

**EMC TEST REPORT**  
for

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

Climate Control

Model No.: SB-9in1-CL, SB-HVAC2-DN, SB-IR-UN, SB-6FAN5S-DN, SB-THP-WL,  
SB-6in1-CL, SB-5in1-CL, SB-Pump-DN, CSS-C3-WL, CSS-D2-WL, SB-GENSet-UN,  
SB-3PhaseP-DN

Prepared for : SMART-GROUP (Dongguan Shima Electronics Co., Ltd.)  
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APPENDIX I (Photos of the EUT) (4 pages)

### TEST REPORT VERIFICATION

Applicant : SMART-GROUP (Dongguan Shima Electronics Co., Ltd.)  
Manufacturer : SMART-GROUP (Dongguan Shima Electronics Co., Ltd.)  
EUT : Climate Control  
Model No. : SB-9in1-CL, SB-HVAC2-DN, SB-IR-UN, SB-6FAN5S-DN,  
SB-THP-WL, SB-6in1-CL, SB-5in1-CL, SB-Pump-DN, CSS-C3-WL,  
CSS-D2-WL, SB-GENSet-UN, SB-3PhaseP-DN  
Rating : 24V $\overline{=}$  15mA, 0.4W  
Trade Mark :   
SMART-BUS/ PREUSSEN/ S-MESH

Measurement Procedure Used:  
EN 61000-6-3: 2007+A1: 2011;  
EN 61000-6-1: 2007;  
(IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4; IEC 61000-4-5; IEC 61000-4-6)

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 of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 61000-6-3 and EN 61000-6-1 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 :  Baron Wen  
(Engineer/ Baron Wen)

Reviewer : Oliay Yang  
(Project Manager/ Oliay Yang)

Approved & Authorized Signer : Tom Chen  
(Manager/ Tom Chen)

## 1. GENERAL INFORMATION

### 1.1. Description of Device (EUT)

EUT	: Climate Control
Model Number	: SB-9in1-CL, SB-HVAC2-DN, SB-IR-UN, SB-6FAN5S-DN, SB-THP-WL, SB-6in1-CL, SB-5in1-CL, SB-Pump-DN, CSS-C3-WL, CSS-D2-WL, SB-GENSet-UN, SB-3PhaseP-DN (Note: All samples are the same except the model number & appliances, so we prepare “SB-HVAC2-DN” for EMC test only.)
Test Power Supply	: DC 24V
Applicant Address	: SMART-GROUP (Dongguan Shima Electronics Co., Ltd.) No.135, Huancheng Road, Mawu Village, QiaoLi Management Community, Changping Town, Dongguan City, Guangdong Province, China
Manufacturer Address	: SMART-GROUP (Dongguan Shima Electronics Co., Ltd.) No.135, Huancheng Road, Mawu Village, QiaoLi Management Community, Changping Town, Dongguan City, Guangdong Province, China
Factory Address	: SMART-GROUP (Dongguan Shima Electronics Co., Ltd.) 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

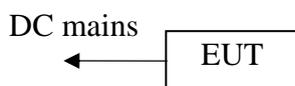
## 1.4. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.1dB (Horizontal) Ur = 4.3dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB
Disturbance Uncertainty	:	Ud = 2.6 dB

### 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 (150KHz To 30MHz)	Mode 1	P
Radiated Emission Test(30MHz To 1000MHz)	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
Magnetic Field Susceptibility Test	/	N
Voltage Dips and Interruptions Test	/	N

P) Indicates that the through the test

N) Don't test.

### 1.7. EMS Performance Criteria

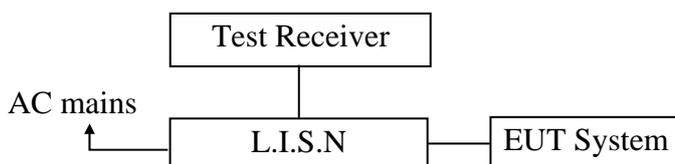
- √ A: Normal performance within the specification limits
- √ B: Temporary degradation or loss of function or performance which is self-recoverable
- √ C: Temporary degradation or loss of function or performance which requires operator intervention or system reset
- √ D: Degradation or loss of function 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. Block Diagram of Test Setup



### 2.2. Measuring Standard

EN 61000-6-3

### 2.3. Power Line Conducted Emission Limits

Frequency (MHz)	Limit (dB $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

NOTE1-The lower limit shall apply at the transition frequencies.  
NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

### 2.4. EUT Configuration on Measurement

The following equipments are installed on conducted emission measurement to meet EN 61000-6-3 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 2.5. Operating Condition of EUT

2.5.1. Setup the EUT as shown on Section 2.1.

2.5.2. Turn on the power of all equipments.

2.5.3. Let the EUT work in measuring mode and measure it.

### 2.6. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network (L.I.S.N). This provided a 50ohm coupling impedance for the tested equipments. Both sides

of AC line are investigated to find out the maximum conducted emission according to the EN61000-6-3 regulations during conducted emission measurement.

The bandwidth of the test receiver (ESCI) is set at 9KHz in 150KHz~30MHz.

The frequency range from 150KHz to 30MHz is investigated for AC mains.

The test results are listed in Section 2.8.

## 2.7. 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

## 2.8. Measuring Results

**PASS**

The frequency range 150KHz to 30MHz is investigated

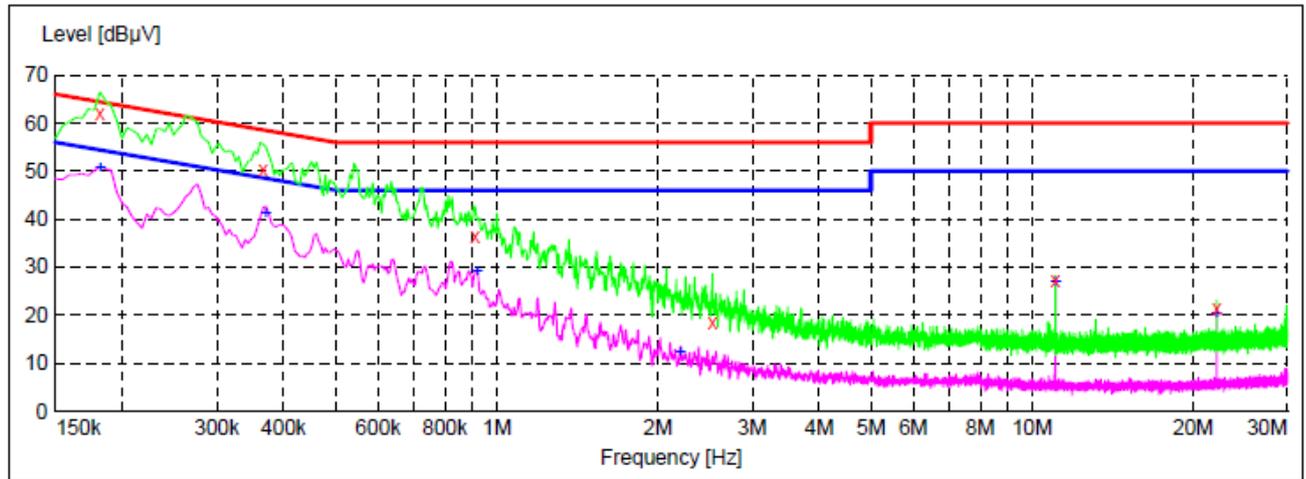
Test data see the following pages.

**CONDUCTED EMISSION TEST DATA**

Test Site: 1# Shielded Room  
 Test Specification: DC 24V  
 Comment: +  
 Tem.: 25°C Hum.: 50%

**SCAN TABLE: "Voltage (150K~30M) FIN"**

Short Description: 150K-30M Disturbance Voltages



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.181500	61.00	20.1	64	3.0	QP	+	GND
0.366000	50.50	20.1	59	8.1	QP	+	GND
0.910500	36.50	20.1	56	19.5	QP	+	GND
2.530000	18.40	20.4	56	37.6	QP	+	GND
11.057500	27.10	20.6	60	32.9	QP	+	GND
22.118500	21.40	20.8	60	38.6	QP	+	GND

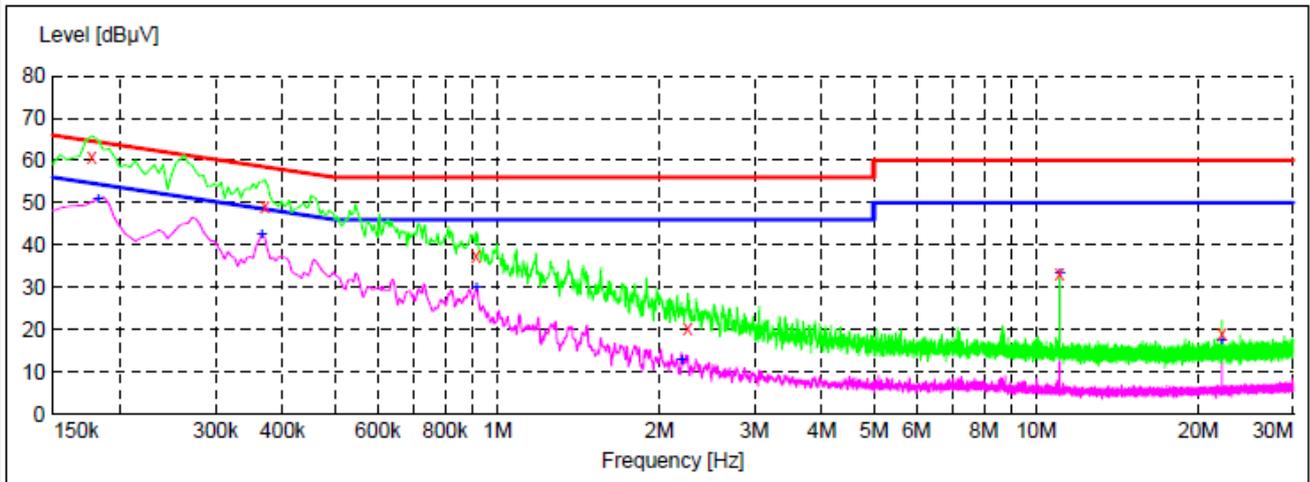
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.181500	50.70	20.1	54	3.3	AV	+	GND
0.370500	41.20	20.1	49	7.3	AV	+	GND
0.919500	29.30	20.1	46	16.7	AV	+	GND
2.206000	12.30	20.3	46	33.7	AV	+	GND
11.057500	27.00	20.6	50	23.0	AV	+	GND
22.118500	20.40	20.8	50	29.6	AV	+	GND

**CONDUCTED EMISSION TEST DATA**

Test Site: 1# Shielded Room  
 Test Specification: DC 24V  
 Comment: -  
 Tem.: 25°C Hum.: 50%

**SCAN TABLE: "Voltage (150K~30M) FIN"**

Short Description: 150K-30M Disturbance Voltages



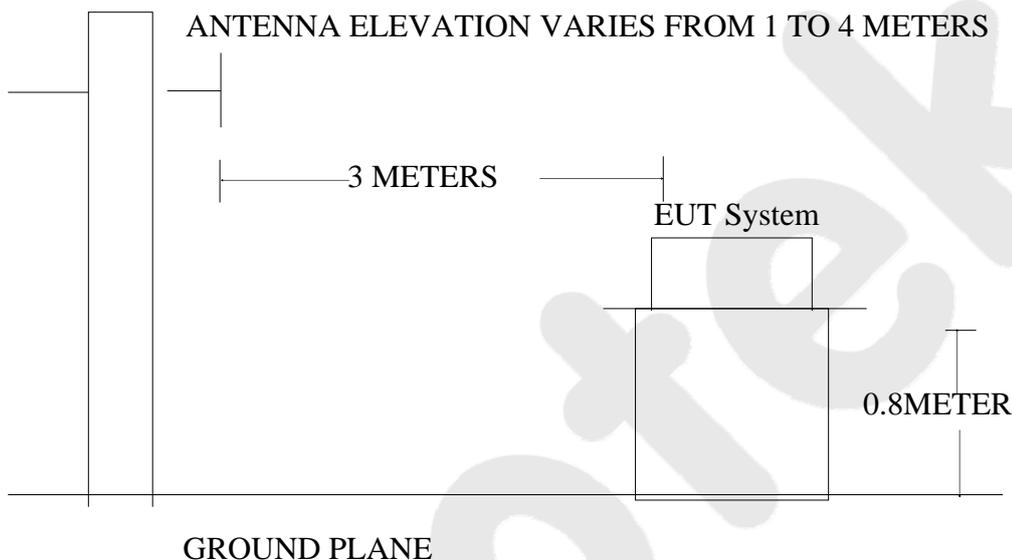
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.177000	61.00	20.1	65	3.6	QP	-	GND
0.370500	49.10	20.1	59	9.4	QP	-	GND
0.915000	37.30	20.1	56	18.7	QP	-	GND
2.260000	20.50	20.3	56	35.5	QP	-	GND
11.057500	33.30	20.6	60	26.7	QP	-	GND
22.118500	19.10	20.8	60	40.9	QP	-	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.181500	50.70	20.1	54	3.3	AV	-	GND
0.366000	42.60	20.1	49	6.0	AV	-	GND
0.915000	30.00	20.1	46	16.0	AV	-	GND
2.197000	12.90	20.3	46	33.1	AV	-	GND
11.057500	33.40	20.6	50	16.6	AV	-	GND
22.118500	17.40	20.8	50	32.6	AV	-	GND

### 3. RADIATED EMISSION TEST

#### 3.1. Block Diagram of Test

##### 3.1.1. Block diagram of test setup (In chamber)



#### 3.2. Measuring Standard

EN 61000-6-3

#### 3.3. Radiated Emission Limits

##### Radiated Emission Limits

All emanations from a EN 61000-6-3 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 $\mu$ V/m)
30 ~ 230	3	40
230 ~ 1000	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 61000-6-3 regulations test method must be used to find the maximum emission during radiated emission measurement.

### 3.5. Operating Condition of EUT

3.5.1. Turn on the power.

3.5.2. 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 a 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 9\*6\*6 Chamber.

The test results are listed in Section 3.8.

### 3.7. 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

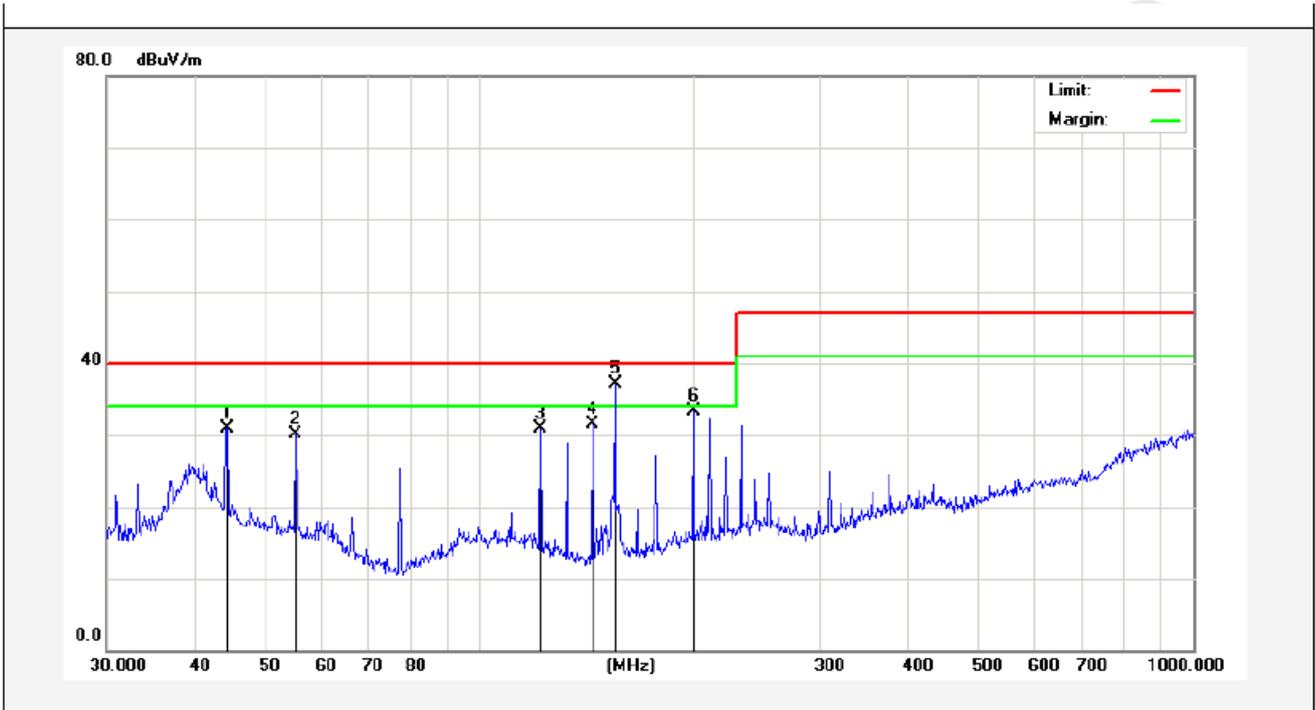
### 3.8. Measuring Results

**PASS**

The frequency range from 30MHz to 1000MHz is investigated.

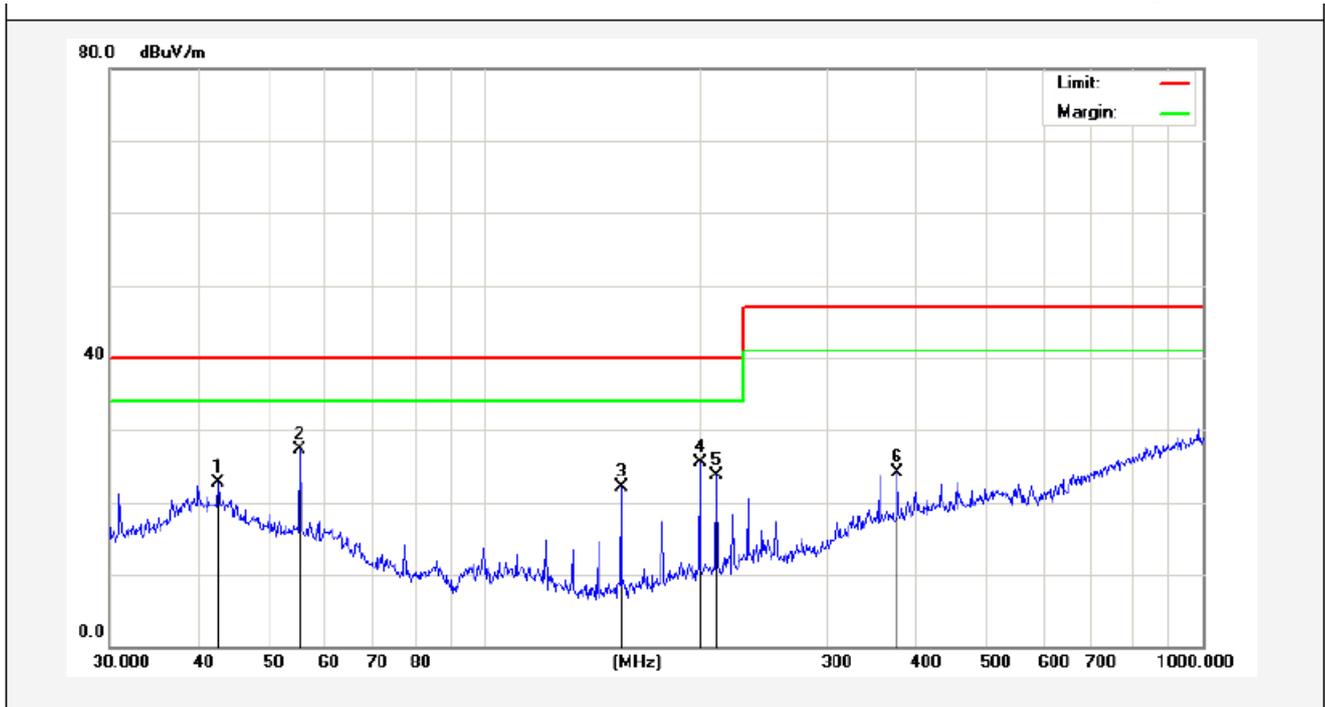
Test data see the following page.

<b>Test item:</b>	<b>Radiation Test</b>	<b>Polarization:</b>	<b>Vertical</b>
<b>Standard:</b>	<b>(RE)EN61000-6-3</b>	<b>Power Source:</b>	<b>DC 24V</b>
<b>Distance:</b>	<b>3m</b>	<b>Temp.(°C)/Hum.(%RH):</b>	<b>24.3( °C)/55%RH</b>
<b>Note:</b>			



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	44.2752	43.03	-12.05	30.98	40.00	-9.02	peak			
2	55.2207	45.03	-14.94	30.09	40.00	-9.91	peak			
3	121.5486	47.48	-16.56	30.92	40.00	-9.08	peak			
4	143.8295	49.87	-18.43	31.44	40.00	-8.56	peak			
5	154.8204	55.12	-18.11	37.01	40.00	-2.99	QP	100	360	
6	199.2855	49.10	-15.87	33.23	40.00	-6.77	peak			

Test item: Radiation Test Polarization: Horizontal  
 Standard: (RE)EN61000-6-3\_3m Power Source: DC 24V  
 Distance: 3m Temp.(°C)/Hum.(%RH): 24.3( °C)/55%RH  
 Note:

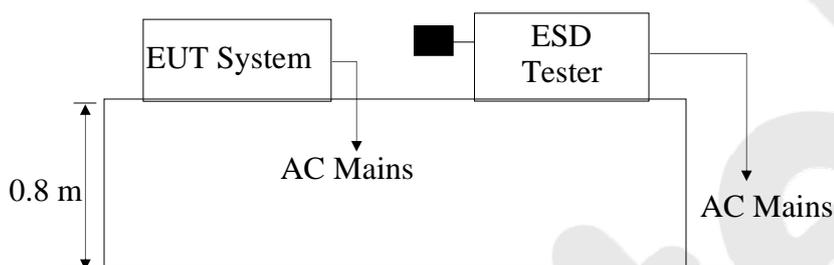


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	42.4508	34.12	-11.33	22.79	40.00	-17.21	peak			
2	55.2207	42.24	-14.94	27.30	40.00	-12.70	peak			
3	154.8204	45.25	-23.11	22.14	40.00	-17.86	peak			
4	199.2855	46.31	-20.87	25.44	40.00	-14.56	peak			
5	210.0482	44.20	-20.48	23.72	40.00	-16.28	peak			
6	375.9385	37.52	-13.35	24.17	47.00	-22.83	peak			

## 4. ELECTROSTATIC DISCHARGE IMMUNITY TEST

### 4.1. Block Diagram of Test Setup

#### 4.1.1. Block diagram of test setup



### 4.2. Measuring Standard

EN 61000-6-1 (IEC 61000-4-2)

Severity Level: 3 / Air Discharge:  $\pm 8$  kV Level: 2 / Contact Discharge:  $\pm 4$  kV

### 4.3. Severity Levels and Performance Criterion

#### 4.3.1. Severity level

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

#### 4.3.2. Performance criterion: **B**

### 4.4. EUT Configuration

The following equipments are installed on electrostatic discharge immunity measurement to meet EN 61000-6-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 4.5. Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 2.5 except the test set up replaced by Section 4.1.

## 4.6. Test Procedure

### 4.6.1. 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 100 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed

### 4.6.2. Contact Discharge:

All the procedure shall be same as Section 4.6.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

### 4.6.3. Indirect discharge for horizontal coupling plane

At least 50 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.

### 4.6.4. Indirect discharge for vertical coupling plane

At least 50 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.

## 4.7. 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

## 4.8. Measuring Results

**PASS**

Please refer to the following pages

## Electrostatic Discharge Test Results

Shenzhen Anbotek Compliance Laboratory Limited

Air discharge :           ±8.0kV	Temperature :           25°C
Contact discharge:       ±4.0kV	Humidity :           54%
Power Supply :           DC 24V	Criterion :           B
Number of discharge : 25	Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

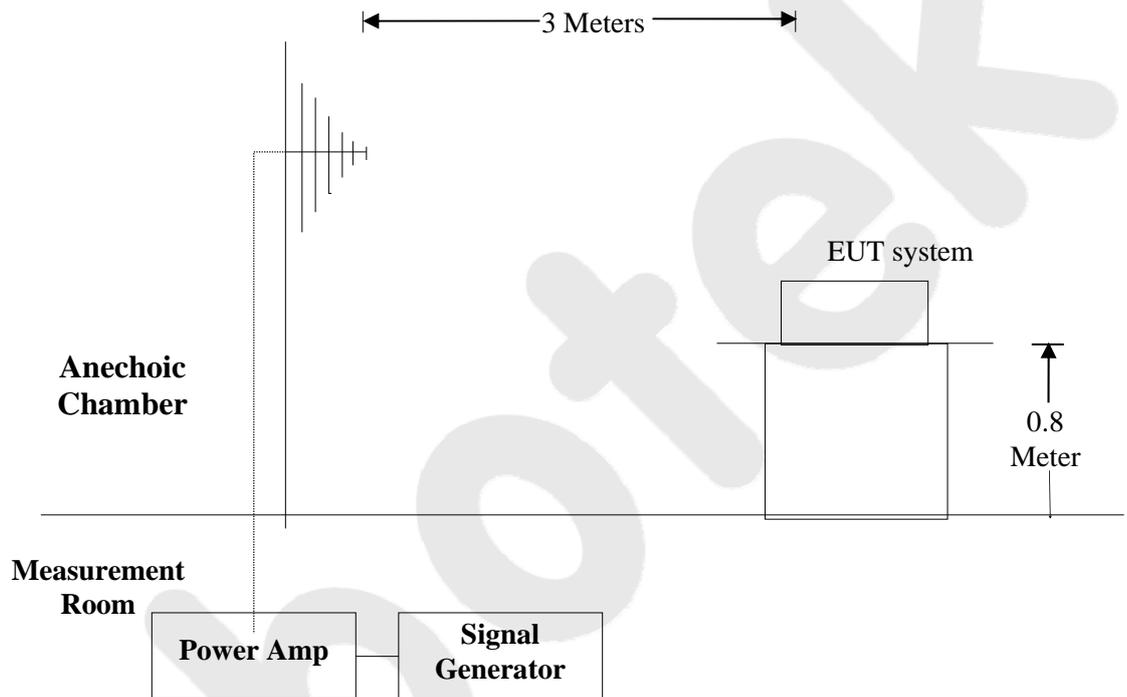
Location	Kind A-Air Discharge C-Contact Discharge	Result
Slot of the EUT           8 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Others                   6 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
HCP                      6 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of front           4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of rear             4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of left             4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of 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).

## 5. RF FIELD STRENGTH SUSCEPTIBILITY TEST

### 5.1. Block Diagram of Test

#### 5.1.1. Block diagram of RS test setup



### 5.2. Measuring Standard

EN 61000-6-1 (IEC 61000-4-3)  
Severity Level: 2, 3V / m

### 5.3. Severity Levels and Performance Criterion

#### 5.3.1. Severity Levels

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

#### 5.3.2. Performance Criterion: **A**

#### 5.4. EUT Configuration on Test

The following equipments are installed on RF Field Strength susceptibility Measurement to meet EN 61000-6-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

#### 5.5. Operating Condition of EUT

Same as conducted emission measurement which is listed in Section 2.5. except the test setup replaced as Section 5.1.

#### 5.6. Test Procedure

The EUT are placed on a table which is 0.8 meter high above the ground. The EUT is set 3 meters 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 the EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD camera is used to monitor its screen.

All the scanning conditions are as following:

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

#### 5.7. 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

#### 5.8. Measuring Results

**PASS**

Please refer to the following page.

## RF Field Strength Susceptibility Test Results

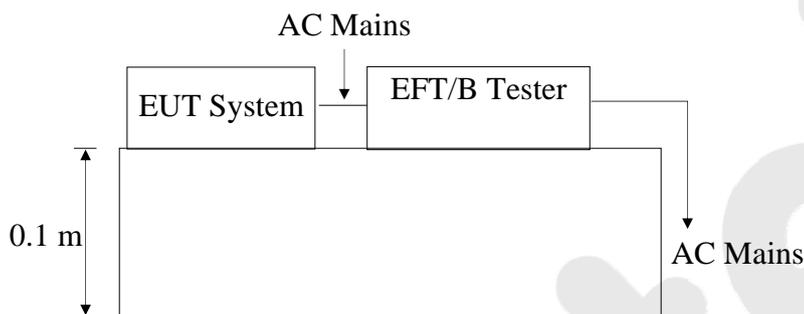
Shenzhen Anbotek Compliance Laboratory Limited

Field Strength : 3 V/m	Temperature : 25°C	
Power Supply : DC 24V	Humidity : 54%	
Criterion required : A	Frequency Range : 80 MHz to 1000 MHz	
Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		
Modulation: <input type="checkbox"/> None <input type="checkbox"/> Pulse <input checked="" type="checkbox"/> AM 1kHz 80%		
Steps	# / %	Result
	Horizontal      Vertical	
Front	3 V/m      3 V/m	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Right	3 V/m      3 V/m	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Rear	3 V/m      3 V/m	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Left	3 V/m      3 V/m	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
<p>Note: The Project in IEC 61000-4-3 was tested in Shenzhen EMTEK Co., Ltd.</p>		

## 6. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

### 6.1. Block Diagram of Test Setup

#### 6.1.1. EFT Test Setup



### 6.2. Measuring Standard

EN 61000-6-1 (IEC 61000-4-4)  
Severity Level 1: 0.5kV

### 6.3. Severity Levels and Performance Criterion

#### 6.3.1. Severity level

Open Circuit Output Test Voltage $\pm 10\%$		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1.	0.5 kV	0.25 kV
2.	1 kV	0.5 kV
3.	2 kV	1 kV
4.	4 kV	2 kV
X	Special	Special

#### 6.3.2. Performance criterion: **B**

### 6.4. EUT Configuration

The following equipments are installed on electrical fast transient/burst immunity measurement to meet EN 61000-6-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 6.5. Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 2.5, except the test set up replaced by Section 6.1.

## 6.6. 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.

### 6.6.1. 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.

### 6.6.2. For signal lines and control lines ports:

No I/O ports. It's unnecessary to test.

### 6.6.3. For DC output line ports:

It's unnecessary to test.

## 6.7. 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

## 6.8. Measuring Results

**PASS**

Please refer to the following page.

## Electrical Fast Transient/Burst Test Results

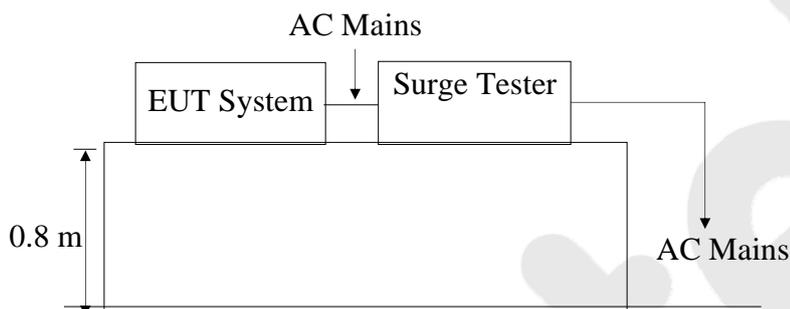
Shenzhen Anbotek Compliance Laboratory Limited

Power Supply: DC 24V Inject Line : AC Mains Inject Method: Direct Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	Criterion: <b>B</b> Ambient Condition : <u>24°C</u> <u>55% RH</u> Inject Time(s): 120																																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Line</th> <th style="width: 25%;">Polarity</th> <th style="width: 25%;">Test Voltage</th> <th style="width: 25%;">Result</th> </tr> </thead> <tbody> <tr> <td>Positive</td> <td style="text-align: center;">±</td> <td style="text-align: center;">0.5kV</td> <td style="text-align: center;"> <input checked="" type="checkbox"/> A    <input type="checkbox"/> B  <input type="checkbox"/> C    <input type="checkbox"/> D                 </td> </tr> <tr> <td>Negative</td> <td style="text-align: center;">±</td> <td style="text-align: center;">0.5kV</td> <td style="text-align: center;"> <input checked="" type="checkbox"/> A    <input type="checkbox"/> B  <input type="checkbox"/> C    <input type="checkbox"/> D                 </td> </tr> <tr> <td>PE</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Positive 、 Negative</td> <td style="text-align: center;">±</td> <td style="text-align: center;">0.5kV</td> <td style="text-align: center;"> <input checked="" type="checkbox"/> A    <input type="checkbox"/> B  <input type="checkbox"/> C    <input type="checkbox"/> D                 </td> </tr> <tr> <td>Positive 、 PE</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Negative 、 PE</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Positive 、 Negative 、 PE</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Signal Line</td> <td></td> <td></td> <td></td> </tr> <tr> <td>DC Line</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Line	Polarity	Test Voltage	Result	Positive	±	0.5kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	Negative	±	0.5kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	PE				Positive 、 Negative	±	0.5kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	Positive 、 PE				Negative 、 PE				Positive 、 Negative 、 PE				Signal Line				DC Line				Note :   Remark:
Line	Polarity	Test Voltage	Result																																						
Positive	±	0.5kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D																																						
Negative	±	0.5kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D																																						
PE																																									
Positive 、 Negative	±	0.5kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D																																						
Positive 、 PE																																									
Negative 、 PE																																									
Positive 、 Negative 、 PE																																									
Signal Line																																									
DC Line																																									

## 7. SURGE IMMUNITY TEST

### 7.1. Block Diagram of Test Setup

#### 7.1.1. Surge Test Setup



### 7.2. Measuring Standard

EN 61000-6-1 (IEC 61000-4-5)  
Severity Level 1, Line to Line: 0.5kV

### 7.3. Severity Levels and Performance Criterion

#### 7.3.1. Severity level

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

#### 7.3.2. Performance criterion: **B**

### 7.4. EUT Configuration

The following equipments are installed on surge immunity measurement to meet EN 61000-6-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 7.5. Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 2.5, except the test set up replaced by Section 7.1.1.

### 7.6. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 7.1.2.
- 2) For line to line coupling mode, provide a 0.5 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.

### 7.7. 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	061100005 N	Jul. 12, 2016	1 Year

### 7.8. Measuring Results

**PASS**

Please refer to the following page.

## Surge Immunity Test Results

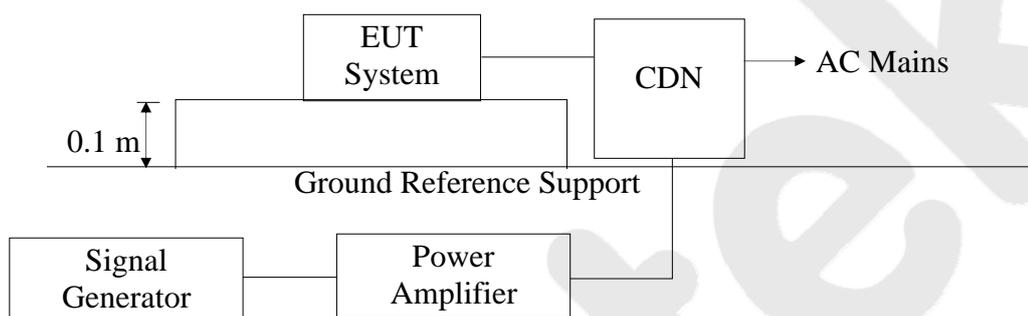
Shenzhen Anbotek Compliance Laboratory Limited

Power Supply: DC 24V		Temperature: 24°C			
Criterion: B		Humidity: 55%			
Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail					
Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (kV)	Result
Positive-Negative	±	<input checked="" type="checkbox"/> 0° <input checked="" type="checkbox"/> 90° <input checked="" type="checkbox"/> 180° <input checked="" type="checkbox"/> 270°	5	0.5	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Positive-PE					
Negative-PE					
Remark:					

## 8. INJECTED CURRENTS SUSCEPTIBILITY TEST

### 8.1. Block Diagram of Test Setup

#### 8.1.1. Block Diagram of Test Setup



### 8.2. Measuring Standard

EN 61000-6-1 (IEC 61000-4-6)  
Severity Level 2: 3V (rms), (0.15MHz ~ 80MHz)

### 8.3. Severity Levels and Performance Criterion

#### 8.3.1. Severity level

Level	Field Strength V(rms)
1.	1
2.	3
3.	10
X	Special

#### 8.3.2. Performance criterion: A

### 8.4. EUT Configuration

The following equipments are installed on currents susceptibility measurement to meet EN 61000-6-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 8.5. Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 2.5, except the test set up replaced by Section 8.1.1.

### 8.6. Test Procedure

#### 8.6.1. For AC Mains

- 1) Set up the EUT, CDN and test generators as shown on Section 8.1.2.
- 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  $1.5 \times 10^{-3}$  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.

#### 8.6.2. For signal lines and control lines ports:

No I/O ports. It's unnecessary to test.

#### 8.6.3. For DC output line ports:

It's unnecessary to test.

### 8.7. 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

### 8.8. Measuring Results

**PASS**

Please refer to the following page.

## Injected Currents Susceptibility Test Results

Shenzhen Anbotek Compliance Laboratory Limited

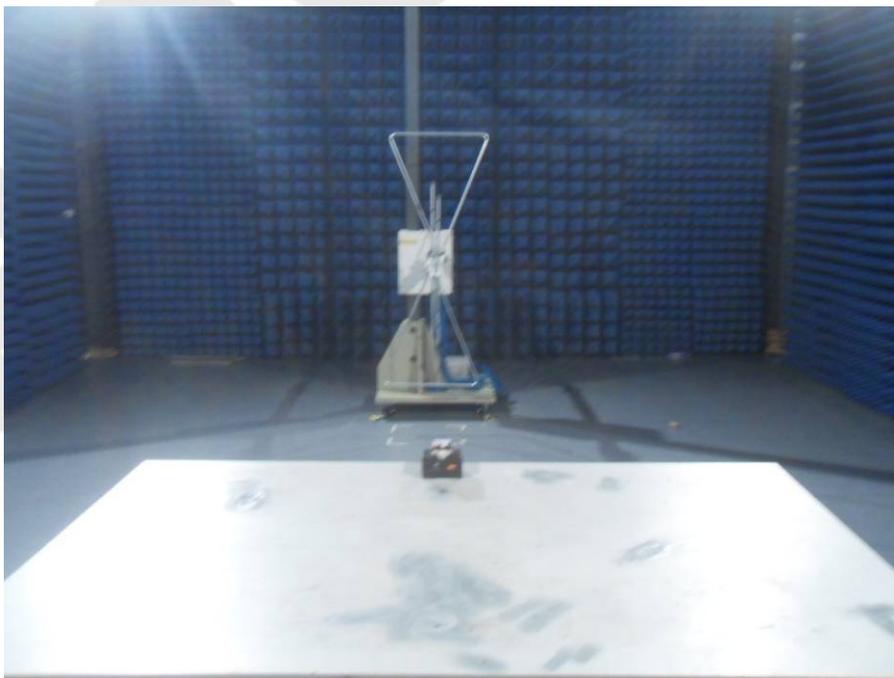
Power Supply : DC 24V		Temperature : 24°C	
Criterion required : A		Humidity :	
Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail			
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Result
0.15 ~ 80	AC Mains	3V	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Test Mode :			
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Result
Remark :		Note:	

## 9. PHOTOGRAPHS

### 9.1. Photo of Power Line Conducted Emission Test



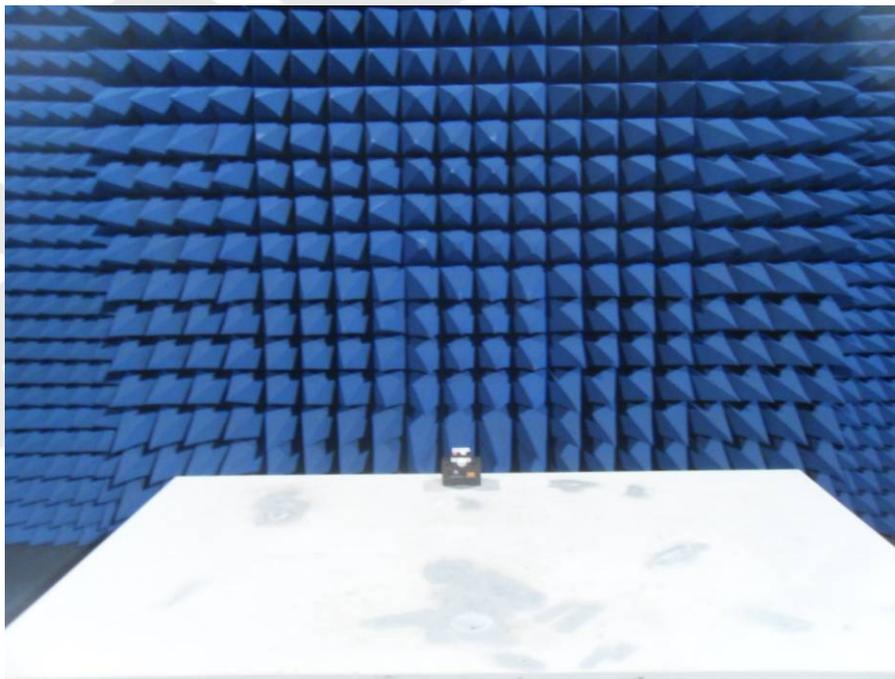
### 9.2. Photo of Radiated Emission Test



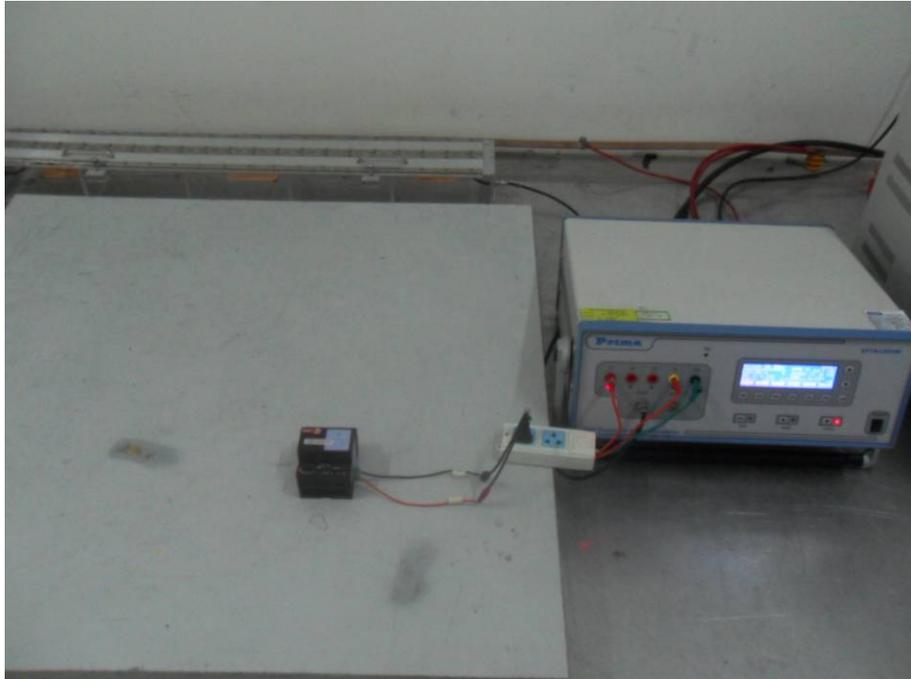
9.3. Photo of Electrostatic Discharge Immunity Test



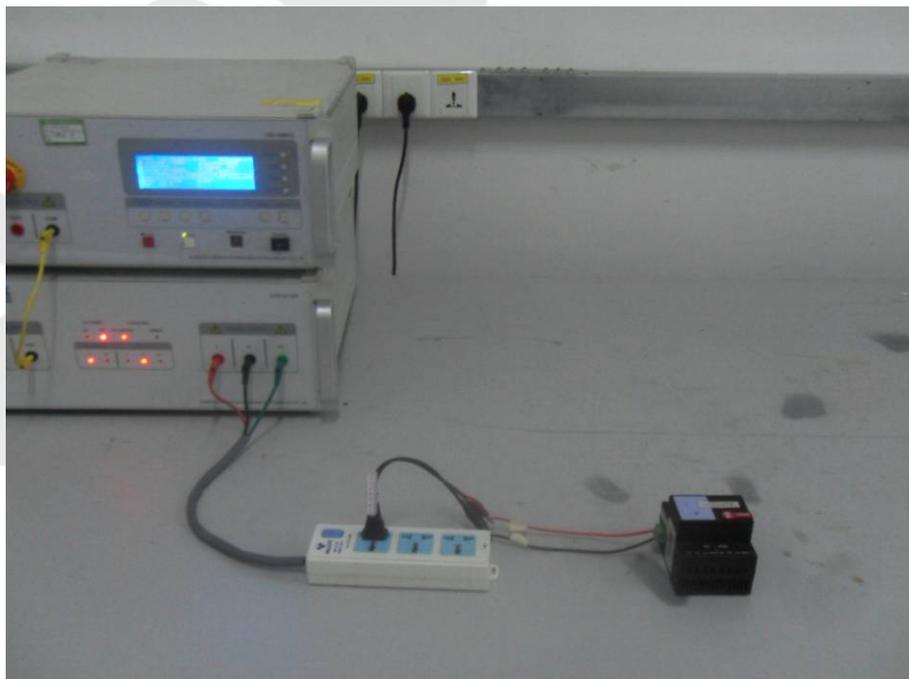
9.4. Photo of RF Field Strength susceptibility Test



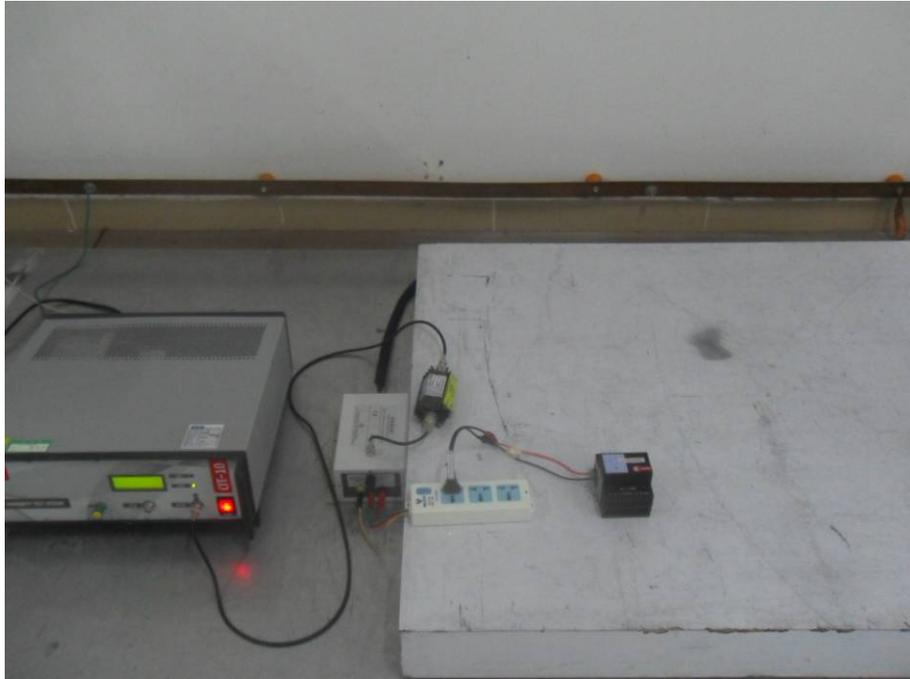
9.5. Photo of Electrical Fast Transient/Burst Immunity Test



9.6. Photo of Surge Immunity Test



9.7. Photo of Injected currents susceptibility Test



**APPENDIX I**  
**(Photos of EUT)**

Anbotek

Figure 1  
The EUT- Top View (Model: SB-HVAC2-DN)

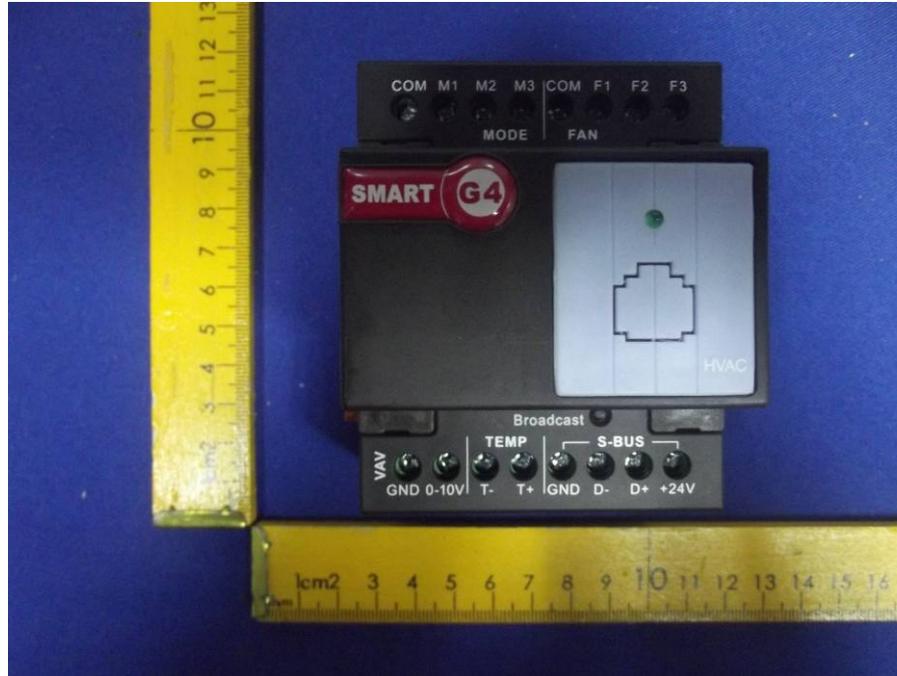


Figure 2  
The EUT- Bottom View (Model: SB-HVAC2-DN)



Figure 3  
The EUT- Side View (Model: SB-HVAC2-DN)

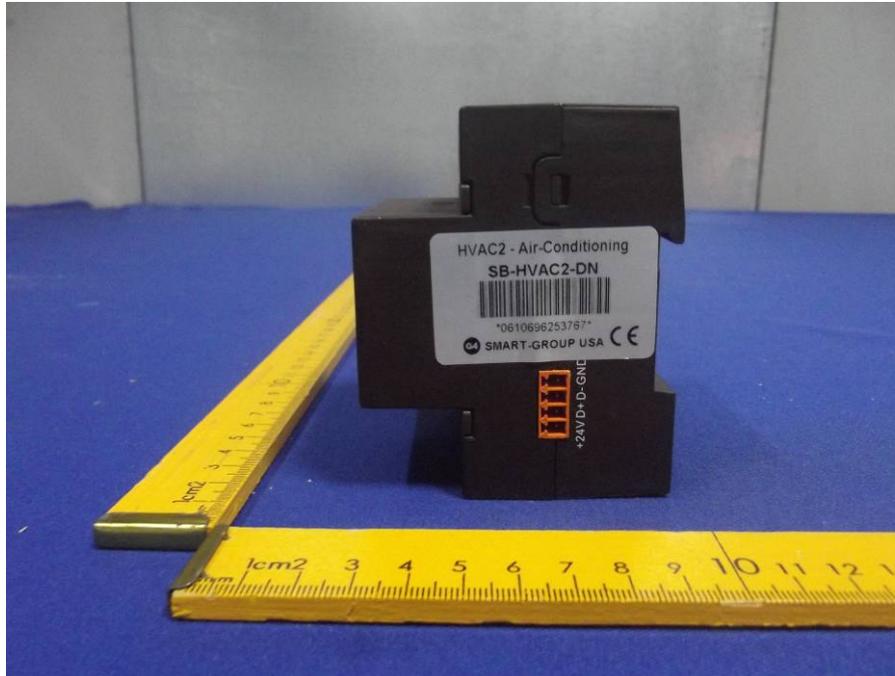


Figure 4  
The EUT- Side View (Model: SB-HVAC2-DN)



Figure 5  
The EUT- Inside View (Model: SB-HVAC2-DN)

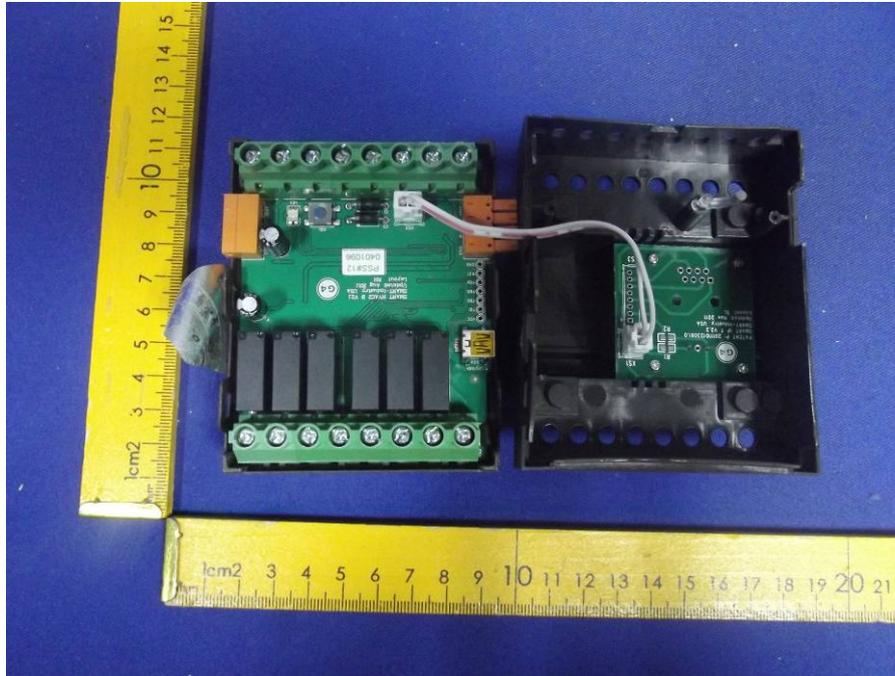


Figure 6  
The EUT- Inside View (Model: SB-HVAC2-DN)

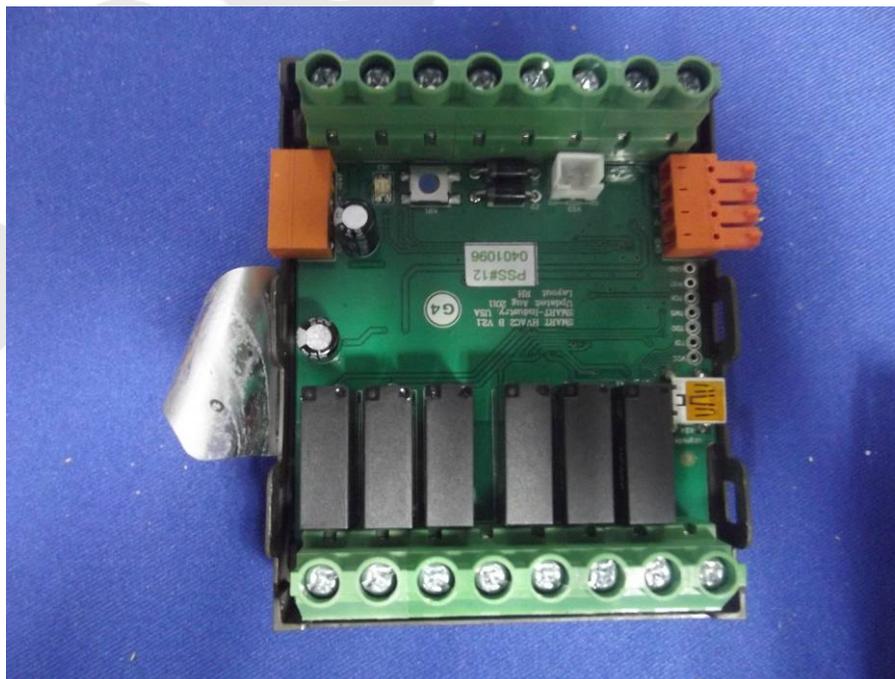
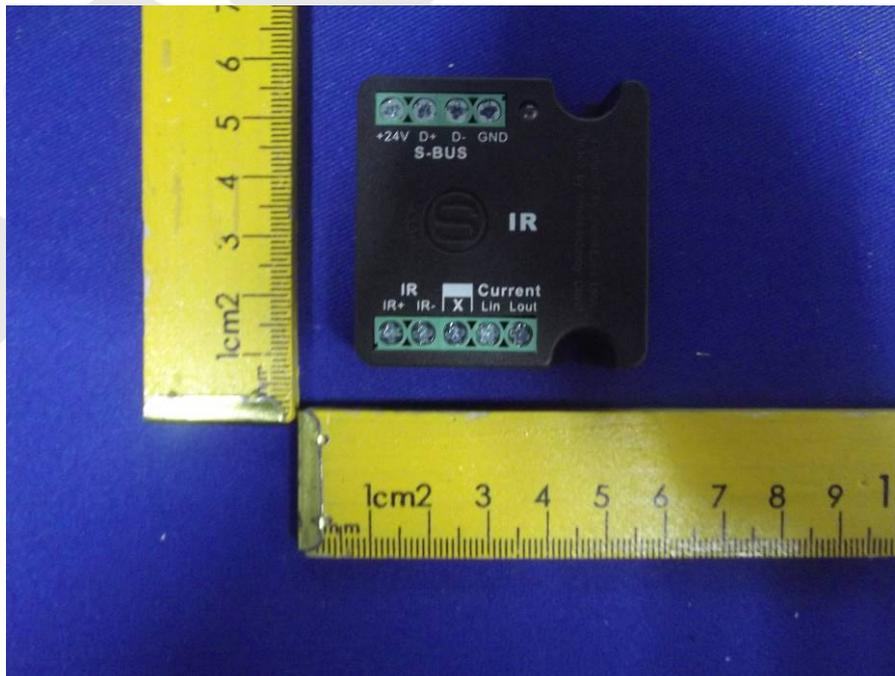


Figure 7  
The EUT- Inside View (Model: SB-HVAC2-DN)



Figure 8  
The EUT- Top View (Model: SB-IR-UN)



### **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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