

Variant FCC Test Report

Report No.: RF190111C05A-2

FCC ID: HD5-CK65L0N

Test Model: CK65L0N

Received Date: Oct. 04, 2019

Test Date: Oct. 22, 2019 ~ Nov. 28, 2019

Issued Date: Dec. 04, 2019

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FCC Registration /
Designation Number: 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF190111C05A-2	Original Release	Dec. 04, 2019

1 Certificate of Conformity

Product: Mobile computer

Brand: Honeywell

Test Model: CK65L0N

Sample Status: Engineering Sample

Applicant: Honeywell International Inc.

Test Date: Oct. 22, 2019 ~ Nov. 28, 2019

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

This report is issued as a supplementary report to BV CPS report no.: RF190111C05-2. This report shall be used by combining with its original report.

Prepared by : Rona Chen, **Date:** Dec. 04, 2019
Rona Chen / Specialist

Approved by : Dylan Chiou, **Date:** Dec. 04, 2019
Dylan Chiou / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	N/A	Without AC power port of the EUT.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.3 dB at 2390 MHz.
15.247(d)	Antenna Port Emission	N/A	Refer to Note
15.247(a)(2)	6 dB Bandwidth	N/A	Refer to Note
---	Occupied Bandwidth Measurement	N/A	Refer to Note
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	N/A	Refer to Note
15.203	Antenna Requirement	Pass	Antenna connector is POGO pin not a standard connector.

Note:

1. Only Radiated Emissions and Conducted power tests were performed for this addendum. Refer to original report for other test data.
2. 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	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Mobile computer
Brand	Honeywell
Test Model	CK65L0N
Status of EUT	Engineering Sample
Power Supply Rating	3.6 Vdc or 3.7 Vdc (Battery)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 300 Mbps 802.11ac: up to 400 Mbps
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20), 802.11ac (VHT20) 7 for 802.11n (HT40), 802.11ac (VHT40)
Output Power	628.946 mW
Antenna Type	Refer to Note as below
Antenna Connector	Refer to Note as below
Accessory Device	Refer to Note as below
Data Cable Supplied	N/A
HW Version	3.1
HW P/N	DVT
SW Version	01.03.00.0686
SW P/N	88.00.00-DEBUG-(0327)

Note:

- This report is issued as a supplementary report to BV CPS report no.: RF190111C0-2. The differences compared with original report are listed as below. Radiated Emissions were verified on the worst case of original report and verified Radiated Emissions in reduced power channel and recorded in this report.
 - Add new scanner Gen 8, the Gen 8 is the next generation of the N6703 scanner.
 - Add Cold Storage.
 - Add Battery 2 for Cold Storage SKU.
 - NFC matching optimize.
 - Add Heater function.
 - Non-camera.

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

Modulation Mode	Tx Function
802.11b	2TX
802.11g	2TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX
802.11ac (VHT20)	2TX
802.11ac (VHT40)	2TX

* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

3. There're 4 configurations for the EUT listed as below.

Sample	Scanner	Keypad	Antenna Type			
			Type	Connector	Gain (dBi)	
					Chain 0	Chain 1
A	GEN8	Alpha	FPC antenna	POGO pin	2.62	2.85
B	GEN8	Large Numeric	FPC antenna	POGO pin	2.62	2.85
C	EX20	Alpha	FPC antenna	POGO pin	2.64	2.88
D	EX20	Num-F	FPC antenna	POGO pin	2.64	2.88

*Above samples had been pre-tested, the worst case was found on Sample C. Therefore, only Sample C were chosen as a representative for final test and recorded in the report.

4. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery 1	Intermec Technologies Corporation	AB18	3.7 Vdc, 5.1 Ah, 18.9 Wh
Battery 2	Honeywell	CK65-BTCS	3.6 Vdc, 5200 mAh, 18.7 Wh

5. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20), and 802.11ac (VHT20):

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

7 channels are provided for 802.11n (HT40) and 802.11ac (VHT40):

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To			Description
	RE $\geq$ 1G	RE<1G	APCM	
-	√	√	√	Sample C

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

APCM: Antenna Port Conducted Measurement

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

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	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
	802.11n (HT20)	1 to 11	1, 11	OFDM	BPSK	6.5
	802.11n (HT40)	3 to 9	3, 6	OFDM	BPSK	13.5

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	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11n (HT40)	3 to 9	6	OFDM	BPSK	13.5

Antenna Port Conducted Measurement:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ 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	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	3.6 Vdc	Tim Chen, Getaz Yang
RE<1G	25 deg. C, 65 % RH	3.6 Vdc	Tim Chen
APCM	25 deg. C, 65 % RH	3.6 Vdc	Gavin Wu

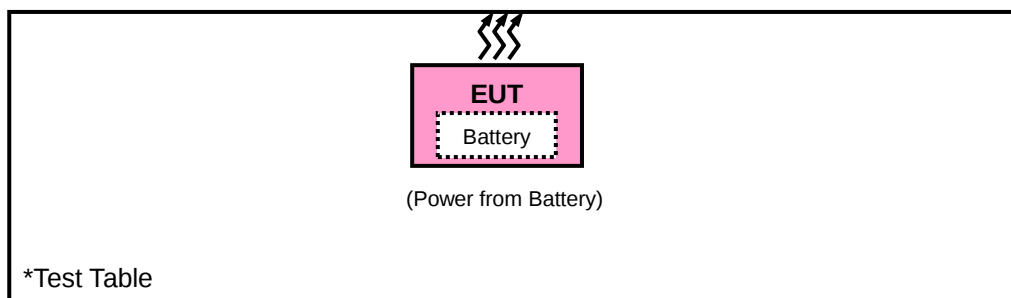
3.3 Description of Support Units

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.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Battery 2	Honeywell	CK65-BTCS	N/A	N/A

No.	Signal Cable Description Of The Above Support Units
1.	N/A

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)

KDB 558074 D01 15.247 Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

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. 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 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 18, 2019	Mar. 17, 2020
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 13, 2018	Dec. 12, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 15, 2019	Apr. 14, 2020
Broadband Horn Antenna SCHWARZBECK	BBHA 9170	148	Nov. 25, 2018	Nov. 24, 2019
			Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 25, 2018	Nov. 24, 2019
			Nov. 24, 2019	Nov. 23, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 23, 2018	Nov. 22, 2019
			Nov. 08, 2019	Nov. 07, 2020
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
Loop Antenna	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
Preamplifier EMCI	EMC001340	980269	Jun. 17, 2019	Jun. 16, 2020
Preamplifier EMCI	EMC 012645	980115	Oct. 08, 2019	Oct. 07, 2020
Preamplifier EMCI	EMC 184045	980116	Oct. 08, 2019	Oct. 07, 2020
Preamplifier EMCI	EMC 330H	980112	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8 000&3000	140811+170717	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1 000(140807)	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 08, 2019	Oct. 07, 2020
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

- 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 9 kHz at frequency below 30 MHz.

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 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:

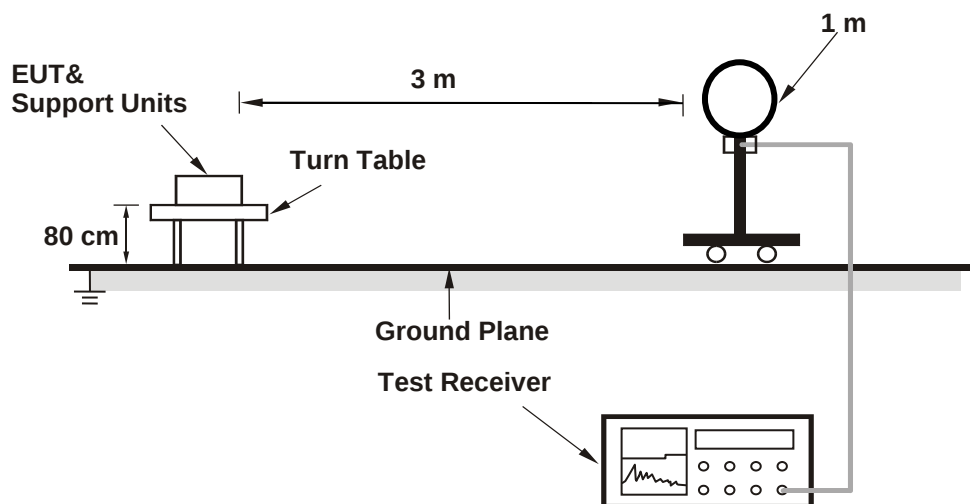
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10 Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1 GHz.
(11n (HT20): RBW = 1 MHz, VBW = 1 kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

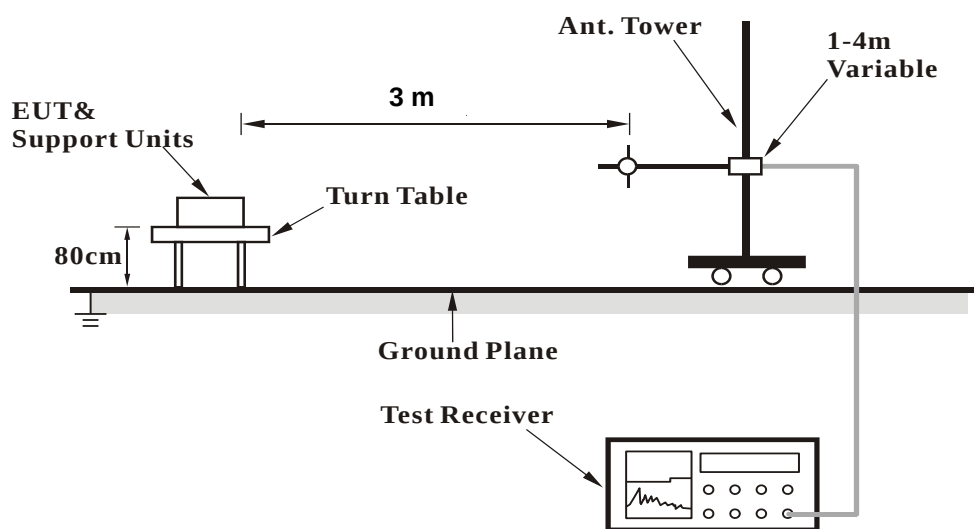
No deviation.

4.1.5 Test Set Up

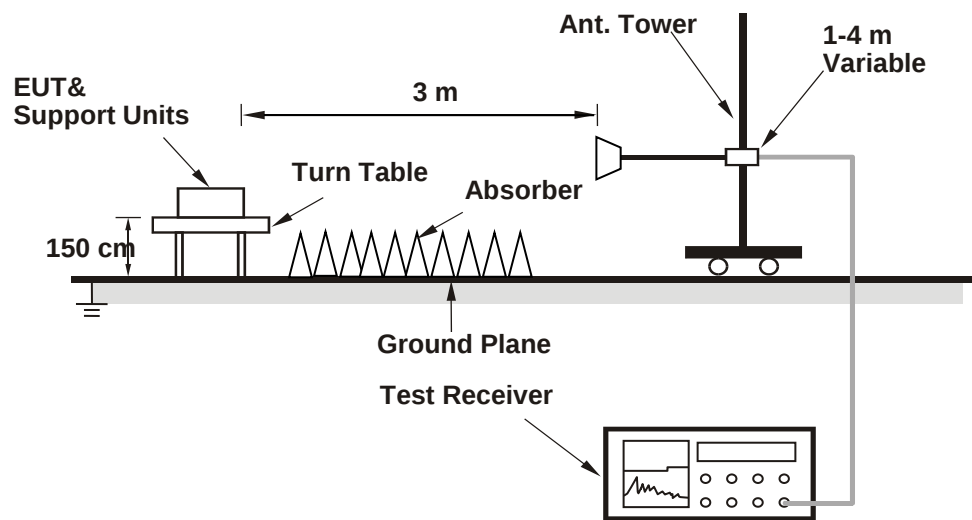
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 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.

4.1.7 Test Results

Above 1 GHz Data :
802.11g

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

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	51.2	56.2	-5	54	-2.8	111	152	Average
2389.94	68.69	73.69	-5	74	-5.31	111	152	Peak
2412	101.73	106.74	-5.01			111	152	Average
2412	111.1	116.11	-5.01			111	152	Peak
4824	33.45	47.83	-14.38	54	-20.55	102	71	Average
4824	42.42	56.8	-14.38	74	-31.58	102	71	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	47.11	52.11	-5	54	-6.89	136	271	Average
2389.94	67.49	72.49	-5	74	-6.51	136	271	Peak
2412	99.19	104.2	-5.01			136	271	Average
2412	108.52	113.53	-5.01			136	271	Peak
4824	43.22	57.6	-14.38	54	-10.78	135	275	Average
4824	42.29	56.67	-14.38	74	-31.71	135	275	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	101.9	106.81	-4.91			130	156	Average
2462	111.41	116.32	-4.91			130	156	Peak
2483.52	51.72	56.57	-4.85	54	-2.28	130	156	Average
2483.52	70.42	75.27	-4.85	74	-3.58	130	156	Peak
4924	34.39	48.35	-13.96	54	-19.61	89	58	Average
4924	43.61	57.57	-13.96	74	-30.39	89	58	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	100.14	105.05	-4.91			144	263	Average
2462	109.86	114.77	-4.91			144	263	Peak
2483.6	50.43	55.28	-4.85	54	-3.57	144	263	Average
2483.6	69.79	74.64	-4.85	74	-4.21	144	263	Peak
4924	34.75	48.71	-13.96	54	-19.25	129	282	Average
4924	43.73	57.69	-13.96	74	-30.27	129	282	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

802.11n (HT20)

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

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.8	51.12	58.12	-5	54	-2.88	100	139	Average
2389.8	69.24	74.24	-5	74	-4.76	100	139	Peak
2412	101.69	106.7	-5.01			100	139	Average
2412	111.27	116.28	-5.01			100	139	Peak
4824	33.98	48.36	-14.38	54	-20.02	94	53	Average
4824	42.85	57.23	-14.38	74	-31.15	94	53	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	51.11	56.11	-5	54	-2.89	131	272	Average
2389.94	68.12	73.12	-5	74	-5.88	131	272	Peak
2412	99.4	104.41	-5.01			131	272	Average
2412	108.5	113.51	-5.01			131	272	Peak
4824	34.12	48.5	-14.38	54	-19.88	127	265	Average
4824	43.22	57.6	-14.38	74	-30.78	127	265	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	101.83	106.74	-4.91			137	156	Average
2462	111.52	116.43	-4.91			137	156	Peak
2483.64	52.28	57.13	-4.85	54	-1.72	137	156	Average
2483.64	69.46	74.31	-4.85	74	-4.54	137	156	Peak
4924	35.37	49.33	-13.96	54	-18.63	112	83	Average
4924	44.39	58.35	-13.96	74	-29.61	112	83	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	99.67	104.58	-4.91			120	263	Average
2462	109.19	114.1	-4.91			120	263	Peak
2483.64	48.66	53.51	-4.85	54	-5.34	120	263	Average
2483.64	67.31	72.16	-4.85	74	-6.69	120	263	Peak
4924	34.75	48.71	-13.96	54	-19.25	149	271	Average
4924	43.73	57.69	-13.96	74	-30.27	149	271	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

802.11n (HT40)

EUT Test Condition		Measurement Detail	
Channel	Channel 3	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	51.54	56.54	-5	54	-2.46	100	156	Average
2389.94	67.18	72.18	-5	74	-6.82	100	156	Peak
2422	95.96	100.93	-4.97			100	156	Average
2422	105.8	110.77	-4.97			100	156	Peak
2483.64	38.32	43.17	-4.85	54	-15.68	100	156	Average
2483.64	50.79	55.64	-4.85	74	-23.21	100	156	Peak
4844	33.59	47.86	-14.27	54	-20.41	105	71	Average
4844	42.6	56.87	-14.27	74	-31.4	105	71	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	49.22	54.22	-5	54	-4.78	165	266	Average
2390	63.85	68.85	-5	74	-10.15	165	266	Peak
2422	93.69	98.66	-4.97			165	266	Average
2422	103.18	108.15	-4.97			165	266	Peak
2483.5	37.34	42.19	-4.85	54	-16.66	165	266	Average
2483.5	54.26	59.11	-4.85	74	-19.74	165	266	Peak
4844	34.86	49.13	-14.27	54	-19.14	138	282	Average
4844	43.79	58.06	-14.27	74	-30.21	138	282	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- 2422 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	52.7	57.7	-5	54	-1.3	100	143	Average
2390	70.6	75.6	-5	74	-3.4	100	143	Peak
2437	96.35	101.33	-4.98			100	143	Average
2437	108.22	113.2	-4.98			100	143	Peak
2483.5	51.96	56.81	-4.85	54	-2.04	100	143	Average
2483.5	68.1	72.95	-4.85	74	-5.9	100	143	Peak
4874	35.63	49.71	-14.08	54	-18.37	100	66	Average
4874	44.89	58.97	-14.08	74	-29.11	100	66	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	50.22	55.22	-5	54	-3.78	100	260	Average
2390	67.04	72.04	-5	74	-6.96	100	260	Peak
2437	94.41	99.39	-4.98			100	260	Average
2437	104.76	109.74	-4.98			100	260	Peak
2483.5	46.78	51.63	-4.85	54	-7.22	100	260	Average
2483.5	64.22	69.07	-4.85	74	-9.78	100	260	Peak
4874	35.43	49.51	-14.08	54	-18.57	133	277	Average
4874	44.42	58.5	-14.08	74	-29.58	133	277	Peak

Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

9 kHz ~ 30 MHz Data:

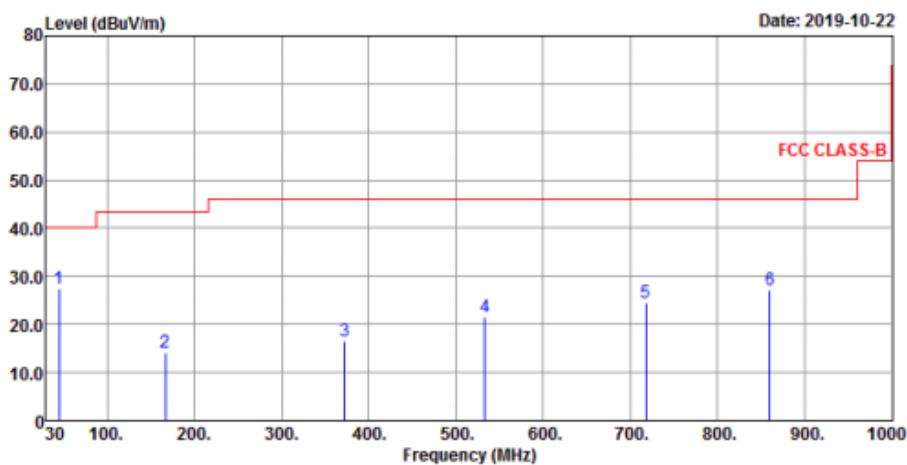
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

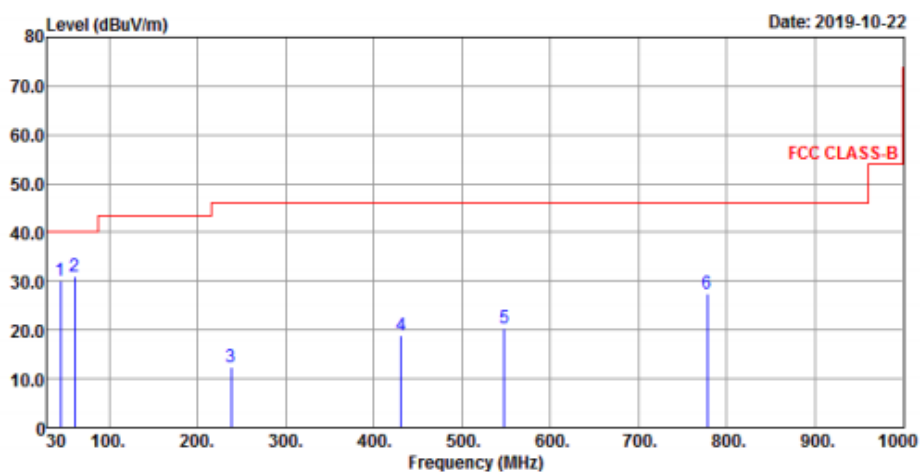
802.11n (HT40)

EUT Test Condition		Measurement Detail	
Channel	Channel 6	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	Tim Chen

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
44.55	27.52	44.53	-17.01	40	-12.48	109	12	Peak
166.77	14.22	31.59	-17.37	43.5	-29.28	123	12	Peak
372.41	16.59	31.72	-15.13	46	-29.41	139	9	Peak
533.43	21.44	31.56	-10.12	46	-24.56	125	36	Peak
717.73	24.63	31.67	-7.04	46	-21.37	111	209	Peak
860.32	27.05	31.22	-4.17	46	-18.95	134	138	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
44.55	30.03	47.04	-17.01	40	-9.97	122	239	Peak
61.04	31.09	49.89	-18.8	40	-8.91	112	11	Peak
238.55	12.44	30.7	-18.26	46	-33.56	101	261	Peak
430.61	19.03	31.32	-12.29	46	-26.97	114	290	Peak
547.98	20.51	30.92	-10.41	46	-25.49	108	181	Peak
777.87	27.55	32.06	-4.51	46	-18.45	121	254	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value.
- The emission levels of other frequencies were very low against the limit.

4.2 Conducted Output Power Measurement

4.2.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30 dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

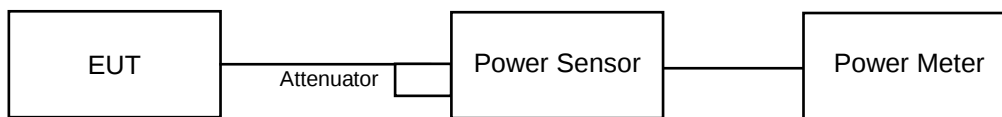
Array Gain = 0 dB (i.e., no array gain) for $NANT \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;

Array Gain = $5 \log(NANT/NSS)$ dB or 3 dB, whichever is less for 20 MHz channel widths with $NANT \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(NANT/NSS)$ dB.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedures

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

4.2.5 Deviation from Test Standard

No deviation.

4.2.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.2.7 Test Results

<Peak Power>

802.11b

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	21.87	21.75	303.439	24.82	30	Pass
6	2437	21.93	21.86	309.417	24.91	30	Pass
11	2462	22.02	21.92	314.818	24.98	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	22.45	22.26	344.059	25.37	30	Pass
6	2437	25.06	24.89	628.946	27.99	30	Pass
11	2462	23.16	23.03	407.923	26.11	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	22.00	21.80	309.845	24.91	30	Pass
6	2437	24.44	24.15	537.987	27.31	30	Pass
11	2462	22.72	22.70	373.277	25.72	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	20.60	19.90	212.539	23.27	30	Pass
6	2437	22.38	22.16	337.419	25.28	30	Pass
9	2452	22.05	21.85	313.434	24.96	30	Pass

<Average Power (For Reference)>

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	19.34	19.11	167.371	22.24
6	2437	19.23	19.20	166.929	22.23
11	2462	19.31	19.29	170.228	22.31

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	16.16	16.05	81.577	19.12
6	2437	19.42	19.25	171.638	22.35
11	2462	14.96	14.92	62.379	17.95

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	14.98	14.90	62.38	17.95
6	2437	18.91	18.87	154.894	21.90
11	2462	15.24	15.19	66.457	18.23

802.11n (HT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
3	2422	12.12	12.11	32.548	15.13
6	2437	14.97	14.91	62.379	17.95
9	2452	13.61	13.58	45.764	16.61

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.

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

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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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