

Test Report

Report No.: CEBCAE-WTW-P22100137

Test Model: TEN 50-4815, TEN 50-4815WI

Series Model: TEN 50 Series - *Multiple listing see item 3.1*

Received Date: Jan. 18, 2021

Test Date: Jan. 22 to Feb. 17, 2021

Issued Date: Nov. 11, 2022

Applicant: TRACO ELECTRONIC AG

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

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Release Control Record

Issue No.	Description	Date Issued
CEBCAE-WTW-P22100137	Original release.	Nov. 11, 2022

1 Certificate of Conformity

Product: DC to DC Converter

Brand:



Test Model: TEN 50-4815, TEN 50-4815WI

Series Model: TEN 50 Series - *Multiple listing see item 3.1*

Sample Status: Engineering sample

Applicant: TRACO ELECTRONIC AG

Test Date: Jan. 22 to Feb. 17, 2021

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

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

EN 61000-3-3:2013 (Not applicable)

EN 55024:2010 / EN 55024:2010 +A1:2015

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

EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2

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

EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2014 +A1:2017 ED. 3.0

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 61000-4-11:2004 +A1:2017 / IEC 61000-4-11:2004 +A1:2017 ED. 2.0 (Not applicable)

EN 55035:2017

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

EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2

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

EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2014 +A1:2017 ED. 3.0

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 61000-4-11:2004 +A1:2017 / IEC 61000-4-11:2004 +A1:2017 ED. 2.0 (Not applicable)

Broadband impulse noise disturbances (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

Prepared by :



Date:

Nov. 11, 2022

Vivian Chen / Senior Specialist

Approved by :



Date:

Nov. 11, 2022

Jim Hsiang / Associate Technical Manager

2 Summary of Test Results

Emission			
Standard	Test Item	Result/Remarks	Verdict
EN 55032:2015 +A11:2020	Conducted emission from the AC mains power port	Minimum passing Class A margin is -4.02 dB at 19.62100 MHz	Pass
	Asymmetric mode conducted emission at telecommunication ports	Without telecom port of the EUT.	N/A
	Radiated emission 30-1000 MHz	Minimum passing Class A margin is -3.02 dB at 159.01 MHz	Pass
	Radiated emission above 1GHz	Not applicable because the EUT's highest frequency is below 108MHz.	N/A
	Conducted differential voltage emissions	Without tuner port of the EUT.	N/A
EN 61000-3-2:2014	Harmonic current emissions	Test not applicable because port does not exist.	N/A
EN 61000-3-3:2013	Voltage fluctuations and flicker	Test not applicable because port does not exist.	N/A

Immunity				
EN 55024 Clause	Basic standard	Test Item	Result/Remarks	Verdict
4.2.1	EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0	Electrostatic discharge (ESD)	Performance Criterion A	Pass
4.2.3.2	EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2	Continuous radiated disturbances (RS)	Performance Criterion A	Pass
4.2.2	EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0	Electrical fast transients (EFT)	Performance Criterion A	Pass
4.2.5	EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2014 +A1:2017 ED. 3.0	Surges	Performance Criterion A	Pass
4.2.3.3	EN 61000-4-6:2014 +AC:2015 / IEC 61000-4-6:2013 ED. 4.0	Continuous conducted disturbances (CS)	Performance Criterion A	Pass
4.2.4	EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0	Power-frequency magnetic fields (PFMF)	Performance Criterion A	Pass
4.2.6	EN 61000-4-11:2004 +A1:2017 / IEC 61000-4-11:2004 +A1:2017 ED. 2.0	Voltage dips and interruptions	Test not applicable because AC power port does not exist.	N/A

Immunity				
EN 55035 Clause	Basic standard	Test Item	Result/Remarks	Verdict
4.2.1	EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0	Electrostatic discharge (ESD)	Performance Criterion A	Pass
4.2.2.2	EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2	Continuous radiated disturbances (RS)	Performance Criterion A	Pass
4.2.4	EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0	Electrical fast transients (EFT)	Performance Criterion A	Pass
4.2.5	EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2014 +A1:2017 ED. 3.0	Surges	Performance Criterion A	Pass
4.2.2.3	EN 61000-4-6:2014 +AC:2015 / IEC 61000-4-6:2013 ED. 4.0	Continuous conducted disturbances (CS)	Performance Criterion A	Pass
4.2.3	EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0	Power-frequency magnetic fields (PFMF)	Performance Criterion A	Pass
4.2.6	EN 61000-4-11:2004 +A1:2017 / IEC 61000-4-11:2004 +A1:2017 ED. 2.0	Voltage dips and interruptions	Test not applicable because AC power port does not exist.	N/A
4.2.7	-	Broadband impulse noise disturbances, Repetitive (Applicable only to xDSL ports.)	Without CPE xDSL port of the EUT.	N/A
4.2.7	-	Broadband impulse noise disturbances, Isolated (Applicable only to xDSL ports.)	Without CPE xDSL port of the EUT.	N/A

Note:

1. There is no deviation to the applied test methods and requirements covered by the scope of this report.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
3. The above EN/IEC basic standards are applied with latest version if customer has no special requirement.
4. N/A: Not Applicable.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Expanded Uncertainty (k=2) (\pm)	Maximum allowable uncertainty (\pm)
Conducted disturbance at mains port using AMN, 150kHz ~ 30MHz	3.00 dB	3.4 dB (U_{CISPR})
Radiated disturbance, 30MHz ~ 1GHz	4.30 dB	6.3 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 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	DC to DC Converter
Brand	
Test Model	TEN 50-4815, TEN 50-4815WI
Series Model	TEN 50 Series - <i>Multiple listing see note as below</i>
Model Difference	Refer to note as below
Sample Status	Engineering sample
Operating Software	N/A
Power Supply Rating	Refer to note as below
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. This report is issued as a duplicate report of BV CPS report no.: CEBCAE-WTW-P21010221 R2. The difference compared with original report are changing applicant, model and brand for marketing purpose; therefore all test data was copied from the original test report.
2. The EUT is a DC to DC Converter, the specifications of standard models were listed as below

TEN 50 SERIES			
Model Number		Input Voltage (Range)	Output Voltage
Standard	With heatsink	VDC	VDC
TEN 50-1210	TEN 50-1210-HS	12 (9 ~ 18)	3.3
TEN 50-1211	TEN 50-1211-HS		5
TEN 50-1212	TEN 50-1212-HS		12
TEN 50-1213	TEN 50-1213-HS		15
TEN 50-1215	TEN 50-1215-HS		24
TEN 50-2410	TEN 50-2410-HS	24 (18 ~ 36)	3.3
TEN 50-2411	TEN 50-2411-HS		5
TEN 50-2412	TEN 50-2412-HS		12
TEN 50-2413	TEN 50-2413-HS		15
TEN 50-2415	TEN 50-2415-HS		24
TEN 50-4810	TEN 50-4810-HS	48 (36 ~ 75)	3.3
TEN 50-4811	TEN 50-4811-HS		5
TEN 50-4812	TEN 50-4812-HS		12
TEN 50-4813	TEN 50-4813-HS		15
TEN 50-4815	TEN 50-4815-HS		24

Model Number		Input Voltage (Range)	Output Voltage
Standard	With heatsink	VDC	VDC
TEN 50-2410WI	TEN 50-2410WI-HS	24 (9 ~ 36)	3.3
TEN 50-2411WI	TEN 50-2411WI-HS		5
TEN 50-2412WI	TEN 50-2412WI-HS		12
TEN 50-2413WI	TEN 50-2413WI-HS		15
TEN 50-2415WI	TEN 50-2415WI-HS		24
TEN 50-4810WI	TEN 50-4810WI-HS	48 (18 ~ 75)	3.3
TEN 50-4811WI	TEN 50-4811WI-HS		5
TEN 50-4812WI	TEN 50-4812WI-HS		12
TEN 50-4813WI	TEN 50-4813WI-HS		15
TEN 50-4815WI	TEN 50-4815WI -HS		24

During the test, the **Model No.: TEN 50-1210, TEN 50-2411, TEN 50-2412, TEN 50-4810, TEN 50-4815, TEN 50-2410WI, TEN 50-2411WI, TEN 50-2415WI, TEN 50-4810WI, TEN 50-4815WI** were selected as the representative models for the test.

3.2 Features of EUT

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

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

1. The EUT was pre-tested under operating and standby condition and the worst emission level was found under **operating condition**.
2. According to client's requirement, test modes are presented in the report as below.

Mode	Model No.	Input Voltage	Output Voltage	Test Condition
Conducted emission test				
1	TEN 50-1210	12Vdc	3.3Vdc	Full Load
2	TEN 50-2411	24Vdc	5Vdc	
3	TEN 50-2412	24Vdc	12Vdc	
4	TEN 50-4810	48Vdc	3.3Vdc	
5	TEN 50-4815	48Vdc	24Vdc	
6	TEN 50-2410WI	24Vdc	3.3Vdc	
7	TEN 50-2411WI	24Vdc	5Vdc	
8	TEN 50-2415WI	24Vdc	24Vdc	
9	TEN 50-4810WI	48Vdc	3.3Vdc	
10	TEN 50-4815WI	48Vdc	24Vdc	
Radiated emission, EFT & Surge tests				
1	TEN 50-1210	12Vdc	3.3Vdc	Full Load
2	TEN 50-2411	24Vdc	5Vdc	
3	TEN 50-2412	24Vdc	12Vdc	
4	TEN 50-4810	48Vdc	3.3Vdc	
5	TEN 50-4815	48Vdc	24Vdc	
6	TEN 50-2410WI	24Vdc	3.3Vdc	
7	TEN 50-2411WI	24Vdc	5Vdc	
8	TEN 50-2415WI	24Vdc	24Vdc	
9	TEN 50-4810WI	48Vdc	3.3Vdc	
10	TEN 50-4815WI	48Vdc	24Vdc	
ESD, RS, CS, Magnetic tests				
5	TEN 50-4815	48Vdc	24Vdc	Full Load
10	TEN 50-4815WI	48Vdc	24Vdc	

Filter (1) used with all modes for conducted and radiated tests only

Filter (2) used with all modes for EFT & surge tests only

3.4 Test Program Used and Operation Descriptions

◆ For Emission tests:

Set the EUT under full load.

◆ For Immunity tests:

Connected the load to DC output port of EUT to make EUT have maximum power consumption and a multimeter was used to monitor voltage of output.

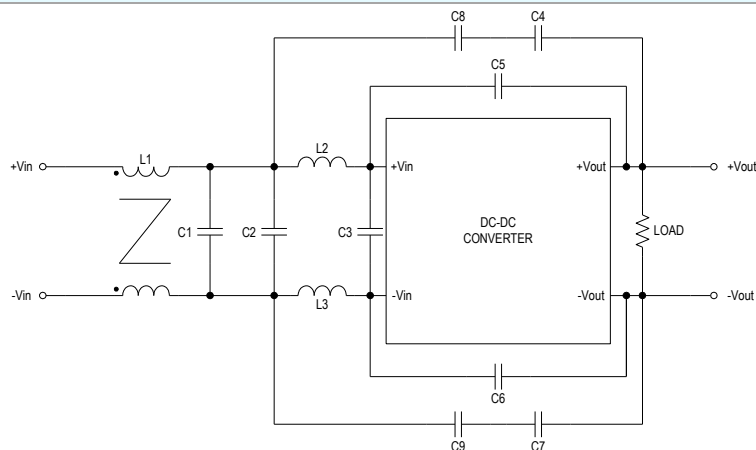
3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is below 108MHz, provided by TRACO ELECTRONIC AG, for detailed internal source, please refer to the manufacturer's specifications.

3.6 Solutions and Package Specifications by Manufacturer

(1) Conduction & Radiation Solution:

External Filter meets Conducted & Radiated EMI EN 55032, class A

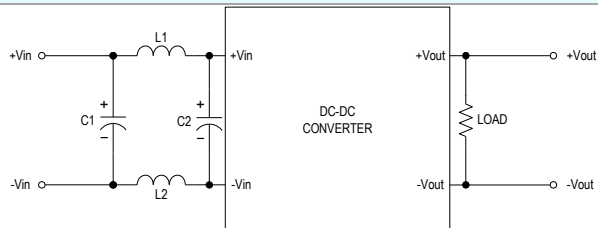


Model	L1	C1, C3	L2, L3	C2	C4, C5, C6, C7	C8, C9
TEN 50 Series	1mH/15A/3.3mΩ 7448031501	4.7μF/100V 1210	100MHz/5A/580Ω 7427512	3.3μF/100V 1210	3300pF/400VAC Y1 Cap.	2200pF/400VAC Y1 Cap.

Model	L1	C1, C3	L2, L3	C2	C4, C5, C6, C7	C8, C9
TEN 50WI Series	1mH/15A/3.3mΩ 7448031501	4.7μF/100V 1210	100MHz/5A/580Ω 7427512	3.3μF/100V 1210	3300pF/400VAC Y1 Cap.	2200pF/400VAC Y1 Cap.

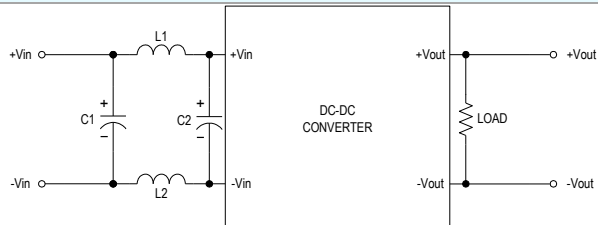
(2) EFT & Surge Solution :

External Filter meets EFT & Surge EMS EN 55024/35, criteria A



Model	L1, L2	C1	C2
TEN 50-12XX	100MHz/6A/98Ω 7427932	1800μF/25V CHEMI-CON KY Series	1800μF/25V CHEMI-CON KY Series

External Filter meets EFT & Surge EMS EN 55024/35, criteria A



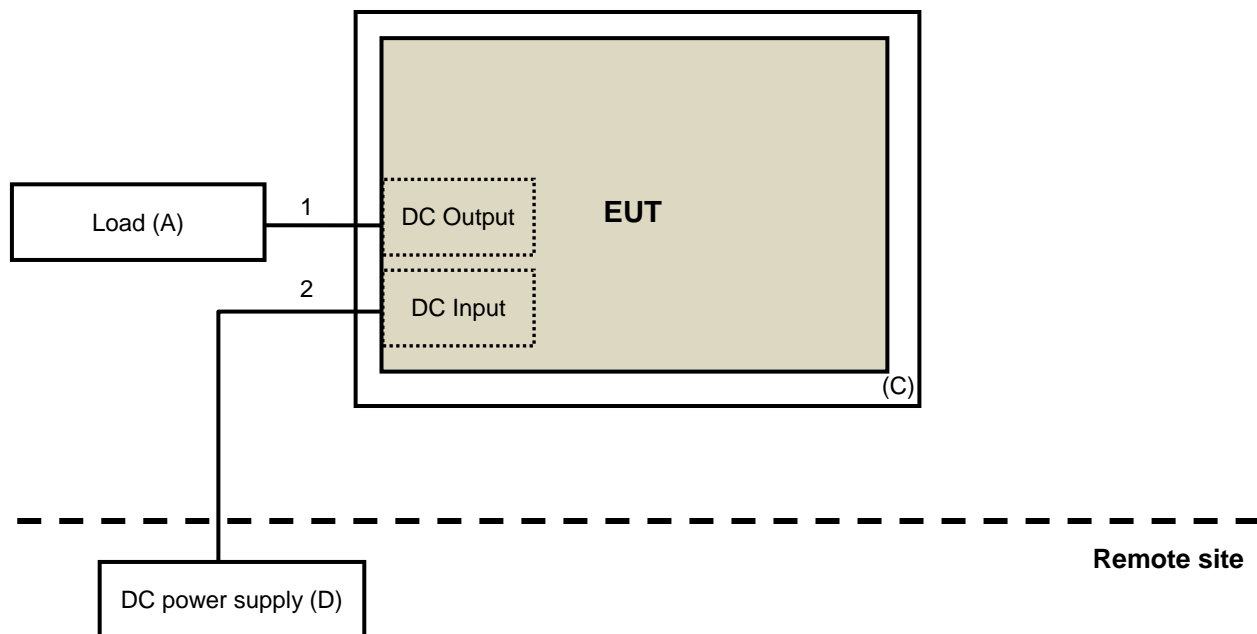
Model	L1, L2	C1	C2
TEN 50-24XX	---	1200μF/50V CHEMI-CON KY Series	---
TEN 50-48XX	4.7μH/2.46A 744773047	560μF/100V CHEMI-CON KY Series	560μF/100V CHEMI-CON KY Series

Model	L1, L2	C1	C2
TEN 50-24XXWI	---	1200μF/50V CHEMI-CON KY Series	---
TEN 50-48XXWI	4.7μH/2.46A 744773047	560μF/100V CHEMI-CON KY Series	560μF/100V CHEMI-CON KY Series

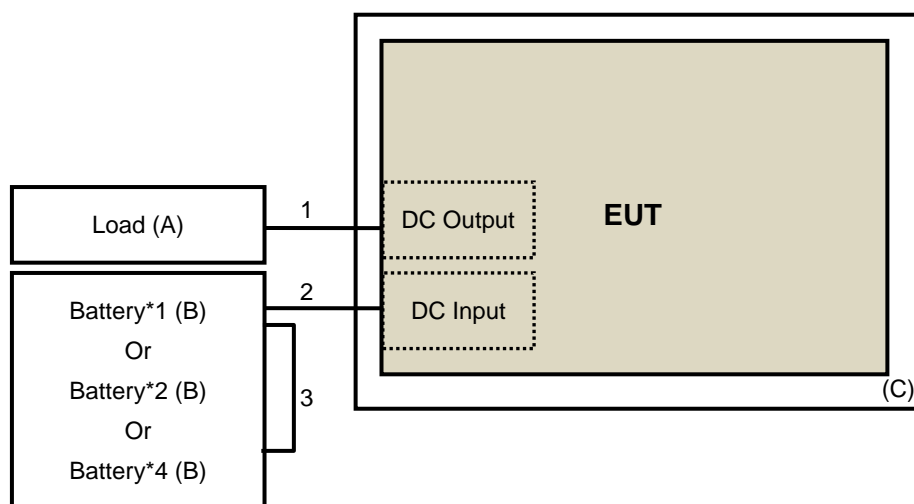
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

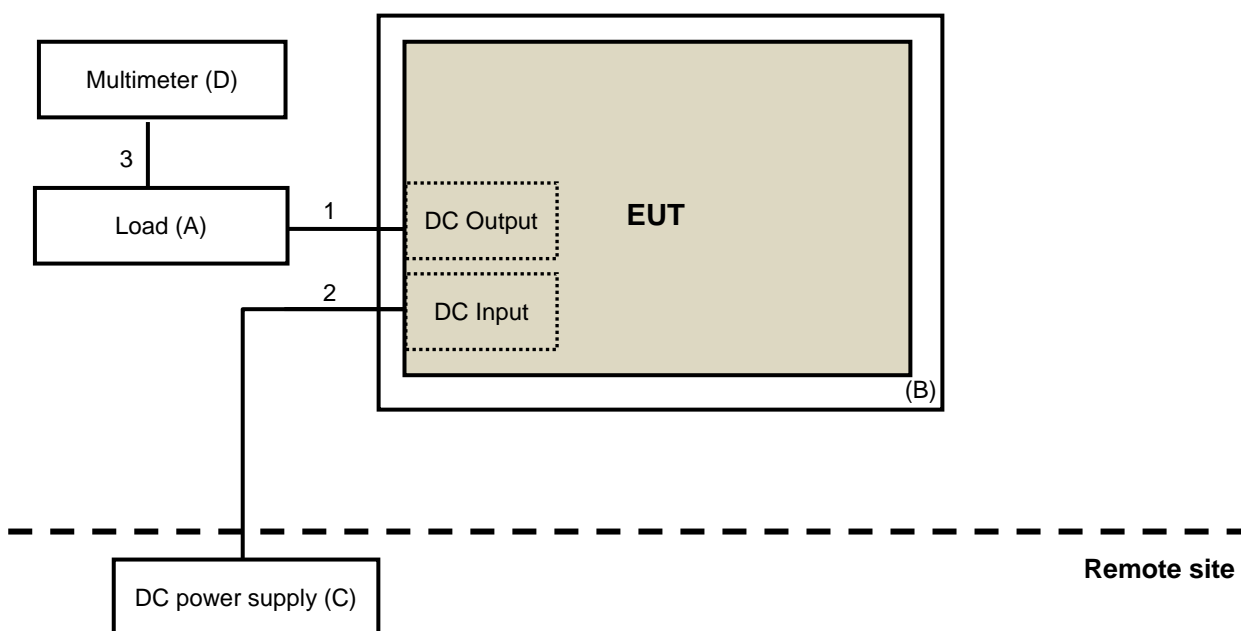
Conducted emission test:



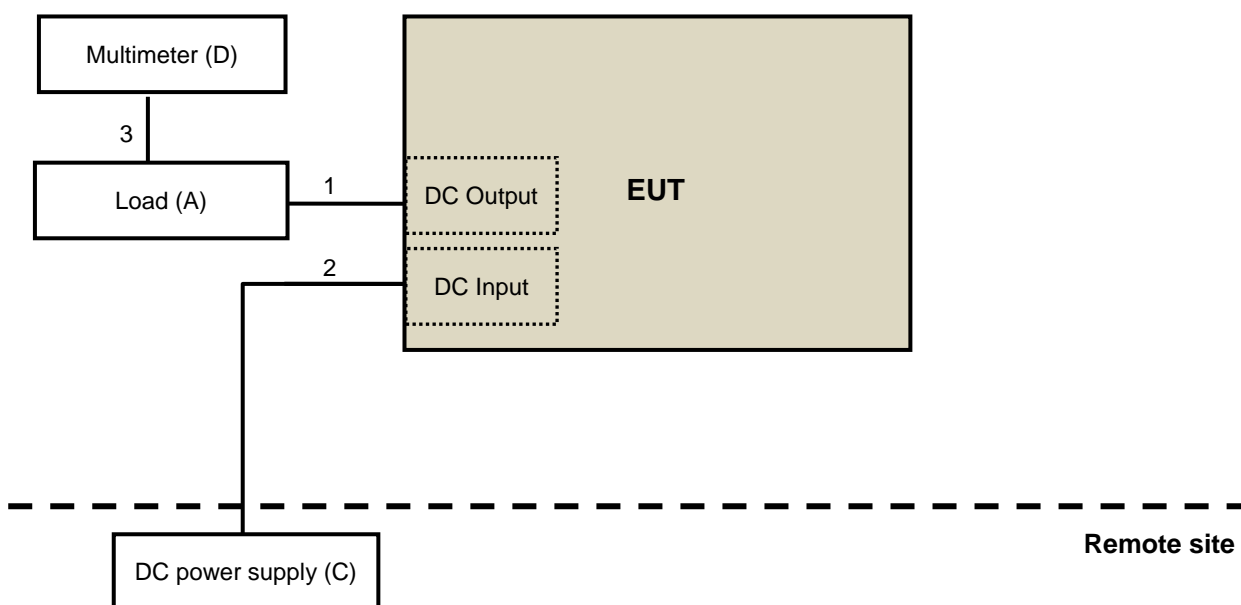
Radiated emission test:



Immunity tests (ESD excluded):



ESD test only:



4.2 Configuration of Peripheral Devices and Cable Connections

Emission tests:

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Load (0.33ohm) For Mode 1, 4, 6, 9	N/A	N/A	N/A	N/A	Supplied by client
	Load (0.5ohm) For Mode 2, 7	N/A	N/A	N/A	N/A	Supplied by client
	Load (2.88ohm) For Mode 3	N/A	N/A	N/A	N/A	Supplied by client
	Load (11.5ohm) For Mode 5, 8, 10	N/A	N/A	N/A	N/A	Supplied by client
B.	Battery*1 For Mode 1	GS	N/A	N/A	N/A	Provided by Lab
	Battery*2 For Mode 2, 3, 6, 7, 8	GS	N/A	N/A	N/A	Provided by Lab
	Battery*4 (GS*2+SMF*2) For Mode 4, 5, 9, 10	GS	N/A	N/A	N/A	Provided by Lab
		SMF	NX120-7L	N/A	N/A	Provided by Lab
C.	Mechanical tool	N/A	N/A	N/A	N/A	Supplied by client
D.	DC Power Supply	N/A	N/A	N/A	N/A	Provided by Lab

Note:

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

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC power cable	1	0.1	N	0	Supplied by client
2.	DC power cable	1	1.8	N	0	Provided by Lab
3.	DC power cable For Mode 2, 3, 6, 7, 8	1	0.5	N	0	Provided by Lab
	DC power cable For Mode 4, 5, 9, 10	3	0.5	N	0	Provided by Lab

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

Immunity tests:

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Load (0.33ohm) For Mode 1, 4, 6, 9	N/A	N/A	N/A	N/A	Supplied by client
	Load (0.5ohm) For Mode 2, 7	N/A	N/A	N/A	N/A	Supplied by client
	Load (2.88ohm) For Mode 3	N/A	N/A	N/A	N/A	Supplied by client
	Load (11.5ohm) For Mode 5, 8, 10	N/A	N/A	N/A	N/A	Supplied by client
B.	Mechanical tool	N/A	N/A	N/A	N/A	Supplied by client
C.	DC Power Supply	N/A	N/A	N/A	N/A	Provided by Lab
D.	Multimeter	YFE	YF-370A	N/A	N/A	Provided by Lab

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC power cable	1	0.1	N	0	Supplied by client
2.	DC power cable	1	1.0	N	0	Provided by Lab
3.	Data cable	1	0.5	N	0	Provided by Lab

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

5 Conducted Emission from the Mains Power Port

5.1 Limits

Class A			
Frequency range (MHz)	Coupling device	Detector type / bandwidth	Limits (dBuV)
0.15 - 0.5	AMN	Quasi-peak / 9kHz	79
0.5 - 30.0			73
0.15 - 0.5		Average / 9kHz	66
0.5 - 30.0			60
Class B			
Frequency range (MHz)	Coupling device	Detector type / bandwidth	Limits (dBuV)
0.15 - 0.5	AMN	Quasi-peak / 9kHz	66 - 56
0.5 - 5			56
5 - 30.0			60
0.15 - 0.5		Average / 9kHz	56 - 46
0.5 - 5			46
5 - 30.0			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 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS30	100276	Apr. 16, 2020	Apr. 15, 2021
SCHWARZBECK Artificial Mains Network (for EUT)	NSLK 8128	8128-244	Nov. 19, 2020	Nov. 18, 2021
LISN With Adapter (for EUT)	AD10	C05Ada-001	Nov. 19, 2020	Nov. 18, 2021
R&S Artificial Mains Network (for peripheral)	ESH3-Z5	100220	Dec. 1, 2020	Nov. 30, 2021
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C05.01	Jan. 29, 2021	Jan. 28, 2022
LYNICS Terminator (For R&S LISN)	0900510	E1-011286	Sep. 16, 2020	Sep. 15, 2021
SCHWARZBECK DC LISN	NNLK 8121	8121-808	Apr. 10, 2020	Apr. 9, 2021

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in Shielded Room No. 5. (Conduction 5)

3. The VCCI Site Registration No. C-11093.

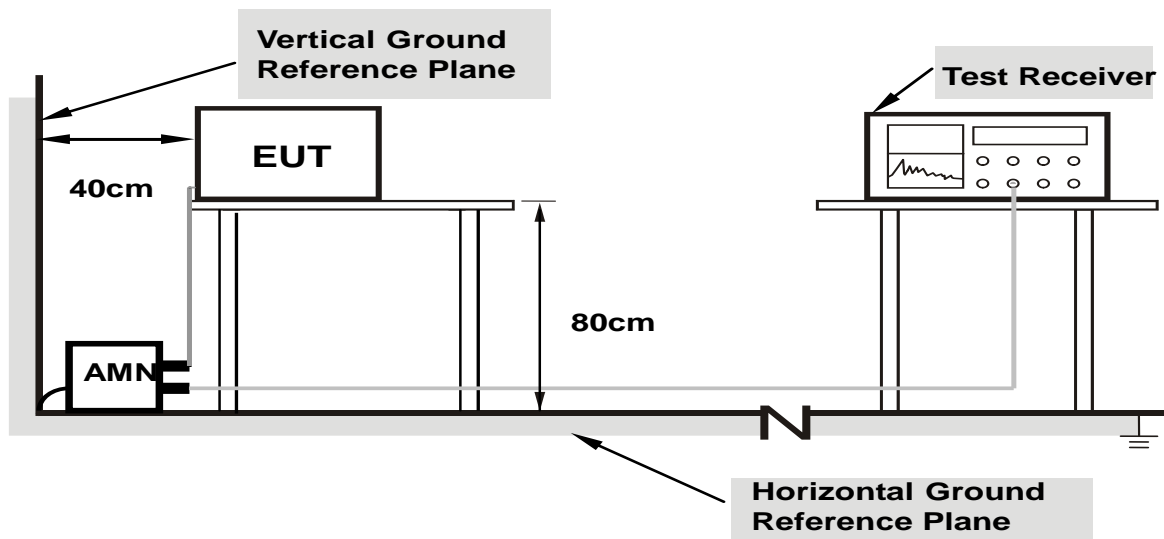
4. The Industry Canada Reference No. IC 3789-5.

5. Tested Date: Feb. 5 to 8, 2021

5.3 Test Arrangement

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through an Artificial Mains Network (AMN). Other support units were connected to the power mains through another AMN. The two AMNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

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



- Note:**
1. Support units were connected to second AMN.
 2. The distance specified between EUT/AE and other metallic objects is ≥ 0.8 m in the measurement arrangement for table-top EUT.
 3. Cable on the RGP must to be insulated.

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

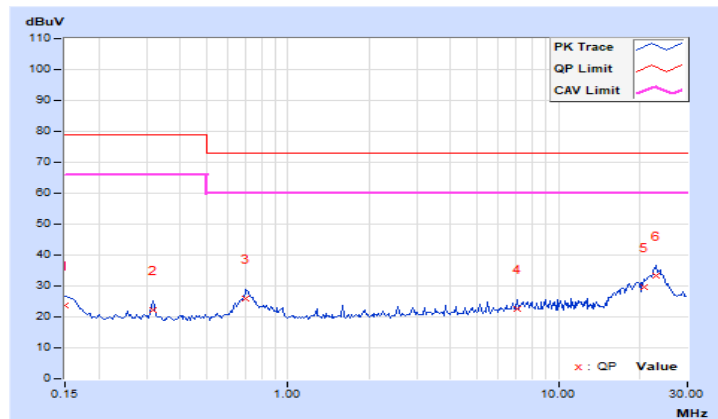
5.4 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	12Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 1		

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	0.15001	9.89	13.65	5.32	23.54	15.21	79.00	66.00	-55.46	-50.79
2	0.31797	9.90	12.36	6.11	22.26	16.01	79.00	66.00	-56.74	-49.99
3	0.70078	9.93	16.12	9.32	26.05	19.25	73.00	60.00	-46.95	-40.75
4	7.01172	10.09	12.32	4.36	22.41	14.45	73.00	60.00	-50.59	-45.55
5	20.83203	10.44	19.30	11.65	29.74	22.09	73.00	60.00	-43.26	-37.91
6	23.07422	10.47	23.02	15.32	33.49	25.79	73.00	60.00	-39.51	-34.21

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

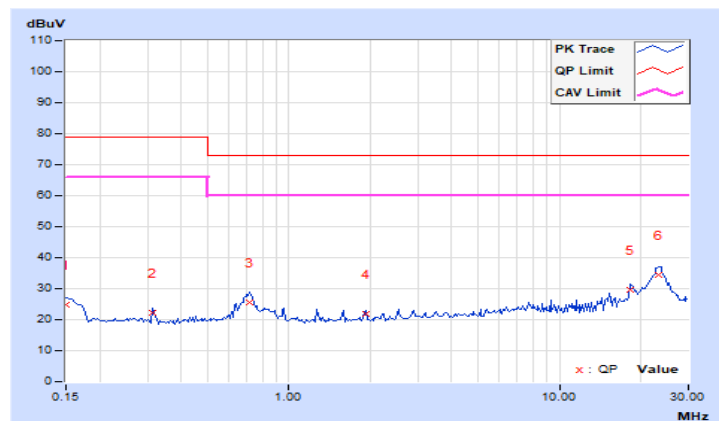


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	12Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 1		

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	0.15001	9.89	14.85	6.98	24.74	16.87	79.00	66.00	-54.26	-49.13
2	0.31406	9.90	12.32	5.63	22.22	15.53	79.00	66.00	-56.78	-50.47
3	0.72031	9.93	15.63	9.65	25.56	19.58	73.00	60.00	-47.44	-40.42
4	1.91797	9.97	12.03	5.26	22.00	15.23	73.00	60.00	-51.00	-44.77
5	18.36328	10.42	19.32	12.03	29.74	22.45	73.00	60.00	-43.26	-37.55
6	23.37891	10.51	23.77	11.67	34.28	22.18	73.00	60.00	-38.72	-37.82

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

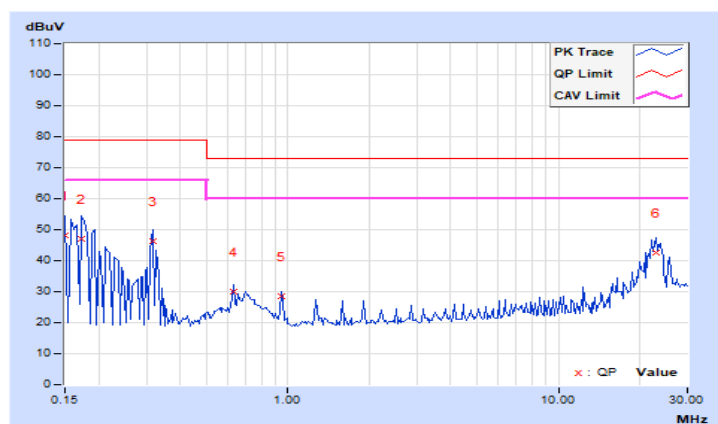


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 2		

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	0.15001	9.89	38.32	19.63	48.21	29.52	79.00	66.00	-30.79	-36.48
2	0.17344	9.89	37.23	16.87	47.12	26.76	79.00	66.00	-31.88	-39.24
3	0.31797	9.90	36.35	15.19	46.25	25.09	79.00	66.00	-32.75	-40.91
4	0.63438	9.92	20.02	10.85	29.94	20.77	73.00	60.00	-43.06	-39.23
5	0.95078	9.94	18.63	11.85	28.57	21.79	73.00	60.00	-44.43	-38.21
6	22.86719	10.47	32.02	16.88	42.49	27.35	73.00	60.00	-30.51	-32.65

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

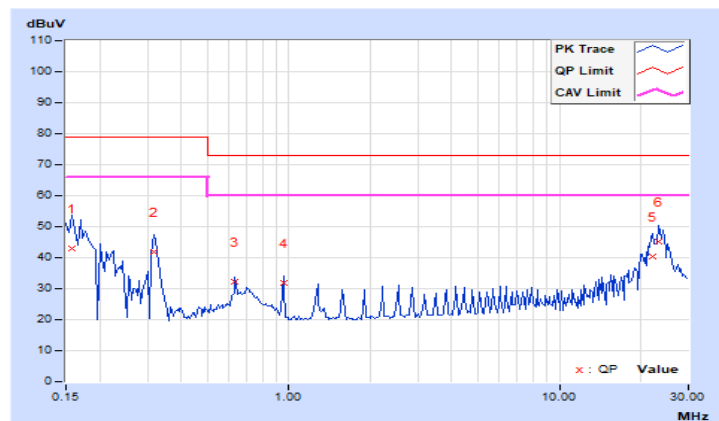


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 2		

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	0.15781	9.89	33.02	18.32	42.91	28.21	79.00	66.00	-36.09	-37.79
2	0.31797	9.90	31.82	15.67	41.72	25.57	79.00	66.00	-37.28	-40.43
3	0.63438	9.93	22.12	13.06	32.05	22.99	73.00	60.00	-40.95	-37.01
4	0.95469	9.95	21.95	10.66	31.90	20.61	73.00	60.00	-41.10	-39.39
5	22.24609	10.49	30.01	13.55	40.50	24.04	73.00	60.00	-32.50	-35.96
6	23.18750	10.51	34.62	18.97	45.13	29.48	73.00	60.00	-27.87	-30.52

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

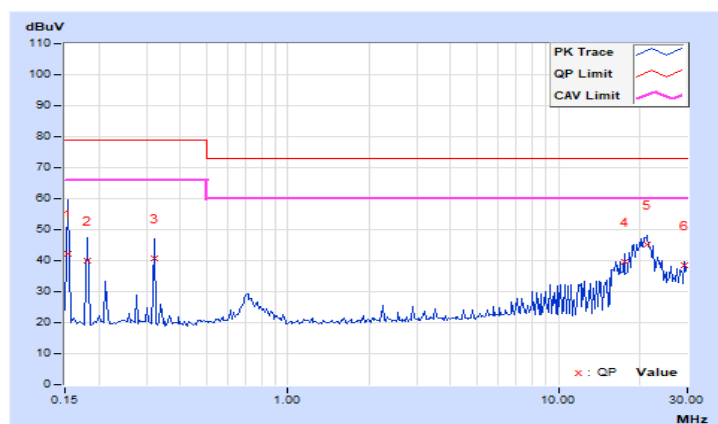


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 3		

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	0.15391	9.89	32.25	17.52	42.14	27.41	79.00	66.00	-36.86	-38.59
2	0.18125	9.89	30.02	11.20	39.91	21.09	79.00	66.00	-39.09	-44.91
3	0.32188	9.90	30.82	10.52	40.72	20.42	79.00	66.00	-38.28	-45.58
4	17.58594	10.38	29.30	15.36	39.68	25.74	73.00	60.00	-33.32	-34.26
5	21.42188	10.45	34.85	17.95	45.30	28.40	73.00	60.00	-27.70	-31.60
6	29.42578	10.56	28.12	11.35	38.68	21.91	73.00	60.00	-34.32	-38.09

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

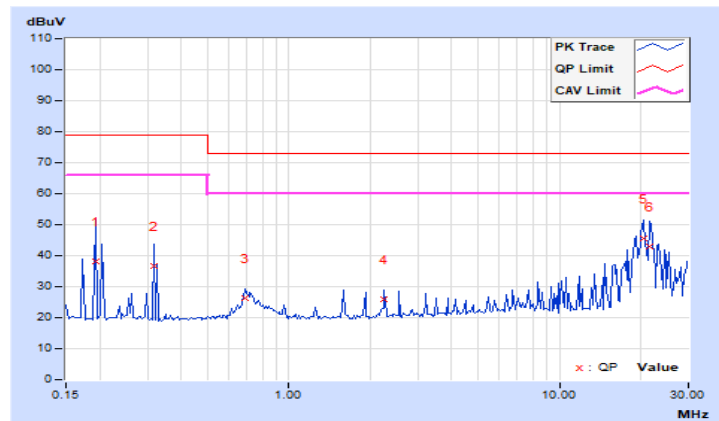


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 3		

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	0.19297	9.89	28.12	10.32	38.01	20.21	79.00	66.00	-40.99	-45.79
2	0.31925	9.90	26.60	9.32	36.50	19.22	79.00	66.00	-42.50	-46.78
3	0.69297	9.93	16.52	8.96	26.45	18.89	73.00	60.00	-46.55	-41.11
4	2.23828	9.98	15.88	5.12	25.86	15.10	73.00	60.00	-47.14	-44.90
5	20.47656	10.47	35.23	16.98	45.70	27.45	73.00	60.00	-27.30	-32.55
6	21.46485	10.48	32.52	14.36	43.00	24.84	73.00	60.00	-30.00	-35.16

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

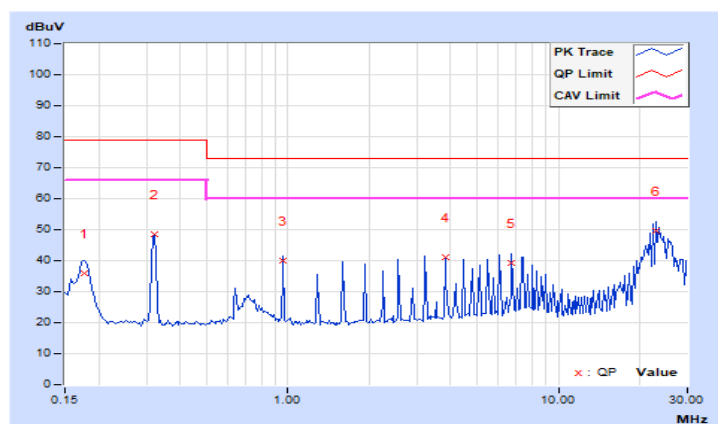


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	48Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 4		

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	0.17734	9.89	25.95	19.81	35.84	29.70	79.00	66.00	-43.16	-36.30
2	0.32057	9.90	38.50	38.40	48.40	48.30	79.00	66.00	-30.60	-17.70
3	0.96036	9.94	30.10	30.05	40.04	39.99	73.00	60.00	-32.96	-20.01
4	3.82999	10.01	31.18	31.02	41.19	41.03	73.00	60.00	-31.81	-18.97
5	6.69766	10.08	29.11	28.14	39.19	38.22	73.00	60.00	-33.81	-21.78
6	22.96250	10.47	39.05	34.88	49.52	45.35	73.00	60.00	-23.48	-14.65

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

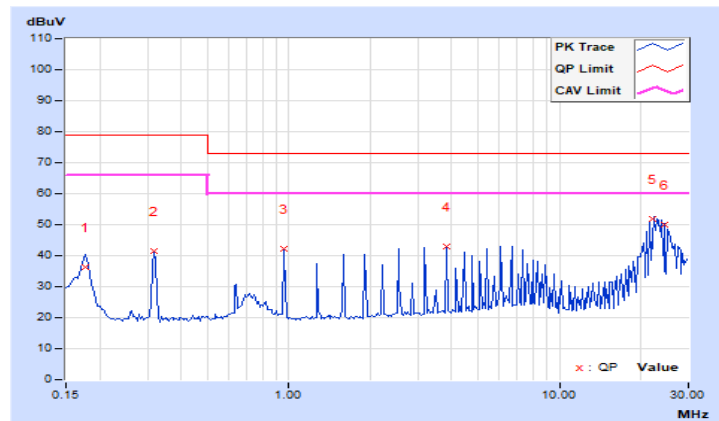


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	48Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 4		

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	0.17734	9.89	26.24	20.23	36.13	30.12	79.00	66.00	-42.87	-35.88
2	0.31797	9.90	31.50	31.46	41.40	41.36	79.00	66.00	-37.60	-24.64
3	0.95321	9.95	32.18	32.17	42.13	42.12	73.00	60.00	-30.87	-17.88
4	3.81031	10.02	32.81	32.79	42.83	42.81	73.00	60.00	-30.17	-17.19
5	22.25001	10.49	41.29	39.83	51.78	50.32	73.00	60.00	-21.22	-9.68
6	24.46172	10.53	39.56	38.55	50.09	49.08	73.00	60.00	-22.91	-10.92

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

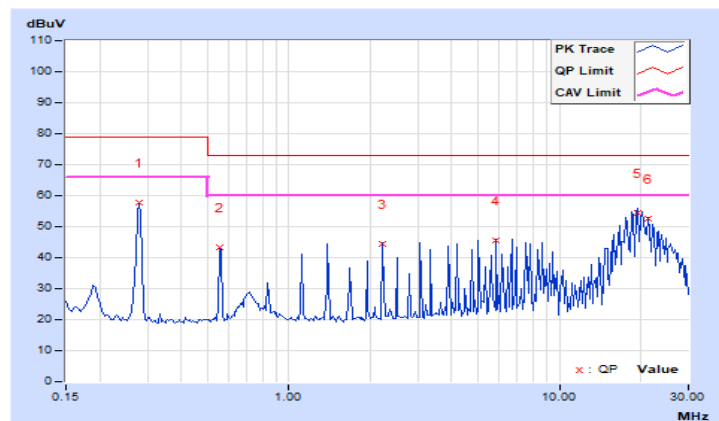


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	48Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 5		

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	0.27891	9.90	48.01	47.95	57.91	57.85	79.00	66.00	-21.09	-8.15
2	0.55625	9.92	33.25	33.23	43.17	43.15	73.00	60.00	-29.83	-16.85
3	2.23047	9.97	34.46	34.43	44.43	44.40	73.00	60.00	-28.57	-15.60
4	5.85547	10.06	35.32	35.26	45.38	45.32	73.00	60.00	-27.62	-14.68
5	19.51953	10.42	44.20	41.88	54.62	52.30	73.00	60.00	-18.38	-7.70
6	21.19141	10.45	42.08	40.91	52.53	51.36	73.00	60.00	-20.47	-8.64

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

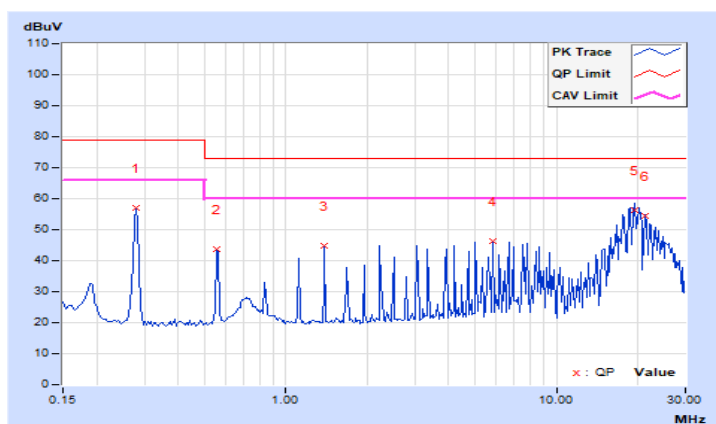


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	48Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 5		

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	0.27891	9.90	46.97	46.95	56.87	56.85	79.00	66.00	-22.13	-9.15
2	0.55625	9.92	33.79	33.77	43.71	43.69	73.00	60.00	-29.29	-16.31
3	1.39453	9.96	34.95	34.92	44.91	44.88	73.00	60.00	-28.09	-15.12
4	5.85547	10.07	36.35	36.32	46.42	46.39	73.00	60.00	-26.58	-13.61
5	19.51581	10.45	45.92	44.35	56.37	54.80	73.00	60.00	-16.63	-5.20
6	21.19159	10.48	43.99	43.26	54.47	53.74	73.00	60.00	-18.53	-6.26

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

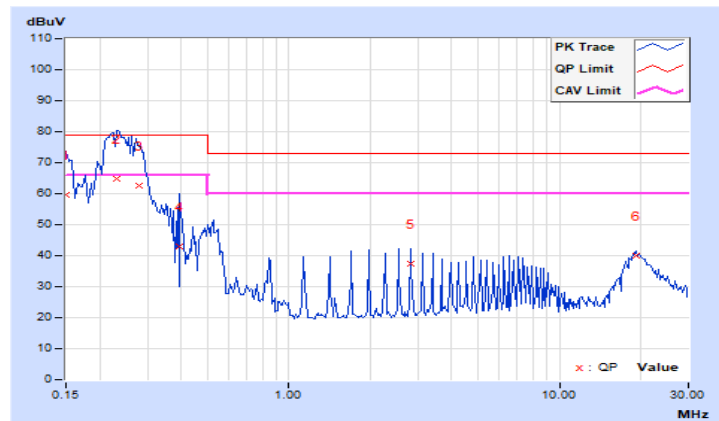


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 6		

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	0.15001	9.89	49.85	22.32	59.74	32.21	79.00	66.00	-19.26	-33.79
2	0.23203	9.89	55.02	26.32	64.91	36.21	79.00	66.00	-14.09	-29.79
3	0.28128	9.90	52.65	37.57	62.55	47.47	79.00	66.00	-16.45	-18.53
4	0.39609	9.91	33.20	16.87	43.11	26.78	79.00	66.00	-35.89	-39.22
5	2.83458	9.99	27.26	20.40	37.25	30.39	73.00	60.00	-35.75	-29.61
6	19.28074	10.41	29.74	21.51	40.15	31.92	73.00	60.00	-32.85	-28.08

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

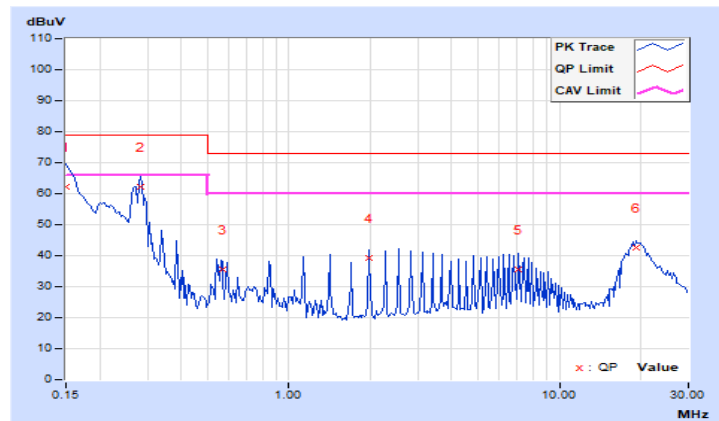


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 6		

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	0.15001	9.89	52.36	22.83	62.25	32.72	79.00	66.00	-16.75	-33.28
2	0.28281	9.90	52.42	36.89	62.32	46.79	79.00	66.00	-16.68	-19.21
3	0.56949	9.92	25.47	20.52	35.39	30.44	73.00	60.00	-37.61	-29.56
4	1.98438	9.97	29.36	22.85	39.33	32.82	73.00	60.00	-33.67	-27.18
5	7.08722	10.10	25.46	18.10	35.56	28.20	73.00	60.00	-37.44	-31.80
6	19.28778	10.44	31.97	23.81	42.41	34.25	73.00	60.00	-30.59	-25.75

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

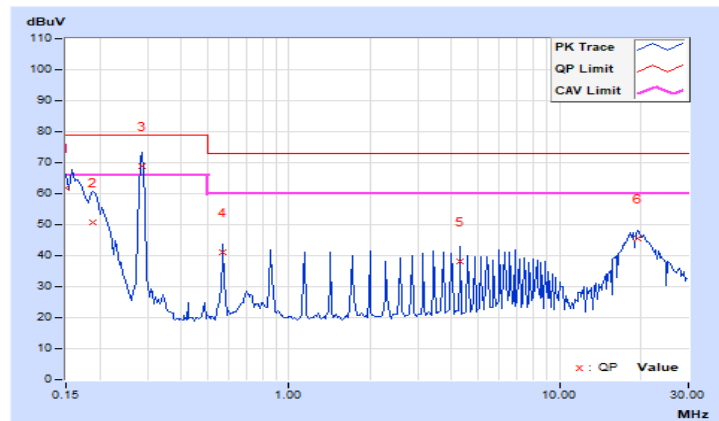


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 7		

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	0.15001	9.89	51.82	21.18	61.71	31.07	79.00	66.00	-17.29	-34.93
2	0.18906	9.89	40.97	11.48	50.86	21.37	79.00	66.00	-28.14	-44.63
3	0.28672	9.90	58.82	39.42	68.72	49.32	79.00	66.00	-10.28	-16.68
4	0.57188	9.92	31.33	22.95	41.25	32.87	73.00	60.00	-31.75	-27.13
5	4.28516	10.03	28.19	21.45	38.22	31.48	73.00	60.00	-34.78	-28.52
6	19.42578	10.42	35.00	27.42	45.42	37.84	73.00	60.00	-27.58	-22.16

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

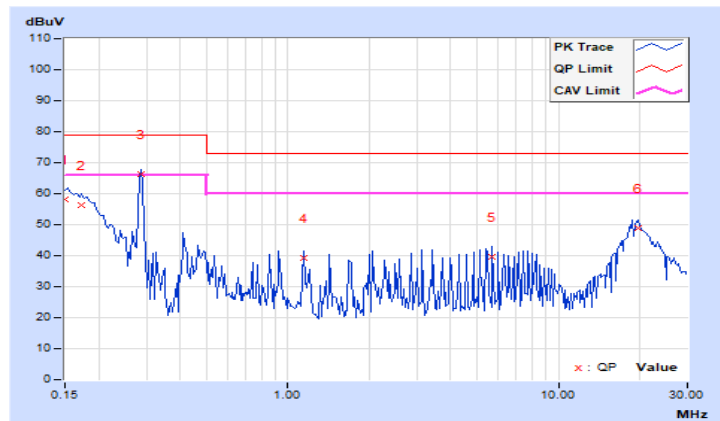


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 7		

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	0.15001	9.89	48.23	20.42	58.12	30.31	79.00	66.00	-20.88	-35.69
2	0.17342	9.89	46.34	17.92	56.23	27.81	79.00	66.00	-22.77	-38.19
3	0.28672	9.90	56.24	37.35	66.14	47.25	79.00	66.00	-12.86	-18.75
4	1.14453	9.95	29.46	22.50	39.41	32.45	73.00	60.00	-33.59	-27.55
5	5.71485	10.06	29.66	22.52	39.72	32.58	73.00	60.00	-33.28	-27.42
6	19.71875	10.45	38.35	31.58	48.80	42.03	73.00	60.00	-24.20	-17.97

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

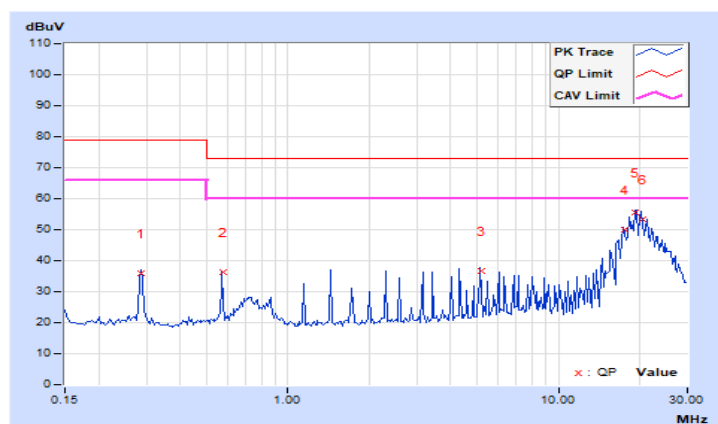


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/8
Test Mode	Mode 8		

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	0.28672	9.90	26.15	25.98	36.05	35.88	79.00	66.00	-42.95	-30.12
2	0.57315	9.92	26.22	26.18	36.14	36.10	73.00	60.00	-36.86	-23.90
3	5.16615	10.05	26.56	26.36	36.61	36.41	73.00	60.00	-36.39	-23.59
4	17.51890	10.38	39.71	39.07	50.09	49.45	73.00	60.00	-22.91	-10.55
5	19.21890	10.41	45.27	44.21	55.68	54.62	73.00	60.00	-17.32	-5.38
6	20.37745	10.44	43.03	41.74	53.47	52.18	73.00	60.00	-19.53	-7.82

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

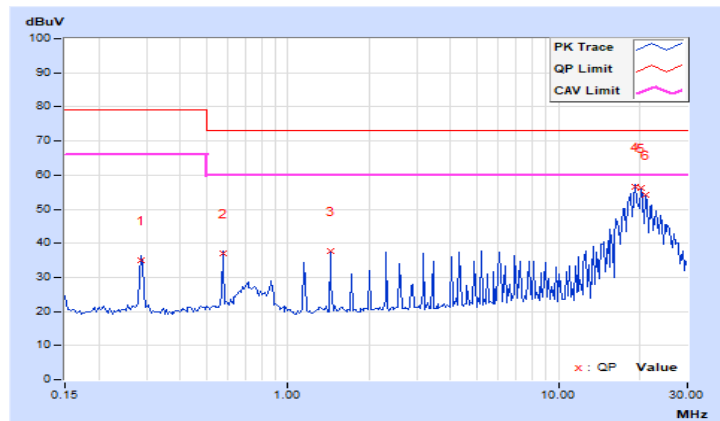


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	24Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/8
Test Mode	Mode 8		

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	0.28679	9.90	25.28	25.19	35.18	35.09	79.00	66.00	-43.82	-30.91
2	0.57578	9.92	27.23	27.20	37.15	37.12	73.00	60.00	-35.85	-22.88
3	1.44132	9.96	27.86	27.85	37.82	37.81	73.00	60.00	-35.18	-22.19
4	19.30999	10.44	46.17	45.45	56.61	55.89	73.00	60.00	-16.39	-4.11
5	20.17509	10.46	45.93	45.49	56.39	55.95	73.00	60.00	-16.61	-4.05
6	21.04003	10.48	43.63	42.68	54.11	53.16	73.00	60.00	-18.89	-6.84

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

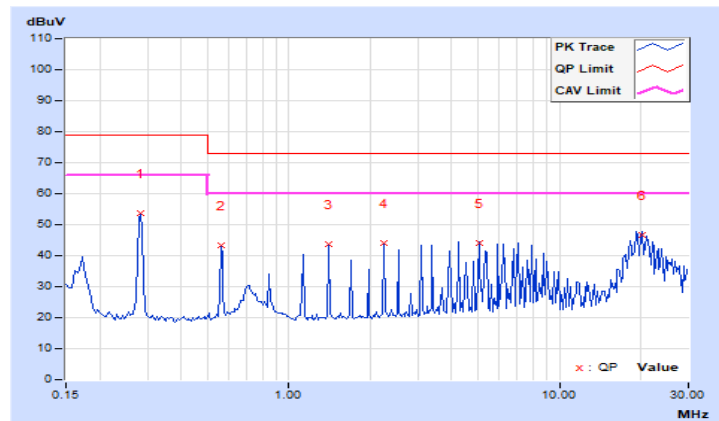


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	48Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 9		

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	0.28281	9.90	43.85	43.82	53.75	53.72	79.00	66.00	-25.25	-12.28
2	0.56406	9.92	33.35	33.33	43.27	43.25	73.00	60.00	-29.73	-16.75
3	1.40888	9.95	33.81	33.79	43.76	43.74	73.00	60.00	-29.24	-16.26
4	2.25272	9.97	34.08	34.02	44.05	43.99	73.00	60.00	-28.95	-16.01
5	5.07255	10.05	34.18	34.02	44.23	44.07	73.00	60.00	-28.77	-15.93
6	20.28993	10.43	36.23	34.54	46.66	44.97	73.00	60.00	-26.34	-15.03

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

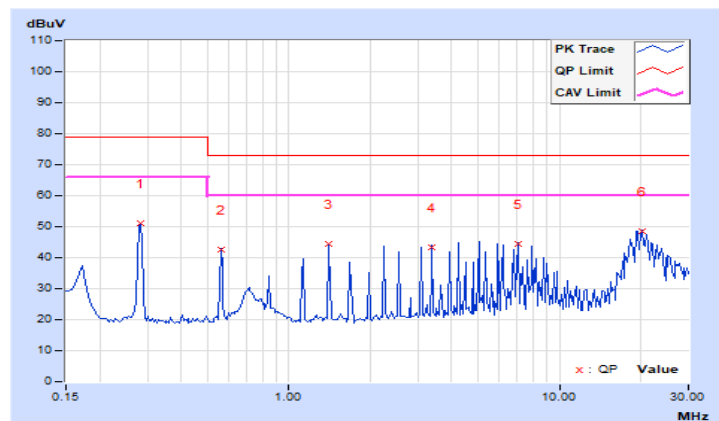


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	48Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 9		

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	0.28281	9.90	41.21	41.19	51.11	51.09	79.00	66.00	-27.89	-14.91
2	0.56406	9.92	32.81	32.79	42.73	42.71	73.00	60.00	-30.27	-17.29
3	1.40625	9.96	34.35	34.32	44.31	44.28	73.00	60.00	-28.69	-15.72
4	3.37636	10.00	33.45	33.42	43.45	43.42	73.00	60.00	-29.55	-16.58
5	7.03524	10.10	34.44	34.22	44.54	44.32	73.00	60.00	-28.46	-15.68
6	20.26317	10.46	37.90	35.93	48.36	46.39	73.00	60.00	-24.64	-13.61

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

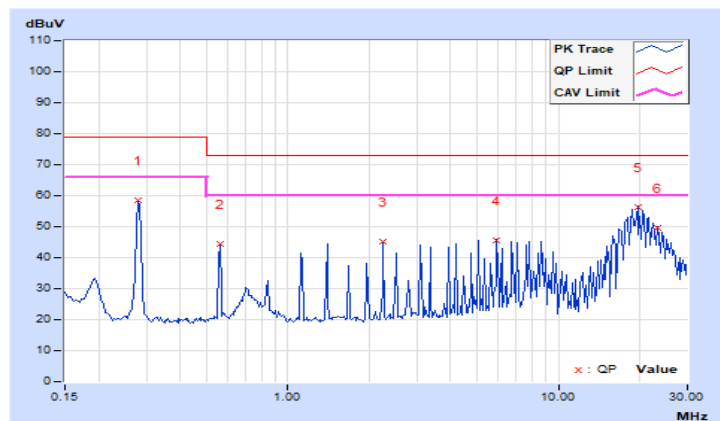


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	48Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 10		

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	0.28019	9.90	48.62	48.60	58.52	58.50	79.00	66.00	-20.48	-7.50
2	0.56016	9.92	34.39	34.36	44.31	44.28	73.00	60.00	-28.69	-15.72
3	2.24221	9.97	35.26	35.22	45.23	45.19	73.00	60.00	-27.77	-14.81
4	5.88672	10.06	35.48	35.46	45.54	45.52	73.00	60.00	-27.46	-14.48
5	19.62763	10.42	45.96	45.50	56.38	55.92	73.00	60.00	-16.62	-4.08
6	23.27343	10.48	39.00	37.91	49.48	48.39	73.00	60.00	-23.52	-11.61

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

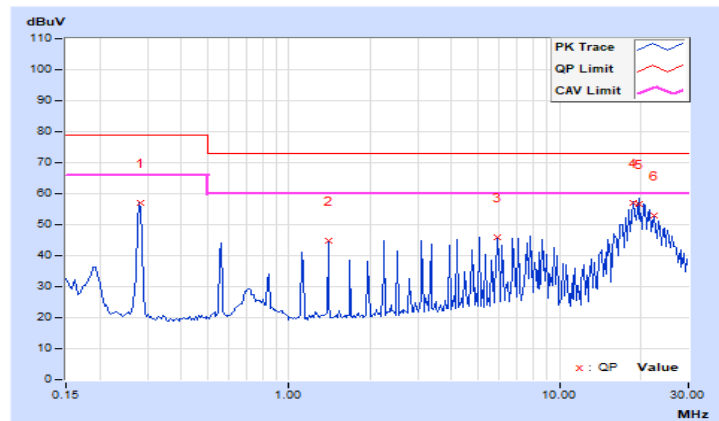


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	48Vdc	Environmental Conditions	21°C, 76%RH, 1011mbar
Tested by	John Liao	Test Date	2021/2/5
Test Mode	Mode 10		

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	0.28146	9.90	47.32	47.31	57.22	57.21	79.00	66.00	-21.78	-8.79
2	1.40234	9.96	34.89	34.88	44.85	44.84	73.00	60.00	-28.15	-15.16
3	5.88810	10.07	35.78	35.77	45.85	45.84	73.00	60.00	-27.15	-14.16
4	18.77970	10.43	46.50	45.12	56.93	55.55	73.00	60.00	-16.07	-4.45
5	19.62100	10.45	46.35	45.53	56.80	55.98	73.00	60.00	-16.20	-4.02
6	22.42806	10.50	42.39	41.64	52.89	52.14	73.00	60.00	-20.11	-7.86

Remarks:

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



6 Radiated Emission at Frequencies up to 1GHz

6.1 Limits

Class A			
Frequency range (MHz)	Distance (m)	Limits (dBuV/m)	
30 - 230	10	40	
230 - 1000		47	
30 - 230	3	50	
230 - 1000		57	
Class B			
Frequency range (MHz)	Distance (m)	Limits (dBuV/m)	
30 - 230	10	30	
230 - 1000		37	
30 - 230	3	40	
230 - 1000		47	
FM Receivers			
Frequency range (MHz)	Distance (m)	Class B limits (dBuV/m)	
		Fundamental	Harmonics
30 - 230	10	50	42
230 - 300			42
300 - 1000			46
30 - 230	3	60	52
230 - 300			52
300 - 1000			56

These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the local oscillator. Signals at all other frequencies shall be compliant with the limits given in Table A.4 of EN 55032.

Note: The lower limit shall apply at the transition frequencies.

6.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100027	May 19, 2020	May 18, 2021
Schwarzbeck Bilog Antenna	VULB9168	9168-303	Nov. 5, 2020	Nov. 4, 2021
Agilent Preamplifier	8447D	2944A08119	Feb. 19, 2020	Feb. 18, 2021
ADT. Turn Table	TT100	0205	NA	NA
ADT. Tower	AT100	0205	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
ADT RF Switches BOX	EMH-011	1001	Oct. 23, 2020	Oct. 22, 2021
Pacific RF cable With 5dB PAD	8D	CABLE-ST2-01	Oct. 23, 2020	Oct. 22, 2021

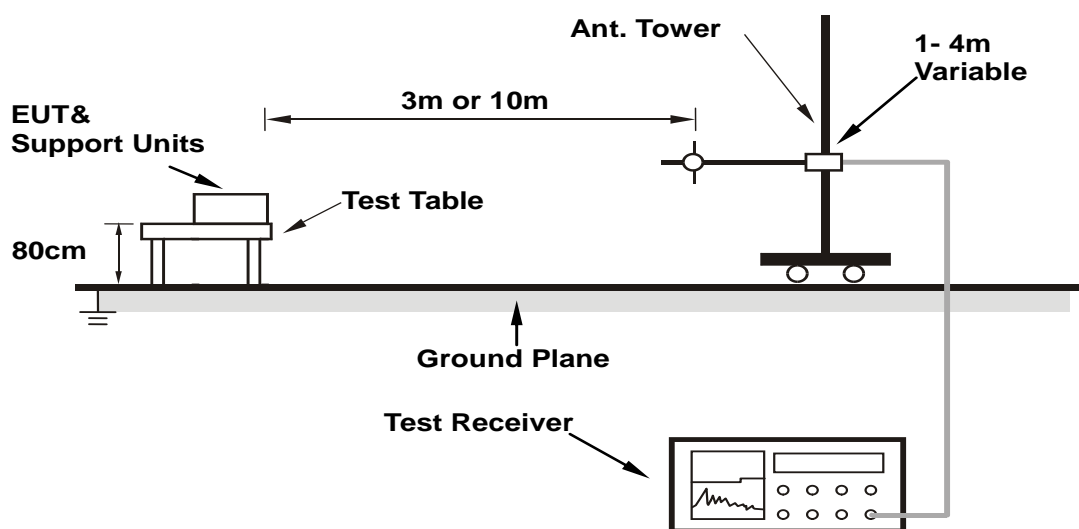
Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in Open Site No. 2.
 3. The VCCI Site Registration No. R-10237.
 4. Tested Date: Feb. 2, 2021

6.3 Test Arrangement

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 10 meters away from the interference-receiving antenna, which was 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 was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.
- The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna.



Note: Cable on the RGP must be insulated.

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

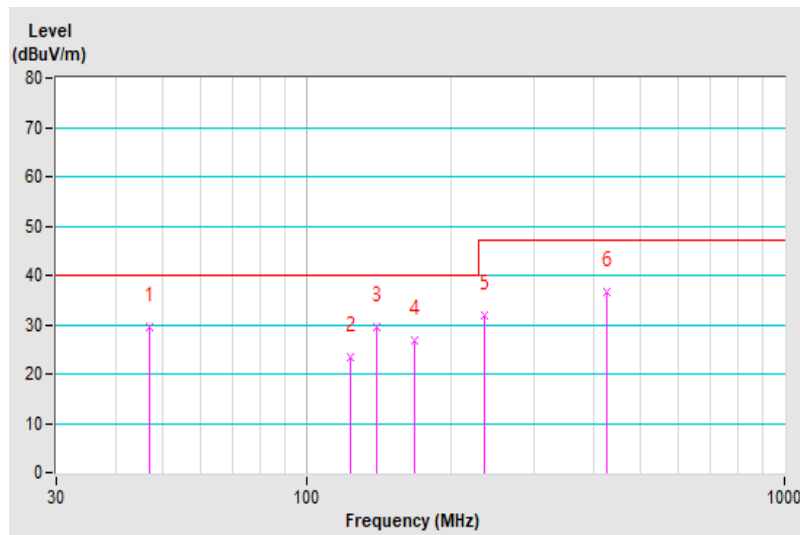
6.4 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	12Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 1		

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	46.97	29.65 QP	40.00	-10.35	4.00 H	314	39.34	-9.69
2	123.84	23.40 QP	40.00	-16.60	4.00 H	315	34.47	-11.07
3	140.64	29.58 QP	40.00	-10.42	4.00 H	252	39.04	-9.46
4	168.00	26.86 QP	40.00	-13.14	4.00 H	200	36.03	-9.17
5	235.20	31.81 QP	47.00	-15.19	3.68 H	138	42.24	-10.43
6	425.50	36.59 QP	47.00	-10.41	2.11 H	251	41.38	-4.79

Remarks:

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

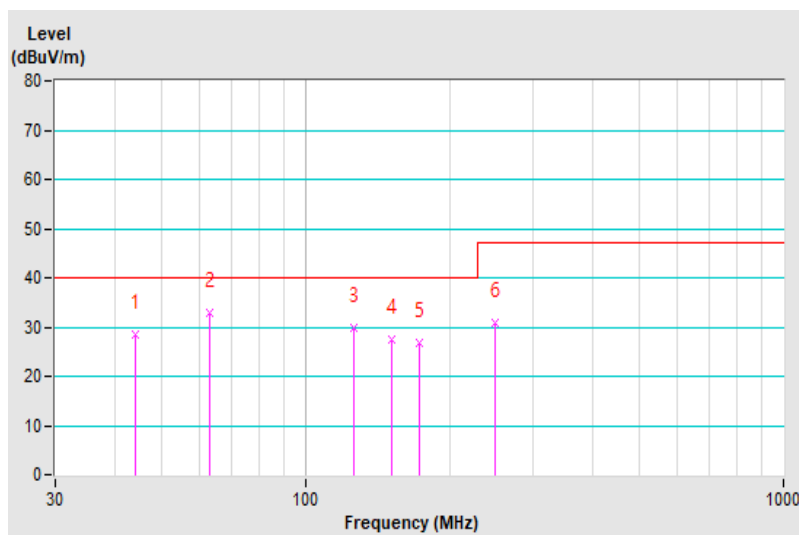


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	12Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 1		

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	44.06	28.43 QP	40.00	-11.57	1.00 V	58	38.28	-9.85
2	62.91	32.88 QP	40.00	-7.12	1.47 V	133	43.46	-10.58
3	126.24	29.81 QP	40.00	-10.19	1.00 V	190	40.52	-10.71
4	151.20	27.38 QP	40.00	-12.62	1.00 V	225	36.40	-9.02
5	172.80	26.66 QP	40.00	-13.34	1.00 V	153	36.16	-9.50
6	250.08	30.79 QP	47.00	-16.21	1.00 V	271	40.35	-9.56

Remarks:

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

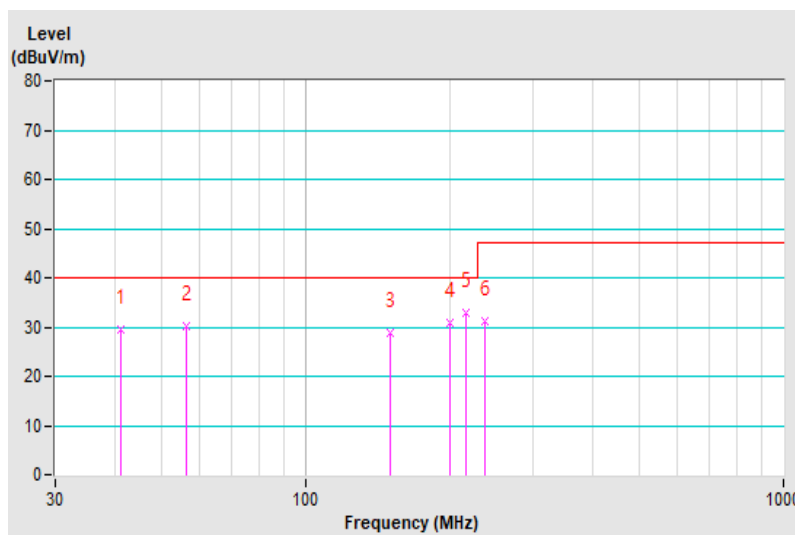


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	24Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 2		

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	41.16	29.48 QP	40.00	-10.52	4.00 H	194	39.46	-9.98
2	56.24	30.33 QP	40.00	-9.67	4.00 H	66	40.35	-10.02
3	150.34	28.67 QP	40.00	-11.33	4.00 H	97	37.66	-8.99
4	200.71	30.71 QP	40.00	-9.29	4.00 H	271	42.81	-12.10
5	216.77	32.93 QP	40.00	-7.07	4.00 H	230	44.60	-11.67
6	237.21	31.03 QP	47.00	-15.97	4.00 H	310	41.28	-10.25

Remarks:

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

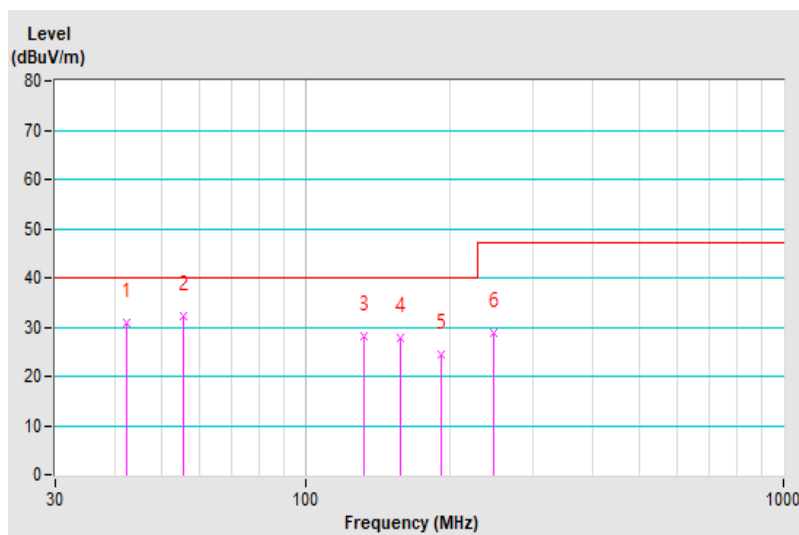


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	24Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 2		

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	42.28	30.72 QP	40.00	-9.28	1.00 V	45	40.60	-9.88
2	55.55	32.32 QP	40.00	-7.68	1.07 V	153	42.22	-9.90
3	132.48	28.09 QP	40.00	-11.91	1.00 V	330	38.16	-10.07
4	158.40	27.84 QP	40.00	-12.16	1.00 V	293	36.72	-8.88
5	192.48	24.52 QP	40.00	-15.48	1.00 V	251	36.38	-11.86
6	248.16	28.74 QP	47.00	-18.26	1.00 V	212	38.36	-9.62

Remarks:

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

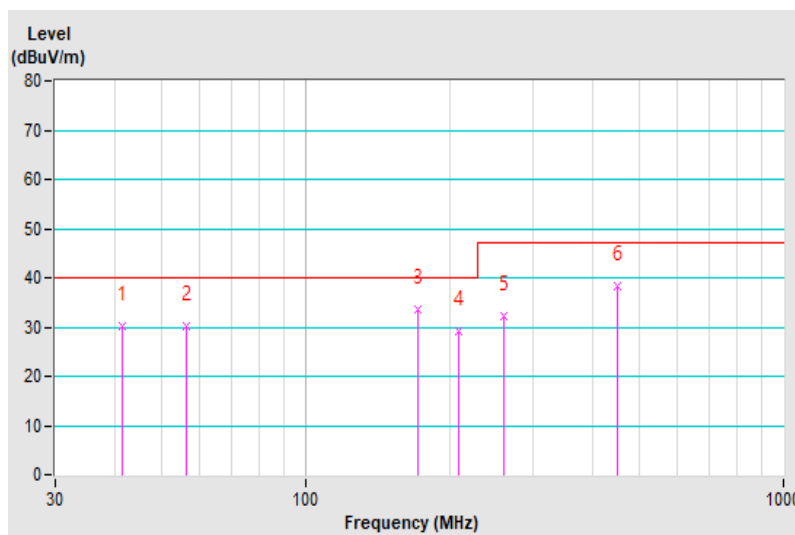


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	24Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 3		

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	41.31	30.21 QP	40.00	-9.79	4.00 H	244	40.18	-9.97
2	56.24	30.29 QP	40.00	-9.71	4.00 H	292	40.31	-10.02
3	172.24	33.41 QP	40.00	-6.59	4.00 H	18	42.85	-9.44
4	208.74	29.05 QP	40.00	-10.95	4.00 H	179	41.06	-12.01
5	260.57	32.28 QP	47.00	-14.72	4.00 H	254	41.46	-9.18
6	450.50	38.28 QP	47.00	-8.72	2.48 H	62	42.54	-4.26

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

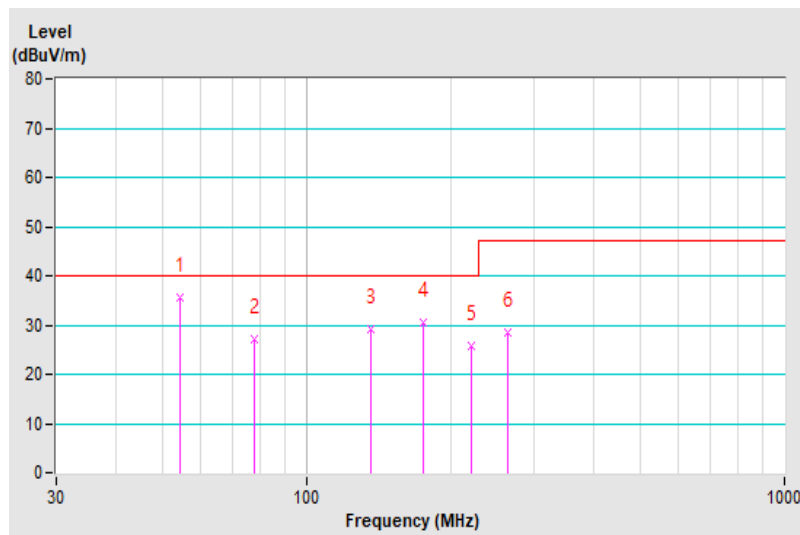


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	24Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 3		

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	54.37	35.44 QP	40.00	-4.56	1.00 V	249	45.39	-9.95
2	77.78	27.05 QP	40.00	-12.95	1.00 V	138	41.22	-14.17
3	136.32	29.14 QP	40.00	-10.86	1.00 V	171	38.89	-9.75
4	176.16	30.56 QP	40.00	-9.44	1.00 V	339	40.41	-9.85
5	220.80	25.92 QP	40.00	-14.08	1.00 V	302	37.45	-11.53
6	264.00	28.45 QP	47.00	-18.55	1.00 V	235	37.41	-8.96

Remarks:

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

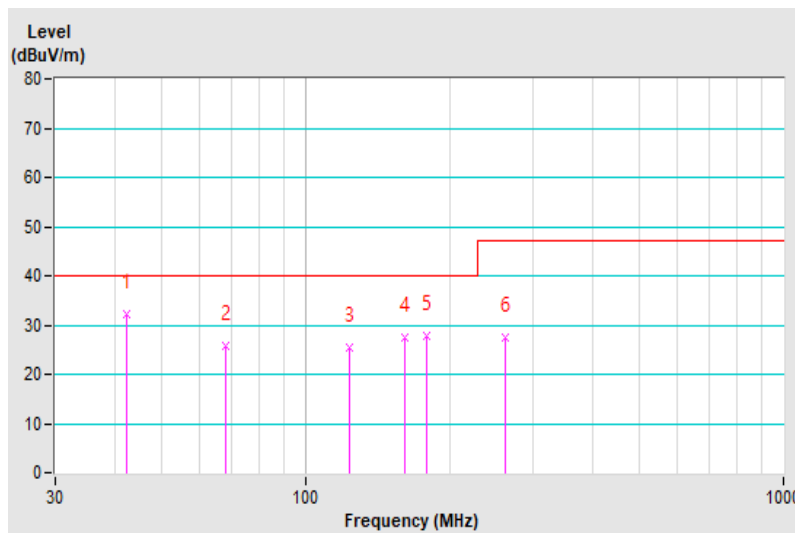


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	48Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 4		

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	42.33	32.35 QP	40.00	-7.65	4.00 H	44	42.23	-9.88
2	68.28	25.70 QP	40.00	-14.30	4.00 H	96	37.50	-11.80
3	123.36	25.58 QP	40.00	-14.42	4.00 H	179	36.64	-11.06
4	161.28	27.34 QP	40.00	-12.66	4.00 H	216	36.26	-8.92
5	179.52	27.67 QP	40.00	-12.33	4.00 H	112	38.00	-10.33
6	262.08	27.62 QP	47.00	-19.38	4.00 H	266	36.70	-9.08

Remarks:

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

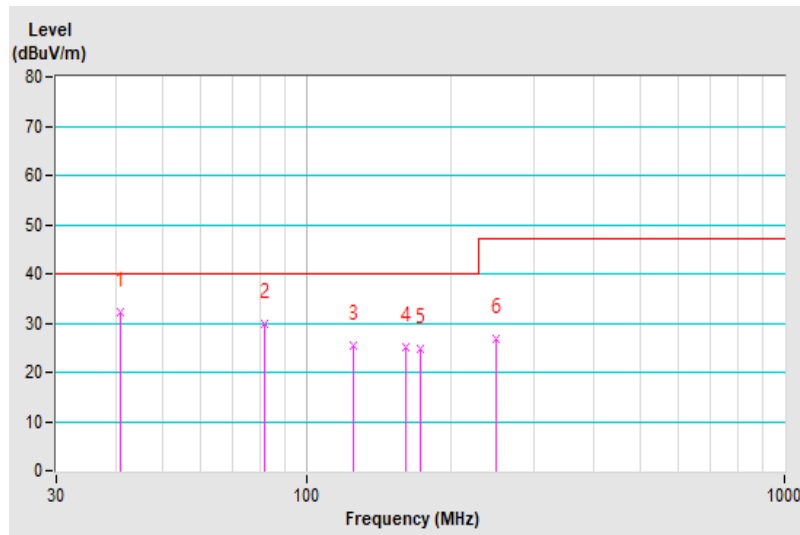


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	48Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 4		

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	40.87	32.13 QP	40.00	-7.87	1.00 V	179	42.15	-10.02
2	82.06	29.78 QP	40.00	-10.22	1.36 V	107	44.90	-15.12
3	125.76	25.56 QP	40.00	-14.44	1.00 V	150	36.31	-10.75
4	161.76	25.22 QP	40.00	-14.78	1.00 V	249	34.13	-8.91
5	172.80	24.79 QP	40.00	-15.21	1.00 V	210	34.29	-9.50
6	249.12	26.72 QP	47.00	-20.28	1.00 V	93	36.31	-9.59

Remarks:

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

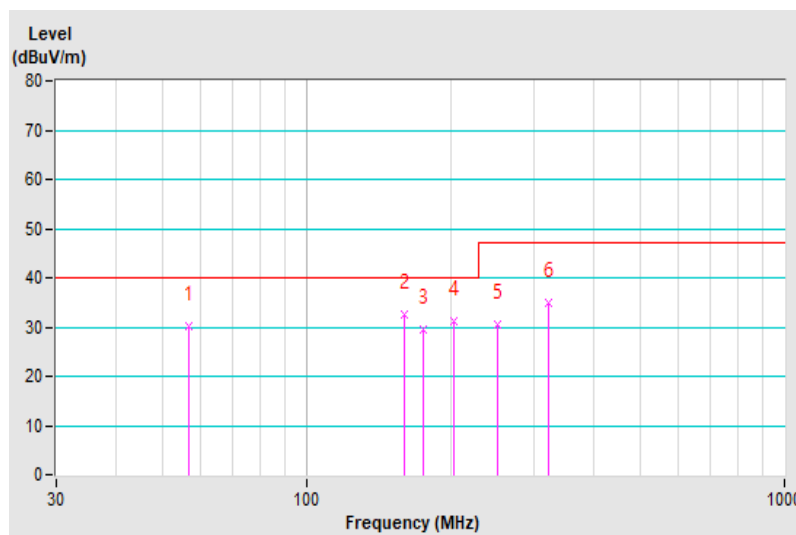


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	48Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 5		

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	56.68	30.33 QP	40.00	-9.67	4.00 H	149	40.43	-10.10
2	159.84	32.54 QP	40.00	-7.46	4.00 H	101	41.49	-8.95
3	175.68	29.40 QP	40.00	-10.60	4.00 H	222	39.18	-9.78
4	203.52	31.04 QP	40.00	-8.96	4.00 H	142	43.13	-12.09
5	250.56	30.44 QP	47.00	-16.56	3.59 H	279	39.99	-9.55
6	321.00	34.77 QP	47.00	-12.23	1.61 H	241	41.61	-6.84

Remarks:

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

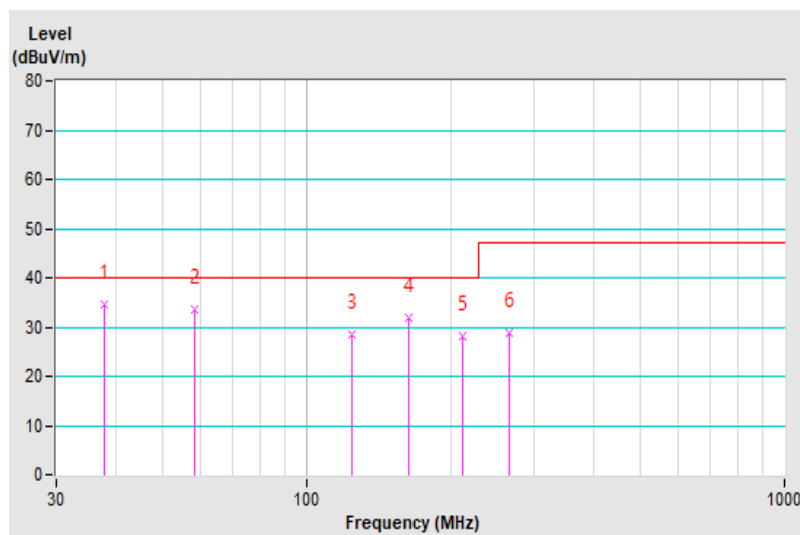


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	48Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 5		

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	37.69	34.62 QP	40.00	-5.38	1.00 V	293	45.00	-10.38
2	58.56	33.55 QP	40.00	-6.45	1.03 V	243	43.83	-10.28
3	124.80	28.46 QP	40.00	-11.54	1.02 V	51	39.41	-10.95
4	163.20	31.81 QP	40.00	-8.19	1.00 V	221	40.79	-8.98
5	211.68	28.07 QP	40.00	-11.93	1.00 V	109	39.96	-11.89
6	265.44	28.78 QP	47.00	-18.22	1.00 V	167	37.63	-8.85

Remarks:

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

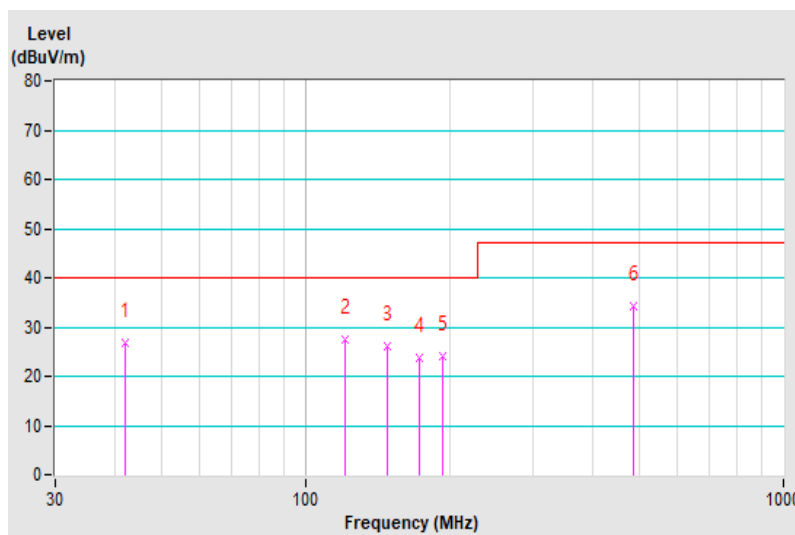


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	24Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 6		

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	42.15	26.62 QP	40.00	-13.38	4.00 H	182	36.51	-9.89
2	121.12	27.41 QP	40.00	-12.59	4.00 H	234	38.66	-11.25
3	148.12	25.95 QP	40.00	-14.05	4.00 H	267	35.09	-9.14
4	173.78	23.72 QP	40.00	-16.28	4.00 H	300	33.28	-9.56
5	193.35	24.23 QP	40.00	-15.77	4.00 H	334	36.15	-11.92
6	484.93	34.26 QP	47.00	-12.74	2.55 H	46	37.91	-3.65

Remarks:

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

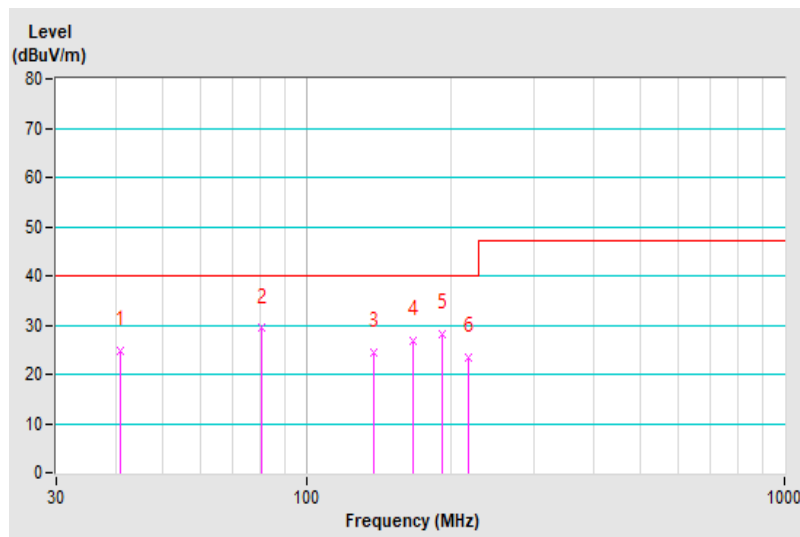


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	24Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 6		

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	40.80	24.82 QP	40.00	-15.18	1.00 V	278	34.85	-10.03
2	80.62	29.32 QP	40.00	-10.68	1.00 V	96	44.20	-14.88
3	138.68	24.35 QP	40.00	-15.65	1.00 V	226	33.92	-9.57
4	167.51	26.94 QP	40.00	-13.06	1.00 V	220	36.05	-9.11
5	192.68	28.25 QP	40.00	-11.75	1.00 V	164	40.12	-11.87
6	219.00	23.39 QP	40.00	-16.61	1.00 V	1	34.96	-11.57

Remarks:

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

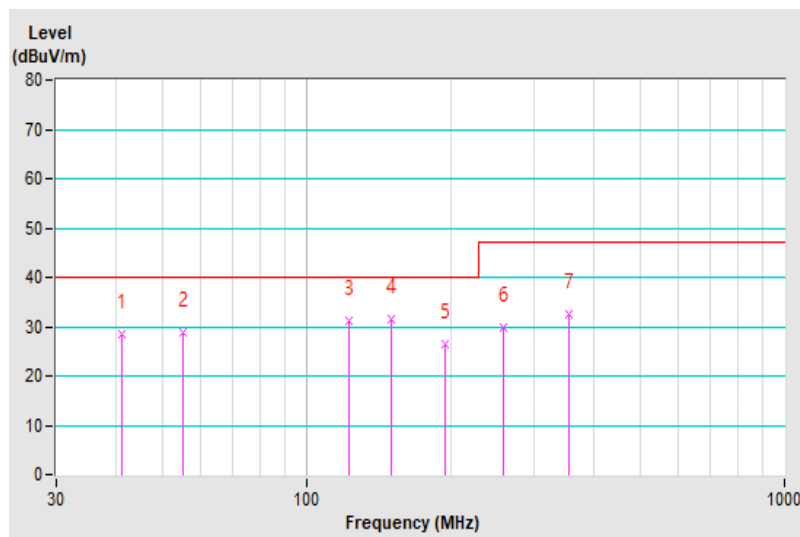


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	24Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 7		

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	41.16	28.31 QP	40.00	-11.69	4.00 H	178	38.29	-9.98
2	55.23	28.71 QP	40.00	-11.29	4.00 H	114	38.56	-9.85
3	122.60	31.20 QP	40.00	-8.80	4.00 H	44	42.34	-11.14
4	150.34	31.56 QP	40.00	-8.44	4.00 H	0	40.55	-8.99
5	194.87	26.28 QP	40.00	-13.72	4.00 H	1	38.24	-11.96
6	259.11	29.72 QP	47.00	-17.28	4.00 H	122	38.97	-9.25
7	354.01	32.65 QP	47.00	-14.35	2.70 H	276	38.97	-6.32

Remarks:

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

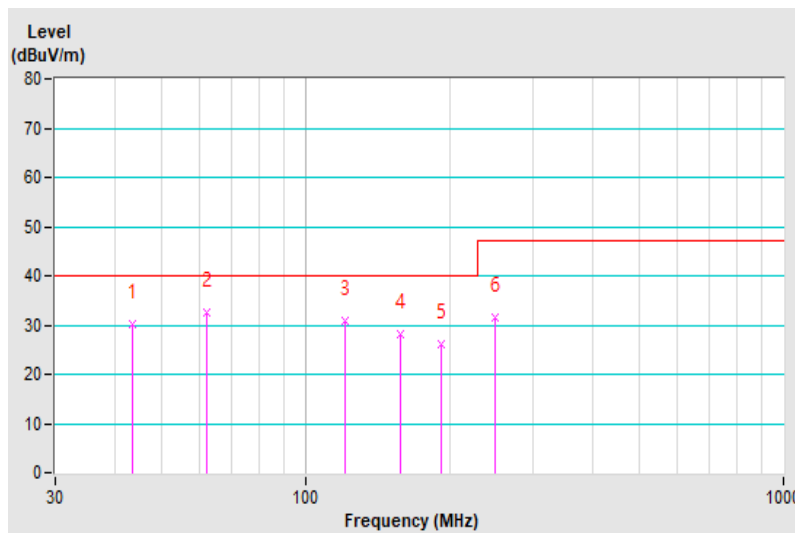


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	24Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 7		

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	43.45	30.20 QP	40.00	-9.80	1.00 V	142	40.05	-9.85
2	62.37	32.41 QP	40.00	-7.59	1.05 V	95	43.08	-10.67
3	120.96	30.77 QP	40.00	-9.23	1.00 V	200	42.02	-11.25
4	157.92	27.98 QP	40.00	-12.02	1.00 V	18	36.91	-8.93
5	192.48	26.05 QP	40.00	-13.95	1.00 V	1	37.91	-11.86
6	250.08	31.56 QP	47.00	-15.44	1.00 V	1	41.12	-9.56

Remarks:

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

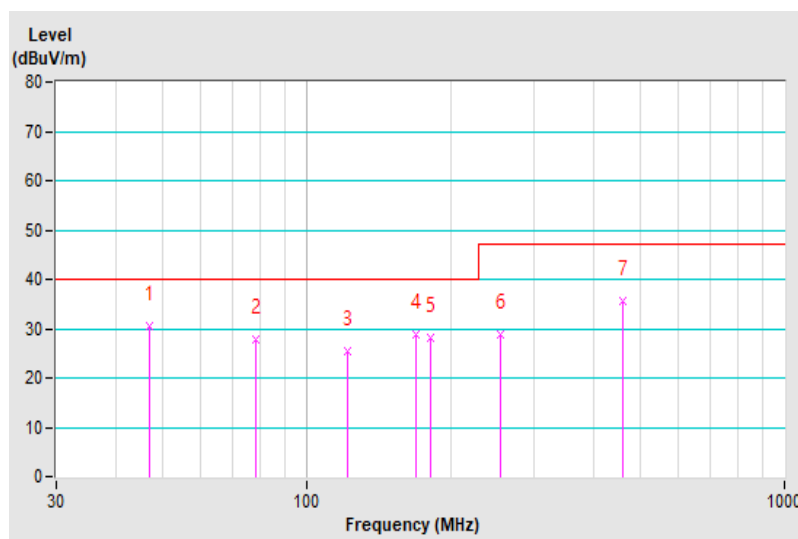


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	24Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 8		

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	46.97	30.48 QP	40.00	-9.52	4.00 H	233	40.17	-9.69
2	78.36	27.68 QP	40.00	-12.32	4.00 H	1	41.97	-14.29
3	121.92	25.42 QP	40.00	-14.58	4.00 H	242	36.71	-11.29
4	169.92	28.84 QP	40.00	-11.16	4.00 H	141	38.10	-9.26
5	181.44	28.03 QP	40.00	-11.97	4.00 H	187	38.68	-10.65
6	254.88	28.68 QP	47.00	-18.32	3.48 H	312	38.12	-9.44
7	460.50	35.74 QP	47.00	-11.26	1.94 H	274	39.75	-4.01

Remarks:

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

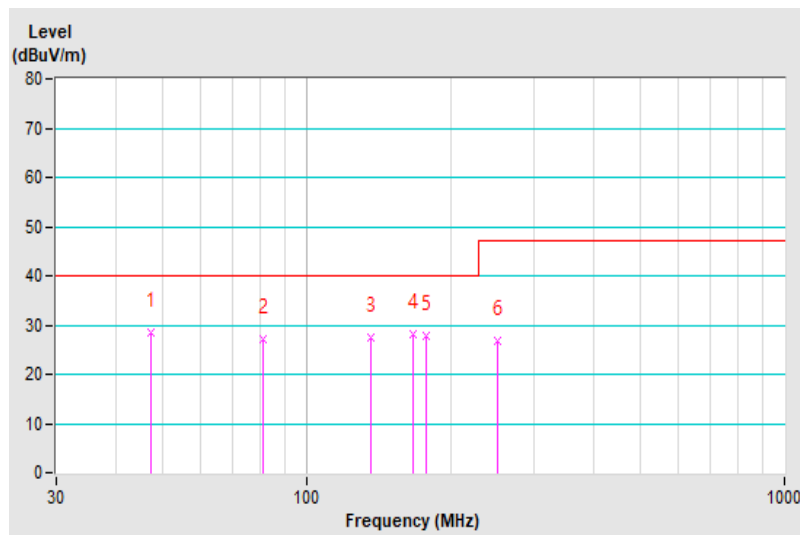


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	24Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 8		

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	47.35	28.53 QP	40.00	-11.47	1.00 V	79	38.17	-9.64
2	81.09	27.11 QP	40.00	-12.89	1.60 V	130	42.12	-15.01
3	136.80	27.47 QP	40.00	-12.53	1.00 V	293	37.18	-9.71
4	167.52	28.03 QP	40.00	-11.97	1.00 V	255	37.14	-9.11
5	178.08	27.81 QP	40.00	-12.19	1.00 V	154	37.91	-10.10
6	251.04	26.67 QP	47.00	-20.33	1.00 V	210	36.21	-9.54

Remarks:

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

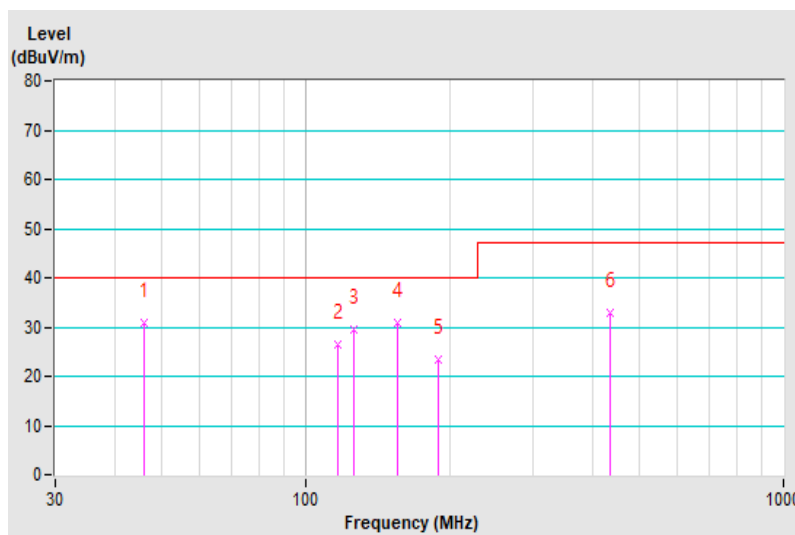


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	48Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 9		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	45.95	30.95 QP	40.00	-9.05	4.00 H	93	40.58	-9.63
2	116.64	26.46 QP	40.00	-13.54	4.00 H	123	38.22	-11.76
3	126.72	29.55 QP	40.00	-10.45	4.00 H	293	40.29	-10.74
4	156.00	30.89 QP	40.00	-9.11	4.00 H	233	39.87	-8.98
5	189.60	23.35 QP	40.00	-16.65	4.00 H	183	34.97	-11.62
6	434.50	32.78 QP	47.00	-14.22	2.74 H	22	37.32	-4.54

Remarks:

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

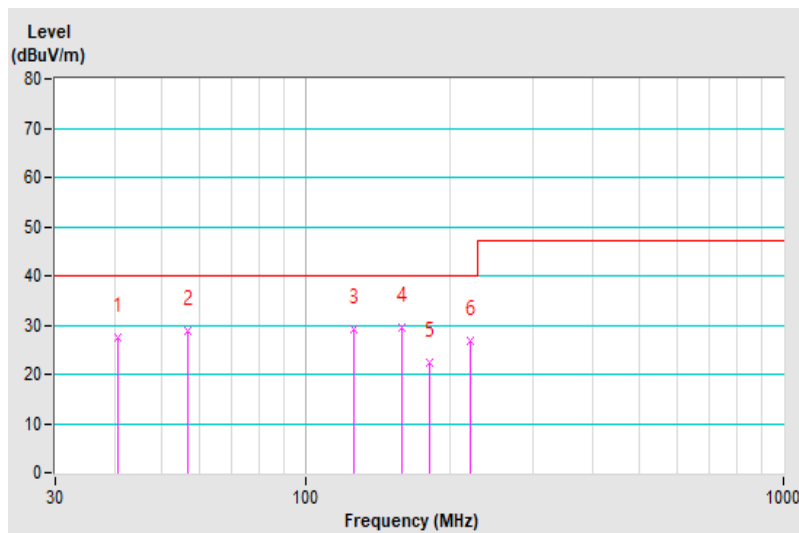


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	48Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 9		

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	40.59	27.52 QP	40.00	-12.48	1.00 V	286	37.59	-10.07
2	56.68	28.97 QP	40.00	-11.03	1.00 V	235	39.07	-10.10
3	126.72	29.30 QP	40.00	-10.70	1.00 V	119	40.04	-10.74
4	159.36	29.58 QP	40.00	-10.42	1.00 V	157	38.47	-8.89
5	181.92	22.45 QP	40.00	-17.55	1.00 V	182	33.18	-10.73
6	221.76	26.69 QP	40.00	-13.31	1.00 V	219	38.21	-11.52

Remarks:

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

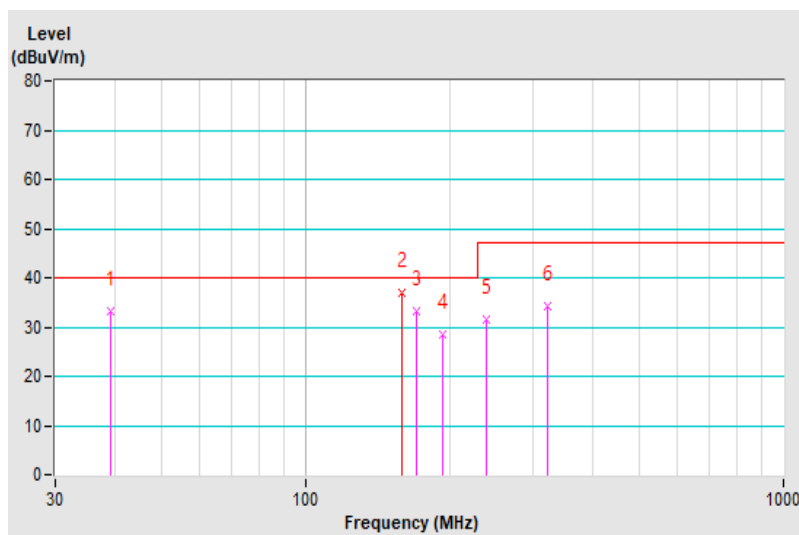


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	48Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 10		

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	39.13	33.33 QP	40.00	-6.67	4.00 H	312	43.59	-10.26
2	159.01	36.98 QP	40.00	-3.02	4.00 H	265	45.81	-8.83
3	171.36	33.21 QP	40.00	-6.79	4.00 H	91	42.51	-9.30
4	193.92	28.33 QP	40.00	-11.67	4.00 H	56	40.28	-11.95
5	239.04	31.57 QP	47.00	-15.43	4.00 H	0	41.64	-10.07
6	321.50	34.23 QP	47.00	-12.77	3.29 H	99	41.06	-6.83

Remarks:

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

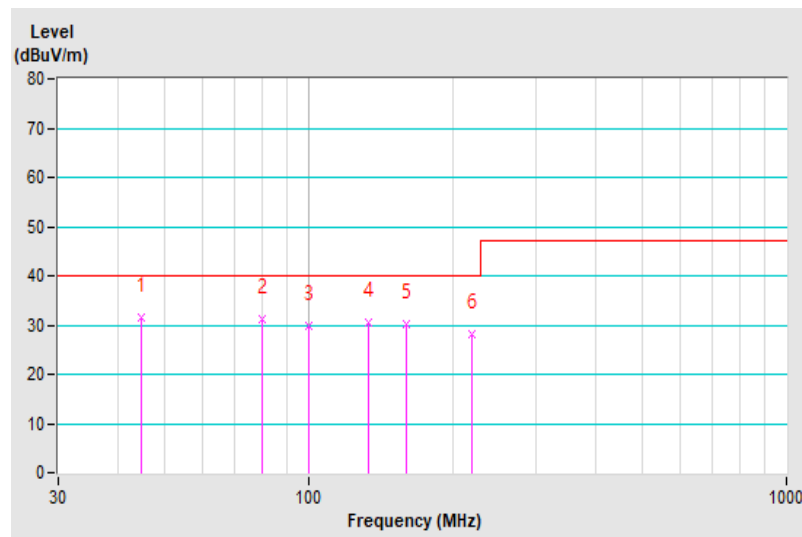


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	48Vdc	Environmental Conditions	16.0°C, 72.0%RH, 1012mbar
Tested By	ED. Lin	Test Date	2021/2/2
Test Mode	Mode 10		

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	44.79	31.63 QP	40.00	-8.37	1.00 V	178	41.34	-9.71
2	80.03	31.33 QP	40.00	-8.67	1.00 V	324	46.00	-14.67
3	100.15	29.70 QP	40.00	-10.30	1.00 V	266	43.49	-13.79
4	133.44	30.37 QP	40.00	-9.63	1.00 V	10	40.30	-9.93
5	160.32	30.24 QP	40.00	-9.76	1.00 V	142	39.21	-8.97
6	219.84	28.01 QP	40.00	-11.99	1.00 V	213	39.53	-11.52

Remarks:

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



7 General Immunity Requirements

EN 55024:2010/ EN 55024:2010 +A1:2015, Immunity requirements				
Clause	Reference standard	Table	Test specification	Performance Criterion
4.2.1	EN/IEC 61000-4-2 ESD	1.3	Enclosure port: ±8kV Air discharge, ±4kV Contact discharge	B
4.2.3.2	EN/IEC 61000-4-3 RS	1.2	Enclosure port: 80-1000 MHz, 3V/m, 80% AM (1kHz)	A
4.2.2	EN/IEC 61000-4-4 EFT	2.3	Signal ports and telecommunication ports: xDSL equipment: ±0.5kV, 5/50 (t _r /t _w) ns, 100kHz others: ±0.5kV, 5/50 (t _r /t _w) ns, 5kHz	B
		3.3	Input DC power port: ±0.5kV, 5/50 (t _r /t _w) ns, 5kHz	
		4.5	Input AC Power ports: ±1kV, 5/50 (t _r /t _w) ns, 5kHz	
4.2.5	EN/IEC 61000-4-5 Surge	2.2	Signal and telecommunication ports (direct to outdoor cables): 10/700 (5/320) (T _r /T _d) µs w/o primary protectors: ±1kV, or with primary protectors fitted: ±4kV	C
		3.2	Input DC power port (direct to outdoor cables): 1.2/50 (8/20) (T _r /T _d) µs Line to earth: ±0.5kV	B
		4.4	Input AC Power ports: 1.2/50 (8/20) (T _r /T _d) µs, Line to line: ±1kV Line to earth: ±2kV	
4.2.3.3	EN/IEC 61000-4-6 CS	2.1	Signal and telecommunication ports(cable length > 3m): 0.15-80 MHz, 3V, 80% AM (1kHz)	A
		3.1	Input DC power port: 0.15-80 MHz, 3V, 80% AM (1kHz)	
		4.1	Input AC Power ports: 0.15-80 MHz, 3V, 80% AM (1kHz)	
4.2.4	EN/IEC 61000-4-8 PFMF	1.1	Enclosure port: 50 or 60 Hz, 1A/m	A

EN 55035:2017, Immunity requirements		
Reference standard	Test specification	Performance Criterion
EN/IEC 61000-4-2 ESD	Enclosure port: ±8kV Air discharge, ±4kV Contact discharge	B
EN/IEC 61000-4-3 RS	Enclosure port: Swept freq. test : 80-1000 MHz, 3V/m, 80% AM (1kHz), Spot freq. test : 1800, 2600, 3500, 5000 MHz (±1 %), 3V/m, 80% AM (1kHz)	A
EN/IEC 61000-4-4 EFT	Analogue/digital data ports (cable length > 3m): xDSL equipment: ±0.5kV, 5/50 (t _r /t _w) ns, 100kHz others: ±0.5kV, 5/50 (t _r /t _w) ns, 5kHz	B
	DC network power port(cable length > 3m): ±0.5kV, 5/50 (t _r /t _w) ns, 5kHz	
	AC mains power ports: ±1.0kV, 5/50 (t _r /t _w) ns, 5kHz	
EN/IEC 61000-4-5 Surge	Analogue/digital data ports (direct to outdoor cables): Port type: unshielded symmetrical 10/700(5/320) (T _r /T _d) µs, w/o primary protectors (line to ground): ±1.0kV, or with primary protectors (line to ground): ±1.0kV, ±4.0kV Port type: coaxial or shielded 1.2/50 (8/20) (T _r /T _d) µs, shield to ground: ±0.5kV	C
	DC network power port (direct to outdoor cables): 1.2/50(8/20) (T _r /T _d) µs, Line to ground: ±0.5kV	B
	AC mains power ports: 1.2/50(8/20) (T _r /T _d) µs, Line to line: ±1kV, Line to ground: ±2kV	B
EN/IEC 61000-4-6 CS	Analogue/digital data ports (cable length > 3m) ; DC network power ports (cable length > 3m) ; AC mains power ports 0.15-10 MHz, 3V, 80% AM (1kHz), 10-30 MHz, 3V-1V, 80% AM (1kHz), 30-80 MHz, 1V, 80% AM (1kHz)	A
EN/IEC 61000-4-8 PFMF	Enclosure port: 50 or 60 Hz, 1A/m	A

7.1 Specific Immunity Requirements by Manufacturer

Reference standard	Test specification	Performance Criterion
EN/IEC 61000-4-2 ESD	Enclosure port: ±6kV Contact discharge	A
EN/IEC 61000-4-3 RS	Enclosure port: 80-1000 MHz, 10V/m, 80% AM (1kHz), Spot freq. test : 1800, 2600, 3500, 5000 MHz, 10V/m, 80% AM (1kHz)	A
EN/IEC 61000-4-4 EFT	DC network power port(cable length > 3m): ±2kV, 5/50 (t _r /t _w) ns, 5kHz	A
EN/IEC 61000-4-5 Surge	DC network power port (direct to outdoor cables): 1.2/50(8/20) (T _f /T _d) µs, Line to ground: ±1kV	A
EN/IEC 61000-4-6 CS	DC network power ports (cable length > 3m) 0.15-80 MHz, 10V, 80% AM (1kHz)	A
EN/IEC 61000-4-8 PFMF	Enclosure port: 50Hz, 3A/m	A

7.2 Performance Criteria

General Performance Criteria

Performance criterion A

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 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

After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena 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. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. 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 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. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

Product Specific Performance Criteria

The particular performance criteria which are specified in the normative annexes of EN 55024 & EN 55035 take precedence over the corresponding parts of the general performance criteria. Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.

8 Electrostatic Discharge Immunity Test (ESD)

8.1 Test Specification

Product Standard:	EN 55024
Basic Standard:	EN/IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: $\pm 2, \pm 4, \pm 8$ kV (Direct) Contact Discharge: $\pm 2, \pm 4, \pm 6$ kV (Direct & Indirect)
Number of Discharge:	Air – Direct: 10 discharges per location (each polarity) Contact – Direct & Indirect: 25 discharges per location (each polarity) and min. 200 times in total
Discharge Mode:	Single Discharge
Discharge Period:	1-second minimum

Product Standard:	EN 55035
Basic Standard:	EN/IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: $\pm 2, \pm 4, \pm 8$ kV (Direct) Contact Discharge: $\pm 2, \pm 4, \pm 6$ kV (Direct & Indirect)
Number of Discharge:	Air – Direct: 10 discharges per location (each polarity) Contact – Direct & Indirect: 10 discharges per location (each polarity)
Discharge Mode:	Single Discharge
Discharge Period:	1-second minimum

8.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EM Test ESD Simulator	Dito	P1315117252/P1317117852	Jul. 15, 2020	Jul. 14, 2021

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in ESD Room No. 3.
3. Tested Date: Feb. 17, 2021

8.3 Test Arrangement

The discharges shall be applied in two ways: (For EN 55024 only)

a. Contact discharges to the conductive surfaces and coupling planes:

The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

b. Air discharges at slots and apertures and insulating surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

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.

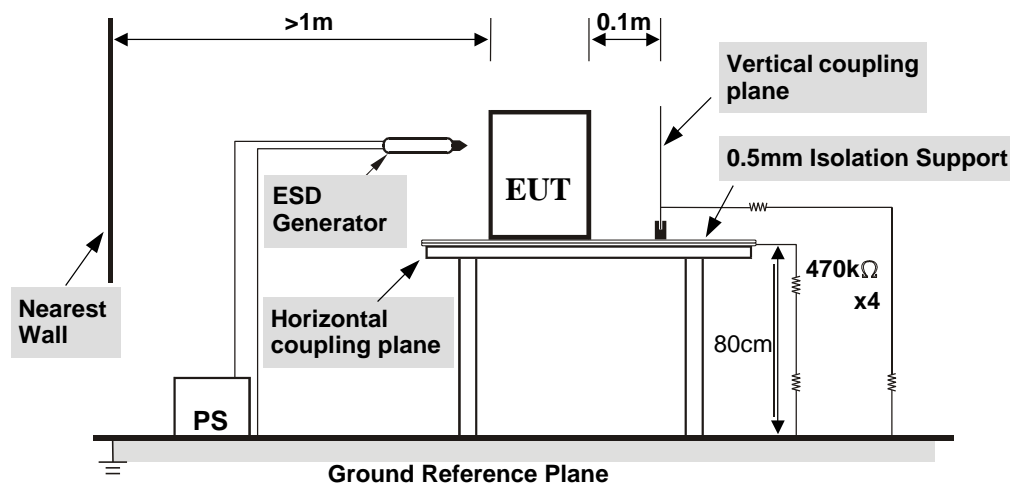


TABLE-TOP EQUIPMENT

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.

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

8.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

8.5 Test Results

For EN 55024 & EN 55035

Input Voltage	48Vdc	Tested by	Thomas Cheng
Environmental Conditions	21 °C, 36% RH 1006mbar	Test Date	2021/2/17
Test mode	Mode 5 & Mode 10		

Test Results of Direct Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2, 4, 6	+/-	1	Note	NA	A
2, 4, 8	+/-	2, 3	NA	Note	A

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

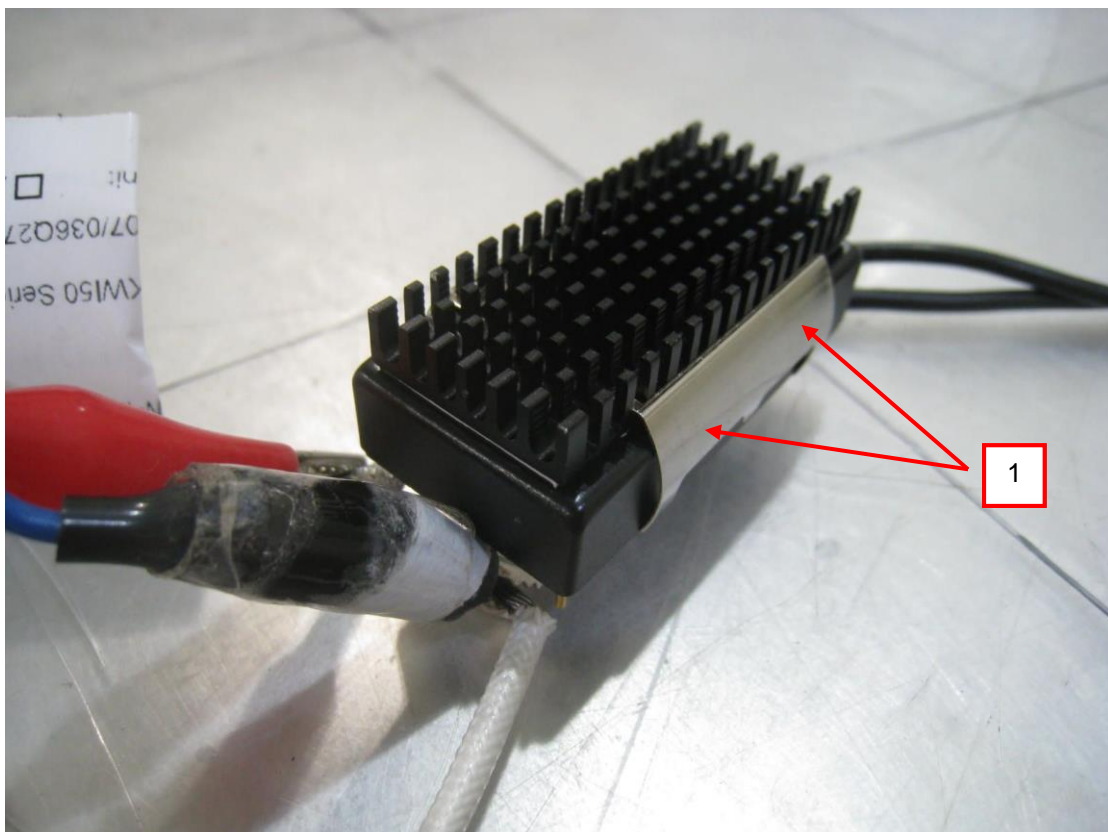
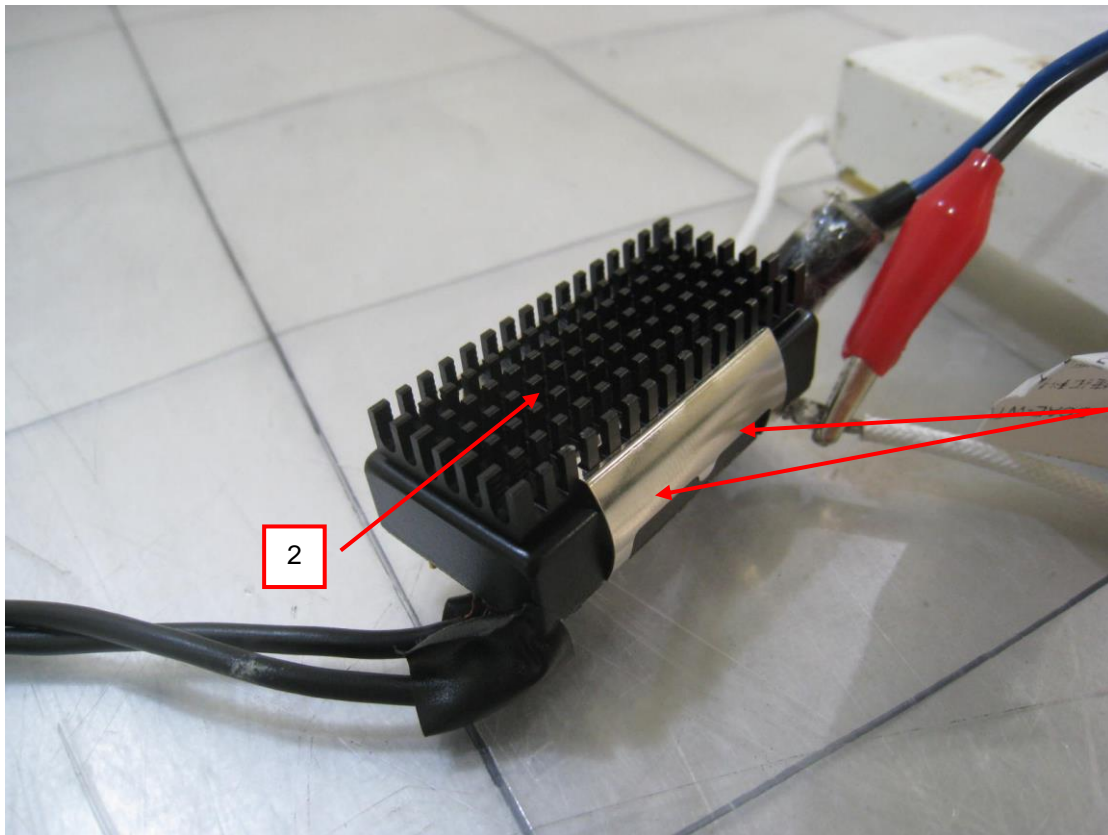
Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2, 4, 6	+/-	Four Sides	Note	Note	A

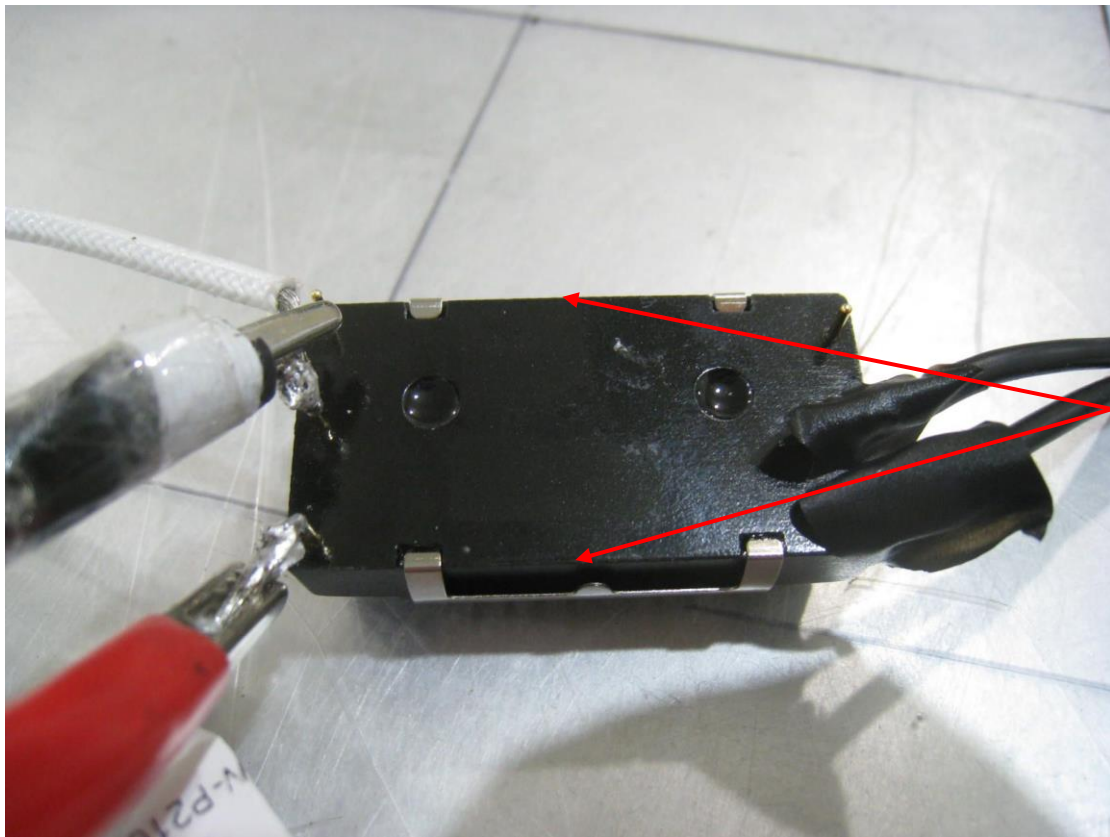
Description of test points of indirect application:

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

Note: The EUT function was correct during the test.

Description of Test Points





3

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

9.1 Test Specification

Product Standard:	EN 55024
Basic Standard:	EN/IEC 61000-4-3
Frequency Range:	80 MHz - 1000 MHz
Field Strength:	3 V/m, 10 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	3 seconds

Product Standard:	EN 55035
Basic Standard:	EN/IEC 61000-4-3
Swept Frequency Range:	80 MHz - 1000 MHz
Spot Frequencies:	1800, 2600, 3500, 5000 MHz
Field Strength:	3 V/m, 10 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	3 seconds

9.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
AgilentSignal Generator	E8257D	MY48050465	Jun. 8, 2020	Jun. 7, 2021
BONN RF Amplifier	BSA 0125-800	1912556	NA	NA
TESTQAmplifier	CBA 1G-275	T44344	NA	NA
AR RF Amplifier	35S4G8AM4	0326094	NA	NA
AR RF Amplifier	100S1G4M3	0329249	NA	NA
AR Controller	SC1000M3	305910	NA	NA
ARLog-Periodic Antenna	AT6080	0329465	NA	NA
BOONTON RF Voltage Meter	4232A	10180	May 29, 2020	May 28, 2021
BOONTON Power Sensor	51011-EMC	34152	May 29, 2020	May 28, 2021
BOONTON Power Sensor	51011-EMC	34153	May 29, 2020	May 28, 2021
EMCO BiconiLog Antenna	3141	1001	NA	NA
ARHigh Gain Antenna	AT4010	0329800	NA	NA
SchwarzbeckLOG ANTENNA	Stlp 9149	9149-260	NA	NA
CHANCE MOST Full Anechoic Chamber (9x5x3m)	Chance Most	RS-002	Feb. 5, 2020	Feb. 4, 2021
Software	RS_V7.6	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in RS Room No.2.
3. The transmit antenna was located at a distance of 3 meters from the EUT.
4. Tested Date: Jan. 29, 2021

9.3 Test Arrangement

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

- The testing was performed in a fully anechoic chamber.
- The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine wave. **(For EN 55024)**
- The swept frequency range is from 80 MHz to 1000 MHz and the spot frequencies are 1800, 2600, 3500, 5000 MHz, with the signal 80% amplitude modulated with a 1kHz sine wave. **(For EN 55035)**
- The dwell time of the amplitude modulated carrier was applied in 3 s at each of the frequencies during the scan. The sensitive frequencies (e.g. clock frequencies or frequencies identified by the manufacturer or obtained as outcome of the test) shall be analyzed in addition to the stepped frequencies.
- The field strength level was 3 V/m, 10 V/m.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

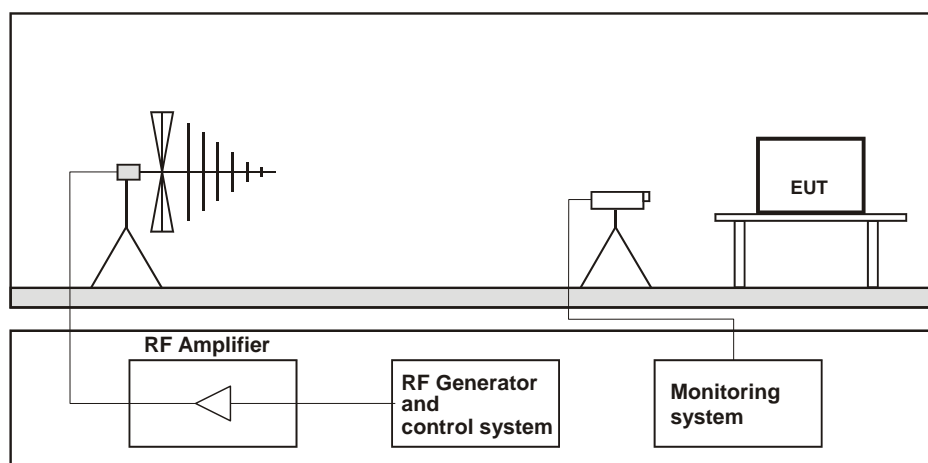


Table-top Equipment

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

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

9.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

9.5 Test Results

For EN 55024

Input Voltage	48Vdc	Tested by	Thomas Cheng
Environmental Conditions	21 °C, 62% RH	Test Date	2021/1/29
Test mode	Mode 5 & Mode 10		

Frequency (MHz)	Polarity	Azimuth (°)	Applied Field Strength		Observation	Performance Criterion
			(V/m)	Modulation		
80 - 1000	V&H	0	3	80% AM (1kHz)	Note	A
80 - 1000	V&H	90	3	80% AM (1kHz)	Note	A
80 - 1000	V&H	180	3	80% AM (1kHz)	Note	A
80 - 1000	V&H	270	3	80% AM (1kHz)	Note	A
80 - 1000	V&H	0	10	80% AM (1kHz)	Note	A
80 - 1000	V&H	90	10	80% AM (1kHz)	Note	A
80 - 1000	V&H	180	10	80% AM (1kHz)	Note	A
80 - 1000	V&H	270	10	80% AM (1kHz)	Note	A

Note: The EUT function was correct during the test.

For EN 55035

Input Voltage	48Vdc	Tested by	Thomas Cheng
Environmental Conditions	21 °C, 62% RH	Test Date	2021/1/29
Test mode	Mode 5 & Mode 10		

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criterion
			(V/m)	Modulation		
80 - 1000	V&H	0	3	80% AM (1kHz)	Note	A
		90	3	80% AM (1kHz)	Note	A
		180	3	80% AM (1kHz)	Note	A
		270	3	80% AM (1kHz)	Note	A
1800, 2600, 3500, 5000	V&H	0	3	80% AM (1kHz)	Note	A
		90	3	80% AM (1kHz)	Note	A
		180	3	80% AM (1kHz)	Note	A
		270	3	80% AM (1kHz)	Note	A
80 - 1000	V&H	0	10	80% AM (1kHz)	Note	A
		90	10	80% AM (1kHz)	Note	A
		180	10	80% AM (1kHz)	Note	A
		270	10	80% AM (1kHz)	Note	A
1800, 2600, 3500, 5000	V&H	0	10	80% AM (1kHz)	Note	A
		90	10	80% AM (1kHz)	Note	A
		180	10	80% AM (1kHz)	Note	A
		270	10	80% AM (1kHz)	Note	A

Note: The EUT function was correct during the test.

10 Electrical Fast Transient/Burst Immunity Test (EFT)

10.1 Test Specification

Product Standard:	EN 55024
Basic Standard:	EN/IEC 61000-4-4
Test Voltage:	Signal / telecommunication port: N/A Input DC power port: $\pm 0.5\text{kV}$, $\pm 2\text{kV}$ Input AC power port: N/A
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.

Product Standard:	EN 55035
Basic Standard:	EN/IEC 61000-4-4
Test Voltage:	Analogue/digital data port (cable length > 3m): N/A DC network power port (cable length > 3m): $\pm 0.5\text{kV}$, $\pm 2\text{kV}$ AC mains power port: N/A
Impulse Repetition Frequency:	100kHz : applicable only to xDSL port 5kHz : others
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.

10.2 Test Instruments

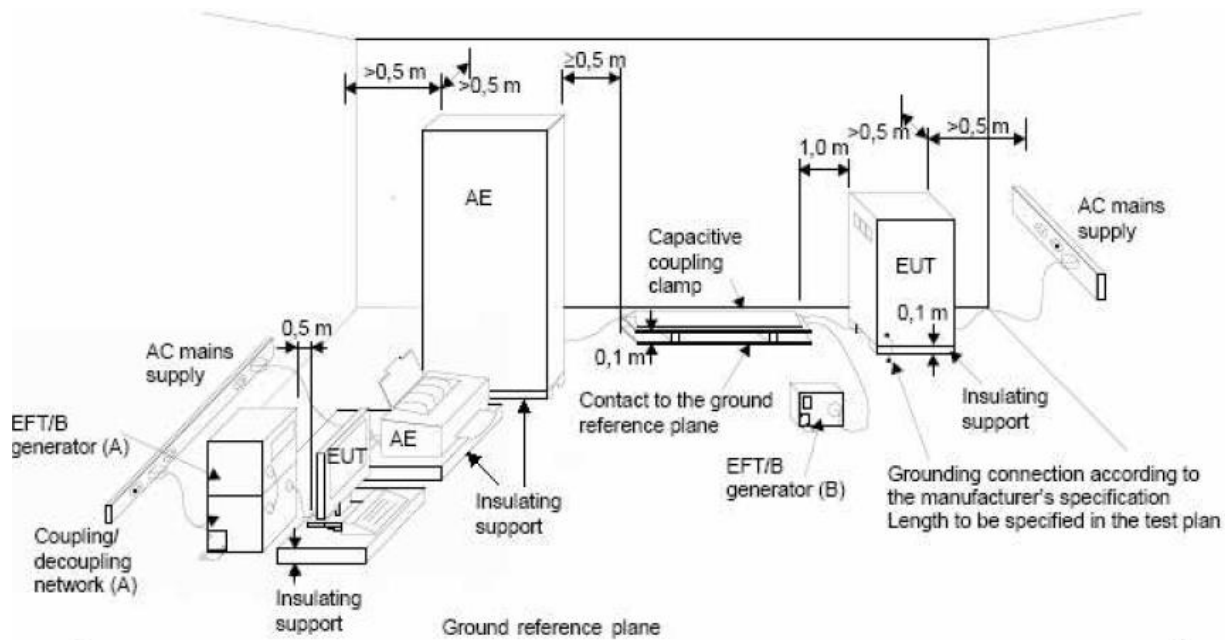
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
TESEQ, EFT Simulator	NSG 3060	1572	May 12, 2020	May 11, 2021
TESEQ, CDN	CDN 3083-B100	303	May 12, 2020	May 11, 2021
Haefely, Capacitive Clamp	IP4A	155173	Apr. 20, 2020	Apr. 19, 2021

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS Room No. 2.
3. Tested Date: Jan. 22 to 28, 2021

10.3 Test Arrangement

- Both positive and negative polarity discharges were applied.
- The distance between any coupling devices and the EUT should be $(0.5 - 0/+0.1)$ m for table-top equipment testing, and (1.0 ± 0.1) 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.



NOTE:

- location for supply line coupling
- location for signal lines coupling

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

10.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

10.5 Test Results

For EN 55024 & EN 55035

Input Voltage	12Vdc	Tested by	Bernie Lu
Environmental Conditions	22 °C, 69% RH	Test Date	2021/1/28
Test mode	Mode 1		

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 2	(+)	+/-	Note	A
0.5, 2	(-)	+/-	Note	A
0.5, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

Input Voltage	24Vdc	Tested by	Michael Cheng
Environmental Conditions	26 °C, 60% RH	Test Date	2021/1/22
Test mode	Mode 2		

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 2	(+)	+/-	Note	A
0.5, 2	(-)	+/-	Note	A
0.5, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

Input Voltage	24Vdc	Tested by	Bernie Lu
Environmental Conditions	20 °C, 63% RH	Test Date	2021/1/28
Test mode	Mode 3		

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 2	(+)	+/-	Note	A
0.5, 2	(-)	+/-	Note	A
0.5, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

Input Voltage	48Vdc	Tested by	Bernie Lu
Environmental Conditions	22 °C, 64% RH	Test Date	2021/1/28
Test mode	Mode 4		

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 2	(+)	+/-	Note	A
0.5, 2	(-)	+/-	Note	A
0.5, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

Input Voltage	48Vdc	Tested by	Michael Cheng
Environmental Conditions	26 °C, 60% RH	Test Date	2021/1/22
Test mode	Mode 5		

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 2	(+)	+/-	Note	A
0.5, 2	(-)	+/-	Note	A
0.5, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

Input Voltage	24Vdc	Tested by	Bernie Lu
Environmental Conditions	22 °C, 68% RH	Test Date	2021/1/28
Test mode	Mode 6		

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 2	(+)	+/-	Note	A
0.5, 2	(-)	+/-	Note	A
0.5, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

Input Voltage	24Vdc	Tested by	Michael Cheng
Environmental Conditions	26 °C, 60% RH	Test Date	2021/1/22
Test mode	Mode 7		

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 2	(+)	+/-	Note	A
0.5, 2	(-)	+/-	Note	A
0.5, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

Input Voltage	24Vdc	Tested by	Michael Cheng
Environmental Conditions	26 °C, 60% RH	Test Date	2021/1/22
Test mode	Mode 8		

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 2	(+)	+/-	Note	A
0.5, 2	(-)	+/-	Note	A
0.5, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

Input Voltage	48Vdc	Tested by	Bernie Lu
Environmental Conditions	22 °C, 66% RH	Test Date	2021/1/28
Test mode	Mode 9		

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 2	(+)	+/-	Note	A
0.5, 2	(-)	+/-	Note	A
0.5, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

Input Voltage	48Vdc	Tested by	Michael Cheng
Environmental Conditions	26 °C, 60% RH	Test Date	2021/1/22
Test mode	Mode 10		

Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 2	(+)	+/-	Note	A
0.5, 2	(-)	+/-	Note	A
0.5, 2	(+)-(-)	+/-	Note	A

Note: The EUT function was correct during the test.

11 Surge Immunity Test

11.1 Test Specification

Product Standard:	EN 55024
Basic Standard:	EN/IEC 61000-4-5
Wave-Shape:	Signal / telecommunication port (direct to outdoor cables*): 10/700 μ s Open Circuit Voltage 5/320 μ s Short Circuit Current Input DC power port (direct to outdoor cables*): 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current Input AC power port: 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current
Test Voltage:	Signal and telecommunication ports**: w/o primary protectors: N/A with primary protectors fitted: N/A Input DC power port: Line to earth or ground: ± 0.5 kV, ± 1 kV Input AC power ports: Line to line: N/A Line to earth or ground: N/A
AC Phase Angle (degree):	0°, 90°, 180°, 270°
Pulse Repetition Rate:	1 time / 20 sec.
Number of Tests:	5 positive and 5 negative at selected points

* This test is only applicable only to ports, which according to the manufacturer's specification, may connect directly to outdoor cables.

** For ports where primary protection is intended, surges are applied at voltages up to 4 kV with the primary protectors fitted. Otherwise the 1 kV test level is applied without primary protection in place.

Product Standard:	EN 55035
Basic Standard:	EN/IEC 61000-4-5
Wave-Shape:	Analogue/digital data ports (direct to outdoor cables*): Port type: unshielded symmetrical 10/700 μ s Open Circuit Voltage 5/320 μ s Short Circuit Current Port type: coaxial or shielded 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current DC network power port (direct to outdoor cables*): 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current AC mains power port: 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current
Test Voltage:	Analogue/digital data ports: Port type: unshielded symmetrical** w/o primary protectors (line to ground): N/A with primary protectors (line to ground): N/A Port type: coaxial or shielded shield to ground: N/A DC network power port: ± 0.5 kV, ± 1 kV AC mains power ports: Line to line : N/A Line to ground : N/A
AC Phase Angle (degree):	90° / 270°
Pulse Repetition Rate:	1 time / 20 sec.
Number of Tests:	5 positive and 5 negative at selected points

* This test is only applicable only to ports, which according to the manufacturer's specification, may connect directly to outdoor cables.

** For ports where primary protection is intended, surges are applied at voltages up to 4 kV with the primary protectors. Otherwise the 1 kV test level is applied without primary protection in place.

11.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
TESEQ, Surge Simulator	NSG 3060	1572	May 12, 2020	May 11, 2021
TESEQ, CDN	CDN 3083-100	1215	May 12, 2020	May 11, 2021
Coupling Decoupling Network	CDN-UTP8	045	Aug. 18, 2020	Aug. 17, 2021
TESEQ Coupling Decoupling Network	CDN HSS-2	41009	May 12, 2020	May 11, 2021
TESEQ Coupling Decoupling Network	CDN 118-T8	40386	Sep. 8, 2020	Sep. 7, 2021
TESEQ CDN for Unshielded Unsymmetrical Signal & Data Lines	CDN117	40144	Sep. 8, 2020	Sep. 7, 2021

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS Room No. 2.
3. Tested Date: Jan. 22 to 28, 2021

11.3 Test Arrangement

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. Analogue/digital data 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.

- 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 in the cable. If coupling arrestors are used, 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 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 ≤ 10 m.

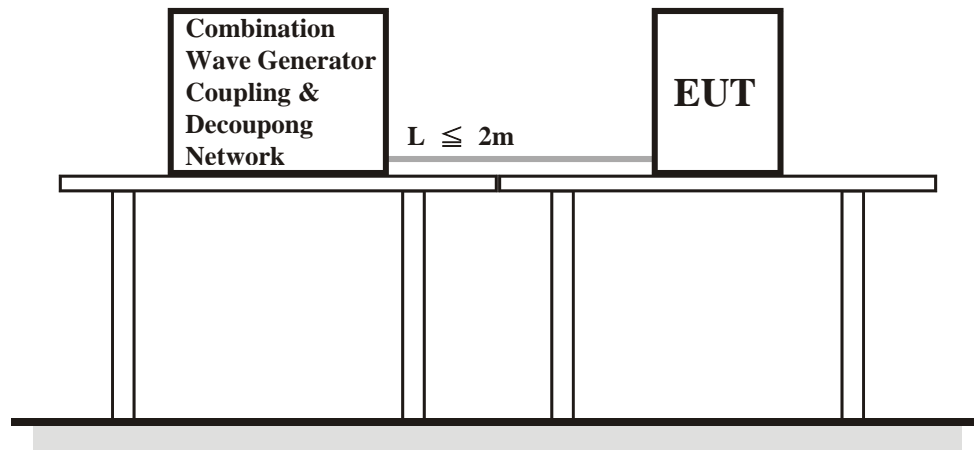
Rules for application of the surge to shielded lines:

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

The test level is applied on shields with a 2Ω generator source impedance and with the $18 \mu\text{F}$ 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.

11.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

11.5 Test Results

For EN 55024 & EN 55035

Input Voltage	12Vdc	Tested by	Bernie Lu
Environmental Conditions	22 °C, 64% RH	Test Date	2021/1/28
Test mode	Mode 1		

Input DC power port

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

Note: The EUT function was correct during the test.

Input Voltage	24Vdc	Tested by	Michael Cheng
Environmental Conditions	26 °C, 60% RH	Test Date	2021/1/22
Test mode	Mode 2		

Input DC power port

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

Note: The EUT function was correct during the test.

Input Voltage	24Vdc	Tested by	Bernie Lu
Environmental Conditions	20 °C, 64% RH	Test Date	2021/1/28
Test mode	Mode 3		

Input DC power port

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

Note: The EUT function was correct during the test.

Input Voltage	48Vdc	Tested by	Bernie Lu
Environmental Conditions	21 °C, 64% RH	Test Date	2021/1/28
Test mode	Mode 4		

Input DC power port

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

Note: The EUT function was correct during the test.

Input Voltage	48Vdc	Tested by	Michael Cheng
Environmental Conditions	26 °C, 60% RH	Test Date	2021/1/22
Test mode	Mode 5		

Input DC power port

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

Note: The EUT function was correct during the test.

Input Voltage	24Vdc	Tested by	Bernie Lu
Environmental Conditions	22 °C, 69% RH	Test Date	2021/1/28
Test mode	Mode 6		

Input DC power port

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

Note: The EUT function was correct during the test.

Input Voltage	24Vdc	Tested by	Michael Cheng
Environmental Conditions	26 °C, 60% RH	Test Date	2021/1/22
Test mode	Mode 7		

Input DC power port

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

Note: The EUT function was correct during the test.

Input Voltage	24Vdc	Tested by	Michael Cheng
Environmental Conditions	26 °C, 60% RH	Test Date	2021/1/22
Test mode	Mode 8		

Input DC power port

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

Note: The EUT function was correct during the test.

Input Voltage	48Vdc	Tested by	Bernie Lu
Environmental Conditions	21 °C, 64% RH	Test Date	2021/1/28
Test mode	Mode 9		

Input DC power port

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

Note: The EUT function was correct during the test.

Input Voltage	48Vdc	Tested by	Michael Cheng
Environmental Conditions	26 °C, 60% RH	Test Date	2021/1/22
Test mode	Mode 10		

Input DC power port

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

Note: The EUT function was correct during the test.

12 Immunity to Conducted Disturbances Induced by RF Fields (CS)

12.1 Test Specification

Product Standard:	EN 55024
Basic Standard:	EN/IEC 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Voltage Level:	3 V, 10 V
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Dwell Time	3 seconds

Product Standard:	EN 55035
Basic Standard:	EN/IEC 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Voltage Level:	0.15 MHz - 10 MHz: 3V 10 MHz - 30 MHz: 3-1 V 30 MHz - 80 MHz: 1V
Additional Test:	0.15 MHz - 80 MHz: 10V
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Dwell Time	3 seconds

12.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ Signal Generator	SML03	101801	Jan. 13, 2021	Jan. 12, 2022
Digital Sweep Function Generator	8120	984801	NA	NA
AR Power Amplifier	75A250AM1	306331	NA	NA
FCC Coupling Decoupling Network	FCC-801-M2-16A	01047	Jun. 18, 2020	Jun. 17, 2021
FISCHER CUSTOM COMMUNICATIONS EM Injection Clamp	F-203I-23mm	455	NA	NA
FISCHER CUSTOM COMMUNICATIONS Current Injection Clamp	F-120-9A	361	Jul. 30, 2020	Jul. 29, 2021
B&K Ear Simulator	4185	2553594	NA	NA
EM TEST Coupling Decoupling Network	CDN M1/32A	306508	Jun. 18, 2020	Jun. 17, 2021
TESEQ Coupling Decoupling Network	CDN T800	34428	Jun. 18, 2020	Jun. 17, 2021
TESEQ Coupling Decoupling Network	CDN T800	29459	Jun. 18, 2020	Jun. 17, 2021
TESEQ Coupling Decoupling Network	CDN T8-230	56641	Feb. 26, 2020	Feb. 25, 2021
TESEQ Coupling Decoupling Network	CDN T8-230	56642	Feb. 26, 2020	Feb. 25, 2021
R&S Power Sensor	NRV-Z5	837878/039	Nov. 10, 2020	Nov. 9, 2021
R&S Power Meter	NRVD	837794/040	Nov. 10, 2020	Nov. 9, 2021
TESEQ Coupling Decoupling Network	CDN M232	37702	Jun. 18, 2020	Jun. 17, 2021
TESEQ Coupling Decoupling Network	CDN M332	41258	Jun. 18, 2020	Jun. 17, 2021
TESEQ Coupling Decoupling Network	CDN M332	41256	Jun. 18, 2020	Jun. 17, 2021
TESEQ Coupling Decoupling Network	CDN T8-10	40376	Jun. 18, 2020	Jun. 17, 2021
TESEQ Coupling Decoupling Network	CDN T8-230	56643	Feb. 26, 2020	Feb. 25, 2021
TESEQ Coupling Decoupling Network	CDN S200	53490	May 27, 2020	May 26, 2021
TESEQ Coupling Decoupling Network	CDN S400	52115	Jun. 18, 2020	Jun. 17, 2021
TESEQ Coupling Decoupling Network	CDN T400A	49918	Feb. 26, 2020	Feb. 25, 2021
FCC Coupling Decoupling Network	FCC-801-M5-50A	100018	Jan. 19, 2021	Jan. 18, 2022
TESEQ Coupling Decoupling Network	CDN T2A-10	54942	Feb. 26, 2020	Feb. 25, 2021
TESEQ Coupling Decoupling Network	CDN S751A	56435	Feb. 26, 2020	Feb. 25, 2021
TESEQ Coupling Decoupling Network	CDN ST08A	56527	Feb. 26, 2020	Feb. 25, 2021
TESEQ Coupling Decoupling Network	CDN ST08A	56525	Feb. 26, 2020	Feb. 25, 2021
TESEQ Coupling Decoupling Network	CDN M432S	56519	Feb. 26, 2020	Feb. 25, 2021
TESEQ Coupling Decoupling Network	CDN S751A	56436	Apr. 13, 2020	Apr. 12, 2021
Software	CS_V7.4.2	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in CS Room No. 1.
 3. Tested Date: Jan. 29, 2021

12.5 Test Results

For EN 55024

Input Voltage	48Vdc	Tested by	Thomas Cheng
Environmental Conditions	22 °C, 64% RH	Test Date	2021/1/29
Test mode	Mode 5 & Mode 10		

Frequency (MHz)	Level (Vrms)	Tested Line	Injection Method	Return Path	Observation	Performance Criterion
0.15 – 80	3, 10	DC power	CDN-M2	N/A	Note	A

Note: The EUT function was correct during the test.

For EN 55035

Input Voltage	48Vdc	Tested by	Thomas Cheng
Environmental Conditions	22 °C, 64% RH	Test Date	2021/1/29
Test mode	Mode 5 & Mode 10		

Frequency (MHz)	Level (Vrms)	Tested Line	Injection Method	Return Path	Observation	Performance Criterion
0.15 – 10	3	DC power	CDN-M2	N/A	Note	A
10 – 30	3 – 1	DC power	CDN-M2	N/A	Note	A
30 – 80	1	DC power	CDN-M2	N/A	Note	A
0.15 – 80	10	DC power	CDN-M2	N/A	Note	A

Note: The EUT function was correct during the test.

13 Power Frequency Magnetic Field Immunity Test

13.1 Test Specification

Product Standard: EN 55024
 Basic Standard: EN/IEC 61000-4-8
 Frequency Range: 50Hz
 Field Strength: 1A/m, 3A/m
 Observation Time: 1 minute
 Inductance Coil: Rectangular type, 1 m x 1 m

Product Standard: EN 55035
 Basic Standard: EN/IEC 61000-4-8
 Frequency Range: 50Hz
 Field Strength: 1A/m, 3A/m
 Observation Time: 1 minute
 Inductance Coil: Rectangular type, 1 m x 1 m

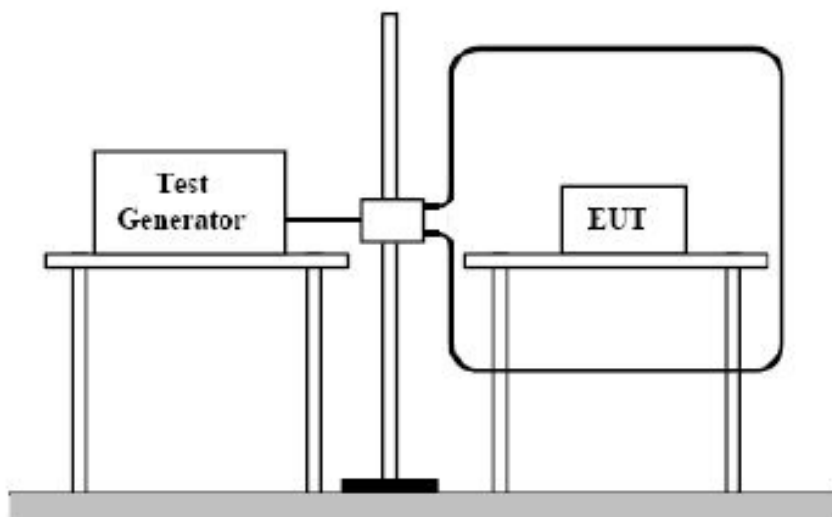
13.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
HAEFELY Magnetic Field Tester	MAG 100	083794-06	NA	NA
COMBINOVA Magnetic Field Meter	MFM10	224	May 7, 2020	May 6, 2021

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in EMS Room No. 1
 3. Tested Date: Jan. 29, 2021

13.3 Test Arrangement

- 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.



TABLETOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

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

13.4 Supplementary Information

The requirement followed by the client's specification. (Refer to item 7.1)

13.5 Test Results

For EN 55024 & EN 55035

Input Voltage	48Vdc	Tested by	Thomas Cheng
Environmental Conditions	22 °C, 69% RH	Test Date	2021/1/29
Test mode	Mode 5 & Mode 10		

Application	Frequency (Hz)	Field Strength (A/m)	Observation	Performance Criterion
X - Axis	50	1	Note	A
Y - Axis	50	1	Note	A
Z - Axis	50	1	Note	A
X - Axis	50	3	Note	A
Y - Axis	50	3	Note	A
Z - Axis	50	3	Note	A

Note: The EUT function was correct during the test.

14 Pictures of Test Arrangements

14.1 Conducted Emission from the Mains Power Port



14.2 Radiated Emission at Frequencies up to 1GHz

Mode 1



Mode 2, Mode 3, Mode 6, Mode 7, Mode 8



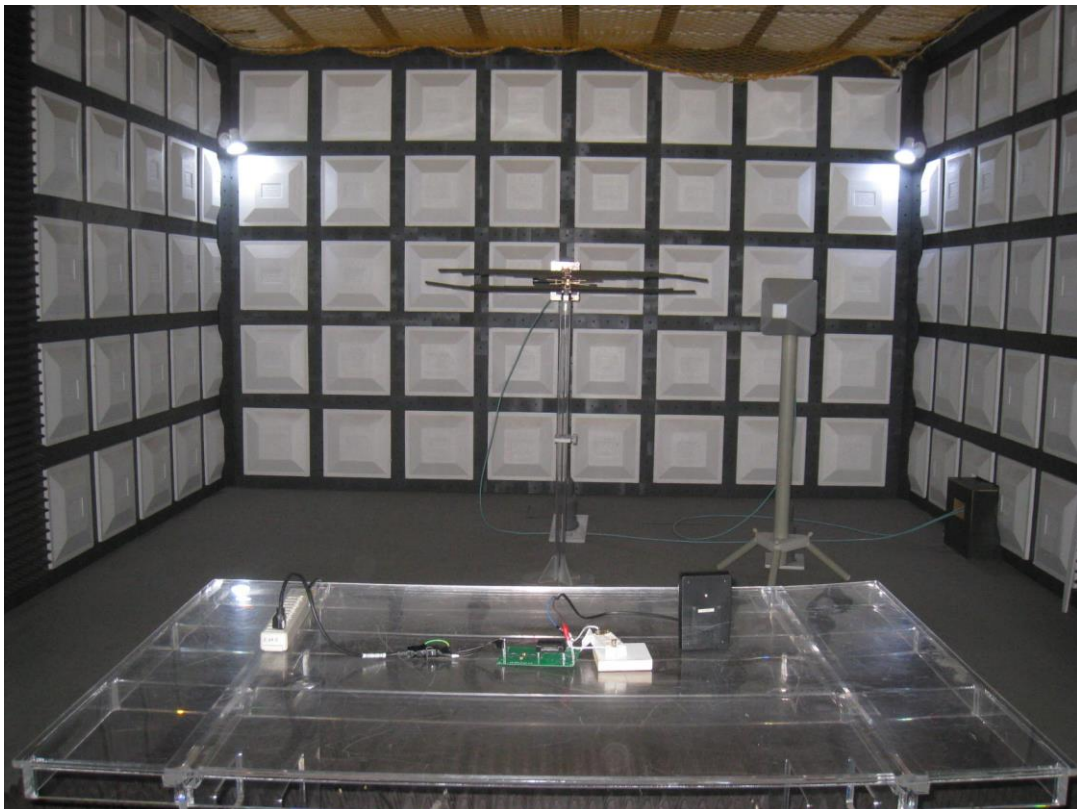
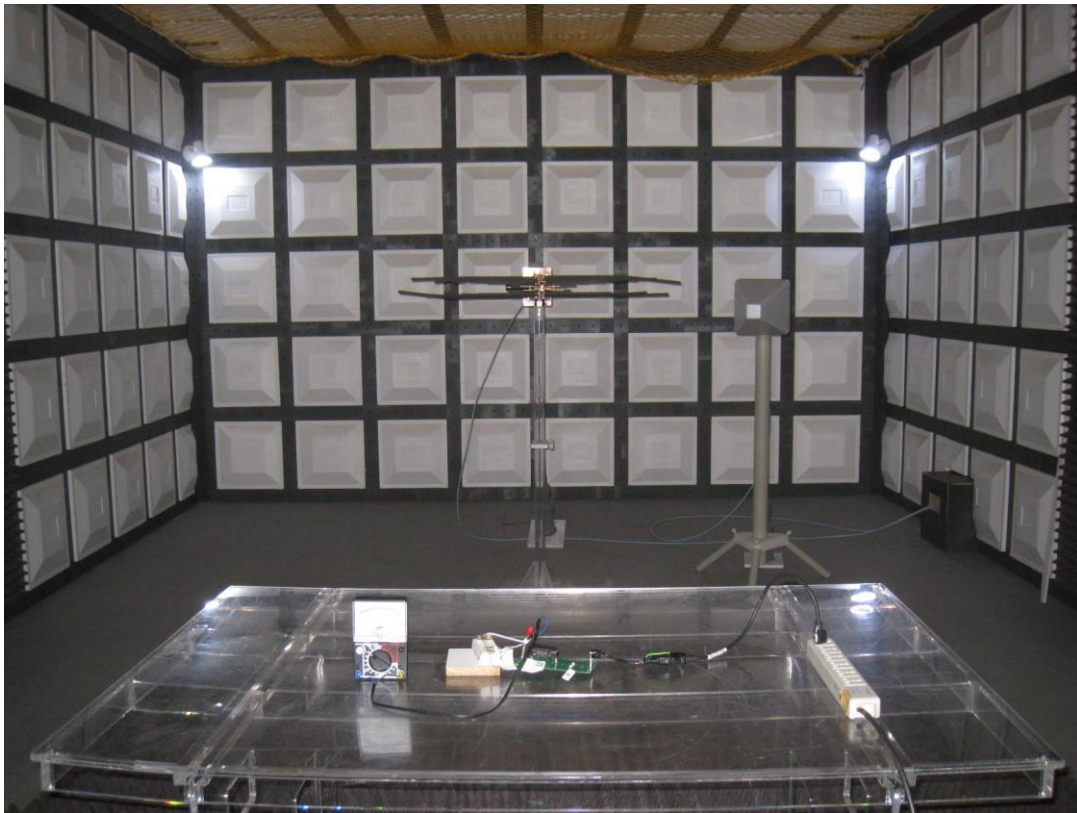
Mode 4, Mode 5, Mode 9, Mode 10



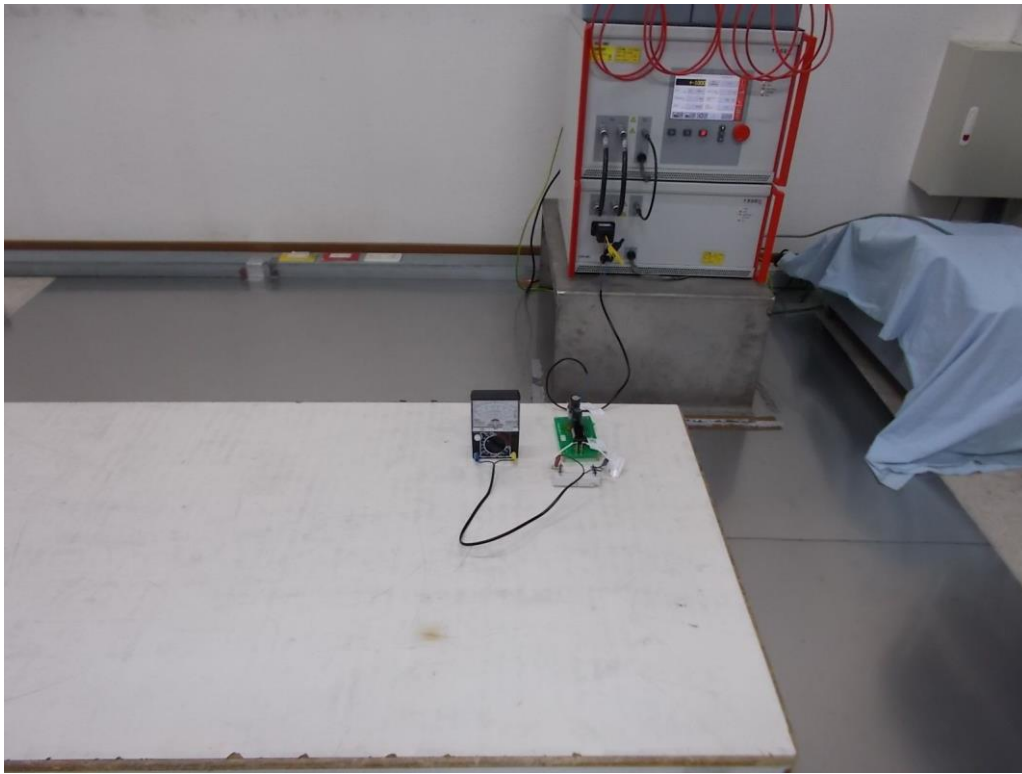
14.3 Electrostatic Discharge Immunity Test (ESD)



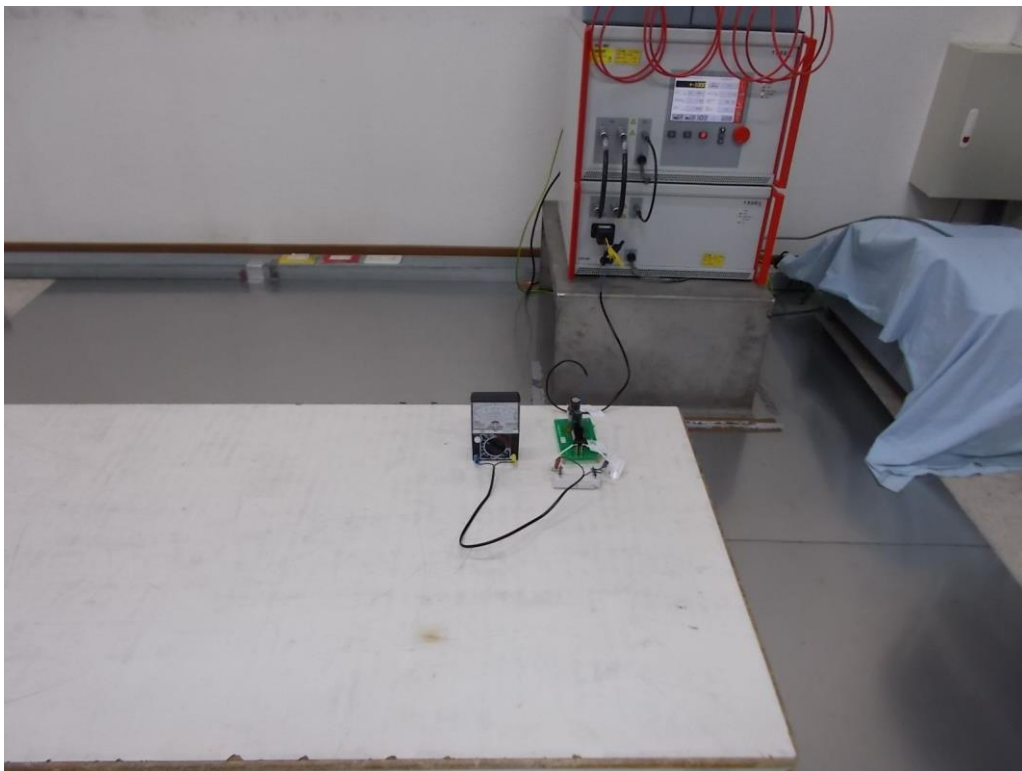
14.4 Radio-frequency, Electromagnetic Field Immunity Test (RS)



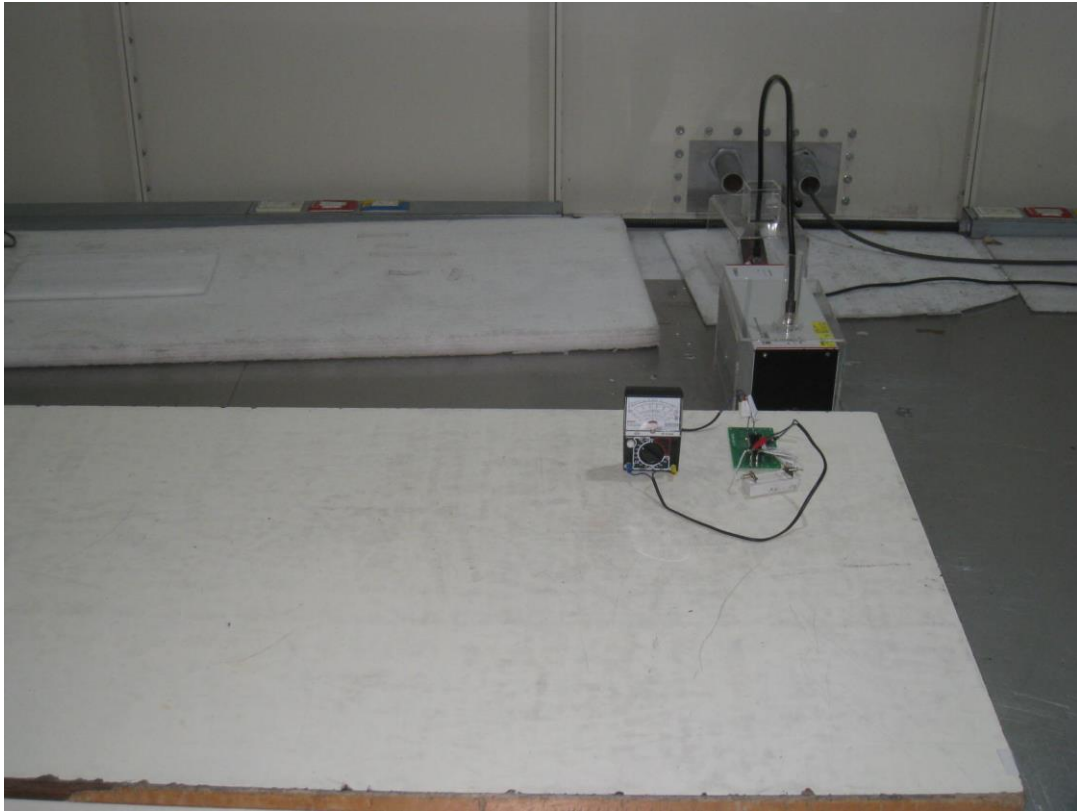
14.5 Electrical Fast Transient/Burst Immunity Test (EFT)



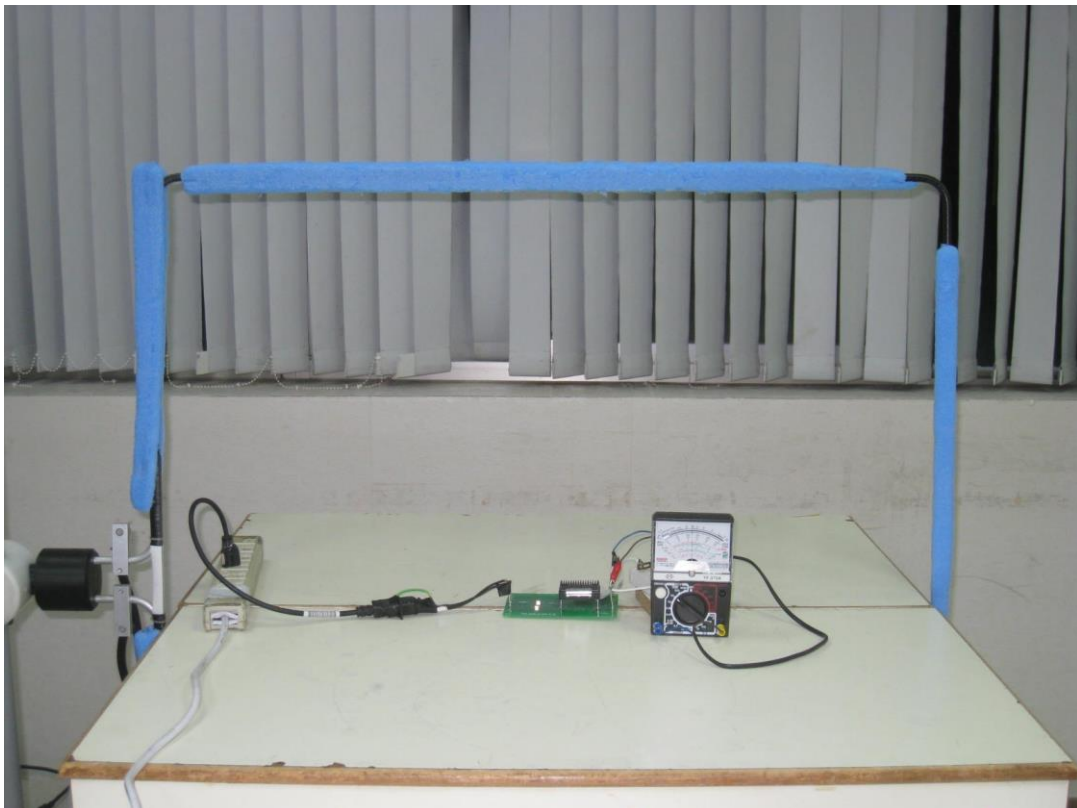
14.6 Surge Immunity Test



14.7 Conducted Disturbances Induced by RF Fields (CS)



14.8 Power Frequency Magnetic Field Immunity Test (PFMF)



Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

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

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

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