

FCC Test Report

(Co-Located)

Report No.: RFBHPY-WTW-P20110791-8

WLAN/BT FCC ID: PVH0965

WWAN FCC ID: A4C01007A

Test Model: ODIN-W2

Received Date: Nov. 20, 2020

Test Date: Feb. 04, 2021 ~ Feb. 05, 2021

Issued Date: Feb. 09, 2021

Applicant: u-blox Malmö AB

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RFBHPY-WTW-P20110791-8	Original Release	Feb. 09, 2021

1 Certificate of Conformity

Product: WLAN and Bluetooth Module

Brand: u-blox Malmö AB

Test Model: ODIN-W2

Sample Status: Identical Prototype

Applicant: u-blox Malmö AB

Test Date: Feb. 04, 2021 ~ Feb. 05, 2021

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)

ANSI C63.10:2013

FCC Part 24, Subpart E

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 :



Date: Feb. 09, 2021

Lena Wang / Specialist

Approved by :



Date: Feb. 09, 2021

Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013 FCC Part 27, Subpart C, H, L			
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.17 dB at 576.11 MHz.
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -21.26 dB at 3465 MHz.

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	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	WLAN and Bluetooth Module			
Brand	u-blox Malmö AB			
Test Model	ODIN-W2			
Status of EUT	Identical Prototype			
Power Supply Rating	12 or 24 Vdc (DC Power Supply)			
Modulation Type	WLAN	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM		
	BT EDR	GFSK, $\pi/4$ -DQPSK, 8DPSK		
	BT LE	GFSK		
	LTE	QPSK, 16QAM		
Operating Frequency	WLAN	2412 ~ 2462 MHz		
	LTE	LTE Band 4	Channel Bandwidth: 1.4 MHz	1710.7 ~ 1754.3 MHz
			Channel Bandwidth: 3 MHz	1711.5 ~ 1753.5 MHz
			Channel Bandwidth: 5 MHz	1712.5 ~ 1752.5 MHz
			Channel Bandwidth: 10 MHz	1715.0 ~ 1750.0 MHz
			Channel Bandwidth: 15 MHz	1717.5 ~ 1747.5 MHz
			Channel Bandwidth: 20 MHz	1720.0 ~ 1745.0 MHz
	BT EDR	2402 ~ 2480 MHz		
BT LE	2402 ~ 2480 MHz			
Number of Channel	2.4 GHz: 11 for 802.11b, 802.11g, 802.11n (HT20) BT EDR: 79 BT LE: 40			
Antenna Type	Refer to Note as below			
Antenna Connector	N/A			
Accessory Device	N/A			
Data Cable Supplied	N/A			

Note:

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

Modulation Mode	Tx Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	2TX

- The EUT was installed in E-log and Fleet Management Device (Brand: Rand McNally, Model: DC210) which also contains WWAN module (FCC ID: A4C01007A). All test result were both share WWAN and WLAN module.

3. The antenna information is listed as below.

WWAN Antenna	
Antenna Type: Dipole Antenna	
Band	LTE 4
Gain (dBi)	2.24

WLAN Antenna		
Brand	Antenna Type	Antenna Gain (dBi)
		BT/WLAN 2.4 GHz
PorAnt	Patch	3

4. 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.

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

WLAN 2.4GHz:

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

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		

BT EDR:

79 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

BT LE:

40 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

3.2.1 Test Mode Applicability and Tested Channel Detail

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

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

Note: Radiated Emission and Conducted Out-Band Emission test items chosen the worst maximum power 2.4G and 5G Radio channel.

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	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
-	802.11g + LTE Band 4	2412 ~ 2462 、 1710.5 ~ 1747.5	1 to 11 、 20025 to 20325	6 + 20175	OFDM 、 QPSK
-	BT EDR + LTE Band 4	2402 ~ 2480 、 1710.5 ~ 1747.5	0 to 78 、 20025 to 20325	78 + 20175	GFSK 、 QPSK
-	LTE Band 4 + 802.11g	1710.5 ~ 1747.5 、 2412 ~ 2462	20025 to 20325 、 1 to 11	20175 + 6	QPSK 、 OFDM
-	LTE Band 4 + BT EDR	1710.5 ~ 1747.5 、 2402 ~ 2480	20025 to 20325 、 0 to 78	20175 + 78	QPSK 、 GFSK

Radiated Emission Test (Below 1 GHz):

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

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
	802.11g + LTE Band 4	2412 ~ 2462 、 1710.5 ~ 1747.5	1 to 11 、 20025 to 20325	6 + 20175	OFDM 、 QPSK
	BT EDR + LTE Band 4	2402 ~ 2480 、 1710.5 ~ 1747.5	0 to 78 、 20025 to 20325	78 + 20175	GFSK 、 QPSK

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE$\geq$1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Tim Chen
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Tim Chen

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.

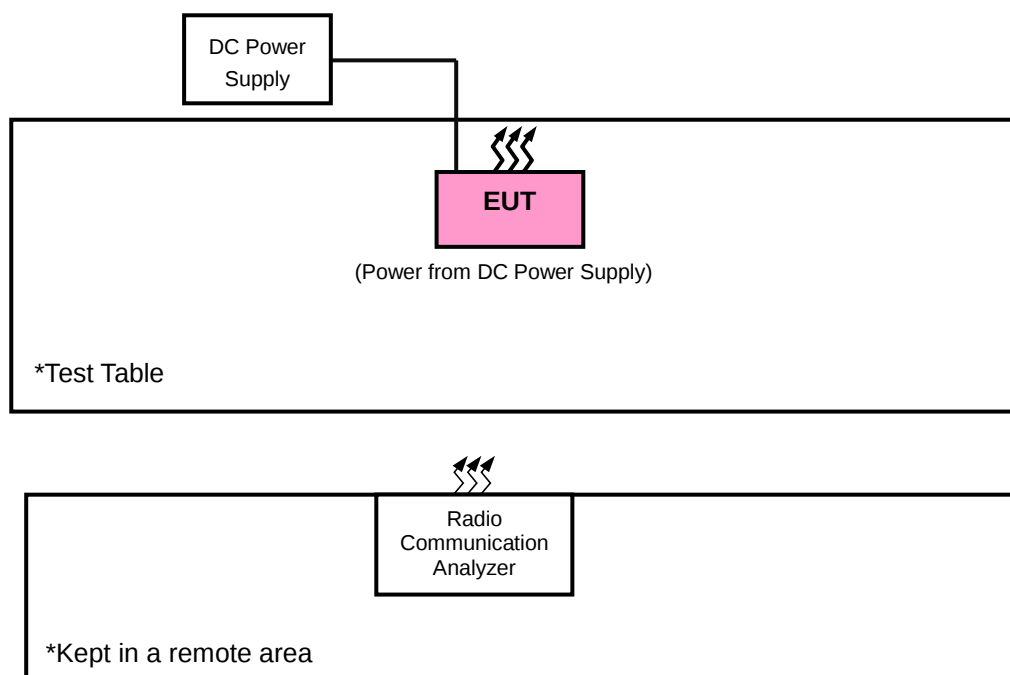
No.	Product	Brand	Model No.	Serial No.	FCC ID
A	DC power supply	Keysight	U8002A	MY56330015	N/A
B	Radio Communication Analyzer	Anritsu	MT8820C	6201010284	N/A

No.	Signal Cable Description Of The Above Support Units
1.	DC Cable: 2.38m

Note:

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

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:

Test Standard:

FCC Part 15, Subpart C (15.247)

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 558074 D01 Meas Guidance v05r02

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 Measurement

4.1.1 Limits of Radiated Emission Measurement

For WLAN & BT

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:

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 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.

Limits of Unwanted Emission Out of the Restricted Bands

Applicable To		Limit	
789033 D02 General UNII Test Procedures New Rules v02r01		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) ^{*1} PK:10 (dBm/MHz) ^{*2} PK:15.6 (dBm/MHz) ^{*3} PK:27 (dBm/MHz) ^{*4}	PK: 68.2 (dBμV/m) ^{*1} PK:105.2 (dBμV/m) ^{*2} PK: 110.8 (dBμV/m) ^{*3} PK:122.2 (dBμV/m) ^{*4}
	☐ 15.407(b)(4)(ii)	Emission limits in section 15.247(d)	

^{*1} beyond 75 MHz or more above of the band edge.
^{*2} below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.
^{*3} below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.
^{*4} 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:

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

For LTE

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit is equal to -13 dBm.

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, 2020	Mar. 17, 2021
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 07, 2020	Dec. 06, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 16, 2020	Apr. 15, 2021
Broadband Horn Antenna SCHWARZBECK	BBHA 9170	148	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 22, 2020	Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 06, 2020	Nov. 05, 2021
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Loop Antenna	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Preamplifier EMCI	EMC001340	980201	Oct. 21, 2020	Oct. 20, 2021
Preamplifier EMCI	EMC 012645	980115	Oct. 07, 2020	Oct. 06, 2021
Preamplifier EMCI	EMC 184045	980116	Oct. 07, 2020	Oct. 06, 2021
Preamplifier EMCI	EMC 330H	980112	Oct. 07, 2020	Oct. 06, 2021
Power Meter Anritsu	ML2495A	1012010	Sep. 01, 2020	Aug. 31, 2021
Power Sensor Anritsu	MA2411B	1315050	Sep. 01, 2020	Aug. 31, 2021
RF Coaxial Cable EMCI	EMC104-SM-SM-8000	180409	Jan. 18, 2020	Jan. 17, 2021
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 07, 2020	Oct. 06, 2021
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 07, 2020	Oct. 06, 2021
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
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 WLAN & BT

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.
4. All modes of operation were investigated and the worst-case emissions are reported.

For LTE

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
- b. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
- c. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

Note:

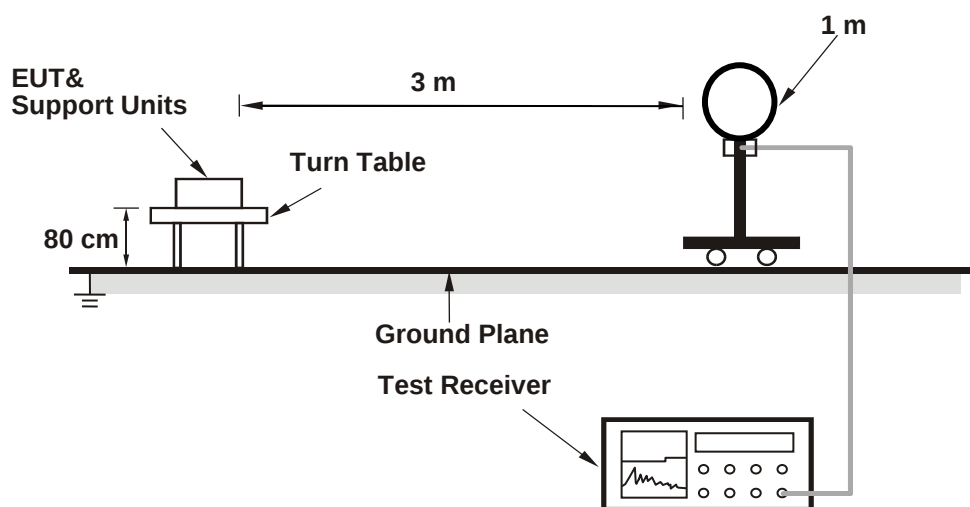
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.1.4 Deviation from Test Standard

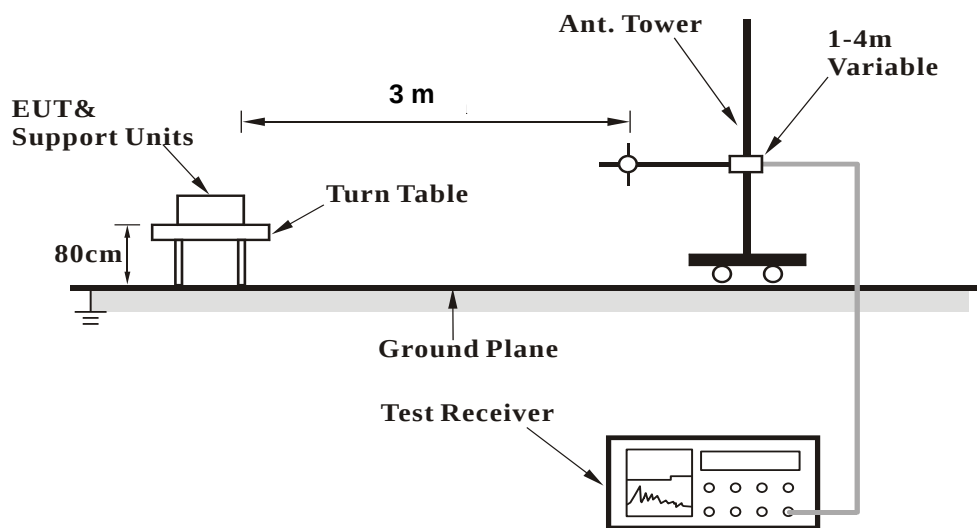
No deviation.

4.1.5 Test Set Up

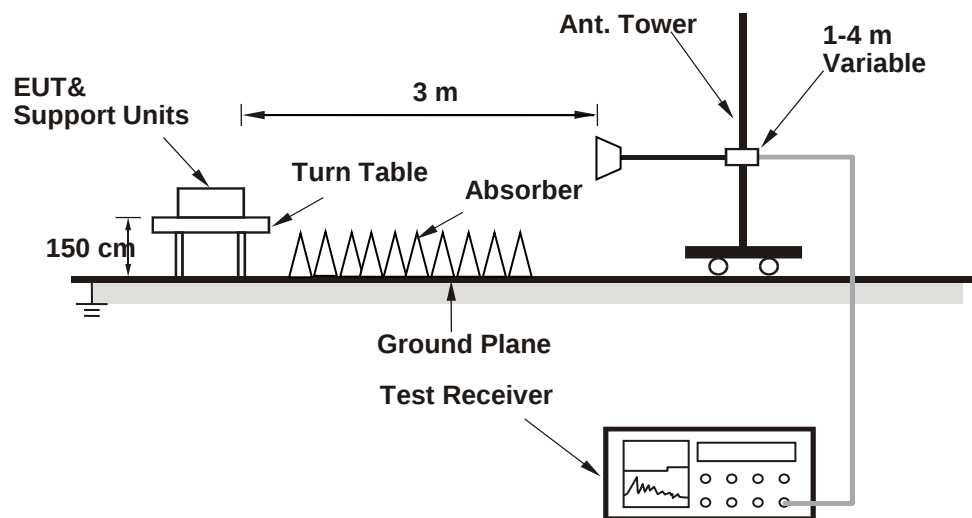
<Radiated Emission below 30 MHz>



<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

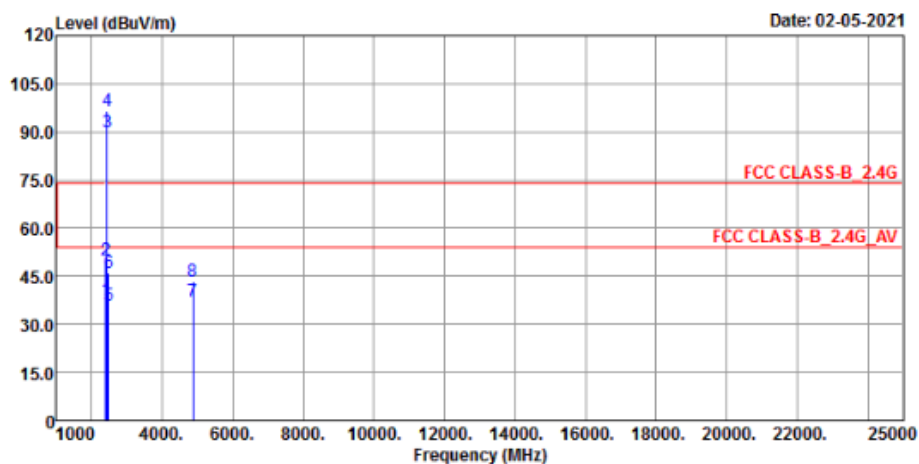
- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

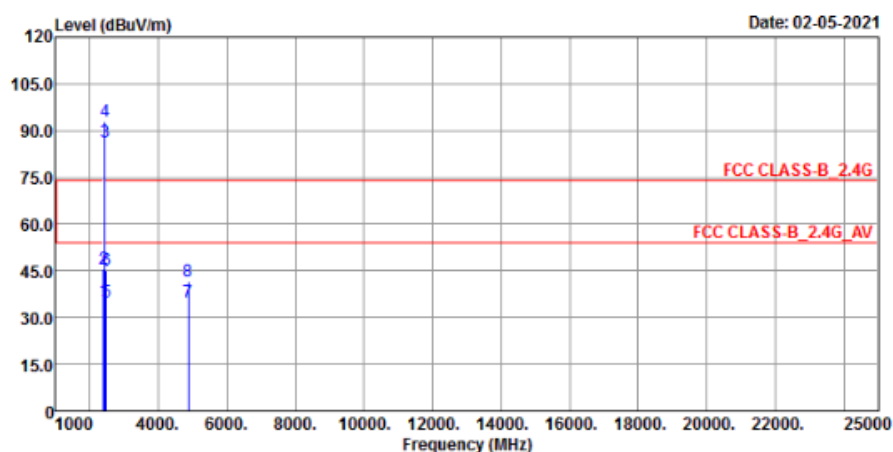
Above 1 GHz Data :
802.11g + LTE Band 4

EUT Test Condition		Measurement Detail	
Channel	Channel 6 + Channel 20175	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	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
2390	37.84	44.89	-7.05	54	-16.16	122	208	Average
2390	49.85	56.9	-7.05	74	-24.15	122	208	Peak
2437	90.01	97.01	-7	-----	-----	122	208	Average
2437	96.49	103.49	-7	-----	-----	122	208	Peak
2483.5	35.7	42.56	-6.86	54	-18.3	122	208	Average
2483.5	45.93	52.79	-6.86	74	-28.07	122	208	Peak
4874	37.07	53.01	-15.94	54	-16.93	120	183	Average
4874	43.43	59.37	-15.94	74	-30.57	120	183	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	35.56	42.61	-7.05	54	-18.44	126	140	Average
2390	45.6	52.65	-7.05	74	-28.4	126	140	Peak
2437	86.46	93.46	-7	-----	-----	126	140	Average
2437	93.09	100.09	-7	-----	-----	126	140	Peak
2483.5	34.93	41.79	-6.86	54	-19.07	126	140	Average
2483.5	45.38	52.24	-6.86	74	-28.62	126	140	Peak
4874	35.18	51.12	-15.94	54	-18.82	137	89	Average
4874	41.54	57.48	-15.94	74	-32.46	137	89	Peak

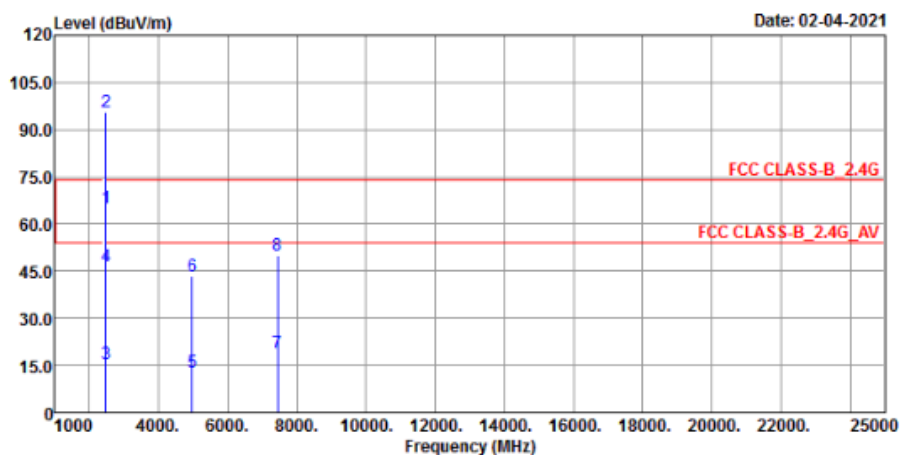
Remarks:

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.

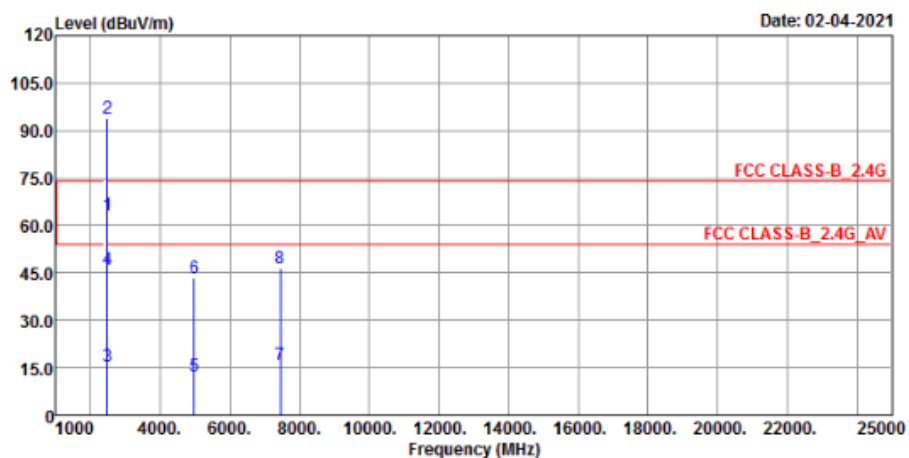
BT EDR + LTE Band 4

EUT Test Condition		Measurement Detail	
Channel	Channel 78 + Channel 20175	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	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
2480	65.09	71.95	-6.86	-----	-----	100	241	Average
2480	95.75	102.61	-6.86	-----	-----	100	241	Peak
2483.5	15.63	22.49	-6.86	54	-38.37	100	241	Average
2483.5	46.29	53.15	-6.86	74	-27.71	100	241	Peak
4960	12.79	28.49	-15.7	54	-41.21	199	245	Average
4960	43.45	59.15	-15.7	74	-30.55	199	245	Peak
7440	19.23	29.15	-9.92	54	-34.77	124	89	Average
7440	49.89	59.81	-9.92	74	-24.11	124	89	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
2480	63.4	70.26	-6.86	-----	-----	297	286	Average
2480	94.06	100.92	-6.86	-----	-----	297	286	Peak
2483.5	15.4	22.26	-6.86	54	-38.6	297	286	Average
2483.5	46.06	52.92	-6.86	74	-27.94	297	286	Peak
4960	12.59	28.29	-15.7	54	-41.41	148	275	Average
4960	43.25	58.95	-15.7	74	-30.75	148	275	Peak
7440	15.98	25.9	-9.92	54	-38.02	213	305	Average
7440	46.64	56.56	-9.92	74	-27.36	213	305	Peak

Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2480 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

LTE Band 4 + 802.11g

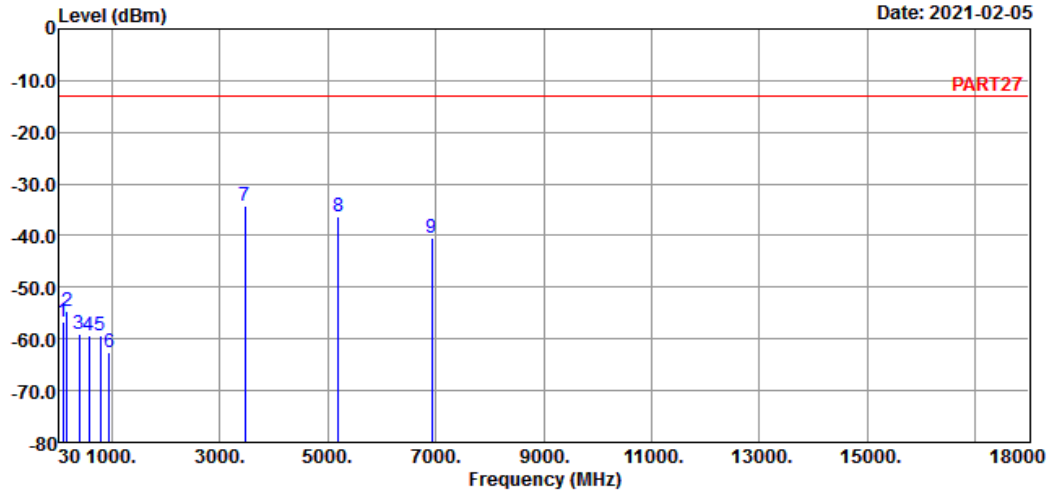


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2021-02-05



Site : 966 Chamber 5
Condition: PART27 HORIZONTAL
Remak : 11G_TX_CH06
: +LTE Band 4 QPSK_15M Link_M-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	96.93	-56.70	-45.97	-13.00	-10.73	-43.70	Peak
2	165.80	-54.69	-49.44	-13.00	-5.25	-41.69	Peak
3	393.75	-59.09	-53.11	-13.00	-5.98	-46.09	Peak
4	576.11	-59.30	-57.54	-13.00	-1.76	-46.30	Peak
5	791.45	-59.19	-59.95	-13.00	0.76	-46.19	Peak
6	949.56	-62.72	-64.52	-13.00	1.80	-49.72	Peak
7 pp	3465.00	-34.26	-26.38	-13.00	-7.88	-21.26	Peak
8	5197.50	-36.21	-34.14	-13.00	-2.07	-23.21	Peak
9	6930.00	-40.57	-43.26	-13.00	2.69	-27.57	Peak

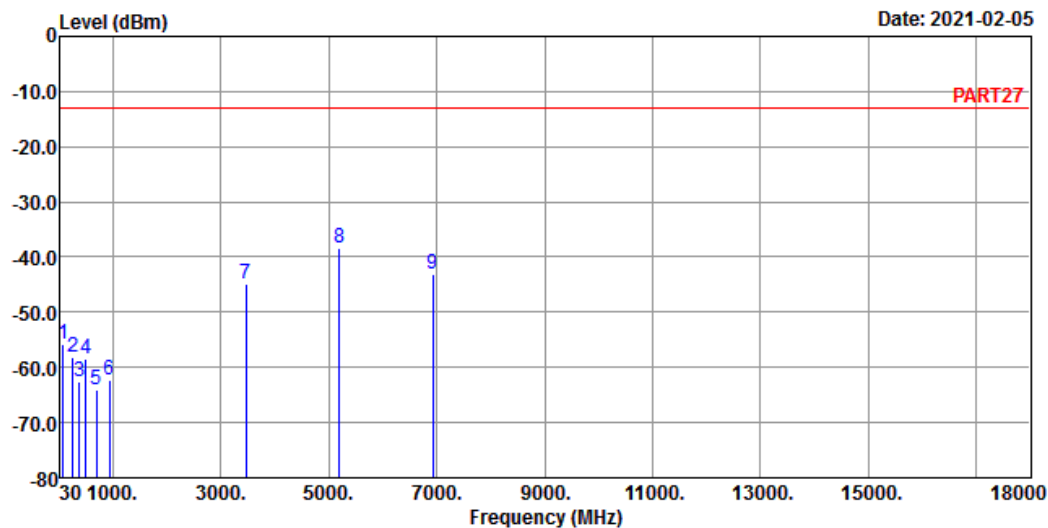


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2021-02-05



Site : 966 Chamber 5
 Condition: PART27 VERTICAL
 Remak : 11G_TX_CH06
 : +LTE Band 4 QPSK_15M Link_M-CH
 Tested by: tim-chen

	Freq	Level	Read Level	Limit	Over	
	MHz	dBm	dBm	dBm	Factor	Limit Remark
1	76.56	-55.77	-45.79	-13.00	-9.98	-42.77 Peak
2	256.98	-58.06	-51.93	-13.00	-6.13	-45.06 Peak
3	383.08	-62.51	-56.47	-13.00	-6.04	-49.51 Peak
4	503.36	-58.38	-53.87	-13.00	-4.51	-45.38 Peak
5	700.27	-63.96	-63.86	-13.00	-0.10	-50.96 Peak
6	935.98	-62.43	-63.89	-13.00	1.46	-49.43 Peak
7	3465.00	-44.74	-36.86	-13.00	-7.88	-31.74 Peak
8 pp	5197.50	-38.34	-36.27	-13.00	-2.07	-25.34 Peak
9	6930.00	-43.21	-45.90	-13.00	2.69	-30.21 Peak

LTE Band 4 + BT EDR

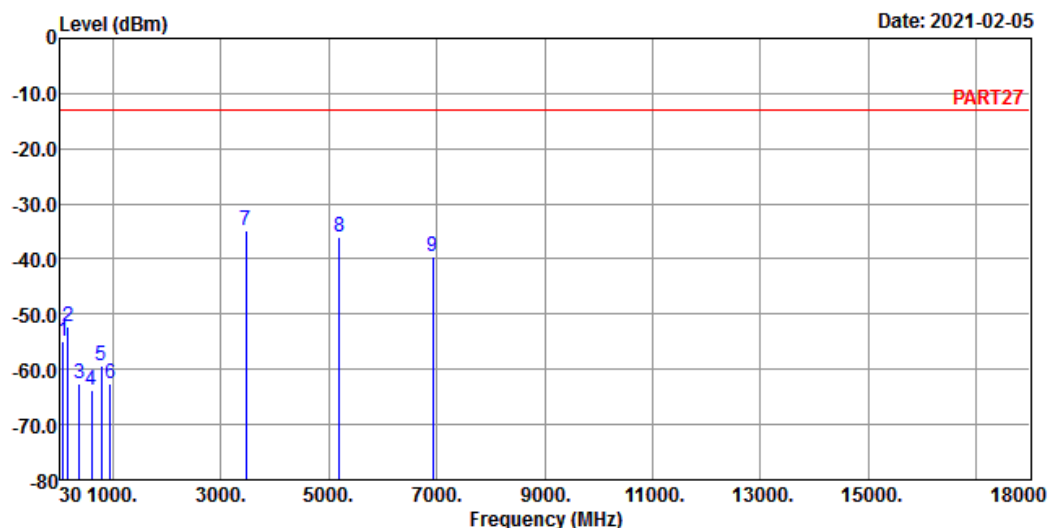


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2021-02-05



Site : 966 Chamber 5

Condition: PART27 HORIZONTAL

Remak : BT_TX_CH78+LTE Band 4 QPSK_15M Link_M-CH

Tested by: tim-chen

			Read	Limit		Over	
	Freq	Level	Level	Line	Factor	Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	86.26	-54.90	-43.88	-13.00	-11.02	-41.90	Peak
2	162.89	-52.28	-47.23	-13.00	-5.05	-39.28	Peak
3	377.26	-62.66	-56.58	-13.00	-6.08	-49.66	Peak
4	611.03	-63.83	-63.05	-13.00	-0.78	-50.83	Peak
5	791.45	-59.19	-59.95	-13.00	0.76	-46.19	Peak
6	949.56	-62.72	-64.52	-13.00	1.80	-49.72	Peak
7 pp	3465.00	-34.76	-26.88	-13.00	-7.88	-21.76	Peak
8	5197.50	-36.15	-34.08	-13.00	-2.07	-23.15	Peak
9	6930.00	-39.68	-42.37	-13.00	2.69	-26.68	Peak

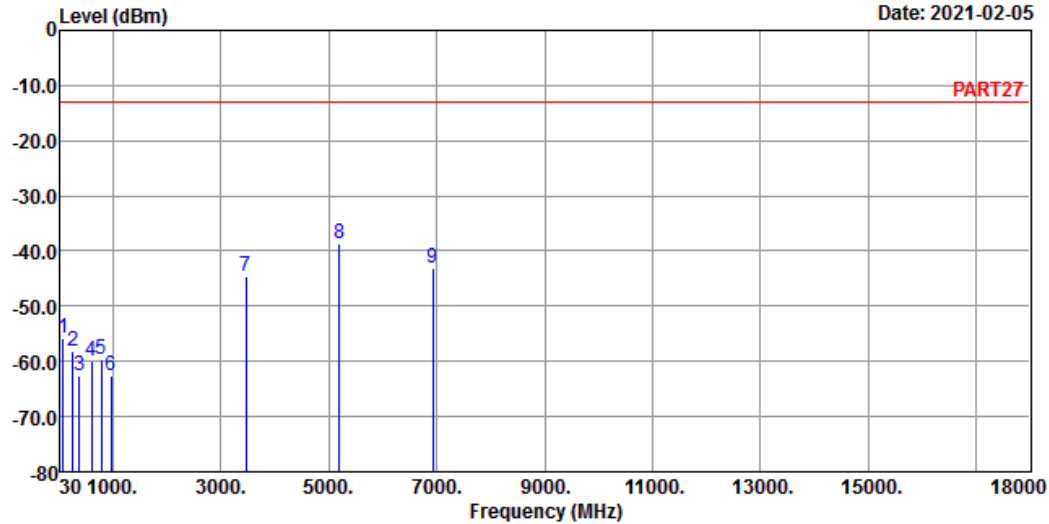


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2021-02-05



Site : 966 Chamber 5

Condition: PART27 VERTICAL

Remak : BT_TX_CH78+LTE Band 4 QPSK_15M Link_M-CH

Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	76.56	-55.77	-45.79	-13.00	-9.98	-42.77	Peak
2	256.98	-58.06	-51.93	-13.00	-6.13	-45.06	Peak
3	383.08	-62.51	-56.47	-13.00	-6.04	-49.51	Peak
4	599.39	-60.05	-59.26	-13.00	-0.79	-47.05	Peak
5	792.42	-59.69	-60.45	-13.00	0.76	-46.69	Peak
6	962.17	-62.71	-64.95	-13.00	2.24	-49.71	Peak
7	3465.00	-44.64	-36.76	-13.00	-7.88	-31.64	Peak
8 pp	5197.50	-38.67	-36.60	-13.00	-2.07	-25.67	Peak
9	6930.00	-43.24	-45.93	-13.00	2.69	-30.24	Peak

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:

802.11g + LTE Band 4

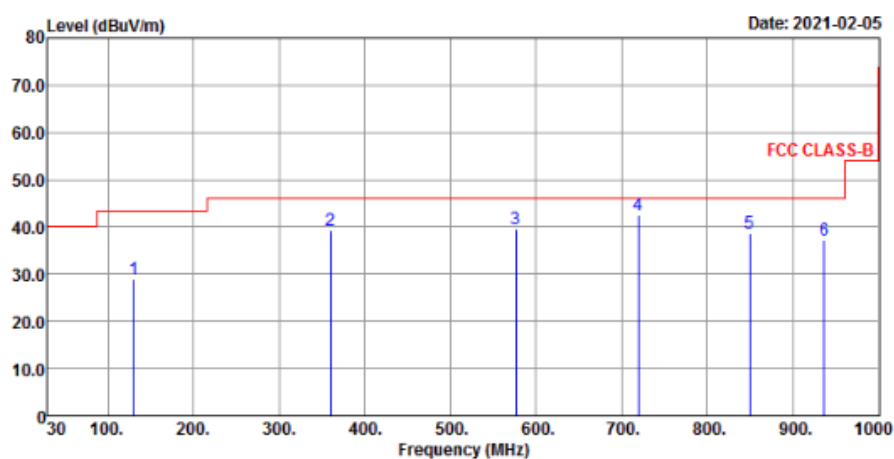
EUT Test Condition		Measurement Detail	
Channel	Channel 6 + Channel 20175	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

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
129.91	29.04	42.11	-13.07	43.5	-14.46	116	102	QP
359.8	39.16	48.89	-9.73	46	-6.84	232	244	QP
576.11	39.6	43.12	-3.52	46	-6.4	187	303	QP
719.67	42.42	43.35	-0.93	46	-3.58	118	190	QP
849.65	38.62	37.19	1.43	46	-7.38	153	252	QP
935.98	37.2	34.2	3	46	-8.8	172	322	QP
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
83.35	34.74	52.58	-17.84	40	-5.26	173	48	QP
359.8	34.3	44.03	-9.73	46	-11.7	118	93	QP
504.33	41.63	47.17	-5.54	46	-4.37	143	206	QP
576.11	42.68	46.2	-3.52	46	-3.32	162	255	QP
792.42	37.97	37.56	0.41	46	-8.03	109	187	QP
935.98	37.99	34.99	3	46	-8.01	136	241	QP

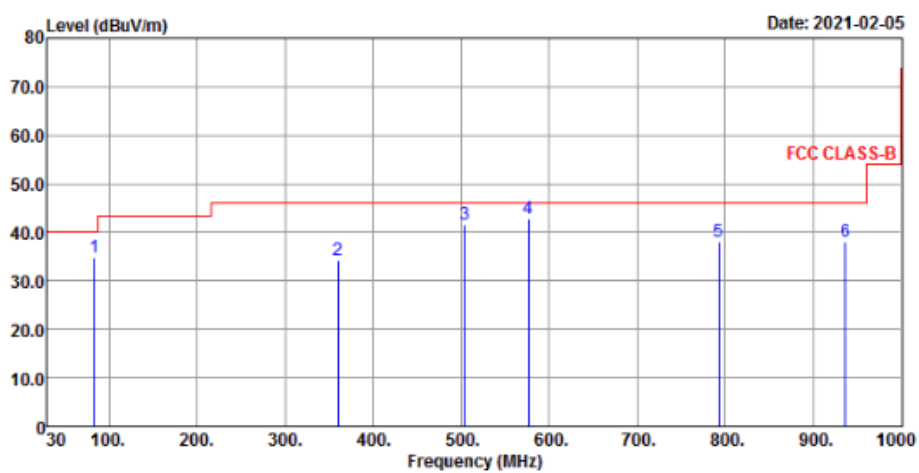
Remarks:

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

Horizontal



Vertical



BT EDR + LTE Band 4

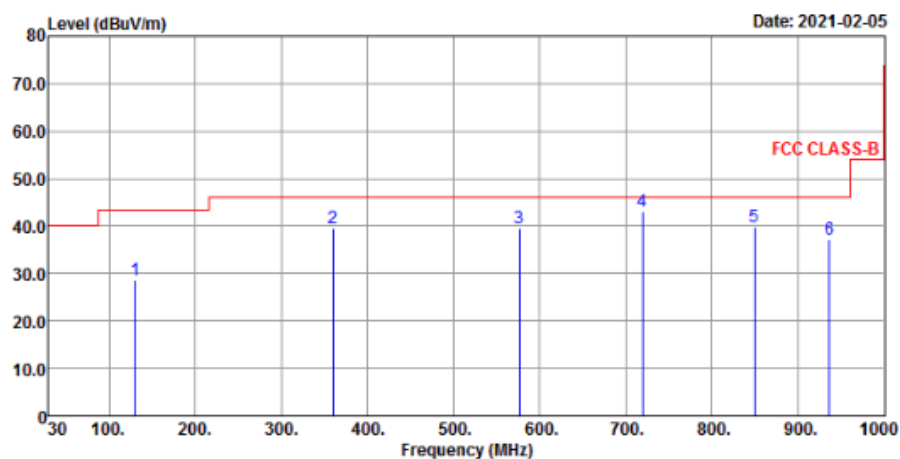
EUT Test Condition		Measurement Detail	
Channel	Channel 78 + Channel 20175	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

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
129.91	28.59	41.66	-13.07	43.5	-14.91	105	111	QP
359.8	39.68	49.41	-9.73	46	-6.32	166	83	QP
576.11	39.53	43.05	-3.52	46	-6.47	197	155	QP
719.67	43.19	44.12	-0.93	46	-2.81	173	322	QP
849.65	39.94	38.51	1.43	46	-6.06	144	202	QP
935.98	37.29	34.29	3	46	-8.71	173	271	QP
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
84.32	34.47	52.4	-17.93	40	-5.53	107	212	QP
504.33	42.45	47.99	-5.54	46	-3.55	191	196	QP
576.11	42.83	46.35	-3.52	46	-3.17	119	74	QP
719.67	36.08	37.01	-0.93	46	-9.92	101	322	QP
849.65	35.05	33.62	1.43	46	-10.95	193	88	QP
935.98	38.95	35.95	3	46	-7.05	172	216	QP

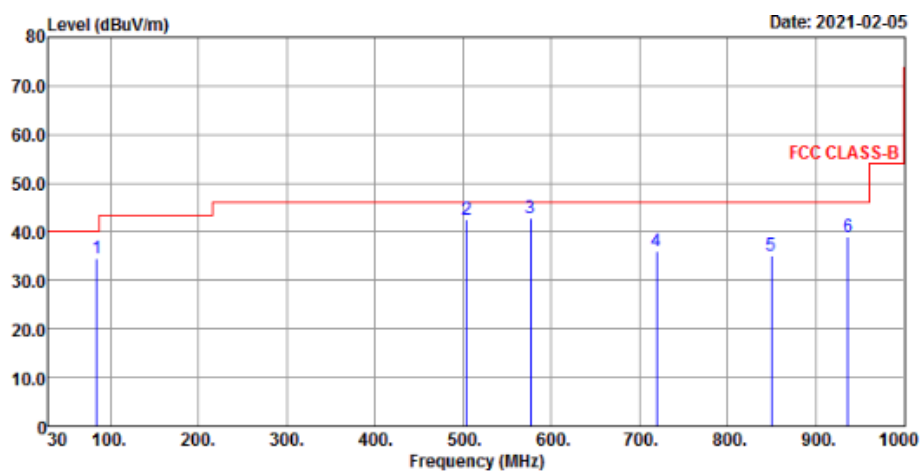
Remarks:

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

Horizontal



Vertical



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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Email: service.adt@tw.bureauveritas.com

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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