

1. RF Exposure Requirements

1.1 General Information

Client Information

Applicant: PIN GENIE, INC. DBA LOCKLY
Address of applicant: 676 Transfer Rd., St. Paul, MN 55114

Manufacturer: Smart Electronic Industrial (Dong Guan) Co., Ltd.
Address of manufacturer: Qing Long Road, Long Jian Tian Village, Huang Jiang Town, Dong Guan, Guang Dong, China

General Description of EUT:

Product Name: INGRESS VISION SMART ACCESS CONTROL
Trade Name: LOCKLY
Model No.: PGI303FC
Adding Model(s): /
Rated Voltage: DC12V
FCC ID: 2ASIV-PGI303FC
Equipment Type: Fixed device

Technical Characteristics of EUT:

Bluetooth

Bluetooth Version: V5.0 (BLE mode)
Frequency Range: 2402-2480MHz
RF Output Power: 0.48dBm (Conducted)
Data Rate: 1Mbps
Modulation: GFSK
Quantity of Channels: 40
Channel Separation: 2MHz
Type of Antenna: FPC Antenna
Antenna Gain: 2.3dBi

2.4G

Frequency Range: 2403.01-2471.01MHz
RF Output Power: 20.77dBm (Conducted)
Modulation: GFSK
Quantity of Channels: 18
Channel Separation: 4MHz
Type of Antenna: FPC Antenna
Antenna Gain: 2.3dBi

SRD

Frequency Range:	433.97-443.97MHz
Max. Field Strength:	433.97MHz: 78.64dBuV/m(3m) 443.97MHz: 80.96dBuV/m(3m)
Data Rate:	/
Modulation:	ASK
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi

NFC

Support Standards:	NFC
Frequency Range:	13.56MHz
Max. Field Strength:	55.05dBuV/m (at 3m)
Antenna Type:	Integral Antenna
Antenna Gain	0dBi

1.2 RF Exposure Exemption

According to §1.1307(b)(3) and 447498 D04 Interim General RF Exposure Guidance v01, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Option A: FCC Rule Part 1.1307 (b)(3)(i)(A): The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

Option B: FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option C: FCC Rule Part 1.1307 (b)(3)(i)(C): The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$
1.34-30	$3,450 R^2/f^2$
30-300	$3.83 R^2$
300-1,500	$0.0128 R^2f$
1,500-100,000	$19.2R^2$

For Multiple RF sources: FCC Rule Part 1.1307(b)(3)(ii):

- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).
- (B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

1.3 Calculated Result

Radio Access Technology	Prediction Frequency (MHz)	Output Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	Tune-Up Time-Averaged Power (dBm)	ERP (dBm)
Bluetooth	2402	0.48	2.3	100	1.00	1.15
2.4G	2403.01	20.77	2.3	100	21.00	21.15
SRD	433.97	-14.30	0	/	-14.0	-16.15
NFC	13.56	-40.21	0	/	-40.00	-42.15

Frequency (MHz)	Option	Min. Distance	Max. Power		Exposure Limit	Ratio	Result
		(cm)	(dBm)	(mW)	(mW)		Pass/Fail
2402	C	20.00	1.15	1.30	768.00	0.01	Pass
2403.01	C	20.00	21.15	130.32	768.00	0.17	Pass
433.97	C	20.00	-16.15	0.02	222.19	0.01	Pass
13.56	C	20.00	-42.15	0.01	750.52	0.01	Pass

Note: 1. a. $\text{Time-Averaged Power} = \text{Output Power} * \text{Duty Cycle}$;

$\text{ERP} = \text{Time-Averaged Power} + \text{Antenna gain} - 2.15\text{dB}$;

b. $\text{EIRP} = E - 104.8 + 20\log D$; $\text{Output Power} = \text{EIRP} - \text{Antenna Gain}$;

$\text{ERP} = \text{EIRP} - 2.15\text{dB}$

2. Option A, B and C refers as clause 1.2.

3. For option B, Max (time-averaged power, effective radiated power (ERP)) converts to Max. Power. For option C, ERP converts to Max. Power;

4. For option B, P_{th} (mW) converts to Exposure Limit (mW); For option C, ERP (W) converts to Exposure Limit (mW).

5. $\text{Ratio} = \text{Tune-Up ERP (mW)} / \text{Exposure Limit (mW)}$

Mode for Simultaneous Multi-band Transmission:

Radio Access Technology	Ratio 1	Ratio 2	Ratio 3	Ratio 4	Simultaneous Ratio	Limit	Result
							Pass/Fail
Bluetooth+2.4G+SRD+NFC	0.01	0.17	0.01	0.01	0.2	1	Pass

Result: Pass