

Confidential Report

EMC Test Report for Vox Power Ltd

Report Reference: 23E10306-1

Vox Power Product: VCCR300

24TH FEBRUARY, 2023
COMPLIANCE ENGINEERING IRELAND LTD.

Client: Vox Power Ltd, Unit 2 Redcow Interchange Estate, Ballymount Dublin 22 Ireland D22 Y8H2 Attention: Mr. Brian McDonald	Test of: 300W DC-DC converter To: EN 55032:2015/A11:2020 EN 55035:2017+A11:2020 EN 50155-1:-2021 EN 50121-3-2:-2016+A1:2019
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TESTED BY: E Duignan L Brien

DATE RECEIVED: 16th January 2023

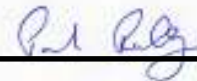
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ISSUE DATE: 24th February 2023

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14. In IEC standards measurement uncertainty is already incorporated into the specifications. Statements of conformity in the CEI test report follow these decision rules: Pass – Results within the stated limit, Fail – Results outside the stated limit.

Executive Summary

The equipment under test fulfils the standards listed below

Standard	Test result
EN 50155-1:-2021 Title: Railway applications - Electronic equipment used on rolling Stock	Pass
EN 50121-3-2:2016+A1:-2019 Title: Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock – Apparatus	Pass
EN 55032:2015/A11:2020 Title: Electromagnetic compatibility of multimedia equipment - Emission Requirements	Pass
EN 55035:2017+A11:2020 Title: Electromagnetic compatibility of multimedia equipment. Immunity requirements	Pass

CONTENTS

Section 1:	Equipment Under Test (E.U.T.)
Section 2:	Test Specification, Methods and Procedures
Section 3:	Deviations or Exclusions from the Test Specifications
Section 4:	Operation of E.U.T. During Testing
Section 5:	Results
Section 6:	Analysis of Test Results, Conclusions

Appendix 1:	Test Equipment Used
Appendix 2:	Test Configuration
Appendix 3:	Radiated Emissions Test Results
Appendix 4:	Conducted Emissions Test Results

**Test Of:
VCCR300**

1 Equipment Under Test (EUT)

1.1 Identification of EUT

Brand Name:	Vox Power
Description:	300W DC-DC converter
Model Name:	VCCR300-24, VCCR300-12, VCCR300-36, VCCR300-48
Serial Number:	N/A

1.2 Description of E.U.T.

The EUT was a VCCR300 which is a DC-DC converter.

1.3 Modifications

There were no modifications incorporated into the EUT

1.4 Support Equipment List

300W Resistive load

1.5 Date of Test

Testing was carried out on 1 sample of the EUT between the 16th of January and the 26th of January 2023.

2 Test Specification, Methods and Procedures

2.1 Emissions Test Specification

EN 55032:2015/A11:2020

Title:

Electromagnetic compatibility of multimedia equipment - Emission Requirements

EN 55035:2017+A11:2020

Title:

Electromagnetic compatibility of multimedia equipment. Immunity requirements

2.2 Immunity

Immunity was assessed to the parts of the following standard as requested by the manufacturer:

EN 50155-1: 2021

Title:

Railway applications - Electronic equipment used on rolling Stock

EN 50121-3-2: 2019

Title:

Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock – Apparatus

EN 61000-4-2:-2009	Electromagnetic Compatibility (EMC) Part4: Testing and measurement techniques Section2: Electrostatic discharge immunity test
EN IEC 61000-4-3:-2020	Electromagnetic Compatibility (EMC) Part4: Testing and measurement techniques Section3: Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4:-2012	Electromagnetic Compatibility (EMC) Part4: Testing and measurement techniques Section4: Electrical fast transient/burst immunity test
EN 61000-4-5:-2014+-A1:-2017	Electromagnetic compatibility (EMC) Part 4. Testing and measurement techniques. Section 5: Surge immunity test.
EN 61000-4-6:-2014	Electromagnetic compatibility (EMC) Part 4. Testing and measurement techniques. Section 6: Immunity to Conducted disturbances, induced by radio-frequency fields.
EN 61000-4-29:-2001	Electromagnetic Compatibility (EMC) Part4: Testing and measurement techniques Section 29: Voltage dips, short interruptions, and voltage variations on d.c. input ports, immunity test.

2.3 Apparatus and Methods:

Measuring apparatus used during tests was designed and built to the requirements of:
C.I.S.P.R. 16.

3 Deviations or Exclusions from the Test Specifications

3.1 Deviations

Up to date versions of the basic standards have been used in this test programme. Where necessary, we have verified that the requirements of any older basic standards as may be referred to in the product standard have been complied with.

3.2 Exclusions

There were no exclusions from the test specification.

4 Operation of E.U.T. During Testing

4.1 Operating Environment

Supply Voltage: Custom DC power supply from VCCS300 modules.
(36V 600W, 48V 600W and 96V 600W)

The following were the conditions at the time of immunity testing.

Temperature: 18-21°C
Humidity: 41-43% RH
Atmospheric pressure: 981-996 hPa

4.2 Operating Mode:

The EUT was configured as 48V output and loaded at 300W, unless stated otherwise.

4.3 Performance Criteria:

The Performance Criteria are defined in EN50155:2021 cl.4.3

5 Results

5.1 Conducted Emissions

Measurements of conducted emissions were carried out using the receiver analysis feature, which uses three detectors, peak, quasi peak and average. Using this mode the voltage emission spectrum could be scanned in peak detection mode and emissions, which exceeded a sub range margin relevant to the respective limits, could be further measured. The receiver bandwidth was set to 10 kHz.

The EUT complied with the Class B conducted emission specification of EN 55032. See Appendix 5 for results.

5.1.1 Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for the conducted emissions test was ± 3.5 dB.

5.2 Radiated Emissions

Compliant measurements of radiated emissions were carried out in a semi anechoic chamber from 30 MHz to 1 GHz. The equipment and cable orientation were investigated to ensure that maximum emissions were obtained at critical frequencies. The antenna height was also adjusted through the range of 1m - 4m.

The receiver bandwidth was set to 120 kHz for frequencies between 30 MHz and 1 GHz.

The EUT complied with the Class B radiated emission specification of EN 55032.

5.2.1 Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for the radiated emissions test was ± 5.3 dB (from 30 to 100 MHz), ± 4.7 dB (from 100 to 300 MHz) and ± 3.9 dB (from 300 to 1000 MHz).

5.3 Immunity to Radiated, Radio Frequency Electromagnetic Fields

Radiated RF EM fields

Port:	Enclosure
Limit:	20 V/m (80% AM 1 kHz modulation)
Frequency range:	80-1000 MHz
Limit:	10 V/m (80% AM 1 kHz modulation)
Frequency range:	1000-2700 MHz
Limit:	3 V/m (80% AM 1 kHz modulation)
Frequency range:	2700-6000 MHz
Dwell time:	3 second dwell

The EUT was placed in the anechoic chamber.

The step sizes from 80-6000MHz were in 1% steps. The dwell time at each frequency was 3 seconds. The test level was maintained at over 20 V/m at frequencies from 80-1000 MHz, at over 10 V/m at frequencies from 1000-2700 MHz and at over 3 V/m at frequencies from 2700-6000 MHz in accordance with EN 60601-1-2.

The distance of the antenna from the EUT was 2.2 metres. The tests were carried out with the antenna oriented in horizontal and vertical polarisations for each side of the EUT.

The EUT was deemed to comply in accordance with the manufacturer's specification.

The EUT output was monitored with an oscilloscope to confirm correct level

Radiated Immunity Tests

Frequency MHz	Modulation Frequency	Polarisation (V/H)	Level (V/m)	Result
80-1000 MHz	1 kHz	V and H	20	Complied
1000-2700 MHz	1 kHz	V and H	10	Complied
2700-6000 MHz	1 kHz	V and H	3	Complied

5.4 Electrostatic Discharge Test

Port: Enclosure
Basic Standard: EN 61000-4-2
Limit: $\pm 2, 4$ & 6 kV contact discharges
 $\pm 2, 4$ & 8 kV air discharges

The ESD generator contained a discharge capacitor of 150pF and resistor of 330Ω in accordance with the requirements of EN 61000-4-2. The tests were carried out using both positive and negative discharges. Discharges were applied to the EUT to comply with EN 61000-4-2.

Only parts of the equipment that can be touched during normal operation were subjected to discharges.

Air discharges of $\pm 2, 4$ & 8 kV, were applied to different points on the enclosure. Contact discharges of $\pm 2, 4$ & 6 kV, were applied to conductive points on the enclosure, in addition to the horizontal and vertical coupling planes. 10 discharges of each polarity were applied at each location.

The EUT while powered complied with Performance Criteria A during and after the application of discharges. Discharges were applied to chassis screws and chassis only.

The EUT output was monitored with an oscilloscope to confirm correct level

5.5 Conducted RF Immunity

Ports: DC, Signal
Basic Standard: EN 61000-4-6
Limit: 10 Vemf, 80% AM 1 kHz modulation
Frequency range: 150 kHz to 80 MHz

The EUT was placed 0.1m above the ground plane and the mains cable was arranged 0.03m above the ground plane. All peripheral equipment was also placed 0.1m above the ground plane.

The current was injected on the mains cable in common mode. The EM Clamp was located at 0.1m from the EUT DC power port. Each surface of the EUT was more than 0.5m from other metal surfaces.

The test configuration used was the EM Clamp injection method. The system was calibrated to provide a current input level equivalent to an injected voltage level of 10 Vemf into a 150 ohm system.

The EUT functioned as normal during and after the testing.

The EUT output was monitored with an oscilloscope to confirm correct level

Port	Disturbance type	Result
DC	10 Vemf, 150 kHz – 80 MHz	Complied
Signal	10 Vemf, 150 kHz – 80 MHz	Complied

Results of Conducted Immunity testing

5.6 Electrical Fast Transient Test

Ports: DC, Signal
Basic Standard: EN 61000-4-4
Limit: ± 0.5 , ± 1 & ± 2 kV DC, signal port
Repetition Rate: 5 kHz

Positive and negative fast transient discharges of amplitude ± 0.5 , 1 & 2 kV were applied to the mains input & Positive and negative fast transient discharges of amplitude ± 0.5 , 1 & 2 kV to the signal port in accordance with the requirements of EN 61000-4-4.

The EUT functioned as normal during and after the testing.

The EUT output was monitored with an oscilloscope to confirm correct level.

Test port	Level	Result
DC	± 0.5 , ± 1 & ± 2 kV	Complied
Control	± 0.5 , ± 1 & ± 2 kV	Complied

Results of Fast transient testing

5.7 Surge Immunity Test

Ports: DC
Basic Standard: EN 61000-4-5
Performance Criterion: A
Limit, DC: $\pm 0.5, \pm 1$ & ± 2 kV
EUT Tested: VCCR300-48

Positive and negative surges were applied to each of the mains inputs in accordance with the requirements of EN 61000-4-5.

Surges were applied to the mains conductors coupled line to line.

The tests were carried out with positive and negative surges. The test was repeated every 60 seconds for a total of 5 times in each polarity and in all coupling modes. The tests were performed at 0° , 90° , 180° and 270° phases for both polarities.

The test was carried out on the VCCR300-48. DC supply voltage was 96V.

The EUT functioned as normal during and after the testing.

The EUT output was monitored with an oscilloscope to confirm correct level

Port	Mode of conduction	Disturbance level	Coupling	Result
DC Positive	Pos-E	$\pm 0.5, \pm 1$ & ± 2 kV	42Ω	Pass A
DC Negative	Neg-E	$\pm 0.5, \pm 1$ & ± 2 kV	42Ω	Pass A
DC Positive to Negative	Pos - Neg	$\pm 0.5, \& \pm 1$ kV	42Ω	Pass A
DC Positive	Pos-E	$\pm 0.5, \pm 1$ & ± 2 kV	12Ω	Pass A
DC Negative	Neg-E	$\pm 0.5, \pm 1$ & ± 2 kV	12Ω	Pass A
DC Positive to Negative	Pos - Neg	$\pm 0.5, \& \pm 1$ kV	12Ω	Pass A

Results of Surge Immunity testing

5.8 Voltage Dips, Oversupply & Interruptions Test

Ports:	DC
Basic Standard:	EN 61000-4-29
Dips:	DC – 48V to 28.8V 100ms
Oversupply:	DC – 110V to 168V 100ms DC – 110V to 168V 1s
Interruption:	DC – 300W load 10ms DC – 300W load < 10ms DC – 180W load 20ms DC – 180W load < 20ms

Dips, oversupply, and interruptions were applied to the mains input in accordance with the requirements of EN 61000-4-29.

The test was carried out at 48V DC

Data is recorded for the duration of the test and analysed after the test.

The EUT continued to operate throughout the duration of the test although with some degradation in performance.

The EUT output was monitored with an oscilloscope to confirm correct level.

Port	Disturbance type	Result
DC	110V to 168V 100ms & 1s	Complied A
DC	48V to 28.8V 100ms	Complied A
DC	300W load 10ms	Complied A
DC	300W load < 10ms	Complied C
DC	180W load 20ms	Complied A
DC	180W load < 20ms	Complied C

Results of Voltage Dips & Interruptions testing 48V

6 Analysis of Test Results, Conclusions

6.1 Measurement Uncertainties

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4 with a confidence level of 95%.

6.2 Radiated Emissions

The EUT complied with the Class B radiated emission specification of EN 55032

6.3 Conducted Emissions

The EUT complied with the Class B conducted emission specification of EN 55032

6.4 Immunity

The EUT complied with the immunity tests carried out to demonstrate compliance with EN 50121-3-2, EN 50155 and EN 55035.-

**Appendix 1
Test Equipment Used:**

Instrument	Mfr.	Model	Serial No.	Cal Due
Measuring Receiver	Rohde and Schwarz	ESVS30	607	23/04/2023
Measuring Receiver	Rohde and Schwarz	ESHS30	605	13/10/2024
LISN	Rohde and Schwarz	ESH3-Z5	604	09/03/2023
Bilog Antenna	Schwarzbeck	VULB 9160	889	09/09/2023
Signal Generator	Rohde and Schwarz	SME 03	765	01/06/2023
Signal Generator	Rohde and Schwarz	SMCV100B	1131	24/12/2023
Power Amplifier	Schaffner	CBA 9433	-	N/A
Power Amplifier	Milmega	AS0825-125	-	N/A
Power Amplifier	Ophir	RF 5292	922	N/A
EM Clamp	Schaffner	KEMZ 801	727	30/05/2023
Directional Coupler	Lab Plant	RX 1026	738	02/09/2023
Directional Coupler	Narda	-	813	02/09/2023
Directional Coupler	Hewlett Packard	87300B	951	30/09/2023
Electrostatic Discharge Simulator	Schaffner	NSG435	788	17/02/2023
Power Meter	Rohde and Schwarz	NRVS-Z5	619	24/07/2023
Power Meter	Rohde and Schwarz	NRVS-Z5	842	17/07/2023
Transient Simulator	EMC Partner	Tema 4000	921	25/04/2023
Current Probe	Eaton	94111-1	829	31/04/2023
AC Power Supply	Kikusui	PCR2000LA	1205	14/12/2023

**Appendix 2
Test Configurations**

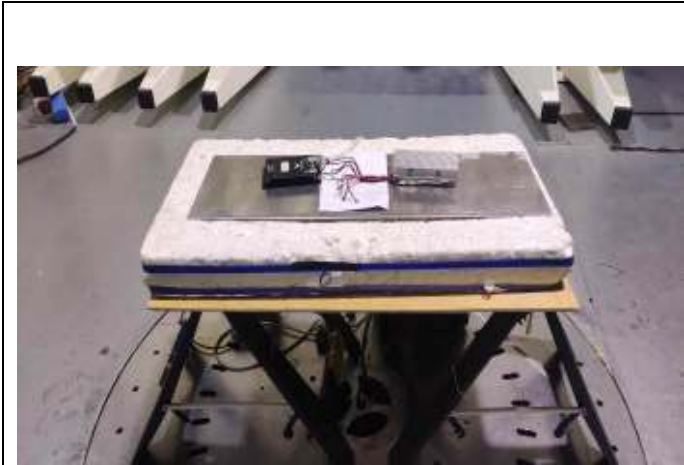


Figure 1: Radiated Emissions Test Set up

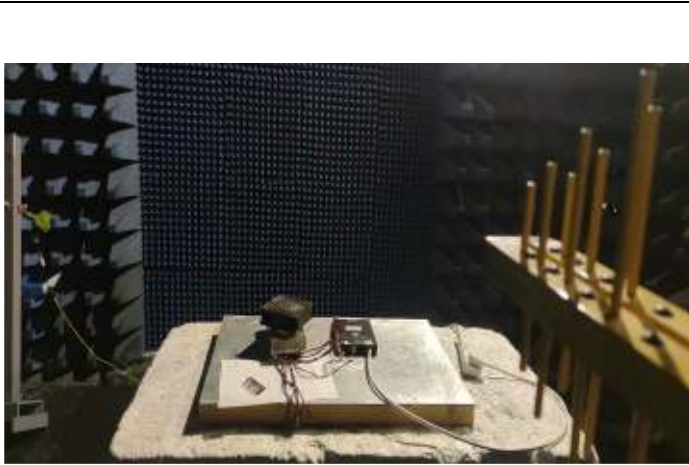


Figure 2: Radiated Immunity Test Set up



Figure 3: ESD Test Set Up



Figure 4: Surges/Dips Test Set Up



Figure 5: Fast Transient Test Set Up

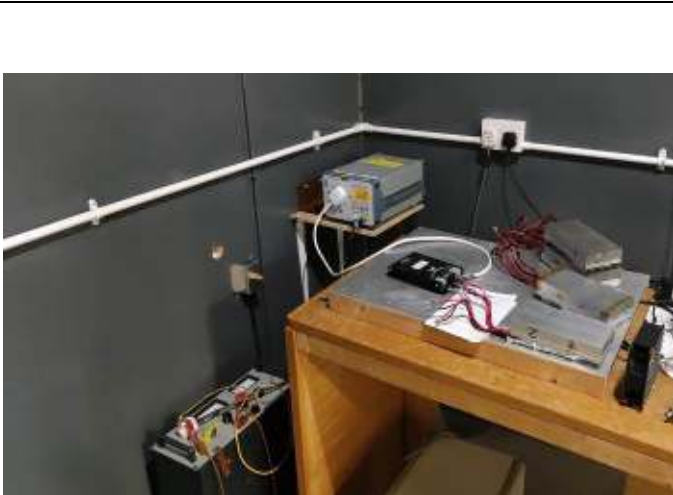


Figure 6: Conducted Emissions Test Set Up



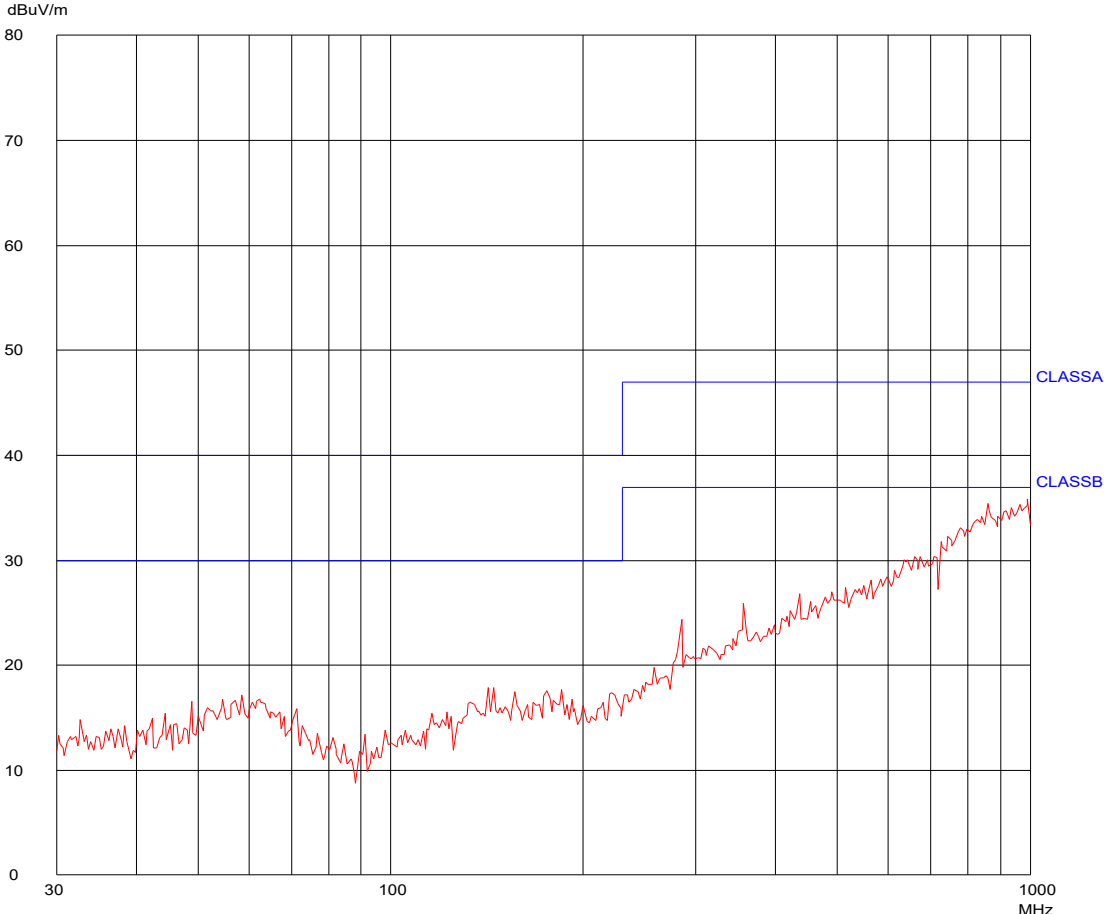
Figure 7: Conducted Immunity Test Set Up

Appendix 3: Radiated Emissions Test Results

17. Jan 23 17:16

Scan Settings (1 Range)
----- Frequencies -----||----- Receiver Settings -----|
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
30M 1000M 120k 120k PK 5ms 0dBLD OFF 60dB

Transducer No.	Start	Stop	Name	
1	16	30M	1000M	963CABLE
21	30M	1000M	BILOG889	



PAGE 1

Figure 1: Radiated Emissions Background Scan, Horizontal

17. Jan 23 17:12

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	120k	120k	PK	5ms	0dB	LD OFF	60dB

Transducer No.	Start	Stop	Name	
1	16	30M	1000M	963CABLE
21	30M	1000M	BILOG889	

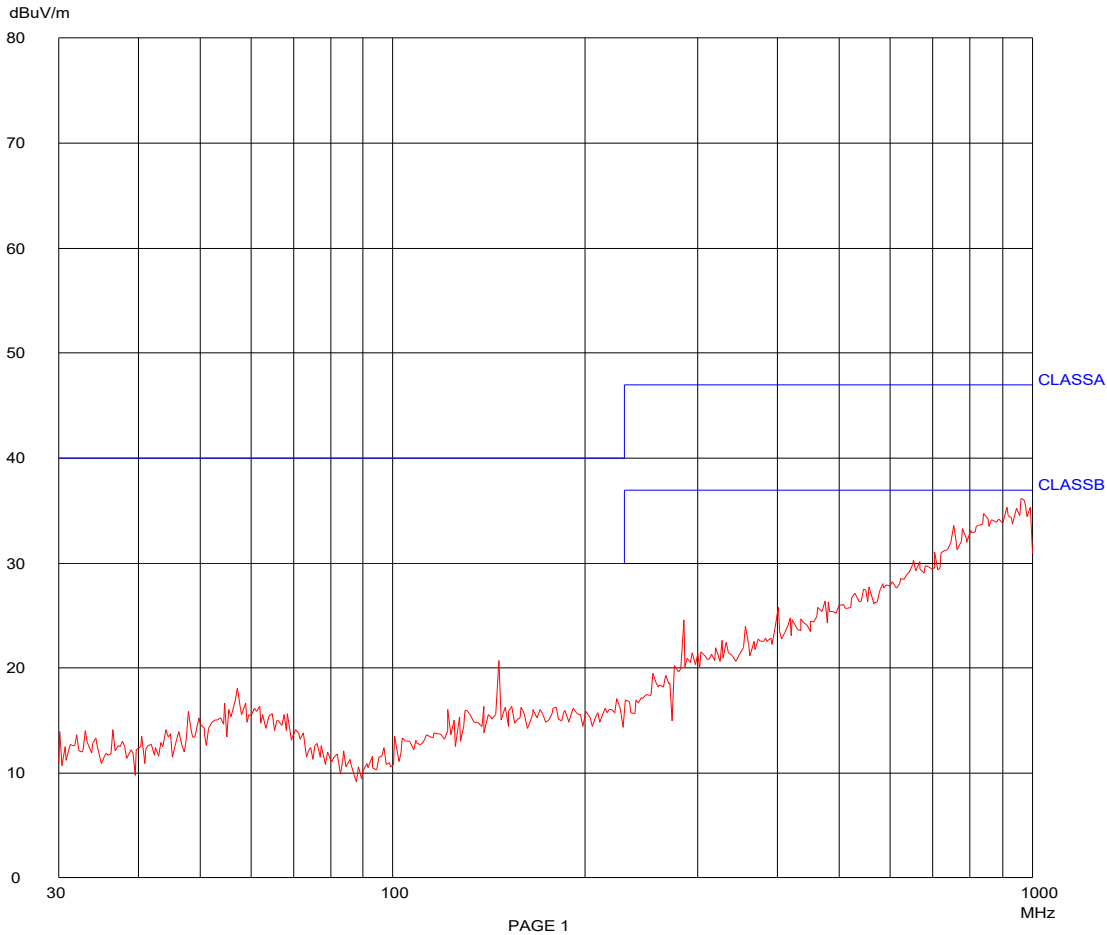


Figure 2: Radiated Emissions Background Scan, Vertical

18. Jan 23 11:15

Scan Settings (1 Range)
|----- Frequencies -----|----- Receiver Settings -----|
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
30M 1000M 120k 120k PK 5ms 0dBLD OFF 60dB

Transducer No.	Start	Stop	Name	
1	16	30M	1000M	963CABLE
21	30M	1000M	BILOG889	

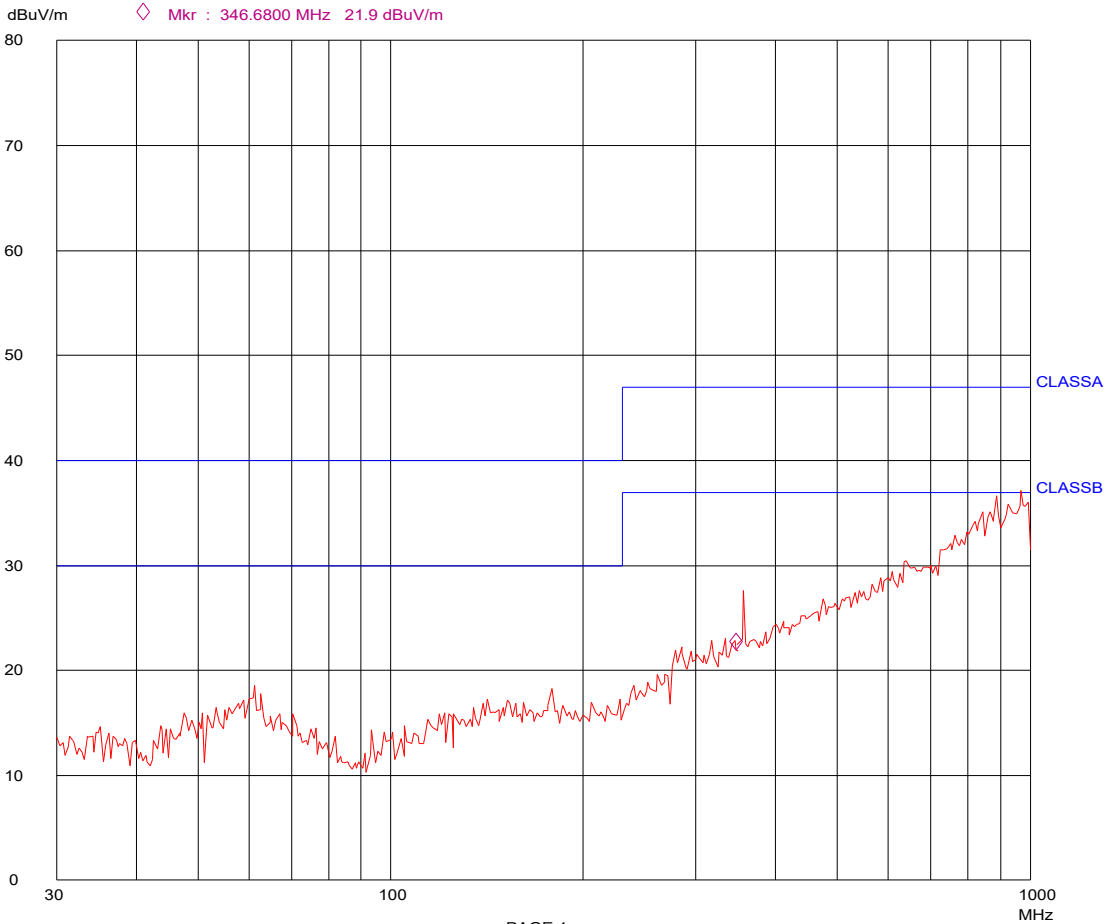


Figure 3: Radiated Emissions 12V, Horizontal

18. Jan 23 10:50

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	120k	120k	PK	5ms	0dB	OFF	60dB

Transducer No.	Start	Stop	Name	
1	16	30M	1000M	963CABLE
21	30M	1000M	BILOG889	

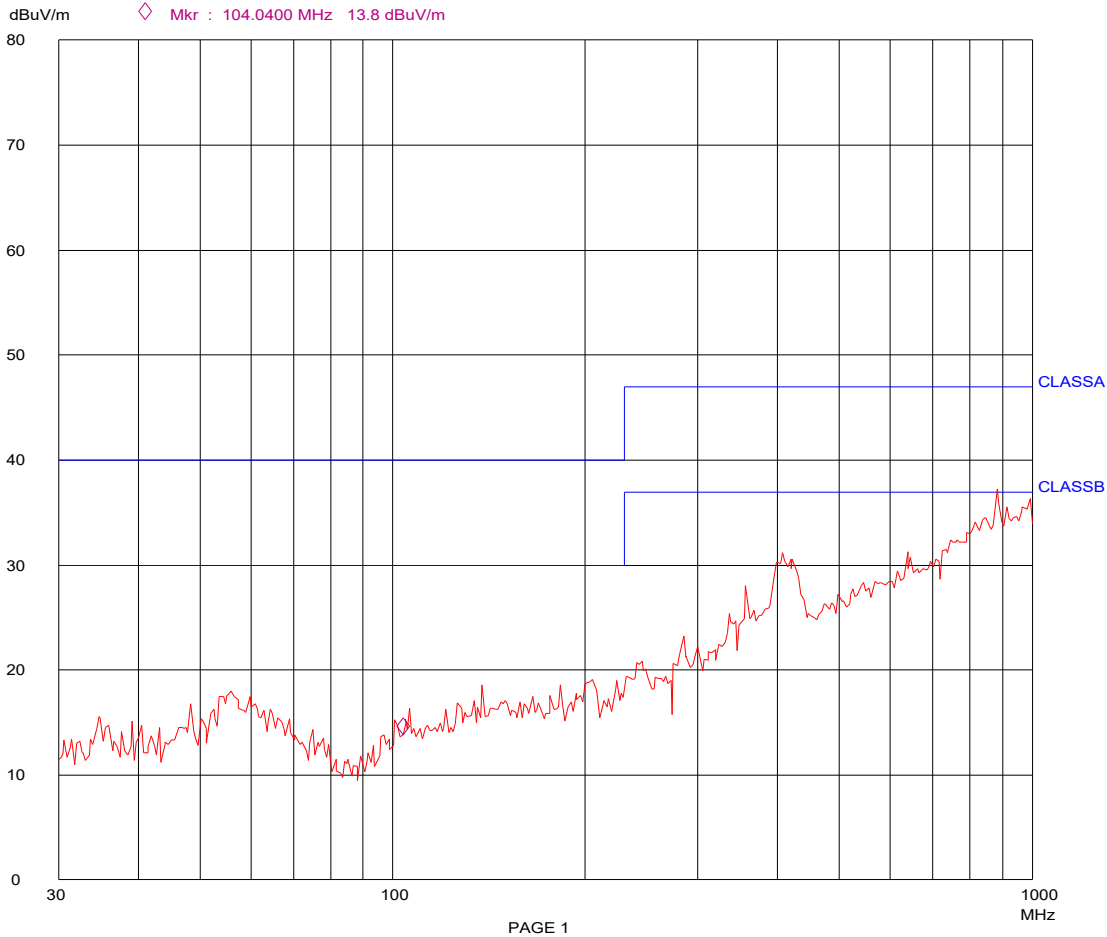


Figure 4: Radiated Emissions 12V, Vertical

Freq (MHz)	Q.P. Level dB(μV/m)	EN 55011 Class B dB(μV/m)	Antenna Pol. Vertical/Horizontal	Antenna Height (m)	Pass / Fail
54.5360	15.0	30	Vertical	1.0	Pass
59.5640	13.3	30	Horizontal	1.0	Pass
241.5780	17.6	37	Vertical	1.0	Pass
336.2460	22.0	37	Vertical	1.0	Pass
398.7720	29.5	37	Vertical	1.0	Pass
638.8820	26.3	37	Vertical	1.0	Pass
888.2180	32.8	37	Horizontal	3.5	Pass

**Table 1: Radiated Emissions, 12V, Class B Limits –
Anechoic Chamber at 10 metres**

18. Jan 23 11:48

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	120k	120k	PK	5ms	0dB	OFF	60dB

Transducer No.	Start	Stop	Name	
1	16	30M	1000M	963CABLE
21	30M	1000M	BILOG889	

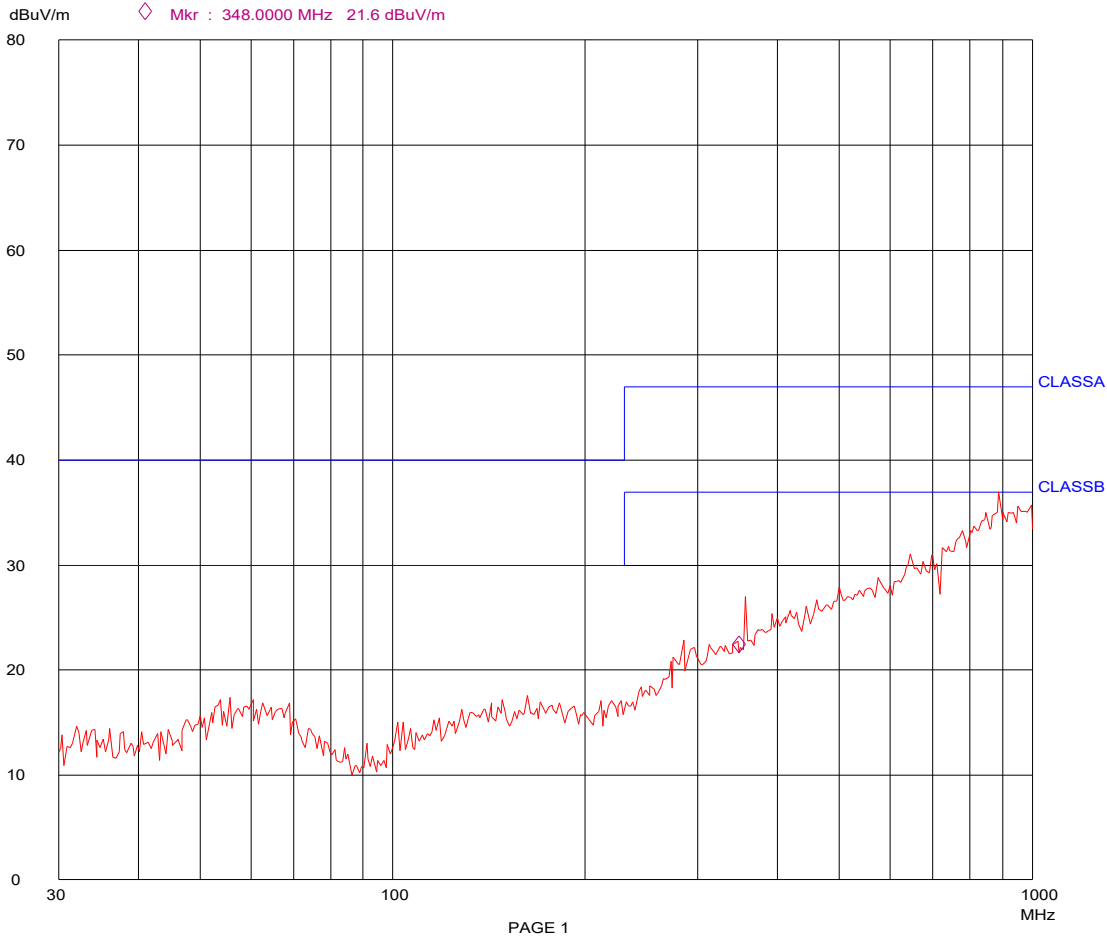


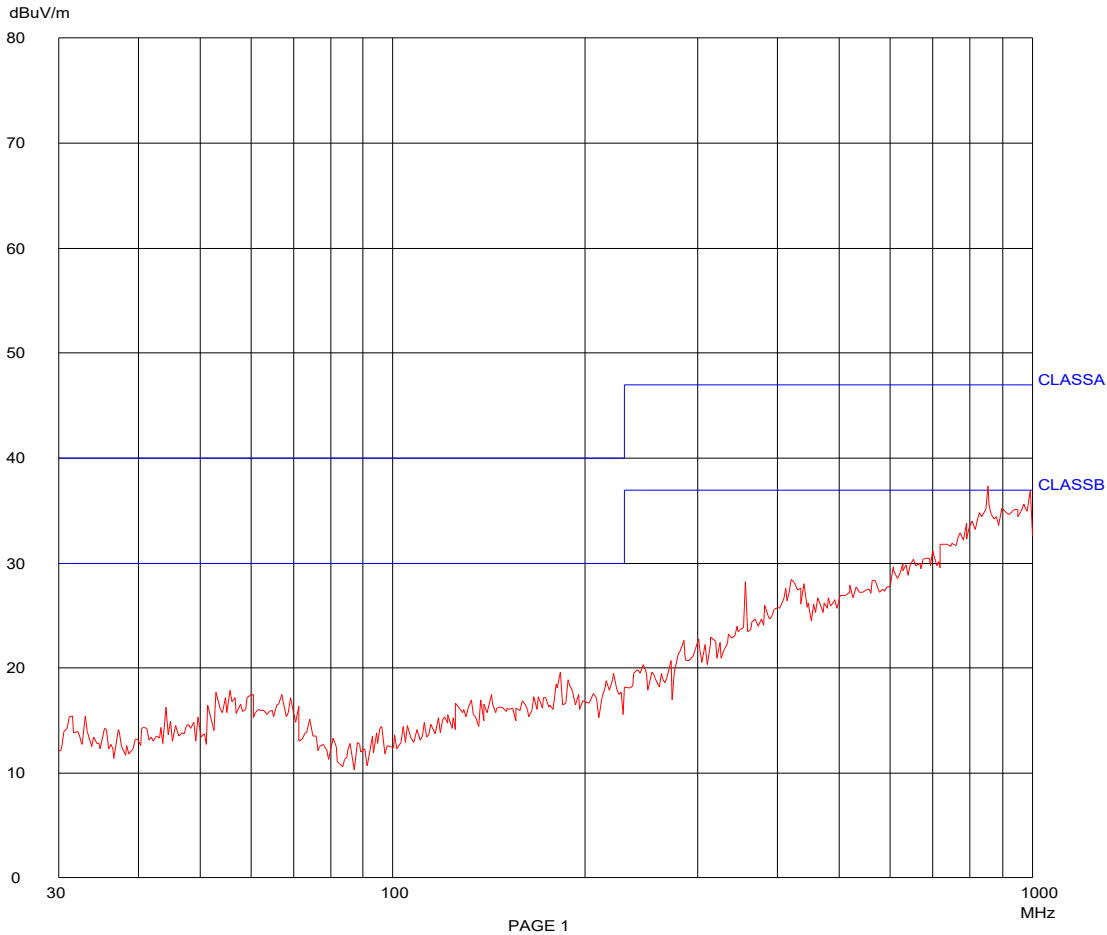
Figure 5: Radiated Emissions 24V, Horizontal

18. Jan 23 11:35

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	120k	120k	PK	5ms	0dB	LD OFF	60dB

Transducer No.	Start	Stop	Name	
1	16	30M	1000M	963CABLE
21	30M	1000M	BILOG889	



PAGE 1

Figure 6: Radiated Emissions 24V, Vertical

Freq (MHz)	Q.P. Level dB(μV/m)	EN 55011 Class B dB(μV/m)	Antenna Pol. Vertical/Horizontal	Antenna Height (m)	Pass / Fail
31.2320	16.4	30	Vertical	1.0	Pass
45.4540	18.0	30	Vertical	3.5	Pass
60.1660	17.1	30	Vertical	1.0	Pass
439.9080	21.8	37	Vertical	1.0	Pass
645.8900	25.9	37	Horizontal	1.0	Pass
853.1920	30.3	37	Vertical	1.0	Pass
886.8500	30.5	37	Horizontal	1.0	Pass

**Table 2: Radiated Emissions, 24V, Class B Limits –
Anechoic Chamber at 10 metres**

18. Jan 23 12:19

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	120k	120k	PK	5ms	0dB	OFF	60dB

Transducer No.	Start	Stop	Name	
1	16	30M	1000M	963CABLE
21	30M	1000M	BILOG889	

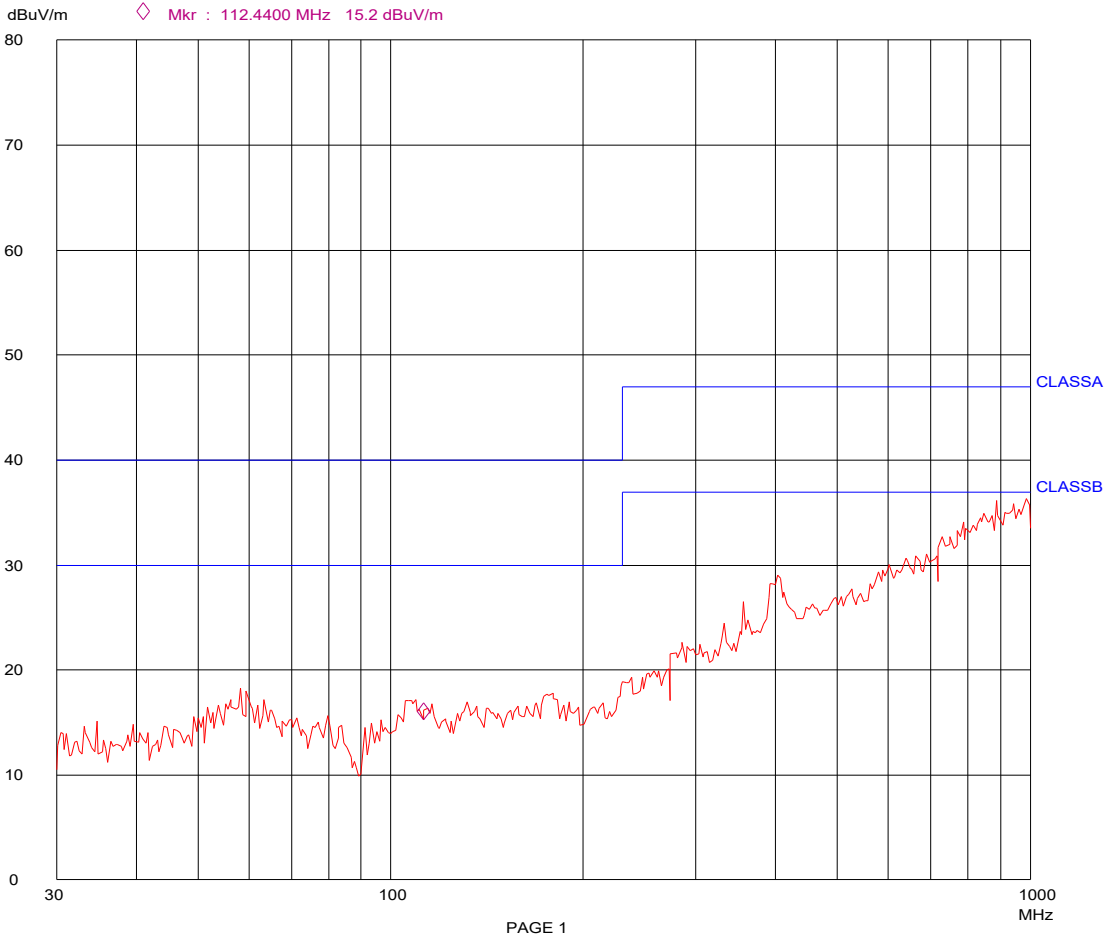


Figure 7: Radiated Emissions 36V, Horizontal

18. Jan 23 12:01

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	120k	120k	PK	5ms	0dB	LD OFF	60dB

Transducer No.	Start	Stop	Name	
1	16	30M	1000M	963CABLE
21	30M	1000M	BILOG889	

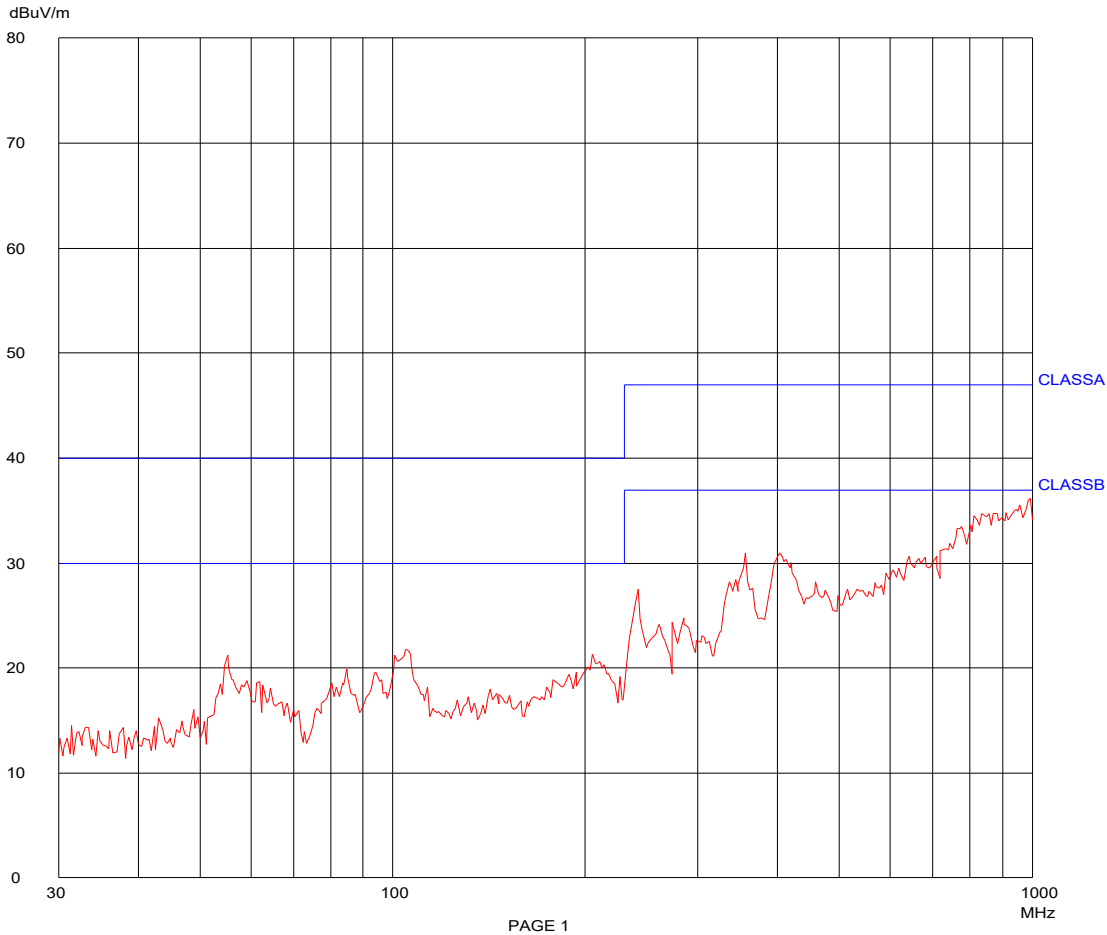


Figure 8: Radiated Emissions 36V, Vertical

Freq (MHz)	Q.P. Level dB(μV/m)	EN 55011 Class B dB(μV/m)	Antenna Pol. Vertical/ Horizontal	Antenna Height (m)	Pass / Fail
55.3200	19.7	30	Vertical	1.0	Pass
57.8620	13.4	30	Horizontal	1.0	Pass
84.0500	24.3	30	Vertical	1.0	Pass
84.5700	23.2	30	Vertical	1.0	Pass
105.0140	20.2	30	Vertical	1.5	Pass
242.4180	29.1	37	Vertical	1.0	Pass
332.9120	23.7	37	Horizontal	3.0	Pass
353.8480	24.8	37	Vertical	1.0	Pass
402.8840	32.2	37	Vertical	1.0	Pass
403.5260	29.9	37	Vertical	1.0	Pass

**Table 3: Radiated Emissions, 36V, Class B Limits –
Anechoic Chamber at 10 metres**

26. Jan 23 15:54

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	120k	120k	PK	5ms	0dB	LD OFF	60dB

Transducer No.	Start	Stop	Name	
1	16	30M	1000M	963CABLE
21	30M	1000M	BILOG889	

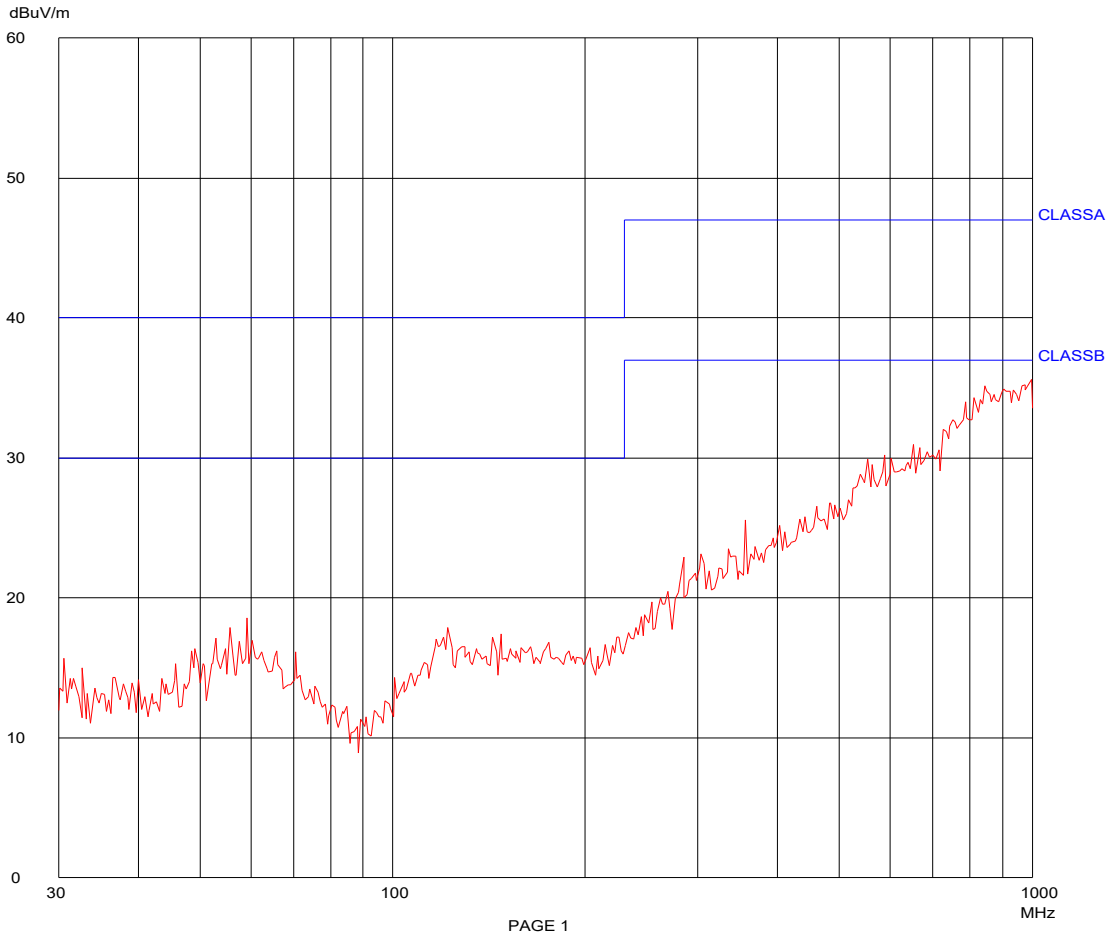


Figure 9: Radiated Emissions 48V, Horizontal

26. Jan 23 15:39

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	120k	120k	PK	5ms	0dB	BLD OFF	60dB

Transducer No.	Start	Stop	Name	
1	16	30M	1000M	963CABLE
21	30M	1000M	BILOG889	

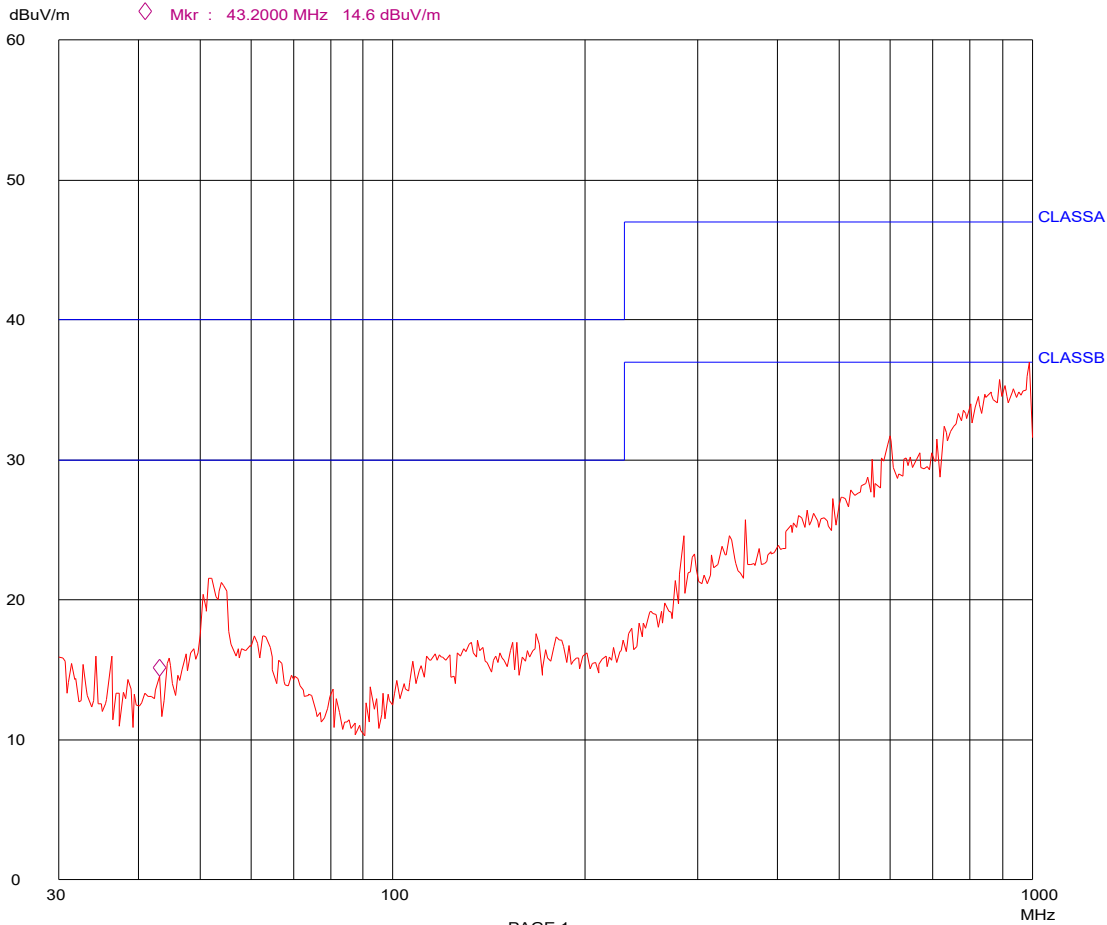


Figure 10: Radiated Emissions 48V, Vertical

Freq (MHz)	Q.P. Level dB(μV/m)	EN 55011 Class B dB(μV/m)	Antenna Pol. Vertical/Horizontal	Antenna Height (m)	Pass / Fail
51.7080	19.7	30	Vertical	1.0	Pass
51.9160	18.7	30	Vertical	1.0	Pass
54.0360	19.6	30	Vertical	1.0	Pass
54.7560	18.9	30	Vertical	1.0	Pass
59.7400	13.3	30	Horizontal	1.0	Pass
122.4400	19.0	30	Horizontal	4.0	Pass
303.0760	17.9	37	Horizontal	4.0	Pass
328.2440	21.8	37	Vertical	1.0	Pass
562.8560	25.8	37	Horizontal	1.5	Pass
598.5440	32.2	37	Horizontal	1.5	Pass
598.9480	31.3	37	Vertical	1.0	Pass
598.9480	32.8	37	Horizontal	1.5	Pass
810.7040	29.4	37	Horizontal	1.0	Pass
889.3240	30.4	37	Vertical	1.0	Pass

Table 4: Radiated Emissions, 48V, Class B Limits – Anechoic Chamber at 10 metres

Appendix 4: Conducted Emissions Test Results

Compliance Engineering Ireland Ltd

16 Jan 2023 14:31

Conducted Emissions

EUT: 12V
Manuf: Vox Power
Op Cond: Normal
Operator: E. Duignan
Test Spec: EN 55022 Class B
Comment: Live
DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	lisa

Final Measurement:	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	25
	Acc Margin:	20 dB

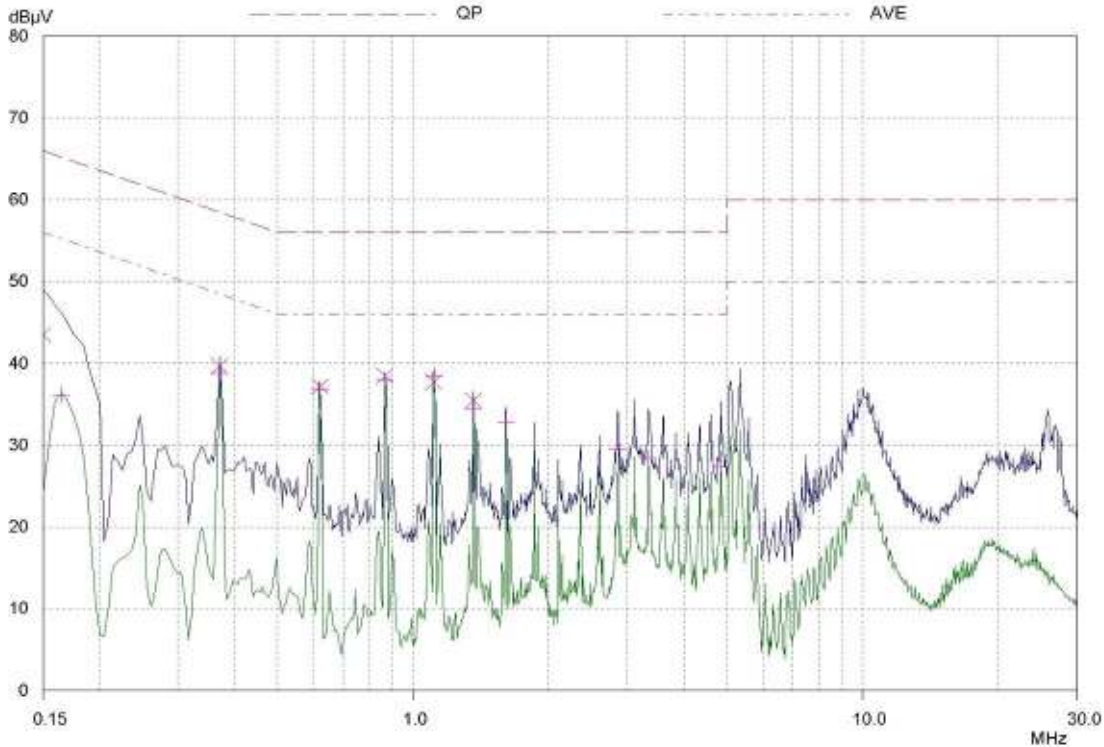


Figure 1: Conducted Emissions 12V, LIVE

Compliance Engineering Ireland Ltd

16 Jan 2023 14:31

Conducted Emissions

EUT: 12V
 Manuf: Vox Power
 Op Cond: Normal
 Operator: E.Duignan
 Test Spec: EN 55022 Class B
 Comment: Live
 DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	ltn

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 20 dB

Final Measurement Results

Frequency MHz	QP Level dB μ V	QP Limit dB μ V	QP Delta dB	Phase	PE
0.15	43.49	66.00	22.51	N	gnd
0.37	39.65	58.50	18.85	N	gnd
0.62	37.18	56.00	18.82	N	gnd
0.865	38.47	56.00	17.53	N	gnd
1.11	37.67	56.00	18.33	N	gnd
1.36	35.46	56.00	20.54	N	gnd

Frequency MHz	AV Level dB μ V	AV Limit dB μ V	AV Delta dB	Phase	PE
0.165	36.08	55.21	19.13	N	gnd
0.37	38.82	46.50	9.68	N	gnd
0.62	36.72	46.00	9.28	N	gnd
0.865	38.00	46.00	8.00	N	gnd
1.115	38.50	46.00	7.50	N	gnd
1.36	34.46	46.00	11.54	N	gnd
1.61	32.73	46.00	13.27	N	gnd
2.845	29.55	46.00	16.45	N	gnd
3.34	28.43	46.00	17.57	N	gnd
4.825	27.40	46.00	18.60	N	gnd

* limit exceeded

Indicated Phase/PE shows Configuration of max. Emission

Compliance Engineering Ireland Ltd

16 Jan 2023 14:48

Conducted Emissions

EUT: 12V
Manuf: Vox Power
Op Cond: Normal
Operator: E.Duignan
Test Spec: EN 55022 Class B
Comment: Neutral
DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	lsm

Final Measurement:	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	25
	Acc Margin:	20 dB

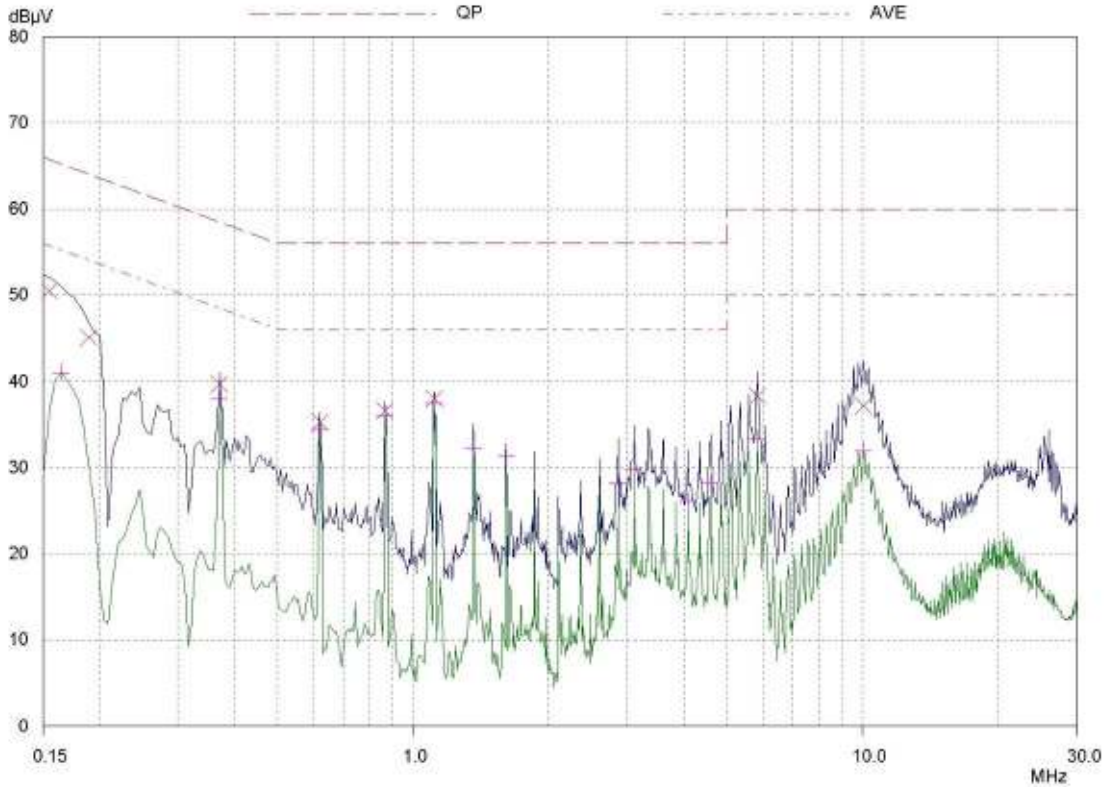


Figure 2: Conducted Emissions 12V, NEUTRAL

Compliance Engineering Ireland Ltd

16 Jan 2023 14:48

Conducted Emissions

EUT: 12V
 Manuf: Vox Power
 Op Cond: Normal
 Operator: E.Duignan
 Test Spec: EN 55022 Class B
 Comment: Neutral
 DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	ltn

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 20 dB

Final Measurement Results

Frequency MHz	QP Level dBuV	QP Limit dBuV	QP Delta dB	Phase	PE
0.155	50.48	65.73	15.25	N	gnd
0.19	45.08	64.04	18.96	N	gnd
0.37	39.69	58.50	18.81	N	gnd
0.62	35.21	56.00	20.79	N	gnd
0.865	36.60	56.00	19.40	N	gnd
1.115	37.99	56.00	18.01	N	gnd
5.82	38.29	60.00	21.71	N	gnd
10.04	37.15	60.00	22.85	N	gnd

Frequency MHz	AV Level dBuV	AV Limit dBuV	AV Delta dB	Phase	PE
0.165	40.95	55.21	14.26	N	gnd
0.37	37.93	48.50	10.57	N	gnd
0.62	34.37	46.00	11.63	N	gnd
0.865	35.99	46.00	10.01	N	gnd
1.115	37.43	46.00	8.57	N	gnd
1.36	32.27	46.00	13.73	N	gnd
1.61	31.28	46.00	14.72	N	gnd
2.845	28.14	46.00	17.86	N	gnd
3.095	29.84	46.00	16.16	N	gnd
4.065	26.04	46.00	19.96	N	gnd
4.56	28.20	46.00	17.80	N	gnd
5.82	33.38	50.00	16.62	N	gnd
10.025	31.93	50.00	18.07	N	gnd

* limit exceeded

Indicated Phase/PE shows Configuration of max. Emission

Compliance Engineering Ireland Ltd

16 Jan 2023 15:05

Conducted Emissions

EUT: 24V
Manuf: Vox Power
Op Cond: Normal
Operator: E.Duignan
Test Spec: EN 55022 Class B
Comment: Live
DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	ltn

Final Measurement:	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	25
	Acc Margin:	20 dB

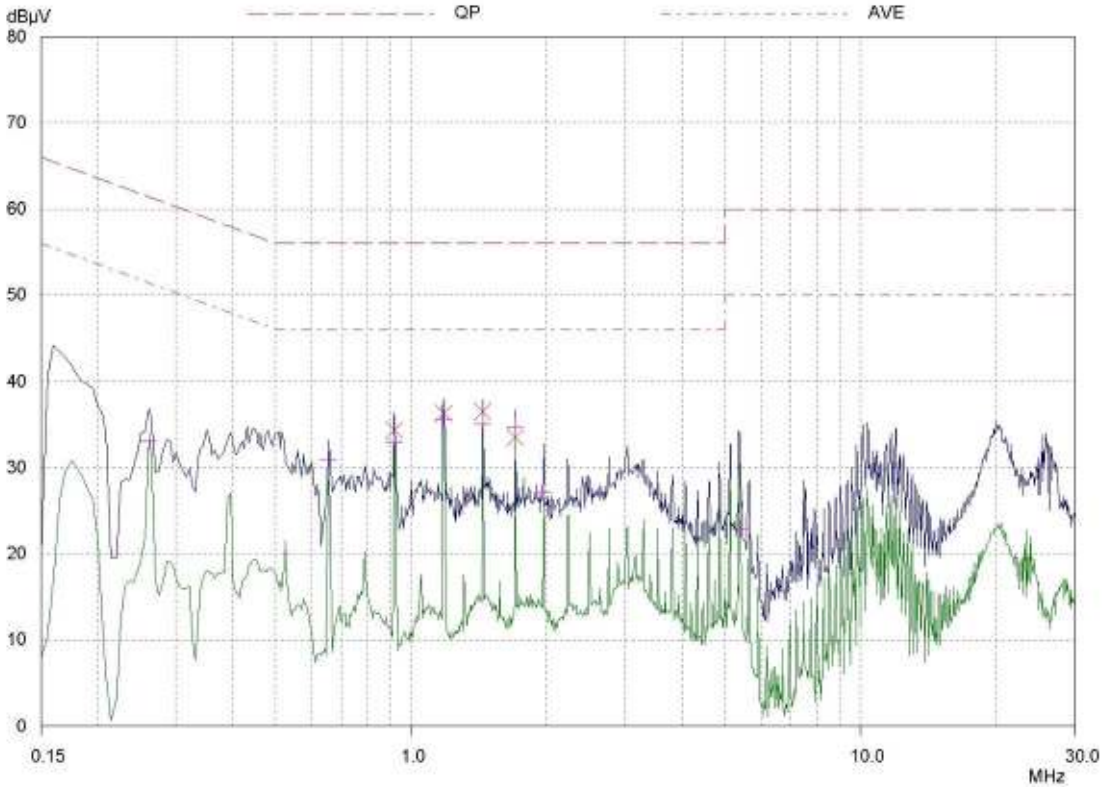


Figure 3: Conducted Emissions 24V, LIVE

Compliance Engineering Ireland Ltd

16 Jan 2023 15:05

Conducted Emissions

EUT: 24V
 Manuf: Vox Power
 Op Cond: Normal
 Operator: E.Duignan
 Test Spec: EN 55022 Class B
 Comment: Live
 DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	ltn

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 20 dB

Final Measurement Results

Frequency MHz	QP Level dBuV	QP Limit dBuV	QP Delta dB	Phase	PE
0.915	34.29	56.00	21.71	N	gnd
1.18	36.30	56.00	19.70	N	gnd
1.44	36.44	56.00	19.56	N	gnd
1.7	33.45	56.00	22.55	N	gnd

Frequency MHz	AV Level dBuV	AV Limit dBuV	AV Delta dB	Phase	PE
0.26	33.02	51.43	18.41	N	gnd
0.855	30.86	46.00	15.14	N	gnd
0.915	32.92	46.00	13.08	N	gnd
1.18	35.59	46.00	10.41	N	gnd
1.44	34.98	46.00	11.02	N	gnd
1.705	34.70	46.00	11.30	N	gnd
1.965	27.08	46.00	18.92	N	gnd
5.37	22.85	50.00	27.15	N	gnd

* limit exceeded

Indicated Phase/PE shows Configuration of max. Emission

Compliance Engineering Ireland Ltd

16 Jan 2023 15:18

Conducted Emissions

EUT: 24V
Manuf: Vox Power
Op Cond: Normal
Operator: E.Duignan
Test Spec: EN 55022 Class B
Comment: Neutral
DC Mains

Scan Settings			(1 Range) Frequencies			Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	ltn

Final Measurement:	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	25
	Acc Margin:	20 dB

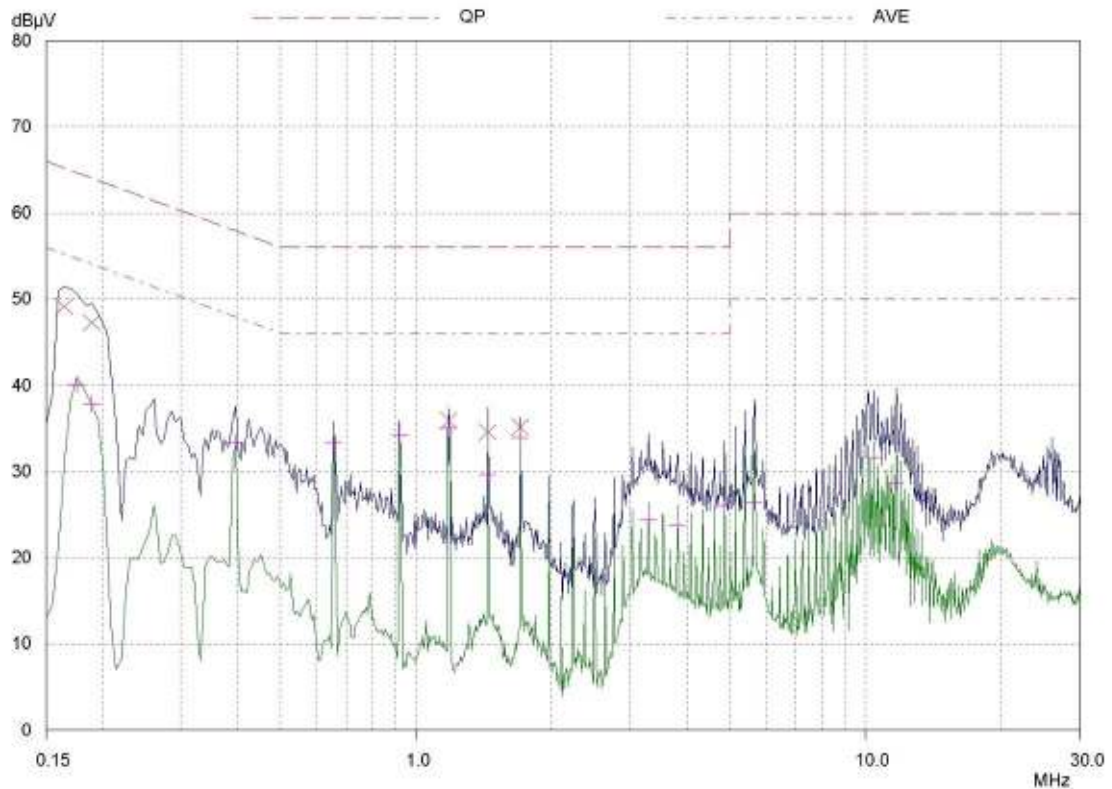


Figure 4: Conducted Emissions 24V, NEUTRAL

Compliance Engineering Ireland Ltd

16 Jan 2023 15:18

Conducted Emissions

EUT: 24V
 Manuf: Vox Power
 Op Cond: Normal
 Operator: E.Duignan
 Test Spec: EN 55022 Class B
 Comment: Neutral
 DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	ltn

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 20 dB

Final Measurement Results

Frequency MHz	QP Level dBuV	QP Limit dBuV	QP Delta dB	Phase	PE
0.165	49.13	65.21	16.08	N	gnd
0.19	47.24	64.04	16.80	N	gnd
1.18	35.90	56.00	20.10	N	gnd
1.44	34.55	56.00	21.45	N	gnd
1.705	35.14	56.00	20.86	N	gnd

Frequency MHz	AV Level dBuV	AV Limit dBuV	AV Delta dB	Phase	PE
0.175	40.05	54.72	14.67	N	gnd
0.19	37.80	54.04	16.24	N	gnd
0.395	33.29	47.96	14.67	N	gnd
0.655	33.44	46.00	12.56	N	gnd
0.92	34.21	46.00	11.79	N	gnd
1.18	34.97	46.00	11.03	N	gnd
1.44	29.66	46.00	16.34	N	gnd
1.705	33.84	46.00	12.16	N	gnd
3.28	24.40	46.00	21.60	N	gnd
3.805	23.80	46.00	22.20	N	gnd
4.855	26.09	46.00	19.91	N	gnd
5.64	26.42	50.00	23.58	N	gnd
10.37	31.60	50.00	18.40	N	gnd
11.66	28.70	50.00	21.30	N	gnd

* limit exceeded

Indicated Phase/PE shows Configuration of max. Emission

Compliance Engineering Ireland Ltd

16 Jan 2023 15:36

Conducted Emissions

EUT: 36V
 Manuf: Vox Power
 Op Cond: Normal
 Operator: E.Duignan
 Test Spec: EN 55022 Class B
 Comment: Live
 DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	
Transducer	No.	Start	Stop	Name					
	2	150kHz	30MHz	liss					
Final Measurement:		Detectors:	X QP / + AV						
		Meas Time:	1sec						
		Subranges:	25						
		Acc Margin:	20 dB						

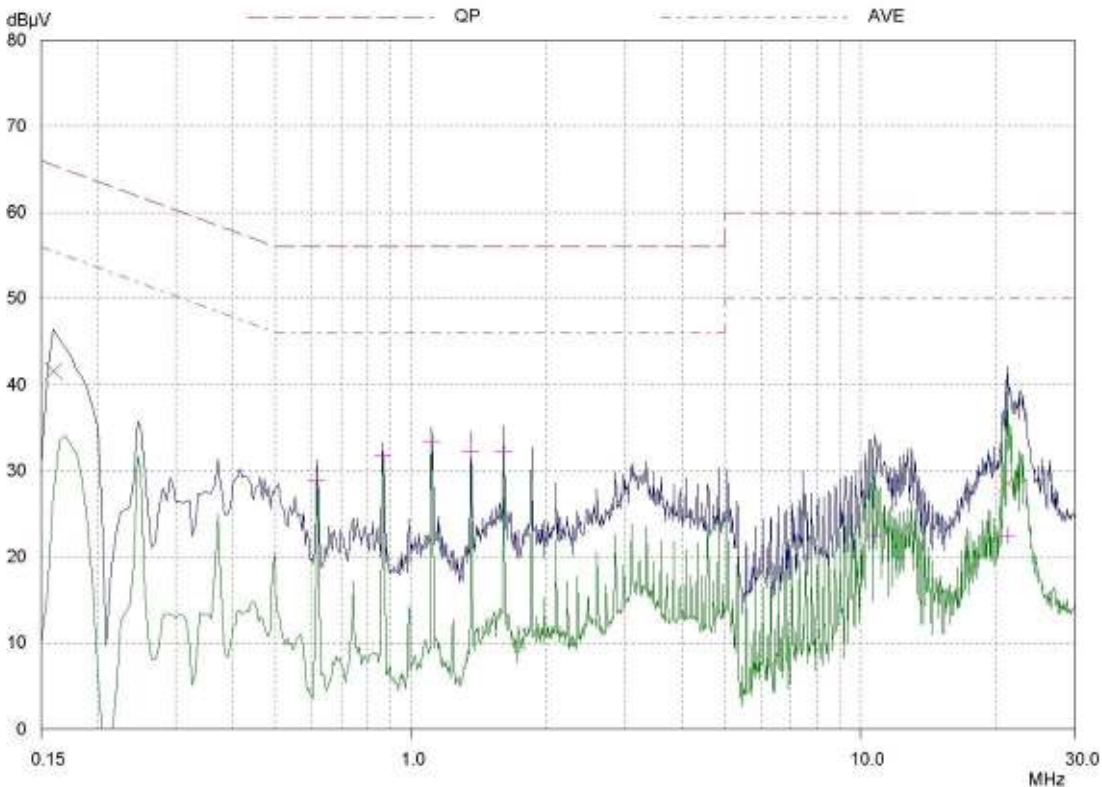


Figure 5: Conducted Emissions 36V, LIVE

Compliance Engineering Ireland Ltd

16 Jan 2023 15:36

Conducted Emissions

EUT: 36V
 Manuf: Vox Power
 Op Cond: Normal
 Operator: E.Duignan
 Test Spec: EN 55022 Class B
 Comment: Live
 DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	ltn

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 20 dB

Final Measurement Results

Frequency MHz	QP Level dBuV	QP Limit dBuV	QP Delta dB	Phase	PE
0.16	41.53	65.46	23.93	N	gnd
21.18	28.52	60.00	31.48	N	gnd

Frequency MHz	AV Level dBuV	AV Limit dBuV	AV Delta dB	Phase	PE
0.615	28.80	46.00	17.20	N	gnd
0.865	31.67	46.00	14.33	N	gnd
1.11	33.42	46.00	12.58	N	gnd
1.355	32.23	46.00	13.77	N	gnd
1.605	32.29	46.00	13.71	N	gnd
10.73	22.47	50.00	27.53	N	gnd
21.18	22.44	50.00	27.56	N	gnd

* limit exceeded

Indicated Phase/PE shows Configuration of max. Emission

Compliance Engineering Ireland Ltd

16 Jan 2023 15:53

Conducted Emissions

EUT: 36V
Manuf: Vox Power
Op Cond: Normal
Operator: E.Duignan
Test Spec: EN 55022 Class B
Comment: Neutral
DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	lisn

Final Measurement:	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	25
	Acc Margin:	20 dB

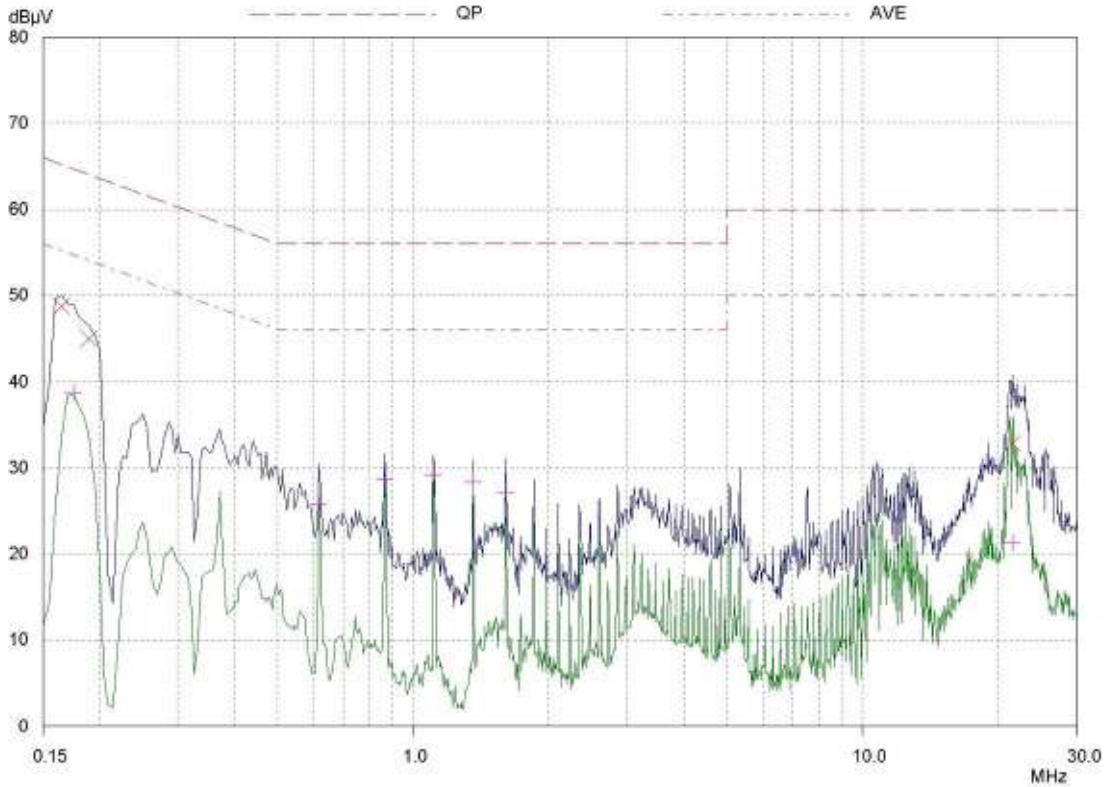


Figure 6: Conducted Emissions 36V, NEUTRAL

Compliance Engineering Ireland Ltd

16 Jan 2023 15:53

Conducted Emissions

EUT: 36V
 Manuf: Vox Power
 Op Cond: Normal
 Operator: E.Duignan
 Test Spec: EN 55022 Class B
 Comment: Neutral
 DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	lisc

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 20 dB

Final Measurement Results

Frequency MHz	QP Level dBuV	QP Limit dBuV	QP Delta dB	Phase	PE
0.165	48.69	65.21	16.52	N	gnd
0.19	44.94	64.04	19.10	N	gnd
21.44	32.83	60.00	27.17	N	gnd

Frequency MHz	AV Level dBuV	AV Limit dBuV	AV Delta dB	Phase	PE
0.175	38.64	54.72	16.08	N	gnd
0.615	25.74	46.00	20.26	N	gnd
0.865	28.73	46.00	17.27	N	gnd
1.11	29.19	46.00	16.81	N	gnd
1.36	28.33	46.00	17.67	N	gnd
1.605	27.15	46.00	18.85	N	gnd
21.44	21.25	50.00	28.75	N	gnd

* limit exceeded

Indicated Phase/PE shows Configuration of max. Emission

Compliance Engineering Ireland Ltd

16 Jan 2023 16:09

Conducted Emissions

EUT: 48V
Manuf: Vox Power
Op Cond: Normal
Operator: E.Duignan
Test Spec: EN 55022 Class B
Comment: Live
DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	l5n

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 20 dB

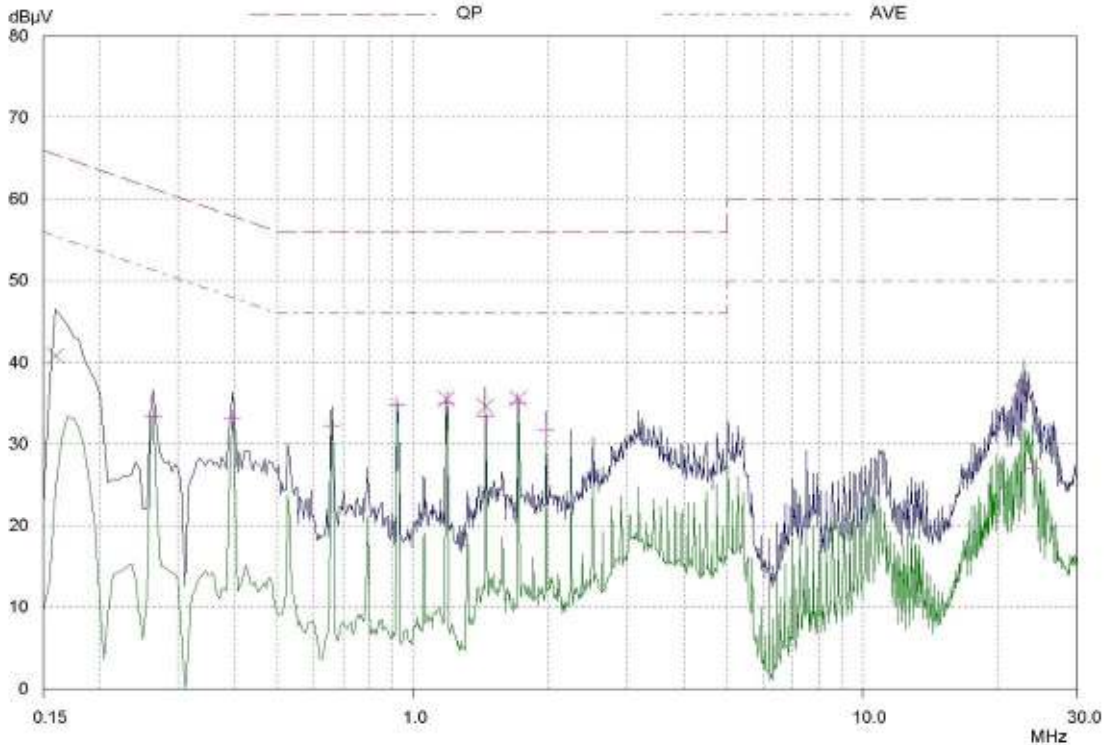


Figure 7: Conducted Emissions 48V, LIVE

Compliance Engineering Ireland Ltd
 Conducted Emissions

16 Jan 2023 16:09

EUT: 48V
 Manuf: Vox Power
 Op Cond: Normal
 Operator: E.Duignan
 Test Spec: EN 55022 Class B
 Comment: Live
 DC Mains

Scan Settings			(1 Range) Frequencies		Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	
Transducer	No.	Start	Stop	Name					
	2	150kHz	30MHz	Isn					
Final Measurement:		Detectors:	X QP / + AV						
		Meas Time:	1sec						
		Subranges:	25						
		Acc Margin:	20 dB						

Final Measurement Results

Frequency MHz	QP Level dBuV	QP Limit dBuV	QP Delta dB	Phase	PE
0.16	40.79	65.46	24.67	N	gnd
1.185	35.50	56.00	20.50	N	gnd
1.45	34.59	56.00	21.41	N	gnd
1.71	35.58	56.00	20.42	N	gnd
22.755	36.33	60.00	23.67	N	gnd

Frequency MHz	AV Level dBuV	AV Limit dBuV	AV Delta dB	Phase	PE
0.265	33.45	51.27	17.82	N	gnd
0.395	33.18	47.96	14.78	N	gnd
0.66	32.33	46.00	13.67	N	gnd
0.92	34.83	46.00	11.17	N	gnd
1.185	34.98	46.00	11.02	N	gnd
1.45	33.40	46.00	12.60	N	gnd
1.71	35.02	46.00	10.98	N	gnd
1.975	31.60	46.00	14.40	N	gnd
23.675	27.03	50.00	22.97	N	gnd

* limit exceeded

Indicated Phase/PE shows Configuration of max. Emission

Compliance Engineering Ireland Ltd

16 Jan 2023 16:23

Conducted Emissions

EUT: 48V
Manuf: Vox Power
Op Cond: Normal
Operator: E. Duignan
Test Spec: EN 55022 Class B
Comment: Neutral
DC Mains

Scan Settings				Receiver Settings				
(1 Range) Frequencies								
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	lisa

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 20 dB

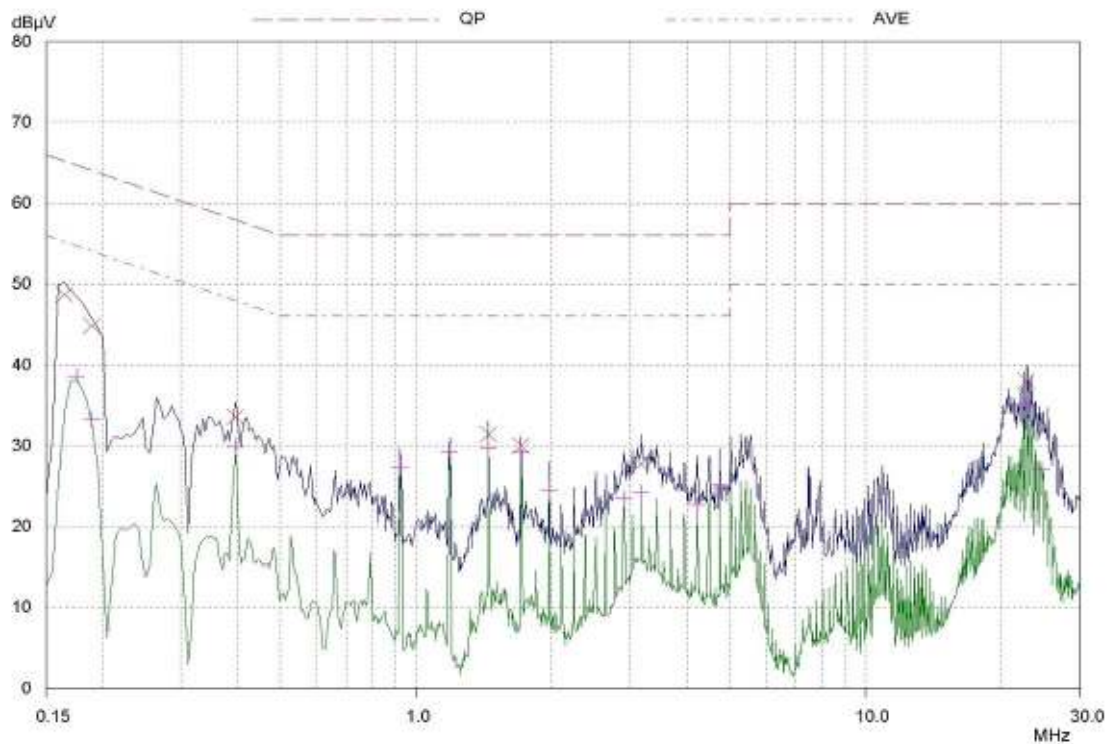


Figure 8: Conducted Emissions 48V, NEUTRAL

Compliance Engineering Ireland Ltd

16 Jan 2023 16:23

Conducted Emissions

EUT: 48V
 Manuf: Vox Power
 Op Cond: Normal
 Operator: E.Duignan
 Test Spec: EN 55022 Class B
 Comment: Neutral
 DC Mains

Scan Settings		(1 Range) Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB	

Transducer	No.	Start	Stop	Name
	2	150kHz	30MHz	Isn

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 20 dB

Final Measurement Results

Frequency MHz	QP Level dBuV	QP Limit dBuV	QP Delta dB	Phase	PE
0.165	48.67	65.21	16.54	N	gnd
0.19	44.80	64.04	19.24	N	gnd
0.395	33.58	57.96	24.38	N	gnd
1.445	31.42	56.00	24.58	N	gnd
1.71	29.96	56.00	26.04	N	gnd
3.155	27.73	56.00	28.27	N	gnd
22.765	37.96	60.00	22.04	N	gnd

Frequency MHz	AV Level dBuV	AV Limit dBuV	AV Delta dB	Phase	PE
0.175	38.51	54.72	16.21	N	gnd
0.19	33.22	54.04	20.82	N	gnd
0.395	29.87	47.96	18.09	N	gnd
0.92	27.28	46.00	18.72	N	gnd
1.185	29.17	46.00	16.83	N	gnd
1.445	29.75	46.00	16.25	N	gnd
1.71	29.14	46.00	16.86	N	gnd
1.975	24.47	46.00	21.53	N	gnd
2.895	23.43	46.00	22.57	N	gnd
3.155	24.17	46.00	21.83	N	gnd
4.21	22.65	46.00	23.35	N	gnd
4.735	25.11	46.00	20.89	N	gnd
22.765	34.81	50.00	15.19	N	gnd
24.605	27.02	50.00	22.98	N	gnd

* limit exceeded

Indicated Phase/PE shows Configuration of max. Emission