

FCC Co-Location Test Report

FCC ID : NKR-DHURAZ53
Equipment : 11a/b/g/n/ac 1x1 module
Model No. : DHUR-AZ53
Brand Name : Amazon
Applicant : Wistron NeWeb Corporation
Address : 20 Park Avenue II, Hsinchu Science Park,
Hsinchu 308,Taiwan,R.O.C.
Standard : 47 CFR FCC Part 15.247
47 CFR FCC Part 15.407
Received Date : Dec. 16, 2021
Tested Date : Jan. 27 ~ Feb. 07, 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

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Release Record

Report No.	Version	Description	Issued Date
FR1D1601CO	Rev. 01	Initial issue	Mar. 21, 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]: 348.16MHz 42.79 (Margin -3.21dB) - PK	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 ~ 2472 MHz 802.11a/n/ac: 5180 MHz ~ 5240 MHz; 5260 MHz ~ 5320 MHz; 5500 MHz ~ 5720 MHz; 5745 ~ 5825 MHz
Modulation Type	802.11b: DSSS (DBPSK/DQPSK/CCK) 802.11a/g/n/ac: OFDM (BPSK/QPSK/16QAM/64QAM/256QAM)
Bluetooth	
Operating Frequency	2402 MHz ~ 2480 MHz
Modulation Type	Bluetooth 5.0 LE: GFSK Bluetooth BR(1Mbps): GFSK Bluetooth EDR (2Mbps): $\pi/4$ -DQPSK Bluetooth EDR (3Mbps): 8-DPSK

1.1.2 Antenna Details

WLAN 2.4G

Ant. No.	Brand	Model	Type	Gain (dBi)	Connector	Remark
1	WNC	WF1_ANT	PIFA	3.16	NA	onboard
2	WNC	81.EK615.GAA	PIFA	2.26	IPEX	---
3	WNC	81.EK615.GAF	PIFA	3.09	IPEX	---

WLAN 5G

Ant. No.	Brand	Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)				Remark
					5150~5250	5250~5350	5470~5725	5725~5850	
1	WNC	WF1_ANT	PIFA	NA	2.17	1.71	1.49	1.61	onboard
2	WNC	81.EK615.GAA	PIFA	IPEX	6.34	6.34	6.54	6.93	---
3	WNC	81.EK615.GAF	PIFA	IPEX	4.23	4.23	5.35	4.06	---

BT

Ant. No.	Brand	Model	Type	Gain (dBi)	Connector	Remark
1	WNC	BT_ANT	PIFA	2.79	NA	onboard
2	WNC	81.EK615.GAM	PIFA	4.04	IPEX	---
3	WNC	81.EK615.GAV	PIFA	4.87	IPEX	---
4	WNC	81.EK615.G90	PIFA	0.75	IPEX	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	5Vdc from host
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1.1.4 Accessories

N/A

1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Jan. 27 ~ Feb. 07, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 12, 2021	Mar. 11, 2022
Spectrum Analyzer	R&S	FSV40	101498	Nov. 29, 2021	Nov. 28, 2022
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 1096	Dec. 03, 2021	Dec. 02, 2022
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2021	Nov. 03, 2022
Preamplifier	EMC	EMC02325	980225	Jun. 29, 2021	Jun. 28, 2022
Preamplifier	Agilent	83017A	MY39501308	Sep. 28, 2021	Sep. 27, 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	Woken	CFD400NL-LW	CFD400NL-001	Oct. 05, 2021	Oct. 04, 2022
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 05, 2021	Oct. 04, 2022
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 05, 2021	Oct. 04, 2022
RF Cable	EMC	EMC104-35M-35M- 8000	210920	Oct. 05, 2021	Oct. 04, 2022
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 05, 2021	Oct. 04, 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

ANSI C63.4-2014
FCC KDB 558074 D01 15.247 Meas Guidance v05r02
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
Radiated emission \leq 1GHz	± 3.41 dB
Radiated emission $>$ 1GHz	± 4.59 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	03CH01-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.)

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- ISED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Test Mode
Radiated Emissions	Mode 1: BT LE CH19 onboard + WIFI 2.4G 11b CH11 external antenna Mode 2: BT LE CH19 onboard + WIFI 5G 11a CH149 external antenna Mode 3: WIFI 2.4G 11b CH11 external antenna + BT LE CH19 external antenna Mode 4: WIFI 5G 11a CH149 external antenna + BT LE CH19 external antenna Mode 5: WIFI 2.4G 11b CH11 onboard + BT LE CH19 external antenna Mode 6: WIFI 5G 11a CH149 onboard + BT LE CH19 external antenna
NOTE:	
1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report. 2. The selected channels are the maximum power channel of Wi-Fi & 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.

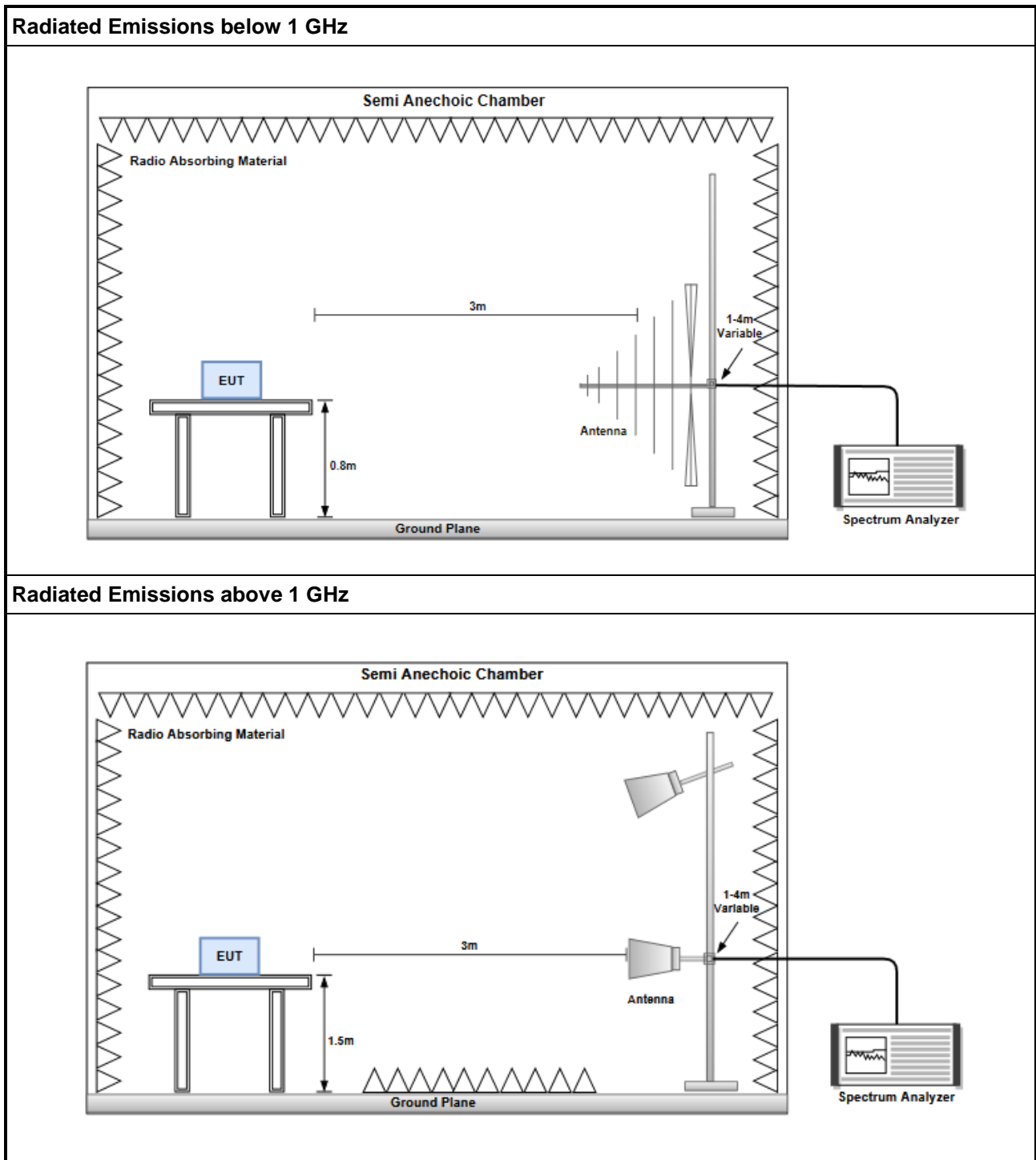
3.1.2 Test Procedures

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.

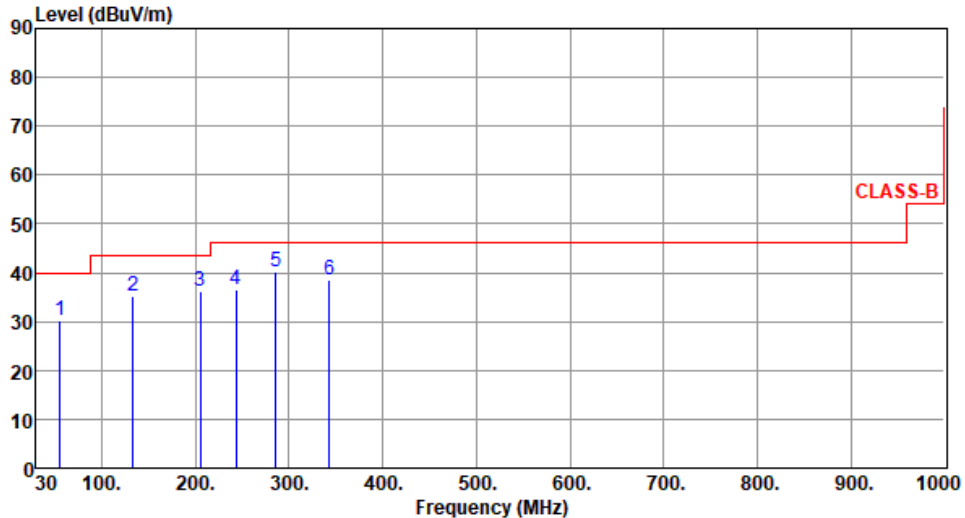
Note:

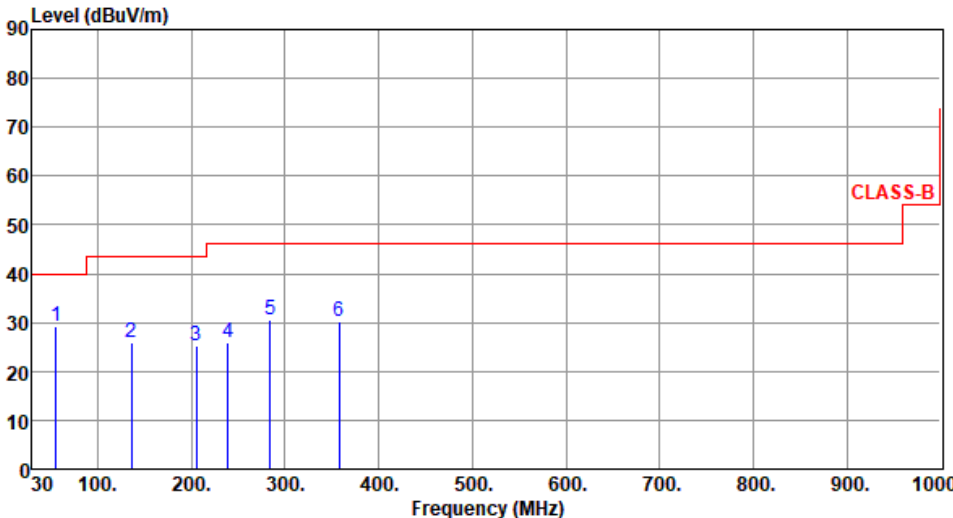
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.1.3 Test Setup



3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

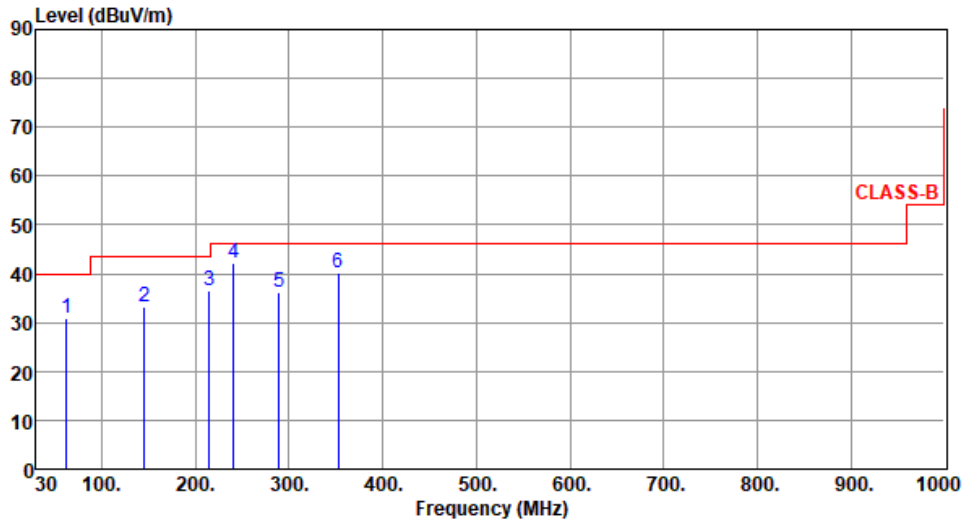
Test Mode	Mode 1: BT LE CH19 onboard + WIFI 2.4G 11b CH11 external antenna									
Polarization	Horizontal									
Test By :Brad Wu			Temperature(°C):24			Humidity(%):65				
 <p>The graph displays the radiated unwanted emissions level in dBuV/m across a frequency range from 30 MHz to 1000 MHz. A red step function represents the CLASS-B limit, which is 40 dBuV/m from 30 MHz to 100 MHz, 43 dBuV/m from 100 MHz to 200 MHz, 46 dBuV/m from 200 MHz to 300 MHz, and 50 dBuV/m from 300 MHz to 1000 MHz. Six blue vertical lines indicate measured peaks at 55.22 MHz, 133.79 MHz, 205.57 MHz, 243.40 MHz, 286.08 MHz, and 343.31 MHz. The emission levels at these peaks are 30.13, 35.20, 36.29, 36.68, 40.32, and 38.37 dBuV/m, respectively. All peaks are below the CLASS-B limit.</p>										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	55.22	30.13	40.00	-9.87	39.12	-8.99	Peak	---	---	
2	133.79	35.20	43.50	-8.30	44.70	-9.50	Peak	---	---	
3	205.57	36.29	43.50	-7.21	48.26	-11.97	Peak	---	---	
4	243.40	36.68	46.00	-9.32	46.92	-10.24	Peak	---	---	
5	286.08	40.32	46.00	-5.68	48.84	-8.52	Peak	---	---	
6	343.31	38.37	46.00	-7.63	45.60	-7.23	Peak	---	---	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + 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>										

Test Mode	Mode 1: BT LE CH19 onboard + WIFI 2.4G 11b CH11 external antenna									
Polarization	Vertical									
Test By :Brad Wu			Temperature(°C):24			Humidity(%):65				
										
	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	55.22	29.27	40.00	-10.73	38.26	-8.99	Peak	---	---	
2	135.73	25.88	43.50	-17.62	35.33	-9.45	Peak	---	---	
3	205.57	25.26	43.50	-18.24	37.23	-11.97	Peak	---	---	
4	239.52	25.90	46.00	-20.10	36.34	-10.44	Peak	---	---	
5	284.14	30.56	46.00	-15.44	39.15	-8.59	Peak	---	---	
6	357.86	30.14	46.00	-15.86	36.90	-6.76	Peak	---	---	

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV) + 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.

Test Mode	Mode 2: BT LE CH19 onboard + WIFI 5G 11a CH149 external antenna
Polarization	Horizontal

Test By :Brad Wu Temperature(°C):24 Humidity(%):65



	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	62.01	30.82	40.00	-9.18	40.47	-9.65	Peak	---	---
2	145.43	33.25	43.50	-10.25	42.46	-9.21	Peak	---	---
3	215.27	36.62	43.50	-6.88	48.56	-11.94	Peak	---	---
4	240.49	42.25	46.00	-3.75	52.61	-10.36	Peak	---	---
5	288.99	36.13	46.00	-9.87	44.53	-8.40	Peak	---	---
6	353.01	40.29	46.00	-5.71	47.25	-6.96	Peak	---	---

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

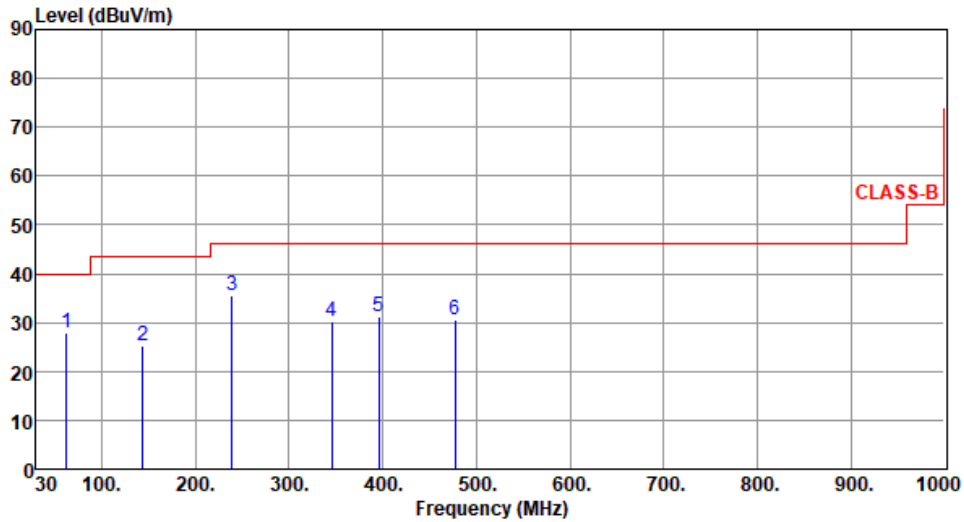
*Factor includes antenna factor , cable loss and amplifier gain

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.

Test Mode	Mode 2: BT LE CH19 onboard + WIFI 5G 11a CH149 external antenna
Polarization	Vertical

Test By :Brad Wu Temperature(°C):24 Humidity(%):65



	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	62.01	27.74	40.00	-12.26	37.39	-9.65	Peak	---	---
2	143.49	25.37	43.50	-18.13	34.40	-9.03	Peak	---	---
3	239.52	35.44	46.00	-10.56	45.88	-10.44	Peak	---	---
4	345.25	30.09	46.00	-15.91	37.29	-7.20	Peak	---	---
5	395.69	31.10	46.00	-14.90	36.98	-5.88	Peak	---	---
6	477.17	30.58	46.00	-15.42	34.40	-3.82	Peak	---	---

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

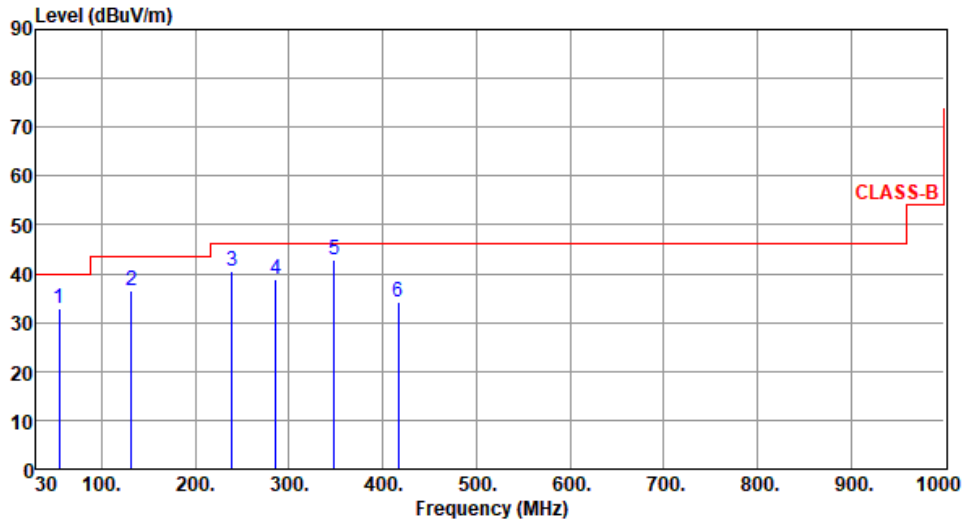
*Factor includes antenna factor , cable loss and amplifier gain

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.

Test Mode	Mode 3: WIFI 2.4G 11b CH11 external antenna + BT LE CH19 external antenna
Polarization	Horizontal

Test By :Brad Wu Temperature(°C):24 Humidity(%):65



	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	54.25	32.77	40.00	-7.23	41.75	-8.98	Peak	---	---
2	131.85	36.46	43.50	-7.04	46.04	-9.58	Peak	---	---
3	239.52	40.60	46.00	-5.40	51.04	-10.44	Peak	---	---
4	286.08	38.94	46.00	-7.06	47.46	-8.52	Peak	---	---
5	348.16	42.79	46.00	-3.21	49.92	-7.13	Peak	---	---
6	417.03	34.16	46.00	-11.84	39.47	-5.31	Peak	---	---

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

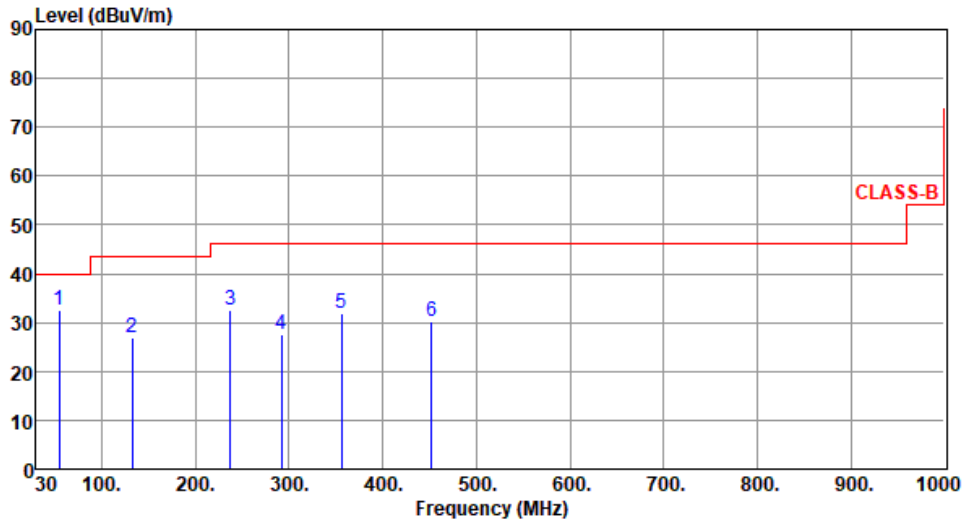
*Factor includes antenna factor , cable loss and amplifier gain

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.

Test Mode	Mode 3: WIFI 2.4G 11b CH11 external antenna + BT LE CH19 external antenna
Polarization	Vertical

Test By :Brad Wu Temperature(°C):24 Humidity(%):65



	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	54.25	32.46	40.00	-7.54	41.44	-8.98	Peak	---	---
2	132.82	26.79	43.50	-16.71	36.44	-9.65	Peak	---	---
3	237.58	32.64	46.00	-13.36	43.27	-10.63	Peak	---	---
4	291.90	27.59	46.00	-18.41	35.90	-8.31	Peak	---	---
5	355.92	31.96	46.00	-14.04	38.79	-6.83	Peak	---	---
6	451.95	30.06	46.00	-15.94	34.25	-4.19	Peak	---	---

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

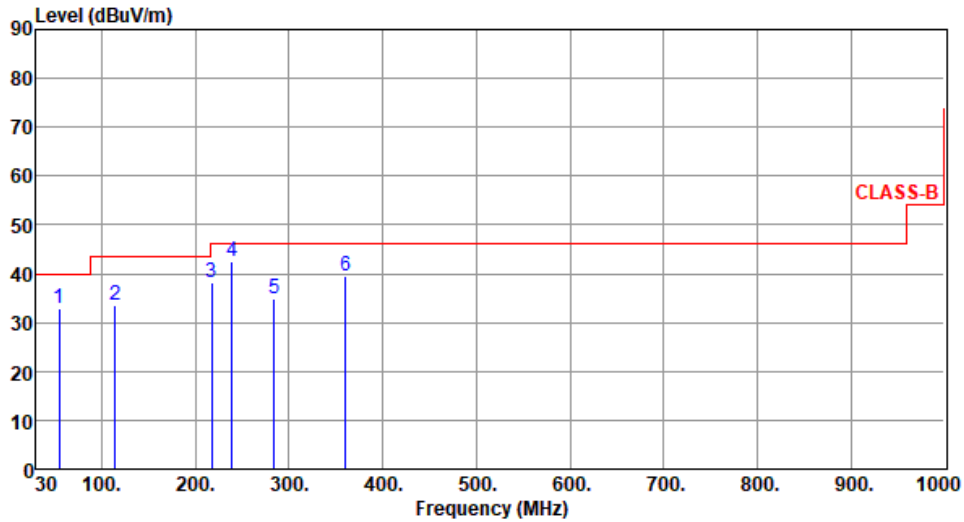
*Factor includes antenna factor, cable loss and amplifier gain

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.

Test Mode	Mode 4: WIFI 5G 11a CH149 external antenna + BT LE CH19 external antenna
Polarization	Horizontal

Test By :Brad Wu Temperature(°C):24 Humidity(%):65



	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	54.25	32.75	40.00	-7.25	41.73	-8.98	Peak	---	---
2	114.39	33.47	43.50	-10.03	44.65	-11.18	Peak	---	---
3	217.21	38.34	46.00	-7.66	50.29	-11.95	Peak	---	---
4	239.52	42.60	46.00	-3.40	53.04	-10.44	Peak	---	---
5	284.14	34.93	46.00	-11.07	43.52	-8.59	Peak	---	---
6	360.77	39.52	46.00	-6.48	46.16	-6.64	Peak	---	---

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

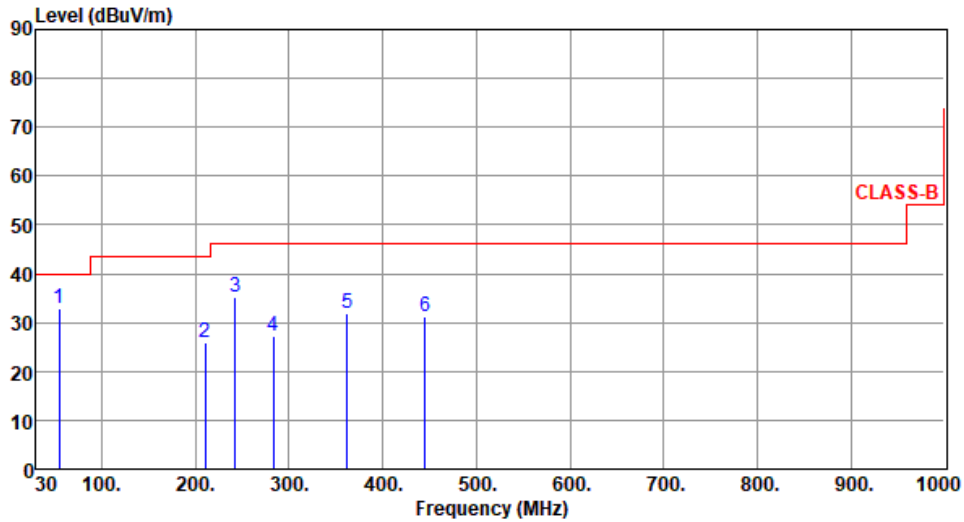
*Factor includes antenna factor , cable loss and amplifier gain

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.

Test Mode	Mode 4: WIFI 5G 11a CH149 external antenna + BT LE CH19 external antenna
Polarization	Vertical

Test By :Brad Wu Temperature(°C):24 Humidity(%):65



	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	54.25	33.04	40.00	-6.96	42.02	-8.98	Peak	---	---
2	210.42	25.94	43.50	-17.56	37.89	-11.95	Peak	---	---
3	242.43	35.15	46.00	-10.85	45.43	-10.28	Peak	---	---
4	283.17	27.11	46.00	-18.89	35.71	-8.60	Peak	---	---
5	361.74	31.85	46.00	-14.15	38.48	-6.63	Peak	---	---
6	445.16	31.08	46.00	-14.92	35.44	-4.36	Peak	---	---

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

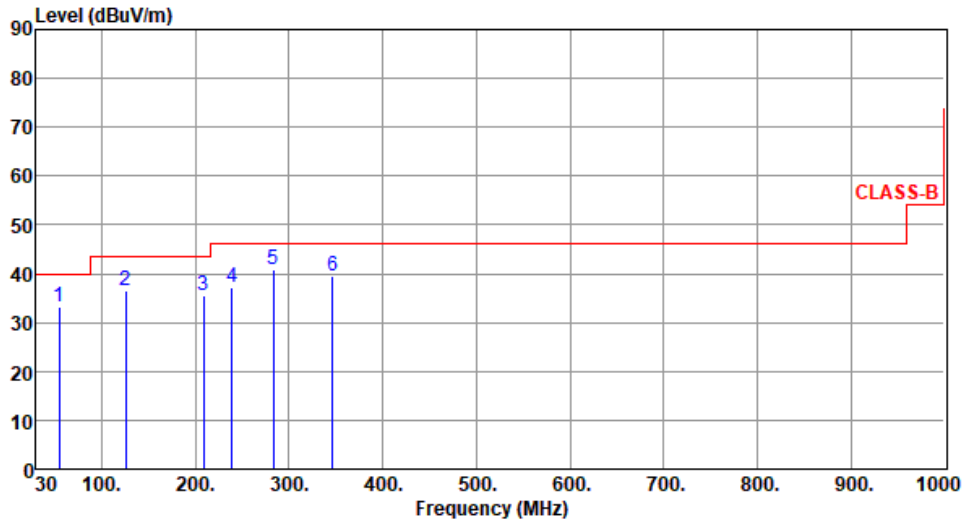
*Factor includes antenna factor, cable loss and amplifier gain

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.

Test Mode	Mode 5: WIFI 2.4G 11b CH11 onboard + BT LE CH19 external antenna
Polarization	Horizontal

Test By :Brad Wu Temperature(°C):24 Humidity(%):65



	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	54.25	33.04	40.00	-6.96	42.02	-8.98	Peak	---	---
2	126.03	36.54	43.50	-6.96	46.71	-10.17	Peak	---	---
3	208.48	35.40	43.50	-8.10	47.36	-11.96	Peak	---	---
4	239.52	37.11	46.00	-8.89	47.55	-10.44	Peak	---	---
5	283.17	40.83	46.00	-5.17	49.43	-8.60	Peak	---	---
6	346.22	39.49	46.00	-6.51	46.67	-7.18	Peak	---	---

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

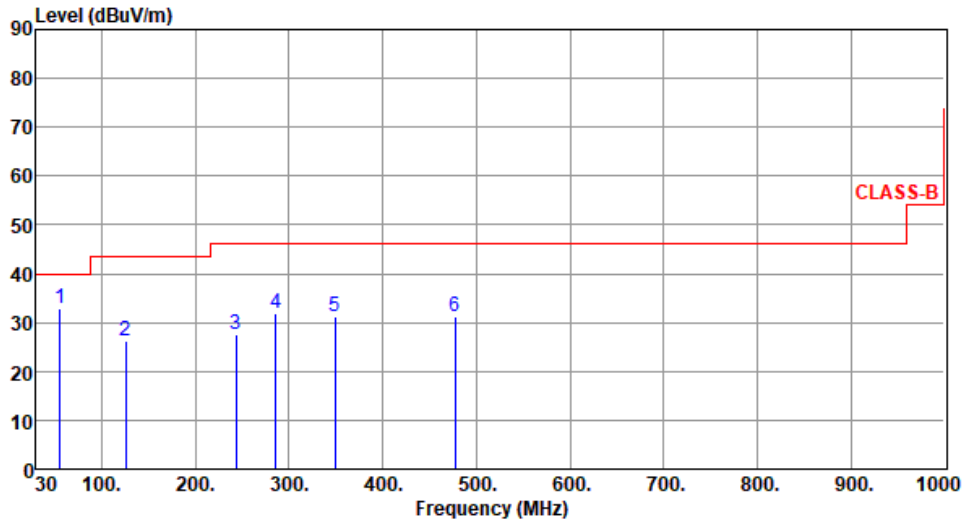
*Factor includes antenna factor , cable loss and amplifier gain

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.

Test Mode	Mode 5: WIFI 2.4G 11b CH11 onboard + BT LE CH19 external antenna
Polarization	Vertical

Test By :Brad Wu Temperature(°C):24 Humidity(%):65



	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	55.22	32.84	40.00	-7.16	41.83	-8.99	Peak	---	---
2	126.03	26.27	43.50	-17.23	36.44	-10.17	Peak	---	---
3	243.40	27.53	46.00	-18.47	37.77	-10.24	Peak	---	---
4	286.08	31.78	46.00	-14.22	40.30	-8.52	Peak	---	---
5	349.13	31.34	46.00	-14.66	38.45	-7.11	Peak	---	---
6	477.17	31.09	46.00	-14.91	34.91	-3.82	Peak	---	---

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

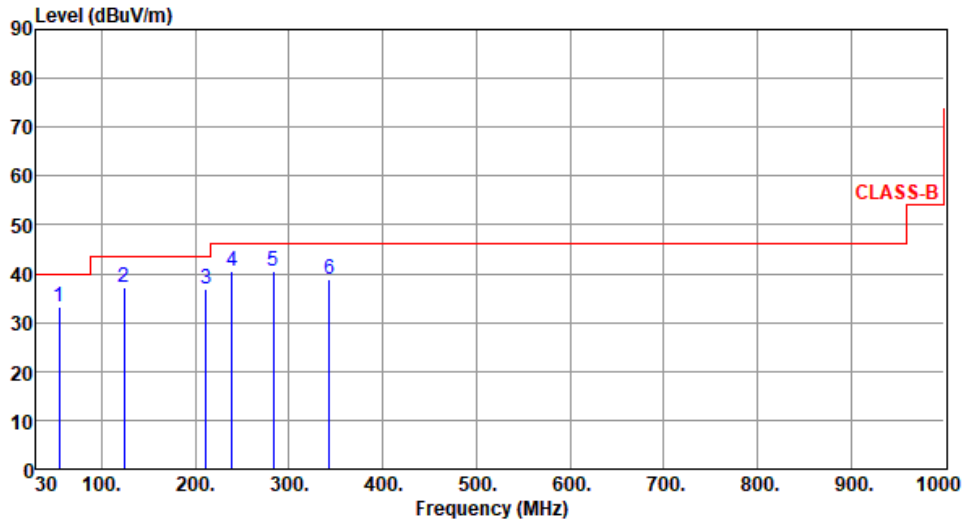
*Factor includes antenna factor , cable loss and amplifier gain

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.

Test Mode	Mode 6: WIFI 5G 11a CH149 onboard + BT LE CH19 external antenna
Polarization	Horizontal

Test By :Brad Wu Temperature(°C):24 Humidity(%):65



	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	54.25	33.30	40.00	-6.70	42.28	-8.98	Peak	---	---
2	124.09	37.34	43.50	-6.16	47.63	-10.29	Peak	---	---
3	211.39	37.01	43.50	-6.49	48.96	-11.95	Peak	---	---
4	239.52	40.53	46.00	-5.47	50.97	-10.44	Peak	---	---
5	283.17	40.41	46.00	-5.59	49.01	-8.60	Peak	---	---
6	343.31	38.93	46.00	-7.07	46.16	-7.23	Peak	---	---

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

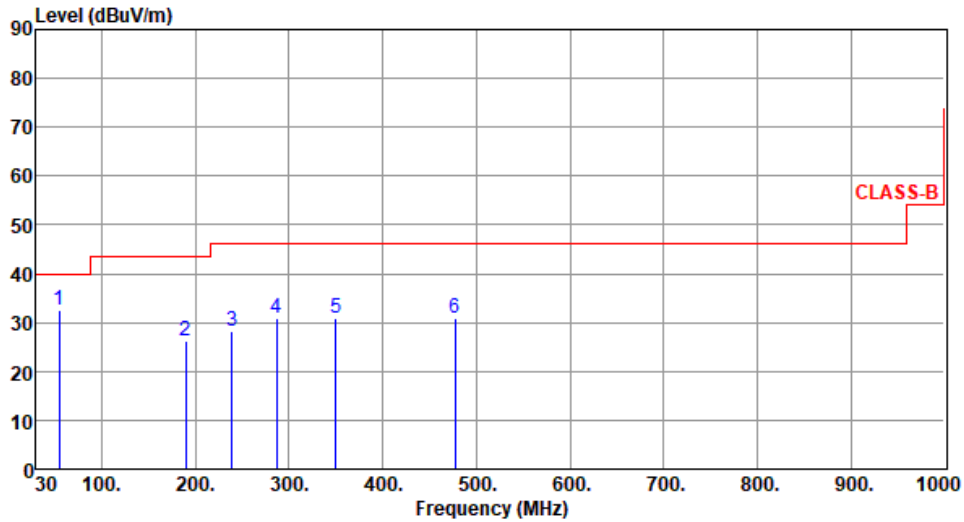
*Factor includes antenna factor , cable loss and amplifier gain

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.

Test Mode	Mode 6: WIFI 5G 11a CH149 onboard + BT LE CH19 external antenna
Polarization	Vertical

Test By :Brad Wu Temperature(°C):24 Humidity(%):65



	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	54.25	32.60	40.00	-7.40	41.58	-8.98	Peak	---	---
2	190.05	26.40	43.50	-17.10	37.81	-11.41	Peak	---	---
3	239.52	28.21	46.00	-17.79	38.65	-10.44	Peak	---	---
4	287.05	31.04	46.00	-14.96	39.52	-8.48	Peak	---	---
5	350.10	30.78	46.00	-15.22	37.86	-7.08	Peak	---	---
6	477.17	30.85	46.00	-15.15	34.67	-3.82	Peak	---	---

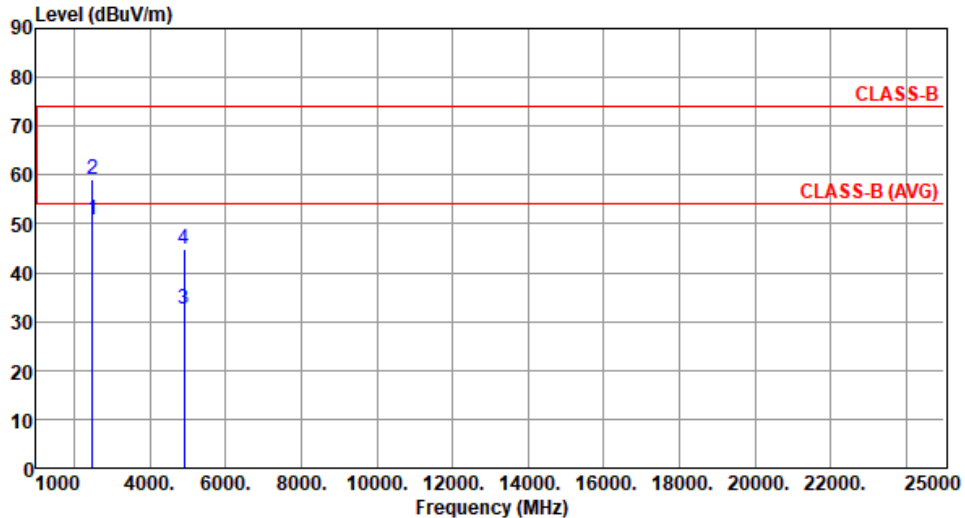
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

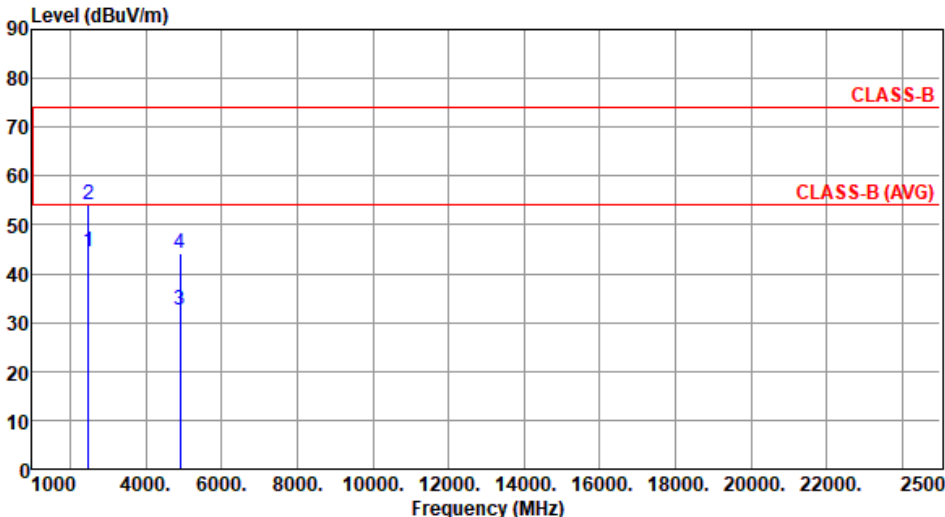
*Factor includes antenna factor , cable loss and amplifier gain

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.

3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Test Mode	Mode 1: BT LE CH19 onboard + WIFI 2.4G 11b CH11 external antenna									
Polarization	Horizontal									
Test By : Roger Lu			Temperature(°C): 23			Humidity(%): 67				
 <p>The graph displays the radiated unwanted emission levels in dBuV/m across a frequency range from 1000 MHz to 25000 MHz. Two horizontal red lines indicate the limits for CLASS-B (at approximately 75 dBuV/m) and CLASS-B (AVG) (at approximately 55 dBuV/m). Two vertical blue lines mark specific frequencies: 2484 MHz (labeled '2') and 4902 MHz (labeled '4').</p>										
	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	2484.00	50.78	54.00	-3.22	53.48	-2.70	Average	142	32	
2	2484.00	59.04	74.00	-14.96	61.74	-2.70	Peak	142	32	
3	4902.00	32.68	54.00	-21.32	28.59	4.09	Average	100	80	
4	4902.00	44.77	74.00	-29.23	40.68	4.09	Peak	100	80	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										

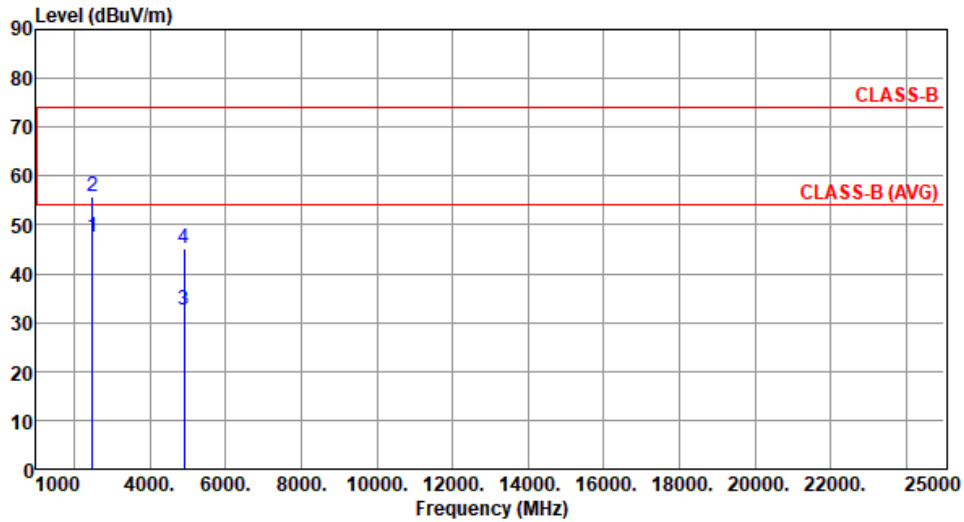
Test Mode	Mode 1: BT LE CH19 onboard + WIFI 2.4G 11b CH11 external antenna									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):23			Humidity(%):67				
										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m			dBuV			cm	deg	
1	2484.00	44.56	54.00	-9.44	47.26	-2.70	Average	105	176	
2	2484.00	54.16	74.00	-19.84	56.86	-2.70	Peak	105	176	
3	4902.00	32.51	54.00	-21.49	28.42	4.09	Average	100	40	
4	4902.00	44.22	74.00	-29.78	40.13	4.09	Peak	100	40	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										

Test Mode	Mode 2: BT LE CH19 onboard + WIFI 5G 11a CH149 external antenna									
Polarization	Horizontal									
Test By :Roger Lu			Temperature(°C):23			Humidity(%):67				
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	3305.00	29.62	54.00	-24.38	30.26	-0.64	Average	100	60	
2	3305.00	40.95	74.00	-33.05	41.59	-0.64	Peak	100	60	
3	8185.00	40.42	54.00	-13.58	30.56	9.86	Average	100	50	
4	8185.00	52.20	74.00	-21.80	42.34	9.86	Peak	100	50	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										

Test Mode	Mode 2: BT LE CH19 onboard + WIFI 5G 11a CH149 external antenna									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):23			Humidity(%):67				
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
								cm	deg	
1	3305.00	29.51	54.00	-24.49	30.15	-0.64	Average	100	20	
2	3305.00	40.49	74.00	-33.51	41.13	-0.64	Peak	100	20	
3	8185.00	40.21	54.00	-13.79	30.35	9.86	Average	100	40	
4	8185.00	52.05	74.00	-21.95	42.19	9.86	Peak	100	40	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										

Test Mode	Mode 3: WIFI 2.4G 11b CH11 external antenna + BT LE CH19 external antenna
Polarization	Horizontal

Test By :Roger Lu Temperature(°C):23 Humidity(%):67



	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	2484.00	47.52	54.00	-6.48	50.22	-2.70	Average	100	176
2	2484.00	55.64	74.00	-18.36	58.34	-2.70	Peak	100	176
3	4902.00	32.64	54.00	-21.36	28.55	4.09	Average	100	90
4	4902.00	45.04	74.00	-28.96	40.95	4.09	Peak	100	90

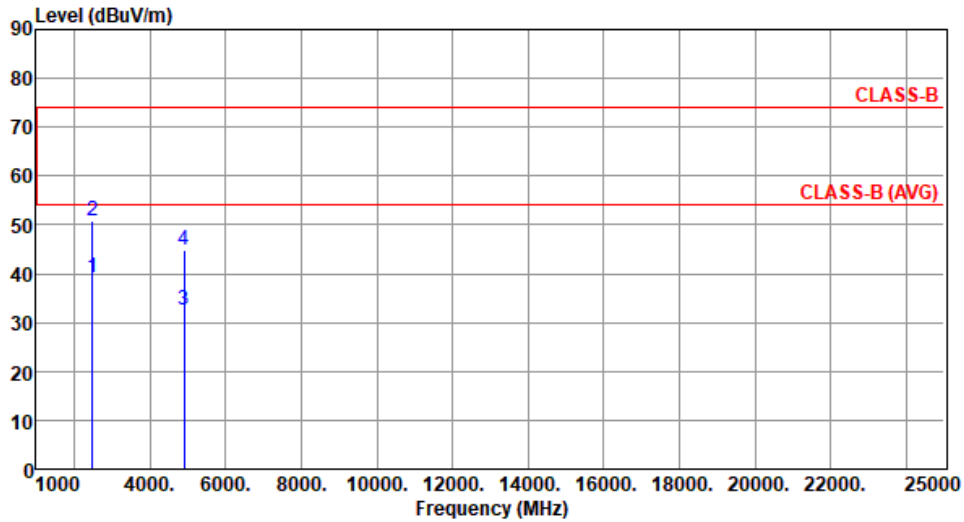
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Test Mode	Mode 3: WIFI 2.4G 11b CH11 external antenna + BT LE CH19 external antenna
Polarization	Vertical

Test By :Roger Lu Temperature(°C):23 Humidity(%):67



	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	2484.00	39.13	54.00	-14.87	41.83	-2.70	Average	105	6
2	2484.00	50.97	74.00	-23.03	53.67	-2.70	Peak	105	6
3	4902.00	32.44	54.00	-21.56	28.35	4.09	Average	100	60
4	4902.00	44.68	74.00	-29.32	40.59	4.09	Peak	100	60

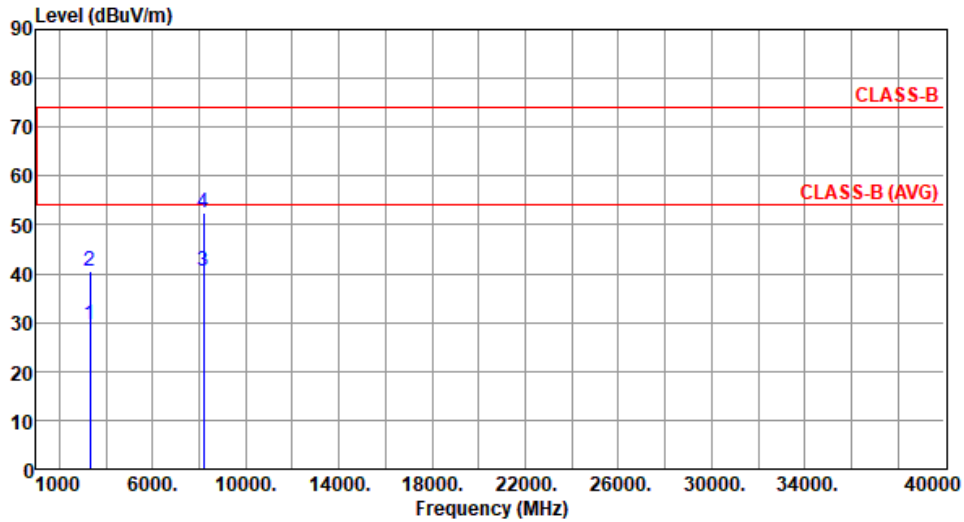
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Test Mode	Mode 4: WIFI 5G 11a CH149 external antenna + BT LE CH19 external antenna
Polarization	Horizontal

Test By :Roger Lu Temperature(°C):23 Humidity(%):67



	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	3305.00	29.54	54.00	-24.46	30.18	-0.64	Average	100	30
2	3305.00	40.62	74.00	-33.38	41.26	-0.64	Peak	100	30
3	8185.00	40.45	54.00	-13.55	30.59	9.86	Average	100	50
4	8185.00	52.34	74.00	-21.66	42.48	9.86	Peak	100	50

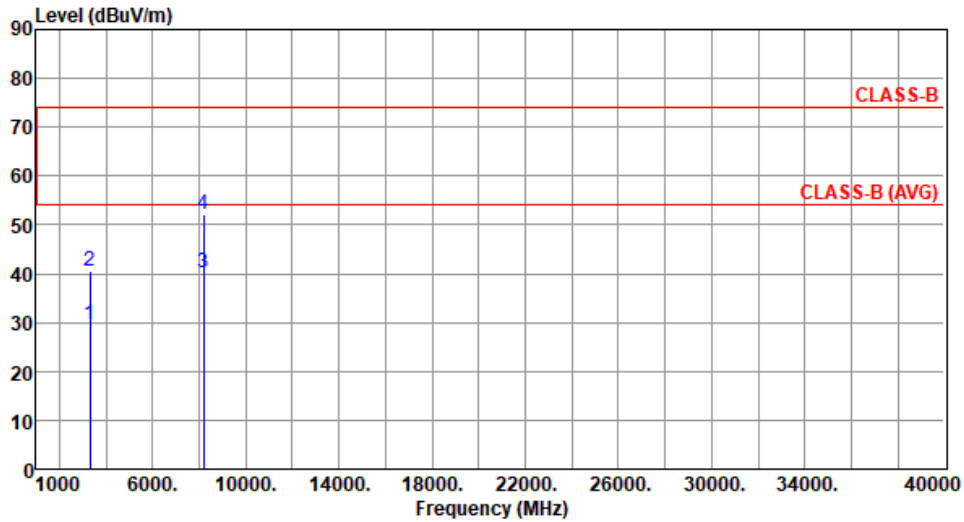
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Test Mode	Mode 4: WIFI 5G 11a CH149 external antenna + BT LE CH19 external antenna
Polarization	Vertical

Test By :Roger Lu Temperature(°C):23 Humidity(%):67



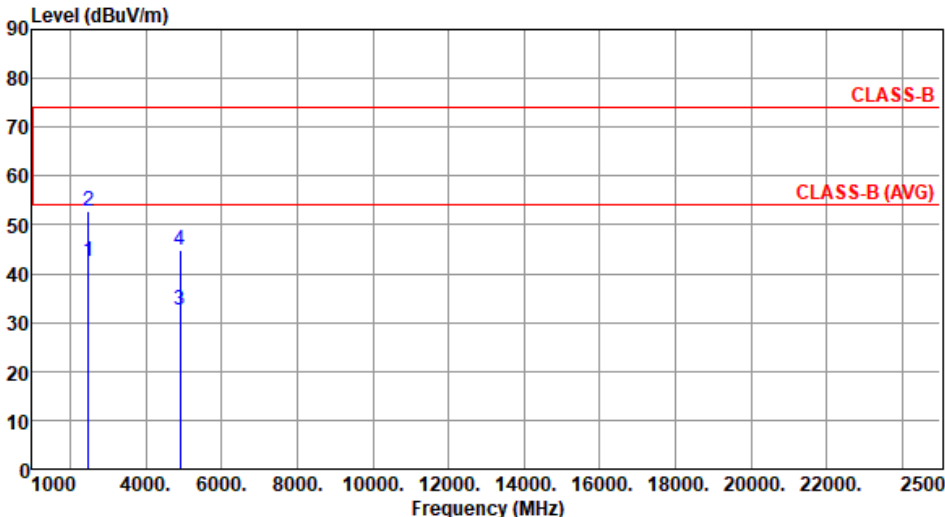
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	3305.00	29.42	54.00	-24.58	30.06	-0.64	Average	100	20
2	3305.00	40.42	74.00	-33.58	41.06	-0.64	Peak	100	20
3	8185.00	40.28	54.00	-13.72	30.42	9.86	Average	100	80
4	8185.00	52.17	74.00	-21.83	42.31	9.86	Peak	100	80

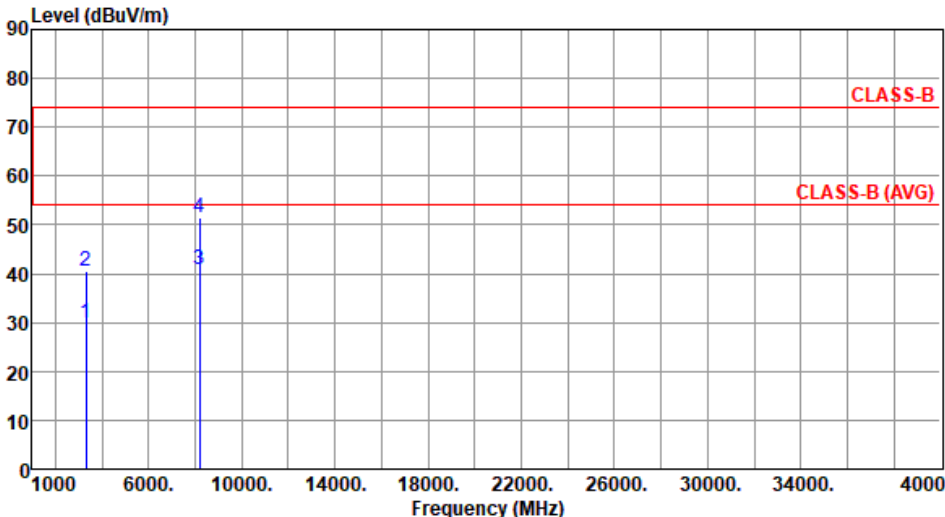
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

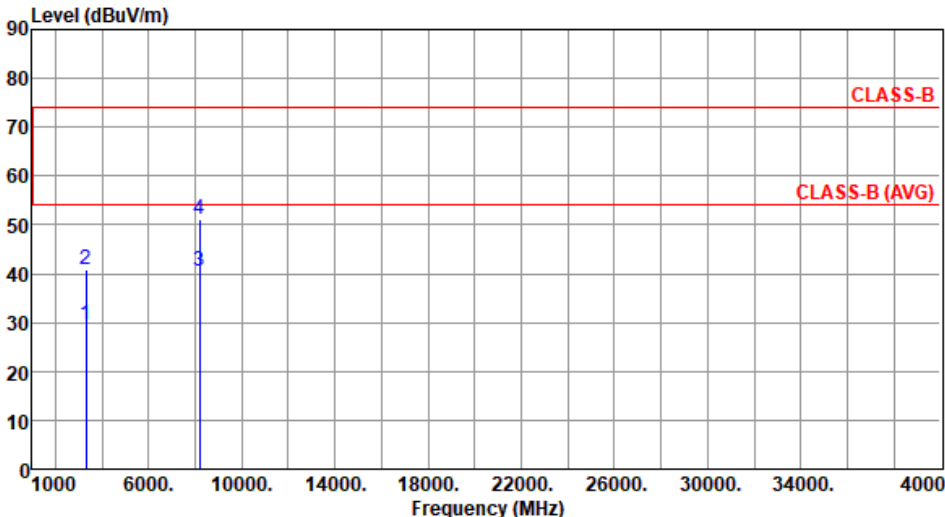
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Test Mode	Mode 5: WIFI 2.4G 11b CH11 onboard + BT LE CH19 external antenna									
Polarization	Horizontal									
Test By :Roger Lu			Temperature(°C):23			Humidity(%):67				
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	2484.00	46.57	54.00	-7.43	49.27	-2.70	Average	239	13	
2	2484.00	55.62	74.00	-18.38	58.32	-2.70	Peak	239	13	
3	4902.00	32.76	54.00	-21.24	28.67	4.09	Average	100	80	
4	4902.00	45.04	74.00	-28.96	40.95	4.09	Peak	100	80	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										

Test Mode	Mode 5: WIFI 2.4G 11b CH11 onboard + BT LE CH19 external antenna									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):23			Humidity(%):67				
										
	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	2484.00	42.35	54.00	-11.65	45.05	-2.70	Average	131	54	
2	2484.00	52.69	74.00	-21.31	55.39	-2.70	Peak	131	54	
3	4902.00	32.47	54.00	-21.53	28.38	4.09	Average	100	70	
4	4902.00	44.73	74.00	-29.27	40.64	4.09	Peak	100	70	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										

Test Mode	Mode 6: WIFI 5G 11a CH149 onboard + BT LE CH19 external antenna									
Polarization	Horizontal									
Test By :Roger Lu			Temperature(°C):23			Humidity(%):67				
										
	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	3305.00	29.92	54.00	-24.08	30.56	-0.64	Average	100	20	
2	3305.00	40.67	74.00	-33.33	41.31	-0.64	Peak	100	20	
3	8185.00	40.85	54.00	-13.15	30.99	9.86	Average	100	60	
4	8185.00	51.45	74.00	-22.55	41.59	9.86	Peak	100	60	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										

Test Mode	Mode 6: WIFI 5G 11a CH149 onboard + BT LE CH19 external antenna									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):23			Humidity(%):67				
										
	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	3305.00	29.64	54.00	-24.36	30.28	-0.64	Average	100	90	
2	3305.00	40.82	74.00	-33.18	41.46	-0.64	Peak	100	90	
3	8185.00	40.53	54.00	-13.47	30.67	9.86	Average	100	100	
4	8185.00	51.29	74.00	-22.71	41.43	9.86	Peak	100	100	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										

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>.

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