

FCC Co-Location Test Report

FCC ID : I8811AXAP2246E
Equipment : 802.11ax (WiFi 6E) Triple-Radio Unified Pro
Access Point
Model No. : WAX640S-6E
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 : May 10, 2022
Tested Date : Jun. 08 ~ Jun. 11, 2022

We, International Certification Corporation, 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 shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

Approved by:



Along Chen / Assistant Manager



Gary Chang / Manager

Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	The Equipment List	7
1.3	Test Standards	8
1.4	Reference Guidance	8
1.5	Deviation from Test Standard and Measurement Procedure.....	8
1.6	Measurement Uncertainty	8
2	TEST CONFIGURATION	9
2.1	Testing Facility.....	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	12

Appendix A. Unwanted Emissions Into Restricted Frequency Bands

Release Record

Report No.	Version	Description	Issued Date
FR251701	Rev. 01	Initial issue	Aug. 02, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.407(b) 15.209	Radiated Emissions	[dBuV/m at 3m]: 45.52MHz 36.98 (Margin -3.02dB) - QP	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

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/ax: 5180 MHz ~ 5240 MHz; 5260 MHz ~ 5320 MHz; 5500 MHz ~ 5720 MHz, 5745 ~ 5825 MHz 5925 MHz ~ 6425 MHz; 6425 MHz ~ 6525 MHz; 6525 MHz ~ 6875 MHz; 6875 MHz ~ 7125 MHz
Modulation Type	802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n/ac/ax: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)
BT	
Operating Frequency	2402 MHz ~ 2480 MHz
Modulation Type	Bluetooth LE: GFSK

1.1.2 Antenna Details

WiFi

Ant. No.	Brand / Model	Type	Connector	Antenna Gain (dBi)	Remark
1	DNI / P3	PIFA	UFL	1.20	-
2	DNI / P9	PIFA	UFL	1.14	

Ant. No.	Brand / Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)				Remark
				5150~5250	5250~5350	5470~5725	5725~5850	
1	DNI / P4	PIFA	UFL	4.58	5.57	2.90	5.15	Mounted 1: Antenna 1 / 3 Mounted 2: Antenna 2 / 4
2	DNI / P6	PIFA	UFL	5.04	5.51	2.84	5.22	
3	DNI / P11	PIFA	UFL	4.46	6.22	4.97	5.19	
4	DNI / P12	PIFA	UFL	4.69	6.29	5.04	5.20	

Ant. No.	Brand / Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)				Remark
				5925 ~ 6425	6425 ~ 6525	6525 ~ 6875	6875 ~ 7125	
1	DNI / P1	PIFA	UFL	3.01	4.21	3.55	4.02	Mounted 1: Antenna 1 / 2 / 3 / 4 Mounted 2: Antenna 1 / 3 / 5 / 6
2	DNI / P2	PIFA	UFL	3.38	2.56	2.74	3.95	
3	DNI / P5	PIFA	UFL	4.07	3.30	2.51	3.12	
4	DNI / P7	PIFA	UFL	2.54	3.14	1.52	2.04	
5	DNI / P8	PIFA	UFL	3.44	3.27	2.35	3.62	
6	DNI / P10	PIFA	UFL	2.18	1.78	1.48	1.87	

BT

Ant. No.	Brand	Model	Type	Connector	Gain (dBi)
1	DNI	WAX640S-6E-ANT	PIFA	No	3

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter 56Vdc from POE
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Note: The above power supplies are not bundled in market.

1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber3 / (03CH03-WS)				
Tested Date	Jun. 08 ~ Jun. 11, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 15, 2022	Mar. 14, 2023
Spectrum Analyzer	R&S	FSV40	101499	Mar. 08, 2022	Mar. 07, 2023
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jun. 30, 2021	Jun. 29, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Dec. 20, 2021	Dec. 19, 2022
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 11, 2022	Jan. 10, 2023
Preamplifier	EMC	EMC02325	980187	Jul. 26, 2021	Jul. 25, 2022
Preamplifier	Agilent	83017A	MY39501309	Sep. 06, 2021	Sep. 05, 2022
Preamplifier	EMC	EMC184045B	980192	Jul. 14, 2021	Jul. 13, 2022
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 05, 2021	Oct. 04, 2022
LF cable 3M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800 -001	Sep. 24, 2021	Sep. 23, 2022
LF cable 11M	EMC	EMC8D-NM-NM-300 0	131103	Sep. 24, 2021	Sep. 23, 2022
LF cable 1M	EMC	EMC8D-NM-NM-130 00	131104	Sep. 24, 2021	Sep. 23, 2022
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Sep. 24, 2021	Sep. 23, 2022
RF Cable	EMC	EMC104-SM-SM-80 00	181107	Sep. 24, 2021	Sep. 23, 2022
Measurement Software	AUDIX	e3	6.120210g	NA	NA

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

1.3 Test Standards

47 CFR FCC Part 15.247
47 CFR FCC Part 15.407
ANSI C63.10-2013

1.4 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
FCC KDB 412172 D01 Determining ERP and EIRP v01r01
FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

1.5 Deviation from Test Standard and Measurement Procedure

None

1.6 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty	
Parameters	Uncertainty
Unwanted Emission \leq 1GHz	± 3.96 dB
Unwanted Emission $>$ 1GHz	± 4.51 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)
Test Site	03CH03-WS
Address of Test Site	No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 333, Taiwan (R.O.C.)

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISED#: 10807C
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode
Unwanted Emissions	2.4G 11G CH06 + 5G 11ax HE20 CH165 + 6G 11ax HE160 + BLE 2M CH00
NOTE: The selected channel is the maximum power channel of Wi-Fi & Bluetooth 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.

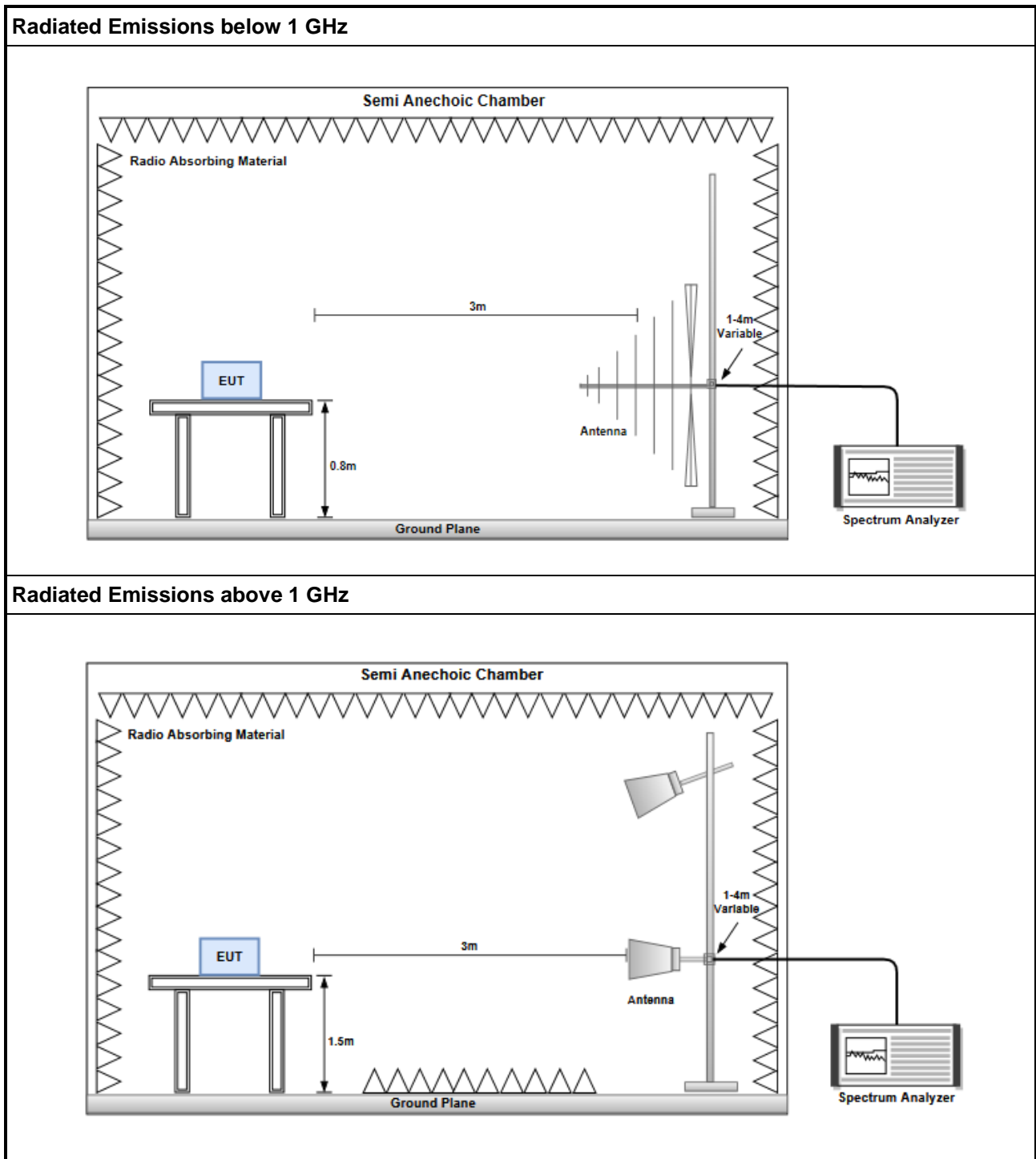
3.1.2 Test Procedures

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 Test Results

Refer to Appendix A.

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 Corporation (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 Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)
No.2-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd
St., Kwei Shan Dist., 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: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

==END==



Adapter mode

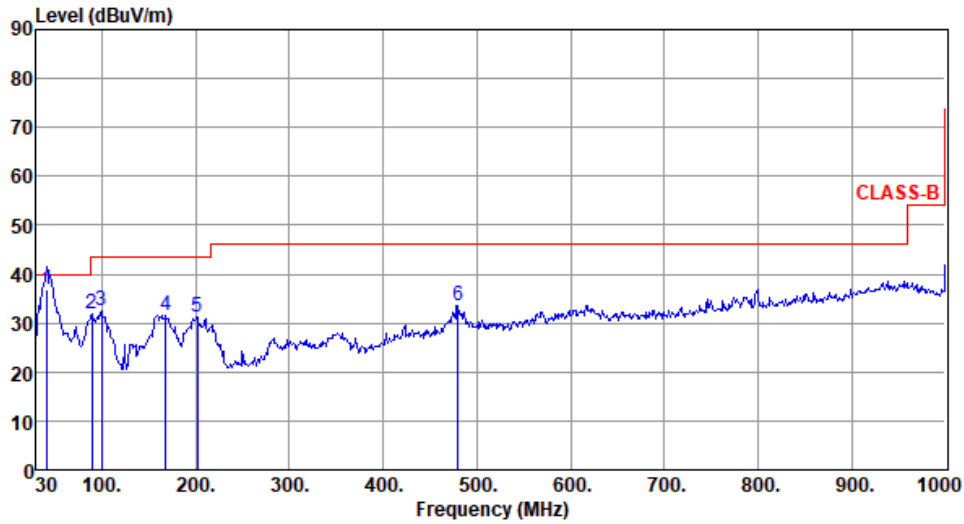
Unwanted Emissions (Below 1GHz)

Modulation	2.4G 11G CH06 + 5G 11ax HE20 CH165 + 6G 11ax HE160 + BLE 2M CH00									
Polarization	Horizontal									
Test By : Akun Chung			Temperature(°C): 23			Humidity(%): 68				
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m			dBuV			cm	deg	
1	41.64	30.17	40.00	-9.83	38.70	-8.53	Peak	---	---	
2	97.90	34.73	43.50	-8.77	48.19	-13.46	Peak	---	---	
3	130.88	34.16	43.50	-9.34	43.58	-9.42	Peak	---	---	
4	139.61	34.90	43.50	-8.60	43.87	-8.97	Peak	---	---	
5	202.66	29.83	43.50	-13.67	41.38	-11.55	Peak	---	---	
6	485.90	38.38	46.00	-7.62	41.12	-2.74	Peak	---	---	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB/m) *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.</p>										



Modulation	2.4G 11G CH06 + 5G 11ax HE20 CH165 + 6G 11ax HE160 + BLE 2M CH00
Polarization	Vertical

Test By :Akun Chung Temperature(°C):23 Humidity(%):68



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	41.64	36.95	40.00	-3.05	45.48	-8.53	QP	100	192
2	89.17	31.98	43.50	-11.52	46.49	-14.51	Peak	---	---
3	99.84	32.55	43.50	-10.95	45.72	-13.17	Peak	---	---
4	167.74	31.52	43.50	-11.98	40.19	-8.67	Peak	---	---
5	201.69	31.27	43.50	-12.23	42.81	-11.54	Peak	---	---
6	480.08	33.59	46.00	-12.41	36.40	-2.81	Peak	---	---

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

*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.



Unwanted Emissions (Above 1GHz)

Modulation	2.4G 11G CH06 + 5G 11ax HE20 CH165 + 6G 11ax HE160 + BLE 2M CH00									
Polarization	Horizontal									
Test By :Akun Chung			Temperature(°C):24			Humidity(%):67				
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	2367.00	47.60	54.00	-6.40	49.07	-1.47	Average	223	344	
2	2367.00	60.59	74.00	-13.41	62.06	-1.47	Peak	223	344	
3	2472.00	48.07	54.00	-5.93	49.68	-1.61	Average	100	359	
4	2472.00	61.30	74.00	-12.70	62.91	-1.61	Peak	100	359	
5	4985.00	36.26	54.00	-17.74	30.42	5.84	Average	100	119	
6	4985.00	49.10	74.00	-24.90	43.26	5.84	Peak	100	119	
7	7505.00	41.05	54.00	-12.95	30.48	10.57	Average	100	133	
8	7505.00	53.85	74.00	-20.15	43.28	10.57	Peak	100	133	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										



Modulation	2.4G 11G CH06 + 5G 11ax HE20 CH165 + 6G 11ax HE160 + BLE 2M CH00									
Polarization	Vertical									
Test By : Akun Chung			Temperature(°C): 24			Humidity(%): 67				
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	2367.00	48.40	54.00	-5.60	49.87	-1.47	Average	222	11	
2	2367.00	60.51	74.00	-13.49	61.98	-1.47	Peak	222	11	
3	2472.00	48.14	54.00	-5.86	49.75	-1.61	Average	100	2	
4	2472.00	61.36	74.00	-12.64	62.97	-1.61	Peak	100	2	
5	4985.00	36.71	54.00	-17.29	30.87	5.84	Average	100	76	
6	4985.00	49.80	74.00	-24.20	43.96	5.84	Peak	100	76	
7	7505.00	41.42	54.00	-12.58	30.85	10.57	Average	100	50	
8	7505.00	54.26	74.00	-19.74	43.69	10.57	Peak	100	50	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										



POE mode

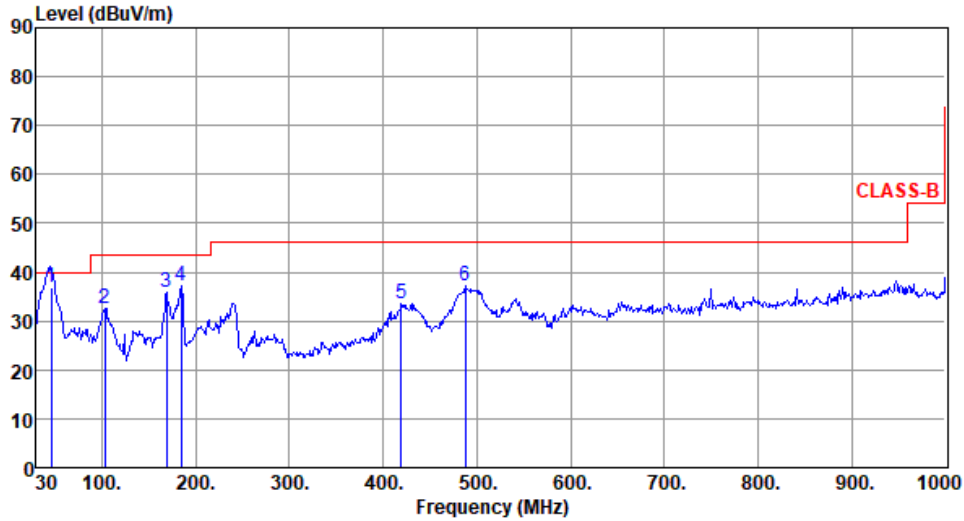
Unwanted Emissions (Below 1GHz)

Modulation	2.4G 11G CH06 + 5G 11ax HE20 CH165 + 6G 11ax HE160 + BLE 2M CH00									
Polarization	Horizontal									
Test By :Akun Chung			Temperature(°C):22			Humidity(%):69				
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m			dBuV			cm	deg	
1	101.78	31.73	43.50	-11.77	44.43	-12.70	Peak	---	---	
2	167.74	38.07	43.50	-5.43	46.74	-8.67	Peak	---	---	
3	184.23	40.31	43.50	-3.19	50.63	-10.32	QP	156	121	
4	240.49	41.80	46.00	-4.20	51.78	-9.98	QP	111	118	
5	423.82	40.52	46.00	-5.48	44.86	-4.34	Peak	---	---	
6	495.60	40.17	46.00	-5.83	42.54	-2.37	QP	155	202	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB/m) *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.</p>										



Modulation	2.4G 11G CH06 + 5G 11ax HE20 CH165 + 6G 11ax HE160 + BLE 2M CH00
Polarization	Vertical

Test By :Akun Chung Temperature(°C):22 Humidity(%):69



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	45.52	36.98	40.00	-3.02	45.40	-8.42	QP	100	15
2	102.75	32.65	43.50	-10.85	45.27	-12.62	Peak	---	---
3	168.71	35.80	43.50	-7.70	44.46	-8.66	Peak	---	---
4	184.23	37.12	43.50	-6.38	47.44	-10.32	Peak	---	---
5	418.97	33.52	46.00	-12.48	38.04	-4.52	Peak	---	---
6	487.84	37.24	46.00	-8.76	39.93	-2.69	Peak	---	---

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

*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.