FCC Co-Location Test Report

FCC ID	:	**MXF-L1000**
Equipment	:	**Luma Home**
Model No.	:	**WRTQ-329ACN**
Brand Name	:	**Gemtek**
Applicant	:	**Gemtek Technology Co., Ltd.**
Address	:	**No. 15-1 Zhonghua Road, Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, 30352.**
Standard	:	**47 CFR FCC Part 15.247** **47 CFR FCC Part 15.407**
Received Date	:	**Mar. 18, 2016**
Tested Date	:	**Apr. 08, 2016**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Approved & Reviewed by:

Gary Chang / Manager

Testing Laboratory
2732

Table of Contents

1 GENERAL DESCRIPTION 5

1.1 Information 5
1.2 The Equipment List 6
1.3 Test Standards 7
1.4 Measurement Uncertainty 7

2 TEST CONFIGURATION 8

2.1 Testing Condition 8
2.2 The Worst Test Modes and Channel Details 8

3 TRANSMITTER TEST RESULTS 9

3.1 Unwanted Emissions into Restricted Frequency Bands 9

4 TEST LABORATORY INFORMATION 19

Release Record

Report No.	Version	Description	Issued Date
FR632301CO	Rev. 01	Initial issue	May 31, 2016

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.407(b) 15.209	Radiated Emissions	[dBuV/m at 3m]: 59.42MHz 37.95 (Margin -2.05dB) – QP	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

WLAN	
Operating Frequency	802.11b/g/n: 2412 MHz ~ 2462 MHz 802.11a/n/ac: 5180 MHz ~ 5240 MHz; 5745 MHz ~ 5825 MHz
Modulation Type	802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n/ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
BT	
Operating Frequency	2402 MHz ~ 2480 MHz
Modulation Type	Bluetooth 4.0 LE: GFSK Bluetooth BR(1Mbps): GFSK Bluetooth EDR (2Mbps): π/4-DQPSK Bluetooth EDR (3Mbps): 8-DPSK

1.1.2 Antenna Details

For WLAN

Ant. No.	Type	Operating Frequency (MHz) / Gain (dBi)			Connector
		2400~2483.5	5150~5250	5725~5850	
1	PIFA	3	4.5	5.5	IPEX

For BT

Ant. No.	Type	Gain (dBi)	Connector	Remark
1	Dipole	3.5	IPEX	---

1.1.3 Accessories

Accessories		
No.	**Equipment**	**Description**
1	Adapter	Brand: Luma Model: LWONCA-US1215 I/P: 100-240Vac, 50-60Hz, 0.5A Max O/P: 12Vdc, 1.5A Power line: 1.55m non-shielded without core
2	RJ45 cable	Brand: EKSON Model: ZP01-C254 1m non-shielded w/o core
3	RJ45 cable	Brand: Ricolink Model: 21A16030101 1m non-shielded w/o core

1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Apr. 08, 2016				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Dec. 13, 2015	Dec. 12, 2016
Receiver	R&S	ESR3	101658	Nov. 04, 2015	Nov. 03, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 20, 2015	Aug. 19, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 16, 2015	Dec. 15, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Loop Antenna	R&S	HFH2-Z2	11900	Nov. 16, 2015	Nov. 15, 2016
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 10, 2015	Dec. 09, 2016
Preamplifier	Burgeon	BPA-530	SN:100219	Sep. 10, 2015	Sep. 09, 2016
Preamplifier	Agilent	83017A	MY39501308	Oct. 02, 2015	Oct. 01, 2016
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 10, 2015	Dec. 09, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.3 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247
47 CFR FCC Part 15.407
ANSI C63.10-2013
FCC KDB 558074 D01 DTS Meas Guidance v03r05
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r02
FCC KDB 644545 D03 Guidance for IEEE 802 11ac New Rules v01
FCC KDB 412172 D01 Determining ERP and EIRP v01r01

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty	
Parameters	**Uncertainty**
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.63 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH01-WS	22-24°C / 61-67%	Vincent Yeh Aska Huang

- FCC site registration No.: 181692
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Test Configuration
Radiated Emissions	2.4G 11g + BLE	CH6 + CH19	6Mbps + 1Mbps	1
	5G 11ac VHT20 + BLE	CH157 + CH19	MCS 0 + 1Mbps	2

NOTE:

1. The device supports simultaneous transmission as below configurations.
   1) Test Configuration 1: Wi-Fi 2.4GHz and Bluetooth
   2) Test Configuration 2: Wi-Fi 5GHz and Bluetooth
2. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The X-plane of configuration1 and **Y-plane** of configuration 2 results were found as the worst case and were shown in this report.
3. 2 RJ45 cables, EKSON and Ricolink, had been pretested and found that **EKSON** was the worst case and was selected for final testing.
4. The selected channel is the maximum power channel of Wi-Fi and BT mode

3 Transmitter Test Results

3.1 Unwanted Emissions into Restricted Frequency Bands

3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.2 Test Procedures

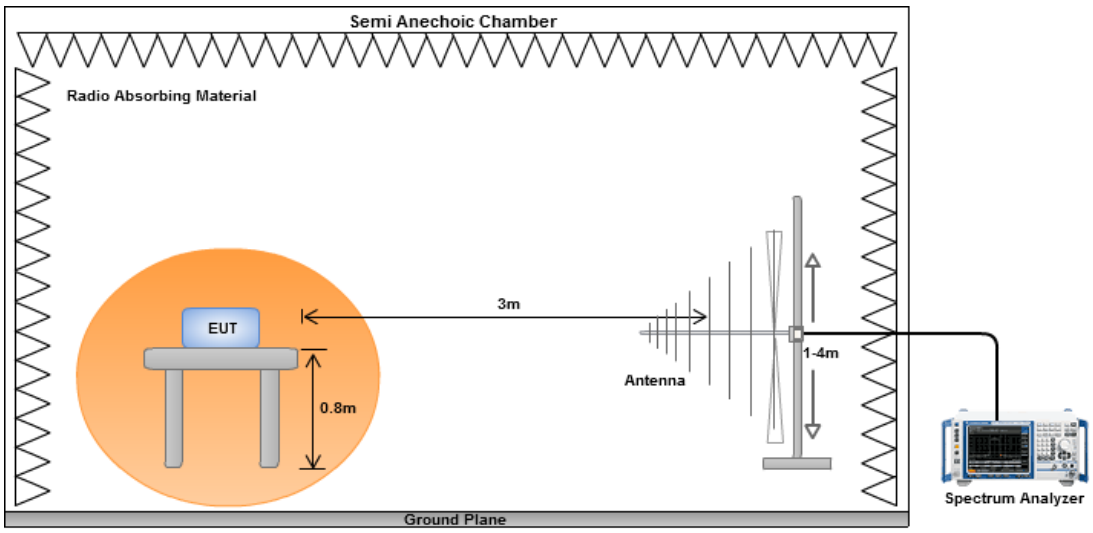
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

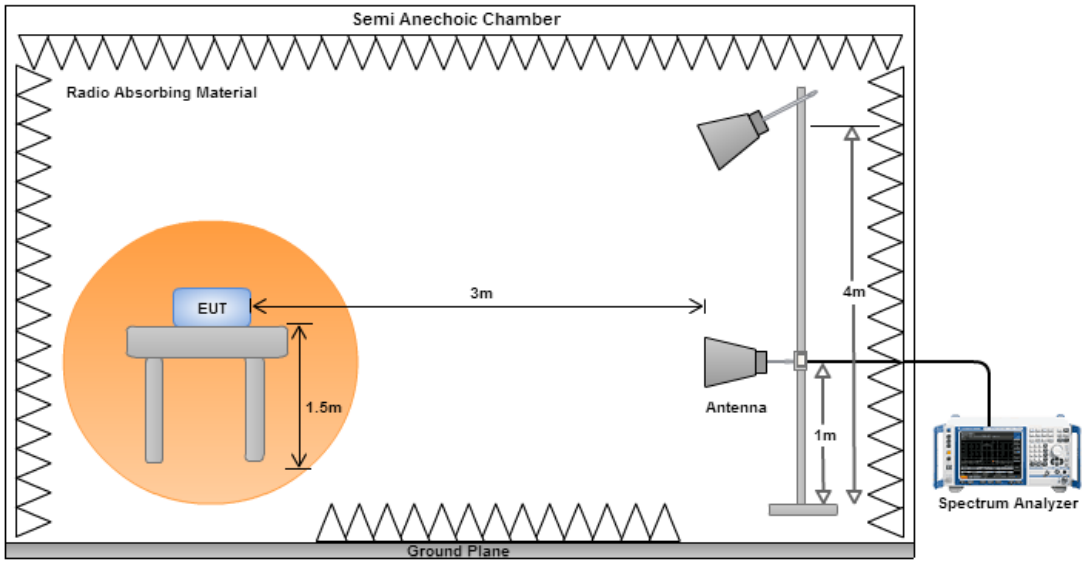
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.1.3 Test Setup

Radiated Emissions below 1 GHz

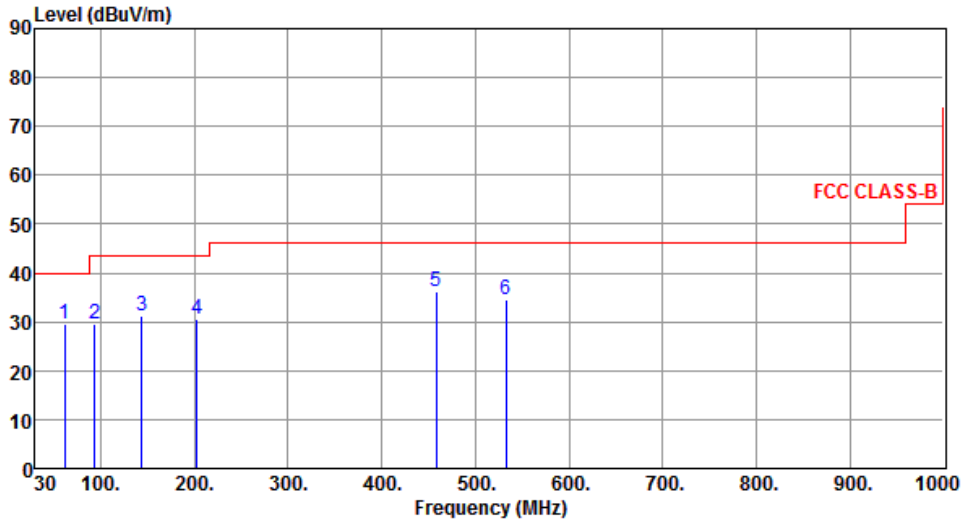


Radiated Emissions above 1 GHz



3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

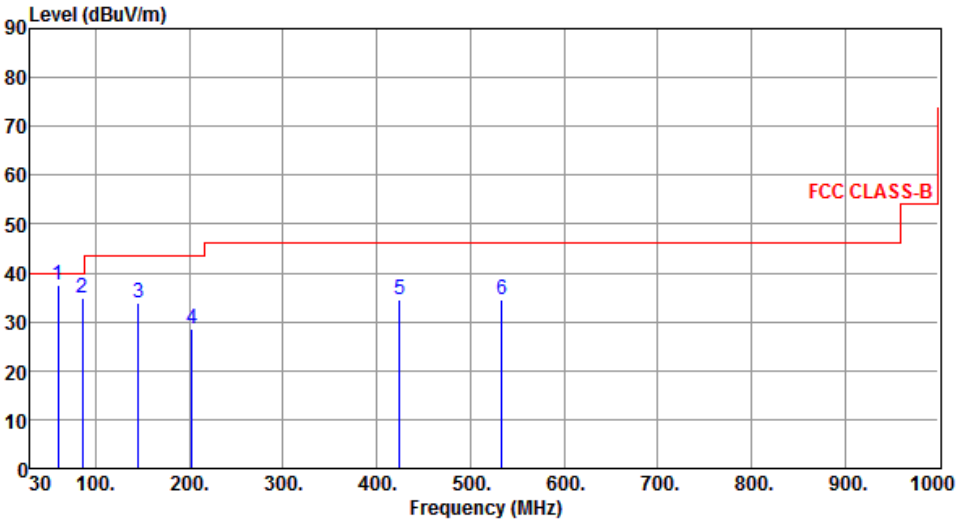
Modulation	2.4G 11g + BLE	**Test Freq. (MHz)**	CH6 + CH19
Polarization	Horizontal	**Test Configuration**	1



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	61.36	29.65	40.00	-10.35	47.40	-17.75	Peak	---	---
2	93.43	29.54	43.50	-13.96	51.96	-22.42	Peak	---	---
3	143.48	31.24	43.50	-12.26	48.12	-16.88	Peak	---	---
4	202.46	30.68	43.50	-12.82	49.97	-19.29	Peak	---	---
5	458.47	36.12	46.00	-9.88	48.11	-11.99	Peak	---	---
6	533.16	34.68	46.00	-11.32	45.37	-10.69	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

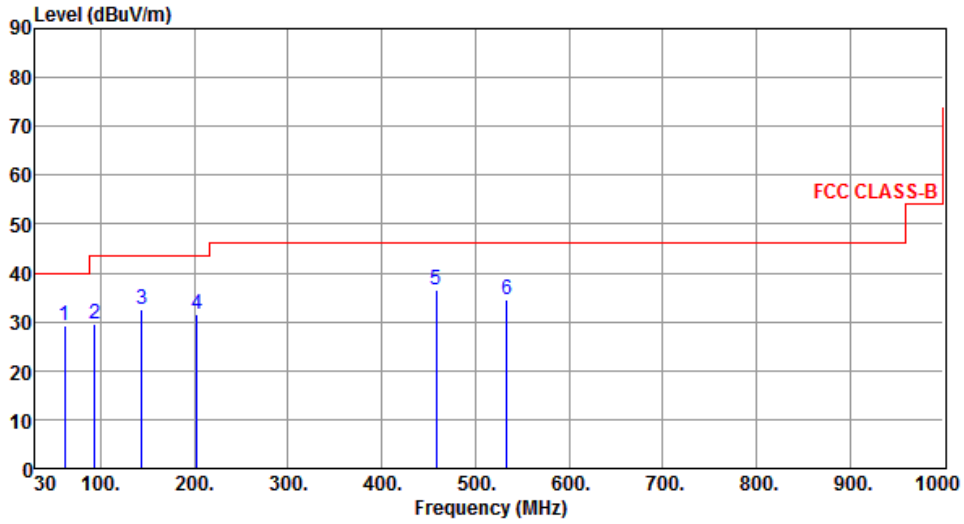
Modulation	2.4G 11g + BLE	Test Freq. (MHz)	CH6 + CH19
Polarization	Vertical	Test Configuration	1



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	59.86	37.45	40.00	-2.55	54.94	-17.49	QP	100	18
2	85.36	34.86	40.00	-5.14	57.04	-22.18	Peak	---	---
3	145.36	33.89	43.50	-9.61	50.73	-16.84	Peak	---	---
4	202.42	28.54	43.50	-14.96	47.83	-19.29	Peak	---	---
5	424.65	34.61	46.00	-11.39	47.42	-12.81	Peak	---	---
6	533.41	34.68	46.00	-11.32	45.37	-10.69	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

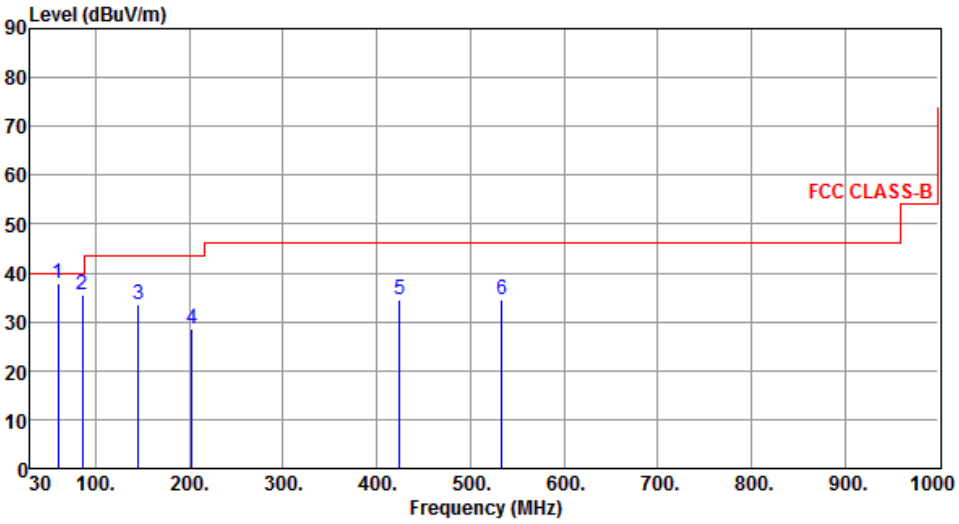
Modulation	5G 11ac VHT20 + BLE	**Test Freq. (MHz)**	CH157 + CH19
Polarization	Horizontal	**Test Configuration**	2



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	61.42	29.28	40.00	-10.72	47.04	-17.76	Peak	---	---
2	93.41	29.65	43.50	-13.85	52.07	-22.42	Peak	---	---
3	143.48	32.41	43.50	-11.09	49.29	-16.88	Peak	---	---
4	202.41	31.45	43.50	-12.05	50.74	-19.29	Peak	---	---
5	458.61	36.55	46.00	-9.45	48.54	-11.99	Peak	---	---
6	533.46	34.52	46.00	-11.48	45.21	-10.69	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	5G 11ac VHT20 + BLE	**Test Freq. (MHz)**	CH157 + CH19
Polarization	Vertical	**Test Configuration**	2

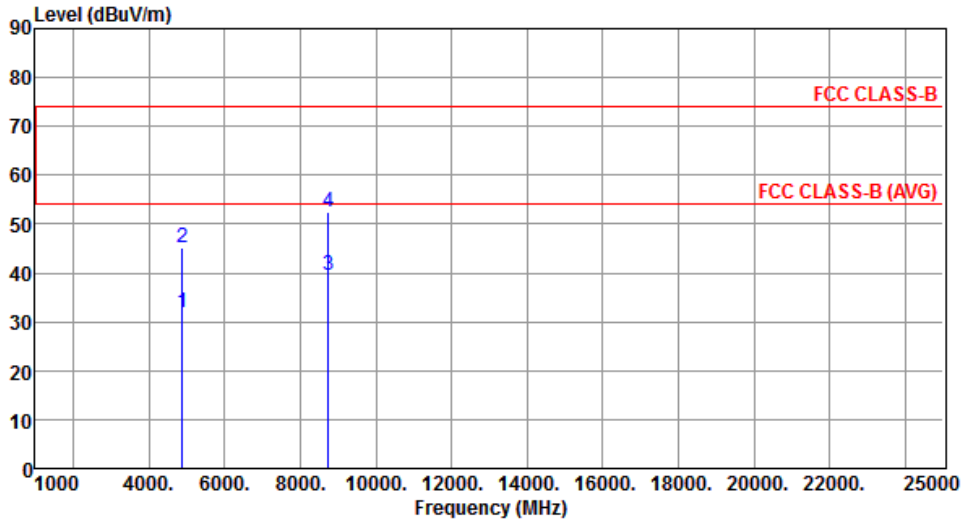


	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	59.42	37.95	40.00	-2.05	55.39	-17.44	QP	100	20
2	85.41	35.45	40.00	-4.55	57.64	-22.19	Peak	---	---
3	145.46	33.51	43.50	-9.99	50.35	-16.84	Peak	---	---
4	202.34	28.46	43.50	-15.04	47.75	-19.29	Peak	---	---
5	424.51	34.53	46.00	-11.47	47.34	-12.81	Peak	---	---
6	533.68	34.50	46.00	-11.50	45.19	-10.69	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

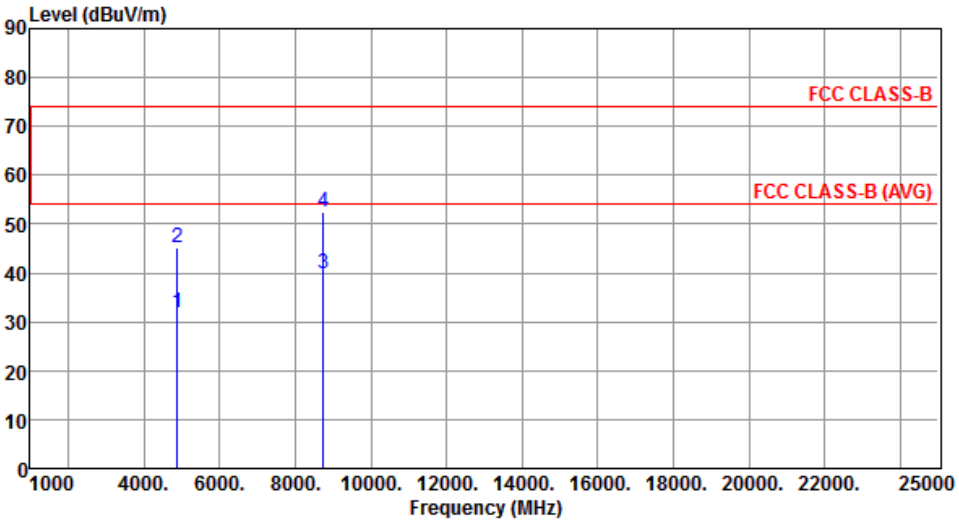
Modulation	2.4G 11g + BLE	**Test Freq. (MHz)**	CH6 + CH19
Polarization	Horizontal	**Test Configuration**	1



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	4877.00	31.84	54.00	-22.16	28.07	3.77	Average	153	248
2	4877.00	45.19	74.00	-28.81	41.42	3.77	Peak	153	248
3	8750.00	39.67	54.00	-14.33	29.25	10.42	Average	168	147
4	8750.00	52.40	74.00	-21.60	41.98	10.42	Peak	168	147

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

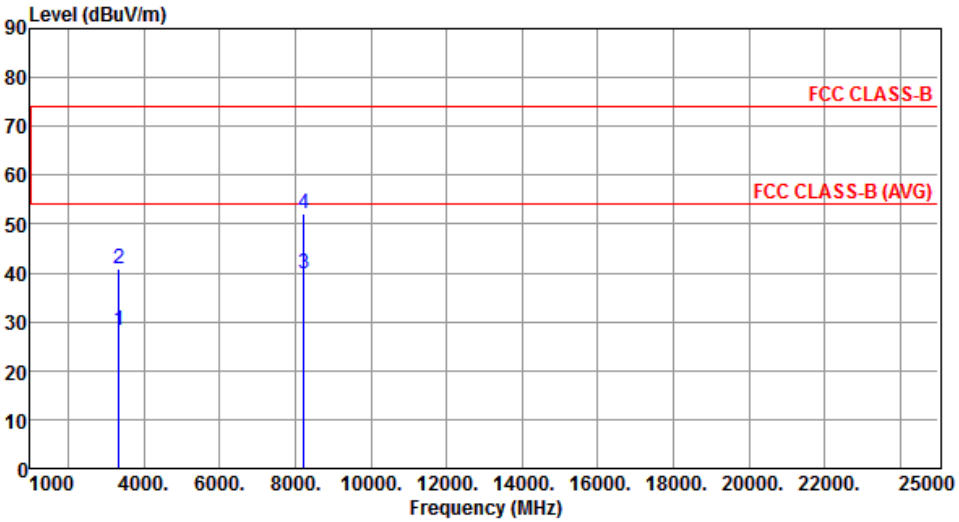
Modulation	2.4G 11g + BLE	**Test Freq. (MHz)**	CH6 + CH19
Polarization	Vertical	**Test Configuration**	1



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	4877.00	31.90	54.00	-22.10	28.13	3.77	Average	156	148
2	4877.00	45.31	74.00	-28.69	41.54	3.77	Peak	156	148
3	8750.00	39.93	54.00	-14.07	29.51	10.42	Average	166	157
4	8750.00	52.57	74.00	-21.43	42.15	10.42	Peak	166	157

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

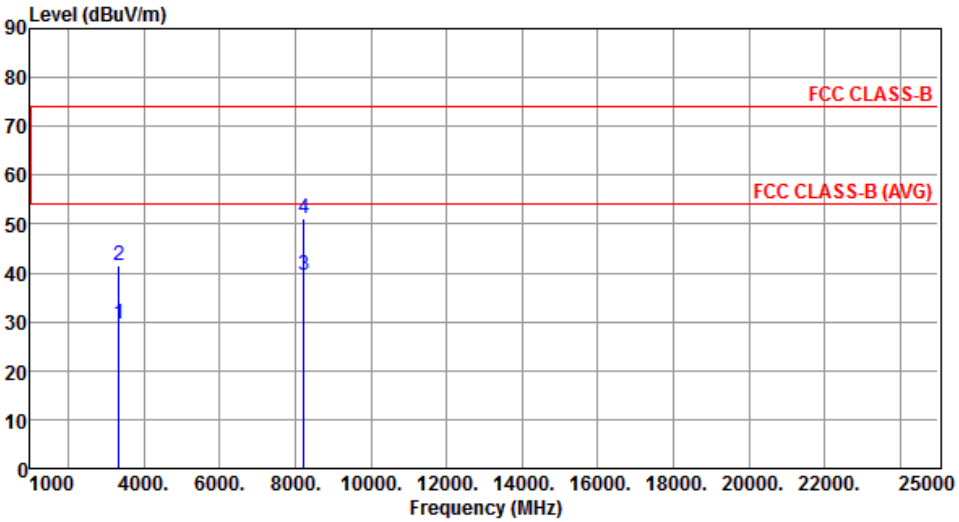
Modulation	5G 11ac VHT20 + BLE	**Test Freq. (MHz)**	CH157 + CH19
Polarization	Horizontal	**Test Configuration**	2



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	3345.00	28.17	54.00	-25.83	28.46	-0.29	Average	182	153
2	3345.00	40.90	74.00	-33.10	41.19	-0.29	Peak	182	153
3	8225.00	39.71	54.00	-14.29	30.07	9.64	Average	155	196
4	8225.00	52.11	74.00	-21.89	42.47	9.64	Peak	155	196

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	5G 11ac VHT20 + BLE	**Test Freq. (MHz)**	CH157 + CH19
Polarization	Vertical	**Test Configuration**	2



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	3345.00	29.48	54.00	-24.52	29.77	-0.29	Average	162	202
2	3345.00	41.63	74.00	-32.37	41.92	-0.29	Peak	162	202
3	8225.00	39.46	54.00	-14.54	29.82	9.64	Average	122	138
4	8225.00	51.15	74.00	-22.85	41.51	9.64	Peak	122	138

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp, it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan Hsiang. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsien 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsien 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

==END==