

FCC Co-Location Test Report

FCC ID : I88EMG3415-B10A
Equipment : Dual-Band Wireless AC/N Gigabit Ethernet Gateway
Model No. : EMG3415-B10A
Brand Name : ZYXEL
Applicant : Zyxel Communications Corporation
Address : No.2 Industry East RD. IX, Hsinchu Science Park, Hsinchu 30075, Taiwan, R.O.C
Standard : 47 CFR FCC Part 15.247
47 CFR FCC Part 15.407
Received Date : Jun. 17, 2016
Tested Date : Sep. 08, 2016 ~ May 10, 2017

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.

Reviewed by:



Along Chen / Assistant Manager

Approved by:



Gary Chang / Manager



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	8
2	TEST CONFIGURATION	9
2.1	Testing Condition	9
2.2	The Worst Test Modes and Channel Details	9
3	TRANSMITTER TEST RESULTS.....	10
3.1	Unwanted Emissions into Restricted Frequency Bands	10
4	TEST LABORATORY INFORMATION	16

Release Record

Report No.	Version	Description	Issued Date
FR651003-02	Rev. 01	Initial issue	Jun. 16, 2017
FR651003-02	Rev. 02	Updated signature	Jul. 07, 2017

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.407(b) 15.209	Radiated Emissions	[dBuV/m at 3m]: 874.87MHz 42.93 (Margin -3.07dB) - PK	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

Operating Frequency	802.11b/g/n: 2412 MHz ~ 2462 MHz 802.11a/n/ac: 5180 MHz ~ 5240 MHz; 5745 ~ 5825 MHz
Modulation Type	802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n/ac: OFDM (BPSK / QPSK / 16QAM / 64QAM/256QAM)

1.1.2 Antenna Details

Model	Type	Connector	Frequencies (MHz) / Antenna Gain (dBi)		
			2400~2483.5	5150~5250	5725~5850
A1	Dipole	UFL	--	-0.54	-0.56
A2	Dipole	UFL	--	-0.54	-0.56
A3	Dipole	UFL	--	-0.54	-0.56
A4	Dipole	UFL	--	-0.54	-0.56
B1	Dipole	UFL	2.9	--	--
B2	Dipole	UFL	1.3	--	--

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter
--------------------------	--------------------

1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber 2 / (03CH02-WS)				
Tested Date	Sep. 08, 2016				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101499	Dec. 17, 2015	Dec. 16, 2016
Receiver	R&S	ESR3	101657	Jan. 12, 2016	Jan. 11, 2017
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-523	Nov. 09, 2015	Nov. 08, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1095	Oct. 07, 2015	Oct. 06, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Loop Antenna	R&S	HFH2-Z2	100330	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	100218	Nov. 03, 2015	Nov. 02, 2016
Preamplifier	Agilent	83017A	MY39501309	Sep. 22, 2015	Sep. 21, 2016
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16140/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16018/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16015/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-003	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	EMCC	CFD400-E	CFD400-001	Dec. 10, 2015	Dec. 09, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA

Note: Calibration Interval of instruments listed above is one year.

Test Item	Radiated Emission				
Test Site	966 chamber 2 / (03CH02-WS)				
Tested Date	May 10, 2017				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101499	Dec. 16, 2016	Dec. 15, 2017
Receiver	R&S	ESR3	101657	Dec. 21, 2016	Dec. 20, 2017
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-523	Nov. 07, 2016	Nov. 06, 2017
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1095	Sep. 21, 2016	Sep. 20, 2017
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Oct. 25, 2016	Oct. 24, 2017
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 10, 2016	Nov. 09, 2017
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 09, 2016	Dec. 08, 2017
Preamplifier	EMC	EMC02325	980194	Sep. 26, 2016	Sep. 25, 2017
Preamplifier	Agilent	83017A	MY39501309	Sep. 29, 2016	Sep. 28, 2017
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16140/4	Dec. 09, 2016	Dec. 08, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16018/4	Dec. 09, 2016	Dec. 08, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16015/4	Dec. 09, 2016	Dec. 08, 2017
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	16051	Dec. 09, 2016	Dec. 08, 2017
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-003	Dec. 09, 2016	Dec. 08, 2017
LF cable 10M	EMCC	CFD400-E	CFD400-001	Dec. 09, 2016	Dec. 08, 2017
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 v04

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04

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 \leq 1GHz	± 3.87 dB
Radiated emission $>$ 1GHz	± 5.60 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH02-WS	26°C / 62% 24°C / 62%	Kevin Lee Vincent Yeh

➤ FCC site registration No.: 181692

➤ IC site registration No.: 10807A-2

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Channel	Data Rate	Test Configuration
Radiated Emissions	2.4G 11n HT20 + 5G 11ac VHT80	CH6 + CH155	MCS0 + MCS0	---
NOTE: The selected channel is the maximum power channel of Wi-Fi 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.

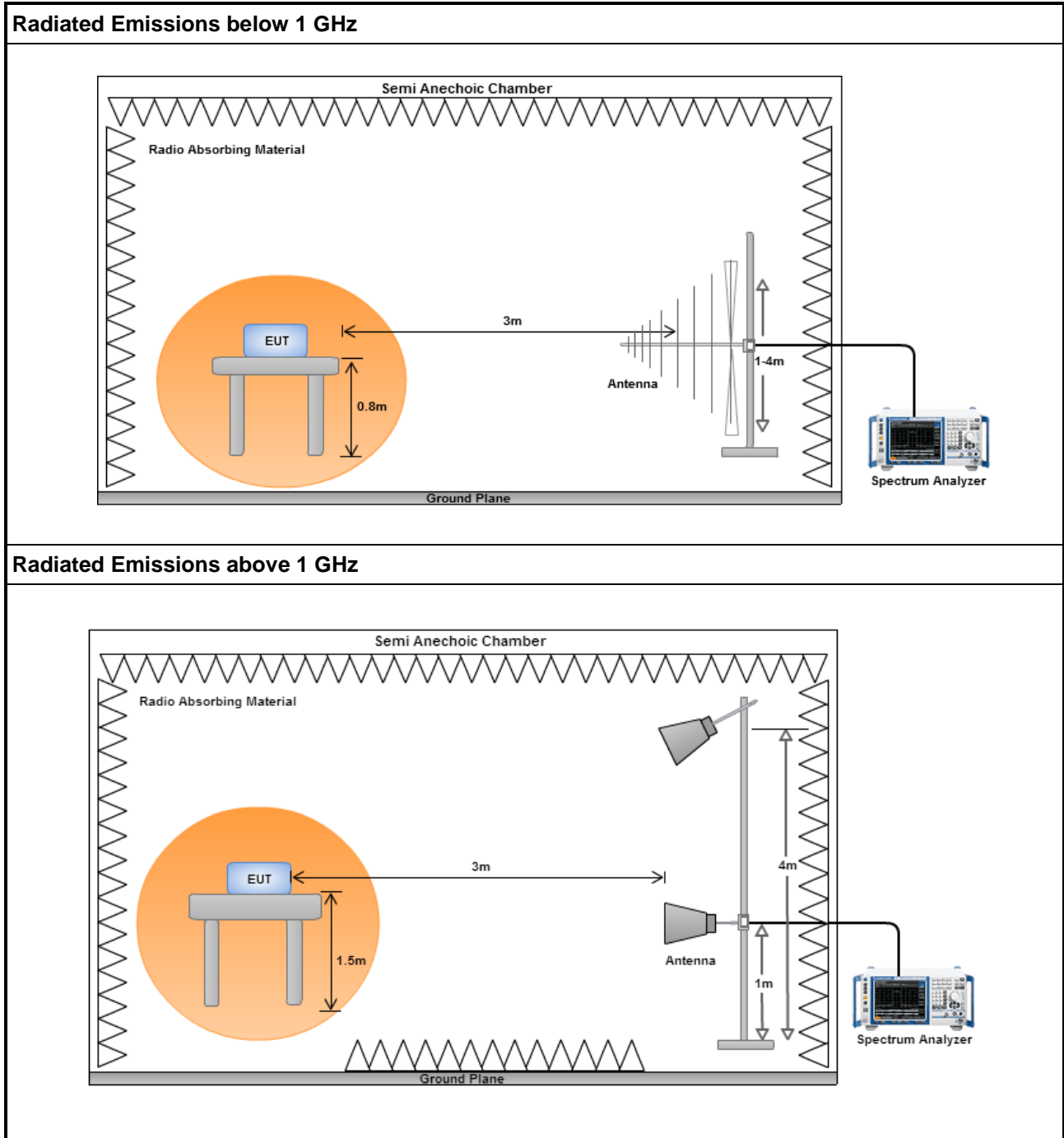
3.1.2 Test Procedures

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:

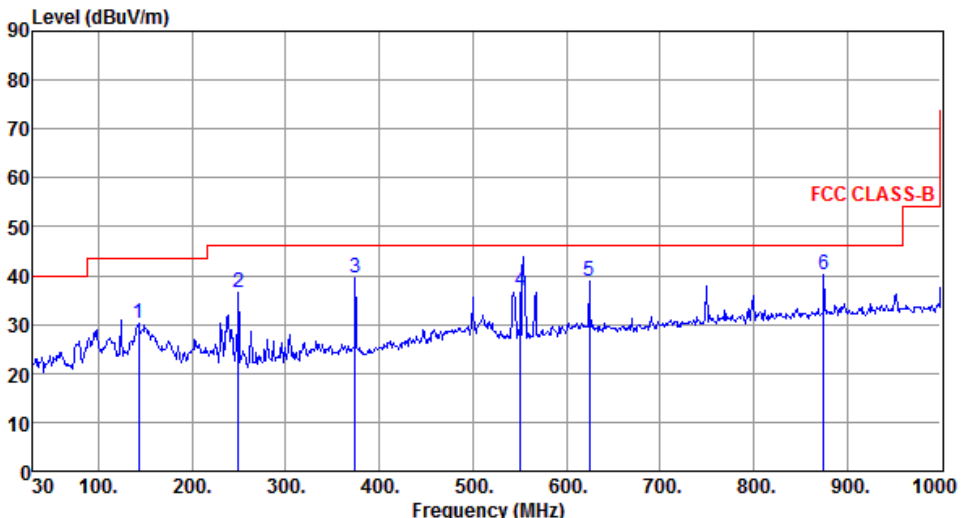
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.1.3 Test Setup



3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

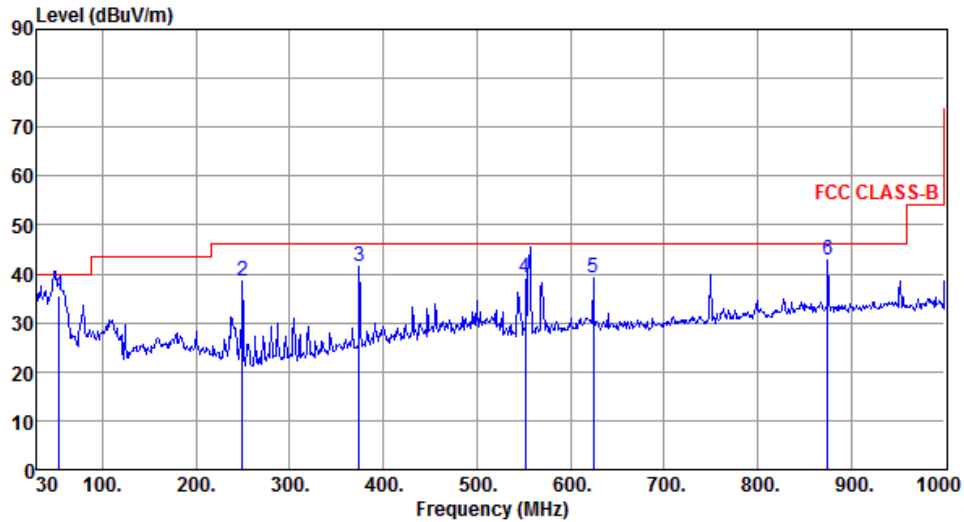
Modulation	2.4G 11n HT20 + 5G 11ac VHT80	Test Channel	CH6 + CH155	
Polarization	Horizontal			



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	142.52	30.15	43.50	-13.35	38.42	-8.27	Peak	---	---
2	249.22	36.41	46.00	-9.59	45.64	-9.23	Peak	---	---
3	374.35	39.58	46.00	-6.42	45.21	-5.63	Peak	---	---
4	551.06	36.77	46.00	-9.23	38.61	-1.84	QP	100	194
5	624.61	38.96	46.00	-7.04	39.31	-0.35	Peak	---	---
6	874.87	40.03	46.00	-5.97	36.25	3.78	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 11n HT20 + 5G 11ac VHT80	Test Channel	CH6 + CH155
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	53.29	35.54	40.00	-4.46	43.61	-8.07	QP	100	31
2	249.22	38.59	46.00	-7.41	47.82	-9.23	Peak	---	---
3	374.35	41.45	46.00	-4.55	47.08	-5.63	Peak	---	---
4	551.39	39.17	46.00	-6.83	41.00	-1.83	QP	100	85
5	624.61	39.08	46.00	-6.92	39.43	-0.35	Peak	---	---
6	874.87	42.93	46.00	-3.07	39.15	3.78	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

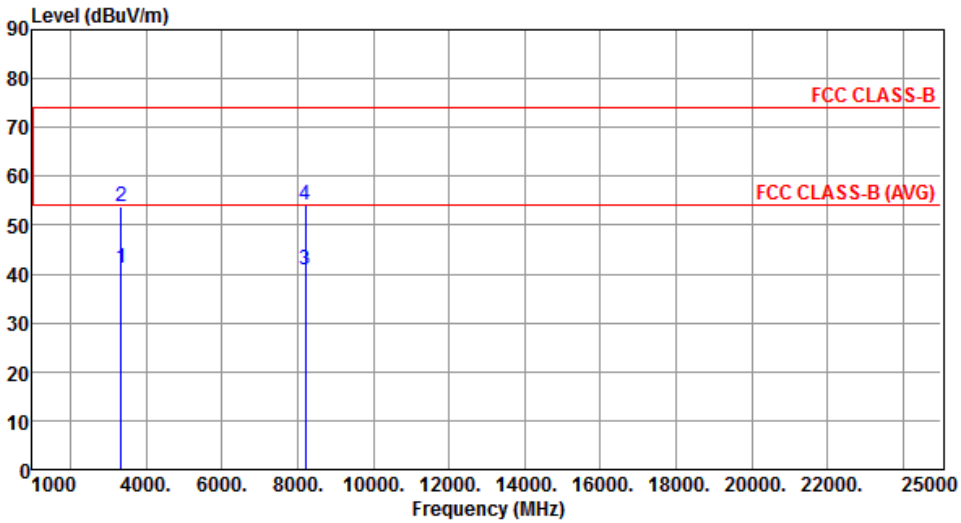
*Factor includes antenna factor , cable loss and amplifier gain

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 11n HT20 + 5G 11ac VHT80	Test Channel	CH6 + CH155	
Polarization	Horizontal			

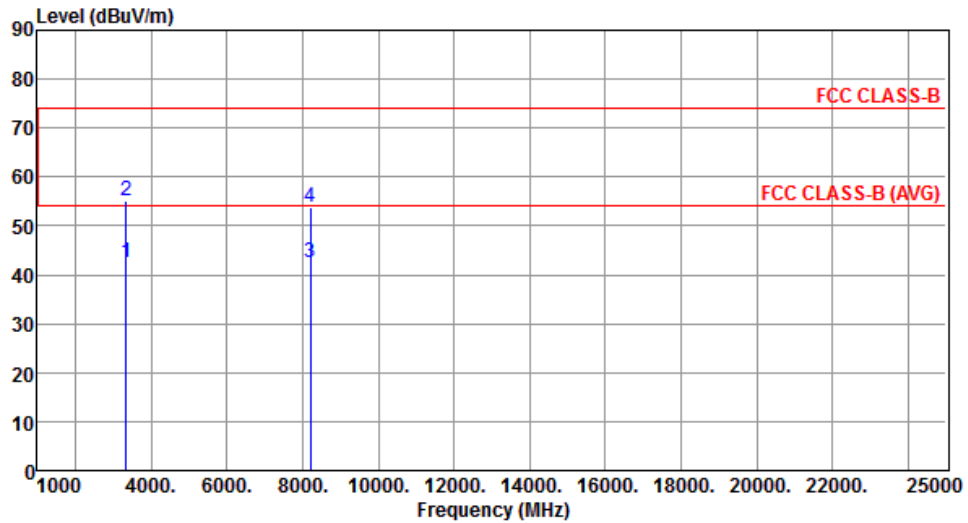


The graph plots Level (dBuV/m) on the y-axis (0 to 90) against Frequency (MHz) on the x-axis (1000 to 25000). Two horizontal red lines represent FCC CLASS-B (at ~75 dBuV/m) and FCC CLASS-B (AVG) (at ~55 dBuV/m). Four vertical blue lines indicate measurement points at 3338 MHz (1, 2) and 8212 MHz (3, 4). The peak values at 3338 MHz are 53.85 dBuV/m (2) and 41.19 dBuV/m (1). The peak values at 8212 MHz are 54.14 dBuV/m (4) and 40.81 dBuV/m (3).

	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	3338.00	41.19	54.00	-12.81	41.43	-0.24	Average	225	284
2	3338.00	53.85	74.00	-20.15	54.09	-0.24	Peak	225	284
3	8212.00	40.81	54.00	-13.19	30.44	10.37	Average	115	294
4	8212.00	54.14	74.00	-19.86	43.77	10.37	Peak	115	294

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 11n HT20 + 5G 11ac VHT80	Test Channel	CH6 + CH155
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	3338.00	42.47	54.00	-11.53	42.71	-0.24	Average	149	275
2	3338.00	55.22	74.00	-18.78	55.46	-0.24	Peak	149	275
3	8212.00	42.62	54.00	-11.38	32.25	10.37	Average	159	182
4	8212.00	53.89	74.00	-20.11	43.52	10.37	Peak	159	182

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 (EMC and Wireless Communication Laboratory), 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 District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin
Kou District, New Taipei City,
Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,
Kwei Shan District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd
St., Kwei Shan District, Tao Yuan
City 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==