

Maximum Permissible Exposure Evaluation

FCC ID:2AW72-K8

1. Client Information

Applicant	:	GUANGDONG AP TENON SCI.&TECH. CO.,LTD.
Address	:	No.3, Zexi Street, Hanxi Business Center, Panyu district, GuangZhou, GuangDong, China
Manufacturer	:	GUANGDONG AP TENON SCI.&TECH. CO.,LTD.
Address	:	No.3, Zexi Street, Hanxi Business Center, Panyu district, GuangZhou, GuangDong, China

2. General Description of EUT

EUT Name	:	SMART LOCK
Model(s) No.	:	K8, K Series
Model Difference	:	All PCB boards and circuit diagrams are the same, the only difference is that appearance.
Product Description	:	Operation Frequency: Bluetooth LE 5.0:2402MHz~2480MHz NFC: 13.56MHz
Power Supply	:	Input: DC 6V/1A
Li-ion Polymer Battery	:	DC 1.5V by AAA battery*4
Software Version	:	V102
Hardware Version	:	V1.0.1

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

1. Antenna Gain:

PCB Antenna for BLE: 2.5dBi.

Coil Antenna for NFC: 1dBi.

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								
Bluetooth LE Mode								
Mode	N _{TX}	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]
1Mbps	1	2.402	0.794	1±1	2	2.5	20	0.0006
		2.440	0.498	0±1	1	2.5	20	0.0004
		2.480	0.501	1±1	2	2.5	20	0.0006
2Mbps	1	2.402	0.766	1±1	2	2.5	20	0.0006
		2.440	0.41	0±1	1	2.5	20	0.0004
		2.480	0.445	0±1	1	2.5	20	0.0004

Note:
 (1) N_{TX}= Number of Transmit Antennas
 (2) RF Output power specifies that Maximum Conducted Peak Output Power.

$$E = \text{EIRP} - 20\log D + 104.8$$

where:

E = electric field strength in dB μ V/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

$$\text{EIRP} = E - 104.8 + 20\log D = 52.81 - 104.8 + 20\log 3 = -42.45 \text{ dBm}$$

NFC					
Frequency (MHz)	Measured Power (dBm)	Tune up Tolerance \pm (dB)	Max tune up power (dBm) [P]	Power Density (mW/cm ²) [S]	Limit (mW)
13.56	-42.45	-42 \pm 1	-41	0.00000002	1

5. Conclusion:

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

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
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 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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

For BLE&NFC

BLE MPE (Ratio)	NFC MPE (Ratio)	simultaneous MPE (Ratio)	MPE Limits (Ratio)
0.0004	0.00000002	0.00040002	1.0000

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.

6. 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-----