

Maximum Permissible Exposure Evaluation

FCC ID: 2A47W-X9

1. Client Information

Applicant	:	Guangzhou Blueberry Photoelectric Technology Co., Ltd.
Address	:	Room 302, Building 2, Meidong Industrial Park, Tieshanhe Road, Sandong Avenue, Huadu District, Guangzhou, Guangdong Province, China.
Manufacturer	:	Guangzhou Blueberry Photoelectric Technology Co., Ltd.
Address	:	Room 302, Building 2, Meidong Industrial Park, Tieshanhe Road, Sandong Avenue, Huadu District, Guangzhou, Guangdong Province, China.

2. General Description of EUT

EUT Name	:	LED PROJECTOR	
Model(s) No.	:	X9, X8, X10, X15, X16, P6, P7, P8, P9, P10, Q7, Q8, Q9, Q10, BP-L500	
Product Description	:	Operation Frequency:	Bluetooth V5.0: 2402MHz~2480MHz 802.11b/g/n(HT20): 2412MHz~2462MHz 802.11n(HT40): 2422MHz~2452MHz
		Number of Channel:	Bluetooth 5.0(BDR+EDR): 79 channels 802.11b/g/n(HT20):11 channels 802.11n(HT40): 7 channels
		Antenna Gain:	2 dBi PIFA Antenna for WIFI -0.68 dBi PCB Antenna for BT
		Modulation Type:	GFSK, $\pi/4$ -DQPSK, 8-DPSK for BT 802.11b: DSSS(CCK, DQPSK, DBPSK) 802.11g/n:OFDM(BPSK,QPSK,16QAM,64QAM)
		Bit Rate of Transmitter:	GFSK(1Mbps) $\pi/4$ -DQPSK(2Mbps) 8-DPSK(3Mbps) 802.11b:11/5.5/2/1 Mbps 802.11g:54/48/36/24/18/12/9/6 Mbps 802.11n:up to 150Mbps
Power Supply	:	Input: AC 110V	
Software Version	:	HV501PJ.BE.210723	
Hardware Version	:	HV501PJ V56.13	
Remark: The antenna gain provided by the applicant, the adapter and verified for the RF conduction test and adapter provided by TOBY test lab.			

Note: More test information about the EUT please refer the RF Test Report.

MPE Calculations for BT

1. Antenna Gain:

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Antenna 1	PIFA Antenna	2412 MHz – 2462 MHz	2dBi
Antenna 2	PCB Antenna	2402 MHz – 2480 MHz	-0.68dBi

2. EUT Operation Condition:

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

3. Exposure Evaluation:

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where

S: power density

P: power input to the antenna

G: power gain of the antenna in the direction of interest relative to an isotropic radiator.

R: distance to the center of radiation of the antenna

4. Test Result:

Worst Maximum MPE Result								
Mode	N T x	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
802.11b	1	2412	16.556	16±1	17	2	20	0.0085
		2437	16.892	16±1	17	2	20	0.0085
		2462	17.062	17±1	18	2	20	0.0107
802.11g	1	2412	16.952	16±1	17	2	20	0.0085
		2437	17.585	17±1	18	2	20	0.0107
		2462	17.707	17±1	18	2	20	0.0107
802.11n(HT20)	1	2412	16.918	16±1	17	2	20	0.0085
		2437	17.396	17±1	18	2	20	0.0107
		2462	17.669	17±1	18	2	20	0.0107
802.11n(HT40)	1	2422	16.319	16±1	17	2	20	0.0085
		2437	16.457	16±1	17	2	20	0.0085
		2452	16.661	16±1	17	2	20	0.0085

BT(GFSK)	1	2402	1.117	1 ± 1	2	-0.68	20	0.0003
		2441	0.211	0 ± 1	1	-0.68	20	0.0001
		2480	-0.513	0 ± 1	1	-0.68	20	0.0001
BT($\pi/4$ -DQPSK)	1	2402	1.734	1 ± 1	2	-0.68	20	0.0003
		2441	0.687	0 ± 1	1	-0.68	20	0.0001
		2480	0.172	0 ± 1	1	-0.68	20	0.0001
BT(8DPSK)	1	2402	2.203	2 ± 1	3	-0.68	20	0.0003
		2402	1.081	1 ± 1	2	-0.68	20	0.0003
		2441	0.641	0 ± 1	1	-0.68	20	0.0001

Note:

(1) N_{TX} = Number of Transmit Antennas

(2) RF Output power specifies that Maximum Conducted Peak Output Power.

5. Measurement Results

Antenna 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11b	18.00	63.096	2	1.0000	100%	0.0199	1.0000
IEEE 802.11g	18.00	63.096	2	1.0000	100%	0.0199	1.0000
IEEE 802.11n HT20	18.00	63.096	2	1.0000	100%	0.0199	1.0000
IEEE 802.11n HT40	17.00	50.119	2	1.0000	100%	0.0158	1.0000

Antenna 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
BT(GFSK)	1.117	1.293	-0.68	1.0000	100%	0.0002	1.0000
BT($\pi/4$ -DQPSK)	1.734	1.491	-0.68	1.0000	100%	0.0002	1.0000
BT(8DPSK)	2.203	1.661	-0.68	1.0000	100%	0.0003	1.0000

6. Conclusion:

As specified in Table 1B of 47 CFR 1.1310- Limits for Maximum Permissible Exposure (MPE),

Limits for General Population/ Uncontrolled Exposure

Frequency Range (MHz)	Power density (mW/ cm ²)
300-1,500	F/1500
1,500-100,000	1.0

7. Summary simultaneous transmission results

The sample supports 2 antennas for 2.4G WLAN and BT. The 2.4G WLAN and BT can transmit simultaneous.

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

Σ of MPE ratios ≤ 1.0

Antenna 1 for 2.4GWLAN

Antenna 2 for BT

Modulation Type	MPE WIFI Ant 1 (mW/cm ²)	MPE BT Ant 2 (mW/cm ²)	Σ MPE ratios	Limit	Results
WIFI	0.0199	0.0003	0.0202	1.0	PASS

MPE limit S: 1mW/ cm²

The MPE is calculated as **0.0291 mW / cm² < limit 1mW / cm²**. So, RF exposure limit warning or SAR test are not required.

The EUT will only be used with a separation of 20cm or greater between the antenna and nearby persons and can therefore be considered a mobile transmitter per 47 CFR2.1091 (b).

The RF Exposure Information page from the manual is included here for reference.

Note

For a more detailed features description, please refer to the RF Test Report.

8. Conclusion:

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

-----END OF REPORT-----