CE EMC Test Report

Report No.:	CE190823C22
Test Model:	TMDC 10-7211H, TMDC 10-7218H, TMDC 10-7222H, TMDC 10-7225H
Series Model:	Multiple listing see item 3.1
Received Date:	Oct. 16, 2018
Test Date:	Oct. 22 to Nov. 15, 2018
Issued Date:	Aug. 28, 2019
Applicant:	TRACO ELECTRONIC AG
Address:	SIHLBRUGGSTRASSE 111 CH-6340 BAAR, SWITZERLAND
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location (1):	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
CE190823C22	Original release.	Aug. 28, 2019

1 Certificate of Conformity

Product:	DC to DC Converter
Brand:	TRACO POWER
Test Model:	TMDC 10-7211H, TMDC 10-7218H, TMDC 10-7222H, TMDC 10-7225H
Series Model:	Multiple listing see item 3.1
Sample Status:	Engineering sample
Applicant:	TRACO ELECTRONIC AG
Test Date:	Oct. 22 to Nov. 15, 2018
Standards:	**EN 55032:2015 +AC:2016, Class A**
	EN 61000-3-2:2014 (Not applicable)
	EN 61000-3-3:2013 (Not applicable)
	EN 55035:2017
	EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0
	EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2
	EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0
	EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2014 +A1:2017 ED. 3.0
	EN 61000-4-6:2014 +AC:2015 / IEC 61000-4-6:2013 ED. 4.0
	EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0
	EN 61000-4-11:2004 +A1:2017 / IEC 61000-4-11:2004 +A1:2017 ED. 2.0 (Not applicable)
	Broadband impulse noise disturbances (Not applicable)
	EN 55024:2010 / EN 55024:2010 +A1:2015
	EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0
	EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2
	EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0
	EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2014 +A1:2017 ED. 3.0
	EN 61000-4-6:2014 +AC:2015 / IEC 61000-4-6:2013 ED. 4.0
	EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0
	EN 61000-4-11:2004 +A1:2017 / IEC 61000-4-11:2004 +A1:2017 ED. 2.0 (Not applicable)

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Aug. 28, 2019

Vivian Chen / Specialist

Approved by : _____ , **Date:** Aug. 28, 2019

Kenny Meng / Assistant Manager

2 Summary of Test Results

Emission			
Standard	Test Item	Result/Remarks	Verdict
EN 55032:2015 +AC:2016	Conducted emission from the mains power port	Minimum passing Class A margin is -8.46 dB at 10.32031 MHz	Pass
	Asymmetric mode conducted emission at telecommunication ports and tuner ports	Without telecom port of the EUT.	N/A
	Radiated emission 30-1000 MHz	Minimum passing Class A margin is -3.79 dB at 177.06 MHz	Pass
	Radiated emission above 1GHz	EUT's highest frequency is below 108MHz.	N/A
	Conducted differential voltage emissions	Without tuner function of the EUT.	N/A
EN 61000-3-2:2014	Harmonic current emissions	Test not applicable because port does not exist.	N/A
EN 61000-3-3:2013	Voltage fluctuations and flicker	Test not applicable because port does not exist.	N/A

EN 55035, Immunity				
EN 55035 Clause	Basic standard	Test Item	Result/Remarks	Verdict
4.2.1	EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0	Electrostatic discharges (ESD)	Performance Criterion A	Pass
4.2.2.2	EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2	Continuous radiated disturbances (RS)	Performance Criterion A	Pass
4.2.4	EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0	Electrical fast transients (EFT)	Performance Criterion A	Pass
4.2.5	EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2014 +A1:2017 ED. 3.0	Surges	Performance Criterion A	Pass
4.2.2.3	EN 61000-4-6:2014 +AC:2015 / IEC 61000-4-6:2013 ED. 4.0	Continuous conducted disturbances (CS)	Performance Criterion A	Pass
4.2.3	EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0	Power-frequency magnetic fields (PFMF)	Performance Criterion A	Pass
4.2.6	EN 61000-4-11:2004 +A1:2017 / IEC 61000-4-11:2004 +A1:2017 ED. 2.0	Voltage dips and interruptions	Test not applicable because port does not exist.	N/A
4.2.7	-	Broadband impulse noise disturbances, **Repetitive** (Applicable only to xDSL ports.)	Without CPE xDSL port of the EUT.	N/A

EN 55035, Immunity				
EN 55035 Clause	Basic standard	Test Item	Result/Remarks	Verdict
4.2.7	-	Broadband impulse noise disturbances, **Isolated** (Applicable only to xDSL ports.)	Without CPE xDSL port of the EUT.	N/A

EN 55024, Immunity				
EN 55024 Clause	Basic standard	Test Item	Result/Remarks	Verdict
4.2.1	EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0	Electrostatic discharges (ESD)	Performance Criterion A	Pass
4.2.3.2	EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2	Continuous radiated disturbances (RS)	Performance Criterion A	Pass
4.2.2	EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0	Electrical fast transients (EFT)	Performance Criterion A	Pass
4.2.5	EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2014 +A1:2017 ED. 3.0	Surges	Performance Criterion A	Pass
4.2.3.3	EN 61000-4-6:2014 +AC:2015 / IEC 61000-4-6:2013 ED. 4.0	Continuous conducted disturbances (CS)	Performance Criterion A	Pass
4.2.4	EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0	Power-frequency magnetic fields (PFMF)	Performance Criterion A	Pass
4.2.6	EN 61000-4-11:2004 +A1:2017 / IEC 61000-4-11:2004 +A1:2017 ED. 2.0	Voltage dips and interruptions	Test not applicable because AC power port does not exist.	N/A

Note:

1. There is no deviation to the applied test methods and requirements covered by the scope of this report.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
3. The above EN/IEC basic standards are applied with latest version if customer has no special requirement.
4. N/A: Not Applicable.

2.1 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	Expended Uncertainty (k=2) (±)	Maximum allowable uncertainty (±)
Conducted emission from AC mains power port using AMN, 150kHz ~ 30MHz	2.77 dB	3.4 dB (U_{cispr})
Radiated emission, 30MHz ~ 1GHz	3.67 dB	6.3 dB (U_{cispr})

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	DC to DC Converter
Brand	TRACO POWER
Test Model	TMDC 10-7211H, TMDC 10-7218H, TMDC 10-7222H, TMDC 10-7225H
Series Model	Refer to note as below
Model Difference	Refer to note as below
Operating Software	N/A
Sample Status	Engineering sample
Power Supply Rating	Refer to note as below
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. This report is issued as a duplicate report of BV CPS report no.: CE181016D09B. The difference compared with original report are changing applicant, brand and models for marketing purpose; therefore all test data was copied from the original test report.

2. The EUT is a DC to DC Converter; the specifications of standard models were listed as below:

Model Number	Input Voltage (Range)	Output Voltage
Standard	VDC	VDC
TMDC 10-7211H-B1	110 (80 ~ 160)	5
TMDC 10-7211H		5.1
TMDC 10-7212H		12
TMDC 10-7213H		15
TMDC 10-7215H		24
TMDC 10-7218H		48
TMDC 10-7222H		±12
TMDC 10-7223H		±15
TMDC 10-7225H		±24

During the test, the **Model No.: TMDC 10-7211H, TMDC 10-7218H, TMDC 10-7222H, TMDC 10-7225H** were selected as the representative models for the test and therefore only their test data was recorded in this report.

3.2 Features of EUT

The tests reported herein were performed according to the method specified by TRACO ELECTRONIC AG, for detailed feature description, please refer to the manufacturer's specifications or user's manual.

3.3 Operating Modes of EUT and Determination of Worst Case Operating Mode

1. The EUT was pre-tested under operating and standby condition and the worst emission level was found under **operating condition**.

2. As client's requirement, test modes are presented in the report as below.

Mode	Model No.	Test Condition	Input power
Conducted emission test & Radiated emission test			
1	TMDC 10-7211H	Full Load	110Vdc
2	TMDC 10-7218H		
3	TMDC 10-7222H		
4	TMDC 10-7225H		
Immunity tests			
2	TMDC 10-7218H	Full Load	110Vdc
EFT, Surge tests			
1	TMDC 10-7211H	Full Load	110Vdc
3	TMDC 10-7222H		
4	TMDC 10-7225H		

3.4 Test Program Used and Operation Descriptions

- **For Conducted & Radiated tests:**
  Set the EUT full load.

- **For Immunity tests:**
  Connected a resistor load to DC output port of EUT to make EUT have maximum power consumption and a multimeter was used to monitor voltage of output.

3.5 Primary Clock Frequencies of Internal Source

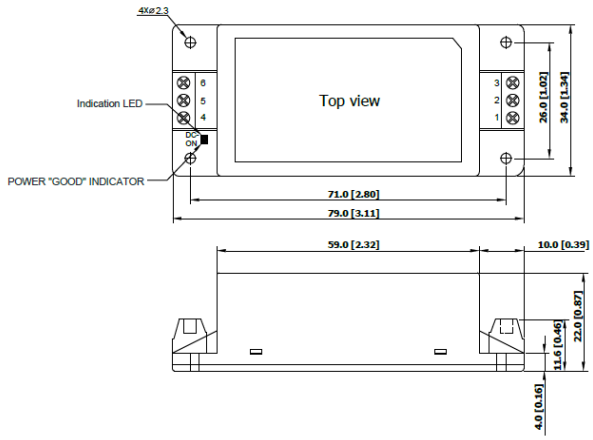
The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 305kHz, provided by TRACO ELECTRONIC AG, for detailed internal source, please refer to the manufacturer's specifications.

3.6 Package Specifications by Manufacturer

Package Specifications：

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Single Output	Dual Output
1	Remote On/Off	Remote On/Off
2	-Vin	-Vin
3	+Vin	+Vin
4	-Vout	-Vout
5	NC	Common
6	+Vout	+Vout

NC: No Connection

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)
  X.XX±0.25 (X.XXX±0.01)

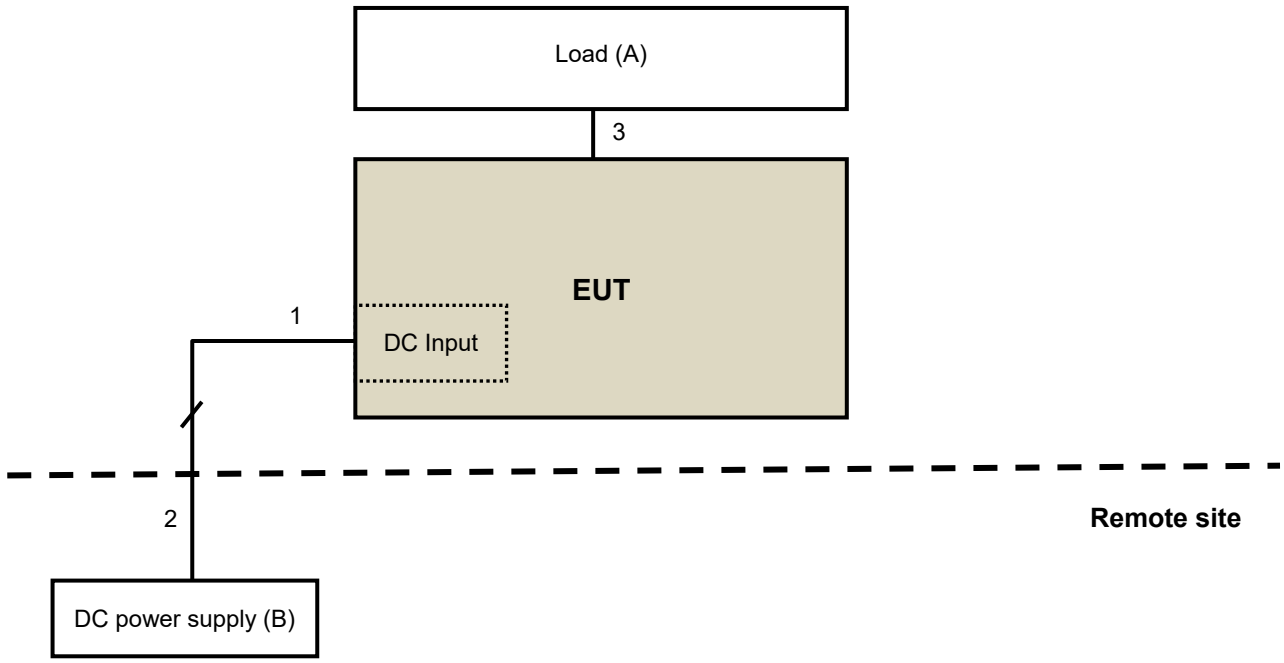
Physical Characteristics

Case Size	:	79.0x34.0x22.0mm (3.11x1.10x0.87 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Weight	:	69g

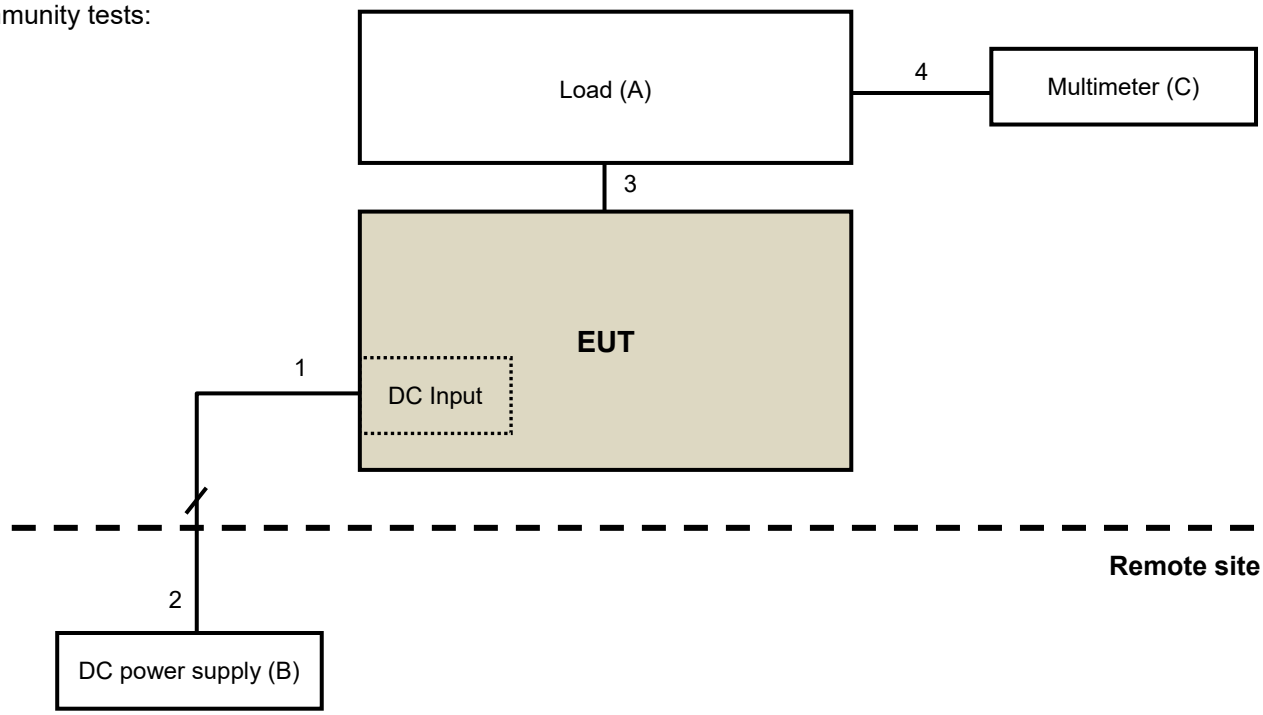
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

Emission tests:



Immunity tests:



4.2 Configuration of Peripheral Devices and Cable Connections

Emission tests:

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	DUMMY LOAD	N/A	N/A	N/A	N/A	Supplied by client
B.	DC power supply	CHROMA	62150H-600S	62150EC00479	N/A	Provided by Lab

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC power cable	1	1.2	N	0	Provided by Lab
2.	DC power cable	1	10	N	0	Provided by Lab
3.	DC power cable	1	0.02	N	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s).

Immunity tests:

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	DUMMY LOAD	N/A	N/A	N/A	N/A	Supplied by client
B.	DC power supply	CHROMA	62150H-600S	62150EC00479	N/A	Provided by Lab
C.	Multimeter	YFE	YF-370A	N/A	N/A	Provided by Lab

Note: All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC power cable	1	1.2	N	0	Provided by Lab
2.	DC power cable	1	3.0	N	0	Provided by Lab
3.	DC power cable	1	0.02	N	0	Provided by Lab
4.	Data cable	1	1.0	N	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s).

5 Conducted Emission from the Mains Power Port

5.1 Limits

Frequency range (MHz)	Coupling device	Detector type / bandwidth	Class A limits (dBuV)
0.15 - 0.5	AMN	Quasi-peak / 9kHz	79
0.5 - 30.0			73
0.15 - 0.5		Average / 9kHz	66
0.5 - 30.0			60

Frequency range (MHz)	Coupling device	Detector type / bandwidth	Class B limits (dBuV)
0.15 - 0.5	AMN	Quasi-peak / 9kHz	66 - 56
0.5 - 5			56
5 - 30.0			60
0.15 - 0.5		Average / 9kHz	56 - 46
0.5 - 5			46
5 - 30.0			50

5.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	838251/021	Nov. 1, 2018	Oct. 31, 2019
ROHDE & SCHWARZ Artificial Mains Network (For EUT)	ENV216	101195	May 2, 2018	May 1, 2019
LISN With Adapter (for EUT)	AD10	C03Ada-002	May 2, 2018	May 1, 2019
EMCO L.I.S.N. (For peripherals)	3825/2	9504-2359	Jul. 26, 2018	Jul. 25, 2019
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 3, 2018	May 2, 2019
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK 8121	8121-808	Mar. 5, 2018	Mar. 4, 2019
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With10dB PAD	5D-FB	Cable-C03-01	Sep. 18, 2018	Sep. 17, 2019
LYNICS Terminator (For EMCO LISN)	0900510	E1-01-300	Jan. 19, 2018	Jan. 18, 2019
LYNICS Terminator (For EMCO LISN)	0900510	E1-01-301	Jan. 19, 2018	Jan. 18, 2019
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 14, 2017	Nov. 13, 2018
LISN With Adapter (for TV EUT)	100220	N/A	Nov. 14, 2017	Nov. 13, 2018

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. 3.
3. The VCCI Site Registration No. C-10274.
4. Tested Date: Nov. 6, 2018

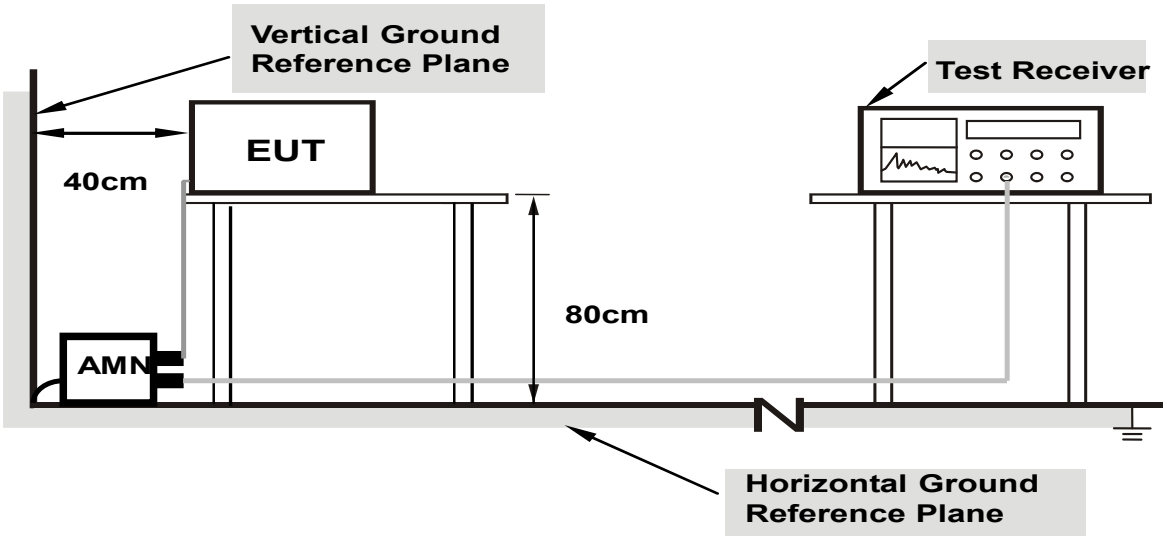
5.3 Test Arrangement

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through an Artificial Mains Network (AMN). Other support units were connected to the power mains through another AMN. The two AMNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.



Note: 1. Support units were connected to second AMN.
2. The distance specified between EUT/AE and other metallic objects is ≥ 0.8 m in the measurement arrangement for table-top EUT.
3. Cable on the RGP must to be insulated.

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

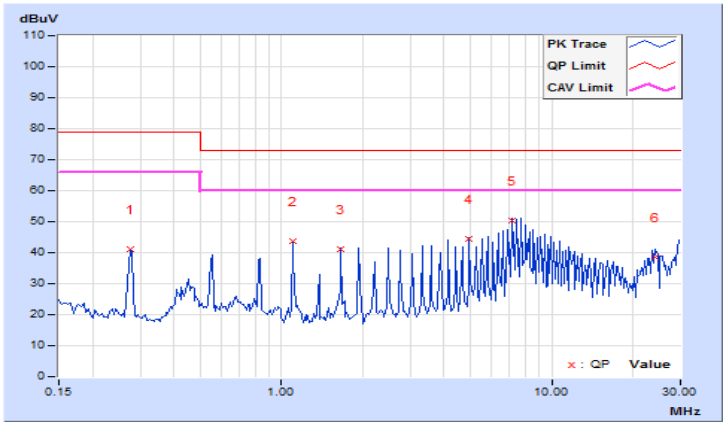
5.4 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vdc	Environmental Conditions	25℃, 85%RH, 1008mbar
Tested by	Vincent Chen		
Test Mode	Mode 1		

Phase Of Power : Positive (+)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.27500	10.02	31.02	31.01	41.04	41.03	79.00	66.00	-37.96	-24.97
2	1.10547	10.11	33.71	33.70	43.82	43.81	73.00	60.00	-29.18	-16.19
3	1.65625	10.12	31.09	31.08	41.21	41.20	73.00	60.00	-31.79	-18.80
4	4.96875	10.24	34.12	34.11	44.36	44.35	73.00	60.00	-28.64	-15.65
5	7.17578	10.30	39.94	39.93	50.24	50.23	73.00	60.00	-22.76	-9.77
6	24.29279	10.55	28.15	26.88	38.70	37.43	73.00	60.00	-34.30	-22.57

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

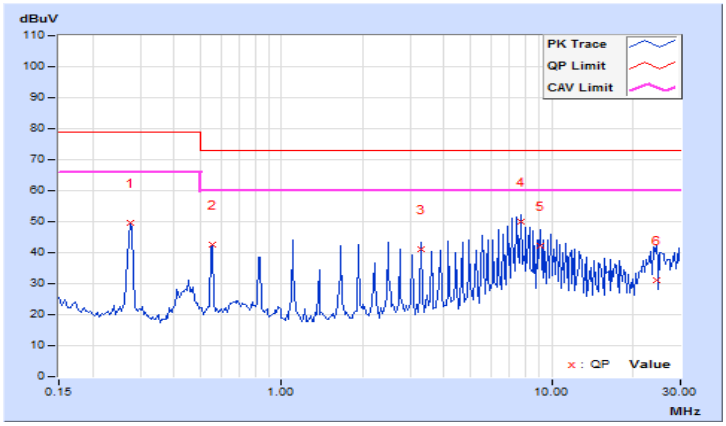


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vdc	**Environmental Conditions**	25℃, 85%RH, 1008mbar
Tested by	Vincent Chen		
Test Mode	Mode 1		

Phase Of Power : Negative (-)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.27500	10.04	39.48	39.47	49.52	49.51	79.00	66.00	-29.48	-16.49
2	0.55234	10.09	32.43	32.42	42.52	42.51	73.00	60.00	-30.48	-17.49
3	3.30859	10.20	31.09	31.08	41.29	41.28	73.00	60.00	-31.71	-18.72
4	7.72266	10.33	39.79	38.81	50.12	49.14	73.00	60.00	-22.88	-10.86
5	9.10156	10.37	31.68	27.99	42.05	38.36	73.00	60.00	-30.95	-21.64
6	24.55988	10.57	20.47	15.84	31.04	26.41	73.00	60.00	-41.96	-33.59

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

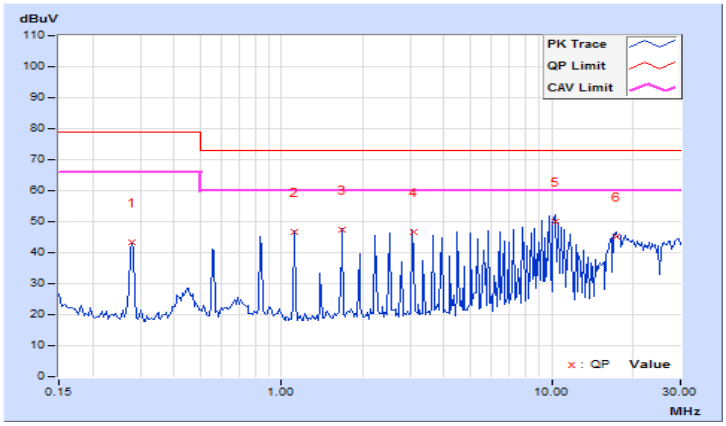


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vdc	**Environmental Conditions**	25℃, 85%RH, 1008mbar
Tested by	Vincent Chen		
Test Mode	Mode 2		

Phase Of Power : Positive (+)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.27891	10.03	33.34	33.33	43.37	43.36	79.00	66.00	-35.63	-22.64
2	1.11719	10.11	36.61	36.60	46.72	46.71	73.00	60.00	-26.28	-13.29
3	1.67188	10.12	37.37	37.36	47.49	47.48	73.00	60.00	-25.51	-12.52
4	3.06641	10.17	36.61	36.59	46.78	46.76	73.00	60.00	-26.22	-13.24
5	10.32422	10.38	39.58	39.14	49.96	49.52	73.00	60.00	-23.04	-10.48
6	17.29688	10.48	34.67	34.66	45.15	45.14	73.00	60.00	-27.85	-14.86

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

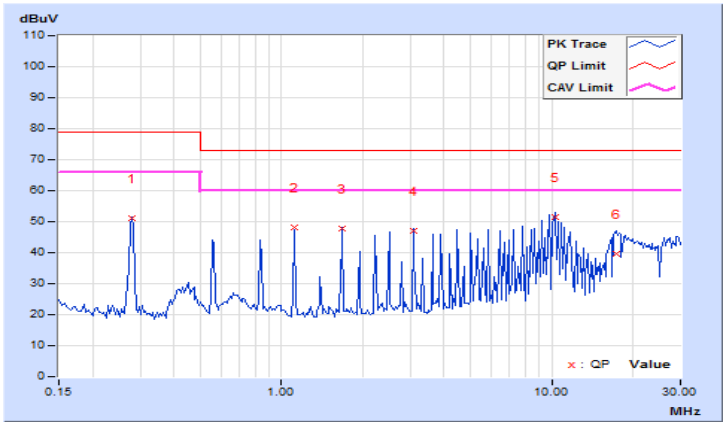


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vdc	**Environmental Conditions**	25℃, 85%RH, 1008mbar
Tested by	Vincent Chen		
Test Mode	Mode 2		

Phase Of Power : Negative (-)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.27891	10.05	41.06	41.05	51.11	51.10	79.00	66.00	-27.89	-14.90
2	1.11719	10.13	37.94	36.93	48.07	47.06	73.00	60.00	-24.93	-12.94
3	1.67188	10.14	37.46	37.45	47.60	47.59	73.00	60.00	-25.40	-12.41
4	3.07031	10.19	36.89	36.88	47.08	47.07	73.00	60.00	-25.92	-12.93
5	**10.32031**	**10.39**	**41.16**	**41.15**	**51.55**	**51.54**	**73.00**	**60.00**	**-21.45**	**-8.46**
6	17.28516	10.50	29.15	23.28	39.65	33.78	73.00	60.00	-33.35	-26.22

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

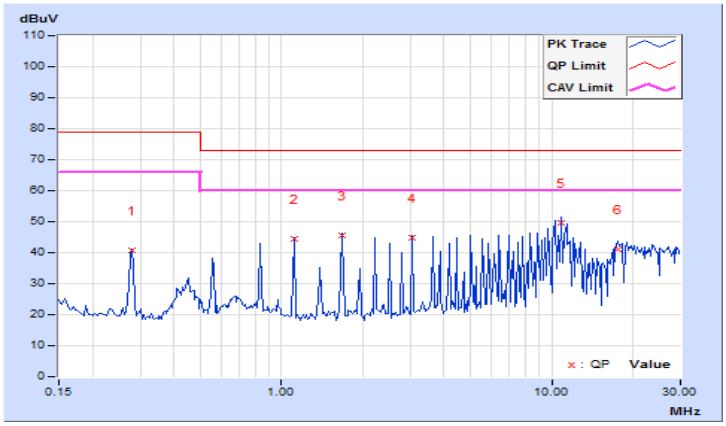


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vdc	**Environmental Conditions**	25℃, 85%RH, 1008mbar
Tested by	Vincent Chen		
Test Mode	Mode 3		

Phase Of Power : Positive (+)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.27891	10.03	30.60	30.59	40.63	40.62	79.00	66.00	-38.37	-25.38
2	1.11328	10.11	34.36	34.35	44.47	44.46	73.00	60.00	-28.53	-15.54
3	1.66797	10.12	35.44	35.43	45.56	45.55	73.00	60.00	-27.44	-14.45
4	3.05859	10.17	34.56	34.53	44.73	44.70	73.00	60.00	-28.27	-15.30
5	10.84766	10.39	39.07	39.06	49.46	49.45	73.00	60.00	-23.54	-10.55
6	17.52344	10.49	30.45	27.68	40.94	38.17	73.00	60.00	-32.06	-21.83

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

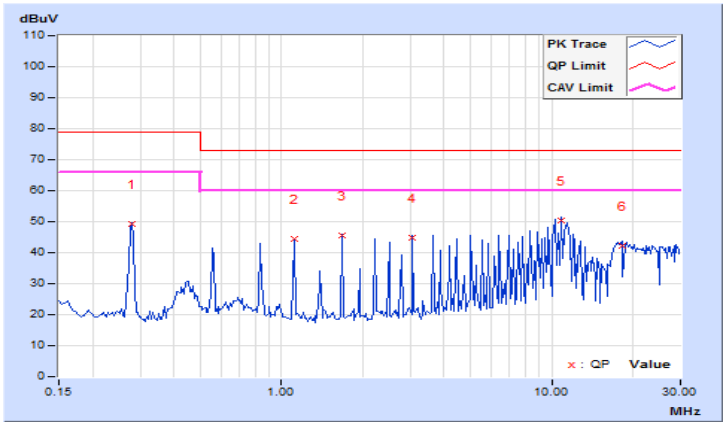


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vdc	**Environmental Conditions**	25℃, 85%RH, 1008mbar
Tested by	Vincent Chen		
Test Mode	Mode 3		

Phase Of Power : Negative (-)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.27891	10.05	39.13	39.12	49.18	49.17	79.00	66.00	-29.82	-16.83
2	1.11328	10.13	34.36	34.35	44.49	44.48	73.00	60.00	-28.51	-15.52
3	1.66797	10.14	35.32	35.31	45.46	45.45	73.00	60.00	-27.54	-14.55
4	3.05859	10.19	34.65	34.63	44.84	44.82	73.00	60.00	-28.16	-15.18
5	10.85156	10.40	40.11	40.10	50.51	50.50	73.00	60.00	-22.49	-9.50
6	18.36719	10.52	31.81	31.79	42.33	42.31	73.00	60.00	-30.67	-17.69

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

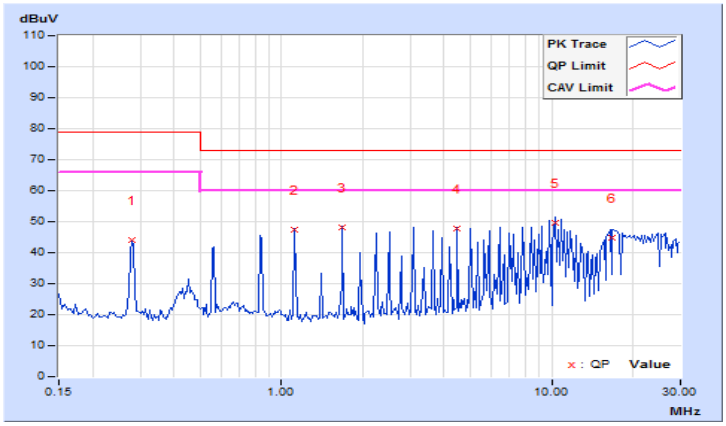


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vdc	**Environmental Conditions**	25℃, 85%RH, 1008mbar
Tested by	Vincent Chen		
Test Mode	Mode 4		

Phase Of Power : Positive (+)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.27891	10.03	33.99	33.98	44.02	44.01	79.00	66.00	-34.98	-21.99
2	1.11719	10.11	37.38	37.37	47.49	47.48	73.00	60.00	-25.51	-12.52
3	1.67578	10.12	38.09	38.08	48.21	48.20	73.00	60.00	-24.79	-11.80
4	4.47266	10.22	37.44	37.43	47.66	47.65	73.00	60.00	-25.34	-12.35
5	10.33984	10.38	39.19	38.84	49.57	49.22	73.00	60.00	-23.43	-10.78
6	16.76953	10.47	34.27	32.75	44.74	43.22	73.00	60.00	-28.26	-16.78

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

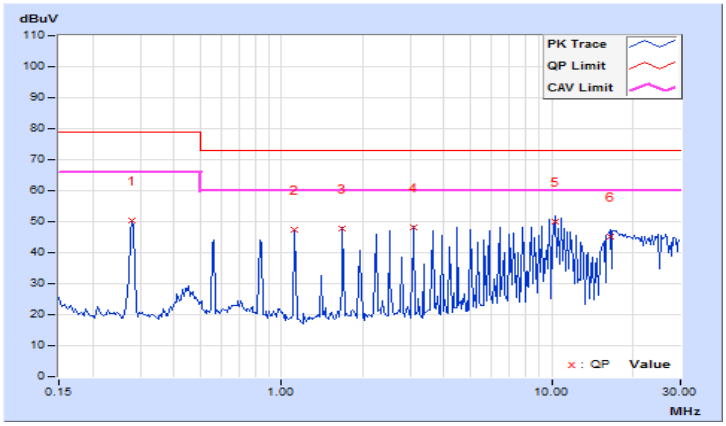


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vdc	**Environmental Conditions**	25℃, 85%RH, 1008mbar
Tested by	Vincent Chen		
Test Mode	Mode 4		

Phase Of Power : Negative (-)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.27891	10.05	40.23	40.22	50.28	50.27	79.00	66.00	-28.72	-15.73
2	1.11719	10.13	37.24	37.23	47.37	47.36	73.00	60.00	-25.63	-12.64
3	1.67578	10.14	37.68	37.67	47.82	47.81	73.00	60.00	-25.18	-12.19
4	3.07422	10.19	38.08	38.07	48.27	48.26	73.00	60.00	-24.73	-11.74
5	10.34375	10.40	39.74	39.73	50.14	50.13	73.00	60.00	-22.86	-9.87
6	16.49609	10.49	34.85	34.11	45.34	44.60	73.00	60.00	-27.66	-15.40

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



6 Radiated Emission at Frequencies up to 1GHz

6.1 Limits

For Class A Equipment

Frequency range (MHz)	Distance (m)	Limits (dBuV/m)
30 - 230	10	40
230 - 1000		47
30 - 230	3	50
230 - 1000		57

For Class B Equipment

Frequency range (MHz)	Distance (m)	Limits (dBuV/m)
30 - 230	10	30
230 - 1000		37
30 - 230	3	40
230 - 1000		47

For FM Receivers

Frequency range (MHz)	Measurement		Class B limits (dBuV/m)	
	Distance (m)	Detector type/ bandwidth	Fundamental	Harmonics
30 - 230	10	Quasi peak/ 120 kHz	50	42
230 - 300				42
300 - 1000				46
30 - 230	3		60	52
230 - 300				52
300 - 1000				56
These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the local oscillator. Signals at all other frequencies shall be compliant with the limits given in Table A4.1 & A4.2 of EN 55032.				

6.2 Test Instruments

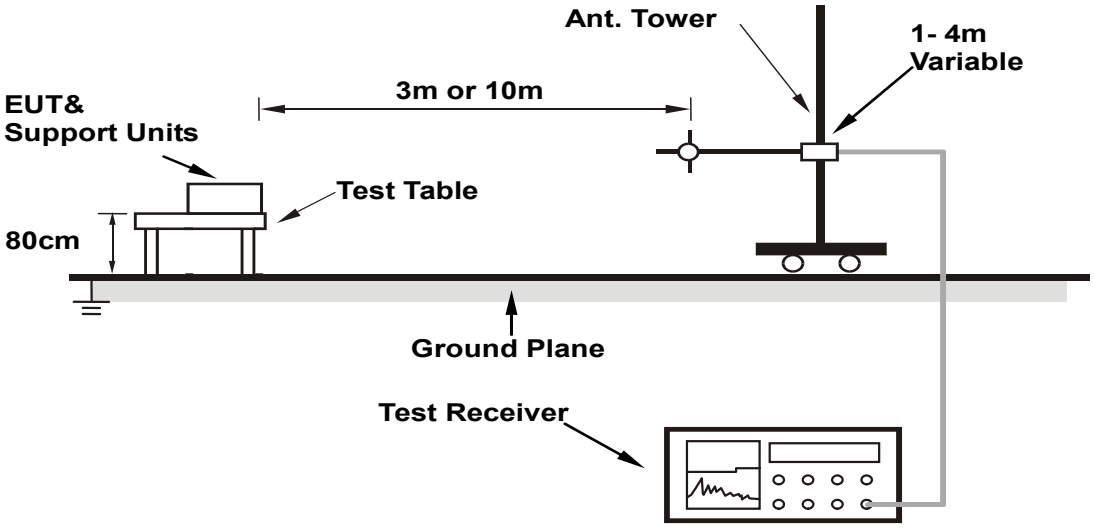
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Sonoma Preamplifier	310N	352922	Feb. 20, 2018	Feb. 19, 2019
Sonoma Preamplifier	310N	352921	Feb. 20, 2018	Feb. 19, 2019
Agilent Test Receiver	N9038A	MY50010158	Jun. 27, 2018	Jun. 26, 2019
Agilent Test Receiver	N9038A	MY51210114	Jul. 2, 2018	Jul. 1, 2019
Schwarzbeck Antenna	VULB9168	9168-316	Dec. 11, 2017	Dec. 10, 2018
Schwarzbeck Antenna	VULB9168	9168-317	Dec. 11, 2017	Dec. 10, 2018
Max Full. Turn Table & Tower	MF7802	MF7802121	NA	NA
Max Full. Tower	MF7802	MF780208105	NA	NA
Software	Radiated_V8.7.08	NA	NA	NA
JYEBAO RF cable With 5dB PAD	LMR-600	CABLE-CH8-01.V	Sep. 28, 2018	Sep. 27, 2019
JYEBAO RF cable With 5dB PAD	LMR-600	CABLE-CH8-02.H	Sep. 28, 2018	Sep. 27, 2019
WOKEN RF cable With 5dB PAD	8D	CABLE-CH8-03.3M	Sep. 28, 2018	Sep. 27, 2019

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Chamber No. 8.
3. The Industry Canada Reference No. IC 7450E-8.
4. The VCCI Site Registration No. R-12946.
5. Tested Date: Oct. 22 ~ Nov. 5, 2018

6.3 Test Arrangement

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.
2. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna.



Note: Cable on the RGP must to be insulated.

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

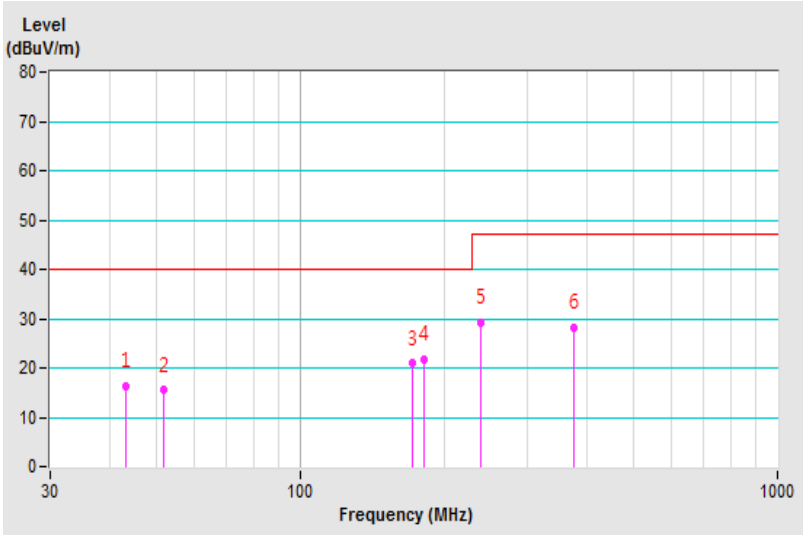
6.4 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	110Vdc	Environmental Conditions	26℃, 76%RH, 1006mbar
Tested by	Chiawei Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	43.12	16.22 QP	40.00	-23.78	3.12 H	147	30.12	-13.90
2	51.85	15.46 QP	40.00	-24.54	4.00 H	236	29.19	-13.73
3	172.59	20.91 QP	40.00	-19.09	3.93 H	174	34.56	-13.65
4	182.00	21.64 QP	40.00	-18.36	3.97 H	348	36.13	-14.49
5	239.50	29.25 QP	47.00	-17.75	4.00 H	297	43.52	-14.27
6	374.25	28.25 QP	47.00	-18.75	3.37 H	155	38.16	-9.91

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

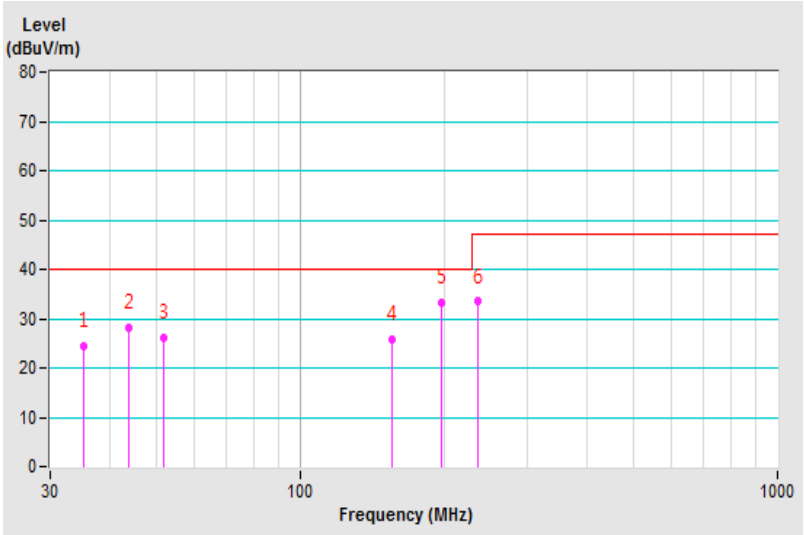


Frequency Range	30MHz ~ 1GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	110Vdc	**Environmental Conditions**	26℃, 76%RH, 1006mbar
Tested by	Chiawei Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	35.19	24.37 QP	40.00	-15.63	1.00 V	57	40.14	-15.77
2	43.77	28.07 QP	40.00	-11.93	1.07 V	53	42.79	-14.72
3	52.02	26.06 QP	40.00	-13.94	1.84 V	268	40.43	-14.37
4	156.05	25.70 QP	40.00	-14.30	1.00 V	349	38.77	-13.07
5	198.25	33.32 QP	40.00	-6.68	1.14 V	228	49.42	-16.10
6	236.17	33.39 QP	47.00	-13.61	1.29 V	27	48.39	-15.00

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

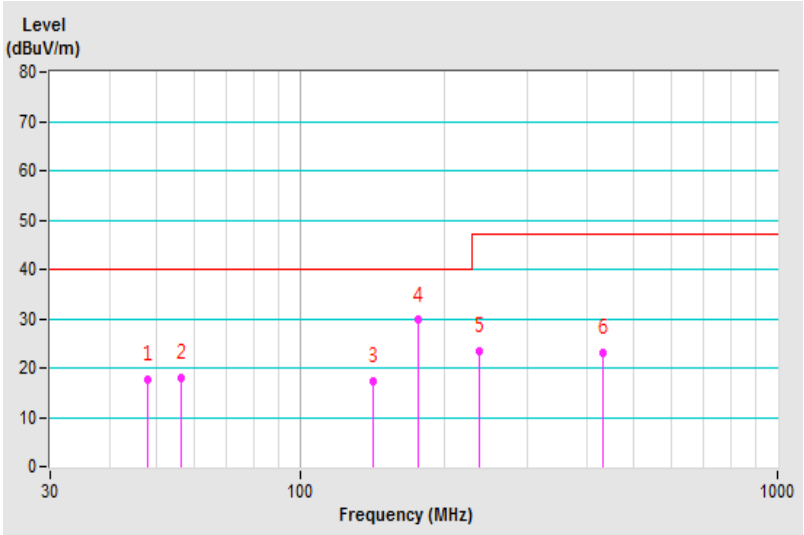


Frequency Range	30MHz ~ 1GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	110Vdc	**Environmental Conditions**	23℃, 67%RH, 1006mbar
Tested by	Chiawei Lin		
Test Mode	Mode 2		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	48.02	17.62 QP	40.00	-22.38	3.24 H	182	31.44	-13.82
2	56.36	17.93 QP	40.00	-22.07	4.00 H	137	31.89	-13.96
3	142.71	17.21 QP	40.00	-22.79	3.96 H	354	31.15	-13.94
4	177.00	29.68 QP	40.00	-10.32	3.91 H	213	43.58	-13.90
5	236.73	23.45 QP	47.00	-23.55	3.51 H	334	37.90	-14.45
6	430.46	23.07 QP	47.00	-23.93	3.15 H	310	31.93	-8.86

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

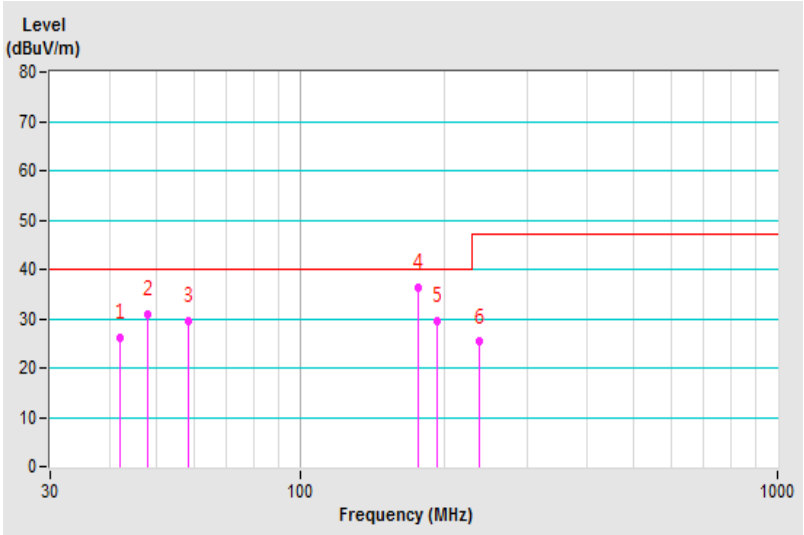


Frequency Range	30MHz ~ 1GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	110Vdc	**Environmental Conditions**	23℃, 67%RH, 1006mbar
Tested by	Chiawei Lin		
Test Mode	Mode 2		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	41.86	26.08 QP	40.00	-13.92	1.32 V	58	44.41	-18.33
2	47.99	30.86 QP	40.00	-9.14	1.53 V	99	48.89	-18.03
3	58.30	29.56 QP	40.00	-10.44	1.10 V	80	47.75	-18.19
4	**177.06**	**36.21 QP**	**40.00**	**-3.79**	**1.00 V**	**70**	**54.28**	**-18.07**
5	193.32	29.51 QP	40.00	-10.49	1.00 V	107	49.51	-20.00
6	236.71	25.33 QP	47.00	-21.67	1.03 V	228	44.28	-18.95

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

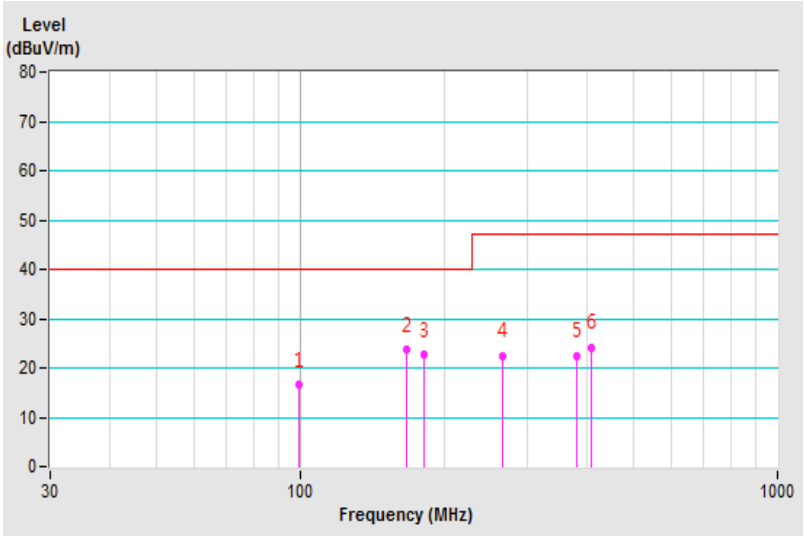


Frequency Range	30MHz ~ 1GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	110Vdc	**Environmental Conditions**	26℃, 76%RH, 1006mbar
Tested by	Chiawei Lin		
Test Mode	Mode 3		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	99.55	16.48 QP	40.00	-23.52	3.00 H	206	34.53	-18.05
2	167.69	23.63 QP	40.00	-16.37	3.91 H	186	36.98	-13.35
3	181.68	22.60 QP	40.00	-17.40	4.00 H	330	37.05	-14.45
4	265.88	22.53 QP	47.00	-24.47	3.87 H	155	36.01	-13.48
5	379.54	22.43 QP	47.00	-24.57	3.14 H	334	32.27	-9.84
6	407.67	24.15 QP	47.00	-22.85	3.07 H	332	33.42	-9.27

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

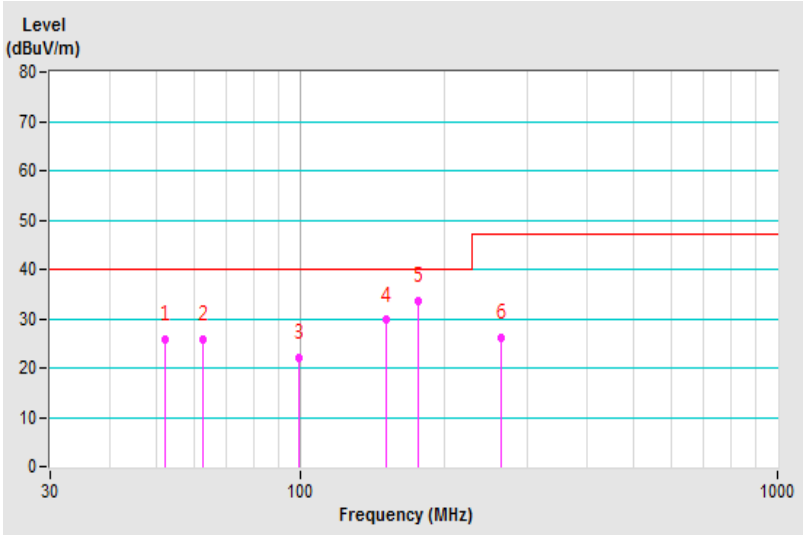


Frequency Range	30MHz ~ 1GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	110Vdc	**Environmental Conditions**	26℃, 76%RH, 1006mbar
Tested by	Chiawei Lin		
Test Mode	Mode 3		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	52.07	25.87 QP	40.00	-14.13	1.06 V	300	40.24	-14.37
2	62.64	25.83 QP	40.00	-14.17	1.00 V	4	41.07	-15.24
3	99.52	22.12 QP	40.00	-17.88	1.84 V	67	40.94	-18.82
4	151.88	29.68 QP	40.00	-10.32	1.20 V	330	43.04	-13.36
5	176.64	33.67 QP	40.00	-6.33	1.97 V	3	47.48	-13.81
6	264.74	26.21 QP	47.00	-20.79	2.19 V	204	40.01	-13.80

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

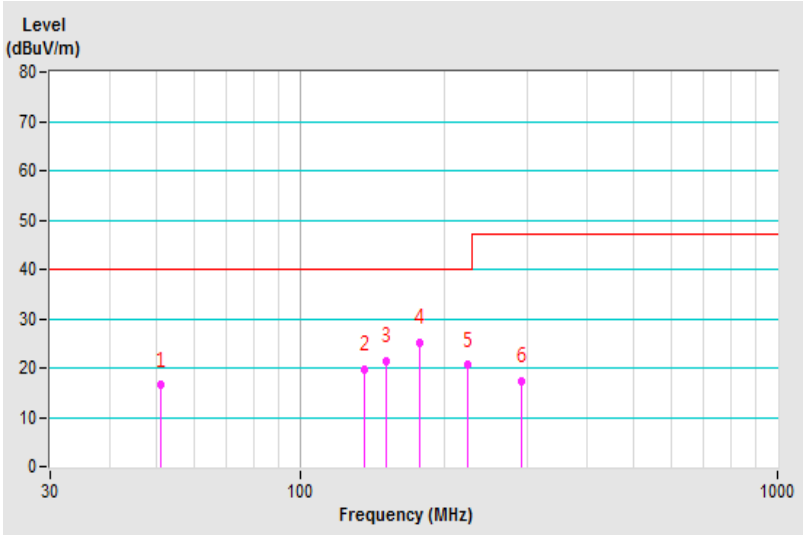


Frequency Range	30MHz ~ 1GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	110Vdc	**Environmental Conditions**	26℃, 76%RH, 1006mbar
Tested by	Chiawei Lin		
Test Mode	Mode 4		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	51.17	16.46 QP	40.00	-23.54	3.01 H	70	30.20	-13.74
2	136.02	19.60 QP	40.00	-20.40	4.00 H	326	34.11	-14.51
3	151.86	21.29 QP	40.00	-18.71	3.87 H	349	34.35	-13.06
4	178.56	25.13 QP	40.00	-14.87	3.76 H	341	39.21	-14.08
5	225.16	20.51 QP	40.00	-19.49	4.00 H	292	35.91	-15.40
6	291.20	17.43 QP	47.00	-29.57	3.12 H	348	29.66	-12.23

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

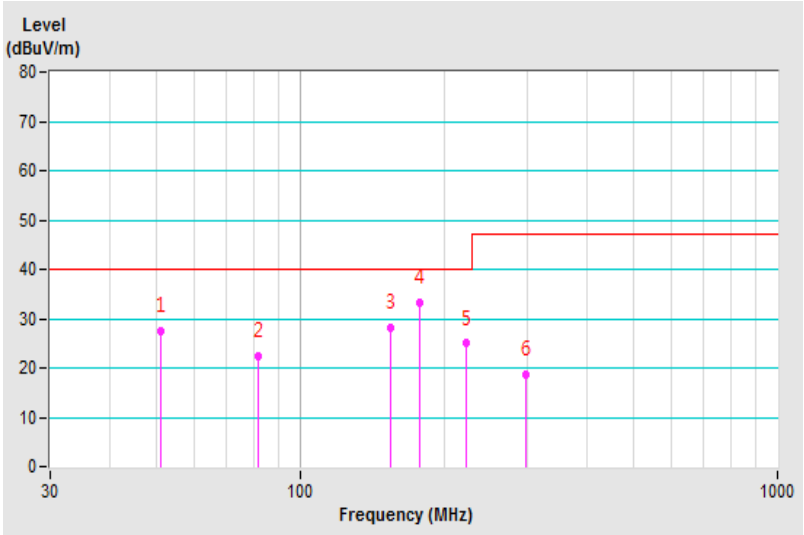


Frequency Range	30MHz ~ 1GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	110Vdc	**Environmental Conditions**	26℃, 76%RH, 1006mbar
Tested by	Chiawei Lin		
Test Mode	Mode 4		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	51.17	27.47 QP	40.00	-12.53	1.02 V	319	41.85	-14.38
2	81.75	22.30 QP	40.00	-17.70	1.20 V	294	41.41	-19.11
3	155.01	28.29 QP	40.00	-11.71	1.00 V	222	41.48	-13.19
4	178.19	33.16 QP	40.00	-6.84	1.36 V	32	47.14	-13.98
5	223.51	24.97 QP	40.00	-15.03	1.00 V	221	40.71	-15.74
6	297.36	18.81 QP	47.00	-28.19	1.98 V	232	31.39	-12.58

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



7 General Immunity Requirements

EN 55035:2017, Immunity requirements		
Reference standard	Test specification	Performance Criterion
EN/IEC 61000-4-2 ESD	Enclosure port: ±8kV Air discharge, ±4kV Contact discharge	B
EN/IEC 61000-4-3 RS	Enclosure port: Swept freq. test : 80-1000 MHz, 3V/m, 80% AM (1kHz), Spot freq. test : 1800, 2600, 3500, 5000 MHz (±1 %), 3V/m, 80% AM (1kHz)	A
EN/IEC 61000-4-4 EFT	Analogue/digital data ports (cable length > 3m): xDSL equipment: ±0.5kV, 5/50 (T_r/T_h) ns, 100kHz others: ±0.5kV, 5/50 (T_r/T_h) ns, 5kHz	B
	DC network power port (cable length > 3m): ±0.5kV, 5/50 (T_r/T_h) ns, 5kHz	
	AC mains power ports: ±1.0kV, 5/50 (T_r/T_h) ns, 5kHz	
EN/IEC 61000-4-5 Surge	Analogue/digital data ports (direct to outdoor cables): Port type: unshielded symmetrical 10/700(5/320) (T_r/T_h) μs, w/o primary protectors (line to ground): ±1.0kV, or with primary protectors (line to ground): ±1.0kV, ±4.0kV Port type: coaxial or shielded 1.2/50 (8/20) (T_r/T_h) μs, shield to ground: ±0.5kV	C
	DC network power port (direct to outdoor cables): 1.2/50(8/20) (T_r/T_h) μs, Line to ground: ±0.5kV	B
	AC mains power ports: 1.2/50(8/20) (T_r/T_h) μs, Line to line: ±1kV, Line to ground: ±2kV	B
EN/IEC 61000-4-6 CS	Analogue/digital data ports (cable length > 3m) ; DC network power ports (cable length > 3m) ; AC mains power ports 0.15-10 MHz, 3V, 80% AM (1kHz), 10-30 MHz, 3V-1V, 80% AM (1kHz), 30-80 MHz, 1V, 80% AM (1kHz)	A
EN/IEC 61000-4-8 PFMF	Enclosure port: 50 or 60 Hz, 1A/m	A

EN 55024:2010 / EN 55024:2010 +A1:2015, Immunity requirements				
Clause	Reference standard	Table	Test specification	Performance Criterion
4.2.1	EN/IEC 61000-4-2 ESD	1.3	Enclosure port: ±8kV Air discharge, ±4kV Contact discharge	B
4.2.3.2	EN/IEC 61000-4-3 RS	1.2	Enclosure port: 80-1000 MHz, 3V/m, 80% AM (1kHz)	A
4.2.2	EN/IEC 61000-4-4 EFT	2.3	Signal ports and telecommunication ports: xDSL equipment: ±0.5kV, 5/50 (T_r/T_h) ns, 100kHz others: ±0.5kV, 5/50 (T_r/T_h) ns, 5kHz	B
		3.3	Input DC power port: ±0.5kV, 5/50 (T_r/T_h) ns, 5kHz	
		4.5	Input AC Power ports: ±1kV, 5/50 (T_r/T_h) ns, 5kHz	
4.2.5	EN/IEC 61000-4-5 Surge	2.2	Signal and telecommunication ports (direct to outdoor cables): 10/700 (5/320) (T_r/T_h) μs w/o primary protectors: ±1kV, or with primary protectors fitted: ±4kV	C
		3.2	Input DC power port (direct to outdoor cables): 1.2/50 (8/20) (T_r/T_h) μs Line to earth: ±0.5kV	B
		4.4	Input AC Power ports: 1.2/50 (8/20) (T_r/T_h) μs, Line to line: ±1kV Line to earth: ±2kV	
4.2.3.3	EN/IEC 61000-4-6 CS	2.1	Signal and telecommunication ports(cable length > 3m): 0.15-80 MHz, 3V, 80% AM (1kHz)	A
		3.1	Input DC power port: 0.15-80 MHz, 3V, 80% AM (1kHz)	
		4.1	Input AC Power ports: 0.15-80 MHz, 3V, 80% AM (1kHz)	
4.2.4	EN/IEC 61000-4-8 PFMF	1.1	Enclosure port: 50 or 60 Hz, 1A/m	A

7.1 Specific Immunity Requirements by Manufacturer

Reference standard	Test specification	Performance Criterion
EN/IEC 61000-4-2 ESD	Enclosure port: ±6kV Indirect Contact discharge	A
EN/IEC 61000-4-3 RS	Enclosure port: Swept freq. test : 80-1000 MHz, 10V/m, 80% AM (1kHz), Spot freq. test : 1800, 2600, 3500, 5000 MHz (±1 %), 10V/m, 80% AM (1kHz)	A
EN/IEC 61000-4-4 EFT	DC network power port (cable length > 3m): ±2kV, 5/50 (T_r/T_h) ns, 5kHz	A
EN/IEC 61000-4-5 Surge	DC network power port (direct to outdoor cables): 1.2/50(8/20) (T_r/T_h) μ s, Line to line: ±2kV	A
EN/IEC 61000-4-6 CS	Input DC Power ports: 0.15-80 MHz, 10V, 80% AM (1kHz)	A
EN/IEC 61000-4-8 PFMF	Enclosure port: 50 Hz, 1000A/m	A

7.2 Performance Criteria

General Performance Criteria

Performance criterion A

The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion B

After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion C

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

Product Specific Performance Criteria

The particular performance criteria which are specified in the normative annexes of EN 55035 / EN 55024 take precedence over the corresponding parts of the general performance criteria. Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.

8 Electrostatic Discharge Immunity Test (ESD)

8.1 Test Specification

Basic Standard:	EN/IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: ±2kV, ±4kV, ±8kV (Direct) Contact Discharge: ±2kV, ±4kV, ±6kV (Indirect)
Number of Discharge:	Air – Direct: 10 discharges per location (each polarity) Contact – Direct & Indirect: 10 discharges per location (each polarity)
Discharge Mode:	Single Discharge
Discharge Period:	1-second minimum

8.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EM Test ESD Simulator	Dito	V0707102251	Apr. 12, 2018	Apr. 11, 2019

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in ESD Room No. 3.
3. Tested Date: Nov. 9, 2018

8.3 Test Arrangement

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

a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.

b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

c. The time interval between two successive single discharges was at least 1 second.

d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.

e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

f. 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.

g. At least ten single discharges (in the most sensitive polarity) were applied to the **H**orizontal **C**oupling **P**lane at points on each side of the EUT. The ESD generator was positioned at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP.**

h. 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 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.

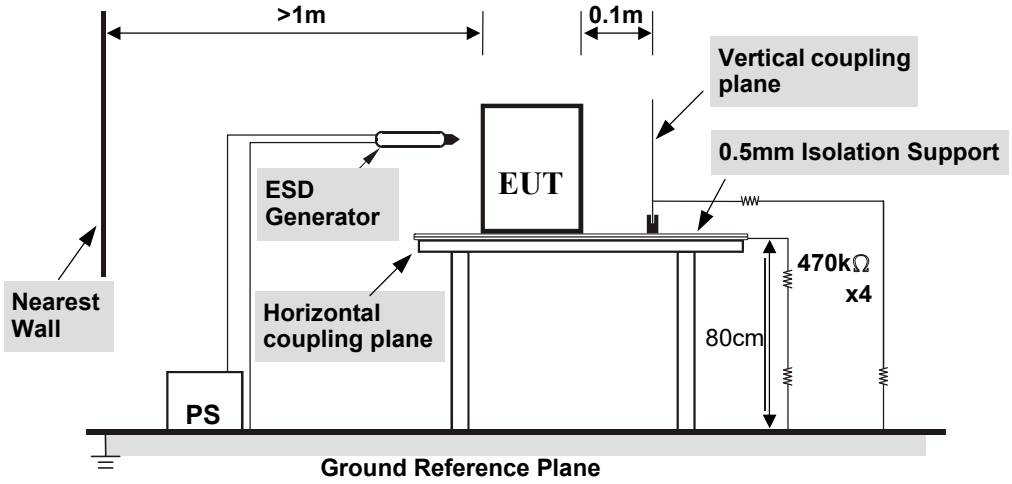


TABLE-TOP EQUIPMENT

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 EN/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.

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

8.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

8.5 Test Results

Input Power	110Vdc	Tested by	Thomas Cheng
Environmental Conditions	22 °C, 42% RH 1008 mbar	Test mode	Mode 1

Test Results of Direct Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2, 4, 8	+/-	1-2	NA	Note	A

Description of test points of direct application: Please refer to following page for representative mark only.

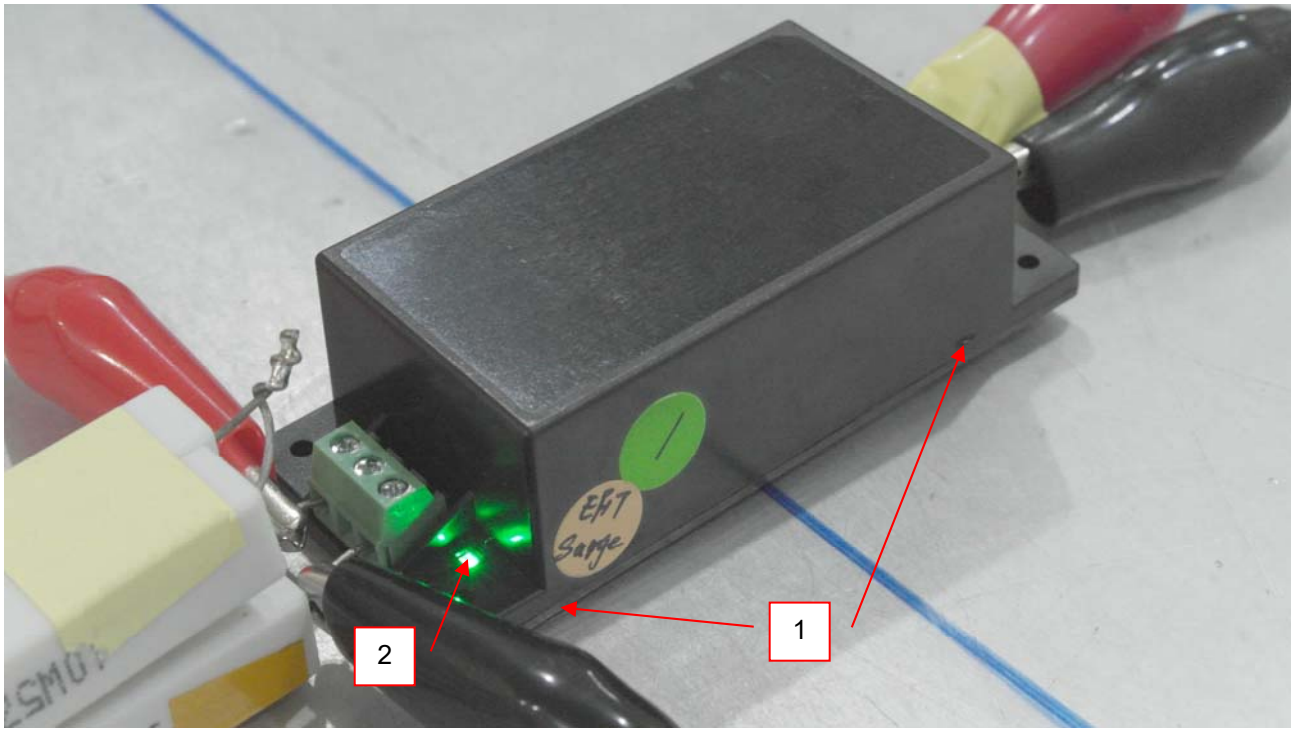
Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2, 4, 6	+/-	Four Sides	Note	Note	A

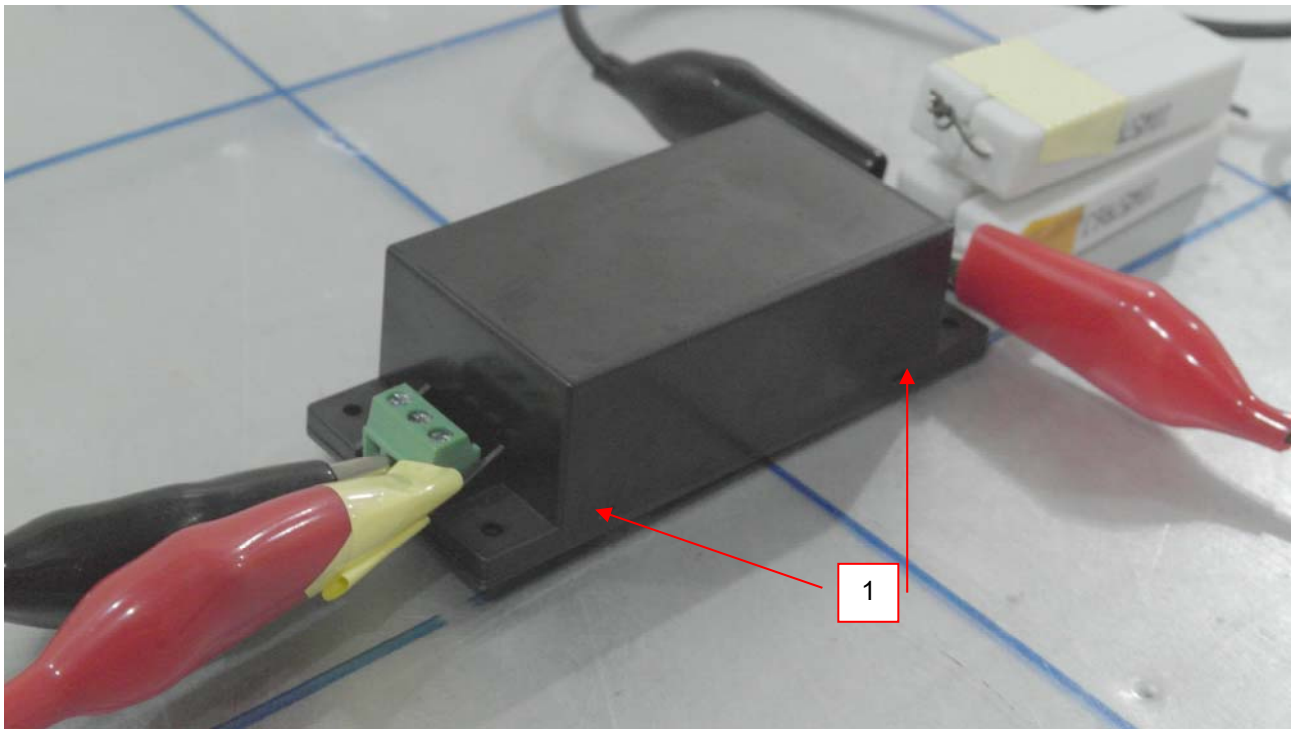
Description of test points of indirect application:

1. Front side 2. Rear side 3. Right side 4. Left side

Note: The EUT function was correct during the test.

Description of Test Points





9 Radiated, Radio-frequency, Electromagnetic Field Immunity Test (RS)

9.1 Test Specification

Basic Standard:	EN/IEC 61000-4-3
Swept Frequency Range:	80 MHz - 1000 MHz
Spot Frequencies:	1800, 2600, 3500, 5000 MHz (±1 %)
Field Strength:	3 V/m, 10 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	3 seconds

9.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Agilent Signal Generator	E8257D	MY48050465	Jun. 6, 2018	Jun. 5, 2019
PRANA RF Amplifier	AP32DP280	0811-894	NA	NA
TESTQ Amplifier	AS1860-50	S-5944/1	NA	NA
AR RF Amplifier	35S4G8AM4	0326094	NA	NA
AR RF Amplifier	100S1G4M3	0329249	NA	NA
AR Controller	SC1000M3	305910	NA	NA
ETS Electric Field Sensor	HI-6105	00217912	Nov. 27, 2017	Nov. 26, 2018
BOONTON RF Voltage Meter	4232A	10180	May 23, 2018	May 22, 2019
BOONTON Power Sensor	51013-4E	34870	Jun. 4, 2018	Jun. 3, 2019
BOONTON Power Sensor	51013-4E	34873	Jun. 4, 2018	Jun. 3, 2019
AR Log-Periodic Antenna	AT6080	0329465	NA	NA
EMCO BiconiLog Antenna	3141	1001	NA	NA
AR High Gain Antenna	AT4010	0329800	NA	NA
Schwarzbeck LOG ANTENNA	Stlp 9149	9149-260	NA	NA
CHANCE MOST Full Anechoic Chamber (9x5x3m)	Chance Most	RS-002	Feb. 6, 2018	Feb. 5, 2019
Software	RS_V7.6	NA	NA	NA

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in RS Room No.2.
3. Tested Date: Nov. 12, 2018

9.3 Test Arrangement

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

a. The testing was performed in a fully anechoic chamber.

b. The swept frequency range is from 80 MHz to 1000 MHz and the spot frequencies are 1800, 2600, 3500, 5000 MHz (±1 %), with the signal 80% amplitude modulated with a 1kHz sine wave.

c. The dwell time of the amplitude modulated carrier was applied in 3 s at each of the frequencies during the scan. The sensitive frequencies (e.g. clock frequencies or frequencies identified by the manufacturer or obtained as outcome of the test) shall be analyzed in addition to the stepped frequencies.

d. The field strength level was 3 V/m, 10 V/m.

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

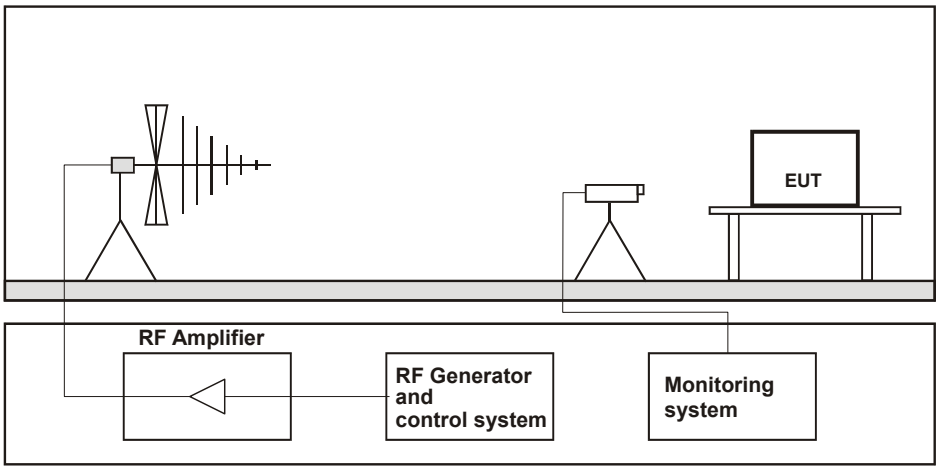


Table-top Equipment

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

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

9.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

9.5 Test Results

Input Power	110Vdc	Tested by	Michael Cheng
Environmental Conditions	25 °C, 61% RH	Test mode	Mode 1

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criterion
			(V/m)	Modulation		
80 - 1000	V&H	0	3, 10	80% AM (1kHz)	Note	A
		90	3, 10	80% AM (1kHz)	Note	A
		180	3, 10	80% AM (1kHz)	Note	A
		270	3, 10	80% AM (1kHz)	Note	A
1800, 2600, 3500, 5000 MHz (±1 %)	V&H	0	3, 10	80% AM (1kHz)	Note	A
		90	3, 10	80% AM (1kHz)	Note	A
		180	3, 10	80% AM (1kHz)	Note	A
		270	3, 10	80% AM (1kHz)	Note	A

Note: The EUT function was correct during the test.

10 Electrical Fast Transient/Burst Immunity Test (EFT)

10.1 Test Specification

Basic Standard:	EN/IEC 61000-4-4
Test Voltage:	Analogue/digital data port (cable length > 3m): N/A DC network power port (cable length > 3m): ±0.5kV, ±1kV, ±2kV AC mains power port: N/A
Impulse Repetition Frequency:	100kHz : applicable only to xDSL port 5kHz : others
Impulse Wave Shape :	5/50 ns
Burst Duration:	0.75 ms for 100kHz Repetition Frequency 15 ms for 5kHz Repetition Frequency,
Burst Period:	300 ms
Test Duration:	1 min.

10.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
TESEQ, EFT Simulator	NSG 3060	1572	May 28, 2018	May 27, 2019
TESEQ, CDN	CDN 3083-B100	303	May 28, 2018	May 27, 2019
Haefely,Capacitive Clamp	IP4A	155173	Apr. 25, 2018	Apr. 24, 2019

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS Room No. 2.
3. Tested Date: Nov. 8, 2018

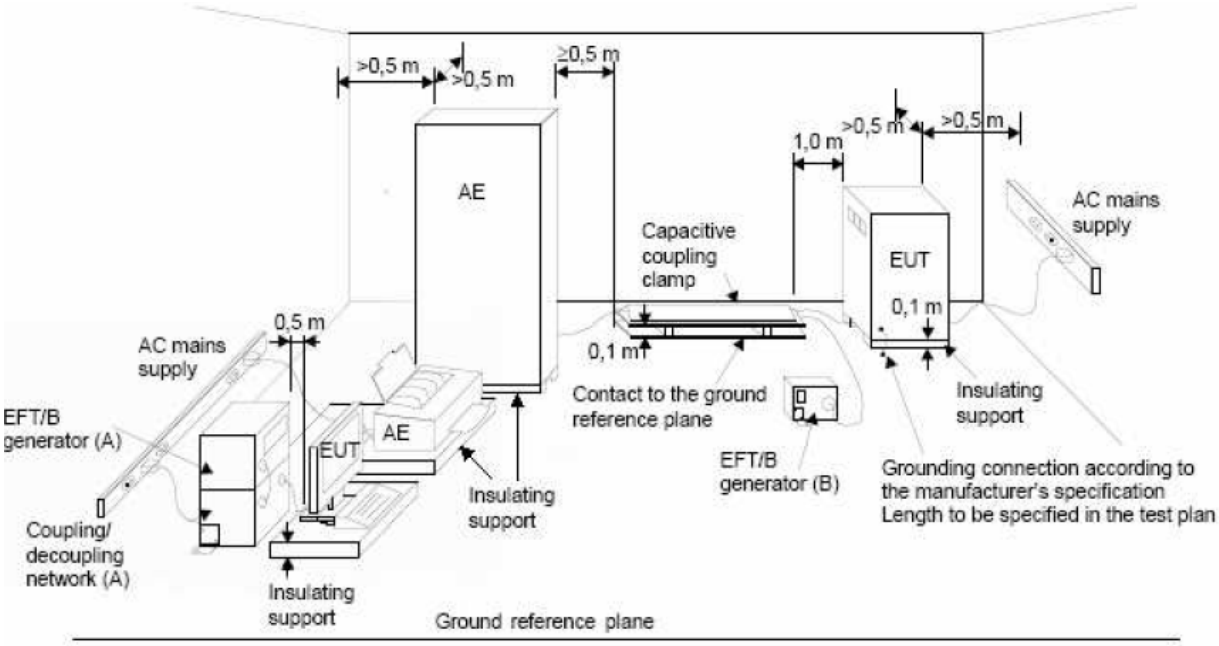
10.3 Test Arrangement

a. Both positive and negative polarity discharges were applied.

b. The distance between any coupling devices and the EUT should be (0.5 − 0/+0.1) m for table-top equipment testing, and (1.0 ± 0.1) m for floor standing equipment.

c. The duration time of each test sequential was 1 minute.

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



NOTE:
(A) location for supply line coupling
(B) location for signal lines coupling

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

10.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

10.5 Test Results

Input Power	110Vdc	Tested by	Xun Lee
Environmental Conditions	25 °C, 67% RH	Test mode	Mode 1, 2, 3, 4

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 1, 2	(+)	+/-	Note	A
0.5, 1, 2	(-)	+/-	Note	A
0.5, 1, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

11 Surge Immunity Test

11.1 Test Specification

Basic Standard:	EN/IEC 61000-4-5
Wave-Shape:	Analogue/digital data ports (direct to outdoor cables*): Port type: unshielded symmetrical 10/700 μs Open Circuit Voltage 5/320 μs Short Circuit Current Port type: coaxial or shielded 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current DC network power port (direct to outdoor cables*): 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current AC mains power port: 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current
Test Voltage:	Analogue/digital data ports: Port type: unshielded symmetrical** w/o primary protectors (line to ground): NA with primary protectors (line to ground): NA Port type: coaxial or shielded shield to ground: NA DC network power port: ±0.5kV, ±1kV, ±2kV AC mains power ports: Line to line : NA Line to ground : NA
AC Phase Angle (degree):	90° / 270°
Pulse Repetition Rate:	1 time / 20 sec.
Number of Tests:	5 positive and 5 negative at selected points

* This test is only applicable only to ports, which according to the manufacturer's specification, may connect directly to outdoor cables.

** For ports where primary protection is intended, surges are applied at voltages up to 4 kV with the primary protectors. Otherwise the 1 kV test level is applied without primary protection in place.

11.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
TESEQ, Surge Simulator	NSG 3060	1572	May 28, 2018	May 27, 2019
TESEQ, CDN	CDN 3083-100	1215	May 28, 2018	May 27, 2019
Coupling Decoupling Network	CDN-UTP8	045	Aug. 27, 2018	Aug. 26, 2019
TESEQ Coupling Decoupling Network	CDN HSS-2	41009	May 23, 2018	May 22, 2019
TESEQ Coupling Decoupling Network	CDN 118-T8	40386	Sep. 20, 2018	Sep. 19, 2019
TESEQ CDN for Unshielded Unsymmetrical Signal & Data Lines	CDN117	40144	Sep. 20, 2018	Sep. 19, 2019

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS Room No. 2.
3. Tested Date: Nov. 8, 2018

11.3 Test Arrangement

a. AC mains /DC network power ports:

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

For double-insulated products without PE or external earth connections, the test shall be done in a similar way as for grounded products but without adding any additional external grounded connections. If there are no other possible connections to earth, line-to-ground tests may be omitted.

b. Analogue/digital data ports,

- Port type: unshielded symmetrical (line to ground)

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

- Port type: coaxial or shielded (shield to ground)

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length.

- High speed communications lines

Prior to the test, the correct operation of the port shall be verified; the external connection shall then be removed and the surge applied directly to the port's terminals with no coupling /decoupling network. After the surge, the correct operation of the port shall again be verified.

- Shielded lines:

  - Direct application,

The EUT is isolated from ground and the surge is applied to its metallic enclosure; the termination (or auxiliary equipment) at the port(s) under test is grounded. This test applies to equipment with single or multiple shielded cables.

Rules for application of the surge to shielded lines:

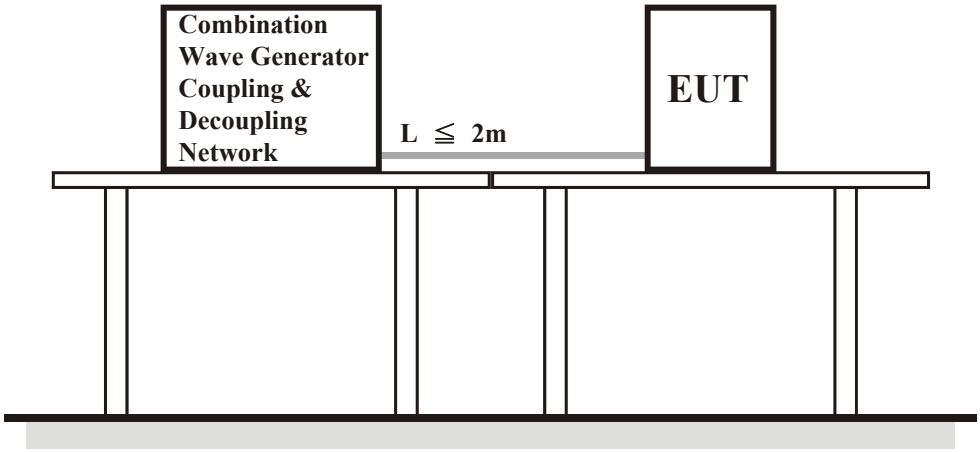
a) Shields grounded at both ends
   - The surge injection on the shield.

b) Shields grounded at one end
   - If in the installation the shield is connected only at the auxiliary equipment, test shall be done in that configuration but with the generator still connected to the EUT side. If cable lengths allow, the cables shall be on insulated supports 0,1 m above the ground plane or cable tray.

For products which do not have metallic enclosures, the surge is applied directly to the shielded cable.

- Alternative coupling method for testing single cables in a multi-shield configuration,

Surges are applied in close proximity to the interconnection cable under test by a wire. The length of the cable between the port(s) under test and the device attached to the other end of the cable shall be the lesser of: the maximum length permitted by the EUT's specification, or 20 m. Where the length exceeds 1 m, excess lengths of cables shall be bundled at the approximate centre of the cables with the bundles 30 cm to 40 cm in length.



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

11.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

11.5 Test Results

Input Power	110Vdc	Tested by	Xun Lee
Environmental Conditions	25 °C, 67% RH	Test mode	Mode 1, 2, 3, 4

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 1, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

12 Immunity to Conducted Disturbances Induced by RF Fields (CS)

12.1 Test Specification

Basic Standard:	EN/IEC 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Voltage Level:	0.15 MHz - 80 MHz: 10V 0.15 MHz - 10 MHz: 3V 10 MHz - 30 MHz: 3-1V 30 MHz - 80 MHz: 1V
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Dwell Time	3 seconds

12.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ Signal Generator	SML03	101801	Jan. 8, 2018	Jan. 7, 2019
Digital Sweep Function Generator	8120	984801	NA	NA
AR Power Amplifier	75A250AM1	306331	NA	NA
FCC Coupling Decoupling Network	FCC-801-M2-16A	01047	Jun. 20, 2018	Jun. 19, 2019
FISCHER CUSTOM COMMUNICATIONS EM Injection Clamp	F-203I-23mm	455	NA	NA
FISCHER CUSTOM COMMUNICATIONS Current Injection Clamp	F-120-9A	361	Jul. 24, 2018	Jul. 23, 2019
B&K Ear Simulator	4185	2553594	NA	NA
EM TEST Coupling Decoupling Network	CDN M1/32A	306508	Jun. 20, 2018	Jun. 19, 2019
TESEQ Coupling Decoupling Network	CDN T800	34428	Jun. 20, 2018	Jun. 19, 2019
FCC Coupling Decoupling Network	FCC-801-T4	02031	Jun. 20, 2018	Jun. 19, 2019
EM TEST Coupling Decoupling Network	CDN T2	306509	Jun. 20, 2018	Jun. 19, 2019
TESEQ Coupling Decoupling Network	CDN M232	37702	Jun. 20, 2018	Jun. 19, 2019
TESEQ Coupling Decoupling Network	CDN M332	41258	Jun. 20, 2018	Jun. 19, 2019
TESEQ Coupling Decoupling Network	CDN M332	41256	Jun. 20, 2018	Jun. 19, 2019
TESEQ Coupling Decoupling Network	CDN T400A	28569	Jun. 20, 2018	Jun. 19, 2019
TESEQ Coupling Decoupling Network	CDN T8-10	40376	Jun. 20, 2018	Jun. 19, 2019
TESEQ Coupling Decoupling Network	ISN ST08	41212	Jun. 20, 2018	Jun. 19, 2019
FCC Coupling Decoupling Network	FCC-801-M5-50A	100018	Jan. 24, 2018	Jan. 23, 2019
Software	CS_V7.4.2	NA	NA	NA

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in CS Room No. 1.
3. Tested Date: Nov. 8, 2018

12.3 Test Arrangement

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

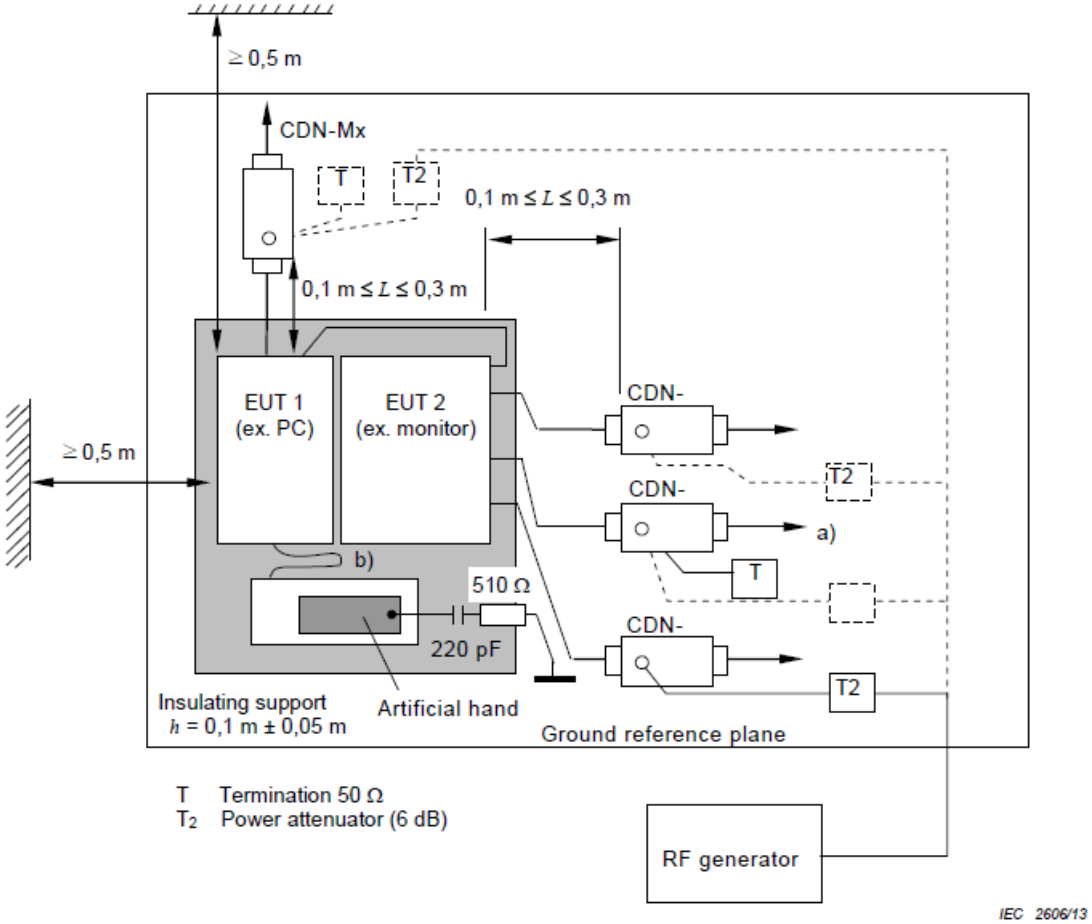
b. An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.

c. One of the CDNs not used for injection was terminated with 50 ohm, providing only one return path. All other CDNs were coupled as decoupling networks.

d. The frequency range is 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 is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value.

e. The dwell time of the amplitude modulated carrier was applied in 3s at each of the frequencies during the scan. The sensitive frequencies (e.g. clock frequencies or frequencies identified by the manufacturer or obtained as outcome of the test) shall be analyzed in addition to the stepped frequencies.

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



Note: 1.The EUT clearance from any metallic obstacles shall be at least 0,5 m.
2. Interconnecting cables (≦1 m) belonging to the EUT shall remain on the insulating support.
3. 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.

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

12.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

12.5 Test Results

Input Power	110Vdc	Tested by	Thomas Cheng
Environmental Conditions	24 °C, 62% RH	Test mode	Mode 1

Frequency (MHz)	Level (Vrms)	Tested Line	Injection Method	Return Path	Observation	Performance Criterion
0.15 – 80	10	DC power	CDN-M2	N/A	Note	A
0.15 – 10	3	DC power	CDN-M2	N/A	Note	A
10 – 30	3 – 1	DC power	CDN-M2	N/A	Note	A
30 – 80	1	DC power	CDN-M2	N/A	Note	A

Note: The EUT function was correct during the test.

13 Power Frequency Magnetic Field Immunity Test

13.1 Test Specification

Basic Standard:	EN/IEC 61000-4-8
Frequency Range:	50Hz
Field Strength:	1A/m, 100A/m, 1000A/m
Observation Time:	1 minute for Field Strength 1A/m, 100A/m 1 second for Field Strength 1000A/m
Inductance Coil:	Rectangular type, 1 m x 1 m

13.2 Test Instruments

For Field Strength 1A/m, 100A/m

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
HAEFELY Magnetic Field Tester	MAG 100	083794-06	NA	NA
COMBINOVA Magnetic Field Meter	MFM10	224	Apr. 24, 2018	Apr. 23, 2019
F.W.BELL 4190 Gaussmeter	4190	0743043	Mar. 12, 2018	Mar. 11, 2019

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS Room No. 1
3. Tested Date: Nov. 9, 2018

For Field Strength 1000A/m

Description & Manufacturer	Model no.	Serial No.	Calibrated DATE	Calibrated Until
Triaxial Elf Magnetic Field Meter BELL	4090	NA	Feb. 08, 2018	Feb. 07, 2019
Power frequency magnetic filed coil 3ctest	TCX30	EC1281401	Mar. 05, 2018	Mar. 04, 2019
Power frequency magnetic filed generator 3ctest	PFMF-1200G	EC0111401	Mar. 05, 2018	Mar. 04, 2019

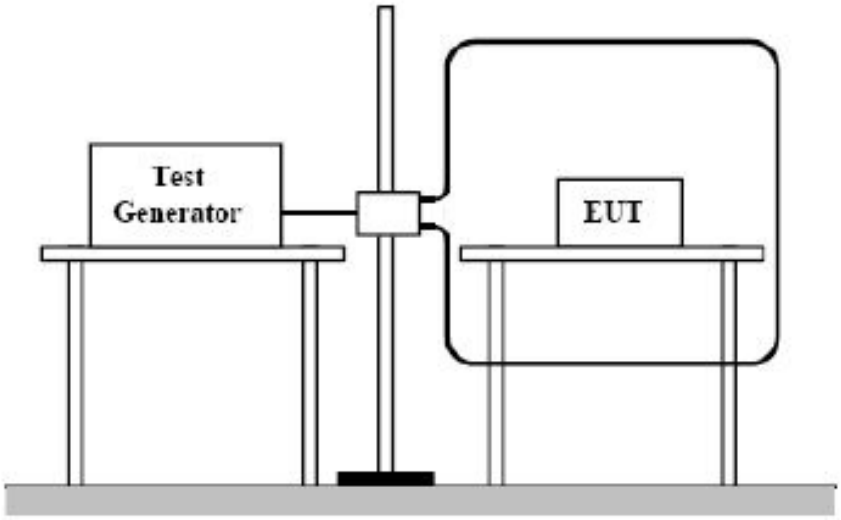
Notes: 1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Hsin Chu EMS-1 room. (TAF code: 2022)
3. Tested Date: Nov. 15, 2018

13.3 Test Arrangement

a. The equipment is configured and connected to satisfy its functional requirements.

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

c. 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.



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.

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

13.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

13.5 Test Results

Input Power	110Vdc	Tested by	Thomas Cheng
Environmental Conditions	22 °C, 68% RH	Test mode	Mode 1

Application	Frequency (Hz)	Test Duration	Field Strength (A/m)	Observation	Performance Criterion
X - Axis	50	1 min.	1, 100	Note	A
Y - Axis	50	1 min.	1, 100	Note	A
Z - Axis	50	1 min.	1, 100	Note	A

Note: The EUT function was correct during the test.

Input Power	110Vdc	Tested by	Kevin Ko
Environmental Conditions	26 °C, 64% RH	Test mode	Mode 1

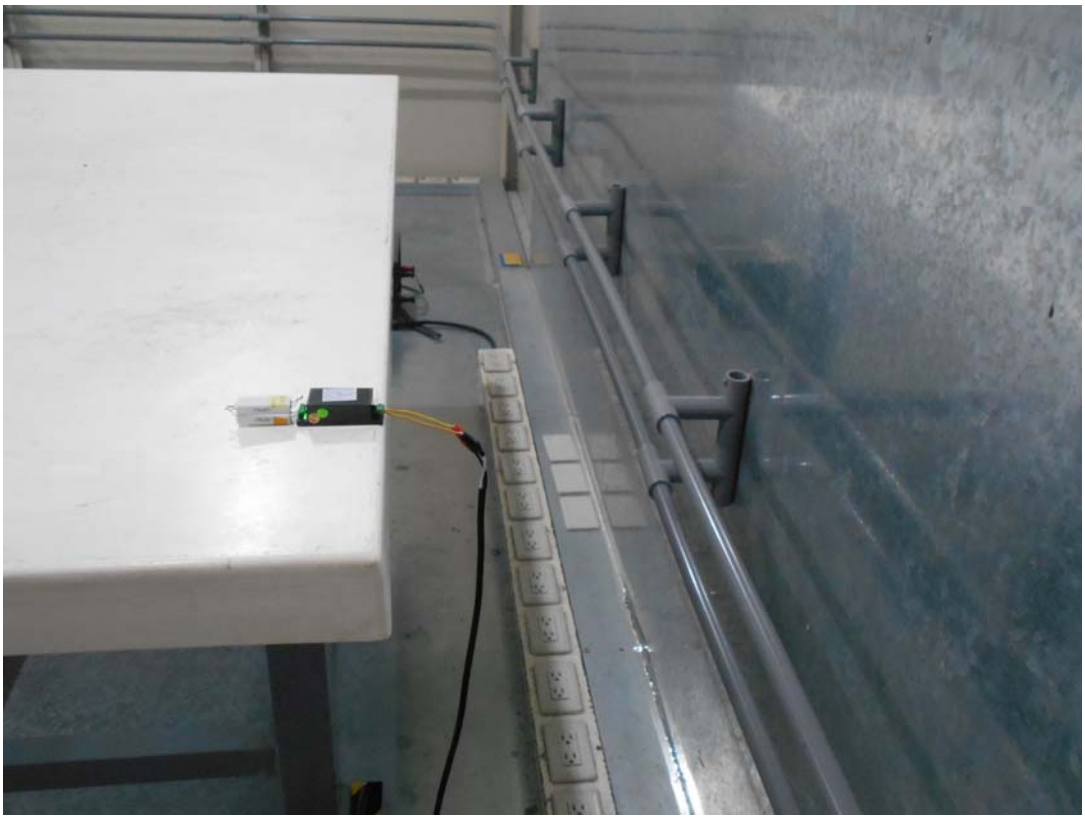
Application	Frequency (Hz)	Test Duration	Field Strength (A/m)	Observation	Performance Criterion
X - Axis	50	1 sec.	1000	Note	A
Y - Axis	50	1 sec.	1000	Note	A
Z - Axis	50	1 sec.	1000	Note	A

Note: The EUT function was correct during the test.
Remark: The test, calibration and test results are compliance with the TAF (TAF code: 2022).

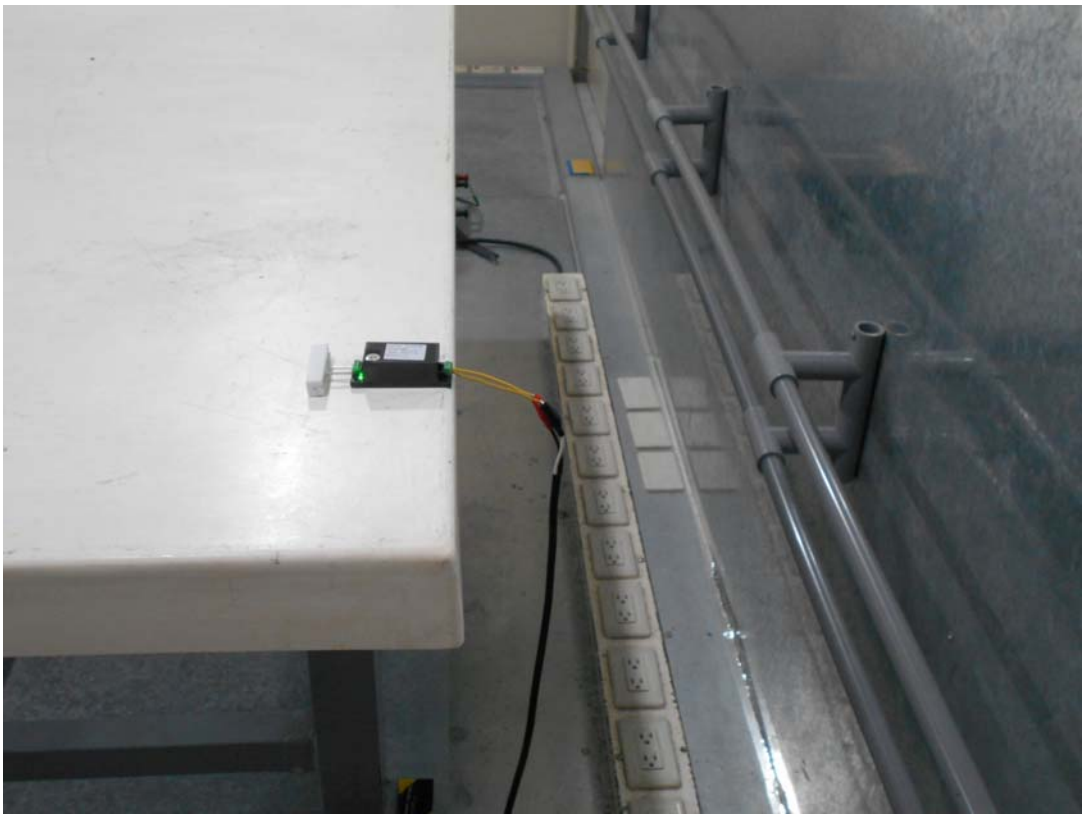
14 Pictures of Test Arrangements

14.1 Conducted Emission from the Mains Power Port

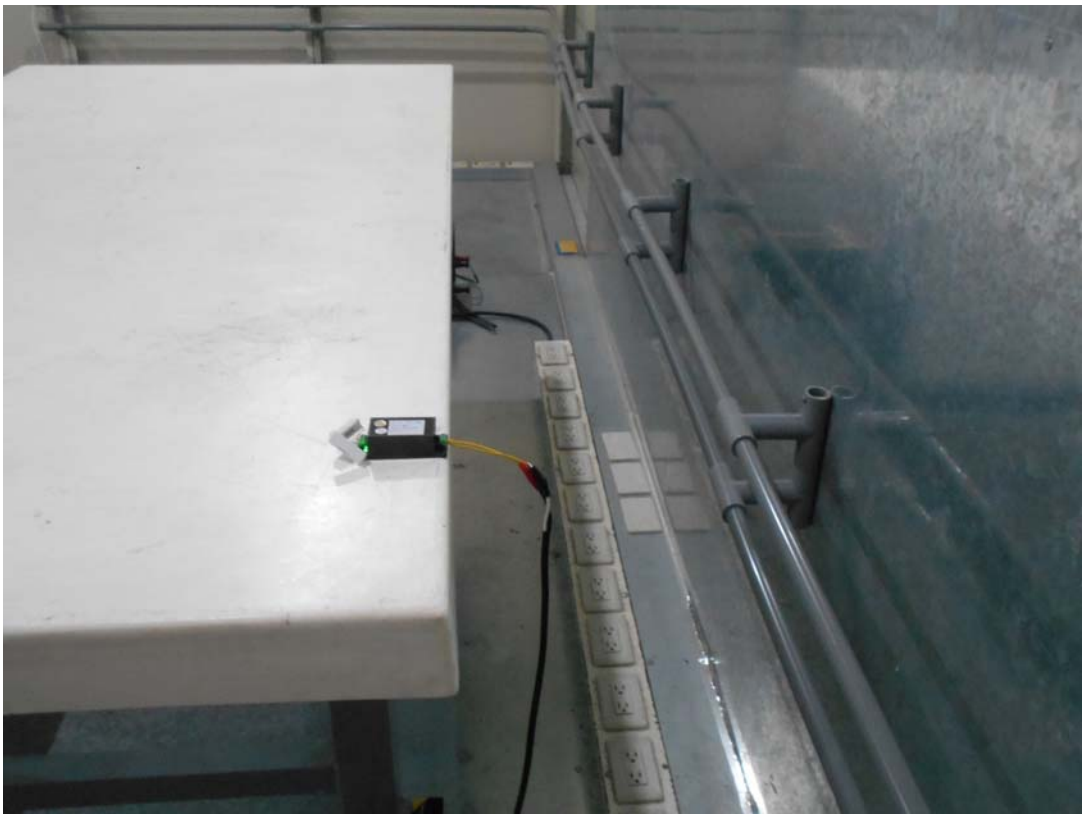
Mode 1



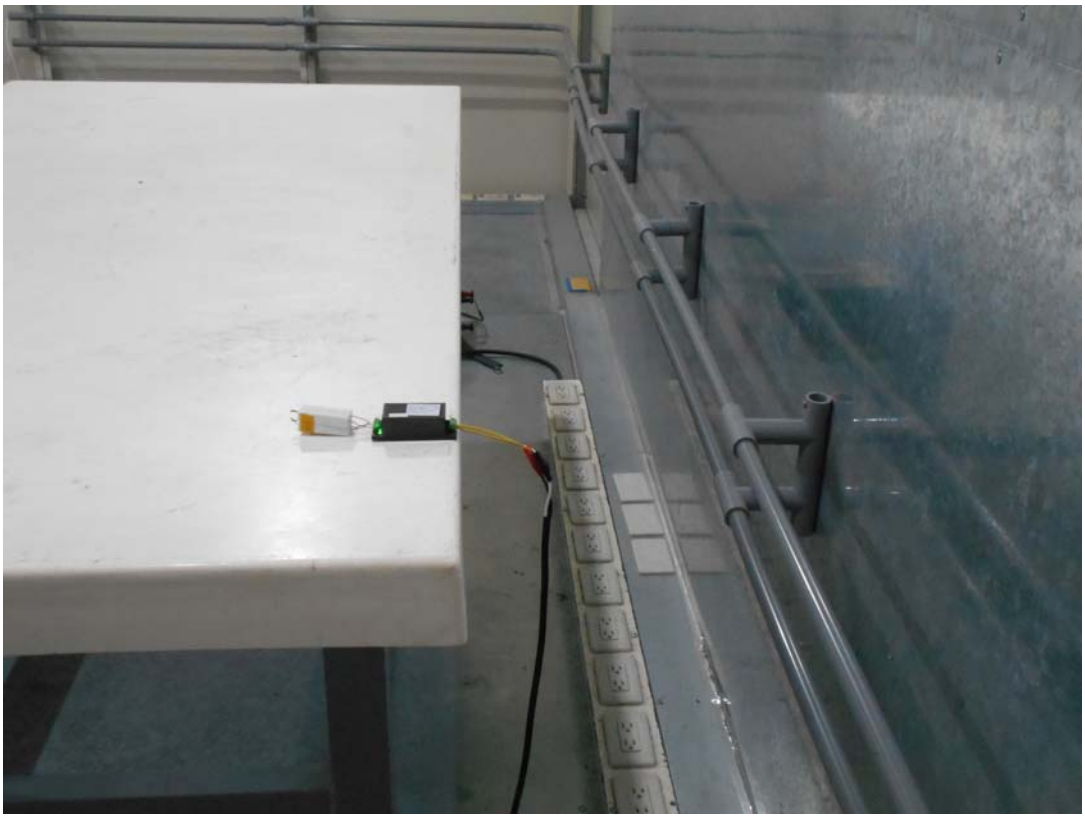
Mode 2



Mode 3

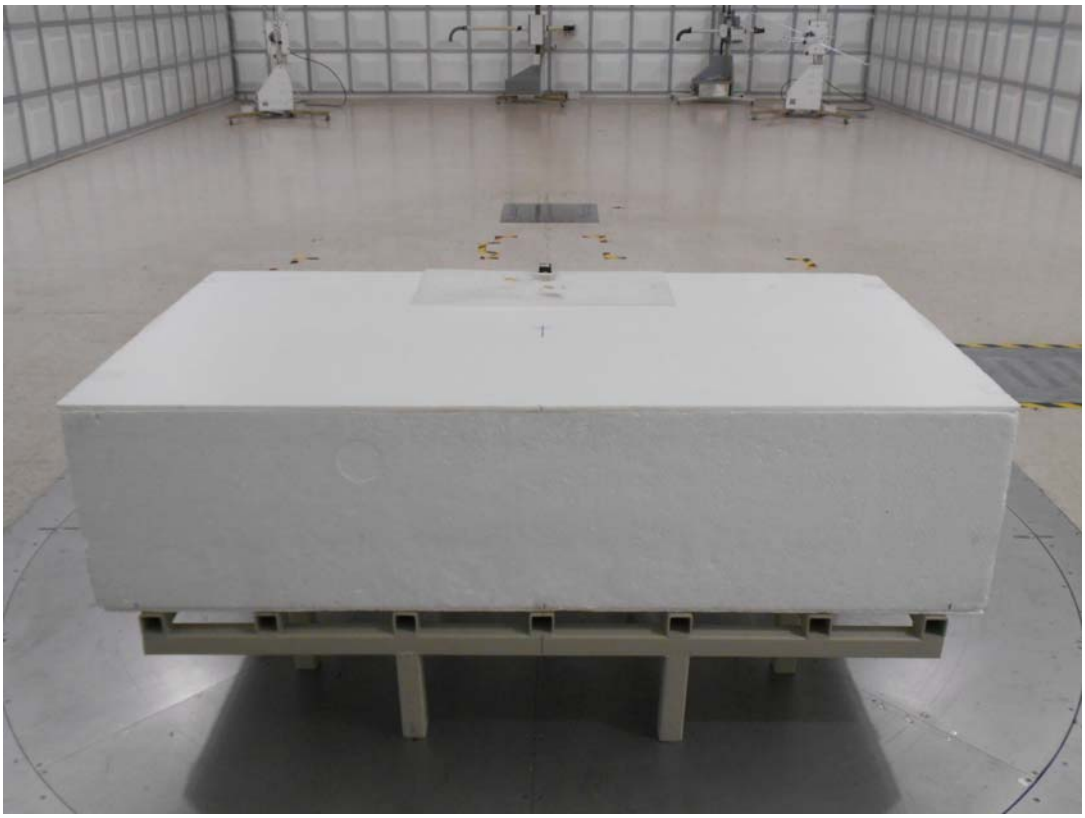


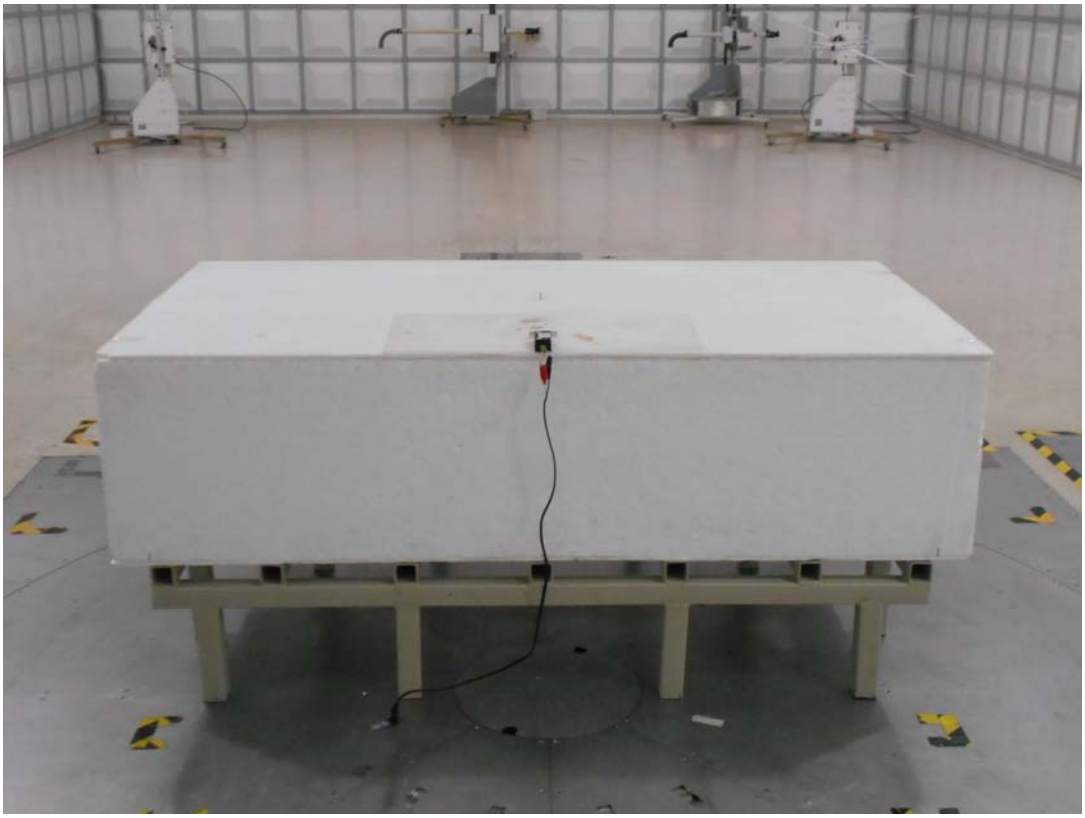
Mode 4



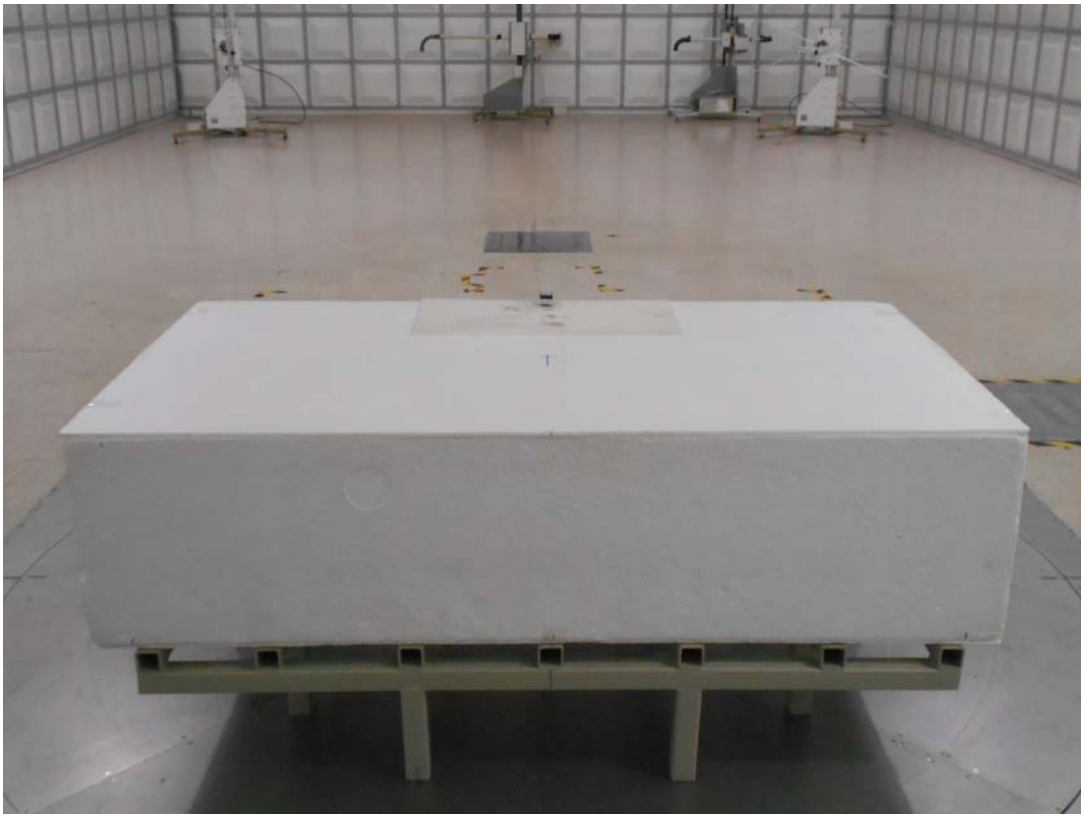
14.2 Radiated Emission at Frequencies up to 1GHz

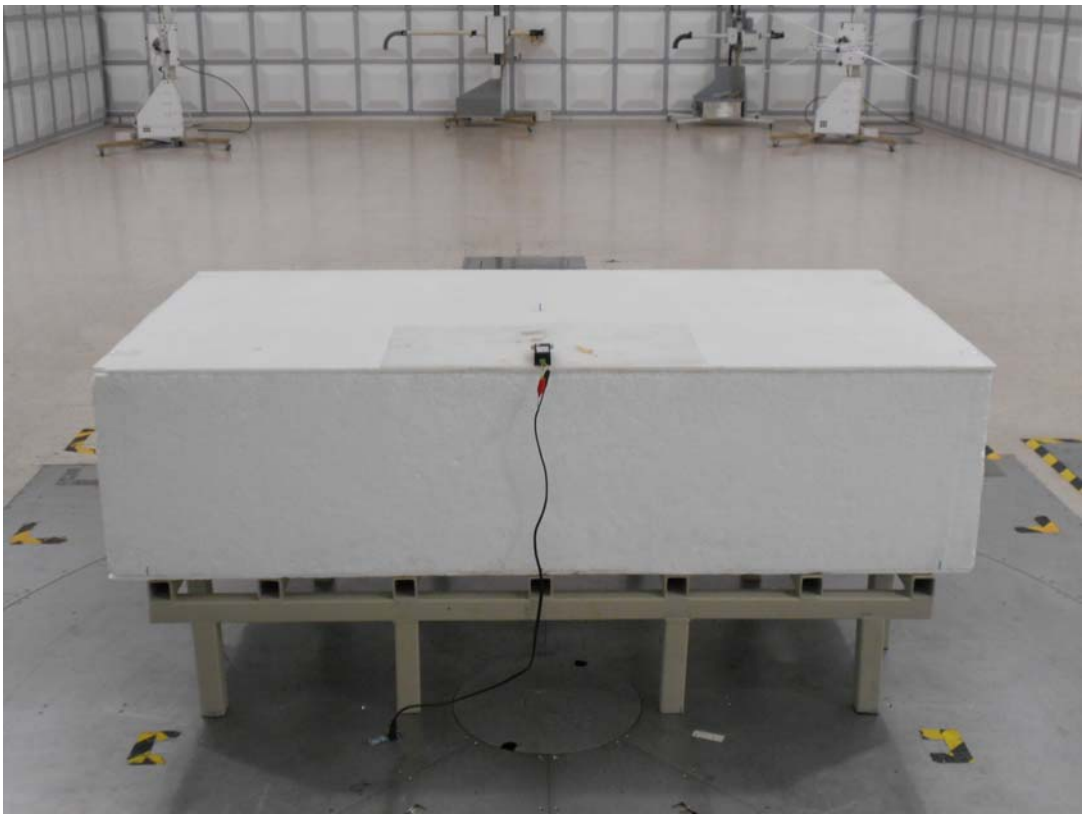
Mode 1



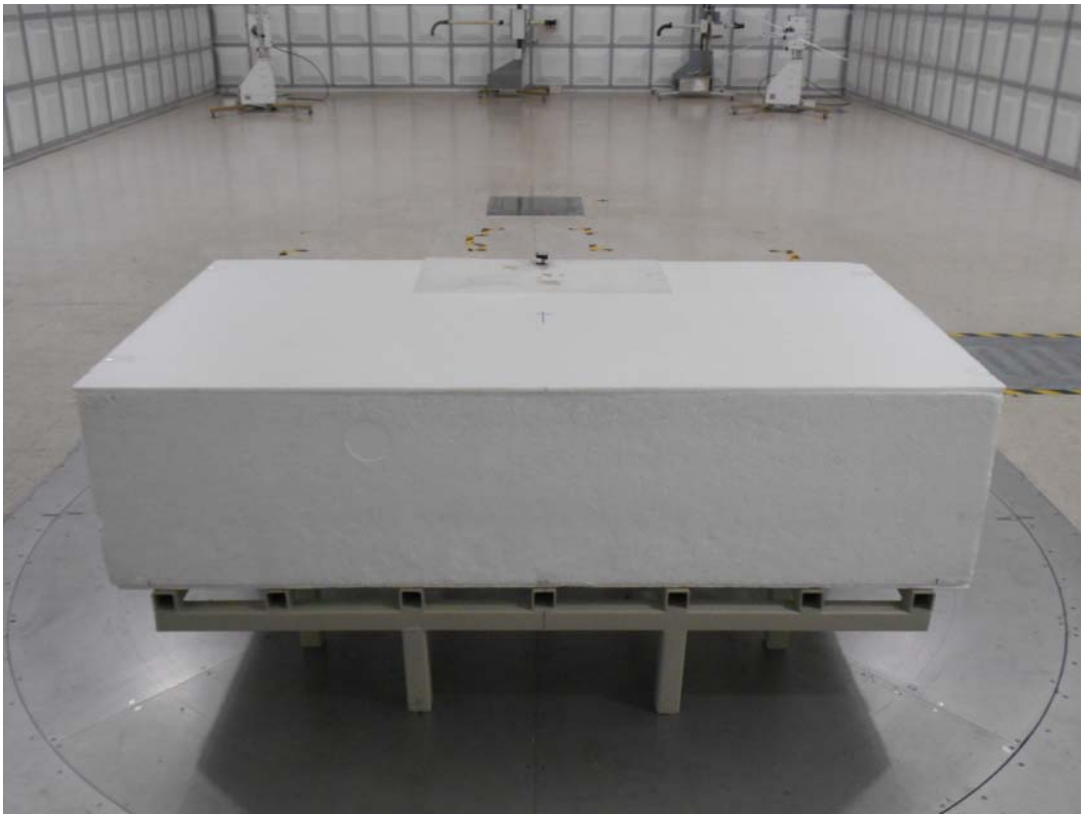


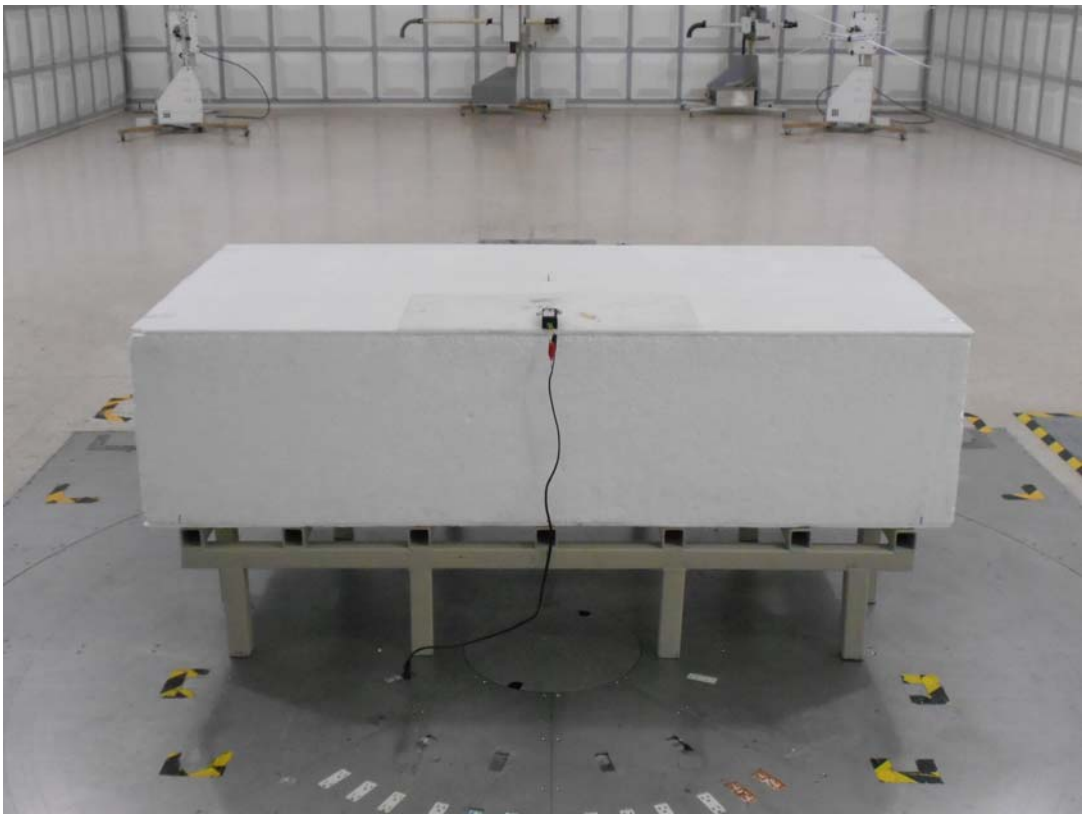
Mode 2



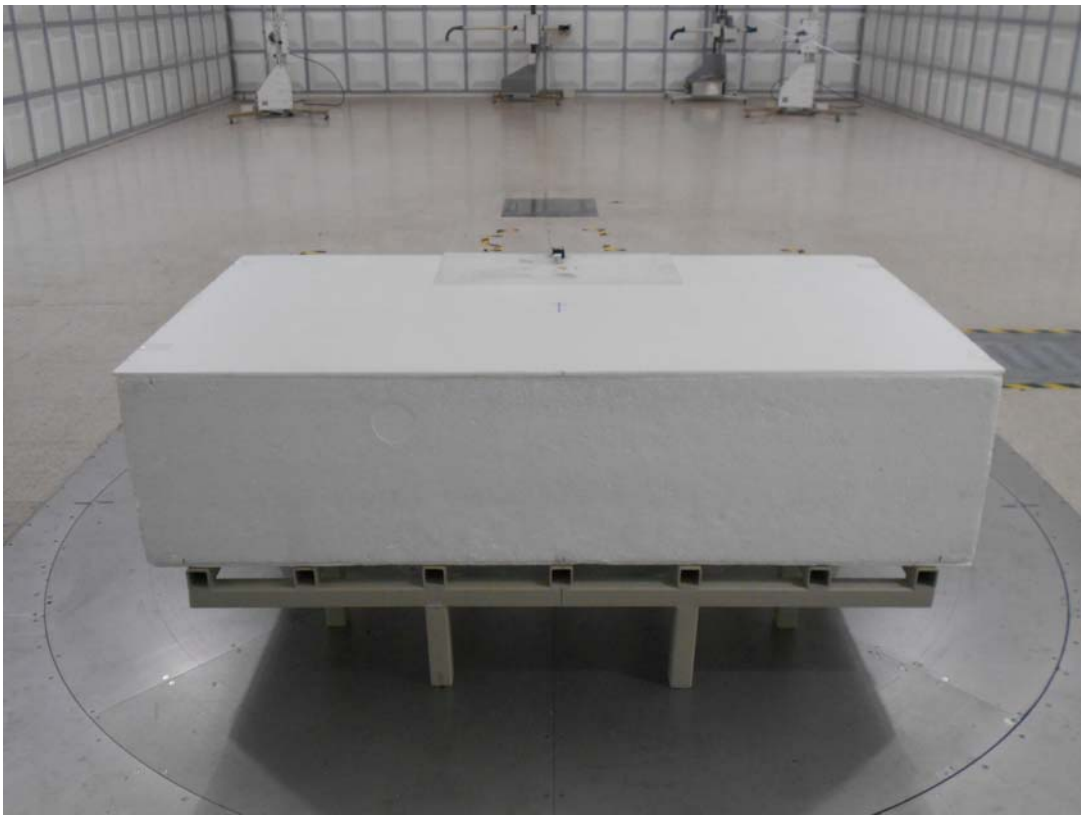


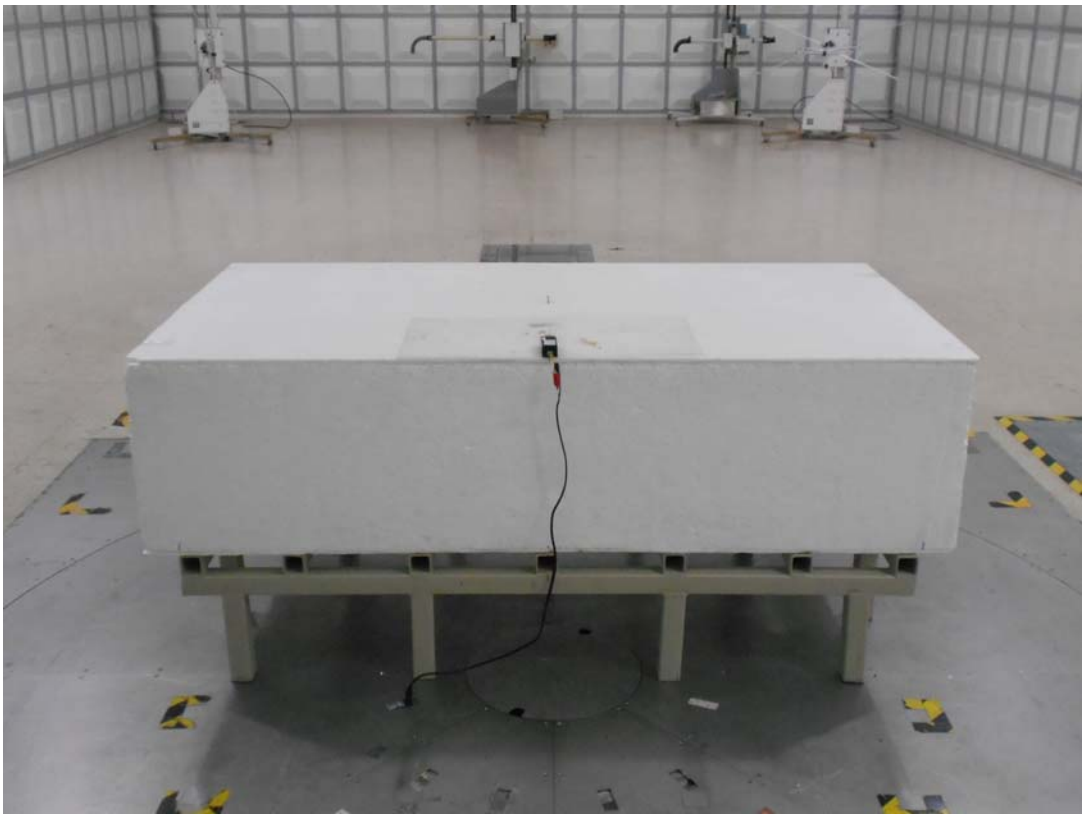
Mode 3



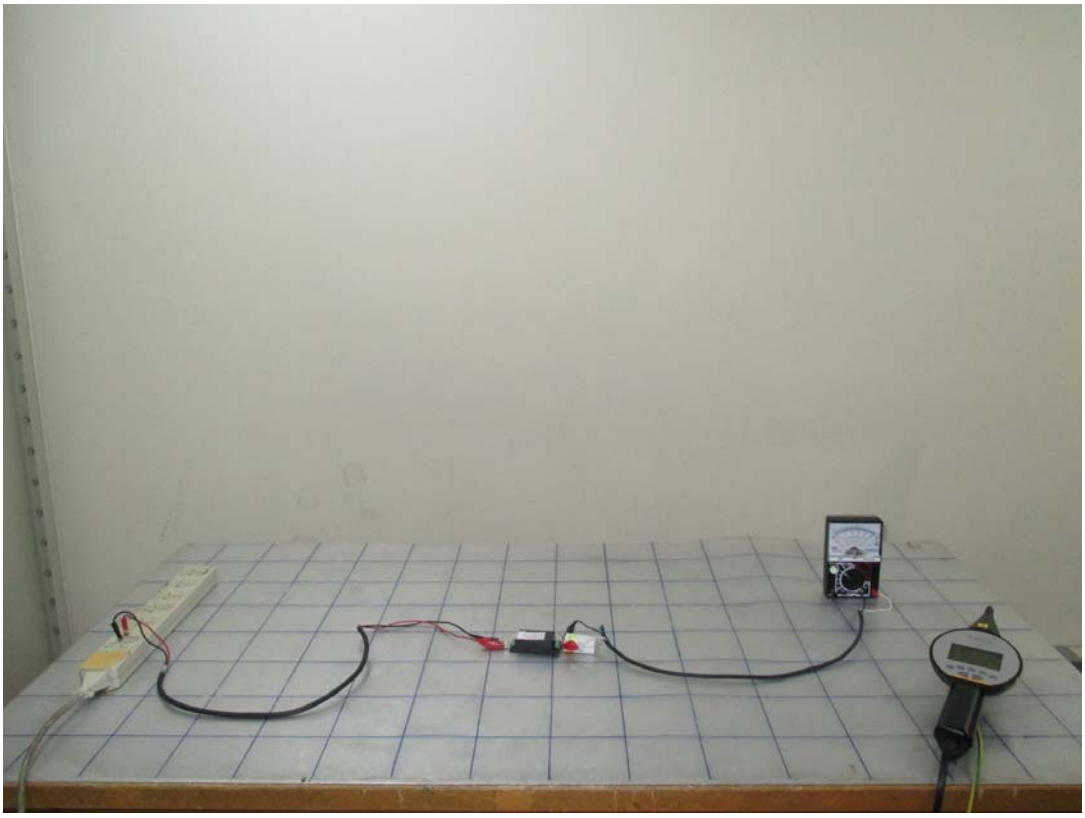


Mode 4

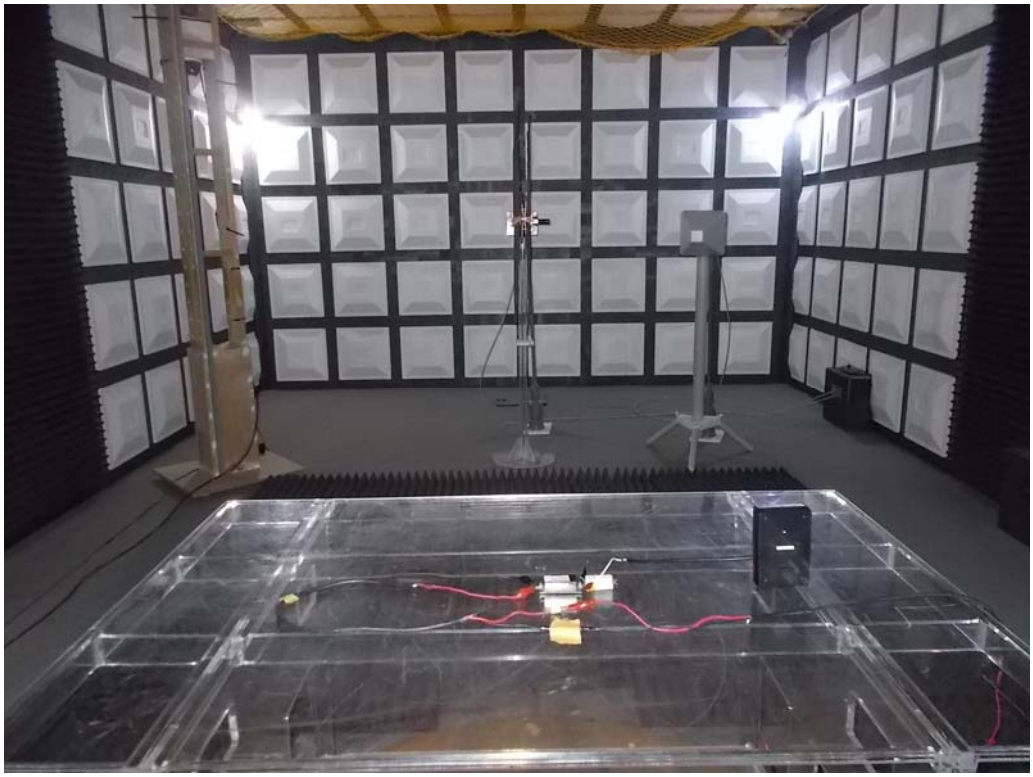




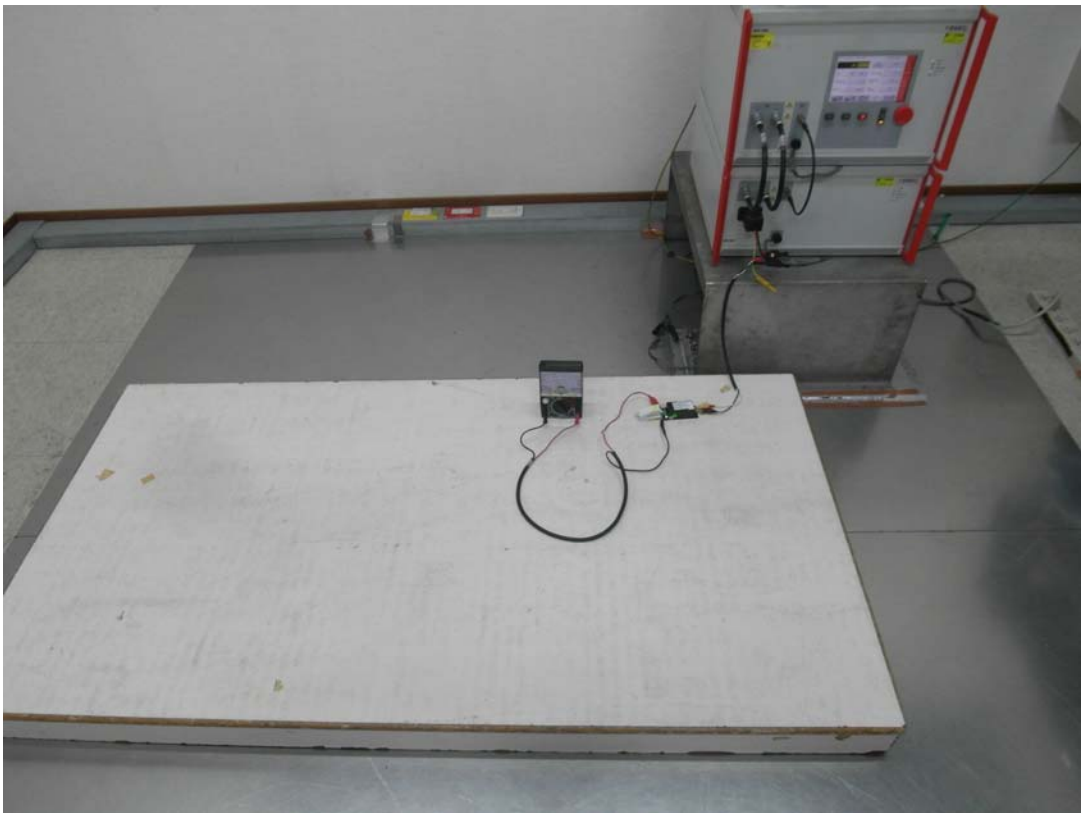
14.3 Electrostatic Discharge Immunity Test (ESD)



14.4 Radio-frequency, Electromagnetic Field Immunity Test (RS)

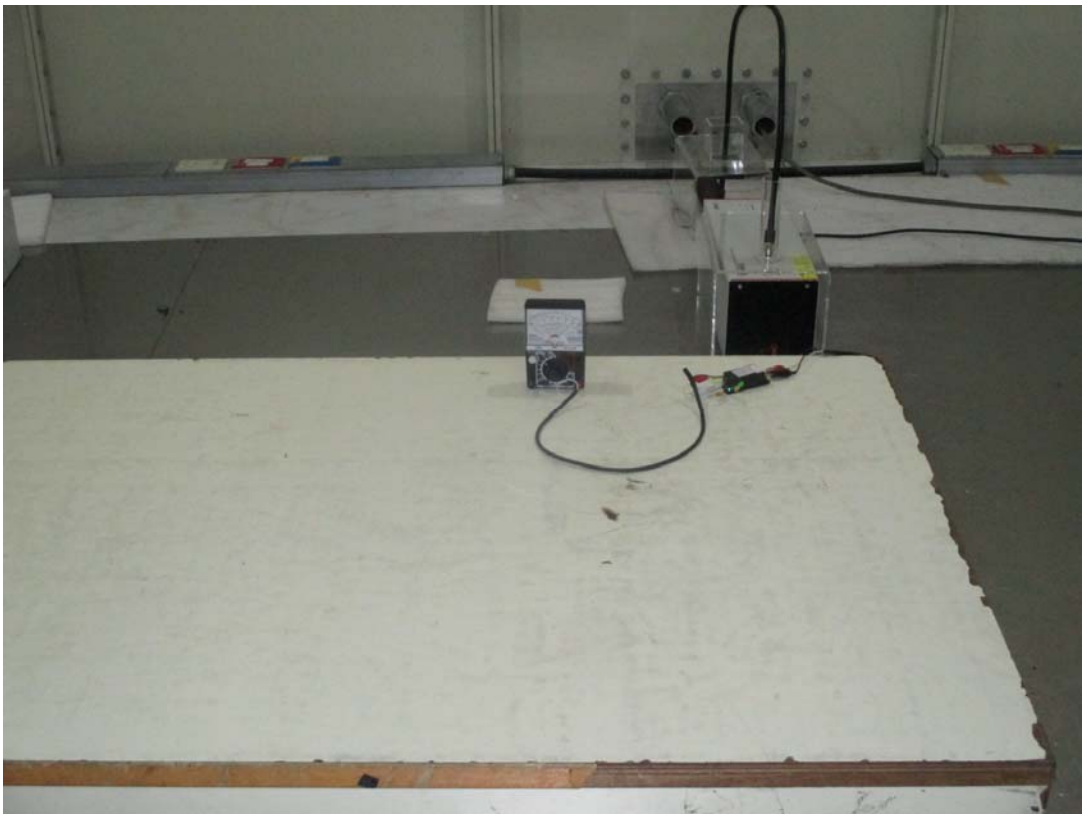


14.5 Electrical Fast Transient/Burst Immunity Test (EFT)



14.6 Surge Immunity Test

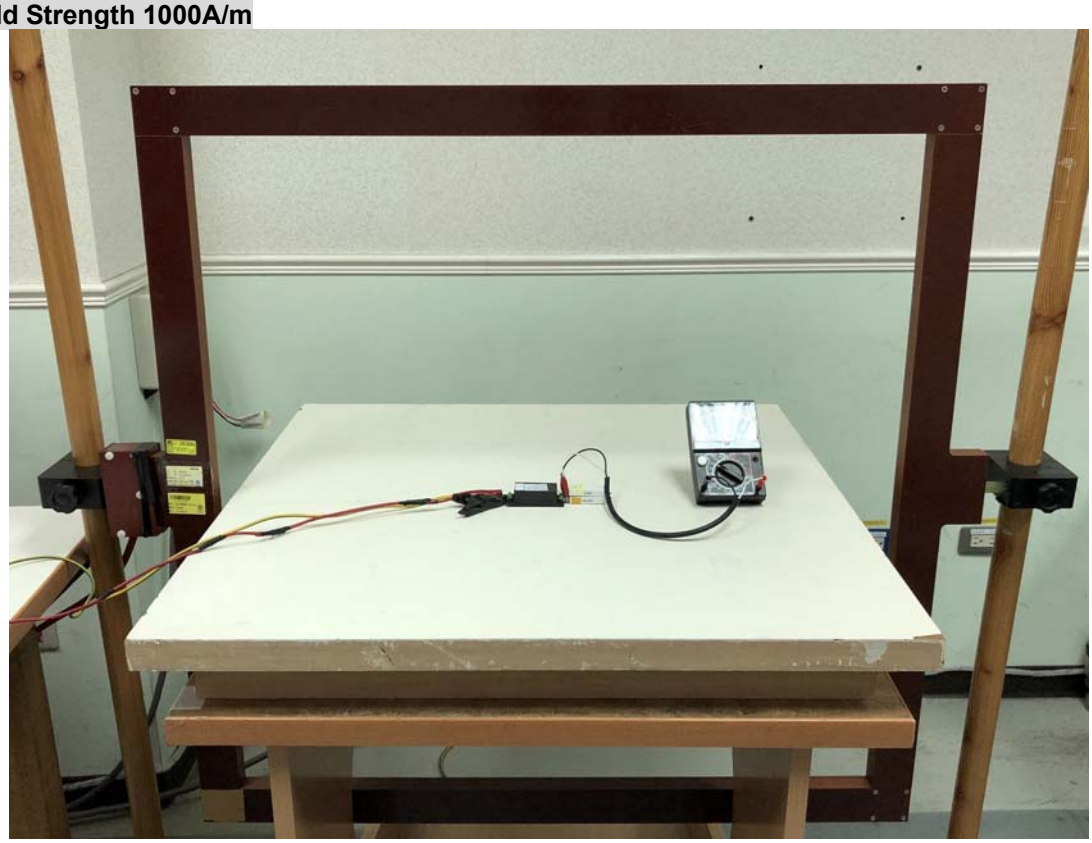
14.7 Conducted Disturbances Induced by RF Fields (CS)



14.8 Power Frequency Magnetic Field Immunity Test (PFMF)

For Field Strength 1A/m, 100A/m

For Field Strength 1000A/m



Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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