

## FCC Test Report

**Report No.:** RF170706C19-3

**FCC ID:** NM8X2-HT

**Test Model:** X2-HT

**Received Date:** Jul. 06, 2017

**Test Date:** Jul. 21, 2017 ~ Aug. 28, 2017

**Issued Date:** Sep. 20, 2017

**Applicant:** HTC Corporation

**Address:** No.23 Xinghua Road, Taoyuan District, Taoyuan City 330, Taiwan

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

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

**Test Location:** No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City  
33383, Taiwan, R.O.C.

**Test Location (2):** No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan,  
R.O.C



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 General Description of EUT .....	6
3.2 Description of Test Modes.....	7
3.2.1 Test Mode Applicability and Tested Channel Detail.....	8
3.3 Description of Support Units .....	9
3.3.1 Configuration of System under Test .....	9
3.4 General Description of Applied Standards.....	9
<b>4 Test Types and Results .....</b>	<b>10</b>
4.1 Radiated Emission and Bandedge Measurement .....	10
4.1.1 Limits of Radiated Emission and Bandedge Measurement .....	10
4.1.2 Test Instruments .....	11
4.1.3 Test Procedures.....	12
4.1.4 Deviation from Test Standard .....	12
4.1.5 Test Set Up .....	13
4.1.6 EUT Operating Conditions.....	13
4.1.7 Test Results .....	14
4.2 Conducted Emission Measurement.....	21
4.2.1 Limits of Conducted Emission Measurement .....	21
4.2.2 Test Instruments .....	21
4.2.3 Test Procedures.....	21
4.2.4 Deviation from Test Standard .....	22
4.2.5 Test Setup.....	22
4.2.6 EUT Operating Conditions.....	22
4.2.7 Test Results .....	23
<b>5 Pictures of Test Arrangements.....</b>	<b>27</b>
<b>Appendix – Information on the Testing Laboratories .....</b>	<b>28</b>

### Release Control Record

Issue No.	Description	Date Issued
RF170706C19-3	Original Release	Sep. 20, 2017

## 1 Certificate of Conformity

**Product:** Smartphone

**Brand:** HTC

**Test Model:** X2-HT

**Sample Status:** Production Unit

**Applicant:** HTC Corporation

**Test Date:** Jul. 21, 2017 ~ Aug. 28, 2017

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.249)  
ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :**



,

**Date:**

Sep. 20, 2017

Ivonne Wu / Supervisor

**Approved by :**



,

**Date:**

Sep. 20, 2017

David Huang / Project Engineer

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.249)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -15.84 dB at 14.44887 MHz.
15.209 15.249 15.249 (d)	Radiated Emission Test Band Edge Measurement Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -17.20 dB at 2368.00 MHz.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

<b>Product</b>	Smartphone
<b>Brand</b>	HTC
<b>Test Model</b>	X2-HT
<b>Status of EUT</b>	Production Unit
<b>Power Supply Rating</b>	5 Vdc or 9 Vdc or 12 Vdc (adapter) 3.85 Vdc (Li-ion battery)
<b>Modulation Type</b>	GFSK
<b>Operating Frequency</b>	2403 ~ 2480 MHz
<b>Number of Channel</b>	78
<b>Antenna Type</b>	PIFA antenna with -2.1 dBi gain
<b>Antenna Connector</b>	N/A
<b>Accessory Device</b>	Refer to Note as below
<b>Data Cable Supplied</b>	Refer to Note as below

Note:

1. There're 2 configurations for the EUT listed as below.  
     Main Sample: EUT + Battery 1  
     2<sup>nd</sup> Sample: EUT + Battery 2  
     ✧ Only the worst test data was presented in the report.
2. The EUT's accessories list refers to Ext. Pho.
3. 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.

### 3.2 Description of Test Modes

78 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		
20	2422	40	2442	60	2462		

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To			Description
	RE $\geq$ 1G	RE<1G	PLC	
A	√	√	√	Main Sample
B	√	√	√	2 <sup>nd</sup> Sample

Where  
**RE $\geq$ 1G:** Radiated Emission above 1 GHz & Bandedge Measurement  
**PLC:** Power Line Conducted Emission

**RE<1G:** Radiated Emission below 1 GHz

**NOTE:** The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane** for mode A and **X-plane** for mode B.

#### **Radiated Emission Test (Above 1 GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
A	1 to 78	1, 39, 78	GFSK
B	1 to 78	78	GFSK

#### **Radiated Emission Test (Below 1 GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Tested Channel	Modulation Technology	Modulation Type
A, B	1 to 78	78	GFSK

#### **Power Line Conducted Emission Test:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Tested Channel	Modulation Technology	Modulation Type
A, B	1 to 78	78	GFSK

#### **Test Condition:**

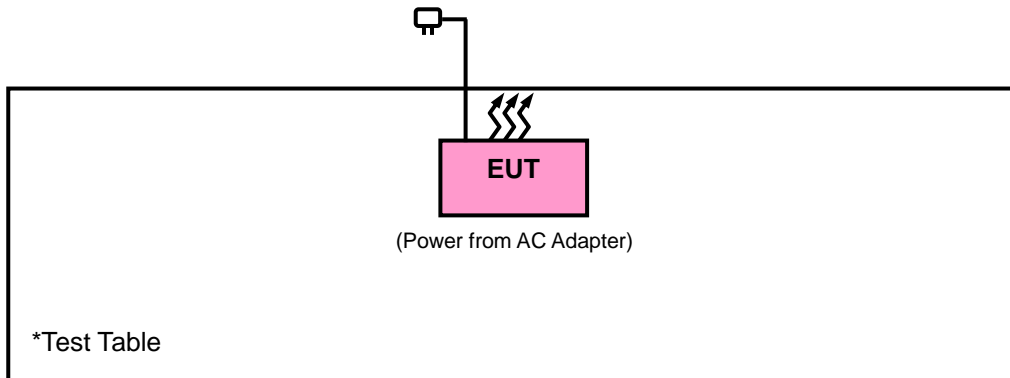
Applicable To	Environmental Conditions	Input Power	Tested By
RE $\geq$ 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee
PLC	25 deg. C, 68 % RH	120 Vac, 60 Hz	Getaz Yang



### 3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

#### 3.3.1 Configuration of System under Test



### 3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

#### **FCC Part 15, Subpart C (15.249)**

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

**NOTE:** The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC).  
The test report has been issued separately.

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. 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 20dB under any condition of modulation.

## 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Jul. 05, 2017	Jul. 04, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 13, 2016	Dec. 12, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 16, 2016	Dec. 15, 2017
HORN Antenna ETS-Lindgren	3117	00143293	Dec. 29, 2016	Dec. 28, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 14, 2016	Dec. 13, 2017
Fixed Attenuator Mini-Circuits	BW-N10W5+	NA	Jul. 07, 2017	Jul. 06, 2018
Bluetooth Tester	CBT	100980	Jun. 28, 2017	Jun. 27, 2019
Loop Antenna	HLA 6121	45745	May 19, 2017	May 18, 2018
Preamplifier Agilent	310N	187226	Jun. 23, 2017	Jun. 22, 2018
Preamplifier Agilent	83017A	MY39501357	Jun. 23, 2017	Jun. 22, 2018
Power Meter Anritsu	ML2495A	1232002	Sep. 08, 2016	Sep. 07, 2017
Power Sensor Anritsu	MA2411B	1207325	Sep. 08, 2016	Sep. 07, 2017
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(R FC-SMS-100-SM S-120+RFC-SMS -100-SMS-400)	Jun. 23, 2017	Jun. 22, 2018
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(R FC-SMS-100-SM S-24)	Jun. 23, 2017	Jun. 22, 2018
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	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 HsinTien Chamber 1.
3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0011. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is IC7450I-1.

#### 4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna 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.
- d. 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.
- e. 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.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

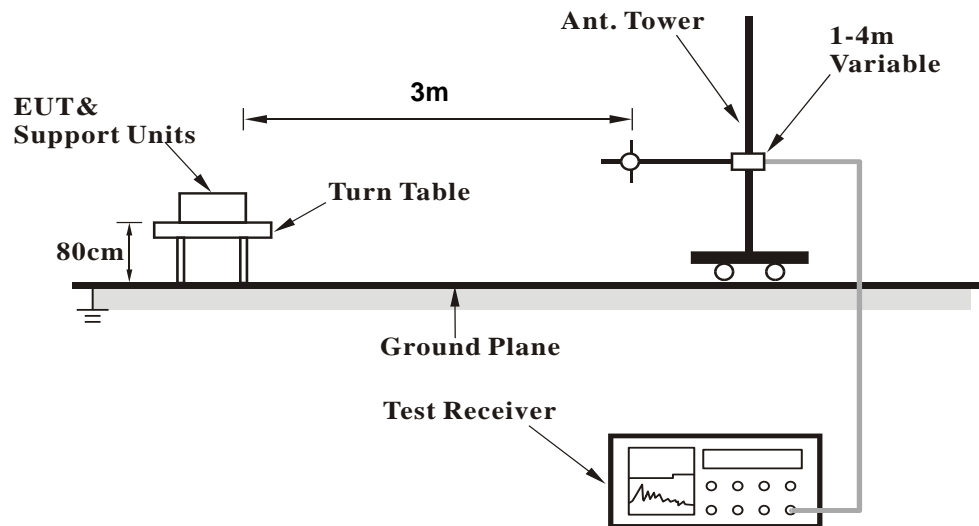
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak value of fundamental frequency.
3. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
5. The average value of emissions at frequency above 1 GHz is: Average = Peak value + 20log(Duty cycle).
6. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

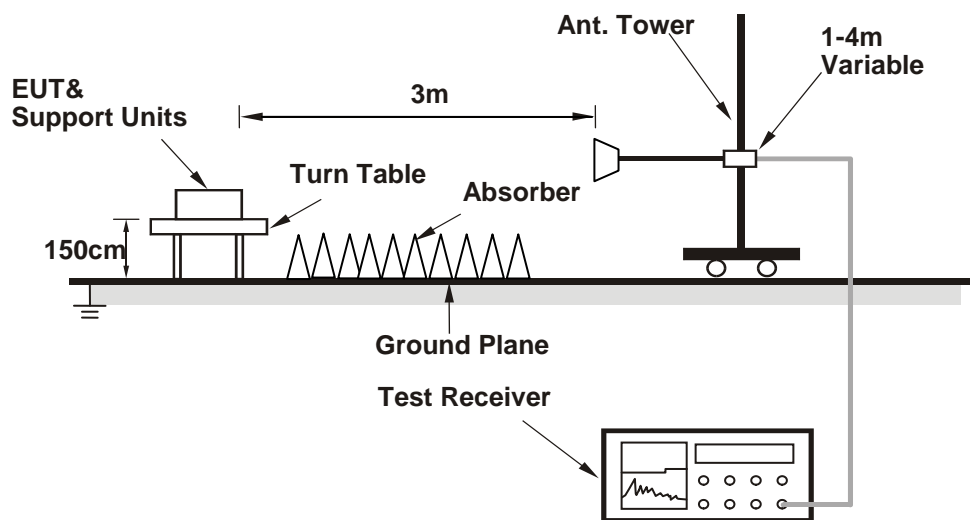
No deviation.

#### 4.1.5 Test Set Up

##### <Frequency Range below 1 GHz>



##### <Frequency Range above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.6 EUT Operating Conditions

Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

**Above 1 GHz WORST-CASE DATA:**

**Mode A**

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2360	32.86	31.23	54	-21.14	31.76	5.37	35.5	187	193	Average
2360	54.9	53.27	74	-19.1	31.76	5.37	35.5	187	193	Peak
2403	59.71	57.97	94	-34.29	31.81	5.4	35.47	187	193	Average
2403	81.75	80.01	114	-32.25	31.81	5.4	35.47	187	193	Peak
2500	33.67	31.65	54	-20.33	31.9	5.53	35.41	187	193	Average
2500	55.31	53.29	74	-18.69	31.9	5.53	35.41	187	193	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2382	33.81	32.12	54	-20.19	31.78	5.4	35.49	116	228	Average
2382	55.85	54.16	74	-18.15	31.78	5.4	35.49	116	228	Peak
2403	62.16	60.42	94	-31.84	31.81	5.4	35.47	116	228	Average
2403	84.2	82.46	114	-29.8	31.81	5.4	35.47	116	228	Peak
2490	33.04	31.03	54	-20.96	31.9	5.53	35.42	116	228	Average
2490	55.08	53.07	74	-18.92	31.9	5.53	35.42	116	228	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
 $20 \log (\text{Duty cycle}) = 20 \log (0.1581 \text{ ms} / 0.05 \text{ ms}) = -22.04 \text{ dB}$   
 Please refer to the plotted duty

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2358	32.97	31.34	54	-21.03	31.76	5.37	35.5	103	225	Average
2358	55.01	53.38	74	-18.99	31.76	5.37	35.5	103	225	Peak
2441	59.27	57.4	94	-34.73	31.85	5.46	35.44	103	225	Average
2441	81.31	79.44	114	-32.69	31.85	5.46	35.44	103	225	Peak
2496	33.93	31.91	54	-20.07	31.9	5.53	35.41	103	225	Average
2496	55.97	53.95	74	-18.03	31.9	5.53	35.41	103	225	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2360	33.38	31.75	54	-20.62	31.76	5.37	35.5	116	228	Average
2360	55.42	53.79	74	-18.58	31.76	5.37	35.5	116	228	Peak
2441	62.48	60.61	94	-31.52	31.85	5.46	35.44	116	228	Average
2441	84.52	82.65	114	-29.48	31.85	5.46	35.44	116	228	Peak
2492	34.4	32.38	54	-19.6	31.9	5.53	35.41	116	228	Average
2492	56.44	54.42	74	-17.56	31.9	5.53	35.41	116	228	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
20 log (Duty cycle) = 20 log (0.1581 ms / 0.05 ms) = -22.04 dB  
Please refer to the plotted duty

EUT Test Condition		Measurement Detail	
Channel	Channel 78	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2368	34.76	33.12	54	-19.24	31.76	5.37	35.49	187	193	Average
2368	56.8	55.16	74	-17.2	31.76	5.37	35.49	187	193	Peak
2480	58.82	56.86	94	-35.18	31.88	5.5	35.42	187	193	Average
2480	80.86	78.9	114	-33.14	31.88	5.5	35.42	187	193	Peak
2498	34.57	32.55	54	-19.43	31.9	5.53	35.41	187	193	Average
2498	56.61	54.59	74	-17.39	31.9	5.53	35.41	187	193	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2376	33.55	31.89	54	-20.45	31.78	5.37	35.49	193	200	Average
2376	55.59	53.93	74	-18.41	31.78	5.37	35.49	193	200	Peak
2480	61.48	59.52	94	-32.52	31.88	5.5	35.42	193	200	Average
2480	83.52	81.56	114	-30.48	31.88	5.5	35.42	193	200	Peak
2494	33.5	31.48	54	-20.5	31.9	5.53	35.41	193	200	Average
2494	55.54	53.52	74	-18.46	31.9	5.53	35.41	193	200	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
20 log (Duty cycle) = 20 log (0.1581 ms / 0.05 ms) = -22.04 dB  
Please refer to the plotted duty



**Mode B**

EUT Test Condition		Measurement Detail	
Channel	Channel 78	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2352	33.33	31.74	54	-20.67	31.76	5.33	35.5	239	56	Average
2352	55.32	53.73	74	-18.68	31.76	5.33	35.5	239	56	Peak
2480	60.69	58.73	94	-33.31	31.88	5.5	35.42	239	56	Average
2480	82.68	80.72	114	-31.32	31.88	5.5	35.42	239	56	Peak
2498	34.02	32	54	-19.98	31.9	5.53	35.41	239	56	Average
2498	56.01	53.99	74	-17.99	31.9	5.53	35.41	239	56	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2340	33.3	31.73	54	-20.7	31.74	5.33	35.5	100	14	Average
2340	55.29	53.72	74	-18.71	31.74	5.33	35.5	100	14	Peak
2480	58.2	56.24	94	-35.8	31.88	5.5	35.42	100	14	Average
2480	80.19	78.23	114	-33.81	31.88	5.5	35.42	100	14	Peak
2500	32.82	30.8	54	-21.18	31.9	5.53	35.41	100	14	Average
2500	54.81	52.79	74	-19.19	31.9	5.53	35.41	100	14	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
 $20 \log (\text{Duty cycle}) = 20 \log (0.1581 \text{ ms} / 0.05 \text{ ms}) = -22.04 \text{ dB}$   
Please refer to the plotted duty

**Below 1 GHz WORST-CASE DATA:**

**Mode A**

EUT Test Condition		Measurement Detail	
Channel	Channel 78	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
85.89	14.13	35.49	40	-25.87	9.44	1.11	31.91	154	116	Peak
159.87	22.42	44.42	43.5	-21.08	8.75	1.52	32.27	167	243	Peak
260.04	14.73	32.4	46	-31.27	12.49	1.94	32.1	195	322	Peak
437.9	14.17	28.44	46	-31.83	15.4	2.49	32.16	134	192	Peak
550.6	16.96	29.3	46	-29.04	17.1	2.76	32.2	161	205	Peak
767.6	20.21	29.12	46	-25.79	19.99	3.22	32.12	115	127	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
55.11	21.7	38.89	40	-18.3	14.14	0.9	32.23	158	127	Peak
101.55	8.9	27.54	43.5	-34.6	12.34	1.28	32.26	168	121	Peak
187.95	21.57	41.76	43.5	-21.93	10.45	1.61	32.25	145	123	Peak
479.9	16.08	29.57	46	-29.92	16.07	2.56	32.12	161	127	Peak
652.1	18.16	28.84	46	-27.84	18.48	2.99	32.15	134	112	Peak
874.7	21.44	28.3	46	-24.56	21.29	3.49	31.64	195	286	Peak

**Remarks:**

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
20 log (Duty cycle) = 20 log (0.1581 ms / 0.05 ms) = -22.04 dB  
Please refer to the plotted duty

**Mode B**

EUT Test Condition		Measurement Detail	
Channel	Channel 78	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

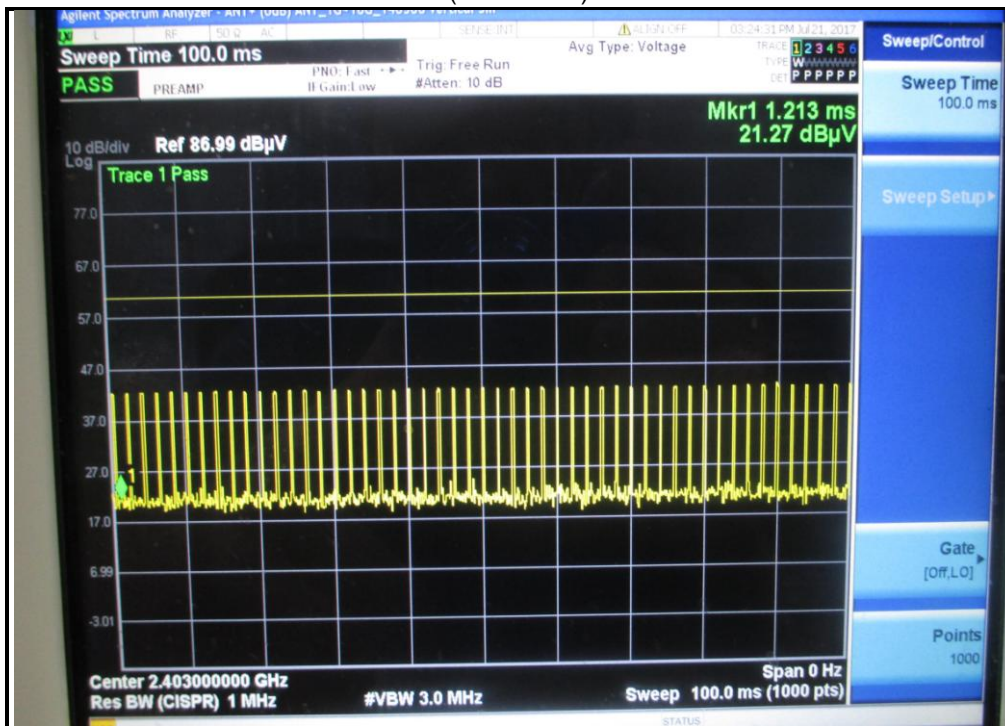
Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
99.66	18.22	36.92	43.5	-25.28	12.28	1.28	32.26	182	223	Peak
147.45	17.09	39.45	43.5	-26.41	8.39	1.52	32.27	165	9	Peak
199.56	27.05	46.62	43.5	-16.45	11.08	1.65	32.3	105	110	Peak
479.2	16.45	29.96	46	-29.55	16.05	2.56	32.12	133	164	Peak
671.7	19.61	29.88	46	-26.39	18.8	3.05	32.12	188	277	Peak
724.2	19.75	29.15	46	-26.25	19.56	3.16	32.12	114	163	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
65.1	17.41	36.64	40	-22.59	12.09	0.9	32.22	120	315	Peak
174.18	23.68	44.93	43.5	-19.82	9.38	1.61	32.24	174	195	Peak
210.9	22.11	41.56	43.5	-21.39	11.16	1.65	32.26	105	104	Peak
440	15.86	30.11	46	-30.14	15.42	2.49	32.16	145	95	Peak
602.4	18	29.37	46	-28	17.95	2.87	32.19	106	180	Peak
727.7	20.08	29.45	46	-25.92	19.59	3.16	32.12	124	322	Peak

Remarks:

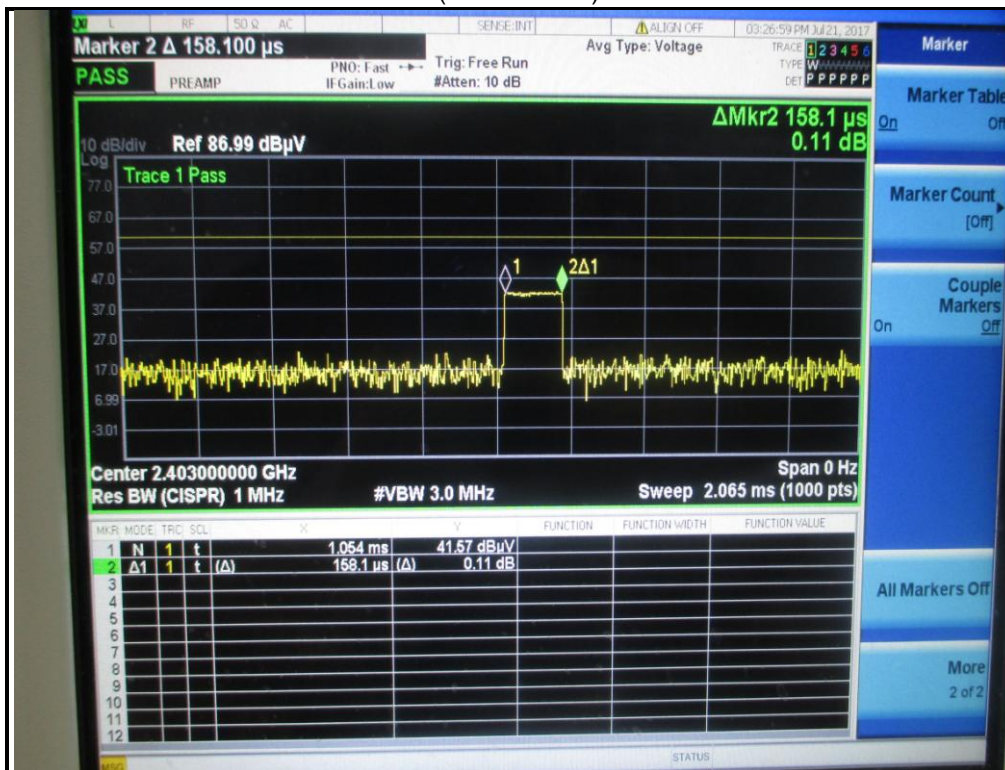
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
 $20 \log (\text{Duty cycle}) = 20 \log (0.1581 \text{ ms} / 0.05 \text{ ms}) = -22.04 \text{ dB}$   
 Please refer to the plotted duty

### <Duty Cycle Correction Factor>

DH5 on time/100 ms (One Pulse) Plot on Channel 39



DH5 on time/100 ms (Count Pulse) Plot on Channel 39



$$20 \log (\text{Duty cycle}) = 20 \log (0.1581 \text{ ms} * 50 / 100 \text{ ms}) = -22.04 \text{ dB}$$

## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note:

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

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 21, 2016	Nov. 20, 2017
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 22, 2016	Dec. 21, 2017
LISN/AMN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ENV216	101196	Apr. 20, 2017	Apr. 19, 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.

### 4.2.3 Test Procedures

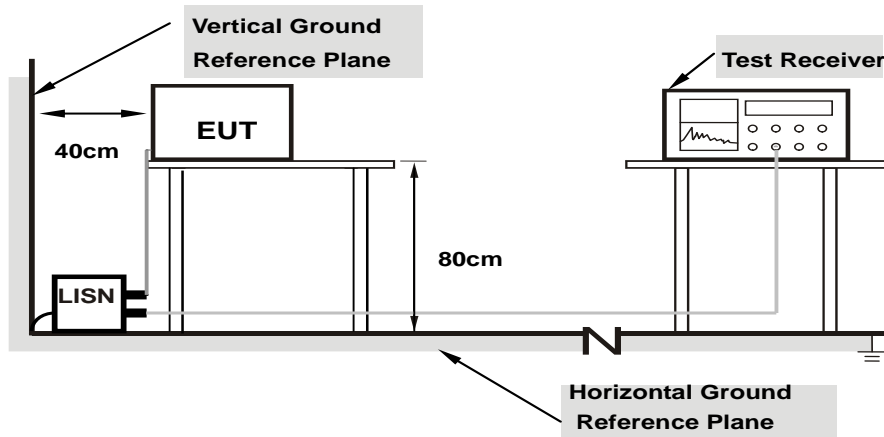
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

**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.

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



**Note: 1.Support units were connected to second LISN.**

For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.2.6 EUT Operating Conditions

Same as 4.1.6.

#### 4.2.7 Test Results

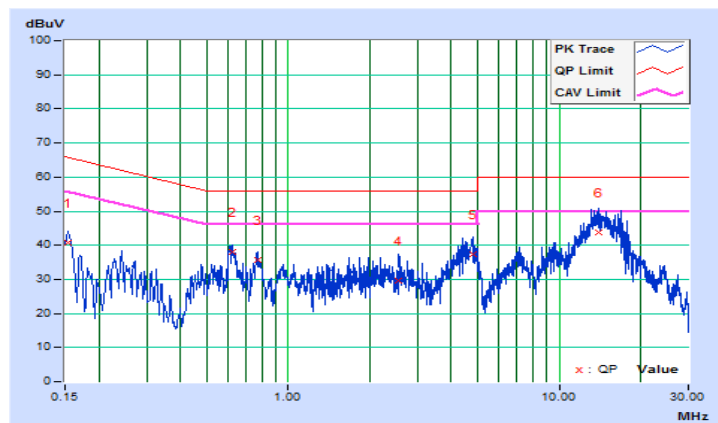
##### Mode A

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/7/28

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.35	30.49	19.38	40.84	29.73	65.79	55.79	-24.95	-26.06
2	0.61920	10.40	27.64	18.45	38.04	28.85	56.00	46.00	-17.96	-17.15
3	0.77195	10.40	25.24	16.71	35.64	27.11	56.00	46.00	-20.36	-18.89
4	2.56638	10.49	19.27	11.45	29.76	21.94	56.00	46.00	-26.24	-24.06
5	4.79117	10.60	26.69	17.71	37.29	28.31	56.00	46.00	-18.71	-17.69
6	13.97967	11.03	32.63	22.34	43.66	33.37	60.00	50.00	-16.34	-16.63

##### 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

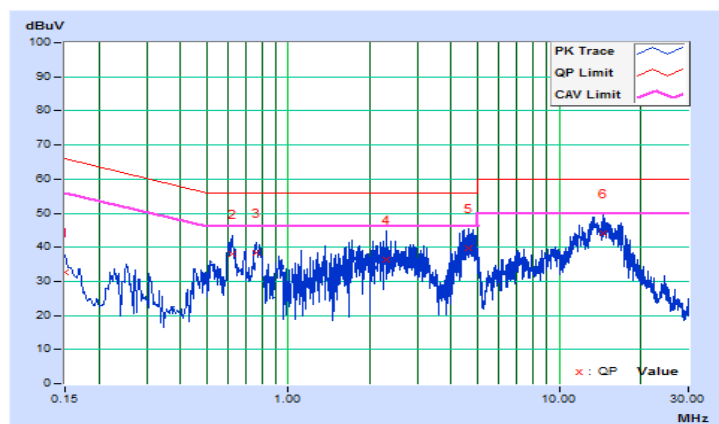


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/7/28

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	10.10	22.43	12.04	32.53	22.14	66.00	56.00	-33.47	-33.86
2	0.62311	10.16	27.84	17.41	38.00	27.57	56.00	46.00	-18.00	-18.43
3	0.76387	10.17	28.31	16.30	38.48	26.47	56.00	46.00	-17.52	-19.53
4	2.29268	10.25	25.98	15.47	36.23	25.72	56.00	46.00	-19.77	-20.28
5	4.60740	10.36	29.46	18.03	39.82	28.39	56.00	46.00	-16.18	-17.61
6	14.44887	10.73	33.43	22.91	44.16	33.64	60.00	50.00	-15.84	-16.36

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





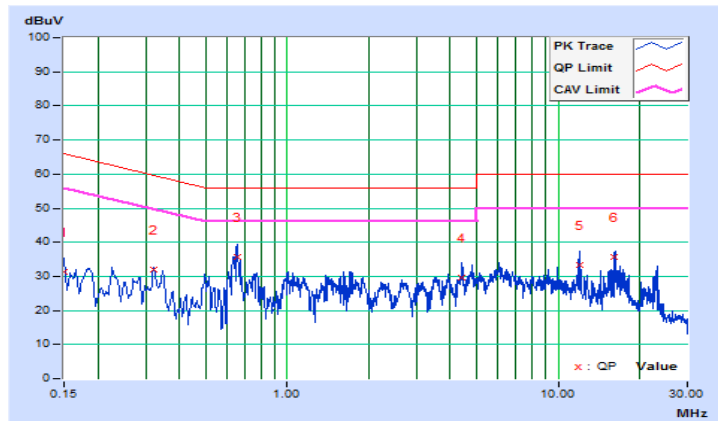
**Mode B**

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	Getaz Yang	Test Date	2017/8/28

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.34	20.98	12.44	31.32	22.78	66.00	56.00	-34.68	-33.22
2	0.32203	10.39	21.57	18.78	31.96	29.17	59.65	49.65	-27.69	-20.48
3	0.65415	10.40	25.30	15.05	35.70	25.45	56.00	46.00	-20.30	-20.55
4	4.42200	10.59	19.14	14.37	29.73	24.96	56.00	46.00	-26.27	-21.04
5	11.94200	10.93	22.51	19.45	33.44	30.38	60.00	50.00	-26.56	-19.62
6	16.16600	11.15	24.49	22.39	35.64	33.54	60.00	50.00	-24.36	-16.46

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

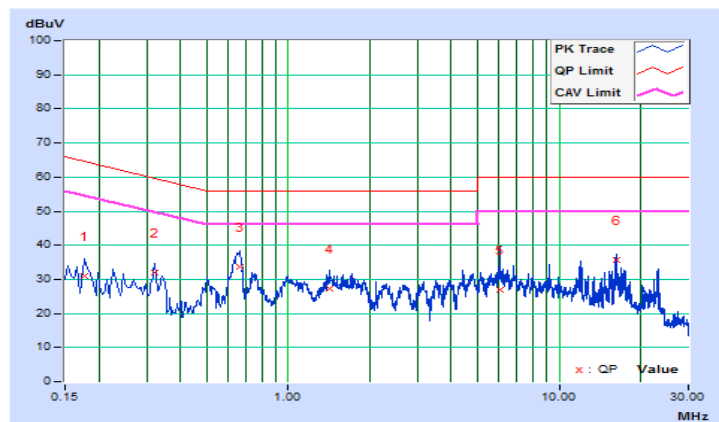


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 75%RH
Tested by	Getaz Yang	Test Date	2017/8/28

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	0.17708	10.12	20.96	15.63	31.08	25.75	64.62	54.62	-33.54	-28.87
2	0.32203	10.15	21.76	18.91	31.91	29.06	59.65	49.65	-27.74	-20.59
3	0.66600	10.16	23.45	13.60	33.61	23.76	56.00	46.00	-22.39	-22.24
4	1.42200	10.20	17.08	8.53	27.28	18.73	56.00	46.00	-28.72	-27.27
5	6.07000	10.41	16.44	9.59	26.85	20.00	60.00	50.00	-33.15	-30.00
6	16.23000	10.80	24.79	22.63	35.59	33.43	60.00	50.00	-24.41	-16.57

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



## 5 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 accredited and approved according to ISO/IEC 17025.

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

**Linko 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 ---