CE EMC Test Report

Report No.: CE200324D15

Test Model: RES-3000-8665U

Series Model: RES-3XXXXXXXXXXXXXXXXXXX
(“X” can be 0-9, A-Z or blank for marketing purpose)

Received Date: Mar. 24, 2020

Test Date: Apr. 20 to May 7, 2020

Issued Date: May 13, 2020

Applicant: Vecow Co., Ltd.

Address: 3F., No.10, Jiankang Rd., Zhonghe Dist., New Taipei City 23586, Taiwan

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

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
CE200324D15	Original release.	May 13, 2020

1 Certificate of Conformity

Product:	RES-3000 Series
Brand:	Vecow
Test Model:	RES-3000-8665U
Series Model:	RES-3XXXXXXXXXXXXXXXXXXX
	("X" can be 0-9, A-Z or blank for marketing purpose)
Sample Status:	Engineering sample
Applicant:	Vecow Co., Ltd.
Test Date:	Apr. 20 to May 7, 2020
Standards:	**EN 60945:2002, clause 9, 10**
	EN 61000-3-2:2014
	EN 61000-3-3:2013
	IEC 61000-4-2:2008 ED. 2.0
	IEC 61000-4-3:2010 ED. 3.2
	IEC 61000-4-4:2012 ED. 3.0
	IEC 61000-4-5:2014 +A1:2017 ED. 3.0
	IEC 61000-4-6:2013 ED. 4.0
	IEC 61000-4-11:2004 +A1:2017 ED. 2.0

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:** May 13, 2020

Celia Chen / Supervisor

Approved by : _____ , **Date:** May 13, 2020

Jim Hsiang / Associate Technical Manager

2 Summary of Test Results

<table>
<tr><th colspan="5">EN 60945:2002</th></tr>
<tr><th>Clause</th><th>Basic standard</th><th>Test parameters</th><th>Result/Remarks</th><th>Verdict</th></tr>
<tr><td>9.2</td><td>CISPR 16-1-1
CISPR 16-1-2</td><td>Conducted Emissions
<table><tr><th>Frequency range:</th><th>Limits:</th><th>Bandwidth / Detectors</th></tr><tr><td>10 – 150 kHz
150 - 350 kHz
350 kHz - 30 MHz</td><td>96 - 50 dBµV
60 - 50 dBµV
50 dBµV</td><td>200 Hz / QP
9 kHz / QP
9 kHz / QP</td></tr></table></td><td>Minimum passing margin is -13.69 dB at 0.48235 MHz</td><td>Pass</td></tr>
<tr><td>9.3</td><td>CISPR 16-1-1
CISPR 16-1-4</td><td>Radiated Emissions from Enclosure Port
<table><tr><th>Frequency range:</th><th>Limits: @ 3m</th><th>Bandwidth / Detectors</th></tr><tr><td>0.15 - 0.3 MHz
0.3 - 30 MHz
30 - 2000 MHz
except for:
156 -165 MHz</td><td>80 - 52 dBµV/m
52 - 34 dBµV/m
54 dBµV/m

24 dBµV/m
or 30 dBµV/m</td><td>9 kHz / QP
9 kHz / QP
120 kHz / QP

9 kHz / QP
9 kHz / peak</td></tr></table></td><td>Minimum passing margin is -0.43 dB at 1078.00 MHz</td><td>Pass</td></tr>
<tr><td colspan="2">EN 61000-3-2:2014</td><td>Harmonic current emissions</td><td>The power consumption of EUT is less than 75W and no limits apply.</td><td>Pass</td></tr>
<tr><td colspan="2">EN 61000-3-3:2013</td><td>Voltage fluctuations and flicker</td><td>$P_{st} \leqq 1.0$
$d_{max} \leqq 4\%$
$P_{lt} \leqq 0.65$
$d_c \leqq 3.3\%$
$T_{max} \leqq 500ms$</td><td>Pass</td></tr>
<tr><td>10.3</td><td>IEC 61000-4-6</td><td>Conducted Radio Frequency disturbance
a.c. and d.c. power ports, signal and control ports:
Modulation: 80% AM at 400 Hz
Amplitude: 3 V rms for frequency range: 150 kHz - 80 MHz
10 V rms at spot frequencies: 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, and 25 MHz.
Performance Criterion A</td><td>Performance Criterion A</td><td>Pass</td></tr>
<tr><td>10.4</td><td>IEC 61000-4-3</td><td>Radiated disturbance, Enclosure port
Frequency range: 80 MHz to 2 GHz
Modulation: 80% AM at 400 Hz
Field strength: 10V/m
Performance Criterion A</td><td>Performance Criterion A</td><td>Pass</td></tr>
<tr><td>10.5</td><td>IEC 61000-4-4</td><td>Bursts/Fast Transients
Rise time/width: 5/50 (T_r/T_h) ns
Amplitude: 2kV differential on a.c. power lines, 2.5kHz
1kV common mode on signal and control lines, 5kHz
Performance Criterion B</td><td>Performance Criterion B</td><td>Pass</td></tr>
<tr><td>10.6</td><td>IEC 61000-4-5</td><td>Surge / Slow transients
AC Power ports: 1.2/50 (8/20) (T_r/T_h) µs
Line to line: ±0.5kV
Line to earth: ±1kV
Performance Criterion B</td><td>Performance Criterion A</td><td>Pass</td></tr>
</table>

<table>
<tr><th colspan="5">EN 60945:2002</th></tr>
<tr><th>Clause</th><th>Basic standard</th><th>Test parameters</th><th>Result/Remarks</th><th>Verdict</th></tr>
<tr><td>10.7</td><td>IEC
61000-4-11</td><td>Power supply short term variation: a.c. power ports
<table><tr><td>Voltage deviation transient (duration 1.5 s)</td><td>Frequency deviation transient (duration 5 s)</td></tr><tr><td>+20 %</td><td>+10 %</td></tr><tr><td>-20 %</td><td>- 10 %</td></tr></table>Performance Criterion B</td><td>Performance Criterion A</td><td>Pass</td></tr>
<tr><td>10.8</td><td>IEC
61000-4-11</td><td>Power supply failure: a.c. and d.c. power ports
60 s interruption
Performance Criterion C</td><td>Performance Criterion C</td><td>Pass</td></tr>
<tr><td>10.9</td><td>IEC 61000-4-2</td><td>Electrostatic Discharge
Contact discharge: 6kV
Air discharge: 8kV
Performance Criterion B</td><td>Performance Criterion B</td><td>Pass</td></tr>
</table>

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 IEC basic standards are applied with latest version if customer has no special requirement.

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	Expanded Uncertainty (k=2) (±)
Conducted disturbance at mains port using AMN, 9kHz ~ 30MHz	2.94 dB
Radiated disturbance, 9kHz ~ 30MHz	2.61 dB
Radiated disturbance, 30MHz ~ 1GHz	5.57 dB
Radiated disturbance, 1GHz ~ 2GHz	4.96 dB

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	RES-3000 Series
Brand	Vecow
Test Model	RES-3000-8665U
Series Model	RES-3XXXXXXXXXXXXXXXXXXX (“X” can be 0-9, A-Z or blank for marketing purpose)
Model Difference	For marketing purpose
Sample Status	Engineering sample
Operating Software	WIN10
Power Supply Rating	24Vdc from adapter
Accessory Device	Adapter
Data Cable Supplied	N/A

Note:

1. The EUT with following interfaces:

- ✧ USB 2.0
- ✧ DVI (resolution up to 1920 x 1200 @ 60Hz)
- ✧ COM 2 (RS-232)
- ✧ COM 3 (RS-232)
- ✧ LAN*2 (10/100/1000Mbps)
- ✧ DC input

2. The EUT uses following adapter.

Brand	FSP
Model	FSP-120AABN2
Input Power	100-240Vac, 50-60Hz, 1.8A
Output Power	24Vdc, 5A
Power Line	AC 3-Pin, Non-shielded DC (1.0m) with one ferrite core

3.2 Features of EUT

1. The tests reported herein were performed according to the method specified by Vecow Co., Ltd., for detailed feature description, please refer to the manufacturer's specifications or user's manual.

2. The EUT was configured with the following key components:

Component	Brand/Model/Specification
CPU	Intel® CoreTM i7-8665UE Processor 1.70GHz
SSD	Innodisk 64GB 2.5" SATA SSD 3ME4, Industrial, W/T Grade
RAM	DDR4 2133 ECC SODIMM / innodisk / M4D0-AGS1QCRG / 16GB

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

Test modes are presented in the report as below.

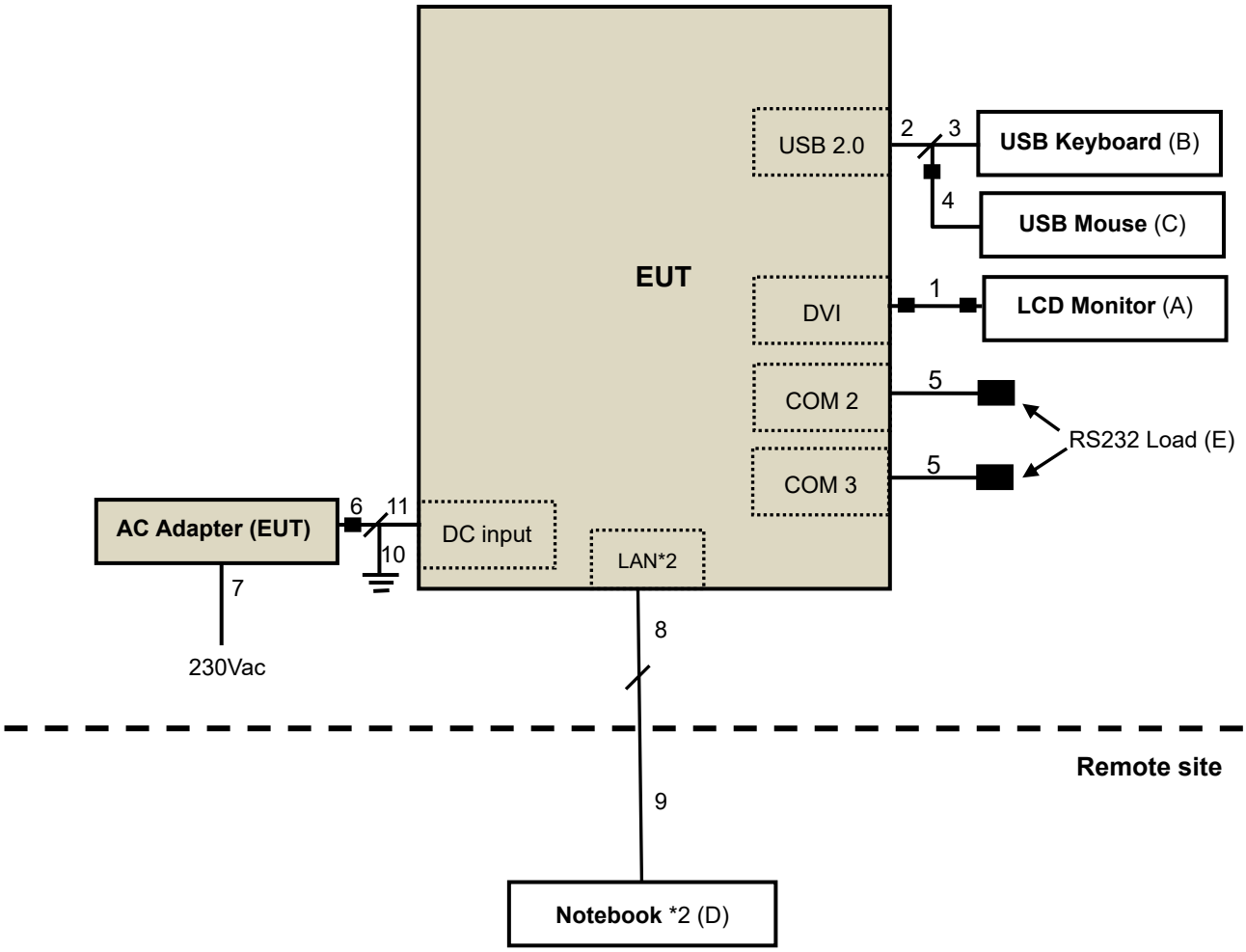
Mode	Test Condition	Input Power
Conducted emission test		
1	Full system, DVI (resolution up to 1920 x 1200 @ 60Hz)	230Vac/ 50Hz
Radiated emission test		
1	Full system, DVI (resolution up to 1920 x 1200 @ 60Hz)	230Vac/ 50Hz
Harmonics, Flicker, Immunity tests		
1	Full system, DVI (resolution up to 1920 x 1200 @ 60Hz)	230Vac/ 50Hz

3.4 Test Program Used and Operation Descriptions

a. Turned on the power of all equipment.
b. EUT ran a test program to enable all functions.
c. EUT read and wrote messages from/to HDD.
d. EUT sent and received messages to/ from Notebook PCs (kept in a remote area) via two UTP LAN cables (each 10m).
e. EUT sent “H” messages to ext. LCD Monitor and displayed “H” patterns on screen.
f. Steps c-e were repeated.

4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices



4.2 Configuration of Peripheral Devices and Cable Connections

Emission tests:

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	LCD Monitor	HP	HSTND-3781-Q	CNK5340QBP T	N/A	Provided by Lab
B.	USB Keyboard	Dell	KB216t	CN-0W33XP-LO300-7CL-1907	N/A	Provided by Lab
C.	USB Mouse	Microsoft	1113	9170528318308	N/A	Provided by Lab
D.	Notebook PC	SONY	SVS151A12P	275548477001024	N/A	Provided by Lab
	Notebook PC	ASUS	PU401L	ECNXBC012528528	N/A	Provided by Lab
E.	RS232 LOAD *2	N/A	N/A	N/A	N/A	Supplied by client

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item D acted as communication partners to transfer data.

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DVI cable	1	1.8	Y	2	Provided by Lab
2.	USB cable	1	2.0	Y	0	Provided by Lab
3.	USB cable	1	1.8	Y	0	Provided by Lab
4.	USB cable	1	1.8	Y	1	Provided by Lab
5.	RS232 cable	2	2.0	Y	0	Provided by Lab
6.	DC power cable	1	1.0	N	1	Supplied by client
7.	AC power cable	1	1.8	N	0	Supplied by client
8.	LAN cable	2	1.0	N	0	Provided by Lab (RJ45, Cat.5e)
9.	LAN cable	2	10.0	N	0	Provided by Lab (RJ45, Cat.5e)
10.	GND cable	1	1.8	N	0	Supplied by client
11.	DC power cable	1	1.8	N	0	Supplied by client

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

Harmonics, Flicker, Immunity tests:

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	LCD Monitor	DELL	U2412M	CN-07N2FG-TV100-975-095U	N/A	Provided by Lab
B.	USB Keyboard	HP	KU-1060	N/A	N/A	Provided by Lab
C.	USB Mouse	HP	MODGUO	N/A	N/A	Provided by Lab
D.	Notebook PC	Lenovo	T470	PF-0QW0NQ	N/A	Provided by Lab
	Notebook PC	DELL	E5420	7YCQBT1	N/A	Provided by Lab
E.	RS232 LOAD *2	N/A	N/A	N/A	N/A	Supplied by client

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item D acted as communication partners to transfer data.

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DVI cable	1	1.8	Y	2	Provided by Lab
2.	USB cable	1	2.0	Y	0	Provided by Lab
3.	USB cable	1	1.8	Y	0	Provided by Lab
4.	USB cable	1	1.8	Y	1	Provided by Lab
5.	RS232 cable	2	2.0	Y	0	Provided by Lab
6.	DC power cable	1	1.0	N	1	Supplied by client
7.	AC power cable	1	1.8	N	0	Supplied by client
8.	LAN cable	2	1.0	N	0	Provided by Lab (RJ45, Cat.5e)
9.	LAN cable	2	10.0	N	0	Provided by Lab (RJ45, Cat.5e)
10.	GND cable	1	1.8	N	0	Supplied by client
11.	DC power cable	1	1.8	N	0	Supplied by client

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

5 Conducted Emissions Measurement

5.1 Limits

Frequency range:	Limits:	Bandwidth / Detectors
10 – 150 kHz	96 - 50 dBµV	200 Hz / QP
150 - 350 kHz	60 - 50 dBµV	9 kHz / QP
350 kHz - 30 MHz	50 dBµV	9 kHz / QP

Notes: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range of 10kHz to 150kHz and 150kHz to 350kHz

5.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESR3	102413	Feb. 17, 2020	Feb. 16, 2021
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH2-Z5	100104	Dec. 13, 2019	Dec. 12, 2020
LISN With Adapter (for EUT)	AD10	C09Ada-001	Dec. 13, 2019	Dec. 12, 2020
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	847265/023	Oct. 31, 2019	Oct. 30, 2020
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 14, 2019	May 13, 2020
SCHWARZBECK Artificial Mains Network (for EUT)	NNLK 8121	8121-808	Apr. 10, 2020	Apr. 9, 2021
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C09.01	Aug. 15, 2019	Aug. 14, 2020
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010789	May 13, 2019	May 12, 2020

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. The test was performed in Shielded Room No. 9.
3. The VCCI Site Registration No. C-11312.
4. Tested Date: Apr. 20, 2020

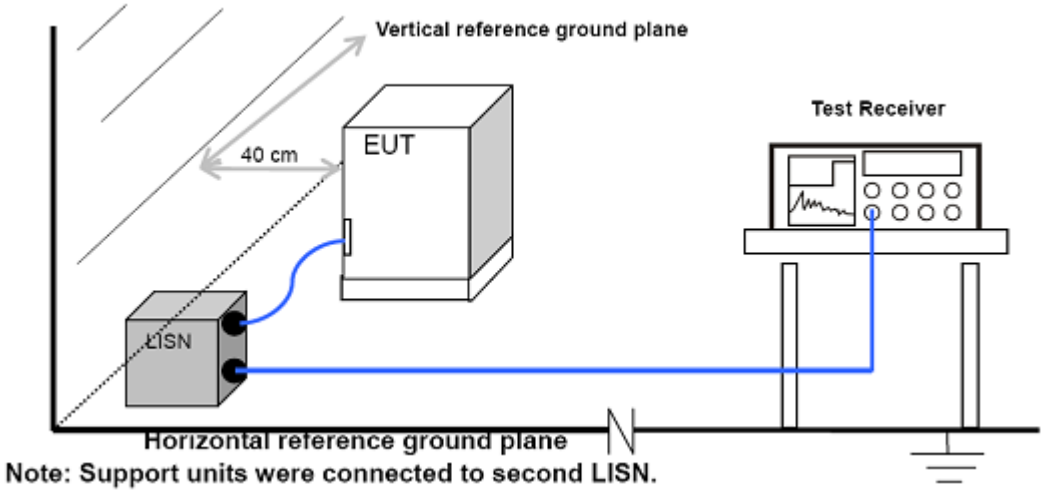
5.3 Test Arrangement

a. The power input cables between the a.c. and the d.c. power ports of the EUT and the artificial mains network shall be screened and not exceed 0,8 m in length.

b. The measuring equipment and EUT was mounted on, and bonded to, an earth plane of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

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

d. The frequency range from 10kHz to 30MHz was searched. The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak values against the limits at frequencies of interest unless the margin is 20 dB or greater.



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

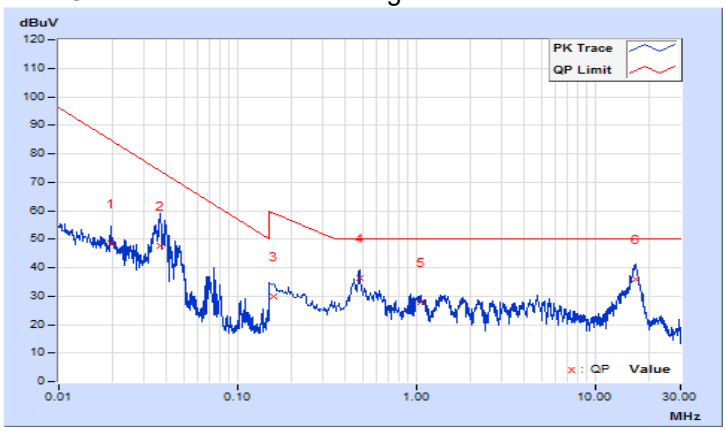
5.4 Test Results

Frequency Range	10kHz ~ 150kHz; 150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 200Hz; Quasi-Peak (QP), 9kHz
Input Power	230Vac, 50Hz	Environmental Conditions	24℃, 76%RH
Tested by	ED. Lin		
Test Mode	Mode 1		

Phase Of Power : Line (L)						
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)
			Q.P.	Q.P.	Q.P.	Q.P.
1	0.01945	10.61	37.98	48.59	84.70	-36.11
2	0.03690	10.46	37.32	47.78	73.82	-26.04
3	0.15750	10.49	19.22	29.71	59.42	-29.71
4	**0.48235**	**10.51**	**25.80**	**36.31**	**50.00**	**-13.69**
5	1.05913	10.52	17.21	27.73	50.00	-22.27
6	16.83557	11.39	24.39	35.78	50.00	-14.22

Remarks:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level – Limit value
3. Correction factor = Insertion loss + Cable loss
4. Emission Level = Correction Factor + Reading Value



Frequency Range	10kHz ~ 150kHz; 150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 200Hz; Quasi-Peak (QP), 9kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	24℃, 76%RH
Tested by	ED. Lin		
Test Mode	Mode 1		

Phase Of Power : Neutral (N)						
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**	**Emission Level (dBuV)**	**Limit (dBuV)**	**Margin (dB)**
			Q.P.	**Q.P.**	**Q.P.**	**Q.P.**
1	0.03848	10.43	35.70	46.13	73.11	-26.98
2	0.15782	10.47	18.06	28.53	59.40	-30.87
3	0.20474	10.49	18.03	28.52	56.33	-27.81
4	0.48235	10.50	24.29	34.79	50.00	-15.21
5	4.61723	10.73	17.09	27.82	50.00	-22.18
6	16.38592	11.21	21.67	32.88	50.00	-17.12

Remarks:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level – Limit value
3. Correction factor = Insertion loss + Cable loss
4. Emission Level = Correction Factor + Reading Value

6 Radiated Emissions from Enclosure Port

6.1 Limits

Frequency range:	Limits: @ 3m	Bandwidth / Detectors
0.15 - 0.3 MHz	80 - 52 dBµV/m	9 kHz / QP
0.3 - 30 MHz	52 - 34 dBµV/m	9 kHz / QP
30 - 2000 MHz	54 dBµV/m	120 kHz / QP
except for:		
156 -165 MHz	24 dBµV/m	9 kHz / QP
	or 30 dBµV/m	9 kHz / peak

Notes:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. All emanations from a digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.
4. In addition, for the frequency band 156 MHz to 165 MHz, the measurement shall be repeated with a receiver bandwidth of 9 kHz, all other conditions remaining unchanged.
5. Alternatively, for the frequency band 156 MHz to165 MHz, a peak receiver or a frequency analyzer may be used, in accordance with the agreement between the manufacturer and the test house.

6.2 Test Instruments

For Frequency Range below 1000 MHz

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Agilent Preamplifier	8447D	2944A10386	Feb. 18, 2020	Feb. 17, 2021
Agilent Test Receiver	N9038A	MY50010135	May 29, 2019	May 28, 2020
Schwarzbeck Antenna	VULB9168	9168-434	Nov. 8, 2019	Nov. 7, 2020
Max Full. Turn Table & Tower	MF7802	MF780208103	NA	NA
Software	Radiated_V8.7.08	NA	NA	NA
WOKEN RF cable With 5dB PAD	8D	CABLE-CH7-01	Jan. 20, 2020	Jan. 19, 2021
EMCI Preamplifier	EMC001340	980269	Jun. 17, 2019	Jun. 16, 2020
EMCI Loop Antenna	LPA600	270	Aug. 23, 2019	Aug. 22, 2021
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA

Note: 1. The calibration interval of the above test instruments is 12/24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Chamber No. 7.
3. The VCCI Site Registration No. R-20008.
4. Tested Date: Apr. 21, 2020

For Frequency Range above 1000 MHz

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Agilent Spectrum	E4446A	MY51100009	Jun. 6, 2019	Jun. 5, 2020
Agilent Test Receiver	N9038A	MY50010135	May 29, 2019	May 28, 2020
EMCI Preamplifier	EMC0126545	980076	Feb. 20, 2020	Feb. 19, 2021
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 20, 2020	Feb. 19, 2021
EMCI Preamplifier	EMC184045B	980235	Feb. 20, 2020	Feb. 19, 2021
ETS Preamplifier	3117-PA	00215857	Nov. 24, 2019	Nov. 23, 2020
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 24, 2019	Nov. 23, 2020
EMCO Horn Antenna	3115	9312-4192	Nov. 24, 2019	Nov. 23, 2020
Max Full. Turn Table & Tower	MF7802	MF780208103	NA	NA
Software	Radiated_V8.7.08	NA	NA	NA
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH7-3.6m	Jul. 10, 2019	Jul. 9, 2020
MICRO-TRONICS Notch filter	BRC50703-01	010	May 30, 2019	May 29, 2020
MICRO-TRONICS Band Pass Filter	BRM17690	005	May 30, 2019	May 29, 2020

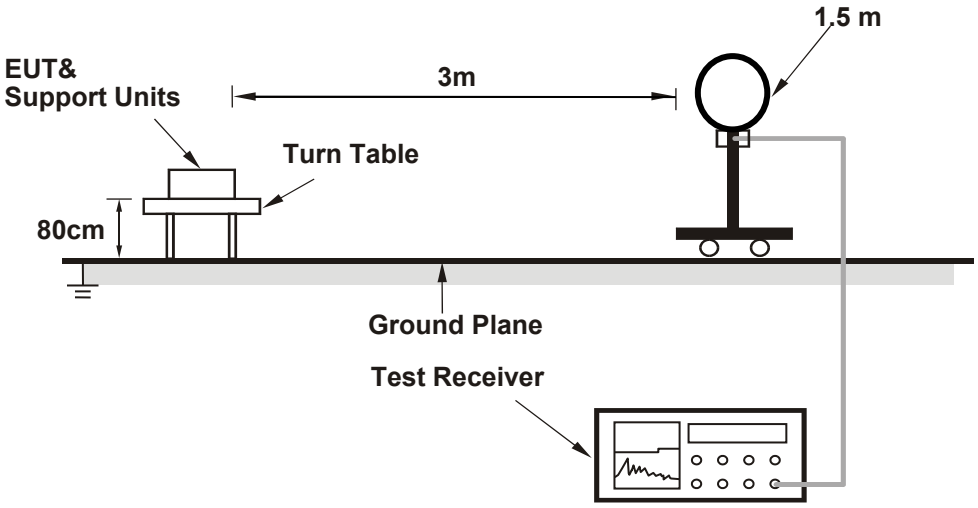
Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The 3dB beamwidth of the horn antenna is minimum 40 degree (or w = 2.18m at 3m distance) for 1~6 GHz.
3. The test was performed in Chamber No. 7.
4. The VCCI Site Registration No. G-10039
5. Tested Date: May 1, 2020

6.3 Test Arrangement

6.3.1 Radiated Emissions Test Arrangement for 150 kHz – 30 MHz:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility.
b. The loop antenna is placed at a height of 1.5 m (center of loop) at a set distance of 3 m from the periphery of the EUT.
c. Emissions reading in frequency range of 0.15 MHz to 30 MHz are measured using a Quasi-Peak detector.
d. During the compliance scan, a number of variables should be altered in combination in order to *maximize* the emission for each frequency. The variables are:
   - *EUT Azimuth.* This is varied by rotating the turntable a full 360° for each frequency of interest.
   - *Antenna Azimuth.* Position the loop antenna vertically in all azimuths, record the maximum readings obtained.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz for quasi-peak detection (QP) at frequency up to 30MHz.

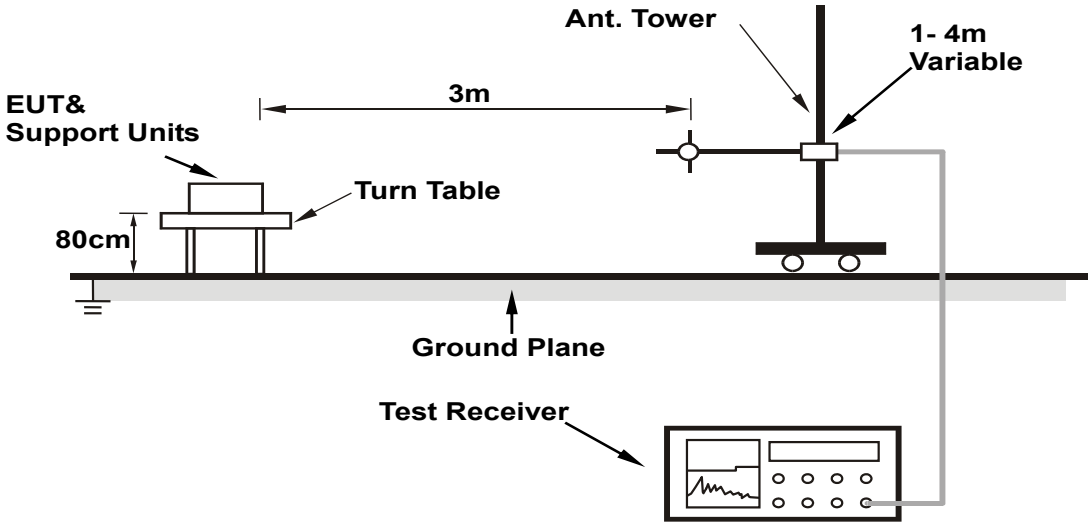


For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

6.3.2 Radiated Emissions Test Arrangement for 30 MHz – 1000 MHz:

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 3 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: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.
In addition, for the frequency band 156 MHz to 165 MHz, the measurement shall be repeated with a receiver bandwidth of 9 kHz, all other conditions remaining unchanged. Alternatively, for the frequency band 156 MHz to165 MHz, a peak receiver or a frequency analyzer may be used, in accordance with the agreement between the manufacturer and the test house.

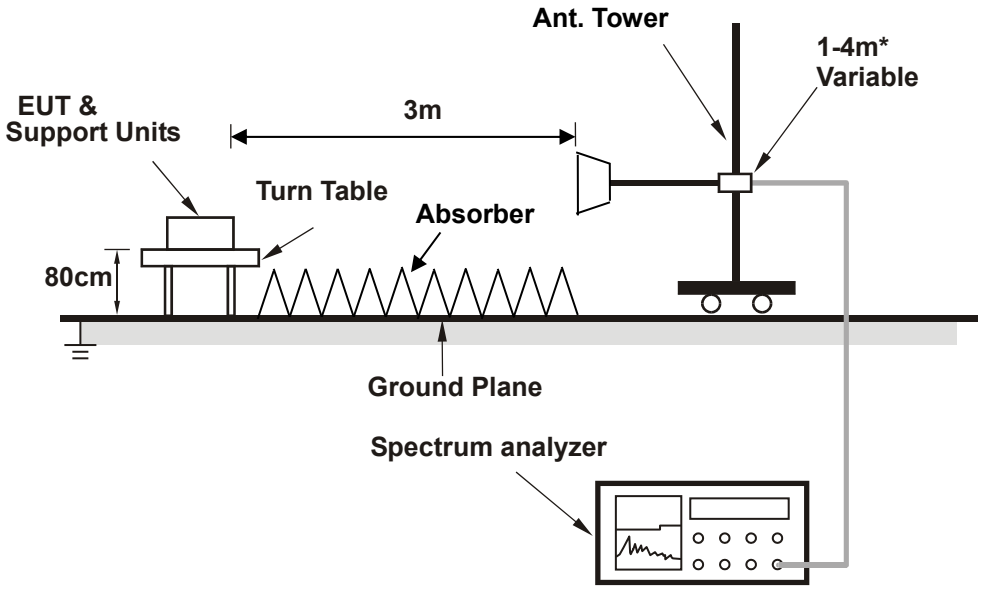


For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

6.3.3 Radiated Emissions Test Arrangement for 1000 MHz – 2000 MHz:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The spectrum analyzer system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for quasi-peak detection (QP) at frequency above 1GHz.



* : depends on the EUT height and the antenna 3dB beamwidth both.

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

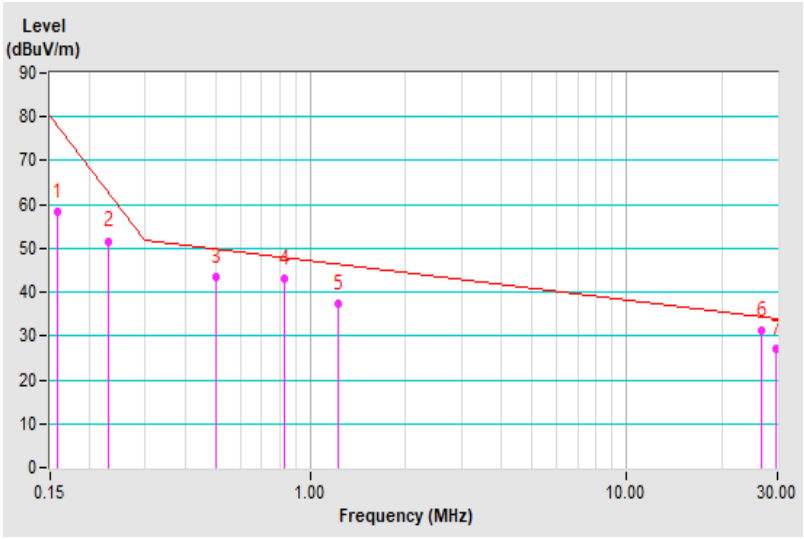
6.4 Test Results for 150 kHz – 30 MHz

Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 9kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	20℃, 70%RH
Tested by	Vincent Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Parallel at 3 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	0.158	58.42 QP	77.90	-19.48	1.50	345	45.46	12.96
2	0.229	51.67 QP	62.91	-11.24	1.50	111	41.59	10.08
3	0.503	43.56 QP	49.98	-6.42	1.50	241	39.91	3.65
4	0.822	42.92 QP	48.06	-5.14	1.50	188	41.84	1.08
5	1.220	37.23 QP	46.52	-9.29	1.50	129	37.97	-0.74
6	26.705	31.18 QP	34.45	-3.27	1.50	156	32.63	-1.45
7	29.599	26.91 QP	34.05	-7.14	1.50	205	26.86	0.05

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

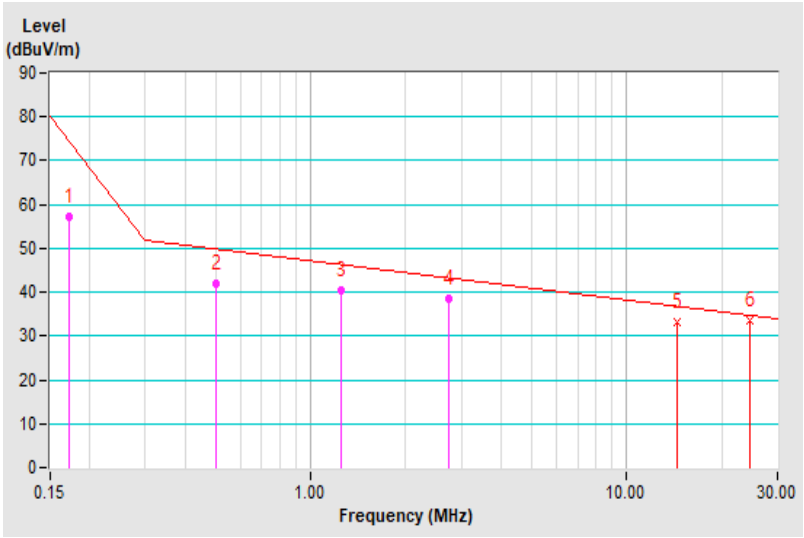


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 9kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	20℃, 70%RH
Tested by	Vincent Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Perpendicular at 3 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	0.172	57.16 QP	74.47	-17.31	1.50	360	44.75	12.41
2	0.504	41.81 QP	49.97	-8.16	1.50	192	38.17	3.64
3	1.244	40.44 QP	46.44	-6.00	1.50	259	41.22	-0.78
4	2.722	38.46 QP	43.38	-4.92	1.50	276	41.90	-3.44
5	14.369	33.15 QP	36.88	-3.73	1.50	180	37.06	-3.91
6	24.627	33.53 QP	34.77	-1.24	1.50	171	36.04	-2.51

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



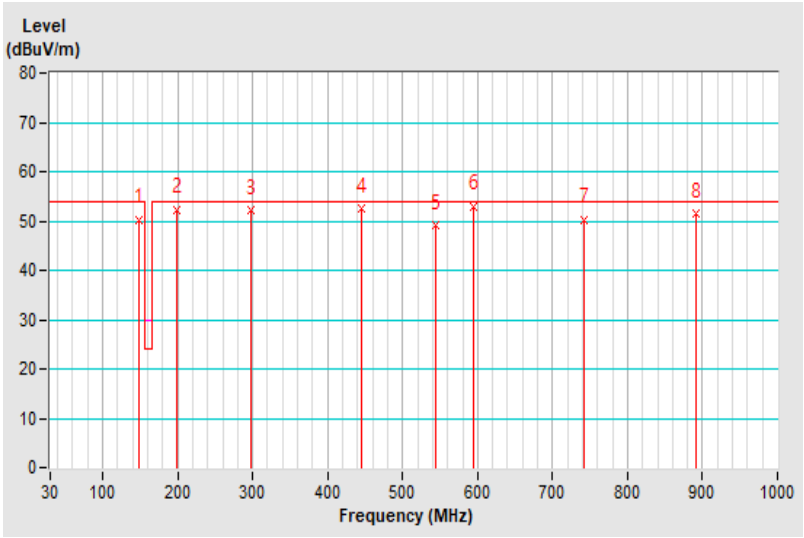
6.5 Test Results for 30 MHz – 1000 MHz

Frequency Range	30MHz ~ 1GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	20℃, 70%RH
Tested by	Vincent Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Horizontal at 3 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	148.50	50.33 QP	54.00	-3.67	1.05 H	229	60.51	-10.18
2	198.02	52.14 QP	54.00	-1.86	1.42 H	124	64.54	-12.40
3	296.99	52.08 QP	54.00	-1.92	1.05 H	342	60.01	-7.93
4	445.51	52.39 QP	54.00	-1.61	1.52 H	341	56.95	-4.56
5	544.40	48.99 QP	54.00	-5.01	1.00 H	131	51.82	-2.83
6	594.01	52.85 QP	54.00	-1.15	1.00 H	175	54.03	-1.18
7	742.50	50.33 QP	54.00	-3.67	1.00 H	162	48.35	1.98
8	891.01	51.37 QP	54.00	-2.63	1.06 H	198	46.62	4.75

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

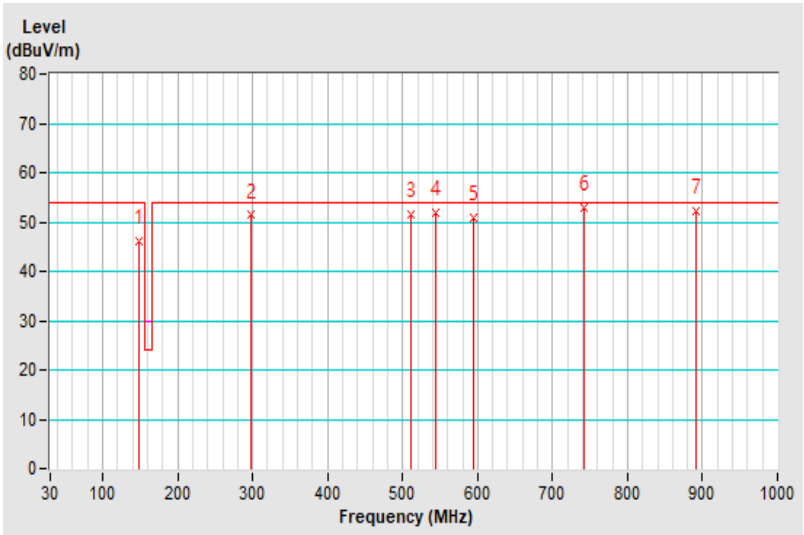


Frequency Range	30MHz ~ 1GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	20℃, 70%RH
Tested by	Vincent Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Vertical at 3 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	148.51	46.22 QP	54.00	-7.78	1.15 V	305	56.40	-10.18
2	297.01	51.38 QP	54.00	-2.62	1.32 V	26	59.31	-7.93
3	511.51	51.57 QP	54.00	-2.43	1.00 V	137	54.94	-3.37
4	544.50	51.95 QP	54.00	-2.05	1.08 V	5	54.78	-2.83
5	594.01	50.81 QP	54.00	-3.19	1.38 V	355	51.99	-1.18
6	742.50	52.88 QP	54.00	-1.12	1.15 V	3	50.90	1.98
7	891.01	52.28 QP	54.00	-1.72	1.35 V	52	47.53	4.75

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

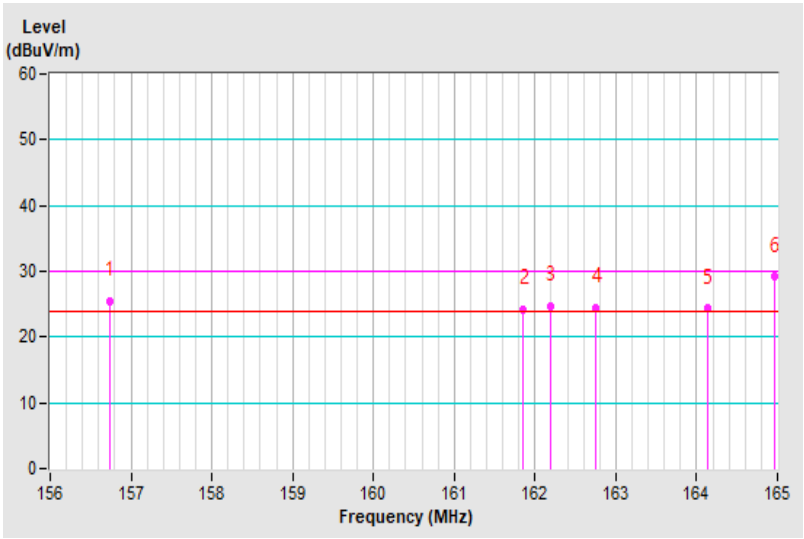


Frequency Range	156MHz ~ 165MHz	**Detector Function & Bandwidth**	Peak (PK), 9kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	20℃, 70%RH
Tested by	Vincent Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Horizontal at 3 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	156.73	25.46 PK	30.00	-4.54	1.45 H	218	35.39	-9.93
2	161.86	24.24 PK	30.00	-5.76	1.65 H	222	34.18	-9.94
3	162.20	24.71 PK	30.00	-5.29	1.46 H	227	34.61	-9.90
4	162.76	24.53 PK	30.00	-5.47	1.43 H	214	34.40	-9.87
5	164.13	24.28 PK	30.00	-5.72	1.53 H	220	34.36	-10.08
6	164.97	29.13 PK	30.00	-0.87	1.55 H	284	39.10	-9.97

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

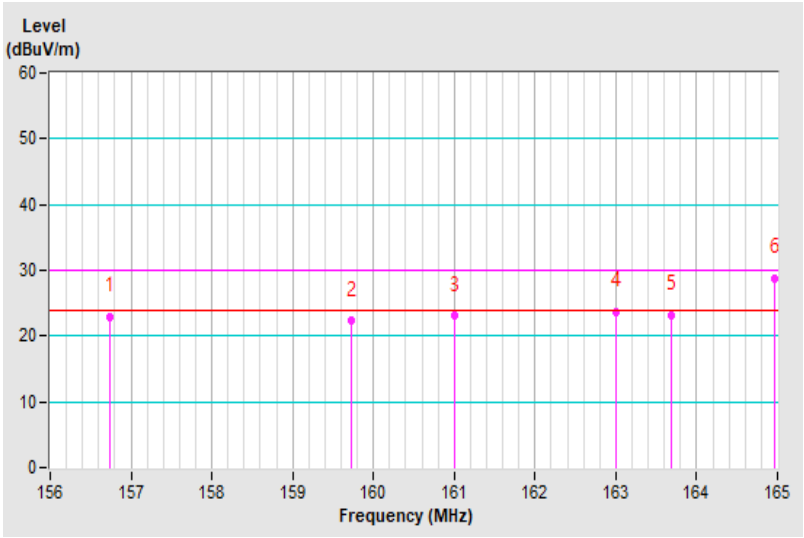


Frequency Range	156MHz ~ 165MHz	**Detector Function & Bandwidth**	Peak (PK), 9kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	20℃, 70%RH
Tested by	Vincent Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Vertical at 3 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	156.73	22.93 PK	30.00	-7.07	1.15 V	181	32.86	-9.93
2	159.73	22.33 PK	30.00	-7.67	1.10 V	315	32.20	-9.87
3	161.01	23.06 PK	30.00	-6.94	1.05 V	319	33.13	-10.07
4	163.00	23.63 PK	30.00	-6.37	1.20 V	330	33.49	-9.86
5	163.68	23.14 PK	30.00	-6.86	1.05 V	325	33.17	-10.03
6	164.97	28.80 PK	30.00	-1.20	1.00 V	303	38.77	-9.97

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



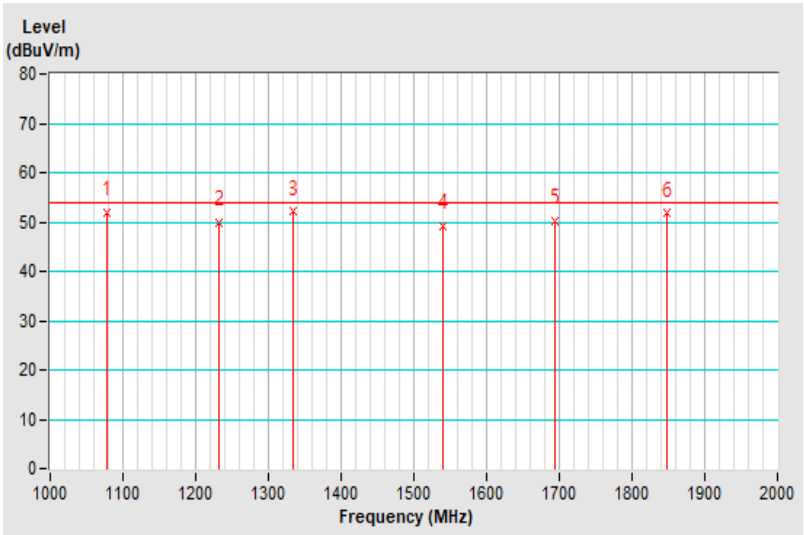
6.6 Test Results for 1000 MHz – 2000 MHz

Frequency Range	1GHz ~ 2GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	19℃, 68%RH
Tested by	Vincent Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Horizontal at 3 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	1078.00	51.84 QP	54.00	-2.16	2.00 H	209	73.55	-21.71
2	1232.00	49.88 QP	54.00	-4.12	2.35 H	132	71.34	-21.46
3	1334.68	52.08 QP	54.00	-1.92	2.10 H	221	73.32	-21.24
4	1540.00	49.30 QP	54.00	-4.70	1.13 H	216	69.99	-20.69
5	1694.01	50.19 QP	54.00	-3.81	1.00 H	225	70.42	-20.23
6	1848.00	51.76 QP	54.00	-2.24	1.12 H	194	70.96	-19.20

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

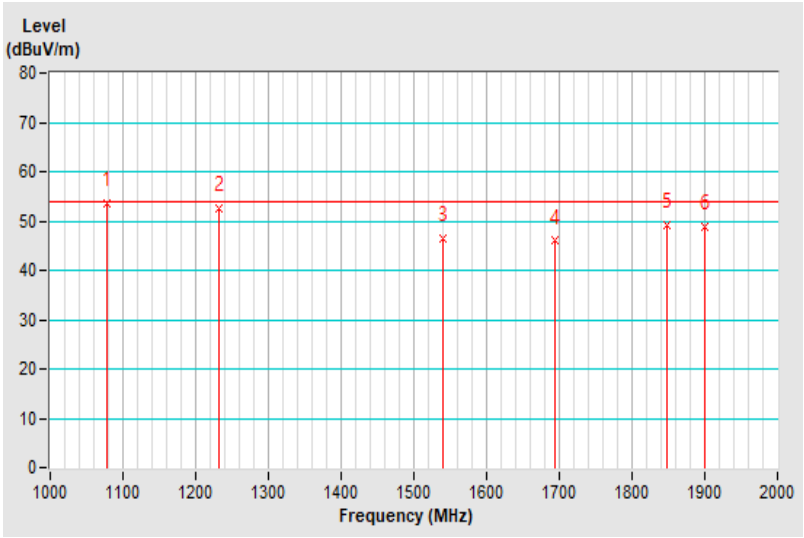


Frequency Range	1GHz ~ 2GHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 120kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	19℃, 68%RH
Tested by	Vincent Lin		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Vertical at 3 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	**1078.00**	**53.57 QP**	**54.00**	**-0.43**	**1.26 V**	**197**	**75.28**	**-21.71**
2	1232.00	52.66 QP	54.00	-1.34	1.80 V	324	74.12	-21.46
3	1540.02	46.52 QP	54.00	-7.48	1.42 V	65	67.21	-20.69
4	1694.02	45.95 QP	54.00	-8.05	1.72 V	230	66.18	-20.23
5	1848.01	49.32 QP	54.00	-4.68	2.07 V	165	68.52	-19.20
6	1899.37	48.85 QP	54.00	-5.15	1.88 V	179	67.77	-18.92

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 Harmonics Current Measurement

7.1 Limits

Limits for Class A equipment	
Harmonic 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	0.15 x 15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8≦n≦40	0.23 x 8/n

Limits for Class D equipment		
Harmonic 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	0.15 x 15/n

Notes: 1. Class A and Class D are classified according to section 5 of EN 61000-3-2.
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.

7.2 Classification of Equipment

Class A	Class B	Class C	Class D
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.	Portable tools; Arc welding equipment which is not professional equipment.	Lighting equipment.	Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors; Television receivers; Refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

7.3 Test Instruments

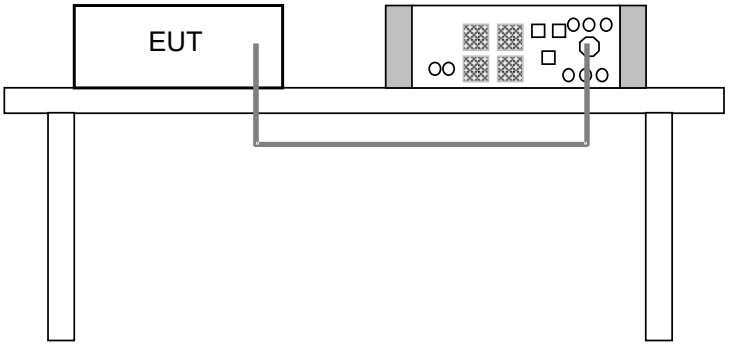
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Teseq Harmonics - Flicker Test System	Profline 2105	32A00983 & 1639A01863	Sep. 17, 2019	Sep. 16, 2020
Software	CTS 4	NA	NA	NA

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. The test was performed in EMS Room No. 1.
3. According to IEC 61000-4-7: 2002, the time window shall be synchronized with each group of 10 or 12 cycles (200 ms)for power frequency of 50 or 60Hz.
4. Tested Date: May 4, 2020

7.4 Test Arrangement

a. 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.

b. 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.



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

7.5 Test Results

Fundamental Voltage/Ampere	230.45Vrms/ 0.418Arms	Power Frequency	50.00Hz
Power Consumption	34.0W	Power Factor	0.377
Environmental Conditions	27 °C, 87%RH	Tested by	Xun Lee
Test Mode	Mode 1		

Note: 1. Limits are not specified for equipment with a rated power of 75W or less (other than lighting equipment).
2. According to EN 61000-3-2 the manufacturer shall specify the power of the apparatus. This value shall be used for establishing limits. The specified power shall be within +/-10% of the measured power.

8 Voltage Fluctuations and Flicker Measurement

8.1 Limits

Test item	Limit	Note
P_{st}	1.0	P_{st}: short-term flicker severity.
P_{lt}	0.65	P_{lt}: long-term flicker severity.
T_{max} (ms)	500	T_{max}: maximum time duration during the observation period that the voltage deviation d(t) exceeds the limit for d_c .
d_{max} (%)	4	d_{max}: maximum absolute voltage change during an observation period.
d_c (%)	3.3	d_c: maximum steady state voltage change during an observation period.

8.2 Test Instruments

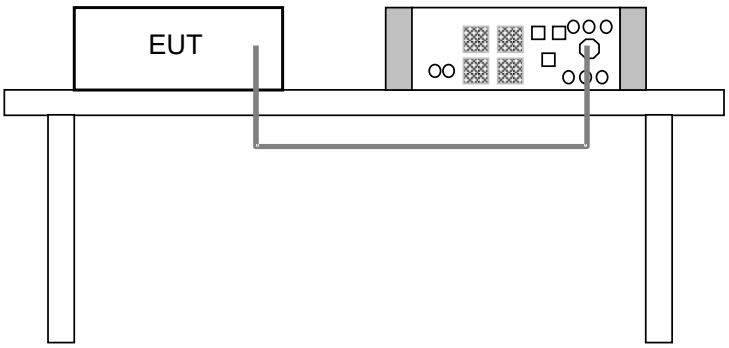
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Teseq Harmonics - Flicker Test System	Profline 2105	32A00983 & 1639A01863	Sep. 17, 2019	Sep. 16, 2020
Software	CTS 4	NA	NA	NA

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. The test was performed in EMS Room No. 1.
3. Tested Date: May 4, 2020

8.3 Test Arrangement

a. 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.

b. 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.



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

8.4 Test Results

Observation (T_p)	10 min.	Power Frequency	50.00Hz
Fundamental Voltage/Ampere	230.45Vrms/ 0.418Arms	Power Factor	0.377
Environmental Conditions	27 °C, 87%RH	Tested by	Xun Lee
Test Mode	Mode 1		

Test Parameter	Measurement Value	Limit	Remarks
P_{st}	0.156	1.00	Pass
P_{lt}	0.068	0.65	Pass
T_{max} (ms)	0	500	Pass
d_{max} (%)	0	4	Pass
d_c (%)	0	3.3	Pass

Note: (1) P_{st} means short-term flicker indicator.
(2) P_{lt} means long-term flicker indicator.
(3) T_{max} means accumulated time value of d(t) with a deviation exceeding 3.3 %.
(4) d_{max} means maximum relative voltage change.
(5) d_c means maximum relative steady-state voltage change.

9 Performance Criteria

General Performance Criteria

The general performance criteria apply for those ports for which no specific performance criteria are defined (e.g. auxiliary ports) in the report.

- performance criterion A: the EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer;
- performance criterion B: the EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.
- performance criterion C: temporary degradation or loss of function or performance is allowed during the test, provided the function is self-recoverable, or can be restored at the end of the test by the operation of the controls, as defined in the relevant equipment standard and in the technical specification published by the manufacturer.

10 Immunity to Conducted Radio Frequency disturbance (CS)

10.1 Test Specification

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Voltage Level:	a.c. and d.c. power ports, signal and control ports: 3 V rms for frequency range: 150 kHz - 80 MHz 10 V rms at spot frequencies: 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, and 25 MHz.
Modulation:	400 Hz Sine Wave, 80%, AM Modulation :
Frequency Step:	1 % of preceding frequency value
Dwell Time	3 seconds

10.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ Signal Generator	SML03	101801	Jan. 17, 2020	Jan. 16, 2021
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. 19, 2019	Jun. 18, 2020
FISCHER CUSTOM COMMUNICATIONS EM Injection Clamp	F-203I-23mm	455	NA	NA
FISCHER CUSTOM COMMUNICATIONS Current Injection Clamp	F-120-9A	361	Jul. 31, 2019	Jul. 30, 2020
B&K Ear Simulator	4185	2553594	NA	NA
EM TEST Coupling Decoupling Network	CDN M1/32A	306508	Jun. 19, 2019	Jun. 18, 2020
TESEQ Coupling Decoupling Network	CDN T800	34428	Jun. 19, 2019	Jun. 18, 2020
TESEQ Coupling Decoupling Network	CDN T800	29459	Jun. 19, 2019	Jun. 18, 2020
FCC Coupling Decoupling Network	FCC-801-T4	02031	Jun. 19, 2019	Jun. 18, 2020
EM TEST Coupling Decoupling Network	CDN T2	306509	Jun. 19, 2019	Jun. 18, 2020
R&S Power Sensor	NRV-Z5	837878/039	Nov. 8, 2019	Nov. 7, 2020
R&S Power Meter	NRVD	837794/040	Nov. 8, 2019	Nov. 7, 2020
TESEQ Coupling Decoupling Network	CDN M232	37702	Jun. 19, 2019	Jun. 18, 2020
TESEQ Coupling Decoupling Network	CDN M332	41258	Jun. 19, 2019	Jun. 18, 2020
TESEQ Coupling Decoupling Network	CDN M332	41256	Jun. 19, 2019	Jun. 18, 2020
TESEQ Coupling Decoupling Network	CDN T8-10	40376	Jun. 19, 2019	Jun. 18, 2020
TESEQ Coupling Decoupling Network	CDN S751S	35791	Mar. 5, 2020	Mar. 4, 2021
TESEQ Coupling Decoupling Network	CDN S200	53490	May 28, 2019	May 27, 2020
TESEQ Coupling Decoupling Network	CDN S400	52115	Jul. 23, 2019	Jul. 22, 2020
TESEQ Coupling Decoupling Network	ISN ST08	41212	Jun. 19, 2019	Jun. 18, 2020
FCC Coupling Decoupling Network	FCC-801-M5-50A	100018	Jan. 20, 2020	Jan. 19, 2021
Software	CS_V7.4.2	NA	NA	NA

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. The test was performed in CS Room No. 1.
3. Tested Date: May 7, 2020

10.3 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 400 Hz 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.

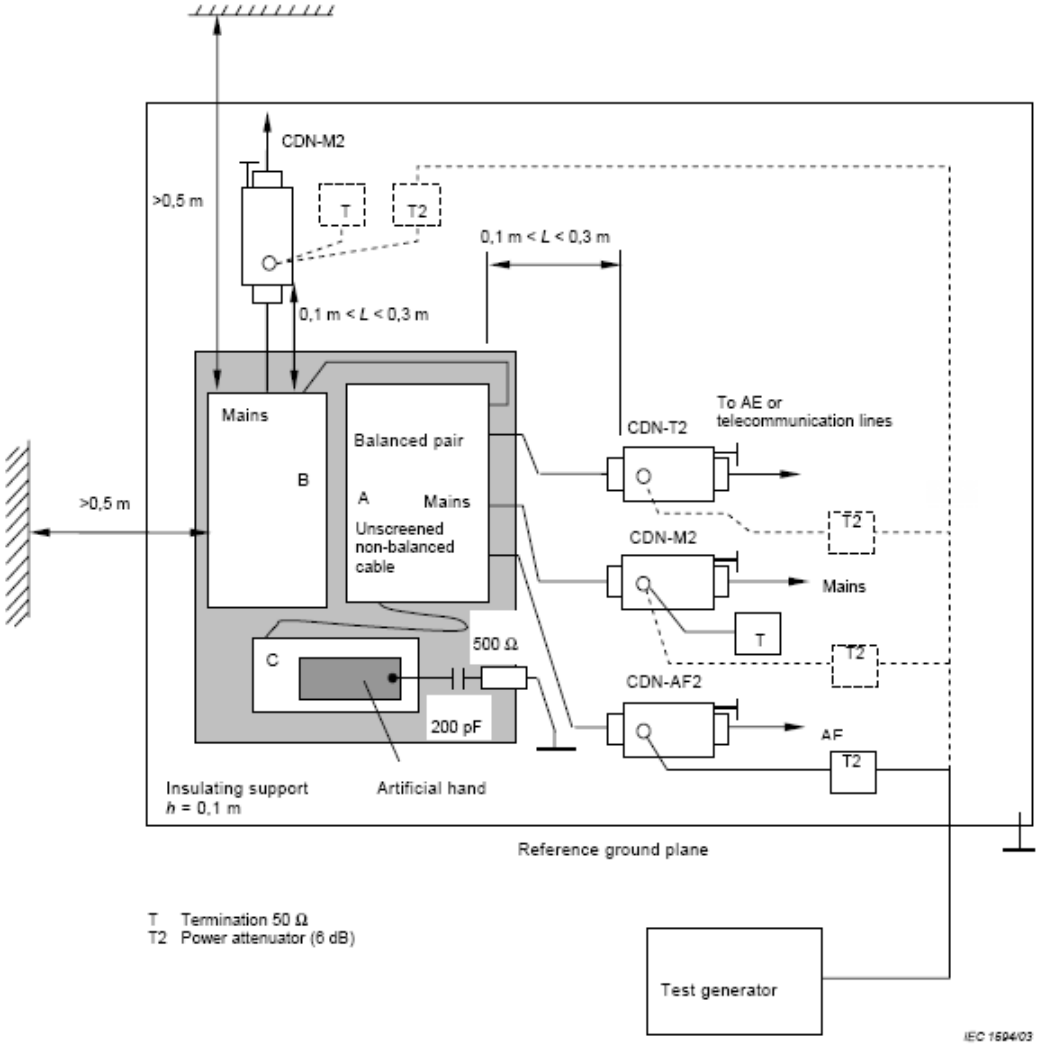
e. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

f. At least one representative cable of each FUNCTION on the ME EQUIPMENT or ME SYSTEM shall be tested.

g. All patient-coupled cables shall be tested, either individually or bundled.

h. The power input cable shall be tested.

i. The POTENTIAL EQUALIZATION CONDUCTOR shall be tested.



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.

10.4 Test Results

Input Power	230Vac, 50Hz	Tested by	Kent Wang
Environmental Conditions	24°C, 73% RH	Test mode	Mode 1

Frequency (MHz)	Level (V rms)	Tested Line	Injection Method	Return Path	Observation	Remark	Performance Criterion
0.15 – 80	3	AC Main	CDN-M3	CDN-M1	Note	-	A
0.15 – 80	3	LAN 1	CDN-T8	CDN-M1	Note	-	A
0.15 – 80	3	LAN 2	CDN-T8	CDN-M1	Note	-	A
2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, and 25	10	AC Main	CDN-M3	CDN-M1	Note	-	A
2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, and 25	10	LAN 1	CDN-T8	CDN-M1	Note	-	A
2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, and 25	10	LAN 2	CDN-T8	CDN-M1	Note	-	A

Note: The EUT function was correct during the test.

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

11.1 Test Specification

Basic Standard:	IEC 61000-4-3
Frequency Range, Field Strength:	80MHz-2GHz, 10V/m
Modulation:	400Hz 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 for 80MHz-1GHz (1.5×10^{-3} decades/s) 9 seconds for 1GHz-2GHz (0.5×10^{-3} decades/s)

11.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
BOONTON Power Meter	4232A	94901	Jun. 11, 2019	Jun. 10, 2020
BOONTON Power Sensor	51011-EMC	32807	Jun. 11, 2019	Jun. 10, 2020
ETS Electric Field Sensor	HI-6105	00217912	Aug. 13, 2019	Aug. 12, 2020
TESEQ RF Generator	ITS 6006	37543	May 9, 2019	May 8, 2020
TESEQ RF Amplifier	CBA1G-150	T44220	NA	NA
TESTQ Amplifier	CBA 3G-050	T44345	NA	NA
TESTQ Amplifier	AS1860-50	S-5944/1	NA	NA
Schwarzbeck RS Antenna	STLP 9129	9129068	NA	NA
CHANCE MOST Compact Full Anechoic Chamber (7x3x3 m)	NA	NA	Jan. 20, 2020	Jan. 19, 2021
Software	RS_V7.6	NA	NA	NA

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. The test was performed in RS Room No.1.
3. The transmit antenna was located at a distance of 2 meters from the EUT.
4. Tested Date: May 5, 2020

11.3 Test Arrangement

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

a. The testing was performed in a fully chamber.

b. The frequency ranges and field strength levels are 80MHz-2GHz, 10V/m with the signal 80% amplitude modulated with a 400Hzsine wave.

c. The frequency range shall be swept at a rate in the order of $1,5 \times 10^{-3}$ decades/s for the frequency range 80 MHz to 1 GHz and $0,5 \times 10^{-3}$ decades/s for the frequency range 1 GHz to 2 GHz, and shall be slow enough to allow the detection of any malfunction of the EUT. Any sensitive frequencies or frequencies of dominant interest shall be discretely analyzed.

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

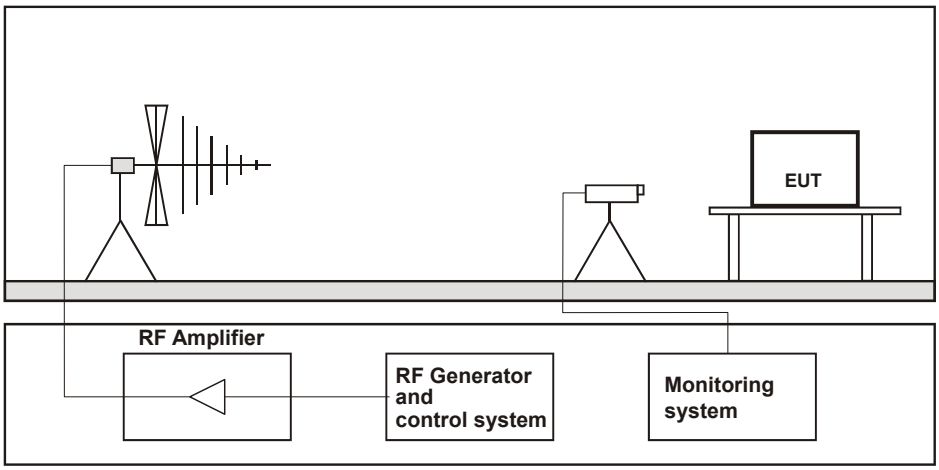


Table-top Equipment

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

11.4 Test Results

Input Power	230Vac, 50Hz	Tested by	Kent Wang
Environmental Conditions	25°C, 75% RH	Test mode	Mode 1

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Remarks	Performance Criterion
			(V/m)	Modulation			
80 - 2000	V&H	0, 90, 180, 270	10	80% AM (400Hz)	Note	-	A

Note: The EUT function was correct during the test.

12 Electrical Fast Transient/Burst Immunity Test (EFT)

12.1 Test Specification

Basic Standard:	IEC 61000-4-4
Test Voltage:	±2kV, differential on a.c. power lines, coupling/decoupling network ±1kV, common mode on signal and control lines, capacitive coupling clamp
Impulse Repetition Frequency:	5kHz (1kV), 2.5kHz (2kV)
Impulse Wave Shape:	5/50 (T_r/T_h) ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	5 min

12.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Haefely, EFT Generator	PEFT 4010	154954	Apr. 20, 2020	Apr. 19, 2021
Haefely,Capacitive Clamp	IP4A	155173	Apr. 20, 2020	Apr. 19, 2021

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. The test was performed in EFT Room.
3. Tested Date: May 6, 2020

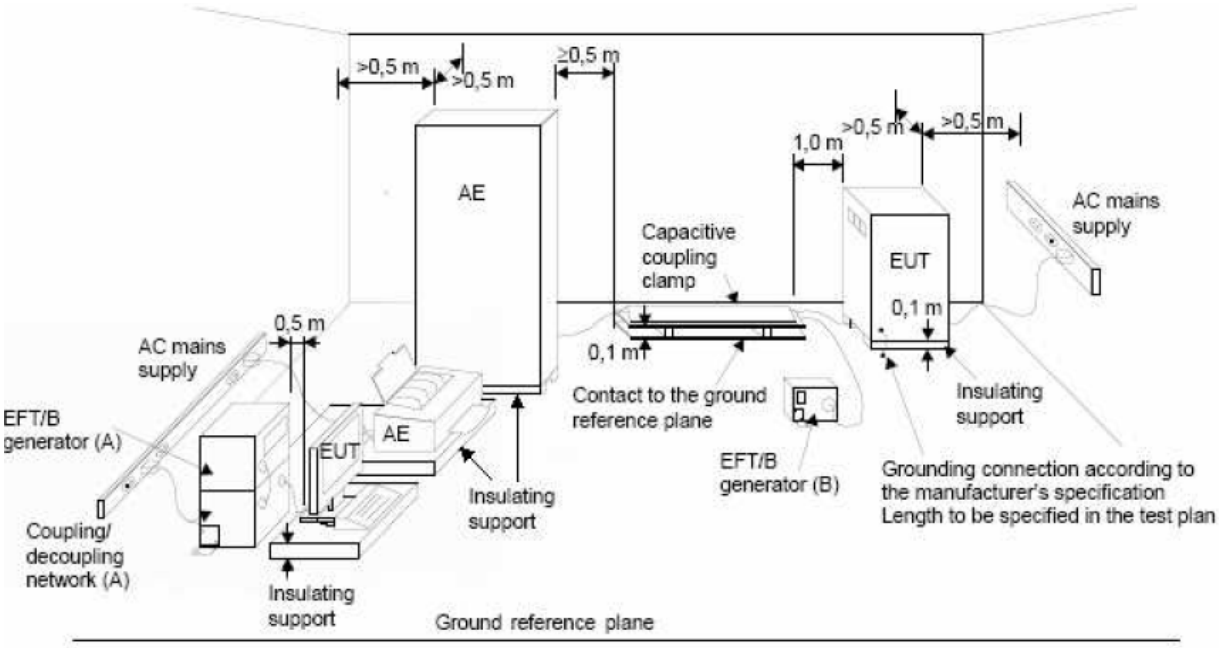
12.3 Test Arrangement

a. Both positive and negative polarity discharges were applied.

b. The distance between any coupling devices and the EUT should be 0.5 m for table-top equipment testing, and 1.0 m for floor standing equipment.

c. The duration time of each test sequential was 5 minutes.

d. The transient/burst waveform was in accordance with 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.

12.4 Test Results

Input Power	230Vac, 50Hz	Tested by	Todd Chang
Environmental Conditions	25°C, 64% RH	Test mode	Mode 1

a.c. power lines

Voltage (kV)	Repetition rate (kHz)	Test Point	Polarity (+/-)	Observation	Performance Criterion
2	2.5	L1-L2	+/-	Note 1	B

Signal and control lines

Voltage (kV)	Repetition rate (kHz)	Test Point	Polarity (+/-)	Observation	Performance Criterion
1	5	LAN 1	+/-	Note 2	B
1	5	LAN 2	+/-	Note 2	B

Note: 1. There was flicker disturbance on screen during the test, but self-recoverable after the test.
2. The LAN transmission was disconnected 3~6 seconds during the test, but self-recoverable after the test.

13 Surge Immunity Test

13.1 Test Specification

Basic Standard:	EN/IEC 61000-4-5
Wave-Shape:	a.c. power lines: 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current
Test Voltage:	a.c. power lines: Line to line: ±0.5kV Line to earth: ±0.5kV, ±1kV
AC Phase Angle (degree):	0°, 90°, 180°, 270°
Pulse Repetition Rate:	1 time / 60 sec.
Number of Tests:	5 positive and 5 negative at selected points

13.2 Test Instruments

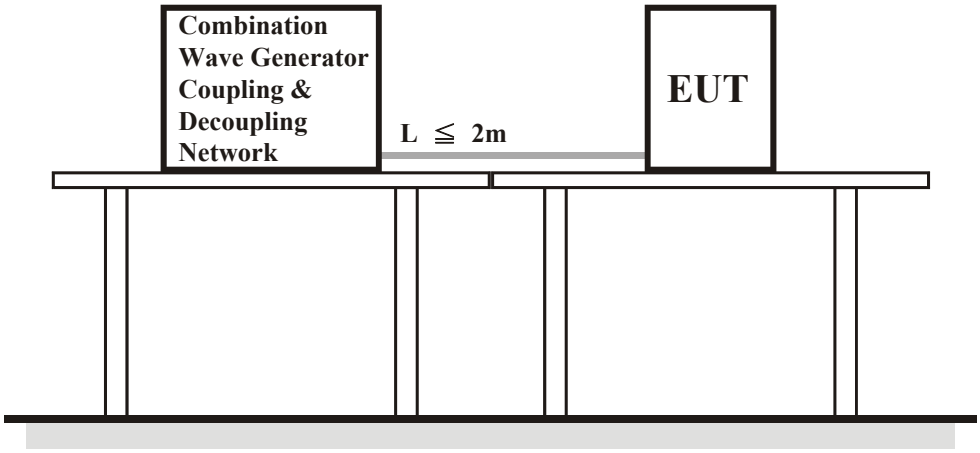
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
KeyTek, Surge Simulator	EMC Pro	9902207	May 10, 2019	May 9, 2020
Coupling Decoupling Network	CDN-UTP8	045	Aug. 27, 2019	Aug. 26, 2020
Software	CEWare32	NA	NA	NA

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. The test was performed in EMS Room No. 1.
3. Tested Date: May 4, 2020

13.3 Test Arrangement

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.



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

13.4 Test Results

Input Power	230 Vac, 50 Hz	Tested by	Xun Lee
Environmental conditions	21°C, 70% RH	Test mode	Mode 1

Input AC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5	L1-L2	+/-	Note	A
0.5, 1	L1-PE	+/-	Note	A
0.5, 1	L2-PE	+/-	Note	A

Note: The EUT function was correct during the test.

14 Power Supply Short Term Variation

14.1 Test Specification

Basic Standard:	EN/IEC 61000-4-11
Test levels:	a) voltage: nominal + (20 ± 1) %, duration 1,5 s ± 0,2 s frequency: nominal + (10 ± 0,5) %, duration 5 s ± 0,5 s, superimposed b) voltage: nominal – (20 ± 1) %, duration 1,5 s ± 0,2 s frequency: nominal – (10 ± 0,5) %, duration 5 s ± 0,5 s, superimposed Voltage and frequency variation rise and decay times are 0,2 s ± 0,1 s (from 10 % to 90 %).
Interval between Event:	1 / min
Test Cycle:	10 times

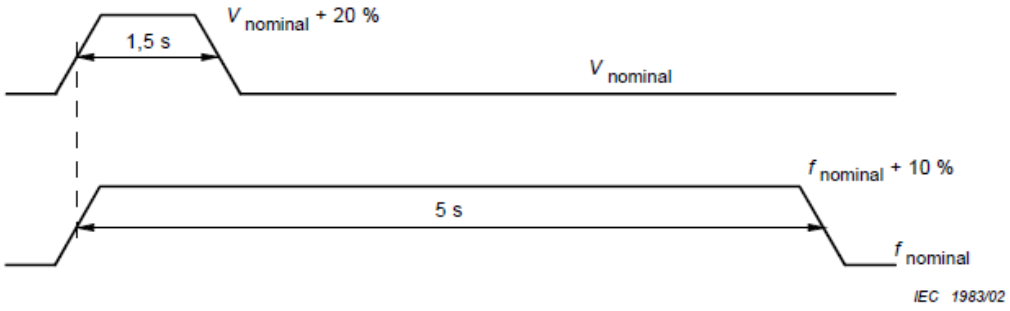


Figure 10a – Test 1: voltage (*V*) + 20 % and frequency (*f*) + 10 %

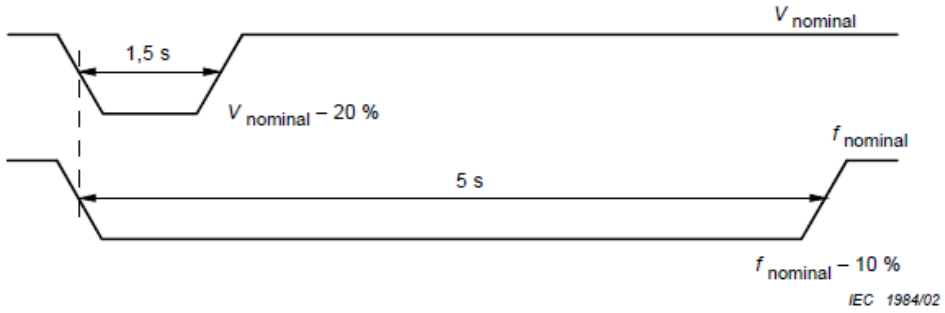


Figure 10b – Test 2: voltage (*V*) – 20 % and frequency (*f*) – 10 %

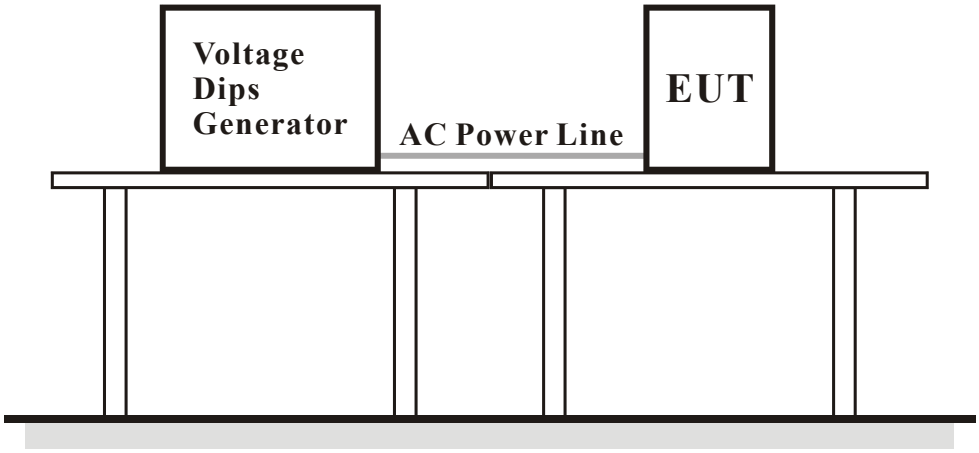
14.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Teseq Immunity Test System	Profline 2105	1632A00983 & 1639A01863	Jun. 19, 2019	Jun. 18, 2020
Software	WIN2120	NA	NA	NA

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. The test was performed in EMS Room No. 1.
3. Tested Date: May 5, 2020

14.3 Test Arrangement

The EUT shall be tested for each selected combination of test levels and duration with a sequence of 10 dips/interruptions with intervals of 60 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at 0 degree crossover point of the voltage waveform.



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

14.4 Test Results

Input Power	230Vac, 50 Hz	Tested by	Xun Lee
Environmental Conditions	25°C, 66% RH	Test mode	Mode 1

Input Power for testing: 230Vac, 50 Hz (Nominal input Voltage)				
Test Conditions	Interval (sec)	Times	Observation	Performance Criterion
a) voltage: (240 + 20%), duration 1,5 s ± 0,2 s frequency: (60 +10%), duration 5 s ± 0,5 s,	60	10	Note	A
b) voltage: (100 - 20%), duration 1,5 s ± 0,2 s frequency: (50 -10%), duration 5 s ± 0,5 s,	60	10	Note	A

Note: The EUT function was correct during the test.

15 Power Supply Failure

15.1 Test Specification

Basic Standard:	IEC 61000-4-11
Test levels:	voltage residual, 0 %
Test Duration Time:	60 s each
Sync Angle (degrees):	0° / 180°
Test Cycle:	3 times

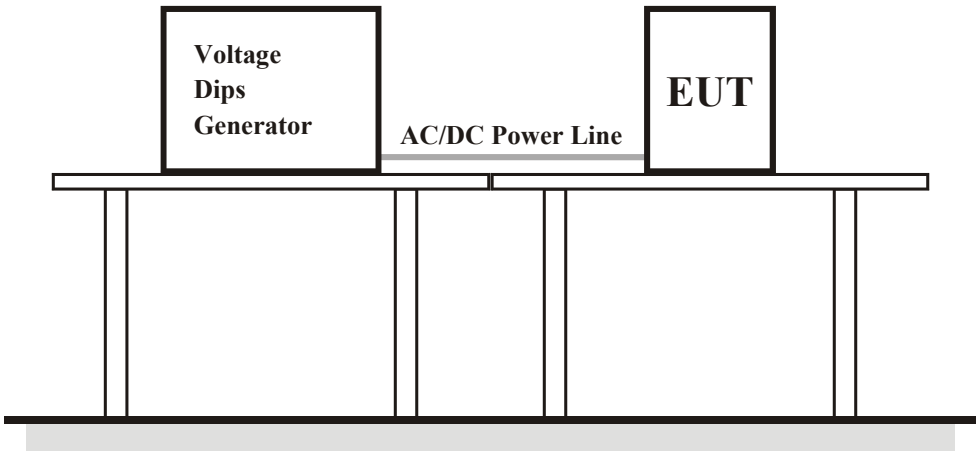
15.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Teseq Immunity Test System	Profline 2105	1632A00983 & 1639A01863	Jun. 19, 2019	Jun. 18, 2020
Software	WIN2120	NA	NA	NA

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. The test was performed in EMS Room No. 1.
3. Tested Date: May 5, 2020

15.3 Test Arrangement

The EUT shall be tested for each selected combination of test levels and duration with three breaks in power supply of duration 60 s each. Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at 0 degree crossover point of the voltage waveform.



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

15.4 Test Results

Input Power	230Vac, 50Hz	Tested by	Xun Lee
Environmental Conditions	25°C, 66% RH	Test mode	Mode 1

Input Power for testing: 230Vac, 50 Hz					
Voltage Residual (%)	Duration (seconds)	Interval (sec)	Times	Observation	Performance Criterion
0	60	10	3	Note	C

Note: The EUT shut down but could be restored by the operator.

16 Electrostatic Discharge Immunity Test (ESD)

16.1 Test Specification

Basic Standard:	IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: ±2, ±4, ±8kV (Direct) Contact Discharge: ±2, ±4kV, ±6kV (Direct & Indirect)
Number of Discharge:	Minimum 20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

16.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
KeyTek, ESD Simulator	MZ-15/EC	0504259	Nov. 8, 2019	Nov. 7, 2020

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. The test was performed in ESD Room No. 2.
3. Tested Date: May 5, 2020

16.3 Test Arrangement

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.

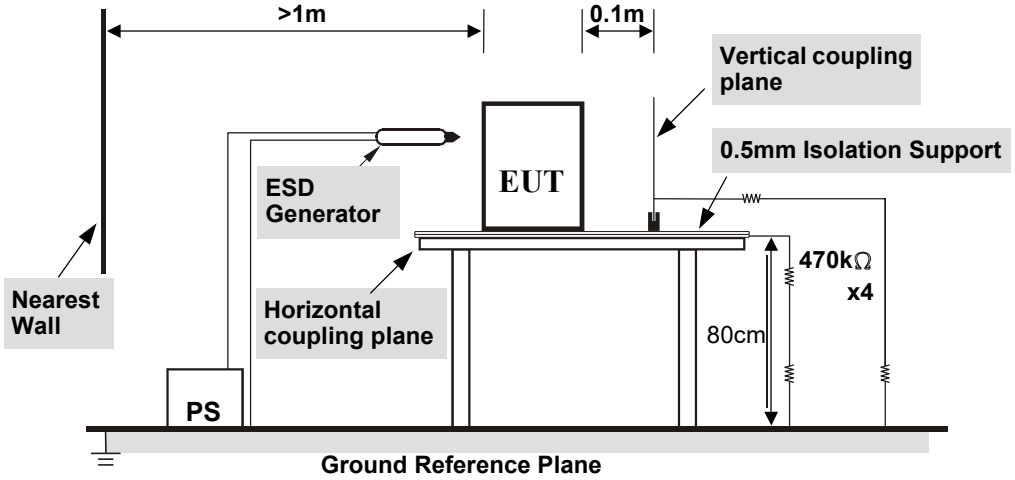


TABLE-TOP EQUIPMENT

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
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.

16.4 Test Results

Input Power	230Vac, 50Hz	Tested by	Xun Lee
Environmental Conditions	22°C, 40% RH 1004 mbar	Test mode	Mode 1

Test Results of Direct Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2	+/-	1-5	Note 1	NA	A
4, 6	+/-	1-5	Note 2	NA	B
2, 4	+/-	6-9	NA	Note 1	A
8	+/-	6-8	NA	Note 1	A
8	+/-	9	NA	Note 2	B

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

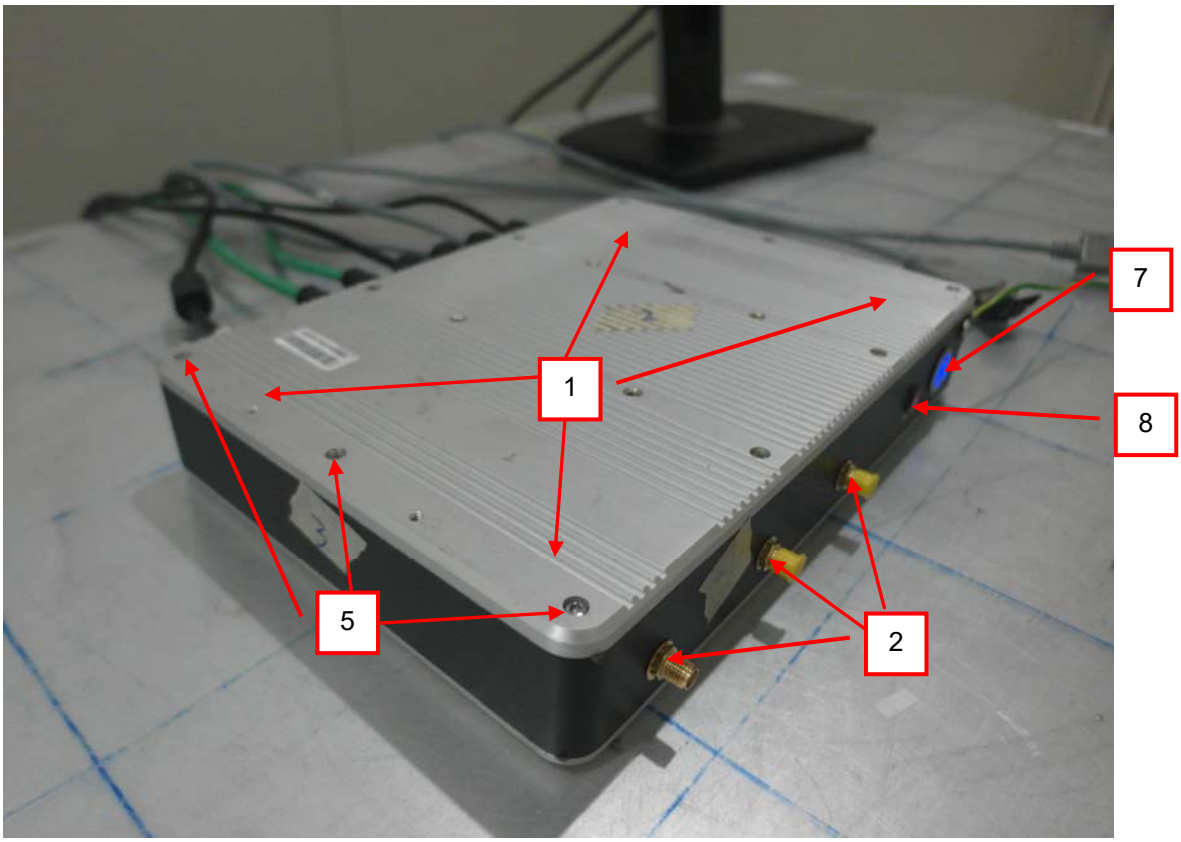
Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2, 4, 6	+/-	Four Sides	Note 1	Note 1	A

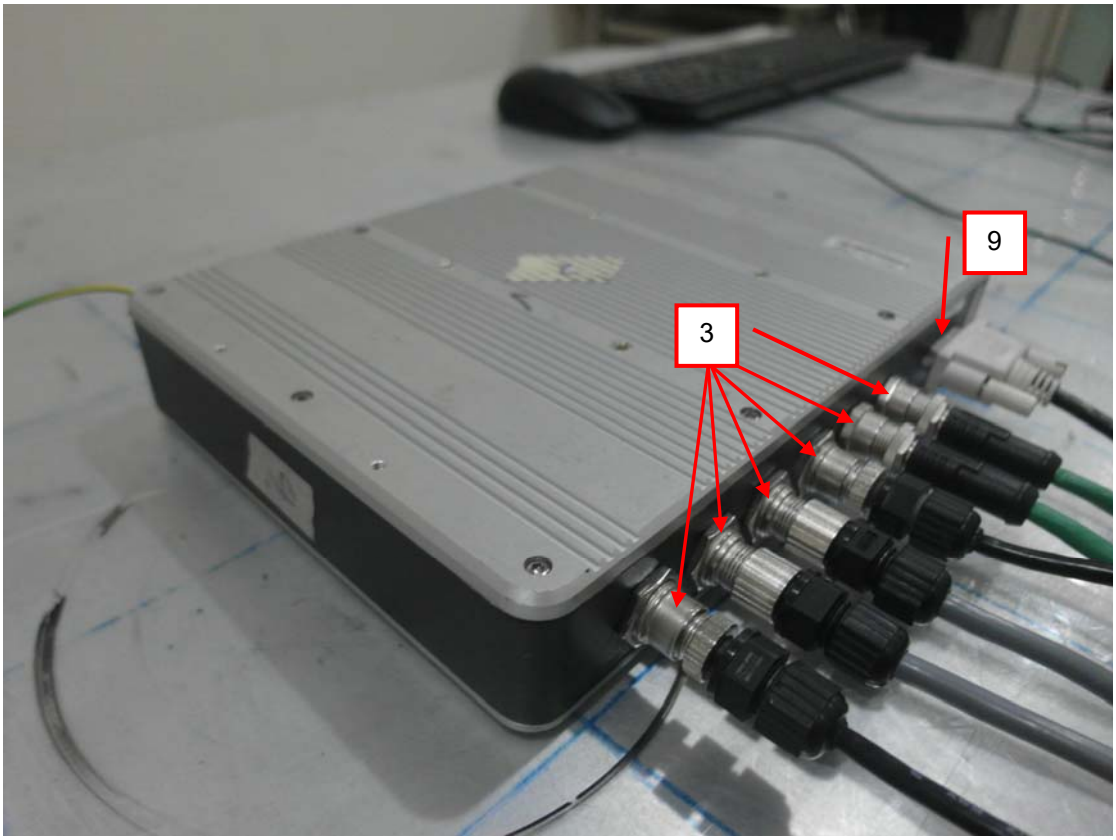
Description of test points of indirect application:

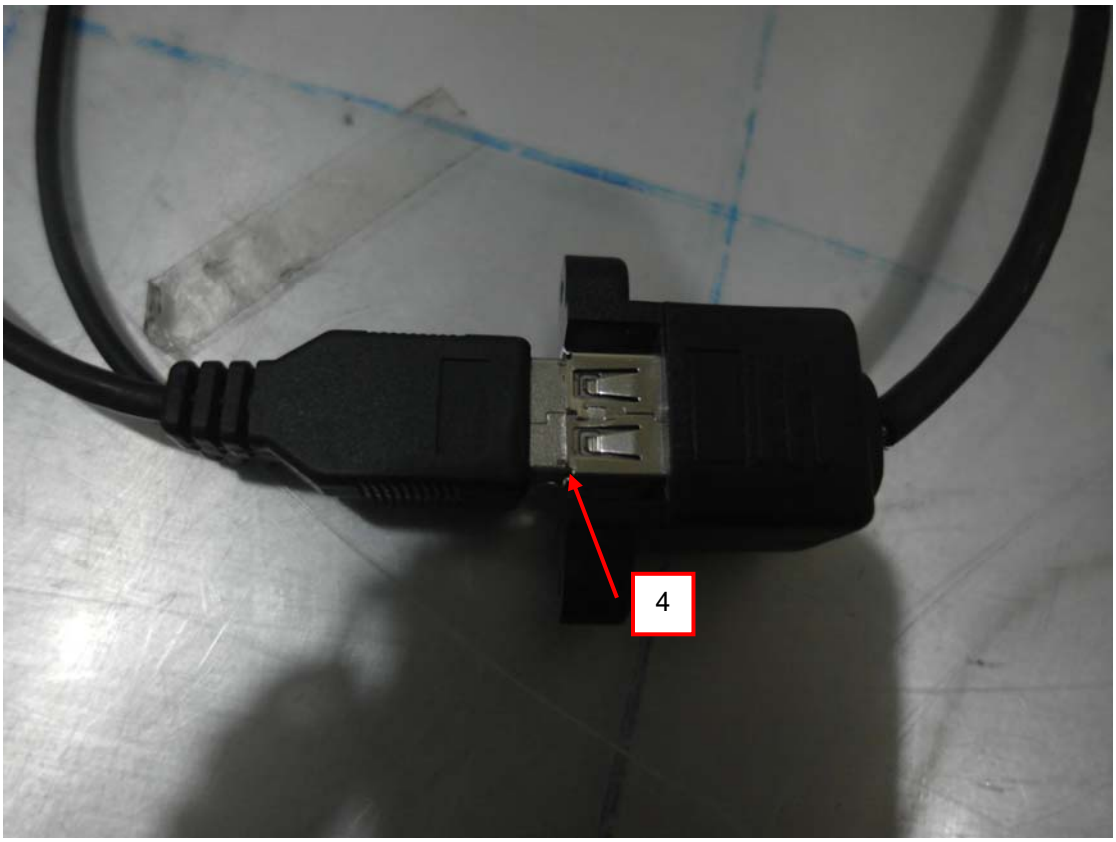
1. Front side 2. Rear side 3. Right side 4. Left side

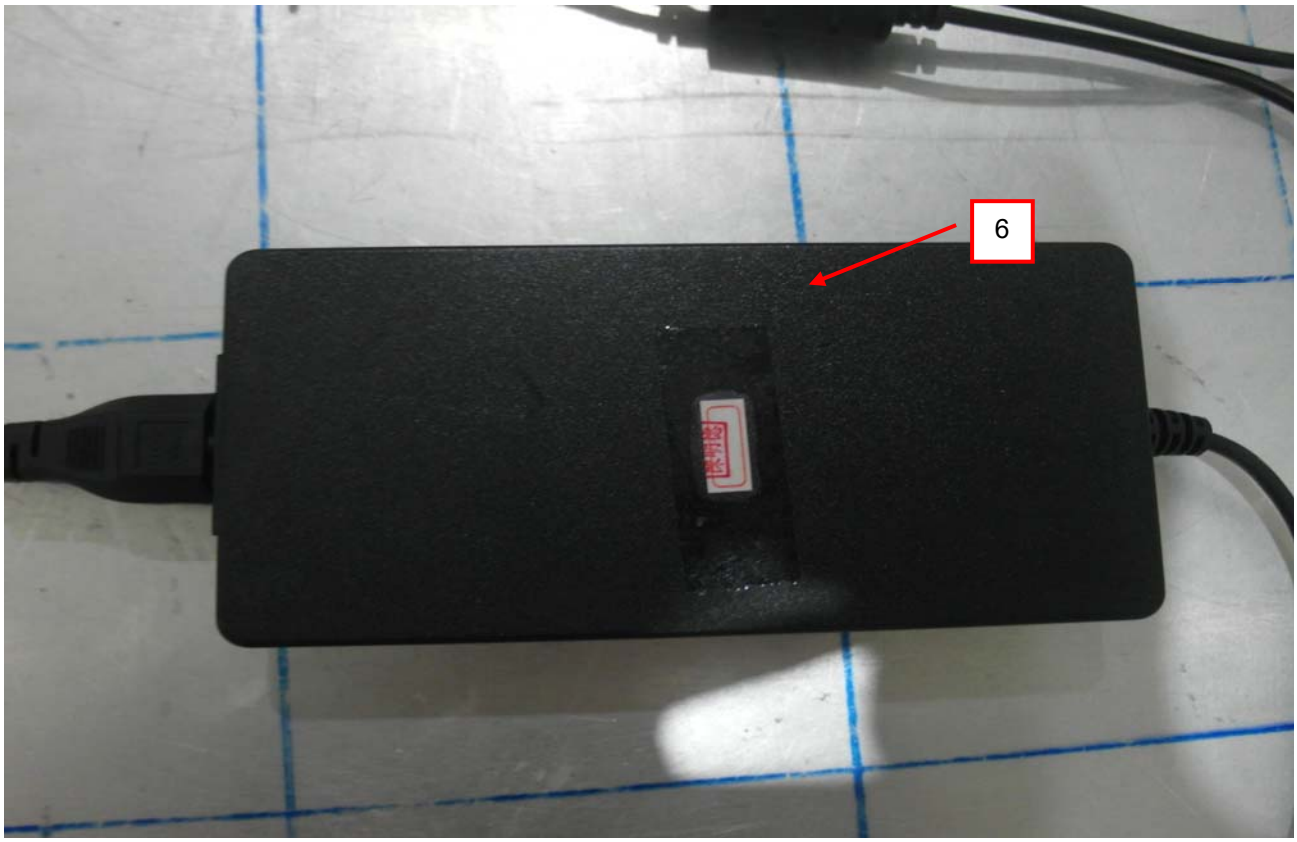
Note: 1. The EUT function was correct during the test.
2. The image on the screen was disappeared during the test, but self-recoverable after the test.

Description of Test Points






4

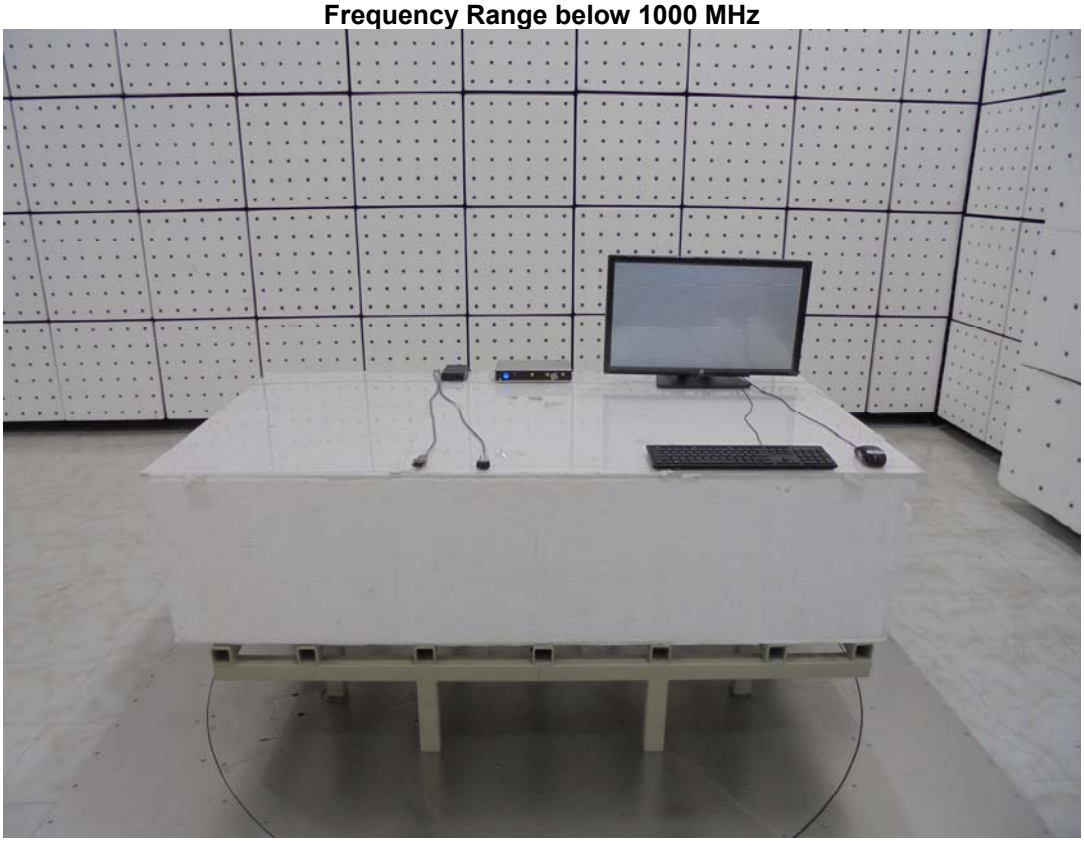

6

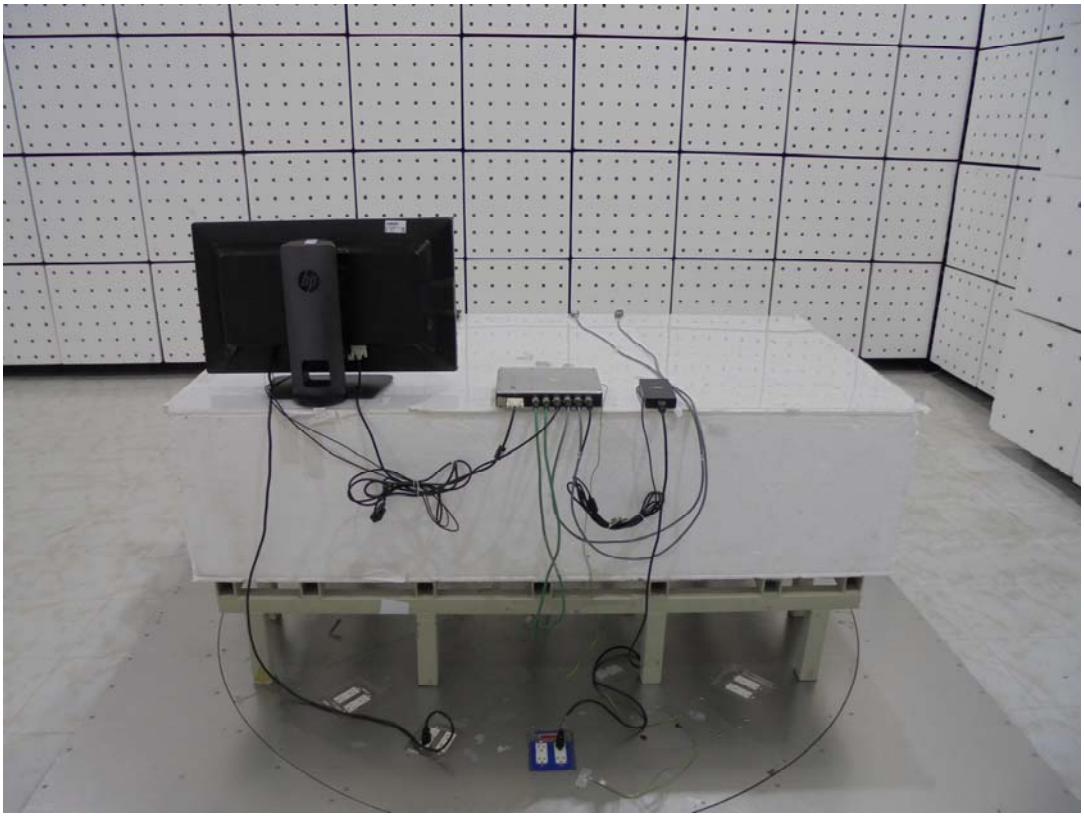
17 Pictures of Test Arrangements

17.1 Conducted Emissions

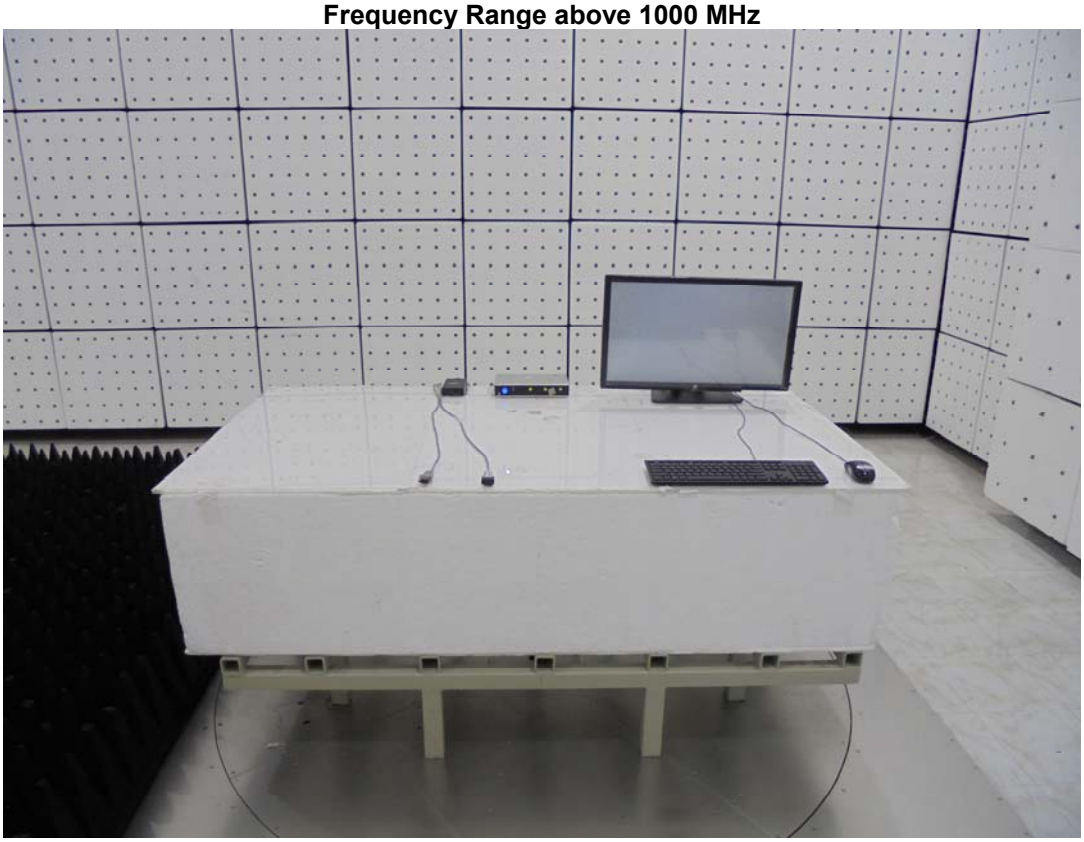
17.2 Radiated Emissions

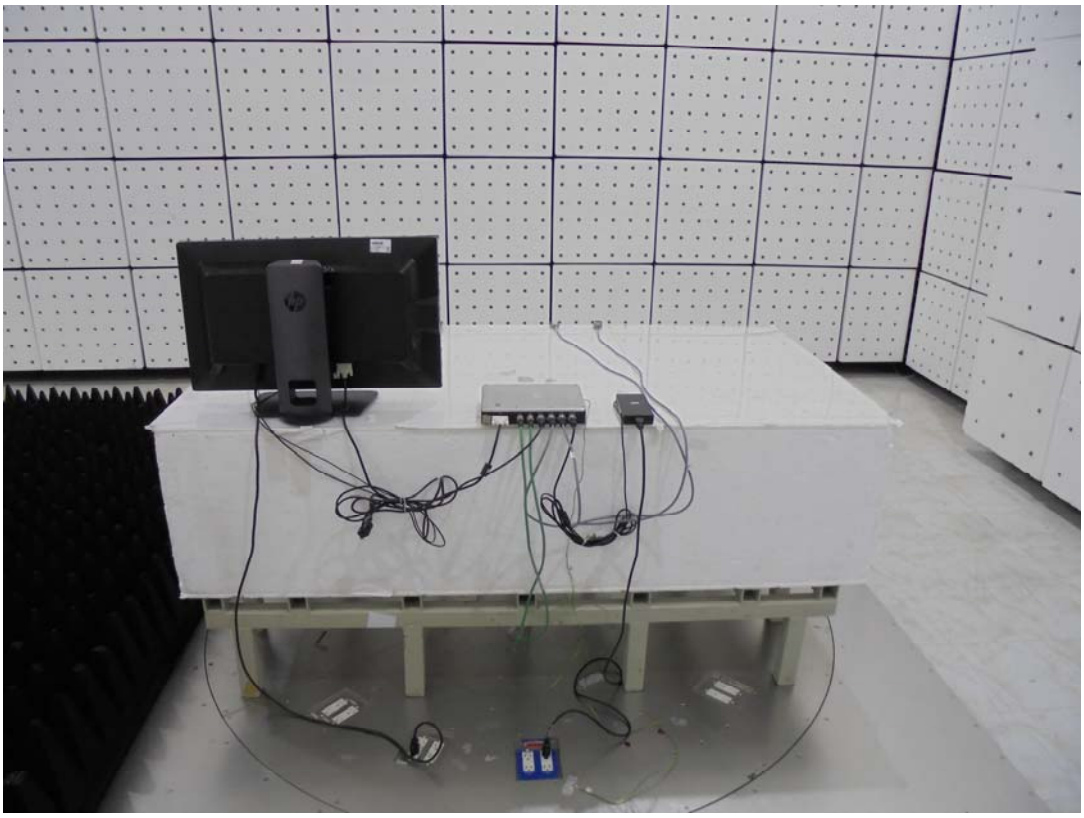
Frequency Range below 1000 MHz





Frequency Range above 1000 MHz

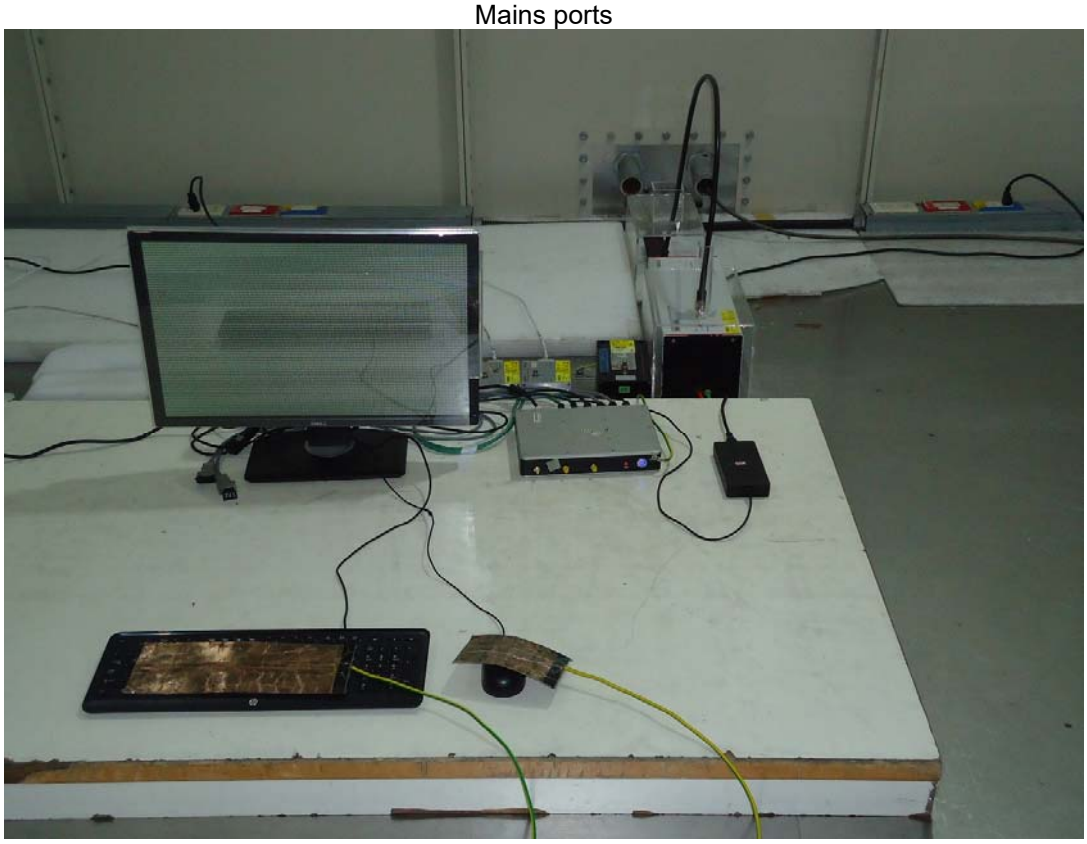




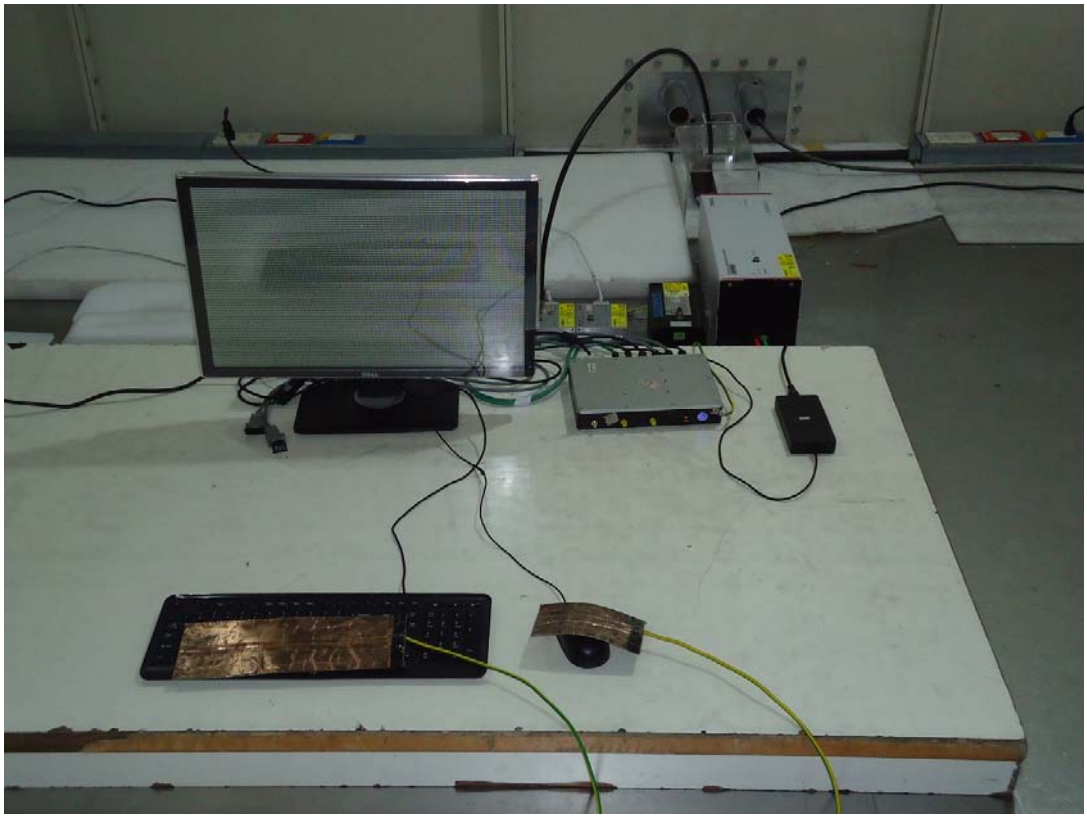
17.3 Harmonics Current, Voltage Fluctuations and Flicker

17.4 Conducted Radio Frequency Disturbance (CS)

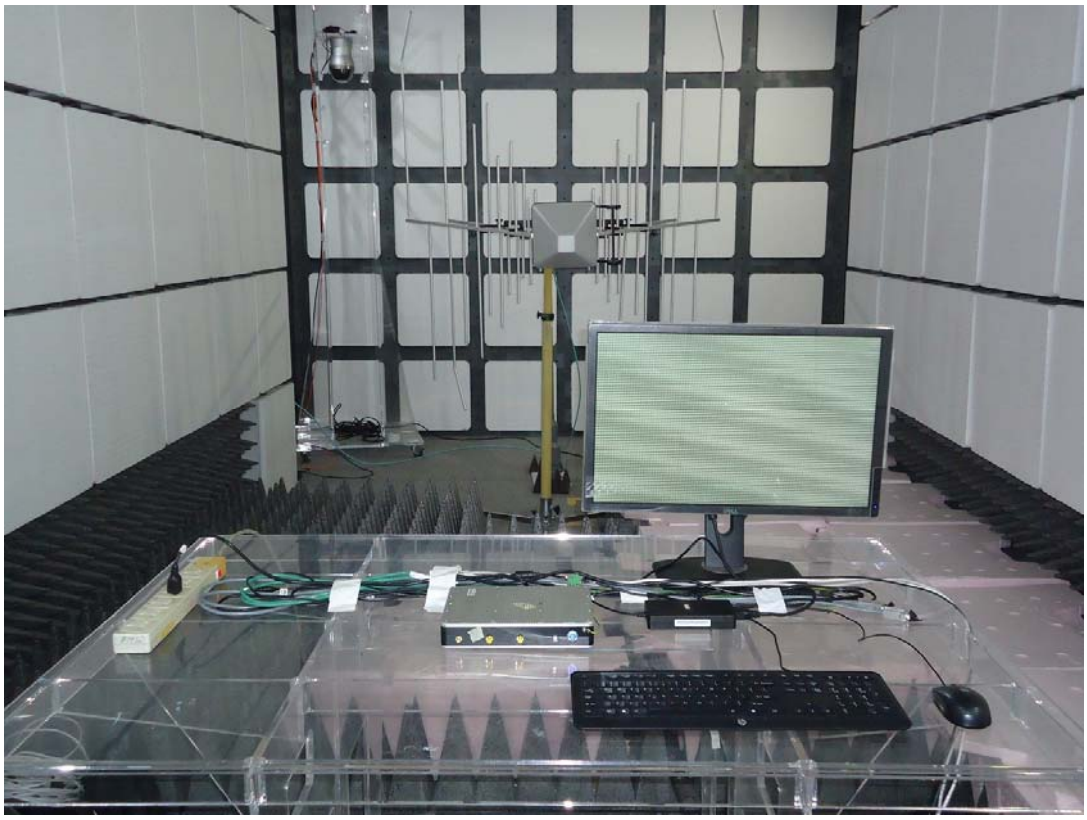
Mains ports

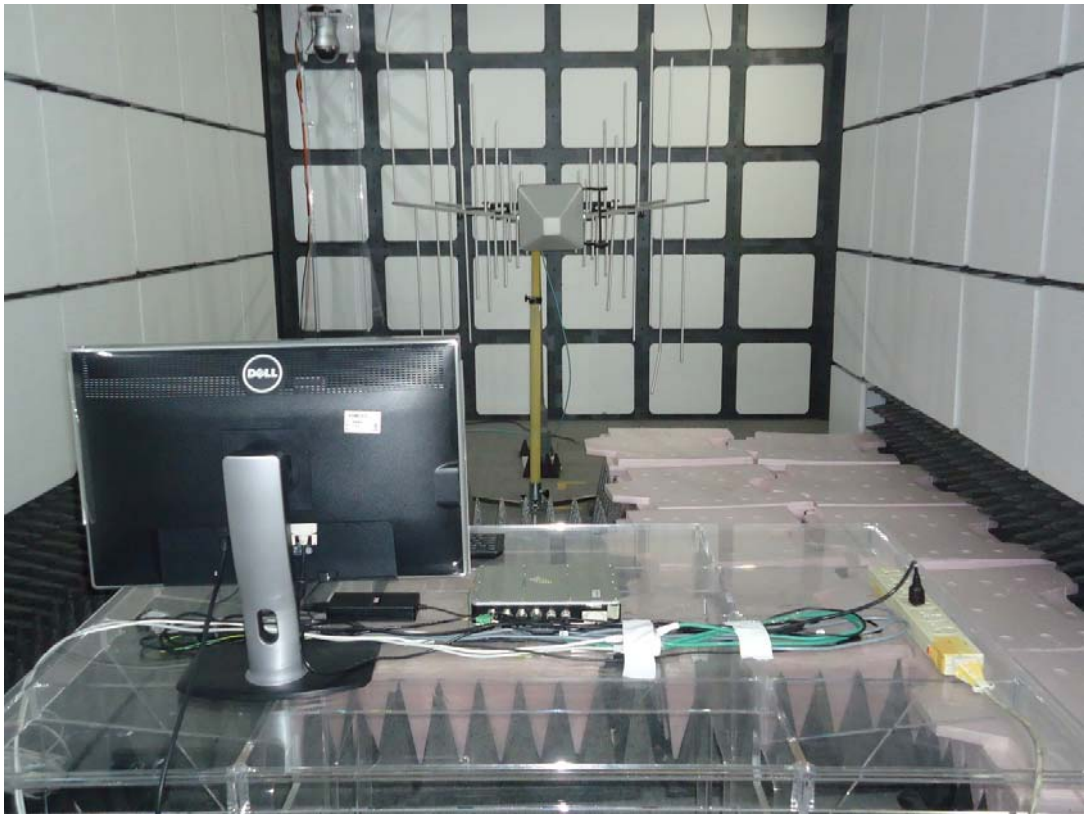


LAN



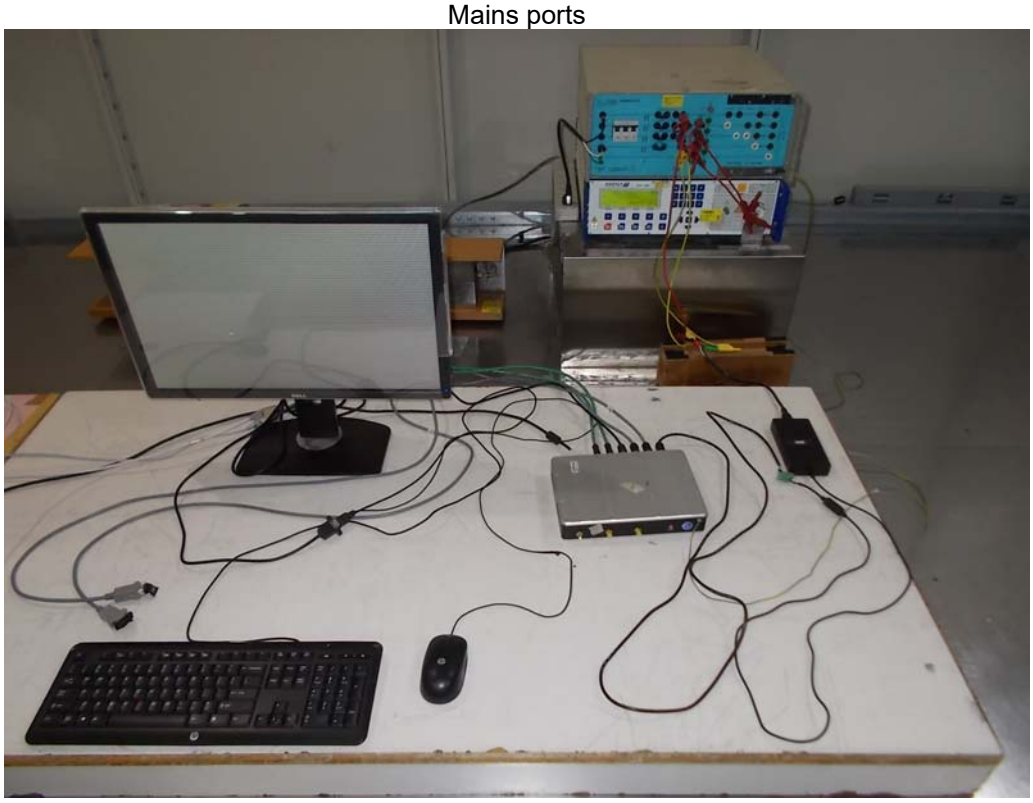
17.5 Radiated Disturbance (RS)





17.6 Burst / Fast Transient (EFT)

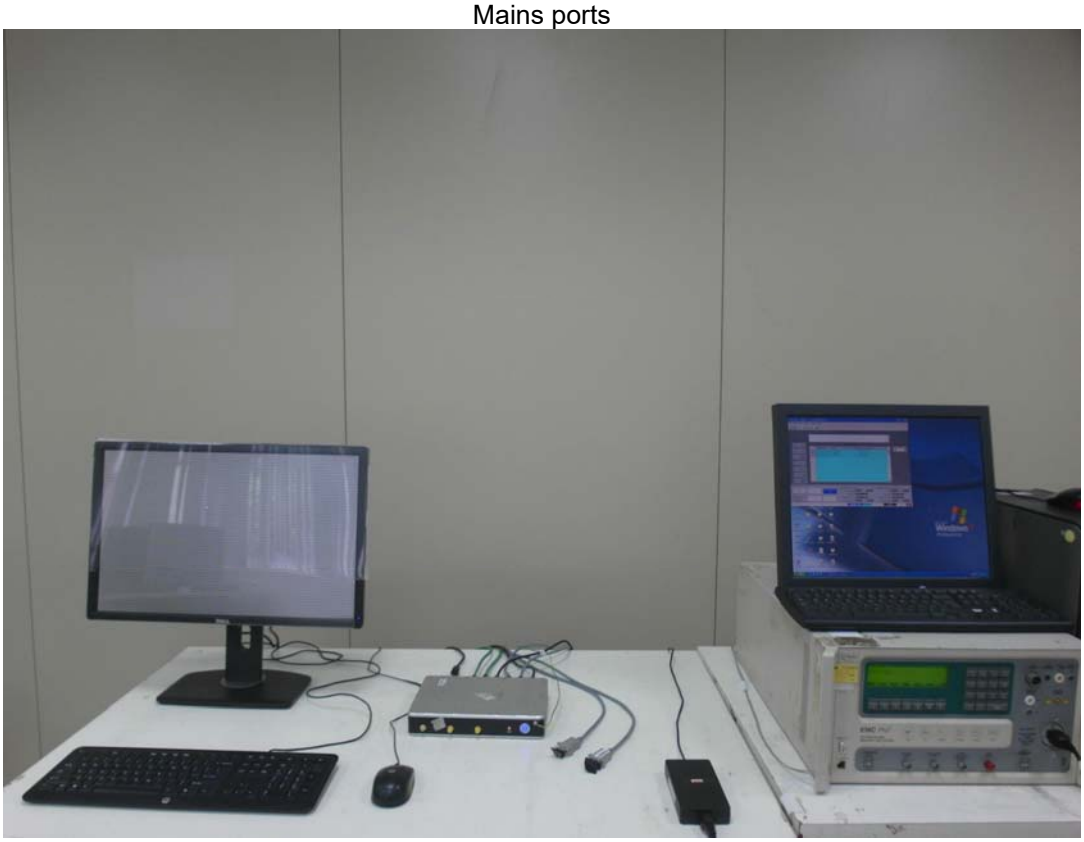
Mains ports



LAN

17.7 Surge / Slow Transients

Mains ports



17.8 Power Supply Short Term Variation and Power Supply Failure

17.9 Electrostatic Discharge Immunity Test (ESD)

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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