

## FCC Test Report

**Report No.:** FC190716E01

**FCC ID:** J9C-QCNFA524

**Test Model:** QCNFA524

**Received Date:** July 16, 2019

**Test Date:** Oct. 16 to 30, 2019

**Issued Date:** Nov. 15, 2019

**Applicant:** Qualcomm Technologies, Inc.

**Address:** 5775 Morehouse Drive, San Diego, CA 92121-1714

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

**Lab Address:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan.

**Test Location (1):** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan.

**Test Location (2):** No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan.

**FCC Registration /** 810758 / TW1085 for Test Location (1)  
**Designation Number:** 960022 / TW1058 for Test Location (2)



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

## Table of Contents

<b>Release Control Record .....</b>	<b>3</b>
<b>1 Certificate of Conformity .....</b>	<b>4</b>
<b>2 Summary of Test Results.....</b>	<b>5</b>
2.1 Measurement Uncertainty .....	5
2.2 Modification Record .....	5
<b>3 General Information .....</b>	<b>6</b>
3.1 Description of EUT .....	6
3.2 Features of EUT .....	7
3.3 Description of Antenna .....	7
3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode .....	8
3.5 Test Program Used and Operation Descriptions.....	8
3.6 Primary Clock Frequencies of Internal Source .....	8
<b>4 Configuration and Connections with EUT .....</b>	<b>9</b>
4.1 Connection Diagram of EUT and Peripheral Devices .....	9
4.2 Configuration of Peripheral Devices and Cable Connections .....	10
<b>5 Conducted Emissions at Mains Ports.....</b>	<b>11</b>
5.1 Limits .....	11
5.2 Test Instruments .....	11
5.3 Test Arrangement .....	12
5.4 Supplementary Information .....	12
5.5 Test Results.....	13
<b>6 Radiated Emissions up to 1 GHz .....</b>	<b>15</b>
6.1 Limits .....	15
6.2 Test Instruments .....	16
6.3 Test Arrangement .....	17
6.4 Supplementary Information .....	17
6.5 Test Results.....	18
<b>7 Radiated Emissions above 1 GHz.....</b>	<b>20</b>
7.1 Limits .....	20
7.2 Test Instruments .....	21
7.3 Test Arrangement .....	22
7.4 Supplementary Information .....	22
7.5 Test Results.....	23
<b>8 Pictures of Test Arrangements .....</b>	<b>25</b>
<b>Appendix – Information of the Testing Laboratories .....</b>	<b>26</b>

### Release Control Record

Issue No.	Description	Date Issued
FC190716E01	Original release.	Nov. 15, 2019

## 1 Certificate of Conformity

**Product:** Wi-Fi 6 + BT 5.1 M.2 1216 Module

**Brand:** Qualcomm

**Test Model:** QCNFA524

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** Qualcomm Technologies, Inc.

**Test Date:** Oct. 16 to 30, 2019

**Standards:** 47 CFR FCC Part 15, Subpart B, Class B  
ICES-003:2016 Issue 6, updated Apr. 2019, 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 :**

Phoenix Huang  
Phoenix Huang / Specialist

**Date:**

Nov. 15, 2019

**Approved by :**

Ken Lu  
Ken Lu / Manager

**Date:**

Nov. 15, 2019

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart B / ICES-003:2016 Issue 6, updated Apr. 2019, Class B

ANSI C63.4:2014

FCC Clause	ICES-003 Clause	Test Item	Result/Remarks	Verdict
15.107	6.1	AC Power Line Conducted Emissions	Minimum passing Class B margin is -11.46 dB at 0.15781 MHz	Pass
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class B margin is -0.97 dB at 199.54 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class B margin is -9.20 dB at 11469.60 MHz	Pass

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

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

Measurement	Frequency	Expanded Uncertainty (k=2) ( $\pm$ )
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.8 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.0 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.7 dB
	6GHz ~ 18GHz	5.2 dB
	18GHz ~ 40GHz	5.3 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 Description of EUT

Product	Wi-Fi 6 + BT 5.1 M.2 1216 Module
Brand	Qualcomm
Test Model	QCNFA524
Sample Status	ENGINEERING SAMPLE
Operating Software	NA
Power Supply Rating	3.3Vdc from host equipment
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. This device of WLAN (2.4GHz & 5GHz U-NII-1 Band) can support hotspot mode.
2. The EUT incorporates a MIMO function:

2.4GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11b	2TX	2RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
VHT20	2TX	2RX
VHT40	2TX	2RX
802.11ax (HE20)	2TX	2RX
802.11ax (HE40)	2TX	2RX
802.11ax (RU26/52/106/242/484)	2TX	2RX
5GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11a	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
802.11ac (VHT20)	2TX	2RX
802.11ac (VHT40)	2TX	2RX
802.11ac (VHT80)	2TX	2RX
802.11ax (HE20)	2TX	2RX
802.11ax (HE40)	2TX	2RX
802.11ax (HE80)	2TX	2RX
802.11ax (RU26/52/106/242/484/996)	2TX	2RX

#### 3. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)
2	WLAN (5GHz)	Bluetooth

4. The device of WLAN (2.4GHz) and Bluetooth technology can't transmit simultaneously, it was used timely shared coexistence technology.

### 3.2 Features of EUT

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

### 3.3 Description of Antenna

The antenna gain was declared by client; please refer to the following table:

Ant. No.	Brand	Model	Antenna Net gain	Frequency range (GHz)	Cable Loss (dBi)	Ant. Type	Connector Type	Cable Length (mm)
1	WNC	81.EBJ15.005	3.00	2.4~2.4835	1.15	PIFA	i-pex(MHF2)	300
			2.56	5.15~5.35	1.70			
			4.76	5.47~5.725	1.74			
			4.76	5.725~5.850	1.79			
2	WNC	81.EBJ15.005	3.62	2.4~2.4835	1.15	PIFA	i-pex(MHF2)	300
			3.08	5.15~5.35	1.70			
			3.31	5.47~5.725	1.74			
			2.42	5.725~5.850	1.79			

Note: 1. Above antenna gains of antenna are Total (H+V).

2. The Antenna No. 1 was selected for the final test.

### 3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode

Test mode is presented in the report as below.

Mode	Test Condition
1	Client MODE AX 2.4G / 5G + Hotspot MODE 2.4G / 5G + Bluetooth

NOTE: The test configurations are defined by the applicant requirement.

### 3.5 Test Program Used and Operation Descriptions

1. Turn on the power of all equipment.
2. Support unit G & H (AP Router) links EUT via wireless 2.4G / 5G of Client MODE.
3. Support unit K & L (Laptop) links EUT via wireless 2.4G / 5G of Hotspot MODE.
4. Support unit K (Laptop) runs "Ping.exe" program to communicate with support unit I (Laptop) via wireless 2.4G.
5. Support unit L (Laptop) runs "Ping.exe" program to communicate with support unit J (Laptop) via wireless 5G.
6. Support unit M (BT Speaker) play audio by support unit A (Laptop) runs "media player.exe" via BT of EUT.
7. Support unit A (Laptop) runs "EMC test.exe" then sends "H" messages to itself.

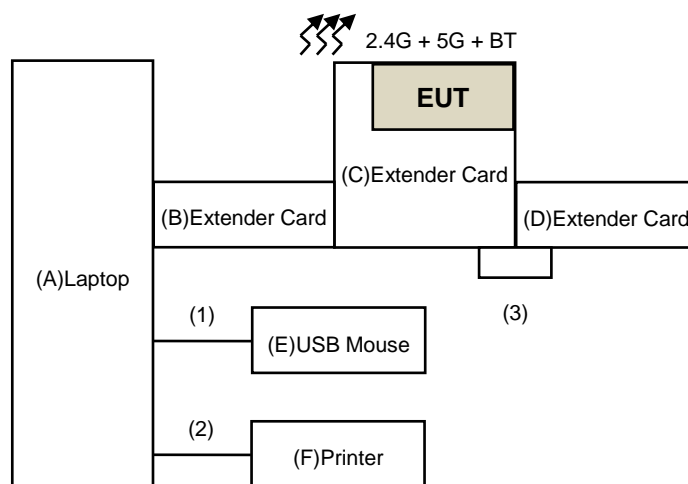
### 3.6 Primary Clock Frequencies of Internal Source

The EUT is provided by Qualcomm Technologies, Inc., for detailed internal source, please refer to the manufacturer's specifications.

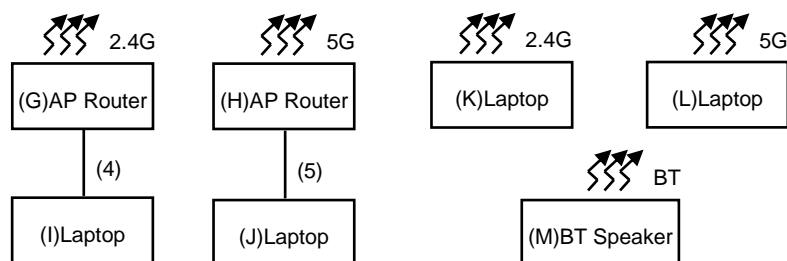


## 4 Configuration and Connections with EUT

### 4.1 Connection Diagram of EUT and Peripheral Devices



#### Remote Site



## 4.2 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	Dell	E6230	4BGVYW1	NA	Provided by Lab
B.	Extender Card	Qualcomm	Y6570	NA	NA	Supplied by client
C.	Extender Card	Qualcomm	YB222	NA	NA	Supplied by client
D.	Extender Card	Qualcomm	Y5984	NA	NA	Supplied by client
E.	USB Mouse	DELL	MO56UO	516045397	NA	Provided by Lab
F.	Printer	EPSON	LQ-300+II	G88Y074083	FCC DoC	Provided by Lab
G.	AP Router	ASUS	AX6000	NA	NA	Provided by Lab
H.	AP Router	ASUS	AX6000	NA	NA	Provided by Lab
I.	Laptop	DELL	PP27L	6YLB32S	FCC DoC	Provided by Lab
J.	Laptop	DELL	PP27L	7YLB32S	FCC DoC	Provided by Lab
K.	Laptop	DELL	P70F	JJY07L2	FCC DoC	Provided by Lab
L.	Laptop	DELL	P70F	1KY07L2	FCC DoC	Provided by Lab
M.	BT Speaker	NA	NA	NA	NA	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Cable	1	1.8	Yes	0	Provided by Lab
2.	USB Cable	1	1.8	Yes	0	Provided by Lab
3.	USB to Micro USB Cable	1	1	Yes	0	Supplied by client

## 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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	100375	May 15, 2019	May 14, 2020
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 04, 2019	Sep. 03, 2020
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV 216	100072	June 12, 2019	June 11, 2020
RF Cable	5D-FB	COACAB-001	Mar. 14, 2019	Mar. 13, 2020
10 dB PAD EMEC	STI02-2200-10	004	Mar. 14, 2019	Mar. 13, 2020
50 ohms Terminator	N/A	EMC-03	Sep. 25, 2019	Sep. 24, 2020
50 ohms Terminator	N/A	EMC-02	Sep. 25, 2019	Sep. 24, 2020
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

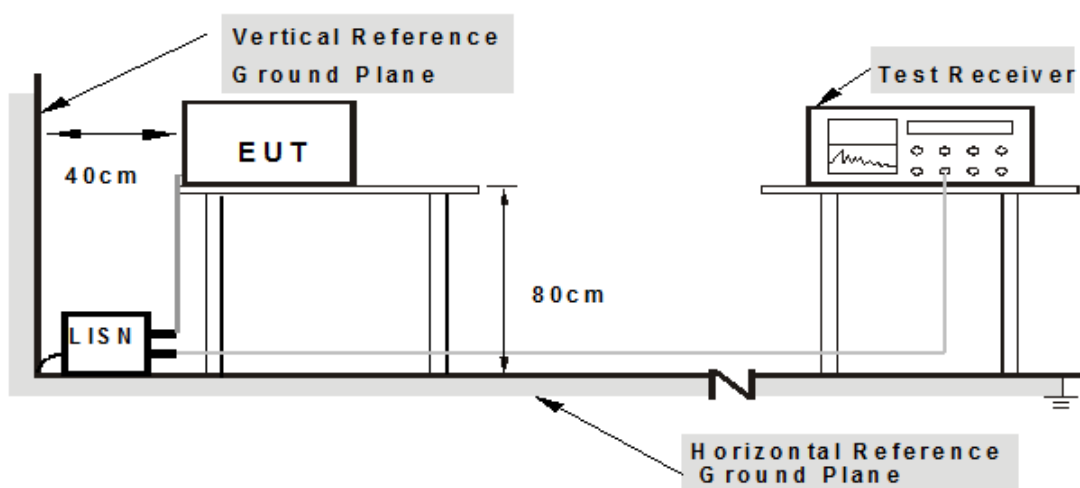
#### Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conducted Room C
3. The VCCI Con C Registration No. is C-13611.
4. Tested Date: Oct. 16, 2019

### 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: 1. 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 Supplementary Information

There is not any deviation from the test standards for the test method.

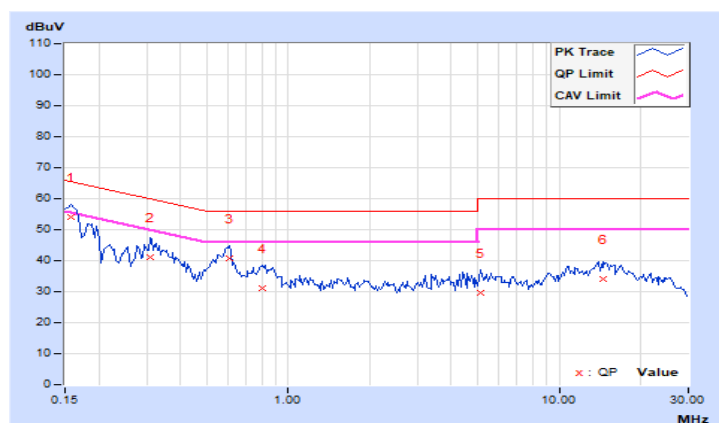
## 5.5 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 75%RH
Tested by	Nick Lo		
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	0.15781	10.02	43.98	34.08	54.00	44.10	65.58	55.58	-11.58	-11.48
2	0.31016	10.02	31.22	19.66	41.24	29.68	59.97	49.97	-18.73	-20.29
3	0.60703	10.04	30.74	23.86	40.78	33.90	56.00	46.00	-15.22	-12.10
4	0.80234	10.05	21.08	14.38	31.13	24.43	56.00	46.00	-24.87	-21.57
5	5.14063	10.22	19.30	11.84	29.52	22.06	60.00	50.00	-30.48	-27.94
6	14.45703	10.47	23.60	16.38	34.07	26.85	60.00	50.00	-25.93	-23.15

### 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

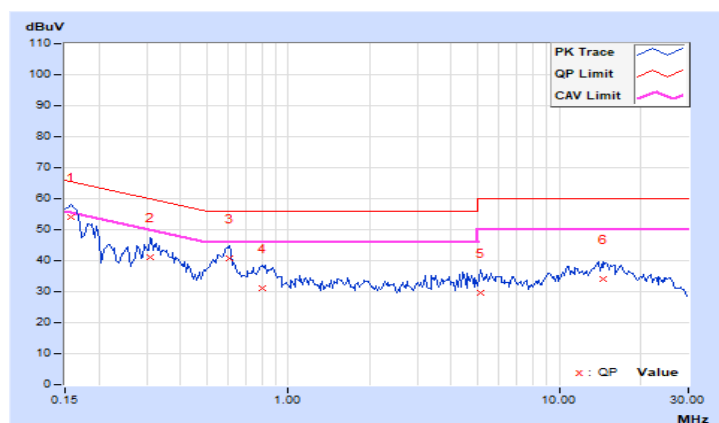


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 75%RH
Tested by	Nick Lo		
Test Mode	Mode 1		

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	0.15781	10.04	43.98	34.08	54.02	44.12	65.58	55.58	-11.56	-11.46
2	0.31016	10.04	31.22	19.66	41.26	29.70	59.97	49.97	-18.71	-20.27
3	0.60703	10.05	30.74	23.86	40.79	33.91	56.00	46.00	-15.21	-12.09
4	0.80234	10.05	21.08	14.38	31.13	24.43	56.00	46.00	-24.87	-21.57
5	5.14063	10.21	19.30	11.84	29.51	22.05	60.00	50.00	-30.49	-27.95
6	14.45703	10.46	23.60	16.38	34.06	26.84	60.00	50.00	-25.94	-23.16

**Remarks:**

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



## 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				
960-1000	60	54	57.5	47.5

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

## 6.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010125	Apr. 11, 2019	Apr. 10, 2020
Test Receiver Agilent	N9038A	MY50010132	July 12, 2019	July 11, 2020
Pre-Amplifier Sonoma	310N	352925	Aug. 26, 2019	Aug. 25, 2020
	310N	352926	Aug. 26, 2019	Aug. 25, 2020
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-359	Nov. 22, 2018	Nov. 21, 2019
	VULB 9168	9168-358	Nov. 21, 2018	Nov. 20, 2019
Fixed attenuator Mini-Circuits	UNAT-5+	CHF-001	Sep. 04, 2019	Sep. 03, 2020
	UNAT-5+	CHF-002	Sep. 04, 2019	Sep. 03, 2020
RF Cable	8D-FB	CHFCAB-001-1 CHFCAB-001-3 CHFCAB-001-4	Sep. 16, 2019	Sep. 15, 2020
		CHFCAB-002-1 CHFCAB-002-3 CHFCAB-002-4	Sep. 16, 2019	Sep. 15, 2020
Software BVADT	ADT_Radiated_V 8.7.08	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

### Note:

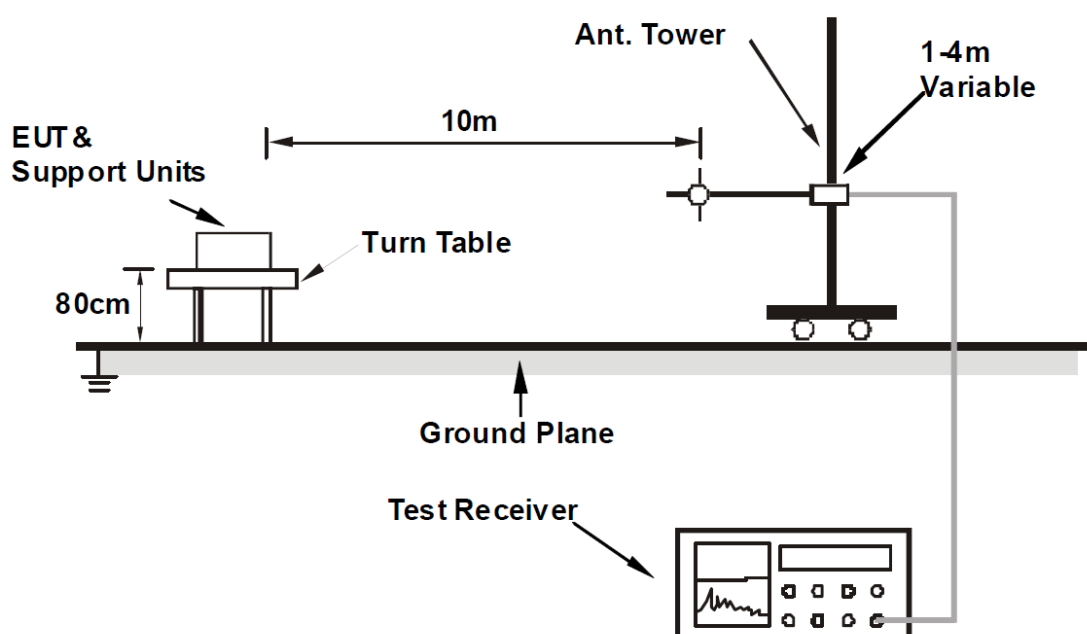
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Chamber F room
3. The VCCI Site Registration No. is R-13252.
4. Tested Date: Oct. 30, 2019



### 6.3 Test Arrangement

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

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



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

### 6.4 Supplementary Information

There is not any deviation from the test standards for the test method.

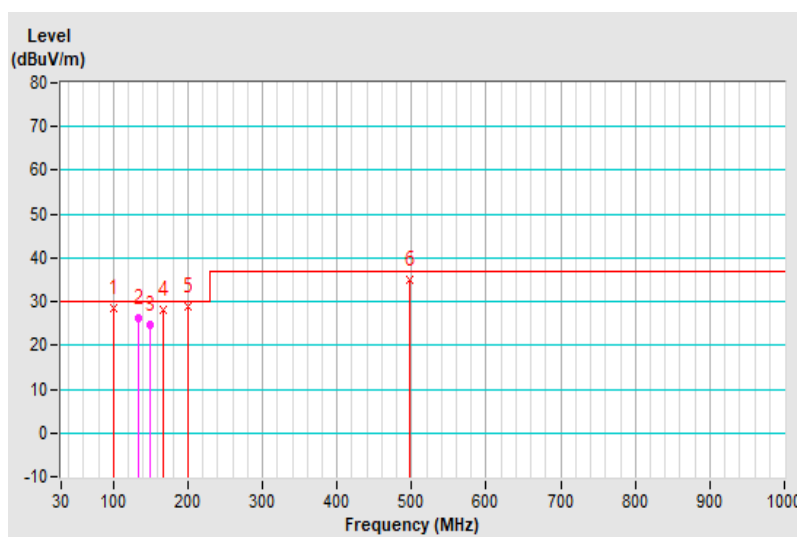
## 6.5 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	3.3Vdc from host equipment	Environmental Conditions	25°C, 62%RH
Tested by	Pon Tsai		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	99.62	28.53 QP	30.00	-1.47	4.00 H	73	45.30	-16.77
2	133.04	26.34 QP	30.00	-3.66	4.00 H	145	39.60	-13.26
3	148.63	24.59 QP	30.00	-5.41	4.00 H	2	36.91	-12.32
4	165.99	28.01 QP	30.00	-1.99	4.00 H	78	40.37	-12.36
<b>5</b>	<b>199.54</b>	<b>29.03 QP</b>	<b>30.00</b>	<b>-0.97</b>	<b>3.98 H</b>	<b>83</b>	<b>43.58</b>	<b>-14.55</b>
6	497.88	35.02 QP	37.00	-1.98	2.00 H	225	40.88	-5.86

Remarks:

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

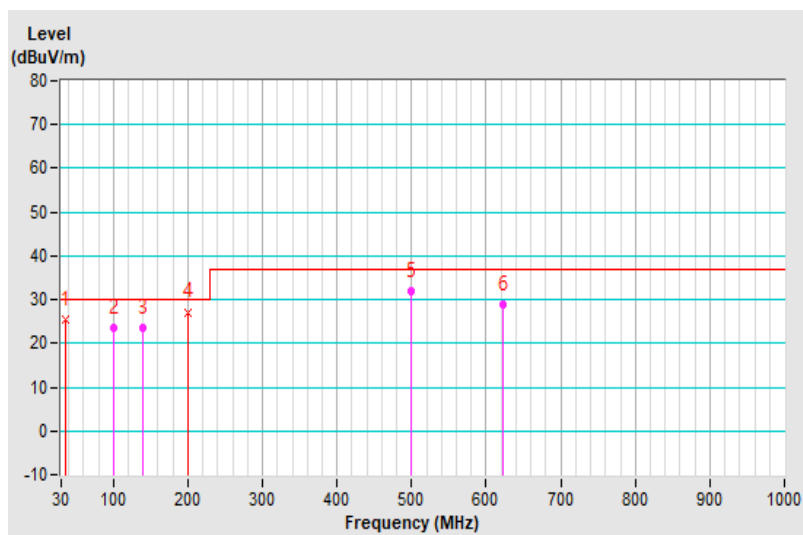


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	3.3Vdc from host equipment	Environmental Conditions	25°C, 62%RH
Tested by	Pon Tsai		
Test Mode	Mode 1		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	35.47	25.57 QP	30.00	-4.43	1.00 V	203	39.59	-14.02
2	99.72	23.54 QP	30.00	-6.46	1.00 V	30	40.19	-16.65
3	139.22	23.37 QP	30.00	-6.63	3.00 V	230	35.97	-12.60
4	199.17	27.16 QP	30.00	-2.84	1.01 V	261	41.83	-14.67
5	498.90	31.82 QP	37.00	-5.18	1.00 V	262	37.31	-5.49
6	623.42	28.88 QP	37.00	-8.12	3.00 V	292	31.33	-2.45

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 $\mu$ 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 Peak: 69.5	Avg: 43.5 Peak: 63.5	Not defined	Not defined
Above 3000			Not defined	Not defined

Radiated Emissions Limits at 3 meters (dB $\mu$ 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 $\mu$ 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 (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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010125	Apr. 11, 2019	Apr. 10, 2020
Pre-Amplifier Agilent	8449B	3008A01975	Feb. 21, 2019	Feb. 20, 2020
Horn Antenna SCHWARZBECK	BBHA 9120D	D123	Nov. 25, 2018	Nov. 24, 2019
RF Coaxial Cable	EMC104-SM-SM -2500	170209	Mar. 05, 2019	Mar. 04, 2020
RF Coaxial Cable	EMC104-SM-SM -6000	170207	Mar. 05, 2019	Mar. 04, 2020
RF Coaxial Cable	EMC104-SM-SM -11000	170206	Mar. 05, 2019	Mar. 04, 2020
Spectrum Analyzer Agilent	E4446A	MY48250253	July 24, 2019	July 23, 2020
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Dec. 04, 2018	Dec. 03, 2019
Horn Antenna SCHWARZBECK	BBHA 9170	9170-424	Nov. 25, 2018	Nov. 24, 2019
RF Cable	SUCOFLEX 102	36432/2	Jan. 10, 2019	Jan. 09, 2020
RF Cable	SUCOFLEX 102	36443/2	Jan. 10, 2019	Jan. 09, 2020
Software BVADT	ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
Fix tool for Boresight antenna tower	BAF-01	5	NA	NA

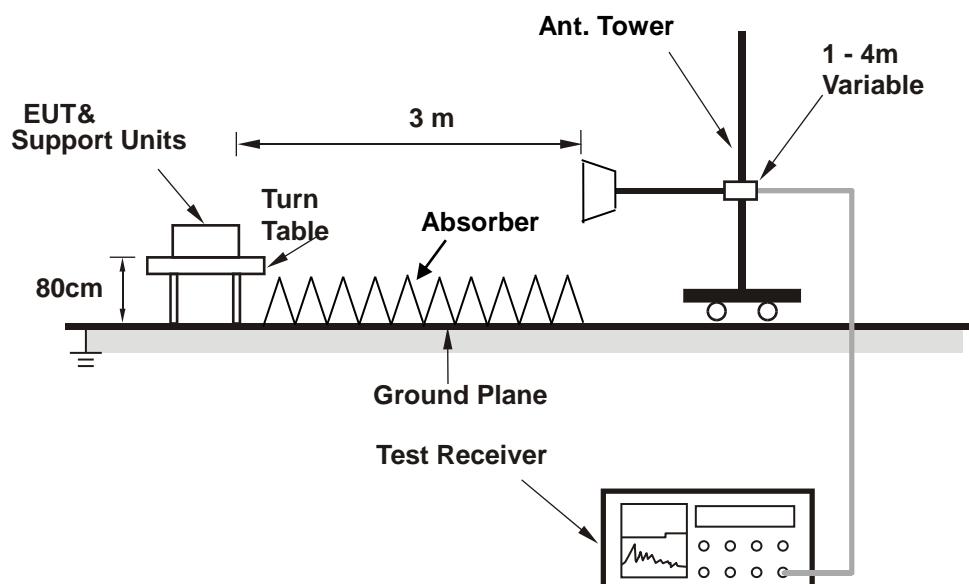
### Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Chamber F room
3. Tested Date: Oct. 30, 2019

### 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.



The test arrangement is in accordance with ANSI 63.4:2014. For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 7.4 Supplementary Information

There is not any deviation from the test standards for the test method.

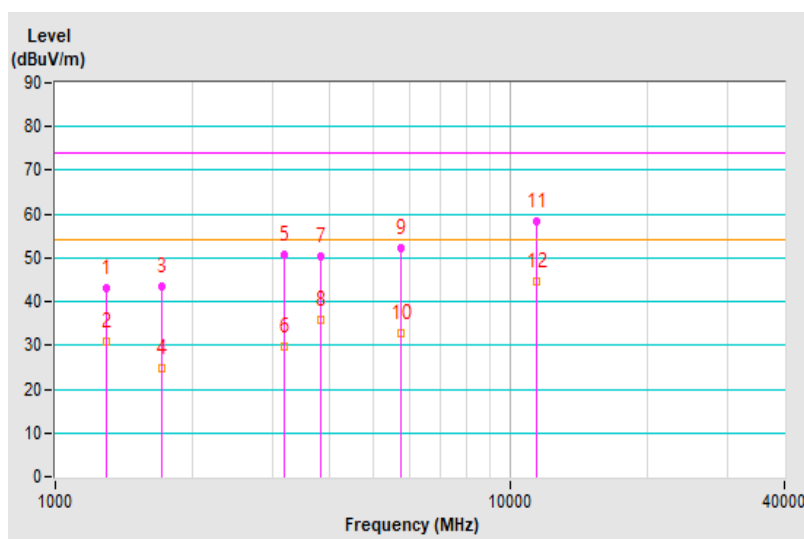
## 7.5 Test Results

Frequency Range	1GHz ~ 29.5GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 62%RH
Tested by	Pon Tsai		
Test Mode	Mode 1		

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	1295.16	43.06 PK	74.00	-30.94	1.00 H	122	46.23	-3.17
2	1295.16	30.95 AV	54.00	-23.05	1.00 H	116	34.12	-3.17
3	1718.67	43.43 PK	74.00	-30.57	1.00 H	38	45.46	-2.03
4	1718.67	24.79 AV	54.00	-29.21	1.00 H	17	26.82	-2.03
5	3188.53	50.83 PK	74.00	-23.17	1.00 H	102	46.79	4.04
6	3188.53	29.67 AV	54.00	-24.33	1.00 H	99	25.63	4.04
7	3836.43	50.21 PK	74.00	-23.79	1.00 H	125	44.33	5.88
8	3836.43	35.82 AV	54.00	-18.18	1.00 H	116	29.94	5.88
9	5759.15	52.33 PK	74.00	-21.67	1.00 H	135	42.08	10.25
10	5759.15	32.78 AV	54.00	-21.22	1.00 H	116	22.53	10.25
11	11452.87	58.23 PK	74.00	-15.77	1.00 H	99	33.74	24.49
12	11452.87	44.56 AV	54.00	-9.44	1.00 H	79	20.07	24.49

### 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

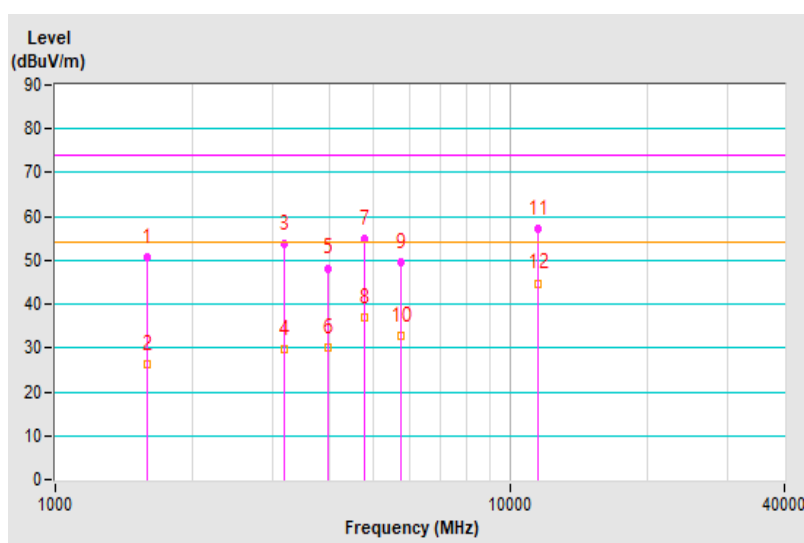


Frequency Range	1GHz ~ 29.5GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 62%RH
Tested by	Pon Tsai		
Test Mode	Mode 1		

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	1596.30	50.67 PK	74.00	-23.33	1.00 V	112	53.02	-2.35
2	1596.30	26.41 AV	54.00	-27.59	1.00 V	128	28.76	-2.35
3	3186.13	53.68 PK	74.00	-20.32	1.00 V	177	49.64	4.04
4	3186.13	29.59 AV	54.00	-24.41	1.00 V	166	25.55	4.04
5	3986.00	48.24 PK	74.00	-25.76	1.00 V	352	41.64	6.60
6	3986.00	30.00 AV	54.00	-24.00	1.00 V	360	23.40	6.60
7	4783.25	54.75 PK	74.00	-19.25	1.00 V	312	41.03	13.72
8	4783.25	37.01 AV	54.00	-16.99	1.00 V	360	23.29	13.72
9	5737.28	49.42 PK	74.00	-24.58	1.00 V	142	39.30	10.12
10	5737.28	32.86 AV	54.00	-21.14	1.00 V	135	22.74	10.12
11	11469.60	57.16 PK	74.00	-16.84	1.00 V	236	32.62	24.54
12	11469.60	44.80 AV	54.00	-9.20	1.00 V	242	20.26	24.54

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

Please refer to the attached file (Test Setup Photo).

## Appendix – Information of the Testing Laboratories

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

**Lin Kou EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-6668565

Fax: 886-3-6668323

**Hwa Ya EMC/RF/Safety Lab**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

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

--- END ---