

EU Declaration of Conformity

According to

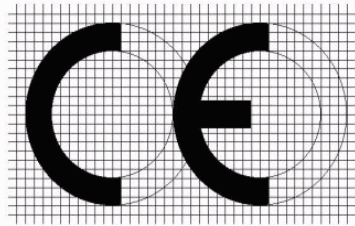
EMC Directive 2004/108/EC

For the following

Product : Lithium Battery Charger
Model Name : TC-7S10A-S
Variant Model Name : TC-7S10A-S/MiL

Manufactured at : Tabos Inc
Saengsankwan #3203. Chungnam Techno Park,
Jiksan-Ro 136, Cheonan-City, Chungnam-Do,
Rep. of KOREA

We hereby declare, Electromagnetic Compatibility Directives (2004/108/EC) are fulfilled, as laid out in the guideline set down by the member states of the EEC Commission. This declaration is valid for all samples that are part of this declaration, which are manufactured according to the production charts appendix.



The standards relevant for the evaluation of EMC requirements are as follows:

Test Standards : EN 55022:2010+AC:2011, Class A
EN 55024:2010
EN 61000-3-2:2006+A1:2009+A2:2009
EN 61000-3-3:2008

Date of issue: December 05, 2014

Tabos Inc

Saengsankwan #3203. Chungnam Techno Park,
Jiksan-Ro 136, Cheonan-City, Chungnam-Do,
Rep. of KOREA

(Name and signature of authorized person)

EMC TEST REPORT

Test report No : EMC-CE-E5251(1)
Type of Equipment : Lithium Battery Charger
Model Name : TC-7S10A-S
Variant Model Name : TC-7S10A-S/MiL
Applicant : Tabos Inc
Saengsankwan #3203. Chungnam Techno Park,
Jiksan-Ro 136, Cheonan-City, Chungnam-Do,
Rep. of KOREA
Manufacturer : Tabos Inc
Saengsankwan #3203. Chungnam Techno Park,
Jiksan-Ro 136, Cheonan-City, Chungnam-Do,
Rep. of KOREA
Test standards : EN 55022:2010+AC:2011, Class A
EN 55024:2010
EN 61000-3-2:2006+A1:2009+A2:2009
EN 61000-3-3:2008
Testing Laboratory : EMC Compliance Ltd.
Test result : Complied

This product complies with the requirements of the EMC Directive 2004/108/ EC.

The results in this report apply only to the sample tested.

This test report shall not be reproduced, except in full, without the written approval of EMC compliance Laboratory.

Date of receipt: 2014. 11. 11

Date of testing: 2014. 11. 12 ~ 11. 13

Issued date: 2014. 12. 05

Tested by: 
JUNG, YONG-JUN

Approved by: 
BAEK, JEONG-SOO

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1. Applicant information

Applicant: Tabos Inc
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Cheonan-City, Chungnam-Do, Rep. of KOREA
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Fax: +82-41-552-1524
E-mail: skpark@tabos.co.kr
Contact name: **Park Sun Kyu**

Manufacturer: Tabos Inc
Address: Saengsankwan #3203. Chungnam Techno Park, Jiksan-Ro 136,
Cheonan-City, Chungnam-Do, Rep. of KOREA
Telephone : +82-41-552-1512
Fax: +82-41-552-1524
E-mail: skpark@tabos.co.kr
Contact name: **Park Sun Kyu**

2. Laboratory information

Address

EMC compliance Ltd.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-390, Korea

Telephone Number: 82 70 5008 1021

Facsimile Number: 82 505 299 8311

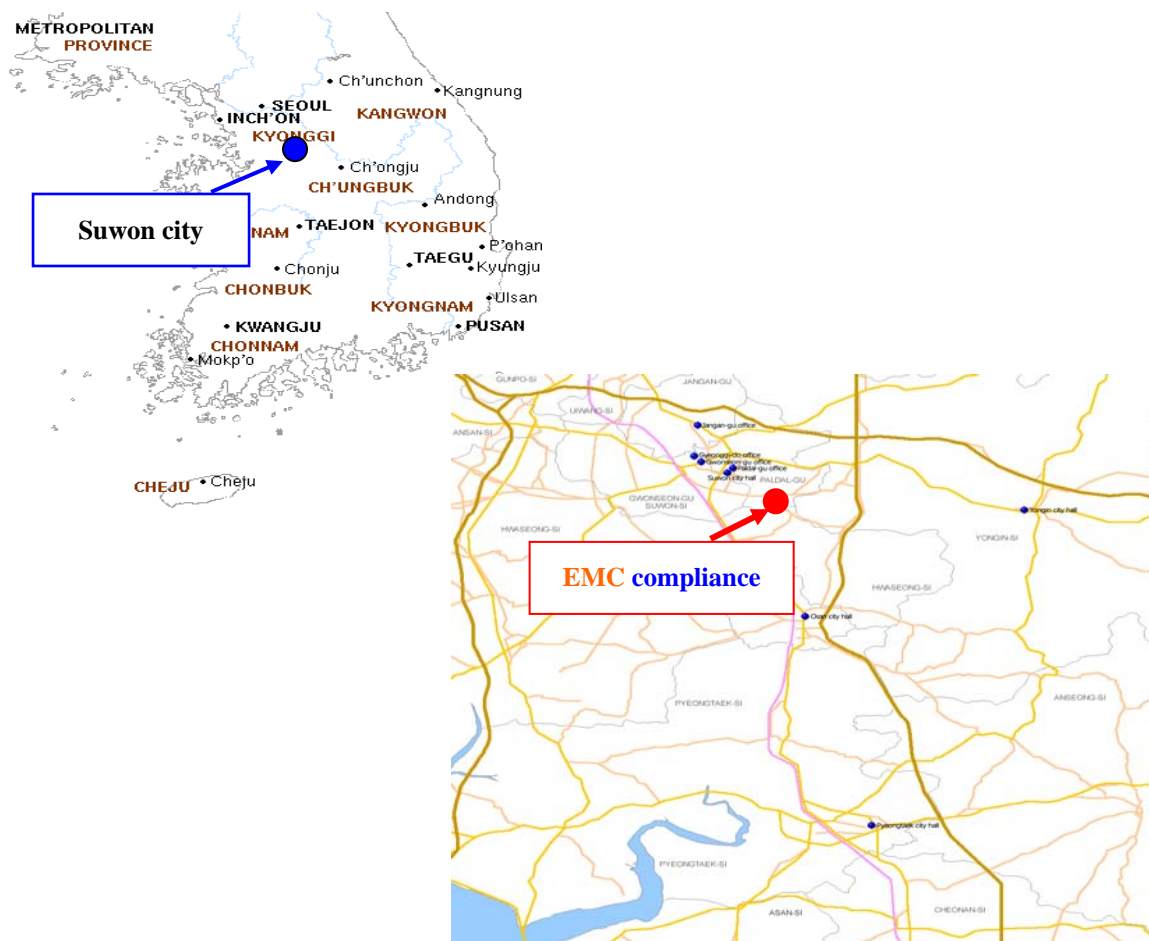
FCC CAB.: KR0040

VCCI Registration No. : R-3327, G-198, C-3706, T-1849

Industry Canada Registration No. : 8035A

KOLAS NO.: 231

SITE MAP



3. Test system configuration

3.1 Operation environment

	Temperature	Humidity	Pressure
Chamber(10 m)	: 28.4 °C	27.2 % R.H.	-
Shielded room(CE)	: 21.9 °C	23.8 % R.H.	-
Shielded room(ESD)	: 21.8 °C	35.8 % R.H.	100.8 kPa

Test site

These testing items were performed following locations;

Test item	Test site
Conducted Emission	Shielded Room
Radiated Emission	10 m Chamber
Harmonics current	Immunity area
Voltage fluctuations and flickers	Immunity area
Electrostatic discharge	Shielded Room
Radiated RF immunity	Fully anechoic chamber (3 m)
Electric Fast Transient/BURST	Shielded Room
Surge	Shielded Room
Conducted RF immunity	Shielded Room
Magnetic field immunity	Shielded Room
Voltage dip/interruption	Shielded Room

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC.

The factors contributing to uncertainties are test receiver, cable loss, antenna factor calibration, Antenna directivity, antenna factor variation with height, antenna phase center variation, antenna frequency interpolation, measurement distance variation, site imperfection, mismatch, and system repeatability. Based on CISPR 16-4-2, the measurement uncertainty level with a 95 % confidence level was applied.

Conducted emission measurement (C.L: Approx 95 %, k = 2)		
Shielded Room (CE#1)	9 kHz ~ 150 kHz: ± 3.75 dB 150 kHz ~ 30 MHz: ± 3.36 dB	
Shielded Room (CE#2)	9 kHz ~ 150 kHz: ± 3.79 dB 150 kHz ~ 30 MHz: ± 3.42 dB	
Radiated Emission measurement (C.L: Approx 95 %, k = 2)		
10 m Chamber (#F4)	30 MHz ~ 300 MHz	3 m: + 4.87 dB, - 4.99 dB 10 m: + 4.86 dB, - 4.98 dB
	300 MHz ~ 1 000 MHz	3 m: + 5.04 dB, - 5.14 dB 10 m: + 4.91 dB, - 5.02 dB
	1 GHz ~ 6 GHz	3 m: + 6.03 dB, - 6.06 dB
10 m Chamber (#F2)	30 MHz ~ 300 MHz	3 m: + 4.94 dB, - 5.06 dB 10 m: + 4.93 dB, - 5.05 dB
	300 MHz ~ 1 000 MHz	3 m: + 4.97 dB, - 5.08 dB 10 m: + 4.84 dB, - 4.96 dB
	1 GHz ~ 6 GHz	3 m: + 6.03 dB, - 6.05 dB
Radio Frequency Electromagnetic Fields (C.L: Approx 95 %, k = 2)		
± 1.82 dB		
Disturbance power Electromagnetic Fields (C.L: Approx 95 %, k = 2)		
± 3.30 dB		

4. Description of E.U.T.

4.1 General information

Model Name	Battery Charging Voltage	Battery Charging Voltage	Maximum Charging Power	Dimension (mm) Weight (Kg) Case materials	Input Power	Maximum Power Consumption	Power Factor
TC-7S10A-S	DC29.4V	11 A (± 10%)	350 W (± 10%)	270 X 120 X 75, 1.7 Kg Aluminum	100~240V AC	390W (± 10%)	95%

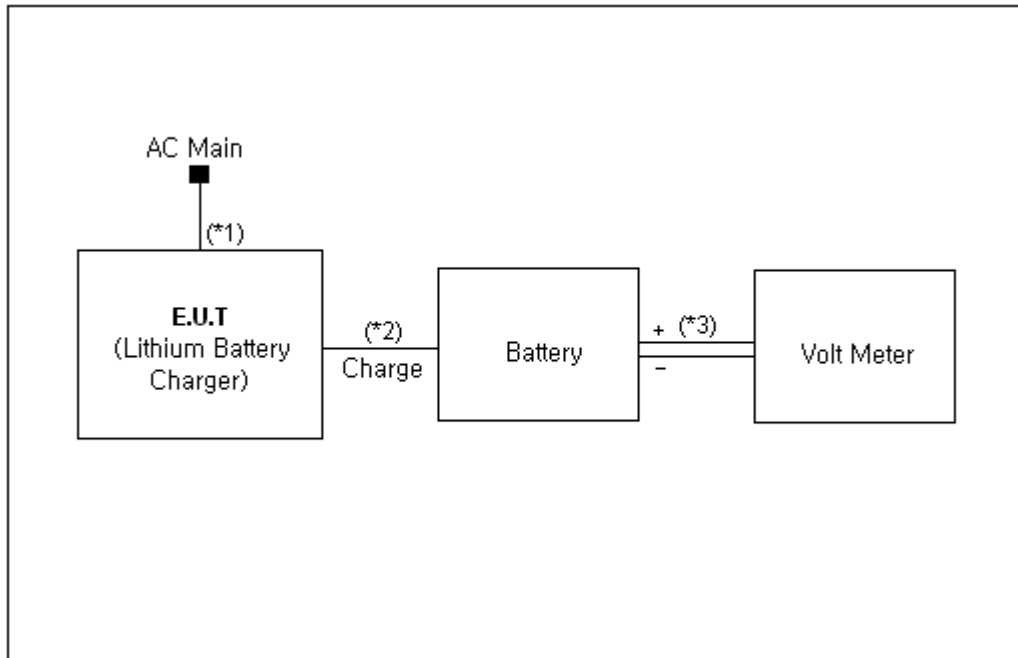
4.2 Product description

Type of product	Lithium Battery Charger
Model name (Basic)	TC-7S10A-S
Model name (Variant)	TC-7S10A-S/MiL
Difference	Case color difference.
Trade name	-
Serial no	-
Testing voltage	230 V, 50 Hz
Product rating	AC 100 - 240 V, 50/60 Hz
Internal clock frequency	25 MHz
Note	-

4.3 Auxiliary equipments

Type	Model / Part #	Serial number	Manufacturer
Volt Meter	2011	-	TOKOGAWA
Battery	LB717-1130W-C	-	Tabos Inc

4.4 Test configuration



Note	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	E.U.T. (Lithium Battery Charger)	Power	AC Main	Power	1.5	Non-Shield
2		Charge	Battery	Charge	0.5	Shield
3	Battery	+, -	Volt Meter	+, -	1.8	Non-Shield

4.5 Operating conditions

The EUT was configured as normal intended use.

Test mode	Normal operating
1	Battery Charge Test.

5. Summary of test results

5.1 Summary of EMI emission test results

Applied	Test items	Test method	Result
<input checked="" type="checkbox"/>	Conducted Emission	EN 55022:2010+AC:2011	Complied
<input checked="" type="checkbox"/>	Radiated Emission	EN 55022:2010+AC:2011	Complied
<input checked="" type="checkbox"/>	Harmonics current	EN 61000-3-2:2006+A1:2009+A2:2009	Complied
<input checked="" type="checkbox"/>	Voltage fluctuations and flickers	EN 61000-3-3:2008	Complied

5.2 Summary of immunity test results

Applied	Test items	Test method	Result
* EN 55024:2010			
<input checked="" type="checkbox"/>	Electrostatic discharge	EN 61000-4-2:2009	Complied
<input checked="" type="checkbox"/>	Radiated RF immunity	EN 61000-4-3:2006+A2:2010	Complied
<input checked="" type="checkbox"/>	Electric Fast Transient/BURST	EN 61000-4-4:2012	Complied
<input checked="" type="checkbox"/>	Surge	EN 61000-4-5:2014	Complied
<input checked="" type="checkbox"/>	Conducted RF immunity	EN 61000-4-6:2014	Complied
<input type="checkbox"/>	Magnetic field immunity	EN 61000-4-8:2010	N/A
<input checked="" type="checkbox"/>	Voltage dip/interruption	EN 61000-4-11:2004	Complied

5.3 Performance criteria

Performance criterion A: The equipment shall continue 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 equipment is used as intended.

The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, 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.

Performance 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.

If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, 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.

Performance criterion C: Loss of function is allowed, provided the function is self-recoverable or can be restored by the operating of the controls by the user In accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

6. Test results

6.1 Conducted Emission

Test specification	EN 55022:2010+AC:2011, Section 5, Class A		
Testing voltage	230 V, 50 Hz		
Test facility	Shielded room (CE#1)		
Date	2014. 11. 12		
Temperature (°C)	21.9 °C	Humidity (% R.H.)	23.8 % R.H.
Remarks	Complied		

6.1.1 Limits of conducted emission measurement

AC main

Frequency [MHz]	Class A (dB(μ V))		Class B (dB(μ V))	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	79	66	66 ~ 56 *	56 ~ 46*
0.5 ~ 5	73	60	56	46
5 ~ 30	73	60	60	50

*The limit decreases linearly with the logarithm of frequency.

Telecommunication

Frequency [MHz]	Class A Voltage Limits (dB(μ V))		Current Limits (dB(μ A))	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15 ~ 0.5	97 to 87	84 to 74	53 to 43	40 to 30
0.5 ~ 30	87	74	43	30
Frequency [MHz]	Class B Limits (dB(μ V))		Current Limits (dB(μ A))	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15 ~ 0.5	84 to 74	74 to 64	40 to 30	30 to 20
0.5 ~ 30	74	64	30	20

* The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz

* The current and voltage disturbance limits are derived for use with an impedance stabilization Network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is $20 \log_{10} 150/I = 44$ dB).

6.1.2 Measurement procedure

The measurements were performed in a shielded room. EUT was setup as shown in photograph and placed on a non-metallic table height of 0.8 m above the reference ground plane. The rear of table was located 0.4 m to the vertical conducted plane. EUT was power through the LISN, which was bonded to the ground plane. The LISN power was filtered. Each EUT power lead, except ground (safety) lead was individually connected through a LISN to input power source. EUT signal cables that hung closer than 0.4 m to the Horizontal metal ground 0.3 m ~ 0.4 m long. The power cord was bundles in the center. All peripheral equipment was powered from a sub LISN. The LISN and ISN were positioned 0.8 m from the EUT. Peak and Average detection were used in preliminary testing and Quasi-peak and Average detections were used at final measurement. Both lines of power cord, hot and neutral, were measured.

6.1.3 Used equipments

Equipment	Model	Serial No.	Makers	Next Cal. Date	Used
Test Receiver	ESCI7	100732	R&S	2015.01.27	<input type="checkbox"/>
Test Receiver	ESCI	100001	R&S	2015.07.14	<input checked="" type="checkbox"/>
Test Receiver	ESCI	100710	R&S	2015.10.13	<input type="checkbox"/>
TWO-LINE V-NETWORK	ENV216	101358	R&S	2015.10.02	<input checked="" type="checkbox"/>
TWO-LINE V-NETWORK	ESH3-Z5	100267	R&S	2015.06.24	<input type="checkbox"/>
8-WIRE ISN	NTFM 8158 CAT5	CAT5-8158-0071	SCHWARZBECK	2015.03.21	<input type="checkbox"/>
8-WIRE ISN	NTFM 8158 CAT3	CAT3-8158-0020	SCHWARZBECK	2015.03.07	<input type="checkbox"/>

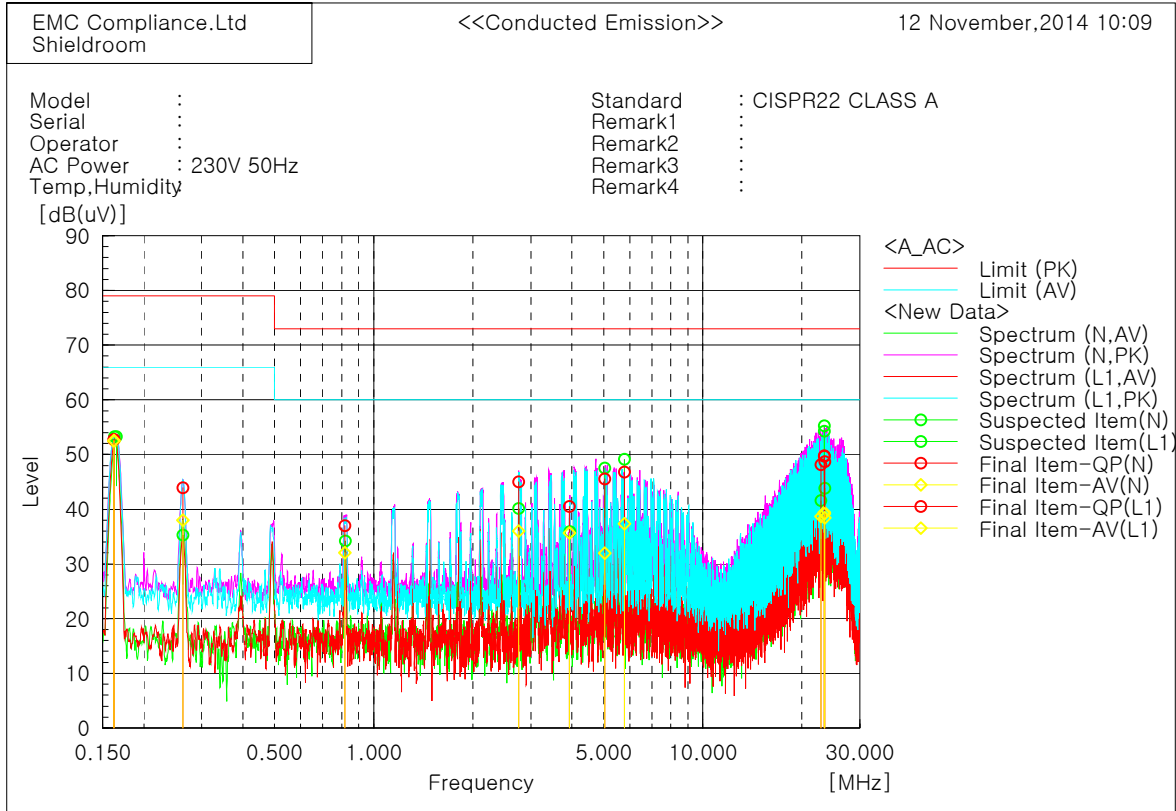
6.1.4 Photographs of test setup

* AC Main



6.1.5 Conducted emission measurement result

* AC Main (TC-7S10A-S)



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.1621	43.0	42.6	9.8	52.8	52.4	79.0	66.0	26.2	13.6
2	0.81553	27.2	22.2	9.8	37.0	32.0	73.0	60.0	36.0	28.0
3	3.93353	30.7	25.9	9.8	40.5	35.7	73.0	60.0	32.5	24.3
4	5.77312	37.1	27.6	9.7	46.8	37.3	73.0	60.0	26.2	22.7
5	22.8459	38.2	28.8	9.9	48.1	38.7	73.0	60.0	24.9	21.3
6	23.40769	39.9	29.5	9.9	49.8	39.4	73.0	60.0	23.2	20.6

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.16259	42.9	42.7	9.8	52.7	52.5	79.0	66.0	26.3	13.5
2	0.26299	34.3	28.4	9.6	43.9	38.0	79.0	66.0	35.1	28.0
3	2.75602	35.4	26.4	9.6	45.0	36.0	73.0	60.0	28.0	24.0
4	5.02967	35.8	22.2	9.7	45.5	31.9	73.0	60.0	27.5	28.1
5	23.4422	39.8	29.3	9.9	49.7	39.2	73.0	60.0	23.3	20.8
6	23.51894	38.8	28.5	9.9	48.7	38.4	73.0	60.0	24.3	21.6

6.2 Radiated Emission

Test specification	EN 55022:2010+AC:2011, Sections 6, Class A		
Testing voltage	230 V, 50 Hz		
Test facility	10 m Chamber (#F2)		
Test distance	10 m		
Date	2014. 11. 13		
Temperature (°C)	28.4 °C	Humidity (% R.H.)	27.2 % R.H.
Remarks	Complied		

6.2.1 Limits of radiated emission measurement

Limits below 1 GHz

Frequency [MHz]	Class A (dB(μ V/m)) @ 10 m	Class B (dB(μ V/m)) @ 10 m
30 ~ 230	40	30
230 ~ 1 000	47	37

Limits above 1 GHz

Frequency [MHz]	Class A (dB(μ V))		Class B (dB(μ V))	
	Average limit (dB(μ V/m))	Peak limit (dB(μ V/m))	Average limit (dB(μ V/m))	Peak limit (dB(μ V/m))
1 ~ 3	56	76	50	70
3 ~ 6	60	80	54	74

Note - The lower limit applies at the transition frequency.

6.2.2 Measurement procedure

The test was done at a 10 m chamber with a quasi-peak detector. EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane. Cables were folded back and forth forming a bundle 0.3 m to 0.4 m long and were hanged at a 0.4 m height to the ground plane.

Cables connected to EUT were fixed to cause maximum emission. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.2.3 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. Date	Used
Test Receiver	ESCI7	100732	R&S	2015.01.27	<input checked="" type="checkbox"/>
Test Receiver	ESCI	100001	R&S	2015.07.14	<input type="checkbox"/>
Test Receiver	ESCI	100710	R&S	2015.10.13	<input type="checkbox"/>
Test Receiver	ESR	101078	R&S	2015.02.24	<input type="checkbox"/>
Bi-Log Antenna	VULB 9168	440	SCHWARZBECK	2016.08.28	<input checked="" type="checkbox"/>
Amplifier	310N	284608	SONOMA INSTRUMENT	2015.04.16	<input checked="" type="checkbox"/>
3 dB Attenuator	8491B	22981	HP	2015.03.04	<input checked="" type="checkbox"/>
Antenna Mast	MA4000-EP	303	Innco Systems	-	<input checked="" type="checkbox"/>
Turn Table	DT2000S-1t	079	Innco Systems	-	<input checked="" type="checkbox"/>
Preamplifier	8449B	3008A02343	AGILENT	2015.10.13	<input type="checkbox"/>
Horn ANT	3115	00155772	ETS	2015.02.26	<input type="checkbox"/>
Spectrum Analyzer	E4407B	US39010142	AGILENT	2015.10.13	<input type="checkbox"/>

6.2.4 Sample calculation

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.

The sample calculation is as follow:

$$\text{Result} = \text{M.R} + \text{C.F}(\text{A.F} + \text{C.L} + 3 \text{ dB Att} - \text{A.G})$$

M.R = Meter Reading

C.F = Correction Factor

A.F = Antenna Factor

C.L = Cable Loss

A.G = Amplifier Gain

3 dB Att = 3 dB Attenuator

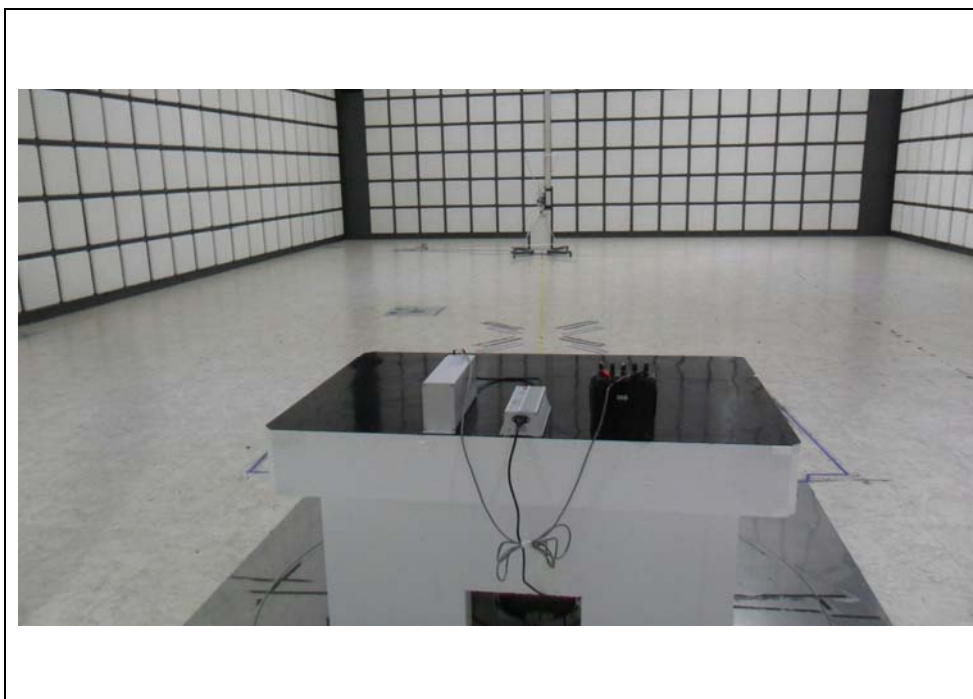
If M.R is 30 dB, A.F 12 dB, C.L 5 dB, 3 dB, A.G 35 dB

The result is

$$30 + 12 + 5 + 3 - 35 = 15 \text{ dB}(\mu\text{V/m})$$

6.2.5 Photographs of test setup

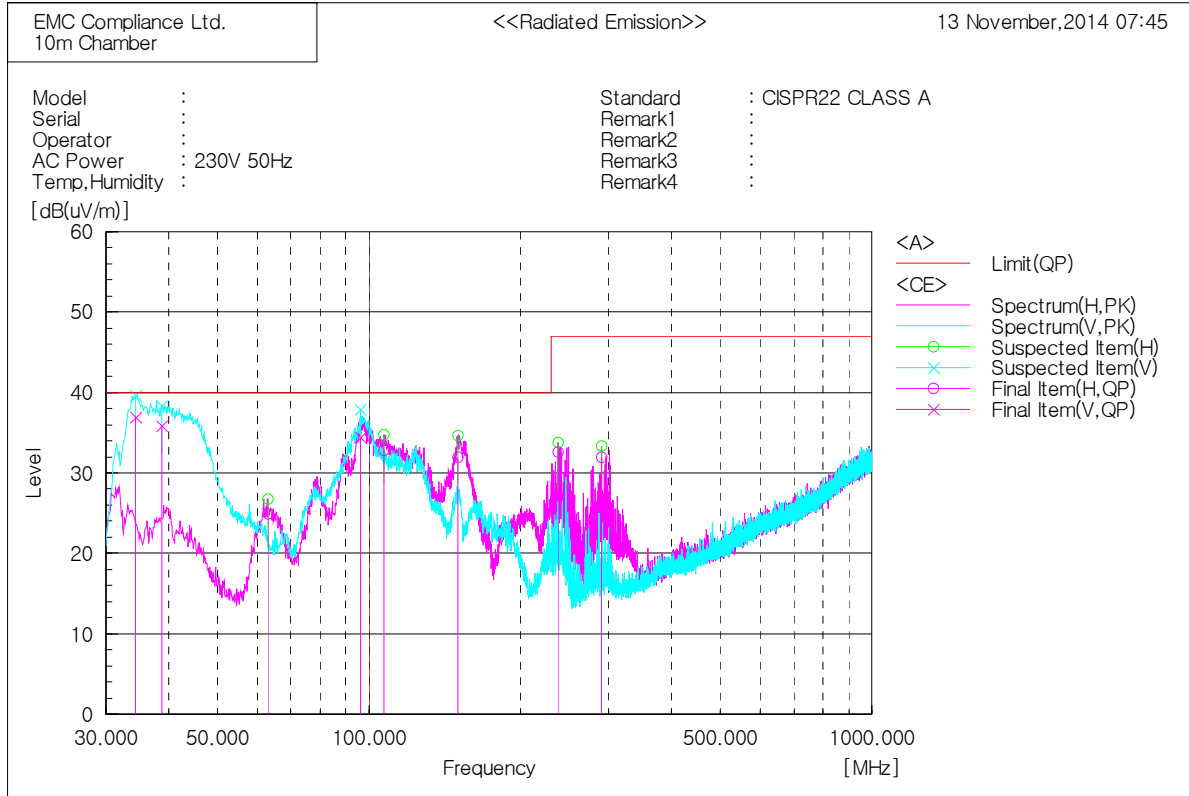
* 30 MHz ~ 1 GHz



6.2.6 Radiated emission measurement result

* Graph and Data

* 30 MHz ~ 1 GHz (TC-7S10A-S)



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c. f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	34.365	V	51.2	-14.3	36.9	40.0	3.1	100.0	172.5
2	38.730	V	49.6	-13.8	35.8	40.0	4.2	400.0	288.5
3	62.980	H	38.4	-13.5	24.9	40.0	15.1	400.0	190.3
4	96.324	V	51.8	-17.4	34.4	40.0	5.6	200.0	224.9
5	107.236	H	48.5	-15.7	32.8	40.0	7.2	302.0	238.5
6	150.159	H	43.9	-11.9	32.0	40.0	8.0	400.0	68.8
7	237.701	H	45.4	-12.8	32.6	47.0	14.4	400.0	235.4
8	290.566	H	42.4	-10.4	32.0	47.0	15.0	302.0	249.0

6.3 Harmonics

Test specification	EN 61000-3-2:2006+A1:2009+A2:2009				
Testing voltage	230 V, 50 Hz				
Test facility	Immunity area				
Date	2014. 11. 12				
Temperature(°C)	20.8 °C	Humidity (% R.H.)	23.3 % R.H.	Pressure (kPa)	101.8 kPa
Remarks	Complied				

6.3.1 Measurement procedure

The equipment is supplied in series with shunt(s) Rm or current transformer(s) from a source having the same nominal voltage and frequency as the rated supply voltage and frequency of the equipment. Measurements shall be made under normal load, or conditions for adequate heat discharge, and under normal operating conditions. User's operation controls or automatic programmers shall be set to produce the maximum harmonic component, for each successive harmonic component in turn. For the purpose of harmonic current limitation, equipment is classified as follows :

Class A : Equipment not specified in one of the three other Classes shall be considered as Class A equipment.

- Balanced three-phase equipment;
- Household appliances excluding equipment identified as Class D;
- Tools excluding portable tools;
- Dimmers for incandescent lamps;
- Audio equipment.

Class B : Portable tools; Arc welding equipment which is not professional equipment.

Class C : Lighting equipment.

Class D : Equipment having a specified power according to 6.2.2 less than or equal to 600 w, of the following types:

- Personal computers and personal computer monitors;
- Television receivers.

6.3.2 Used equipments

Equipment	Model	Serial No.	Makers	Next Cal. Date	Used
Harmonics/Flicker meter	5001x-CTS -400-413	54984	C.I.	2015.04.17	<input checked="" type="checkbox"/>

6.3.3 Photographs of test setup



6.3.4 Measurement result

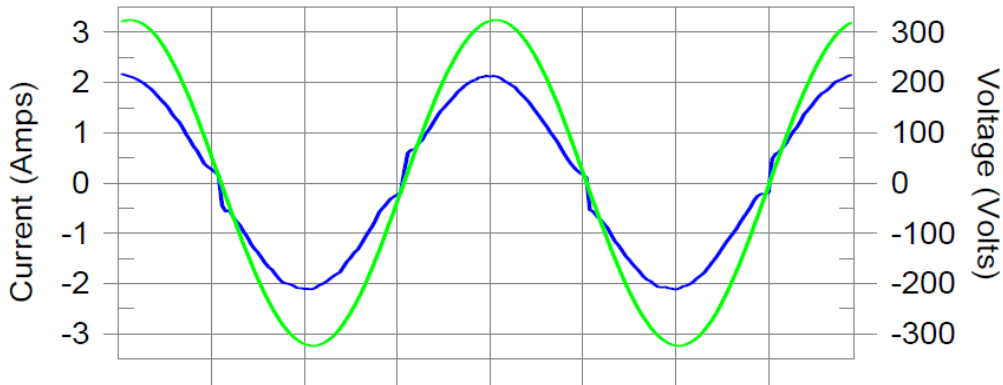
Harmonics – Class-A per Ed. 3.2 (2009)(Run time) incl. inter-harmonics

EUT: TC-7S10A-S
 Test category: Class-A per Ed. 3.2 (2009) (European limits)
 Test date: 2014-11-12
 Test duration (min): 2.5
 Comment: Comments
 Customer: Tabos Inc

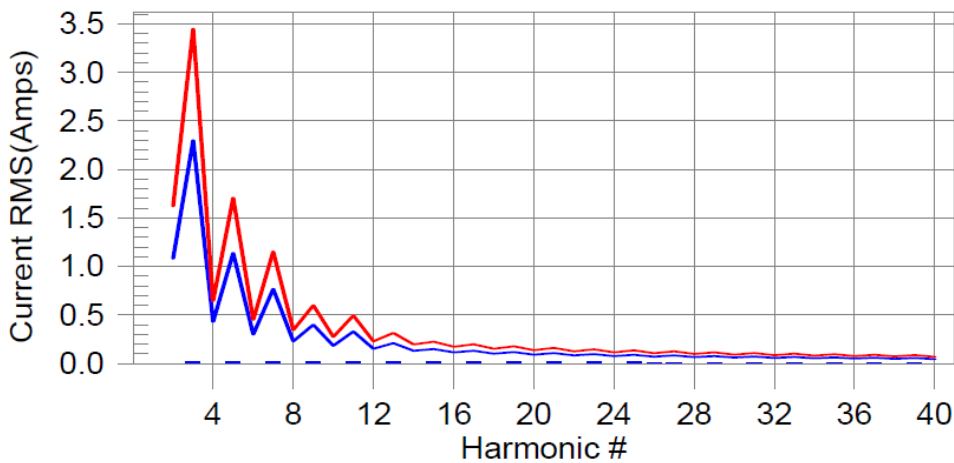
Tested by: Test Operator
 Test Margin: 100
 Start time: 오후 4:36:37
 End time: 오후 4:39:27
 Data file name: H-000115.cts_data

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class A limit line European Limits



Test result: Pass Worst harmonic was #33 with 15.03% of the limit.

Current Test Result Summary (Run time)

EUT: TC-7S10A-S
 Test category: Class-A per Ed. 3.2 (2009) (European limits)
 Test date: 2014-11-12
 Test duration (min): 2.5
 Comment: Comments
 Customer: Tabos Inc

Tested by: Test Operator
 Test Margin: 100
 Start time: 오후 4:36:37
 End time: 오후 4:39:27

Data file name: H-000115.cts_data

Test Result: Pass Source qualification: Normal
 THC(A): 0.07 I-THD(%): 4.70 POHC(A): 0.036 POHC Limit(A): 0.251
 Highest parameter values during test:

V_RMS (Volts): 229.53
 I_Peak (Amps): 2.181
 I_Fund (Amps): 1.488
 Power (Watts): 339.7
 Frequency(Hz): 50.00
 I_RMS (Amps): 1.491
 Crest Factor: 1.465
 Power Factor: 0.993

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	0.0	0.002	1.620	0.10	Pass
3	0.017	2.300	0.8	0.018	3.450	0.53	Pass
4	0.001	0.430	0.0	0.002	0.645	0.24	Pass
5	0.020	1.140	1.8	0.020	1.710	1.19	Pass
6	0.001	0.300	0.0	0.001	0.450	0.24	Pass
7	0.022	0.770	2.8	0.022	1.155	1.90	Pass
8	0.001	0.230	0.0	0.001	0.345	0.27	Pass
9	0.022	0.400	5.4	0.022	0.600	3.62	Pass
10	0.001	0.184	0.0	0.001	0.276	0.42	Pass
11	0.021	0.330	6.5	0.021	0.495	4.33	Pass
12	0.001	0.153	0.0	0.002	0.230	0.71	Pass
13	0.021	0.210	9.9	0.022	0.315	6.91	Pass
14	0.001	0.131	0.0	0.002	0.197	0.87	Pass
15	0.020	0.150	13.2	0.020	0.225	8.81	Pass
16	0.001	0.115	0.0	0.001	0.173	0.52	Pass
17	0.018	0.132	13.9	0.018	0.199	9.25	Pass
18	0.001	0.102	0.0	0.001	0.153	0.56	Pass
19	0.017	0.118	14.3	0.017	0.178	9.58	Pass
20	0.001	0.092	0.0	0.001	0.138	0.90	Pass
21	0.016	0.107	14.6	0.016	0.161	9.77	Pass
22	0.001	0.084	0.0	0.001	0.125	0.79	Pass
23	0.015	0.098	14.8	0.015	0.147	9.92	Pass
24	0.001	0.077	0.0	0.001	0.115	0.98	Pass
25	0.013	0.090	15.0	0.014	0.135	10.05	Pass
26	0.001	0.071	0.0	0.002	0.106	2.13	Pass
27	0.012	0.083	15.0	0.013	0.125	10.09	Pass
28	0.001	0.066	0.0	0.001	0.099	1.21	Pass
29	0.012	0.078	15.0	0.012	0.116	10.19	Pass
30	0.001	0.061	0.0	0.002	0.092	1.73	Pass
31	0.011	0.073	14.8	0.011	0.109	9.96	Pass
32	0.001	0.058	0.0	0.002	0.086	2.05	Pass
33	0.010	0.068	15.0	0.010	0.102	10.14	Pass
34	0.001	0.054	0.0	0.001	0.081	1.66	Pass
35	0.009	0.064	14.7	0.010	0.096	9.91	Pass
36	0.001	0.051	0.0	0.002	0.077	2.51	Pass
37	0.009	0.061	14.9	0.009	0.091	10.11	Pass
38	0.001	0.048	0.0	0.002	0.073	2.22	Pass
39	0.008	0.058	0.0	0.009	0.087	9.90	Pass
40	0.001	0.046	0.0	0.001	0.069	1.13	Pass

Voltage Source Verification Data (Run time)

EUT: TC-7S10A-S
 Test category: Class-A per Ed. 3.2 (2009) (European limits)
 Test date: 2014-11-12
 Test duration (min): 2.5
 Comment: Comments
 Customer: Tabos Inc

Tested by: Test Operator
 Test Margin: 100
 Start time: 오후 4:36:37
 End time: 오후 4:39:27

Data file name: H-000115.cts_data

Test Result: Pass Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms): 229.53
 I_{Peak} (Amps): 2.181
 I_{Fund} (Amps): 1.488
 Power (Watts): 339.7
 Frequency(Hz): 50.00
 I_{RMS} (Amps): 1.491
 Crest Factor: 1.465
 Power Factor: 0.993

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.100	0.459	21.79	OK
3	0.576	2.066	27.91	OK
4	0.020	0.459	4.30	OK
5	0.015	0.918	1.67	OK
6	0.025	0.459	5.35	OK
7	0.032	0.689	4.61	OK
8	0.019	0.459	4.15	OK
9	0.015	0.459	3.26	OK
10	0.009	0.459	1.96	OK
11	0.033	0.230	14.32	OK
12	0.020	0.230	8.79	OK
13	0.025	0.230	11.06	OK
14	0.009	0.230	3.87	OK
15	0.029	0.230	12.44	OK
16	0.019	0.230	8.24	OK
17	0.008	0.230	3.35	OK
18	0.012	0.230	5.34	OK
19	0.017	0.230	7.56	OK
20	0.011	0.230	4.60	OK
21	0.010	0.230	4.29	OK
22	0.006	0.230	2.57	OK
23	0.016	0.230	6.89	OK
24	0.009	0.230	4.08	OK
25	0.016	0.230	7.15	OK
26	0.006	0.230	2.80	OK
27	0.013	0.230	5.49	OK
28	0.007	0.230	2.94	OK
29	0.017	0.230	7.55	OK
30	0.017	0.230	7.29	OK
31	0.008	0.230	3.35	OK
32	0.005	0.230	2.34	OK
33	0.018	0.230	7.96	OK
34	0.012	0.230	5.10	OK
35	0.007	0.230	2.98	OK
36	0.007	0.230	3.26	OK
37	0.021	0.230	8.99	OK
38	0.005	0.230	2.11	OK
39	0.008	0.230	3.63	OK
40	0.008	0.230	3.63	OK

6.4 Flicker

Test specification	EN 61000-3-3:2008				
Testing voltage	230 V, 50 Hz				
Test facility	Immunity area				
Date	2014. 11. 12				
Temperature(°C)	20.8 °C	Humidity (% R.H.)	23.3 % R.H.	Pressure (kPa)	101.8 kPa
Remarks	Complied				

6.4.1 Measurement procedure

EUT was connected to the power analyzer system.

Measurement was performed to obtain the desired flicker parameters.

The measuring time depends on which parameters are to be measured.

P_{lt} = 2 h

P_{st} = 10 min

Controls and automatic programs shall be set to produce the most unfavorable sequence of voltage changes, using only those combinations of controls and programs are mentioned by the manufacturer in the instruction manual.

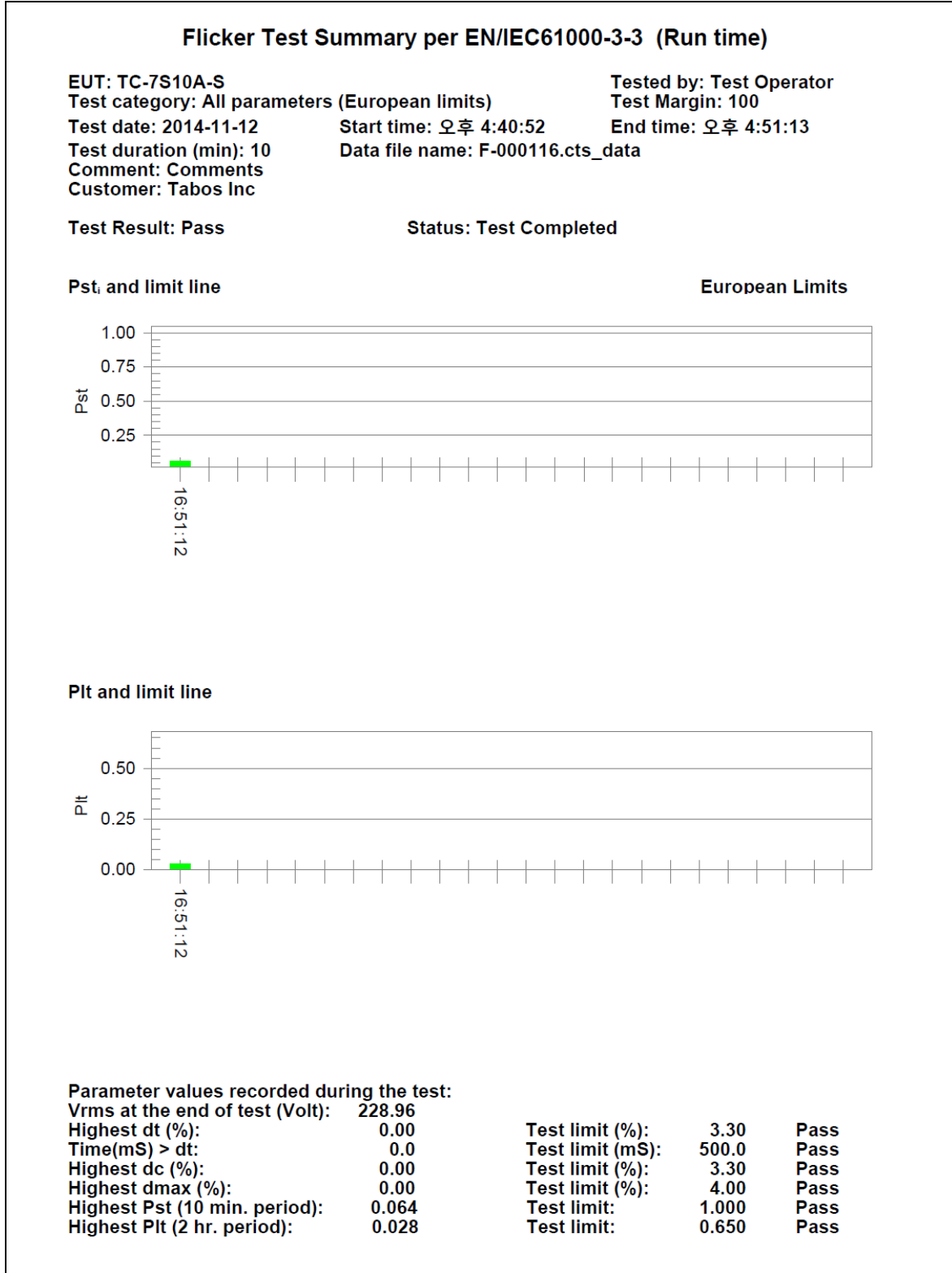
6.4.2 Used equipments

Equipment	Model	Serial No.	Makers	Next Cal. Date	Used
Harmonics/Flicker meter	5001x-CTS-400-413	54984	C.I.	2015.04.17	<input checked="" type="checkbox"/>

6.4.3 Photographs of test setup



6.4.4 Measurement result



6.5 Electrostatic Discharge

Test specification	EN 61000-4-2:2009, Criteria : B				
Test level	<input checked="" type="checkbox"/> Contact: ± 4 kV <input checked="" type="checkbox"/> Air: ± 2 kV, ± 4 kV, ± 8 kV <input checked="" type="checkbox"/> HCP: ± 2 kV, ± 4 kV <input checked="" type="checkbox"/> VCP: ± 2 kV, ± 4 kV				
Discharge impedance	330 Ω / 150 pF				
Number of discharge (Each polarity)	<input checked="" type="checkbox"/> Contact: 25 <input checked="" type="checkbox"/> Air: 10 <input checked="" type="checkbox"/> HCP / VCP: 25				
Interval between discharges	1 s				
Testing voltage	230 V, 50 Hz				
Test facility	Shielded room				
Date	2014. 11. 13				
Temperature(°C)	21.8 °C	Humidity (% R.H.)	35.8 % R.H.	Pressure (kPa)	100.8 kPa
Remarks	Complied - A: There was no change of operation status during above testing.				

6.5.1 Measurement procedure

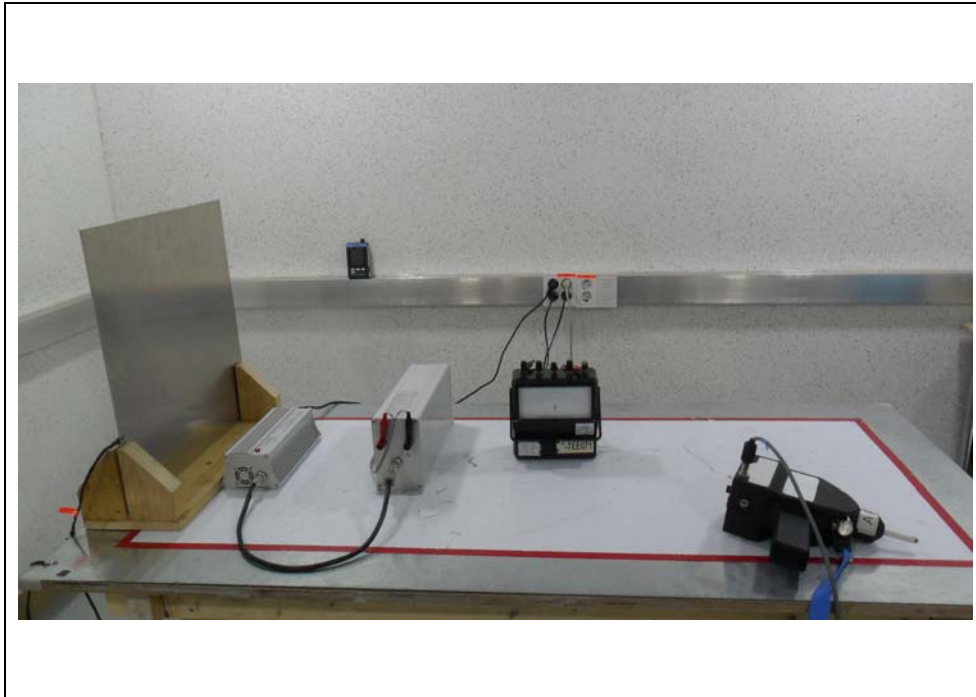
A ground reference plane was located on the floor, and connected to earth via a low Impedance connection. The return cable of the ESD generator was connected to the reference plane.

In case of floor standing equipment, EUT was placed on the reference plane on 0.1 m of insulating Support. In case of table top equipment, EUT was placed on a wooden table 0.8 m above the reference grounded floor. A horizontal coupling plane (HCP) was placed on the table, and Connected to the reference plane via a 470 k Ω resistor located in each end (0.5 mm insulating support between EUT and HCP). In both cases a vertical coupling plane(VCP) OF 0.5 X 0.5 m was located 0.1 m from the EUT's sides. The VCP was connected to the reference plane in the same matter as the HCP.

6.5.2 Used equipments

Equipment	Model No.	Serial No.	Makers	Next Cal. Date	Used
ESD Tester	PESD-1600	H011 309	HAEFELY	2015.06.30	<input checked="" type="checkbox"/>
ESD Tester	NSG 437	182	TESEQ	2015.01.04	<input type="checkbox"/>
HCP	-	-	-	-	<input checked="" type="checkbox"/>
VCP	-	-	-	-	<input checked="" type="checkbox"/>

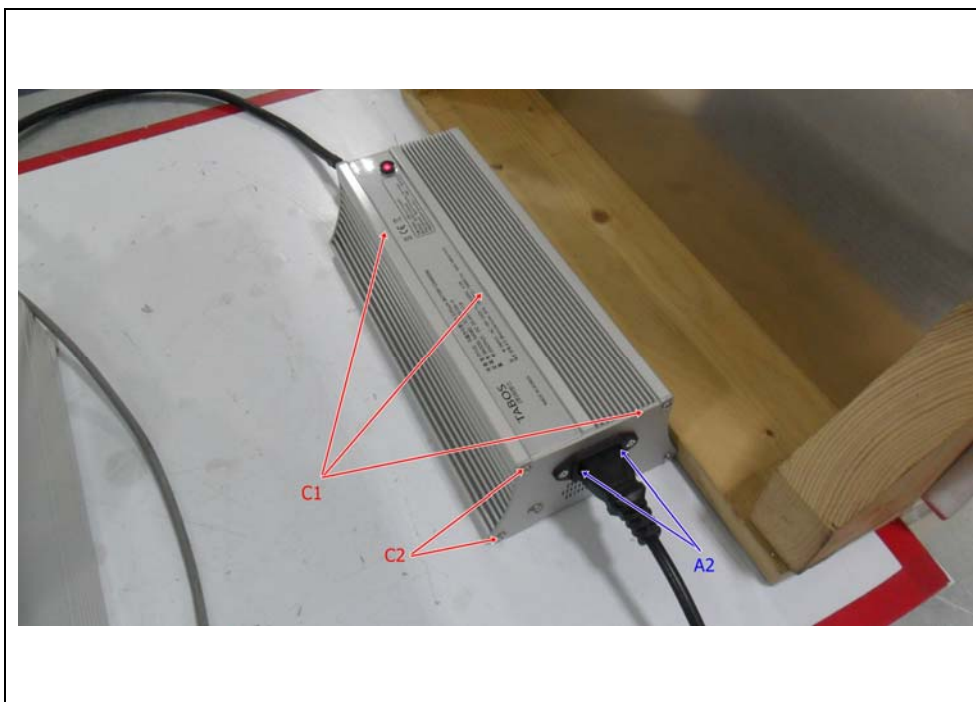
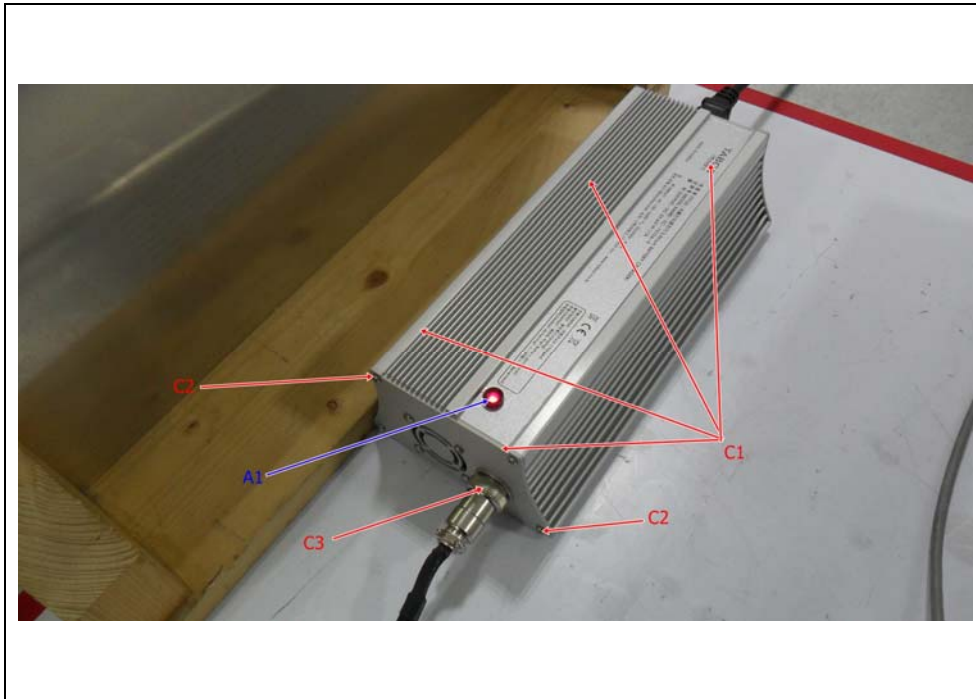
6.5.3 Photographs of test setup



6.5.4 Measurement result

Electrostatic Discharge (Test Point)

Air discharge	→
Contact discharge	→



HCP/VCP discharge

Location(EUT)	Applied level (\pm)	Result
HCP (All 4 sides)	± 2 kV, ± 4 kV	A
VCP (All 4 sides)	± 2 kV, ± 4 kV	A

Contact discharge

Location(EUT)	Applied level (\pm)	Result
C1 Enclosure(Case)	± 4 kV	A
C2 Screw	± 4 kV	A
C3 Charge Port	± 4 kV	A

Air discharge

Location(EUT)	Applied level (\pm)	Result
A1 LED	± 2 kV, ± 4 kV, ± 8 kV	A
A2 Power Port	± 2 kV, ± 4 kV, ± 8 kV	A

6.6 Radio Frequency Electromagnetic Fields

Test specification	EN 61000-4-3:2006+A2:2010, Criteria : A				
Tested frequency	80 MHz ~ 1 GHz				
Test level & Modulation	3 V/m, 80 % Amplitude Modulation (1 kHz)				
Frequency Step	log 1 % step				
Dwell time	3 s				
Distance	3 m from EUT to tip of antenna				
Testing Voltage	230 V, 50 Hz				
Test facility	Fully anechoic chamber (3 m)				
Date	2014. 11. 13				
Temperature(°C)	20.8 °C	Humidity (% R.H.)	23.3 % R.H.	Pressure (kPa)	101.8 kPa
Remarks	Complied - A: There was no change of operation status during above testing.				

6.6.1 Measurement procedure

The test was performed at 3 m full anechoic chamber.

For floor standing equipment, the EUT was standing on the floor.

For tabletop equipment, the EUT was located on a wooden table 0.8 m above the floor.

The EUT was tested all sides, horizontal and vertical polarization.

6.6.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. date	Used
Power meter	PM2002	302852	AR	2015.09.23	<input checked="" type="checkbox"/>
Power sensor	PH2000	303224	AR	2015.09.23	<input checked="" type="checkbox"/>
Power sensor	PH2000	311217	AR	2015.09.23	<input checked="" type="checkbox"/>
Directional coupler	DC6180	303976	AR	2015.09.23	<input checked="" type="checkbox"/>
Signal generator	E4421B	GB40052295	AGILENT	2015.09.23	<input checked="" type="checkbox"/>
Broadband Amplifier	BBA100	100996-1	R&S	2015.02.06	<input checked="" type="checkbox"/>
Log Periodic Dipole Antenna	LPDA-0803	-	ETS	-	<input checked="" type="checkbox"/>
Isotropic Probe	HI-6105	156301	ETS-LINDG REN	2015.07.14	<input checked="" type="checkbox"/>
Antenna master	-	-	ETS	-	<input checked="" type="checkbox"/>

6.6.3 Photographs of test setup



6.6.4 Measurement result

Location(EUT)	Antenna polarization	Result
Front side	Horizontal	A
	Vertical	A
Rear side	Horizontal	A
	Vertical	A
Left side	Horizontal	A
	Vertical	A
Right side	Horizontal	A
	Vertical	A

6.7 Electric Fast Transient/BURST

Test specification	EN 61000-4-4:2012, Criteria : B				
Coupling	<input checked="" type="checkbox"/> AC main <input type="checkbox"/> Signal: Clamp <input type="checkbox"/> Telecommunication: Clamp				
Test level	<input checked="" type="checkbox"/> AC main: ± 1 kV Peak <input type="checkbox"/> Signal: ± 0.5 kV Peak <input type="checkbox"/> Telecommunication: ± 0.5 kV Peak				
Repetition frequency	5 kHz, Tr/Th = 5 / 50 ns				
Coupling time (Minimum)	60 s				
Testing Voltage	230 V, 50 Hz				
Test facility	Shielded room				
Date	2014. 11. 13				
Temperature(°C)	21.4 °C	Humidity (% R.H.)	27.1 % R.H.	Pressure (kPa)	100.8 kPa
Remarks	Complied - A: There was no change of operation status during above testing.				

6.7.1 Measurement procedure

A ground reference plane was located on the floor.

EFT generator was connected to reference ground plane via low impedance connection.

For floor standing equipment, EUT was placed on a 0.1 m wooden table.

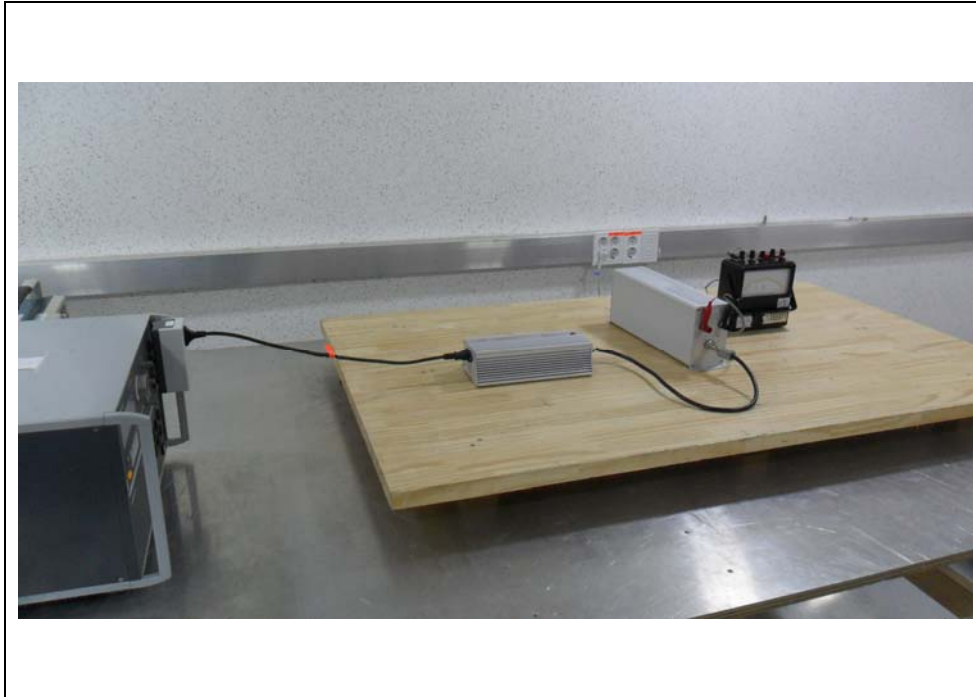
For tabletop equipment, EUT was placed on a 0.1 m above the ground reference plane.

Test generator and coupling/decoupling network was placed on, and bounded to, the ground reference plane. When using the coupling clamp, the minimum distance between the coupling plates and all other conductive surfaces, except the ground reference plane beneath the coupling clamp, Shall be 0.5 m.

6.7.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. date	Used
Ultra compact simulator	UCS 500N5T	P1317117973	EM TEST	2015.11.10	<input checked="" type="checkbox"/>
Capacitive coupling clamp	HFK	P1411132494	EM TEST	2015.04.21	<input type="checkbox"/>

6.7.3 Photographs of test setup



6.7.4 Measurement result

* AC main

Coupling point	(+)	(-)	Result
L+N+PE	+ 1 kV	- 1 kV	A

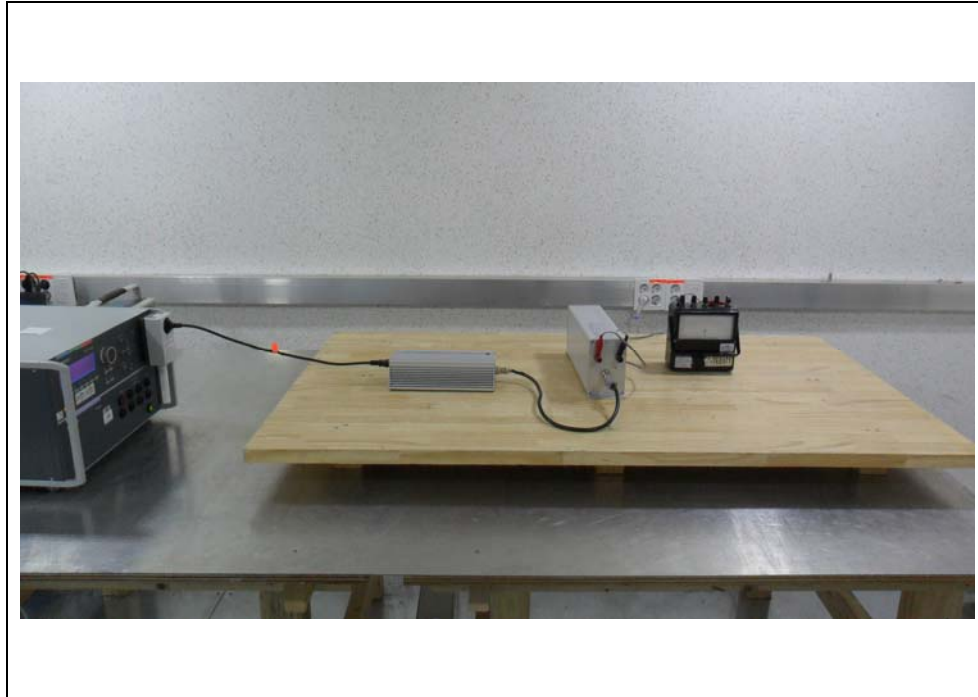
* Signal

Coupling point	(+)	(-)	Result
-	-	-	-

* Telecommunication

Coupling point	(+)	(-)	Result
-	-	-	-

6.8.3 Photographs of test setup



6.8.4 Measurement result

* AC main

Coupling point	(+)	(-)	Result
L+N	+ 0.5 kV, +1 kV	- 0.5 kV, - 1 kV	A
L+PE	+ 0.5 kV, + 1 kV, + 2 kV	- 0.5 kV, - 1 kV, - 2 kV	A
N+PE	+ 0.5 kV, + 1 kV, + 2 kV	- 0.5 kV, - 1 kV, - 2 kV	A

* Signal

Coupling point	(+)	(-)	Result
-	-	-	-

* Telecommunication

Coupling point	(+)	(-)	Result
-	-	-	-

6.9 Conducted Immunity

Test specification	EN 61000-4-6:2014, Criteria : A				
Tested frequency	0.15 MHz ~ 80 MHz				
Test level & Modulation	3 V, 80 % Amplitude Modulation (1 kHz)				
Frequency Step	log 1 % step				
Dwell time	3 s				
Coupling method	<input checked="" type="checkbox"/> AC main : CDN(M3) <input type="checkbox"/> Signal: Clamp <input type="checkbox"/> Telecommunication: Clamp				
Testing Voltage	230 V, 50 Hz				
Test facility	Shielded room				
Date	2014. 11. 12				
Temperature(°C)	21.7 °C	Humidity (% R.H)	32.6 % R.H	Pressure(kPa)	100.8 kPa
Remarks	Complied - A: There was no change of operation status during above testing.				

6.9.1 Measurement procedure

A ground reference plane was located on the floor.

The test was performed on a ground reference plane on a 0.1 m wooden table. This test were Performed using CDN for mains, clamp for signal and injection probe. The frequency range was swept from 0.15 MHz to 80 MHz. This frequency range was Modulated with 1 kHz sine wave at 80 %.

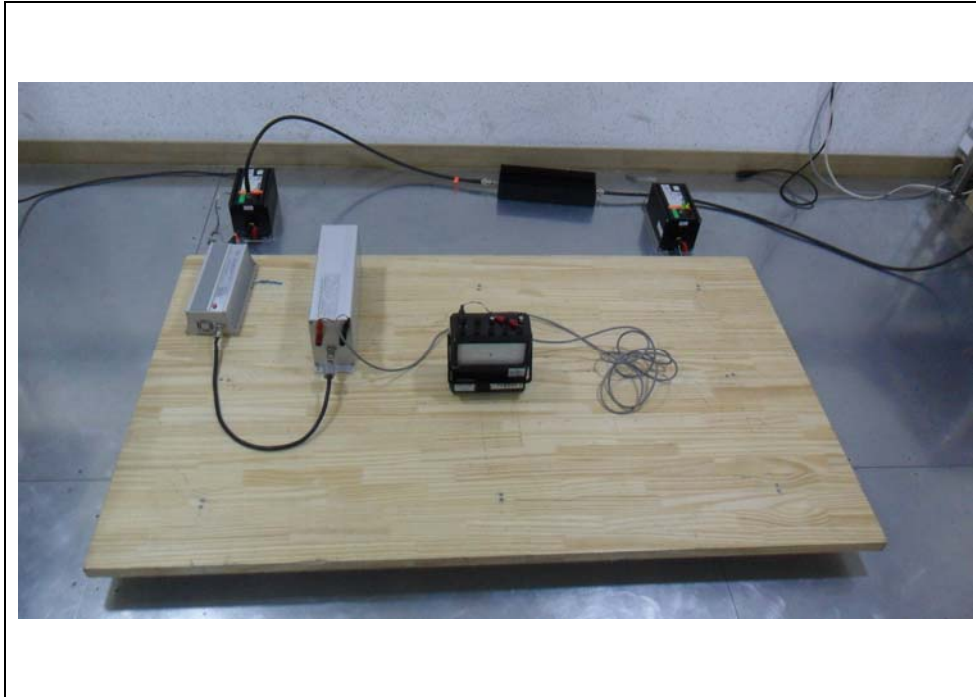
The signal generators provided the modulated frequency at a 1 % step size.

The power and all network cable, I/O cables longer than 3 m length were tested.

6.9.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. date	Used
Continuous Wave Simulator	CWS500N1.4	P1409132195	EM TEST	2015.05.13	<input checked="" type="checkbox"/>
CDN	CDN M2/M3	P1402128648	EM TEST	2015.05.10	<input checked="" type="checkbox"/>
CDN	CDN M2/M3	P1402128649	EM TEST	2015.05.10	<input type="checkbox"/>
Attenuator	ATT6/80	P1402129094	EM TEST	2015.05.10	<input checked="" type="checkbox"/>
Electromagnetic Injection Clamp	EM101	36197	Liithi	2015.05.13	<input type="checkbox"/>
CDN	CDN S1-75	P1404129801	EM TEST	2015.05.10	<input type="checkbox"/>
CDN	CDN-T8-RJ45	P1404129872	EM TEST	2015.05.10	<input type="checkbox"/>

6.9.3 Photographs of test setup



6.9.4 Measurement result

* AC main

Coupling point	Coupling method	Result
Power	CDN(M3)	A

* Signal

Coupling point	Coupling method	Result
-	-	-

* Telecommunication

Coupling point	Coupling method	Result
-	-	-

6.10 Dips and Interruptions

Test specification	EN 61000-4-11:2004, Criteria: B or C				
Number of dips	3 T				
Duration	10 s				
Phase	Zero crossing (0 °, 180 °)				
Testing Voltage	100 V, 50/60 Hz / 240 V, 50/60 Hz				
Test facility	Shielded room				
Test Date	2014. 11. 13				
Temperature (°C)	21.4 °C	Humidity (% R.H.)	27.1 % R.H.	Pressure (kPa)	100.8 kPa
Remarks	Complied				

6.10.1 Measurement procedure

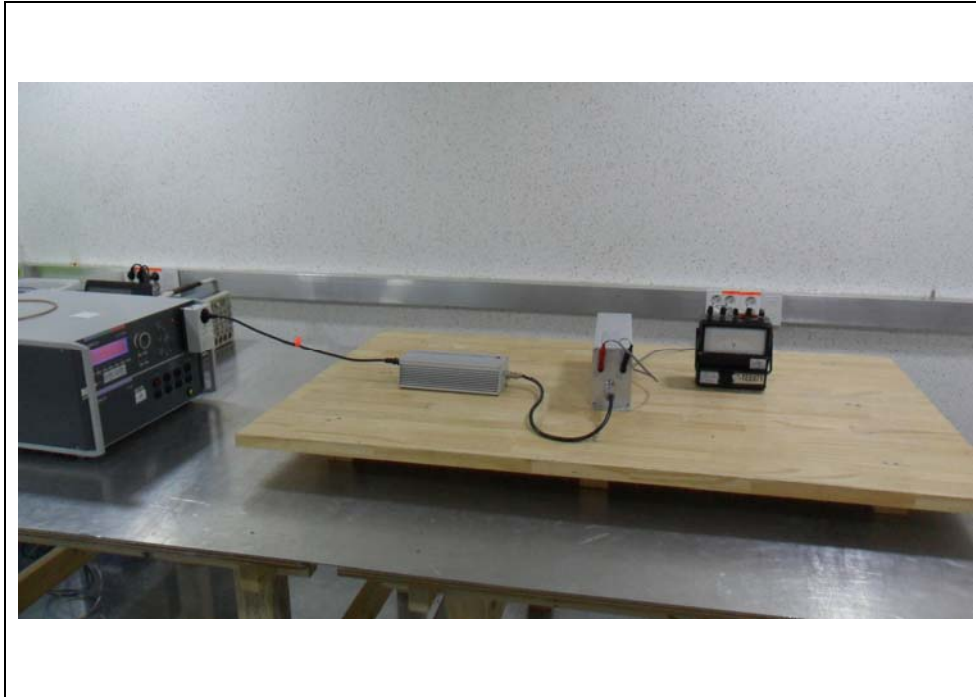
The dips/interruption test is only applicable to AC mains.

The dips/interruptions were applied at zero crossing.

6.10.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. date	Used
Ultra compact simulator	UCS 500N5T	P1317117973	EM TEST	2015.11.10	<input checked="" type="checkbox"/>

6.10.3 Photographs of test setup



6.10.4 Measurement result

* 100 V, 50/60 Hz / 240 V, 50/60 Hz

Test Level (%UT)	Dip/Int. (%UT)	Duration /Period	Angle (°)	Count number	Result
0 %	100 %	0.5 Period	0 / 180	3T	A
70 %	30 %	25/30 Period	0	3T	A
0 %	100 %	250/300 Period	0	3T	B

Comment:

- A: There was no change of operation status during above testing. (0.5 Period, 25/30 Period)

- B: The power of EUT is off during the interruption test.

After the test, EUT is getting back to normal operation. (250/300 Period)

7. E.U.T. photographs

Front View



Rear View



Left View



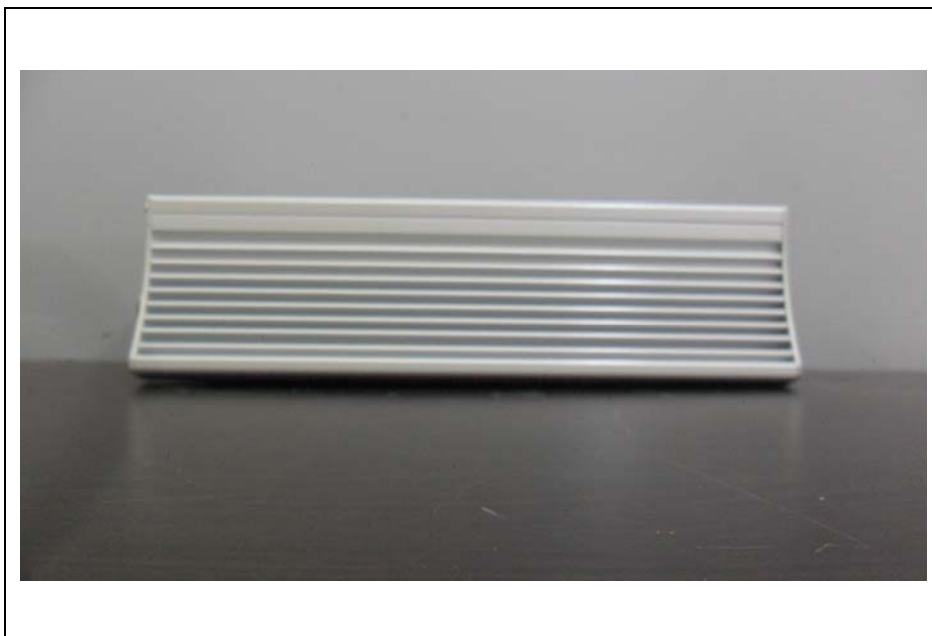
Right View



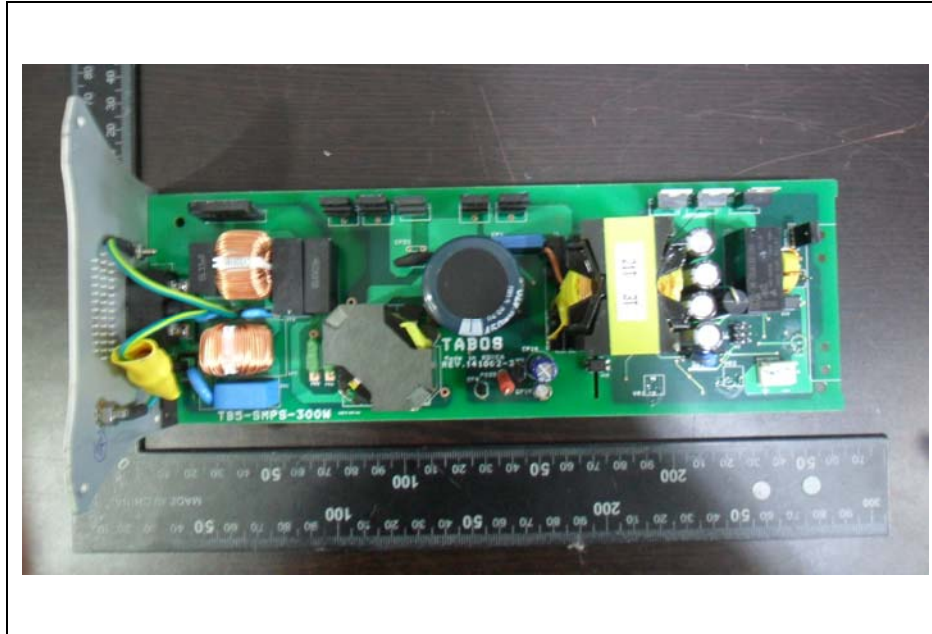
Top View



Bottom View



Inside



Main Board

