

MPE REPORT

Report No.: SRTC2022-9004(F)- 22110301(I)

Product Name: i1421-sw

Model Name: i1421-sw

Applicant: Barrot Technology Limited

Manufacturer: Barrot Technology Limited

Specification: FCC Part §2.1091, §2.1093, §1.1307(b), §1.1310 (2019)

FCC ID: 2AOXV-I1421-SW

The State Radio_monitoring_center Testing Center (SRTC)

15th Building, No.30 Shixing Street, Shijingshan District,

Beijing, P.R.China

Tel: 86-10-57996183 Fax: 86-10-57996388

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1 GENERAL INFORMATION

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio_monitoring_center Testing Center (SRTC). The test results relate only to individual items of the samples which have been tested. The certification and accreditation identifiers used in this report shall not be applicable to the tested or calibrated samples thereof. The manufacturer shall not mark the tested samples or items (or a separate part of the item) with the identifiers of certification and accreditation to mislead relevant parties about the tested samples or items.

1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Address:	15th Building, No.30 Shixing Street, Shijingshan District, P.R.China
City:	Beijing
Country or Region:	P.R.China
Contacted person:	Liu Jia
Tel:	+86 10 57996183
Fax:	+86 10 57996388
Email:	liujiaf@srtc.org.cn
Registration Number	239125
Designation Number	CN1267

1.3 Applicant's details

Company:	Barrot Technology Limited
Address:	A1009, Block A, Jia Hua Building, No.9 Shangdisanjie St, Haidian District, Beijing

1.4 Manufacturer's details

Company:	Barrot Technology Limited
Address:	A1009, Block A, Jia Hua Building, No.9 Shangdisanjie St, Haidian District, Beijing

1.5 Test environment

Date of Receipt of test sample at SRTC:	2022-11-04
Testing Start Date:	2022-11-13
Testing End Date:	2022-11-14

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	22	35

Normal Supply Voltage (V d.c.):	3.3
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2 DESCRIPTION OF THE DEVICE UNDER TEST

2.1 Final Equipment Build Status

Frequency Bands	BT: 2402MHz – 2480MHz WIFI2.4GHz: 2400MHz – 2483.5MHz WIFI5GHz UNII-1: 5150MHz – 5250MHz WIFI5GHz UNII-2A: 5250MHz – 5350MHz WIFI5GHz UNII-2C: 5470MHz – 5725MHz WIFI5GHz UNII-3: 5725MHz – 5850MHz
Mode	BT: GFSK / π /4DQPSK / 8DPSK WIFI2.4GHz: 802.11b/g/n HT20/n HT40 WIFI5GHz: 802.11a/n HT20/n HT40/ac VHT20/ac VHT40 /ac VHT80
Antenna Gain	WLAN2.4GHz: 3dBi WLAN5GHz: 3dBi BT: 3dBi
Power Supply	DC supply
Hardware Version	V2.0
Software Version	/

3 REFERENCE SPECIFICATION

Specification	Version	Title
2.1091	2022	Radio frequency radiation exposure evaluation: mobile devices.
2.1093	2022	Radio frequency radiation exposure evaluation: portable devices.
1.1307(b)	2022	Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.
1.1310	2022	Radio frequency radiation exposure limits.
KDB447498	October 23, 2015	RF exposure procedures and equipment authorization policies for mobile and portable devices

4 RESULT SUMMARY

No.	Test case	FCC reference
1	MPE Calculation	FCC Part §2.1091, FCC Part §2.1093, FCC Part §1.1307(b) FCC Part §1.1310 KDB 447498

This Test Report Is Approved by: Mr. Peng Zhen 彭振	Review by: Mr. Li Bin 李彬
Tested and issued by: Mr. Du Wei 杜威	Approved date: 20221114

5 TEST RESULTS

5.1 Average Power Output Test Result

WIFI 2.4GHz

Mode	Freq (MHz)	Average power output (dBm)	Tune-up (dBm)
802.11b	2412	15.76	16.0
802.11b	2437	15.09	15.5
802.11b	2462	14.09	14.5
802.11g	2412	9.13	9.5
802.11g	2437	7.86	8.0
802.11g	2462	6.97	7.0
802.11n HT20	2412	10.02	10.5
802.11n HT20	2437	8.74	9.0
802.11n HT20	2462	7.83	8.0
802.11n HT40	2422	8.79	9.0
802.11n HT40	2437	8.10	8.5
802.11n HT40	2452	7.40	7.5

WIFI5GHz UNII-1

Mode	Freq (MHz)	Average power output (dBm)	Tune-up (dBm)
802.11a	5180	13.90	14.0
802.11a	5220	14.73	15.0
802.11a	5240	14.94	15.0
802.11n HT20	5180	14.75	15.0
802.11n HT20	5220	15.47	15.5
802.11n HT20	5240	15.69	16.0
802.11ac VHT20	5180	14.92	15.0
802.11ac VHT20	5220	15.54	16.0
802.11ac VHT20	5240	15.68	16.0
802.11n HT40	5190	14.35	14.5
802.11n HT40	5230	15.03	15.5
802.11ac VHT40	5190	14.27	14.5
802.11ac VHT40	5230	15.01	15.5
802.11ac VHT80	5210	13.20	13.5

WIFI5GHz UNII-2A

Mode	Freq (MHz)	Average power output (dBm)	Tune-up (dBm)
802.11a	5260	14.37	14.5
802.11a	5280	14.72	15.0
802.11a	5320	15.06	15.5
802.11n HT20	5260	15.00	15.0
802.11n HT20	5280	15.23	15.5
802.11n HT20	5320	15.66	16.0
802.11ac VHT20	5260	14.78	15.0
802.11ac VHT20	5280	15.39	15.5
802.11ac VHT20	5320	15.65	16.0
802.11n HT40	5270	14.47	14.5
802.11n HT40	5310	14.93	15.0
802.11ac VHT40	5270	14.73	15.0
802.11ac VHT40	5310	15.16	15.5
802.11ac VHT80	5290	13.38	13.5

WIFI5GHz UNII-2C

Mode	Freq (MHz)	Average power output (dBm)	Tune-up (dBm)
802.11a	5500	13.26	13.5
802.11a	5580	13.26	13.5
802.11a	5700	12.23	12.5
802.11n HT20	5500	13.87	14.0
802.11n HT20	5580	13.88	14.0
802.11n HT20	5700	12.86	13.0
802.11ac VHT20	5500	13.94	14.0
802.11ac VHT20	5580	13.92	14.0
802.11ac VHT20	5700	12.95	13.0
802.11n HT40	5510	13.20	13.5
802.11n HT40	5590	13.06	13.5
802.11n HT40	5670	12.56	13.0
802.11ac VHT40	5510	13.36	13.5
802.11ac VHT40	5590	13.22	13.5
802.11ac VHT40	5670	12.71	13.0
802.11ac VHT80	5530	11.73	12.0
802.11ac VHT80	5610	11.54	12.0

WIFI5GHz UNII-3

Mode	Freq (MHz)	Average power output (dBm)	Tune-up (dBm)
802.11a	5745	12.05	12.5
802.11a	5785	12.49	12.5
802.11a	5825	12.33	12.5
802.11n HT20	5745	12.83	13.0
802.11n HT20	5785	13.30	13.5
802.11n HT20	5825	13.17	13.5
802.11ac VHT20	5745	12.86	13.0
802.11ac VHT20	5785	13.30	13.5
802.11ac VHT20	5825	13.15	13.5
802.11n HT40	5755	12.34	12.5
802.11n HT40	5795	12.74	13.0
802.11ac VHT40	5755	12.48	12.5
802.11ac VHT40	5795	12.79	13.0
802.11ac VHT80	5775	11.04	11.5

Bluetooth

Modulation type	Conducted Average Power(dBm)			Tune-up (dBm)
	2402MHz	2440MHz	2480MHz	
GFSK(DH5)	10.24	9.69	9.49	10.5
$\pi/4$ DQPSK(2DH5)	-1.50	-1.50	-1.75	-1.5
8DPSK(3DH5)	-1.58	-1.55	-1.84	-1.5

BLE

Modulation type	Conducted Average Power(dBm)			Tune-up (dBm)
	2402MHz	2440MHz	2480MHz	
GFSK (LE 1Mbps)	-5.85	-6.25	-6.25	-5.5

5.2 Calculation result

FCC LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

(A) Limits for Occupational/Controlled Exposure ☐

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure ☒

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

Calculation procedure:

According to §2.1091, §2.1093, §1.1307(b) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = PG / (4\pi R^2)$$

Where S = power density in mW/cm²

P = transmit power in mW

G = numeric gain of transmit antenna

R = distance (cm)

The calculations in the table below use the highest gain of antenna for client EUT. These calculations represent worst case in terms of the exposure levels.

Band	Freq. (MHz)	Maximum Power (dBm)	Ant Gain (dBi)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm	Limit (mW/cm ²)	Power Density / Limit
BT	2402	10.5	3.0	13.5	22.39	0.004	1.0	0.004
BLE	2402	-5.5	3.0	-2.5	0.56	0.001	1.0	0.001
WLAN2.4GHz	2412	16.0	3.0	19.0	79.43	0.016	1.0	0.016
WLAN5.2GHz	5240	16.0	3.0	19.0	79.43	0.016	1.0	0.016
WLAN5.3GHz	5320	16.0	3.0	19.0	79.43	0.016	1.0	0.016
WLAN5.6GHz	5580	14.0	3.0	17.0	50.12	0.010	1.0	0.010
WLAN5.8GHz	5785	13.5	3.0	16.5	44.67	0.009	1.0	0.009

Note1:

SAR considers the worst case, use Tune up with maximum power plus antenna gain as EIRP.

Note2:

For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.

Worst Simultaneous Transmission Result

BT Power Density / Limit	WLAN Power Density / Limit	Σ(Power Density / Limit) of BT+ WLAN
0.004	0.016	0.020

Note: Simultaneous Transmission Limit=Power Density₁/ limit₁ + Power Density₂/ limit₂<1

According to the KDB447498 D01 section 7.1 determine the device is exclusion from SAR test.

---End of Test Report---