



Test Report

FCC Part 15 Subpart B

for

Electromagnetic Interference

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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Prepared by

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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:

- 47 CFR FCC Part 15 Subpart B
- ANSI C63.4: 2014

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-F.
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 Measurement Uncertainty

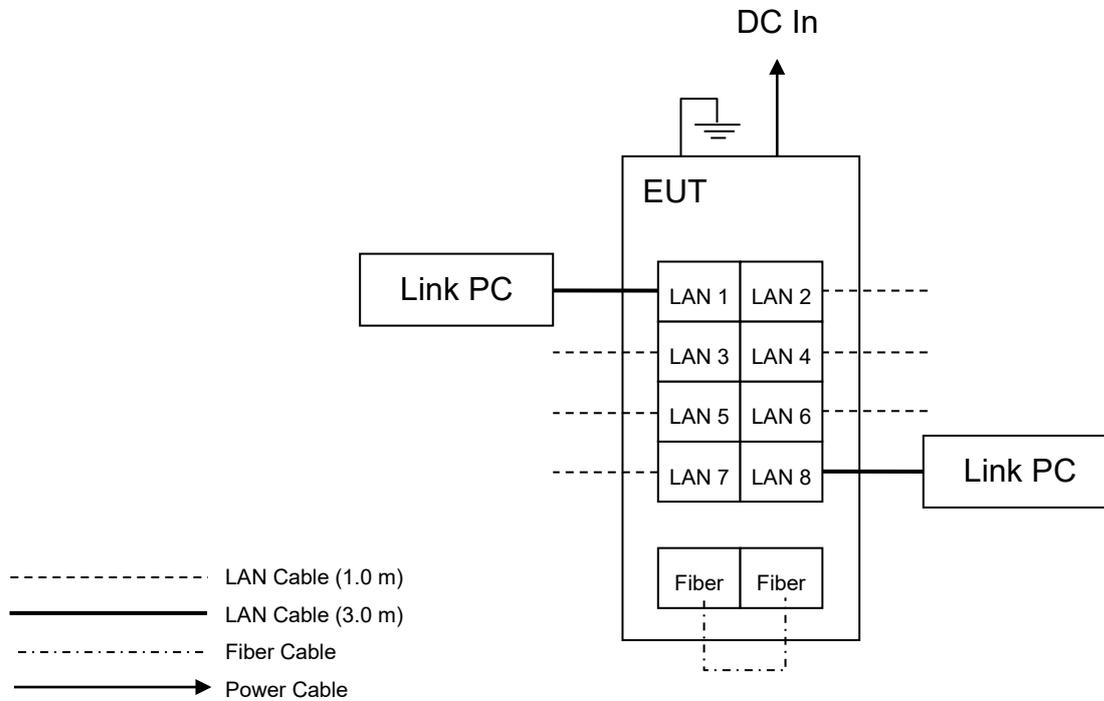
Item	Value
Conduction 1:	
Conducted Emission - AMN (9 kHz to 30 MHz)	3.0 dB
OATS 1:	
Radiated Emission Test (30 MHz to 200 MHz)	4.6 dB
Radiated Emission Test (200 MHz to 1 GHz)	4.8 dB
OATS 3:	
Radiated Emission Test (30 MHz to 200 MHz)	4.8 dB
Radiated Emission Test (200 MHz to 1 GHz)	4.8 dB
Chamber 3:	
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 18 GHz)	5.0 dB
Radiated Emission Test (18 GHz to 40 GHz)	5.4 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%	

1.4 Measured Mode

1.4.1 The test mode for final test is as following:

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

1.5 Configuration of EUT Setup



1.6 Test Step of EUT

- 1.6.1 Set the EUT and peripheral as above.
- 1.6.2 Turn on the power of all equipments.
- 1.6.3 Let Link PCs ping each other.
- 1.6.4 Confirm all functions are normal.
- 1.6.5 Execute the test.



2 Power Line Conducted Emission Measurement

The EUT does not intend to connected AC distribution network, therefore it is not specified in this section.

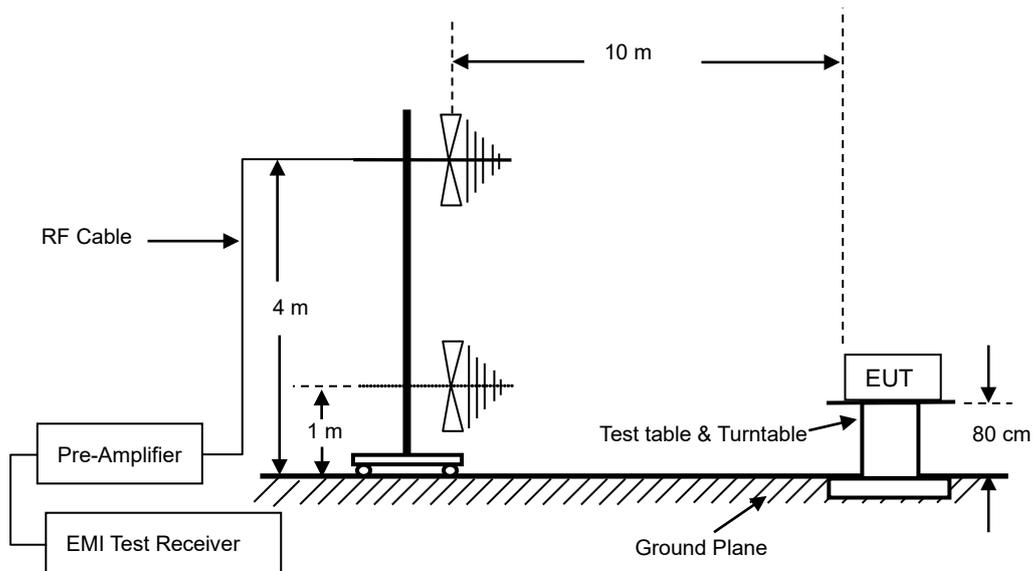
3 Radiated Emission Measurement (Below 1 GHz)

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

FCC Part 15

Frequency (MHz)	<input type="checkbox"/> Class A (10 m)		<input type="checkbox"/> Class B (3 m)	
	Field Strength (μ V/m)	Quasi-Peak dB(μ V/m)	Field Strength (μ V/m)	Quasi-Peak dB(μ V/m)
30 to 88	90	39.08	100	40.00
88 to 216	150	43.52	150	43.52
216 to 960	210	46.44	200	46.02
960 above	300	49.54	500	53.98

 CISPR 22

	<input checked="" type="checkbox"/> Class A	<input type="checkbox"/> Class B
Frequency (MHz)	Quasi-Peak dB(μ V/m)	Quasi-Peak dB(μ V/m)
30 to 230	40.00	30.00
230 to 1000	47.00	37.00

** According to 47 CFR FCC Part 15 § 15.109(g) as refer to CISPR 22 Limits and method of measurement.

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 EUT was set 10 meters away from the receiving antenna that was mounted on a non-conductive mast. 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



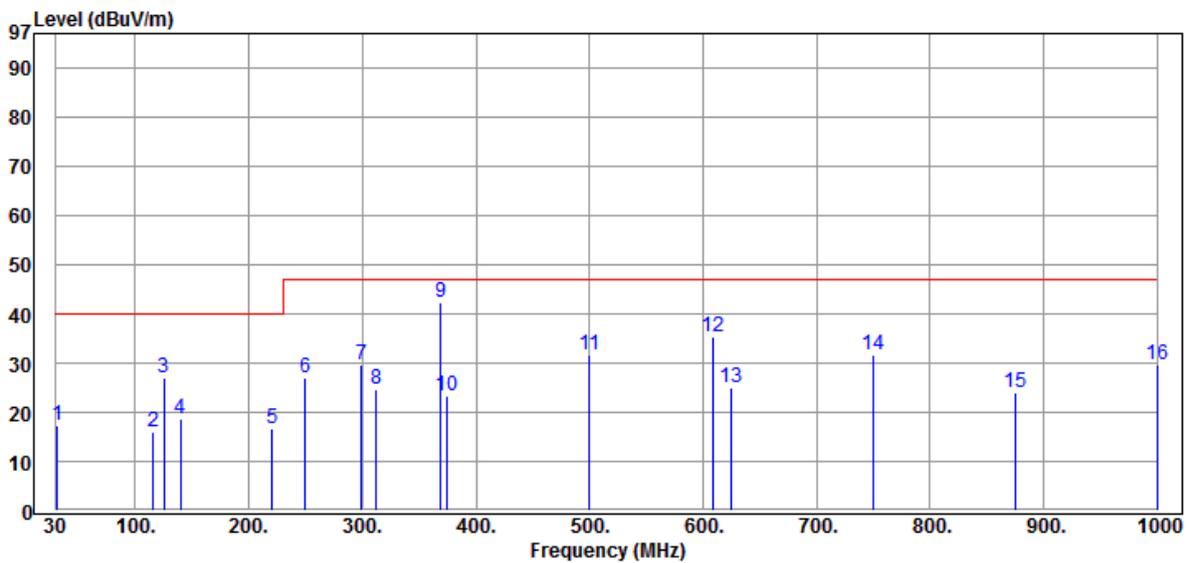
Radiated Emission Measurement Data

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:10

2020-07-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	31.080	28.39	-11.14	17.25	40.00	-22.75	QP
2	115.837	31.60	-15.72	15.88	40.00	-24.12	QP
3	125.000	41.59	-14.74	26.85	40.00	-13.15	QP
4	139.620	32.10	-13.54	18.56	40.00	-21.44	QP
5	220.620	27.60	-10.99	16.61	40.00	-23.39	QP
6	249.997	36.40	-9.42	26.98	47.00	-20.02	QP
7	298.964	36.70	-7.09	29.61	47.00	-17.39	QP
8	312.000	36.81	-12.23	24.58	47.00	-22.42	QP
9	369.100	53.11	-10.83	42.28	47.00	-4.72	QP
10	375.000	33.80	-10.57	23.23	47.00	-23.77	QP
11	500.000	39.50	-7.82	31.68	47.00	-15.32	QP
12	609.365	40.10	-4.91	35.19	47.00	-11.81	QP
13	624.991	29.90	-4.86	25.04	47.00	-21.96	QP
14	749.987	34.30	-2.78	31.52	47.00	-15.48	QP
15	874.986	24.50	-0.41	24.09	47.00	-22.91	QP
16	999.982	28.20	1.39	29.59	47.00	-17.41	QP

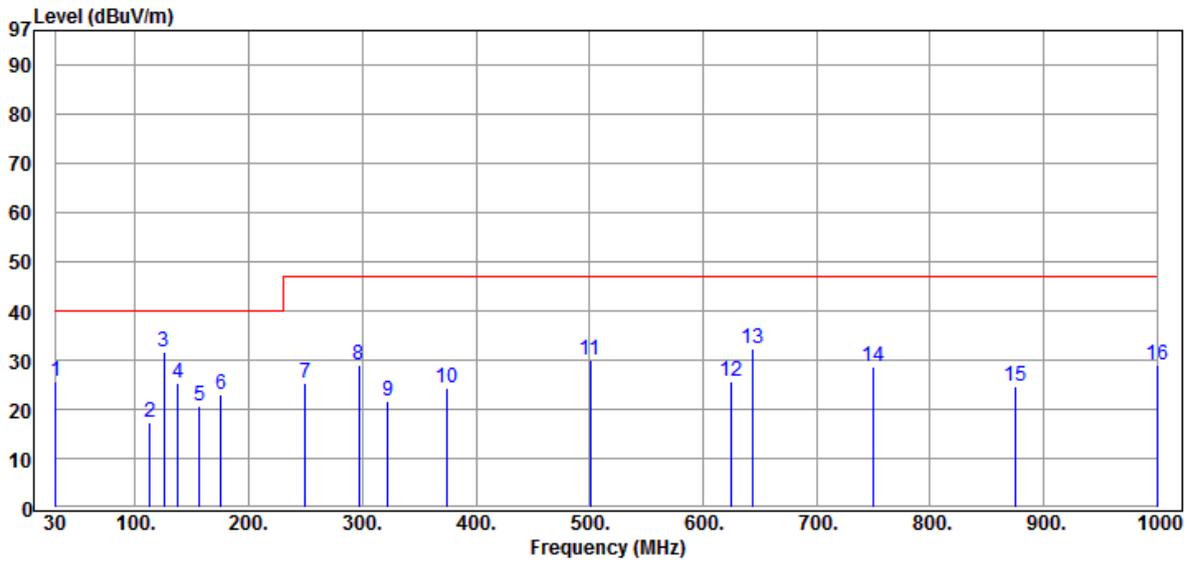


Radiated Emission Measurement Data

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:9

2020-07-06



Item Mark	Freq. MHz	Reading dBUV	Factor dB/m	Level dBUV/m	Limit dBUV/m	Margin dB	Remark
1	30.010	36.30	-10.77	25.53	40.00	-14.47	QP
2	112.620	33.41	-16.17	17.24	40.00	-22.76	QP
3	124.999	46.49	-14.74	31.75	40.00	-8.25	QP
4	137.666	38.91	-13.71	25.20	40.00	-14.80	QP
5	156.346	33.50	-12.78	20.72	40.00	-19.28	QP
6	175.815	34.80	-11.71	23.09	40.00	-16.91	QP
7	249.996	34.60	-9.42	25.18	47.00	-21.82	QP
8	297.300	36.13	-7.23	28.90	47.00	-18.10	QP
9	322.198	33.40	-11.82	21.58	47.00	-25.42	QP
10	375.000	34.80	-10.57	24.23	47.00	-22.77	QP
11	501.000	37.90	-7.77	30.13	47.00	-16.87	QP
12	624.990	30.50	-4.86	25.64	47.00	-21.36	QP
13	643.878	36.79	-4.42	32.37	47.00	-14.63	QP
14	749.988	31.55	-2.78	28.77	47.00	-18.23	QP
15	874.987	24.98	-0.41	24.57	47.00	-22.43	QP
16	999.983	27.53	1.39	28.92	47.00	-18.08	QP

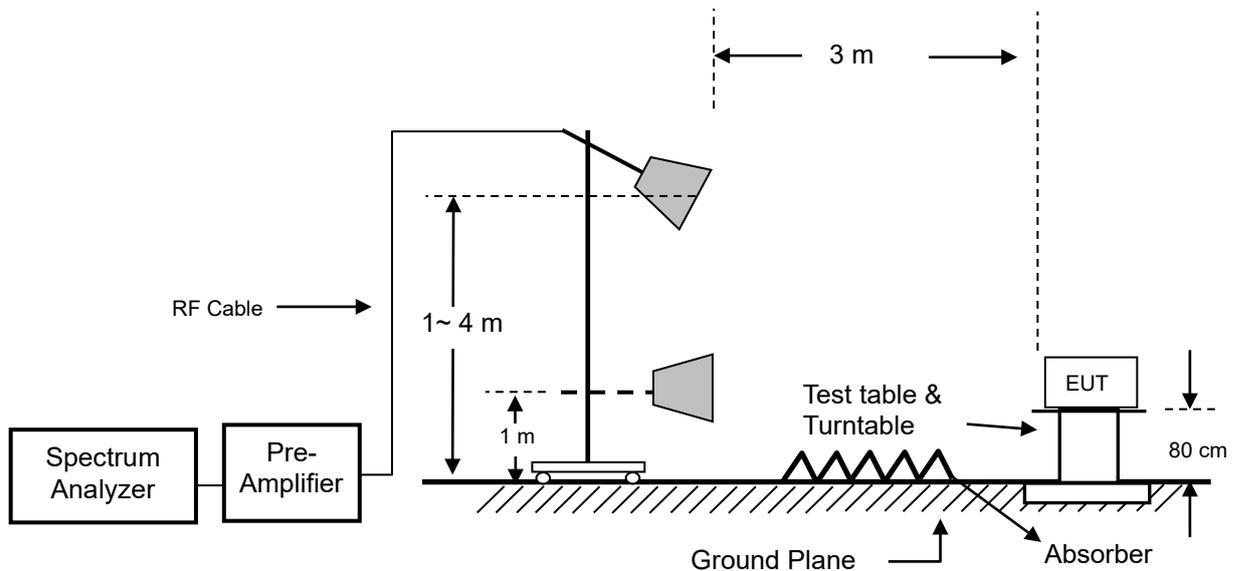
4 Radiated Emission Measurement (Above 1 GHz)

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 (MHz)	<input checked="" type="checkbox"/> Class A (3 m)		<input type="checkbox"/> Class B (3 m)	
	Peak dB(μ V/m)	Average dB(μ V/m)	Peak dB(μ V/m)	Average dB(μ V/m)
Above 1000	80.0	60.0	74.0	54.0

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 1MHz 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 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.
- 4.5.2 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. The antenna can move up and down between 1 to 4 meters to find out 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



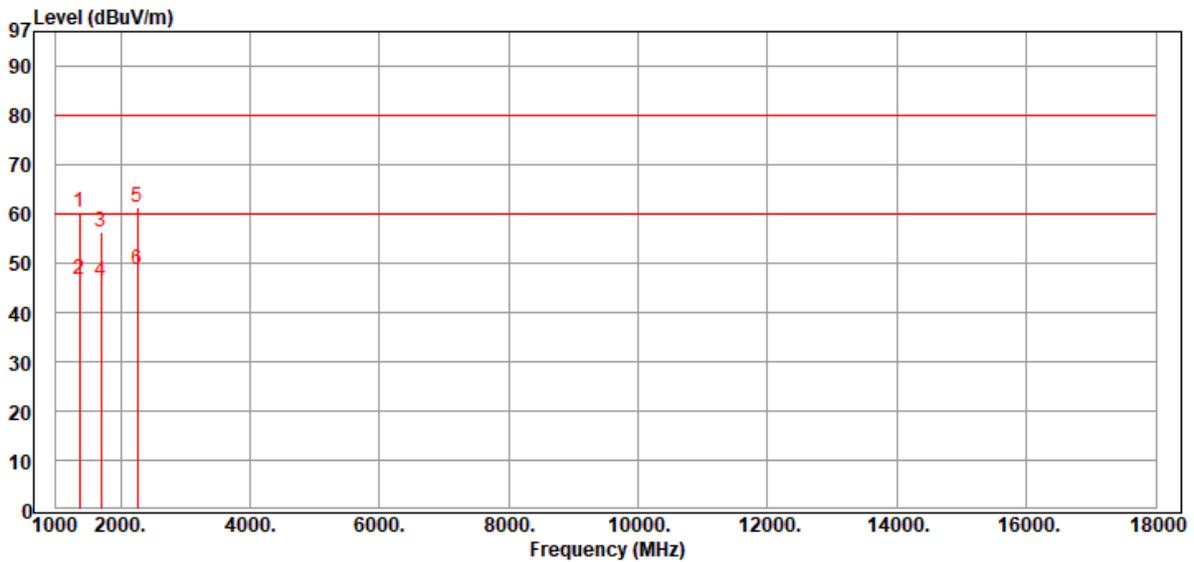
Radiated Emission Measurement Data

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:25

2020-06-30



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	1372.000	71.95	-11.74	60.21	80.00	-19.79	Peak
2	1372.000	58.38	-11.74	46.64	60.00	-13.36	Average
3	1704.000	68.76	-12.29	56.47	80.00	-23.53	Peak
4	1704.000	58.57	-12.29	46.28	60.00	-13.72	Average
5	2264.000	69.97	-8.76	61.21	80.00	-18.79	Peak
6	2264.000	57.58	-8.76	48.82	60.00	-11.18	Average



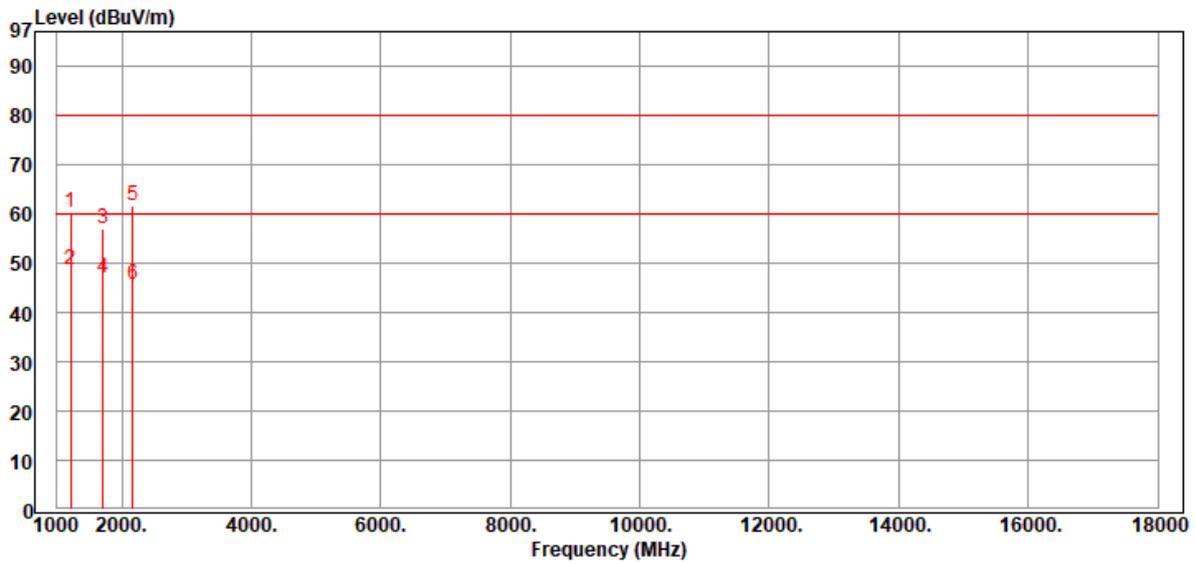
Radiated Emission Measurement Data

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 : VERTICAL
 TEMP/HUM : 30.6°C/ 44%

Data:26

2020-06-30



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	1220.000	72.84	-12.42	60.42	80.00	-19.58	Peak
2	1220.000	61.21	-12.42	48.79	60.00	-11.21	Average
3	1712.000	69.18	-12.28	56.90	80.00	-23.10	Peak
4	1712.000	59.15	-12.28	46.87	60.00	-13.13	Average
5	2168.000	70.72	-9.03	61.69	80.00	-18.31	Peak
6	2168.000	54.83	-9.03	45.80	60.00	-14.20	Average



5 Photographs of Test

5.1 Radiated Emission Measurement



Front View



Rear View

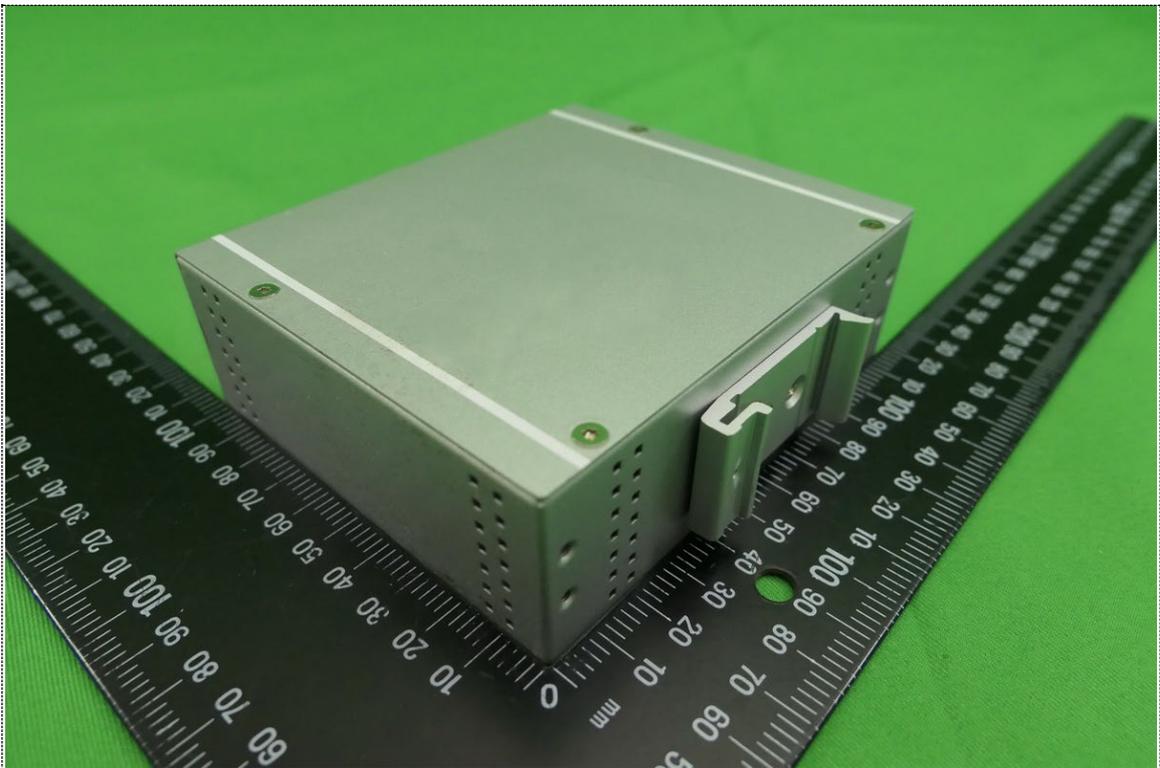


6 Photographs of EUT

6.1 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