



CE Test Report

for

Electromagnetic Compatibility

of

Product : **Industrial Gigabit Layer 2 Unmanaged Ethernet Switch**

Trade Name : N/A

Model Number : VLS-2000 Series,
VLS-2XXXXXXXXXXXXXXXXX ("X" can be 0-9,
A-Z, - or blank for marketing purpose)

Prepared for

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Remark :

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The test result in this report is only subjected to the test sample.



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Statement of Compliance

Applicant: Vecow Co., Ltd.
Manufacturer: Vecow Co., Ltd.
Product: Industrial Gigabit Layer 2 Unmanaged Ethernet Switch
Model No.: VLS-2000 Series, VLS-2XXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z, - or blank for marketing purpose)
Tested Power Voltage: DC 24 V
Date of Final Test: Jul. 06, 2020

Measurement Procedures and Standards Used :

Emission:


EN 55032: 2015+AC: 2016

Immunity:

- EN 55024: 2010+A1: 2015
- IEC 61000-4-2: 2008
- IEC 61000-4-3: 2006+A1: 2007+A2: 2010
- IEC 61000-4-4: 2012
- IEC 61000-4-5: 2014+A1: 2017
- IEC 61000-4-6: 2013+COR1: 2015
- IEC 61000-4-8: 2009
- IEC 61000-4-11: 2004+A1: 2017

The measurement results in this test report were performed at Interocean EMC Technology Corp. the responsibility of measurement result is only subjected to the tested sample. This report shows the EUT is technically compliance with the above official standards. This report shall not be partial reproduced without written approval by Interocean EMC Technology Corporation. Statement of Conformity: Judgment of conformity is based on test result, regardless of measurement uncertainty.

Report Issued: 2022/12/21

Approved: 
Jim Chu



1 General Information

1.1 Description of Equipment Under Test

- Product** : Industrial Gigabit Layer 2 Unmanaged Ethernet Switch
- Model Number** : VLS-2000 Series, VLS-2XXXXXXXXXXXXXXXXX (“X” can be 0-9, A-Z, - or blank for marketing purpose)
- Applicant** : **Vecow Co., Ltd.**
3F., No.10, Jiankang Rd., Zhonghe Dist., New Taipei City
23586, Taiwan
- Manufacturer** : **Vecow Co., Ltd.**
3F., No.10, Jiankang Rd., Zhonghe Dist., New Taipei City
23586, Taiwan
- Power Supply** : 12-58 VDC
- Date of Test** : Jun. 30 ~ Jul. 06, 2020
- Additional Description** : 1.) The test model is “**VLS-2010-2F**” included in this report.
2.) The difference for all models included in this report is only for different marketing purposes.
3.) All the test data presented in this report are the test data of the original file No.: 20A062301E-E.
4.) For more detail specification about EUT, please refer to the user’s manual.



1.2 Details of Tested Supporting System

1.2.1 Link PC

PC40

Model Number : CM6850
CPU Speed : Dual Core Intel Core i7 2600 3.4GHz
RAM : 4GB DDR3 1333MHz
EMC Compliance : CE, C-Tick, NCC, BSMI: R33567
Hard Disk Drive : 1TB Serial ATA3
Manufacturer : ASUS
Switching Power Supply : HBA005
Power Cord : Non-shielded, Detachable, 1.8 m, w/o core

PC42

Model Number : Vostro 470
CPU Speed : Dual Core Intel Core i5 3450 3.10GHz
RAM : 4GB DDR3 1600MHz
EMC Compliance : CE, CCC, BSMI 35737
Serial Number : J4MP3W1
Hard Disk Drive : 500GB Serial ATA3
Manufacturer : DELL
Switching Power Supply : H350PD-01
Power Cord : Non-shielded, Detachable, 1.8 m, w/o core

1.2.2 Test Cable

Power Cable *1 : Non-shielded, Detachable, 1.0 m, w/o core
LAN Cable *6 : Non-shielded, Detachable, 1.0 m, w/o core
LAN Cable *2 : Non-shielded, Detachable, 3.0 m, w/o core
Fiber Cable *1 : Non-shielded, Detachable, 5.0 m, w/o core

**1.3 Summary of Test Results****1.3.1 Test program according EN 55032**

Emission test equipment intended	
<input checked="" type="checkbox"/>	Class A
<input type="checkbox"/>	Class B

Report Clause	Phenomenon	Application	Reference Clause(s)	Reference Standard	Result
	Power Line Conducted Emission	AC Power Port	Annex A.3	CISPR 16-2-1	Not Applicable
2	Asymmetric Mode Conducted Emissions	Wired Network Ports	Annex A.3	CISPR 16-2-1	PASS
	Asymmetric Mode Conducted Emissions	Optical Fibre Ports	Annex A.3	--	Not Applicable
	Asymmetric Mode Conducted Emissions	Broadcast Receiver Tuner Ports	Annex A.3	--	Not Applicable
	Asymmetric Mode Conducted Emissions	Antenna Ports	Annex A.3	--	Not Applicable
	Conducted Differential Voltage Emissions	TV Broadcast Receiver Tuner Ports	Annex A.3	--	Not Applicable
	Conducted Differential Voltage Emissions	RF Modulator Output Ports	Annex A.3	--	Not Applicable
	Conducted Differential Voltage Emissions	FM Broadcast Receiver Tuner Ports	Annex A.3	--	Not Applicable
3	Radiated Emission (Below 1 GHz)	Enclosure Port	Annex A.2	CISPR 16-1-4	PASS
4	Radiated Emission (Above 1 GHz)	Enclosure Port	Annex A.2	CISPR 16-1-4	PASS
	Radiated Emissions (FM Receivers)	Enclosure Port	Annex A.2	CISPR 16-1-4	Not Applicable

1.3.2 Test program according EN 61000-3-2

Report Clause	Phenomenon	Application	Reference Clause	Reference Standard	Result
	Harmonic Current Emissions	AC Power Port	5	--	Not Applicable

1.3.3 Test program according EN 61000-3-3

Report Clause	Phenomenon	Application	Reference Clause	Reference Standard	Result
	Voltage Changes, Voltage Fluctuations and Flicker	AC Power Port	5	--	Not Applicable



1.3.4 Test program according EN 55024

Report Clause	Phenomenon	Application	Reference Clause(s)	Reference Standard	Result
6	Electrostatic Discharge (ESD)	Enclosure Port	4.2.1	IEC 61000-4-2	PASS
7	Radio-Frequency Electromagnetic Field	Enclosure Port	4.2.3.1	IEC 61000-4-3	PASS
8	Fast Transients	DC Power Port Telecommunication Port	4.2.2	IEC 61000-4-4	PASS
9	Surges	DC Power Port Telecommunication Port	4.2.5	IEC 61000-4-5	PASS
10	Radio-Frequency Continuous Conducted	DC Power Port Telecommunication Port	4.2.3.2	IEC 61000-4-6	PASS
11	Power-Frequency Magnetic Field	Enclosure Port	4.2.4	IEC 61000-4-8	PASS
	Voltage Dips and Interruptions	AC Power Port	4.2.6	IEC 61000-4-11	Not Applicable

**1.4 Measurement Uncertainty**

Item	Value
Conduction 1:	
Conducted Emission - AMN (9 kHz to 30 MHz)	3.0 dB
Conducted Emission - AAN (ISN T800) (150 kHz to 30 MHz)	3.3 dB
Conducted Emission - CP (9 kHz to 30 MHz)	3.1 dB
Radiated Emission - LAS (2 m Loop) (9 kHz to 30 MHz)	3.3 dB
Antenna Power (30 MHz to 2150 MHz)	2.1 dB
Conduction 2:	
Conducted Emission - VP (9 kHz to 30 MHz)	2.5 dB
Disturbance Power (30 MHz to 300 MHz)	4.1 dB
OATS 1:	
Radiated Emission Test (30 MHz to 200 MHz)	4.6 dB
Radiated Emission Test (200 MHz to 1 GHz)	4.8 dB
OATS 3:	
Radiated Emission Test (30 MHz to 200 MHz)	4.8 dB
Radiated Emission Test (200 MHz to 1 GHz)	4.8 dB
Chamber 3:	
Radiated Emission Test (9 kHz to 30 MHz)	3.2 dB
Radiated Emission Test (30 MHz to 200 MHz)	4.6 dB
Radiated Emission Test (200 MHz to 1 GHz) (Antenna: without tilting)	5.9 dB
Radiated Emission Test (1 GHz to 6 GHz)	4.9 dB
Induced Current Density (20 kHz to 10 MHz)	1.9 dB
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%	

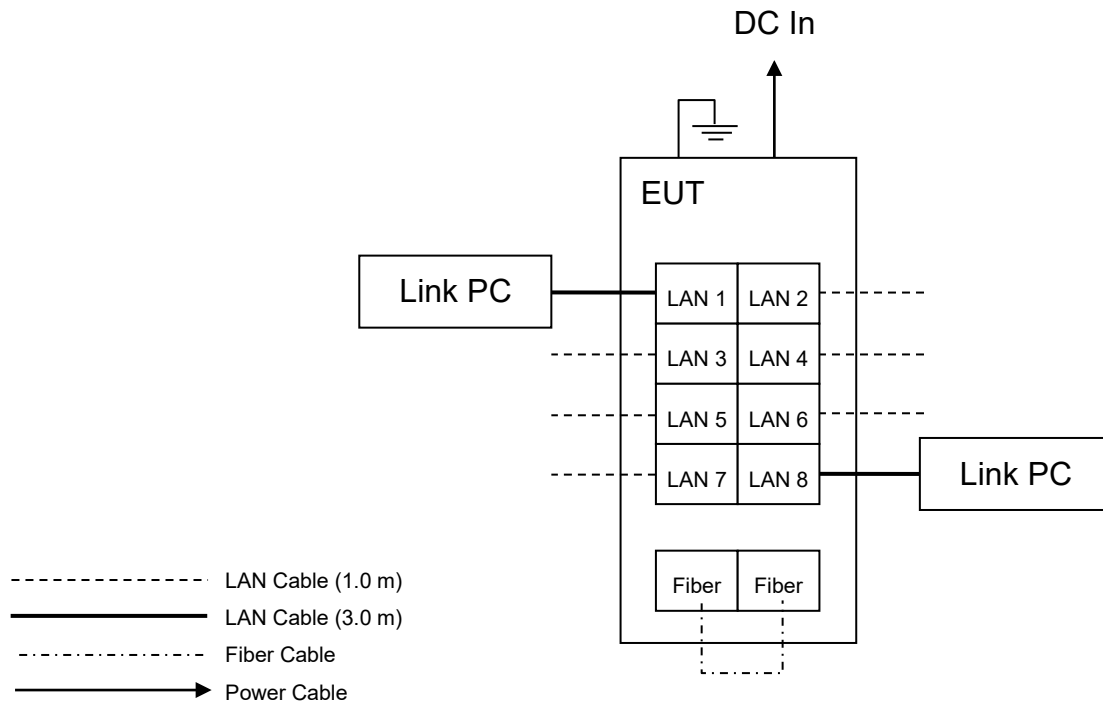
1.5 Measured Mode

1.5.1 The test mode for final test is as following:

- Mode 1: Working Mode (Model No.: VLS-2010-2F)

1.5.2 For signal port test : LAN 1 Port

1.6 Configuration of EUT Setup



1.7 Test Step of EUT

- 1.7.1 Set the EUT and peripheral as above.
- 1.7.2 Turn on the power of all equipments.
- 1.7.3 Let Link PCs ping each other.
- 1.7.4 Confirm all functions are normal.
- 1.7.5 Execute the test.

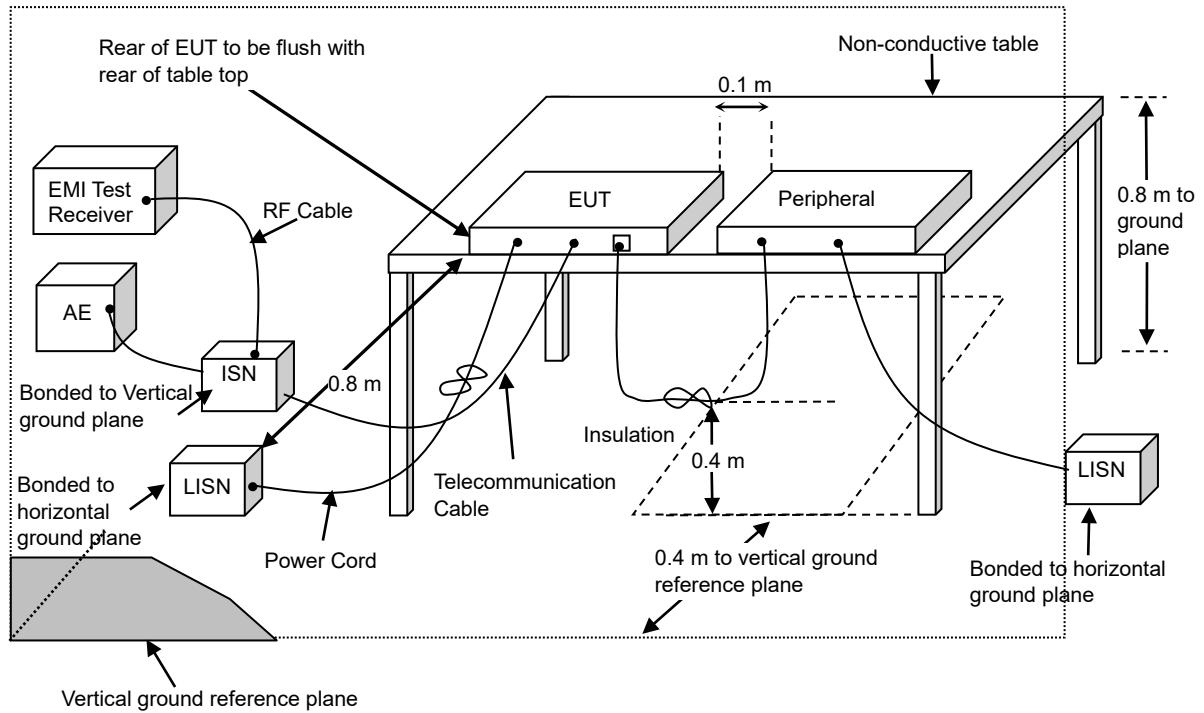
2 Asymmetric Mode Conducted Emission (Wired Network Ports)

2.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100127	2020/11/20
RF Cable	IETC	CBL68	CBL68	2020/07/29
L.I.S.N.	Schwarzbeck	NNLK8121	8121417	2021/03/08
L.I.S.N.	Schaffner	MN2050D	1598	2020/08/15
ISN	TESEQ GmbH	ISN T800	39144	2021/03/08
Measurement Software	AUDIX-e3			

Note: The above equipments are within the valid calibration period.

2.2 Block Diagram of Test Configuration





2.3 Conducted Limit

For Class A equipment

Coupling Device	Frequency Range (MHz)	Voltage Limits dB(μ V)		Current Limits dB(μ A)	
		Q.P. (Quasi-Peak)	A.V. (Average)	Q.P. (Quasi-Peak)	A.V. (Average)
<input checked="" type="checkbox"/> AAN	0.15 – 0.5	97 – 87	84 – 74	N/A	N/A
	0.5 – 30	87	74		
<input type="checkbox"/> Current Probe	0.15 – 0.5	N/A	N/A	53 – 43	40 – 30
	0.5 – 30			43	30

For Class B equipment

Coupling Device	Frequency Range (MHz)	Voltage Limits dB(μ V)		Current Limits dB(μ A)	
		Q.P. (Quasi-Peak)	A.V. (Average)	Q.P. (Quasi-Peak)	A.V. (Average)
<input type="checkbox"/> AAN	0.15 – 0.5	84 – 74	74 – 64	N/A	N/A
	0.5 – 30	74	64		
<input type="checkbox"/> Current Probe	0.15 – 0.5	N/A	N/A	40 – 30	30 – 20
	0.5 – 30			30	20

2.4 Instrument Configuration

- 2.4.1 Set the EMI test receiver frequency range from 150 kHz to 30 MHz.
- 2.4.2 Set the EMI test receiver bandwidth at 9 kHz.
- 2.4.3 Set the EMI test receiver detector as Quasi-Peak (Q.P.) and Average (AV).

2.5 Configuration of Measurement

Measurement procedure using an AAN:

- 2.5.1 Measurement is made at wired network ports using AANs with longitudinal conversion losses as defined in EN 55032 Table C.2. The AAN for the cable category specified by the equipment documentation provided to the user shall be used. The level of emissions from the EUT shall not exceed the applicable limits of EN 55032 Annex A.
- 2.5.2 When emission voltage measurements are performed, the AAN shall provide a voltage measurement port suitable for connection to a measuring receiver while simultaneously satisfying the analogue/digital data port common mode termination impedance requirements.
- 2.5.3 For unscreened cables containing balanced pairs, an AAN conforming to EN 55032 C.4.1.2 shall be used. The LCL values of the AAN shall be within the tolerance given in EN 55032 Table C.2 for an AAN appropriate to the cable category connected to the EUT.

The procedure shall be as follows:

- a) Arrange the EUT, local AE and associated cabling (examples are given EN 55032 Annex D);
- b) Measure the voltage at the measurement port of the AAN;



- c) Correct the measured voltage by adding the AAN voltage division factor (V_{vdf}) defined in EN 55032 C.4.1.2 e);
- d) Compare the corrected voltage with the limit.

Measurement procedure using a combination of current probe:

- 2.5.4 Arrange the EUT, local AE and associated cabling, generally as shown in EN 55032 Figure D.4 or EN 55032 Figure D.5, replacing the CVP in EN 55032 Figure D.4 by a 150 Ω adaptor. The current probe to EUT horizontal distance may be increased to 0.8 m. Alternatively in EN 55032 Figure D.5, the AAN shall be replaced by the 150 Ω adaptor/current probe combination.
- 2.5.5 Break the external protective insulation (exposing the shield) and connect a 150 Ω resistor with a physical connection between the cable screen and the RGP. The 150 Ω resistor shall be ≤ 0.3 m from the outside surface of the screen to ground. For further information refer to EN 55032 G.2.5.
- 2.5.6 Insert a ferrite tube or clamp between the 150 Ω connection and the AE.
- 2.5.7 Measure the current with a current probe and compare to the current limit. Use the procedure given in EN 55032 C.4.1.7 to measure the asymmetric common mode impedance from the 150 Ω resistor towards the AE, which should be much greater than 150 Ω so as not to affect the measurement at frequencies emitted by the EUT.
- 2.5.8 The separation distance between the AE and the ground plane is not critical if the impedance of the ferrite is higher than that given in EN 55032 G.2.5. If this cannot be achieved, then the AE shall be placed at 0.4 m from a vertical or horizontal RGP, as defined for the EUT in Table EN 55032 D.2.

2.6 Test Result

PASS.

The final test data is shown as following pages.

Factor = Insertion Loss + Cable Loss

Level = Reading + Factor

Margin = Level - Limit



Telecommunication Ports Conducted Emission Test Data

CLIENT: Vecow Co., Ltd.

OPERATOR: Ivan

EUT: Industrial Gigabit Layer 2 Unmanaged Ethernet Switch

TEST SITE: Conducted 1

MODEL: VLS-2010-2F

POLARIZATION: ISN

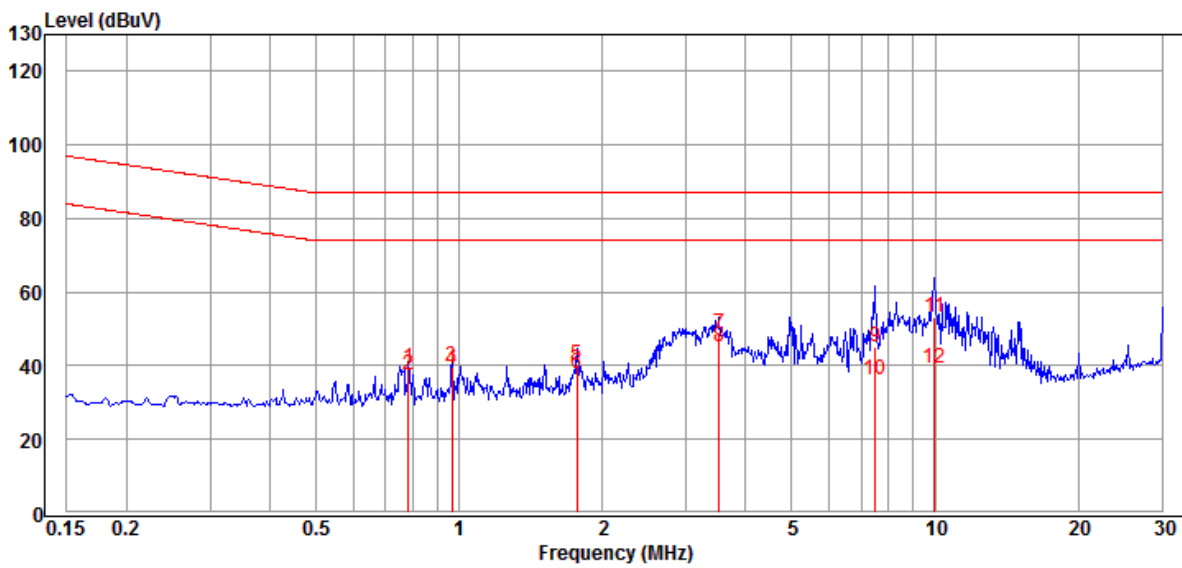
RATING: DC 24 V

TEMP/HUM: 26.8°C / 44%

COMMENT: Test Mode: Mode 1: Working Mode (Model No.: VLS-2010-2F)(LAN 1 Port Speed: 10 Mbps)

Data:9

2020-07-01



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.7835	19.61	19.70	39.31	87.00	-47.69	QP
2	0.7835	17.94	19.70	37.64	74.00	-36.36	Average
3	0.9684	20.15	19.68	39.83	87.00	-47.17	QP
4	0.9684	19.04	19.68	38.72	74.00	-35.28	Average
5	1.7720	20.74	19.68	40.42	87.00	-46.58	QP
6	1.7720	18.13	19.68	37.81	74.00	-36.19	Average
7	3.5280	28.92	19.68	48.60	87.00	-38.40	QP
8	3.5280	25.46	19.68	45.14	74.00	-28.86	Average
9	7.4860	25.33	19.66	44.99	87.00	-42.01	QP
10	7.4860	16.62	19.66	36.28	74.00	-37.72	Average
11	9.9660	33.41	19.66	53.07	87.00	-33.93	QP
12	9.9660	19.53	19.66	39.19	74.00	-34.81	Average



Telecommunication Ports Conducted Emission Test Data

CLIENT: Vecow Co., Ltd.

OPERATOR: Ivan

EUT: Industrial Gigabit Layer 2 Unmanaged Ethernet Switch

TEST SITE: Conducted 1

MODEL: VLS-2010-2F

POLARIZATION: ISN

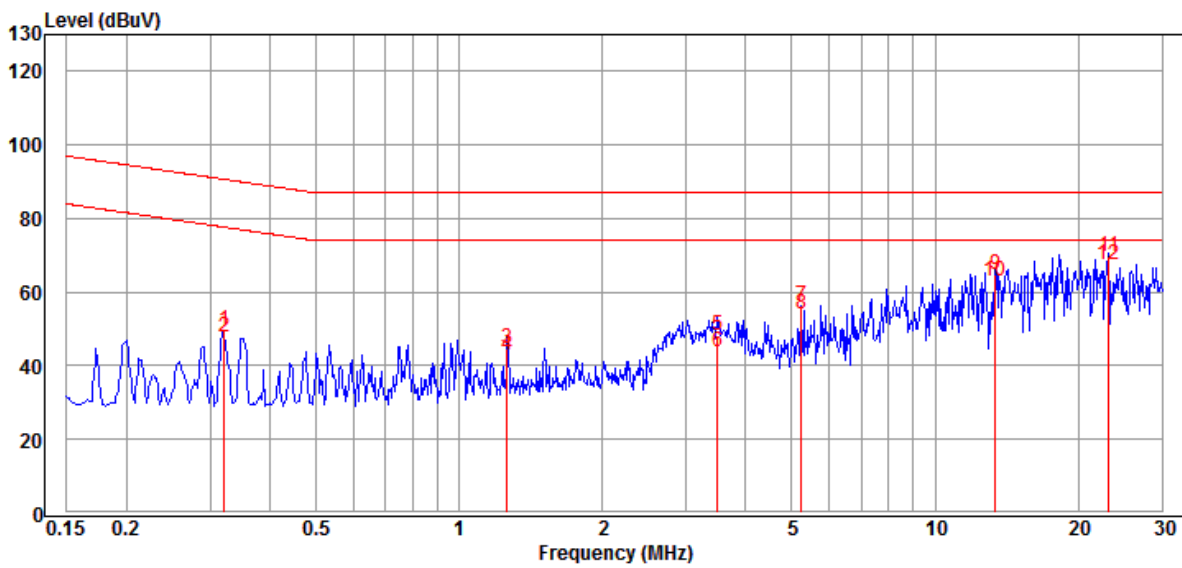
RATING: DC 24 V

TEMP/HUM: 26.8°C / 44%

COMMENT: Test Mode: Mode 1: Working Mode (Model No.: VLS-2010-2F)(LAN 1 Port Speed: 100 Mbps)

Data:8

2020-07-01



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.3217	29.82	19.86	49.68	90.66	-40.98	QP
2	0.3217	28.07	19.86	47.93	77.66	-29.73	Average
3	1.2620	24.79	19.68	44.47	87.00	-42.53	QP
4	1.2620	23.34	19.68	43.02	74.00	-30.98	Average
5	3.4910	28.73	19.68	48.41	87.00	-38.59	QP
6	3.4910	24.12	19.68	43.80	74.00	-30.20	Average
7	5.2490	36.79	19.67	56.46	87.00	-30.54	QP
8	5.2490	34.28	19.67	53.95	74.00	-20.05	Average
9	13.4080	45.11	19.71	64.82	87.00	-22.18	QP
10	13.4080	43.14	19.71	62.85	74.00	-11.15	Average
11	23.1400	49.58	20.11	69.69	87.00	-17.31	QP
12	23.1400	47.31	20.11	67.42	74.00	-6.58	Average



Telecommunication Ports Conducted Emission Test Data

CLIENT: Vecow Co., Ltd.

OPERATOR: Ivan

EUT: Industrial Gigabit Layer 2 Unmanaged Ethernet Switch

TEST SITE: Conducted 1

MODEL: VLS-2010-2F

POLARIZATION: ISN

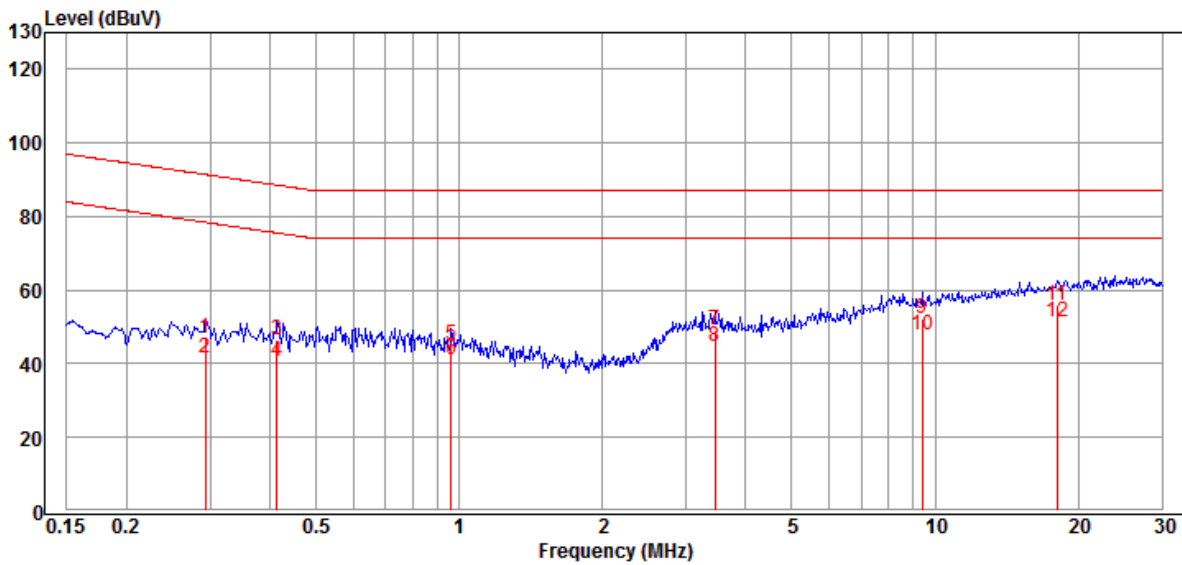
RATING: DC 24 V

TEMP/HUM: 26.8°C / 44%

COMMENT: Test Mode: Mode 1: Working Mode (Model No.: VLS-2010-2F)(LAN 1 Port Speed: 1 Gbps)

Data:7

2020-07-01



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.2940	26.94	19.88	46.82	91.41	-44.59	QP
2	0.2940	21.75	19.88	41.63	78.41	-36.78	Average
3	0.4149	26.65	19.80	46.45	88.55	-42.10	QP
4	0.4149	21.06	19.80	40.86	75.55	-34.69	Average
5	0.9633	25.43	19.68	45.11	87.00	-41.89	QP
6	0.9633	21.38	19.68	41.06	74.00	-32.94	Average
7	3.4540	29.64	19.69	49.33	87.00	-37.67	QP
8	3.4540	25.21	19.69	44.90	74.00	-29.10	Average
9	9.4010	32.51	19.66	52.17	87.00	-34.83	QP
10	9.4010	28.31	19.66	47.97	74.00	-26.03	Average
11	18.0390	35.85	19.89	55.74	87.00	-31.26	QP
12	18.0390	31.51	19.89	51.40	74.00	-22.60	Average

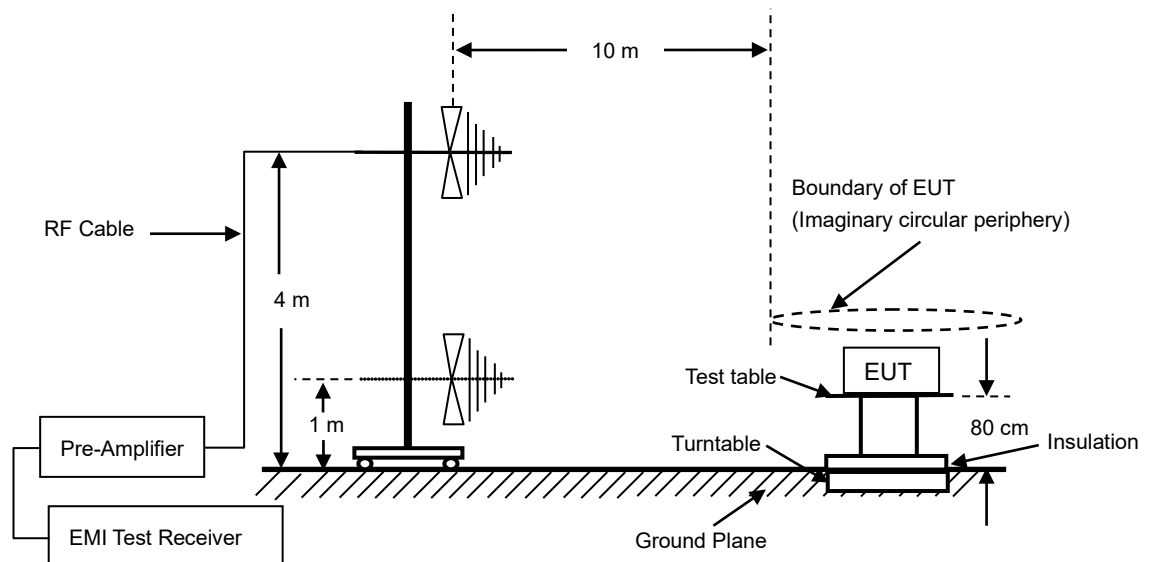
3 Radiated Emission (Below 1 GHz)

3.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCS30	830245/027	2021/06/03
Biconical Antenna	Schwarzbeck	VHA 9103 & BBA 9106	VHA 9103-2418	2020/08/14
Log Antenna	Schwarzbeck	UHALP 9108-A	9108-A 0739	2020/08/14
Pre-Amplifier	Agilent	8447D	2944A09703	2020/07/29
RF Cable	EMCI	EMC8D-NM-NM-25000	140105	2020/07/29
RF Cable	Mini-Circuits	CBL-3FL-NMNM	CBL56	2020/07/29
Measurement Software	AUDIX-e3			

Note: The above equipments are within the valid calibration period.

3.2 Block Diagram of Test Configuration



3.3 Radiated Limits

Frequency (MHz)	<input checked="" type="checkbox"/> Class A	<input type="checkbox"/> Class B
	Quasi-Peak dB(μ V/m)	Quasi-Peak dB(μ V/m)
30 to 230	40.0	30.0
230 to 1000	47.0	37.0



3.4 Instrument Configuration

- 3.4.1 Set the EMI test receiver frequency range from 30 MHz to 1000 MHz.
- 3.4.2 Set the EMI test receiver bandwidth at 120 kHz.
- 3.4.3 Set the EMI test receiver detector as Quasi-Peak (Q.P.).

3.5 Configuration of Measurement

- 3.5.1 The EUT was placed on a non-conductive table whose total height equaled 80 cm. The turntable can rotate 360 degree to determine the position of the maximum emission level.
- 3.5.2 The central point of the arrangement shall be positioned at the centre of the turntable. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level.
- 3.5.3 The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.
- 3.5.4 The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

3.6 Test Result

PASS.

The final test data is shown as following pages.

Factor = Antenna Factor + Cable Loss - Preamplifier Gain

Level = Reading + Factor

Margin = Level - Limit



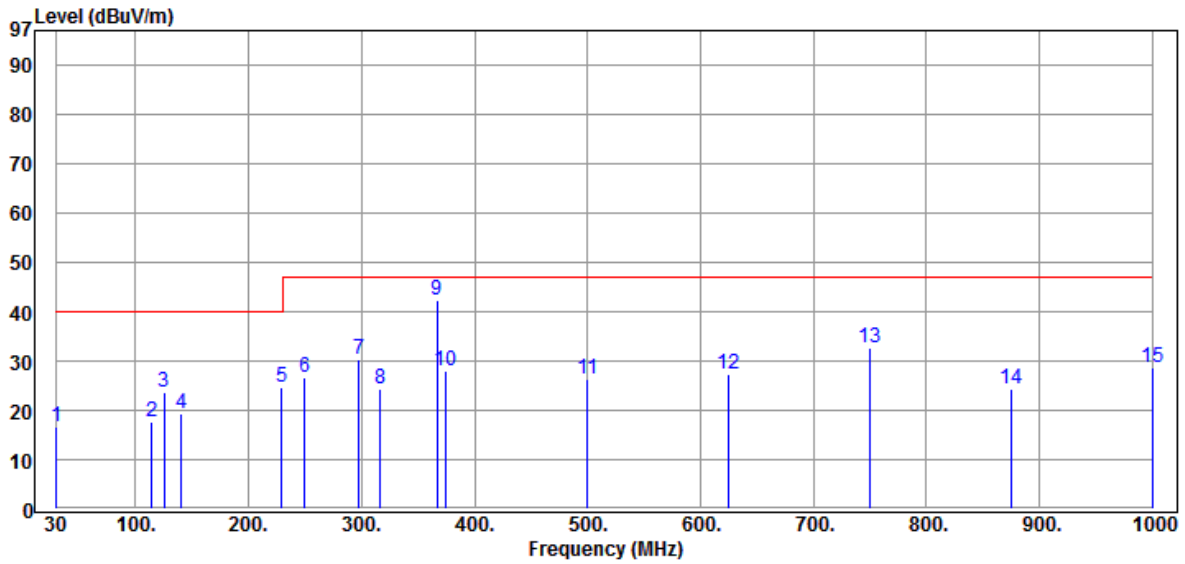
Radiated Emission Measurement Data

CLIENT: Vecow Co., Ltd.
 EUT: Industrial Gigabit Layer 2 Unmanaged Ethernet Switch
 MODEL: VLS-2010-2F
 RATING: DC 24 V
 COMMENT: Test Mode: Mode 1: Working Mode (Model No.: VLS-2010-2F)

OPERATOR : Sam
 TEST SITE : OATS 1
 TEST DISTANCE : 10 m
 POLARIZATION : HORIZONTAL
 TEMP/HUM : 26.6°C / 55%

Data:12

2020-07-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	30.000	27.40	-10.77	16.63	40.00	-23.37	QP
2	114.240	33.50	-15.94	17.56	40.00	-22.44	QP
3	124.998	38.39	-14.74	23.65	40.00	-16.35	QP
4	140.684	32.70	-13.49	19.21	40.00	-20.79	QP
5	229.374	35.21	-10.68	24.53	40.00	-15.47	QP
6	249.996	36.10	-9.42	26.68	47.00	-20.32	QP
7	297.874	37.59	-7.17	30.42	47.00	-16.58	QP
8	316.800	36.50	-12.03	24.47	47.00	-22.53	QP
9	367.183	53.40	-10.91	42.49	47.00	-4.51	QP
10	374.995	38.50	-10.57	27.93	47.00	-19.07	QP
11	500.000	34.10	-7.82	26.28	47.00	-20.72	QP
12	624.990	32.30	-4.86	27.44	47.00	-19.56	QP
13	749.988	35.40	-2.78	32.62	47.00	-14.38	QP
14	874.986	24.65	-0.41	24.24	47.00	-22.76	QP
15	999.983	27.40	1.39	28.79	47.00	-18.21	QP

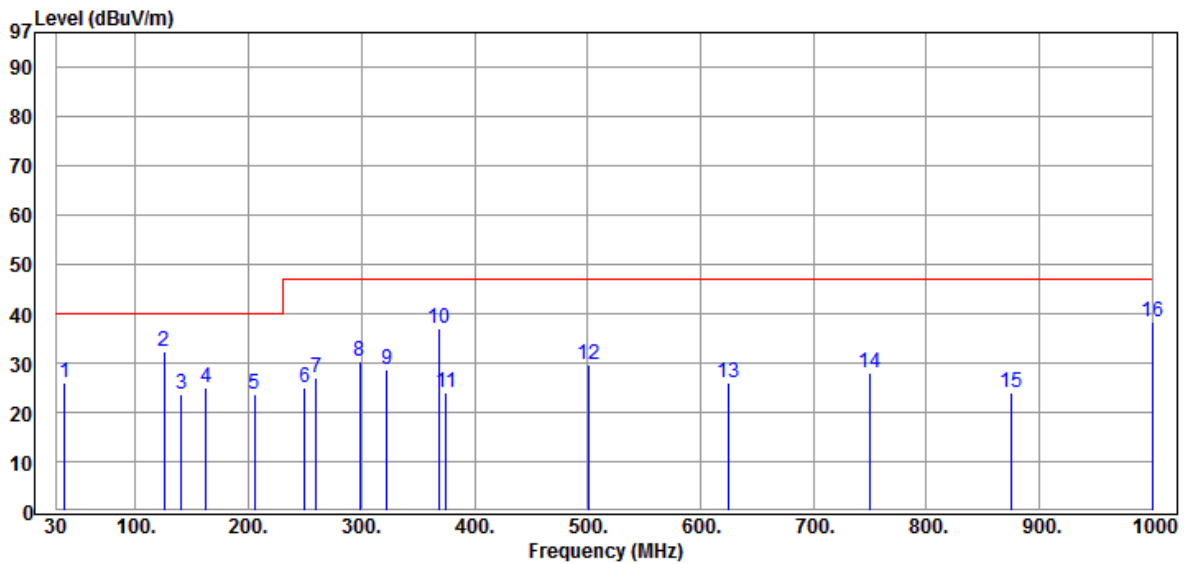


Radiated Emission Measurement Data

CLIENT: Vecow Co., Ltd.	OPERATOR : Sam
EUT: Industrial Gigabit Layer 2 Unmanaged Ethernet Switch	TEST SITE : OATS 1
MODEL: VLS-2010-2F	TEST DISTANCE : 10 m
RATING: DC 24 V	POLARIZATION : VERTICAL
COMMENT: Test Mode: Mode 1: Working Mode (Model No.: VLS-2010-2F)	TEMP/HUM : 26.6°C / 55%

Data:11

2020-07-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	37.022	39.40	-13.25	26.15	40.00	-13.85	QP
2	124.998	47.09	-14.74	32.35	40.00	-7.65	QP
3	140.700	37.21	-13.49	23.72	40.00	-16.28	QP
4	162.300	37.41	-12.44	24.97	40.00	-15.03	QP
5	204.960	34.30	-10.64	23.66	40.00	-16.34	QP
6	249.996	34.30	-9.42	24.88	47.00	-22.12	QP
7	260.097	36.40	-9.26	27.14	47.00	-19.86	QP
8	298.325	37.40	-7.14	30.26	47.00	-16.74	QP
9	322.807	40.30	-11.80	28.50	47.00	-18.50	QP
10	369.145	47.71	-10.83	36.88	47.00	-10.12	QP
11	374.990	34.50	-10.57	23.93	47.00	-23.07	QP
12	500.500	37.40	-7.80	29.60	47.00	-17.40	QP
13	624.988	30.80	-4.86	25.94	47.00	-21.06	QP
14	749.870	30.90	-2.78	28.12	47.00	-18.88	QP
15	874.986	24.50	-0.41	24.09	47.00	-22.91	QP
16	999.984	36.80	1.39	38.19	47.00	-8.81	QP

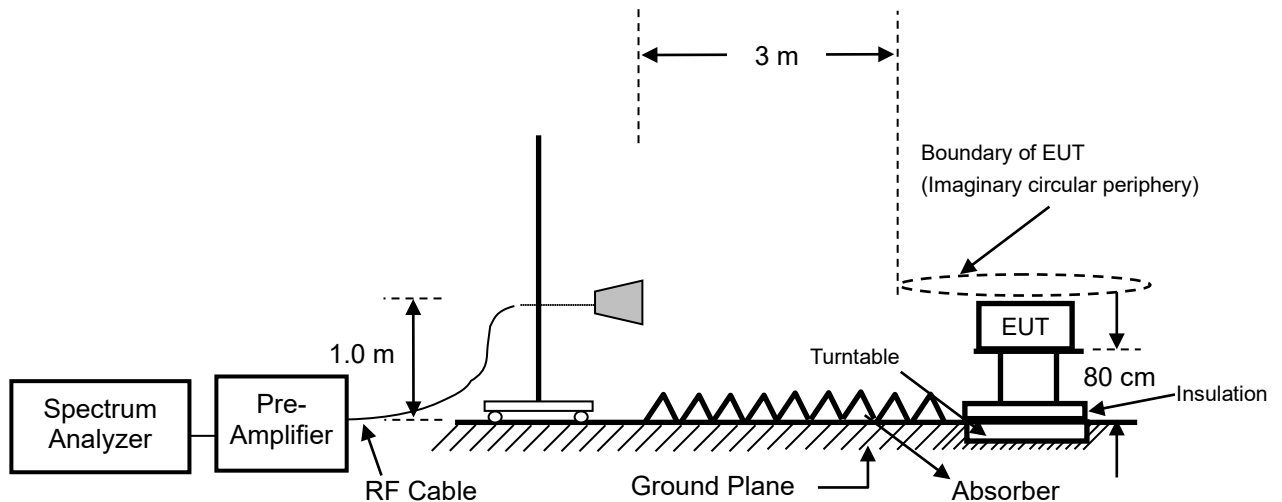
4 Radiated Emission (Above 1 GHz)

4.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSP40	100478	2020/08/01
Horn Antenna	Schwarzbeck	BBHA9120	9120D-1051	2020/08/19
Pre-Amplifier	EMCI	EMC 051845	980110	2020/08/18
RF Cable	HARBOUR	27478LL142	CBL65	2020/07/29
RF Cable	Marvelous Microwave	MCBL-LL266.50	CBL70	2020/07/29
Measurement Software	AUDIX-e3			

Note: The above equipments are within the valid calibration period.

4.2 Block Diagram of Test Configuration



4.3 Radiated Limit

Frequency (GHz)	<input checked="" type="checkbox"/> Class A		<input type="checkbox"/> Class B	
	Peak dB(μV/m)	Average dB(μV/m)	Peak dB(μV/m)	Average dB(μV/m)
1 to 3	76	56	70	50
3 to 6	80	60	74	54

4.4 Instrument Configuration

- 4.4.1 Set the EMI test Spectrum frequency range above 1 GHz.
- 4.4.2 Set the EMI test Spectrum bandwidths above 1 GHz are at 1 MHz for peak value and average value.
- 4.4.3 All readings of the test Spectrum detector above 1 GHz are average value.



4.5 Configuration of Measurement

- 4.5.1 The EUT was set 3 meters for measuring frequency above 1 GHz away from the receiving antenna that was mounted on a non-conductive mast.
- 4.5.2 The antenna set at 1 meter height and EUT was placed on a non-conductive table whose total height equaled 80cm. The turntable can rotate 360 degree to determine the position of the maximum emission level.
- 4.5.3 The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.
- 4.5.4 The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

4.6 Test Result

PASS.

The final test data is shown as following pages.

Factor = Antenna Factor + Cable Loss - Preamplifier Gain

Level = Reading + Factor

Margin = Level - Limit



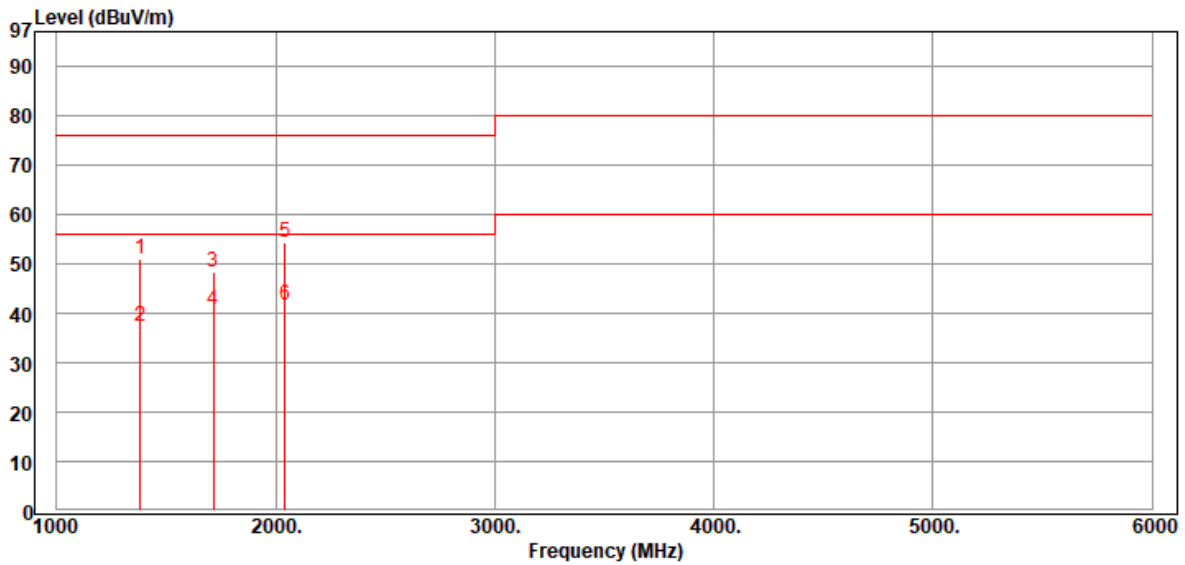
Radiated Emission Measurement Data

CLIENT: Vecow Co., Ltd.
EUT: Industrial Gigabit Layer 2 Unmanaged Ethernet Switch
MODEL: VLS-2010-2F
RATING: DC 24 V
COMMENT: Test Mode: Mode 1: Working Mode (Model No.: VLS-2010-2F)

OPERATOR : Scott
TEST SITE : Chamber 3
TEST DISTANCE : 3 m
POLARIZATION : HORIZONTAL
TEMP/HUM : 30.6°C/ 44%

Data:23

2020-06-30



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	1383.000	62.74	-11.74	51.00	76.00	-25.00	Peak
2	1383.000	49.16	-11.74	37.42	56.00	-18.58	Average
3	1717.000	60.58	-12.26	48.32	76.00	-27.68	Peak
4	1717.000	52.91	-12.26	40.65	56.00	-15.35	Average
5	2043.000	64.98	-10.69	54.29	76.00	-21.71	Peak
6	2043.000	52.43	-10.69	41.74	56.00	-14.26	Average

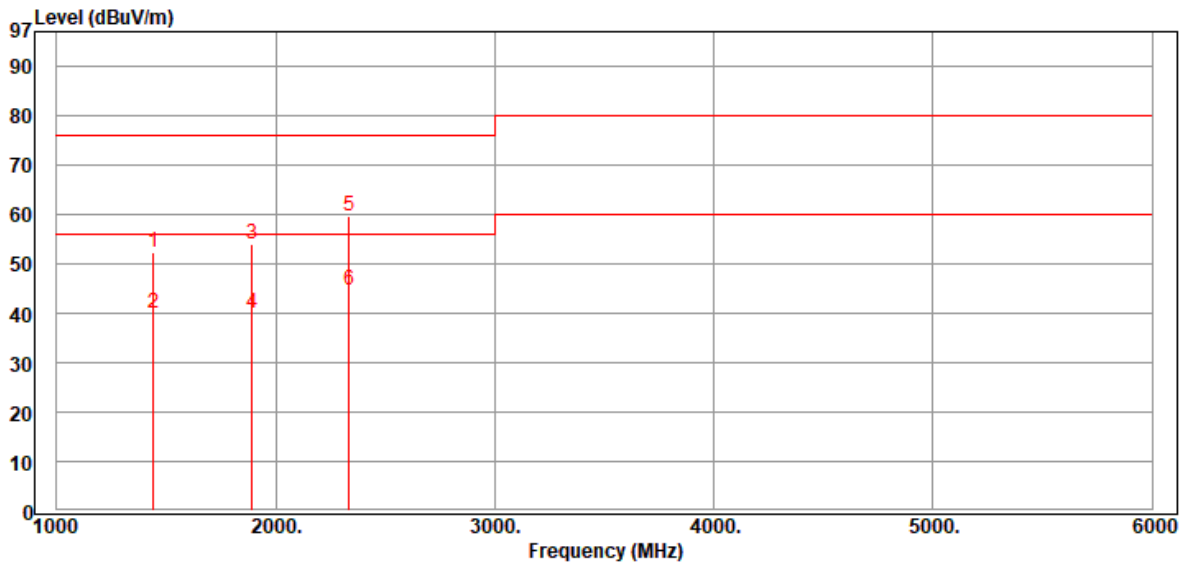


Radiated Emission Measurement Data

CLIENT: Vecow Co., Ltd.	OPERATOR	: Scott
EUT: Industrial Gigabit Layer 2 Unmanaged Ethernet Switch	TEST SITE	: Chamber 3
MODEL: VLS-2010-2F	TEST DISTANCE	: 3 m
RATING: DC 24 V	POLARIZATION	: VERTICAL
COMMENT: Test Mode: Mode 1: Working Mode (Model No.: VLS-2010-2F)	TEMP/HUM	: 30.6°C/ 44%

Data:24

2020-06-30



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	1442.000	63.96	-11.66	52.30	76.00	-23.70	Peak
2	1442.000	51.60	-11.66	39.94	56.00	-16.06	Average
3	1893.000	65.51	-11.62	53.89	76.00	-22.11	Peak
4	1893.000	51.71	-11.62	40.09	56.00	-15.91	Average
5	2335.000	68.51	-8.88	59.63	76.00	-16.37	Peak
6	2335.000	53.40	-8.88	44.52	56.00	-11.48	Average



5 Performance Criteria of Immunity Test

5.1 EN 55024

General performance criteria	
Criterion	Description
A	During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT 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 EUT if used as intended.
B	After the test, the EUT 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 EUT 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 EUT if used as intended.
C	During and after testing, a temporary loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls or cycling of the power to the EUT by the user in accordance with the manufacturer's instructions.
Particular performance criteria	
<p>The particular performance criteria which are specified in the normative annexes B~H take precedence over the corresponding parts of the general performance criteria.</p> <p>Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.</p> <p>Annex B Data processing equipment: (Read, write and storage of data; Data display; Data input; Data printing; Data processing)</p> <p>Annex C Local area networks (LAN)</p> <p>Annex D Printers and plotters</p> <p>Annex E Copying machines</p> <p>Annex F Automatic teller machines (ATM)</p> <p>Annex G Point of sale terminals (POST)</p> <p>Annex H xDSL Terminal equipment</p>	

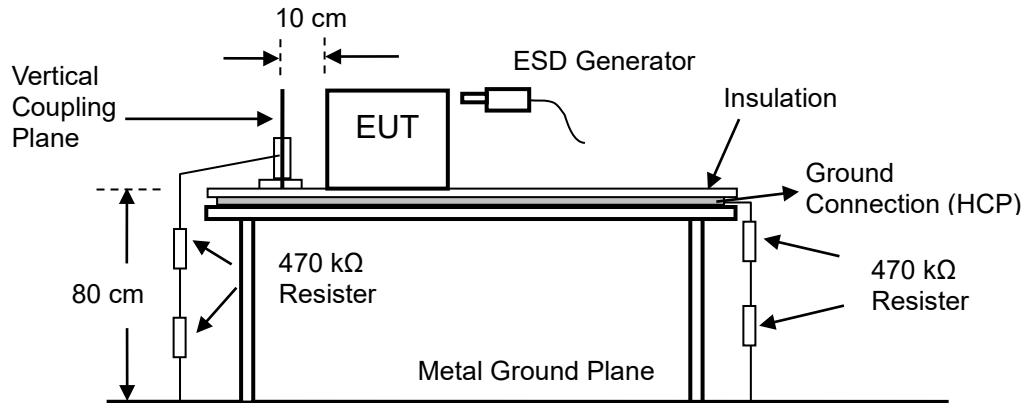
6 Electrostatic Discharge Immunity Test (IEC 61000-4-2)

6.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
ESD Simulator	EMC PARTNER	ESD3000	276	2021/03/05

Note: The above equipments are within the valid calibration period.

6.2 Block Diagram of Test Configuration



6.3 Test Requirement

IEC 61000-4-2 (EN 55024) require:

Air discharge: ± 8 kV

Contact discharge: ± 4 kV

Performance criterion: **B**

6.4 Configuration of Measurement

6.4.1 The test setup consists of the test generator, EUT and auxiliary instrumentation necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- Contact discharge to the conductive surfaces and to coupling planes;
- Air discharge at insulating surfaces.

6.4.2 The EUT shall be arranged in accordance with the manufacturer's instructions for installation.

6.5 Test Result

PASS.

The performance criterion after tested EN 55024:

Temperature: 26.3 °C ; Humidity: 44 % ; Atmospheric: 997 hPa ; Test Engineer: Ivan

Air discharge ± 2 kV, ± 4 kV, ± 8 kV:	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C
Contact discharge ± 2 kV, ± 4 kV:	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C
Indirect discharge (HCP) ± 2 kV, ± 4 kV:	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C
Indirect discharge (VCP) ± 2 kV, ± 4 kV:	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C

Note: Criterion B denotes loss of packets during test and auto-recovery after test.

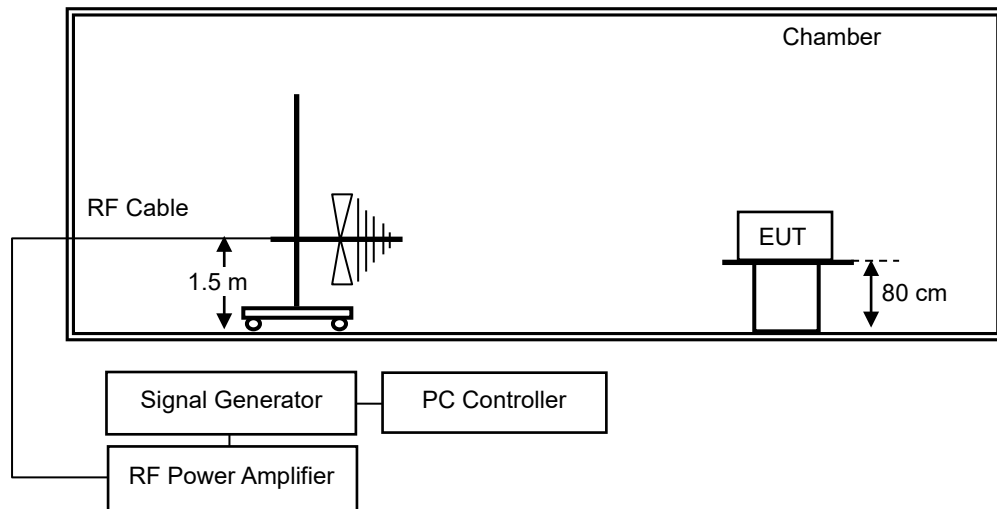
7 Radio-frequency, Electromagnetic field Immunity Test (IEC 61000-4-3)

7.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Signal Generator	KEYSIGHT	N5171B	MY53051802	2021/03/03
Power Amplifier	R&K	A080M102-5555R	B30850	2021/04/18
Log Antenna	Schwarzbeck	VULP 9118 G Special	9118GS912	2021/04/18

Note: The above equipments are within the valid calibration period.

7.2 Block Diagram of Test Configuration



7.3 Test Requirement

IEC 61000-4-3 (EN 55024) require:

The frequency steps: 1 %, Log sweep, Dwell time: 3.0 sec.

Frequency range: **80 to 1000** MHz, Field strength: **3** V/m, 80 % AM (1 kHz)

Performance criterion: **A**

7.4 Configuration of Measurement

- 7.4.1 Before testing, the intensity of the established field strength was checked by placing the field sensor at a calibration grid point, and with the field generating antenna and cables in the same positions as used for the calibration, the forward and reverse power were measured. The forward power needed to give the calibrated field was evaluated.
- 7.4.2 The EUT was placed on a non-metallic table 0.8m above the reference ground plane (RGP) and was operated according to its specified operating mode.
- 7.4.3 Ferrite tiles/ absorbers were placed on the RGP between the EUT and the antenna to reduce the reflections from the RGP.
- 7.4.4 The distance between antenna and EUT is 1 meter.



7.5 Test Result

PASS.

The performance criterion after tested EN 55024:

Temperature: 27.3 °C ; Humidity: 52 % ; Atmospheric: 996 hPa ; Test Engineer: Scott

Frequency range: 80 to 1000 MHz, Field strength: 3 V/m, 80 % AM (1 kHz)

Performance criterion: A B C

8 Electrical Fast Transient/Burst Immunity Test (IEC 61000-4-4)

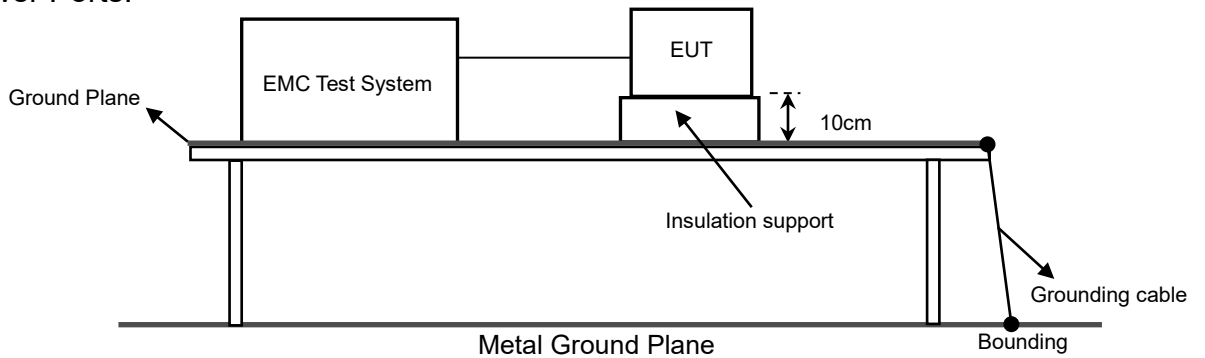
8.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMC Test System	EMC PARTNER	TRANSIENT-2000	812	2021/02/05
Injection Clamp	EMC PARTNER	CN-EFT1000	497	2021/02/05

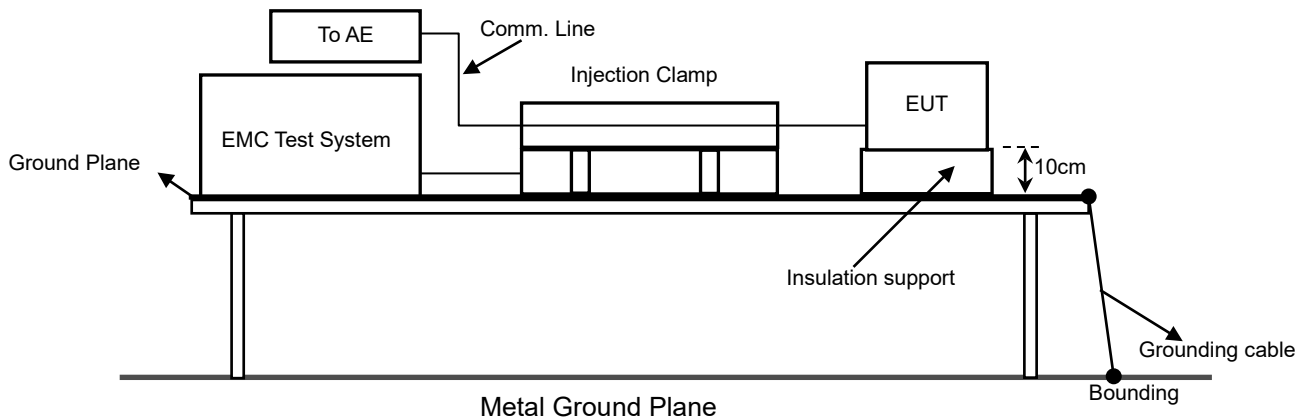
Note: The above equipments are within the valid calibration period.

8.2 Block Diagram of Test Configuration

For Power Ports.



For Signal/Telecommunication Ports.



8.3 Test Requirement

IEC 61000-4-4 (EN 55024) require:

5 kHz Repetition frequency

± 1.0 kV Input AC power ports.

± 0.5 kV Input DC power ports.

± 0.5 kV Signal ports.

± 0.5 kV Telecommunication ports.

Performance criterion: **B**



8.4 Configuration of Measurement

- 8.4.1 The EUT and the auxiliary equipment were placed on a wooden table of 0.8 meters height. The size of ground plane is greater than 1 m×1 m and project beyond the EUT by at least 0.1 m on all sides. The ground plane is connected to the protective earth.
- 8.4.2 The EUT was connected to the power mains through a coupling device that directly couples the EFT interference signal. Each of the Line, Neutral and Protective Earth (PE) conductors was impressed with burst noise for 1 minute. Both the voltage polarities were applied for each test level. The length of the signal and power lines between the coupling device and the EUT shall be 0.5 m ± 0.05 m.

8.5 Test Result

PASS.

The performance criterion after tested EN 55024:

Temperature: 25.9 °C ; Humidity: 44 % ; Atmospheric: 997 hPa ; Test Engineer: Ivan

- ☒ ± 0.5 kV Input DC power port: Line
Performance criterion: ☒ **A** ☐ **B** ☐ **C**
- ☒ ± 0.5 kV Input DC power port: Neutral
Performance criterion: ☒ **A** ☐ **B** ☐ **C**
- ☒ ± 0.5 kV Input DC power port: Line + Neutral
Performance criterion: ☒ **A** ☐ **B** ☐ **C**
- ☒ ± 0.5 kV Input DC power port: PE
Performance criterion: ☒ **A** ☐ **B** ☐ **C**
- ☒ ± 0.5 kV Input DC power port: Line + PE
Performance criterion: ☒ **A** ☐ **B** ☐ **C**
- ☒ ± 0.5 kV Input DC power port: Neutral + PE
Performance criterion: ☒ **A** ☐ **B** ☐ **C**
- ☒ ± 0.5 kV Input DC power port: Line + Neutral + PE
Performance criterion: ☒ **A** ☐ **B** ☐ **C**
- ☒ ± 0.5 kV Telecommunication port: LAN 1 Port
Performance criterion: ☒ **A** ☐ **B** ☐ **C**



9 Surge Immunity Test (IEC 61000-4-5)

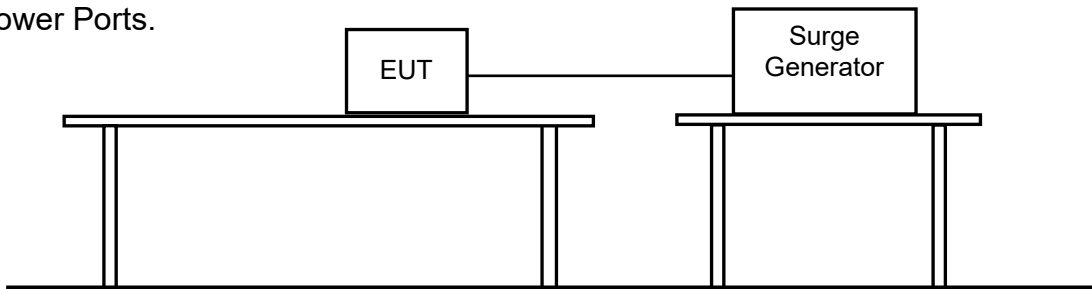
9.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Surge Generator	KeyTek	EMC Pro	0003234	2021/02/05
Surge Generator	3ctest	CWS600T	ES0311801	2021/03/05
C.D.N	Sheng Xuan	HSX-1G3B	HSX-20150003	2021/03/05

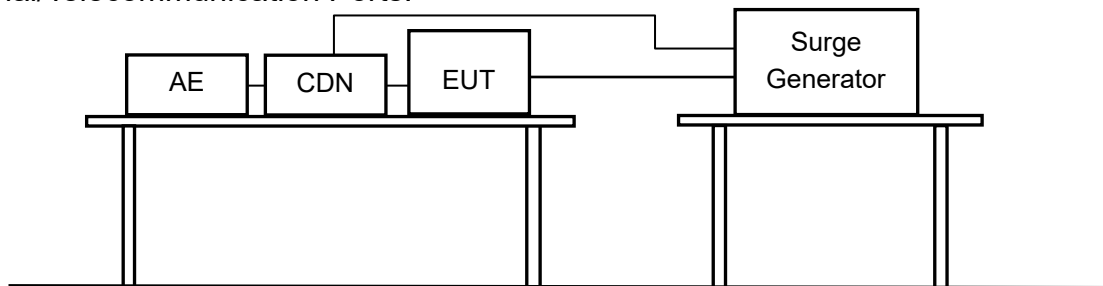
Note: The above equipments are within the valid calibration period.

9.2 Block Diagram of Test Configuration

For Power Ports.



For Signal/Telecommunication Ports.



9.3 Test Requirement

IEC 61000-4-5 (EN 55024) require:

- Input AC power ports:
 - Line to line: ± 1.0 kV (peak), 1.2/50 (8/20) Tr/Th μ s
 - Line to earth (ground): ± 2.0 kV (peak), 1.2/50 (8/20) Tr/Th μ s
- Input DC power ports: ± 0.5 kV (peak): Line to earth, 1.2/50 (8/20) Tr/Th μ s

Performance criterion: **B**

- Signal ports:
 - without primary protections: ± 1.0 kV (peak): 10/700 Tr/Th μ s
 - Primary protectors: ± 4.0 kV (peak): 10/700 Tr/Th μ s
- Telecommunication ports:
 - without primary protections: ± 1.0 kV (peak): 10/700 Tr/Th μ s
 - Primary protectors: ± 4.0 kV (peak): 10/700 Tr/Th μ s

Where the coupling network for the 10/700 μ s waveform affects the functioning of high speed data ports, the test shall be carried out using a 1.2/50 (8/20) μ s waveform and appropriate coupling network.

- Signal ports:
 - without primary protections: ± 1.0 kV (peak): 1.2/50 (8/20) Tr/Th μ s
 - Primary protectors: ± 4.0 kV (peak): 1.2/50 (8/20) Tr/Th μ s
- Telecommunication ports:
 - without primary protections: ± 1.0 kV (peak): 1.2/50 (8/20) Tr/Th μ s
 - Primary protectors: ± 4.0 kV (peak): 1.2/50 (8/20) Tr/Th μ s

Performance criterion: **C**



9.4 Configuration of Measurement

- 9.4.1 The EUT and support units were located on a wooden table 0.8 m away from ground floor.
- 9.4.2 The EUT was connected to the power mains through a coupling device that directly couples the Surge interference signal.
- 9.4.3 The surges were applied line to line and line(s) to earth. When testing line to earth the test voltage was applied successively between each of the lines and earth. Steps up to the test level specified increased the test voltage. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.

9.5 Test Result

PASS.

The performance criterion after tested EN 55024:

Temperature: 26.6 °C ; Humidity: 43 % ; Atmospheric: 997 hPa ; Test Engineer: Ivan

± 0.5 kV (peak) Input DC power port: Line to earth (ground)

Performance criterion: A B C

± 0.5 kV (peak) Telecommunication port: LAN 1 Port

Performance criterion: A B C

± 1.0 kV (peak) Telecommunication port: LAN 1 Port

Performance criterion: A B C

Note: Criterion B denotes loss of packets during test and auto-recovery after test.

10 Radio-frequency, Conducted Disturbances Immunity Test (IEC 61000-4-6)

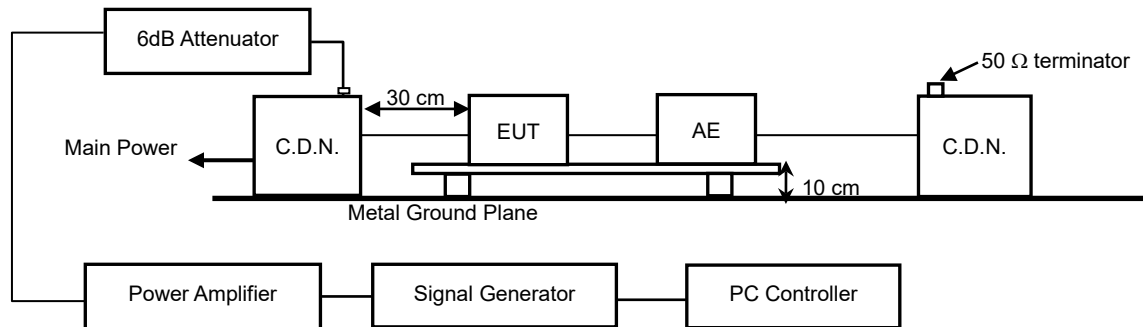
10.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Signal Generator	Marconi Instruments	2024	112246/087	2021/03/03
RF Power Amplifier	R&K	A009K101-5050R	B30850	2021/03/14
Attenuator	Microwave Device Inc.	MA-5250/6N	001052	2021/03/14
C.D.N	FCC	FCC-801-M3-25A	01030	2021/03/10
C.D.N	FCC	FCC-801-16A	2045	N.C.R.
EM Injection Clamp	SCHAFFNER	KEMZ 801	17037	2021/03/10

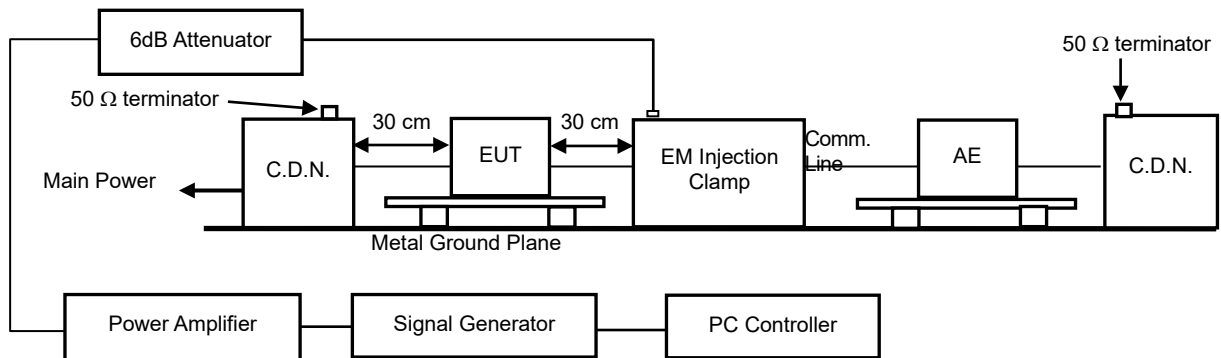
Note: The above equipments are within the valid calibration period.

10.2 Block Diagram of Test Configuration

For Power Ports.



For Signal/ Telecommunication Ports.



10.3 Test Requirement

IEC 61000-4-6 (EN 55024) require:

The frequency steps: 1 %, Log sweep, Dwell time: 3.0 sec.

Frequency Range is from **0.15** to **80** MHz.

Field strength: **3** V, 80 % AM (1 kHz)

Input AC power ports.

Input DC power ports.

Signal ports.

Telecommunication ports.

Performance criterion: **A**



10.4 Configuration of Measurement

- 10.4.1 The EUT was placed on a table of is 0.1 m height. In Semi-Anechoic chamber A Ground reference plane was placed on the table and a 0.1 meter insulating support was inserted between the EUT and Ground reference plane.
- 10.4.2 The EUT was connected to the power mains through a Coupling and Decoupling Networks (CDN).
- 10.4.3 The test was performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF input ports of the coupling devices were terminated by a 50 Ω terminator.
- 10.4.4 The frequency range was swept from 150 kHz to 80 MHz. Using the signal levels established during the setting process, and without the disturbance signal 80 % amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to switch coupling devices as necessary. The rate of sweep was less than 1.5×10^{-3} decades/s. And the step size of the frequency sweep was also less than 1 % of the start and thereafter
1 % of the preceding frequency value. The dwell time at each frequency was more than the time necessary for the EUT to be excited, and able to respond.
- 10.4.5 The EUT was fully excised during the testing and all the selected excise modes were fully interrogated for susceptibility.

10.5 Test Result

PASS.

The performance criterion after tested EN 55024:

Temperature: 24.6 °C ; Humidity: 44 % ; Atmospheric: 997 hPa ; Test Engineer: Ivan

Frequency range: 0.15 to 80 MHz, Field strength: 3 V, 80 % AM (1 kHz)

- Input DC power port.
Performance criterion: A B C
- Telecommunication port: LAN 1 Port
Performance criterion: A B C

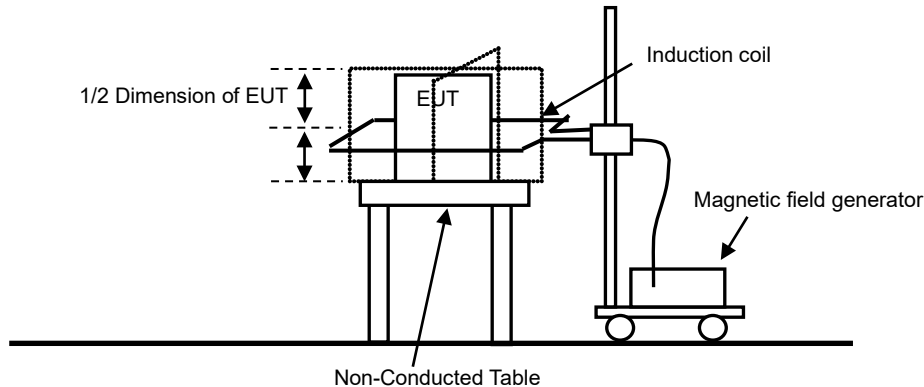
11 Power Frequency Magnetic Field Immunity Test (IEC 61000-4-8)

11.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Magnetic field generator	PMM	PMM1008	0000J00301	2021/04/29

Note: The above equipments are within the valid calibration period.

11.2 Block Diagram of Test Configuration



11.3 Test Requirement

IEC 61000-4-8 (EN 55024) require:

Power Frequency is 50 Hz.

Magnetic field strength: 1 A/m

Performance criterion: **A**

11.4 Configuration of Measurement

11.4.1 The equipment is configured and connected to satisfy its functional requirements.

11.4.2 All cables shall be exposed to the magnetic field for 1 m of their length.

11.4.3 Different induction coils may be selected for testing in the different orthogonal directions.

11.5 Test Result

PASS.

The performance criterion after tested EN 55024:

Temperature: 25.6 °C ; Humidity: 43 % ; Atmospheric: 997 hPa ; Test Engineer: Ivan

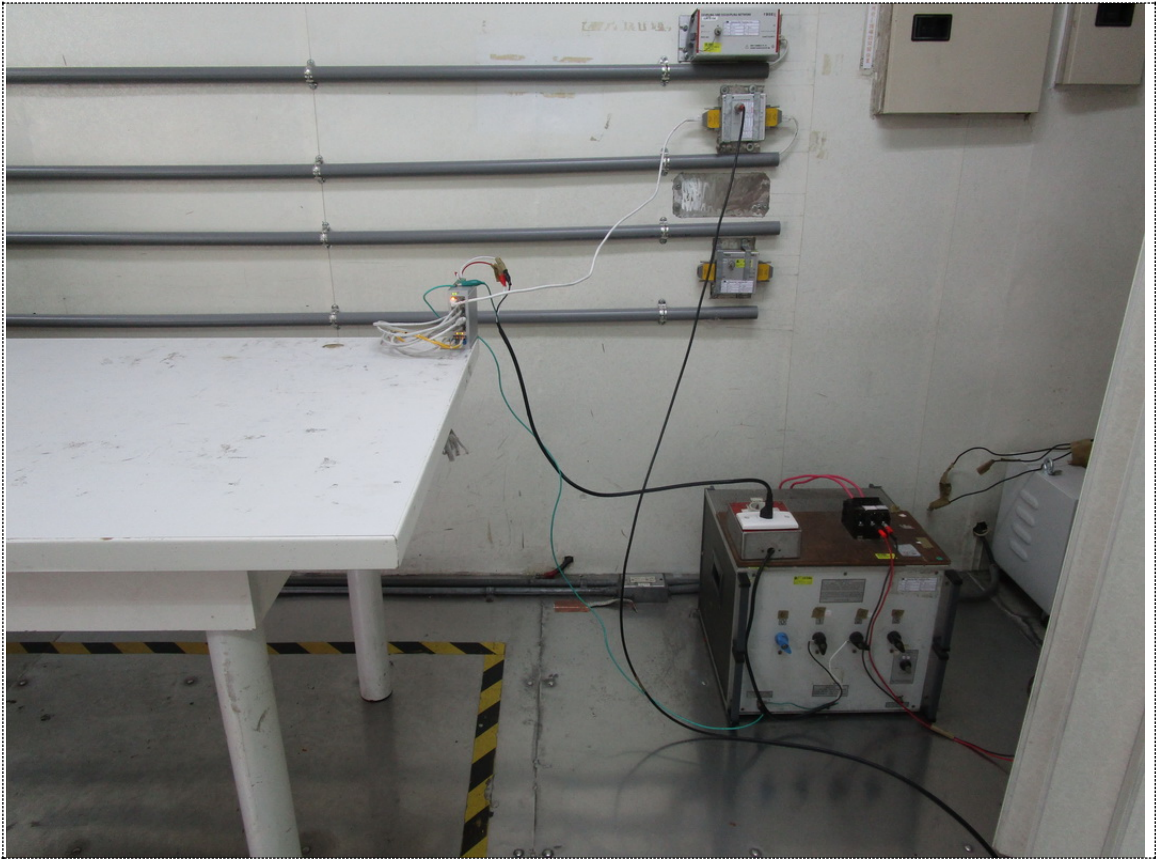
Power Frequency is 50 Hz, Magnetic field strength: 1 A/m

Performance criterion: **A** **B** **C**



12 Photographs of Test

12.1 Asymmetric Mode Conducted Emission Measurement



Front View



Rear View

12.2 Radiated Emission Measurement

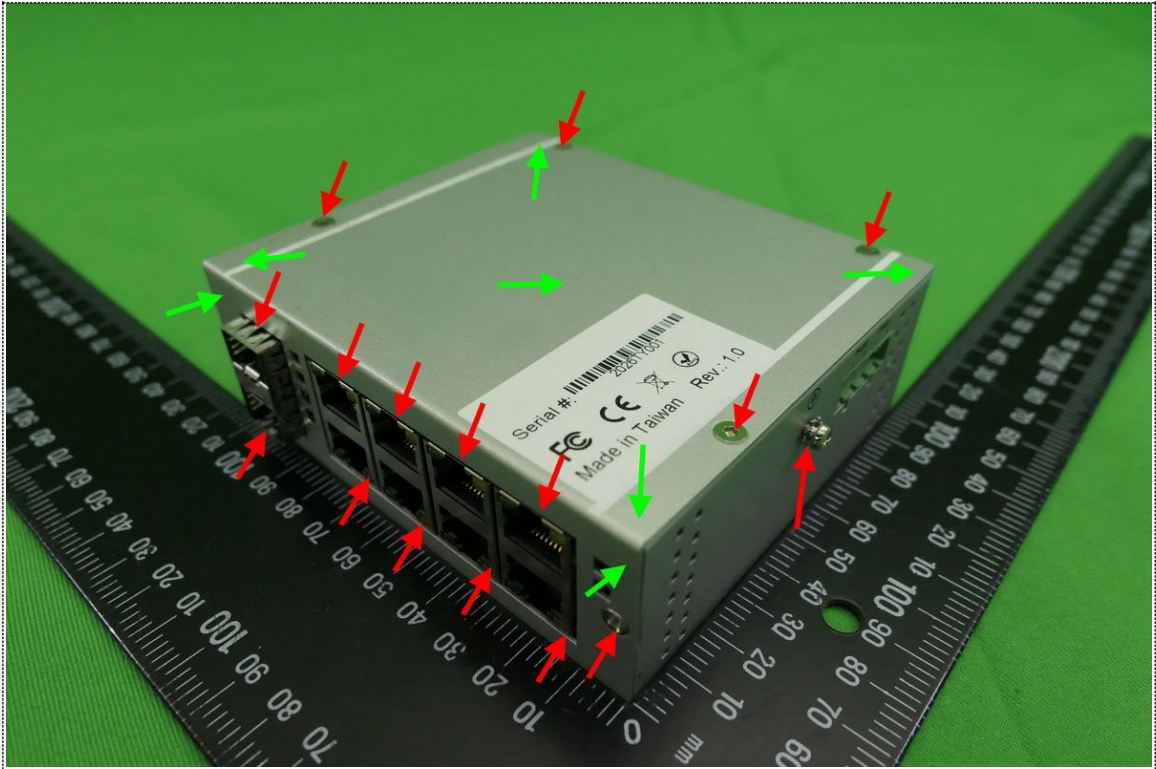


Front View

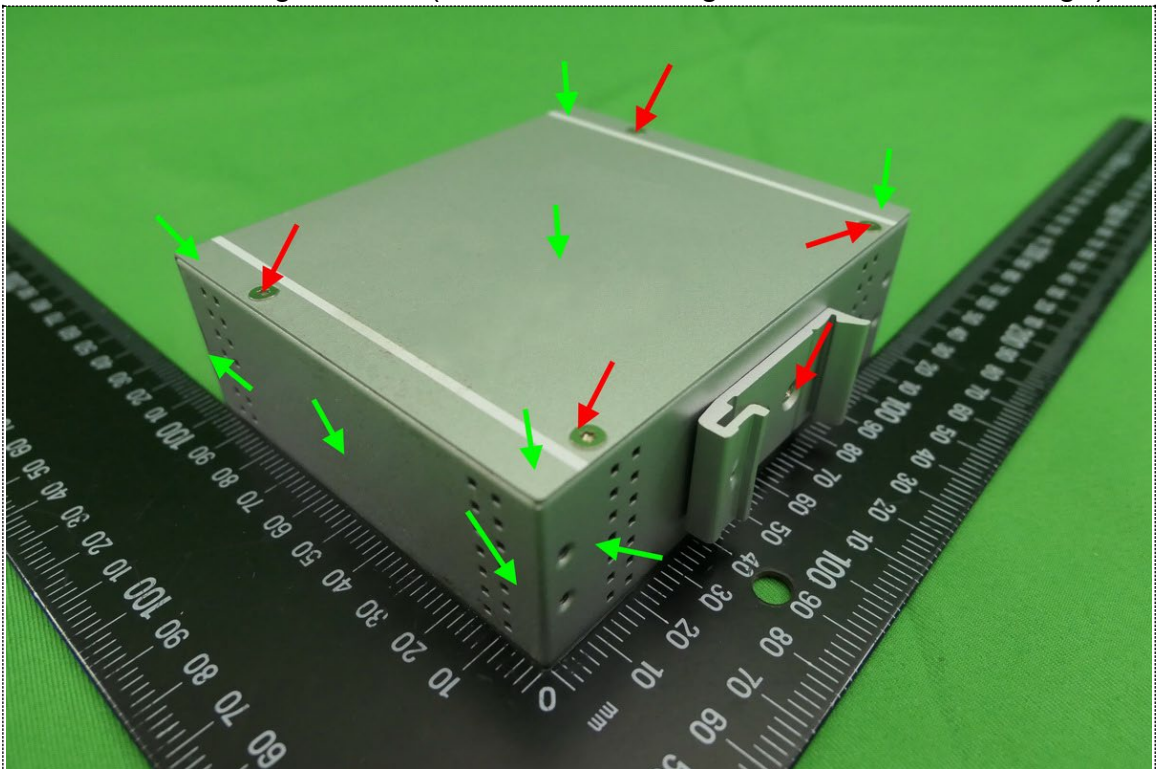


Rear View

12.3 Discharge Test Point



View of Discharge Point-1 (Green: Air Discharge; Red: Contact Discharge)



View of Discharge Point-2 (Green: Air Discharge; Red: Contact Discharge)

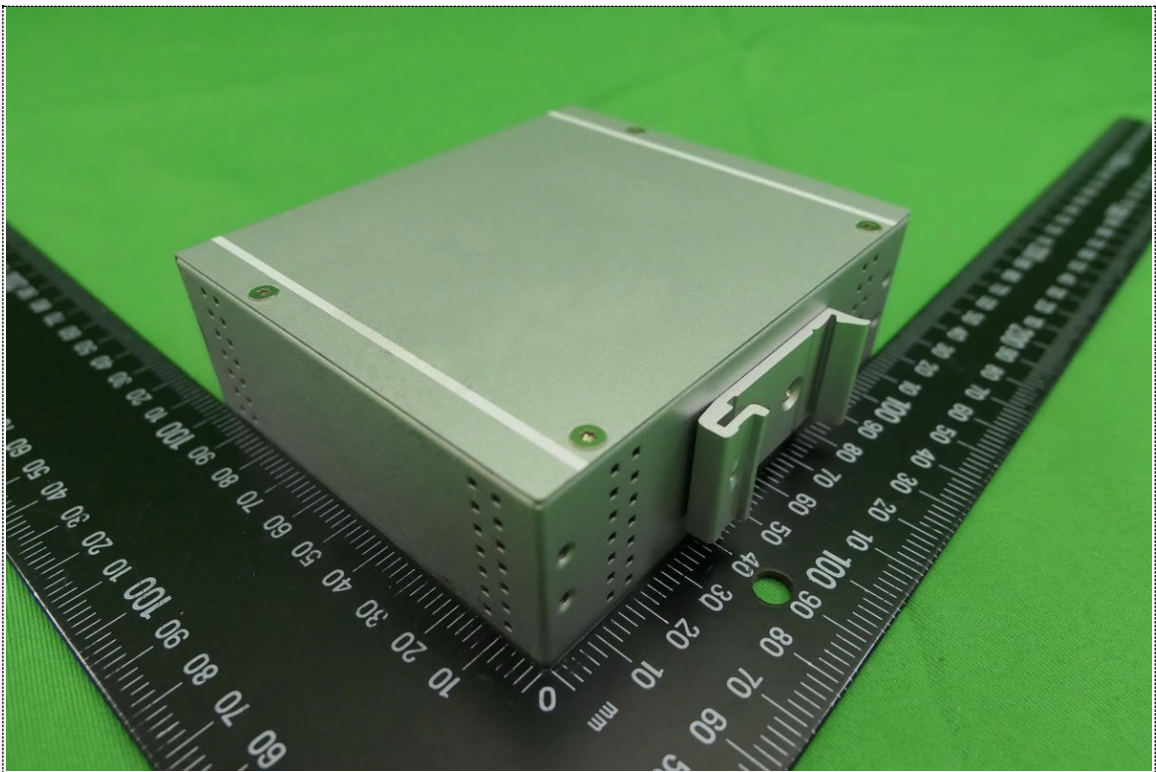


13 Photographs of EUT

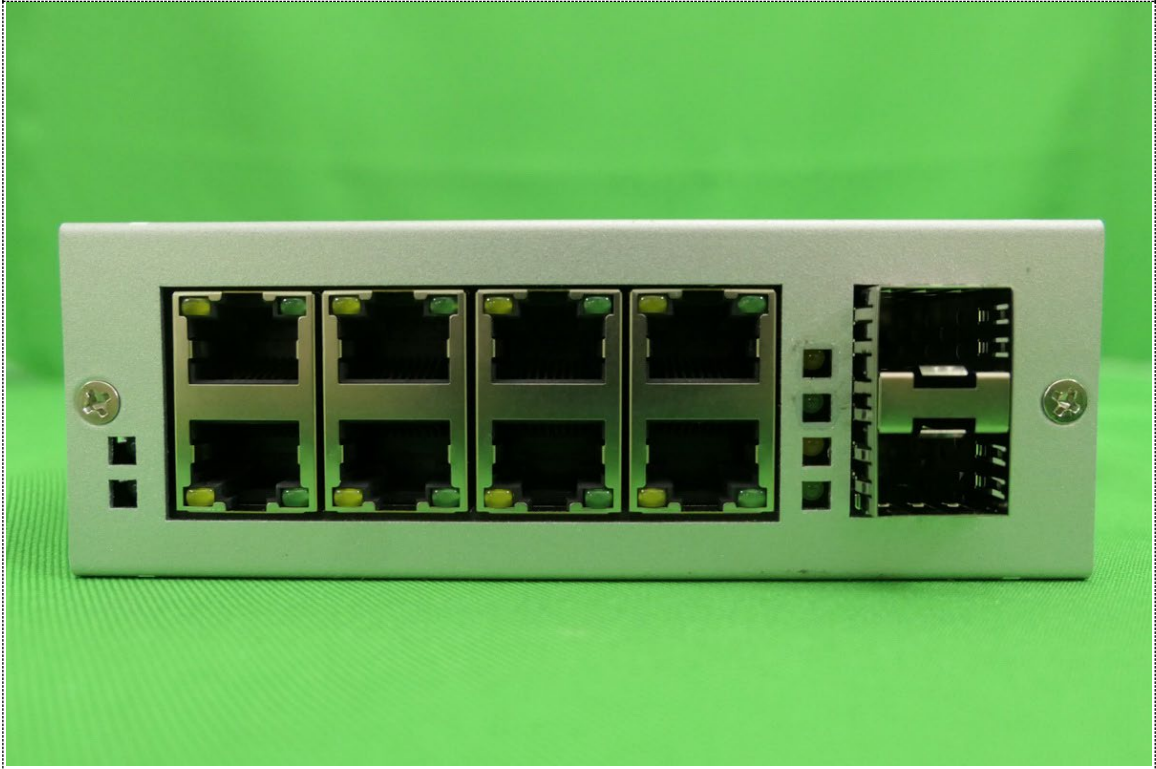
13.1 Model No.: VLS-2010-2F



Front View of EUT



Rear View of EUT



View of I/O Port-1



View of I/O Port-2