

FCC Test Report

Report No.: FC180410E17

Test Model: N782

Received Date: Apr. 10, 2018

Test Date: May 12 to 16, 2018

Issued Date: July 16, 2018

Applicant: NETRONIX, INC.

Address: No. 945, Boai St., Jubei City, Hsin-Chu,302,Taiwan, R.O.C.

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

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

FCC Registration / 810758 / TW1085 for Test Location (1)

Designation Number: 960022 / TW1058 for Test Location (2)



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Release Control Record

Issue No.	Description	Date Issued
FC180410E17	Original release.	July 16, 2018

1 Certificate of Conformity

Product: Electronic Display Device

Brand: Rakuten kobo

Test Model: N782

Sample Status: ENGINEERING SAMPLE

Applicant: NETRONIX, INC.

Test Date: May 12 to 16, 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 : Mary Ko , **Date:** July 16, 2018
Mary Ko / Specialist

Approved by : Ken Lu , **Date:** July 16, 2018
Ken Lu / 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	AC Power Line Conducted Emissions	Minimum passing Class B margin is -11.33 dB at 0.18125 MHz	Pass
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class B margin is -3.42 dB at 204.14 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class B margin is -11.54 dB at 5998.62 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:

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	Expanded Uncertainty (k=2) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.95 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.51 dB
	6GHz ~ 18GHz	5.14 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Features of EUT

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

3.2 General Description of EUT

Product	Electronic Display Device
Brand	Rakuten kobo
Test Model	N782
Sample Status	ENGINEERING SAMPLE
Operating Software	NA
Power Supply Rating	DC 3.7V from battery DC 5V from USB interface
Accessory Device	NA
Data Cable Supplied	USB Cable x 1 (Shielded, 1m)

Note:

1. The EUT could be supplied with a rechargeable battery as the following table:

Brand Name	Model No.	Spec.
SPRINGPOWER TECHNOLOGY	SP178098- A	3.7Vdc, 1200mAh, 4.44Wh

2. The antennas provided to the EUT, please refer to the following table:

Antenna No.	Brand	Model	Antenna Net Gain (dBi)	Frequency range (MHz)	Antenna Type	Connecter Type	Cable Length (mm)
1	Walsin Technology Corporation	RFFPA1716 03EMAB101	3.44	2400~2500	FPC	IPEX (Gold)	30
2	Walsin Technology Corporation	RFFPA1816 14EMAB101	3.48	2400~2500	FPC	IPEX (Gold)	147

3. Three EMMC provided to the EUT, please refer to the following table:

No.	Brand	Spec.	Remark
1	Sandisk	8G	SDINBDG4-8G
2	Samsung	8G	KLM8G1GETF-B041
3	Sandisk	32G	SDINBDG4-32G

4. The EUT incorporates a MIMO function.

MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	2TX	2RX
802.11g	6 ~ 54Mbps	2TX	2RX
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX

5. When USB port is charging the rechargeable battery, the EUT has WiFi function under charging mode. And the USB port is connected to Host unit, the EUT WiFi function will be disabled.

6. The above EUT information is declared by manufacturer and for more detailed features 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

For conducted emission and radiated emission test, the EUT has been pre-tested under following test modes, and test mode A, C, H were the worst case for final test.

Mode	Test Condition				
	Conducted emission test				
	Power Source	Mode	eMMC	Capacity	Arrangement
A	DC 5V with Host	USB	Sandisk	32G	Horizontal Placement
B	DC 5V with Adapter	USB	Sandisk	32G	Horizontal Placement
Mode	Radiated emission test				
	Power Source	Mode	eMMC	Capacity	Arrangement
C	Battery	Wi-Fi	Sandisk	32G	Horizontal Placement
D	Battery	Wi-Fi	Sandisk	32G	Vertical Placement
E	Battery	Wi-Fi	Sandisk	32G	Side Placement
F	Battery	Wi-Fi	Sandisk	8G	Horizontal Placement
G	Battery	Wi-Fi	Samsung	8G	Horizontal Placement
H	DC 5V with Host	USB	Sandisk	32G	Horizontal Placement
I	DC 5V with Adapter	USB	Sandisk	32G	Horizontal Placement

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

Test modes are presented in the report as below.

Mode	Test Condition				
	Conducted emission test				
	Power Source	Mode	eMMC	Capacity	Arrangement
1	DC 5V with Host	USB	Sandisk	32G	Horizontal Placement
Mode	Radiated emission test				
	Power Source	Mode	eMMC	Capacity	Arrangement
1	DC 5V with Host	USB	Sandisk	32G	Horizontal Placement
2	Battery	Wi-Fi	Sandisk	32G	Horizontal Placement

3.4 Test Program Used and Operation Descriptions

For Conducted emission / Radiated emission tests (Mode 1):

1. Turn on the power of all equipment.
2. Support unit A (Laptop) runs a test program "EMC.bat" to enable EUT under "Read – Write mode" continually via one USB cable.
3. Support unit A (PC) runs "EMC test.exe" then sends "H" messages.

For Radiated emission test (Mode 02):

1. Turn on the power of all equipment.
2. Support unit A (Laptop) runs "Ping.exe" program to communicate with EUT via wireless.

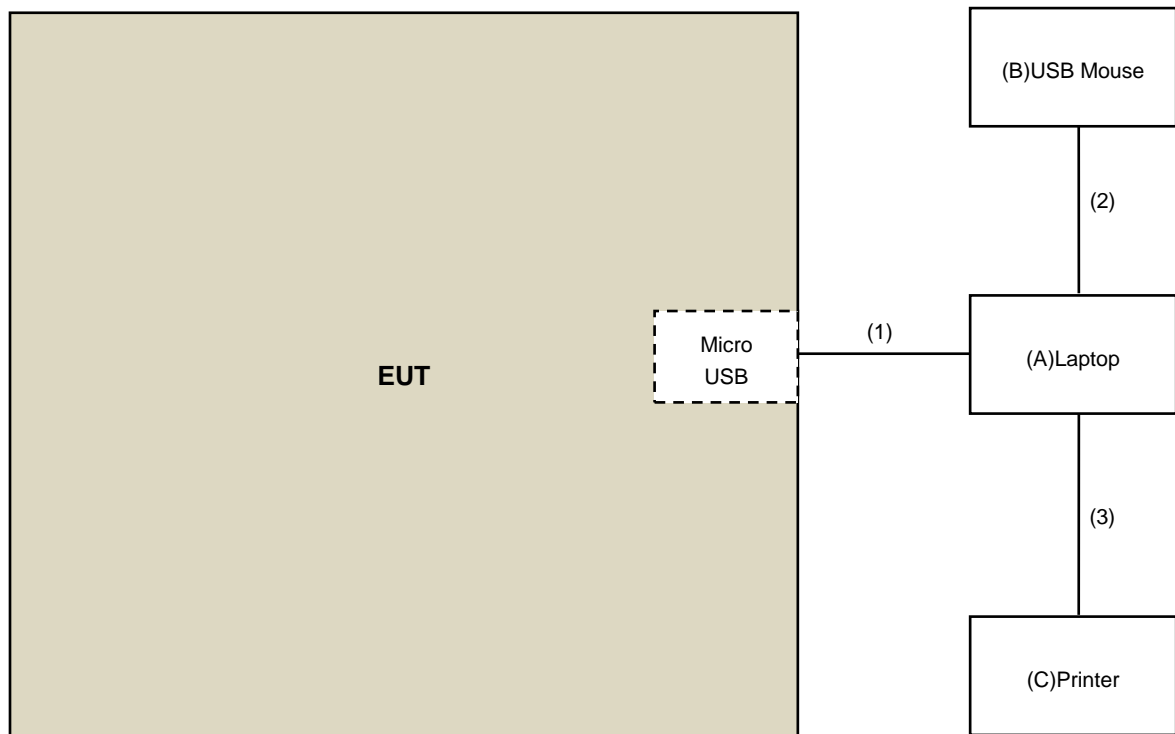
3.5 Primary Clock Frequencies of Internal Source

The EUT is provided by NETRONIX, INC., for detailed internal source, please refer to the manufacturer's specifications..

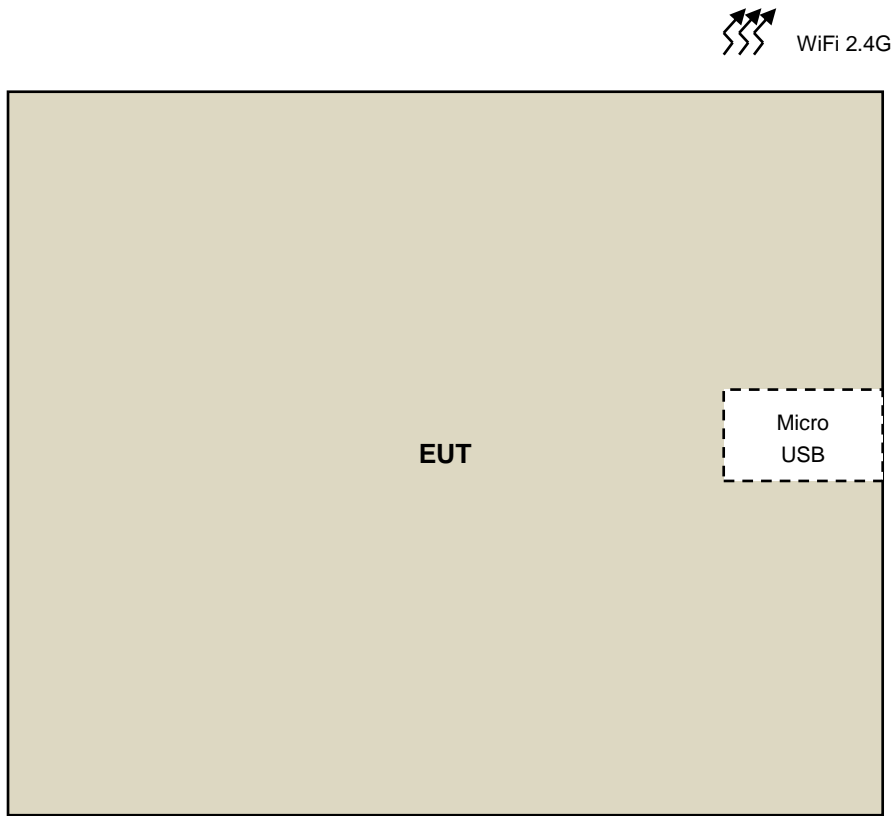
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

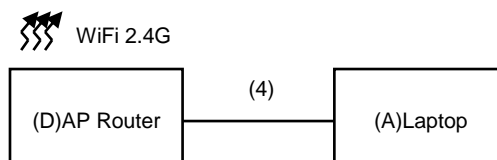
For Conducted emission / Radiated emission tests (Mode1):



For Radiated emission test (Mode 2):



Remote Site



4.2 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	DELL	P70F	1KY07L2	FCC DoC	Provided by Lab
B	USB Mouse	DELL	MO56UO	516045397	NA	Provided by Lab
C	Printer	EPSON	LQ-300+II	G88Y074083	FCC DoC	Provided by Lab
D	AP Router	ASUS	RT-AC66U B1	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 to MicroUSB Cable	1	1	Yes	0	Supplied by client
2	USB Cable	1	1.8	Yes	0	Provided by Lab
3	USB Cable	1	1.8	Yes	0	Provided by Lab
4	Cat 5e cable	1	1	No	0	Provided by Lab

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	100287	Apr. 19, 2018	Apr. 18, 2019
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Aug. 31, 2017	Aug. 30, 2018
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 03, 2017	June 02, 2018
RF Cable	5D-FB	COACAB-002	Feb. 23, 2018	Feb. 22, 2019
10 dB PAD EMEC	STI02-2200-10	001	Mar. 16, 2018	Mar. 15, 2019
50 ohms Terminator	N/A	EMC-03	Sep. 22, 2017	Sep. 21, 2018
50 ohms Terminator	N/A	EMC-02	Sep. 22, 2017	Sep. 21, 2018
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

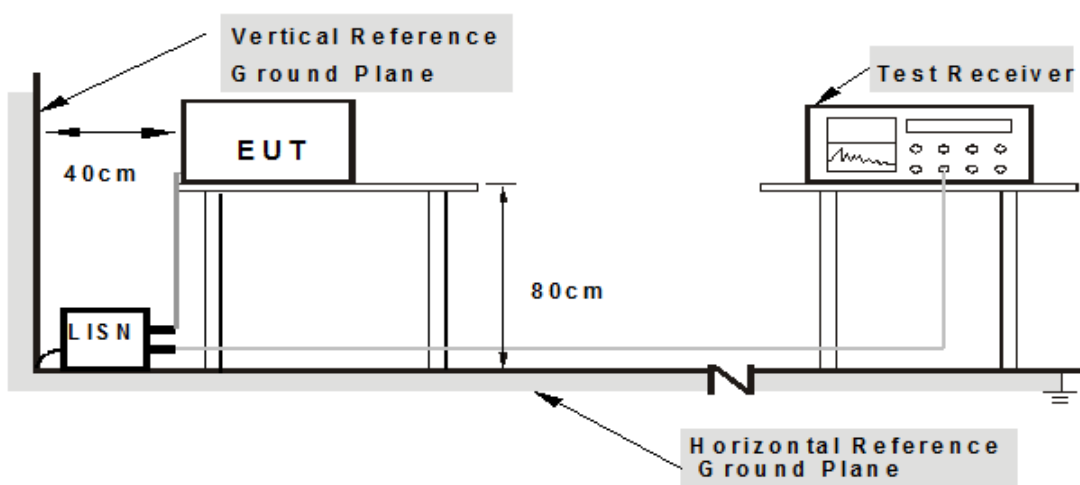
Note:

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-3611.
4. Tested Date: May 14, 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: 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.

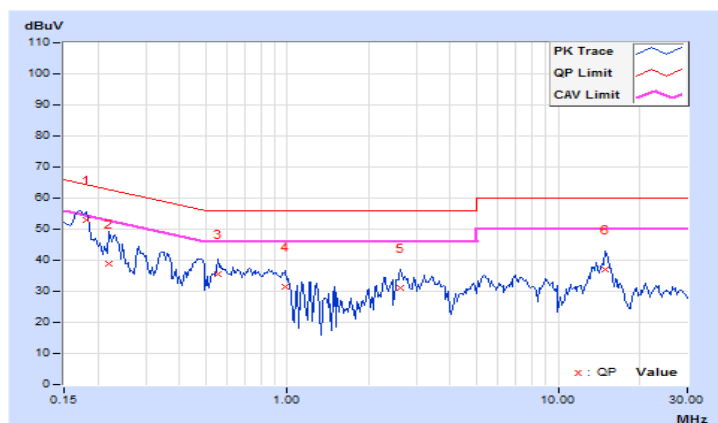
5.5 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power (system)	120Vac, 60Hz	Environmental Conditions	25°C, 62%RH
Tested by	Cody Lee		

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	0.18125	9.98	43.12	32.48	53.10	42.46	64.43	54.43	-11.33	-11.97
2	0.22031	9.98	29.05	9.75	39.03	19.73	62.81	52.81	-23.78	-33.08
3	0.55234	10.01	25.43	12.23	35.44	22.24	56.00	46.00	-20.56	-23.76
4	0.98594	10.05	21.37	8.57	31.42	18.62	56.00	46.00	-24.58	-27.38
5	2.62500	10.10	21.10	12.13	31.20	22.23	56.00	46.00	-24.80	-23.77
6	14.87500	10.45	26.53	19.95	36.98	30.40	60.00	50.00	-23.02	-19.60

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

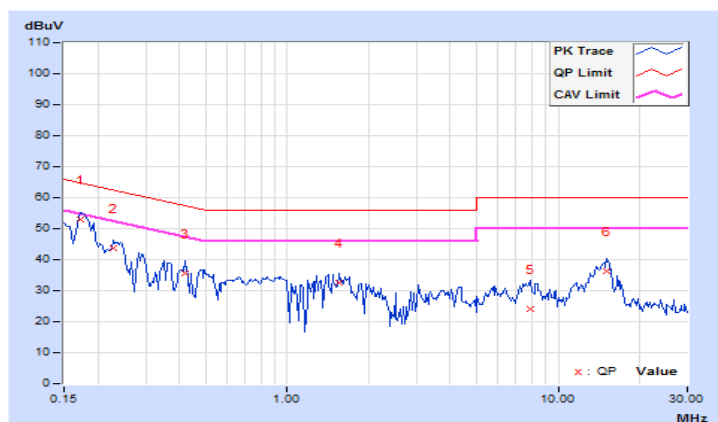


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power (system)	120Vac, 60Hz	Environmental Conditions	25°C, 62%RH
Tested by	Cody Lee		

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	0.17344	9.98	43.00	31.17	52.98	41.15	64.79	54.79	-11.81	-13.64
2	0.22812	9.99	33.67	23.24	43.66	33.23	62.52	52.52	-18.86	-19.29
3	0.41953	10.01	25.40	15.08	35.41	25.09	57.46	47.46	-22.05	-22.37
4	1.55078	10.07	22.54	11.64	32.61	21.71	56.00	46.00	-23.39	-24.29
5	7.91797	10.31	13.74	7.61	24.05	17.92	60.00	50.00	-35.95	-32.08
6	15.19531	10.50	25.79	16.31	36.29	26.81	60.00	50.00	-23.71	-23.19

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 (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
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 (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
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 (uV/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. 12, 2018	Apr. 11, 2019
	N9038A	MY50010132	June 16, 2017	June 15, 2018
Pre-Amplifier Sonoma	310N	352925	Aug. 28, 2017	Aug. 27, 2018
	310N	352926	Aug. 28, 2017	Aug. 27, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-359	Dec. 11, 2017	Dec. 10, 2018
	VULB 9168	9168-358	Dec. 06, 2017	Dec. 05, 2018
Fixed attenuator Mini-Circuits	UNAT-5+	CHF-001	Sep. 07, 2017	Sep. 06, 2018
	UNAT-5+	CHF-002	Sep. 07, 2017	Sep. 06, 2018
RF Cable	8D-FB	CHFCAB-001-1 CHFCAB-001-3 CHFCAB-001-4	Sep. 20, 2017	Sep. 19, 2018
		CHFCAB-002-1 CHFCAB-002-3 CHFCAB-002-4	Sep. 20, 2017	Sep. 19, 2018
Software BVADT	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

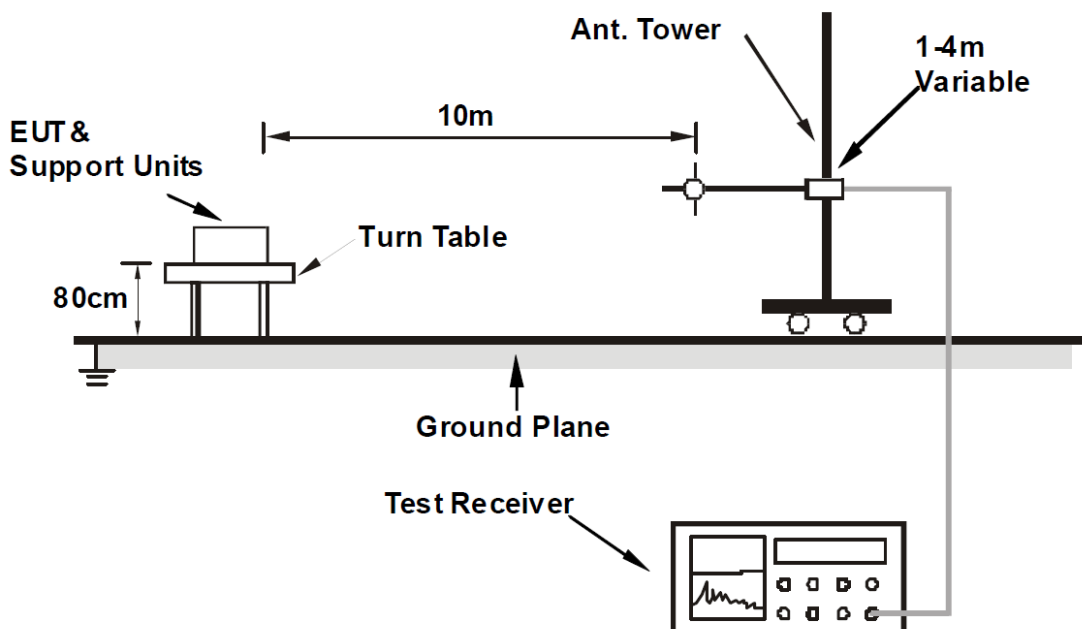
Note:

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-3252.
4. The CANADA Site Registration No. is IC 7450H-1.
5. Tested Date: May 12, 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 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.



6.4 Supplementary Information

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

6.5 Test Results (Mode 1)

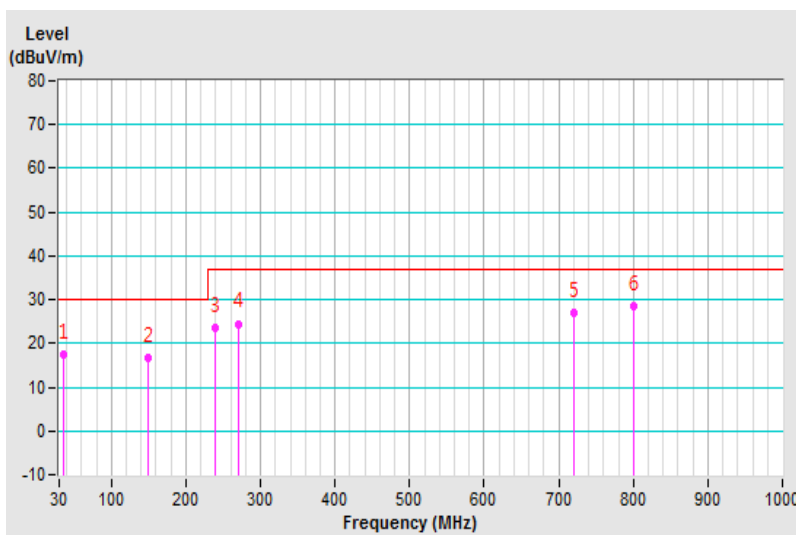
Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	DC 5V from USB interface	Environmental Conditions	19°C, 65%RH
Tested by	Duncan Wang		
Test Mode	Mode 1		

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	36.64	17.51 QP	30.00	-12.49	4.00 H	29	31.09	-13.58
2	148.51	16.58 QP	30.00	-13.42	3.00 H	261	28.97	-12.39
3	240.05	23.50 QP	37.00	-13.50	2.00 H	2	37.36	-13.86
4	271.29	24.49 QP	37.00	-12.51	4.00 H	114	37.06	-12.57
5	720.01	27.10 QP	37.00	-9.90	1.00 H	107	29.56	-2.46
6	801.44	28.49 QP	37.00	-8.51	1.98 H	183	29.29	-0.80

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



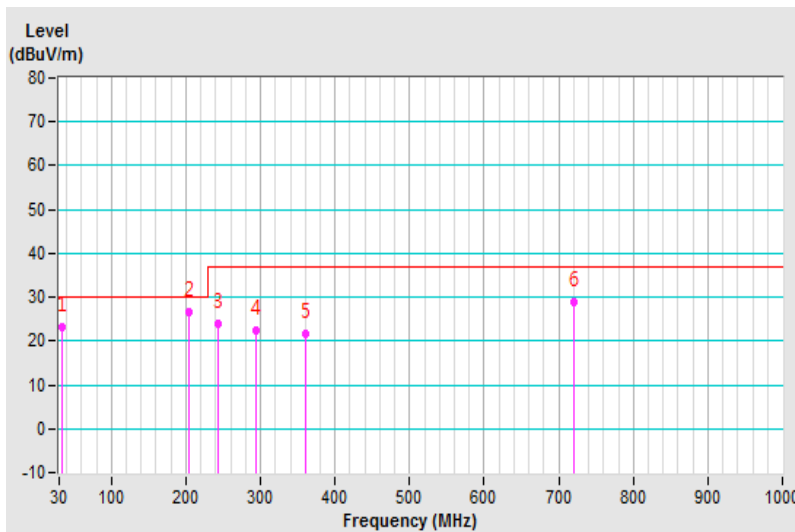
Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	DC 5V from USB interface	Environmental Conditions	19°C, 65%RH
Tested by	Duncan Wang		
Test Mode	Mode 1		

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	34.17	23.00 QP	30.00	-7.00	1.06 V	106	37.05	-14.05
2	204.14	26.58 QP	30.00	-3.42	1.00 V	145	42.25	-15.67
3	244.03	23.80 QP	37.00	-13.20	1.00 V	145	37.24	-13.44
4	293.45	22.38 QP	37.00	-14.62	1.00 V	122	33.82	-11.44
5	360.04	21.72 QP	37.00	-15.28	2.00 V	2	31.35	-9.63
6	720.11	28.84 QP	37.00	-8.16	3.00 V	35	30.47	-1.63

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



6.6 Test Results (Mode 2)

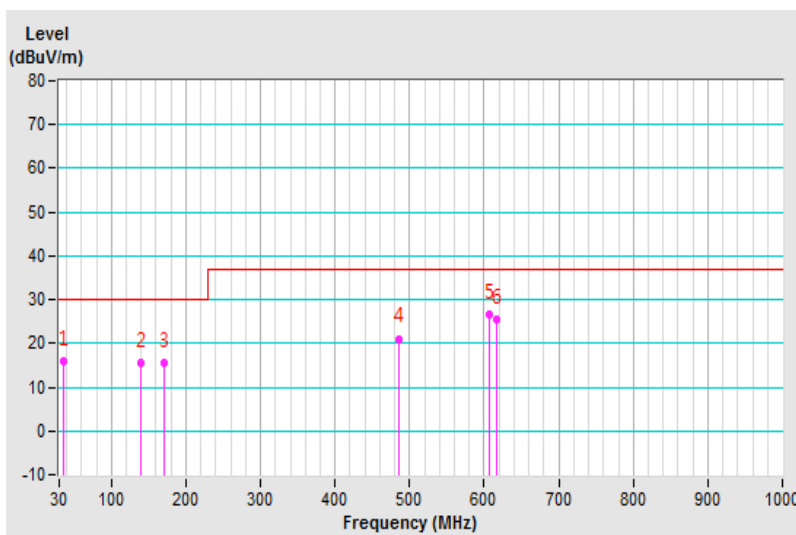
Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	DC 3.7V from battery	Environmental Conditions	19°C, 65%RH
Tested by	Duncan Wang		
Test Mode	Mode 2		

Antenna Polarity & Test Distance : Horizontal at 10 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	36.43	16.04 QP	30.00	-13.96	4.00 H	193	29.65	-13.61
2	138.88	15.63 QP	30.00	-14.37	4.00 H	34	28.75	-13.12
3	170.75	15.58 QP	30.00	-14.42	3.00 H	23	28.42	-12.84
4	485.17	21.05 QP	37.00	-15.95	2.00 H	129	27.79	-6.74
5	607.25	26.63 QP	37.00	-10.37	2.02 H	344	30.43	-3.80
6	615.95	25.60 QP	37.00	-11.40	4.00 H	355	29.27	-3.67

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

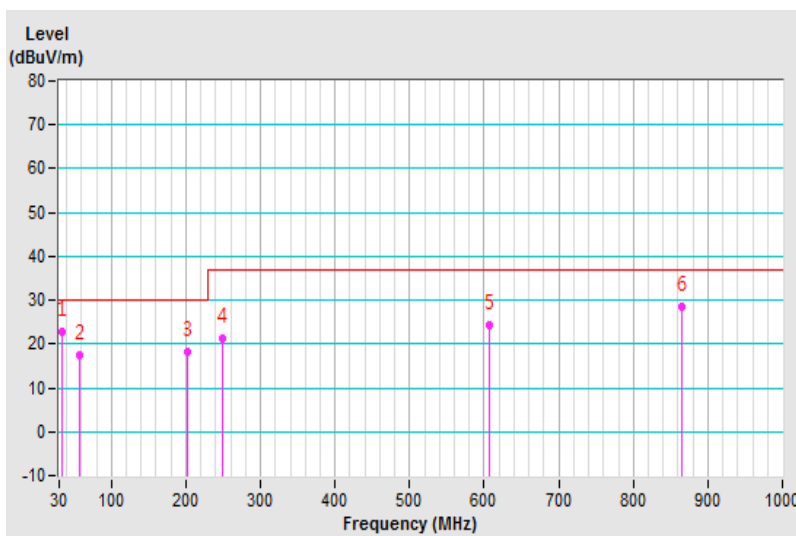


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	DC 3.7V from battery	Environmental Conditions	19°C, 65%RH
Tested by	Duncan Wang		
Test Mode	Mode 2		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	34.85	22.81 QP	30.00	-7.19	1.03 V	290	36.87	-14.06
2	56.77	17.32 QP	30.00	-12.68	4.00 V	96	30.25	-12.93
3	202.59	18.33 QP	30.00	-11.67	1.00 V	4	33.99	-15.66
4	248.86	21.33 QP	37.00	-15.67	4.00 V	241	34.61	-13.28
5	607.22	24.44 QP	37.00	-12.56	1.00 V	191	27.47	-3.03
6	864.76	28.59 QP	37.00	-8.41	4.00 V	8	27.32	1.27

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	Avg: 54	Avg: 56 Peak: 76	Avg: 50 Peak: 70
Above 3000	Peak: 80	Peak: 74	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 (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	MY51210105	June 24, 2017	June 23, 2018
Horn_Antenna FT-RF	HA-07M18G-NF	0000320091110	Dec. 01, 2017	Nov. 30, 2018
Pre-Amplifier Agilent	8449B	3008A02578	June 19, 2017	June 18, 2018
RF Cable	104 RF cable	150406 131217 131205	Jan. 11, 2018	Jan. 10, 2019
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

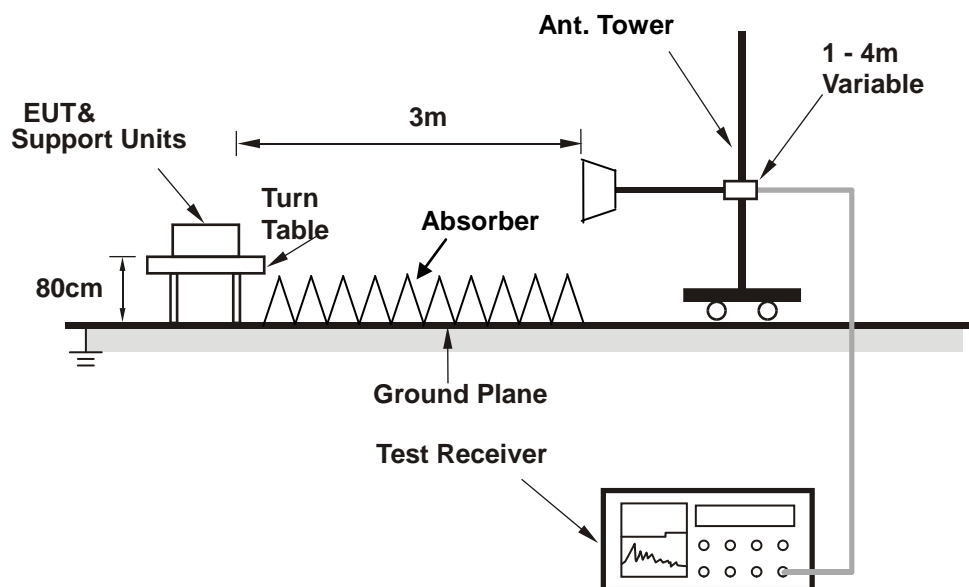
Note:

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 G room
3. Tested Date: May 16, 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 detects 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.

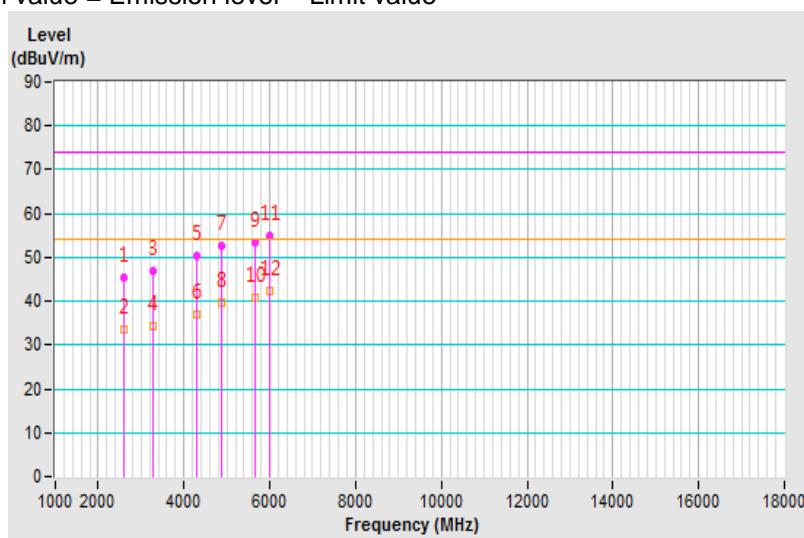
7.5 Test Results (Mode 1)

Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	DC 5V from USB interface	Environmental Conditions	25°C, 67%RH
Tested by	Eagle Chen		
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	2600.00	45.50 PK	74.00	-28.50	1.00 H	86	43.44	2.06
2	2600.00	33.39 AV	54.00	-20.61	1.00 H	340	31.33	2.06
3	3289.62	46.75 PK	74.00	-27.25	1.00 H	115	42.45	4.30
4	3289.62	34.25 AV	54.00	-19.75	1.00 H	315	29.95	4.30
5	4289.00	50.33 PK	74.00	-23.67	1.00 H	14	42.54	7.79
6	4289.00	36.99 AV	54.00	-17.01	1.00 H	197	29.20	7.79
7	4867.25	52.47 PK	74.00	-21.53	1.00 H	224	42.08	10.39
8	4867.25	39.78 AV	54.00	-14.22	1.00 H	137	29.39	10.39
9	5663.50	53.33 PK	74.00	-20.67	1.00 H	360	41.36	11.97
10	5663.50	40.69 AV	54.00	-13.31	1.00 H	360	28.72	11.97
11	5998.62	54.77 PK	74.00	-19.23	1.00 H	355	41.36	13.41
12	5998.62	42.46 AV	54.00	-11.54	1.00 H	57	29.05	13.41

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



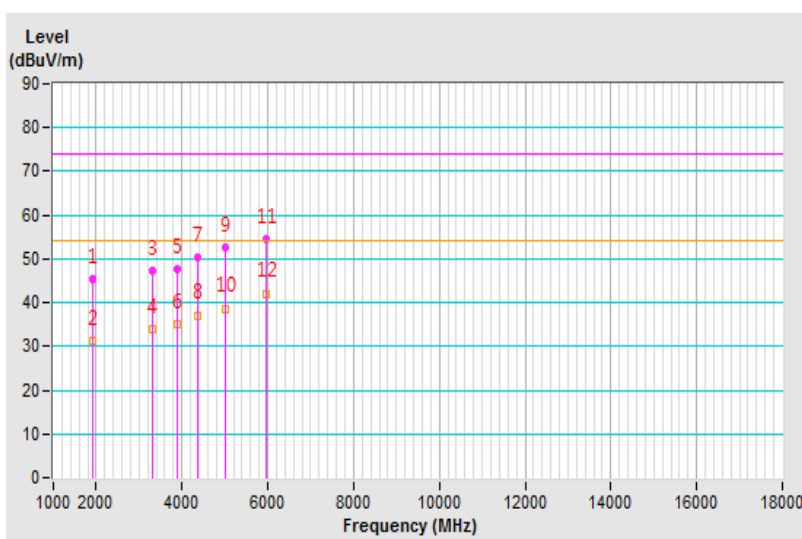
Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	DC 5V from USB interface	Environmental Conditions	25°C, 67%RH
Tested by	Eagle Chen		
Test Mode	Mode 1		

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	1927.25	45.27 PK	74.00	-28.73	1.00 V	71	46.68	-1.41
2	1927.25	31.34 AV	54.00	-22.66	1.00 V	260	32.75	-1.41
3	3323.37	47.43 PK	74.00	-26.57	1.00 V	119	43.04	4.39
4	3323.37	34.07 AV	54.00	-19.93	1.00 V	360	29.68	4.39
5	3903.75	47.74 PK	74.00	-26.26	1.00 V	360	41.35	6.39
6	3903.75	35.04 AV	54.00	-18.96	1.00 V	166	28.65	6.39
7	4365.25	50.18 PK	74.00	-23.82	1.00 V	9	41.90	8.28
8	4365.25	37.15 AV	54.00	-16.85	1.00 V	149	28.87	8.28
9	5002.62	52.73 PK	74.00	-21.27	1.00 V	24	42.08	10.65
10	5002.62	38.68 AV	54.00	-15.32	1.00 V	80	28.03	10.65
11	5980.50	54.55 PK	74.00	-19.45	1.00 V	58	41.23	13.32
12	5980.50	42.12 AV	54.00	-11.88	1.00 V	0	28.80	13.32

Remarks:

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



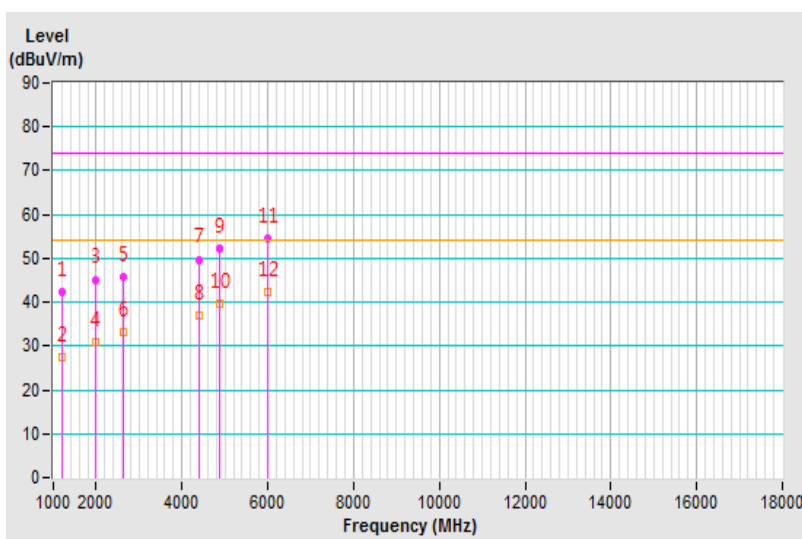
7.6 Test Results (Mode 2)

Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	DC 3.7V from battery	Environmental Conditions	25°C, 67%RH
Tested by	Eagle Chen		
Test Mode	Mode 2		

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	1198.37	42.42 PK	74.00	-31.58	1.00 H	255	47.71	-5.29
2	1198.37	27.30 AV	54.00	-26.70	1.00 H	50	32.59	-5.29
3	1996.87	45.16 PK	74.00	-28.84	1.00 H	255	45.92	-0.76
4	1996.87	30.89 AV	54.00	-23.11	1.00 H	150	31.65	-0.76
5	2616.37	45.77 PK	74.00	-28.23	1.00 H	163	43.70	2.07
6	2616.37	33.21 AV	54.00	-20.79	1.00 H	360	31.14	2.07
7	4412.25	49.73 PK	74.00	-24.27	1.00 H	243	41.19	8.54
8	4412.25	36.94 AV	54.00	-17.06	1.00 H	204	28.40	8.54
9	4860.37	52.28 PK	74.00	-21.72	1.00 H	280	41.98	10.30
10	4860.37	39.72 AV	54.00	-14.28	1.00 H	145	29.42	10.30
11	5993.50	54.45 PK	74.00	-19.55	1.00 H	253	41.07	13.38
12	5993.50	42.40 AV	54.00	-11.60	1.00 H	91	29.02	13.38

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



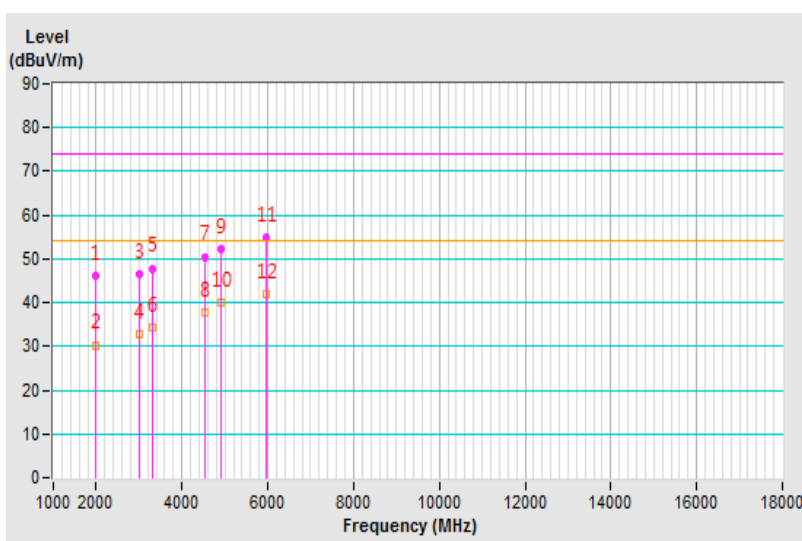
Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	DC 3.7V from battery	Environmental Conditions	25°C, 67%RH
Tested by	Eagle Chen		
Test Mode	Mode 2		

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	1994.62	46.19 PK	74.00	-27.81	1.00 V	228	46.97	-0.78
2	1994.62	30.31 AV	54.00	-23.69	1.00 V	240	31.09	-0.78
3	2999.12	46.41 PK	74.00	-27.59	1.00 V	2	43.65	2.76
4	2999.12	32.73 AV	54.00	-21.27	1.00 V	355	29.97	2.76
5	3323.37	47.84 PK	74.00	-26.16	1.00 V	115	43.45	4.39
6	3323.37	34.30 AV	54.00	-19.70	1.00 V	286	29.91	4.39
7	4527.50	50.51 PK	74.00	-23.49	1.00 V	190	41.42	9.09
8	4527.50	37.79 AV	54.00	-16.21	1.00 V	277	28.70	9.09
9	4921.50	52.27 PK	74.00	-21.73	1.00 V	76	41.46	10.81
10	4921.50	40.03 AV	54.00	-13.97	1.00 V	135	29.22	10.81
11	5969.87	54.78 PK	74.00	-19.22	1.00 V	52	41.51	13.27
12	5969.87	41.95 AV	54.00	-12.05	1.00 V	0	28.68	13.27

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 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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