

FCC ID : 2AOKI-AL7655B

1. RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) Radiation as specified in §1.1307(b).

Limits for Maximum Permissible Exposure (MPE).

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where

P_d = Power density in mW/cm².

P_{out} =output power to antenna in mW.

G = Numeric gain of the antenna relative to isotropic antenna.

π =3.1416.

R = distance between observation point and center of the radiator in 20cm.

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the nd total. power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

2. EUT TECHNICAL DESCRIPTION

Product Name:	WIFI BT Module
Model Number:	AL-7655B-WG-A, WF-M655-UWD1
Power Supply:	DC 3.3V
Temperature Range:	-10℃~70℃

Bluetooth Version:	V5.1
Data Rate:	1Mbps for GFSK modulation 2Mbps for pi/4-DQPSK modulation 3Mbps for 8DPSK modulation
Modulation:	GFSK, pi/4-DQPSK, 8DPSK
Operating Frequency Range:	2402-2480MHz
Number of Channels:	79 channels

BLE Version:	V5.1
Device Type:	Bluetooth with BLE mode
Data Rate :	1Mbps and 2Mbps
Modulation:	GFSK
Operating Frequency Range:	2402-2480MHz
Number of Channels:	40 Channels

IEEE 802.11 WLAN Mode Supported:	802.11b 802.11g 802.11n(20MHz channel bandwidth) 802.11n(40MHz channel bandwidth)
Modulation:	DSSS, OFDM
Operating Frequency Range:	2412-2462MHz for 802.11b/g/n(HT20) 2422-2452MHz for 802.11b/g/n(HT40)
Number of Channels:	11 channels for 802.11b/g/n(HT20) 7 Channels for 802.11n(HT40)
Smart System:	MIMO

WIFI Type:	UNII-1: 5150MHz-5250MHz Band UNII-2A: 5250MHz-5350MHz Band UNII-2C: 5470MHz-5725MHz Band UNII-3: 5725MHz-5850MHz Band
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WLAN Supported:	IEEE 802.11a IEEE 802.11n(20MHz channel bandwidth) IEEE 802.11n(40MHz channel bandwidth) IEEE 802.11ac(20MHz channel bandwidth) IEEE 802.11ac(40MHz channel bandwidth) IEEE 802.11ac(80MHz channel bandwidth)
Frequency Range:	5150MHz-5250MHz Band: 5180-5240MHz for 802.11a 5180-5240MHz for 802.11n(20) 5190-5230MHz for 802.11n(40) 5180-5240MHz for 802.11ac(20) 5190-5230MHz for 802.11ac(40) 5210MHz for 802.11ac(80) 5250MHz-5350MHz Band: 5260-5320MHz for 802.11a 5260-5320MHz for 802.11n(20) 5270-5310MHz for 802.11n(40) 5260-5320MHz for 802.11ac(20) 5270-5310MHz for 802.11ac(40) 5290MHz for 802.11ac(80) 5470MHz-5725MHz Band: 5500-5700MHz for 802.11a 5500-5700MHz for 802.11n(20) 5510-5670MHz for 802.11n(40) 5500-5700MHz for 802.11ac(20) 5510-5670MHz for 802.11ac(40) 5530-5610MHz for 802.11ac(80) 5725MHz-5850MHz Band: 5745-5825MHz for 802.11a 5745-5825MHz for 802.11n(20) 5755-5795MHz for 802.11n(40) 5745-5825MHz for 802.11ac(20) 5755-5795MHz for 802.11ac(40) 5775MHz for 802.11ac(80)
Modulation:	OFDM
TPC Function:	Not Support
Beamforming:	Support
DFS Function:	Slave
Smart System:	MIMO

3. Feature of EUT

a) Antenna information

Specification	Antenna	Brand	Model	Antenna Type	Gain
BT	1	/	/	External Antenna	3.93dBi
BLE	1	/	/	External Antenna	3.93dBi
2.4G WIFI	1	/	/	External Antenna	3.93dBi
2.4G WIFI	2	/	/	Integrated Antenna	3.47dBi
2.4G WIFI	Beamforming	/	/	/	4.43dBi
5G WIFI	1	/	/	External Antenna	5.19dBi
5G WIFI	2	/	/	Integrated Antenna	3.54dBi
5G WIFI	Beamforming	/	/	/	5.69dBi

Note: The antenna information provided by the manufacturer will have a certain impact on the test results.

b) Modification Record

There were no modifications required for compliance.

c) For more details, please refer to the user's manual of the EUT.

4. Measurement Result

Mode	Frequency (MHz)	Max Power (dBm)	Antenna gain (dBi)	Antenna Gain Numeric	R (cm)	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
BT	2402	8.74	3.93	2.47	20	0.004	1.0000
BLE	2402	13.61	3.93	2.47	20	0.011	1.0000
2.4G WIFI	2412	19.80	6.71	4.69	20	0.089	1.0000
5G WIFI	5180	20.13	7.41	5.51	20	0.113	1.0000

NOTE:

- (1) All the modes are tested, only the worst data are described in the table.
- (2) 2.4G WIFI: Ant1: 3.93dBi, Ant2: 3.47dBi, Directional gain: 6.71dBi.
- (3) 5G WIFI: Ant1: 5.19dBi, Ant2: 3.54dBi, Directional gain: 7.41dBi.

Conclusion of simultaneous transmitter:

They can transmit simultaneously, the formula of calculated the MPE is:

$CPD1/LPD1 + CPD2/LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

Therefore the worst-case situation is $0.004/1 + 0.011/1 + 0.089/1 + 0.113/1 = 0.217$, which is less than 1, this confirmed that the device comply with FCC 1.1310 MPE limit.

----- The End -----