

## Variant FCC Test Report

**Report No.:** RF170425C26A-7

**FCC ID:** MSQZ01KD

**Test Model:** ASUS\_Z01KD

**Received Date:** Aug. 24, 2017

**Test Date:** Sep. 18, 2017 ~ Sep. 19, 2017

**Issued Date:** Nov. 13, 2017

**Applicant:** ASUSTek COMPUTER INC.

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

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( R.O.C )

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R.O.C



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### Release Control Record

Issue No.	Description	Date Issued
RF170425C26A-7	Original Release	Nov. 13, 2017

## 1 Certificate of Conformity

**Product:** ASUS Phone

**Brand:** ASUS

**Test Model:** ASUS\_Z01KD

**Sample Status:** Production Unit

**Applicant:** ASUSTek COMPUTER INC.

**Test Date:** Sep. 18, 2017 ~ Sep. 19, 2017

**Standards:** 47 CFR FCC Part 15, Subpart E (Section 15.407)  
ANSI C63.10:2013

This report is issued as a supplementary report to BV CPS report no.: RF170425C26-8. This report shall be used by combining with its original report.

**Prepared by :**  , **Date:** Nov. 13, 2017  
Ivonne Wu / Supervisor

**Approved by :**  , **Date:** Nov. 13, 2017  
Dylan Chiou / Project Engineer

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -16.71 dB at 0.19400 MHz.
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.1 dB at 5350.99 MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	N/A	Refer to Note
15.407(a)(1/2/3)	Peak Power Spectral Density	N/A	Refer to Note
15.407(e)	6 dB Bandwidth	N/A	Refer to Note
15.407(g)	Frequency Stability	N/A	Refer to Note
15.203	Antenna Requirement	Pass	No antenna connector is used.

**Note:** Only conducted emission and radiated emissions tests had been performed for the addendum. Refer to original report for other test data.

### 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	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 ~ 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>	ASUS Phone
<b>Brand</b>	ASUS
<b>Test Model</b>	ASUS_Z01KD
<b>SKU</b>	BR/NA/SA-2CA US/BR/CO/PE/CL
<b>Status of EUT</b>	Production Unit
<b>Power Supply Rating</b>	5.0 Vdc or 9 Vdc (adapter) 5.0 Vdc (host equipment) 3.85 Vdc (Li-ion battery)
<b>Modulation Type</b>	256QAM, 64QAM, 16QAM, QPSK, BPSK
<b>Modulation Technology</b>	OFDM
<b>Transfer Rate</b>	802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0 Mbps 802.11n: up to MCS7 802.11ac: up to V9
<b>Operating Frequency</b>	5180 ~ 5240 MHz, 5260 ~ 5320 MHz, 5500 ~ 5700 MHz, 5745 ~ 5825 MHz
<b>Number of Channel</b>	5180 ~ 5240 MHz: 4 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40) 1 for 802.11ac (VHT80) 5260 ~ 5320 MHz: 4 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40) 1 for 802.11ac (VHT80) 5500 ~ 5700 MHz: 11 for 802.11a, 802.11n (HT20) 5 for 802.11n (HT40) 2 for 802.11ac (VHT80) 5745 ~ 5825 MHz: 5 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40) 1 for 802.11ac (VHT80)
<b>Antenna Type</b>	PIFA antenna with -0.03 dBi gain (5180 ~ 5240 MHz) PIFA antenna with 1.42 dBi gain (5260 ~ 5320 MHz) PIFA antenna with 1.08 dBi gain (5500 ~ 5700 MHz) PIFA antenna with -0.62 dBi gain (5745 ~ 5825 MHz)
<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. This report is issued as a supplementary report to BV CPS report no.: RF170425C26-8. The difference compared with original report is adding 2<sup>nd</sup> source of front camera and rear camera. Therefore, only conducted emission and radiated emissions tests had been performed for this report.
2. The EUT provides one transmitter and receiver.

Modulation Mode	Tx Function
802.11a	1TX
802.11n (HT20)	1TX
802.11n (HT40)	1TX
802.11ac (HT20)	1TX
802.11ac (HT40)	1TX
802.11ac (VHT80)	1TX

\* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for HT20 / HT40, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

3. The EUT's accessories list refers to Ext. Pho.
4. 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

#### For 5180 ~ 5240 MHz

4 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
40	5200	48	5240

2 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency (MHz)
42	5210

#### For 5260 ~ 5320 MHz

4 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	60	5300
56	5280	64	5320

2 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
54	5270	62	5310

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency (MHz)
58	5290

### For 5500 ~ 5700 MHz

11 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	124	5620
104	5520	128	5640
108	5540	132	5660
112	5560	136	5680
116	5580	140	5700
120	5600		

5 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
102	5510	126	5630
110	5550	134	5670
118	5590		

2 channels are provided for 802.11ac (VHT80):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
106	5530	122	5610

### For 5745 ~ 5825 MHz:

5 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	161	5805
153	5765	165	5825
157	5785		

2 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency (MHz)
155	5775

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To			Description
	RE $\geq$ 1G	RE $<$ 1G	PLC	
-	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz      **RE $<$ 1G**: Radiated Emission below 1 GHz  
**PLC**: Power Line Conducted Emission

**Note:**

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
2. "-" means no effect.

#### **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	Frequency Band (MHz)	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	5180-5240	802.11ac (VHT80)	42	42	OFDM	BPSK	MCS0
-	5260-5320	802.11ac (VHT80)	58	58	OFDM	BPSK	MCS0
-	5500-5700	802.11ac (VHT80)	106 to 122	106	OFDM	BPSK	MCS0
-	5745-5825	802.11a	149 to 165	165	OFDM	BPSK	6.0

#### **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	Frequency Band (MHz)	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	5180-5240	802.11ac (VHT80)	42	42	OFDM	BPSK	MCS0
-	5260-5320	802.11ac (VHT80)	58	58	OFDM	BPSK	MCS0
-	5500-5700	802.11ac (VHT80)	106 to 122	106	OFDM	BPSK	MCS0
-	5745-5825	802.11a	155	165	OFDM	BPSK	6.0

#### **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	Frequency Band (MHz)	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	5500-5700	802.11ac (VHT80)	106 to 122	106	OFDM	BPSK	6.0

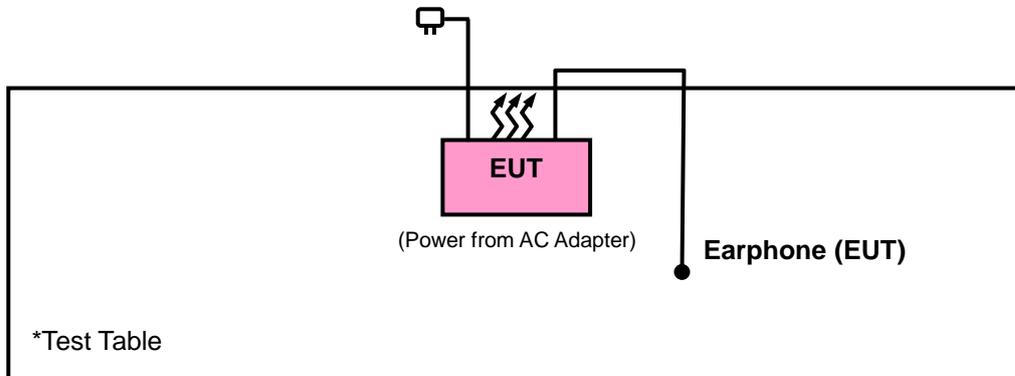
#### **Test Condition:**

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao
RE $<$ 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao
PLC	25 deg. C, 65 % 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 E (15.407)

789033 D02 General UNII Test Procedures New Rules v01r04

644545 D01 Guidance for IEEE 802 11ac v01r02

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

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

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 20 dB under any condition of modulation.

4.1.2 Limits of Unwanted Emission Out of the Restricted Bands

Applicable To		Limit	
789033 D02 General UNII Test Procedures New Rules v01r04		Field Strength at 3 m	
		PK: 74 (dBµV/m)	AV: 54 (dBµV/m)
Frequency Band	Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
5150~5250 MHz	15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.2 (dBµV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	15.407(b)(4)(i)	PK:-27 (dBm/MHz) <sup>*1</sup> PK:10 (dBm/MHz) <sup>*2</sup> PK:15.6 (dBm/MHz) <sup>*3</sup> PK:27 (dBm/MHz) <sup>*4</sup>	PK: 68.2 (dBµV/m) <sup>*1</sup> PK:105.2 (dBµV/m) <sup>*2</sup> PK: 110.8 (dBµV/m) <sup>*3</sup> PK:122.2 (dBµV/m) <sup>*4</sup>
	15.407(b)(4)(ii)	Emission limits in section 15.247(d)	
<sup>*1</sup> beyond 75 MHz or more above of the band edge. <sup>*2</sup> below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. <sup>*3</sup> below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. <sup>*4</sup> from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.			

**Note:**

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where } P \text{ is the eirp (Watts).}$$

#### 4.1.3 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
HORN Antenna ETS-Lindgren	3117	00143293	Jun. 26, 2017	Jun. 25, 2018
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	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier Agilent	310N	187226	Jun. 23, 2017	Jun. 22, 2018
Preamplifier Agilent	83017A	MY39501357	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 / 24 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 1 GHz if tested.
4. The IC Site Registration No. is IC7450I-1.

#### 4.1.4 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 detected 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:**

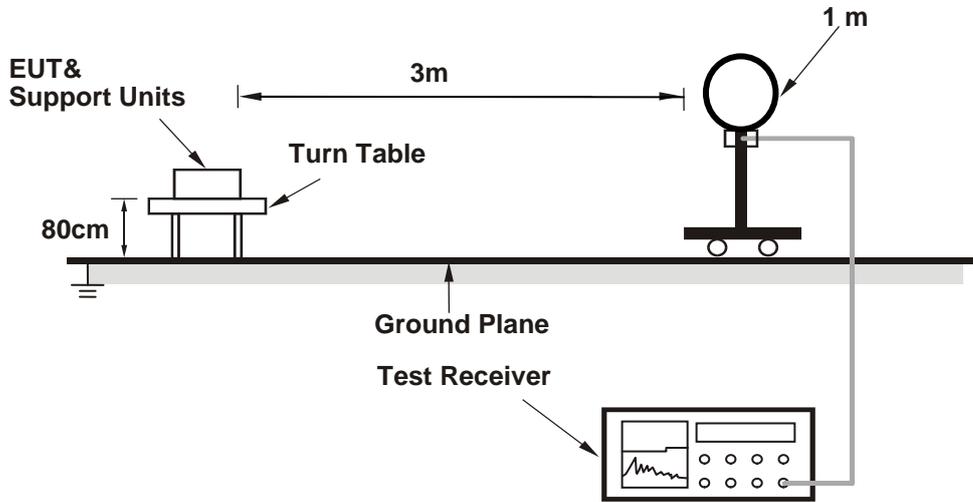
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for Average (Duty cycle < 98 %) detection at frequency above 1 GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.5 Deviation from Test Standard

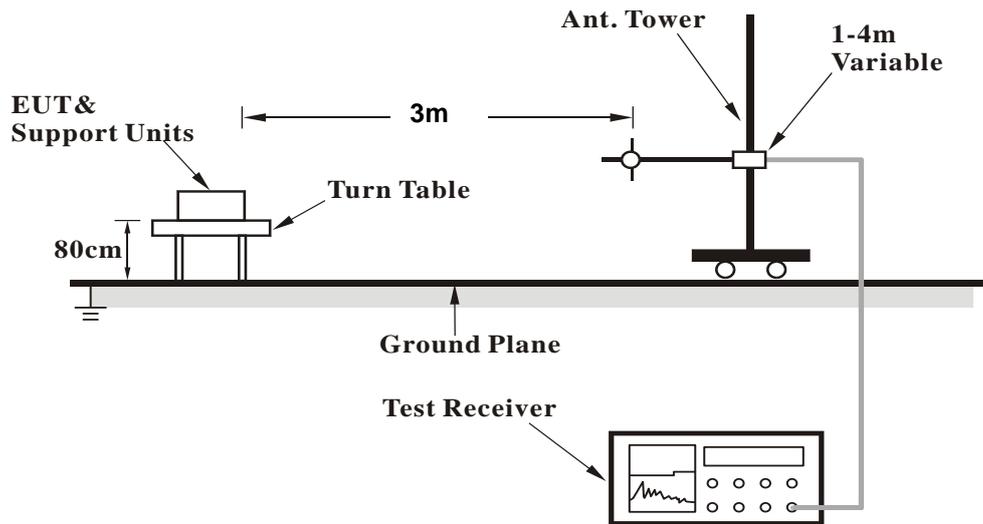
No deviation.

4.1.6 Test Set Up

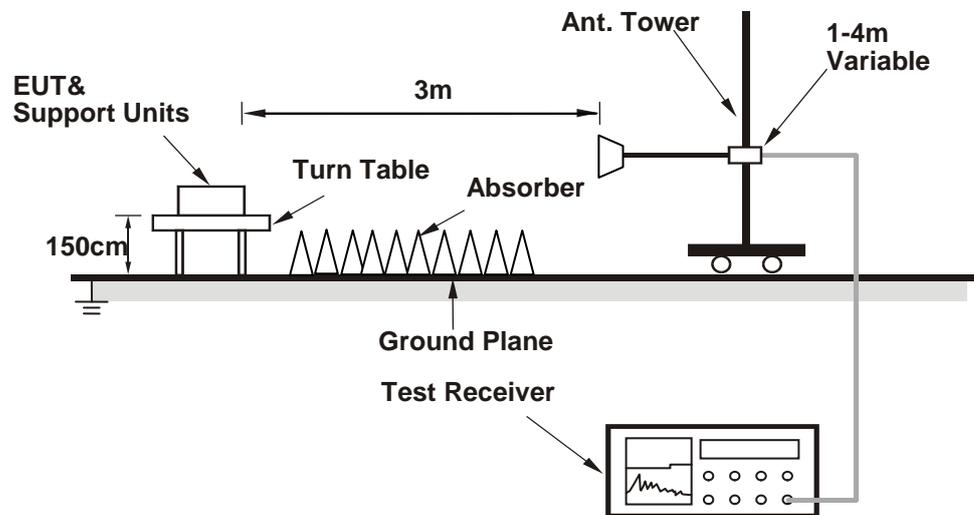
<Radiated emission below 30MHz>



<Frequency Range below 1 GHz>



<Frequency Range above 1 GHz>



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

#### 4.1.7 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.8 Test Results  
 Above 1 GHz Data :  
 802.11ac (VHT80)

EUT Test Condition		Measurement Detail	
Channel	Channel 42	Frequency Range	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

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
5149.4	52.12	43.87	54	-1.88	34.12	8.13	34	218	301	Average
5149.4	62.99	54.74	74	-11.01	34.12	8.13	34	218	301	Peak
5210	92.58	84.22			34.17	8.19	34	218	301	Average
5210	99.03	90.67			34.17	8.19	34	218	301	Peak
5358.03	44.34	35.71	54	-9.66	34.28	8.38	34.03	218	301	Average
5358.03	55.08	46.45	74	-18.92	34.28	8.38	34.03	218	301	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
5149.55	49.45	41.2	54	-4.55	34.12	8.13	34	110	260	Average
5149.55	59.19	50.94	74	-14.81	34.12	8.13	34	110	260	Peak
5210	88.62	80.26			34.17	8.19	34	110	260	Average
5210	95.65	87.29			34.17	8.19	34	110	260	Peak
5360.34	43.7	35.07	54	-10.3	34.28	8.38	34.03	110	260	Average
5360.34	54.48	45.85	74	-19.52	34.28	8.38	34.03	110	260	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
 Margin value = Emission level – Limit value
- 5210 MHz: Fundamental Frequency

**802.11ac (VHT80)**

EUT Test Condition		Measurement Detail	
Channel	Channel 58	Frequency Range	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

**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
5125.4	43.71	35.49	54	-10.29	34.11	8.1	33.99	212	296	Average
5125.4	54.28	46.06	74	-19.72	34.11	8.1	33.99	212	296	Peak
5290	93.65	85.12			34.23	8.32	34.02	212	296	Average
5290	100.63	92.1			34.23	8.32	34.02	212	296	Peak
5350.99	52.9	44.27	54	-1.1	34.28	8.38	34.03	212	296	Average
5350.99	67.81	59.18	74	-6.19	34.28	8.38	34.03	212	296	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
5057.15	43.56	35.46	54	-10.44	34.05	8.03	33.98	100	245	Average
5057.15	53.74	45.64	74	-20.26	34.05	8.03	33.98	100	245	Peak
5290	90.65	82.12			34.23	8.32	34.02	100	245	Average
5290	97.12	88.59			34.23	8.32	34.02	100	245	Peak
5350.11	48.78	40.15	54	-5.22	34.28	8.38	34.03	100	245	Average
5350.11	60.4	51.77	74	-13.6	34.28	8.38	34.03	100	245	Peak

## Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 5290 MHz: Fundamental Frequency

**802.11ac (VHT80)**

EUT Test Condition		Measurement Detail	
Channel	Channel 106	Frequency Range	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

**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
5460	50.85	42.03	54	-3.15	34.36	8.51	34.05	169	185	Average
5460	60.89	52.07	74	-13.11	34.36	8.51	34.05	159	148	Peak
*5469.25	51.24	42.41	54	-2.76	34.37	8.51	34.05	169	185	Average
*5469.25	61.85	53.02	74	-12.15	34.37	8.51	34.05	159	148	Peak
5530	93.12	84.19			34.42	8.58	34.07	113	254	Average
5530	99.86	90.93			34.42	8.58	34.07	113	254	Peak
*5725.08	43.25	34.09	54	-10.75	34.62	8.65	34.11	166	195	Average
*5725.08	52.49	43.33	74	-21.51	34.62	8.65	34.11	166	195	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
5460	47.21	38.39	54	-6.79	34.36	8.51	34.05	119	125	Average
5460	55.84	47.02	74	-18.16	34.36	8.51	34.05	114	152	Peak
*5469.11	49.24	40.41	54	-4.76	34.37	8.51	34.05	119	125	Average
*5469.11	57.17	48.34	74	-16.83	34.37	8.51	34.05	114	152	Peak
5530	89.15	80.22			34.42	8.58	34.07	157	184	Average
5530	96.42	87.49			34.42	8.58	34.07	157	184	Peak
*5726.33	41.57	32.41	54	-12.43	34.62	8.65	34.11	158	174	Average
*5726.33	50.56	41.4	74	-23.44	34.62	8.65	34.11	158	174	Peak

## Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 5530 MHz: Fundamental Frequency
- \*: Out of Restricted Band

802.11a

EUT Test Condition		Measurement Detail	
Channel	Channel 165	Frequency Range	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

<Spurious Emission>

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
5825	99.62	90.33			34.73	8.69	34.13	200	292	Average
5825	106.65	97.36			34.73	8.69	34.13	200	292	Peak
11650	46.55	31.02	54	-7.45	38.09	12.8	35.36	155	125	Average
11650	55.41	39.88	74	-18.59	38.09	12.8	35.36	155	125	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
5825	95.42	86.13			34.73	8.69	34.13	100	173	Average
5825	102.2	92.91			34.73	8.69	34.13	100	173	Peak
11650	47.1	31.57	54	-6.9	38.09	12.8	35.36	136	152	Average
11650	56.42	40.89	74	-17.58	38.09	12.8	35.36	136	152	Peak

<Out of Band Emission (OOBE)>

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
*5640.175	54.5	45.43	68.2	-13.7	34.54	8.62	34.09	200	292	Peak
5654.35	54.04	44.95	71.42	-17.38	34.56	8.63	34.1	200	292	Peak
5920	52.81	43.43	71.9	-19.09	34.81	8.73	34.16	200	292	Peak
*5989.825	54.48	45	68.2	-13.72	34.9	8.75	34.17	200	292	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
*5599.75	54.49	45.47	68.2	-13.71	34.5	8.6	34.08	100	173	Peak
5655.4	52.82	43.73	72.2	-19.38	34.56	8.63	34.1	100	173	Peak
5919.475	52.27	42.89	72.29	-20.02	34.81	8.73	34.16	100	173	Peak
*5986.15	54.72	45.26	68.2	-13.48	34.88	8.75	34.17	100	173	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 5825 MHz: Fundamental Frequency
- \*: Out of Restricted Band

**9 kHz ~ 30 MHz DATA:**

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

**30 MHz ~ 1 GHz WORST-CASE DATA:**

**802.11ac (VHT80)**

EUT Test Condition		Measurement Detail	
Channel	Channel 42	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	Charles Hsiao

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
96.15	24.86	43.87	43.5	-18.64	11.75	1.28	32.04	165	115	Peak
144.75	17.12	39.63	43.5	-26.38	8.38	1.38	32.27	138	120	Peak
210.9	16.03	35.48	43.5	-27.47	11.16	1.65	32.26	180	9	Peak
486.2	15.24	28.57	46	-30.76	16.15	2.63	32.11	185	75	Peak
574.4	16.44	28.28	46	-29.56	17.54	2.82	32.2	105	14	Peak
849.5	22.65	29.99	46	-23.35	21.02	3.44	31.8	154	227	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
33.78	28.22	47.89	40	-11.78	11.83	0.74	32.24	154	224	Peak
80.22	24.89	47.77	40	-15.11	8.22	1.11	32.21	160	332	Peak
201.99	9.09	28.64	43.5	-34.41	11.09	1.65	32.29	187	199	Peak
473.6	19.88	33.49	46	-26.12	15.95	2.56	32.12	106	29	Peak
668.9	18.47	28.79	46	-27.53	18.76	3.05	32.13	114	154	Peak
800.5	20.73	29.14	46	-25.27	20.33	3.32	32.06	127	207	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin value = Emission level – Limit value

**802.11ac (VHT80)**

EUT Test Condition		Measurement Detail	
Channel	Channel 58	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	Charles Hsiao

**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
95.61	27.08	46.09	43.5	-16.42	11.75	1.28	32.04	157	270	Peak
184.17	16.48	37	43.5	-27.02	10.11	1.61	32.24	164	360	Peak
243.3	15.1	33.2	46	-30.9	12.17	1.85	32.12	199	198	Peak
553.4	15.44	27.72	46	-30.56	17.16	2.76	32.2	154	173	Peak
678.7	19.44	29.59	46	-26.56	18.91	3.05	32.11	120	129	Peak
847.4	20.79	28.23	46	-25.21	20.99	3.38	31.81	124	227	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
47.55	21.82	38.63	40	-18.18	14.51	0.9	32.22	124	222	Peak
82.11	26.78	49.17	40	-13.22	8.61	1.11	32.11	186	19	Peak
174.72	10.72	31.97	43.5	-32.78	9.38	1.61	32.24	174	104	Peak
558.3	16.32	28.5	46	-29.68	17.26	2.76	32.2	161	310	Peak
689.2	18.85	28.82	46	-27.15	19.08	3.05	32.1	190	275	Peak
854.4	22.33	29.57	46	-23.67	21.08	3.44	31.76	125	333	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

802.11ac (VHT80)

EUT Test Condition		Measurement Detail	
Channel	Channel 106	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	Charles Hsiao

**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
102.36	22.04	40.66	43.5	-21.46	12.36	1.28	32.26	127	229	Peak
145.02	15.71	38.23	43.5	-27.79	8.37	1.38	32.27	105	104	Peak
243.84	14.41	32.51	46	-31.59	12.17	1.85	32.12	191	124	Peak
587.7	16.71	28.33	46	-29.29	17.75	2.82	32.19	160	330	Peak
712.3	19.49	29.08	46	-26.51	19.4	3.11	32.1	197	198	Peak
853	21.81	29.09	46	-24.19	21.06	3.44	31.78	124	111	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
57.27	23.6	41.1	40	-16.4	13.83	0.9	32.23	128	123	Peak
86.16	24.2	45.56	40	-15.8	9.44	1.11	31.91	180	197	Peak
192.27	9.02	28.92	43.5	-34.48	10.75	1.61	32.26	164	107	Peak
549.2	16.11	28.49	46	-29.89	17.06	2.76	32.2	134	111	Peak
605.9	16.91	28.24	46	-29.09	17.99	2.87	32.19	197	266	Peak
721.4	19.33	28.75	46	-26.67	19.53	3.16	32.11	127	195	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

## 802.11a

EUT Test Condition		Measurement Detail	
Channel	Channel 165	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	Charles Hsiao

## Antenna Polarity &amp; 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
91.83	28.32	48.11	43.5	-15.18	10.92	1.11	31.82	124	222	Peak
178.5	18.01	39.02	43.5	-25.49	9.62	1.61	32.24	190	190	Peak
244.38	14.09	32.17	46	-31.91	12.19	1.85	32.12	164	355	Peak
545.7	16.42	28.85	46	-29.58	17	2.76	32.19	124	90	Peak
647.9	18.5	29.25	46	-27.5	18.41	2.99	32.15	108	1	Peak
827.8	21.82	29.61	46	-24.18	20.74	3.38	31.91	187	219	Peak

## Antenna Polarity &amp; 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
32.97	31.85	51.62	40	-8.15	11.74	0.74	32.25	138	325	Peak
77.79	23.08	45.86	40	-16.92	8.33	1.11	32.22	198	21	Peak
92.64	21.69	41.3	43.5	-21.81	11.16	1.11	31.88	114	131	Peak
462.4	14.71	28.52	46	-31.29	15.76	2.56	32.13	177	132	Peak
650	17.69	28.41	46	-28.31	18.44	2.99	32.15	157	205	Peak
762	19.84	28.8	46	-26.16	19.94	3.22	32.12	199	346	Peak

## Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

## 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	Sep. 05, 2017	Sep. 04, 2018
LISN/AMN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN/AMN 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.

#### 4.2.3 Test Procedures

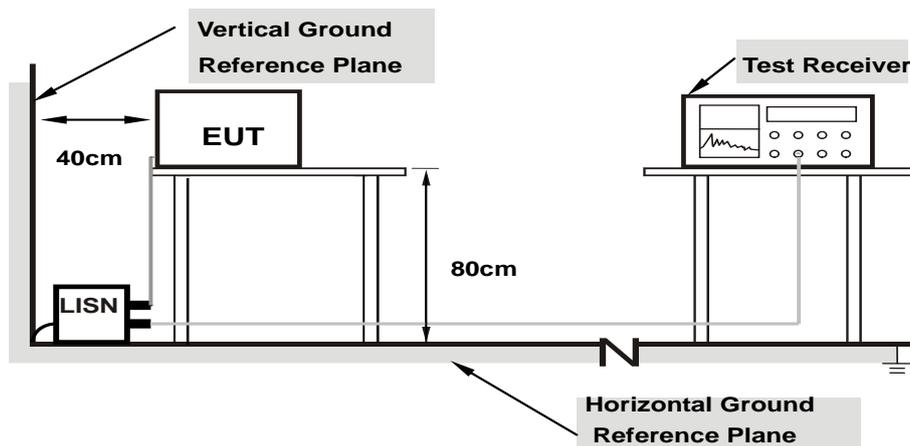
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



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

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

#### 4.2.6 EUT Operating Conditions

- a. Placed the EUT on a testing table.
- b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

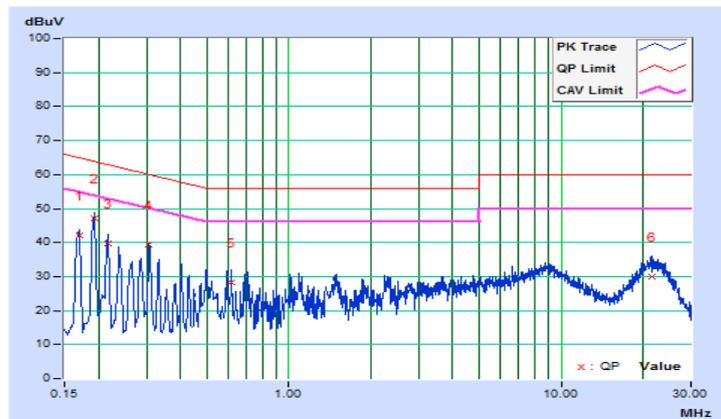
#### 4.2.7 Test Results

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	2017/9/19

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	0.16977	10.39	31.76	16.11	42.15	26.50	64.97	54.97	-22.82	-28.47
2	0.19400	10.39	36.76	20.33	47.15	30.72	63.86	53.86	-16.71	-23.14
3	0.21800	10.40	29.36	14.64	39.76	25.04	62.89	52.89	-23.13	-27.85
4	0.30630	10.40	28.89	12.78	39.29	23.18	60.07	50.07	-20.78	-26.89
5	0.61407	10.41	17.77	5.11	28.18	15.52	56.00	46.00	-27.82	-30.48
6	21.67400	11.42	18.71	9.41	30.13	20.83	60.00	50.00	-29.87	-29.17

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

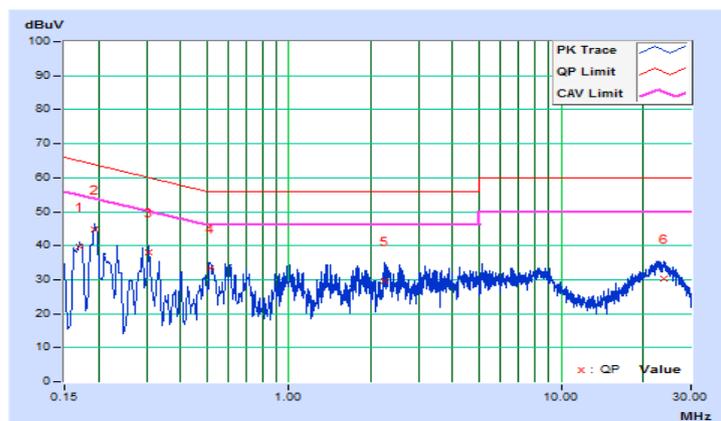


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/9/19

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	0.17000	10.16	29.41	14.90	39.57	25.06	64.96	54.96	-25.39	-29.90
2	0.19418	10.16	34.71	20.05	44.87	30.21	63.86	53.86	-18.99	-23.65
3	0.30600	10.17	27.71	14.47	37.88	24.64	60.08	50.08	-22.20	-25.44
4	0.51200	10.17	23.28	14.43	33.45	24.60	56.00	46.00	-22.55	-21.40
5	2.24600	10.25	19.48	10.31	29.73	20.56	56.00	46.00	-26.27	-25.44
6	23.77400	11.07	19.40	12.81	30.47	23.88	60.00	50.00	-29.53	-26.12

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

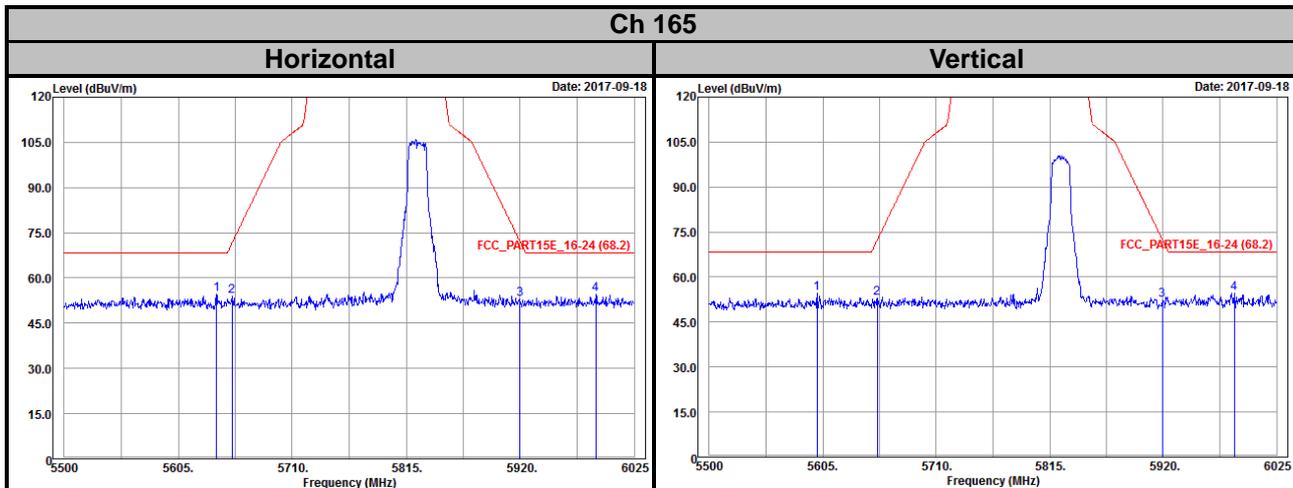


## 5 Pictures of Test Arrangements

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

# Annex A- Radiated Out of Band Emisison (OOBE) Measurement (For U-NII-3 band)

## 802.11a



## 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 and approved 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](http://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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