

## FCC Test Report (Co-Located)

**Report No.:** RF191104C18-3

**FCC ID:** 2ACTO-APX320X

**Test Model:** APX 320X

**Received Date:** Nov. 04, 2019

**Test Date:** Feb. 26, 2020

**Issued Date:** Apr. 01, 2020

**Applicant:** Sophos Ltd

**Address:** The Pentagon, Abingdon Science Park, Abingdon OX14 3YP, United Kingdom Of Great Britain And Northern Ireland

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

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

**FCC Registration /  
Designation Number:** 788550 / TW0003



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### Release Control Record

Issue No.	Description	Date Issued
RF191104C18-3	Original release	Apr. 01, 2020

## 1 Certificate of Conformity

**Product:** Sophos Access Point

**Brand:** Sophos

**Test Model:** APX 320X

**Sample Status:** Engineering sample

**Applicant:** Sophos Ltd

**Test Date:** Feb. 26, 2020

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
47 CFR FCC Part 15, Subpart E (Section 15.407)  
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 RF characteristics under the conditions specified in this report.

**Prepared by :** Pettie Chen , **Date:** Apr. 01, 2020  
Pettie Chen / Senior Specialist

**Approved by :** Bruce Chen , **Date:** Apr. 01, 2020  
Bruce Chen / Senior Project Engineer

## 2 Summary of Test Results

Applied Standard:	47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407)		
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d) / 15.407(b) / (1/2/3/4(i/ii)/6)	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -1.8dB at 5470.00MHz.

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

### 2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) ( $\pm$ )
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	Sophos Access Point	
Brand	Sophos	
Test Model	APX 320X	
Sample Status	Engineering sample	
Power Supply Rating	55Vdc (PoE)	
Modulation Type	WLAN	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
	Bluetooth LE	GFSK
Modulation Technology	WLAN	DSSS, OFDM
Transfer Rate	WLAN	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 300Mbps 802.11ac: up to 867Mbps
	Bluetooth LE	1Mbps
Operating Frequency	WLAN	2.4GHz: 2412~2462MHz 5.0GHz: 5180~5240MHz, 5260~5320MHz, 5500~5720MHz, 5745~5825MHz
	Bluetooth LE	2402 ~ 2480MHz
Number of Channel	WLAN	2412 ~ 2462MHz: 802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7 5180 ~ 5240MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5260 ~ 5320MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5500 ~ 5700MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 11 802.11n (HT40), 802.11ac (VHT40): 5 802.11ac (VHT80): 2 5745 ~ 5825MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
	Bluetooth LE	40

Output Power	WLAN		Dipole antenna	Directional antenna	Sector antenna
		CDD Mode			
		2412 ~ 2462MHz	576.047mW	249.141mW	249.141mW
		5180 ~ 5240MHz	140.275mW	6.953mW	6.953mW
		5260 ~ 5320MHz	220.863mW	51.488mW	51.488mW
		5500 ~ 5700MHz	183.736mW	49.191mW	49.191mW
		5745 ~ 5825MHz	198.616mW	189.930mW	189.930mW
		Beamforming Mode			
		2412 ~ 2462MHz	447.495mW	124.867mW	124.867mW
		5180 ~ 5240MHz	69.735mW	3.445mW	3.445mW
		5260 ~ 5320MHz	156.359mW	25.805mW	25.805mW
		5500 ~ 5700MHz	130.743mW	24.654mW	24.654mW
	5745 ~ 5825MHz	198.616mW	95.379mW	95.379mW	
	Bluetooth LE	7.129mW			
Antenna Type	Refer to Note				
Antenna Connector	Refer to Note				
Accessory Device	NA				
Data Cable Supplied	NA				

Note:

- The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

2.4GHz Band		
Modulation Mode	TX Function	Beamforming
802.11b	2TX	Not Support
802.11g	2TX	Not Support
802.11n (HT20)	2TX	Support
802.11n (HT40)	2TX	Support
5GHz Band		
Modulation Mode	TX Function	Beamforming
802.11a	2TX	Not Support
802.11n (HT20)	2TX	Support
802.11n (HT40)	2TX	Support
802.11ac (VHT20)	2TX	Support
802.11ac (VHT40)	2TX	Support
802.11ac (VHT80)	2TX	Support

- The EUT uses the following PoE. (Support unit only)

Brand	Microsemi
Model	PD-9001GR/AC
Input Power	100-240Vac~50/60Hz, 0.67A
Output Power	55Vdc / 0.6A

3. The EUT uses the following antennas.

NO.	Type	Gain(dBi)								Connector
		2400 MHz	2450 MHz	2500 MHz	5150 MHz	5325 MHz	5500 MHz	5675 MHz	5850 MHz	
1	Dipole	3.1	3.2	3.1	5.1	5.0	5.6	5.7	6.0	N type
2	Directional	11.6	12.0	11.9	10.55	11.2	11.5	11.2	11.5	N type
3	Sector	10.6	11.4	11.2	12.57	12.7	13.0	12.4	13.1	N type

### 3.2 Description of Test Modes

For 2.4GHz

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

Channel	Frequency	Channel	Frequency
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

7 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

For 5180~5240MHz:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

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

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz



For 5260 ~ 5320MHz:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

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

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
58	5290 MHz

For 5500 ~ 5700MHz:

11 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

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

5 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

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

2 channels are provided for 802.11ac (VHT80):

Channel	Frequency	Channel	Frequency
106	5530 MHz	122	5610

For 5745 ~ 5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

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

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775 MHz

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to		Description
	RE $\geq$ 1G	RE<1G	
-	√	√	EUT with Sector antenna

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz

Note: The antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.

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

- 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	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
-	BT LE + 802.11g + 802.11ac (VHT20)	2400-2480	0 to 39	39 + 6 + 48	GFSK
		2412-2462	1 to 11		OFDM
		5180-5240	36 to 48		OFDM
		5260-5320	52 to 64		
-	BT LE + 802.11ac (VHT20) + 802.11a	2400-2480	0 to 39	39 + 48 + 100	GFSK
		5180-5240	36 to 48		OFDM
		5260-5320	52 to 64		
		5500-5700 5745-5825	100 to 140 149 to 165		OFDM

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

- 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	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
-	BT LE + 802.11g + 802.11ac (VHT20)	2400-2480	0 to 39	39 + 6 + 48	GFSK
		2412-2462	1 to 11		OFDM
		5180-5240	36 to 48		OFDM
		5260-5320	52 to 64		
-	BT LE + 802.11ac (VHT20) + 802.11a	2400-2480	0 to 39	39 + 48 + 100	GFSK
		5180-5240	36 to 48		OFDM
		5260-5320	52 to 64		
		5500-5700 5745-5825	100 to 140 149 to 165		OFDM

#### **Test Condition:**

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	22 deg. C, 67% RH	120Vac, 60Hz	Greg Lin
RE<1G	22 deg. C, 67% RH	120Vac, 60Hz	Greg Lin

### 3.3 Description of Support Units

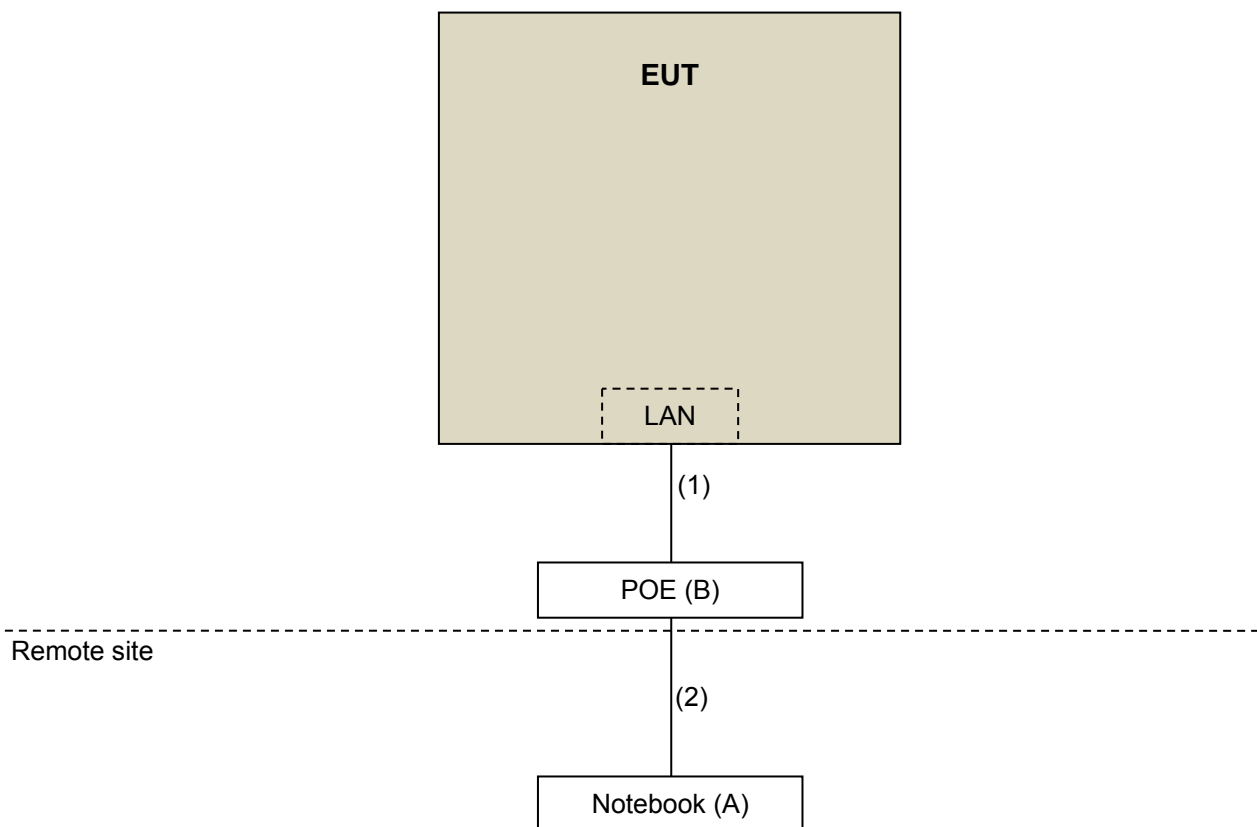
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	Lenovo	80Q7	PF0KUGU6	NA	-
B.	PoE	Microsemi	PD-9001GR/AC	NA	NA	-

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45 cable	1	2	N	0	-
2.	RJ45 cable	1	10	N	0	-

#### 3.3.1 Configuration of System under Test



### 3.4 General Description of Applied Standards

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

**FCC Part 15, Subpart C (15.247)**

**FCC Part 15, Subpart E (15.407)**

ANSI C63.10-2013

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

## 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.

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 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To		Limit	
789033 D02 General UNII Test Procedure New Rules v02r01		Field Strength at 3m	
		PK: 74 (dBuV/m)	AV: 54 (dBuV/m)
Frequency Band	Applicable To	EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.2(dBuV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	<input checked="" type="checkbox"/> 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(dBuV/m) <sup>*1</sup> PK: 105.2 (dBuV/m) <sup>*2</sup> PK: 110.8(dBuV/m) <sup>*3</sup> PK: 122.2 (dBuV/m) <sup>*4</sup>
	<input type="checkbox"/> 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>*3</sup> below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.		<sup>*2</sup> below the band edge increasing linearly to 10 dBm/MHz at 25 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:

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

#### 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 15, 2019	Apr. 14, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2019	Jun. 11, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 25, 2018 Nov. 24, 2019	Nov. 24, 2019 Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018 Nov. 24, 2019	Nov. 24, 2019 Nov. 23, 2020
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jul. 11, 2019	Jul. 10, 2020
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 19, 2019 Feb. 18, 2020	Feb. 18, 2020 Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 19, 2019 Jan. 18, 2020	Jan. 18, 2020 Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jul. 11, 2019	Jul. 10, 2020
RF signal cable Woken	8D-FB	Cable-CH9-01	Jul. 30, 2019	Jul. 29, 2020
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 05, 2019	Sep. 04, 2020
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190 004/MY55190007/MY55 210005	Jul. 15, 2019	Jul. 14, 2020

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 9.

### 4.1.3 Test Procedures

#### For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case 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.

**Note:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

#### For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) 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 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
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 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

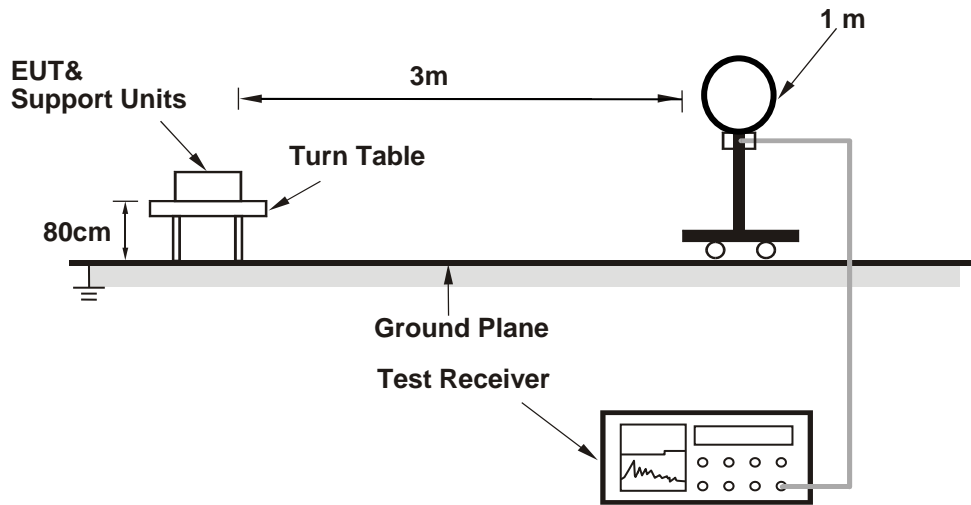
### 4.1.4 Deviation from Test Standard

No deviation.

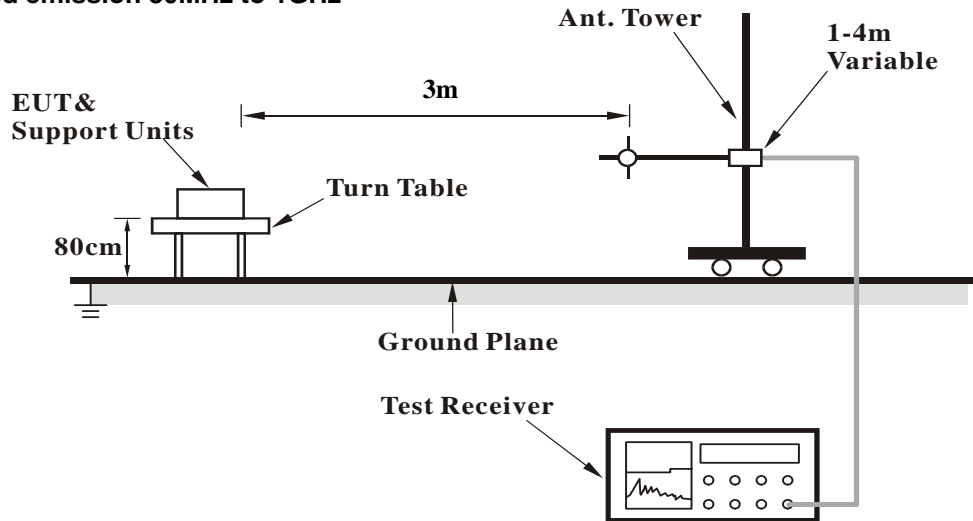


#### 4.1.5 Test Setup

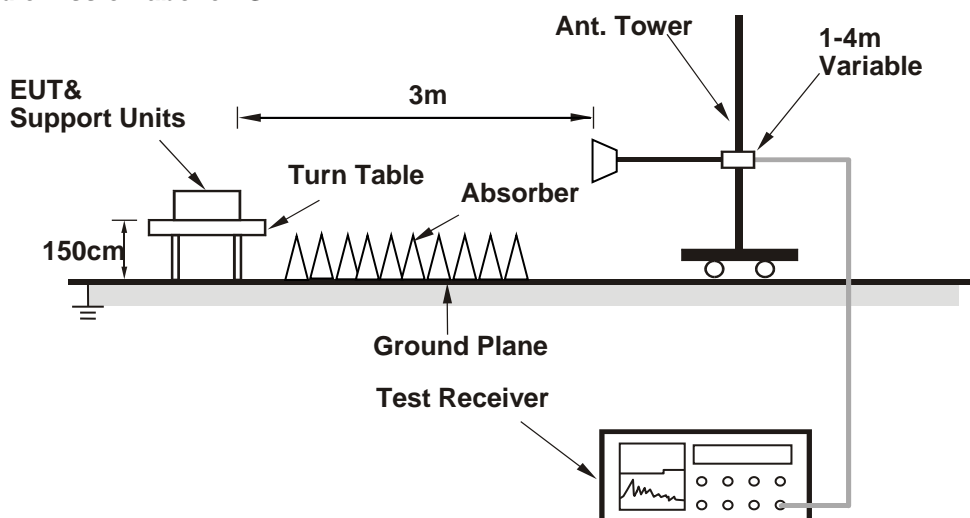
##### For Radiated emission below 30MHz



##### For Radiated emission 30MHz to 1GHz



### For Radiated emission above 1GHz



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

#### 4.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Prepared a notebook to act as a communication partner and placed it outside of testing area.
- The communication partner connected with EUT via a RJ45 cable and ran a test program (QRCT3) to enable EUT under transmission condition continuously at specific channel frequency.
- The communication partner sent data to EUT by command "PING".

#### 4.1.7 Test Results

Above 1GHz Data:

BT LE + 802.11g + 802.11ac (VHT20)

CHANNEL	CH 39 + CH 6 + CH 48	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	124.1 PK			1.67 H	7	93.0	31.1
2	*2437.00	113.6 AV			1.67 H	7	82.5	31.1
3	*2480.00	100.5 PK			2.63 H	4	69.4	31.1
4	*2480.00	95.7 AV			2.63 H	4	64.6	31.1
5	2483.50	57.4 PK	74.0	-16.6	3.05 H	348	26.2	31.2
6	2483.50	46.8 AV	54.0	-7.2	3.05 H	348	15.6	31.2
7	4874.00	56.9 PK	74.0	-17.1	1.96 H	186	54.9	2.0
8	4874.00	42.9 AV	54.0	-11.1	1.96 H	186	40.9	2.0
9	4960.00	44.6 PK	74.0	-29.4	1.58 H	47	42.3	2.3
10	4960.00	32.1 AV	54.0	-21.9	1.58 H	47	29.8	2.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	122.1 PK			1.69 V	10	91.0	31.1
2	*2437.00	111.8 AV			1.69 V	10	80.7	31.1
3	*2480.00	105.7 PK			1.72 V	71	74.6	31.1
4	*2480.00	100.9 AV			1.72 V	71	69.8	31.1
5	2483.50	61.5 PK	74.0	-12.5	1.86 V	64	30.3	31.2
6	2483.50	50.3 AV	54.0	-3.7	1.86 V	64	19.1	31.2
7	4874.00	58.4 PK	74.0	-15.6	3.42 V	182	56.4	2.0
8	4874.00	44.3 AV	54.0	-9.7	3.42 V	182	42.3	2.0
9	4960.00	44.8 PK	74.0	-29.2	2.38 V	56	42.5	2.3
10	4960.00	32.3 AV	54.0	-21.7	2.38 V	56	30.0	2.3

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
5. " \* ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	CH 39 + CH 6 + CH 48	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	123.6 PK			1.74 H	11	87.5	36.1
2	*5240.00	112.6 AV			1.74 H	11	76.5	36.1
3	5350.00	54.4 PK	74.0	-19.6	1.67 H	7	52.4	2.0
4	5350.00	42.3 AV	54.0	-11.7	1.67 H	7	40.3	2.0
5	#10480.00	56.7 PK	68.2	-11.5	1.43 H	118	41.6	15.1

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	125.1 PK			1.83 V	15	89.0	36.1
2	*5240.00	114.0 AV			1.83 V	15	77.9	36.1
3	5350.00	55.1 PK	74.0	-18.9	1.78 V	9	53.1	2.0
4	5350.00	42.7 AV	54.0	-11.3	1.78 V	9	40.7	2.0
5	#10480.00	62.1 PK	68.2	-6.1	2.41 V	226	47.0	15.1

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
5. " \* ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

BT LE + 802.11ac (VHT20) + 802.11a

CHANNEL	CH 39 + CH 48 + CH 100	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	100.4 PK			2.76 H	358	69.3	31.1
2	*2480.00	95.7 AV			2.76 H	358	64.6	31.1
3	2483.50	57.5 PK	74.0	-16.5	2.71 H	353	26.3	31.2
4	2483.50	46.7 AV	54.0	-7.3	2.71 H	353	15.5	31.2
5	4960.00	44.6 PK	74.0	-29.4	1.74 H	63	42.3	2.3
6	4960.00	32.2 AV	54.0	-21.8	1.74 H	63	29.9	2.3

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	105.7 PK			1.72 V	59	74.6	31.1
2	*2480.00	100.8 AV			1.72 V	59	69.7	31.1
3	2483.50	61.6 PK	74.0	-12.4	1.79 V	64	30.4	31.2
4	2483.50	50.3 AV	54.0	-3.7	1.79 V	64	19.1	31.2
5	4960.00	45.0 PK	74.0	-29.0	2.33 V	56	42.7	2.3
6	4960.00	32.4 AV	54.0	-21.6	2.33 V	56	30.1	2.3

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
5. " \* ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	CH 39 + CH 48 + CH 100	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	123.3 PK			1.77 H	12	87.2	36.1
2	*5240.00	112.5 AV			1.77 H	12	76.4	36.1
3	5350.00	54.3 PK	74.0	-19.7	1.73 H	9	52.3	2.0
4	5350.00	42.4 AV	54.0	-11.6	1.73 H	9	40.4	2.0
5	5460.00	57.5 PK	74.0	-16.5	1.81 H	29	54.8	2.7
6	5460.00	45.8 AV	54.0	-8.2	1.81 H	29	43.1	2.7
7	#5470.00	63.5 PK	68.2	-4.7	1.71 H	33	60.8	2.7
8	*5500.00	117.1 PK			1.76 H	21	80.1	37.0
9	*5500.00	106.7 AV			1.76 H	21	69.7	37.0
10	#10480.00	56.8 PK	68.2	-11.4	1.45 H	117	41.7	15.1
11	11000.00	59.4 PK	74.0	-14.6	1.62 H	127	42.5	16.9
12	11000.00	45.9 AV	54.0	-8.1	1.62 H	127	29.0	16.9
13	#16500.00	62.3 PK	68.2	-5.9	3.31 H	293	44.0	18.3

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	125.1 PK			1.85 V	13	89.0	36.1
2	*5240.00	114.2 AV			1.85 V	13	78.1	36.1
3	5350.00	55.1 PK	74.0	-18.9	1.76 V	5	53.1	2.0
4	5350.00	42.7 AV	54.0	-11.3	1.76 V	5	40.7	2.0
5	5460.00	60.7 PK	74.0	-13.3	1.79 V	13	58.0	2.7
6	5460.00	47.1 AV	54.0	-6.9	1.79 V	13	44.4	2.7
7	#5470.00	<b>66.4 PK</b>	<b>68.2</b>	<b>-1.8</b>	<b>1.67 V</b>	<b>11</b>	<b>63.7</b>	<b>2.7</b>
8	*5500.00	120.2 PK			1.84 V	21	83.2	37.0
9	*5500.00	109.3 AV			1.84 V	21	72.3	37.0
10	#10480.00	62.0 PK	68.2	-6.2	2.51 V	217	46.9	15.1
11	11000.00	62.0 PK	74.0	-12.0	2.67 V	159	45.1	16.9
12	11000.00	48.8 AV	54.0	-5.2	2.67 V	159	31.9	16.9
13	#16500.00	65.4 PK	68.2	-2.8	2.86 V	221	47.1	18.3

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
5. " \* ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Below 1GHz data

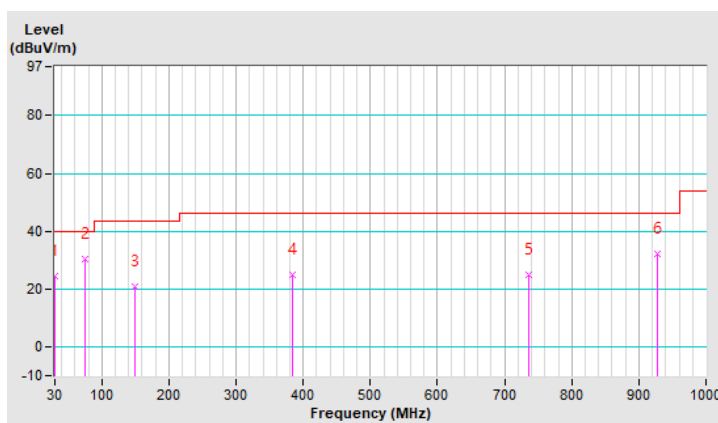
BT LE + 802.11g + 802.11ac (VHT20)

CHANNEL	CH 39 + CH 6 + CH 48	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.00	24.4 QP	40.0	-15.6	1.25 H	59	35.7	-11.3
2	74.62	30.3 QP	40.0	-9.7	1.25 H	111	42.8	-12.5
3	148.34	20.7 QP	43.5	-22.8	1.00 H	58	30.0	-9.3
4	383.08	24.7 QP	46.0	-21.3	1.50 H	72	30.7	-6.0
5	736.16	24.9 QP	46.0	-21.1	1.50 H	22	24.7	0.2
6	928.22	32.1 QP	46.0	-13.9	1.50 H	52	28.2	3.9

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 of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20dB below the permissible value to be report.

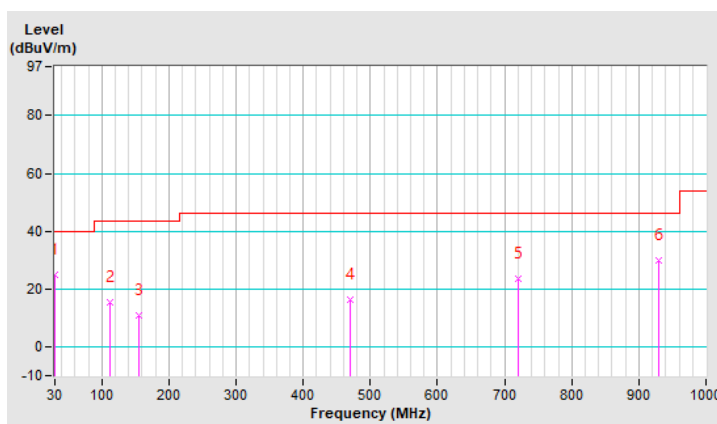


CHANNEL	CH 39 + CH 6 + CH 48	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.97	24.7 QP	40.0	-15.3	1.25 V	301	36.5	-11.8
2	111.48	15.5 QP	43.5	-28.0	1.25 V	57	28.0	-12.5
3	156.10	10.9 QP	43.5	-32.6	1.00 V	283	20.1	-9.2
4	470.38	16.5 QP	46.0	-29.5	1.50 V	50	20.7	-4.2
5	720.64	23.7 QP	46.0	-22.3	1.00 V	95	23.9	-0.2
6	930.16	29.9 QP	46.0	-16.1	1.50 V	18	26.0	3.9

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 of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20dB below the permissible value to be report.





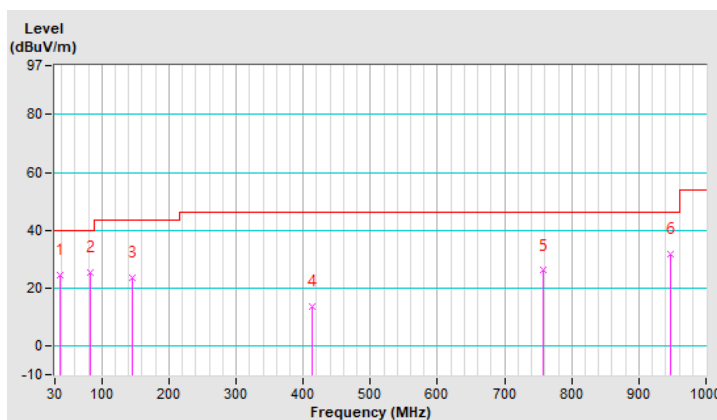
BT LE + 802.11ac (VHT20) + 802.11a

CHANNEL	CH 39 + CH 48 + CH 100	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	38.73	24.3 QP	40.0	-15.7	1.25 H	55	35.0	-10.7
2	83.35	25.3 QP	40.0	-14.7	1.00 H	104	39.8	-14.5
3	145.43	23.6 QP	43.5	-19.9	1.50 H	178	33.1	-9.5
4	414.12	13.8 QP	46.0	-32.2	1.50 H	83	19.3	-5.5
5	757.50	26.0 QP	46.0	-20.0	1.00 H	216	24.9	1.1
6	947.62	31.7 QP	46.0	-14.3	1.50 H	184	27.3	4.4

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 of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20dB below the permissible value to be report.

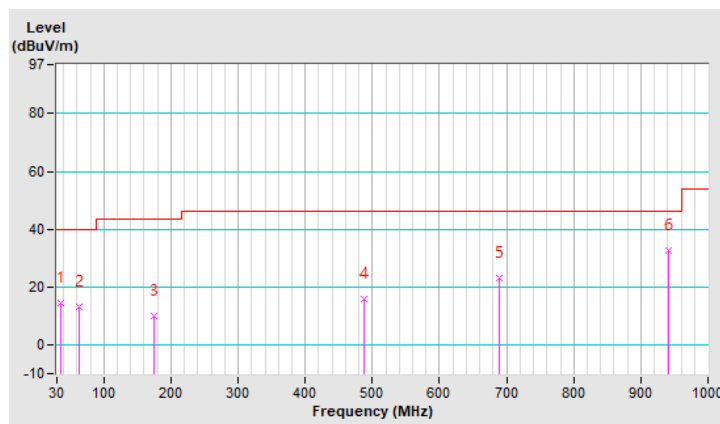


CHANNEL	CH 39 + CH 48 + CH 100	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	35.82	14.6 QP	40.0	-25.4	1.25 V	245	25.7	-11.1
2	63.95	13.1 QP	40.0	-26.9	1.25 V	243	23.6	-10.5
3	174.53	9.8 QP	43.5	-33.7	1.00 V	339	19.7	-9.9
4	487.84	15.8 QP	46.0	-30.2	1.50 V	12	19.8	-4.0
5	689.60	23.0 QP	46.0	-23.0	1.00 V	68	23.7	-0.7
6	941.80	32.6 QP	46.0	-13.4	1.25 V	301	28.3	4.3

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 of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20dB below the permissible value to be report.



## 5 Pictures of Test Arrangements

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

## Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited 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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The address and road map of all our labs can be found in our web site also.

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