



RF EXPOSURE EVALUATION

EUT Specification

EUT	Nanoleaf BLE&Thread-Matter module
Model Number	NL04A
FCC ID	2AEWY-NL04A
Antenna gain (Max)	2.15dBi
Operation Frequency	BLE:2.402-2.480GHz Thread: 2.405-2.480GHz
Input Rating	DC 2.7V~3.8V
Max. output power	BLE: 8.71dBm(0.0074W) Thread: 9.1dBm(0.0081W)

Test Requirement:

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/cm ²)	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

11.1 Friis transmission formula: $P_d = \frac{P_{out} * G}{4 * \pi * R^2}$

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

Under the limit of MPE, $1\text{mW}/\text{cm}^2$. If we know the maximum gain of the antenna, through the calculation, we will know the distance where the MPE limit is reached.

11.2 Measurement Result

Antenna gain: 2.15 dBi

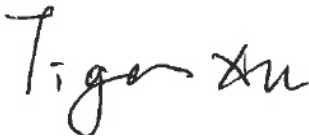
BLE:

Mode	Channel Freq. (MHz)	Measured power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain (Numeric)	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
GFSK	2402	8.09	8±1	9	1.641	0.002593	1
GFSK	2440	8.45	8±1	9	1.641	0.003265	1
GFSK	2480	8.71	9±1	10	1.641	0.003265	1

Thread:

Mode	Channel Freq. (MHz)	Measured power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain (Numeric)	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
O-QPSK	2405	8.48	8±1	9	1.641	0.002593	1
O-QPSK	2440	8.80	9±1	10	1.641	0.003265	1
O-QPSK	2480	9.10	9±1	10	1.641	0.003265	1

Signature:



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Date: 2022-08-02