EMC Test Report

for the

The Lighting Industry Association Limited

Handrail Luminaire

Model: Continulux

Project Engineer: L. Marsh:

Approval Signatory

Approved signatories: R. P. St John James ☐ J. A. Jones ☑ A. V. Jones ☐

The above named are authorised Hursley EMC Services signatories.

Hursley EMC Services Ltd.
Trafalgar House
Trafalgar Close
Chandlers Ford, Eastleigh
Hampshire. UK. SO53 4BW

Tel. +44 (0) 23 8027 1111
e mail. sales@hursley-emc.co.uk
www.hursley-emc.co.uk

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1.0 OVERVIEW

1.1 Introduction

The Equipment Under Test (EUT), as described within this document, was submitted for EMC testing as agreed with the customer.

1.2 Objective

The purpose of the test was to measure and report the EUT against limits and methods of the standards, as requested for and listed in section **2.0 Test Summary**.

1.3 Product Modifications

None to sample submitted.

1.4 Conclusion

The EUT met the emission requirements and the immunity tests as defined in section **2.0 Test Summary**.

This report relates to the sample tested and may not represent the entire population. It is valid only for the product identified, either in part or in full, to the relevant electromagnetic requirements necessary for compliance with the EMC Directive 2014/30/EU.

1.5 Test Deviations

The latest test referenced standard dates were used in place of those listed in the test standard.

1.6 EMC Test Lab Reference

Hursley EMC Services file: 17J389

2.0 TEST SUMMARY

2.1 Summary

The EUT, as described and reported within this document, complies with the applied sections of the standards listed below.

The EUT met the **emission** test requirements of the following standards:

Description	General Standard	Referenced Standard
Radiated emissions	EN 55015:2013 A1:2015, 3a, 3b and Annex B	CISPR 15:2013
		CISPR 15:2013
Conducted emissions, AC port	EN 55015:2013 A1:2015, Table 2a	CISPR 15:2013

The EUT met the **immunity** test requirements of the following standards:

Description	General Standard	Referenced Standard
Electrostatic discharge	EN 61547:2009	EN 61000-4-2:2009
Radiated RF immunity		EN 61000-4-3:2006 inc A1:2008 & A2:2010
Fast transient bursts, AC port		EN 61000-4-4:2012
Conducted immunity		EN 61000-4-6:2014

3.0 EQUIPMENT & TEST DETAILS

3.1 General

EUT:	Handrail Lamp Model: Continulux Serial number: EMC001 (designated by Hursley EMC Services)
EUT mains rating:	24V DC
EUT support equipment:	None
EUT manufacturer:	Penhale Quantock
EUT build level:	Production sample
Customer:	The Lighting Industry Association Limited Stafford Park 7 Telford Shropshire TF3 3BQ United Kingdom
Test commissioned by:	Ms Belinda Callear
Date EUT received:	26th July 2017
Test date(s):	26th July to the 1st August 2017
EMC measurement site(s):	Hursley EMC Services Limited • Trafalgar House, Trafalgar Close, Chandlers Ford, Hampshire • Hursley Park, Winchester, Hampshire

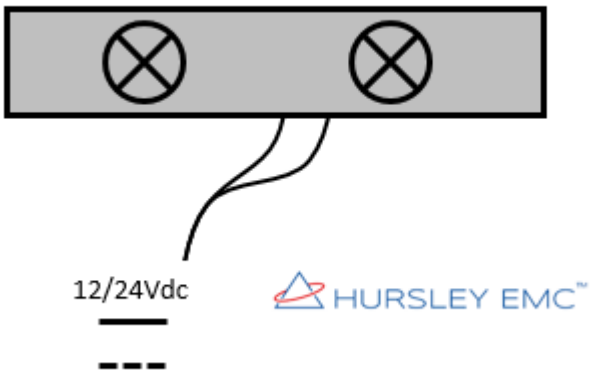
3.2 EUT Description

The EUT is an LED luminaire intended for indoor and outdoor use and it is installed within a handrail which also provides power via the hand rail.

3.3 EUT Test Exerciser

The EUT was powered on and positioned in a typical orientation. The mounting rail was not available at the time of testing.

3.4 EUT Configuration Diagram



3.5 Environmental Test Conditions

Temperature	20.5 to 25.7ºC
Relative Humidity	50 to 67%
Atmospheric Pressure	998 to 1015 mb

3.6 EMC Test Equipment

#ID	CP	Manufacturer	Type	Serial Nø	Description	Calibration due date
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	11/10/2017
050	1	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	14/09/2017
068	1	EM	CWS500C	1001-07	Conducted immunity simulator	25/05/2018
068a	1	EM	6dB pad	001	CWS 6dB matcher	23/05/2018
125	1	Rohde & Schwarz	SMHU	828875/018	Signal generator (100kHz-4.32GHz)	19/09/2017
150	3	Rohde & Schwarz	ESH2-Z1	894545/10	RF current probe (10k-30M)	06/02/2018
158	1	Rohde & Schwarz	ESH3-Z2	357881052	Pulse limiter	20/09/2017
171	1	Fischer	FCC150-50	337	Adapter (100Ω)	Internal
213	1	Fischer	801-M3-16	1051	CDN 3W 16A	22/11/2017
218	1	Boonton	4230	26603	Power meter/probe(a) (18GHz)	22/06/2018
233	3	Rohde & Schwarz	ESH2-Z1	881389/33	RF current probe (10k-30M)	06/02/2018
265	1	Rohde & Schwarz	ESH3-Z5	861189/003	Mains LISN / AMN	15/09/2017
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	17/07/2017
334	1	HEMCS	SMC	003	Dual 470k ohm resistance unit	Internal
390	0	Schwarzbeck	STLP9128D	9128D-060	RES antenna Saturn	Internal
422	1	Schaffner	CDN	14594	CDN M2/M3	Internal
555	1	Milmega	500W Amp	0	80-1000 MHz	Internal
560	1	Narda	3022	72498	Directional Coupler	Internal
649	3	Rohde & Schwarz	ESH2-Z1	338.3516.52	RF current probe (10k-30M)	11/02/2018
668	1	EMC Partner	IMU 4000	0	IMU 4000+E698+A698:G698	03/10/2017
679	1	Gauss	TDEIM30M	1510003	30MHz TD Receiver	18/10/2017
746	3	Dare!	CTR1004	15100078SNO50	18GHz field Probe	01/06/2019
762a	3	Schwarzbeck	DGA 9552N	0	6dB attenuator for #762	07/04/2019
764	2	Haefely Trench	PESD 3000	0	ESD gun	20/06/2019

CP = Interval period [year] prescribed for external calibrations

Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.
'Internal' means internally calibrated using HEMCS procedures

4.0 EMISSION RESULTS

4.1 Radiated Emissions

A profile scan was taken at a distance of three metres on eight azimuths of the EUT in both the vertical and horizontal polarities of the antenna in a semi-anechoic chamber.

Using the pre-scan results as a guide, each emission from the EUT was maximised. Measurements were carried out a distance of three metres in a CISPR 16-1-4 compliant semi-anechoic chamber. Cable positions were then finally adjusted to produce the maximum emission levels. The worst-case CISPR quasi-peak results are recorded below.

4.1.1 Data

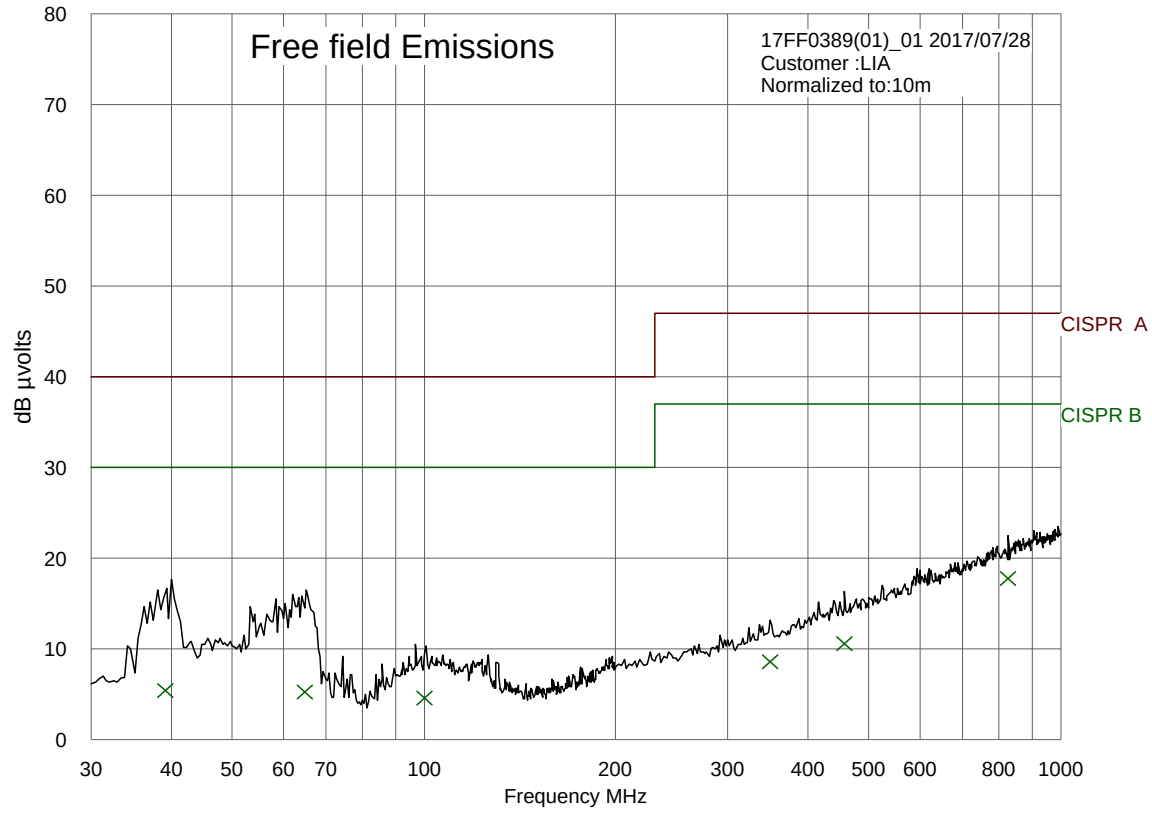
Emission frequency (MHz)	Antenna polarity	Measured quasi-peak value (dBµV/m)	Class B specified quasi-peak limit (dBµV/m)	Status
39.135	Vertical	5.55	30.0	Pass
65.080	Vertical	5.40	30.0	Pass
100.200	Vertical	4.64	30.0	Pass
350.000	Horizontal	8.64	37.0	Pass
457.600	Vertical	10.64	37.0	Pass
826.240	Vertical	17.78	37.0	Pass

The measurements reported are the highest emissions relative to the CISPR 22 Class B limits and take into account the antenna and cable loss factors. Measurements made according to the CISPR 22 test standard and Hursley EMC Services test procedure RAD-01.

TEST ENGINEER: Luke Marsh

4.1.2 Profile

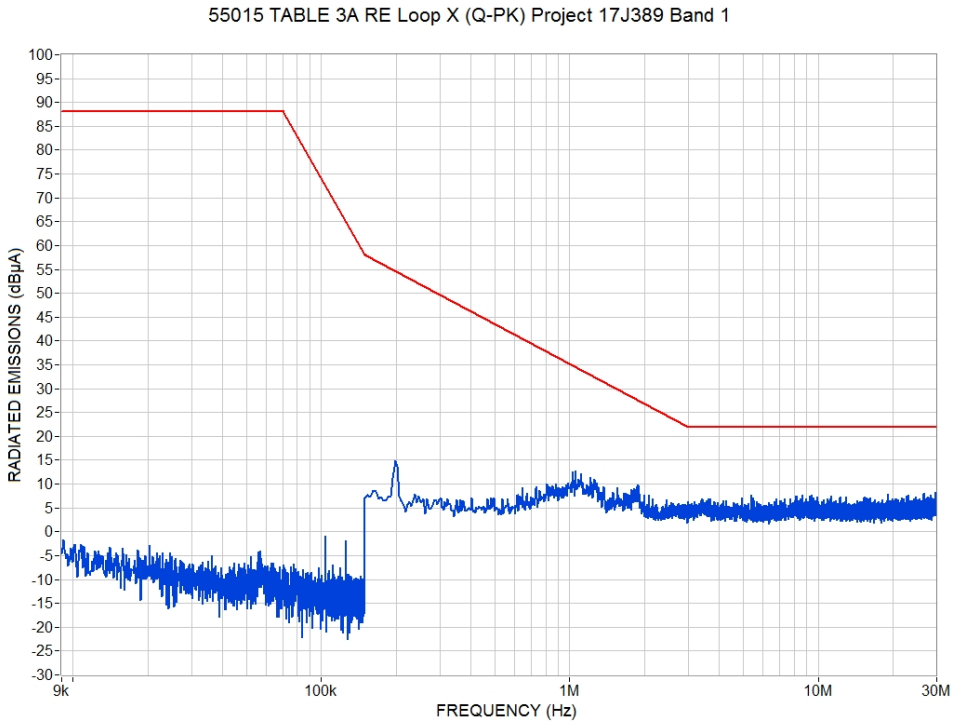
Maximum peak hold trace with quasi-peak values (✕)



4.2 Radiated Magnetic Emissions; 0.009 to 30MHz

Profile scans between 9kHz and 30MHz were taken within 2m loops.

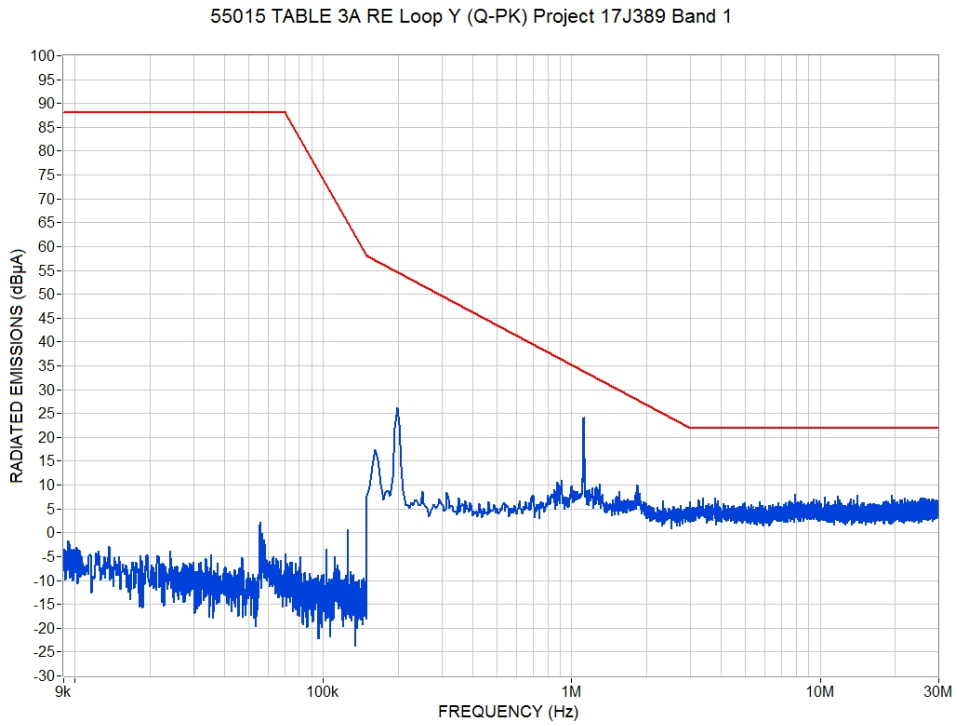
4.2.1 Profile; X Plane



Freq (Hz)	Quasi-Peak Emissions (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Margin (dB)	Result
198.000k	12.14	54.66	42.53	PASS
1.054M	7.41	34.57	27.16	PASS
1.890M	4.03	27.55	23.52	PASS
5.386M	-4.50	22.00	26.50	PASS
9.482M	-6.04	22.00	28.04	PASS
23.138M	-6.01	22.00	28.01	PASS

TEST ENGINEER: Luke Marsh

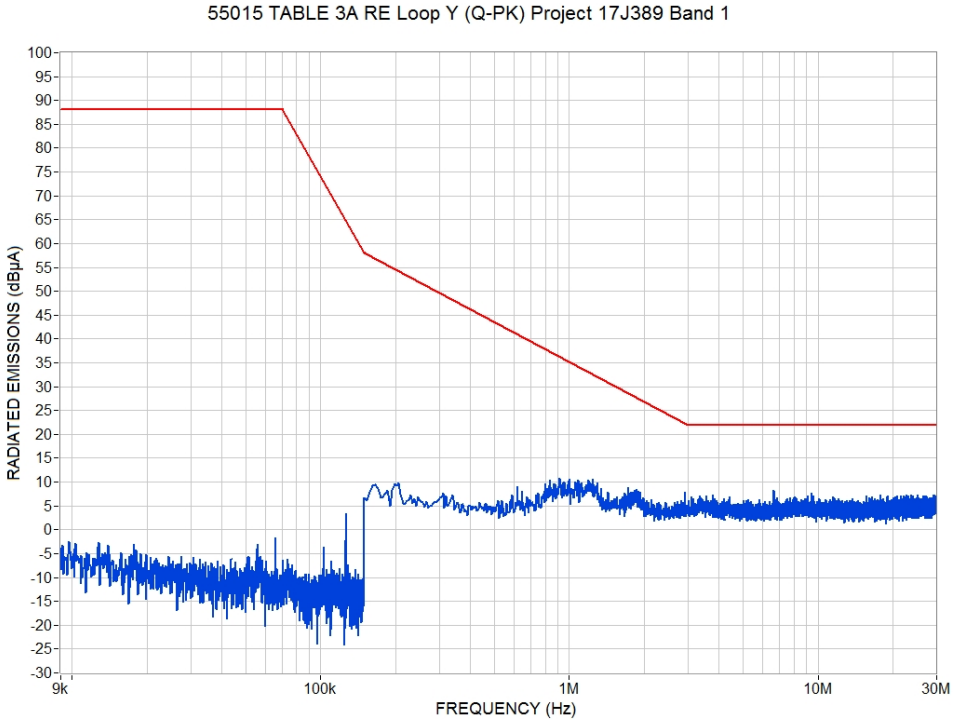
4.2.2 Profile; Y Plane



Freq (Hz)	Quasi-Peak Emissions (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Margin (dB)	Result
198.000k	24.84	54.66	29.83	PASS
910.000k	6.85	36.34	29.48	PASS
1.118M	1.85	33.86	32.02	PASS
1.842M	0.29	27.86	27.57	PASS
3.394M	-3.51	22.00	25.51	PASS
14.194M	-6.53	22.00	28.53	PASS

TEST ENGINEER: Luke Marsh

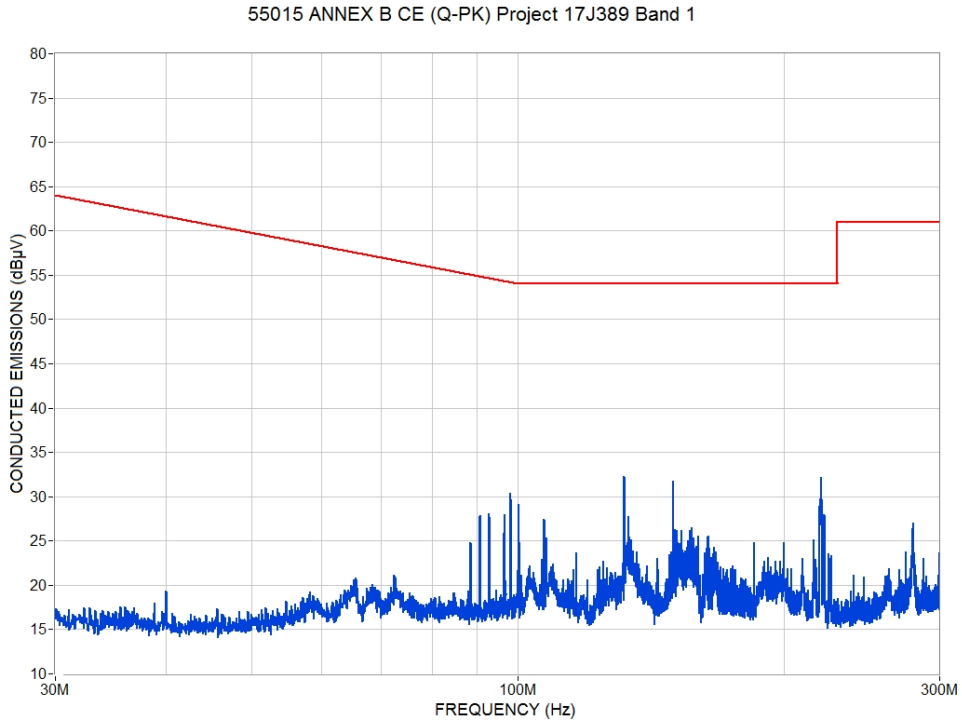
4.2.3 Profile; Z Plane



Freq (Hz)	Quasi-Peak Emissions (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Margin (dB)	Result
206.000k	4.33	54.19	49.86	PASS
838.000k	2.13	37.33	35.19	PASS
1.242M	3.31	32.60	29.28	PASS
1.726M	-0.52	28.64	29.16	PASS
2.934M	-4.37	22.27	26.63	PASS
6.662M	-4.48	22.00	26.48	PASS

TEST ENGINEER: Luke Marsh

4.3 Radiated Emissions; Annex B



Freq (Hz)	Quasi-Peak Emissions (dBµV)	Quasi-Peak Limit (dBµV)	Margin (dB)	Result
90.720M	28.57	54.81	26.24	PASS
92.880M	25.06	54.61	29.56	PASS
96.680M	26.37	54.28	27.91	PASS
98.200M	31.29	54.15	22.86	PASS
100.280M	30.10	54.00	23.90	PASS
107.200M	25.51	54.00	28.49	PASS
132.040M	28.33	54.00	25.67	PASS
133.560M	20.39	54.00	33.61	PASS
150.040M	30.28	54.00	23.72	PASS
220.640M	25.81	54.00	28.19	PASS

TEST ENGINEER: Luke Marsh

4.4 Continuous Emissions; 0.009 to 30MHz

A filtered 230V/50 supply was fed to the EUT via a 50Ω/50µH Artificial Mains Network (AMN). The AMN was bonded to a conductive ground plane. Line and neutral phases were measured separately.

A spectrum analyser was set to scan between 0.009MHz and 30.0MHz to record the peak emission profiles. The worst-case peaks were then measured using an average and/or quasi-peak receiver and compared to the EN 55015 limits. Measurements made according to the EN 55015 test standard and Hursley EMC Services test procedure CON-02. The worst-case results are shown here.

4.4.1 Data; EUT with One LED

0V

	Quasi-peak value (dBµV)		Average value (dBµV)		
Frequency	Measured	Specified Limit	Measured	Specified Limit	**Status**
20.564 kHz	36.96	110.00	n/a	n/a	Pass
26.027 kHz	13.32	110.00	n/a	n/a	Pass
50.565 kHz	13.55	89.90	n/a	n/a	Pass
61.691 kHz	14.47	88.09	n/a	n/a	Pass
66.857 kHz	28.85	87.36	n/a	n/a	Pass
92.586 kHz	14.20	84.39	n/a	n/a	Pass
99.242 kHz	16.78	83.76	n/a	n/a	Pass
121.693 kHz	12.71	81.90	n/a	n/a	Pass
133.713 kHz	16.71	81.05	n/a	n/a	Pass
150.000 kHz	10.13	66.00	n/a	n/a	Pass
534.058 kHz	20.01	56.00	16.79	47.46	Pass
3.433 MHz	17.61	56.00	12.77	46.00	Pass
8.926 MHz	18.11	60.00	13.42	50.00	Pass
11.816 MHz	18.49	60.00	13.71	50.00	Pass
14.739 MHz	18.70	60.00	14.04	50.00	Pass
16.489 MHz	18.86	60.00	14.12	50.00	Pass
20.313 MHz	19.75	60.00	14.86	50.00	Pass
23.842 MHz	19.65	60.00	14.74	50.00	Pass
26.608 MHz	19.91	60.00	15.16	50.00	Pass
29.979 MHz	20.41	60.00	15.72	50.00	Pass

Conducted emission (continued)

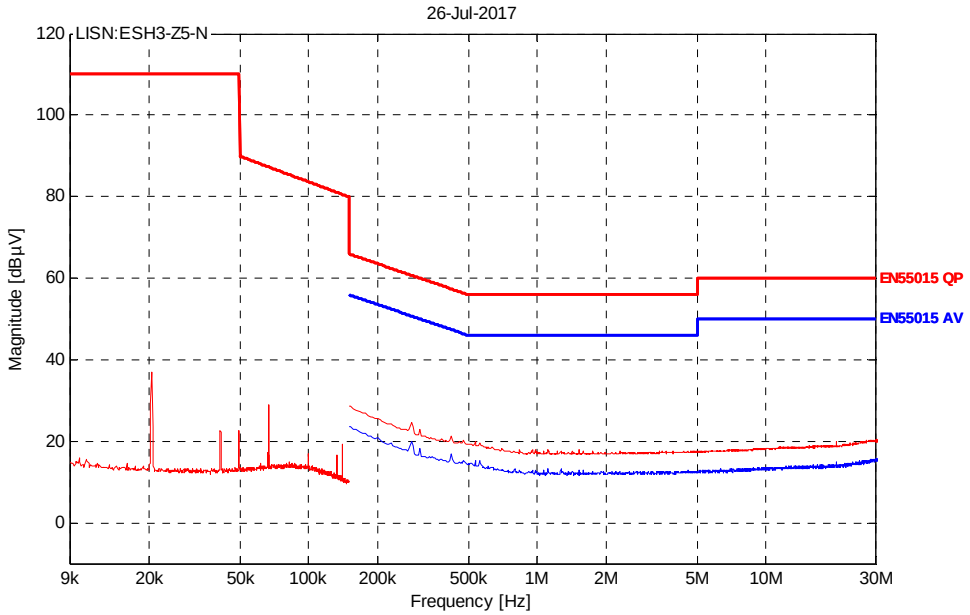
24V

	Quasi-peak value (dBµV)		Average value (dBµV)		
Frequency	Measured	Specified Limit	Measured	Specified Limit	**Status**
20.762 kHz	34.94	110.00	n/a	n/a	Pass
28.908 kHz	13.57	110.00	n/a	n/a	Pass
50.167 kHz	13.70	89.97	n/a	n/a	Pass
64.870 kHz	14.01	87.63	n/a	n/a	Pass
66.857 kHz	28.76	87.36	n/a	n/a	Pass
90.897 kHz	14.30	84.56	n/a	n/a	Pass
99.242 kHz	16.79	83.76	n/a	n/a	Pass
118.315 kHz	12.92	82.16	n/a	n/a	Pass
133.713 kHz	16.62	81.05	n/a	n/a	Pass
150.000 kHz	10.07	66.00	n/a	n/a	Pass
534.058 kHz	19.86	56.00	15.24	46.00	Pass
4.935 MHz	17.63	56.00	13.03	46.00	Pass
9.065 MHz	18.10	60.00	13.37	50.00	Pass
11.940 MHz	18.47	60.00	13.75	50.00	Pass
15.011 MHz	18.69	60.00	14.10	50.00	Pass
17.748 MHz	18.88	60.00	14.08	50.00	Pass
20.261 MHz	19.09	60.00	14.25	50.00	Pass
23.842 MHz	19.51	60.00	14.76	50.00	Pass
26.770 MHz	19.86	60.00	15.23	50.00	Pass
29.802 MHz	20.37	60.00	15.62	50.00	Pass

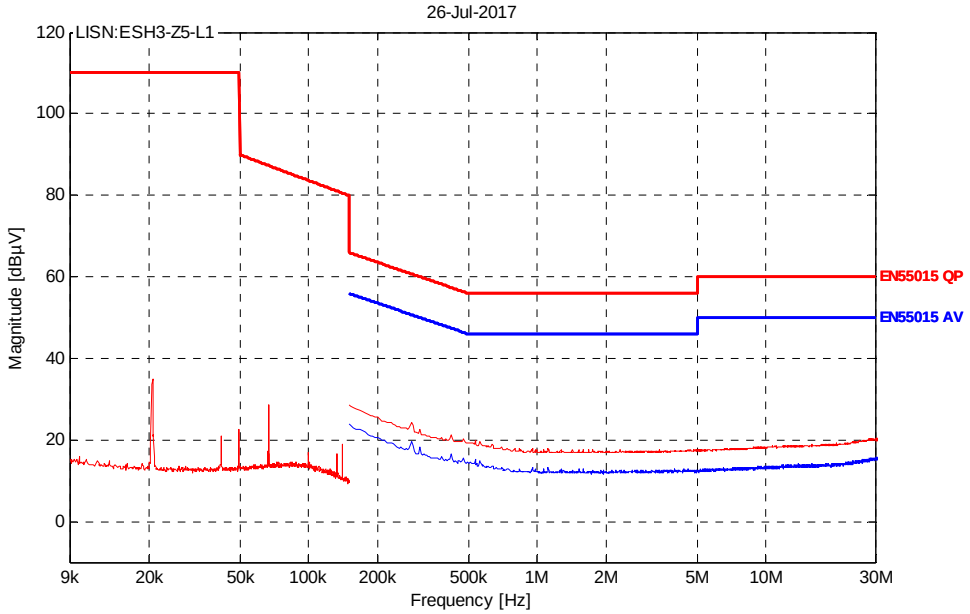
TEST ENGINEER: Luke Marsh

4.4.2 Profiles; EUT with One LED

Shown here is the 0V plot.



Shown here is the 24V plot.



Conducted emission (continued)

4.4.3 Data; EUT with Two LEDs

0V

	Quasi-peak value (dBµV)		Average value (dBµV)		
Frequency	Measured	Specified Limit	Measured	Specified Limit	**Status**
20.564 kHz	36.99	110.00	n/a	n/a	Pass
28.710 kHz	13.64	110.00	n/a	n/a	Pass
51.061 kHz	13.46	89.81	n/a	n/a	Pass
61.889 kHz	14.84	88.06	n/a	n/a	Pass
66.857 kHz	29.67	87.36	n/a	n/a	Pass
92.586 kHz	14.41	84.39	n/a	n/a	Pass
99.242 kHz	17.34	83.76	n/a	n/a	Pass
110.467 kHz	13.48	82.78	n/a	n/a	Pass
133.713 kHz	18.89	81.05	n/a	n/a	Pass
150.000 kHz	10.42	66.00	n/a	n/a	Pass
281.334 kHz	25.04	60.78	15.70	46.00	Pass
4.544 MHz	17.92	56.00	13.10	46.00	Pass
9.031 MHz	18.11	60.00	13.33	50.00	Pass
11.296 MHz	18.48	60.00	13.85	50.00	Pass
13.909 MHz	18.75	60.00	13.95	50.00	Pass
16.708 MHz	18.85	60.00	14.18	50.00	Pass
20.313 MHz	19.49	60.00	14.67	50.00	Pass
23.842 MHz	19.53	60.00	14.76	50.00	Pass
26.951 MHz	20.00	60.00	15.20	50.00	Pass
29.845 MHz	20.41	60.00	15.64	50.00	Pass

Conducted emission (continued)

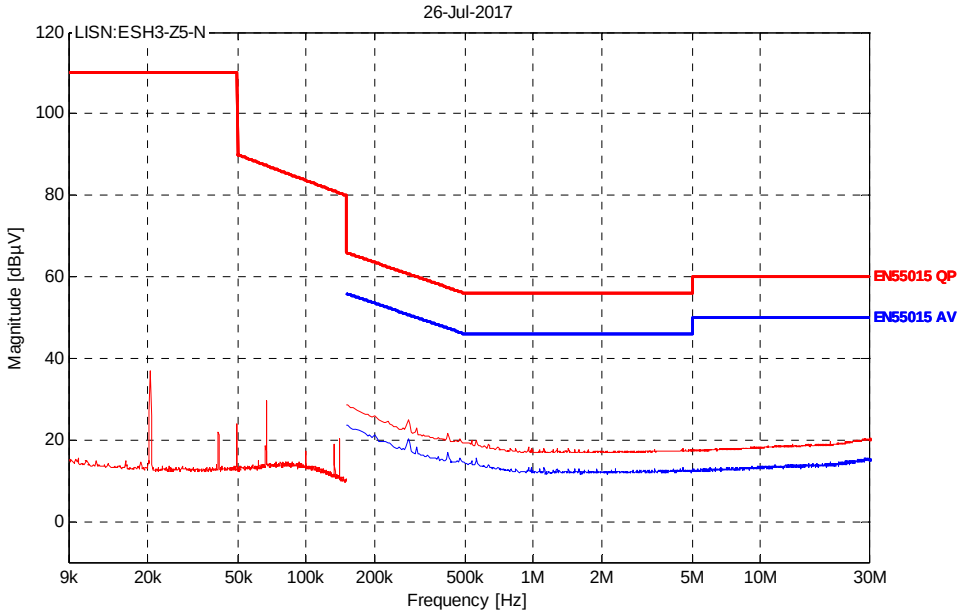
24V

	Quasi-peak value (dBµV)		Average value (dBµV)		
Frequency	Measured	Specified Limit	Measured	Specified Limit	**Status**
20.762 kHz	36.26	110.00	n/a	n/a	Pass
26.723 kHz	13.51	110.00	n/a	n/a	Pass
51.061 kHz	13.34	89.81	n/a	n/a	Pass
64.572 kHz	14.15	87.67	n/a	n/a	Pass
66.857 kHz	29.62	87.36	n/a	n/a	Pass
91.692 kHz	14.23	84.48	n/a	n/a	Pass
99.242 kHz	17.24	83.76	n/a	n/a	Pass
109.375 kHz	13.69	82.88	n/a	n/a	Pass
133.713 kHz	19.17	81.05	n/a	n/a	Pass
150.000 kHz	10.37	66.00	n/a	n/a	Pass
419.617 kHz	21.50	57.46	17.33	47.46	Pass
4.544 MHz	17.85	56.00	12.90	46.00	Pass
8.807 MHz	18.19	60.00	13.45	50.00	Pass
11.716 MHz	18.56	60.00	13.90	50.00	Pass
14.462 MHz	18.71	60.00	13.97	50.00	Pass
17.953 MHz	18.83	60.00	14.10	50.00	Pass
20.432 MHz	19.09	60.00	14.28	50.00	Pass
24.023 MHz	19.45	60.00	14.84	50.00	Pass
26.946 MHz	19.97	60.00	15.27	50.00	Pass
29.631 MHz	20.36	60.00	15.66	50.00	Pass

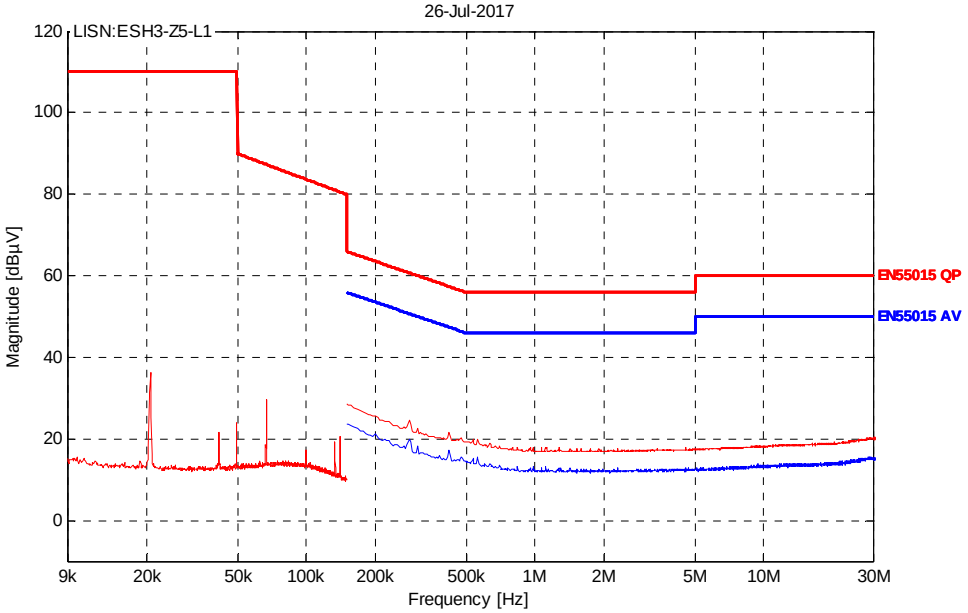
TEST ENGINEER: Luke Marsh

4.4.4 Profiles; EUT with Two LEDs

Shown here is the 0V plot.



Shown here is the 24V plot.



5.0 IMMUNITY RESULTS

5.1 Performance Criteria

General performance criteria for immunity testing are defined below:-

Criterion A:	The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. If the performance level or the permissible level is not specified by the manufacturer then either of these may be derived from the EUT description and documentation and what the user may reasonably expect from the apparatus if used as intended.
Criterion B:	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible level is not specified by the manufacturer then either of these may be derived from the EUT description and documentation and what the user may reasonably expect from the apparatus if used as intended.
Criterion C:	Temporary loss of function is allowed provided the loss of function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

5.2 Electrostatic Discharge

TEST METHOD	EN 61000-4-2 REFERENCING PROCEDURE: ESD-03

TEST DETAILS

Test severity, <u>contact discharge</u>	± 4.0 kV, 20 discharges (10 with positive and 10 with negative polarity) was applied to each metal part of the enclosure.
Test severity, <u>air discharge</u>	± 8.0 kV, non-conductive parts
Exerciser program during test	Referencing section 3.3
Specified test criterion	Criterion 'B'
EUT performance criterion	Criterion 'A'

RESULTS

Contact, Indirect

SPECIFIED VOLTS	REFERENCE PLANE @ 10cm	STATUS
± 4.0 kV	Horizontal; front, rear and sides	PASS

Contact, Direct To EUT

SPECIFIED VOLTS	TEST POINTS	STATUS
± 2.0 & 4.0 kV	Please refer to the following page.	PASS

Air Discharge (Insulating, Slots & Apertures)

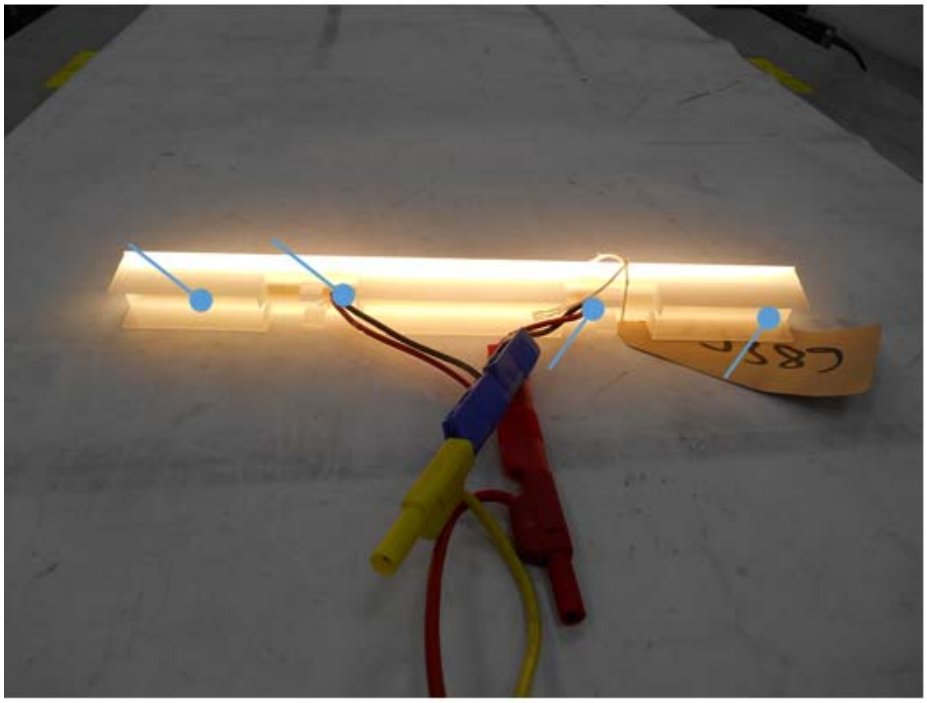
SPECIFIED VOLTS	TEST POINTS	STATUS
± 2.0, 4.0 & 8.0 kV	Please refer to the following page.	PASS

COMMENT: No performance degradation was observed. The EUT met the specified test criterion.

TEST ENGINEER: Luke Marsh

5.2.1 Electrostatic Discharge Test Points

Blue arrow indicates Air discharge



5.3 Radiated RF Immunity

TEST METHOD	EN 61000-4-3 REFERENCING PROCEDURE: RES-02

TEST DETAILS

Test severity levels, swept frequency	• **80 to 1000 MHz; 3.0 V/m** **80% amplitude modulation at 1kHz** **1% Steps, 3s dwell time**
Exerciser program during test	**Referencing section 3.3**
Specified test criterion	**Criterion 'A'**
EUT performance criterion	**Criterion 'A'**

RESULTS

TEST POINTS	ANTENNA POLARITIES	FIELD LEVEL SWEPT FREQUENCY	STATUS
Front	**Horizontal & vertical**	**As detailed in above table**	**PASS**
Side, left	**Horizontal & vertical**		**PASS**
Side, right	**Horizontal & vertical**		**PASS**
Rear	**Horizontal & vertical**		**PASS**

COMMENT: No performance degradation was observed. The EUT met the specified test criterion.

TEST ENGINEER: Luke Marsh

5.4 Fast Transient Bursts

TEST METHOD	EN 61000-4-4 REFERENCING PROCEDURE: FTB-01

TEST DETAILS

Test severity	**± 0.5 kV AC Mains Port** **5/50ns Tr/Td 5kHz Repetition Rate**
Exerciser program during test	**Referencing section 3.3**
Specified test criterion	**Criterion 'B'**
EUT performance criterion	**Criterion 'A'**

RESULTS

Direct Injection

PORT	TEST VOLTAGE	STATUS
DC Power Port	**± 0.5 kV**	**PASS**

COMMENT: No performance degradation was observed. The EUT met the specified test criterion.

TEST ENGINEER: Luke Marsh

5.5 Conducted Immunity

TEST METHOD	EN 61000-4-6 REFERENCING PROCEDURE: CES-02

TEST DETAILS

Test severity level	**3.0V rms, 80% (1kHz) amplitude modulation 0.15 to 80 MHz**
Exerciser program during test	**Referencing section 3.3**
Specified test criterion	**Criterion 'A'**
EUT performance criterion	**Criterion 'A'**

RESULTS

TEST VOLTAGE	TEST POINTS	COUPLING METHOD	STATUS
3.0V	**DC power port**	**CDN**	**PASS**

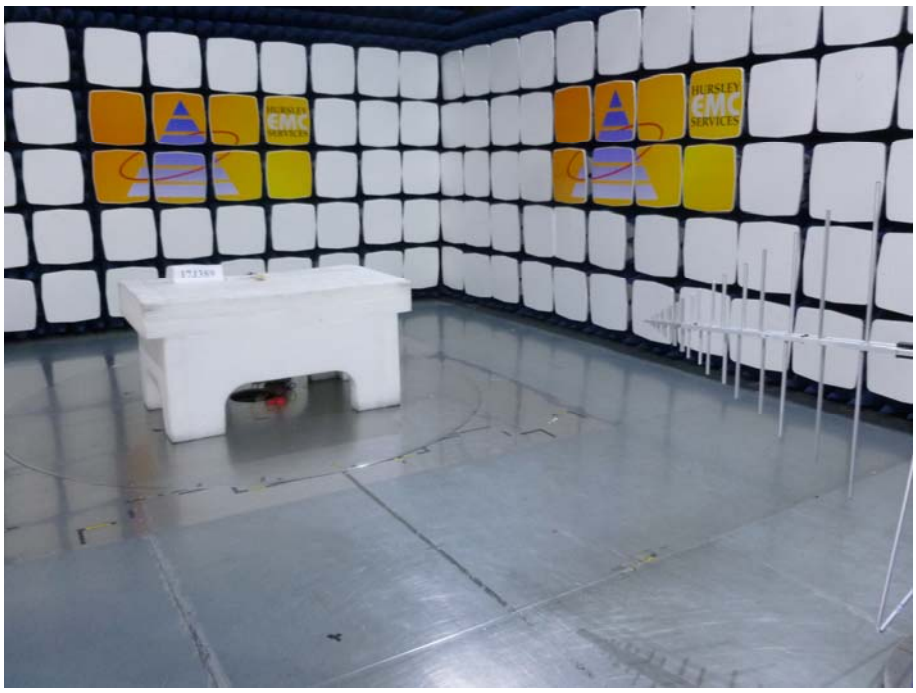
COMMENT: The EUT met the specified test criterion.

TEST ENGINEER: Luke Marsh

6.0 PHOTO LOG

Emissions:

Radiated emissions



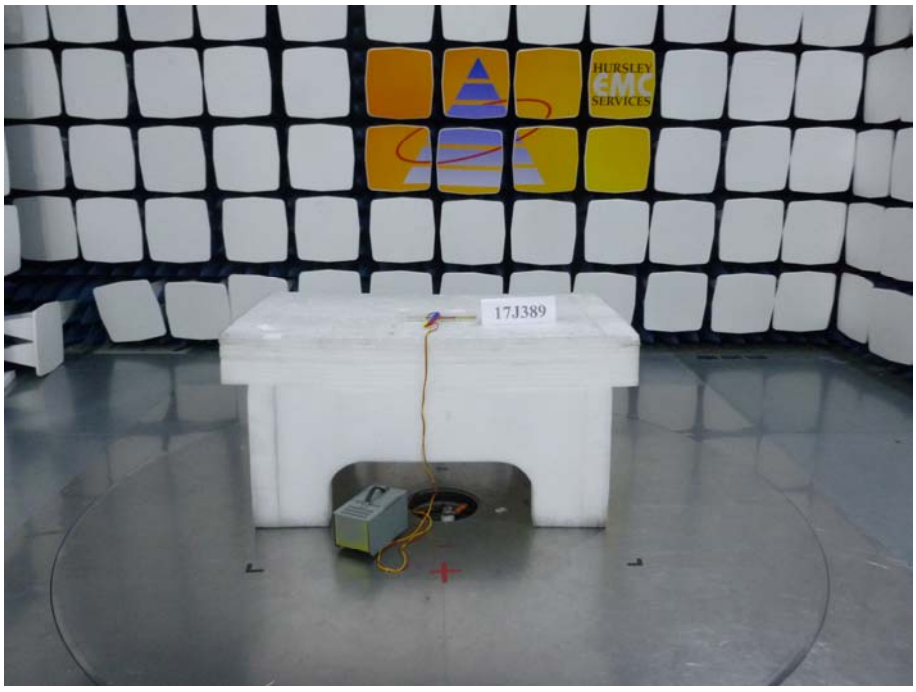


Photo Log (continued)

Emissions:

Radiated magnetic emissions

Photo Log (continued)

Emissions:

Radiated emissions (Annex B)

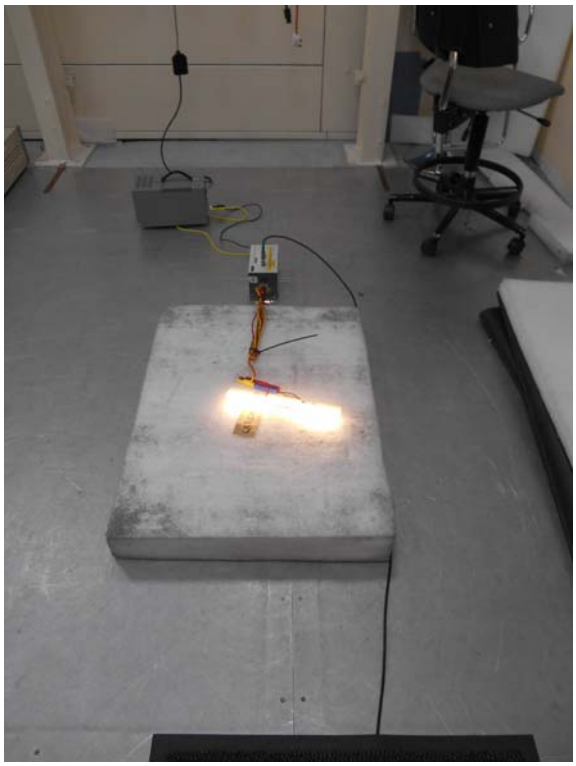


Photo Log (continued)

Emissions:

Conducted emissions

Photo Log (continued)

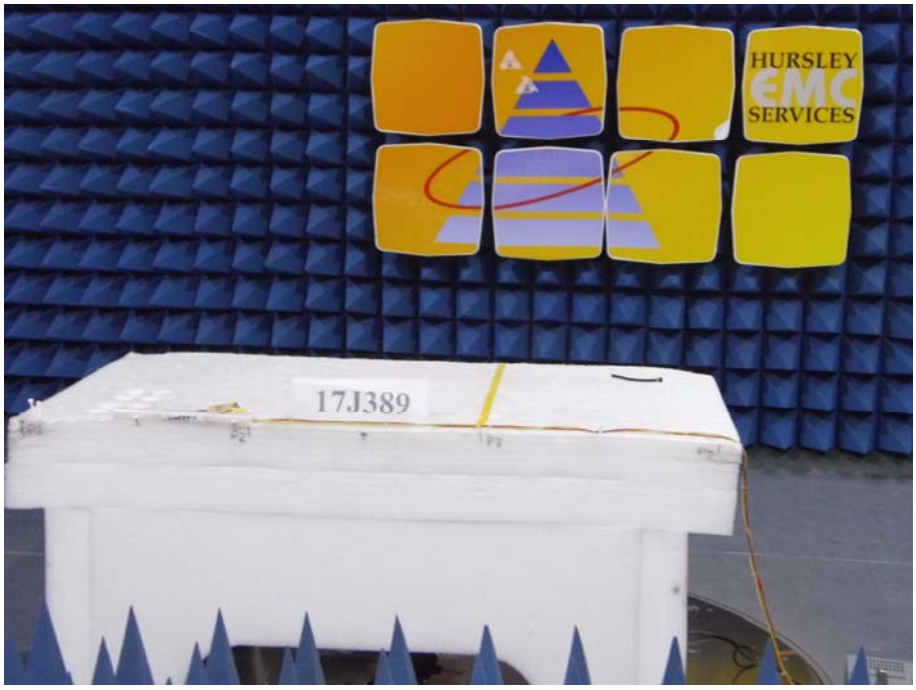
Immunity:

Electrostatic discharge (set-up)

Photo Log (continued)

Immunity:

Radiated RF immunity



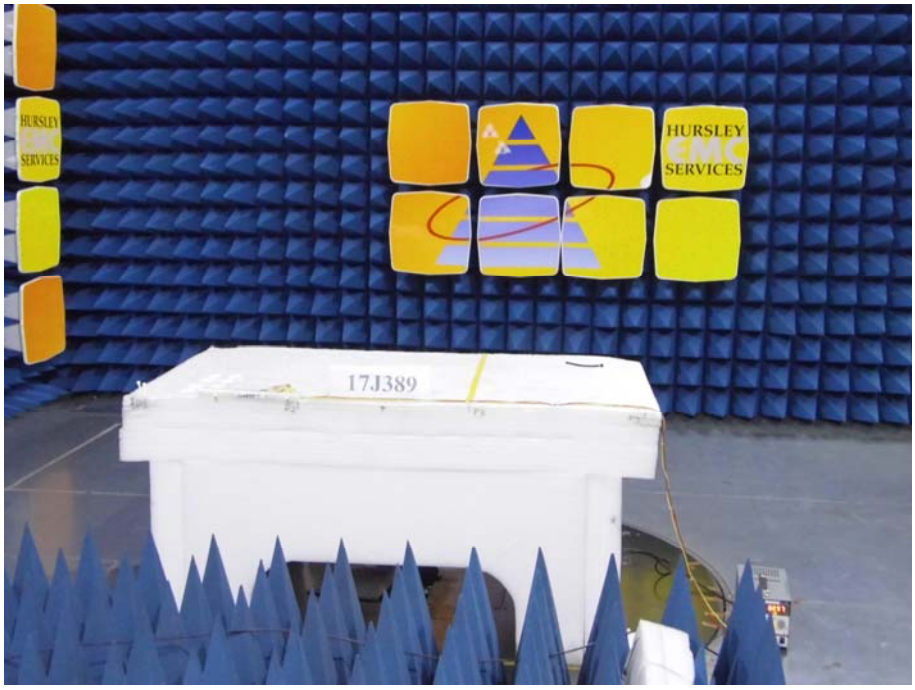


Photo Log (continued)

Immunity:

Fast transient bursts

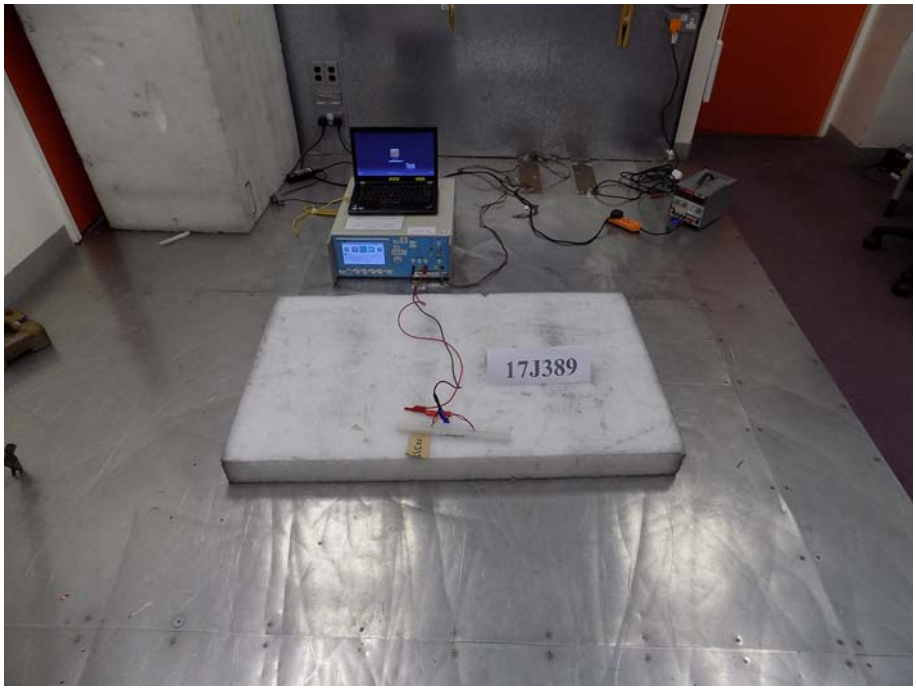
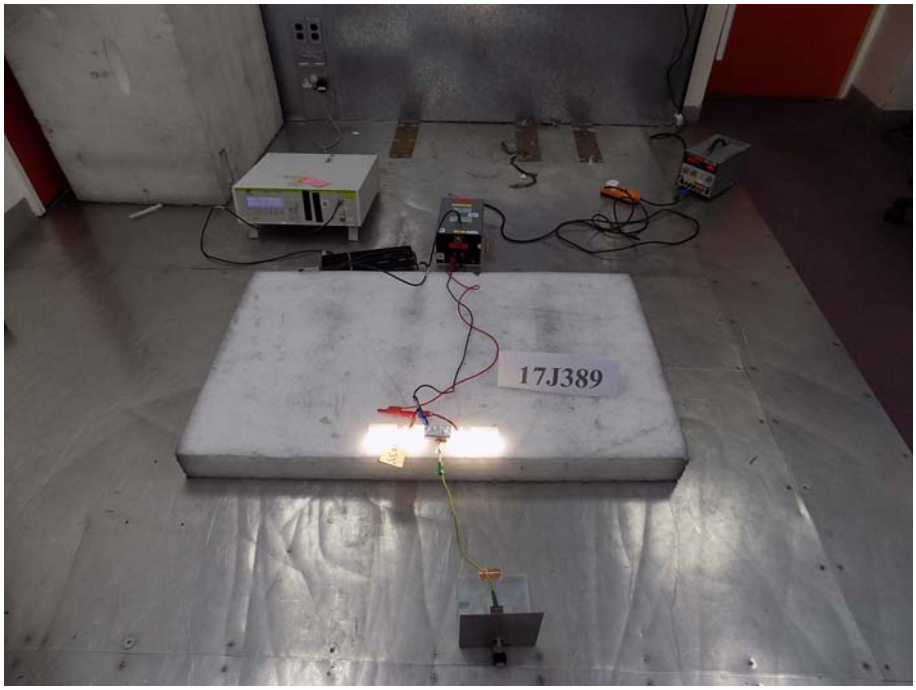
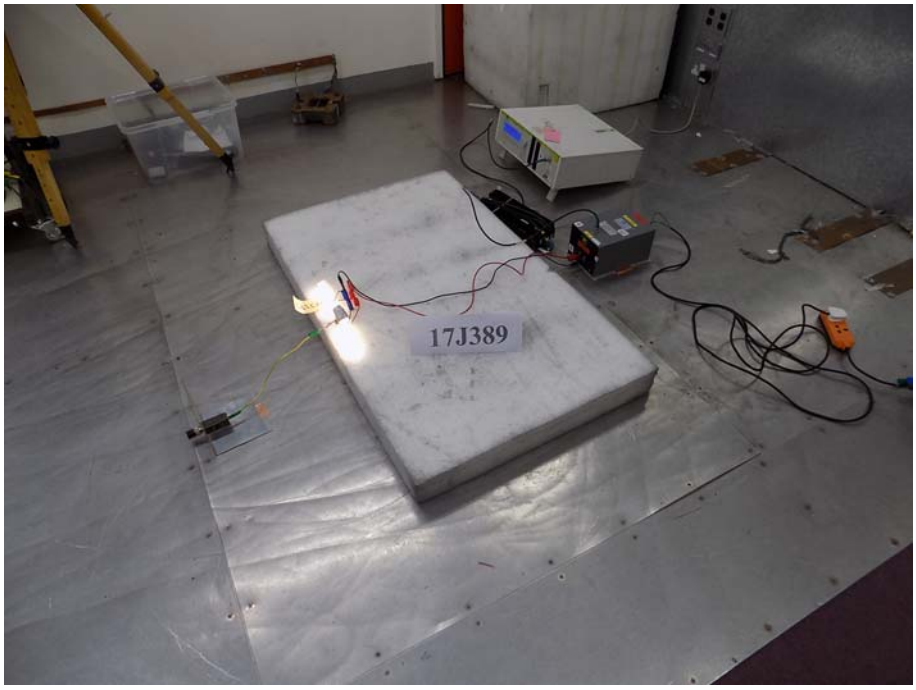


Photo Log (continued)

Immunity:

Conducted immunity





7.0 MEASUREMENT UNCERTAINTIES

Emissions tests

For all emissions tests, measurement uncertainties have been calculated in line with the requirements of CISPR 16-4-2 to give a confidence level of greater than 95%. In all cases the laboratories calculated uncertainty values (known as Ulab) are equal to or are less than the expected uncertainty values contained in CISPR 16-4-2 (known as Ucispr).

Below is a list of the laboratories calculated measurement uncertainties:

Conducted emissions:

Via AMN/LISN:	±3.3 dB (9 kHz – 150 kHz), ±3.3 dB (150 kHz – 30 MHz)
Via AAN/ISN:	±5.0 dB (150 kHz – 30 MHz)
Via CVP:	±3.5 dB (150 kHz – 30 MHz)
Via CP:	±2.7 dB (150 kHz – 30 MHz)
Via 100 Ω:	±2.7 dB (150 kHz – 30 MHz)
Clicks:	±2.8 dB (150 kHz – 30 MHz)
Harmonics:	±5.8 % (100 Hz – 2 kHz)
Flicker:	±3.8 % (worst case for all parameters)

Radiated emissions:

H-Field:	±2.7 dB (9 kHz – 3 MHz), ±2.9 dB (3 MHz – 30 MHz)
D = 3.0 m:	±2.8 dB (30 MHz – 200 MHz), ±2.9 dB (200 MHz – 1 GHz)
D = 3.0 m:	±4.5 dB (1 GHz – 6 GHz), ±4.4 dB (6 GHz – 40 GHz)
D = 10.0 m:	±4.4 dB (30 MHz – 200 MHz), ±4.8 dB (200 MHz – 1 GHz)

Immunity tests

For IEC 61000-4-2, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-8, IEC 61000-4-9, IEC 61000-4-11 tests, the following applies:

Measurement uncertainty has been calculated or calibrated for the various required parameters to provide a confidence level of 95% (k=2). These parameters have been compared to the basic standard tolerance requirements for each of the various parameters.
In all cases the calculated or calibrated uncertainty meets the basic standard requirements.

For IEC 61000-4-3, IEC 61000-4-6 tests, the following applies:

Measurement uncertainty has been calculated to provide a confidence level of 95%, or k=2, but this has not been applied to the applied test level, therefore the applied test level has an uncertainty of ±50%. This is in accordance with Cenelec and other international guidance.

In the case of Maritime equipment tested to IEC 60945, there is a specific requirement that the applied test level be increased by the calculated measurement uncertainty. This is done by applying a coverage factor of k = 1.64, which provides a 95% confidence that the applied test level has been achieved.

End of document