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EMC Test Report for Vox Power Ltd

Report Reference: 13E4772-3

Vox Power Product: Nevo+1200S & Nevo+1200M

JANUARY 2017

COMPLIANCE ENGINEERING IRELAND LTD.

Client:	Test of:
VOX Power, **Vox Power Ltd** **Unit 2** **Red Cow interchange estate** **Ballymount** **Dublin 22** **Attention: Mr. Brian McDonald**	**NEVO+1200ML & NEVO+1200M** **NEVO+1200SL & NEVO+1200S,** **Modular Power supply system** **To:** **EN 55011: 2009 + A1: 2010** **EN 60601-1-2: 2007 (3rd Edition)** **EN 60601-1-2: 2014 (4th Edition)** **EN 61000-6-2: 2005** **EN 61000-3-2: 2014** **EN 61000-3-3: 2013**

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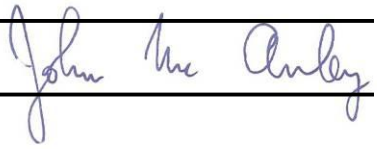
	SIGNATURE: 

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Executive Summary

The equipment under test fulfils the standards listed below

Standard	Test result
EN 60601-1-2: 2014 (4th Edition) Title: Medical Electrical Equipment Section 1.2: Collateral standard: Electromagnetic Compatibility – Requirements and tests.	**Pass**
EN 61000-6-3: 2007 Title: Generic Standard Section 6.3: Emission Standard for residential, commercial and light industrial environments.	**Pass**
EN 61000-6-2: 2005 Title: Generic Standard Section 6.2: Immunity for industrial Environments	**Pass**
EN 61000-6-1:2007 Generic Standard Immunity for residential, commercial and light-industrial environments	**Pass**

Declaration of conformity
The intention of these tests is such that the following statement can be added to the Declaration of Conformity I.e. DoC

The NEVO+1200 S/SL/M/ML products comply with the EMC directive 2014/30/EU, EMC directive.

Conformity was demonstrated by testing to and passing the limits set in the following standards.

EN55011:2009 +A1:2010 Class B
EN61000-3-2:2014
EN61000-3-3:2013
EN60601-1-2:2007 (3RD Edition)
EN60601-1-2:2014 (4TH Edition)

Guidance and manufacturer's declaration – electromagnetic emissions		
The Device is intended for use in the electromagnetic environment specified below. The customer or the user of the Device should assure that it is used in such an environment		
Emissions test	**Compliance**	
RF Emissions CISPR 11 EN 55011: 2009 + A1: 2010	Group 1	The Device must emit electromagnetic energy in order to perform its intended function. Nearby electronic equipment may be affected.
RF Emissions CISPR 11 EN 55011: 2009 + A1: 2010	Class B	Class B equipment is equipment suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes. In the documentation for the user, a statement shall be included drawing attention to the fact that there may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.
Harmonic emissions IEC 61000-3-2 EN 61000-3-2: 2014	Class A	
Voltage fluctuations / flicker emissions IEC 61000-3-3 EN 61000-3-3: 2013	All Parameters	

Table 201 – Guidance and manufacturer's declaration – electromagnetic emissions – for all equipment and systems

Guidance and manufacturer's declaration – electromagnetic immunity			
The Device is intended for use in the electromagnetic environment specified below. The customer or the user of the Device should assure that it is used in such an environment			
Immunity test	**IEC 60601 Test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2 EN 61000-4-2: 2009	±8 kV contact ±15 kV air	±2, 4, 6 & 8 kV contact ±2, 4, 8 & 15 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4 EN 61000-4-4: 2012	±2kV for power supply lines ±1 kV for input/output lines	±2kV for power supply lines ±1kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment
Surge IEC 61000-4-5 EN 61000-4-5: 2006	±1kV differential mode ±2 kV common mode	±0.5 & 1kV differential mode ±0.5, 1 & 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11 EN 61000-4-11: 2004	<5 % Ut (>95 % dip in Ut) for 0.5 cycle @ 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315° 70 % Ut (30 % dip in Ut) for 25 cycles <5 % Ut (>95 % dip in Ut) for 5 sec <5 % Ut (>95 % dip in Ut) for 1 cycle 40 % Ut (>60 % dip in Ut) for 5 cycle	<5 % Ut (>95 % dip in Ut) for 0.5 cycle @ 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315° 70 % Ut (30 % dip in Ut) for 25 cycles <5 % Ut (>95 % dip in Ut) for 5 sec <5 % Ut (>95 % dip in Ut) for 1 cycle 40 % Ut (>60 % dip in Ut) for 5 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the Device requires continued operation during power mains operation, it is recommended that the Device must be powered from an uninterruptible power supply or battery
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8 EN 61000-4-8: 2010	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment

Note: Ut is the a.c.mains voltage prior to application of the test level

Table 202 – Guidance and manufacturer's declaration – electromagnetic immunity – for all equipment and systems

Guidance and manufacturer's declaration – electromagnetic immunity			
The Device is intended for use in the electromagnetic environment specified below. The customer or the user of the Device should assure that it is used in such an environment			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
			Portable and mobile RF communications equipment should be used no closer to any part of the EUT, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance**
Conducted RF IEC 61000-4-6 EN 61000-4-6: 2014	3 Vrms outside industrial, scientific and medical (ISM) and amateur radio bands. 6 Vrms in ISM and amateur radio bands 150 kHz to 80 MHz	6 Vrms 150 kHz to 80 MHz	d = [1.17]√P
Radiated RF IEC 61000-4-3 EN 61000-4-3: 2006 + A1: 2008 + A2: 2010	10 V/m 80 MHz to 2.7 GHz	10 V/m 80 MHz to 2.7 GHz	d = [1.17]√P…80MHz to 800 MHz d = [2.33]√P…800 MHz to 2.5GHz
	27 V/m, 18 Hz PM 385 MHz 28 V/m, 50 %18 Hz PM 450 MHz 9 V/m, 217 Hz PM 710 MHz 9 V/m, 217 Hz PM 745 MHz 9 V/m, 217 Hz PM 780 MHz 28V/m, 18 Hz PM 810 MHz 28 V/m, 18 Hz PM 870 MHz 28 V/m, 18 Hz PM 930 MHz 28V/m, 217 Hz PM 1720 MHz	27 V/m, 18 Hz PM 385 MHz 28 V/m, 50 %18 Hz PM 450 MHz 9 V/m, 217 Hz PM 710 MHz 9 V/m, 217 Hz PM 745 MHz 9 V/m, 217 Hz PM 780 MHz 28V/m, 18 Hz PM 810 MHz 28 V/m, 18 Hz PM 870 MHz 28 V/m, 18 Hz PM 930 MHz 28V/m, 217 Hz PM 1720 MHz	Where P is the maximum output power rating of the transmitter in Watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m) Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, [a] should be less than the compliance level in each frequency range. [b] Interference may occur in the vicinity of equipment marked with the following symbol 

	28 V/m, 217 Hz PM 1845 MHz 28 V/m, 217 Hz PM 1970 MHz 27 V/m, 217 Hz PM 2450 MHz 9V/m, 217 Hz PM 5240 MHz 9 V/m, 217 Hz PM 5500 MHz 9 V/m, 217 Hz PM 5785 MHz	28 V/m, 217 Hz PM 1845 MHz 28 V/m, 217 Hz PM 1970 MHz 27 V/m, 217 Hz PM 2450 MHz 9V/m, 217 Hz PM 5240 MHz 9 V/m, 217 Hz PM 5500 MHz 9 V/m, 217 Hz PM 5785 MHz	
Note 1: At 80 MHz and 800 MHz, the higher frequency range applies Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the EUT is used exceeds the applicable RF compliance level above, the EUT should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orientating or relocating the EUT. b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than $[V_1]$V/m			

Table 204 – Guidance and manufacturer's declaration – electromagnetic immunity – for equipment and systems that are not life-supporting

Recommended separation distances between portable and mobile RF communication equipment and the EUT			
The Device is intended for use in an electromagnetic environment specified in Table 201. The customer or the user of the Device can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Device as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output power of transmitter W	**Separation distance according to frequency of transmitter m**		
	150 kHz to 80 MHz $d = [1.17]\sqrt{P}$	**80 MHz to 800 MHz** $d = [1.17]\sqrt{P}$	**800 MHz to 2.5GHz** $d = [2.33]\sqrt{P}$
0.01	**0.12**	**0.12**	**0.23**
0.1	**0.37**	**0.37**	**0.75**
1	**1.17**	**1.17**	**2.33**
10	**3.70**	**3.70**	**7.36**
100	**11.70**	**11.70**	**23.30**
For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where *P* is the maximum output power rating of the transmitter in watts (w) according to the transmitter manufacturer. NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

Table 206 – Recommended separation distances between portable and mobile RF communications equipment and the equipment and system – for equipment and systems that are not life supporting

Table of Contents

1 Equipment under Test (E.U.T.)

1.1 Identification of E.U.T.

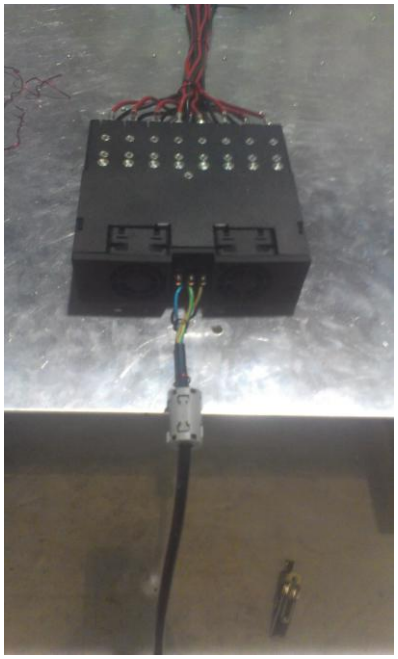
Brand Name:	Nevo + 1200S/SL, Nevo + 1200M/ML
Description:	1200W Configurable Modular PSU
Model Number:	1200 S, 1200M
Serial Number:	1340A003
Cables:	Mains Cable
Country of Manufacture:	Ireland

1.2 Description of E.U.T.

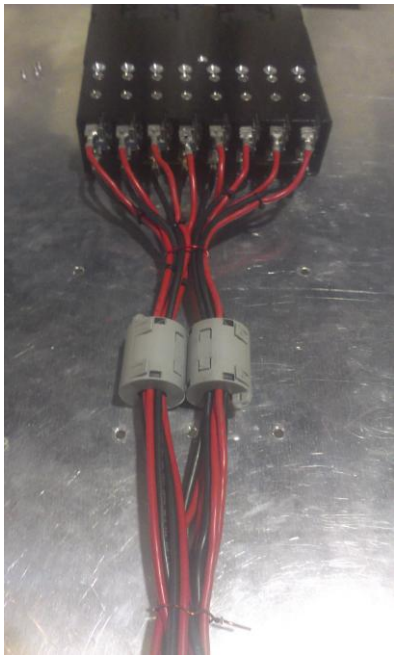
The EUT mains powered 1200 watt modular configurable PSU.

1.3 Modifications incorporated in E.U.T.

A ferrite (TDK - ZCAT2032-0930) was fitted to the input mains cable to comply with EN55022 Radiated emissions Class B
Two ferrites (TDK - ZCAT3035-1330) were fitted to the output mains cable to comply with EN55022 Radiated emissions Class B



Input Cable Ferrite



Output Cable Ferrite

1.4 Support Equipment List

No Support Equipment was required.

1.5 Date of Test

The tests were carried during the months of August and October 2013.

Additional testing required to meet EN 60601-1-2: 2014 (4th Edition) was carried out between the 5th and 8th of December 2016.

2 Test Specification, Methods and Procedures

2.1 Emissions

Emissions were assessed to the following standards:

EN 55011: Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.

EN 61000-3-2: Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

EN 61000-3-3: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection

2.2 Immunity

Immunity was assessed according to the following standards:

EN 61000-6-1: Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments

EN 61000-4-2	Electromagnetic Compatibility (EMC) Part4: Testing and measurement techniques Section2: Electrostatic discharge immunity test
EN 61000-4-3	Electromagnetic Compatibility (EMC) Part4: Testing and measurement techniques Section3: Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4	Electromagnetic Compatibility (EMC) Part4: Testing and measurement techniques Section4: Electrical fast transient/burst immunity test
EN 61000-4-5	Electromagnetic compatibility (EMC) Part 4. Testing and measurement techniques. Section 5: Surge immunity test.
EN 61000-4-6	Electromagnetic compatibility (EMC) Part 4. Testing and measurement techniques. Section 6: Immunity to Conducted disturbances, induced by Radio-frequency fields.
EN 61000-4-8	Electromagnetic Compatibility (EMC) Part4: Testing and measurement techniques Section4: Power frequency magnetic field immunity test
EN 61000-4-11	Electromagnetic compatibility (EMC) Part 4. Testing and measurement techniques. Section 11: Voltage dips, short interruptions and voltage variations 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 and 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: 230 Vac, 50 Hz for all tests and repeated at 120 Vac for EN 61000-4-11.

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

Temperature: 19-20°C
Humidity: 54-56% RH

4.2 Operating Modes:

The E.U.T was connected to a bank of power resistors which loaded with DC output with 1 ohm.

The maximum clocking source in the EUT was 260 kHz

4.3 Compliance Criteria:

For radiated and conducted emissions, compliance was determined by comparing the measured results to the appropriate limits.

For immunity testing, compliance was determined by monitoring the output LED's and voltage for any signs of disturbance.

4.4 Criteria for compliance during immunity test

4.4.1 Performance Criteria A

During testing, normal performance within the specification limits.

4.4.2 Performance Criteria B

After the test the EUT shall maintain normal operation with no degradation of performance or loss of function.

4.4.3 Performance Criteria C

After the test it shall be possible to restart the EUT and regain normal operation with no degradation of performance or loss of function.

5 Results

5.1 Conducted Emissions

Voltage & Frequency: 230V 50Hz

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.

Appendix 3 illustrate the results. The test configuration is shown in Appendix 2.

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 an 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. See Appendix 3 for results.

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

a) Radiated RF EM fields

Port:	Enclosure
Basic Standard:	EN 61000-4-3
Limit:	10 V/m (80% AM 1 kHz modulation)
Frequency range:	80-2700 MHz
Dwell time:	3 second dwell
Performance Criteria:	A

The EUT was placed in the anechoic chamber.

The step sizes from 80-2700MHz were in 1% steps. The dwell time at each frequency was 3 seconds. The test level was maintained at over 10 V/m at all frequencies 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.

Radiated Immunity Tests

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

b) Proximity fields from RF wireless communications equipment

Port: Enclosure
Dwell time: 3 second dwell

The EUT was placed in the anechoic chamber.

The testing was carried out on the spot frequencies as listed below. The dwell time at each frequency was at least 3 seconds.

A field sensor was placed in close proximity to the system. 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 with Performance Criteria A when tested in accordance with the manufacturer's specification.

Radiated Immunity Tests

Frequency MHz	Modulation Frequency	Polarisation (V/H)	Level (V/m)	Result
385	18 Hz Pulse Modulation	V and H	27	Complied
450	50% 18 Hz Pulse Modulation	V and H	28	Complied
710	217 Hz Pulse Modulation	V and H	9	Complied
745	217 Hz Pulse Modulation	V and H	9	Complied
780	217 Hz Pulse Modulation	V and H	9	Complied
810	18 Hz Pulse Modulation	V and H	28	Complied
870	18 Hz Pulse Modulation	V and H	28	Complied
930	18 Hz Pulse Modulation	V and H	28	Complied
1720	217 Hz Pulse Modulation	V and H	28	Complied
1845	217 Hz Pulse Modulation	V and H	28	Complied
1970	217 Hz Pulse Modulation	V and H	28	Complied
2450	217 Hz Pulse Modulation	V and H	28	Complied
5240	217 Hz Pulse Modulation	V and H	9	Complied
5500	217 Hz Pulse Modulation	V and H	9	Complied
5785	217 Hz Pulse Modulation	V and H	9	Complied

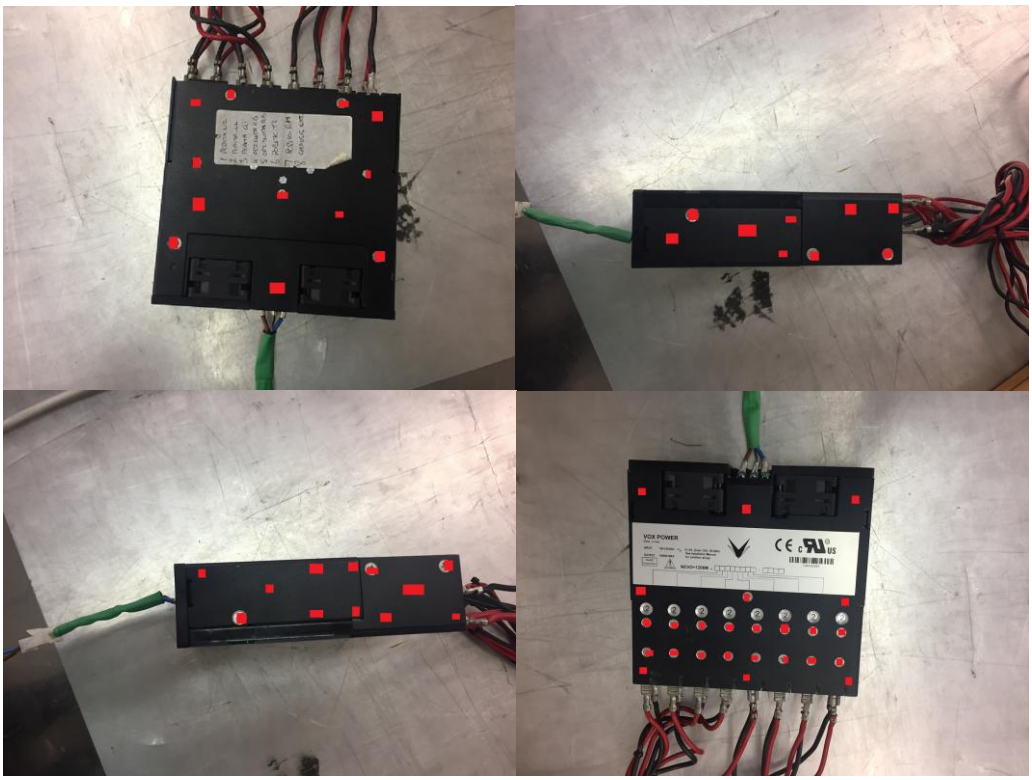
5.4 Electrostatic Discharge Test

Port:	Enclosure
Basic Standard:	EN 61000-4-2
Limit:	±2, ±4 & ±8 kV contact discharges
	±2, ±4, ±8 & ±15 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 ±2, ±4, ±8 & ±15 kV, were applied to different points on the enclosure. Contact discharges of ±2, ±4 & ±8 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.



ESD Discharge Points

5.5 Conducted RF Immunity

Ports: AC mains.
Basic Standard: EN 61000-4-6
Performance Criterion: A
Limit: 10V emf, 80% AM modulation
Frequency range: 150 kHz to 80 MHz

The EUT was arranged according to the EN61000-4-6.

The test configuration is shown in Appendix 2.

The current was injected on the mains cable in common mode. 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 10V emf into a 150-ohm system. The dwell time at each frequency was 3 seconds.

The E.U.T. was found to be operating satisfactorily during and subsequent to testing.

Port	Disturbance type	Result
Mains	10V emf, 150 kHz – 80 MHz	Complied

Results of Conducted Immunity Testing

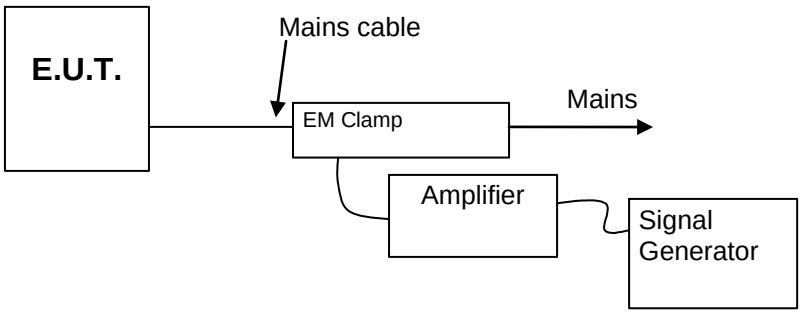


Figure 5: Conducted Immunity Test Set up

5.6 Electrical Fast Transient Test

Ports: AC mains
Basic Standard: EN 61000-4-4
Performance Criterion: A
Level: 4
Limit: ±1, ±2 & ±4 kV mains power ports

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

The test configuration is shown in Appendix 2.

The tests were carried out with negative and positive transients. The application time for each test was 1 minute.

The E.U.T. was found to be operating satisfactorily during and subsequent to testing.

Test port	Level	Result
Live	±1, ±2, ±4 kV	Complied
Neutral	±1, ±2, ±4 kV	Complied
L-N-E	±1, ±2, ±4 kV	Complied
Earth	±1, ±2, ±4 kV	Complied

5.7 Surge Immunity Test

Ports: AC Mains
Basic Standard: EN 61000-4-5
Performance Criterion: A
Level: 3
Limit, Line to Earth: ±0.5, ±1 & ±2 kV
Limit, Live to Neutral: ±0.5 & ±1 kV

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 and line to earth.

The test configuration is shown in Appendix 2.

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 E.U.T. was found to be operating satisfactorily during and subsequent to testing.

Results of Surge Immunity Testing

Port	Mode of conduction	Disturbance level	Result
PSU	L-E	± 0.5, ±1, ±2 kV	Complied
PSU	N-E	± 0.5, ±1, ±2 kV	Complied
PSU	L-N	± 0.5, ±1 kV	Complied

5.8 Voltage Dips & Interruptions Test

Ports:	AC Mains
Basic Standard:	EN 61000-4-11
Dips:	Mains port - > 95% dip 0.5 cycles At 0º, 45º, 90º, 135º, 180º, 225º, 270º & 315º Mains port - >95% dip 1 cycle Mains port – 30% dip 25 cycles Mains port – 60% dip 10 cycles
Interruption:	Mains port – Interruption 250 cycles

Dips and interruptions were applied to the mains input in accordance with the requirements of EN 61000-4-11.

The test configuration is shown in Appendix 2.

The E.U.T. was checked after each test run to ensure correct operation.

The E.U.T. was found to be operating satisfactorily during and subsequent to testing.

Results of Voltage Dips and Interruptions Testing

Port	Disturbance type	Result
Mains supply 240 Vac	>95% dip 0.5 cycles At 0º, 45º, 90º, 135º, 180º, 225º, 270º & 315º	Complied A
Mains supply 240 Vac	>95% dip 1 cycles	Complied A
Mains supply 240 Vac	30% dip 25 cycles	Complied A
Mains supply 240 Vac	60% dip 10 cycles	Complied A
Mains supply 240 Vac	>95% interruption 250 cycles	Complied C

5.9 Power Frequency Magnetic Field Immunity Test

Basic Standard: EN 61000-4-8
Performance Criterion: A
Limit: 30 A/m

The unit was placed on a non-conductive table of 0.8-meter height from the ground plane.

The test configuration is shown in Appendix 2.

The current level was set to 30 A/m and the unit was centred in the middle of the loop. The EUT was tested with the loop in both horizontal and vertical positions for one minute. The test was carried out at 230 Vac.

The EUT maintained normal operation during and subsequent to testing.

5.10 Fluctuating Harmonics

Ports: AC mains
Basic Standard: EN 61000-3-2
Class: A

The test measures the current at each of the harmonic frequencies from the second harmonic up to the fortieth harmonic.

A 50 Hertz, 230 Volt AC source was used to power the unit in compliance with EN 61000-3-2. The current harmonic levels were measured and compared with the limit levels for Class A waveforms. See Appendix 3 for results.

The test configuration is shown in Appendix 2.

5.11 Flicker

Ports: AC mains
Basic Standard: EN 61000-3-3

The E.U.T. was connected to an impedance network and a 50 Hertz, 230 Volt AC source to power the unit in compliance with EN 61000-3-3.

The mains voltage flicker test was performed for 120 minutes. The E.U.T. flicker levels were significantly below the limit. See Appendix 3 for results.

The test configuration is shown in Appendix 2.

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 to EN 55011.

The E.U.T. complied with the radiated emission specification of EN 55011 class A by a margin of 6.4 dB at frequency 116.240 Mhz.

The E.U.T. complied with the radiated emission specification of EN 55011 class B with a ferrite fitted as outlined in Section 1.3 by a margin of 2.0 dB at frequency 229.652 Mhz.

6.3 Conducted Emissions to EN 55011.

The E.U.T. complied with the EN 55011 Class B conducted emission specification by a margin of greater than 1 dB (Ave detector)

6.4 Immunity.

The EUT complied with the immunity tests carried out to demonstrate compliance with EN 61000-6-2 & EN 60601-1-2 when tested in accordance with the manufacturers specifications.

6.5 Steady State and Fluctuating Harmonics

The E.U.T. complied with the tests carried out to demonstrate compliance with EN 61000-3-2.

6.6 Flicker

The E.U.T. complied with the tests carried out to demonstrate compliance with EN 61000-3-3.

Appendix 1

Test Equipment Used:

Instrument	Mftr.	Model	Serial No.
Measuring Receiver	Rohde and Schwarz	ESVS30	607
Measuring Receiver	Rohde and Schwarz	ESHS30	605
LISN	Rohde and Schwarz	ESH3-Z5	604
Signal Generator	Rohde and Schwarz	SME 03	765
Signal Generator	Rohde and Schwarz	SME 03	782
Power Amplifier	Ophir	5292FE	-
Anachoic Chamber	CEI	CEI	845
Power Amplifier	Schaffner	CBA9433	-
Field Monitor System	Amplifier Research	FM2000	616
Field Probe	Amplifier Research	FP2000	616
Bilog Antenna	Schaffner	CBL6140	-
Bilog Antenna	Schwarbeck	VULB9160	889
Transient Simulator	EMC Partner	TEMA 4000	921
Anechoic Chamber	CEI	-	845
Anechoic Chamber	CEI	-	627
N Type Cable	-	615	615
BNC Cable	-	601	601
EM Clamp	Schaffner	KEMZ 801	727
Directional Coupler	Lab Plant	RX 1026	738

Appendix 2

Test Configurations

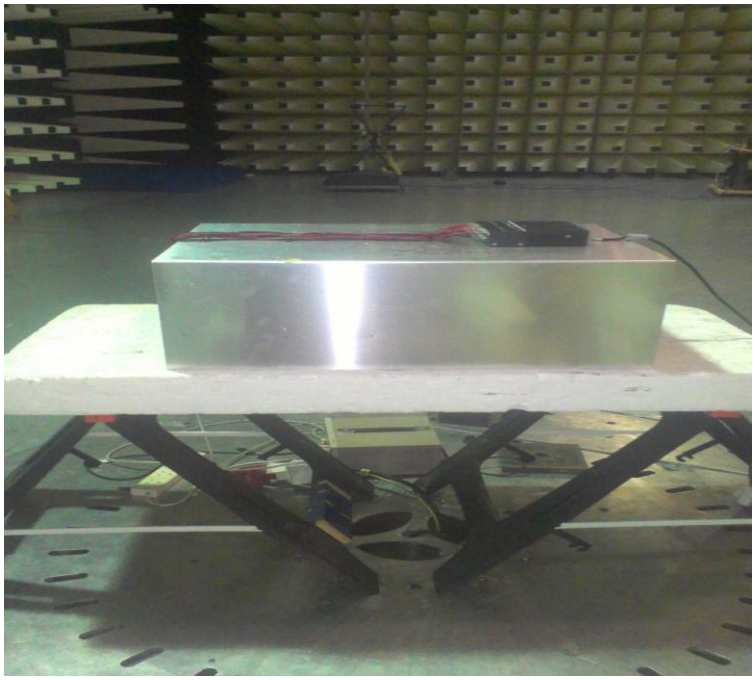


Figure 1: Radiated Emissions Test Set up

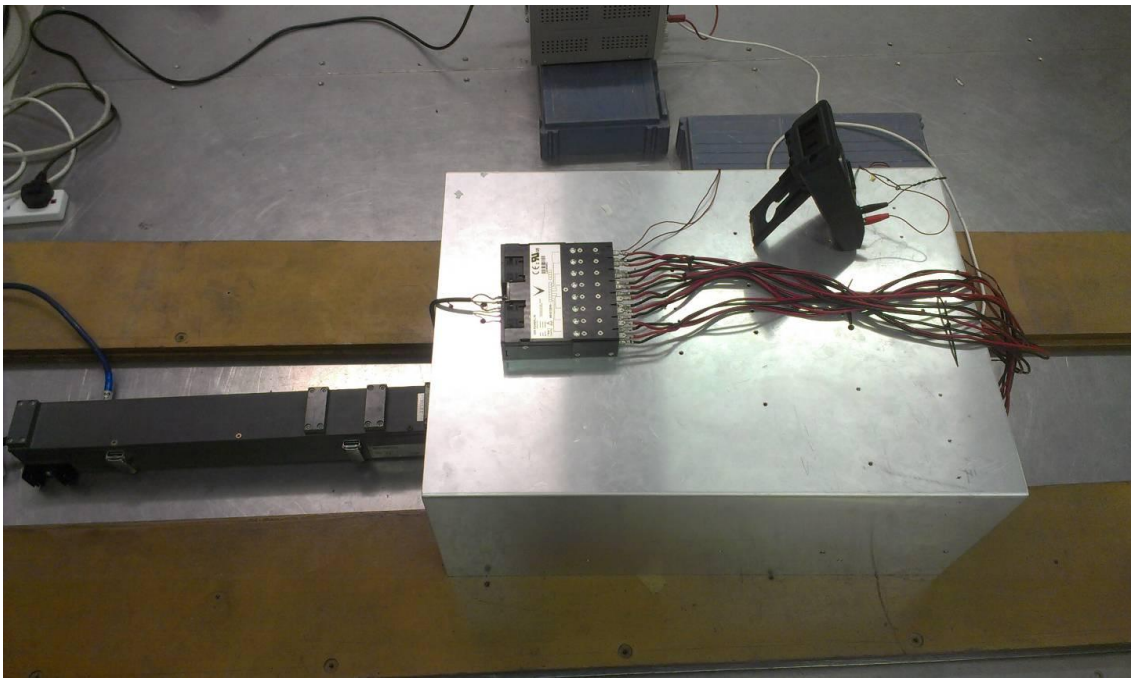


Figure 2: Conducted Immunity Test Set up

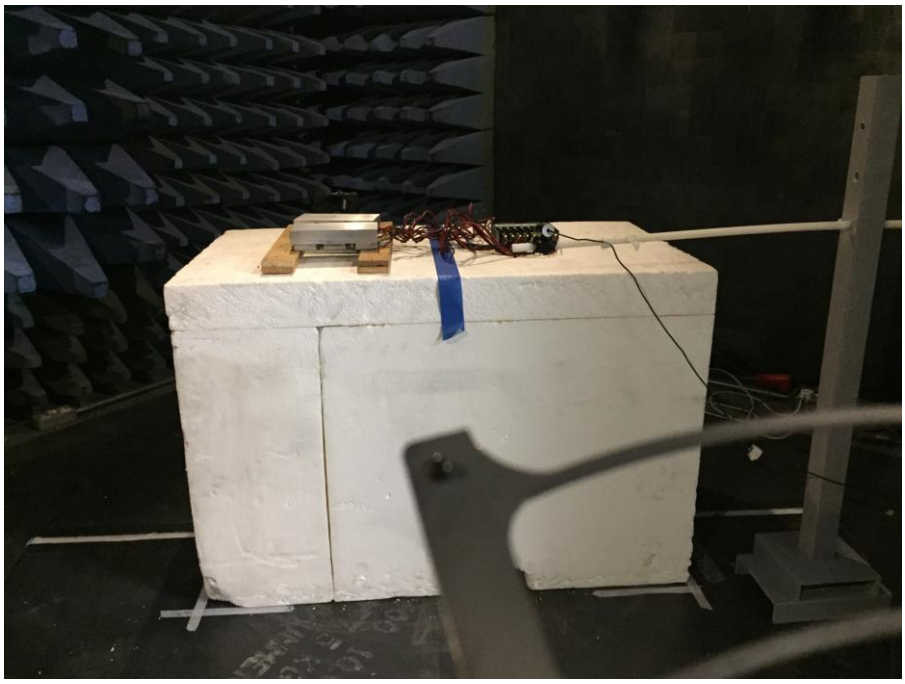


Figure 3: Radiated Immunity Test Set up

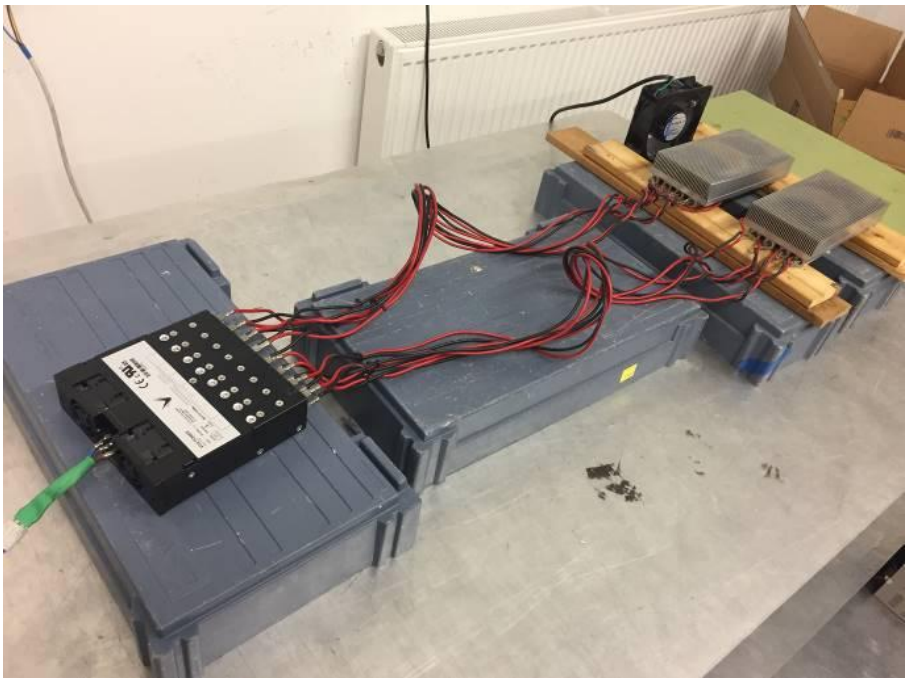


Figure 4: Fast Transients Test Set up

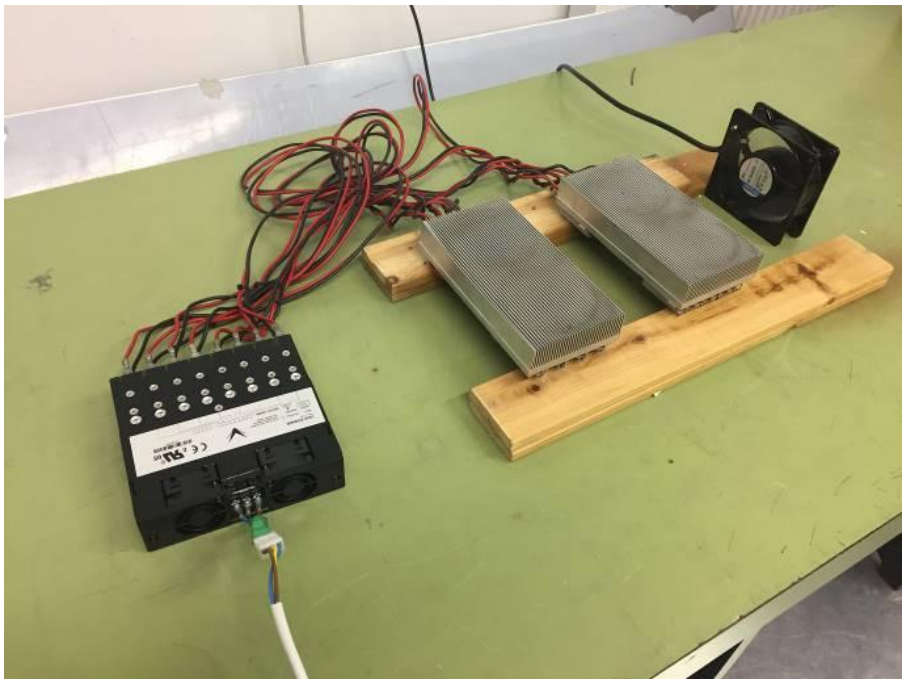


Figure 5: Surges / Voltage Dips & Interruptions Test Set up

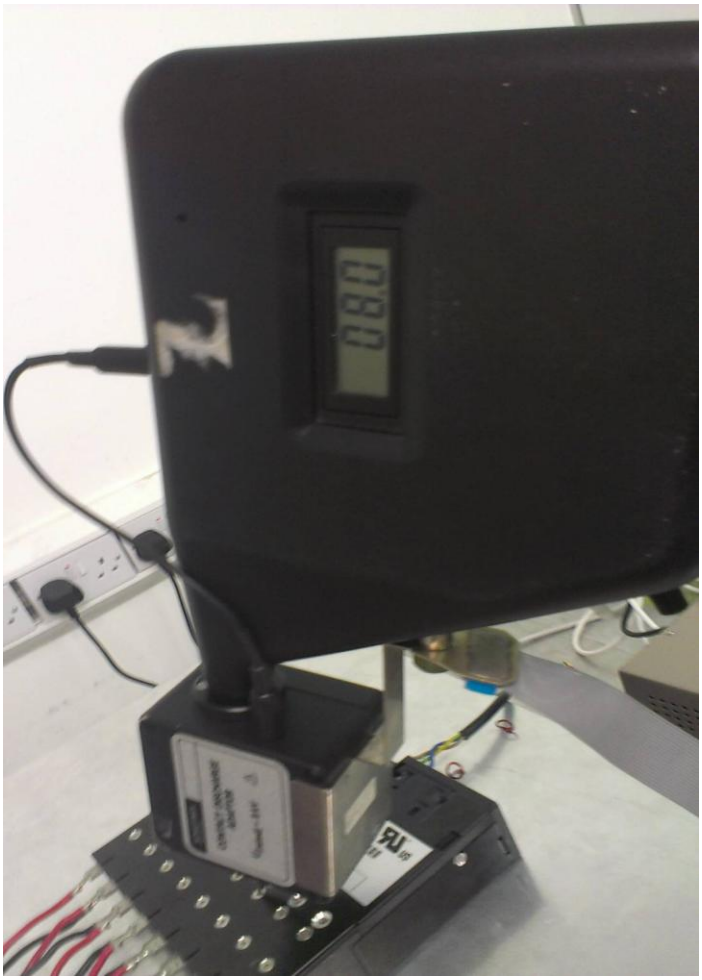


Figure 6: ESD Test set up

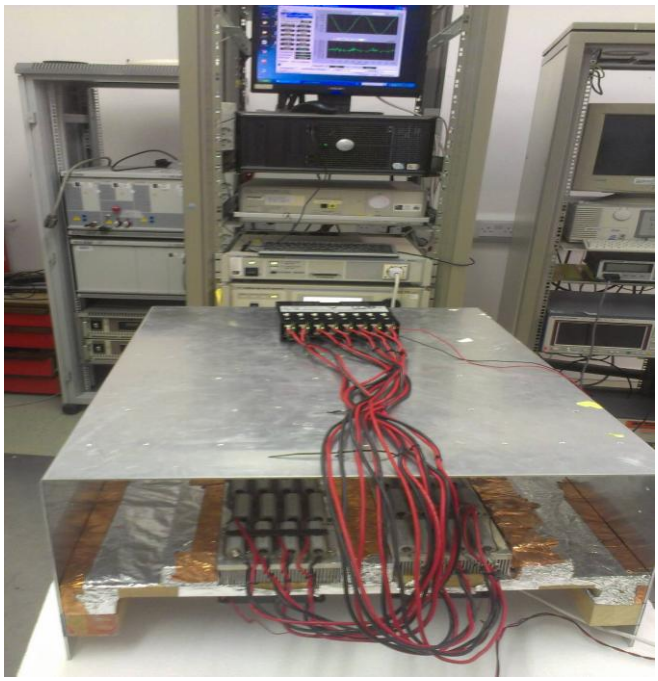


Figure 7: Harmonic and Flicker Test set up

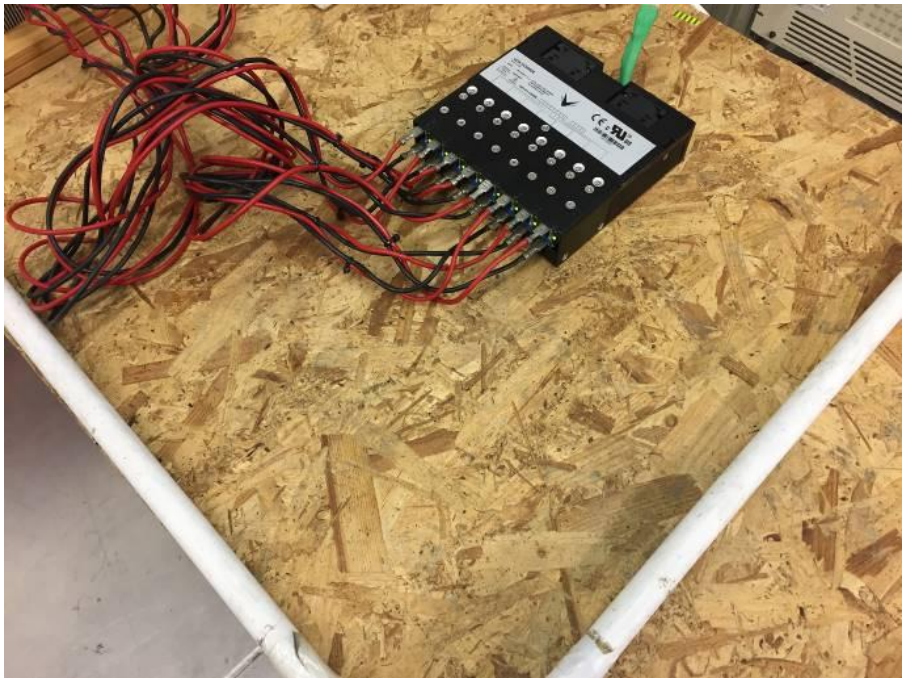


Figure 8: Magnetic field Test set up

Appendix 3: Results

Compliance Engineering Ireland ltd
Conducted Emissions

23. Aug 13 15:15

Manuf: VoxPower
Operator: L Brien
Comment: Live

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 8
Acc Margin: 20dB

Transducer No.	Start	Stop	Name
1	9k	30M	LISN

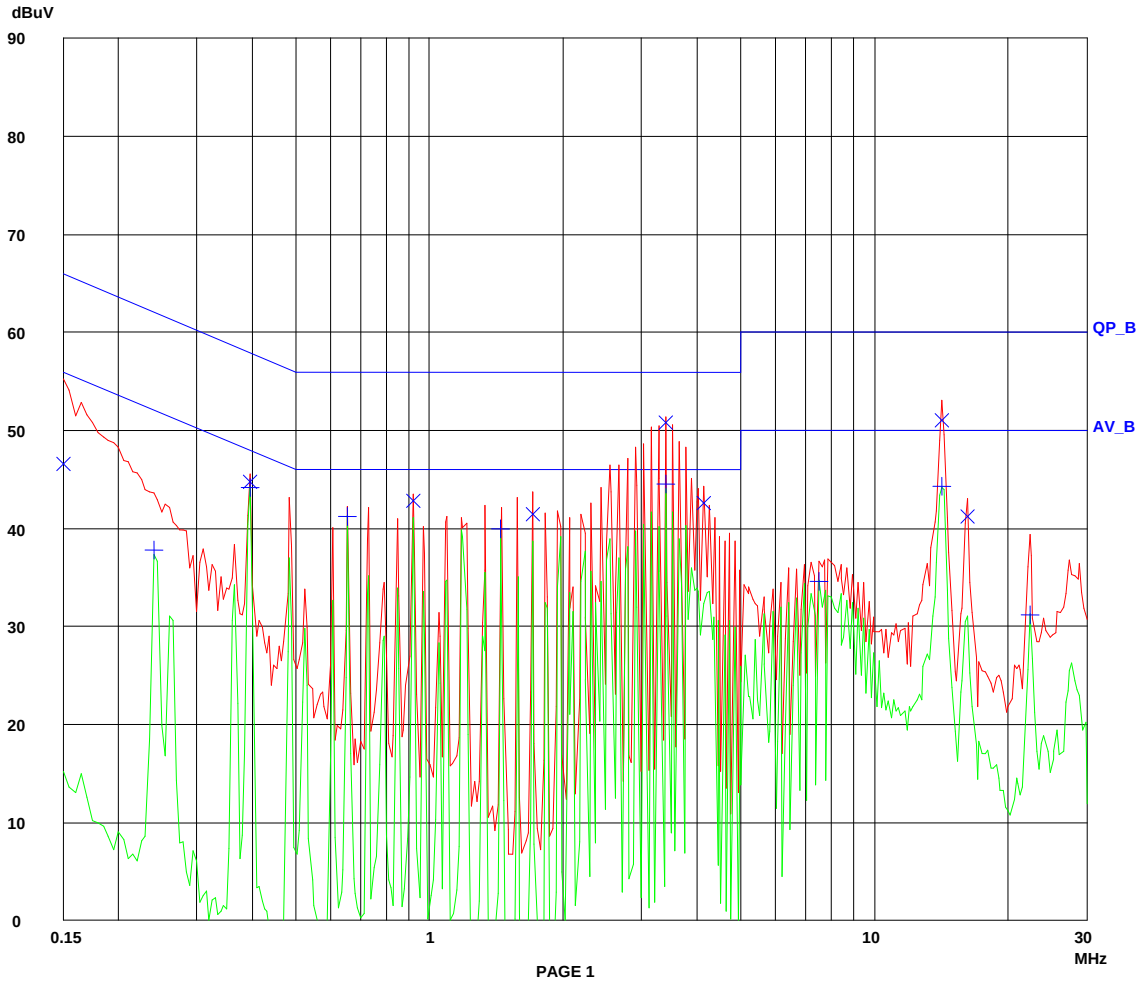


Figure 1: Conducted Emissions, Live (Class B)

Compliance Engineering Ireland ltd

23. Aug 13 15:30

Conducted Emissions

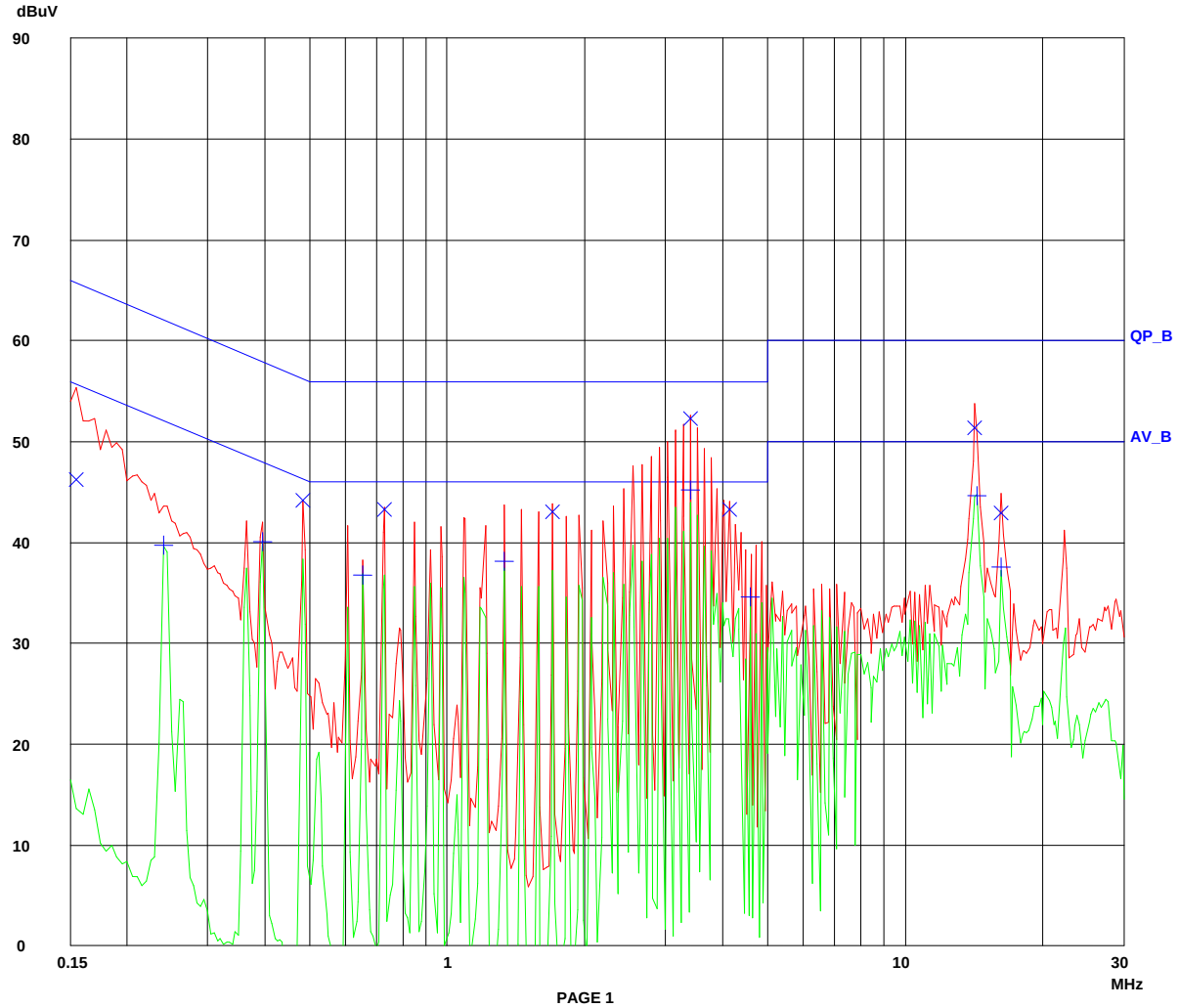
Manuf: Vox Power
Operator: L Brien
Comment: Neutral

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 8
Acc Margin: 20dB

Transducer No.	Start	Stop	Name
1	9k	30M	LISN



PAGE 1

Figure 2: Conducted Emissions, Neutral (Class B)

RADIATED EMISSIONS

23. Aug 13 09:09

Manuf: Kelsius
Op Cond: Normal
Operator: J McAuley
Test Spec: EN 55022
Comment: NO CABLES

Scan Settings (1 Range)

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

Final Measurement: x Hor-Max / + Vert-Max
Meas Time: 1 s
Subranges: 8
Acc Margin: 0dB

Transducer No.	Start	Stop	Name
3	9 20M	1000M	CEIL615
19	30M	1000M	BILOG

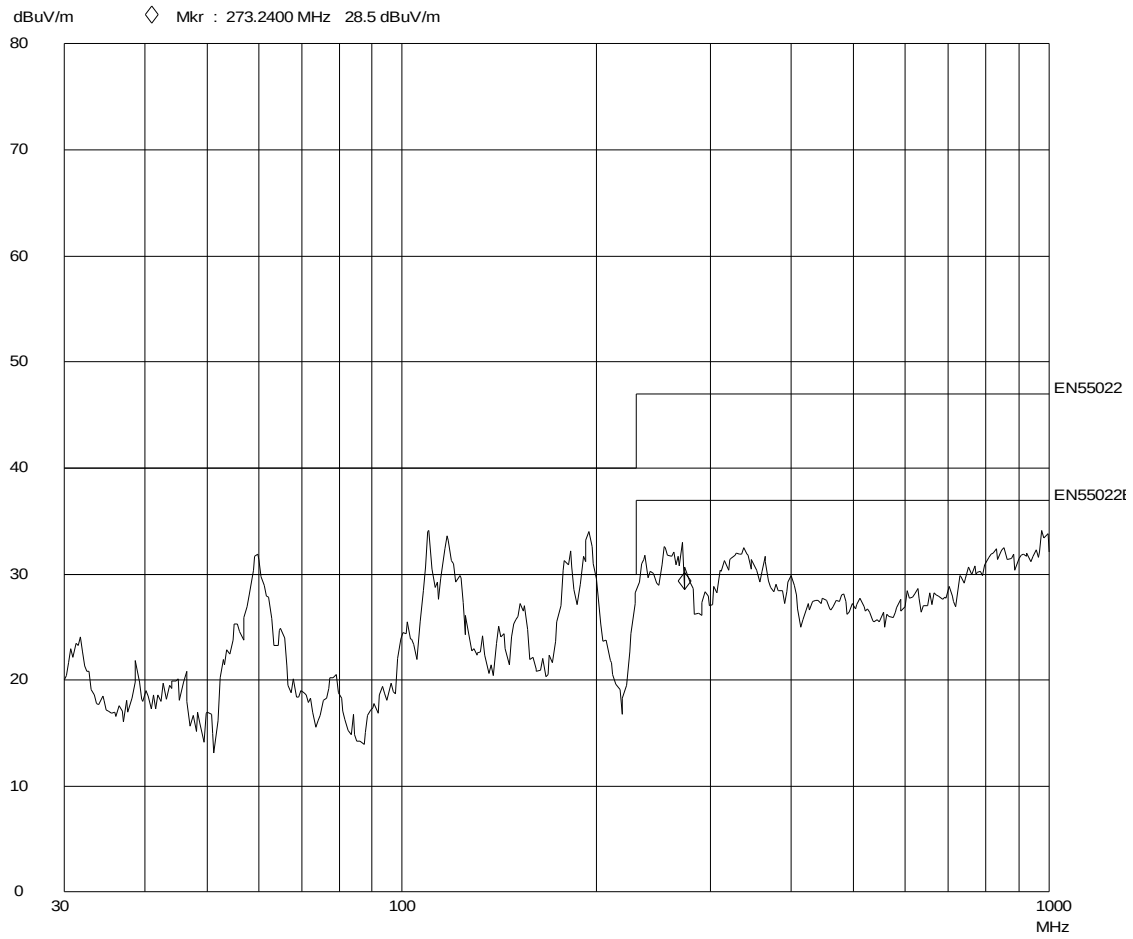


Figure 3: Radiated Emissions, Vertical Scan (Class A) Pre-scan

RADIATED EMISSIONS

23. Aug 13 08:45

Manuf: Kelsius
Op Cond: Normal
Operator: J McAuley
Test Spec: EN 55022
Comment: NO CABLES

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

Final Measurement: x Hor-Max / + Vert-Max
Meas Time: 1 s
Subranges: 8
Acc Margin: 0dB

Transducer No. Start Stop Name
3 9 20M 1000M CEIL615
19 30M 1000M BILOG

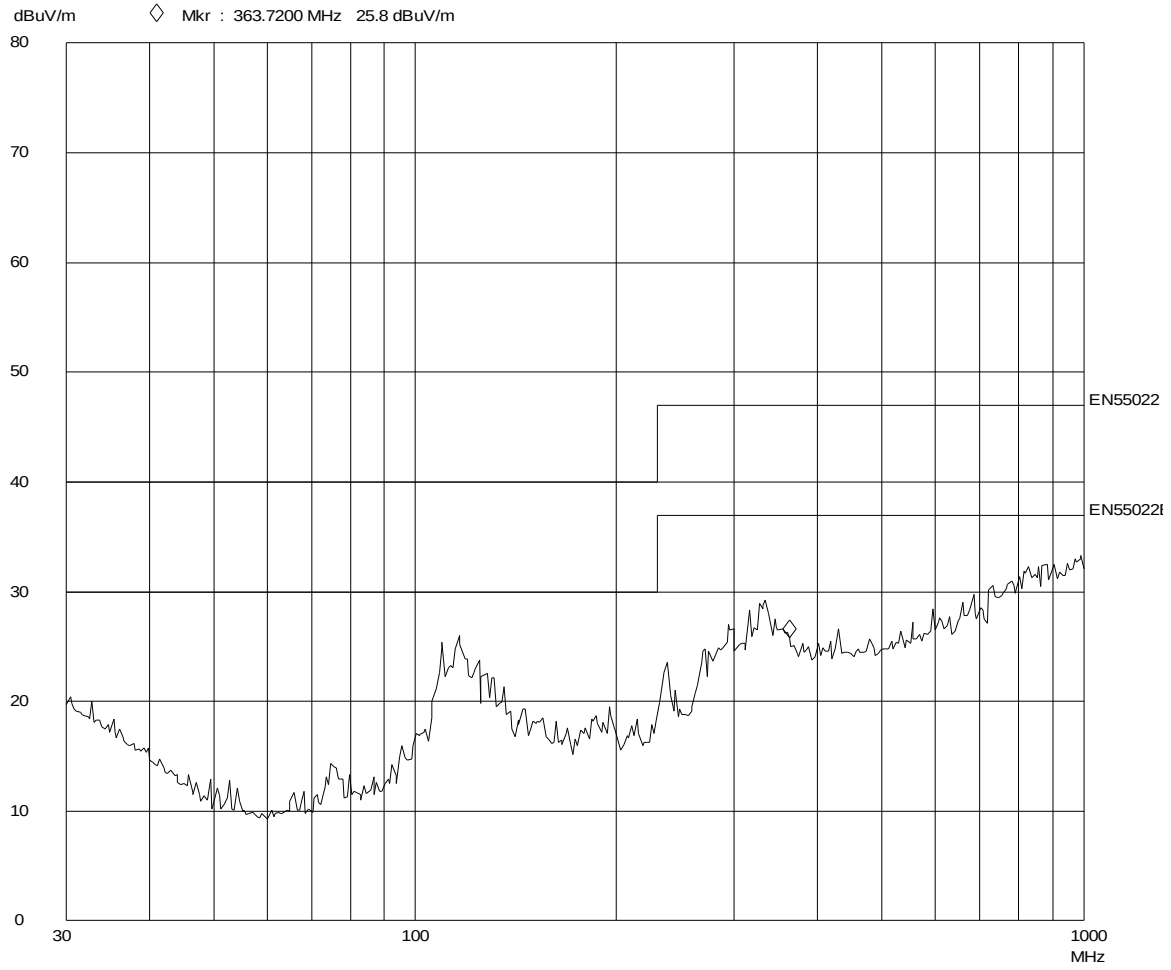


Figure 4: Radiated Emissions, Horizontal Scan (Class A)

Pre-scan

Frequency MHz	QP Level dBuV/m	Limit dbuV/m	Antenna Polarity	Antenna Height (m)	Pass / Fail
117.572	32.4	40	Vertical	1.00	Pass
274.200	28.7	47	Vertical	1.00	Pass
235.484	28.1	47	Vertical	1.00	Pass
150.480	25.6	40	Vertical	1.00	Pass
116.240	33.1	40	Horizontal	4.00	Pass

Table 1:

Radiated Emissions, 30MHz -1GHz, Class A Limits– Anechoic Chamber at 10metres

Figure 3 and 4 are peak level scan used to indicate peaks

RADIATED EMISSIONS

23. Aug 13 09:36

Manuf: Kelsius
Op Cond: Normal
Operator: J McAuley
Test Spec: EN 55022
Comment: NO CABLES

Scan Settings (1 Range)

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

Final Measurement: x Hor-Max / + Vert-Max
Meas Time: 1 s
Subranges: 8
Acc Margin: 0dB

Transducer No.	Start	Stop	Name
3	20M	1000M	CEIL615
9			
19	30M	1000M	BILOG

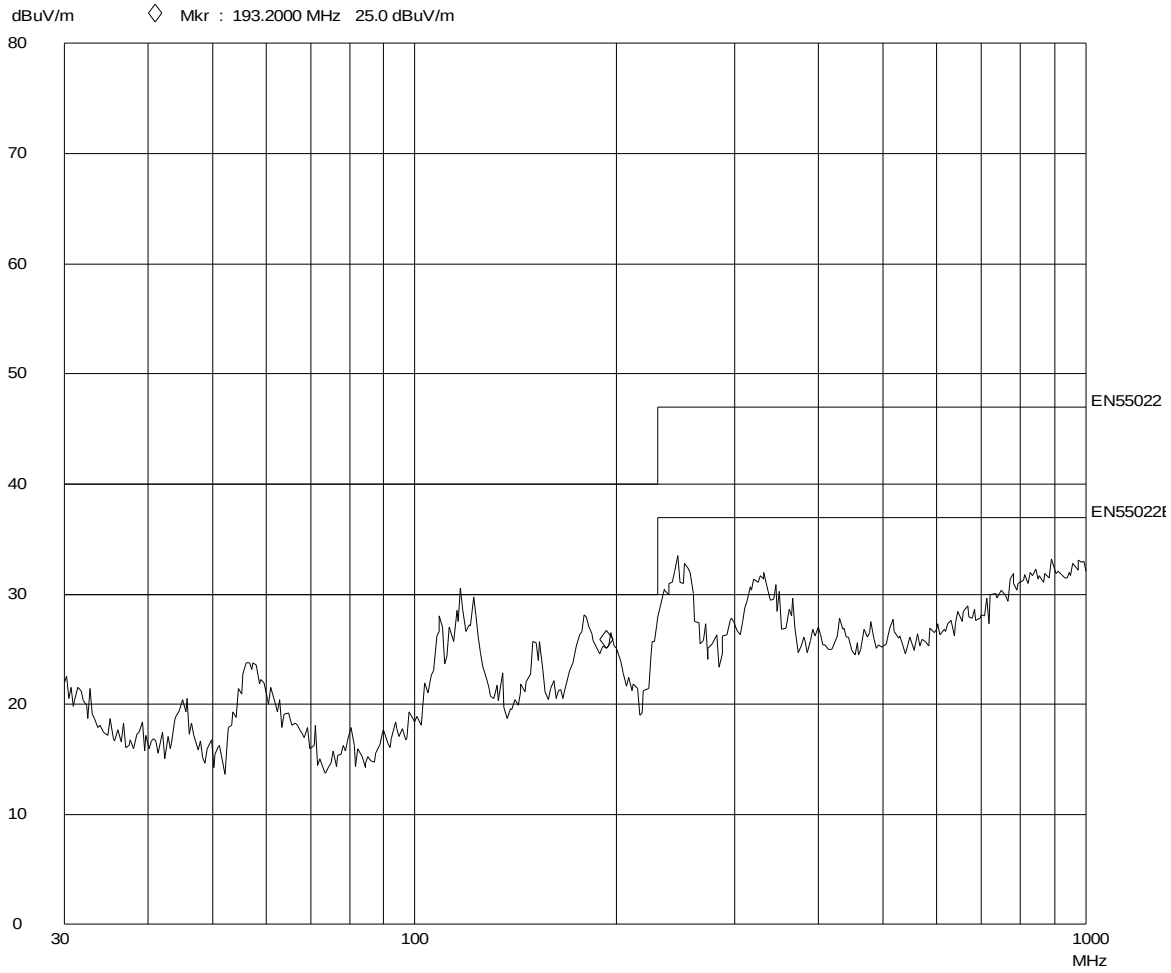


Figure 5: Radiated Emissions, Vertical Scan (Class B)
Pre-scan

RADIATED EMISSIONS

23. Aug 13 09:44

Manuf: Kelsius
Op Cond: Normal
Operator: J McAuley
Test Spec: EN 55022
Comment: NO CABLES

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

Final Measurement: x Hor-Max / + Vert-Max
Meas Time: 1 s
Subranges: 8
Acc Margin: 0dB

Transducer No. Start Stop Name
3 9 20M 1000M CEIL615
19 30M 1000M BILOG

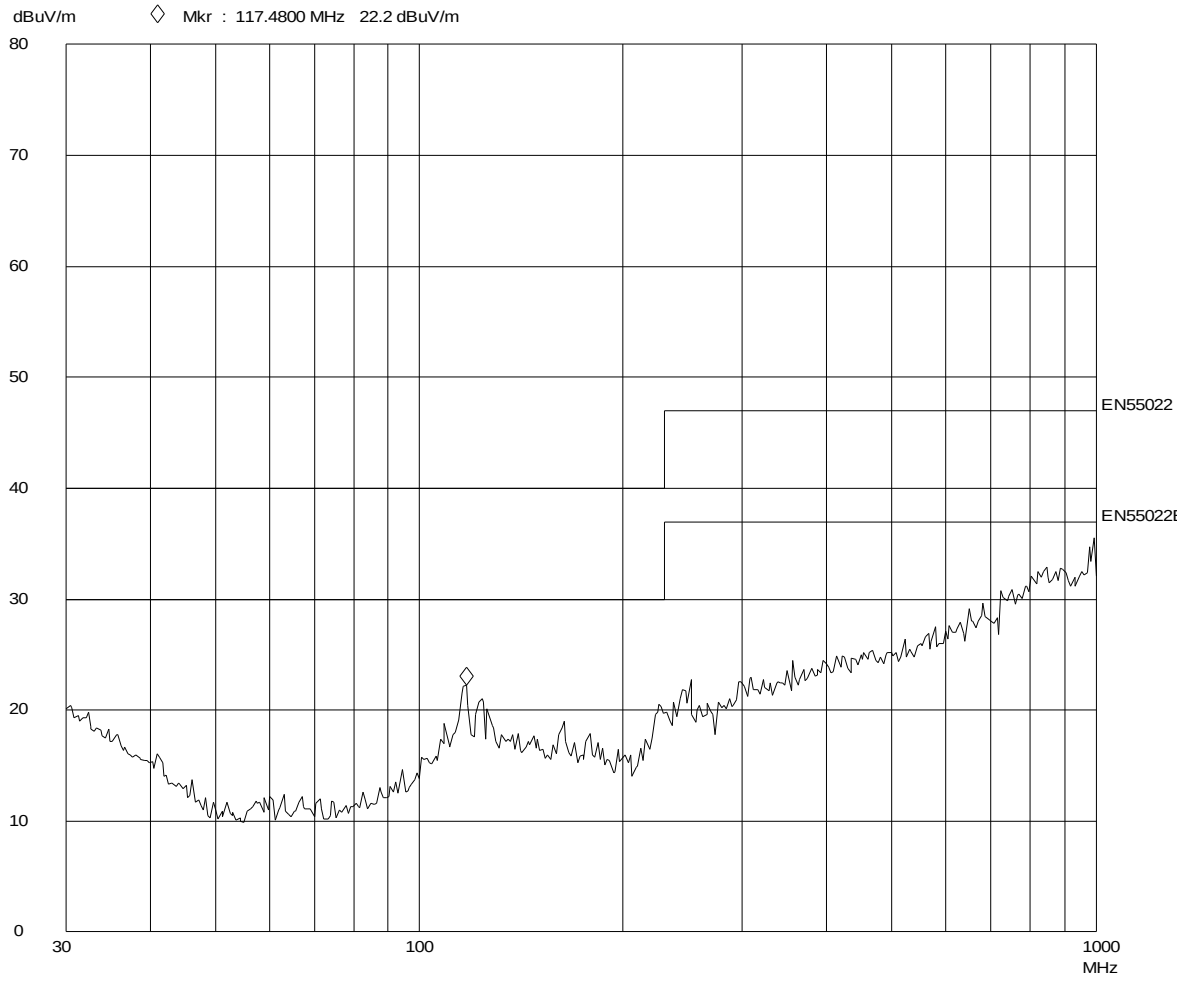


Figure 6: Radiated Emissions, Horizontal Scan (Class B)
Pre-scan

Frequency MHz	QP Level dBuV/m	EN55022 Limit dbuV/m	Antenna Polarity	Antenna Height (m)	Pass / Fail
117.652	23.1	30	Vertical	1.00	Pass
229.652	28.0	30	Vertical	1.00	Pass
117.700	26.6	30	Horizontal	4.00	Pass

Table 1:

Radiated Emissions, with ferrites 30MHz -1GHz, Class B Limits– Anechoic Chamber at 10metres

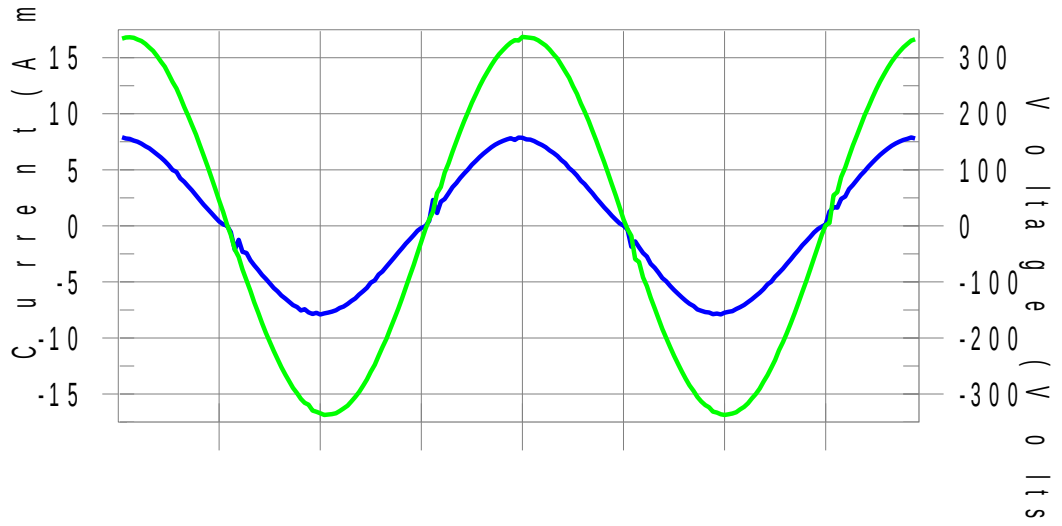
Figure 5 and 6 are peak level scan used to indicate peaks

Harmonics – Class-A per Ed. 3.0 (2005-11) (Run time)

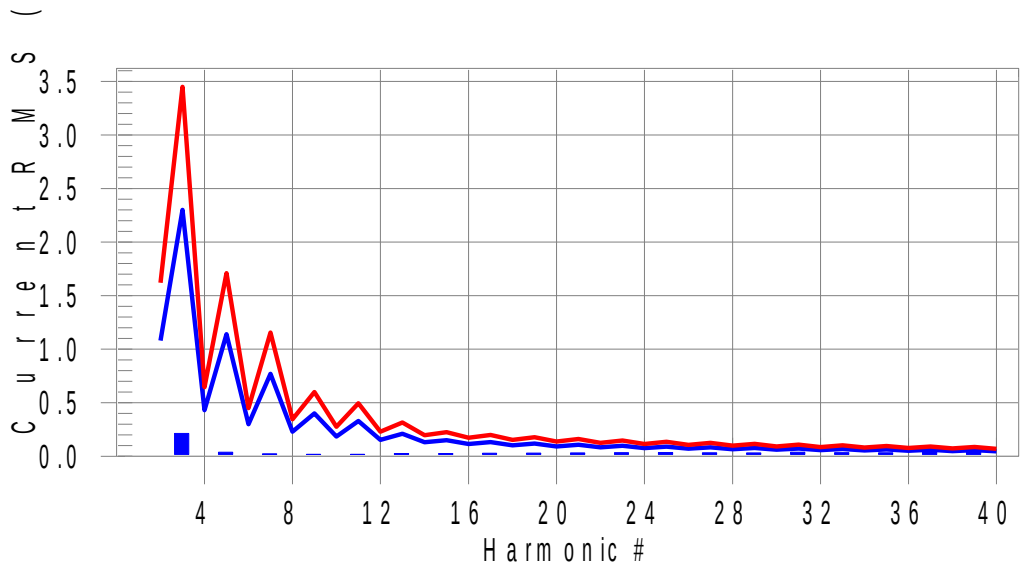
EUT: Nevo1200 **Tested by: Lewis Brien**
Test category: Class-A per Ed. 3.0 (2005-11) (European limits) Test Margin: 100
Test date: 24/10/2013 Start time: 16:37:26 End time: 16:47:47
Test duration (min): 10 Data file name: H-001712.cts_data
Comment: Comments
Customer: Vox Power 13E4772

Test Result: Pass Source qualification: Distorted

Current & voltage waveforms



Harmonics and Class A limit line **European Limits**



Test result: Pass Worst harmonic was #39 with 70.28% of the limit.

Current Test Result Summary (Run time)

EUT: Nevo1200 **Tested by: Lewis Brien**
Test category: Class-A per Ed. 3.0 (2005-11) (European limits) **Test Margin: 100**
Test date: 24/10/2013 **Start time: 16:37:26** **End time: 16:47:47**
Test duration (min): 10 **Data file name: H-001712.cts_data**
Comment: Comments
Customer: Vox Power 13E4772

Test Result: Pass **Source qualification: Distorted**
THC (A): 0.24 **I-THD (%): 4.55** **POHC (A): 0.105** **POHC Limit (A): 0.251**
Highest parameter values during test:

V_RMS (Volts):	**238.20**	**Frequency (Hz):**	**50.00**
I-Peak (Amps):	**8.161**	**I-RMS (Amps):**	**5.393**
I-Fund (Amps):	**5.383**	**Crest Factor:**	**1.517**
Power (Watts):	**1276.7**	**Power Factor:**	**0.994**

Harm#	Harms (avg)	100%Limit	%of Limit	Harms (max)	150%Limit	%of Limit	Status
2	0.004	1.080	0.4	0.006	1.620	0.35	Pass
3	0.208	2.300	9.1	0.214	3.450	6.20	Pass
4	0.002	0.430	0.5	0.004	0.645	0.56	Pass
5	0.036	1.140	3.1	0.037	1.710	2.18	Pass
6	0.002	0.300	0.6	0.002	0.450	0.51	Pass
7	0.021	0.770	2.8	0.022	1.155	1.94	Pass
8	0.001	0.230	0.5	0.002	0.345	0.55	Pass
9	0.017	0.400	4.2	0.018	0.600	3.01	Pass
10	0.001	0.184	0.8	0.002	0.276	0.83	Pass
11	0.017	0.330	5.2	0.018	0.495	3.68	Pass
12	0.002	0.153	1.5	0.003	0.230	1.19	Pass
13	0.025	0.210	11.8	0.026	0.315	8.22	Pass
14	0.002	0.131	1.8	0.003	0.197	1.76	Pass
15	0.024	0.150	15.8	0.026	0.225	11.36	Pass
16	0.002	0.115	1.5	0.003	0.173	1.75	Pass
17	0.028	0.132	20.9	0.029	0.199	14.55	Pass
18	0.002	0.102	2.0	0.003	0.153	1.81	Pass
19	0.028	0.118	24.0	0.030	0.178	16.89	Pass
20	0.002	0.092	1.9	0.003	0.138	2.34	Pass
21	0.031	0.107	28.6	0.032	0.161	19.81	Pass
22	0.002	0.084	2.3	0.003	0.125	2.40	Pass
23	0.033	0.098	33.5	0.034	0.147	23.30	Pass
24	0.002	0.077	2.4	0.003	0.115	2.71	Pass
25	0.033	0.090	36.5	0.035	0.135	25.56	Pass
26	0.002	0.071	3.0	0.003	0.106	2.77	Pass
27	0.030	0.083	36.3	0.032	0.125	25.83	Pass
28	0.003	0.066	4.4	0.004	0.099	4.12	Pass
29	0.029	0.078	37.9	0.032	0.116	27.21	Pass
30	0.002	0.061	3.9	0.004	0.092	4.14	Pass
31	0.037	0.073	50.5	0.038	0.109	34.96	Pass
32	0.002	0.058	3.8	0.004	0.086	4.14	Pass
33	0.032	0.068	47.4	0.034	0.102	33.51	Pass
34	0.003	0.054	5.4	0.005	0.081	5.77	Pass
35	0.030	0.064	47.2	0.032	0.096	33.69	Pass
36	0.003	0.051	6.1	0.005	0.077	6.11	Pass
37	0.038	0.061	63.0	0.040	0.091	44.37	Pass
38	0.003	0.048	6.9	0.008	0.073	10.28	Pass
39	0.041	0.058	70.3	0.043	0.087	49.03	Pass
40	0.003	0.046	6.0	0.005	0.069	6.85	Pass

Voltage Source Verification Data (Run time)

EUT: Nevo1200 **Tested by: Lewis Brien**
Test category: Class-A per Ed. 3.0 (2005-11) (European limits) **Test Margin: 100**
Test date: 24/10/2013 **Start time: 16:37:26** **End time: 16:47:47**
Test duration (min): 10 **Data file name: H-001712.cts_data**
Comment: Comments
Customer: Vox Power 13E4772

Test Result: Pass **Source qualification: Distorted**

Highest parameter values during test:

Voltage (Vrms):	**238.20**	**Frequency (Hz):**	**50.00**
I-Peak (Amps):	**8.161**	**I-RMS (Amps):**	**5.393**
I-Fund (Amps):	**5.383**	**Crest Factor:**	**1.517**
Power (Watts):	**1276.7**	**Power Factor:**	**0.994**

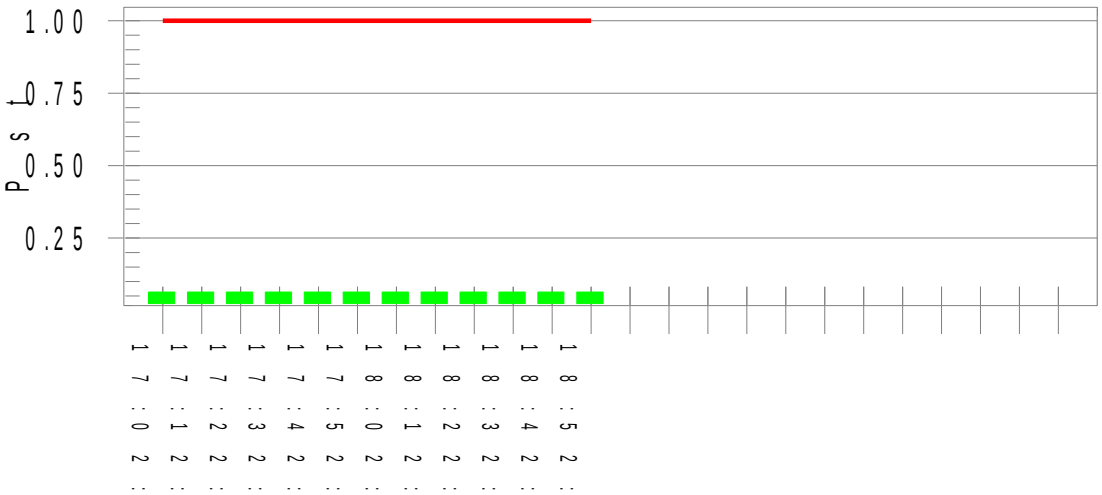
Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.137	0.476	28.70	OK
3	0.275	2.142	12.82	OK
4	0.159	0.476	33.49	OK
5	0.283	0.952	29.74	OK
6	0.107	0.476	22.53	OK
7	0.177	0.714	24.78	OK
8	0.096	0.476	20.10	OK
9	0.169	0.476	35.50	OK
10	0.078	0.476	16.28	OK
11	0.200	0.238	83.96	OK
12	0.083	0.238	34.92	OK
13	0.219	0.238	91.88	OK
14	0.106	0.238	44.64	OK
15	0.142	0.238	59.56	OK
16	0.074	0.238	31.25	OK
17	0.182	0.238	76.37	OK
18	0.078	0.238	32.76	OK
19	0.209	0.238	87.72	OK
20	0.073	0.238	30.62	OK
21	0.241	0.238	101.37	Marg.
22	0.075	0.238	31.36	OK
23	0.289	0.238	121.56	Dist.
24	0.068	0.238	28.70	OK
25	0.260	0.238	109.15	Marg.
26	0.069	0.238	29.05	OK
27	0.258	0.238	108.34	Marg.
28	0.092	0.238	38.62	OK
29	0.295	0.238	123.75	Dist.
30	0.073	0.238	30.55	OK
31	0.380	0.238	159.50	Dist.
32	0.076	0.238	31.78	OK
33	0.301	0.238	126.24	Dist.
34	0.090	0.238	37.81	OK
35	0.329	0.238	138.20	Dist.
36	0.077	0.238	32.13	OK
37	**0.453**	**0.238**	**190.19**	**Dist.**
38	**0.093**	**0.238**	**38.84**	**OK**
39	**0.422**	**0.238**	**177.10**	**Dist.**
40	**0.064**	**0.238**	**26.80**	**OK**

Flicker Test Summary per EN/IEC61000-3-3 (Run time)

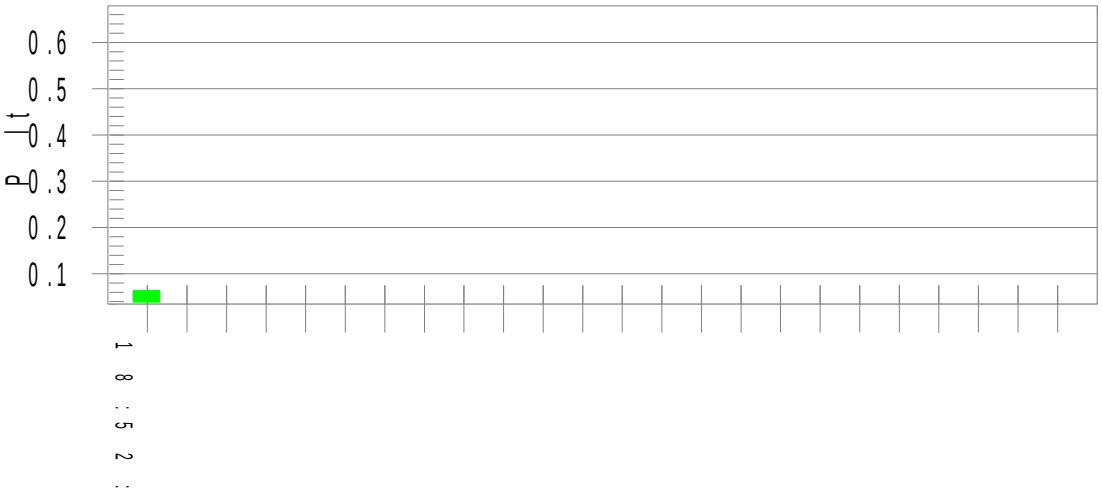
EUT: Nevo1200 **Tested by: L Brien**
Test category: All parameters (European limits) **Test Margin: 100**
Test date: 24/10/2013 **Start time: 16:52:02** **End time: 18:52:23**
Test duration (min): 120 **Data file name: F-001713.cts_data**
Comment: Comments
Customer: Vox Power 13E4772

Test Result: Pass **Status: Test Completed**

Pst and limit line **European Limits**



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	**238.06**			
Highest dt (%):	**0.21**	**Test limit (%):**	**3.30**	**Pass**
Time (mS) > dt:	**0.0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.10**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**-0.21**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.064**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.064**	**Test limit:**	**0.650**	**Pass**