

EMC TEST REPORT
for

SMART-GROUP (Dongguan Shima Electronics Co., Ltd.)

Lighting & Dimming Controls

Model No: SB-DIM2c6A-DN, SB-DIM4c3A-DN, SB-DIM6c2A-DN,
SB-DIM8c1A-DN, SB-DIM1c10A-DN, SB-Zmix20-DN, SB-CC25x1-WL

Prepared for : SMART-GROUP (Dongguan Shima Electronics Co., Ltd.)
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Report Number : R0117011393E
Date of Test : Jan. 19~Feb. 07, 2017
Date of Report : Feb. 07, 2017

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APPENDIX I (Photos of EUT) (2 pages)

Anbotek

TEST REPORT VERIFICATION

Applicant : SMART-GROUP (Dongguan Shima Electronics Co., Ltd.)
Manufacturer : SMART-GROUP (Dongguan Shima Electronics Co., Ltd.)
EUT : Lighting & Dimming Controls
Rating : 110-260V~, 50Hz, 10Amax

Trade Mark :  SMART-BUS/ PREUSSEN/ S-MESH

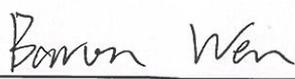
Measurement Procedure Used:

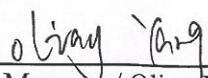
EN 55015: 2013+A1: 2015;
EN 61000-3-2: 2014;
EN 61000-3-3: 2013;
EN 61547: 2009;
(IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4;
IEC 61000-4-5; IEC 61000-4-6; IEC 61000-4-11)

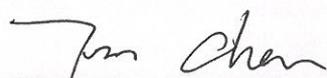
The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the EN55015, EN61000-3-2, EN61000-3-3 and EN61547 requirements. The Project in IEC 61000-4-3 was tested in Shenzhen EMTEK Co., Ltd.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : Jan. 19~Feb. 07, 2017

Prepared by : 
(Engineer/ Baron Wen)

Reviewer : 
(Project Manager/ Oliay Yang)

Approved & Authorized Signer : 
(Manager/ Tom Chen)



1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	: Lighting & Dimming Controls
Model Number	: SB-DIM2c6A-DN, SB-DIM4c3A-DN, SB-DIM6c2A-DN, SB-DIM8c1A-DN, SB-DIM1c10A-DN, SB-Zmix20-DN, SB-CC25x1-WL (Note: All samples are the same except the model number & appearance, so we prepare “SB-DIM2c6A-DN” for EMC test only.)
Test Power Supply	: AC 230V, 50Hz
Applicant	: SMART-GROUP (Dongguan Shima Electronics Co., Ltd.)
Address	: No.135, Huancheng Road, Mawu Village, QiaoLi Management Community, Changping Town, Dongguan City, Guangdong Province, China
Manufacturer	: SMART-GROUP (Dongguan Shima Electronics Co., Ltd.)
Address	: No.135, Huancheng Road, Mawu Village, QiaoLi Management Community, Changping Town, Dongguan City, Guangdong Province, China
Factory	: SMART-GROUP (Dongguan Shima Electronics Co., Ltd.)
Address	: No.135, Huancheng Road, Mawu Village, QiaoLi Management Community, Changping Town, Dongguan City, Guangdong Province, China

1.2. Auxiliary Equipment Used during Test

N/A

1.3. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 752021

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752021, July 06, 2016.

IC-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A-1, June 13, 2016.

CNAS – LAB Code: L3503

Shenzhen Anbotek Compliance Laboratory Limited., Laboratory has been assessed and in compliance with CNAS/CL01: 2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing Laboratories.

Test Location

All Emissions tests were performed

Shenzhen Anbotek Compliance Laboratory Limited. At 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

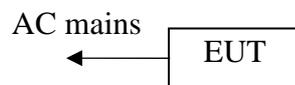
1.4. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.1dB (Horizontal) Ur = 4.3dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4dB
Magnetic Uncertainty	:	Um = 3.3dB

1.5. Description of Test Mode

Pretest Mode	Description
Mode 1	On

For Mode 1 Block Diagram of Test Setup



1.6. Test Summary

Test Items	Test Mode	Status
Power Line Conducted Emission Test (9KHz To 30MHz)	Mode 1	P
Radiated Emission Test(30MHz To 300MHz)	Mode 1	P
Magnetic Radiated Emission Test(9KHz To 30MHz)	Mode 1	P
Harmonic Current Test	Mode 1	P
Voltage Fluctuations and Flicker Test	Mode 1	P
Electrostatic Discharge immunity Test	Mode 1	P
RF Field Strength susceptibility Test	Mode 1	P
Electrical Fast Transient/Burst Immunity Test	Mode 1	P
Surge Immunity Test	Mode 1	P
Injected Currents Susceptibility Test	Mode 1	P
Voltage Dips and Interruptions Test	Mode 1	P

P) Indicates that the through the test

N) Don't test.

1.7. EMS Performance Criteria

- √ A: Normal performance within the specification limits
- √ B: Temporary degradation or loss of function or performance which is self-recoverable
- √ C: Temporary degradation or loss of function or performance which requires operator intervention or system reset
- √ D: Degradation or loss of function which is not recoverable due to damage of equipment (components) or software, or loss of data

Note: The manufacturer's specification may define effects on the EUT which may be considered insignificant, and therefore acceptable.

This classification may be used as a guide in formulating performance criteria, by committees responsible for generic, product and product-family standards, or as a framework for the agreement on performance criteria between the manufacturer and the purchaser, for example where no suitable generic, product or product-family standard exists.

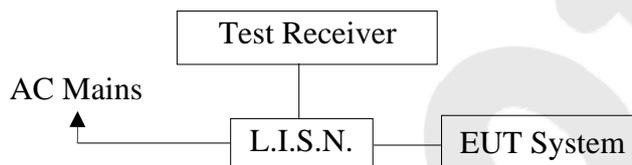
2. POWER LINE CONDUCTED EMISSION TEST

2.1. Test Equipment

The following test equipments are used during the power line conducted measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Two-Line V-network	Rohde & Schwarz	ENV216	100055	Jul. 19, 2016	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Jun. 17, 2016	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Jun. 17, 2016	1 Year

2.2. Block Diagram of Test Setup



2.3. Measuring Standard

EN 55015

2.4. Power Line Conducted Emission Limits

Frequency	At mains terminals (dB μ V)	
	Quasi-peak Level	Average Level
9KHz ~ 50KHz	110	--
50KHz ~ 150KHz	90 ~ 80*	--
150KHz ~ 0.5MHz	66 ~ 56*	56 ~ 46*
0.5MHz ~ 5.0MHz	56	46
5.0MHz ~ 30MHz	60	50

1. At the transition frequency the lower limit applies.
2. * decreasing linearly with logarithm of the frequency.

2.5. EUT Configuration on Measurement

The following equipments are installed on Conducted Emission Measurement to meet EN 55015 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

2.6. Operating Condition of EUT

- 2.6.1. Setup the EUT as shown in Section 2.2.
- 2.6.2. Turn on the power of all equipments.
- 2.6.3. Let the EUT work in test mode and measure it.

2.7. Test Procedure

The EUT is put on the table which is 0.8 meter high above the ground and connected to the AC mains through a Line Impedance Stabilization Network (L.I.S.N.). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are checked to find out the maximum conducted emission according to the EN 55015 regulations during conducted emission measurement. And the voltage probe had been used for the load terminals measurement according to the EN 55015 standard.

The bandwidth of the test receiver (R&S ESCI) is set at 200Hz in 9K~150KHz range and 9KHz in 150K~30MHz range.

The frequency range from 9KHz to 30MHz is checked.

All the test results are listed in Section 2.8.

2.8. Measuring Results

PASS

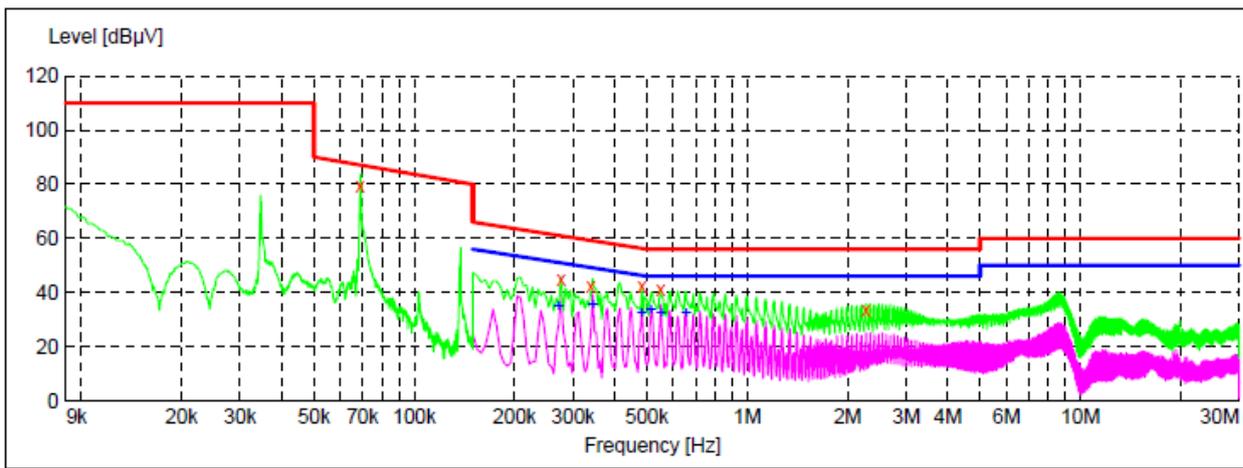
The frequency range 9KHz to 30MHz is investigated.

The test curves are shown in the following pages.

CONDUCTED EMISSION TEST DATA

Test Site: 1# Shielded Room
 Test Specification: AC 230V, 50Hz
 Comment: L
 Temp.: 22.2°C Hum.: 60%

SCAN TABLE: "Voltage (9K~30M) FIN"
 Short Description: 9K-30M Disturbance Voltages



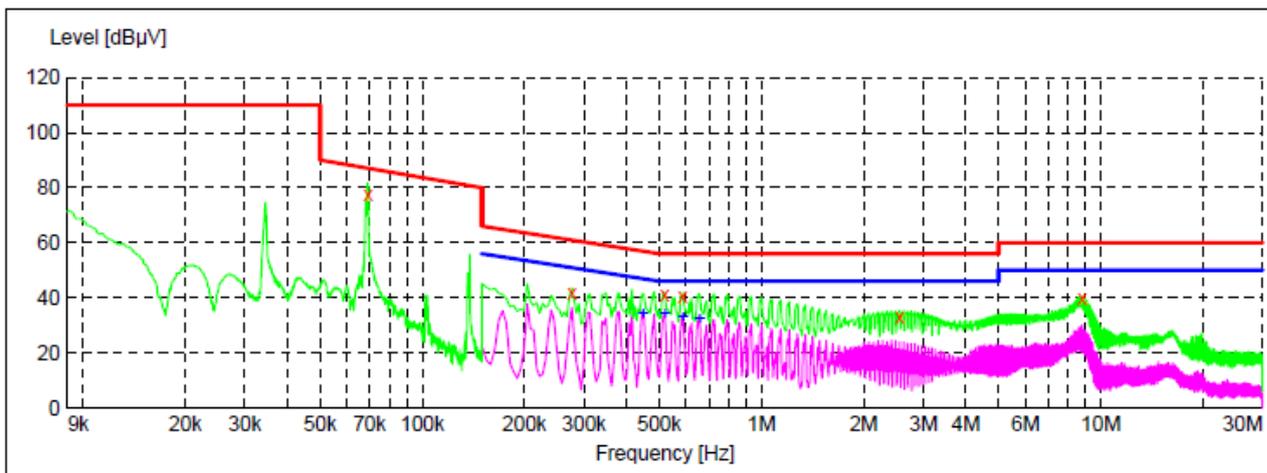
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.068800	79.10	10.2	87	8.0	QP	L1	GND
0.276000	44.70	10.2	61	16.2	QP	L1	GND
0.339000	42.10	10.2	59	17.1	QP	L1	GND
0.483000	42.10	10.2	56	14.2	QP	L1	GND
0.550500	41.00	10.2	56	15.0	QP	L1	GND
2.269500	33.70	10.4	56	22.3	QP	L1	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.271500	35.00	10.2	51	16.1	AV	L1	GND
0.343500	35.60	10.2	49	13.5	AV	L1	GND
0.483000	32.40	10.2	46	13.9	AV	L1	GND
0.514500	33.70	10.2	46	12.3	AV	L1	GND
0.550500	32.20	10.2	46	13.8	AV	L1	GND
0.654000	32.50	10.2	46	13.5	AV	L1	GND

CONDUCTED EMISSION TEST DATA

Test Site: 1# Shielded Room
 Test Specification: AC 230V, 50Hz
 Comment: N
 Temp.:22.2°C Hum.:60%

SCAN TABLE: "Voltage (9K~30M) FIN"
 Short Description: 9K-30M Disturbance Voltages



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.069200	77.60	10.2	87	9.4	QP	N	GND
0.276000	42.00	10.2	61	18.9	QP	N	GND
0.519000	41.00	10.2	56	15.0	QP	N	GND
0.586500	40.20	10.2	56	15.8	QP	N	GND
2.557500	33.00	10.4	56	23.0	QP	N	GND
8.808000	39.90	10.6	60	20.1	QP	N	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.447000	34.40	10.2	47	12.5	AV	N	GND
0.519000	34.00	10.2	46	12.0	AV	N	GND
0.586500	33.20	10.2	46	12.8	AV	N	GND
0.658500	32.50	10.2	46	13.5	AV	N	GND

3. RADIATED EMISSION TEST

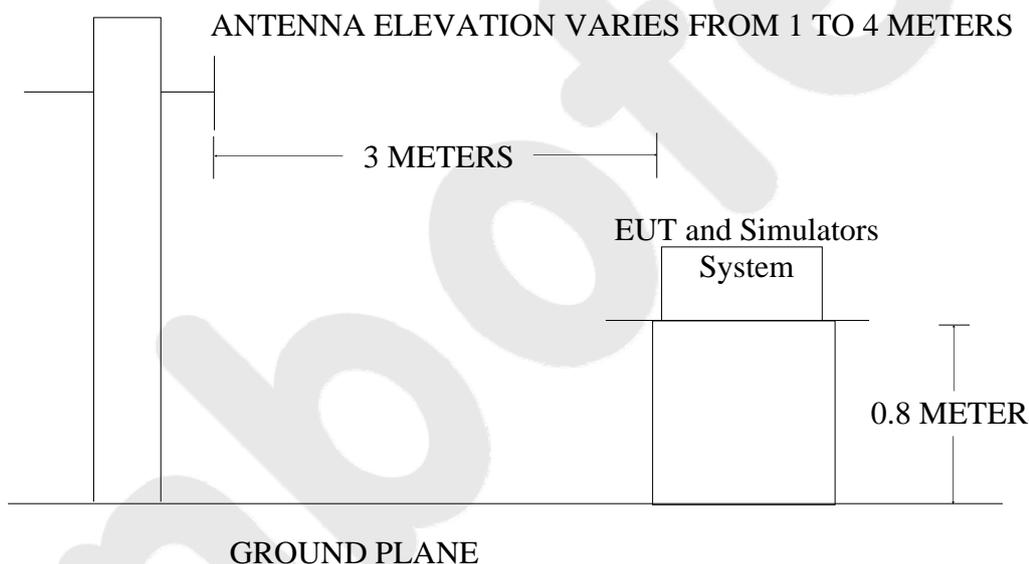
3.1. Test Equipment

The following test equipments are used during radiated emission measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Jun. 17, 2016	1 Year
2.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 06, 2016	1 Year
3.	Pre-amplifier	SONOMA	310N	186860	Jun. 17, 2016	1 Year

3.2. Block Diagram of Test

3.2.1. Block diagram of test setup in chamber



3.3. Measuring Standard

EN 55015

Radiated Emission Limits

All emanations from an EN 55015 device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dB μ V/m)
30 ~ 230	3	40
230 ~ 300	3	47

- Note:
- (1) The smaller limit shall apply at the combination point between two frequency bands.
 - (2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

3.4. EUT Configuration on Test

The EN 55015 regulations test method must be used to find the maximum emission during radiated emission measurement.

3.5. Operating Condition of EUT

3.5.1. Setup the EUT as shown in Section 3.2.

3.5.2. Turn on the power of all equipments.

3.5.3. Let the EUT work in test mode and measure it.

3.6. Test Procedure

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on an antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.

The EUT is tested in Chamber.

The test results are listed in Section 3.7.

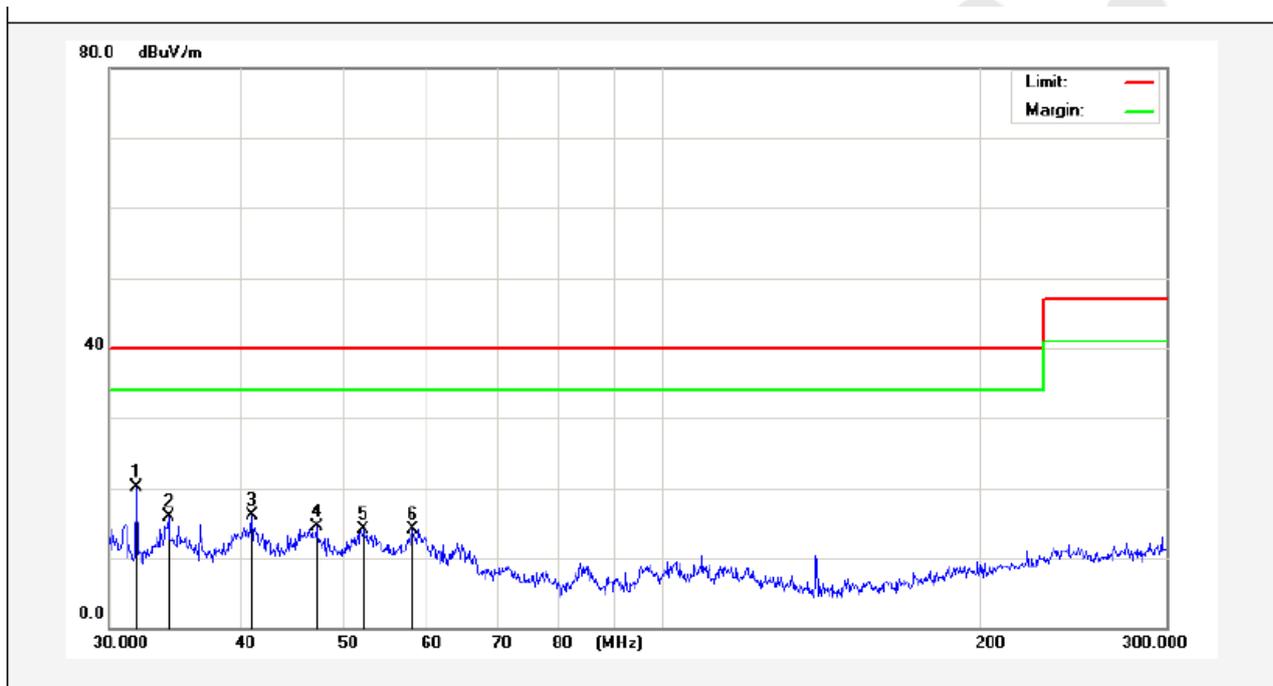
3.7. Measuring Results

PASS

The frequency range from 30MHz to 300MHz is investigated.

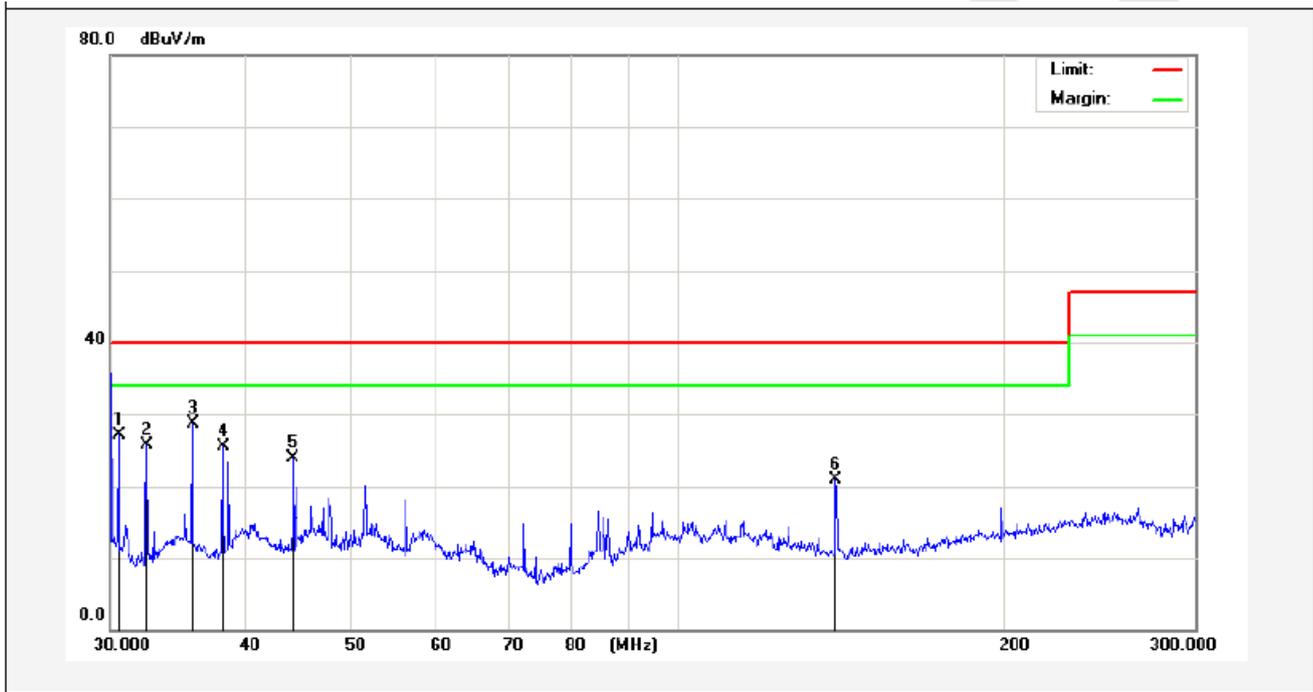
The test curves are shown in the following pages.

Test item: Radiation Test Polarization: Horizontal
 Standard: (RE)EN55015 Power Source: AC 230V, 50Hz
 Distance: 3m Temp.(°C)/Hum.(%RH): 24.3(°C)/55%RH
 Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	31.8509	46.47	-26.28	20.19	40.00	-19.81	peak			
2	34.1288	42.11	-26.22	15.89	40.00	-24.11	peak			
3	40.9375	40.86	-24.82	16.04	40.00	-23.96	peak			
4	47.1109	39.29	-24.81	14.48	40.00	-25.52	peak			
5	52.2542	39.05	-25.01	14.04	40.00	-25.96	peak			
6	58.0927	39.34	-25.31	14.03	40.00	-25.97	peak			

Test item:	Radiation Test	Polarization:	Vertical
Standard:	(RE)EN55015	Power Source:	AC 230V, 50Hz
Distance:	3m	Temp.(°C)/Hum.(%RH):	24.3(°C)/55%RH
Note:			



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	30.5577	53.46	-26.30	27.16	40.00	-12.84	peak			
2	32.4430	51.90	-26.26	25.64	40.00	-14.36	peak			
3	35.7373	54.79	-26.00	28.79	40.00	-11.21	peak			
4	38.1172	50.83	-25.35	25.48	40.00	-14.52	peak			
5	44.2712	48.69	-24.75	23.94	40.00	-16.06	peak			
6	139.9978	48.08	-27.14	20.94	40.00	-19.06	peak			

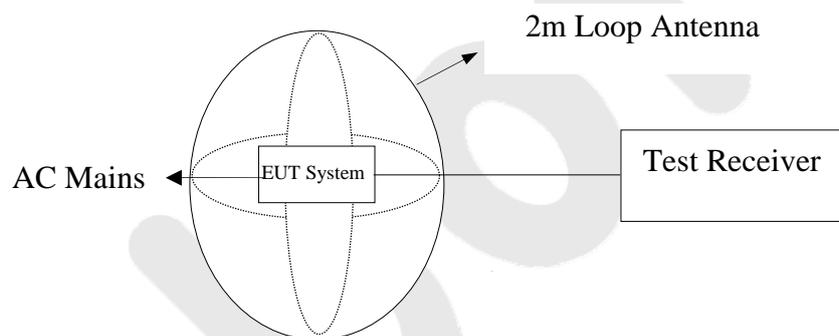
4. MAGNETIC RADIATED EMISSION TEST

4.1. Test Equipment

The following test equipments are used during the Magnetic Radiated emission measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Jun. 17, 2016	1 Year
2.	Triple-Loop Antenna(2M)	EVERFINE	LLA-2	905003	Apr. 16, 2016	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Jun. 17, 2016	1 Year

4.2. Block Diagram of Test Setup



4.3. Magnetic Field Emission Measurement Standard and Limits

4.3.1. Measuring Standard

EN 55015

4.3.2. Measuring Limits

Frequency	Limits for loop diameter (dB μ A)
	2m
9KHz ~ 70KHz	88
70KHz ~ 150KHz	88 ~ 58*
150KHz ~ 3.0MHz	58 ~ 22*
3.0MHz ~ 30MHz	22

1. At the transition frequency the lower limit applies.
2. * decreasing linearly with logarithm of the frequency.

4.4. EUT Configuration on Measurement

The following equipments are installed on Magnetic Radiated emission Measurement to meet EN 55015 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

4.5. Operating Condition of EUT

- 4.5.1. Setup the EUT as shown in Section 4.2.
- 4.5.2. Turn on the power of all equipments.
- 4.5.3. Let the EUT work in test mode and measure it.

4.6. Test Procedure

The EUT is placed on a wood table in the center of a loop antenna. The induced current in the loop antenna is measured by means of a current probe and the test receiver. Three field components are checked by means of a coaxial switch.

The frequency range from 9KHz to 30MHz is investigated. The receiver is measured with the quasi-peak detector. For frequency band 9KHz to 150KHz, the bandwidth of the test receiver (ESCI) is set at 200Hz. For frequency band 150KHz to 30MHz, the bandwidth is set at 9KHz.

All the test results are listed in Section 4.7.

4.7. Measuring Results

PASS

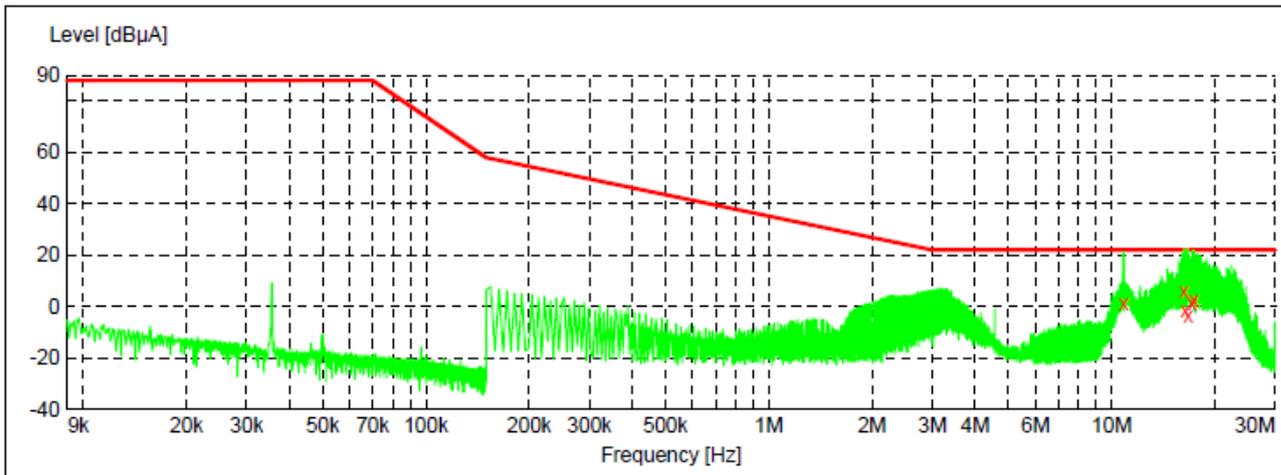
The frequency range from 9KHz to 30MHz is investigated.

The test curves are shown in the following pages.

MAGNETIC RADIATED EMISSION TEST

Test Site: 1# Shielded Room
 Test Specification: AC 230V, 50Hz
 Comment: X
 Temp.: 22.2°C Hum.: 59%

SCAN TABLE: "Macm (9K-30M) FIN"
 Short Description: 9K~30M Magn. Field



Frequency MHz	Level dBµA	Transd dB	Limit dBµA	Margin dB	Det.	Loop	Azimuth deg
10.846500	1.30	-14.0	22	20.7	QP	X	0.00
16.305000	6.10	-13.3	22	15.9	QP	X	0.00
16.453500	-1.70	-13.3	22	23.7	QP	X	0.00
16.732500	-3.30	-13.4	22	25.3	QP	X	0.00
17.223000	1.40	-13.5	22	20.6	QP	X	0.00
17.416500	2.80	-13.5	22	19.2	QP	X	0.00

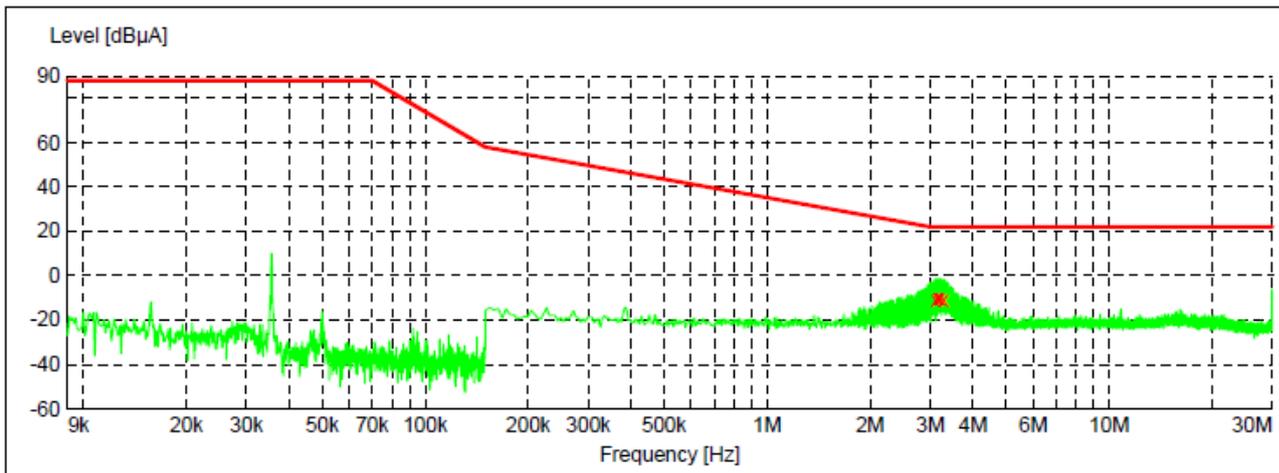
AEM

MAGNETIC RADIATED EMISSION TEST

Test Site: 1# Shielded Room
 Test Specification: AC 230V, 50Hz
 Comment: Y
 Temp.: 22.2°C Hum.: 59%

SCAN TABLE: "Macm (9K-30M) FIN"

Short Description: 9K~30M Magn. Field



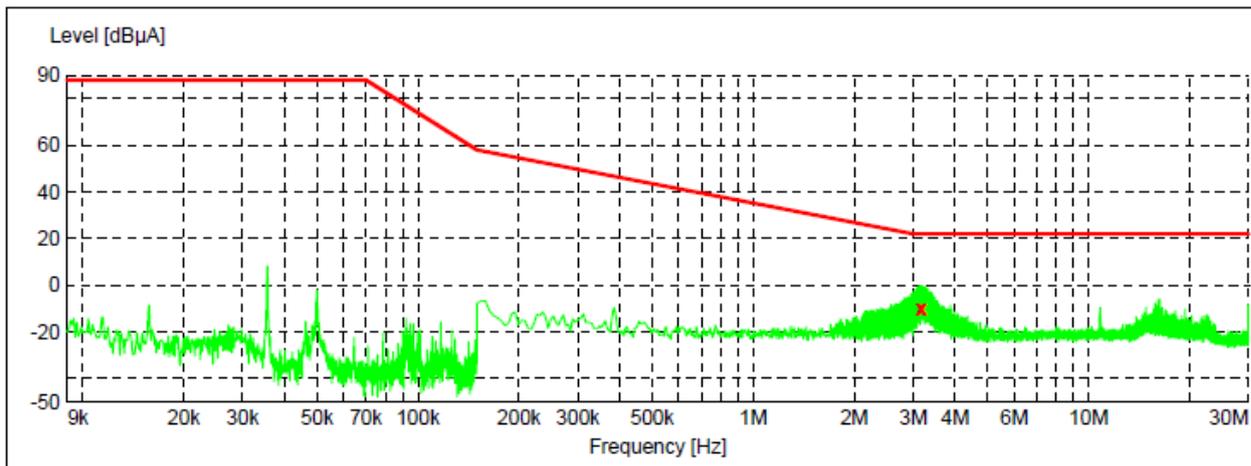
Frequency MHz	Level dBµA	Transd dB	Limit dBµA	Margin dB	Det.	Loop	Azimuth deg
3.115500	-10.90	-15.6	22	32.9	QP	Y	0.00
3.156000	-10.30	-15.6	22	32.3	QP	Y	0.00
3.160500	-10.40	-15.6	22	32.4	QP	Y	0.00
3.192000	-10.30	-15.6	22	32.3	QP	Y	0.00
3.219000	-10.40	-15.6	22	32.4	QP	Y	0.00
3.291000	-10.90	-15.6	22	32.9	QP	Y	0.00

AEM

MAGNETIC RADIATED EMISSION TEST

Test Site: 1# Shielded Room
 Test Specification: AC 230V, 50Hz
 Comment: Z
 Temp.: 22.2°C Hum.: 59%

SCAN TABLE: "Macm (9K-30M) FIN"
 Short Description: 9K~30M Magn. Field



Frequency MHz	Level dBµA	Transd dB	Limit dBµA	Margin dB	Det.	Loop	Azimuth deg
3.151500	-9.70	-15.6	22	31.7	QP	Z	0.00
3.160500	-9.70	-15.6	22	31.7	QP	Z	0.00
3.169500	-9.80	-15.6	22	31.8	QP	Z	0.00
3.174000	-9.90	-15.6	22	31.9	QP	Z	0.00
3.187500	-9.70	-15.6	22	31.7	QP	Z	0.00
3.192000	-9.80	-15.6	22	31.8	QP	Z	0.00

AME

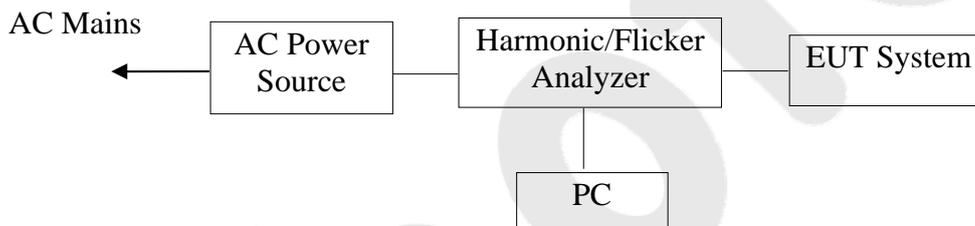
5. HARMONIC CURRENT EMISSION TEST

5.1. Test Equipment

The following test equipments are used during harmonic current emission measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Programmable AC Power source	SOPH POWER	PAG-1050	630250	Jun. 17, 2016	1 Year
2.	Harmonic and Flicker Analyzer	LAPLACE	AC-2000A	272629	Apr. 16, 2016	1 Year

5.2. Block Diagram of Test Setup



5.3. Measuring Standard

EN 61000-3-2

5.4. Operating Condition of EUT

- 5.4.1. Setup the EUT as shown on Section 5.2.
- 5.4.2. Turn on the power of all equipments.
- 5.4.3. After that, let the EUT work in test mode measure it.

5.5. Measuring Results

PASS

The test curves are shown in the following pages.

HARMONIC CURRENT TEST RESULT SUMMARY (RUN TIME)

Tested On : Jan. 19, 2017 10:55 for 150 Seconds.

Supply Voltage : 229.3 Vrms 325.4 Vpk Frequency : 49.99 to 50.04 Hz

Supply Meets EN Requirements

Load Power : 100.130 W 100.84 VA Power Factor 0.993

Load Current : 439.8 to 440.0 mArms 629.0 to 633.3 mApk Crest Factor: 1.431

Measurement Standard : EN61000-4-7:2002

Limits Applied : EN61000-3-2 Class C Limits >25W for 0.437A at 0.993 PF.

Harmonic Number	Limit Current mA	Average (filtered) mA	% Limit	max. Value (Filtered) mA	% Limit	Assessment
Fundamental :		437.2				
2 :	8.7	0.9	10.3	0.8	9.2	Pass
3 :	130.2	24.5	18.8	24.5	18.8	Pass
4 :	-	0.2	-	0.2	-	-
5 :	43.7	22.1	50.6	22.2	50.8	Pass
6 :	-	0.1	-	0.0	-	-
7 :	30.6	19.7	64.4	19.7	64.4	Pass
8 :	-	0.3	-	0.3	-	-
9 :	21.9	16.1	73.5	16.0	73.1	Pass
10 :	-	0.3	-	0.3	-	-
11 :	13.1	12.5	95.4	12.5	95.4	Pass
12 :	-	0.3	-	0.2	-	-
13 :	13.1	9.4	71.8	9.4	71.8	Pass
14 :	-	0.1	-	0.1	-	-
15 :	13.1	7.2	55.0	7.1	54.2	Pass
16 :	-	0.0	-	0.0	-	-
17 :	13.1	5.7	43.5	5.7	43.5	Pass
18 :	-	0.1	-	0.0	-	-
19 :	13.1	5.3	40.5	5.3	40.5	Pass
20 :	-	0.1	-	0.1	-	-
21 :	13.1	5.2	39.7	5.2	39.7	Pass
22 :	-	0.1	-	0.0	-	-
23 :	13.1	5.2	39.7	5.2	39.7	Pass
24 :	-	0.1	-	0.0	-	-
25 :	13.1	4.8	36.6	4.8	36.6	Pass
26 :	-	0.1	-	0.0	-	-
27 :	13.1	4.3	32.8	4.3	32.8	Pass
28 :	-	0.1	-	0.0	-	-
29 :	13.1	3.8	29.0	3.7	28.2	Pass
30 :	-	0.1	-	0.0	-	-
31 :	13.1	3.3	25.2	3.3	25.2	Pass
32 :	-	0.1	-	0.0	-	-
33 :	13.1	3.1	23.7	3.1	23.7	Pass
34 :	-	0.1	-	0.0	-	-
35 :	13.1	3.1	23.7	3.1	23.7	Pass
36 :	-	0.0	-	0.0	-	-
37 :	13.1	3.1	23.7	3.0	22.9	Pass
38 :	-	0.0	-	0.0	-	-
39 :	13.1	3.0	22.9	3.0	22.9	Pass
40 :	-	0.0	-	0.0	-	-
21 - 39 :	41.5	12.6	30.4	12.6	30.4	-

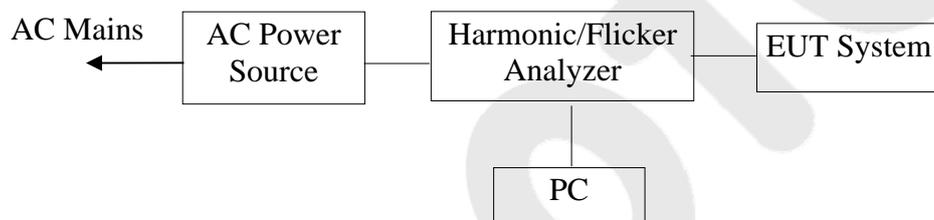
6. VOLTAGE FLUCTUATIONS & FLICKER TEST

6.1. Test Equipment

The following test equipments are used during the voltage fluctuations and flicker measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Programmable AC Power source	SOPH POWER	PAG-1050	630250	Jun. 17, 2016	1 Year
2.	Harmonic and Flicker Analyzer	LAPLACE	AC-2000A	272629	Apr. 16, 2016	1 Year

6.2. Block Diagram of Test Setup



6.3. Measuring Standard

EN 61000-3-3

6.4. Operating Condition of EUT

- 6.4.1. Setup the EUT as shown on Section 6.2.
- 6.4.2. Turn on the power of all equipments.
- 6.4.3. After that, let the EUT work in test mode measure it.

6.5. Measuring Results

PASS

The test curves are shown in the following pages.

Flicker Test Summary per EN/IEC61000-3-3 (Run time)

Tested On : Jan. 19, 2017 10:53 for 600 Seconds.

Supply Voltage : 229.1 to 229.3 Vrms 325.4 Vpk Frequency : 49.96 to 50.05 Hz
Load Current : 433.3 to 440.3 mArms 629.2 to 642.2 mApk Crest Factor: 1.430

Test Method: EN61000-3-3: 2013

Voltage Variations :

Highest Level:	-0.18%	
Lowest Level:	-0.53%	
d(max):	0.35%	PASS
Highest d(t) of 500ms:	0.00%	PASS
Present d(t) over 3.33%:	0.00 Seconds	
Longest d(t) over 3.33%:	0.00 Seconds	
Highest Steady State:	-0.36%	
Lowest Steady State:	-0.36%	
Max d(c) Between Adjacent:	0.00%	PASS
Max d(c) Between Any:	0.00%	
Short Term Flicker Pst:	0.16	PASS

Flicker Results :

Pst Classifier	Plt Calculation		
Duration	Flicker	Interval	Pst
0.1%	0.70		
0.7%	0.06		
1.0%	0.02		
1.5%	0.02		
2.2%	0.01		
3%	0.00		
4%	0.00		
6%	0.00		
8%	0.00		
10%	0.00		
13%	0.00		
17%	0.00		
30%	0.00		
50%	0.00		
80%	0.00		

7. ELECTROSTATIC DISCHARGE IMMUNITY TEST

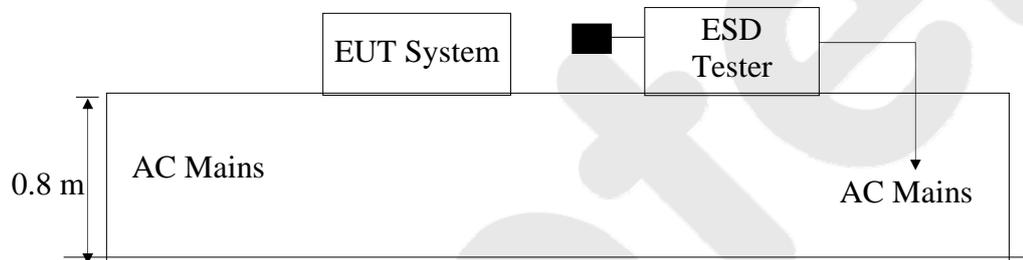
7.1. Test Equipment

The following test equipments are used during the Electrostatic Discharge measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Simulators	KIKUSUI	KES4021	LJ003477	Jun. 17, 2016	1 Year

7.2. Block Diagram of Test Setup

7.2.1. Test Setup Diagram



7.3. Measuring Standard

EN 61547 (IEC 61000-4-2)

Severity Level: 3 / Air Discharge: $\pm 8\text{kV}$, Level: 2 / Contact Discharge: $\pm 4\text{kV}$

7.4. Severity Levels and Performance Criterion

7.4.1. Severity level

Level	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)
1.	± 2	± 2
2.	± 4	± 4
3.	± 6	± 8
4.	± 8	± 15
X	Special	Special

7.4.2. Performance criterion: B

7.5. EUT Configuration

The following equipments are installed on Electrostatic Discharge immunity Measurement to meet EN 61547 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

7.6. Operating Condition of EUT

- 7.6.1. Setup the EUT as shown on Section 7.2.
- 7.6.2. Turn on the power of all equipments.
- 7.6.3. After that, let the EUT work in test mode measure it.

7.7. Test Procedure

7.7.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed

7.7.2. Contact Discharge:

All the procedure shall be same as Section 7.7.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

7.7.3. Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

7.7.4. Indirect discharge for vertical coupling plane

At least 20 single discharge shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

7.8. Measuring Results

PASS

Please refer to the following page.

Electrostatic Discharge Test Results

Shenzhen Anbotek Compliance Laboratory Limited

Air discharge :	±8.0kV	Temperature :	24°C
Contact discharge :	±4.0kV	Humidity :	53%
Power Supply :	AC 230V, 50Hz	Criterion required :	B
Test Result :	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

For each point positive 25 times and negative 25 times discharge

Location		Kind A-Air Discharge C-Contact Discharge	Result
Slot of the EUT	6 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Function Keys	6 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Others	6 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
HCP	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of the front	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of the rear	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of the left	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of the right	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D

Note: Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).

8. RF FIELD STRENGTH SUSCEPTIBILITY TEST

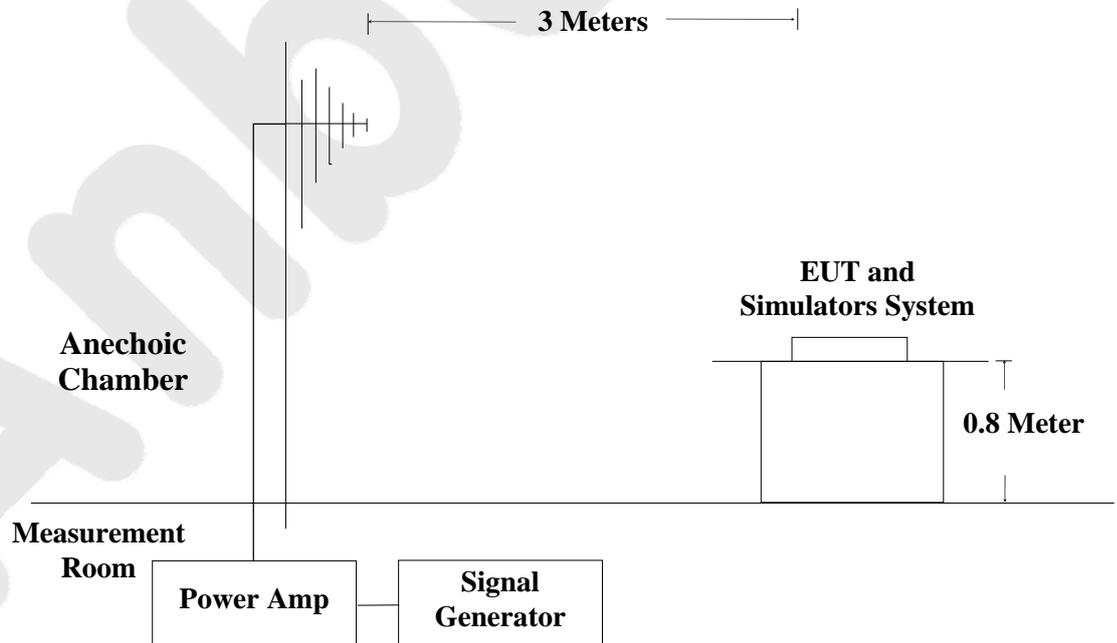
8.1. Test Equipment

The following test equipments are used during the R/S (Shenzhen EMTEK) measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	RF Power Meter. Dual Channel	BOONTON	4232A	10539	May 29, 2016	1 year
2.	50ohm Diode Power Sensor	BOONTON	51011EMC	34236/34238	May 29, 2016	1 year
3.	Broad-Band Horn Antenna	SCHWARZBECK	BBHA9120 L3F	332	May 29, 2016	1 year
4.	Power Amplifier	PRANA	AP32MT215	N/A	May 29, 2016	1 year
5.	Power Amplifier	MILMEGA	AS0102-55	N/A	May 29, 2016	1 year
6.	Signal Generator	AEROFLEX	2023B	N/A	May 29, 2016	1 year
7.	Field Strength Meter	HOLADAY	HI-6005	N/A	May 29, 2016	1 year
8.	RS232 Fiber Optic Modem	HOLADAY	HI-4413P	N/A	May 29, 2016	1 year
9.	Log.-Per. Antenna	SCHWARZBECK	VULP 9118E	N/A	May 29, 2016	1 year

8.2. Block Diagram of Test Setup

8.2.1. R/S Test Setup



8.3. Measuring Standard

EN 61547 ((IEC 61000-4-3)

Severity Level 2: 3V/m

8.4. Severity Levels and Performance Criterion

8.4.1. Severity level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X	Special

8.4.2. Performance criterion: A

8.5. EUT Configuration

The following equipments are installed on RF Field Strength susceptibility Measurement to meet EN 61547 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

8.6. Operating Condition of EUT

8.6.1. Setup the EUT as shown on Section 8.2.

8.6.2. Turn on the power of all equipments.

8.6.3. After that, let the EUT work in test mode measure it.

8.7. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. EUT is set 3 meter away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD camera is used to monitor EUT screen. All the scanning conditions are as follow:

Condition of Test	Remarks
1. Fielded Strength	3 V/m (Severity Level 2)
2. Radiated Signal	Unmodulated
3. Scanning Frequency	80 - 1000 MHz
4. Dwell time of radiated	0.0015 decade/s
5. Waiting Time	1 Sec.

8.8. Measuring Results

PASS

Please refer to the following page.

RF Field Strength Susceptibility Test Results

Shenzhen Anbotek Compliance Laboratory Limited

Field Strength :	3V/m	Temperature :	25°C
Criterion required :	A	Humidity :	55%
Power Supply :	AC 230V, 50Hz	Test Result :	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Modulation :	<input checked="" type="checkbox"/> AM 1 KHz 80% <input type="checkbox"/> Pulse <input type="checkbox"/> none		
Steps 1 %	Frequency Rang: 80-1000MHz		Result
	Horizontal	Vertical	
Front	3V/m	3V/m	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Right	3V/m	3V/m	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Rear	3V/m	3V/m	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Left	3V/m	3V/m	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Note: The Project was tested in Shenzhen EMTEK Co., Ltd.			

9. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

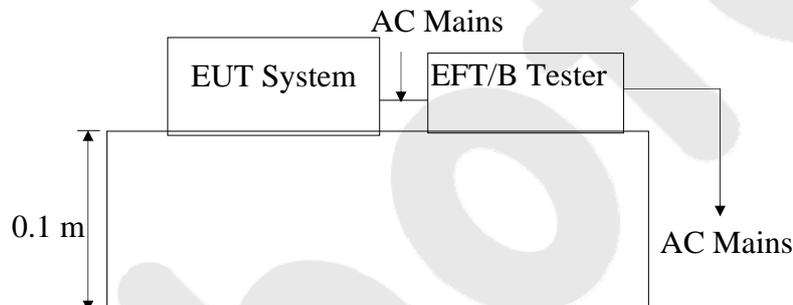
9.1. Test Equipment

The following test equipments are used during the Electrical Fast Transient /Burst Immunity measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EFT Burst Simulator	PRIMA	EFT61004B	PR10114282	Jul. 12, 2016	1 Year
2.	EFT-Clamp	PRIMA	EFT-Clamp	/	Jul. 12, 2016	1 Year

9.2. Block Diagram of Test Setup

9.2.1. Block Diagram of the AC Mains



9.3. Measuring Standard

EN 61547 (IEC 61000-4-4)

Severity Level 2: 1.00kV

9.4. Severity Levels and Performance Criterion

9.4.1. Severity level

Level	Open Circuit Output Test Voltage $\pm 10\%$	
	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1.	0.50 kV	0.25 kV
2.	1.00 kV	0.50 kV
3.	2.00 kV	1.00 kV
4.	4.00 kV	2.00 kV
X	Special	Special

9.4.2. Performance criterion: B

9.5. EUT Configuration

The following equipments are installed on Electrical Fast Transient/Burst Immunity Measurement to meet EN 61547 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

9.6. Operating Condition of EUT

- 9.6.1. Setup the EUT as shown in Section 9.2.
- 9.6.2. Turn on the power of all equipments.
- 9.6.3. Let the EUT work in test mode and measure it.

9.7. Test Procedure

The EUT is put on the table which is 0.1 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

9.7.1. For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

9.7.2. For signal lines and control lines ports:

It's unnecessary to test.

9.7.3. For DC output line ports:

It's unnecessary to test.

9.8. Measuring Results

PASS

Please refer to the following page.

Electrical Fast Transient/Burst Test Results

Shenzhen Anbotek Compliance Laboratory Limited

Ambient Condition : 25°C / 56% RH		Criterion required : B	
Power Supply .: AC 230V, 50Hz		Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
Inject Line : AC Mains		Inject Method: Direct	Inject Time(s): 120
Line	Polarity	Test Voltage	Result
L	±	1.00kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
N	±	1.00kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
PE			
L、N	±	1.00kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
L、PE			
N、PE			
L、N、PE			
Signal Line			
DC output Line			
Note :			
Remark:			

10. SURGE IMMUNITY TEST

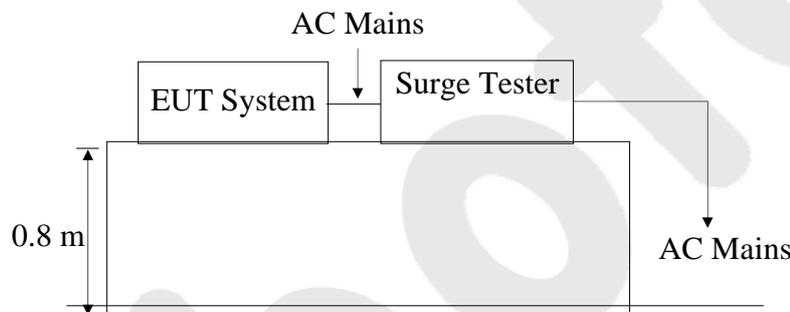
10.1. Test Equipment

The following test equipments are used during the Surge Immunity measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	6kV Surge Generator	EMPEK	LSG-5060G	06010017N	Jul. 12, 2016	1 Year
2.	CDN	EMPEK	CDN-5110G	061100005N	Jul. 12, 2016	1 Year

10.2. Block Diagram of Test Setup

10.2.1. Surge Test Setup



10.3. Measuring Standard

EN61547 (IEC61000-4-5)
(Severity Level: Level 2, Line to Line: 1.0kV)

10.4. Severity Levels and Performance Criterion

10.4.1. Severity level

Severity Level	Open-Circuit Test Voltage kV
1	0.5
2	1.0
3	2.0
4	4.0
X	Special

10.4.2. Performance criterion: **B**

10.5. EUT Configuration

The following equipments are installed on Surge immunity Measurement to meet EN 61547 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

10.6. Operating Condition of EUT

- 10.6.1. Setup the EUT as shown in Section 10.2.
- 10.6.2. Turn on the power of all equipments.
- 10.6.3. Let the EUT work in test mode and measure it.

10.7. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 10.2.2.
- 2) For line to line coupling mode, provide a 1.0 kV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.
- 3) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 4) Different phase angles are done individually.
- 5) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

10.8. Measuring Results

PASS

Please refer to the following page

Surge Immunity Test Results

Shenzhen Anbotek Compliance Laboratory Limited

Humidity :	56%	Temperature :	25°C
Power Supply :	AC 230V, 50Hz	Criterion required:	B
Test Result :	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (kV)	Result
L-N	±	<input type="checkbox"/> 0° <input checked="" type="checkbox"/> 90° <input type="checkbox"/> 180° <input checked="" type="checkbox"/> 270°	5	1.0	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
L-PE					
N-PE					

Remark:

11. INJECTED CURRENTS SUSCEPTIBILITY TEST

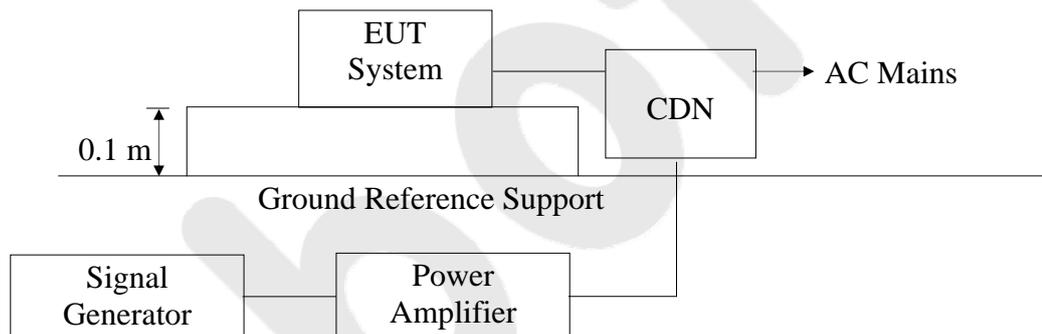
11.1. Test Equipment

The following test equipments are used during the Injected Current Susceptibility measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	C/S Conducted Immunity Test System	FRANKONIA	CIT-10	126A1196/2012	Apr. 16, 2016	1 Year
2.	CDN	FRANKONIA	CDN - M2+ M3	A2210178/2012	Jun. 18, 2016	1 Year
3.	6dB attenuator	FRANKONIA	DAM 26W	1172202	Jun. 17, 2016	1 Year

11.2. Block Diagram of Test Setup

11.2.1. Block Diagram of AC Mains



11.3. Measuring Standard

EN 61547 (IEC 61000-4-6)
Severity Level 2: 3V (rms), (0.15MHz ~80MHz)

11.4. Severity Levels and Performance Criterion

11.4.1. Severity level

Level	Field Strength V
1.	1
2.	3
3.	10
X	Special

11.4.2. Performance criterion: A

11.5. EUT Configuration

The following equipments are installed on currents susceptibility Measurement to meet EN 61547 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

11.6. Operating Condition of EUT

- 11.6.1. Setup the EUT as shown in Section 11.2.
- 11.6.2. Turn on the power of all equipments.
- 11.6.3. Let the EUT work in test mode and measure it.

11.7. Test Procedure

- 1) Set up the EUT, CDN and test generators as shown on Section 11.2.2.
- 2) Let the EUT work in test mode and measure it.
- 3) The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m 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).
- 4) The disturbance signal described below is injected to EUT through CDN.
- 5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 6) The frequency range is swept from 150KHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave.
- 7) The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- 8) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

11.8. Measuring Results

PASS

Please refer to the following page.

Injected Currents Susceptibility Test Results

Shenzhen Anbotek Compliance Laboratory Limited

Humidity : 56%		Temperature : 24°C	
Power Supply : AC 230V, 50Hz		Criterion required: A	
Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail			
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Result
0.15 ~ 80	AC Mains	3V	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Result
Remark : 1. Modulation Signal:1KHz 80% AM			

12. VOLTAGE DIPS AND INTERRUPTIONS TEST

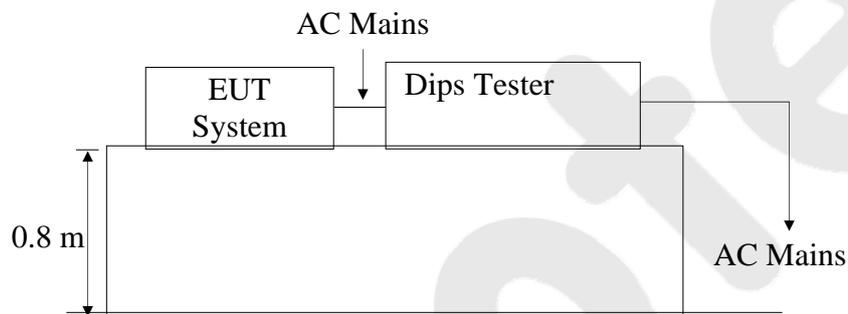
12.1. Test Equipment

The following test equipments are used during the Dips Immunity measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	CYCLE SAG Simulator	PRIMA	DRP61011AG	PR12046234	Jun. 17, 2016	1 Year

12.2. Block Diagram of Test Setup

12.2.1. Dips Test Setup



12.3. Measuring Standard

EN 61547 (IEC 61000-4-11)

12.4. Severity Levels and Performance Criterion

12.4.1. Severity level

Test Level %U _T	Voltage dip and short interruptions %U _T	Duration (in period)
0	100	0.5
70	30	10
		*

12.4.2. Performance criterion: B&C

12.5. EUT Configuration

The following equipments are installed on Voltage dips and interruptions Measurement to meet EN 61547 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

12.6. Operating Condition of EUT

12.6.1. Setup the EUT as shown in Section 12.2.

12.6.2. Turn on the power of all equipments.

12.6.3. Let the EUT work in test mode and measure it.

12.7. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 12.2.2.
- 2) The interruptions is introduced at selected phase angles with specified duration.
- 3) Record any degradation of performance.

12.8. Measuring Results

PASS

Please refer to the following page.

Voltage Dips and Interruptions Test Results

Shenzhen Anbotek Compliance Laboratory Limited

Temperature : 25°C

Humidity : 56%

Power Supply : AC 230V, 50Hz

Criterion required : B&C

Test Result : Pass Fail

Test Level % U _T	Voltage Dips & Short Interruptions % U _T	Duration (in periods)	Result
70	30	10P	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
0	100	0.5P	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D

Test Level % U _T	Voltage Dips & Short Interruptions % U _T	Duration (in periods)	Result

Remark:

APPENDIX I
(Photos of EUT)

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Figure 1
The EUT- Top View

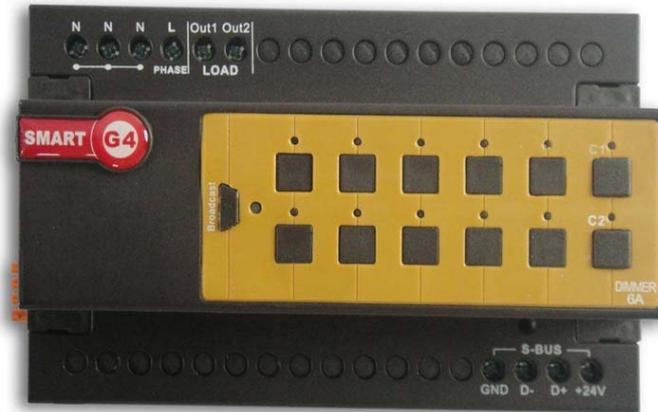


Figure 2
The EUT- Top View



Figure 3
The EUT- Top View



CE Label

1. The CE conformity marking must consist of the initials 'CE' taking the following form:
If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
2. The CE marking must have a height of at least 5 mm except where this is not possible on account of the nature of the apparatus.
3. The CE marking must be affixed to the product or to its data plate. Additionally it must be affixed to the packaging, if any, and to the accompanying documents.
4. The CE marking must be affixed visibly, legibly and indelibly.
It must have the same height as the initials 'CE'.

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