

TEST REPORT

Product: LED STRIP

Model No.: LT-2835W192R-W12 (Other models see model list of page 5)

Trade mark: N/A

Report No.: TCT170227E001

Issued Date: Feb. 28, 2017

Issued for:

Lightstec CO., LIMITED

**RM.192, EASEY COMM, BLDG, .253-261 HENNESSY ROAD, WANCHAI,
HONGKONG**

Issued By:

Shenzhen TCT Testing Technology Co., Ltd.

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1. Test Certification

Product:	LED STRIP
Model No.:	LT-2835W192R-W12(Other models see model list of page 5)
Applicant:	Lightstec CO., LIMITED
Address:	RM.192, EASEY COMM, BLDG, .253-261 HENNESSY ROAD, WANCHAI, HONGKONG
Manufacturer:	Lightstec CO., LIMITED
Address:	5F-6F, No.41, WANLE EASTROAD, SHENGFENG, XIAOLAN TOWN, ZHONGSHAN, CHINA
Test Voltage:	DC 12 V
Date of Test:	Feb. 27, 2017 ~ Feb. 28, 2017
Applicable Standards:	EN 55015: 2013+A1: 2015 EN 61547: 2009

The above equipment has been tested by Shenzhen TCT Testing Technology Co., Ltd. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:

Jerry

Jerry

Date:

Feb. 28, 2017

Check By:

Joe Zhou

Joe Zhou

Date:

Feb. 28, 2017

Approved By:

Tomsin

Tomsin

Date:

Feb. 28, 2017



2. Test Result Summary

Emission		
Test Method	Item	Result
EN 55015: 2013+A1: 2015	Conducted Emission at Mains Terminals	N/A
	Conducted Emission at Load Terminals	N/A
	Radiated Electromagnetic Disturbance	Pass
	Radiated Emission	Pass
EN 61000-3-2: 2014	Harmonic Current Emissions	N/A
EN 61000-3-3: 2013	Voltage Fluctuations & Flicker	N/A

Immunity (EN 61547: 2009)		
Test Method	Item	Result
EN 61000-4-2: 2009	Electrostatic Discharge (ESD)	Pass
EN 61000-4-3: 2006 +A1: 2008+A2: 2010	Radio-frequency Electromagnetic Field Amplitude Modulated (RS)	Pass
EN 61000-4-4: 2012	Electrical Fast Transients (EFT)	N/A
EN 61000-4-5: 2014	Surges	N/A
EN 61000-4-6: 2014	Radio-frequency Continuous Conducted (CS)	N/A
EN 61000-4-8: 2010	Power-frequency Magnetic Fields (PFMF)	N/A
EN 61000-4-11: 2004	Voltage Dips & Voltage Interruptions	N/A

Note:

1. Pass: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.
5. The information of measurement uncertainty is available upon the customer's request.

3. EUT Description

Product Name:	LED STRIP
Model No.:	LT-2835W192R-W12
Product Parameter:	Input: DC 12 V, 2.7 A
AC Mains:	<input type="checkbox"/> Shielded <input type="checkbox"/> Unshielded, <input type="checkbox"/> Detachable <input type="checkbox"/> Un-detachable <input checked="" type="checkbox"/> Not applicable <input type="checkbox"/> Length:
DC Line:	<input type="checkbox"/> Shielded <input type="checkbox"/> Unshielded, <input type="checkbox"/> Detachable <input type="checkbox"/> Un-detachable <input checked="" type="checkbox"/> Not applicable <input type="checkbox"/> Length:
Control Line:	<input type="checkbox"/> Shielded <input type="checkbox"/> Unshielded, <input type="checkbox"/> Detachable <input type="checkbox"/> Un-detachable <input checked="" type="checkbox"/> Not applicable <input type="checkbox"/> Length:

Model(s) List

No.	Model Number	Tested With
1	LT-2835W192R-W12	<input checked="" type="checkbox"/>
Other models	LT-3528W60R-W12, LT-3528W120R-W12, LT-3528W240R-W12, LT-3528W60R-W24, LT-3528W120R-W24, LT-3528W240R-W24, LT-5050W30R-W12, LT-5050W60R-W12, LT-5050W120R-W12, LT-5050W30R-W24, LT-5050W60R-W24, LT-5050W120R-W24, LT-2835W60R-W12, LT-2835W120R-W12, LT-2835W192R-W12, LT-2835W60R-W24, LT-2835W120R-W24, LT-2835W192R-W24, LT-3014W60R-W12, LT-3014W120R-W12, LT-3014W60R-W24, LT-3014W120R-W24, LT-3014W238R-W24, LT-3014W240R-W24, LT-335W60R-W12, LT-335W120R-W12, LT-335W60R-W24, LT-335W120R-W24, LT-2216W300R-W24	<input type="checkbox"/>

Note: LT-2835W192R-W12 is tested model, other models are derivative models. The models are identical in circuit and PCB layout, only different on the model names. So the test data of LT-2835W192R-W12 can represent the remaining models.

4. Test Methodology

4.1. Decision of Final Test Mode

The EUT was tested together with the thereafter additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The following test mode(s) were assessed:

Test Mode
Mode 1: Lighting

4.2. EUT System Operation

1. Set up EUT with the support equipments.
2. Make sure the EUT work normally during the test.

5. Setup of Equipment under Test

5.1. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. Configuration of System Under Test



(EUT: LED STRIP)

6. Facilities and Accreditations

6.1. Facilities

All measurement facilities used to collect the measurement data are located at TCT Lab.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

No.	Item	MU
1.	Temperature	$\pm 0.1^{\circ}\text{C}$
2.	Humidity	$\pm 1.0\%$
3.	Spurious Emissions, Conducted	$\pm 2.56\text{ dB}$
4.	All Emissions, Radiated	$\pm 4.50\text{ dB}$

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k=2$.

7. Emission Test

7.1. Conducted Emission at Mains Terminals

7.1.1. Test Specification

Test Requirement:	EN 55015
Test Method:	EN 55015
Frequency Range:	9 kHz to 30 MHz

7.1.2. Limits

Frequency (MHz)	Limits dB(μV) ^a	
	Quasi-peak	Average
0.009 - 0.05	110	N/A
0.05 - 0.15	90 – 80 ^b	N/A
0.15 - 0.5	66 - 56 ^b	56 - 46 ^b
0.50 - 5.0	56 ^c	46 ^c
5.0 - 30.0	60	50

a. At the transition frequency, the lower limit applies.

b. The limit decreases linearly with the logarithm of the frequency in the ranges 50 kHz to 150 kHz and 150 kHz to 0.5 MHz.

c. For electrode less lamps and luminaires, the limit in the frequency range of 2.51 MHz to 3.0 MHz is 73 dB(μV) quasi-peak and 63 dB(μV) average.

7.1.3. Test Instruments

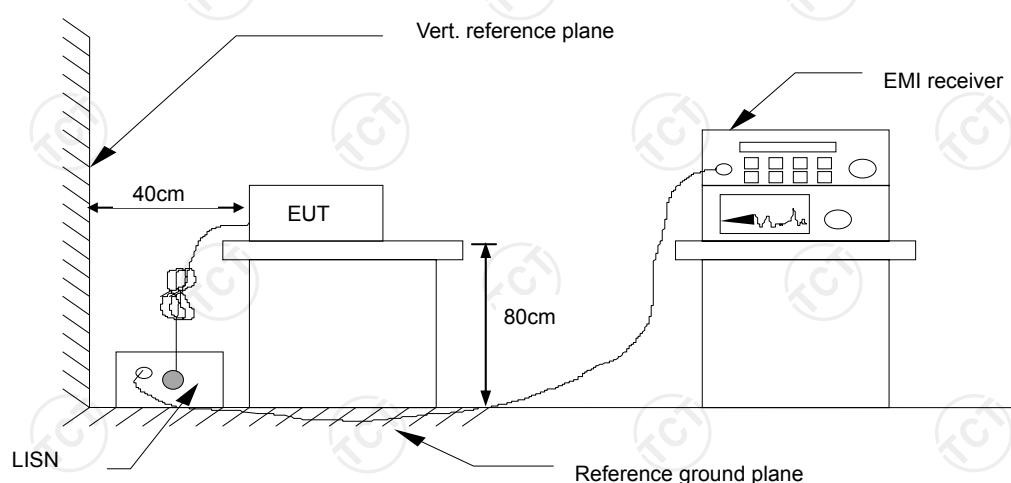
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	100139	Aug. 11, 2017
LISN	Schwarzbeck	NSLK 8126	8126453	Aug. 16, 2017

Note: the calibration interval of the above test instruments is 12 months and the calibration can be traced to international system unit (SI).

7.1.4. Test Method

The AMN was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.

7.1.5. Block Diagram of Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.1.6. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

7.2. Conducted Emission at Load Terminals

7.2.1. Test Specification

Test Requirement:	EN 55015
Test Method:	EN 55015
Frequency Range:	9 kHz to 30 MHz

7.2.2. Limits

Frequency (MHz)	Limits dB(μV) ^a	
	Quasi-peak	Average
0.15 - 0.5	80	70
0.5 - 30.0	74	64

a. At the transition frequency, the lower limit applies.

7.2.3. Test Instruments

Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	100139	Aug. 11, 2017
LISN	Schwarzbeck	NSLK 8126	8126453	Aug. 16, 2017

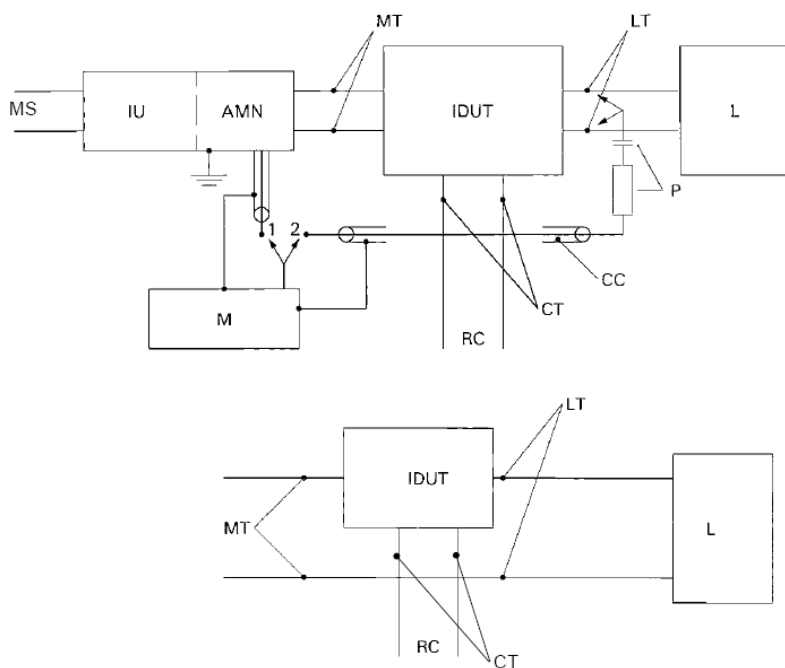
Note: the calibration interval of the above test instruments is 12 months and the calibration can be traced to international system unit (SI).

7.2.4. Test Method

A voltage probe shall be used when measuring on the load terminals (see Figure 5). It contains a resistor having a resistance value of at least 1 500 Ω in series with a capacitor with a reactive value negligible to the resistance (in the range 150 kHz to 30 MHz) (see 5.2 of CISPR 16-1-2:2003).

The measuring results shall be corrected according to the voltage division between the probe and the measuring set. For this correction, only the resistive parts of the impedance shall be taken into account.

7.2.5. Block Diagram of Test Setup



IEC 1706/01

Key

MS	= Mains supply
IU	= Isolating unit
AMN	= $50 \square / 50 \square H + 5 \square$ (or $50 \square / 50 \square H$) artificial mains V-network as specified in CISPR 16-1-2
MT	= Mains terminals
IDUT	= Independent device under test
LT	= Load terminals
L	= Load
P	= Probe ($R \square 1\ 500 \square$ and $C \square 0,005 \square F$)
CC	= Coaxial cable
CT	= Control terminals
M	= CISC measuring receiver
RC	= Remote control (if any)

Switch positions and probe connections:

- 1 For mains measurements
- 2 For load measurements

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.2.6. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

7.3. Radiated Electromagnetic Disturbance

7.3.1. Test Specification

Test Requirement:	EN 55015
Test Method:	EN 55015
Frequency Range:	9 kHz to 30 MHz

7.3.2. Limits

Frequency	Limits for loop diameter dB(μA) ^a		
	2 m	3 m	4 m
9 kHz-70 kHz	88	81	75
70 kHz-150 kHz	88 - 58 ^b	81 - 51 ^b	75 - 45 ^b
150 kHz-3.0 MHz	58 - 22 ^b	51 - 15 ^b	45 - 9 ^b
3.0 MHz-30 MHz	22	15 - 16 ^c	9 - 12 ^c

a. At the transition frequency, the lower limit applies.
b. Decreasing linearly with the logarithm of the frequency. For electrode less lamps and luminaires, the limit in the frequency range of 2.2 MHz to 3.0 MHz is 58 dB(μA) for 2 m, 51 dB(μA) for 3 m and 45 dB(μA) for 4 m loop diameter.
c. Increasing linearly with the logarithm of the frequency.

7.3.3. Test Instruments

Radiated Electromagnetic Emission Test Site(843)				
Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
EMI Test Receiver	R&S	ESCS30	100139	Aug. 11, 2017
Triple-Loop Antenna	EVERFINE	LLA-2	--	Aug. 11, 2017

Note: the calibration interval of the above test instruments is 12 months and the calibration can be traced to international system unit (SI).

7.3.4. Test Method

The EUT and support equipment are positioned in the centre of loop antenna system (LAS). The LAS consists of three circular, mutually perpendicular large-loop antennas (LLAs), having a diameter of 2 m, supported by a non-metallic base. A 50 Ω coaxial cable between the current probe of an LLA and the coaxial switch, and between this switch and the measuring equipment, shall have a surface transfer impedance smaller than 10 mΩ/m at 100 kHz and 1 mΩ/m at 10 MHz. The distance between the outer

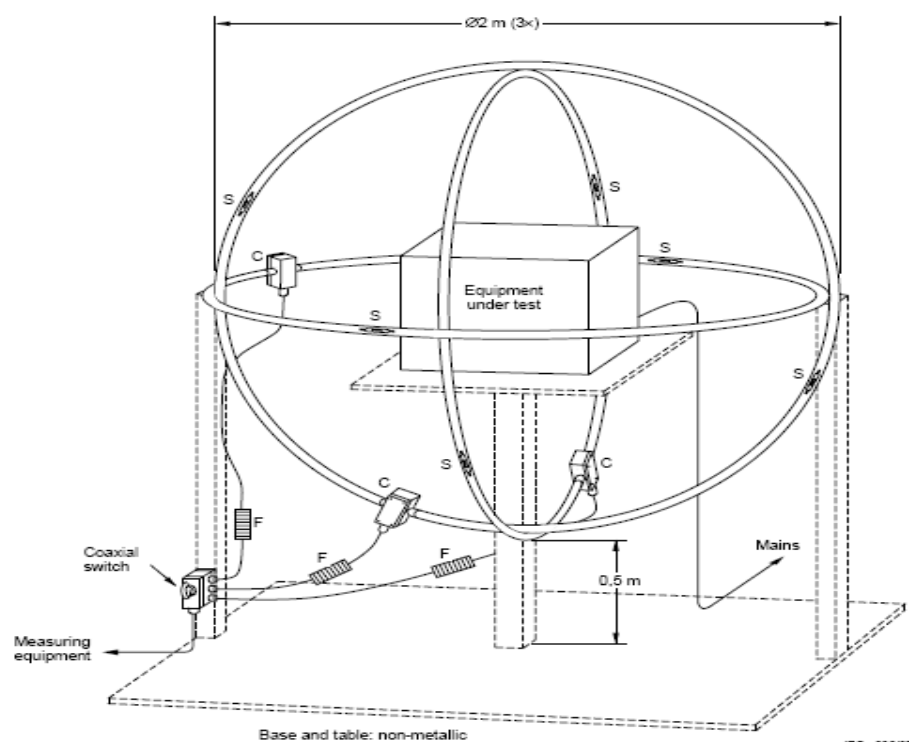
diameter of the loop antenna system and nearby objects, such as floor and walls, shall be at least 0.5 m as per CISPR 15/ EN 55015.

The induced current in the loop antenna is measured by means of a current probe (1 V/A) and the CISPR measuring receiver. By means of a coaxial switch, the three field directions (X, Y, Z) can be measured in sequence.

The receiver scanned from 9 kHz to 30 MHz for emissions in each of the test modes. and recorded at least the six highest emission. Each value shall comply with the requirement given.

The test data of the worst-case condition(s) was recorded.

7.3.5. Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.3.6. Test Results

Test Environment:	Temp.: 23 °C	Humid.: 54 %	Press.: 96 kPa
Test Mode:	Mode 1		
Test Voltage:	DC 12 V		
Test Result:	Pass		

Note:

Freq. = Emission frequency in MHz

Reading level dB(uA) = Receiver reading

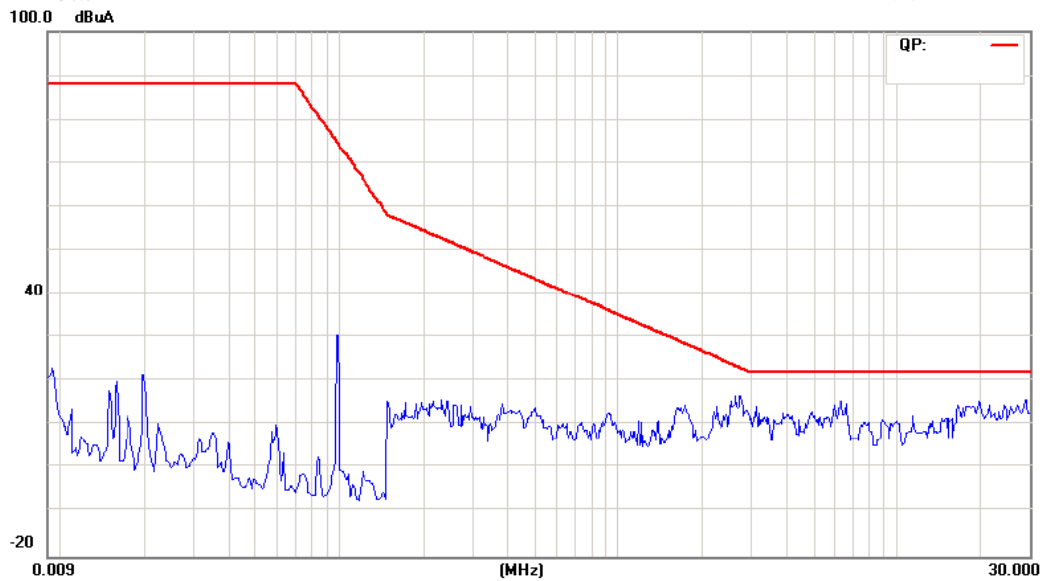
Corr. Factor (dB) = Antenna factor + Cable loss

Measurement dB(uA) = Reading level dB(uA) + Corr. Factor (dB)

Limit dB(uA) = Limit stated in standard

Margin (dB) = Measurement dB(uA) – Limits dB(uA)

Please refer to following diagram for individual



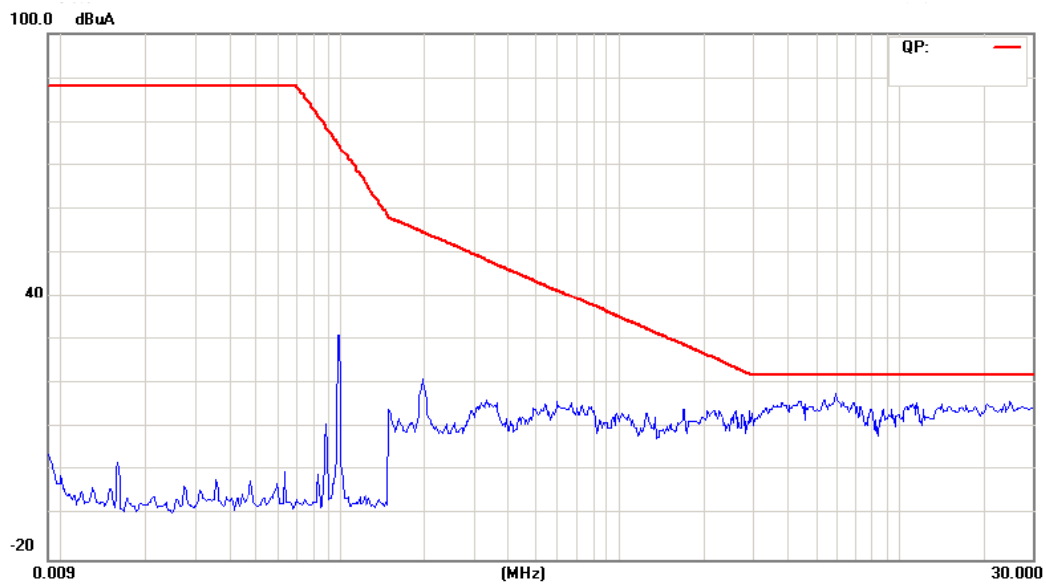
Site Chamber #2
Limit: EN55015_2LOOP
Mode: Lighting
Note:

Polarization: **X**
Power: DC12V

Temperature: 23 (C)
Humidity: 54 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuA	dB	dBuA	dBuA	dB		

Note: Any value more than 10 dB below limit have not been specifically reported.



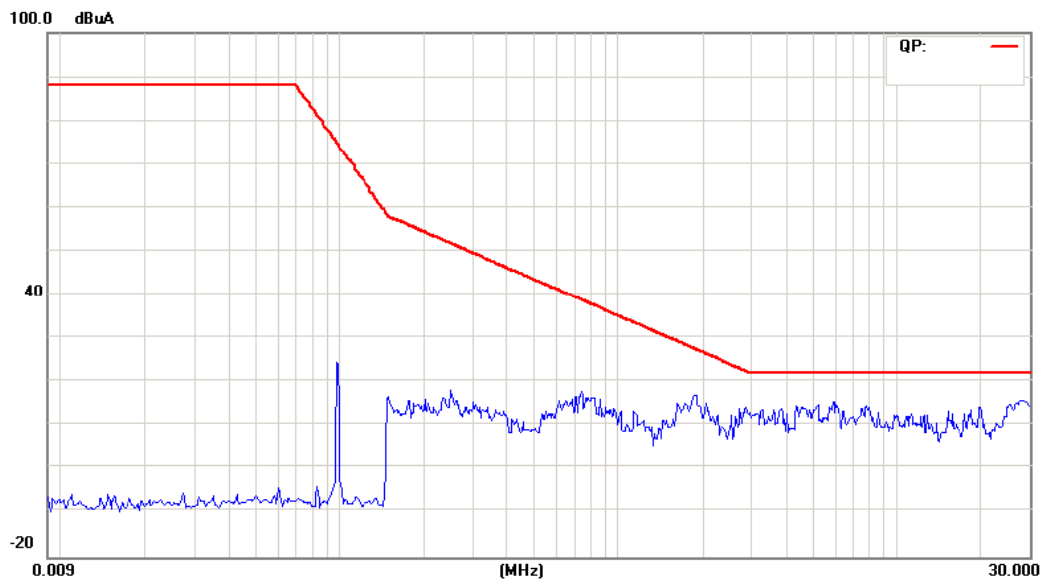
Site Chamber #2
Limit: EN55015_2LOOP
Mode: Lighting
Note:

Polarization: **Y**
Power: DC12V

Temperature: 23 (C)
Humidity: 54 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuA	dB	dBuA	dBuA	dB	Detector	Comment

Note: Any value more than 10 dB below limit have not been specifically reported.



Site Chamber #2
Limit: EN55015_2LOOP
Mode: Lighting
Note:

Polarization: **Z**
Power: DC12V

Temperature: 23 (C)
Humidity: 54 %

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
		MHz	Level	Factor	ment			Detector	Comment
			dBuA	dB	dBuA	dBuA	dB		

Note: Any value more than 10 dB below limit have not been specifically reported.

7.4. Radiated Emission

7.4.1. Test Specification

Test Requirement:	EN 55015
Test Method:	EN 55015
Frequency Range:	30 MHz to 300 MHz
Measurement Distance:	3 m
Antenna Polarization:	Horizontal & Vertical

7.4.2. Limits

Frequency (MHz)	Quasi-Peak Limit dB(μ V/m) At 3 m
30 - 230	40
230 - 300	47

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level dB(μ V/m) = 20 log Emission level (μ V/m).

7.4.3. Test Instruments

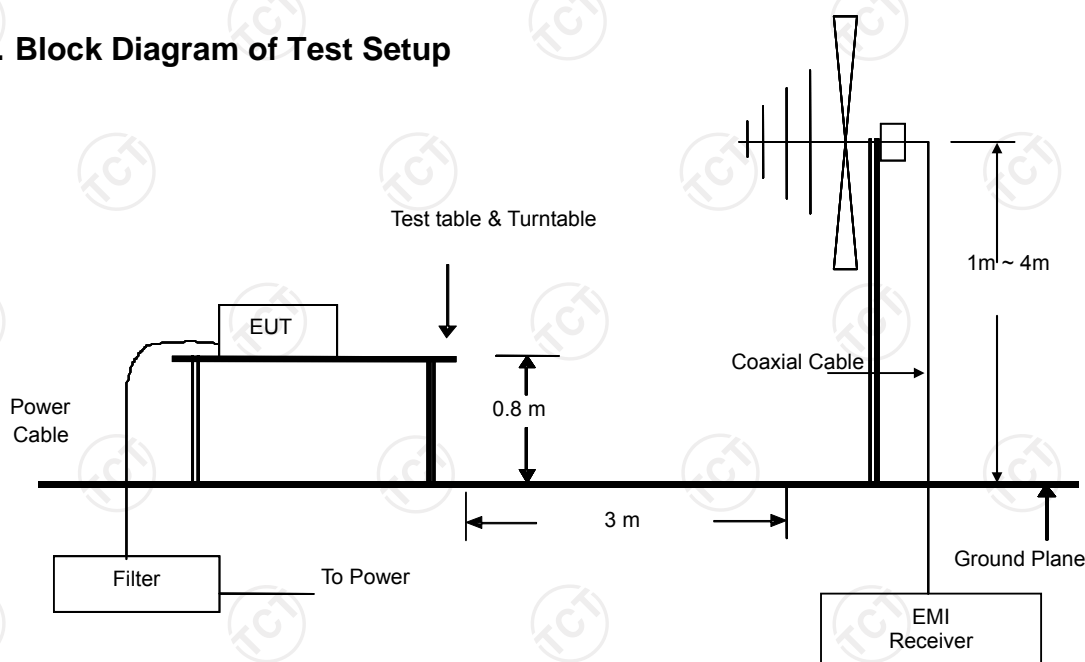
Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESVD	100008	Aug. 11, 2017
Spectrum Analyzer	R&S	FSEM	848597-001	Aug. 11, 2017
Amplifier	HP	8447D	2727A05017	Aug. 11, 2017
Amplifier	EM	EM30265	07032613	Aug. 11, 2017
Broadband Antenna	Schwarzbeck	VULB9163	340	Aug. 13, 2017
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Aug. 13, 2017

Note: the calibration interval of the above test instruments is 12 months and the calibration can be traced to international system unit (SI).

7.4.4. Test Method

Measurements were made in a 3-meter semi-anechoic chamber or Open Area Test Site that complies to CISPR 16. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (quasi-peak) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable. Block Diagram of Test Setup.

7.4.5. Block Diagram of Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.4.6. Test Results

Test Environment:	Temp.: 25 °C	Humid.: 54 %	Press.: 96 kPa
Test Mode:	Mode 1		
Test Voltage:	DC 12 V		
Test Result:	Pass		

Note:

Freq. = Emission frequency in MHz

Reading level dB(μV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

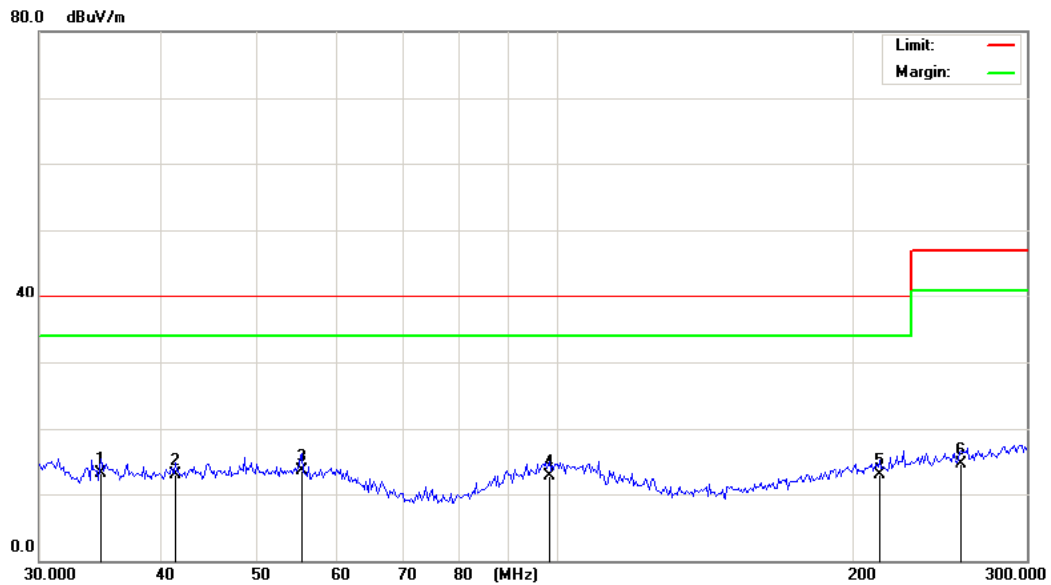
Measurement dB(μV/m) = Reading level dB(μV) + Corr. Factor (dB)

Limit dB(μV/m) = Limit stated in standard

Margin (dB) = Measurement dB(μV/m) – Limits dB(μV/m)

Q.P. =Quasi-Peak

Please refer to following diagram for individual



Site: Polarization: **Horizontal** Temperature: 25
 Limit: EN 55015 RE_3 M Power: DC 12V Humidity: 54 %
 Mode: Lighting
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		34.6435	26.20	-13.14	13.06	40.00	-26.94	QP	
2		41.2042	25.30	-12.43	12.87	40.00	-27.13	QP	
3	*	55.3537	25.90	-12.45	13.45	40.00	-26.55	QP	
4		98.4343	24.30	-11.67	12.63	40.00	-27.37	QP	
5		212.8545	24.10	-11.23	12.87	40.00	-27.13	QP	
6		257.8790	24.30	-9.70	14.60	47.00	-32.40	QP	



Site: Polarization: **Vertical** Temperature: 25
 Limit: EN 55015 RE_3 M Power: DC 12V Humidity: 54 %
 Mode: Lighting
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	30.3340	33.20	-13.68	19.52	40.00	-20.48	QP	
2		49.1886	29.30	-12.08	17.22	40.00	-22.78	QP	
3		78.3047	31.80	-16.36	15.44	40.00	-24.56	QP	
4		99.5301	24.60	-11.50	13.10	40.00	-26.90	QP	
5		123.7388	24.30	-14.17	10.13	40.00	-29.87	QP	
6		235.1538	24.10	-10.47	13.63	47.00	-33.37	QP	

7.5. Harmonic Current Emissions

7.5.1. Test Specification

Test Requirement:	EN 61000-3-2
Test Method:	EN 61000-3-2
Limit:	Class C

7.5.2. Limits of Harmonic Current Measurement

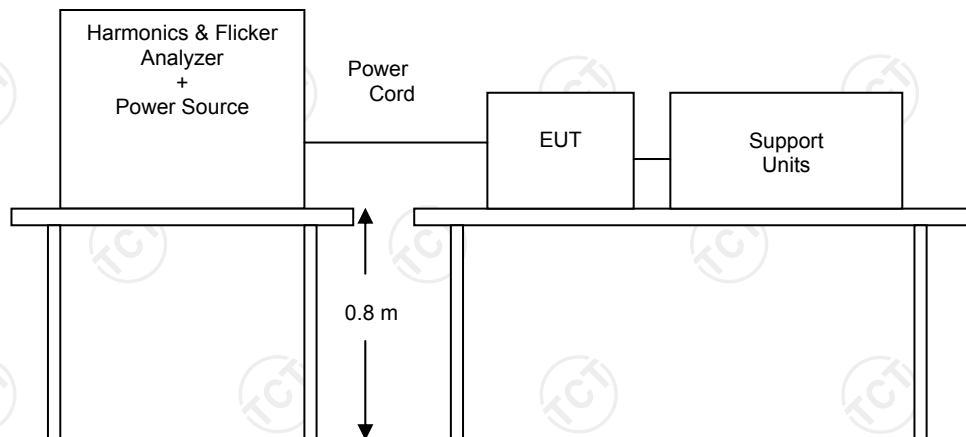
Limits for Class C equipment	
Harmonics Order n	Max. permissible harmonics current expressed as a percentage of the input current at the fundamental frequency A
2	2
3	30 x F
5	10
7	7
9	5
11 ≤ n ≤ 39 (odd harmonics only)	3
"F" is the circuit power factor	

7.5.3. Test Instruments

Harmonic Test Equipment				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
AC Power Supply	KIKUSUI	PCR4000M	UC002552	Aug. 11, 2017
Harmonic/Flicker Analyzer	KIKUSUI	KHA1000	UD002324	Aug. 11, 2017
Multi Outlet Unit	KIKUSUI	OT01-KHA	UF003026	Aug. 11, 2017
Line Impedance Network	KIKUSUI	LIN1020JF	UC001738	Aug. 11, 2017

Note: the calibration interval of the above test instruments is 12 months and the calibration can be traced to international system unit (SI).

7.5.4. Block Diagram of Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.5.5. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

7.6. Flicker and Voltage Fluctuation

7.6.1. Test Specification

Test Requirement:	EN 61000-3-3
Test Method:	EN 61000-3-3

7.6.2. Limits

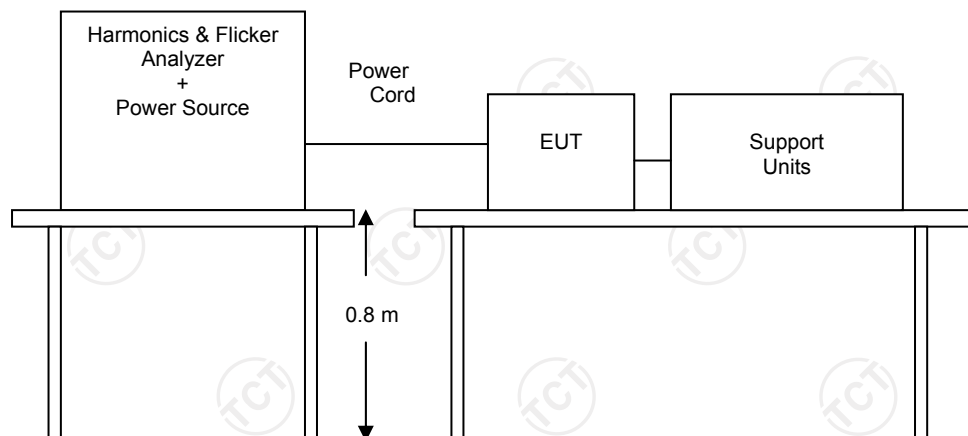
Test Item	Limit	Note
Pst	1.0	Pst means short-term flicker indicator
Plt	0.65	Plt means long-term flicker indicator
Tdt (ms)	500	Tdt means maximum time that dt exceeds 3 %.
dmax (%)	4/6/7	Dmax means maximum relative voltage change.
dc (%)	3.3	Dc means relative steady-state voltage change.

7.6.3. Test Instruments

Flicker Test Equipment				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
AC Power Supply	KIKUSUI	PCR4000M	UC002552	Aug. 11, 2017
Harmonic/Flicker Analyzer	KIKUSUI	KHA1000	UD002324	Aug. 11, 2017
Multi Outlet Unit	KIKUSUI	OT01-KHA	UF003026	Aug. 11, 2017
Line Impedance Network	KIKUSUI	LIN1020JF	UC001738	Aug. 11, 2017

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

7.6.4. Block Diagram of Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.6.5. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

8. Immunity Test

8.1. General Performance Criteria Description

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.
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 the control shall be the same as before the test provided that during the test no mode changing commands were given.
Criterion C:	<p>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.</p> <p>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.</p>

8.2. Electrostatic Discharge (ESD)

8.2.1. Test Specification

Test Requirement:	EN 61547
Test Method:	EN 61000-4-2
Storage capacitor:	150 pF
Discharge resistor:	330 ohm
Discharge Voltage:	Contact Discharge: ± 4 kV Air Discharge: ± 8 kV Indirect application: ± 4 kV
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: Minimum 20 times at each test point Contact Discharge: Minimum 50 times at each test point
Discharge Mode:	1 time/s
Performance Criterion:	B

8.2.2. Test Instruments

Immunity Shielded Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Electrostatic Discharge Generator	Prima	ESD61002AG	PR12092502	Aug. 11, 2017

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.2.3. Test Method

1. Air Discharge:

The test was applied on non-conductive surfaces of EUT. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the discharge electrode was removed from the EUT. The generator was re-triggered for a new single discharge and repeated 20 times for each pre-selected test point. This Method was repeated until all the air discharge completed.

2. Contact Discharge:

The test was applied on accessible metallic parts of the EUT. The generator was re-triggered for a new single discharge and repeated 50 times for each pre-selected test point. The tip of the discharge electrode was touching the EUT before the discharge switch was operated.

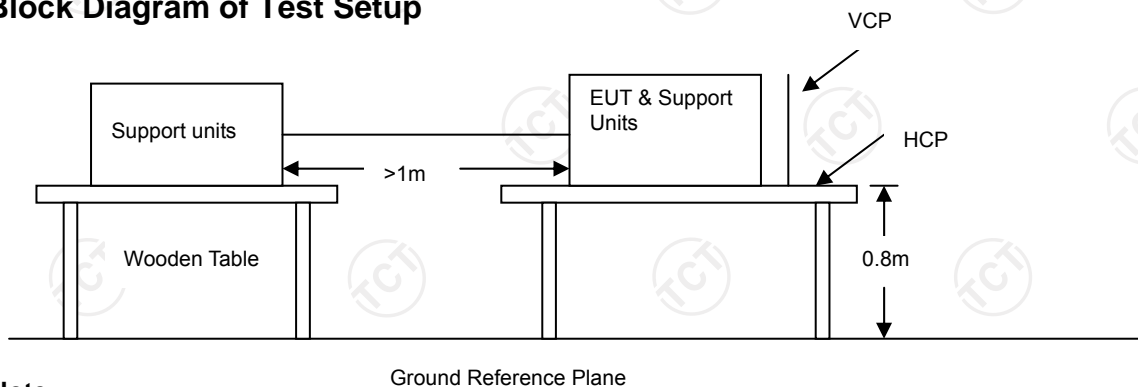
3. Indirect discharge for horizontal coupling plane:

At least 10 single discharges (in the most sensitive polarity) were applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1 m from the EUT and with the discharge electrode touching the coupling plane.

4. Indirect discharge for vertical coupling plane:

At least 10 single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5 m X 0.5 m, was placed parallel to, and positioned at a distance of 0.1 m from the EUT. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

8.2.4. Block Diagram of Test Setup



Note:

1. Table-top Equipment

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25 mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6 m x 0.8 m) was placed on the table and attached to the **GRP** by means of a cable with 940 k total impedance.

The equipment under test was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5 mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

2. Floor-standing Equipment

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25 mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

8.2.5. Test Results

Test Environment:	Temp.:	24 °C	Humid.:	54 %	Press.:	96 kPa
Test Mode:	Mode 1					
Test Voltage:	DC 12 V					
Test Result:	Pass					

Air Discharge						
Test Points		Test Levels	Results			
		± 8 kV	Pass	Fail	Performance Criterion	Observation
Slot	4 Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3

Contact Discharge						
Test Points		Test Levels	Results			
		± 4 kV	Pass	Fail	Performance Criterion	Observation
HCP	4 Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
VCP	4 Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3

Note:

1. There was no change compared with initial operation during the test.
2. During the test the luminous intensity change, and after the test the luminous intensity can be restored to its initial value within 1 min.
3. During the test the luminous intensity change, and after the test the luminous intensity can return to normal within 30 min.

8.3. Radio-frequency Electromagnetic Field Amplitude Modulated (RS)

8.3.1. Test Specification

Test Requirement:	EN 61547
Test Method	EN 61000-4-3
Frequency Range:	80 MHz -1000 MHz
Test level:	3 V/m (unmodulated, r.m.s)
Modulation:	1 kHz, 80 % AM, sine wave
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal & Vertical
Antenna Height:	1.5 m
Performance Criterion:	A

8.3.2. Test Instruments

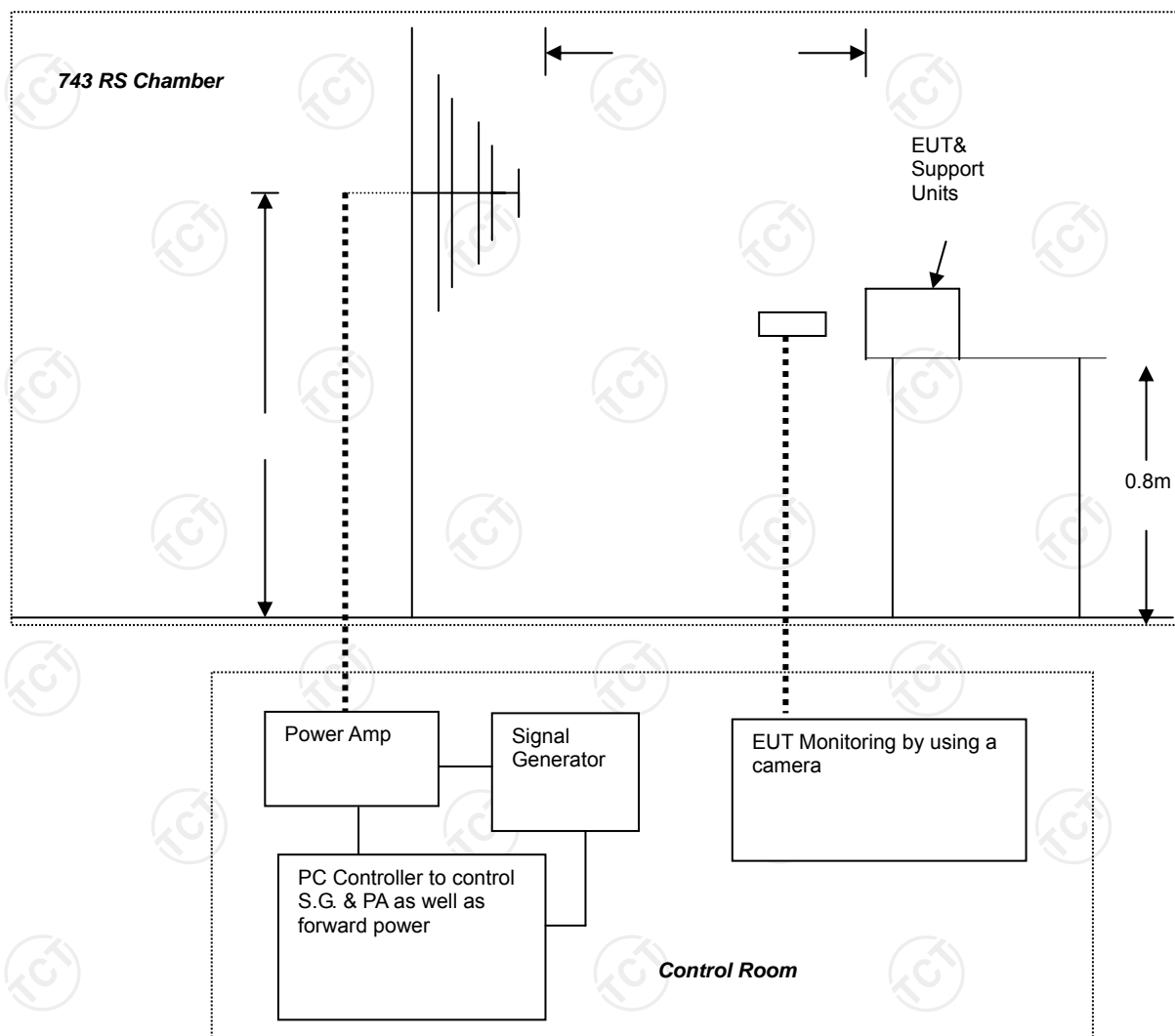
743 RS Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Generator	Maconi	2022D	119246/003	Aug. 11, 2017
Power Amplifier	M2S	A00181-1000	9801-112	Aug. 11, 2017
Power Amplifier	M2S	AC8113/ 800-250A	9801-179	Aug. 11, 2017
Power Antenna	SCHAFFNER	CBL6140A	1204	Aug. 11, 2017

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.3.3. Test Method

1. The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
2. The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1 kHz sine-wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s, where the frequency range is swept incrementally; the step size was 1% of preceding frequency value.
3. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond and was not less than 0,5 s.
4. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.
5. The EUT was performed in a configuration to actual installation conditions, a video camera and/or a audio monitor were used to monitor the performance of the EUT.

8.3.4. Block Diagram of Test Setup



Note:

Table-top Equipment

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

Floor-standing Equipment

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

8.3.5. Test Results

Test Environment:	Temp.:	24 °C	Humid.:	53 %	Press.:	96 kPa
Test Mode:	Mode 1					
Test Voltage:	DC 12 V					
Test Result:	Pass					

Frequency(MHz)	Polarity	Position	Field Strength(V/m)	Observation
80 ~ 1000	V&H	Front	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
80 ~ 1000	V&H	Rear	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
80 ~ 1000	V&H	Left	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
80 ~ 1000	V&H	Right	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3

Note:

1. There was no change compared with initial operation during the test.
2. During the test the luminous intensity change, and after the test the luminous intensity can be restored to its initial value within 1 min.
3. During the test the luminous intensity change, and after the test the luminous intensity can return to normal within 30 min.

8.4. Electrical Fast Transient (EFT)

8.4.1. Test Specification

Test Requirement:	EN 61547
Test Method:	EN 61000-4-4
Test Level:	Signal and control lines: ± 0.5 kV (peak) Input and output d.c. power ports: ± 0.5 kV (peak) Input and output a.c. power ports: ± 1 kV (peak)
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave-shape:	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	2 minutes per level & polarity
Performance Criterion:	B

8.4.2. Test Instruments

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Fast Transient Burst Simulator	Prima	EFT61004BG	PR12074375	Aug. 11, 2017
Capacitive coupling folder	Prima	EFT-CLAMP	N/A	Aug. 11, 2017
Single-phase transformer	Prima	JMB-3KVA	L12121902-2	Aug. 11, 2017

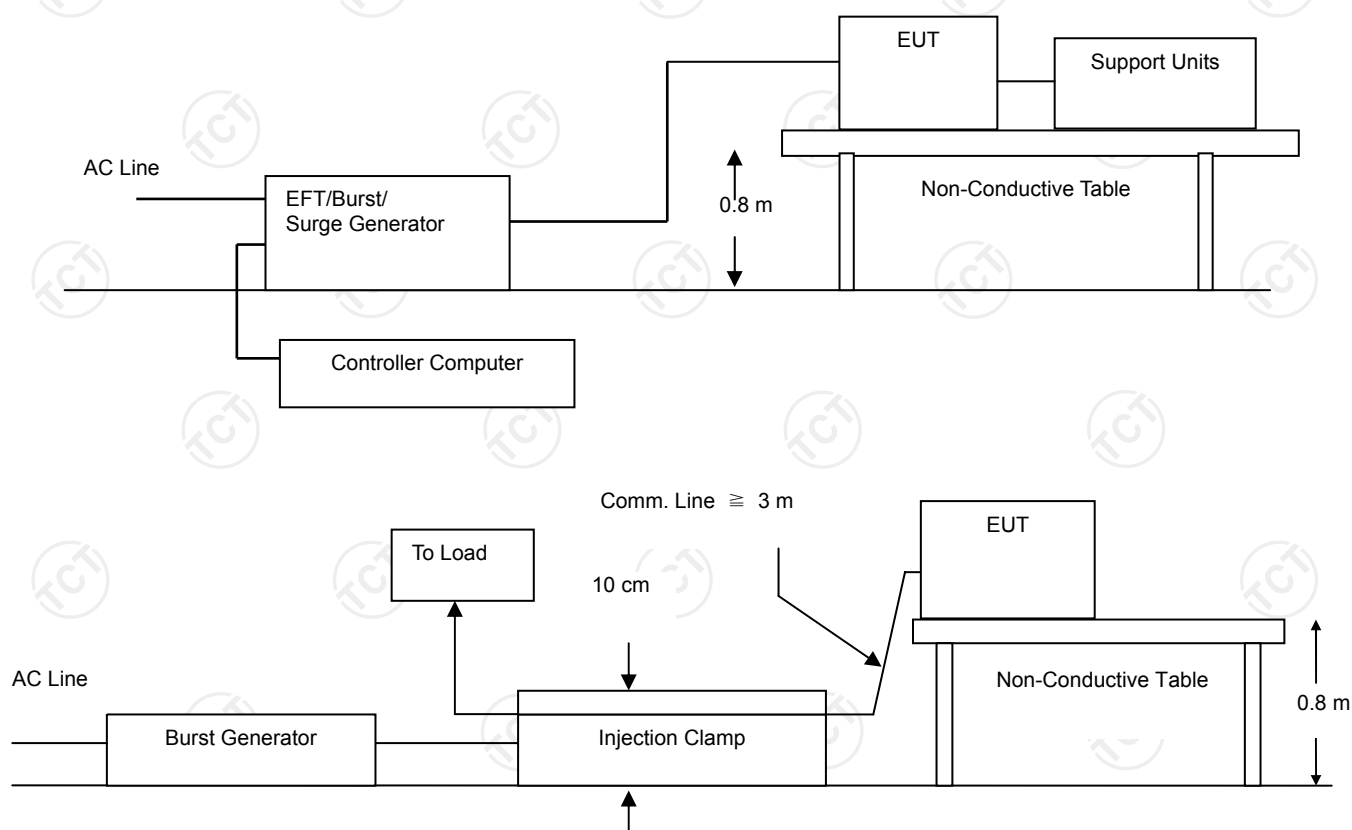
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.4.3. Test Method

1. The EUT and its simulators were placed on the ground reference plane and were insulated from it by a wood support 0.1 m + 0.01 m thick. The ground reference plane was 1 m*1 m metallic sheet with 0.65 mm minimum thickness.
2. This reference ground plane was project beyond the EUT by at least 0.1 m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane was more than 0.5 m.
3. All cables to the EUT was placed on the wood support, cables not subject to EFT/B was routed as far as possible from the cable under test to minimize the coupling between the cables.
4. The length of the signal and power lines between the coupling device and the EUT is 0.5 m.

5. The EUT is connected to the power mains through a coupling device that directly couples the EFT/B interference signal.
6. Each of the Line and Neutral conductors is impressed with burst noise for 2 minutes.

8.4.4. Block Diagram of Test Setup



Note:

1. Table-top Equipment

The configuration consisted of a wooden table (0.8 m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25 mm thick and 2.5 m square) connected to the protective grounding system. A minimum distance of 0.5 m was provided between the EUT and the walls of the laboratory or any other metallic structure.

2. Floor-standing Equipment

The EUT installed in a representative system as described in section 7 of IEC 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25 mm thick and 2.5 m square) connected to the protective grounding system.

8.4.5. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

8.5. Surges

8.5.1. Test Specification

Test Requirement:	EN 61547
Test Method:	EN 61000-4-5
Test Level:	Self-ballasted lamps and semi-luminaires: Line to line: ± 0.5 kV, Line to ground: ± 1 kV Luminaires and independent auxiliaries(≤ 25 W): Line to line: ± 0.5 kV, Line to ground: ± 1 kV Luminaires and independent auxiliaries(> 25 W) Line to line: ± 1 kV, Line to ground: ± 2 kV
Polarity:	Positive & Negative
Wave-Shape:	Combination Wave 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current
Generator Source Impedance:	2 ohm between networks 12 ohm between network and ground
Test Interval:	60 s between each surge
Number of Tests:	5 positive at 90° phase angle, and 5 negative at 270° phase angle
Performance Criterion:	B; C

8.5.2. Test Instruments

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Lightning Surge Generator	Prima	SUG61005BG	PR12125534	Aug. 11, 2017
Single-phase transformer	Prima	JMB-3KVA	L12121902-2	Aug. 11, 2017

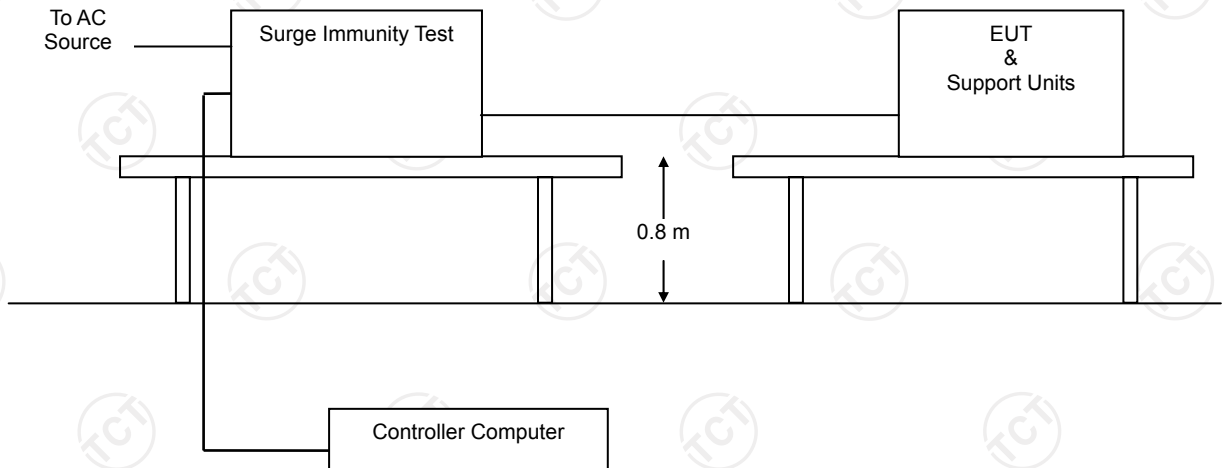
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.5.3. Test Method

1. For line-to-line coupling mode, provide a 1 kV 1.2/50 μ s voltage surge (at open-circuit condition) and 8/20 μ s current surge to EUT selected points, and for active line / neutral lines to ground are same except test level is 2 kV.
2. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are applied during test.
3. Different phase angles are done individually.

4. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

8.5.4. Block Diagram of Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

8.5.5. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

8.6. Radio-frequency Continuous Conducted (CS)

8.6.1. Test Specification

Test Requirement:	EN 61547
Test Method	EN 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Test Level:	3 V r.m.s. (unmodulated)
Modulation:	1 kHz, 80 % AM, sine wave
Performance Criterion:	A

8.6.2. Test Instrument

CS Test				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Conducted Disturbances Test System	Schloder	CDG 6000-75	126B1290	Aug. 12, 2017
CDN	Schloder	CDN M2+M3-16	A2210281	Aug. 16, 2017
Attenuator	Schloder	ATT-6DB-100	A100W225	Aug. 16, 2017
EM-Clamp	Schloder	EMCL-20	132A1194	Aug. 16, 2017

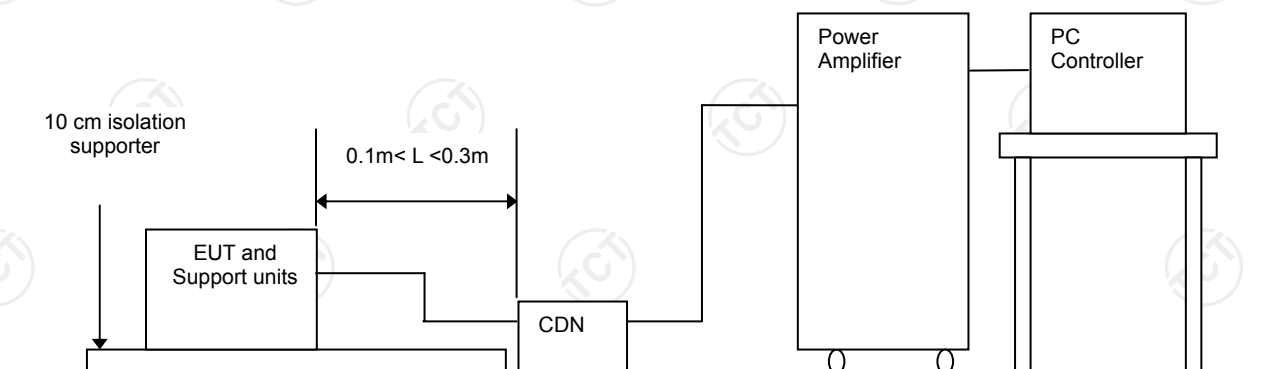
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.6.3. Test Method

1. The EUT are placed on an insulating support 0.1 m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3 m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
2. The disturbance signal described below is injected to EUT through CDN.
3. The EUT operates within its operational mode(s) under intended climatic conditions after power on.
4. The frequency range is swept from 0.150 MHz to 80 MHz using 3 V signal level, and with the disturbance signal 80 % amplitude modulated with a 1 kHz sine wave.

5. Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

8.6.4. Block Diagram of Test Setup



Note:

1. Table-Top and Floor-Standing Equipment

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

8.6.5. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

8.7. Power-frequency Magnetic Field (PFMF)

8.7.1. Test Specification

Test Requirement:	EN 61547
Test Method:	EN 61000-4-8
Frequency:	50/60 Hz
Test level:	3 A/m
Observation Time:	5 minutes
Performance criterion:	A

8.7.2. Test Instrument

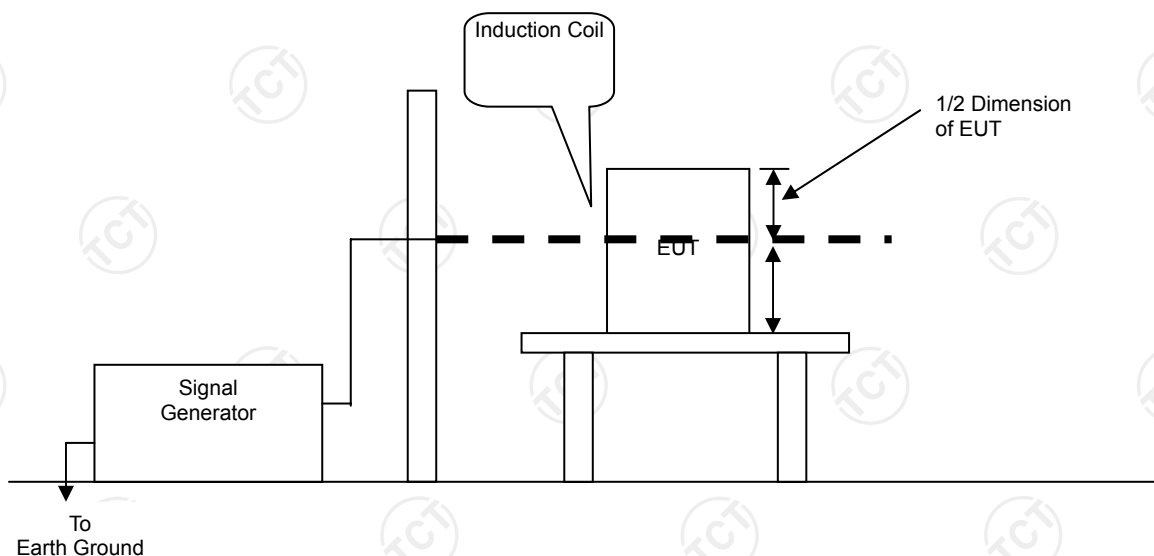
Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Continuous Wave Simulator	EM TEST	UCS 500 M4	0304-42	Aug. 1, 2017
Power Source Network	EM TEST	MV 2616	0104-14	Aug. 16, 2017
Magnetic Coil	EM TEST	MS100	0304-42	Aug. 16, 2017

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.7.3. Test Method

1. the equipment is configured and connected to satisfy its functional requirements.
It shall be placed on the GRP with the interposition of a 0.1 m-thick insulating support.
2. the equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
3. the power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
4. the cables supplied or recommended by the equipment manufacturer shall be used.
1 meter of all cables used shall be exposed to the magnetic field.

8.7.4. Block Diagram of Test Setup



Note:

1. Table-top Equipment

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

2. Floor-standing Equipment

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

8.7.5. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

8.8. Voltage Dip & Voltage Interruptions

8.8.1. Test Specification

Test Requirement:	EN 61547
Test Method:	EN 61000-4-11
Test Level:	70 % of U_T (Supply Voltage) for 10 periods 0 % of U_T (Supply Voltage) for 0.5 period
Performance Criterion:	B&C

8.8.2. Test Instrument

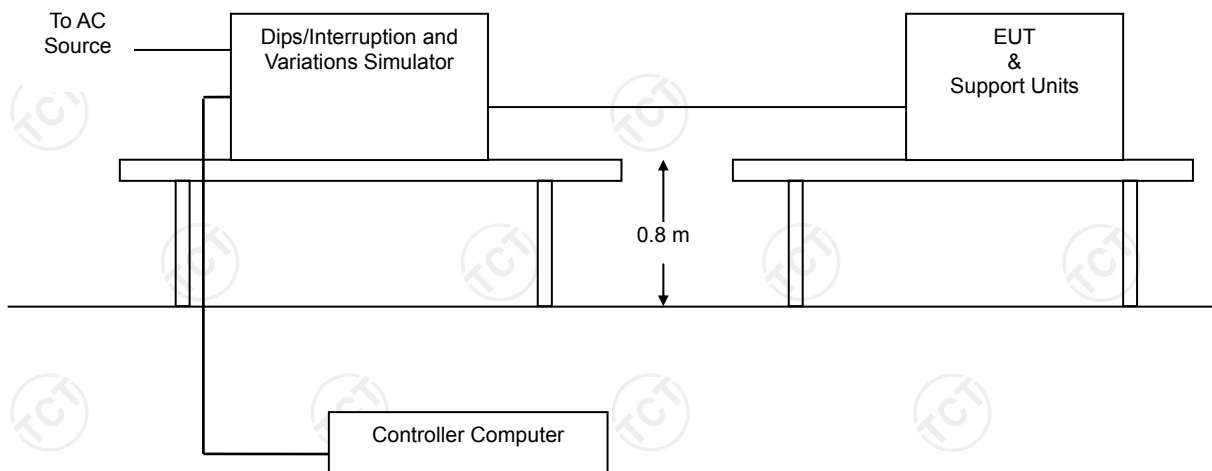
Immunity shielded room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Cycle Sag Simulator	Prima	DRP61011AG	PR12106201	Aug. 11, 2017
Single-phase transformer	Prima	JMB-3KVA	L12121902-2	Aug. 11, 2017

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.8.3. Test Method

1. The EUT and support units were located on a wooden table, 0.8 m away from ground floor.
2. Setting the parameter of tests and then perform the test software of test simulator.
3. Conditions changes to occur at 0 degree crossover point of the voltage waveform.
4. Recording the test result in test record form.

8.8.4. Block Diagram of Test Setup



8.8.5. Test Results

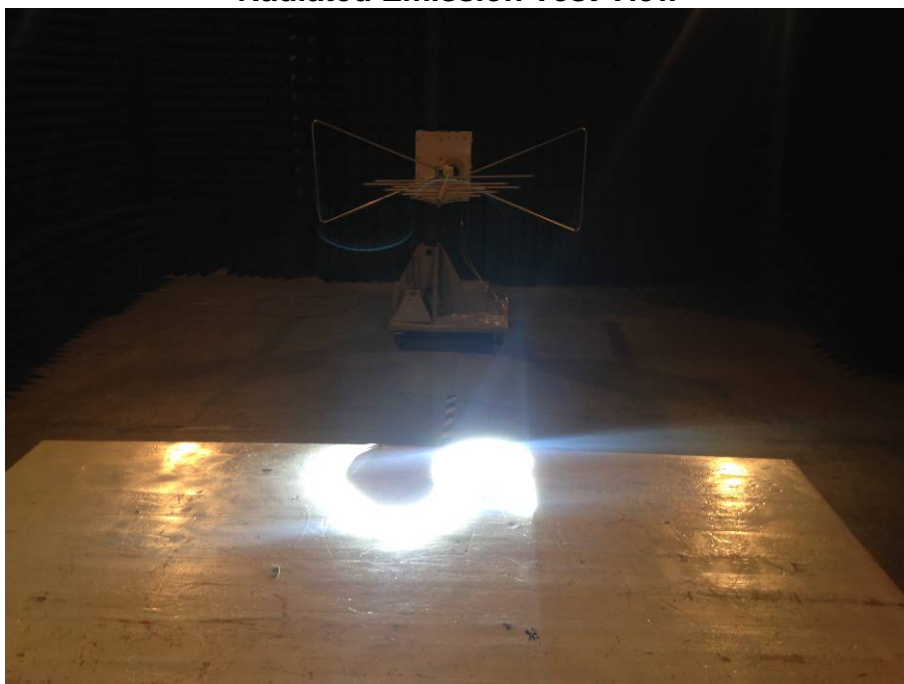
Note: This test isn't applicable because the EUT doesn't have relative function.

9. Photographs of Test Configuration

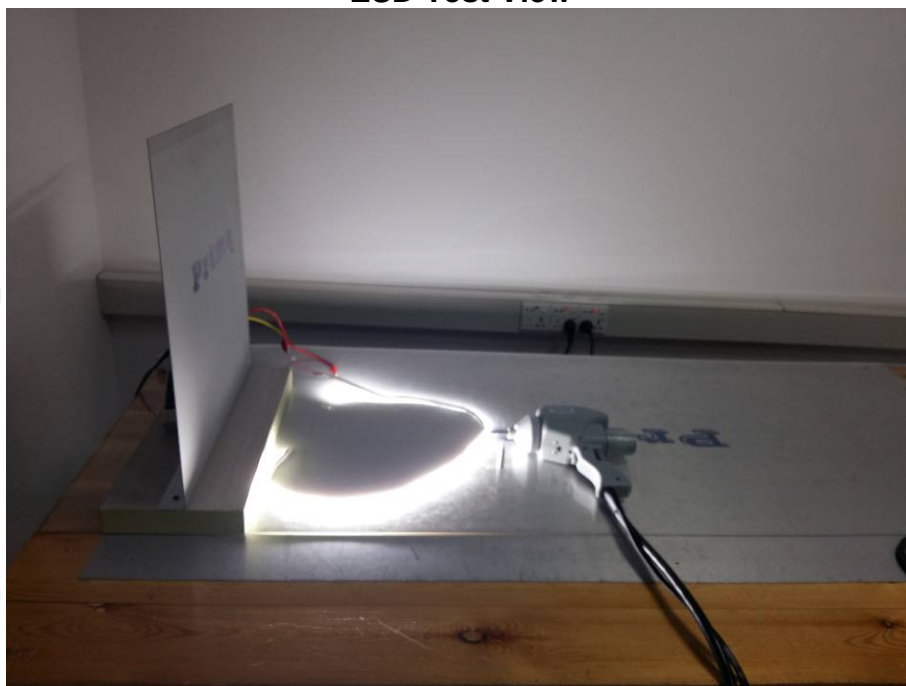
Radiated Electromagnetic Disturbance Test View



Radiated Emission Test View

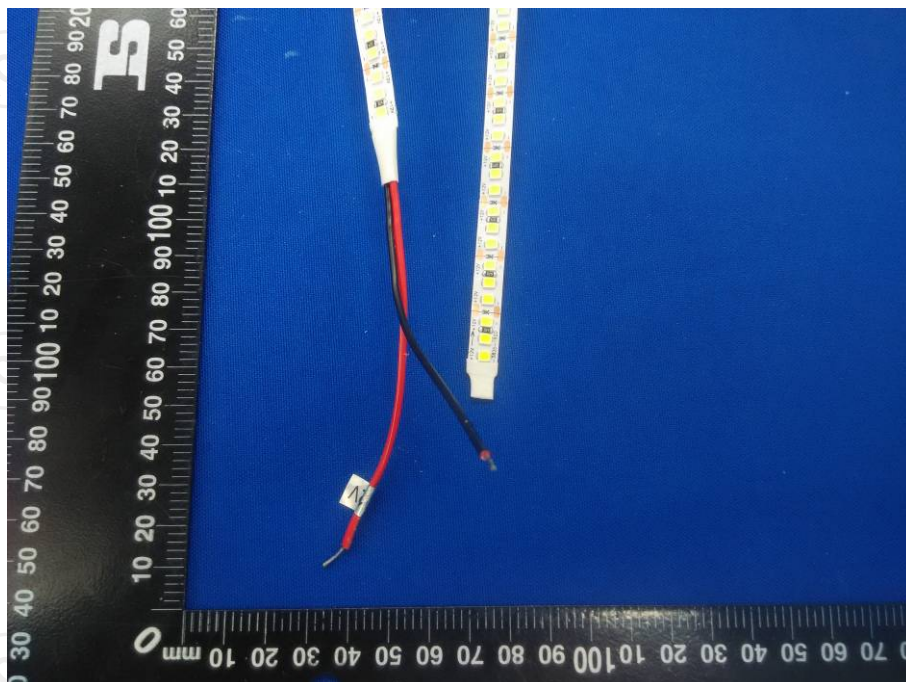
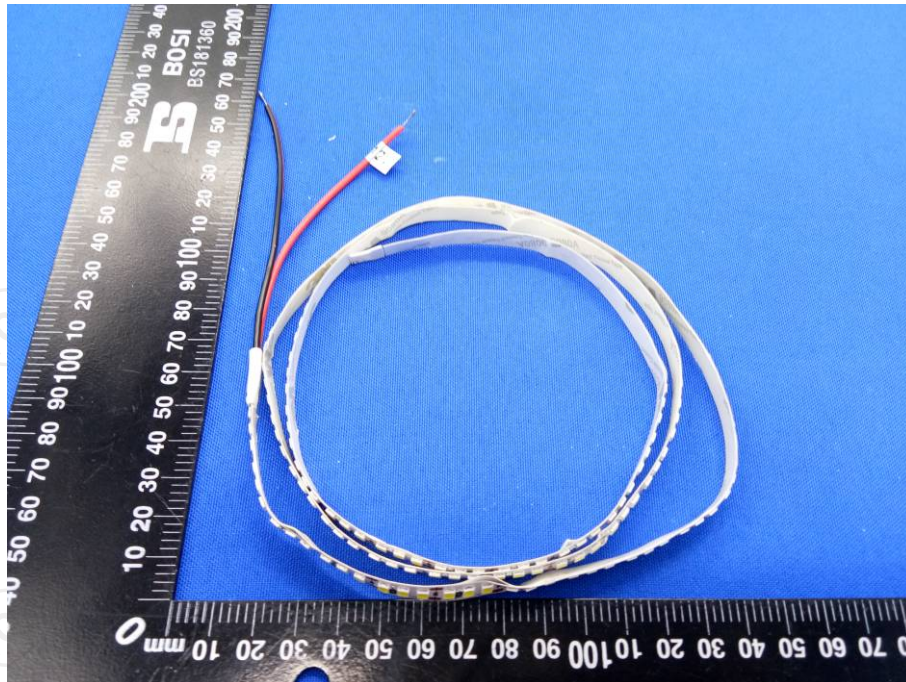


ESD Test View



10. Photographs of EUT





*****END OF REPORT*****