

FCC Certification Test Report

Report No.: FC170808C08

Test Model: F-01K

FCC ID: VQK-F01K

Received Date: Aug. 08, 2017

Test Date: Oct. 06, 2017 ~ Oct. 07, 2017

Issued Date: Oct. 16, 2017

Applicant: FUJITSU CONNECTED TECHNOLOGIES Ltd.

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Release Control Record

Issue No.	Description	Date Issued
FC170808C08	Original Release	Oct. 16, 2017

1 Certificate of Conformity

Product: Smart Phone
Brand: FUJITSU
Test Model: F-01K
Sample Status: Identical Prototype
Applicant: FUJITSU CONNECTED TECHNOLOGIES Ltd.
Test Date: Oct. 06, 2017 ~ Oct. 07, 2017
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 : Gina Liu , **Date:** Oct. 16, 2017
Gina Liu / Specialist

Approved by : Carl Chen , **Date:** Oct. 16, 2017
Carl Chen / Project Engineer

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 -15.61 dB at 0.50110 MHz	Pass
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class B margin is -9.47 dB at 36.89 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class B margin is -21.23 dB at 19836.48 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	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	4.70 dB
Radiated Emissions above 1 GHz	Above 1 GHz	2.26 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 FUJITSU CONNECTED TECHNOLOGIES Ltd., for detailed feature description, please refer to the manufacturer's specifications or user's manual.

3.2 General Description of EUT

Product	Smart Phone
Brand	FUJITSU
Test Model	F-01K
Status of EUT	Identical Prototype
Operating Software	Android 7.1.1
Power Supply Rating	3.75 Vdc (Battery) 5 Vdc (Adapter or host equipment)
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	FUJITSU CONNECTED TECHNOLOGIES Ltd.	CA54310-0067	3.75 Vdc, 2850 mAh

2. The EUT uses following adapter which provided by client as support unit.

Product	Brand	Model	Description
Adapter	NTT docomo	AC Adapter 06	I/P: 100-240 Vac, 50-60 Hz, 0.8 A O/P: 5.0 Vdc, 3.0 A

3.3 Operating Modes of EUT and Determination of Worst Case Operating Mode

Test modes are presented in the report as below.

Mode	Test Condition
Conducted Emission	
1	GSM850 Idle + BT Idle + WLAN Idle (2.4G) + GPS+GLONASS Rx + Earphone + Adapter + NFC On
2	WCDMA2100 Idle + BT Idle + WLAN Idle (5G) + ANT ⁺ + Earphone + Adapter + NFC On
3	LTE Band 5 Idle + BT Idle + WLAN Link (2.4G) + Camera + Earphone + Adapter + NFC On
4	GSM1900 Idle + BT Idle + WLAN Link (2.4G) + Colour Bars + USB Cable + Earphone + USB Link
Radiated Emission	
1	GSM850 Idle + BT Idle + WLAN Idle (2.4G) + GPS+GLONASS Rx + Earphone + Adapter + NFC On
2	WCDMA2100 Idle + BT Idle + WLAN Idle (5G) + ANT ⁺ + Earphone + Adapter + NFC On
3	LTE Band 5 Idle + BT Idle + WLAN Link (5G) + Camera + Earphone + Adapter + NFC On
4	GSM1900 Idle + BT Idle + WLAN Link (5G) + Colour Bars + USB Cable + Earphone + USB Link
Remark:	
<ol style="list-style-type: none"> For conducted emission test, test mode 3 was the worst case and only this mode was presented in the report. For radiated emission test, test mode 2 was the worst case and only this mode was presented in the report. 	

3.4 Test Program Used and Operation Descriptions

For Conducted Emission

- The EUT linked with Bluetooth earphone in idle mode.
- The NFC function was turned on.
- The EUT played camera and sent audio signal to the earphone.
- The EUT communicated data with the Radio Communication Analyzer and Wireless AP, which acted as communication partners.
- Set WWAN function in idle mode.

For Radiated Emission

- The EUT linked with Bluetooth earphone in idle mode.
- The NFC function was turned on.
- The EUT linked with ANT⁺.
- The EUT played camera and sent audio signal to the earphone.
- The EUT communicated data with the Radio Communication Analyzer and Wireless AP, which acted as communication partners.
- Set WWAN and WLAN functions in idle mode.

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 5 GHz, provided by FUJITSU CONNECTED TECHNOLOGIES Ltd., for detailed internal source, please refer to the manufacturer's specifications.

3.6 Miscellaneous

Labelling Requirements for Part 15 Devices:

➤ Verification

The specific labelling requirements for a device subject to the Verification procedure are contained in Section 15.19(a). These labelling requirements are:

If the device is subject only to Verification, include a label bearing a unique identifier (Section 2.954) and one of three compliance statements specified in Section 15.19(a). If the labeling area for the device is so small, and/or it is not practical to place the compliance statement on the device, then the statement can be placed in the user manual or product packaging (Section 15.19(a)(5)). However, the device must still be labelled with the unique identifier (Verification). Generally, devices smaller than the palm of the hand are considered too small for the compliance statement.

➤ Certification

If the device is subject to Certification: (1) Section 2.925 contains information on identification of the equipment; (2) include a label bearing an FCC Identifier (FCC ID) (Section 2.926) and (3) include the appropriate compliance statement in Section 15.19(a). If the device is considered too small and therefore it is impractical (smaller than the palm of the hand) to display the compliance statement, then the statement may be placed in the user manual or product packaging. However, the device must still be labelled with the FCC ID. If the device is unquestionably too small for the FCC ID to be readable (smaller than 4-6 points), the FCC ID may be placed in the user manual. However, it must be determined that the device itself is too small – the label area allocated to the FCC ID may not be reduced because of over crowded identification of other product and regulatory information.

An electronic display of the FCC ID (see 9. Electronic Labelling below) may be used for Certification of Section 15.212 modular transmitters and software defined radios (Section 2.944).

➤ Declaration of Conformity (DoC):

The labelling requirements for a device subject to the DoC procedure are specified in Section 15.19(b). The label should include the FCC logo along with the Trade Name and Model Number, which satisfies the unique identifier requirement of Section 2.1074 if it represents the identical equipment tested for DoC compliance. For personal computers assembled from authorized components, the following additional text must also be included: “Assembled from tested components,” “Complete system not tested.” When the device is so small and/or when it is not practical to place the required additional text on the device, the text may be placed in the user manual or pamphlet supplied to the user. However, the FCC logo, Trade Name, and Model Number must still be displayed on the device (Section 15.19(b)(3)).



Part 15 Declaration of Conformity (DoC) Label Examples

Equipment certified as software defined radio may use a means that readily displays the FCC ID on an electronic display screen, instead of labelling the device (Section 2.925 (e)).

Further information may refer to FCC KDB:784748 D01 Labelling Part 15 &18 Guidelines

Labelling Requirements for ICES-003 Devices:

➤ Industry Canada ICES-003 Compliance Label:

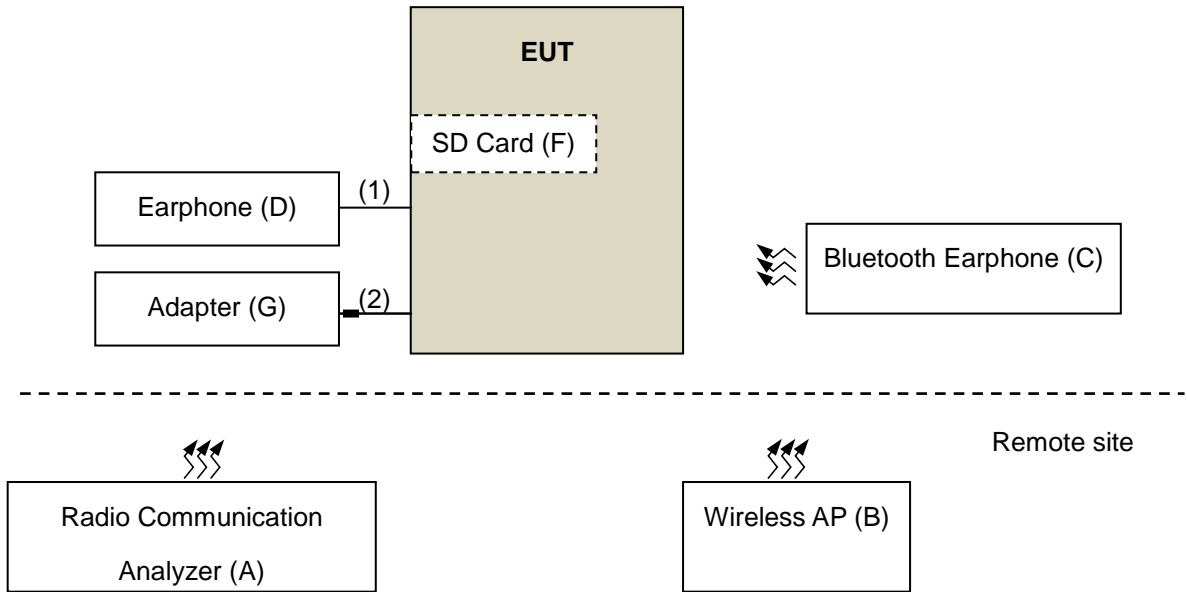
CAN ICES-3 (*)/NMB-3(*)

* Insert either “A” or “B” but not both to identify the applicable Class of ITE.

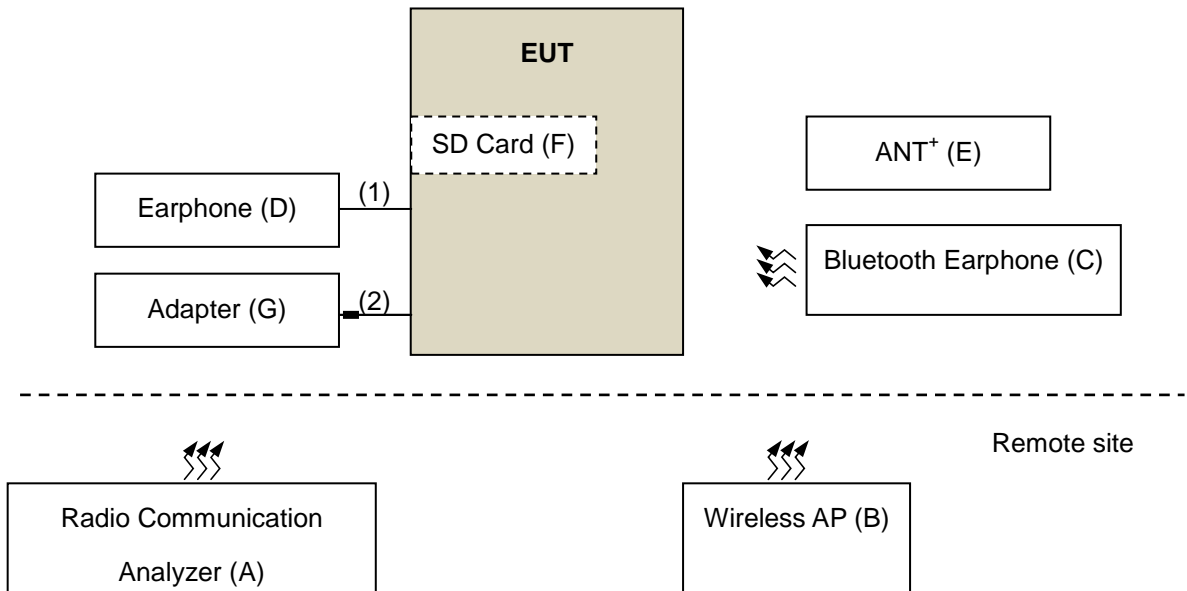
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

For Conducted Emission



For Radiated Emission



4.2 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Radio Communication Analyzer	Anritsu	MT8820C	6201010284	N/A	--
B.	Wireless N Dual band Router	D-LINK	DIR-815	PVK21B5000399	KA21R815A1	--
C.	BLUETOOTH EARPHONE	ELECOM	LBT-MPHS400	N/A	N/A	--
D.	Earphone	Apple	N/A	N/A	N/A	--
E.	ANT ⁺	N/A	N/A	N/A	N/A	Provided by client
F.	SD Card	Transcend	N/A	N/A	N/A	--
G.	Adapter	NTT docomo	AC Adapter 06	N/A	N/A	Provided by client

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items A~C acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Earphone Cable	1	1.2	N	0	
2.	DC Cable	1	1.15	N	1	Provided 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

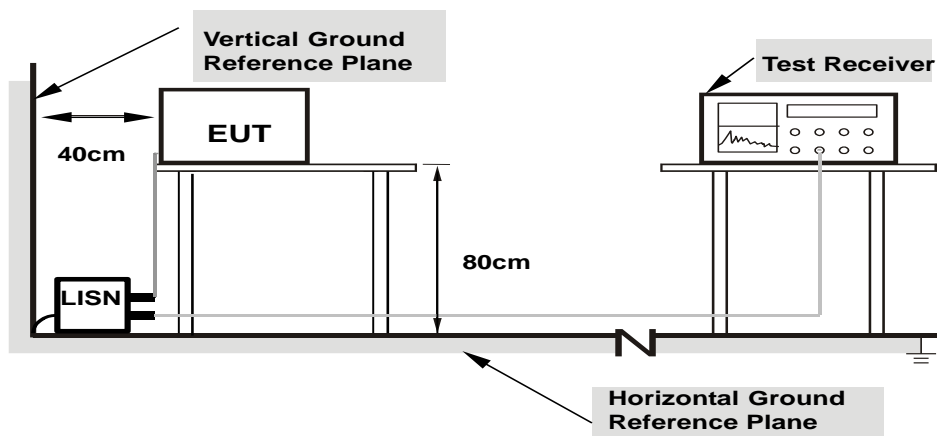
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 21, 2016	Nov. 20, 2017
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2017	Sep. 04, 2018
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 15, 2017	Aug. 14, 2018
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

Note: 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 HwaYa Shielded Room 1.
 3. The VCCI Site Registration No. is C-2040.

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/ 50 uH 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 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.



- Note:**
- Support units were connected to second LISN.
 - Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

5.4 Supplementary Information

N/A

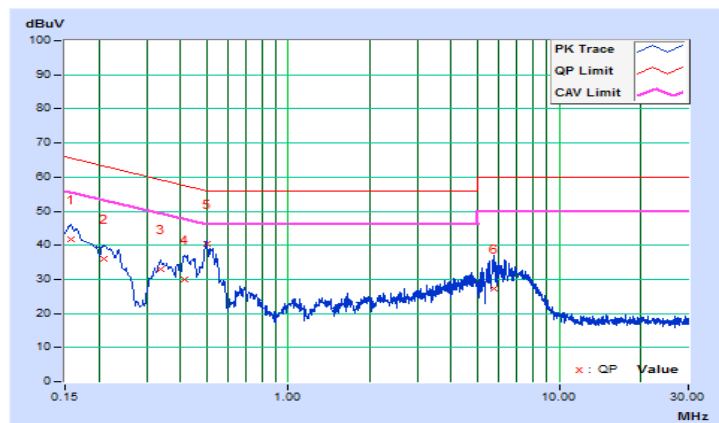
5.5 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2017/10/7
Test Mode	Mode 3		

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	0.15760	10.45	31.18	15.54	41.63	25.99	65.59	55.59	-23.96	-29.60
2	0.20838	10.46	25.53	10.92	35.99	21.38	63.27	53.27	-27.28	-31.89
3	0.33750	10.50	22.56	16.25	33.06	26.75	59.26	49.26	-26.20	-22.51
4	0.41560	10.52	19.35	5.09	29.87	15.61	57.54	47.54	-27.67	-31.93
5	0.50110	10.51	29.88	18.56	40.39	29.07	56.00	46.00	-15.61	-16.93
6	5.77258	10.73	16.41	3.19	27.14	13.92	60.00	50.00	-32.86	-36.08

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

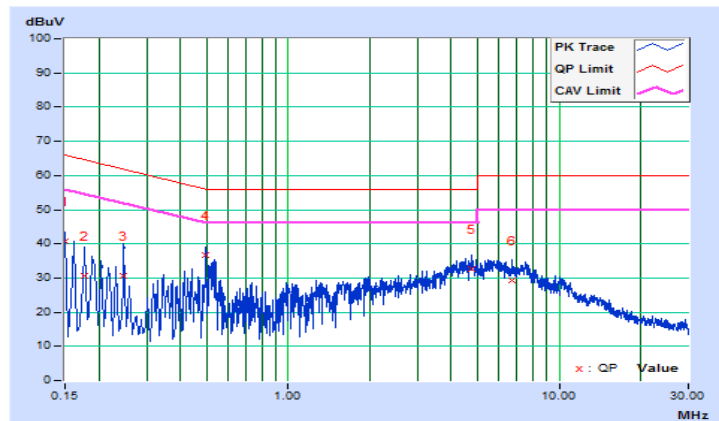


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2017/10/7
Test Mode	Mode 3		

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	10.20	30.65	16.53	40.85	26.73	66.00	56.00	-25.15	-29.27
2	0.17737	10.21	20.38	6.92	30.59	17.13	64.61	54.61	-34.02	-37.48
3	0.24775	10.23	20.51	8.35	30.74	18.58	61.83	51.83	-31.09	-33.25
4	0.49799	10.24	26.32	16.74	36.56	26.98	56.03	46.03	-19.47	-19.05
5	4.77553	10.44	22.18	10.38	32.62	20.82	56.00	46.00	-23.38	-25.18
6	6.69534	10.52	18.65	6.12	29.17	16.64	60.00	50.00	-30.83	-33.36

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 (μ V/m).
3. QP detector shall be applied if not specified.

6.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ (V)	ESR	101240	Oct. 13, 2016	Oct. 12, 2017
Test Receiver ROHDE & SCHWARZ (H)	ESR	101264	Dec. 19, 2016	Dec. 18, 2017
BILOG Antenna SCHWARZBECK (V)	VULB9168	9168-149	Dec. 13, 2016	Dec. 12, 2017
BILOG Antenna SCHWARZBECK (H)	VULB9168	9168-154	Dec. 13, 2016	Dec. 12, 2017
Preamplifier Agilent (V)	310N	352924	Jul. 12, 2017	Jul. 11, 2018
Preamplifier Agilent (H)	310N	352923	Jul. 12, 2017	Jul. 11, 2018
RF signal cable (with 5dB PAD) Times (V)	LMR-600 (18M) +LMR-400 (7M)	CABLE-CH1 (VER) -01	Oct. 25, 2016	Oct. 24, 2017
RF signal cable (with 5dB PAD) Times (H)	LMR-600 (11.8M) +LMR-400 (7M)	CABLE-CH1 (HOR) -01	Oct. 25, 2016	Oct. 24, 2017
Software BV ADT	BV ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower (V)	MFA-440	9707	NA	NA
Antenna Tower (H)	MFA-440	970705	NA	NA
Turn Table	DS430	50303	NA	NA
Controller (V)	MF7802	074	NA	NA
Controller (H)	MF7802	08093	NA	NA

NOTE: 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 HwaYa Chamber 1.

3. The FCC Designation Number is TW1050. The number will be varied with the Lab location and scope as attached.

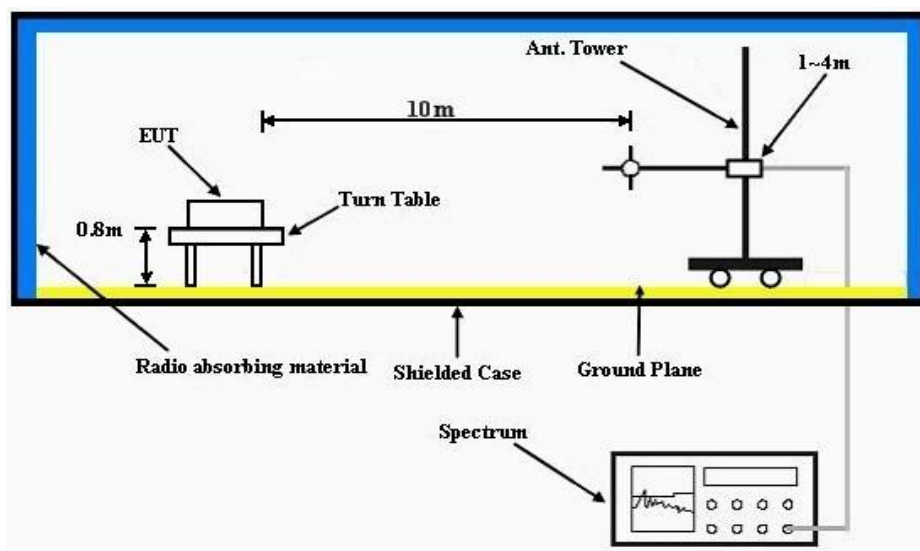
4. The IC Site Registration No. is IC 7450F-1.

5. The VCCI Site Registration No. is R-1893.

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 120 kHz for quasi-peak detection (QP) at frequency below 1 GHz.



6.4 Supplementary Information

N/A

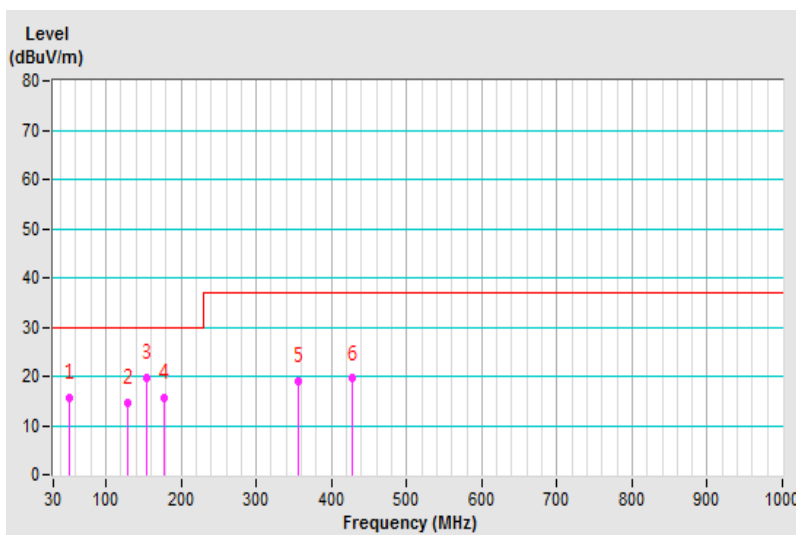
6.5 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Ben Huang	Test Date	2017/10/6
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	51.97	15.59 QP	30.00	-14.41	3.00 H	16	28.92	-13.33
2	129.43	14.58 QP	30.00	-15.42	2.00 H	178	29.30	-14.72
3	154.80	19.60 QP	30.00	-10.40	1.50 H	34	32.63	-13.03
4	176.91	15.70 QP	30.00	-14.30	2.00 H	33	29.78	-14.08
5	355.79	19.11 QP	37.00	-17.89	4.00 H	94	30.03	-10.92
6	426.90	19.49 QP	37.00	-17.51	3.00 H	259	28.35	-8.86

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



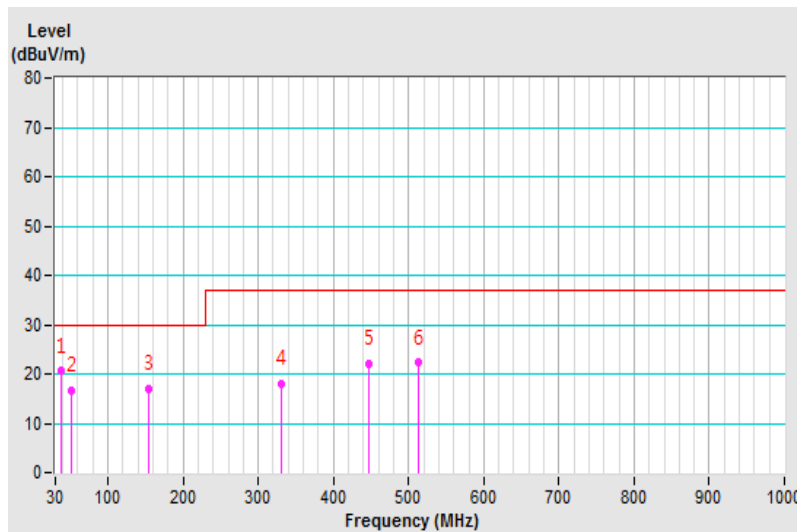
Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Ben Huang	Test Date	2017/10/6
Test Mode	Mode 2		

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	36.89	20.53 QP	30.00	-9.47	1.00 V	8	35.09	-14.56
2	51.05	16.53 QP	30.00	-13.47	3.00 V	349	29.79	-13.26
3	153.24	17.00 QP	30.00	-13.00	2.00 V	38	29.99	-12.99
4	331.49	18.13 QP	37.00	-18.87	3.00 V	296	29.32	-11.19
5	446.25	21.96 QP	37.00	-15.04	2.50 V	309	30.11	-8.15
6	512.50	22.25 QP	37.00	-14.75	1.50 V	76	29.39	-7.14

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 1000 MHz, 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 20 dB under any condition of modulation.

Radiated Emissions Limits at 1.5 meters (dB μ V/m)		
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B
Above 18000	Avg: 66 Peak: 86	Avg: 60 Peak: 80

Note: Limit@1.5m = Limit@3m + 20log(3/1.5)

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	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

7.2 Test Instruments

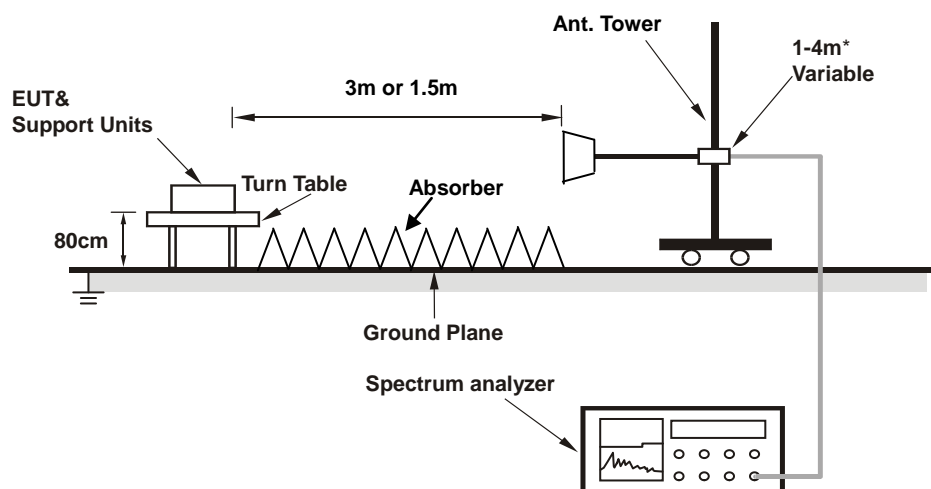
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ (Above 1GHz)	ESR7	101471	Feb. 23, 2017	Feb. 22, 2018
Spectrum Analyzer Agilent	E4446A	MY51100039	Sep. 05, 2017	Sep. 04, 2018
RF signal cable (with 5dB PAD) Times	LMR-400 (18M)	CABLE-CH2-01	Apr. 28, 2017	Apr. 27, 2018
HORN Antenna (with 4dB PAD) SCHWARZBECK	BBHA 9120 D	9120D-405	Dec. 28, 2016	Dec. 27, 2017
Preamplifier Agilent (Above 1GHz)	8449B	3008A01961	Oct. 17, 2016	Oct. 16, 2017
RF signal cable ALLTEST & EMC	JUNFLON+EMC10 4-SM-SM-6000	Cable-CH2-02(MWX3221308 G003+130710)	Jun. 12, 2017	Jun. 11, 2018
Software BV ADT	BV ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Controller BV ADT	SC100	SC93021702	NA	NA
RF Coaxial Cable EMCI	EMC102-KM-KM-1 000	170820	Aug. 29, 2017	Aug. 28, 2018
RF Coaxial Cable EMCI	EMC102-KM-KM-3 000	170818	Aug. 29, 2017	Aug. 28, 2018
Fix tool for Boresight antenna	BAF-01	2	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Nov. 07, 2016	Nov. 06, 2017
HORN Antenna (with 3dB PAD) SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 2017

- Note:
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 HwaYa Chamber 2.
 3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Designation Number is TW1050. The number will be varied with the Lab location and scope as attached.
 5. The IC Site Registration No. is IC 7450F-2.
 6. The VCCI Site Registration No. is G-18.

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.
- For frequency range 1 GHz ~ 18 GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- For frequency range 18 GHz ~ 40 GHz, the EUT was set 1.5 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 3 dB 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 1 MHz and video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1 GHz.



7.4 Supplementary Information

N/A

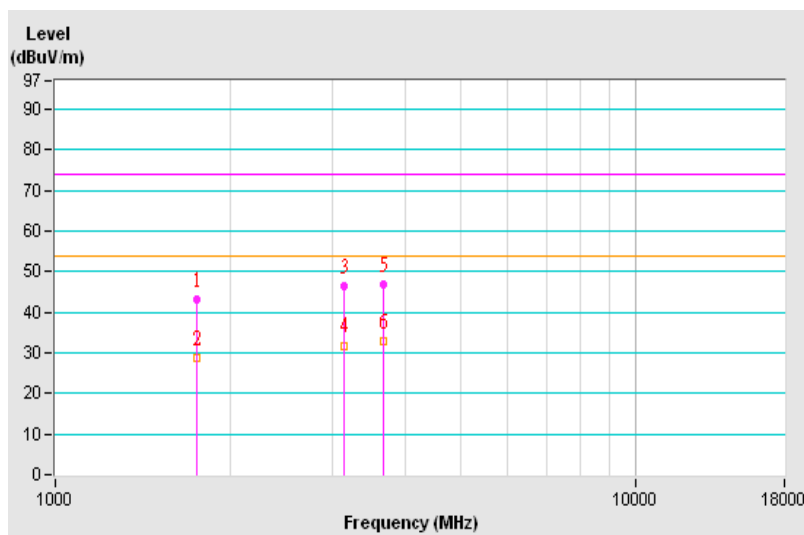
7.5 Test Results

Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 65%RH
Tested by	Felix Chen	Test Date	2017/10/7
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	1754.37	43.23 PK	74.00	-30.77	1.15 H	139	44.92	-1.69
2	1754.37	28.59 AV	54.00	-25.41	1.15 H	139	30.28	-1.69
3	3140.79	46.37 PK	74.00	-27.63	1.28 H	162	43.79	2.58
4	3140.79	31.83 AV	54.00	-22.17	1.28 H	162	29.25	2.58
5	3665.88	46.74 PK	74.00	-27.26	1.00 H	133	42.67	4.07
6	3665.88	32.76 AV	54.00	-21.24	1.00 H	133	28.69	4.07

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



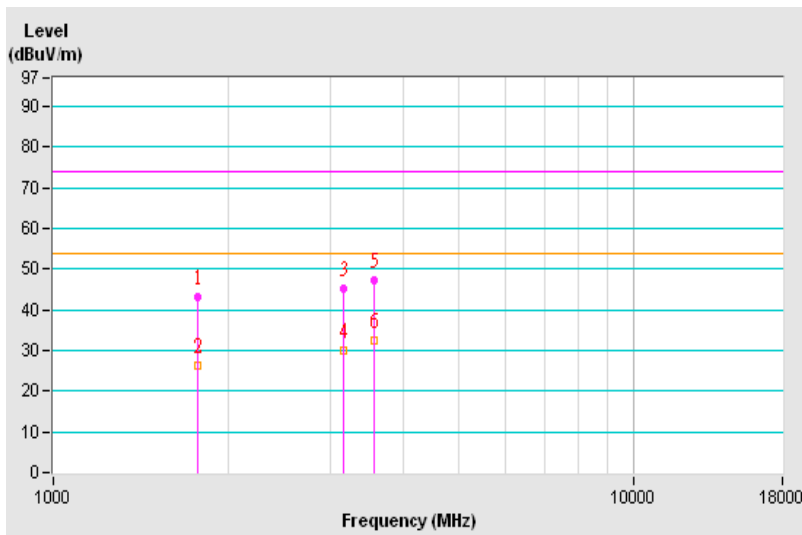
Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 65%RH
Tested by	Felix Chen	Test Date	2017/10/7
Test Mode	Mode 2		

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	1768.92	43.00 PK	74.00	-31.00	1.22 V	147	44.63	-1.63
2	1768.92	26.39 AV	54.00	-27.61	1.22 V	147	28.02	-1.63
3	3159.47	45.32 PK	74.00	-28.68	1.00 V	198	42.69	2.63
4	3159.47	30.02 AV	54.00	-23.98	1.00 V	198	27.39	2.63
5	3566.25	47.14 PK	74.00	-26.86	1.18 V	37	43.37	3.77
6	3566.25	32.38 AV	54.00	-21.62	1.18 V	37	28.61	3.77

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

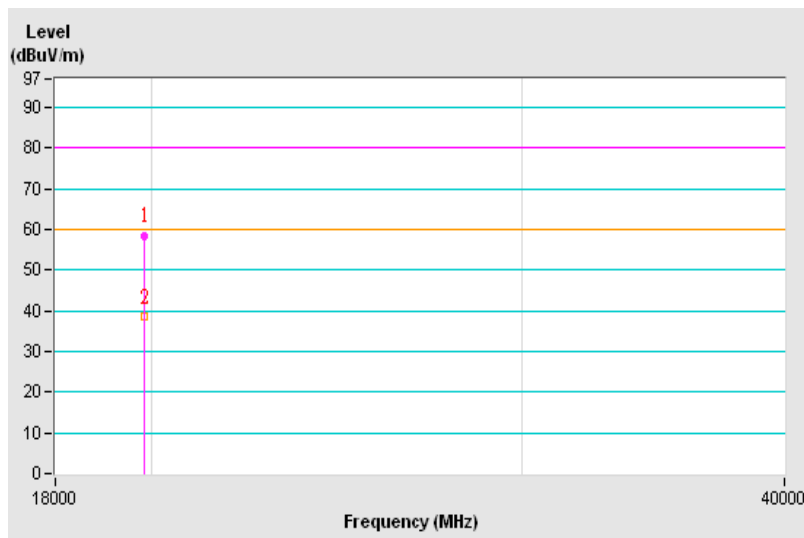


Frequency Range	18GHz ~ 40GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 65%RH
Tested by	Felix Chen	Test Date	2017/10/7
Test Mode	Mode 2		

Antenna Polarity & Test Distance : Horizontal at 1.5 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	19836.48	58.51 PK	80.00	-21.49	1.00 H	323	60.96	-2.45
2	19836.48	38.77 AV	60.00	-21.23	1.00 H	323	41.22	-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

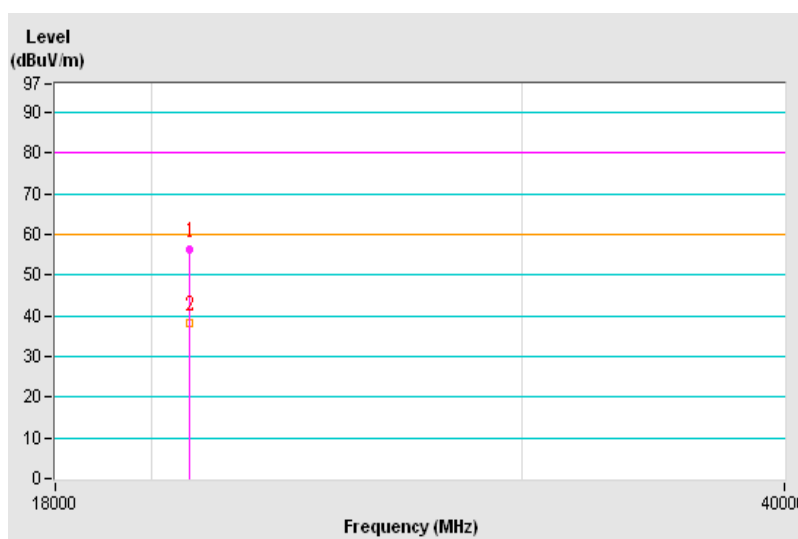


Frequency Range	18GHz ~ 40GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 65%RH
Tested by	Felix Chen	Test Date	2017/10/7
Test Mode	Mode 2		

Antenna Polarity & Test Distance : Vertical at 1.5 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	20832.94	56.37 PK	80.00	-23.63	1.38 V	122	58.64	-2.27
2	20832.94	38.11 AV	60.00	-21.89	1.38 V	122	40.38	-2.27

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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Email: service.adt@tw.bureauveritas.com

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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