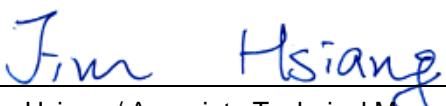


# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** VCCI-CISPR 32: 2016, Class A  
**Report No.:** VBDBO-WTW-P23050406  
**Product:** QEC  
**Brand:** ICOP  
**Model No.:** QEC-M-01  
**Received Date:** 2023/3/13  
**Test Date:** 2023/3/23 ~ 2023/3/25  
**Issued Date:** 2023/5/19  
**Applicant:** ICOP TECHNOLOGY INC.  
**Address:** NO.15,Wugong 5th Rd., Xinzhuang 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:

2023/5/19

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Prepared by : Albee Chu / Senior Specialist

## 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 .....	7
3.7 Configuration of Peripheral Devices and Cable Connections .....	8
<b>4 Test Instruments .....</b>	<b>9</b>
4.1 Conducted Emissions from Power Ports.....	9
4.2 Conducted Emissions from Wired Network Ports .....	10
4.3 Radiated Emissions up to 1 GHz .....	11
4.4 Radiated Emissions above 1 GHz.....	12
<b>5 Limits of Test Items.....</b>	<b>13</b>
5.1 Conducted Emissions from Power Ports.....	13
5.2 Conducted Emissions from Wired Network Ports .....	13
5.3 Radiated Emissions up to 1 GHz .....	13
5.4 Radiated Emissions above 1 GHz.....	14
<b>6 Test Arrangements.....</b>	<b>15</b>
6.1 Conducted Emissions from Power Ports.....	15
6.2 Conducted Emissions from Wired Network Ports .....	16
6.3 Radiated Emissions up to 1 GHz .....	19
6.4 Radiated Emissions above 1 GHz.....	20
<b>7 Test Results of Test Item .....</b>	<b>21</b>
7.1 Conducted Emissions from Power Ports.....	21
7.2 Conducted Emissions from Wired Network Ports .....	23
7.3 Radiated Emissions up to 1 GHz .....	24
7.4 Radiated Emissions above 1 GHz.....	26
<b>8 Pictures of Test Arrangements .....</b>	<b>28</b>
8.1 Conducted Emissions from Power Ports.....	28
8.2 Conducted Emissions from Wired Network Ports .....	29
8.3 Radiated Emissions up to 1 GHz .....	30
8.4 Radiated Emissions above 1 GHz.....	31
<b>9 Information of the Testing Laboratories .....</b>	<b>32</b>

## Release Control Record

Issue No.	Description	Date Issued
VBDBO-WTW-P23050406	Original release.	2023/5/19

## 1 Certificate

**Product:** QEC

**Brand:** iCOP

**Test Model:** QEC-M-01

**Sample Status:** Engineering sample

**Applicant:** ICOP TECHNOLOGY INC.

**Test Date:** 2023/3/23 ~ 2023/3/25

**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 -5.39 dB at 0.92201 MHz
VCCI-CISPR 32	Conducted Emissions from Wired Network Ports	Pass	Minimum passing Class A margin is -26.49 dB at 1.23054 MHz
VCCI-CISPR 32	Radiated Emissions up to 1 GHz	Pass	Minimum passing Class A margin is -3.03 dB at 33.66 MHz
VCCI-CISPR 32	Radiated Emissions above 1 GHz	Pass	Minimum passing Class A margin is -20.83 dB at 1000.04 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	2.94 dB	3.4 dB ( $U_{\text{CISPR}}$ )
Conducted Emissions from Wired Network Ports	9 kHz ~ 30 MHz	ISN Cat3 : 3.42 dB ISN Cat5 : 3.88 dB ISN Cat6 : 4.38 dB Current Probe : 1.82 dB Voltage Probe : 2.94 dB Coaxial : 2.38 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 : 5.72 dB 10m : 4.38 dB	6.3 dB ( $U_{\text{CISPR}}$ )
Radiated Emissions above 1 GHz	1 GHz ~ 6 GHz	4.94 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	QEC-M-01
Sample Status	Engineering sample
Operating Software	N/A
Power Supply Rating	DC power from host equipment
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

This report is issued as a duplicate report of BV CPS report no.: VBDBO-WTW-P23030414 (iCOP/ QEC-R11-D88D-C). The EUT (iCOP/ QEC-M-01) was tested with another QEC (iCOP/ QEC-R11-D88D-C) together; therefore all test data was copied from the original test report.

#### 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 533MHz, 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	With system,lay flat
2	<b>With system,upright</b>
Notes:	
1. There are both standby mode and normal mode to be pre-tested then normal mode has the highest emission value.	
2. The worst case is that mode 2 is shown in bold.	

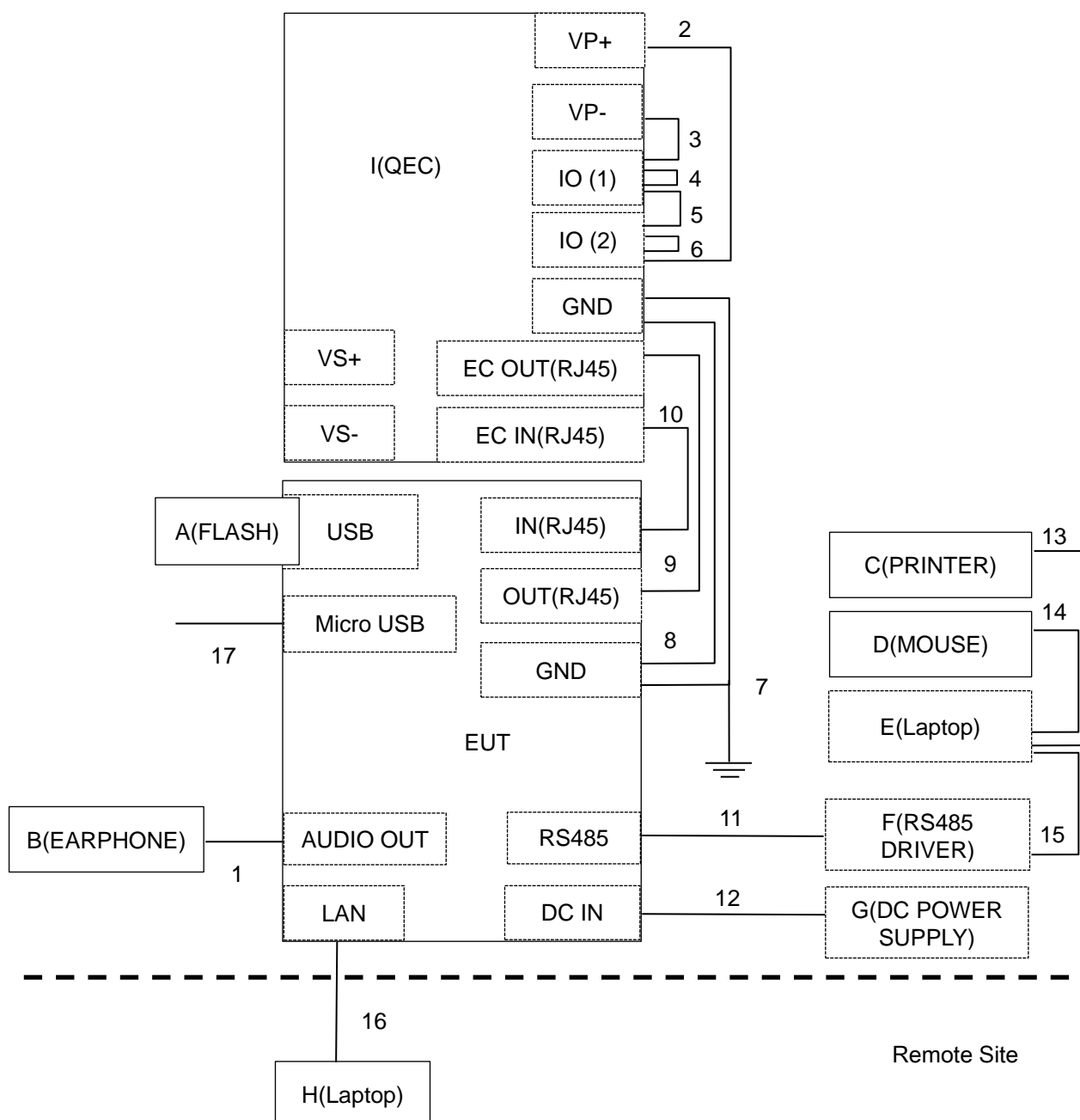
Test modes are presented in the report as below.

Test Condition	
Mode	Conducted Emissions from Power Ports
A	With system,upright
Mode	Conducted Emissions from Wired Network Ports
A	With system,upright,Lan 1Gbps
Mode	Radiated Emissions up to 1 GHz
A	With system,upright
Mode	Radiated Emissions above 1 GHz
A	With system,upright

### 3.5 Test Program Used and Operation Descriptions

- Turned on the power of all equipment.
- EUT ran a test program to enable all functions.
- Laptop sent and received message to/ from QEC via EUT with RS485 driver.
- Laptop (kept at remote site) sent and received message to/ from QEC via EUT.
- Laptop sent "ITU-R 471-1" messages to panel. Then it displayed messages on its screen.
- Laptop sent messages to printer and printed them out.
- EUT sent "audio signal" to earphone.
- Steps c-g were repeated.

### 3.6 Connection Diagram of EUT and Peripheral Devices



### 3.7 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	FLASH	HP	V222W	N/A	N/A	Supplied by applicant
B	EARPHONE	PHILIPS	SBC HL145	N/A	N/A	Provided by Lab
C	Printer	HP	HP Officejet Pro 251dW	N/A	B94SDGOB1191	Provided by Lab
D	USB Mouse	DELL	MOCZUL	CN-049TWY-PRC00-77B-007R	N/A	Provided by Lab
E	Laptop	Lenovo	2786	L3AAE9K	N/A	Supplied by applicant
F	RS485 DRIVER	SOYAL	N/A	N/A	N/A	Supplied by applicant
G	DC POWER SUPPLY	Topward	6603D	721260	N/A	Provided by Lab
H	Laptop	LENOVO	T480	PF1EK03U	N/A	Provided by Lab
I	QEC	iCOP	QEC-R11-D88D-C	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	Audio (3.5") cable	1	1.2	No	0	Provided by Lab
2	Data cable	1	0.4	No	0	Supplied by applicant
3	Data cable	1	0.4	No	0	Supplied by applicant
4	Data cable	7	0.05	No	0	Supplied by applicant
5	Data cable	8	0.1	No	0	Supplied by applicant
6	Data cable	7	0.05	No	0	Supplied by applicant
7	GND (PE) cable	1	1.6	No	0	Supplied by applicant
8	GND (PE) cable	1	0.1	No	0	Supplied by applicant
9	RJ45 (Cat. 5e) cable	1	0.1	No	0	Supplied by applicant
10	RJ45 (Cat. 5e) cable	1	0.1	No	0	Supplied by applicant
11	Data cable	1	1.2	No	0	Supplied by applicant
12	DC power cable	1	1.8	No	0	Provided by Lab
13	USB cable	1	1.8	Yes	0	Provided by Lab
14	USB cable	1	1.8	Yes	0	Provided by Lab
15	USB cable	1	0.9	Yes	0	Supplied by applicant
16	RJ45 (Cat. 5e) cable	1	10	No	0	Provided by Lab
17	USB (Micro) cable	1	1	Yes	0	Provided by Lab



## 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 LYNICS	0900510	E1-011286	2022/9/19	2023/9/18
50 ohms Terminator LYNICS	0900510	E1-01-299	2023/1/5	2024/1/4
Attenuator STI	STI02-2200-10	NO.2	2022/8/11	2023/8/10
DC LISN R&S	ESH3-Z6	100219	2022/8/2	2023/8/1
		844950/018	2022/8/2	2023/8/1
DC LISN Schwarzbeck	NNLK 8121	8121-808	2022/4/29	2023/4/28
Isolation Transformer Erika Fiedler	D-65396	017	2022/9/8	2023/9/7
LISN R & S	ESH3-Z5	847265/023	2022/10/26	2023/10/25
LISN R&S	ENV216	101196	2022/5/24	2023/5/23
	ESH2-Z5	100104	2022/12/15	2023/12/14
LISN Schwarzbeck	NNLK 8121	8121-00759	2022/8/18	2023/8/17
		8121-731	2022/5/26	2023/5/25
	NNLK8129	8129229	2022/6/8	2023/6/7
RF Coaxial Cable Commate	5D-FB	Cable-CO9-01	2022/8/11	2023/8/10
Software BVADT	Cond_V7.3.7.4	N/A	N/A	N/A
Test Receiver R&S	ESR3	102414	2022/12/14	2023/12/13

#### Notes:

1. The test was performed in Linkou Conduction 9.
2. The VCCI Site Registration No. C-11312.
3. Tested Date: 2023/3/23

#### 4.2 Conducted Emissions from Wired Network Ports

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohms Terminator LYNICS	0900510	E1-01-299	2023/1/5	2024/1/4
Capacitive Voltage Probe FCC	F-CVP-1	82	2022/8/11	2023/8/10
DC LISN R&S	ESH3-Z6	100219	2022/8/2	2023/8/1
		844950/018	2022/8/2	2023/8/1
DC LISN Schwarzbeck	NNLK 8121	8121-808	2022/4/29	2023/4/28
Impedance-stabilization-network TESEQ	ISN ST08	41211	2022/9/26	2023/9/25
	ISN T8-Cat.6	53159	2023/3/22	2024/3/21
	ISN T400A	28573	2022/8/17	2023/8/16
	ISN T800	36181	2022/8/19	2023/8/18
Injection Clamp FCC	FCC-203I	50	N/A	N/A
ISN FCC	F-071115-1057-1	20650	2022/6/15	2023/6/14
		20651	2023/3/15	2024/3/14
		20652	2023/1/10	2024/1/9
	F-071115-1057-1-09	120033	2022/6/16	2023/6/15
ISN TESEQ	ISN S751	40599	2022/8/18	2023/8/17
	ISN ST08	41212	2022/8/16	2023/8/15
Isolation Transformer Erika Fiedler	D-65396	017	2022/9/8	2023/9/7
LISN R & S	ESH3-Z5	847265/023	2022/10/26	2023/10/25
LISN R&S	ENV216	101196	2022/5/24	2023/5/23
	ESH2-Z5	100104	2022/12/15	2023/12/14
LISN Schwarzbeck	NNLK 8121	8121-731	2022/5/26	2023/5/25
		8121-00759	2022/8/18	2023/8/17
	NNLK8129	8129229	2022/6/8	2023/6/7
RF Coaxial Cable Commate	5D-FB	Cable-CO9-01	2022/8/11	2023/8/10
RF Current Probe FCC	F-33-4	45	2022/4/27	2023/4/26
		56	2022/8/1	2023/7/31
Software BVADT	ISN_V7.3.7.4	N/A	N/A	N/A
Test Receiver R&S	ESR3	102414	2022/12/14	2023/12/13

#### Notes:

1. The test was performed in Linkou Conduction 9(ISN 9).
2. The VCCI Site Registration No. T-11587.
3. Tested Date: 2023/3/23

### 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
Attenuator Mini-Circuits	UNAT-5+	PAD-ST2-01	2022/10/21	2023/10/20
Bi-log Broadband Antenna Schwarzbeck	VULB9168	9168-303	2022/10/25	2023/10/24
Coupling/Dcoupling Network Schwarzbeck	CDNE-M2	00097	2022/6/1	2023/5/31
	CDNE-M3	00091	2022/6/1	2023/5/31
Preamplifier Agilent	8447D	2944A11062	2023/2/15	2024/2/14
Pre_Amplifier EMCI	EMC9135	980711	2023/3/12	2024/3/11
Pre_Amplifier HP	8447D	2944A08313	2023/2/15	2024/2/14
RF Coaxial Cable Pacific	8D-FB	Cable-ST2-01	2022/10/21	2023/10/20
Software BVADT	Radiated_V7.6.15.9.5	N/A	N/A	N/A
TEST RECEIVER R&S	ESCS 30	100276	2022/4/19	2023/4/18
		100292	2022/8/30	2023/8/29

Notes:

1. The test was performed in Linkou Open Site2 , The test site validated date: 2022/7/16 (NSA)
2. The VCCI Site Registration No. R-10237.
3. Tested Date: 2023/3/23

#### 4.4 Radiated Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Attenuator Mini-Circuits	BW-K3-2W44+	PAD-CH7-03	2022/7/7	2023/7/6
	BW-N4W5+	PAD-CH7-02	2022/7/7	2023/7/6
Band Pass Filter MICRO-TRONICS	BRM17690	005	2022/5/26	2023/5/25
Fix tool for Boresight antenna tower BV	BAF-01	4	N/A	N/A
Horn Antenna EMCO	3115	9312-4192	2022/11/13	2023/11/12
Horn Antenna ETS-Lindgren	3117-PA	00215857	2023/2/3	2024/2/2
Horn Antenna Schwarzbeck	BBHA-9170	BBHA9170190	2022/11/13	2023/11/12
Notch Filter MICRO-TRONICS	BRC50703-01	010	2022/5/26	2023/5/25
Pre-amplifier HP	8449B	3008A01292	2023/2/16	2024/2/15
Pre-amplifier (18GHz-40GHz) EMCI	EMC184045B	980175	2022/9/3	2023/9/2
Pre_Amplifier EMCI	EMC0126545	980076	2023/2/16	2024/2/15
	EMC184045B	980235	2023/2/16	2024/2/15
RF Coaxial Cable HUBER SUHNER	SF-102	Cable-CH7(3.6M)-02	2022/7/7	2023/7/6
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
Spectrum Keysight	N9020B	MY60110438	2022/12/6	2023/12/5
		MY60112260	2022/5/21	2023/5/20
Test Receiver Agilent	N9038A	MY50010135	2022/8/30	2023/8/29
		MY51210114	2023/1/3	2024/1/2
Turn Table & Tower Max Full	MF7802	MF780208103	N/A	N/A

##### Notes:

1. The test was performed in Linkou 966 Chamber 2 (CH 7).
2. The VCCI Site Registration No. G-10039.
3. Tested Date: 2023/3/25

## 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	Using a 150 $\Omega$ load	-	-	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

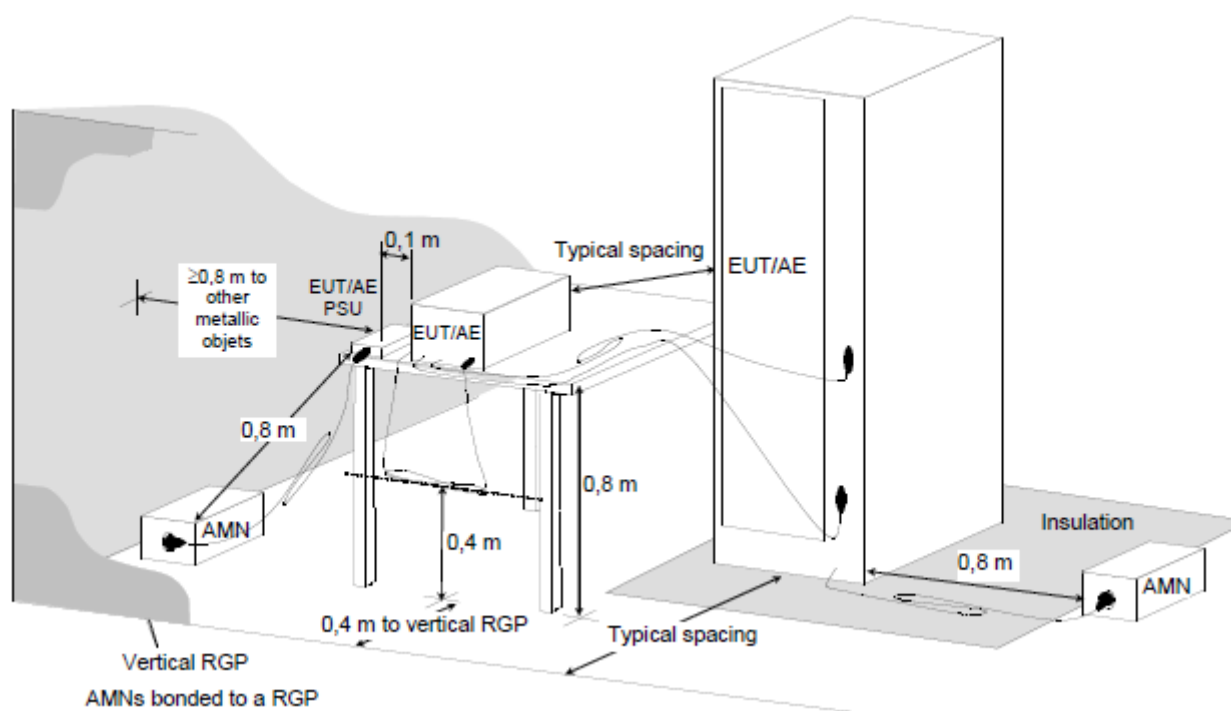
$F_x$  is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.

## 6 Test Arrangements

## 6.1 Conducted Emissions from Power Ports

- a. The EUT is placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN), or an Artificial Network (AN) as specified in CISPR 25 if used in a vehicle. Other support units are connected to the power mains through another LISN and/or AN. They provide coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

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



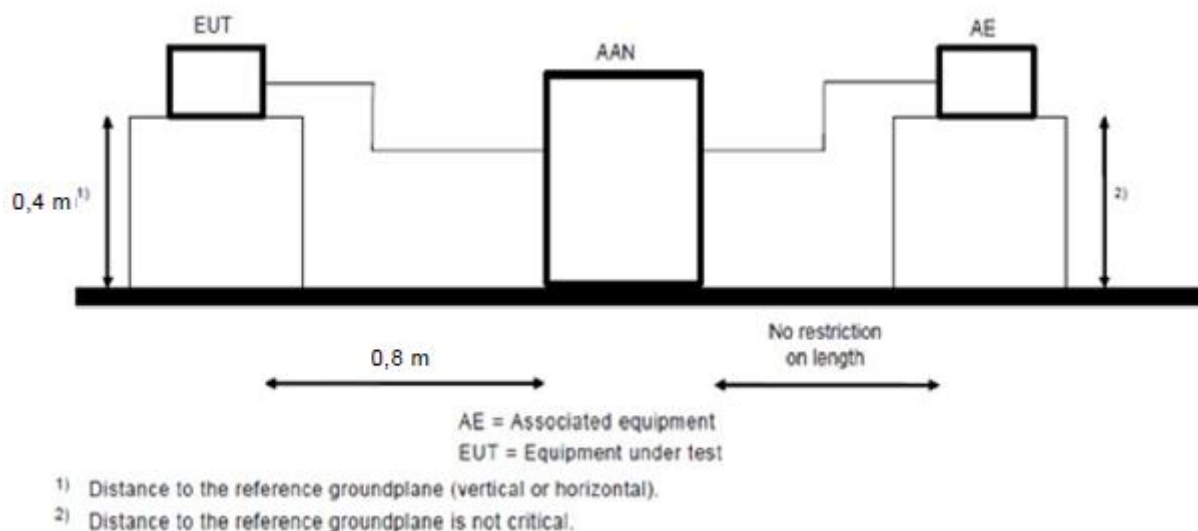
For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

## 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 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.



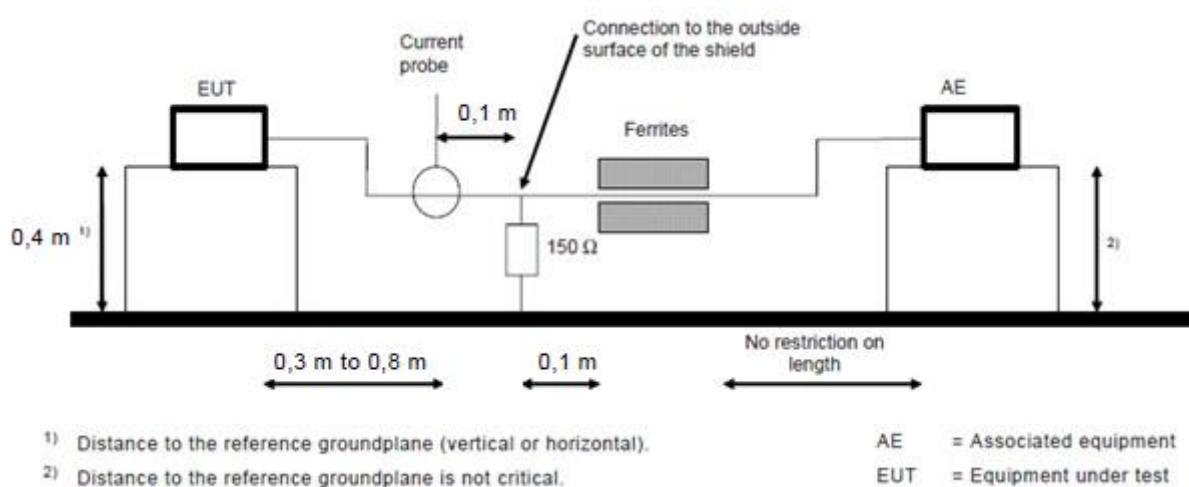
For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.



### Method of Using a 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 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

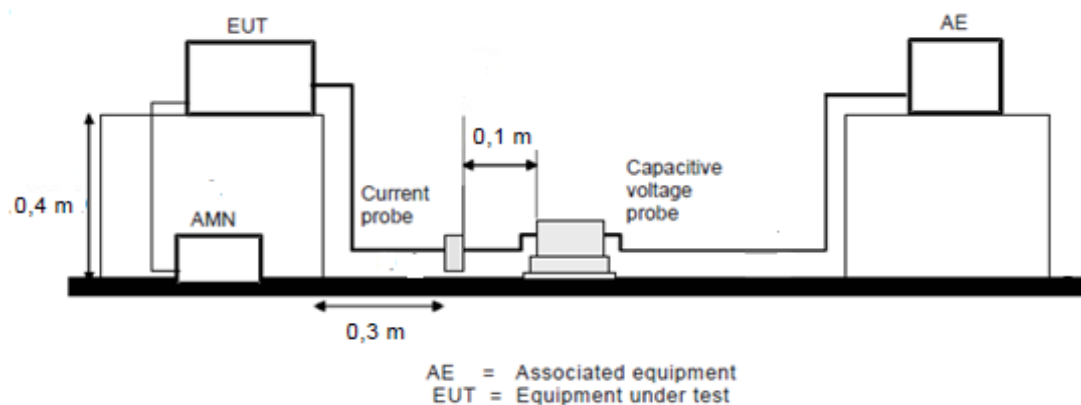


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

### 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 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

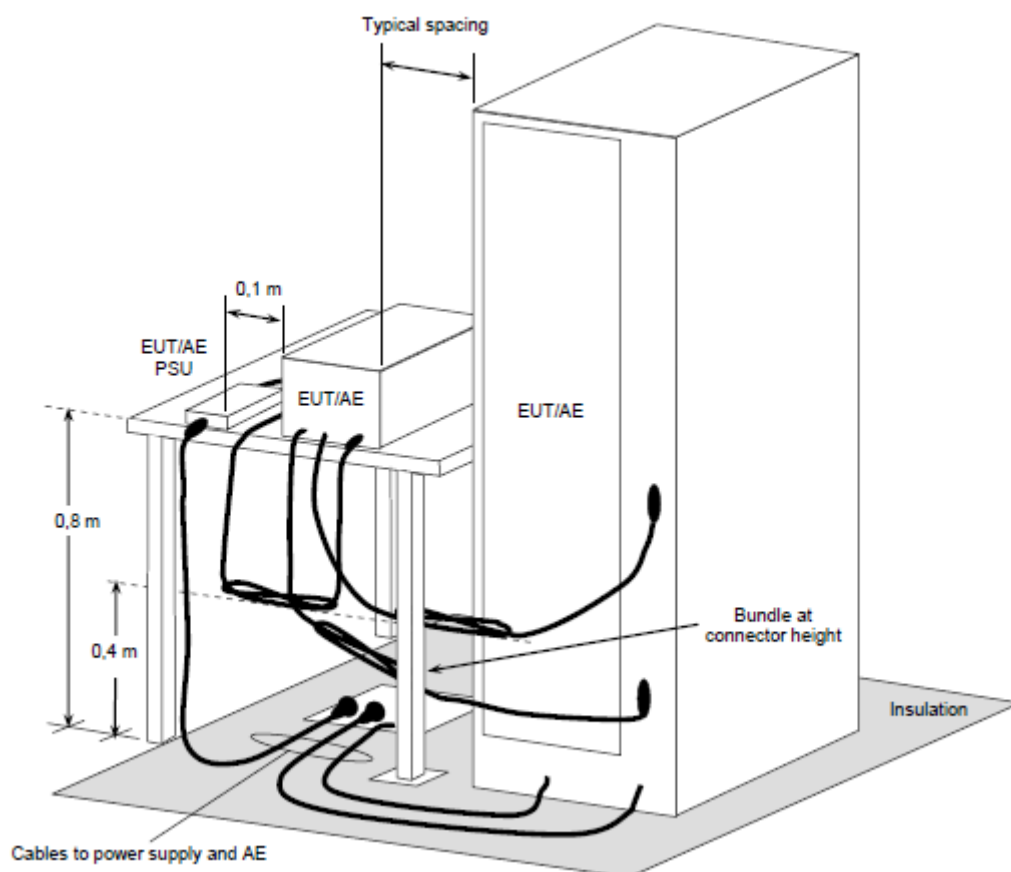


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

### 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 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.

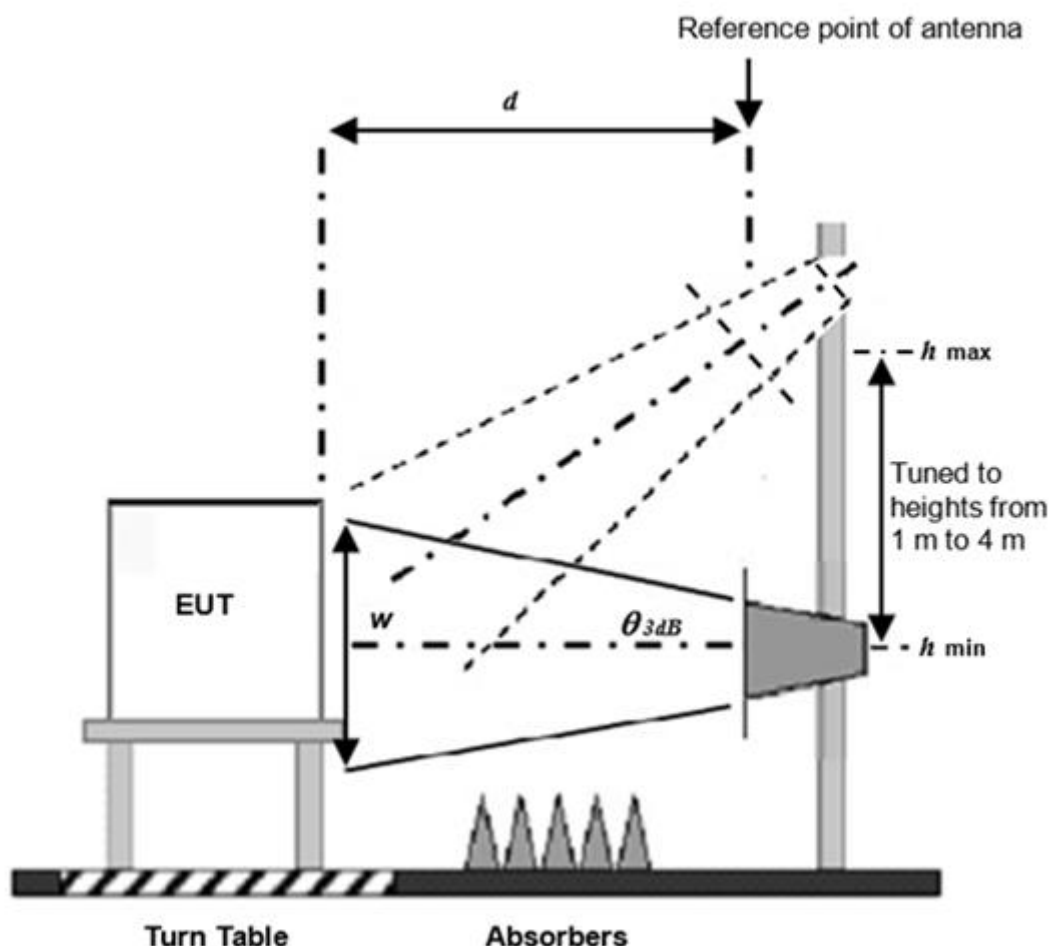


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

#### 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 12 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 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.
- 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 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.



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

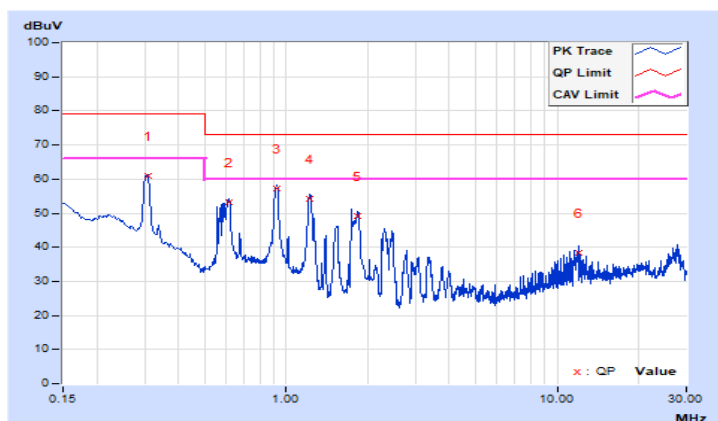
#### Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	DC 24 V	Environmental Conditions	23°C, 82% RH
Tested by	Bob 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	0.30798	9.92	50.99	50.23	60.91	60.15	79.00	66.00	-18.09	-5.85
2	0.61340	9.94	43.18	41.25	53.12	51.19	73.00	60.00	-19.88	-8.81
3	0.92201	9.96	47.26	44.65	57.22	54.61	73.00	60.00	-15.78	-5.39
4	1.22804	9.98	44.08	40.56	54.06	50.54	73.00	60.00	-18.94	-9.46
5	1.84288	10.00	39.05	34.63	49.05	44.63	73.00	60.00	-23.95	-15.37
6	11.95376	10.27	27.99	24.22	38.26	34.49	73.00	60.00	-34.74	-25.51

#### 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

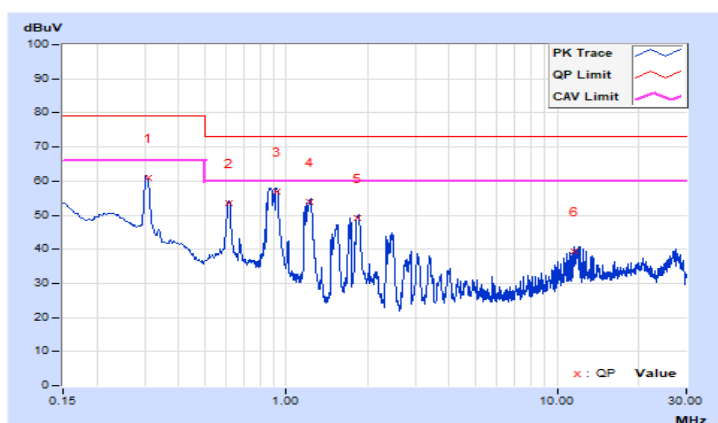


Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	DC 24 V	Environmental Conditions	23°C, 82% RH
Tested by	Bob Lin		

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	0.30763	9.91	50.87	50.24	60.78	60.15	79.00	66.00	-18.22	-5.85
2	0.61424	9.94	43.52	41.65	53.46	51.59	73.00	60.00	-19.54	-8.41
3	0.92300	9.96	47.11	44.52	57.07	54.48	73.00	60.00	-15.93	-5.52
4	1.22780	9.97	43.84	40.69	53.81	50.66	73.00	60.00	-19.19	-9.34
5	1.84041	9.99	39.08	34.63	49.07	44.62	73.00	60.00	-23.93	-15.38
6	11.58734	10.24	29.30	25.53	39.54	35.77	73.00	60.00	-33.46	-24.23

#### 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

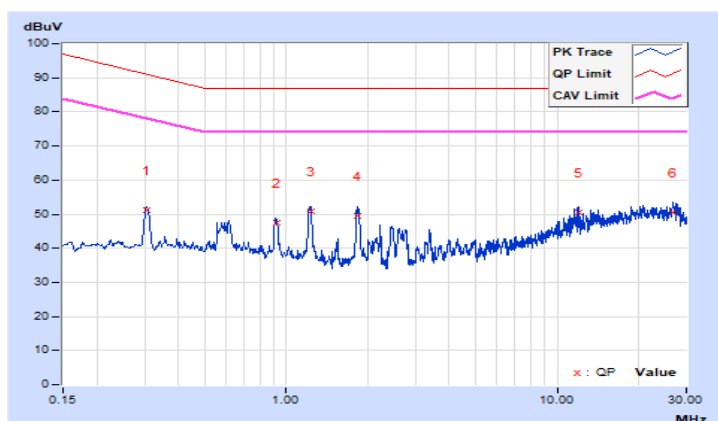
### Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	DC 24 V	Environmental Conditions	23°C, 82% RH
Tested by	Bob 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	0.30635	9.61	41.46	40.44	51.07	50.05	91.07	78.07	-40.00	-28.02
2	0.92231	9.39	38.19	35.17	47.58	44.56	87.00	74.00	-39.42	-29.44
<b>3</b>	<b>1.23054</b>	<b>9.36</b>	<b>41.61</b>	<b>38.15</b>	<b>50.97</b>	<b>47.51</b>	<b>87.00</b>	<b>74.00</b>	<b>-36.03</b>	<b>-26.49</b>
4	1.84431	9.30	40.10	35.52	49.40	44.82	87.00	74.00	-37.60	-29.18
5	11.95376	9.50	40.84	36.37	50.34	45.87	87.00	74.00	-36.66	-28.13
6	26.80183	10.27	40.07	34.46	50.34	44.73	87.00	74.00	-36.66	-29.27

#### 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

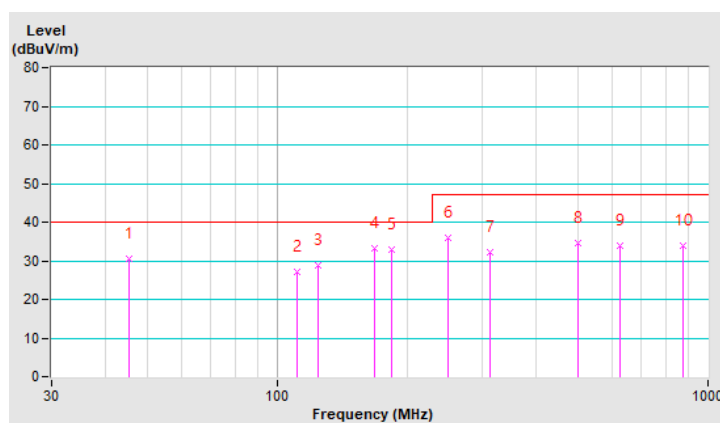
#### Mode A

Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Tested By	Paul Chen	Environmental Conditions	23°C, 65% RH

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	45.52	30.54 QP	40.00	-9.46	4.00 H	13	39.04	-8.50
2	111.05	27.02 QP	40.00	-12.98	4.00 H	231	38.20	-11.18
3	125.00	28.69 QP	40.00	-11.31	4.00 H	319	38.51	-9.82
4	168.08	33.22 QP	40.00	-6.78	4.00 H	317	41.30	-8.08
5	184.41	32.91 QP	40.00	-7.09	4.00 H	248	42.74	-9.83
6	250.06	35.84 QP	47.00	-11.16	3.74 H	193	43.94	-8.10
7	312.07	32.34 QP	47.00	-14.66	3.17 H	229	37.99	-5.65
8	499.99	34.59 QP	47.00	-12.41	1.95 H	308	36.28	-1.69
9	625.02	33.96 QP	47.00	-13.04	1.37 H	114	32.15	1.81
10	875.00	33.94 QP	47.00	-13.06	1.00 H	175	26.73	7.21

#### 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





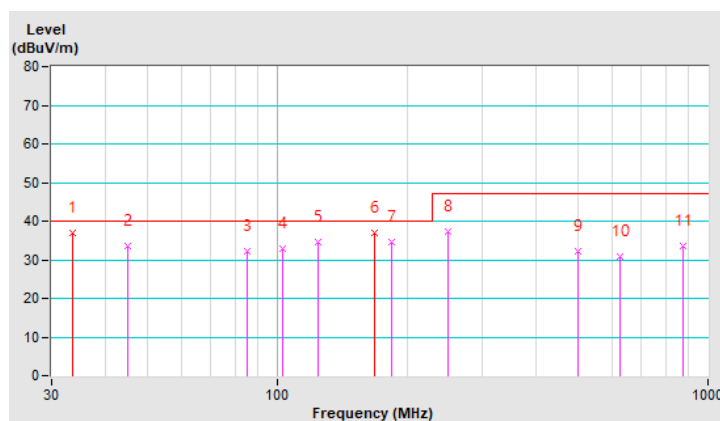
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Tested By	Paul Chen	Environmental Conditions	23°C, 65% RH

**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	33.66	36.97 QP	40.00	-3.03	1.06 V	0	46.82	-9.85
2	44.94	33.40 QP	40.00	-6.60	1.28 V	307	41.99	-8.59
3	85.53	32.28 QP	40.00	-7.72	1.79 V	261	46.49	-14.21
4	102.75	32.87 QP	40.00	-7.13	1.00 V	45	45.04	-12.17
5	125.00	34.44 QP	40.00	-5.56	1.00 V	345	44.28	-9.84
6	168.00	36.80 QP	40.00	-3.20	1.00 V	119	44.88	-8.08
7	184.41	34.71 QP	40.00	-5.29	1.00 V	237	44.54	-9.83
8	250.00	37.41 QP	47.00	-9.59	1.00 V	147	45.51	-8.10
9	499.99	32.16 QP	47.00	-14.84	1.00 V	235	33.85	-1.69
10	624.97	31.01 QP	47.00	-15.99	3.22 V	169	29.22	1.79
11	874.99	33.56 QP	47.00	-13.44	2.48 V	238	26.35	7.21

**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



## 7.4 Radiated Emissions above 1 GHz

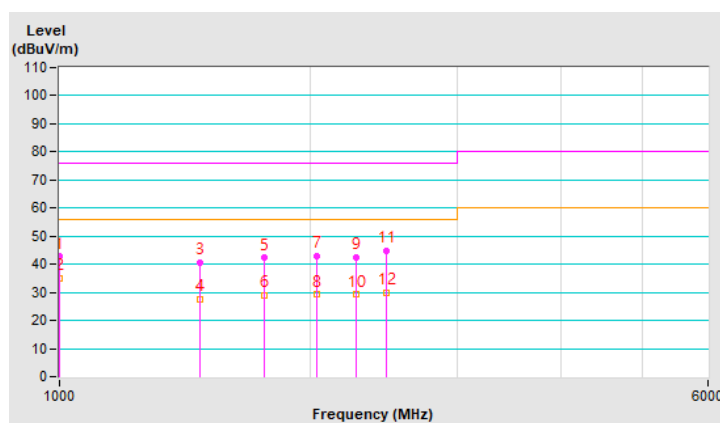
### Mode A

Frequency Range	1 GHz ~ 5 GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Tested By	Perry Yang	Environmental Conditions	23°C, 70% RH

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	1000.04	42.69 PK	76.00	-33.31	1.00 H	255	51.33	-8.64
2	1000.04	35.17 AV	56.00	-20.83	1.00 H	255	43.81	-8.64
3	1474.00	40.66 PK	76.00	-35.34	1.89 H	360	46.16	-5.50
4	1474.00	27.46 AV	56.00	-28.54	1.89 H	360	32.96	-5.50
5	1761.87	42.30 PK	76.00	-33.70	1.21 H	26	45.75	-3.45
6	1761.87	29.00 AV	56.00	-27.00	1.21 H	26	32.45	-3.45
7	2033.29	42.95 PK	76.00	-33.05	2.51 H	352	45.75	-2.80
8	2033.29	29.23 AV	56.00	-26.77	2.51 H	352	32.03	-2.80
9	2271.90	42.58 PK	76.00	-33.42	1.98 H	346	44.98	-2.40
10	2271.90	29.16 AV	56.00	-26.84	1.98 H	346	31.56	-2.40
11	2467.91	44.65 PK	76.00	-31.35	1.88 H	206	46.52	-1.87
12	2467.91	29.96 AV	56.00	-26.04	1.88 H	206	31.83	-1.87

### 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

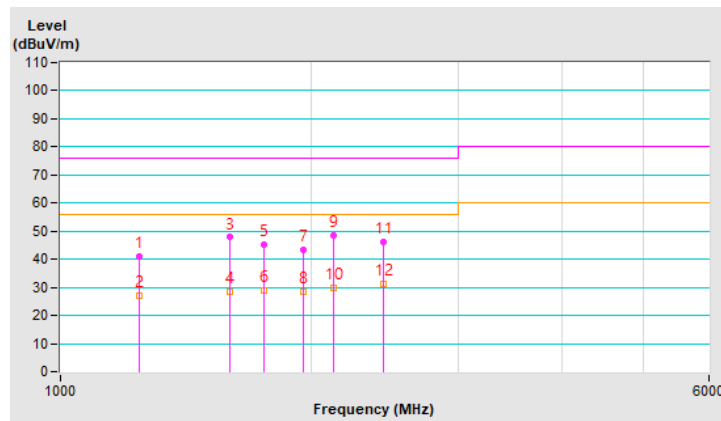


Frequency Range	1 GHz ~ 5 GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Tested By	Perry Yang	Environmental Conditions	23°C, 70% RH

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	1242.37	41.12 PK	76.00	-34.88	1.87 V	357	47.39	-6.27
2	1242.37	26.94 AV	56.00	-29.06	1.87 V	357	33.21	-6.27
3	1595.88	47.89 PK	76.00	-28.11	1.98 V	12	52.99	-5.10
4	1595.88	28.47 AV	56.00	-27.53	1.98 V	12	33.57	-5.10
5	1757.40	45.18 PK	76.00	-30.82	2.00 V	6	48.60	-3.42
6	1757.40	29.09 AV	56.00	-26.91	2.00 V	6	32.51	-3.42
7	1955.06	43.40 PK	76.00	-32.60	1.42 V	350	46.30	-2.90
8	1955.06	28.59 AV	56.00	-27.41	1.42 V	350	31.49	-2.90
9	2129.88	48.69 PK	76.00	-27.31	2.00 V	338	51.41	-2.72
10	2129.88	30.05 AV	56.00	-25.95	2.00 V	338	32.77	-2.72
11	2437.52	46.35 PK	76.00	-29.65	1.09 V	358	48.29	-1.94
12	2437.52	31.25 AV	56.00	-24.75	1.09 V	358	33.19	-1.94

**Remarks:**

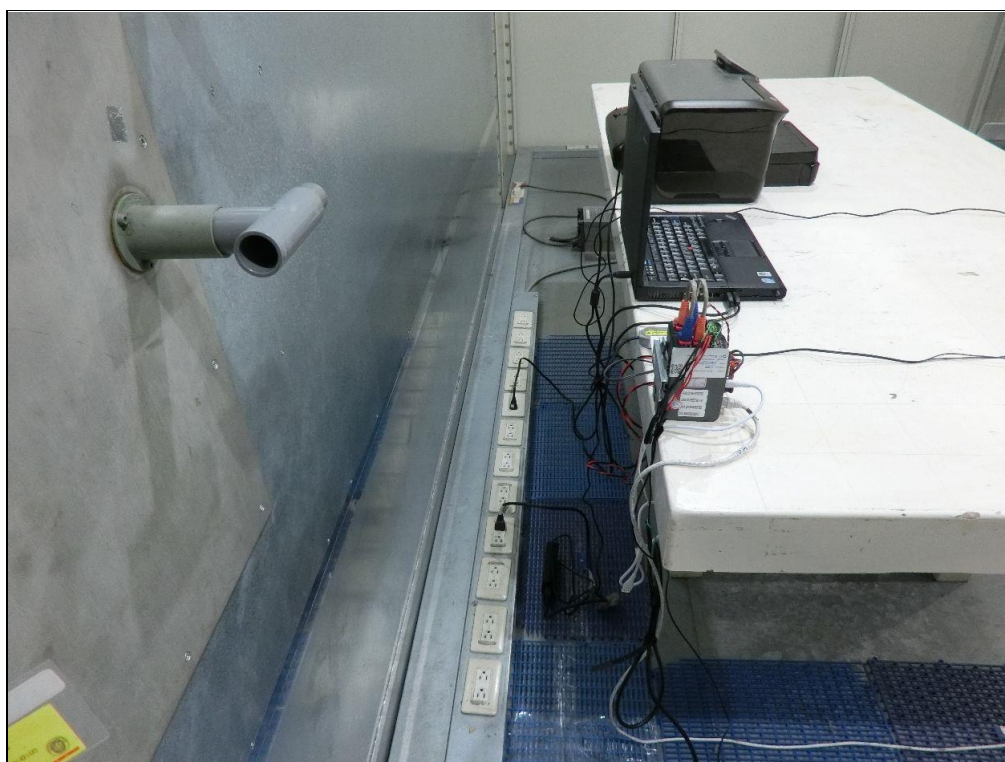
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)  
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



## 8 Pictures of Test Arrangements

### 8.1 Conducted Emissions from Power Ports

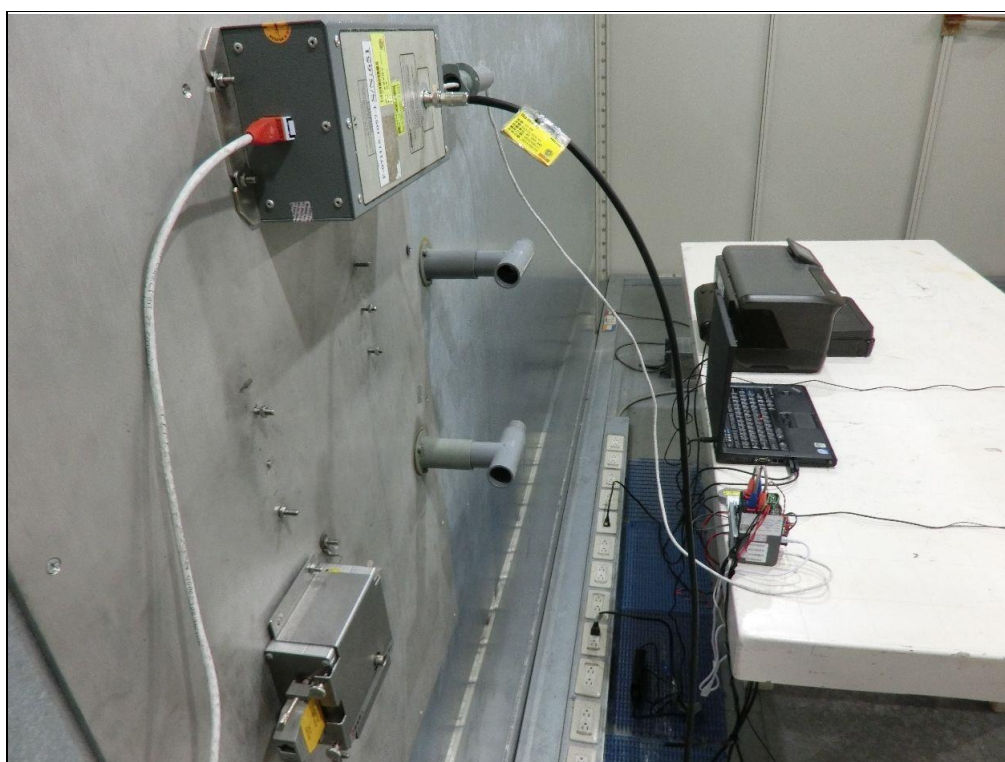
#### Mode A





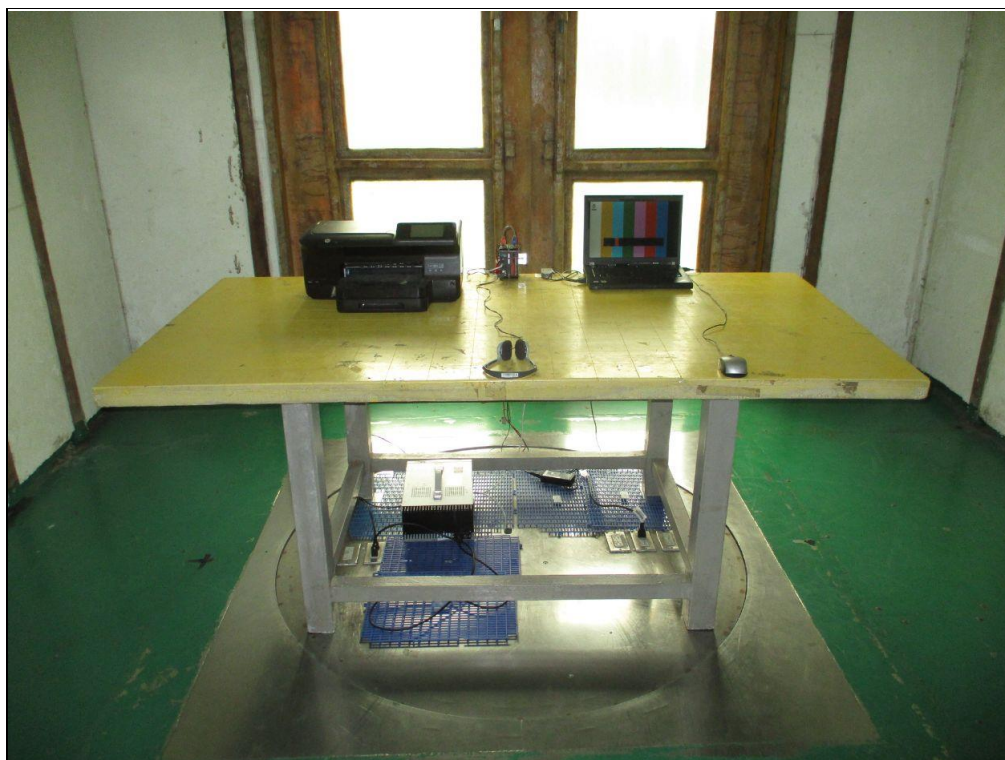
## 8.2 Conducted Emissions from Wired Network Ports

### Mode A



### 8.3 Radiated Emissions up to 1 GHz

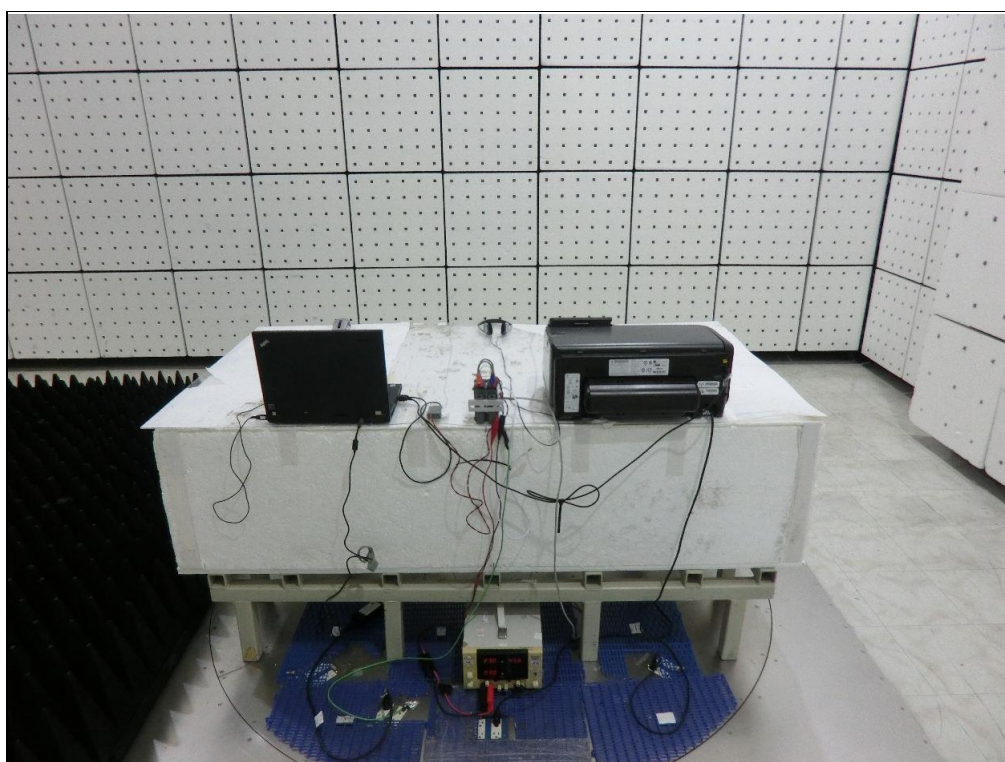
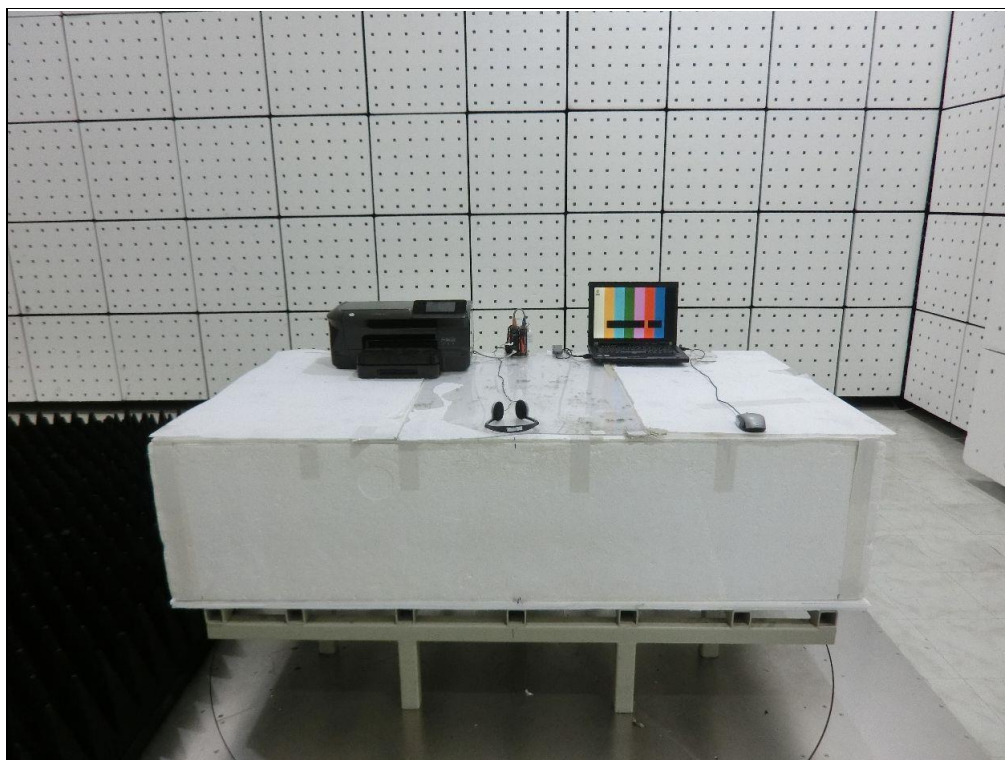
#### Mode A





## 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.

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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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