EMC Test Report

Certificate No.	:	TB171117271
Applicant	:	JER EDUCATION TECHNOLOGY CO.,LIMITED
Equipment Under Test (EUT)		
EUT Name	:	3D pen
Model No.	:	RP800A
Serial Model No.		N/A
Brand Name	:	JER
Receipt Date	:	2017-11-11
Test Date	:	2017-11-11 to 2017-11-16
Issue Date	:	2017-11-16
Standards	:	EN 55032:2015 EN 61000-3-2:2014 EN 61000-3-3:2013 EN 55024:2010+A1:2015
Conclusions	:	**PASS** In the configuration tested, the EUT complied with the standards specified above. The EUT technically complies with the 2014/30/EU directive requirements
Test/Witness Engineer	:	Rebeca
Approved & Authorized	:	

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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Revision History

Report No.	Version	Description	Issued Date
TB-EMC157007	Rev.01	Initial issue of report	2017-11-16

1. General Information

1.1. Client Information

Applicant	:	JER EDUCATION TECHNOLOGY CO.,LIMITED
Address	:	FLAT/RM 826 8/F OCEAN CENTRE HARBORUR CITY 5 CANTON ROAD TST KL HK
Manufacturer	:	JER EDUCAITON TECHNOLOGY CO., LIMITED
Address	:	2nd Floor, Block D, No.9 Henggangtou, Xintang Avenue, Tianhe District, Guangzhou City, China

1.2. General Description of EUT (Equipment Under Test)

EUT Name	:	3D pen
Model(s)	:	RP800A
Model Difference	:	N/A
Class of EUT	:	☐ Class A ☒ Class B
EUT Type	:	☒ Table top ☐ Floor standing ☐ combination
F_X	:	≤108 MHz
Power Supply	:	Input: AC 100-240V, 50/60Hz, 0.5A Output: DC 5V, 2A
F_X: Highest internal frequency.		

1.3. Description of Operating Mode

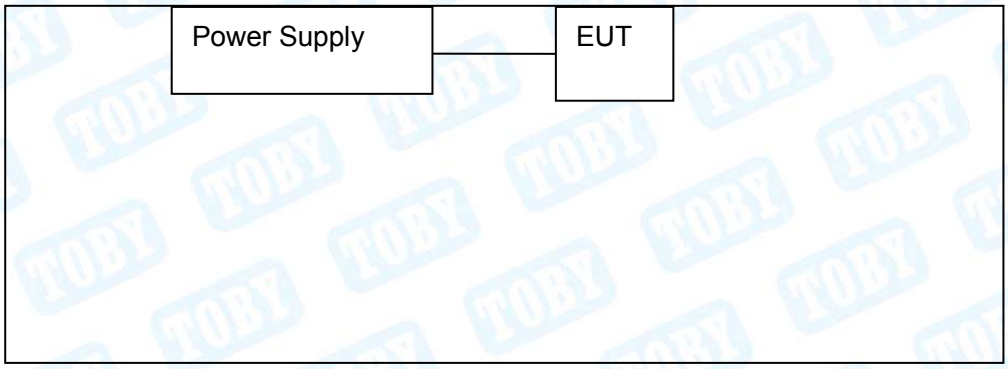
To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Working Mode

The EUT system operated these modes were found to be the worst case during the pre-scanning test as Following:

For EMI Test	
Final Test Mode	**Description**
Mode 1	Working Mode
For EMS Test	
Final Test Mode	**Description**
Mode 1	Working Mode

1.4. Block Diagram Showing The Configuration of System Tested



1.5. Description of Support Units

Equipment Information				
Name	**Model**	**S/N**	**Manufacturer**	**Used "√"**
LCD Monitor	E170Sc	----	DELL	
PC	OPTIPLEX380	----	DELL	
Keyboard	L100	U01C	DELL	
Mouse	M-UARDEL7	----	DELL	
TV	K600S	----	KONKA	
Camera	PA75895	----	JUNSHI	
Cable Information				
Number	**Shielded Type**	**Ferrite Core**	**Length**	**Note**
Cable 1	YES	YES(2)	1.8M	
Cable 2	YES	YES(1)	2.0M	
Cable 3	YES	NO	1.5M	
Cable 4	NO	NO	0.5M	

1.6. Performance Criterion

Criterion A: The equipment shall continue to operate as intended without operator intervention. No degradation of performance of loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.

Criterion B: After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended.

Criterion C: Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.

1.7. Measurement Uncertainty

The reported uncertainty of measurement y ± U，where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2，providing a level of confidence of approximately 95 %.

Test	Parameters	Expanded Uncertainty (U_{Lab})	Expanded Uncertainty (U_{Cispr})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	±3.42 dB ±3.42 dB	±4.0 dB ±3.6 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB	N/A
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.40 dB	±5.2 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.20 dB	N/A
Mains Harmonic	Voltage	±3.11%	N/A
Voltage Fluctuations & Flicker	Voltage	±3.25%	N/A

1.8. Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)
The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

FCC List No.: (811562)
The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562.

IC Registration No.: (11950A-1)
The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.

2. TEST Results Summary

EMISSION (☒EN 55032:2015)			
Description of test items	**Standards**	**Class**	**Results**
Conducted disturbance at mains terminals	EN 55032: 2015	☐ Class A ☒ Class B	Pass(1)
Conducted disturbance for asymmetric mode	EN 55032: 2015	☐ Class A ☐ Class B	N/A(2)
Conducted differential voltage emission	EN 55032: 2015	Class B	N/A(2)
Radiated Disturbance	EN 55032: 2015	☐ Class A ☒ Class B	Pass
Harmonic current emissions	EN 61000-3-2: 2014	☐ Class A ☐ Class D	N/A(4)
Voltage fluctuation and flicker	EN 61000-3-3: 2013		Pass

Note:
(1) Class A/Class B: Applicable to AC mains power ports
(2) Class A: Applicable to wired network ports, optical fibre ports with metallic shield or tension members and antenna ports.
Class B: Applicable to wired network ports, optical fibre ports with metallic shield or tension members, broadcast receiver tuner ports and antenna ports.
Applicable to ports listed above and intended to connect to cables longer than 3 m.
(3) Class B: Applicable to TV broadcast receiver tuner ports with an accessible connector, RF modulator output ports and FM broadcast receiver tuner ports with an accessible connector.
(4) 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 D: Equipment having a specified power less than or equal to600 W of the following types: Personal computers and personal computer monitors and television receivers.

IMMUNITY (☒EN 55024:2010+A1:2015)		
Description of test items	**Standards**	**Results**
Electrostatic Discharge (ESD)	EN 61000-4-2: 2009	Pass
Radio-frequency, Continuous radiated disturbance	EN 61000-4-3: 2006+A2:2008+ A2: 2010	Pass
EFT/B Immunity	EN 61000-4-4: 2012	Pass
Surge Immunity	EN 61000-4-5: 2014	Pass
Conducted RF Immunity	EN 61000-4-6: 2014	Pass
Power frequency magnetic field	EN 61000-4-8: 2010	N/A(1)
Voltage dips, >95% reduction	EN 61000-4-11: 2004	Pass
Voltage dips, 30% reduction		
Voltage interruptions		
Note: N/A is an abbreviation for Not Applicable. (1) Not applicable, the EUT is not containing devices susceptible to magnetic fields.		

3. Test Equipment Used

Conducted Emission Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal.Due Date**
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul. 20, 2017	Jul. 19, 2018
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul. 20, 2017	Jul. 19, 2018
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 20, 2017	Jul. 19, 2018
LISN	Rohde & Schwarz	ENV216	101131	Jul. 21, 2017	Jul. 20, 2018
ISN	SCHWARZBECK	NTFM 8131	8131-193	Jul. 03, 2017	Jul. 02, 2018
ISN	SCHWARZBECK	CAT3 8158	cat3 8158-0094	Jul. 03, 2017	Jul. 02, 2018
ISN	SCHWARZBECK	NTFM8158	NTFM8158 0145	Jul. 03, 2017	Jul. 02, 2018
ISN	SCHWARZBECK	CAT 8158	cat5 8158-179	Jul. 03, 2017	Jul. 02, 2018
Radiation Emission Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal.Due Date**
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 20, 2017	Jul. 19, 2018
EMI Test Receiver	Rohde & Schwarz	ESCI	101165	Jul. 20, 2017	Jul. 19, 2018
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar.25, 2017	Mar. 24, 2018
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar.25, 2017	Mar. 24, 2018
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar.24, 2017	Mar. 23, 2018
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar.24, 2017	Mar. 23, 2018
Pre-amplifier	HP	11909A	185903	Mar.24, 2017	Mar. 23, 2018
Pre-amplifier	HP	8449B	3008A00849	Mar.25, 2017	Mar. 24, 2018
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 24, 2017	Mar. 23, 2018
Signal Generator	Rohde & Schwarz	SML03	IKW682-054	Mar. 24, 2017	Mar. 23, 2018
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Harmonic Current and Voltage Fluctuation and Flicker Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal.Due Date**
Harmonic Flicker Test System	CI	5001ix-CTS-400	100321	Jul. 20, 2017	Jul. 19, 2018
5K VA	CI	500liX	59468	Jul. 20, 2017	Jul. 19, 2018

Discharge Immunity Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal.Due Date**
ESD Generator	HAFELY	PESD 1610	H808671	Mar. 27, 2017	Mar.26, 2018
ESD Tester	TESEQ	NSG437	304	Jul. 21, 2017	Jul. 20, 2018
Radiated Immunity Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal.Due Date**
Signal Generator	Rohde & Schwarz	SMT03	200754	Mar. 24, 2017	Mar. 23, 2018
Power Meter	Rohde & Schwarz	NRVD	110562	Feb. 14, 2017	Feb. 13, 2018
Voltage Probe	Rohde & Schwarz	URV5-Z2	12056	Feb. 14, 2017	Feb. 13, 2018
Voltage Probe	Rohde & Schwarz	URV5-Z2	12074	Feb. 14, 2017	Feb. 13, 2018
RF Amplifier	AR	50S1G4A	326720	Feb. 14, 2017	Feb. 13, 2018
Bilog Antenna	ETS	3142C	00047662	Feb. 14, 2017	Feb. 13, 2018
Horn Antenna	ARA	DRG-118A	16554	Feb. 14, 2017	Feb. 13, 2018
Electrical Fast Transient/ Surge/ Voltage Dip and Interruption Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal.Due Date**
Simulator	EMTEST	UCS500N5	V0948105575	Jul. 20, 2017	Jul. 19, 2018
Auto-transformer	EMTEST	V4780S2	0109-41	Jul. 20, 2017	Jul. 19, 2018
Coupling Clamp	EMTEST	HFK	1109-04	Jul. 20, 2017	Jul. 19, 2018
Conducted Immunity Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal.DueDate**
RF Generator	FRANKONIA	CIT-10/75	126B1126	Jul. 20, 2017	Jul. 19, 2018
Attenuator	FRANKONIA	59-6-33	A413	Jul. 20, 2017	Jul. 19, 2018
M-CDN	LUTHI	L-801 M2/M3	2599	Jul. 20, 2017	Jul. 19, 2018
AF2-CDN	LUTHI	L-801:AF2	2538	Mar.25, 2017	Mar. 24, 2018
EM Injection Clamp	LUTHI	EM101	35958	Jul. 20, 2017	Jul. 19, 2018

4. Conducted Emission from the AC Mains Power Ports

4.1. Test Standard and Limit

4.1.1. Test Standard

EN 55032: 2015

4.1.2. Test Limit

Conducted Disturbance Test Limit (Class A)

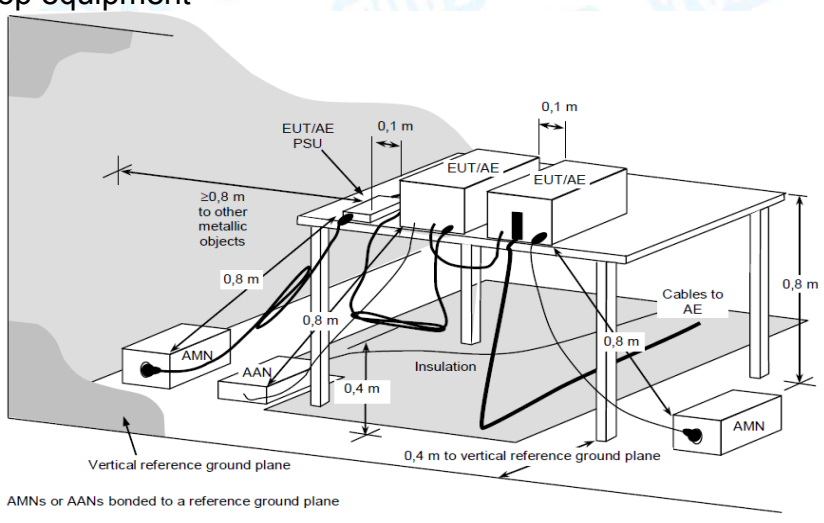
Frequency (MHz)	Maximum RF Line Voltage (dBμV)	
	Quasi-peak Level	Average Level
0.15~0.50	79	66
0.50~30	73	60
NOTE The lower limit shall apply at the transition frequency.		

Conducted Disturbance Test Limit (Class B)

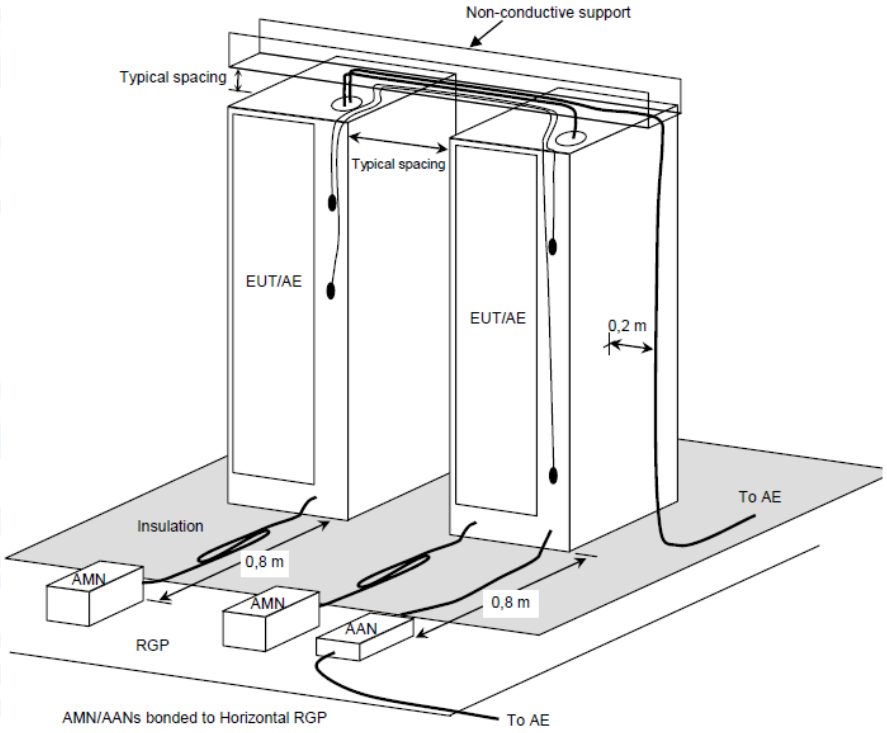
Frequency (MHz)	Maximum RF Line Voltage (dBμV)	
	Quasi-peak Level	Average Level
0.15~0.5	66 ~ 56 *	56 ~ 46 *
0.50~5	56	46
5~30	60	50
NOTE 1 The lower limit shall apply at the transition frequencies. NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

4.2. Test Setup

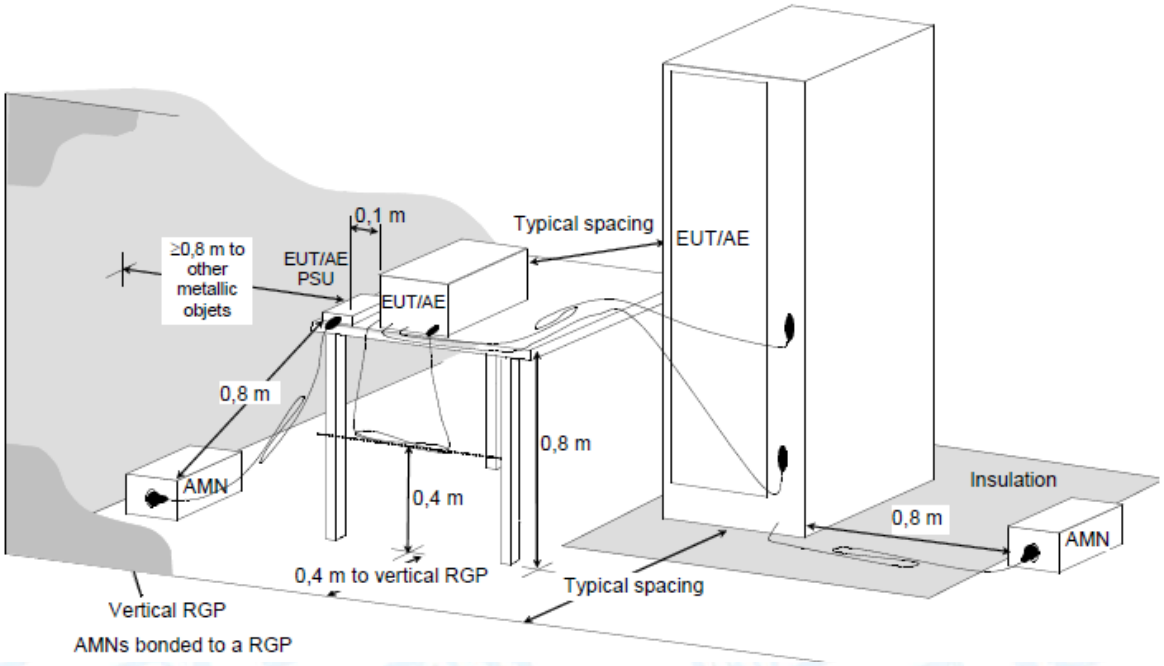
☒ For table top equipment



☐ For floor standing equipment



☐ For combination equipment



4.3. Test Procedure

Detailed test procedure was following clause 7 of CISPR 16-2-1.

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.
The bandwidth of EMI test receiver is set at 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

4.4. Test Data

Please refer to the Attachment A.

5 Conducted Emissions for Asymmetric Mode

5.1 Test Standard and Limit

5.1.1. Test Standard

EN 55032: 2015

5.1.2. Limits

Limits for class A equipment

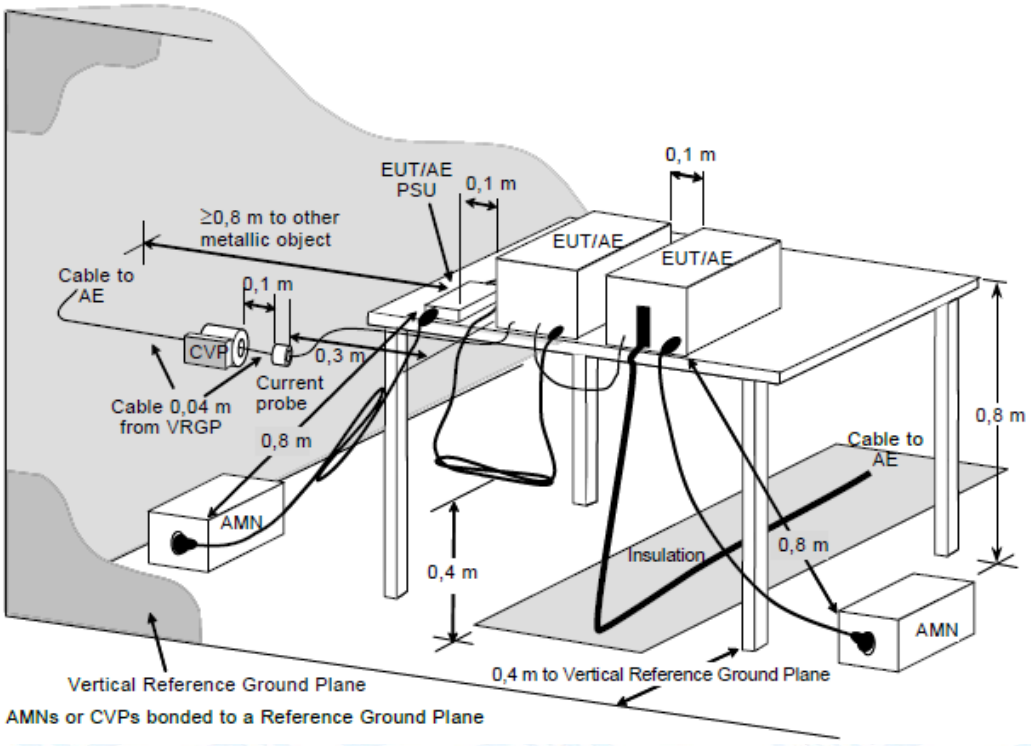
Frequency range (MHz)	Voltage Limits dB(μV)		Current limits dB(μA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	97 ~ 87	84 ~ 74	53 ~ 43	40 ~ 30
0.5 ~ 30	87	74	43	30
Note: if "150Ω to 50Ω adaptor" applied, correction factor of 9.5dB should be added to the test data.				

Limits for class B equipment

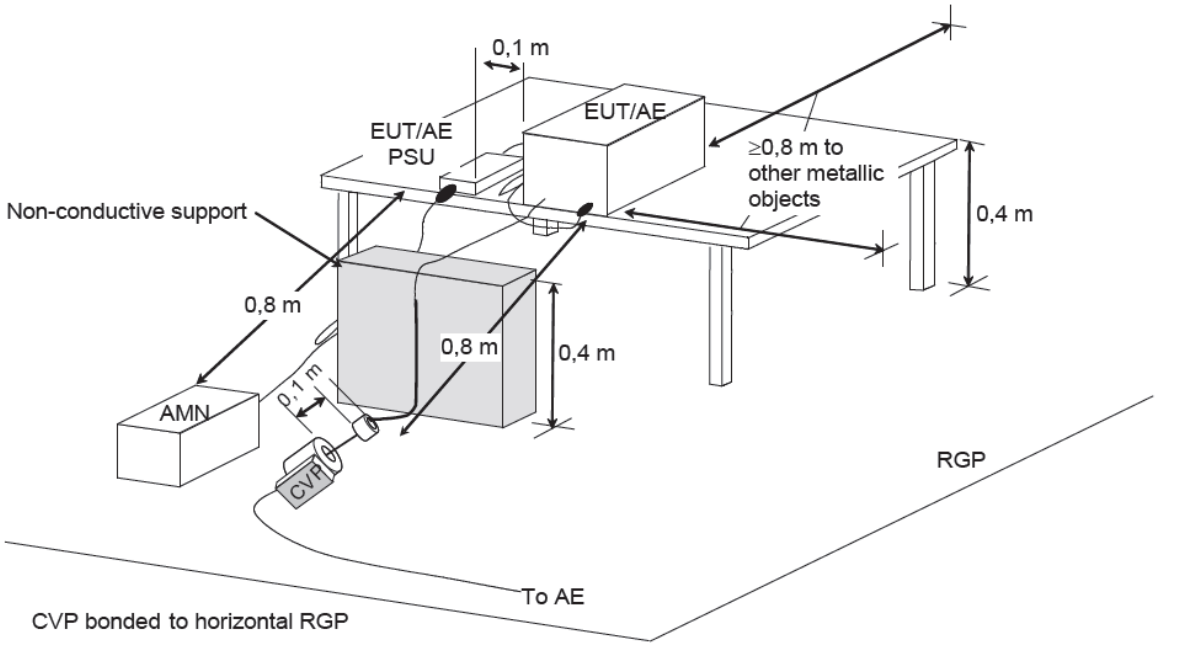
Frequency range (MHz)	Voltage Limits dB(μV)		Current limits dB(μA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	84 ~ 74	74 ~ 64	40 ~ 30	30 ~ 20
0.5 ~ 30	74	64	30	20
Note: if "150Ω to 50Ω adaptor" applied, correction factor of 9.5dB should be added to the test data.				

5.2 Test setup

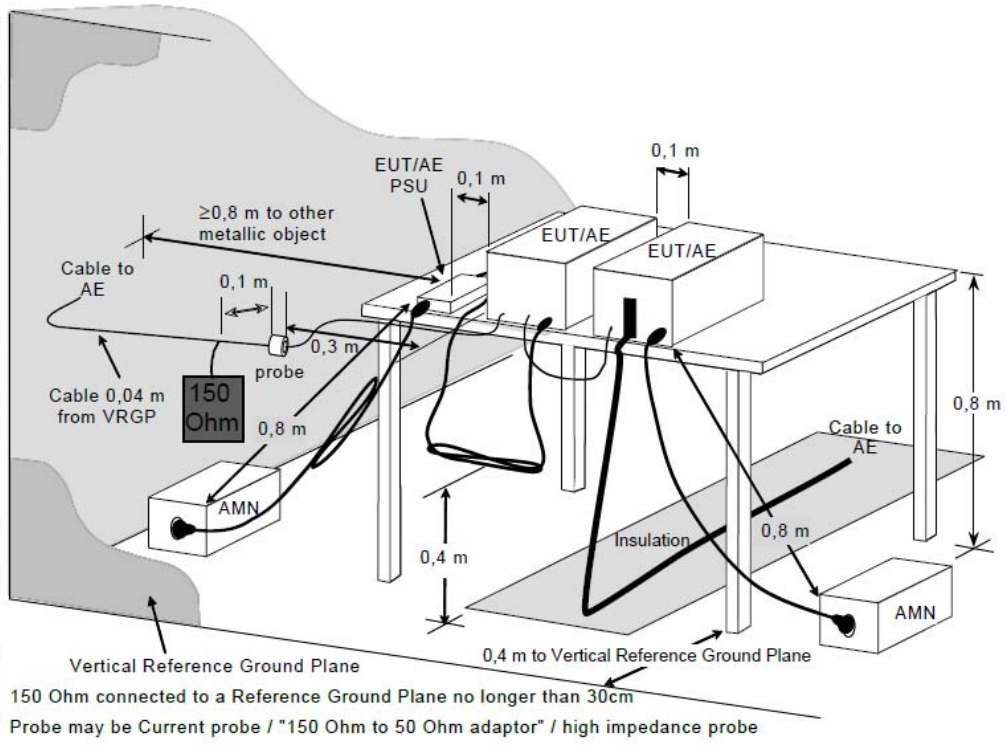
☐ Coupling device: CVP and Current probe (alternative method 1)



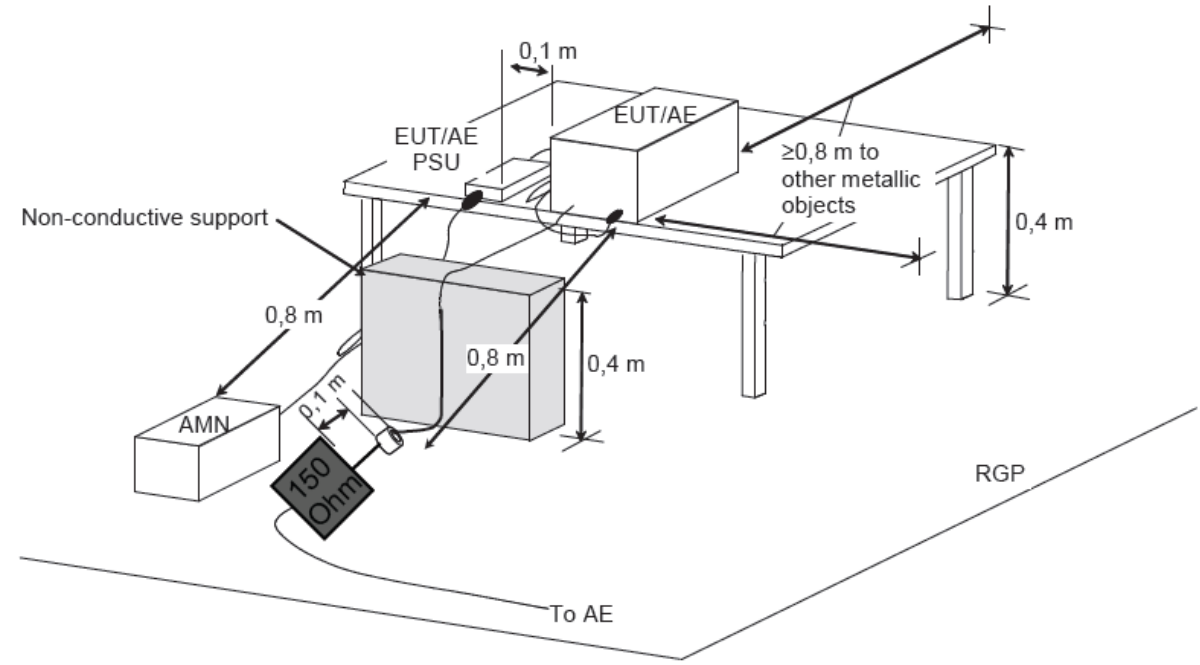
☐ Coupling device: CVP and Current probe (alternative method 2)



☐ Coupling device: Current probe / "150Ω to 50Ω adaptor" / high impedance probe (alternative method 1)



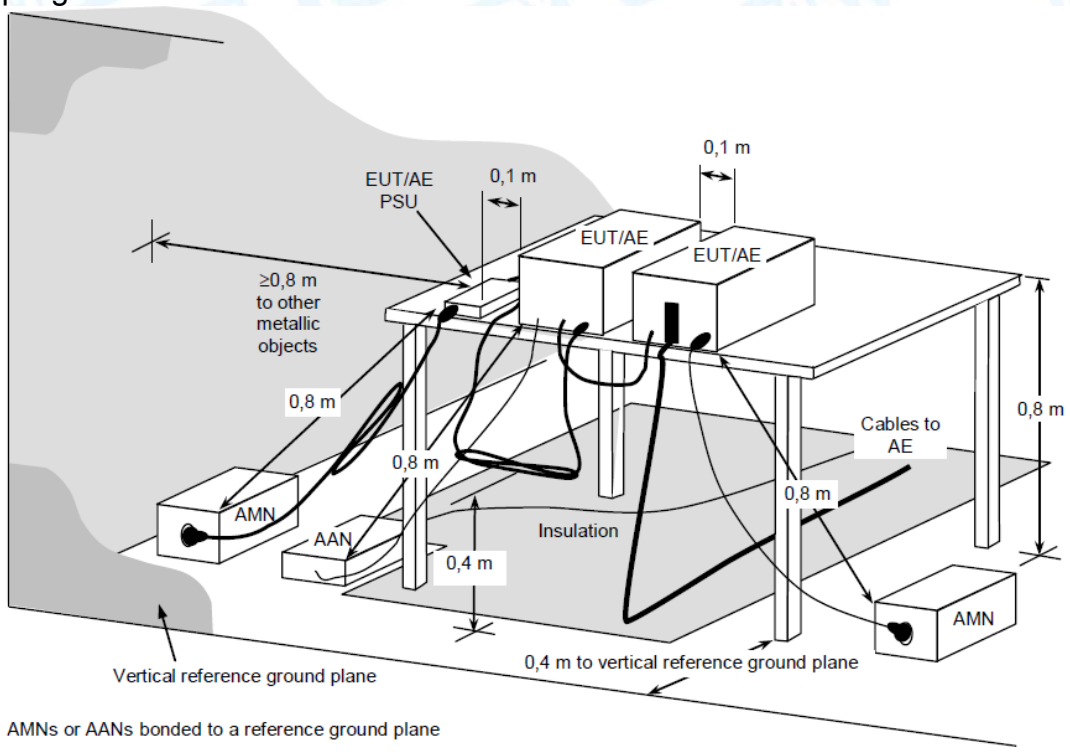
☐ Coupling device: Current probe / “150Ω to 50Ω adaptor” / high impedance probe (alternative method 2)



150 Ohm connected to a Reference Ground Plane no longer than 30cm

Probe may be Current probe / "150 Ohm to 50 Ohm adaptor" / high impedance probe

☐ Coupling device: AAN



AMNs or AANs bonded to a reference ground plane

5.3 Test Setup and Test Procedure

Detailed test procedure was following clause C.4.1 of EN 55032.

Frequency range 150kHz – 30MHz was checked and EMI receiver measurement

bandwidth was set to 9 kHz.

Data Port	Measurement type	Coupling device	No. of Pairs
Balanced Unscreened	Voltage	AAN	≤ 4
Balanced Unscreened	Voltage and Current	CVP & Current probe	>4 or unable to AAN
Screened or Coaxial	Voltage	AAN	N/A
Screened or Coaxial	Voltage or Current	Current probe / “150Ω to 50Ω adaptor” / high impedance probe	N/A
Unbalanced cables	Voltage and Current	CVP & Current probe	N/A

5.4 Test Data

This test is not applicable.

6 Conducted Differential Voltage Emissions

6.1 Test Standard and Limit

6.1.1. Test Standard

EN 55032: 2015

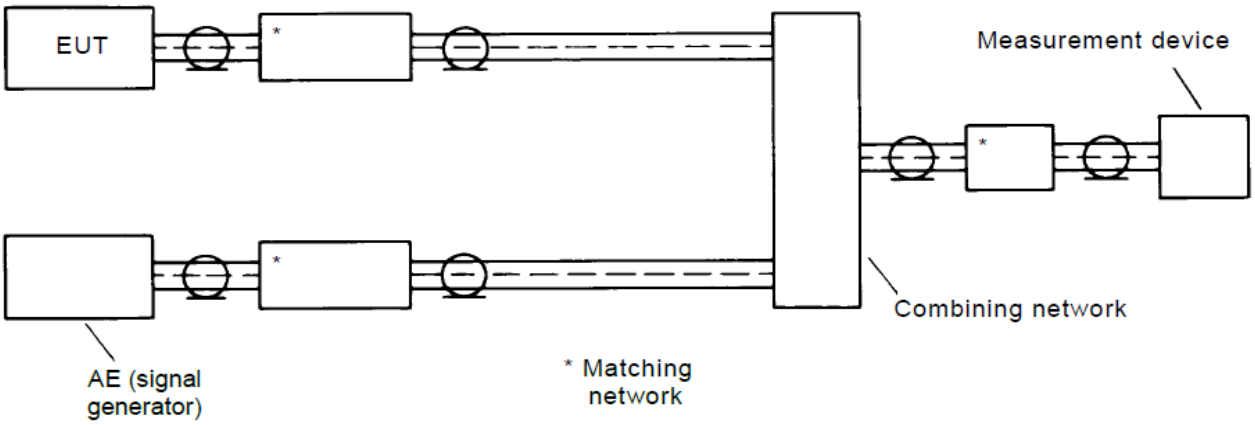
6.1.2. Limits

Requirements for Conducted differential voltage emissions from Class B equipment

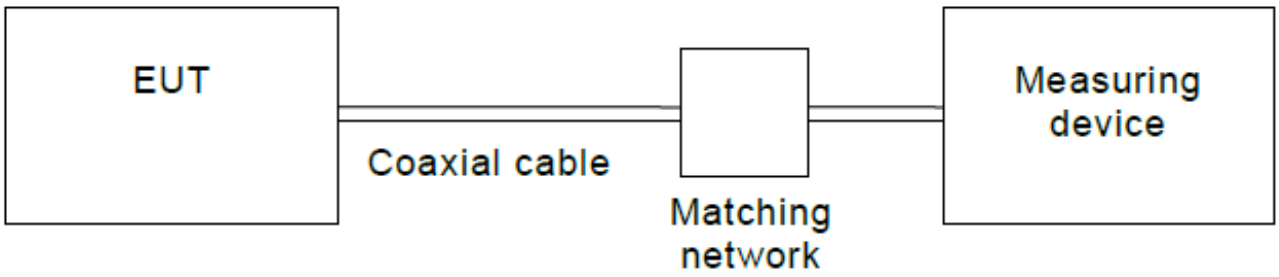
Applicability	Frequency range (MHz)	Differential voltage limit @ 75Ω (dBuV)		
		Other	Local Oscillator Fundamental	Local Oscillator Harmonics
Television receivers; 3D pens; PC TV broadcast receiver tuner cards; Digital audio receivers;	30 ~ 950	46	46	46
	950 ~ 2 150	46	54	54
Tuner units (not the LNB) for satellite signal reception	950 ~ 2 150	46	54	54
FM audio receivers and PC tuner cards	30 ~ 300	46	54	50
	300 ~ 1 000	46	54	52
FM car radios	30 ~ 300	46	66	59
	300 ~ 1 000	46	66	52
RF modulator output ports connect to TV broadcast receiver tuner ports	30 ~ 950	46	76	46
	950 ~ 2150	46	/	54

6.2 Test setup

☐TV/FM broadcast receiver tuner ports



☐RF modulator output port



6.3 Test Setup and Test Procedure

Detailed test procedure was following clause C4.2 and C4.3 of EN55032. Frequency range 30MHz – 2150MHz was checked and EMI receiver measurement bandwidth was set to 120kHz /1MHz.

6.4 Test Data

This test is not applicable.

☐ TV tuner ports

After the preliminary scan, we found the following test mode (ATV 55.25MHz) producing the highest emission level.

Frequency MHz	Emission Level dBμV	Limits dBμV/75Ω	Margin dB	Remark
Remark: All readings are Quasi-Peak values.				

7 Radiated Emission Test

7.1 Test Standard and Limit

7.1.1 Test Standard

EN 55032: 2015

7.1.2 Test Limit

Bellow 1GHz

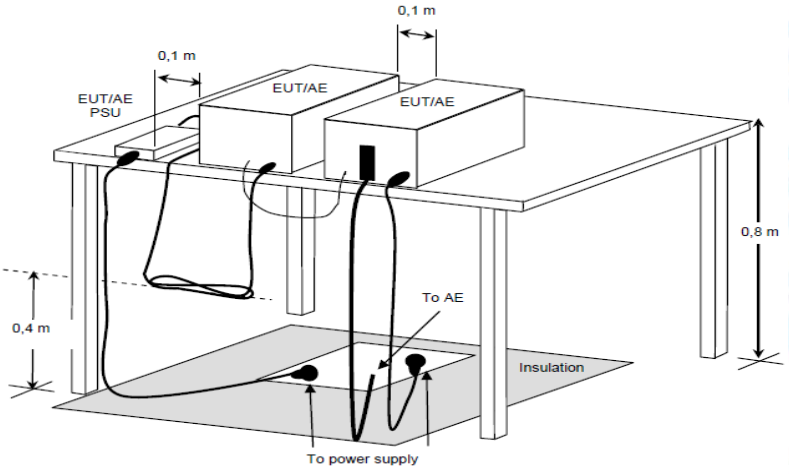
Frequency	Limit (dBμV/m) (3m)	
	Quasi-peak Level	
	Class A	Class B
30MHz~230MHz	50	40
230MHz~1000MHz	57	47
Remark: 1. The lower limit shall apply at the transition frequency. 2. The test distance is 3m.		

Above 1GHz

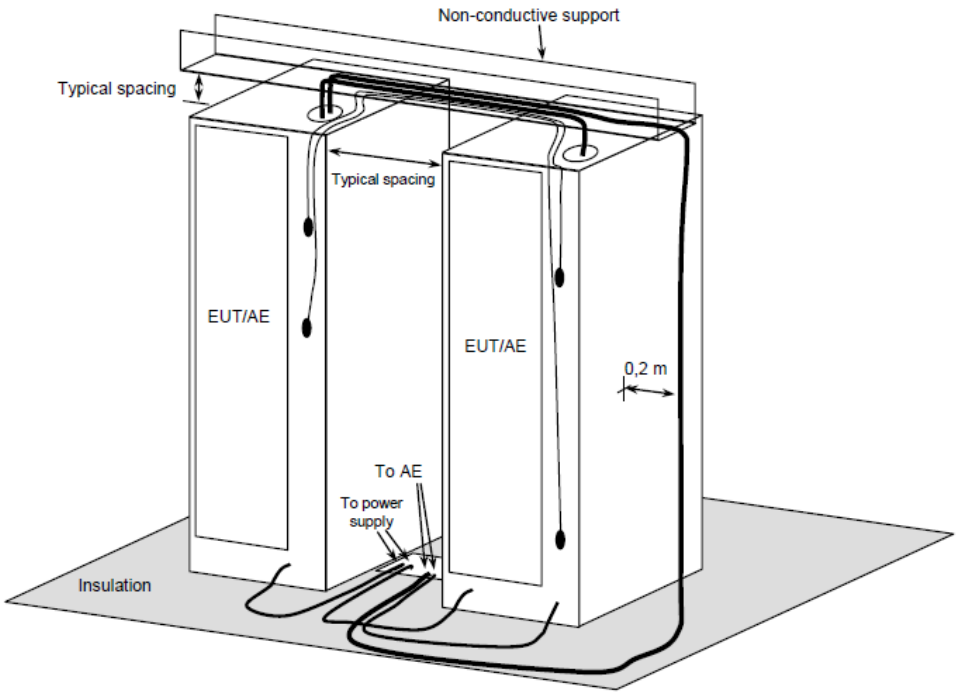
Frequency (GHz)	Limit (dBμV/m) (3m)			
	Class A		Class B	
	Peak	Average	Peak	Average
1~3	76	56	70	50
3~6	80	60	74	54
Remark: 1. The lower limit shall apply at the transition frequency. 2. The test distance is 3m.				

7.2 Test Setup

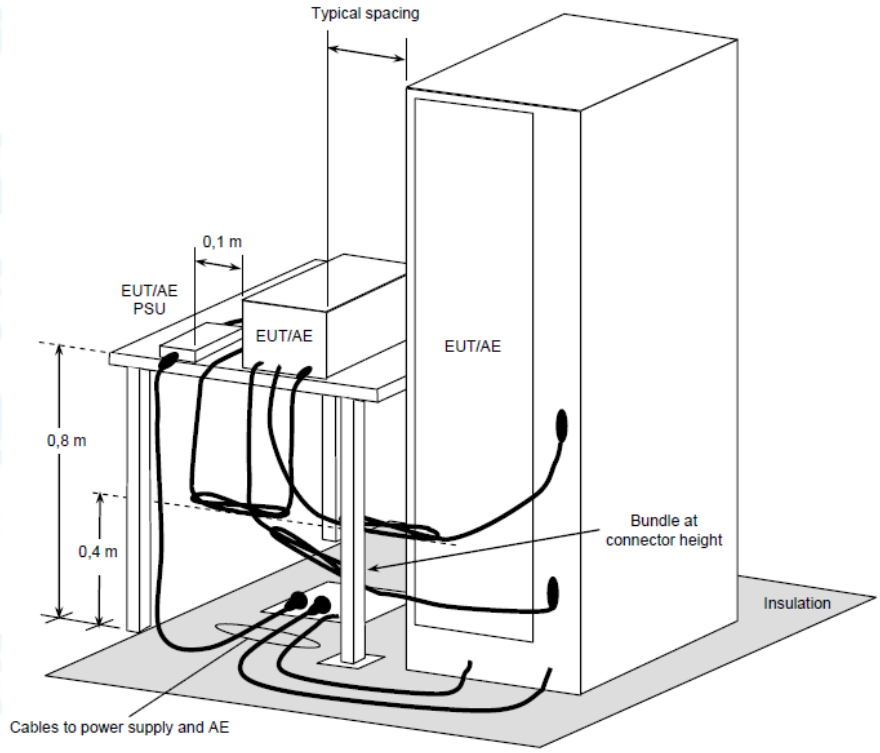
☒ For table top equipment



☐ For floor standing equipment



☐ For combination equipment



7.3 Test Procedure

Measurement was performed according to clause 7.3 of CISPR 16-2-3.

The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m. The table was rotated 360 degrees to determine the position of the highest radiation. The height of the equipment or of the substitution antenna 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 radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range.

If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

Highest internal frequency (Fx)	Highest measured frequency for radiated measurement	Measured Bandwidth
Fx ≤ 108 MHz	1 GHz	120kHz
108 MHz < Fx ≤ 500 MHz	2 GHz	1MHz
500 MHz < Fx ≤ 1 GHz	5 GHz	1MHz
Fx > 1 GHz	5*Fx up to a maximum of 6 GHz	1MHz
NOTE 1: For FM and TV broadcast receivers, Fx is determined from the highest frequency generated orused excluding the local oscillator and tuned frequencies. **NOTE 2:** For outdoor units of home satellEquipment receiving systems highest measured frequency shall be 18GHz.		

7.4 Test Data

Please refer to the Attachment B.

8 Harmonic Current Emission Test

8.1 Test Standard and Limit

8.1.1. Test Standard

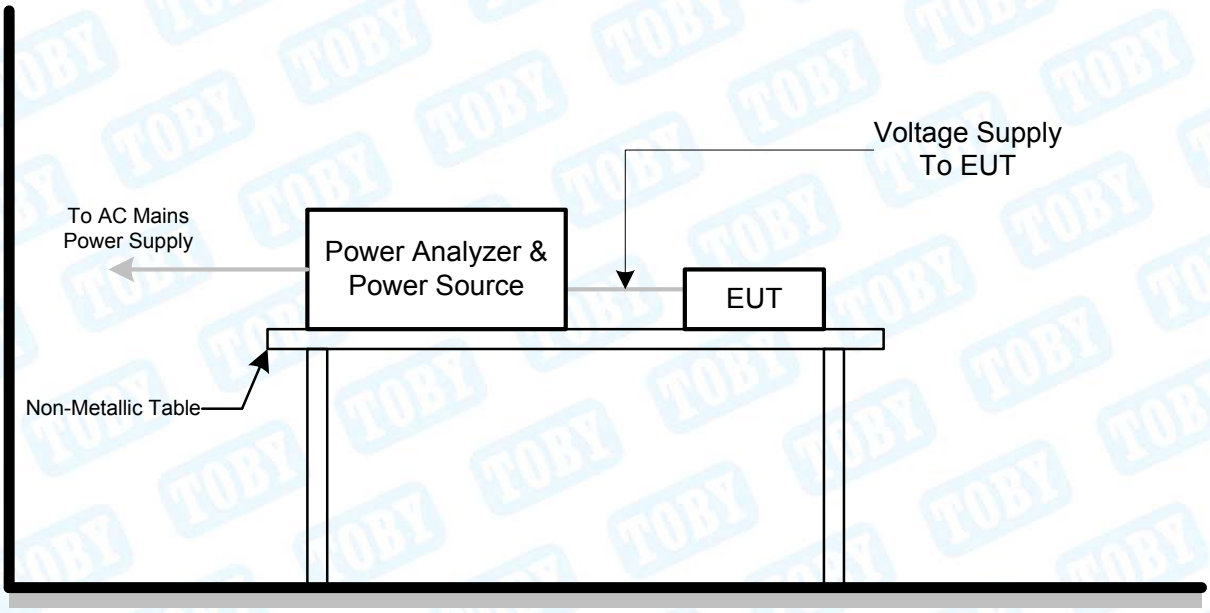
EN 61000-3-2:2014

8.1.2 Limits

Harmonic Current Test Limit

Limits for Class A equipment				Limits for Class D equipment		
Odd Harmonics		Even Harmonics		Harmonic Order (n)	Maximum Permissible Harmonic Current per watt (mA/W)	Maximum Permissible Harmonic Current (A)
Harmonic Order (n)	Maximum permissible harmonic Current (A)	Harmonic Order (n)	Maximum permissible harmonic Current (A)			
3	2.30	2	1.08	3	3.4	2.30
5	1.14	4	0.43	5	1.9	1.14
7	0.77	6	0.30	7	1.0	0.77
9	0.40	8≤n≤40	0.23X8/n	9	0.5	0.40
11	0.33			11	0.35	0.33
13	0.21			15≤n≤39 (odd harmonics only)	3.85/n	0.15X15/n
15≤n≤39	0.15X15/n					

8.2 Test Setup



8.3 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: 2006.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. Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

Class D: Equipment having a specified power less than or equal to600 W of the following types: Personal computers and personal computer monitors and television receivers.

8.4 Test Data

The EUT's rated input power is less than 75W and does not belong to lighting equipment, therefore harmonic current test is not applicable in accordance with Clause 7 of EN 61000-3-2:2014.

9 Voltage Fluctuation and Flicker Test

9.1 Test Standard and Limit

9.1.1. Test Standard

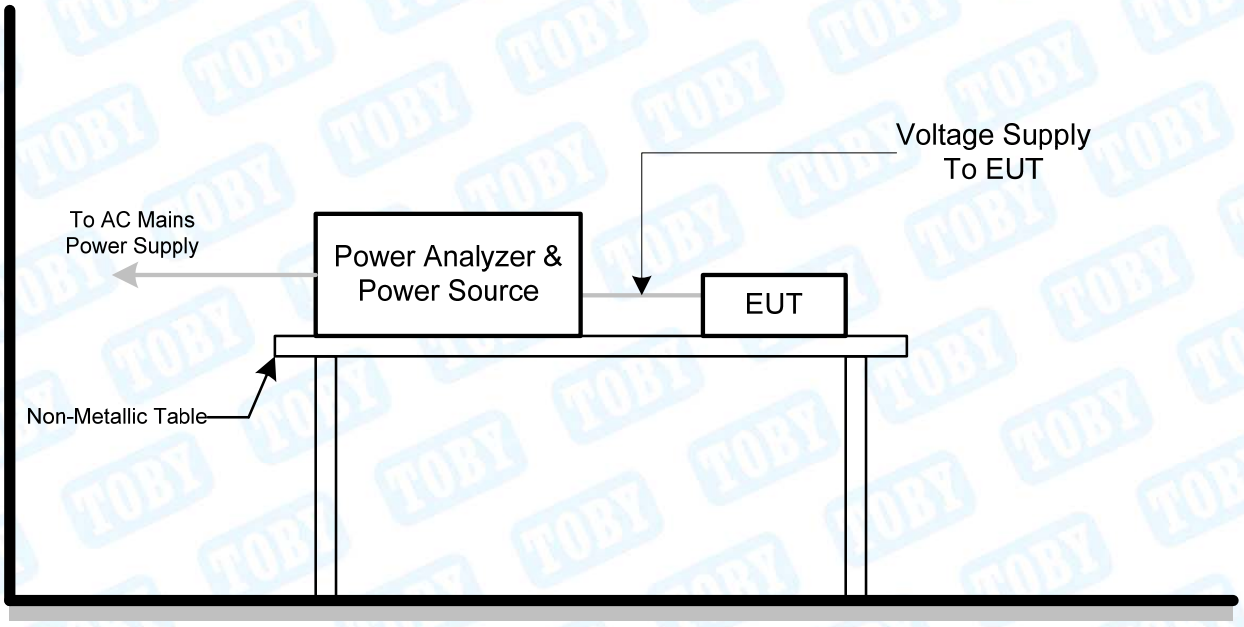
EN 61000-3-3:2013

9.1.2. Limit

Voltage Fluctuation and Flicker Test Limit

Test Items	Limits
Pst	1.0
dc	3.3%
dmax	4.0%
dt	Not exceed 3.3% for 500ms

9.2 Test Setup



9.3 Test Procedure

9.3.1 Harmonic Current Test

Test was performed according to the procedures specified in Clause 5.0 of IEC555-2 and/or Sub-clause 6.2 of IEC/EN 61000-3-2 depend on which standard adopted for compliance measurement.

9.3.2 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.

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

For the actual test configuration, please refer to the related Item –Block Diagram of system tested (please refer to 1.3).

9.4 Test Data

Please refer to the Attachment C.

10 Electrostatic Discharge Immunity Test

10.1 Test Requirements

10.1.1. Test Standard

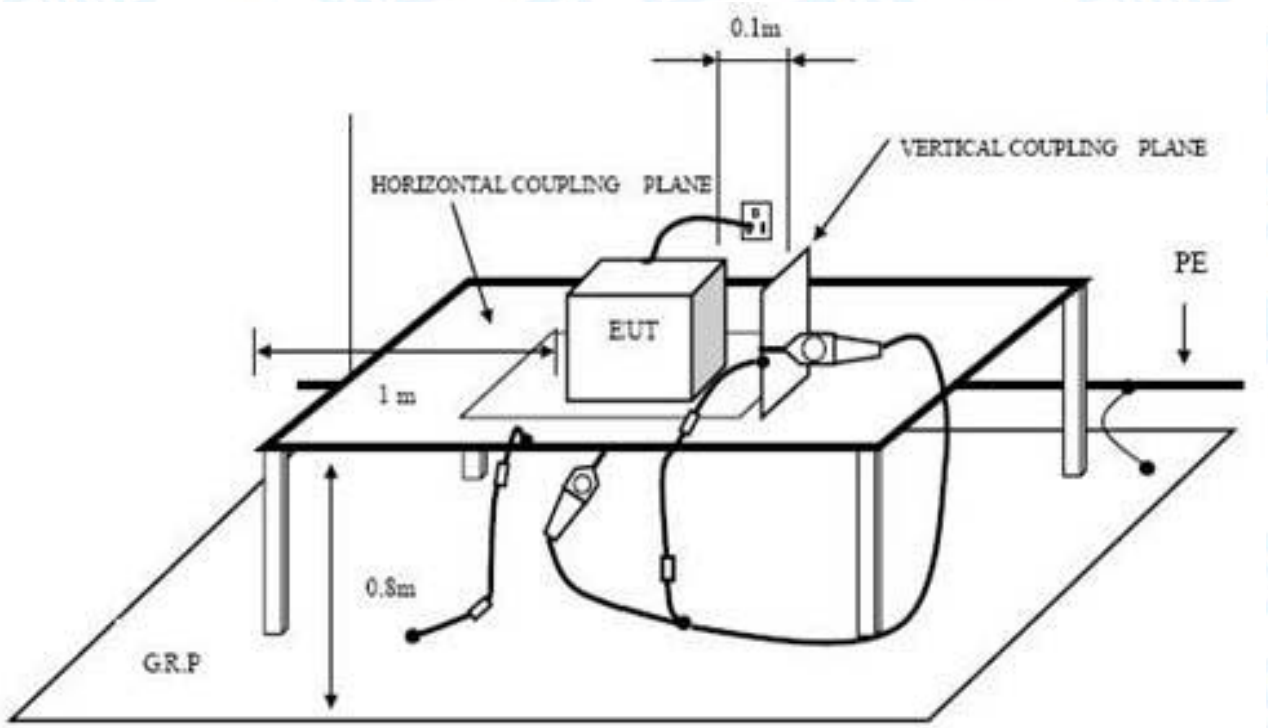
EN 55024:2010+A1:2015 (EN 61000-4-2:2009)

10.1.2. Test 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

10.1.2 Performance criterion: **B**

10.2 Test Setup



INDIRECT DISCHARGE SETUP

10.3 Test Procedure

10.3.1 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.

10.3.2 Contact Discharge:

All the procedure shall be same as air discharge. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

10.3.3 Indirect discharge for horizontal coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

10.3.4 Indirect discharge for vertical coupling plane

At least 10 single discharges (in the most sensitive polarity) 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.

10.4 Test Data

Please refer to the Attachment D.

11 Radiated Electromagnetic Field Immunity Test

11.1 Test Requirements

11.1.1. Test Standard

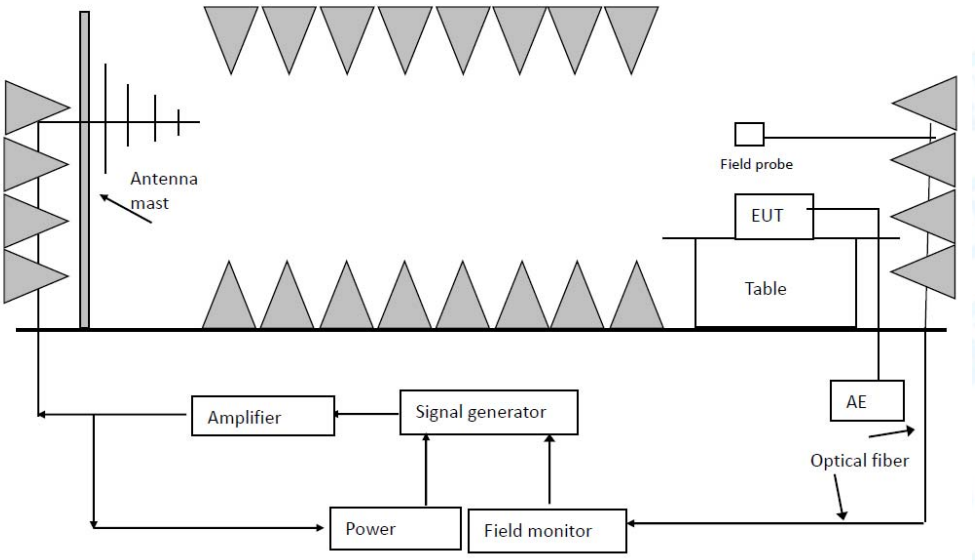
EN 55024:2010+A1:2015 (EN 61000-4-3:2006+A1:2008+A2:2010)

11.1.2. Test Level

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

Performance criterion: **A**

11.2 Test Setup



11.3 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 is 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 camera is used to monitor its screen.

All the scanning conditions are as following:

Condition of Test	Remark
Fielded strength	3V/m (Severity Level 2)
Radiated signal	Modulated
Scanning frequency	80-1000MHz
Sweep time of radiated	0.0015 Decade/s
Dwell time	1 Sec.

11.4 Test Data

Please refer to the Attachment E.

12 Electrical Fast Transient/Burst Test

12.1 Test Requirements

12.1.1.Test Standard

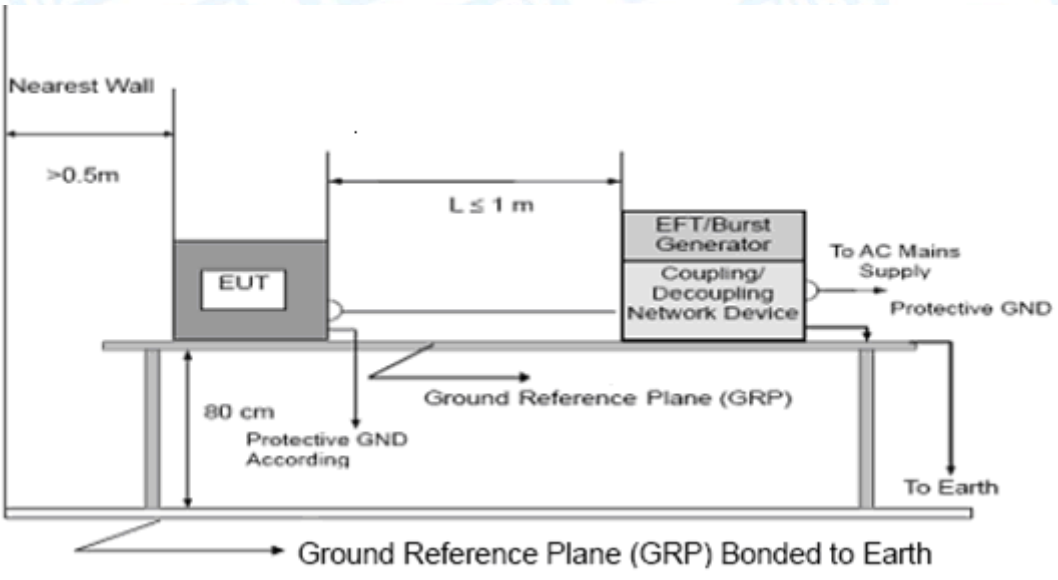
EN 55024:2010+A1:2015 (EN 61000-4-4:2012)

12.1.2.Level

	On Switching Adapter Lines	On I/O (Input/Output) Signal data and DC Port
Test Voltage:	1 KV	0.5 KV
Polarity:	Positive&Negative	
Impulse Wave Shape:	5/50ns	
Burst Duration:	15ms	
Burst Period:	300ms	
Test Duration:	Not less than 1 min	

12.1.3.Performance criterion: B

12.2 Test Setup



12.3 Test Procedure

12.3.1 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 1minute.

12.3.2 For signal lines and control lines ports:

A coupling clamp is use to couple the EFT interference signal to the signal and control lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 1 minute.

12.3.3For DC input and DC output 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 1 minute.

12.4 Test Data

Please refer to the Attachment F.

13 Surge Immunity Test

13.1 Test Requirements

13.1.1.Test Standard

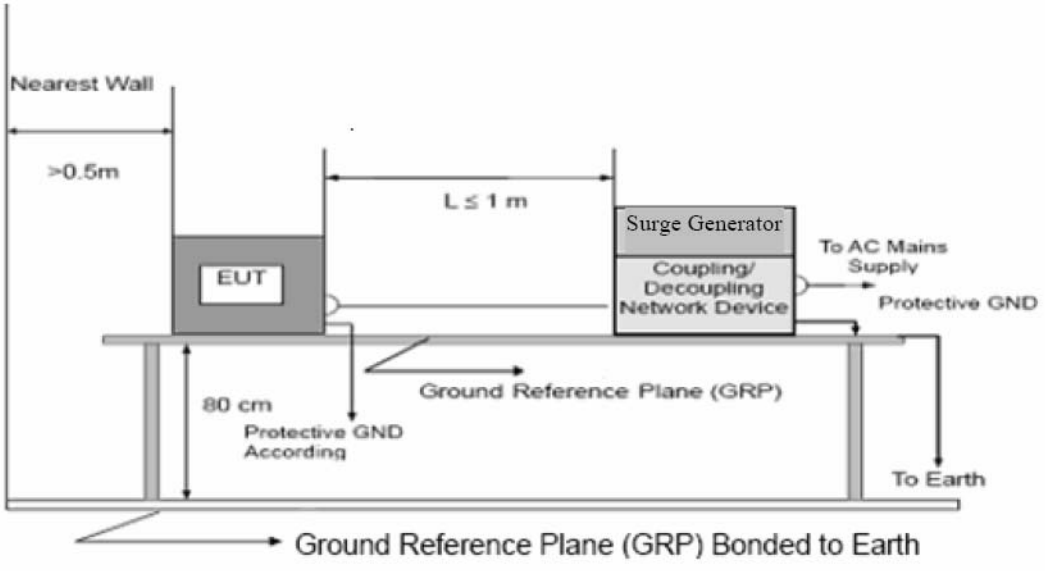
EN 55024:2010+A1: 2015 (EN 61000-4-5:2014)

13.1.2.Level

Basic Standard:	**EN 61000-4-5**
Wave-Shape:	Combination Wave 1.2/50us Open Circuit Voltage 8/20us Short Circuit Current
Test Voltage	Power Line:0.5kV,1kV,2kV
Surge Input/Output:	L1-L2,L1-PE,L2-PE
Generator Source:	2 ohm between networks
Impedance:	12ohm 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

13.1.3.Performance criterion: **B**

13.2 Test Setup



13.3 Test Procedure

13.3.1 Set up the EUT and test generator as shown on Section 11.1.2.

13.3.2 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.

13.3.3 At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.

13.3.4 Different phase angles are done individually.

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

13.4 Test Data

Please refer to the Attachment G.

14 Conducted Immunity Test

14.1 Test Requirements

14.1.1.Test Standard

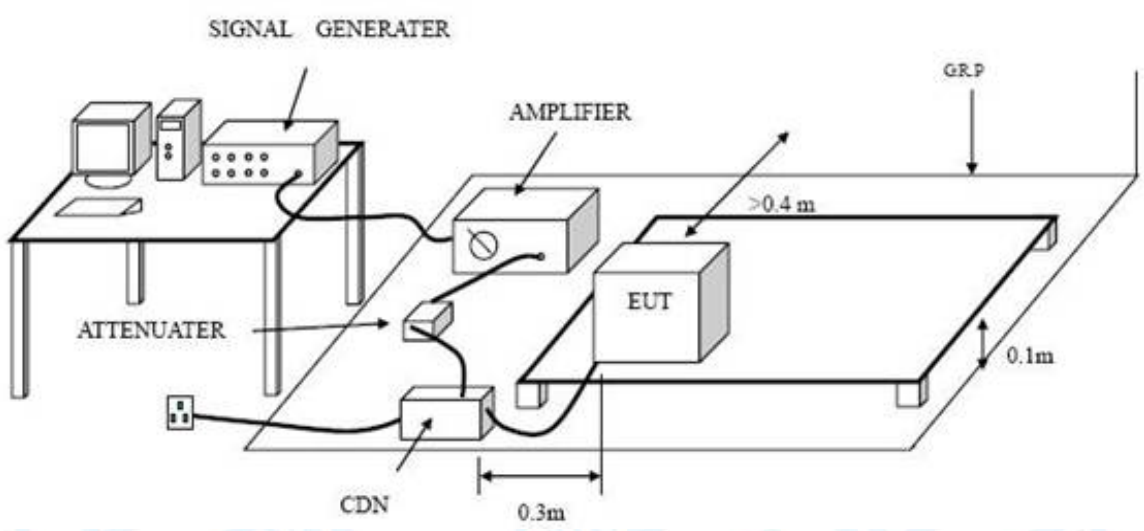
EN 55024:2010+A1: 2015 (EN 61000-4-6:2014)

14.1.2.Level

Port	Test Specification
Input AC power port	0.**15MHz~80MHz** **3V(r.m.s.) (unmodul**ated)
Signal Port	
Input DC Port	

14.1.3.Performance criterion: **A**

14.2 Test Setup



14.3 Test Procedure

14.3.1 Set up the EUT, CDN and test generators.

14.3.2 Let the EUT work in test mode and test it.

14.3.3 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).

14.3.4 The disturbance signal description below is injected to EUT through CDN.

14.3.5 The EUT operates within its operational mode(s) under intended climatic conditions after power on.

14.3.6 The frequency range is swept from 0.150MHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave.

14.3.7 The rate of sweep shall not exceed 1.5*10-3decades/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.

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

14.4 Test Data

Please refer to the Attachment H.

15 Voltage Dips and Interruptions Immunity Test

15.1 Test Requirements

15.1.1.Test Standard

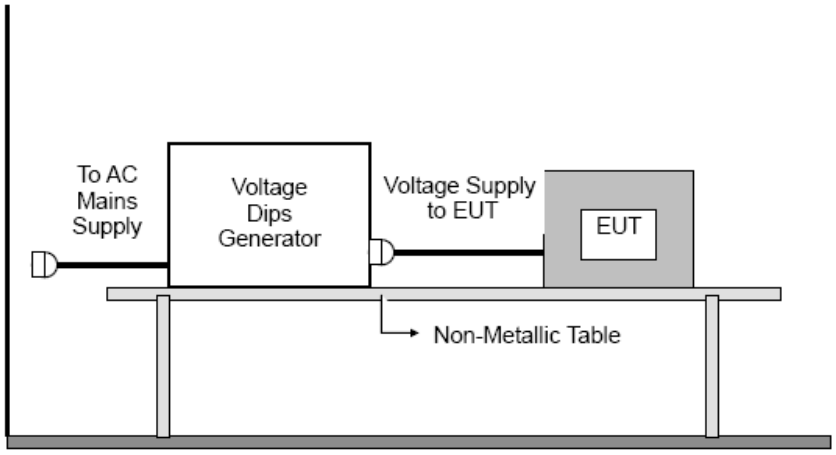
EN 55024:2010+A1: 2015 (EN 61000-4-11:2004)

15.1.2.Level

Basic Standard:	**EN 61000-4-11**
Required Performance:	B(For 100%, 0.5 cycle Voltage Dips) C(For 70%, 25 cycle Voltage Dips) C(For 100%, 250 cycle 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

15.1.3.Performance criterion: **B&C**

15.2 Test Setup



15.3 Test Procedure

Set up the EUT and test generator as shown above. The EUT is tested for each selected combination of test level and duration with a sequence of three dips/interruptions with intervals of 10s minimum.

15.4 Test Data

Please refer to the Attachment I.

16 Photographs - Constructional Details

Photo 1 Appearance of EUT

Photo 2 Appearance of EUT

Photo 3 Appearance of EUT

Photo 4 Appearance of EUT

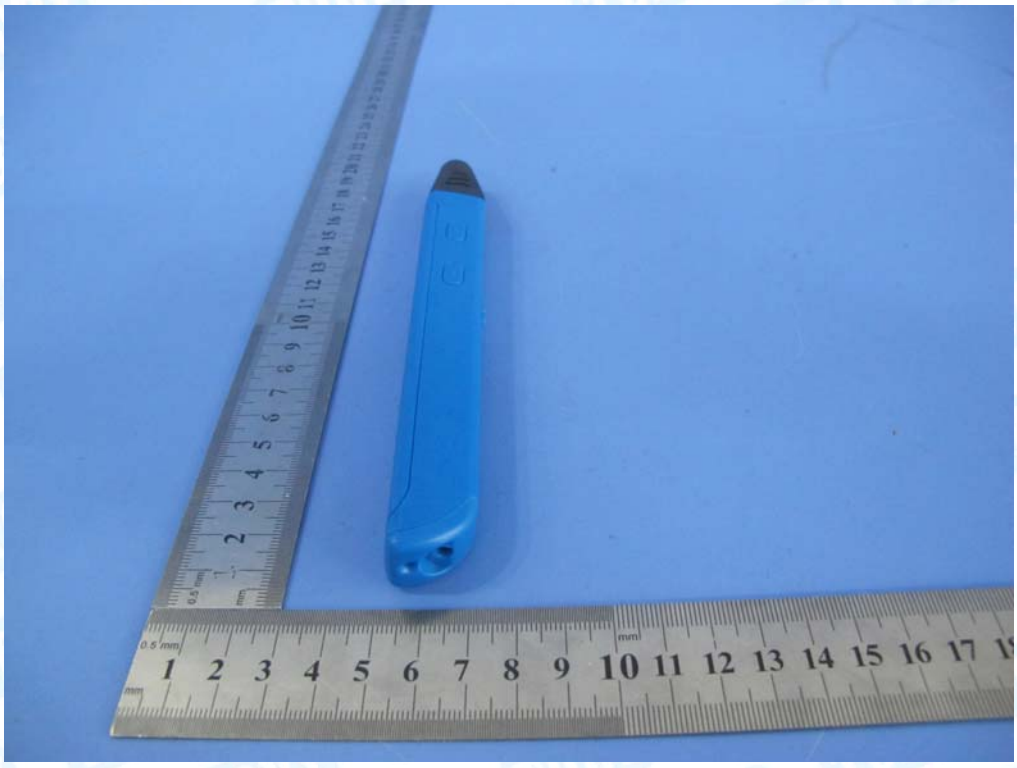


Photo 5 Internal of EUT

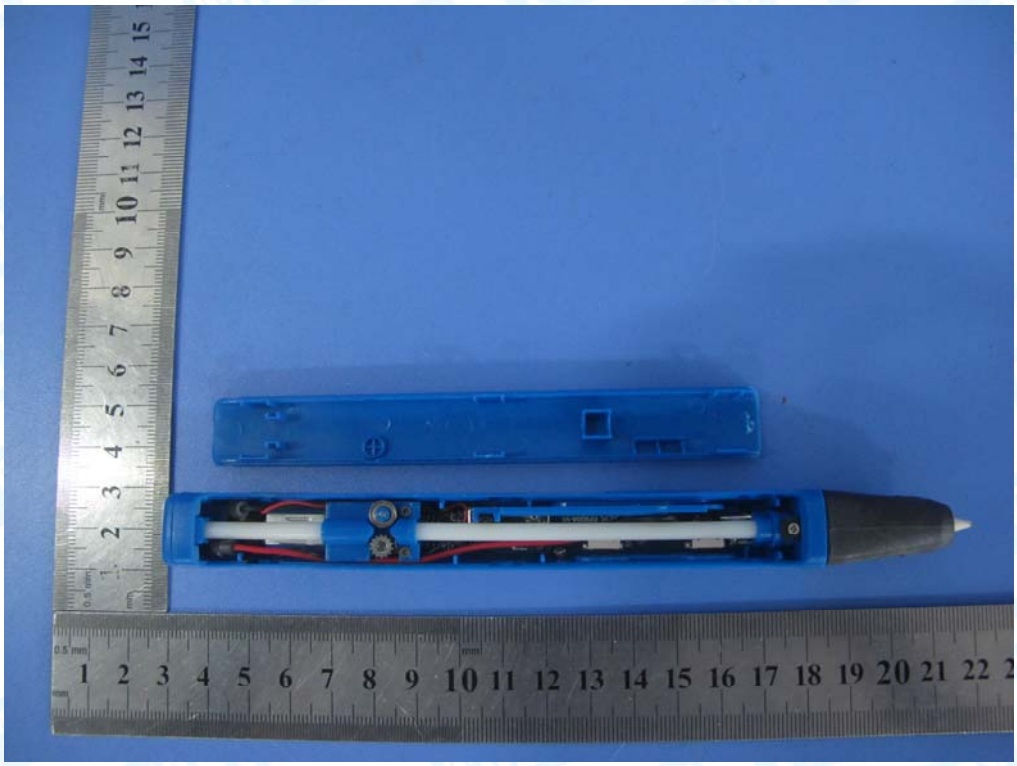


Photo 6 Appearance of PCB

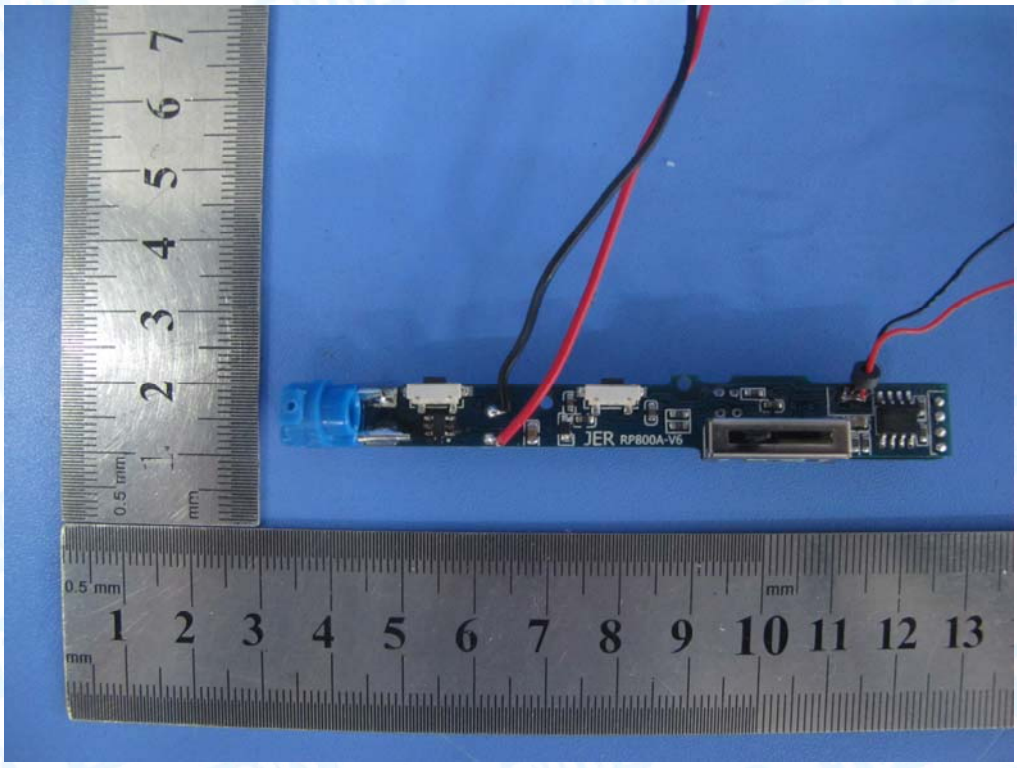
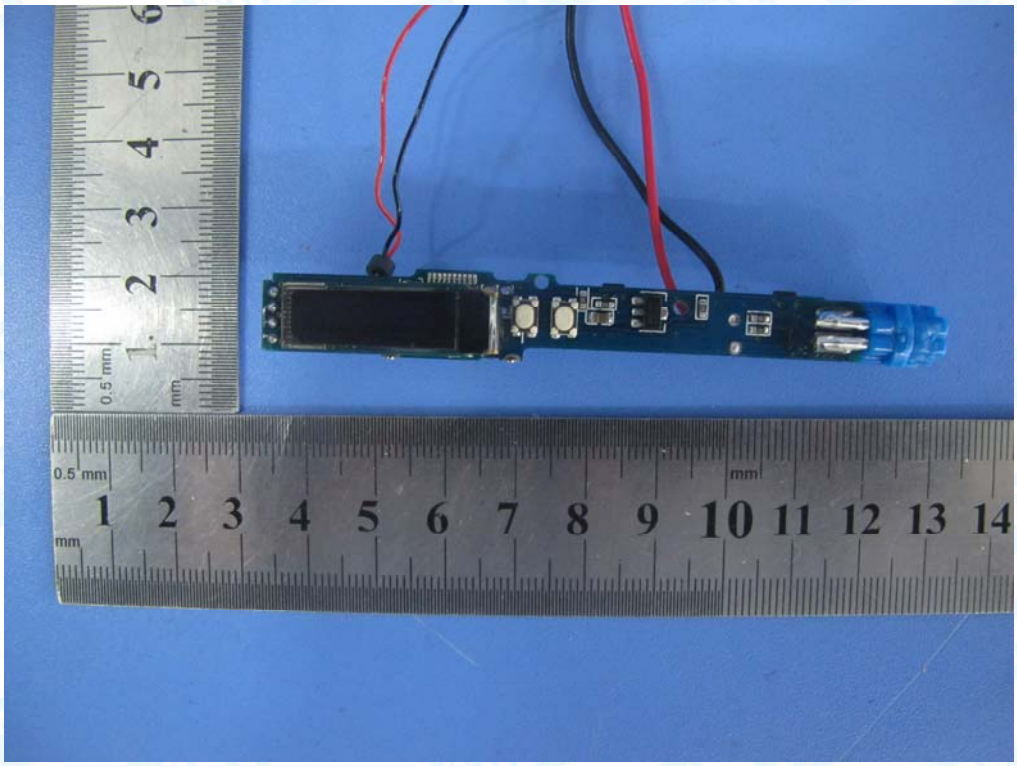


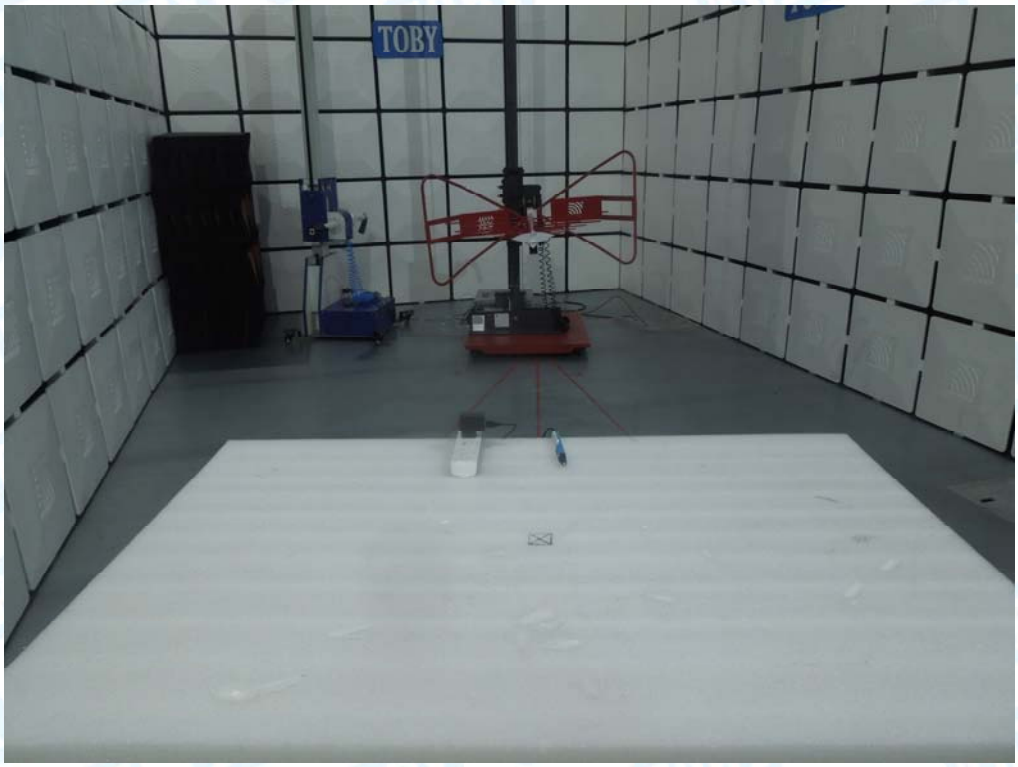
Photo 7 Appearance of PCB



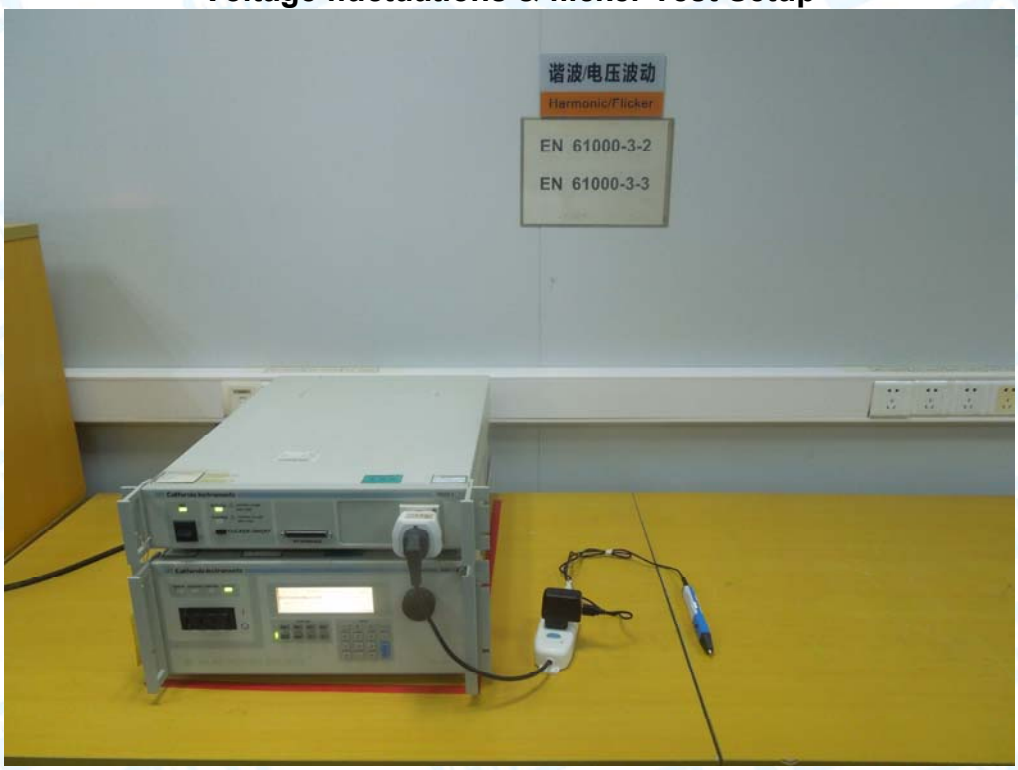
17 Photographs - Test Setup

Conducted Emission Test Setup

Radiated Emission Test Setup—Below 1G



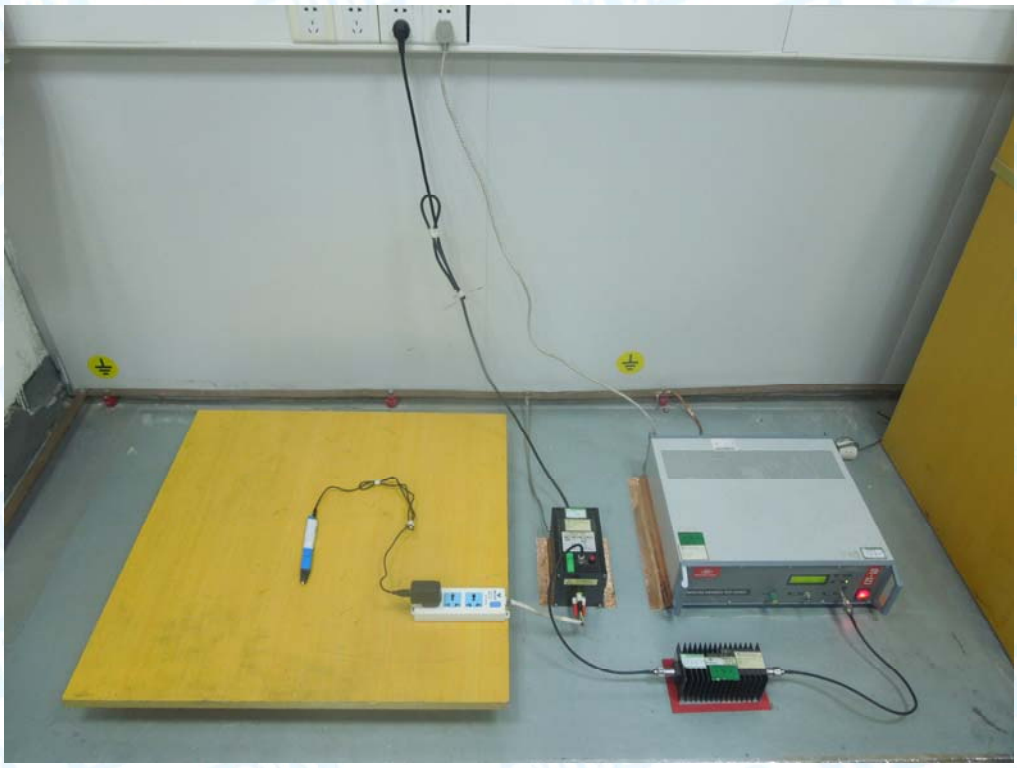
Voltage fluctuations & flicker Test Setup



Electrostatic Discharge Test Setup

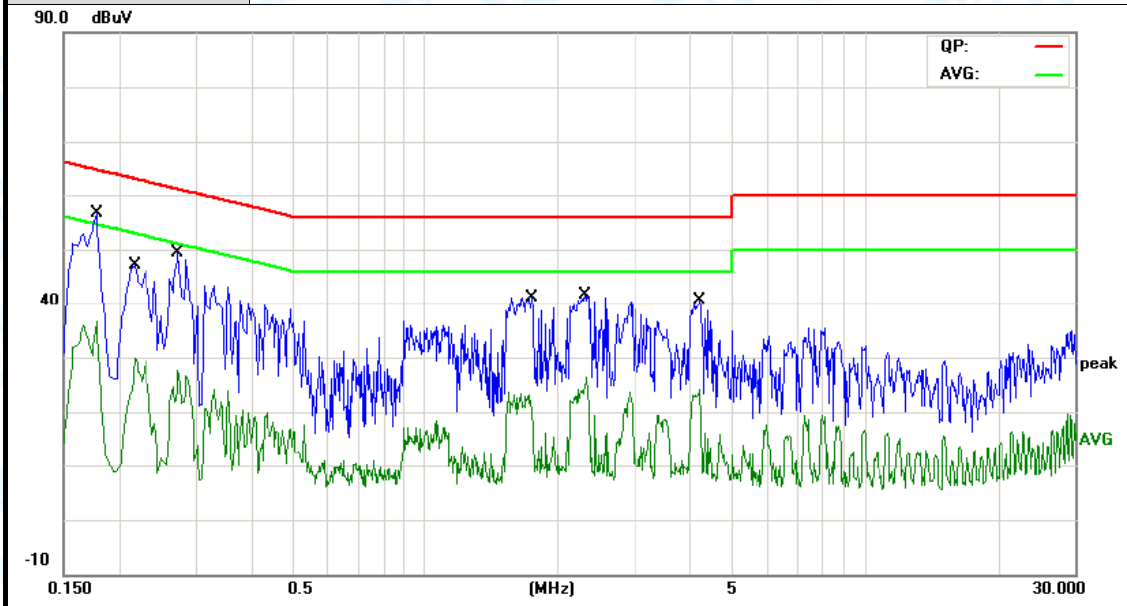
EFT, Surge, Voltage Dips Test Setup

Radio-frequency, Continuous Conducted Disturbance Test Setup



Attachment A--Conducted Emission Data (AC Mains)

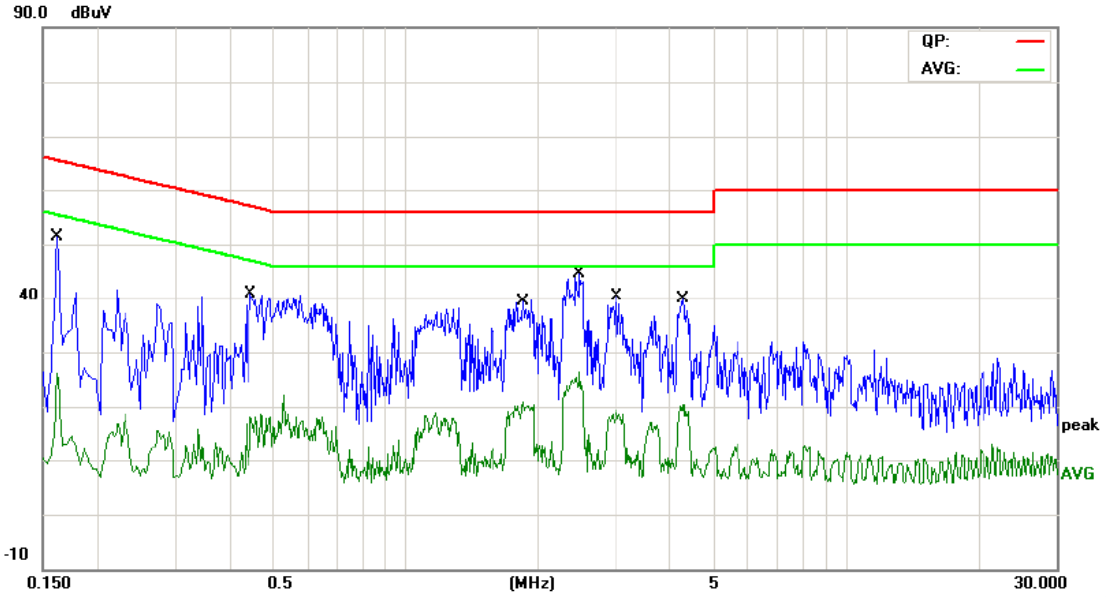
Temperature:	25 ℃	**Relative Humidity:**	55%
Pressure:	1010 hPa		
Test Voltage:	AC 110V/60 Hz		
Terminal:	Line		
Test Mode:	Mode 1		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1780	38.69	9.58	48.27	64.57	-16.30	QP
2		0.1780	12.31	9.58	21.89	54.57	-32.68	AVG
3		0.2180	33.91	9.58	43.49	62.89	-19.40	QP
4		0.2180	12.96	9.58	22.54	52.89	-30.35	AVG
5		0.2740	31.76	9.59	41.35	60.99	-19.64	QP
6		0.2740	8.29	9.59	17.88	50.99	-33.11	AVG
7		1.7460	25.82	9.61	35.43	56.00	-20.57	QP
8		1.7460	6.08	9.61	15.69	46.00	-30.31	AVG
9		2.2980	25.32	9.62	34.94	56.00	-21.06	QP
10		2.2980	8.29	9.62	17.91	46.00	-28.09	AVG
11		4.2060	22.02	9.69	31.71	56.00	-24.29	QP
12		4.2060	7.22	9.69	16.91	46.00	-29.09	AVG

Emission Level= Read Level+ Correct Factor

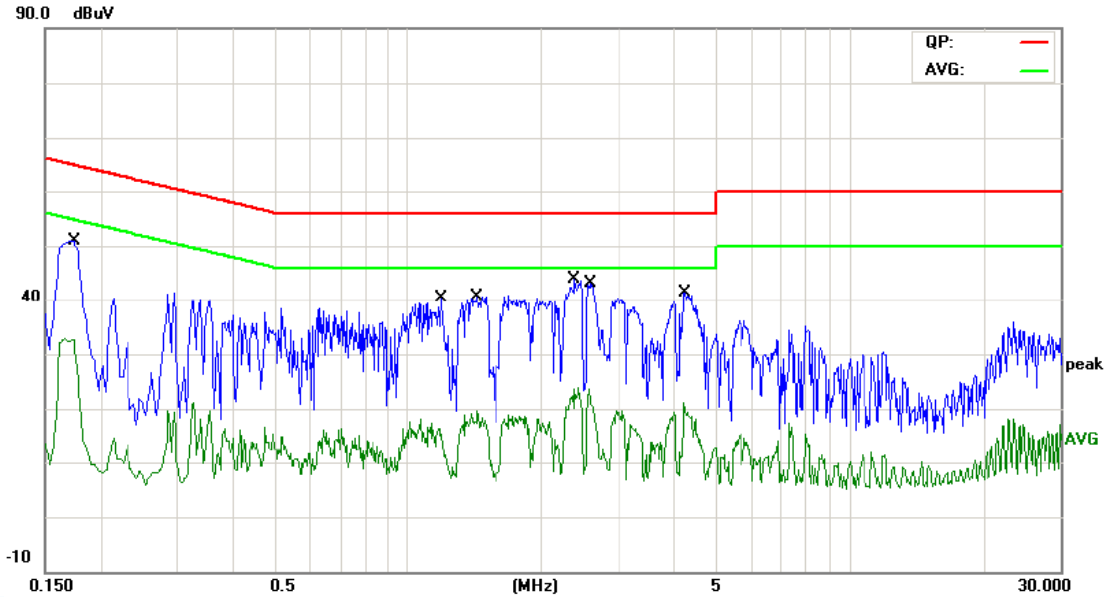
Temperature:	25 ℃	**Relative Humidity:**	55%
Pressure:	1010 hPa		
Test Voltage:	AC 110V/60 Hz		
Terminal:	Neutral		
Test Mode:	Mode 1		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1620	42.29	9.64	51.93	65.36	-13.43	QP
2		0.1620	21.33	9.64	30.97	55.36	-24.39	AVG
3		0.4460	22.67	9.58	32.25	56.95	-24.70	QP
4		0.4460	2.59	9.58	12.17	46.95	-34.78	AVG
5		1.8580	20.04	9.61	29.65	56.00	-26.35	QP
6		1.8580	4.74	9.61	14.35	46.00	-31.65	AVG
7		2.4780	22.79	9.64	32.43	56.00	-23.57	QP
8		2.4780	8.58	9.64	18.22	46.00	-27.78	AVG
9		3.0100	19.82	9.67	29.49	56.00	-26.51	QP
10		3.0100	3.68	9.67	13.35	46.00	-32.65	AVG
11		4.2538	19.48	9.77	29.25	56.00	-26.75	QP
12		4.2538	3.54	9.77	13.31	46.00	-32.69	AVG

Emission Level= Read Level+ Correct Factor

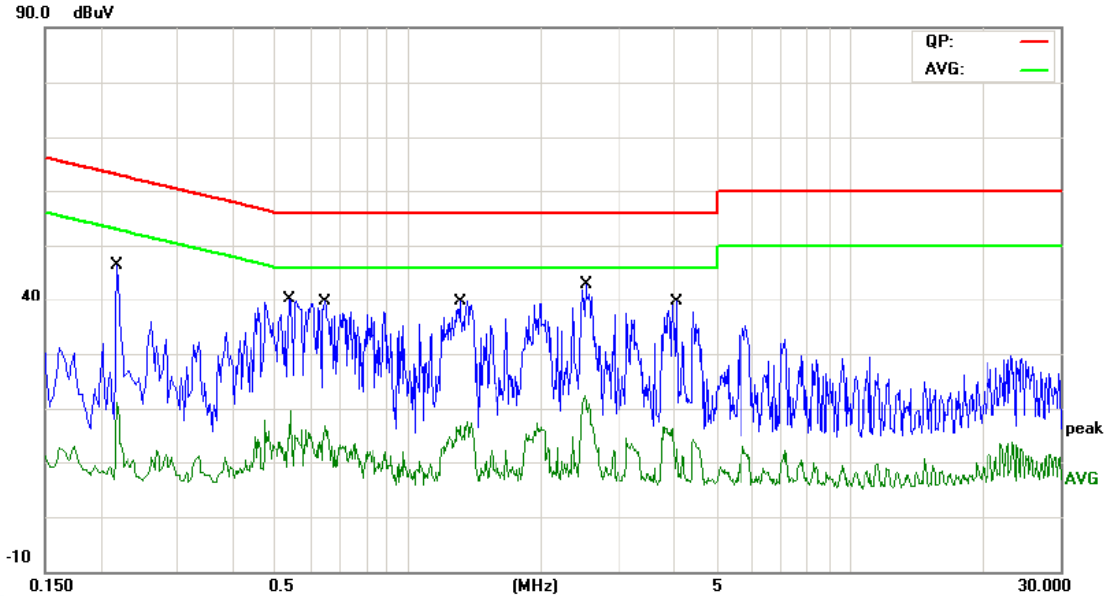
Temperature:	25 ℃	Relative Humidity:	55%
Pressure:	1010 hPa		
Test Voltage:	AC 230V/50 Hz		
Terminal:	Line		
Test Mode:	Mode 1		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1740	37.53	9.58	47.11	64.76	-17.65	QP
2		0.1740	10.68	9.58	20.26	54.76	-34.50	AVG
3		1.1900	22.45	9.60	32.05	56.00	-23.95	QP
4		1.1900	1.31	9.60	10.91	46.00	-35.09	AVG
5		1.4299	25.41	9.60	35.01	56.00	-20.99	QP
6		1.4299	2.63	9.60	12.23	46.00	-33.77	AVG
7		2.3740	27.76	9.62	37.38	56.00	-18.62	QP
8		2.3740	4.44	9.62	14.06	46.00	-31.94	AVG
9		2.5740	28.68	9.63	38.31	56.00	-17.69	QP
10		2.5740	5.22	9.63	14.85	46.00	-31.15	AVG
11		4.2380	26.00	9.69	35.69	56.00	-20.31	QP
12		4.2380	3.23	9.69	12.92	46.00	-33.08	AVG

Emission Level= Read Level+ Correct Factor

Temperature:	25 ℃	**Relative Humidity:**	55%
Pressure:	1010 hPa		
Test Voltage:	AC 230V/50 Hz		
Terminal:	Neutral		
Test Mode:	Mode 1		
Remark:	N/A		

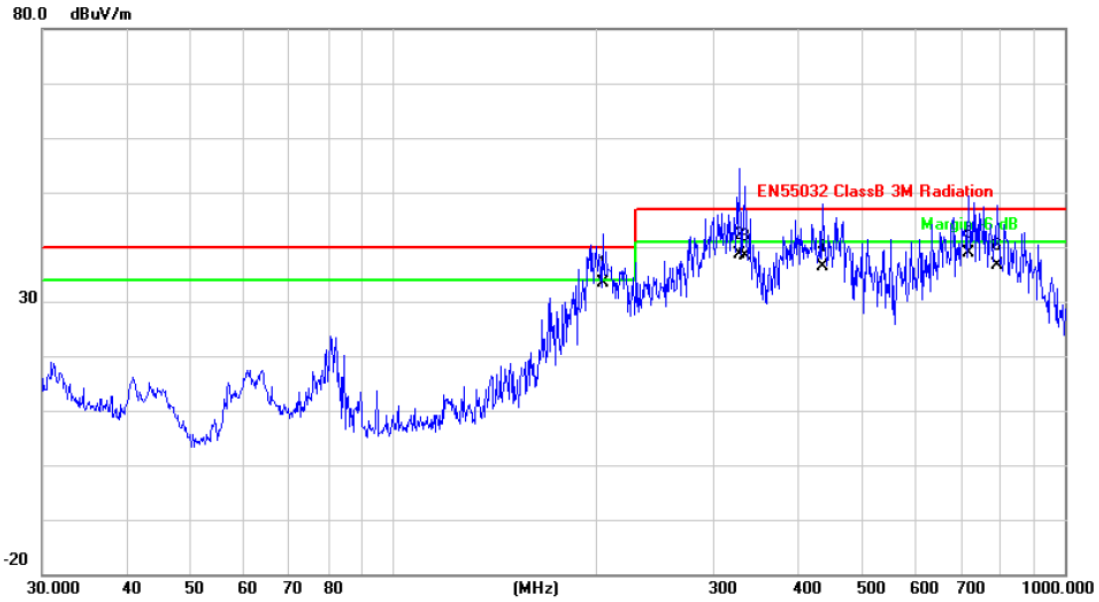


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.2180	33.25	9.64	42.89	62.89	-20.00	QP
2		0.2180	6.79	9.64	16.43	52.89	-36.46	AVG
3		0.5380	25.82	9.58	35.40	56.00	-20.60	QP
4		0.5380	2.45	9.58	12.03	46.00	-33.97	AVG
5		0.6460	23.58	9.59	33.17	56.00	-22.83	QP
6		0.6460	1.99	9.59	11.58	46.00	-34.42	AVG
7		1.3060	23.24	9.60	32.84	56.00	-23.16	QP
8		1.3060	1.11	9.60	10.71	46.00	-35.29	AVG
9		2.5220	25.40	9.64	35.04	56.00	-20.96	QP
10		2.5220	4.77	9.64	14.41	46.00	-31.59	AVG
11		4.0500	21.16	9.73	30.89	56.00	-25.11	QP
12		4.0500	1.36	9.73	11.09	46.00	-34.91	AVG

Emission Level= Read Level+ Correct Factor

Attachment B--Radiated Emission Test Data(Below 1G)

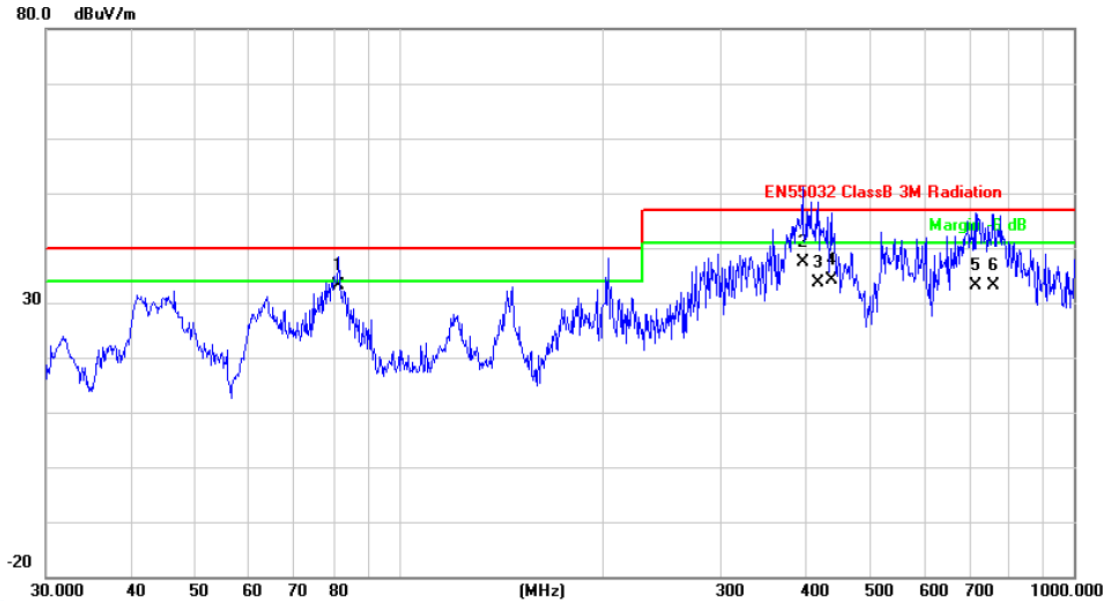
Temperature:	25 ℃	**Relative Humidity:**	55%
Pressure:	1010 hPa		
Test Voltage:	AC 230V/50 Hz		
Ant. Pol.	Horizontal		
Test Mode:	Mode 1		
Remark:			



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	204.9551	52.62	-19.22	33.40	40.00	-6.60	QP
2		327.8873	53.45	-14.85	38.60	47.00	-8.40	QP
3		333.6867	52.91	-14.51	38.40	47.00	-8.60	QP
4		435.5898	48.27	-11.77	36.50	47.00	-10.50	QP
5		719.1995	44.74	-5.84	38.90	47.00	-8.10	AVG
6		793.3960	41.94	-5.34	36.60	47.00	-10.40	QP

Emission Level= Read Level+ Correct Factor

Temperature:	25 ℃	**Relative Humidity:**	55%
Pressure:	1010 hPa		
Test Voltage:	AC 230V/50 Hz		
Ant. Pol.	Vertical		
Test Mode:	Mode 1		
Remark:			



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	81.4970	55.85	-22.65	33.20	40.00	-6.80	QP
2		396.2415	49.56	-12.06	37.50	47.00	-9.50	QP
3		417.6411	45.61	-11.91	33.70	47.00	-13.30	QP
4		437.1199	45.85	-11.75	34.10	47.00	-12.90	QP
5		714.1734	39.01	-5.91	33.10	47.00	-13.90	QP
6		760.7036	38.94	-5.74	33.20	47.00	-13.80	QP

Emission Level= Read Level+ Correct Factor

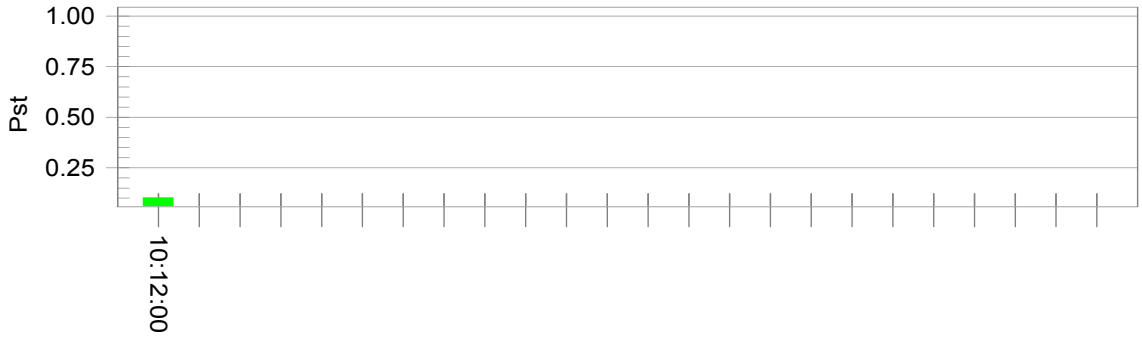
Attachment C--Voltage Fluctuation and Flicker Test Data

Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

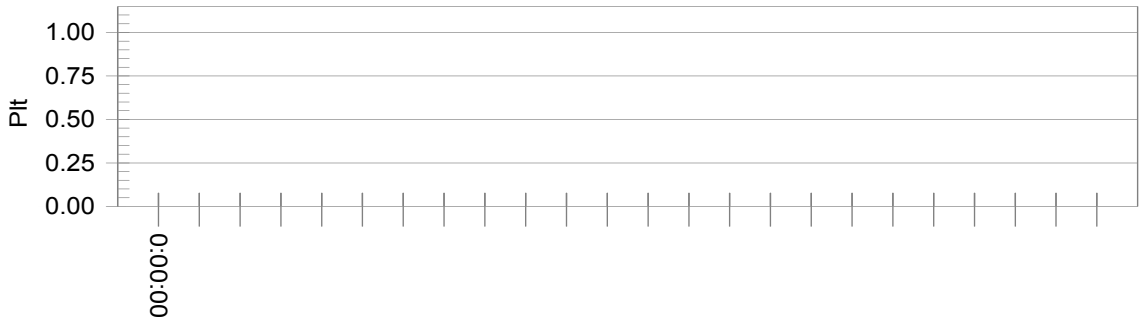
EUT: 3D pen **Tested by: Tested by**
Test category: All parameters (European limits) **Test Margin: 100**
Test date: 2017/11/15 **Start time: 10:01:39** **End time: 10:12:06**
Test duration (min): 10 **Data file name: F-000307.cts_data**
Comment: RP800A
Customer: Customer information

Test Result: Pass **Status: Test Completed**

Pst_i and limit line **European Limits**



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	**228.98**			
T-max (mS):	**0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.00**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.102**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.044**	**Test limit:**	**0.650**	**Pass**

Attachment D--Electrostatic Discharge Test Data

Temperature : 22℃ Humidity : 50%

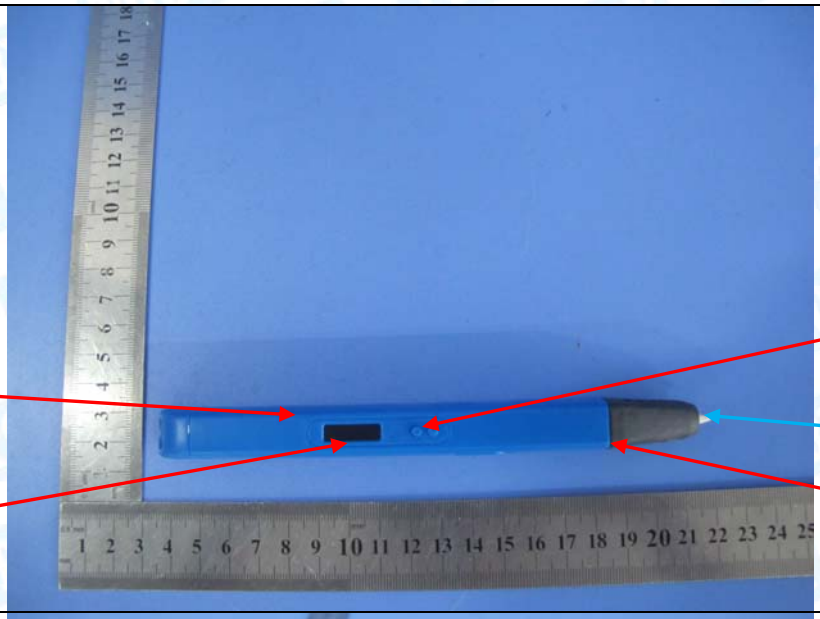
Power supply : AC 230V/50Hz Test Mode : Mode 1

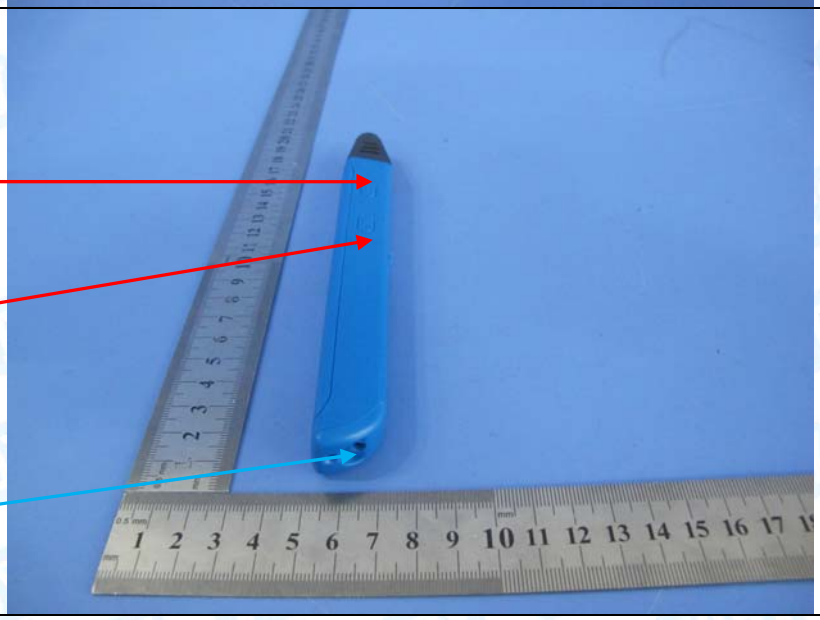
Required Performance Criteria: B

Air Discharge: ±2/±4/±8kV Contact Discharge: ±2/±4kV

Location	Test Level (kV)	No. of Discharge	Judgment	Result
A1	±2kV ±4kV ±8kV	20	A	PASS
A2		20	A	
A3		20	A	
A4		20	A	
A5		20	A	
A6		20	A	
C1	±2kV ±4kV	20	A	
C2		20	A	
HCP	±4kV	40	A	
VCP	±4kV	40	A	

Test Location Photos





Note:

1) Criteria A: There was no change operated with initial operating during the test.
2) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
3) Criteria C: The system shut down during the test.

Attachment E--RF Field Strength Susceptibility Test Data

Temperature	: 22℃	Humidity	: 50%
Power supply	: AC 230V/50Hz	Test Mode	: Mode 1

Required Performance Criteria: A

Modulation: AM 80%

Pulse: 1 kHz

EUT Position	Actual Performance Criteria				Result
	Frequency Range 1: 80~1000MHz		Frequency Range 2: /		
	Horizontal	Vertical	Horizontal	Vertical	
Front	A	A	/	/	PASS
Right	A	A	/	/	PASS
Rear	A	A	/	/	PASS
Left	A	A	/	/	PASS

Remark:

1) Criteria A: There was no change operated with initial operating during the test.
2) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
3) Criteria C: The system shut down during the test.

Attachment F--Electrical Fast Transient/Burst Test Data

Temperature : 22℃ Humidity : 50%

Power supply : AC 230V/50Hz Test Mode : Mode 1

Required Performance Criteria: B

Line : ☒ AC Mains Coupling : ☐ Direct

Line : ☒ Signal ☐ I/O Cable Coupling : ☐ Capacitive

Line	Voltage(kV)	Required Performance Criteria		Actual Performance Criteria		Result
		(+)	(-)	(+)	(-)	
L	1.0	B	B	A	A	PASS
N	1.0	B	B	A	A	PASS
L-N	1.0	B	B	A	A	PASS
L-PE	1.0	B	B	/	/	/
N-PE	1.0	B	B	/	/	/
L-N-PE	1.0	B	B	/	/	/
RJ45	0.5	B	B	/	/	/

Remark:

1) Criteria A: There was no change operated with initial operating during the test.
2) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
3) Criteria C: The system shut down during the test.

Attachment G--Surge Immunity Test Data

Temperature : 22℃ Humidity : 50%

Power supply : AC 230V/50Hz Test Mode : Mode 1

Required Performance Criteria: B

Injected Line	Voltage (kV)	Phase	Actual Performance Criteria		Result	
			(+)	(-)	(+)	(-)
L-N	1.0	0°	A	A	PASS	PASS
		90°	A	A	PASS	PASS
		180°	A	A	PASS	PASS
		270°	A	A	PASS	PASS
L-PE	2.0	0°	/	/	/	/
		90°	/	/	/	/
		180°	/	/	/	/
		270°	/	/	/	/
N-PE	2.0	0°	/	/	/	/
		90°	/	/	/	/
		180°	/	/	/	/
		270°	/	/	/	/
RJ 45	1.0	+/-	/	/	/	/

Remark:

1) Criteria A: There was no change operated with initial operating during the test.
2) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
3) Criteria C: The system shut down during the test.

Attachment H--Conducted Immunity Test Data

Temperature	: 22℃	Humidity	: 50%
Power supply	: AC 230V/50Hz	Test Mode	: Mode 1

Required Performance Criteria: **A**

Frequency Range (MHz)	Injected Position	Voltage Level (e.m.f.)	Required Performance Criteria	Actual Performance Criteria	Result
0.15 ~ 80	AC Mains	3V(rms), AM 80% Modulated with 1 kHz	**A**	A	**PASS**
0.15 ~ 80	DC Mains	3V(rms), AM 80% Modulated with 1 kHz	**A**	/	/
0.15 ~ 80	Signal Line	3V(rms), AM 80% Modulated with 1 kHz	**A**	/	/

Remark:

1) Criteria A: There was no change operated with initial operating during the test.
2) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
3) Criteria C: The system shut down during the test.

Attachment I--Voltage Dips and Interruptions Test Data

Temperature :	25℃	Humidity :	50%
Power supply :	AC 230V/50Hz	Test Mode :	Mode 1

Criterion: B&C

Test Level % UT	Voltage Dips & Short Interruptions % UT	Duration (in period)	Phase Angle	Required Performance Criteria	Actual Performance Criteria	Result
0	100	250P	0°	**C**	C	**Pass**
70	30	25P	0°	**C**	C	**Pass**
0	100	0.5P	0°	**B**	A	**Pass**

Remark: U_T is the rated voltage for the equipment.

1) Criteria A: There was no change operated with initial operating during the test.
2) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
3) Criteria C: The system shut down during the test.

-----END OF REPORT-----