

FCC Co-Location Test Report

FCC ID : I88NWA5123-ACHD
Equipment : 802.11ac Wave2 Dual-Radio Unified Access Point
Model No. : NWA5123-AC HD
Multiple Listing : Refer to item 1.1.1 for more details
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. 22, 2017
Tested Date : Jul. 13, 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



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Release Record

Report No.	Version	Description	Issued Date
FR762202CO	Rev. 01	Initial issue	Aug. 28, 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]: 250.00MHz 42.95 (Margin -3.05dB) - QP	Pass

1 General Description

1.1 Information

1.1.1 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name
ZYTEL	NWA5123-AC HD	802.11ac Wave2 Dual-Radio Unified Access Point
	NWA1123-AC HD	802.11ac Wave2 Dual-Radio Access Point
	NAP113	802.11ac Wave2 Dual-Radio Nebula Cloud Managed Access Point
<p>✦ All models are electrically identical, different model names are for marketing purpose.</p> <p>✦ The above models, model NWA5123-AC HD was selected as a representative one for the final test and only its data was recorded in this report.</p>		

1.1.2 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)

1.1.3 Antenna Details

Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)		
		2400~2483.5	5150~5250	5725~5850
PIFA	I-PEX	3	---	---
PIFA	I-PEX	3	---	---
Monopole	I-PEX	---	4	4
Monopole	I-PEX	---	4	4
Monopole	I-PEX	---	4	4

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	From AC adapter: 12Vdc From PoE: 54Vdc
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1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber 3 / (03CH03-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	Agilent	N9010A	MY53400091	Sep. 09, 2016	Sep. 08, 2017
Receiver	Agilent	N9038A	MY53290044	Oct. 06, 2016	Oct. 05, 2017
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 28, 2017	Apr. 27, 2018
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 09, 2017	Feb. 08, 2018
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	980187	Sep. 08, 2016	Sep. 07, 2017
Preamplifier	Agilent	83017A	MY53270014	Aug. 22, 2016	Aug. 21, 2017
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Feb. 04, 2017	Feb. 03, 2018
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY22600/4	Feb. 04, 2017	Feb. 03, 2018
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Feb. 04, 2017	Feb. 03, 2018
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Feb. 04, 2017	Feb. 03, 2018
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Feb. 04, 2017	Feb. 03, 2018
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Feb. 04, 2017	Feb. 03, 2018
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	± 3.66 dB
Radiated emission $>$ 1GHz	± 5.37 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH03-WS	25°C / 67%	Aska Huang

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- IC site registration No.: 10807C-1

2.2 The Worst Test Modes and Channel Details

Test item	Test Mode
Radiated Emissions	2.4G 11g CH6 + 5G 11ac VHT40 CH151
NOTE: <ol style="list-style-type: none">1. The selected channel is the maximum power channel of Wi-Fi mode.2. This device can be powered by AC adapter or POE. Each power supply was selected for final testing as below configuration.<ol style="list-style-type: none">1) Test configuration 1: POE mode2) Test configuration 2: Adapter 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:

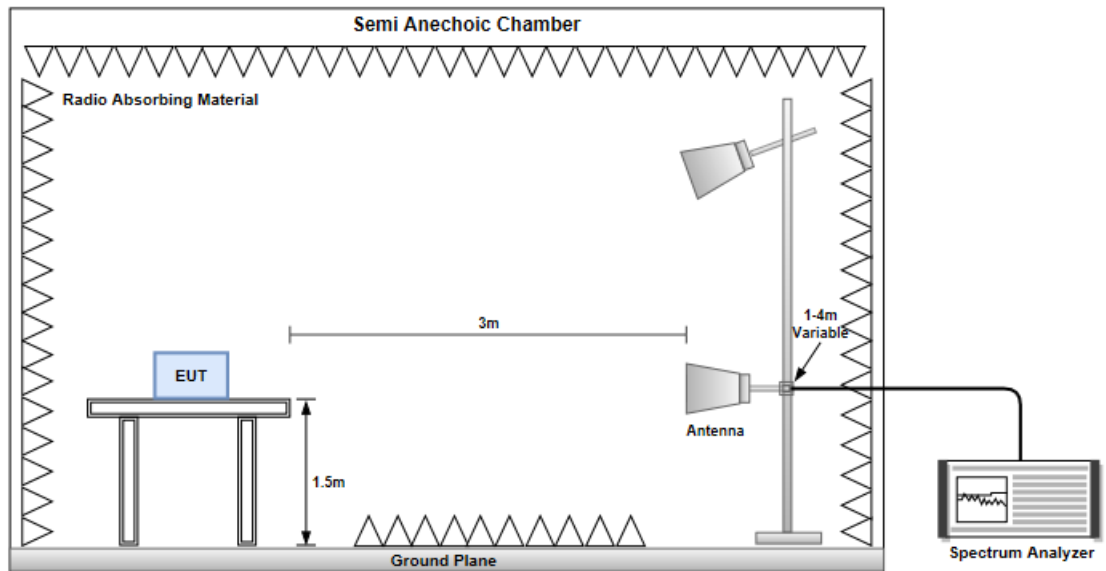
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.1.3 Test Setup

Radiated Emissions below 1 GHz

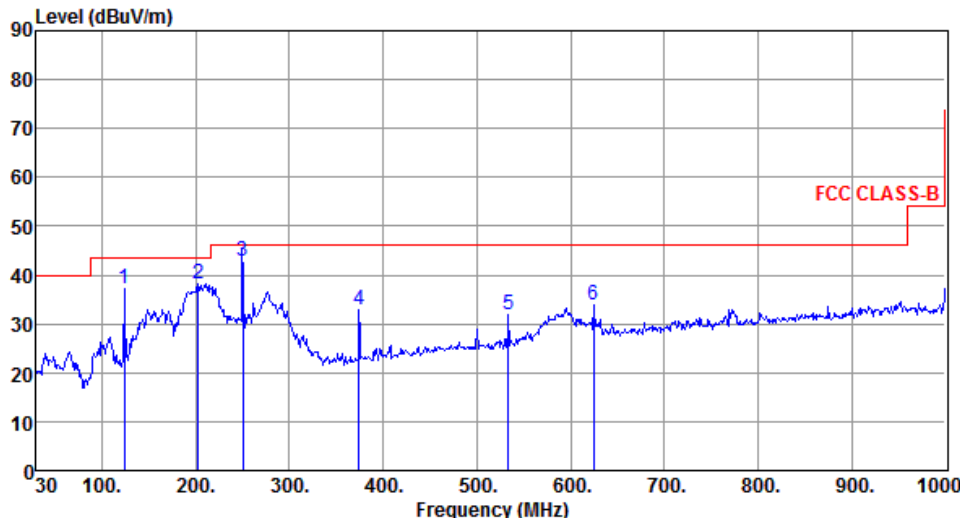


Radiated Emissions above 1 GHz



3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

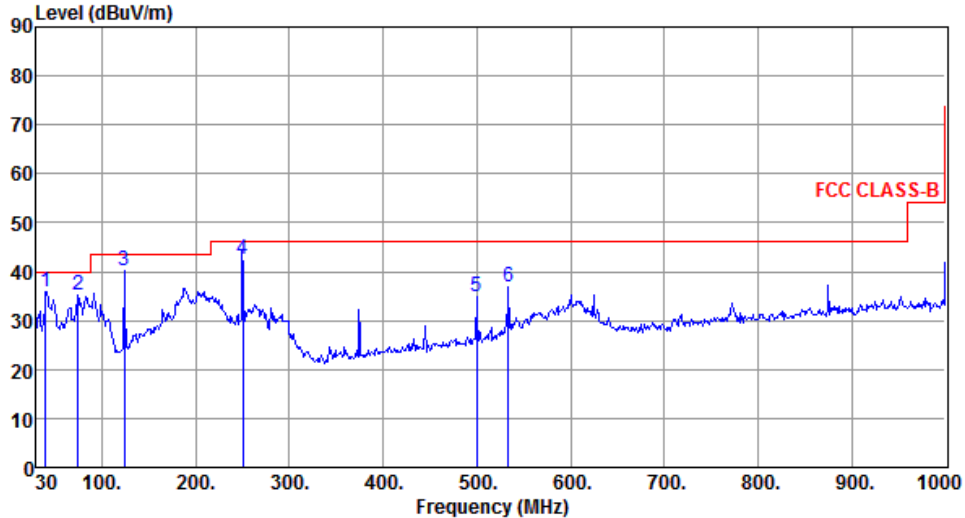
Modulation	2.4G 11g CH6 + 5G 11ac VHT40 CH151								
Polarization	Horizontal			Test Configuration		1			



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	124.09	37.18	43.50	-6.32	47.79	-10.61	Peak	---	---
2	202.66	38.29	43.50	-5.21	49.48	-11.19	Peak	---	---
3	250.00	42.95	46.00	-3.05	52.36	-9.41	QP	100	114
4	374.35	32.98	46.00	-13.02	38.96	-5.98	Peak	---	---
5	533.43	31.76	46.00	-14.24	34.32	-2.56	Peak	---	---
6	624.61	33.75	46.00	-12.25	34.37	-0.62	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.

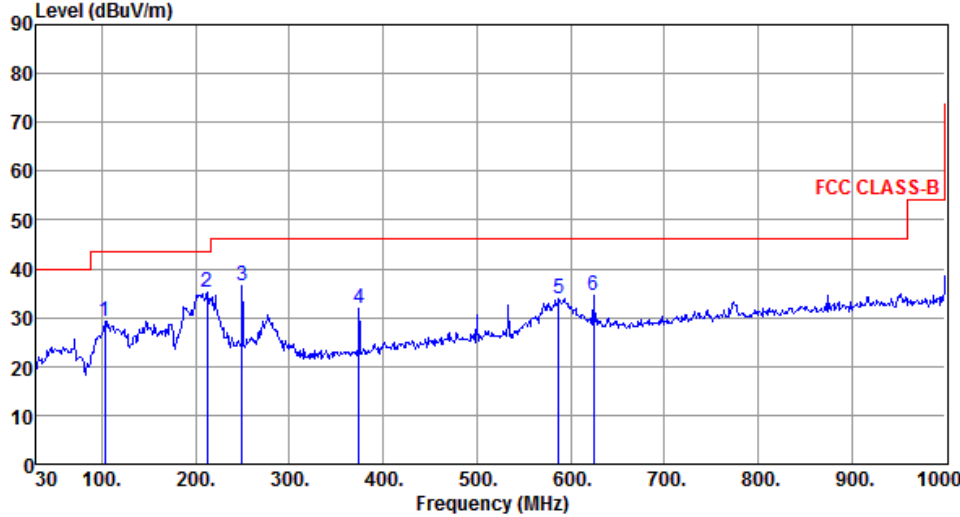
Modulation	2.4G 11g CH6 + 5G 11ac VHT40 CH151								
Polarization	Vertical				Test Configuration	1			



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	39.70	35.96	40.00	-4.04	44.70	-8.74	Peak	---	---
2	74.62	35.17	40.00	-4.83	47.09	-11.92	Peak	---	---
3	124.09	40.09	43.50	-3.41	50.70	-10.61	Peak	---	---
4	250.00	42.61	46.00	-3.39	52.02	-9.41	QP	100	2
5	499.48	34.99	46.00	-11.01	38.24	-3.25	Peak	---	---
6	533.43	37.01	46.00	-8.99	39.57	-2.56	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.

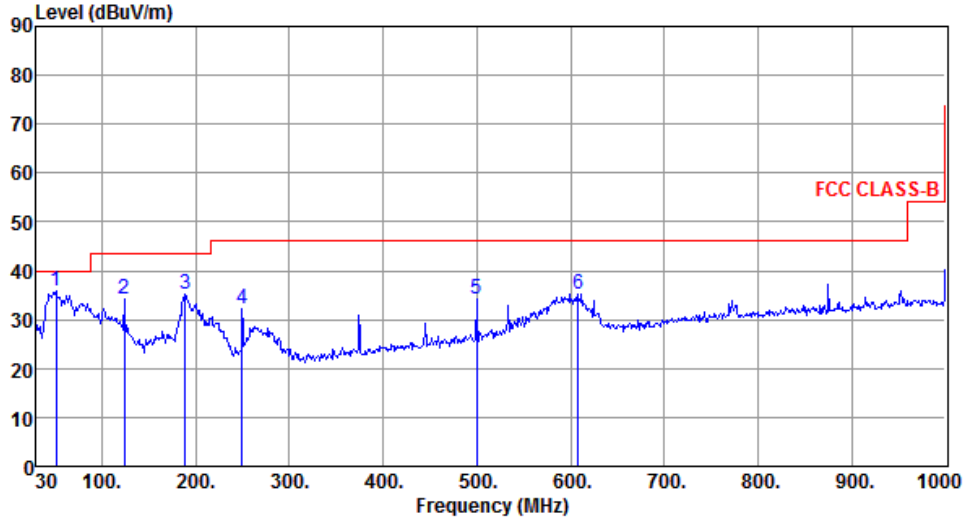
Modulation	2.4G 11g CH6 + 5G 11ac VHT40 CH151							
Polarization	Horizontal	Test Configuration		2				



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	102.75	29.22	43.50	-14.28	42.29	-13.07	Peak	---	---
2	212.36	35.31	43.50	-8.19	46.39	-11.08	Peak	---	---
3	249.22	36.39	46.00	-9.61	45.82	-9.43	Peak	---	---
4	374.35	31.81	46.00	-14.19	37.79	-5.98	Peak	---	---
5	587.75	33.83	46.00	-12.17	35.07	-1.24	Peak	---	---
6	624.61	34.61	46.00	-11.39	35.23	-0.62	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 CH6 + 5G 11ac VHT40 CH151							
Polarization	Vertical	Test Configuration		2				

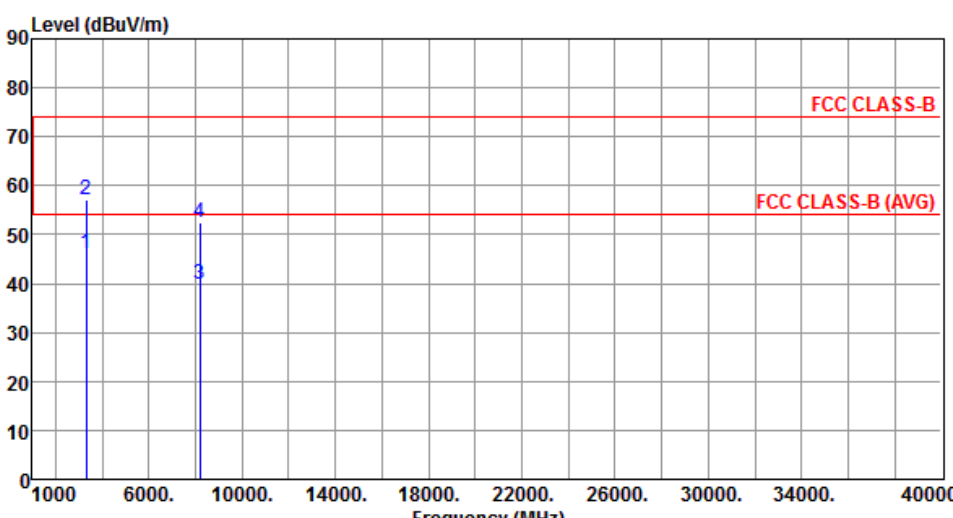


	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	51.34	35.89	40.00	-4.11	44.13	-8.24	Peak	---	---
2	124.09	34.12	43.50	-9.38	44.73	-10.61	Peak	---	---
3	189.08	35.14	43.50	-8.36	45.90	-10.76	Peak	---	---
4	249.22	32.26	46.00	-13.74	41.69	-9.43	Peak	---	---
5	499.48	34.16	46.00	-11.84	37.41	-3.25	Peak	---	---
6	608.12	35.30	46.00	-10.70	36.13	-0.83	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.

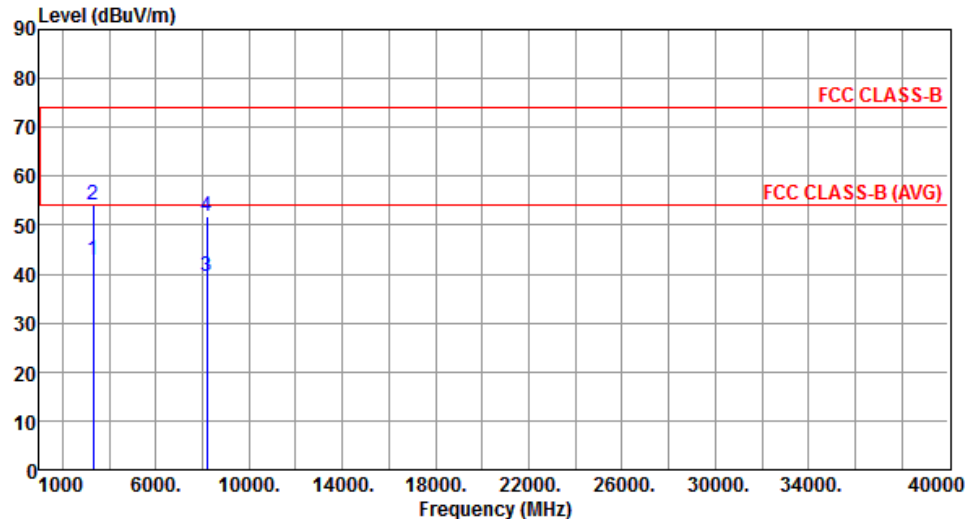
3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	2.4G 11g CH6 + 5G 11ac VHT40 CH151								
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	3318.00	46.09	54.00	-7.91	45.47	0.62	Average	117	304
2	3318.00	57.03	74.00	-16.97	56.41	0.62	Peak	117	304
3	8192.00	39.69	54.00	-14.31	29.54	10.15	Average	100	212
4	8192.00	52.41	74.00	-21.59	42.26	10.15	Peak	100	212

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 CH6 + 5G 11ac VHT40 CH151																																																										
Polarization	Vertical				Test Configuration		1																																																				
<div><div><div>Level (dBuV/m)</div><div></div><div>Frequency (MHz)</div></div><table><thead><tr><th></th><th>Freq. MHz</th><th>Emission level dBuV/m</th><th>Limit dBuV/m</th><th>Margin dB</th><th>SA reading dBuV</th><th>Factor dB</th><th>Remark</th><th>ANT High cm</th><th>Turn Table deg</th></tr></thead><tbody><tr><td>1</td><td>3318.00</td><td>42.73</td><td>54.00</td><td>-11.27</td><td>42.11</td><td>0.62</td><td>Average</td><td>248</td><td>0</td></tr><tr><td>2</td><td>3318.00</td><td>54.01</td><td>74.00</td><td>-19.99</td><td>53.39</td><td>0.62</td><td>Peak</td><td>248</td><td>0</td></tr><tr><td>3</td><td>8192.00</td><td>39.48</td><td>54.00</td><td>-14.52</td><td>29.33</td><td>10.15</td><td>Average</td><td>100</td><td>162</td></tr><tr><td>4</td><td>8192.00</td><td>51.96</td><td>74.00</td><td>-22.04</td><td>41.81</td><td>10.15</td><td>Peak</td><td>100</td><td>162</td></tr></tbody></table></div>											Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg	1	3318.00	42.73	54.00	-11.27	42.11	0.62	Average	248	0	2	3318.00	54.01	74.00	-19.99	53.39	0.62	Peak	248	0	3	8192.00	39.48	54.00	-14.52	29.33	10.15	Average	100	162	4	8192.00	51.96	74.00	-22.04	41.81	10.15	Peak	100	162
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg																																																		
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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

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