Test Report EMC

Test Laboratory:
VDE Prüf- und Zertifizierungsinstitut GmbH
VDE Testing and Certification Institute
Laboratory for EMC measurements

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Accreditations/Recognitions:
DAkkS: D-PL-12061-01-01
Notified body EMC: BNetzA-bS-07/61-17/1
KBA: KBA-P00021-97
FCC (USA): 91098; Industry Canada: 7003A-2

Equipment under Test:

Applicant:	-
Manufacturer:	Philips
Brand:	Philips
Model:	LED Lamp E14 2,3W (EAN 878696517574)
EUT received:	2016-01-25

Information concerning the Test report:

Report No.:	-
Contact:	Georg Kleinhans (Mr.)

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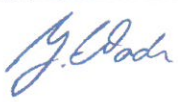
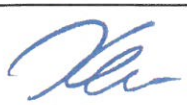
Applied standards:

German Standard	European Standard	IEC/CISPR-Standard
DIN EN 55015:2014-03	EN 55015:2013	CISPR 15:2013 + IS1:2013 + IS2:2013
DIN EN 61547:2010-03	EN 61547:2009	IEC 61547:2009
DIN EN 61000-3-2:2015-03	EN 61000-3-2:2014	IEC 61000-3-2:2014
DIN EN 61000-3-3:2014-03	EN 61000-3-3:2013	IEC 61000-3-3:2013

Remarks to the Standards:	None
Remarks to the test report:	On applicants request only selected test items are measured. For details refer to the clause 4: "Summary of test results"

Result:	Fail* (Note: Valid for tested items only)

Date of issue:	2016-02-03	
Tested by: (Authorization of test report)	J. Wade (Mr.)	
Reviewed:	G. Kleinhans (Mr.)	

Contents Directory

1 Description of the Equipment under Test (EUT)

Type of EUT:	**Luminary with build in Electronic Control Gear**
Model:	**Type: Philips LED Lamp E14 2,3W (EAN 878696517574)** AC 220-240 V, 50-60 Hz, Class II Test sample: Philips LED Lamp E14 2,3W (EAN 878696517574)
Serial number:	Sample No. 1, No. 2, No. 3
Factory(ies):	---

Technical data:

Rated voltage:	AC 220-240 V	Protection: Class	II
Rated current:	--	Rated frequency:	50-60 Hz
Rated power consumption:	2,3 W	Number of phases:	1

Mains voltage during the Test (If not otherwise specified):

Nominal voltage:	230 Volt	Nominal frequency:	50 Hz

Power Input and Load Terminals AC or DC

No.	Description
1	AC mains terminal

Additional Terminals for Signal- Control and Data-Terminals, Ancillary devices

No.	Description of the Terminal	Specified length	Shield type
1			

Operating modes of the sample:

No.	Description
1	Continuous operation after 15 minutes warm up

Operating modes used for the Test:

No.	Operating mode	
1	Continuous operation after 15 minutes warm up	

Required performance criteria according to EN 61547:

Criteria	Operating mode	Description
A	All modes	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.
B	All modes	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. Regulation controls need not function during the test, but after the test the mode of the control shall be the same as before.
C	All modes	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 interrupt of the mains supply and/or operating the regulating control.

Support equipment for the EUT (Simulators):

Device	Description
--	---

General remarks: ---

Generated frequencies:

ISM-Frequency:	None
Operational frequencies:	Switch mode power supply.

Disturbance sources

No.	Description	Manufacturer	Type designation	Remarks
1	Switch mode power supply			
2				

EMC-measures for the reduction of emissions

No.	Location	Description	Specification	Manufacturer	Type designation
1	Not evaluated				
2					
3					

Description of shield- and contacting measures for EMC

No.	Description of the measure
1	Not evaluated

EMC measure for the improvement of immunity

No.	Location	Description	Specifications	Manufacturer	Type designation
1	Not evaluated				

Further measures

The installation guide of the manufacturer must be observed.

2 Test case verdicts

Pass (P)	Test item does meet the requirement.
Fail (F)	Test item does not meet the requirement.
Not applicable (N/A)	Test case does not apply to the test object.

3 Applied basic standards

German Standard	European Standard	IEC/CISPR-Standard
DIN EN 61000-4-2:2009-12	EN 61000-4-2:2009	IEC 61000-4-2:2008
DIN EN 61000-4-3:2008-06	EN 61000-4-3:2006 + A1:2008	IEC 61000-4-3:2006 + A1:2007
DIN EN 61000-4-4:2005-07	EN 61000-4-4:2004	IEC 61000-4-4:2004
DIN EN 61000-4-5:2007-06	EN 61000-4-5:2006	IEC 61000-4-5:2005
DIN EN 61000-4-6:2009-12	EN 61000-4-6:2009	IEC 61000-4-6:2008
DIN EN 61000-4-8:2001-12	EN 61000-4-8:1993 + A1:2001	IEC 61000-4-8:1993 + A1:2000
DIN EN 61000-4-11:2005-02	EN 61000-4-11:2004	IEC 61000-4-11:2004

4 Summary of Test results

4.1 EN 55015 Emission in the frequency range 9 kHz - 300 MHz

Test		Frequency range	Page	Remark	Result
1.	Insertion loss	150 kHz – 1605 kHz			Not applicable
2.	Terminal disturbance voltage Power input terminal AC/DC	9 kHz - 150 kHz 1) 148.5 kHz – 30 MHz 1) „preliminary"	7		Fail
3.	Terminal disturbance voltage Load terminals	150 kHz – 30 MHz	7		Not applicable
4.	Terminal disturbance voltage Control terminals	150 kHz – 30 MHz	7		Not applicable
5.	Disturbance field strength Radiated disturbance measured with a loop antenna	9 kHz - 150 kHz 1) 150 kHz – 30 MHz 1) not in Japan	14		Not applicable
6.	Disturbance field strength Radiated disturbance CDN method (Annex B)	30 MHz - 100 MHz 100 MHz - 230 MHz 230 MHz - 300 MHz	15		Pass
7.	Disturbance field strength Radiation disturbance Antenna-method (CISPR 22)	30 MHz – 230MHz 30dBµV/m 230 MHz – 300MHz 37dBµV/m			Not tested

4.2 EN 61000-3-2 Emission Tests in the frequency range DC - 2 kHz (Harmonics)

Test		Frequency range	Page	Remarks	Result
1.	AC-Mains Harmonics	DC - 2 kHz	19	Class: C	Pass

4.3 EN 61000-3-3 Emission Tests in the frequency range DC - 2 kHz (Flicker)

Test		Frequency range	Page	Remarks	Result
1.	AC-Mains Voltage fluctuations and flicker	DC - 2 kHz	20		Pass

4.4 EN 61547 Immunity Tests

Test		Test parameters and severity levels		Page	Requirement of the standard (Criteria)	Result
1.	Electrostatic discharge			21	B	Pass
		Contact discharge 4 kV				Pass
		Air discharge 8 kV				Pass
2.	Radiated radio frequency (RF) electromagnetic field	80 - 1000 MHz 3 V/m (unmod.) 1 kHz, 80% AM, sinusoidal		22	A	Not tested*
3.	Fast transients (Burst), unsymmetrical	5/50 ns T_r/T_h 5 kHz repetition frequency.		23	B	Pass
	AC Terminals	1.0 kV peak voltage				Pass
	DC Terminals	0.5 kV peak voltage				Not applicable
	Signal-, and control lines	0.5 kV peak voltage				Not applicable
4.	Surges AC Inputs	1.2/50 (8/20) T_r/T_h µs		24	B**) C	Pass
	Self-ballasted lamps and semi-luminaires	Line to line:	0.5 kV peak			Not applicable
		Line to ground:	1 kV peak			Not applicable
	Luminaires and independent auxiliaries Input power ≤ 25 W	Line to line:	0.5 kV peak			Pass
		Line to ground:	1 kV peak			Not applicable
	Luminaires and independent auxiliaries Input power > 25 W	Line to line:	1 kV peak			Not applicable
		Line to ground:	2 kV peak			Not applicable
5.	Injected currents (RF), unsymmetrical	0.15 ... 80 MHz 80 % AM @ 1 kHz 150 Ω Source impedance		25	A	Not tested*
	AC in- and output	3 V (unmod.) e.m.f				
	DC in- and output	3 V (unmod.) e.m.f				
	Signal and control lines	3 V (unmod.) e.m.f				
6.	Power magnetic fields	50/60 Hz 3 A/m		---	A	Not applicable*)
7.	Voltage dips and interruptions AC terminals	Reduction	Duration	26	B ***) C	Not tested*
		100 % :	0.5 cycles			
		30 % :	10 cycles			

*Not tested: On applicants request the test item was not measured

*) only applicable if the EUT contains components which are susceptible for power magnetic fields, like Hall-generator, magnetic field sensors etc.

**) valid with control unit for ballast or converter

***) for ballasts: That assessment criteria are only valid for ballasts for fluorescent lamps; for other discharge lamps the assessment criteria C is valid

5 Test and measuring results

5.1 EN 55015 Disturbance voltage (9 kHz - 30 MHz)

General information about the Test:

Tested by:	J. Wade (Mr.)
Test date:	2016-01-27 / 2016-01-28

Instruments:	EC1 08 Test site for luminaries		
Inventory number	Description	Manufacturer	Type
1800135	EMI Receiver	R&S	ESCI
1430342	Universal power supply	Spitzenberger	PAS 1000
1820017	LISN	R&S	ESH3-Z5

Environmental conditions:	Rated value	Measured value
Ambient temperature:	15 - 25 °C	23 ° C

Information concerning the Test:

Test set-up:	EN 55015
Operating mode:	No. 1
Tested Samples:	Sample No. 1, Sample No. 2, Sample No. 3

Result:	**Fail**

Protocol:	See next pages

Sample No. 1: Conducted Voltage Emission Measurement

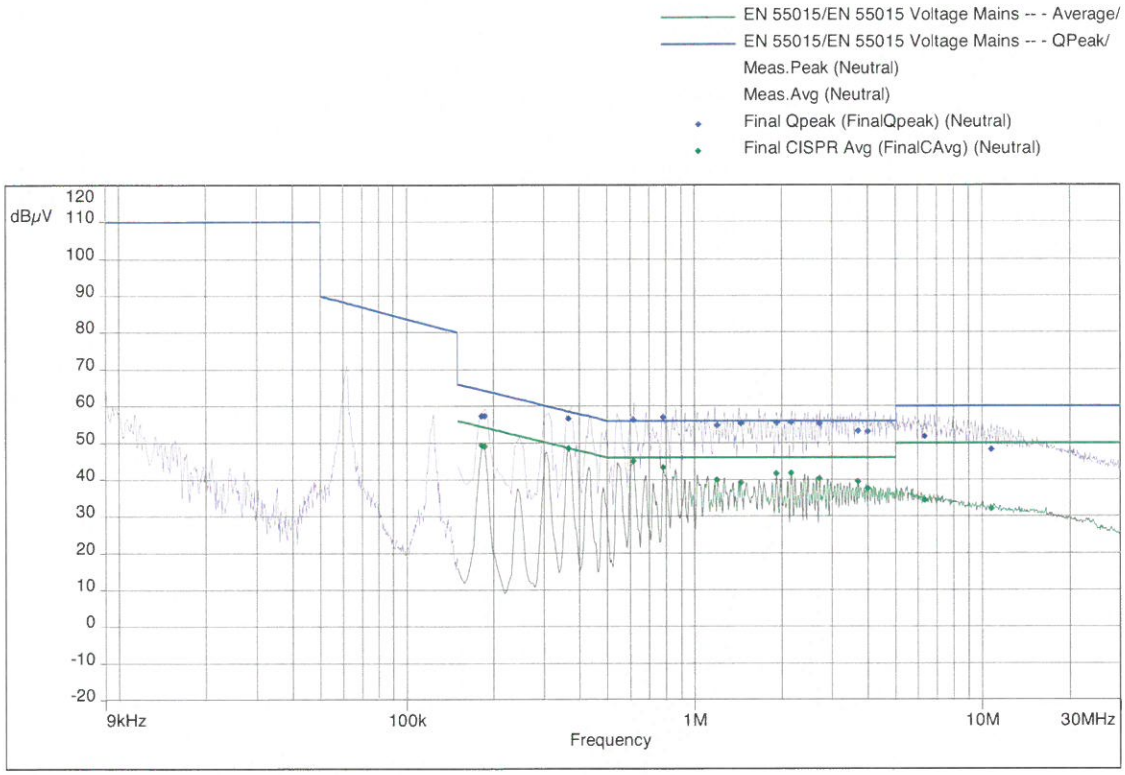
Limit / Class	EN 55015 Voltage Mains / --
Equipment under test (EUT)	EAN 8718696517574 Typ 1/1
Manufacturer	Philips
Operating mode	230 V AC 50 Hz
Tested by	J. Wade
Test date	27.01.2016
Test place	8
Result	Fail

Instruments:

Inventory number	Description	Manufacturer	Type
--	Cable	--	lumin1-1 + lumin1-2
1800135	EMI Test Receiver	Rohde & Schwarz	ESCI 3
1820017	Artificial Mains Network	Rohde & Schwarz	ESH3-Z5

Prescan settings:

Subrange	Line	Frequency step	IF Bandwith	Measurement time	RF Attenuation	Preamplifier	Presel. Multisampling
9kHz - 150kHz	Neutral	100Hz	200Hz	20 ms/Pts	Auto	OFF	OFF
150kHz - 30MHz	Neutral	4kHz	9kHz	20 ms/Pts	Auto	OFF	OFF



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Results:

FinalCAvg (14)

Frequency (MHz)	SR	Final CISPR Avg (dBµV)	Avg Limit (dBµV)	Margin (dB)	Line	Comments	Correction (dB)
0.1833	2	49.37	54.39	5.02	0.00	Pass	10.00
0.1847	2	49.05	54.21	5.17	0.00	Pass	10.00
0.3659	2	48.63	48.59	-0.04	0.00	Fail	10.00
0.6126	2	44.96	46.00	1.04	0.00	Pass	10.00
0.782	2	43.33	46.00	2.67	0.00	Pass	10.00
1.1983	2	40.04	46.00	5.96	0.00	Pass	10.00
1.4409	2	39.07	46.00	6.93	0.00	Pass	10.00
1.9113	2	41.75	46.00	4.25	0.00	Pass	10.00
2.158	2	41.83	46.00	4.17	0.00	Pass	10.01
2.7126	2	40.33	46.00	5.67	0.00	Pass	10.02
3.7033	2	39.43	46.00	6.57	0.00	Pass	10.06
4.0113	2	37.54	46.00	8.46	0.00	Pass	10.07
6.3242	2	34.43	50.00	15.57	0.00	Pass	10.10
10.7325	2	32.01	50.00	17.99	0.00	Pass	10.20

FinalQpeak (14)

Frequency (MHz)	SR	Final Qpeak (dBµV)	QP Limit (dBµV)	Margin (dB)	Line	Comments	Correction (dB)
0.1833	2	57.36	64.39	6.86	0.00	Pass	10.00
0.1847	2	57.33	64.21	6.89	0.00	Pass	10.00
0.3659	2	56.58	58.59	1.93	0.00	Pass	10.00
0.6126	2	56.25	56.00	-0.25	0.00	Fail	10.00
0.782	2	57.01	56.00	-1.01	0.00	Fail	10.00
1.1983	2	54.85	56.00	1.15	1.00	Pass	10.00
1.4409	2	55.29	56.00	0.71	0.00	Pass	10.00
1.9113	2	55.52	56.00	0.48	0.00	Pass	10.00
2.158	2	55.68	56.00	0.32	0.00	Pass	10.01
2.7126	2	55.26	56.00	0.74	0.00	Pass	10.02
3.7033	2	53.34	56.00	2.66	0.00	Pass	10.06
4.0113	2	53.15	56.00	2.85	0.00	Pass	10.07
6.3242	2	51.77	60.00	8.23	1.00	Pass	10.10
10.7325	2	48.21	60.00	11.79	0.00	Pass	10.20

Line 0 = Neutral, Line 1 = Phase 1, Line 2 = Phase 2, Line 3 = Phase 3

Sample No. 2

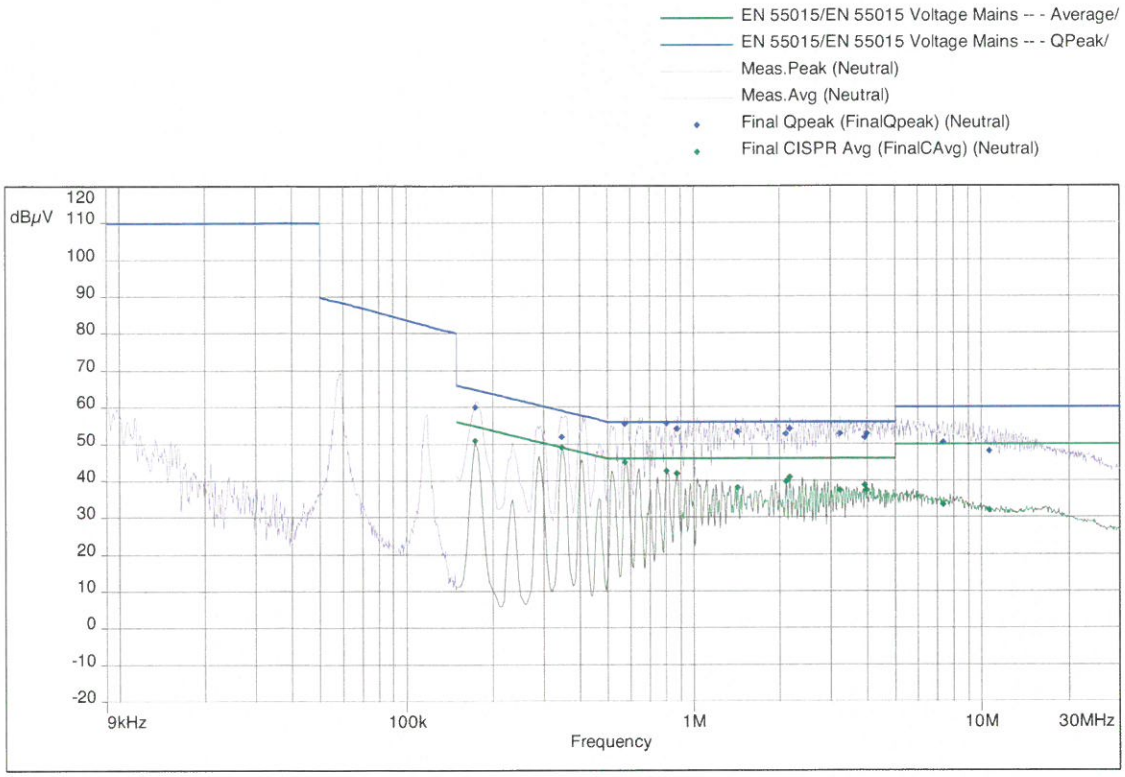
Limit / Class	EN 55015 Voltage Mains / --
Equipment under test (EUT)	EAN 8718696517574 Typ 1/2
Manufacturer	Philips
Operating mode	230 V AC 50 Hz
Tested by	J. Wade
Test date	28.01.2016 13:52:47
Test place	8
Result	Fail

Instruments:

Inventory number	Description	Manufacturer	Type
--	Cable	--	lumin1-1 + lumin1-2
1800135	EMI Test Receiver	Rohde & Schwarz	ESCI 3
1820017	Artificial Mains Network	Rohde & Schwarz	ESH3-Z5

Prescan settings:

Subrange	Line	Frequency step	IF Bandwith	Measurement time	RF Attenuation	Preamplifier	Presel. Multisampling
9kHz - 150kHz	Neutral	100Hz	200Hz	20 ms/Pts	Auto	OFF	OFF
150kHz - 30MHz	Neutral	4kHz	9kHz	20 ms/Pts	Auto	OFF	OFF



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Results:

FinalCAvg (13)

Frequency (MHz)	SR	Final CISPR Avg (dBµV)	Avg Limit (dBµV)	Margin (dB)	Line	Comments	Correction (dB)
0.1743	2	50.97	54.77	3.79	0.00	Pass	10.00
0.3472	2	49.06	49.06	0.00	0.00	Fail	10.00
0.5739	2	44.98	46.00	1.02	0.00	Pass	10.00
0.802	2	42.63	46.00	3.37	0.00	Pass	10.00
0.8753	2	42.02	46.00	3.98	0.00	Pass	10.00
1.4276	2	38.20	46.00	7.80	0.00	Pass	10.00
2.106	2	39.84	46.00	6.16	0.00	Pass	10.00
2.1633	2	40.93	46.00	5.07	0.00	Pass	10.01
3.2193	2	37.49	46.00	8.51	0.00	Pass	10.04
3.9233	2	38.78	46.00	7.22	0.00	Pass	10.06
3.982	2	37.47	46.00	8.53	0.00	Pass	10.07
7.322	2	33.54	50.00	16.46	0.00	Pass	10.11
10.6512	2	32.10	50.00	17.90	0.00	Pass	10.20

FinalQpeak (13)

Frequency (MHz)	SR	Final Qpeak (dBµV)	QP Limit (dBµV)	Margin (dB)	Line	Comments	Correction (dB)
0.1743	2	60.00	64.77	4.77	0.00	Pass	10.00
0.3472	2	51.95	59.06	6.83	0.00	Pass	10.00
0.5739	2	55.52	56.00	0.48	0.00	Pass	10.00
0.802	2	55.61	56.00	0.39	0.00	Pass	10.00
0.8753	2	54.06	56.00	1.94	0.00	Pass	10.00
1.4276	2	53.33	56.00	2.67	0.00	Pass	10.00
2.106	2	52.72	56.00	3.28	0.00	Pass	10.00
2.1633	2	54.07	56.00	1.93	0.00	Pass	10.01
3.2193	2	52.74	56.00	3.26	0.00	Pass	10.04
3.9233	2	51.75	56.00	4.25	0.00	Pass	10.06
3.982	2	52.75	56.00	3.25	0.00	Pass	10.07
7.322	2	50.42	60.00	9.58	1.00	Pass	10.11
10.6512	2	48.00	60.00	12.00	1.00	Pass	10.20

Line 0 = Neutral, Line 1 = Phase 1, Line 2 = Phase 2, Line 3 = Phase 3

Sample No. 3

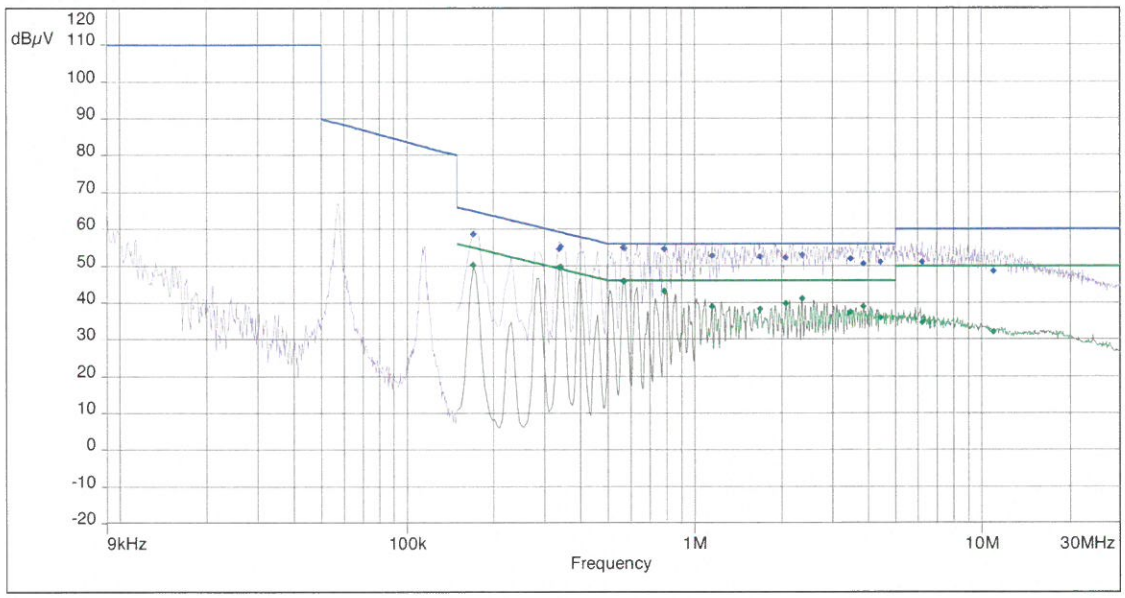
Limit / Class	EN 55015 Voltage Mains / --
Equipment under test (EUT)	EAN 8718696517574 Typ 1/3
Manufacturer	Philips
Operating mode	230 V AC 50 Hz
Tested by	J. Wade
Comment on test / measurement	Philips EAN 8718696517574 Typ 1/3
Test date	28.01.2016 14:30:37
Test place	8
Result	Fail

Instruments:

Inventory number	Description	Manufacturer	Type
--	Cable	--	lumin1-1 + lumin1-2
1800135	EMI Test Receiver	Rohde & Schwarz	ESCI 3
1820017	Artificial Mains Network	Rohde & Schwarz	ESH3-Z5

Prescan settings:

Subrange	Line	Frequency step	IF Bandwith	Measurement time	RF Attenuation	Preamplifier	Presel. Multisampling
9kHz - 150kHz	Neutral	100Hz	200Hz	20 ms/Pts	Auto	OFF	OFF
150kHz - 30MHz	Neutral	4kHz	9kHz	20 ms/Pts	Auto	OFF	OFF



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Results:

FinalCAvg (15)

Frequency (MHz)	SR	Final CISPR Avg (dBµV)	Avg Limit (dBµV)	Margin (dB)	Line	Comments	Correction (dB)
0.1716	2	50.33	54.96	4.63	0.00	Pass	10.00
0.3393	2	49.62	49.25	-0.37	0.00	Fail	10.00
0.3407	2	49.78	49.15	-0.63	0.00	Fail	10.00
0.5674	2	45.84	46.00	0.16	0.00	Pass	10.00
0.5687	2	45.86	46.00	0.14	0.00	Pass	10.00
0.7873	2	43.24	46.00	2.76	0.00	Pass	10.00
1.1473	2	39.00	46.00	7.00	0.00	Pass	10.00
1.6849	2	38.23	46.00	7.77	0.00	Pass	10.00
2.066	2	39.78	46.00	6.22	0.00	Pass	10.00
2.354	2	41.08	46.00	4.92	0.00	Pass	10.01
3.4716	2	37.39	46.00	8.61	0.00	Pass	10.05
3.8513	2	38.89	46.00	7.11	0.00	Pass	10.06
4.426	2	36.01	46.00	9.99	0.00	Pass	10.08
6.2046	2	34.65	50.00	15.35	0.00	Pass	10.10
10.9726	2	32.07	50.00	17.93	0.00	Pass	10.20

FinalQpeak (15)

Frequency (MHz)	SR	Final Qpeak (dBµV)	QP Limit (dBµV)	Margin (dB)	Line	Comments	Correction (dB)
0.1716	2	58.61	64.96	6.35	0.00	Pass	10.00
0.3393	2	54.69	59.25	4.37	0.00	Pass	10.00
0.3407	2	55.31	59.15	3.94	0.00	Pass	10.00
0.5674	2	55.05	56.00	0.95	0.00	Pass	10.00
0.5687	2	54.87	56.00	1.13	0.00	Pass	10.00
0.7873	2	54.66	56.00	1.34	0.00	Pass	10.00
1.1473	2	52.72	56.00	3.28	0.00	Pass	10.00
1.6849	2	52.51	56.00	3.49	0.00	Pass	10.00
2.066	2	52.24	56.00	3.76	0.00	Pass	10.00
2.354	2	52.97	56.00	3.03	0.00	Pass	10.01
3.4716	2	51.98	56.00	4.02	0.00	Pass	10.05
3.8513	2	50.62	56.00	5.38	0.00	Pass	10.06
4.426	2	51.11	56.00	4.89	0.00	Pass	10.08
6.2046	2	51.15	60.00	8.85	1.00	Pass	10.10
10.9726	2	48.49	60.00	11.51	0.00	Pass	10.20

Line 0 = Neutral, Line 1 = Phase 1, Line 2 = Phase 2, Line 3 = Phase 3

5.2 EN 55015 Radiated Magnetic field strength (9 kHz - 30 MHz)

General information about the Test:

Tested by:	J. Wade (Mr.)
Test date:	2016-01-26

Instruments:	EC1 17 Test site for luminaries		
Inventory number	Description	Manufacturer	Type

Environmental conditions:	Rated value	Measured value
Ambient temperature:	15 °C - 25 °C	° C

Information concerning the Test:

Test set-up:	
Operating mode:	---

Result:	N/A

Protocol:	The LED lamp is supplied with currents less then 100Hz. Therefore the test is not applicable to the device. For details refer to clause 5.2.4 of EN55015.

5.3 EN 55015 RF Emission in the frequency range 30 MHz - 300 MHz

Selected measurement method for RF disturbances in the frequency range from 30 to 300 MHz

x	CDN-method according to Annex B of EN 55015
	Antenna-method according to CISPR 32

Remarks to the CDN Method:	If the lighting equipment complies with the requirements of Annex B of EN 55015, it is deemed to comply with the limits of the sub clause 4.4.2 Table 3b - Radiated RF disturbances limits in the frequency range 30 – 300 MHz

5.3.1 EN 55015 RF Emission in the frequency range 30 MHz - 300 MHz (CDN-Method)

General information about the Test:

Tested by:	J. Wade (Mr.)
Test date:	2016-01-29

Instruments:	EC1 43 Test site for luminaries		
Inventory number	Description	Manufacturer	Type
1800142	MESSEMPFAENGER	R&S	ESCI

CDN / Clamps:	EC1 43 Test site for luminaries		
Inventory number	Description	Manufacturer	Type
1820071	KOPPEL- UND ENTKOPPELNETZWERK	BERNSTEIN	102.01 / CDNE M2

	Rated value	Measured value
Environmental conditions:		
Ambient temperature:	15 °C - 25 °C	23 ° C

Information concerning the Test:

Test set-up:	EN 55015, Annex B
Operating mode:	No. 1

Result:	**Pass**

Protocol:	Next pages

Sample No. 1: Conducted Voltage Emission Measurement

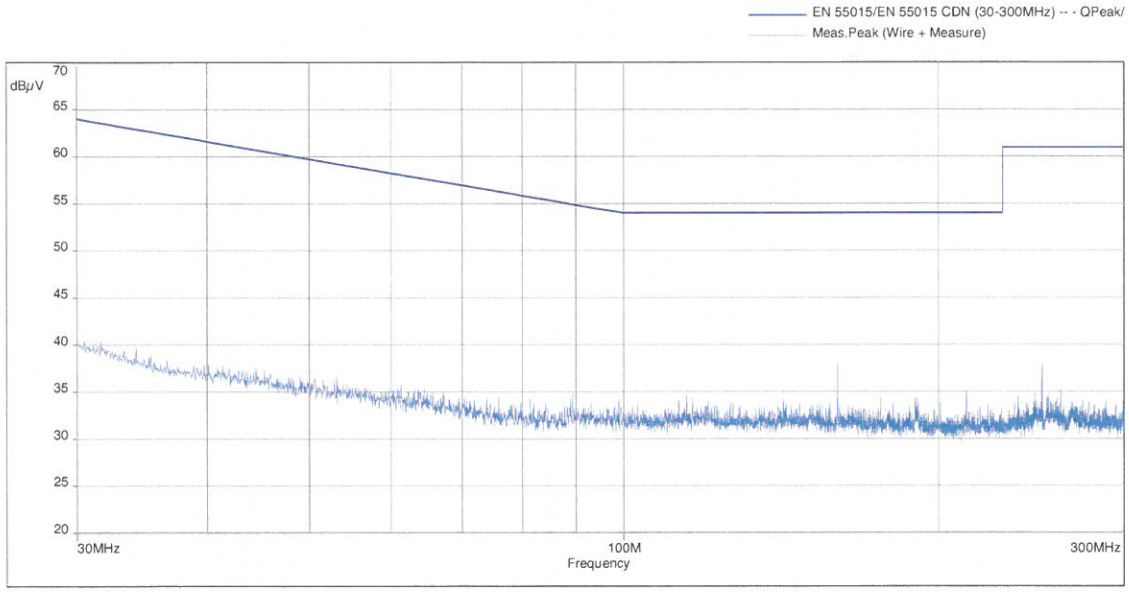
Limit / Class	EN 55015 CDN (30-300MHz) / --
Equipment under test (EUT)	Typ 1/2 EAN 8718696517574
Manufacturer	Philips
Operating mode	230 VAC 50 Hz
Tested by	J. Wade
Test date	29.01.2016
Test place	Test site 5
Result	Pass

Instruments:

Inventory number	Description	Manufacturer	Type
--	Cable	--	SR5-1
1820071	CDNE	Bernstein	M2
1800142	EMI Test Receiver	Rohde & Schwarz	ESCI 3

Prescan settings:

Subrange	Line	Frequency step	IF Bandwith	Measurement time	RF Attenuation	Preamplifier	Presel. Multisampling
30MHz - 100MHz	Wire + Measure	50kHz	120kHz	20 ms/Pts	Auto	ON	OFF
100MHz - 230MHz	Wire + Measure	50kHz	120kHz	20 ms/Pts	Auto	ON	OFF
230MHz - 300MHz	Wire + Measure	50kHz	120kHz	20 ms/Pts	Auto	ON	OFF



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Sample No. 2

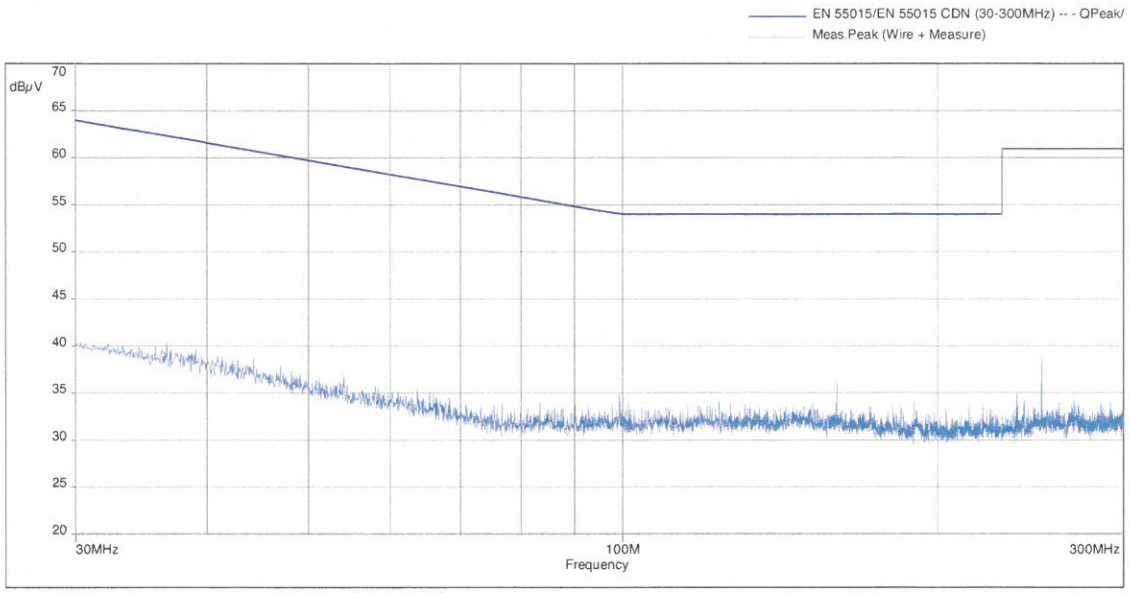
Limit / Class	EN 55015 CDN (30-300MHz) / --
Equipment under test (EUT)	Typ 1/2 EAN 8718696517574
Manufacturer	Philips
Operating mode	230 VAC 50 Hz
Tested by	J. Wade
Test date	29.01.2016
Test place	Test site 5
Result	Pass

Instruments:

Inventory number	Description	Manufacturer	Type
--	Cable	--	SR5-1
1820071	CDNE	Bernstein	M2
1800142	EMI Test Receiver	Rohde & Schwarz	ESCI 3

Prescan settings:

Subrange	Line	Frequency step	IF Bandwith	Measurement time	RF Attenuation	Preamplifier	Presel. Multisampling
30MHz - 100MHz	Wire + Measure	50kHz	120kHz	20 ms/Pts	Auto	ON	OFF
100MHz - 230MHz	Wire + Measure	50kHz	120kHz	20 ms/Pts	Auto	ON	OFF
230MHz - 300MHz	Wire + Measure	50kHz	120kHz	20 ms/Pts	Auto	ON	OFF



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5.3.2 EN 55015 RF Emission in the frequency range 30 MHz - 300 MHz (Antenna-Method)

General information about the Test:

Tested by:	
Test date:	

Instruments:	EC1 26 Electrical Field strength 10 m		
Inventory number	Description	Manufacturer	Type

Environmental conditions:	Rated value	Measured value
Ambient temperature:	15 °C - 25 °C	° C

Information concerning the Test:

Test set-up:	
Operating modes:	

Result:	Not tested (see clause 5.3 of this report)

Protocol:	----

5.4 EN 61000-3-2 AC-Mains harmonic current emissions (DC - 2 kHz)

General information about the Test:

Tested by:	
Test date:	

Instruments:	EC1 23 AC-Mains harmonics (1 ph 5 kVA)		
Inventory number	Description	Manufacturer	Type

Environmental conditions:	Rated value	Measured value
Ambient temperature:	20 °C - 27 °C	° C

Information concerning the Test:

Test set-up:	
Mains voltage [V]:	
Operating mode:	

EUT class according to the standard:	
Control principle:	

Result:	Pass (see note below)

Note::	No limit applicable to LED Lamps of rated power consumption less or equal 25Watts

5.5 EN 61000-3-3 AC-Mains Voltage fluctuations and flicker (DC - 2 kHz)

General information about the Test:

Tested by:	
Test date:	

Instruments:			
Inventory number	Description	Manufacturer	Type

Information concerning the Test:

Test set-up:	
Mains voltage [V]:	
Operating mode:	

Result:	**Pass**

Protocol:	Incandescent lamp luminaires with ratings less than or equal to 1 000 W and discharge lamp luminaires with ratings less than or equal to 600 W and LED luminaires with ratings less than or equal to 200 W, are deemed to comply with the dmax limits in this standard and are not required to be tested.

5.6 IEC 61000-4-2 Electrostatic discharge immunity test (ESD)

General information about the Test:

Tested by:	J. Wade (Mr.)
Test date:	2016-01-29

Instruments:	EC1 14 ESD		
Inventory number	Description	Manufacturer	Type
5200223	ESD-SIMULATOR	SCHLOEDER	SESD200

Environmental conditions:	Rated value	Measured value
Ambient temperature:	15 - 35 °C	23 ° C
Atmospheric pressure:	860 - 1060 hPa	1025 hPa
Relative humidity:	30 - 60 %	40 %

Information concerning the Test:

Test set-up:	The EUT was operated on a wooden table 0.8 meter above the reference ground. A HCP is lying on the table. Between the EUT and the HCP is a 0.5 mm isolated base.
Monitoring:	The light intensity of the Tested EUT was optically observed.
Required performance criteria:	B
Operating mode:	No. 1

Result:	**Pass**

Protocol:

No.	Locations of discharges	Polarity	Number of discharges	Charging voltage [kV]	Result	Remarks
1.	VCP (0.5m x 0.5 m) right side	positive	10	4.0	Pass	No malfunction
2.	VCP (0.5m x 0.5 m) right side	negative	10	4.0	Pass	No malfunction
3.	HCP (0.8m x 1.6 m) bottom side	positive	10	4.0	Pass	No malfunction
4.	HCP (0.8m x 1.6 m) bottom side	negative	10	4.0	Pass	No malfunction
5.	VCP (0.5m x 0.5 m) left side	positive	10	4.0	Pass	No malfunction
6.	VCP (0.5m x 0.5 m) left side	negative	10	4.0	Pass	No malfunction

Only the maximum withstand voltage of the EUT is documented (up to the level required by the generic or product standard). All necessary lower test levels given by the basic standard were applied as well.

Air discharges

No.	Locations of discharges	Polarity	Number of discharges	Charging voltage [kV]	Result	Remarks
1.	Enclosure	positive	---	8.0	Pass	No discharge possible
2.	Enclosure	negative	---	8.0	Pass	No discharge possible

Only the maximum withstand voltage of the EUT is documented (up to the level required by the generic or product standard). All necessary lower test levels given by the basic standard were applied as well.

5.7 IEC 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity test

General information about the Test:

Tested by:	J. Wade (Mr.)
Test date:	

Instruments:	EC1 18 Electromagnetic field immunity		
Inventory number	Description	Manufacturer	Type

Environmental conditions:	Rated value	Measured value
Ambient temperature:	-	° C
Atmospheric pressure:	-	hPa
Relative humidity:	-	%

Information concerning the Test:

Test set-up:
Monitoring:
Required performance criteria:
Required Test level:
Operating mode:

Result:	Not tested *(see note below) *Note: On applicants request the test was not performed.

Protocol:

Generator:

Dwell time:
Frequency range:
Modulation:
Step size in %(log.):
Control software:

Exposed side of EUT:	Distance Antenna-EUT	Polarization:

Dimensions of EUT:	
height:	cm
length:	cm
width:	cm

Table of Tests applied concerning immunity against radiated fields

Scan No.	Field strength [V/m]	Polarization	Position of EUT	Operating mode	Result	Remarks
1						
2						

5.8 IEC 61000-4-4 Electrical fast transient/burst immunity test

General information about the Test:

Tested by:	J. Wade (Mr.)
Test date:	2016-01-29

Instruments:	EC1 12 Burst		
Inventory number	Description	Manufacturer	Type
1060552	DIGITAL-MULTIMETER	GOSSEN METRAWATT	METRAHIT 22S
1150126	ZANGENSTROMWANDLER	GMC	Z3510
5200202	COMPACT-GENERATOR	EM TEST	UCS 500 M4

Environmental conditions:	Rated value	Measured value
Ambient temperature:	15 - 35 °C	23 ° C
Atmospheric pressure:	860 - 1060 hPa	1025 hPa
Relative humidity:	30 - 60 %	40 %

Information concerning the Test:

Test set-up:	The EUT was located on a wooden table 0.1 meter above the reference ground plane. The generator was located directly on the reference ground.
Monitoring:	The light intensity of the Tested EUT was optically observed. The primary mains current of the EUT was measured by a current clamp.
Required performance criteria:	B
Operating mode:	No. 1

Result:	**Pass**

Protocol:

Generator settings:

Rise time / Hold time	5/50 ns
Repetition frequency	5 kHz
Test duration	2 min
Applied test Level	See protocol below

Terminal	Operating mode	Test level [V]	Polarity	Coupling	Result	Remarks
AC Mains input	1	1000	+	L1/N	**Pass**	---
AC Mains input	1	1000	-	L1/N	**Pass**	---

5.9 IEC 61000-4-5 Surge immunity test

General information about the Test:

Tested by:	J. Wade (Mr.)
Test date:	2016-01-29

Instruments:	EC1 012 Surge		
Inventory number	Description	Manufacturer	Type
1060552	DIGITAL-MULTIMETER	GOSSEN METRAWATT	METRAHIT 22S
1150126	ZANGENSTROMWANDLER	GMC	Z3510
5200202	COMPACT-GENERATOR	EM TEST	UCS 500 M4

Environmental conditions:	Rated value	Measured value
Ambient temperature:	15 - 35 °C	23 ° C
Atmospheric pressure:	860 - 1060 hPa	1025 hPa
Relative humidity:	10 - 75 %	40 %

Generator, Parameter:

Repetition rate	1/min

Information concerning the Test:

Test set-up:	The device is located on a wooden table, 0.1 meters above reference ground.
Monitoring:	The light intensity of the Tested EUT was optically observed. The primary mains current of the EUT was measured by a current clamp.
Required performance Criteria:	B
Operating mode:	No. 1

Result:	**Pass**

Protocol:	See next page

Terminal	Operating Mode	Test Voltage [V]	Polarity	Coupling	Phase	Number of pulses	Result	Remarks
symmetrical								
AC Mains	1	500	+	L1-N	90°	5	Pass	---
AC Mains	1	500	-	L1-N	270°	5	Pass	---

5.10 IEC 61000-4-6 Immunity to conducted disturbances, induced by radio-frequency fields

General information about the Test:

Tested by:	---
Test date:	---

Instruments:	EC1 09 Immunity to conducted RF-Currents		
Inventory number	Description	Manufacturer	Type

CDN / Clamps:	EC1 09 Immunity to conducted RF-Currents		
Inventory number	Description	Manufacturer	Type

Environmental conditions:	Rated value	Measured value
Ambient temperature:	-	° C
Atmospheric pressure:	-	hPa
Relative humidity:	-	%

Information concerning the Test:

Test set-up:
Ground plane:
Artificial Hand:
Monitoring :
Required performance criteria:
Required Test level:
Operating mode:

Result:	Not tested *(see note below) *Note: On applicants request the test was not performed.

Protocol:

Generator:

Dwell time per frequency:
Frequency range:
Modulation:
Step size in %(log.):
Control software:

Table of Tests applied concerning immunity against conducted disturbances:

Scan No.	Test voltage e.m.f. [V]	Component under investigation	Port under investigation	Operating mode	Coupling device	Result	Remarks
1							
2							

5.11 IEC 61000-4-11 Voltage dips, short interruptions and voltage variations immunity test

General information about the Test:

Tested by:	---
Test date:	---

Instruments:	EC1 12 Voltage Dips		
Inventory number	Description	Manufacturer	Type
1060552	DIGITAL-MULTIMETER	GOSSEN METRAWATT	METRAHIT 22S
1150126	ZANGENSTROMWANDLER	GMC	Z3510
1800113	COMPACT-GENERATOR	EM TEST	UCS500M6

Environmental conditions:	Rated value	Measured value
Ambient temperature:		° C
Atmospheric pressure:		hPa
Relative humidity:		%

Generator, Parameter:

Repetition rate:	
Number of dips per Test:	

Information concerning the Test:

Test set-up:	
Monitoring:	
Required performance criteria:	
Operating mode:	

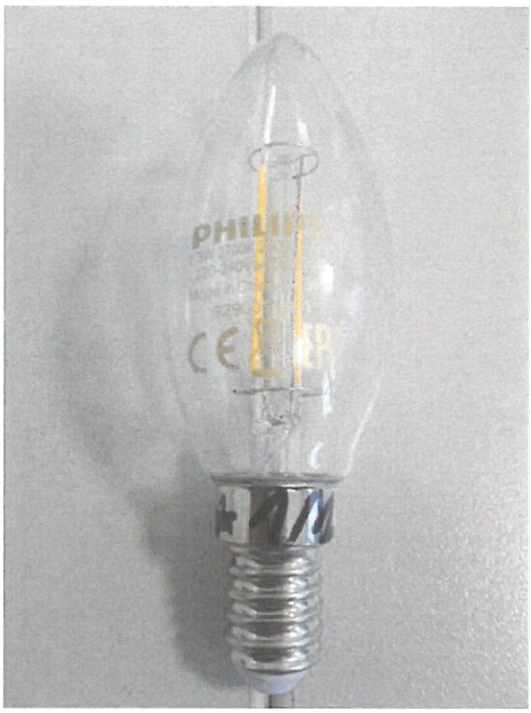
Result:	Not tested *(see note below) *Note: On applicants request the test was not performed.

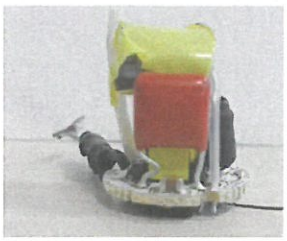
Protocol:

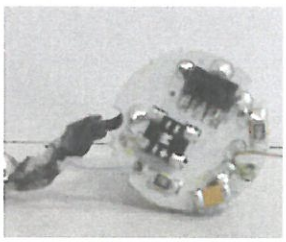
Terminal	Operating Mode	Voltage Reduction	Duration of Impulse [ms]	Time between the Impulses [s]	Phase Position of the disturbance relative to phase L1	Result	Remarks

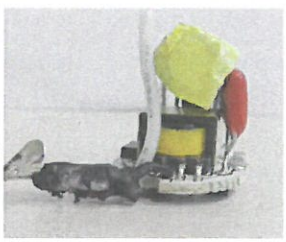
6 Appendix

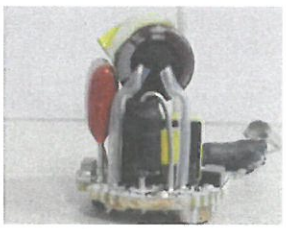
6.1 Photos











6.2 Uncertainties of measurements

Conducted disturbances

Type of disturbance Test method	Used test equipment	Calculated uncertainty	U_{CISPR}
Disturbance voltage Mains terminals 9 kHz ... 150 kHz 150 kHz ... 30 MHz	50 Ω II (50 µH + 5 Ω) Artificial mains V-network Test receicer TDEMI	 3.4 dB 3.1 dB	 3.8 dB 3.4 dB
Disturbance voltage Unsym. load terminals and others 150 kHz ... 30 MHz	1500 Ω Passive voltage probe Test receicer TDEMI	 2.5 dB	 2.9 dB
Asymmetrical disturbance voltage Telecommunication port 150 kHz ... 30 MHz	ISN-T8 Test receicer TDEMI aLCL = 55 ... 40 dB aLCL = 65 ... 50 dB aLCL = 75 ... 60 dB	 3.3 dB 3.8 dB 4.3 dB	 5.0 dB 5.0 dB 5.0 dB
Asymmetrical disturbance voltage Telecommunication port 150 kHz ... 30 MHz	Capacitive voltage probe Test receiver TDEMI	 3.7 dB	 3.9 dB
Asymmetrical disturbance current Shielded cables 150 kHz ... 30 MHz	RF Current Clamp ESH2-Z1 Test receiver TDEMI	 2.3 dB	 2.9 dB
Disturbance power Power cables and others 30 MHz ... 300 MHz	Absorbing clamp Lüthi MDS 21 Test receiver ESCI	 4.1 dB	 4.5 dB

Radiated disturbances

Type of disturbance Test method	Used test equipment	Calculated uncertainty	U_{CISPR}
Magnetic field strength 9 kHz ... 30 MHz	Loop antenna 60 cm (HFH2-Z2) Test receiver ESH 2 3 m test distance	 3.66 dB	 not specified
Magnetic field strength (Induced RF current) 9 kHz ... 30 MHz	Loop antenna system 2 m Ø (Van Veen) Test receiver ESHS, ESI, ESCI	 3.64 dB	 not specified
Electric field strength Horiz. 30 MHz ... 200 MHz Horiz. 200 MHz ... 1000 MHz Vert. 30 MHz ... 200 MHz Vert. 200 MHz ... 1000 MHz	Biconical/Log.-per. combination antenna Test receiver ESVS 30, ESI, ESCI 10 m SAC no external preamp in use	 5.64 dB 4.29 dB 5.45 dB 3.7 dB	 6.3 dB 6.3 dB 6.3 dB 6.3 dB
Electric field strength 1 GHz ... 3.5 GHz 3.5 GHz ... 7 GHz	Log.per. antenna Spectrum Analyzer FSEK Switching unit with amplifiers + filter 3 m FAR (SAC with floor absorbers)	 5.03 dB 5,50 dB	 5.2 dB 5.5 dB above 6 GHz

The values were calculated in accordance with CISPR 16-4-2 (Ed.2):2011. They are valid for the expanded uncertainty (k=2) of measurements that have been carried out in accordance with the provisions of the relevant parts of CISPR 16.

Harmonic currents (50 Hz ... 2000 Hz) and Flicker

Type of disturbance Test method	Used test equipment	Measurement uncertainty*)	U_{CISPR}
Harmonic currents EN 61000-3-2 EN 61000-3-12	EN 61000-3-2/-3, -11/-12 Measuring system Spitzenberger & Spies	Fundamental frequency: ± 0.2% of the measured value Harmonic currents: ± 0.2% of the selected measurement range	not applicable
Flicker EN 61000-3-3 EN 61000-3-11	EN 61000-3-2/-3, -11/-12 Measuring system Spitzenberger & Spies	d_c: ± 5% d_{max}: ± 5% P_{st}: ± 8%	not applicable
*) The values presented in the above table were provided by the manufacturer of the measurement system. The publication of the manufacturer does not indicate whether these values are expanded uncertainties or not. An expansion factor was not provided with the data.			

Immunity

Type of disturbance Test method	Used test equipment	Calculated uncertainty
Disturbance field strength IEC 61000-4-3 80-1000 MHz 1-3 GHz	Radiated fieldstrength test systems: Generator, Amplifier, Power meter, fieldprobe	 1.79 dB 1.74 dB
Conducted RF IEC 61000-4-6 0.15 - 80 (230) MHz	Test systems for conducted RF: Generator, Amplifier, Power meter, CDN	 0.97 dB

Date: 2013-11-25

Except for the level of the disturbance when testing against IEC 61000-4-3 or 61000-4-6, there is no standardized procedure for the calculation of uncertainties in immunity measurements and no procedure how to deal with the results of such calculations during testing. Therefore the uncertainties of the immunity test set-ups have not been calculated. All instrumentation used for immunity tests is calibrated and within the specifications required by the basic standards (IEC 61000-4-X).