EMC TEST REPORT

Authorized under **D**eclaration **o**f **C**onformity

According to

EN 55032: 2015
EN 61000-3-2: 2014
EN 61000-3-3 : 2013

EN 55024: 2010+A1: 2015
IEC 61000-4-2 : 2008
IEC 61000-4-3 : 2006+A1:2007+A2:2010
IEC 61000-4-4 : 2012
IEC 61000-4-5 : 2014
IEC 61000-4-6 : 2013
IEC 61000-4-8 : 2009
IEC 61000-4-11 : 2004

Applicant	:	Shenzhen Yinghuiyuan Electronics Co., Ltd
Address	:	3F A Building NongDian Industrial Park, East of Baishixia, FuYong Town, BaoAn District, SHENZHEN 518103, P.R. China
Equipment	:	AC /DC ADAPTER
Model No.	:	YHY-XXXYYYYY (XXX =050-300 means output voltage, three digits, For example: 050 can be 5V, 300 can be 30V, Min. rise step is 0.01V; YYYYY=00001-10000 means output current, five digits, For example:00001 can be 0.01A, 10000 can be 10A, Min. rise step is 0.01A)
Trade Mark	:	N/A

I HEREBY CERTIFY THAT:

The sample was received on Jun. 23, 2017 and the testing was carried out on Jul. 06, 2017 at Cerpass Technology (Suzhou) Co., Ltd., The test result refers exclusively to the test presented test model/sample. Without written approval of Cerpass Technology (Suzhou) Co., Ltd., the test report shall not be reproduced except in full.

EMC TEST REPORT

Issued by:

Cerpass Technology (Suzhou) Co., Ltd.

No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China

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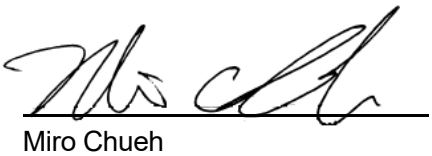
The test record, data evaluation & Equipment Under Test configurations represented herein are true and accurate accounts of the measurements of the samples EMC characteristics under the conditions specified in this report.

The above equipment was tested by **Cerpass Technology (Suzhou) Co., Ltd.** for compliance with the requirements of technical standards specified above under the EMC Directive **2014/30/EU.** The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties

Approved by:



Miro Chueh
EMC/RF B.U. Manager

Laboratory Accreditation:

☐ Cerpass Technology Corporation Test Laboratory

TAF LAB Code:	**1439**

☒ Cerpass Technology (SuZhou) Co., Ltd.

NVLAP LAB Code:	**200814-0**
CNAS LAB Code:	**L5515**

Contents

1. Summary of Test Procedure and Test Results 6
2. Immunity Testing Performance Criteria Definition 7
3. Test Configuration of Equipment under Test 8
3.1. Feature of Equipment under Test 8
3.2. Test Manner 9
3.3. Description of Test System 9
3.1. General Information of Test 10
3.2. Measurement Uncertainty 11
4. Test of Conducted Emission 12
4.1. Test Limit 12
4.2. Test Procedures 15
4.3. Typical Test Setup 15
4.4. Measurement equipment 15
4.5. Test Result and Data 16
4.6. Test Photographs 18
5. Test of Radiated Emission 19
5.1. Test Limit 19
5.2. Test Procedures 22
5.3. Typical Test Setup 22
5.4. Measurement Equipment 24
5.5. Test Result and Data (30MHz ~ 1000MHz) 25
5.6. Test Photographs (30MHz ~ 1000MHz) 27
6. Harmonics Test 28
6.1. Limits Of Harmonics Current Measurement 28
6.2. Measurement equipment 29
6.3. Test Result and Data 30
6.4. Test Photographs 34
7. Voltage Fluctuations Test 35
7.1. Test Procedure 35
7.2. Measurement equipment 35
7.3. Test Result and Data 36
7.4. Test Photographs 38
8. Electrostatic Discharge Immunity Test 39
8.1. Test Procedure 39
8.2. Test Setup for Tests Performed in Laboratory 40
8.3. Test Severity Levels 41
8.4. Measurement equipment 41
8.5. Test Result and Data 42
8.6. Test Photographs 43
9. Radio Frequency electromagnetic field immunity test 44
9.1. Test Procedure 44
9.2. Test Severity Levels 45
9.3. Measurement equipment 45

9.4. Test Result and Data 46
9.5. Test Photographs 47
10. Electrical Fast Transient/ Burst Immunity Test 48
10.1. Test Procedure 48
10.2. Test Severity Levels 49
10.3. Measurement equipment 49
10.4. Test Result and Data 50
10.5. Test Photographs 51
11. Surge Immunity Test 52
11.1. Test Procedure 52
11.2. Test Severity Level 53
11.1. Measurement equipment 53
11.2. Test Result and Data 54
11.3. Test Photographs 55
12. Conduction Disturbances induced by Radio-Frequency Fields 56
12.1. Test Procedure 56
12.2. Test Severity Levels 57
12.1. Test Setup 57
12.2. Measurement equipment 58
12.3. Test Result and Data 59
12.4. Test Photogrphs 60
13. Power Frequency Magnetic Field Immunity Tests 61
13.1. Test Setup 61
13.2. Test Severity Levels 61
13.3. Test Result and Data 61
14. Voltage Dips and Voltage Interruptions Immunity Test Setup 62
14.1. Test Conditions 62
14.1. Test Setup 62
14.2. Measurement equipment 62
14.3. Test Result and Data 63
14.4. Test Photographs 64
15. Photographs of EUT 65

History of this test report

■Original

☐Additional attachment as following record:

Report No	Version	Date	Description
DECE1706078	Rev 01	Jul. 06, 2017	Initial Issue

1. Summary of Test Procedure and Test Results

The measurements shown in this test report were made in accordance with the procedures given in **EUROPEAN COUNCIL DIRECTIVE 2014/30/EU.**

The energy emitted by this equipment was passed both Radiated and Conducted Emissions Class **B** limits.

Test Item	Normative References	Test Result
Conducted Emission	EN 55032:2015	PASS
Radiated Emission	EN 55032:2015	PASS
Harmonics	EN 61000-3-2:2014	PASS
Voltage Fluctuations	EN 61000-3-3:2013	PASS
EN 55024: 2010+A1: 2015		
Electrostatic Discharge Immunity Test (ESD)	IEC 61000-4-2:2008	PASS
Radio Frequency electromagnetic field immunity test (RS)	IEC 61000-4-3:2006+A1:2007+A2:2010	PASS
Electrical Fast Transient/ Burst Immunity Test (EFT)	IEC 61000-4-4:2012	PASS
Surge Immunity Test	IEC 61000-4-5:2014	PASS
Conduction Disturbances induced by Radio-Frequency Fields	IEC 61000-4-6:2013	PASS
Power Frequency Magnetic Field Immunity Test	IEC 61000-4-8:2009	N/A
Voltage Dips and Voltage Interruptions Immunity Test	IEC 61000-4-11:2004	PASS

2. Immunity Testing Performance Criteria Definition

Criteria A:	The apparatus shell continues to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criteria B:	After test, the apparatus shell continues to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomenon below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. However, no change of operating state if stored data is allowed to persist after the test. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criteria C:	Temporary loss of function is allowed, provided the functions is self-recoverable or can be restored by the operation of controls by the user in accordance with the manufacturer instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

3. Test Configuration of Equipment under Test

3.1. Feature of Equipment under Test

Product Name:	AC /DC ADAPTER
Model Name:	YHY-XXXYYYYY (XXX =050-300 means output voltage, three digits, For example: 050 can be 5V, 300 can be 30V, Min. rise step is 0.01V; YYYYY=00001-10000 means output current, five digits, For example:00001 can be 0.01A, 10000 can be 10A, Min. rise step is 0.01A)
Model Discrepancy:	All models are identical except for output spec and transformer. More details please refer to model list.
Housing material:	Plastic case
EUT Highest Frequency:	＜108MHz
EUT Power Rating:	Input: 100-240V~, 50/60Hz, 0.8A Max. output: Please refer to model list

Note: 1) More details please refer to user manual or product specification.

Model List:

Model	Input	Transformer	Output		
			Voltage (V)	Current (A)	W
YHY-XXXYYYYY	100-240Vac, 50-60Hz, 2.5A	TF32-050120	5.0	0.01-10.00	50
			5.1-6.0	0.01-10.00	60
			6.1-7.0	0.01-10.00	70
			7.1-8.0	0.01-10.00	80
			8.1-9.0	0.01-10.00	90
			9.1-10.0	0.01-10.00	100
			10.1-11.0	0.01-10.00	110
			11.1-12.0	0.01-10.00	120
		TF32-121300	12.1-13.0	0.01-9.20	119.6
			13.1-14.0	0.01-8.50	119
			14.1-15.0	0.01-8.00	120
			15.1-16.0	0.01-7.50	120
			16.1-17.0	0.01-7.00	119
			17.1-18.0	0.01-6.60	118.8
			18.1-19.0	0.01-6.30	119.7
			19.1-20.0	0.01-6.00	120
			20.1-21.0	0.01-5.70	119.7
			21.1-22.0	0.01-5.40	118.8
			22.1-23.0	0.01-5.20	119.6
			23.1-24.0	0.01-5.00	120
			24.1-25.0	0.01-4.80	120
			25.1-26.0	0.01-4.60	119.6
			26.1-27.0	0.01-4.40	118.8
			27.1-28.0	0.01-4.20	117.6
			28.1-29.0	0.01-4.10	118.9
			29.1-30.0	0.01-4.00	120

Note: YHY-XXXYYYYY (XXX =050-300 means output voltage, three digits. For example: 050 can be 5V, 300 can be 30V, Min. rise step is 0.01V; YYYYY=00001-10000 means output current, five digits, For example:00001 can be 0.01A, 10000 can be 10A, Min. rise step is 0.01A)

3.2. Test Manner

a. During testing, the interface cables and equipment positions were varied according to Europe Standard.
b. The complete test system includes Meter, LOAD and EUT for EMI test.
c. The test modes as Radiated Emission/ Conducted Emission follow:
   Test Mode 1: FULL LOAD For 30V/4A
   Test Mode 2: FULL LOAD For 12V/10A
   Test Mode 3: FULL LOAD For 13V/9.2A
   Test Mode 4: HALF LOAD For 30V/2A
   The “Test Mode 1” generated the worst test result; it was reported as final data.
d. The maximum operating frequency is under 108MHz; the test frequency range is from 30MHz to 1GHz.

3.3. Description of Test System

No.	Device	Manufacturer	Model No.	Description
1	Meter	Fluke	15B	N/A
2	LOAD	N/A	N/A	N/A

Item	Cable	Quantity	Description
A	Meter Cable	2	1.2m Non Shielding
B	DC Cable	1	1.1m Non Shielding With one core

3.1.General Information of Test

☐	Test Site	**Cerpass Technology Corporation Test Laboratory** Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881 Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C. Tel: +886-2-2663-8582
	FCC	TW1079, TW1061,390316, 228391, 641184
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication Test C-4663 for Conducted emission test R-3428, R-4218 for Radiated emission test G-812, G-813 for radiated disturbance above 1GHz
☒	Test Site	**Cerpass Technology (Suzhou) Co., Ltd.** Address: No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China Tel: +86-512-6917-5888 Fax: +86-512-6917-5666
	FCC	331395
	IC	7290A-1, 7290A-2
	VCCI	T-1945 for Telecommunication Test C-2919 for Conducted emission test R-2670 for Radiated emission test G-227 for radiated disturbance above 1GHz
Frequency Range Investigated:		Conducted: from 150kHz to 30 MHz Radiation: from 30 MHz to 6000MHz
Test Distance :		The test distance of radiated emission below 1GHz from antenna to EUT is 3 M. The test distance of radiated emission above 1GHz from antenna to EUT is 3 M.

3.2. Measurement Uncertainty

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

Conducted Emission	
The measurement uncertainty is evaluated as ± 3.19 dB.	
Radiated Emission	
(30MHz -200MHz)	The measurement uncertainty is evaluated as ±3.69 dB.
(200M-1000M)	The measurement uncertainty is evaluated as ±3.67 dB.

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

Consistent with industry standard (e.g. CISPR 22: 2008, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.

4. Test of Conducted Emission

4.1. Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz and return leads of the EUT according to the methods defined in European Standard EN 55032.

Table A.8 – Requirements for conducted emissions from the AC mains power ports of Class A equipment

Applicable to 1. AC mains power ports (3.1.1)				
Table clause	**Frequency range** MHz	**Coupling device** (see Table A.7)	**Detector type / bandwidth**	**Class A limits dB(µV)**
A8.1	0,15 – 0,5	AMN	Quasi Peak / 9 kHz	79
	0,5 – 30			73
A8.2	0,15 – 0,5	AMN	Average / 9 kHz	66
	0,5 – 30			60
NOTE Apply A8.1 and A8.2 across the entire frequency range.				

Table A.9 – Requirements for conducted emissions from the AC mains power ports of Class B equipment

Applicable to 1. AC mains power ports (3.1.1)				
Table clause	**Frequency range** MHz	**Coupling device** (see Table A.7)	**Detector type / bandwidth**	**Class B limits dB(µV)**
A9.1	0,15 – 0,5	AMN	Quasi Peak / 9 kHz	66 – 56
	0,5 – 5			56
	5 – 30			60
A9.2	0,15 – 0,5	AMN	Average / 9 kHz	56 – 46
	0,5 – 5			46
	5 – 30			50
NOTE Apply A9.1 and A9.2 across the entire frequency range.				

Table A.10 – Requirements for asymmetric mode conducted emissions from Class A equipment

Applicable to

1. wired network ports (3.1.30)
2. optical fibre ports (3.1.24) with metallic shield or tension members
3. antenna ports (3.1.3)

Table clause	Frequency range MHz	Coupling device (see Table A.7)	Detector type / bandwidth	Class A voltage limits dB(µV)	Class A current limits dB(µA)
A10.1	0,15 – 0,5	AAN	Quasi Peak / 9 kHz	97 – 87	n/a
	0,5 – 30			87	
	0,15 – 0,5	AAN	Average / 9 kHz	84 – 74	
	0,5 – 30			74	
A10.2	0,15 – 0,5	CVP and current probe	Quasi Peak / 9 kHz	97 – 87	53 – 43
	0,5 – 30			87	43
	0,15 – 0,5	CVP and current probe	Average / 9 kHz	84 – 74	40 – 30
	0,5 – 30			74	30
A10.3	0,15 – 0,5	Current Probe	Quasi Peak / 9 kHz	n/a	53 – 43
	0,5 – 30				43
	0,15 – 0,5	Current Probe	Average / 9 kHz		40 – 30
	0,5 – 30				30

NOTE 1 The choice of coupling device and measurement procedure is defined in Annex C.

NOTE 2 AC mains power ports shall meet the limits given in Table A.8.

NOTE 3 The test shall cover the entire frequency range.

NOTE 4 The application of the voltage and/or current limits is dependent on the measurement procedure used. Refer to Table C.1 for applicability.

NOTE 5 Testing is required at only one EUT supply voltage and frequency.

NOTE 6 Applicable to ports listed above and intended to connect to cables longer than 3 m.

Table A.11 – Requirements for asymmetric mode conducted emissions from Class B equipment

Applicable to

1. wired network ports (3.1.30)
2. optical fibre ports (3.1.24) with metallic shield or tension members
3. broadcast receiver tuner ports (3.1.8)
4. antenna ports (3.1.3)

Table clause	Frequency range MHz	Coupling device (see Table A.7)	Detector type / bandwidth	Class B voltage limits dB(µV)	Class B current limits dB(µA)
A11.1	0,15 – 0,5	AAN	Quasi Peak / 9 kHz	84 – 74	n/a
	0,5 – 30			74	
	0,15 – 0,5	AAN	Average / 9 kHz	74 – 64	
	0,5 – 30			64	
A11.2	0,15 – 0,5	CVP and current probe	Quasi Peak / 9 kHz	84 – 74	40 – 30
	0,5 – 30			74	30
	0,15 – 0,5	CVP and current probe	Average / 9 kHz	74 – 64	30 – 20
	0,5 – 30			64	20
A11.3	0,15 – 0,5	Current Probe	Quasi Peak / 9 kHz	n/a	40 – 30
	0,5 – 30				30
	0,15 – 0,5	Current Probe	Average / 9 kHz		30 – 20
	0,5 – 30				20

NOTE 1 The choice of coupling device and measurement procedure is defined in Annex C.

NOTE 2 Screened ports including TV broadcast receiver tuner ports are tested with a common-mode impedance of 150 Ω. This is typically accomplished with the screen terminated by 150 Ω to earth.

NOTE 3 AC mains power ports shall meet the limits given in Table A.**9**.

NOTE 4 The test shall cover the entire frequency range.

NOTE 5 The application of the voltage and/or current limits is dependent on the measurement procedure used. Refer to Table C.1 for applicability.

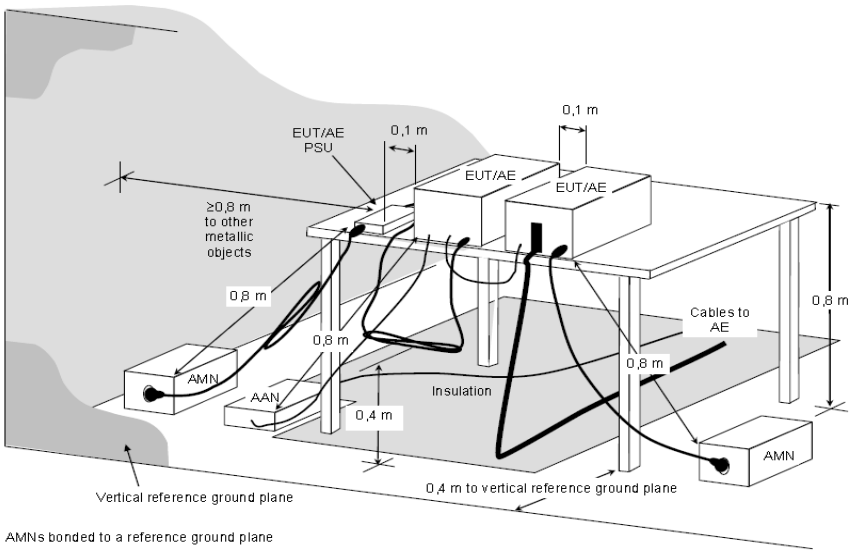
NOTE 6 Testing is required at only one EUT supply voltage and frequency.

NOTE 7 Applicable to ports listed above and intended to connect to cables longer than 3 m.

4.2. Test Procedures

a. The EUT was placed on a desk 0.8 meters height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
c. All the support units are connecting to the other LISN.
d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
e. The CISPR states that a 50 ohm, 50 micro-Henry LISN should be used.
f. Both sides of AC line were checked for maximum conducted interference.
g. The frequency range from 150 kHz to 30 MHz was searched
h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

4.3. Typical Test Setup



NOTE The 0,8 m distance specified between EUT/AE/PSU and AMN/AAN, is applicable only to the EUT being measured. If the device is AE then it shall be ≥0,8 m.

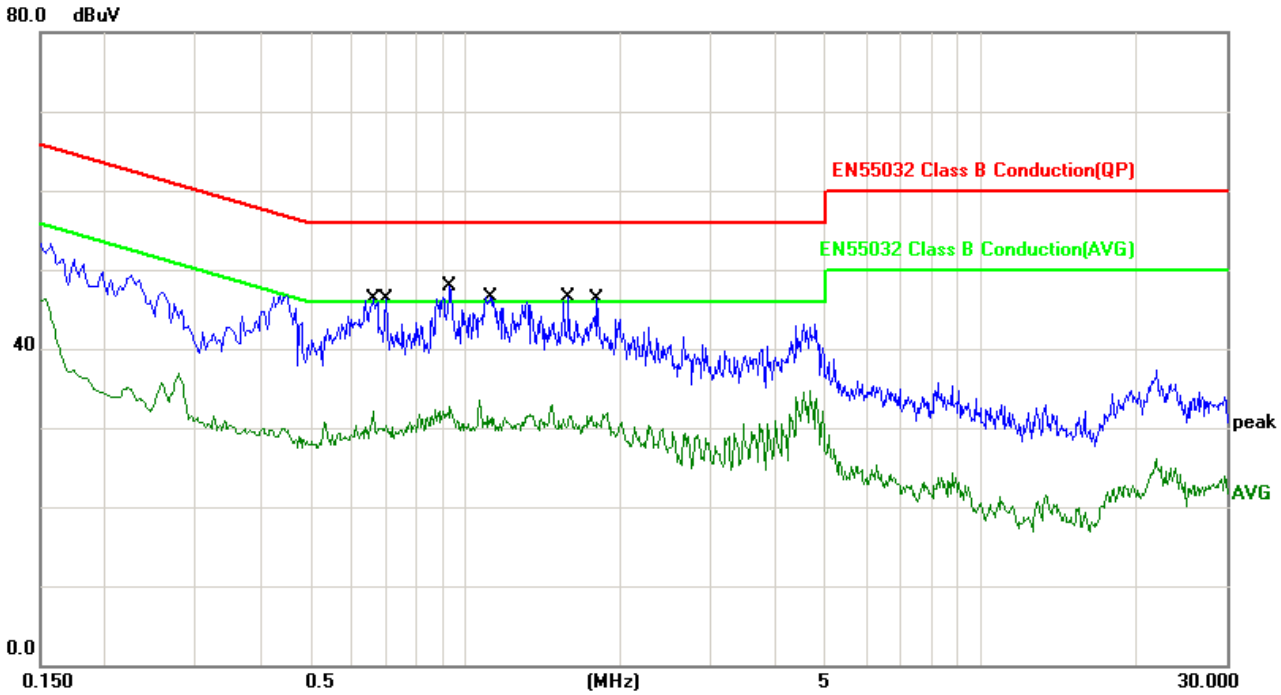
Figure D.2 – Example measurement arrangement for table-top EUT (Conducted emission measurement – alternative 1)

4.4. Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Test Receiver	R&S	ESCI	100564	2017.02.14	2018.02.13
LISN	SCHWARZBECK	NSLK 8127	8127748	2017.02.14	2018.02.13
LISN	SCHWARZBECK	NSLK 8127	8127749	2017.02.14	2018.02.13
Pulse Limiter with 10dB Attenuation	SCHWARZBECK	VTSD 9561-F	9561-F106	2017.02.14	2018.02.13
Temperature/ Humidity Meter	mingle	ETH529	N/A	2017.02.14	2018.02.13

4.5. Test Result and Data

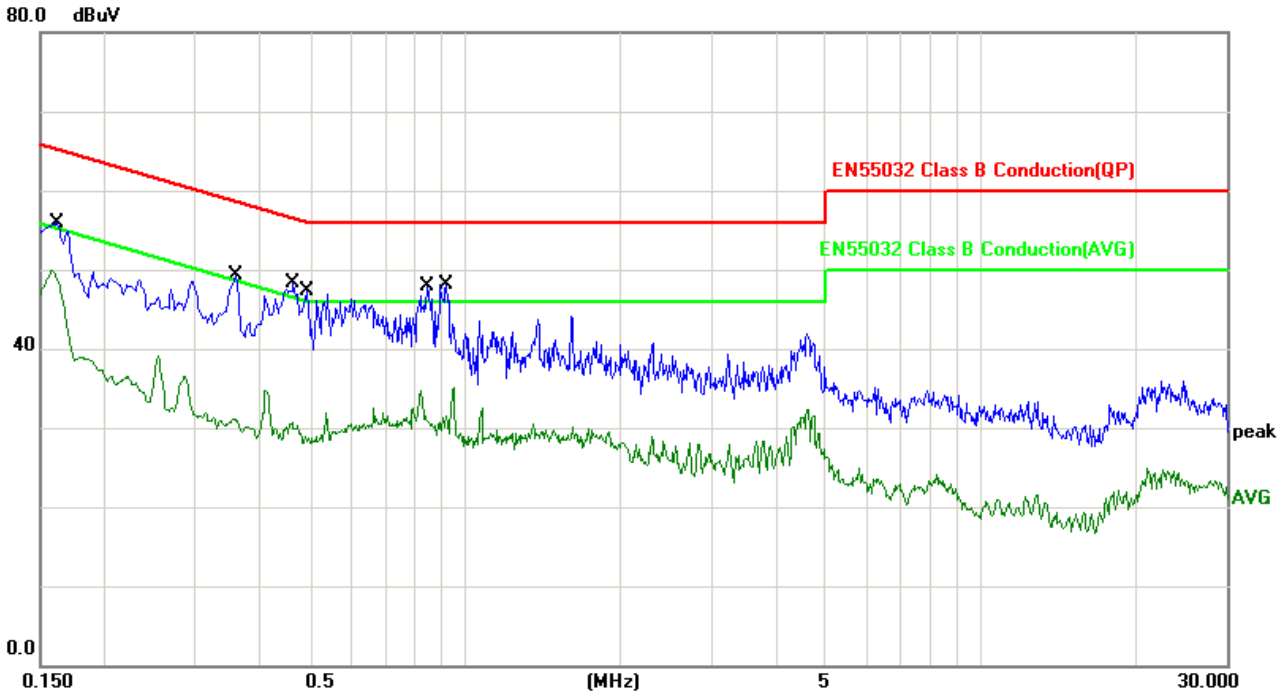
Test Mode 1:	FULL LOAD For 30V/4A		
AC Power :	AC 230V/50Hz	Phase :	LINE
Temperature :	22°C	Humidity :	50%
Pressure(mbar) :	1002	Date:	Jul. 06, 2017



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.6660	9.95	28.43	38.38	56.00	-17.62	QP
2	0.6660	9.95	21.03	30.98	46.00	-15.02	AVG
3	0.7019	9.98	25.18	35.16	56.00	-20.84	QP
4	0.7019	9.98	18.94	28.92	46.00	-17.08	AVG
5	0.9380	10.03	27.61	37.64	56.00	-18.36	QP
6	0.9380	10.03	21.69	31.72	46.00	-14.28	AVG
7	1.1220	10.15	29.45	39.60	56.00	-16.40	QP
8	1.1220	10.15	20.53	30.68	46.00	-15.32	AVG
9	1.5859	10.59	25.96	36.55	56.00	-19.45	QP
10	1.5859	10.59	19.68	30.27	46.00	-15.73	AVG
11	1.8020	10.78	26.62	37.40	56.00	-18.60	QP
12	1.8020	10.78	19.80	30.58	46.00	-15.42	AVG

Note: Measurement Level = Reading Level + Correct Factor+ Attenuator

Test Mode 1:	FULL LOAD For 30V/4A		
AC Power :	AC 230V/50Hz	Phase :	NEUTRAL
Temperature :	22°C	Humidity :	50%
Pressure(mbar) :	1002	Date:	Jul. 06, 2017



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1620	9.97	42.87	52.84	65.36	-12.52	QP
2	0.1620	9.97	39.41	49.38	55.65	-6.27	AVG
3	0.3580	9.88	34.51	44.39	58.77	-14.38	QP
4	0.3580	9.88	21.09	30.97	50.06	-19.09	AVG
5	0.4660	9.82	32.43	42.25	56.58	-14.33	QP
6	0.4660	9.82	19.66	29.48	46.97	-17.49	AVG
7	0.4940	9.80	30.49	40.29	56.10	-15.81	QP
8	0.4940	9.80	25.39	35.19	46.17	-10.98	AVG
9	0.8460	10.01	32.30	42.31	56.00	-13.69	QP
10	0.8460	10.01	22.08	32.09	46.00	-13.91	AVG
11	0.9220	10.02	27.55	37.57	56.00	-18.43	QP
12	0.9220	10.02	20.69	30.71	46.00	-15.29	AVG

Note: Measurement Level = Reading Level + Correct Factor+ Attenuator

Test engineer: Nuny

4.6. Test Photographs

Front View

Side View

5. Test of Radiated Emission

5.1. Test Limit

The EUT shall meet the limits of below Table when measured at the measuring distance R in accordance with the methods described in European Standard EN 55032. If the reading on the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the highest reading shall be recorded, with the exception of any brief isolated high reading, which shall be ignored.

Table 1 – Required highest frequency for radiated measurement

Highest internal frequency (F_x)	Highest measured frequency
$F_x \leq 108$ MHz	1 GHz
108 MHz $< F_x \leq$ 500 MHz	2 GHz
500 MHz $< F_x \leq$ 1 GHz	5 GHz
$F_x >$ 1 GHz	$5 \times F_x$ up to a maximum of 6 GHz
NOTE 1 For FM and TV broadcast receivers, F_x is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies. NOTE 2 F_x is defined in 3.1.19.	

Where the F_x is unknown, the radiated emission measurements shall be performed up to 6 GHz.

Table A.3 – Requirements for radiated emissions at frequencies above 1 GHz for Class A equipment

Table clause	Frequency range MHz	Measurement		Class A limits dB(µV/m)
		Distance m	Detector type/ bandwidth	FSOATS (see Table A.1)
A3.1	1 000 – 3 000	3	Average / 1 MHz	56
	3 000 – 6 000			60
A3.2	1 000 – 3 000		Peak / 1 MHz	76
	3 000 – 6 000			80
NOTE Apply A3.1 and A3.2 across the frequency range from 1 000 MHz to the highest required frequency of measurement derived from Table 1.				

Table A.2 – Requirements for radiated emissions at frequencies up to 1 GHz for Class A equipment

Table clause	Frequency range MHz	Measurement		Class A limits dB(µV/m)
		Distance m	Detector type/ bandwidth	OATS/SAC (see Table A.1)
A2.1	30 – 230	10	Quasi Peak / 120 kHz	40
	230 – 1 000			47
A2.2	30 – 230	3		50
	230 – 1 000			57
NOTE Apply only A2.1 or A2.2 across the entire frequency range.				

Table A.4 – Requirements for radiated emissions at frequencies up to 1 GHz for Class B equipment

Table clause	Frequency range MHz	Measurement		Class B limits dB(μV/m)
		Distance m	Detector type/ bandwidth	OATS/SAC (see Table A.1)
A4.1	30 – 230	10	Quasi Peak / 120 kHz	30
	230 – 1 000			37
A4.2	30 – 230	3		40
	230 – 1 000			47
NOTE Apply only table clause A4.1 or A4.2 across the entire frequency range.				

Table A.5 – Requirements for radiated emissions at frequencies above 1 GHz for Class B equipment

Table clause	Frequency range MHz	Measurement		Class B limits dB(μV/m)
		Distance m	Detector type/ bandwidth	FSOATS (see Table A.1)
A5.1	1 000 – 3 000	3	Average/ 1 MHz	50
	3 000 – 6 000			54
A5.2	1 000 – 3 000		Peak/ 1 MHz	70
	3 000 – 6 000			74
NOTE Apply A5.1 and A5.2 across the frequency range from 1 000 MHz to the highest required frequency of measurement derived from Table 1.				

Table A.6 – Requirements for radiated emissions from FM receivers

Table clause	Frequency range MHz	Measurement		Class B limit dB(μV/m)	
		Distance m	Detector type/ bandwidth	Fundamental	Harmonics
				OATS/SAC (see Table A.1)	OATS/SAC (see Table A.1)
A6.1	30 – 230	10	Quasi peak/ 120 kHz	50	42
	230 – 300				42
	300 – 1 000				46
A6.2	30 – 230	3		60	52
	230 – 300				52
	300 – 1 000				56
NOTE 1 Apply only A.6.1 or A.6.2 across the entire frequency range. NOTE 2 These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the local oscillator. Signals at all other frequencies shall be compliant with the limits given in Table A.4.					

Table A.12 – Requirements for conducted differential voltage emissions from Class B equipment

Applicable to
1. TV broadcast receiver tuner ports (3.1.8) with an accessible connector
2. RF modulator output ports (3.1.27)
3. FM broadcast receiver tuner ports (3.1.8) with an accessible connector

Table clause	Frequency range MHz	Detector type/ bandwidth	Class B limits dB(µV) 75 Ω			Applicability
			Other	Local Oscillator Fundamental	Local Oscillator Harmonics	
A12.1	30 – 950	For frequencies ≤1 GHz Quasi Peak/ 120 kHz	46	46	46	See NOTE 1
	950 – 2 150		46	54	54	
A12.2	950 – 2 150		46	54	54	See NOTE 2
A12.3	30 – 300		46	54	50	See NOTE 3
	300 – 1 000				52	
A12.4	30 – 300	For frequencies ≥1 GHz Peak/ 1 MHz	46	66	59	See NOTE 4
	300 – 1 000				52	
A12.5	30 – 950		46	76	46	See NOTE 5
	950 – 2 150			n/a	54	

NOTE 1 Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers.

NOTE 2 Tuner units (not the LNB) for satellite signal reception.

NOTE 3 Frequency modulation audio receivers and PC tuner cards.

NOTE 4 Frequency modulation car radios.

NOTE 5 Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports.

NOTE 6 Testing is required at only one EUT supply voltage and frequency.

NOTE 7 The term 'other' refers to all emissions other than the fundamental and the harmonics of the local oscillator.

NOTE 8 The test shall be performed with the device operating at each reception channel.

NOTE 9 The test shall cover the entire frequency range.

5.2. Test Procedures

a. The EUT was placed on a rotatable table top 0.8 meter above ground.
b. The EUT was set 3/10 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
c. The table was rotated 360 degrees to determine the position of the highest radiation.
d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 6 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 6 dB margin will be repeated one by one using the quasi-peak method and reported.

5.3. Typical Test Setup

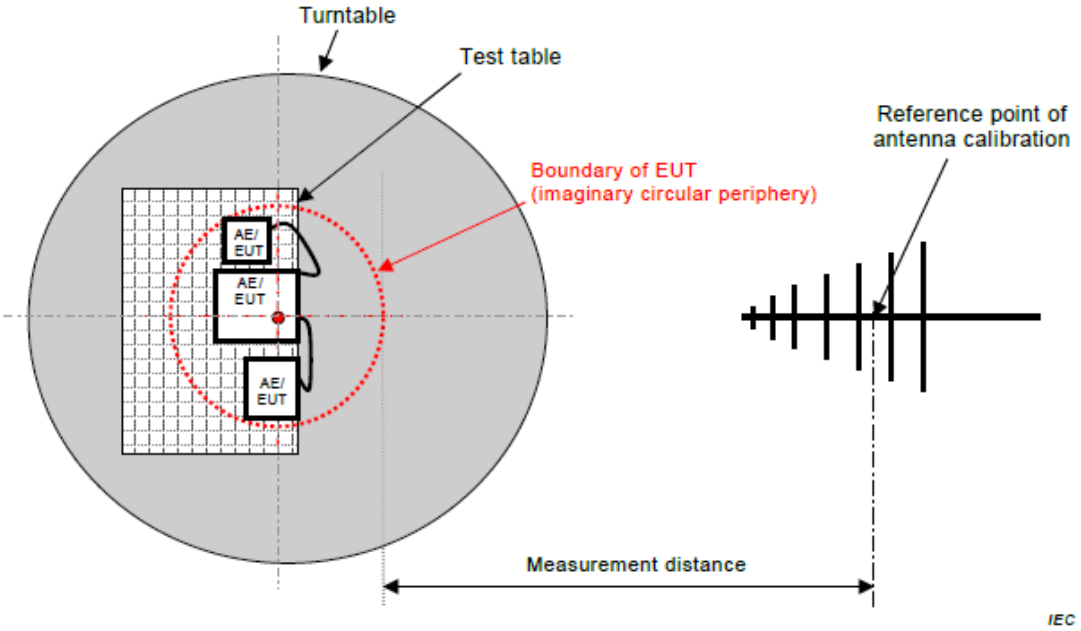
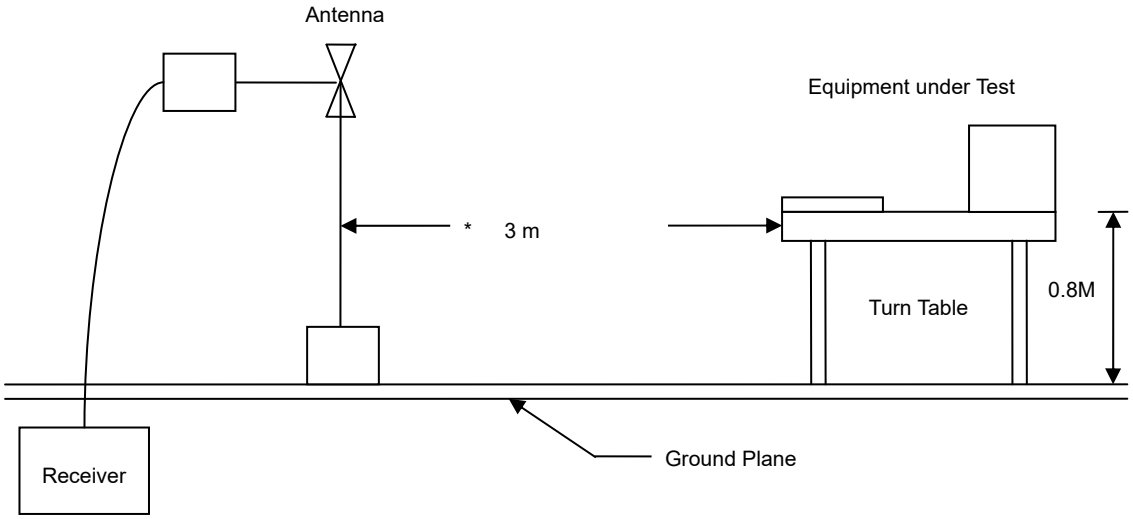
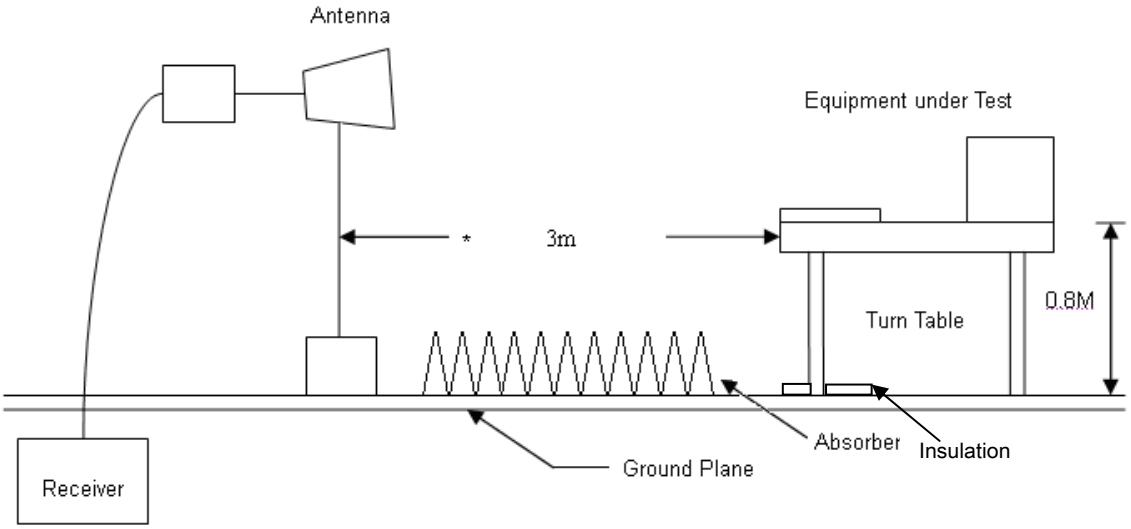


Figure C.1 – Measurement distance

Below 1GHz Test Setup



Above 1GHz Test Setup

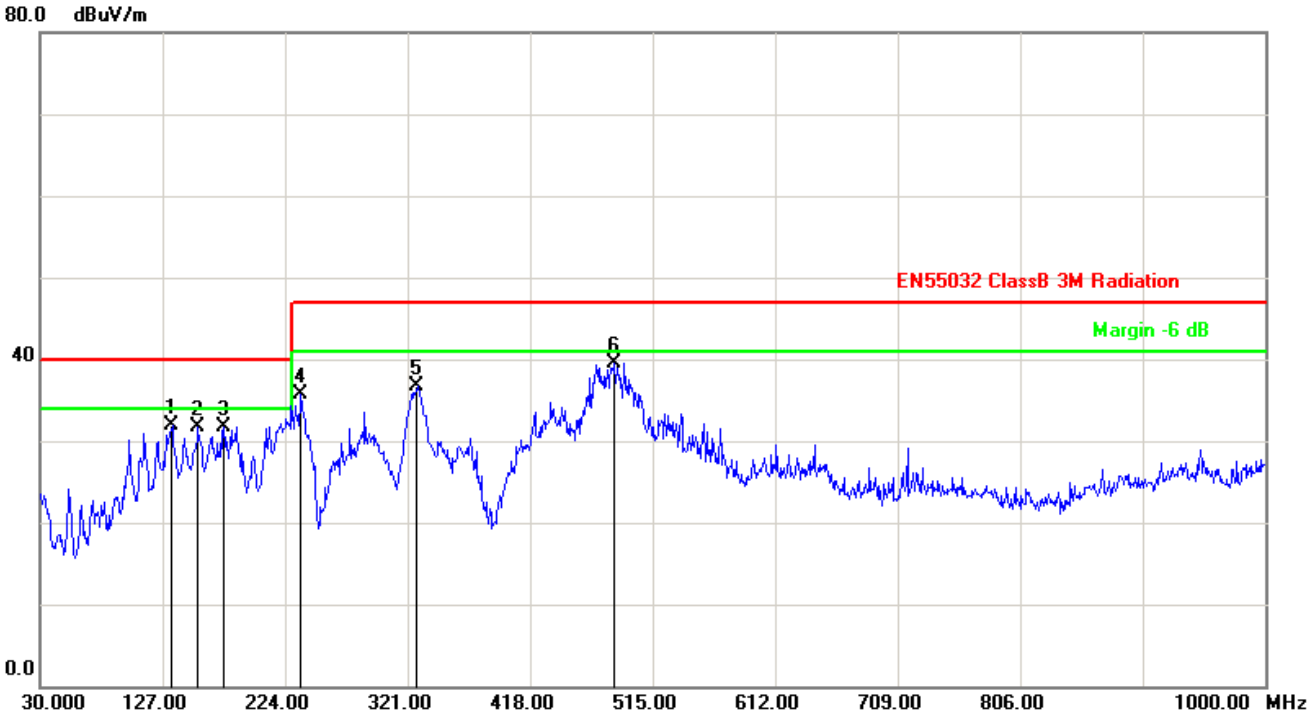


5.4. Measurement Equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
EMI Test Receiver	R&S	ESCI	100853	2017.02.14	2018.02.13
Preamplifier	HP	8447F	3113A05915	2017.02.14	2018.02.13
Preamplifier	FIELD	AFS44-00101800 -25-10P-44	1579008	2016.09.29	2017.09.28
Ultra Broadband Antenna	SCHAFFNER	CBL6112D	22241	2017.02.14	2018.02.13
Broad-Band Horn Antenna	Sunol	DRH-118	A072913	2016.10.12	2017.10.11
Spectrum Analyzer	Agilent	E4407B	MY45118947	2017.05.26	2018.05.25
Temperature/ Humidity Meter	mingle	ETH529	N/A	2017.02.14	2018.02.13

5.5. Test Result and Data (30MHz ~ 1000MHz)

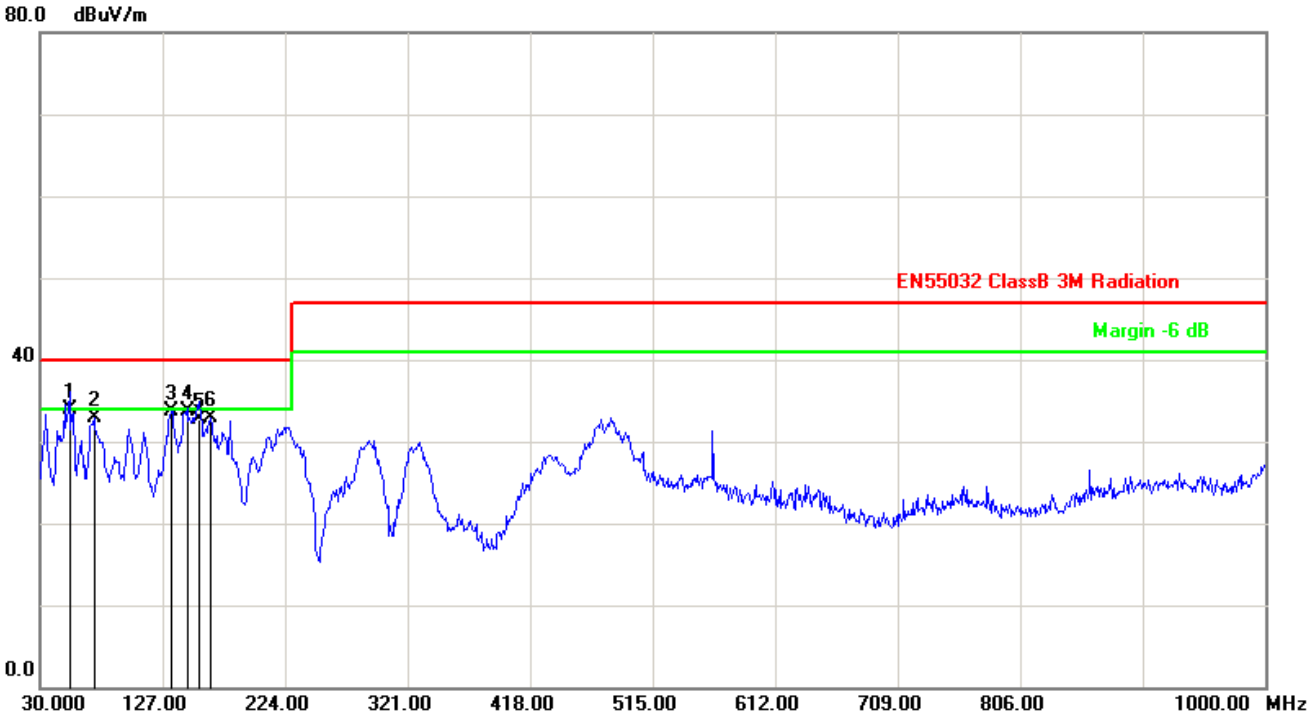
Test Mode 1:	FULL LOAD For 30V/4A		
AC Power :	AC 230V/50Hz	Ant. Polarization:	Horizontal
Temp :	23℃	Humidity :	52%
Pressure(mbar) :	1002	Date :	Jul. 05, 2017



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)
1	134.7599	-9.50	41.44	31.94	40.00	-8.06	peak	200	334
2	155.1299	-11.69	43.49	31.80	40.00	-8.20	peak	400	295
3	175.5000	-11.84	43.45	31.61	40.00	-8.39	peak	100	104
4	236.6100	-9.23	44.90	35.67	47.00	-11.33	peak	300	293
5	328.7599	-4.39	41.00	36.61	47.00	-10.39	peak	200	85
6	484.9300	-1.42	41.02	39.60	47.00	-7.40	peak	300	53

Note: Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss - Amplifier Factor

Test Mode 1:	FULL LOAD For 30V/4A		
AC Power :	AC 230V/50Hz	Ant. Polarization:	Vertical
Temp :	23℃	Humidity :	52%
Pressure(mbar) :	1002	Date :	Jul. 05, 2017



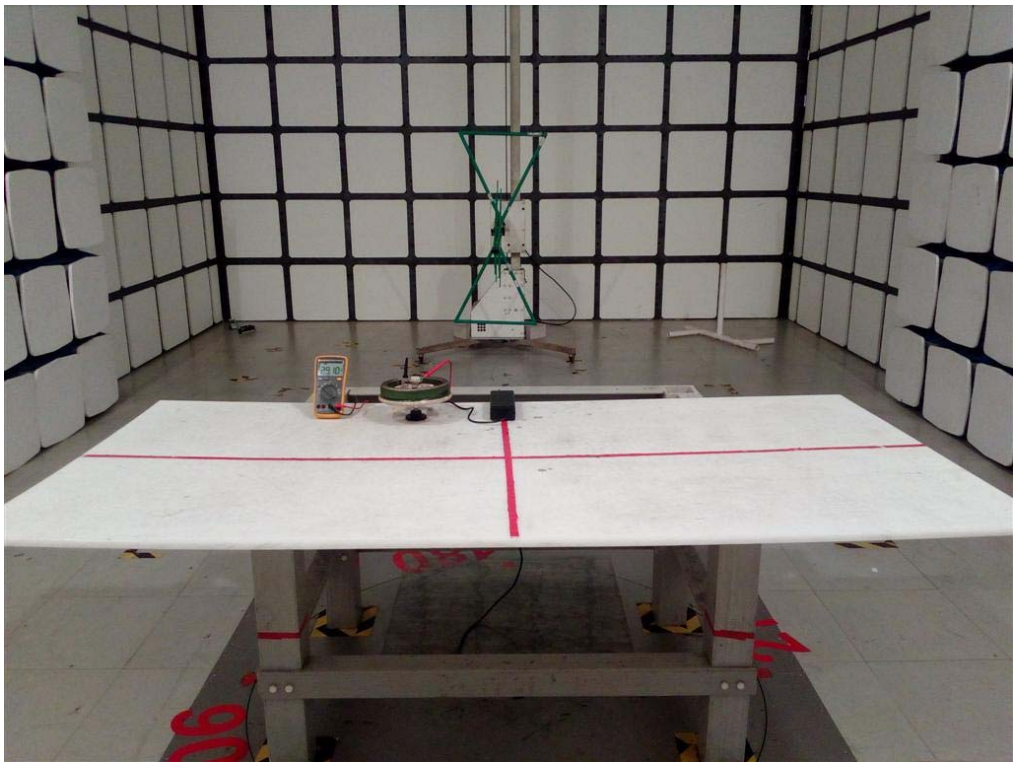
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)
1	53.2800	-14.73	48.70	33.97	40.00	-6.03	QP	114	149
2	72.6800	-14.52	47.39	32.87	40.00	-7.13	peak	100	0
3	133.7899	-9.38	43.15	33.77	40.00	-6.23	peak	100	107
4	146.4000	-10.88	44.67	33.79	40.00	-6.21	peak	100	11
5	156.1000	-11.77	44.57	32.80	40.00	-7.20	QP	135	19
6	164.8300	-12.35	45.30	32.95	40.00	-7.05	peak	100	155

Note: Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss - Amplifier Factor

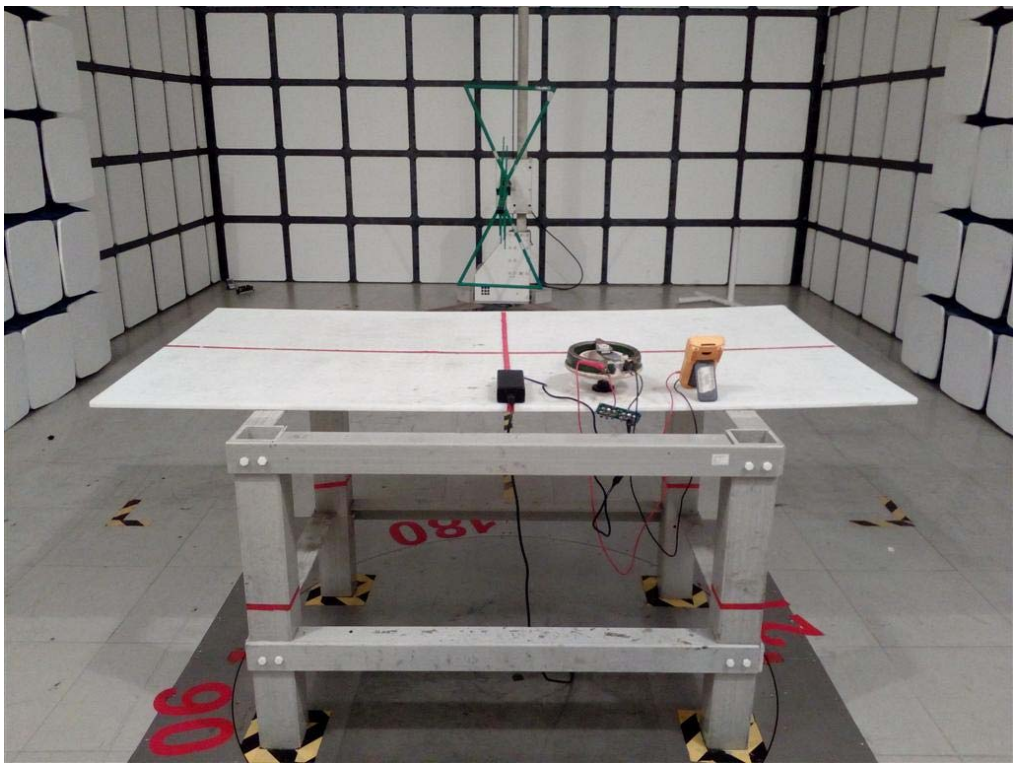
Test engineer: Nunu

5.6. Test Photographs (30MHz ~ 1000MHz)

Front View



Rear View



6. Harmonics Test

6.1. Limits Of Harmonics Current Measurement

Limits for Class A equipment

Harmonics Order n	Max. permissible harmonics current A	Harmonics Order n	Max. permissible harmonics current A
Odd harmonics		Even harmonics	
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	8<=n<=40	0.23x8/n
11	0.33		
13	0.21		
15<=n<=39	0.15x15/n		

(b) Limits for Class B equipment

For Class B equipment, the harmonics of the input current shall not exceed the values given in Table that is the limit of Class A multiplied by a factor of 1,5.

(c) Limits for Class C equipment

Harmonics Order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency %
2	2
3	30 . λ*
5	10
7	7
9	5
11<n<39 (odd harmonics only)	3
* λ is the circuit power factor	

(d) Limits for Class D equipment

Harmonics Order n	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
11 < n < 39 (odd harmonics only)	3.85/n	See limit of Class A

NOTE: According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an ctive input power up to and including 75 W.

6.2. Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Power Source	TESEQ	NSG 1007-3	1330A03972	2016.09.29	2017.09.28
Harmonic & Flicker Tester	TESEQ	CCN 1000-1	1330A03972	2016.09.29	2017.09.28
Temperature/ Humidity Meter	mingle	ETH529	N/A	2016.09.27	2017.09.26

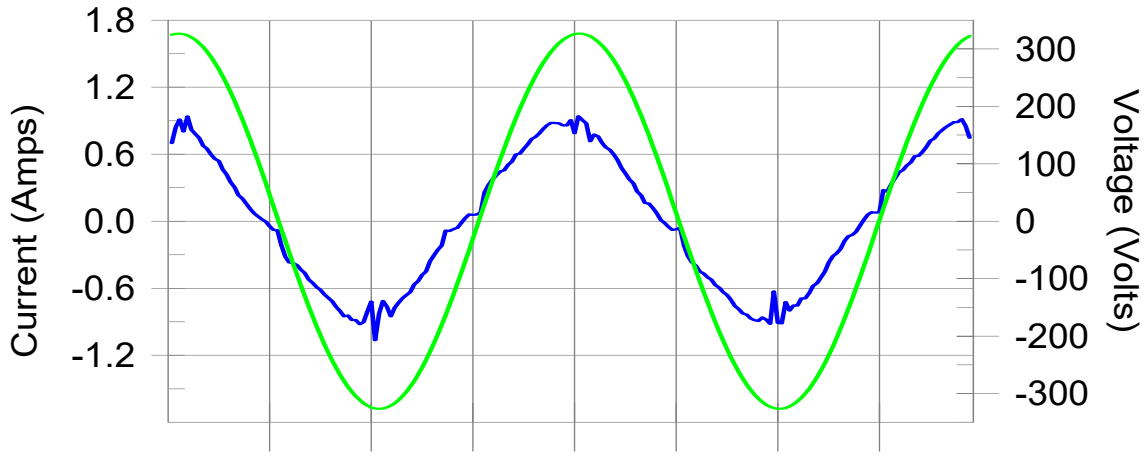
6.3. Test Result and Data

Basic Standard	:	EN 61000-3-2
Final Test Result	:	PASS
Test Mode 1 :	:	FULL LOAD For 30V/4A
Temperature	:	22℃
Humidity	:	50 %
Atmospheric Pressure	:	100 kPa
Test Data	:	Jul. 06, 2017

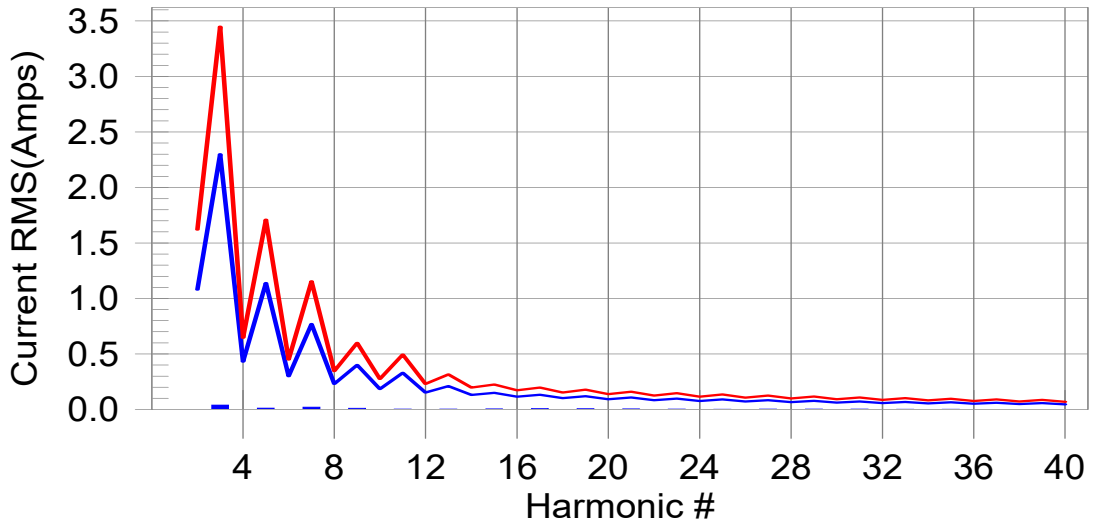
Harmonics – Class-A per Ed. 4.0 (2014)(Run time)

EUT: YHY-XXXYYYYY **Tested by: start**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 2017-7-6 **Start time: 15:35:37** **End time: 15:38:58**
Test duration (min): 3 **Data file name: H-010027.cts_data**
Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class A limit line **European Limits**



Test result: Pass **Worst harmonic was #17 with 5.3% of the limit.**

Current Test Result Summary (Run time)

EUT: YHY-XXXYYYYY **Tested by: start**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 2017-7-6 **Start time: 15:35:37** **End time: 15:38:58**
Test duration (min): 3 **Data file name: H-010027.cts_data**
Test Result: Pass **Source qualification: Normal**
THC(A): 0.051 **I-THD(%): 8.6** **POHC(A): 0.005** **POHC Limit(A): 0.251**

Highest parameter values during test:

V_RMS (Volts):	231.02	Frequency(Hz):	50.00
I_Peak (Amps):	1.127	I_RMS (Amps):	0.600
I_Fund (Amps):	0.597	Crest Factor:	1.912
Power (Watts):	133.8	Power Factor:	0.966

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	N/A	0.002	1.620	N/A	Pass
3	0.040	2.300	1.7	0.048	3.450	1.4	Pass
4	0.001	0.430	N/A	0.001	0.645	N/A	Pass
5	0.011	1.140	1.0	0.017	1.710	1.0	Pass
6	0.001	0.300	N/A	0.001	0.450	N/A	Pass
7	0.021	0.770	2.7	0.027	1.155	2.3	Pass
8	0.001	0.230	N/A	0.002	0.345	N/A	Pass
9	0.011	0.400	2.6	0.015	0.600	2.5	Pass
10	0.001	0.184	N/A	0.002	0.276	N/A	Pass
11	0.005	0.330	1.6	0.008	0.495	1.5	Pass
12	0.001	0.153	N/A	0.002	0.230	N/A	Pass
13	0.003	0.210	N/A	0.005	0.315	N/A	Pass
14	0.001	0.131	N/A	0.001	0.197	N/A	Pass
15	0.005	0.150	3.5	0.007	0.225	3.0	Pass
16	0.001	0.115	N/A	0.002	0.173	N/A	Pass
17	0.008	0.132	6.0	0.010	0.198	5.3	Pass
18	0.001	0.102	N/A	0.002	0.153	N/A	Pass
19	0.007	0.118	5.6	0.008	0.178	4.6	Pass
20	0.001	0.092	N/A	0.002	0.138	N/A	Pass
21	0.005	0.107	5.0	0.006	0.161	4.0	Pass
22	0.001	0.084	N/A	0.002	0.125	N/A	Pass
23	0.004	0.098	N/A	0.005	0.147	N/A	Pass
24	0.001	0.077	N/A	0.002	0.115	N/A	Pass
25	0.002	0.090	N/A	0.004	0.135	N/A	Pass
26	0.001	0.071	N/A	0.003	0.107	N/A	Pass
27	0.003	0.083	N/A	0.004	0.125	N/A	Pass
28	0.001	0.066	N/A	0.003	0.099	N/A	Pass
29	0.003	0.078	N/A	0.005	0.116	N/A	Pass
30	0.001	0.061	N/A	0.003	0.092	N/A	Pass
31	0.003	0.073	N/A	0.005	0.109	N/A	Pass
32	0.001	0.058	N/A	0.003	0.086	N/A	Pass
33	0.003	0.068	N/A	0.004	0.102	N/A	Pass
34	0.001	0.054	N/A	0.004	0.081	N/A	Pass
35	0.002	0.064	N/A	0.004	0.096	N/A	Pass
36	0.001	0.051	N/A	0.003	0.077	N/A	Pass
37	0.002	0.061	N/A	0.004	0.091	N/A	Pass
38	0.001	0.048	N/A	0.002	0.073	N/A	Pass
39	0.002	0.058	N/A	0.003	0.087	N/A	Pass
40	0.001	0.046	N/A	0.002	0.069	N/A	Pass

Voltage Source Verification Data (Run time)

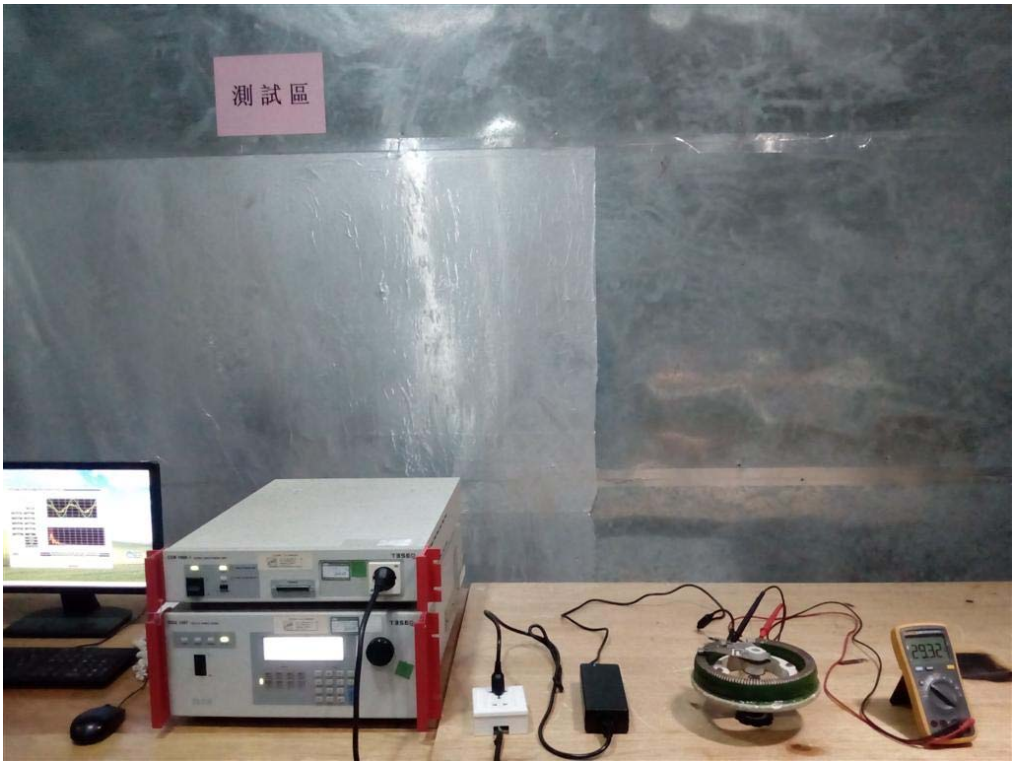
EUT: YHY-XXXYYYYY **Tested by: start**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 2017-7-6 **Start time: 15:35:37** **End time: 15:38:58**
Test duration (min): 3 **Data file name: H-010027.cts_data**
Test Result: Pass **Source qualification: Normal**

Highest parameter values during test:

Voltage (Vrms):	**231.02**	**Frequency(Hz):**	**50.00**
I_Peak (Amps):	**1.127**	**I_RMS (Amps):**	**0.600**
I_Fund (Amps):	**0.597**	**Crest Factor:**	**1.912**
Power (Watts):	**133.8**	**Power Factor:**	**0.966**

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.064	0.462	13.95	OK
3	0.430	2.079	20.69	OK
4	0.053	0.462	11.49	OK
5	0.021	0.924	2.28	OK
6	0.024	0.462	5.10	OK
7	0.041	0.693	5.85	OK
8	0.015	0.462	3.24	OK
9	0.057	0.462	12.41	OK
10	0.016	0.462	3.53	OK
11	0.029	0.231	12.50	OK
12	0.014	0.231	6.01	OK
13	0.018	0.231	7.59	OK
14	0.006	0.231	2.53	OK
15	0.013	0.231	5.55	OK
16	0.010	0.231	4.45	OK
17	0.013	0.231	5.47	OK
18	0.015	0.231	6.38	OK
19	0.012	0.231	5.29	OK
20	0.012	0.231	5.31	OK
21	0.009	0.231	3.83	OK
22	0.006	0.231	2.46	OK
23	0.009	0.231	3.78	OK
24	0.005	0.231	2.10	OK
25	0.006	0.231	2.49	OK
26	0.004	0.231	1.88	OK
27	0.006	0.231	2.53	OK
28	0.004	0.231	1.84	OK
29	0.004	0.231	1.91	OK
30	0.003	0.231	1.50	OK
31	0.006	0.231	2.53	OK
32	0.003	0.231	1.16	OK
33	0.004	0.231	1.87	OK
34	0.003	0.231	1.41	OK
35	0.007	0.231	2.94	OK
36	0.004	0.231	1.63	OK
37	0.004	0.231	1.66	OK
38	0.003	0.231	1.28	OK
39	0.007	0.231	2.89	OK
40	0.006	0.231	2.71	OK

6.4. Test Photographs



7. Voltage Fluctuations Test

7.1. Test Procedure

The equipment shall be tested under the conditions of **Clause 5.**

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of ±8% is achieved during the whole assessment procedure.

7.2. Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Power Source	TESEQ	NSG 1007-3	1330A03972	2016.09.29	2017.09.28
Harmonic & Flicker Tester	TESEQ	CCN 1000-1	1330A03972	2016.09.29	2017.09.28
Temperature/ Humidity Meter	mingle	ETH529	N/A	2016.09.27	2017.09.26

7.3. Test Result and Data

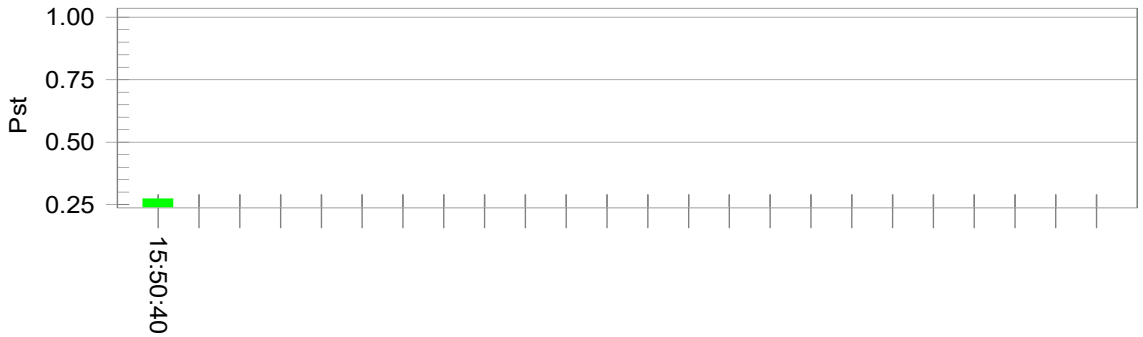
Basic Standard	:	EN 61000-3-3
Final Test Result	:	PASS
Test Mode 1 :	:	FULL LOAD For 30V/4A
Temperature	:	22℃
Humidity	:	50 %
Atmospheric Pressure	:	100 kPa
Test Data	:	Jul. 06, 2017

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

EUT: YHY-XXXYYYYY **Tested by: start**
Test category: All parameters (European limits) **Test Margin: 100**
Test date: 2017-7-6 **Start time: 15:40:10** **End time:15:50:41**
Test duration (min): 10 **Data file name: F-010028.cts_data**

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

Pst_i and limit line **European Limits**

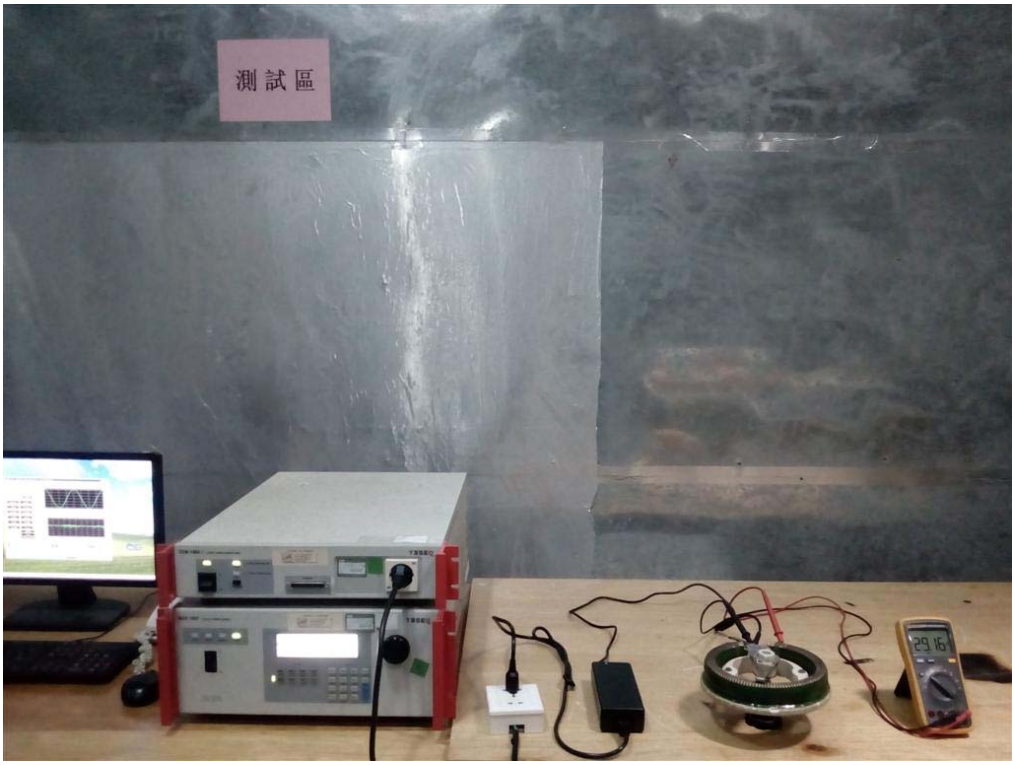


Plt and limit line

Parameter values recorded during the test:

Vrms at the end of test (Volt):	**230.76**			
Highest dt (%):	**0.00**	**Test limit (%):**	**N/A**	**N/A**
T-max (mS):	**0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**-0.04**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.273**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.119**	**Test limit:**	**0.650**	**Pass**

7.4. Test Photographs



8. Electrostatic Discharge Immunity Test

8.1. Test Procedure

a. In the case of air discharge testing the climatic conditions shall be within the following ranges:
   - ambient temperature: 15℃ to 35℃;
   - relative humidity : 30% to 60%;
   - atmospheric pressure : 86 KPa (860 hPa) to 106 KPa (1060 hPa).

b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.

c. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.

d. The test shall be performed with both air discharge and contact discharge. On reselected points at least 10 single discharges (in the most sensitive polarity) shall be applied on air discharge. On reselected points at least 25 single discharges (in the most sensitive polarity) shall be applied on contact discharge.

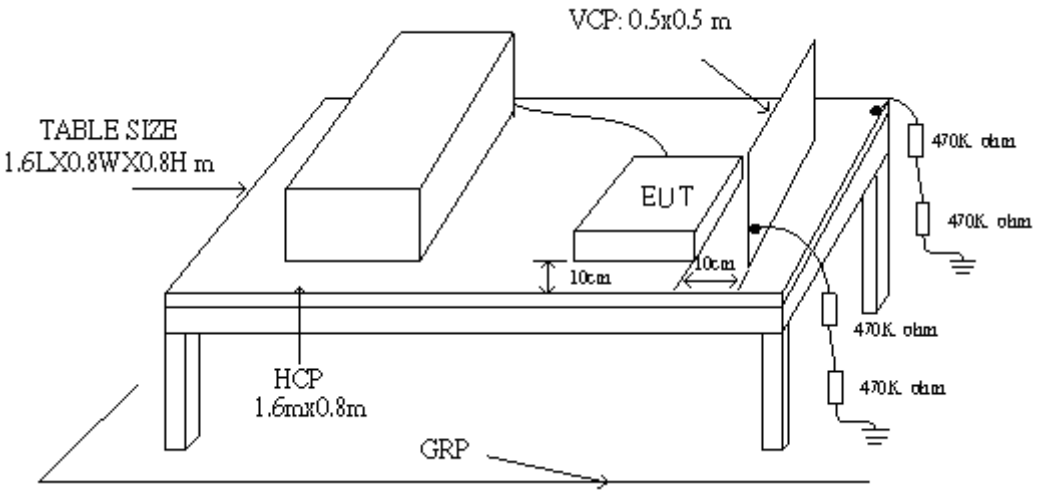
e. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.

f. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

g. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
   - ✧ If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
   - ✧ Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
   - ✧ The contact discharge test shall not be applied to such surfaces.

h. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT . After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

8.2. Test Setup for Tests Performed in Laboratory



The test setup consists of the test generator, EUT and auxiliary instrumentation necessary to perform DIRECT and INDIRECT application of discharges to the EUT as applicable, in the follow manner :

a. Contact Discharge to the conductive surfaces and to coupling plane;

b. Air Discharge at insulating surfaces.

The preferred test method is that of type tests performed in laboratories and the only accepted method of demonstrating conformance with this standard. The EUT was arranged as closely as possible to arrangement in final installed conditions.
A ground reference plane was provided on the floor of the test site. It was a metallic sheet (copper or aluminum) of 0.25 mm, minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. In the Exclusive Certification Corp., we provided 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 2.5 m x 2.5 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system.
The EUT was arranged and connected according to its functional requirements. A distance of 1m minimum was provided between the EUT and the wall of the lab. and any other metallic structure. In cases where this length exceeds the length necessary to apply the discharges to the selected points, the excess length shall, where possible, be placed non-inductively off the ground reference plane and shall not come closer than 0.2m to other conductive parts in the test setup.
Where the EUT is installed on a metal table, the table was connected to the reference plane via a cable with a 470k ohm resister located at each end, to prevent a build-up of charge. The test setup was consist a wooden table, 0.8m high, standing on the ground reference plane. A HCP, 1.6 m x 0.8 m, was placed on the table. The EUT and cables was isolated from the HCP by an insulating support 0.5 mm thick. The VCP size, 0.5 m x 0.5 m.

8.3. Test Severity Levels

Contact Discharge		Air Discharge	
Level	Test Voltage (kV) of Contact discharge	Level	Test Voltage (kV) of Air Discharge
1	±2	1	±2
2	±4	2	±4
3	±6	3	±8
4	±8	4	±15
X	Specified	X	Specified
Remark: “X” is an open level.			

8.4. Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
ESD Simulator	TESEQ	NSG437	575	2017.02.15	2018.02.14
Temperature/ Humidity Meter	mingle	ETH529	N/A	2017.02.14	2018.02.13

8.5. Test Result and Data

Basic Standard	:	IEC 61000-4-2
Final Test Result	:	PASS
Pass performance criteria	:	B
Test Voltage	:	±2 / ±4 / ±8 kV for air discharge, ±2 / ±4 kV for contact discharge
Temperature	:	20°C
Relative Humidity	:	50 %
Atmospheric Pressure	:	100 kPa
Test Date	:	Jul. 06, 2017

Mode 1: FULL LOAD For 30V/4A

	Contact Discharge								Air Discharge							
	25 times / each								10 times / each							
Voltage	2 kV		4 kV		6 kV		8 kV		2 kV		4 kV		8 kV		10 kV	
Point\Polarity	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
HCP	A	A	A	A	---	---	---	---	---	---	---	---	---	---	---	---
VCP	A	A	A	A	---	---	---	---	---	---	---	---	---	---	---	---
Screw	A	A	A	A	---	---	---	---	---	---	---	---	---	---	---	---
DC Output Port	---	---	---	---	---	---	---	---	A	A	A	A	A	A	---	---
Case	---	---	---	---	---	---	---	---	A	A	A	A	A	A	---	---

Test engineer: Nunu

8.6. Test Photographs

9. Radio Frequency electromagnetic field immunity test

9.1. Test Procedure

a. The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.

b. The antenna which is enabling the complete frequency range of 80-1000 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.

c. The test is normally performed with the antenna facing the most sensitive side of the EUT. The polarization of the field generated by the bucolical antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. The circular polarization of the field from the log-spiral antenna makes a change of position of the antenna unnecessary.

d. At each of the above conditions, the frequency range is swept 80-1000 MHz, pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of 1.5*10-3 decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

9.2. Test Severity Levels

Frequency Band : 80-1000 MHz	
Level	Test field strength (V/m)
1	1
2	3
3	10
X	Specified
Remark: “X” is an open class.	

9.3. Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Signal Generator	R&S	SML03	103287	2017.03.23	2018.03.22
Power Sensor	R&S	NR P-Z91	100383	2017.03.23	2018.03.22
Power Sensor	R&S	NRP-Z91	100384	2017.03.23	2018.03.22
Power Meter	R&S	NRP	101206	2017.03.23	2018.03.22
Power Amplifer	BONN	BLWA0830-160/100/40D	076659	2017.03.23	2018.03.22
Istropic Electric Field Probe	EST.LINDGREN	HI-6105	137445	2016.11.20	2017.11.19
EMS Antenna	R&S	HL046E	100028	N/A	N/A
Temperature/ Humidity Meter	feiyan	N/A	101	2017.03.23	2018.03.22
EMC-32	Rohde&Schwarz	Ver 6.10.0	N/A	N/A	N/A

9.4. Test Result and Data

Basic Standard	:	IEC 61000-4-3
Final Test Result	:	PASS
Pass performance criteria	:	A
Frequency Range	:	80~1000 MHz
Temperature	:	22°C
Relative Humidity	:	52%
Atmospheric Pressure	:	100 kPa
Test Date	:	Jul. 06, 2017

Mode 1: FULL LOAD For 30V/4A

Modulation : AM 80% , 1KHz sine wave , Dwell time: 3 S
Frequency Step Size : 1 % of preceding frequency value

Frequency (MHz)	Antenna Polarization	face	Field strength (V/m)	Result
80~1000	Vertical	Front	3 V/m	A
80~1000	Vertical	Rear	3 V/m	A
80~1000	Vertical	Left	3 V/m	A
80~1000	Vertical	Right	3 V/m	A
80~1000	Horizontal	Front	3 V/m	A
80~1000	Horizontal	Rear	3 V/m	A
80~1000	Horizontal	Left	3 V/m	A
80~1000	Horizontal	Right	3 V/m	A

Test engineer: Nuny

9.5. Test Photographs

10. Electrical Fast Transient/ Burst Immunity Test

10.1. Test Procedure

a. In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements:
   - ✧ ambient temperature: 15℃ to 35℃;
   - ✧ relative humidity : 45% to 75%;
   - ✧ Atmospheric pressure: 86 Kpa (860 hPa) to 106 Kpa (1060 hPa).

b. In order to minimize the effect of environmental parameters on test results, the electromagnetic environment of the laboratory shall not influence the test results.

c. The variety and diversity of equipment and systems to be tested make it difficult to establish general criteria for the evaluation of the effects of fast transients/bursts on equipment and systems.

d. Test on Power Line:
   - ✧ The EFT/B-generator was located on the GRP.. The length from the EFT/B-generator to the EUT is not exceeding 1 m.
   - ✧ The EFT/B-generator provides the ability to apply the test voltage in a non-symmetrical condition to the power supply input terminals of the EUT.

e. Test on Communication Lines
   - ✧ The coupling clamp is composed of a clamp unit for housing the cable (length more than 3 m), and was placed on the GRP.
   - ✧ The coupling clamp provides the ability of coupling the fast transient/bursts to the cable under test.

f. The test results may be classified on the basic of the operating conditions and the functional specification of the equipment under test, according to the following performance criteria :
   - ✧ Normal performance within the specification limits.
   - ✧ Temporary degradation or loss of function or performance which is self-recoverable.
   - ✧ Temporary degradation or loss of function or performance which requires operator intervention or system reset.
   - ✧ Degradation or loss of function which is not recoverable due to damage of equipment (components).

10.2. Test Severity Levels

The following test severity levels are recommended for the fast transient/burst test :

Open circuit output test voltage ± 10%		
Level	On Power Supply	On I/O signal, data and control line
1	0.5 kV	0.25 kV
2	1.0 kV	0.50 kV
3	2.0 kV	1.00 kV
4	4.0 kV	2.00 kV
X	Specified	Specified

Remark : " X " is an open level. The level is subject to negotiation between the user and the manufacturer or is specified by the manufacturer.

10.3. Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Integrated Generator	TESEQ	NSG 3040	2032	2017.02.14	2018.02.13
voltage regulator	TESEQ	VAR 3005-S16	850	2017.02.14	2018.02.13
Temperature/ Humidity Meter	mingle	ETH529	N/A	2016.09.27	2017.09.26

10.4. Test Result and Data

Basic Standard	:	IEC 61000-4-4
Final Test Result	:	PASS
Pass performance criteria	:	B
Test Voltage	:	On Power Supply -- ±1.0 kV On I/O signal, data and control line -- ±0.5 kV
Temperature	:	21°C
Relative Humidity	:	51 %
Atmospheric Pressure	:	100 kPa
Test Date	:	Jul. 05, 2017

Mode 1: FULL LOAD For 30V/4A

Pulse : 5/50 ns		Repetition Rate: 5 kHz above 2.0 kV			
Burst : 15m/300ms		5 kHz below and equal 2.0 kV			
Test time : 1 min/each condition					
Voltage/ Mode/ Polarity/ Result/ Phase		0.5 kV		1.0 kV	
		+	-	+	-
Power Line	L	---	---	A	A
	N	---	---	A	A
	L-N	---	---	A	A
	PE	---	---	A	A
	L-PE	---	---	A	A
	N-PE	---	---	A	A
	L-N-PE	---	---	A	A

Test engineer: Nuny

10.5. Test Photographs

11. Surge Immunity Test

11.1. Test Procedure

a. Climatic conditions

The climatic conditions shall comply with the following requirements :

- ✧ ambient temperature : 15 ℃ to 35 ℃
- ✧ relative humidity : 10 % to 75 %
- ✧ atmospheric pressure : 86 kPa to 106 kPa (860 hPa to 1060 hPa)

b. Electromagnetic conditions

the electromagnetic environment of the laboratory shall not influence the test results.

c. The test shall be performed according the test plan that shall specify the test set-up with

- ✧ generator and other equipment utilized;
- ✧ test level (voltage/current);
- ✧ generator source impedance;
- ✧ internal or external generator trigger;
- ✧ number of tests : at least five positive and five negative at the selected points;
- ✧ repetition rate : maximum 1/min.
- ✧ inputs and outputs to be tested;
- ✧ representative operating conditions of the EUT;
- ✧ sequence of application of the surge to the circuit;
- ✧ phase angle in the case of AC. power supply;
- ✧ actual installation conditions, for example :

  AC : neutral earthed,

  DC : (+) or (-) earthed to simulated the actual earthing conditions.

d. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the AC. voltage wave (positive and negative).

e. The surges have to be applied line to line and line(s) and earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.

f. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan.

g. All lower levels including the selected test level shall be satisfied. For testing the secondary protection, the output voltage of the generator shall be increased up to the worst-case voltage breakdown level (let-through level) of the primary protection.

h. If the actual operating signal sources are not available, that may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according to a test plan.

i. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied. For acceptance test previously unstressed equipment shall be used to the protection devices shall be replaced.

11.2. Test Severity Level

Level	Open-circuit test voltage, ± 10%, kV
1	0.5
2	1.0
3	2.0
4	4.0
X	Specified
NOTE: "X" is an open class. This level can be specified in the product specification.	

11.1. Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Integrated Generator	TESEQ	NSG 3040	2032	2017.02.14	2018.02.13
voltage regulator	TESEQ	VAR 3005-S16	850	2017.02.14	2018.02.13
Temperature/ Humidity Meter	mingle	ETH529	N/A	2016.09.27	2017.09.26

11.2. Test Result and Data

Basic Standard	:	IEC 61000-4-5
Final Test Result	:	PASS
Pass performance criteria	:	B
Test Voltage	:	Input AC Power Port -- ±0.5/1.0 kV for Line to Line ±0.5/1.0 /2.0kV for Line to Ground
Temperature	:	21°C
Relative Humidity	:	51 %
Atmospheric Pressure	:	100 kPa
Test Date	:	Jul. 05, 2017

Power Port

Mode 1: FULL LOAD For 30V/4A

Test Voltage:230V/50Hz						
Waveform : 1.2/50μs(8/20μs) Repetition rate : 60 sec Time : 10 time/each condition						
/Phase Voltage / Mode / Polarity / Result			0°	90°	180°	270°
0.5/1.0 kV	L-N	+	A	A	A	A
		-	A	A	A	A
0.5/1.0/2.0kV	L-PE	+	A	A	A	A
		-	A	A	A	A
	N-PE	+	A	A	A	A
		-	A	A	A	A

Test engineer: Nuny

11.3. Test Photographs

12. Conduction Disturbances induced by Radio-Frequency Fields

12.1. Test Procedure

a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.

b. This test method test can be performed without using a sell shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not likely to radiated a high amount of energy, especially at the lower frequencies. If under certain circumstances the radiated energy is too high, a shielded enclosure has to be used.

c. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.

d. The frequency range is swept from 150 KHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1KHz sign wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5 x 10-3 decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.

e. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency (ies) and harmonics or frequencies of dominant interest shall be analyzed separately.

f. An alternative test procedure may be adopted, wherein the frequency range is swept incrementally, with a step size not exceeding 4% of the start ad thereafter 4% of the preceding frequency value. The test level should be at least twice the value of the specified test level.

g. In cases of dispute, the test procedure using a step size not exceeding 1% of the start and thereafter 1% of preceding frequency value shall take precedence.

h. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

i. The use of special exercising programs is recommended.

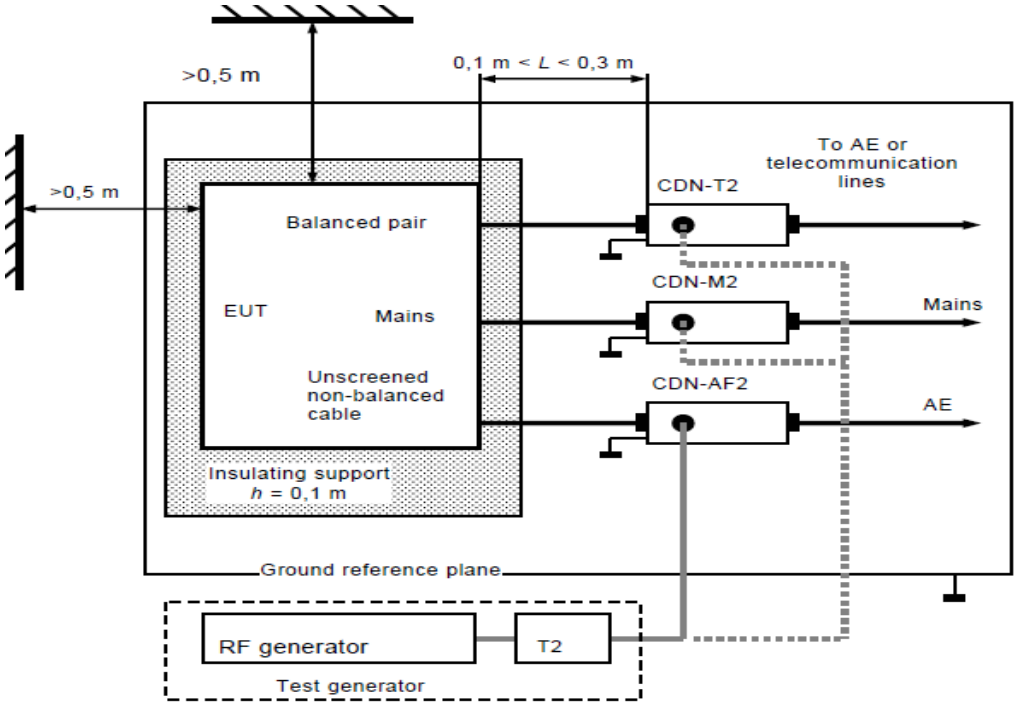
j. Testing shall be performed according to a Test Plan, which shall be included in the test report.

k. It may be necessary to carry out some investigatory testing in order to establish some aspects of the test plan.

12.2. Test Severity Levels

Level	Voltage Level (EMF),
1	1 V
2	3 V
3	10 V
x	Specified
NOTE - x is an open class. This level can be specified in the product specification.	

12.1. Test Setup



Note: 1. The EUT is setup 0.1m above Ground Reference Plane

2. The CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.

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

12.2. Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Conducted immunity test system	TESEQ	NSG 4070	35902	2016.09.29	2017.09.28
EM Injection clamp	TESEQ	KEMZ 801A	33492	2016.10.12	2017.10.11
CDN	TESEQ	CDN M016	35841	2016.09.30	2017.09.29
6 dB Attenuator	TESEQ	ANT 6050	34864	2016.09.29	2017.09.28
Temperature/ Humidity Meter	mingle	ETH529	N/A	2016.09.27	2017.09.26

12.3. Test Result and Data

Basic Standard	:	IEC 61000-4-6
Final Test Result	:	PASS
Pass performance criteria	:	A
Coupling mode	:	CDN-(M2+M3) for AC power ports CDN-T4 for signal ports EM-Clamp for signal ports
Temperature	:	21°C
Relative Humidity	:	51%
Atmospheric Pressure	:	100 kPa
Test Date	:	Jul. 05, 2017

Mode 1: FULL LOAD For 30V/4A

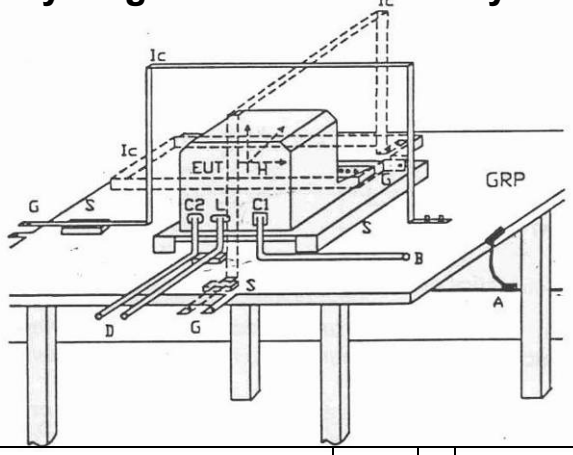
Frequency : 0.15~80MHz, Modulation : AM 80%,1KHz sine wave, Dwell time: 2.9s Frequency Step Size : 1 % of preceding frequency value			
Frequency	Test mode	Voltage(V)	Result
0.15 ~ 80MHz	Power(M3)	3	A

Test engineer: Nuny

12.4. Test Photogrphs

13. Power Frequency Magnetic Field Immunity Tests

13.1. Test Setup



GPR	:	Ground plane	C1	:	Power supply circuit
A	:	Safety earth	C2	:	Signal circuit
S	:	Insulating support	L	:	Communication line
EUT	:	Equipment under test	B	:	To power supply source
Lc	:	Induction coil	D	:	To signal source, simulator
E	:	Earth terminal	G	:	To the test generator

13.2. Test Severity Levels

Level	Magnetic field strength A/m
1	1
2	3
3	10
4	30
5	100
X[1)]	special
NOTE 1 “X” is an open level. This level can be givenin the product specification.	

13.3. Test Result and Data

Not Applicable.

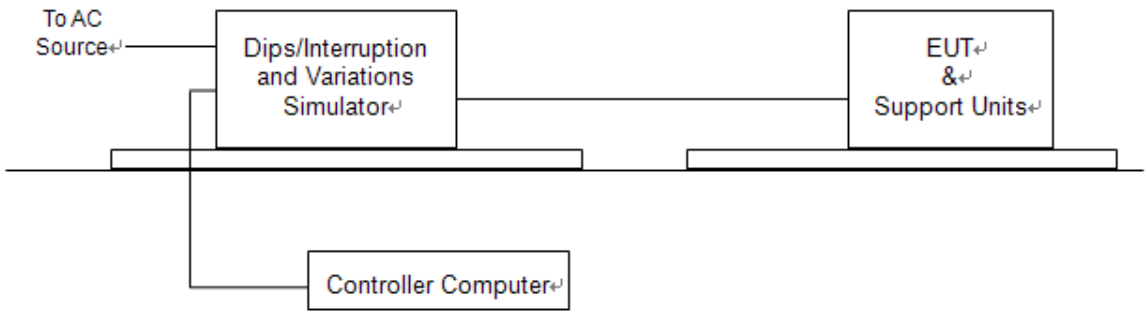
14. Voltage Dips and Voltage Interruptions Immunity Test Setup

14.1. Test Conditions

1. Source voltage and frequency : AC100-240V / 50-60Hz, Single phase.
2. Test of interval : 10 sec.
3. Level and duration : Sequence of 3 dips/interrupts.
4. Voltage rise (and fall) time : 1 ~ 5 μs.
5. Test severity :

Voltage dips and Interrupt reduction (%)	Test Duration (period)
>95%	250
30%	25
>95%	0.5

14.1. Test Setup



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

14.2. Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Integrated Generator	TESEQ	NSG 3040	2032	2017.02.14	2018.02.13
voltage regulator	TESEQ	VAR 3005-S16	850	2017.02.14	2018.02.13
Temperature/ Humidity Meter	mingle	ETH529	N/A	2016.09.27	2017.09.26

14.3. Test Result and Data

Basic Standard	:	IEC 61000-4-11
Final Test Result	:	PASS
Pass performance Criteria	:	C for voltage interruption, B/C for voltage dips
Temperature	:	21°C
Relative Humidity	:	51%
Atmospheric Pressure	:	100 kPa
Test Date	:	Jul. 05, 2017

Mode 1: FULL LOAD For 30V/4A

Voltage(UT): AC 100V/240V/230V 50Hz Interval(s) : 10s Times : 3

Test mod	Test level UT %	Durations (period / ms)	Phase / Result							
			0	45	90	135	180	225	270	315
Voltage interruptions	>95%	250	C	C	C	C	C	C	C	C
Voltage dips	30%	25	B	B	B	B	B	B	B	B
	>95%	0.5	B	B	B	B	B	B	B	B

Test engineer: Nunu

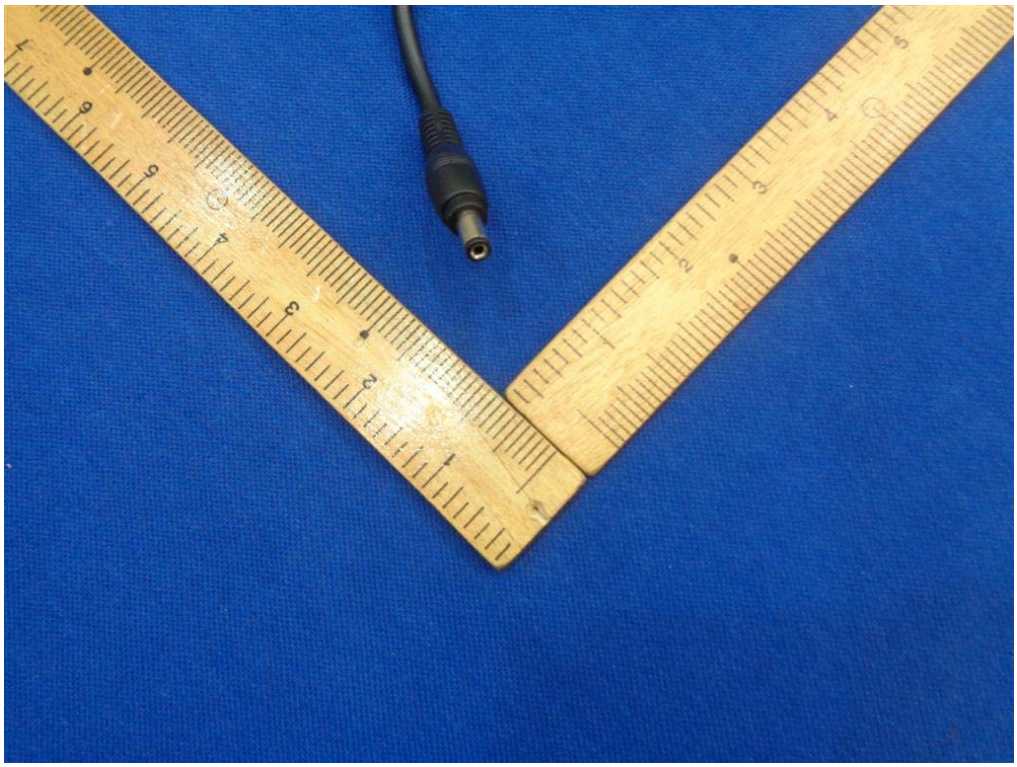
14.4. Test Photographs

15. Photographs of EUT

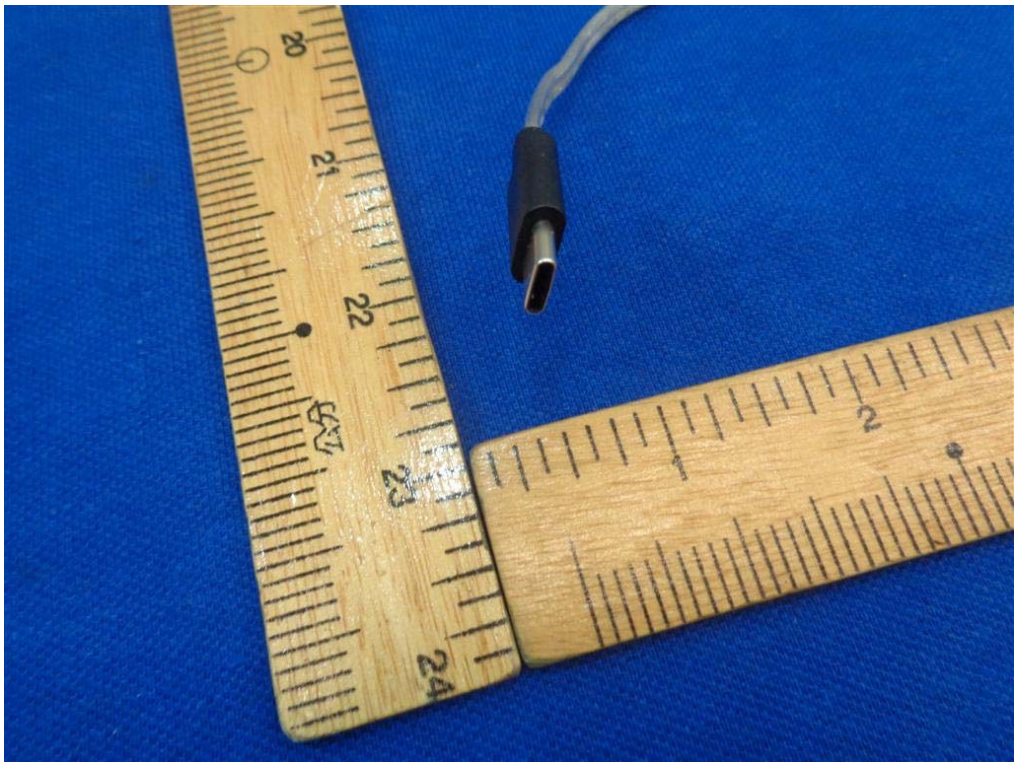
1) EUT Photo

2) EUT Photo

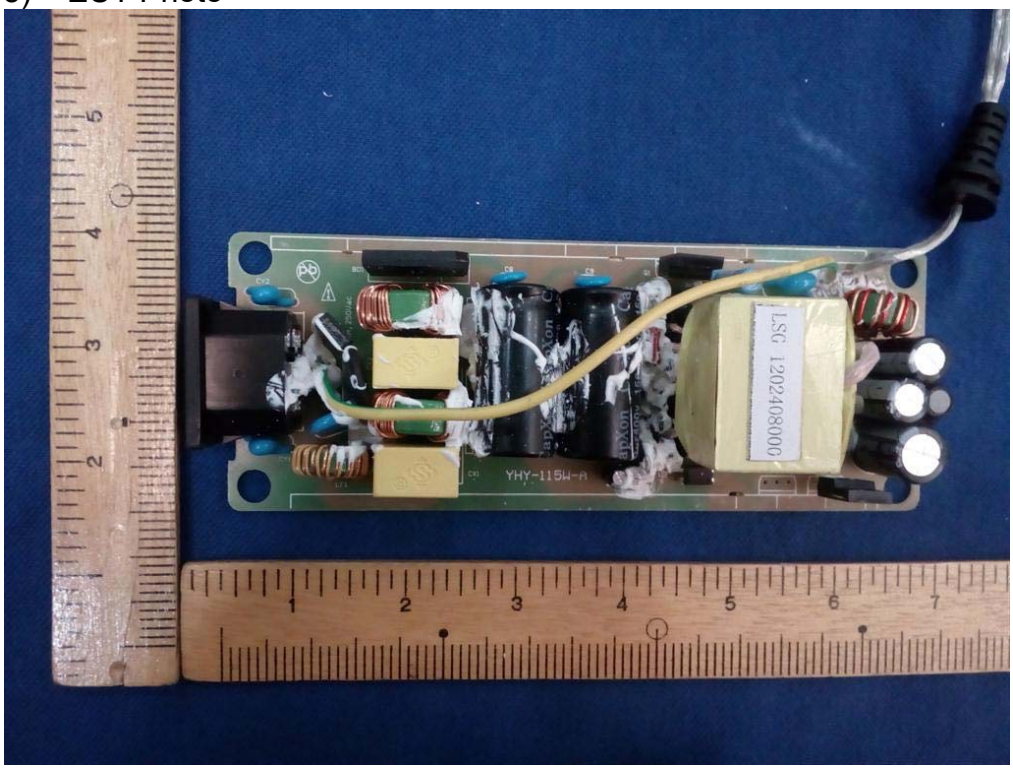
3) EUT Photo



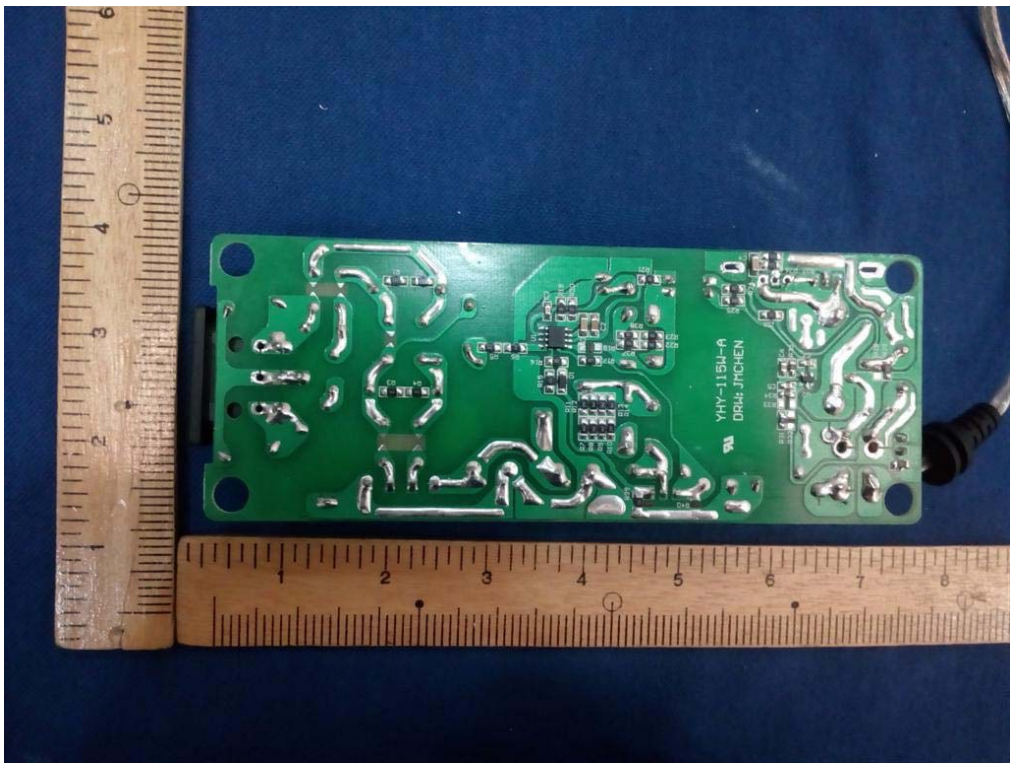
4) EUT Photo



5) EUT Photo



6) EUT Photo



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