)	Limit (°)	Margin (°)	Result
VEGAZW-6-74537	4.2	8.0	3.8	Complied
VEGAZW-6-74539	8.0	8.0	0.0	Complied
VEGAZW-6-74547	3.8	8.0	4.2	Complied
VEGAZW-6-74538	4.5	8.0	3.5	Complied

7.2 Antenna Side Lobe Gain

Test Summary:

FCC Reference:	Parts 15.256(j)
Test Method Used:	N/A

Note(s):

1. Antenna measurement data supplied by the manufacturer was compared against the limit defined in Part 15.256(i) to assess compliance.

Results: Lower Band Edge

Antenna	Measured Side Lobe Gain (dB)	Limit (dB)	Margin (dB)	Result
VEGAZW-6-74537	-40.2	-38.0	2.2	Complied
VEGAZW-6-74539	-41.3	-38.0	3.3	Complied
VEGAZW-6-74547	-38.6	-38.0	0.6	Complied
VEGAZW-6-74538	-38.1	-38.0	0.1	Complied

--- END OF REPORT ---