

## FCC Test Report (Co-Located)

**Report No.:** RF200709D02-9

**FCC ID:** 2AK5B-HB1

**Test Model:** HB1LW1NA1

**Received Date:** Jul. 9, 2020

**Test Date:** Aug. 4, 2020

**Issued Date:** Aug. 20, 2020

**Applicant:** Latchable, Inc.

**Address:** 508 West 26th Street Suite 6G New York, NY 10001

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

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

**FCC Registration /  
Designation Number:** 198487 / TW2021



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### Release Control Record

Issue No.	Description	Date Issued
RF200709D02-9	Original release.	Aug. 20, 2020

## 1 Certificate of Conformity

**Product:** Hub  
**Brand:** LATCH  
**Test Model:** HB1LW1NA1  
**Sample Status:** Engineering sample  
**Applicant:** Latchable, Inc.  
**Test Date:** Aug. 4, 2020  
**Standard:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
47 CFR FCC Part 15, Subpart C (Section 15.249)  
47 CFR FCC Part 15, Subpart E (Section 15.407)  
FCC Part 22, Subpart H  
FCC Part 24, Subpart E  
FCC Part 27, Subpart C, H, F, L  
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 :** Celia Chen , **Date:** Aug. 20, 2020  
Celia Chen / Supervisor

**Approved by :** Rex Lai , **Date:** Aug. 20, 2020  
Rex Lai / Associate Technical Manager

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247), 47 CFR FCC Part 15, Subpart C (Section 15.249) 47 CFR FCC Part 15, Subpart E (Section 15.407), FCC Part 22, Subpart H FCC Part 24, Subpart E FCC Part 27, Subpart C, H, F, L			
FCC Clause	Test Item	Result	Remarks
15.205 15.209 15.247(d) 15.407(b) (1/2/3/4(i/ii)/6) 2.1053 22.917 24.238 27.53(h) 27.53(g) 27.53(c)(2)&(f)	Radiated Emissions Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.43dB at 2390.00MHz.

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) (±)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.38 dB
	30MHz ~ 1GHz	5.43 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.42 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	Hub	
Brand	LATCH	
Test Model	HB1LW1NA1	
Status of EUT	Engineering sample	
Power Supply Rating	12Vdc from adapter or 7.5Vdc from battery	
Modulation Type	WLAN	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode only.
	Z-Wave	FSK
	Zigbee	OQPSK
	BT LE	GFSK
	BT EDR	GFSK, $\pi/4$ -DQPSK, 8DPSK
	WCDMA	BPSK, QPSK
	HSDPA	BPSK
	HSUPA	QPSK
	LTE	QPSK, 16QAM
Modulation Technology	WLAN	DSSS, OFDM
	BT EDR	FHSS
Transfer Rate	WLAN	802.11a: up to 6Mbps 802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.7Mbps
	Zigbee	250Kbps
	BT LE	1Mbps
Operating Frequency	WLAN	2412~2462MHz, 5180~5240MHz, 5745~5825MHz
	Z-Wave	908.4MHz, 916.0MHz
	Zigbee	2405 ~ 2480MHz
	BT LE	2402 ~ 2480MHz
	BT EDR	2402 ~ 2480MHz

Frequency Range	WCDMA Band 2	1852.4 ~ 1907.6 MHz
	WCDMA Band 5	826.4 ~ 846.6 MHz
	LTE Band 2	Channel Bandwidth 1.4MHz: 1850.7 ~ 1909.3MHz Channel Bandwidth 3MHz: 1851.5 ~ 1908.5MHz Channel Bandwidth 5MHz: 1852.5 ~ 1907.5MHz Channel Bandwidth 10MHz: 1855.0 ~ 1905.0MHz Channel Bandwidth 15MHz: 1857.5 ~ 1902.5MHz Channel Bandwidth 20MHz: 1860.0 ~ 1900.0MHz
	LTE Band 4	Channel Bandwidth 1.4MHz: 1710.7 ~ 1754.3MHz Channel Bandwidth 3MHz: 1711.5 ~ 1753.5MHz Channel Bandwidth 5MHz: 1712.5 ~ 1752.5MHz Channel Bandwidth 10MHz: 1715.0 ~ 1750.0MHz Channel Bandwidth 15MHz: 1717.5 ~ 1747.5MHz Channel Bandwidth 20MHz: 1720.0 ~ 1745.0MHz
	LTE Band 5	Channel Bandwidth 1.4MHz: 824.7 ~ 848.3MHz Channel Bandwidth 3MHz: 825.5 ~ 847.5MHz Channel Bandwidth 5MHz: 826.5 ~ 846.5MHz Channel Bandwidth 10MHz: 829.0 ~ 844.0MHz
	LTE Band 12	Channel Bandwidth 1.4MHz: 699.7 ~ 715.3MHz Channel Bandwidth 3MHz: 700.5 ~ 714.5MHz Channel Bandwidth 5MHz: 701.5 ~ 713.5MHz Channel Bandwidth 10MHz: 704.0 ~ 711.0MHz
	LTE Band 13	Channel Bandwidth 5MHz: 779.5 ~ 784.5MHz Channel Bandwidth 10MHz: 782.0MHz
Number of Channel	WLAN	<b>2412~2462MHz:</b> 802.11b, 802.11g, 802.11n (20MHz): 11 802.11n (40MHz): 7 <b>5180 ~ 5240MHz</b> 802.11a, 802.11n (20MHz), 802.11ac (20MHz): 4 802.11n (40MHz), 802.11ac (40MHz): 2 802.11ac (80MHz): 1 <b>5745 ~ 5825MHz</b> 802.11a, 802.11n (20MHz), 802.11ac (20MHz): 5 802.11n (40MHz), 802.11ac (40MHz): 2 802.11ac (80MHz): 1
	Z-Wave	2
	Zigbee	16
	BT LE	40
	BT EDR	79
Output Power	WLAN	<b>2412~2462MHz:</b> 591.16mW <b>5180 ~ 5240MHz:</b> 71.703mW <b>5745 ~ 5825MHz:</b> 241.053mW
	Zigbee	56.494mW
	BT LE	2.992mW
	BT EDR	3.873mW

Max. ERP Power	WCDMA Band 5	232.27 mW (23.66dBm)
	LTE Band 5	Channel Bandwidth 1.4MHz: 166.72 mW (22.22dBm)
		Channel Bandwidth 3MHz: 175.39 mW (22.44dBm)
		Channel Bandwidth 5MHz: 185.35 mW (22.68dBm)
Channel Bandwidth 10MHz: 195.43 mW (22.91dBm)		
LTE Band 12	Channel Bandwidth 1.4MHz: 137.09 mW (21.37dBm)	
	Channel Bandwidth 3MHz: 144.88 mW (21.61dBm)	
	Channel Bandwidth 5MHz: 152.76 mW (21.84dBm)	
LTE Band 13	Channel Bandwidth 10MHz: 160.32 mW (22.05dBm)	
	Channel Bandwidth 5MHz: 169.43 mW (22.29dBm)	
Channel Bandwidth 10MHz: 179.89 mW (22.55dBm)		
	WCDMA Band 2	271.02 mW (24.33dBm)
Max. EIRP Power	LTE Band 2	Channel Bandwidth 1.4MHz: 269.15 mW (24.30dBm)
		Channel Bandwidth 3MHz: 283.79 mW (24.53dBm)
		Channel Bandwidth 5MHz: 300.61 mW (24.78dBm)
		Channel Bandwidth 10MHz: 316.96 mW (25.01dBm)
		Channel Bandwidth 15MHz: 334.97 mW (25.25dBm)
	LTE Band 4	Channel Bandwidth 20MHz: 353.18 mW (25.48dBm)
		Channel Bandwidth 1.4MHz: 339.63 mW (25.31dBm)
		Channel Bandwidth 3MHz: 358.10 mW (25.54dBm)
		Channel Bandwidth 5MHz: 380.19 mW (25.58dBm)
		Channel Bandwidth 10MHz: 401.79 mW (26.04dBm)
Channel Bandwidth 15MHz: 425.60 mW (26.29dBm)		
Channel Bandwidth 20MHz: 448.75 mW (26.52dBm)		
Antenna Type	Refer to note as below	
Antenna Connector	Refer to note as below	
Accessory Device	Adapter	
Data Cable Supplied	N/A	

Note:

1. The EUT provides 2 completed transmitter and 2 receiver.

Modulation Mode	TX Function
802.11a	2TX
802.11b	2TX
802.11g	2TX
802.11n (20MHz)	2TX
802.11n (40MHz)	2TX
802.11ac (20MHz)	2TX
802.11ac (40MHz)	2TX
802.11ac (80MHz)	2TX

2. 2.4GHz & 5GHz WLAN technologies cannot transmit at same time.

WCDMA & LTE technologies cannot transmit at same time.

WLAN, WWAN, Bluetooth, Zigbee & Z-Wave technologies can transmit at same time.

3. The EUT was pre-tested with the following modes:

- ✧ Operating Mode (EUT + Battery)
- ✧ Operating + Charging Mode (EUT + Adapter)

The worst emission level was found when the EUT tested under **Operating + Charging Mode (EUT + Adapter)**, therefore, only its test data was recorded in this report.



4. The EUT uses following adapter or battery.

Item	Adapter	Battery
Brand	APD	Simplo
Model	WB-24J12FU	NA50X
AC I/P Rating	100-240V, 50-60Hz, 0.7A	-
DC O/P Rating	12V, 2A	7.5V, 2500mAh, 18Wh
Power cord	AC 2 Pin, Non-shielded DC cable (1.5m)	-

5. The EUT used antennas listed as below:

Function	Ant. No.	Frequency Band (MHz)	Antenna Type	Antenna Connector	Gain (dBi)	
					Chian 0	Chian 1
WCDMA Band 2	Ant. 1 & 2	1852.4 ~ 1907.6	PIFA	I-PEX	2.3	2.6
WCDMA Band 5		826.4 ~ 846.6	PIFA	I-PEX	1.3	2.5
LTE Band 2		1850.7-1909.3	PIFA	I-PEX	2.3	2.6
LTE Band 4		1710.7-1754.3	PIFA	I-PEX	2.8	2.8
LTE Band 5		824.7-848.3	PIFA	I-PEX	1.3	2.5
LTE Band 12		699.7-715.3	PIFA	I-PEX	1.1	2.8
LTE Band 13		779.5-784.5	PIFA	I-PEX	1.1	2.8
Z-Wave	Ant. 3	908.4, 916.0	PIFA	I-PEX	2.7	-
WLAN	Ant. 4 & 5	2412-2462	Dipole	I-PEX	2.5	3.2
WLAN		5180-5240	Dipole	I-PEX	3.3	3.1
WLAN		5745-5825	Dipole	I-PEX	2.5	2.4
BT LE	Ant. 6	2402-2480	Dipole	I-PEX	3.3	-
BT EDR						
Zigbee	Ant. 7	2405-2480	Dipole	I-PEX	3.4	-

6. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

7. 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 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To		Description
	RE $\geq$ 1G	RE<1G	
-	√	√	Operating + Charging Mode (EUT + Adapter)

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

**NOTE:** The EUT 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
-	LTE B12 + WiFi 2.4GHz + Zigbee + Z-Wave + BT EDR

#### **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
-	LTE B12 + WiFi 2.4GHz + Zigbee + Z-Wave + BT EDR

#### **Test Condition:**

Applicable To	Environmental Conditions	Input Power	Tested By
RE $\geq$ 1G	22deg. C, 69%RH	120Vac, 60Hz	Ian Chang
RE<1G	22deg. C, 69%RH	120Vac, 60Hz	Ian Chang

### 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 PC	ASUS	PU401L	E9NXBC002007372	NA	Provided by Lab

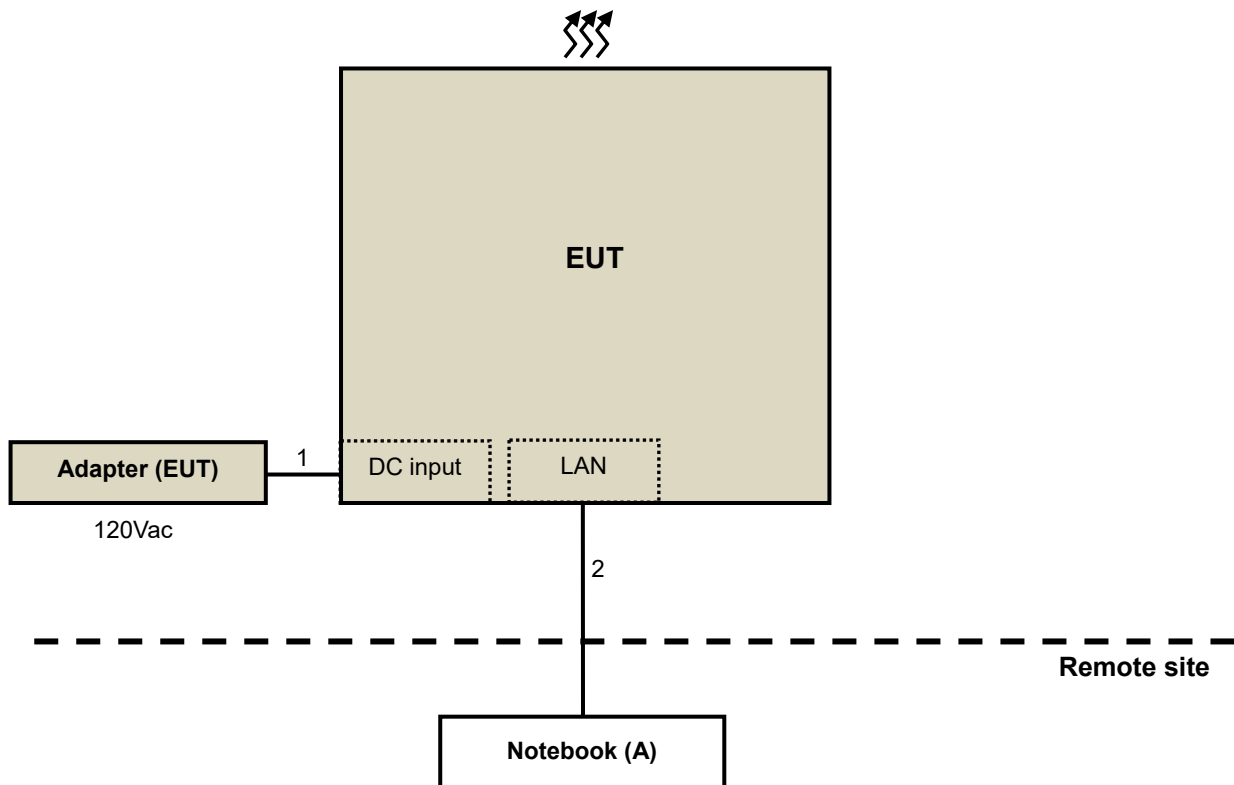
Note:

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

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/ No)	Cores (Qty.)	Remarks
1.	DC cable	1	1.5	N	0	Supplied by client
2.	LAN cable	1	10	N	0	Provided by Lab (RJ45, Cat.5e)

Note: The core(s) is(are) originally attached to the cable(s).

#### 3.3.1 Configuration of System under Test



### 3.4 General Description of Applied Standard and References

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

**Test standard:**

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

**ANSI C63.10-2013**

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

**References Test Guidance:**

**KDB 558074 D01 15.247 Meas Guidance v05r02**

**KDB 662911 D01 Multiple Transmitter Output v02r01**

All test items have been performed as a reference to the above KDB test guidance.

**Test standard:**

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

**ANSI C63.10-2013**

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

**References Test Guidance:**

**KDB 789033 D02 General UNII Test Procedure New Rules v02r01**

**KDB 662911 D01 Multiple Transmitter Output v02r01**

All test items have been performed as a reference to the above KDB test guidance.

**Test standard:**

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

**ANSI C63.10-2013**

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

**Test Standard:**

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 22**

**ANSI 63.26-2015**

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

**References Test Guidance:**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

**ANSI/TIA/EIA-603-E 2016**

All test items have been performed as a reference to the above KDB test guidance.

**Test Standard:**

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 24**

**ANSI 63.26-2015**

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

**References Test Guidance:**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

**ANSI/TIA/EIA-603-E 2016**

All test items have been performed as a reference to the above KDB test guidance.

**Test Standard:**

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 27**

**ANSI 63.26-2015**

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

**References Test Guidance:**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

**ANSI/TIA/EIA-603-E 2016**

All test items have been performed as a reference to the above KDB test guidance.

## 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.

## 4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 19, 2020	Feb. 18, 2021
HP Preamplifier	8449B	3008A01201	Feb. 20, 2020	Feb. 19, 2021
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 19, 2020	Feb. 18, 2021
Agilent TEST RECEIVER	N9038A	MY51210129	Mar. 18, 2020	Mar. 17, 2021
Schwarzbeck Antenna	VULB 9168	139	Nov. 7, 2019	Nov. 6, 2020
Schwarzbeck Antenna	VHBA 9123	480	Jun. 3, 2019	Jun. 2, 2021
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 24, 2019	Nov. 23, 2020
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Nov. 24, 2019	Nov. 23, 2020
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF102	Cable-CH6-01	Jul. 9, 2020	Jul. 8, 2021
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH8-3.6m	Jul. 9, 2020	Jul. 8, 2021
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	Jun. 16, 2020	Jun. 15, 2021
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Jul. 22, 2019	Jul. 21, 2020
			Jul. 22, 2020	Jul. 21, 2021
Loop Antenna EMCI	LPA600	270	Aug. 23, 2019	Aug. 22, 2021
EMCO Horn Antenna	3115	00028257	Nov. 24, 2019	Nov. 23, 2020
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 23, 2019	Sep. 22, 2020
Anritsu Power Sensor	MA2411B	0738404	Apr. 13, 2020	Apr. 12, 2021
Anritsu Power Meter	ML2495A	0842014	Apr. 13, 2020	Apr. 12, 2021

- 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 horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  3. The test was performed in Chamber No. 6.

#### 4.1.3 Test Procedure

##### **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 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.

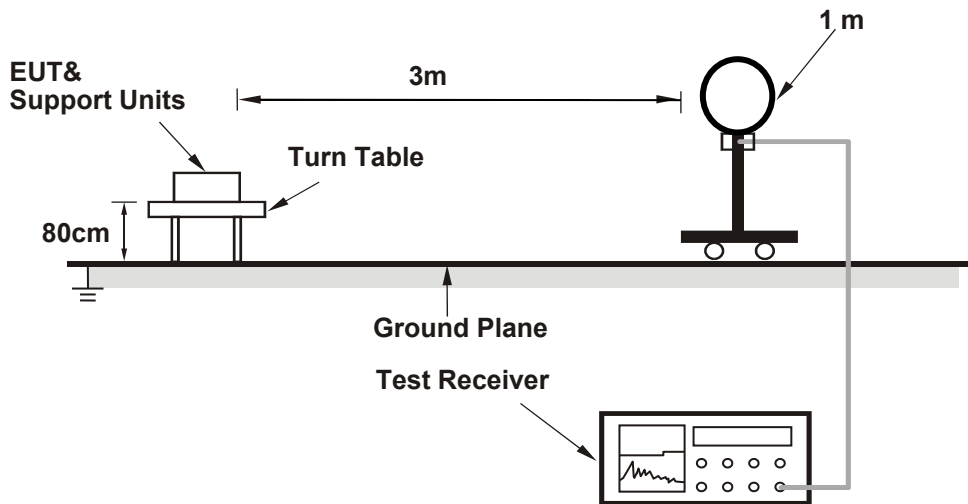
#### 4.1.4 Deviation from Test Standard

No deviation.

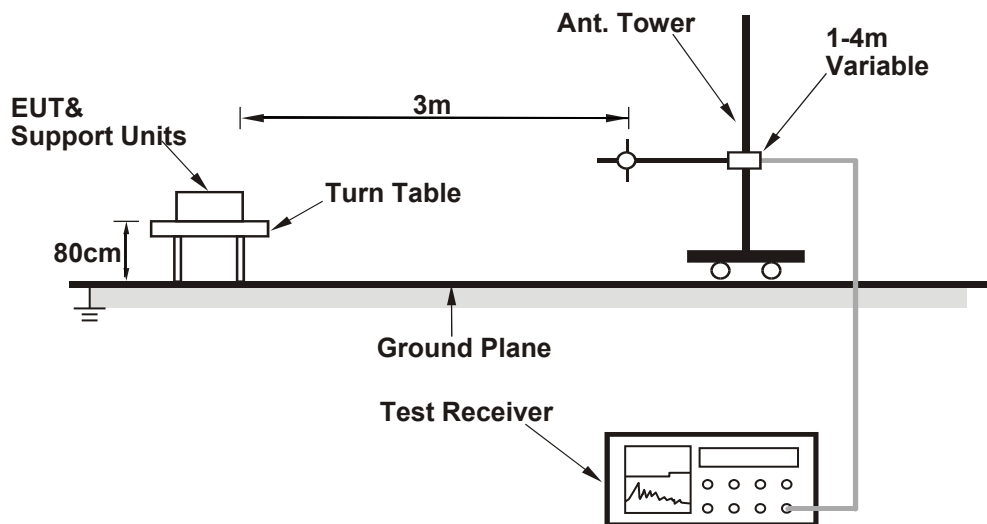


4.1.5 Test Setup

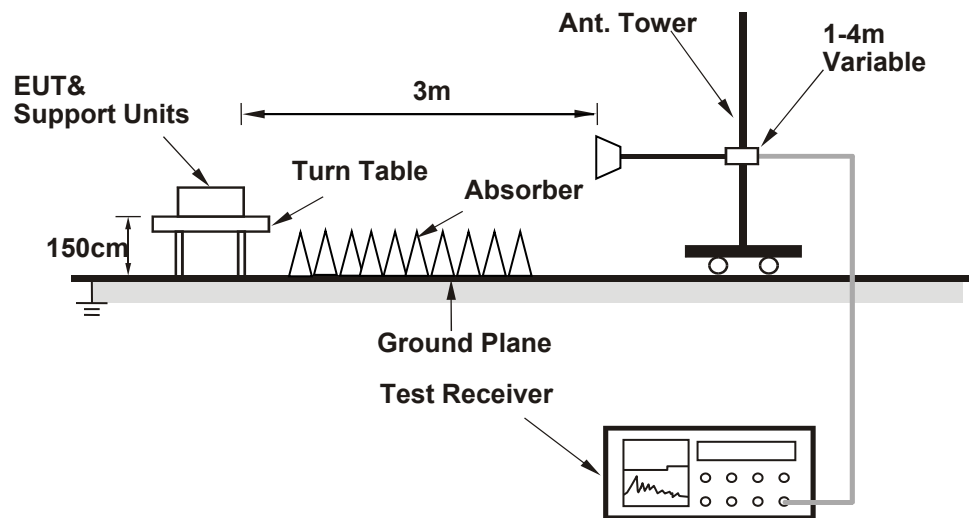
For Radiated emission below 30MHz



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 Condition

- Placed the EUT on the testing table.
- Prepared notebooks to act as communication partner and placed it outside of testing area.
- The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the system in full functions.

## 4.1.7 Test Results

**ABOVE 1GHz DATA**

<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	Peak (PK) Average (AV)
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Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1415.00	56.48 PK	74.00	-17.52	1.64 H	235	60.91	-4.43
2	1415.00	40.25 AV	54.00	-13.75	1.64 H	235	44.68	-4.43
3	2390.00	68.85 PK	74.00	-5.15	2.48 H	278	68.46	0.39
<b>4</b>	<b>2390.00</b>	<b>52.57 AV</b>	<b>54.00</b>	<b>-1.43</b>	<b>2.48 H</b>	<b>278</b>	<b>52.18</b>	<b>0.39</b>
5	2483.50	69.46 PK	74.00	-4.54	2.48 H	278	68.77	0.69
6	2483.50	51.82 AV	54.00	-2.18	2.48 H	278	51.13	0.69
7	2748.00	58.08 PK	74.00	-15.92	3.77 H	112	56.89	1.19
8	2748.00	40.42 AV	54.00	-13.58	3.77 H	112	39.23	1.19
9	4810.00	51.07 PK	74.00	-22.93	1.84 H	262	43.26	7.81
10	4810.00	39.82 AV	54.00	-14.18	1.84 H	262	32.01	7.81
11	4874.00	53.95 PK	74.00	-20.05	1.61 H	248	46.21	7.74
12	4874.00	40.70 AV	54.00	-13.30	1.61 H	248	32.96	7.74
13	4882.00	47.92 PK	74.00	-26.08	1.50 H	263	40.19	7.73
14	4882.00	34.97 AV	54.00	-19.03	1.50 H	263	27.24	7.73

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1415.00	54.23 PK	74.00	-19.77	1.89 V	263	58.66	-4.43
2	1415.00	38.55 AV	54.00	-15.45	1.89 V	263	42.98	-4.43
3	2390.00	64.65 PK	74.00	-9.35	2.32 V	125	64.26	0.39
4	2390.00	47.91 AV	54.00	-6.09	2.32 V	125	47.52	0.39
5	2483.50	64.84 PK	74.00	-9.16	2.32 V	125	64.15	0.69
6	2483.50	46.24 AV	54.00	-7.76	2.32 V	125	45.55	0.69
7	2748.00	57.34 PK	74.00	-16.66	1.66 V	252	56.15	1.19
8	2748.00	39.22 AV	54.00	-14.78	1.66 V	252	38.03	1.19
9	4810.00	49.15 PK	74.00	-24.85	1.35 V	139	41.34	7.81
10	4810.00	36.33 AV	54.00	-17.67	1.35 V	139	28.52	7.81
11	4874.00	51.86 PK	74.00	-22.14	1.64 V	222	44.12	7.74
12	4874.00	38.72 AV	54.00	-15.28	1.64 V	222	30.98	7.74
13	4882.00	46.75 PK	74.00	-27.25	1.79 V	194	39.02	7.73
14	4882.00	33.84 AV	54.00	-20.16	1.79 V	194	26.11	7.73

**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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

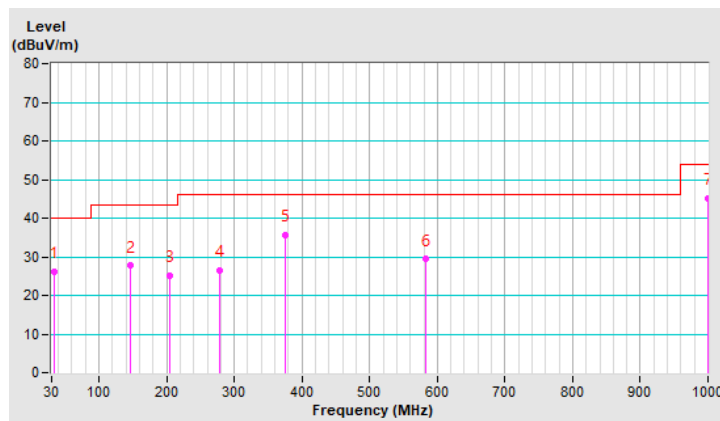
### Below 1GHz DATA

Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	32.96	26.07 QP	40.00	-13.93	1.69 H	357	34.51	-8.44
2	147.18	27.63 QP	43.50	-15.87	2.69 H	246	34.19	-6.56
3	203.78	25.20 QP	43.50	-18.30	2.41 H	214	34.13	-8.93
4	278.27	26.59 QP	46.00	-19.41	1.84 H	125	31.51	-4.92
5	374.98	35.52 QP	46.00	-10.48	1.70 H	223	38.00	-2.48
6	582.08	29.39 QP	46.00	-16.61	1.53 H	69	27.42	1.97
7	1000.00	45.23 QP	54.00	-8.77	1.00 H	214	35.76	9.47

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

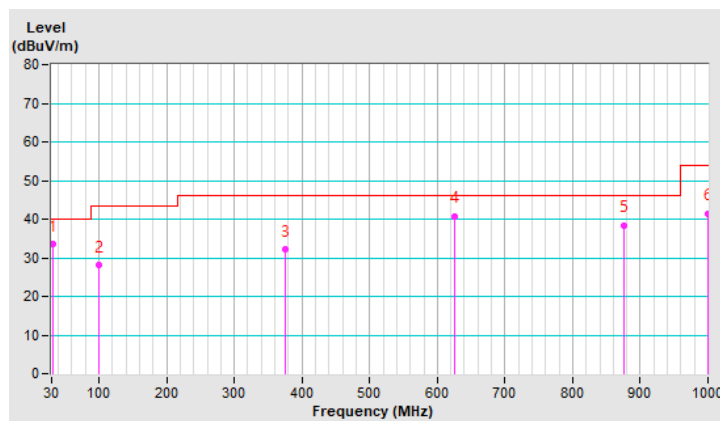


<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	32.04	33.41 QP	40.00	-6.59	1.52 V	158	42.16	-8.75
2	99.31	28.02 QP	43.50	-15.48	1.06 V	348	39.36	-11.34
3	375.16	32.07 QP	46.00	-13.93	1.24 V	183	34.55	-2.48
4	625.00	40.60 QP	46.00	-5.40	1.08 V	158	37.57	3.03
5	875.11	38.47 QP	46.00	-7.53	1.21 V	151	31.59	6.88
6	1000.00	41.32 QP	54.00	-12.68	1.84 V	216	31.85	9.47

**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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB 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 according to ISO/IEC 17025.

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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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