

# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** VCCI-CISPR 32: 2016, Class A  
**Report No.:** VBDBO-WTW-P25070009  
**Product:** QEC  
**Brand:** ICOP  
**Model No.:** M  
**Series Model:** 02X-DXX ("X" can be A-Z, 0-9 or nil to indicate I/O port differentiation.)  
**Received Date:** 2025/7/1  
**Test Date:** 2025/7/2 ~ 2025/7/14  
**Issued Date:** 2025/8/5  
**Applicant:** ICOP Technology Inc.  
**Address:** NO.15,Wugong 5th Rd., Xinzhuan Dist.,New Taipei City 24890,Taiwan ( R.O.C )  
**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories  
**Lab. VCCI Member No:** 395  
**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan  
**Test Location:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Approved by:

Jim Hsiang / Associate Technical Manager

, Date:

2025/8/5

This test report consists of 38 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The test results in the report only apply to the tested sample. The test results in this report are traceable to the national or international standards.



Prepared by : Vivian Chen / Senior Specialist

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/>, and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

## Table of Contents

<b>Release Control Record .....</b>	<b>3</b>
<b>1 Certificate.....</b>	<b>4</b>
<b>2 Summary of Test Results .....</b>	<b>5</b>
2.1 Measurement Uncertainty .....	5
2.2 Supplementary Information .....	5
<b>3 General Information .....</b>	<b>6</b>
3.1 Description of EUT .....	6
3.2 Primary Clock Frequencies of Internal Source.....	6
3.3 Features of EUT .....	6
3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode .....	6
3.5 Test Program Used and Operation Descriptions .....	7
3.6 Connection Diagram of EUT and Peripheral Devices .....	8
3.7 Configuration of Peripheral Devices and Cable Connections .....	10
<b>4 Test Instruments .....</b>	<b>11</b>
4.1 Conducted Emissions from Power Ports.....	11
4.2 Conducted Emissions from Wired Network Ports .....	12
4.3 Radiated Emissions up to 1 GHz .....	13
4.4 Radiated Emissions above 1 GHz.....	14
<b>5 Limits of Test Items.....</b>	<b>15</b>
5.1 Conducted Emissions from Power Ports.....	15
5.2 Conducted Emissions from Wired Network Ports .....	15
5.3 Radiated Emissions up to 1 GHz .....	15
5.4 Radiated Emissions above 1 GHz.....	16
<b>6 Test Arrangements.....</b>	<b>17</b>
6.1 Conducted Emissions from Power Ports.....	17
6.2 Conducted Emissions from Wired Network Ports .....	18
6.3 Radiated Emissions up to 1 GHz .....	21
6.4 Radiated Emissions above 1 GHz.....	22
<b>7 Test Results of Test Item.....</b>	<b>23</b>
7.1 Conducted Emissions from Power Ports.....	23
7.2 Conducted Emissions from Wired Network Ports .....	25
7.3 Radiated Emissions up to 1 GHz .....	28
7.4 Radiated Emissions above 1 GHz.....	30
<b>8 Pictures of Test Arrangements .....</b>	<b>32</b>
8.1 Conducted Emissions from Power Ports.....	32
8.2 Conducted Emissions from Wired Network Ports .....	33
8.3 Radiated Emissions up to 1 GHz .....	36
8.4 Radiated Emissions above 1 GHz.....	37
<b>9 Information of the Testing Laboratories .....</b>	<b>38</b>

## Release Control Record

Issue No.	Description	Date Issued
VBDBO-WTW-P25070009	Original release.	2025/8/5

## 1 Certificate

**Product:** QEC

**Brand:** iCOP

**Test Model:** M

**Series Model:** 02X-DXX ("X" can be A-Z, 0-9 or nil to indicate I/O port differentiation.)

**Sample Status:** Engineering sample

**Applicant:** ICOP Technology Inc.

**Test Date:** 2025/7/2 ~ 2025/7/14

**Standard:** VCCI-CISPR 32: 2016, Class A

**Measurement procedure:** CISPR 32: 2015 (Edition 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.

## 2 Summary of Test Results

The test items that the EUT need to perform in accordance with its interfaces, evaluated functions, are as follows:

Standard	Test Item	Result	Remark
VCCI-CISPR 32	Conducted Emissions from Power Ports	Pass	Minimum passing Class A margin is -6.77 dB at 0.36902 MHz
VCCI-CISPR 32	Conducted Emissions from Wired Network Ports	Pass	Minimum passing Class A margin is -9.34 dB at 1.02342 MHz
VCCI-CISPR 32	Radiated Emissions up to 1 GHz	Pass	Minimum passing Class A margin is -0.40 dB at 175.00 MHz
VCCI-CISPR 32	Radiated Emissions above 1 GHz	Pass	Minimum passing Class A margin is -19.33 dB at 1766.53 MHz

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 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	Specification	Expanded Uncertainty (k=2) (±)	Maximum allowable uncertainty (±)
Conducted Emissions from Power Ports	9 kHz ~ 30 MHz	2.9 dB	3.4 dB ( $U_{\text{CISPR}}$ )
Conducted Emissions from Wired Network Ports	150 kHz ~ 30 MHz	ISN Cat3 : 3.0 dB ISN Cat5 : 3.26 dB ISN Cat6 : 3.0 dB Current Probe : 1.56 dB Voltage Probe : 2.90 dB Coaxial : 2.34 dB	5.0 dB ( $U_{\text{CISPR}}$ ) using AAN 2.9 dB ( $U_{\text{CISPR}}$ ) using CP 3.9 dB ( $U_{\text{CISPR}}$ ) using CVP
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	3m : 5.54 dB 10m : 4.16 dB	6.3 dB ( $U_{\text{CISPR}}$ )
Radiated Emissions above 1 GHz	1 GHz ~ 6 GHz	4.64 dB	5.2 dB ( $U_{\text{CISPR}}$ )

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

### 2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

### 3 General Information

#### 3.1 Description of EUT

Product	QEC
Brand	iCOP
Test Model	M
Series Model	02X-DXX ("X" can be A-Z, 0-9 or nil to indicate I/O port differentiation.)
Model Difference	Marketing Differentiation
Sample Status	Engineering sample
Power Supply Rating	DC 24V

#### 3.2 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 533 MHz, provided by ICOP Technology Inc., for detailed internal source, please refer to the manufacturer's specifications.

#### 3.3 Features of EUT

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

Please refer to appendix of the report if the applicant has provided additional descriptions of the EUT.

#### 3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT has been pre-tested under following test modes.

Test Condition	
Mode	Radiated Emissions up to 1 GHz
1	Operating mode + HDMI out + EtherCAT IN/OUT link + Lan_1Gbps ping + Input Power(24 Vdc)
Note: There are both standby mode and normal mode to be pre-tested then normal mode has the highest emission value.	

Test modes are presented in the report as below.

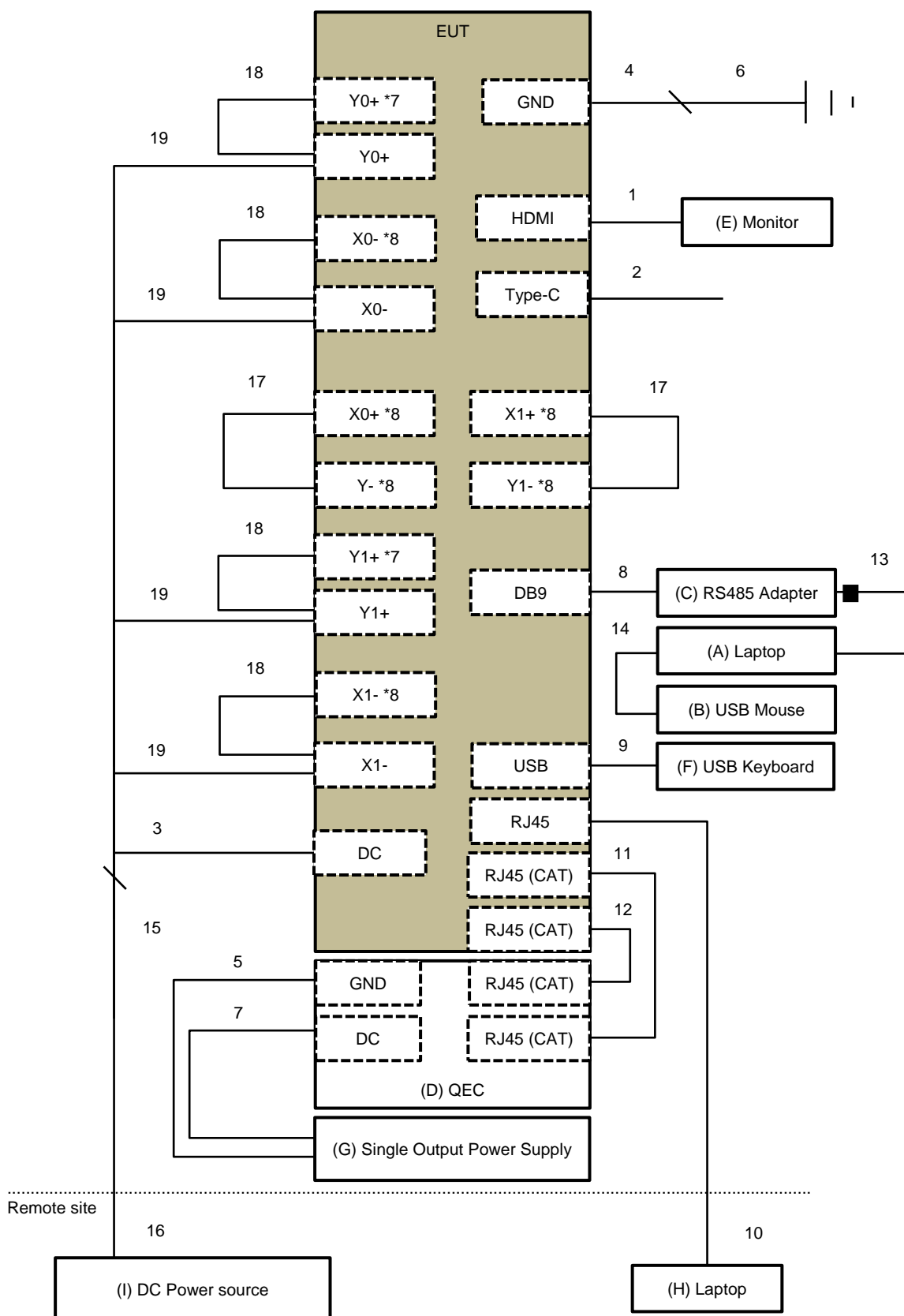
Test Condition	
Mode	Conducted Emissions from Power Ports
A	Operating mode + HDMI out + EtherCAT IN/OUT link + Lan_1Gbps ping + Input Power(24 Vdc)
Mode	Conducted Emissions from Wired Network Ports
A	Operating mode + HDMI out + EtherCAT IN/OUT link + Under test port(Lan_1Gbps link) + Input Power(24 Vdc)
B	Operating mode + HDMI out + EtherCAT IN/OUT link + Lan_1Gbps ping + Under test port(EtherCAT IN link) + Input Power(24 Vdc)
C	Operating mode + HDMI out + EtherCAT IN/OUT link + Lan_1Gbps ping + Under test port(EtherCAT OUT link) + Input Power(24 Vdc)
Note: The idle mode of conducted emission test at wired network ports test was pre-tested based on the worst case of link mode. Due to emissions of idle mode being very low compared to link mode, only the link mode data were presented in the test report.	
Mode	Radiated Emissions up to 1 GHz
A	Operating mode + HDMI out + EtherCAT IN/OUT link + Lan_1Gbps ping + Input Power(24 Vdc)
Mode	Radiated Emissions above 1 GHz
A	Operating mode + HDMI out + EtherCAT IN/OUT link + Lan_1Gbps ping + Input Power(24 Vdc)

### 3.5 Test Program Used and Operation Descriptions

- a. Turned on the power of all equipment.
- b. Laptop sent and received message to/ from EUT via RS485 Adapter.
- c. EUT sent (H) messages to monitor, and then displayed messages on its screen.
- d. Laptop sent and received messages to/ from EUT via LAN cable.
- e. EUT sent and received messages to/ from another QEC via wire cable.
- f. Laptop sent (ITU-R BT 471-1) messages to panel, and then displayed messages on its screen.

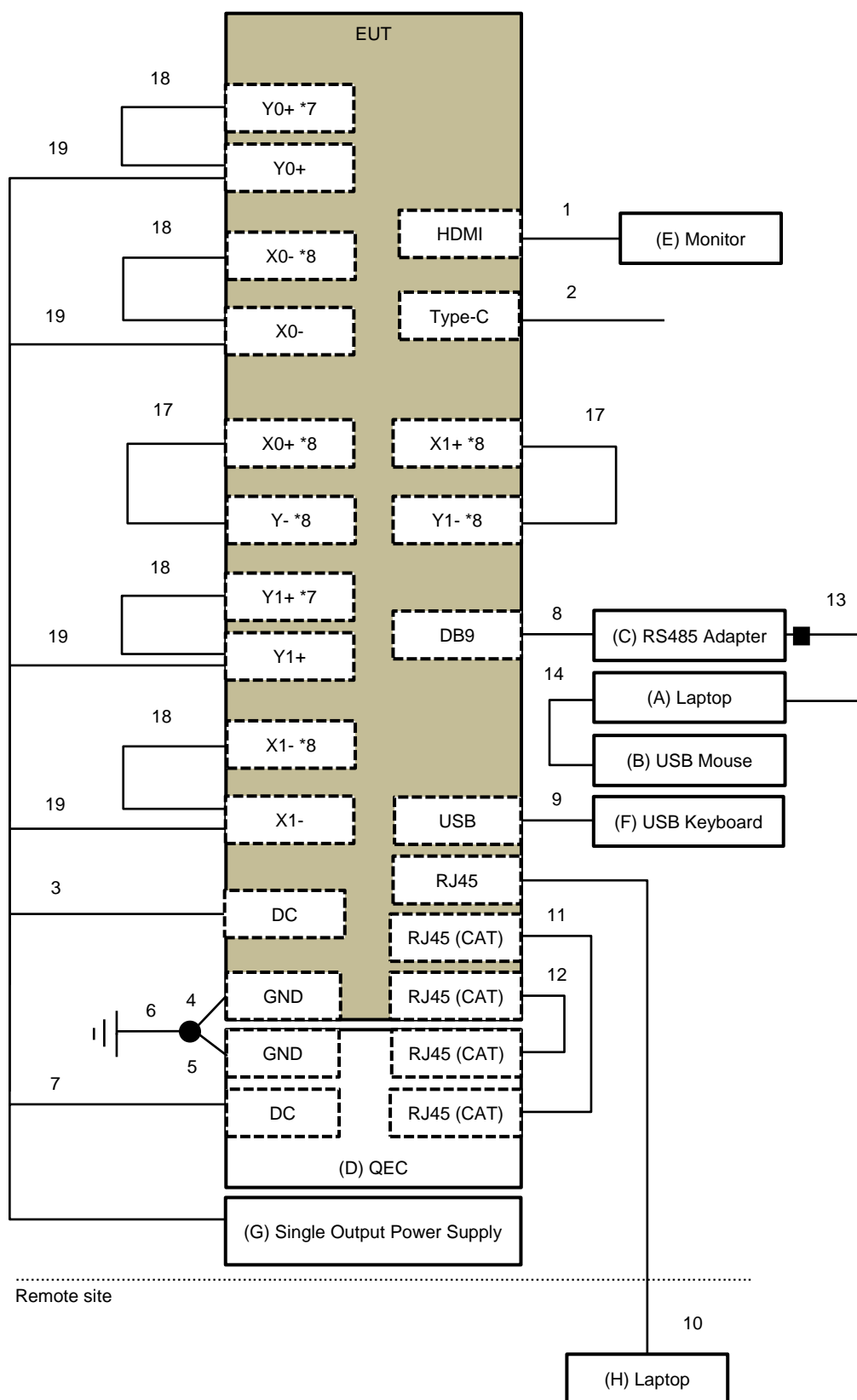
### 3.6 Connection Diagram of EUT and Peripheral Devices

For Conducted, ISN tests





For Radiated



### 3.7 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	Lenovo	TP00050A	N/A	N/A	Supplied by applicant
B	USB Mouse	DELL	MOCZUL	CN-049TWY-PRC00-77B-007R	N/A	Provided by Lab
C	RS485 Adapter	SOYAL	AR-321-CM	N/A	N/A	Supplied by applicant
D	QEC	QEC	QEC-R11D88D-C	N/A	N/A	Supplied by applicant
E	Monitor	DELL	U2410	CN082WXD728720CC0KCL	DoC	Provided by Lab
F	USB Keyboard	Dell	KB216t	CN-0W33XP-LO300-7CL-1907	N/A	Provided by Lab
G	Single Output Power Supply	Agilent	U8002A	MY52140016	N/A	Provided by Lab
H	Laptop	LENOVO	T480	PF1EK03U	N/A	Provided by Lab
I	DC Power source	Chroma	62024P-80-60	62024PA00674	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	HDMI	1	2	Y	0	Provided by Lab HDMI 2.0 (Brand: Amber Model: HDMI-AA120)
2	Type C	1	1	Y	0	Provided by Lab
3	Power	1	0.2	N	0	Supplied by applicant
4	GND (PE)	1	0.6	N	0	Supplied by applicant
5	GND (PE)	1	0.8	N	0	Supplied by applicant
6	GND (PE)	1	1.5	N	0	Provided by Lab
7	Power	1	0.4	N	0	Supplied by applicant
8	Data	1	0.6	N	0	Supplied by applicant
9	USB	1	1.8	Y	0	Provided by Lab
10	Cat. 5e	1	10	N	0	Provided by Lab
11	Cat. 5e	1	0.9	N	0	Supplied by applicant
12	Cat. 5e	1	0.9	N	0	Supplied by applicant
13	USB	1	0.9	Y	1	Supplied by applicant
14	USB	1	1.8	Y	0	Provided by Lab
15	Power	1	1.8	N	0	Provided by Lab
16	Power	1	10	N	0	Provided by Lab
17	Data	16	0.05	N	0	Supplied by applicant
18	Power	4	0.03	N	0	Supplied by applicant
19	Power	4	0.1	N	0	Supplied by applicant

## 4 Test Instruments

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

### 4.1 Conducted Emissions from Power Ports

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohm terminal resistance LYNICS	0900510	E1-011284	2024/9/16	2025/9/15
		E1-011286	2024/9/25	2025/9/24
Diode Pulse Limiter Schwarzbeck	VTSD 9561 F-N	01587	2025/5/2	2026/5/1
EMI Test Receiver R&S	EPL 1000	101065	2025/4/22	2026/4/21
	ESR3	102414	2024/12/11	2025/12/10
Highpass filter EMCI	150HPF-ME	114005	2025/5/2	2026/5/1
		114006	2025/5/2	2026/5/1
	150HPF-MF	113009	2025/5/2	2026/5/1
LISN R&S	ENV216	101196	2025/5/19	2026/5/18
	ESH2-Z5	100104	2024/12/11	2025/12/10
	ESH3-Z5	847265/023	2024/10/23	2025/10/22
LISN Schwarzbeck	NNLK 8121	8121-00759	2024/8/20	2025/8/19
		8121-808	2025/4/23	2026/4/22
	NNLK 8129	00624	2024/10/9	2025/10/8
		8129229	2024/10/14	2025/10/13
RF Coaxial Cable PEWC	5D-FB	Cable-CO9-01	2025/7/4	2026/7/3
Software BVADT	Cond_V7.4.1.0	N/A	N/A	N/A

Notes:

1. The test was performed in Linkou Conduction 9.
2. The VCCI Site Registration No. C-11312.
3. Tested Date: 2025/7/14

## 4.2 Conducted Emissions from Wired Network Ports

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohm terminal resistance LYNICS	0900510	E1-011284	2024/9/16	2025/9/15
		E1-011286	2024/9/25	2025/9/24
Capacitive Voltage Probe FCC	F-CVP-1	94	2025/4/9	2026/4/8
DC LISN R&S	ESH3-Z6	100219	2025/7/10	2026/7/9
		844950/018	2025/7/10	2026/7/9
EMI Test Receiver R&S	EPL 1000	101065	2025/4/22	2026/4/21
	ESR3	102414	2024/12/11	2025/12/10
Impedance Stabilization Network TESEQ	ISN S751	40599	2024/8/15	2025/8/14
	ISN ST08	41212	2024/9/9	2025/9/8
	ISN T8_Cat.6	53159	2025/6/10	2026/6/9
	ISN T400A	28573	2024/8/26	2025/8/25
	ISN T800	36181	2024/8/27	2025/8/26
LISN R&S	ENV216	101196	2025/5/19	2026/5/18
	ESH2-Z5	100104	2024/12/11	2025/12/10
	ESH3-Z5	847265/023	2024/10/23	2025/10/22
LISN Schwarzbeck	NNLK 8121	8121-00759	2024/8/20	2025/8/19
		8121-808	2025/4/23	2026/4/22
	NNLK 8129	00624	2024/10/9	2025/10/8
		8129229	2024/10/14	2025/10/13
Matching Pad EMCI	EMCI-3PD5M75BF	N/A	2024/12/17	2025/12/16
RF Coaxial Cable PEWC	5D-FB	Cable-CO9-01	2025/7/4	2026/7/3
RF Current Probe FCC	F-33-4	56	2024/8/5	2025/8/4
Software BVADT	ISN_V7.4.1.0	N/A	N/A	N/A

### Notes:

1. The test was performed in Linkou Conduction 9(ISN 9).
2. The VCCI Site Registration No. T-11587.
3. Tested Date: 2025/7/14

### 4.3 Radiated Emissions up to 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
ADT. Tower	AT100	0205	N/A	N/A
ADT. Turn Table	TT100	0205	N/A	N/A
Bi_Log Antenna schaffner	CBL 6111D	22270	2024/10/8	2025/10/7
Coupling / Decoupling Network Schwarzbeck	CDNE-M2	00097	2025/5/28	2026/5/27
	CDNE-M3	00091	2025/3/20	2026/3/19
EMI Test Receiver R&S	ESCS 30	100292	2024/9/18	2025/9/17
Fixed Attenuator Mini-Circuits	UNAT-5+	PAD-ST2-01	2024/10/19	2025/10/18
Preamplifier HP	8447D	2727A05786	2025/2/14	2026/2/13
RF Coaxial Cable Pacific	8D-FB	Cable-ST2-01	2024/11/6	2025/11/5
Software BVADT	Radiated_V8.8.09	N/A	N/A	N/A

Notes:

1. The test was performed in Linkou Open Site2 , The test site validated date: 2024/7/13 (NSA)
2. The VCCI Site Registration No. R-10237.
3. Tested Date: 2025/7/2

#### 4.4 Radiated Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Fix tool for Boresight antenna tower BV	BAF-01	9	N/A	N/A
Fixed Attenuator Mini-Circuits	BW-K3-2W44+	PAD-CH7-03	2025/7/4	2026/7/3
	BW-N4W5+	PAD-CH10-02	2025/7/4	2026/7/3
Horn Antenna EMCO	3115	6714	2024/11/10	2025/11/9
Horn Antenna ETS-Lindgren	3117-PA	00215857	2024/11/10	2025/11/9
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170190	2024/11/10	2025/11/9
MXA Signal Analyzer Keysight	N9020B	MY60110438	2024/12/5	2025/12/4
		MY60112260	2025/5/26	2026/5/25
Notch Filter Micro-Tronics	BRC50703-01	010	2025/5/22	2026/5/21
	BRM17690	005	2025/5/22	2026/5/21
Preamplifier EMCI	EMC0126545	980076	2025/2/14	2026/2/13
	EMC184045B	980235	2025/2/14	2026/2/13
Preamplifier HP	8449B	3008A01292	2025/2/14	2026/2/13
RF Coaxial Cable EMEC	EM102-KMKM-100	02	2025/7/4	2026/7/3
	EM102-KMKM-350	01	2025/7/4	2026/7/3
Software BVADT	Radiated_V8.8.09	N/A	N/A	N/A
Turn Table & Tower Max Full	MF7802	MF780208216	N/A	N/A

#### Notes:

1. The test was performed in Linkou 966 Chamber 3 (CH 10).
2. The VCCI Site Registration No. G-10427.
3. Tested Date: 2025/7/14

## 5 Limits of Test Items

### 5.1 Conducted Emissions from Power Ports

Frequency (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

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 0.15 to 0.50 MHz.

### 5.2 Conducted Emissions from Wired Network Ports

Frequency (MHz)	Coupling Device	Class A				Class B			
		Voltage Limit (dBuV)		Current limits (dBuA)		Voltage Limit (dBuV)		Current limits (dBuA)	
		Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
0.15-0.5	Using AAN	97-87	84-74	-	-	84-74	74-64	-	-
0.5-30		87	74	-	-	74	64	-	-
0.15-0.5	Using CVP and Current probe	97-87	84-74	53-43	40-30	84-74	74-64	40-30	30-20
0.5-30		87	74	43	30	74	64	30	20
0.15-0.5	Current probe	-	-	53-43	40-30	-	-	40-30	30-20
0.5-30		-	-	43	30	-	-	30	20

Note: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

### 5.3 Radiated Emissions up to 1 GHz

Frequency (MHz)	Class A Quasi-peak (dBuV/m)		Class B Quasi-peak (dBuV/m)	
	at 3m	at 10m	at 3m	at 10m
30 - 230	50	40	40	30
230 - 1000	57	47	47	37

#### For radiated emissions from FM receivers only (Measurement Facility: OATS/SAC)

Frequency (MHz)	Fundamental (dBuV/m)		Harmonics (dBuV/m)	
	at 3m	at 10m	at 3m	at 10m
30 - 230	60	50	52	42
230 - 300	60	50	52	42
300 - 1000	60	50	56	46

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 class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

#### 5.4 Radiated Emissions above 1 GHz

Frequency (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	Average	Peak	Average	Peak
1 to 3	56	76	50	70
3 to 6	60	80	54	74

- 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 class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

#### Frequency Range of Radiated Measurement (For unintentional radiators)

Highest internal frequency ( $F_x$ )	Highest measurement frequency ( $F_m$ ) (GHz)
$F_x \leq 108 \text{ MHz}$	1
$108 \text{ MHz} < F_x \leq 500 \text{ MHz}$	2
$500 \text{ MHz} < F_x \leq 1 \text{ GHz}$	5
$F_x > 1 \text{ GHz}$	5 x $F_x$ up to a maximum of 6 GHz

$F_x$  is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.



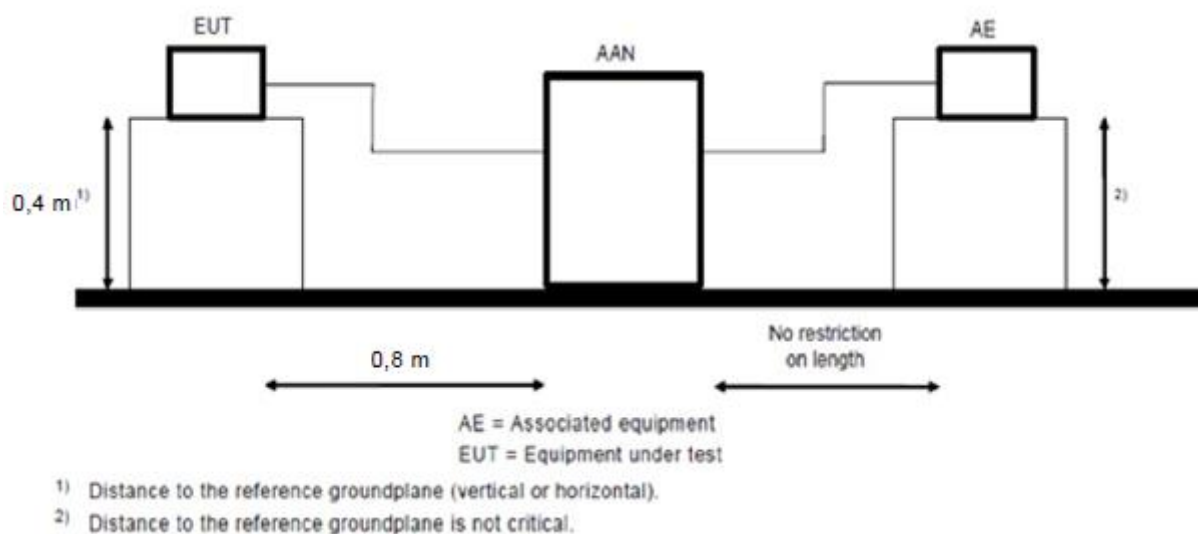


## 6.2 Conducted Emissions from Wired Network Ports

### Method of Using AANs:

- The EUT is placed 0.4 meters from the conducting wall of the shielded room and connected to AAN directly to reference ground plane.
- If voltage measurement is used, measure voltage at the measurement port of the AAN, correct the reading by adding the AAN voltage division factor, and compare to the voltage limit.
- It is not necessary to apply the current limit if a AAN is used.
- The test results of disturbance at telecommunication 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 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz-30 MHz.

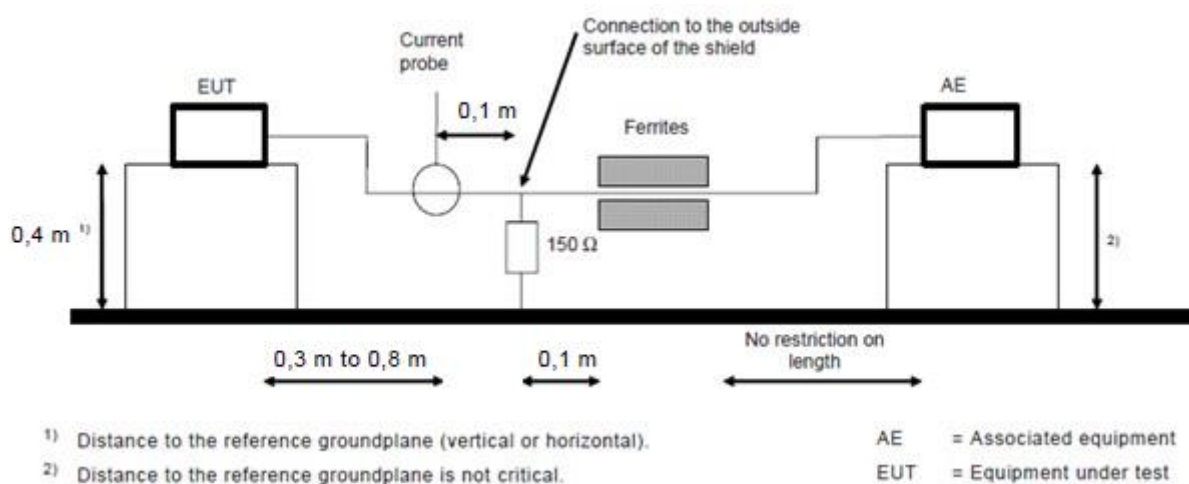


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

### Method of Using a combination of Current Probe and 150 $\Omega$ load to the outside surface of the shielding cable:

- Breaks the external protective insulation (exposing the shield) and connect a 150 $\Omega$  resistor from the outside surface of the shield to ground.
- A current probe shall be placed at 0.1 m from the 150 $\Omega$  resistor. The current probe to EUT horizontal distance is between 0.3 m to 0.8 m.
- If current measurement is used, measure current at the measurement port of the current probe, correct the reading by adding the current probe division factor, and compare to the current limit.
- It is not necessary to apply the voltage limit if a current probe is used.
- The test results of disturbance at telecommunication 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 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz-30 MHz.

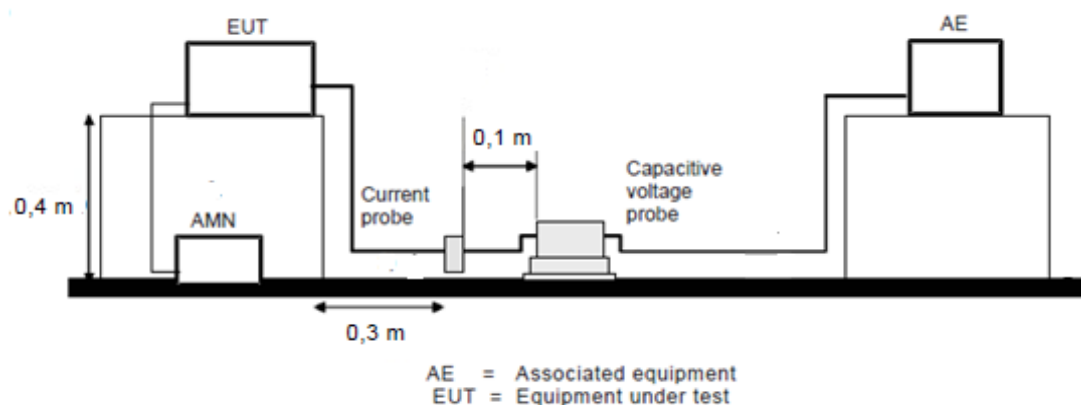


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

### Method of Using a combination of current probe and capacitive voltage probe:

- a. Measure current with a current probe.
- b. Compare the measured current with the applicable current limit.
- c. Measure voltage with a capacitive voltage probe as specified in 5.2.2 of CISPR 16-1-2.
- d. Adjust the measured voltage as follows:
  - current margin  $\leq 6$  dB – subtract the actual current margin from measured voltage;
  - current margin  $> 6$  dB – subtract 6 dB from measured voltage.
- e. Compare adjusted voltage with the applicable voltage limit
- f. Both the measured current and the adjusted voltage shall be below the applicable
- g. The test results of disturbance at telecommunication 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 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz-30 MHz.

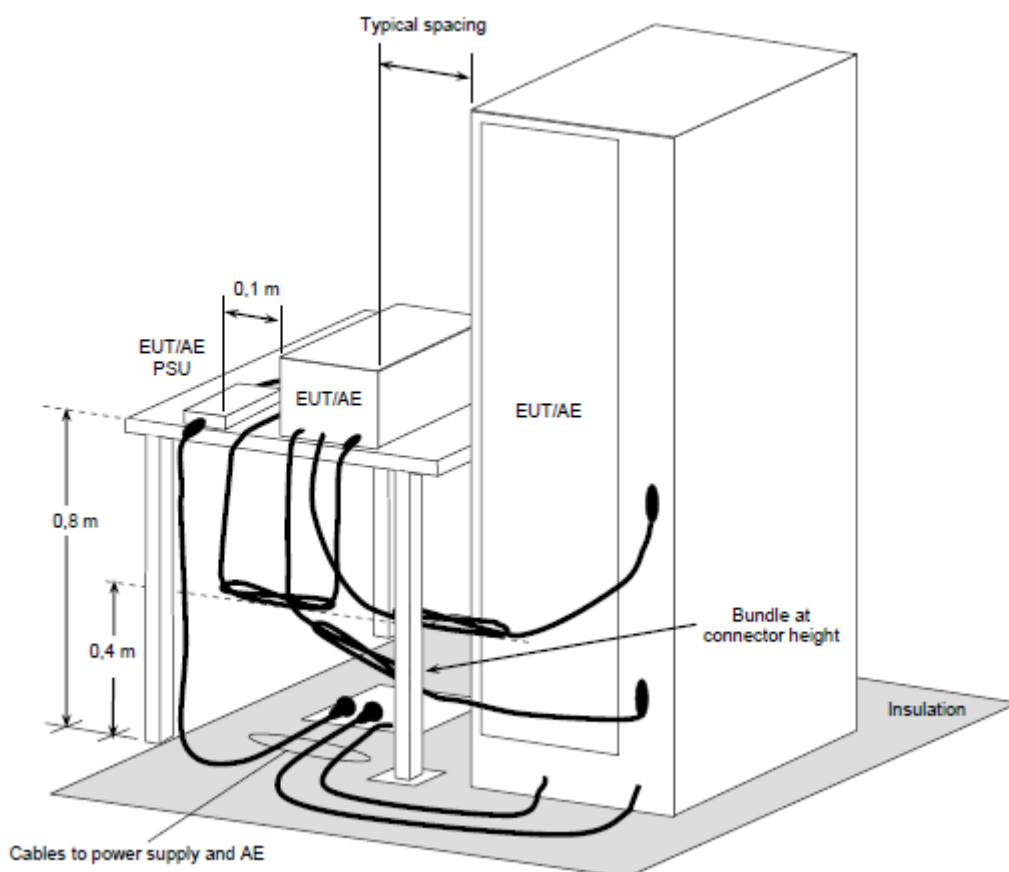


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

### 6.3 Radiated Emissions up to 1 GHz

- For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the floor standing EUT shall be insulated (by insulation of maximum thickness of 150 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- The EUT is set 10 meters away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- 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.
- For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1 m to 4 m and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system is 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 120 kHz for quasi-peak detection (QP) at frequency up to 1 GHz.

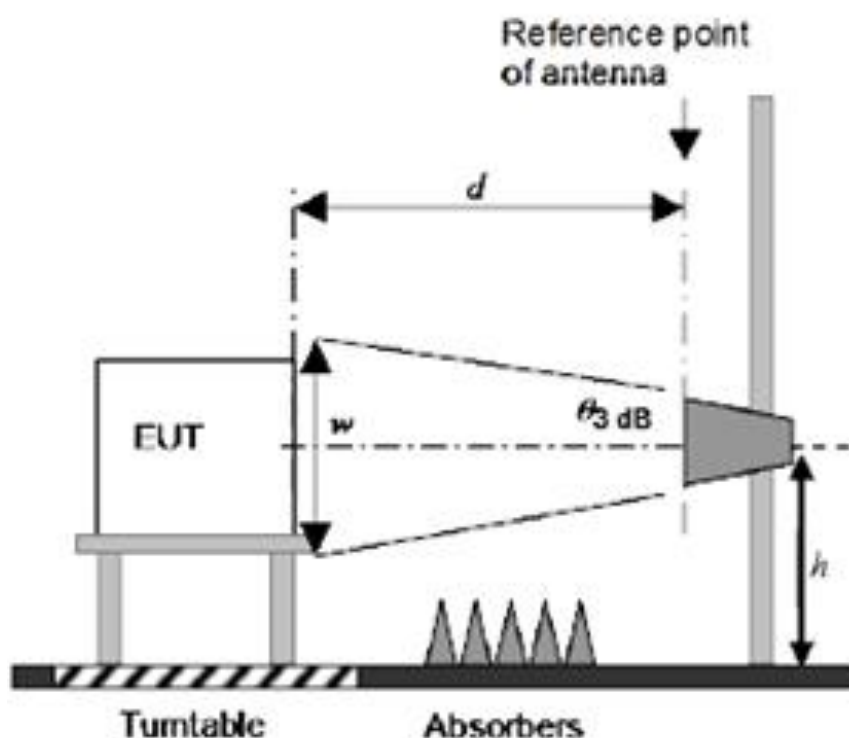


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

#### 6.4 Radiated Emissions above 1 GHz

- For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the floor standing EUT shall be insulated (by insulation of maximum thickness of 150 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- The EUT was set  $d = 3$  meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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 3 dB 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.
- 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.
- 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 1 MHz and video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1 GHz.



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

## 7 Test Results of Test Item

### 7.1 Conducted Emissions from Power Ports

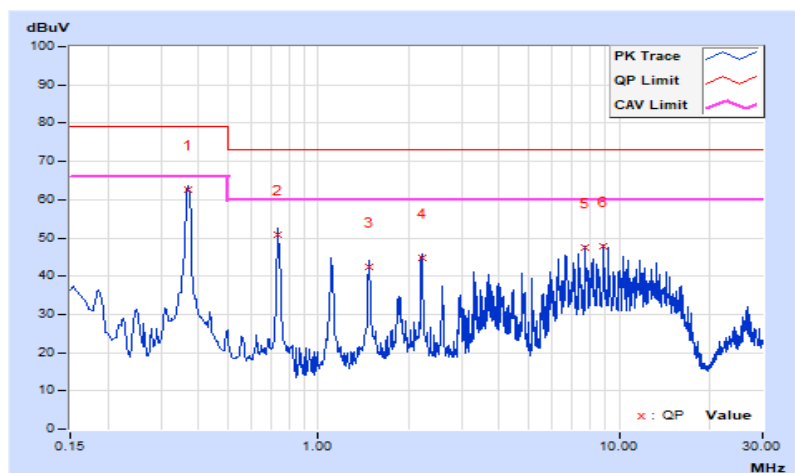
#### Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	24 Vdc	Environmental Conditions	24 °C, 73% RH, 995.4 mbar
Tested by	Ed Lin		

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	0.36902	10.11	52.40	48.95	62.51	59.06	79.00	66.00	-16.49	-6.94
2	0.73466	10.13	40.78	40.50	50.91	50.63	73.00	60.00	-22.09	-9.37
3	1.46993	10.17	32.33	32.03	42.50	42.20	73.00	60.00	-30.50	-17.80
4	2.20520	10.20	34.45	34.29	44.65	44.49	73.00	60.00	-28.35	-15.51
5	7.71814	10.33	37.02	36.55	47.35	46.88	73.00	60.00	-25.65	-13.12
6	8.82105	10.35	37.60	37.12	47.95	47.47	73.00	60.00	-25.05	-12.53

#### 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

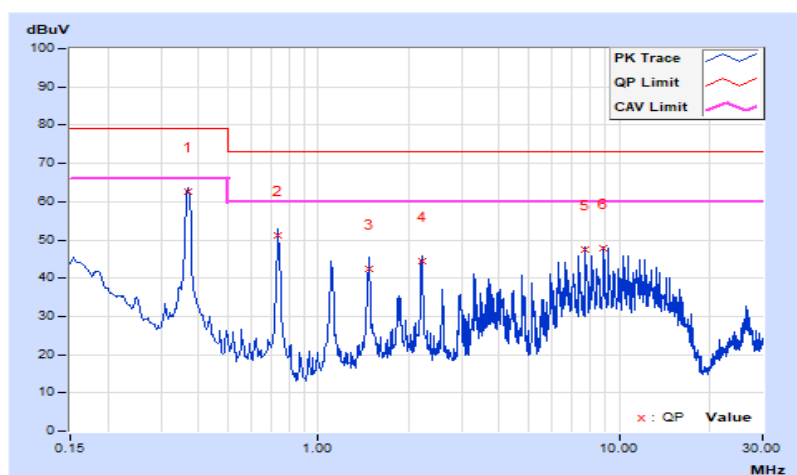


Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	24 Vdc	Environmental Conditions	24 °C, 73% RH, 995.4 mbar
Tested by	Ed Lin		

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	0.36902	10.11	52.63	49.12	62.74	59.23	79.00	66.00	-16.26	-6.77
2	0.73466	10.13	41.02	40.53	51.15	50.66	73.00	60.00	-21.85	-9.34
3	1.46993	10.16	32.41	31.83	42.57	41.99	73.00	60.00	-30.43	-18.01
4	2.20520	10.20	34.27	34.01	44.47	44.21	73.00	60.00	-28.53	-15.79
5	7.72206	10.32	37.03	36.57	47.35	46.89	73.00	60.00	-25.65	-13.11
6	8.82647	10.35	37.44	36.79	47.79	47.14	73.00	60.00	-25.21	-12.86

#### 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





## 7.2 Conducted Emissions from Wired Network Ports

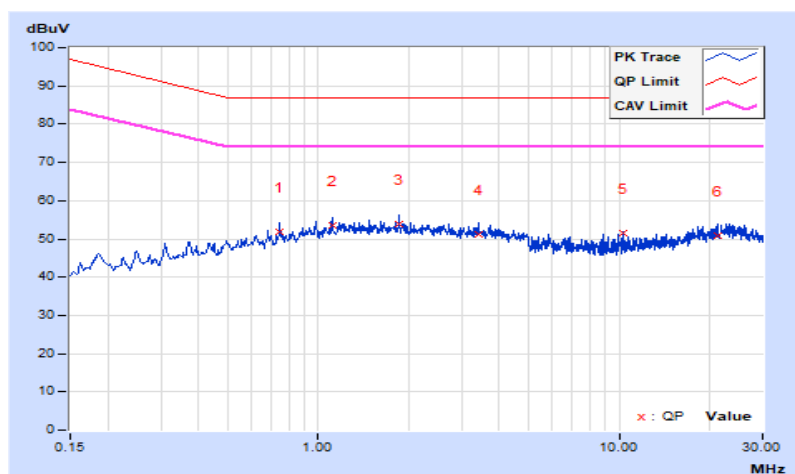
### Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	24 Vdc	Environmental Conditions	24 °C, 73% RH, 995.4 mbar
Tested by	Ed Lin		

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	0.74248	9.91	41.92	36.46	51.83	46.37	87.00	74.00	-35.17	-27.63
2	1.11053	9.85	43.64	38.12	53.49	47.97	87.00	74.00	-33.51	-26.03
3	1.85712	9.81	44.08	38.47	53.89	48.28	87.00	74.00	-33.11	-25.72
4	3.40978	9.78	41.52	35.74	51.30	45.52	87.00	74.00	-35.70	-28.48
5	10.30332	9.79	41.73	37.57	51.52	47.36	87.00	74.00	-35.48	-26.64
6	21.34407	10.01	40.68	35.66	50.69	45.67	87.00	74.00	-36.31	-28.33

#### 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



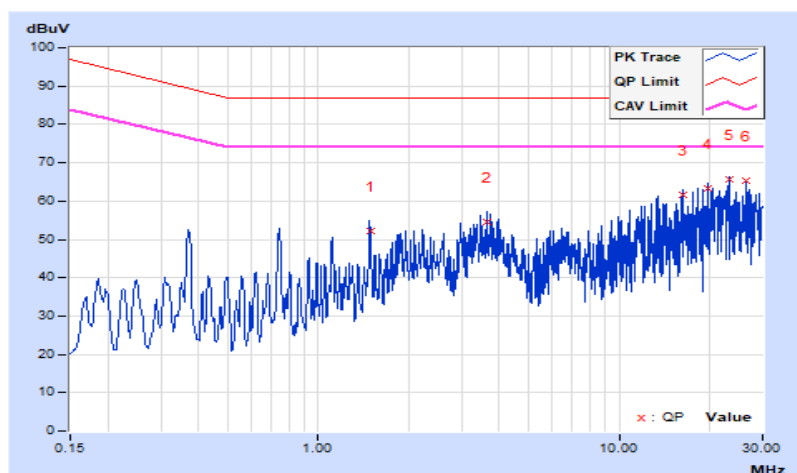
## Mode B

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	24 Vdc	Environmental Conditions	24 °C, 73% RH, 995.4 mbar
Tested by	Ed Lin		

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	1.48661	9.83	42.24	39.02	52.07	48.85	87.00	74.00	-34.93	-25.15
2	3.64444	9.78	44.85	40.10	54.63	49.88	87.00	74.00	-32.37	-24.12
3	16.22848	9.89	51.70	49.52	61.59	59.41	87.00	74.00	-25.41	-14.59
4	19.70927	9.96	53.48	49.98	63.44	59.94	87.00	74.00	-23.56	-14.06
5	23.12749	10.06	55.59	52.81	65.65	62.87	87.00	74.00	-21.35	-11.13
6	26.48703	10.16	55.13	51.85	65.29	62.01	87.00	74.00	-21.71	-11.99

### 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



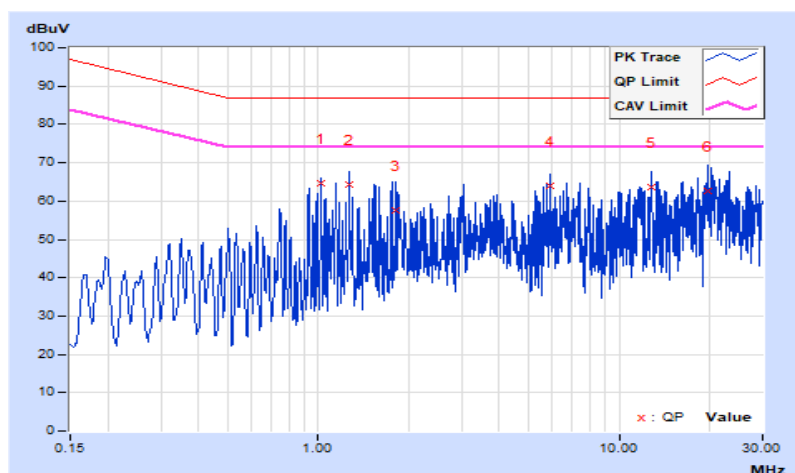
## Mode C

<b>Frequency Range</b>	150 kHz ~ 30 MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9 kHz
<b>Input Power</b>	24 Vdc	<b>Environmental Conditions</b>	24 °C, 73% RH, 995.5 mbar
<b>Tested by</b>	Ed Lin		

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	1.02342	9.86	54.83	54.80	64.69	64.66	87.00	74.00	-22.31	-9.34
2	1.26656	9.84	54.39	54.35	64.23	64.19	87.00	74.00	-22.77	-9.81
3	1.81770	9.81	47.85	47.27	57.66	57.08	87.00	74.00	-29.34	-16.92
4	5.90735	9.78	54.16	53.81	63.94	63.59	87.00	74.00	-23.06	-10.41
5	12.80843	9.83	53.79	52.68	63.62	62.51	87.00	74.00	-23.38	-11.49
6	19.70927	9.96	52.54	49.76	62.50	59.72	87.00	74.00	-24.50	-14.28

### 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



### 7.3 Radiated Emissions up to 1 GHz

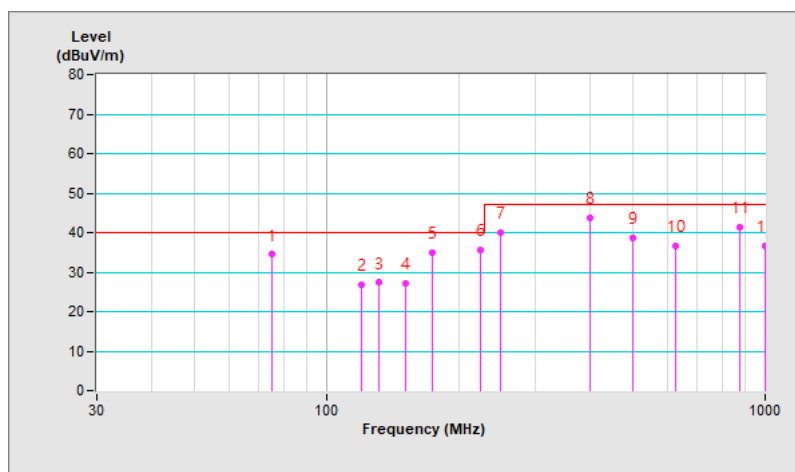
#### Mode A

Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	24 Vdc	Environmental Conditions	32 °C, 77% RH, 1000 mbar
Tested By	Paul Chen		

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	75.00	34.49 QP	40.00	-5.51	4.00 H	33	49.01	-14.52
2	120.50	26.71 QP	40.00	-13.29	4.00 H	94	36.05	-9.34
3	131.94	27.33 QP	40.00	-12.67	4.00 H	176	36.59	-9.26
4	151.52	27.19 QP	40.00	-12.81	4.00 H	154	36.88	-9.69
5	174.96	35.01 QP	40.00	-4.99	4.00 H	356	46.12	-11.11
6	225.00	35.55 QP	40.00	-4.45	4.00 H	360	45.56	-10.01
7	250.00	40.07 QP	47.00	-6.93	3.78 H	105	47.21	-7.14
8	400.00	43.81 QP	47.00	-3.19	2.76 H	197	47.51	-3.70
9	500.01	38.62 QP	47.00	-8.38	1.92 H	200	40.70	-2.08
10	624.98	36.57 QP	47.00	-10.43	1.55 H	227	35.61	0.96
11	874.99	41.39 QP	47.00	-5.61	1.00 H	187	36.87	4.52
12	999.99	36.59 QP	47.00	-10.41	1.00 H	272	29.24	7.35

#### 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. Margin value = Emission level – Limit value
4. The other emission levels were very low against the limit.

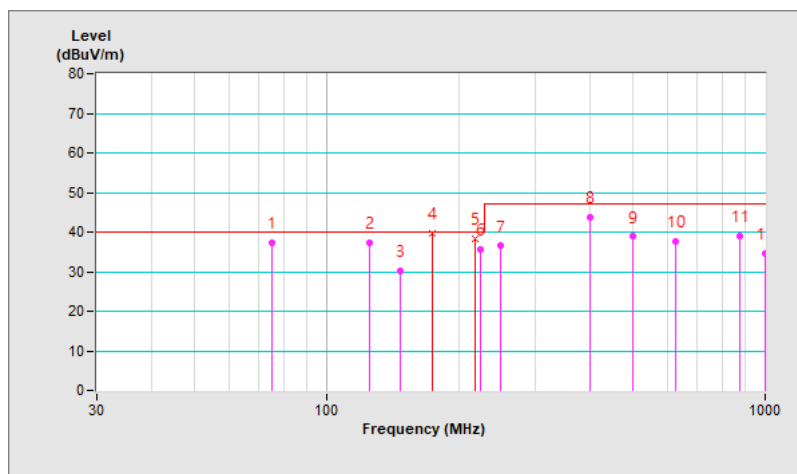


Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	24 Vdc	Environmental Conditions	32 °C, 77% RH, 1000 mbar
Tested By	Paul Chen		

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	75.00	37.45 QP	40.00	-2.55	1.69 V	300	51.97	-14.52
2	125.18	37.37 QP	40.00	-2.63	1.00 V	283	46.47	-9.10
3	147.92	30.18 QP	40.00	-9.82	1.00 V	231	39.75	-9.57
4	175.00	39.60 QP	40.00	-0.40	1.00 V	360	50.71	-11.11
5	218.02	38.34 QP	40.00	-1.66	1.00 V	294	49.01	-10.67
6	225.00	35.53 QP	40.00	-4.47	1.00 V	236	45.54	-10.01
7	250.06	36.46 QP	47.00	-10.54	1.00 V	360	43.59	-7.13
8	400.00	43.77 QP	47.00	-3.23	1.00 V	279	47.47	-3.70
9	500.00	38.87 QP	47.00	-8.13	1.00 V	360	40.95	-2.08
10	625.20	37.79 QP	47.00	-9.21	3.21 V	1	36.83	0.96
11	874.99	39.01 QP	47.00	-7.99	2.65 V	199	34.49	4.52
12	999.99	34.73 QP	47.00	-12.27	2.16 V	289	27.38	7.35

#### 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. Margin value = Emission level – Limit value
4. The other emission levels were very low against the limit.



## 7.4 Radiated Emissions above 1 GHz

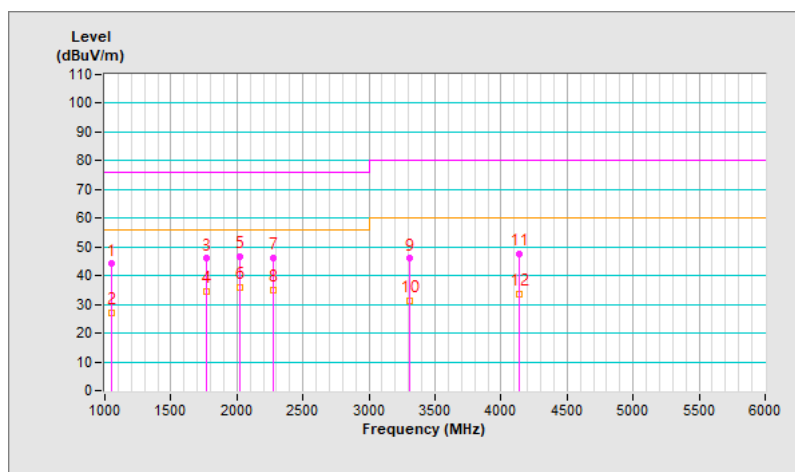
### Mode A

Frequency Range	1 GHz ~ 6 GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1 MHz
Input Power	24 Vdc	Environmental Conditions	24 °C, 62% RH, 994.1 mbar
Tested By	Perry Yang		

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	1052.67	44.14 PK	76.00	-31.86	2.13 H	122	68.31	-24.17
2	1052.67	27.00 AV	56.00	-29.00	2.13 H	122	51.17	-24.17
3	1766.75	45.93 PK	76.00	-30.07	1.10 H	348	67.18	-21.25
4	1766.75	34.55 AV	56.00	-21.45	1.10 H	348	55.80	-21.25
5	2018.94	46.57 PK	76.00	-29.43	1.00 H	355	66.59	-20.02
6	2018.94	35.87 AV	56.00	-20.13	1.00 H	355	55.89	-20.02
7	2271.09	46.18 PK	76.00	-29.82	1.00 H	232	65.77	-19.59
8	2271.09	34.86 AV	56.00	-21.14	1.00 H	232	54.45	-19.59
9	3303.67	46.00 PK	80.00	-34.00	2.92 H	276	61.60	-15.60
10	3303.67	31.23 AV	60.00	-28.77	2.92 H	276	46.83	-15.60
11	4135.33	47.75 PK	80.00	-32.25	1.00 H	304	61.58	-13.83
12	4135.33	33.51 AV	60.00	-26.49	1.00 H	304	47.34	-13.83

### 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. Margin value = Emission level – Limit value
4. The other emission levels were very low against the limit.

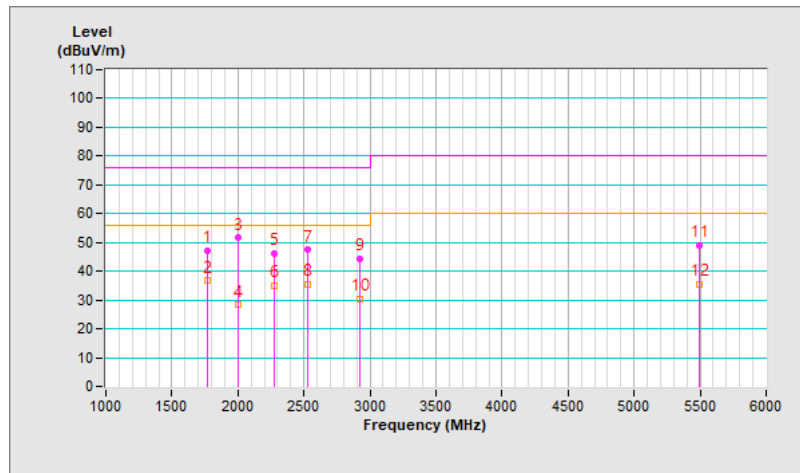


Frequency Range	1 GHz ~ 6 GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1 MHz
Input Power	24 Vdc	Environmental Conditions	24 °C, 62% RH, 994 mbar
Tested By	Perry Yang		

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	1766.53	47.05 PK	76.00	-28.95	1.05 V	162	68.30	-21.25
2	1766.53	36.67 AV	56.00	-19.33	1.05 V	162	57.92	-21.25
3	1999.41	51.62 PK	76.00	-24.38	1.00 V	296	71.75	-20.13
4	1999.41	28.28 AV	56.00	-27.72	1.00 V	296	48.41	-20.13
5	2271.30	46.17 PK	76.00	-29.83	2.13 V	165	65.76	-19.59
6	2271.30	35.06 AV	56.00	-20.94	2.13 V	165	54.65	-19.59
7	2523.64	47.32 PK	76.00	-28.68	1.64 V	188	65.63	-18.31
8	2523.64	35.62 AV	56.00	-20.38	1.64 V	188	53.93	-18.31
9	2923.67	44.38 PK	76.00	-31.62	1.00 V	356	61.11	-16.73
10	2923.67	30.27 AV	56.00	-25.73	1.00 V	356	47.00	-16.73
11	5492.50	49.07 PK	80.00	-30.93	2.96 V	85	61.47	-12.40
12	5492.50	35.64 AV	60.00	-24.36	2.96 V	85	48.04	-12.40

**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. Margin value = Emission level – Limit value
4. The other emission levels were very low against the limit.



## 8 Pictures of Test Arrangements

### 8.1 Conducted Emissions from Power Ports

#### Mode A





## 8.2 Conducted Emissions from Wired Network Ports

### Mode A



Mode B



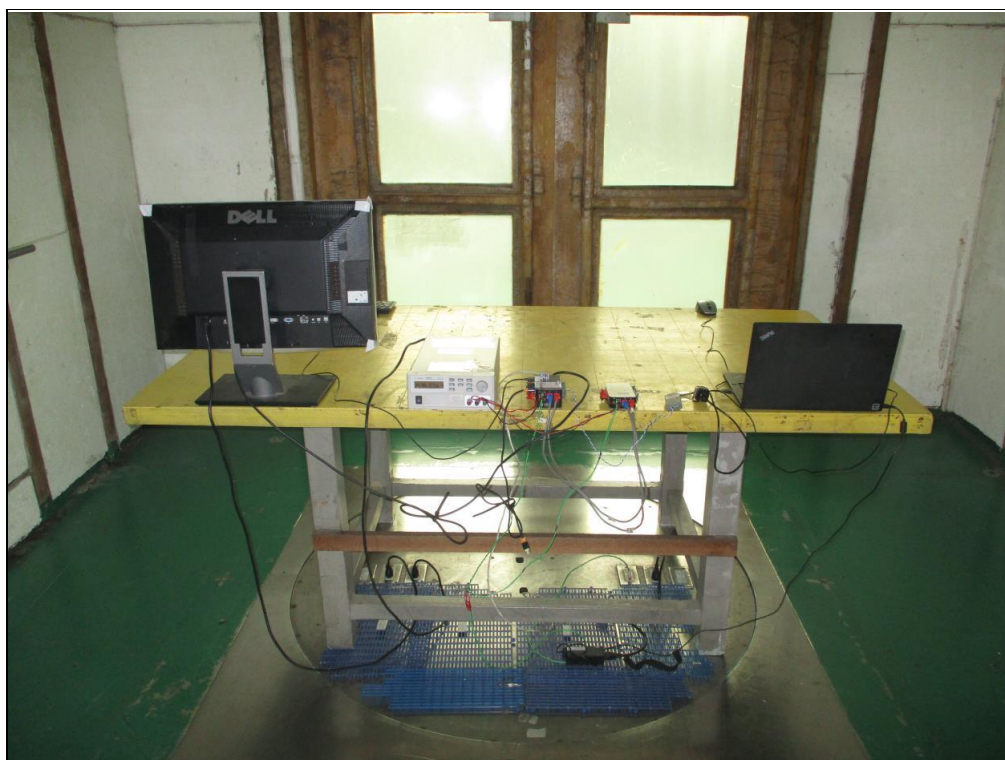
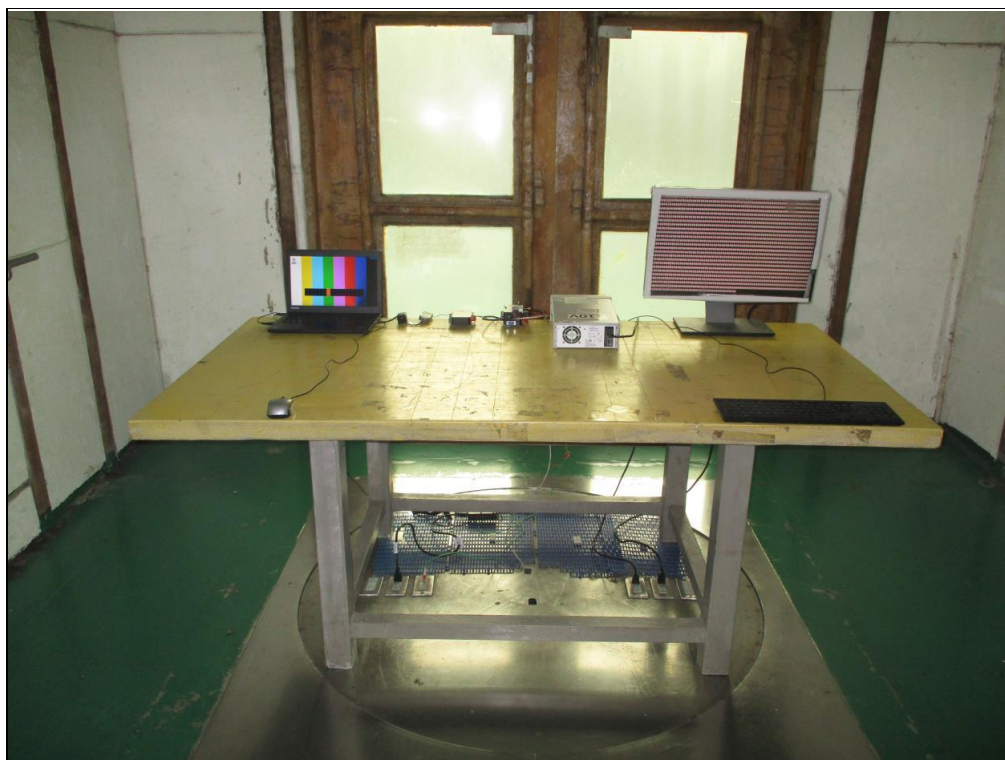
Mode C





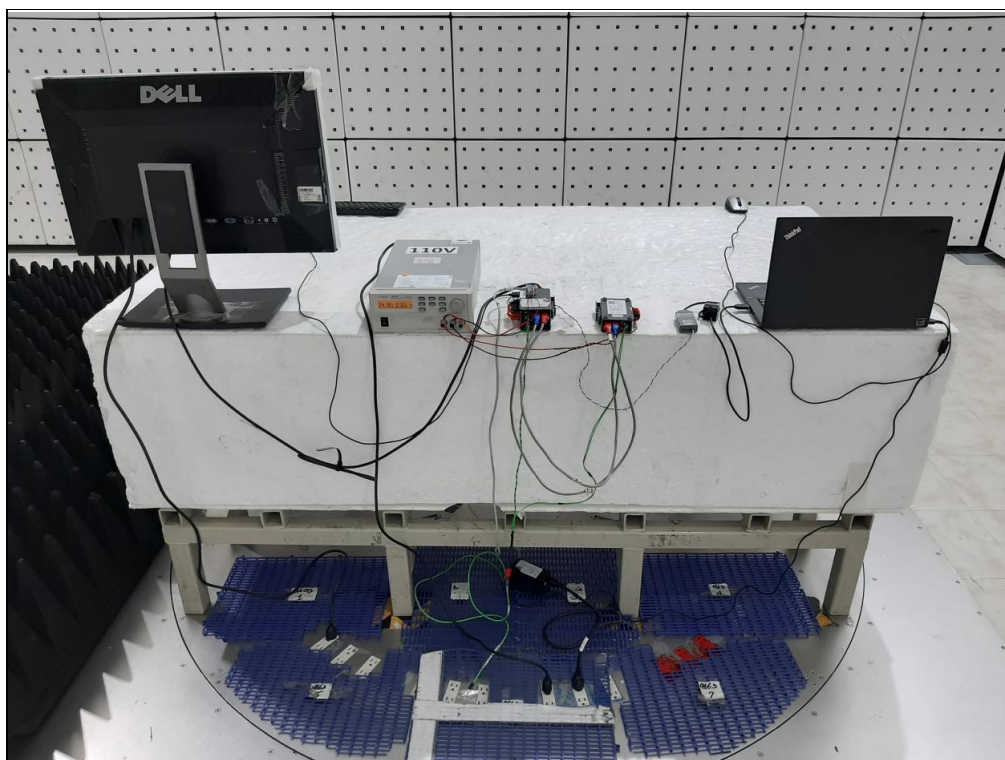
### 8.3 Radiated Emissions up to 1 GHz

#### Mode A



## 8.4 Radiated Emissions above 1 GHz

### Mode A



## 9 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 FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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

**Lin Kou EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-6668565

Fax: 886-3-6668323

**Hwa Ya EMC/RF/Safety Lab**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@bureauveritas.com](mailto:service.adt@bureauveritas.com)

**Web Site:** <http://ee.bureauveritas.com.tw>

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

--- END ---