

EMC TEST REPORT

ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.2.4 (2020-09)

Report Reference No. : POCE211019032PRW

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Guangdong, China

Test Specification Standard : ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.2.4 (2020-09)

Product Name : Switch module

Model/Type Reference : SH-WiFi-SW01-10A

Listed Models : See page 6 General Description of EUT

Date of Receipt : Oct. 09, 2021

Date of Test : Oct. 09, 2021 - Oct. 19, 2021

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Result : PASS

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Revision History Of Report

Version	Description	REPORT No.	Issue Date
V1.0	Original	POCE211019032PRW	Oct. 19, 2021

NOTE1:

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EU Directives.

**NOTE2:**

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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1. TEST SUMMARY

1.1 Test Standards

The tests were performed according to following standards:

ETSI EN 301 489-1 V2.2.3 (2019-11) —ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility

ETSI EN 301 489-17 V3.2.4 (2020-09) —ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility

1.2 Summary of Test Result

ETSI EN 301 489-1/ Requirements		
Emission		
Conducted Emission(AC Mains)	ETSI EN301 489-1 V2.2.3 Clause 7.1	PASS
Radiated Emission	ETSI EN301 489-1 V2.2.3 Clause 7.1	PASS
Conducted Emission (Telecommunication Ports)	ETSI EN301 489-1 V2.2.3 Clause 7.1	N/A
Harmonic Current Emissions	ETSI EN301 489-1 V2.2.3 Clause 7.1	N/A
Voltage Fluctuations and Flicker	ETSI EN301 489-1 V2.2.3 Clause 7.1	PASS
Immunity		
Electrostatic Discharge	ETSI EN301 489-1 V2.2.3 Clause 7.2	PASS
RF Electromagnetic Field	ETSI EN301 489-1 V2.2.3 Clause 7.2	PASS
Fast Transients Common Mode	ETSI EN301 489-1 V2.2.3 Clause 7.2	PASS
Surges	ETSI EN301 489-1 V2.2.3 Clause 7.2	PASS
RF Common Mode 0,15 MHz to 80 MHz	ETSI EN301 489-1 V2.2.3 Clause 7.2	PASS
Transients and Surges	ETSI EN301 489-1 V2.2.3 Clause 7.2	N/A
Voltage Dips and Interruptions	ETSI EN301 489-1 V2.2.3 Clause 7.2	PASS

Note1: N/A means this test item is not applicable for this device.

Note2: This device also belong to information technology equipment, and most of EN55032 and EN55035's test items are same with ETSI EN301 489's.so most of EN55032 and EN55035's tests were performed together with EN301 489's test.

2. GENERAL INFORMATION

2.1 Client Information

Applicant : Shenzhen Netplus Technology Co., Ltd

Address : 2 / F, building C, Yilai Industrial Zone, No. 18, Shuitian Road, Shuitian community, Shiyan street, Bao'an District, Shenzhen, Guangdong

Manufacturer : Shenzhen Netplus Technology Co., Ltd

Address : 2 / F, building C, Yilai Industrial Zone, No. 18, Shuitian Road, Shuitian community, Shiyan street, Bao'an District, Shenzhen, Guangdong

2.2 TEST Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	15°C -35°C
Relative Humidity	35%-55 %
Air Pressure	101KPa

2.3 Description of Device (EUT)

Equipment	Switch module
Trade Mark	N/A
Model Name	SH-WiFi-SW01-10A
Series model	SH-Zigbee-SW01-10A, SH-BT-SW01-10A, SH-WiFi-SW02, SH-WiFi-SW02-PM, SH-Zigbee-SW02, SH-BT-SW02, SH-WiFi-S03, SH-WiFi-S03-PM, SH-Zigbee-SW03, SH-Zigbee-SW03-PM, SH-BT-SW03, SH-WiFi-SW04, SH-WiFi-SW04-PM, SH-Zigbee-SW04, SH-Zigbee-SW04-PM, SH-BT-SW04, SH-WiFi-SW01-16A, SH-WiFi-SW01-16A-PM, SH-Zigbee-SW01-16A, SH-Zigbee-SW01-16A-PM, SH-WiFi-CS01-1C, SH-Zigbee-CS01-1C, SH-BT-CS01-1C, SH-WiFi-CS01-2C, SH-Zigbee-CS01-2C, SH-BT-CS01-2C, SH-WiFi-DIM01, SH-Zigbee-DIM01, SH-BT-DIM01, SH-WiFi-DIM02, SH-Zigbee-DIM02, SH-BT-DIM02, SH-Zigbee-SW01-L, SH-Zigbee-SW02-L, SH-Zigbee-SW03-L
Model Difference	There are several models of this product. The circuit principle and internal structure of each product are the same. Only the naming method and appearance color are a little different, so the main test model is: SH-WiFi-SW01-10A
Power Source	AC 230V 50/60Hz
Zigbee	
Supported type	IEEE 802.15.4
Operation frequency	IEEE 802.15.4: 2405-2480
Modulation Type	IEEE 802.15.4: DSSS
Number of Channels	IEEE 802.15.4:16
Channels Separation	5MHz
Antenna type	PCB Antenna
Antenna gain	3.09 dBi
BLE	
Supported type	BLE
Frequency Range	2402MHz -- 2480MHz
Number of Channels	40
Channels Separation	2MHz
Modulation Type	GFSK
Antenna type:	PCB Antenna
Antenna gain:	2.5 dBi
2.4G WIFI	
Supported type	IEEE 802.11b/802.11g/802.11n(H20)
Operation frequency	IEEE 802.11b/g/n20: 2412-2472MHz
Modulation Type	IEEE 802.11b/g/n(HT20): CCK/DSSS
Number of Channels	IEEE 802.11b/802.11g/802.11n(HT20): 13
Channels Separation	5MHz
Antenna type	PCB Antenna
Antenna gain	2.3 dBi

Note:1. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.4 Description of Test Modes

The EUT has been tested under typical operating condition. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode	
EMI	Mode 1: Zigbee
EMS	Mode 1: Zigbee Mode 2: Standby

NOTE: For DC (battery-powered equipment, no adapter) equipment, we tested the conducted Emission using HP notebook, notebook model: HP-CQ45, notebook adapter model: 0713A1990 INPUT: 100-240V~1.5A 50-60Hz OUTPUT: 19V---4.74A

2.5 Equipments Used During The Test

Conducted Emission

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1	Test Receiver	Rohde & Schwarz	ESCI TEST RECEIVER	ID:1164.6607 K03-102109-MH	Dec. 10, 2020	1 Year
2	L.I.S.N	Rohde & Schwarz	ESH3-Z5.831 .5518.52	9561-G071	Dec. 10, 2020	1 Year
3	50ΩCoaxial Switch	Anritsu	MP59B	M20531	N/A	N/A
4	Pulse Limiter	SCHWARZ BECK	VTSD 9561-F Pulse limiter 10dB Ateennator	561-G071	Dec. 10, 2020	1 Year
5	Cable	SCHWARZ BECK	N/A	N/A	Dec. 10, 2020	1 Year

Radiated Emission

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Test Receiver	Rohde & Schwarz	ESCI TEST RECEIVER	ID:1164.6607 K03-102109-MH	Dec. 10, 2020	1 Year
2	Bilog Antenna	Sunol Sciences	Model JB6 Antenna	A090414	Dec. 10, 2020	1 Year
3	HF Antenna	Sunol Sciences	Model DRH-118	A091114	Dec. 10, 2020	1 Year
4	50ΩCoaxial Switch	Anritsu	MP59B	M20531	N/A	1 Year
5	control	Positioning Controller	Model MF-7802	MF78020836 2	Dec. 10, 2020	1 Year
6	Cable(LF)	SCHWARZ BECK	N/A	N/A	Dec. 10, 2020	1 Year
7	Cable(HF)	SCHWARZ BECK	N/A	N/A	Dec. 10, 2020	1 Year
8	Amplifier (LF)	SCHWARZ BECK	BBV9743	9743-151	Dec. 10, 2020	1 Year
9	Amplifier(HF)	SCHWARZ BECK	BBV9718	9718-282	Dec. 10, 2020	1 Year
10	Spectrum analyzer	Agilent	E4408B	56110	Dec. 10, 2020	1 Year

Electrostatic Discharge

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	ESD Tester	PRIMA	61002AG	PR14042705	Dec. 10, 2020	1 Year

RF Electromagnetic Field

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Signal Generator	HP	8648A	3625U00573	Dec. 10, 2020	1 Year
2	Amplifier	AR	500A100	17034	NCR	NCR
3	Amplifier	AR	100W/1000M	17028	NCR	NCR
4	Isotropic Field Monitor	AR	FM2000	16829	NCR	NCR
5	Isotropic Field Probe	AR	FP2000	16755	Dec. 10, 2020	1 Year
6	Biconic Antenna	EMCO	3108	9507-2534	NCR	NCR
7	Log-periodic Antenna	AR	AT1080	16812	NCR	NCR
8	Audio Analyzer	R&S	UPV	100419	Dec. 10, 2020	1 Year

2.6 Test Lab Information

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

VCCI Membership No.: 3941

The 3m Semi-anechoic chamber of Shenzhen POCE Technology Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.:R-3941.
Date of Registration: Oct. 22, 2018.

2.7 Statement Of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented .quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for POCE laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	$\pm 2.50\text{dB}$	(1)
Radiated Emission	1~12.75GHz	$\pm 3.20\text{dB}$	(1)
Conducted Emission	0.15~30MHz	$\pm 2.64\text{dB}$	(1)

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

Electrostatic Discharge

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 1999[2], the requirements for measurement uncertainty in ESD testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant ESD standards. The immunity test signal from the ESD system meet the required specifications in IEC 61000-4-2 through the calibration report with the calibrated uncertainty for the waveform of voltage and timing as being 1.22% and 2.36%.

RF Electromagnetic Field

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 1999[2], the requirements for measurement uncertainty in RS testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant RS standards. The immunity test signal from the RS system meet the required specifications in IEC 61000-4-3 through the calibration for the uniform field strength and monitoring for the test level with the uncertainty evaluation report for the electrical filed strength as being 2.50 dB.

3. TEST CONDITIONS AND RESULTS

3.1 EMC EMISSION TEST

3.1.1 Conducted Emission (AC Mains)

LIMIT

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

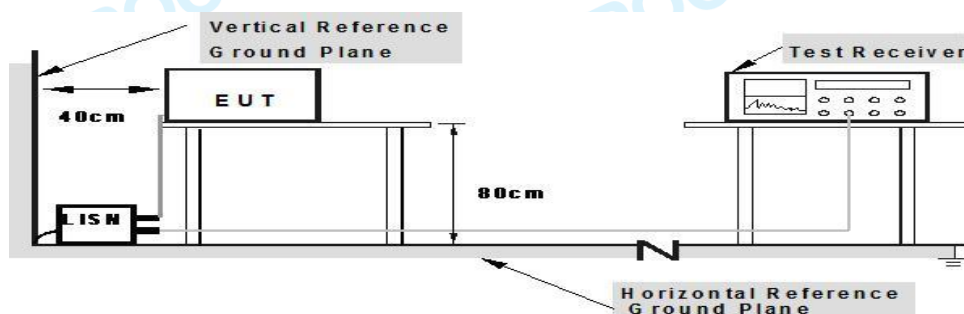
Note: (1)The tighter limit applies at the band edges.

(2)The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Block diagram of test setup



Note: 1.Support units were connected to second LISN.

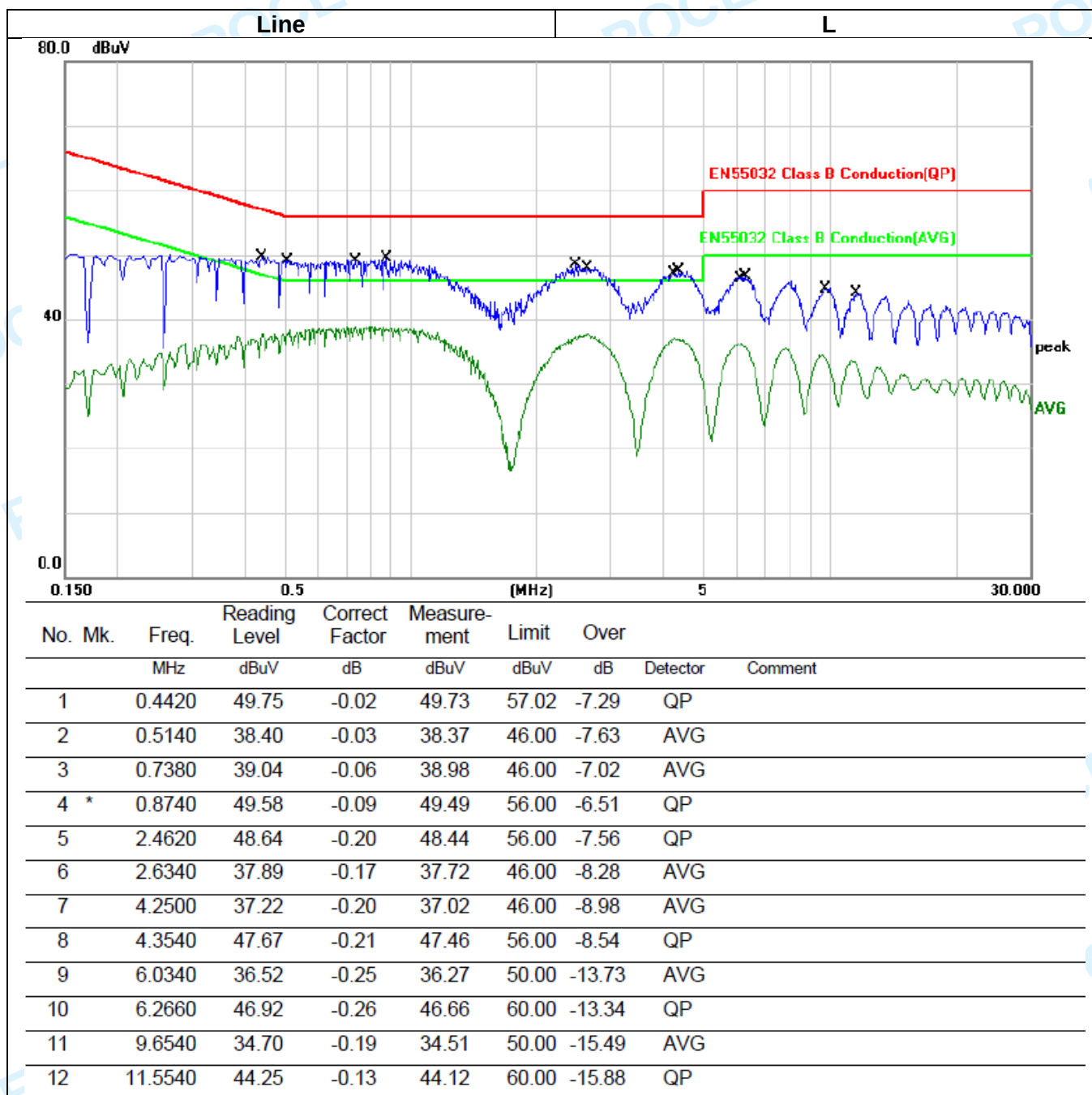
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

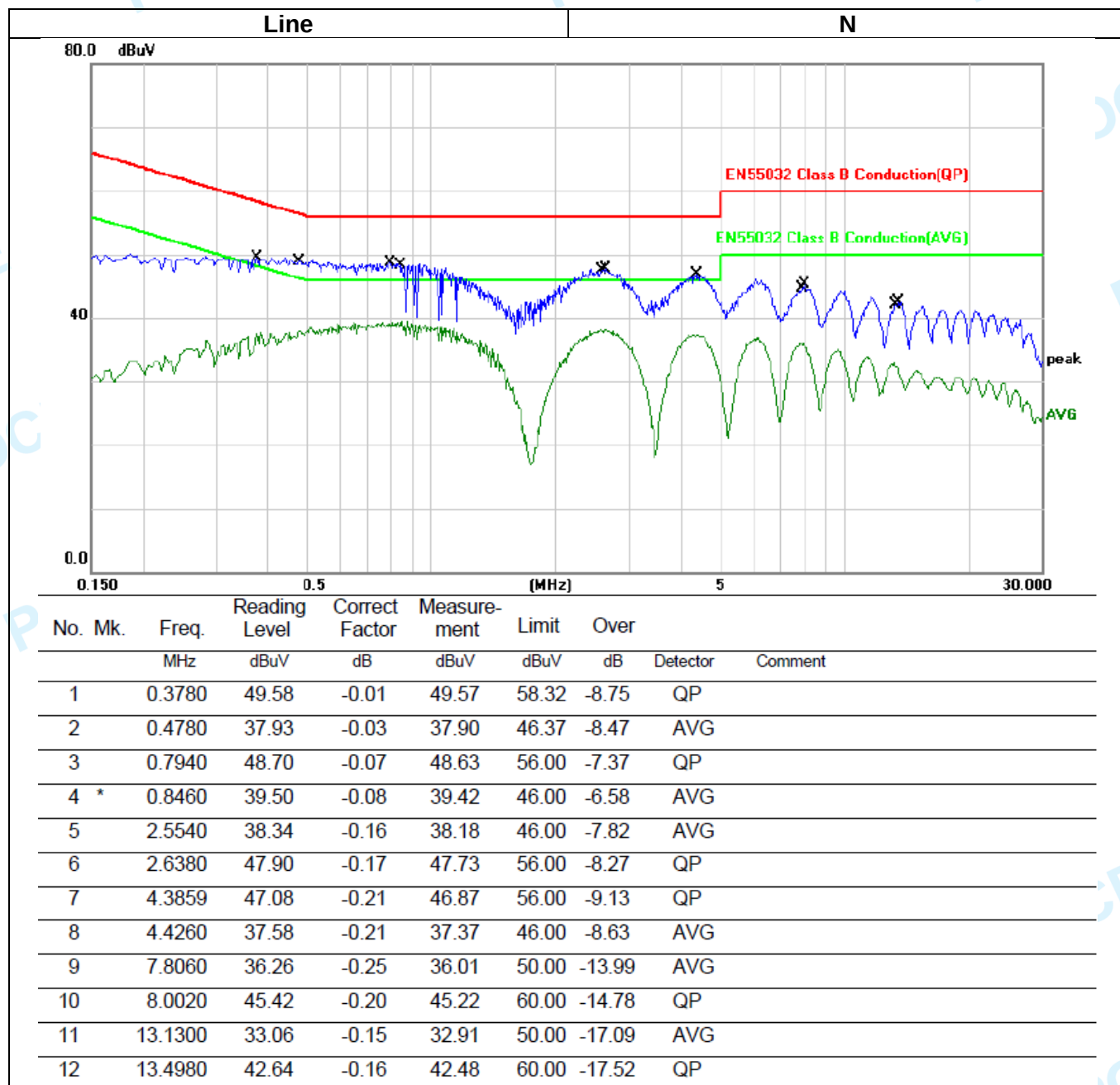
TEST RESULTS

---PASS---

Please refer to the below test data:

Mode 2:





3.1.2 Radiated Emission**LIMIT****LIMITS OF RADIATED EMISSION MEASUREMENT (Below 1000MHz)**

FREQUENCY (MHz)	Class B(at 10m)	Class B (at 3m)
	dBuV/m	dBuV/m
30 – 230	30	40
230 – 1000	37	47

LIMITS OF RADIATED EMISSION MEASUREMENT(Above 1000MHz)

FREQUENCY (MHz)	Class A (at 10m) dBuV/m		Class B (at 3m) dBuV/m	
	Peak	Avg	Peak	Avg
1000-3000	76	56	74	54
3000-6000	80	60	74	54

Notes: (1)The limit for radiated test was performed according to as following:

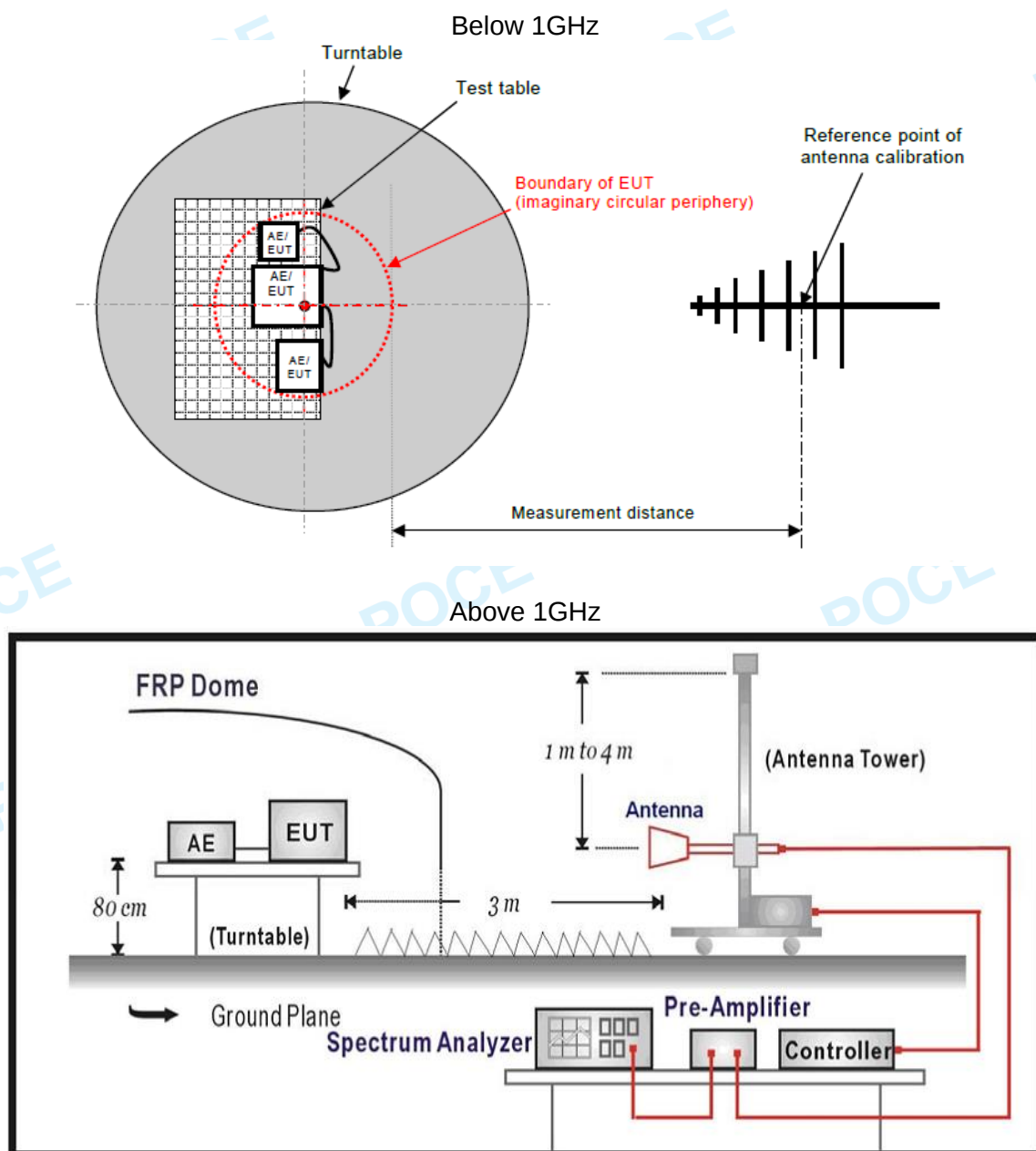
ETSI EN 301 489-1/EN 55022

(2)The tighter limit applies at the band edges.

TEST PROCEDURE

- The EUT was placed on the top of a rotating table 3 meters away from the receiver antenna and 0.8 meters above the ground at a 9X9X6 anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak/Average detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak/Average Mode Limit, the EUT shall be deemed to meet QP/AV Limits and then no additional QP/AV Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Block diagram of test setup

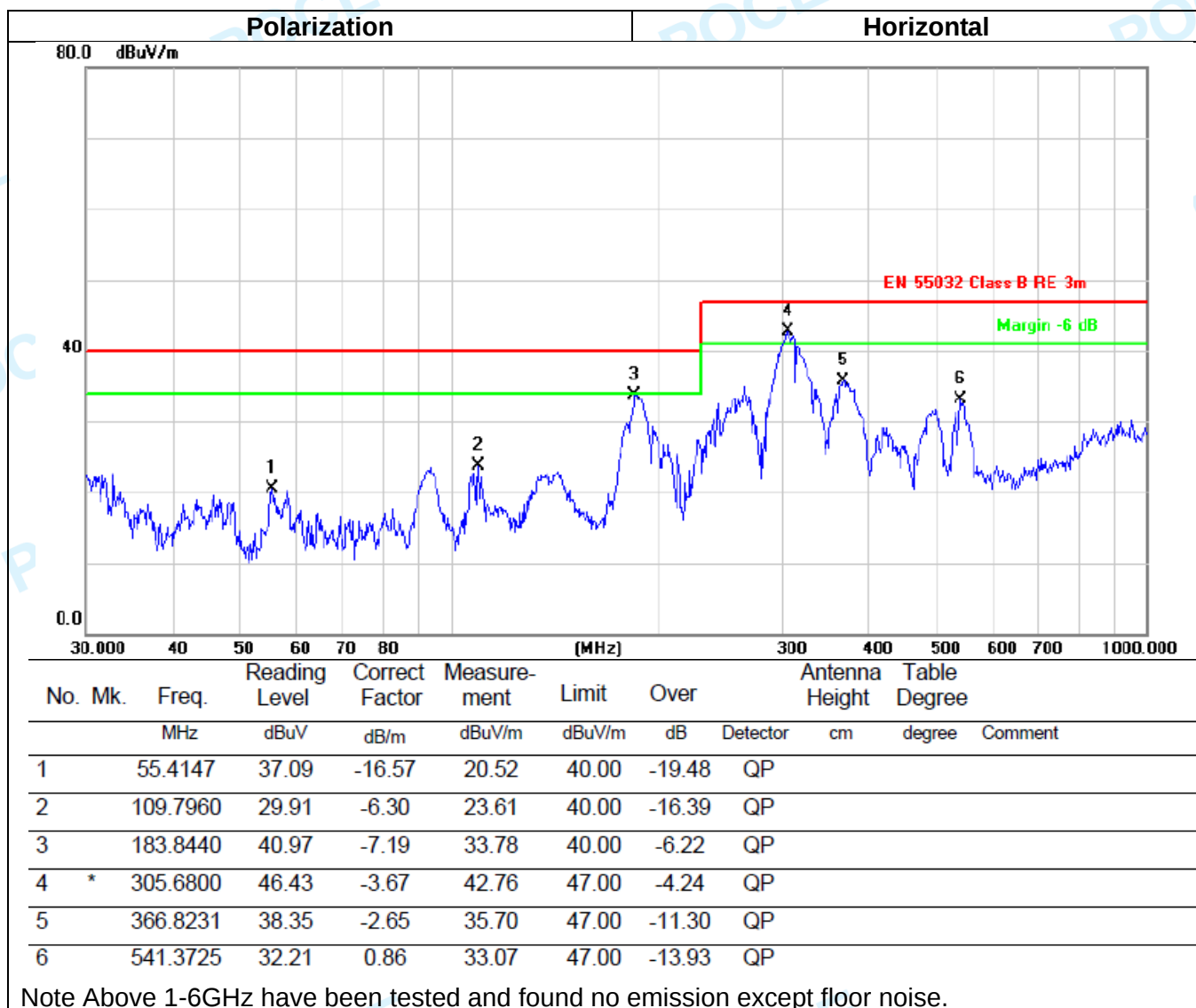


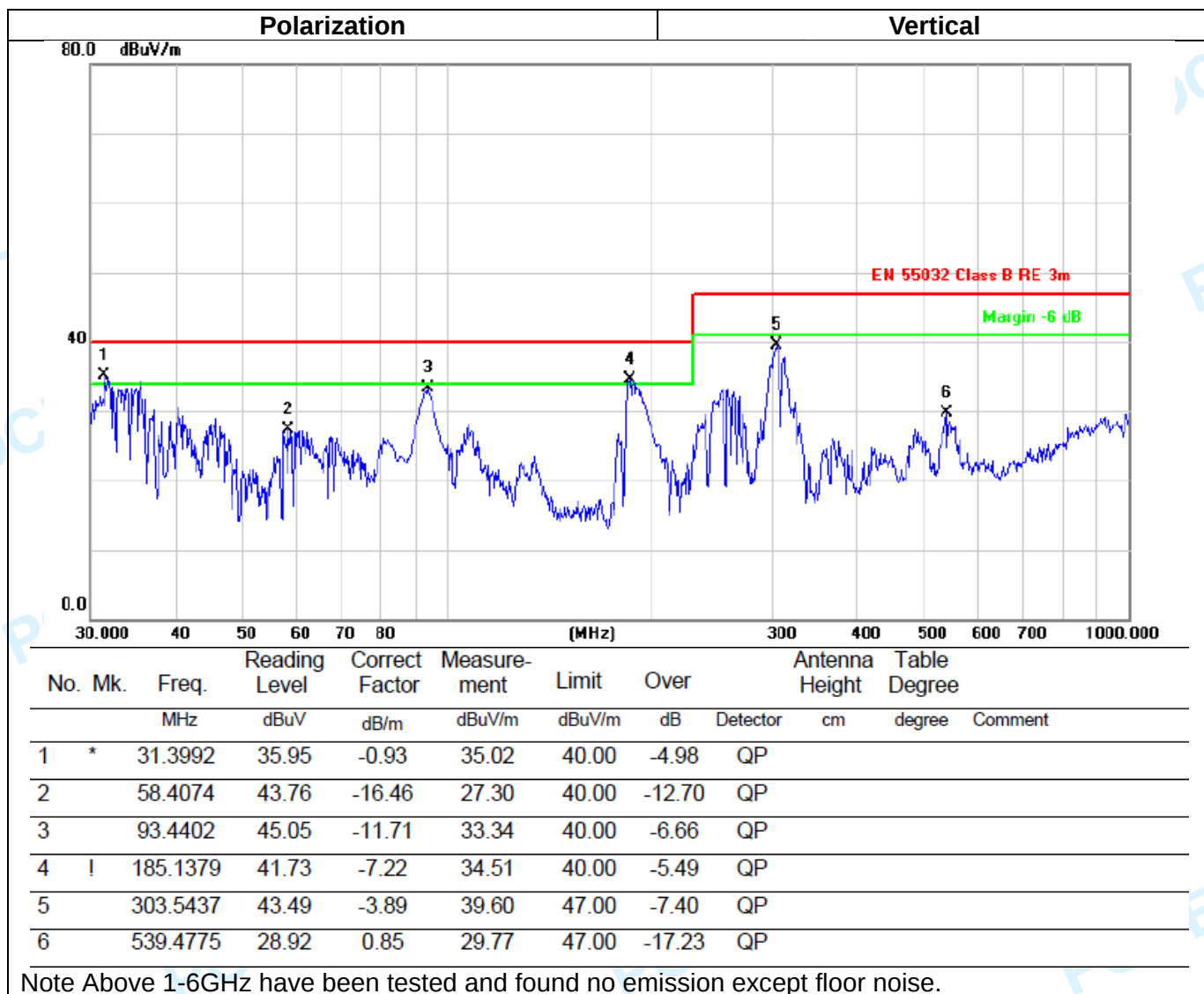
TEST RESULTS

---PASS---

Please refer to the below test data:

Mode 2:





3.1.3 Harmonic Current Emissions

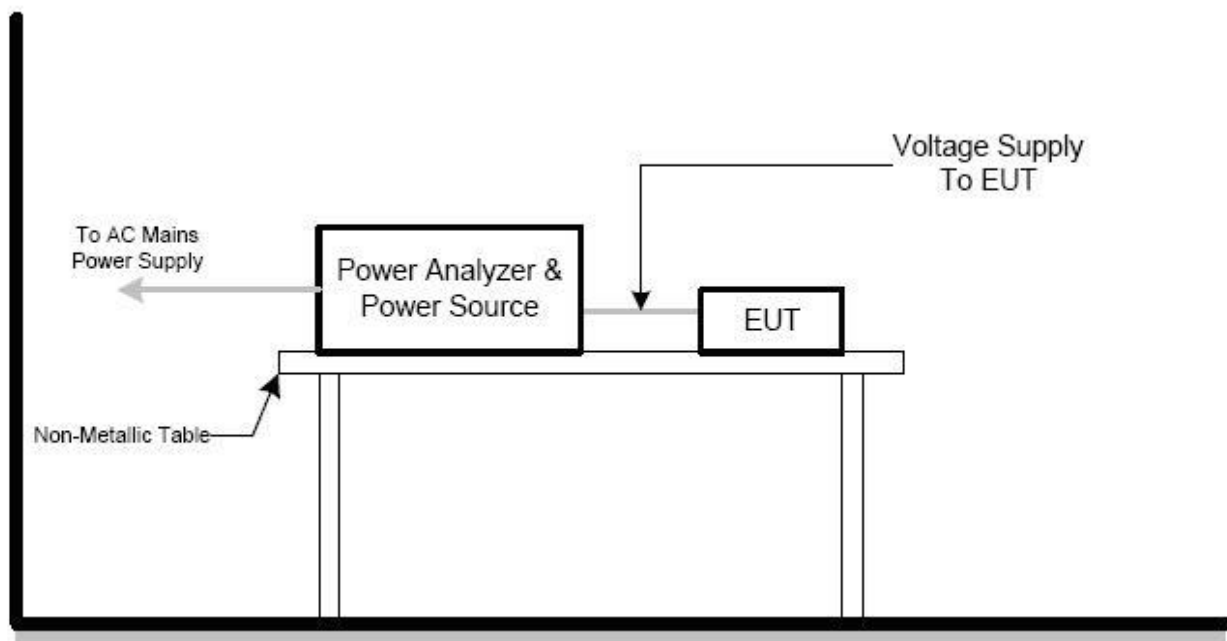
LIMITS

IEC 555-2					
Table - I			Table - II		
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)
Non Portable Tools or TV Receivers	Odd Harmonics		TV Receivers	Odd Harmonics	
	3	2.30		3	0.80
	5	1.14		5	0.60
	7	0.77		7	0.45
	9	0.40		9	0.30
	11	0.33		11	0.17
	13	0.21		13	0.12
	15≤n≤39	0.15 · 15/n		15≤n≤39	0.10 · 15/n
	Even Harmonics			Even Harmonics	
	2	1.08		2	0.30
4	0.43	4	0.15		
8	0.30				
8≤n≤40	0.23 · 8/n		DC	0.05	

EN 61000-3-2/IEC 61000-3-2					
Equipment Category	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in A) (mA/w)	
Class A	Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required	Class D	3	2.30	3.4
			5	1.14	1.9
			7	0.77	1.0
			9	0.40	0.5
			11	0.33	0.35
			13≤n≤39	see Table I	3.85/n
			only odd harmonics required		

TEST PROCEDURE

- The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.
- The classification of EUT is according to section 5 of EN 61000-3-2: 2000. The EUT is classified as follows:
 Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
 Class B: Portable tools. Portable tools. Arc welding equipment which is not professional equipment.
 Class C: Lighting equipment.
 Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.
- The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.
- For the actual test configuration, please refer to the related item –EUT Test Photos.

Block diagram of RS test setup**TEST RESULTS**

Not applicable to this device, which output power is less than 75W.

3.1.4 Voltage Fluctuations and Flicker

LIMITS

Tests	Limits		Descriptions
	IEC555-3	IEC/EN 61000-3-3	
Pst	≤ 1.0 , Tp= 10 min.	≤ 1.0 , Tp= 10 min.	Short Term Flicker Indicator
Plt	N/A	≤ 0.65 , Tp=2 hr.	Long Term Flicker Indicator
dc	$\leq 3\%$	$\leq 3.3\%$	Relative Steady-State V-Chang
dmax	$\leq 4\%$	$\leq 4\%$	Maximum Relative V-change
d (t)	N/A	$\leq 3.3\%$ for > 500 ms	Relative V-change characteristic

TEST PROCEDURE

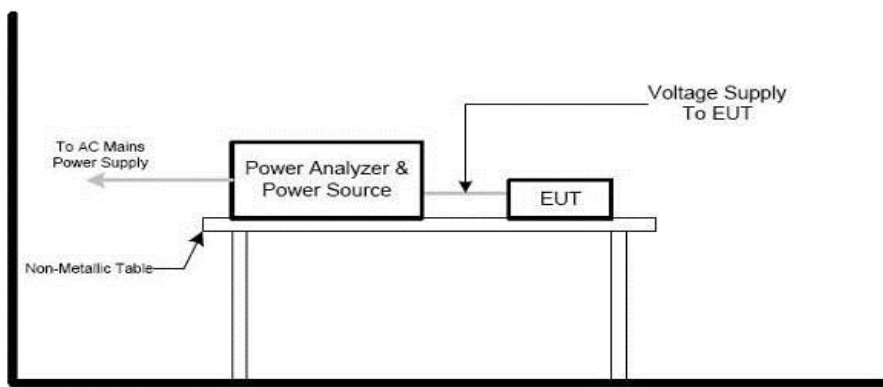
a) Fluctuation and Flickers Test:

Tests was performed according to the Test Conditions Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

b) All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

c) For the actual test configuration, please refer to the related Item –EUT Test Photos.

Block diagram of RS test setup



TEST RESULTS

---PASS---

Please reference to the following:

EN 61000-3-3:2013 - Voltage reduction is positive

Voltage Variations

Nominal Voltage: 230 Vrms

Highest Half-cycle level: +0.04%

Lowest Half-cycle level: +0.12%

d(max):	0.00%	Limit: 4%	PASS
t(max):	0.00seconds	Limit: 500ms	PASS

Steady State definition: >1000ms within +/- 0.2%

Largest d(c) change down: 0.00%

Largest d(c) change up: +0.00%

Largest d(c) change: 0.00% Limit: 3.3% PASS

3.2 EMC IMMUNITY TEST

3.2.1 Immunity Performance criteria

A. General Requirements (ETSI EN 301489-1):

The performance criteria are used to take a decision on whether a radio equipment passes or fails immunity tests.

For the purpose of the present document two categories of performance criteria apply:

- Performance criteria for continuous phenomena.
- Performance criteria for transient phenomena

NOTE: Normally, the performance criteria depends upon the type of radio equipment and/or its intended application. Thus, the present document only contains general performance criteria commonly used for the assessment of radio equipment.

(1) Performance criteria for continuous phenomena

During the test, the equipment shall:

- continue to operate as intended;
- not unintentionally transmit;
- not unintentionally change its operating state;
- not unintentionally change critical stored data.

(2) Performance criteria for transient phenomena

For all ports and transient phenomena with the exception described below, the following applies:

- The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data.
- After application of the transient phenomena, the equipment shall operate as intended.
- For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:
- For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.
- For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

B. EN301489-17

General performance criteria

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following.

Criteria	During test	After test
A	Shall operate as intended. (See note). Shall be no loss of function.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function.

	Shall be no unintentional transmissions.	Shall be no loss of critical stored data.
B	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data..
NOTE: Operate as intended during the test allows a level of degradation in accordance with clause 6.2.2.		

(1)Minimum performance level

For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %.

For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment.

(2)Performance criteria for Continuous phenomena

The performance criteria A shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur during the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur during the test.

(3)Performance criteria for Transient phenomena

The performance criteria B shall apply, except for voltage dips greater than or equal to 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur as a result of the application of the test.

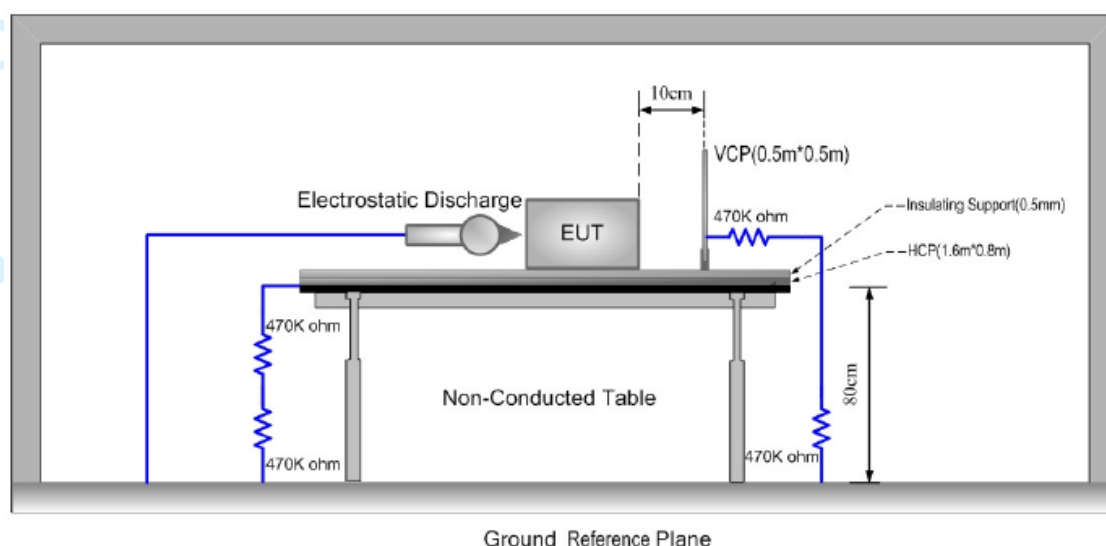
Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur as a result of the application of the test.

3.2.2 Electrostatic Discharge

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance	B
Discharge Voltage:	Air Discharge: 2kV/4kV/8kV (Direct) Contact Discharge: 2kV/4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 200 times in total
Discharge Period:	1 second minimum

Block diagram of RS test setup



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 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 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 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

Severity Levels and Performance Criterion

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

The test method shall be in accordance with CENELEC EN 61000-4-2 [2], clause 8.

Test Procedure

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- a) Contact discharge was applied to conductive surfaces and coupling planes of the EUT. During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges.

If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

- b) Air discharges at insulation surfaces of the EUT. It was at least ten single discharges with positive and negative at the same selected point.

Test Results

---PASS---

Please refer to the following :

Direct discharge				
Type of discharge	Discharge voltage (KV)	Observations Performance	Criteria Level	Result
Contact discharge	±2	B	B	Pass
	±4	B	B	
Air discharge	±2	B	B	
	±4	B	B	
	±8	B	B	
Indirect discharge				
Type of discharge	Discharge voltage (KV)	Observations Performance	Criteria Level	Result
HCP (6 sides)	±2	B	B	Pass
	±4	B	B	
VCP (4 sides)	±2	B	B	
	±4	B	B	

Note1: The EUT loss communication link a while and it can self-recoverable after test.

3.2.3 RF Electromagnetic Field

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-3
Required Performance	A
Frequency Range:	80 MHz - 6000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 3 seconds

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 six sides of the EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a audio analyzer is used to monitor SINAD values. All the scanning conditions are as following:

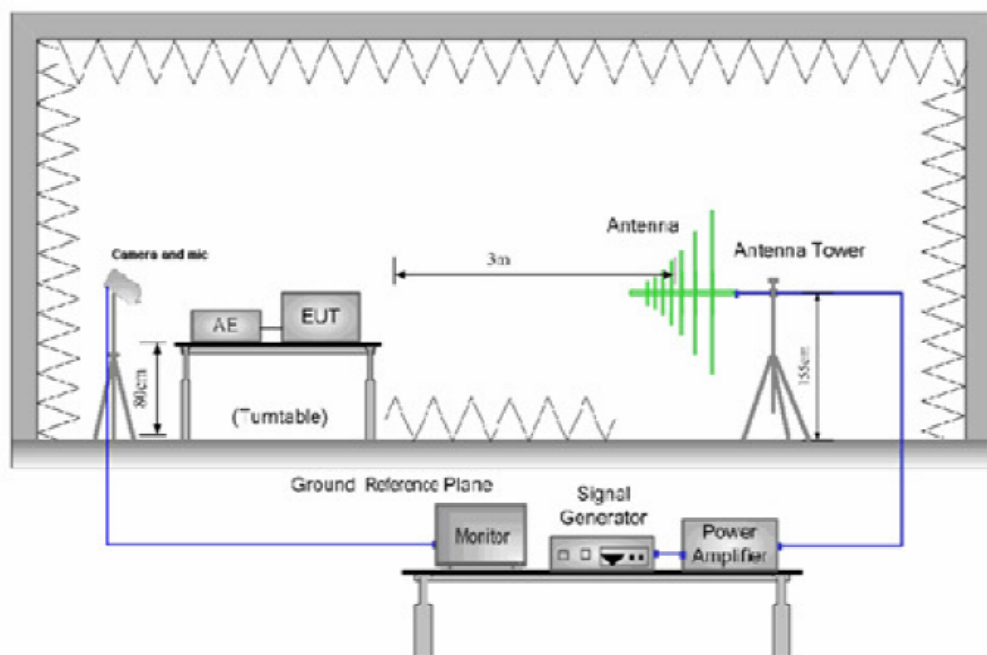
Condition of Test

Remark

1. Fielded Strength
2. Radiated Signal
3. Scanning Frequency
4. Sweep time of radiated
2. Dwell Time

3V/m (Severity Level 2)
Modulated
80-6000MHz
0.0015 Decade/s
1 Sec.

Block diagram of test setup



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/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/EN 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.

TEST RESULTS

---PASS---

Please refer to the below test data:

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Observations Performance	Perform. Criteria	Result
80~6000	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Top	A	A	PASS
			Front			
			Rear			
			Left			
			Right			
			Bottom			

Note1: The EUT can maintain communication link and not operate unintentionally during the test also can operate without any loss of user control functions after test.

3.2.4 Fast Transients Common Mode

TEST SPECIFICATION

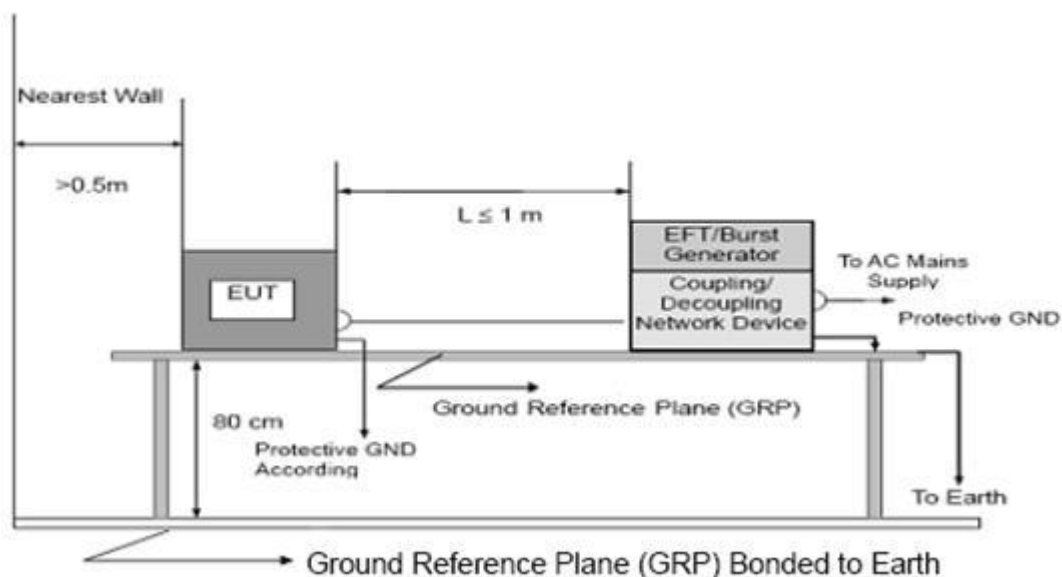
Basic Standard:	IEC/EN 61000-4-4
Required Performance	B
Test Voltage:	Power Line:1 kV Signal/Control Line:0.5 KV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave shape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

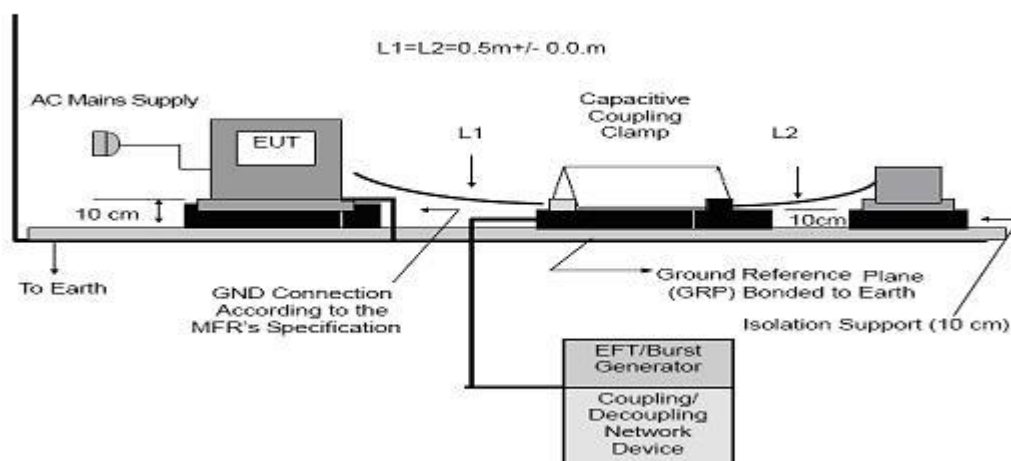
TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min. The other condition as following manner:

- The length of power cord between the coupling device and the EUT should not exceed 1 meter.
- Both positive and negative polarity discharges were applied.
- The duration time of each test sequential was 1 minute
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Block diagram of RS test setup





Note:

TABLE-TOP EQUIPMENT

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

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 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 0.25mm thick and 2.5m square) connected to the protective grounding system.

TEST RESULTS

---PASS---

Please refer to the below test data:

Lead under Test	Level ($\pm$ kV)	Coupling Direct/Clamp	Observations (Performance Criterion)	Result
L	± 1	Direct	B	Pass
N	± 1	Direct	B	Pass
L+N	± 1	Direct	B	Pass

Note1: The EUT can maintain communication link and not operate unintentionally during the test also can operate without any loss of user control functions after test.

3.2.5 Surge Testing

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-5
Required Performance	B
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	Power Port ~ Line to line: 1kV, Line to ground: 2kV
Surge Input /Output:	L-N
Generator Source:	2 ohm between networks
Impedance:	12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0 /90/180/270
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

TEST PROCEDURE

a) For EUT power supply:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2meters in length (or shorter).

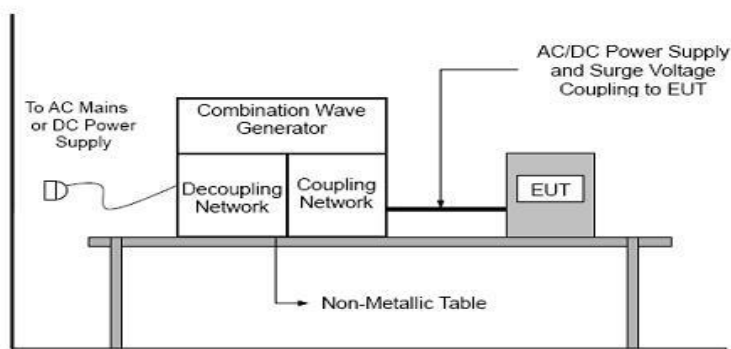
b) For test applied to unshielded unsymmetrical operated interconnection lines of EUT:

The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

c) For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT: The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

d) For the actual test configuration, please refer to the related Item –EUT Test Photos.

Block diagram of RS test setup



TEST RESULTS**---PASS---**

Please refer to the below test data:

Location	Level (kV)	Pulse No	Surge Interval	Phase (deg)	Observations (Performance Criterion)	Result
L-N	± 1	5	60s	0°	B	Pass
				90°	B	Pass
				180°	B	Pass
				270°	B	Pass

Note1: The EUT can maintain communication link and not operate unintentionally during the test also can operate without any loss of user control functions after test.

3.2.6 RF Common Mode**TEST SPECIFICATION**

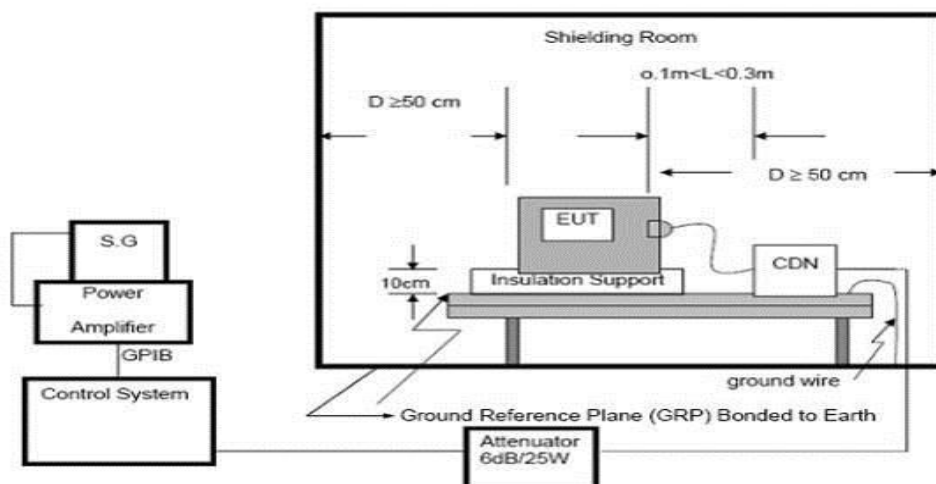
Basic Standard:	IEC/EN 61000-4-6
Required Performance	A
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3 V rms
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Dwell Time:	at least 3 seconds

TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min. The other condition as following manner:

- The field strength level was 3V.
- The frequency range is swept from 150 KHz to 80 MHz, with the signal 80%amplitude modulated with a 1kHz 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 fundamental.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Block diagram of RS test setup



For the actual test configuration, please refer to the related Item –EUT Test Photos.

NOTE:

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.

TEST RESULTS

---PASS---

Please refer to the below test data:

Test Ports (Mode)	Freq. Range (MHz)	Field Strength	Coupling type	Observations Performance	Perform. Criteria	Results
Input/ Output AC. Power Port	0.15-80	3V(rms) AM Modulated 1000Hz, 80%	CDN	A	A	PASS
Input/ Output DC. Power Port			CDN	N/A	N/A	N/A

Note1: The EUT can maintain communication link and not operate unintentionally during the test also can operate without any loss of user control functions after test.

3.2.7 Voltage Dips and Interruptions

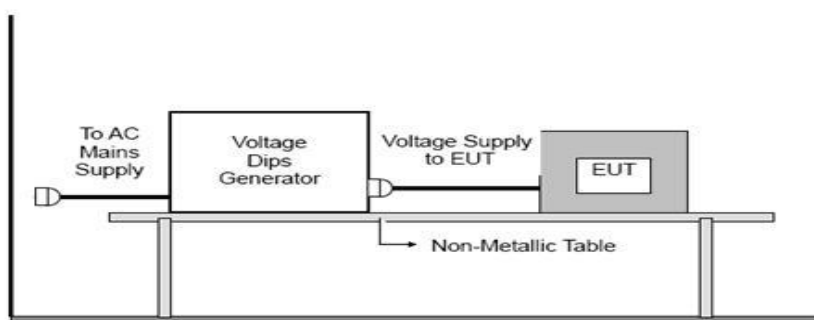
TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-11
Required Performance	B (For 0% Voltage Dips) C (For 70% Voltage Dips) C (For 0% Voltage Interruptions)
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°/360°
Test Cycle:	3 times

TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

Block diagram of RS test setup



For the actual test configuration, please refer to the related Item –EUT Test Photos.

TEST RESULTS

---PASS---

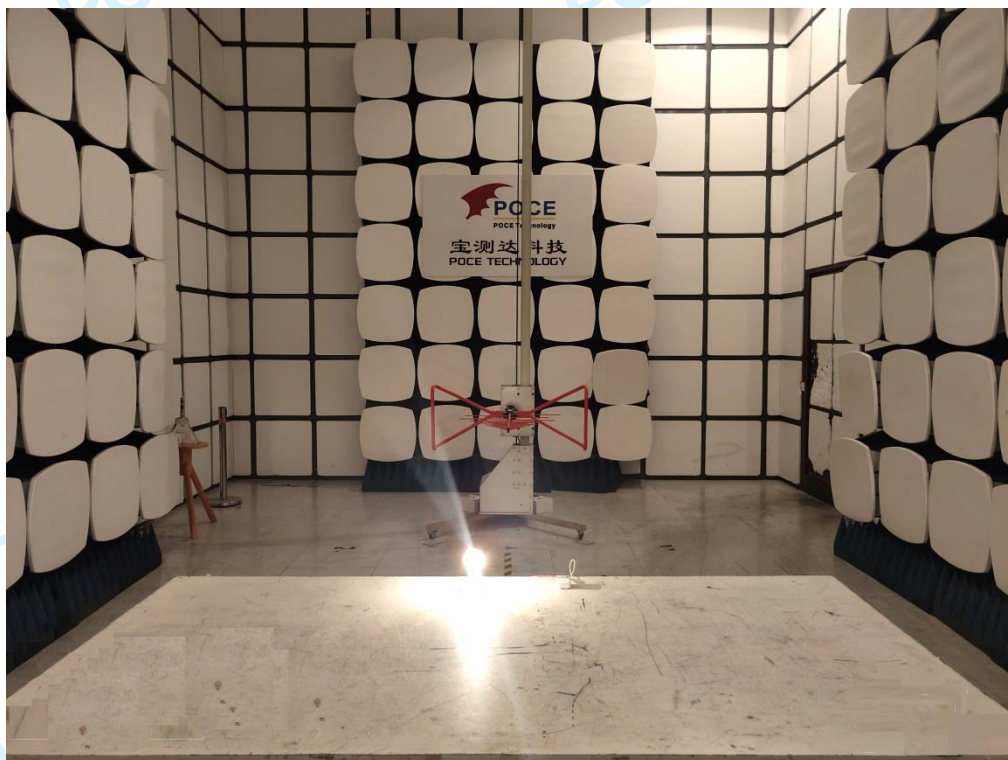
Please refer to the below test data:

Voltage Reduction	Duration (ms)	Perform Criteria	Observations Performance	Results
Voltage dip 0%	10	B	A	PASS
Voltage dip 0%	20	B	A	PASS
Voltage dip 70%	500	B	B	PASS
Voltage interruptions	5000	C	B	PASS

Note1: The EUT loss communication link a while and it can self-recoverable after test.

4. TEST SETUP PHOTOS

Radiated Emission 30MHz-1GHz



Radiated Emission 1GHz-6GHz



Conducted disturbance (AC main)



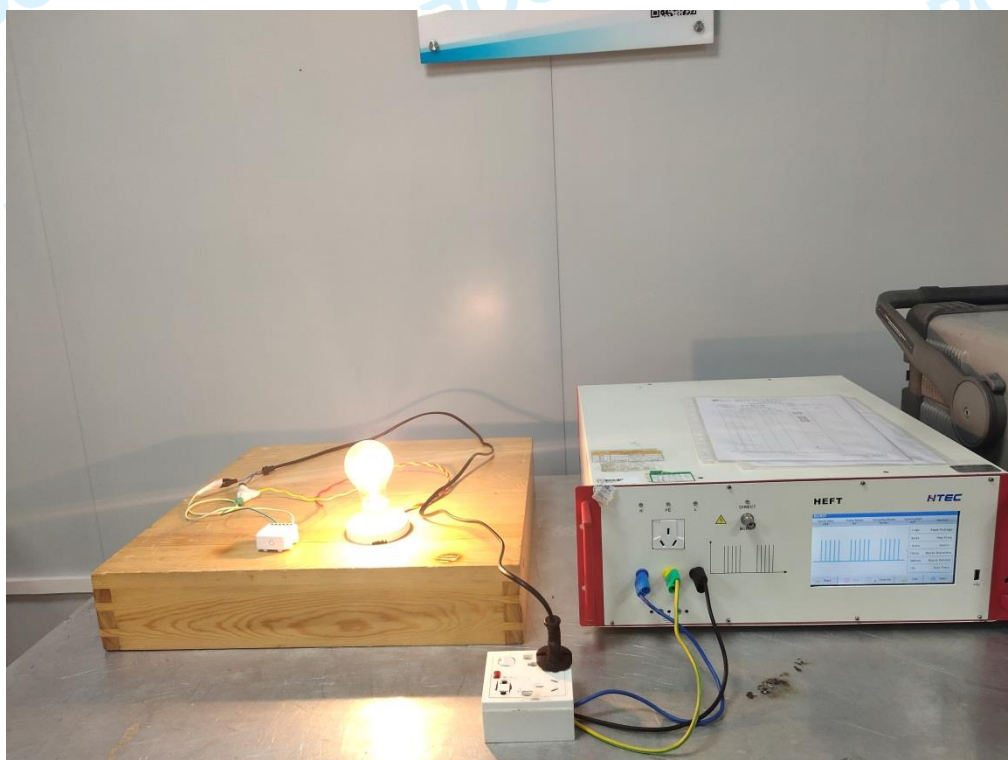
Harmonic Current Emission and Voltage Fluctuation and Flicker



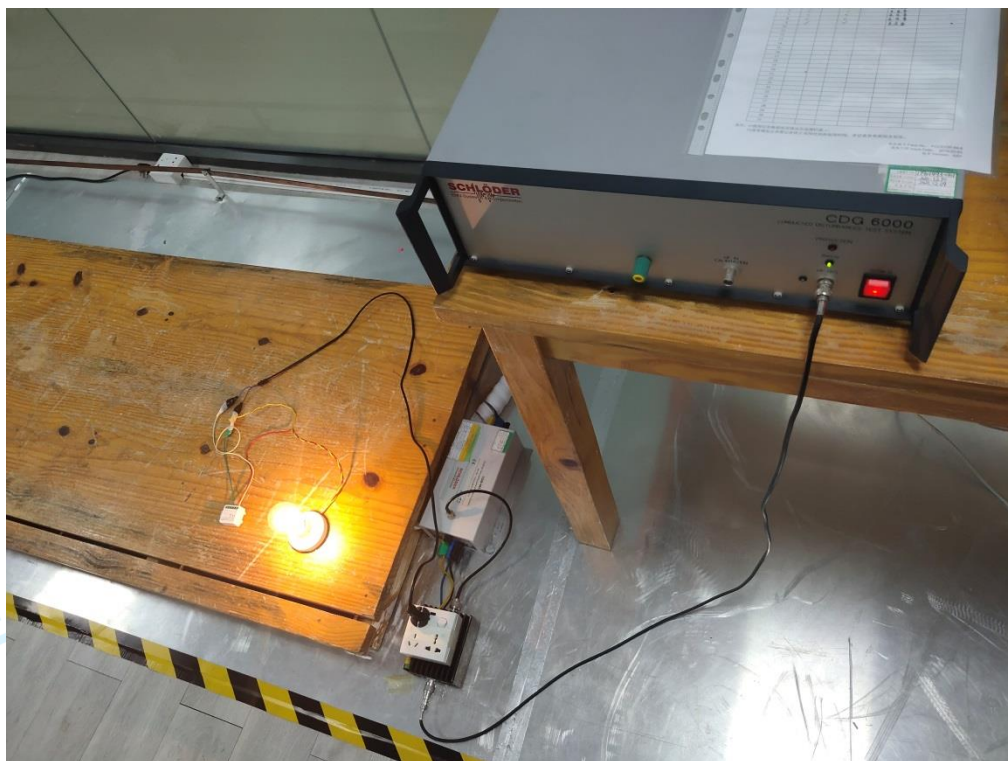
Electrostatic discharge



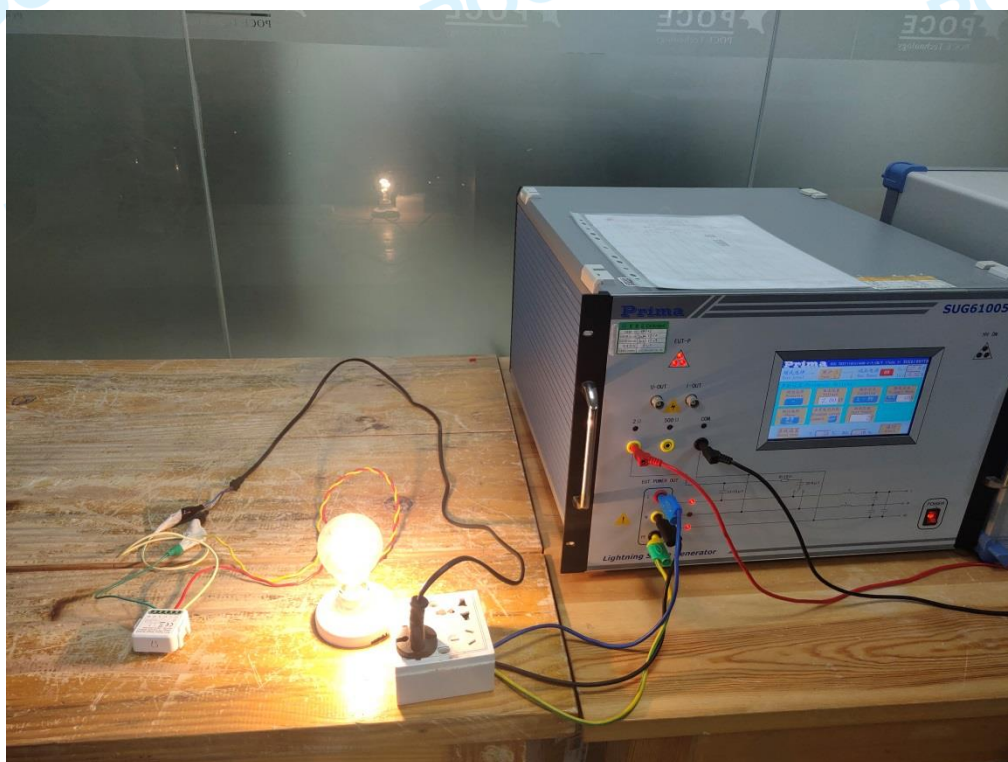
Fast Transients Common Mode



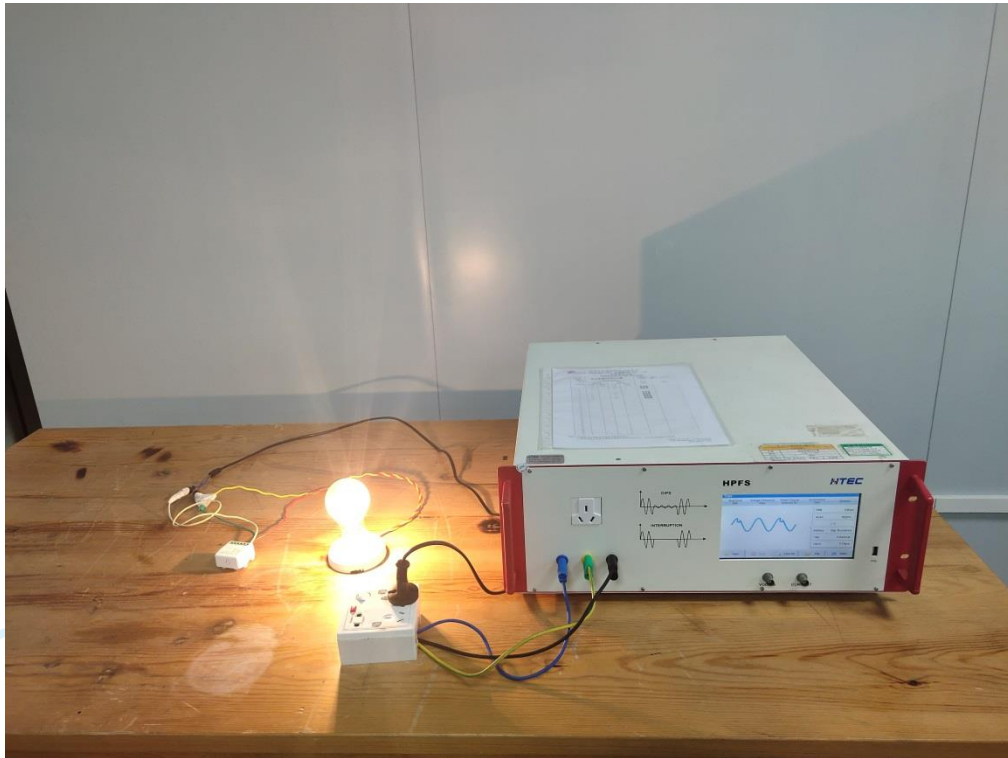
RF Common Mode 0,15 MHz to 80 MHz



Surges

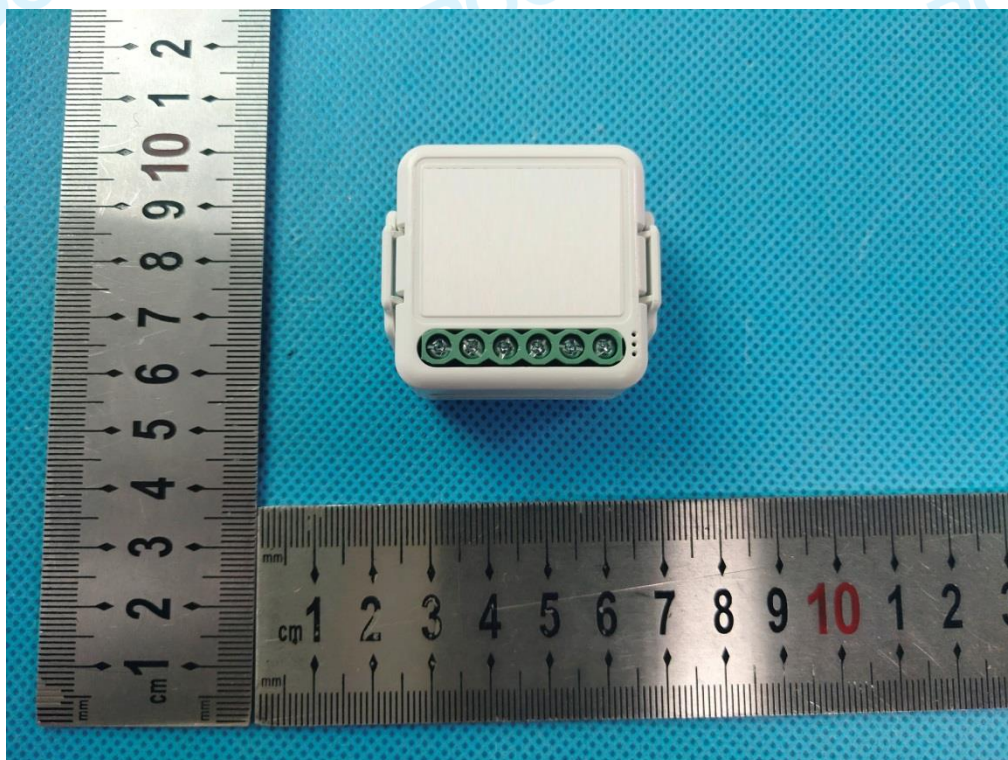


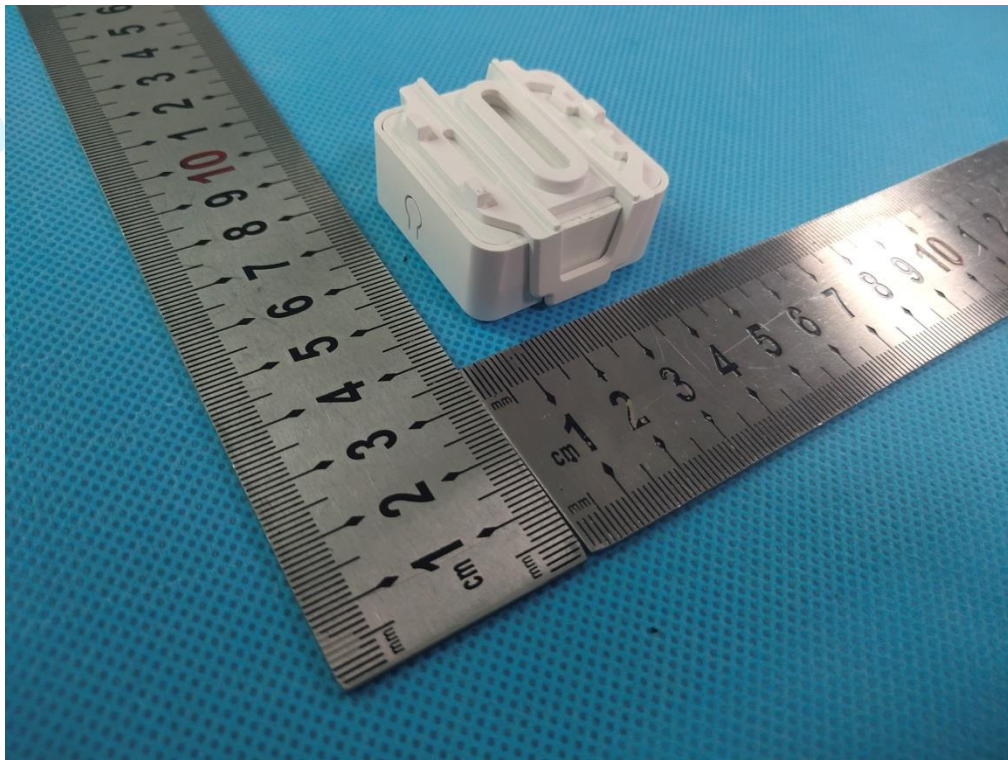
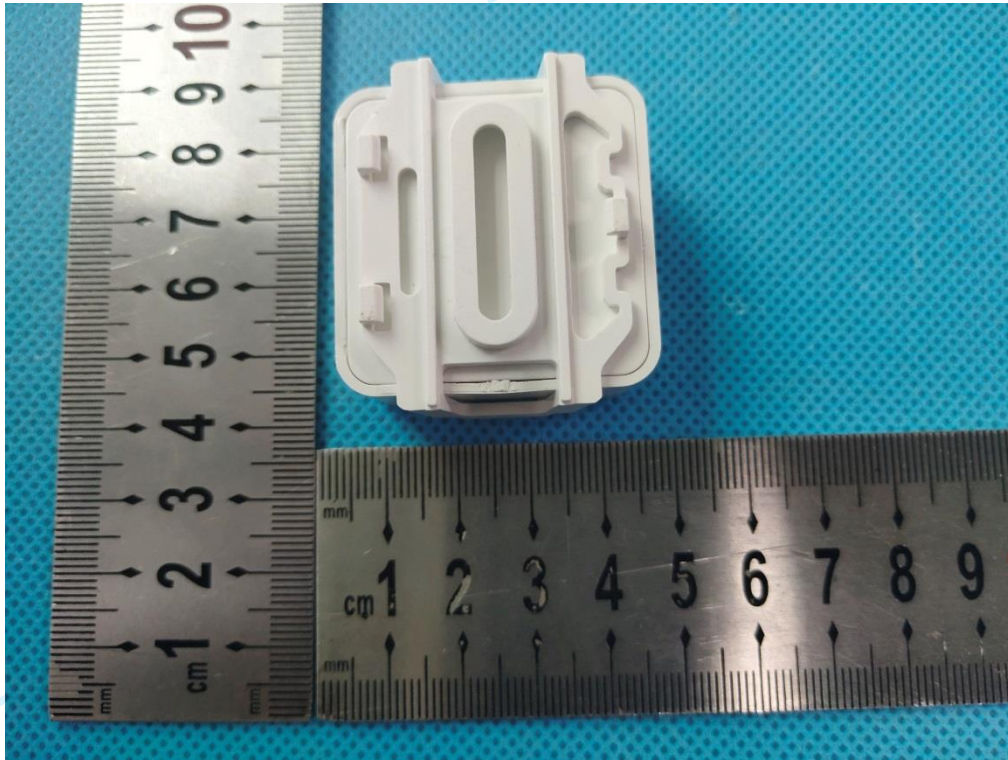
Voltage Dips and Interruptions

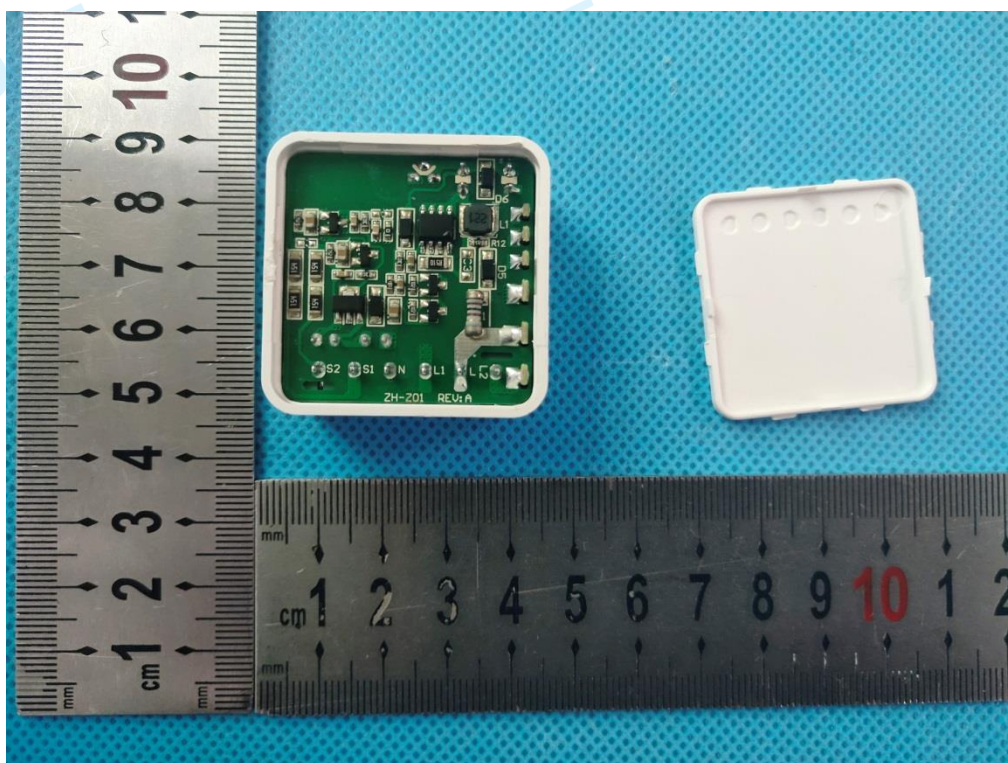
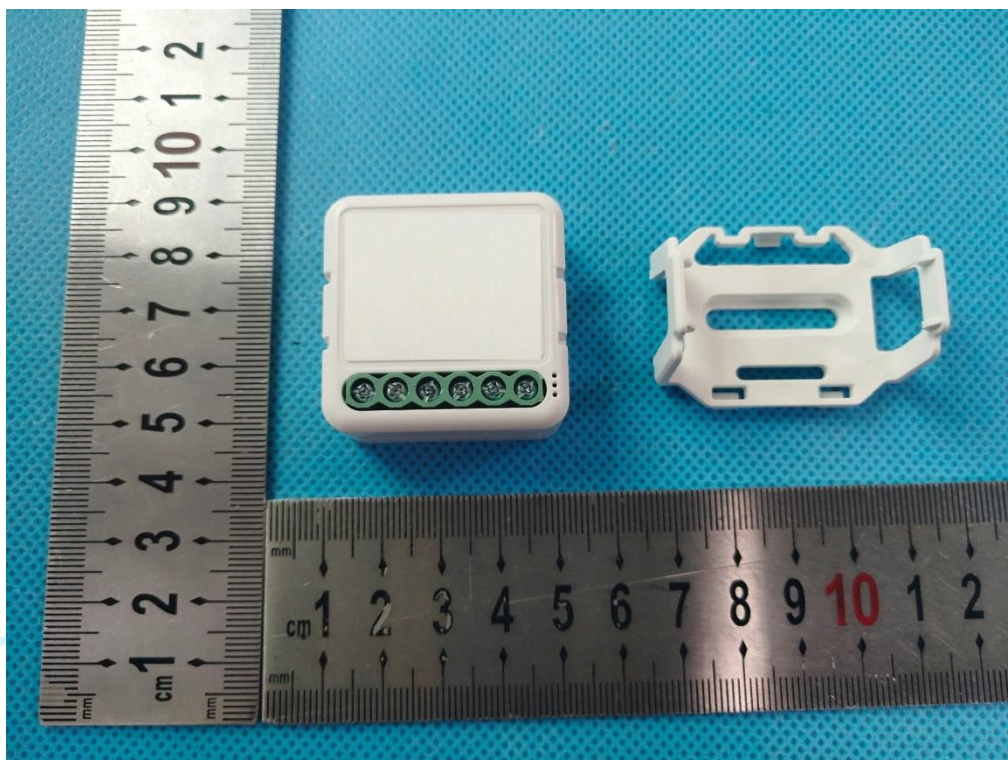


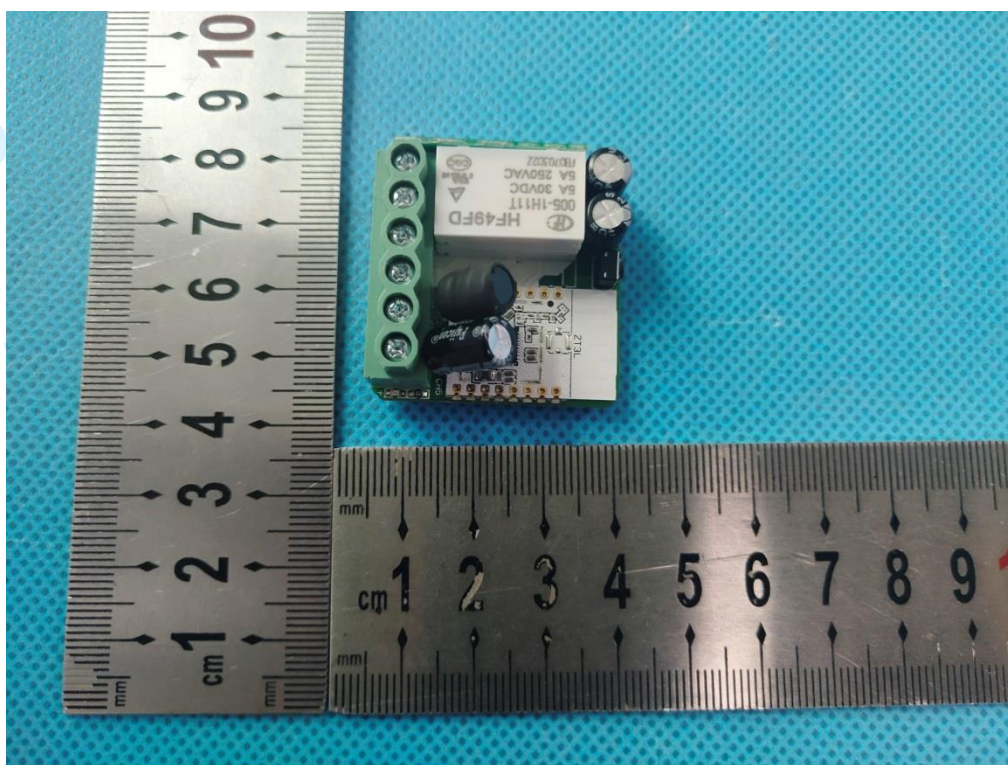
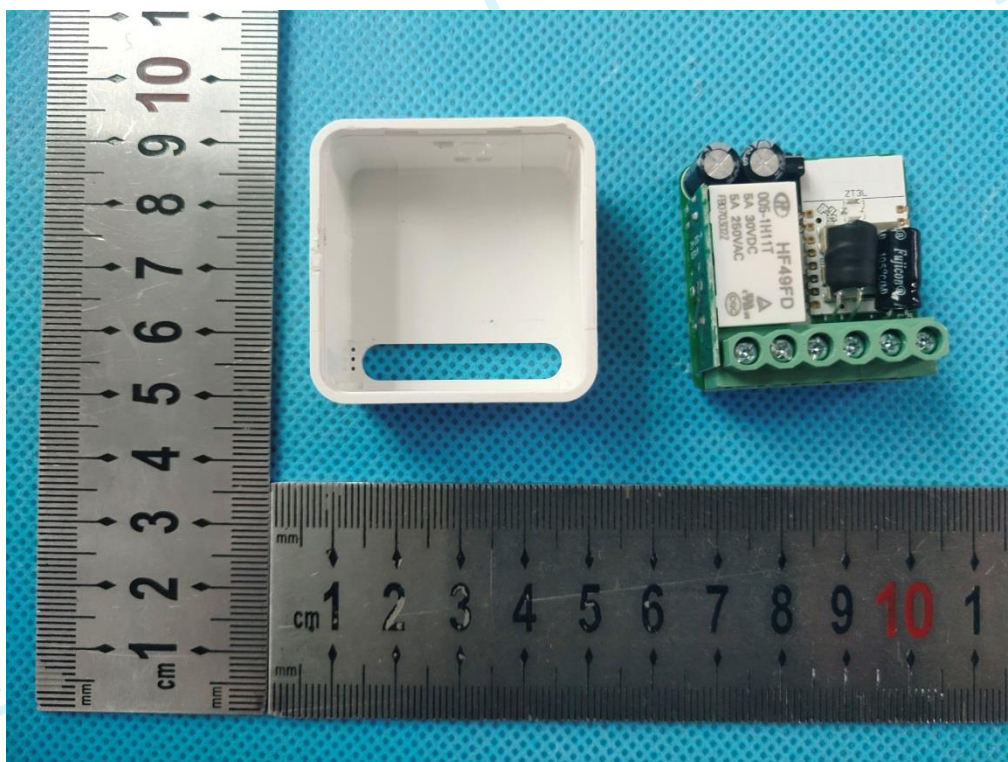
5. PHOTOSOF THE EUT

External Photos of EUT

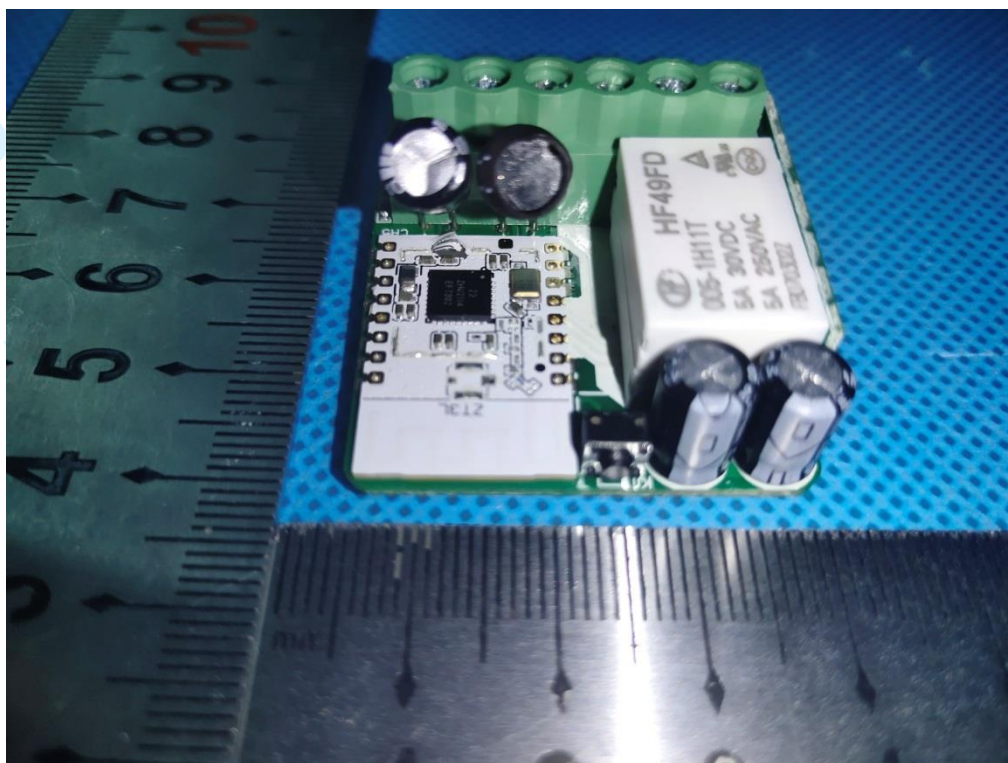
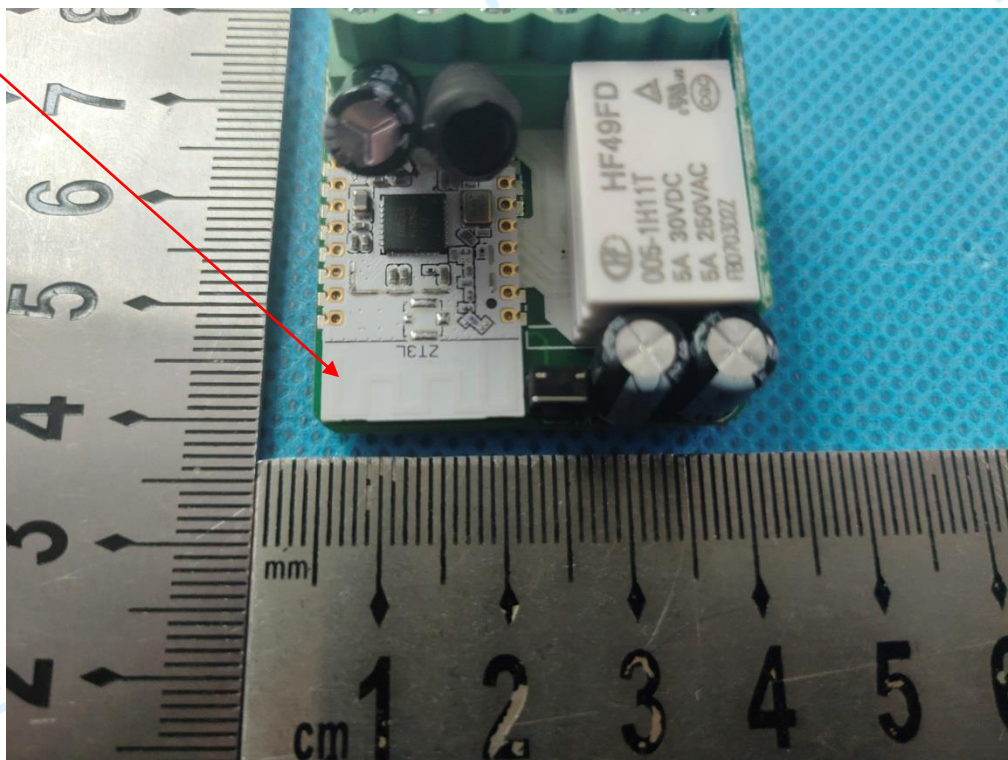


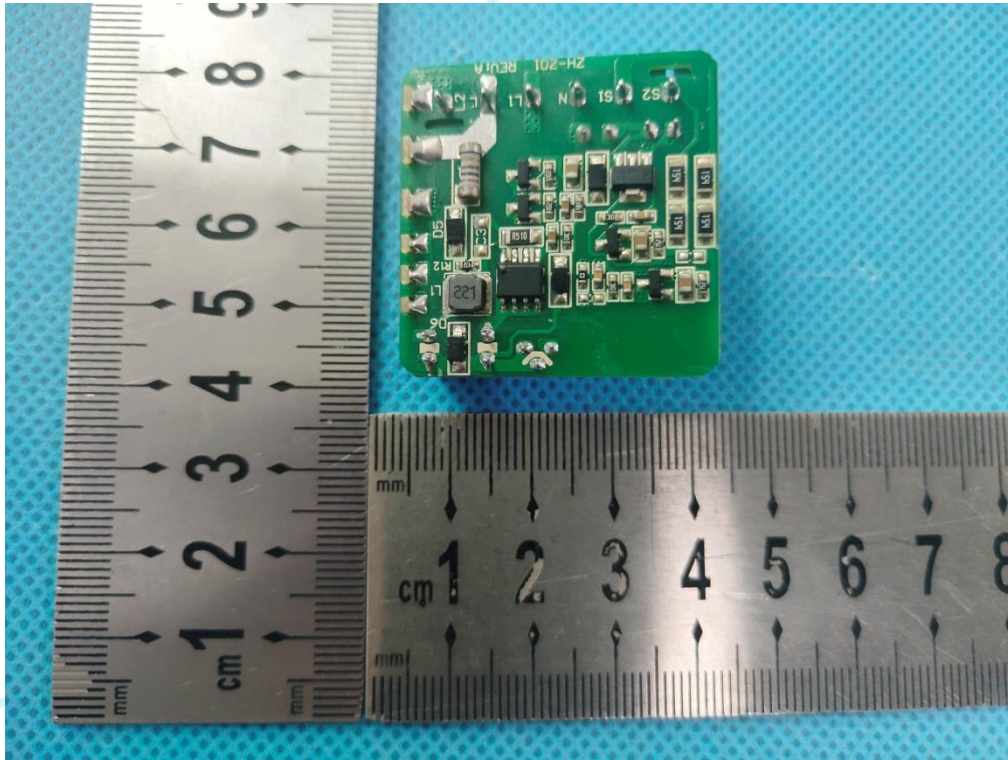


Internal Photos of EUT



Antenna





***** End of Report *****