CE EMC
TEST REPORT

for

AC DC Power Module

MODEL:
TMPS 03-103; TMPS 03-105; TMPS 03-109; TMPS 03-112;
TMPS 03-115; TMPS 03-124

BRAND: TRACO POWER

Test Report Number:
T140701N04-E1

Issued to:

TRACO ELECTRONIC AG

SIHLBRUGGSTRASSE 111 CH-6340 BAAR, SWITZERLAND

Issued by:

Compliance Certification Services Inc.
Tainan BU.
No.8,Jiucengling, Xinhua Dist., Tainan City
712, Taiwan (R.O.C.)
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Issued Date: July 02, 2014

ilac-MRA TAF Testing Laboratory 1109

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	July 02, 2014	Initial Issue	ALL	Sunny Chang

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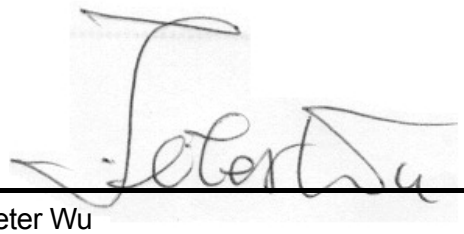
1 TEST CERTIFICATION

Product:	AC DC Power Module
Model:	TMPS 03-103; TMPS 03-105; TMPS 03-109; TMPS 03-112; TMPS 03-115; TMPS 03-124
Brand:	TRACO POWER
Applicant:	**TRACO ELECTRONIC AG** SIHLBRUGGSTRASSE 111 CH-6340 BAAR, SWITZERLAND
Tested:	April 11, 2014 ~ June 11, 2014
Applicable Standards:	**EN 55014-1: 2006+A1: 2009+A2:2011** EN 61000-3-2: 2006+A2: 2009 EN 61000-3-3: 2008
	EN 55014-2: 1997 + A1: 2001+ A2: 2008 including(Category IV) IEC 61000-4-2: 2008 IEC 61000-4-3: 2010 IEC 61000-4-4: 2012 IEC 61000-4-5: 2005 IEC 61000-4-6: 2008 IEC 61000-4-11: 2004

Deviation from Applicable Standard
None

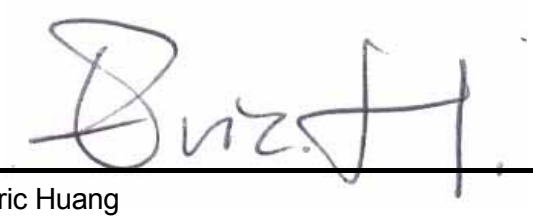
The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements of technical standards specified above under the EMC Directive 2004/108/EC.The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:



Jeter Wu
Assistant Manager

Reviewed by:



Eric Huang
Assistant Section Manager

2 TEST RESULT SUMMARY

EMISSION			
Standard	**Item**	**Result**	**Remarks**
EN 55014-1: 2006+A1: 2009+A2:2010	Terminals voltage	PASS	Meet the limit
	Disturbance power	PASS	Meet the limit
	Radiated disturbance	N/A	Please see the page 37
	Discontinuous disturbance	N/A	Please see the page 40
EN 61000-3-2: 2006+A2: 2009	Harmonic current emissions	PASS	Meets the requirements
EN 61000-3-3: 2008	Voltage fluctuations & flicker	PASS	Meets the requirements

IMMUNITY (EN 55014-2:1997 + A1: 2001)			
Category IV			
Standard	**Item**	**Result**	**Remarks**
IEC 61000-4-2: 2008	ESD	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-3: 2010	RS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-4: 2012	EFT	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-5: 2005	Surge	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-6: 2008	CS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-11: 2004	Voltage dips & voltage variations	PASS	Meets the requirements of **Voltage Dips:** (1) 60% reduction Performance Criterion A (2) 30% reduction Performance Criterion A **Voltage Interruptions:** (1)>95% reduction Performance Criterion B

Note: The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.

3 EUT DESCRIPTION

Product	AC DC Power Module
Model	TMPS 03-103; TMPS 03-105; TMPS 03-109; TMPS 03-112; TMPS 03-115; TMPS 03-124
Brand Name	TRACO POWER
Applicant	TRACO ELECTRONIC AG
Housing material	Plastics
Identify Number	T140701N04-E1
Received Date	April 11, 2014
EUT Power Rating	See Below

I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
1. AC Power	1	AC Source
2. DC Power	1	Load

Note:

1. Client consigns only seven model samples to test (Model Number: TMPS 03-103; TMPS 03-105; TMPS 03-109; TMPS 03-112; TMPS 03-115; TMPS 03-124)**.** Therefore, the testing Lab. just guarantees the unit, which has been tested.
2. For more details, please refer to the User's manual of the EUT.
3. The different of the each model is shown as below:

Model Number	Output Voltage	Output Current		Input Current	Max. capacitive Load	Efficiency (typ.)
		Max.	Peak(1)	@Max. Load		@Max. Load
	VDC	mA	mA	mA(typ.)	µF	%
TMPS 03-103	3.3	900	1170	62	1200	70
TMPS 03-105	5	600	780	61	800	72
TMPS 03-109	9	333	430	57	440	77
TMPS 03-112	12	250	320	56	330	78
TMPS 03-115	15	200	260	56	260	78
TMPS 03-124	24	125	160	56	160	78

4 TEST METHODOLOGY

4.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the above additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration/ modes are as the following:

Mains terminals voltage modes:

1.	**TMPS 03-103**	**4.**	**TMPS 03-112**
2.	**TMPS 03-105**	**5.**	**TMPS 03-115**
3.	**TMPS 03-109**	**6.**	**TMPS 03-124**

Disturbance power modes:

1.	**TMPS 03-103**	**4.**	**TMPS 03-112**
2.	**TMPS 03-105**	**5.**	**TMPS 03-115**
3.	**TMPS 03-109**	**6.**	**TMPS 03-124**

Radiated disturbance: Not applicable.

Discontinuous disturbance: Not applicable.

Flicker:

1	**TMPS 03-103**

Immunity:

1	**TMPS 03-103**

4.2. EUT SYSTEM OPERATION

1. Setup a whole system for test as shown on setup diagram.
2. Turn on power and check function.
3. Start to test by test mode.

5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

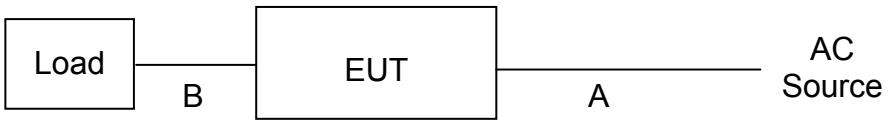
Peripherals Devices:

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	N/A	N/A	N/A	N/A	N/A

No.	Signal cable description	
A	AC Power cable	Unshielded, 1.6m, 1pcs.
B	DC Power cable	Unshielded, 0.1m, 1pcs.

Note:
1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. CONFIGURATION OF SYSTEM UNDER TEST



6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at CCS Taiwan Tainan BU. at No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.).

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4 and CISPR 16-1-5.

6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	TAF

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Germany	TUV NORD
Taiwan	BSMI
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccsrf.com

6.3. 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:

Measurement		Frequency	Uncertainty
Power Line Conducted Emission		9kHz~30MHz	±1.91dB
Conduction Emission	ISN	150kHz~30MHz	±2.6dB
	T-ISN	150kHz~30MHz	±2.6dB
	Clamp	30MHz ~ 300MHz	±2.0736dB
Radiated Emission (10m)	Test Site : OATS-5	30 MHz ~200 MHz	±3.4725dB
		200 MHz ~1000 MHz	±3.3356dB
	Test Site : OATS-6	30 MHz ~200 MHz	±3.5822dB
		200 MHz ~1000 MHz	±3.2357dB
	Test Site : OATS-7	30 MHz ~200 MHz	±3.4018dB
		200 MHz ~1000 MHz	±2.7949dB
Radiated Emission (3m)	Test Site : OATS-5	30 MHz ~200 MHz	±3.0153dB
		200 MHz ~1000 MHz	±2.919dB
	Test Site : OATS-6	30 MHz ~200 MHz	±3.3456dB
		200 MHz ~1000 MHz	±2.6828dB
	Test Site : OATS-7	30 MHz ~200 MHz	±3.0101dB
		200 MHz ~1000 MHz	±3.0638dB

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: 2005+AC: 20111, 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.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than U_{CISPR} which is 3.6dB and 5.2dB respectively. CCS values (called U_{Lab} in CISPR 16-4-2) is less than U_{CISPR} as shown in the table above. Therefore, MU need not be considered for compliance.

7 EMISSION TEST

7.1. TERMINALS VOLTAGE MEASUREMENT

7.1.1. LIMITS

Mains terminals of household appliances

FREQUENCY (MHz)	Mains terminals (dBuV)		Load / Additional terminals (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	66 - 56	59 - 46	80	70
0.50 - 5.0	56	46	74	64
5.0 - 30.0	60	50	74	64

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

Mains terminals of tools

FREQUENCY (MHz)	Rated power ≦ 700W (dBuV)		Rated power 700W ~ 1000W (dBuV)		Rated power ＞ 1000W (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.35	66 - 59	59 - 49	70 - 63	63 - 53	76 - 69	69 - 59
0.35 - 5.0	59	49	63	53	69	59
5.0 - 30.0	64	54	68	58	74	64

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

7.1.2. TEST INSTRUMENTS

Conducted Emission room # 1				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
L.I.S.N.	SCHWARZBECK	NNLK 8130	8130124	AUG. 12, 2014
	Rohde & Schwarz	ESH 3-Z5	840062/021	SEP. 09, 2014
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	AUG. 09, 2014
BNC COAXIAL CABLE	CCS	BNC50	11	NOV. 19, 2014
Test S/W	e-3 (5.04211c) R&S (2.27)			

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

7.1.3. TEST PROCEDURES

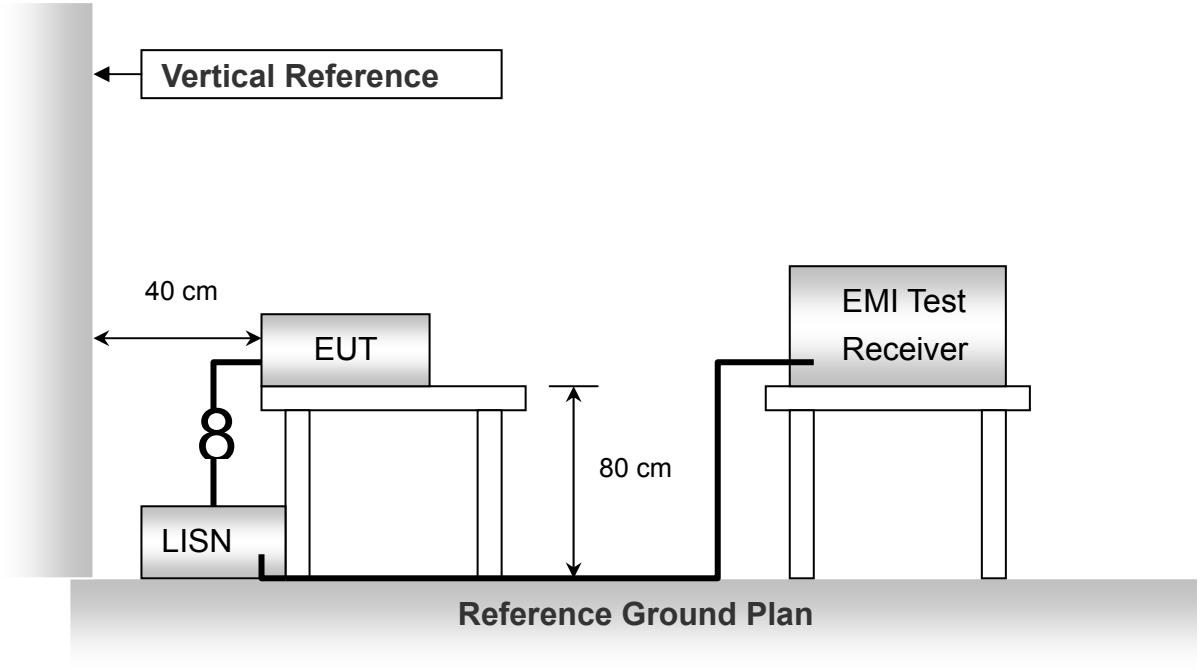
Procedure of Preliminary Test

- The EUT and Support equipment, if needed, was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55014-1 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 10 cm non-conductive covering to insulate the EUT from the ground plane.
- All I/O cables were positioned to simulate typical actual usage as per EN 55014-1.
- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment power received from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- The test data of the worst-case condition(s) was recorded.

7.1.4. TEST SETUP



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

7.1.5. DATA SAMPLE

Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Meter Reading (dBuV)	Measured Level (dBuV)	Limits (dBuV)	Over Limits (dBuV)	Detector
x.xx	9.6	0.1	15.7	25.4	46	-20.6	QP

Freq. = Emission frequency in MHz
LISN Factor = Insertion loss of LISN and Pulse Limiter
Cable Loss =Cable's loss (LISN to EMI Tester Receiver)
Meter Reading = Uncorrected Analyzer/Receiver reading
Measured Level = Meter Reading + Factor
Limit = Limit stated in standard
Over Limit = Measured Level in reference to limit
Detector: Peak = Peak Reading
QP = Quasi-peak Reading
AV = Average Reading

Calculation Formula

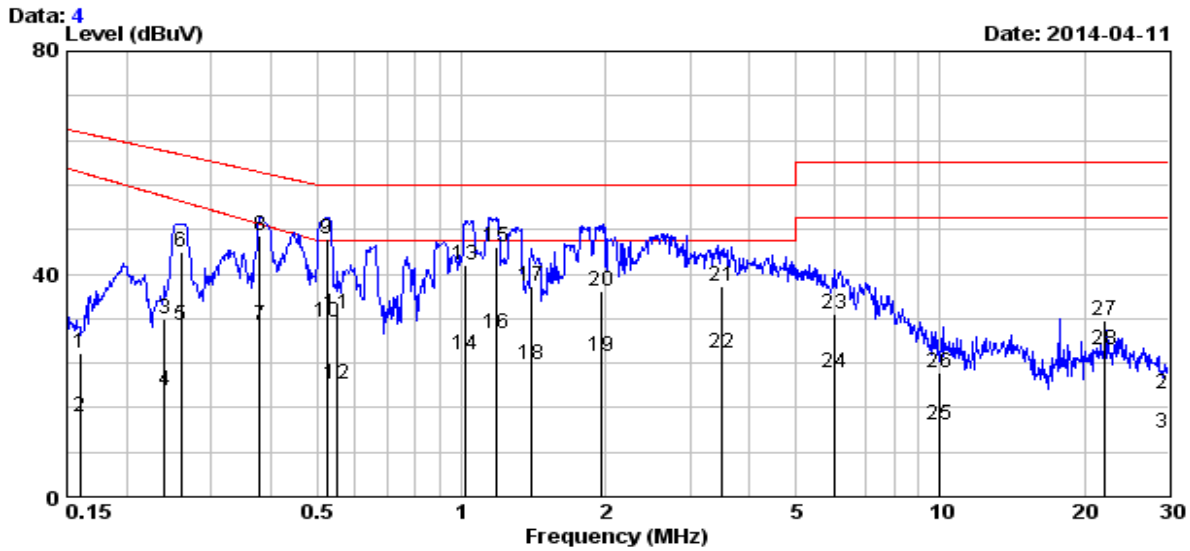
1. Measured Level (dBuV) = LISN Factor (dB) + Cable Loss (dB)+ Meter Reading (dBuV)
2. Over Limit (dBuV) = Measured Level (dBuV) – Limits (dBuV)

7.1.6. TEST RESULTS

Model No.	TMPS 03-103	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by	Vis Liang		

LINE

(The chart below shows the highest readings taken from the final data.)



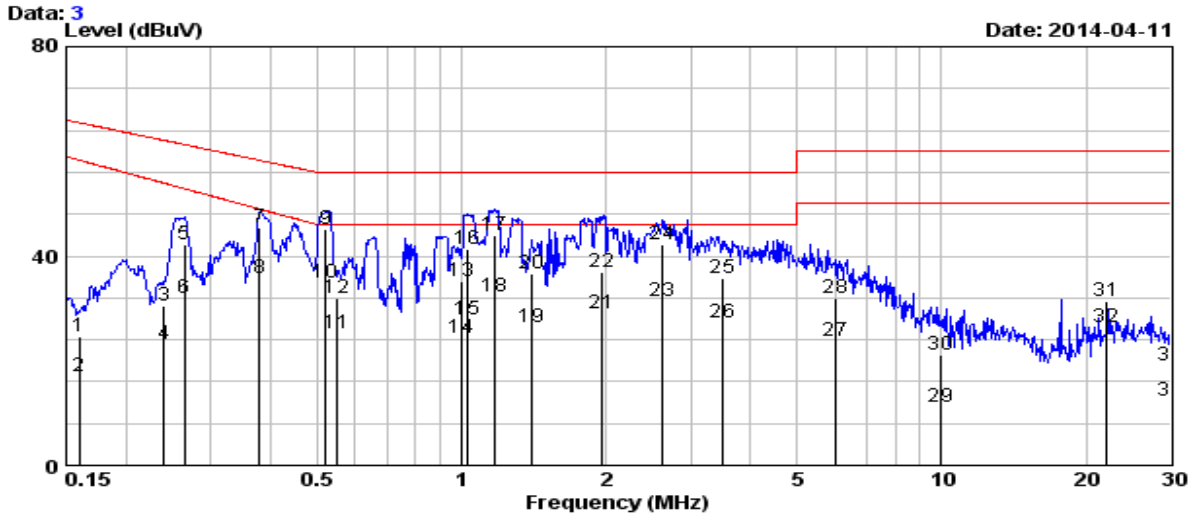
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.52	0.09	18.22	25.83	65.46	-39.63	QP
0.16	7.52	0.09	6.77	14.38	58.30	-43.92	AVERAGE
0.24	7.82	0.14	23.95	31.91	62.10	-30.19	QP
0.24	7.82	0.14	11.11	19.07	53.93	-34.86	AVERAGE
0.26	7.86	0.14	22.78	30.79	53.05	-22.27	AVERAGE
0.26	7.86	0.14	35.81	43.82	61.42	-17.61	QP
0.38	8.06	0.21	22.46	30.73	49.01	-18.28	AVERAGE
0.38	8.06	0.21	38.62	46.89	58.32	-11.43	QP
0.52	8.02	0.23	38.05	46.30	56.00	-9.70	QP
0.52	8.02	0.23	23.02	31.27	46.00	-14.73	AVERAGE
0.55	8.01	0.24	24.65	32.90	56.00	-23.10	QP
0.55	8.01	0.24	11.98	20.23	46.00	-25.77	AVERAGE
1.02	7.86	0.24	33.57	41.67	56.00	-14.33	QP
1.02	7.86	0.24	17.34	25.44	46.00	-20.56	AVERAGE
1.19	7.86	0.24	36.71	44.82	56.00	-11.18	QP
1.19	7.86	0.24	21.08	29.19	46.00	-16.81	AVERAGE
1.40	7.87	0.24	29.80	37.91	56.00	-18.09	QP
1.40	7.87	0.24	15.67	23.78	46.00	-22.22	AVERAGE
1.96	7.88	0.25	16.96	25.09	46.00	-20.91	AVERAGE
1.96	7.88	0.25	28.69	36.82	56.00	-19.18	QP
3.50	8.61	0.27	28.87	37.75	56.00	-18.25	QP
3.50	8.61	0.27	17.03	25.91	46.00	-20.09	AVERAGE
6.00	8.79	0.30	23.71	32.80	60.00	-27.20	QP
6.00	8.79	0.30	13.28	22.37	50.00	-27.63	AVERAGE
10.00	8.80	0.31	3.82	12.93	50.00	-37.07	AVERAGE
10.00	8.80	0.31	13.09	22.20	60.00	-37.80	QP
22.00	9.22	0.38	22.02	31.62	60.00	-28.38	QP
22.00	9.22	0.38	16.77	26.37	50.00	-23.63	AVERAGE
30.00	9.39	0.42	8.54	18.35	60.00	-41.65	QP
30.00	9.39	0.42	1.74	11.55	50.00	-38.45	AVERAGE

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)
2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-103	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by	Vis Liang		

NEUTRAL

(The chart below shows the highest readings taken from the final data.)

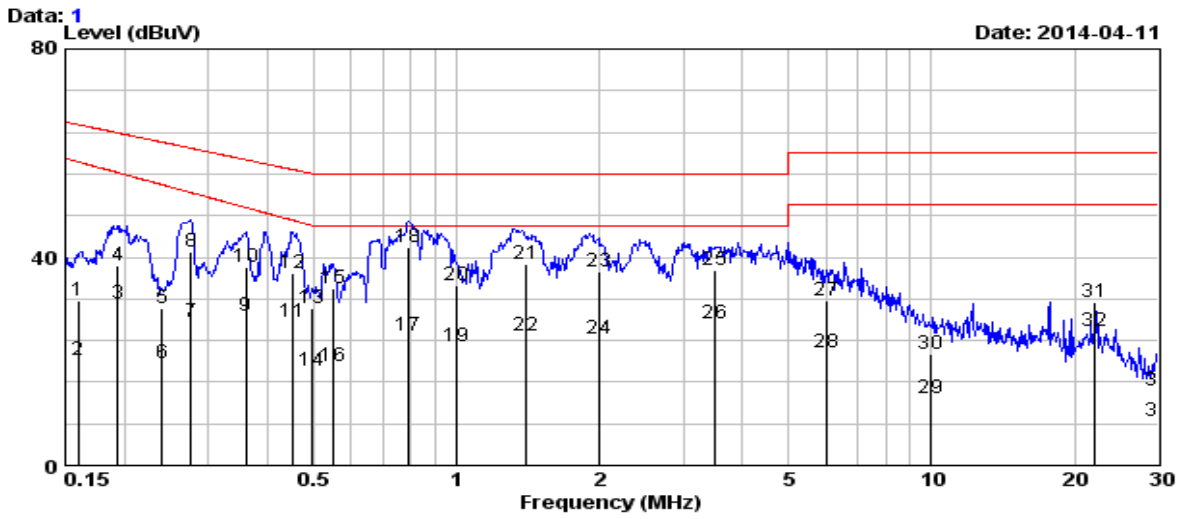


Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.56	0.09	16.97	24.62	65.46	-40.84	QP
0.16	7.56	0.09	9.26	16.91	58.30	-41.39	AVERAGE
0.24	7.86	0.14	22.44	30.44	62.10	-31.66	QP
0.24	7.86	0.14	15.08	23.08	53.93	-30.85	AVERAGE
0.26	7.91	0.14	34.21	42.26	61.29	-19.03	QP
0.26	7.91	0.14	23.78	31.83	52.88	-21.04	AVERAGE
0.38	8.10	0.21	37.23	45.54	58.28	-12.75	QP
0.38	8.10	0.21	27.48	35.79	48.97	-13.18	AVERAGE
0.52	8.07	0.23	36.70	45.00	56.00	-11.00	QP
0.52	8.07	0.23	26.46	34.76	46.00	-11.24	AVERAGE
0.55	8.06	0.24	16.83	25.12	46.00	-20.88	AVERAGE
0.55	8.06	0.24	23.57	31.86	56.00	-24.14	QP
1.00	7.92	0.24	26.90	35.06	56.00	-20.94	QP
1.00	7.92	0.24	16.19	24.35	46.00	-21.65	AVERAGE
1.03	7.92	0.24	19.82	27.98	46.00	-18.02	AVERAGE
1.03	7.92	0.24	33.25	41.41	56.00	-14.59	QP
1.17	7.92	0.24	35.79	43.95	56.00	-12.05	QP
1.17	7.92	0.24	23.95	32.11	46.00	-13.89	AVERAGE
1.40	7.92	0.24	18.33	26.49	46.00	-19.51	AVERAGE
1.40	7.92	0.24	28.45	36.61	56.00	-19.39	QP
1.96	7.92	0.25	20.87	29.04	46.00	-16.96	AVERAGE
1.96	7.92	0.25	28.83	37.00	56.00	-19.00	QP
2.62	8.28	0.26	22.96	31.50	46.00	-14.50	AVERAGE
2.62	8.28	0.26	33.63	42.17	56.00	-13.83	QP
3.50	8.65	0.27	26.95	35.87	56.00	-20.13	QP
3.50	8.65	0.27	18.28	27.20	46.00	-18.80	AVERAGE
6.00	8.84	0.30	14.59	23.73	50.00	-26.27	AVERAGE
6.00	8.84	0.30	22.70	31.84	60.00	-28.16	QP
10.00	8.85	0.31	1.94	11.10	50.00	-38.90	AVERAGE
10.00	8.85	0.31	11.88	21.04	60.00	-38.96	QP
22.00	9.22	0.38	21.68	31.28	60.00	-28.72	QP
22.00	9.22	0.38	16.72	26.32	50.00	-23.68	AVERAGE
30.00	9.36	0.42	9.17	18.95	60.00	-41.05	QP
30.00	9.36	0.42	2.64	12.42	50.00	-37.58	AVERAGE

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)
2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-105	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by	Vis Liang		

LINE



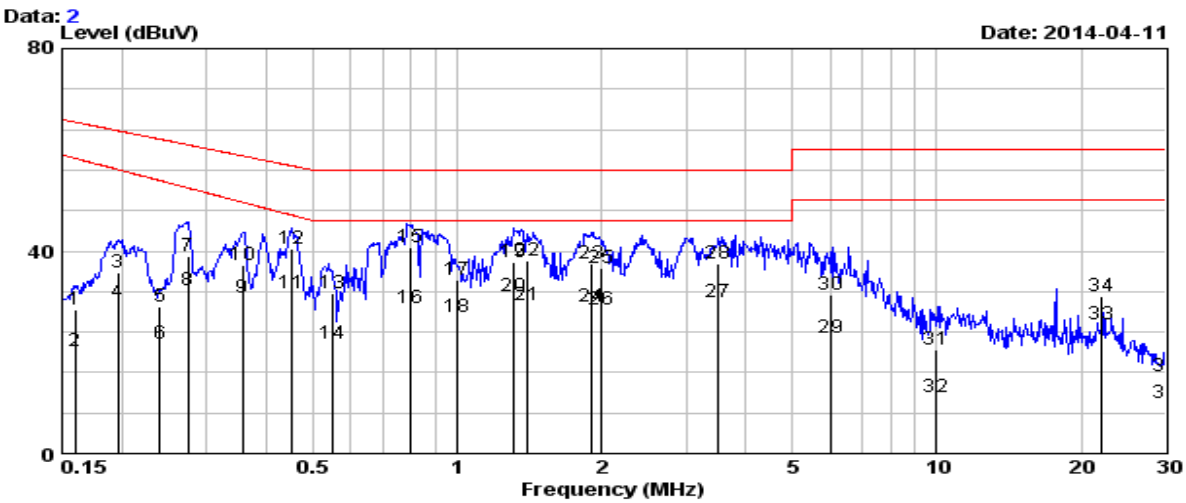
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.52	0.09	23.93	31.54	65.46	-33.92	QP
0.16	7.52	0.09	12.70	20.31	58.30	-37.99	AVERAGE
0.19	7.69	0.12	23.39	31.20	56.25	-25.05	AVERAGE
0.19	7.69	0.12	30.65	38.46	63.89	-25.42	QP
0.24	7.82	0.14	22.32	30.28	62.10	-31.82	QP
0.24	7.82	0.14	11.70	19.66	53.93	-34.27	AVERAGE
0.28	7.89	0.15	19.64	27.68	52.42	-24.74	AVERAGE
0.28	7.89	0.15	33.06	41.10	60.94	-19.84	QP
0.36	8.03	0.19	20.40	28.63	49.56	-20.93	AVERAGE
0.36	8.03	0.19	29.78	38.01	58.74	-20.73	QP
0.45	8.06	0.22	19.29	27.57	47.10	-19.53	AVERAGE
0.45	8.06	0.22	28.68	36.96	56.85	-19.89	QP
0.49	8.04	0.22	21.78	30.04	56.10	-26.06	QP
0.49	8.04	0.22	10.05	18.31	46.13	-27.82	AVERAGE
0.55	8.01	0.24	25.62	33.87	56.00	-22.13	QP
0.55	8.01	0.24	10.86	19.11	46.00	-26.89	AVERAGE
0.79	7.92	0.30	16.77	24.99	46.00	-21.01	AVERAGE
0.79	7.92	0.30	33.71	41.93	56.00	-14.07	QP
1.00	7.86	0.24	14.85	22.95	46.00	-23.05	AVERAGE
1.00	7.86	0.24	26.45	34.55	56.00	-21.45	QP
1.40	7.87	0.24	30.65	38.76	56.00	-17.24	QP
1.40	7.87	0.24	16.84	24.95	46.00	-21.05	AVERAGE
2.00	7.88	0.25	29.19	37.32	56.00	-18.68	QP
2.00	7.88	0.25	16.25	24.38	46.00	-21.62	AVERAGE
3.50	8.61	0.27	28.57	37.45	56.00	-18.55	QP
3.50	8.61	0.27	18.32	27.20	46.00	-18.80	AVERAGE
6.00	8.79	0.30	22.64	31.73	60.00	-28.27	QP
6.00	8.79	0.30	12.53	21.62	50.00	-28.38	AVERAGE
10.00	8.80	0.31	3.71	12.82	50.00	-37.18	AVERAGE
10.00	8.80	0.31	12.28	21.39	60.00	-38.61	QP
22.00	9.22	0.38	21.72	31.32	60.00	-28.68	QP
22.00	9.22	0.38	16.11	25.71	50.00	-24.29	AVERAGE
30.00	9.39	0.42	4.54	14.35	60.00	-45.65	QP
30.00	9.39	0.42	-1.36	8.45	50.00	-41.55	AVERAGE

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-105	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by:	Vis Liang		

NEUTRAL



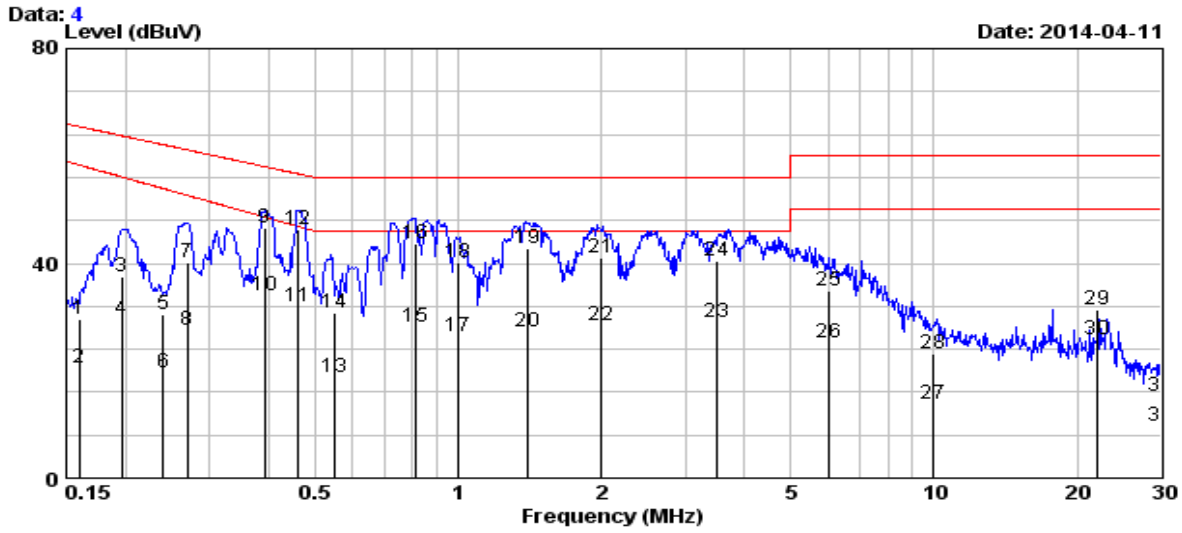
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.56	0.09	20.90	28.55	65.46	-36.91	QP
0.16	7.56	0.09	12.45	20.10	58.30	-38.20	AVERAGE
0.20	7.75	0.13	28.00	35.87	63.76	-27.88	QP
0.20	7.75	0.13	22.12	29.99	56.08	-26.09	AVERAGE
0.24	7.86	0.14	20.94	28.94	62.10	-33.16	QP
0.24	7.86	0.14	13.69	21.69	53.93	-32.24	AVERAGE
0.27	7.93	0.15	30.77	38.84	60.98	-22.14	QP
0.27	7.93	0.15	24.28	32.35	52.48	-20.12	AVERAGE
0.36	8.07	0.19	22.60	30.86	49.62	-18.76	AVERAGE
0.36	8.07	0.19	28.83	37.09	58.78	-21.69	QP
0.45	8.10	0.22	23.34	31.66	47.10	-15.44	AVERAGE
0.45	8.10	0.22	32.21	40.53	56.85	-16.32	QP
0.55	8.06	0.24	23.37	31.66	56.00	-24.34	QP
0.55	8.06	0.24	13.30	21.59	46.00	-24.41	AVERAGE
0.80	7.97	0.30	32.50	40.77	56.00	-15.23	QP
0.80	7.97	0.30	20.37	28.64	46.00	-17.36	AVERAGE
1.00	7.92	0.24	26.14	34.30	56.00	-21.70	QP
1.00	7.92	0.24	18.85	27.01	46.00	-18.99	AVERAGE
1.31	7.92	0.24	29.64	37.80	56.00	-18.20	QP
1.31	7.92	0.24	22.93	31.09	46.00	-14.91	AVERAGE
1.40	7.92	0.24	21.26	29.42	46.00	-16.58	AVERAGE
1.40	7.92	0.24	30.04	38.20	56.00	-17.80	QP
1.90	7.92	0.25	29.24	37.41	56.00	-18.59	QP
1.90	7.92	0.25	20.73	28.90	46.00	-17.10	AVERAGE
2.00	7.92	0.25	28.53	36.70	56.00	-19.30	QP
2.00	7.92	0.25	20.18	28.35	46.00	-17.65	AVERAGE
3.50	8.65	0.27	20.94	29.86	46.00	-16.14	AVERAGE
3.50	8.65	0.27	28.73	37.65	56.00	-18.35	QP
6.00	8.84	0.30	13.59	22.73	50.00	-27.27	AVERAGE
6.00	8.84	0.30	22.34	31.48	60.00	-28.52	QP
10.00	8.85	0.31	11.40	20.56	60.00	-39.44	QP
10.00	8.85	0.31	1.87	11.03	50.00	-38.97	AVERAGE
22.00	9.22	0.38	15.94	25.54	50.00	-24.46	AVERAGE
22.00	9.22	0.38	21.48	31.08	60.00	-28.92	QP
30.00	9.36	0.42	0.11	9.89	50.00	-40.11	AVERAGE
30.00	9.36	0.42	5.49	15.27	60.00	-44.73	QP

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-109	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by	Vis Liang		

LINE



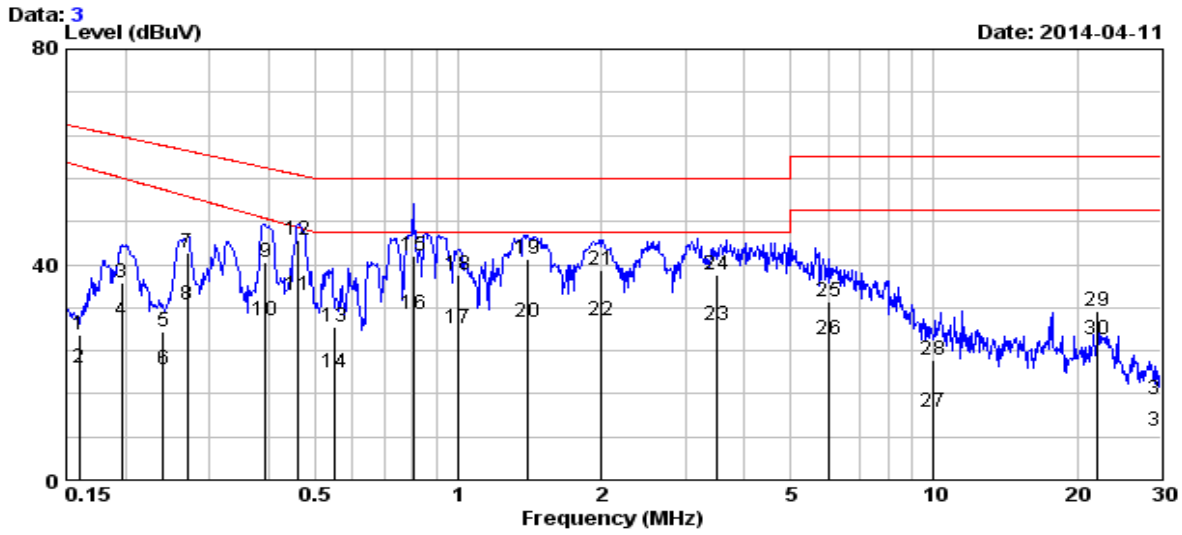
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.52	0.09	21.92	29.53	65.46	-35.93	QP
0.16	7.52	0.09	12.87	20.48	58.30	-37.82	AVERAGE
0.20	7.71	0.13	29.77	37.60	63.76	-26.15	QP
0.20	7.71	0.13	21.87	29.70	56.08	-26.38	AVERAGE
0.24	7.82	0.14	22.52	30.48	62.10	-31.62	QP
0.24	7.82	0.14	11.55	19.51	53.93	-34.42	AVERAGE
0.27	7.88	0.14	32.10	40.12	61.12	-20.99	QP
0.27	7.88	0.14	19.64	27.66	52.65	-24.99	AVERAGE
0.39	8.08	0.21	38.27	46.56	58.03	-11.47	QP
0.39	8.08	0.21	25.57	33.86	48.65	-14.78	AVERAGE
0.46	8.06	0.22	23.65	31.93	46.93	-15.00	AVERAGE
0.46	8.06	0.22	38.15	46.43	56.71	-10.29	QP
0.55	8.01	0.24	10.65	18.90	46.00	-27.10	AVERAGE
0.55	8.01	0.24	22.66	30.91	56.00	-25.09	QP
0.81	7.91	0.29	20.05	28.25	46.00	-17.75	AVERAGE
0.81	7.91	0.29	35.34	43.54	56.00	-12.46	QP
1.00	7.86	0.24	18.20	26.30	46.00	-19.70	AVERAGE
1.00	7.86	0.24	31.92	40.02	56.00	-15.98	QP
1.40	7.87	0.24	34.59	42.70	56.00	-13.30	QP
1.40	7.87	0.24	19.10	27.21	46.00	-18.79	AVERAGE
2.00	7.88	0.25	32.75	40.88	56.00	-15.12	QP
2.00	7.88	0.25	20.34	28.47	46.00	-17.53	AVERAGE
3.50	8.61	0.27	20.05	28.93	46.00	-17.07	AVERAGE
3.50	8.61	0.27	31.56	40.44	56.00	-15.56	QP
6.00	8.79	0.30	25.69	34.78	60.00	-25.22	QP
6.00	8.79	0.30	16.09	25.18	50.00	-24.82	AVERAGE
10.00	8.80	0.31	4.54	13.65	50.00	-36.35	AVERAGE
10.00	8.80	0.31	13.90	23.01	60.00	-36.99	QP
22.00	9.22	0.38	21.72	31.32	60.00	-28.68	QP
22.00	9.22	0.38	16.11	25.71	50.00	-24.29	AVERAGE
30.00	9.39	0.42	-0.19	9.62	50.00	-40.38	AVERAGE
30.00	9.39	0.42	5.29	15.10	60.00	-44.90	QP

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-109	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by:	Vis Liang		

NEUTRAL



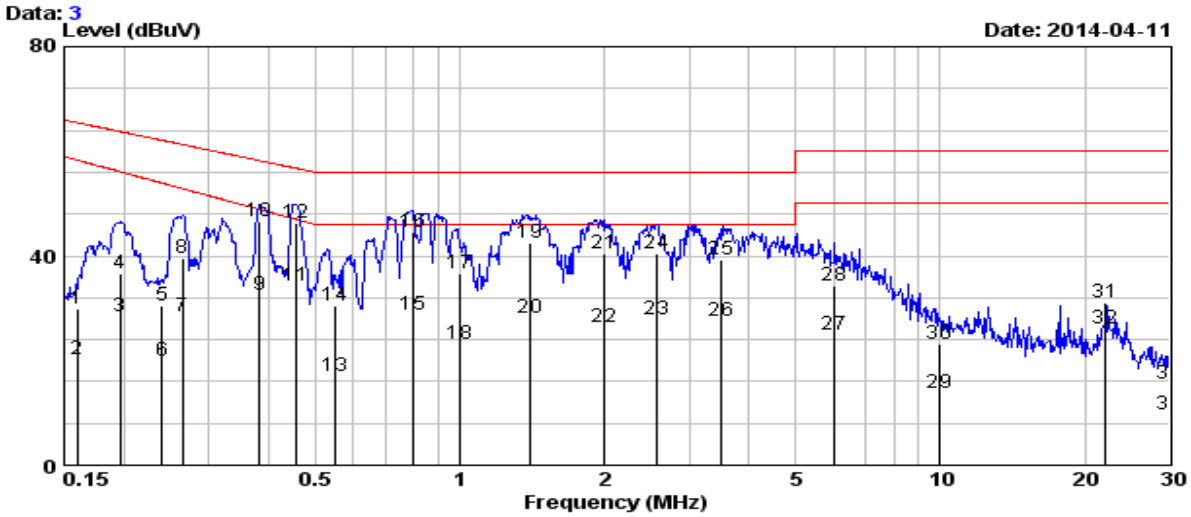
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.56	0.09	19.35	27.00	65.46	-38.46	QP
0.16	7.56	0.09	13.20	20.85	58.30	-37.45	AVERAGE
0.20	7.75	0.13	28.71	36.58	63.76	-27.17	QP
0.20	7.75	0.13	21.79	29.66	56.08	-26.42	AVERAGE
0.24	7.86	0.14	19.61	27.61	62.10	-34.49	QP
0.24	7.86	0.14	12.64	20.64	53.93	-33.29	AVERAGE
0.27	7.92	0.14	34.15	42.21	61.12	-18.90	QP
0.27	7.92	0.14	24.50	32.56	52.65	-20.09	AVERAGE
0.39	8.12	0.22	32.12	40.46	57.99	-17.53	QP
0.39	8.12	0.22	21.32	29.66	48.59	-18.93	AVERAGE
0.46	8.10	0.22	25.90	34.22	46.93	-12.71	AVERAGE
0.46	8.10	0.22	36.28	44.60	56.71	-12.12	QP
0.55	8.06	0.24	20.16	28.45	56.00	-27.55	QP
0.55	8.06	0.24	11.70	19.99	46.00	-26.01	AVERAGE
0.80	7.97	0.30	33.41	41.68	56.00	-14.32	QP
0.80	7.97	0.30	22.37	30.64	46.00	-15.36	AVERAGE
1.00	7.92	0.24	20.10	28.26	46.00	-17.74	AVERAGE
1.00	7.92	0.24	29.79	37.95	56.00	-18.05	QP
1.40	7.92	0.24	32.72	40.88	56.00	-15.12	QP
1.40	7.92	0.24	21.06	29.22	46.00	-16.78	AVERAGE
2.00	7.92	0.25	30.90	39.07	56.00	-16.93	QP
2.00	7.92	0.25	21.51	29.68	46.00	-16.32	AVERAGE
3.50	8.65	0.27	19.90	28.82	46.00	-17.18	AVERAGE
3.50	8.65	0.27	29.09	38.01	56.00	-17.99	QP
6.00	8.84	0.30	24.03	33.17	60.00	-26.83	QP
6.00	8.84	0.30	17.07	26.21	50.00	-23.79	AVERAGE
10.00	8.85	0.31	3.39	12.55	50.00	-37.45	AVERAGE
10.00	8.85	0.31	13.13	22.29	60.00	-37.71	QP
22.00	9.22	0.38	21.66	31.26	60.00	-28.74	QP
22.00	9.22	0.38	16.50	26.10	50.00	-23.90	AVERAGE
30.00	9.36	0.42	-0.66	9.12	50.00	-40.88	AVERAGE
30.00	9.36	0.42	5.03	14.81	60.00	-45.19	QP

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-112	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by	Vis Liang		

LINE



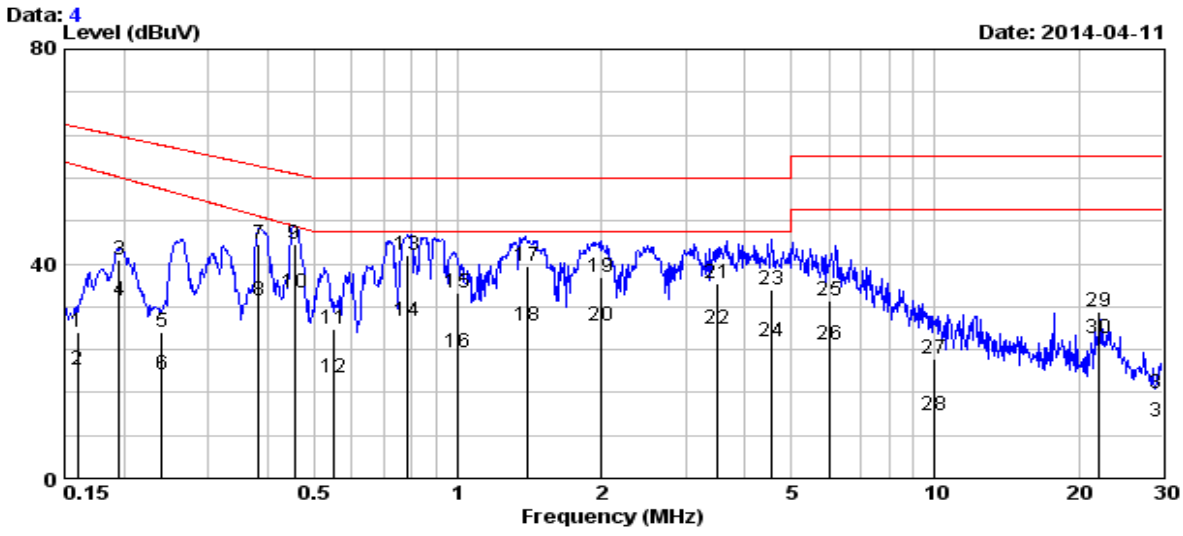
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.52	0.09	22.24	29.85	65.46	-35.61	QP
0.16	7.52	0.09	12.70	20.31	58.30	-37.99	AVERAGE
0.20	7.71	0.13	20.61	28.44	56.08	-27.64	AVERAGE
0.20	7.71	0.13	28.73	36.56	63.76	-27.19	QP
0.24	7.82	0.14	22.58	30.54	62.10	-31.56	QP
0.24	7.82	0.14	11.94	19.90	53.93	-34.03	AVERAGE
0.26	7.87	0.14	20.50	28.51	52.88	-24.36	AVERAGE
0.26	7.87	0.14	31.63	39.64	61.29	-21.65	QP
0.38	8.06	0.21	24.40	32.67	48.87	-16.20	AVERAGE
0.38	8.06	0.21	38.40	46.67	58.21	-11.54	QP
0.45	8.06	0.22	26.13	34.41	47.04	-12.63	AVERAGE
0.45	8.06	0.22	38.07	46.35	56.80	-10.45	QP
0.55	8.01	0.24	8.88	17.13	46.00	-28.87	AVERAGE
0.55	8.01	0.24	22.28	30.53	56.00	-25.47	QP
0.80	7.92	0.30	20.48	28.70	46.00	-17.30	AVERAGE
0.80	7.92	0.30	36.27	44.49	56.00	-11.51	QP
1.00	7.86	0.24	28.47	36.57	56.00	-19.43	QP
1.00	7.86	0.24	15.17	23.27	46.00	-22.73	AVERAGE
1.40	7.87	0.24	34.43	42.54	56.00	-13.46	QP
1.40	7.87	0.24	20.10	28.21	46.00	-17.79	AVERAGE
2.00	7.88	0.25	32.26	40.39	56.00	-15.61	QP
2.00	7.88	0.25	18.30	26.43	46.00	-19.57	AVERAGE
2.58	8.22	0.26	19.51	27.99	46.00	-18.02	AVERAGE
2.58	8.22	0.26	32.11	40.59	56.00	-15.41	QP
3.50	8.61	0.27	30.51	39.39	56.00	-16.61	QP
3.50	8.61	0.27	18.80	27.68	46.00	-18.32	AVERAGE
6.00	8.79	0.30	15.81	24.90	50.00	-25.10	AVERAGE
6.00	8.79	0.30	25.33	34.42	60.00	-25.58	QP
10.00	8.80	0.31	4.80	13.91	50.00	-36.09	AVERAGE
10.00	8.80	0.31	13.90	23.01	60.00	-36.99	QP
22.00	9.22	0.38	21.42	31.02	60.00	-28.98	QP
22.00	9.22	0.38	16.50	26.10	50.00	-23.90	AVERAGE
30.00	9.39	0.42	5.63	15.44	60.00	-44.56	QP
30.00	9.39	0.42	-0.15	9.66	50.00	-40.34	AVERAGE

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-112	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by:	Vis Liang		

NEUTRAL



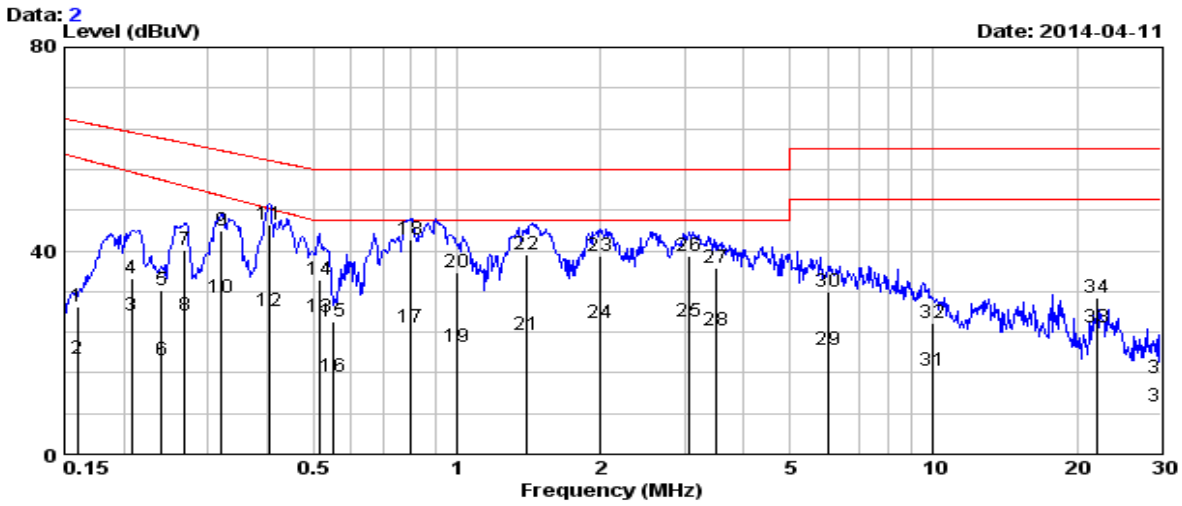
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.56	0.09	19.74	27.39	65.46	-38.07	QP
0.16	7.56	0.09	12.53	20.18	58.30	-38.12	AVERAGE
0.20	7.74	0.13	32.97	40.83	63.80	-22.97	QP
0.20	7.74	0.13	25.19	33.05	56.14	-23.09	AVERAGE
0.24	7.86	0.14	19.15	27.15	62.10	-34.95	QP
0.24	7.86	0.14	11.21	19.21	53.93	-34.72	AVERAGE
0.38	8.10	0.21	35.35	43.66	58.21	-14.55	QP
0.38	8.10	0.21	24.67	32.98	48.87	-15.89	AVERAGE
0.45	8.10	0.22	35.31	43.63	56.80	-13.17	QP
0.45	8.10	0.22	26.13	34.45	47.04	-12.59	AVERAGE
0.55	8.06	0.24	19.64	27.93	56.00	-28.07	QP
0.55	8.06	0.24	10.43	18.72	46.00	-27.28	AVERAGE
0.79	7.98	0.30	33.22	41.49	56.00	-14.51	QP
0.79	7.98	0.30	21.05	29.32	46.00	-16.68	AVERAGE
1.00	7.92	0.24	26.46	34.62	56.00	-21.38	QP
1.00	7.92	0.24	15.29	23.45	46.00	-22.55	AVERAGE
1.40	7.92	0.24	31.54	39.70	56.00	-16.30	QP
1.40	7.92	0.24	20.38	28.54	46.00	-17.46	AVERAGE
2.00	7.92	0.25	29.47	37.64	56.00	-18.36	QP
2.00	7.92	0.25	20.25	28.42	46.00	-17.58	AVERAGE
3.50	8.65	0.27	27.49	36.41	56.00	-19.59	QP
3.50	8.65	0.27	18.88	27.80	46.00	-18.20	AVERAGE
4.55	8.83	0.29	26.03	35.15	56.00	-20.85	QP
4.55	8.83	0.29	16.39	25.51	46.00	-20.49	AVERAGE
6.00	8.84	0.30	23.99	33.13	60.00	-26.87	QP
6.00	8.84	0.30	15.69	24.83	50.00	-25.17	AVERAGE
10.00	8.85	0.31	13.09	22.25	60.00	-37.75	QP
10.00	8.85	0.31	2.50	11.66	50.00	-38.34	AVERAGE
22.00	9.22	0.38	21.58	31.18	60.00	-28.82	QP
22.00	9.22	0.38	16.34	25.94	50.00	-24.06	AVERAGE
30.00	9.36	0.42	5.91	15.69	60.00	-44.31	QP
30.00	9.36	0.42	0.63	10.41	50.00	-39.59	AVERAGE

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-115	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by	Vis Liang		

LINE



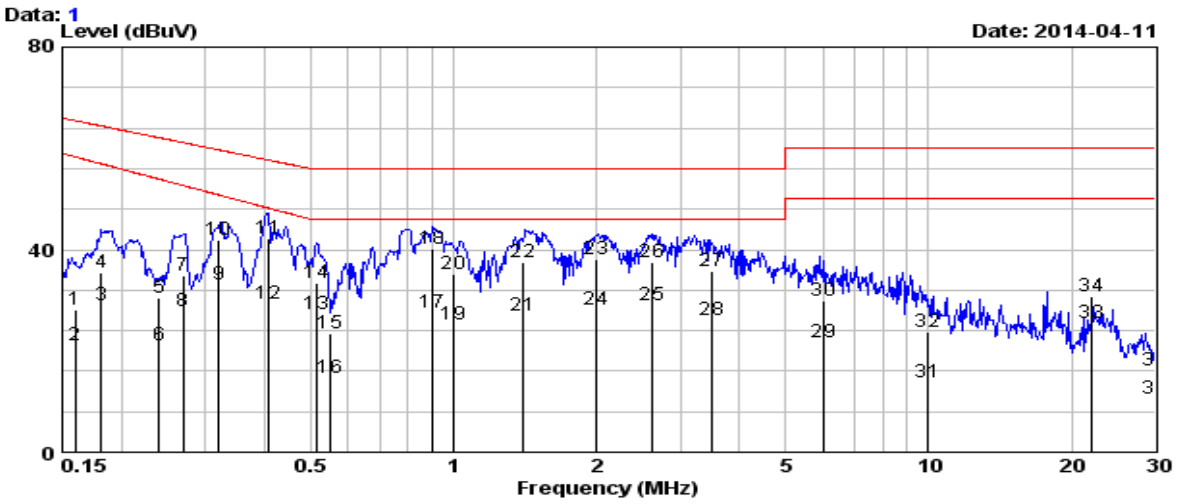
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.52	0.09	21.28	28.89	65.46	-36.57	QP
0.16	7.52	0.09	11.14	18.75	58.30	-39.55	AVERAGE
0.21	7.74	0.13	19.29	27.16	55.51	-28.35	AVERAGE
0.21	7.74	0.13	26.71	34.58	63.32	-28.73	QP
0.24	7.82	0.14	24.27	32.23	62.10	-29.87	QP
0.24	7.82	0.14	10.38	18.34	53.93	-35.59	AVERAGE
0.27	7.88	0.14	32.00	40.02	61.16	-21.14	QP
0.27	7.88	0.14	19.23	27.25	52.71	-25.45	AVERAGE
0.32	7.97	0.17	35.70	43.84	59.71	-15.87	QP
0.32	7.97	0.17	22.65	30.79	50.82	-20.03	AVERAGE
0.40	8.09	0.22	36.69	45.00	57.77	-12.77	QP
0.40	8.09	0.22	19.89	28.20	48.30	-20.10	AVERAGE
0.51	8.03	0.22	18.72	26.97	46.00	-19.03	AVERAGE
0.51	8.03	0.22	26.15	34.40	56.00	-21.60	QP
0.55	8.01	0.24	17.90	26.15	56.00	-29.85	QP
0.55	8.01	0.24	6.87	15.12	46.00	-30.88	AVERAGE
0.80	7.92	0.30	16.72	24.94	46.00	-21.06	AVERAGE
0.80	7.92	0.30	34.02	42.24	56.00	-13.76	QP
1.00	7.86	0.24	13.02	21.12	46.00	-24.88	AVERAGE
1.00	7.86	0.24	27.79	35.89	56.00	-20.11	QP
1.40	7.87	0.24	15.23	23.34	46.00	-22.66	AVERAGE
1.40	7.87	0.24	31.04	39.15	56.00	-16.85	QP
2.00	7.88	0.25	30.92	39.05	56.00	-16.95	QP
2.00	7.88	0.25	17.55	25.68	46.00	-20.32	AVERAGE
3.06	8.43	0.26	17.31	26.00	46.00	-20.00	AVERAGE
3.06	8.43	0.26	30.27	38.96	56.00	-17.04	QP
3.50	8.61	0.27	27.88	36.76	56.00	-19.24	QP
3.50	8.61	0.27	15.32	24.20	46.00	-21.80	AVERAGE
6.00	8.79	0.30	11.44	20.53	50.00	-29.47	AVERAGE
6.00	8.79	0.30	22.74	31.83	60.00	-28.17	QP
10.00	8.80	0.31	7.27	16.38	50.00	-33.62	AVERAGE
10.00	8.80	0.31	16.69	25.80	60.00	-34.20	QP
22.00	9.22	0.38	15.39	24.99	50.00	-25.01	AVERAGE
22.00	9.22	0.38	21.10	30.70	60.00	-29.30	QP
30.00	9.39	0.42	5.17	14.98	60.00	-45.02	QP
30.00	9.39	0.42	-0.34	9.47	50.00	-40.53	AVERAGE

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-115	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by:	Vis Liang		

NEUTRAL



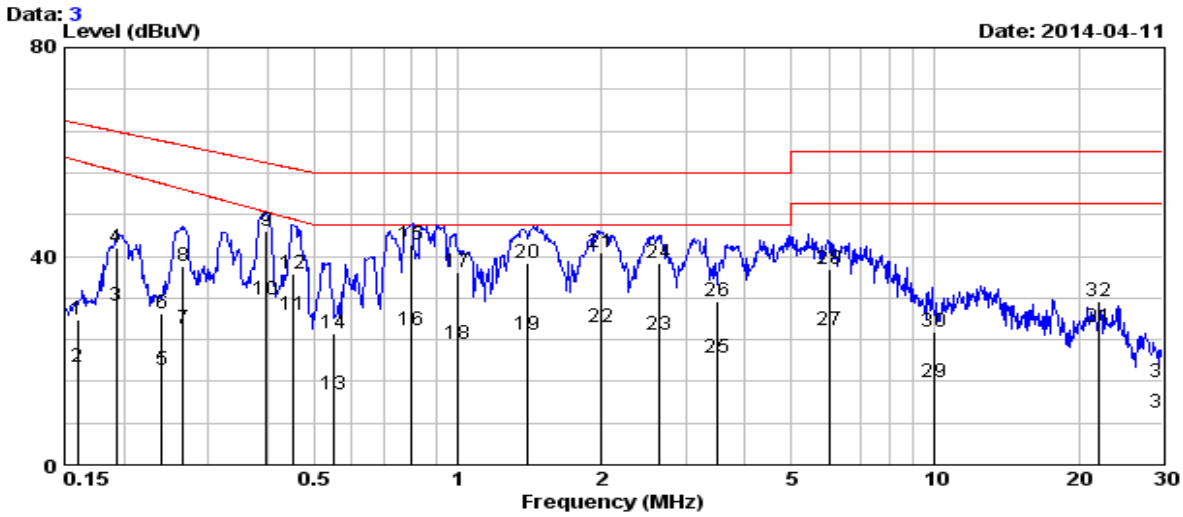
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.56	0.09	20.49	28.14	65.46	-37.32	QP
0.16	7.56	0.09	13.59	21.24	58.30	-37.06	AVERAGE
0.18	7.67	0.11	21.23	29.01	56.94	-27.93	AVERAGE
0.18	7.67	0.11	27.68	35.46	64.42	-28.95	QP
0.24	7.86	0.14	22.62	30.62	62.10	-31.48	QP
0.24	7.86	0.14	13.22	21.22	53.93	-32.71	AVERAGE
0.27	7.92	0.14	26.82	34.88	61.12	-26.23	QP
0.27	7.92	0.14	19.68	27.74	52.65	-24.91	AVERAGE
0.32	8.01	0.17	25.04	33.22	50.80	-17.58	AVERAGE
0.32	8.01	0.17	33.85	42.03	59.69	-17.67	QP
0.41	8.13	0.22	33.71	42.06	57.73	-15.67	QP
0.41	8.13	0.22	20.93	29.28	48.24	-18.97	AVERAGE
0.52	8.07	0.23	18.90	27.20	46.00	-18.80	AVERAGE
0.52	8.07	0.23	25.15	33.45	56.00	-22.55	QP
0.55	8.06	0.24	15.16	23.45	56.00	-32.55	QP
0.55	8.06	0.24	6.46	14.75	46.00	-31.25	AVERAGE
0.90	7.94	0.23	19.34	27.51	46.00	-18.49	AVERAGE
0.90	7.94	0.23	32.00	40.17	56.00	-15.83	QP
1.00	7.92	0.24	17.15	25.31	46.00	-20.69	AVERAGE
1.00	7.92	0.24	27.10	35.26	56.00	-20.74	QP
1.40	7.92	0.24	18.77	26.93	46.00	-19.07	AVERAGE
1.40	7.92	0.24	29.29	37.45	56.00	-18.55	QP
2.00	7.92	0.25	29.84	38.01	56.00	-17.99	QP
2.00	7.92	0.25	19.88	28.05	46.00	-17.95	AVERAGE
2.62	8.28	0.26	20.41	28.95	46.00	-17.05	AVERAGE
2.62	8.28	0.26	29.01	37.55	56.00	-18.45	QP
3.50	8.65	0.27	26.81	35.73	56.00	-20.27	QP
3.50	8.65	0.27	17.18	26.10	46.00	-19.90	AVERAGE
6.00	8.84	0.30	12.45	21.59	50.00	-28.41	AVERAGE
6.00	8.84	0.30	20.79	29.93	60.00	-30.07	QP
10.00	8.85	0.31	4.75	13.91	50.00	-36.09	AVERAGE
10.00	8.85	0.31	14.45	23.61	60.00	-36.39	QP
22.00	9.22	0.38	15.94	25.54	50.00	-24.46	AVERAGE
22.00	9.22	0.38	21.08	30.68	60.00	-29.32	QP
30.00	9.36	0.42	6.35	16.13	60.00	-43.87	QP
30.00	9.36	0.42	0.87	10.65	50.00	-39.35	AVERAGE

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-124	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by	Vis Liang		

LINE



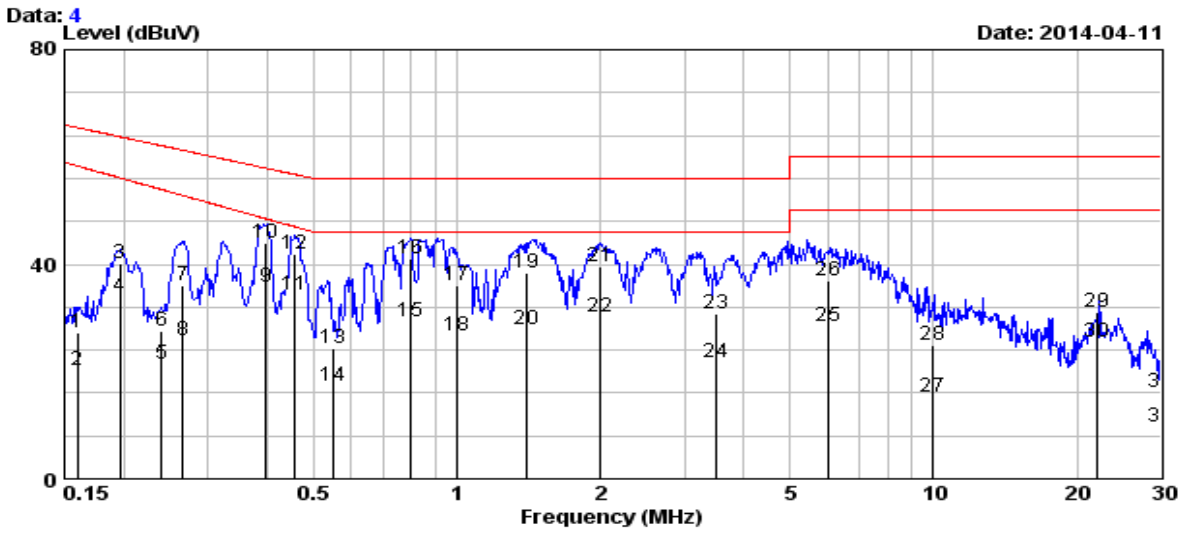
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.52	0.09	20.27	27.88	65.46	-37.58	QP
0.16	7.52	0.09	11.19	18.80	58.30	-39.50	AVERAGE
0.19	7.69	0.12	22.78	30.59	56.28	-25.69	AVERAGE
0.19	7.69	0.12	33.77	41.58	63.91	-22.32	QP
0.24	7.82	0.14	10.07	18.03	53.93	-35.90	AVERAGE
0.24	7.82	0.14	20.98	28.94	62.10	-33.16	QP
0.27	7.87	0.14	18.15	26.16	52.82	-26.66	AVERAGE
0.27	7.87	0.14	30.06	38.07	61.25	-23.17	QP
0.40	8.09	0.22	36.55	44.85	57.91	-13.05	QP
0.40	8.09	0.22	23.27	31.57	48.48	-16.91	AVERAGE
0.45	8.06	0.22	20.30	28.58	47.10	-18.52	AVERAGE
0.45	8.06	0.22	28.32	36.60	56.85	-20.25	QP
0.55	8.01	0.24	5.15	13.40	46.00	-32.60	AVERAGE
0.55	8.01	0.24	16.83	25.08	56.00	-30.92	QP
0.80	7.92	0.30	34.00	42.22	56.00	-13.78	QP
0.80	7.92	0.30	17.49	25.71	46.00	-20.29	AVERAGE
1.00	7.86	0.24	28.75	36.85	56.00	-19.15	QP
1.00	7.86	0.24	14.91	23.01	46.00	-22.99	AVERAGE
1.40	7.87	0.24	16.73	24.84	46.00	-21.16	AVERAGE
1.40	7.87	0.24	30.55	38.66	56.00	-17.34	QP
2.00	7.88	0.25	32.46	40.59	56.00	-15.41	QP
2.00	7.88	0.25	18.34	26.47	46.00	-19.53	AVERAGE
2.64	8.24	0.26	16.39	24.89	46.00	-21.11	AVERAGE
2.64	8.24	0.26	30.30	38.80	56.00	-17.20	QP
3.50	8.61	0.27	11.69	20.57	46.00	-25.43	AVERAGE
3.50	8.61	0.27	22.37	31.25	56.00	-24.75	QP
6.00	8.79	0.30	16.81	25.90	50.00	-24.10	AVERAGE
6.00	8.79	0.30	28.44	37.53	60.00	-22.47	QP
10.00	8.80	0.31	6.77	15.88	50.00	-34.12	AVERAGE
10.00	8.80	0.31	16.45	25.56	60.00	-34.44	QP
22.00	9.22	0.38	16.72	26.32	50.00	-23.68	AVERAGE
22.00	9.22	0.38	21.78	31.38	60.00	-28.62	QP
30.00	9.39	0.42	6.03	15.84	60.00	-44.16	QP
30.00	9.39	0.42	0.03	9.84	50.00	-40.16	AVERAGE

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

Model No.	TMPS 03-124	Test Mode	Full Load
Environmental Conditions	25.9℃, 57% RH	Resolution Bandwidth	9 kHz
Tested by:	Vis Liang		

NEUTRAL



Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.16	7.56	0.09	19.51	27.16	65.46	-38.30	QP
0.16	7.56	0.09	12.62	20.27	58.30	-38.03	AVERAGE
0.20	7.75	0.13	32.34	40.21	63.78	-23.57	QP
0.20	7.75	0.13	26.09	33.96	56.11	-22.15	AVERAGE
0.24	7.86	0.14	13.30	21.30	53.93	-32.63	AVERAGE
0.24	7.86	0.14	19.45	27.45	62.10	-34.65	QP
0.27	7.91	0.14	28.10	36.15	61.25	-25.09	QP
0.27	7.91	0.14	17.73	25.78	52.82	-27.04	AVERAGE
0.40	8.13	0.22	27.51	35.85	48.48	-12.63	AVERAGE
0.40	8.13	0.22	35.74	44.08	57.91	-13.82	QP
0.46	8.10	0.22	25.96	34.28	46.99	-12.71	AVERAGE
0.46	8.10	0.22	33.73	42.05	56.76	-14.71	QP
0.55	8.06	0.24	15.94	24.23	56.00	-31.77	QP
0.55	8.06	0.24	9.00	17.29	46.00	-28.71	AVERAGE
0.80	7.97	0.30	20.90	29.17	46.00	-16.83	AVERAGE
0.80	7.97	0.30	32.71	40.98	56.00	-15.02	QP
1.00	7.92	0.24	27.89	36.05	56.00	-19.95	QP
1.00	7.92	0.24	18.42	26.58	46.00	-19.42	AVERAGE
1.40	7.92	0.24	30.20	38.36	56.00	-17.64	QP
1.40	7.92	0.24	19.72	27.88	46.00	-18.12	AVERAGE
2.00	7.92	0.25	31.50	39.67	56.00	-16.33	QP
2.00	7.92	0.25	21.90	30.07	46.00	-15.93	AVERAGE
3.50	8.65	0.27	21.81	30.73	56.00	-25.27	QP
3.50	8.65	0.27	12.88	21.80	46.00	-24.20	AVERAGE
6.00	8.84	0.30	19.43	28.57	50.00	-21.43	AVERAGE
6.00	8.84	0.30	27.74	36.88	60.00	-23.12	QP
10.00	8.85	0.31	6.03	15.19	50.00	-34.81	AVERAGE
10.00	8.85	0.31	15.78	24.94	60.00	-35.06	QP
22.00	9.22	0.38	21.54	31.14	60.00	-28.86	QP
22.00	9.22	0.38	15.88	25.48	50.00	-24.52	AVERAGE
30.00	9.36	0.42	6.35	16.13	60.00	-43.87	QP
30.00	9.36	0.42	-0.19	9.59	50.00	-40.41	AVERAGE

Note: 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

7.2. DISTURBANCE POWER MEASURMENT

7.2.1. LIMITS

Household and similar appliance

FREQUENCY (MHz)	Voltage Limit (dBpW)	
	Quasi-peak	Average
30 - 300	45 - 55	35 - 45

Note: The limits increase linearly with the logarithm of the frequency in the range 30 MHz to 300 MHz.

Tools

FREQUENCY (MHz)	Rated power ≦ 700W (dBpW)		Rated power 700W ~ 1000W (dBpW)		Rated power ＞ 1000W (dBpW)	
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
30 - 300	45 - 55	35 - 45	49 - 59	39 - 49	55 - 65	45 - 55

Note: The limits increase linearly with the logarithm of the frequency in the range 30 MHz to 300 MHz.

7.2.2. TEST INSTRUMENTS

Disturbance Power Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ABSORBING CLAMP	Rohde & Schwarz	MDS-21	74418	MAY. 13, 2015
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	AUG. 09, 2014
BNC COAXIAL CABLE	CCS	BNC50	12	NOV. 19, 2014
Test S/W	e-3 (5.04211c) ESCS 30:R&S (2.27) ESHS 10:(2.13)			

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R. = No Calibration Request.

7.2.3. TEST PROCEDURE

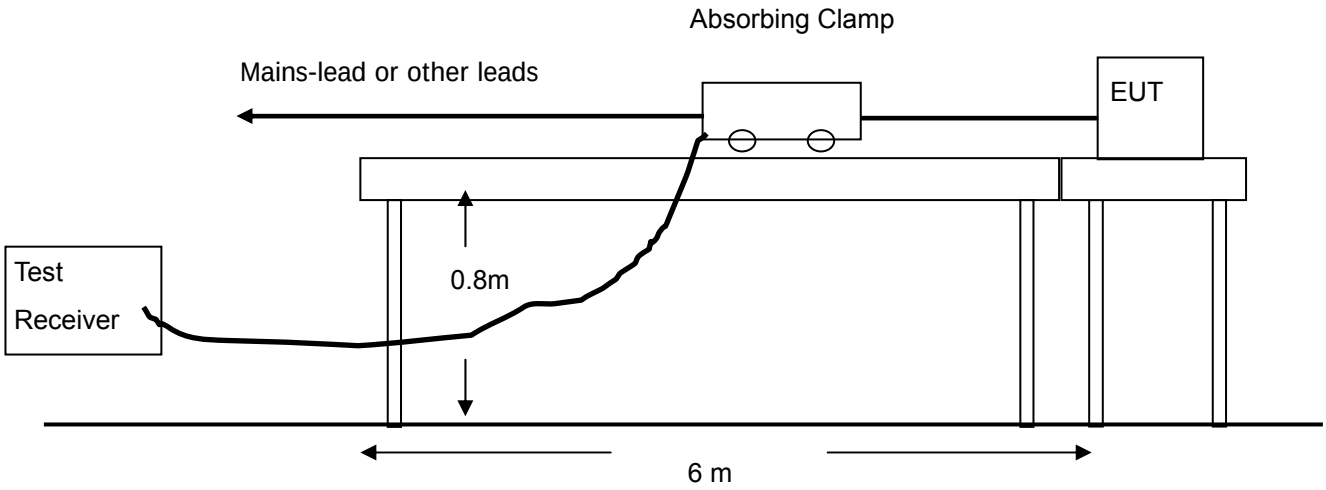
Procedure of Preliminary Test

- The EUT was set up as per the test configuration to simulate typical usage per the user's manual. The EUT was put on a wooden table with a height of 0.8 meters was used and placed on the ground plane as per EN 55014-1 (see Test Facility for the dimensions of the ground plane used).
- Support equipment, if needed, was placed as per EN 55014-1.
- All I/O cables were positioned to simulate typical actual usage as per EN 55014-1.
- The test equipment EUT installed received AC power, from the outlet socket. All support equipment received power was from another socket.
- The line under test was put on a wooden bracket that is 0.8 meters from ground plane and 6 meters in length to connect to power source or other auxiliaries. The EUT test program was executed. Emissions were measured on each tested line of the EUT using an EMI Test Receiver connected to the Clamp.
- The Receiver scanned quickly from 30MHz to 300MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by Clamp manipulation.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.

Procedure of Final Test

- EUT and support equipment were set up on the table as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 300MHz and moved the Clamp on bracket from 0 to 6 meters to receive maximum emission, the frequencies, amplitude were recorded in which correction factors were used to calculate the emission level and compare reading to the applicable limit, and only Q.P reading will record in this report.
- Recorded at least the six highest emissions. Emission frequencies, amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.
- The test data of the worst-case condition(s) was recorded.

7.2.4. TEST SETUP



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

7.2.5. DATA SAMPLE

Freq. (MHz)	Clamp Factor dB	Cable Loss dB	Meter Reading dBpW	Measured Level dBpW	Limits dBpW	Over Limits dBpW	Detector
x.xx	9.71	0.02	37.17	46.9	66	-19.10	QP

Freq. = Emission frequency in MHz
Clamp Factor = Insertion loss of Absorbing Clamp
Cable loss = Insertion loss of cable (Absorbing Clamp to EMI Tester Receiver)
Meter Reading = Uncorrected Analyzer/Receiver reading
Measured Level = Meter Reading + Clamp Factor + Cable loss
Limit = Limit stated in standard
Over Limit = Measured Level in reference to limit
Detector : Peak = Peak Reading
QP = Quasi-peak Reading
AV = Average Reading

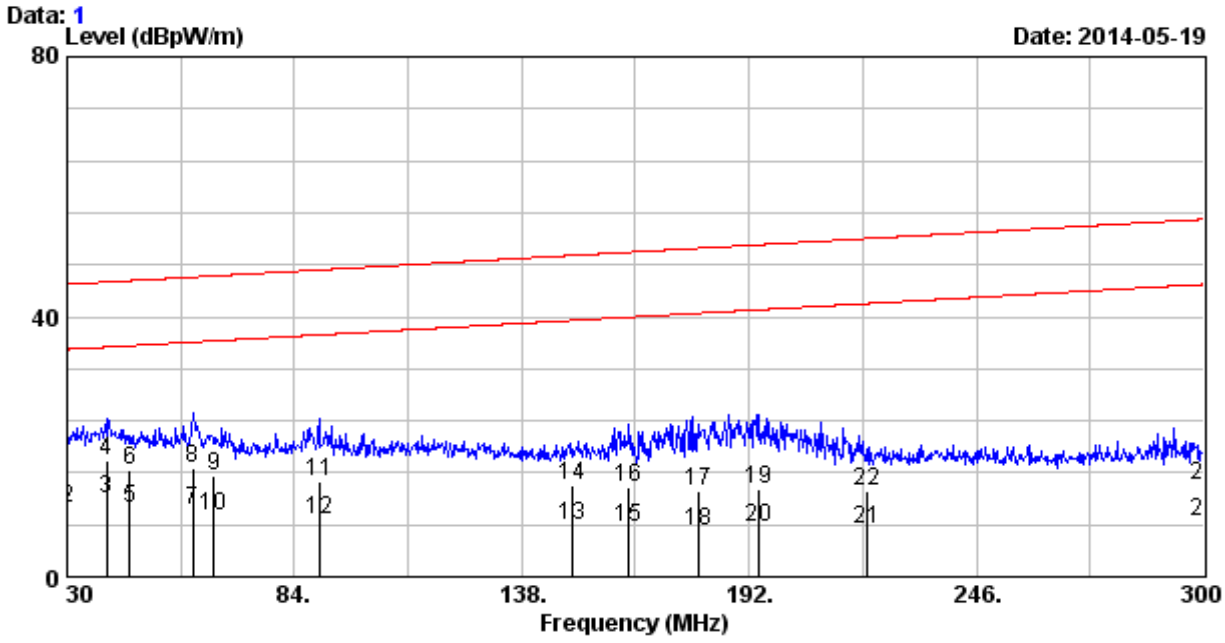
Calculation Formula

Over Limit (dB) = Measured Level (dBpW) – Limit (dBpW)

7.2.6. TEST RESULTS

Model No.	TMPS 03-103	Test Mode	Full Load
Environmental Conditions	24.5℃, 55% RH	Resolution Bandwidth	120 kHz
Tested by	Vis Liang		

(The chart below shows the highest readings taken from the final data.)

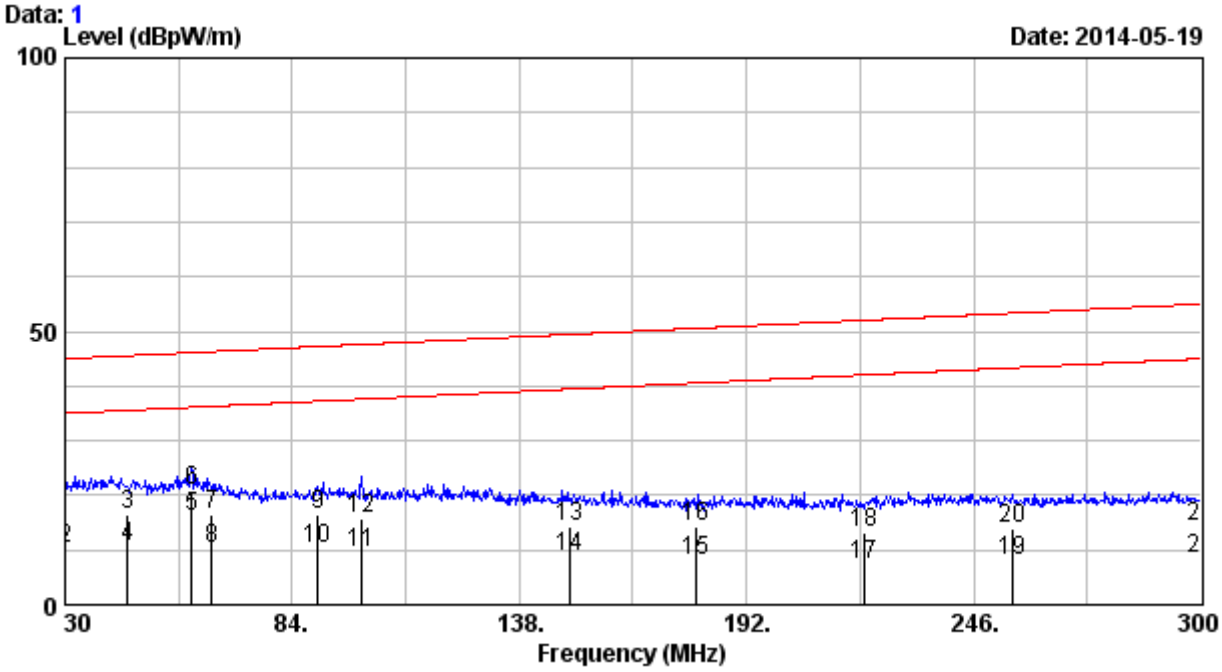


Freq. MHz	Clamp Factor dB	Cable Loss dB	Meter Reading dBpW	Measured Level dBpW	Limits dBpW	Over Limits dBpW	Detector
30.00	1.20	0.15	18.47	19.82	45.00	-25.18	QP
30.00	1.20	0.15	9.25	10.60	35.00	-24.40	AVERAGE
39.45	1.01	0.26	10.73	12.00	35.35	-23.35	AVERAGE
39.45	1.01	0.26	16.72	17.99	45.35	-27.36	QP
45.00	0.58	0.30	9.77	10.65	35.56	-24.91	AVERAGE
45.00	0.58	0.30	15.45	16.33	45.56	-29.23	QP
59.97	0.30	0.26	9.67	10.23	36.11	-25.88	AVERAGE
59.97	0.30	0.26	16.05	16.61	46.11	-29.50	QP
65.00	-0.80	0.29	15.92	15.41	46.30	-30.88	QP
65.00	-0.80	0.29	9.96	9.45	36.30	-26.84	AVERAGE
90.00	-1.60	0.42	15.69	14.51	47.22	-32.71	QP
90.00	-1.60	0.42	9.95	8.77	37.22	-28.45	AVERAGE
150.00	-2.66	0.86	9.83	8.03	39.44	-31.42	AVERAGE
150.00	-2.66	0.86	15.76	13.96	49.44	-35.49	QP
163.38	-3.02	0.89	9.89	7.76	39.94	-32.18	AVERAGE
163.38	-3.02	0.89	15.81	13.68	49.94	-36.26	QP
180.00	-3.60	0.96	15.77	13.13	50.56	-37.43	QP
180.00	-3.60	0.96	9.71	7.07	40.56	-33.49	AVERAGE
194.16	-3.60	1.05	15.99	13.44	51.08	-37.64	QP
194.16	-3.60	1.05	10.04	7.49	41.08	-33.59	AVERAGE
220.00	-3.34	1.12	9.60	7.38	42.04	-34.66	AVERAGE
220.00	-3.34	1.12	15.48	13.26	52.04	-38.78	QP
300.00	-3.30	1.30	10.36	8.36	45.00	-36.64	AVERAGE
300.00	-3.30	1.30	16.14	14.14	55.00	-40.86	QP

Note: The emission level was or more than 2dB below the Average limit, so no re-check anymore.

Model No.	TMPS 03-105	Test Mode	Full Load
Environmental Conditions	24.5℃, 55% RH	Resolution Bandwidth	120 kHz
Tested by	Vis Liang		

(The chart below shows the highest readings taken from the final data.)

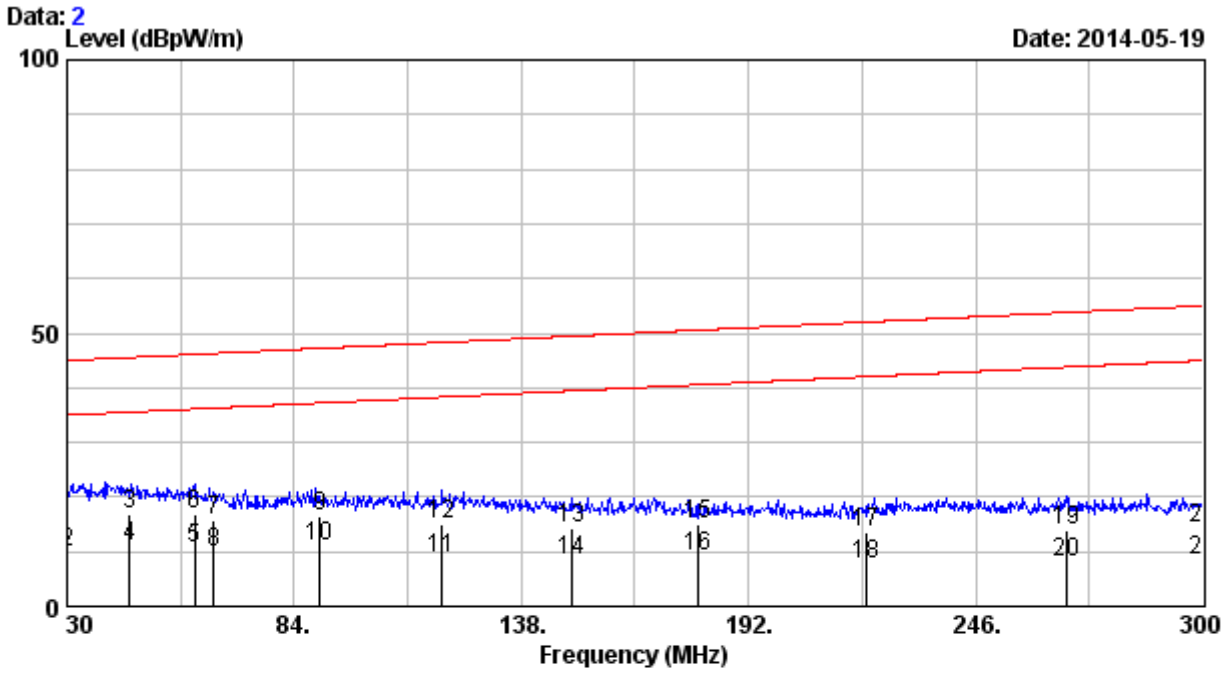


Freq. MHz	Clamp Factor dB	Cable Loss dB	Meter Reading dBpW	Measured Level dBpW	Limits dBpW	Over Limits dBpW	Detector
30.00	1.20	0.15	14.67	16.02	45.00	-28.98	QP
30.00	1.20	0.15	8.93	10.28	35.00	-24.72	AVERAGE
45.00	0.58	0.30	15.78	16.66	45.56	-28.90	QP
45.00	0.58	0.30	9.83	10.71	35.56	-24.85	AVERAGE
60.01	0.30	0.26	15.52	16.08	36.11	-20.03	AVERAGE
60.01	0.30	0.26	20.47	21.03	46.11	-25.08	QP
65.00	-0.80	0.29	17.00	16.49	46.30	-29.80	QP
65.00	-0.80	0.29	10.90	10.39	36.30	-25.90	AVERAGE
90.00	-1.60	0.42	17.59	16.41	47.22	-30.81	QP
90.00	-1.60	0.42	11.26	10.08	37.22	-27.14	AVERAGE
100.47	-1.71	0.43	10.85	9.57	37.61	-28.04	AVERAGE
100.47	-1.71	0.43	16.86	15.58	47.61	-32.03	QP
150.00	-2.66	0.86	16.14	14.34	49.44	-35.11	QP
150.00	-2.66	0.86	10.42	8.62	39.44	-30.83	AVERAGE
180.00	-3.60	0.96	10.86	8.22	40.56	-32.34	AVERAGE
180.00	-3.60	0.96	16.95	14.31	50.56	-36.25	QP
220.00	-3.34	1.12	9.69	7.47	42.04	-34.57	AVERAGE
220.00	-3.34	1.12	15.58	13.36	52.04	-38.68	QP
255.45	-3.49	1.19	10.37	8.08	43.35	-35.27	AVERAGE
255.45	-3.49	1.19	16.13	13.84	53.35	-39.51	QP
300.00	-3.30	1.30	10.42	8.42	45.00	-36.58	AVERAGE
300.00	-3.30	1.30	16.36	14.36	55.00	-40.64	QP

Note: The emission level was or more than 2dB below the Average limit, so no re-check anymore.

Model No.	TMPS 03-109	Test Mode	Full Load
Environmental Conditions	24.5℃, 55% RH	Resolution Bandwidth	120 kHz
Tested by	Vis Liang		

(The chart below shows the highest readings taken from the final data.)

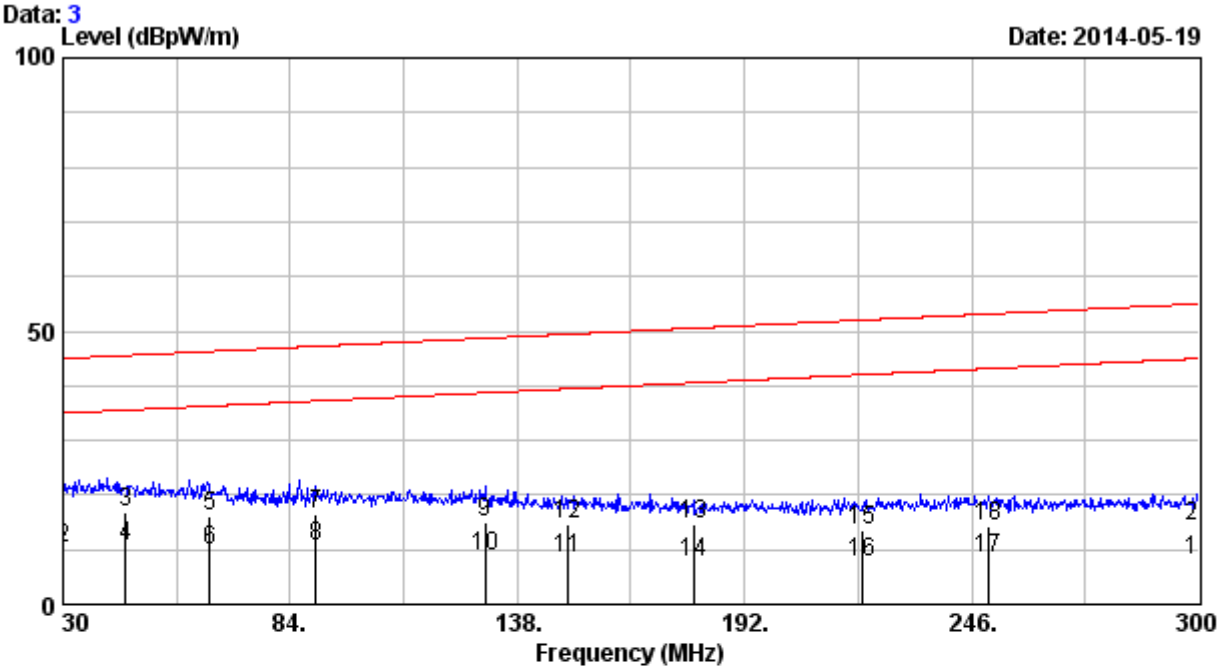


Freq. MHz	Clamp Factor dB	Cable Loss dB	Meter Reading dBpW	Measured Level dBpW	Limits dBpW	Over Limits dBpW	Detector
30.00	1.20	0.15	14.55	15.90	45.00	-29.10	QP
30.00	1.20	0.15	8.71	10.06	35.00	-24.94	AVERAGE
45.00	0.58	0.30	16.06	16.94	45.56	-28.62	QP
45.00	0.58	0.30	9.96	10.84	35.56	-24.72	AVERAGE
60.24	0.24	0.26	10.25	10.75	36.12	-25.37	AVERAGE
60.24	0.24	0.26	16.19	16.69	46.12	-29.43	QP
65.00	-0.80	0.29	16.26	15.75	46.30	-30.54	QP
65.00	-0.80	0.29	10.28	9.77	36.30	-26.52	AVERAGE
90.00	-1.60	0.42	17.75	16.57	47.22	-30.65	QP
90.00	-1.60	0.42	12.31	11.13	37.22	-26.09	AVERAGE
119.10	-1.99	0.76	10.20	8.97	38.30	-29.33	AVERAGE
119.10	-1.99	0.76	16.32	15.09	48.30	-33.21	QP
150.00	-2.66	0.86	16.24	14.44	49.44	-35.01	QP
150.00	-2.66	0.86	10.15	8.35	39.44	-31.10	AVERAGE
180.00	-3.60	0.96	17.69	15.05	50.56	-35.51	QP
180.00	-3.60	0.96	11.68	9.04	40.56	-31.52	AVERAGE
220.00	-3.34	1.12	15.75	13.53	52.04	-38.51	QP
220.00	-3.34	1.12	9.82	7.60	42.04	-34.44	AVERAGE
267.60	-3.53	1.22	16.25	13.95	53.80	-39.85	QP
267.60	-3.53	1.22	10.19	7.89	43.80	-35.91	AVERAGE
300.00	-3.30	1.30	10.55	8.55	45.00	-36.45	AVERAGE
300.00	-3.30	1.30	16.40	14.40	55.00	-40.60	QP

Note: The emission level was or more than 2dB below the Average limit, so no re-check anymore.

Model No.	TMPS 03-112	Test Mode	Full Load
Environmental Conditions	24.5℃, 55% RH	Resolution Bandwidth	120 kHz
Tested by	Vis Liang		

(The chart below shows the highest readings taken from the final data.)

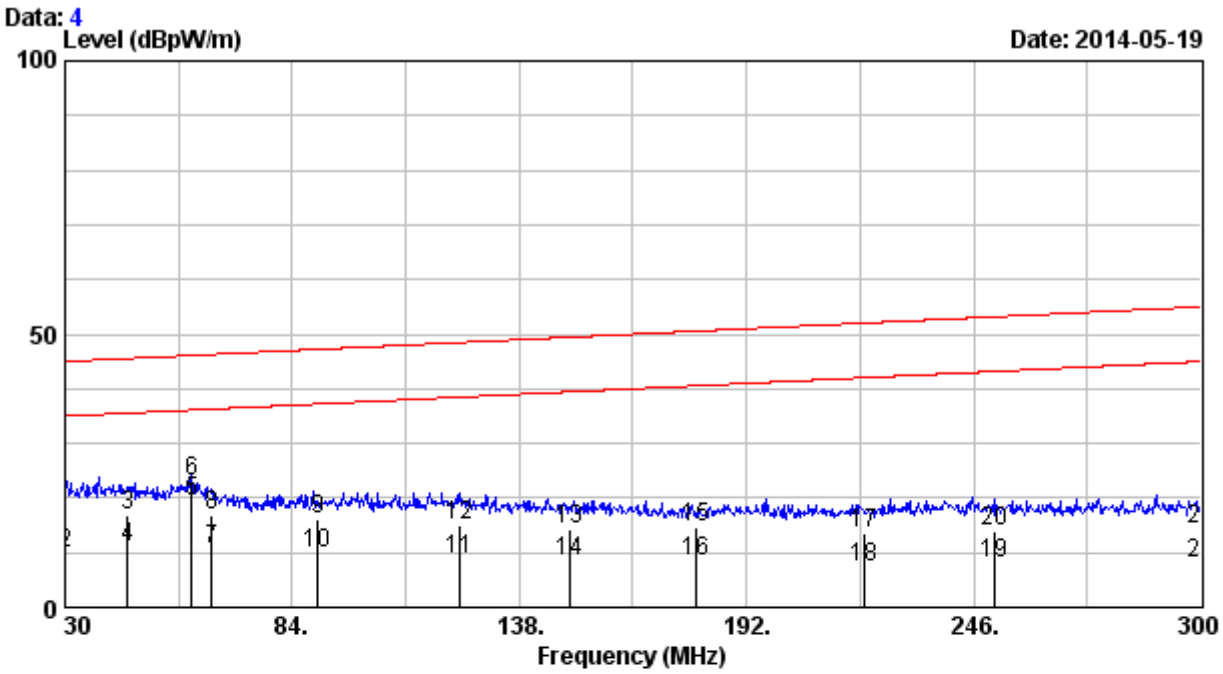


Freq. MHz	Clamp Factor dB	Cable Loss dB	Meter Reading dBpW	Measured Level dBpW	Limits dBpW	Over Limits dBpW	Detector
30.00	1.20	0.15	14.37	15.72	45.00	-29.28	QP
30.00	1.20	0.15	8.93	10.28	35.00	-24.72	AVERAGE
45.00	0.58	0.30	16.04	16.92	45.56	-28.64	QP
45.00	0.58	0.30	9.90	10.78	35.56	-24.78	AVERAGE
65.00	-0.80	0.29	16.50	15.99	46.30	-30.30	QP
65.00	-0.80	0.29	10.55	10.04	36.30	-26.25	AVERAGE
90.00	-1.60	0.42	17.77	16.59	47.22	-30.63	QP
90.00	-1.60	0.42	11.77	10.59	37.22	-26.63	AVERAGE
130.44	-2.21	0.80	16.34	14.93	48.72	-33.79	QP
130.44	-2.21	0.80	10.28	8.87	38.72	-29.85	AVERAGE
150.00	-2.66	0.86	10.36	8.56	39.44	-30.89	AVERAGE
150.00	-2.66	0.86	16.62	14.82	49.44	-34.63	QP
180.00	-3.60	0.96	17.39	14.75	50.56	-35.81	QP
180.00	-3.60	0.96	10.50	7.86	40.56	-32.70	AVERAGE
220.00	-3.34	1.12	15.87	13.65	52.04	-38.39	QP
220.00	-3.34	1.12	9.76	7.54	42.04	-34.50	AVERAGE
249.78	-3.34	1.18	10.58	8.42	43.14	-34.72	AVERAGE
249.78	-3.34	1.18	16.47	14.31	53.14	-38.83	QP
300.00	-3.30	1.30	10.15	8.15	45.00	-36.85	AVERAGE
300.00	-3.30	1.30	16.28	14.28	55.00	-40.72	QP

Note: The emission level was or more than 2dB below the Average limit, so no re-check anymore.

Model No.	TMPS 03-115	Test Mode	Full Load
Environmental Conditions	24.5℃, 55% RH	Resolution Bandwidth	120 kHz
Tested by	Vis Liang		

(The chart below shows the highest readings taken from the final data.)

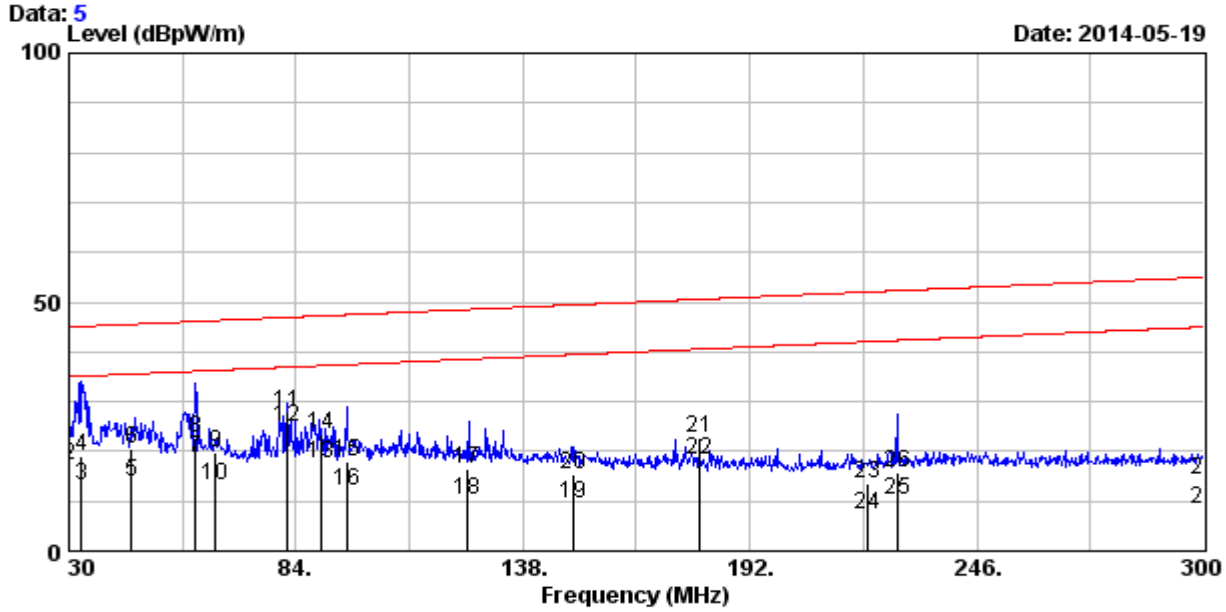


Freq. MHz	Clamp Factor dB	Cable Loss dB	Meter Reading dBpW	Measured Level dBpW	Limits dBpW	Over Limits dBpW	Detector
30.00	1.20	0.15	14.79	16.14	45.00	-28.86	QP
30.00	1.20	0.15	8.71	10.06	35.00	-24.94	AVERAGE
45.00	0.58	0.30	16.12	17.00	45.56	-28.56	QP
45.00	0.58	0.30	10.22	11.10	35.56	-24.46	AVERAGE
60.00	0.30	0.26	19.01	19.57	36.11	-16.54	AVERAGE
60.00	0.30	0.26	22.48	23.04	46.11	-23.07	QP
65.00	-0.80	0.29	11.21	10.70	36.30	-25.59	AVERAGE
65.00	-0.80	0.29	17.26	16.75	46.30	-29.54	QP
90.00	-1.60	0.42	17.23	16.05	47.22	-31.17	QP
90.00	-1.60	0.42	10.89	9.71	37.22	-27.51	AVERAGE
123.96	-2.08	0.78	10.15	8.85	38.48	-29.63	AVERAGE
123.96	-2.08	0.78	16.16	14.86	48.48	-33.62	QP
150.00	-2.66	0.86	16.16	14.36	49.44	-35.09	QP
150.00	-2.66	0.86	10.09	8.29	39.44	-31.16	AVERAGE
180.00	-3.60	0.96	17.19	14.55	50.56	-36.01	QP
180.00	-3.60	0.96	10.99	8.35	40.56	-32.21	AVERAGE
220.00	-3.34	1.12	15.73	13.51	52.04	-38.53	QP
220.00	-3.34	1.12	9.60	7.38	42.04	-34.66	AVERAGE
250.86	-3.37	1.18	10.07	7.88	43.18	-35.30	AVERAGE
250.86	-3.37	1.18	16.24	14.05	53.18	-39.13	QP
300.00	-3.30	1.30	10.09	8.09	45.00	-36.91	AVERAGE
300.00	-3.30	1.30	16.28	14.28	55.00	-40.72	QP

Note: The emission level was or more than 2dB below the Average limit, so no re-check anymore.

Model No.	TMPS 03-124	Test Mode	Full Load
Environmental Conditions	24.5℃, 55% RH	Resolution Bandwidth	120 kHz
Tested by	Vis Liang		

(The chart below shows the highest readings taken from the final data.)



Freq. MHz	Clamp Factor dB	Cable Loss dB	Meter Reading dBpW	Measured Level dBpW	Limits dBpW	Over Limits dBpW	Detector
30.00	1.20	0.15	22.59	23.94	45.00	-21.06	QP
30.00	1.20	0.15	16.03	17.38	35.00	-17.62	AVERAGE
32.97	1.13	0.11	11.91	13.16	35.11	-21.95	AVERAGE
32.97	1.13	0.11	17.64	18.89	45.11	-26.22	QP
45.00	0.58	0.30	13.15	14.03	35.56	-21.53	AVERAGE
45.00	0.58	0.30	19.70	20.58	45.56	-24.98	QP
60.01	0.30	0.26	18.07	18.63	36.11	-17.48	AVERAGE
60.01	0.30	0.26	22.00	22.56	46.11	-23.55	QP
65.00	-0.80	0.29	20.16	19.65	46.30	-26.64	QP
65.00	-0.80	0.29	13.55	13.04	36.30	-23.25	AVERAGE
82.02	-1.99	0.42	29.51	27.94	46.93	-18.99	QP
82.02	-1.99	0.42	26.37	24.80	36.93	-12.13	AVERAGE
90.00	-1.60	0.42	18.93	17.75	37.22	-19.47	AVERAGE
90.00	-1.60	0.42	24.46	23.28	47.22	-23.94	QP
95.99	-1.66	0.42	19.02	17.78	47.44	-29.67	QP
95.99	-1.66	0.42	13.15	11.91	37.44	-25.54	AVERAGE
124.93	-2.11	0.79	17.71	16.39	48.52	-32.13	QP
124.93	-2.11	0.79	11.48	10.16	38.52	-28.36	AVERAGE
150.00	-2.66	0.86	11.15	9.35	39.44	-30.10	AVERAGE
150.00	-2.66	0.86	17.30	15.50	49.44	-33.95	QP
180.00	-3.60	0.96	25.53	22.89	50.56	-27.67	QP
180.00	-3.60	0.96	20.97	18.33	40.56	-22.23	AVERAGE
220.00	-3.34	1.12	15.91	13.69	52.04	-38.35	QP
220.00	-3.34	1.12	9.69	7.47	42.04	-34.57	AVERAGE
227.07	-3.25	1.14	12.38	10.26	42.30	-32.03	AVERAGE
227.07	-3.25	1.14	17.75	15.63	52.30	-36.66	QP
300.00	-3.30	1.30	10.36	8.36	45.00	-36.64	AVERAGE
300.00	-3.30	1.30	16.34	14.34	55.00	-40.66	QP

Note: The emission level was or more than 2dB below the Average limit, so no re-check anymore.

7.3. RADIATED DISTURBANCE MEASUREMENT

7.3.1. LIMITS

Toys

FREQUENCY (MHz)	dBuV/m (At 10m)
30 ~ 230	30
230 ~ 1000	37

Note: The lower limit shall apply at the transition frequencies.

7.3.2. TEST INSTRUMENTS

Open Area Test Site # 7				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	Rohde & Schwarz	ESCS30	100343	FEB. 26, 2015
EMI Test Receiver	Rohde & Schwarz	ESCI3	101336	JAN. 17, 2015
TYPE N COAXIAL CABLE	SUHNER	RG_214_U/2X	7	NOV. 18, 2014
BILOG ANTENNA	Sunol sciences	JB1	A013105-1	SEP. 11, 2014
Test Software	EMI e-3 / AUDIX (5.04211c)			

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R. = No Calibration Request.

7.3.3. TEST PROCEDURE

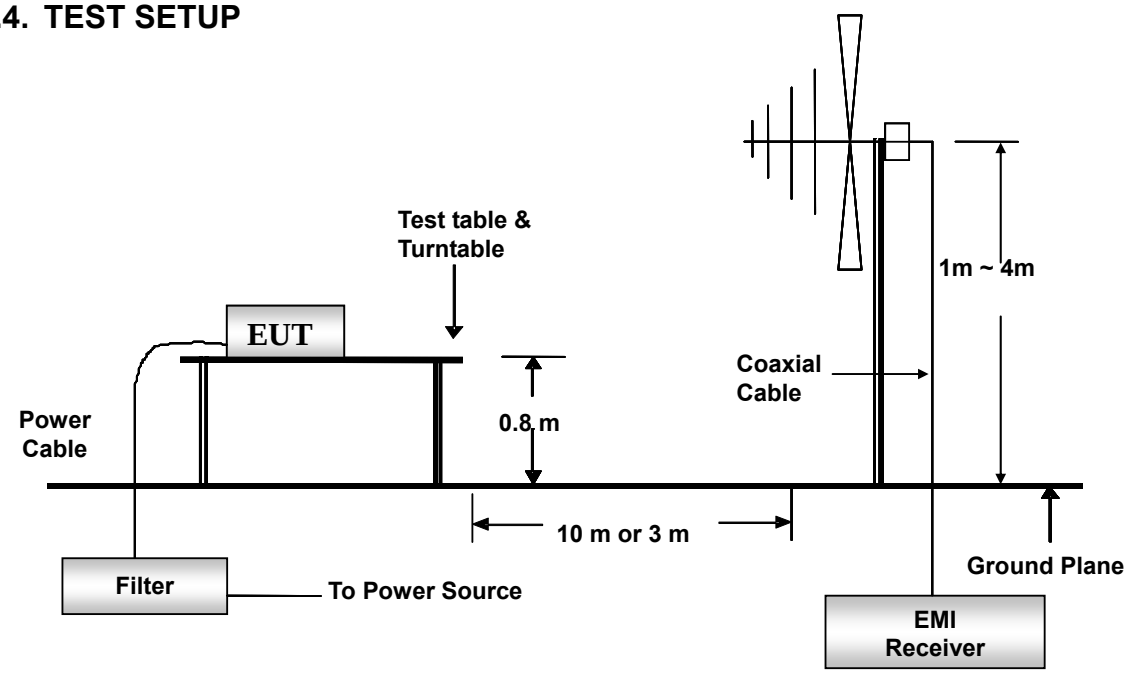
Procedure of Preliminary Test

- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 10 cm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per CISPR 22.
- All I/O cables were positioned to simulate typical usage as per CISPR 22.
- The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- The antenna was placed at 10 meter away from the EUT as stated in CISPR 22. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.
- The test data of the worst-case condition(s) was recorded.

7.3.4. TEST SETUP



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

7.3.5. DATA SAMPLE

Freq. (MHz)	Reading dBuV/m	Antenna Factor dB	Cable loss dB	Measure level dBuV/m	Limit dBuV/m	Over limit dBuV/m	Detector
x.xx	24.48	7.33	1.50	33.31	40	-6.69	QP

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Antenna Factor = Antenna Factor
Cable loss = Insertion loss of cable
Measure level = Reading + Antenna Factor +Cable loss
Limit = Limit stated in standard
Over limit = Measure level – Limit

Detector:Peak = Peak Reading
QP = Quasi-peak Reading
AV = Average Reading

Calculation Formula

Over limit (dBuV/m) = Measure Level (dBuV/m) – Limit (dBuV/m)

7.3.6. TEST RESULTS

※**Note:** Not applicable.

7.4. DISCONTINUOUS DISTURBANCE MEASUREMENT

7.4.1. LIMITS

According to clause 4.2 of EN 55014-1, the limits depend on click rate as following description:

4.2.2.1 The limits of Table 1 of EN 55014-1 apply also to discontinuous disturbances from all equipment which produce:

a) disturbances other than clicks, or

b) clicks with a click rate *N* equal to or greater than 30.

4.2.2.2 For discontinuous disturbance, the click limit *L*q is attained by increasing the relevant limit *L* (as given in 4.1.1) with:

44 dB for $N < 0,2$, or

20 lg (30/*N*) dB for $0,2 \leq N < 30$

Note: Using the upper quartile method to determent compliance with disturbance limits.

7.4.2. TEST INSTRUMENTS

Open Area Test Site # 7				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	Rohde & Schwarz	ESCS30	100343	FEB. 26, 2015
EMI Test Receiver	Rohde & Schwarz	ESCI3	101336	JAN. 17, 2015
TYPE N COAXIAL CABLE	SUHNER	RG_214_U/2X	7	NOV. 18, 2014
BILOG ANTENNA	Sunol sciences	JB1	A013105-1	SEP. 11, 2014
Test Software	EMI e-3 / AUDIX (5.04211c)			

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R. = No Calibration Request.

7.4.3. TEST PROCEDURE

Procedure of Test

- The appliance shall be operated under the condition as given in clause 7.2 or 7.3 of EN 55014-1. For some kinds of appliances these subclauses contain additional rules for determining the click rate.
- The click rate is determined from the formula: N = n1 / T.
- Where n1 is the number of measured clicks during the minimum observation time T in minutes.
- Where n2 is the number of the counted switching operations during the minimum observation time T in minutes.
- The amplitude of the clicks shall be evaluated only at the following restricted number of frequencies: 150kHz; 500kHz; 1.4MHz and 30MHz.
- Corresponding to the click rate N shall be calculated the amount ∆L by which the limits L for continuous disturbance shall be increased (see EN 55014-1 section 4.2.2.2):

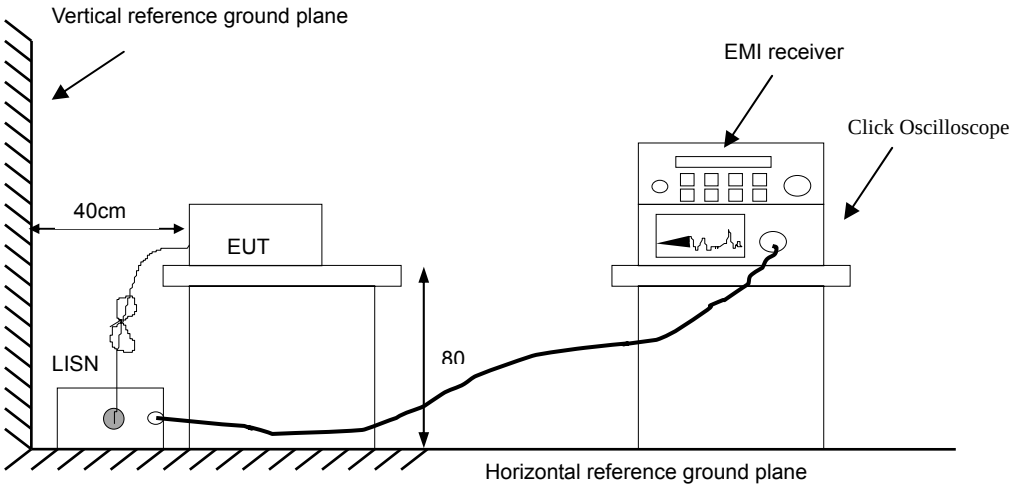
  $\Delta \mathbf{L}$ = 44 dB for $\mathbf{N} < 0.2$

  $\Delta \mathbf{L}$ = [20log(30/N)] dB for $0.2 \leq \mathbf{N} < 30$

- The click limit $\mathbf{L_q}$ is determined from the formula: $\mathbf{L_q} = \mathbf{L} + \Delta\mathbf{L}$.
- The appliance under test is deemed to comply with the limits for discontinuous disturbance if not more than a quarter of the number of clicks registered during the observation time **T** exceeds the click limit $\mathbf{L_q}$ (see EN 55014-1 section 7.4.2.6). That means the number **N** of clicks exceeding $\mathbf{L_q}$ has to be compared with the number $\mathbf{n_1}$ or $\mathbf{n_2}$, obtained during the determination of the click rate (see EN 55014-1 annex C.4.1 and section 7.4.2.3). The requirements of this standard are fulfilled when the following conditions apply:

  $\mathbf{N} \leq \mathbf{n_1} \times 0.25$ or $\mathbf{N} \leq \mathbf{n_2} \times 0.25$

7.4.4. TEST SETUP



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

7.4.5. DATA SAMPLE

Frequency	=the frequency under test
T	=minimum observation time
n1	=first counting click numbers
n2	=second counting click numbers
L1	=hot side
L2	=neutral side
N	=click rate = n1/T
L	=relevant continuous disturbance limit
Δ L	=click limit is attained by increasing the relevant limit *L* that is decided as below condition 1) 44 dB for N $<$ 0,2, or 2) 20 log (30/N) dB for 0,2 ϕ N $<$ 30
Lq	= L+ Δ L

7.4.6. TEST RESULTS

Note: Not applicable.

7.5. HARMONICS CURRENT MEASUREMENT

7.5.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

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

Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd Harmonics only		
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
13	0.30	0.21
15<=n<=39	3.85/n	0.15x15/n

Note: 1. Class A and Class D are classified according to item 7.5.3.
2. 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 active input power up to and including 75 W.

7.5.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonics Analyzer	TTI	HA1600	198202	MAY. 12, 2015
Software	H/F HA 1600 PC LINK Field Probe			

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

7.5.3. TEST PROCEDURE

- The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
- The classification of EUT is according to section 5 of EN 61000-3-2.
- The EUT is classified as follows:

  Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

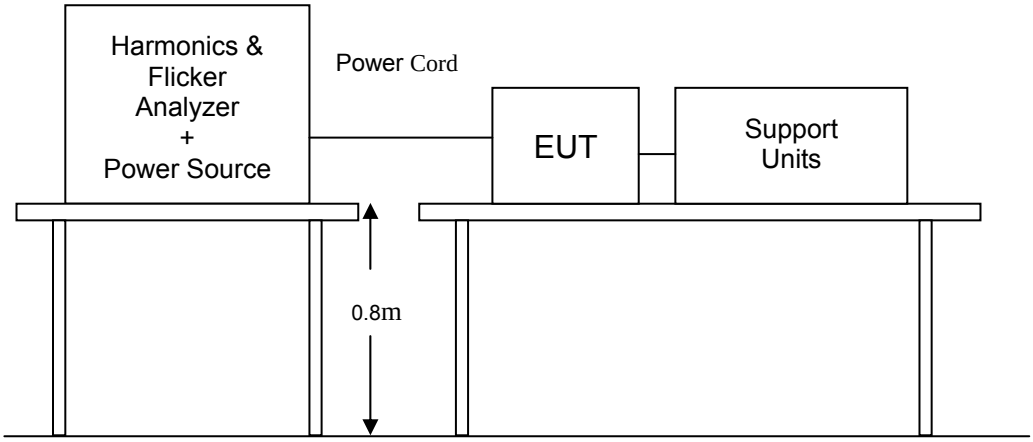
  Class B: Portable tools; Arc welding equipment which is not professional equipment.

  Class C: Lighting equipment.

  Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.

- The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

7.5.4. TEST SETUP



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

7.5.5. TEST RESULTS

Power Consumption	---W	**Test Mode**	---
Environmental Conditions	---℃, ---% RH, ---mbar	**Tested by**	---

Note: 1. Limits classified according to item 7.5.3.
2. According to clause 7 of EN 61000-3-2: 2006, equipment with a rated power of 75W or less, no limits apply. The test result is only for reference.

Test result of EN 61000-3-2

※ **For the equipment with a rated power of 75 W or less, limits are not specified in this standard.**

7.6. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

7.6.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

TEST ITEM	LIMIT	REMARK
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
T_{dt} (ms)	500	T_{dt} means maximum time that dt exceeds 3 %.
d_{max} (%)	4%	d_{max} means maximum relative voltage change.
dc (%)	3.3%	dc means relative steady-state voltage change

7.6.2. TEST INSTRUMENTS

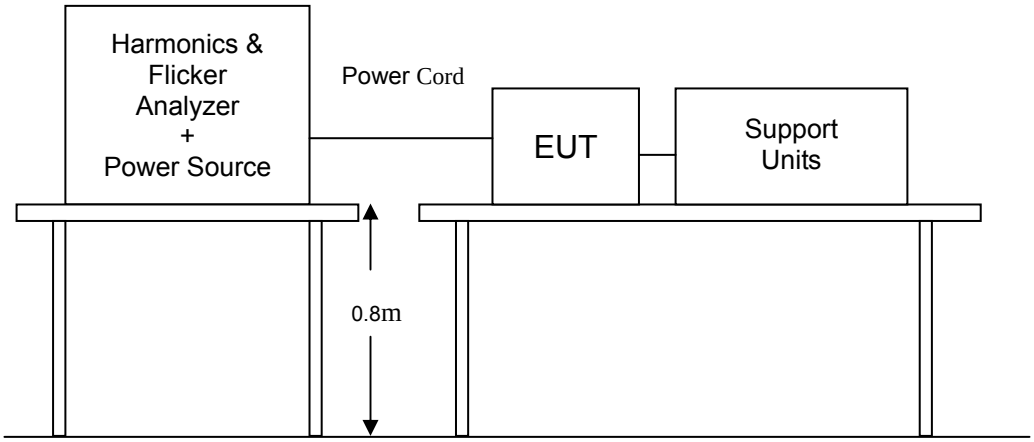
IMMUNITY SHIELDED ROOM				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Harmonics Analyzer	TTI	HA1600	198202	MAY. 12, 2015
Software	H/F HA 1600 PC LINK Field Probe			

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

7.6.3. TEST PROCEDURE

- The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.
- During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

7.6.4. TEST SETUP



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

7.6.5. TEST RESULTS

Observation Period (Tp)	7200 Seconds	**Test Mode**	Full Load
Environmental Conditions	25°C, 48% RH, 1028mbar	**Tested by**	Sam Shen

Test result of EN 61000-3-3

Supply Voltage : 230.1 to 230.6 Vrms 312.0 Vpk Frequency : 50.04 to 50.09 Hz
Load Current : 57.0 to 58.0 mArms 67.4 to 71.0 mApk Crest Factor: 1.213

Test Method: EN61000-3-3:2008

Voltage Variations :

Highest Level:	-2.04%	
Lowest Level:	-3.19%	
d(max):	1.14%	PASS
Highest d(t) of 500ms:	0.00%	PASS
Present d(t) over 3.33%:	0.00 Seconds	
Longest d(t) over 3.33%:	0.02 Seconds	
Highest Steady State:	-2.24%	
Lowest Steady State:	-2.52%	
Max d(c) Between Adjacent:	0.28%	PASS
Max d(c) Between Any:	0.28%	
Short Term Flicker Pst:	0.30	PASS
Long Term Flicker Plt:	0.13	PASS

Flicker Results :

Pst Classifier Duration	Flicker	Plt Calculation Interval	Pst
0.1%	2.39		
0.7%	0.17	1:	0.30
1.0%	0.09	2:	0.30
1.5%	0.06	3:	0.30
2.2%	0.05	4:	0.30
3%	0.05	5:	0.30
4%	0.03	6:	0.30
6%	0.03	7:	0.30
8%	0.02	8:	0.30
10%	0.02	9:	0.30
13%	0.02	10:	0.30
17%	0.02	11:	0.30
30%	0.00	12:	0.30
50%	0.00	Plt =	0.13
80%	0.00		

8 IMMUNITY TEST

8.1. GENERAL DESCRIPTION

Product Standard	EN 55014-2: 1997 + A1: 2001+A2:2008	
	Test Type	Minimum Requirement
Basic Standard, Specification, and Performance Criterion required	IEC 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 4kV Contact discharge, Category II, III, IV Performance Criterion B (C for toy without memory)
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz, 3V/m, 80% AM(1kHz), Category III, IV Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst – EFT: AC Power Port: 1kV DC Power Port: 0.5kV Category II, IV Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, AC Power Port ~ line to line: 1kV, line to earth (ground): 2kV Category II, IV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15 ~ 80(IV)/230(II) MHz, 80% AM, 1kHz AC Power Port:3Vrms, DC Power/Signal control Port: 1Vrms, Category II, IV Performance Criterion A
	IEC 61000-4-11	Voltage Dips: i) 60% reduction for 10 periods, ii) 30% reduction for 50 periods, Voltage Interruptions: 100% reduction for 0.5 periods Category II, IV Performance Criterion C

8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

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 (or permissible loss of performance)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 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 from what the user may reasonably expect from the apparatus if used as intended.
Criteria B:	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however, no change of actual operating state or stored data is allowed. 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 from what the user may reasonably expect from the apparatus 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, or by any operation specified in the instructions for use.

Note: Classification of apparatus

Category I: apparatus containing no electronic control circuitry.

Category II: containing electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15 MHz.

Category III: battery powered apparatus containing an electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15 MHz.

Category IV: all other apparatus covered by the scope of EN 55014-2.

8.3. ELECTROSTATIC DISCHARGE (ESD)

8.3.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: 2,4,8 kV (Direct) Contact Discharge: 4 kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Contact and Air Discharge: min. 10 times at each test point for each polarity. (Contact discharge is the preferred test method)
Discharge Mode:	Single Discharge 1 second minimum

8.3.2. TEST INSTRUMENT

IMMUNITY SHIELDED ROOM				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
ESD Simulator	NoiseKen	ESS-2002	ESS04Z3762	MAR. 16, 2015

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

8.3.3. TEST PROCEDURE

The discharges shall be applied in two ways:

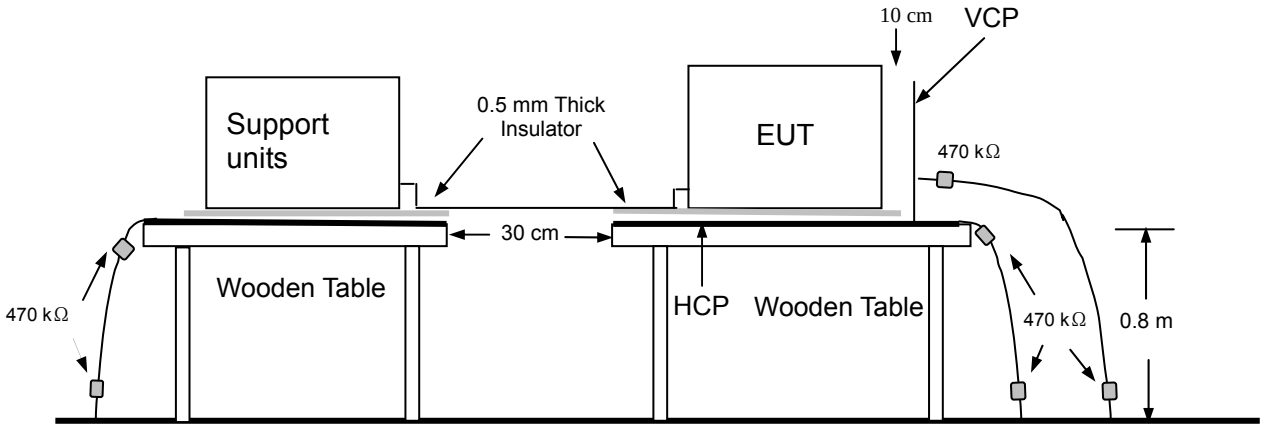
a) Contact discharges to the conductive surfaces and coupling planes:
   The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the **H**orizontal **C**oupling **P**lane (**HCP**). The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

b) Air discharges at slots and apertures and insulating surfaces:
   On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with IEC 61000-4-2:

a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
c) The time interval between two successive single discharges was at least 1 second.
d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **V**ertical **C**oupling **P**lane (**VCP**) in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

8.3.4. TEST SETUP



Ground Reference Plane

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

Note:

TABLETOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **G**round **R**eference **P**lane. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **H**orizontal **C**oupling **P**lane (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940kΩ ˙ total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

8.3.5. TEST RESULTS

Temperature	23°C	**Humidity**	45% RH
Pressure	1028mbar	**Tested By**	Sam Shen
Required Performance	**Category II / III / IV: Criterion B**		

Note: A performance criterion C could be applied to toys not using score or data entered by the user.

Air Discharge								
Test Points	**Test Levels**					**Results**		
	± 2 kV	**± 4 kV**	**± 8 kV**	**± 12 kV**	**± 15 kV**	**Pass**	**Fail**	**Performance Criterion**
Front	☒	☒	☒	☐	☐	☒	☐	☒A ☐B
Back	☒	☒	☒	☐	☐	☒	☐	☒A ☐B
Left	☒	☒	☒	☐	☐	☒	☐	☒A ☐B
Right	☒	☒	☒	☐	☐	☒	☐	☒A ☐B
Top	☒	☒	☒	☐	☐	☒	☐	☒A ☐B
Bottom	☐	☐	☐	☐	☐	☐	☐	☐A ☐B

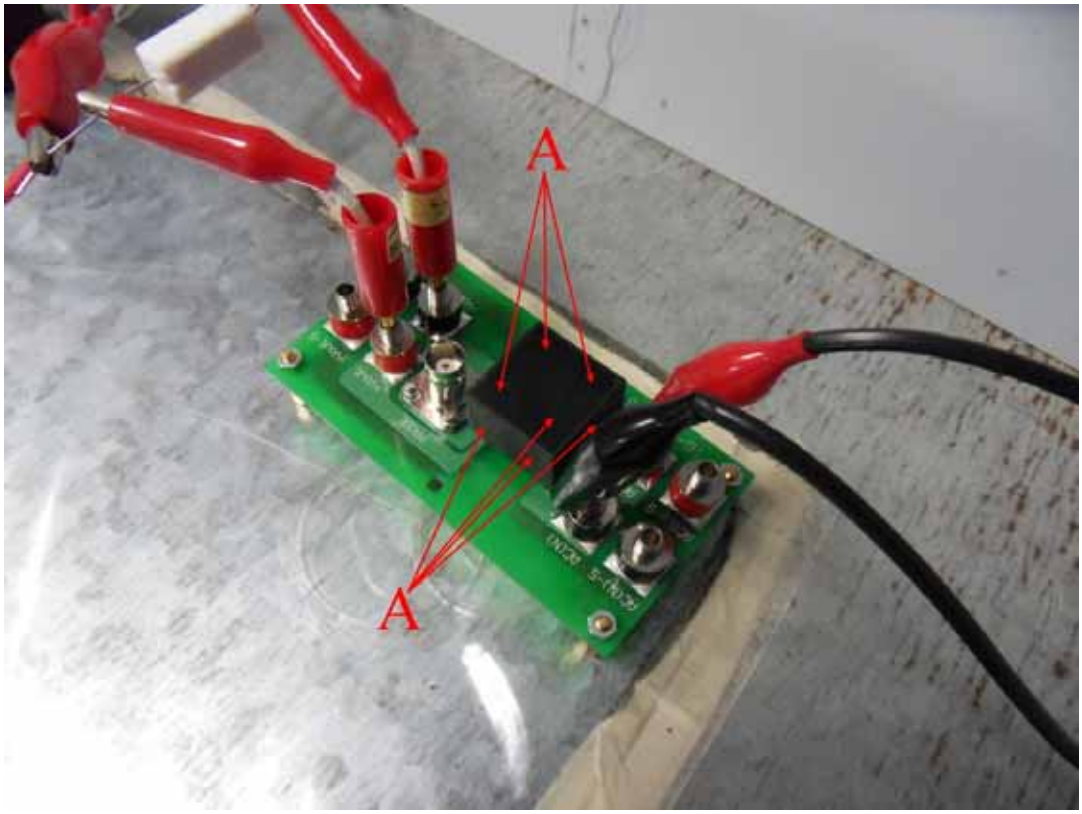
Please refer to ESD test photo on next page for detail discharge point

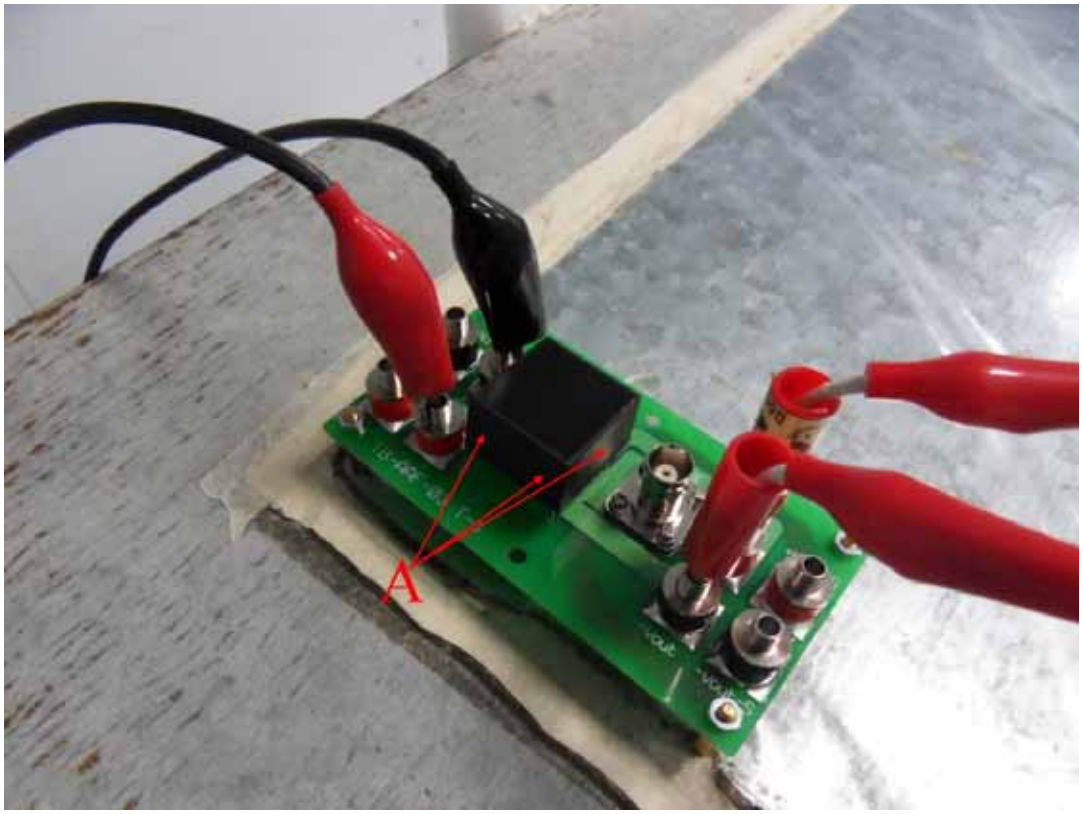
Contact Discharge								
Test Points	**Test Levels**					**Results**		
	± 2 kV	**± 4 kV**	**± 8 kV**	**± 12 kV**	**± 15 kV**	**Pass**	**Fail**	**Performance Criterion**
Front	☐	☐	☐	☐	☐	☐	☐	☐A ☐B
Back	☐	☐	☐	☐	☐	☐	☐	☐A ☐B
Left	☐	☐	☐	☐	☐	☐	☐	☐A ☐B
Right	☐	☐	☐	☐	☐	☐	☐	☐A ☐B
Top	☐	☐	☐	☐	☐	☐	☐	☐A ☐B
Bottom	☐	☐	☐	☐	☐	☐	☐	☐A ☐B

Discharge To Horizontal Coupling Plane							
Side of EUT	**Test Levels**				**Results**		
	± 2 kV	**± 4 kV**	**± 6 kV**	**± 8 kV**	**Pass**	**Fail**	**Performance Criterion**
Front	☐	☒	☐	☐	☒	☐	☒A ☐B
Back	☐	☒	☐	☐	☒	☐	☒A ☐B
Left	☐	☒	☐	☐	☒	☐	☒A ☐B
Right	☐	☒	☐	☐	☒	☐	☒A ☐B

Discharge To Vertical Coupling Plane							
Side of EUT	**Test Levels**				**Results**		
	± 2 kV	**± 4 kV**	**± 6 kV**	**± 8 kV**	**Pass**	**Fail**	**Performance Criterion**
Front	☐	☒	☐	☐	☒	☐	☒A ☐B
Back	☐	☒	☐	☐	☒	☐	☒A ☐B
Left	☐	☒	☐	☐	☒	☐	☒A ☐B
Right	☐	☒	☐	☐	☒	☐	☒A ☐B

The Photo for Discharge Points of EUT





Red Dot —Air Discharged
Blue Dot —Contact Discharged

8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS)

8.4.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Frequency Range:	80 MHz ~1000 MHz
Field Strength:	10 Vrms/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5m

8.4.2. TEST INSTRUMENT

966 RS Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Computer	SYNNEX	BTO -LMIW300 - GB	A41202-0031	N.C.R.
LCD Monitor	Acer	AL1715sm	ETL130719944302366RH01	N.C.R.
Keyboard	SYNNEX	5211A	G4430091266	N.C.R.
Amplifier Freq. Range :80MHz 1GHz	AR	150W1000M3	310037	N.C.R.
Amplifier Freq. Range :0.8 3GHz	AR	60S1G3M3	310102	N.C.R.
Digital SIGNAL GENERATOR	HP	ESG-D3000A	US36260655	JUN. 08 ,2015
RF Power Meter	BOONTON	4232A-01-02	122202	MAY. 27, 2015
Log – Periodic Antenna	AR	AT5080	309817	N.C.R.
Software	RS SW1005 R1_4			

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required.

8.4.3. TEST PROCEDURE

The test procedure was in accordance with IEC 61000-4-3

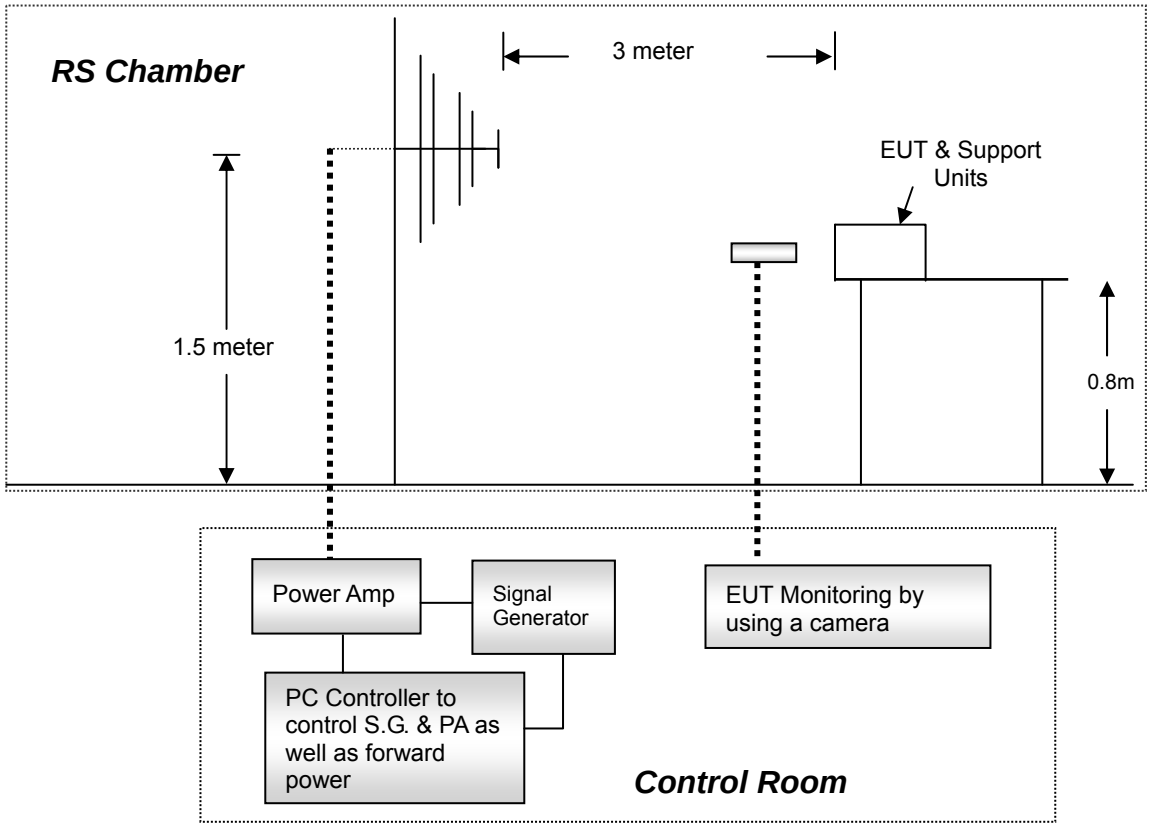
a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.

b) The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed 1.5 x 10^{-3} decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.

c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

d) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

8.4.4. TEST SETUP



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

Note:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

8.4.5. TEST RESULTS

Temperature	26℃	**Humidity**	51% RH
Pressure	1028mbar	**Tested By**	Sam Shen
Required Performance	**Category III / IV: Criterion A**		

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion	Result
80 ~ 1000	V&H	0	3	☒A ☐B	PASS
80 ~ 1000	V&H	90	3	☒A ☐B	PASS
80 ~ 1000	V&H	180	3	☒A ☐B	PASS
80 ~ 1000	V&H	270	3	☒A ☐B	PASS

For customer special：

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion	Result	Observation
80 ~ 1000	V&H	0	10	☒A ☐B	PASS	
80 ~ 1000	V&H	90	10	☒A ☐B	PASS	
80 ~ 1000	V&H	180	10	☒A ☐B	PASS	
80 ~ 1000	V&H	270	10	☒A ☐B	PASS	

8.5. ELECTRICAL FAST TRANSIENT (EFT)

8.5.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-4
Test Voltage:	AC Power Port: 2kV DC Power Port: --kV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave-shape:	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	2 min.

8.5.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	9171602305842005 72P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	EMCpro	0312231	APR. 07, 2015
Software	CE Ware 3.00b			

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

8.5.3. TEST PROCEDURE

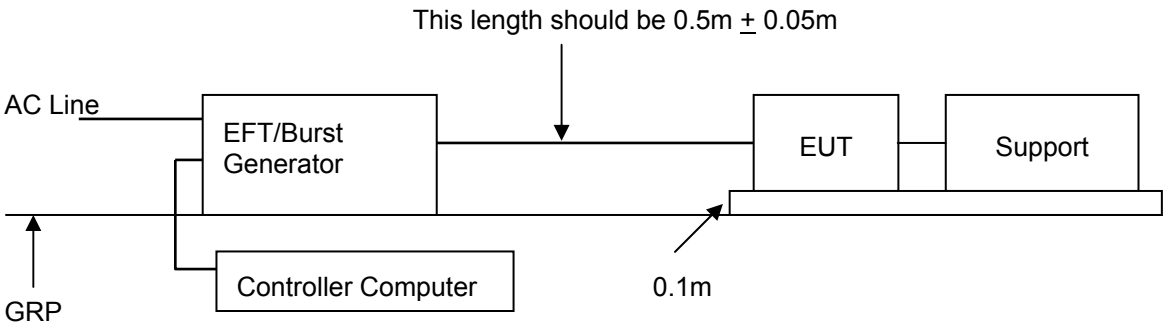
a) Both positive and negative polarity discharges were applied.

b) The length of the " hot wire " from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 0.5 meter.

c) The duration time of each test sequential was 2 minute.

d) The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

8.5.4. TEST SETUP



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

Note:

TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.1m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

8.5.5. TEST RESULTS

Temperature	25℃	**Humidity**	47 % RH
Pressure	1028 mbar	**Tested by**	Sam Shen
Required Passing Performance		**Criterion B**	

POWER

Test Point	Polarity	Test Level (kV)	Performance Criterion	Result	Observation
L	+/-	1	☒A ☐B ☐C ☐D	PASS	
N	+/-	1	☒A ☐B ☐C ☐D	PASS	
L+N	+/-	1	☒A ☐B ☐C ☐D	PASS	

SIGNAL

Test Point	Polarity	Test Level (kV)	Performance Criterion	Result	Observation
---	Clamp	---	☐A ☐B ☐C ☐D	PASS	

For customer special：

Test Point	Polarity	Test Level (kV)	Performance Criterion	Result	Observation
L	+/-	2	☒A ☐B ☐C ☐D	PASS	
N	+/-	2	☒A ☐B ☐C ☐D	PASS	
L+N	+/-	2	☒A ☐B ☐C ☐D	PASS	

8.6. SURGE IMMUNITY TEST

8.6.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-5
Wave-Shape:	Combination Wave 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current
Test Voltage:	AC Power Port~ line to line: 1kV
Generator Source Impedance:	2 ohm between networks 12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0° / 90° / 180° / 270°
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected phase angle

8.6.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	917160230584200572P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	EMCpro	0312231	APR. 07, 2015
Switzerland	CDN	CDN-UTP8	See headine	MAR. 06, 2015
Software	CE Ware 3.00b			

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

8.6.3. TEST PROCEDURE

a) For EUT power supply:

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

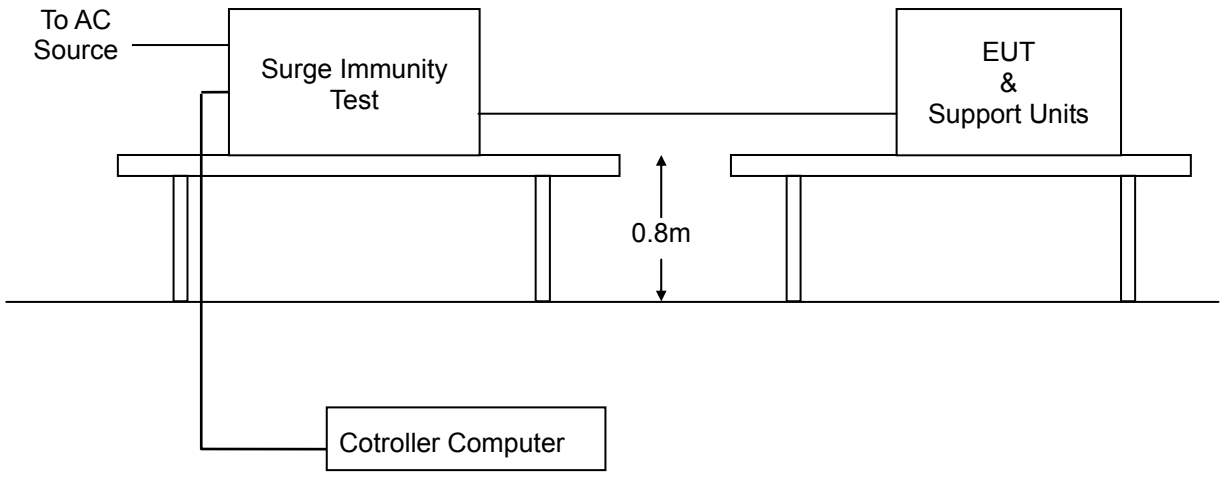
b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

c) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

8.6.4. TEST SETUP



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

8.6.5. TEST RESULTS

Temperature	25℃	**Humidity**	48 % RH
Pressure	1028 mbar	**Tested by**	Sam Shen
Required Passing Performance		**Criterion B**	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Result	Observation
L - N	+/-	1	☒A ☐B ☐C ☐D	PASS	

8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

8.7.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz ~ 80 MHz (up to 230Mhz for category)
Field Strength:	10 Vrms
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Coupling device:	CDN-M2 (2 wires)

8.7.2. TEST INSTRUMENT

CS Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Computer	HP	d330 uT	SGH3480LTH	N.C.R.
VGA Monitor	NEC	JC-1572VMA	6600645RA	N.C.R.
Keyboard	IBM	KB - 8923	1021424	N.C.R.
CS Frankonia EMVMess-System Gmbh	FRANKONIA	CIT-10/75	102C3220	JUN 10, 2015
FCC Coupling Decoupling Network Freq. range : 150KHz~230MHz	FRANKONIA	CDN M2+M3	A3011095	JUN. 09, 2015
FCC EM Injection Clamp	----------	F-203I-23mm	449	NOV. 17, 2014
Software	CS-EN61000-4-6			

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

8.7.3. TEST PROCEDURE

The EUT shall be tested within its intended operating and climatic conditions.

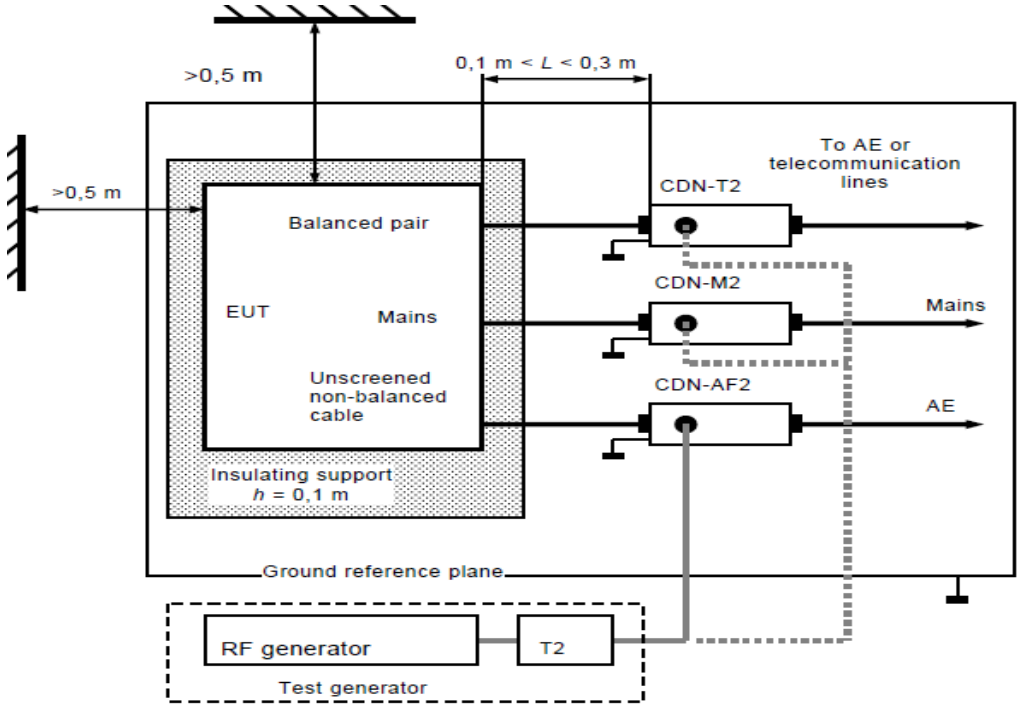
The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5 x 10^{-3} decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, was analyzed separately.

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

8.7.4. 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 depend on ports and cables configuration of EUT.

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

Note:

TABLETOP AND FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

8.7.5. TEST RESULTS

Temperature	25℃	**Humidity**	46 % RH
Pressure	1028 mbar	**Tested by**	Sam Shen
Required Passing Performance		**Criterion A**	

POWER

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Result	Observation
0.15 ~ 230	3	AC Power	CDN-☒**M2** ☐**M3**	☒**A** ☐**B**☐**C**	PASS	

SIGNAL

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Result	Observation
N/A	---	---	Clamp	☐**A** ☐**B**☐**C**	---	

For customer special：

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Result	Observation
0.15 ~ 230	10	AC Power	CDN-☒**M2** ☐**M3**	☒**A** ☐**B**☐**C**	PASS	

8.8. POWER FREQUENCY MAGNETIC FIELD

8.8.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-8
Frequency Range:	50Hz
Field Strength:	30 A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1mx1m

8.8.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Magnetic field generator	Schaffner	MFO 6501	154	MAR. 24, 2015

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

8.8.3. TEST PROCEDURE

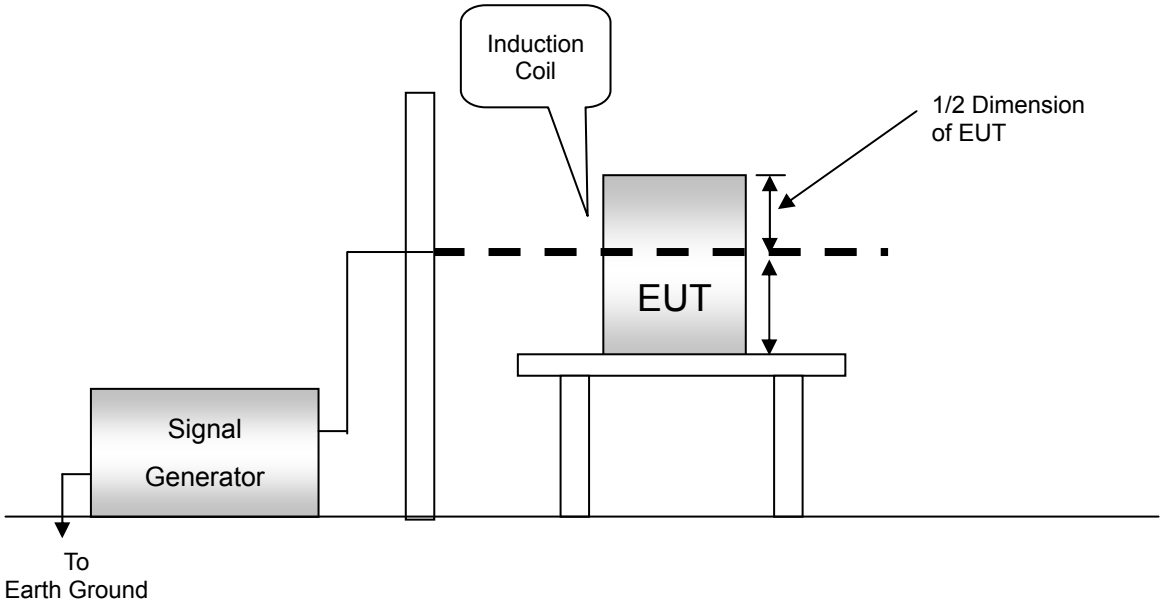
a) The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m-thick insulating support.

b) The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.

c) The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

d) The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

8.8.4. TEST SETUP



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

Note:
TABLETOP EQUIPMENT
The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT
The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

8.8.5. TEST RESULTS

For customer special：

Temperature	25°C	**Humidity**	46% RH
Pressure	1028mbar	**Tested By**	Sam Shen
Required Passing Performance		**Criterion A**	

DIRECTION	Field Strength (A/m)	Performance Criterion	Result	Observation
X	30	A	PASS	
Y	30	A	PASS	
Z	30	A	PASS	

8.9. VOLTAGE DIPS & VOLTAGE INTERRUPTIONS

8.9.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-11
Test type	Interruption: 0% Ut, 0.5 periods Dips: 40% Ut, 10 periods 70% Ut, 50 periods
Test duration time:	Minimum three test events in sequence
Interval between event:	Minimum 10 seconds
Phase Angle:	0 / 45 / 90 / 135 / 180 / 225 / 270 / 315
Test cycle:	3 times

8.9.2. TEST INSTRUMENT

Immunity shielded room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	917160230584200572P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	EMCpro	0312231	APR. 07, 2015
Software	CE Ware 3.00b			

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

8.9.3. TEST PROCEDURE

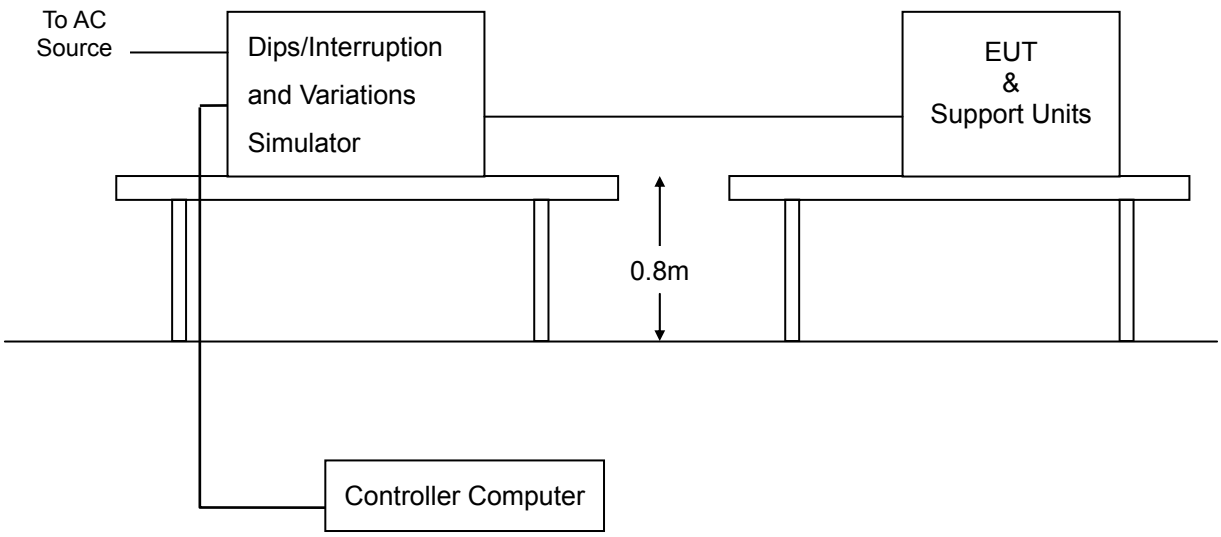
a) The EUT and support units were located on a wooden table, 0.8 m away from ground floor.

b) Setting the parameter of tests and then perform the test software of test simulator.

c) Conditions changes to occur at 0 degree crossover point of the voltage waveform.

d) Recording the test result in test record form.

8.9.4. TEST SETUP



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

8.9.5. TEST RESULTS

Temperature	25℃	**Humidity**	48 % RH
Pressure	1028 mbar	**Tested by**	Sam Shen
Required Passing Performance	**Criterion C: 95% reduction 0.5 period & 60% reduction 10 period & 30% reduction 50 period**		

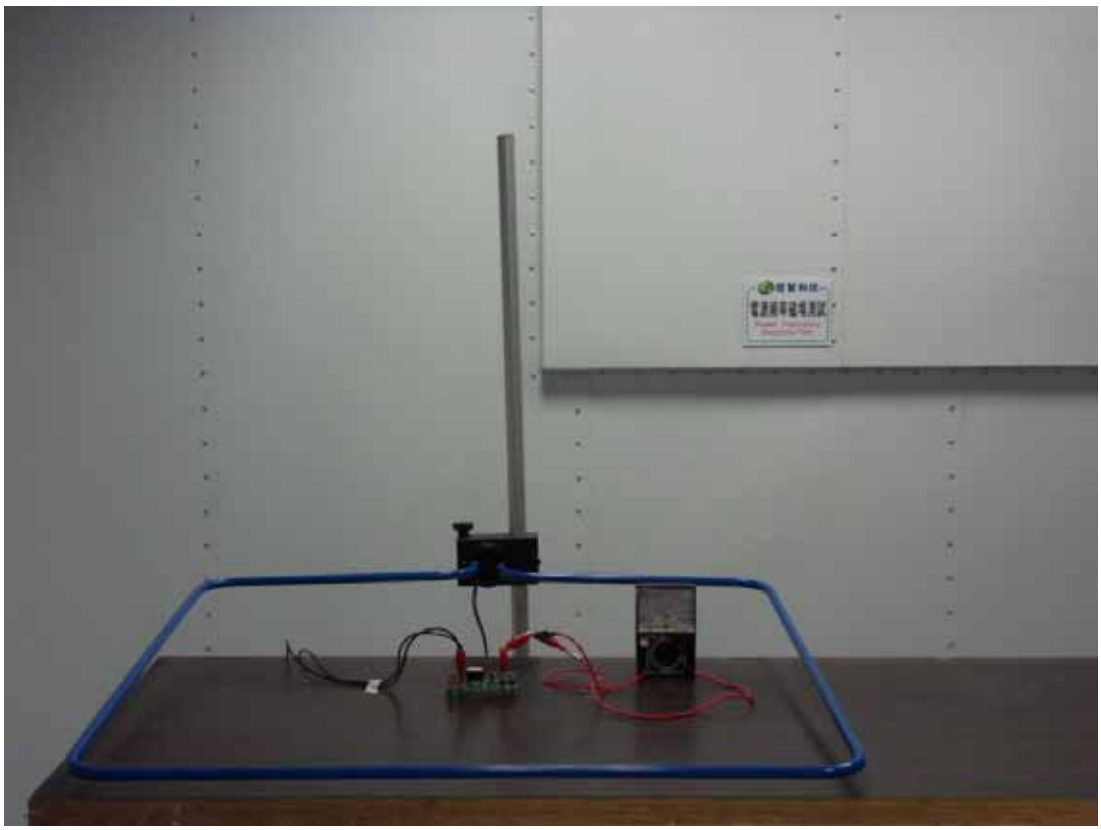
Test Power: 230Vac, 50Hz				
Voltage (% Reduction)	**Duration (Period)**	**Performance Criterion**	**Result**	**Observation**
>95	0.5	☒**A** ☐**B** ☐**C**	PASS	
60	10	☒**A** ☐**B** ☐**C**	PASS	
30	50	☐**A** ☒**B** ☐**C**	PASS	

9 PHOTOGRAPHS OF THE TEST CONFIGURATION

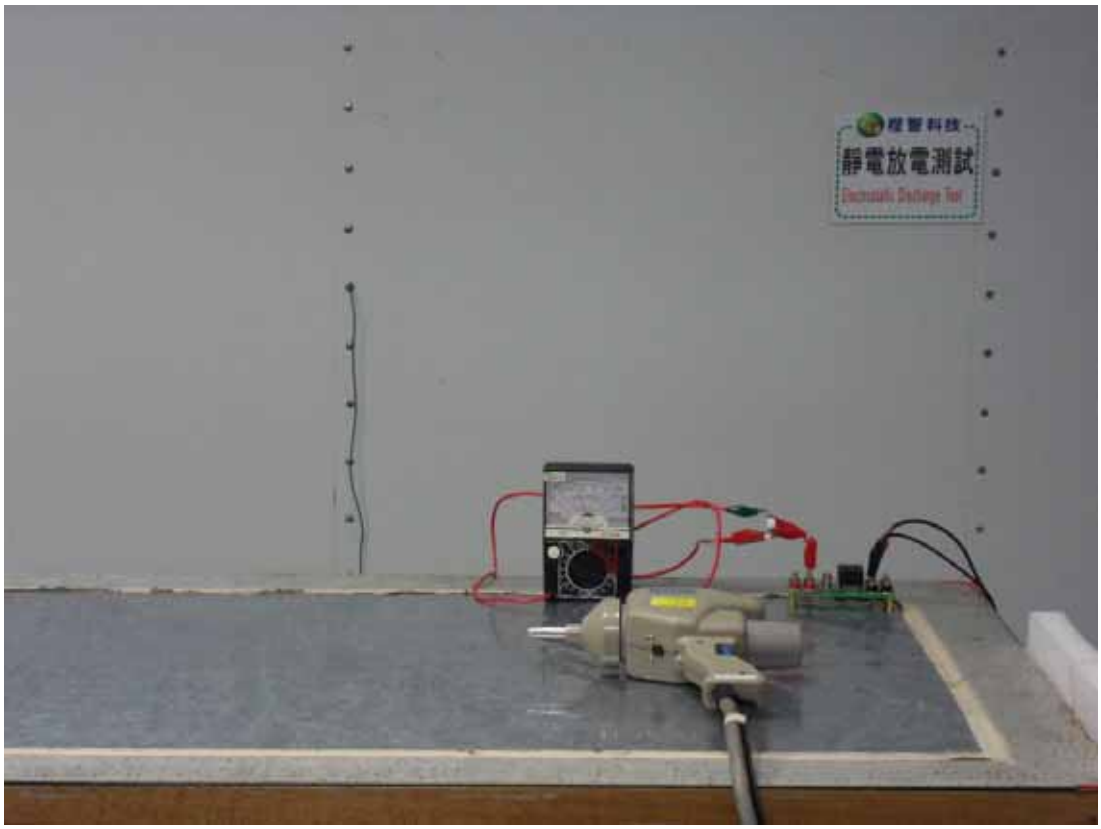
CONDUCTED EMISSION TEST

DISTURBANCE POWER MEASURMENT TEST

FLICKER TEST



ESD TEST

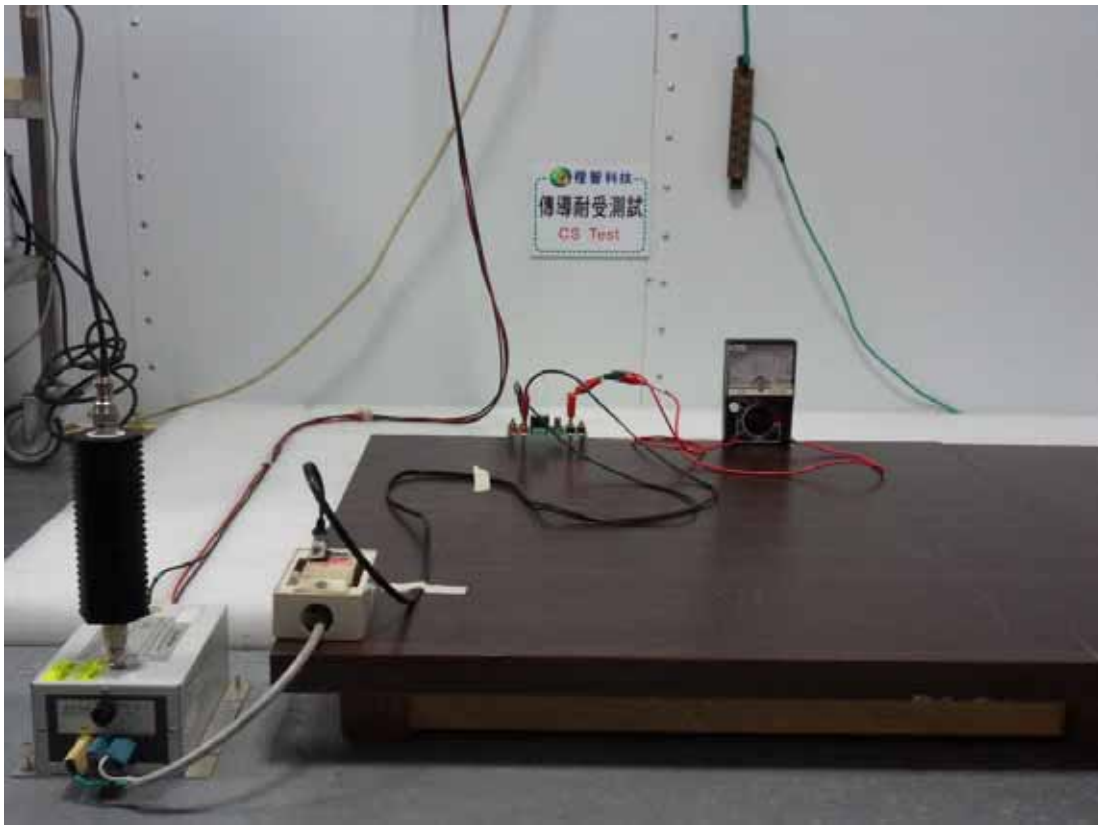


RS TEST

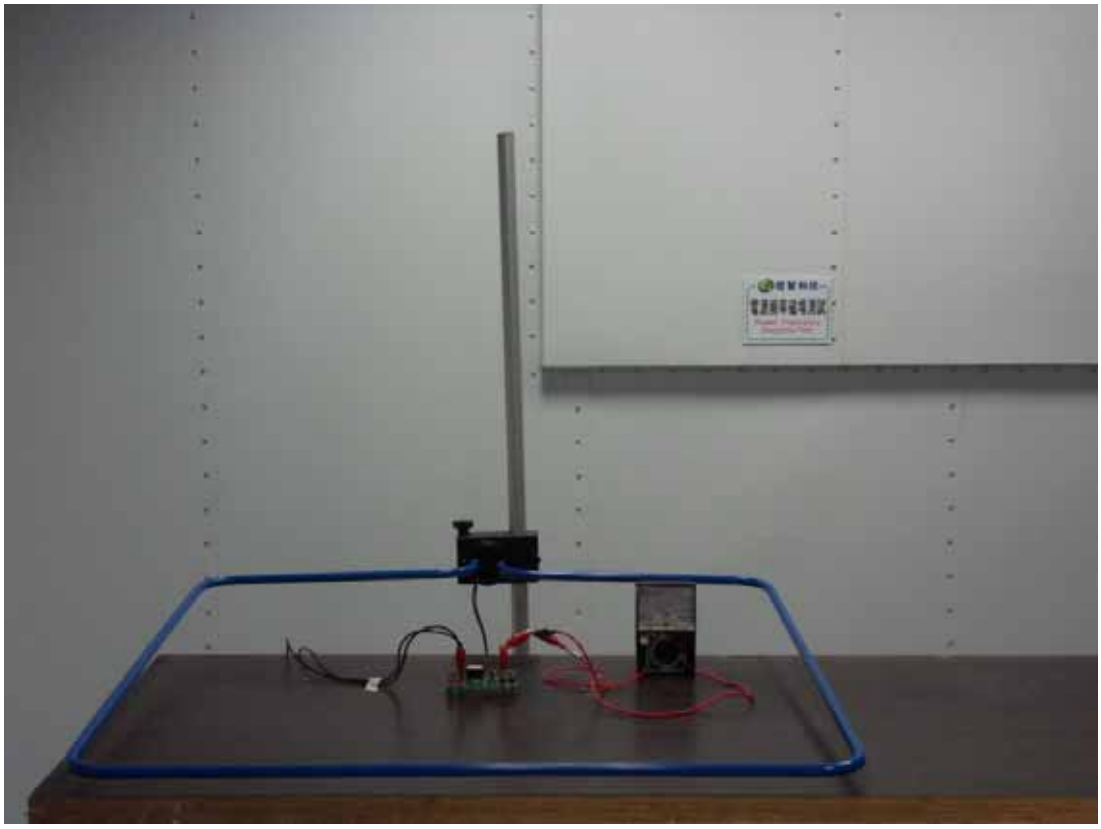
EFT TEST

SURGE TEST

CS TEST



PFMF TEST



VOLTAGE DIPS / INTERRUPTIONS TEST