



EMC Bayswater Pty Ltd

52 Holloway Drive Bayswater, Victoria, 3153, Australia
Telephone: +61 3 9762 4111
Facsimile: +61 3 9762 8519
Email: sales@emcbayswater.com.au
ABN: 49 112 221 333

EMC COMPLIANCE REPORT

In accordance with:

AS/NZS CISPR 15: 2011

Indice Ecotech Pty Ltd

14W LED Downlight

Integrated LED Light and Driver

REPORT: E1207-0204
DATE: July, 2012



Accreditation Number: 18553
Accredited for compliance with ISO/IEC 17025

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.



Certificate of Compliance

EMC Bayswater Test Report: E1207-0204
Issue Date: July, 2012

Test Sample(s): Integrated LED Light and Driver
Model No: 14W LED Downlight
Serial No: None Stated

Client Details: Mr Aaron Brown
Indice Ecotech Pty Ltd
PO Box 4329
Level 1 16 Harvey St
East Richmond VIC 3121
Phone No: 03 9427 8999 Fax No: 03 9427 1588
e-mail: abrown@indice.com.au

Test Specification: AS/NZS CISPR 15: 2011
Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.

Results Summary: Disturbance Voltage at Mains Terminals (9kHz – 30MHz) **Complied**
Radiated Electromagnetic Disturbance (9kHz – 30MHz) **Complied**
Radiated Electromagnetic Disturbance (30MHz – 300MHz) **Complied**

Test Date(s): 6th July, 2012

Test House (Issued By) EMC Bayswater Pty Ltd
52 Holloway Drive
Bayswater
Victoria, 3153
Australia

Telephone: +61 3 9762 4111 Email: sales@emcbayswater.com.au
Fax No: +61 3 9762 8519 Web: www.emcbayswater.com.au

The Indice Ecotech Pty Ltd, 14W LED Downlight, Integrated LED Light and Driver, complied with the applicable requirements of AS/NZS CISPR 15: 2011.

Prepared by:



Sean Regan
(EMC Test Engineer)

Approved by:



Andrew Whiteford
(General Manager)

18/07/2012 15:35

Date

EMC Compliance Report *for* Indice Ecotech Pty Ltd

Contents

1. Introduction	4
2. Summary of Results	4
3. Product Sample, Configuration & Modifications	4
3.1. Product Sample Details	4
3.2. Configuration	4
3.3. Modifications.....	4
4. Test Facility & Equipment	5
4.1. Test Facility	5
4.2. Test Equipment	5
5. Referenced Standards	5
6. Disturbance Voltage at Mains Terminals (Conducted Emissions)	6
6.1. Test Procedure	6
6.2. Limits.....	6
6.3. Test Results.....	6
7. Radiated Electromagnetic Disturbance (Radiated Emissions 30MHz – 300MHz)	8
7.1. Test Procedure	8
7.2. Limits.....	8
7.3. Test Results.....	8
8. Radiated Electromagnetic Disturbance (Radiated Emissions 9kHz – 30MHz)	10
8.1. Test Procedure	10
8.2. Limits.....	10
8.3. Test Results.....	10
9. Conclusion	11
Appendix A – Test Equipment	12
Appendix B – Photographs	13
Appendix C – Measurement Graphs	17

1. Introduction

Electromagnetic compatibility (EMC) tests were performed on a Indice Ecotech Pty Ltd, 14W LED Downlight, Integrated LED Light and Driver in accordance with the requirements of AS/NZS CISPR 15: 2011.

2. Summary of Results

Test	Result
Disturbance Voltage at Mains Terminals (Active line)	Complied with quasi-peak limit by 4.6dB
	Complied with average limit by 2.7dB ⁺
Disturbance Voltage at Mains Terminals (Neutral line)	Complied with quasi-peak limit by 3.7dB
	Complied with average limit by 1.9dB ⁺
Radiated Electromagnetic Disturbance (9kHz – 30MHz)	Complied with quasi-peak limit by >10dB
Radiated Electromagnetic Disturbance (30MHz – 300MHz) Horizontal Antenna Polarisation	Complied with quasi-peak limit by >10dB
Radiated Electromagnetic Disturbance (30MHz – 300MHz) Vertical Antenna Polarisation	

⁺Refer to measurement uncertainty statement

Table 1: Results Summary

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: Integrated LED Light and Driver
 Model No: 14W LED Downlight
 Serial No: None Stated
 Specifications: 240VAC @ 50Hz

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

3.2. Configuration

The EUT was connected to and powered by 240VAC @ 50Hz mains supply.

3.3. Modifications

EMC Bayswater Pty Ltd did not modify the EUT.

4. Test Facility & Equipment

4.1. Test Facility

Tests were performed at EMC Bayswater Pty Ltd, located at 52 Holloway Drive, Bayswater, Victoria, Australia.

4.2. Test Equipment

Refer to Appendix A for the measurement instrument list.

5. Referenced Standards

AS/NZS CISPR 15: 2011

Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.

CISPR 16-2-1: 2003

Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements.

CISPR 16-1-4: 2008

Specification for radio disturbance and immunity measuring apparatus and methods Part 1.4: Radio disturbance and immunity measuring apparatus— Ancillary equipment— Radiated disturbances

6. Disturbance Voltage at Mains Terminals (Conducted Emissions)

6.1. Test Procedure

The EUT was tested to Disturbance Voltage at Mains Terminals in accordance with AS/NZS CISPR 15: 2011.

The EUT was positioned 0.4 metres above the ground reference plane (chamber floor), and was connected to a LISN located 0.8 metres away.

The measuring port of the LISN was connected to the EMI measuring receiver. In order to avoid unwanted ambient signals, power to the LISN was supplied via power line filters fitted to the shielded enclosure wall.

The mains flexible cord provided by the manufacturer is required to be 0.8 metres long for these measurements. If the manufacturer supplies a non-removable power lead, in excess of 0.8 metres, the cable in excess of 0.8 metres is folded into a figure 8 bundle approximately 0.4 metres in length.

Both the active and neutral lines were tested, in turn.

(Refer to Photograph 1 in Appendix B for a view of the test configuration)

6.2. Limits

The EUT shall meet the limits in the following table:

Frequency Range (MHz)	Quasi Peak Limit (dB-V)	Average Limit (dB-V)
0.009 – 0.05	110	-
0.05 – 0.15	90 to 80**	-
0.15 – 0.5	66 to 56**	56 to 46**
0.5 – 5	56	46
5 – 30	60	50

* At the transition frequency, the lower limit applies.
** The limit decreases linearly with the logarithm of the frequency in the ranges 50kHz to 150kHz and 150kHz to 0.5MHz.

Table 2: Disturbance Voltage at Mains Terminals limits

6.3. Test Results

Disturbance Voltage at Mains Terminals measurements are tabulated below.

(Refer to Graphs 1 and 2 in Appendix C)

Quasi - Peak Measurements				Average Measurements			
Frequency (MHz)	Result (dB~V)	Limit (dB~V)	Delta Limit (dB)	Frequency (MHz)	Result (dB~V)	Limit (dB~V)	Delta Limit (dB)
0.665	51.4	56.0	-4.6*	0.665	43.3	46.0	-2.7**
1.329	39.2	56.0	-16.8	1.325	29.3	46.0	-16.7

* worst case emissions, ** Refer to measurement uncertainty statement

Table 3: Disturbance Voltage at Mains Terminals – Active Line

Quasi - Peak Measurements				Average Measurements			
Frequency (MHz)	Result (dB~V)	Limit (dB~V)	Delta Limit (dB)	Frequency (MHz)	Result (dB~V)	Limit (dB~V)	Delta Limit (dB)
0.661	52.3	56.0	-3.7*	0.661	44.1	46.0	-1.9**
1.321	42.9	56.0	-13.1	1.321	33.1	46.0	-12.9

* worst case emissions, ** Refer to measurement uncertainty statement

Table 4: Disturbance Voltage at Mains Terminals – Neutral Line

The measurement uncertainty was calculated at ± 3.3 dB for the frequency range 0.009MHz to 0.15MHz and ± 2.9 dB for the frequency range 0.15MHz to 30MHz. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of $k=2$ which gives a level of confidence of approximately 95%.

Climatic Conditions	
Temperature:	17°C
Humidity:	50%

Table 5: Climatic conditions

Comments: Disturbance Voltages at the Mains Terminals were below the specified limits for both active and neutral lines.

Assessment: The EUT complied with the Disturbance Voltage at Mains Terminals requirements of AS/NZS CISPR 15: 2011.

7. Radiated Electromagnetic Disturbance (Radiated Emissions 30MHz – 300MHz)

7.1. Test Procedure

The EUT was tested to Radiated Electromagnetic Disturbance in accordance with AS/NZS CISPR 15: 2011.

Radiated Emissions were measured 3 metres away from the EUT in the iOATS (indoor Open Area Test Site) facility, which is a CISPR 16-1-4:2008 compliant semi-anechoic chamber with ground plane.

The EUT was placed on a non-conductive table, at a height of 0.8m above the ground plane. Mains power was provided to the EUT. For both horizontal and vertical antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned. The antenna height was varied from 1 to 4 metres and the turntable slowly rotated, in order to find worst-case emissions. Quasi peak measurements were performed at spot frequencies where the peak emission was close to, or exceeded the applicable limit line.

Plots of the accumulated measurement data for both horizontal and vertical antenna polarizations, including all transducer correction factors were produced.

(Refer to photographs 2 to 4 in Appendix B for views of the test configuration)

7.2. Limits

The EUT shall meet the limits in the following table.

Frequency Range (MHz)	Limits (dB μ V/m)
	Quasi-Peak
30 to 230	40
230 to 300	47

NOTE The lower limit shall apply at the transition frequency.

Table 6: Limits for Radiated Electromagnetic Disturbance at a measuring distance of 3m.

7.3. Test Results

Radiated Electromagnetic Disturbance measurements are tabulated below. Quasi-peak measurements were performed at spot frequencies where the peak emission was close to, or exceeded the applicable limit line.

(Refer to graphs 3 & 4 in Appendix C)

Frequency (MHz)	Result Quasi-peak (dB-V/m)	Limit Quasi-peak (dB-V/m)	Delta limit (dB)
Complied with quasi-peak limit by >10dB			

Table 7: Radiated Electromagnetic Disturbance – Horizontal Antenna Polarisation

Frequency (MHz)	Result Quasi-peak (dB-V/m)	Limit Quasi-peak (dB-V/m)	Delta limit (dB)
Complied with quasi-peak limit by >10dB			

Table 8: Radiated Electromagnetic Disturbance – Vertical Antenna Polarisation

The measurement uncertainty was calculated at ± 4.7 dB. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of $k=2$ which gives a level of confidence of approximately 95%.

Climatic Conditions	
Temperature:	16°C
Humidity:	60%

Table 9: Climatic conditions

Comments: Radiated Electromagnetic Disturbance measurements were below the limit.

Assessment: The EUT complied with the Radiated Electromagnetic Disturbance requirements of AS/NZS CISPR 15: 2011.

8. Radiated Electromagnetic Disturbance (Radiated Emissions 9kHz – 30MHz)

8.1. Test Procedure

The EUT was tested to Radiated Electromagnetic Disturbance in accordance with AS/NZS CISPR 15: 2006.

To reduce the impact of surrounding structures on the magnetic emissions, all measurements were performed well clear of any large metallic structures.

The EUT was positioned on a non-conductive table in the centre of a 2.0m Van Veen Loop (triple loop) antenna.

The measuring receiver was connected to the triple loop by shielded coaxial cable via the coaxial switch. The coaxial switch was positioned to the relevant axis that was being measured.

Measurements were made over the 9kHz to 30MHz frequency band. Quasi-peak measurements were performed at spot frequencies where peak emissions were close to or exceeded the quasi-peak limit line.

Radiated electromagnetic disturbance measurements were performed in sequence for each of the X, Y and Z antenna axis.

(Refer to photograph 5 in Appendix B for a view of the test configuration)

8.2. Limits

The EUT shall meet the limits in the following table:

Frequency Range (MHz)	Quasi-Peak Limit 2m Loop (dB-A)
0.009 – 0.07	88
0.07 – 0.15	88 to 58**
0.15 - 3	58 to 22**
3 - 30	22

* At the transition frequency, the lower limit applies.
** The limit decreases linearly with the logarithm of the frequency .

Table 10: Radiated Electromagnetic Disturbance Limits

8.3. Test Results

Radiated Electromagnetic Disturbance measurements are tabulated below.

(Refer to graphs 5 to 7 in Appendix C)

Quasi-Peak Measurements			
Frequency (MHz)	Result (dB~A)	Limit (dB~A)	Delta Limit (dB)
Complied with quasi-peak limit by >10dB			

Table 11: Radiated Electromagnetic Disturbance – X antenna axis

Quasi-Peak Measurements			
Frequency (MHz)	Result (dB~A)	Limit (dB~A)	Delta Limit (dB)
0.670	23.1	40.0	-16.9

Table 12: Radiated Electromagnetic Disturbance – Y antenna axis

Quasi-Peak Measurements			
Frequency (MHz)	Result (dB~A)	Limit (dB~A)	Delta Limit (dB)
0.662	20.6	40.2	-19.6

Table 13: Radiated Electromagnetic Disturbance – Z antenna axis

The measurement uncertainty was calculated at ± 2.9 dB. The reported uncertainty is an expanded uncertainty, calculated using a coverage factor of $k=2$ which gives a level of confidence of approximately 95%.

Climatic Conditions	
Temperature:	16°C
Humidity:	50%

Table 14: Climatic conditions

Comments: Radiated Electromagnetic Disturbances were below the specified limit.

Assessment: The EUT complied with the Radiated Electromagnetic Disturbance requirements of AS/NZS CISPR 15: 2011.

9. Conclusion

The Indice Ecotech Pty Ltd, 14W LED Downlight, Integrated LED Light and Driver complied with the applicable requirements of AS/NZS CISPR 15: 2011.

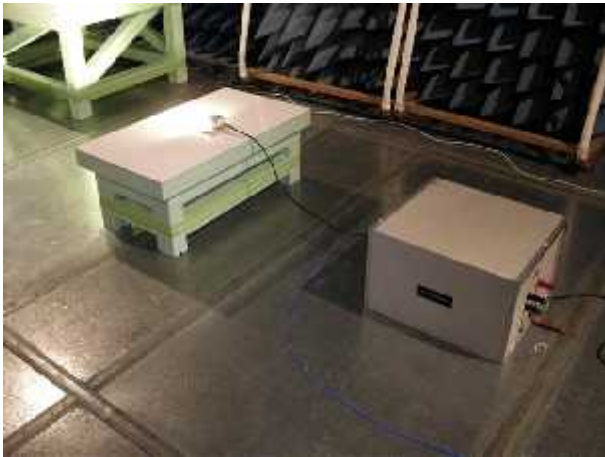
Appendix A – Test Equipment

Inv	Equipment	Make	Model No	Serial No	Calibration	
					Due Date	Type
48	LISN	Electro Metrics	3850/2	9105 1006	Mar 13	E
358	LIMITER, Transient, 9k-200M	Hewlett Packard	11947A	3107A01832	Jun 14	I
539	Triple Loop Antenna	RFI Industries	RFI-4051-2m	RFI-2m-9k-30m	May 13	I
666	Shielded enclosure	RFI Industries	S800 iOATS	1229	Mar 13	I
173	Shielded enclosure	RFI Industries	S100	651	N/A	V
818	EMI Receiver	Rohde & Schwarz	ESIB 40	100295	Jul 12	E
932	CONTROLLER, Position	Sunol Sciences	SC104V-3	081006-1	N/A	V
933	TURNTABLE	Sunol Sciences	SM46C	081006-2	N/A	V
934	MAST, Antenna	Sunol Sciences	TLT2	TBA	N/A	V
935	ANTENNA, Biconilog	Sunol Sciences	JB5	A07116	Nov 12	E
954	EMI Receiver	Rohde & Schwarz	ESCI	100196	Apr 13	E
793	CABLE, Coax, Multiflex MF141	Huber+Suhner	84025724/1806	C351	Apr 13	I
812	CABLE, Coax, Multiflex MF141	Huber+Suhner	84025730/1806	C354	Jan 13	I
811	CABLE, Coax, Multiflex MF141	Huber+Suhner	84025730/1806	C334	Jul 12	I
790	CABLE, Coax, Multiflex MF141	Huber+Suhner	84025724/1806	84025724/1806	Jul 12	I
997	HYGROMETER, Temp, Humidity	RS	408	6109	Mar 14	E

V: Verification of operation against an internal reference
I: Internal calibration against a NATA traceable standard
E: External calibration by a NATA endorsed facility
N/A: Not Applicable

Appendix B – Photographs

Number	Photograph Description
1	Disturbance Voltage at Mains Terminals – Test configuration
2	Radiated Electromagnetic Disturbance (30MHz – 300MHz) – Test configuration
3	
4	
5	Radiated Electromagnetic Disturbance (9kHz – 30MHz) – Test configuration
6	Integrated LED Light and Driver – Internal Views
7	
8	Integrated LED Light and Driver – External Views
9	



Photograph 1



Photograph 2



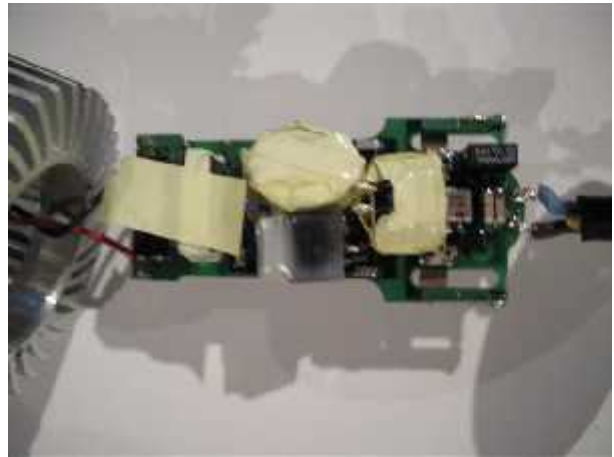
Photograph 3



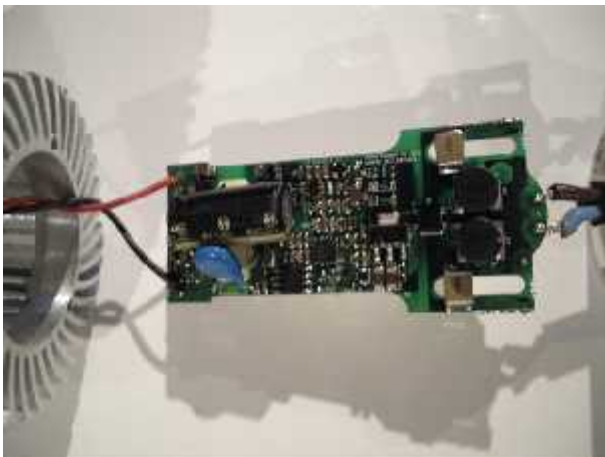
Photograph 4



Photograph 5



Photograph 6



Photograph 7



Photograph 8

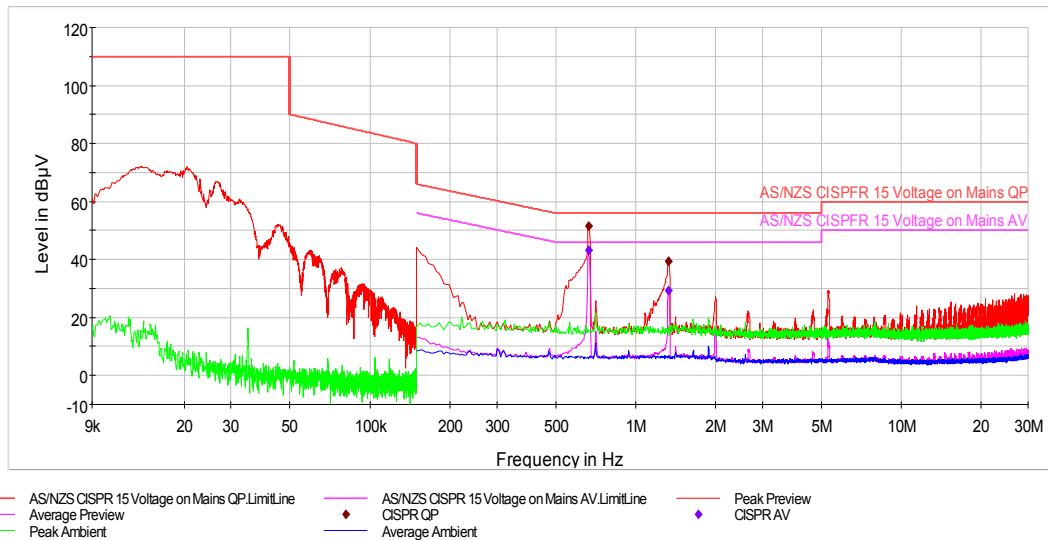


Photograph 9

Appendix C – Measurement Graphs

No.	Test	Graph Description
1	Disturbance Voltage at Mains Terminals	Active Line
2		Neutral Line
3	Radiated Electromagnetic Disturbance (30MHz – 300MHz)	Horizontal Antenna Polarisation
4		Vertical Antenna Polarisation
5	Radiated Electromagnetic Disturbance (9kHz – 30MHz)	X axis
6		Y axis
7		Z axis

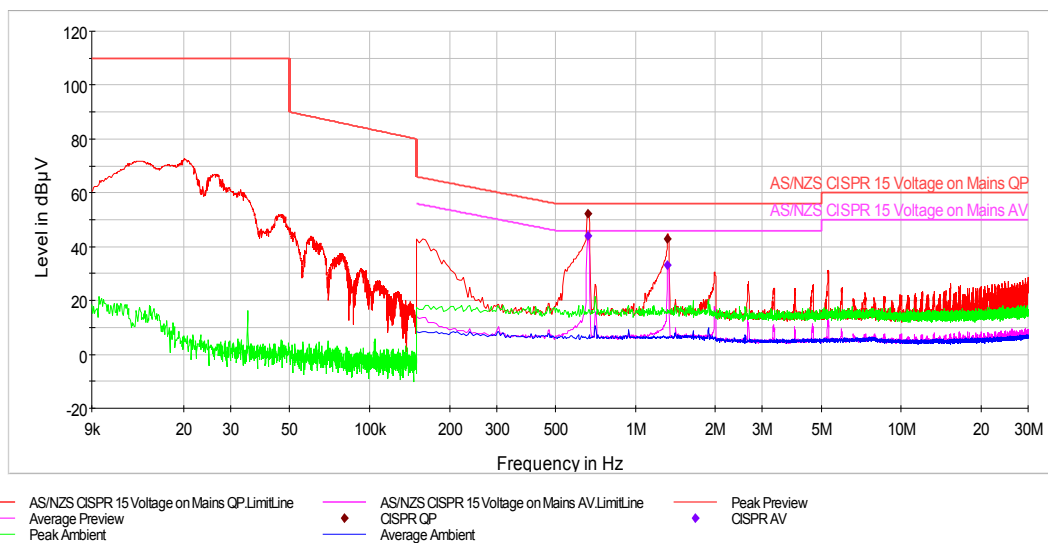
	EMC Bayswater Pty. Ltd.	
	AS/NZS CISPR 15: 2011 - Disturbance Voltage at Mains Terminals Indice Ecotech Pty Ltd - 14W LED Downlight Integrated LED Light and Driver Active Line	Job Number: E1207-0204 Test Engineer: SR



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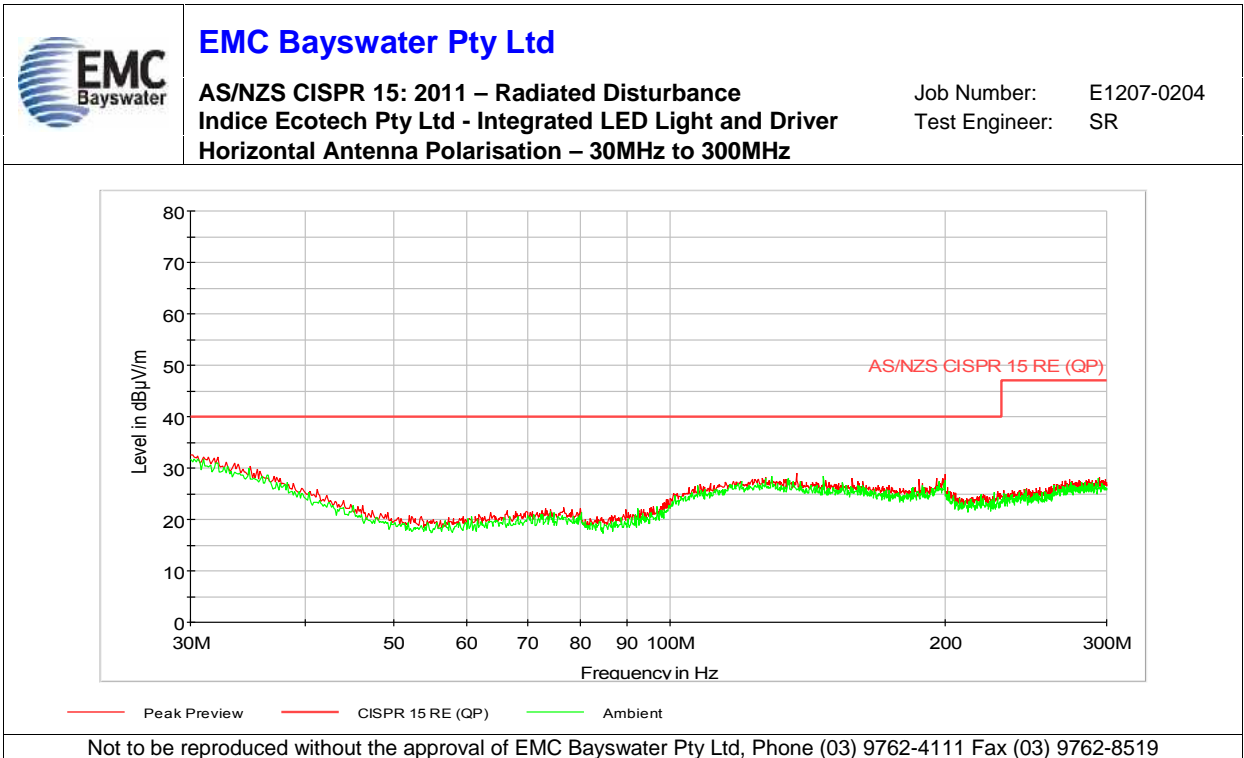
Graph 1

	EMC Bayswater Pty. Ltd.	
	AS/NZS CISPR 15: 2011 – Disturbance Voltage at Mains Terminals Indice Ecotech Pty Ltd - 14W LED Downlight Integrated LED Light and Driver Neutral Line	Job Number: E1207-0204 Test Engineer: SR

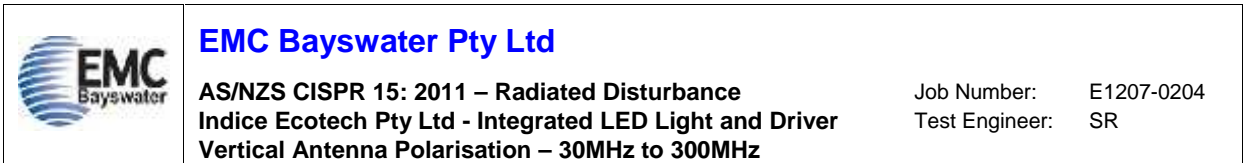


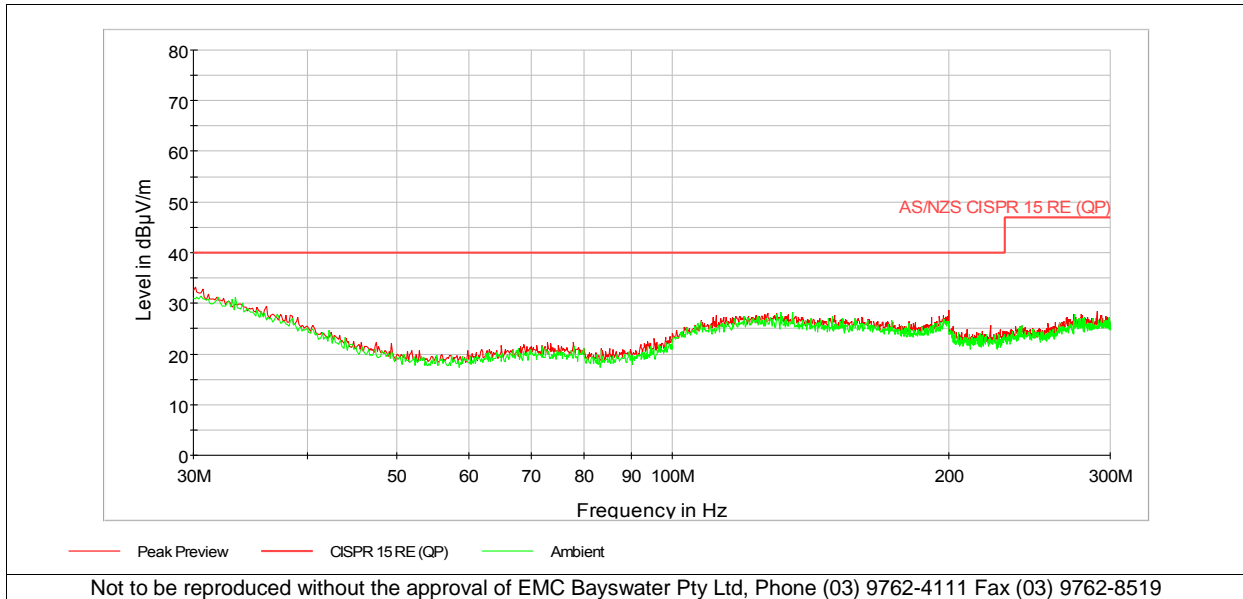
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Graph 2

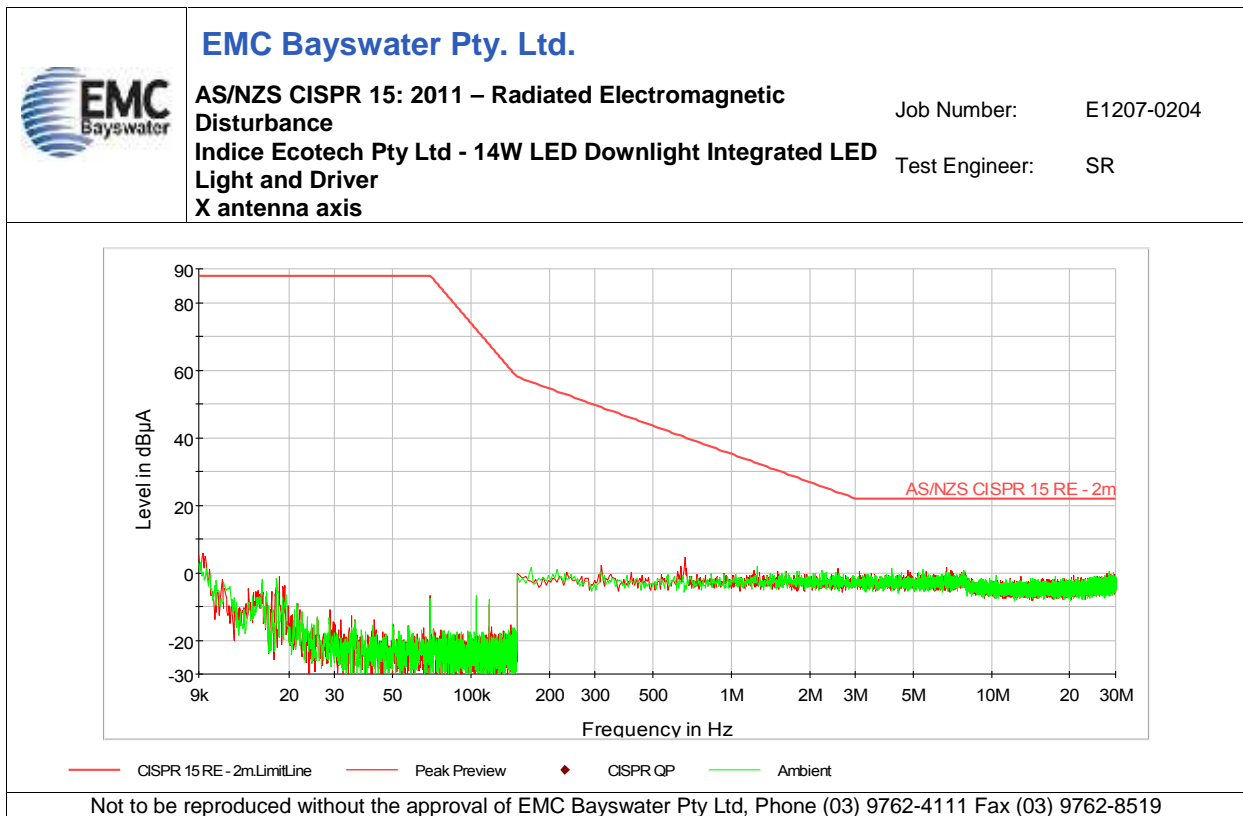


Graph 3






Graph 4



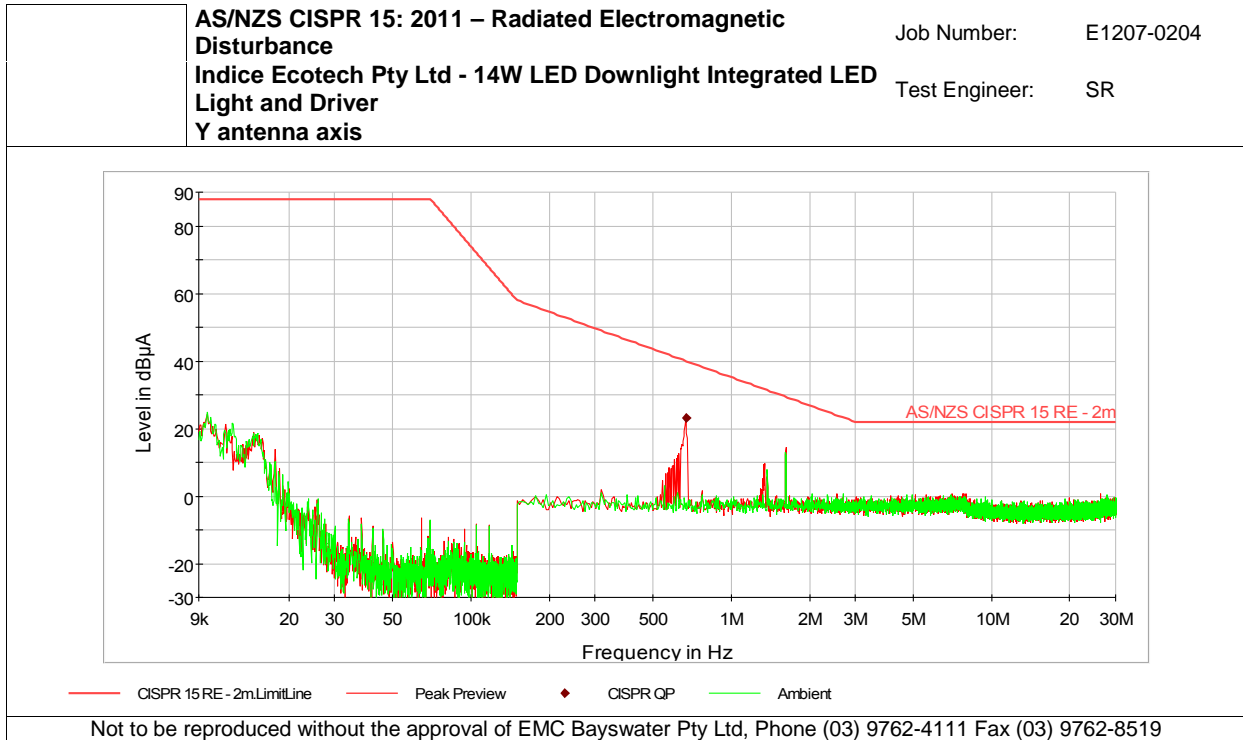
Graph 5



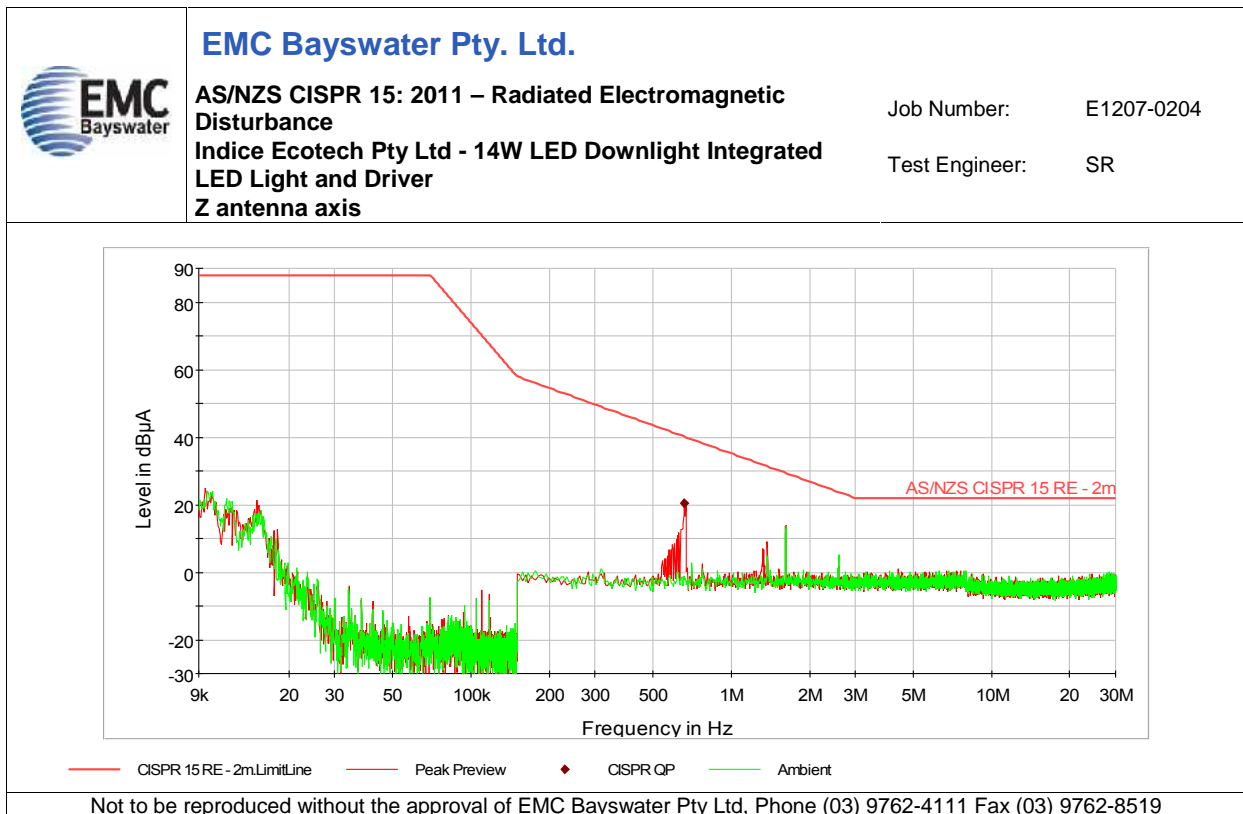
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Graph 6



Graph 7