

FCC&IC RF Exposure Evaluation

1. Product Information

FCC ID:	2AEUPBHAPB001
ISED:	20271-BHAPB001
Product name	Pathlight
Model number	5LP1Y8
Power supply	DC 6V
Modulation Type	BLE LoRa
Antenna Type	PCB Antenna(BT) Monopole Antenna type(Lora)
Antenna Gain	1 dBi (For BT); 3 dBi (For LoRa)
Bluetooth Operation frequency	2402MHz-2480MHz
Lora Operation frequency	902.5MHz – 927MHz
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Fix Device

2. Evaluation method and Limit

According to ANSI/IEEE C95.1-1992, the Criteria Listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
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
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
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
300-1,500			f/1500	30
1,500-100,000			1.0	30

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

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:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna

3. Antenna Information

Product can only use antennas certificated as follows provided by manufacturer;

Antenna Type:	Bluetooth	PCB Antenna
	LoRa	Monopole Antenna
Antenna gain:	Bluetooth	1dBi
	LoRa	3dBi

Note: The product has two antenna, BT and LoRa can not working simultanuously .

4. Conducted Power

4.1 Test Setup Block Diagram



4.2 Test Procedure

- 1) The EUT was directly connected to the spectrum analyser and antenna output port as show in the Block diagram;
- 2) Reading average power in peak detector.

4.3 Measurement Equipment

Item	Equipment	Manufacturer	Model No.	Inventory No.	Last Cal.	Next Cal.
1	Spectrum Analyzer	Keysight	N9010A	MY56070788	2019-01-23	2020-01-22

Conducted Power Results

BT V4.2

Mode	Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)
GFSK	0	2402	-10.543
	19	2440	-10.683
	39	2480	-10.671

Lora 500KHz DTS

Mode	Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)
Lora	Low	902.5	16.036
	Middle	913.7	16.172
	High	927.0	15.847

5. Manufacturing tolerance

Bluetooth

GFSK (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	-10	-10	-10
Tolerance \pm (dB)	1	1	1

Lora

Channel	Low	Middle	High
Target (dBm)	16	16	16
Tolerance \pm (dB)	1	1	1

6. Evaluation Results

FCC:

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Maximum Output Power Limit (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
Bluetooth	2402	1	-9	-8	0.000158	1.000	0.158	0.000032	1.000
LoRa	902.5	3	17	20	0.100	1.000	12.589	0.003	0.602

Stimulation Trasmission

Band	Frequency	Power Density / Limit	Σ (Power Density / Limit) Of LoRa + Bluetooth
Bluetooth	2402	0.000032	0.166132
Lora	902.5	0.1661	

Remark:

- Output power including tune up tolerance;
- Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna include in the simultaneous transmission)/(corresponding MPE limit)], for LoRa + Bluetooth.
- Considering the LoRa /Bluetooth transmitter of the EIRP performance listed in the table above,the aggregated (power density / limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant

7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 and RSS-102 Issue 5 for the uncontrolled RF Exposure.

.....THE END OF REPORT.....