

# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** EN 55032: 2015+A11:2020, Class A  
EN 61000-3-2: 2014 (Not Applicable)  
EN IEC 61000-3-2: 2019+A1:2021 (Not Applicable)  
EN 61000-3-3: 2013+A1:2019+A2:2021 (Not Applicable)  
EN 55035: 2017+A11:2020

**Report No.:** CEBDBO-WTW-P23060658

**Product:** QEC

**Brand:** ICOP

**Model No.:** R

**Series Model:** QEC-RXXJTXS-X (X=0~9, A~Z, (,), /, - or Blank)

**Received Date:** 2023/6/28

**Test Date:** 2023/11/16 ~ 2023/11/29

**Issued Date:** 2023/12/15

**Applicant:** ICOP TECHNOLOGY INC.

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**Test Location:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**Approved by:**

  
Jim Hsiang / Associate Technical Manager

**Date:**

2023/12/15

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Prepared by : Ivy Lin / Specialist

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## Release Control Record

Issue No.	Description	Date Issued
CEBDBO-WTW-P23060658	Original release.	2023/12/15

## 1 Certificate

**Product:** QEC

**Brand:** iCOP

**Test Model:** R

**Series Model:** QEC-RXXJTXS-X (X=0~9, A~Z, (,), /, - or Blank)

**Sample Status:** Engineering sample

**Applicant:** ICOP TECHNOLOGY INC.

**Test Date:** 2023/11/16 ~ 2023/11/29

**Standard:** EN 55032: 2015+A11:2020, Class A

EN 61000-3-2: 2014 (Not Applicable)

EN IEC 61000-3-2: 2019+A1:2021 (Not Applicable)

EN 61000-3-3: 2013+A1:2019+A2:2021 (Not Applicable)

EN 55035: 2017+A11:2020

**Measurement procedure:** EN 61000-4-2: 2009 / IEC 61000-4-2: 2008 ED. 2.0

EN IEC 61000-4-3: 2020 / IEC 61000-4-3: 2020 ED. 4.0

EN 61000-4-4: 2012 / IEC 61000-4-4: 2012 ED. 3.0

EN 61000-4-5: 2014+A1:2017 / IEC 61000-4-5: 2017 ED. 3.1

EN 61000-4-6: 2014+AC:2015 / IEC 61000-4-6: 2013 ED. 4.0

EN 61000-4-8: 2010 / IEC 61000-4-8: 2009 ED. 2.0

EN IEC 61000-4-11: 2020+AC:2020 / IEC 61000-4-11: 2020 ED. 3.0 (Not Applicable)

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

## 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
EN 55032	Conducted Emissions from Power Ports	Pass	Minimum passing Class A margin is -2.73 dB at 0.29884 MHz
EN 55032	Radiated Emissions up to 1 GHz	Pass	Minimum passing Class A margin is -2.32 dB at 125.00 MHz
IEC 61000-4-2	Electrostatic Discharges (ESD)	Pass	For EN 55035 Performance Criteria B
IEC 61000-4-3	Radio Frequency Electromagnetic Field (RS)	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-4	Fast Transients Common Mode (EFT)	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-5	Surges	Pass	For EN 55035 Performance Criteria B
IEC 61000-4-6	Radio Frequency Common Mode (CS)	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-8	Power Frequency Magnetic Field (PFMF)	Pass	For EN 55035 Performance Criteria A

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

## 2.1 Performance Criteria

### For EN 55035

#### General Performance Criteria

These criteria shall be used during the testing of primary functions where no specified in the normative annexes of EN 55035 is applicable.

#### Performance criterion A

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

#### Performance criterion B

During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.

After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.

If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

#### Performance criterion C

Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.

Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

### Product Specific Performance criteria for Audio output functions

#### Performance criterion A

**Table – Performance criterion A – Limits for devices supporting telephony**

Type of immunity test	Frequency range MHz	Acoustic or electrical interference ratio	Equivalent direct measurement		
			dB(SPL)	Digital dBm0	Analogue dBm
Conducted	0.15 to 30	–20 dB	55	–50	–50
	30 to 80	–10 dB	65	–40	–40
Radiated	80 to 1 000	0 dB	75	–30	–30

The acoustic level of the demodulated audio shall be less than the limits in column 4.

For all other Audio output devices:

The measured acoustic interference ratio and/or the measured electrical interference ratio during the test shall be –20 dB or better.

#### Performance criterion B

Use the general performance criterion B.

#### Performance criterion C

Use the general performance criterion C.

### Product Specific Performance criteria for network functions

Equipment that provides these functions transmits and receives data through ports such as an analogue/digital data port. The networking functions are just like network switching and routing ; data transmission ; supervisory...etc.

The particular performance criteria which are specified in the normative annexes of CISPR 35/ EN 55035 take precedence over the corresponding parts of the general performance criteria.

#### Performance criterion A

Where relevant, during the application of the test the network function shall, as a minimum, operate ensuring that:

- established connections shall be maintained throughout the application of the test;
- no change of operational state or corruption of stored data occurs;
- no increase in error rate above the figure defined by the manufacturer occurs. The manufacturer should select the most appropriate performance measurement criteria for the product or system, for example bit error rate, block error rate;
- no request for retry above the figure defined by the manufacturer;
- the data transmission rate does not reduce below the figure defined by the manufacturer;
- no protocol failure occurs;
- other verifications are described in F.3.3.1 of CISPR 35/ EN 55035.

#### Performance criterion B

Established connections shall be maintained throughout the test, or shall self-recover in a way and timescale that is imperceptible to the user.

The error rate, request for retry and data transmission rates may be degraded during the application of the test. Degradation of the performance as described in criterion A is permitted, provided that the normal operation of the EUT is self-recoverable to the condition established prior to the application of the test.

Where required, as defined in Clause 5 of CISPR 35/ EN 55035, the acceptable operation of the function shall be verified at the completion of the test as described in Table H.1 of CISPR 35/ EN 55035, by confirming the following:

- the EUT's ability to establish a connection,
- the EUT's ability to clear a connection.

During surge testing disconnection is allowed on the analogue/digital data port being tested.

If the EUT is a supervisory equipment, it shall not impact the normal operation of the network being monitored. In addition, any supervisory functions impacted during the period of the test shall return to the state prior to the test. Elements to consider include: alarms, signalling lamps, printer output, network traffic rates, network monitoring.

#### Performance criterion C

Degradation of performance as described in criteria A and B is permitted provided that the normal operation of the EUT is self-recoverable to the condition immediately before the application of the test, or can be restored after the test by the operator.

### Product Specific Performance Criteria for xDSL

The particular performance criteria which are specified in the normative annexes of CISPR 35/ EN 55035 take precedence over the corresponding parts of the general performance criteria.

#### Performance criterion A

##### Applicable for the test requirement defined in table clause 2.1 of EN 55035

During the swept frequency test the established connection shall be maintained throughout the testing and the information transferred without any additional reproducible errors or loss of synchronisation. If a degradation in performance is observed and the system is adaptive, for example has the capability to automatically retrain in the presence of an interfering signal, then for conducted immunity tests only, the following procedure shall be followed:

- a) For each range of interfering frequencies in which degradation in performance is observed, three frequencies (beginning, middle and end) shall be identified.
- b) At each of the frequencies identified in step a), the interfering signal shall be turned on and the system is allowed to retrain.
- c) If the system is able to retrain and then functions correctly for a dwell time of at least 60 seconds without any additional reproducible errors or loss of synchronisation, then the performance level of the system is considered acceptable.
- d) The frequencies identified in step a) and the data rates achieved in step b) shall be recorded in the test report.



#### Applicable for the test requirement defined in table clause 2.2 of EN 55035

It is important that the modems are able to train in the presence of repetitive impulsive noise and minimize disruption to the end-user where a repetitive impulsive noise source starts after the link has synchronized. Therefore the following procedure and performance criteria shall apply.

The manufacturer shall select the class of impulsive noise protection (INP) to be used for the immunity test and should state this information in the technical documentation and in the test report. The maximum delay shall be set to 8 ms.

**In the absence of impulsive noise:** The modem shall operate without retraining at its target noise margin with a bit rate value depending on the line attenuation and the stationary noise being present on the line. (The actual value will be between the minimum and maximum bit rate values programmed in the port).

The impulsive noise source shall then be applied at the required test level.

**With the impulsive noise applied:** The modem shall operate without retraining and without SES at the bit rate established prior to the application of the impulsive noise. No extra CRC errors shall occur due to the impulsive noise.

After the test, the noise margin value shall return to the target noise margin.

#### Performance criterion B

##### Applicable for the test requirement defined in table clause 2.3 of EN 55035

Modems shall withstand the occurrence of isolated impulsive noise events. The performance criteria defined in below Table shall be applied.

Impulse duration (ms)	Performance criteria
0.24	The application of the impulse shall not cause the xDSL link to lose synchronisation. No CRC errors are permitted.
10	The application of the 5 impulses shall result in less than 75 CRC errors and shall not cause the link to lose synchronisation.
300	The application of the impulse shall not cause the xDSL link to lose synchronisation.

##### Applicable for the test requirements defined in table clauses 2.5 and 4.5 of EN 55035

For application of this test to the xDSL port, a repetition rate of 100 kHz (burst length 0.75 ms) shall be used.

Degradation of the performance as described in criterion A is permitted in that errors are acceptable during the application of the test. However the application of the test shall not cause the system to lose the established connection or re-train. At the cessation of the test the system shall operate in the condition established prior to the application of the test without user intervention.

After the application of the EFT/B tests to the xDSL or AC mains port, the CRC error count shall not have increased by more than 600 when compared to the count prior to the application of the test.

#### Performance criterion C

Degradation of the performance as described in criteria A and B is permitted provided that the normal operation of the EUT is self-recoverable to the condition established prior to application of the test or can be restored after the test by the operator.

## 2.2 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 ( $U_{\text{CISPR}}$ )
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	3m : 5.62 dB 10m : 4.26 dB	6.3 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.

## 2.3 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	R
Series Model	QEC-RXXJTXS-X (X=0~9, A~Z, (,), /, - or Blank)
Model Difference	Marketing Differentiation
Sample Status	Engineering sample
Operating Software	N/A
Power Supply Rating	24Vdc
Accessory Device	N/A

#### 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 100 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 + 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 + Input Power(24 Vdc)
Mode	Radiated Emissions up to 1 GHz
A	operating mode + Input Power(24 Vdc)
Mode	Electrostatic Discharges (ESD)
A	operating mode + Input Power(24 Vdc)
Mode	Radio Frequency Electromagnetic Field (RS)
A	operating mode + Input Power(24 Vdc)
Mode	Fast Transients Common Mode (EFT)
A	operating mode + Input Power(24 Vdc)
Mode	Surges
A	operating mode + Input Power(24 Vdc)
Mode	Radio Frequency Common Mode (CS)
A	operating mode + Input Power(24 Vdc)
Mode	Power Frequency Magnetic Field (PFMF)
A	operating mode + Input Power(24 Vdc)

### 3.5 Test Program Used and Operation Descriptions

#### For Emission test

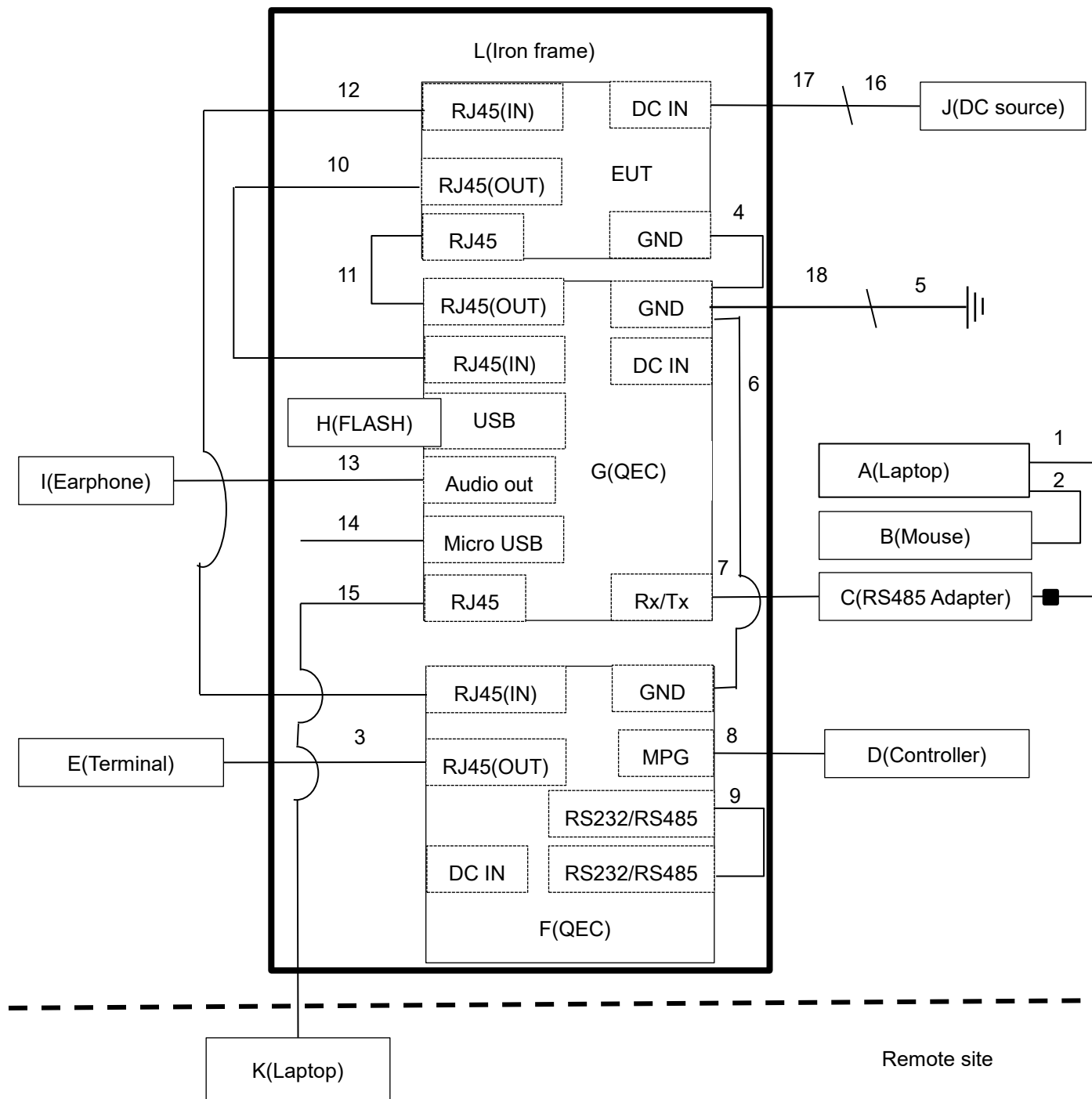
- a. Turned on the power of all equipment.
- b. EUT ran a test program to enable all functions.
- c. Laptop (kept at remote site) sent and received message to/ from EUT via QEC with RJ45 cable.
- d. Laptop sent "ITU-R 471-1" messages to panel. Then it displayed messages on its screen.
- e. EUT sent "audio signal" to earphone.
- f. Steps c-e were repeated.

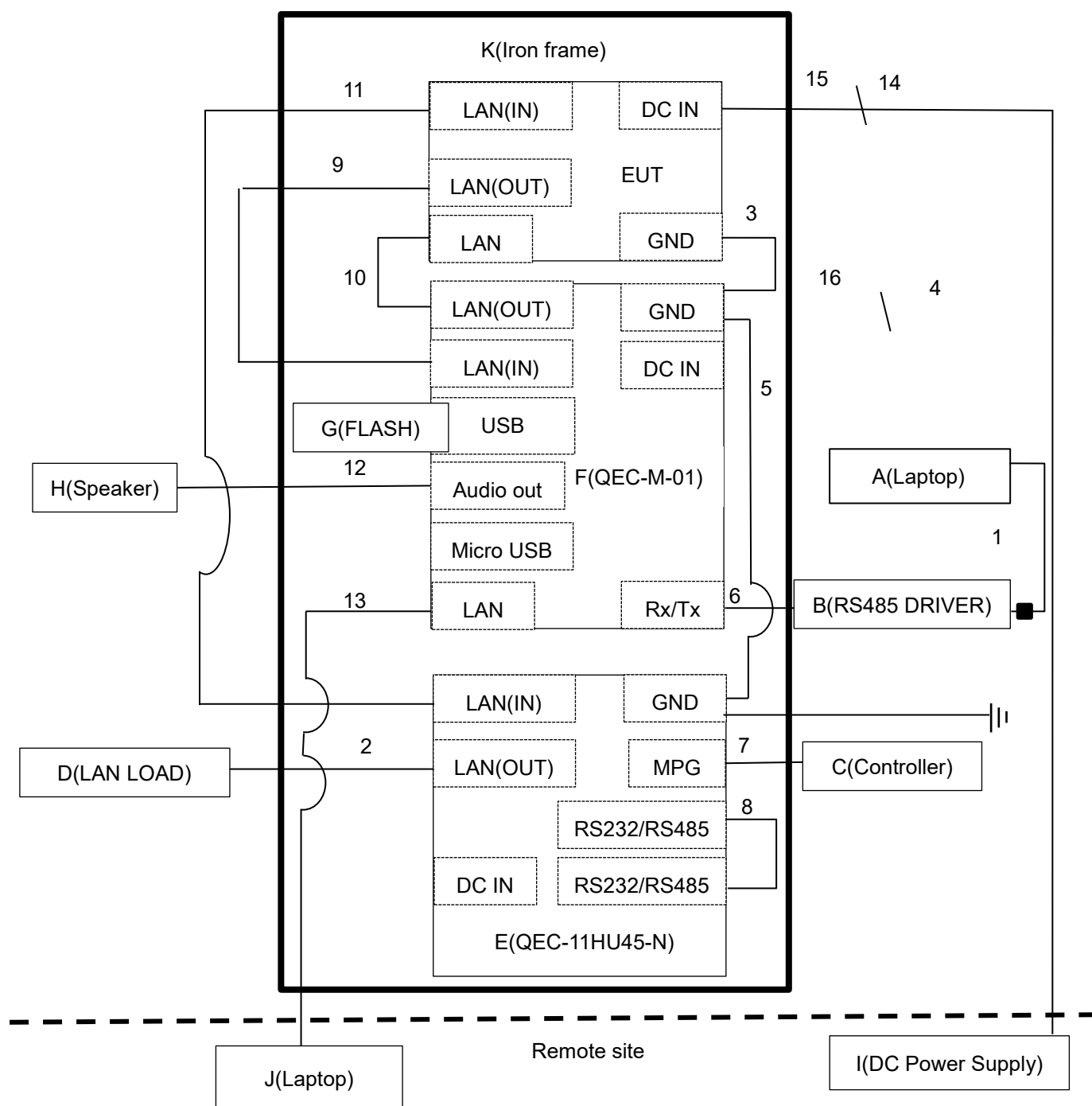
#### For Immunity test

- a. Turned on the power of all equipment.
- b. EUT ran a test program to enable all functions.
- c. Laptop (kept at remote site) sent and received message to/ from EUT via QEC with RJ45 cable.
- d. Laptop sent "ITU-R 471-1" messages to panel. Then it displayed messages on its screen.
- e. EUT sent "audio signal" to speaker.
- f. Steps c-e were repeated.

### 3.6 Connection Diagram of EUT and Peripheral Devices

For Emission test





### 3.7 Configuration of Peripheral Devices and Cable Connections

#### For Emission test

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-321CM	N/A	N/A	Supplied by applicant
D	Controller	SAH	TM1474-100B-5L- Z6	N/A	N/A	Supplied by applicant
E	Terminal	N/A	N/A	N/A	N/A	Provided by Lab
F	QEC	QEC	QEC-11HU4S-N	N/A	N/A	Supplied by applicant
G	QEC	QEC	QEC-M-01	N/A	N/A	Supplied by applicant
H	FLASH	HP	V222W	N/A	N/A	Supplied by applicant
I	EARPHONE	PHILIPS	SBC HL145	N/A	N/A	Provided by Lab
J	DC Power Supply	HILA	DP-6010	2216AP041904059	N/A	Provided by Lab
K	Laptop	LENOVO	T480	PF1EK03U	N/A	Provided by Lab
L	Iron frame	N/A	N/A	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB cable	1	0.9	Yes	1	Supplied by applicant
2	USB cable	1	1.8	Yes	0	Provided by Lab
3	RJ45 (Cat. 5e) cable	1	1.5	No	0	Provided by Lab
4	GND (PE) cable	1	0.1	No	0	Supplied by applicant
5	GND (PE) cable	1	1.6	No	0	Provided by Lab
6	GND (PE) cable	1	0.1	No	0	Supplied by applicant
7	Data cable	1	0.5	No	0	Supplied by applicant
8	MPG cable	1	2	Yes	0	Supplied by applicant
9	RS232 cable	1	0.1	Yes	0	Supplied by applicant
10	RJ45 (Cat. 5e) cable	1	0.1	No	0	Supplied by applicant
11	RJ45 (Cat. 5e) cable	1	0.2	No	0	Supplied by applicant
12	RJ45 (Cat. 5e) cable	1	0.1	No	0	Supplied by applicant
13	Audio (3.5") cable	1	1	No	0	Provided by Lab
14	USB (Micro) cable	1	1	Yes	0	Provided by Lab
15	RJ45 (Cat. 5e) cable	1	10	No	0	Provided by Lab
16	DC power cable	1	1.5	No	0	Provided by Lab
17	DC power cable	1	0.1	No	0	Supplied by applicant
18	GND (PE) cable	1	0.1	No	0	Supplied by applicant

## For Immunity test

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	Lenovo	TP00050A	N/A	N/A	Supplied by applicant
B	RS485 DRIVER	SOYAL	AR-321CM	N/A	N/A	Supplied by applicant
C	Controller	SAH	TM1474-100B-5L-Z6	N/A	N/A	Supplied by applicant
D	LAN LOAD	N/A	N/A	N/A	N/A	Provided by Lab
E	QEC	QEC	QEC-11HU4S-N	N/A	N/A	Supplied by applicant
F	QEC	QEC	QEC-M-01	N/A	N/A	Supplied by applicant
G	FLASH	HP	x750w	N/A	N/A	Supplied by applicant
H	Speaker	N/A	N/A	N/A	N/A	Provided by Lab
I	DC Power Supply	Chroma	62024P-80-60	62024PA03093	N/A	Provided by Lab
J	Laptop	DELL	Latitude 5420	FHS33F3	N/A	Provided by Lab
K	Iron frame	N/A	N/A	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB cable	1	0.9	Yes	1	Supplied by applicant
2	RJ45 (Cat. 5e) cable	1	1.5	No	0	Provided by Lab
3	GND (PE) cable	1	0.1	No	0	Supplied by applicant
4	GND (PE) cable	1	3	No	0	Provided by Lab
5	GND (PE) cable	1	0.1	No	0	Supplied by applicant
6	Data cable	1	0.5	No	0	Supplied by applicant
7	MPG cable	1	2	Yes	0	Supplied by applicant
8	RS232 cable	1	0.1	Yes	0	Supplied by applicant
9	RJ45 (Cat. 5e) cable	1	0.1	No	0	Supplied by applicant
10	RJ45 (Cat. 5e) cable	1	0.2	No	0	Supplied by applicant
11	RJ45 (Cat. 5e) cable	1	0.1	No	0	Supplied by applicant
12	Audio (3.5") cable	1	1.2	No	0	Provided by Lab
13	RJ45 (Cat. 5e) cable	1	10	No	0	Provided by Lab
14	DC power cable	1	5	No	0	Provided by Lab
15	DC power cable	1	0.1	No	0	Supplied by applicant
16	GND (PE) cable	1	0.1	No	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	E1-01-305	2023/2/13	2024/2/12
		E1-011285	2023/9/21	2024/9/20
		E1-011286	2023/9/21	2024/9/20
Coupling / Decoupling Network TESEQ	CDN A201A	44601	2022/12/14	2023/12/13
EMI Test Receiver R&S	ESCS 30	100276	2023/4/20	2024/4/19
	ESR3	102413	2023/2/7	2024/2/6
Fixed Attenuator EMEC	EM-ATT30002602NN	N/A	2023/3/24	2024/3/23
Fixed Attenuator STI	STI02-2200-10	NO.3	2023/10/20	2024/10/19
High Voltage Probe Schwarzbeck	TK9420	00982	2022/12/14	2023/12/13
LISN R&S	ENV216	101195	2023/7/25	2024/7/24
		101196	2023/5/22	2024/5/21
		101197	2023/7/12	2024/7/11
LISN Schwarzbeck	NNLK 8121	8121-731	2023/6/9	2024/6/8
		8121-00759	2023/8/21	2024/8/20
		8121-808	2023/5/2	2024/5/1
	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_V7.3.7.4	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: 2023/11/16



## 4.2 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
Coupling / Decoupling Network Schwarzbeck	CDNE-M2	00097	2023/5/25	2024/5/24
	CDNE-M3	00091	2023/5/25	2024/5/24
EMI Test Receiver R&S	ESCS 30	100276	2023/4/20	2024/4/19
		100292	2023/9/7	2024/9/6
Fixed Attenuator Mini-Circuits	UNAT-5+	PAD-ST2-01	2023/10/20	2024/10/19
Preamplifier Agilent	8447D	2944A11062	2023/2/15	2024/2/14
Preamplifier EMCI	EMC9135	980711	2023/3/12	2024/3/11
Preamplifier HP	8447D	2944A08313	2023/2/15	2024/2/14
RF Coaxial Cable Pacific	8D-FB	Cable-ST2-01	2023/11/7	2024/11/6
Software BVADT	Radiated_V7.6.15.9.5	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: 2023/11/17

## 4.3 Electrostatic Discharges (ESD)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Electronic Discharge Simulator Noiseken	ESS-2000	ESS0382041	2023/10/13	2024/10/12
Electrostatic Analog Tester TESEQ	NSG 438	1875	2023/11/10	2024/11/9
ESD Generator EM TEST	Dito//DM-150/330//DM-150/330-rfci	P1315117252/P1317117852	2023/7/6	2024/7/5
ESD Simulator EM TEST	Dito	V0707102251	2023/3/24	2024/3/23
ESD Simulator TESEQ	NSG 438	1364	2023/11/10	2024/11/9

### Notes:

1. The test was performed in Linkou ESD Room No.03.
2. Tested Date: 2023/11/27

#### 4.4 Radio Frequency Electromagnetic Field (RS)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Amplifier TESEQ	CBA 1G-150	T44220	N/A	N/A
Amplifier TESTQ	AS1860-50	S-5944/1	N/A	N/A
	CBA 3G-050	T44345	N/A	N/A
Audio analyzer R&S	UPV	104934	2023/8/7	2024/8/6
Band Pass Filter B&K	WH3278	N/A	2023/11/20	2024/11/19
CHANCE MOST Compact Full Anechoic Chamber (7x3x3 m)	N/A	N/A	2023/1/17	2024/1/16
Isotropic EM Field Probe+EM Field Meter Wavecontrol	WPF18+SMP2	21WP090492+21SN1691	2022/12/15	2023/12/14
Power Meter Boonton	4232A	94901	2023/5/31	2024/5/30
Power Sensor Boonton	51011-EMC	32807	2023/5/31	2024/5/30
		32832	2023/5/31	2024/5/30
Pressure-field Microphone B&K	4192	3190854	N/A	N/A
		3190855	2022/12/12	2023/12/11
Radiated Immunity Test System TESEQ	ITS 6006	37543	2023/5/10	2024/5/9
Software BVADT	BV ADT_ABMS_ V7.4.3	N/A	N/A	N/A
Software BVADT	RS_V7.6	N/A	N/A	N/A
Stacked Log Periodic Antenna Schwarzbeck	STLP 9129	9129068	N/A	N/A
Two channel microphone conditioning amplifier B&K	2690 OS2	3001996	2023/11/20	2024/11/19
Wireless Connection Tester R&S	CMW270	101075	2023/4/28	2024/4/27

##### Notes:

1. The test was performed in Linkou RS Room No.1.
2. Tested Date: 2023/11/22

#### 4.5 Fast Transients Common Mode (EFT)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Capacitive Coupling clamp EMC PARTNER	CN-EFT1000	352	2023/6/5	2024/6/4
Surge & EFT Generators TESEQ	NSG 3060	1572	2023/4/18	2024/4/17

##### Notes:

1. The test was performed in Linkou EMS Room No.02.
2. Tested Date: 2023/11/24

#### 4.6 Surges

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
CDN for Unshielded Unsymmetrical Signal & Data Lines TESEQ	CDN117	40144	2023/8/29	2024/8/28
Coupling / Decoupling Network TESEQ	CDN 118-T8	40386	2023/8/28	2024/8/27
	CDN HSS-2	41009	2023/4/18	2024/4/17
Surge & EFT Generators TESEQ	NSG 3060	1572	2023/4/18	2024/4/17

Notes:

1. The test was performed in Linkou EMS Room No.02.
2. Tested Date: 2023/11/24

#### 4.7 Radio Frequency Common Mode (CS)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Amplifier AR	75A250AM1	306331	N/A	N/A
Audio analyzer R&S	UPV	104934	2023/8/7	2024/8/6
CDN Calibration Kit TESEQ	CDN T8S	29459	2023/2/21	2024/2/20
Coupling / Decoupling Network EM TEST	CDN M1/32A	306508	2023/2/22	2024/2/21
Coupling / Decoupling Network FCC	FCC-801-M2-16A	01047	2023/2/22	2024/2/21
	FCC-801-M5-50A	100018	2023/1/17	2024/1/16
Coupling / Decoupling Network TESEQ	CDN M232	37702	2023/2/22	2024/2/21
	CDN M332	41256	2023/2/22	2024/2/21
		41258	2023/2/22	2024/2/21
	CDN M432S	56519	2023/2/22	2024/2/21
	CDN S200	53490	2023/2/23	2024/2/22
	CDN S400	52115	2023/2/23	2024/2/22
	CDN S751A	56435	2023/2/20	2024/2/19
		56436	2023/2/21	2024/2/20
	CDN ST08A	56525	2023/2/20	2024/2/19
		56527	2023/2/20	2024/2/19
	CDN T2A-10	54942	2023/2/21	2024/2/20
	CDN T8-10	40376	2023/2/21	2024/2/20
	CDN T8-230	56641	2023/9/28	2024/9/27
		56642	2023/9/28	2024/9/27
	CDN T400A	49918	2023/2/22	2024/2/21
	CDN T800	34428	2023/2/21	2024/2/20
Current Clamp FCC	F-120-9A	361	2023/8/23	2024/8/22
Ear Simulator Telephonometry B&K	4185	2553594	N/A	N/A

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
FCC EM Injection Clamp FCC	F-203I-23mm	455	N/A	N/A
Mouth Simulator B&K	4227	2630632	N/A	N/A
POWER AMPLIFIER B&K	2716C	2610979	N/A	N/A
Power Meter R&S	NRVD	837794/040	2023/10/16	2024/10/15
Power Sensor R&S	NRV-Z5	837878/039	2023/10/16	2024/10/15
Pressure-field Microphone B&K	4192	2735407	N/A	N/A
Signal Generator R&S	SML03	101364	2023/8/16	2024/8/15
Software BVADT	ABMS_ V7.4.3	N/A	N/A	N/A
Software BVADT	BVADT_CS_V7.6.6	N/A	N/A	N/A
Two channel microphone conditioning amplifier B&K	2690 OS2	3001996	2023/11/20	2024/11/19
Wireless Connection Tester R&S	CMW270	101075	N/A	N/A

## Notes:

1. The test was performed in Linkou CS Room No.1.
2. Tested Date: 2023/11/22

#### 4.8 Power Frequency Magnetic Field (PFMF)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Gaussmeter F.W. Bell	4190	0743043	2023/4/19	2024/4/18
Magnetic Field Test System Haefely Trench AG	MAG 100	083794-06	N/A	N/A

## Notes:

1. The test was performed in Linkou EMS Room No.1.
2. Tested Date: 2023/11/29

## 5 Limits of Test Items

### 5.1 Conducted Emissions from Power Ports

Frequency (MHz)	Class A (dB $\mu$ V)		Class B (dB $\mu$ V)	
	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 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.

### 5.3 General immunity requirements

For EN 55035

Port	Basic Standard	Test item	Test specification	Performance criteria
Power input (AC)	IEC 61000-4-4	Fast Transients, Common Mode (EFT)	±1 kV 5/50 ns (Tr/Th) 5 kHz, repetition frequency	B
	IEC 61000-4-5	Surge	Line to line: ±1 kV, 1.2/50 µs Line to earth: ±2 kV, 1.2/50 µs	B
	IEC 61000-4-6	Radio Frequency, Common Mode (CS)	0.15-10 MHz, 3 V, 80% AM (1 kHz), 10-30 MHz, 3 V-1 V, 80% AM (1 kHz), 30-80 MHz, 1 V, 80% AM (1 kHz),	A
	IEC 61000-4-11	Voltage dips and interruptions (DIP)	<b>Voltage Dips:</b> < 5% residual voltage, 0.5 cycle 70% residual voltage, 25 cycles (at 50 Hz) <b>Voltage Interruption:</b> < 5% residual voltage, 250 cycles (at 50 Hz)	B C C
DC power/ Wired network and Signal/ Control port	IEC 61000-4-4	Fast Transients, Common Mode (EFT)	±0.5 kV 5/50 ns (Tr/Th) 100 kHz, repetition frequency for xDSL port 5 kHz, repetition frequency for other port	B
	IEC 61000-4-5	Surge	<b>Wired network ports</b> (directly connected to outdoor cables): Symmetrically operated: 10/700 µs w/o primary protectors: ±1.0 kV, or with primary protectors fitted: ±1.0 kV and ±4.0 kV, Coaxial or shielded operated: 1.2/50 µs shield to ground: ±0.5 kV,	C B B
			<b>DC power ports</b> (directly connected to outdoor cables): 1.2/50 µs each individual line to earth, or shield to ground: ±0.5 kV,	
		Radio Frequency, Common Mode (CS)	0.15-10 MHz, 3 V, 80% AM (1 kHz), 10-30 MHz, 3 V-1 V, 80% AM (1 kHz), 30-80 MHz, 1 V, 80% AM (1 kHz),	A
	IEC 61000-4-6	Broadband impulse noise disturbances (Applicable only to xDSL ports.)	<b>Repetitive :</b> Impulse frequency profile : 0.15 – 0.5 MHz, 107 dBuV ; 0.5 – 10 MHz, 107 – 36 dBuV ; 10 – 30 MHz, 36 – 30 dBuV Burst duration : 0.70 ms Burst period : 10 ms (for 50 Hz) At least 2 minutes for each port under test.	A
			<b>Isolated :</b> Impulse frequency profile : 0.15 – 30 MHz, 110 dBuV Burst duration : 0.24 ms, 10 ms and 300 ms Isolated impulses : 5 times Interval : at least 60 seconds	B

Port	Basic Standard	Test item	Test specification	Performance criteria
Enclosure	IEC 61000-4-2	Electrostatic Discharge (ESD)	±4 kV (contact) ±8 kV (Air)	B
	IEC 61000-4-3	Radio Frequency Electromagnetic Field (RS)	Swept Frequency Test: 80 to 1000(MHz), 3 V/m, 80% AM (1 kHz) Spot Frequency Test: 1800, 2600, 3500, 5000 MHz (±1%), 3 V/m, 80% AM (1 kHz)	A
	IEC 61000-4-8	Power Frequency Magnetic Field (PFMF)	1 A/m, 50 Hz	A

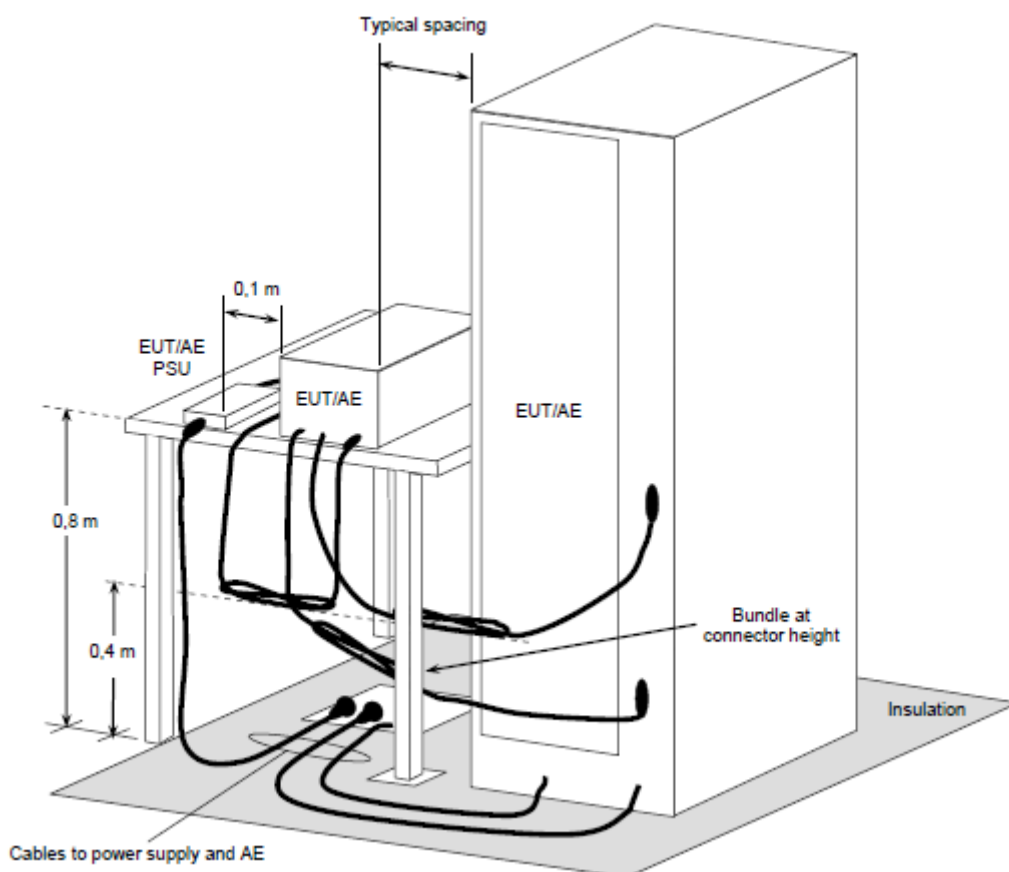




## 6.2 Radiated Emissions up to 1 GHz

- 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.



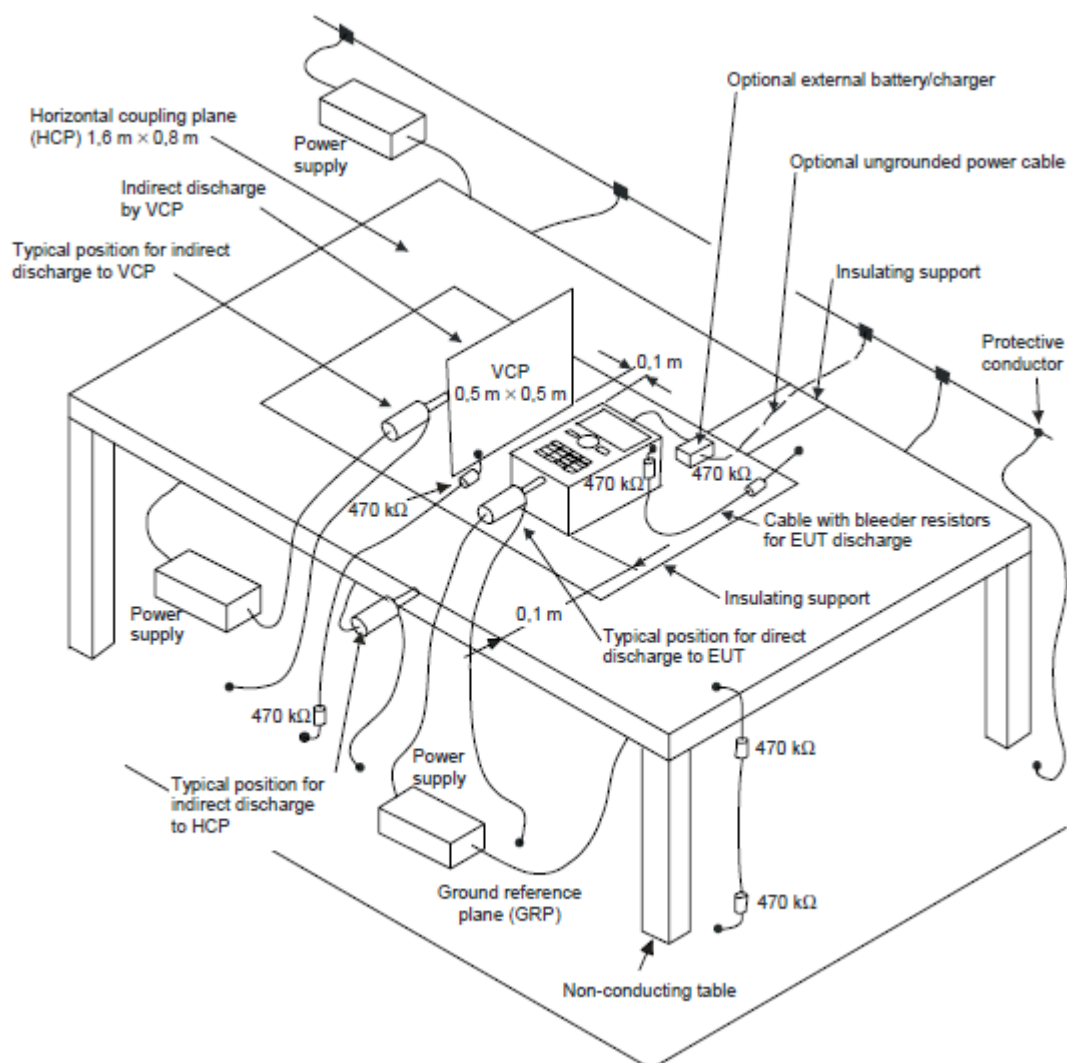
For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

### 6.3 Electrostatic Discharges (ESD)

<b>Discharge Impedance:</b>	330 ohm / 150 pF
<b>Number of Discharge:</b>	Air – Direct: 10 discharges per location (each polarity) Contact – Direct & Indirect: 10 discharges per location (each polarity)
<b>Discharge Period:</b>	1-second minimum

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

- Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- The time interval between two successive single discharges was at least 1 second.
- The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- At least ten single discharges (in the most sensitive polarity) were applied to the **Horizontal Coupling Plane** at points on each side of the EUT. The ESD generator was positioned at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP**.
- At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.



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

#### **NOTE:**

#### **TABLE-TOP EQUIPMENT**

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN/IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

#### **FLOOR-STANDING EQUIPMENT**

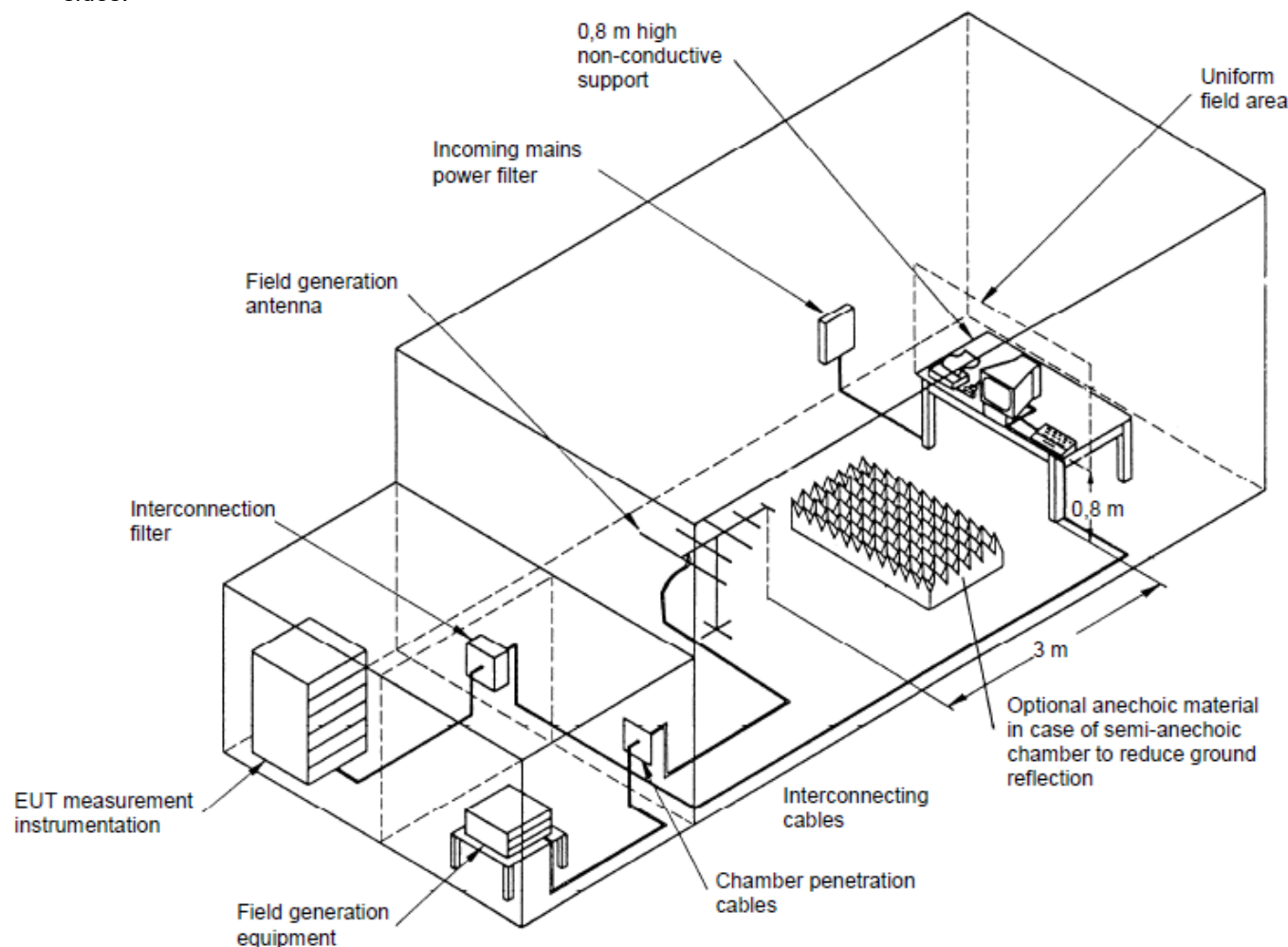
The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 m.

## 6.4 Radio Frequency Electromagnetic Field (RS)

Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Dwell Time:	3 seconds

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

- The testing was performed in a modified semi-anechoic chamber.
- The frequency range shall be swept, with the signal 80% amplitude modulated with a 1kHz sine wave.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.



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

### NOTE:

#### **TABLETOP EQUIPMENT**

The EUT installed in a representative system as described in section 7 of EN/IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

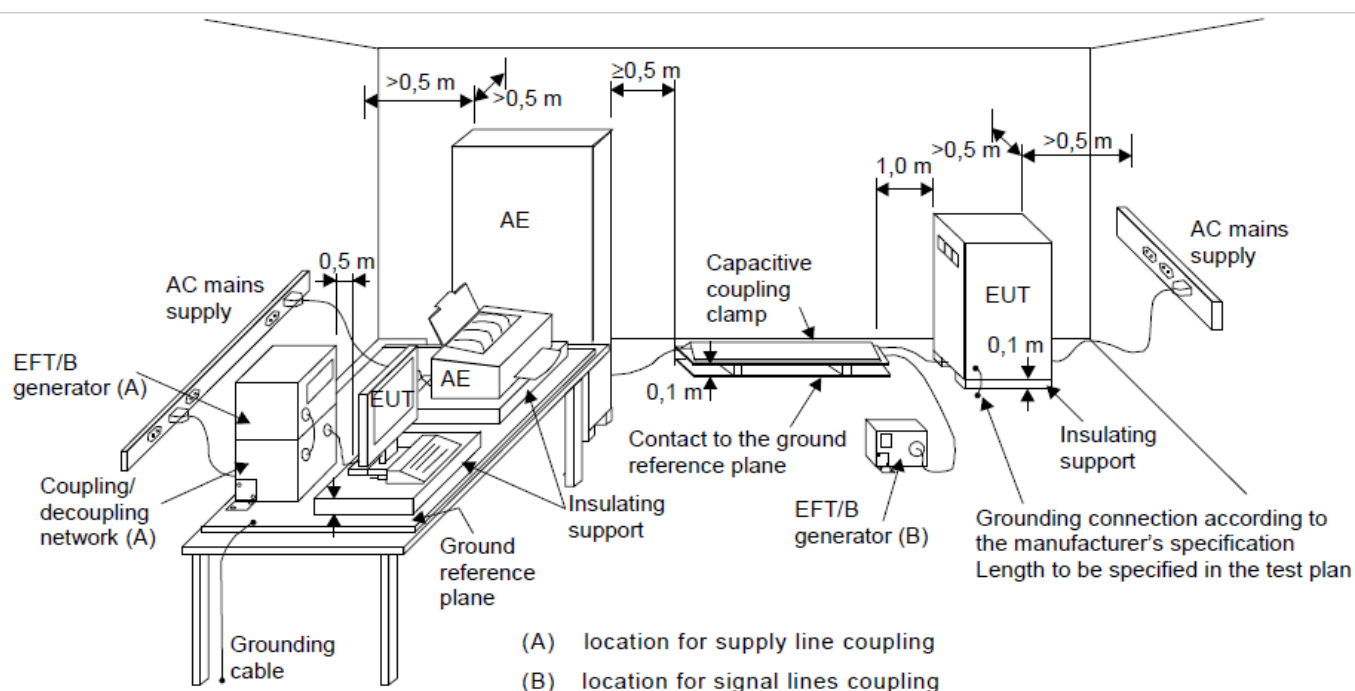
#### **FLOOR STANDING EQUIPMENT**

The EUT installed in a representative system as described in section 7 of EN/IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

## 6.5 Fast Transients Common Mode (EFT)

Impulse Repetition Frequency:	xDSL telecommunication port: 100kHz others: 5kHz
Impulse Wave Shape:	5/50 ns
Burst Duration:	0.75 ms for 100kHz Repetition Frequency 15 ms for 5kHz Repetition Frequency
Burst Period:	300 ms
Test Duration:	1 min.

- Both positive and negative polarity discharges were applied.
- The distance between any coupling devices and the EUT should be 0.5 m for table-top equipment testing, and 1.0 m for floor standing equipment.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was in accordance with EN/IEC 61000-4-4, 5/50 ns.



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

## 6.6 Surges

Wave-Shape:	<b>Wired network ports (direct to outdoor cables):</b> <b>Symmetrically operated:</b> 10/700 $\mu$ s Open Circuit Voltage 5/320 $\mu$ s Short Circuit Current <b>Non-symmetrically operated:</b> 1.2/50 $\mu$ s Open Circuit Voltage 8/20 $\mu$ s Short Circuit Current <b>Shielded cables (direct to outdoor cables):</b> 1.2/50 $\mu$ s Open Circuit Voltage 8/20 $\mu$ s Short Circuit Current <b>Wired network ports (indoor cables, longer than 30m):</b> 1.2/50 $\mu$ s Open Circuit Voltage 8/20 $\mu$ s Short Circuit Current <b>Input DC power port (direct to outdoor cables):</b> 1.2/50 $\mu$ s Open Circuit Voltage 8/20 $\mu$ s Short Circuit Current <b>Input AC power port:</b> 1.2/50 $\mu$ s Open Circuit Voltage 8/20 $\mu$ s Short Circuit Current
Pulse Repetition Rate:	20 sec.
Number of Tests:	5 positive and 5 negative at selected points

### a. EUT Power ports:

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

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

### b. Wired network ports

#### ● Unshielded unsymmetrical interconnection lines:

The coupling / decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling network shall not exceed 2 meters in length.

No line-to-ground surges are applied for double-insulated products (i.e. products without any dedicated earth terminal).

#### ● Unshielded symmetrical interconnection lines:

For symmetrical interconnection lines and high-speed interconnection lines, the CDN shall be selected to match the number of lines/pairs existing the cable. If coupling arrestors are use, test levels below the ignition point of the coupling arrestor cannot be specified.

The interconnection line between the EUT and the coupling/decoupling networks shall not exceed 2 meters in length.

In order to avoid the coupling and decoupling capacitors having a filtering effect on the data transfer, a balanced high frequency design associating the coupling capacitors with coupling chokes is required. Where normal functioning of high speed communications lines cannot be achieved because of the impact of the CDN on the EUT, product committees should specify appropriate operation or that no surge immunity test is required.

#### ● Shielded lines:

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

The length of the cable between the port(s) under test and the device attached to the other end of the cable (AE in Figure 12) shall be:

- 20 m (preferred length) or,
- the shortest length over 10 m, where the manufacturer provides pre-assembled cables used in actual installations.

No test shall be required for cables which according to the manufacturer's specification are  $\leq 10$  m.

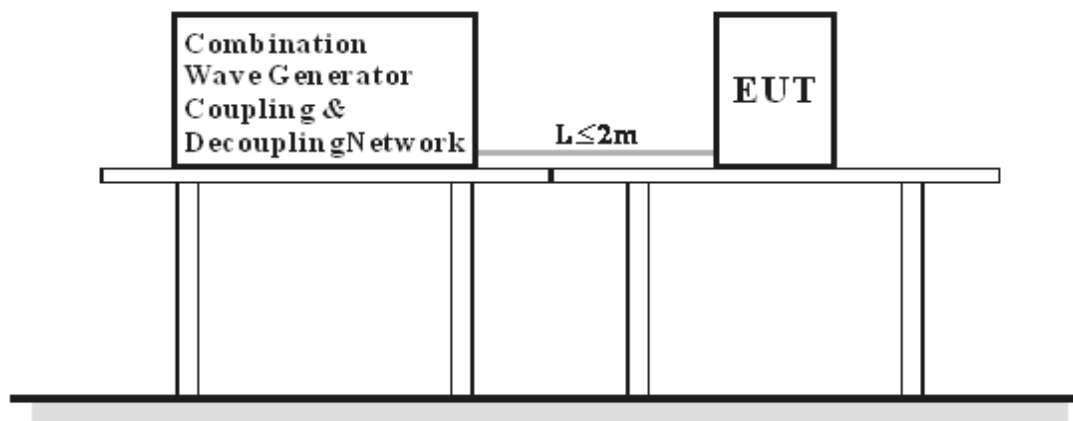
Rules for application of the surge to shielded lines:

- a) Shields grounded at both ends:  
 – the test shall be carried out.

The test level is applied on shields with a 2  $\Omega$  generator source impedance and with the 18  $\mu$ F capacitor.

- b) Shields grounded at one end:  
 – the test shall be carried out according to unshielded unsymmetrical interconnection lines or unshielded symmetrical interconnection lines because the shield does not provide any protection against surges induced by magnetic fields.

For EUTs which do not have metallic enclosures, the surge is applied directly to the shielded cable at the EUT side.



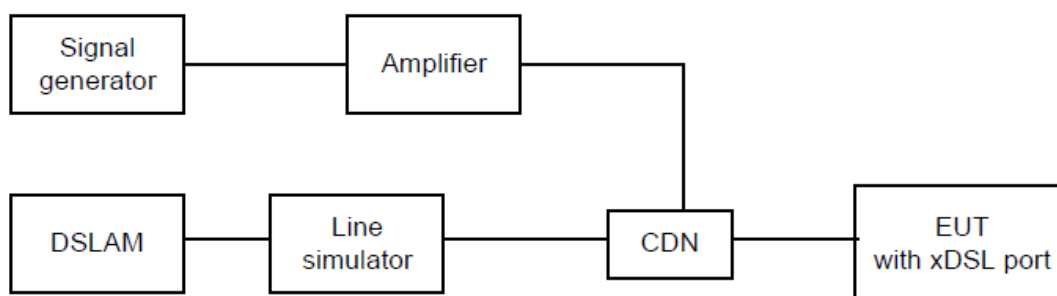
For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.





**Broadband impulse noise disturbances, Repetitive and Isolated** (Applicable only to xDSL ports.)

- a. The EUT shall be tested within its intended operating and climatic conditions.
- b. An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.
- c. One of the CDNs not used for injection was terminated with 50 ohm, providing only one return path. All other CDNs were coupled as decoupling networks.
- d. For the repetitive impulse test the disturbance shall be applied for a period of at least 2 minutes for each port under test.
- e. For the isolated impulse test a minimum of 5 isolated impulses shall be applied with an interval of at least 60 seconds between successive impulses.
- f. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.



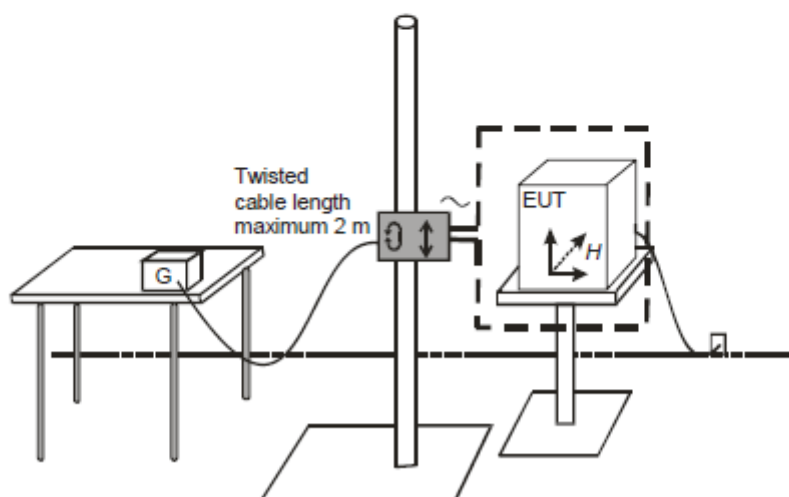
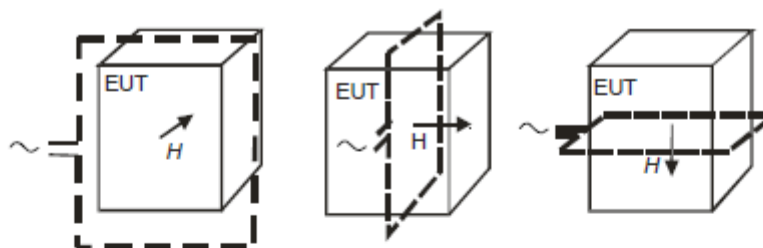
**Example schematic of the broadband impulsive conducted disturbances test setup**

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

## 6.8 Power Frequency Magnetic Field (PFMF)

<b>Observation Time:</b>	1 minute
<b>Inductance Coil:</b>	Rectangular coil, 1 m x 1 m (L x W) or 2.6 m x 1 m (L x W)

- The equipment is configured and connected to satisfy its functional requirements.
- The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.



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

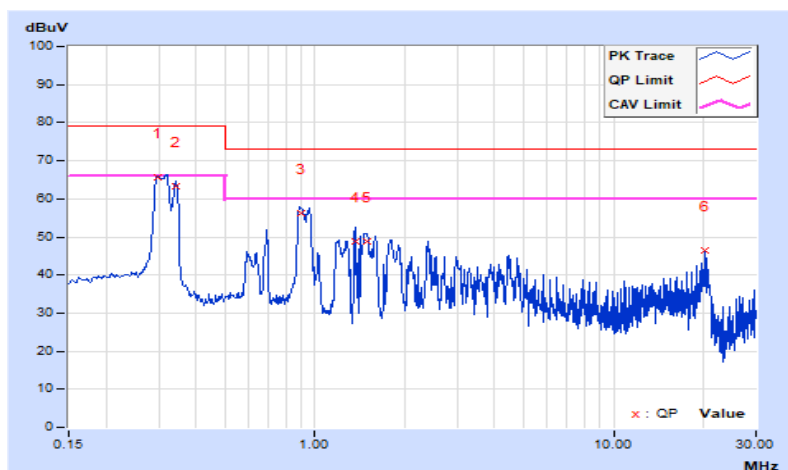
#### Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24 Vdc	Environmental Conditions	23°C, 76% RH
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	0.29884	9.94	55.55	53.33	65.49	63.27	79.00	66.00	-13.51	-2.73
2	0.34164	9.94	53.33	49.95	63.27	59.89	79.00	66.00	-15.73	-6.11
3	0.89566	9.96	46.39	41.03	56.35	50.99	73.00	60.00	-16.65	-9.01
4	1.36278	9.98	38.73	32.86	48.71	42.84	73.00	60.00	-24.29	-17.16
5	1.48774	9.98	38.75	31.42	48.73	41.40	73.00	60.00	-24.27	-18.60
6	20.25821	10.41	36.00	30.83	46.41	41.24	73.00	60.00	-26.59	-18.76

#### 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

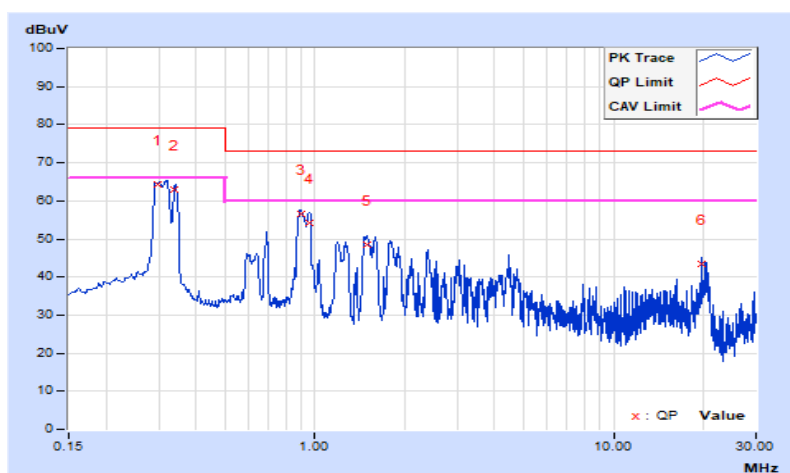


Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24 Vdc	Environmental Conditions	23°C, 76% RH
Tested by	Kenny Chang		

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	0.29928	9.95	54.30	52.16	64.25	62.11	79.00	66.00	-14.75	-3.89
2	0.34036	9.95	53.12	50.45	63.07	60.40	79.00	66.00	-15.93	-5.60
3	0.89659	9.97	46.52	41.51	56.49	51.48	73.00	60.00	-16.51	-8.52
4	0.95312	9.97	44.28	26.93	54.25	36.90	73.00	60.00	-18.75	-23.10
5	1.49167	9.99	38.63	31.66	48.62	41.65	73.00	60.00	-24.38	-18.35
6	19.70927	10.44	33.03	27.73	43.47	38.17	73.00	60.00	-29.53	-21.83

#### Remarks:

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



## 7.2 Radiated Emissions up to 1 GHz

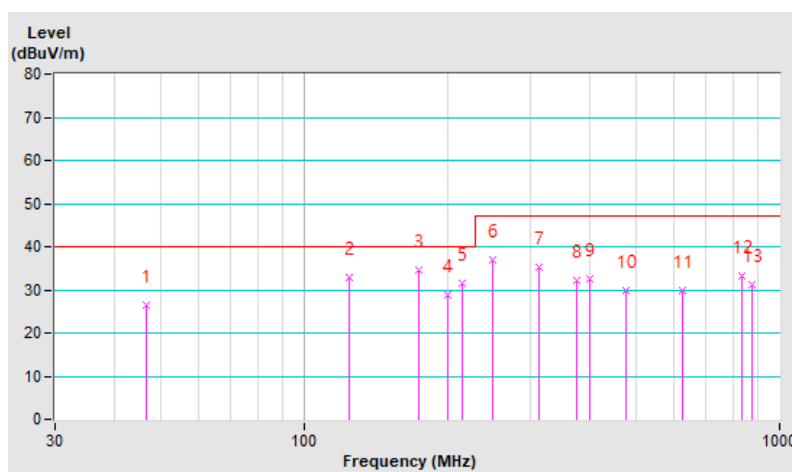
### Mode A

Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	24 Vdc	Environmental Conditions	22°C, 76% RH
Tested By	Kobe Lu		

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	46.82	26.40 QP	40.00	-13.60	4.00 H	337	34.85	-8.45
2	125.00	33.00 QP	40.00	-7.00	4.00 H	245	42.58	-9.58
3	175.00	34.52 QP	40.00	-5.48	4.00 H	195	42.95	-8.43
4	200.00	28.86 QP	40.00	-11.14	4.00 H	6	39.75	-10.89
5	216.00	31.68 QP	40.00	-8.32	4.00 H	227	42.12	-10.44
6	250.12	36.89 QP	47.00	-10.11	4.00 H	314	45.09	-8.20
7	312.69	35.38 QP	47.00	-11.62	4.00 H	213	41.20	-5.82
8	375.25	32.32 QP	47.00	-14.68	3.12 H	40	37.09	-4.77
9	400.25	32.48 QP	47.00	-14.52	2.45 H	66	36.90	-4.42
10	475.00	29.82 QP	47.00	-17.18	2.21 H	325	32.74	-2.92
11	625.00	29.97 QP	47.00	-17.03	1.00 H	112	29.76	0.21
12	832.70	33.16 QP	47.00	-13.84	1.00 H	157	29.05	4.11
13	875.00	31.29 QP	47.00	-15.71	1.00 H	299	26.48	4.81

#### 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.

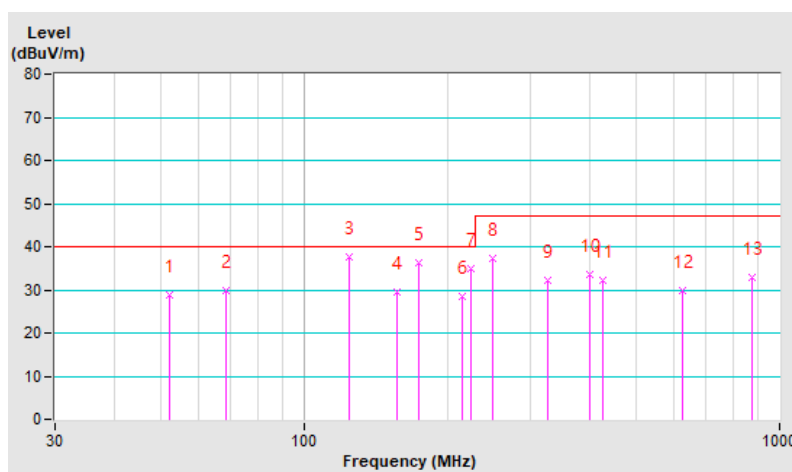


Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	24 Vdc	Environmental Conditions	22°C, 76% RH
Tested By	Kobe Lu		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	52.04	28.87 QP	40.00	-11.13	1.00 V	358	37.25	-8.38
2	68.86	29.82 QP	40.00	-10.18	1.00 V	239	40.37	-10.55
3	125.00	37.68 QP	40.00	-2.32	1.00 V	142	47.25	-9.57
4	157.51	29.45 QP	40.00	-10.55	1.00 V	231	37.02	-7.57
5	175.00	36.36 QP	40.00	-3.64	1.00 V	186	44.78	-8.42
6	216.00	28.61 QP	40.00	-11.39	1.00 V	85	39.05	-10.44
7	225.00	35.05 QP	40.00	-4.95	1.00 V	200	45.20	-10.15
8	250.12	37.32 QP	47.00	-9.68	1.00 V	17	45.52	-8.20
9	324.94	32.10 QP	47.00	-14.90	1.00 V	259	37.61	-5.51
10	400.19	33.71 QP	47.00	-13.29	1.00 V	329	38.13	-4.42
11	425.45	32.23 QP	47.00	-14.77	1.98 V	122	35.90	-3.67
12	624.92	29.91 QP	47.00	-17.09	2.85 V	0	29.72	0.19
13	875.01	33.04 QP	47.00	-13.96	1.66 V	299	28.23	4.81

#### 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.



### 7.3 Electrostatic Discharges (ESD)

#### Mode A

#### For EN 55035

Input Power	DC 24V	Environmental conditions	22 °C, 47 % RH 1019 mbar
Tested by	Todd Chang		

Test Results of Direct Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criteria
2	+/-	1,6~10	Note 1	---	A
4	+/-	1,6,8,9,10	Note 3	---	B
4	+/-	7	Note 2	---	B
2, 4	+/-	2~5,11	---	Note 1	A
8	+/-	2,3,11	---	Note 1	A
8	+/-	4,5	---	Note 3	B

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

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

Description of test points of indirect application:

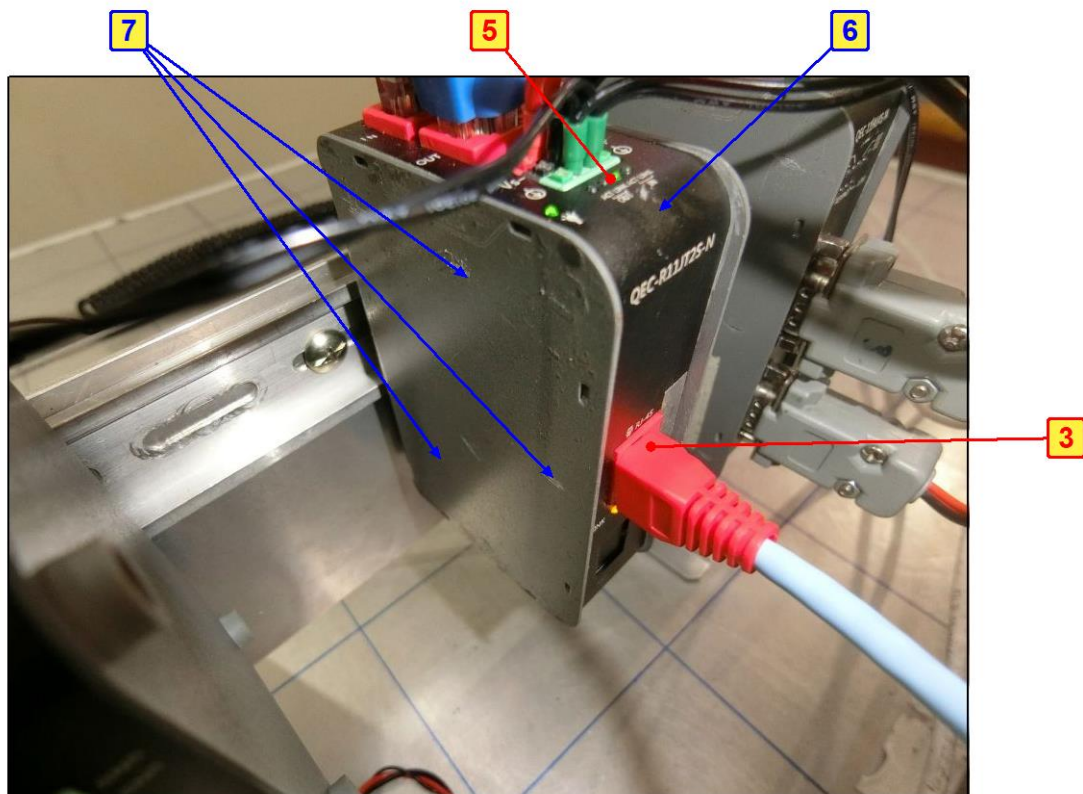
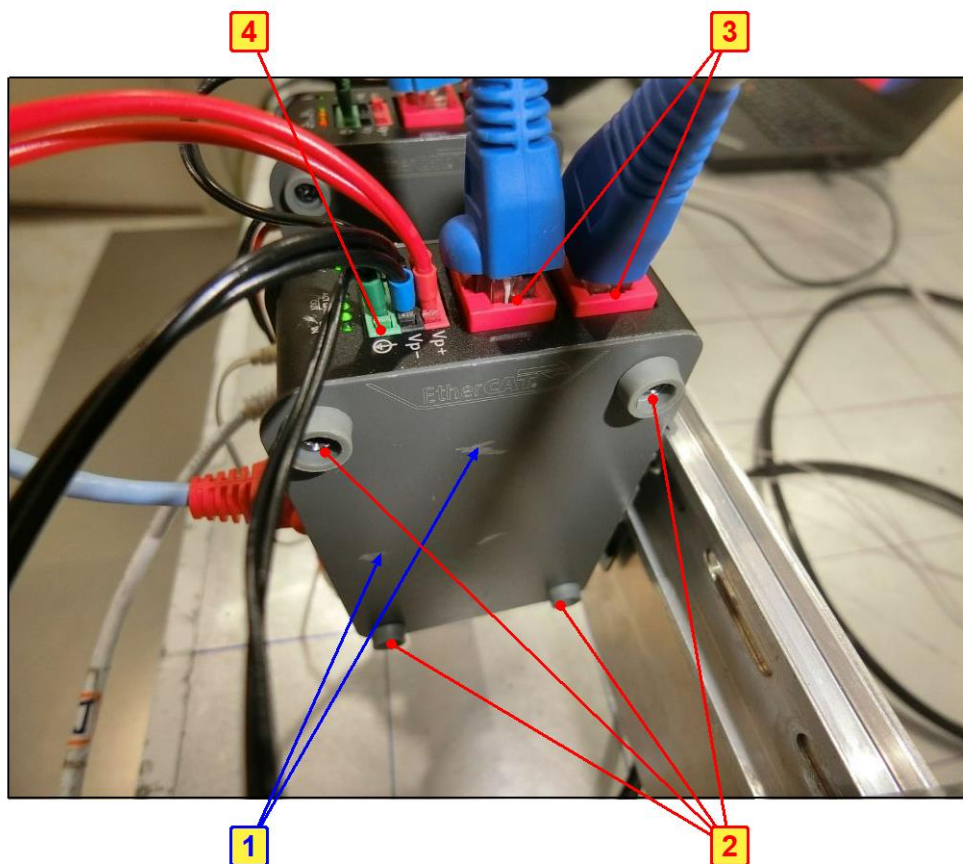
1. Front side                      2. Rear side                      3. Right side                      4. Left side

Please refer to the attached page for description of test points.

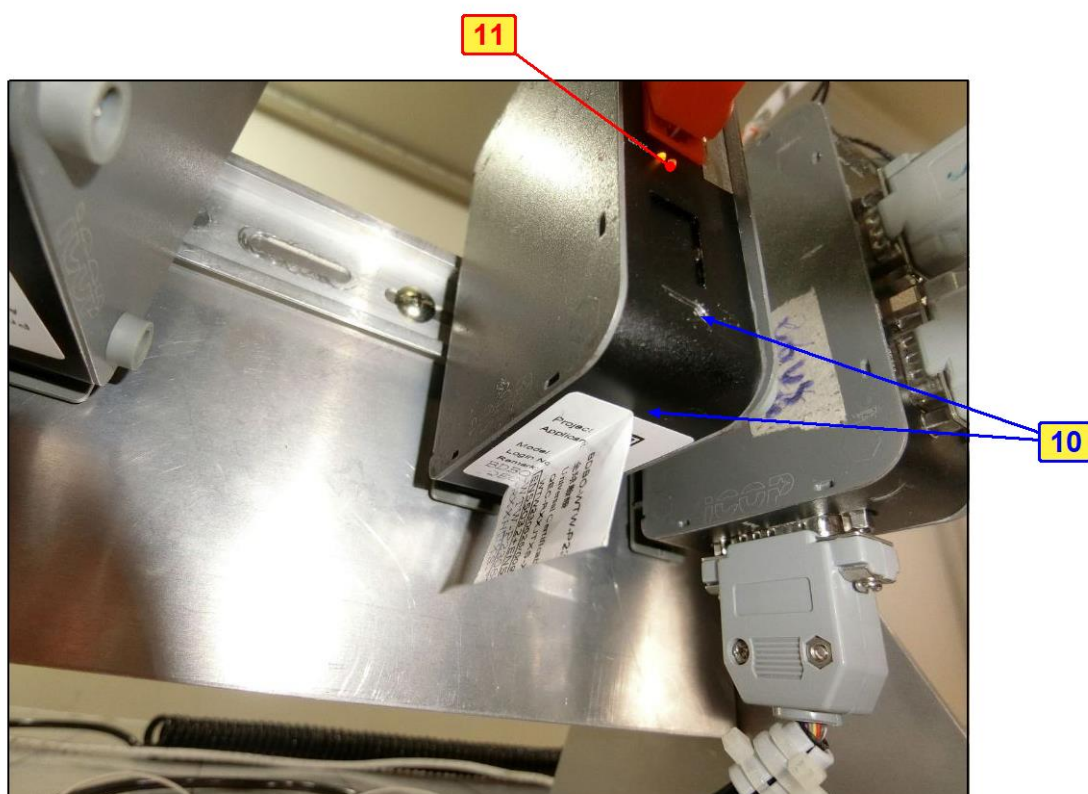
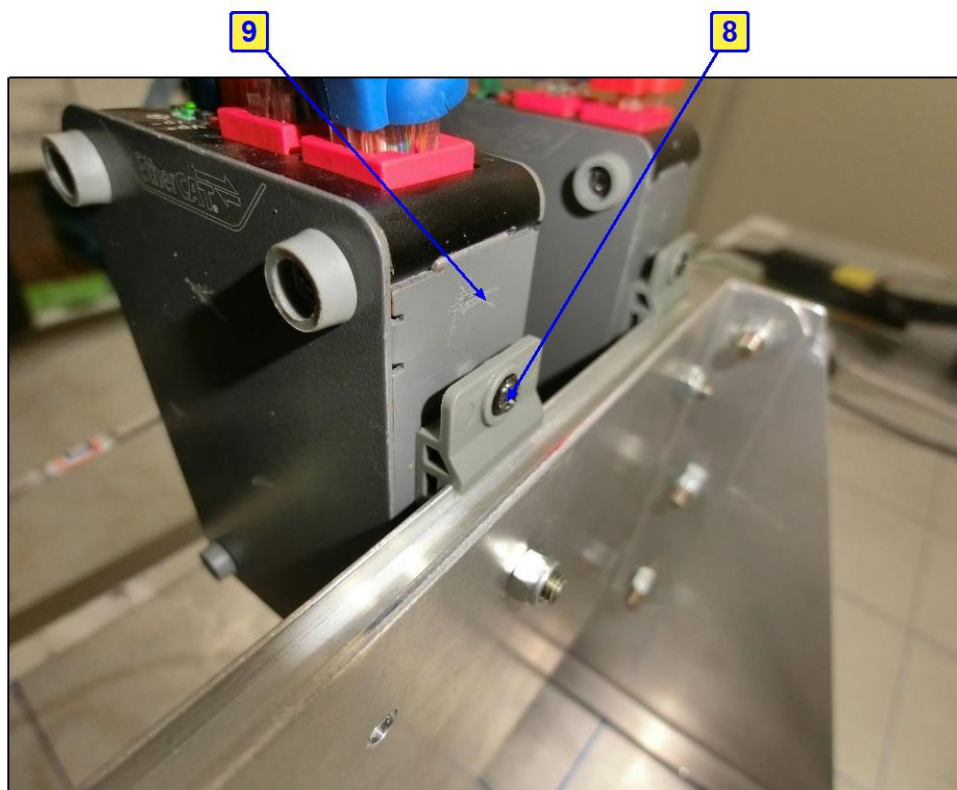
Notes:

1. The EUT is operated normal during the test.
2. EUT LAN time out & Communications 15sec~25sec during the test, but self-recovered after the test.
3. EUT LED flicked during the test, but self-recovered after the test.

## Description of test point







## 7.4 Radio Frequency Electromagnetic Field (RS)

### Mode A

#### For EN 55035

Input Power	DC 24V	Environmental conditions	25 °C, 65 % RH 1017 mbar
Tested by	Xun Lee		

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

Note: The EUT is operated normal during the test.

## 7.5 Fast Transients Common Mode (EFT)

### Mode A

#### For EN 55035

Input Power	DC 24V	Environmental conditions	24 °C, 68 % RH 1022 mbar
Tested by	Todd Chang		

Input DC power port				
Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criteria
0.5	DC(+)	+/-	Note	A
0.5	DC(-)	+/-	Note	A
0.5	PE	+/-	Note	A
0.5	DC(+)-DC(-)-PE	+/-	Note	A

Note: The EUT is operated normal during the test.

## 7.6 Surges

### Mode A

#### For EN 55035

Input Power	DC 24V	Environmental conditions	24 °C, 68 % RH 1022 mbar
Tested by	Todd Chang		

Input DC power port				
Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criteria
0.5	DC(+)-PE	+/-	Note	B
0.5	DC(-)-PE	+/-	Note	B

Note: The EUT Reset during the test, but auto recoverable after the test.

## 7.7 Radio Frequency Common Mode (CS)

### Mode A

#### For EN 55035

Input Power	DC 24V	Environmental conditions	23 °C, 70 % RH 1015 mbar
Tested by	Todd Chang		

Input DC power port							
Frequency (MHz)	Level (V rms)	Modulation	Tested Line	Injection Method	Return Path	Observation	Performance Criteria
0.15 – 10	3	80% AM (1kHz)	DC Power	CDN-M3	CDN-T8	Note	A
10 – 30	3~1	80% AM (1kHz)	DC Power	CDN-M3	CDN-T8	Note	A
30 – 80	1	80% AM (1kHz)	DC Power	CDN-M3	CDN-T8	Note	A

Note: The EUT is operated normal during the test.

## 7.8 Power Frequency Magnetic Field (PFMF)

### Mode A

#### For EN 55035

Input Power	DC 24V	Environmental conditions	21 °C, 80 % RH 1012 mbar
Tested by	Xun Lee		

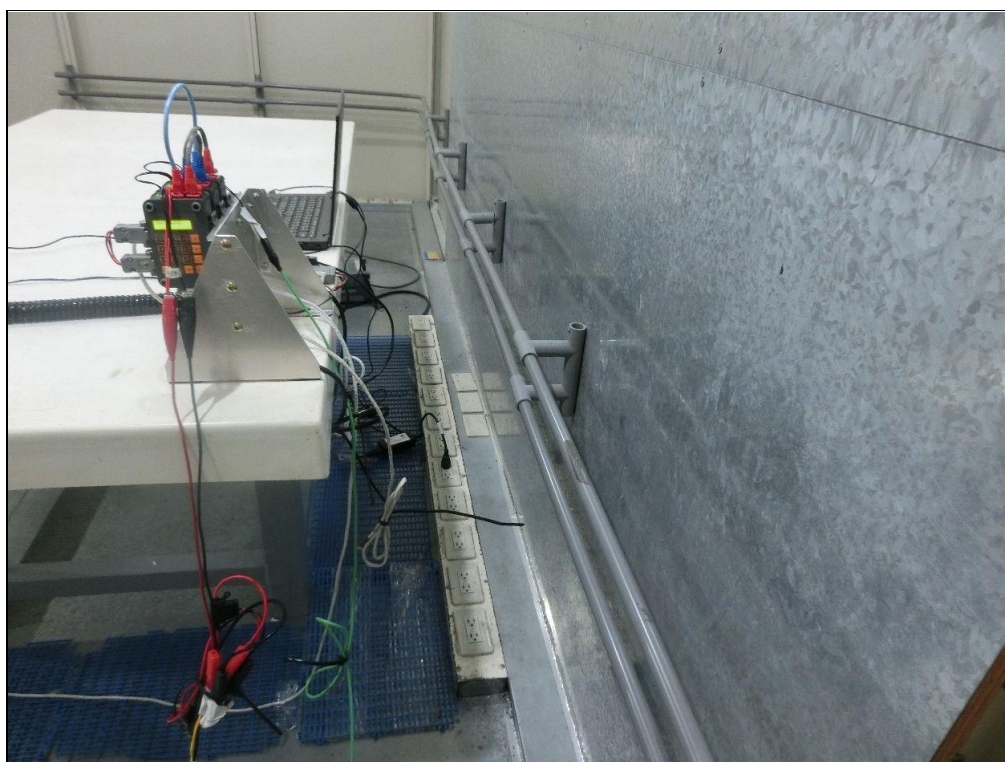
Application	Frequency (Hz)	Field Strength (A/m)	Observation	Performance Criteria
X - Axis	50	1	Note	A
Y - Axis	50	1	Note	A
Z - Axis	50	1	Note	A

Note: The EUT is operated normal during the test.

## 8 Pictures of Test Arrangements

### 8.1 Conducted Emissions from Power Ports

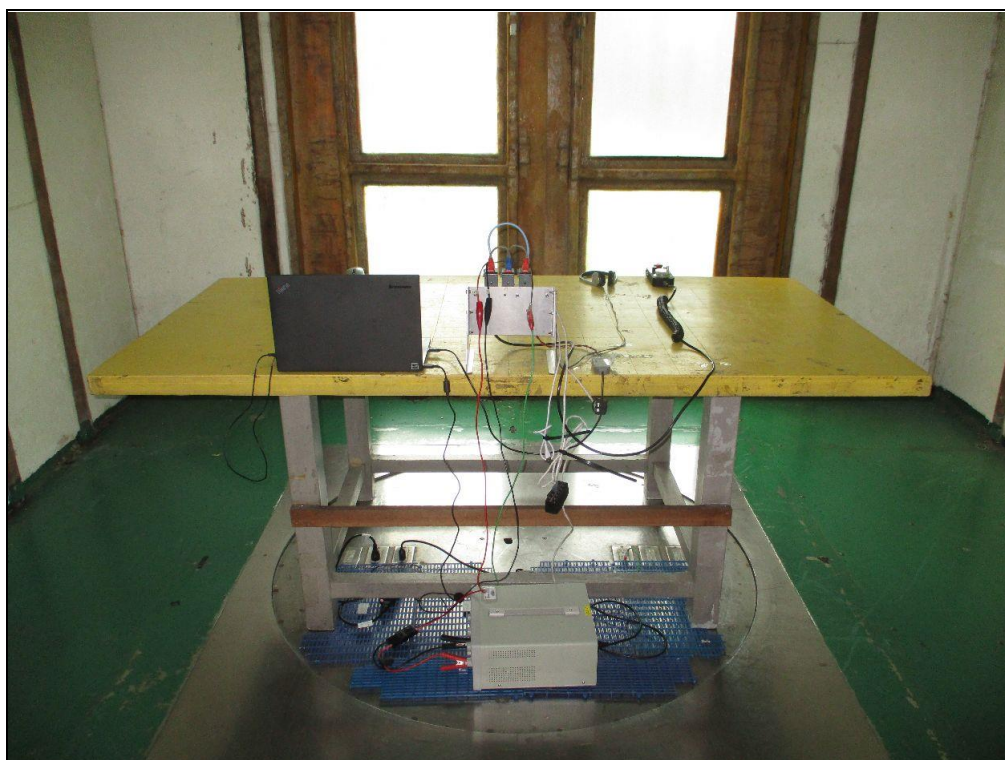
#### Mode A





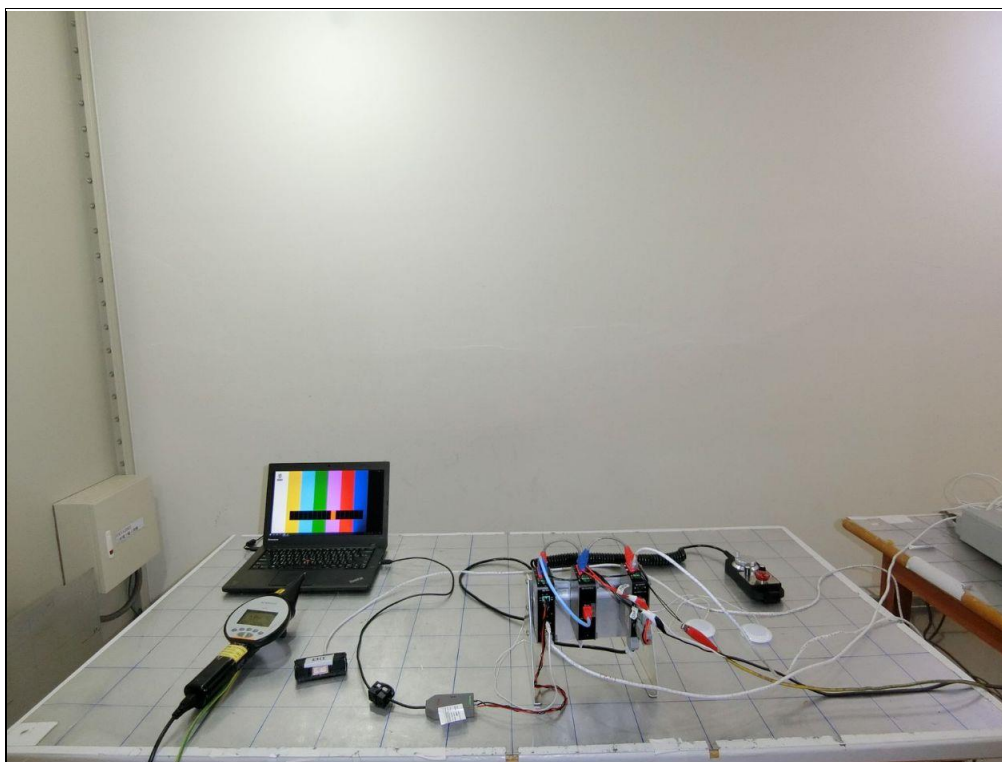
## 8.2 Radiated Emissions up to 1 GHz

### Mode A



### 8.3 Electrostatic Discharges (ESD)

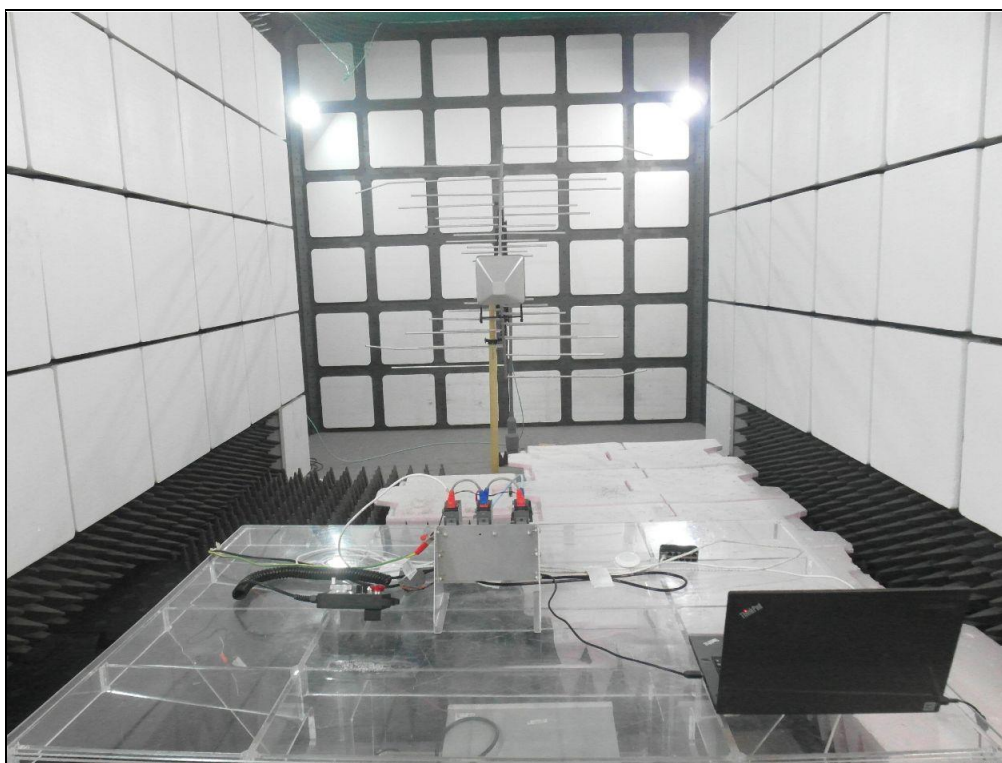
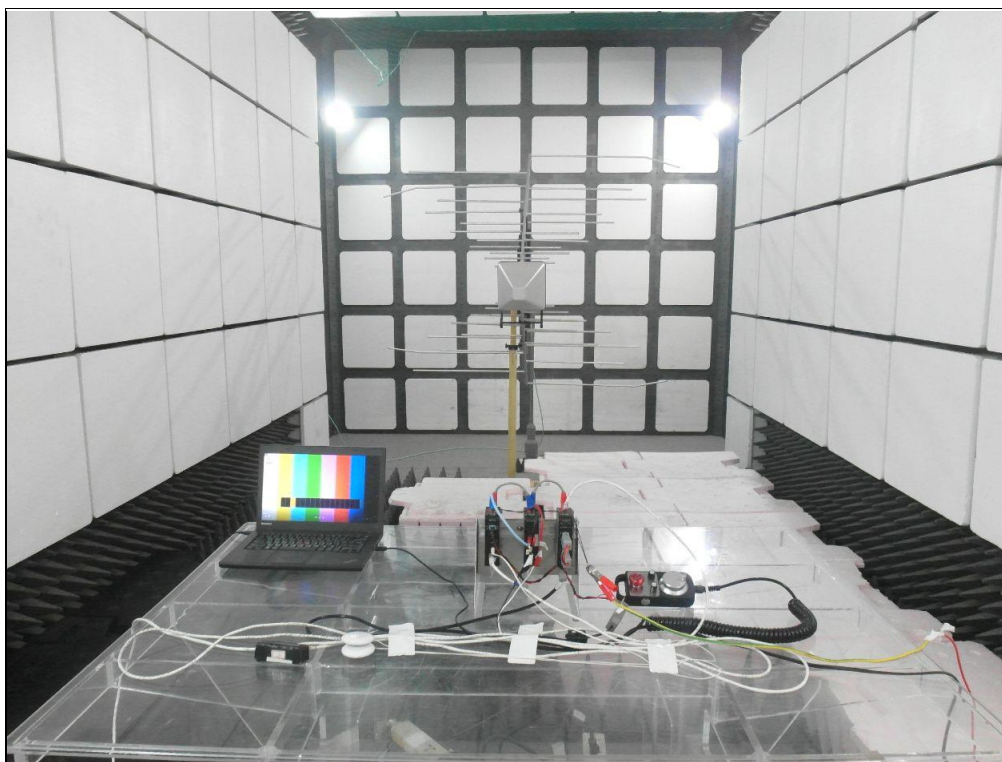
## Mode A





## 8.4 Radio Frequency Electromagnetic Field (RS)

### Mode A

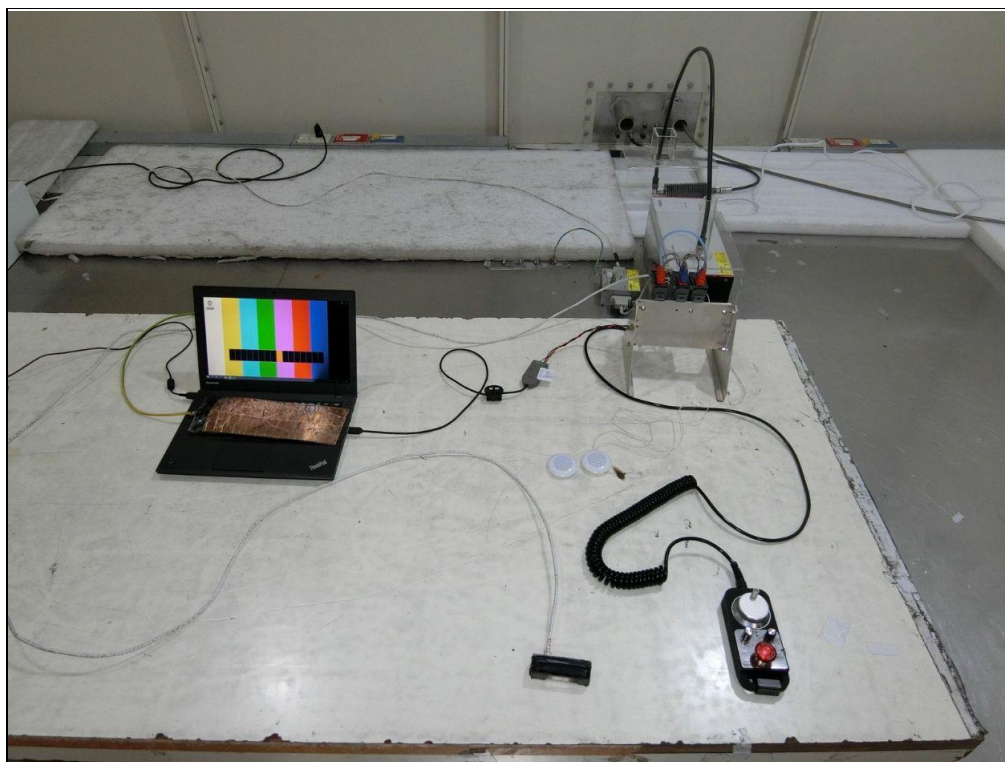






## 8.7 Radio Frequency Common Mode (CS)

### Mode A



## 8.8 Power Frequency Magnetic Field (PFMF)

### 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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