



## EMC Bayswater Pty Ltd

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### EMC COMPLIANCE REPORT

*In accordance with:*

IEC 61547: 2009

IEC 61000-3-2: 2005 plus amendments to 2009

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Indice Ecotech Pty Ltd

LED MINI-ULTRA-WW

LED Mini MR16 12VAC Lamp with VIPER electronic transformer

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REPORT: E1207-0200

DATE: July, 2012



## Certificate of Compliance

EMC Bayswater Test Report: E1207- 0200  
Issue Date: July, 2012

**Test Sample(s):** LED Mini MR16 12VAC Lamp with VIPER electronic transformer  
**Model No:** LED MINI-ULTRA-WW  
**Serial No:** Not specified

**Client Details:** Mr Aaron Brown  
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**Test Specification(s):** IEC 61547: 2009  
Equipment for general lighting purposes – EMC immunity requirements  
  
IEC 61000-3-2: 2005 plus amendments to 2009  
Limits for harmonic current emissions (equipment input current less than or equal to 16A per phase)

<b>Results Summary:</b>	Electrostatic Discharges (ESD)	(EN 61000-4-2)	<b>Complied</b>
	Fast Transients	(IEC 61000-4-4)	<b>Complied</b>
	Radio Frequency Electromagnetic Fields	(IEC 61000-4-3)	<b>Complied</b>
	Injected Currents	(IEC 61000-4-6)	<b>Complied</b>
	Power frequency Magnetic Fields	(IEC 61000-4-8)	<b>N/A</b>
	Surges	(IEC 61000-4-5)	<b>Complied</b>
	Voltage Dips and Interruptions	(IEC 61000-4-11)	<b>Complied</b>
	Harmonic Current Emissions	(IEC 61000-3-2)	<b>Complied</b>

**Test Date(s):** 2<sup>nd</sup> and 3<sup>rd</sup> of July 2012

**Test House (Issued By)** EMC Bayswater Pty Ltd  
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The Indice Ecotech Pty Ltd, LED MINI-ULTRA-WW, LED Mini MR16 12VAC Lamp with VIPER electronic transformer, complied with the applicable requirements of IEC 61547: 2009 and IEC 61000-3-2: 2005 plus amendments to 2009.

Prepared by:

Approved by:



16/07/2012 08:58

\_\_\_\_\_  
Neville Liyanapatabendige  
(Senior Test Engineer)

\_\_\_\_\_  
Andrew Whiteford  
(General Manager)

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Date

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## EMC Compliance Report *for* Indice Ecotech Pty Ltd

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## 1. Introduction

Electromagnetic Compatibility (EMC) tests were performed on a Indice Ecotech Pty Ltd, LED MINI-ULTRA-WW, LED Mini MR16 12VAC Lamp with VIPER electronic transformer in accordance with IEC 61547: 2009.

## 2. Summary of Results

Test	Result
Electrostatic Discharges (ESD)	Complied, Criterion B
Fast Transients – AC Power	Complied, Criterion A
Radio Frequency Electromagnetic Fields	Complied, Criterion A
Inject Currents – AC Power	Complied, Criterion A
Surges – AC Power	Complied, Criterion A
Voltage Dips and Interruptions	Complied, Criterion B
Harmonic Current Emissions	Complied

Table 1: Summary of test results

## 3. Product Sample, Configuration & Modifications

### 3.1. Product Sample Details

The EUT (Equipment Under Test), as supplied by the client, is described as follows:

Product: LED Mini MR16 12VAC Lamp with VIPER electronic transformer  
Model No: LED MINI-ULTRA-WW  
Serial No: Not specified  
Specifications: Indice Ecotech Mini Ultra LED Downlight: 12VAC, 5W

VIPER 60VA Electronic Transformer:  
PRI: 230-240VAC, 50/60Hz, SEC: 11.6VAC

The EUT is a 12VAC MR16 LED lamp.

The measured maximum active input power of the EUT is 7.16W.

*(Refer to photographs in Appendix B for views of the EUT)*

### 3.2. EUT Configuration

The EUT was powered through the 240V 50 Hz AC mains supply.

### 3.3. Modifications

EMC Bayswater did not modify the EUT.

### 3.4. Monitoring

The luminous intensity of the lamp was measured by a lux meter during testing. The EUT's operation was monitored visually during testing and any changes in the lamp operation were recorded.

As per section 4.3 of IEC 61547: 2009, the luminous intensity shall be deemed unchanged if the measured intensities do not deviate by more than 15%.

## 4. Test Facility & Equipment

### 4.1. Test Facility

Immunity tests were performed inside an anechoic chamber or a standard shielded enclosure, where applicable, at EMC Bayswater Pty Limited, located at 52 Holloway Drive Bayswater, Victoria, Australia.

### 4.2. Test Equipment

Refer to Appendix A for the measurement instrument list.

## 5. Referenced Standards

### IEC 61547: 2009

Equipment for general lighting purposes – EMC immunity requirements

### IEC 61000-4-2: 2008

Electromagnetic Compatibility – Part 4. Testing and measurement techniques. Section 2. Electrostatic discharge immunity test.

### IEC 61000-4-3: 2006

Electromagnetic Compatibility – Part 4. Testing and measurement techniques. Section 3. Radiated, radio frequency, electromagnetic field immunity test.

### IEC 61000-4-4: 2004

Electromagnetic Compatibility – Part 4. Testing and measurement techniques. Section 4. Electrical Fast Transient/burst immunity test.

### IEC 61000-4-5: 2005

Electromagnetic Compatibility – Part 4. Testing and measurement techniques. Section 5. Surge Immunity test.

### IEC 61000-4-6: 2008

Electromagnetic Compatibility – Part 4. Testing and measurement techniques. Section 6. Immunity to conducted disturbances, induced by radio-frequency fields.

### IEC 61000-4-11: 2004

Electromagnetic Compatibility – Part 4. Testing and measurement techniques. Section 11. Voltage dips, short interruptions and voltage variations immunity tests.

### IEC 61000-3-2: 2005 plus amendments to 2009

Limits for harmonic current emissions (equipment input current less than or equal to 16A per phase)

## 6. Performance (Pass/Fail) Criteria

The performance of the EUT was subject to the following performance criteria as specified in the referenced Standard:

**Performance criterion A:** During the test no change of the luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.

**Performance criterion B:** During the test the luminous intensity may change to any value. After the test the luminous intensity shall be restored to its initial value within 1 min.

Regulating controls need not function during the test, but after the test the mode of control shall be the same as before the test provided that during the test no mode changing commands were given.

**Performance criterion C:** During and after the test any change of the luminous intensity is allowed and the lamp(s) may be extinguished. After the test, within 30 min, all functions shall return to normal if necessary by temporary interruption of the mains supply and/or operating the regulating control.

Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.

In addition to the above, *the EUT shall not become dangerous or unsafe as a result of the application of the tests defined in this Standard.*

*Luminaire including active electronic components performance criterion as per Table 15 of IEC 61547: 2009 is applicable to the EUT.*

## 7. Electrostatic Discharges (IEC 61000-4-2)

### 7.1. Requirements

The EUT must comply with performance criterion B.

### 7.2. Test Procedure

The EUT was tested to Electrostatic Discharges in accordance with IEC 61000-4-2.

- Both contact and air discharge were applied (as applicable) to:
  - all faces and access points of the EUT
  - the Vertical Coupling Plane (VCP)
  - the Horizontal Coupling Plane (HCP)
- All coupling planes were connected to the ground reference plane via a strap with a 470k $\Omega$  resistor located at each end.
- Contact discharges were applied to all conductive surfaces and to the coupling planes. Air discharges were applied only to the insulating surfaces.
- Discharges applied to the HCP and VCP were applied on each side of the EUT. Discharges made to the HCP were applied 0.1m from the EUT. Discharges made to the VCP were applied to the centre of one vertical edge of the coupling plane. The VCP (0.5m x 0.5m), was placed parallel to and positioned 0.1m from the EUT.
- The test voltage was increased from the minimum to the selected test level, in order to determine any threshold of failure.
- The test voltage was increased from the minimum (contact:  $\pm 2$ kV, air:  $\pm 2$ kV) to the selected test level (contact:  $\pm 4$ kV, air:  $\pm 8$ kV), in order to determine any threshold of failure.
- At least 10 single discharges were applied in both positive and negative polarities at  $\pm 4.0$ kV for HCP, VCP and contact discharge and at  $\pm 8.0$ kV for air discharges.

*(Refer to photographs 11 to 14 in Appendix B for views of the test configurations)*

### 7.3. Discharge Points

Indirect contact discharges were applied to the Horizontal Coupling Plane (HCP) at the following positions:

- Front & Rear of EUT
- Right and Left hand sides of EUT

Indirect contact discharges were applied to the Vertical Coupling Plane (VCP) with the EUT at the following positions:

- Front & Rear of EUT
- Right and left hand sides of EUT

Direct contact discharges were applied to the following points (Test points 1 to 20):

- Lens surface
- Metal screws
- Metallic lamp cover

Direct air discharges were applied to the following points (Test points A to I):

- Insulated connectors
- VIPER Transformer plastic cover

*(Refer to photographs 15 to 19 in Appendix B for views of the ESD test points)*

#### 7.4. Test Results

##### Indirect Application

Application	ESD Voltage	Observation	Results
HCP	±2.0 kV	No degradation	Complied, Criterion A
	±4.0 kV		
VCP	±2.0 kV	No degradation	Complied, Criterion A
	±4.0 kV		

Table 2: Electrostatic Discharge – Indirect Application

##### Direct Application – Contact Discharge

Application	ESD Voltage	Observation	Results
1 to 20	±2.0 kV	No degradation	Complied, Criterion A
	±4.0 kV		

Table 3: Electrostatic Discharge – Contact discharge

##### Direct Application – Air Discharge

Application	ESD Voltage	Observation	Results
A to I	±4.0 kV	No degradation	Complied, Criterion A
	±8.0 kV		

Table 4: Electrostatic Discharge – Air discharge

Climatic Conditions	
Temperature:	19°C
Humidity:	54%

Table 5: Climatic conditions

**Comments:** No degradation observed. The luminous intensity was stable.

**Assessment:** The EUT complied with the ESD requirements of IEC 61547: 2009, performance criterion B.



## 8. Radio Frequency Electromagnetic Fields (IEC 61000-4-3)

### 8.1. Requirements

The EUT must comply with performance criterion A.

### 8.2. Test Procedure

The EUT was tested to Radio Frequency Electromagnetic Fields in accordance with IEC 61000-4-3.

Prior to testing, a sixteen point 3V/m uniform CW electric field was calibrated at 3 metres from the transmitting antenna using an orthogonal electric field probe. The forward power to the antenna, required to achieve the desired electric field strength, was recorded using immunity software and stored as a look up table. The frequency range of 80MHz to 1000MHz was swept incrementally using 1% step sizes, whilst a levelled RF field of 3V/m (CW calibration) was maintained.

The orthogonal electric field probe was replaced by the EUT. The drive level of the amplifier was adjusted accordingly to achieve the net power level recorded in the electric field lookup table at each frequency interval.

The EUT was positioned on a non-conductive table, 0.8m above the reference ground plane. All wiring to the EUT was left exposed to the electromagnetic field for a distance of 1m. All wiring less than or equal to 3m was bundled low-inductively to a 1m length. All wiring greater than 3m had RF ferrite beads placed 1m along the wiring.

The frequency range of 80MHz to 1000MHz was swept incrementally using 1% step sizes, with modulation (80% AM @ 1kHz) with a dwell time of 3 seconds per frequency step.

Both horizontal and vertical antenna polarizations were used to radiate the EUT in turn.

*(Refer to photographs 20 & 21 in Appendix B for views of the test configuration)*

### 8.3. Test Results

Field Level	Antenna Polarisation	Observation	Results
3V/m	Vertical	Worst-case measured luminous intensity deviation 2.5% (less than 15% therefore luminous intensity deemed to be unchanged)	Complied, Criterion A
3V/m	Horizontal		Complied, Criterion A

Table 6: Radio Frequency Electromagnetic Fields (Amplitude Modulated)

Climatic Conditions	
Temperature:	18°C
Humidity:	55%

Table 7: Climatic conditions

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**Comments:** Luminous intensity deviation less than 15% during test therefore deemed as no change to luminous intensity. No visible changes to light output.

**Assessment:** The EUT complied with the Radio Frequency Electromagnetic Fields requirements of IEC 61547: 2009, performance criterion A.

## 9. Fast Transients (IEC 61000-4-4)

### 9.1. Requirements

The EUT must comply with performance criterion B.

### 9.2. Test Procedure

The EUT was tested to Fast Transients in accordance with IEC 61000-4-4.

In a shielded chamber, the EUT was placed on the ground plane (chamber floor) separated by a 0.1m high insulating support. The EUT was connected to, and powered by, the transient generator via the AC power port.

The length of the signal and power cables between the coupling devices and the EUT was less than 0.5m. In the case of a non-detachable supply cable more than 0.5m long, the excess length of this cable was folded to avoid a flat coil and situated 0.1m above the ground plane. The distance of 0.5m between the EUT and the coupling device remained.

Transient bursts at the specified severity level were applied to the AC port.

The transient generator settings were as follows:

Test Voltage:  $\pm 1.0\text{kV}$  (AC port)  
 Rise time (Tr): 5ns  
 Pulse width (Th): 50ns  
 Repetition rate: 5kHz  
 Burst duration: 15ms  
 Burst period: 300ms  
 Test time: 2 min

*(Refer to photograph 23 in Appendix B for a view of the test configuration)*

### 9.3. Test Results

AC Port (Mains)	Test Voltage	Observation	Results
Active	$\pm 0.5\text{kV}$	Worst-case measured luminous intensity deviation 1.3% (less than 15% therefore luminous intensity deemed to be unchanged)	Complied, Criterion A
Neutral			
A+N	$\pm 1.0\text{kV}$		Complied, Criterion A
Active			
Neutral			
A+N			

Table 8: Fast Transients – AC Ports

Climatic Conditions	
Temperature:	24°C
Humidity:	40%

Table 9: Climatic conditions

**Comments:** Luminous intensity deviation less than 15% during application therefore deemed as no change to luminous intensity. No visible changes to light output.

**Assessment:** The EUT complied with the Fast Transients requirements of IEC 61547: 2009, performance criterion B.

## 10. Injected Currents (IEC 61000-4-6)

### 10.1. Requirements

The EUT must comply with performance criterion A.

### 10.2. Test Procedure

The EUT was tested to Injected Currents in accordance with IEC 61000-4-6.

The EUT was placed on a wooden support, 0.1m above the ground reference plane. All coupling and decoupling devices were placed in direct contact with the ground reference plane and at a distance of 0.3m away from the EUT. Cables running to the EUT were kept as short as possible and were not bundled or wrapped. The cables were kept between 30 mm to 50 mm above the ground reference plane.

A signal generator was used to provide a drive signal to an RF power amplifier, which in turn provided the drive level to the coupling device.

The interfering RF signal was applied to the AC supply lines of the EUT via a Coupling De-coupling Network (CDN).

A 3Vrms pre-calibrated (CW calibration using a 50Ω system) RF signal was applied to the coupling device with modulation (AM, 80%, 1kHz) over the frequency range of 0.150 MHz to 80 MHz.

The frequency was incremented using 1% step sizes with a dwell time of 3 seconds.

*(Refer to photograph 22 in Appendix B for a view of the test configuration)*

### 10.3. Test Results

Port	Test Level (V <sub>RMS</sub> )	Observation	Results
AC Power	3	Worst-case measured luminous intensity deviation 1% (less than 15% therefore luminous intensity deemed to be unchanged)	Complied, Criterion A

Table 10: Injected Currents (Amplitude Modulated)

Climatic Conditions	
Temperature:	18°C
Humidity:	54%

Table 11: Climatic conditions

**Comments:** Luminous intensity deviation less than 15% during test therefore deemed as no change to luminous intensity. No visible changes to light output.

**Assessment:** The EUT complied with the Injected Currents requirements of IEC 61547: 2009, performance criterion A.

## 11. Surges (IEC 61000-4-5)

### 11.1. Requirements

The EUT must comply with performance criterion C.

### 11.2. Test Procedure

The EUT was tested to Surges in accordance with IEC 61000-4-5.

For testing on the AC port, the EUT was placed on a wooden table 0.8m high, above the metal ground plane. The EUT was connected to, and powered by, the surge generator. The length of the power cable between the coupling devices and the EUT was less than 1m. In the case of a non-detachable supply cable more than 1m long, the excess length of this cable was gathered into a flat coil with a 0.4m diameter.

Surges at the specified severity level were applied to the AC Input power port:

- (a) Phase - to – Neutral (Line to Line)

The surge generator settings were as follows:

Test Voltage:	±0.5kV (Line to Line).
Rise time (Tr):	1.2µs
Pulse width (Th):	50µs
No of pulses:	5 of positive polarity at 90° phase angle, 5 of negative polarity at 270 ° phase angle.
Repetition rate:	2 per minute

*(Refer to photograph 23 in Appendix B for a view of the test configuration)*

### 11.3. Test Results

AC Port (Mains)	Test Voltage	Observation	Results
Phase-to-Neutral (Line to Line)	±0.5 kV	Worst-case measured luminous intensity deviation 0.5% (less than 15% therefore luminous intensity deemed to be unchanged)	Complied, Criterion A

Table 12: Surges – AC Power Port

Climatic Conditions	
Temperature:	18°C
Humidity:	56%

Table 13: Climatic conditions

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**Comments:** The EUT input power is less than 25W.

Luminous intensity deviation less than 15% during test therefore deemed as no change to luminous intensity. No visible changes to light output.

**Assessment:** The EUT complied with the Surge immunity requirements of IEC 61547: 2009, performance criterion C.

## 12. Voltage Dips and Interruptions (IEC 61000-4-11)

### 12.1. Requirements

The EUT must comply with performance criterion B for voltage interruptions of 0% for 0.5 periods. The EUT must comply with performance criterion C, for voltage dips of 70% for 10 periods.

### 12.2. Test Procedure

The EUT was tested to Voltage Dips and Interruptions in accordance with IEC 61000-4-11.

The EUT was placed on a wooden table 0.8m high, above the metal ground plane. The EUT was connected to, and powered by, the test generator. The length of the power cable between the coupling devices and the EUT was less than 1m. In the case of a non-detachable supply cable more than 1m long, the excess length of this cable was gathered into a flat coil with a 0.4m diameter.

Voltage interruptions of 100% reduction for 0.5 periods (10ms), and voltage dips of 30% reduction for 10 periods (200ms) were applied to the AC input power port.

*(Refer to photograph 24 in Appendix B for a view of the test configuration)*

### 12.3. Test Results

Type	Test Specification	Observation	Results
Voltage Interruption	0%, 0.5 periods	*refer to comments below	Complied, Criterion B
Voltage Dip	70%, 10 periods	**refer to comments below	Complied, Criterion B

Table 14: Voltage Dips and Interruptions

Climatic Conditions	
Temperature:	18°C
Humidity:	59%

Table 15: Climatic conditions

**Comments:** \*LED lamp flashed during 0% voltage interruption application and returned to normal as soon as application completed within seconds (less than 1min) thus complying with performance criterion B.

\*\*LED Lamp dimmed during 70% voltage Dip application (Luminous intensity reduction 32%) and returned to normal as soon as application completed within seconds (less than 1min) thus complying with criterion B.

**Assessment:** The EUT complied with the Voltage Dips requirements of IEC 61547: 2009, performance criterion C and the Short Interruptions requirements of IEC 61547: 2009, performance criterion B.



## 13. Harmonic Current Emissions (IEC 61000-3-2)

### 13.1. Test Procedure

The EUT was tested for harmonic current emissions in accordance with IEC 61000-3-2. The EUT was connected to a harmonics analyser, which was connected via serial cable to a PC. A proprietary program called HARCS was used to control the harmonics analyser. Parameters were set up in the HARCS Harmonics test.

The test duration was 5 minutes. The results were produced in graphical and tabular form.

To establish limits for similar types of harmonic current distortion, the EUT must be categorised in one of the four defined classes.

#### Class A:

- Balanced three-phase equipment
- Household appliances, excluding equipment identified as Class D
- Tools, excluding portable tools
- Dimmers for incandescent lamps
- Audio equipment

Equipment not specified in one of the three other classes shall be considered as Class A equipment.

#### Class B:

- Portable tools
- Arc welding equipment which is not professional equipment

#### Class C:

- Lighting equipment

#### Class D:

Equipment having a specified power according to 6.2.2 less than or equal to 600 W, of the following types:

- Personal computers and personal computer monitors
- Television receivers

The EUT was determined to be a Class C device with active input power 25 W and was subsequently tested to power rated limits of Table 3, column 3 of IEC 61000-3-2: 2005 plus amendments to 2009 as per customer request (The EUT is not discharge lighting equipment however there is no requirements defined in IEC 61000-3-2: 2005 plus amendments to 2009 for lighting equipment having active input power 25 W other than Discharge lighting equipment).

*(Refer to photograph 25 in Appendix B for a view of the test configuration)*

### 13.2. Requirements

The harmonic currents shall not exceed the power related limits of Table 3, column 2 of IEC 61000-3-2: 2005 plus amendments to 2009.

General :

- Maximum and Average values are calculated over the full test-time
- The individual measurements are taken over every 16 periods and smoothed with an 1.5 second filter.

**13.3.Test Results**

Measurement

Indices Date : 2/07/2012 1:34:08 PM V4.18

File : C:\Documents and Settings\All Users\Desktop\Default.hsu

Operator NL  
Unit LLD Mini MR10  
Serial Number  
Remarks :

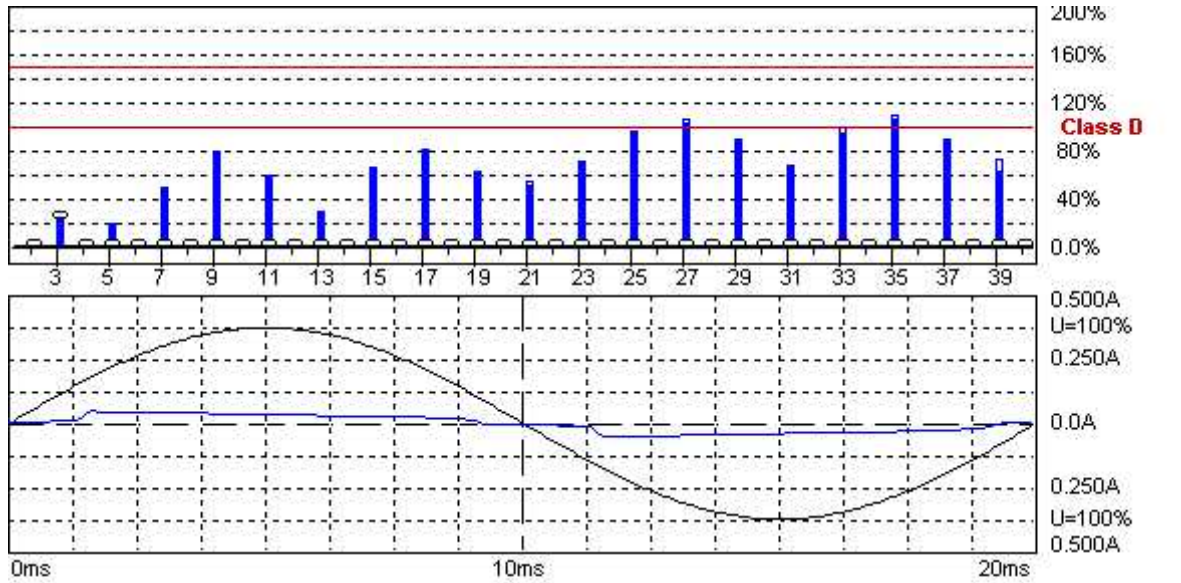
Urms = 230.3V Freq = 50.030 Range: 0.5 A  
Irms = 0.032A Ipk = 0.053A cf = 1.624  
P = 7.154W S = 7.478VA pf = 0.957  
THDI = 25.20% THDu = 0.10% Class D

Test - Time 5min -100%

Limit Refer Pmax = 7.1663W

Test completed, Result: PASSED

Order	Freq [Hz]	Iavg [A]	Irms [A]	Ipeak [A]	Limit [A]
1	50	0.0314	0.0314	0.0315	
2	100	0	0	0	
3	150	0.0055	0.0055	0.0055	0.0244
4	200	0	0	0	
5	250	0	0.0023	0.0023	0.0130
6	300	0	0	0	
7	350	0	0.0033	0.0034	0.0072
8	400	0	0	0	
9	450	0	0.0028	0.0028	0.0035
10	500	0	0	0	
11	550	0	0.0014	0.0014	0.0020
12	600	0	0	0	
13	650	0	0.0005	0.0006	0.0021
14	700	0	0	0	
15	750	0	0.0011	0.0012	0.0015
16	800	0	0	0	
17	850	0	0.0013	0.0013	0.0015
18	900	0	0	0	
19	950	0	0.0009	0.0009	0.0015
20	1000	0	0	0	
21	1050	0	0.0006	0.0007	0.0013
22	1100	0	0	0	
23	1150	0	0.0008	0.0008	0.0012
24	1200	0	0	0	
25	1250	0	0.0011	0.0011	0.0011
26	1300	0	0	0	
27	1350	0	0.0011	0.0011	0.0011
28	1400	0	0	0	
29	1450	0	0.0008	0.0008	
30	1500	0	0	0	
31	1550	0	0.0006	0.0006	
32	1600	0	0	0	
33	1650	0	0.0000	0.0000	
34	1700	0	0	0	
35	1750	0	0.0000	0.0009	
36	1800	0	0	0	
37	1850	0	0.0006	0.0006	
38	1900	0	0	0	
39	1950	0	0.0004	0.0005	
40	2000	0	0	0	



**Harmonic Emission - IEC 61000-3-2 , EN 61000-3-2 , (EN60555-2)** 2/07/2012 1:34:08 PM

Urms = 230.3 V	P = 7.154 W	THC = 0.008 A	Range: 0.5 A
Irms = 0.032 A	pf = 0.957	Pmax = 7.166 W	V-nom: 230 V
			TestTime: 5 min (100%)

LED Mini MR16 **Test completed, Result: PASSED**

HAR-1000 EMC-Partner

**Legend**

Full Bar: Actual Values      Empty Bar: Maximum Values      Green: Voltage  
Blue: Current      Red: Failed

Table 16: Harmonic Current Emissions measurement

Climatic Conditions	
Temperature:	20°C
Humidity:	55%

Table 17: Climatic conditions

**Comments:** Harmonic Current Emissions were below the specified limit.

**Assessment:** The EUT complied with the Harmonic Current Emission requirements of IEC 61000-3-2: 2005 plus amendments to 2009.

**14. Conclusion**

The Indice Ecotech Pty Ltd, LED MINI-ULTRA-WW, LED Mini MR16 12VAC Lamp with VIPER electronic transformer complied with the applicable EMC requirements of IEC 61547: 2009 and IEC 61000-3-2: 2005 plus amendments to 2009 .

## Appendix A – Test Equipment

Inv	Equipment	Make	Model No.	Serial No.	Calibration	
					Due	Type
<b>Electrostatic Discharge</b>						
730	ESD Generator System	EMC Partner	ESD3000	150	Jun 13	E
174	Shielded Enclosure #4	RFI Industries	S100	652	N/A	V
<b>Fast Transients, Surges, Voltage Dips and Interruptions</b>						
1008	Transient Generator	Thermo Electron Corp (KeyTek)	EMCPROplus	0411224	Aug 12	E
409	Digital Oscilloscope	Tektronix	TDS 380	B012299	Aug 12	E
174	Shielded Enclosure #4	RFI Industries	S100	652	N/A	V
<b>Radio-Frequency Electromagnetic Fields</b>						
636	Signal Generator	Gigatronics	6080A	5465602	Feb 13	I
467	1-1000MHz RF Amplifier	Amplifier Research	100W1000	20724	N/A	V
269	Biconilog Antenna	EMCO	3143	1026	N/A	V
310	E-Field Probe	Holiday	HI-4416	8970966	Mar 14	E
560	Mainframe Field Monitor	Amplifier Research	FM 5004	21422	N/A	V
581	Power Meter	Hewlett Packard	HP 437B	2835U00273	Nov 12	E
738	Bi-Directional Coupler	Werlatone	C6277-10	20129	Nov 13	I
630	Power Sensor	Hewlett Packard	8482A	US37290856	Mar 14	E
441	Anechoic Chamber #2	RFI Industries	TC-800-20	933	N/A	V
<b>Injected Currents (Radio-Frequency common mode)</b>						
38	Signal Generator	Fluke	6060A	3710024	Jun 13	I
583	Amplifier, RF, power	ENI	3200L	127	N/A	V
737	Power Meter, Dual	Agilent	E4419B	MY45100325	Dec 14	E
214	Bi-Directional Coupler	Amplifier Research	DC2000	12090	May 14	I
740	Power Sensor	Agilent	E9304A	MY41496556	Dec 14	E
478	M3 Powerline CDN	FCC	FCC-801-M3-25	9712	N/A	V
477	M2 Powerline CDN	FCC	FCC-801-M2-16	9727	N/A	V
476	M1 Powerline CDN	FCC	FCC-801-M1-16	9713	N/A	V
656	Bulk Current Injection Probe	FCC	F-120-3	101	N/A	V
945	Attenuator 6dB	JFW	50FH-006-300	0703	Jan 13	I
667	Shielded Enclosure #1	RFI Industries	S800	1201	N/A	V
<b>Harmonic Current Emissions</b>						
615	Harmonics Analyser	EMC Partner	HAR1H01B	HAR1000-64	Feb 12	E
<b>General Equipment</b>						
997	HYGROMETER, Temp, Humidity	RS	408	6109	Mar 14	E
1081	METER, Light	DigiTech	QM-1587	12039241	N/A	V

*V: Verification of operation against an internal reference  
I: Internal calibration against a NATA traceable standard  
E: External calibration by a NATA endorsed facility*

## Appendix B – Photographs

Number	Photograph Description
1	EUT – External view
2	EUT – External views – LED Downlight
3	
4	EUT – VIPER Transformer
5	EUT – PCB Views – LED Downlight
6	
7	EUT – PCB Views – VIPER Transformer
8	
9	EUT – LED Downlight – Identification label
10	EUT – VIPER Transformer – Identification label
11	Electrostatic Discharge – Test Configuration – HCP
12	Electrostatic Discharge – Test Configuration - VCP
13	Electrostatic Discharge – Test Configuration – Contact discharges
14	Electrostatic Discharge – Test Configuration – Air discharges
15	Electrostatic Discharge – Contact discharge test points
16	
17	
18	Electrostatic Discharge – Air discharge test points
19	
20	Radio Frequency Electromagnetic Radiation – Test Configuration
21	
22	Injected currents – Test Configuration
23	Fast transients and Surges – Test configuration
24	Voltage dips and interruptions – Test configuration
25	Harmonic Current Emissions – Test configuration



Photograph 1



Photograph 2



Photograph 3



Photograph 4



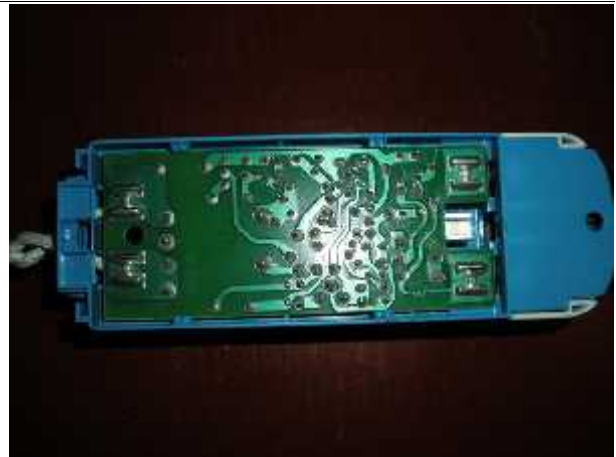
Photograph 5



Photograph 6



Photograph 7



Photograph 8



Photograph 9



Photograph 10



Photograph 11



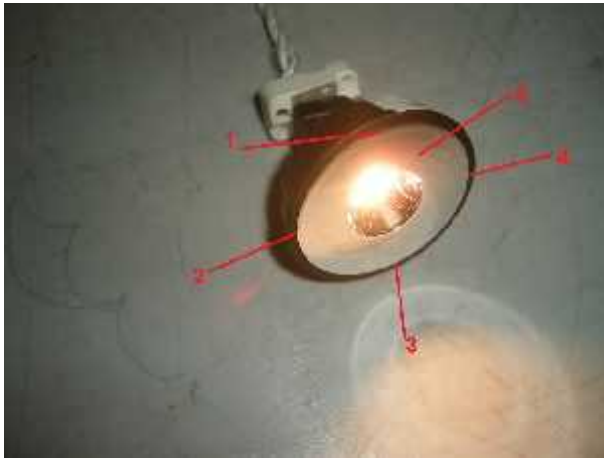
Photograph 12



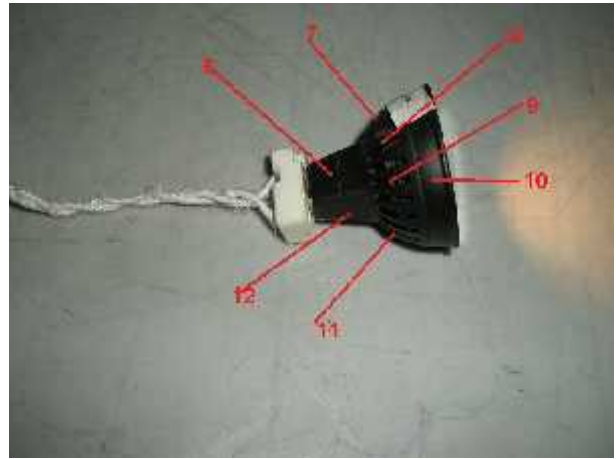
Photograph 13



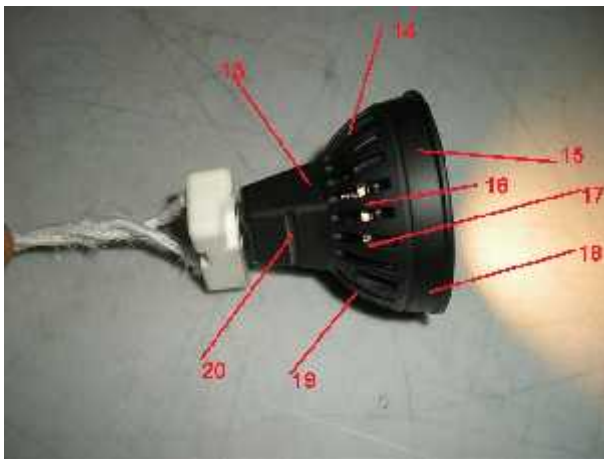
Photograph 14



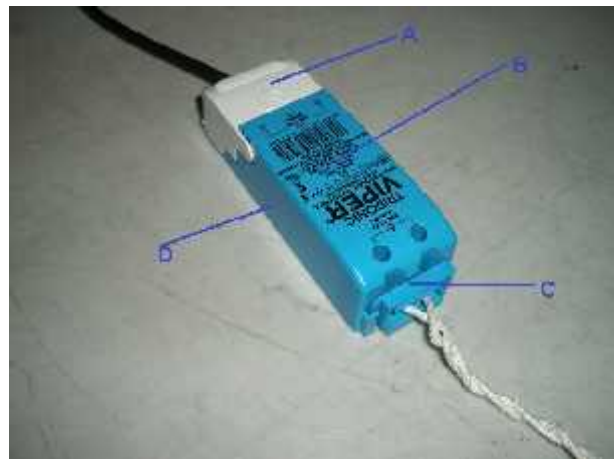
Photograph 15



Photograph 16

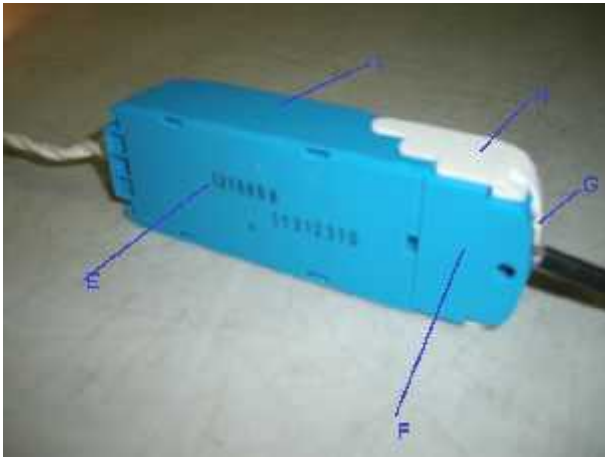


Photograph 17



Photograph 18





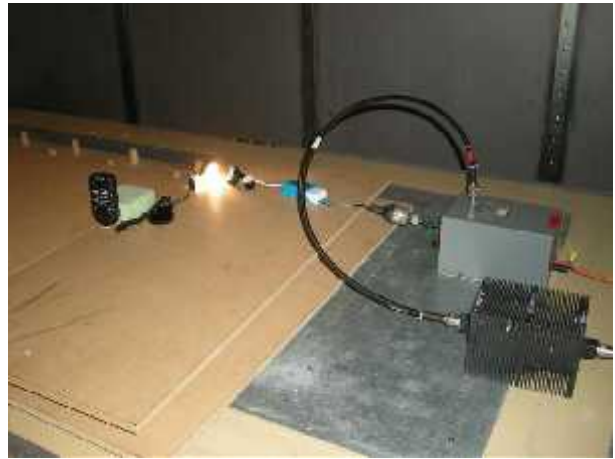
Photograph 19



Photograph 20



Photograph 21



Photograph 22



Photograph 23



Photograph 24



Photograph 25