

FCC Test Report

Report No.: FD181017D24

Test Model: FD9387-EHTV

Series Model: FD9387-HV, FD9387-HTV, FD9387-EHV

Received Date: Oct. 17, 2018

Test Date: Oct. 19 ~ Nov. 15, 2018

Issued Date: Nov. 15, 2018

Applicant: VIVOTEK INC.

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

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)

**FCC Registration /
Designation Number:** 418586 / TW1078



Certificate #4327.01



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Release Control Record

Issue No.	Description	Date Issued
FD181017D24	Original release.	Nov. 15, 2018

1 Certificate of Conformity

Product: Network Camera

Brand: VIVOTEK INC.

Test Model: FD9387-EHTV

Series Model: FD9387-HV, FD9387-HTV, FD9387-EHV

Sample Status: Engineering sample

Applicant: VIVOTEK INC.

Test Date: Oct. 19 ~ Nov. 15, 2018

Standards: 47 CFR FCC Part 15, Subpart B, Class B
ICES-003:2016 Issue 6, Class B
ANSI C63.4:2014

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. 15, 2018

Albee Chu / Specialist

Approved by :



Date: Nov. 15, 2018

Jim Hsiang / Associate Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart B / ICES-003:2016 Issue 6, Class B

ANSI C63.4:2014

FCC Clause	ICES-003 Clause	Test Item	Result/Remarks	Verdict
15.107	6.1	Conducted Emissions at mains ports	Minimum passing Class B margin is -14.47 dB at 0.36334 MHz	Pass
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class B margin is -3.70 dB at 720.00 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class B margin is -9.79 dB at 8500.67 MHz	Pass

Note: There is no deviation to the applied test methods and requirements covered by the scope of this report.

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:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expended Uncertainty (k=2) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.97 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.08 dB
	Above 6GHz	5.06 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	Network Camera
Brand	VIVOTEK
Test Model	FD9387-EHTV
Series Model	FD9387-HV, FD9387-HTV, FD9387-EHV
Model Difference	Refer to below note
Sample Status	ENGINEERING SAMPLE
Operating Software	N/A
Power Supply Rating	Brand: HONOTO Model: ADS-26FSG-12 12018EPCU Input: 100-240Vac, 50/60Hz, 0.7A Output: 12V, 1A Power Cord: AC 2 Pin Non-shielded DC cable (3.0m)
Accessory Device	Adapter
Data Cable Supplied	N/A

Note:

The EUT is a Network Camera, and it has several models, which are identical with each other, except for following difference:

Model	FD9387-HV	FD9387-HTV	FD9387-EHV	FD9387-EHTV
Heater	NO	NO	YES	YES
PoE	AF	AF	AT	AT
Wide-Range Temperature	NO	NO	YES	YES
Zoom Focus	NO	YES	NO	YES

During the test, the **Model: FD9387-EHTV** was selected as the representative one and therefore only its test data was recorded in this report.

3.2 Features of EUT

The tests reported herein were performed according to the method specified by VIVOTEK INC., 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 consumes power from Adapter, which designed with AC power supply of rating 100-240Vac, 50/60Hz. For radiated emission evaluation, 230Vac/50Hz (for EN 55032 & AS/NZS CISPR 32), 120Vac/60Hz (for FCC Part 15), 100Vac/50Hz & 100Vac/60Hz (for VCCI) had been covered during the pre-test. The worst radiated emission data was found at **100Vac/60Hz**.
2. EUT has been pre-tested under following test modes, and test **mode 2** was the worst case.

Mode	Test Condition
1	A LAN 100Mbps + Power from Adapter
	B LAN 10Mbps + Power from Adapter
2	LAN 100Mbps + Power from PoE Adapter

3. Test modes are presented in the report as below.

Mode	Test Condition	Input Power
Conducted emission test		
1	Power from Adapter	120Vac/ 60Hz
2	Power from PoE Adapter	48Vdc
Radiated emission test		
1	Power from Adapter	100Vac/ 60Hz
2	Power from PoE Adapter	48Vdc

3.4 Test Program Used and Operation Descriptions

- a. Connected the EUT with Adapter or PoE adapter.
- b. Turned on the power of all equipment.
- c. EUT captured video / audio signal to notebook (kept in a remote area) via an UTP LAN cable, then it displayed messages on its screen simultaneously. **<For Power from Adapter>**
- d. EUT captured video / audio signal to notebook (kept in a remote area) via PoE adapter with an UTP LAN cable, then it displayed messages on its screen simultaneously. **<For Power from PoE Adapter>**
- e. EUT sent 1kHz audio signal to earphone.
- f. EUT Save images to SD card.
- g. Steps c-f were repeated.

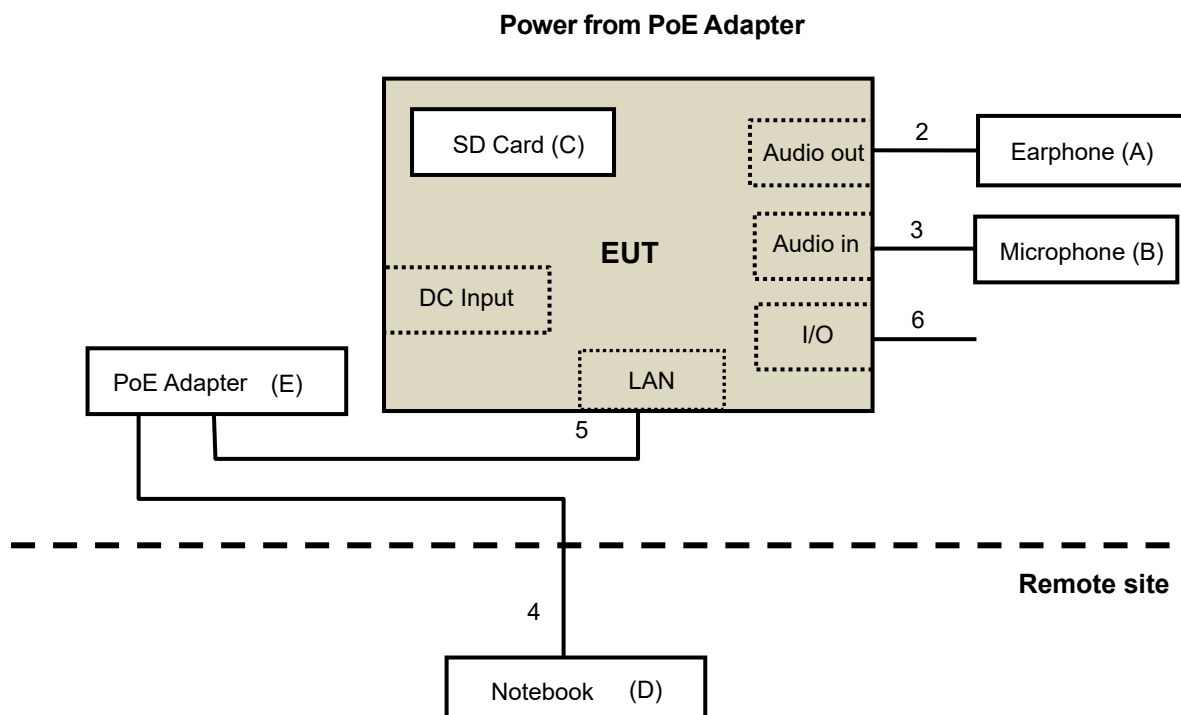
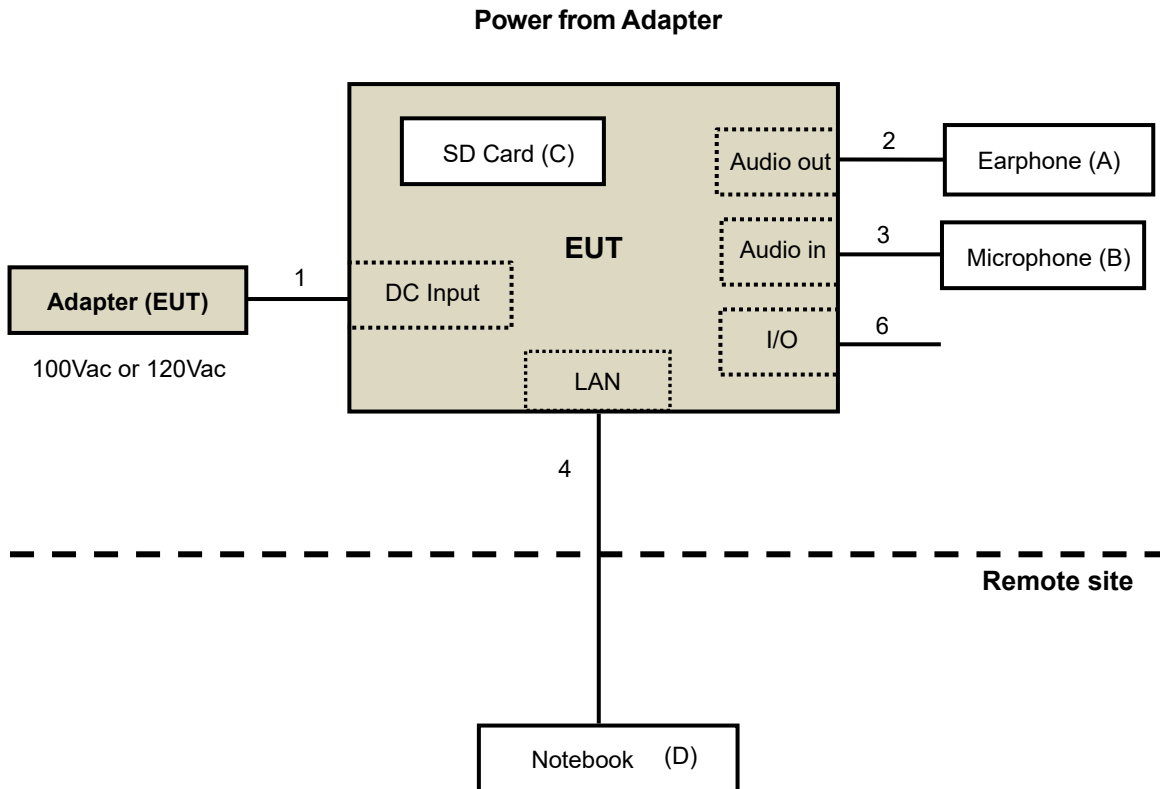
3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 1866MHz, provided by VIVOTEK INC., for detailed internal source, please refer to the manufacturer's specifications.

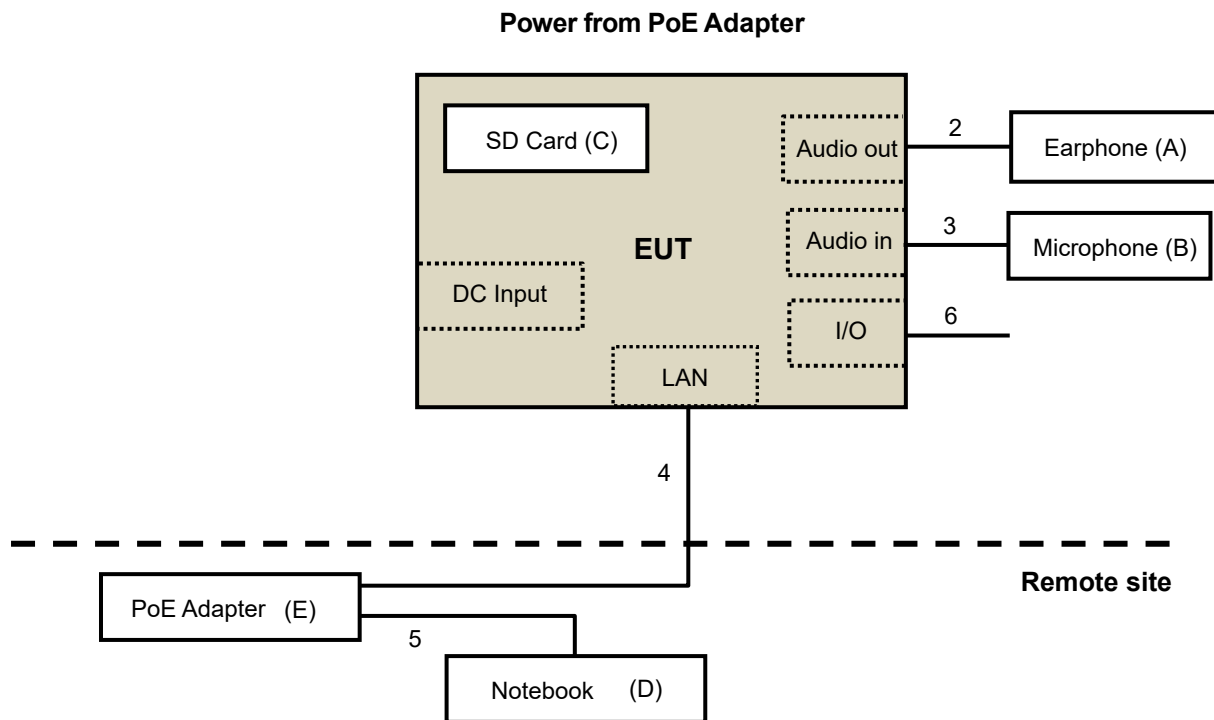
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

Conducted emission test



Radiated emission test



4.2 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Earphone	PHILIPS	SBC HL150	H2010149	N/A	Provided by Lab
B.	Microphone	Labtec	mic-333	N/A	N/A	Provided by Lab
C.	SD Card	Apacer	8GN	N/A	N/A	Provided by Lab
D.	Notebook	DELL	PP27L	8SNZ12S	FCC DoC Approved	Provided by Lab
E.	PoE Adapter	PSE	PSE151	N/A	FCC DoC Approved	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items D-E acted as communication partners to transfer data.
3. Rating of item E was listed as below:
AC I/P: 100-240V, 50/60Hz, 0.4A
DC O/P: 48V, 16W

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC power cable	1	3.0	N	0	Supplied by client
2.	Audio cable	1	1.2	N	0	Provided by Lab
3.	Audio cable	1	1.8	N	0	Provided by Lab
4.	LAN cable (Cat.5e)	1	10	N	0	Provided by Lab
5.	LAN cable (Cat.5e)	1	1.0	N	0	Provided by Lab
6.	I/O cable	4	1.0	N	0	Supplied by client

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

5 Conducted Emissions at Mains Ports

5.1 Limits

Frequency (MHz)	Class A (dBUV)		Class B (dBUV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Notes: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

5.2 Test Instruments

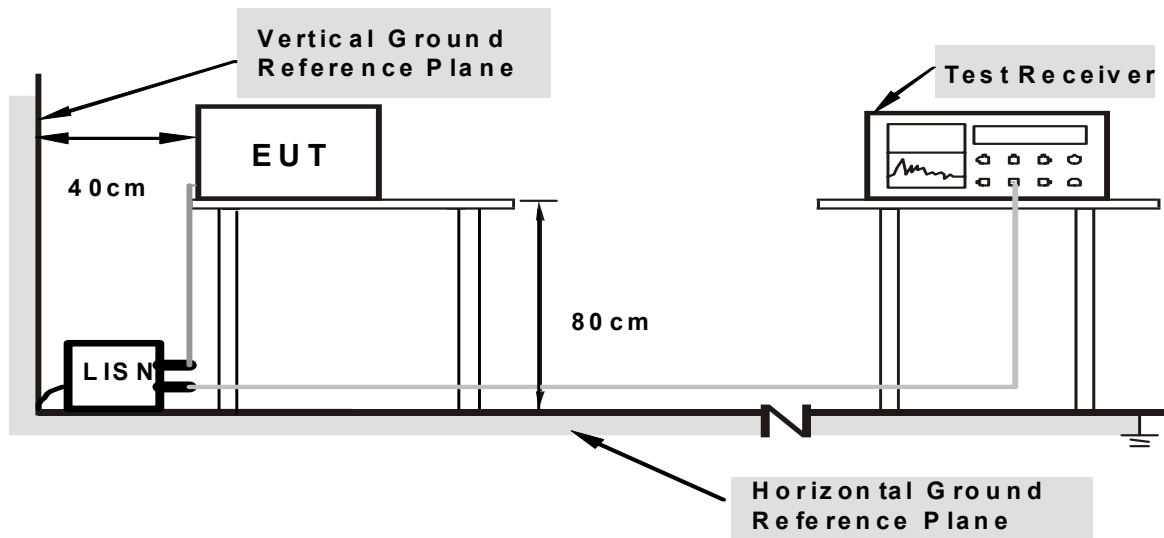
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESR3	102413	Feb. 8, 2018	Feb. 7, 2019
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH2-Z5	100104	Dec. 6, 2017	Dec. 5, 2018
LISN With Adapter (for EUT)	AD10	C09Ada-001	Dec. 6, 2017	Dec. 5, 2018
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	847265/023	Nov. 3, 2017	Nov. 2, 2018
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 3, 2018	May 2, 2019
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK 8121	8121-808	Mar. 5, 2018	Mar. 4, 2019
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C09.01	Feb. 21, 2018	Feb. 20, 2019
SUHNTER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010789	May 8, 2018	May 7, 2019

Notes: 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. 9.
3. The VCCI Site Registration No. C-1312.
4. Tested Date: Oct. 20, 2018

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 a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs 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: Support units were connected to second LISN.

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

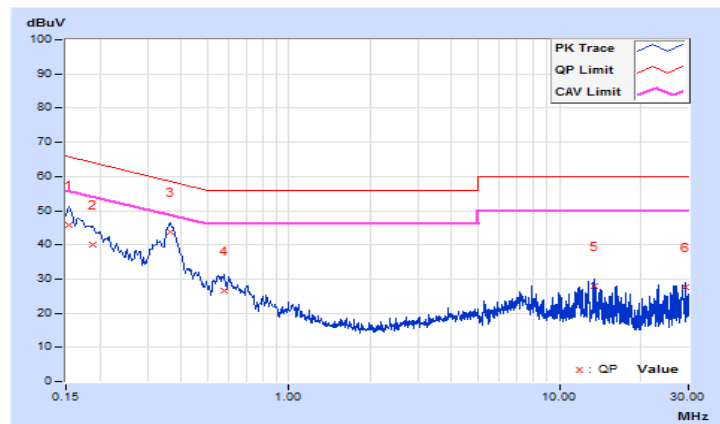
5.4 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	24°C, 72%RH
Tested by	Adam Chen		
Test Mode	Mode 1		

Phase Of Power : Line (L)										
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	10.14	35.61	19.21	45.75	29.35	65.79	55.79	-20.04	-26.44
2	0.18754	10.17	30.01	17.45	40.18	27.62	64.14	54.14	-23.96	-26.52
3	0.36334	10.21	33.47	23.97	43.68	34.18	58.65	48.65	-14.97	-14.47
4	0.57429	10.26	16.29	10.62	26.55	20.88	56.00	46.00	-29.45	-25.12
5	13.41823	11.07	16.79	15.60	27.86	26.67	60.00	50.00	-32.14	-23.33
6	29.23418	11.48	16.21	16.21	27.69	27.69	60.00	50.00	-32.31	-22.31

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

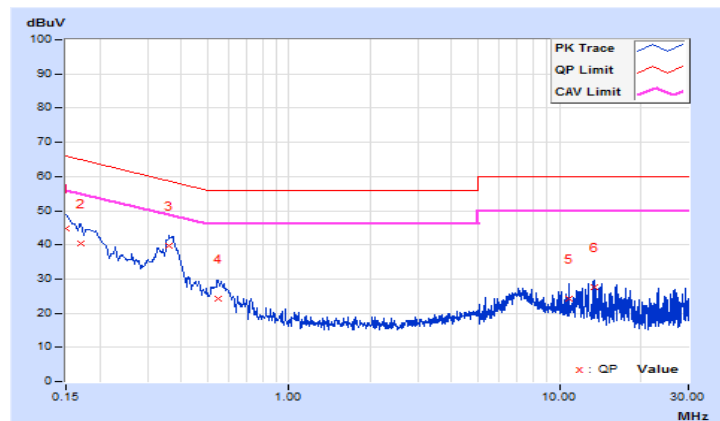


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	24°C, 72%RH
Tested by	Adam Chen		
Test Mode	Mode 1		

Phase Of Power : Neutral (N)										
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	0.15000	10.14	34.55	17.18	44.69	27.32	66.00	56.00	-21.31	-28.68
2	0.16955	10.16	30.41	15.76	40.57	25.92	64.98	54.98	-24.41	-29.06
3	0.36114	10.20	29.61	19.68	39.81	29.88	58.70	48.70	-18.89	-18.82
4	0.54692	10.25	13.90	8.07	24.15	18.32	56.00	46.00	-31.85	-27.68
5	10.79462	10.91	13.44	11.44	24.35	22.35	60.00	50.00	-35.65	-27.65
6	13.41823	11.00	16.62	15.44	27.62	26.44	60.00	50.00	-32.38	-23.56

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

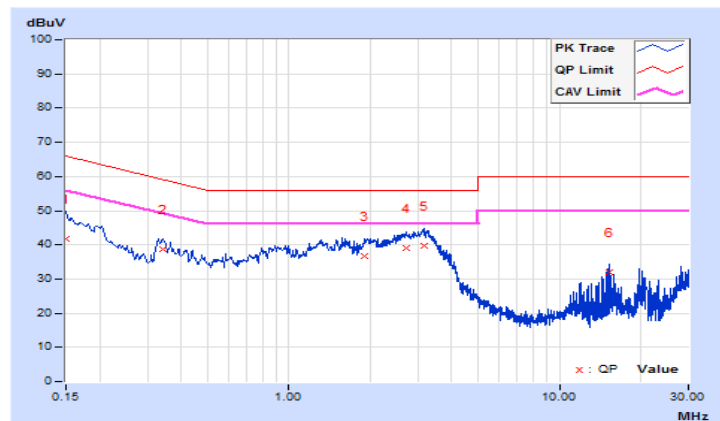


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	48Vdc	Environmental Conditions	24°C, 72%RH
Tested by	Adam Chen		
Test Mode	Mode 2		

Phase Of Power : Line (L)										
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	0.15000	10.11	31.75	20.46	41.86	30.57	66.00	56.00	-24.14	-25.43
2	0.34107	10.14	28.50	22.92	38.64	33.06	59.18	49.18	-20.54	-16.12
3	1.91082	10.31	26.53	18.03	36.84	28.34	56.00	46.00	-19.16	-17.66
4	2.71697	10.37	28.84	19.64	39.21	30.01	56.00	46.00	-16.79	-15.99
5	3.16662	10.41	29.29	19.58	39.70	29.99	56.00	46.00	-16.30	-16.01
6	15.32631	10.90	20.93	18.48	31.83	29.38	60.00	50.00	-28.17	-20.62

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

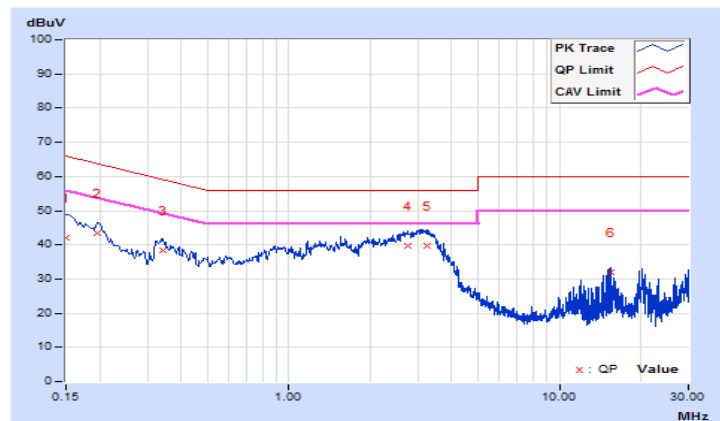


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	48Vdc	Environmental Conditions	24°C, 72%RH
Tested by	Adam Chen		
Test Mode	Mode 2		

Phase Of Power : Neutral (N)										
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	0.15000	10.12	31.80	20.47	41.92	30.59	66.00	56.00	-24.08	-25.41
2	0.19613	10.14	33.22	25.71	43.36	35.85	63.77	53.77	-20.41	-17.92
3	0.34107	10.15	28.29	23.05	38.44	33.20	59.18	49.18	-20.74	-15.98
4	2.74434	10.39	29.41	19.69	39.80	30.08	56.00	46.00	-16.20	-15.92
5	3.23309	10.43	29.23	19.27	39.66	29.70	56.00	46.00	-16.34	-16.30
6	15.58046	10.79	21.17	19.38	31.96	30.17	60.00	50.00	-28.04	-19.83

Remarks:

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



6 Radiated Emissions up to 1 GHz

6.1 Limits

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 10 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	39	29.5	40	30
88-216	43.5	33.1		
216-230	46.4	35.6		
230-960			47	37
960-1000	49.5	43.5		

Radiated Emissions Limits at 3 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	49.5	40	50.5	40.5
88-216	54	43.5		
216-230	56.9	46		
230-960			57.5	47.5
960-1000	60	54		

- Notes:
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
 3. QP detector shall be applied if not specified.

6.2 Test Instruments

Mode 1

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100027	Dec. 4, 2017	Dec. 3, 2018
Schwarzbeck Bilog Antenna	VULB9168	9168-303	Nov. 29, 2017	Nov. 28, 2018
Agilent Preamplifier	8447D	2944A08119	Feb. 21, 2018	Feb. 20, 2019
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. 25, 2018	Oct. 24, 2019
Pacific RF cable With 5dB PAD	8D	CABLE-ST2-01	Oct. 25, 2018	Oct. 24, 2019

Notes: 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-237.
 4. Tested Date: Nov. 15, 2018

Mode 2

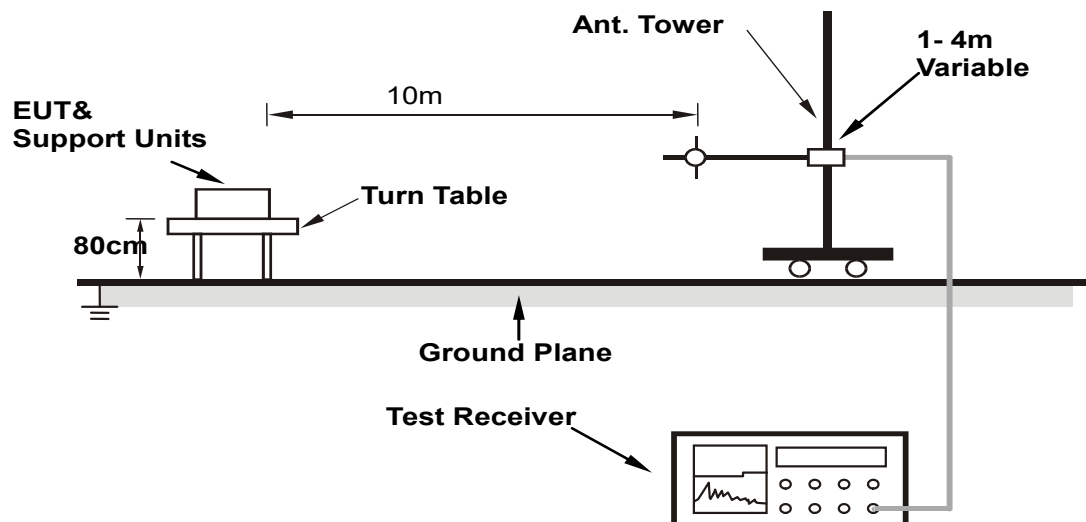
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100027	Dec. 4, 2017	Dec. 3, 2018
Schwarzbeck Bilog Antenna	VULB9168	9168-303	Nov. 29, 2017	Nov. 28, 2018
Agilent Preamplifier	8447D	2944A08119	Feb. 21, 2018	Feb. 20, 2019
ADT. Turn Table	TT100	0205	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. 26, 2017	Oct. 25, 2018
Pacific RF cable With 5dB PAD	8D	CABLE-ST2-01	Oct. 26, 2017	Oct. 25, 2018

Notes: 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-237.
 4. Tested Date: Oct. 19, 2018

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 below 1 GHz.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency below 1GHz.



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

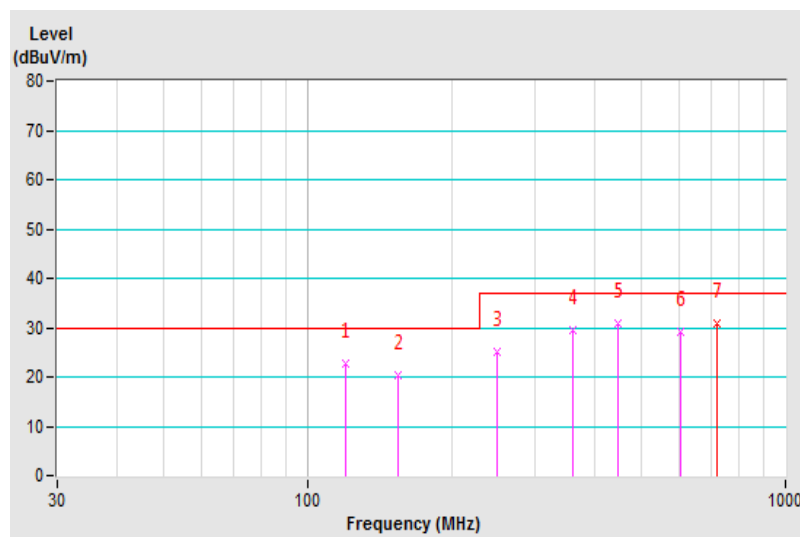
6.4 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Test Mode	Mode 1	Environmental Conditions	24°C, 74%RH
Tested by	Vincent Lin		

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	120.32	22.80 QP	30.00	-7.20	4.00 H	355	33.76	-10.96
2	154.99	20.17 QP	30.00	-9.83	4.00 H	224	28.89	-8.72
3	250.00	25.24 QP	37.00	-11.76	4.00 H	223	35.55	-10.31
4	360.01	29.65 QP	37.00	-7.35	3.43 H	85	36.48	-6.83
5	447.25	30.85 QP	37.00	-6.15	3.76 H	160	35.42	-4.57
6	603.25	29.20 QP	37.00	-7.80	1.00 H	215	29.91	-0.71
7	720.00	30.85 QP	37.00	-6.15	1.35 H	27	30.20	0.65

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

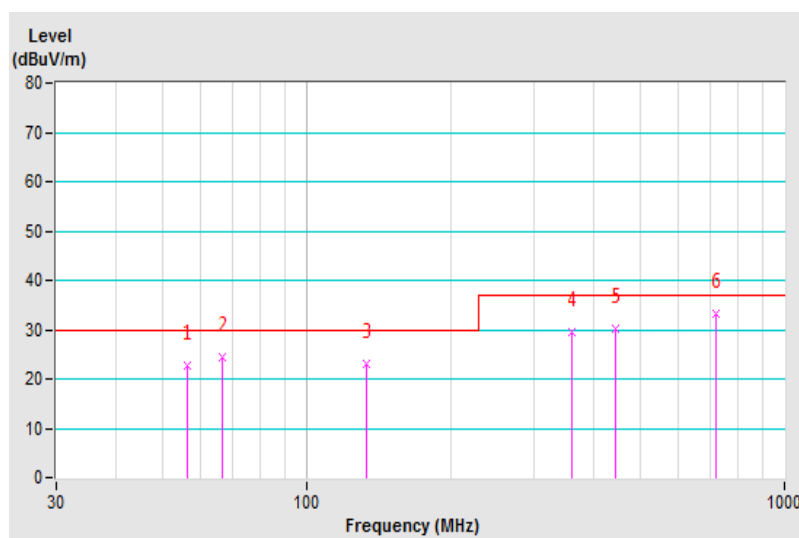


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Test Mode	Mode 1	Environmental Conditions	24°C, 74%RH
Tested by	Vincent Lin		

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	56.54	22.73 QP	30.00	-7.27	1.00 V	347	31.84	-9.11
2	66.53	24.50 QP	30.00	-5.50	1.00 V	208	34.64	-10.14
3	133.18	23.11 QP	30.00	-6.89	1.00 V	48	32.94	-9.83
4	359.98	29.52 QP	37.00	-7.48	1.16 V	339	36.35	-6.83
5	443.42	30.31 QP	37.00	-6.69	2.46 V	80	35.00	-4.69
6	720.00	33.30 QP	37.00	-3.70	2.40 V	287	32.65	0.65

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

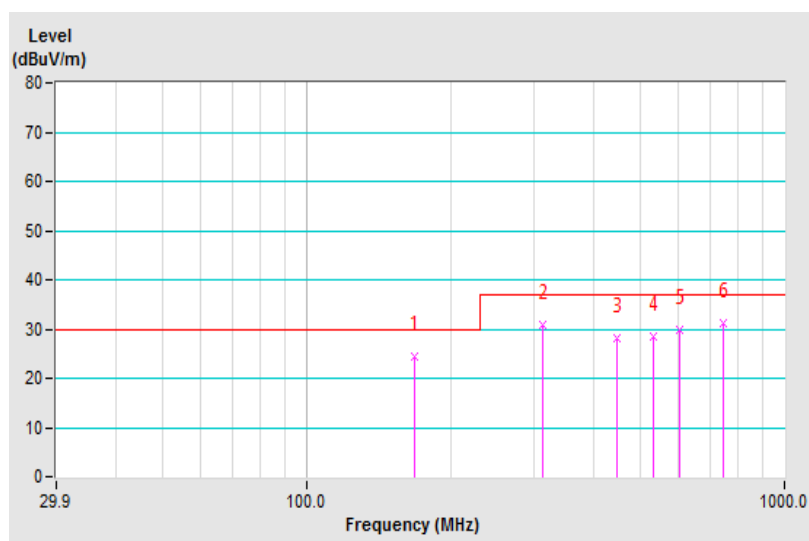


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Test Mode	Mode 2	Environmental Conditions	22°C, 78%RH
Tested by	Vic Lin		

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	168.37	24.38 QP	30.00	-5.62	4.00 H	162	33.56	-9.18
2	311.01	30.82 QP	37.00	-6.18	2.93 H	124	38.98	-8.16
3	447.37	28.09 QP	37.00	-8.91	1.99 H	116	32.90	-4.81
4	530.87	28.41 QP	37.00	-8.59	2.01 H	105	31.47	-3.06
5	602.71	29.81 QP	37.00	-7.19	3.00 H	121	31.22	-1.41
6	747.23	31.22 QP	37.00	-5.78	1.00 H	128	30.70	0.52

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

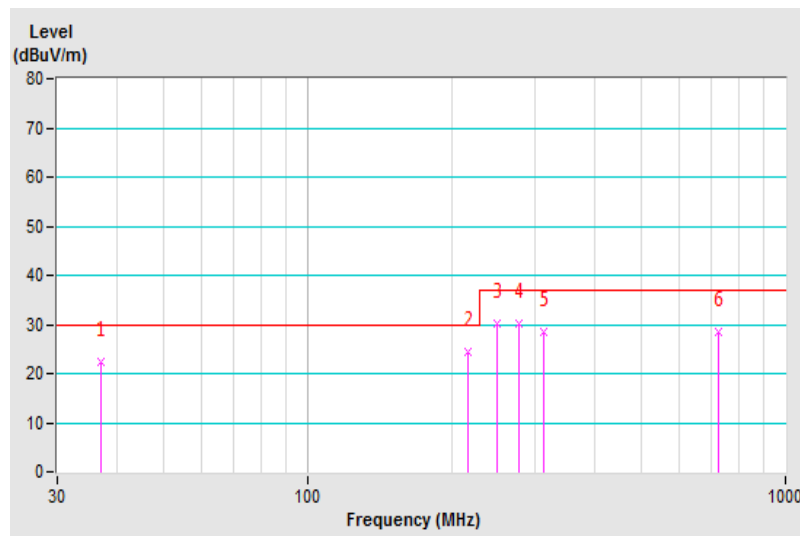


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Test Mode	Mode 2	Environmental Conditions	22°C, 78%RH
Tested by	Vic Lin		

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	37.03	22.32 QP	30.00	-7.68	1.00 V	162	32.01	-9.69
2	216.41	24.38 QP	30.00	-5.62	1.00 V	308	36.46	-12.08
3	250.02	30.28 QP	37.00	-6.72	1.00 V	133	40.65	-10.37
4	276.18	30.33 QP	37.00	-6.67	1.00 V	108	39.42	-9.09
5	311.10	28.61 QP	37.00	-8.39	1.00 V	181	36.77	-8.16
6	725.82	28.44 QP	37.00	-8.56	2.00 V	61	28.44	0.00

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 Radiated Emissions above 1 GHz

7.1 Limits

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 10 meters (dB μ V/m)				
Frequencies (MHz)	FCC 15B/ ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
1000-3000	Avg: 49.5	Avg: 43.5	Not defined	Not defined
Above 3000	Peak: 69.5	Peak: 63.5	Not defined	Not defined

Radiated Emissions Limits at 3 meters (dB μ V/m)				
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
1000-3000	Avg: 60 Peak: 80	Avg: 54 Peak: 74	Avg: 56 Peak: 76	Avg: 50 Peak: 70
Above 3000			Avg: 60 Peak: 80	Avg: 54 Peak: 74

- Notes: 1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dB μ V/m) = 20 log Emission level (uV/m).
 3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Frequency Range of Radiated Measurement (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5th harmonic of the highest frequency or 40GHz, whichever is lower

7.2 Test Instruments

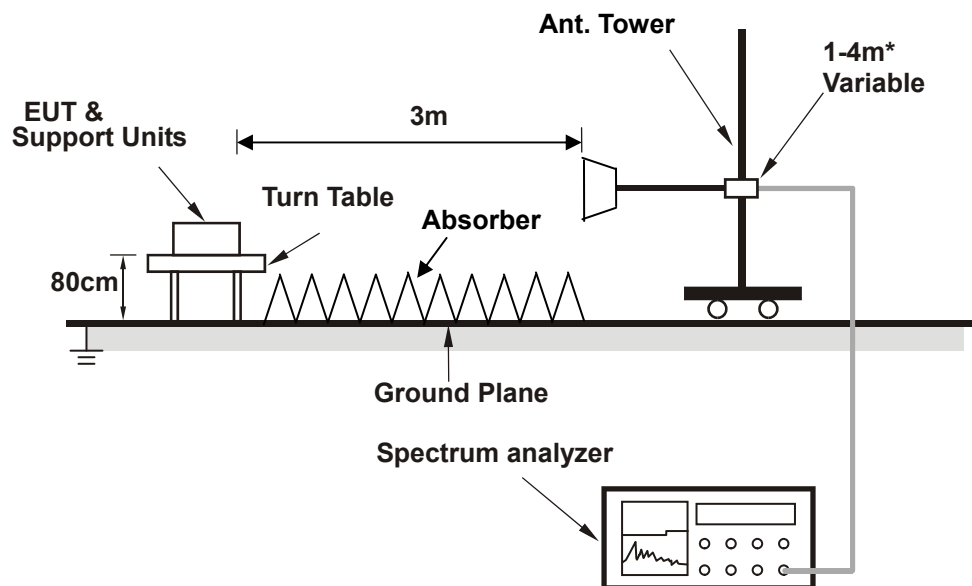
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Agilent Spectrum	E4446A	MY51100009	Jun. 4, 2018	Jun. 3, 2019
Agilent Test Receiver	N9038A	MY51210137	Jun. 19, 2018	Jun. 18, 2019
Agilent Preamplifier	8449B	3008A01292	Feb. 22, 2018	Feb. 21, 2019
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 21, 2018	Feb. 20, 2019
EMCI Preamplifier	EMC184045B	980235	Feb. 22, 2018	Feb. 21, 2019
Schwarzbeck Horn Antenna	BBHA-9170	212	Dec. 1, 2017	Nov. 30, 2018
EMCO Horn Antenna	3115	6714	Dec. 12, 2017	Dec. 11, 2018
Max Full. Turn Table	MF7802	MF780208216	NA	NA
Software	Radiated_V8.7.08	NA	NA	NA
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH10-3.6m	Aug. 13, 2018	Aug. 12, 2019
MICRO-TRONICS Notch filter	BRC50703-01	010	May 31, 2018	May 30, 2019
MICRO-TRONICS Band Pass Filter	BRM17690	005	May 31, 2018	May 30, 2019

- Notes:
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 Chamber No. 10.
 3. The Industry Canada Reference No. IC 7450E-11.
 4. The VCCI Site Registration No. G-10427
 5. Tested Date: Oct. 20 ~ Nov. 15, 2018

7.3 Test Arrangement

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The spectrum analyzer system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.



* :depends on the EUT height and the antenna 3dB beamwidth both.

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

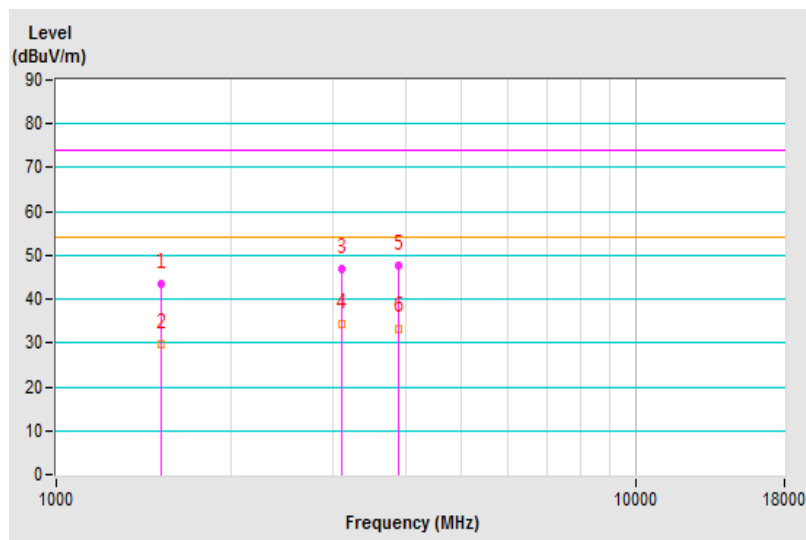
7.4 Test Results

Frequency Range	1GHz ~ 10GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Test Mode	Mode 1	Environmental Conditions	19°C, 70%RH
Tested by	Chin-wen Wang		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1514.25	43.30 PK	74.00	-30.70	1.08 H	146	46.53	-3.23
2	1514.25	29.85 AV	54.00	-24.15	1.08 H	146	33.08	-3.23
3	3108.85	46.97 PK	74.00	-27.03	1.53 H	330	44.53	2.44
4	3108.85	34.30 AV	54.00	-19.70	1.53 H	330	31.86	2.44
5	3900.62	47.59 PK	74.00	-26.41	1.96 H	76	41.99	5.60
6	3900.62	33.33 AV	54.00	-20.67	1.96 H	76	27.73	5.60

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

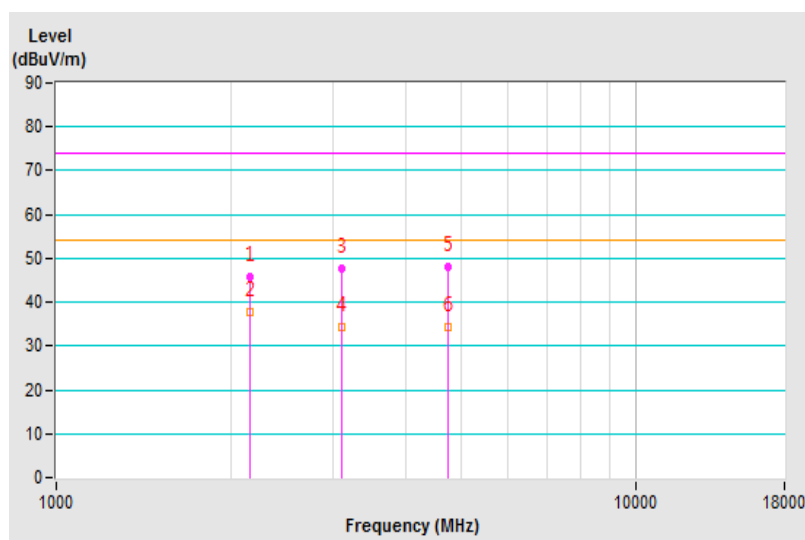


Frequency Range	1GHz ~ 10GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Test Mode	Mode 1	Environmental Conditions	19°C, 70%RH
Tested by	Chin-wen Wang		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2159.98	45.81 PK	74.00	-28.19	1.53 V	87	46.63	-0.82
2	2159.98	37.75 AV	54.00	-16.25	1.53 V	87	38.57	-0.82
3	3110.97	47.58 PK	74.00	-26.42	2.34 V	182	45.13	2.45
4	3110.97	34.26 AV	54.00	-19.74	2.34 V	182	31.81	2.45
5	4733.20	48.15 PK	74.00	-25.85	1.06 V	302	42.57	5.58
6	4733.20	34.22 AV	54.00	-19.78	1.06 V	302	28.64	5.58

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

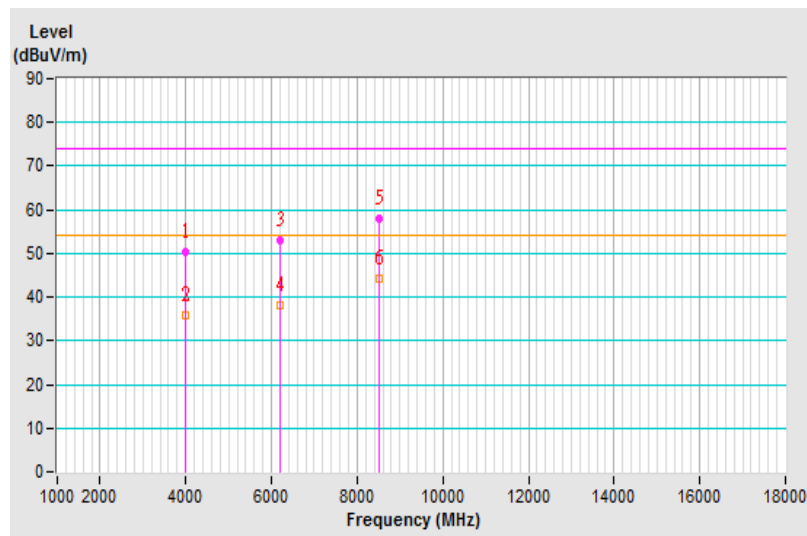


Frequency Range	1GHz ~ 10GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Test Mode	Mode 2	Environmental Conditions	23°C, 77%RH
Tested by	Vincent Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4007.33	50.47 PK	74.00	-23.53	1.65 H	166	45.24	5.23
2	4007.33	35.84 AV	54.00	-18.16	1.65 H	166	30.61	5.23
3	6190.70	52.84 PK	74.00	-21.16	1.11 H	178	44.57	8.27
4	6190.70	37.95 AV	54.00	-16.05	1.11 H	178	29.68	8.27
5	8500.67	57.79 PK	74.00	-16.21	1.20 H	12	46.56	11.23
6	8500.67	44.21 AV	54.00	-9.79	1.20 H	12	32.98	11.23

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

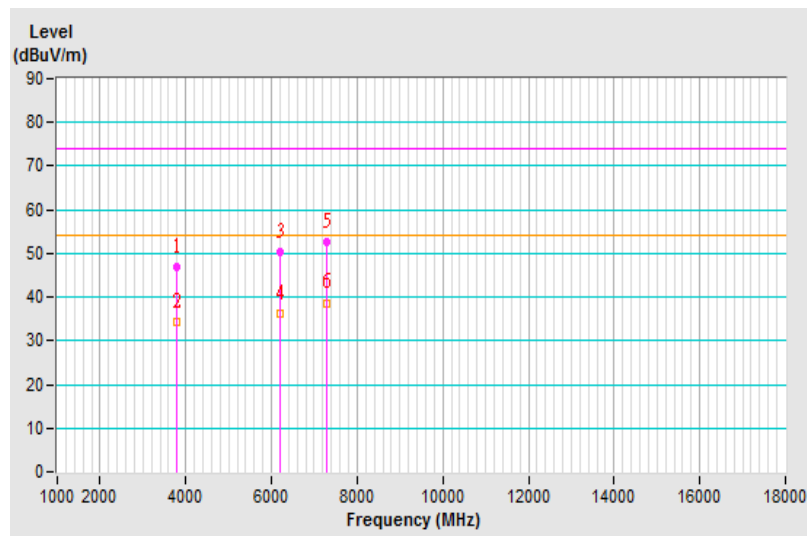


Frequency Range	1GHz ~ 10GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Test Mode	Mode 2	Environmental Conditions	23°C, 77%RH
Tested by	Vincent Chen		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3780.78	47.00 PK	74.00	-27.00	1.32 V	156	42.17	4.83
2	3780.78	34.35 AV	54.00	-19.65	1.32 V	156	29.52	4.83
3	6214.75	50.18 PK	74.00	-23.82	2.34 V	290	41.84	8.34
4	6214.75	36.19 AV	54.00	-17.81	2.34 V	290	27.85	8.34
5	7280.65	52.50 PK	74.00	-21.50	2.18 V	349	41.96	10.54
6	7280.65	38.70 AV	54.00	-15.30	2.18 V	349	28.16	10.54

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



8 Pictures of Test Arrangements

8.1 Conducted Emissions at Mains Ports

Mode 1



Mode 2



8.2 Radiated Emissions up to 1 GHz

Mode 1



Mode 2



8.3 Radiated Emissions above 1 GHz

Mode 1



Mode 2



Appendix – Information on the Testing Laboratories

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

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

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Web Site: www.bureauveritas-adt.com

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

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