

TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: VCCI-CISPR 32: 2016, Class A
Report No.: VBDBO-WTW-P24050433
Product: QEC
Brand: ICOP Technology Inc.
Model No.: QEC-M-150T
Series Model: QEC-M-150TXXX (X=0~9, A~Z, (,), /, - or Blank)
Received Date: 2024/5/16
Test Date: 2024/5/28 ~ 2024/5/29
Issued Date: 2024/6/24
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:



, Date:

2024/6/24

Jim Hsiang / Associate Technical Manager

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Prepared by : Ivy Lin / Specialist



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Table of Contents

Release Control Record	3
1 Certificate.....	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	5
2.2 Supplementary Information	5
3 General Information	6
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	7
3.5 Test Program Used and Operation Descriptions	8
3.6 Connection Diagram of EUT and Peripheral Devices	8
3.7 Configuration of Peripheral Devices and Cable Connections	9
4 Test Instruments	10
4.1 Conducted Emissions from Power Ports	10
4.2 Conducted Emissions from Wired Network Ports	11
4.3 Radiated Emissions up to 1 GHz	12
4.4 Radiated Emissions above 1 GHz.....	13
5 Limits of Test Items.....	14
5.1 Conducted Emissions from Power Ports	14
5.2 Conducted Emissions from Wired Network Ports	14
5.3 Radiated Emissions up to 1 GHz	14
5.4 Radiated Emissions above 1 GHz.....	15
6 Test Arrangements.....	16
6.1 Conducted Emissions from Power Ports	16
6.2 Conducted Emissions from Wired Network Ports	17
6.3 Radiated Emissions up to 1 GHz	20
6.4 Radiated Emissions above 1 GHz.....	21
7 Test Results of Test Item	22
7.1 Conducted Emissions from Power Ports	22
7.2 Conducted Emissions from Wired Network Ports	24
7.3 Radiated Emissions up to 1 GHz	25
7.4 Radiated Emissions above 1 GHz.....	27
8 Pictures of Test Arrangements	29
8.1 Conducted Emissions from Power Ports	29
8.2 Conducted Emissions from Wired Network Ports	30
8.3 Radiated Emissions up to 1 GHz	31
8.4 Radiated Emissions above 1 GHz.....	32
9 Information of the Testing Laboratories	33

Release Control Record

Issue No.	Description	Date Issued
VBDBO-WTW-P24050433	Original release.	2024/6/24

1 Certificate

Product: QEC

Brand: ICOP Technology Inc.

Test Model: QEC-M-150T

Series Model: QEC-M-150TXXX (X=0~9, A~Z, (,), /, - or Blank)

Sample Status: Engineering sample

Applicant: ICOP TECHNOLOGY INC.

Test Date: 2024/5/28 ~ 2024/5/29

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 -9.06 dB at 0.19397 MHz
VCCI-CISPR 32	Conducted Emissions from Wired Network Ports	Pass	Minimum passing Class A margin is -27.36 dB at 23.12749 MHz
VCCI-CISPR 32	Radiated Emissions up to 1 GHz	Pass	Minimum passing Class A margin is -0.80 dB at 480.00 MHz
VCCI-CISPR 32	Radiated Emissions above 1 GHz	Pass	Minimum passing Class A margin is -13.26 dB at 1920.00 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_{CISPR})
Conducted Emissions from Wired Network Ports	150 kHz ~ 30 MHz	ISN Cat3 : 3.0 dB ISN Cat5 : 3.0 dB ISN Cat6 : 3.0 dB Current Probe : 1.56 dB Voltage Probe : 2.90 dB Coaxial : 2.34 dB	5.0 dB (U_{CISPR}) using AAN 2.9 dB (U_{CISPR}) using CP 3.9 dB (U_{CISPR}) using CVP
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	3m : 5.44 dB 10m : 4.00 dB	6.3 dB (U_{CISPR})
Radiated Emissions above 1 GHz	1 GHz ~ 6 GHz	4.44 dB	5.2 dB (U_{CISPR})

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

2.2 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 Technology Inc.
Test Model	QEC-M-150T
Series Model	QEC-M-150TXXX (X=0~9, A~Z, (,), /, - or Blank)
Sample Status	Engineering sample
Power Supply Rating	24Vdc

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.

The EUT configured with the following key components for test:

Components	Brand	Model	Specification
LCD Panel	IVO	M150GWX3 R0	15" 1024 x 768 TFT
Processor	DM&P	Vortex86EX2	Master 533MHz
Memory	Micron	MT41K256M16TW-107 IT:P	512MB/1GB DDRIII
Storage	MXIC	MX25L25645GM2I-08G & MX52LM02B11XUI	32MB SPI Flash/ 2GB SLC eMMC

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	Resolution 1024*768,USB R/W,Lan link + 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.

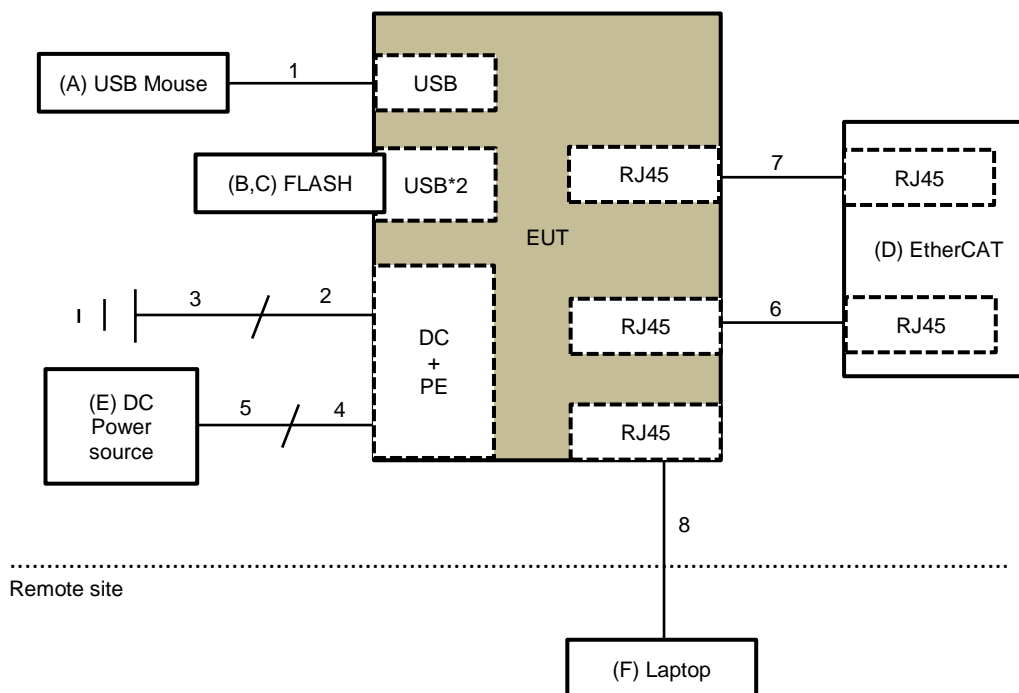
Test Condition	
Mode	Conducted Emissions from Power Ports
A	Resolution 1024*768,USB R/W,Lan link + Input Power(24 Vdc)
Mode	Conducted Emissions from Wired Network Ports
A	Resolution 1024*768,USB R/W,Lan link + Lan 1Gbps link + Input Power(24 Vdc)
Note: The idle mode of conducted emission test at wired 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	Resolution 1024*768,USB R/W,Lan link + Input Power(24 Vdc)
Mode	Radiated Emissions above 1 GHz
A	Resolution 1024*768,USB R/W,Lan link + Input Power(24 Vdc)

Note: The EUT uses DOS, therefore it can only display "H" pattern.

3.5 Test Program Used and Operation Descriptions

- Turned on the power of all equipment.
- EUT ran a test program to enable all functions.
- EUT read and wrote messages to/ from Flash devices.
- Laptop (kept in a remote area) sent and received messages to/ from EUT via LAN cable.
- EUT sent and received messages to/ from EtherCAT.
- EUT sent (H) messages to panel. Then the displayed messages on their screens simultaneously.
- Steps c-f 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	USB Mouse	DELL	MOCZUL	CN-049TWY- PRC00-77B-007R	N/A	Provided by Lab
B	FLASH	TRANSCEND	TS64GJF340	N/A	N/A	Supplied by applicant
C	FLASH	TRANSCEND	TS64GJF340	N/A	N/A	Supplied by applicant
D	EtherCAT	QEC	QEC-R11D88D-C	N/A	N/A	Supplied by applicant
E	DC Power source	HILA	DP-6010	2216AP041904059	N/A	Provided by Lab
F	Laptop	LENOVO	T480	PF1EK03U	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB	1	1.8	Y	0	Provided by Lab
2	GND (PE)	1	0.3	N	0	Supplied by applicant
3	GND (PE)	1	1.8	N	0	Provided by Lab
4	Power	1	0.3	N	0	Supplied by applicant
5	Power	1	1.8	N	0	Provided by Lab
6	Cat. 5e	1	0.8	N	0	Supplied by applicant
7	Cat. 5e	1	0.8	N	0	Supplied by applicant
8	Cat. 5e	1	10	N	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 resistance LYNICS	0900510	E1-01-305	2024/2/6	2025/2/5
		E1-011285	2023/9/21	2024/9/20
		E1-011286	2023/9/21	2024/9/20
Coupling / Decoupling Network TESEQ	CDN A201A	44601	2023/12/14	2024/12/13
EMI Test Receiver R&S	ESCS 30	100276	2024/4/24	2025/4/23
	ESR3	102413	2024/1/29	2025/1/28
Fixed Attenuator EMEC	EM-ATT30002602NN	N/A	2024/3/22	2025/3/21
Fixed Attenuator STI	STI02-2200-10	NO.3	2023/10/20	2024/10/19
High Voltage Probe Schwarzbeck	TK9420	00982	2023/12/11	2024/12/10
LISN R&S	ENV216	101196	2024/5/22	2025/5/21
		101197	2023/7/12	2024/7/11
	ESH3-Z5	100220	2023/11/22	2024/11/21
LISN Schwarzbeck	NNLK 8121	8121-731	2023/6/9	2024/6/8
		8121-00759	2023/8/21	2024/8/20
	NNLK 8129	8129229	2023/6/27	2024/6/26
RF Coaxial Cable PEWC	5D-FB	Cable-CO3-01	2023/9/13	2024/9/12
Software BVADT	Cond_V7.4.1.0	N/A	N/A	N/A

Notes:

1. The test was performed in Linkou Conduction 3.
2. The VCCI Site Registration No. C-10274.
3. Tested Date: 2024/5/29

4.2 Conducted Emissions from Wired Network Ports

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohm terminal resistance LYNICS	0900510	E1-011285	2023/9/21	2024/9/20
		E1-011286	2023/9/21	2024/9/20
Capacitive Voltage Probe FCC	F-CVP-1	82	2023/8/24	2024/8/23
		94	2024/3/22	2025/3/21
Coupling / Decoupling Network TESEQ	CDN A201A	44601	2023/12/14	2024/12/13
EMI Test Receiver R&S	ESCS 30	100276	2024/4/24	2025/4/23
	ESR3	102413	2024/1/29	2025/1/28
Impedance Stabilization Network FCC	F-071115-1057-1	20651	2024/3/14	2025/3/13
		20652	2024/1/4	2025/1/3
Impedance Stabilization Network TESEQ	ISN S751	40599	2023/8/18	2024/8/17
	ISN ST08	41212	2023/8/31	2024/8/30
LISN R&S	ENV216	101196	2024/5/22	2025/5/21
		101197	2023/7/12	2024/7/11
	ESH3-Z5	100220	2023/11/22	2024/11/21
LISN Schwarzbeck	NNLK 8121	8121-00759	2023/8/21	2024/8/20
Matching Pad EMCI	EMCI-3PD5M75BF	N/A	2023/12/13	2024/12/12
RF Coaxial Cable PEWC	5D-FB	Cable-CO3-01	2023/9/13	2024/9/12
RF Current Probe FCC	F-33-4	45	2023/6/16	2024/6/15
		56	2023/8/2	2024/8/1
Software BVADT	ISN_V7.4.1.0	N/A	N/A	N/A

Notes:

1. The test was performed inLinkou Conduction 3 (ISN 3).
2. The VCCI Site Registration No. T-11651.
3. Tested Date: 2024/5/29

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 Schwarzbeck	VULB 9168	9168-303	2023/10/17	2024/10/16
EMI Test Receiver R&S	ESCS 30	100276	2024/4/24	2025/4/23
Fixed Attenuator Mini-Circuits	UNAT-5+	PAD-ST2-01	2023/10/20	2024/10/19
Preamplifier Agilent	8447D	2944A11062	2024/2/7	2025/2/6
RF Coaxial Cable Pacific	8D-FB	Cable-ST2-01	2023/11/7	2024/11/6
Software BVADT	Radiated_V8.8.09	N/A	N/A	N/A

Notes:

1. The test was performed in Linkou Open Site 2. The test site validated date: 2023/7/15 (NSA).
2. The VCCI Site Registration No. R-10237.
3. Tested Date: 2024/5/28

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	2023/7/6	2024/7/5
	BW-N4W5+	PAD-CH10-02	2023/7/6	2024/7/5
Horn Antenna EMCO	3115	6714	2023/11/12	2024/11/11
Horn Antenna ETS-Lindgren	3117-PA	00215857	2023/11/12	2024/11/11
Horn Antenna Schwarzbeck	BBHA-9170	BBHA9170190	2023/11/12	2024/11/11
MXA Signal Analyzer Keysight	N9020B	MY60112260	2024/5/29	2025/5/28
Notch Filter Micro-Tronics	BRC50703-01	010	2024/5/24	2025/5/23
	BRM17690	005	2024/5/24	2025/5/23
Preamplifier EMCI	EMC0126545	980076	2024/2/15	2025/2/14
Preamplifier EMCI	EMC184045B	980235	2024/2/15	2025/2/14
Preamplifier HP	8449B	3008A01292	2024/2/15	2025/2/14
PSA Spectrum Analyzer Agilent	E4446A	MY51100009	2023/6/21	2024/6/20
RF Coaxial Cable EMCI	EMC102-KM-KM-1000	200310	2024/3/11	2025/3/10
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	200312	2024/3/11	2025/3/10
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: 2024/5/29

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 (dBA)		Voltage Limit (dBuV)		Current limits (dBA)	
		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

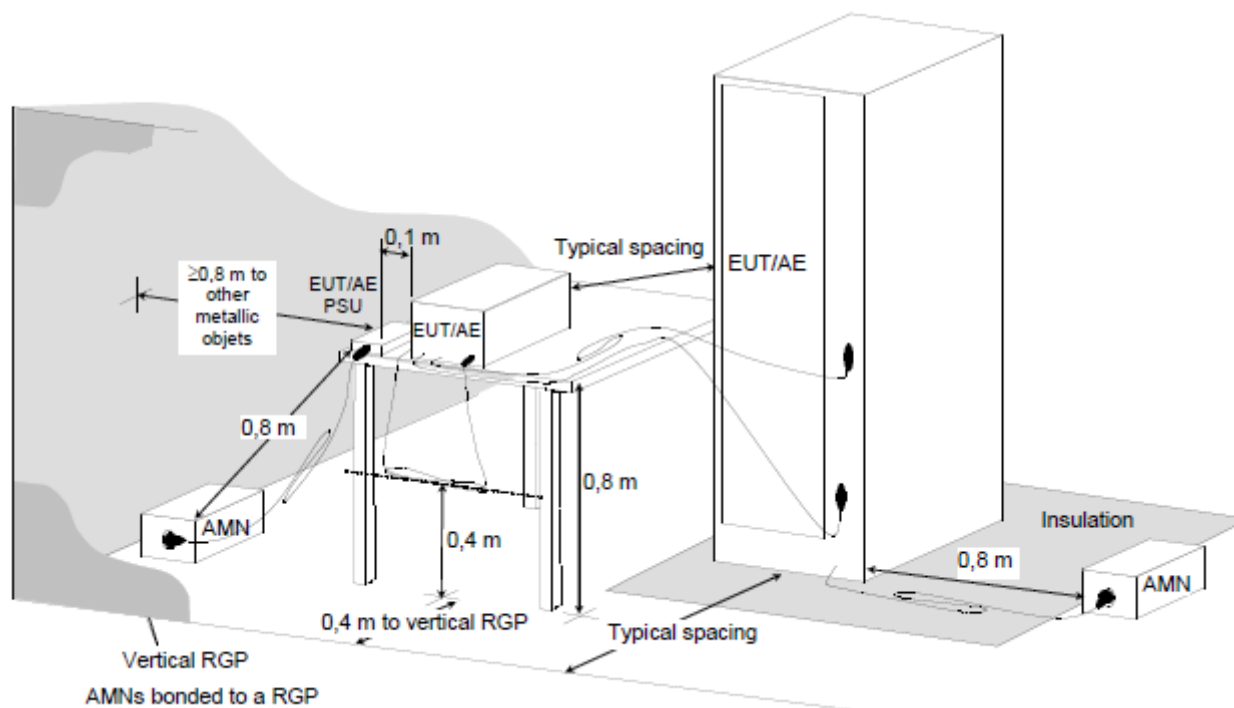
F_x is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.

6 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 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz-30 MHz.



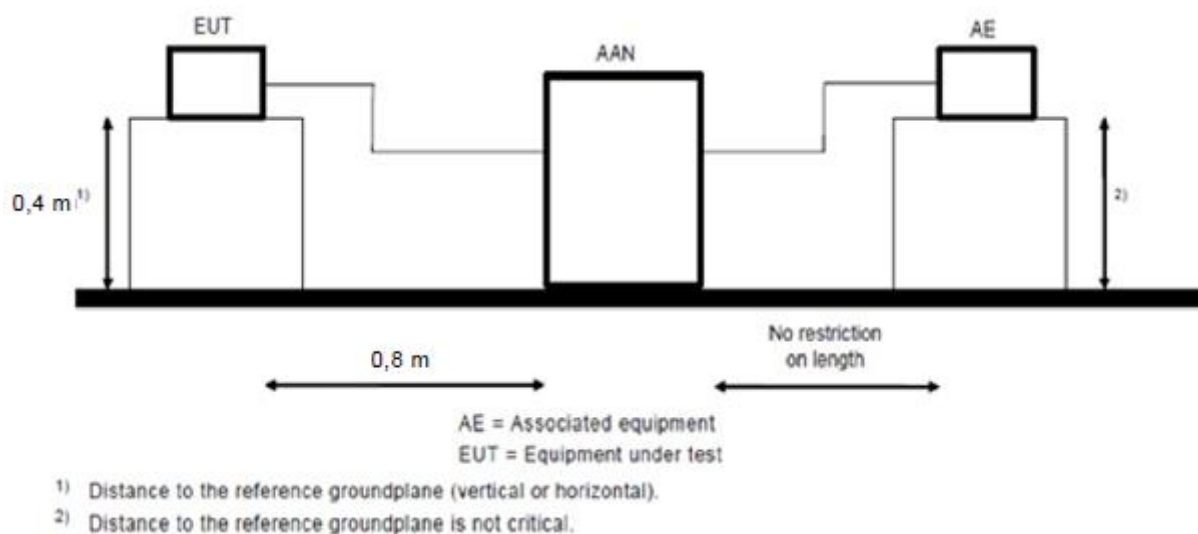
For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

6.2 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.

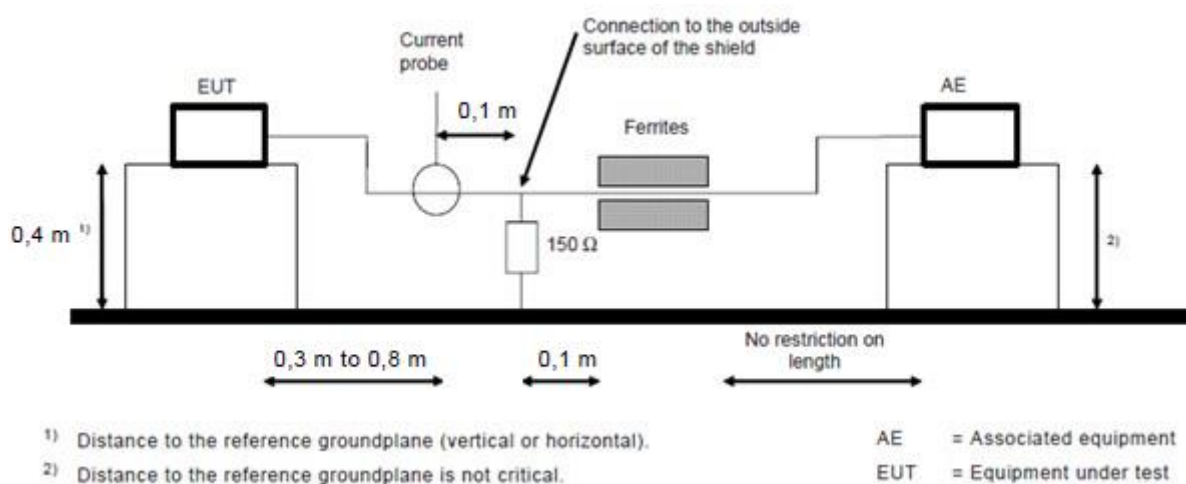


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

Method of Using a combination of Current Probe and 150 Ω load to the outside surface of the shielding cable:

- Breaks the external protective insulation (exposing the shield) and connect a 150 Ω resistor from the outside surface of the shield to ground.
- A current probe shall be placed at 0.1 m from the 150 Ω 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.

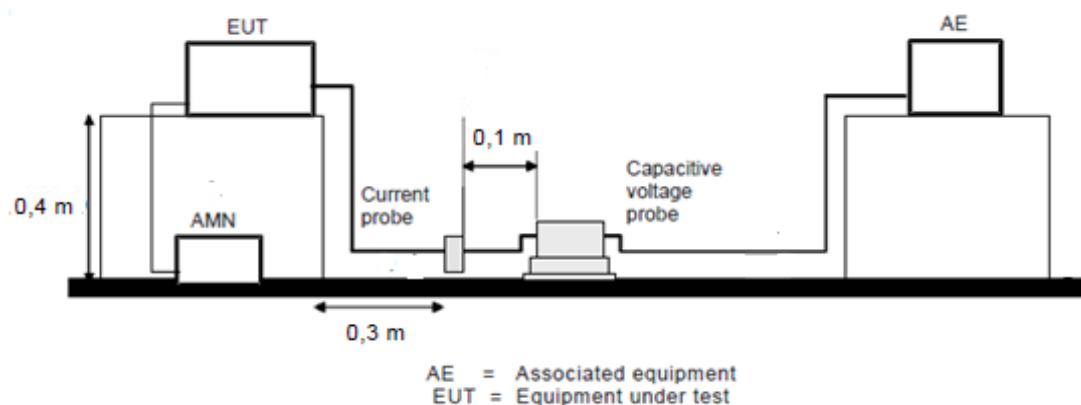


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

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 ≤ 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.

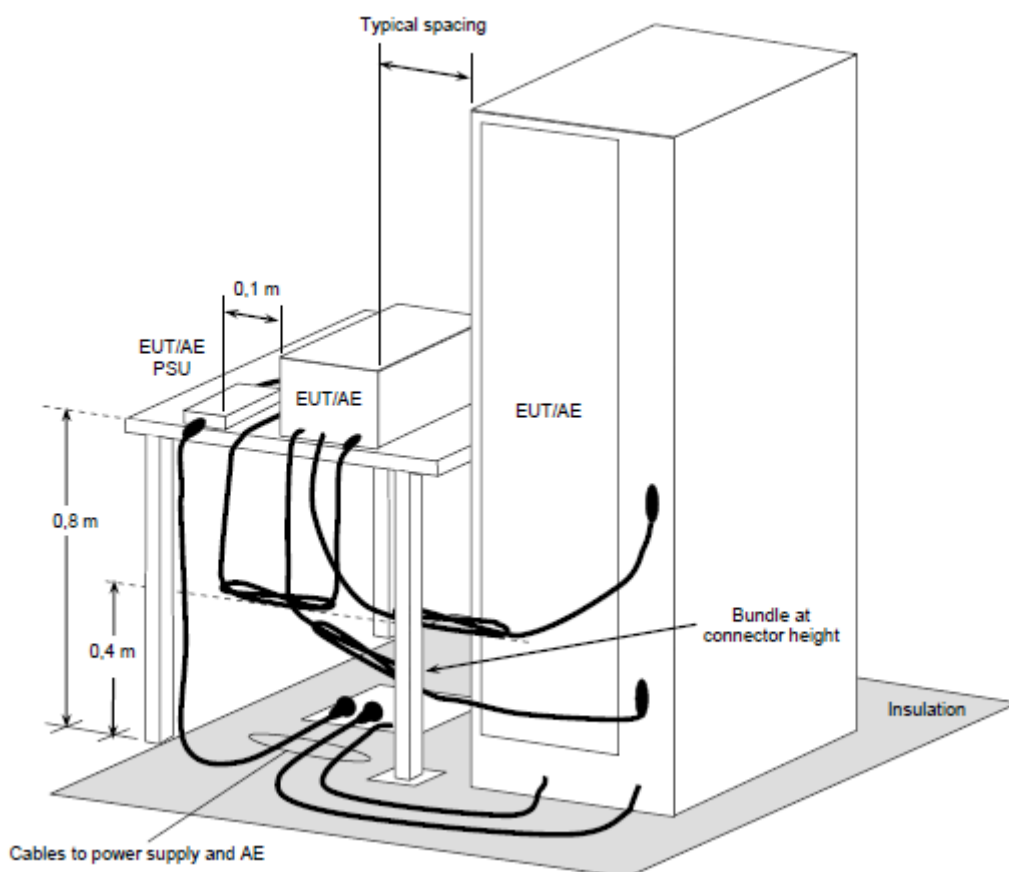


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

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.

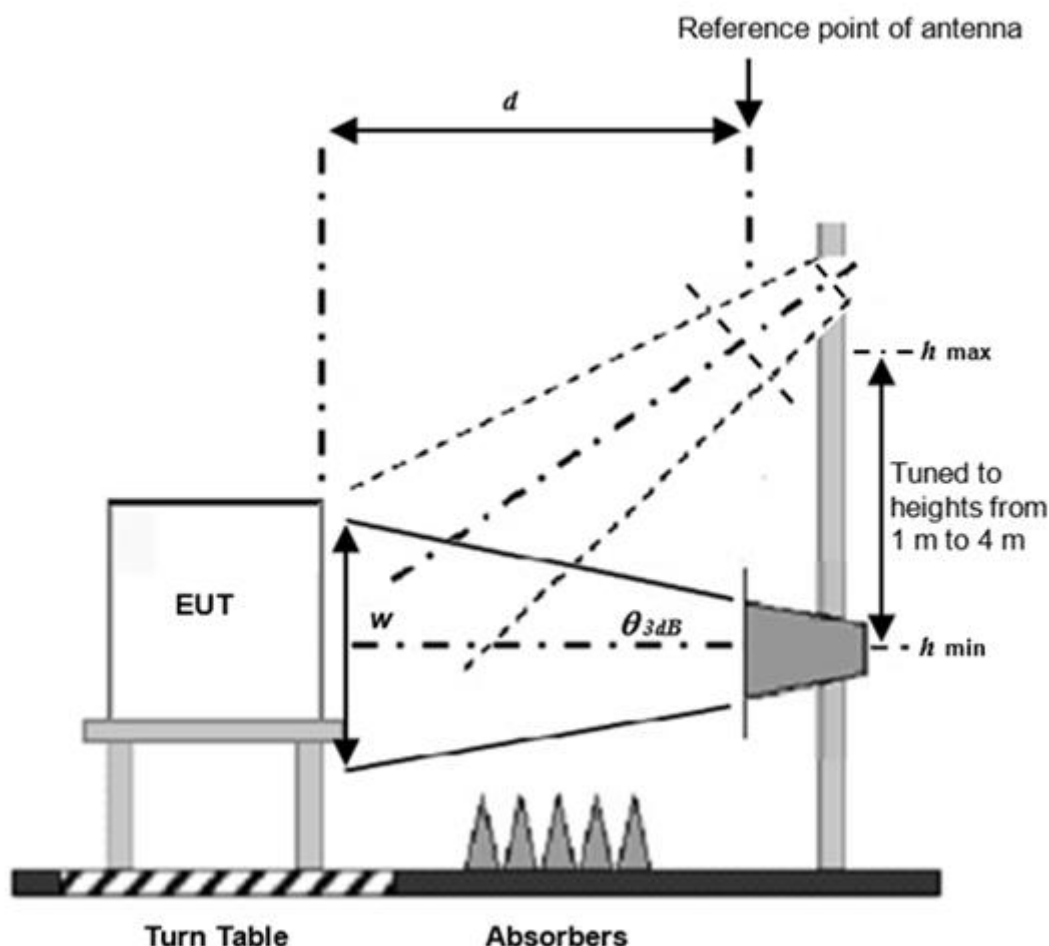


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

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

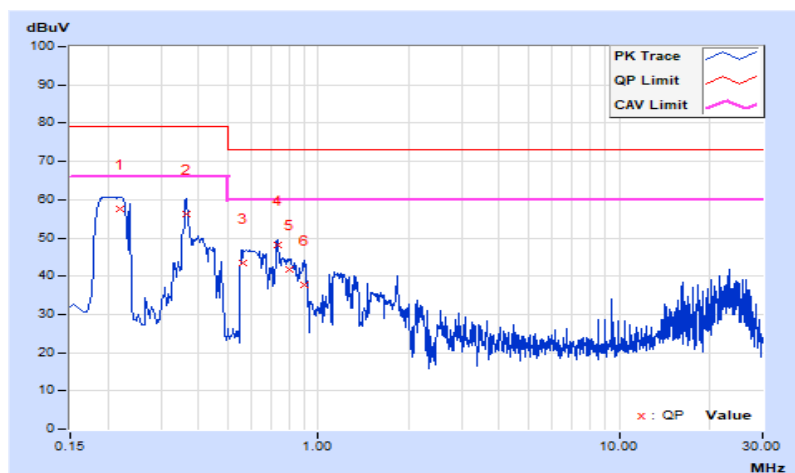
Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	24 Vdc	Environmental Conditions	20 °C, 77 % RH, 999.4 mbar
Tested by	Kenny Chang		

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	0.21851	10.00	47.55	23.59	57.55	33.59	79.00	66.00	-21.45	-32.41
2	0.36431	10.02	46.22	40.97	56.24	50.99	79.00	66.00	-22.76	-15.01
3	0.56258	10.02	33.29	13.74	43.31	23.76	73.00	60.00	-29.69	-36.24
4	0.73043	10.03	38.10	36.41	48.13	46.44	73.00	60.00	-24.87	-13.56
5	0.80106	10.03	31.72	22.36	41.75	32.39	73.00	60.00	-31.25	-27.61
6	0.89443	10.03	27.67	7.13	37.70	17.16	73.00	60.00	-35.30	-42.84

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

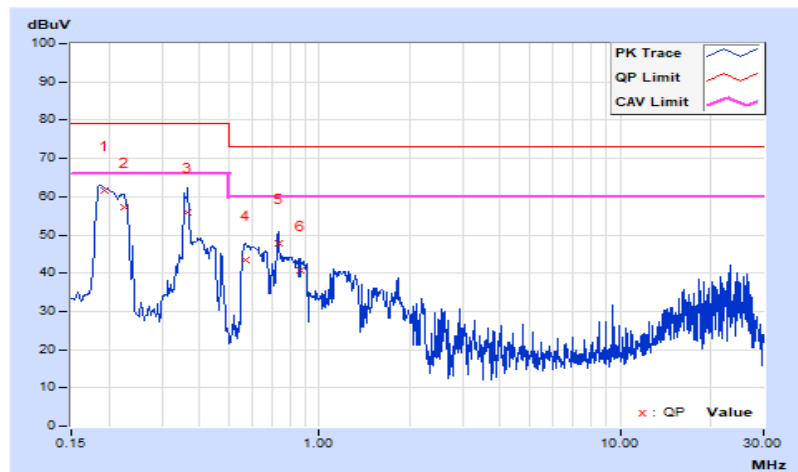


Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	24 Vdc	Environmental Conditions	20 °C, 77 % RH, 999.4 mbar
Tested by	Kenny Chang		

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	0.19397	9.99	51.49	46.95	61.48	56.94	79.00	66.00	-17.52	-9.06
2	0.22431	9.99	47.31	21.49	57.30	31.48	79.00	66.00	-21.70	-34.52
3	0.36511	10.01	45.72	41.15	55.73	51.16	79.00	66.00	-23.27	-14.84
4	0.56649	10.01	33.57	13.98	43.58	23.99	73.00	60.00	-29.42	-36.01
5	0.73075	10.02	37.73	36.19	47.75	46.21	73.00	60.00	-25.25	-13.79
6	0.87147	10.02	30.74	6.52	40.76	16.54	73.00	60.00	-32.24	-43.46

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

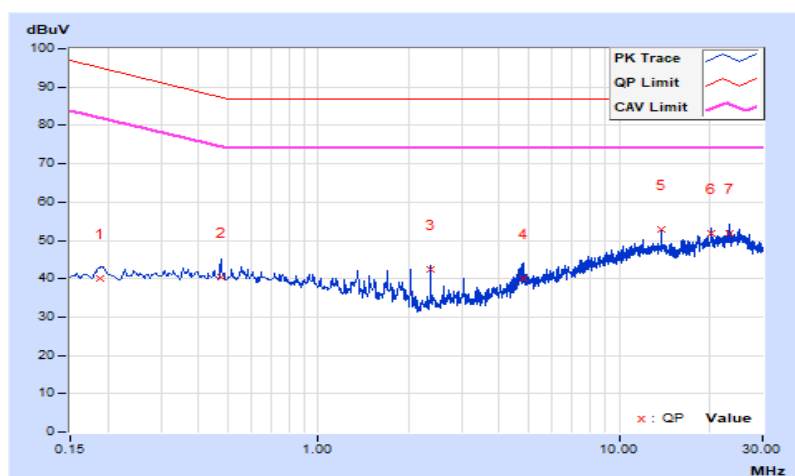
Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	24 Vdc	Environmental Conditions	20 °C, 77 % RH, 999.2 mbar
Tested by	Kenny Chang		

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	0.18853	9.75	30.21	24.97	39.96	34.72	95.10	82.10	-55.14	-47.38
2	0.47461	9.50	31.05	26.93	40.55	36.43	87.43	74.43	-46.88	-38.00
3	2.36763	9.25	33.19	32.03	42.44	41.28	87.00	74.00	-44.56	-32.72
4	4.83156	9.26	30.79	25.16	40.05	34.42	87.00	74.00	-46.95	-39.58
5	13.76064	9.60	43.42	29.65	53.02	39.25	87.00	74.00	-33.98	-34.75
6	20.25681	9.92	42.10	34.65	52.02	44.57	87.00	74.00	-34.98	-29.43
7	23.12749	10.09	41.87	36.55	51.96	46.64	87.00	74.00	-35.04	-27.36

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

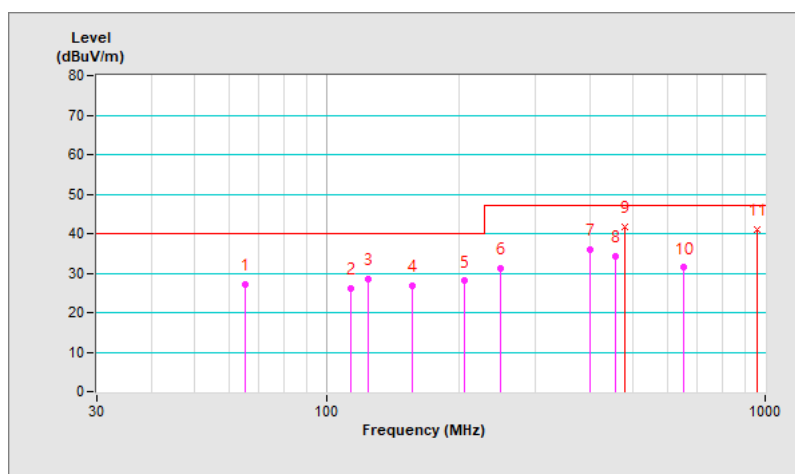
Mode A

Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	24 Vdc	Environmental Conditions	24 °C, 79 % 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	65.53	27.04 QP	40.00	-12.96	4.00 H	319	36.73	-9.69
2	113.53	26.24 QP	40.00	-13.76	4.00 H	56	36.81	-10.57
3	124.99	28.46 QP	40.00	-11.54	4.00 H	100	37.93	-9.47
4	156.48	26.84 QP	40.00	-13.16	4.00 H	293	34.29	-7.45
5	207.04	28.05 QP	40.00	-11.95	4.00 H	103	38.78	-10.73
6	250.00	31.34 QP	47.00	-15.66	3.78 H	256	39.45	-8.11
7	400.01	35.86 QP	47.00	-11.14	2.42 H	231	40.14	-4.28
8	455.20	34.33 QP	47.00	-12.67	2.12 H	229	37.40	-3.07
9	479.89	41.75 QP	47.00	-5.25	2.04 H	0	44.55	-2.80
10	650.40	31.40 QP	47.00	-15.60	1.42 H	277	30.68	0.72
11	960.00	41.10 QP	47.00	-5.90	1.00 H	25	34.81	6.29

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.

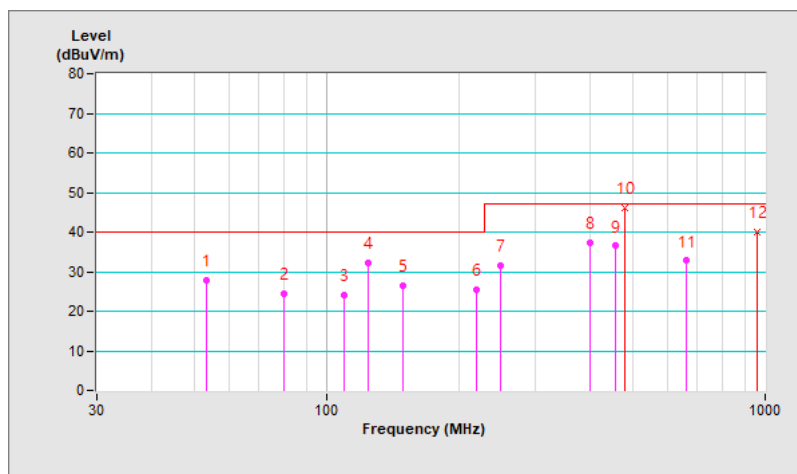


Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	24 Vdc	Environmental Conditions	24 °C, 79 % RH, 1000 mbar
Tested By	Paul Chen		

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	53.20	27.93 QP	40.00	-12.07	1.48 V	64	36.29	-8.36
2	79.88	24.37 QP	40.00	-15.63	1.86 V	165	37.39	-13.02
3	109.86	24.09 QP	40.00	-15.91	1.00 V	115	35.07	-10.98
4	125.00	32.22 QP	40.00	-7.78	1.00 V	52	41.69	-9.47
5	149.52	26.46 QP	40.00	-13.54	1.00 V	116	33.97	-7.51
6	219.91	25.47 QP	40.00	-14.53	1.00 V	91	35.68	-10.21
7	250.00	31.50 QP	47.00	-15.50	1.00 V	37	39.61	-8.11
8	399.99	37.30 QP	47.00	-9.70	1.00 V	147	41.58	-4.28
9	455.19	36.46 QP	47.00	-10.54	1.00 V	106	39.53	-3.07
10	480.00	46.20 QP	47.00	-0.80	3.37 V	247	49.00	-2.80
11	660.90	32.78 QP	47.00	-14.22	3.18 V	305	31.93	0.85
12	960.00	39.93 QP	47.00	-7.07	2.22 V	150	33.64	6.29

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

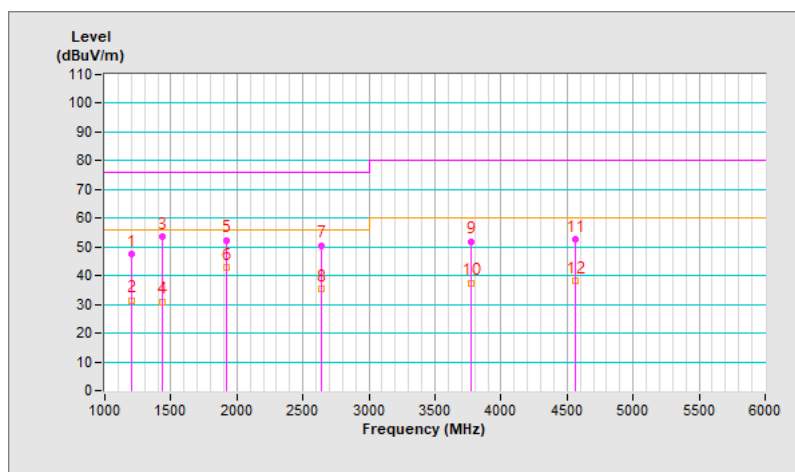
Mode A

Frequency Range	1 GHz ~ 5 GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1 MHz
Input Power	24 Vdc	Environmental Conditions	21 °C, 68 % RH, 1000.2 mbar
Tested By	Bob Lin		

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	1200.22	47.36 PK	76.00	-28.64	1.00 H	225	65.41	-18.05
2	1200.22	31.41 AV	56.00	-24.59	1.00 H	225	49.46	-18.05
3	1440.00	53.40 PK	76.00	-22.60	1.30 H	165	71.24	-17.84
4	1440.00	30.99 AV	56.00	-25.01	1.30 H	165	48.83	-17.84
5	1920.00	52.17 PK	76.00	-23.83	1.42 H	116	65.99	-13.82
6	1920.00	42.74 AV	56.00	-13.26	1.42 H	116	56.56	-13.82
7	2638.99	50.24 PK	76.00	-25.76	2.21 H	58	61.70	-11.46
8	2638.99	35.27 AV	56.00	-20.73	2.21 H	58	46.73	-11.46
9	3770.72	51.66 PK	80.00	-28.34	1.08 H	358	61.44	-9.78
10	3770.72	37.34 AV	60.00	-22.66	1.08 H	358	47.12	-9.78
11	4564.28	52.46 PK	80.00	-27.54	1.86 H	245	61.87	-9.41
12	4564.28	38.07 AV	60.00	-21.93	1.86 H	245	47.48	-9.41

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.

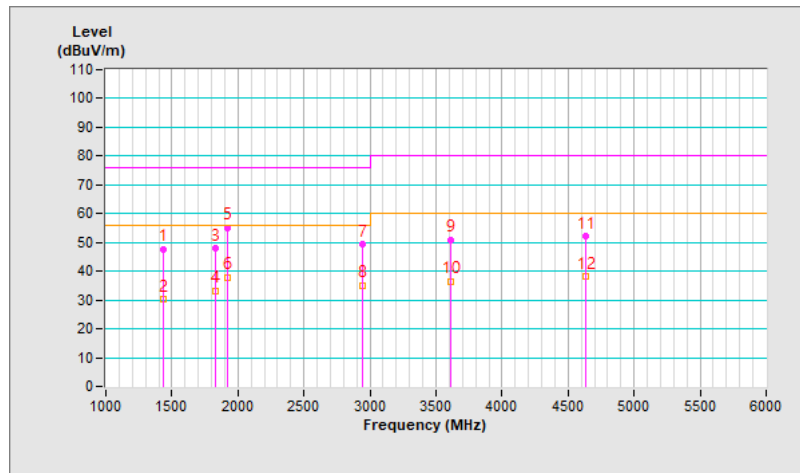


Frequency Range	1 GHz ~ 5 GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1 MHz
Input Power	24 Vdc	Environmental Conditions	21 °C, 68 % RH, 1000.3 mbar
Tested By	Bob Lin		

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	1440.00	47.46 PK	76.00	-28.54	1.26 V	87	65.30	-17.84
2	1440.00	30.08 AV	56.00	-25.92	1.26 V	87	47.92	-17.84
3	1832.01	47.81 PK	76.00	-28.19	2.09 V	313	61.76	-13.95
4	1832.01	33.10 AV	56.00	-22.90	2.09 V	313	47.05	-13.95
5	1920.00	55.08 PK	76.00	-20.92	1.47 V	159	68.90	-13.82
6	1920.00	37.91 AV	56.00	-18.09	1.47 V	159	51.73	-13.82
7	2944.21	49.23 PK	76.00	-26.77	1.95 V	2	60.39	-11.16
8	2944.21	35.12 AV	56.00	-20.88	1.95 V	2	46.28	-11.16
9	3613.23	50.89 PK	80.00	-29.11	1.26 V	242	60.83	-9.94
10	3613.23	36.49 AV	60.00	-23.51	1.26 V	242	46.43	-9.94
11	4629.59	52.06 PK	80.00	-27.94	1.10 V	0	61.32	-9.26
12	4629.59	38.05 AV	60.00	-21.95	1.10 V	0	47.31	-9.26

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



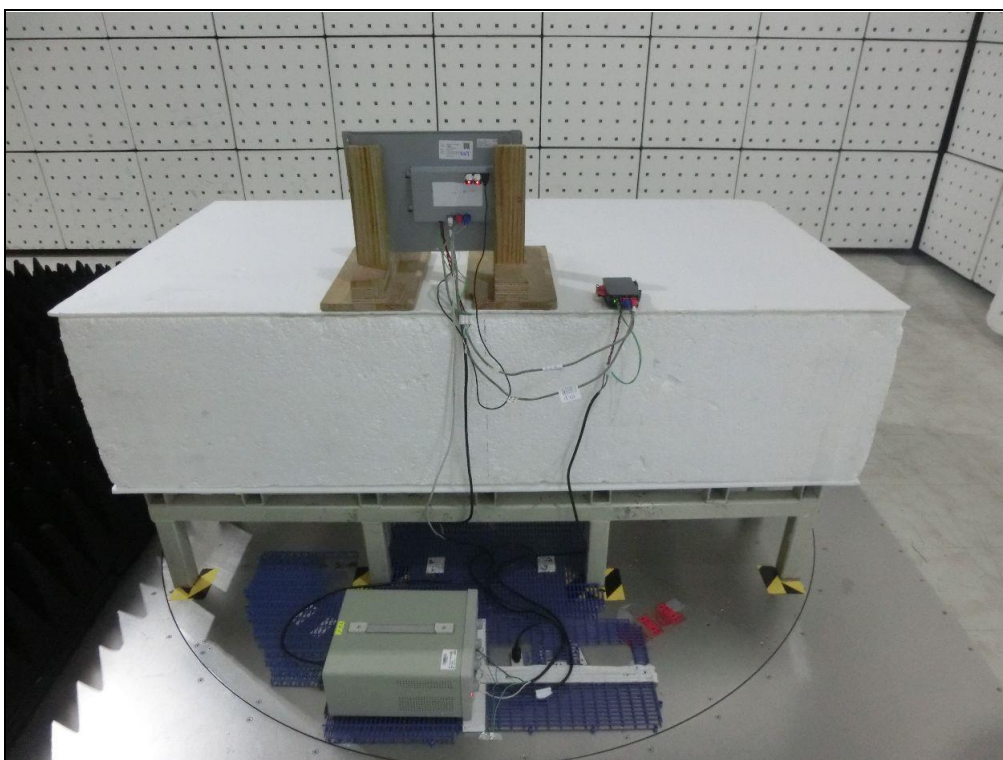
8.3 Radiated Emissions up to 1 GHz

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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